

## ANALYSIS REPORT

<b>Customer:</b>	Suomen Luonnonmaalit Oy	<b>Address:</b>	Upokaskuja 6-8 01450 Vantaa (Tuusula)
<b>Contact:</b>	Lauri Koski		
<b>Date:</b>	08.08.2020	<b>Reference</b>	Robert john
<b>Arrived:</b>	11.10.2019 part 1, 15.8.2020 part 2 (5 L)		
<b>Subject:</b>	VOC analyses looking for the paint to clean the air in the test chamber		

### Background:

Reduction of the Volatile Organic Compounds from air in the test chamber when light is added.

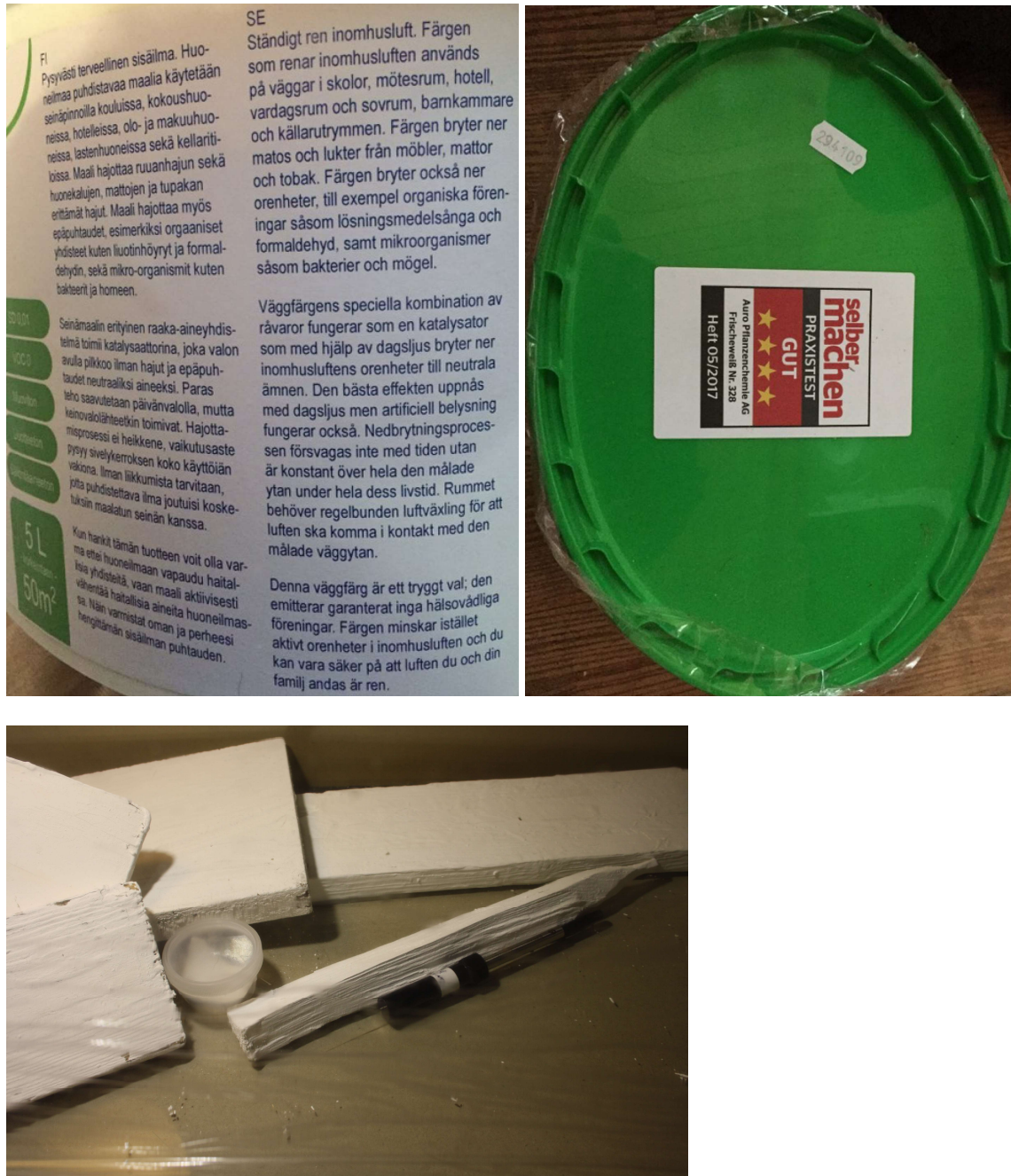
### Sample:

Lab ID	Sample name	Description	Date
012-3	Auro 328	Ilmaa puhdistava seinämaali, 5 L	15.8.2020

### Task: Measurements:

Looking for the reduction in test chamber air when a 0,25 m<sup>2</sup> of wall is painted using "ilmaa puhdistava seinämaali. This was performed during a long period of measurements taken by SPME CAR/PDMS 75 µm or PDMS 100 µm. It will be shown that the paint cleans up the air in the test chamber as the producer claims.

These results are exclusively to the tested samples. This report may only be copied as whole.  
Without our permission, it is not allowed to reproduce extracts from this report.



Picture 1. A picture of the supplied paint that the manufacturer specifies to be able to clean the air. Below a picture of the painted items inside the glass chamber.

These results are exclusively to the tested samples. This report may only be copied as whole. Without our permission, it is not allowed to reproduce extracts from this report.

## Experimental

### Sample preparation

The sample was used to paint wood pieces, 0.25 m<sup>2</sup>, and the painted wood items was put into a 167 liters test chamber made of glass. The chamber was dark for a period and the VOC levels were measured. Then we introduced light to simulate daylight. We only used normal lights that you can found in any house. When the light was applied the concentration of the VOC compounds were reduced. It can be seen from the SPME runs that we performed during a period of 1 month.

### SPME sampling

The SPME fiber 75µm CAR/PDMS and the holder were obtained from Supelco Ltd. The fiber was conditioned according to the manufacturer's specification. The samples were taken from the test sample in the test chamber. Sampling time was normally 60 minutes. The test period was 27 days with this fiber. The stabilization period before was 30 days.

After the absorption, the fiber was introduced to the injector for 5 minutes. The run was started immediately after and the detector was on after the elution of air.

### GC-MS analysis

The GC-MS equipment was an HP 5890 Gas Chromatograph equipped with a msd 5970 mass selective detector (msd). The analytical column was a ZB-1, length 30 m, inner diameter 0.32 mm, 1.0 µm phase thickness connected in series with an Hp 5, length 25 m, inner diameter 0.20 mm, 0.11 µm phase thickness. Total column length 55 m. The injection temperature was set to 270 °C and operated in splitless injection mode for 1 minute, split ratio (1:30). The oven program was 50°C for 1 minute and then the temperature was raised by 10 °C/minute up to 300 °C and kept there for 4 minutes. Total run time 30 minutes.

The scanning range was from 40-450 m/z and the threshold was set to 100. The recorded Total Ion Chromatogram (TIC) is showing the changes in VOC concentrations in the test chamber.

## Results

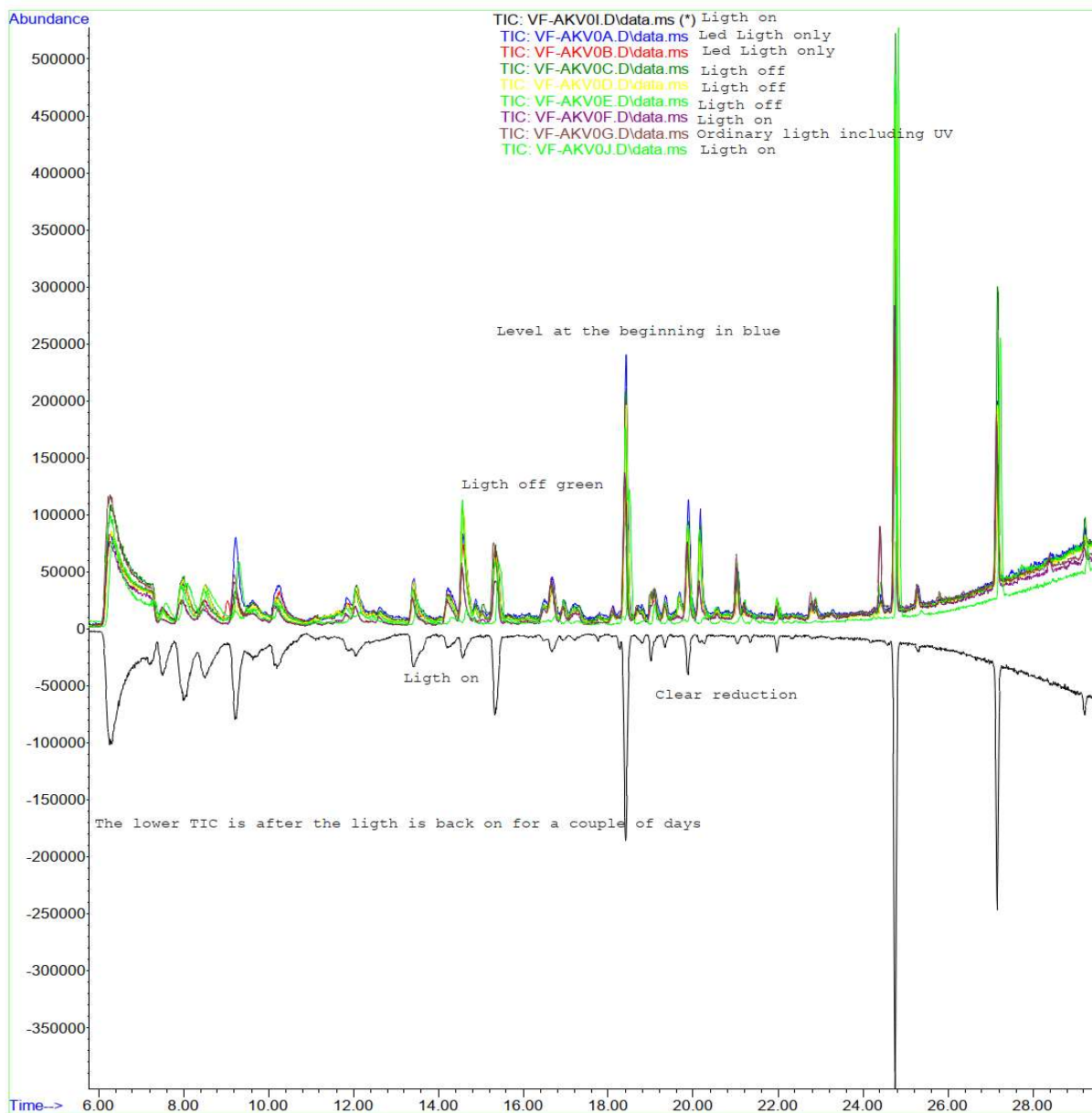
The sample consisted of white paint.

The paint was easy to handle. Did not drip easily and dried quickly. The paint is water based and all tools used are easy to clean with only plain water. The test chamber is shown in picture 1. The sample was painted on wood or board pieces, 0.25 m<sup>2</sup>, and put into a 167 liters test chamber made of glass, shown in picture 1. The chamber was dark for a period of time and the VOC concentrations were measured. Then we introduced light to simulate daylight. We only used normal lights that you can find in any house. When the light was applied the concentration of the VOC compounds in the test chamber were reduced, see pictures 2, 3a, 3b, 6 and 7. It can

These results are exclusively to the tested samples. This report may only be copied as whole.  
Without our permission, it is not allowed to reproduce extracts from this report.

be seen from the runs that we performed during a period of 27 days, picture 2, 6 and 7.

File :C:\msdchem\1\DATA\msd5973\VF-AKV01.D  
 Operator :  
 Acquired : 17 Oct 2020 14:36 using AcqMethod VOB\_1030  
 Instrument : GC/MS Ins  
 Sample Name: SPME D,akvarie valo>48h 2,ZB-1,>90min, 201016  
 Misc Info :  
 Vial Number: 1



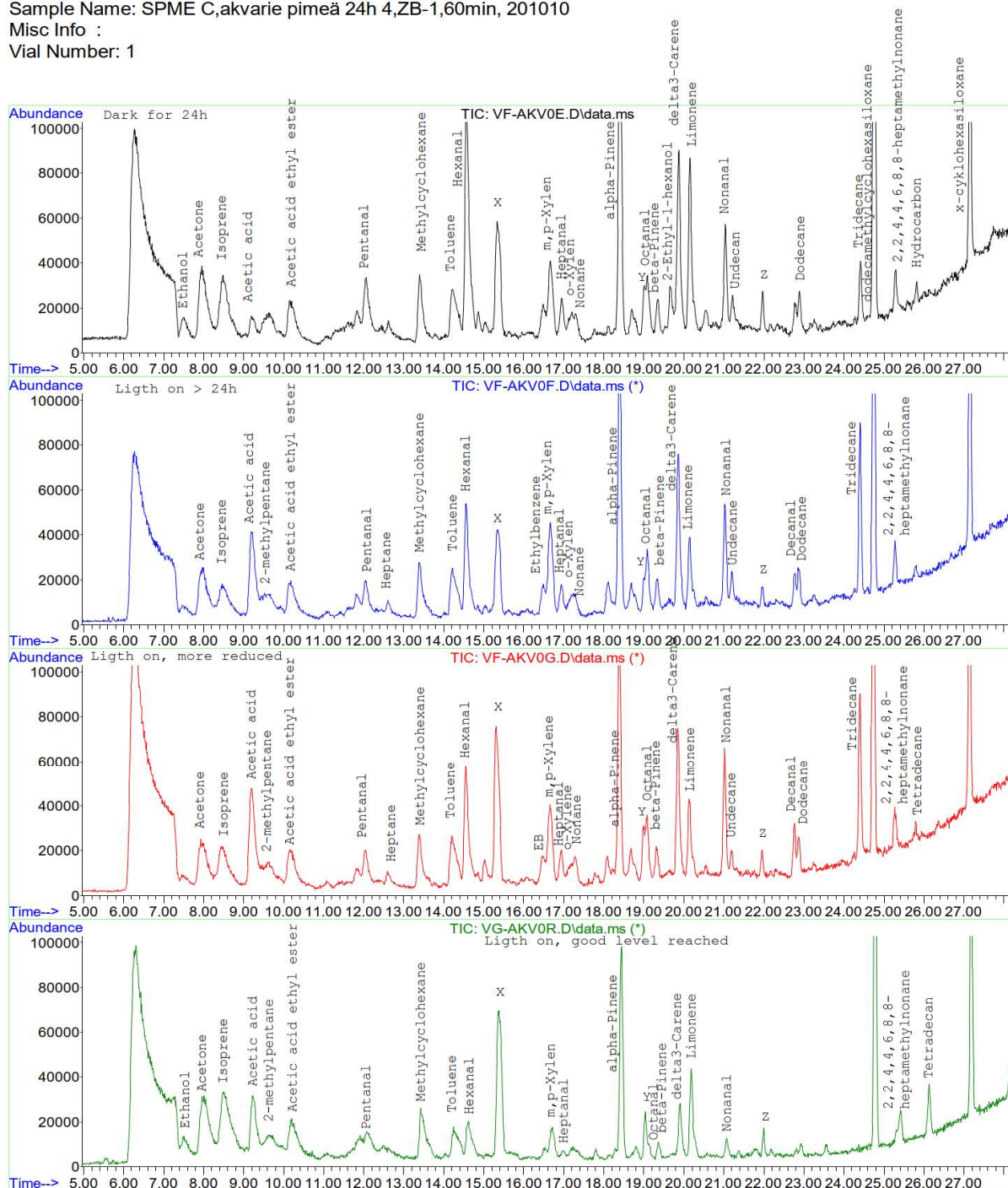
Picture 2. The comparison between the SPME sampled at different time. Samples A, B during light conditions at starting concentrations. Samples C, D and E no light was on. The rest of the samples was with light on. It can be observed that when the light is missing the concentrations rise, and when the light is switched on, they are again reduced. The test

These results are exclusively to the tested samples. This report may only be copied as whole.  
 Without our permission, it is not allowed to reproduce extracts from this report.



chamber had a steady emission of a few silicon compounds used in the seals.

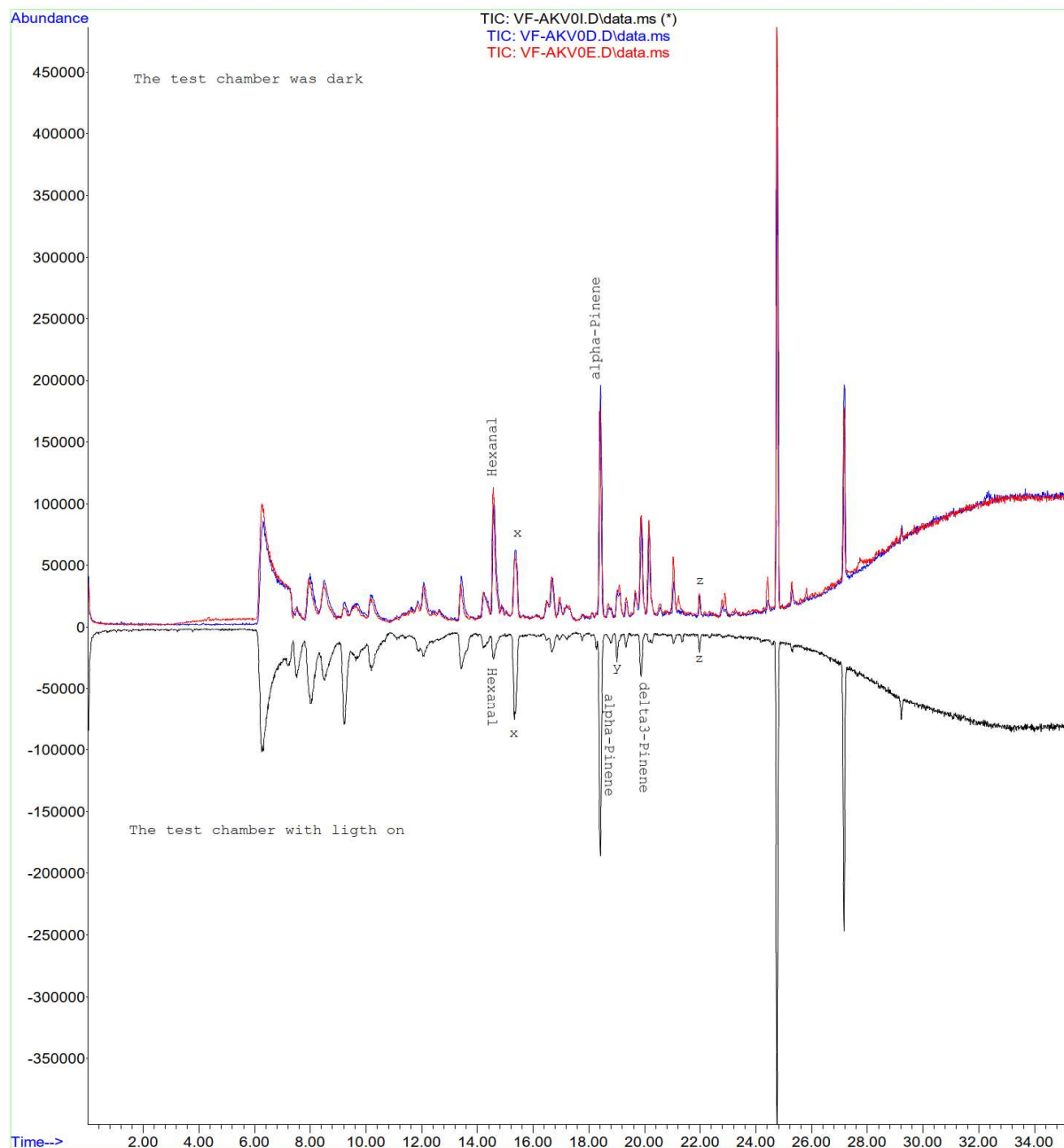
File :C:\msdchem\1\DATA\maskit\akvario\VF-AKV0E.D  
 Operator :  
 Acquired : 10 Oct 2020 12:05 using AcqMethod VOB\_1030  
 Instrument : GC/MS Ins  
 Sample Name: SPME C,akvarie pimeä 24h 4,ZB-1,60min, 201010  
 Misc Info :  
 Vial Number: 1



Picture 3a. The comparison between the SPME sampled at different times. Sample E at the end of the dark period, sample F when lit for 24 h, sample G after even longer time and sample R, when we begin to reach background levels. The reduction is clearly shown.

These results are exclusively to the tested samples. This report may only be copied as whole.  
 Without our permission, it is not allowed to reproduce extracts from this report.

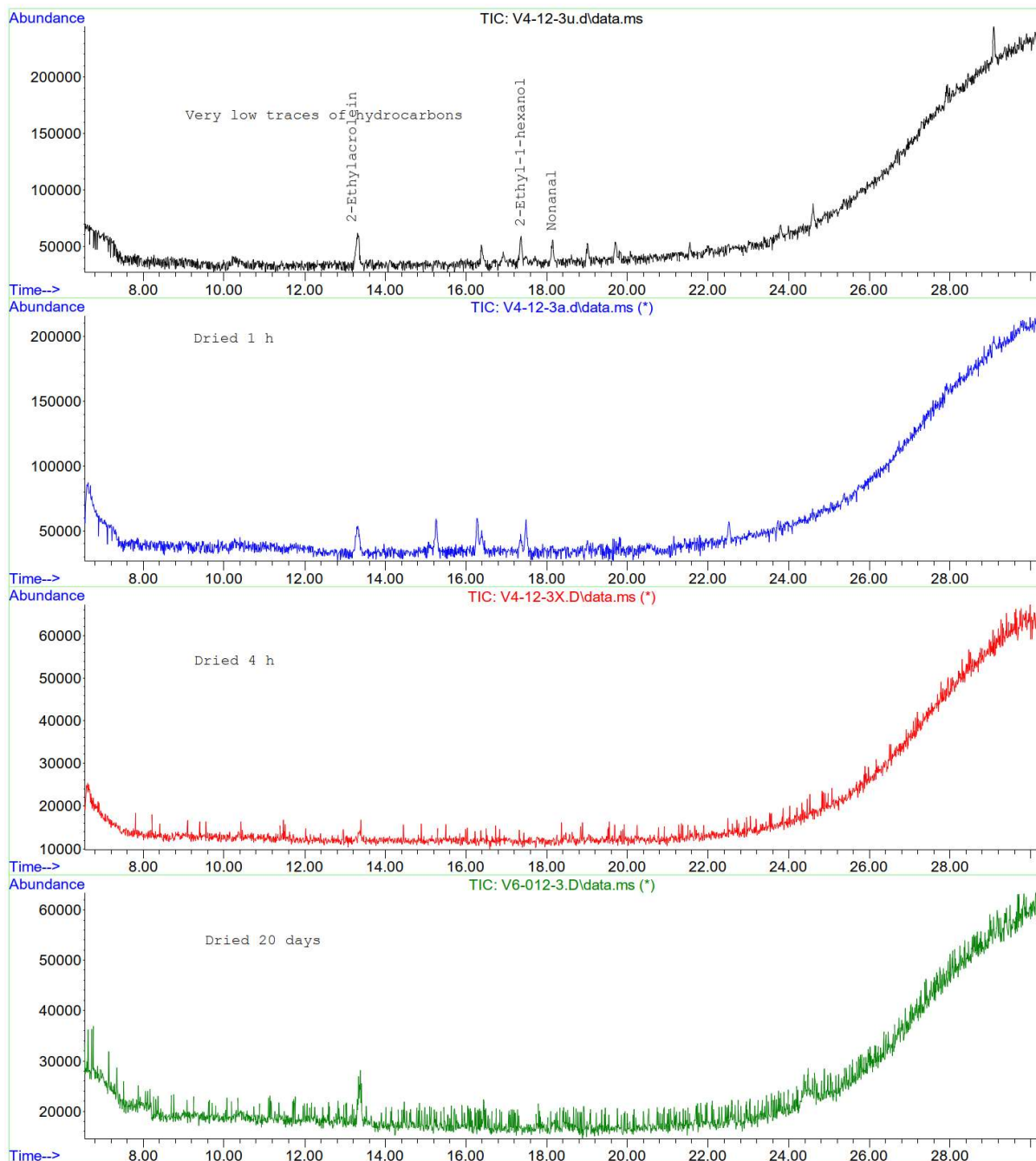
File :C:\msdchem\1\DATA\msd5973\VF-AKV0I.D  
Operator :  
Acquired : 17 Oct 2020 14:36 using AcqMethod VOB\_1030  
Instrument : GC/MS Ins  
Sample Name: SPME D,akvarie valo>48h 2,ZB-1,>90min, 201016  
Misc Info :  
Vial Number: 1



Picture 3b. The comparison between the SPME sampled at different conditions. Sample D and E at the dark period, sample I light was on. The reduction is clearly shown in this picture.

These results are exclusively to the tested samples. This report may only be copied as whole.  
Without our permission, it is not allowed to reproduce extracts from this report.

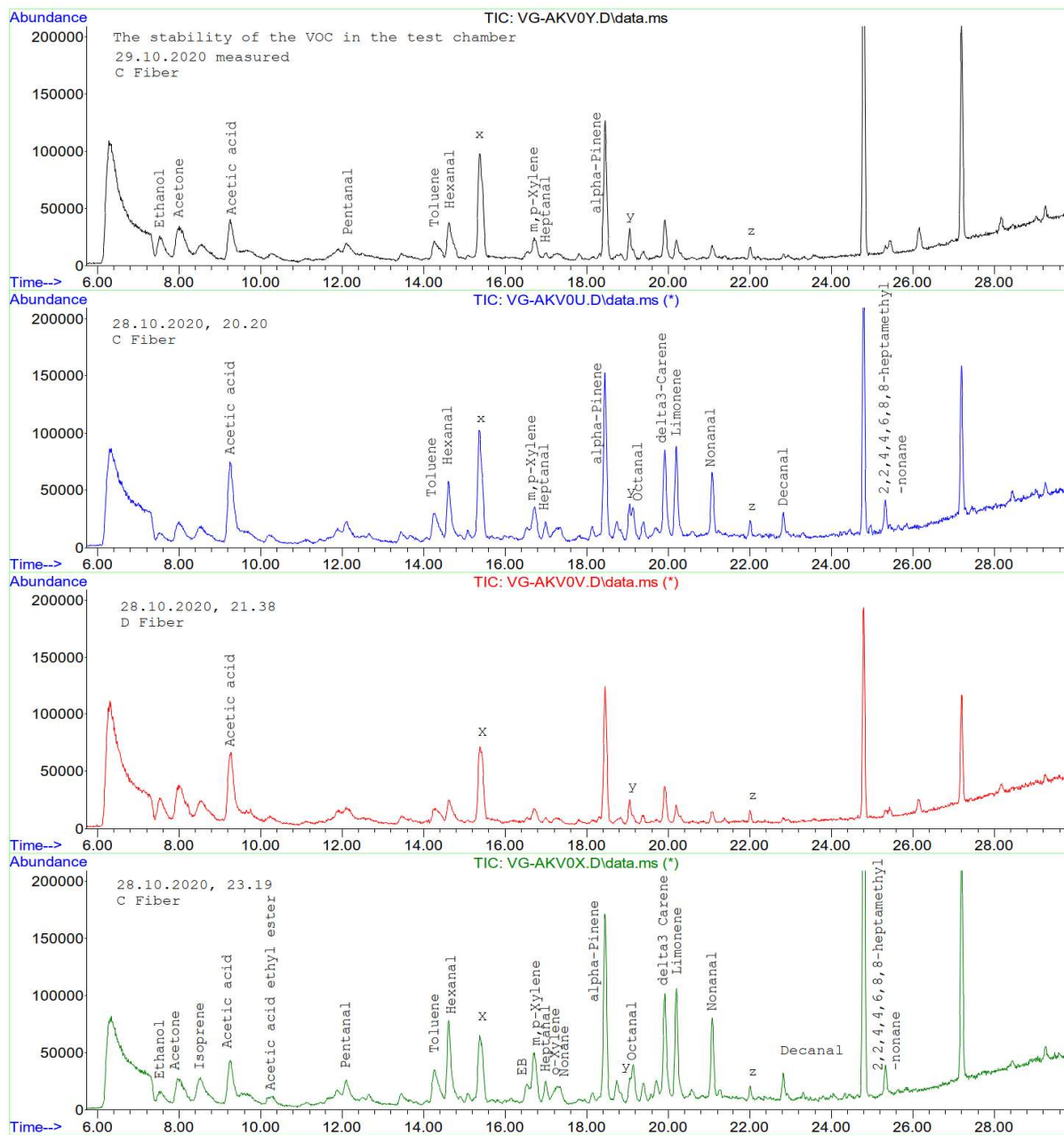
File :C:\msdchem\1\DATA\tyo0012\_1\_5 VOC\V4-12-3u.d  
Operator : Erik Sandell  
Acquired : 10 Apr 2020 9:49 using AcqMethod VOC\_1019  
Instrument : GC/MS Ins  
Sample Name: SPME B, astia pieni 12-3 0,6g, 10min 200410  
Misc Info :  
Vial Number: 1



Picture 4. From the earlier report the complete TICs of AURO 328 paint, as wet, dried 1 hour, dried 4 hours and dried several weeks. SPME injection after the dried paints was washed with a stream of pure nitrogen gas. This paint had extremely low VOC emissions.

These results are exclusively to the tested samples. This report may only be copied as whole. Without our permission, it is not allowed to reproduce extracts from this report.

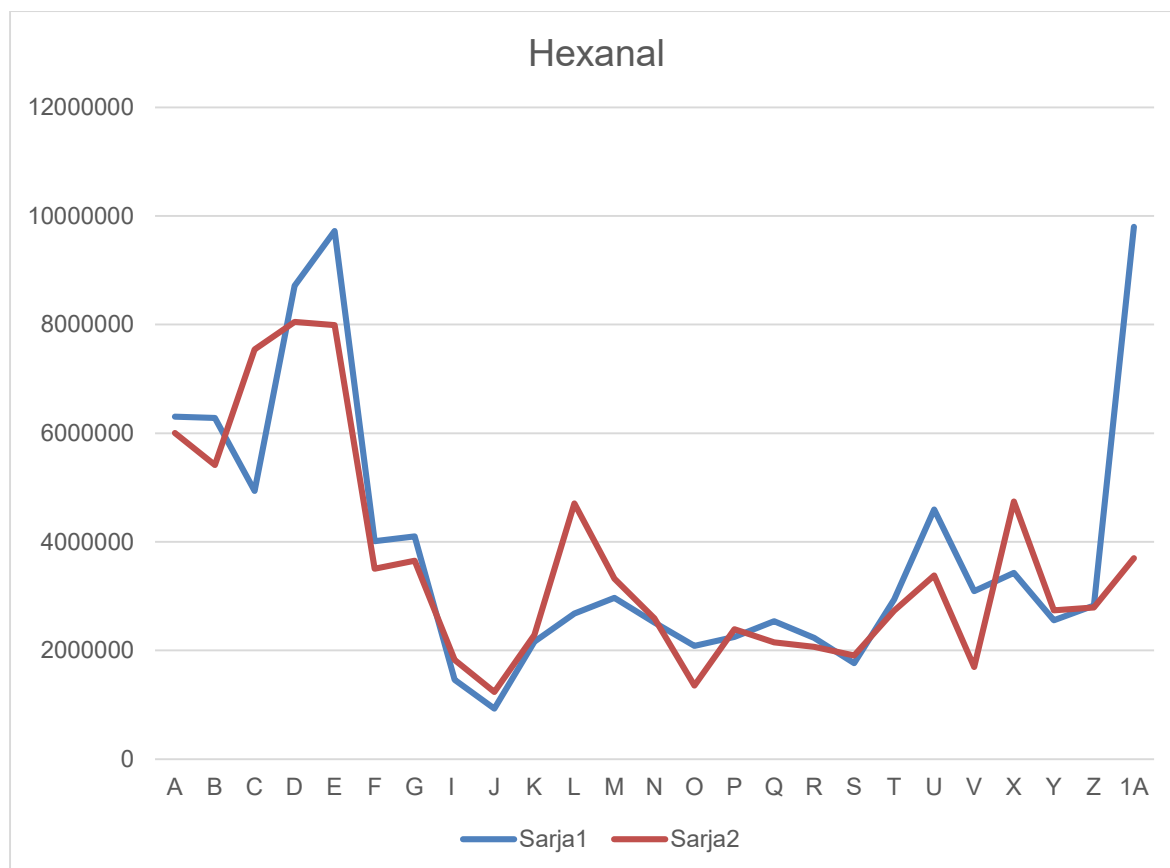
File :C:\msdchem\1\DATA\maskit\akvario\VG-AKV0Y.D  
 Operator :  
 Acquired : 29 Oct 2020 12:23 using AcqMethod VOB\_1030  
 Instrument : GC/MS Ins  
 Sample Name: SPME C,Akv. 12.22 valot,ZB-1,60min, 201029  
 Misc Info :  
 Vial Number: 1



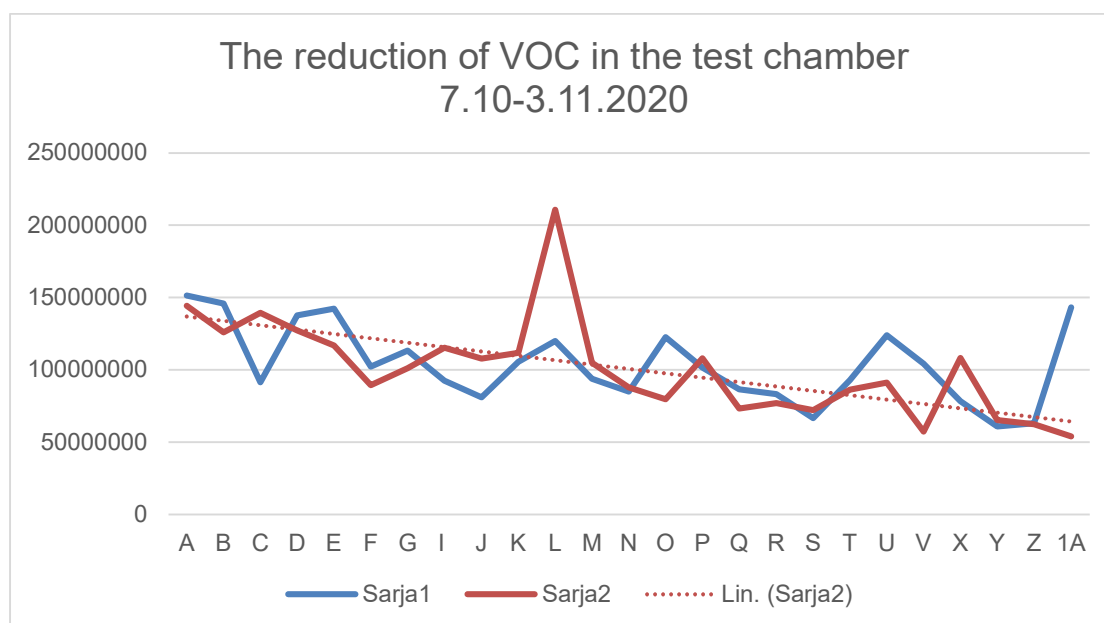
Picture 5. The stability of the measurements with different fibres from same batch. The analysis was performed for 48 hours.

These results are exclusively to the tested samples. This report may only be copied as whole.  
 Without our permission, it is not allowed to reproduce extracts from this report.





Picture 6. Here in blue we can observe the Hexanal concentrations in the chamber against time presented as sample points A-1A (7.10-3.11.2020). The sample points C, D, E and 1A was under dark conditions. The brown line is raw data.



Picture 8. The VOC content in the test chamber against time exposed to light. The dotted line shows the steady decrease in VOC concentrations. At the end we can observe the increase when the only change was, that the light was switched off.

These results are exclusively to the tested samples. This report may only be copied as whole.  
Without our permission, it is not allowed to reproduce extracts from this report.

Table 1. The VOC eluted from Auro paints at 25-30 °C, SPME injection from earlier report.

Sample	Name	Sample amount, wet g	Sample dry matter content, %	Amount µg/sample
12-3	Auro 328, "Ilmaa puhdistava seinämaali"	0.76428	48.4	1.5

## Conclusions

The samples consisted of white paint. The sample 012-3 have extremely low VOC emissions, both wet and dry, see table 1. It has also been shown that the paint really cleans the air from VOC compounds, under light conditions, as specified. This is clearly shown in the Pictures 1-7. In the picture 7 we can see the trend line of all VOC present in the test chamber. From picture 6 we can follow the decrease in the concentration of Hexanal in the test chamber air. This paint is very good for the indoor air.

**Special analytics expert: Erik Sandell / EKG Consulting Oy/Ltd**

**Signature:**



These results are exclusively to the tested samples. This report may only be copied as whole.  
Without our permission, it is not allowed to reproduce extracts from this report.