Department of Civil Engineering and Energy Technology

Energy and Environment in Buildings - Master

Master thesis

Experimental study on cooking emissions and kitchen contamination risks in Norwegian dwellings

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ABSTRACT

This thesis is a part of the Healthy Energy-efficient Urban Home Ventilation project at SINTEF Community. The projects consists of advanced residential exposure studies where the main goal is to come with new knowledge and recommendations regarding the ventilation in residential buildings in urban environments. In this thesis several experiments have been performed with different ventilation and meals where particles have been measured in different locations including the breathing zone, middle of the room and sitting zone.

3 key words:
COOKING EMISSIONS
URBAN VENTILATION
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Summary

Indoor air quality is important for both health and well being, with the COVID-19 pandemic, indoor quality has been of even greater significance. Modern buildings are built more space efficient and tight open plan solutions are becoming more common. This has therefore led to a growing awareness regarding the exposures from cooking and the adverse effects it may lead to, whereas today's kitchen ventilation requirements may not be sufficient to remove these pollutants.

A series of experiments were performed at SINTEF communities ventilation test room. These experiments included testing TEK17s minimum kitchen ventilation requirements. Also, three different typically Norwegian test meals were considered and these were tested with two different ventilation scenarios. One low ventilation scenario with only primary ventilation and one high ventilation scenario with primary ventilation with additional ventilation from the hood at level 2. Moreover, for one of the test meals, experiments were performed with varying portion sizes. In addition various usage patterns of the kitchen hood were investigated towards understanding the kitchen emission and exposure.

Similar to previous findings, the cooking emissions varied with the different food type, ventilation rate, cooking style, and temperature. The $PM_{2.5}$ peak emissions from the different test meals with only primary ventilation were found to be in the range of 38.9 to 84.6 $\mu g/m^3$. While when the hood was on level 2, the $PM_{2.5}$ levels of the meals lie between 0.7 to 1.6 $\mu g/m^3$, showing the importance of using the range hood. The TEK17 ventilation scenario got a peak $PM_{2.5}$ value of $14.8 \mu g/m^3$ in the middle of the room. However, the cook was exposed to up to 10 times higher amounts of particles during cooking. Furthermore, leaving the hood on for the entire experiment time versus turning it off right after the cooking time had little impact on particle emissions in all measuring locations. In contrast, when the hood was turned on 5 minutes after the beginning of the cook the particle emissions increased significantly, especially in location 1. Finally, the portion size of the meal did not show any great significance on the PM concentrations when the hood was turned on.

Preface

This Master thesis has been completed as a part of the master in Energy and Environment in buildings at Oslo Metropolitan University. The thesis is a part of the Healthy Energy-efficient Urban Home Ventilation project at SINTEF community, and is written in collaboration with them.

I would especially like to thank my supervisors Arnab Chaudhuri and Kari Thunshelle. You have provided me with plenty of guidance and have supported me throughout the whole project period, your help has been invaluable. I would also like to thank Peter Schild, Aileen Yang, Bjørn Ludvigsen who have provided assistance whenever needed and added value to this project, for that I am grateful.

Moreover, a big thank you to my lab partner Zahra Amgaisi Fulsebakke, who has kept me motivated throughout this whole project with her good company. She has also assisted me when needed with the experiments and the thesis discussions.

Lastly, I would like to thank my family and friends for supporting me throughout the entire process.

Adele Jutulstad: ____

Master in Energy and Environment in Buildings

Oslo, 30 June, 2021

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LIST OF ABBREVIATIONS

C | N | P | T | U | W

C

CO carbon monoxide.

N

NO_2 nitrogen dioxide.

P

PAHs polycyclic aromatic hydrocarbons.
PM particulate matter.
PM_1 PM of 1μm and less.
PM_{10} PM of 10μm and less.
$PM_{2.5}$ PM of 2.5μm and less.

T

TEK 17 Norwegian directive for technical requirements in buildings.
TSPs Total suspended particles.

U

UFP ultrafine particles, PM of 0.1 μm and less.

W

WHO World Health Organisation.

1
INTRODUCTION

Indoor air quality is important for both health and well-being. Indoor air pollution was reported to be responsible for 2.7 % of the global burden disease and is presumed by World Health Organisation (WHO) to have caused more than 4.3 million deaths in year 2014 [1] [2]. During the Covid 19 pandemic indoor air quality has been of even greater significance as most people have spend a greater amount of their time indoors.

Most indoor pollution comes from smoking, cleaning products, consumer products and cooking activities. Cooking has been identified as one of the most significant sources of indoor pollution and particle emissions[3]. Emissions from cooking are a product from two main sources; the emissions from the stove used and the emissions produced from cooking the food itself.

The emissions from the stove depends highly on the type used, both gas and electric coil burners have shown to have significant emission such as ultrafine particles, PM of 0.1 μm and less (UFP), formaldehyde, carbon monoxide (CO), and nitrogen dioxide (NO_2). However, these types of stoves are uncommon in Norway, where the most used stoves are electric or induction and these have significantly fewer emissions.

The emissions from the cooking process depends on the type of food, method of cooking, and cooking temperature, where the main emission include particulate matter (PM), acrolein and polycyclic aromatic hydrocarbons (PAHs). All these emissions impact the indoor air quality and human health[4] [5] [6].

PAHs emitted from cooking activities have been shown to have potential carcinogenic effects. A recent study showed that the indoor UFP concentration increased by a factor of 10 during cooking periods. These particles are so small that they can penetrate deep into the respiratory system and may also be transferred into the bloodstream through lung alveoli. This type of exposure may cause adverse health effects such as cardiovascular disease, DNA damage, and may aggravate cough or attacks for people with asthma[4]. Similarly, PM of 2.5μm and less ($PM_{2.5}$) have been shown to increase by a factor of 3, and PM emitted from cooking oil fumes have been associated with respiratory problems, lung cancer and cardiopulmonary death [5][7].

Studies from other countries have shown that the the standard kitchen ventilation requirements in Norway may not be sufficient to remove acceptable levels of particle matter.

Moreover, as today's buildings are built more energy and space efficient in order to achieve more sustainable cities. This results in more compact and tight apartments and open plan solutions are becoming more common. The URBAN ventilation research project investigates the challenges and solutions in regards of energy efficient ventilation systems that also takes good indoor climate and thermal comfort into consideration.

The aim of this study is to come with new recommendations for urban building ventilation systems in order to remove sufficient amount of emissions. This master thesis will look at kitchen ventilation systems and exposure from different meals in urban buildings.

1.1 Problem statement

In order to come with new recommendations, more research has to be done within common Norwegian meals, kitchen ventilation usage patterns, portion sizes and different exhaust flow rates. The research questions to be answered are therefore:

1. What consequence does different Norwegian meals and cooking style have in regards of exposure, air quality and particle pollution?

2. How does the emissions from cooking affect other areas in open plan kitchen and living rooms spaces, and how long does it take for the emissions to recede?

3. How much does the exposure vary with usage patterns such as when exhaust is

turned on and off?

4. How much difference in exposure is there when cooking the same meal but different portion sizes?

5. How does the emissions from Scandinavian cooking compare to other western styles of cooking?

1.2 Prerequisites and limitations

This project is seen as an important step towards finding new recommendations for kitchen ventilation requirements . The project could have been done with even more detail and more experiments could have been performed. However, due to the deadline, COVID 19 restrictions and delays, some limits had to be set.

The experiments performed were supposed be be performed with one of each particle counter in measuring location 1 and 3. But due to lack of instruments only the Aerotrak measured in all locations, while it was decided to place the GRIMM and Ptrak in the middle of the room(location 2) to record an estimated middle value between the cook making food(location 1) and the dining area(location 3) in the room.
Moreover, due to lack of time and other limitations, not all instruments were factory calibrated before the experiments. The calibration data and dates of each instrument is mentioned and discussed in the method chapter.

The project was initially supposed to test both a wall mounted exhaust hood, a recirculating hood and a down draft exhaust hood. However, because of the time it took to get the test room up and running, only the wall mounted exhaust hood was tested due to time restrictions.

Moreover, a more detailed regulation of the raw data could have been done. In this case, the background particle count was regulated against the average background PM values at the beginning of each test day.

2
THEORY AND LITERATURE

This chapter presents regulations for kitchen ventilation in Norway and test standards for kitchen ventilation. The chapter will also look into previous relevant research regarding exposure from cooking.

2.1 Kitchen ventilation and standards

There are three main ventilation methods, these are: natural, mechanical and balanced ventilation. SINTEF Building Research Design Guides(SINTEF) recommends that new ventilation systems are balanced. This is because natural and mechanical ventilation in most cases deviates from the requirements set by TEK 17. With natural and mechanical ventilation the supply air requirements are difficult to adhere to as these are difficult to control. Due to this, most new ventilation systems today are balanced, meaning there is an equal supply and exhaust air volume[8].

The general outline of a modern apartment ventilation system is that air is supplied into spaces like living room and bedroom, which are the least polluted areas. The supply air is then moved to the kitchen and bathroom where the exhaust is located. This is to prevent spreading pollution, smell and moisture accumulation from cooking and bathroom usage. Figure 2.1 shows a typical apartment ventilation outline. This floor plan shows an open plan kitchen solution where the kitchen and living room are in a mutual space [9].

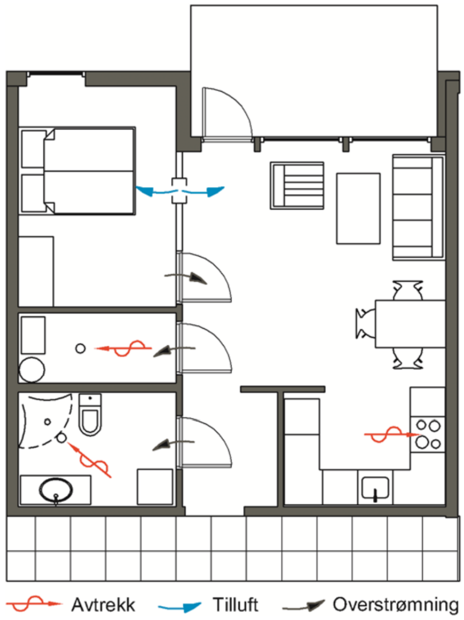

Figure 2.1: Example of an apartment with open plan solution and a balanced ventilation system [9].

2.1.1 Requirements and recommendations for kitchen ventilation

TEK 17 presents different requirements for kitchen ventilation in apartment buildings, while SINTEF Building Research Design Guides(SINTEF) comes with recommendations.

TEK17 requires ventilation that ensures an average fresh air supply of $1.2m^3/h$ per m^2 and that bedrooms must be supplied with a minimum of 26 m^3/h per person sleeping in the bedroom. In addition a minimum of $0.7m^3/h$ per m^2 is required in spaces that are not intended for longer stays.

The general governmental requirements and recommendations for kitchen ventilation systems are as follows [10]:

- The kitchen is required to have a minimum primary exhaust of 36 m^3/h, this should always be on. In addition the kitchen should have a minimum additional exhaust when cooking of 108 m^3/h. However, SINTEF states that (from experience) the TEK17 minimum exhaust requirements are not sufficient to remove the pollution accumulated from cooking and therefore recommend higher exhaust levels depending on the size of the apartment.

- According to SINTEF the exhaust hood should have the same length as the cook-top, preferably the same dept as well for most efficient exhaust.
- According to SINTEF the exhaust should not have a higher noise level than 45dB.
- SINTEF does not recommended to use a recirculating hood with coal filter as this only removes some particles before supplying the air back to the room. In addition, a coal filter hood does not remove moisture accumulated during cooking. Therefore, this does not count as satisfying exhaust ventilation system.
- It is recommended that the exhaust hood should be 0.6 m above the cook-top.

An efficient exhaust hood is important to avoid spreading emissions from cooking throughout the apartment. Studies have shown that if the cook-top is located on a kitchen island the exhaust hood will have to have twice the capacity of a hob placed in a corner or close to a wall. It is therefore recommended to have the cook-top against a wall or in a corner[9].

The air from the kitchen hood has to be led in a separate duct that leads directly to the open air, this is due to the accumulation of grease in the duct. Therefore, it is recommended to have a separate exhaust for the primary ventilation so that the air can be used for heat recovery. When cooking the exhaust hood can be turned on for additional ventilation to reduce emissions from the cooking process[9].

2.1.2 Test methods for kitchen hoods

The standardized test method in Europe is NEK IEC 61591:2019 [11], while the standardized test method in United States is the ASTM standard. The most used test methods in Europe is shortly summarized in table 2.1.

Table 2.1: Overview of test standards for kitchen hoods[12][13][11][14].

Standard	Test time	Disturbance	Tracer substance	Total amount of tracer substance	Air intake with diffuser plate	Dimensions of pan/spreader	Temperature	Height above hob	Test room volume	Temperature test room	Temperature inlet air
Swedish Standard SS 433 05 01	10 min	Yes	N_2O	510 liter	Close to the ceiling	Ø = 200 mm H = 20 mm	200 ± 5 °C	≥ 500 mm *	23 ± 1 m³	20 ± 5 °C	20 ± 2 °C
"Hybrid method" (mix of SS 433 0501 and IEC 61591)	10 min	Yes	MEK	100 g	Close to the ceiling	Ø = 200 mm H = 25 mm	170 ± 10 °C	≥ 500 mm *	23 ± 1 m³	20 ± 5 °C	20 ± 2 °C
IEC 61591:2019	30 min	No	MEK	312 g	Close to the floor	Ø = 200 ± 20 mm H = 125 mm	170 ± 10 °C	600 mm	22 ± 2 m³	23 ± 2 °C ***	No requirements
EN 13141-3:2017 **	10 min	Yes	MEK	100 g	Close to the floor	Ø = 200 ± 20 mm H = 45 ± 2 mm	170 ± 5 °C	≥ 600 mm	22 ± 2 m³	No requirements	No requirements

The Swedish Standard SS 433 05 01 and EN 13141-3:2017 only include test methods for extract hoods, the hybrid method includes recirculating hoods and IEC 61591:2019 includes extract, recirculating hoods, as well as down draft[13][14][11]. The standards use tracker gas to evaluate the hoods, however, this is not satisfactory to asses exposure from food preparation. Most literature uses the standards as guidelines to asses capture efficiency and exposure from cooking.

2.1.3 Test room setup

The test room setup generally consists of a kitchen bench with wall cupboards and a kitchen hood in the middle. Figure 3.1 shows the test room setup from NEK IEC 61591:2019 which is used as guideline for many exposure studies in Europe.

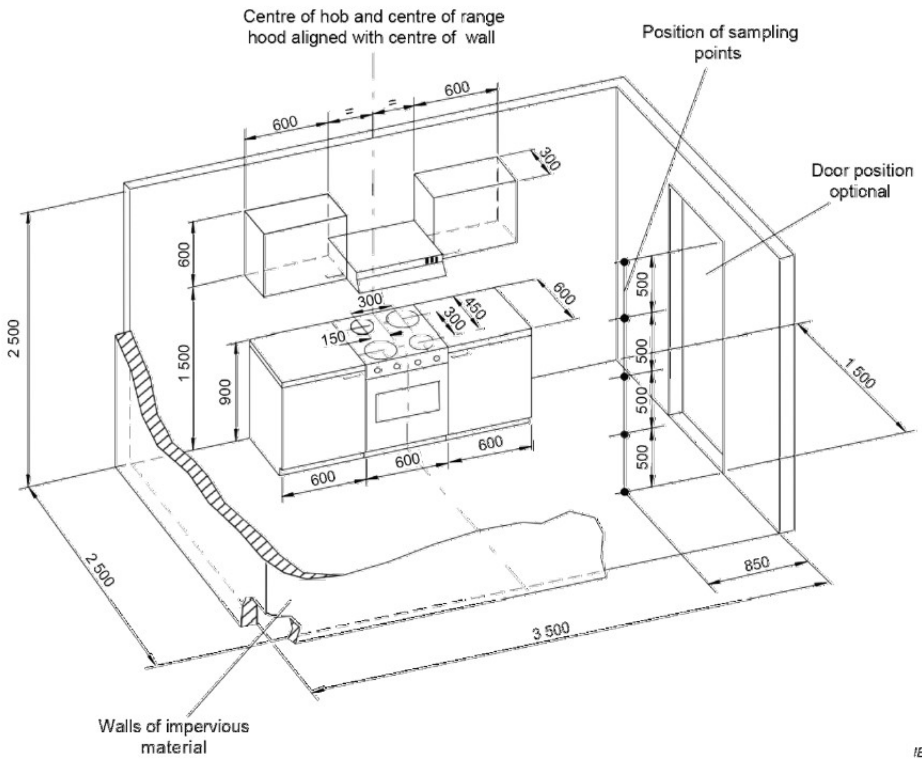

Figure 2.2: Test room setup from NEK IEC 61591:2019[11].

2.2 Emissions from cooking

Previous research is used identify what work that has been carried out in to order identify gaps that remains to be explored and to specify the research questions. By analysing previous results of the literature, recommendations and reflections from previous papers can be used as guidelines for experimental setup and as comparison data for the result obtained in this thesis. The literature research methodology is presented in appendix A.

2.2.1 Particulate matter

Particulate Matter is one of the most important emissions from cooking[6]. It is defined as the mass of a mix of liquid droplets and solid particles suspended in a volume of air which represents a range of physically and chemically diverse substances. PM ranges from a few nanometers to tens of micrometers, where:

- Total suspended particles (TSPs) is particles ranging in size from 0.1 μm to about 30 μm.

- PM of 10μm and less (PM_{10}) is the PM concentration of aerodynamic diameter 10 μm and less.
- $PM_{2.5}$ is the PM concentration of aerodynamic diameter 2.5 μm and less.
- PM of 1μm and less (PM_1) is the PM concentration of aerodynamic diameter 1 μm and less.
- UFP is the PM concentration of aerodynamic diameter 0.1 μm and less.

The indoor PM distribution and intensity from cooking depends on many factors, these include[6]:

- Type of cooking; frying, roasting, grilling, boiling and broiling.
- Ingredients: Different foods and oil emit different amounts of particles.
- Temperatures used during cooking.
- Kitchen ventilation; exhaust, hood type, air flow etc..

Several studies have investigated variation of PM emissions due to these factors. The most relevant works will be listed in chapter 2.3.

Previous research has found that it is mainly particles from aerodynamic diameter of 2.5 μm and less that give adverse health effect from cooking.

Cooking particles contains organic compounds including mainly PAHs, carbonyl compounds and, n-alkanes. The adverse heath effects coming from cooking particles are not only due to its physical proprieties, but also the chemical proprieties of the PM.

PAHs are hydrocarbons with multiple aromatic rings. They occur when unsaturated fatty acids are cooked at high temperature resulting in PAHs through pyrolysis mechanism. PAHs does not exceed a proportion of more than 2.07 % of the quantified organic matter.

Carbonyl compounds usually occur from cooking oil and stove fuel type. The main carbonyl compunds that occurs during cooking activities include formaldehyde, acetaldehyde, acrolein and pelargonic aldehyde.

According to previous studies, the proportion of n-alkanes account for 0.32–5.97% of the quantified organic matter from cooking particles.

Moreover, the main component of cooking particles has been found to be fatty acids. These consist on staurated and unsatured fats, whereas animal fats contain more saturated fatty acids than vegetable fats. During cooking the glyserides realese free fatty acids by hydrolysis an thermal oxidation.

Depending on the type of food, cooking fuel and oil, both the chemical proprieties, size, distribution, and mass concentration varies. Similarly, the adverse health effects from cooking emissions varies with these same factors[7][15].

There are different maximum PM level recommendations depending on where in the world you are located. These are divided into 24 hours mean, and annual levels. Whereas we will mostly compare with 24 hours mean values. These values are listed in table 2.2. FHI is responsible for Norways recommendations, where we can see that these are somewhat lower than the other peak values.

Table 2.2: Overview of legal limits and guidelines of PM concentration [16][17][1].

	Period	PM10(µg/m3)	PM2.5(µg/m3)
WHO	Yearly	20	10
	Daily	50	25
EU	Yearly	40	25
	Daily	50*	-
Norway	Yearly	20	8
	Daily	30	15
USA	Yearly	50	15**
	Daily	150	35

*Max 35 days higher than 50 µg/m3

**3 years average

2.3 Exposure from cooking: a review

Previous research has been assessed and divided into categories of relevance, this list can be found in appendix B. The most relevant articles were then summarized in a literature review matrix that can be found in appendix C, whereas the reviewed studies are listed in table 2.3 . All cooking information from these papers are included in this review, including information like food and oil type, cooking temperatures, appliance, cooking method and particle measurements. However, very few of these included all of this data. This will be discussed in more detail later in this chapter.

Table 2.3: Most relevant studies reviewed[18][19][20][21][22][16][23][24].

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Rikke Bramming Jørgensen, Bo Strandberg, Ann Kristin Sjaastad, Arve Johansen & Kristin Svendsen (2013) Simulated Restaurant Cook Exposure to Emissions of PAHs, Mutagenic Aldehydes, and Particles from Frying Bacon, Journal of Occupational and Environmental Hygiene, 10:3, 122-131, DOI: 10.1080/15459624.2012.755864
Jacobs, Piet & Borsboom, Wouter & Kemp, Richard. (2016). PM2.5 in Dutch Dwellings due to Cooking.
Jacobs, P., Openbaar eindrapport VentKook Ventilatiesysteem met goede kookafzuiging. (2018), TNO: Delft, the Netherlands. p. 40.
O'Leary, C, Kluizenaar, Y, Jacobs, P, Borsboom, W, Hall, I, Jones, B. Investigating measurements of fine particle (PM2.5) emissions from the cooking of meals and mitigating exposure using a cooker hood. Indoor Air. 2019; 29: 423– 438. https://doi.org/10.1111/ina.12542

2.3.1 Test room setup in literature

Table 2.4 shows the test room setup from the chosen literature. Buonanno et al. 2009, Jorgensen et al. 2013, Jacobs et al. 2018 and O'Leary et al. 2019 based their test room setup on the dimensions used in the standards mentioned in 2.1.2 with a few deviations. Dennekamp et al. performed tests entirely without ventilation flows, this is not realistic in terms of new building ventilation designs, but the data obtained shows the emissions from a worst case scenario, which could have been the case if no building requirements were set. Zhang et al. 2010 only used a recirculating hood during experiments with no additional ventilation except and additional air conditioning system. Jacobs et al. 2016 also performed a study in 9 different dutch dwellings with variations in both ventilation systems and different cooker hoods, this study can therefore only be used as an indication due to the lack of controlled conditions[25].

The test room setup is significant when assessing and comparing data from different studies, as smaller rooms have shown to get a higher peak at lower ventilation rates, but also had a quicker decay rate[5]. Moreover, with higher ventilation rates the mass concentration will be lower, so in order to compare these with other studies, similar ventilation rates should be used.

Moreover, the location of the sampling point were varied, this may also affect the estimation and interpretation of the emissions. Evidently, outcomes of the sampling point closer to the food has shown to have higher emissions.

Table 2.4: Test room setup from literature

Study	Setup	Ventilation
Dennekamp et al. 2001	The test room was a laboratory of volume 70 m3 and internal surface area of 130m2.	No mechanical ventilation was used during the studies and the windows were closed during all measurements.
Sjaastad et al.	Experiments were done in a room of 19m2. Electrical stove. Hood 50 cm above stove.	Hood on during frying at 335 m3/h. Supply air volume of 119 m3/h and primary exhaust of 112 m3/h .
G. Buonanno et al. 2009	Experiments done in an laboratory of 80 m^2 and height 2.8m. Testing at minimal ventilation and mechanical ventilation. Both gas and electrical stoves. Sampling point 2 m from stove.	Minimal ventilation scenatio (0.29 ± 0.05 h-1) and mechanical ventilation scenario (0.89±0.11 h-1) doors and windows were closed forboth scenarios.
Zhang et al. 2010	The study was conducted in three different locations a one–story, 140-m2 single family house. A student dorm of 20 m2 and 2 two bedroom apartments of approximately 60m2. Breathing zone and 1 m from the stove.	Recirculating exhaust fan and central air conditioning systems. Doors and windows were closed. AERs between 0.28-0.39 h-1.
Torkmahalleh et al. 2012	All of the experiments were conducted in a 0.81-m3 laboratory hood. Sampling point 0.35 m above the oil surface	Hood operating at 65 m3/h (80 air changes per h) to standardize environmental conditions and control emission rates.
Jørgensen et al. 2013	The size of the kitchen was 19 m2 (56.1 m3) and was equipped with a modern kitchen fume extractor. Both electric stove, and a gas stove. The hood was installed 65 cm over the stove. Sampling module was placed on the chefs shoulder.	During frying, the hood extracted 335 m3 air/hr. Basic ventilation in the kitchen room was 119 m3/hr of air supply, and 112 m3/hr outlet (without kitchen hood ventilation)
Jacobs et al. 2016	9 Dutch dwellings with different ventilation systems and different cooker hoods. Volumes of kitchens raging from 15-350 m3.	Various different ventilation systems. Ranging from motorised, recirculating, motorless and no hood.
Jacobs et al. 2018	The test room had dimensions of 3.65 x 2.66 x 2.68 m. The kitchen setup is according to NEN-EN-IEC 61591.	The room was ventilated with an airflow rate of 76m3/h(primary ventilation), kitchen range hood operated with 300m3/h. Two range hood were tested T shaped and inclined.
O'Leary et al. 2019	The test room had a depth of 3.65 m, width of 2.66 m, height of 2.68 m. The chamber layout was comparable to the EN 6159141 standard for kitchen test facilities. The hood was installed 70cm above the stove. The OPC was placed below the extract grille 1.25m above the floor.	Airflow rate for low ventilation scenario was 75 m3/h using a sigle extract grille. And a high ventilation scenario using a cooker hood with a flow rate of 300 m3/h. Circulation fans were used in the low ventilation scenario to ensure full mising conditions.

2.3.2 Food and cooking procedure from the literature

As mentioned in the introduction, there are several different factors influencing the release of cooking particles. The literature assessed has tested different types of foods, cooking techniques and temperatures, all these factors affect the final result.

Some of the studies looked at only the cooking of a single ingredients with different cooking conditions. This ensure better reproducibility and less deviation. Buananno et al. 2009 mainly performed tests with frying and grilling typical Italian ingredients at different temperatures with both a high temperature and low temperature scenarios for both grilling and frying. Dennekamp et al. 2001 tested emissions from only the stove types as well the emissions from different ingredients such as bacon and vegetables at maximum heat on the different stove types. They also performed tests with different foods on a grill and in an oven. Jorgensen et al. 2013 performed test with different bacon types on both gas and electrical stoves. While Torkmahalleh et al. 2012 tested emissions from different oil types at different temperatures and Jacobs et al looked at $PM_{2.5}$ emissions form olive oil cooked with different cooking scenarios.

The rest of the studies reviewed looked at cooking whole meals which is a more realistic approach, on the other hand, these experiments may have more uncertainty due to more disturbance during testing. Zhang et al. 2010 tested cooking techniques and foods from different parts of the world, they also looked at how different cooking conditions while cooking the same meal affected the results. Both O'leary et al. 2019 and Jacobs et al. 2018 cooked variations of chicken with vegetables and carbohydrates(such as potatoes and noodles) as well as pasta bolognese which are common meals in northern Europe. For detailed ingredients, temperatures and cooking procedure from the litterature see appendix C.

2.3.3 Measurement methodology

Most studies measure the particle mass concentration in different size ranges. Some studies look at the particle count, and the PAHs as well. See table 2.5 for details on which instruments and parameters have been recorded in each of the studies.

Table 2.5: Instruments and parameters measured in the literature.

Study	Instrument	Parameter
Dennekamp et al. 2001	TSI 3934 scanning mobility particle sizer; Model 3071A electrostatic classifier; Model 3022A condensation particle counter.	Size distribution of UFPs(nm vs particles/cm3), particle number concentration from 10-500nm (particles/cm3)
Sjaastad et al. 2008	The sampling tubes and Gelman AE glassfiber filters (37 mm) were placed on the left shoulder of the person frying the beefsteak (the cook).	TSP(µg/m3), PM1 concentration(µg/m3)
G. Buonanno et al. 2009	Scanning Mobility Particle Sizer (SMPS 3936, TSI Inc., St. Paul, MN); Aerodynamic Particle Sizer (APS 3321, TSI Inc., St. Paul, MN)	Emission Factor(particles/min), particle number concentration(particles/cm3), TSP concentration(µg/m3)
Zhang et al. 2010	Scanning mobility particle sizer (SMPS; 3936L85, TSI Inc.); TSI DustTrak photometer (Model 8520 TSI, Inc.)	Size distribution of UFPs(nm), total particle number concentration (particles/cm3), PM2.5 mass concentration and BC mass concentration(µg/m3)
Torkmahalleh et al. 2012	TSI DustTrak photometer; Kanomax Piezobalance Model 3511; TSI Model 3007 condensation particle counter (CPC)	PM2.5 concentration(mg/m3), total particle number concentration(particles/cm3), particle number mode diameter(nm), UFPs particle number concentration (particles/cm3)
Jørgensen et al. 2013	A TSI-3939 scanning mobility particle sizer; TSI-3936 SMPS; sampling modules to measure PAHs.	Size distribution of UFPs(nm vs particles/cm3), PAHs and total PM mass concentation(µg/m3), UFP number concentration (particles/cm3)
Jacobs et al. 2016	Two optical particle counters (OPC) have been used in parallel: a Grimm 1.109 and a Grimm 11-R.	PM2.5 concentration(µg/m3)
Jacobs et al. 2016	Grimm 11R OPC; Sampling modules to measure PAHs.	PM2.5 concentration(µg/m3), 16 EPA PAHs(µg/m3)
O'Leary et al. 2019	Grimm 11-R Mini Laser Aerosol Spectrometer optical particle counter (OPC);	PM2.5 concentration(µg/m3), Emission rate(mg/min)

2.3.4 Particle emissions from cooking studies

The results from the experiments performed in the previous literature is shown in table 2.6. While the particle mass concentration can be used as comparison data the particle count is more difficult to use for comparison as the size range is unknown. To elaborate, previous studies have shown that smaller particles are more dangerous to our health than bigger particles. Therefore, when measuring particle count, it doesn't tell us what amount of particles that are a certain size range. Hence, only mass concentration data can be used for comparison, as these include a certain size range as well as weight per unit volume [15].

Table 2.6: Particle emissions from previous studies.

Reference	Particle size	Comment	Concentration(µg/m3)	Particle count (part cm-3)
Dennekamp	UFP	Frying vegetables (500g)-electric stove		0.11×10^5
et al. 2001		Frying bacon(4 racers)-electric stove		1.6×10^5
		Frying vegetables (500g)-gas stove		1.4×10^5
		Frying bacon(4 racers)-gas stove		5.9×10^5
Sjaastad	TSPs	Frying beefsteak		1.2×10^3
et al., 2008				
Buonanno	TSPs	Grilling on gas stove at maximum power with:		
et al., 2009		Cheese	283	1.1×10^5
		Wurstel sausage	352	1.3×10^5
		Bacon	389	1.0×10^5
		Eggplant	78	1.2×10^5
		Frying 50g of chips on gas stove with:		
		Olive oil	118	1.2×10^5
		Peanut oil	68	1.2×10^5
		Sunflower oil	60	1.1×10^5
		Frying 50g of chips on electrical stove with:		
		Olive oil	27	2.6×10^4
		Peanut oil	13	1.5×10^4
		Sunflower oil	12	1.4×10^4
Zhang	$PM_{2.5}$/UFP	Indian: Chicken and rice	94.3-143.7	$1.13\text{-}1.27 \times 10^5$
et al, 2010		Indian: Egg and vegetable	38.6	0.92×10^5
		Italian: Pasta and vegetable	34.5	0.13×10^5
		Indian: Onion and tomato	36.5	0.99×10^5
		Chinese: Chicken, shrimp and vegetable	230.9	1.99×10^5
		American: Fried chicken	20.4-98.1	$0.30\text{-}6.04 \times 10^5$
Jacobs	$PM_{2.5}$	Pancakes with bacon - gas	16-1919	
et al., 2016		Pancakes with bacon - Induction	70-110	
Jacobs	$PM_{2.5}$	Chicken breast with boiled potatoes and green beans	21.7	
et al. 2018		Chicken with fried potatoes and green beans	19.1	
		Pasta bolognese (back hob)	46.3	
		Sliced chicken breast with vegetable wok and noodles	52.2	
O'leary	$PM_{2.5}$	Chicken breast with potatoes, green beans and olive oil	300-590	
et al., 2019		Chicken fillet with potatoes, green beans and olive oil	250-690	
		Pasta bolognese with bacon	1000-2750	
		Sliced chicken breast with vegetable wok and olive oil	800-1600	
Jacobs	$PM_{2.5}$	Olive oil	15-327	
et al., 2016				
Jørgensen	UFP	Fresh bacon on an electric stove		1.7×10^5
et al., 2013		Fresh bacon on a gas stove		1.0×10^6
		Smoked bacon on a gas stove		1.1×10^6

2.3.5 Findings

Cooking fuel is one of the factors affecting the emissions as some of the studies reviewed used gas, this has to be taken into consideration as it is not comparable with experiments using electrical or induction stove. Buonanno et al 2019 did an experiment with frying chips, the TSPs emissions when cooking with gas was 118 $\mu g/m^3$ while the exact same meal cooked on an electric stove produced only 27 $\mu g/m^3$[23]. Similarly, Zhang et al. 2010 observed that the type of stove had the most significant effect on all parameters analysed except the decay rate[19]. O'leary et al. 2018, on the other hand, found that when doing a blank test with the only the combustion from the cooking process, without the food, that PM2.5 concentrations were generally less than 1 $\mu g/m^3$. O'leary et al. 2018 therefore concluded that the emissions from the gas burners were nearly negligible[20]. This indicates that the stove type and gas type used is of great significance regarding the emissions from the different experiments.

Cooking oil type has also shown to have a significant effect when it comes to emissions. Torkmahalleh et al. 2012 analyzed emissions from different cooking oils. The tests showed that at 197°C soybean, safflower, canola, and peanut oils produced lower PM2.5 emission than corn, coconut, and olive oils and that the total particle number at 197°C was lower for soybean, safflower, and canola oils than the corn, coconut, olive, and peanut oils. The study also showed that oils with higher smoke temperatures had lower particle concentrations. For instance, olive oil was shown to have 10 times higher emissions than safflower oil [26]. Moreover, Sjaastad et al. 2008 showed that margarine had significantly higher particle numbers in all size fractions compared with rapeseed, soybean and olive oils. On the contrary O'Leary et al. 2018 found that replacing cooking oil with margarine had minimal impact on PM2.5, this indicates that different margarine sorts may emits differently[24].

Temperature plays an important role on the particle number and particle concentration. Buonanno et al 2008 found that the grill temperature had a significant impact on emission factors, the number concentration had an 70% increase and the mass concentration was 29 times higher at a high grill temperature compared to a low grill temperature[23]. Dennekamp et al. 2001 found that the UFP concentration rose rapidly with temperature, the oil at 256℃released about twice as many particles as the oil at 223℃[18]. Similarly, Torkmahalleh et al. 2012 showed that the PM2.5 concentrations of olive oil at 200 ℃were about 5 times higher than at a temperature of 170 ℃[26].

Both the cooking method and food type has shown to affect particles. O'Leary et al.2018 found that PM2.5 emission were reduced when not browning or charring the food and by using a non stick pan. Moreover, with prolonged cooking times without proper ventilation increased the PM2.5 values significantly. The pasta bolognese was the meal that had the highest emissions with a peak $PM_{2.5}$ mass concentration of about 2500 $\mu g/m^3$, the meal with the lowest concentration was the chicken fillet with pre cooked potatoes and green beans with a peak of about 550 $\mu g/m^3$ [20]. This indicated that red meat has significantly higher emissions than white meat. Jacobs et al. 2018 which tested similar meals also got higher concentrations with the pasta bolognese, however the fried noodles with chicken and vegetables showed even higher PM2.5 levels[16]. Buonanno et al. 2009 found that the type of food significantly affected emissions rates, whereas fatty foods cooked at high temperatures generated the highest emission rates. The study also showed that sunflower oil was the oil type that generated the least amount of particles and olive oil generated the most[23].

Jørgensen et al. 2013 showed that the total level of PAHs were highest when frying smoked bacon, even though the TSPs was half that of frying freash bacon. Moreover Jørgensen et al. found that the cooking method that exposed the cook to the highest level of UFP wasnt necesaraly correlated with with the highest level of TSPs, aldehydes or PAHs[21].

All the studies that tested several ventilation scenarios found that an efficient ventilation system can efficiently remove the particulates.

For instance, Zhang et al. found that the decay rate was largely determined by the exhaust air volume, whereas, when turning on the fan the decay rate increased by a factor of 2. In addition the hood showed to have little impact on all other parameters except peak particle number concentration[19]. Jacobs et al. 2018 found that the lowest $PM_{2.5}$ emission of 1 $\mu g/m^3$ were obtained at 300 m^3/h with a wall mounted hood, whereas with the same ventilation rate with an inclined hood the $PM_{2.5}$ emission were 4 times higher. Moreover, when the ventilation rate on the wall mounted hood was reduced to 75 m^3/h the concentrations were increased by a factor of 8[16]. o'Leary et al got a reduction of more than 90 % for all meals while using an extracting hood [20].

Jacobs et al. performed a field study with significant findings regarding factors affecting PM concentrations, these include: [25]:

- Cooking method: lids on or off, cooking on gas or induction and the type of dishes showed to have a large effect on PM concentrations; The study showed that using lids reduced the amount of PM due to less cooking fumes. In this study the meals that led to the largest PM concentration were pancakes with bacon and meat frying in general.

- Type of range hood and exhaust flowrate; Higher flowrates on the exhaust hood seemed to reduce PM concentration. Indicative findings showed that motorless hoods resulted in the highest concentrations with PM increase between 0-44%. The lowest increase of PM was motorized hoods with high flowrates. Recirculation hoods had PM increase between 0-8%.

- Ventilation amount compared to kitchen volume and exhaust flowrate; The study showed that a small closed kitchen caused high PM2.5 peaks up to 651 µg/m3, however, due to high the flowrate and small volmue the peaks decayed quickly. This situation is similar to an earlier cooking experiment by Jacobs et al. where olive oil was heated in a 26 m^3 room where the peak PM concentration reached 826 µg/m3 and within an hour the concentration were back to previous levels by dilution ventilation[22]. In larger rooms exposure showed to be quite high over longer periods of time even though the peaks were lower[25].

- Infiltration of ambient PM2.5; The study showed that most of the time the effect of the indoor PM sources were larger than ambient sources. However, when the ambient PM2.5 concentrations were high, it was more difficult to determine the effect of cooking on the PM2.5 concentrations. Hanninen et al. predicted that with supply air filters PM2.5 could be reduced by 25%[27]. This study got similar findings, in dwellings with filters the indoor PM2.5 concentration were lower than ambient PM2.5 concentrations.

- During the field study, observations were done regarding relative humidity levels and PM levels, were it seemed that the OPC measured higher values of PM with higher levels of RH. However, when this was investigated further only increased PM levels were observed when the OPC was located directly in the visible water vapour. While when the OPC was placed 1 meter from the boiling water no increase in PM was observed.

3
METHOD

3.1 Laboratory facilities

The test facility is located in SINTEF communities ventilation lab in Oslo, Norway. Tests were performed during May 2021 whereas outdoor temperatures were between 0.3 - 25.7 ℃[28].

3.1.1 Test room

All experiments were performed under controlled ventilation conditions in a test room with a height of 2.70 m, width of 6.20 m, depth of 4.80 m and a total volume of 77.76 m^3. Due to limitations the layout of the test room was not amendable, the room is therefore significantly larger than the test rooms used in the European standards(V= 22±3 m^3). Figure 3.1 shows a sketch of the test room with dimensions and figure 3.2 shows the dimensions of the kitchen setup.

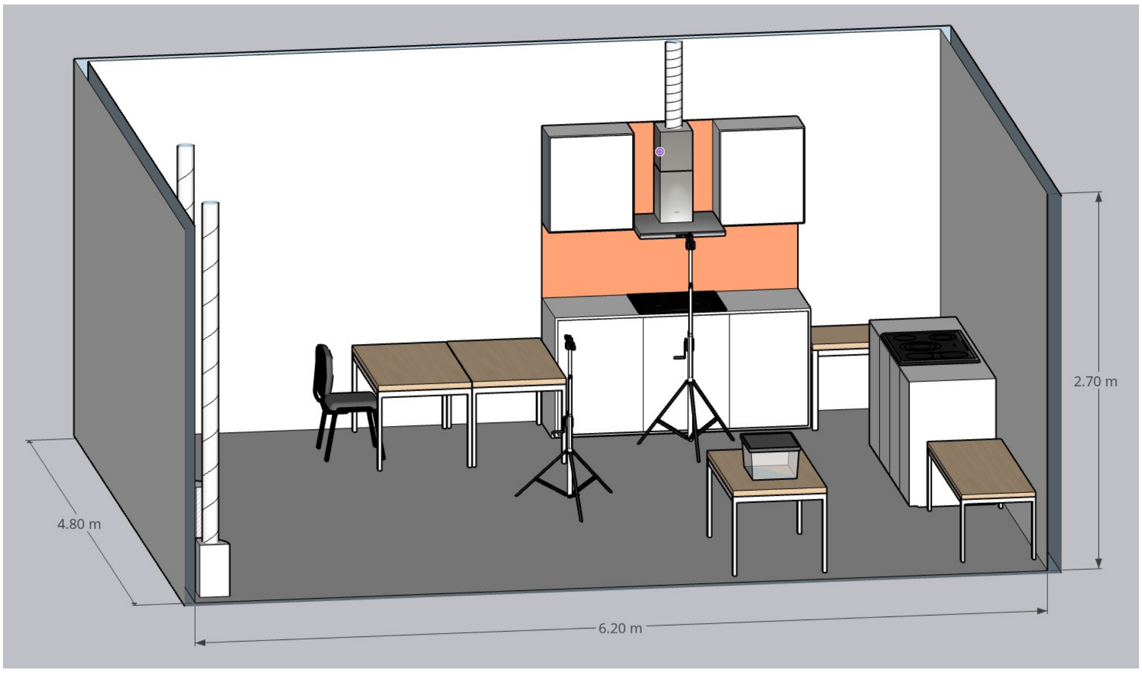


Figure 3.1: Test room sketch

Figure 3.2 shows the kitchen setup, this is similar to the NEK IEC 61591:2019 standard.

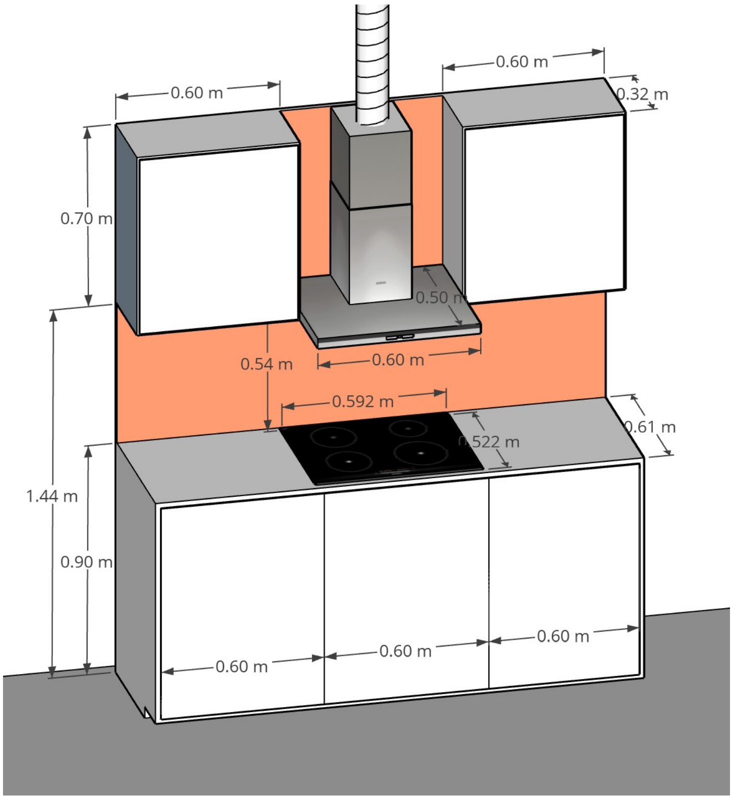


Figure 3.2: Kitchen setup similar to NEK IEC 61591:2019

3.1.2 Instruments and placement

The main measuring locations are shown in figure 3.3 and 3.4. Location 1 is assumed to be the breathing height of an average Norwegian person cooking. The average height in Norway is 179.9 cm for males and 167.7 cm for females, the gender average therefore set to 173.8 cm(assuming equal distribution of men and women)[29]. Measurement location 1 is therefore set to be 154 cm above the floor(assuming the mouth is 20cm lower than the total height), and 50 cm away from the cook-top. Measurement location 2 is placed in the middle of the room 125 cm above the floor. And measuring location 3 is assumed to be the dining location in the test room, this is therefore placed at a height of 110 cm, which is assumed to be the breathing height of a sitting person[30]. Figure 3.3 shows the measuring locations from above.

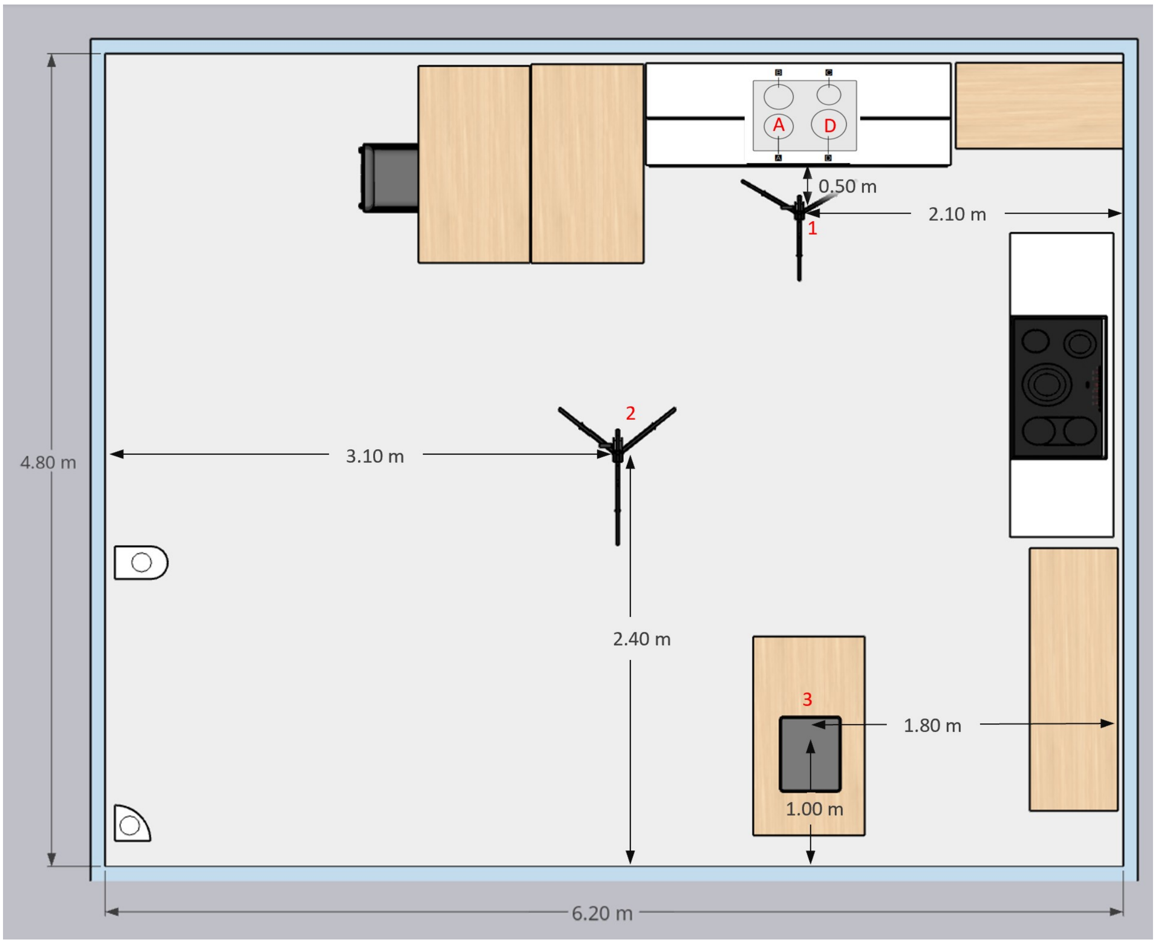


Figure 3.3: Measuring locations for experiments from top view

Figure 3.4 shows the measuring point and dimensions from the front with the height of the measuring locations.

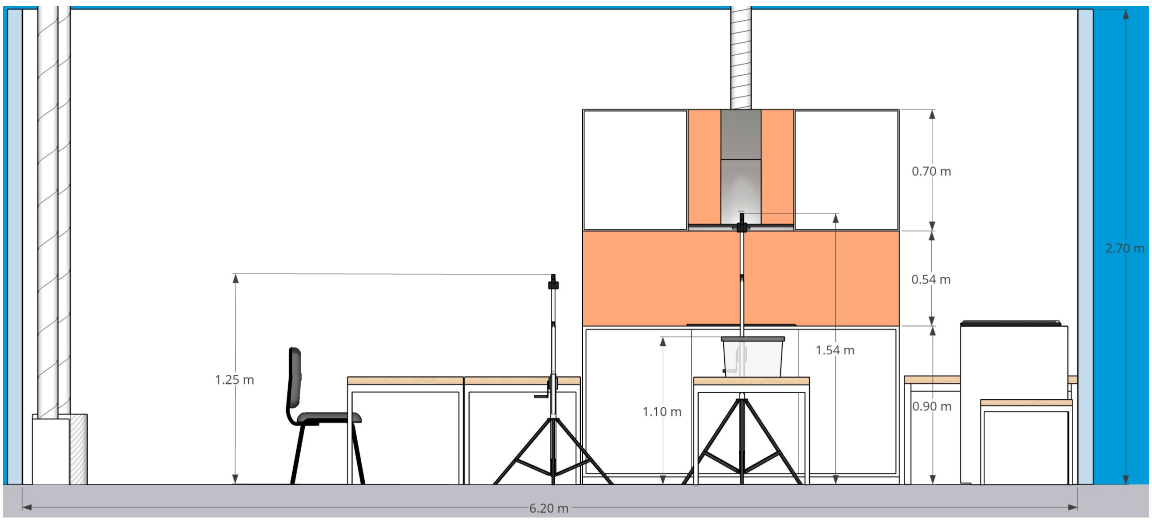


Figure 3.4: Measuring locations for experiments from front view

All different measuring locations, instruments and parameters are presented in table 3.1.

Table 3.1: Instruments, parameters and locations used in experiment

Location	**Instrument**	**Parameter**
2	P-track	Particle count (particles/cm^3)
1, 2, 3	Aerotrack	Particle count (particles/m^3)
2	Rotronic	RH(%), CO_2(ppm) and Temperature (℃)
Cooktop A & D	Thermocouples type K	Temperature (℃)
Inside room, hall, air supply, exhaust	Thermocouples type T	Temperature (℃)
Supply and exhaust air	DPT-CTRL 2500-D	Airflow (m3/h)
Tube between test room and hall	DPT250-R8-D	Pressure(Pa)
2	Grimm	Particle count(particles/liter)

Moreover a detailed description of the instruments used is listed in table 3.2.

Table 3.2: Instruments used during experiments with detailed description

Instrument	Parameters	Size range	Accuracy	Operating Conditions	Measurement principle
Aerotrak: HANDHELP AIRBORNE PARTICLE COUNTER Model 9303	Measuring in particles/m^3 in 3 different bins.	Particle size 0.3-25 µm; Channels: 3 (0.3, 2.5, 5.0 µm)	Counting efficiency: 50% at 0.3 µm;100% for particles >0.45 µm	5-35 C. 20-95% non-condensing RH	Not publicly available
Grimm: PORTABLE DUST MONITOR 1.108	PM1, PM2.5, PM10 measuring in particles/liter in 15 different bins.	Particle size 0.3-20 µm ; Channels: 15 (0.3, 0.4, 0.5, 0.65, 0.8, 1, 1.6, 2, 3, 4, 5, 7.5, 10, 15, 20 µm)	Reproducability: ± 3 %	Temperature Operation 4 to 45°C. 10 to 90 % RH non-condensing. Maximum Particle Concentration 2000 counts per cm3 or 0.1mg per cm3.	Measures particles by quantifying the angular dispersion or scattering caused by the passage of particles of various sizes through a light beam produced by a laser diode. The light that is scattered is collected at a 90° angle, through the aperture of a photodiode. The signals are then sent to a pulse height analyzer, where the presize size distribution of particles is derived. By summing up the total number of overall sizes, the total number concentration can be derived.
P-TRAK: ULTRAFINE PARTICLE COUNTER MODEL 8525	UFP. Concentration Range: 0 to 5 x 10^5 particles/cm^3	Particle size 0.02 to 1 µm.	Not publicly available	Temperature Operation 0 to 38°C. Flow Rate sample and total: Approx 100 cm^3/min. 700 cm^3/min	Mixes the particles with alcohol, causing them to grown into a larger droplet. The droplets are then passed through a focused laser beam, producing light flashes. The particle concentration is determined by counting the light flashes with a photodetector.
Rotronic CP11	RH, dew point, wet bulb	0.1%-99.95%	±3.0%(10-95% at 25C), ±5%(other)	(-20-60) °C. 10-90% RH, non condensing	Uses non dispersive infrared (NDIR) with automatic baseline correction (ABC) to measure the different parameters.
	CO2	0-9999ppm	±(30ppm+5% og reading) at 0-5000 ppm		
	Temperature	-20-60 °C	±0.3°C at5-40°C		
Fluke Infrared thermometer 64 max	Temperature celsius	-30 °C to 600 °C	±1.0 °C or ±1.0% of reading, whichever is greater / (-10 to 0 °C):± 2.0 / (-30 to -10 °C) ± 3.0	0 °C to 50 °C Non- condensing @ ≤ 10 °C ≤ 90 % RH @ 10 °C to 30 °C ≤ 75 % RH @ 30 °C to 40 °C ≤ 45 % RH @ 40 °C to 50 °C	Measures surface temperature by measuring the amount of infrared energy radiated by the target's surface.
Thermocouples type K and T	Temperature celsius	Type K: −270 to 1260°C Type T:-270 to 370°C	Type K: Standard: +/- 2.2C or +/- .75% Type T: Standard: +/- 1.0C or +/- .75% (whichever is greater)	Operating temperature same as size range	Uses two wires legs that are welded together at one end, creating a junction. This junction is where the temperature is measured. When the junction experiences a change in temperature, a voltage is created. The voltage can then be interpreted using thermocouple reference tables to calculate the temperature.
AIR HANDLING CONTROLLER DPT-CTRL-2500-D	Air flow rate (m^3/h)	0 to 2500 Pa	Pressure <125Pa= 1 % + ±2 Pa Pressure >125Pa= 1 % + ±1 Pa	Operating temperature: -20-50 °C; Storage temperature: -40-70 °C Humidity: 0 to 95 % rH, non condensing	Multifunctional PID controller with differential pressure or air flow transmitter for building automation systems
DIFFERENTIAL PRESSURE TRANSMITTERS DPT250-R8-D	Pressure(Pa)	0 to 250 Pa	Pressure <125Pa= 1 % + ±2 Pa Pressure >125Pa= 1 % + ±1 Pa	Operating temperature: -10-50 °C; Storage temperature: -20-70 °C Humidity: 0 to 95 % rH, non condensing	Measuring static and differential pressure, with field selectable units, range and output, all in a single device.

3.1.3 Ventilation setup

The test room was connected to an individual ventilation system used for test purposes only. The inlet air was controlled using GK-cloud, and the air supplied was filtered with an HEPA filter before entering the room ensuring clean air supply. For detailed design, the GK cloud ventilation system can be found in appendix D.

Moreover, the air was supplied with two air diffusers of type Trox Siv inn 1 and 2000 as shown in figure 3.5. These were placed on the floor on each side of the door, to simulate a realistic apartment system where air is coming through the door from other rooms(e.g. bedrooms).

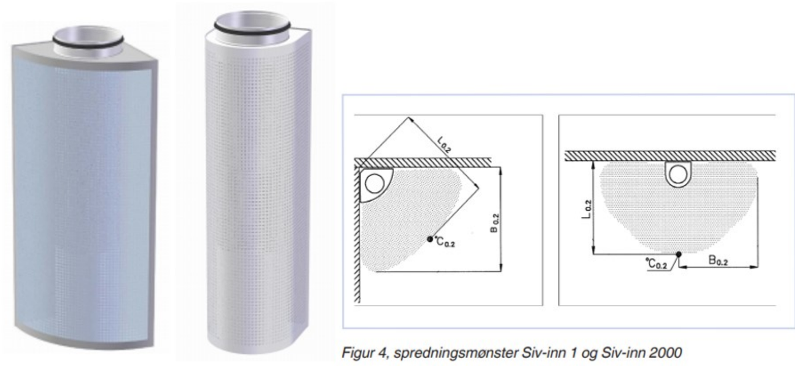


Figure 3.5: Displacement ventilation diffusers used in the test room.

Next, for the exhaust there was a primary exhaust and the additional exhaust. The primary exhaust was mounted in the ceiling and was regulated externally using a fan connected to the exhaust duct. The primary ventilation was operated at 36 m^3/h when the hood was on and was operated at 72 m^3/h when the hood was off. The additional exhaust was the siemens kitchen hood, which had several settings but could also be be turned off and regulated externally using a fan connected to the exhaust duct for specific flow rates. The flowrates were measured and logged for each test by an differential pressure regulator with transmitter output (DPT-CTRL 2500-D) connected to the HIOKI logging device.

3.1.4 Kitchen hood

A standard wall mounted siemens kitchen hood has been selected for the experiment. The hood can be used with both exhaust and recirculation function, but only exhaust is used during these tests. The hood has three power levels, one intensive level that lasts for 6 minutes and one boost function that lasts for 20 seconds. For the experiments the hood is installed 54 cm over the cooktop, which is the same height as the cupboards. Figure 3.6 shows a visualization of the cooker hood.

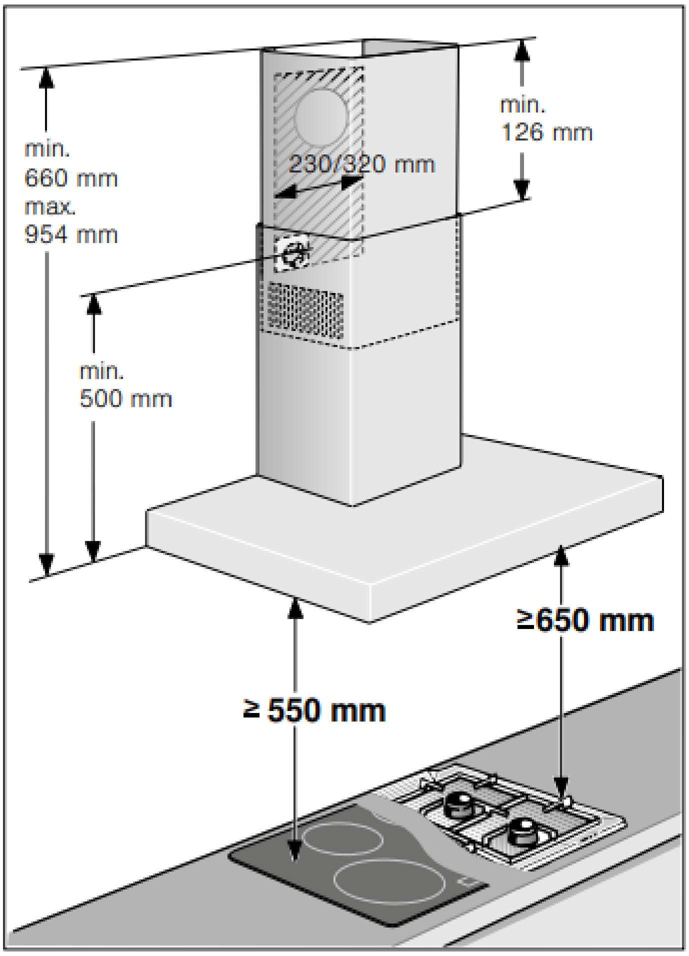


Figure 3.6: Outline of kitchen hood used in the experiment.

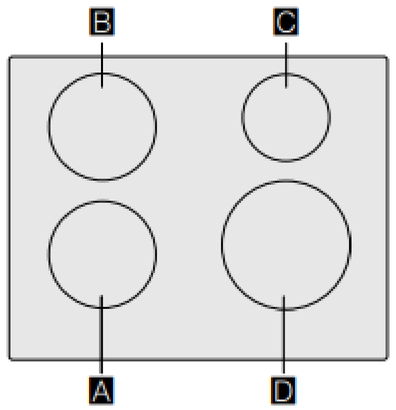
The different settings were measured with the DPT-CTRL 2500-D with the door open to allow natural inlet ventilating during testing. The different settings gave the flow rates shown in table 3.3.

Setting	Exhaust volume m^3/h
1	183
2	286
3	362
b	496

Table 3.3: Exhaust flow rates from the different hood settings.

3.1.5 Cooktop

The induction cooktop from Siemens is used for the experiments. The cooktop as seen in figure 3.7 has 4 cooking plates in various sizes and power, two plates of 18cm, one plate of 14,5 cm and one plate of 21 cm. The cooktop has 17 power steps(these include mid-channels between each main power levels) whereas there are 9 main power levels and one boost function. Figure 3.7 shows an outline of the cooktop and the power level of the two highest functions.



		9*	b*
A / B	Ø 18	1.800 W	3.100 W
C	Ø 14,5	1.400 W	2.200 W
D	Ø 21	2.200 W	3.700 W

* IEC 60335-2-6

Figure 3.7: Outline of siemens cooktop and highest power levels.

3.1.6 Cooking utensils

A list of the cooking equipment is listed in table 3.4 and a photo of all cooking utensils is shown in figure 3.8.

Table 3.4: Cooking utensils used in the experiments.

Equipment	Description
Small and big frying pan	Tefal frying pan set 24cm & 28cm ingenio resource; made with aluminum and Tefal Titanium Pro non-stick coating
Pot	INVITE pot 3,6 liter; made with aluminum core and stainless steal coating
Cooking tool kit	TEFAL TOOL KIT RESOURCE 4 pieces
Kitchen weight	SOEHNLE pagecompact 300 - Kitchen weight
Measuring cup	OXO angled measuring cup (in ml)
Measuring spoons	FUNKTION measuring spoons 4 sizes
Sieve	INVITE sieve in stainless steel

Figure 3.8: Equipment used in the tests

3.2 Survey

A survey was executed to asses Norwegian cooking habits. The survey included 15 questions assessing both age, living situation, type and use of kitchen hood, and most common meals. The questions in the survey where as follows, and included multiple answer choices, for detailed survey, see appendix E.

Table 3.5: Questions used in the survey.

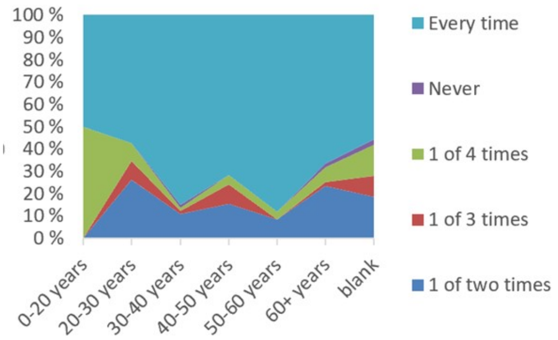
	Questions
1	Do you rent or own your home?
2	What type of housing do you live in?
3	What age group are you in?
4	How often do you cook during a week?
5	How many do you cook for?
6	What type of kitchen fan do you have?
7	Do you have a recycling kitchen hood or with exhaust?
8	How often do you wash the grease filter?
9	If you have a recirculating fan, how often do you change the coal filter?
10	How often would you say you use a kitchen hood the times you cook?
11	What setting do you usually have the kitchen hood on when it is in use?
12	If you choose not to use a kitchen hood, what is the reason for it?
13	Do you use a kitchen hood when you only use an oven?
14	What meal do you make most often?
15	How long after cooking do you turn off the kitchen hood?

3.2.1 Survey results

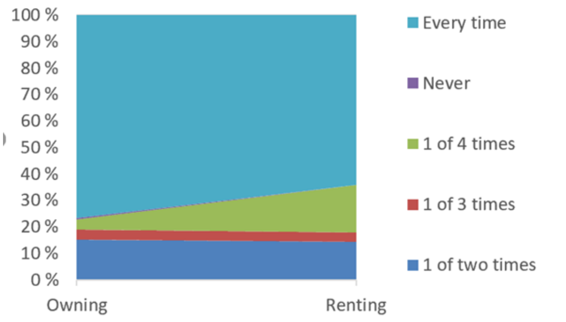
The survey was shared on social media platforms and was also shared by SINTEF community. The survey had a total of 397 participants, however, as some of the questions were added after the survey was published only 225 participant answered too all questions.

Kitchen hood use

Figure 3.9 shows how often the participants used a kitchen hood depending on age and whether they rented or owned their own home.



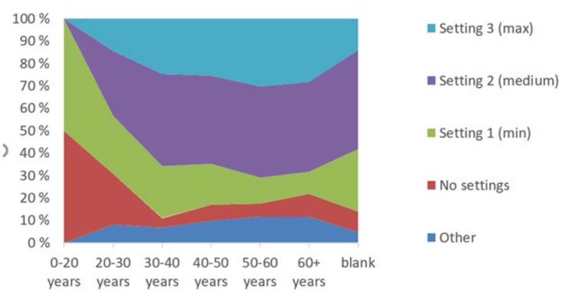
(a) Hood use - age dependent



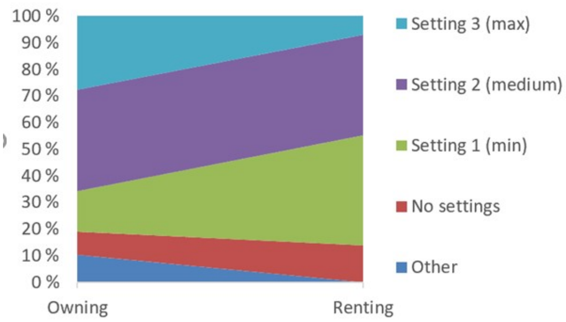
(b) Hood use when owning vs renting

Figure 3.9: How often do you use kitchen hood when cooking?

Next, figure show what setting the respondents most commonly use when the hood is on.



(a) Setting used - age dependent



(b) Setting used - owning vs renting

Figure 3.10: Replies regarding how often the hood is used and what setting is the most common

Lastly, figure 3.11 shows trends of when the respondents usually turns off their hood after cooking.

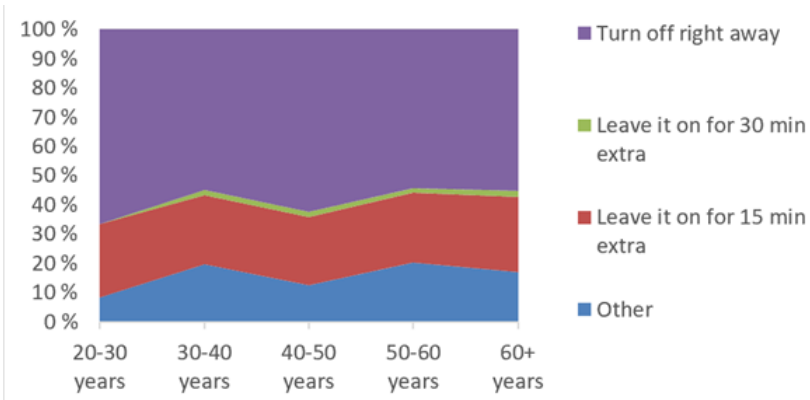


Figure 3.11: Usage of the hood after cooking, left on or turned off

Meals

The survey asked what meal the respondents cooked most often. The result was filtered by dividing the response into single words and counting the most common replies. A visualization of the most common foods is presented in Figure 3.12.

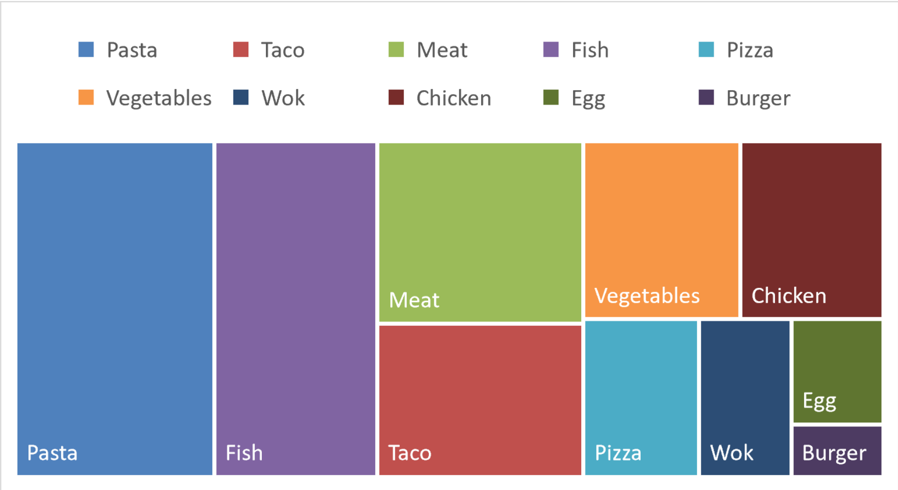


Figure 3.12: Most common foods mentioned in the survey.

3.3 Calibration and preliminary testing

In order to ensure accuracy and as little deviations as possible, calibration and pretests are done. This includes calibration for both the test room and factory calibrations of the instruments. With factory calibration a report is provided by the calibration expert, which shows the error in measurements with the measuring device before and after the calibration, all these documents are added to appendix F.

3.3.1 Calibration Aerotrack, GRIMM, P-track and Rotronic

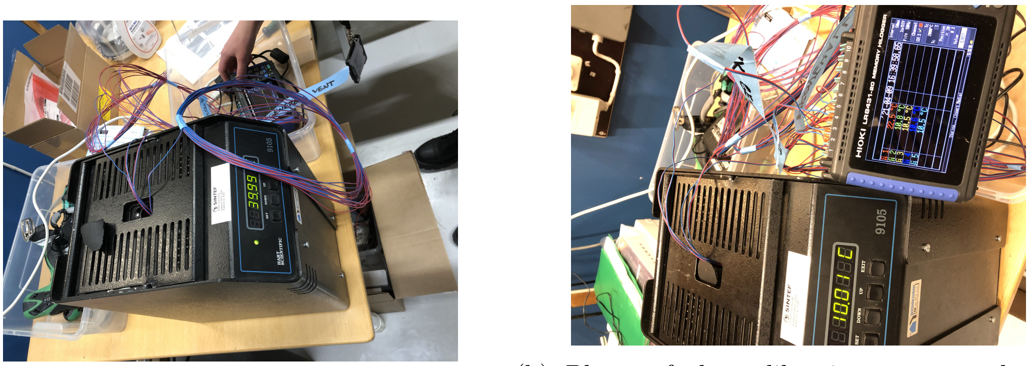
The Aerotraks was lastly calibrated 5th October 2017, whereas the calibration document states that the calibration was valid until the 5th October 2018. Moreover, to ensure all Aerotraks measured similarly 3 different repetitive tests were performed to see the similarities, results from this calibration can be found in appendix in appendix F.1, table 3.6 shows the RSD from the calibration. The Optical Particle Counter (GRIMM 1.108) was calibrated in 2015 and the calibration document was valid until 30th april 2016 the calibration document can be found in appendix F.3. Lastly, the p trak was lastly calibrated 7th october 2013 , with documentation in appendix F.4. The Rotronic was lastly calibrated in late 2016 and the calibration document can be found in appendix F.5.

Table 3.6: Aerotrak instrument calibration.

Aerotrak instrument calibration	**STD**	**AVG**	**RSD**
Averaged from Test 1	85555.15	1198945.4	7%
Averaged from Test 2	74558.31	1143138.5	7%
Averaged from Test 3	77607.44	1168591.1	7%
Total average	**79240.3**	**1170225**	**7%**

3.3.2 Thermocouples calibration

To ensure that all temperatures were accurate all thermocouples used were calibrated using a Hart Scientific 9105 Calibrator, whereas a range of different temperatures were tested, see figure 3.13.



(a) Photo of the calibration process

(b) Photo of the calibration process, showing hioki logger along with the calibrator

Figure 3.13: Thermocouple calibration using the Hart Scientific 9105 Calibrator

The thermocouples were tested against 140, 80, 40, 22, 10 °C. From measuring the the values from the thermocouples compared with the calibrator the error for each thermocouple can be calculated. Table 3.7 shows the results from the calibration.

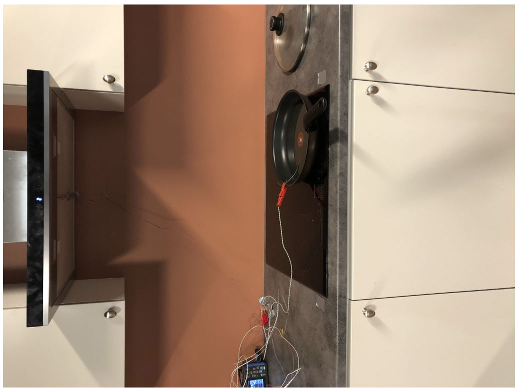
Table 3.7: Thermocouple calibration with the hart scientific 9105 calibrator.

Hioki Logger test-hall						
Hart Scientific 9105 Calibrator	Calibration temperature(\celsius)	140	80	40	22	10
Test-hall - Thermocouple Type T (Ch 2)	Measured value (℃)	137.5	80.6	39.7	22	10
	Error	2%	-1%	1%	0%	0%
Exhaust hood - Thermocouples Type T (Ch 3)	Measured value (℃)	137.9	80.8	39.2	22.3	9.9
	Error	2%	-1%	2%	-1%	1%
Exhaust primary- Thermocouples Type T (Ch 4)	Measured value (℃)	137.6	80.6	39.4	22.4	10.3
	Error	2%	-1%	2%	-2%	-3%
Supply air- Thermocouples Type T (Ch 5)	Measured value (℃)	137.2	80.7	40.5	22.7	10.5
	Error	2%	-1%	-1%	-3%	-5%
Hioki Logger inside test-room						
Hart Scientific 9105 Calibrator	Calibration temperature(℃)	140	80	40	22	10
Test room - Thermocouples type T (Ch 4)	Measured value (℃)	138.8	79	39.2	21.5	9.9
	Error	1%	1%	2%	2%	1%
Cooktop A - Thermocouples type K(Ch 5)	Measured value (℃)	140.3	79	39.6	22.3	10.6
	Error	0%	1%	1%	-1%	-6%
Cooktop D - Thermocouples type K(Ch 6)	Measured value (℃)	140.3	79.2	39.5	22.3	10.6
	Error	0%	1%	1%	-1%	-6%

3.3.3 Pre-test pan temperature

In order to see if the selected method with thermocouples connected to a piece of aluminium would measure correct temperatures, the thermocouples were tested against an infrared thermometer. Figure 3.14 shows a photo of the temperature measurement solution during food preparation.

(a) Photo of the calibration process



(b) Photo of the setup with the termocouple in the pan

Figure 3.14: Preliminary test to ensure correct temperatures using thermocouple connected to metal piece

Figure 3.15 shows the results from the calibration of the thermocouples versus the infrared thermometer. The figure shows that there is a marginal temperature deviation, but not significant, with a relative standard deviation of 3% and 1% for cooktop A and D, respectively. However, during this testing the metal piece was not disturbed by any movements in the pan, this therefore has to be taken into consideration for the experiments with food preparation. See appendix for details.

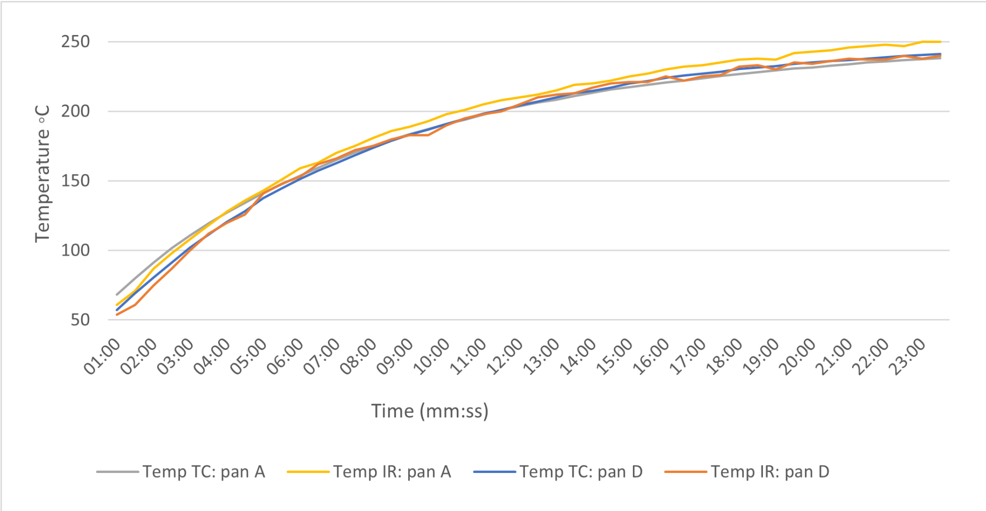


Figure 3.15: Temperature calibration infrared thermometer vs thermocouples connected to pan.

3.3.4 Regulation of supply air GK cloud

The ventilation system had a capacity of max. 4500 m3/h. In order to achieve balanced ventilation for all tests, the inlet flowrate had to be carefully regulated to avoid under or over pressure. The inlet air was first regulated with the automatic Butterfly flat Dish Damper in GK-cloud, if the airflow was still too high the inlet air was then regulated manually with a Blade damper located before each of the diffusers. In order to ensure reproducibility a procedure, table 3.8 was made to ensure similar regulation for each experiment. The airflows were also controlled by the DPT-CTRL 2500-D.

Table 3.8: Regulations in GK cloud to ensure balanced ventilation for the different hood settings.

Test	Hood Setting	GK-cloud [m3/h]		Supply 1(corner)		Supply 2		Total supply [m3/h]
		Set-point supply air %	KA402 Damper %	Manual blade Damper %		Manual Damper %	DPT-CTRL-2500-D [m3/h]	
HOOD OFF + primary exhaust*2 (72m3/h)	OFF	300	70	20	72	closed	0	72
TEK17 requirements (108+36m3/h)	OFF	400	50	open	144	closed	0	144
HOOD LEVEL 2 + primary exhaust	level 2	400	17	open	164	open	158	322

3.3.5 Preliminary experiments

In order to develop a reproducible test procedure, a series of preliminary experiments were completed, these are listed in table 3.9.

Table 3.9: Preliminary tests before main experiments

Preliminary test nr	Ventilation rate	Meal	Measurement time	Description
1	OFF(36 $m^3/h \times 2$)	No meal	20 mins	Place all intruments in correct locations, adjust correct sample times and run for 20 mins to see that data and sampling is working.
2	OFF(36 $m^3/h \times 2$)	No meal	1h	Testing backround levels without exposure.
3	OFF(36 $m^3/h \times 2$)	Oil	1h	Check values for all intruments, and check that instruments can handle the exposure
4	OFF(36 $m^3/h \times 2$)	Meal 1	1h	If test 3 is ok. Check values for all instruments, and check that instruments can handle the exposure
5	OFF(36$m^3/h \times 2$)	All Meals (3 tests)	1h $\times 3$	Perform preliminary test on all meals to ajust test procedure for each in order to ensure reproducibility

3.4 Experiments

The experiments are set up specifically to be able to answer the research questions that were specified in the introduction.

3.4.1 Assumptions and limitations

Preliminary to the experiments, some assumption and limitations have to be mentioned.

- When cooking the cook moves only when mixing to make minimal disturbance. To ensure reproducibility mixing was done at the same time for each experiment, following the cooking procedure strictly. Possible movements were not recorded, and even though a strict procedure was followed there was most like small changes in movement each time, this may have contributed.
- The primary flow rate of 36 m^3/h was supposed to be used as a ventilation rate for the experiments with the hood off. However, as the AHU was made for much higher flowrate, it was not possible to get such a low flowrate without instability. Therefore, the primary exhaust was increased to 72 m3/h when the hood was turned off to ensure that the AHU could deliver a stable supply air ensuring balanced ventilation. The particle count from the instruments were therefore doubled (Particles $\times$ 2).
- The particle density was assumed to be $1.650 g/cm^3$. This is based on the density of typical outdoor ambient particles [31].
- It was assumed that the exhaust from the hood was stable, since there was only enough instruments to measure supply and primary ventilation. Pre-tests were performed to validate this.
- Most of the instrument calibrations were outdated, there should therefore have been performed new calibrations. However, due to limitations, it was not possible during this time frame. The result of this may be an higher instrument uncertainty.

3.4.2 Meals

The selection of the meals was done by using results from the survey in order to see what most Norwegian people cook. From the survey there was a few meals that particularly stood out, these were therefore selected for the experiments. As the experiments need to be as reproducible as possible, the meals were simplified so that there would be as little variation in content as possible. Moreover, considering the size of the test room, which is assumed to be an open plan kitchen and living room. The test room is assumed to be a living space for 2 adults. The portion sizes are therefore assumed to be for 2 hungry adults, between 1400kcal-1600kcal per meal. A list of the meals selected is listed in table

3.10.

Table 3.10: Different meals with ingredient list

Meal number	Meals	Ingredience list
Meal 1	Tacomeat	400 gram ground meat, 1 bag tacospice, 15ml rapeseed oil, 150 ml water
Meal 2	Vegetarian Pasta bolognese	250 gram spagetti, 1 can of dolmio tomato saus, 300g soyafarse, 15ml rapeseed oil, 10g salt, 2 liters of water
Meal 3	Fried salmon with wok	400 gram fisk, 400 gram wok, 15ml rapeseed oil, 1 g salt, 1 gram pepper

Picture of the food products used in the experiments is shown in figure 3.16, for detailed list of ingredients and contents in each ingredient see appendix G.

Figure 3.16: Picture of the food used in the experiments.

Table 3.11 shown the nutritional content for each of the meals. While meal 2 and 3 are complete meals, meal 1 is only a component of a taco dinner, which should also includes fresh vegetables, sauce, and tortillas, these are not included because they are not cooked components.

Table 3.11: Nutritional contents for each of the meals.

Nutritional value pr. meal	Meal 1 (425g)	Meal 2(1050g)	Meal 3(900g)
Energy	3681kJ/ 876.5 kcal	6544kJ/ 1548 kcal	5903kJ/ 1411kcal
Fat / of which saturated	57.5g/25g	14.5g/1.9g	69g/13g
Carbohydrates/ of which sugars	13g/3.75g	247g/49g	95g/9g
Fiber	0.05g	32g	13g
Protein	74.2g	90.5g	96g
Salt	8.5g	8.3g	3.9g

In addition, for each meal a cooking procedure was made to ensure reproducibility. The procedure for the different meals is listed in table 3.12.

Table 3.12: Procedure for each test meal

Meal	Step	Description	Timeline
1	1	Measure all ingredients, place on kitchen bench, turn on instruments	-00:05:00
	2	Turn on cooktop D for big pan, setting 8, add oil, wait 1 min.	0:00:00
	3	Add minced meat, fry for 1 min	0:01:00
	4	Turn around meat, fry for 30 sec	0:02:00
	5	Chop meat into pieces, then let it fry without movement	0:02:30
	6	Blend an chop meat	0:04:00
	7	Add spices blend, mix for 1 min	0:05:00
	8	Add 1,5dl of water and cook on setting 5 for 10 more minutes, mix every 2 mins	0:06:00
	9	Turn off plate, transfer food to plate and move to location 3	0:16:00
	10	Remove pan from room	0:17:00
	11	Stop intruments and increse ventilation for next experiment	1:05:00
2	1	Measure all ingredients, place on kitchen bench, turn on instruments	-00:05:00
	2	Turn on cooktop A, for casserole with water and salt, boost setting(B)	0:00:00
	3	Turn on cooktop D, setting 7, add oil to pan	0:01:00
	4	Add vegan färs (mix every minute)	0:02:00
	5	Add pasta reduce to setting 7(boil for 7 min)	0:05:00
	6	Add tomato sauce, mix well	0:09:00
	7	Drain pasta, add to pan with tomato sauce	0:12:00
	8	Turn off heat, add pasta to container, transfer food to a plate and move to location 3	0:13:00
	9	Remove pan from room and leave room	0:14:00
	10	Stop intruments and increase ventilation for next experiment	1:05:00
3	1	Measure all ingredients, place on kitchen bench, turn on instruments	-00:05:00
	2	Season fish with salt and pepper	-00:01:00
	3	Turn on cooktop A for small pan, setting 9, add oil, wait 1 min	0:00:00
	4	Turn heat down to 7 on cooktop A, add salmon skin side down	0:01:00
	5	Press the salmon down with the spatula, then fry fish for total of 5 mins skin side down	0:01:30
	5	Change locations of the fillets	0:03:00
	6	Turn fillets, fry for 30 more seconds	0:06:00
	7	Remove salmon from pan, put on a plate	0:06:30
	8	Turn on cooktop D for big pan, setting 8, add oil, wait 1 min	0:07:00
	9	Add wok mix, mic every minute	0:08:00
	10	Turn off cooktop, transfer wok to a plate, and move fish and wok to location 3	0:13:00
	11	Remove pan from room and leave room	0:14:00
	12	Stop intruments and increase ventilation before next experiment	1:05:00

3.4.3 Emissions using TEK 17 minimum requirements

In order to see if the minimum requirements from TEK 17 are enough to remove emissions from the cooking process, we look at the emissions when using TEK 17 minimum kitchen ventilation requirements. Table 3.13 shows the test setup for experiment setup 0.

Table 3.13: Preliminary test setup - Emissions using TEK 17 ventilation requirements.

TEK 17 requirements and emissions	Experiments setup 0	Ventilation rate	Meal	Measurement time	Repetitions	Description
	0.1	TEK 17 requirements ($36\ m^3/h$+$108m^3/h$)	Meal 1	1h	3	Big pan

3.4.4 Emission from cooking at different ventilation rates

Experiment 1 looks at emissions from the different meals with two different flowrates. The first is without the hood on, so only a base exhaust air of 72(36×2) m^3/h. The second test for each meal is done with the hood on setting 2. The experiments are performed to see emissions from typical Norwegian meals, and to see how efficiently the hood removes particles compared to when the hood is off. Table 3.14 shows the experimental setup.

Table 3.14: Test setup 1 - Cooking emissions of various meal with different flow rates

	Experiments setup 1	Ventilation rate	Meal	Measurement time	Repetitions	Description
Different cooking emissions at different flow rates	1.1	Hood off ($72\ m^3/h$)	Meal 1	1h	3	Big pan (cooktop D)
	1.2	Medium flow ($36\ m^3/h$+$286\ m^3/h$)	Meal 1	1h	3	Big pan (cooktop D)
	1.3	Hood off ($72\ m^3/h$)	Meal 2	1h	3	Big pan (cooktop D) and big pot (cooktop A)
	1.4	Medium flow ($36\ m^3/h$+$286\ m^3/h$)	Meal 2	1h	3	Big pan (cooktop D) and big pot (cooktop A)
	1.5	Hood off ($72\ m^3/h$)	Meal 3	1h	3	Small pan (cooktop A) and big pan (cooktop D)
	1.6	Medium flow ($36\ m^3/h$+$286\ m^3/h$)	Meal 3	1h	3	Small pan (cooktop A) and big pan (cooktop D)

3.4.5 Cooking emissions with varying exhaust stop and start time

Experiment 2 was set up to see how much the kitchen ventilation usage patterns affects particle emissions. The tests were set up so that we can see variations from different scenarios, including delayed start time of the kitchen ventilation and regulating when the hood is turned off. See table 3.15 for experiment setup.

Table 3.15: Test setup 2 - Cooking emissions with varying exhaust stop and start time.

Cooking emissions with varying exhaust stop and start time	Experiment setup 2	Ventilation rate	Meal	Measurement time	Repetitions	Description
	2.1	Medium flow (36 m^3/h+286 m^3/h)	Meal 1	1h	3	Fan turned on at beginning of cook, then turned off right away when meal is done
	2.2	Medium flow (36 m^3/h+286 m^3/h)	Meal 1	1h	3	Fan turned on at beginning of cook, left on for entire experiment time (same as test 1.2)
	2.3	Medium flow (36 m^3/h+286 m^3/h)	Meal 1	1h	3	Fan turned on 5 mins after beginning of cook, then left on for entire experiment time

3.4.6 Portion sizes and emissions

Experiment 3 was set up to look at possible variations when cooking different portion sizes. Whereas the experiment tests reviews one portion of meal 1, equivalent to 2 portions and two portions of meal one, equivalent to 4 people. See table 3.16 for experiment setup.

Table 3.16: Test setup 3 - Portion sizes and emissions.

Portions sizes and emissions	Experiment setup 3	Ventilation rate	Meal	Measurement time	Repetitions	Description
	3.1	Medium flow (36 m^3/h+286 m^3/h)	Meal 1	1h	3	Same as test 1.2
	3.2	Medium flow (36 m^3/h+286 m^3/h)	Meal 1* 2	1h	3	All ingredients are doubled. Due to increased portion the meat fried for 1 min longer on setting 8, and simmering heat is increased from setting 5 to 6.

3.5 Analysing method

The data that will be analysed is primarily from the particle counters. Whereas the other instruments are to determine the variations of the test room conditions. If there are abnormal results from the particle counters, data from the instruments that are measuring lab conditions will be assessed to determine whether the conditions in the lab may be the cause of the abnormalities from the measurements. The data from the Aerotrak particle counter will mainly be used to see variations in the distribution of particles throughout the room in different locations. While the Grimm will be used to asses PM1, PM2.5 and PM10 levels inside the room whereas these values will be compared with recommended maximum values mentioned in chapter 2.3. The P-trak will be used to asses the UFP distribution in the room.

3.5.1 Conversion from particle number count to PM1, PM2.5 and PM10

A pre-developed excel sheet developed by professionals from SINTEF Community was used to convert the output from the optical particle counters(particles per unit volume) to mass concentration M $[\mu g/m^3]$. Simplified, this was done by using an assumed particle density ρ of 1.650 g/cm^3 and the assumed particle diameter d_i in each bin(middle value between each bin). The volume of each particle(m^3) is then calculated using the formula for volume of a sphere and multiplied with the particle density ρ and particle count N_i(particles/m^3)[31]. Equation 3.1 calculates the particle mass concentration M.

$$M_i = \sum_i \frac{\pi}{6} \rho \overline{d_i}^3 N_i \tag{3.1}$$

Within each size bin, the equivalent particle diameter can be calculated using equation 3.2:

$$\overline{d_i}^3 N_i = \int_{d_{i,a}}^{d_{i,b}} \frac{N_i}{d_{i,b} - d_{i,a}} x^3 dx \qquad \overline{d_i} = \left[\frac{d_{i,b}^4 - d_{i,a}^4}{4(d_{i,b} - d_{i,a})} \right]^{\frac{1}{3}} \tag{3.2}$$

Finally to get the mass concentrations PM_1, $PM_{2.5}$ and PM_{10}, equation 3.3 is used, where the particle mass concentration is is calculated by adding the mass of particles in each bin (i):

$$PM1 = \sum^{i=1} M_i \qquad PM2.5 = \sum^{i=2.5} M_i \qquad PM10 = \sum^{i=10} M_i \tag{3.3}$$

3.5.2 Standard deviation

Standard deviation was calculated by assembling all the data for each tests[32]. The average result($\overline{x}$) is then calculated by summing all the individual results(x_n and dividing the sum by the number of samples (n), see formula.

$$\overline{x} = \frac{x_1 + x_2 + x_3 + ...}{n} \tag{3.4}$$

The standard deviation(σ) is then calculated. The standard deviation is a measure of how precise the average is, in other word, how well the average from each test agrees with each other. It is calculated using the following formula.

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \overline{x})^2}{n-1}} \tag{3.5}$$

To make the deviation easier to asses and compare the relative standard deviation(RSD) can be calculated using the following formula:

$$RSD = 100 \times \frac{\sigma}{\overline{x}} \tag{3.6}$$

3.5.3 Regulation against start value

As background particle concentration varied for each of the tests. The first particle measurement was regulated to match the background particle value from the beginning of each test day. This was to regulate so that all similar tests begin with the same value so that each test would be more comparable. This was done using the following formula:

$$P(x) = P_{start} - \Delta P_{diff} \tag{3.7}$$

where $P(x)$ is the regulated concentration for each sample, P_{start} is the first value from the measurements, and ΔP_{diff} is the difference between the start value and the average morning background concentration from all test days.
This is a simplified way to regulate the data, and it has to be taken into consideration that this is not a scientific approach.

4
RESULTS

4.1 Test room conditions

The test room conditions during the different experiments are summarised and presented in table 4.1. Conditions for each of the individual tests is presented in appendix H, I, J and K.

Table 4.1: Lab conditions summarised for the different tests.

Experiment	**Test room** (°C)	**Test hall** (°C)	**RH** (%)	**CO2** (ppm)	**Cooktop A Peak** (°C)	**Cooktop D Peak** (°C)	**Ventilation flow** (m^3/h)	**Pressure** (Pa)
0.1	23 ± 1	23 ± 1	38-50	420-515	-	140-157	144 ± 5	-2 ±1
1.1	22 ± 1	21 ± 1	10 to 35	425-580	-	150-180	72 ± 5	0 ± 0.05
1.2/2.2/3.1	22 ± 1	21 ± 1	12 to 40	415-490	-	135-180	322± 5	0 ± 1
1.3	23 ± 1	22 ±1	40 to 60	460-580	97-99	110-164	72 ± 5	0 ± 0.02
1.4	22.5 ± 1	22 ± 1	35 to 45	425-455	99-100	100-130	322± 5	0 ± 1
1.5	23 ± 1	19 ± 2	35 to 40	450-625	185-220	100-125	72 ± 10	0 ± 1
1.6	23 ± 1	21 ± 1	40-45	415-480	194-205	97-117	322± 5	0 ± 1
2.1	22 ± 1	21.5 ±1	20 to 40	425-460	-	145-180	322± 5/72 ± 5	-1 ± 1
2.3	23 ± 1	23 ± 1	26-41	420-520	-	131-164	72 ± 10 / 322± 5	-1 ± 1
3.2	23 ± 1	21 ± 2	25-37	420-460	-	120-129	322± 5	0 ± 1

4.1.1 Background values

The background values for each test day were recorded in the morning. These were averaged and then put in a table in order to average all background values for each of the test days. Table 4.2 shows the background values for each of the test days, and the total average of all values.

Table 4.2: Background values in the morning of each test day.

Background values	Aerotrak	P trak	GRIMM		
Date	**(particles/m^3)**	**(part/cm^3)**	**PM1 [µg/m^3]**	**PM2.5 [µg/m^3]**	**PM10 [µg/m^3]**
5.05.2021	4143973	1500	0.199	0.571	10.483
6.05.2021	5621225	823	0.172	0.340	1.531
10.05.2021	2354967	1004	0.108	0.309	1.468
11.05.2021	13315642	496	0.440	0.704	2.065
13.05.2021	7904139	521	0.376	0.966	10.889
19.05.2021	12185139	1770	0.486	0.962	5.237
20.05.2021	10499647	1078	0.368	0.512	0.861
26.05.2021	6723776	1192	0.313	0.777	7.792
27.05.2021	5321876	1243	0.152	0.350	1.916
01.06.2021	9701837	1514	0.519	1.504	8.719
Total average	**7777222**	**1114**	**0.313**	**0.700**	**5.096**

4.2 Instrument comparison

In order to asses if the instruments are comparable, the channel that measures particles count with particle diameter from 0.3 μm to 20 μm for the Grimm and 0.3 μm to 25 μm for the Aerotrak were compared. In figure 4.1 you can see the similarity between the two instruments in the same location during the same test. These results are not manipulated against background value in order to get the most correct comparison of instruments.

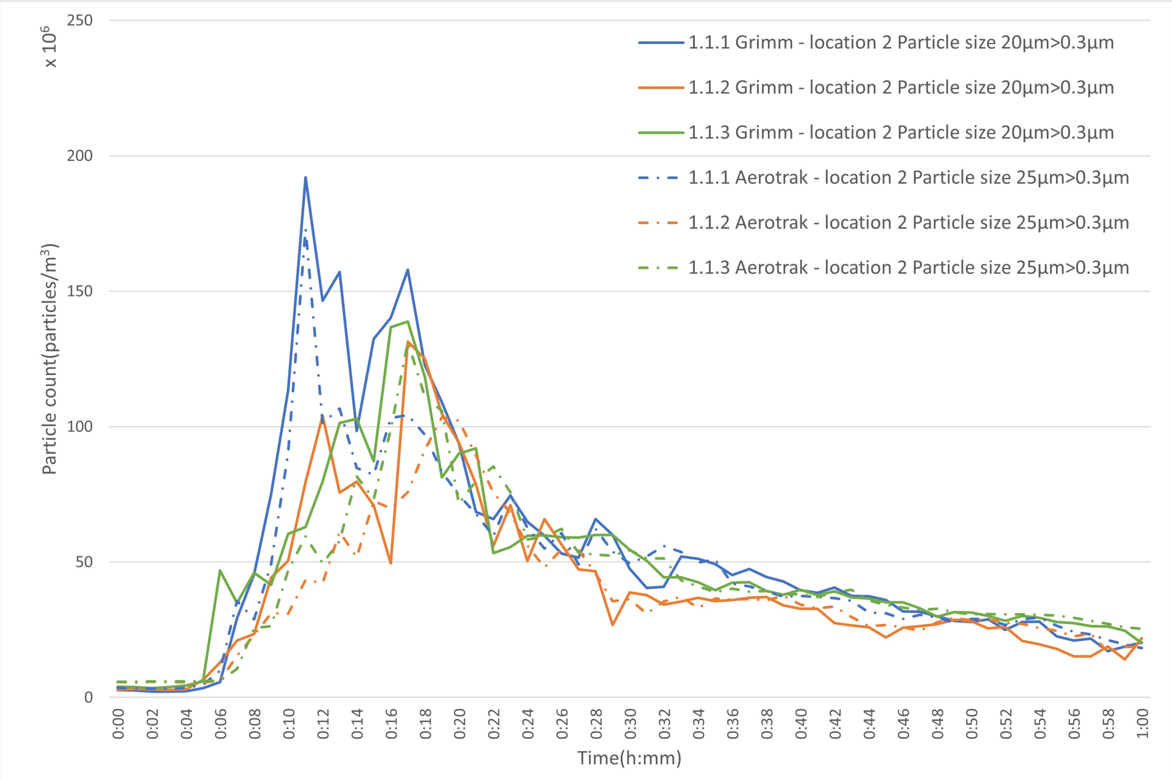


Figure 4.1: Comparison of the particle count between the Grimm and the Aerotrak from experiment 1.1

Moreover, the relative standard deviation between the two were compared. Results can be seen in table 4.3.

Table 4.3: RSD between Aerotrak and Grimm for experiment 1.1

Test	RSD (%)
1.1.1	12%
1.1.2	16%
1.1.3	13%

4.3 Experiment 0 - TEK17 kitchen ventilation requirements

Three repetitive tests were performed to verify if the existing minimum kitchen requirements from TEK 17 are enough or not. The average particle count distribution is shown in Figure 4.2. We can see a peak in location 1 of 140×10^6 particles/m^3 which is about 10 times higher than the particle count peak in location 2.

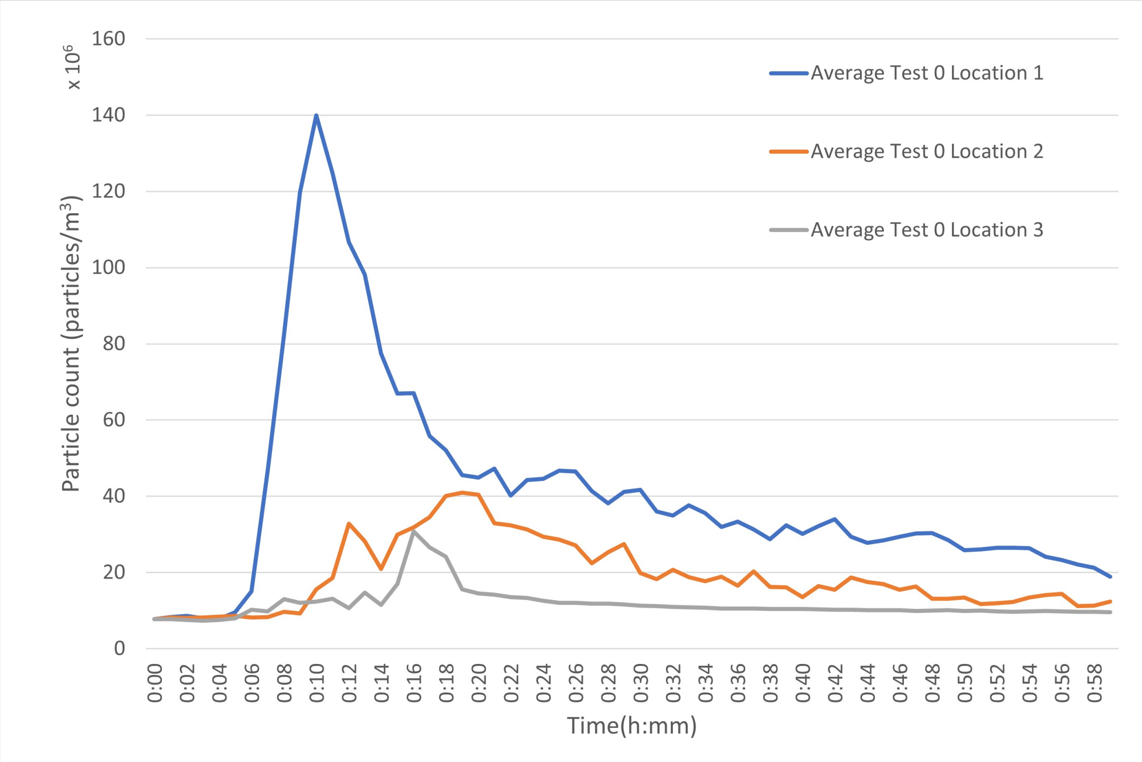
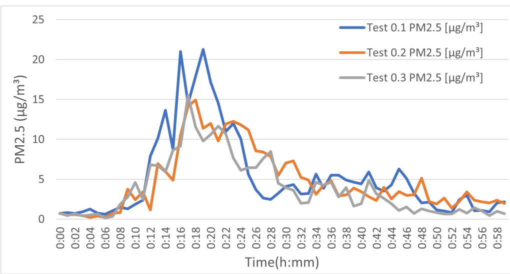
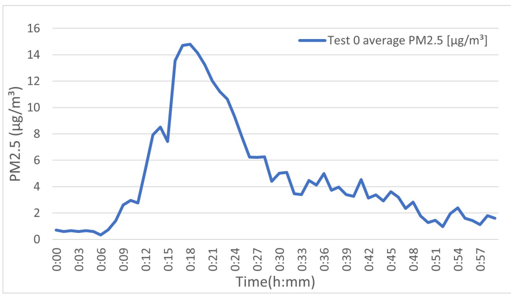


Figure 4.2: Particle distribution in the test room for test 0

Figure 4.3a shows the $PM_{2.5}$ mass concentration from all three repetitions in experiment 0 as well as average particle mass concentration. As mentioned in the theory, it is the smaller particles of diameter 2.5μm and less that are the most dangerous, it is also the value that is easily comparable with the maximum particle mass concentration recommendations. From the averaged values we can see that the emissions increases the first 17 minutes before decaying. This is correlated with the cooking time of 16 minutes, whereas the cook turns off the plate, transfers the food to a plate and leaves the room after 17 minutes.



(a) PM2.5 mass concentration for test 0 with all repetitions

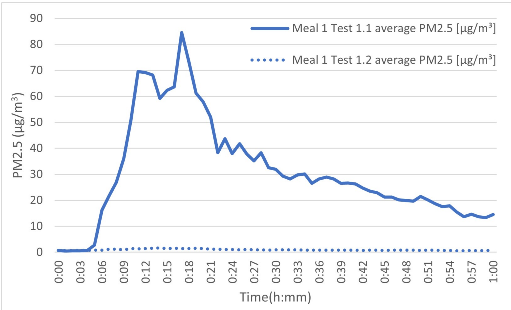


(b) PM2.5 mass concentration for test 0 averaged

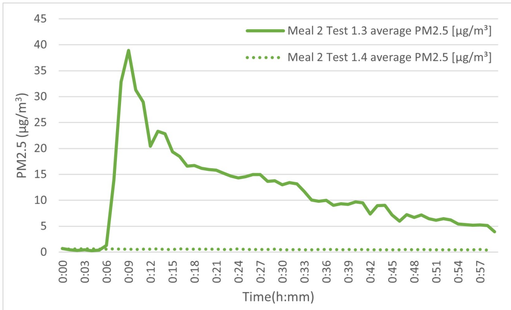
Figure 4.3: PM2.5 mass concentration for test 0

4.4 Experiment 1 - Different meals and ventilation rate

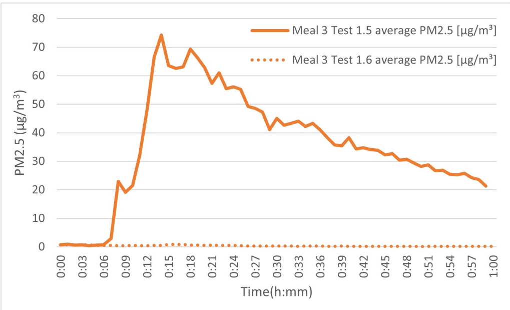
Figure 4.4 shows the average PM2.5 distribution for the repeated tests from each test meals with the hood off(solid line) and hood on(stippled line). Here we can see that the highest peak value occurs in meal 1 with a value of 84.6 $\mu g/m^3$, while the slowest decay rate with the hood off is meal 3.



(a) PM2.5 concentrations from meal 1 in experiment 1 with the hood on and off.



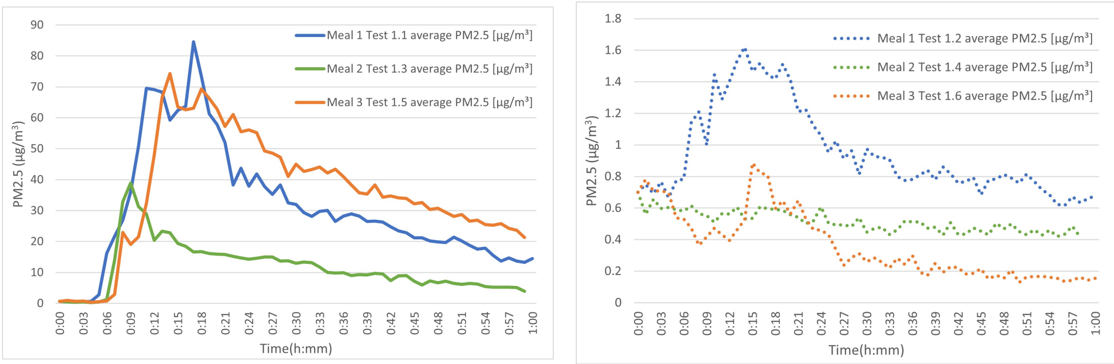
(b) PM2.5 concentrations from meal 2 in experiment 1 with the hood on and off.



(c) PM2.5 concentrations from meal 3 in experiment 1 with the hood on and off.

Figure 4.4: PM2.5 mass concentrations from all meals in experiment 1 with hood on and off.

Figure 4.5 Shows all meals together in each of the figures. Figure 4.5a shows the meals with the hood off, whereas meal 2 sems to have a significantly lower $PM_{2.5}$ concentration than the two other meals. We can also see that the $PM_{2.5}$ mass concentration is much lower with the hood on ranging from about 0.2 to 1.6 $\mu g/m^3$.

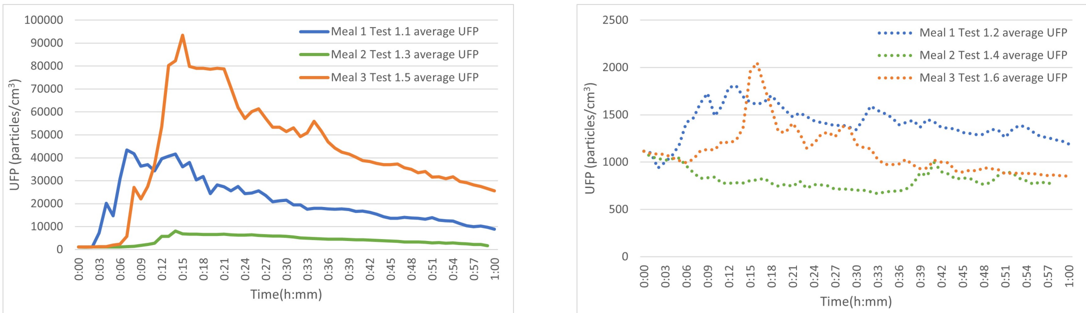


(a) PM2.5 concentrations from all meals in experiment 1 with the hood off

(b) PM2.5 mass concentrations from all meals in experiment 1 with the hood on medium setting

Figure 4.5: PM2.5 mass concentrations from all meals in experiment 1 with hood on and off.

Figure 4.6 shows the UFP particle count for all meals with the hood on and off. In contrast to the PM2.5 mass concentration values, meal 3 has a significantly higher peak and average UFP count than the two other meals.



(a) UFP count for experiemnt 1 with the hood off.

(b) UFP count for experiment 1 with the hood on.

Figure 4.6: UFP count from all meals with hood on and off.

4.4.1 Particle count the the different measuring locations

The TSPs was measured for each experiment, figure 4.7 shows the distribution for each of the meals in all three locations when the hood was off. The particle count shows similar distributions as the PM2.5 mass concentration. Here we can also see that the peak is reached much more quickly in location one, whereas the peak in location 2 and 3 occurs a few minutes later.

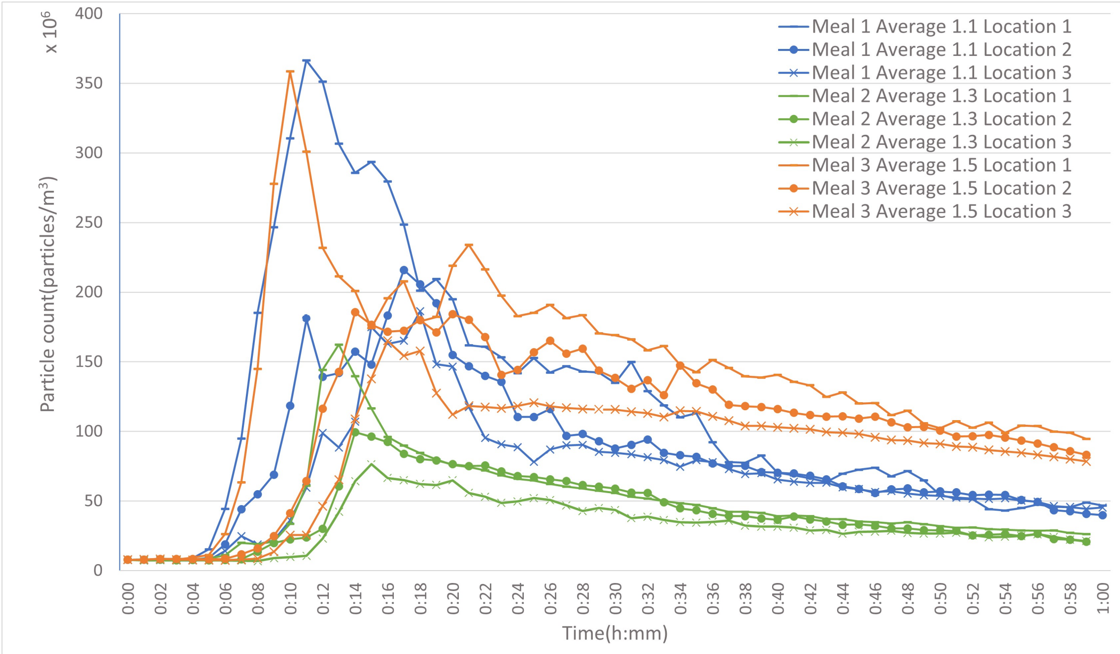


Figure 4.7: Particle count for all the meals in the different locations with the hood off.

Figure 4.8 shows the particle count in all locations for experiment 1 with the hood on. There is significantly lower amounts of particles than in 4.7. In addition, the variation between start and peak values, in additions to location differences is much less significant.

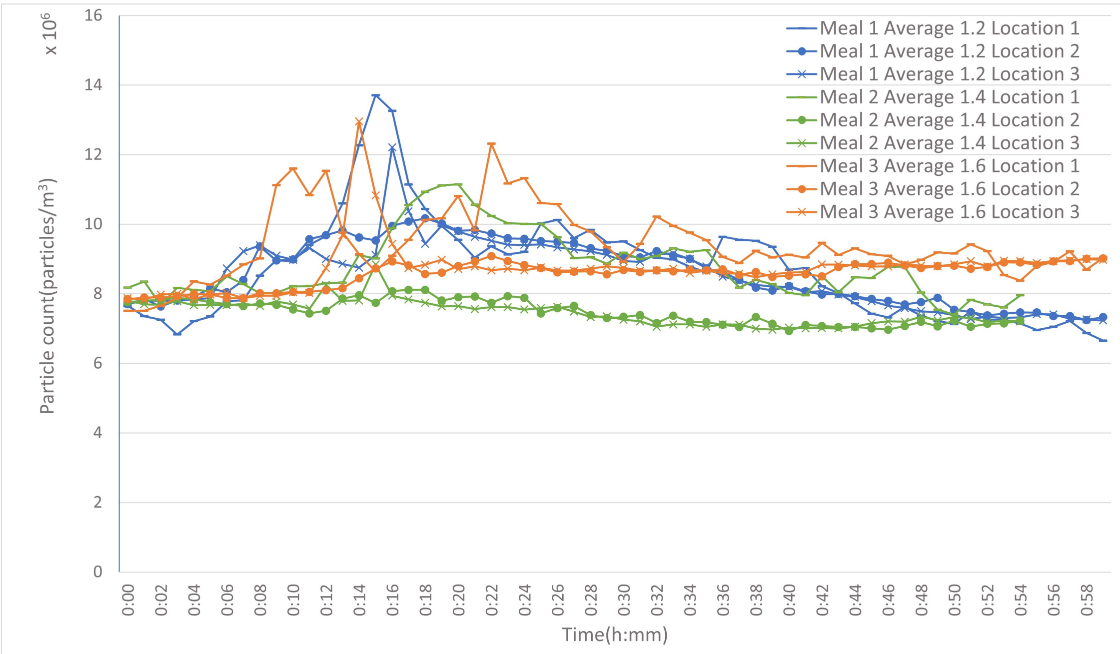


Figure 4.8: Particle count for all the meals in the different locations with the hood on.

4.4.2 Relation between exposure and hood use

Figure 4.9 shows the exposure to the cook in location 1 when the hood is on and off. For meal 1 and 3 the peak particle count is about 25 times higher when the hood is off than when the hood is on.

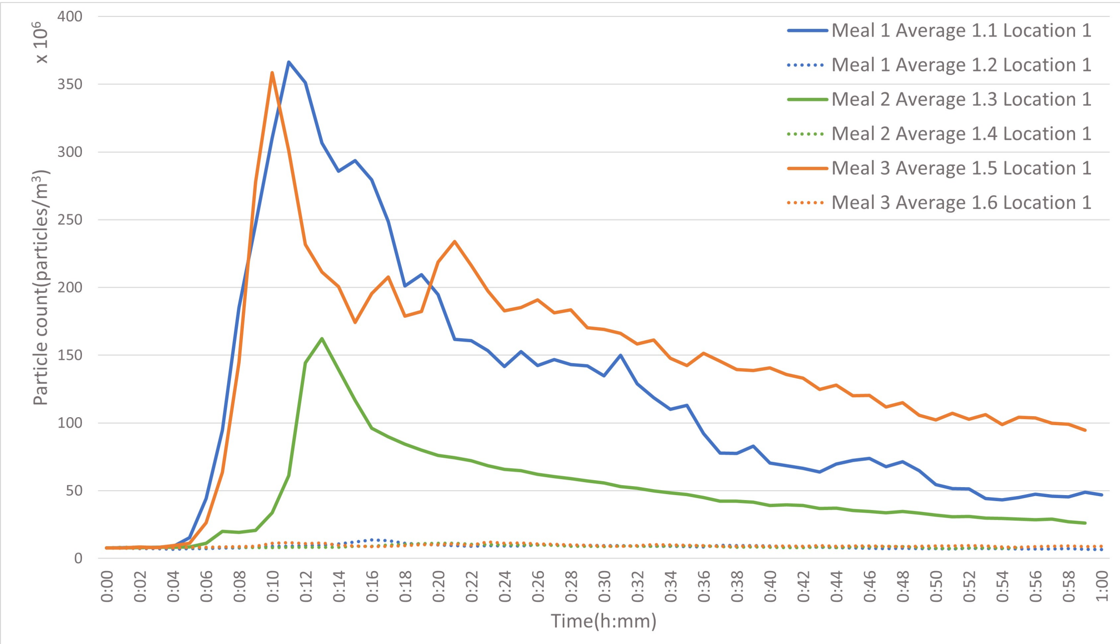
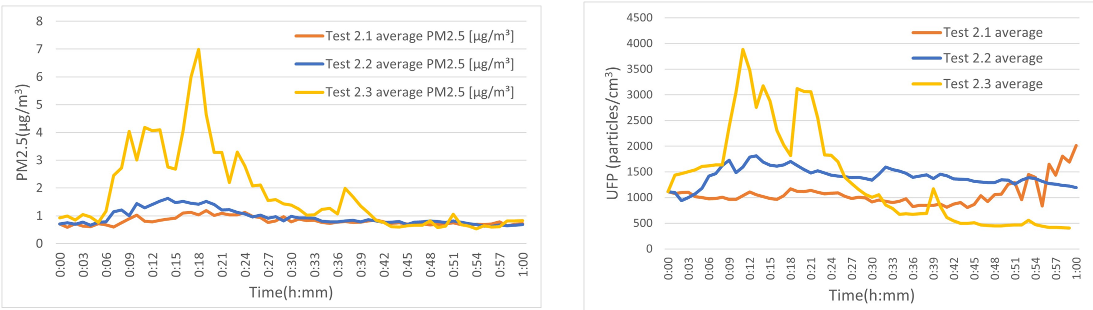


Figure 4.9: Particle count for particles with diameter 0.3 to 25 μm for all three meals with the hood on and off in location 1.

4.5 Experiment 2 - Hood usage patterns and emissions

Figure 4.10 shows the emissions from experiment 2. In test 2.1 the hood was turned on when cooking was done, after 16 minutes. In test 2.2 the hood was left on for the entire experiment(same as test 1.2) and in test 2.3 the hood was turned on 5 minutes late, whereas the minced meat already had been frying for 4 minutes with the hood off. For experiment 2.3, in one of the repetitions the difference in start value from the raw data and the background value was very high, resulting in negative values. This test was therefore re-manipulated against the minimum values which was regulated up to 0.



(a) PM2.5 mass concentrations from meal 1 with different hood use.

(b) UFP count from meal 1 with different hood use.

Figure 4.10: UFP count from meal 1 with different hood use.

Figure 4.11 shows the particle count in all locations for test 2.1 and 2.2. Except for test 2.1 having a slightly lower overall particle count, the curves seems to be similar in shape, with not much difference.

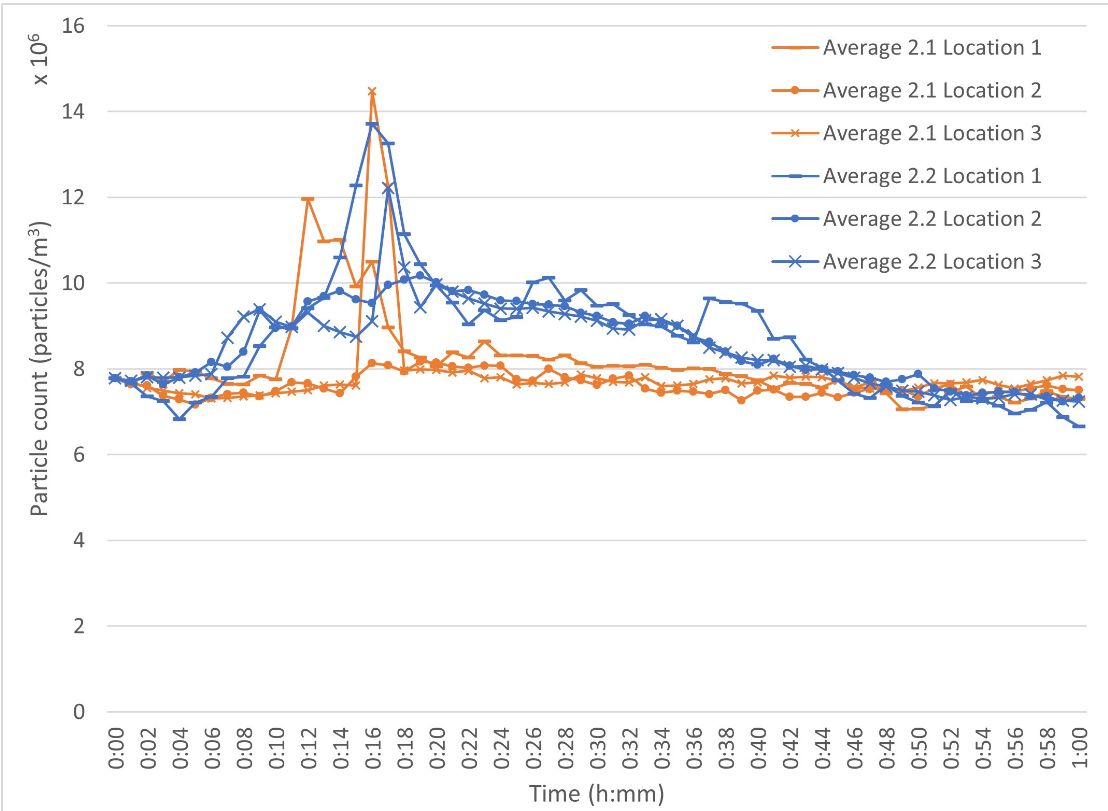


Figure 4.11: Particle count for experiment 2.1 and 2.2

As the emissions were much higher for test 2.3, figure 4.12 was made to show the particle count for all tests in all locations for experiment 2. Whereas the peak of test 2.3 in location 1 is about 10 times higher than the two other tests.

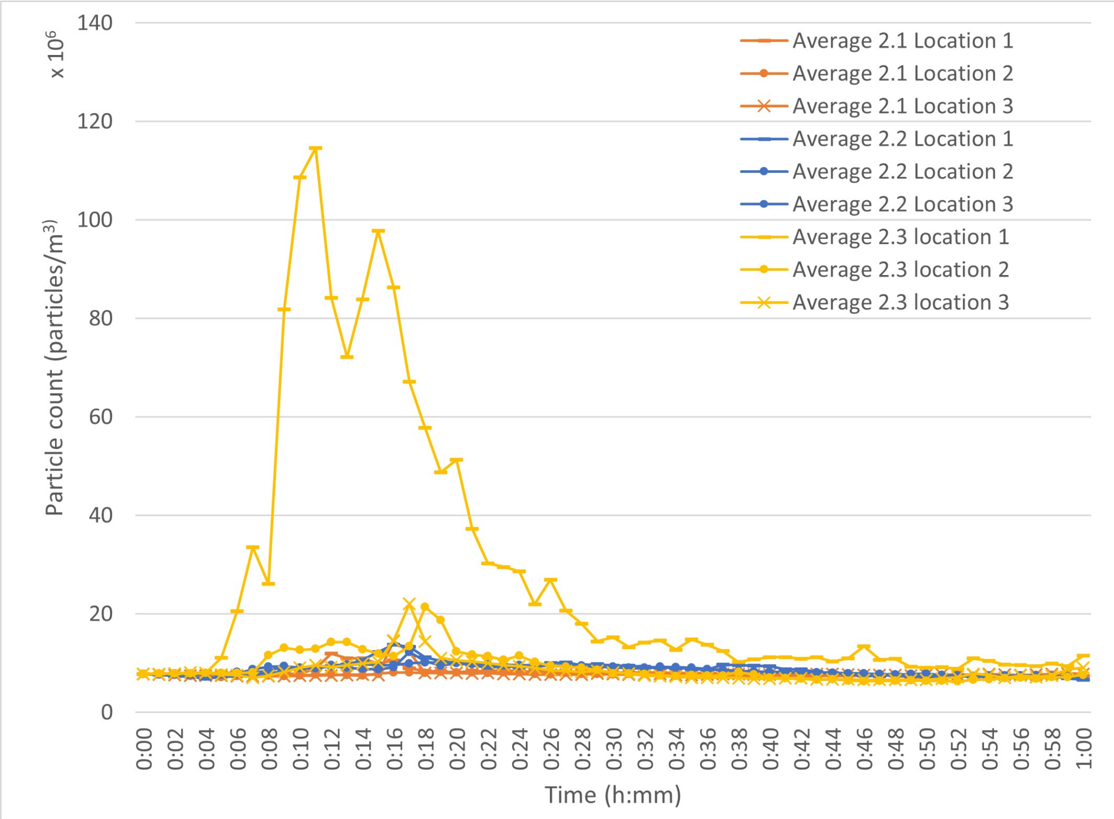
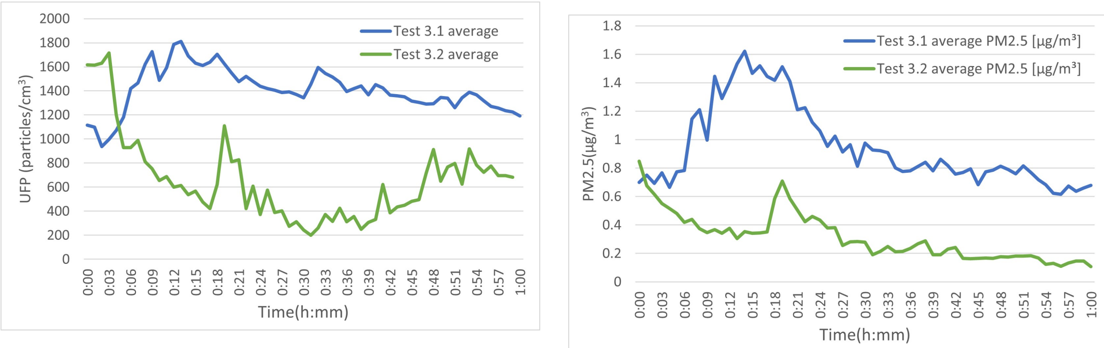


Figure 4.12: Particle count for experiment 2.3

4.6 Experiment 3 - Portion size and emissions

Experiment 3 included looking at emissions from different portion sizes. Test 3.1 represents a small portion while test 3.2 represents a big portion. Similarly as experiment 2.3, the difference in start value from the raw data and the background value it was regulated against was very high for 3.2 as well. These datas were therefore re-manipulated against the minimum values which was regulated up to 0. Figure 4.13 shows the PM2.5 mass concentration and UFP count from experiment 3.



(a) UFP count from meal 1 with different portion sizes

(b) $PM_{2.5}$ mass concentration from experiment 3.

Figure 4.13: UFP count and PM2.5 concentration from experiment 3

Figure 4.14 shows the particle count in the different locations. Even though 3.2 was the larger portion size, the particle count is mainly lower than in test 3.1.

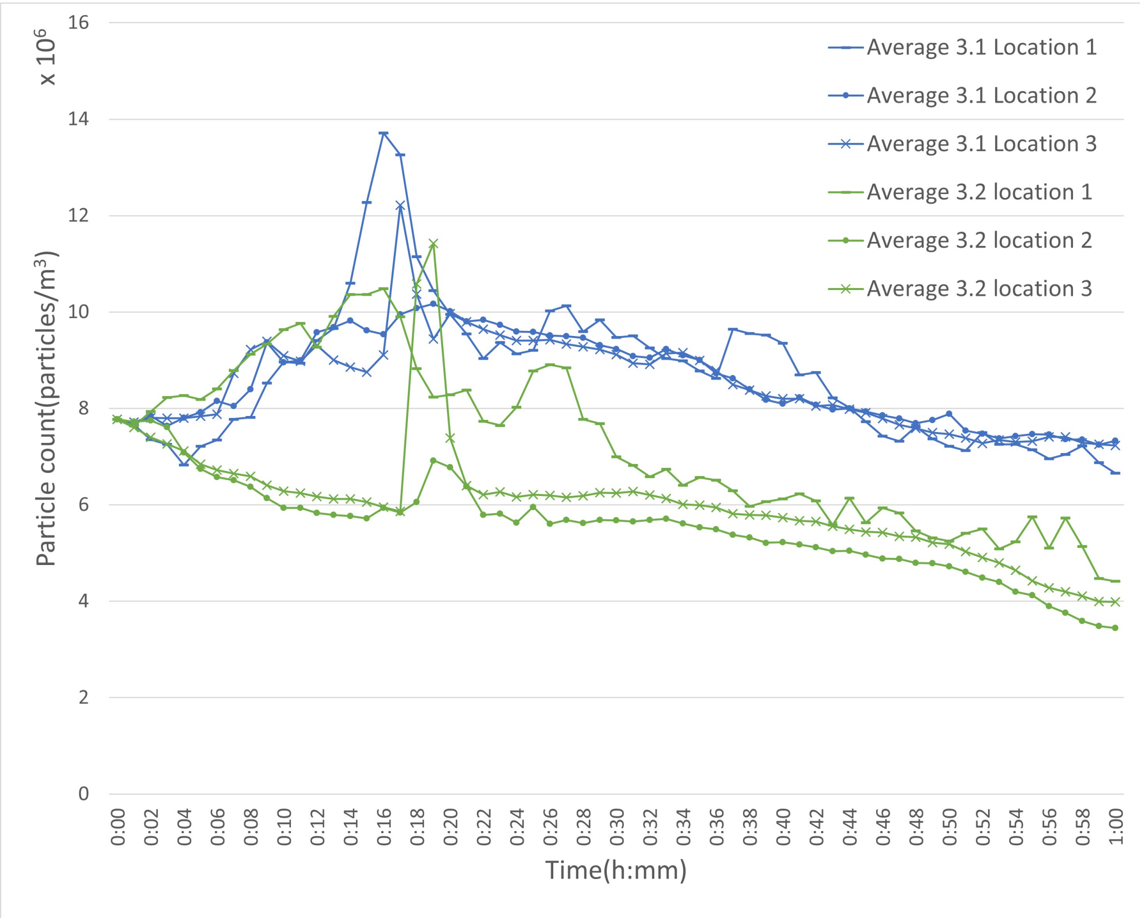


Figure 4.14: Particle count for experiment 3 in all locations.

4.7 Peak and average particle concentrations

The peak and average PM mass concentration from raw and manipulated data for all tests values are shown in table 4.4. For more details data curves please see appendix H, I, J, K and L.

Table 4.4: PM1 and PM2.5 averaged and peak values for the manipulated and raw data.

Experiment	Manipulated data				Raw data			
	Peak		Average		Peak		Average	
	PM1 ($\mu g/m^3$)	PM2.5 ($\mu g/m^3$)	PM1 ($\mu g/m^3$)	PM2.5 ($\mu g/m^3$)	PM1 ($\mu g/m^3$)	PM2.5 ($\mu g/m^3$)	PM1 ($\mu g/m^3$)	PM2.5 ($\mu g/m^3$)
0.1	4.2	14.8	1.1	4.6	4.7	15.8	1.7	5.5
1.1	25.7	84.6	8.5	30.8	25.8	84.9	8.6	31.2
1.2/2.2/3.2	0.6	1.6	0.4	1.0	0.5	1.3	0.3	0.6
1.3	8.4	38.9	2.5	11.6	10.0	43.7	4.1	16.3
1.4	0.3	0.7	0.3	0.5	0.4	0.7	0.4	0.5
1.5	19.9	74.3	9.8	35.8	20.8	77.0	10.6	38.6
1.6	0.4	0.9	0.3	0.4	0.5	1.2	0.5	0.7
2.1	0.4	1.2	0.3	0.8	0.3	0.9	0.2	0.5
2.3	1.7	7.0	0.5	1.8	1.7	7.1	0.6	1.9
3.2	0.3	0.8	0.2	0.3	0.3	0.8	0.2	0.3

Peak and average particle count for all tests in summarised in table 4.5.

Table 4.5: Peak and average particle count with particle diameter from 0.3 μm to 25μm for all tests.

Experiment	Peak (particles/m^3)			Average (particles/m^3)		
	Location 1	Location 2	Location 3	Location 1	Location 2	Location 3
0.1	1.52x10^8	5.19x10^7	4.02x10^7	5.25x10^7	2.98x10^7	2.11x10^7
1.1	3.67x10^8	2.16x10^8	1.86x10^8	1.20x10^8	8.37x10^7	6.94x10^7
1.2/2.2/3.2	1.37x10^7	1.02x10^7	1.22x10^7	8.70x10^6	8.58x10^6	8.52x10^6
1.3	1.62x10^8	9.95x10^7	7.65x10^7	4.87x10^7	4.17x10^7	3.27x10^7
1.4	1.11x10^7	8.12x10^6	8.85x10^6	8.77x10^6	7.48x10^6	7.46x10^6
1.5	3.59x10^8	1.86x10^8	1.65x10^8	1.42x10^8	1.08x10^8	8.68x10^7
1.6	1.23x10^7	9.09x10^6	1.30x10^7	9.40x10^6	8.56x10^6	8.72x10^6
2.1	1.20x10^7	8.17x10^6	1.45x10^7	8.09x10^6	7.61x10^6	7.85x10^6
2.3	1.15x10^8	2.14x10^7	2.20x10^7	2.72x10^7	9.09x10^6	8.40x10^6
3.2	1.05x10^7	7.78x10^6	1.14x10^7	7.26x10^6	5.56x10^6	6.05x10^6

Peak and average ultrafine particle count for all tests in shown in table 4.6.

Table 4.6: Ultrafine particle count for particles with diameter from 0.02 to 0.1 μm

Experiment	Peak UFP	Average UFP
1.1	4.35x10ˆ4	2.06x10ˆ4
1.2/2.2/3.2	1.81x10ˆ3	1.41x10ˆ3
1.3	8.01x10ˆ3	4.08x10ˆ3
1.4	1.11x10ˆ3	8.17x10ˆ2
1.5	9.35x10ˆ4	4.22x10ˆ4
1.6	2.05x10ˆ3	1.11x10ˆ3
2.1	2.01x10ˆ3	1.07x10ˆ3
2.3	3.89x10ˆ3	1.36x10ˆ3
3.2	1.71x10ˆ3	6.57x10ˆ2

4.8 Relative standard deviation

The relative standard deviation was calculated for each of the tests to see the reproducibility of the 3 repetitions done for each tests. The RSD was calculated for both the manipulated and raw data.

4.8.1 Manipulated data

The relative standard deviation has been calculated for each of the experiments. As mentioned in chapter 3.5.3, it was attempted to regulate the data against the total averaged background values from the beginning of each test day. In some cases this resulted in a higher RSD, as seen in table 4.7. That aside, for most cases the RSD was lower than with the raw data as seen in table 4.8.

Table 4.7: RSD for all particle counters and the thermocouples measuring cooktop temperature.

Experiments	AEROTRAK LOC 1 RSD (%)	AEROTRAK LOC 2 RSD (%)	AEROTRAK LOC 3 RSD (%)	GRIMM(PM1) RSD (%)	GRIMM(PM2.5) RSD (%)	P-TRAK RSD (%)	Cooktop A RSD (%)	Cooktop D RSD (%)
0.1	23%	21%	18%	27%	40%	-	-	12%
1.1	22%	17%	22%	19%	22%	31%	-	10%
1.2/2.2/3.2	15%	12%	12%	21%	21%	18%	-	12%
1.3	10%	28%	21%	49%	55%	42%	8%	13%
1.4	10%	17%	15%	29%	27%	49%	6%	12%
1.5	11%	15%	12%	16%	21%	35%	9%	12%
1.6	14%	11%	14%	15%	51%	38%	10%	7%
2.1	9%	5%	6%	19%	34%	56%	-	6%
2.3	32%	46%	45%	64%	64%	35%	-	11%
3.2	18%	19%	21%	27%	82%	49%	-	11%
Total	**16%**	**19%**	**19%**	**29%**	**42%**	**39%**	**8%**	**11%**

4.8.2 Raw data

The relative standard deviation was calculated for the raw data so that the RSDs could be compared. The RSD from the raw data is presented in table 4.8.

Table 4.8: RSD for all particle counters from the raw data.

Experiment	AEROTRAK LOC 1 RSD (%)	AEROTRAK LOC 2 RSD (%)	AEROTRAK LOC 3 RSD (%)	GRIMM(PM1) RSD (%)	GRIMM(PM2.5) RSD (%)	P-TRAK RSD (%)
0.1	18%	16%	11%	18%	28%	-
1.1	25%	18%	24%	21%	20%	34%
1.2	63%	62%	63%	32%	56%	42%
1.3	22%	18%	23%	21%	20%	28%
1.4	12%	12%	12%	12%	14%	24%
1.5	11%	14%	13%	16%	18%	36%
1.6	25%	18%	19%	15%	16%	34%
2.1	18%	15%	17%	30%	44%	50%
2.3	28%	30%	33%	46%	55%	32%
3.1	62%	82%	85%	68%	44%	53%
Total	**28%**	**29%**	**30%**	**28%**	**32%**	**37%**

4.9 Exponential growth and decay rates

The exponential increase and decay curves from the GRIMM measurements has been calculated to compare the growth and decay of the different tests. The formulas for each of the curves can be found in table 4.9. The figures with all exponential curves can be found in appendix H, I, J and K.

Table 4.9: Exponential growth and decay for all experiments.

Experiment	PM1		PM2.5	
	Exponential growth	**Exponential decay**	**Exponential growth**	**Exponential decay**
0.1	$y = 0.1503e^{252.22x}$	$y = 6.3163e^{-72.09x}$	$y = 0.3104^{e314.23x}$	$y = 31.313e^{-79.06x}$
1.1	$y = 0.2595e^{458.8x}$	$y = 29.462e^{-52.61x}$	$y = 0.6023e^{505.88x}$	$y = 99.027e^{-48.32x}$
1.2	$y = 0.275e^{82.434x}$	$y = 0.5895e^{-15.69x}$	$y = 0.6212e^{97.984x}$	$y = 1.7227e^{-25.45x}$
1.3	$y = 0.1031e^{439.54x}$	$y = 10.847e^{-60.51x}$	$y = 0.1455e^{770.1x}$	$y = 35.571e^{-49.75x}$
1.4	-	$y = 0.2979e^{-7.653x}$	-	$y = 0.6117e^{-8.996x}$
1.5	$y = 0.1181e^{526.95x}$	$y = 24.506e^{-31.3x}$	$y = 0.2475e^{603.34x}$	$y = 98.231e^{-35.73x}$
1.6	$y = 0.3137e^{7.9747x}$	$y = 0.371e^{-6.227x}$	-	$y = 0.756e^{-42.78x}$
2.1	$y = 0.2894e^{27.326x}$	$y = 0.4196e^{-8.396x}$	$y = 0.5955e^{45.555x}$	$y = 1.2529e^{-16.44x}$
2.3	$y = 0.2723e^{137.97x}$	$y = 1.2381e^{-41.95x}$	$y = 0.5927e^{190.79x}$	$y = 5.7752e^{-63.18x}$
3.2	-	$y = 0.2812e^{-18.21x}$	-	$y = 0.4322e^{-31.69x}$

5
DISCUSSION

The discussion chapter will assess the results thoroughly, looking at the different factors affecting the cooking emissions.

5.1 Uncertainties

As this is an actual live experiment, there is a list of uncertainties related to the lab conditions, instruments, manipulation of data, and more.

5.1.1 Raw versus manipulated data

The results from the particle counters were manipulated so that all tests started at the same average background value. This regulation was successful for most tests, whereas the RSD was reduced compared to the raw data. However, for the tests with very high initial background values, the difference subtracted resulted in minus values in some cases. As negative particle emissions are not possible, the affected tests were re-manipulated so that the lowest value would be equal to zero. The tests that were additionally altered were test number 3.2.2, 3.2.3, and 2.3.2.

Another uncertainty includes the particle emission in the low ventilation scenario. As mentioned in the method chapter, the AHU could not supply the air volume of 36 m^3/h which was supposed to be the low ventilation scenario. The airflow was therefore doubled, and it was assumed the particle emissions per unit volume was proportional to the airflow. However, this calculation method has shown to be somewhat controversial. For instance, if we compare the average PM2.5 mass concentration from test 0 and test 1.1, we have 4.6 and 30.8 $\mu g/m^3$, respectively. The ventilation rate was 144 m^3/h for test 0 and 36 m^3/h for test 1.2; we have 0.25 times the ventilation rate in test 1.1 compared to experiment 0. Thus, if this method was exact, the average concentration of test 1.1 should have been 18.4 $\mu g/m^3$, resulting in a quite significant difference from the manipulated data. That aside, for these calculations entirely appropriate, there should have been well-mixed conditions which was not the case for these experiments.

5.1.2 Relative standard deviation

For each experiment, an RSD was calculated to assess the repeatability of the experiments. The RSD from all manipulated data varied between 5% to 82%, while the RSD from the raw data ranged from 11% to 85%. For some experiments, this value is very high; the tests with higher RSD are more uncertain than the experiments with lower RSD; this is important to consider when analyzing the results.

5.1.3 Instrument calibration and errors

All instruments used in the tests have been calibrated; however, the calibration for all instruments is outdated to various degrees. This may result in unknown uncertainties, which has to be considered when using the data.

Moreover, for multiple tests, the P trak signalized a ”Lo Alc” error; according to the manual, this is either low alcohol in the cartridge or moisture accumulation. Since the alcohol cartridge was refilled before each experiment, it is assumed that this warning is due to moisture accumulation. However, the effects of this warning are unknown; the results from the P trak are, therefore, in some cases questionable.

5.1.4 Temperature

The temperature in the pan was measured with a thermocouple connected to a piece of aluminum. The calibration with only oil was very accurate to the actual temperature measured with the infrared thermometer. With food, the piece of aluminum was moved a lot, causing a higher uncertainty and less contact with the pan surface. For instance, in some of the tests, it seems the metal piece may not have been in contact with the pan surface resulting in lower measured temperatures, while in other tests, a good connection gave higher cooking temperature even though the exact same cook-top setting was used. Nevertheless, the RSD for the cook-tops remained relatively low, with an RSD between

6-13 % for all tests.

Moreover, the test room temperature and test hall temperature varied between 21-24 and 17-24, respectively. While the temperature in the test room was easy to regulate, the temperature in the test hall was more unstable due to a garage door that opened and closed during some of the experiments. Despite this, this doesn't seem to be of any significance concerning particle emissions deviations.

5.1.5 Relative humidity

The relative humidity during the test period varied between 10 to 60 %. There seems to be a correlation between the relative humidity level and particle emissions from looking at each test. Whereas the emissions seem to be higher with the tests with higher relative humidity. Jacobs et al. had a similar observation, but only when the OPC was in direct contact with water vapor from cooking, which is not the case for the GRIMM in the test room. The results suggests that either particle increase is higher when relative humidity is higher or that the particle counters misinterpret water droplets as particle emission. This may be investigated further.

5.2 TEK 17 requirements

Meal 1 (minced meat with taco spices) was the meal that had the highest peak emissions. Therefore, it was the meal selected to be tested against the minimum requirements from TEK 17. The experiment showed that in location 2, the average PM2.5 peak concentration was 14.8 $\mu g/m^3$, which is not a critically high particle concentration. However, let's look at the distribution of particles throughout the room. The particle count measured with the Aerotrack in location 1 seems to be about ten times higher than the particle count in location 2. As the comparison of the OPC(Grimm) and the Aerotrak had a pretty similar particle count in the same bin with an average RSD of 13.7 %, we can assume that the cook may have been exposed to an average PM2.5 peak concentration of about 147.9 ± 20 $\mu g/m^3$, which is significantly higher than the recommended daily mean PM2.5 concentration of 14 $\mu g/m^3$ in Norway. This indicates that it seems the TEK17 minimum requirements may be sufficient to remove concentrations further from the cooktop in the room; however, during cooking, the cook is exposed to a significant amount of particles, which may cause adverse health effects.

5.3 Consequence of different meals in regards of exposure and particle pollution

Three different meals were tested at two different ventilation scenarios. Similarly, as both Jacobs and oleary found, meal 1 containing red meat seems to have the highest peak PM2.5 concentration of 84.55 $\mu g/m^3$ despite being the meal with the lowest calorific value and least weight. That aside, by looking at the nutritional information, there seems to be a significantly higher amount of saturated fats in meal 1 compared to the two other meals. Based on these observations and previous findings, it can be claimed that high temperatures combined with high amounts of saturated fats result in high particle concentrations.

Next, meal 3 containing salmon and wok got a peak pm2.5 concentration of 74.26 $\mu g/m^3$. Meal 3 was the meal with the highest fat content but had about half the amount of saturated fats compared with meal 1. Despite higher cooking temperatures, this may be why the peak of meal 3 was slightly lower than meal 1. On the other hand, meal 3 had over twice the number of ultrafine particles with a peak value of 9.35 $\times 10^4$ particles/cm3 compared with meal 1 with a peak ultra-fine particle count of 4.35 $\times 10^4$ particles/cm3. Zhang et al found a strict correlation between cooking temperature and UFP peaks; the cooking style also showed great significance whereas frying emitted the most and boiling the least amount of particles. These results suggest that the UFP emissions from meal 3 may have been due to higher frying temperatures over longer time compared to meal 1, resulting in higher UFP count. Meal 2 scored lowest on all parameters, with a peak PM2.5 of 38.9 $\mu g/m^3$ and a UFP count of 8.01 $\times 10^3$ particles/cm3. Meal 2 may have gotten such low values due to the lower cooking temperature, in addition to significantly less fat content. Buananao got similar findings, whereas fat content seemed to be a critical factor concerning emissions levels.

There was also a slight increase in CO2 concentration during cooking; however, these emissions were presumed to be the cook's emissions. The values were also well below recommended values at all times; the CO_2 values will therefore not be discussed any further.

5.3.1 Growth and decay rates

For the experiments with the hood off, meal 2 had the highest exponential increase to reach its peak PM2.5 value. Followed by meal 3, and lastly meal 1. Moreover, meal 2 seems to have the highest exponential decay rate, followed by meal 1 and lastly, meal 3. This results in a higher overall average particle concentration for meal 3. This makes sense as meal 3 is cooked at high temperatures during the whole cooking period of 14 minutes.

5.3.2 PM concentration with the hood on and off

By looking at the figures in chapter 4.4 the significance of proper kitchen ventilation is clear. With the low ventilation scenario with only primary exhaust, the PM2.5 peak values of meals 1, 2, and 3 are 84.55, 38.9 and 74.26 $\mu g/m^3$, respectively. For meal 1 and 2 these values are over 50 times higher than the peak values with the hood on, while with meal 3 the peak is over 80 times higher than the test with the hood on. As meal 3 had significantly higher amounts of UFP count this may indicate that the hood has more difficulties removing ultrafine particles than particle of larger sizes.

5.3.3 Distribution of particle emissions in different locations

During both the test with the TEK 17 ventilation and low ventilation scenario, a similar pattern of a significantly higher particle count in location one was observed. For all meals, the particle count seems to be about double in location 1 than in location 2. This may indicate that the cook is exposed to significant amounts of particle concentrations at low ventilation volumes. In comparison with the high ventilation scenario with the hood at level 2, although the count still seems to be highest in location 1, the locations have fewer differences. By looking at figure 4.9 we can see the significance of using the hood, whereas the peak values are up to 30 times higher when the hood is off.

5.4 Significance off hood usage patterns

Experiment 2 was done to investigate exposure in regards to hood usage patterns. The experiments' results show that turning the hood off right away versus leaving it on for the entire test time had minimal effect on particle concentration. On the other hand, when the hood was turned on 5 minutes late, the peak PM2.5 exposure was 6 folded compared two the other tests. More importantly, the exposure in location 1 was almost ten times higher than the two other tests and over five times higher than in location two. This may indicate that the cook may have been exposed to a significant amount of particles even though there was only a delay of 5 minutes on turning on the hood.

5.5 Significance of portion sizes in regards of exposure

Experiment 3 was performed to see if greater portion size would lead to higher exposures. From figure 4.13, we can see that the exposure from both meals already are relatively low due to the hood's use, but the larger portion is actually emitting less. After analyzing the test conditions, we can see that the pan temperature with the larger portion was significantly lower than, the smaller portion size. To get more accurate results, better pretests should have been performed to ensure more similar conditions; in addition, it would have been easier to see the effect of portion sizes with a low ventilation scenario rather than the high ventilation scenario.

It should also be noted that the RSD in test 3.2 was significantly higher than all other tests, meaning this is the test with the most elevated uncertainty.

6
CONCLUSION

In this thesis several experiments have been performed with different ventilation scenarios and meals where particles have been measured in different size bins and locations including the breathing zone, middle of the room and sitting zone.

The study found that cooking was a significant source of particle mass concentration, increasing with up to a factor of 80 when the hood was off. Furthermore, when the hood was off the average PM2.5 mass concentration, UPF number concentration and particle count in the middle of the room ranged from 2.5 to 35.8$\mu g/m^3$, 4.08 $\times 10^3$ to 4.22 $\times 10^3$ particles/cm^3 and 4.17 $\times 10^7$ to 1.08 $\times 10^8$ particles/m^3 ,respectively. This contrasts with the high ventilation scenario with the hood on medium setting, whereas there was only a non-significant increase in particle pollution before receding again to background values very rapidly.

The cook was exposed to a large number of particles with the TEK 17 ventilation requirements and the low ventilation scenario. With an up to 3.5 times higher peak in location 1 than in location 2. Moreover, the cooking emissions seemed to vary depending on cooking temperature, RH, food, and cooking style. The meal with the highest PM2.5 mass concentration peak was the minced meat, which had the highest amount of saturated fat. Meal 3 had the highest average concentration throughout the experiment, most likely due to the high cooking temperature and the nutritional contents of the meal, with high-fat content. The test performed where there was recorded higher relative humidity seemed to have a higher PM concentration.

Hood usage patterns only showed significance when the hood was turned on 5 minutes after the beginning of the cooking, whereas the cook in front of the stovetop was exposed to a large amount of particles. IN contrast, the hood seemed to remove particles very efficiently throughout the cooking process; thus, turning the hood off right away versus letting it on for the rest of the experiment did not significantly differ in particle emissions. Lastly, the portion sizes did not seem to make a big difference; however, as the temperature was lower during the larger portion size experiment, the results may not be correct. These findings show the significance of sufficient kitchen ventilation, whereas, with today's minimum ventilation requirements, there are still significant amounts of particle emissions, which may lead to health issues.

Further works

From these experiments, I would recommend that future works look into:

- Different hood types remove particles differently; kitchen ventilation requirements should account for all different hood types. Therefore it is recommended to test different commonly used hood types, such as downdraft, roof-mounted hood, as well as recirculating hoods versus exhaust hoods. To see how efficiently they remove particles in comparison with a wall-mounted exhaust hood.
- For the instruments with outdated calibration, these may be sent to factory calibration after the experiments to define the errors from the measurements.
- Investigate whether there should be different ventilation requirements for different hood heights depending on particle emissions with varying hood heights.
- Investigate the assumptions of particle emissions per unit volume being proportional to the ventilation rate.
- Develop a detailed methodology for particle emission data manipulation. In addition, it is recommended to look into a better regulation method against background values.
- Develop a better methodology to measure pan temperature during cooking experiments.
- The results suggest that either particle increase is higher when relative humidity is higher or that the particle counters misinterprets water droplets as particle emission. This may be investigated further.

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APPENDICES

A Literature research method

In order to find literature, a good research methodology has to be implemented.

A.1 Search terms

First of the right search terms need to be found. This is done by assessing the key concepts of the research topic and then for each concept the synonyms, antonyms, related, broader and narrower terms are found. For this review the topic is divided into different concepts with a lists of relevant terms, these are listed in table 1.

Table 1: Key concepts and terms

Concept 1: Cooking	Cooking, Cooking generated particles, Cooking fume particles, Clean cooking, Cooking emissions, Cooking oils, Oils, Frying, Broiling, Boiling, Meat, Fish, Spices
Concept 2: Exposure	Air quality, emmisions, exposure, particle removal, moisture, Indoor air quality, PM, PM2.5, PM10, Household air pollution, Health, Contaminants, Nitrogen dioxide, NO, NO2, Ultra fine particles, CO, Particle behaviour, Polluant, Pollution evaluation
Concept 3: Ventilation	Kitchen ventilation, downdraft, draft, cooker hood, stove hood, range hood, kitchen hood, stovetop, cooker, Aggregate, Air distribution, Exhaust, Exhaust airflow rate, Activated carbon, Plasma filters, Capture efficiency, CFD, Extractor fan, Thermal environment, Indoor airflow, Temperature distribution

A.2 Search engine

In order to sharpen the scope of the search, research guidelines were set. In order to find relevant reports, several different search engines were used. Main guideline for the search and engines are listed in table 2.

Table 2: Search engines

Main search guideline	Search engines
Sources: electronic databases, selected journals, and specific recommendations; Timespan: last fifteen years (2006-2021); Sources must be peer-reviewed; Must have access to full-text	Oria (Norwegian university libraries); Scopus; Elsevier Engineering Village; Springer; Science Direct; Taylor & Francis journals; Osti.gov; Wiley Online Library; SAGE Journals; Research gate

In addition, to limit the search results, refine options and different search techniques were used. These included phrase searching, truncation, and the use of operators such as "AND" and "OR".

A.3 Search method

There are three main search methods[33].

- The snowball method; finds literature by using a key document as a starting point. This methods finds articles by looking at other articles from the same author or finding articles by using similar keywords.
- Citation searching; finds literature by using a key document and looking at other articles that have been cited or articles that have cited the literature selected.

- Systematic method; searching on the basis of combined search terms in search engines.

For this literature review the citation method was selected. A few recent key articles were found, and on this basis more articles were found by looking at citations.

A.4 Data collection and filtering results

In order to filter out the studies found, the article data is collected in a structured excel sheet. First, the literature found is added to the literature survey list, where the collected articles are put into three categories depending on relevance:

- Green: Will read and review
- Yellow: Will read and review if I have time
- Red: Not relevant, will not read

Once the articles are filtered, all articles in the green category are added to the literature review matrix, were more detailed data is collected. The list of collected data is shown i table 3.

Table 3: Article data collection

Generall data collection (Literature survey list)	Detailed data collection (Literature review matrix)
Key words; Citations; Title; URL; Year	Full reference; Study parameters; Focus; Method; Instruments; Findings

B Literature survey list

No.	Publication	Citations	Year
0	Keywords: Cooking - generated particles, Range hood, Particle decay rate constant, Living–Kitchen (L/K) ratio. Emission ratePM2.5	-	-
1	Characteristics of cooking-generated PM10 and PM2.5 in residential buildings with different cooking and ventilation types	16	2019
0	Keywords: Thermal comfort, Indoor air quality, RNG k- ε model, Air conditioning, CFD	-	-
2	Improving indoor air quality and thermal comfort in residential kitchens with a new ventilation system	0	2020
0	Keywords: Filtration, Cooking fume particles, Spacer fabrics, Pressure dropVentilation	-	-
3	Exploration of a novel three-dimensional knitted spacer air filter with low pressure drop on cooking fume particles removal	2	2020
0	Keywords: Low-energy houses, Indoor air quality, Passive house, PM2.5Ventilation	-	-
4	The impacts of cooking and an assessment of indoor air quality in Colorado passive and tightly constructed homes	11	2018
0	Keywords: Clean cooking, Solid biomass fuel, Household air pollution, Particulate matter, Black carbon, Rural India, Ambient particulate pollution	-	-
5	Assessing the role of advanced cooking technologies to mitigate household air pollution in rural areas of Solan, Himachal Pradesh, India	0	2020
0	Keywords: Chinese cooking, PM, VOC, PAH, Health	-	-
6	Role of Chinese cooking emissions on ambient air quality and human health	61	2017
0	Keywords: Kitchen environment, Air quality, Thermal comfort, Computational fluid dynamics, Experimental calibration	-	-
7	Air quality and thermal comfort analysis of kitchen environment with CFD simulation and experimental calibration	2	2020
0	Keywords: CFD, Particle, Distribution, Motion, Cooking	-	-
8	CFD Simulation of Cooking Particle Distribution and Motion	5	2017
0	Keywords: Cooking - generated particles, Air Quality, Atmosphere & Health	-	-
0	Keywords: Range hood, capture efficiency, exposure	-	-
9	Assessment of Range Hoods based on Exposure		2018
0	Keywords: Indoor emissions, Aggregate, Size distribution, cooking activities	-	-
10	Particle emission factors during cooking activities	230	2009
0	Keywords: Capture efficiency, Exhaust hood, Exhaust airflow rate, Kitchen ventilation, Air distribution	-	-
11	Hood performance and capture efficiency of kitchens: A review	11	2019
0	Keywords: Cooking emissions, Patriculate matter, activated carbon, plasma filters	-	-
12	Efficiency of recirculation hoods with regard to PM2.5 and NO2	0	2017
0	Keywords: Cooking emissions, Pm2.5, indoor emissions	-	-
13	PM2.5 in Dutch Dwellings due to Cooking	0	2016
0	Keywords: Kitchen ventilation, contaminants, cooking process	-	-
14	Air quality impacts of open-plan cooking in tiny substandard homes in Hong Kong	3	2019
0	Keywords: Range hoods, Kitchen ventilation, Capture efficiency, capture principle, cfd, indoor air quality	-	-
15	Residential Kitchen Range Hoods - Buoyancy-Capture Principle and Capture Efficiency Revisited	29	2004
0	Keywords: Range hoods, Kitchen ventilation, Capture efficiency, capture principle, cfd, indoor air quality, HVAC filters	-	-
16	Laboratory performance of new and used residential HVACfilters: Comparison to field results (RP-1649)	1	2020
0	Keywords: Cooker hood; Extractor fan; Kitchen ventila-tion; PM2.5; Range hood.	-	-
17	Capture efficiency of cooking-related fine and ultrafine particlesby residential exhaust hoods	49	2014
0	Keywords: Cooking emissions	-	-
18	Cooking Emissions	0	2019
0	Keywords: Cooking emissions, Cooking pollutants, NO2, CO, PM	-	-
19	Take Care in the Kitchen: Avoiding Cooking-Related Pollutants	10	2014
0	Keywords:	-	-
20	Effect of venting range hood flow rate on size-resolved ultrafine particle concentrations from gas stove cooking	2	2018
0	Keywords: Kitchen ventilation, Extracting range hood, Recirculating range hood, Capture Efficiency	-	-
21	Comparing extracting and recirculating residential kitchen range hoods for the use in high energy efficient housing	-	2017
0	Keywords: Indoor air qualityCookingFine particulate matter (PM2.5)Ultrafine particles (UFP)Nitric oxideGas stove	-	-
22	The benefit of kitchen exhaust fan use after cooking - An experimental assessment	24	2018
0	Keywords: Cooktop, gas burners, indoor air quality, kitchen, oven, nitrogen dioxide, pollutant	-	-
23	Experimental Evaluation of Installed Cooking Exhaust Fan Performance	11	2011
0	Keywords:		-
24	Pollutant Exposures from Natural Gas Cooking Burners: A Simulation-Based Assessment for Southern California	47	2013
0	Keywords:	-	-
25	Addressing kitchen contaminants for healthy, low-energy homes	7	2015
0	Keywords:	-	-
26	Energy impacts of effective range hood use for all U.S. residential cooking	5	2014
0	Keywords: Indoor air quality, Pork cooking , Number concentra tion, Size distribu tion, Particle behavior	-	-
27	Particle number size distributions generated by different Korean pork cooking methods	0	2020
0	Keywords:	-	-
28	Modeling population exposures to pollutants emitted from natural gas cooking burners	2	2011
0	Keywords: Indoor air quality, Exposure, Meteorological parameter, Transmission, Pollution evaluation	-	-
29	Experimental study of relative exposure to particles transmitted from kitchen in an apartment	-	2017
0	Keywords: Indoor air pollution; Fine particles; Size distribution; Temporal variation	-	-
30	Indoor PM2.5 Characteristics and CO Concentration Related to Water-Based and Oil-Based Cooking Emissions Using a Gas Stove	50	2011
0	Keywords: Cooking oil, Frying, Emission flux, PM2.5, Ultrafine particles, Surface area	-	-
31	PM2.5 and ultrafine particles emitted during heating of commercial cooking oils	54	2012
0	Keywords: Cooking oils, Frying, Particulate matter, PM2.5, Size distribution	-	-
32	A systematic and controlled study for comparison of ultrafine and PM2.5 particles emitted during frying	2	2011
0	Keywords: Kitchen fumes, Ceiling radiation, Radiant cooling, Thermal environment, Indoor airflow, Temperature distribution	-	-
33	Control of temperature and fume generation by cooking in a residential kitchen by ceiling radiative cooling and fume hood extraction	0	2020
0	Keywords: Capture efficiency, Temperature, Cooktop	-	-
34	The effects of cook-top temperature on range hood capture efficiency	0	2020
0	Keywords: Cooking of olive oil, Particulate Matter, PM1 cooker hoods	-	-
35	Energy efficient measures to reduce PM2,5 emissions due to cooking	2	2016
0	Keywords: fresh and smoked bacon, gas and electric stoves, occupational exposure, pan frying, retene, trans,trans-24-decadienal	-	-
36	Simulated restaurant cook exposure to emissions of PAHs, mutagenic aldehydes, and particles from frying bacon	27	2013
0	Keywords:	-	-
37	Simulations of short-term exposure to NO 2 and PM 2.5 to inform capture efficiency standards	0	2020
0	Keywords: Indoor air quality, Cooking, Particulate matter (PM), Ventilation; Range hood, Residential building.	-	-
38	Range Hood and Make-up Air Supply System to Prevent Dispersion of Cooking-generated Particulate Matter	0	2021
0	Keywords: calibration factor, cooker hood, gas burner, size distribution, source strength	-	-
39	Investigating measurements of fine particle (PM2.5) emissions from the cooking of meals and mitigating exposure using a cooker hood	8	2019
0	Keywords: Cooking particles; Indoor air quality; Health effect; Kitchen ventilation.	-	-
40	Review of Effluents and Health Effects of Cooking and the Performance of Kitchen Ventilation	2	2019
	Keywords: Cooking, Cooking aerosol, Cooking emissions, Cooking tracers		
41	Emissions and indoor concentrations of particulate matter and its specific chemical components from cooking: A review	227	2013

C Matrix of most relevant litterature

Table 4: Test room setup from literature

Study	Setup	Ventilation
Dennekamp et al. 2001	The test room was a laboratory of volume 70 m3 and internal surface area of 130m2.	No mechanical ventilation was used during the studies and the windows were closed during all measurements.
Sjaastad et al.	Experiments were done in a room of 19m2. Electrical stove. Hood 50 cm above stove.	Hood on during frying at 335 m3/h. Supply air volume of 119 m3/h and primary exhaust of 112 m3/h .
G. Buonanno et al. 2009	Experiments done in an laboratory of 80 m^2 and height 2.8m. Testing at minimal ventilation and mechanical ventilation. Both gas and electrical stoves. Sampling point 2 m from stove.	Minimal ventilation scenatio (0.29 ± 0.05 h-1) and mechanical ventilation scenario (0.89±0.11 h-1) doors and windows were closed forboth scenarios.
Zhang et al. 2010	The study was conducted in three different locations a one–story, 140-m2 single family house. A student dorm of 20 m2 and 2 two bedroom apartments of approximately 60m2. Breathing zone and 1 m from the stove.	Recirculating exhaust fan and central air conditioning systems. Doors and windows were closed. AERs between 0.28-0.39 h-1.
Torkmahalleh et al. 2012	All of the experiments were conducted in a 0.81-m3 laboratory hood. Sampling point 0.35 m above the oil surface	Hood operating at 65 m3/h (80 air changes per h) to standardize environmental conditions and control emission rates.
Jørgensen et al. 2013	The size of the kitchen was 19 m2 (56.1 m3) and was equipped with a modern kitchen fume extractor. Both electric stove, and a gas stove. The hood was installed 65 cm over the stove. Sampling module was placed on the chefs shoulder.	During frying, the hood extracted 335 m3 air/hr. Basic ventilation in the kitchen room was 119 m3/hr of air supply, and 112 m3/hr outlet (without kitchen hood ventilation)
Jacobs et al. 2016	9 Dutch dwellings with different ventilation systems and different cooker hoods. Volumes of kitchens raging from 15-350 m3.	Various different ventilation systems. Ranging from motorised, recirculating, motorless and no hood.
Jacobs et al. 2018	The test room had dimensions of 3.65 x 2.66 x 2.68 m. The kitchen setup is according to NEN-EN-IEC 61591.	The room was ventilated with an airflow rate of 76m3/h(primary ventilation), kitchen range hood operated with 300m3/h. Two range hood were tested T shaped and inclined.
O'Leary et al. 2019	The test room had a depth of 3.65 m, width of 2.66 m, height of 2.68 m. The chamber layout was comparable to the EN 6159141 standard for kitchen test facilities. The hood was installed 70cm above the stove. The OPC was placed below the extract grille 1.25m above the floor.	Airflow rate for low ventilation scenario was 75 m3/h using a sigle extract grille. And a high ventilation scenario using a cooker hood with a flow rate of 300 m3/h. Circulation fans were used in the low ventilation scenario to ensure full mising conditions.

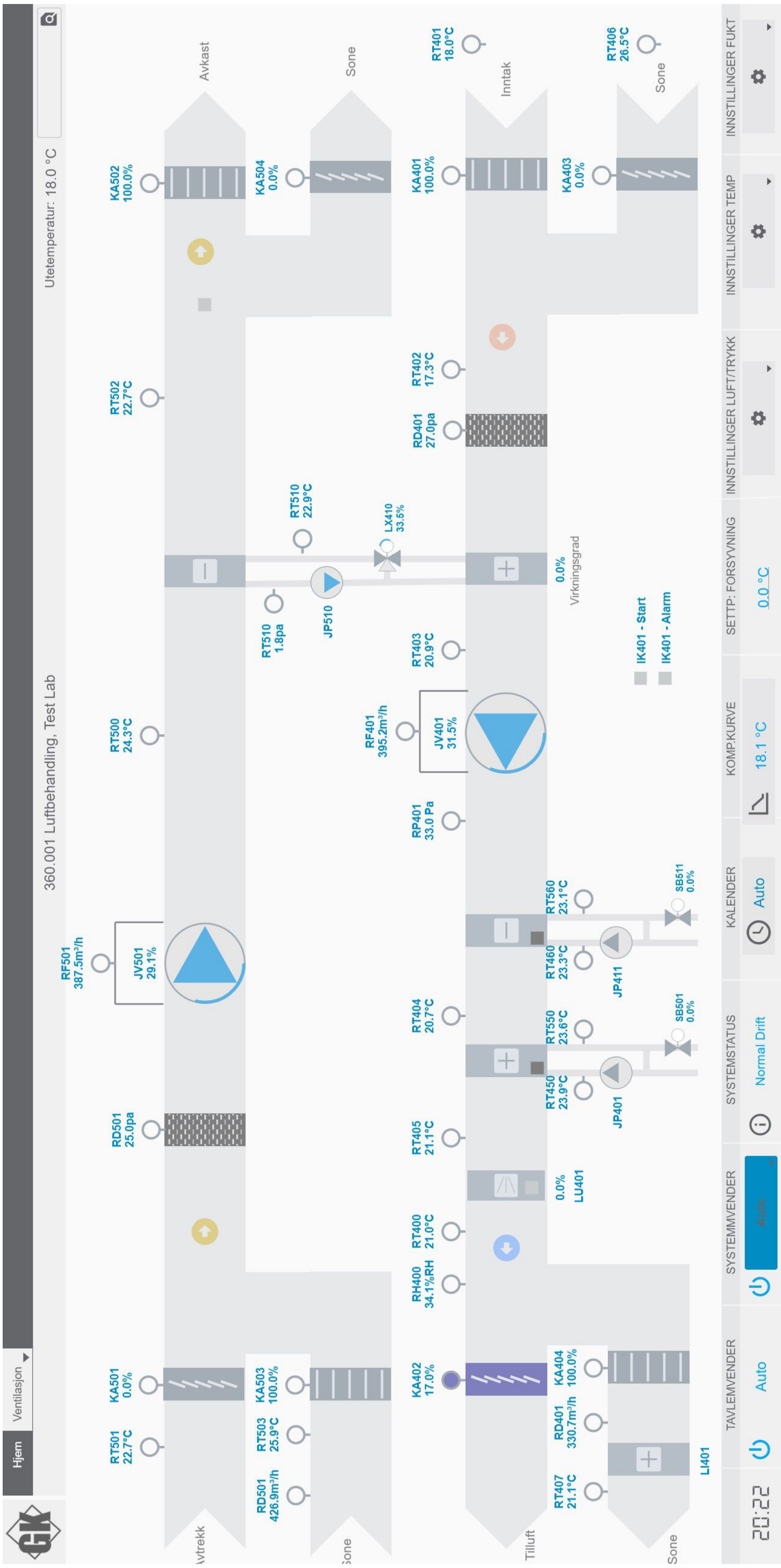
Table 5: Food and cooking procedure from the literature.

Study	Cooking procedure
Dennekamp et al. 2001	Experiments on cooktop: Boiling water for 15 mins, Frying 500g vegetables with 15 ml vegetable oil at full power for 5 minutes, Frying 4 bacon strips with 15 ml vegetable oi at full power for 7 minutesl; Oven: Sponge cake cooking at 180C for 40 mins, Roast meat for at 180C for 75 mins, Bake potatoes at 180C for 75 mins. ; Grill: grill only, Toast 2 slices at full power for 5 mins, 4 bacon slices at full power for 10 mins.
Sjaastad et al. 2008	Beefsteak from the shoulder of bovine ox was cooked with different fats including margarine, virgin olive oil, soybean oil and rapeseed oil.
G. Buonanno et al. 2009	Experiments done on both gas and electric stove with cooking duration between 8-10 mins: Griling: Cheese(70g), pork meat(130g), bacon(50g), eggplants(30g); Frying: Chips(50g),Onion(60g). Grilling was done at two different scenarios: max power and low power, with high temperature 242+- 5.2 and low temp 171+- 17C.
Zhang et al. 2010	First experiment - cooking style. Indian: pan-frying chicken, peppers and vegetables. Chinese: frying chicken, shrimp and vegetables in a wok. Italian: boiling pasta and subsequently stir-frying it with vegetables. Cooking time ranged from 0.5 to 1 hour, depending on the dish being prepared. The electric stove was turned on with the dial at full power, and the exhaust fan was turned on for each cooking activity. Second experiment- cooking conditions while frying chicken. A pan was heated for 1 min, after which 50 mL of corn oil were poured into it. Then 1.5 lb of seasoned chicken breast were added and slowly stirred until browning was observed. Stove type, cooking temperature and ventilation settings were varied to assess the factors affecting cooking emissions and exposures.
Torkmahalleh et al. 2012	Commercial cooking oils, including peanut, coconut, soybean, safflower, olive, corn and canola oils. In one section 200 cc oil was heated to 205C in a 1-1 glass beaker. The beaker was then moved to the adjacent part of the hood to monitor the particle number and mass concentrations 0.35 m above the oil surface. Particle monitoring continued until the oils reached a temperature of 131C. All experiments were replicated five times.
Jørgensen et al. 2013	Three different types of frying were examined: fresh bacon on an electric stove, fresh bacon on a gas stove, and smoked bacon on a gas stove. Pan temperature 200°C during startup, increasing to 270–320°C during the frying period. Measurements done throughout entire day. and combinations were repeated 3 times.
Jacobs et al. 2016	Variyng food.
Jacobs et al. 2018	Chicken, green beans, boiled potatoes; Chicken, green beans, fried potatoes; Pasta bolognese (back hob) ; Noodles wooked with chicken and vegetables (back hob). Tested these meals with both T shaped and inclined hood.
O'Leary et al. 2019	All meals were cooked on a gas stove. Meal 1 cooking duration of 28 mins: Chicken breast with potatoes slices and green beans; Meal 2 cooking duration of 28 mins: Chicken fillet with halved potatoes and green beans; Meal 3 cooking duration of 28 mins: Pasta with bacon, ground beef and tomato sauce.; Meal 4 cooking duration of 17 mins: Stir fry with pre sliced chicken breast , cabbage, peppers, leek, green beans and bean sprouts. All meals were cooked in olive oil. Instead of measuring temperature various gas flow rates were used to ensure reproducability.

Table 6: Instruments and parameters measured in the litterature.

Study	Instrument	Parameter
Dennekamp et al. 2001	TSI 3934 scanning mobility particle sizer; Model 3071A electrostatic classifier; Model 3022A condensation particle counter.	Size distribution of UFPs(nm vs particles/cm3), particle number concentration from 10-500nm (particles/cm3)
Sjaastad et al. 2008	The sampling tubes and Gelman AE glassfiber filters (37 mm) were placed on the left shoulder of the person frying the beefsteak (the cook).	TSP(µg/m3), PM1 concentration(µg/m3)
G. Buonanno et al. 2009	Scanning Mobility Particle Sizer (SMPS 3936, TSI Inc., St. Paul, MN); Aerodynamic Particle Sizer (APS 3321, TSI Inc., St. Paul, MN)	Emission Factor(particles/min), particle number concentration(particles/cm3), TSP concentration(µg/m3)
Zhang et al. 2010	Scanning mobility particle sizer (SMPS; 3936L85, TSI Inc.); TSI DustTrak photometer (Model 8520 TSI, Inc.)	Size distribution of UFPs(nm), total particle number concentration (particles/cm3), PM2.5 mass concentration and BC mass concentration(µg/m3)
Torkmahalleh et al. 2012	TSI DustTrak photometer; Kanomax Piezobalance Model 3511; TSI Model 3007 condensation particle counter (CPC)	PM2.5 concentration(mg/m3), total particle number concentration(particles/cm3), particle number mode diameter(nm), UFPs particle number concentration (particles/cm3)
Jørgensen et al. 2013	A TSI-3939 scanning mobility particle sizer; TSI-3936 SMPS; sampling modules to measure PAHs.	Size distribution of UFPs(nm vs particles/cm3), PAHs and total PM mass concentation(µg/m3), UFP number concentration (particles/cm3)
Jacobs et al. 2016	Two optical particle counters (OPC) have been used in parallel: a Grimm 1.109 and a Grimm 11-R.	PM2.5 concentration(µg/m3)
Jacobs et al. 2016	Grimm 11R OPC; Sampling modules to measure PAHs.	PM2.5 concentration(µg/m3), 16 EPA PAHs(µg/m3)
O'Leary et al. 2019	Grimm 11-R Mini Laser Aerosol Spectrometer optical particle counter (OPC);	PM2.5 concentration(µg/m3), Emission rate(mg/min)

D GK cloud


360.001 Luftbehandling, Test Lab
Utetemperatur: 18.0 °C
Hjem
Ventilasjon
Avkast
Sone
Inntak
Tilluft
TAVLEMVENDER
SYSTEMMVENDER
SYSTEMSTATUS
Normal Drift
KALENDER
Auto
KOMP.KURVE
18.1 °C
SETTP: FORSYNING
0.0 °C
INNSTILLINGER LUFT/TRYKK
INNSTILLINGER TEMP
INNSTILLINGER FUKT
IK401 - Start
IK401 - Alarm
Virkningsgrad
20:22

E Survey

Leier du eller eier du egen bolig?	Hva slags boligtype bor du i?	Hvilken aldersgruppe er du i?	Hvor ofte lager du mat i løpet av en uke?	Hvor mange lager du mat til?	Hva slags type kjøkkenventilator har du?	Har du resirkulerende kjøkkenhette eller med avkast?	Hvor ofte vasker du fettfilteret?	Hvis du har resirkulerende vifte, hvor ofte bytter du kullfilteret?	Hvor ofte vil du si at du bruker kjøkkenhette av de gangene du lager mat?	Hvilken innstilling pleier du å ha kjøkkenhetten på når den er i bruk?	Hvis du velger å ikke bruke kjøkkenhette, hva er grunnen til det?	Bruker du kjøkkenhette når du kun bruker stekeovn?	Hva er den/de matrettene du lager oftest?	Hvor lang tid etter matlaging slår du av kjøkkenhetten?
Eier	Leilighet	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)		Nei		Annet (vennligst spesifiser)
Eier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden		Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Kjøtt- og fiskerettar i steikepanne	Med en gang
Eier	Hus	40-50 år	5 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Annet (vennligst spesifiser)	Ja	Steking og koking	Lar den stå på ca. 15 min ekstra
Eier	Leilighet	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang i året	Sjeldnere	1 av 4 ganger	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	koker, ikke mye fett eller krydder	Med en gang
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	For mye støy	Ja	Stekt mat	Annet (vennligst spesifiser)
Eier	Leilighet	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Hyppigst retter med pasta eller ris	Med en gang
Eier	Hus	50-60 år	5 ganger i uka	2 personer	(Kjøkkenventilator på benken)	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Annet (vennligst spesifiser)	Nei		Med en gang
Eier	Hus	50-60 år	3 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	For mye støy	Nei		Med en gang
Eier	Hus	30-40 år	Sjeldnere	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Fiskekaker (huff)	Lar den stå på ca. 30 min ekstra
Eier	Hus	30-40 år	Hver dag	5+ personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	(vennligst spesifiser)	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)		Nei	fisk og koking av grønnsaker, pasta	Lar den stå på ca. 15 min ekstra
Leier	Leilighet	20-30 år	Hver dag	1 person	Kjøkkenhette over kjøkkenøy	Vet ikke	1 gang i året	Sjeldnere	Hver gang	Innstilling 3 (max)		Ja		Lar den stå på ca. 15 min ekstra
Eier	Hus	40-50 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Annet (vennligst spesifiser)	Nei	Taco/Pizza	Med en gang
Eier	Hus	60+ år	Hver dag	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	1 av 4 ganger	Innstilling 1 (min)	Glemmer å skru på	Nei	stekt fisk	Lar den stå på ca. 15 min ekstra
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned		Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei	Middag	Lar den stå på ca. 15 min ekstra
Leier	Leilighet	30-40 år	Hver dag	5+ personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Nei		Med en gang
Leier	Hybel	20-30 år	Hver dag	2 personer	Veggmontert kjøkkenhette	Vet ikke	Aldri		1 av 4 ganger	Innstilling 2 (medium)	For mye støy	Nei		Med en gang
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	For mye støy	Nei	Wok	Med en gang
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)		Nei	Potet/ris, stekt kjøtt/fisk	Med en gang
Eier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden		Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei	50/50 koking og steking	Lar den stå på ca. 15 min ekstra
Eier	Hus	30-40 år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Annet (vennligst spesifiser)	Nei	taco:)	Med en gang
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Alt mulig!	Med en gang
Eier	Leilighet	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)		Nei	Ulike retter	Med en gang
Eier	Hus	30-40 år	5 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	(vennligst spesifiser)	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Nei	Egg	Annet (vennligst spesifiser)
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	(vennligst spesifiser)		Hver gang	Annet (vennligst spesifiser)		Nei	kjøkkenhette brukes når stekeovnsdøra	Annet (vennligst spesifiser)
Eier	Hus	50-60 år	5 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 2 (medium)	For mye støy	Nei	og koking av grønnskaker, ris,	Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Annet (vennligst spesifiser)	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Glemmer å skru på	Nei	.	Med en gang
Eier	Hus	60+ år	Hver dag	2 personer	(Kjøkkenventilator på benken)	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	Kylling, hamburger, omelett, gryteretter	Med en gang
Eier	Hus	50-60 år	Hver dag	2 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Nei		Med en gang
Eier	Hus	40-50 år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 2 (medium)	Glemmer å skru på	Nei	stekepanne. Koker poteter eller pasta.	Med en gang

Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden		1 av 2 ganger	Innstilling 1 (min)	Glemmer å skru på	Nei	Stekt mat	Med en gang
Eier	Leilighet	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Har bare 1 innstilling	Glemmer å skru på	Nei	stekte middagsretter av fisk	Lar den stå på ca. 15 min ekstra
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Annet (vennligst spesifiser)	Ja	stekt fisk og stekt kylling	Med en gang
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året		1 av 3 ganger	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	middag	Med en gang
Eier	Leilighet	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei	gryte med grønnsaker	Med en gang
Eier	Hus	30-40 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)		Nei		Annet (vennligst spesifiser)
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 3 (max)	Glemmer å skru på	Nei	Steker fisk, koteletter, wok	Med en gang
Eier	Leilighet	50-60 år		2 personer	Veggmontert kjøkkenhette		1 gang hver 3 måned		Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei		Med en gang
Eier	Leilighet	50-60 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Ja	Vanskelig å si	Med en gang
Eier	Hus	50-60 år	3 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	For mye støy	Nei	Ovnstekt kjøtt/fisk m/Wok-grønnsaker	Med en gang
Eier	Leilighet	60+ år	Hver dag	1 person	Annet (vennligst spesifiser)	kommer tilbake til rommet)	(vennligst spesifiser)	Sjeldnere	1 av 2 ganger	Annet (vennligst spesifiser)	Glemmer å skru på	Nei	poteter/grønnsaker som fryses,	Annet (vennligst spesifiser)
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Nei	Stekt kjøttdeig	Lar den stå på ca. 15 min ekstra
Eier	Leilighet	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned		Hver gang	Innstilling 2 (medium)	For mye støy	Ja	middag	Med en gang
Eier	Leilighet	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Sjeldnere	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei		Med en gang
Eier	Hus	50-60 år	Hver dag	2 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Nei	Fisk og kjøttretter	Lar den stå på ca. 30 min ekstra
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	Egg	Lar den stå på ca. 15 min ekstra
Eier	Hus	60+ år	Sjeldnere	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	Pannestekt kjøtt	Lar den stå på ca. 30 min ekstra
Eier	Hus	50-60 år	Hver dag	2 personer	Annet (vennligst spesifiser)	Annet (vennligst spesifiser)	1 gang hver 3 måned	ca. 1 gang i året	Hver gang	Annet (vennligst spesifiser)	Annet (vennligst spesifiser)	Nei		Annet (vennligst spesifiser)
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)		Nei		Med en gang
Eier	Hus	60+ år	5 ganger i uka	1 person	Veggmontert kjøkkenhette	kommer tilbake til rommet)	Sjeldnere	Sjeldnere	1 av 4 ganger	Har bare 1 innstilling	For mye støy	Nei	pasta	Med en gang
Eier	Leilighet	60+ år	Hver dag	2 personer	Annet (vennligst spesifiser)	Annet (vennligst spesifiser)	(vennligst spesifiser)	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	Fisk.	Med en gang
Eier	Hus	50-60 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	(vennligst spesifiser)	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)	Annet (vennligst spesifiser)	Nei	koke poteter, grønnsaker, ris og	Annet (vennligst spesifiser)
Eier	Hus	60+ år	3 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned		Hver gang	Innstilling 1 (min)	For mye støy	Ja		Med en gang
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	(vennligst spesifiser)	Annet (vennligst spesifiser)	Hver gang	Innstilling 3 (max)		Ja	mye lages fra bunnen av.	Annet (vennligst spesifiser)
Eier	Leilighet	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	For mye støy	Nei	Stekt kylling	Med en gang
Eier	Leilighet	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang i året	Sjeldnere	Hver gang	Innstilling 2 (medium)	For mye støy	Nei	kokt mat (fisk, kjøtt, grønnsaker, pasta	Annet (vennligst spesifiser)
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden		Hver gang	Innstilling 2 (medium)		Nei		Lar den stå på ca. 15 min ekstra
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 2 (medium)	Glemmer å skru på	Nei	Fisk	Med en gang
Eier	Hus	60+ år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	(vennligst spesifiser)	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)		Ja	Ovnsbakt eller kokt mat	Annet (vennligst spesifiser)
Eier	Leilighet	50-60 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	Sjeldnere	Sjeldnere	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Ja	bakte grønnsaker	Med en gang
Eier	Leilighet	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Har bare 1 innstilling	For mye støy	Ja		Med en gang
Eier	Leilighet	50-60 år	(vennligst spesifiser)	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte		Innstilling 3 (max)		Nei	Pizza	Lar den stå på ca. 15 min ekstra

Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	(vennligst spesifiser)		Hver gang	Innstilling 3 (max)		Ja	grønnsaker, ris/pasta og	Annet (vennligst spesifiser)
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Fisk/kjøtt, pasta og poteter	Med en gang
Eier	Hus	30-40 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Kokte retter/i stekeovn	Lar den stå på ca. 15 min ekstra
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året		Hver gang	Innstilling 3 (max)		Ja		Med en gang
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere		Hver gang	Innstilling 2 (medium)		Nei	Kjøttkaker	Med en gang
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)		Nei		Lar den stå på ca. 15 min ekstra
Eier	Leilighet	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)		Nei	middag	Med en gang
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Annet (vennligst spesifiser)	Hver gang	Innstilling 3 (max)	For mye støy	Ja	kjøtt, fisk, mange andre alternativer	Med en gang
Eier	Hus	60+ år	Hver dag	2 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang i måneden		1 av 2 ganger	Innstilling 2 (medium)		Nei	Middag	Med en gang
Eier	Leilighet	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang i året	ca. 2 ganger i året	1 av 4 ganger	Innstilling 2 (medium)	For mye støy	Nei		Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	Wok med ris	Med en gang
Eier	Hus	60+ år	Hver dag	2 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Annet (vennligst spesifiser)	Nei	stekt kylling	Annet (vennligst spesifiser)
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)	For mye støy	Nei	grøt, pasta, suppe, grønnsaker.	Med en gang
Eier	Hus	60+ år	Hver dag	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	(vennligst spesifiser)	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)	Annet (vennligst spesifiser)	Nei	Det varierer, både koking og steking	Annet (vennligst spesifiser)
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Middag	Annet (vennligst spesifiser)
Eier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	Vet ikke	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Nei	Middag	Med en gang
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	middag	Lar den stå på ca. 15 min ekstra
Eier	Hus	50-60 år	Hver dag	2 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	stekt kylling, egg og bacon	Lar den stå på ca. 15 min ekstra
Eier	Hus	50-60 år	3 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 2 (medium)	Glemmer å skru på	Nei	supper	Lar den stå på ca. 15 min ekstra
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	(Taco/Pasta etc.), Indisk og kinesisk	Annet (vennligst spesifiser)
Eier	Hus	50-60 år	Hver dag	3-5 personer	Annet (vennligst spesifiser)	eller føres i kanal ut av boenheten)	1 gang i måneden	Annet (vennligst spesifiser)	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei		Med en gang
Eier	Hus	30-40 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	Pomfritt	Annet (vennligst spesifiser)
Eier	Leilighet	60+ år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	Sjeldnere	Sjeldnere	Hver gang	Har bare 1 innstilling	Glemmer å skru på	Nei	Stekt mat	Annet (vennligst spesifiser)
Eier	Hus	60+ år	Hver dag	2 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang i året		1 av 2 ganger	Innstilling 3 (max)		Nei	Stekt kjøtt og fisk	Lar den stå på ca. 15 min ekstra
Eier	Leilighet	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei	Steking	Annet (vennligst spesifiser)
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned		Hver gang	Innstilling 3 (max)		Ja	Fiskeretter og grønnsaker	Lar den stå på ca. 15 min ekstra
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere		1 av 2 ganger	Innstilling 3 (max)	Glemmer å skru på	Nei		Lar den stå på ca. 15 min ekstra
Eier	Hus	40-50 år	5 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Ja		Med en gang
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Ja	Kjøttkaker, Curry, Taco	Med en gang
Eier	Hus	50-60 år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned		1 av 2 ganger	Innstilling 2 (medium)	Glemmer å skru på	Nei	Kjøtt og fisk og kylling som stekes	Annet (vennligst spesifiser)
Eier	Hus	50-60 år	Hver dag	2 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	tilbehør som oppvarming av	Annet (vennligst spesifiser)
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	For mye støy	Ja	Pasta/ris + noe i ovnen	Med en gang

Eier	Hus	50-60 år	Hver dag	2 personer	Kjøkkenhette over kjøkkenøy	kommer tilbake til rommet)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei		Med en gang
Eier	Hus	60+ år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året		1 av 2 ganger	Innstilling 2 (medium)	Glemmer å skru på	Nei		Med en gang
Eier	Hus	50-60 år	5 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Annet (vennligst spesifiser)	Ja	Noe med kylling el fisk	Annet (vennligst spesifiser)
Leier	Leilighet	30-40 år	3 ganger i uka	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Aldri	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Glemmer å skru på	Ja	Asiatisk. Høy varm og steking	Lar den stå på ca. 15 min ekstra
Eier	Hus	50-60 år	5 ganger i uka	3-5 personer	Annet (vennligst spesifiser)	eller føres i kanal ut av boenheten)	1 gang hver 3 måned		Hver gang	Innstilling 2 (medium)		Ja		Annet (vennligst spesifiser)
Eier	Hus	50-60 år	Hver dag	2 personer	Annet (vennligst spesifiser)	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	mange forskjellige retter i rotasjon	Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	Middag	Med en gang
Eier	Hus	20-30 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)		Nei		Annet (vennligst spesifiser)
Eier	Hus	60+ år	3 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Nei	koteletter, gryteretter	Med en gang
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året		Hver gang	Annet (vennligst spesifiser)		Nei	svinefilet eller fisk med tilbehør.	Annet (vennligst spesifiser)
Eier	Leilighet	40-50 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 4 ganger	Innstilling 1 (min)	For mye støy	Nei	vegetare grytteretter	Annet (vennligst spesifiser)
Eier	Leilighet	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang i året	ca. 1 gang i året	1 av 2 ganger	Innstilling 2 (medium)		Nei		Med en gang
Eier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)		Ja	pasta	Med en gang
Eier	Leilighet	40-50 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	(vennligst spesifiser)	Har ikke resirkulerende vifte	Hver gang	Har bare 1 innstilling		Ja	Stekte ting	Lar den stå på ca. 15 min ekstra
Eier	Leilighet	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året		Hver gang	Innstilling 3 (max)		Nei		Lar den stå på ca. 15 min ekstra
Eier	Hus	60+ år	Hver dag	3-5 personer	Annet (vennligst spesifiser)	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Ja		Med en gang
Eier	Hus	40-50 år	5 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei		Med en gang
Eier	Hus	60+ år	Hver dag	1 person	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang i året	ca. 1 gang i året	Hver gang	Annet (vennligst spesifiser)		Nei	steiking av ymse	Annet (vennligst spesifiser)
Leier	Hus	50-60 år	5 ganger i uka	2 personer	(Kjøkkenventilator på benken)	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)		Nei		Med en gang
Eier	Hus	30-40 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)	Annet (vennligst spesifiser)	Nei	Champignonsaus, kjøttdeig pg	Annet (vennligst spesifiser)
Eier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei	Middager	Med en gang
Eier	Hus	50-60 år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	middager med kjøtt i ovn eller på plate	Lar den stå på ca. 15 min ekstra
Eier	Hus	50-60 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte		Innstilling 1 (min)	Glemmer å skru på	Nei	Veldig forskjellig mat	Med en gang
Eier	Hus	40-50 år	Hver dag	5+ personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)	Glemmer å skru på	Ja		Lar den stå på ca. 30 min ekstra
Eier	Leilighet	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)		Nei	ingen "mest"	Annet (vennligst spesifiser)
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)		Ja	mat i panne, kokt fisk	Lar den stå på ca. 15 min ekstra
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Nei		Annet (vennligst spesifiser)
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	Kjøtt - Fisk - Pasta - Poteter	Med en gang
Eier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)	Glemmer å skru på	Nei	steking av mat/ grønsaker	Lar den stå på ca. 15 min ekstra
Eier	Leilighet	20-30 år	3 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Aldri	Har ikke resirkulerende vifte	1 av 4 ganger	Innstilling 1 (min)	For mye støy	Nei		Med en gang
Eier	Hus	50-60 år	Hver dag	3-5 personer	(Kjøkkenventilator på benken)	eller føres i kanal ut av boenheten)	(vennligst spesifiser)	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Vet ikke	Annet (vennligst spesifiser)
Eier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Har bare 1 innstilling		Nei	grønnsaker, kjøtt, fisk og lign.	Med en gang

Eier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)	Glemmer å skru på	Nei	middag	Lar den stå på ca. 15 min ekstra
Eier	Hus	40-50 år	Hver dag	3-5 personer	(Kjøkkenventilator på benken)	eller føres i kanal ut av boenheten)	(vennligst spesifiser)		Hver gang	Innstilling 2 (medium)		Nei	Steker kjøtt/fisk	Med en gang
Eier	Hus	40-50 år	5 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden		Hver gang	Innstilling 1 (min)	For mye støy	Nei	ovnsstekt mat	Annet (vennligst spesifiser)
Eier	Hus	30-40 år	3 ganger i uka	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 3 ganger	Innstilling 1 (min)	For mye støy	Nei		Med en gang
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei		Lar den stå på ca. 15 min ekstra
Eier	Hus	30-40 år	5 ganger i uka	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	Fiskekaker	Lar den stå på ca. 15 min ekstra
Eier	Leilighet	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden		Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Ja	kokte potet og grønnsaker	Lar den stå på ca. 15 min ekstra
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året		1 av 2 ganger	Innstilling 2 (medium)	Glemmer å skru på	Nei	kylling. Kokt ris og poteter	Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Ja	Pasta	Lar den stå på ca. 15 min ekstra
Eier	Leilighet	30-40 år	5 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Har bare 1 innstilling	For mye støy	Nei	Gryter	Med en gang
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Nei	supper, kokt ris, -poteter, grønnsaker	Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Glemmer å skru på	Nei	Pasta	Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned		Hver gang	Innstilling 2 (medium)		Nei		Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Glemmer å skru på	Nei	Pasta, pizza, taco	Med en gang
Eier	Hus	60+ år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden		1 av 2 ganger	Innstilling 3 (max)	Annet (vennligst spesifiser)	Ja		Lar den stå på ca. 15 min ekstra
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 2 (medium)	For mye støy	Nei	Kokt fisk	Med en gang
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	(vennligst spesifiser)	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)		Nei	kokt potet, pannekaker	Lar den stå på ca. 15 min ekstra
Eier	Hus	40-50 år	Hver dag	2 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	Sjeldnere	Sjeldnere	1 av 2 ganger	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Varierende	Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året		Hver gang	Innstilling 3 (max)		Nei	Vegetarmat stekt i panne	Med en gang
Eier	Hus	60+ år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden		Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei	Middager	Med en gang
Eier	Hus	40-50 år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Har bare 1 innstilling	Glemmer å skru på	Nei	kokt ris/pasta og grønnsaker	Med en gang
Eier	Leilighet	40-50 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)	For mye støy	Nei	Gryte	Med en gang
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året		Hver gang	Annet (vennligst spesifiser)		Nei		Annet (vennligst spesifiser)
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)		Nei	Potet og saus	Lar den stå på ca. 15 min ekstra
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Glemmer å skru på	Nei	omelett, pastaretter,	Lar den stå på ca. 15 min ekstra
Eier	Hus	30-40 år	Hver dag	3-5 personer	Annet (vennligst spesifiser)	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	Taco,	Med en gang
Eier	Leilighet	30-40 år	5 ganger i uka	1 person	Veggmontert kjøkkenhette	kommer tilbake til rommet)	Aldri	Sjeldnere	1 av 2 ganger	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	Kyllingfilet.	Med en gang
Eier	Hus	40-50 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)		Nei	Stekt mat	Lar den stå på ca. 15 min ekstra
Eier	Leilighet	50-60 år	Hver dag	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	ca. 1 gang i året	Hver gang	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	Stekt mat	Annet (vennligst spesifiser)
Eier	Hus	20-30 år	Hver dag	2 personer	Annet (vennligst spesifiser)	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	Veldig variert	Lar den stå på ca. 15 min ekstra
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)		Ja	fisk, grønnsaker, taco, pizza,	Med en gang
Eier	Leilighet	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Nei		Med en gang

Eier	Hus	30-40 år	3 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	(vennligst spesifiser)	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)	Annet (vennligst spesifiser)	Nei	Steker kjøttdeig osv.	Annet (vennligst spesifiser)
Eier	Hus	30-40 år	5 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	1 av 4 ganger	Innstilling 1 (min)	Annet (vennligst spesifiser)	Nei	a/ovnsbakt fisk/kylling/ris/potet	Lar den stå på ca. 15 min ekstra
Eier	Hus	40-50 år	5 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	For mye støy	Nei		Med en gang
Eier	Leilighet	40-50 år	3 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere		Hver gang	Innstilling 1 (min)	For mye støy	Nei	pasta	Med en gang
Eier	Hus	30-40 år	5 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året		Hver gang	Innstilling 1 (min)	Glemmer å skru på	Nei	Pasta	Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Ja	grønnsaker, steking av kjøtt og fisk	Med en gang
Eier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	Stekt mat	Med en gang
Eier	Leilighet	20-30 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Har bare 1 innstilling	Glemmer å skru på	Nei	Stekt kjøttdeig, kokt potet	Med en gang
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Nei	stekeovn. Koker potet da brukes vifta	Med en gang
Eier	Hus	40-50 år	3 ganger i uka	5+ personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei	Stekt alt mulig	Med en gang
Eier	Leilighet	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Koker potet, ris eller bulgur	Med en gang
Eier	Leilighet	40-50 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)	Annet (vennligst spesifiser)	Nei	Middag	Lar den stå på ca. 15 min ekstra
Eier	Hus	30-40 år	5 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Annet (vennligst spesifiser)	Nei	Vet ikke	Med en gang
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året		1 av 2 ganger	Annet (vennligst spesifiser)	Glemmer å skru på	Nei	Kjøttkaker	Lar den stå på ca. 15 min ekstra
Eier	Hus	40-50 år	Hver dag	2 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang i året		Hver gang	Annet (vennligst spesifiser)	Glemmer å skru på	Nei	stekt fisk/kjøtt/vegetar	Lar den stå på ca. 15 min ekstra
Leier	Leilighet	20-30 år	3 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei		Med en gang
Eier	Leilighet	30-40 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Har bare 1 innstilling	Annet (vennligst spesifiser)	Nei	Taco	Annet (vennligst spesifiser)
Eier	Leilighet	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	Annet (vennligst spesifiser)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Har bare 1 innstilling		Nei	Middag	Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)		Nei	Pasta	Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	For mye støy	Nei	Middag	Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang i måneden	ca. 1 gang i året	Hver gang	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	laks	Med en gang
Eier	Leilighet	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned		Hver gang	Innstilling 3 (max)		Ja		Lar den stå på ca. 15 min ekstra
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	For mye støy	Ja	Fisk	Lar den stå på ca. 15 min ekstra
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Ja	?	Med en gang
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)		Ja	Stekt mat	Lar den stå på ca. 15 min ekstra
Eier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 1 (min)	Annet (vennligst spesifiser)	Nei	Middag	Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	For mye støy	Nei	Kjøtt/pasta	Med en gang
Eier	Hus	50-60 år	3 ganger i uka	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	For mye støy	Nei	Varierer veldig	Med en gang
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Ja	Middag	Med en gang
Eier	Leilighet	40-50 år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	kommer tilbake til rommet)	1 gang hver 3 måned	Sjeldnere	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	tacokjøtt	Med en gang
Eier	Hus	30-40 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Glemmer å skru på	Ja	Stekte og kokte matvarer	Lar den stå på ca. 15 min ekstra
Eier	Hus	40-50 år	(vennligst spesifiser)	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	(vennligst spesifiser)		Hver gang	Annet (vennligst spesifiser)	Annet (vennligst spesifiser)	Nei	Taco, pasta, fisk	Med en gang

Eier	Hus	50-60 år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)	Glemmer å skru på	Nei	Umulig å si, varierer mye.	Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	For mye støy	Nei	bunnen av hjemme. rettene kan variere	Lar den stå på ca. 15 min ekstra
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)		Ja	Kjøtt / fisk	Med en gang
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned		Hver gang	Innstilling 1 (min)	Glemmer å skru på	Ja	Stekt egg. Eggerøre	Med en gang
Eier	Hus	50-60 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Nei	Biff	Med en gang
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året		Hver gang	Innstilling 2 (medium)	For mye støy	Nei	Stekte grønnsaker	Lar den stå på ca. 15 min ekstra
Eier	Hus	30-40 år	5 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Glemmer å skru på	Nei	Koker ting (saus, pasta, poteter etc)	Med en gang
Eier	Leilighet	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette		1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)		Nei		Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Nei	variert. Men steker ofte noe, men annet	Med en gang
Eier	Leilighet	40-50 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)		Nei	steker - kan ikke spesifikt so en rett	Lar den stå på ca. 15 min ekstra
Eier	Leilighet	40-50 år	Hver dag	1 person	Veggmontert kjøkkenhette	kommer tilbake til rommet)	Sjeldnere	Sjeldnere	1 av 3 ganger	Innstilling 2 (medium)	Glemmer å skru på	Nei	Steker ting i stekeovnen	Med en gang
Eier	Hus	40-50 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Ja		Lar den stå på ca. 15 min ekstra
Eier	Hus	20-30 år	Hver dag	2 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	1 av 4 ganger	Innstilling 2 (medium)	Glemmer å skru på	Nei	Taco, pizza	Med en gang
Eier	Hus	30-40 år	3 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 3 (max)	Glemmer å skru på	Nei	Fisk	Med en gang
Leier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Ja	Kjøttkaker, fersk suppe , fisk	Med en gang
Eier	Leilighet	20-30 år	Hver dag	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	Stekt kylling	Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang i året	ca. 1 gang i året	1 av 2 ganger	Innstilling 2 (medium)	For mye støy	Nei	Pasta	Lar den stå på ca. 15 min ekstra
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 3 (max)	Glemmer å skru på	Nei	Gryteretter, stekt kjøtt og kjøttdeig	Med en gang
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei		Med en gang
Eier	Leilighet	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden		Hver gang	Annet (vennligst spesifiser)		Ja	Middag	Lar den stå på ca. 15 min ekstra
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	1 av 2 ganger	Har bare 1 innstilling		Ja	Taco	Med en gang
Eier	Hus	30-40 år	5 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	For mye støy	Nei	Gryte mat	Med en gang
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Spaghetti og taco	Lar den stå på ca. 15 min ekstra
Eier	Hus	20-30 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	Vet ikke.	Med en gang
Eier	Leilighet	20-30 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 3 (max)	Glemmer å skru på	Nei	Taco, pizza, pasta	Med en gang
Eier	Hus	30-40 år	5 ganger i uka	2 personer	(Kjøkkenventilator på benken)	kommer tilbake til rommet)	1 gang hver 3 måned	Annet (vennligst spesifiser)	Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Taco	Med en gang
Eier	Hus	40-50 år	3 ganger i uka	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	For mye støy	Nei	Steke kjøtt og koke potet	Med en gang
Eier	Hus	20-30 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)	Annet (vennligst spesifiser)	Ja	2,3 fiske middager en del kjøtt osv.	Lar den stå på ca. 15 min ekstra
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	Stekt laks, supper,	Med en gang
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året		Hver gang	Annet (vennligst spesifiser)	Annet (vennligst spesifiser)	Nei	Middager. Variert.	Med en gang
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Annet (vennligst spesifiser)	Ja	pasta, taco, pizza, burrito	Lar den stå på ca. 15 min ekstra
Eier	Leilighet	40-50 år	Hver dag	1 person	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang i året	Aldri	1 av 3 ganger	Innstilling 2 (medium)	For mye støy	Nei	Gryterett pasta	Annet (vennligst spesifiser)

Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Ja	Fisk	Lar den stå på ca. 15 min ekstra
Eier	Hus	50-60 år	5 ganger i uka	3-5 personer	Annet (vennligst spesifiser)	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	For mye støy	Nei	Koke poteter/ris	Med en gang
Eier	Leilighet	30-40 år	Hver dag	3-5 personer	(Kjøkkenventilator på benken)	kommer tilbake til rommet)	(vennligst spesifiser)	Annet (vennligst spesifiser)	Hver gang	Annet (vennligst spesifiser)	Annet (vennligst spesifiser)	Nei	Asiatisk mat	Annet (vennligst spesifiser)
Eier	Leilighet	40-50 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang i året	ca. 1 gang i året	1 av 2 ganger	Innstilling 1 (min)	For mye støy	Nei		Med en gang
Eier	Leilighet	30-40 år	Hver dag	2 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	(vennligst spesifiser)	Annet (vennligst spesifiser)	Hver gang	Annet (vennligst spesifiser)	For mye støy	Nei	wok, koke egg, gryter + grandis	
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei	Pasta	
Eier	Hus	30-40 år	Hver dag	3-5 personer	(Kjøkkenventilator på benken)	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei	stekt mat	
Eier	Leilighet	50-60 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Har bare 1 innstilling		Ja	poteter og fisk, gryteretter, baker	
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned		Hver gang	Innstilling 1 (min)	Annet (vennligst spesifiser)	Nei	Gryterett, stekt fisk, stekt kjøtt	
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	For mye støy	Nei	Forskjellig middag	
Eier	Leilighet	30-40 år	Hver dag	2 personer	Veggmontert kjøkkenhette	Vet ikke	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	Pasta/ris kjøtt og saus	
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	Mat	
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	(vennligst spesifiser)	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)		Nei	Stekt kylling i en eller annen form	
Eier	Hus	20-30 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)		Ja	husmannskost, asiatiske retter	
Eier	Leilighet	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Har bare 1 innstilling	For mye støy	Nei		
Eier	Leilighet	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 3 ganger	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Ja	pasta/lasagne, fisk, taco	
Eier	Hus	20-30 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei	Koking og steking	
Eier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Har bare 1 innstilling	Glemmer å skru på	Nei	Kokt potet	
Eier	Leilighet	20-30 år	5 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	Vet ikke	1 gang i året	Har ikke resirkulerende vifte	1 av 2 ganger	Har bare 1 innstilling	Glemmer å skru på	Nei	Quesedillas, torsk, taco	
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 1 (min)	Glemmer å skru på	Nei	på... Vanlige middager?	
Eier	Leilighet	30-40 år	Hver dag	1 person	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang i året	Aldri	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei	Pasta	
Eier	Hus	60+ år	Hver dag	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Aldri	Annet (vennligst spesifiser)	For mye støy	Nei	pasta	
Eier	Leilighet	60+ år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)		Ja	Kokt torsk	
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Glemmer å skru på	Nei	Steking	
Eier	Hus	50-60 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Annet (vennligst spesifiser)	For mye støy	Nei	Sashimi, kanskje? Sesongavhengig	
Eier	Hus	60+ år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned		1 av 2 ganger	Innstilling 2 (medium)	For mye støy	Nei	eller karbonadedeig, gryter, pasta	
Eier	Leilighet	30-40 år	Hver dag	2 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang i året	Sjeldnere	Hver gang	Innstilling 3 (max)	For mye støy	Nei	pastaretter, ovnsbakte ting,	
Leier	Leilighet	20-30 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	Vet ikke	1 gang i måneden	ca. 1 gang i året	Hver gang	Innstilling 1 (min)	For mye støy	Nei		
Eier	Leilighet	20-30 år	5 ganger i uka	5+ personer	Veggmontert kjøkkenhette	Vet ikke	Sjeldnere	Annet (vennligst spesifiser)	Hver gang	Innstilling 1 (min)	For mye støy	Nei	Kylling, kjøttdeig, kikerter, bønner, ris,	
Eier	Hus	20-30 år	Hver dag	2 personer	(Kjøkkenventilator på benken)	kommer tilbake til rommet)	1 gang i måneden	ca. 1 gang i året	1 av 2 ganger	Innstilling 2 (medium)	Glemmer å skru på	Nei		
Eier	Leilighet	30-40 år	Hver dag	1 person	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang i året	Sjeldnere	1 av 2 ganger	Innstilling 2 (medium)	For mye støy	Ja	Taco	
Eier	Hus	50-60 år	Hver dag	3-5 personer	Annet (vennligst spesifiser)	eller føres i kanal ut av boenheten)	1 gang hver 3 måned		Hver gang	Innstilling 1 (min)	Glemmer å skru på	Ja	supper/kjøtt og fiskeretter.	

Leier	Kollektiv	20-30 år	Hver dag	1 person	Veggmontert kjøkkenhette	Vet ikke	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	For mye støy	Nei	burger, pizza, laks i ovn
Eier	Hus	30-40 år	Hver dag	2 personer	Annet (vennligst spesifiser)	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)		Nei	Grandis
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Sjeldnere	Hver gang	Har bare 1 innstilling	Annet (vennligst spesifiser)	Ja	Entrecôte
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	For mye støy	Nei	Middag
Eier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Nei	Middag
Eier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Annet (vennligst spesifiser)	Nei	Ingen spesielle
Eier	Hus	50-60 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Sjeldnere	Hver gang	Innstilling 2 (medium)		Ja	
Eier	Hus	60+ år	3 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	
Leier	Leilighet	60+ år	Hver dag	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 4 ganger	Innstilling 1 (min)	Annet (vennligst spesifiser)	Nei	Forskjellig middagsmat
Eier	Hus	60+ år	3 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)		Nei	Bacalao
Leier	Leilighet	20-30 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	Vet ikke	1 gang i året	ca. 1 gang i året	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	pasta, gryter
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året		1 av 3 ganger	Innstilling 2 (medium)	For mye støy	Nei	pizza og taco
Eier	Leilighet	30-40 år	Hver dag	2 personer	Kjøkkenhette over kjøkkenøy	kommer tilbake til rommet)	1 gang hver 3 måned	ca. 1 gang i året	1 av 2 ganger	Innstilling 2 (medium)	For mye støy	Ja	Mye pakistansk mat. :)
Leier	Hybel	20-30 år	Hver dag	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 4 ganger	Innstilling 2 (medium)	For mye støy	Ja	Pasta med scampi eller kylling
Eier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Annet (vennligst spesifiser)	Nei	Bolognese, fisk, kyllinggryte
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Gryte
Eier	Hus	50-60 år	Hver dag	3-5 personer	(Kjøkkenventilator på benken)	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	egg, kjøttdeig, koker havregrøt og suppe
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Pastaretter, supper, fiskemiddager
Eier	Hus	30-40 år	Hver dag	5+ personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året		Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Ja	Bolognese
Eier	Hus	60+ år	Hver dag	2 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Frokost og middag.
Leier	Hus	50-60 år	Sjeldnere	3-5 personer	(Kjøkkenventilator på benken)	kommer tilbake til rommet)	Aldri	Aldri	1 av 4 ganger	Innstilling 2 (medium)	Glemmer å skru på	Nei	Spaghetti
Leier	Leilighet	50-60 år	Hver dag	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	For mye støy	Ja	Stekt kjøtt/fisk
Leier	Leilighet	20-30 år	3 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)		Nei	
Eier	Hus	60+ år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere		Hver gang	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	Stekt kjøtt ig fisk pasta pizza
Eier	Hus	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	(vennligst spesifiser)	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	Annet (vennligst spesifiser)	Nei	Middagsretter
Eier	Hus	50-60 år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned		Hver gang	Innstilling 2 (medium)		Ja	Variert
Eier	Hus	50-60 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)		Nei	Varierer veldig
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	(vennligst spesifiser)		Hver gang	Innstilling 1 (min)	For mye støy	Ja	Pasta, pizza, taco, minestronesuppe
Leier	Hus	20-30 år	5 ganger i uka	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 3 ganger	Innstilling 1 (min)	Glemmer å skru på	Nei	
Eier	Hus	40-50 år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	Sjeldnere	Har ikke resirkulerende vifte	1 av 3 ganger	Innstilling 3 (max)	For mye støy	Nei	Steker ofte grønnsaker og kjøtt
Eier	Hus	60+ år	3 ganger i uka	2 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	Sjeldnere		1 av 2 ganger	Innstilling 2 (medium)	For mye støy	Nei	Gryterett
Eier	Leilighet	30-40 år	Hver dag	2 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang hver 3 måned	Sjeldnere	Hver gang	Innstilling 3 (max)	For mye støy	Nei	Fisk, kjøtt, egg.

Eier	Hus	50-60 år	Hver dag	1 person	Kjøkkenhette over kjøkkenøy	Vet ikke	1 gang hver 3 måned	Har ikke resirkulerende vifte	1 av 4 ganger	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	Ofte i slowcocker eller i stekeovn.
Eier	Hus	50-60 år	3 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang i året	Sjeldnere	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei	Fisk eller pastaretter
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 2 (medium)	Glemmer å skru på	Nei	Div vanlig Middag
Eier	Leilighet	20-30 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	1 av 2 ganger	Har bare 1 innstilling	Glemmer å skru på	Nei	Pasta
Eier	Leilighet	30-40 år	Hver dag	2 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	Aldri	Aldri	Aldri	Har bare 1 innstilling	For mye støy	Nei	
Eier	Hus	50-60 år	Sjeldnere	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Aldri	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	
Eier	Hus	50-60 år	3 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	Egg, kjøtt, fisk, kylling
Eier	Hus	50-60 år	(vennligst spesifiser)	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned		Hver gang	Innstilling 2 (medium)		Nei	Ulike typer kjøtt eller fisk (middag)
Eier	Hus	40-50 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang i året	ca. 1 gang i året	1 av 4 ganger	Innstilling 3 (max)	Glemmer å skru på	Nei	Pasta
Eier	Hus	30-40 år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)	For mye støy	Ja	Inspirasjon fra all verdenshjørner
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	Sjeldnere	Aldri	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	Pasta
Eier	Leilighet	40-50 år	Hver dag	1 person	Veggmontert kjøkkenhette	kommer tilbake til rommet)	Sjeldnere	Sjeldnere	Hver gang	Har bare 1 innstilling	Glemmer å skru på	Nei	Middag
Eier	Leilighet	20-30 år	5 ganger i uka	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere	Har ikke resirkulerende vifte	1 av 3 ganger	Innstilling 1 (min)	Glemmer å skru på	Nei	
Eier	Hus	50-60 år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)	For mye støy	Ja	Wok
Eier	Hus	50-60 år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang i måneden	ca. 1 gang i året	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	Middag
Eier	Hus	20-30 år	5 ganger i uka	2 personer	Kjøkkenhette over kjøkkenøy	Vet ikke	Sjeldnere	Aldri	1 av 3 ganger	Har bare 1 innstilling	For mye støy	Nei	pasta carbonara
Eier	Hus	60+ år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Innstilling 2 (medium)		Nei	Brødskiver
Eier	Leilighet	30-40 år	Hver dag	2 personer	Annet (vennligst spesifiser)	Vet ikke	Sjeldnere	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 2 (medium)	Annet (vennligst spesifiser)	Nei	
Leier	Leilighet	20-30 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Aldri	Aldri	Hver gang	Innstilling 2 (medium)		Ja	Stekt kylling/kjøtt, med ris/pasta.
Eier	Hus	40-50 år	5 ganger i uka	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 1 (min)	For mye støy	Nei	Gryteretter
Eier	Leilighet	20-30 år	Hver dag	2 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang hver 3 måned	Sjeldnere	Hver gang	Annet (vennligst spesifiser)		Nei	
Leier	Hybel	20-30 år	3 ganger i uka	1 person	Veggmontert kjøkkenhette	Vet ikke	Aldri	Aldri	1 av 4 ganger	Har bare 1 innstilling	Glemmer å skru på	Nei	blodet til mine fiender
Leier	Leilighet	20-30 år	Hver dag	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Har bare 1 innstilling	Glemmer å skru på	Nei	Kylling m pannemix
Eier	Hus	50-60 år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang i året		Hver gang	Har bare 1 innstilling		Ja	
Leier	Leilighet	20-30 år	Hver dag	1 person	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	ca. 1 gang i året		Innstilling 3 (max)	For mye støy	Nei	
Leier	Hybel	0-20 år	Sjeldnere	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Aldri	Aldri	Hver gang	Har bare 1 innstilling	For mye støy	Ja	
Leier	Kollektiv	20-30 år	5 ganger i uka	1 person	Veggmontert kjøkkenhette	Vet ikke	Aldri	Aldri	Hver gang	Innstilling 1 (min)	Glemmer å skru på	Nei	Pastarett
Leier	Kollektiv	20-30 år	5 ganger i uka	1 person	Veggmontert kjøkkenhette	Vet ikke	Aldri	Har ikke resirkulerende vifte	Hver gang	Innstilling 1 (min)	For mye støy	Ja	Gryter
Eier	Hus	60+ år	3 ganger i uka	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Aldri	Sjeldnere	Hver gang	Innstilling 1 (min)	Annet (vennligst spesifiser)	Nei	Pasta
Eier	Hus	40-50 år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	(vennligst spesifiser)		Hver gang	Innstilling 2 (medium)		Ja	Stekt kylling i diverse formater
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 2 (medium)	Glemmer å skru på	Nei	Kjøttkaker
Eier	Leilighet	20-30 år	5 ganger i uka	2 personer	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang hver 3 måned	Aldri	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	Taco

Eier	Leilighet	20-30 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	Hver gang	Innstilling 3 (max)		Nei	
Eier	Hus	50-60 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere	Sjeldnere	1 av 4 ganger	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	
Eier	Hus	0-20 år	3 ganger i uka	3-5 personer	Veggmontert kjøkkenhette	Vet ikke	Aldri	Aldri	1 av 4 ganger	Innstilling 1 (min)	Glemmer å skru på	Nei	Gryterett
Leier	Kollektiv	20-30 år	Hver dag	1 person	Veggmontert kjøkkenhette	kommer tilbake til rommet)	1 gang i året	Sjeldnere	1 av 2 ganger	Innstilling 1 (min)	For mye støy	Nei	Pannestekte grønnsaker
Eier	Leilighet	20-30 år	Hver dag	1 person	Annet (vennligst spesifiser)	kommer tilbake til rommet)	1 gang i året	ca. 1 gang i året	Hver gang	Innstilling 2 (medium)	For mye støy	Nei	Wok, vegetariske gryteretter, grøt
Eier	Leilighet	20-30 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere	Har ikke resirkulerende vifte	1 av 3 ganger	Har bare 1 innstilling	Glemmer å skru på	Nei	Pasta, egg
Eier	Hus	40-50 år	Hver dag	3-5 personer	Annet (vennligst spesifiser)	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	Pasta
Eier	Leilighet	20-30 år	5 ganger i uka	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	ca. 2 ganger i året	Hver gang	Har bare 1 innstilling	Annet (vennligst spesifiser)	Nei	Fullkornspasta med div kjøtt
Eier	Leilighet	40-50 år	Hver dag	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Har ikke resirkulerende vifte	1 av 3 ganger	Har bare 1 innstilling	Glemmer å skru på	Nei	Koking av egg 😂
Leier	Kollektiv	20-30 år	Hver dag	1 person	Veggmontert kjøkkenhette	kommer tilbake til rommet)	Aldri	Aldri	Hver gang	Innstilling 1 (min)		Nei	Taco
Eier	Leilighet	30-40 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang i året	Aldri	Hver gang	Innstilling 3 (max)	For mye støy	Nei	masala, butter chicken osv.
Leier	Kollektiv	20-30 år	Hver dag	1 person	(Kjøkkenventilator på benken)	kommer tilbake til rommet)	1 gang i måneden	Sjeldnere	Hver gang	Innstilling 2 (medium)	Glemmer å skru på	Nei	Pasta og wok
Eier	Leilighet	20-30 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	Hver gang	Har bare 1 innstilling	Glemmer å skru på	Nei	Pasta
Eier	Hus	20-30 år	Hver dag	3-5 personer	Veggmontert kjøkkenhette	Vet ikke	1 gang i måneden	Har ikke resirkulerende vifte	Hver gang	Har bare 1 innstilling	Glemmer å skru på	Ja	går i ovnen. Ellers pannekaker eller
Leier	Hus	20-30 år	Hver dag	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 1 (min)	For mye støy	Nei	Wok!
Eier	Hus	40-50 år	Hver dag	3-5 personer	Annet (vennligst spesifiser)	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Aldri	Hver gang	Innstilling 3 (max)		Nei	
Eier	Leilighet	30-40 år	Hver dag	3-5 personer	Kjøkkenhette over kjøkkenøy	eller føres i kanal ut av boenheten)	1 gang i året		Hver gang	Innstilling 3 (max)	Annet (vennligst spesifiser)	Nei	pasta/ris/potet/gryt er/kylling/kjøtt/fisk
Eier	Leilighet	20-30 år	Hver dag	2 personer	(Kjøkkenventilator på benken)	eller føres i kanal ut av boenheten)	Aldri	Sjeldnere	1 av 2 ganger	Innstilling 3 (max)	For mye støy	Nei	wok
Eier	Leilighet	30-40 år	Hver dag	2 personer	Kjøkkenhette over kjøkkenøy	Vet ikke	Aldri	Aldri	Hver gang	Innstilling 3 (max)	Glemmer å skru på	Nei	
Leier	Kollektiv	20-30 år	5 ganger i uka	1 person	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	1 gang hver 3 måned	Har ikke resirkulerende vifte	1 av 2 ganger	Har bare 1 innstilling	Glemmer å skru på	Nei	Pasta med tomatsaus
Eier	Leilighet	20-30 år	Hver dag	2 personer	Veggmontert kjøkkenhette	eller føres i kanal ut av boenheten)	Sjeldnere	Har ikke resirkulerende vifte	1 av 2 ganger	Innstilling 2 (medium)	Glemmer å skru på	Nei	
Leier	Leilighet	20-30 år		2 personer	Veggmontert kjøkkenhette	Vet ikke	1 gang i året		1 av 2 ganger	Innstilling 1 (min)	Glemmer å skru på	Nei	Wok

F Calibration

F.1 Calibration dokumentation - Aerotrak

CERTIFICATE OF CALIBRATION

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 http://www.tsi.com

Environment Conditions		
Temperature	74.87 (23.8)	°F (°C)
Relative Humidity	37	%RH
Barometric Pressure	29.17 (987.8)	inHg (hPa)

Model	9303-01
Serial Number	93031740006

☒ As Left ☒ In Tolerance
☐ As Found ☐ Out of Tolerance

AeroTrak Calibration Bench			
Measurement Variable	System ID	Date Last Calibrated	Calibration Due Date
Concentration	E003254	01-04-17	01-31-18
Particle Size	E003259	08-03-17	08-31-18
Flow	E003142	07-28-17	07-31-18
Flow	E003396	07-27-17	07-31-18
Flow	E002371	03-02-17	03-31-18

Particle Standards				
Particle Size	Standard Uncertainty	Standard Deviation	Lot No.	Expiration Date
0.296 µm	0.003 µm	0.0053 µm	44638	06-30-18
0.508 µm	0.004 µm	0.0085 µm	168223	04-30-19
0.994 µm	0.0075 µm	0.010 µm	171667	07-31-19
5.02 µm	0.015 µm	0.060 µm	173759	09-30-19

TSI does hereby certify that the calibration performed on the above described instrument meets the requirements of ISO 21501-4. TSI does hereby certify that the above described instrument conforms to the original manufacturer's specification (not applicable to As Found data) and has been calibrated using standards whose accuracies are traceable to the United States National Institute of Standards and Technology (NIST) or has been verified with respect to instrumentation whose accuracy is traceable to NIST, or is derived from accepted values of physical constants. TSI is registered to ISO-9001:2015 and complies with ISO 10012:2003, Quality Assurance Requirements for Measuring Equipment.

Calibrated ____________ Date: October 5, 2017

Document Number: CERT_CCAPC_ISO

Model 9303-01 SN 93031740006 October 05, 2017 Page 1 of 2

TSI P/N 2300157

CERTIFICATE OF CALIBRATION

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 http://www.tsi.com

Size Calibration and Verification of Size Setting		
Nominal Particle Size	Digital Cutpoint	Expanded Uncertainty
0.3 µm	220	4.1%
0.5 µm	605	4.1%
1 µm	910	4.1%
5 µm	2425	4.0%

Counting Efficiency			
Particle Size	Actual	Allowable Range	Pass/Fail
0.3 µm	49%	50% ± 20	Pass
0.5 µm	98%	100% ± 10	Pass

Size Resolution			
Particle Size	Measured	Allowable Range	Pass/Fail
0.5 µm	9%	≤ 15 %	Pass

False Count Rate						
Sample Time (min)	Sampled (L)	Measured Counts (#)	Concentration (#/m^3)	95% UCL (#/m^3)	Allowable Range (#/m^3)	Pass/Fail
60	169	3	17.79	46.3	≤ 71.2	Pass

Sampling Flow Rate (L/min)				
Nominal	Actual	Error	Allowable Range	Pass/Fail
2.83	2.81	-0.7 %	± 5%	Pass

Sampling Time Accuracy †		
Measured	Allowable Range	Pass/Fail
< ± 0.1%	± 1%	Pass

Response Rate †		
Measured	Allowable Range	Pass/Fail
0.008 %	≤ 0 5%	Pass

Maximum Particle Concentration †
120000000 #/m^3 @10% Coincidence Loss

† Tested and verified during product development

Calibration Interval	
Calibration Date	Expiration Date
October 5, 2017	October 5, 2018

Model 9303-01 SN 93031740006 October 05, 2017

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TSI P/N 2300157

CERTIFICATE OF CALIBRATION

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 http://www.tsi.com

Environment Conditions		
Temperature	75.35 (24.1)	°F (°C)
Relative Humidity	37	%RH
Barometric Pressure	29.16 (987.5)	inHg (hPa)

Model	9303-01
Serial Number	93031740010

☒ As Left
☐ As Found

☒ In Tolerance
☐ Out of Tolerance

AeroTrak Calibration Bench			
Measurement Variable	System ID	Date Last Calibrated	Calibration Due Date
Concentration	E003254	01-04-17	01-31-18
Particle Size	E003259	08-03-17	08-31-18
Flow	E003142	07-28-17	07-31-18
Flow	E003396	07-27-17	07-31-18
Flow	E002371	03-02-17	03-31-18

Particle Standards				
Particle Size	Standard Uncertainty	Standard Deviation	Lot No.	Expiration Date
0.296 µm	0.003 µm	0.0053 µm	44638	06-30-18
0.508 µm	0.004 µm	0.0085 µm	168223	04-30-19
0.994 µm	0.0075 µm	0.010 µm	171667	07-31-19
5.02 µm	0.015 µm	0.060 µm	173759	09-30-19

TSI does hereby certify that the calibration performed on the above described instrument meets the requirements of ISO 21501-4. TSI does hereby certify that the above described instrument conforms to the original manufacturer's specification (not applicable to As Found data) and has been calibrated using standards whose accuracies are traceable to the United States National Institute of Standards and Technology (NIST) or has been verified with respect to instrumentation whose accuracy is traceable to NIST, or is derived from accepted values of physical constants. TSI is registered to ISO-9001:2015 and complies with ISO 10012:2003, Quality Assurance Requirements for Measuring Equipment.

Calibrated: [signature]

Date: October 5, 2017

Document Number: CERT_CCAPC_ISO

TSI P/N 2900157

CERTIFICATE OF CALIBRATION

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 http://www.tsi.com

Size Calibration and Verification of Size Setting		
Nominal Particle Size	Digital Cutpoint	Expanded Uncertainty
0.3 µm	231	4.1%
0.5 µm	615	4.1%
1 µm	912	4.1%
5 µm	2408	4.0%

Counting Efficiency			
Particle Size	Actual	Allowable Range	Pass/Fail
0.3 µm	50%	50% ± 20	Pass
0.5 µm	95%	100% ± 10	Pass

Size Resolution			
Particle Size	Measured	Allowable Range	Pass/Fail
0.5 µm	9.3%	≤ 15 %	Pass

False Count Rate						
Sample Time (min)	Sampled (L)	Measured Counts (#)	Concentration ($\#/m^3$)	95% UCL ($\#/m^3$)	Allowable Range ($\#/m^3$)	Pass/Fail
30	85	1	11.78	55.4	≤ 70.7	Pass

Sampling Flow Rate (L/min)				
Nominal	Actual	Error	Allowable Range	Pass/Fail
2.83	2.83	0.0 %	± 5%	Pass

Sampling Time Accuracy †		
Measured	Allowable Range	Pass/Fail
< ± 0.1%	± 1%	Pass

Response Rate †		
Measured	Allowable Range	Pass/Fail
0.008 %	≤ 0.5%	Pass

Maximum Particle Concentration †
120000000 $\#/m^3$ @10% Coincidence Loss

† Tested and verified during product development

Calibration Interval	
Calibration Date	Expiration Date
October 5, 2017	October 5, 2018

Model 9303-01 SN 93031740010 October 05, 2017

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TSI P/N 2300157

CERTIFICATE OF CALIBRATION

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 http://www.tsi.com

Environment Conditions		
Temperature	75.4 (24.1)	°F (°C)
Relative Humidity	38	%RH
Barometric Pressure	29.18 (988.1)	inHg (hPa)

Model	9303-01
Serial Number	93031740007

☒ As Left
☐ As Found

☒ In Tolerance
☐ Out of Tolerance

AeroTrak Calibration Bench			
Measurement Variable	System ID	Date Last Calibrated	Calibration Due Date
Concentration	E003254	01-04-17	01-31-18
Particle Size	E003259	08-03-17	08-31-18
Flow	E003142	07-28-17	07-31-18
Flow	E003396	07-27-17	07-31-18
Flow	E002371	03-02-17	03-31-18

Particle Standards				
Particle Size	Standard Uncertainty	Standard Deviation	Lot No.	Expiration Date
0.296 µm	0.003 µm	0.0053 µm	44638	06-30-18
0.508 µm	0.004 µm	0.0085 µm	168223	04-30-19
0.994 µm	0.0075 µm	0.010 µm	171667	07-31-19
5.02 µm	0.015 µm	0.060 µm	173759	09-30-19

TSI does hereby certify that the calibration performed on the above described instrument meets the requirements of ISO 21501-4. TSI does hereby certify that the above described instrument conforms to the original manufacturer's specification (not applicable to As Found data) and has been calibrated using standards whose accuracies are traceable to the United States National Institute of Standards and Technology (NIST) or has been verified with respect to instrumentation whose accuracy is traceable to NIST, or is derived from accepted values of physical constants. TSI is registered to ISO-9001:2015 and complies with ISO 10012:2003, Quality Assurance Requirements for Measuring Equipment.

Sou Her
Calibrated

October 5, 2017
Date

Document Number: CERT_CCAPC_ISO

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TSI P/N 2300157

CERTIFICATE OF CALIBRATION

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA
Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 http://www.tsi.com

Size Calibration and Verification of Size Setting		
Nominal Particle Size	Digital Cutpoint	Expanded Uncertainty
0.3 µm	226	4.1%
0.5 µm	603	4.1%
1 µm	920	4.1%
5 µm	2583	4.0%

Counting Efficiency			
Particle Size	Actual	Allowable Range	Pass/Fail
0.3 µm	46%	50% ± 20	Pass
0.5 µm	99%	100% ± 10	Pass

Size Resolution			
Particle Size	Measured	Allowable Range	Pass/Fail
0.5 µm	9.1%	≤ 15 %	Pass

False Count Rate						
Sample Time (min)	Sampled (L)	Measured Counts (#)	Concentration (#/m^3)	95% UCL (#/m^3)	Allowable Range (#/m^3)	Pass/Fail
60	169	3	17.73	46.1	≤ 70.9	Pass

Sampling Flow Rate (L/min)				
Nominal	Actual	Error	Allowable Range	Pass/Fail
2.83	2.82	-0.4 %	± 5%	Pass

Sampling Time Accuracy †		
Measured	Allowable Range	Pass/Fail
< ± 0.1%	± 1%	Pass

Response Rate †		
Measured	Allowable Range	Pass/Fail
0.008 %	≤ 0.5%	Pass

Maximum Particle Concentration †
120000000 #/m^3 @10% Coincidence Loss

† Tested and verified during product development

Calibration Interval	
Calibration Date	Expiration Date
October 5, 2017	October 5, 2018

Model 9303-01 SN 93031740007 October 05, 2017

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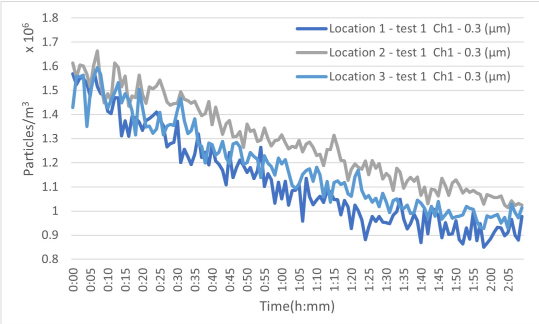
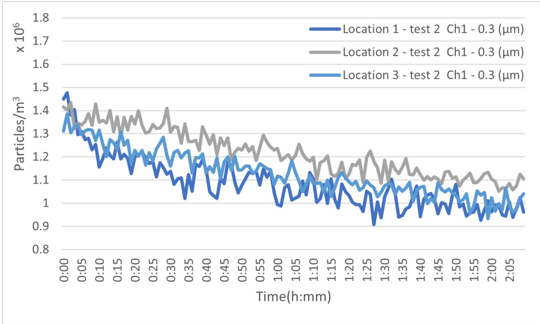
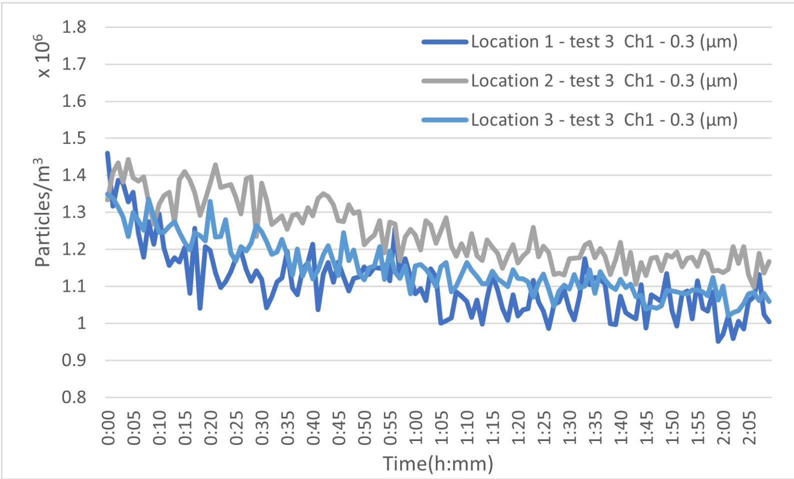
F.2 Calibration of aerotraks against each other



(a) Differences from measurements with all three Aerotraks during test 1



(b) Differences from measurements with all three Aerotraks during test 2



(c) Differences from measurements with all three Aerotraks during test 3

Figure 1: Results from the aerotrak calibration

F.3 Calibration documentation - Grimm

GRIMM Aerosol-Technik GmbH, 83404 Ainring Germany
Tel:+49-8654-5780- email: service@grimm-aerosol.com

Spectrometer Calibration Certificate

Model: 1.108 **Size Channels:** 15 Channels (0,30µm->20µm)
Ser. No.: 8E990906 **Firmware Version/Revision**: 8.50E

Instruments used for Calibration

- Reference instrument model 1.108 S/N: 8F000502
- Oscilloscope Hameg HM504; S/N: 2318
- Gapmeter Platon 0,2 l/min. (ATP) – 2,0 l/min.; S/N:C6HD-CA201001
- Calibration tower Model: 7851 S/N: CT05001

Calibration Material:

- Monodisperse Latex of 1µm from Duke Scientific Corp.
- Micro Dolomit DR80 polydisperse powder from Bassermann & Co. (0,20µm – 80µm)

Tolerance Ranges:

- Sample Flow Rate: 1,2 l/min +/- 5%
- Count Correlation : at 1µm +/- 5%
- Relative Mass Deviation : +/- 5% to Reference Unit

Measured Mean Mass Values

	Reference Unit	**Calibrated Unit**	**Deviation**
Total-Dust:	354,3 µg/m³	352,1 µg/m³	<3%

Sampled Volume: 0,0121 m³

We hereby confirm that this instrument has successfully calibrated and **passed also the mass test.** All work has been done by qualified and trained person(s) of GRIMM Aerosol Technik.

This calibration is valid until 2016-04-30.

Pouch, 2015-04-22

…………………………(Signature of Inspector)

GIP Messinstrumente GmbH
OT Pouch
Mühlbecker Weg 18
D - 06774 Muldestausee
Tel.: 03493 57367 Fax: 03493 55314

Serviceprotocol

Grimm Aerosol Technik - Servicecenter Pouch - Germany

Customer	IM	**Last Service**	Ind_Male03.10.10
RMA	11764-002-15	**Responsible Technician**	W. Herz
	receive / inspection		Inspection
Date of	11.02.15 / 25.02.15	**Responsible Technician**	W. Herz
			Final Inspection
Model	Grimm 1.108	**Serial Number**	8E990906
			service@grimm-aerosol.com

Reason for service

Case up cover screws missing

Filter OK

Customer values

Alarm N	0µg/m³	Alarm C	0p/L	weight	4 µg
Thr. Humidity	70%	C-factor	1,00	S-weight	64 mg
Intervall	0	Location	1		

Values before Service		**pre-Comparison**	Yes	No	**Values after Service**	
Date of Inspection	25.02.15				Date of EK	31.03.15
Run-Time	620.7	Ramp	☐	☐	Run-Time	626.8
Software Version		Mass	✓	☐	Software Version	
8.50 E DM108E 25.08.99		**Calibration**			like before	
DC/v	143,3mV	Calibration	✓	☐	DC/v	114,0mV
DC_d	310,3mV	Ramp	☐	☐	DC_d	245,4mV
DC_h	454,7mV	Mass Tower	✓	☐	DC_h	389,3mV
DC_diff	144,4mV	Counts amb.	✓	☐	DC_diff	143,9mV
CO_h	0	**Mass amb. air (only Enviro)**	☐	☐	CO_h	0
CO_d	0				CO_d	0
La_l	-				La_l	-
La_h	-	Check data archiving	✓	☐	La_h	-
Laserpower (mW)					Laserpower (mW)	-
Flow	0,000L/min				Flow	1,200L/min
Imot	33,0%				Imot	34,0%
Date/Time	ok MESZ	**device function check-up**			Date/Time	ok
		No (included in calibration)				

Service activities

Note Thresholds ✓

Inspection & Final Check		Mirrorscrew inspection	
Analog Inputs	✓ / ✓	correct ✓ wrong ☐	
Batterypower	✓ / ✓	Mirrorscrew Fin.Check	
Keyboard	✓ / ✓	correct ✓	
Mixer control	✓ / ✓	Check all screws	
Memorycard	✓ / ✓	Yes ☐ No ☐	
Rinsing Air Contr.	✓	Update Firmware	
Pneumatic tightn.	✓ / ✓	Yes ☐ No ✓	
0-Filter Check	✓ / ✓	Customer Paper(s)	
electr. Flow: 100	☐ / ✓	Yes ✓ No ☐	
Fast-Mode OFF	☐	Customer Email(s)	
Cleaning	✓ / ✓	Yes ✓ No ☐	
DC-balancing	☐		

Grimm Aerosol Pass Check

		piece	
J01SM11803-047K	PTFE-filter	1	✓
J01SM16592K	rinsing air filter	1	✓

71 134 92 224 197 254 52 66 173 156 64 103 111 198 58 98

threshold new

F.4 Calibration documentation - Ptrak

TSI P/N 2300157

CERTIFICATE OF TESTING

TSI Instruments Ltd, Stirling Road, Cressex Business Park, High Wycombe, HP12 3ST, UK
TEL:+44-(0)1494 459200 FAX: +44-(0)1494 459700 www.tsi.com

CALIBRATION STANDARDS USED
PortaCount Bench UK1

MODEL	P-TRAK® Ultrafine Particle Counter 8525
SERIAL NO.	8525-02021038

VERIFICATION DATA (PARTICLE CONCENTRATION)			
TESTING NUMBER	MEASURED CONCENTRATION IN *Particles/cm³* *Tolerance: 95% to 105% of standard*		
	TESTING STANDARD	INSTRUMENT OUTPUT	PERCENT OF STANDARD
1	138.8	140.3	101.0
2	470.0	466.8	99.3
3	1121.9	1126.2	100.4
4	3251.4	3279.4	100.9
5	8687.7	8747.6	100.7

** Indicates out of tolerance condition*

TSI Instruments Ltd does hereby certify that the above described instrument conforms to the original manufacturer's specifications (not applicable to As Found data) and has been calibrated using standards whose accuracies are traceable to National Standards or have been derived from accepted values of natural physical constants or have been derived by the ratio type of self calibration techniques. This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the calibration organisation issuing this report.

Measurement Variable	System ID Number	Date Last Calibrated	Calibration Due Date
DC Voltage	UK0968101	01-10-13	01-10-14
DC Voltage	UK0968101	01-10-13	01-10-14
Particle Concentration	UK2442	12-09-13	12-09-14
Particle Concentration	UK2445	12-09-13	12-09-14
Particle Concentration	UK2464	22-05-13	22-05-14

Calibration procedure used: 9030029B

Overall Rating: PASS

Calibrated By

Oct. 7, 2013
Calibration Date

F.5 Calibration dokumentation - Rotronic

Calibration Certificate & Function Test

rotronic
MEASUREMENT SOLUTIONS

Gerät / Device / Appareillage / Apparecchio

Instrument	CP11
Version number	v1.6
Serial number	1170219
Measuring range	0…100 %RH / -20…60 °C / 0…5000 ppm
Accuracy	±3 %RH / ±0.3 K / ±30 ppm +5 %

Allgemein / General / Général / Generale

ROTRONIC AG certifies that this instrument meets the specifications of our datasheet. It has been calibrated and corresponds to the test requirements of **ISO9001-2008**. The instrument mentioned above was calibrated by comparison of the relative humidity and temperature values to the HygroClip HC2-S factory transfer standards. The traceability of the factory transfer standards is given by calibration at an **ISO 17025 (SCS-065)** accredited calibration laboratory. The **SCS-065** calibration laboratory is traceable to the national standard at the **Federal Institute of Metrology (METAS)**.
The CO2 sensor is individually calibrated and verified in a 1000ppm certified calibration gas mixture (±1% calibration gas mixture uncertainty) by sensor manufacturer and rechecked by comparison to a 400ppm standard gas tested device.

Referenz / Reference / Référence / Referenza

Parameter	Instrument	Serial number	Calibration date
Humidity	HC2-S	20048914	25.11.2016
Temperature	HC2-S	20048915	25.11.2016
CO2	400 ppm standard gas tested device		

Kalibrierung / Calibration / Étalonnage / Calibratura

Humidity

No.	Reference [%RH]	Reading [%RH]	Deviation [%RH]
1	23.1	24.5	1.4
2	92.2	94.1	1.9

Temperature

No.	Reference [°C]	Reading [°C]	Deviation [°C]
1	24.7	24.8	0.1
2	25.3	25.2	-0.1

CO2

No.	Reference [ppm]	Reading [ppm]	Deviation [ppm]
1	564	565	1

Funktionstest / Function test / Test de fonctionnement / Test funzionali

Display	OK
Backlight	OK
Keys	OK
Power	OK
Communication	OK

Datum / Date / Date / Date 24.02.2017
Prüfer / Inspector / Vérificateur / Verificatore 15035
This document has been automatically created

F.6 Temperature kalibration Thermocouples vs Infrared thermometer

Table 7: Calibration of temperature measurement with aluminum piece connected to thermocouples.

Start time	Pan A level: 6				Pan D level: 6			
17:20	Front left burner				Front right burner			
time	Temp TC: pan A	Temp IR: pan A	Standard deviation	RSD	Temp TC: pan D	Temp IR: pan D	Standard deviation	RSD
01:00	68.10	61	5.02	8%	57.10	54	2.19	4%
01:30	79.90	71	6.29	8%	69.20	61	5.80	9%
02:00	91.50	87	3.18	4%	80.50	75	3.89	5%
02:30	101.60	98	2.55	3%	91.50	87	3.18	4%
03:00	110.70	108	1.91	2%	102.00	100	1.41	1%
03:30	119.40	118	0.99	1%	111.60	112	0.28	0%
04:00	127.20	128	0.57	0%	120.40	120	0.28	0%
04:30	134.40	136	1.13	1%	128.30	126	1.63	1%
05:00	141.20	143	1.27	1%	137.70	141	2.33	2%
05:30	147.70	151	2.33	2%	144.60	148	2.40	2%
06:00	153.80	159	3.68	2%	151.40	153	1.13	1%
06:30	159.50	163	2.47	2%	157.30	162	3.32	2%
07:00	165.20	170	3.39	2%	162.90	166	2.19	1%
07:30	170.50	175	3.18	2%	168.60	172	2.40	1%
08:00	175.00	181	4.24	2%	173.80	175	0.85	0%
08:30	179.40	186	4.67	3%	178.90	180	0.78	0%
09:00	183.40	189	3.96	2%	183.10	183	0.07	0%
09:30	187.30	193	4.03	2%	187.00	183	2.83	2%
10:00	190.80	198	5.09	3%	190.80	190	0.57	0%
10:30	194.00	201	4.95	3%	194.50	195	0.35	0%
11:00	197.50	205	5.30	3%	198.30	198	0.21	0%
11:30	200.80	208	5.09	2%	201.10	200	0.78	0%
12:00	203.60	210	4.53	2%	204.20	205	0.57	0%
12:30	206.20	212	4.10	2%	207.10	210	2.05	1%
13:00	208.50	215	4.60	2%	210.00	212	1.41	1%
13:30	211.00	219	5.66	3%	212.90	213	0.07	0%
14:00	213.30	220	4.74	2%	214.80	217	1.56	1%
14:30	215.70	222	4.45	2%	217.00	220	2.12	1%
15:00	217.40	225	5.37	2%	220.00	221	0.71	0%
15:30	219.10	227	5.59	3%	221.90	221	0.64	0%
16:00	220.60	230	6.65	3%	224.00	225	0.71	0%
16:30	222.20	232	6.93	3%	225.70	222	2.62	1%
17:00	223.70	233	6.58	3%	227.10	225	1.48	1%
17:30	225.30	235	6.86	3%	228.50	226	1.77	1%
18:00	226.80	237	7.21	3%	230.30	232	1.20	1%
18:30	228.10	238	7.00	3%	231.40	233	1.13	0%
19:00	229.50	237	5.30	2%	232.50	230	1.77	1%
19:30	230.70	242	7.99	3%	234.10	235	0.64	0%
20:00	231.60	243	8.06	3%	235.20	234	0.85	0%
20:30	232.90	244	7.85	3%	236.00	236	0.00	0%
21:00	233.90	246	8.56	4%	236.80	238	0.85	0%
21:30	235.10	247	8.41	3%	237.70	237	0.49	0%
22:00	235.70	248	8.70	4%	238.80	237	1.27	1%
22:30	236.70	247	7.28	3%	239.90	240	0.07	0%
23:00	237.50	250	8.84	4%	240.50	238	1.77	1%
23:30	238.30	250	8.27	3%	241.20	240	0.85	0%
Average error			5.11	3%	Average error		1.42	1%

F.7 Ventilation

Table 8: Test measurements from GK to actual airflows measured with Swema 3000

GK-cloud [m3/h]				Svema/Measured [m3/h]*			Difference [m3/h]
Set Point	RD403 max	RD401 min	Difference	Supply 1(corner)	Supply 2	Total	
36	0	0	0	45-26-00	0	-	-
50	0	0	0	0	0	-	-
75	0	0	0	0	30-00	-	-
				42	0		
				70-48	closed		
				53-26	closed		
100	0	0	0	53	38	91	-
				35	0		
				68	closed		
				71-30	closed		
150	0	0	0	66	55	121	-29
180	190,9	135	55,9	77	67	144	-36
200	190,9	190,9	0	88	82	170	-30
250	270	233	37	105	101	206	-44
300	301,9	301,9	0	129	125	254	-46
350	357	330	27	157	151	308	-42
400	405	381	24	176	169	345	-55
450	447	426	21	194	187	381	-69
500	505	486	19	221	214	435	-65
550	556	540	16	241	233	474	-76

G Meals and nutritional content

G.1 Meal 1

Table 9: Ground meat nutritional content.

Ground meat 400 g		
Nutritional value pr. 100g/ml		Ingredients
Energy	839 kJ / 200 kcal	Beef(meat content 94%),water and salt(1%)
Fat / of which saturated	14g / 6.20g	
Carbohydrates/ of which sugars	0g	
Fiber	0g	
Protein	18g	
Salt	1g	

Table 10: Nutritional content for spices for tacomeat

Spices 25 g		
Nutritional value pr. 100g/ml		Ingredients
Energy	1300 kJ/ 306 kcal	Spices (paprika (20%), cumin (12%), chili), vegetable powder (onion (13%), garlic (8%)), salt, maltodextrin, starch, herbs (oregano, marjoram), yeast extract, paprika extract .
Fat / of which saturated	6.10g/0.80g	
Carbohydrates/ of which sugars	52g/15g	
Fiber	0.20g	
Protein	8.9	
Salt	18g	

G.2 Meal 2

Table 11: Nutritional information of vegan minced soy

Vegan minced soy 300 g		
Nutritional value pr. 100g/ml		Ingredients
Energy	618kJ/ 147 kcal	Rehydrated soy / soy protein (85%), vegetable oil /
Fat / of which saturated	3g/0.30g	oil (sunflower / sunflower, rapeseed in varying proportions),
Carbohydrates/ of which sugars	9g/5g	rehydrated wheat / wheat / wheat protein (2%),
Fiber	6g	maltodextrin,onion powder, salt,
Protein	18g	yeast, malt extract (barley),
Salt	1.40g	garlic powder, potassium chloride, aroma, spices, glucose

Table 12: Nutritional information of dolmio tomatosauce

Dolmio tomato sauce 500g		
Nutritional value pr. 100g/ml		Ingredients
Energy	185kJ/ 44kcal	Tomatoes (73%), Tomato puree (17%), Onions, Sugar, Lemon juice, Salt, Basil, Olive oil, Garlic, Parsley, Oregano, Spices.
Fat / of which saturated	0.60g/0.10g	
Carbohydrates/ of which sugars	7.60g/5.80g	
Fiber	1.30g	
Protein	1.30g	
Salt	0.80g	

Table 13: Nutritional information of pasta used

Pasta 250 g		
Nutritional value pr. 100g/ml		Ingredients
Energy	1506 kJ/355kcal	Semolina durum wheat.
Fat / of which saturated	1g /0.20g	
Carbohydrates/ of which sugars	73g /2g	
Fiber	3g	
Protein	12g	
Salt	0.03g	

G.3 Meal 3

Table 14: Nutritional information for salmon

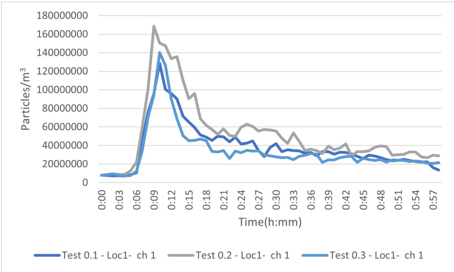
Salmon 400 g		
Nutritional value pr. 100g/ml		Ingredients
Energy	932kJ/224 kcal	Salmon
Fat / saturated fat	16g / 3g	
Carbohydrates/ sugar	0g	
Fiber	0g	
Protein	20g	
Salt	0.10g	

Table 15: Nutritional information for frozen wok.

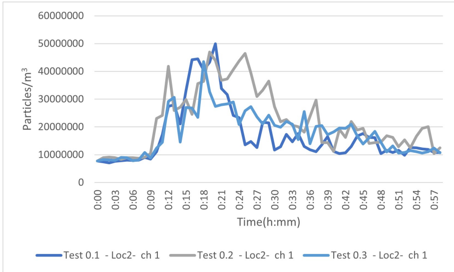
Fullkornsris & Grønnsaker 500 g		
Nutritional value pr. 100g/ml		Ingredients
Energy	435kJ/103kcal	Precooked brown rice (50 %), peas (16 %), maize (12 %), broccoli (12 %), paprika(5 %), onion (5 %).
Fat / of which saturated	1g / 0.20 g	
Carbohydrates/ of which sugars	19g /1.80g	
Fiber	2.60g	
Protein	3.20g	
Salt	0.50g	

H Experiment 0

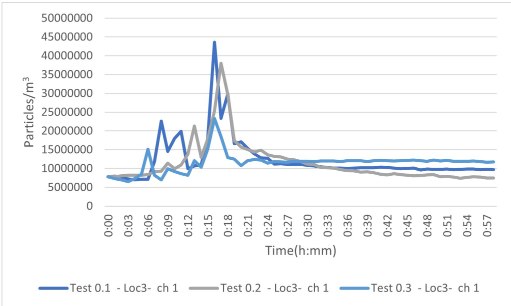
H.1 0 - Emission data



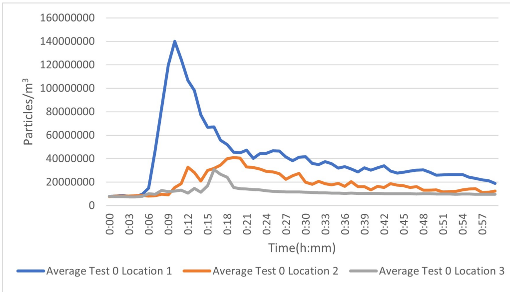
(a) Aerotrak measurements for all three tests in location 1 for test 0



(b) Aerotrak measurements for all three tests in location 2 for test 0

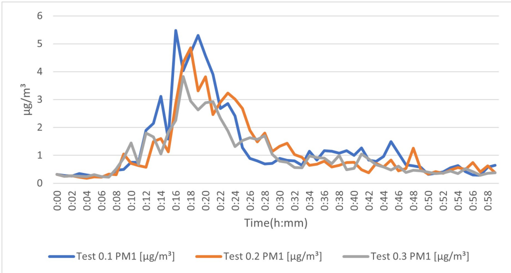


(c) Aerotrak measurements for all three tests in location 3 for test 0

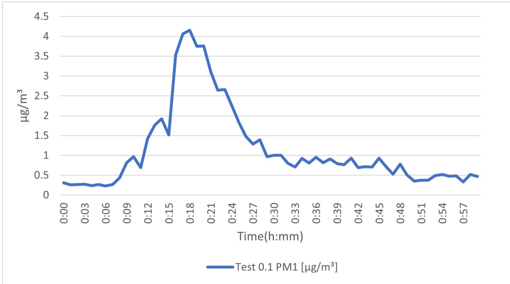


(d) Aerotrak measurements for all three location, averaged values from all three tests 0

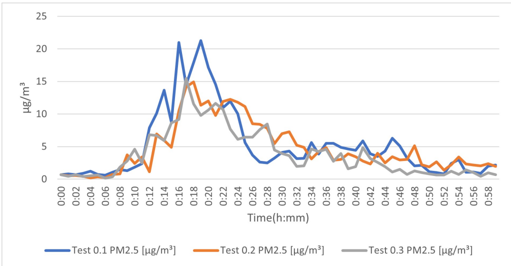
Figure 2: Aerotrak measurements for test 0 in all locations



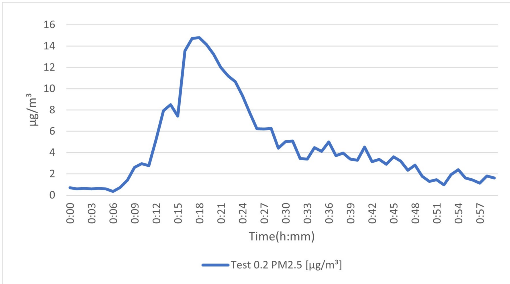
(a) PM1 measurements from all three tests 0



(b) PM1 averaged for test 0



(c) PM2.5 measurements from all three tests 0



(d) PM2.5 averaged for test 0

Figure 3: PM1 and PM2.5 concentrations converted from data measured by the GRIMM for test 0

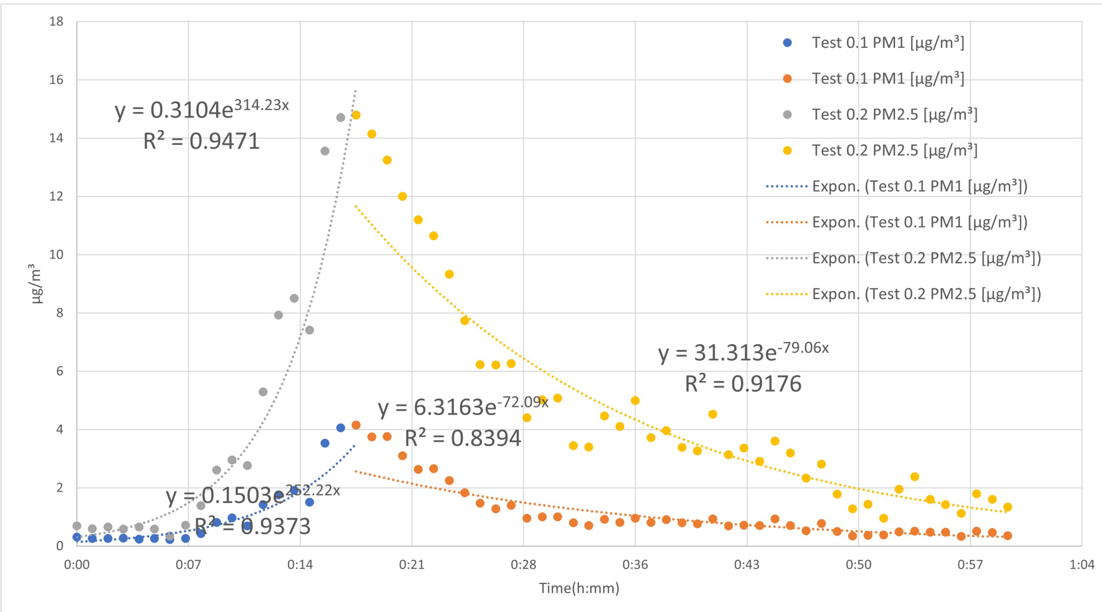


Figure 4: Exponential curves for the PM2.5 concentrations for test 0

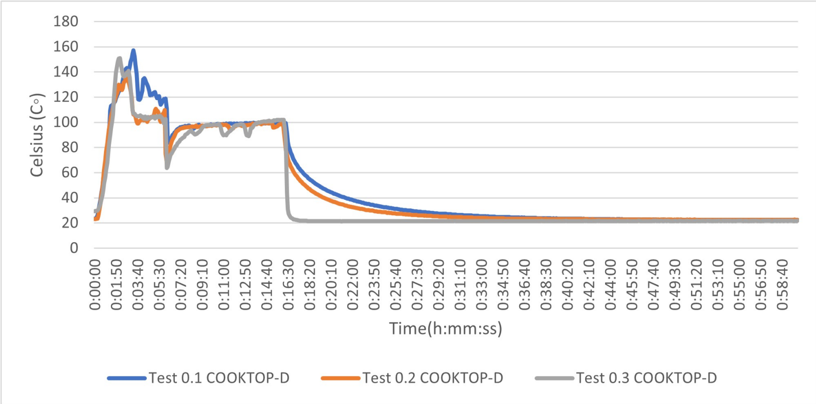
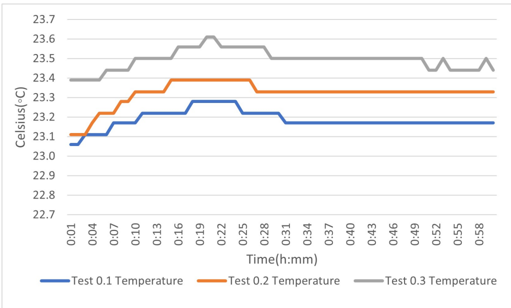
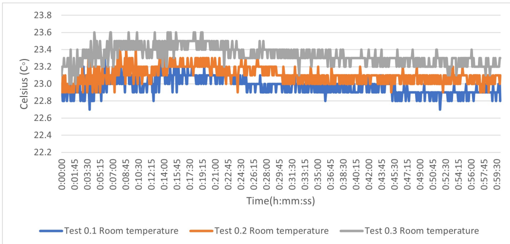


Figure 5: Pan temperature for cooktop D for test 0

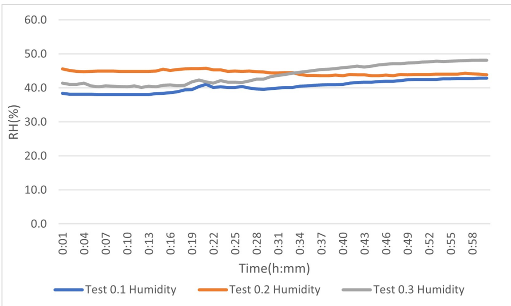
H.2 0 - Lab conditions



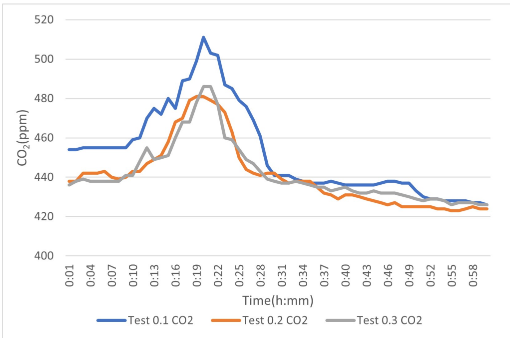
(a) Room temperature measured with rotronic for test 0



(b) Room temperature measured with thermo-couples for test 0

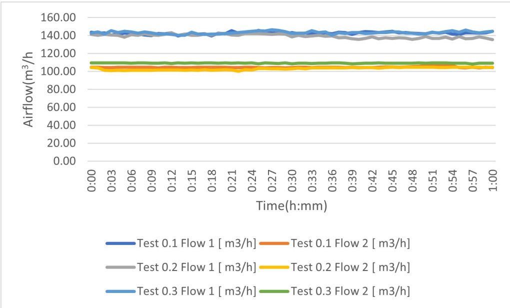


(c) Relative Humidity for test 0

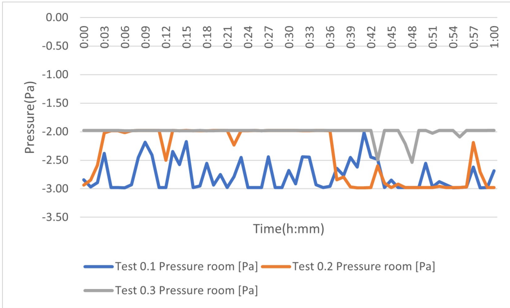


(d) CO_2 concentrations for test 0

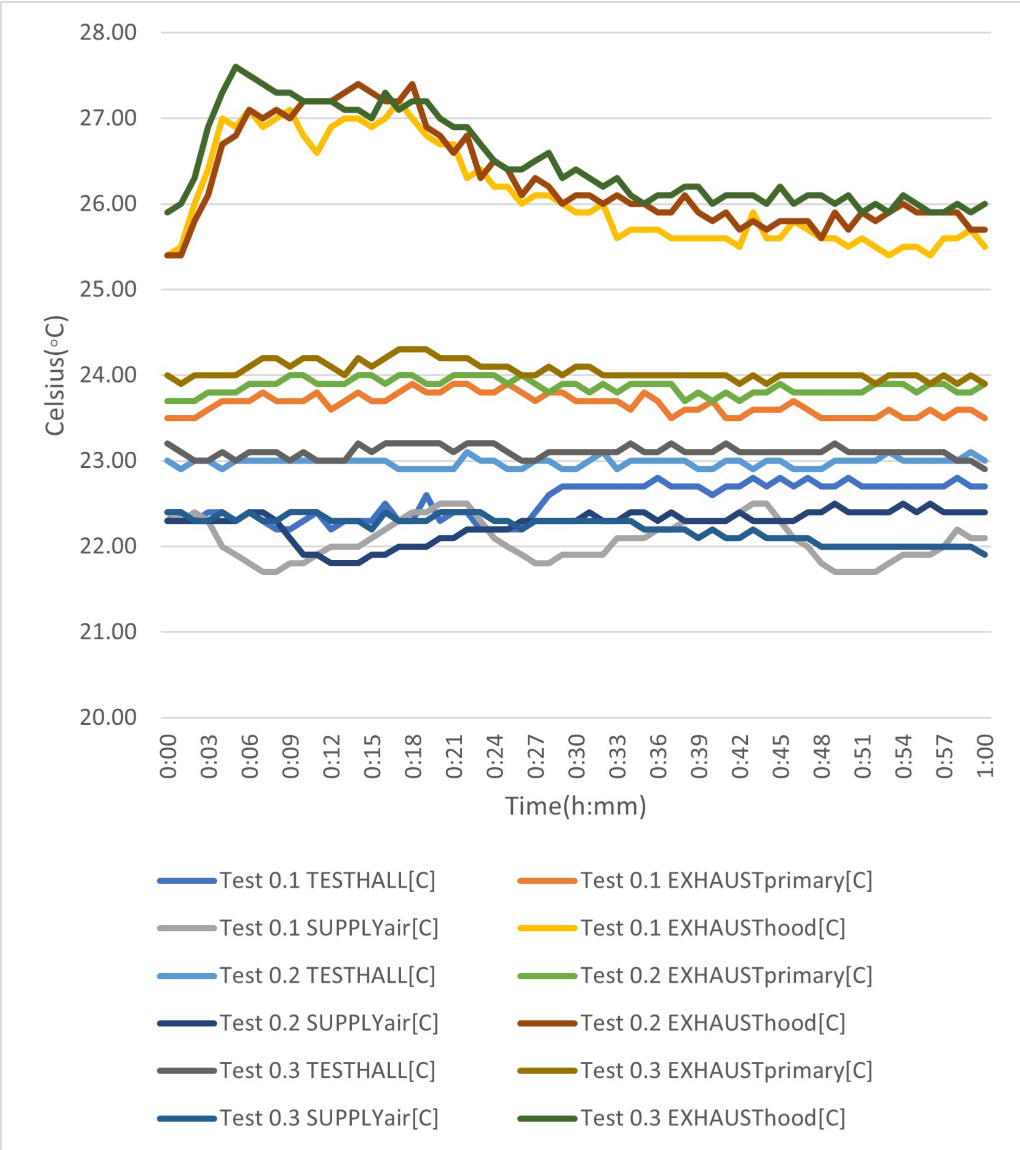
Figure 6: Test room conditions for test 0



(a) Exhaust flow rates for test 0



(b) Differential pressure between test room and hall for test 0

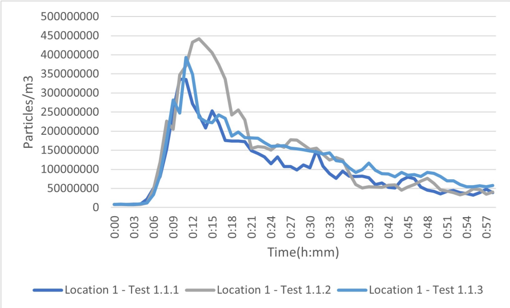


(c) Temperature conditions in the hall for test 0

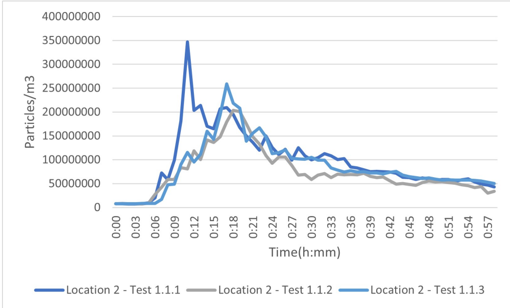
Figure 7: Test hall conditions for test 0

I Experiment 1

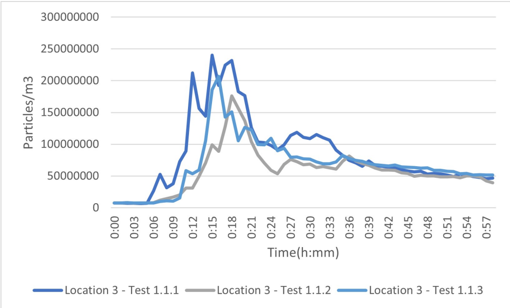
I.1 1.1 - Emission data



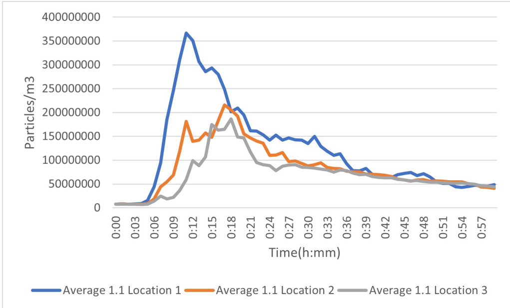
(a) Aerotrak measurements for all three tests in location 1 for test 1.1



(b) Aerotrak measurements for all three tests in location 2 for test 1.1

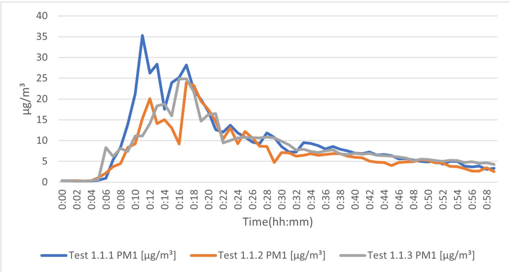


(c) Aerotrak measurements for all three tests in location 3 for test 1.1

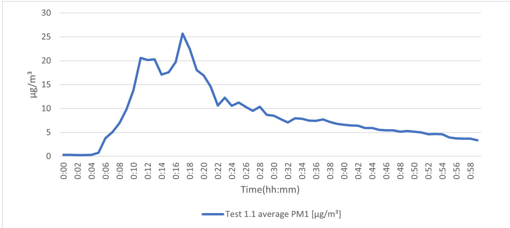


(d) Aerotrak measurements for all three location, averaged values from all three tests 1.1

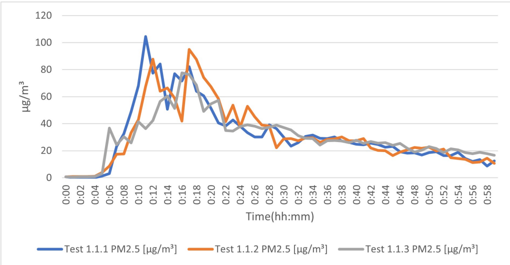
Figure 8: Aerotrak measurements for test 1.1 in all locations



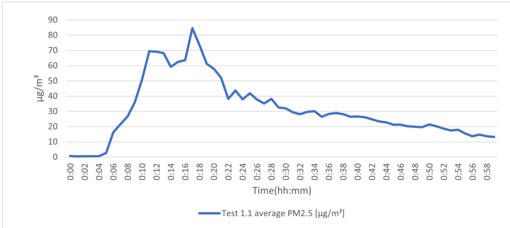
(a) PM1 measurements from all three tests 1.1



(b) PM1 averaged for test 1.1

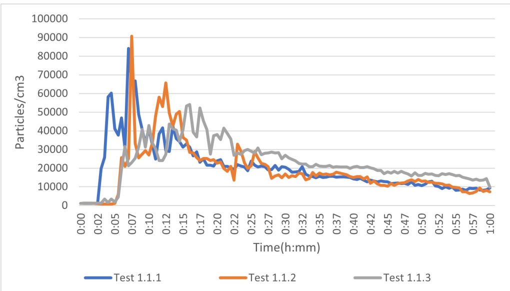


(c) PM2.5 measurements from all three tests 1.1

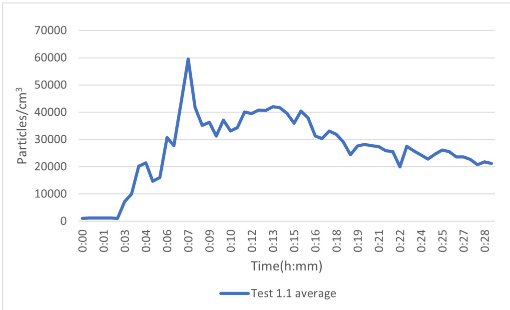


(d) PM2.5 averaged for test 1.1

Figure 9: PM1 and PM2.5 concentrations converted from data measured by the GRIMM for test 1.1.



(a) UFP concentration from all three tests in test 1.1



(b) UFP concentration averaged for test 1.1

Figure 10: UFP concentration measured with the P trak in location 2 for test 1.1

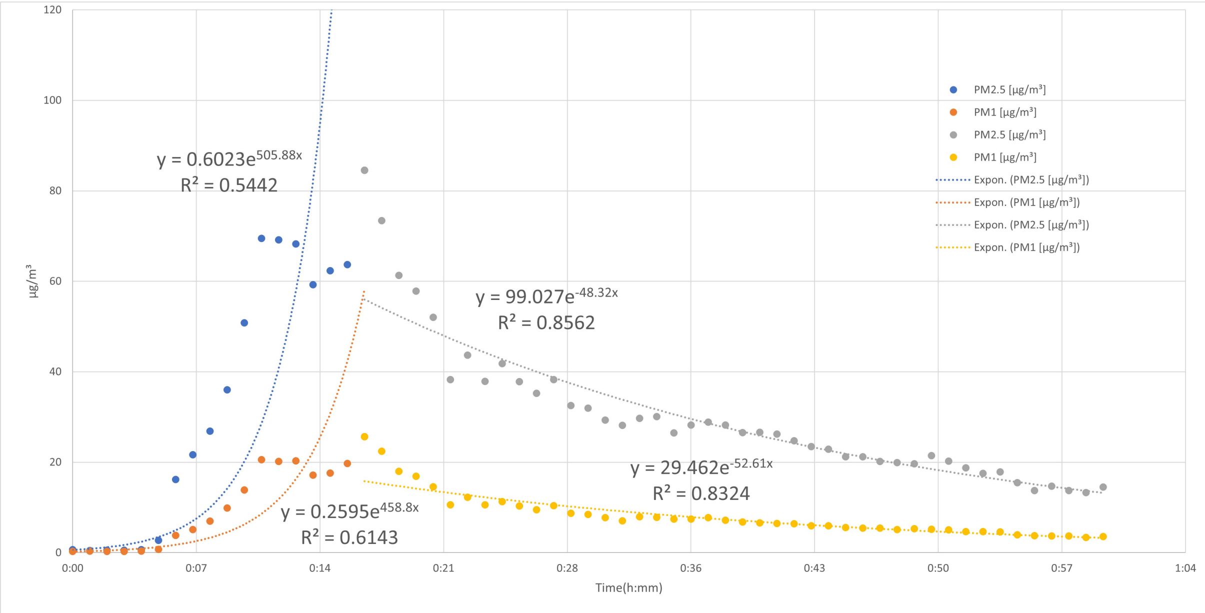


Figure 11: Exponential curves for the PM2.5 concentrations for test 1.1

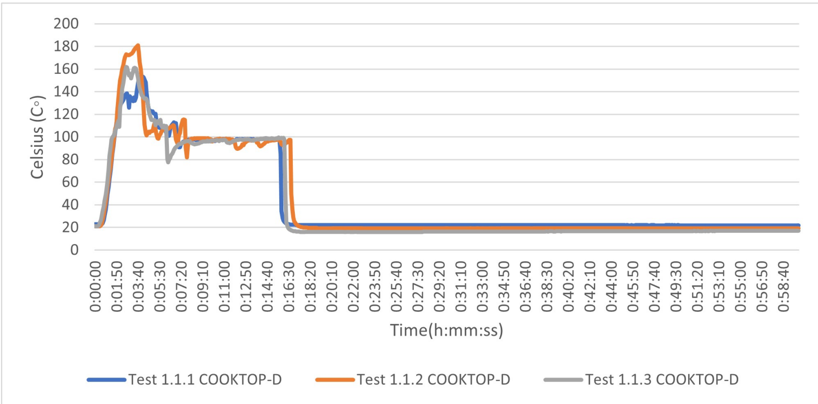
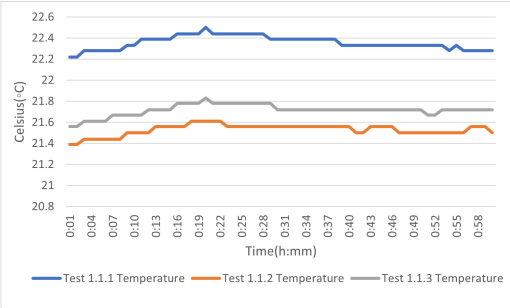
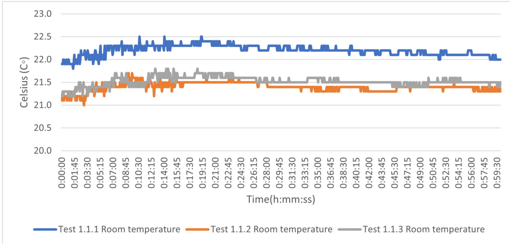


Figure 12: Pan temperature for cooktop D for test 1.1

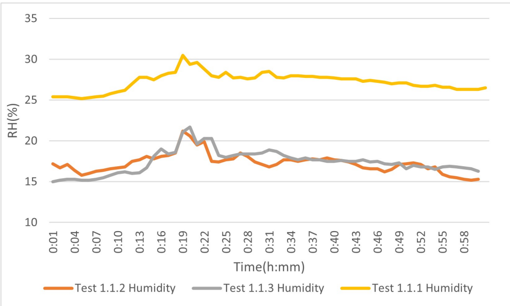
I.2 1.1 - Lab conditions



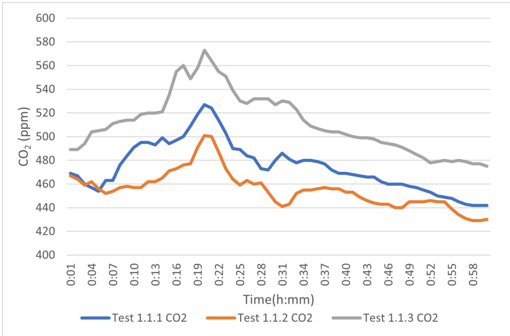
(a) Room temperature measured with rotronic for test 1.1



(b) Room temperature measured with thermo-couples for test 1.1

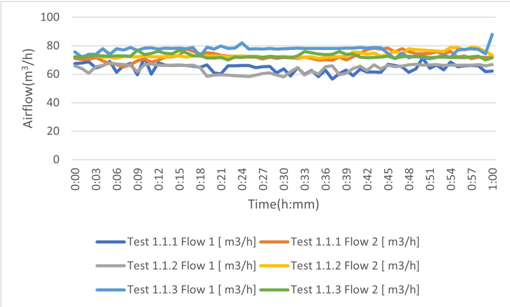


(c) Relative Humidity for test 1.1

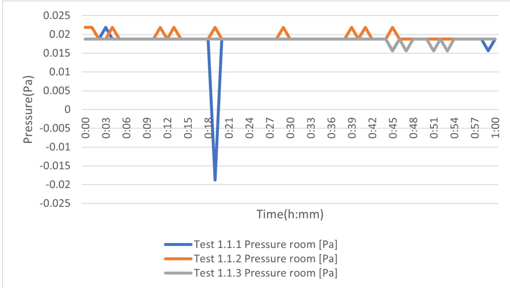


(d) CO_2 concentrations for test 1.1

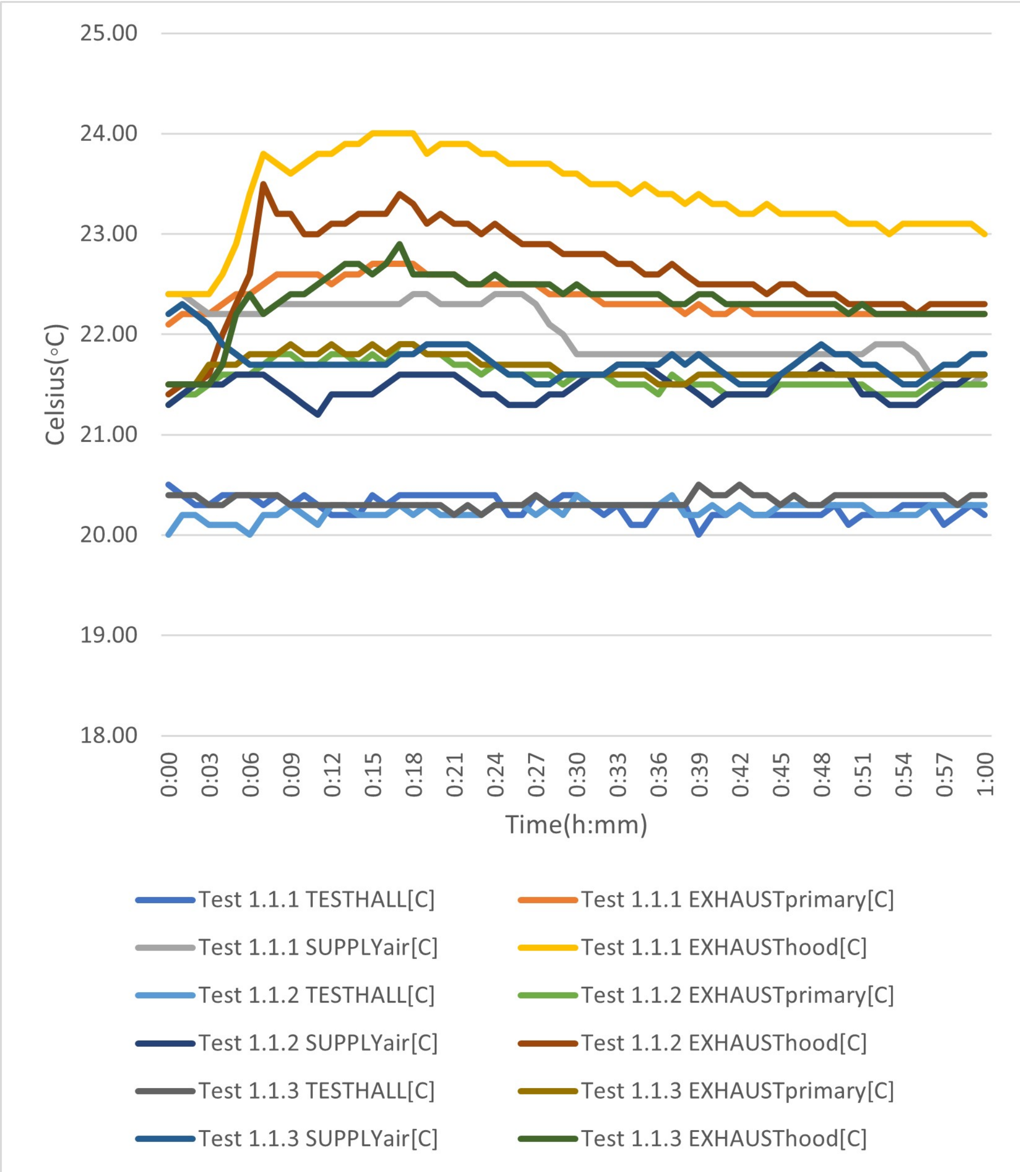
Figure 13: Test room conditions



(a) Exhaust flow rates for test 1.1



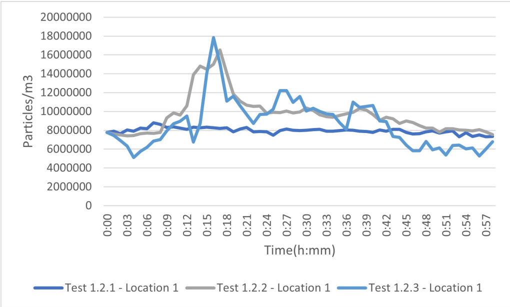
(b) Differential pressure between test room and hall for test 1.1



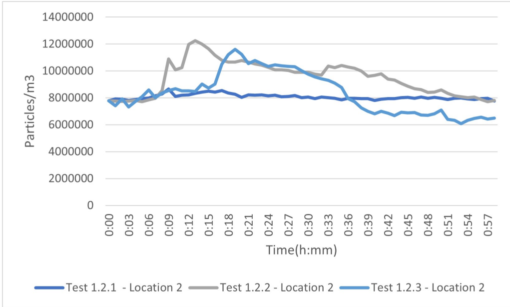
(c) Temperature conditions in the hall for test 1.1

Figure 14: Test hall conditions for test 1.1

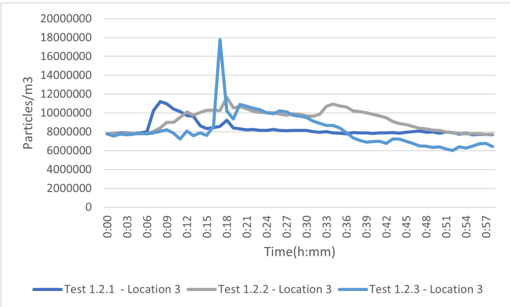
I.3 1.2 - Emission data



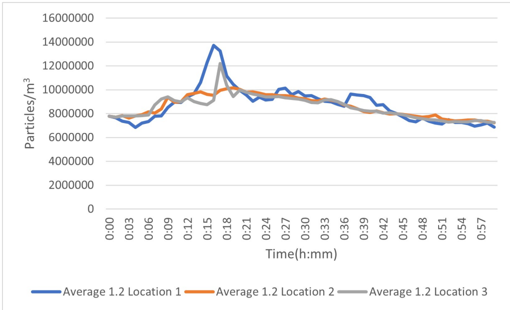
(a) Aerotrak measurements for all three tests in location 1 for test 1.2



(b) Aerotrak measurements for all three tests in location 2 for test 1.2

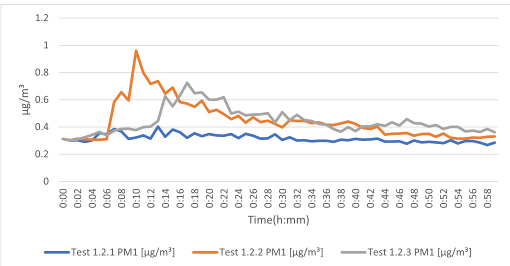


(c) Aerotrak measurements for all three tests in location 3 for test 1.2

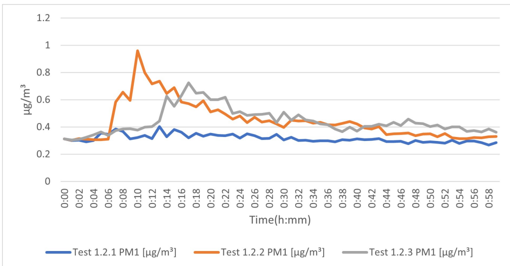


(d) Aerotrak measurements for all three location, averaged values from all three tests 1.2

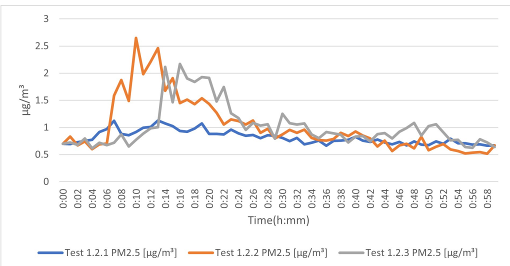
Figure 15: Aerotrak measurements for test 1.2 in all locations



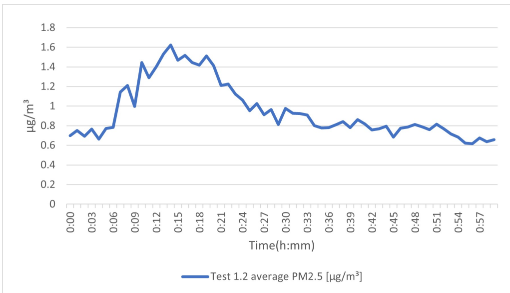
(a) PM1 measurements from all three tests 1.2



(b) PM1 averaged for test 1.2

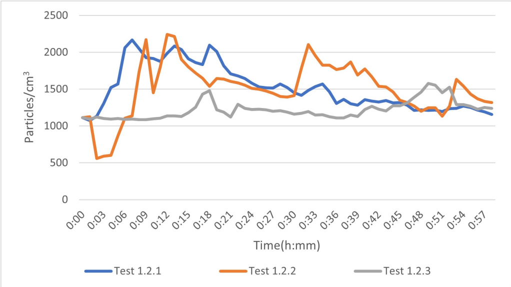


(c) PM2.5 measurements from all three tests 1.2

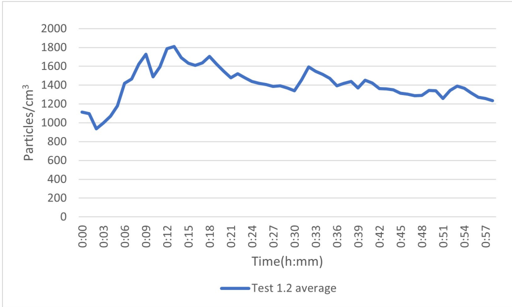


(d) PM2.5 averaged for test 1.2

Figure 16: PM1 and PM2.5 concentrations converted from data measured by the GRIMM for test 1.2

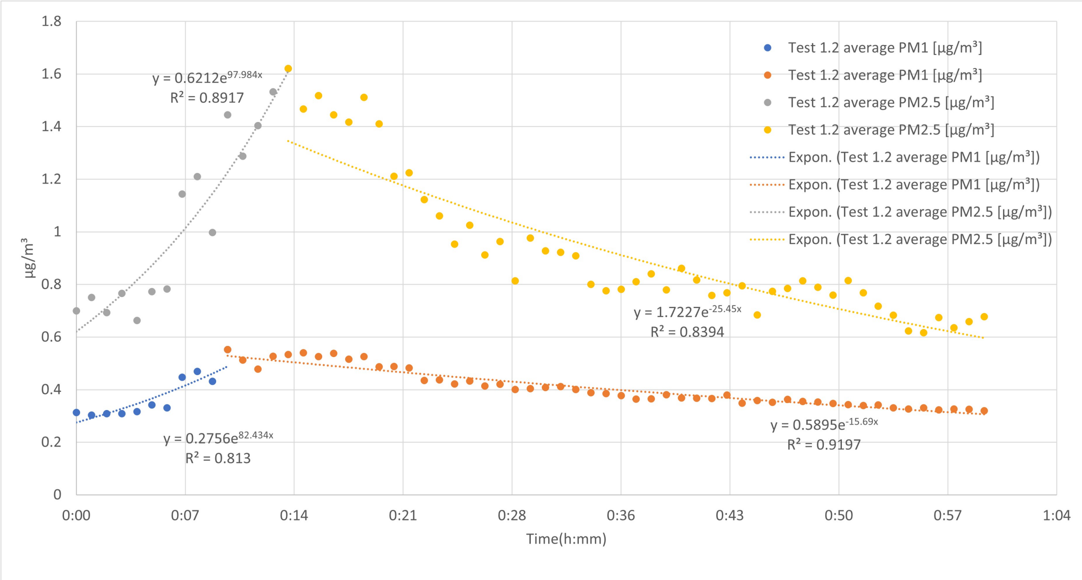


(a) UFP concentration from all three tests in test 1.2



(b) UFP concentration averaged for test 1.2

Figure 17: UFP concentration measured with the P trak in location 2 for test 1.2



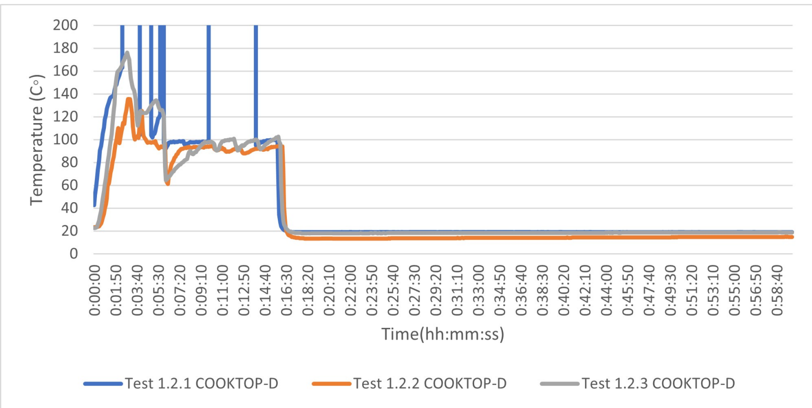
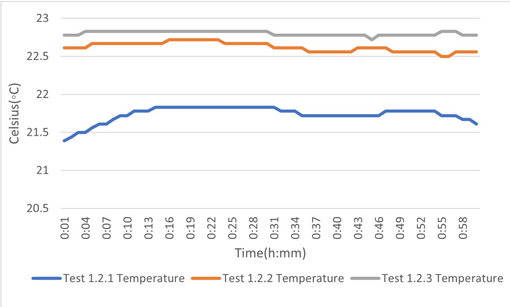
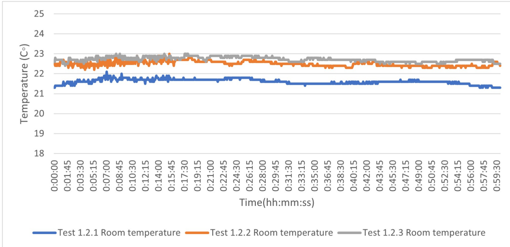


Figure 18: Pan temperature for cooktop D for test 1.2

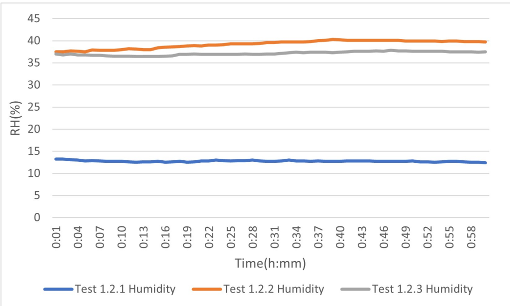
I.4 1.2 - Lab conditions



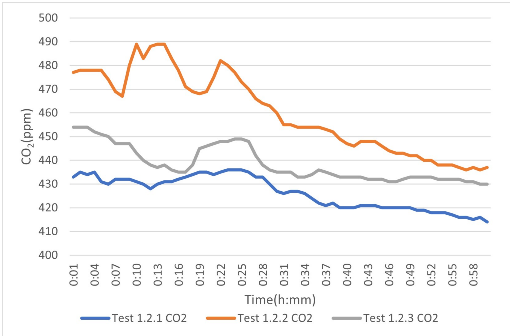
(a) Room temperature measured with the rotronic for test 1.2



(b) Room temperature measured with thermocouples for test 1.2

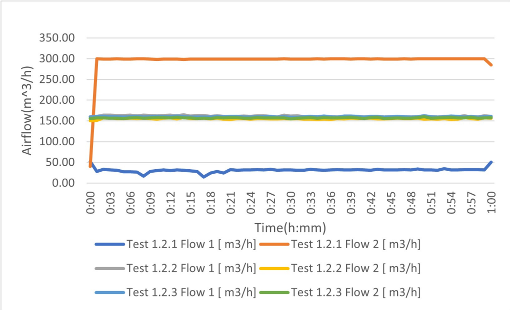


(c) Relative Humidity for test 1.2

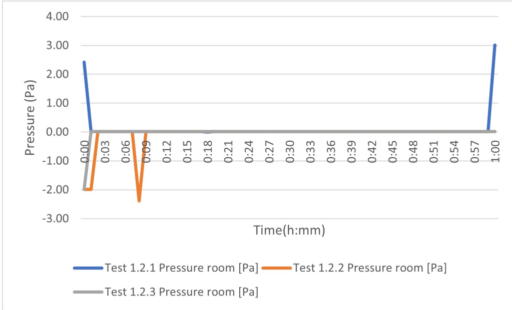


(d) CO_2 concentrations for test 1.2

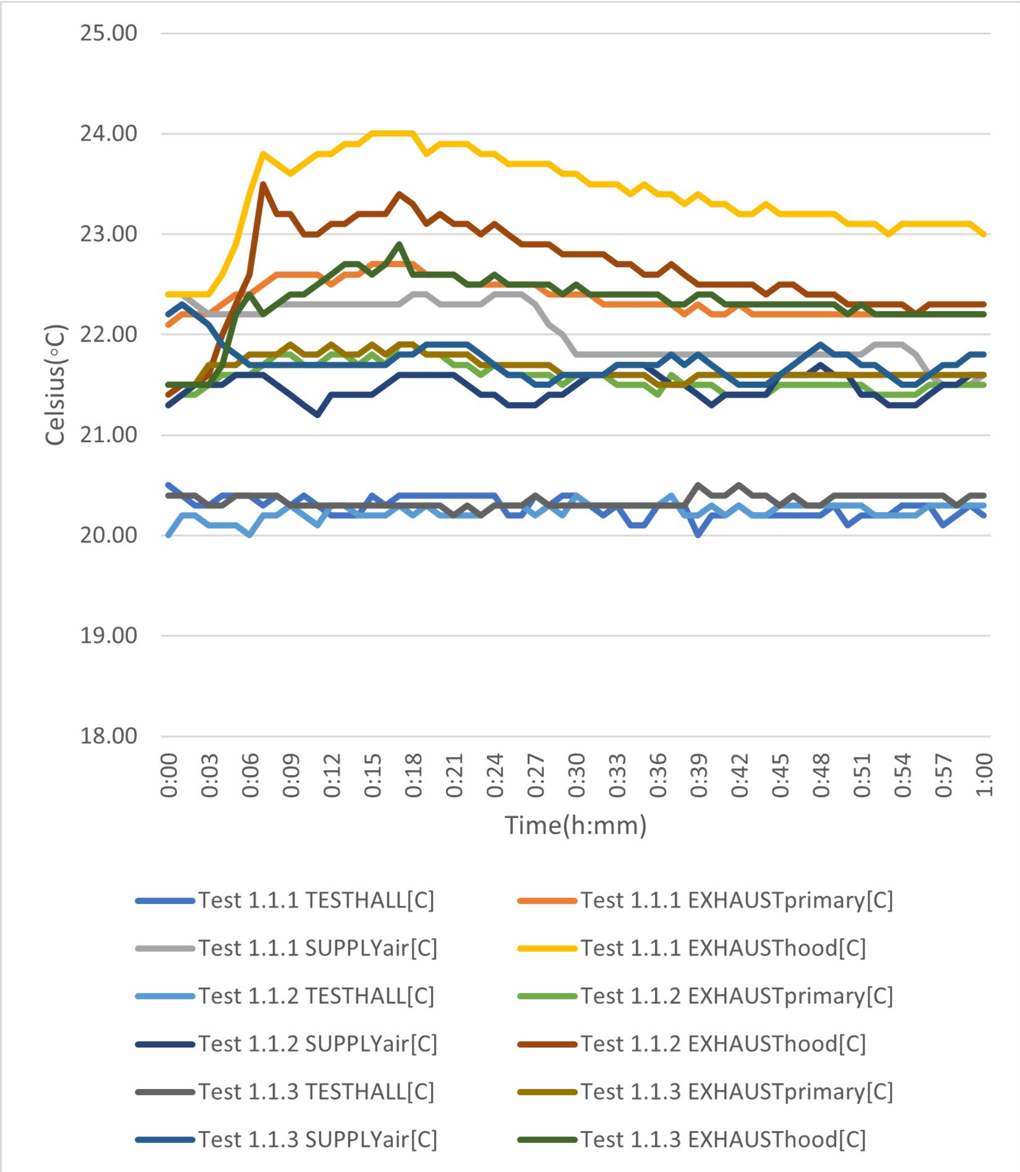
Figure 19: Test room conditions for test 1.2



(a) Exhaust flow rates for test 1.2



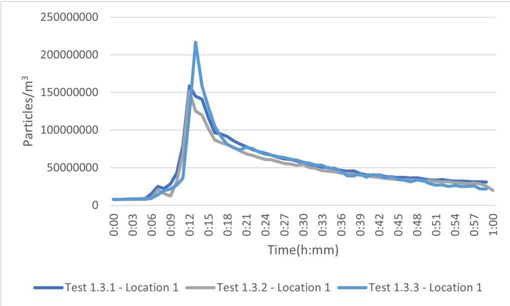
(b) Differential pressure between test room and hall for test 1.2



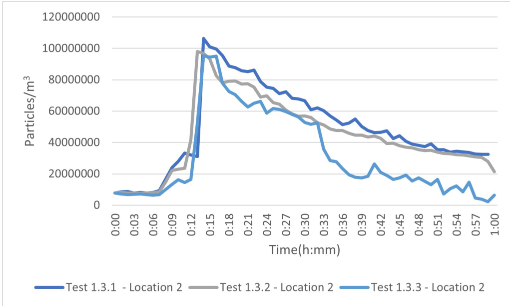
(c) Temperature conditions in the hall for test 1.1

Figure 20: Test hall conditions for test 1.1

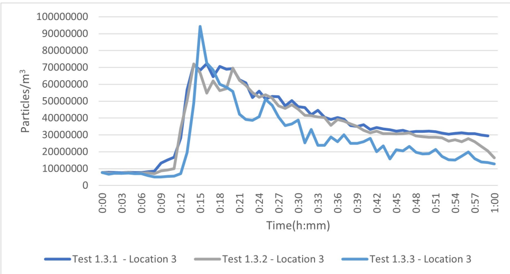
I.5 1.3 - Emission data



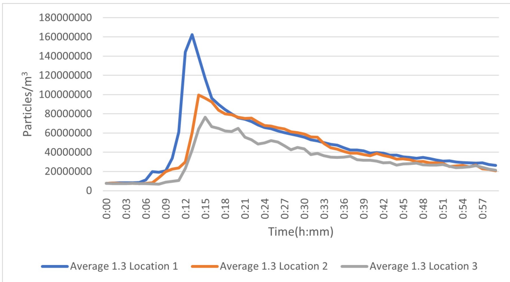
(a) Aerotrak measurements for all three tests in location 1 for test 1.3



(b) Aerotrak measurements for all three tests in location 2 for test 1.3

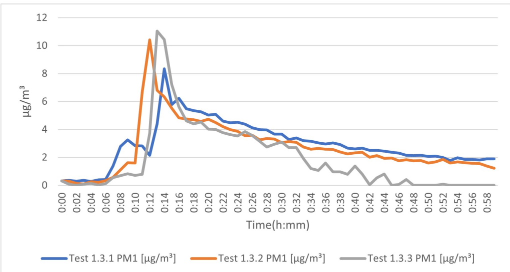


(c) Aerotrak measurements for all three tests in location 3 for test 1.3

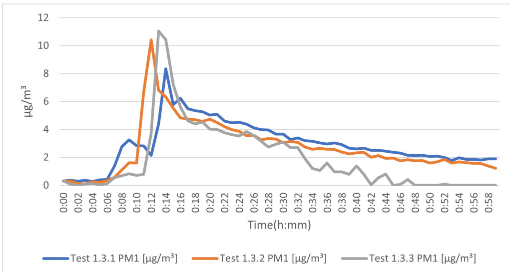


(d) Aerotrak measurements for all three location, averaged values from all three tests 1.3

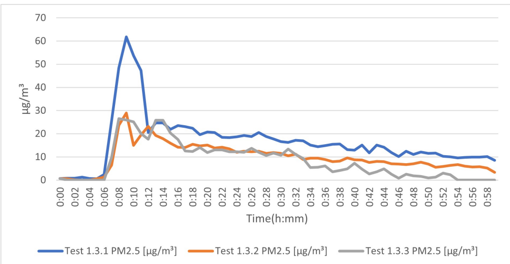
Figure 21: Aerotrak measurements for test 1.3 in all locations



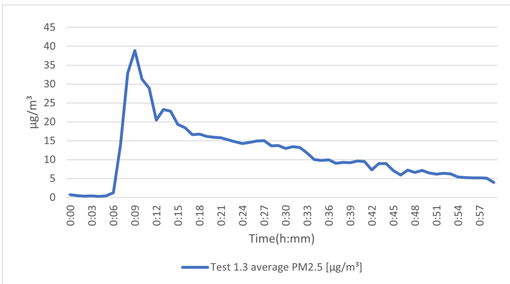
(a) PM1 measurements from all three tests 1.3



(b) PM1 averaged for test 1.3

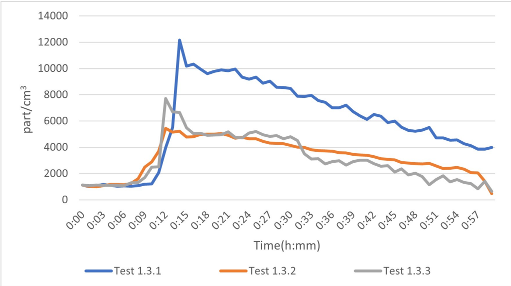


(c) PM2.5 measurements from all three tests 1.3

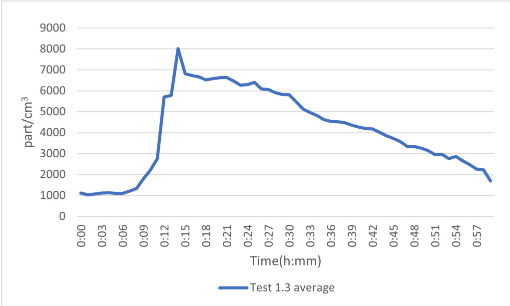


(d) PM2.5 averaged for test 1.3

Figure 22: PM1 and PM2.5 concentrations converted from data measured by the GRIMM for test 1.3



(a) UFP concentration from all three tests for 1.3



(b) UFP concentration averaged for test 1.3

Figure 23: UFP concentration measured with the P trak in location 2 for test 1.3

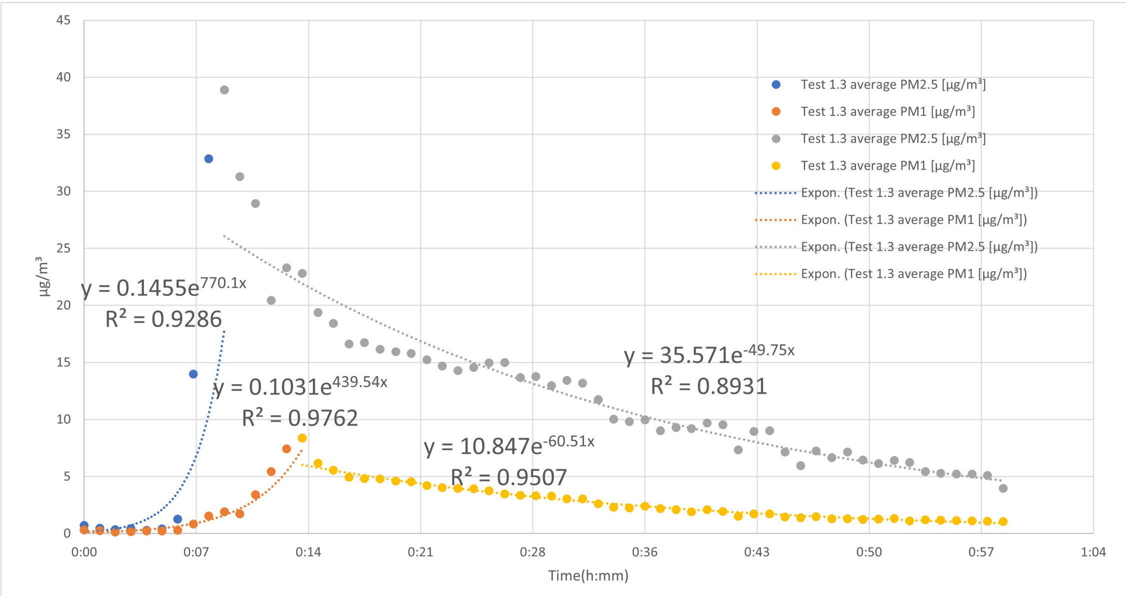
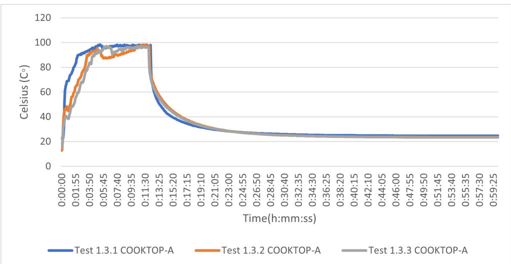
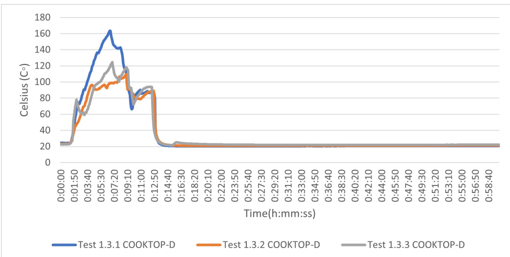


Figure 24: Exponential curves for the PM2.5 concentrations for test 0



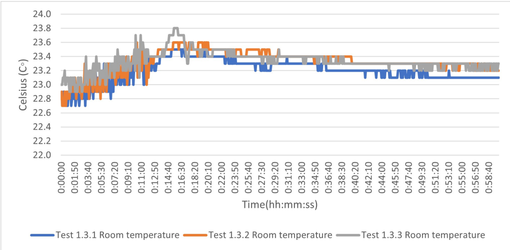
(a) Temperature for cooktop A for test 1.3



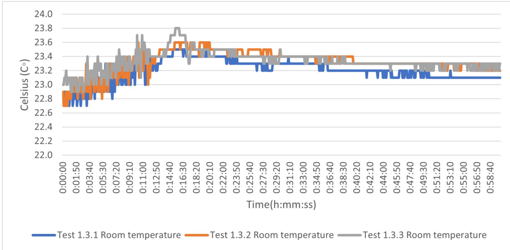
(b) Pan temperature for cooktop D for test 1.3

Figure 25: Cooktop temperatures for test 1.3

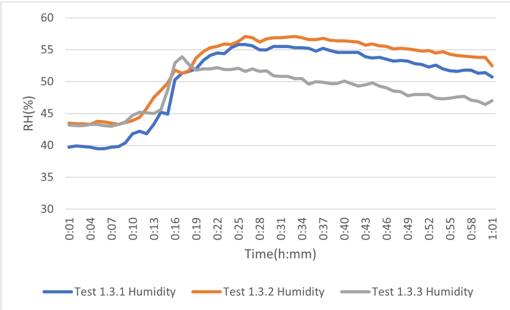
I.6 1.3 - Lab conditions



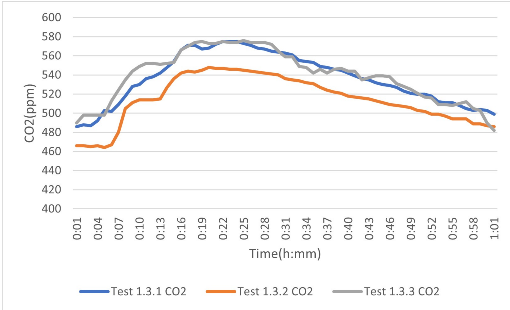
(a) Room temperature measured with the rotronic for test 1.3



(b) Room temperature measured with thermocouples for test 1.3

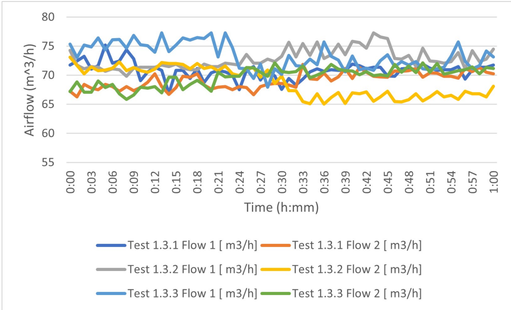


(c) Relative Humidity for test 1.3

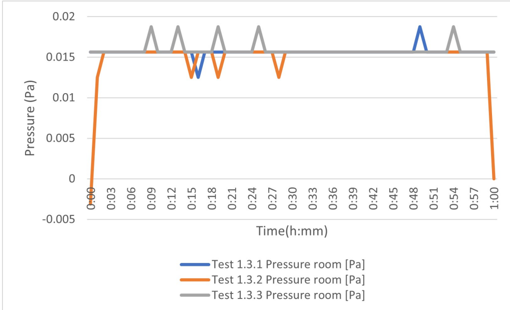


(d) CO_2 concentrations for test 1.3

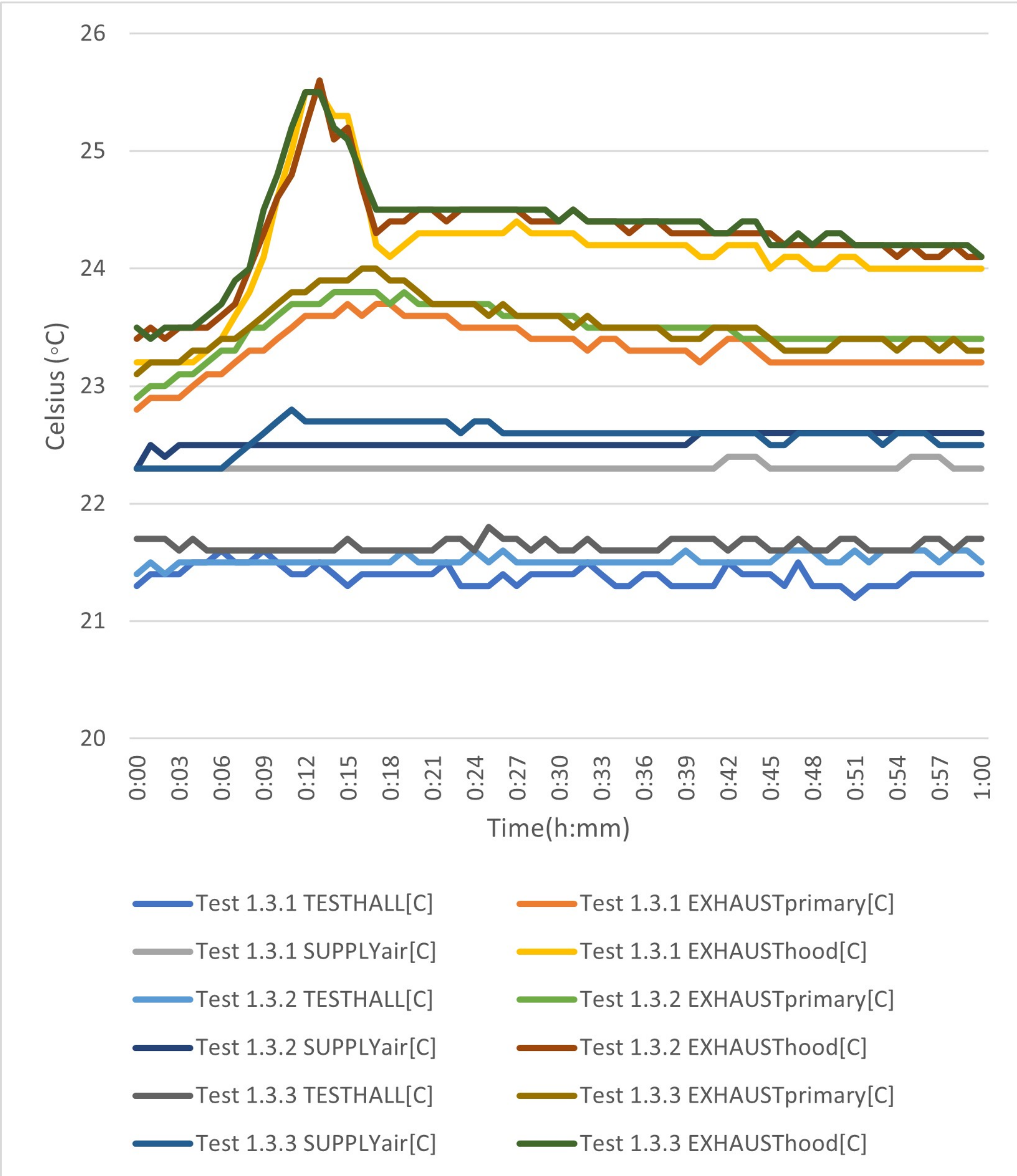
Figure 26: Test room conditions for test 1.3



(a) Exhaust flow rates for test 1.3



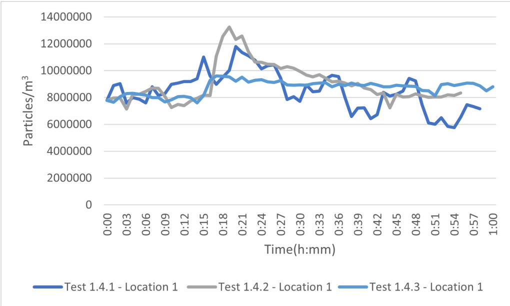
(b) Differential pressure between test room and hall for test 1.3



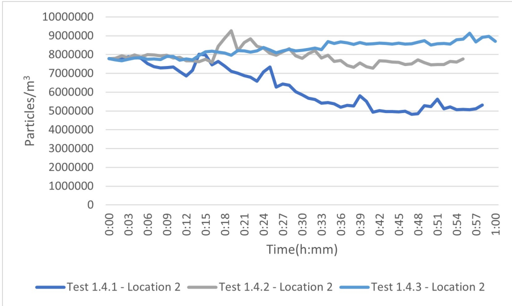
(c) Temperature conditions in the hall for test 1.3

Figure 27: Test hall conditions for test 1.3

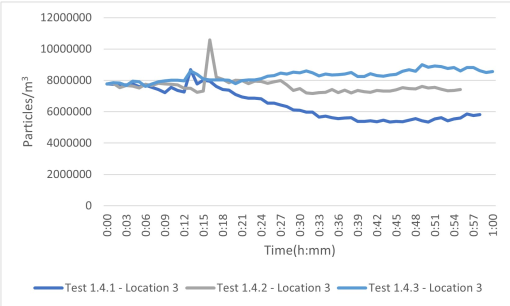
I.7 1.4 - Emission data



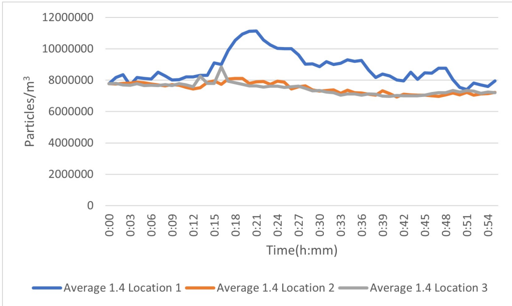
(a) Aerotrak measurements for all three tests in location 1 for test 1.4



(b) Aerotrak measurements for all three tests in location 2 for test 1.4

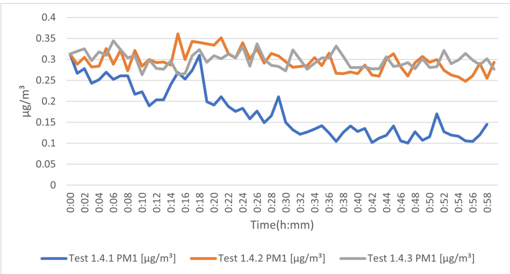


(c) Aerotrak measurements for all three tests in location 3 for test 1.4

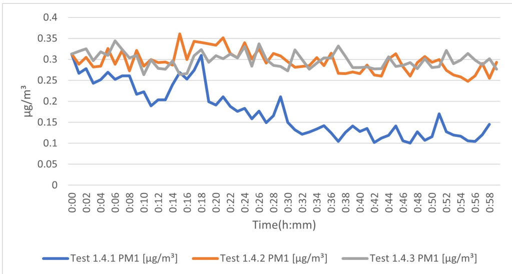


(d) Aerotrak measurements for all three location, averaged values from all three tests 1.4

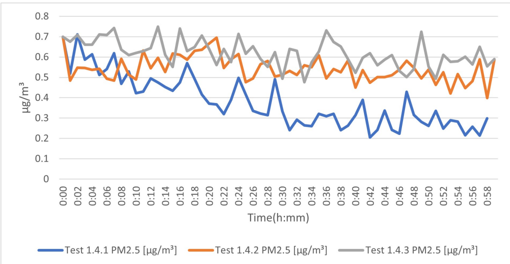
Figure 28: Aerotrak measurements for test 1.4 in all locations



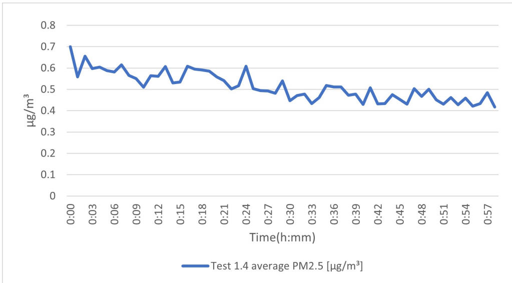
(a) PM1 measurements from all three tests 1.4



(b) PM1 averaged for test 1.4

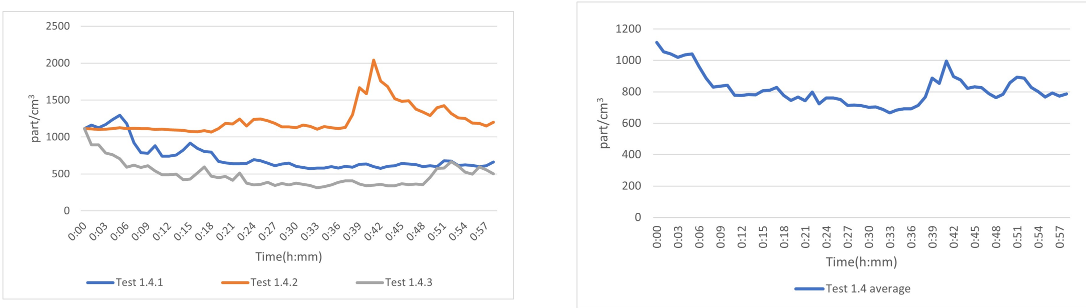


(c) PM2.5 measurements from all three tests 1.4



(d) PM2.5 averaged for test 1.4

Figure 29: PM1 and PM2.5 concentrations converted from data measured by the GRIMM for test 1.4



(a) UFP concentration from all three tests for 1.4

(b) UFP concentration averaged for test 1.4

Figure 30: UFP concentration measured with the Ptrak in location 2 for test 1.4

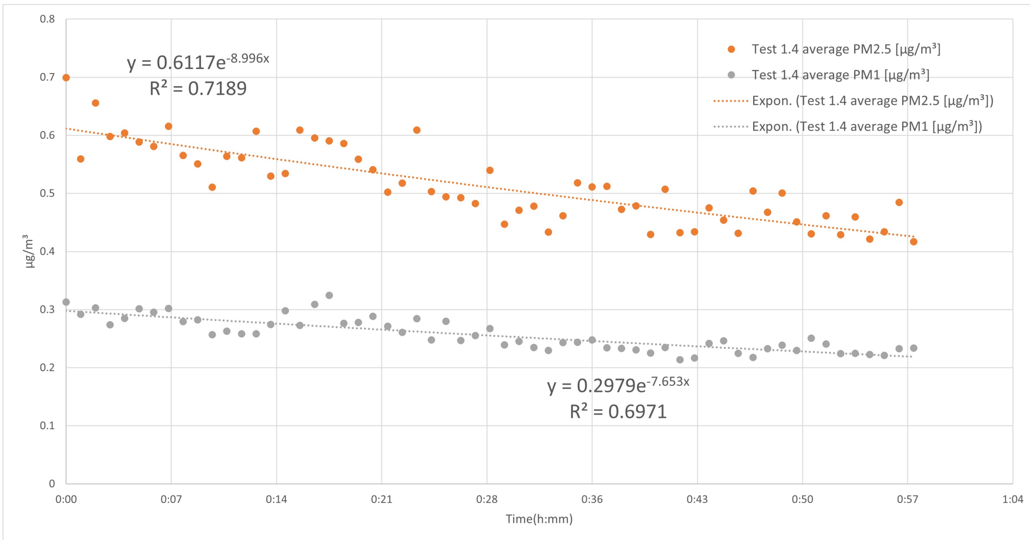
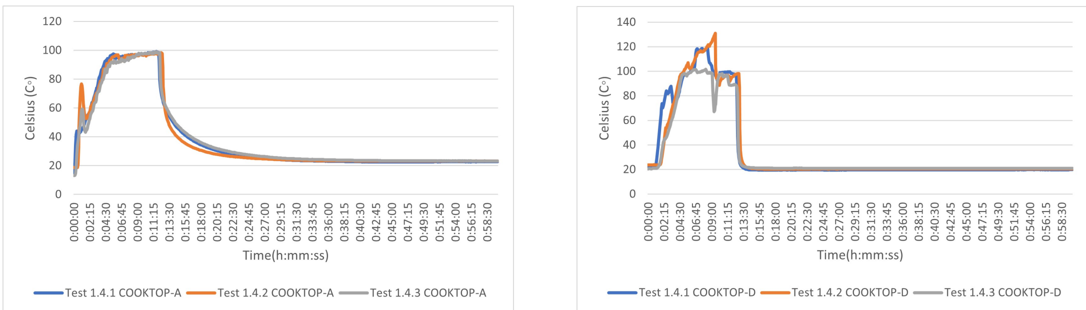


Figure 31: Exponential curves for the PM2.5 concentrations for test 0

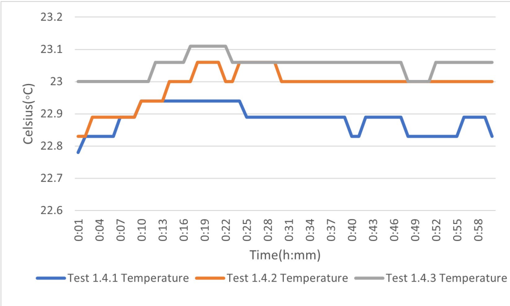


(a) Temperature for cooktop A for test 1.4

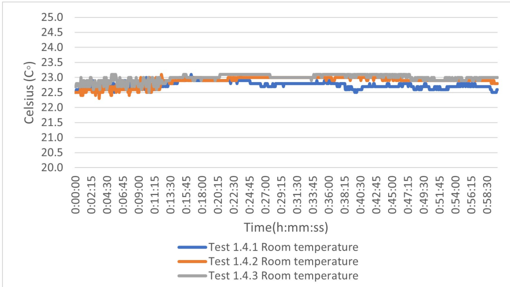
(b) Pan temperature for cooktop D for test 1.4

Figure 32: Cooktop temperatures for test 1.4

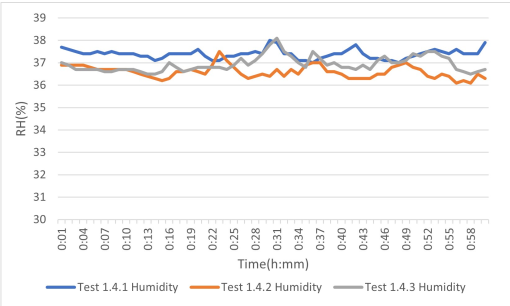
I.8 1.4 - Lab conditions



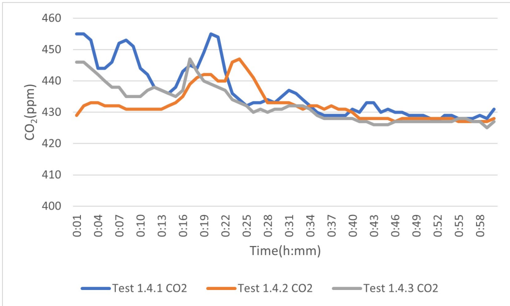
(a) Room temperature measured with the rotronic for test 1.4



(b) Room temperature measured with thermocouples for test 1.4

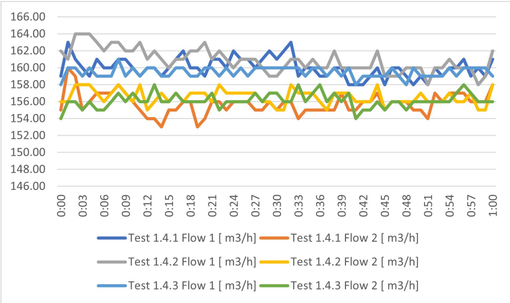


(c) Relative Humidity for test 1.4

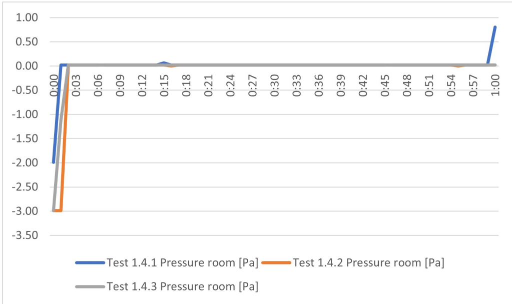


(d) CO_2 concentrations for test 1.4

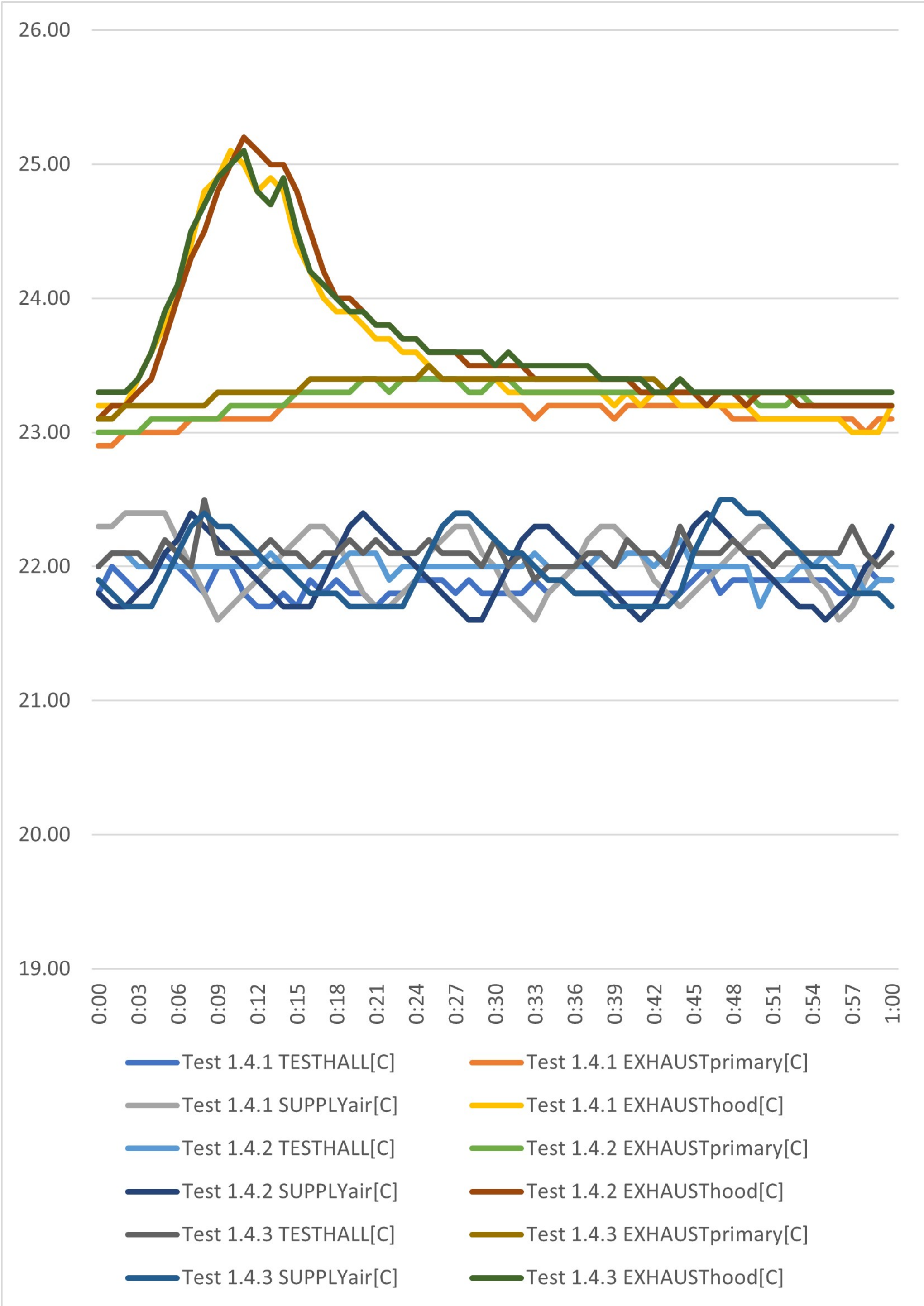
Figure 33: Test room conditions for test 1.4



(a) Exhaust flow rates for test 1.4



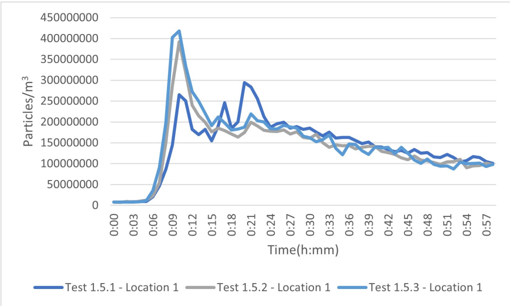
(b) Differential pressure between test room and hall for test 1.4



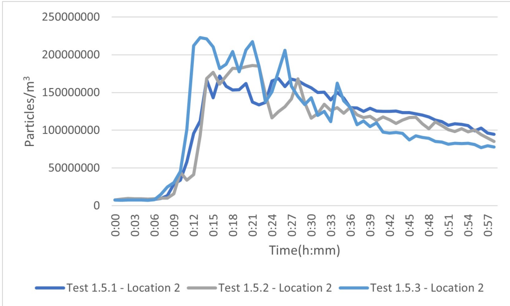
(c) Temperature conditions in the hall for test 1.4

Figure 34: Test hall conditions for test 1.4

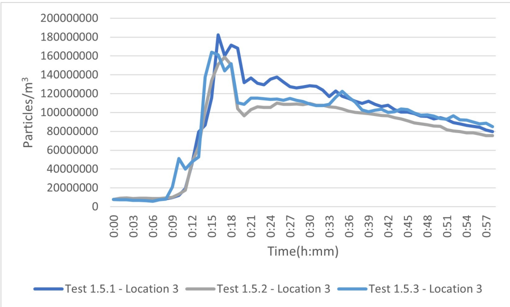
I.9 1.5 - Emission data



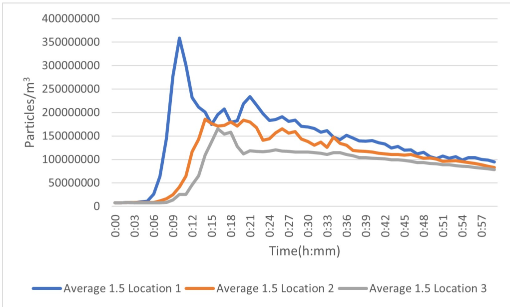
(a) Aerotrak measurements for all three tests in location 1 for test 1.5



(b) Aerotrak measurements for all three tests in location 2 for test 1.5

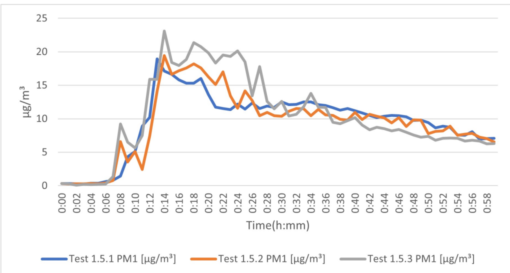


(c) Aerotrak measurements for all three tests in location 3 for test 1.5

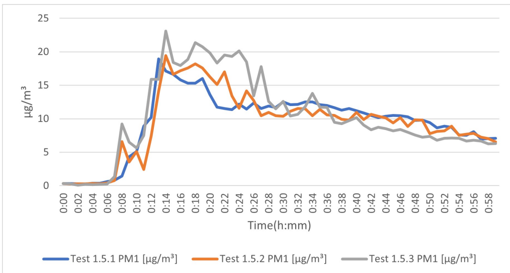


(d) Aerotrak measurements for all three location, averaged values from all three tests 1.5

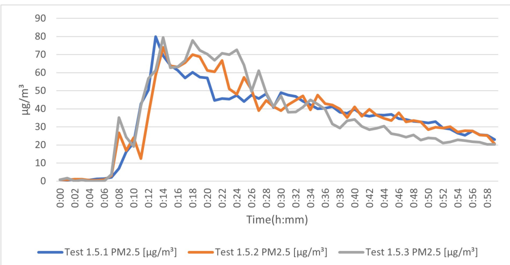
Figure 35: Aerotrak measurements for test 1.5 in all locations



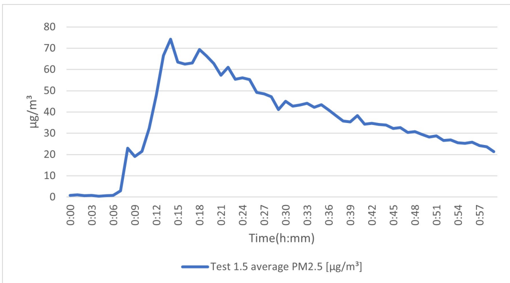
(a) PM1 measurements from all three tests 1.5



(b) PM1 averaged for test 1.5

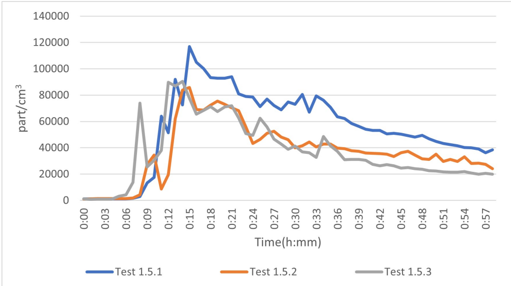


(c) PM2.5 measurements from all three tests 1.5

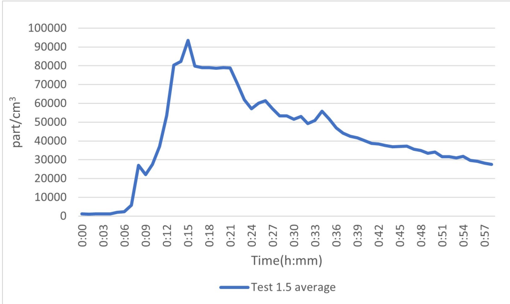


(d) PM2.5 averaged for test 1.5

Figure 36: PM1 and PM2.5 concentrations converted from data measured by the GRIMM for test 1.5



(a) UFP concentration from all three tests for 1.5



(b) UFP concentration averaged for test 1.5

Figure 37: UFP concentration measured with the P trak in location 2 for test 1.5

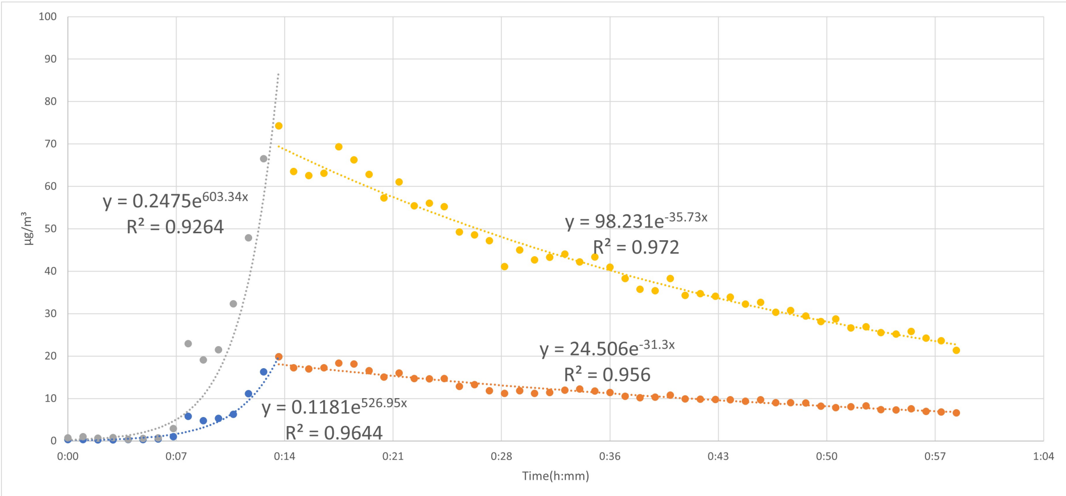
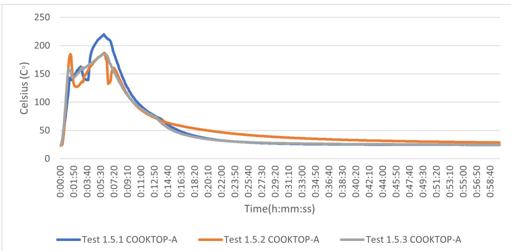
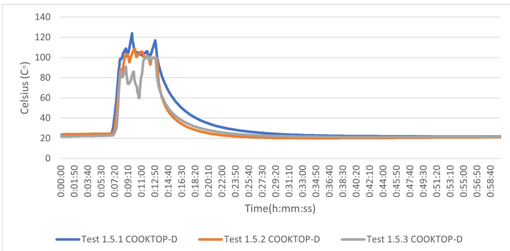


Figure 38: Exponential curves for the PM2.5 concentrations for test 1.5



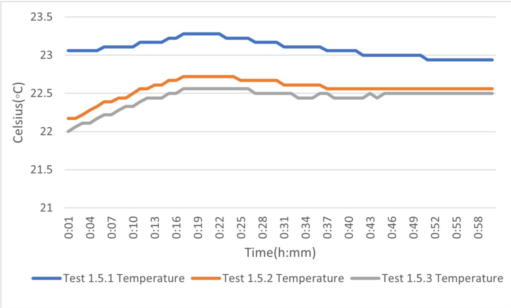
(a) Temperature for cooktop A for test 1.5



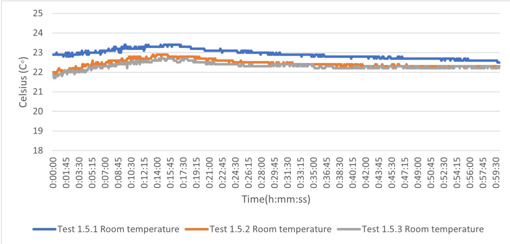
(b) Pan temperature for cooktop D for test 1.5

Figure 39: Cooktop temperatures for test 1.5

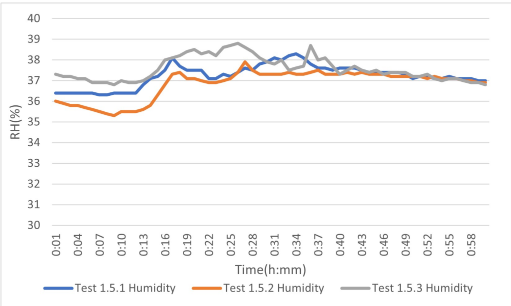
I.10 1.5 - Lab conditions



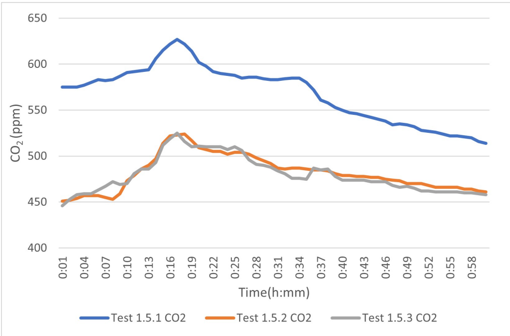
(a) Room temperature measured with rotronic for test 1.5



(b) Room temperature measured with thermo-couples for test 1.5

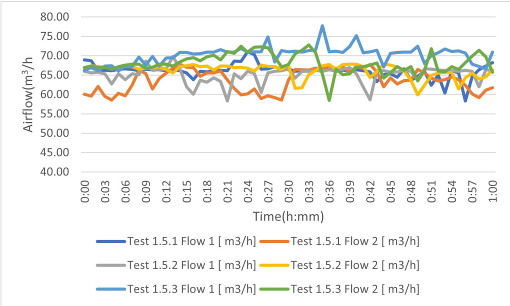


(c) Relative Humidity for test 1.5

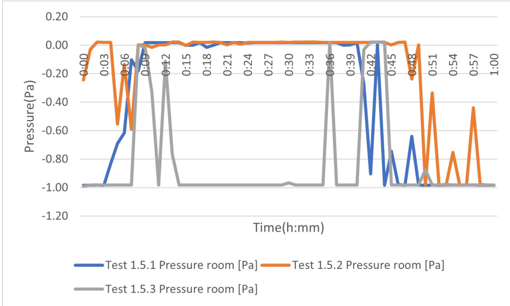


(d) CO_2 concentrations for test 1.5

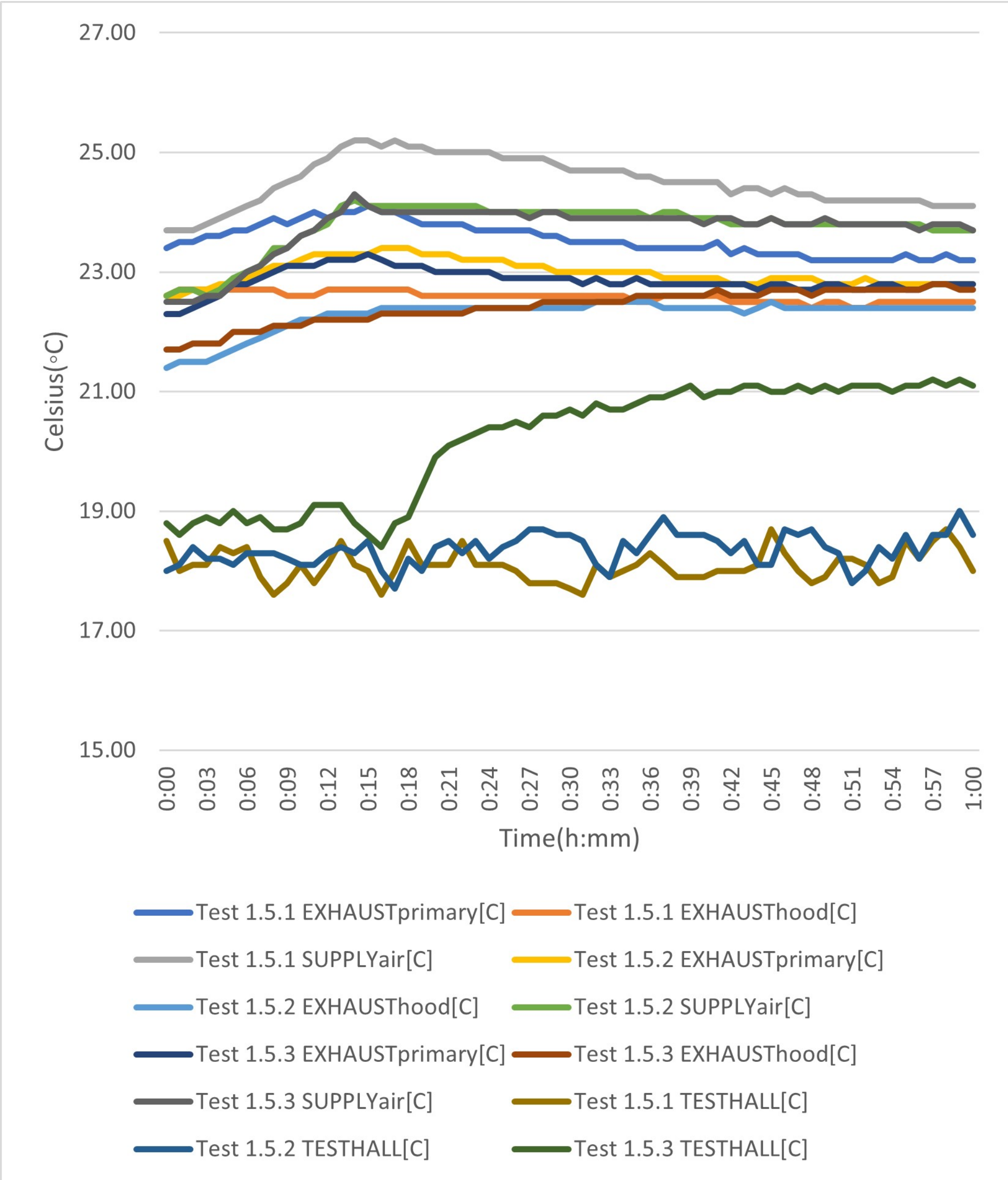
Figure 40: Test room conditions for test 1.5



(a) Exhaust flow rates for test 1.5



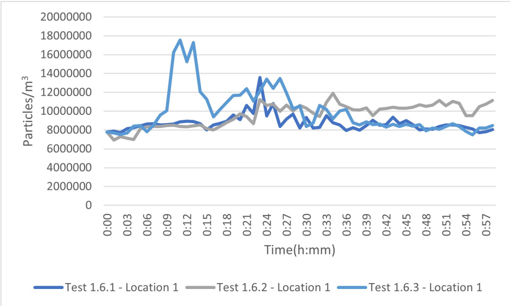
(b) Differential pressure between test room and hall for test 1.5



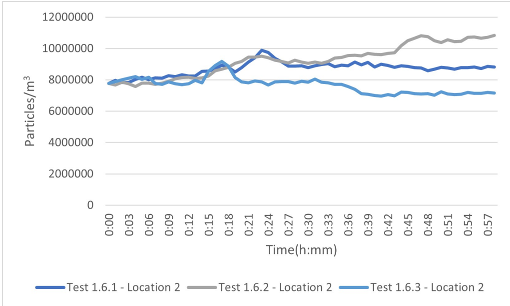
(c) Temperature conditions in the hall for test 1.5

Figure 41: Test hall conditions for test 1.5

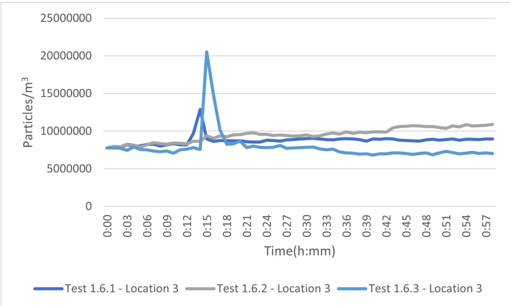
I.11 1.6 - Emission data



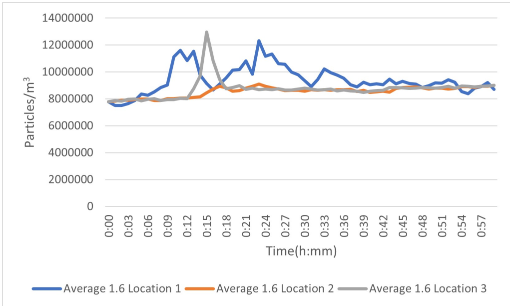
(a) Aerotrak measurements for all three tests in location 1 for test 1.6



(b) Aerotrak measurements for all three tests in location 2 for test 1.6



(c) Aerotrak measurements for all three tests in location 3 for test 1.6



(d) Aerotrak measurements for all three location, averaged values from all three tests 1.6

Figure 42: Aerotrak measurements for test 1.6 in all locations

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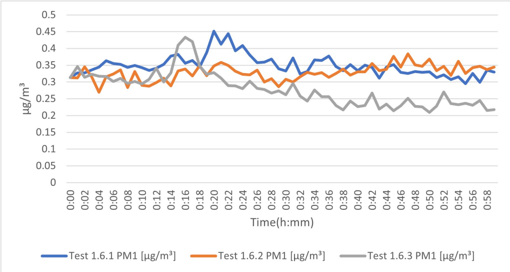
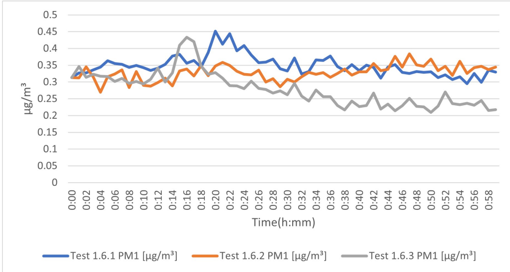
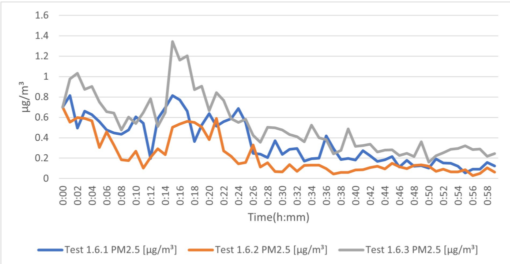


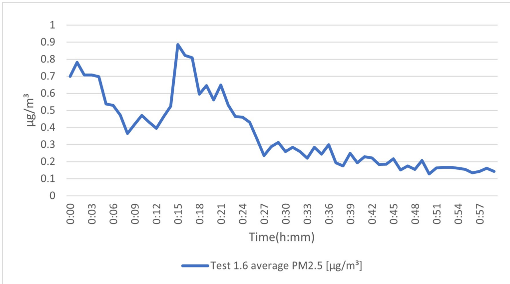
(a) PM1 measurements from all three tests 1.6



(b) PM1 averaged for test 1.6

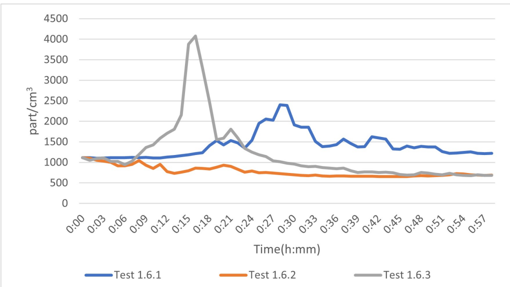


(c) PM2.5 measurements from all three tests 1.6

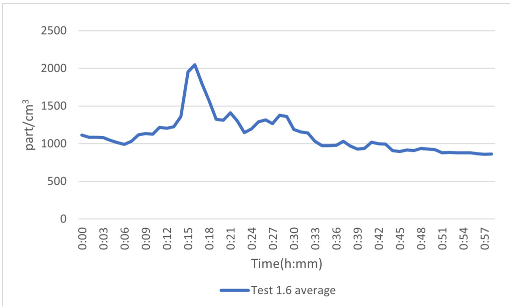


(d) PM2.5 averaged for test 1.6

Figure 43: PM1 and PM2.5 concentrations converted from data measured by the GRIMM for test 1.6



(a) UFP concentration from all three tests for 1.6



(b) UFP concentration averaged for test 1.6

Figure 44: UFP concentration measured with the P trak in location 2 for test 1.6

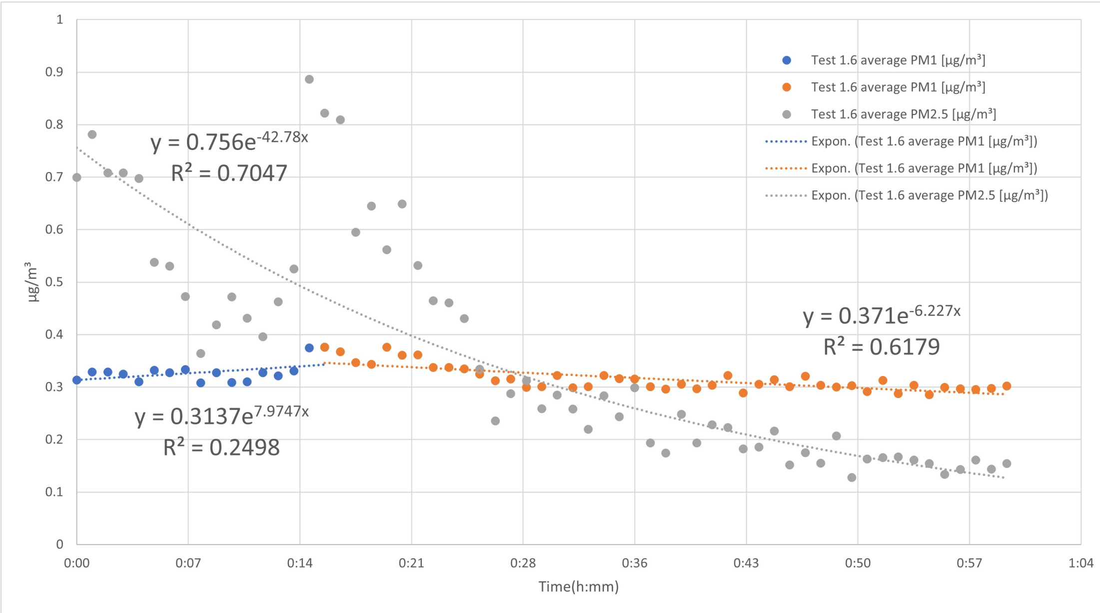
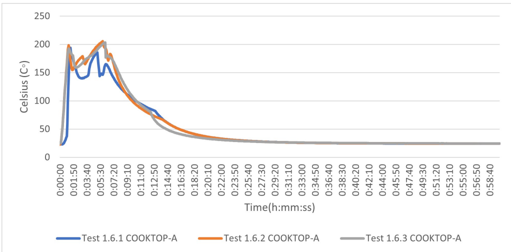
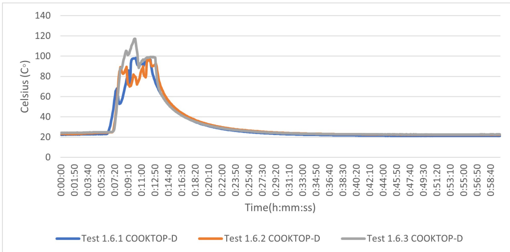


Figure 45: Exponential curves for the PM2.5 concentrations for test 1.6



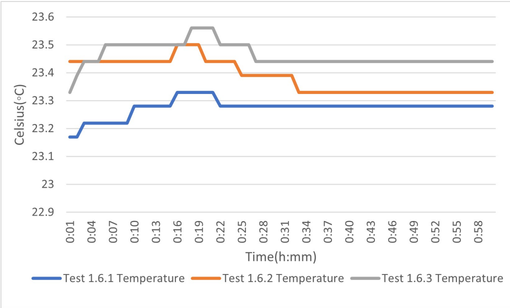
(a) Temperature for cooktop A for test 1.6



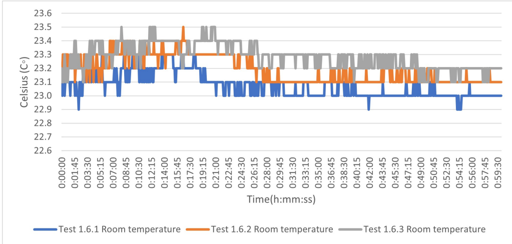
(b) Pan temperature for cooktop D for test 1.6

Figure 46: Cooktop temperatures for test 1.6

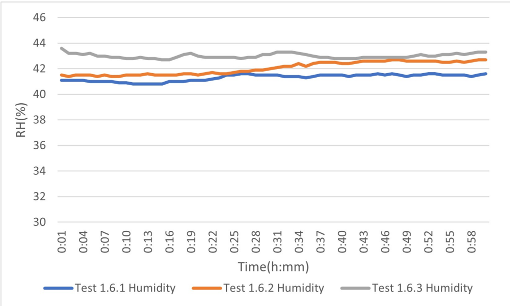
I.12 1.6 - Lab conditions



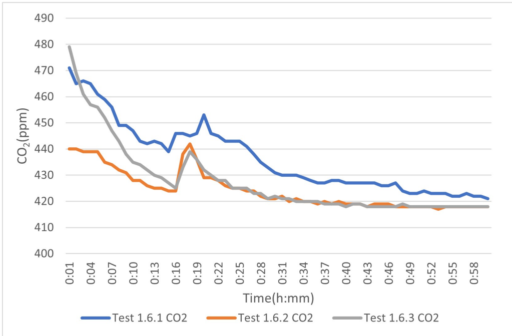
(a) Room temperature measured with rotronic for test 1.6



(b) Room temperature measured with thermocouples for test 1.6

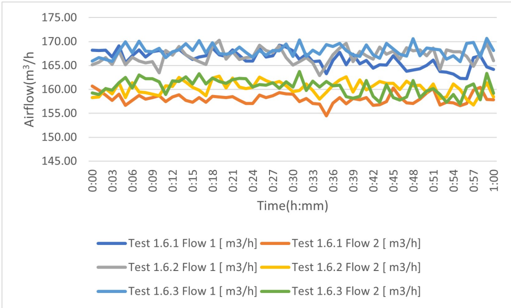


(c) Relative Humidity for test 1.6

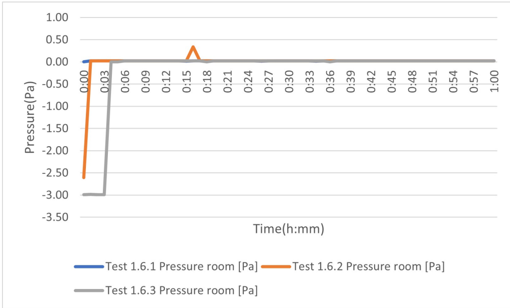


(d) CO_2 concentrations for test 1.6

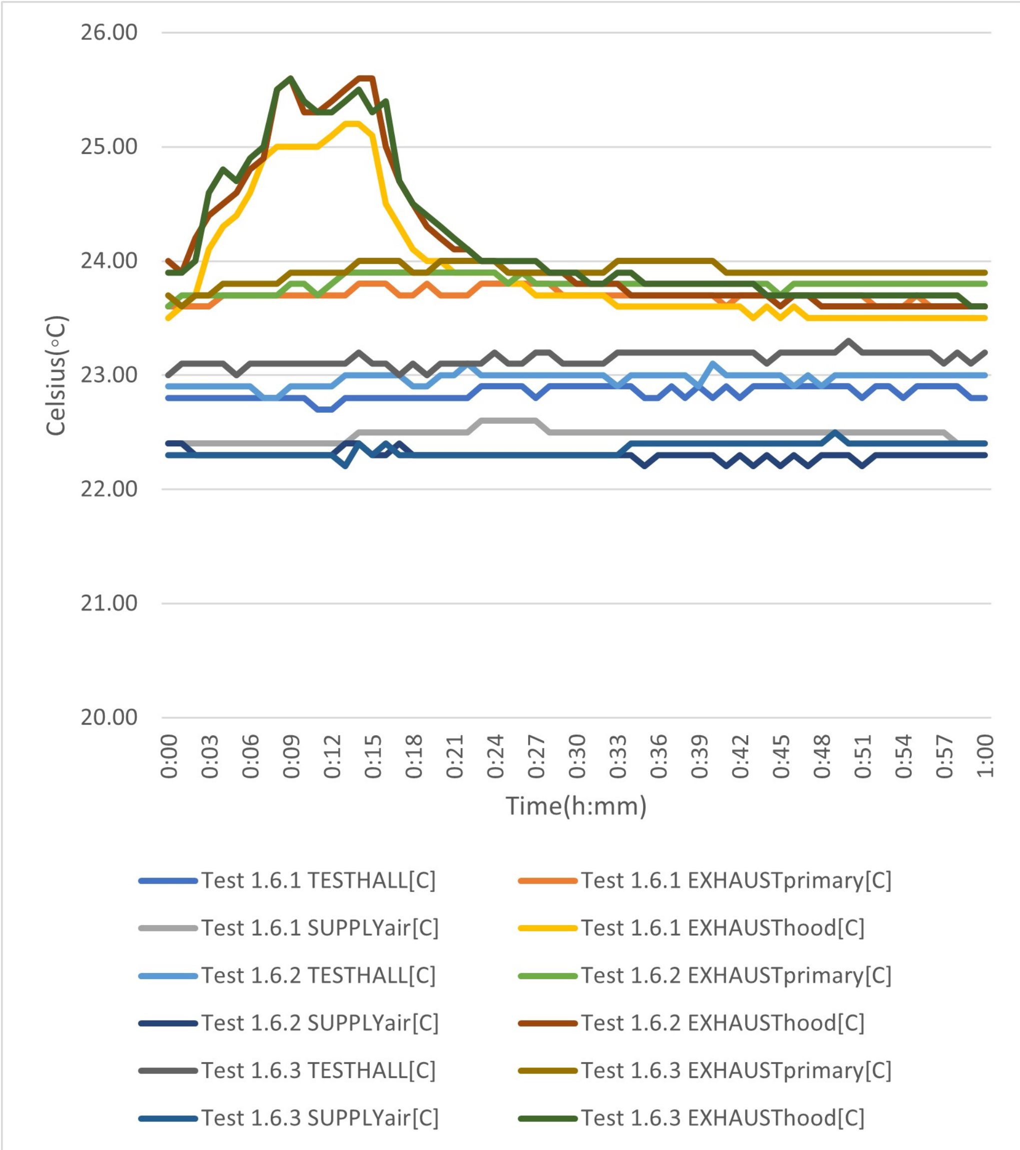
Figure 47: Test room conditions for test 1.6



(a) Exhaust flow rates for test 1.6



(b) Differential pressure between test room and hall for test 1.6

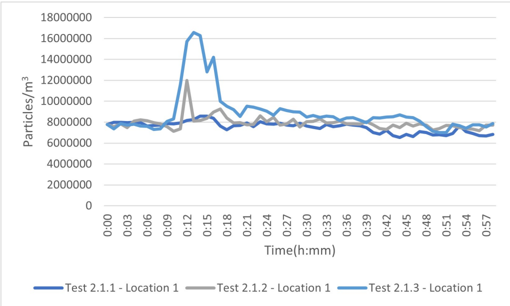


(c) Temperature conditions in the hall for test 1.6

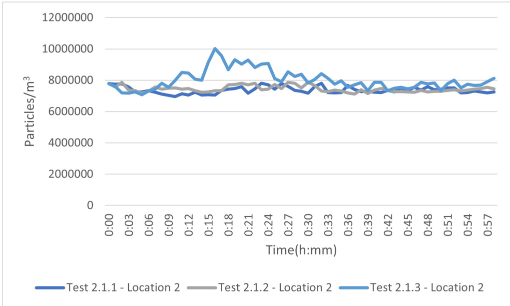
Figure 48: Test hall conditions for test 1.6

J Experiment 2

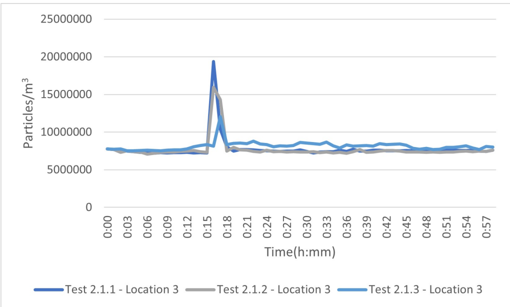
J.1 2.1 - Emission data



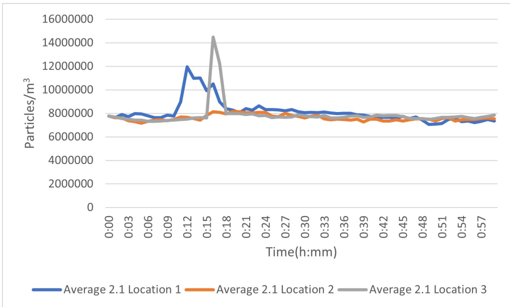
(a) Aerotrak measurements for all three tests in location 1 for test 2.1



(b) Aerotrak measurements for all three tests in location 2 for test 2.1

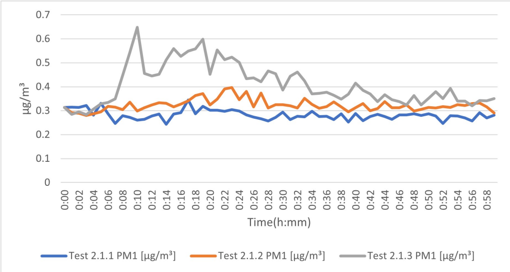


(c) Aerotrak measurements for all three tests in location 3 for test 2.1

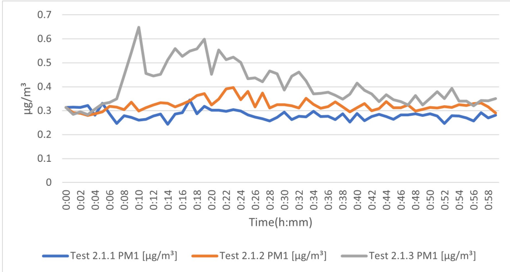


(d) Aerotrak measurements for all three location, averaged values from all three tests 2.1

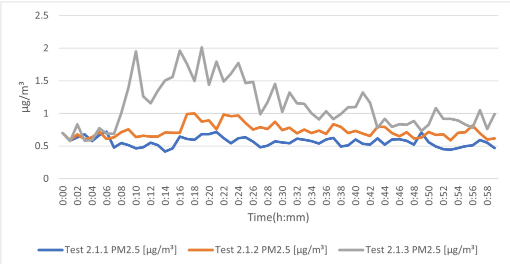
Figure 49: Aerotrak measurements for test 2.1 in all locations



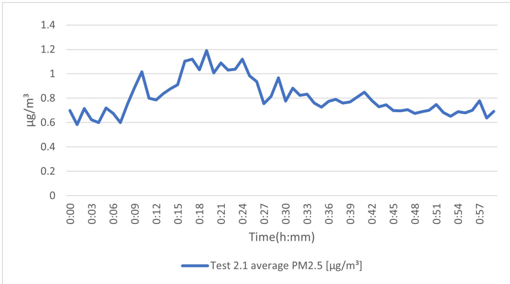
(a) PM1 measurements from all three tests 2.1



(b) PM1 averaged for test 2.1

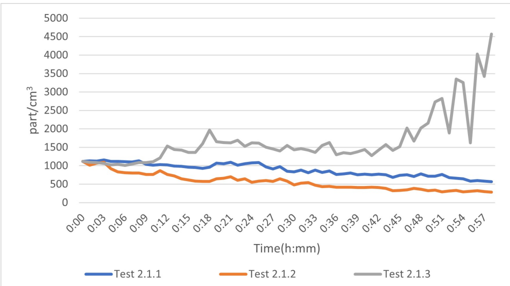


(c) PM2.5 measurements from all three tests 2.1

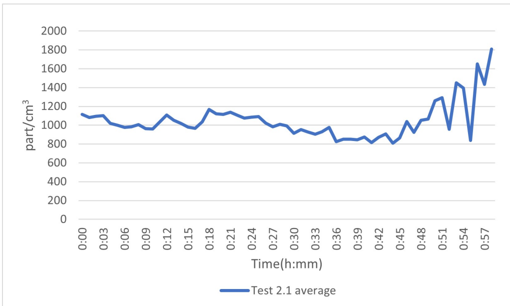


(d) PM2.5 averaged for test 2.1

Figure 50: PM1 and PM2.5 concentrations converted from data measured by the GRIMM for test 2.1



(a) UFP concentration from all three tests for 2.1



(b) UFP concentration averaged for test 2.1

Figure 51: UFP concentration measured with the P trak in location 2 for test 2.1

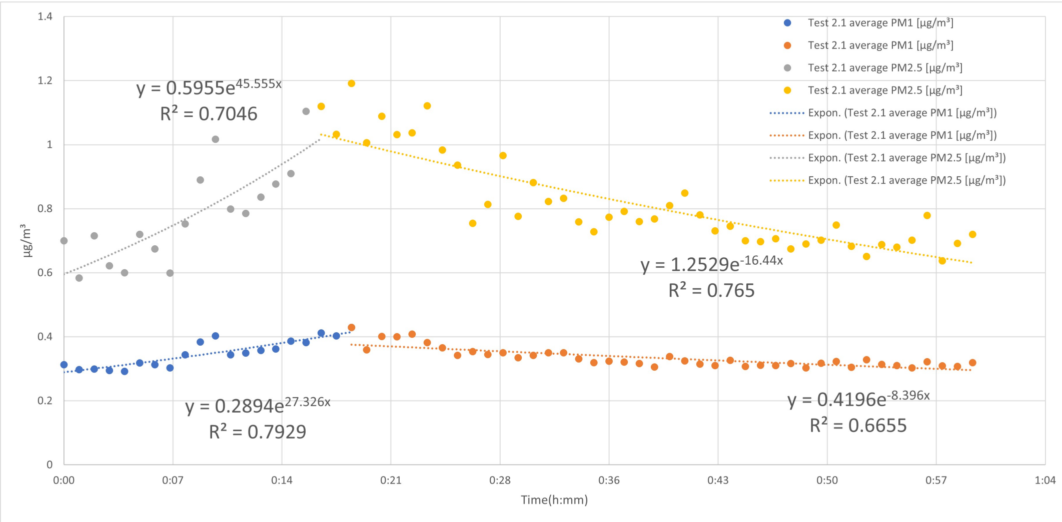


Figure 52: Exponential curves for the PM2.5 concentrations for test 2.1

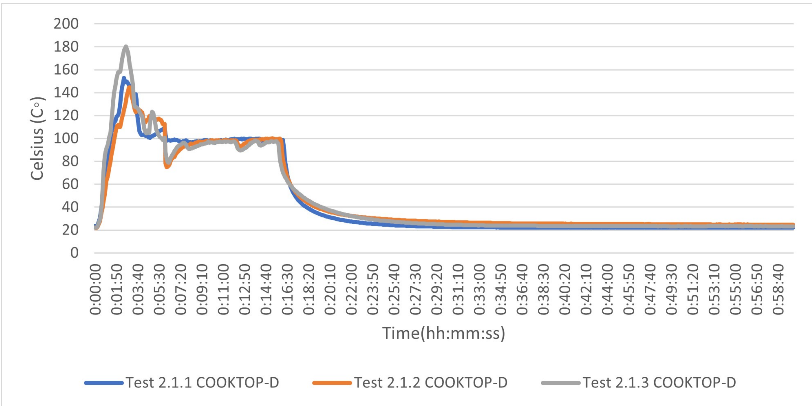
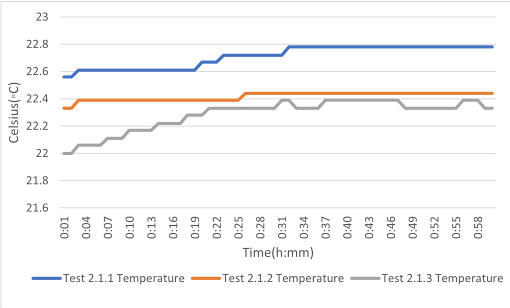
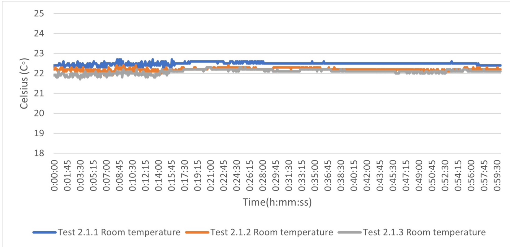


Figure 53: Pan temperature for cooktop D for test 2.1

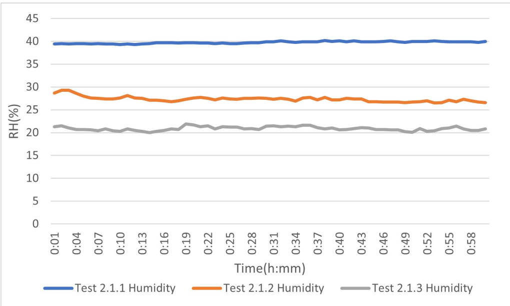
J.2 2.1 - Lab conditions



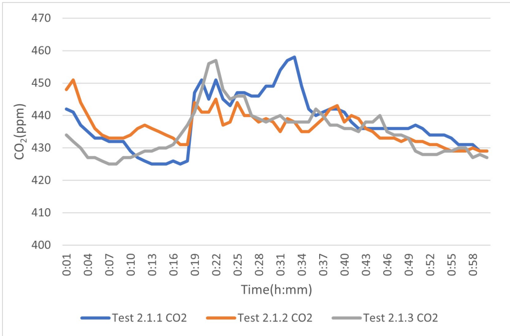
(a) Room temperature measured with the rotronic for test 2.1



(b) Room temperature measured with thermocouples for test 2.1

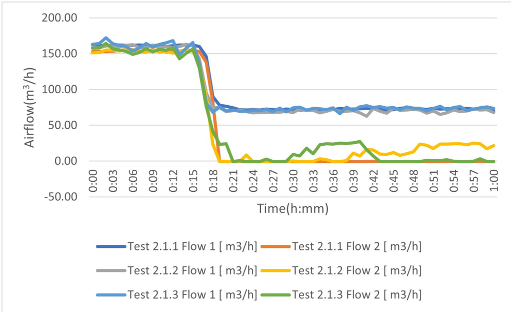


(c) Relative Humidity for test 2.1

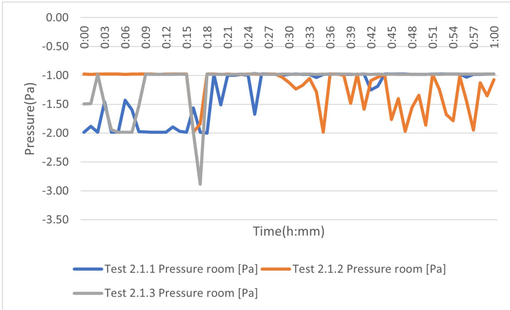


(d) CO_2 concentrations for test 2.1

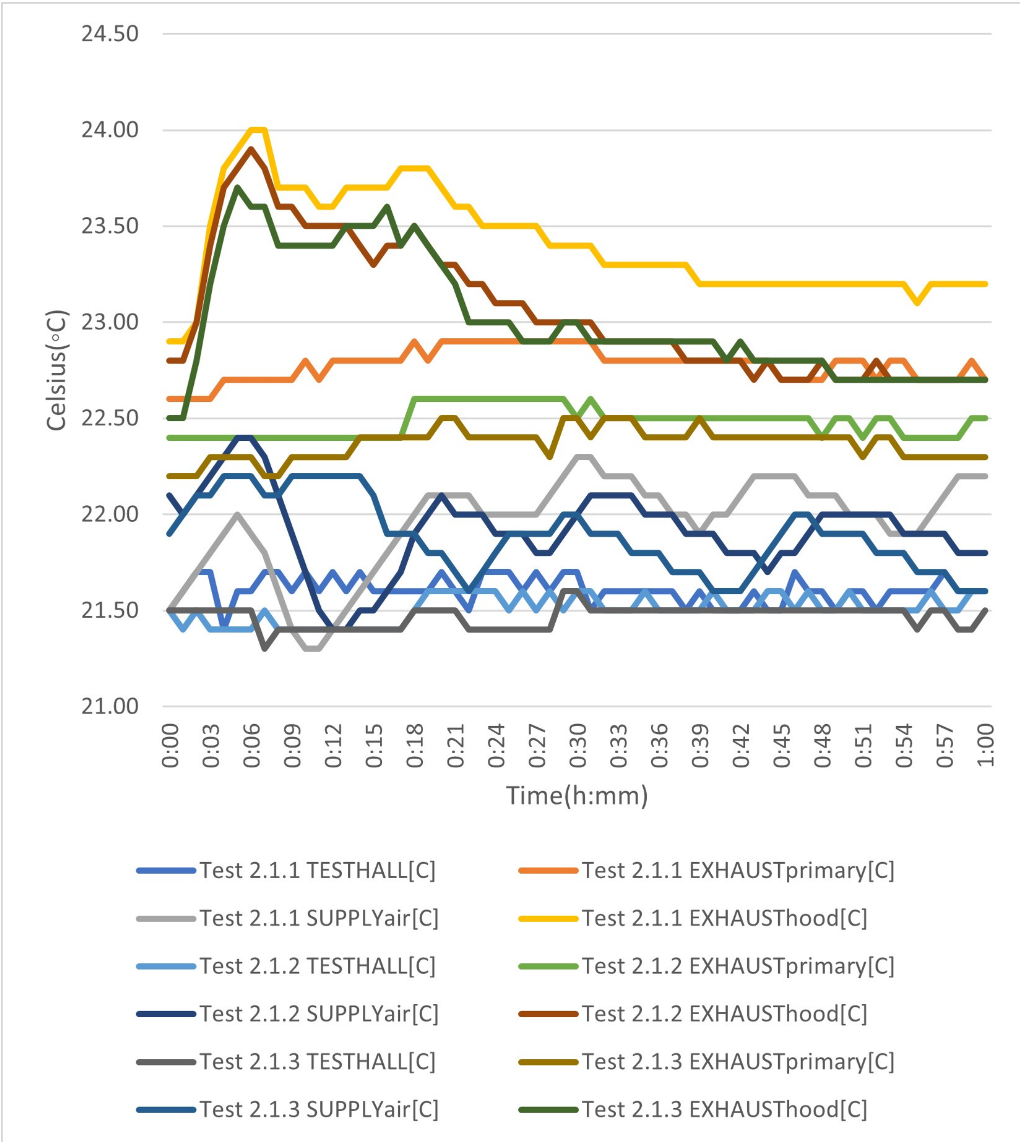
Figure 54: Test room conditions for test 2.1



(a) Exhaust flow rates for test 2.1



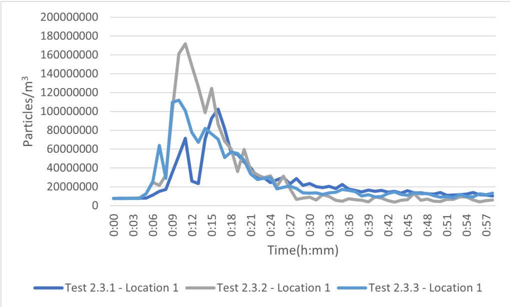
(b) Differential pressure between test room and hall for test 2.1



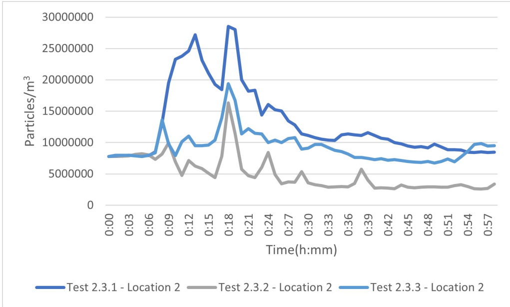
(c) Temperature conditions in the hall for test 2.1

Figure 55: Test hall conditions for test 2.1

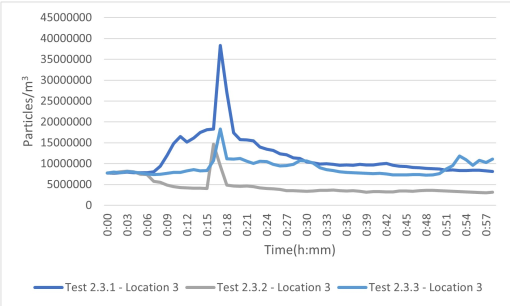
J.3 2.3 - Emission data



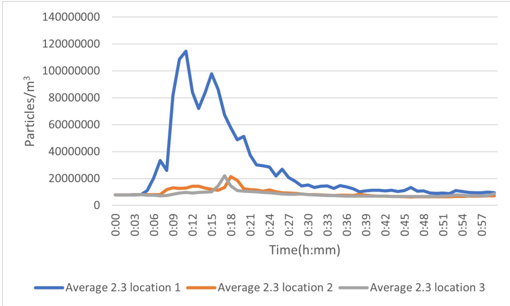
(a) Aerotrak measurements for all three tests in location 1 for test 2.3



(b) Aerotrak measurements for all three tests in location 2 for test 2.3

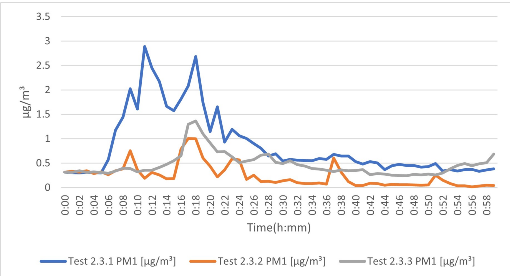


(c) Aerotrak measurements for all three tests in location 3 for test 2.3

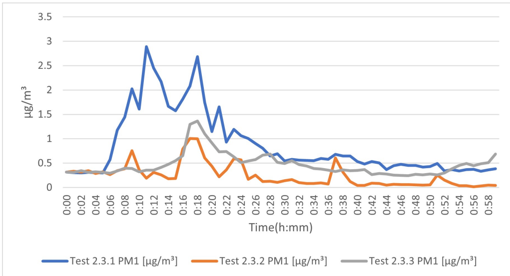


(d) Aerotrak measurements for all three location, averaged values from all three tests 2.3

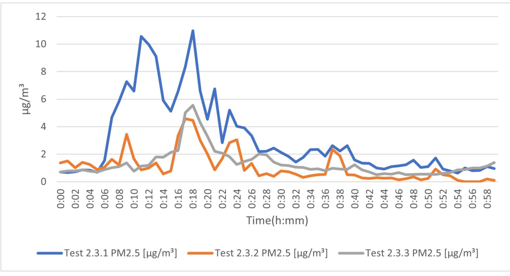
Figure 56: Aerotrak measurements for test 2.3 in all locations



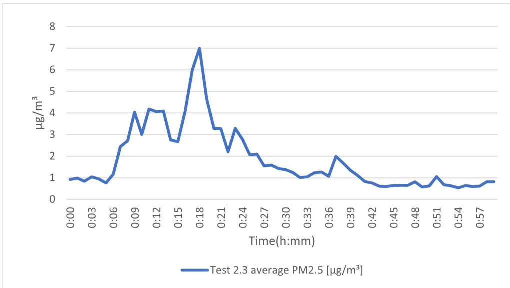
(a) PM1 measurements from all three tests 2.3



(b) PM1 averaged for test 2.3

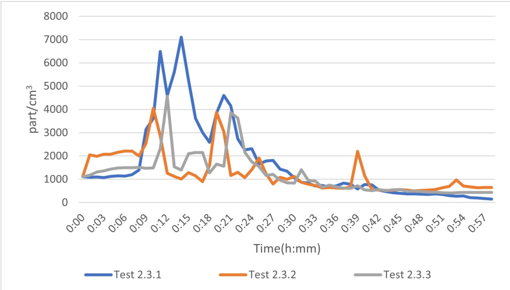


(c) PM2.5 measurements from all three tests 2.3

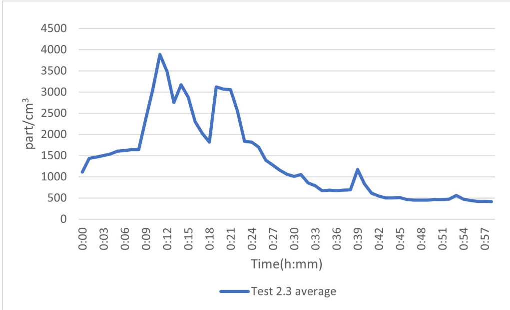


(d) PM2.5 averaged for test 2.3

Figure 57: PM1 and PM2.5 concentrations converted from data measured by the GRIMM for test 2.3



(a) UFP concentration from all three tests for 2.3



(b) UFP concentration averaged for test 2.3

Figure 58: UFP concentration measured with the P trak in location 2 for test 2.3

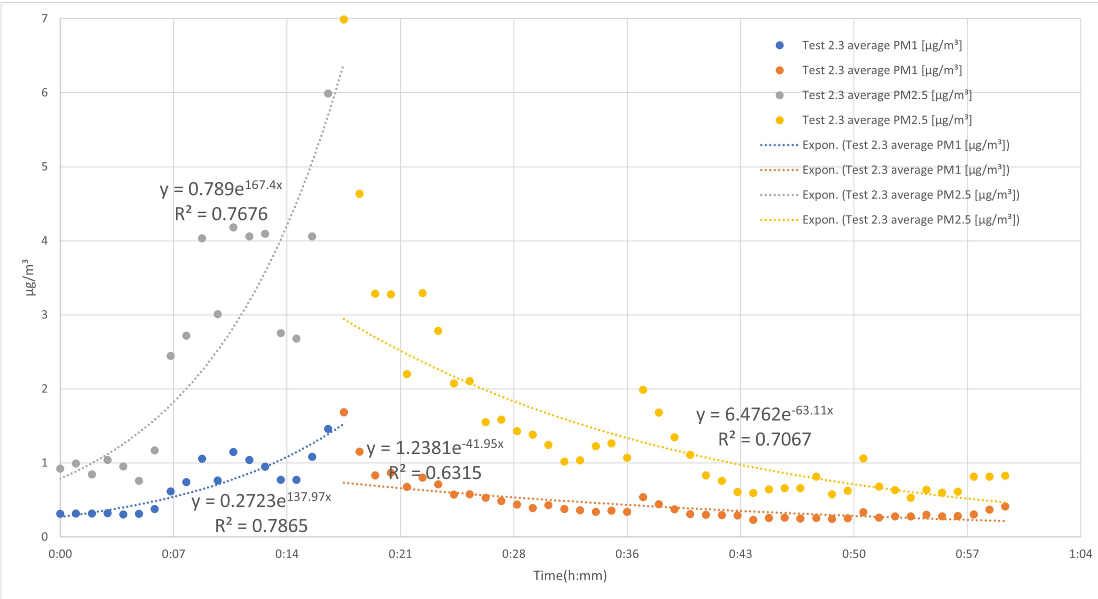


Figure 59: Exponential curves for the PM2.5 concentrations for test 2.3

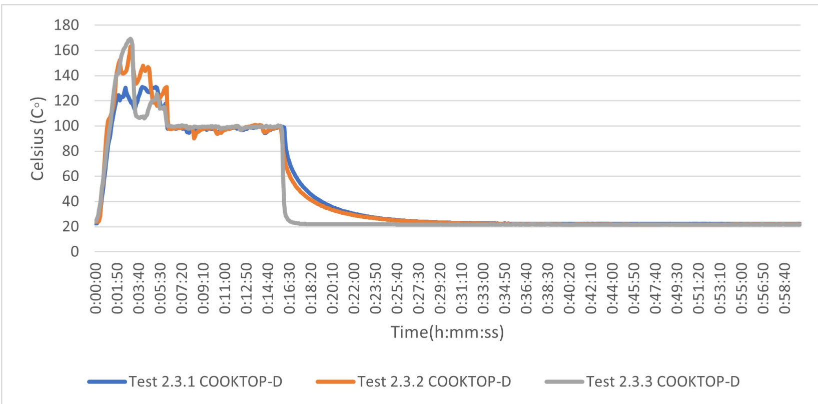
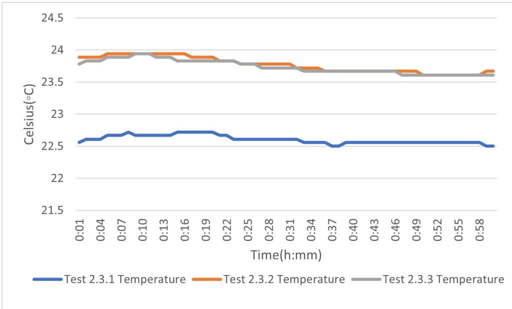
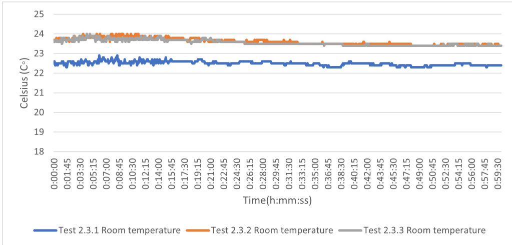


Figure 60: Pan temperature for cooktop D for test 2.3

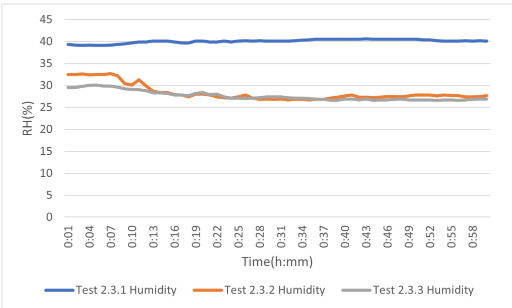
J.4 2.3 - Lab conditions



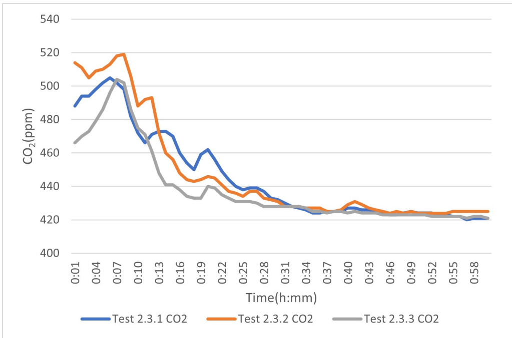
(a) Room temperature measured with rotronic for test 2.3



(b) Room temperature measured with thermocouples for test 2.3

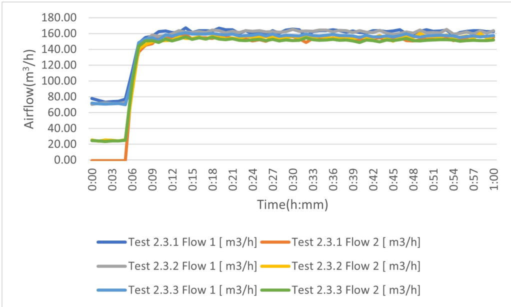


(c) Relative Humidity for test 2.3

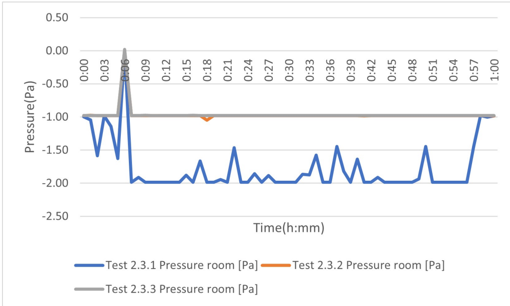


(d) CO_2 concentrations for test 2.3

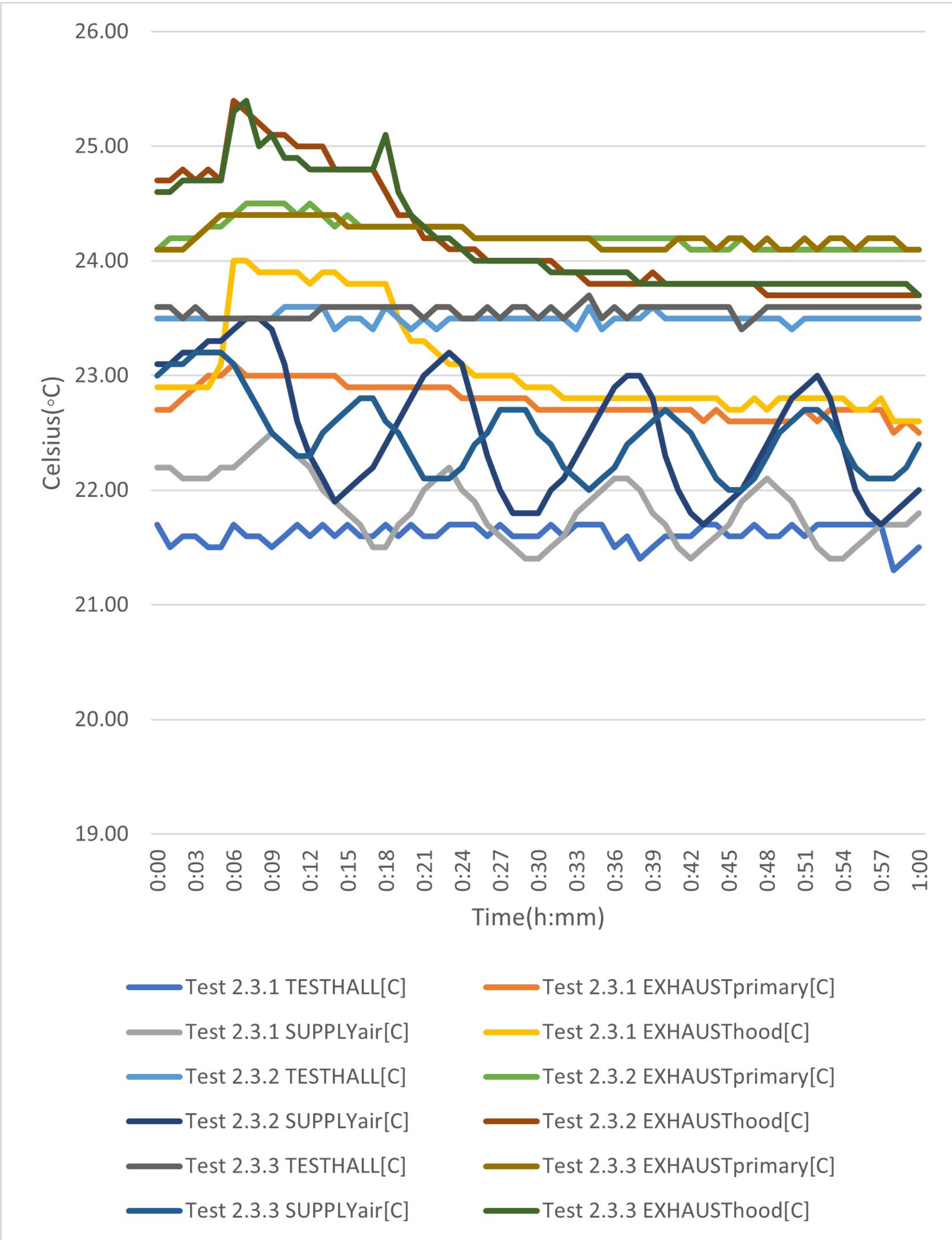
Figure 61: Test room conditions for test 2.3



(a) Exhaust flow rates for test 2.3



(b) Differential pressure between test room and hall for test 2.3

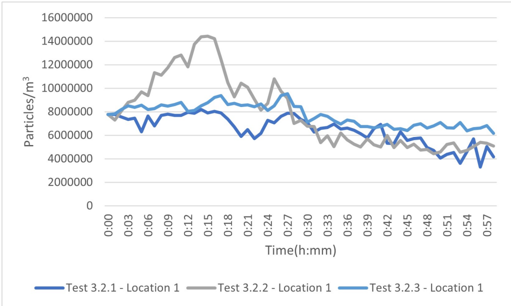


(c) Temperature conditions in the hall for test 2.3

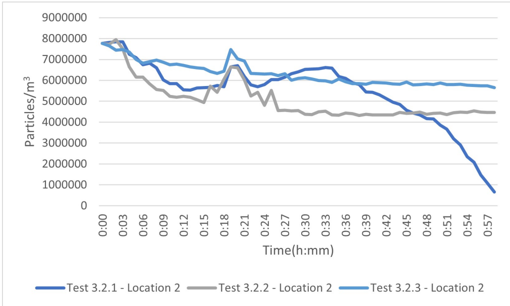
Figure 62: Test hall conditions for test 2.3

K Experiment 3

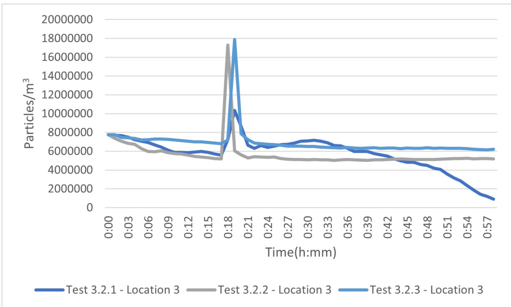
K.1 3.2 - Emission data



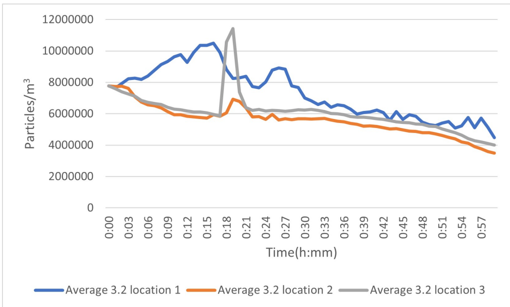
(a) Aerotrak measurements for all three tests in location 1 for test 3.2



(b) Aerotrak measurements for all three tests in location 2 for test 3.2

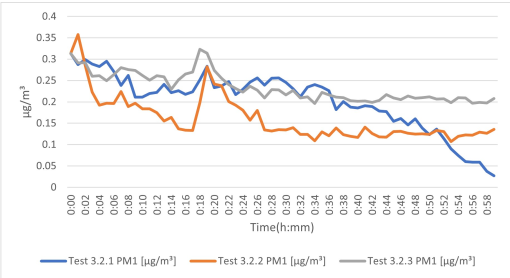


(c) Aerotrak measurements for all three tests in location 3 for test 3.2

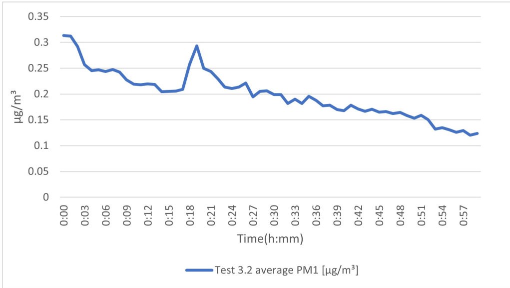


(d) Aerotrak measurements for all three location, averaged values from all three tests 3.2

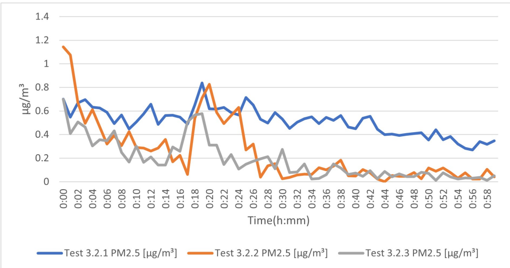
Figure 63: Aerotrak measurements for test 3.2 in all locations



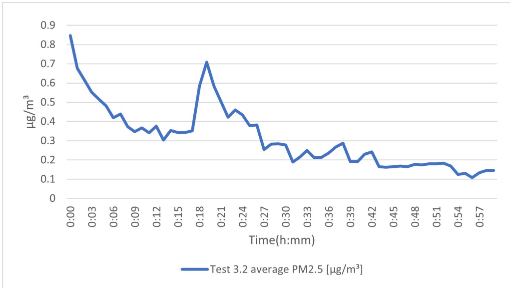
(a) PM1 measurements from all three tests 3.2



(b) PM1 averaged for test 3.2

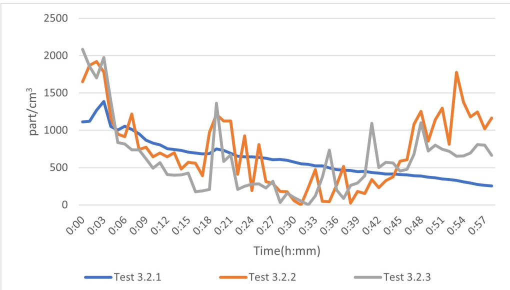


(c) PM2.5 measurements from all three tests 3.2

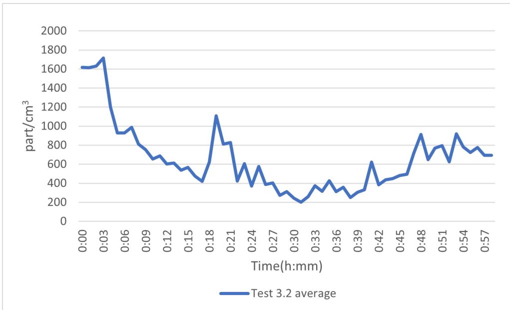


(d) PM2.5 averaged for test 3.2

Figure 64: PM1 and PM2.5 concentrations converted from data measured by the GRIMM for test 3.2



(a) UFP concentration from all three tests for 3.2



(b) UFP concentration averaged for test 3.2

Figure 65: UFP concentration measured with the P trak in location 2 for test 3.2

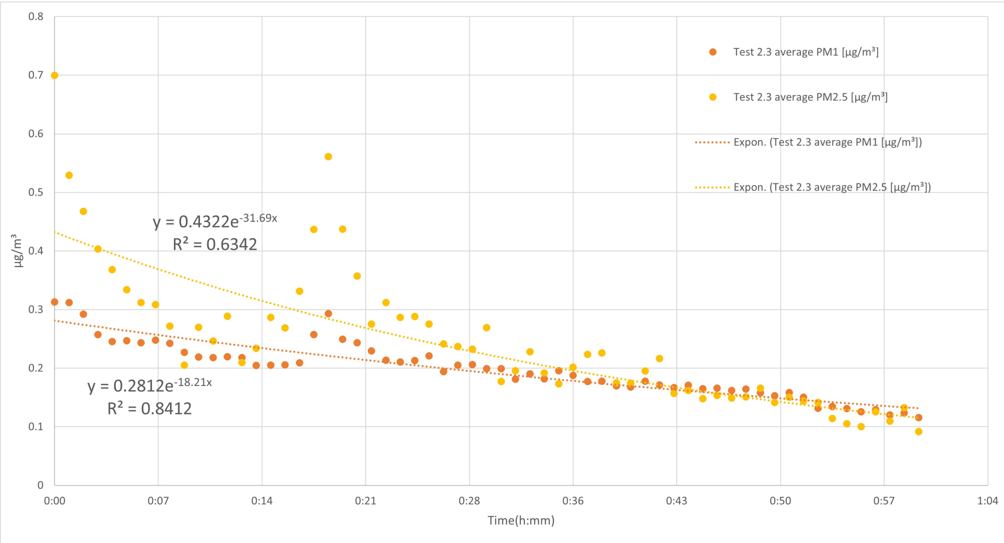


Figure 66: Exponential curves for the PM2.5 concentrations for test 3.2

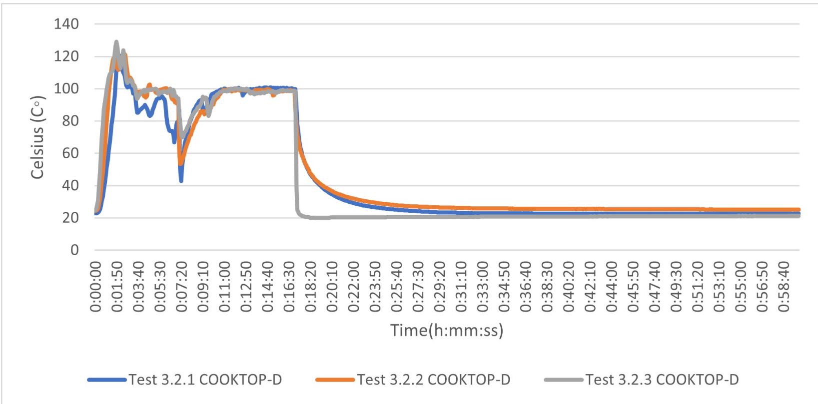
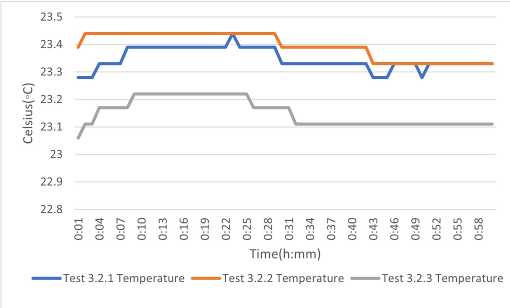
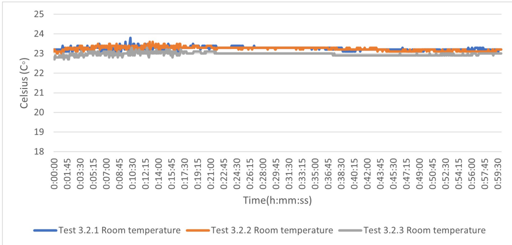


Figure 67: Pan temperature for cooktop D for test 3.2

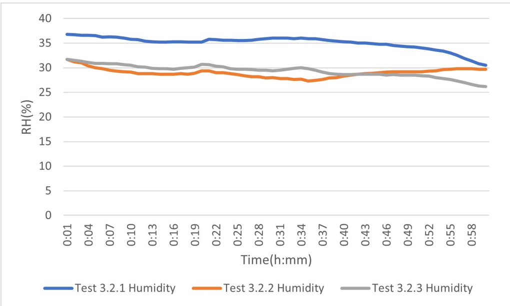
K.2 3.2 - Lab conditions



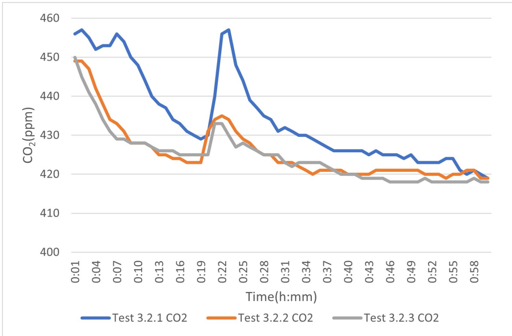
(a) Room temperature measured with rotronic for test 3.2



(b) Room temperature measured with thermocouples for test 3.2

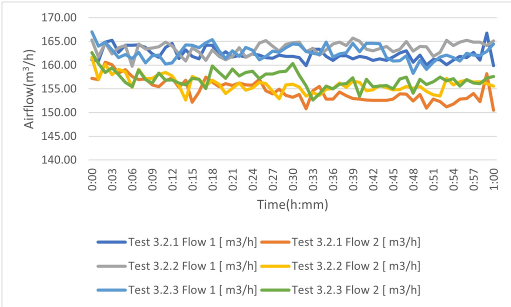


(c) Relative Humidity for test 3.2

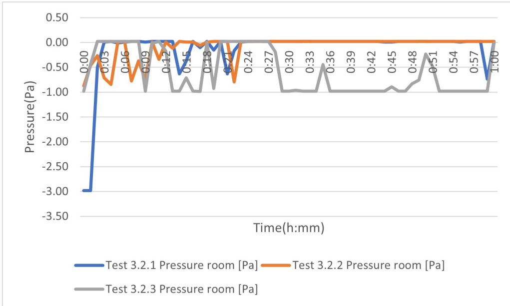


(d) CO_2 concentrations for test 3.2

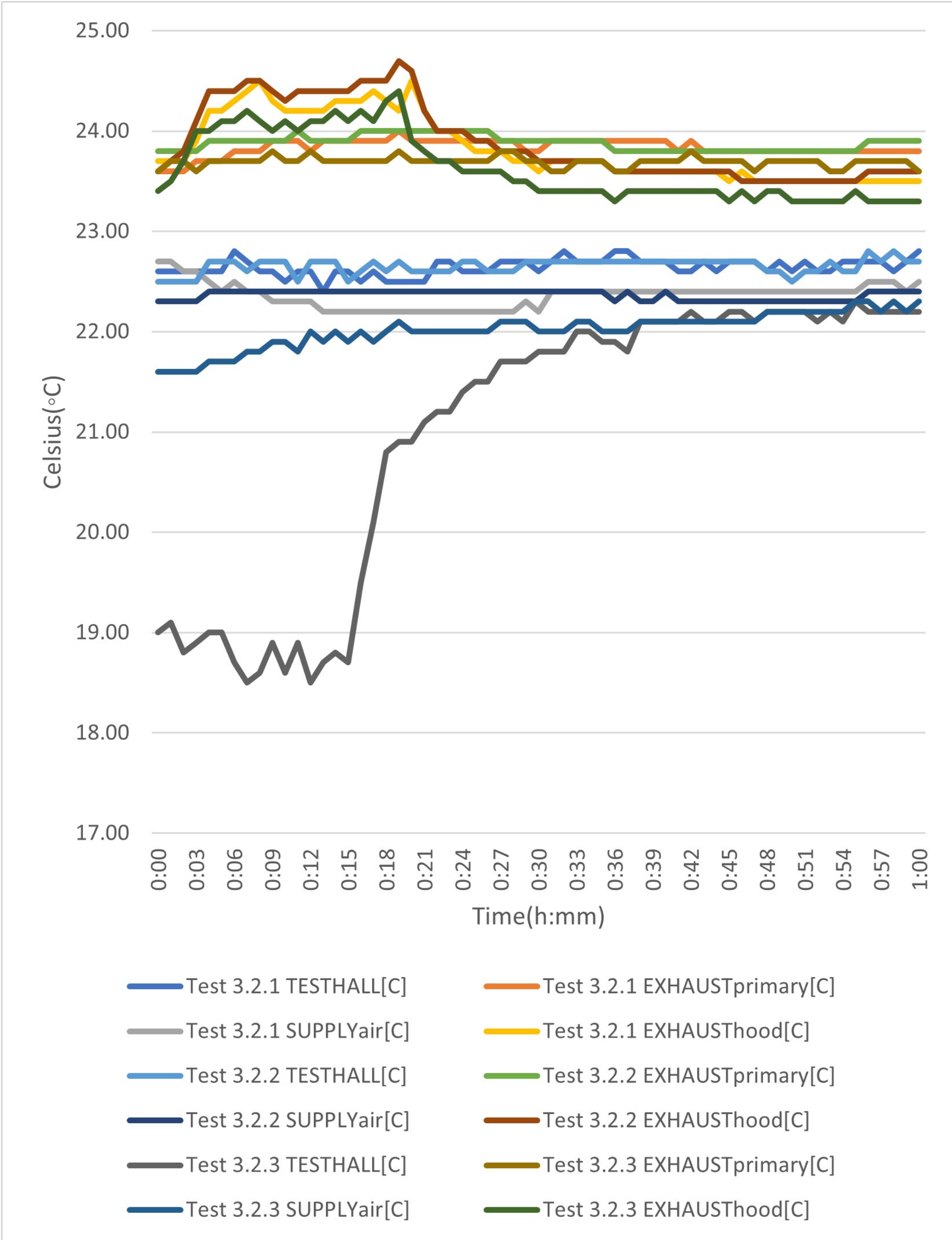
Figure 68: Test room conditions for test 3.2



(a) Exhaust flow rates for test 3.2



(b) Differential pressure between test room and hall for test 3.2



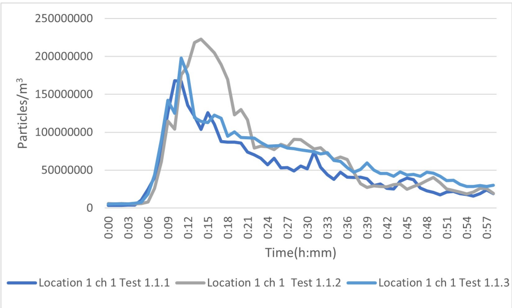
(c) Temperature conditions in the hall for test 3.2

Figure 69: Test hall conditions for test 3.2

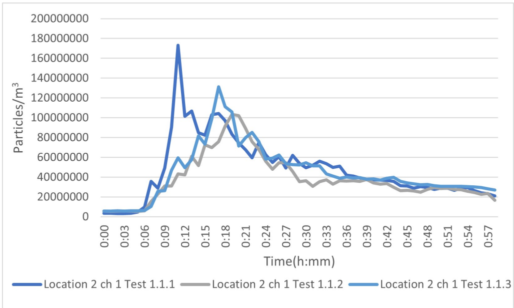
L Raw data from particle counters

L.1 Experiment 1.1

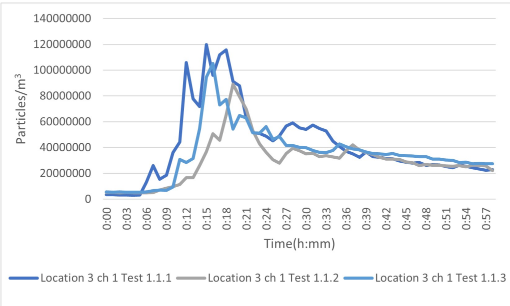
Figure 70 shows the particle count in size 0.3 to 25 μm and all locations.



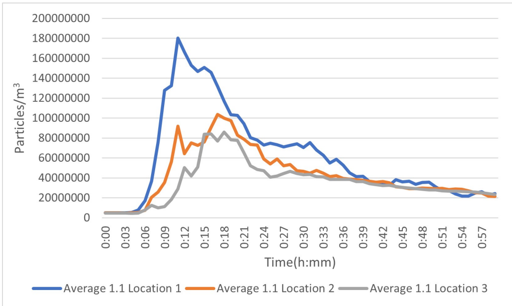
(a) Raw Aerotrak measurements for all three tests in location 1 for test 1.1



(b) Raw Aerotrak measurements for all three tests in location 2 for test 1.1



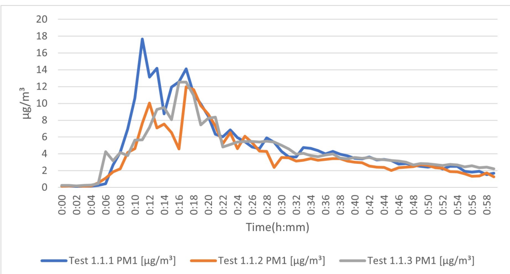
(c) Raw Aerotrak measurements for all three tests in location 3 for test 1.1



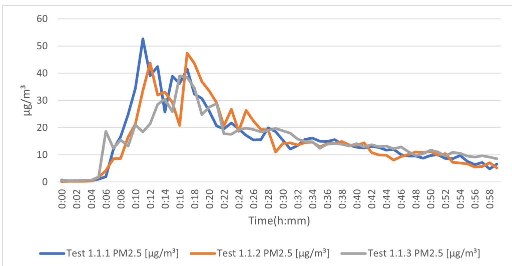
(d) Raw Aerotrak measurements, averaged values from all three tests 1.1

Figure 70: Raw Aerotrak measurements for test 1.1 in all locations

Results from the Grimm converted to PM2.5 and PM1, is shown in figure 71.



(a) Raw PM1 measurements from all three tests in experiment 1.1



(b) Raw PM2.5 measurements from all three tests in experiment 1.1

Figure 71: Raw PM1 and PM2.5 mass concentration for test 1.1

Figure 72 show the raw ultrafine concentration from experiment 1.1.

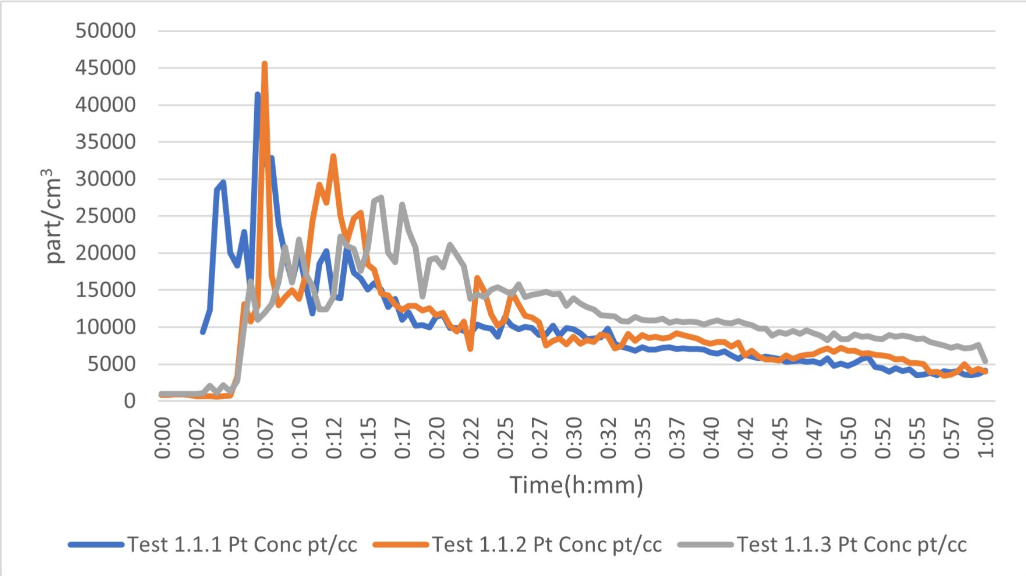
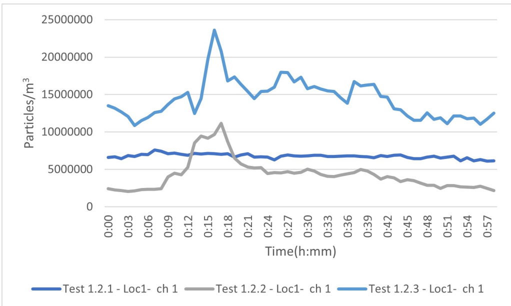


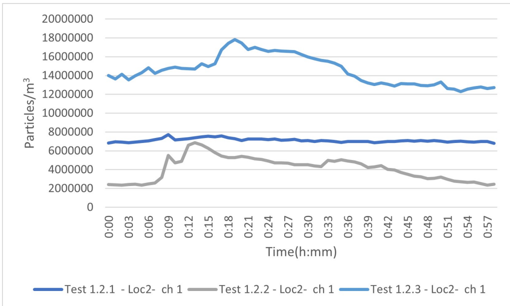
Figure 72: Raw UFP count for test 1.1

L.2 Experiment 1.2

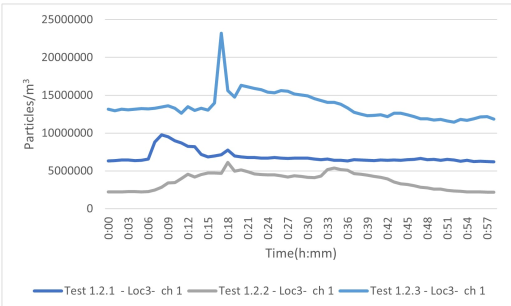
Figure 73 shows the particle count in size 0.3 to 25 μm and all locations.



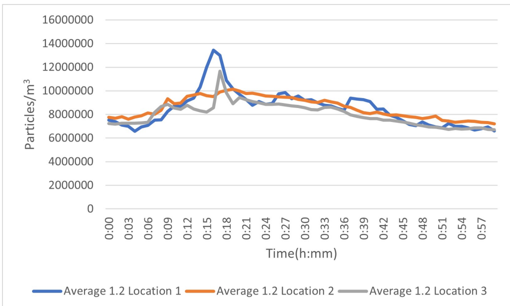
(a) Raw Aerotrak measurements for all three tests in location 1 for test 1.2



(b) Raw Aerotrak measurements for all three tests in location 2 for test 1.2



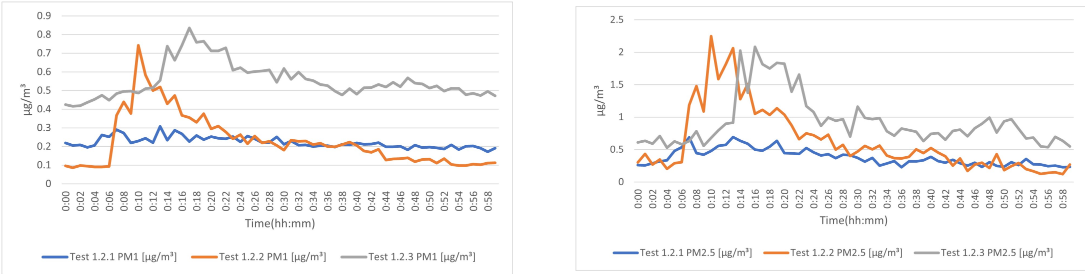
(c) Raw Aerotrak measurements for all three tests in location 3 for test 1.2



(d) Raw Aerotrak measurements, averaged values from all three tests 1.2

Figure 73: Raw Aerotrak measurements for test 1.2 in all locations

Results from the Grimm converted to PM2.5 and PM1, is shown in figure 74.



(a) Raw PM1 measurements from all three tests in experiment 1.2

(b) Raw PM2.5 measurements from all three tests in experiment 1.2

Figure 74: Raw PM1 and PM2.5 mass concentration for test 1.2

Figure 75 show the raw ultrafine concentration from experiment 1.2.

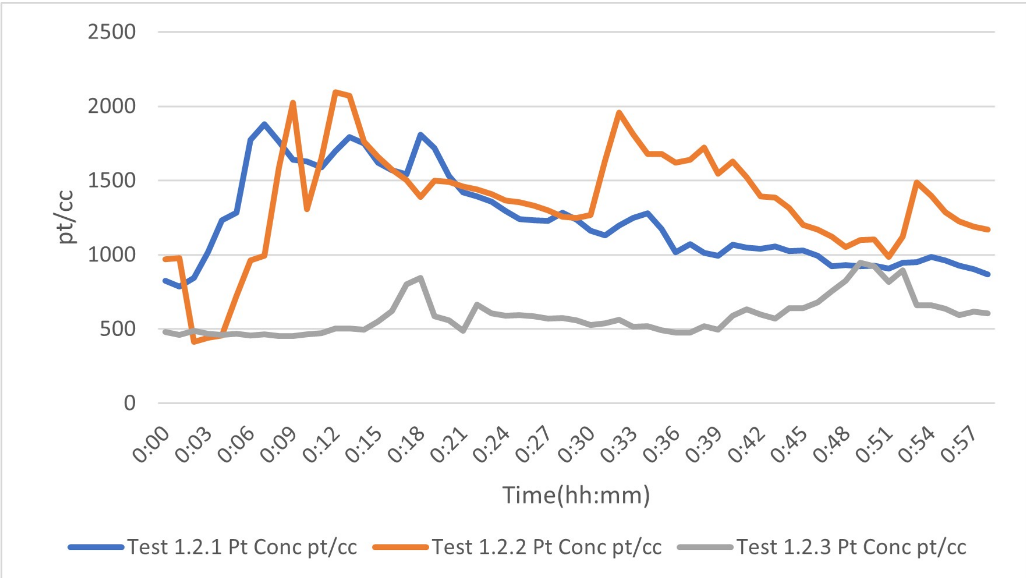
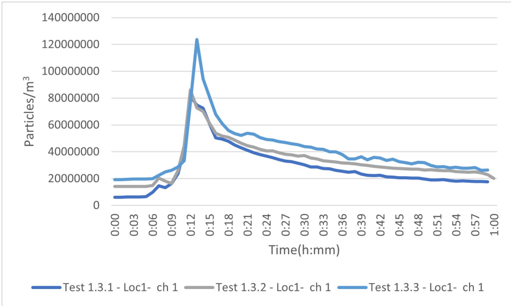


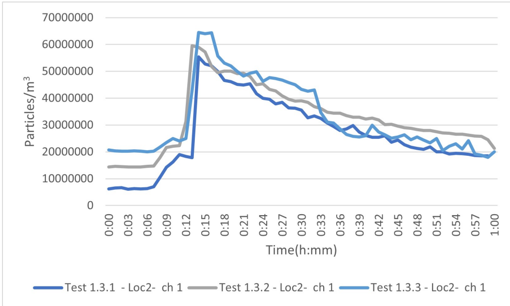
Figure 75: Raw UFP count for test 1.2

L.3 Experiment 1.3

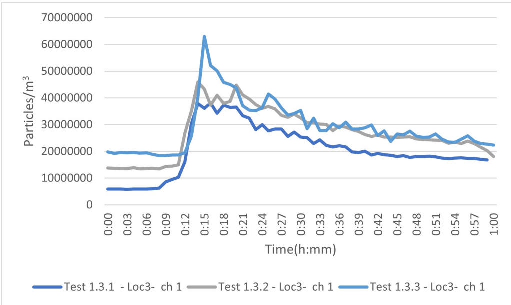
Figure 76 shows the particle count in size 0.3 to 25 μm and all locations.



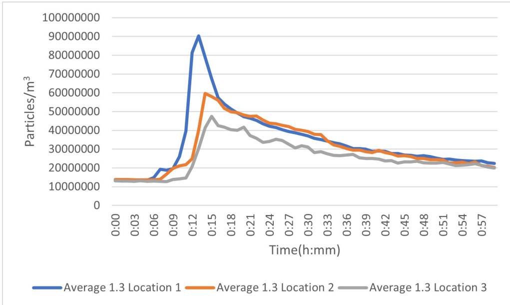
(a) Raw Aerotrak measurements for all three tests in location 1 for test 1.3



(b) Raw Aerotrak measurements for all three tests in location 2 for test 1.3



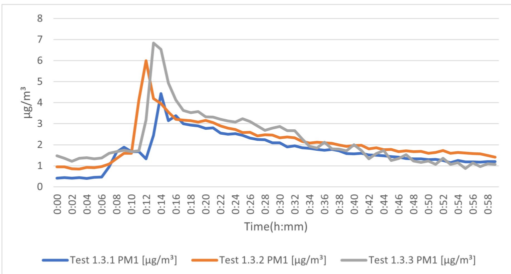
(c) Raw Aerotrak measurements for all three tests in location 3 for test 1.3



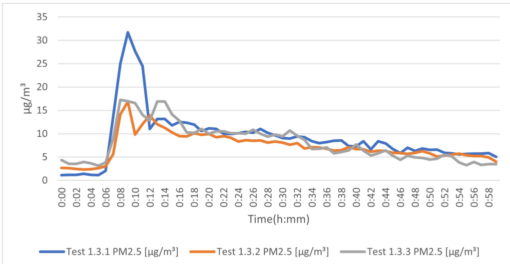
(d) Raw Aerotrak measurements, averaged values from all three tests 1.3

Figure 76: Raw Aerotrak measurements for test 1.3 in all locations

Results from the Grimm converted to PM2.5 and PM1, is shown in figure 77.



(a) Raw PM1 measurements from all three tests in experiment 1.3



(b) Raw PM2.5 measurements from all three tests in experiment 1.3

Figure 77: Raw PM1 and PM2.5 mass concentration for test 1.3

Figure 78 show the raw ultrafine concentration from experiment 1.3.

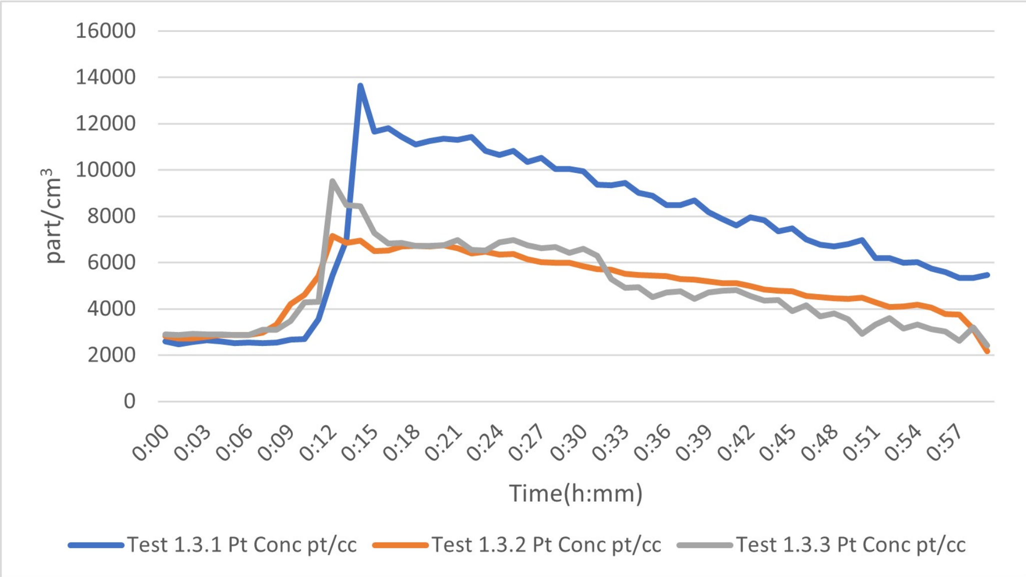
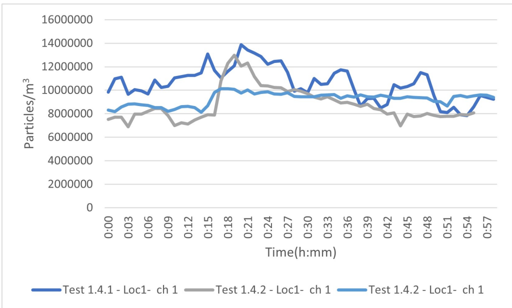


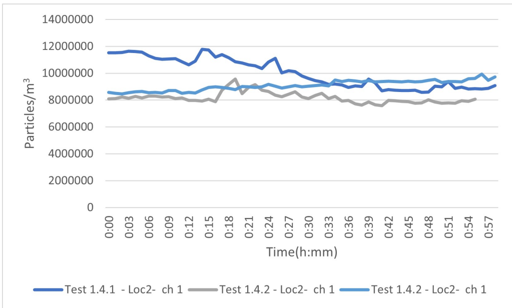
Figure 78: Raw UFP count for test 1.3

L.4 Experiment 1.4

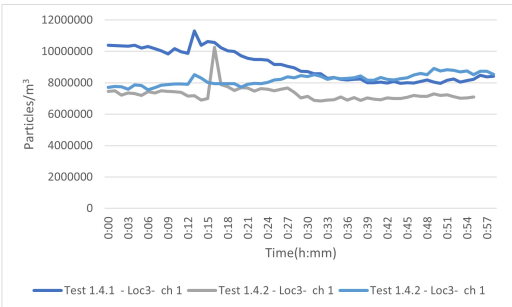
Figure 79 shows the particle count in size 0.3 to 25 μm and all locations.



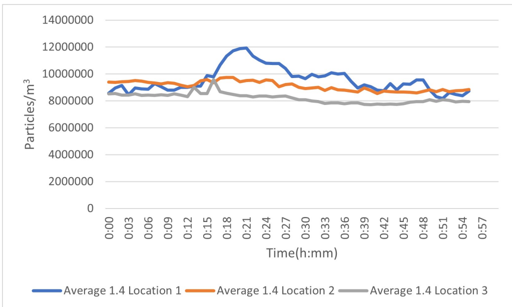
(a) Raw Aerotrak measurements for all three tests in location 1 for test 1.4



(b) Raw Aerotrak measurements for all three tests in location 2 for test 1.4



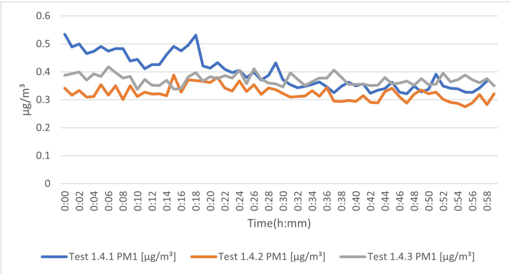
(c) Raw Aerotrak measurements for all three tests in location 3 for test 1.4



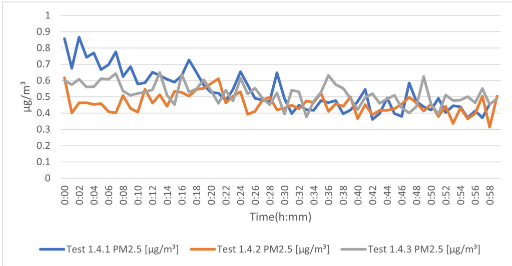
(d) Raw Aerotrak measurements, averaged values from all three tests 1.4

Figure 79: Raw Aerotrak measurements for test 1.4 in all locations

Results from the Grimm converted to PM2.5 and PM1, is shown in figure **??**.



(a) Raw PM1 measurements from all three tests in experiment 1.4



(b) Raw PM2.5 measurements from all three tests in experiment 1.4

Figure 80: Raw PM1 and PM2.5 mass concentration for test 1.4

Figure 81 show the raw ultrafine concentration from experiment 1.4.

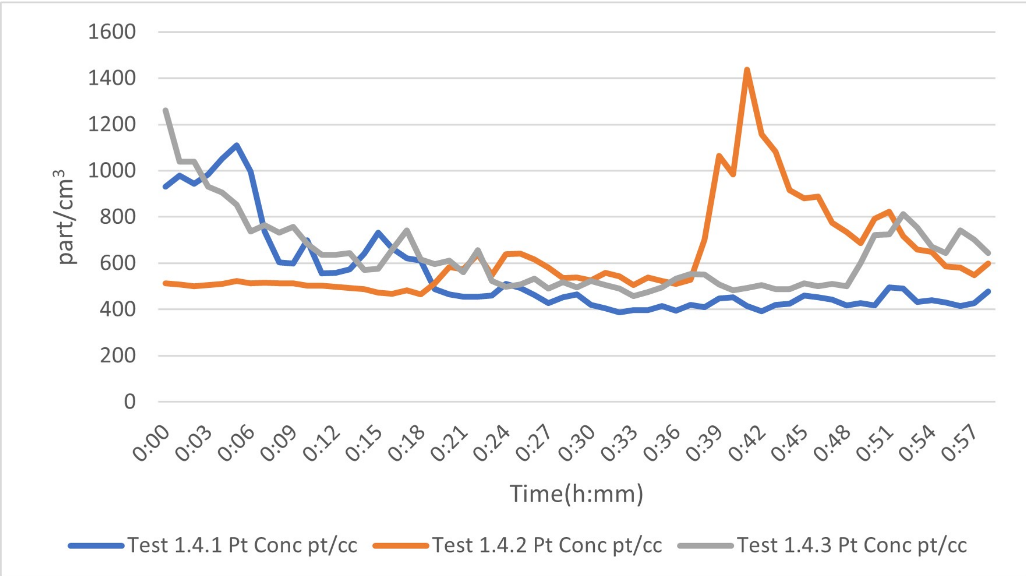
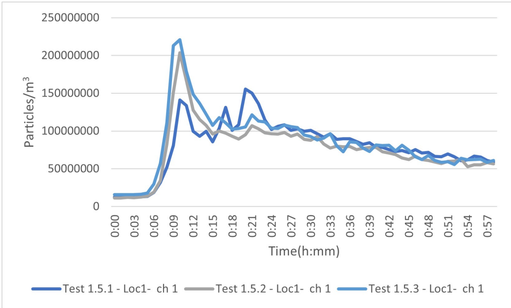


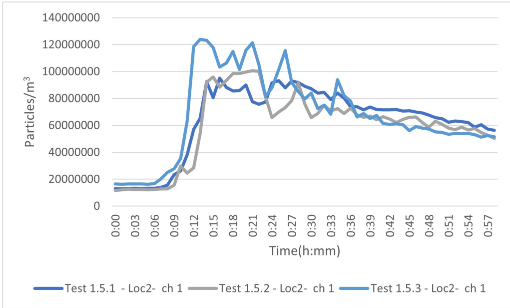
Figure 81: Raw UFP count for test 1.4

L.5 Experiment 1.5

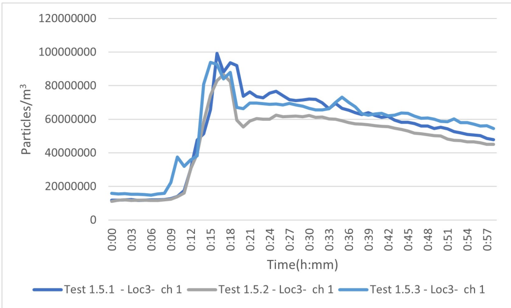
Figure 82 shows the particle count in size 0.3 to 25 μm and all locations.



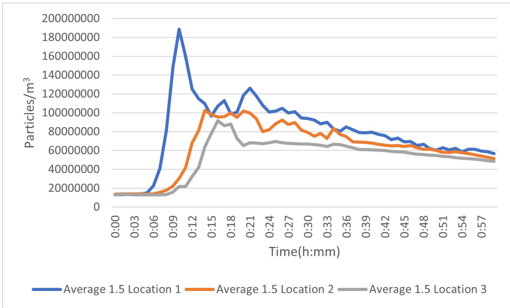
(a) Raw Aerotrak measurements for all three tests in location 1 for test 1.5



(b) Raw Aerotrak measurements for all three tests in location 2 for test 1.5



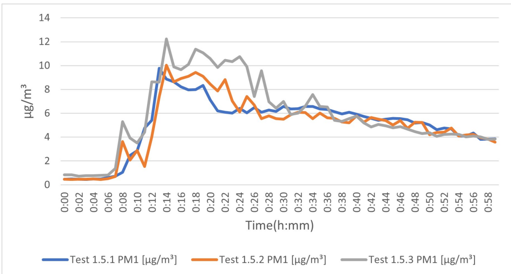
(c) Raw Aerotrak measurements for all three tests in location 3 for test 1.5



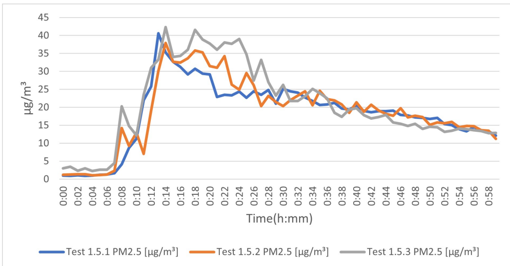
(d) Raw Aerotrak measurements, averaged values from all three tests 1.5

Figure 82: Raw Aerotrak measurements for test 1.5 in all locations

Results from the Grimm converted to PM2.5 and PM1, is shown in figure 83.



(a) Raw PM1 measurements from all three tests in experiment 1.5



(b) Raw PM2.5 measurements from all three tests in experiment 1.5

Figure 83: Raw PM1 and PM2.5 mass concentration for test 1.5

Figure 84 show the raw ultrafine concentration from experiment 1.5.

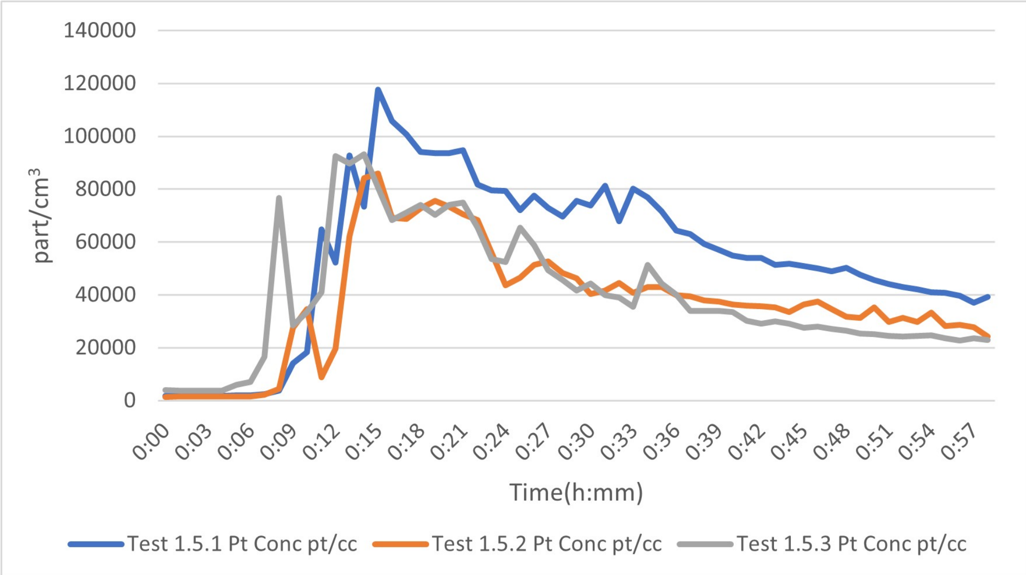
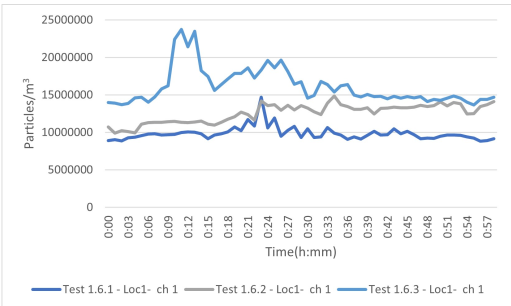


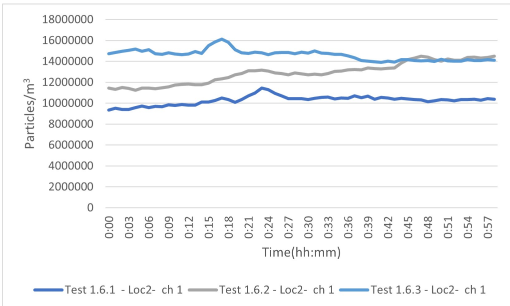
Figure 84: Raw UFP count for test 1.5

L.6 Experiment 1.6

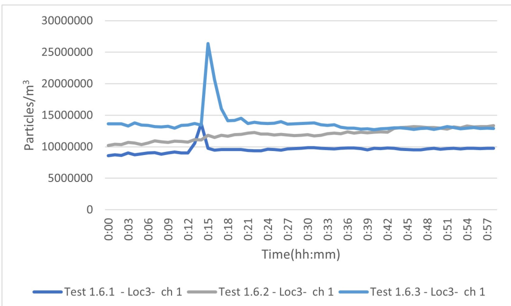
Figure 85 shows the particle count in size 0.3 to 25 μm and all locations.



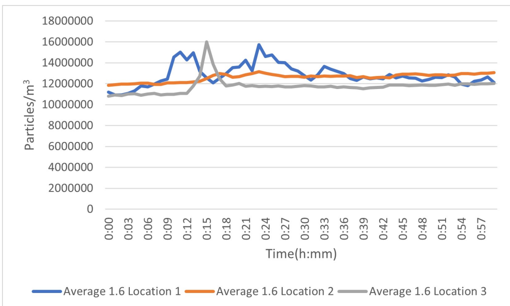
(a) Raw Aerotrak measurements for all three tests in location 1 for test 1.6



(b) Raw Aerotrak measurements for all three tests in location 2 for test 1.6



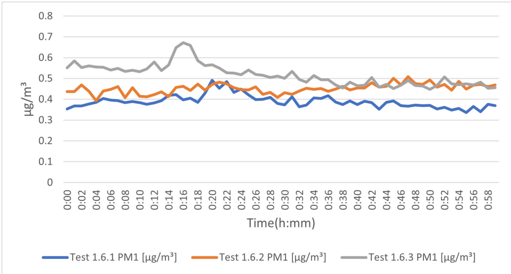
(c) Raw Aerotrak measurements for all three tests in location 3 for test 1.6



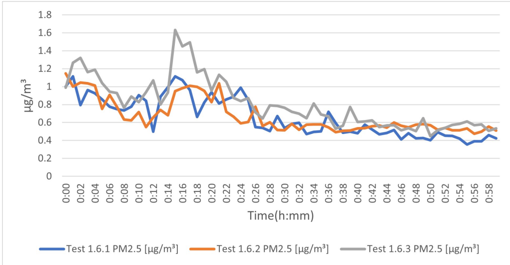
(d) Raw Aerotrak measurements, averaged values from all three tests 1.6

Figure 85: Raw Aerotrak measurements for test 1.6 in all locations

Results from the Grimm converted to PM2.5 and PM1, is shown in figure 86.



(a) Raw PM1 measurements from all three tests in experiment 1.6



(b) Raw PM2.5 measurements from all three tests in experiment 1.6

Figure 86: Raw PM1 and PM2.5 mass concentration for test 1.6

Figure 87 show the raw ultrafine concentration from experiment 1.6.

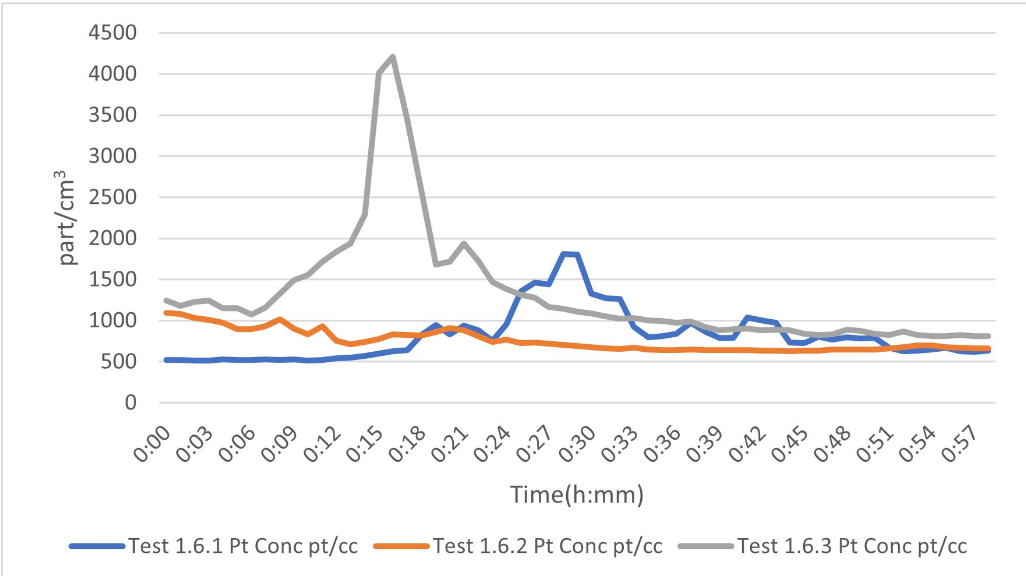
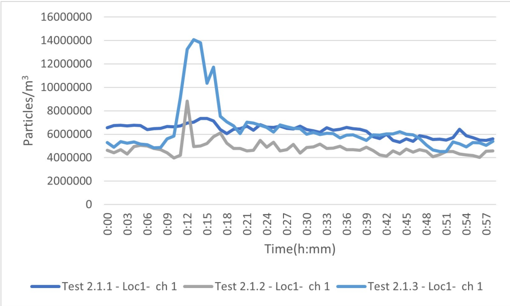


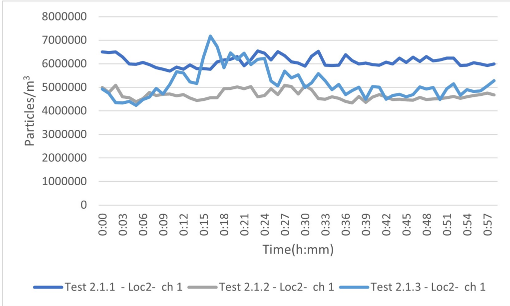
Figure 87: Raw UFP count for test 1.6

L.7 Experiment 2.1

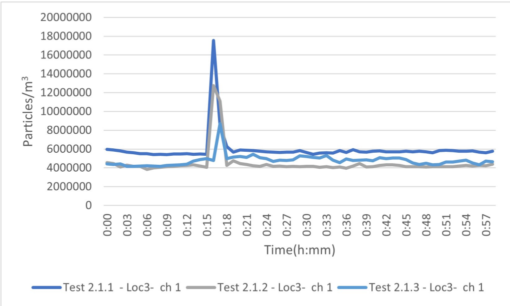
Figure 88 shows the particle count in size 0.3 to 25 μm and all locations.



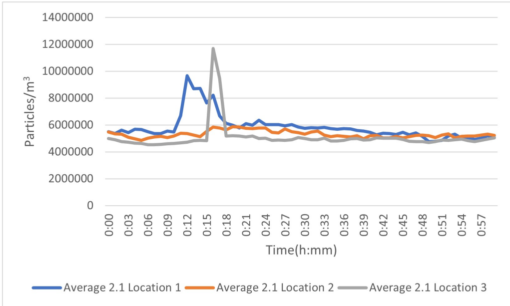
(a) Raw Aerotrak measurements for all three tests in location 1 for test 2.1



(b) Raw Aerotrak measurements for all three tests in location 2 for test 2.1



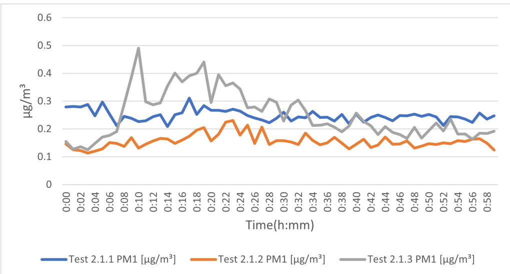
(c) Raw Aerotrak measurements for all three tests in location 3 for test 2.1



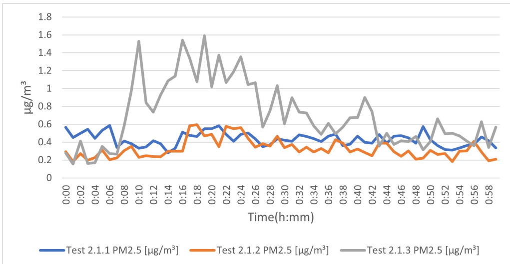
(d) Raw Aerotrak measurements, averaged values from all three tests 2.1

Figure 88: Raw Aerotrak measurements for test 2.1 in all locations

Results from the Grimm converted to PM2.5 and PM1, is shown in figure 89.



(a) Raw PM1 measurements from all three tests in experiment 2.1



(b) Raw PM2.5 measurements from all three tests in experiment 2.1

Figure 89: Raw PM1 and PM2.5 mass concentration for test 2.1

Figure 90 show the raw ultrafine concentration from experiment 2.1.

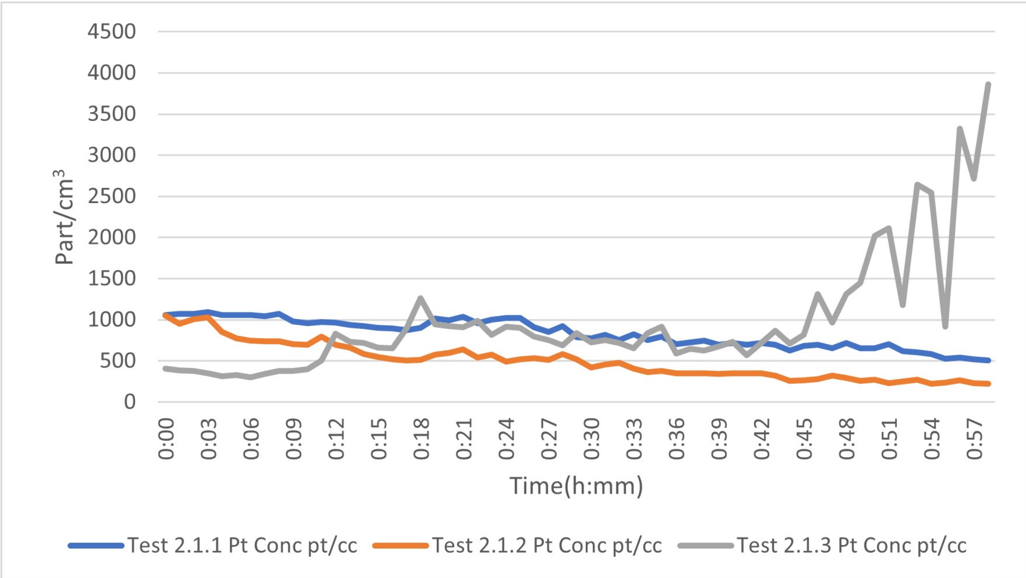
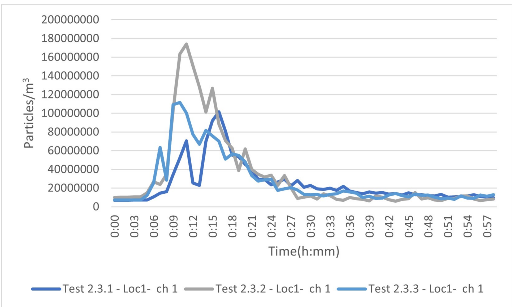


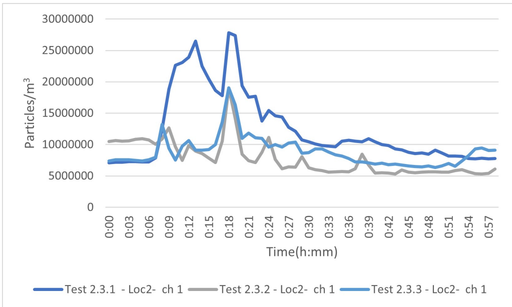
Figure 90: Raw UFP count for test 2.1

L.8 Experiment 2.3

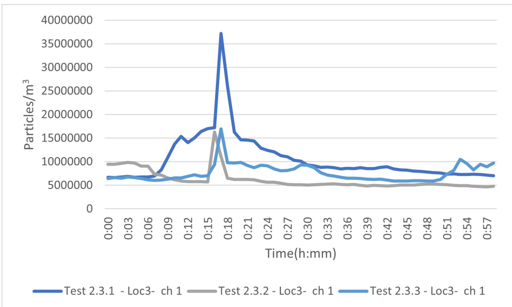
Figure 91 shows the particle count in size 0.3 to 25 μm and all locations.



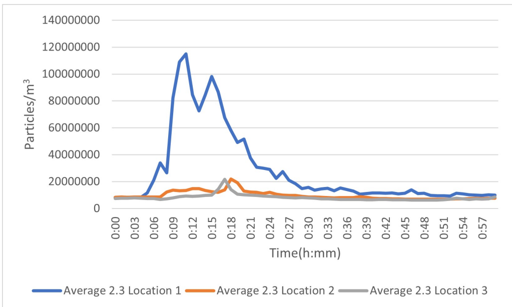
(a) Raw Aerotrak measurements for all three tests in location 1 for test 2.3



(b) Raw Aerotrak measurements for all three tests in location 2 for test 2.3



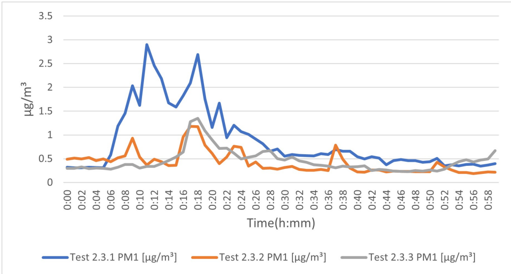
(c) Raw Aerotrak measurements for all three tests in location 3 for test 2.3



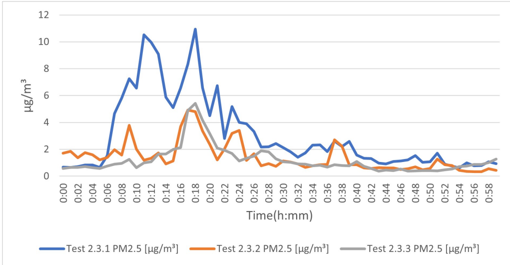
(d) Raw Aerotrak measurements, averaged values from all three tests 2.3

Figure 91: Raw Aerotrak measurements for test 2.3 in all locations

Results from the Grimm converted to PM2.5 and PM1, is shown in figure 92.



(a) Raw PM1 measurements from all three tests in experiment 2.3



(b) Raw PM2.5 measurements from all three tests in experiment 2.3

Figure 92: Raw PM1 and PM2.5 mass concentration for test 2.3

Figure 93 show the raw ultrafine concentration from experiment 2.3.

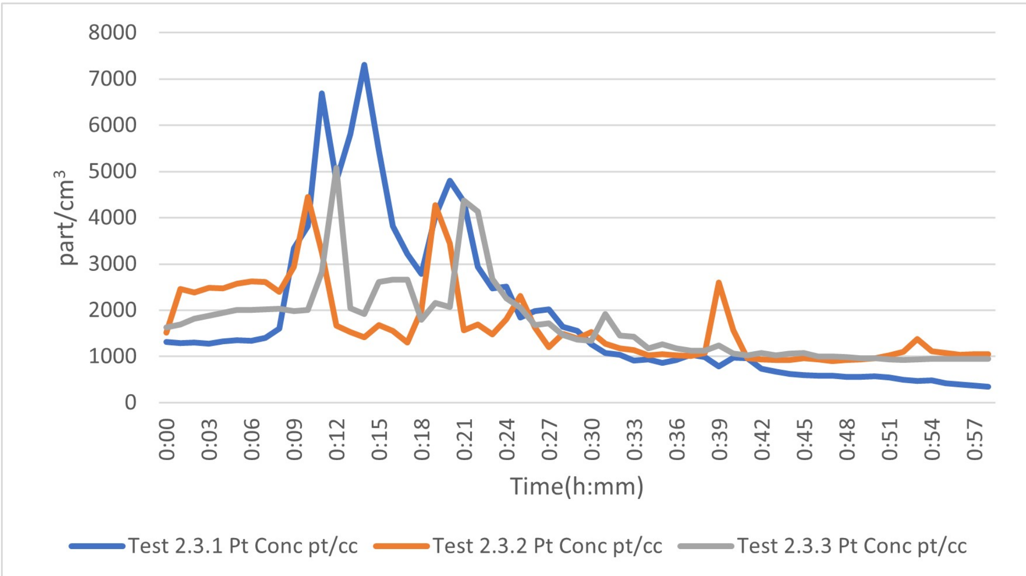
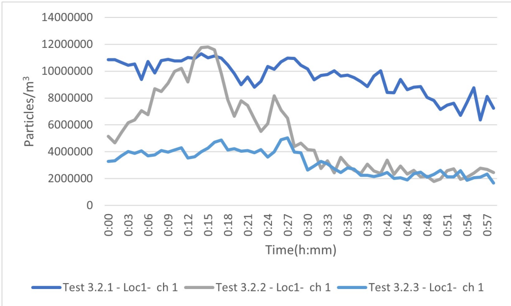


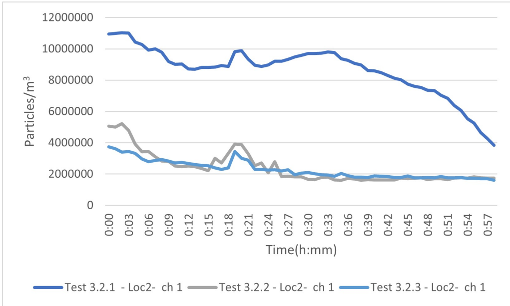
Figure 93: Raw UFP count for test 2.3

L.9 Experiment 3.2

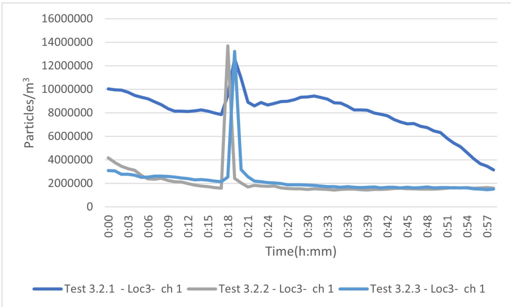
Figure 94 shows the particle count in size 0.3 to 25 μm and all locations.



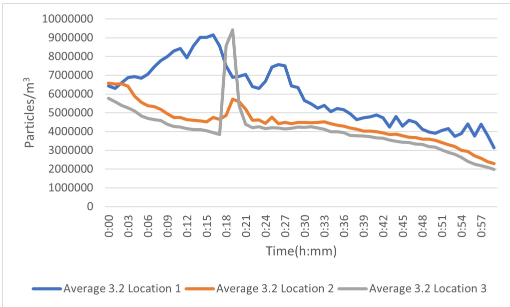
(a) Raw Aerotrak measurements for all three tests in location 1 for test 3.2



(b) Raw Aerotrak measurements for all three tests in location 2 for test 3.2



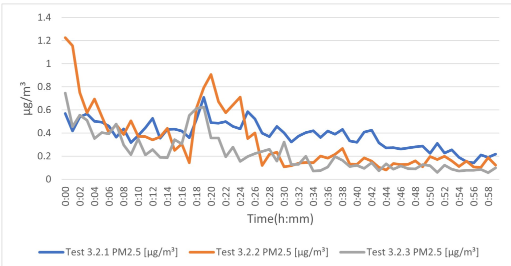
(c) Raw Aerotrak measurements for all three tests in location 3 for test 3.2



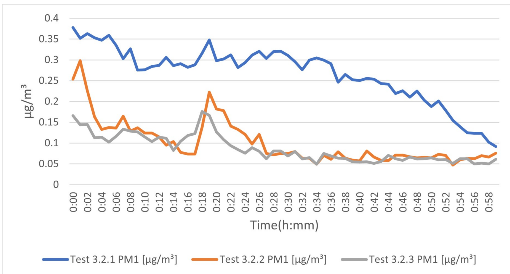
(d) Raw Aerotrak measurements, averaged values from all three tests 3.2

Figure 94: Raw Aerotrak measurements for test 3.2 in all locations

Results from the Grimm converted to PM2.5 and PM1, is shown in figure 95.



(a) Raw PM1 measurements from all three tests in experiment 3.2



(b) Raw PM2.5 measurements from all three tests in experiment 3.2

Figure 95: Raw PM1 and PM2.5 mass concentration for test 3.2

Figure 96 show the raw ultrafine concentration from experiment 3.2.

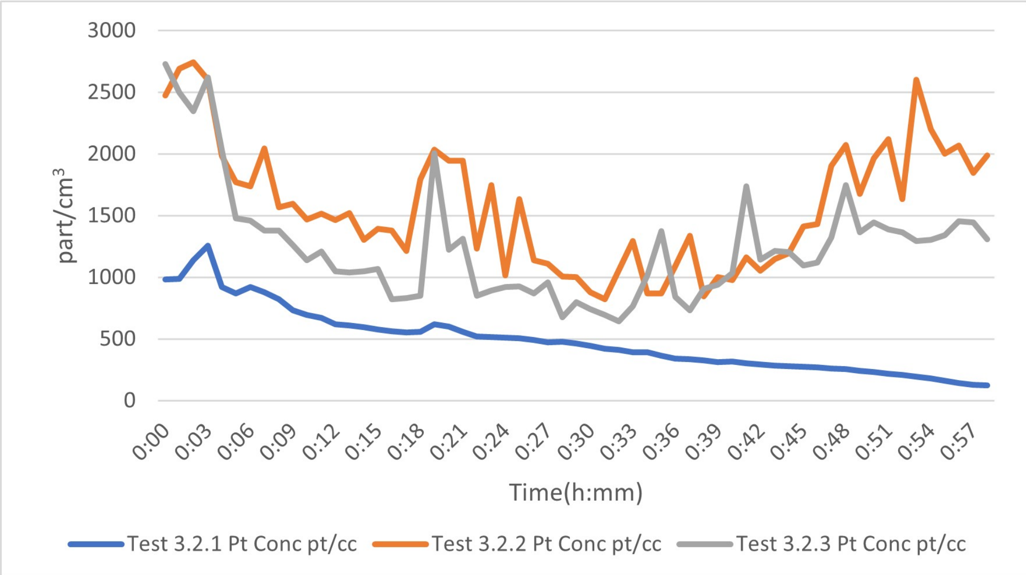


Figure 96: Raw UFP count for test 3.2