

# Test Report

<b>Product</b>	Wireless Gas Detector
<b>Name and address of the applicant</b>	GasSecure AS Hoffsveien 70C, 0377 Oslo Norway
<b>Name and address of the manufacturer</b>	Same as above
<b>Model</b>	GS01
<b>Rating</b>	7.2 V DC (Primary Batteries)
<b>Trademark</b>	GasSecure
<b>Serial number</b>	N/A
<b>Additional information</b>	/
<b>Tested according to</b>	<b>FCC Part 15.247</b> Frequency Hopping Transmitters / Digital Transmission Systems <b>Industry Canada RSS-247, Issue 2</b> Low Power Licence-Exempt Radiocommunications Devices
<b>Order number</b>	320210
<b>Tested in period</b>	2016.12.06 and 2017.01.26
<b>Issue date</b>	2017.04.27
<b>Name and address of the testing laboratory</b>	 FCC No: 994405 IC OATS: 2040D-1 Instituttveien 6 Kjeller, Norway TEL: +47 22 96 03 30 FAX: +47 22 96 05 50
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">   Prepared by [Frode Sveinsen] </div> <div style="text-align: center;">   Approved by [G. Suhantakumar] </div> </div>	
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## 1 INFORMATION

### 1.1 Test Item

<b>Name :</b>	GasSecure
<b>FCC ID :</b>	2AEJXGS01AA
<b>Industry Canada ID :</b>	/
<b>Model/version :</b>	GS01
<b>Serial number :</b>	/
<b>Hardware identity and/or version:</b>	/
<b>Software identity and/or version :</b>	/
<b>Frequency Range :</b>	2405 – 2475 MHz
<b>Number of Channels :</b>	15
<b>Type of Modulation :</b>	Digital (O-QPSK)
<b>User Frequency Adjustment :</b>	None
<b>Rated Output Power :</b>	11.8 mW
<b>Type of Power Supply :</b>	Primary Batteries (2x D-size Lithium Thionyl Chloride cells)
<b>Antenna Connector :</b>	None
<b>Number of antennas :</b>	1
<b>Antenna Diversity Supported :</b>	No
<b>Desktop Charger :</b>	N/A

#### Description of Test Item

The EUT is a 2.4GHz Transceiver in a Gas Leakage Detector.

The EUT contains the Nivis LLC, VN210 Module (FCC ID: SQB-NIVISMOD0003), but with different antennas.

## 1.2 Test conditions

Temperature:	20 - 24 °C
Relative humidity:	20 - 50 %
Normal test voltage:	7.2 V DC (2x Primary Batteries)

The values are the limit registered during the test period.

## 1.3 Test Engineer(s)

Frode Sveinsen  
Jan G. Eriksen

## 1.4 Description of modification for Modification Filing

Not applicable.

## 1.5 Family List Rational

Not Applicable.

## 1.6 Comments

All ports were populated during spurious emission measurements.

## 2 TEST REPORT SUMMARY

### 2.1 General

All measurements are traceable to national standards.

The tests were conducted for demonstrating compliance with FCC CFR 47 Part 15.247 and ISED RSS-247 Issue 2.

Tests were performed in accordance with ANSI C63.4-2014 and ANSI C63.10-2013.

Radiated tests were made in a semi-anechoic chamber at measuring distances of 3m and 10m.

A description of the test facility is on file with the FCC and ISED.

☐ New Submission

☒ Production Unit

☒ Class II Permissive Change

☐ Pre-production Unit

**DTS** Equipment Code

☐ Family Listing



#### THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".

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## 2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-247 Issue 2, RSS-GEN Issue 4 reference	Result
Spurious Emissions (Radiated)	15.247(c) 15.109(a) 15.209(a)	5.5 (RSS-247) 6.13 (RSS-GEN) 8.9 (RSS-GEN)	Complies

### 3 TEST RESULTS

#### 3.1 Spurious Emissions (Radiated)

Para. No.: 15.247 (c)

Test Results: Complies

Measurement Data:

Band-edge Long Antenna:

	Measured field strength (dBμV/m)		Limit	Margin	
	2390 MHz	2483.5 MHz	dBμV/m	dB	
Peak Detector	61.7	66.3	74	12.3	7.7
Average Detector	41.7	46.3	54	12.3	7.7

Band-edge Short Antenna:

	Measured field strength (dBμV/m)		Limit	Margin	
	2390 MHz	2483.5 MHz	dBμV/m	dB	
Peak Detector	57.9	60.6	74	16.1	13.4
Average Detector	37.9	40.6	54	16.1	13.4

Average Detector values are measured with Peak Detector and corrected for Duty Cycle.

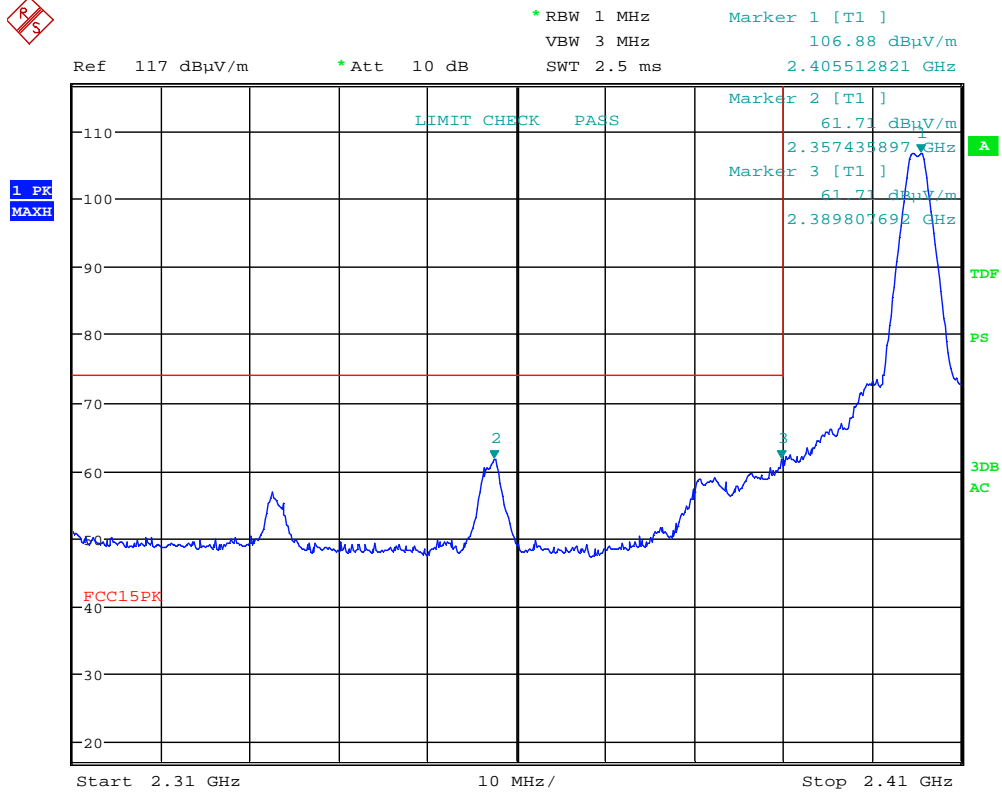
See attached plots.

**Duty Cycle Correction Factor Calculation:**

Duty Cycle = slot length / frame length

Duty Cycle Correction factor =  $-20 \times \log(\text{Duty Cycle}) = 27.5 \text{ dB}$

**Maximum Duty Cycle Correction Factor according to Para 15.35 (b): 20 dB**



Date: 26.JAN.2017 10:52:53

**Lower Band Edge, 2405 MHz, Peak (Max: VP)**



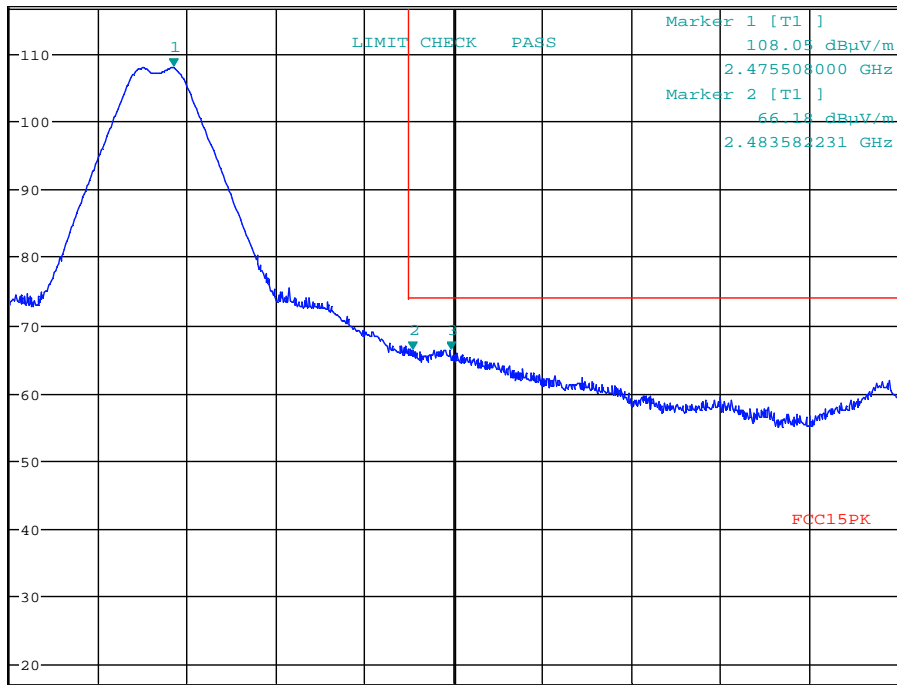


**MARKER 3**  
2.484880308 GHz  
Ref 117 dBμV/m \*Att 10 dB

\*RBW 1 MHz  
VBW 3 MHz  
SWT 15 ms

Marker 3 [T1 ]  
66.27 dBμV/m  
2.484880308 GHz

1 PK  
MAXH



Date: 26.JAN.2017 11:12:22

**Upper Band Edge, 2475 MHz, Peak (Max: VP)**



**MARKER 1**

2.40552 GHz

\* RBW 1 MHz

\* VBW 3 MHz

SWT 15 ms

Marker 1 [T1 ]

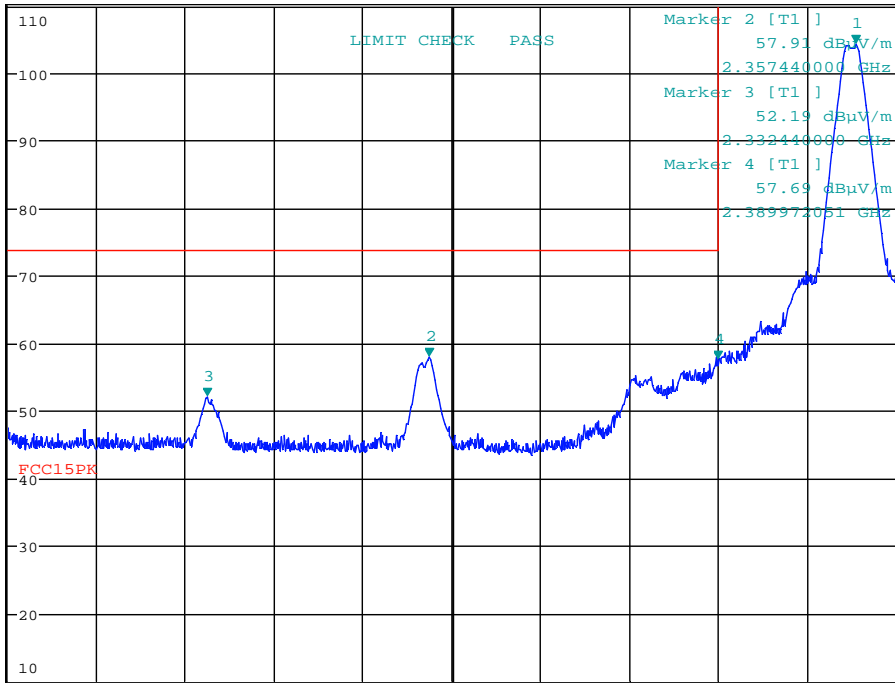
104.13 dBuV/m

2.405520000 GHz

Ref 110 dBuV/m

\* Att 10 dB

1 PK  
MAXH



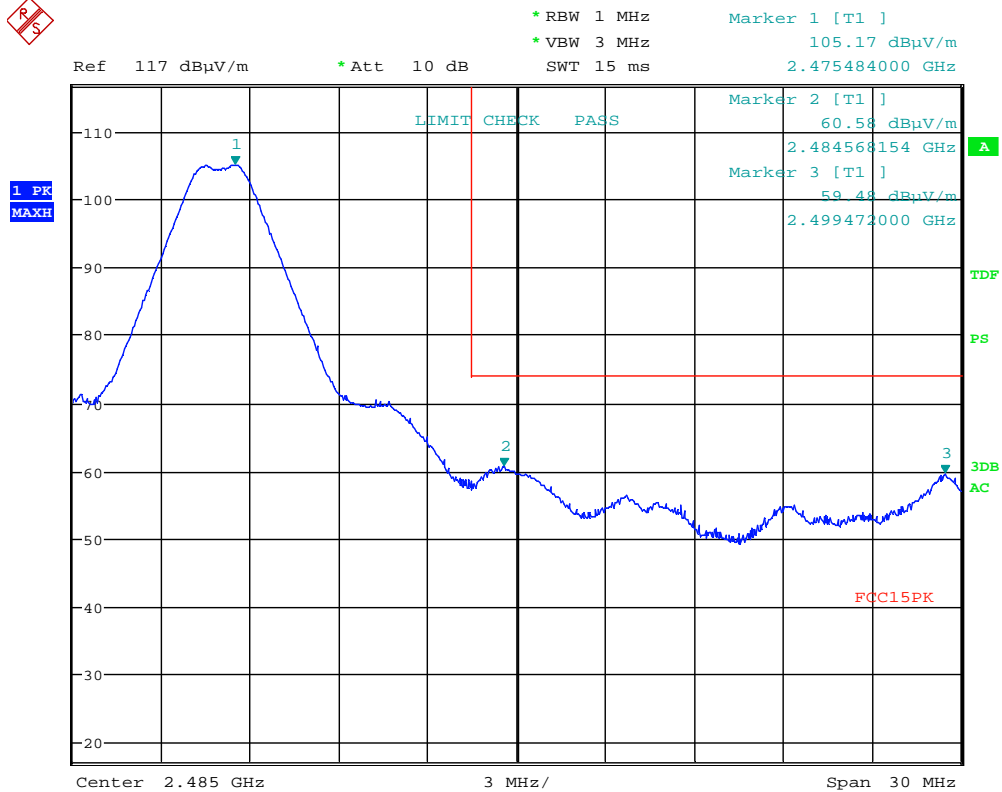
Start 2.31 GHz

10 MHz /

Stop 2.41 GHz

Date: 26.JAN.2017 12:47:04

**Lower Band Edge, 2405 MHz, Peak, Short Antenna (Max: VP)**



Date: 26.JAN.2017 12:35:54

**Lower Band Edge, 2475 MHz, Peak, Short Antenna (Max: VP)**

**Radiated emission 30 – 1000 MHz.**

Detector: Peak

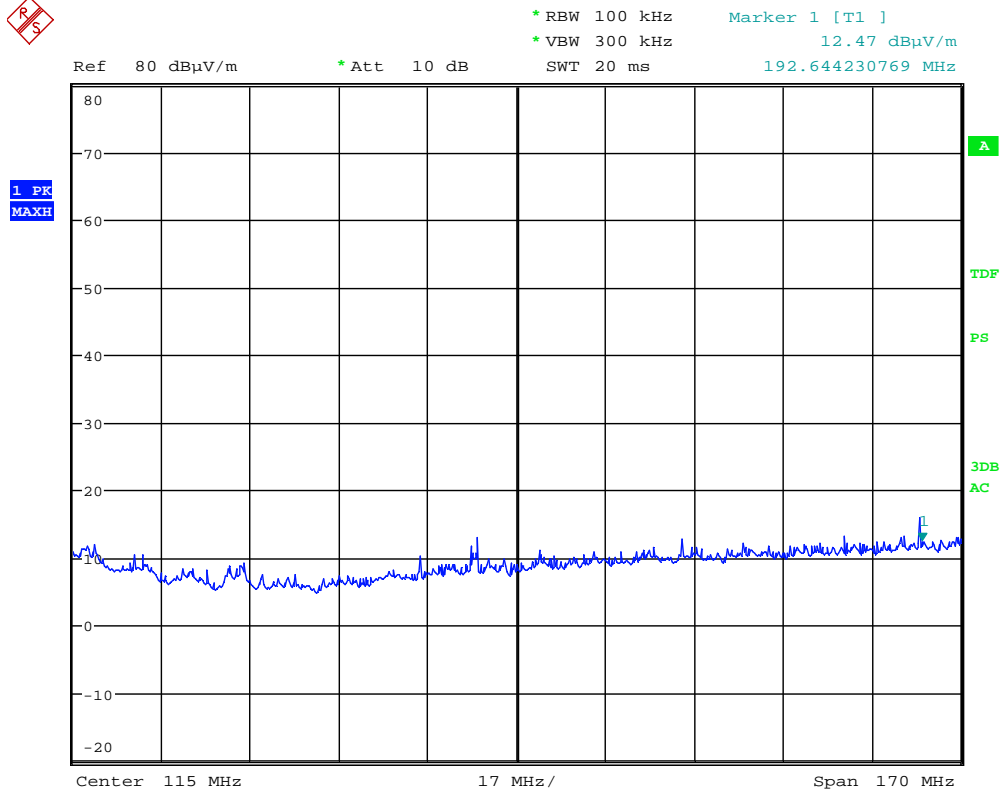
Measuring distance 3m

Measured to ANSI C63.4-2014

Tested with radio active.

All emissions in restricted bands were below the limits, even when measured with Peak Detector.

See attached plots.



Date: 11.JAN.2017 14:00:24

**Radiated Emissions, 30 -200MHz, 2440MHz, Short Antenna, VP**



**MARKER 1**

743.5897436 MHz

Ref 66 dBuV/m

\*Att 10 dB

\*RBW 100 kHz

\*VBW 10 MHz

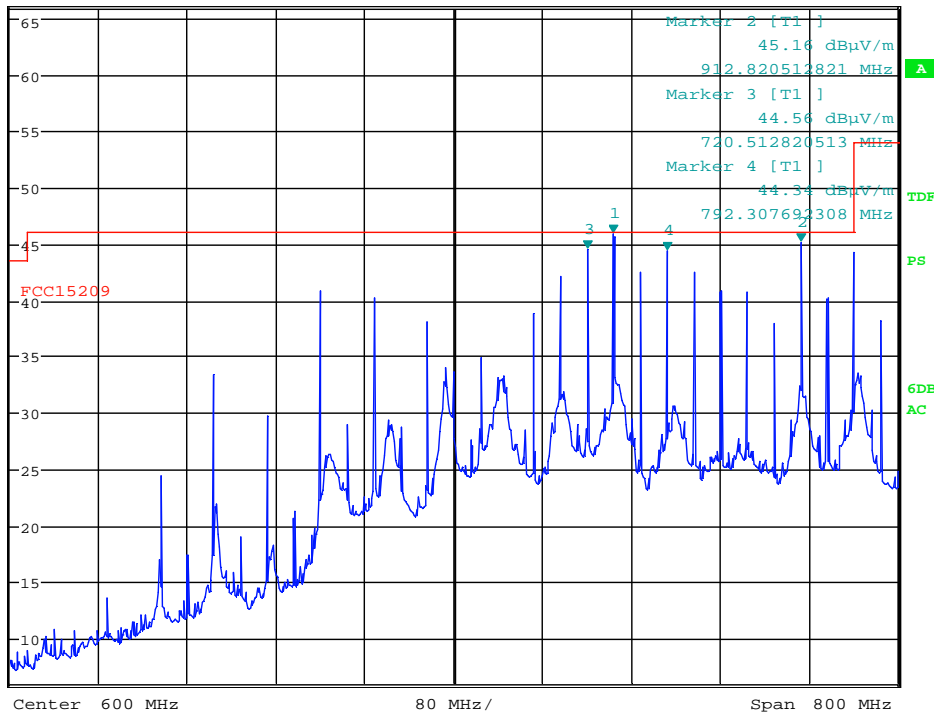
SWT 195 ms

Marker 1 [T1]

45.93 dBuV/m

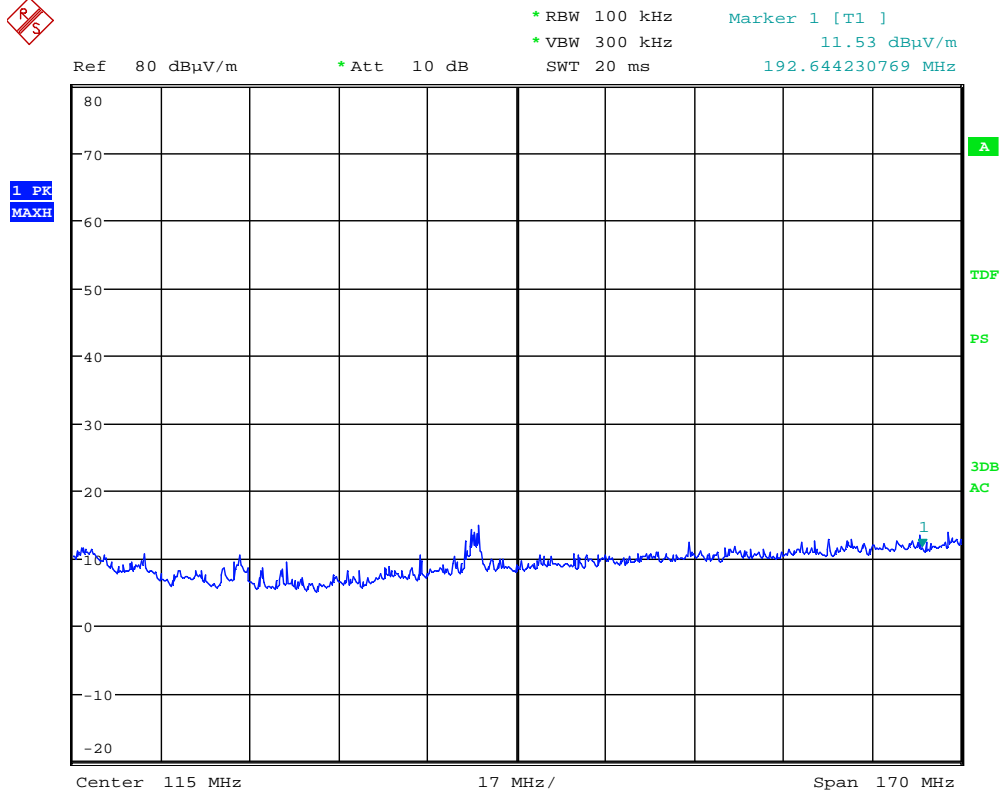
743.589743590 MHz

1 PK  
MAXH



Date: 11.JAN.2017 16:17:34

**Radiated Emissions, 200 -1000MHz, 2440MHz, Short Antenna, VP**



Date: 11.JAN.2017 13:58:15

### Radiated Emissions, 30 -200MHz, 2440MHz, Long Antenna, VP



MARKER 1

935.8974359 MHz

\* RBW 100 kHz

Marker 1 [T1]

\* VBW 10 MHz

50.44 dBuV/m

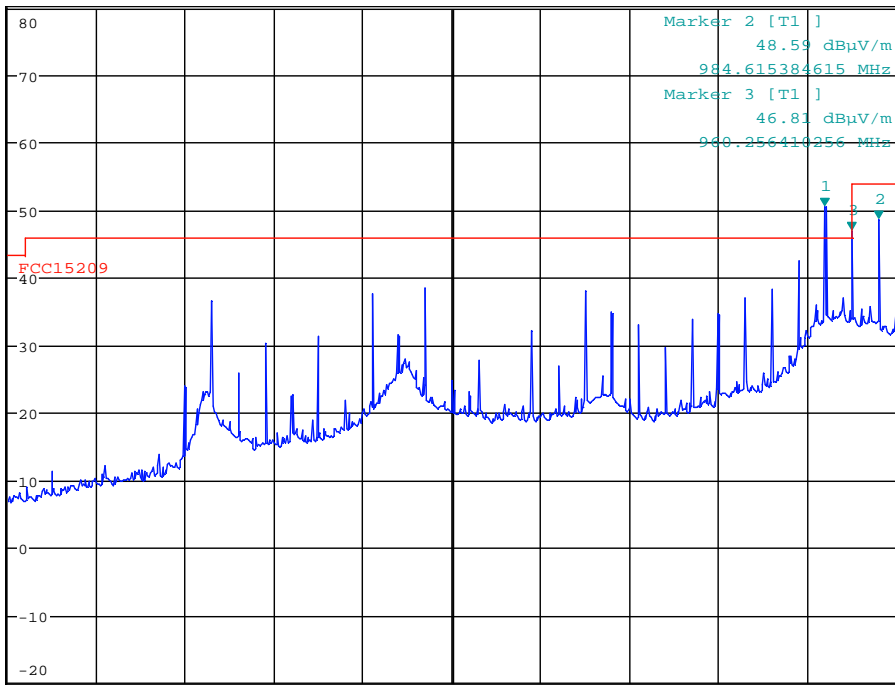
Ref 80 dBuV/m

\* Att 10 dB

SWT 195 ms

935.897435897 MHz

1 PK  
MAXH



Center 600 MHz

80 MHz /

Span 800 MHz

Date: 11.JAN.2017 17:06:59

**Radiated Emissions, 200 -1000MHz, 2440MHz, Long Antenna, VP**



### 3.2 Radiated Emissions, 1-25 GHz

Measuring distance: 3m (1 – 8.5 GHz)  
1m (8.5 – 18 GHz)

A pre-scan was performed above 18 GHz and no spurious emissions were detected.

#### Peak Detector:

Frequency	RF channel	Dist. corr. factor	Field strength, Peak Detector, 3m	Limit	Margin
GHz	L,M,H	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
All freqs	L,M,H	0	< 62	74	>12

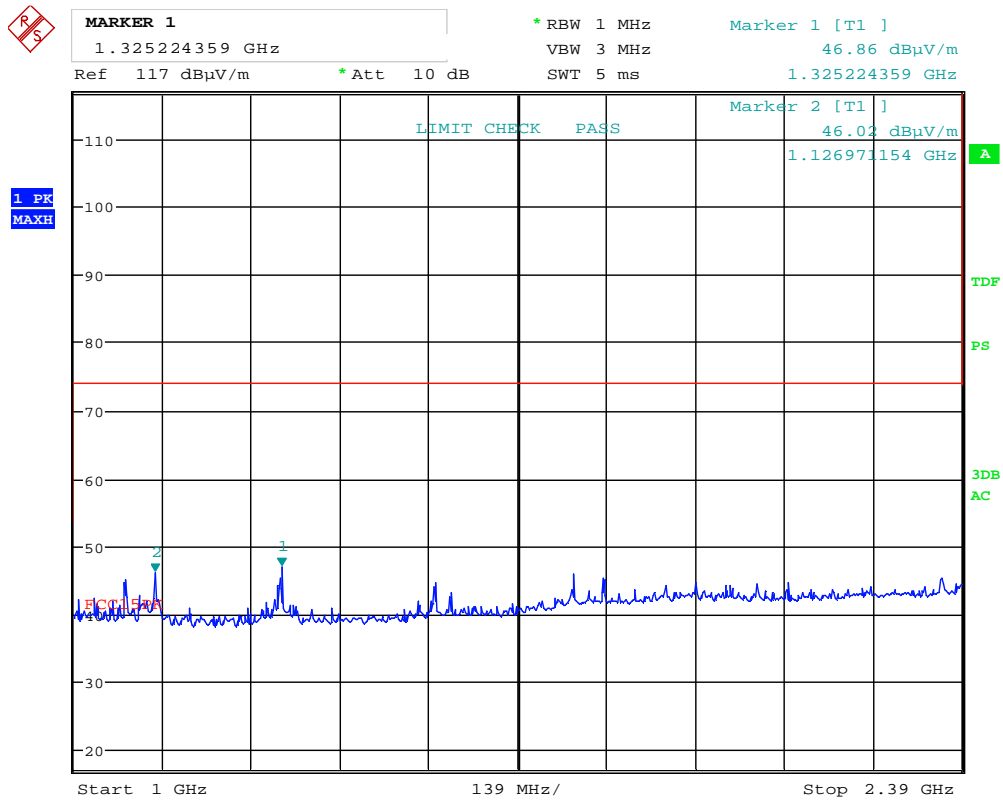
#### Average Detector:

Frequency	RF channel	Dist. corr. factor	Field strength, Peak Detector, 3m	Duty cycle corr. factor	Limit	Margin
GHz	L,M,H	dB	dB $\mu$ V/m	dB	dB $\mu$ V/m	dB
All freqs	L,M,H	/	< 42	20	54	>12

Average Detector values are calculated from Peak values by Duty Cycle Correction Factor.

Antenna factor, amplifier gain and cable loss are included in spectrum analyzer "Transducer factor".

See plots.



Date: 26.JAN.2017 11:04:18

**Radiated Emissions, 1000 -2390MHz, 2405MHz, HP**



MARKER 1

2.069230769 GHz

Ref 117 dBµV/m

\*Att 10 dB

\*RBW 1 MHz

VBW 3 MHz

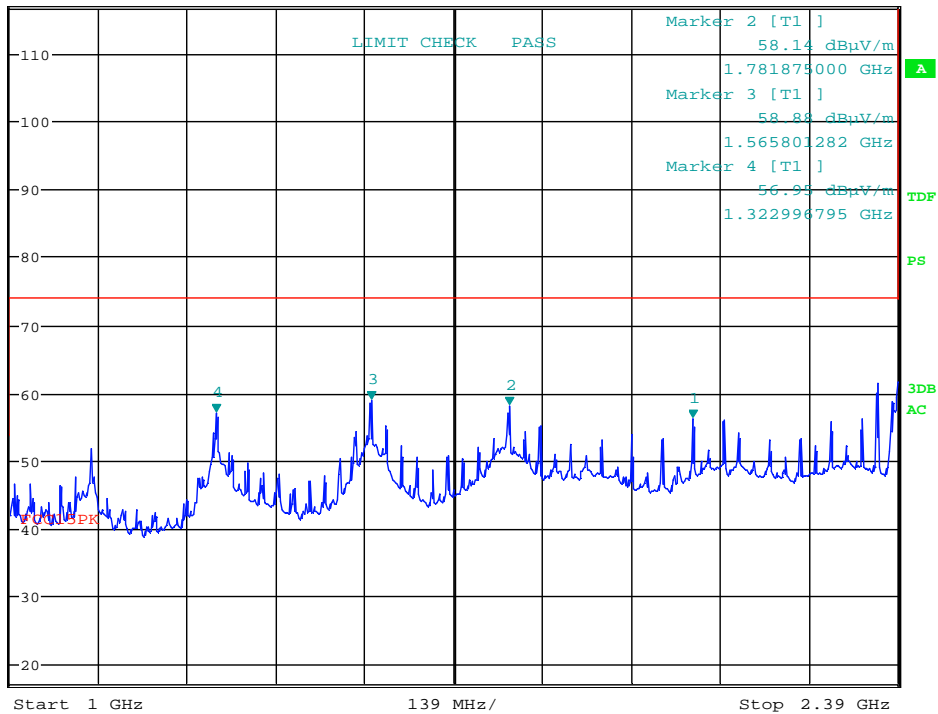
SWT 5 ms

Marker 1 [T1]

56.27 dBµV/m

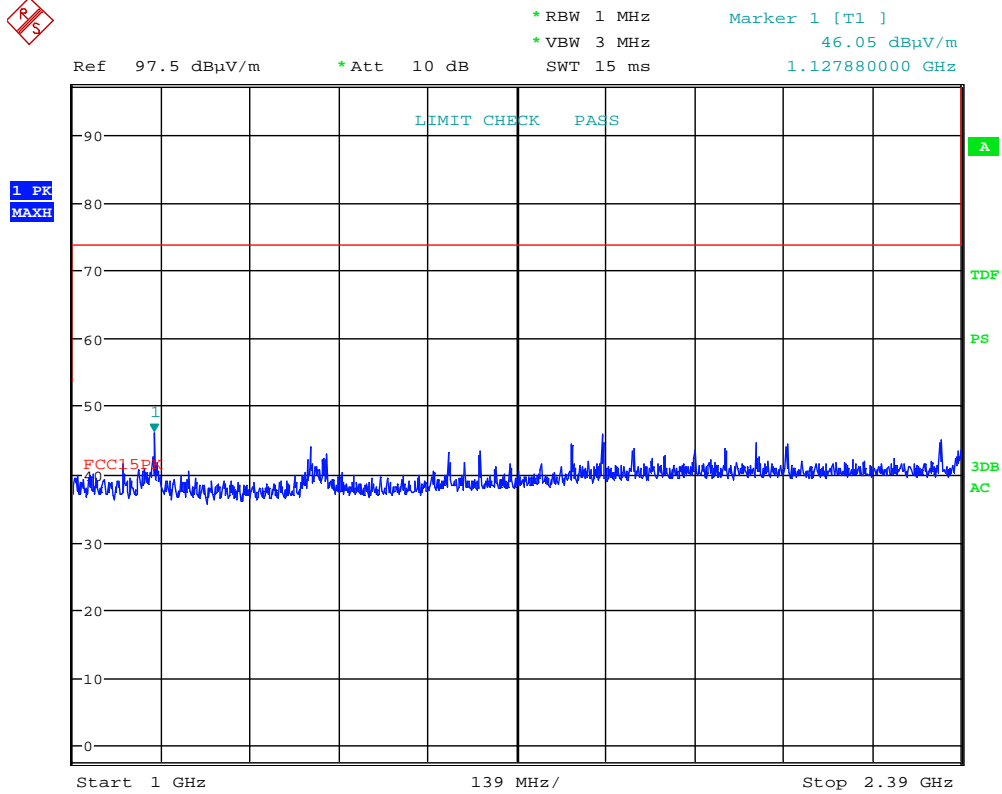
2.069230769 GHz

1 PK  
MAXH



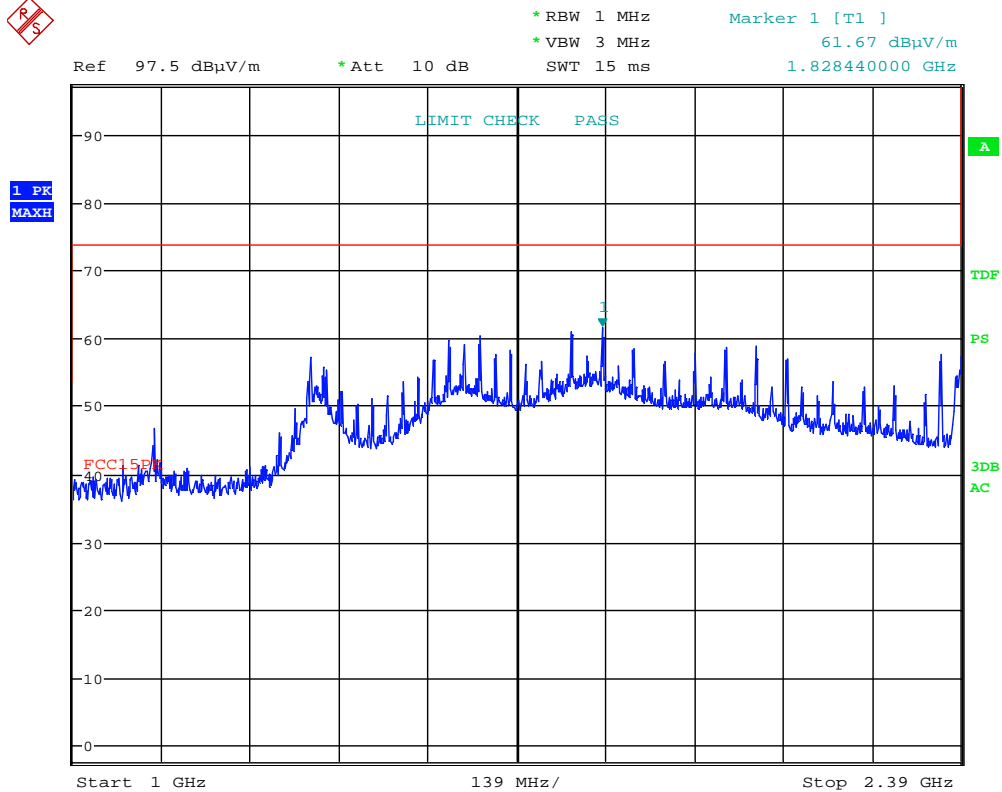
Date: 26.JAN.2017 11:01:14

### Radiated Emissions, 1000 -2390MHz, 2405MHz, VP



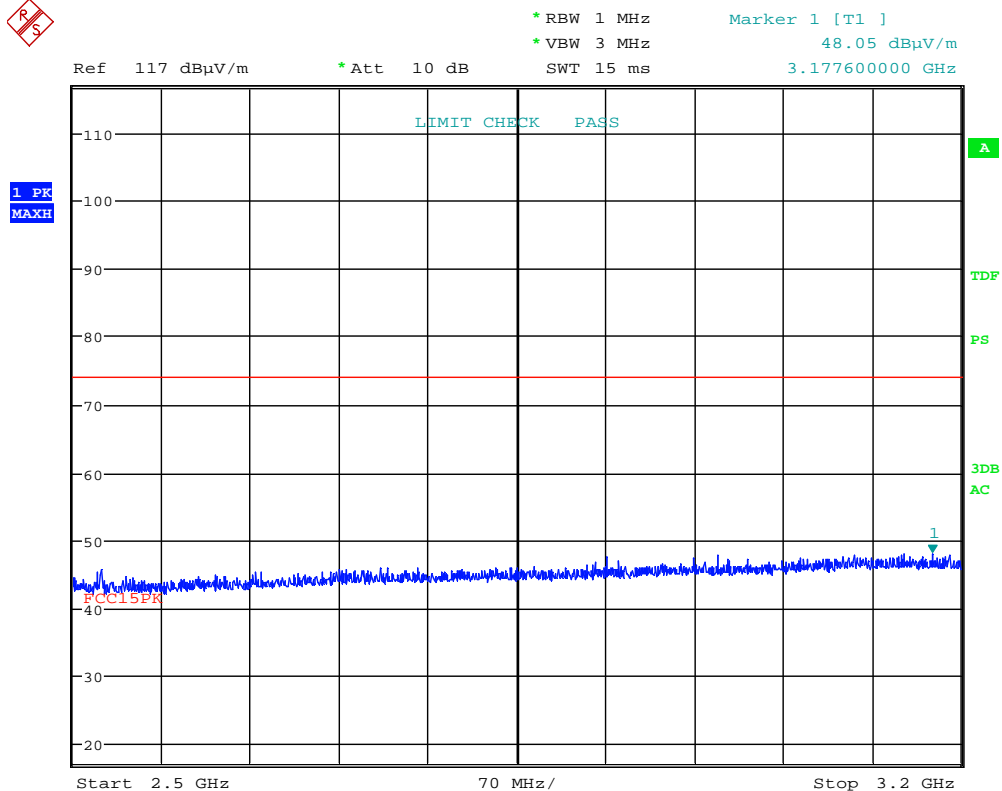
Date: 26.JAN.2017 12:52:47

### Radiated Emissions, 1000 -2390MHz, 2405MHz, HP, Short Antenna



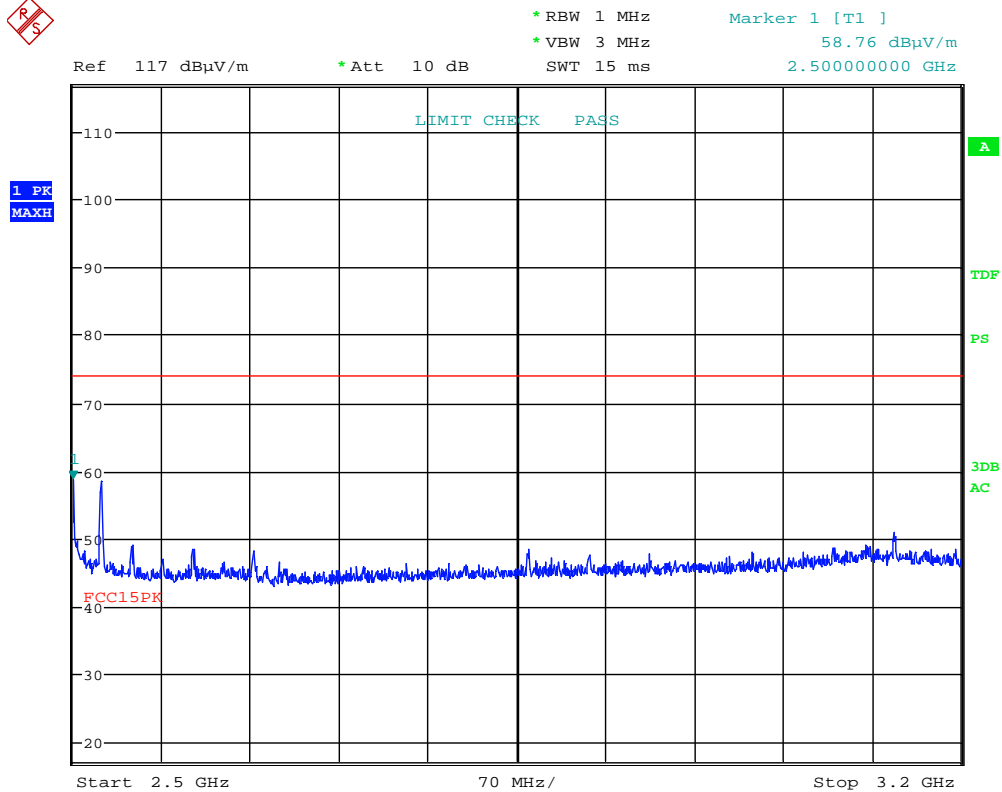
Date: 26.JAN.2017 12:50:56

**Radiated Emissions, 1000 -2390MHz, 2405MHz, VP, Short Antenna**



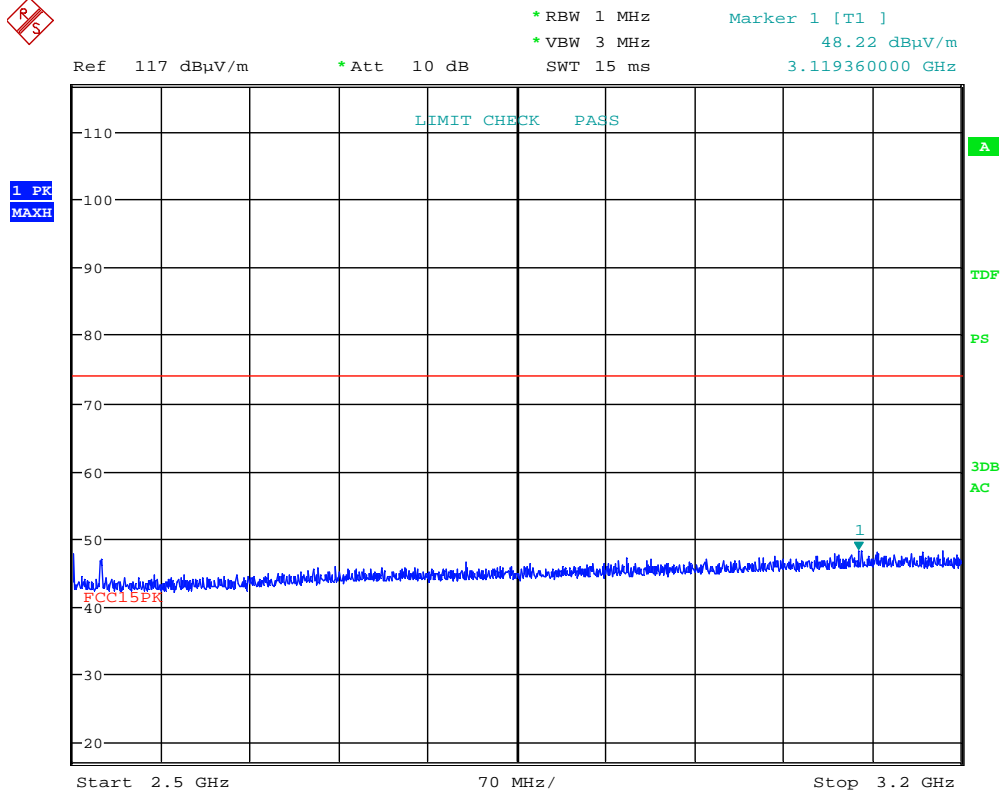
Date: 26.JAN.2017 11:23:13

**Radiated Emissions, 2500 -3200MHz, 2475MHz, HP**



Date: 26.JAN.2017 11:21:21

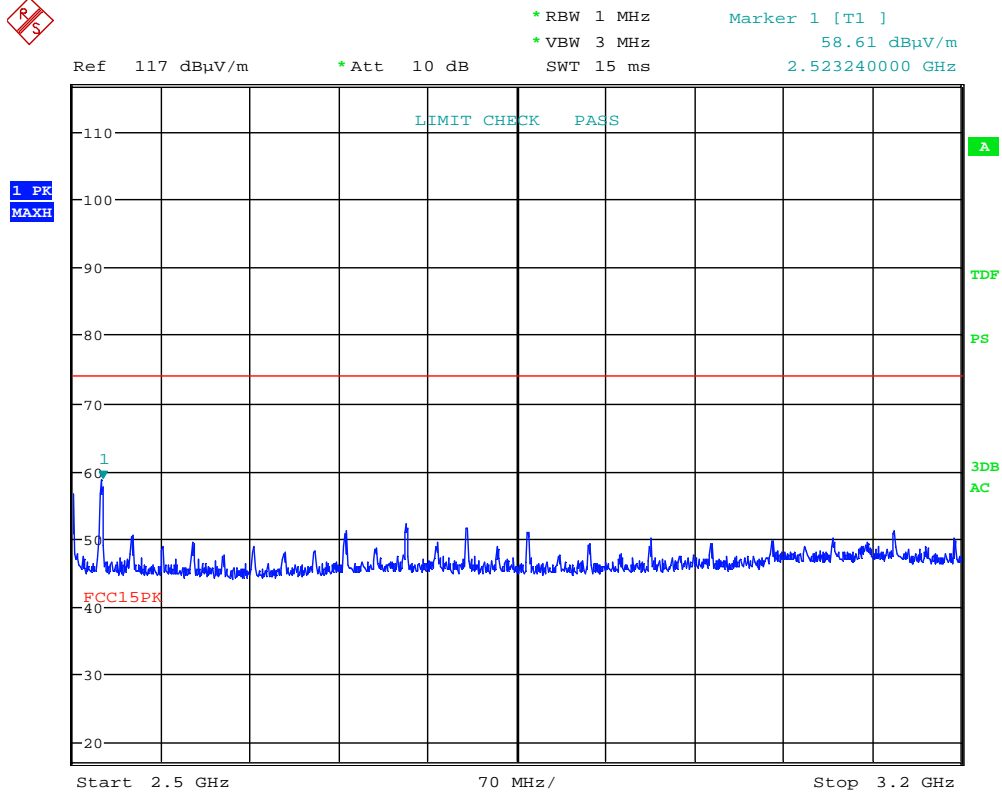
### Radiated Emissions, 2500 -3200MHz, 2475MHz, VP



Date: 26.JAN.2017 12:26:46

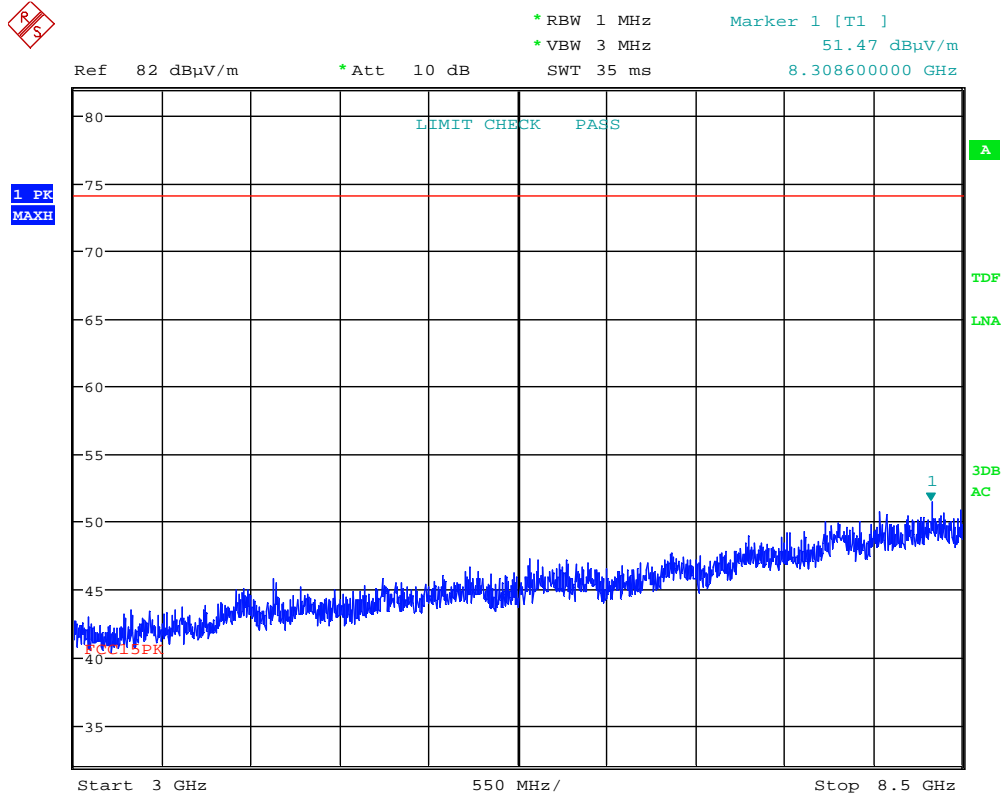
### Radiated Emissions, 2500 -3200MHz, 2475MHz, HP, Short Antenna





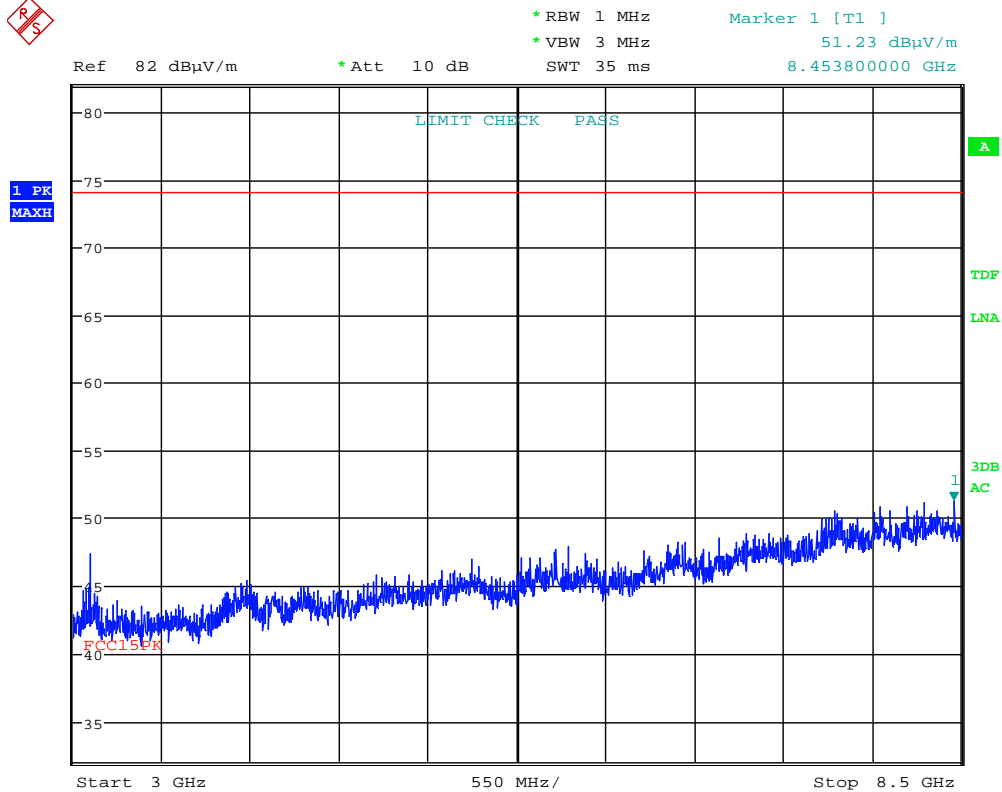
Date: 26.JAN.2017 12:24:54

### Radiated Emissions, 2500 -3200MHz, 2475MHz, VP, Short Antenna



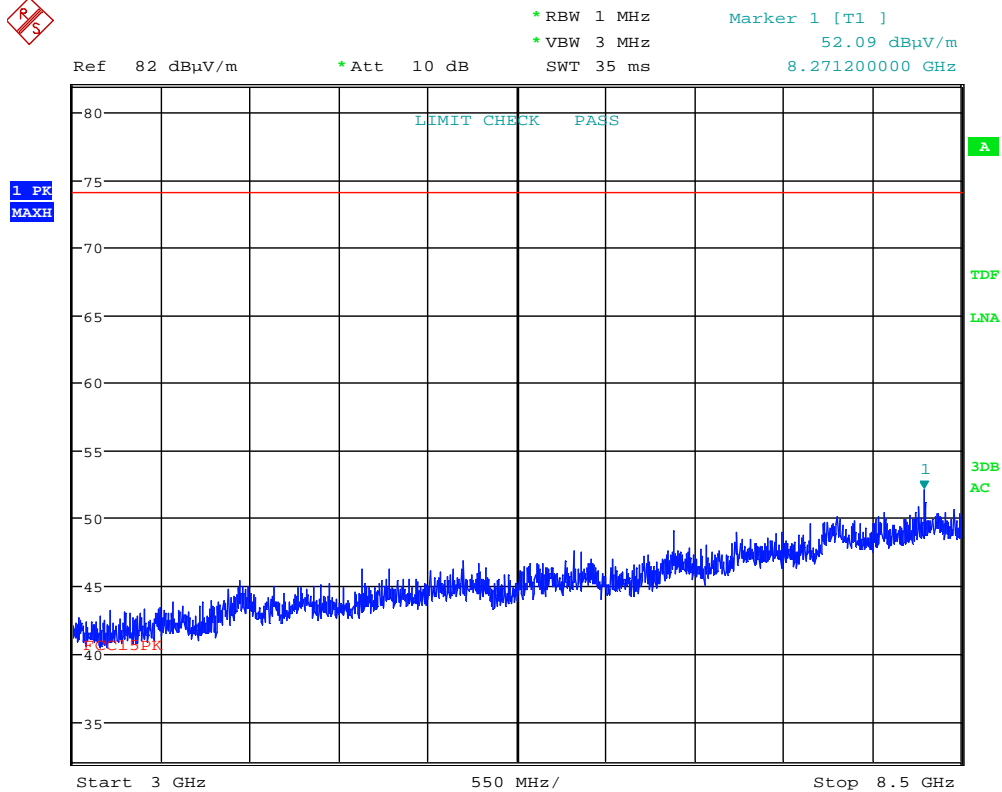
Date: 26.JAN.2017 12:09:09

**Radiated Emissions, 3000 -8500MHz, 2440MHz, HP**



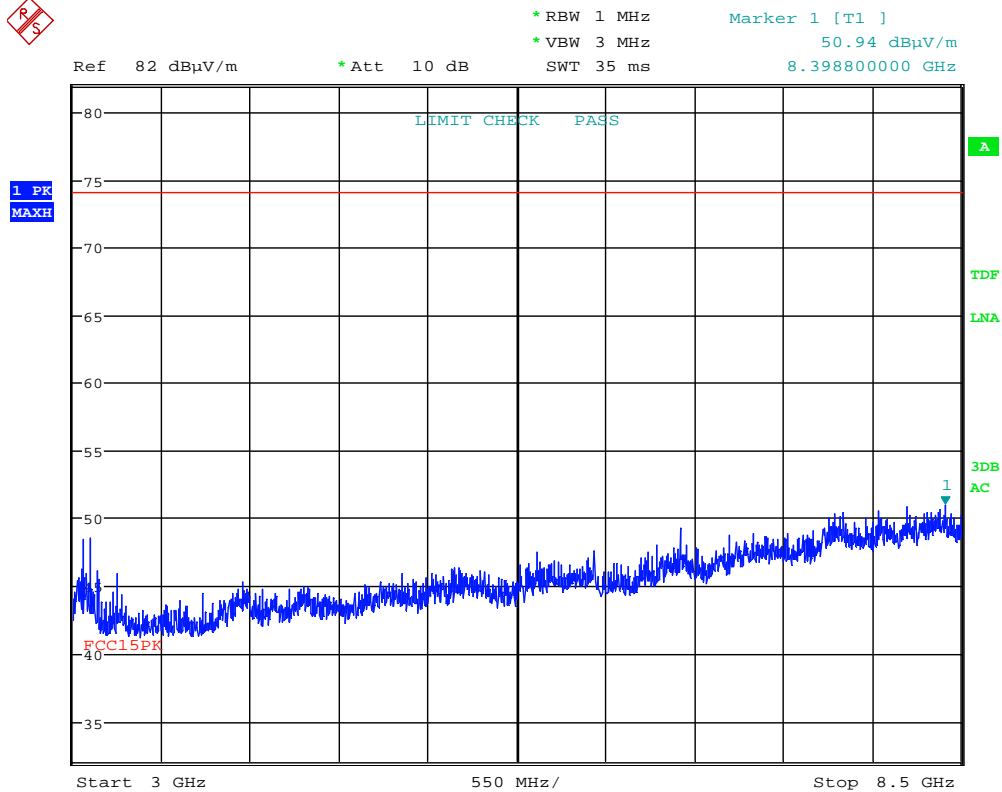
Date: 26.JAN.2017 12:07:17

### Radiated Emissions, 3000 -8500MHz, 2440MHz, VP



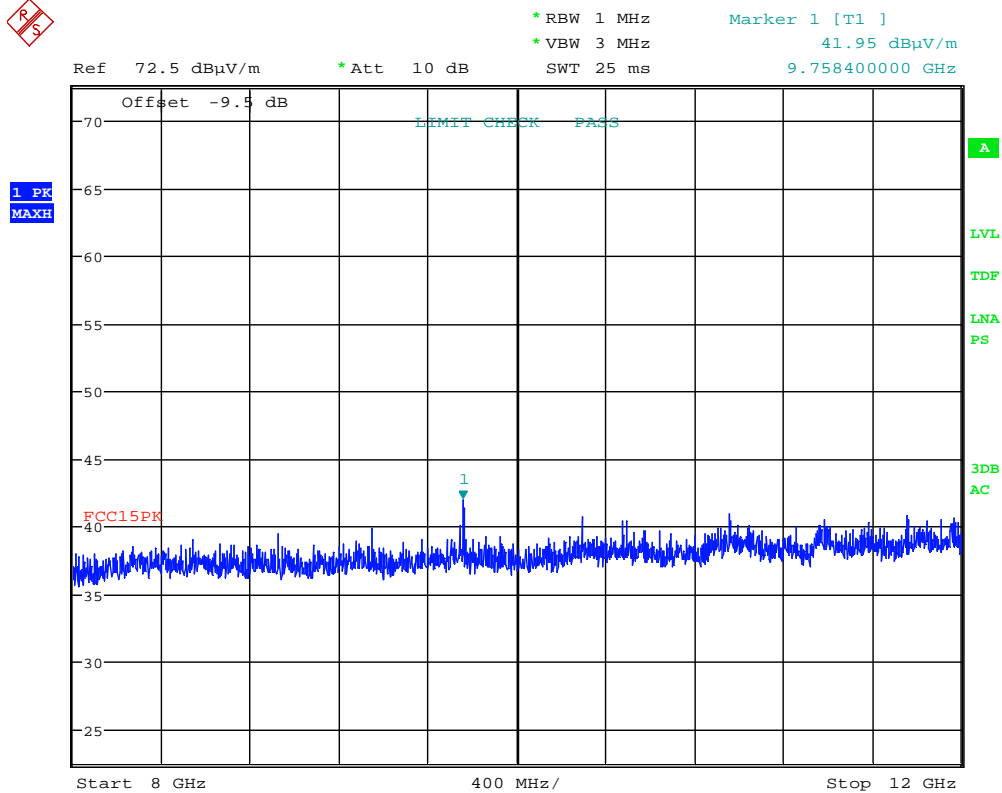
Date: 26.JAN.2017 12:15:59

**Radiated Emissions, 3000 -8500MHz, 2440MHz, HP, Short Antenna**



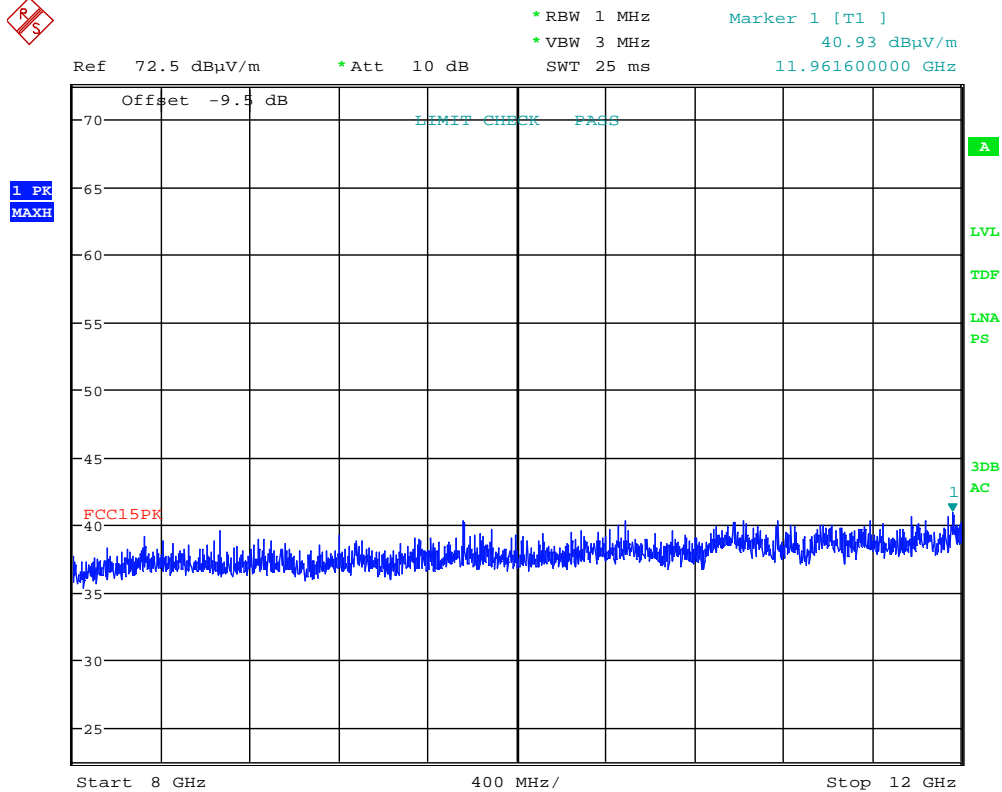
Date: 26.JAN.2017 12:14:06

**Radiated Emissions, 3000 -8500MHz, 2440MHz, VP, Short Antenna**



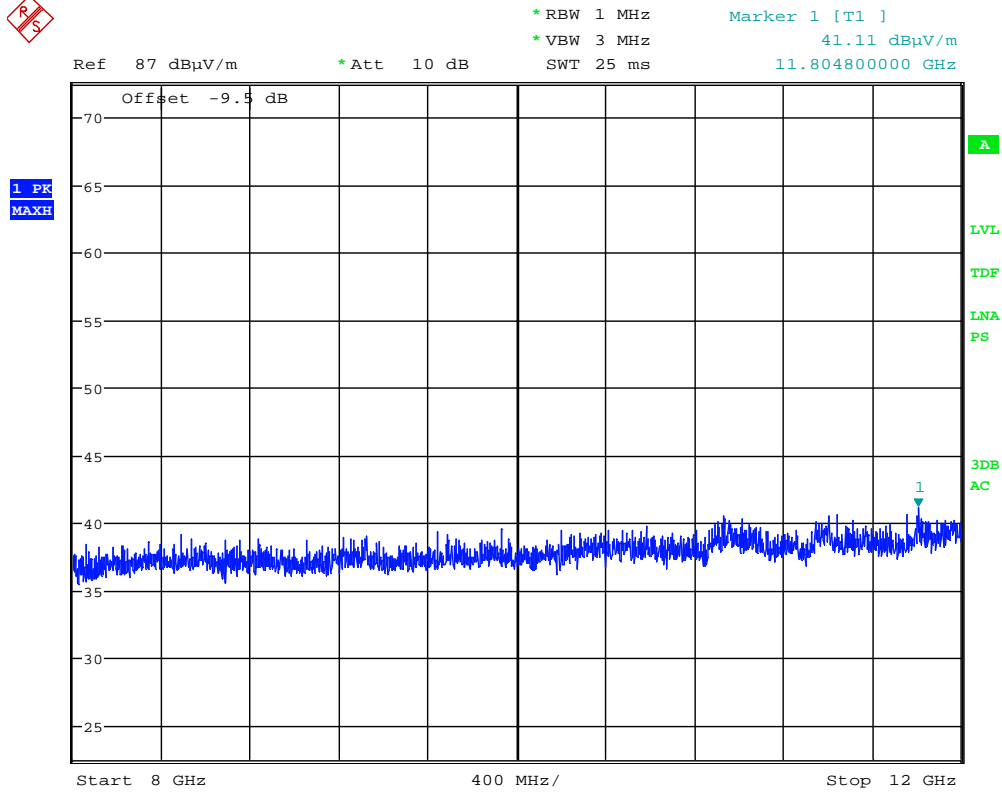
Date: 26.JAN.2017 13:31:34

**Radiated Emissions, 8000 -12000MHz, 2440MHz, HP, 1m**



Date: 26.JAN.2017 13:29:29

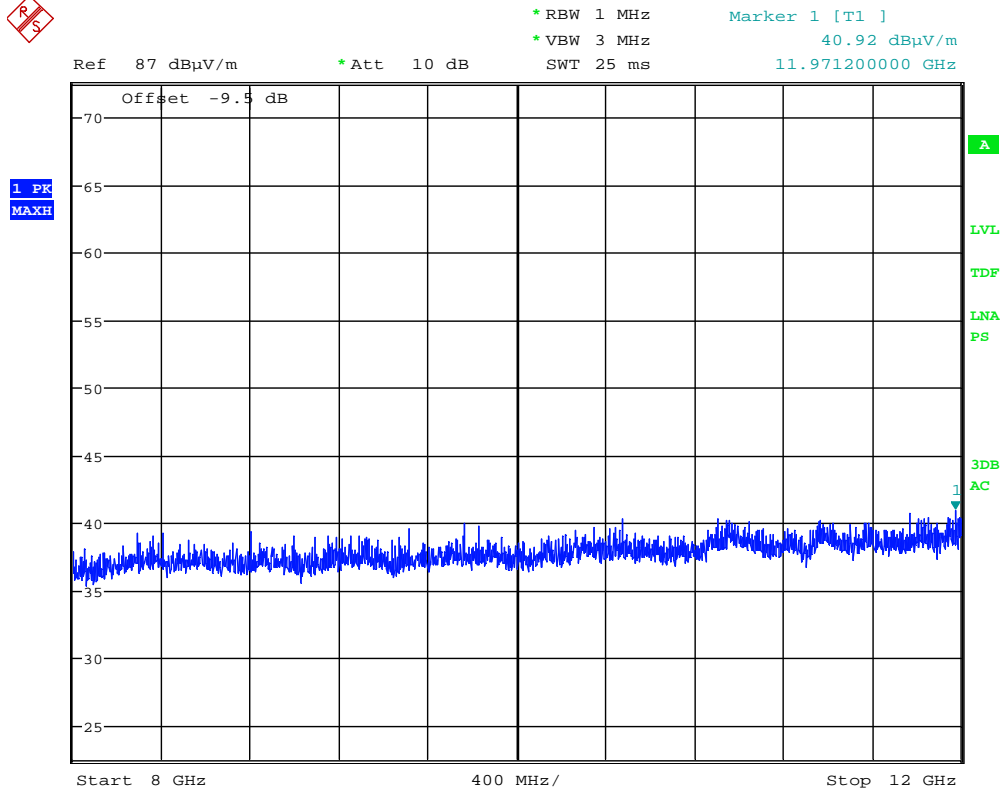
**Radiated Emissions, 8000 -12000MHz, 2440MHz, VP, 1m**



Date: 26.JAN.2017 13:11:10

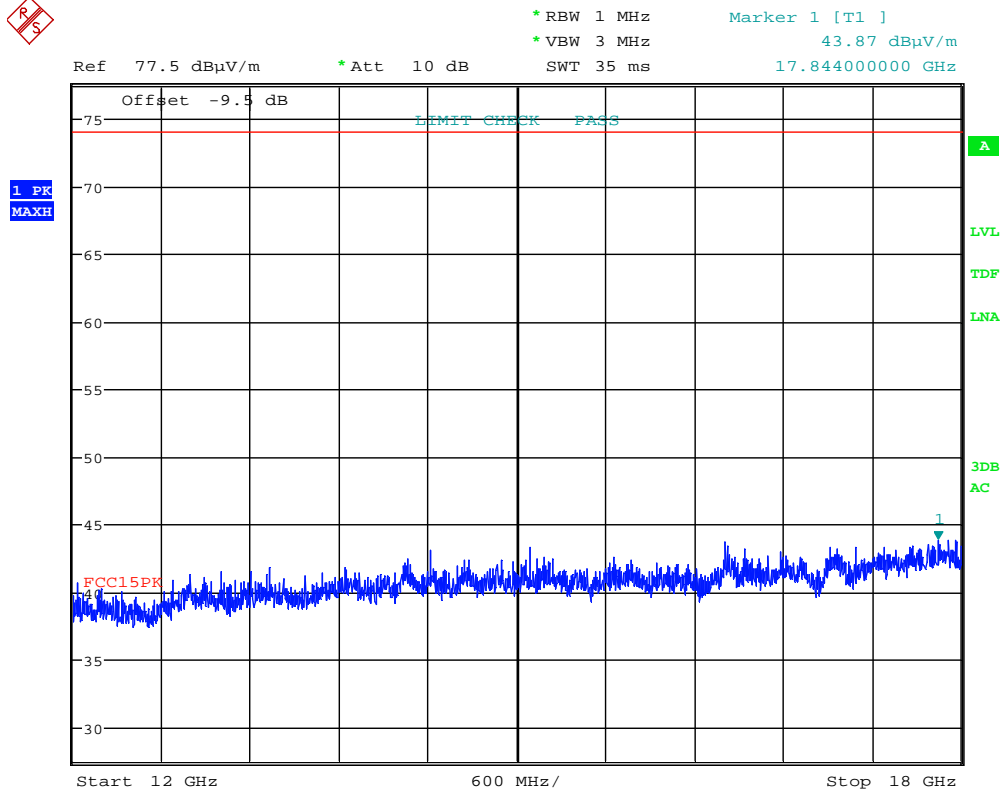
**Radiated Emissions, 8000 -12000MHz, 2440MHz, HP, Short Antenna, 1m**





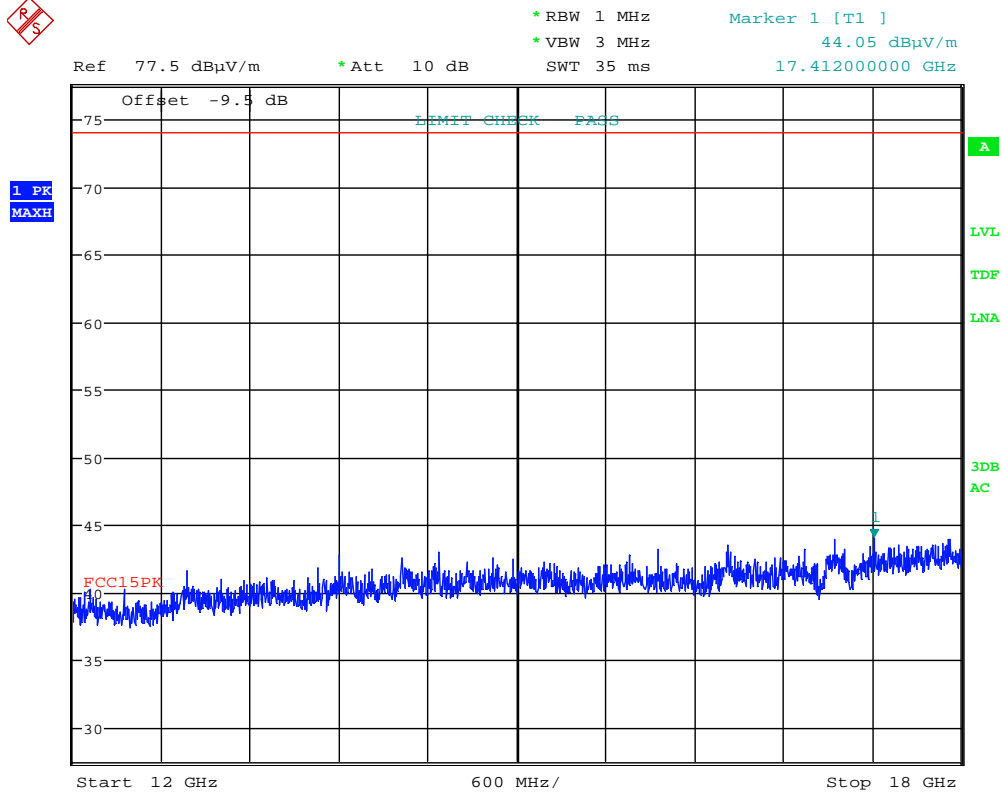
Date: 26.JAN.2017 13:09:03

**Radiated Emissions, 8000 -12000MHz, 2440MHz, VP, Short Antenna, 1m**



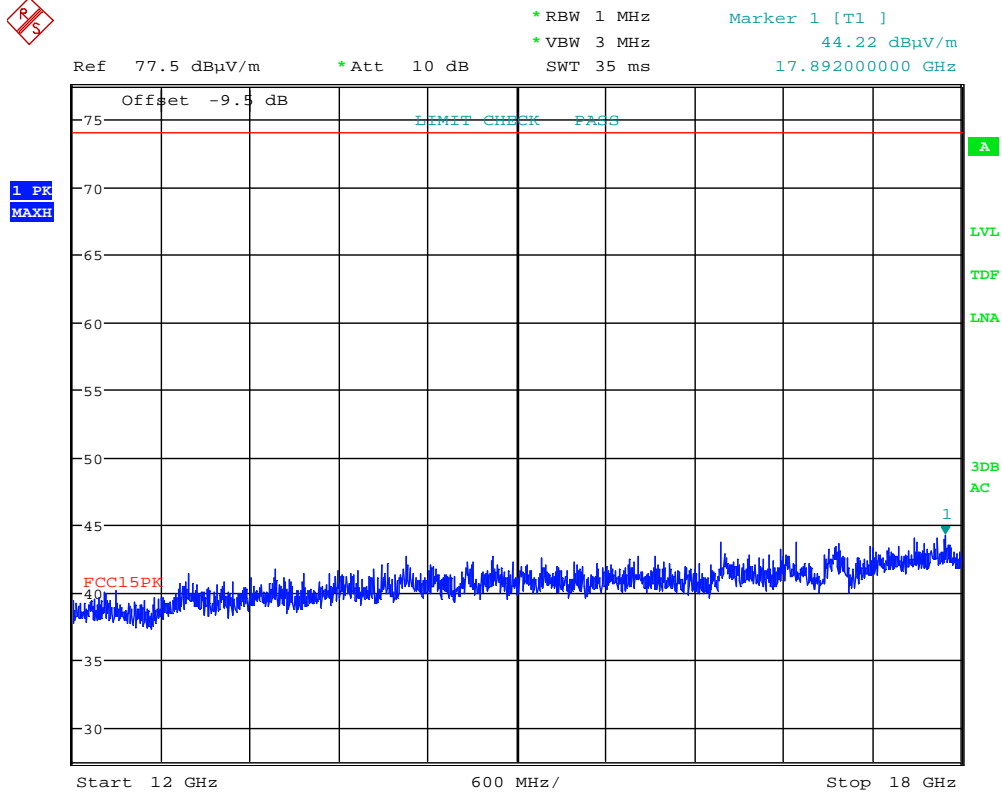
Date: 26.JAN.2017 13:26:10

**Radiated Emissions, 12000 -18000MHz, 2440MHz, HP, 1m**



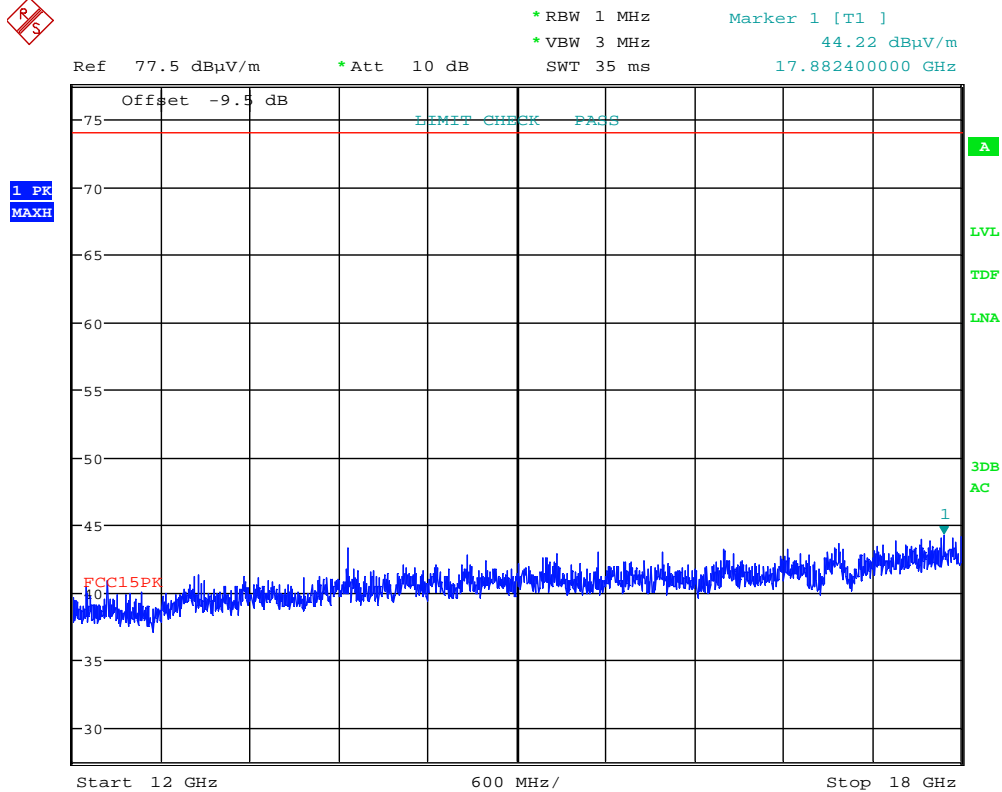
Date: 26.JAN.2017 13:24:20

**Radiated Emissions, 12000 -18000MHz, 2440MHz, VP, 1m**



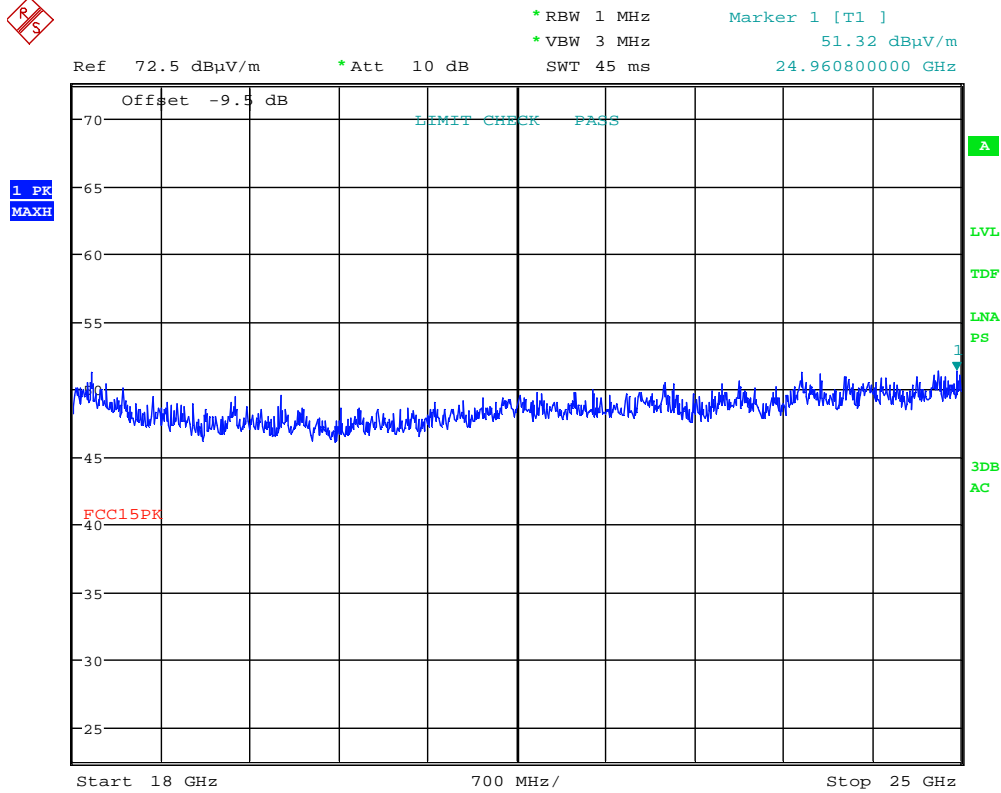
Date: 26.JAN.2017 13:20:31

**Radiated Emissions, 12000 -18000MHz, 2440MHz, HP, Short Antenna, 1m**



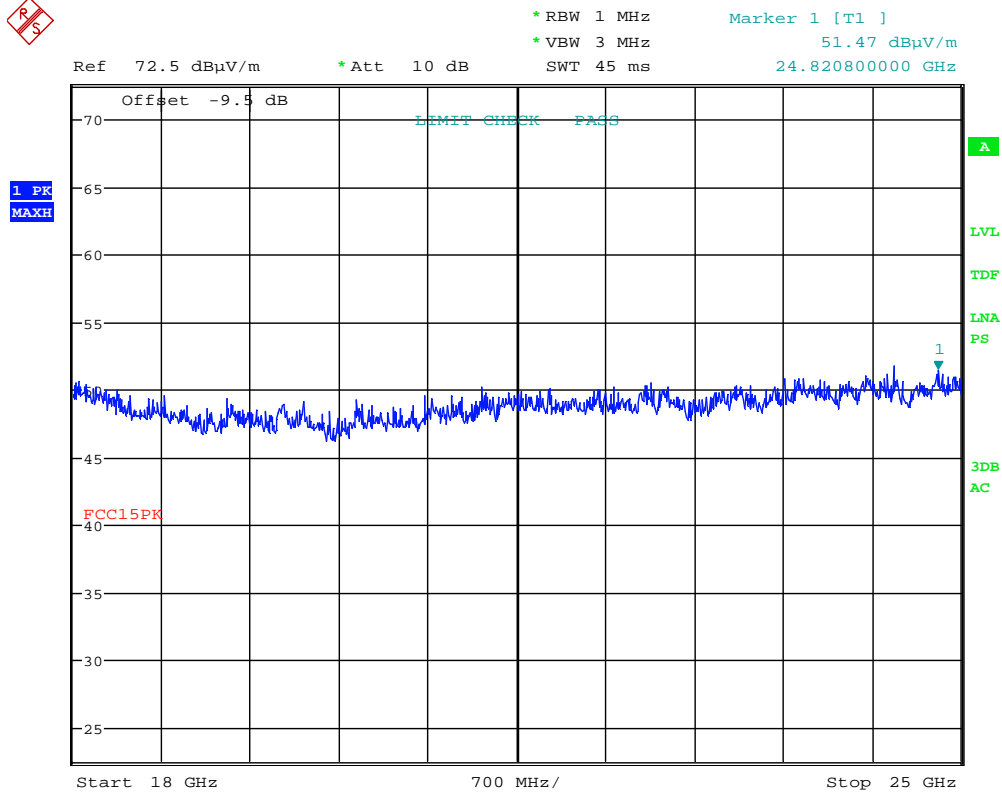
Date: 26.JAN.2017 13:18:41

**Radiated Emissions, 12000 -18000MHz, 2440MHz, VP, Short Antenna, 1m**



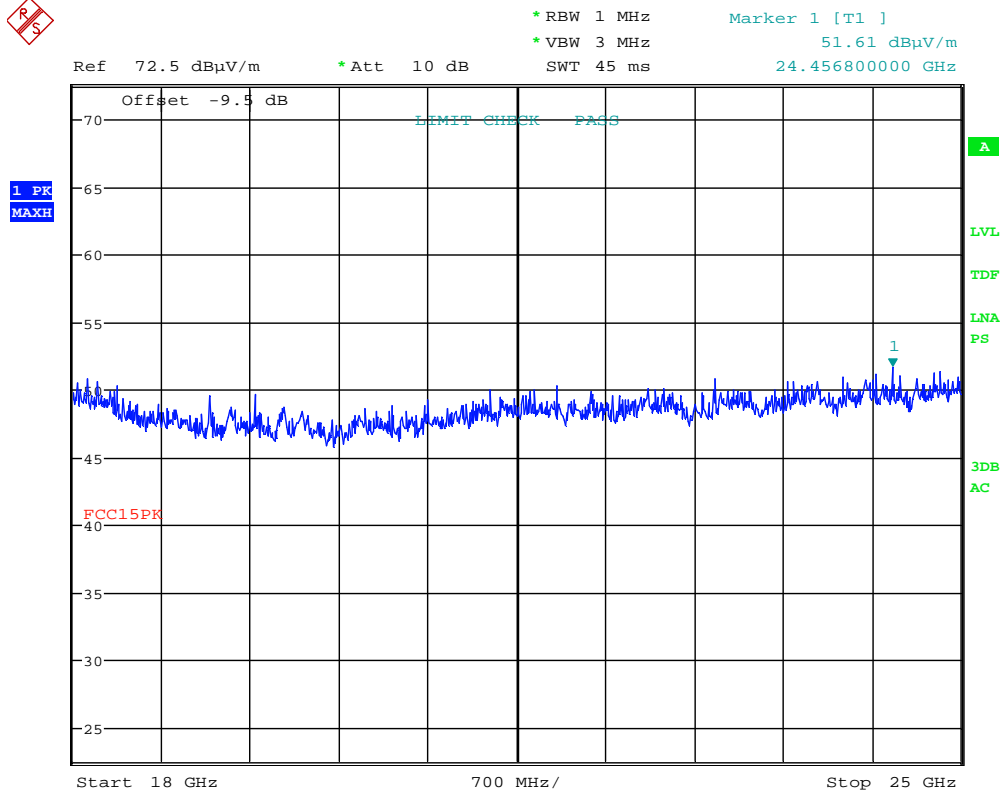
Date: 26.JAN.2017 13:52:56

**Radiated Emissions, 18000 -25000MHz, 2440MHz, HP, 1m**



Date: 26.JAN.2017 13:50:07

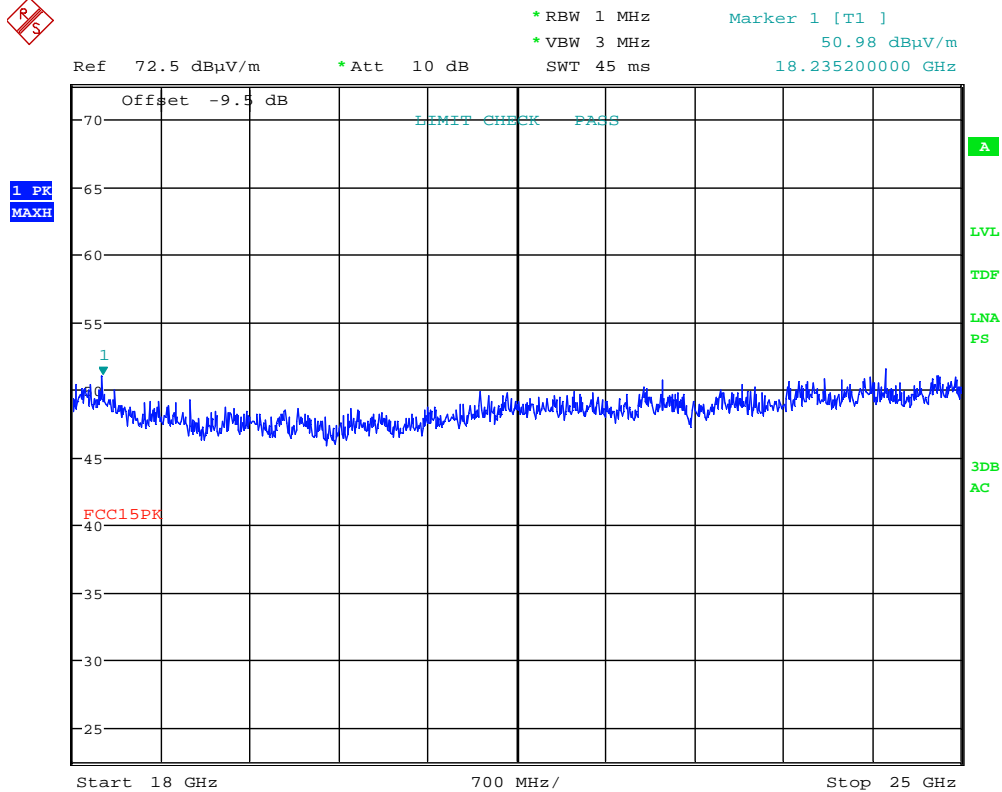
**Radiated Emissions, 18000 -25000MHz, 2440MHz, VP, 1m**



Date: 26.JAN.2017 13:59:01

**Radiated Emissions, 18000 -25000MHz, 2440MHz, HP, Short Antenna, 1m**





Date: 26.JAN.2017 13:56:34

**Radiated Emissions, 18000 -25000MHz, 2440MHz, VP, Short Antenna, 1m**

## 4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		Uncertainty
Output Power		±0.5 dB
Power Spectral Density		±0.5 dB
Out of Band Emissions, Conducted	< 3.6 GHz	±0.6 dB
	> 3.6 GHz	±0.9 dB
Spurious Emissions, Radiated	< 1 GHz	±2.5 dB
	> 1 GHz	±2.2 dB
Emission Bandwidth		±4 %
Power Line Conducted Emissions		+2.9 / -4.1 dB
Spectrum Mask Measurements	Frequency	±5 %
	Amplitude	±1.0 dB
Frequency Error		±0.6 ppm
Temperature Uncertainty		±1 °C

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

## 5 LIST OF TEST EQUIPMENT

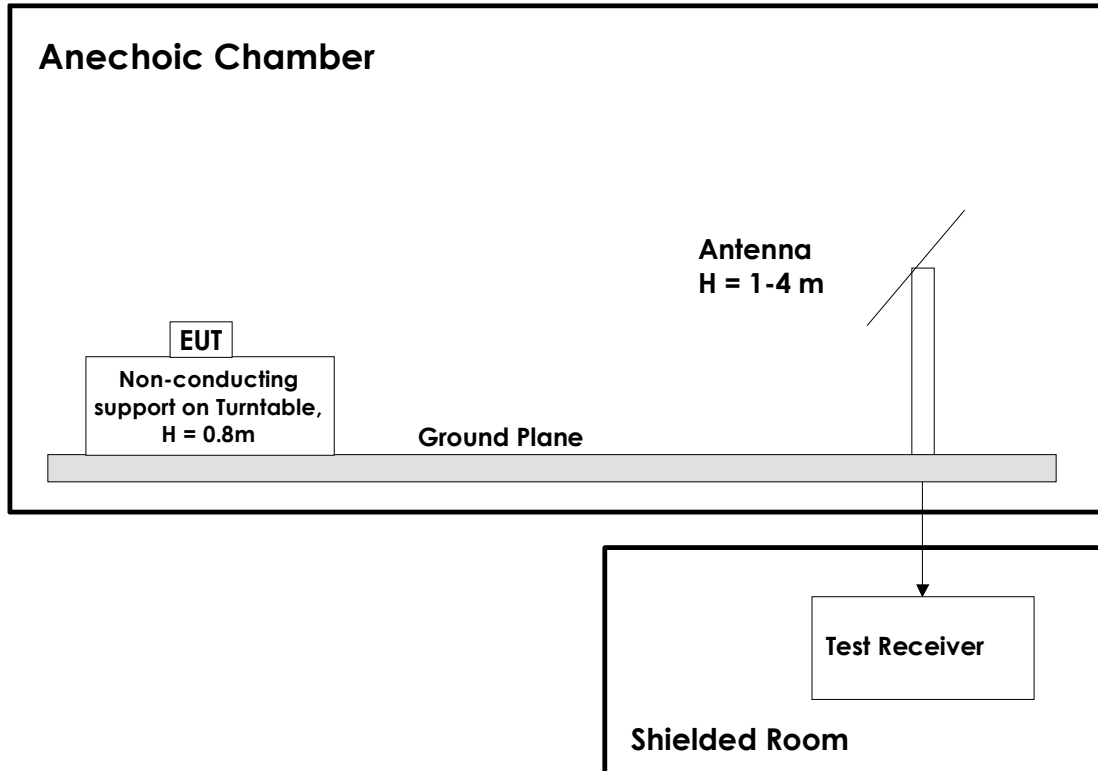
To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2016.12	2017.12
2	6810.17B	Attenuator	Suhner	LR 1669	Cal b4 use	
3	6HC3000/18000	Highpass Filter	Trilithic	LR 1614	Cal b4 use	
4	317	Preamplifier	Sonoma Instrument	LR 1687	2016.05	2017.05
5	3115	Horn Antenna	EMCO	LR 1330	2016.10	2021.10
6	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2016-09	2017-09
7	PM7320X	Antenna Horn	Sivers Lab	LR 102	2009.01	2019.01
8	DBF-520-20	Antenna Horn	Systron Donner	LR 100	2009.01	2019.01
9	638	Antenna Horn	Narda	LR 098	2010.06	2020.06
10	HK116	Biconical Antenna	Rohde & Schwarz	LR 1260	2013.12	2018.12
11	HL223	LogPeriod Antenna	Rohde & Schwarz	LR 1261	2013.12	2018.12
12	Model 87 V	Multimeter	Fluke	LR 1597	2016.10	2017.10

Test Software List			
Description	Manufacturer	Model	Version
EMC Software for radiated tests	Rohde & Schwarz	EMC32	9.26.01

## 6 BLOCK DIAGRAM

### 6.1 Test Site Radiated Emission



Measurements at 1GHz and above were performed with turntable height 1.5m and with the ground plane covered by absorbers.

## Revision history

Version	Date	Comment	Sign
1.0	2017.04.27	First edition	FS