

# Test Report

<b>Product</b>	Transceiver Module		
<b>Name and address of the applicant</b>	Scanreco AB Stensättravägen 13, SE-127 39 Skärholmen Box 90304, SE-120 25 Stockholm SWEDEN		
<b>Name and address of the manufacturer</b>	Scanreco AB Stensättravägen 13, SE-127 39 Skärholmen Box 90304, SE-120 25 Stockholm SWEDEN		
<b>Model</b>	TR06-001		
<b>Rating</b>	3.4Vdc and 4.0Vdc, Battery		
<b>Trademark</b>	Scanreco		
<b>Serial number</b>	See page 3		
<b>Additional information</b>	2.4GHz, DTS, Radio module		
<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> Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices		
<b>Order number</b>	400635		
<b>Tested in period</b>	2020.06.24 – 2020.08.12		
<b>Issue date</b>	2021.01.18		
<b>Name and address of the testing laboratory</b>	 Instituttveien 6 Kjeller, Norway	CAB Number: FCC: NO0001 ISED: NO0470 TEL: +47 22 96 03 30 FAX: +47 22 96 05 50	 
An accredited technical test executed under the Norwegian accreditation scheme			
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# 1 INFORMATION

## 1.1 Test Item

<b>Name</b>	Transceiver Module
<b>FCC ID</b>	N5OTR061
<b>ISED ID</b>	6476A-TR061
<b>Model/version</b>	TR06-001
<b>Serial number</b>	Marked as "DTS"
<b>Hardware identity and/or version</b>	102112
<b>Software identity and/or version</b>	G6COMM_TEST
<b>Frequency Range</b>	2405 – 2480 MHz
<b>Channel Separation</b>	5 MHz
<b>Number of Channels</b>	16
<b>Operating Modes</b>	TX and RX
<b>Measured BW (99%)</b>	2.61 MHz
<b>Emission classification</b>	F2D
<b>Transmitter spurious, dB<math>\mu</math>V/m@3m</b>	PK: 68.35; AV: 48.35 ((2.4835GHz)
<b>Type of Modulation</b>	O-QPSK, DTS
<b>User Frequency Adjustment</b>	None
<b>Conducted Output Power, Max</b>	47.32 mW
<b>Type of Power Supply</b>	Battery, 3.4Vdc and 4Vdc
<b>Antenna Connector</b>	Yes, RP-SMA for external antennas for both TX and RX
<b>Number of Antennas</b>	2 (one TX and one for RX) 1 at a time (either Monopole antenna or dipole antenna) The two antennas are never used simultaneously.
<b>Diversity or Smart Antennas</b>	Yes, Diversity
<b>Desktop Charger</b>	N/A

Tested with Dipole antenna type S151AH-2450 and monopole antenna type M70XCR

### Description of Test Item

2.4GHz band transceiver module

## 1.2 Normal test condition

Temperature: 20 - 24 °C  
 Relative humidity: 20 - 50 %  
 Normal test voltage: 3.4Vdc and 4.0Vdc

The values are the limit registered during the test period.

## 1.3 Test Engineer(s)

G.Suwanthakumar

## 1.4 Model Variants

The same printed circuit board is used for the different radio module models. Different frequencies (f. ex. 915Mhz and 2.4GHz) can not be transmitted simultaneously, only one at a time.

Model/type	Comment	Tested
TR06 004	Components belonging to the 2.4GHz, 915MHz and additional sub-GHz radio parts are assembled on the board.	<input checked="" type="checkbox"/>
TR06 001	Components belonging just to the 2.4GHz radio part are assembled on the board.	<input type="checkbox"/>
TR06 002	Components belonging to the 2.4GHz and 915MHz parts are assembled on the board.	<input type="checkbox"/>

## 1.5 Antenna Requirement

Is the antenna detachable?

Yes  No

If detachable, is the antenna connector non-standard?

Yes  No

Type of antenna connector: RP-SMA

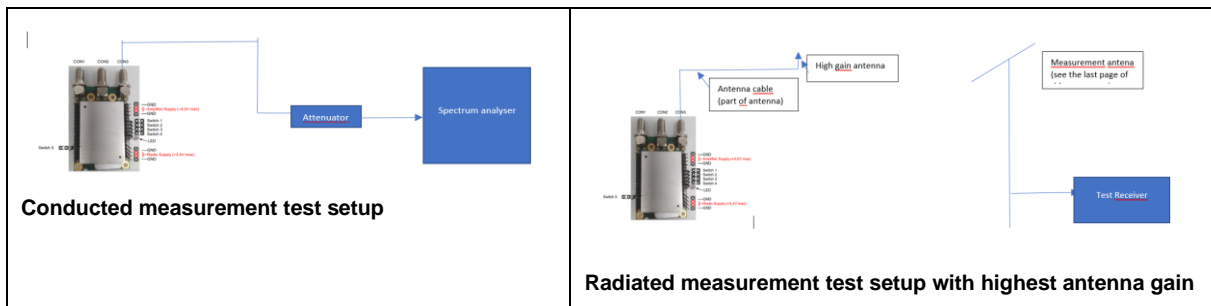
Ref. FCC §15.203

## 1.6 Worst-Case Configuration and Mode

Radiated Emissions were performed with the EUT set to transmit at the channel with the highest output power as worst-case scenario.

Channel no.	Frequency (MHz)	Modulation	SW Name	Power setting (dBm)
1	2405	O-QPSK	G6COMM_TEST	17
8	2440	O-QPSK	G6COMM_TEST	17
16	2480	O-QPSK	G6COMM_TEST	17

Output power was set and pre-determined in the SW and adjusted by moving the jumpers. It is described document "TR06 Output power adjusting."



## 1.7 Comments

All measurements were done with the EUT powered with external dc power supply instead of battery.

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, paragraph 15.247 and ISED Canada RSS-247 Issue 2 and RSS-GEN Issue 5.

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

Radiated tests were made in a semi-anechoic chamber at measuring distances of 1m, 3m and 10m.

A description of the test facility is on file with 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 5 reference	Result
Supply Voltage Variations	15.31(e)	6.11 (RSS-GEN)	N/A <sup>1</sup>
Number of frequencies	15.31(m)	6.8 (RSS-GEN)	Complies
Antenna Requirement	15.203	6.8 (RSS-GEN)	Complies <sup>2</sup>
Power Line Conducted Emission	15.107(a) 15.207(a)	7.2 / 8.8 (RSS-GEN)	N/A <sup>1</sup>
99% Occupied Bandwidth	N/A	6.7 (RSS-GEN)	Complies
Minimum 6 dB Bandwidth	15.247(a)(2)	5.2 (1) (RSS-247)	Complies
Peak Power Output	15.247(b)	5.4 (RSS-247)	Complies
Power Spectral Density	15.247(e)	5.2 (2) (RSS-247)	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)(d)	5.5 (RSS-247)	Complies
Spurious Emissions (Radiated)	15.247(c)(d) 15.109(a) 15.209(a)	5.5 (RSS-247) 7.3 (RSS-GEN) 8.9 (RSS-GEN)	Complies

<sup>1</sup> The tested equipment only operates with battery.

<sup>2</sup> External antenna with R-SMA connector

### 3 TEST RESULTS

#### 3.1 Occupied Bandwidth

RSS-Gen, 6.7

ISED Canada RSS-247 Issue 2, Clause 5.1

ISED Canada RSS-GEN Issue 5, Clause 6.7

Measurement procedure: ANSI C63.10-2013 Clause 6.9.2 / 7.8.3

Test Results: Complies

Measurement Data:

Channel Frequency (MHz)	Measured 99% BW (MHz)
2405	2.61
2440	2.61
2480	2.59

See attached plots.

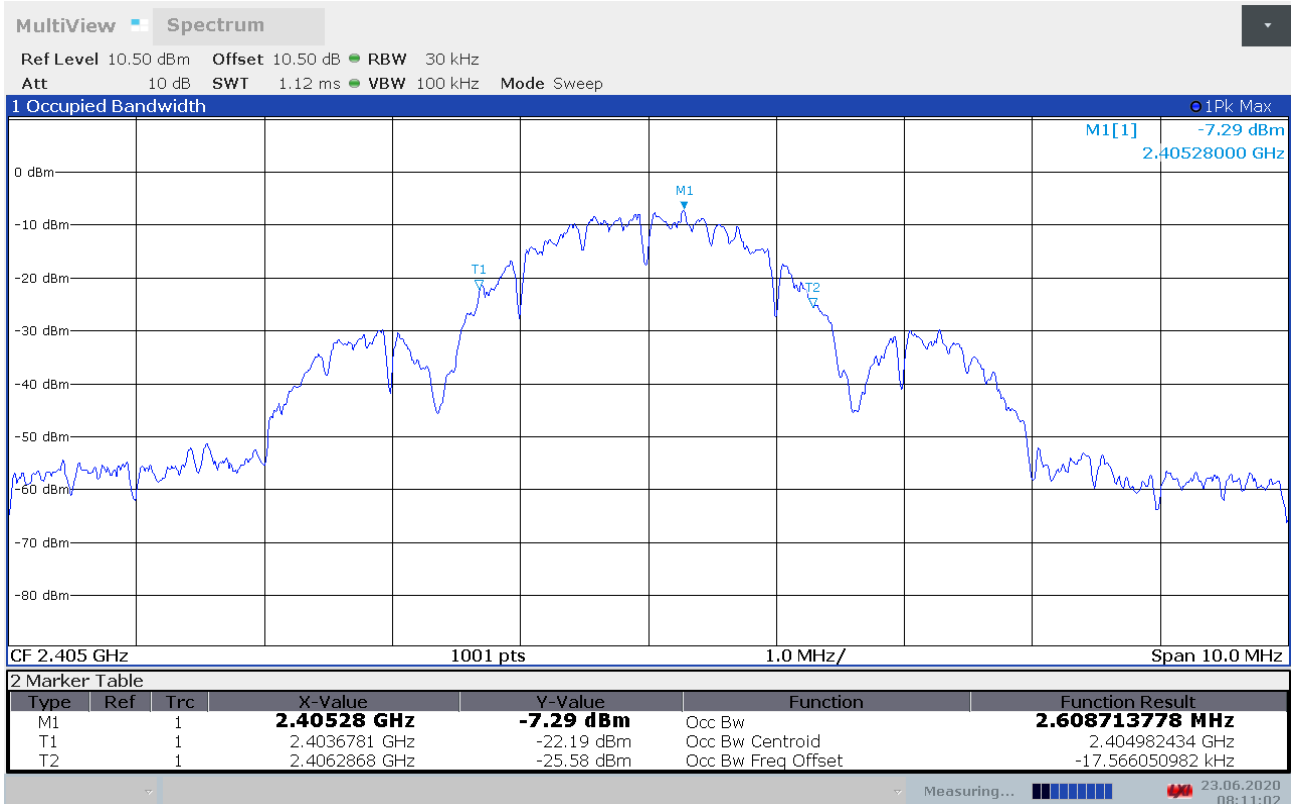
#### Requirements:

Frequency hopping systems in the 2400 - 2483.5 MHz band shall use at least 15 non-overlapping channels. No requirements for bandwidth for this frequency band.

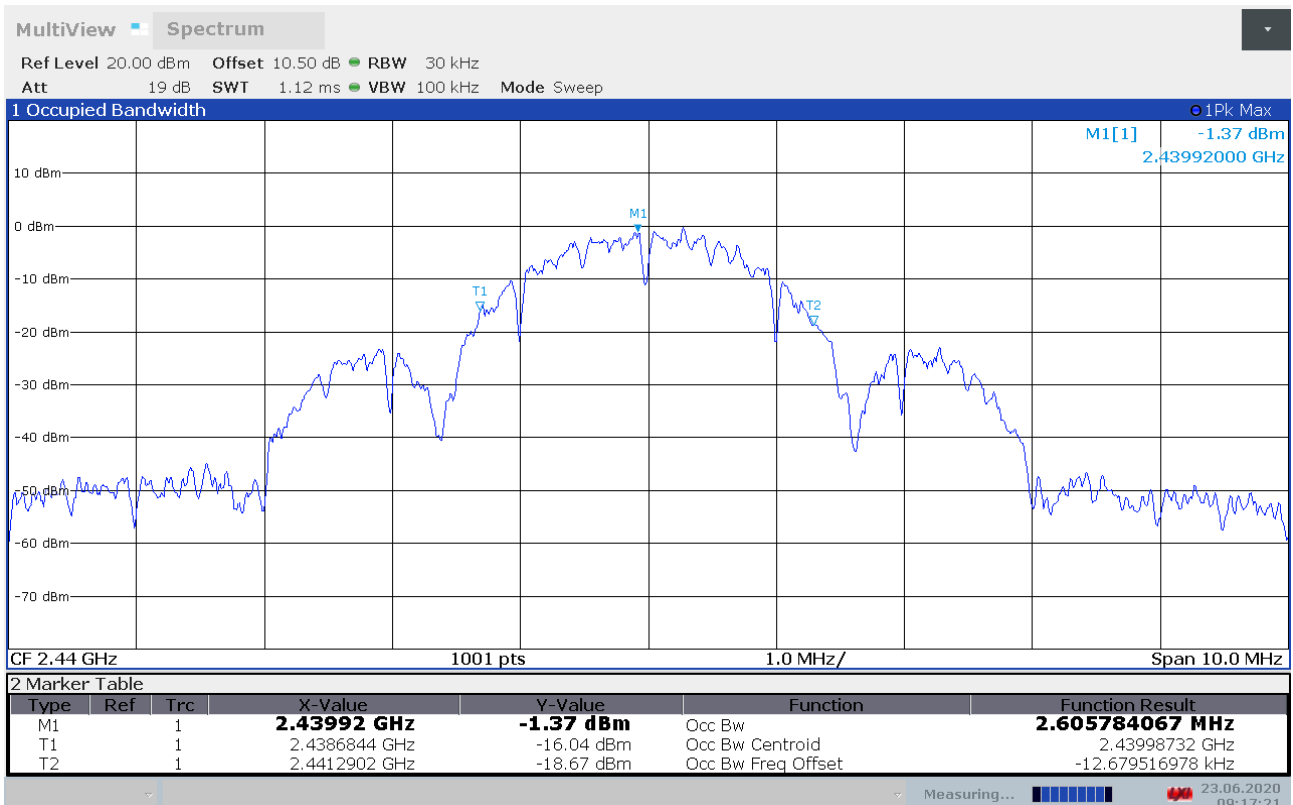
No requirements for Digital Transmission Systems.

No requirement for 99% BW, reported for information only.

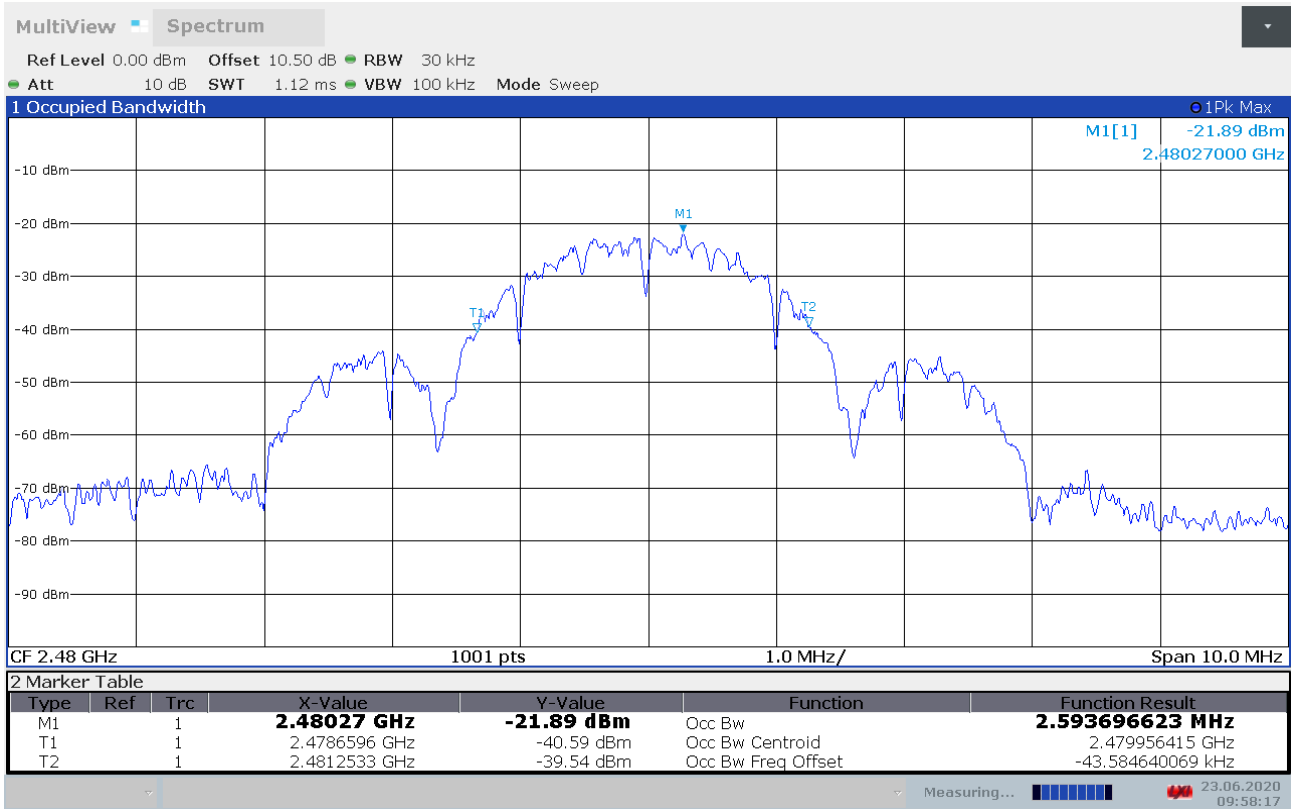




99% Bandwidth, ch2405MHz



99% Bandwidth, ch2440MHz



**99% Bandwidth , ch2480MHz**

### 3.2 DTS Bandwidth

FCC Part 15.247 (a)(2)

ISED Canada RSS-247 Issue 2, Clause 5.2 (a)

Measurement procedure: ANSI C63.10-2013 Clause 11.8

Test Results: **Complies**

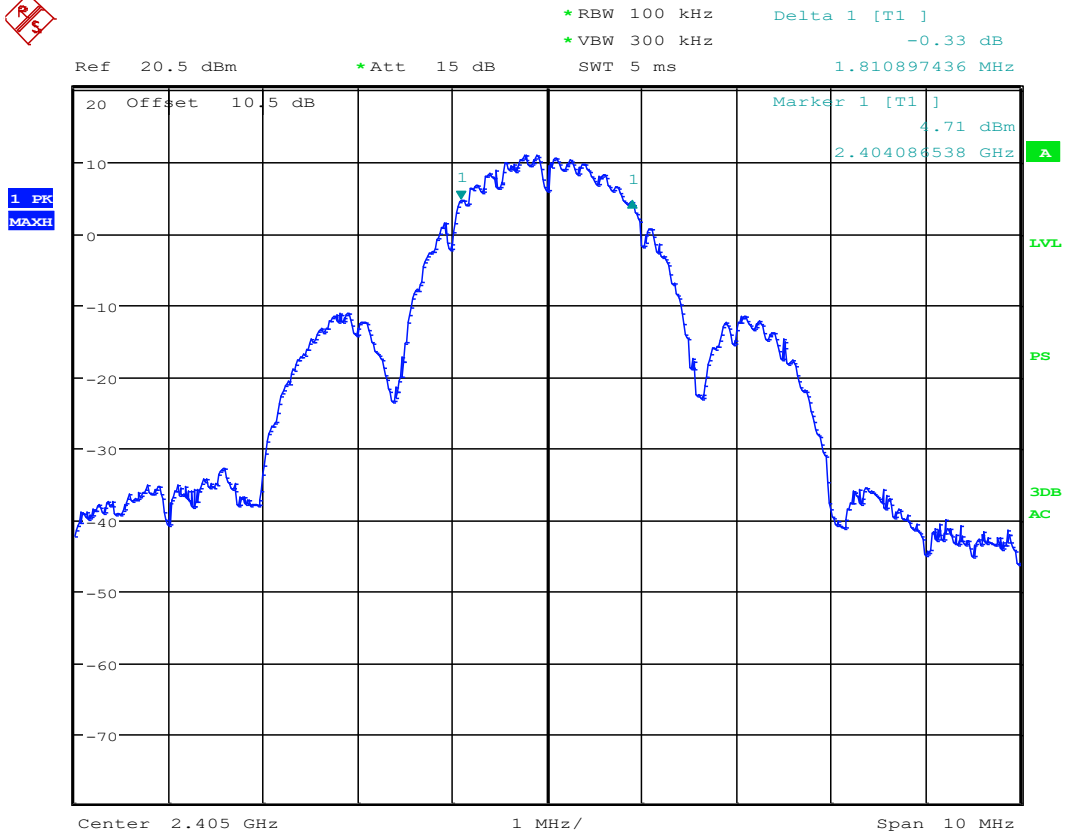
Measurement Data:

Channel Frequency (MHz)	Measured DTS BW (MHz)
2405	1.81
2440	1.68
2480	1.71

#### Requirements:

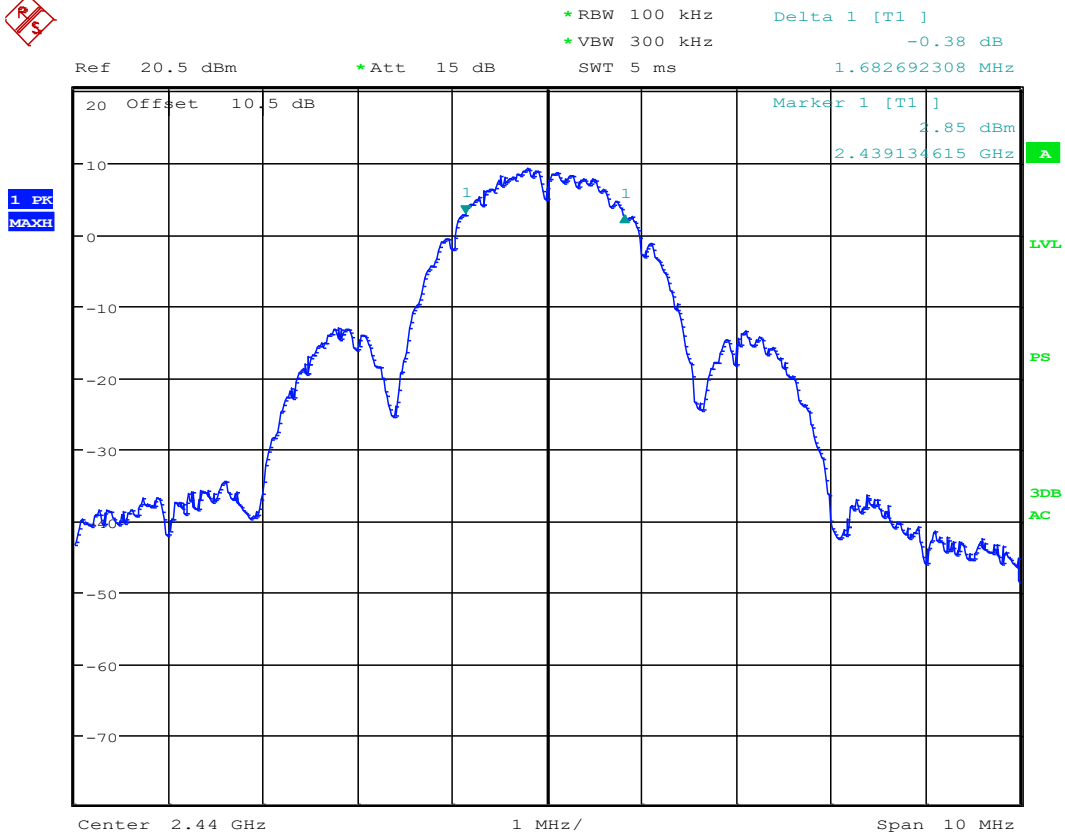
For Digital Transmission Systems in the 2400-2483.5 MHz band the minimum 6 dB bandwidth shall be at least 500 KHz.

No requirements for Frequency Hopping Systems.



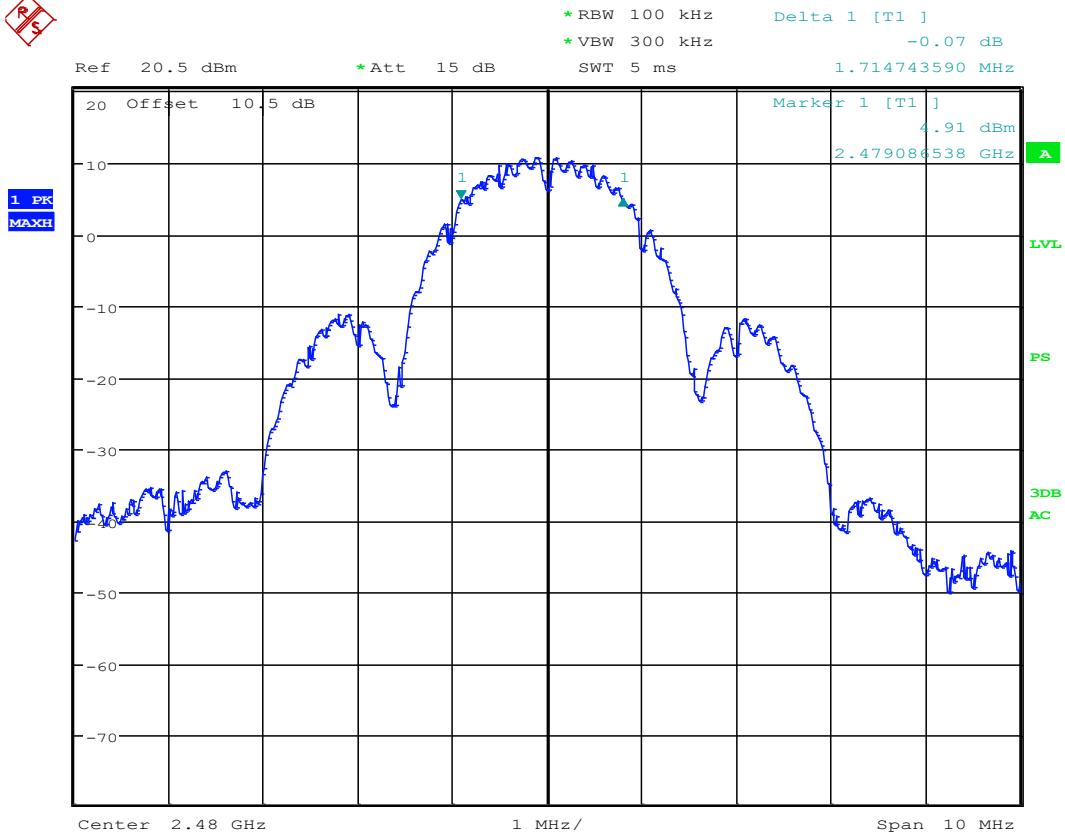
Date: 12.AUG.2020 07:36:10

DTS Bandwidth, ch2405MHz



Date: 12.AUG.2020 07:38:08

DTS Bandwidth, ch2440MHz



Date: 12.AUG.2020 07:52:34

DTS Bandwidth, ch2480MHz

### 3.3 Peak Power Output

FCC part 15.247 (b)

ISED Canada RSS-247 Issue 2, Clause 5.4

Measurement procedure: ANSI C63.10-2013 Clause 11.9.1.2

Test Results: Complies

Measurement Data:

	2405 MHz	2440 MHz	2480 MHz
Conducted Power (dBm)	16.52	16.22	16.75
Conducted Power (mWatts)	44.87	41.88	47.32
Monopole antenna: Field Strength (dB $\mu$ V/m), VP	112.6	109.4	112.2
Monopole antenna EIRP, Calculated (mW)	54.5	26.4	50.4
Monopole antenna: Antenna gain (dBi)	0.8	-2.0	0.3
Dipole antenna: Field Strength (dB $\mu$ V/m), VP	111.3	109.1	112.2
Dipole antenna EIRP, Calculated (mW)	40.9	24.8	50.0
Dipole antenna: Antenna gain (dBi)	-0.4	-2.3	0.2

Antenna gain =  $10 \cdot \log(\text{EIRP}/\text{Conducted power})$  dBi

EIRP is calculated from measured field strength by the formulas in ANSI C63.10-2013 Eq. 39.

See attached plots.

#### Requirements:

The maximum peak output power shall not exceed the following limits:

For frequency hopping systems employing at least 75 hopping channels: 1 Watt

For all other frequency hopping systems in the 2400 - 2483.5 MHz band: 0.125 Watts

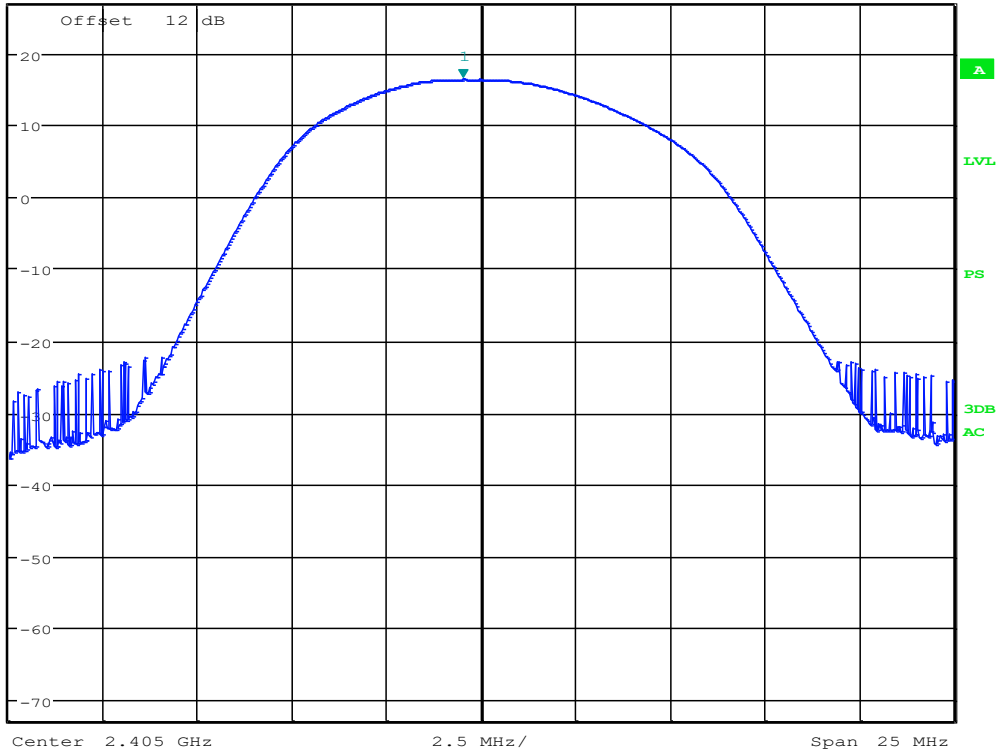
For Digital Transmission Systems in the 2400 - 2483.5 MHz band: 1 Watt

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced below the stated value above by the amount in dB that the directional gain of the antenna exceeds 6 dBi.



**MARKER 1**  
 2.404519231 GHz  
 Ref 27 dBm \*Att 15 dB \*RBW 5 MHz \*SWT 10 ms  
 Marker 1 [T1 ] 16.52 dBm  
 2.404519231 GHz

1 PK  
 MAXH



Date: 14.SEP.2020 09:41:17

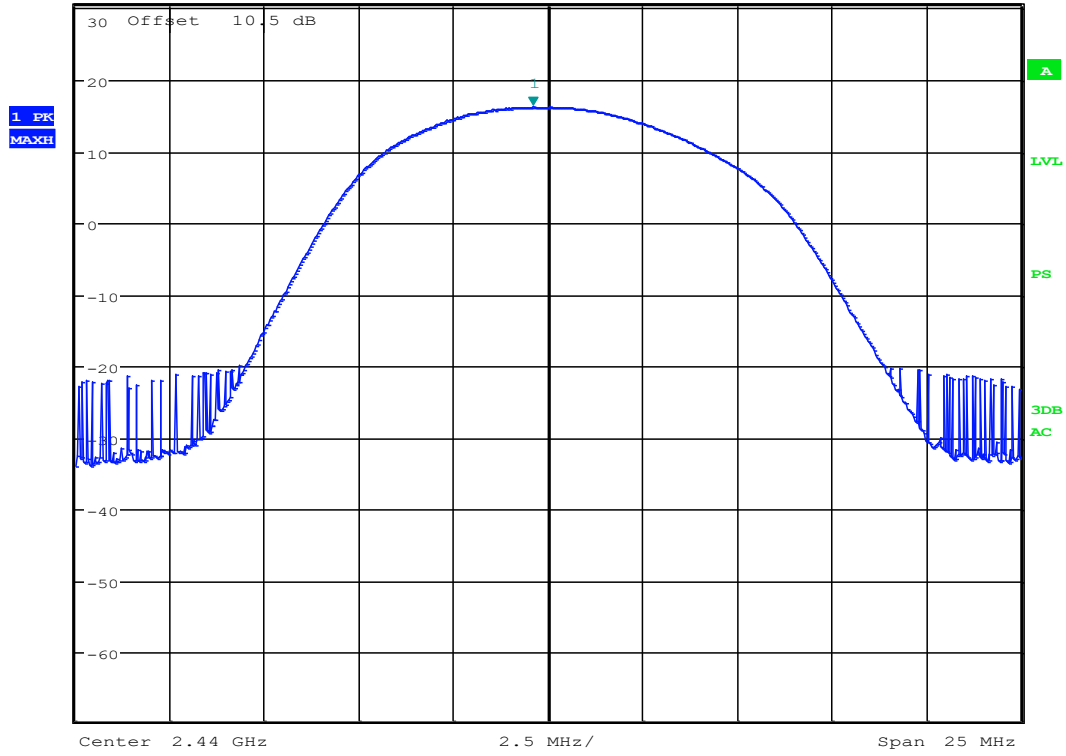
**Conducted Power, Ch2405MHz**





**MARKER 1**  
 2.439599359 GHz

\*RBW 5 MHz      Marker 1 [T1 ]  
 VBW 10 MHz      16.22 dBm  
 \*Att 20 dB      \*SWT 10 ms      2.439599359 GHz



Date: 14.SEP.2020 09:07:06

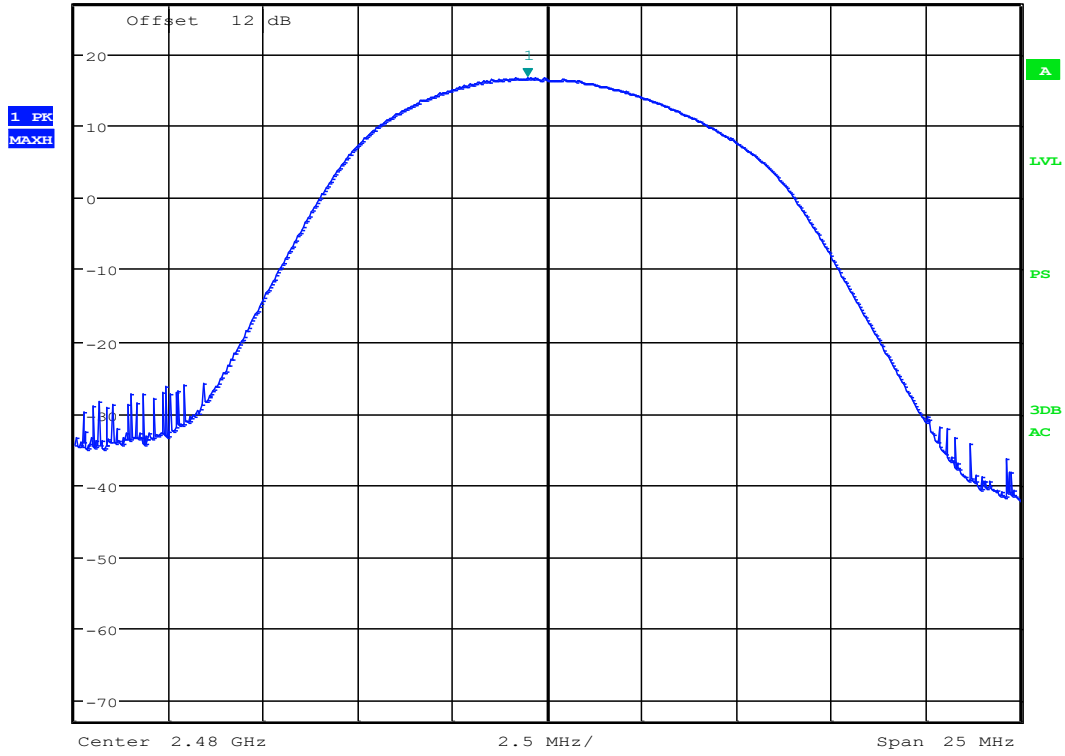
**Conducted Power, Ch2440MHz**



**MARKER 1**  
 2.479479167 GHz

\*RBW 5 MHz      Marker 1 [T1 ]  
 VBW 10 MHz      16.75 dBm  
 \*Att 15 dB      \*SWT 10 ms      2.479479167 GHz

Ref 27 dBm      \*Att 15 dB      \*SWT 10 ms      2.479479167 GHz

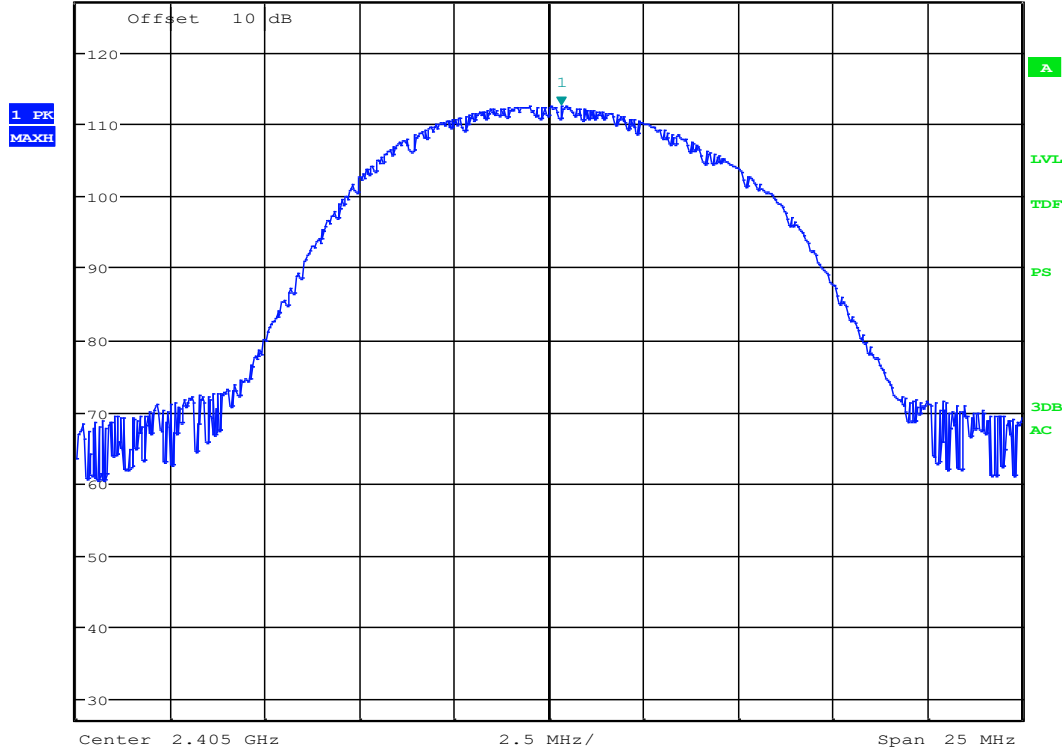


Date: 14.SEP.2020 09:42:50

**Conducted Power , Ch2480MHz**



**MARKER 1**  
 2.405320513 GHz  
 Ref 127 dBμV/m \*Att 10 dB  
 \*RBW 5 MHz Marker 1 [T1 ]  
 VBW 10 MHz 112.56 dBμV/m  
 \*SWT 50 ms 2.405320513 GHz

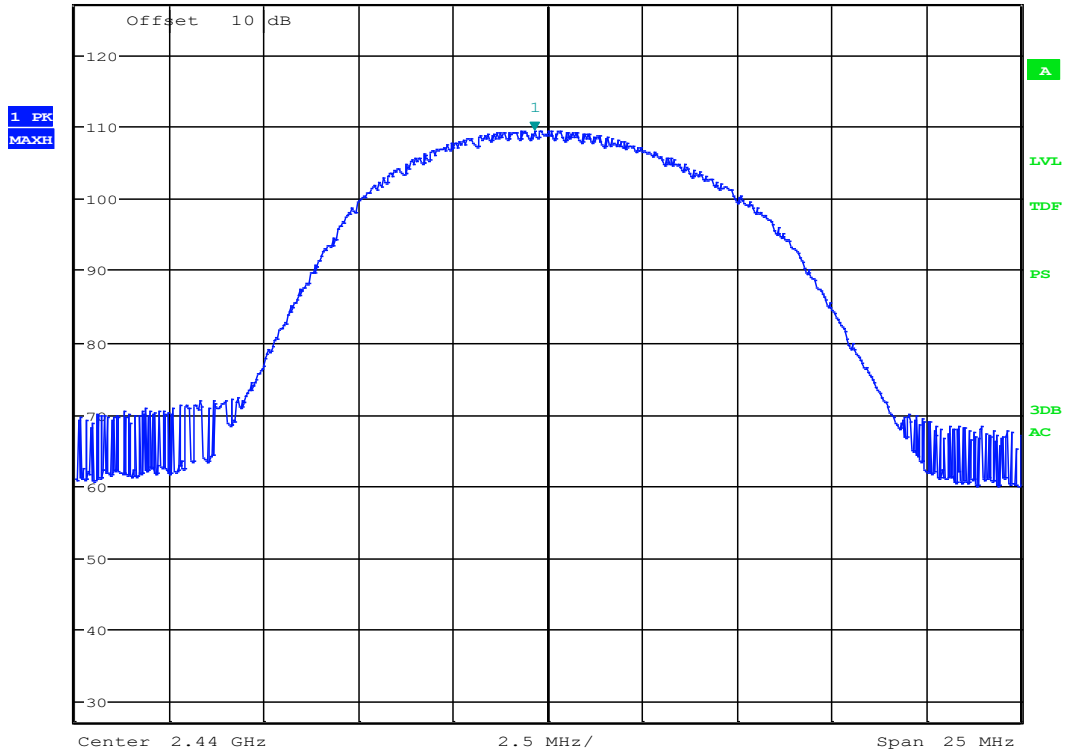


Date: 18.JUN.2020 14:34:45

**Monopole antenna: Measured Field Strength, VP, ch2405MHz**



Ref 127 dB $\mu$ V/m \*Att 10 dB \*RBW 5 MHz Marker 1 [T1 ]  
 \*SWT 50 ms VBW 10 MHz 109.42 dB $\mu$ V/m  
 2.439639423 GHz



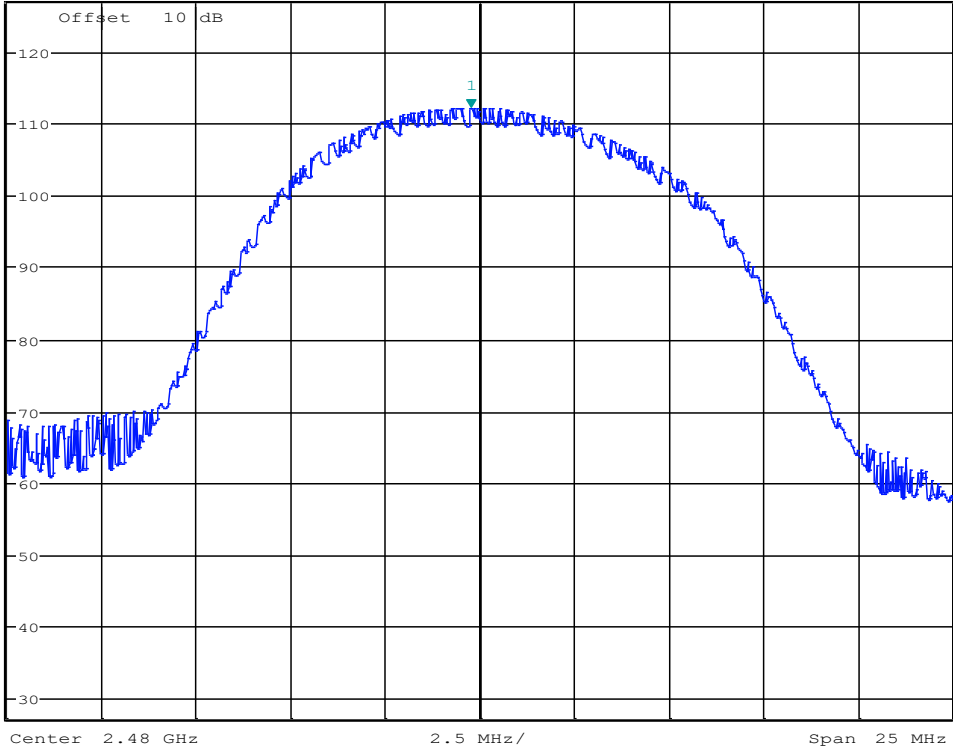
Date: 18.JUN.2020 14:28:38

**Monopole antenna: Measured Field Strength, VP, ch2440MHz**



**MARKER 1**  
 2.479759615 GHz

\*RBW 5 MHz      Marker 1 [T1 ]  
 VBW 10 MHz      112.22 dBμV/m  
 \*Att 10 dB      \*SWT 50 ms      2.479759615 GHz



Date: 18.JUN.2020 14:39:25

**Monopole antenna: Measured Field Strength, VP, ch2480MHz**



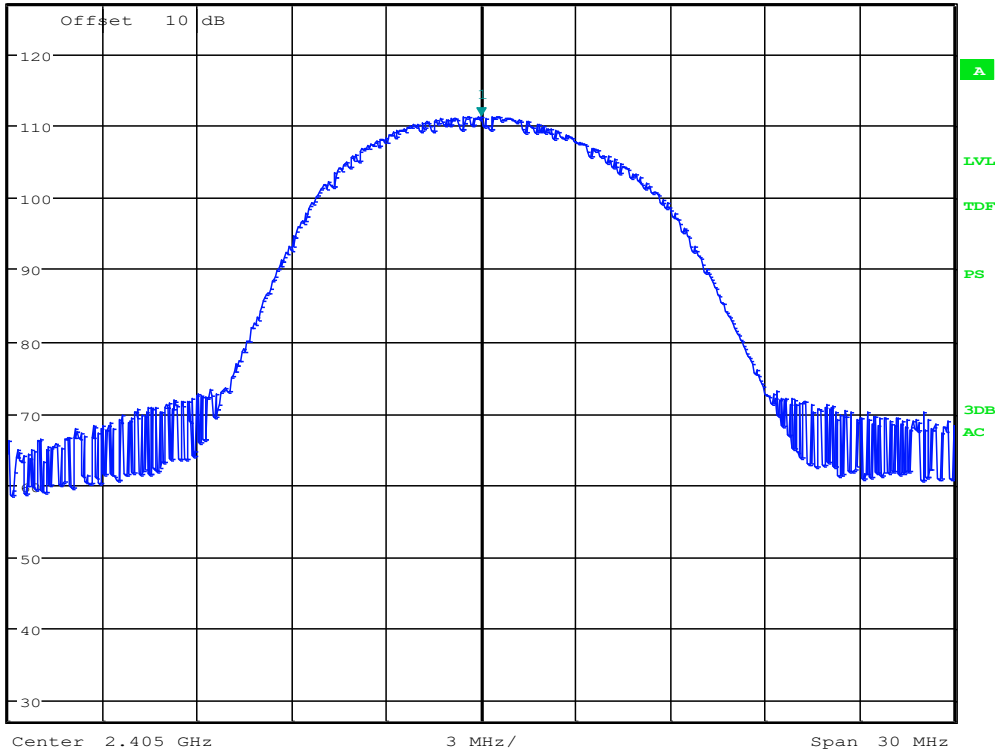
**MARKER 1**  
 2.405 GHz

\*RBW 5 MHz  
 VBW 10 MHz  
 \*SWT 50 ms

Marker 1 [T1 ]  
 111.32 dBμV/m  
 2.405000000 GHz

Ref 127 dBμV/m \*Att 10 dB

1 PK  
 MAXH



Date: 19.JUN.2020 09:43:03

**Dipole antenna: Measured Field Strength, VP, ch2405MHz**

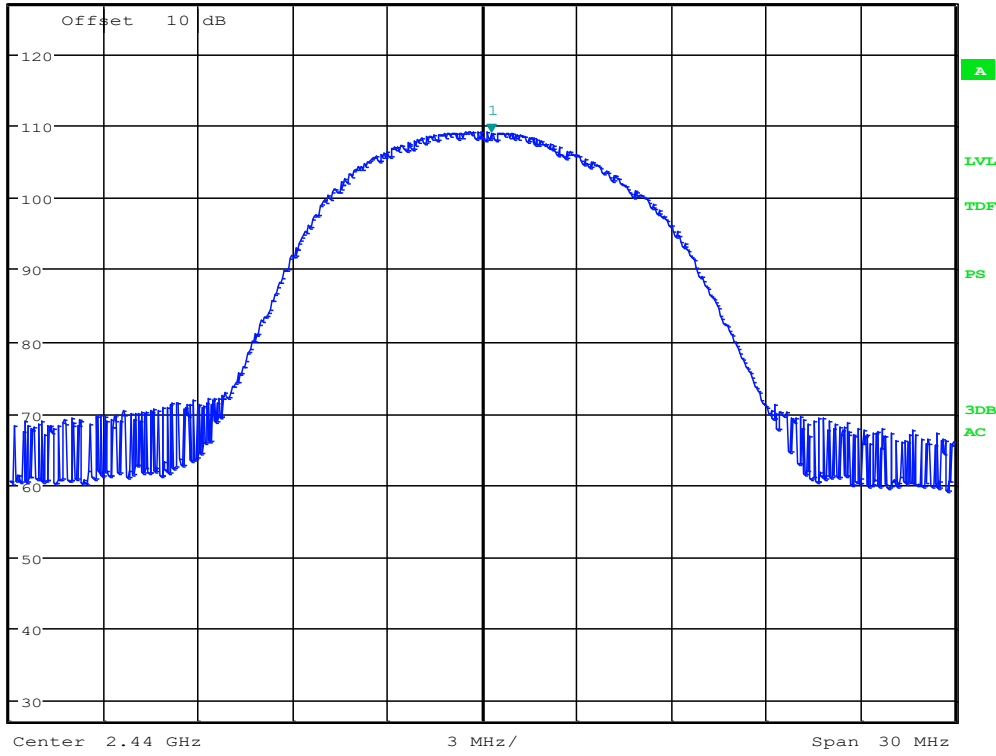


**MARKER 1**  
 2.440288462 GHz

\*RBW 5 MHz      Marker 1 [T1 ]  
 VBW 10 MHz      109.14 dBμV/m  
 \*SWT 50 ms      2.440288462 GHz

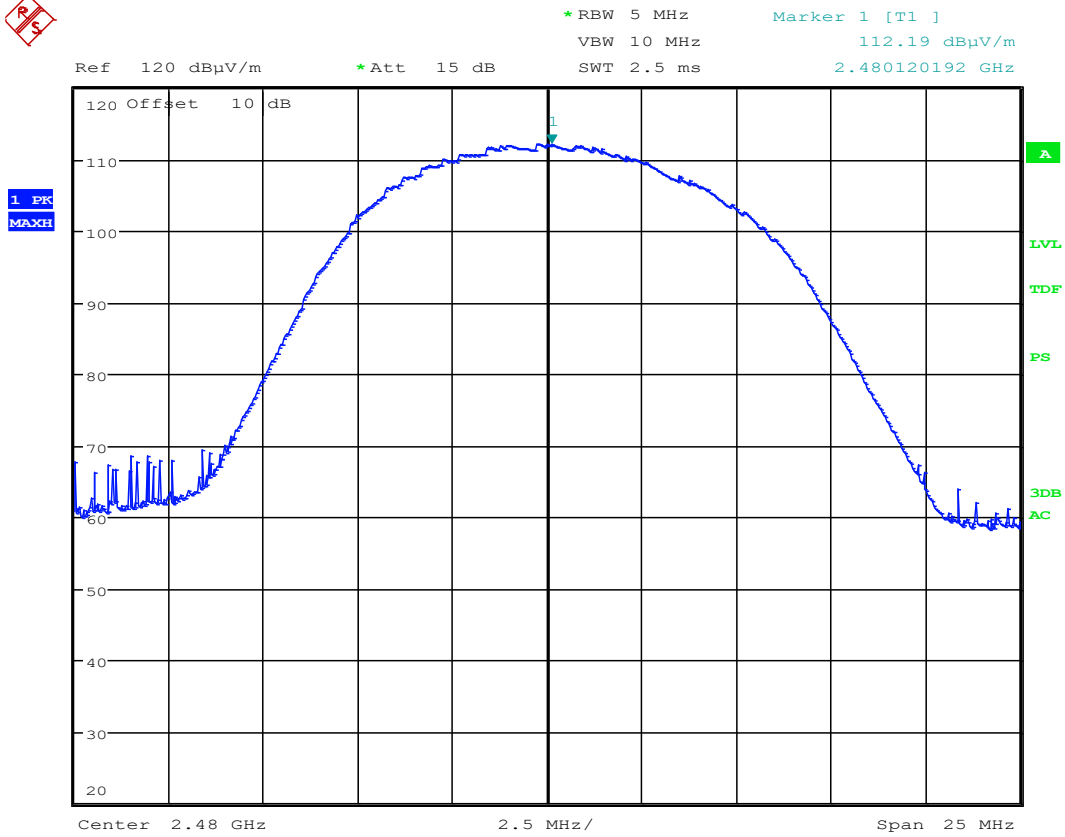
Ref 127 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



Date: 19.JUN.2020 10:13:09

**Dipole antenna: Measured Field Strength, VP, ch2440MHz**



Date: 12.AUG.2020 13:16:01

**Dipole antenna: Measured Field Strength, VP, ch2480MHz**



### 3.4 Conducted Emissions at Antenna Connector

Para. No.: 15.247 (d)

ISED Canada RSS-247 Issue 2, Clause 5.5

Measurement procedure: ANSI C63.10-2013 Clause 11.11

Test Results: Complies

Carrier Frequency	Highest Value (dBc)	Margin (dB)	Verdict
2405 MHz	59.8	>30	Pass
2440 MHz	62.3	>30	Pass
2480 MHz	35.9	>30	Pass

Measured with Peak Detector

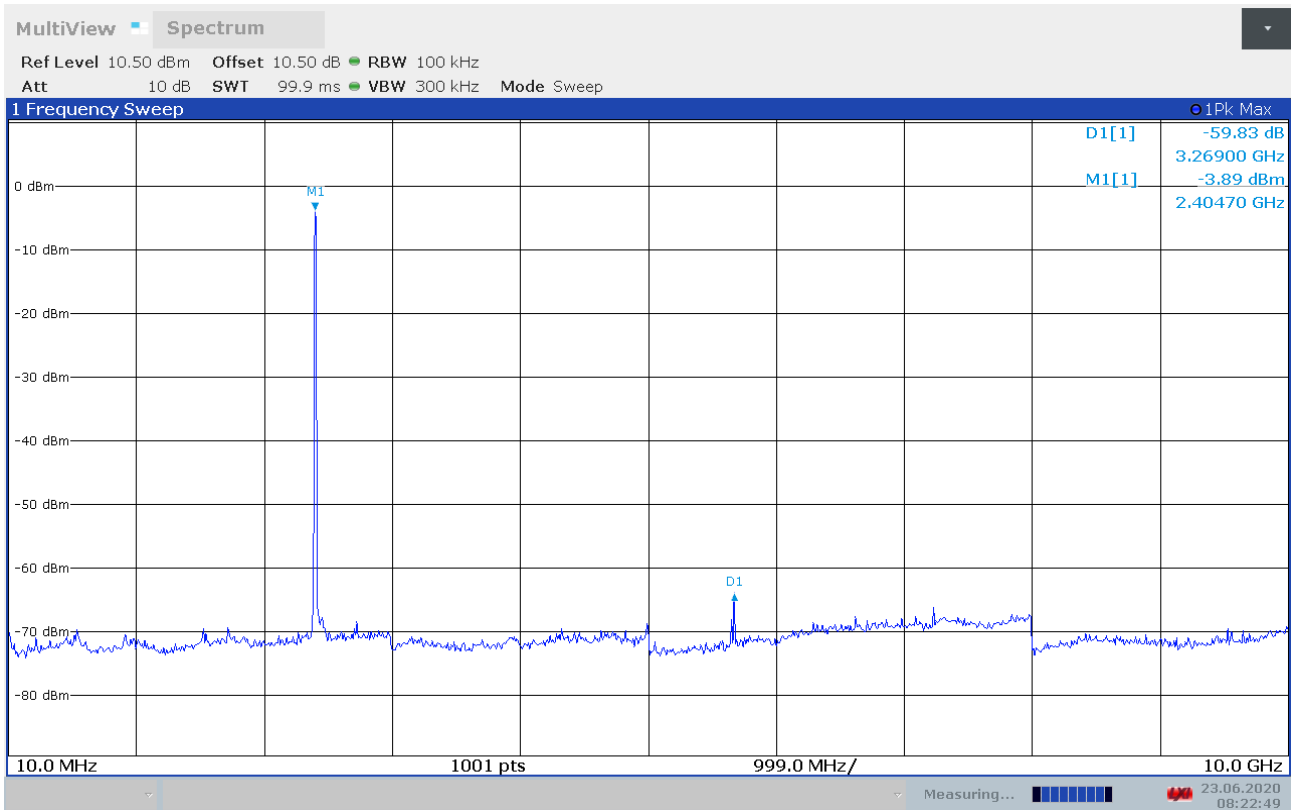
RF conducted power to 25 GHz: see attached plots.

#### Limit

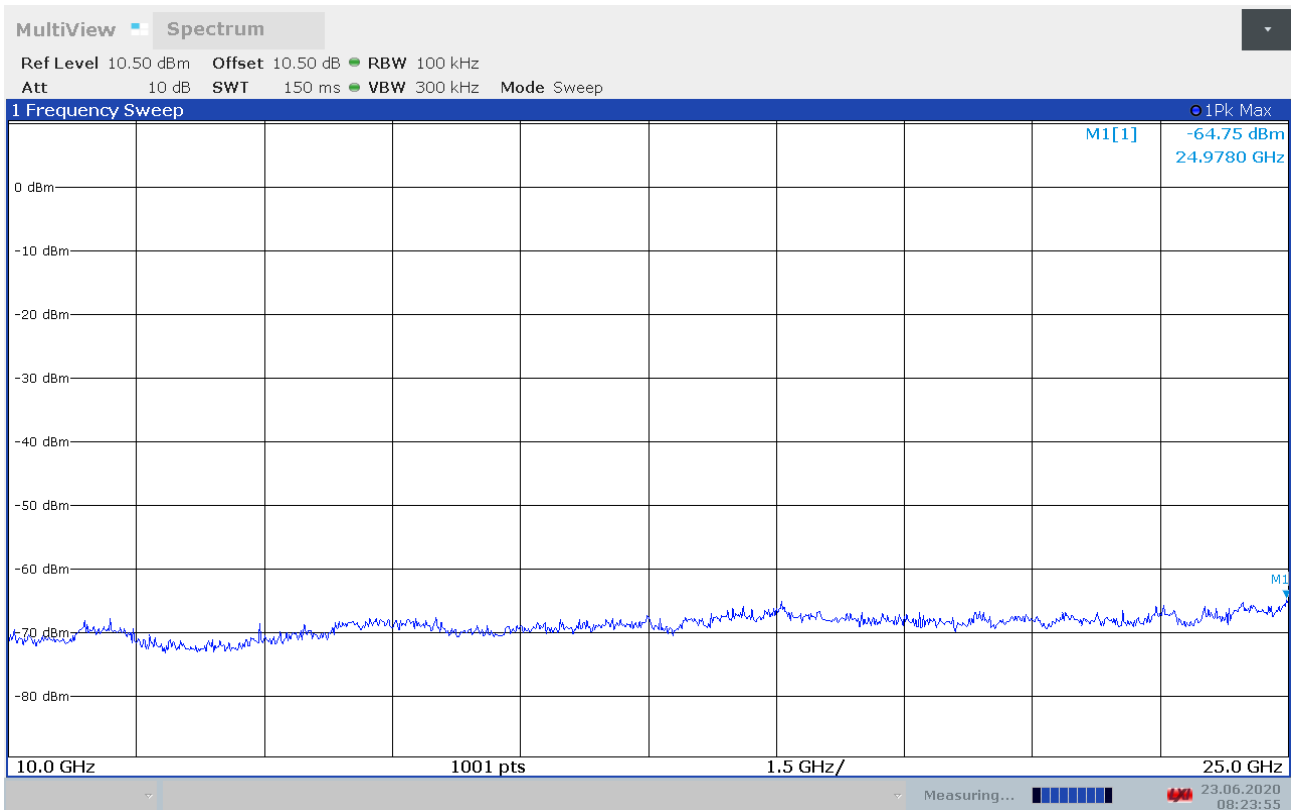
Peak measurement	RMS averaging
20 dBc or more in 100 kHz bandwidth	30 dBc or more in 100 kHz bandwidth

Detector type shall be the same as used for measuring Output Power.

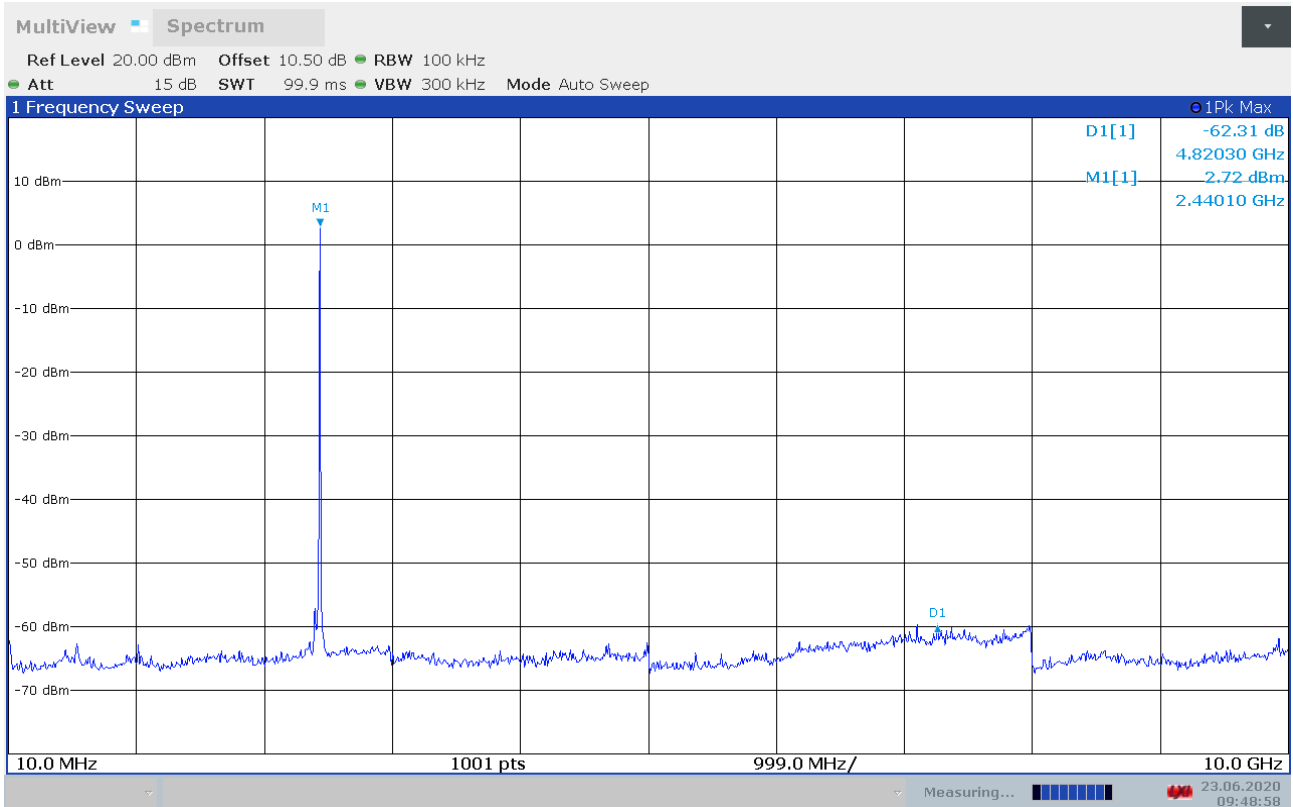
Attenuation below the general limits specified in part 15.209(a) is not required.



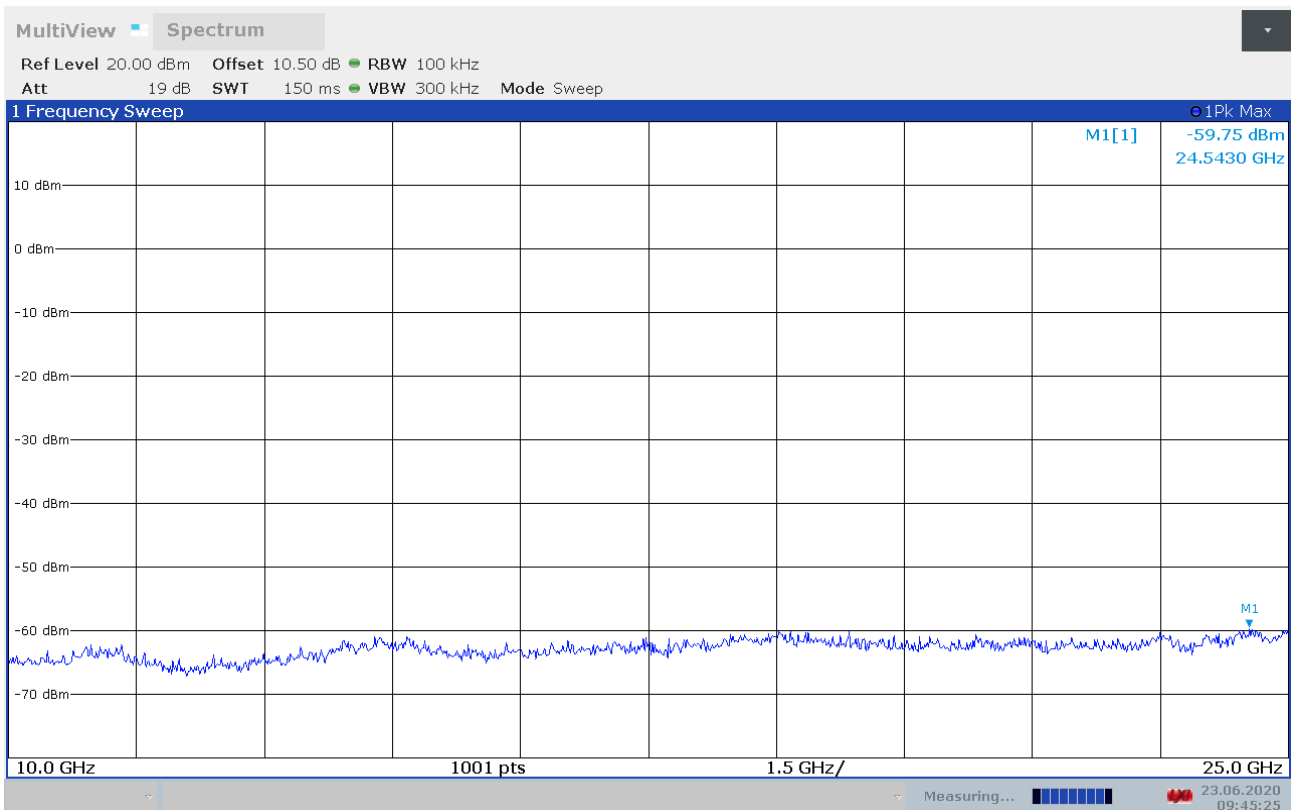
Conducted spurious emissions, 10MHz - 10GHz, ch2405MHz



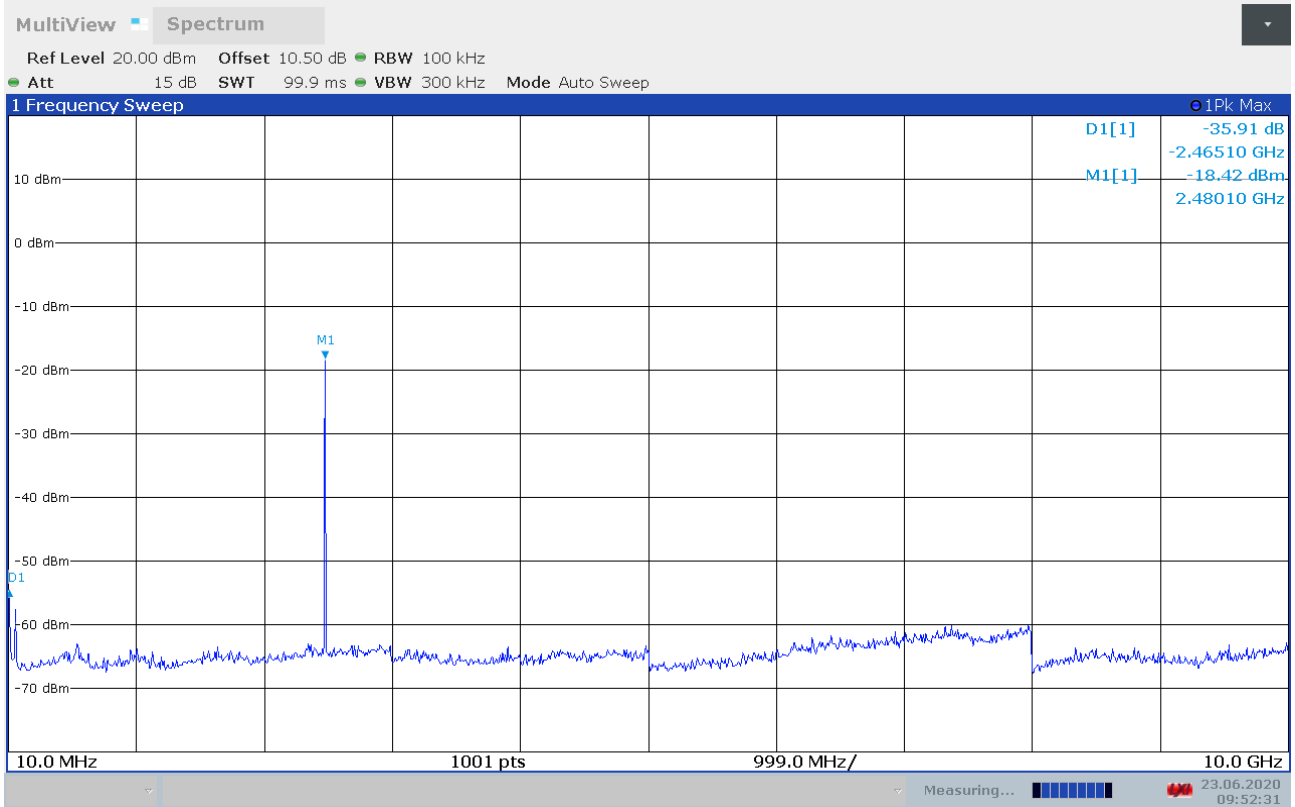
Conducted spurious emissions, 10GHz - 25GHz, ch2405MHz



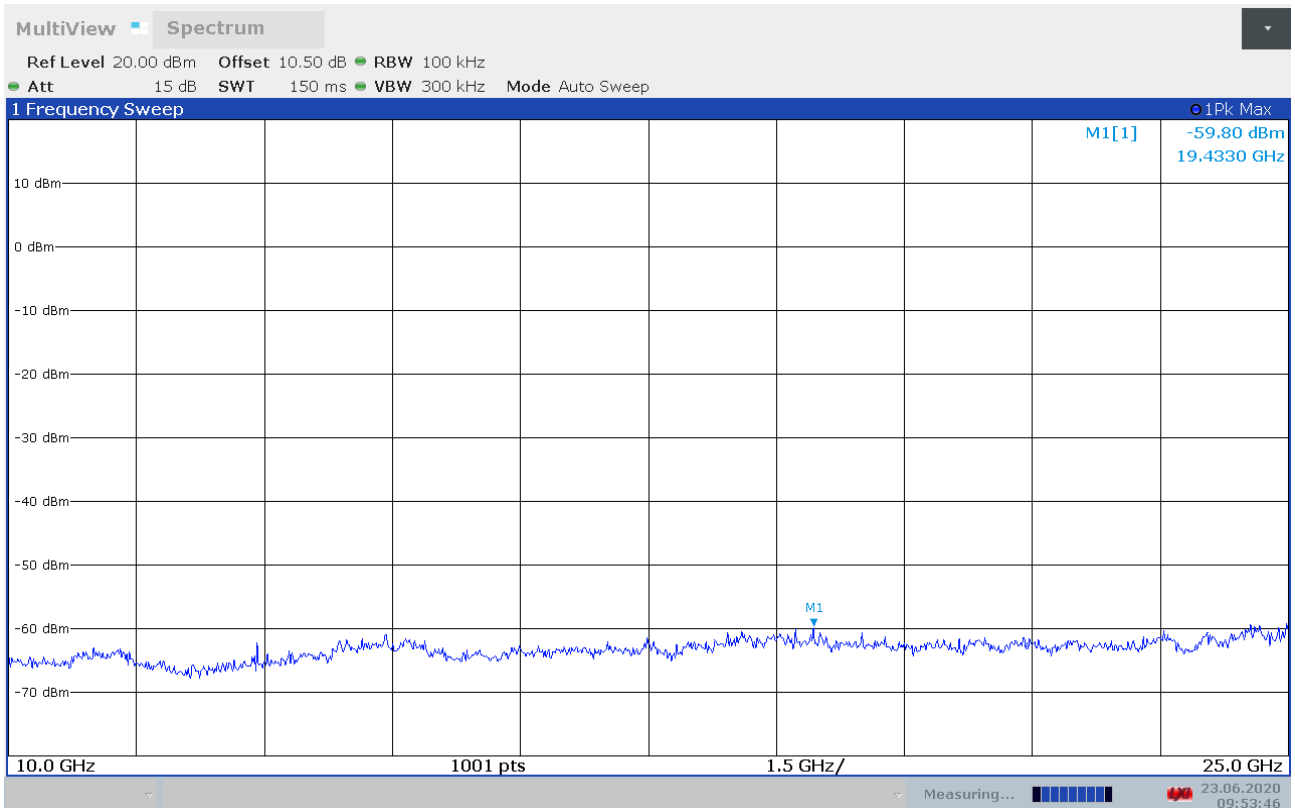
Conducted spurious emissions, 10MHz - 10GHz, ch2440MHz



Conducted spurious emissions, 10GHz - 25GHz, ch2440MHz



Conducted spurious emissions, 10MHz - 10GHz, ch2480MHz



Conducted spurious emissions, 10GHz - 25GHz, ch2480MHz

### 3.5 Restricted Bands of operation

Restricted Bands of operation for FCC and ISED are defined in FCC Part 15.205 and ISED RSS-GEN, Issue 4 clause 8.10.

Generally, no fundamentals are allowed in the restricted bands and all emissions must comply with the limits in FCC 15.209 or RSS-GEN, Issue 5, clause 8.9.

FCC (MHz)	ISED (MHz)	FCC (GHz)	ISED (GHz)
0.090-0.110		<b>0.96-1.24</b> <b>1.3-1.427</b>	<b>0.96-1.427</b>
0.495-0.505		1.435-1.6265	
2.1735-2.1905		1.6455-1.6465	
	<b>3.020-3.026</b>	1.660-1.710	
4.125-4.128		1.7188-1.7222	
4.17725-4.17775		2.2-2.3	
4.20725-4.20775		2.31-2.39	
	<b>5.677-5.683</b>	2.4835-2.5	
6.215-6.218		<b>2.69-2.9</b>	<b>2.655-2.9</b>
6.26775-6.26825		3.26-3.267	
6.31175-6.31225		3.332-3.339	
8.291-8.294		3.3458-3.358	
8.362-8.366		<b>3.6-4.4</b>	<b>3.5-4.4</b>
8.37625-8.38675		4.5-5.15	
8.41425-8.41475		5.35-5.46	
12.29-12.293		7.25-7.75	
12.51975-12.52025		8.025-8.5	
12.57675-12.57725		9.0-9.2	
13.36-13.41		9.3-9.5	
16.42-16.423		10.6-12.7	
16.69475-16.69525		13.25-13.4	
16.80425-16.80475		14.47-14.5	
25.5-25.67		15.35-16.2	
37.5-38.25		17.7-21.4	
73-74.6		22.01-23.12	
74.8-75.2		23.6-24.0	
<b>108-121.94</b> <b>123-138</b>	<b>108-138</b>	31.2-31.8	
149.9-150.05		36.43-36.5	
156.52475-156.52525		Above 38.6	
156.7-156.9			
162.0125-167.17			
167.72-173.2			
240-285			
322-335.4			
399.9-410			
608-614			

Frequencies in **Bold** text are specific for FCC or ISED, all other frequencies are common.

### 3.6 Band Edge Emissions (Radiated)

FCC Part 15.209 (a)

ISED Canada RSS-GEN Issue 5, Clause 7.3 / 8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measurement Data:

Band-Edge: Monopole antenna

	Measured field strength (dB $\mu$ V/m)		Limit dB $\mu$ V/m	Margin	
	2390 MHz	2483.5 MHz		dB	
Peak Detector	52.12	65.65	74	29.89	8.35
Average Detector	/	/	54	/	/
Average with Duty Cycle correction	/	45.65	54	/	8.35

Band-Edge: Dipole antenna

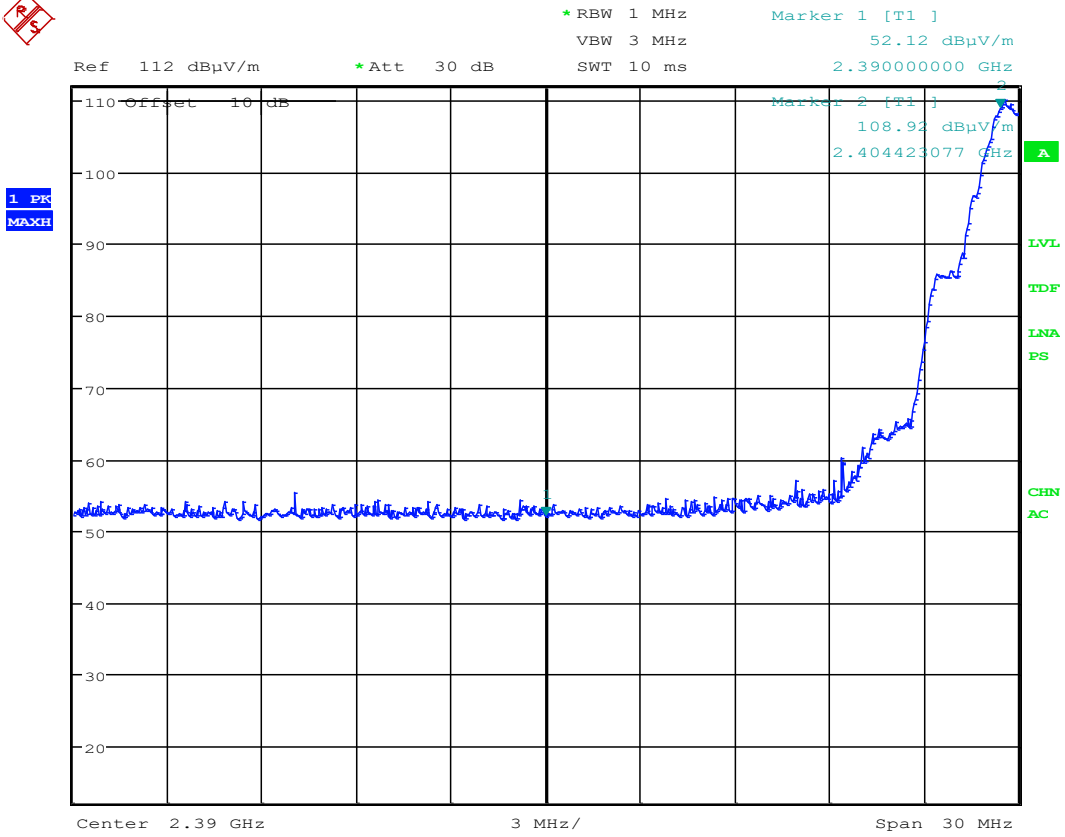
	Measured field strength (dB $\mu$ V/m)		Limit dB $\mu$ V/m	Margin	
	2390 MHz	2483.5 MHz		dB	
Peak Detector	52.79	68.35	74	22.44	5.65
Average Detector	/	/	54	/	/
Average with Duty Cycle correction	/	48.65	54	/	5.65

See attached plots.

#### Duty Cycle Correction Factor Calculation:

The maximum duty cycle calculation given by manufacturer in the operational description is 4.3%

Duty Cycle Correction factor =  $-20 \times \log(0.043) = -27.3$  dB



Date: 12.AUG.2020 11:07:40

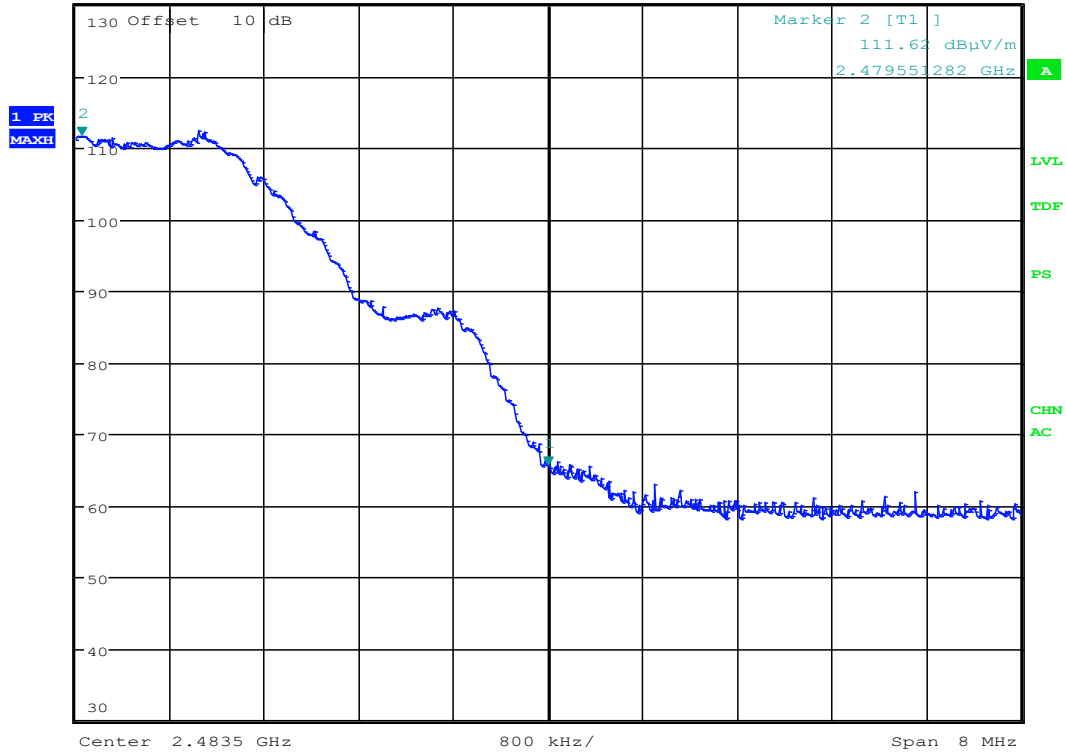
**Monopole antenna: Lower Band Edge, PK, ch2405MHz**



**MARKER 1**  
 2.4835 GHz

\*RBW 1 MHz  
 VBW 3 MHz  
 SWT 2.5 ms  
 Marker 1 [T1 ]  
 65.65 dBμV/m  
 2.483500000 GHz

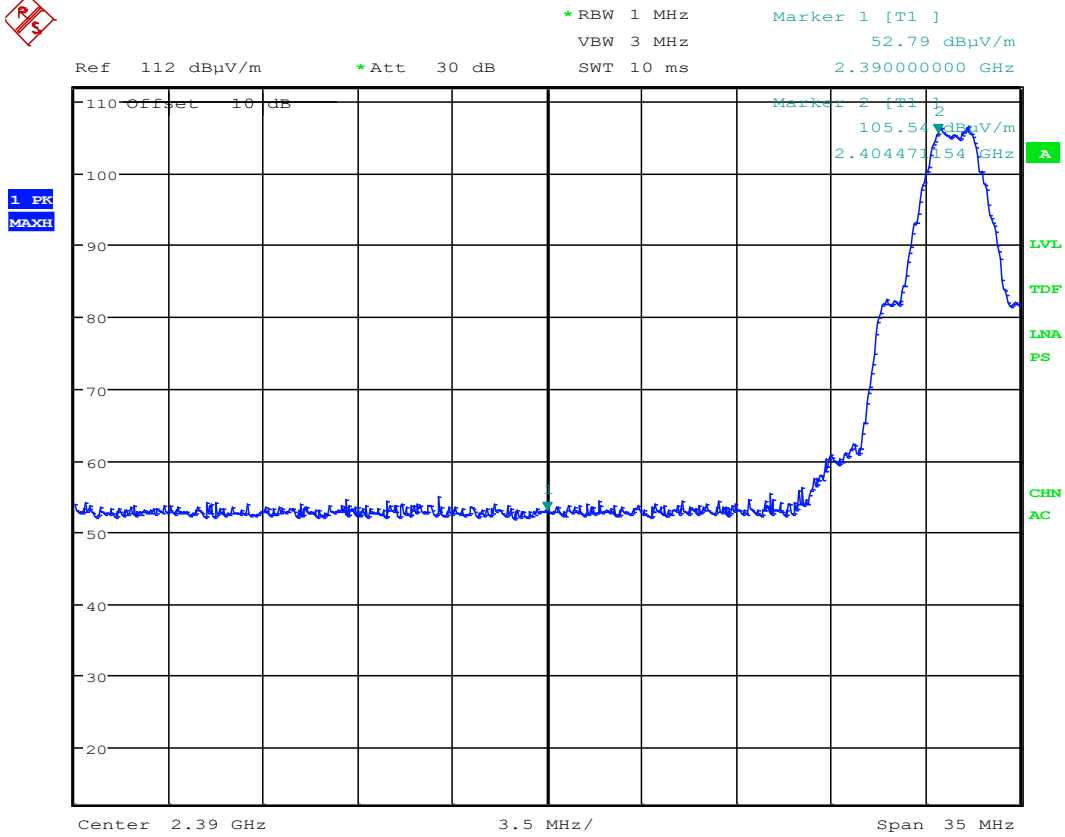
Ref 130 dBμV/m \*Att 15 dB



Date: 12.AUG.2020 10:44:36

**Monopole antenna: Upper band Edge, PK, ch2480MHz**





Date: 12.AUG.2020 12:46:54

**Dipole antenna: Lower Band Edge, PK, ch2405MHz**



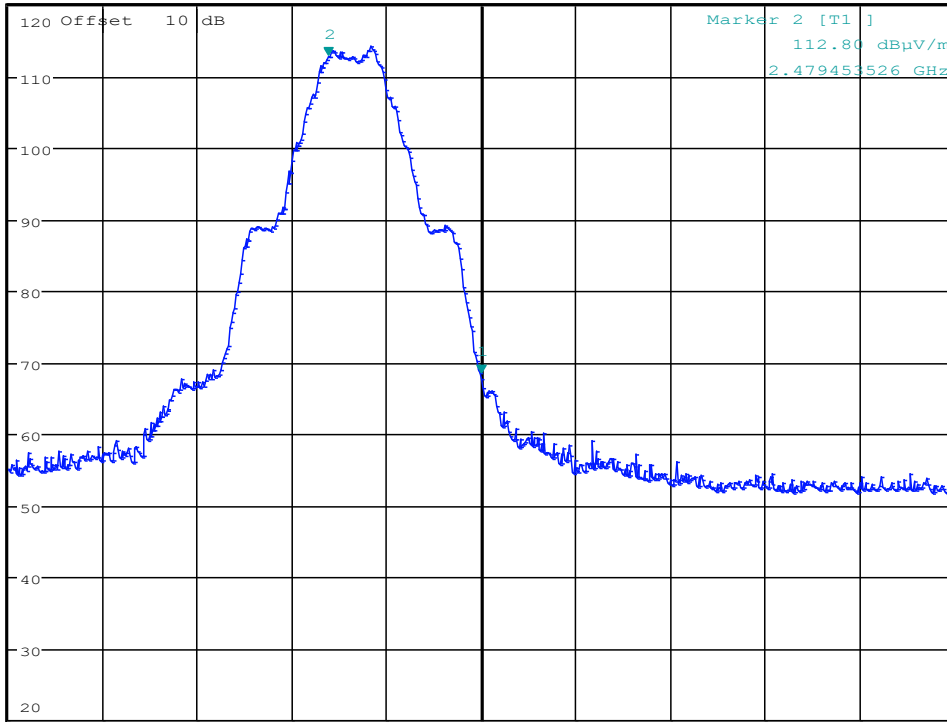
**MARKER 1**  
 2.4835 GHz

\*RBW 1 MHz  
 VBW 3 MHz  
 SWT 5 ms

Marker 1 [T1 ]  
 68.35 dBμV/m  
 2.483500000 GHz

Ref 120 dBμV/m \*Att 15 dB

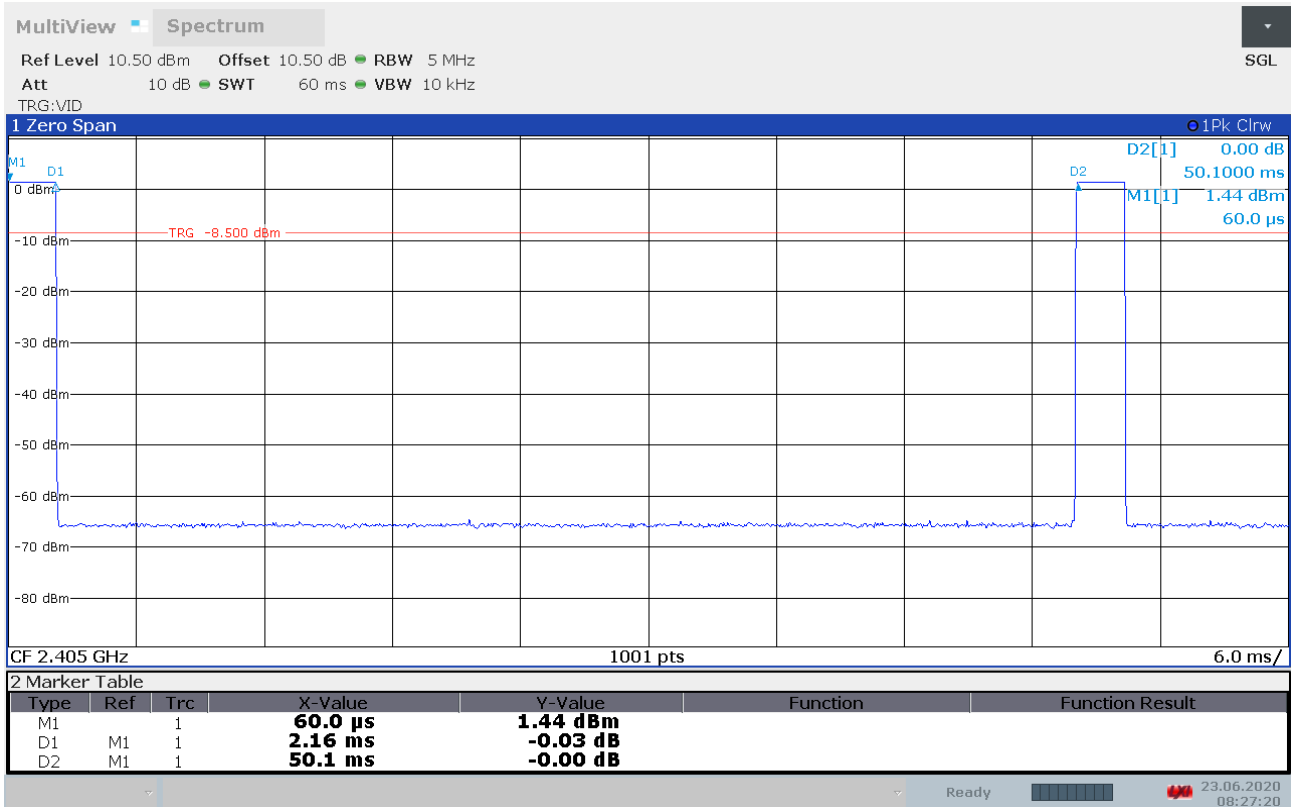
1 PK  
 MAXH



Center 2.4835 GHz 2.5 MHz/ Span 25 MHz

Date: 12.AUG.2020 13:17:30

**Dipole antenna: Upper Band Edge, PK, ch2480MHz**



Duty Cycle

### 3.7 Radiated emissions 30 – 1000 MHz.

FCC Part 15.209 (a)

ISED Canada RSS-GEN Issue 5, Clause 7.3/8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Detector: Quasi-Peak

Measuring distance 3 m

Tested in TX mode

With Monopole antenna:

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
35.292650	27.22	40.00	12.78	1000.0	120.000	100.0	V	294.0

With dipole antenna:

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
41.964050	22.93	40.00	17.07	1000.0	120.000	103.0	V	144.0
50.892600	14.80	40.00	25.20	1000.0	120.000	105.0	V	265.0
869.467200	26.79	46.00	19.21	1000.0	120.000	125.0	V	64.0

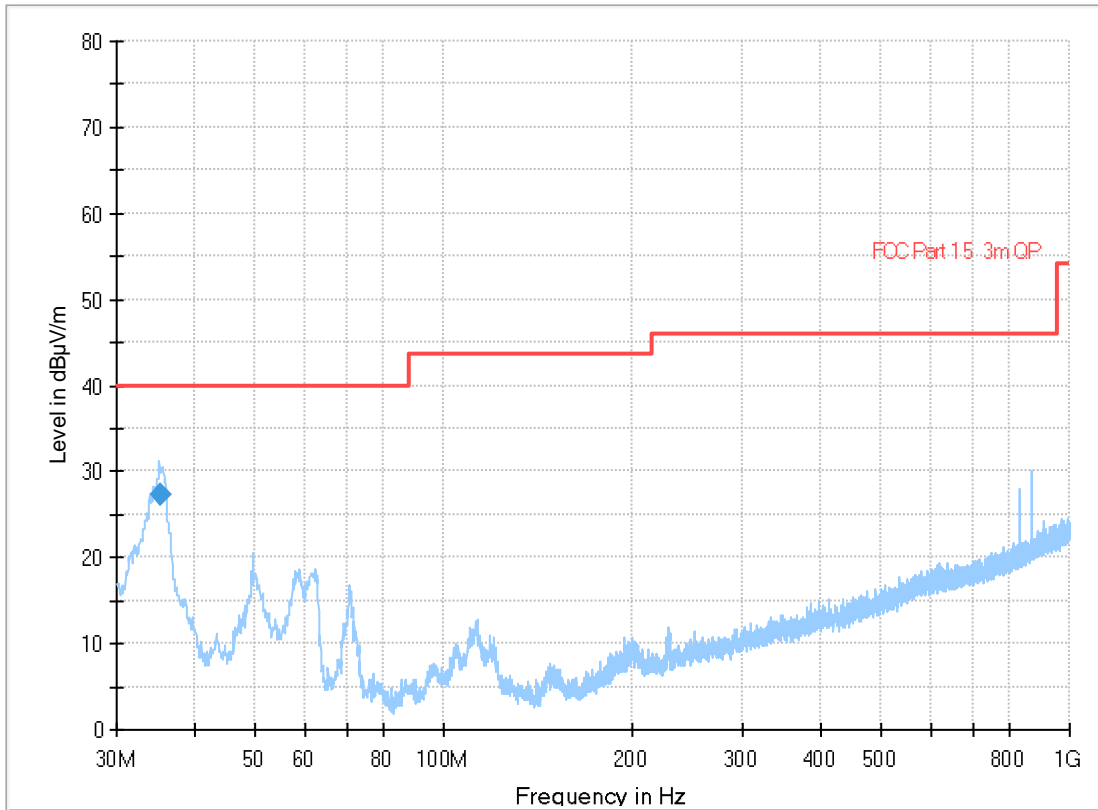
See attached plots

#### Requirements/Limit

<b>FCC</b>	Part 15.209 @ frequencies defined in §15.205	
<b>ISED</b>	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	<b>Radiated emission limit @3 meters</b>	
<b>Frequency (MHz)</b>	<b>Quasi Peak (<math>\mu</math>V/m)</b>	<b>Quasi Peak (dB<math>\mu</math>V/m)</b>
<b>30 – 88</b>	100	40.0
<b>88 – 216</b>	150	43.5
<b>216 – 960</b>	200	46.0
<b>Above 960</b>	500	54.0

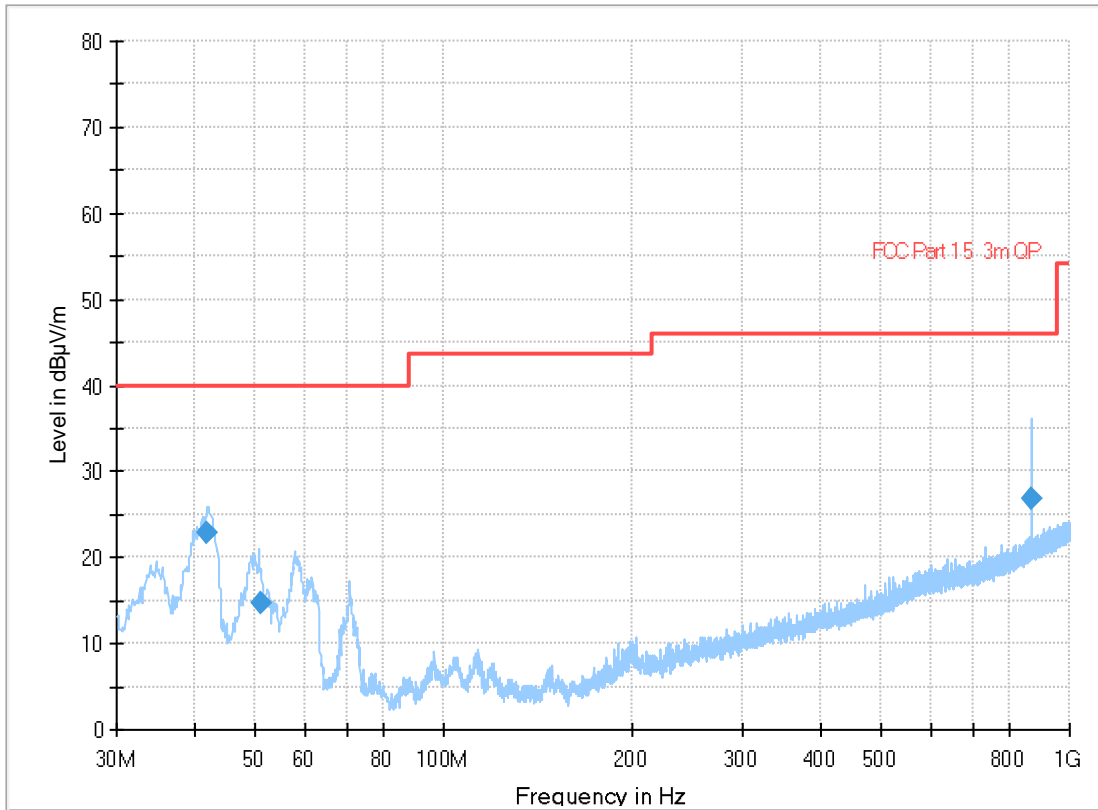
The limit above 1000 MHz is specified for Average Detector, when the measurement is performed with a Peak Detector a Duty-Cycle Correction Factor has to be calculated to find the corresponding Average Detector value.

Full Spectrum



With Monopole antenna

Full Spectrum



With dipole antenna

### 3.8 Radiated Emissions, 1-25 GHz

FCC Part 15.209 (a)

ISED Canada RSS-GEN Issue 5, Clause 7.3/8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measurement Data:

Measuring distance: 3m (1 – 18 GHz)

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

Monopole Antenna:

Restricted band:

Peak Detector:

Frequency	RF channel	Dist. corr. factor	Field strength, Peak Detector, 3m	Duty cycle corr. factor	Limit	Margin
GHz		dB	dB $\mu$ V/m	dB	dB $\mu$ V/m	dB
4.81	L	0	49.20	/	74	24.8
4.88	M	0	50.19	/	74	23.8
4.96	H	0	55.54	/	74	18.5
7.32	M	0	48.33	/	74	25.7
7.44	H	0	52.90	/	74	21.1
Other freqs	/	0	Below AV limit	/	74	>20

Restricted band:

Average Detector:

Frequency	RF channel	Dist. corr. factor	Field strength, Peak Detector, 3m	Duty cycle corr. factor	Limit	Margin
GHz		dB	dB $\mu$ V/m	dB	dB $\mu$ V/m	dB
4.81	L	0	/	20	54	/
4.88	M	0	/	20	54	/
4.96	H	0	35.54	20	54	18.5
7.32	M	0	/	20	54	/
7.44	H	0	/	20	54	/
Other freqs	Hopping	0	Below AV limit	/	54	>20

Maximum is obtained in vertical polarization.

Duty Cycle Correction factor =  $-20 \times \log(0.043) = -27$  dB (Duty cycle: 4.3%) , For single channel

Hopping channels 16.

Maximum allowed Duty Cycle Correction: 20 dB

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

A High Pass Filter was used for measurements from 3 GHz to 18 GHz.

**Non- Restricted band:**

**Peak Detector:**

Frequency	RF channel	Dist. corr. factor	Field strength of emission Peak Detector, 3m	Field strength of Fundamental frequency Peak Detector, 3m	Limit	Margin
MHz	MHz	dB	dB $\mu$ V/m	dB $\mu$ V/m	dBc	dB
7.21	L	0	48.74	112.6	20	63.86
9.62	L	0	50.42	112.6	20	62.18
9.76	M	0	/	109.4	20	/
9.92	H	0	50.78	112.2	20	61.42
Other freqs	hopping	0	None detcted	112	20	/

Maximum is obtained in vertical polarization.

Duty Cycle Correction factor =  $-20 \times \log(0.043) = -27$  dB (Duty cycle: 4.3%)

Maximum allowed Duty Cycle Correction: 20 dB

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

A High Pass Filter was used for measurements from 3 GHz to 18 GHz .

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

See plots.

**Requirements/Limit**

<b>FCC</b>	<b>Part 15.209 @ frequencies defined in §15.205</b>	
<b>ISED</b>	<b>RSS-GEN Issue 5, clause 8.9 @ frequencies defined in clause 8.10</b>	
	<b>Radiated emission limit @3 meters</b>	
<b>Frequency</b>	<b>Average Detector</b>	<b>Peak Detector</b>
<b>1 – 26 GHz</b>	<b>54.0 dB<math>\mu</math>V/m</b>	<b>74.0 dB<math>\mu</math>V/m</b>



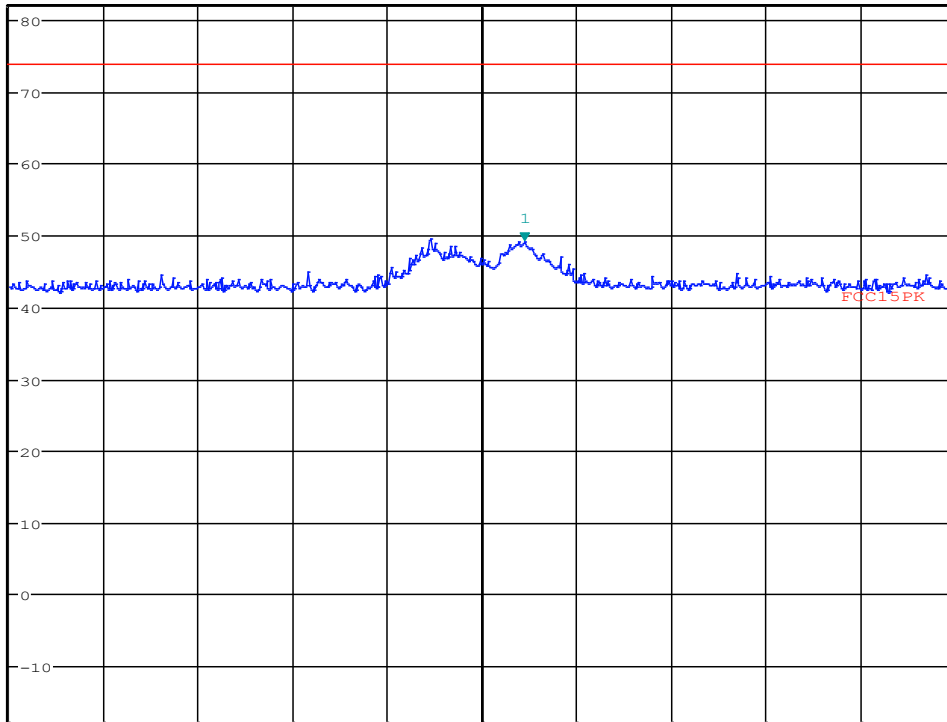


**MARKER 1**  
 4.810897436 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      49.20 dBμV/m  
 SWT 20 ms      4.810897436 GHz

Ref 82 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



Center 4.81 GHz      2 MHz/      Span 20 MHz

Date: 18.JUN.2020 15:53:15

Monopole antenna:2<sup>nd</sup> Harmonic, VP, ch2405MHz

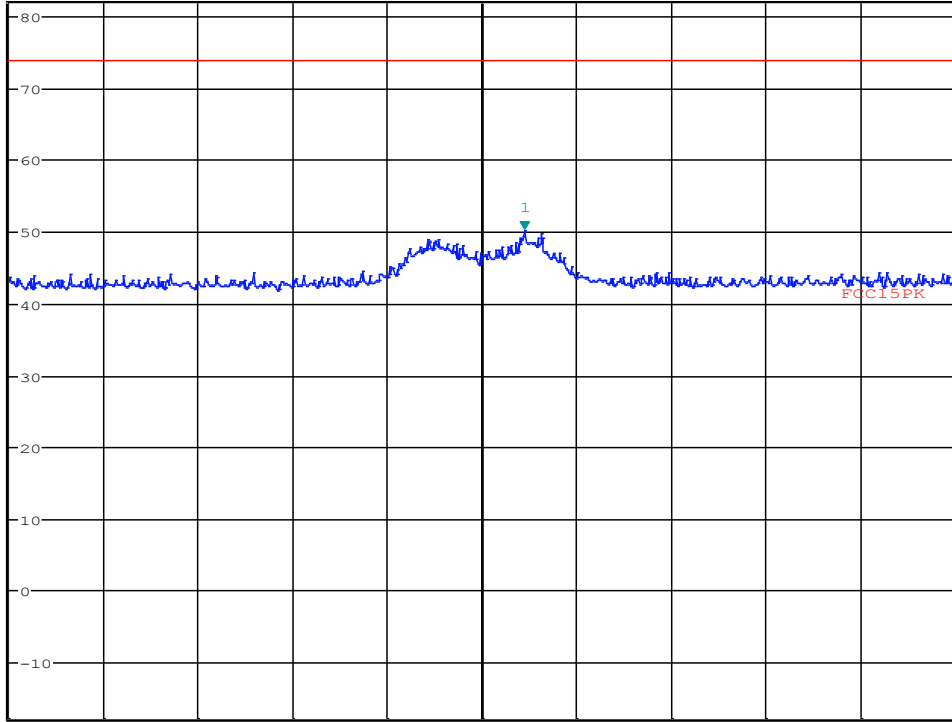


**MARKER 1**  
 4.880897436 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      50.19 dBμV/m  
 SWT 20 ms      4.880897436 GHz

Ref 82 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



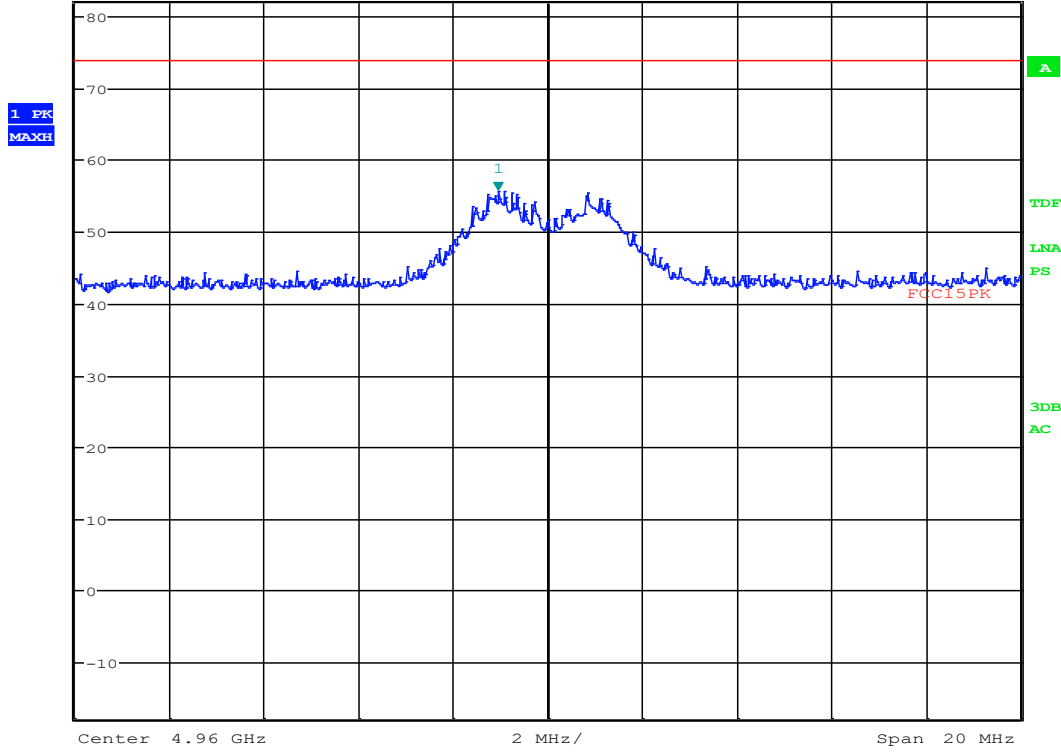
Date: 18.JUN.2020 16:05:55

Monopole antenna:2<sup>nd</sup> Harmonic, VP, ch2440MHz



\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      55.54 dBμV/m  
 \*SWT 20 ms      4.958942308 GHz

Ref 82 dBμV/m      \*Att 10 dB



Date: 18.JUN.2020 15:37:24

Monopole antenna:2<sup>nd</sup> Harmonic, VP, ch2480MHz

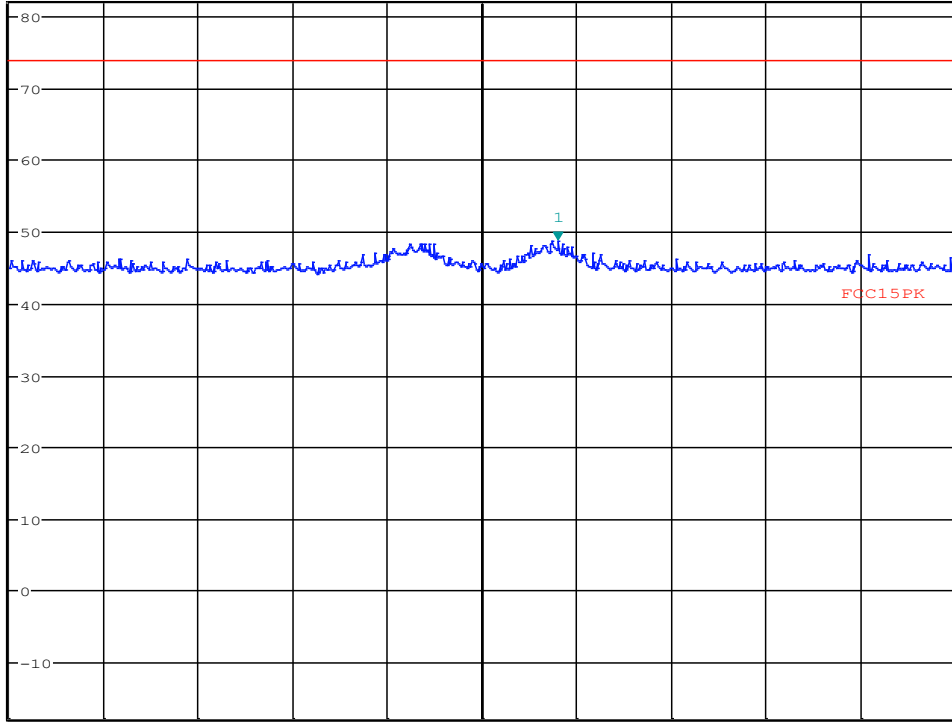


**MARKER 1**  
 7.216602564 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      48.74 dBμV/m  
 SWT 20 ms      7.216602564 GHz

Ref 82 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



Date: 18.JUN.2020 15:54:26

Monopole antenna:3rd Harmonic, VP, ch2405MHz

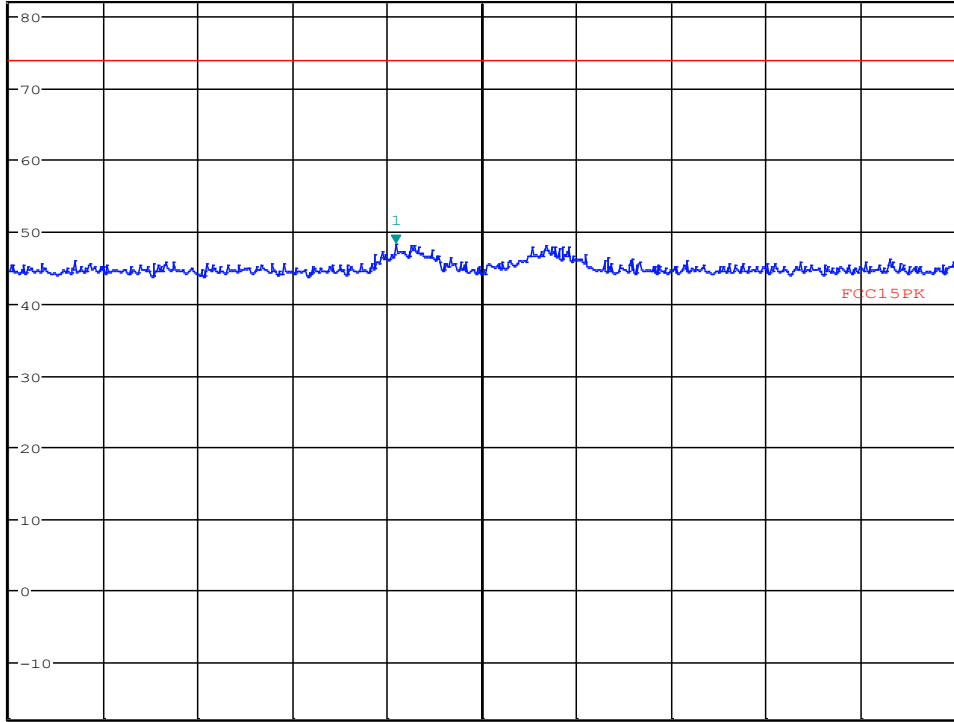


**MARKER 1**  
 7.318173077 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      48.33 dBμV/m  
 SWT 20 ms      7.318173077 GHz

Ref 82 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



Center 7.32 GHz      2 MHz/      Span 20 MHz

Date: 18.JUN.2020 16:06:46

Monopole antenna:3rd Harmonic, VP, ch2440MHz

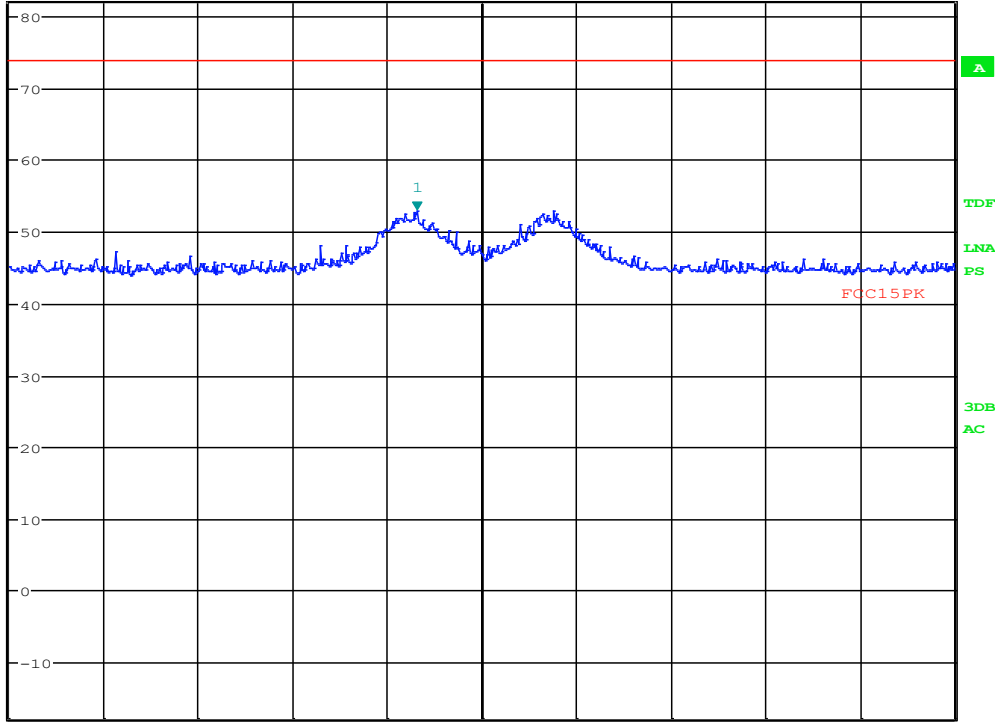


**MARKER 1**  
 7.438621795 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      52.90 dBμV/m  
 \*SWT 20 ms      7.438621795 GHz

Ref 82 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



Center 7.44 GHz      2 MHz/      Span 20 MHz

Date: 18.JUN.2020 15:38:42

Monopole antenna:3rd Harmonic, VP, ch2480MHz

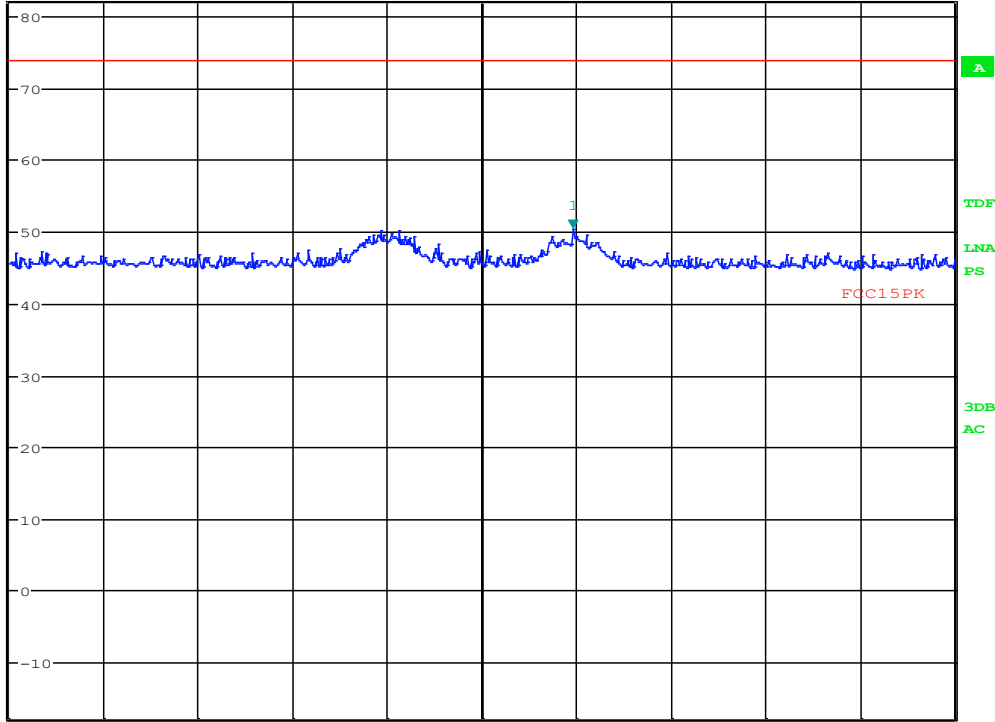


**MARKER 1**  
 9.621923077 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      50.42 dBμV/m  
 SWT 20 ms      9.621923077 GHz

Ref 82 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



Date: 18.JUN.2020 15:55:01

Monopole antenna:4<sup>th</sup> Harmonic, VP, ch2405MHz

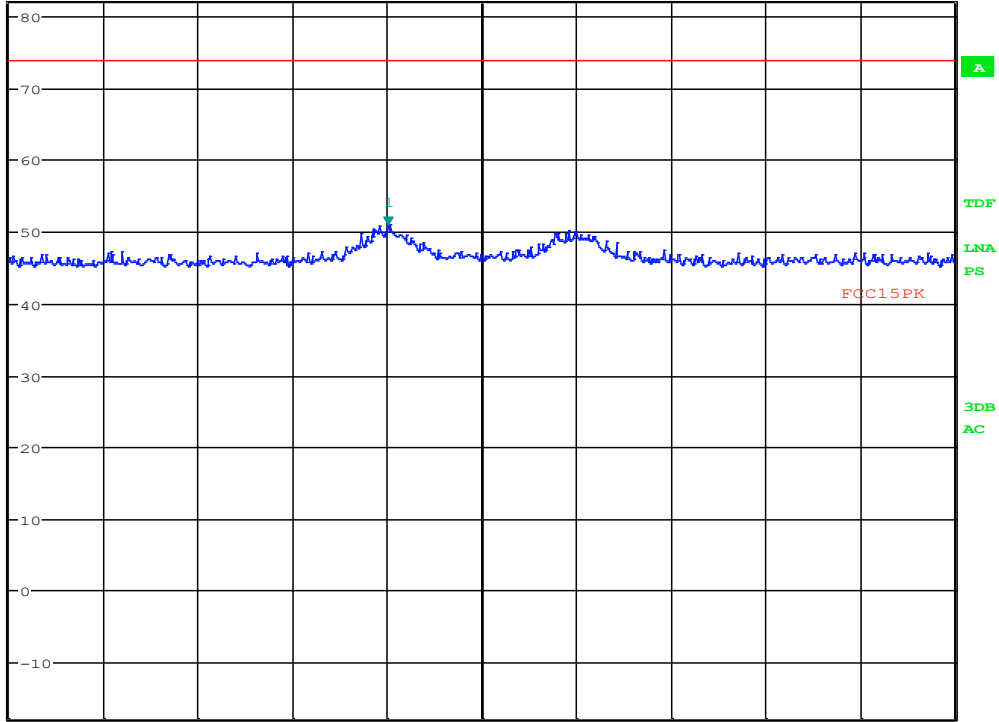


**MARKER 1**  
 9.918012821 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      50.78 dBμV/m  
 \*SWT 20 ms      9.918012821 GHz

Ref 82 dBμV/m      \*Att 10 dB

1 PK  
 MAXH

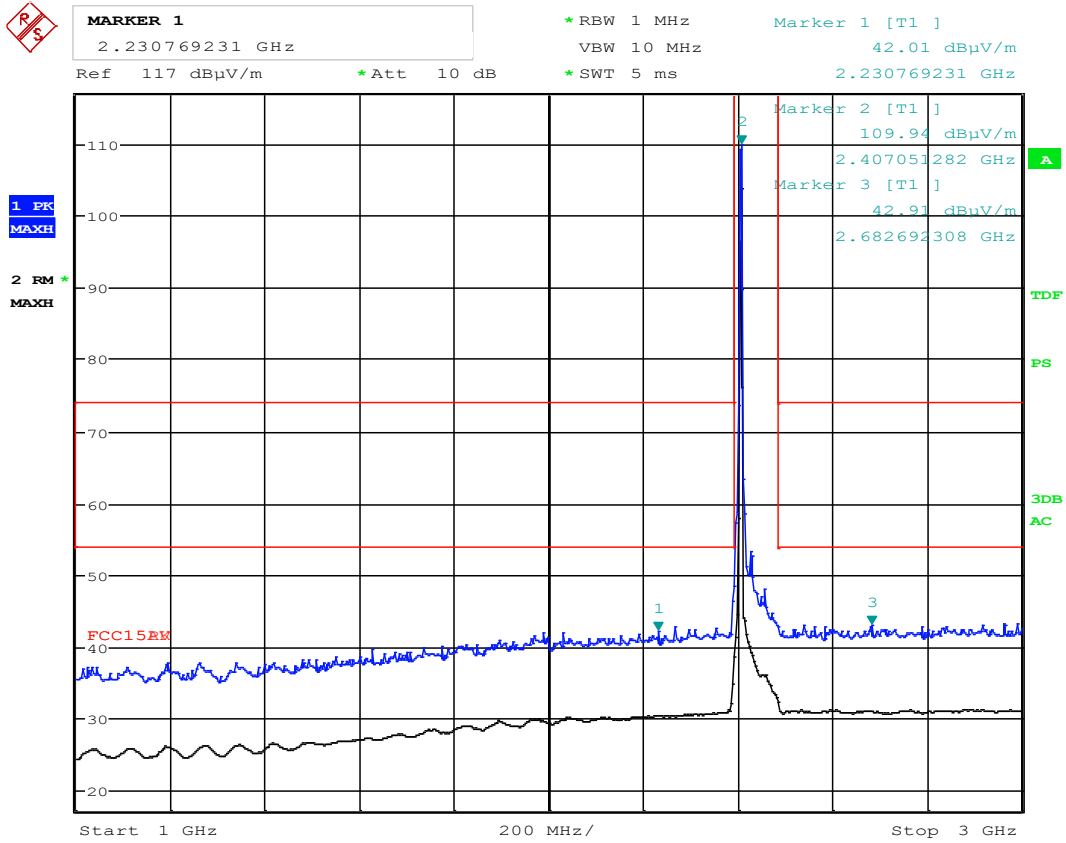


Center 9.92 GHz      2 MHz/      Span 20 MHz

Date: 18.JUN.2020 15:41:27

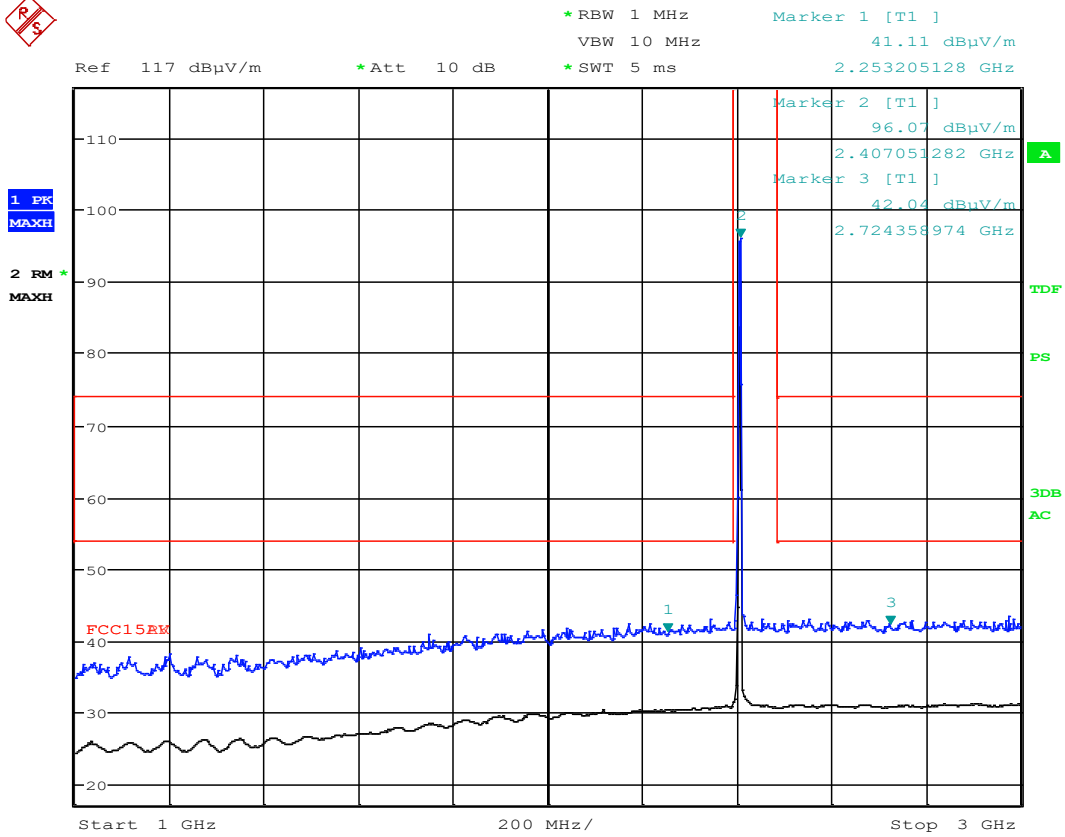
Monopole antenna:4<sup>th</sup> Harmonic, VP, ch2480MHz





Date: 18.JUN.2020 13:19:51

Monopole antenna: Radiated spurious emissions, VP, 1 - 3GHz, ch2405MHz, PK scan



Date: 18.JUN.2020 13:18:32

Monopole antenna: Radiated spurious emissions, HP, 1 - 3GHz, ch2405MHz, PK scan

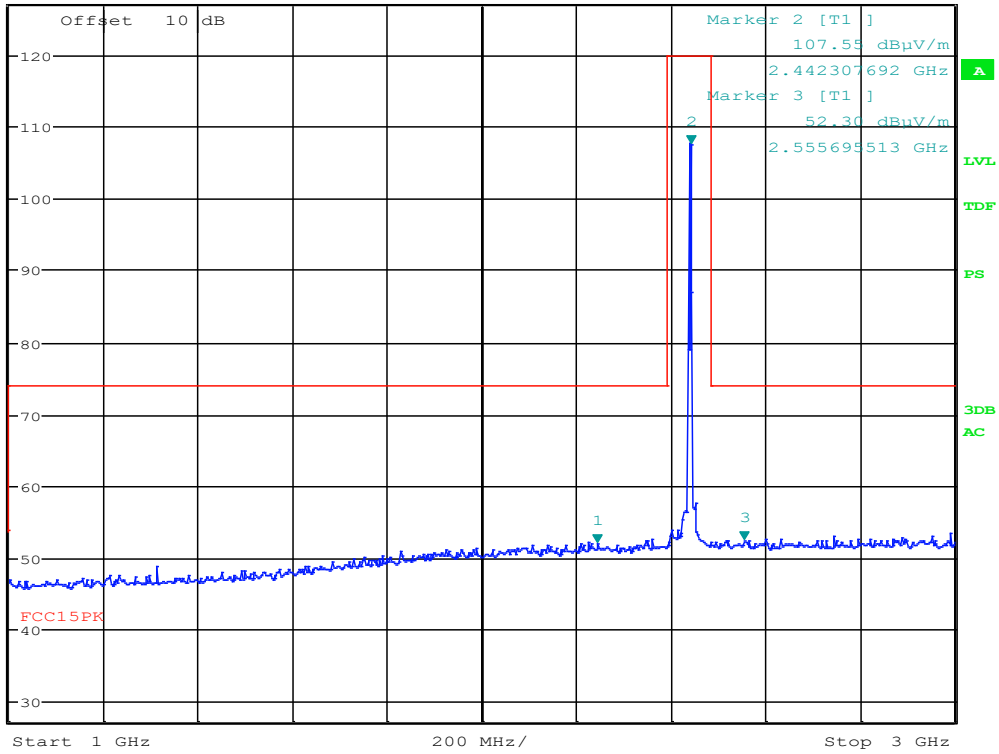


**MARKER 1**  
 2.24199359 GHz

\*RBW 1 MHz  
 VBW 3 MHz  
 \*SWT 5 ms  
 Marker 1 [T1 ]  
 51.88 dBμV/m  
 2.241993590 GHz

Ref 127 dBμV/m \*Att 10 dB

1 PK  
 MAXH



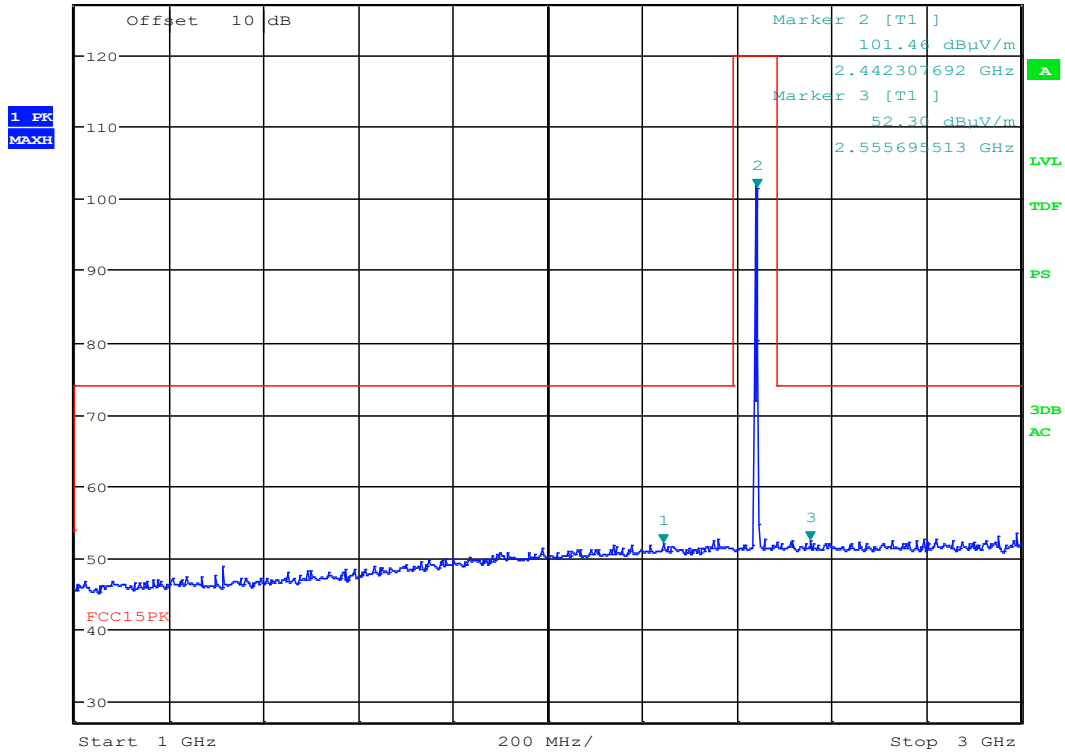
Date: 18.JUN.2020 13:40:46

Monopole antenna: Radiated spurious emissions, VP, 1 - 3GHz, ch2440MHz, PK scan



**MARKER 1**  
 2.24199359 GHz

\*RBW 1 MHz  
 \*Att 10 dB  
 \*SWT 5 ms  
 Marker 1 [T1 ]  
 51.88 dBμV/m  
 2.241993590 GHz



Date: 18.JUN.2020 13:39:37

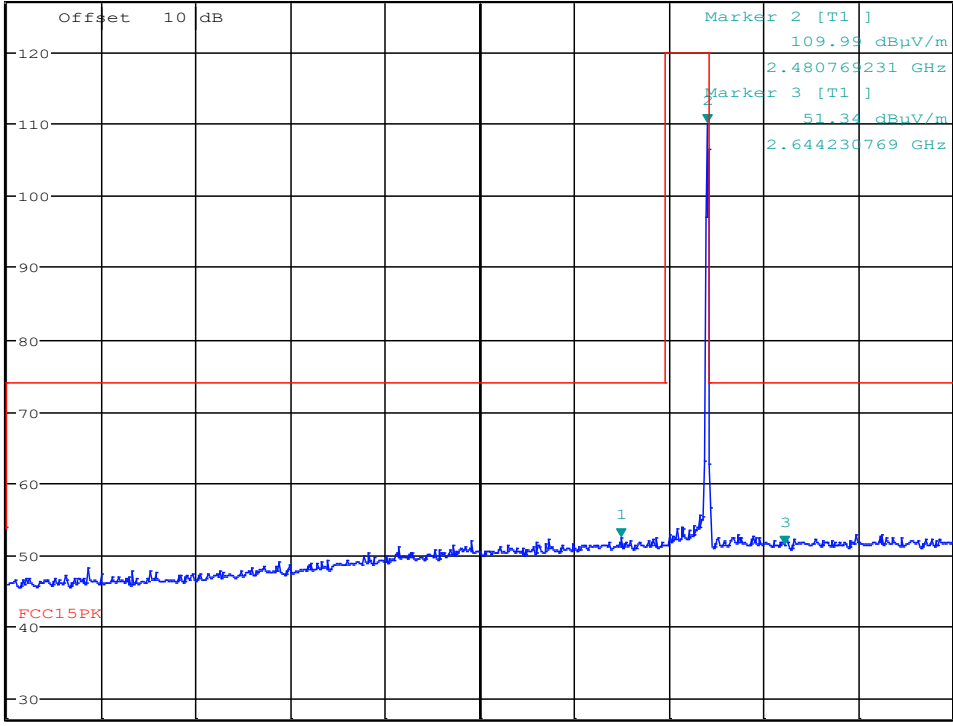
Monopole antenna: Radiated spurious emissions, HP, 1 - 3GHz, ch2440MHz, PK scan



**MARKER 1**  
 2.297067308 GHz

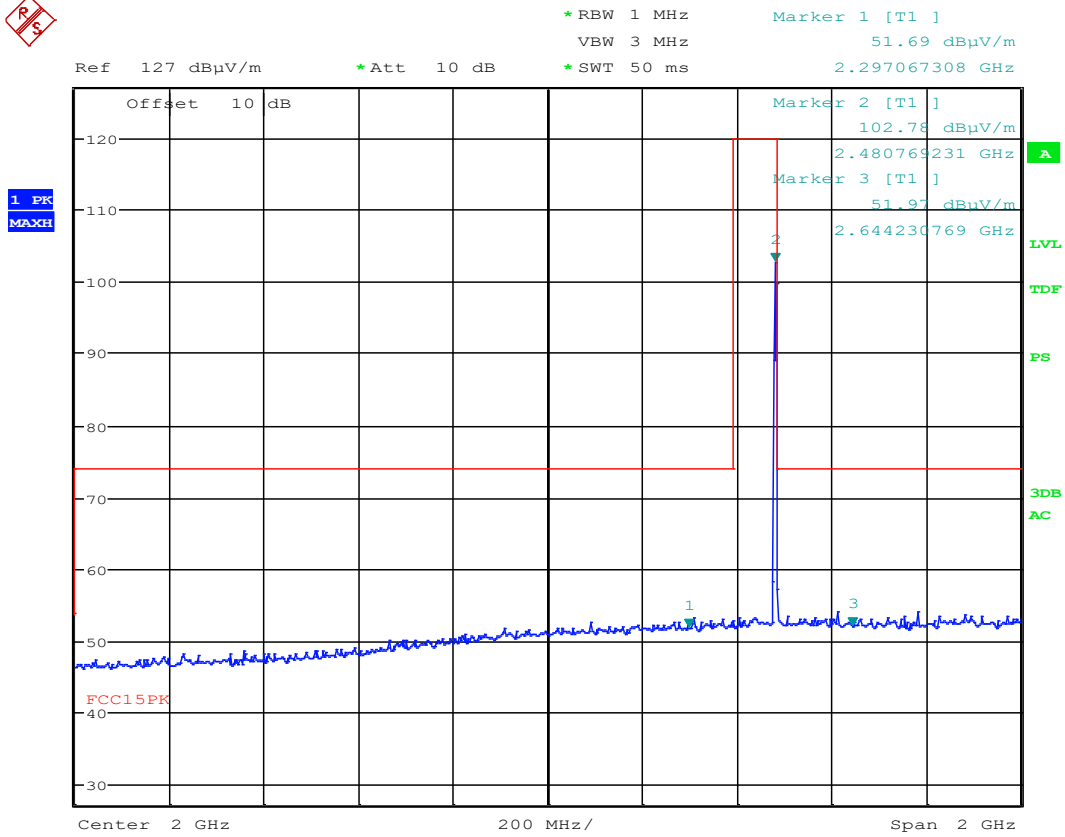
\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      52.37 dBμV/m  
 \*SWT 50 ms      2.297067308 GHz

Ref 127 dBμV/m      \*Att 10 dB



Date: 18.JUN.2020 14:41:06

Monopole antenna: Radiated spurious emissions, VP, 1 - 3GHz, ch2480MHz, PK scan



Date: 18.JUN.2020 14:57:39

Monopole antenna: Radiated spurious emissions, HP, 1 - 3GHz, ch2480MHz, PK scan



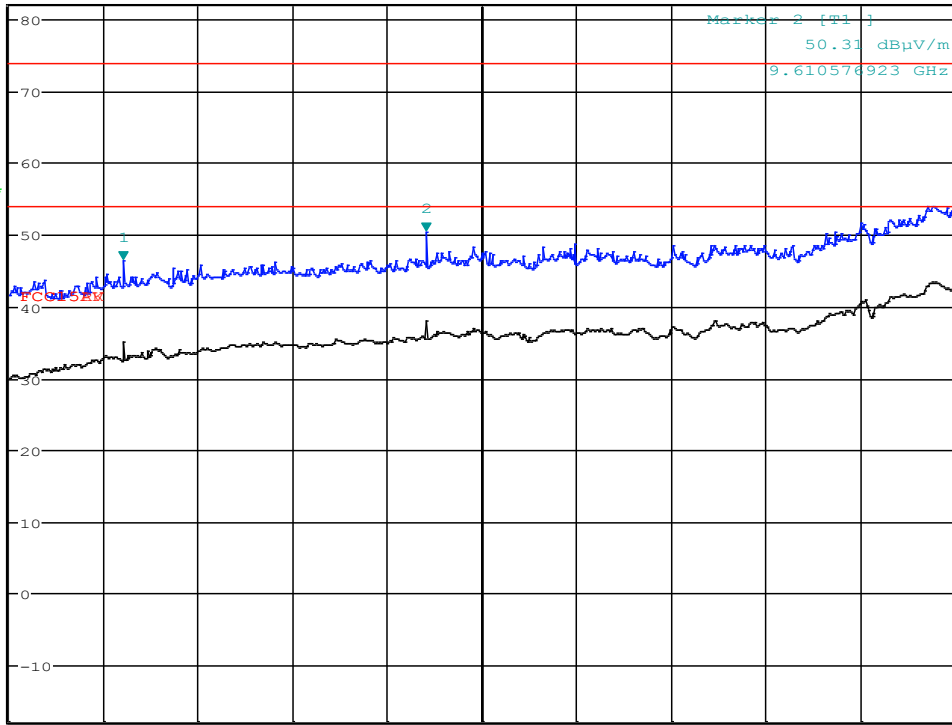
**MARKER 1**  
 4.797820513 GHz

\*RBW 1 MHz  
 VBW 10 MHz  
 SWT 90 ms  
 Marker 1 [T1 ]  
 46.29 dBμV/m  
 4.797820513 GHz

Ref 82 dBμV/m \*Att 10 dB

1 PK  
 MAXH

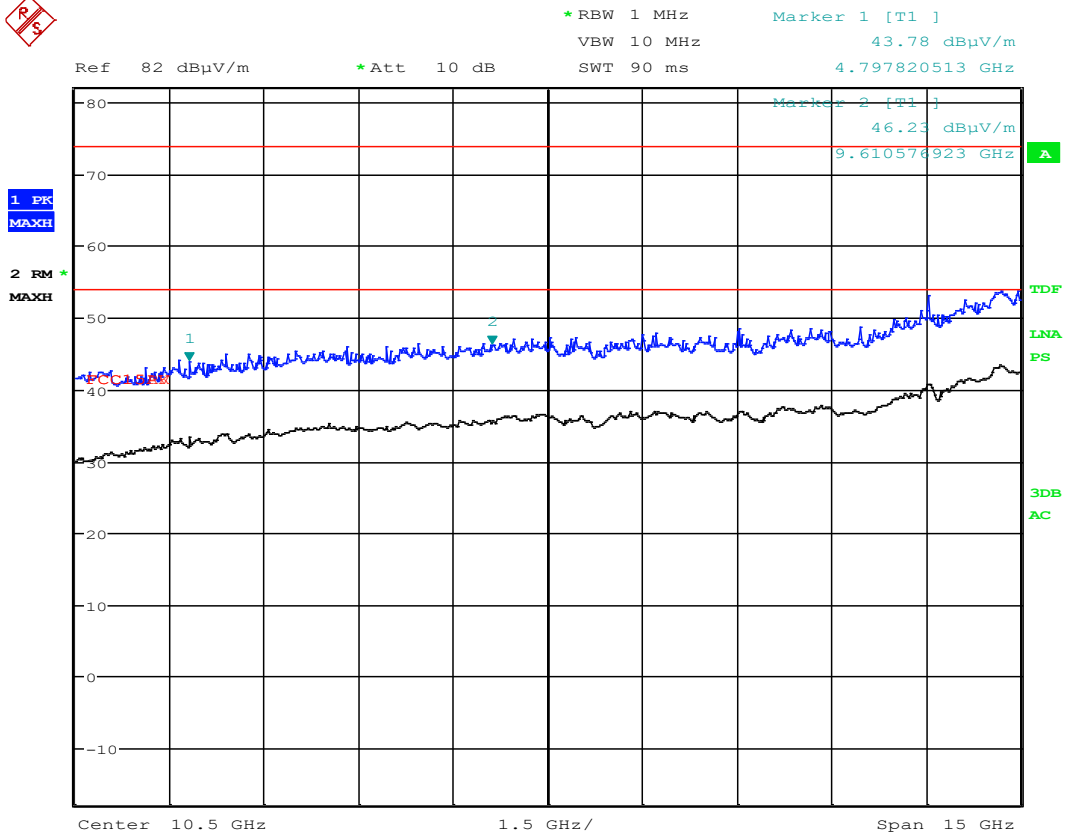
2 RM  
 MAXH



Center 10.5 GHz 1.5 GHz/ Span 15 GHz

Date: 18.JUN.2020 15:49:24

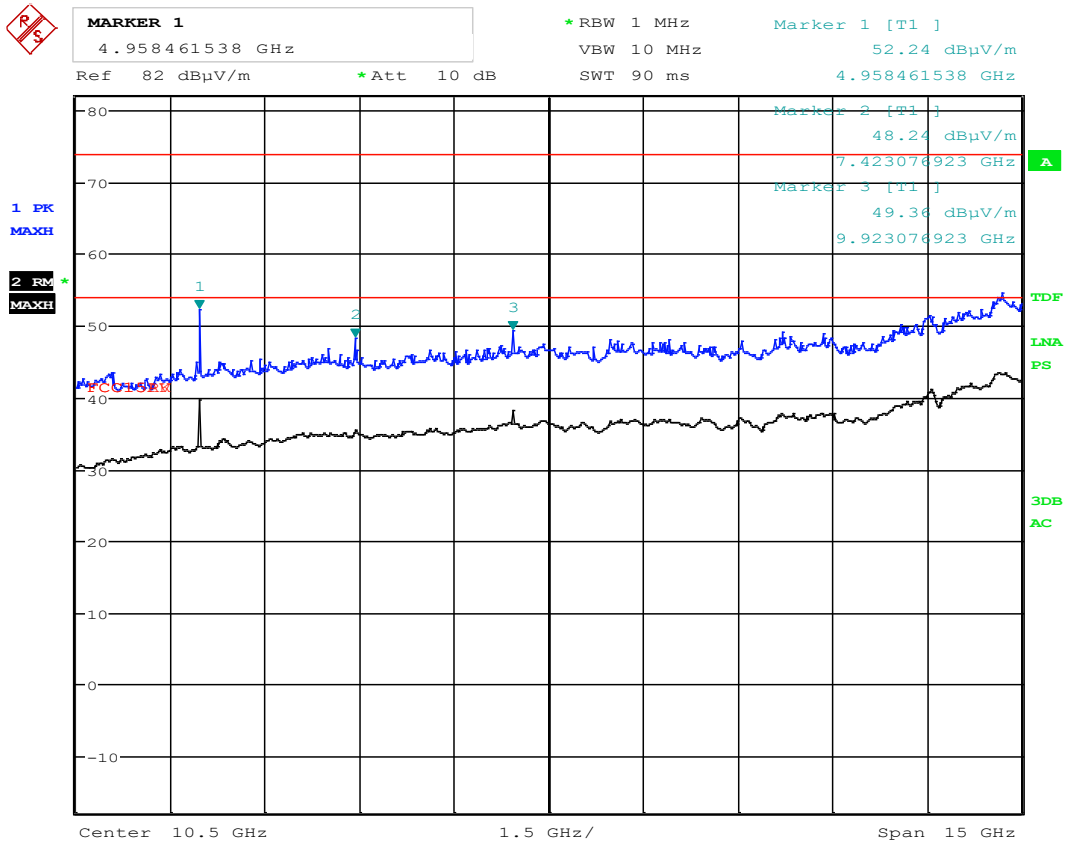
Monopole antenna: Radiated spurious emissions, VP, 3 - 18GHz, ch2405MHz, PK scan



Date: 18.JUN.2020 15:50:39

Monopole antenna: Radiated spurious emissions, HP, 3 - 18GHz, ch2405MHz, PK scan





Date: 18.JUN.2020 15:57:53

Monopole antenna: Radiated spurious emissions, VP, 3 - 18GHz, ch2440MHz, PK scan



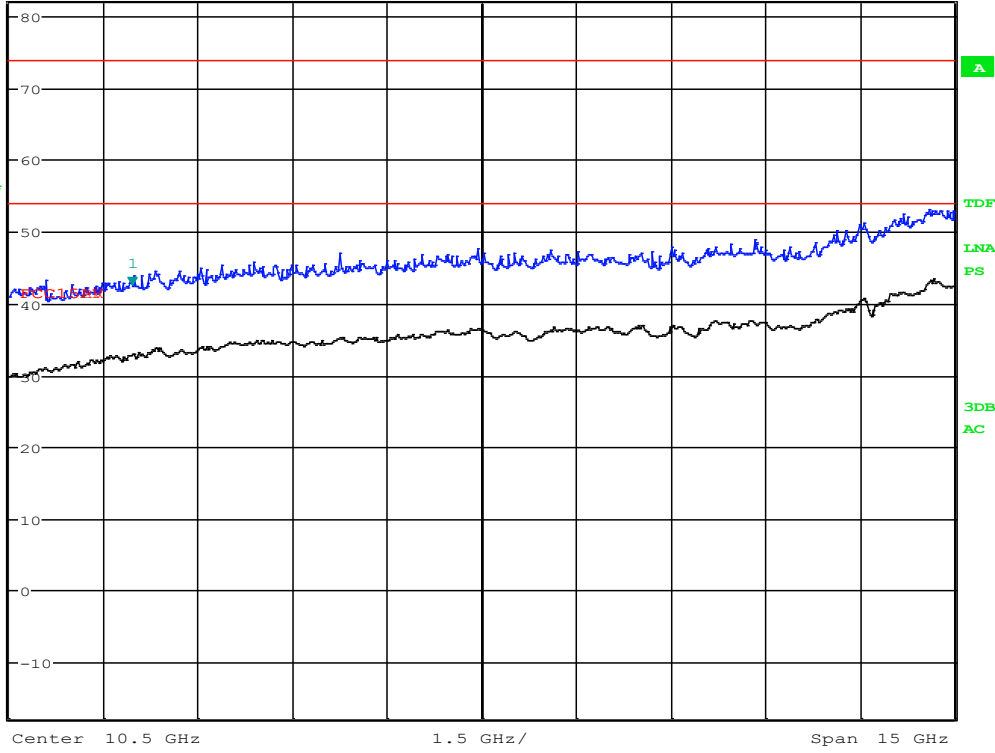
**MARKER 1**  
 4.958461538 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 10 MHz      42.49 dBμV/m  
 SWT 90 ms      4.958461538 GHz

Ref 82 dBμV/m      \*Att 10 dB

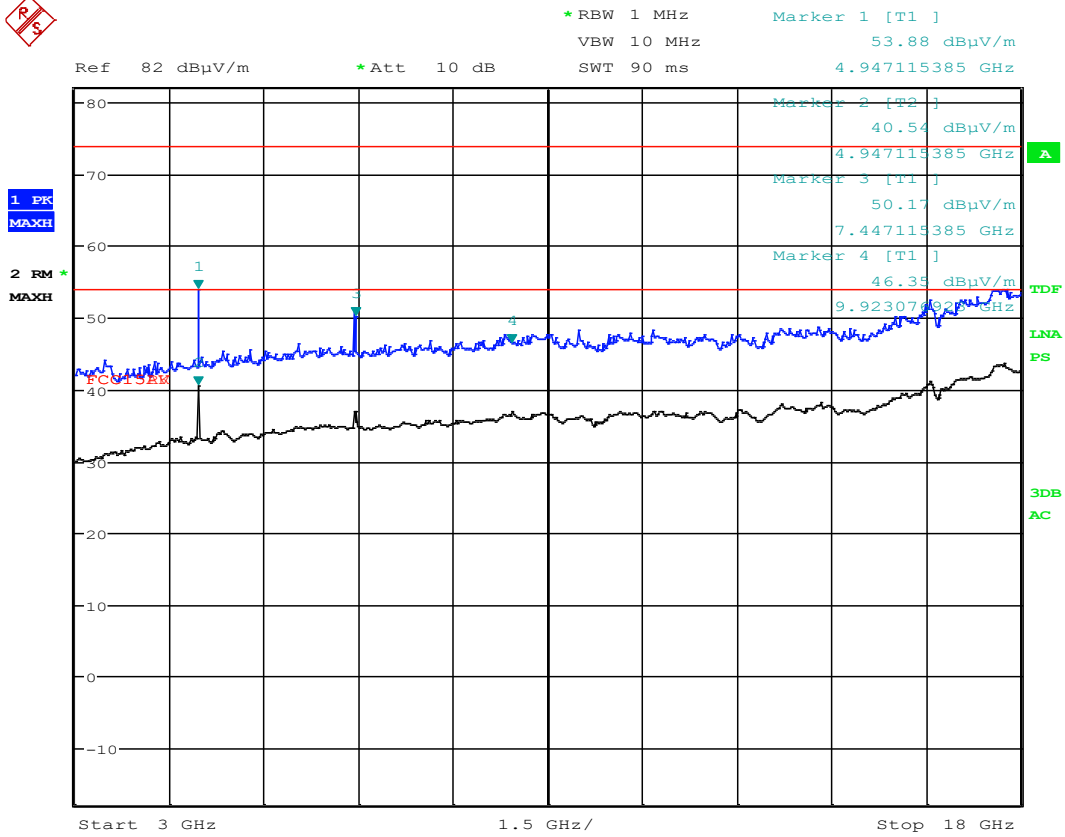
1 PK  
 MAXH

2 RM \*  
 MAXH



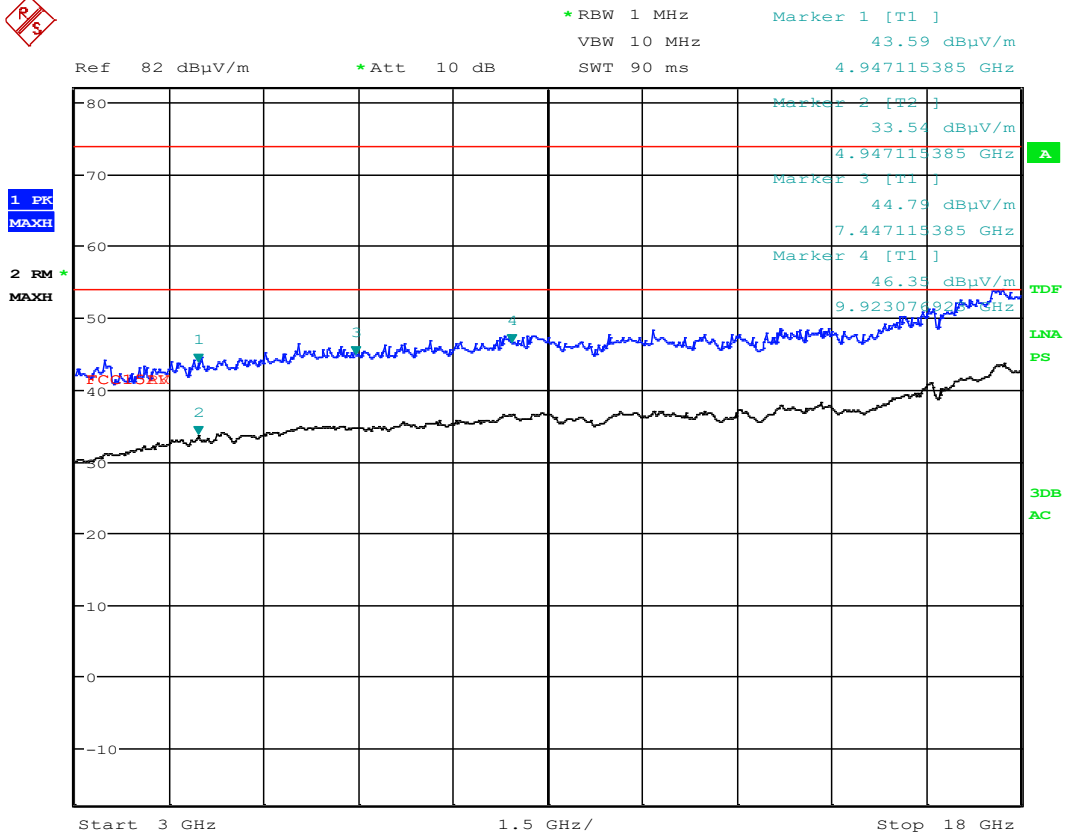
Date: 18.JUN.2020 15:59:40

Monopole antenna: Radiated spurious emissions, HP, 3 - 18GHz, ch2440MHz, PK scan



Date: 18.JUN.2020 15:21:34

Monopole antenna: Radiated spurious emissions, VP, 3 - 18GHz, ch2480MHz, PK scan



Date: 18.JUN.2020 15:20:25

Monopole antenna: Radiated spurious emissions, HP, 3 - 18GHz, ch2480MHz, PK scan

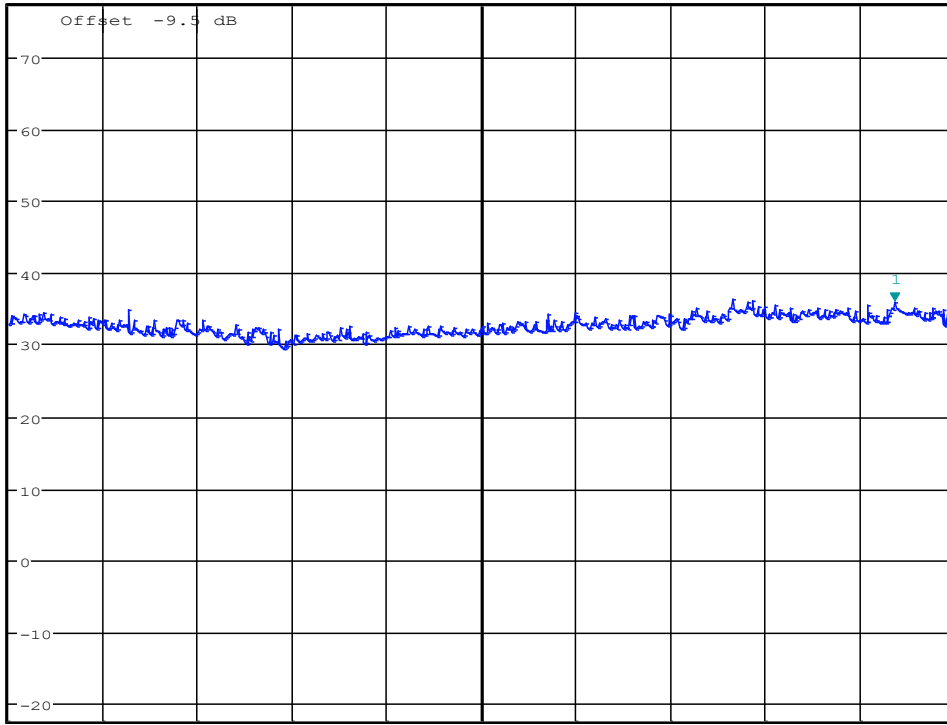


**MARKER 1**  
 24.5625 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      35.91 dBμV/m  
 SWT 45 ms      24.562500000 GHz

Step 77.5 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



Date: 20.JUN.2020 09:17:40

Monopole antenna, Pre-scan, Radiated spurious emissions, VP, 18 - 25GHz

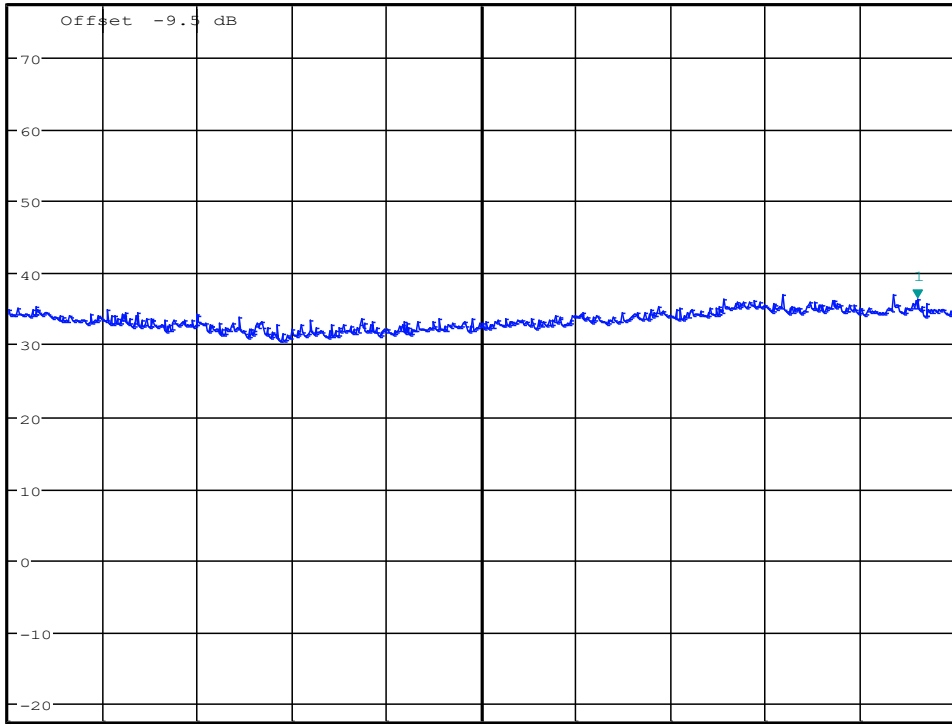


**MARKER 1**  
 24.73076923 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      36.53 dBμV/m  
 SWT 45 ms      24.730769231 GHz

Step 77.5 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



Date: 20.JUN.2020 09:15:30

Monopole antenna, Pre-scan, Radiated spurious emissions, HP, 18 - 25GHz

**FCC Part 15.209 (a)**

**ISED Canada RSS-GEN Issue 5, Clause 7.3/8.9**

**Measurement procedure:** ANSI C63.10-2013 Clause 11.12

**Test Results: Complies**

**Measurement Data:**

Measuring distance: 3m (1 – 18 GHz)

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

**Dipole Antenna:**

**Restricted band:**

**Peak Detector:**

Frequency	RF channel	Dist. corr. factor	Field strength, Peak Detector, 3m	Duty cycle corr. factor	Limit	Margin
GHz		dB	dB $\mu$ V/m	dB	dB $\mu$ V/m	dB
4.81	L	0	48.07	/	74	25.9
4.88	M	0	48.00	/	74	26.0
4.96	H	0	50.88	/	74	23.1
7.32	M	0	48.61	/	74	25.4
7.44	H	0	53.34	/	74	20.7
Other freqs	/	0	Below AV limit	/	74	>20

**Restricted band:**

**Average Detector:**

Frequency	RF channel	Dist. corr. factor	Field strength, Peak Detector, 3m	Duty cycle corr. factor	Limit	Margin
GHz		dB	dB $\mu$ V/m	dB	dB $\mu$ V/m	dB
4.81	L	0	/	20	54	/
4.88	M	0	/	20	54	/
4.96	H	0	/	20	54	/
7.32	M	0	/	20	54	/
7.44	H	0	/	20	54	/
Other freqs	Hopping	0	Below AV limit	/	54	>20

Maximum is obtained in vertical polarization.

Duty Cycle Correction factor =  $-20 \times \log(0.043) = -27$  dB (Duty cycle: 4.3%) , For single channel

Hopping channels 16.

Maximum allowed Duty Cycle Correction: 20 dB

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

A High Pass Filter was used for measurements from 3 GHz to 18 GHz.

**Non- Restricted band:**

**Peak Detector:**

Frequency	RF channel	Dist. corr. factor	Field strength of emission Peak Detector, 3m	Field strength of Fundamental frequency Peak Detector, 3m	Limit	Margin
MHz	MHz	dB	dB $\mu$ V/m	dB $\mu$ V/m	dBc	dB
7.21	L	0	48.41	111.3	20	62.9
9.62	L	0	52.79	111.3	20	58.5
9.76	M	0	48.42	109.1	20	60.7
9.92	H	0	50.79	106.1	20	55.3
Other freqs	hopping	0	None detcted	112	20	/

Maximum is obtained in vertical polarization.

Duty Cycle Correction factor =  $-20 \times \log(0.043) = -27$  dB (Duty cycle: 4.3%)

Maximum allowed Duty Cycle Correction: 20 dB

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

A High Pass Filter was used for measurements from 3 GHz to 18 GHz .

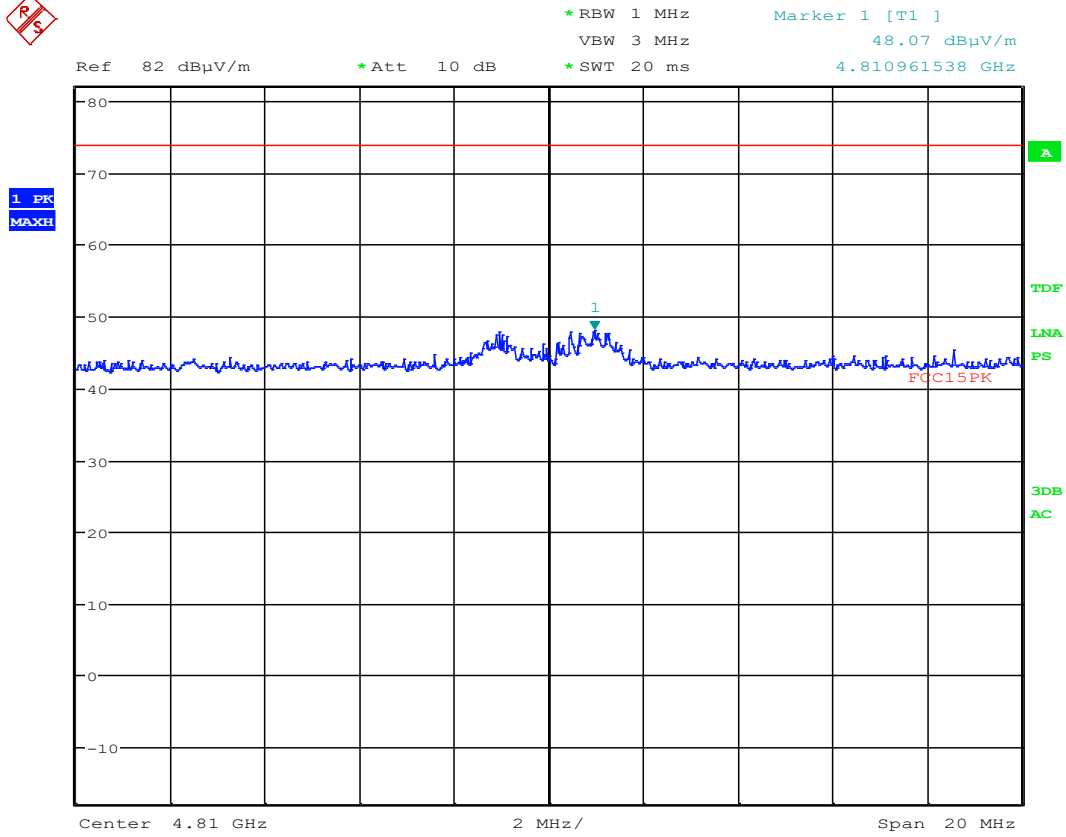
Antenna factor, amplifier gain and cable loss are included in spectrum analyzer "Transducer factor".

See plots.

**Requirements/Limit**

FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, clause 8.9 @ frequencies defined in clause 8.10	
Radiated emission limit @3 meters		
Frequency	Average Detector	Peak Detector
1 – 26 GHz	54.0 dB $\mu$ V/m	74.0 dB $\mu$ V/m





Date: 19.JUN.2020 07:24:21

Dipole antenna:2<sup>nd</sup> Harmonic, HP, ch2405MHz

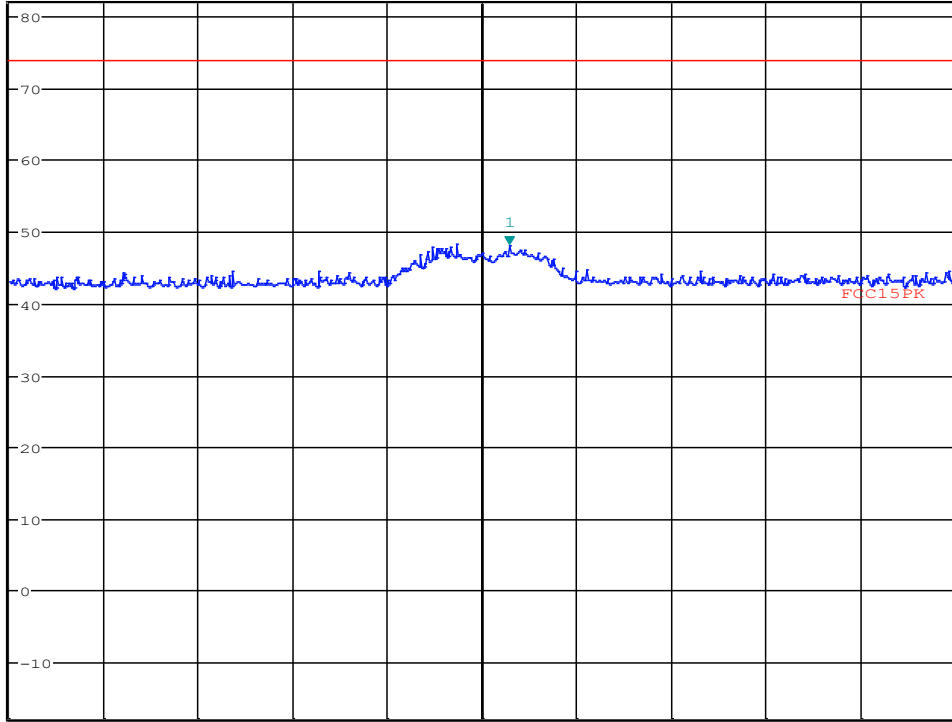


**MARKER 1**  
 4.880576923 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      48.00 dBμV/m  
 SWT 20 ms      4.880576923 GHz

Ref 82 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



Center 4.88 GHz      2 MHz/      Span 20 MHz

Date: 19.JUN.2020 08:24:00

Dipole antenna:2<sup>nd</sup> Harmonic, HP, ch2440MHz

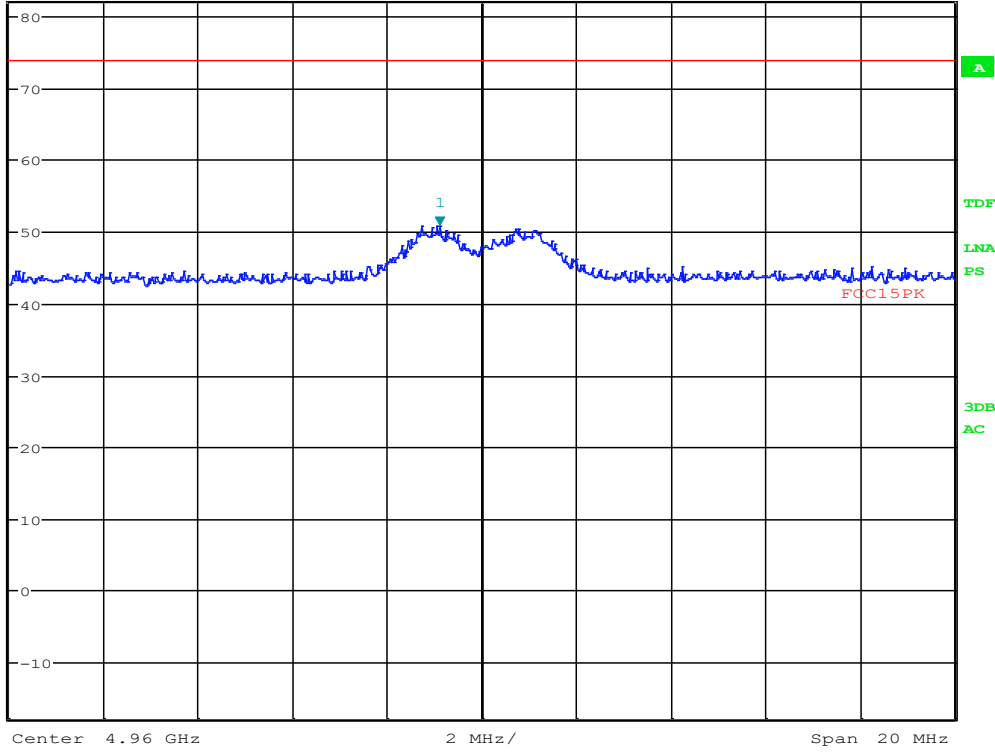


**MARKER 1**  
 4.959102564 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      50.88 dBμV/m  
 SWT 20 ms      4.959102564 GHz

Ref 82 dBμV/m      \*Att 10 dB

1 PK  
 MAXH

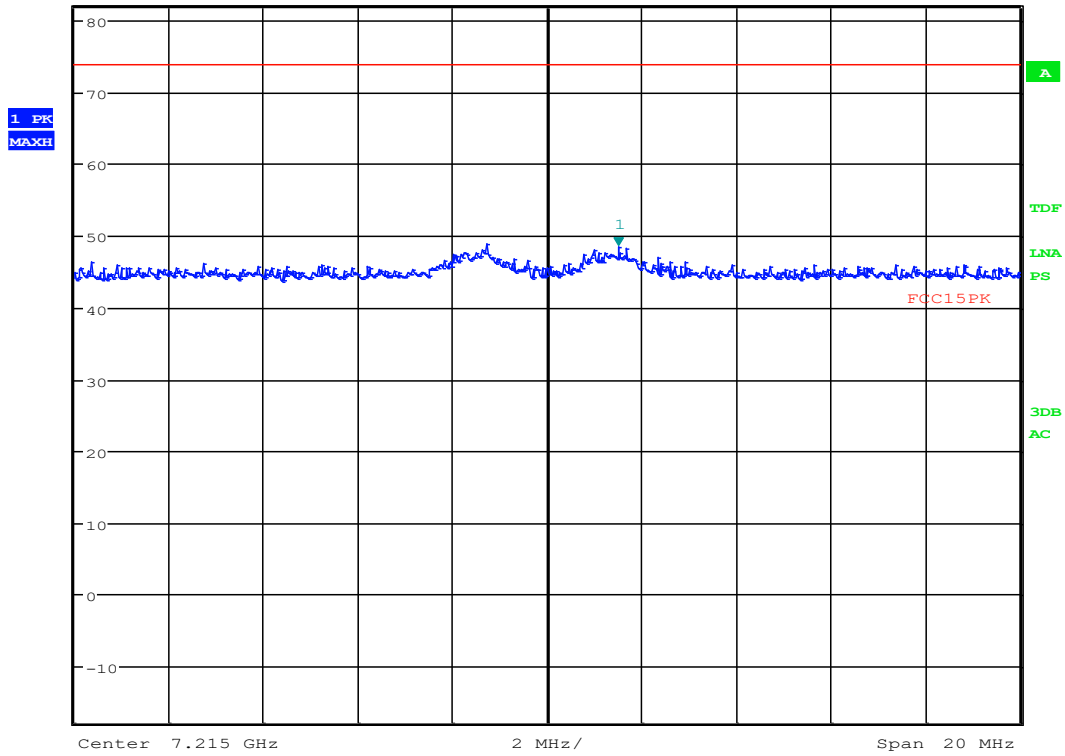


Date: 19.JUN.2020 08:37:40

Dipole antenna:2<sup>nd</sup> Harmonic, HP, ch2480MHz



\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      48.41 dBμV/m  
 \*Att 10 dB      \*SWT 20 ms      7.216506410 GHz  
 Ref 82 dBμV/m



Date: 19.JUN.2020 07:33:38

Dipole antenna:3rd Harmonic, VP, ch2405MHz

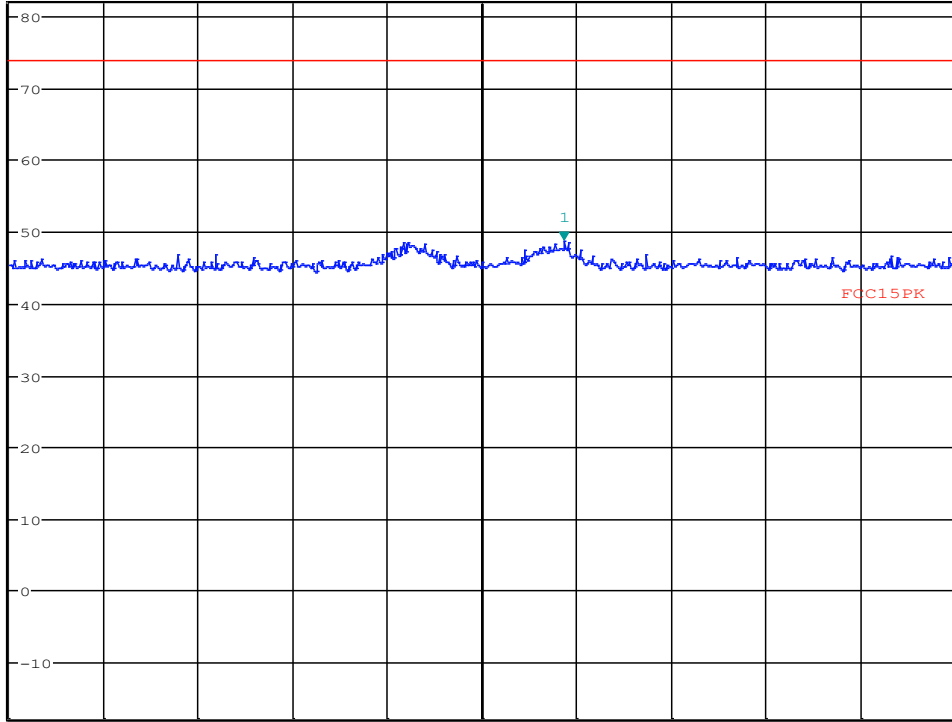


**MARKER 1**  
 7.321730769 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      48.61 dBμV/m  
 SWT 20 ms      7.321730769 GHz

Ref 82 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



Center 7.32 GHz      2 MHz/      Span 20 MHz

Date: 19.JUN.2020 08:27:11

Dipole antenna:3rd Harmonic, VP, ch2440MHz

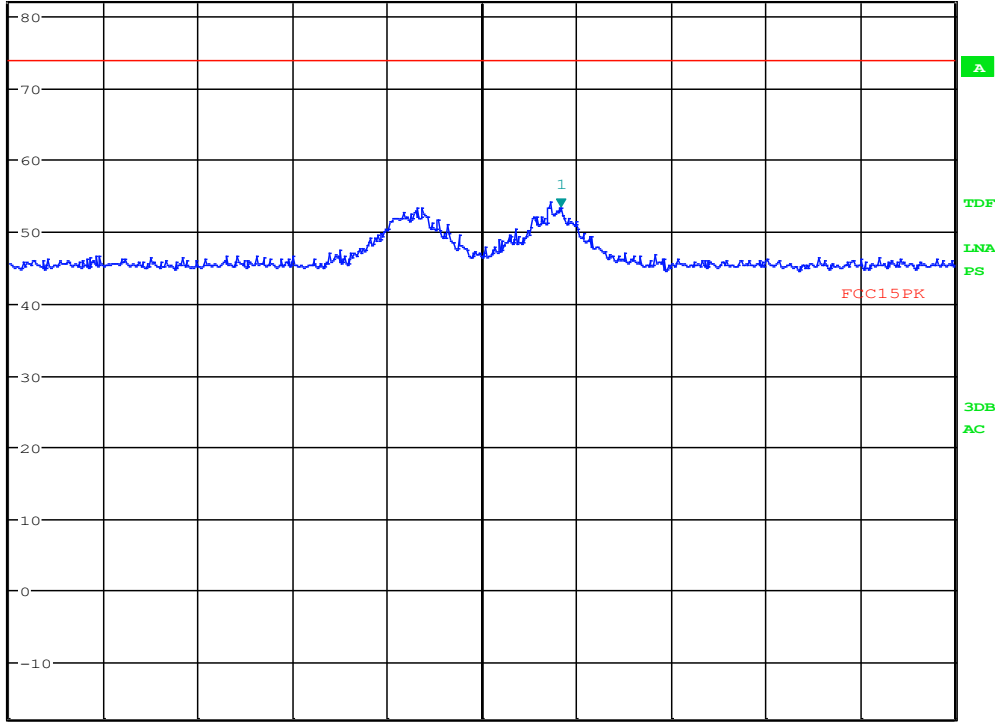


**MARKER 1**  
 7.441666667 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      53.34 dBμV/m  
 SWT 20 ms      7.441666667 GHz

Ref 82 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



Date: 19.JUN.2020 08:33:20

Dipole antenna:3rd Harmonic, VP, ch2480MHz

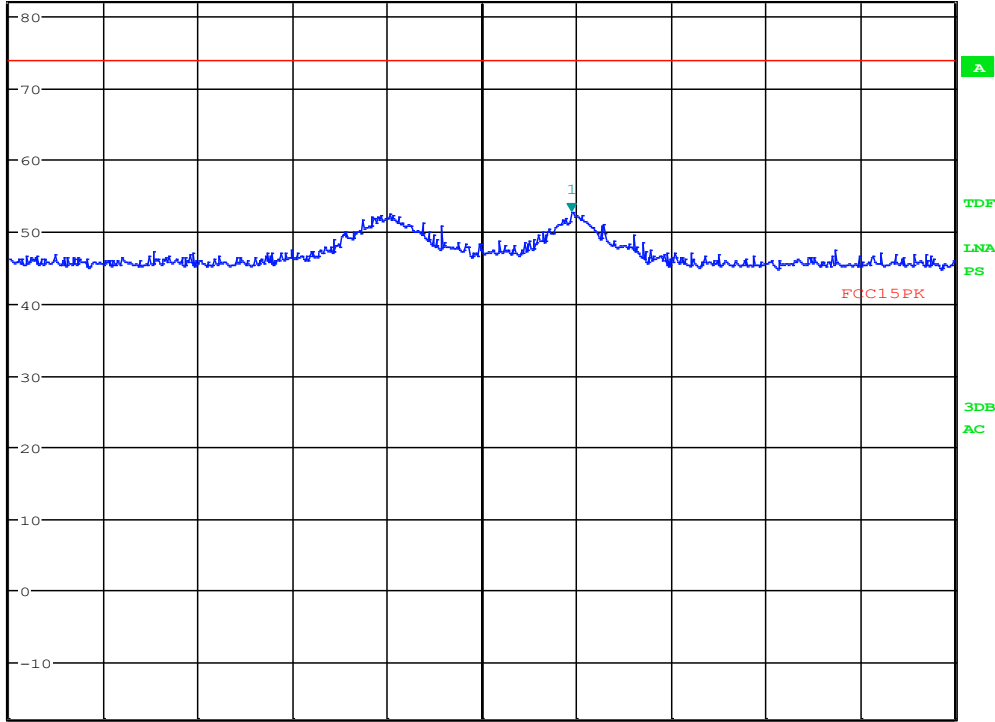


**MARKER 1**  
 9.621891026 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      52.79 dBμV/m  
 \*SWT 20 ms      9.621891026 GHz

Ref 82 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



Center 9.62 GHz      2 MHz/      Span 20 MHz

Date: 19.JUN.2020 08:05:21

Dipole antenna:4<sup>th</sup> Harmonic, VP, ch2405MHz

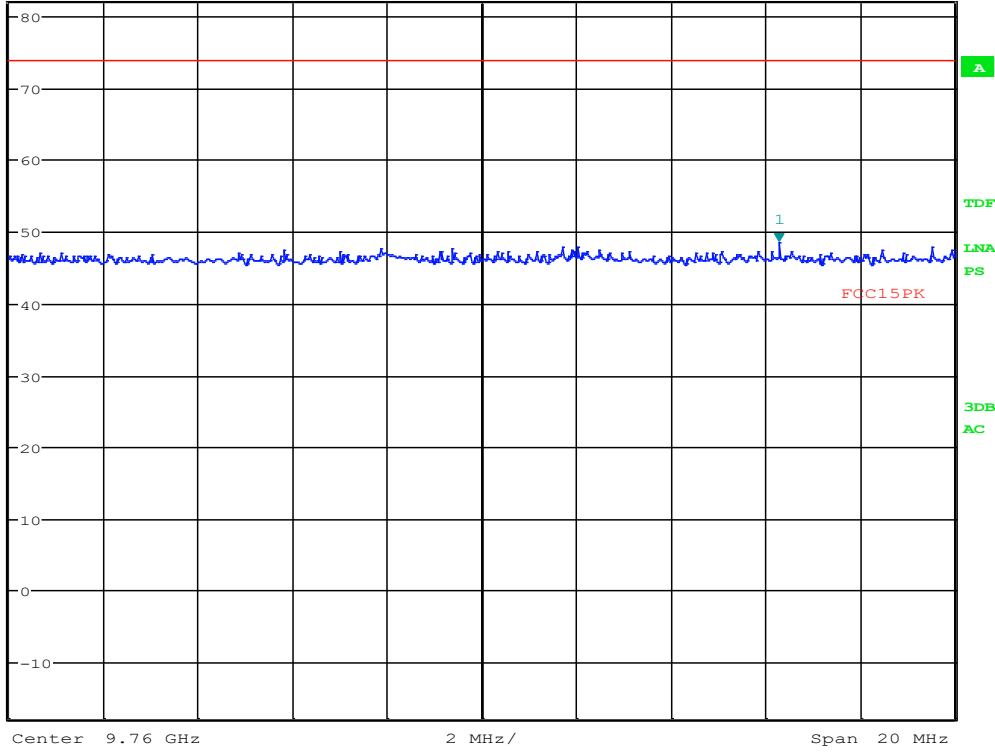


**MARKER 1**  
 9.766282051 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      48.42 dBμV/m  
 SWT 20 ms      9.766282051 GHz

Ref 82 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



Date: 19.JUN.2020 08:29:08

Dipole antenna:4<sup>th</sup> Harmonic, VP, ch2440MHz



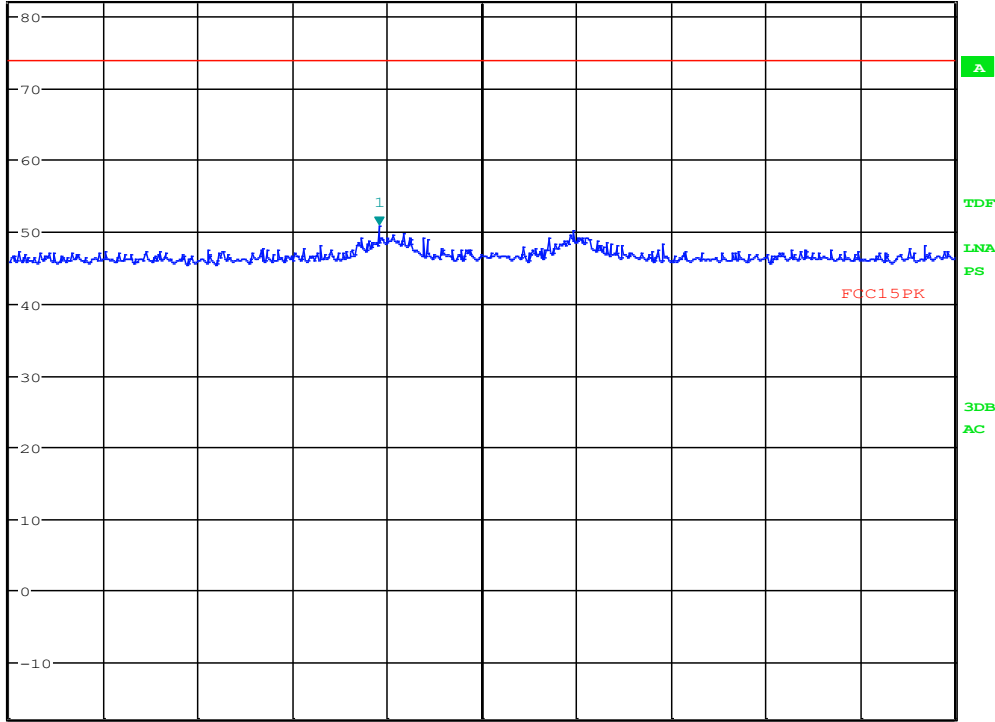


**MARKER 1**  
 9.917820513 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      50.79 dBμV/m  
 SWT 20 ms      9.917820513 GHz

Ref 82 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



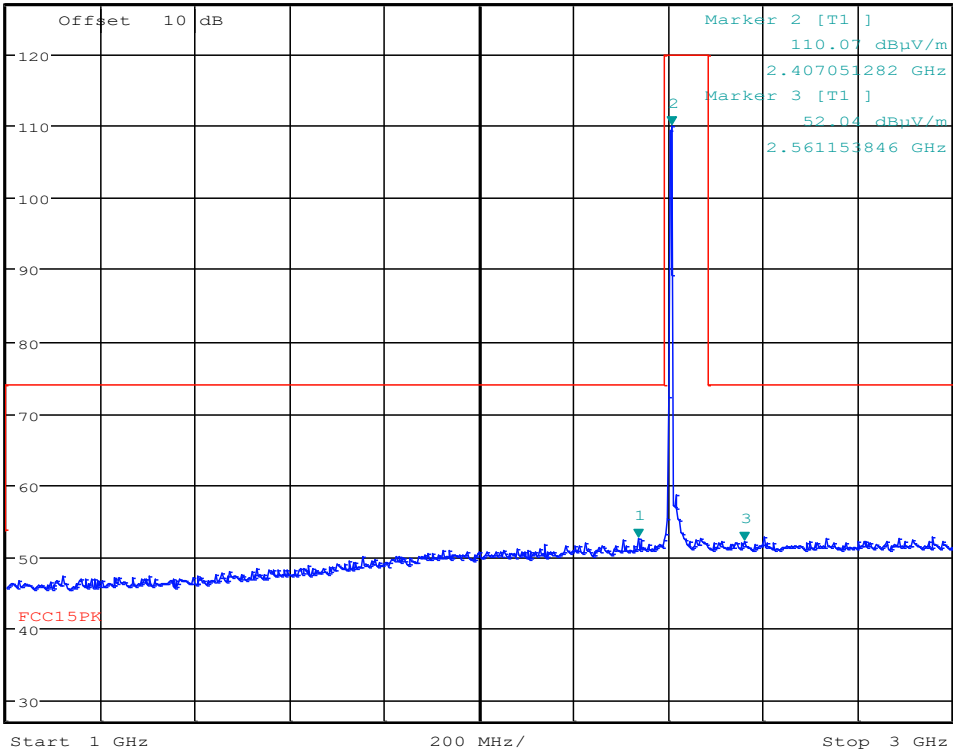
Date: 19.JUN.2020 08:36:38

Dipole antenna:4<sup>th</sup> Harmonic, VP, ch2480MHz



**MARKER 1**  
 2.335512821 GHz

\*RBW 1 MHz  
 \*Att 10 dB  
 \*SWT 50 ms  
 Marker 1 [T1 ]  
 52.43 dBμV/m  
 2.335512821 GHz



Date: 19.JUN.2020 09:39:22

Dipole Antenna: Radiated spurious emissions, VP, 1 - 3GHz, ch2405MHz, PK scan

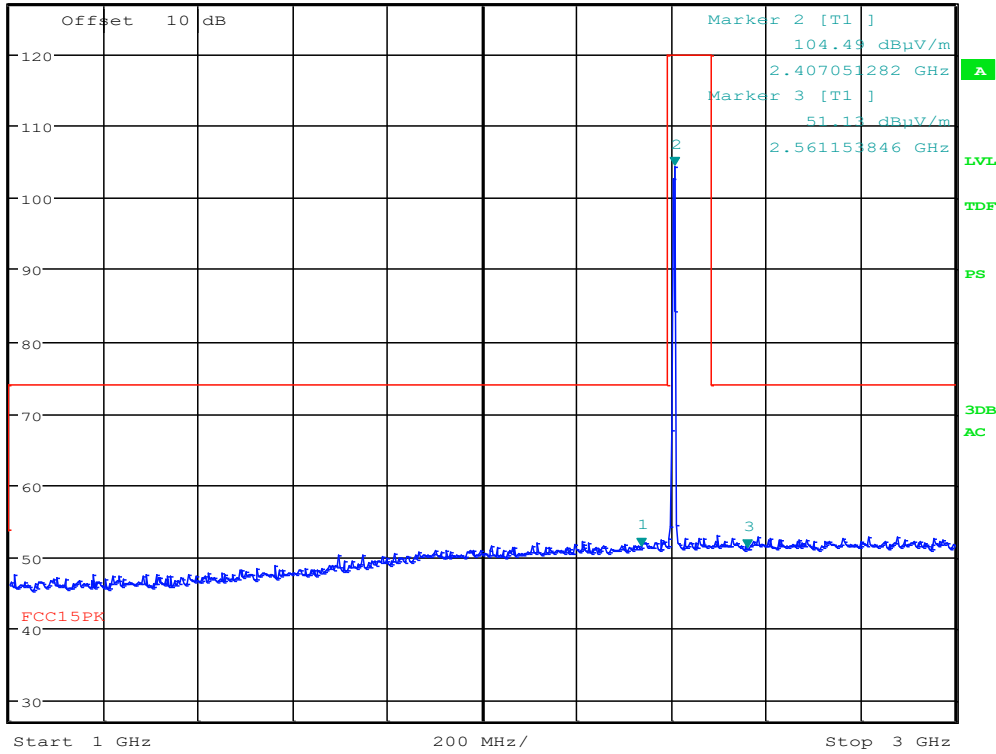


**MARKER 1**  
 2.335512821 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      51.20 dBµV/m  
 \*Att 10 dB      2.335512821 GHz  
 \*SWT 50 ms

Ref 127 dBµV/m

1 PK  
 MAXH



Date: 19.JUN.2020 09:40:36

Dipole Antenna: Radiated spurious emissions, HP, 1 - 3GHz, ch2405MHz, PK scan

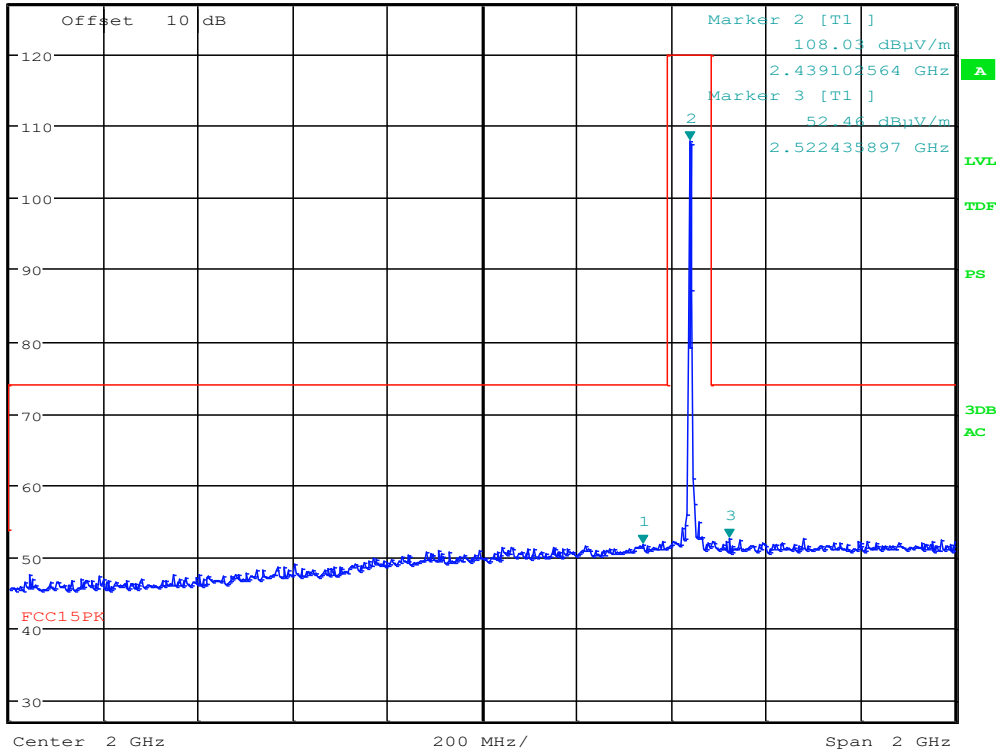


**MARKER 1**  
 2.340929487 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      51.73 dBμV/m  
 \*Att 10 dB      2.340929487 GHz  
 \*SWT 50 ms

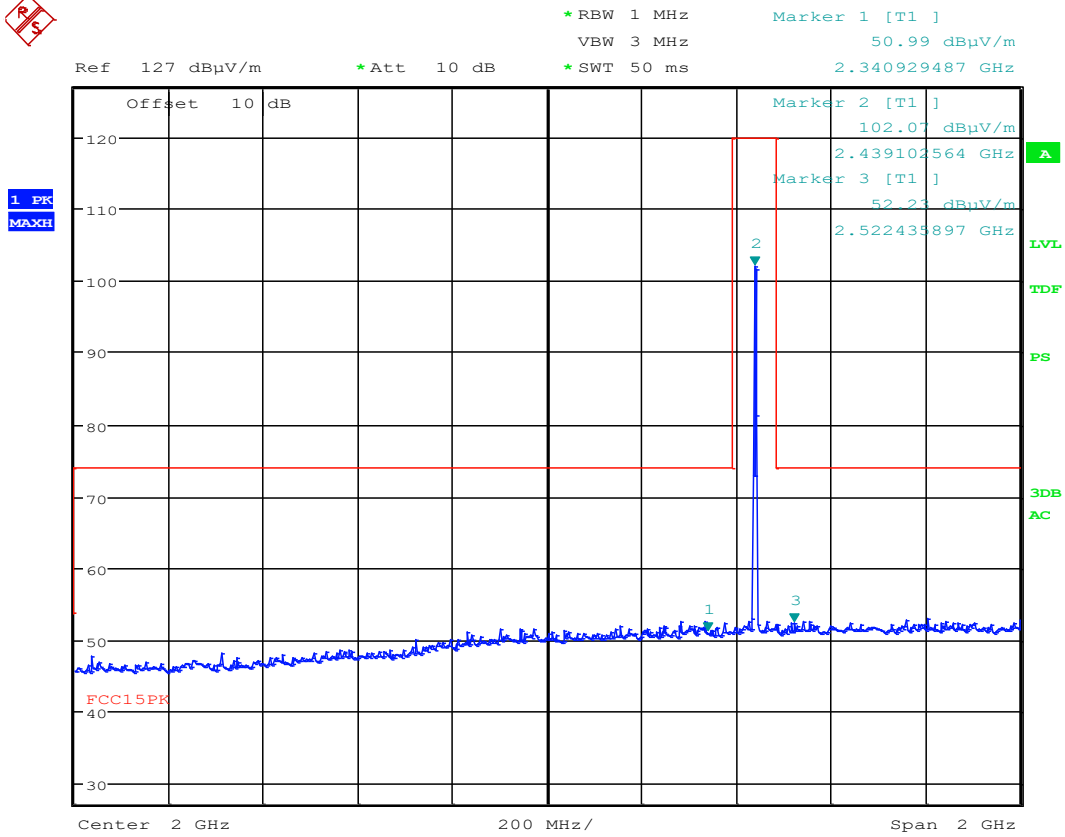
Ref 127 dBμV/m

1 PK  
 MAXH



Date: 19.JUN.2020 10:13:56

Dipole Antenna: Radiated spurious emissions, VP, 1 - 3GHz, ch2440MHz, PK scan



Date: 19.JUN.2020 10:15:05

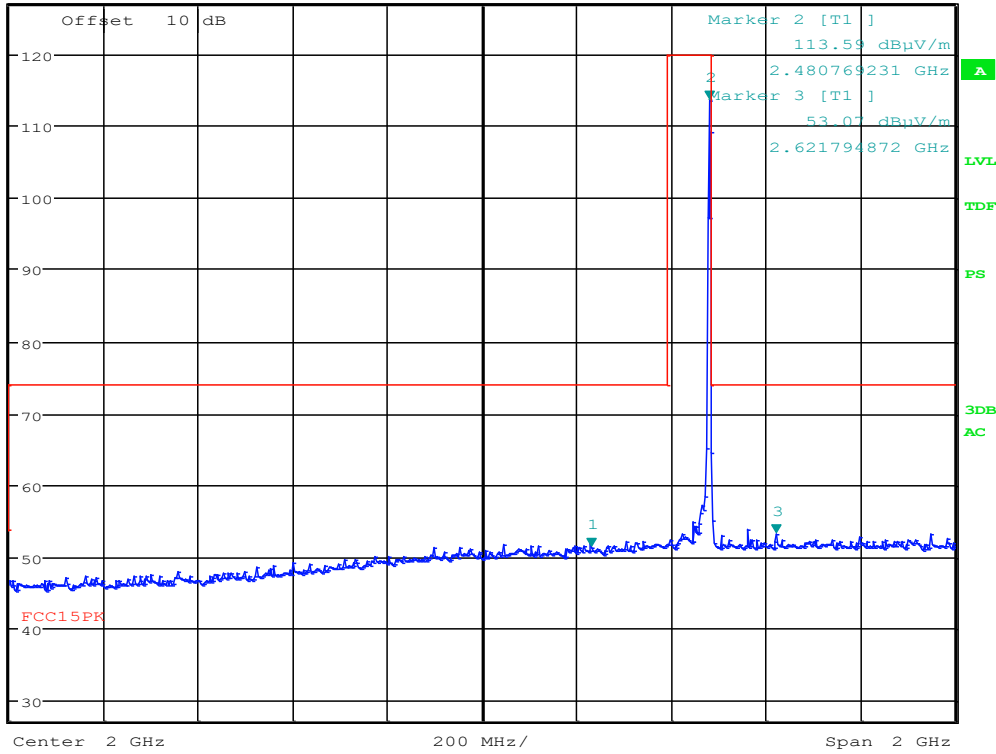
Dipole Antenna: Radiated spurious emissions, HP, 1 - 3GHz, ch2440MHz, PK scan



**MARKER 1**  
 2.230048077 GHz

\*RBW 1 MHz  
 \*Att 10 dB  
 \*SWT 50 ms  
 Marker 1 [T1 ]  
 51.20 dBµV/m  
 2.230048077 GHz

1 PK  
 MAXH



Date: 19.JUN.2020 09:20:08

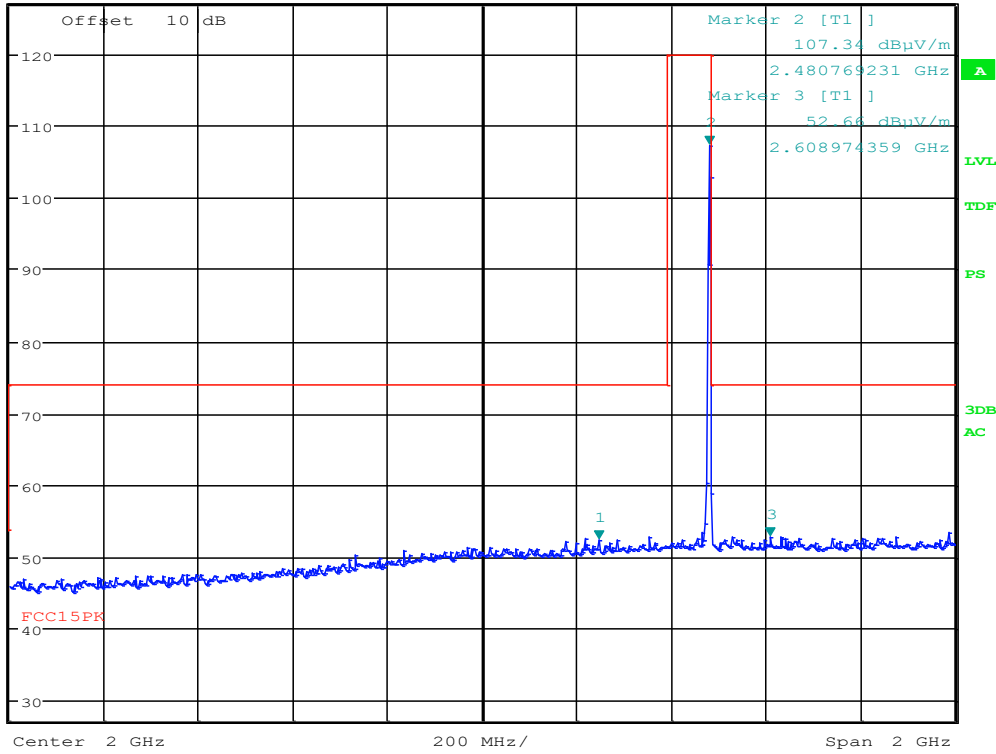
Dipole Antenna: Radiated spurious emissions, VP, 1 - 3GHz, ch2480MHz, PK scan



**MARKER 1**  
 2.246073718 GHz

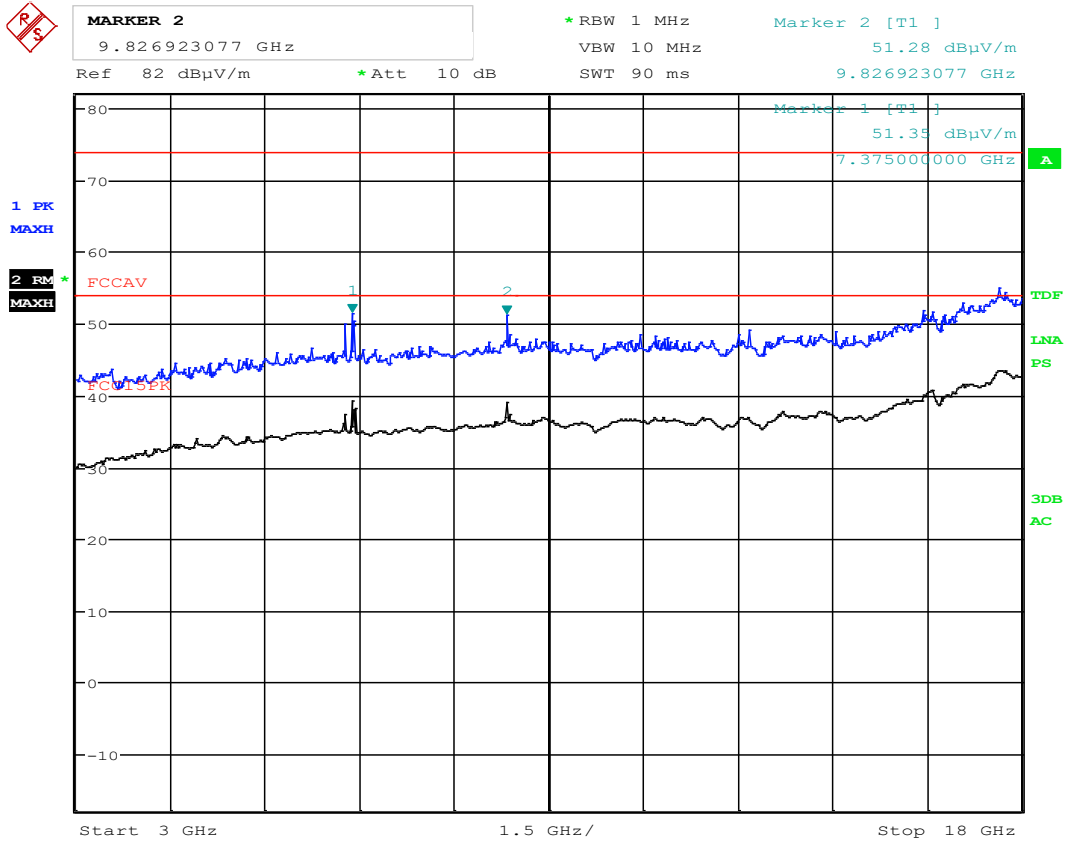
\*RBW 1 MHz  
 \*Att 10 dB  
 \*SWT 50 ms  
 Marker 1 [T1 ]  
 52.23 dBμV/m  
 2.246073718 GHz

1 PK  
 MAXH



Date: 19.JUN.2020 09:21:29

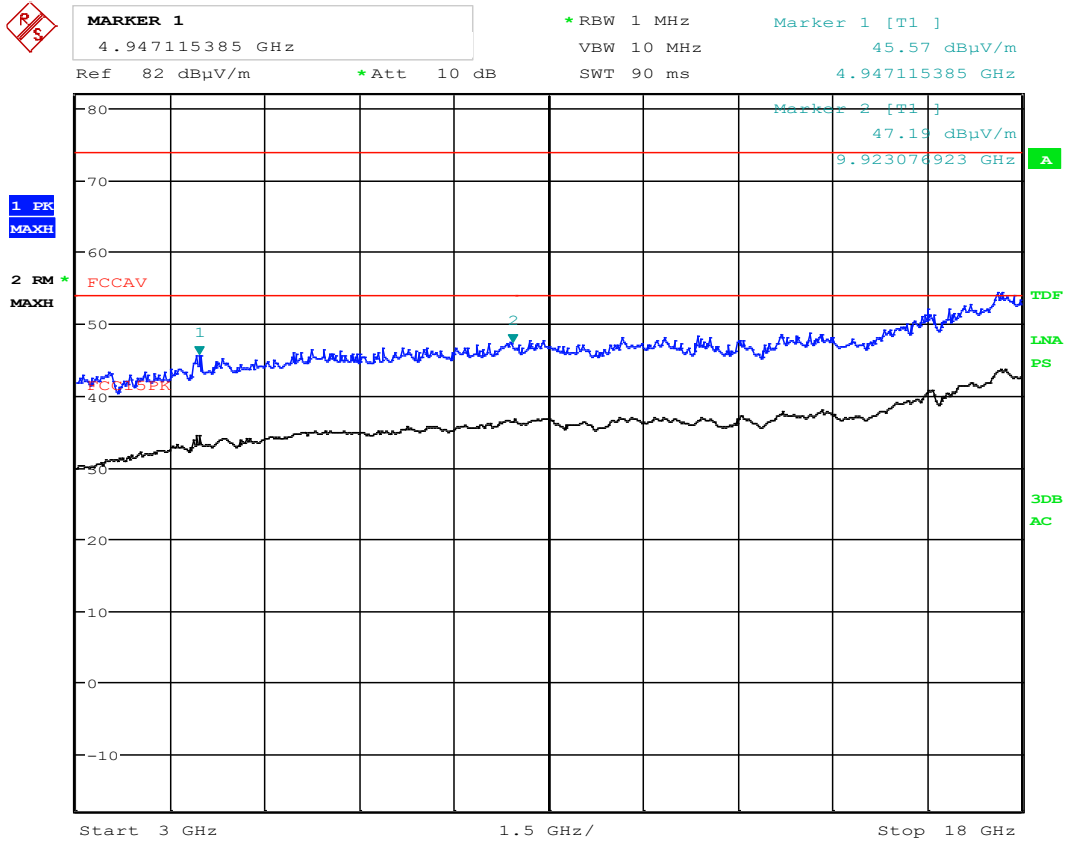
Dipole Antenna: Radiated spurious emissions, HP, 1 - 3GHz, ch2480MHz, PK scan



Date: 19.JUN.2020 07:05:12

Dipole Antenna: Radiated spurious emissions, VP, 3 - 18GHz, ch2405MHz, PK scan





Date: 19.JUN.2020 07:07:45

Dipole Antenna: Radiated spurious emissions, HP, 3 - 18GHz, ch2405MHz, PK scan



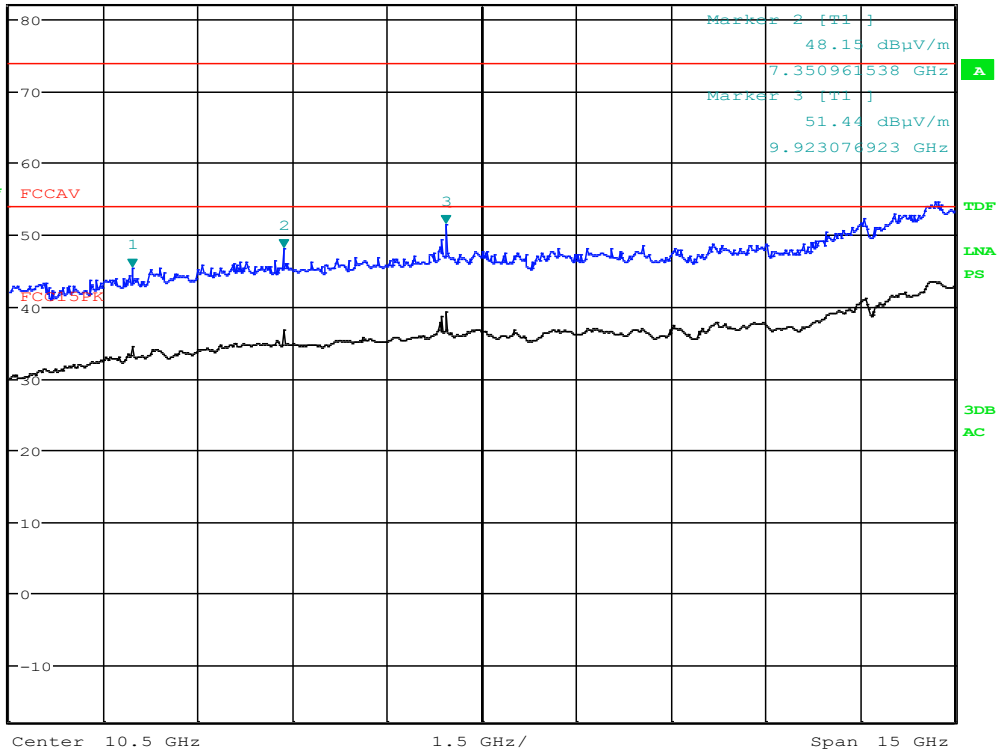
**MARKER 1**  
 4.958429487 GHz

\*RBW 1 MHz  
 VBW 10 MHz  
 SWT 90 ms  
 Marker 1 [T1 ]  
 45.37 dBμV/m  
 4.958429487 GHz

Ref 82 dBμV/m \*Att 10 dB

1 PK  
 MAXH

2 RM \*  
 MAXH



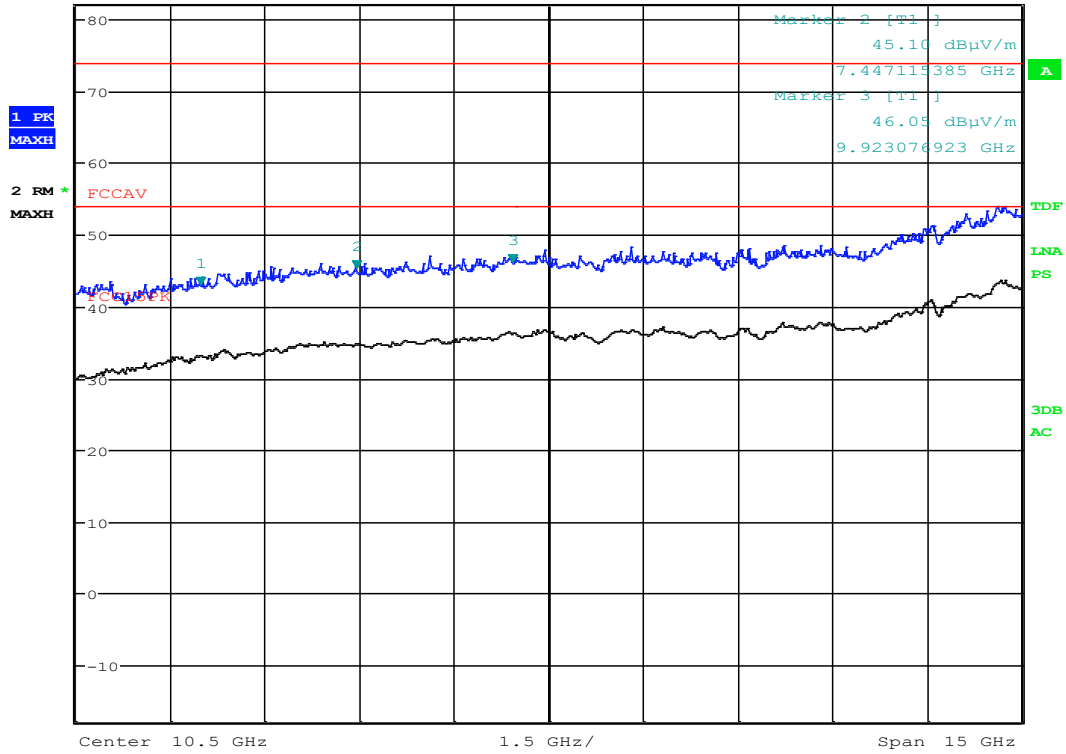
Date: 19.JUN.2020 08:12:39

Dipole Antenna: Radiated spurious emissions, VP, 3 - 18GHz, ch2440MHz, PK scan



**MARKER 1**  
 4.982467949 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 10 MHz      42.78 dBμV/m  
 Ref 82 dBμV/m    \*Att 10 dB      SWT 90 ms      4.982467949 GHz



Date: 19.JUN.2020 08:14:37

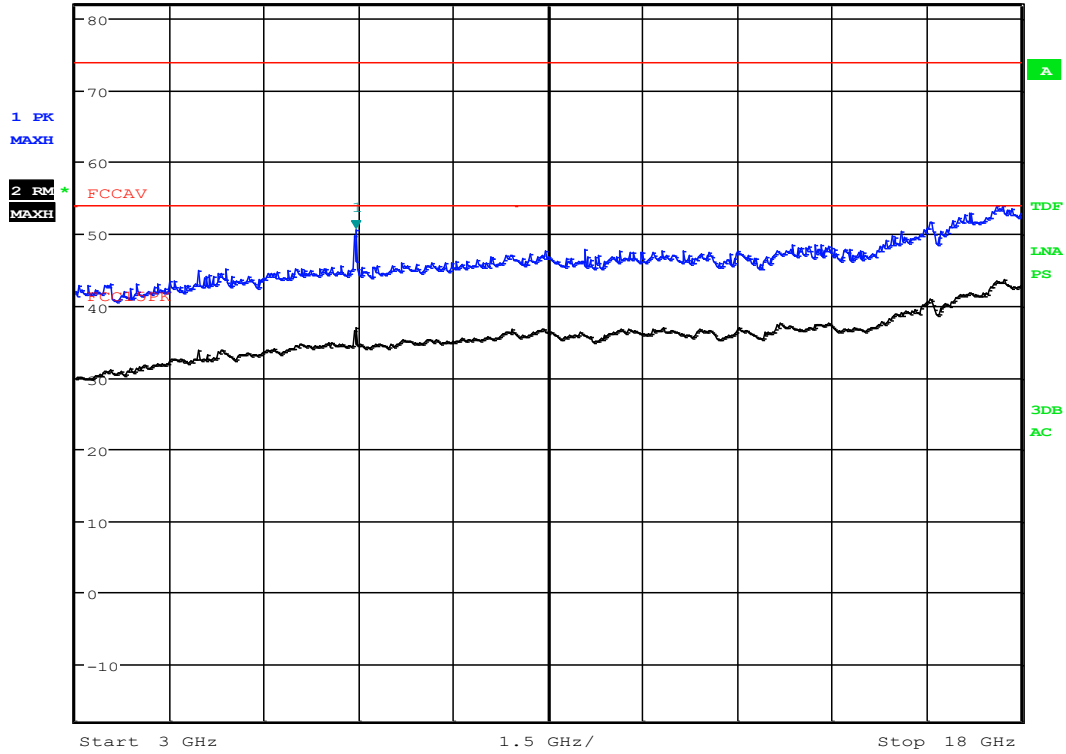
Dipole Antenna: Radiated spurious emissions, HP, 3 - 18GHz, ch2440MHz, PK scan



**MARKER 1**  
 7.454201923 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 10 MHz      50.59 dBμV/m  
 SWT 90 ms      7.454201923 GHz

Ref 82 dBμV/m      \*Att 10 dB



Date: 19.JUN.2020 08:57:39

Dipole Antenna: Radiated spurious emissions, VP, 3 - 18GHz, ch2480MHz, PK scan



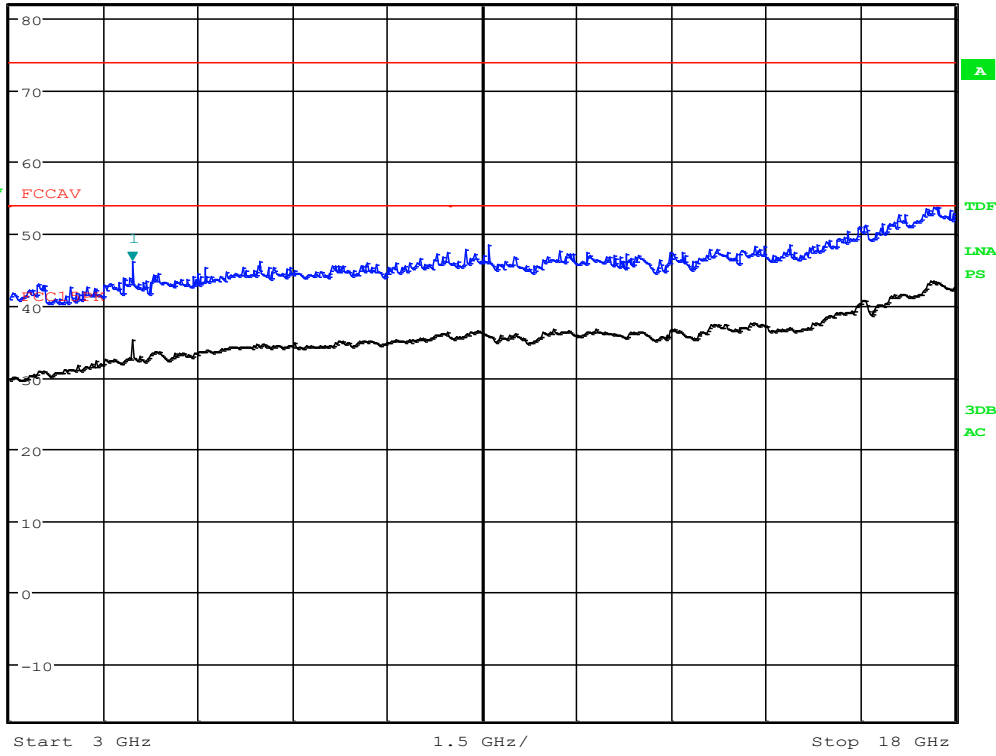
**MARKER 1**  
 4.954201923 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 10 MHz      46.10 dBμV/m  
 SWT 90 ms      4.954201923 GHz

Ref 82 dBμV/m      \*Att 10 dB

1 PK  
 MAXH

2 RM \*  
 MAXH



Date: 19.JUN.2020 08:58:43

Dipole Antenna: Radiated spurious emissions, HP, 3 - 18GHz, ch2480MHz, PK scan

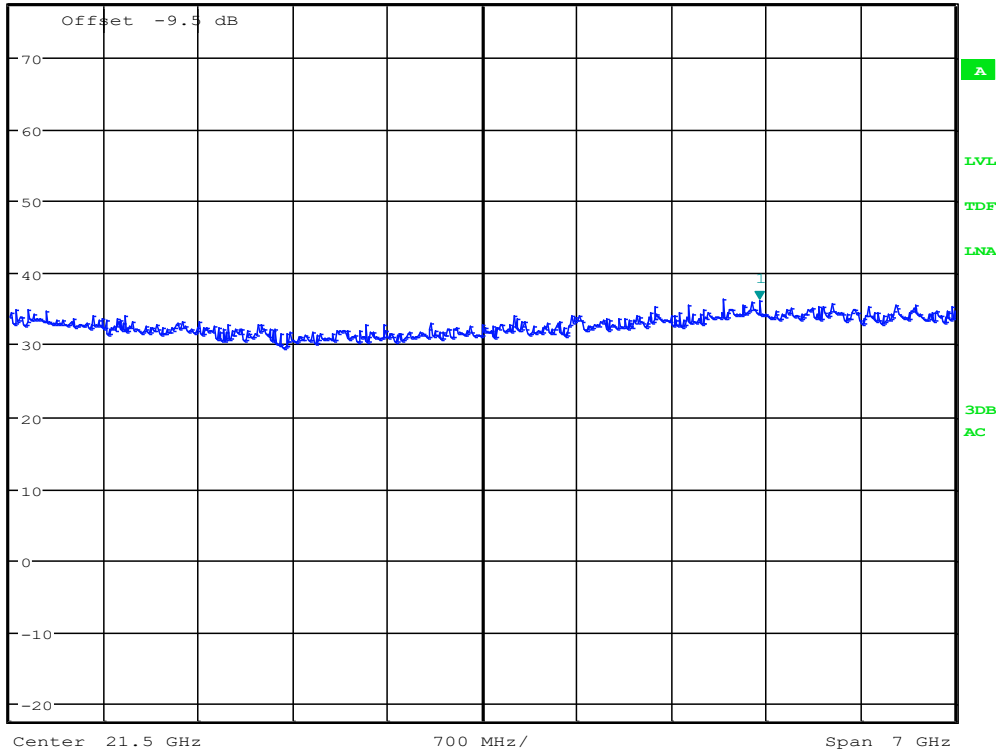


**MARKER 1**  
 23.55288462 GHz

\*RBW 1 MHz      Marker 1 [T1 ]  
 VBW 3 MHz      36.30 dBμV/m  
 SWT 45 ms      23.552884615 GHz

Step 77.5 dBμV/m      \*Att 10 dB

1 PK  
 MAXH



Date: 20.JUN.2020 09:18:51

Dipole Antenna, Pre-scan, Radiated spurious emissions, VP, 18 - 25GHz

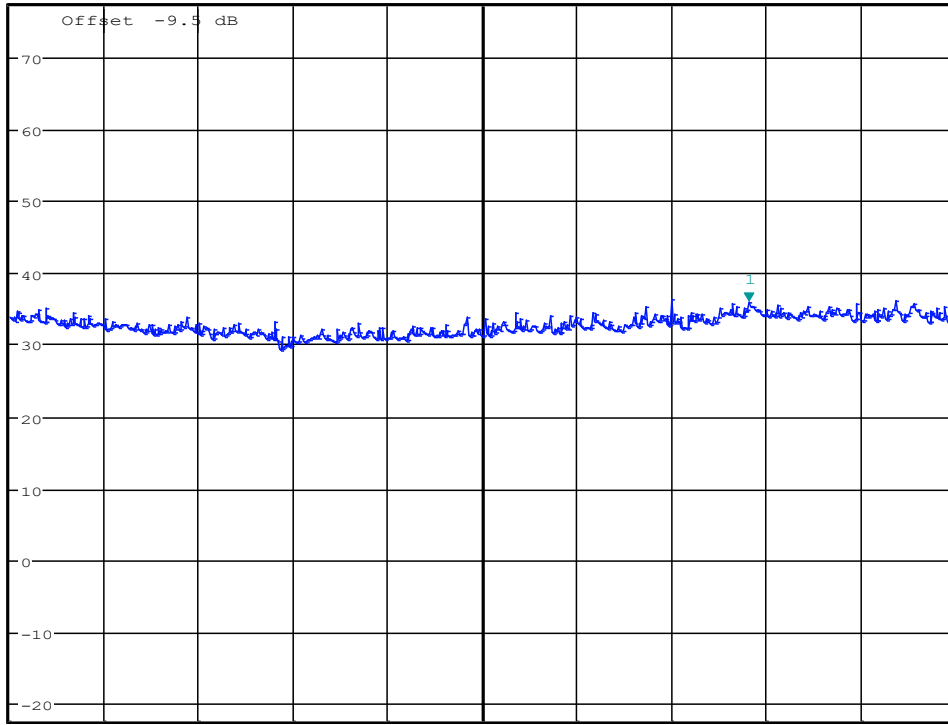


**MARKER 1**  
 23.47435897 GHz

\*RBW 1 MHz  
 VBW 3 MHz  
 SWT 45 ms  
 Marker 1 [T1 ]  
 36.04 dBμV/m  
 23.474358974 GHz

Step 77.5 dBμV/m \*Att 10 dB

1 PK  
 MAXH



A

LVL

TDF

LNA

3DB

AC

Date: 20.JUN.2020 09:18:37

Dipole Antenna, Pre-scan, Radiated spurious emissions, HP, 18 - 25GHz

### 3.9 Power Spectral Density (PSD)

FCC part 15.247(e)

ISED Canada RSS-247 Issue 2, Clause 5.2 (2)

Measurement procedure: ANSI C63.10-2013 Clause 11.10

Test Results: Complies

#### Measured and Calculated Data:

The measurement procedures PKPSD described in ANSI C63.10-2013 was used.

	2405 MHz	2440 MHz	2480 MHz
Measured value (dBm/3kHz)	6.1	4.0	6.1

#### Requirements:

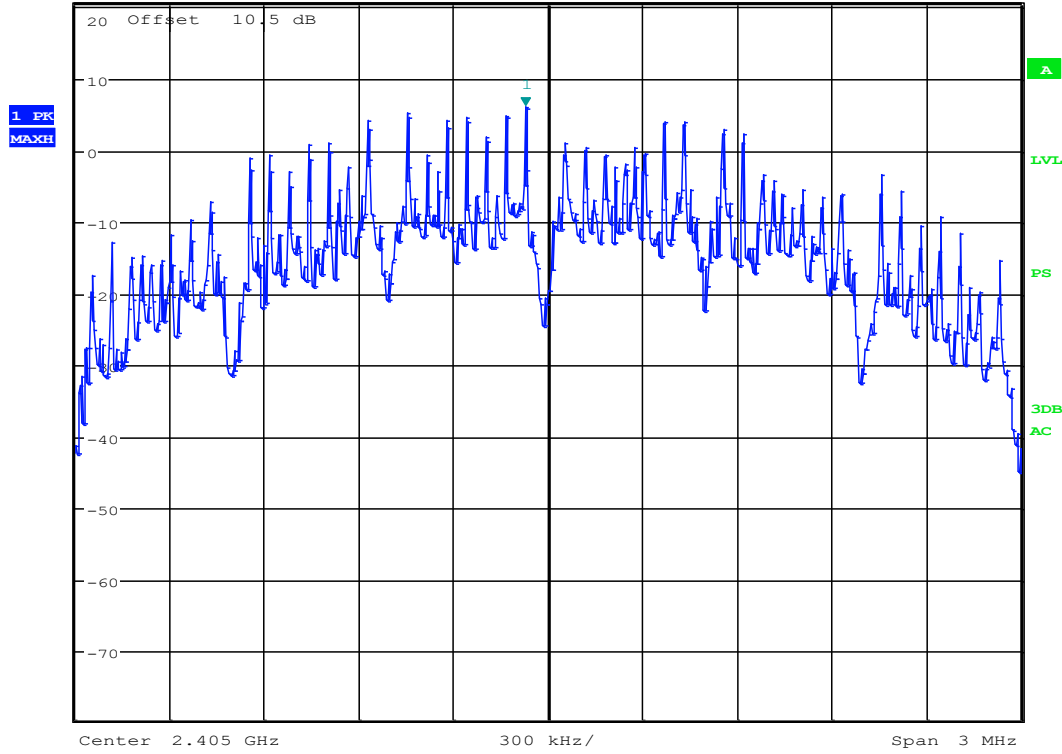
The Power Spectral Density of a Digital Transmission System shall be no greater than +8 dBm in any 3 kHz band

No requirements for Frequency Hopping Systems.





**MARKER 1**  
2.404927885 GHz  
\*RBW 3 kHz  
\*VBW 10 kHz  
Ref 20.5 dBm \*Att 15 dB SWT 340 ms  
Marker 1 [T1 ] 6.06 dBm  
2.404927885 GHz



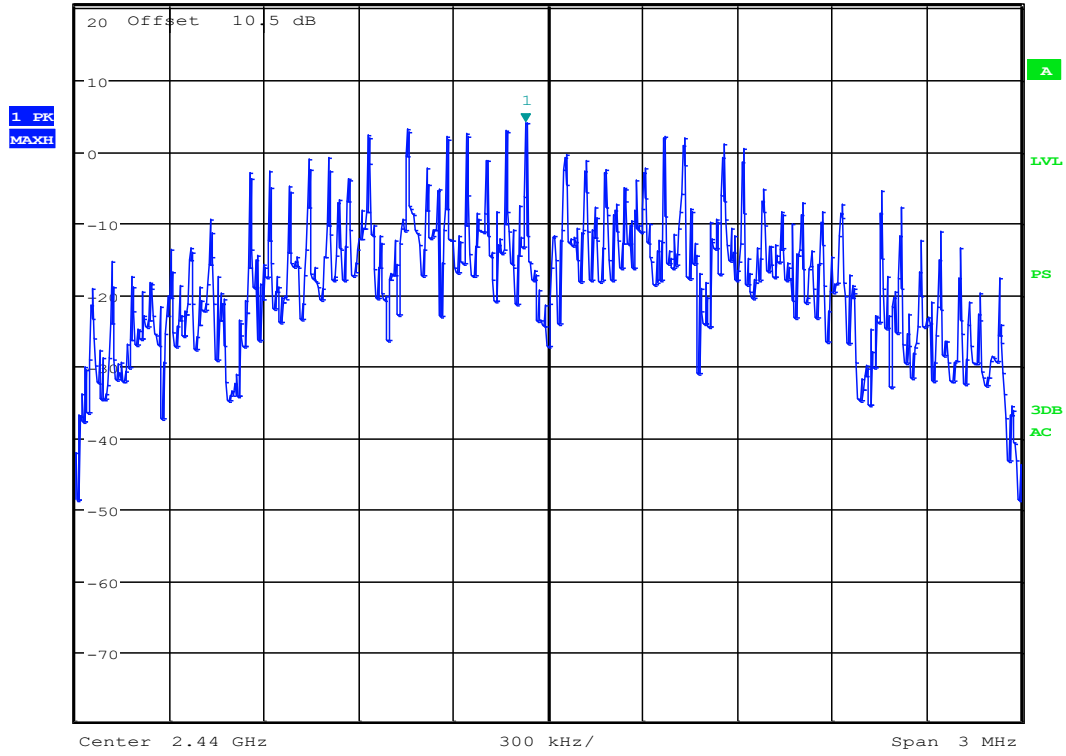
Date: 12.AUG.2020 07:34:06

Conducted PSD, ch2405MHz



**MARKER 1**  
 2.439927885 GHz

\*RBW 3 kHz      Marker 1 [T1 ]  
 \*VBW 10 kHz      4.03 dBm  
 Ref 20.5 dBm      \*Att 15 dB      SWT 340 ms      2.439927885 GHz



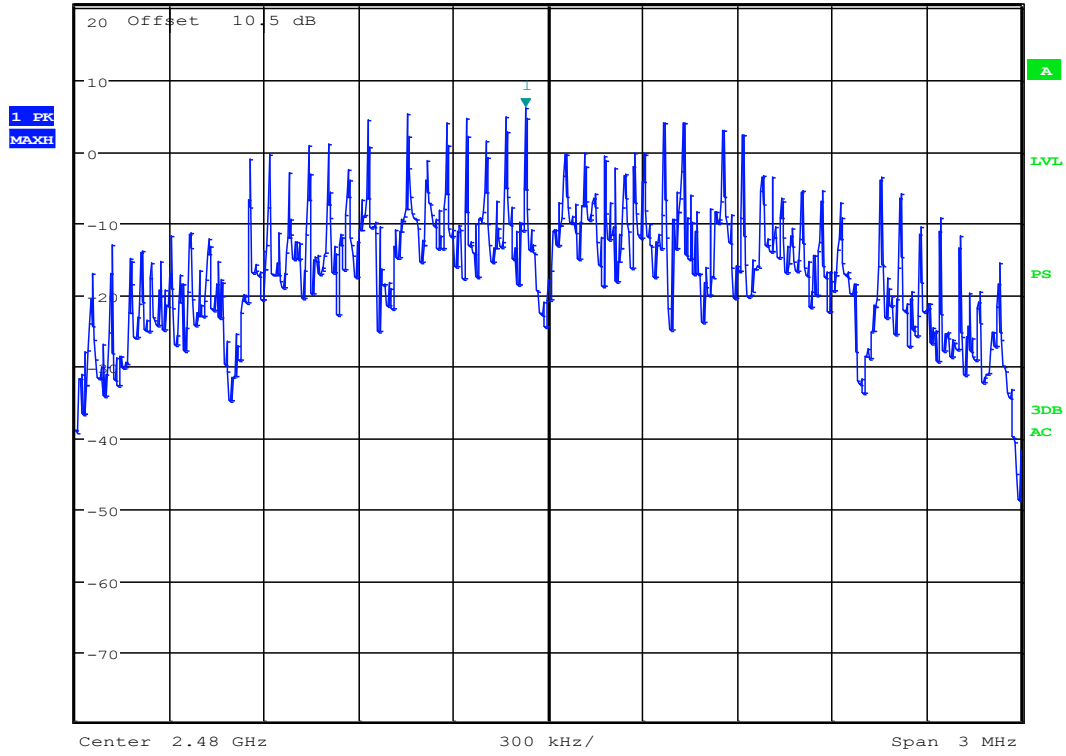
Date: 12.AUG.2020 07:41:11

Conducted PSD, ch2440MHz



**MARKER 1**  
2.479927885 GHz

\*RBW 3 kHz      Marker 1 [T1 ]  
\*VBW 10 kHz      6.05 dBm  
Ref 20.5 dBm      \*Att 15 dB      SWT 340 ms      2.479927885 GHz



Date: 12.AUG.2020 07:51:39

Conducted PSD, ch2480MHz

## 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.	Instrument/ ancillary	Type of instrument/ ancillary	Manufacturer	Ref. no.	Cal. Date	Cal. Due
1.	ESU40	EMI Receiver	Rohde & Schwarz	LR1639	2020.01	2021.01
2.	FSW43	Spectrum analyser	Rohde & Schwarz	LR1690	2020.01	2021.01
3.	HFH2-Z2	Active Loop antenna	Rohde & Schwarz	LR1660	2019.06	2021.06
4.	3117-PA	Antenna horn	EMCO	LR 1717	2017.12	2020.12
5.	3115	Antenna horn	EMCO	LR 1330	2016.10	2020.10
6.	PM 320K	Antenna Horn	Sivers	LR 102	N/A	
7.	DBF-520-20	Antenna Horn	Systron-Donner corp	LR 101	N/A	
8.	638	Antenna Horn	NARDA	LR 1480	N/A	
9.	637	Antenna Horn	NARDA	LR 099	N/A	
10.	VULB9163	Bi-log Hybrid Antenna	Schwarzbeck	LR 1616	2020.01	2022.01
11.	4768-10	Attenuator	Narda	LR 1356	Cal b4 use	
12.	6HC3000/18000	Highpass Filter	Trilithic	LR 1614	Cal b4 use	
13.	8449B	Pre-amplifier	Hewlett Packard	LR 1322	2020.08	2021.08
14.	310N	Pre-amplifier	Sonoma	LR 1686	2020.08	2021.08
15.	Model 87	Multimeter	Fluke	N4672	2018.11	2020.11
16.	6812B	AC Power source	Agilent	LR 1515	2019.03	2021.03
17.	CPX400D	Power supply	TTi	LR 1744	Cal b4 use	

The software listed below has been used for one or more tests.

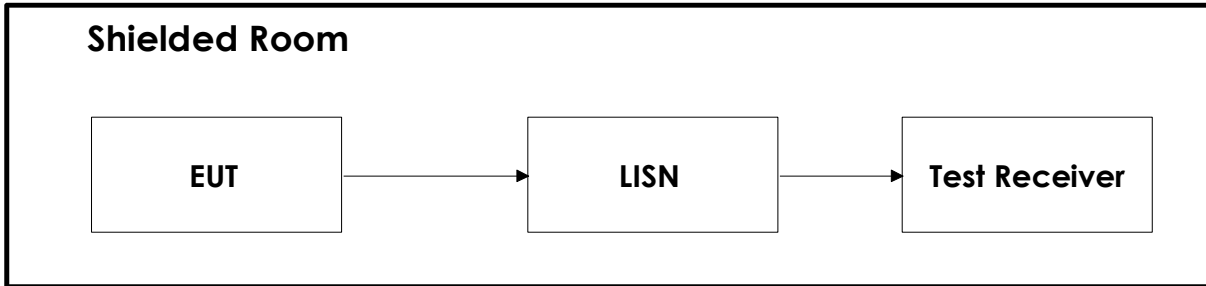
No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	GPIBShot	2.7	Screenshots from R&S Spectrum Analyzers
2	Rohde & Schwarz	RSc commander	1.9.2 64bit	Versatile Software Tool for R&S Instruments
3	Rohde & Schwarz	EMC 32	10.40.50	Radiated Emission test software

### Revision history

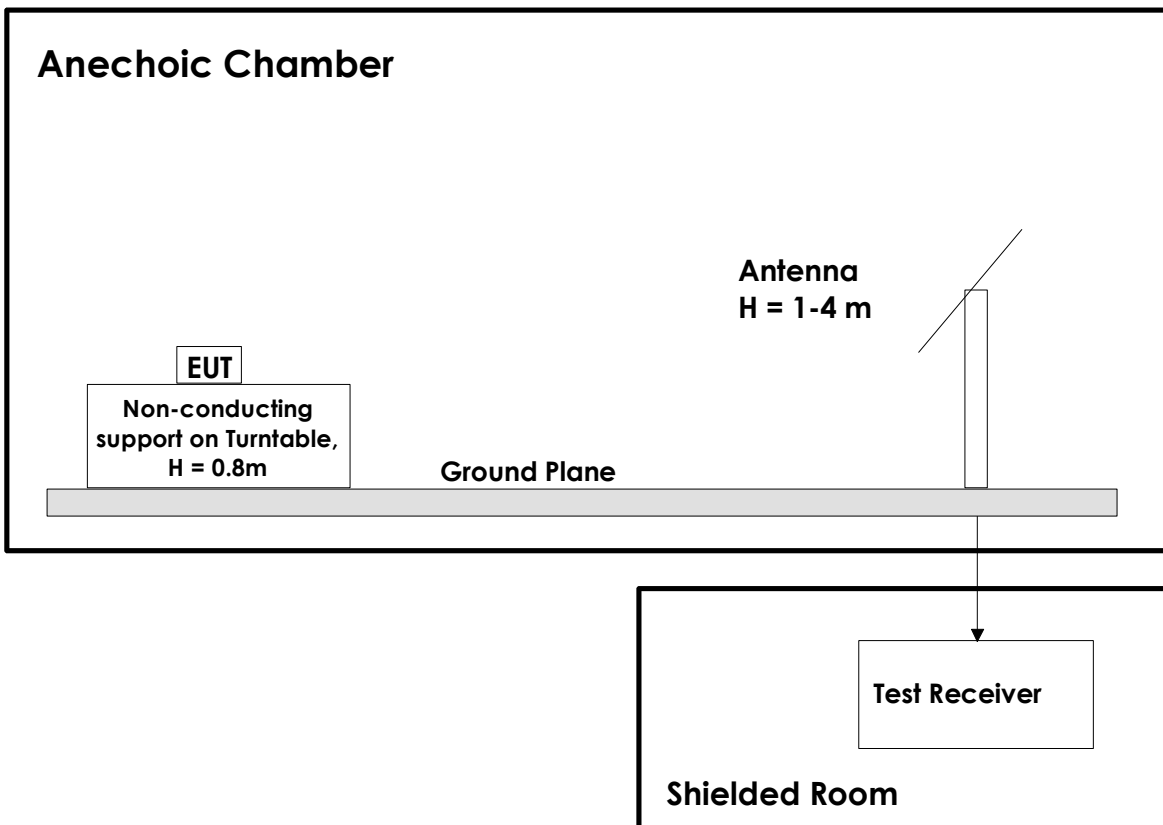
Version	Date	Comment	Sign
00	2020.09.07	First Version	gns
01	2020.12.10	In cl.1.6 detailed test information is given and power table in page 15 is corrected	gns
02	2021.01.18	FCC/ISED updated for each module and SW name is provided	gns

## 6 BLOCK DIAGRAM

### 6.1 Power Line Conducted Emission



### 6.2 Test Site Radiated Emission



This test setup is used for all radiated emissions tests. For frequencies below 30 MHz the measuring distance is 10m, for all other frequencies it is 3m or 1m. Emissions above 1 GHz are measured with a Spectrum Analyzer and Horn Antenna. For measurements above 18 GHz the test receiver is moved inside the anechoic chamber and located next to the antenna to minimize the cable loss. All measurements at 1GHz and above were performed with turntable height 1.5m and with the ground plane covered by absorbers. A pre-amplifier is used for all measurements above 30 MHz, and High-Pass or Band-Pass filter is used for all harmonics.