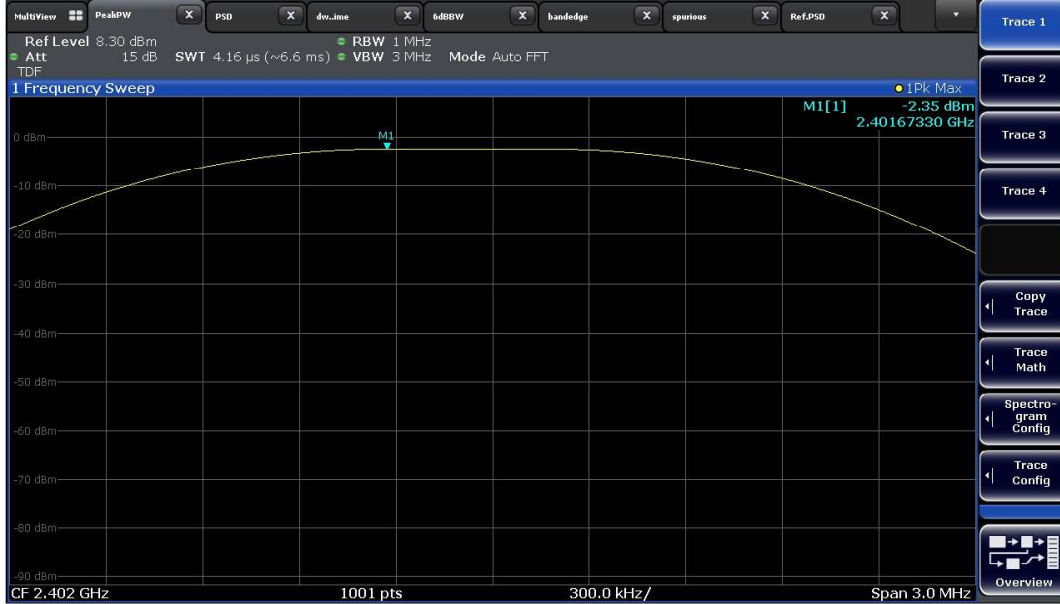


# PLOT OF TEST DATA

## LE 1M mode

### Maximum Peak Output Power, Lowest Channel (2402 MHz)



### Maximum Peak Output Power, Middle Channel (2442 MHz)



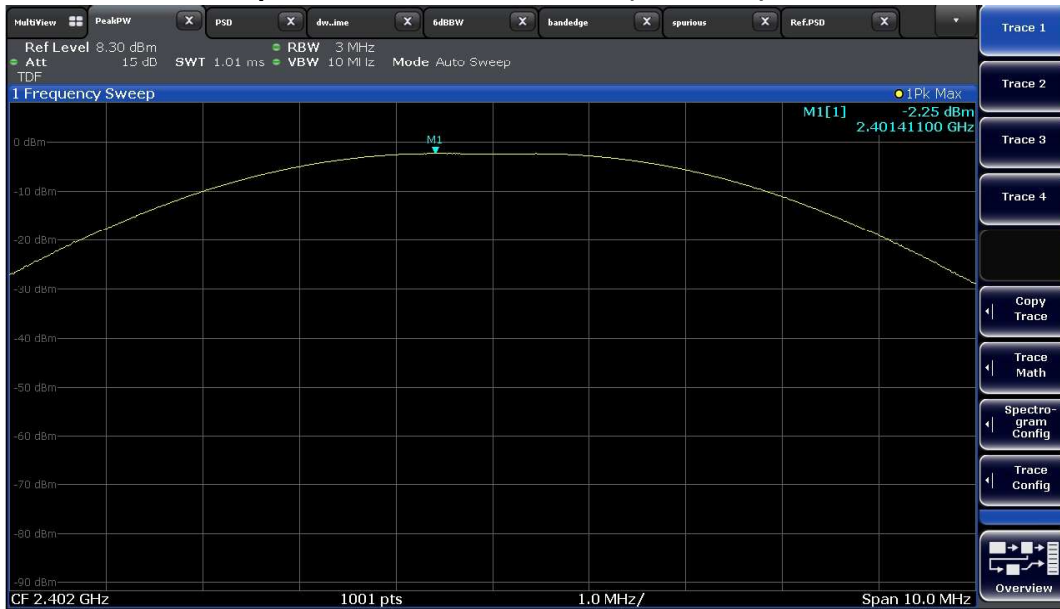
# PLOT OF TEST DATA

## Maximum Peak Output Power, Highest Channel (2480 MHz)



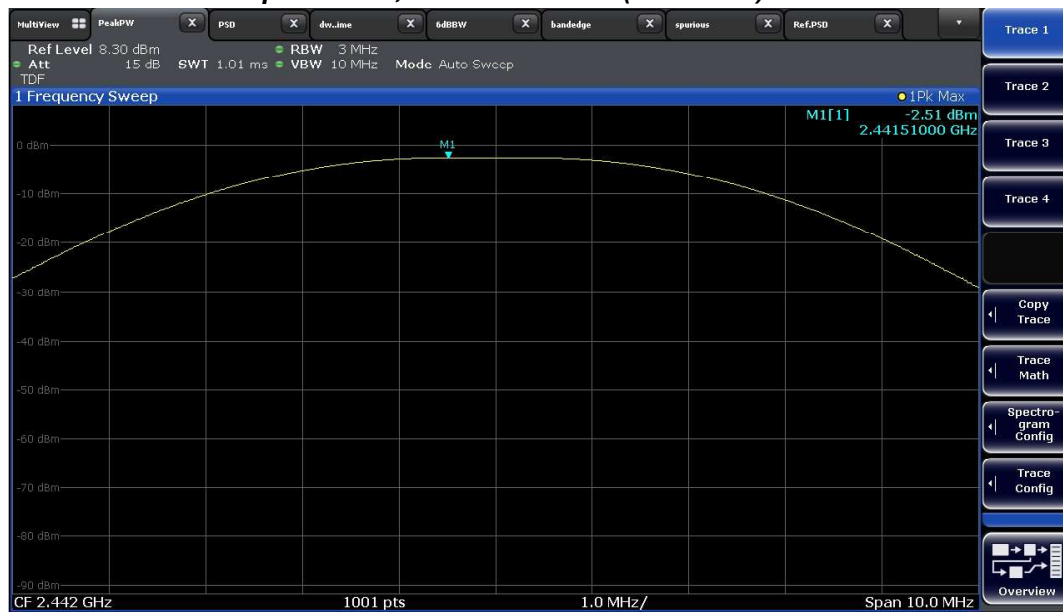
## LE 2M mode

## Maximum Peak Output Power, Lowest Channel (2402 MHz)



# PLOT OF TEST DATA

## Maximum Peak Output Power, Middle Channel (2442 MHz)



## Maximum Peak Output Power, Highest Channel (2480 MHz)



## TEST DATA

---

### 8.4 Peak Power Spectral Density

#### FCC §15.247(e), IC RSS-247 Issue 2 5.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel

#### LE 1M mode

Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)
Low	2402	-9.72	8.00
Middle	2442	-9.87	8.00
High	2480	-10.15	8.00

#### LE 2M mode

Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)
Low	2402	-10.46	8.00
Middle	2442	-10.45	8.00
High	2480	-10.77	8.00

**Note:**

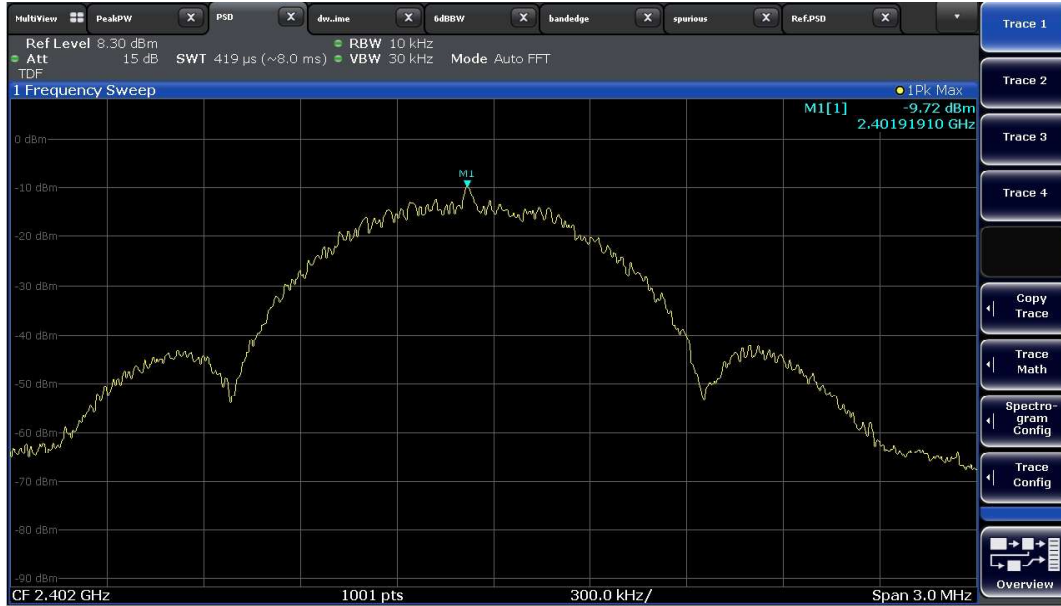
The following equation was used for spectrum offset:

$Spectrum\ offset\ (dB) = Attenuator\ (dB) + Cable\ Loss\ (dB) + SMA\ Type\ Connector\ Loss\ (dB)$

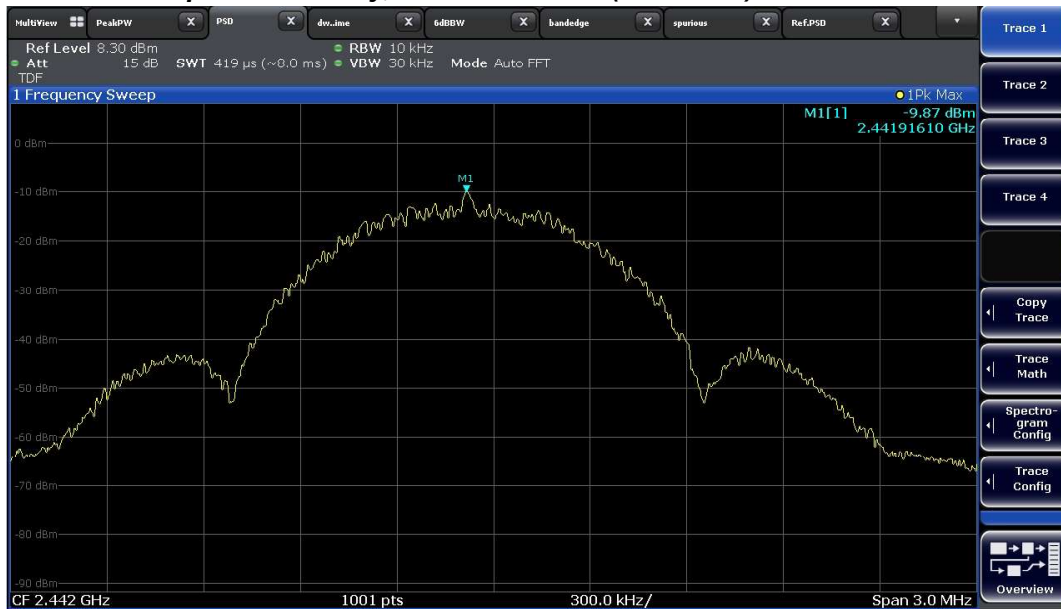
# PLOT OF TEST DATA

## LE 1M mode

### Peak Power Spectral Density, Lowest Channel (2402 MHz)

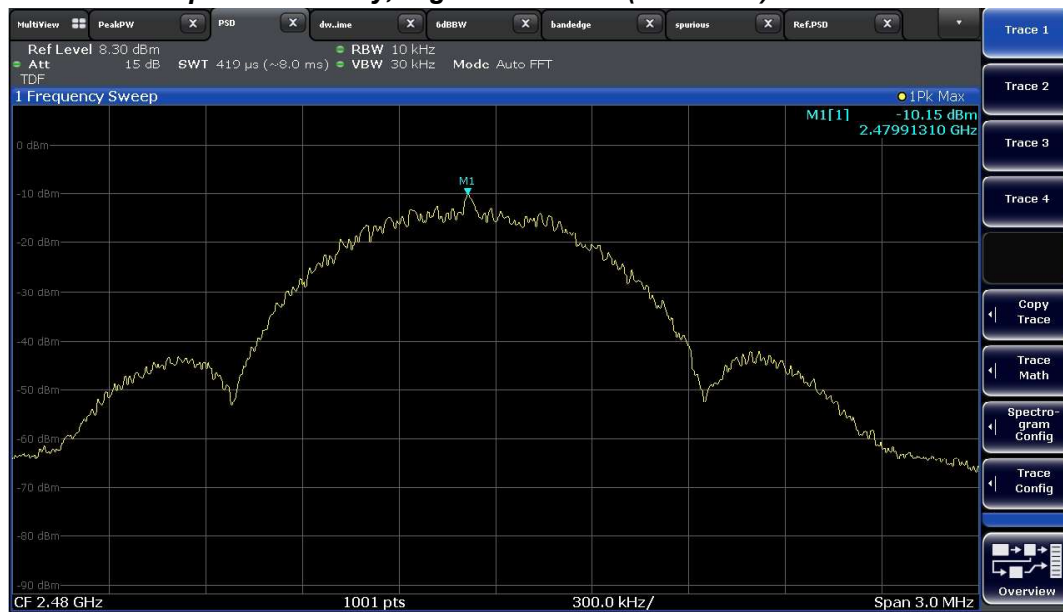


### Peak Power Spectral Density, Middle Channel (2442 MHz)



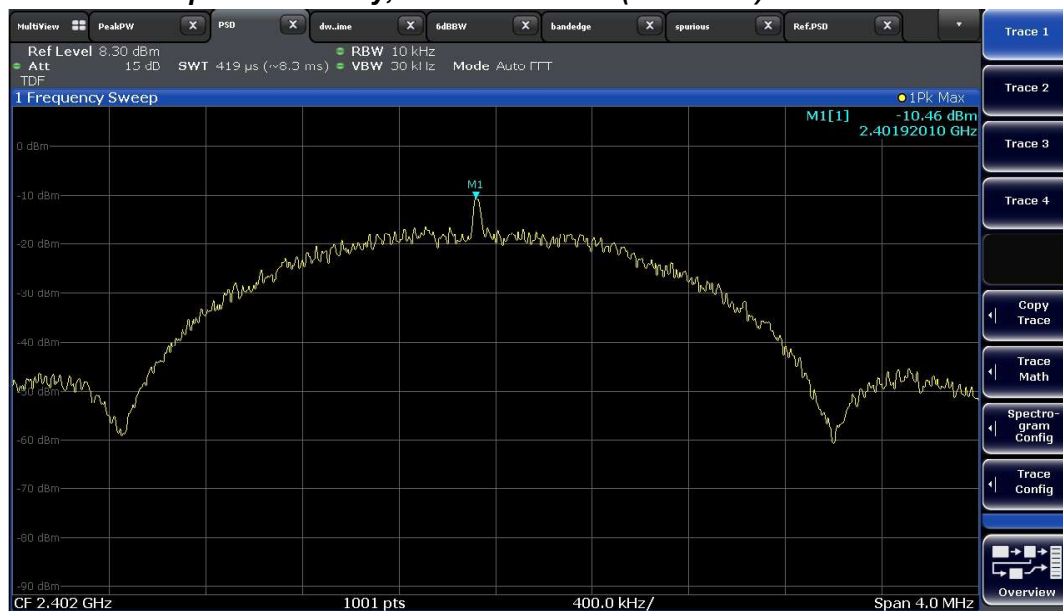
# PLOT OF TEST DATA

## Peak Power Spectral Density, Highest Channel (2480 MHz)



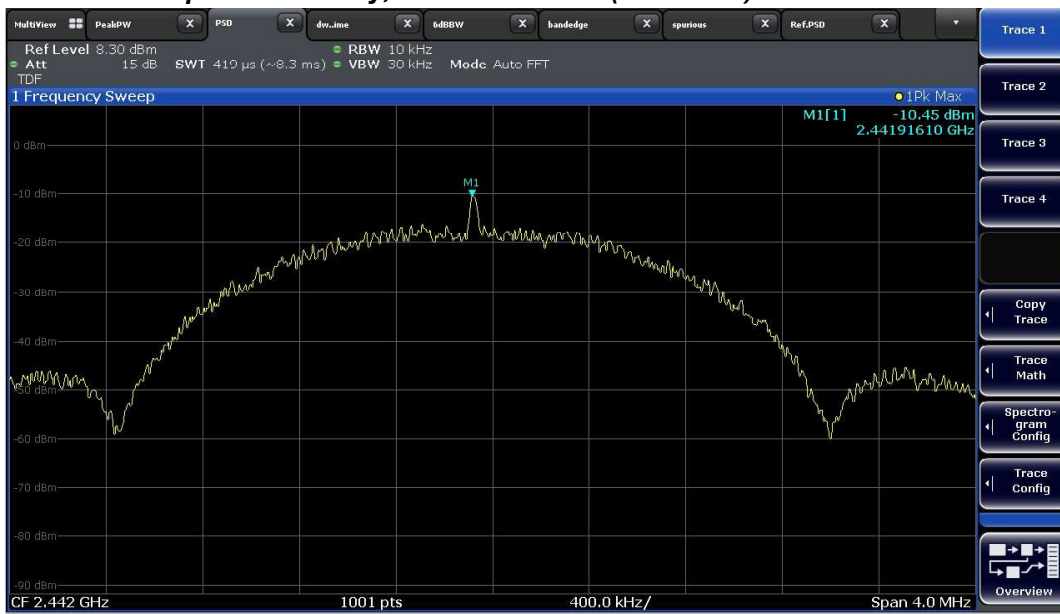
## LE 2M mode

## Peak Power Spectral Density, Lowest Channel (2402 MHz)

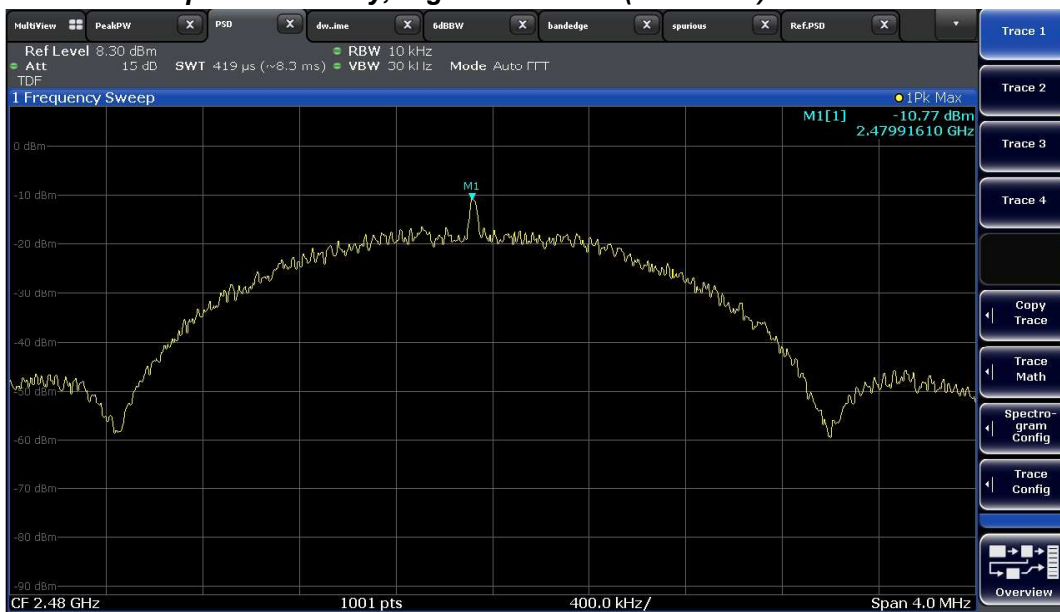


# PLOT OF TEST DATA

**Peak Power Spectral Density, Middle Channel (2442 MHz)**



**Peak Power Spectral Density, Highest Channel (2480 MHz)**



## TEST DATA

---

### 8.5 Conducted Spurious Emissions

#### FCC §15.247(d), IC RSS-247 Issue 2 5.5

**Test Mode : Set to Lowest channel, Middle channel and Highest channel**

#### **LE 1M mode**

Channel	Frequency (MHz)	Reference Level (dBm)	Conducted Spurious Emissions (dBc)	Limit (dBc)
Low	2402	-3.51	More than 20 dBc	20
Middle	2442	-3.34	More than 20 dBc	20
High	2480	-3.62	More than 20 dBc	20

#### **LE 2M mode**

Channel	Frequency (MHz)	Reference Level (dBm)	Conducted Spurious Emissions (dBc)	Limit (dBc)
Low	2402	-2.85	More than 20 dBc	20
Middle	2442	-2.95	More than 20 dBc	20
High	2480	-3.97	More than 20 dBc	20

**Note:**

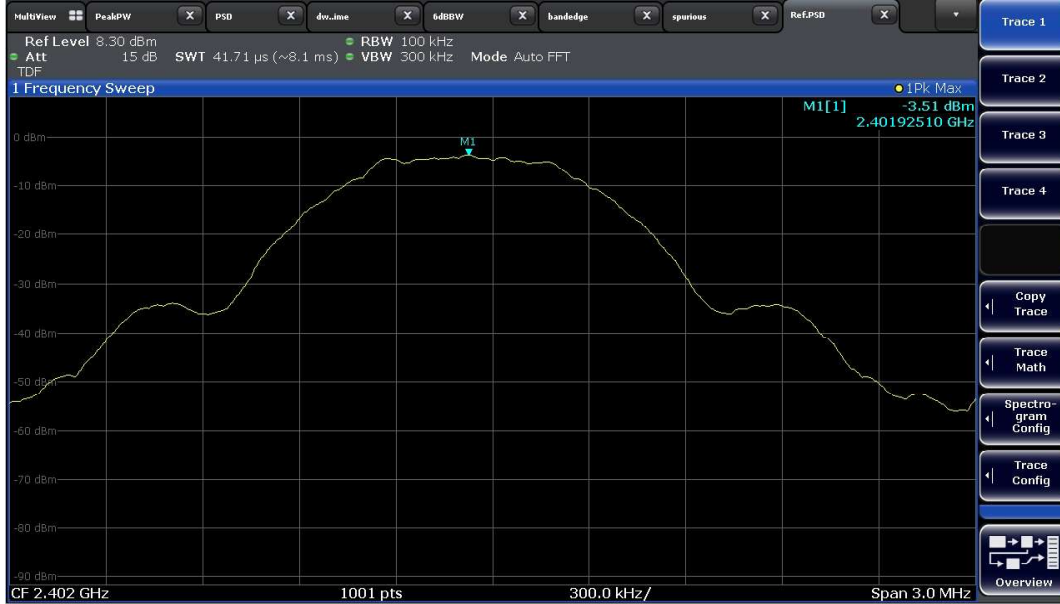
*The cable and attenuator loss from 30 MHz to 26.5 GHz was reflected in spectrum analyzer with correction factor for the spurious emissions test.*



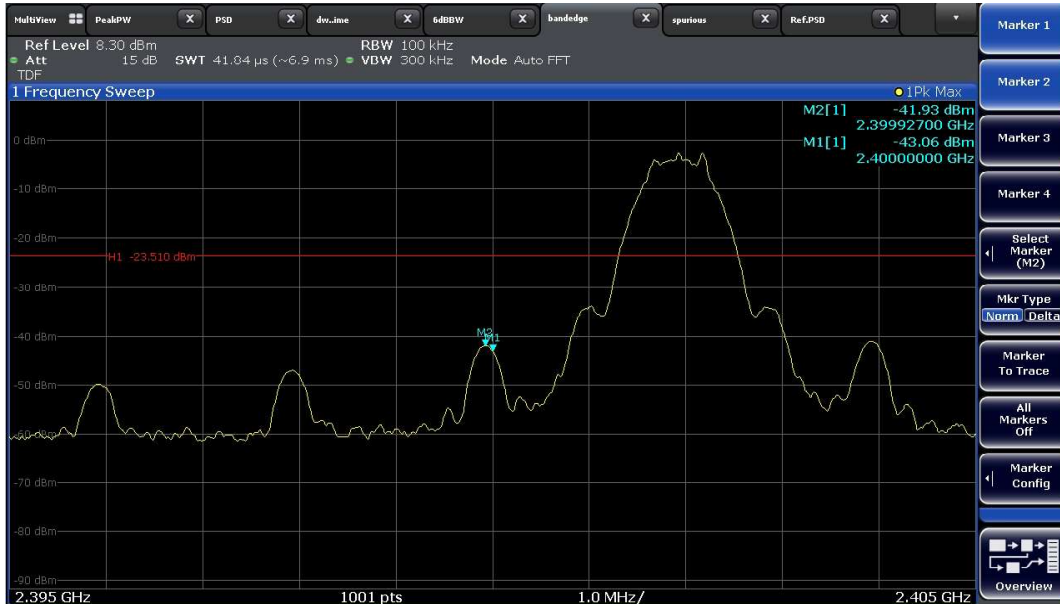
# PLOT OF TEST DATA

## LE 1M mode

### Reference Power Spectral Density, Lowest Channel (2402 MHz)

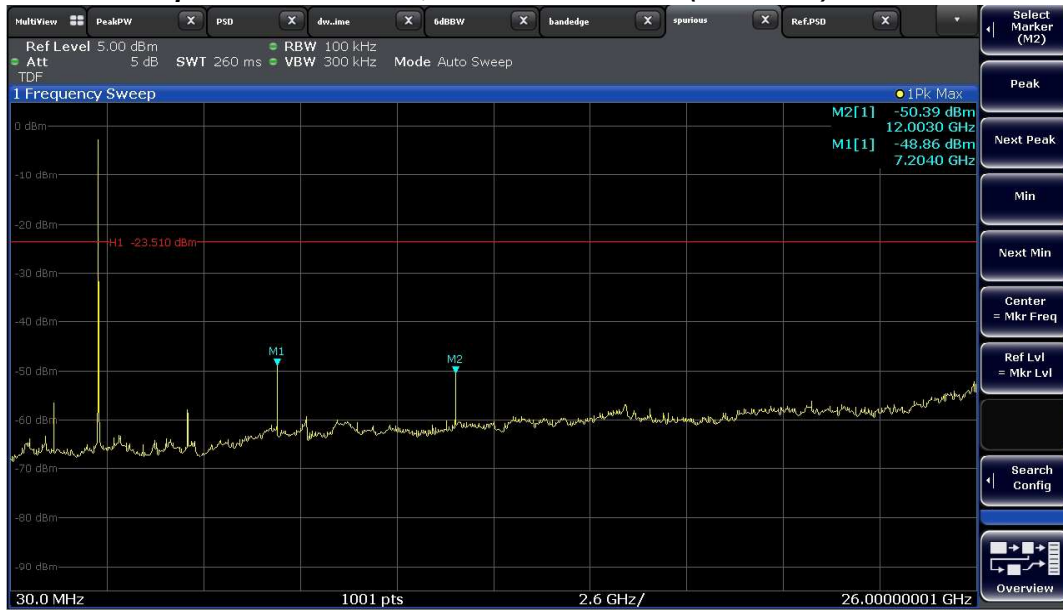


### Band Edge, Lowest Channel (2402 MHz)

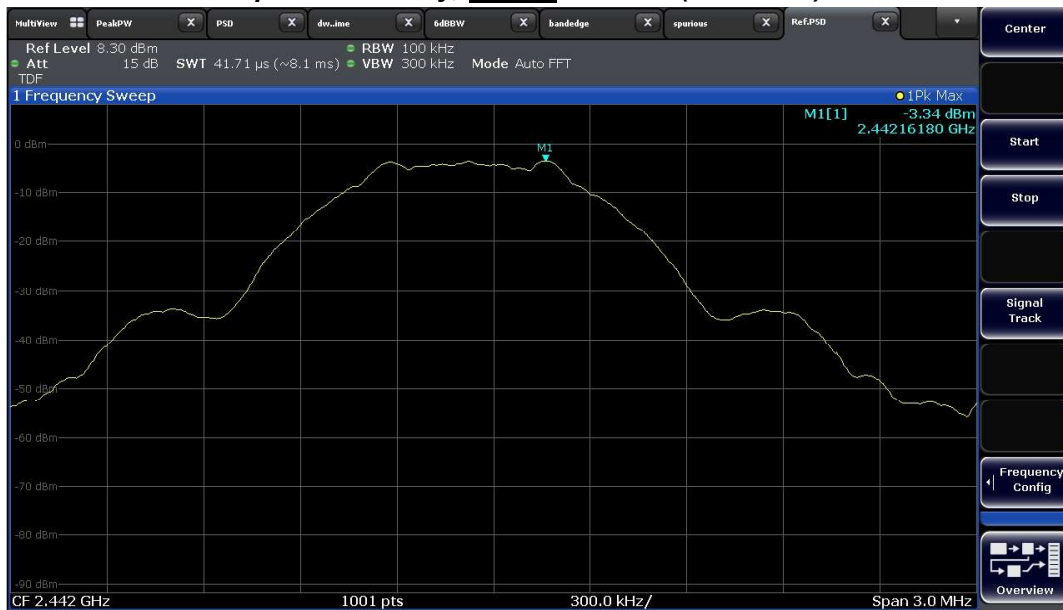


# PLOT OF TEST DATA

## Conducted Spurious Emissions, 30 MHz ~ 26.5 GHz (2402 MHz)

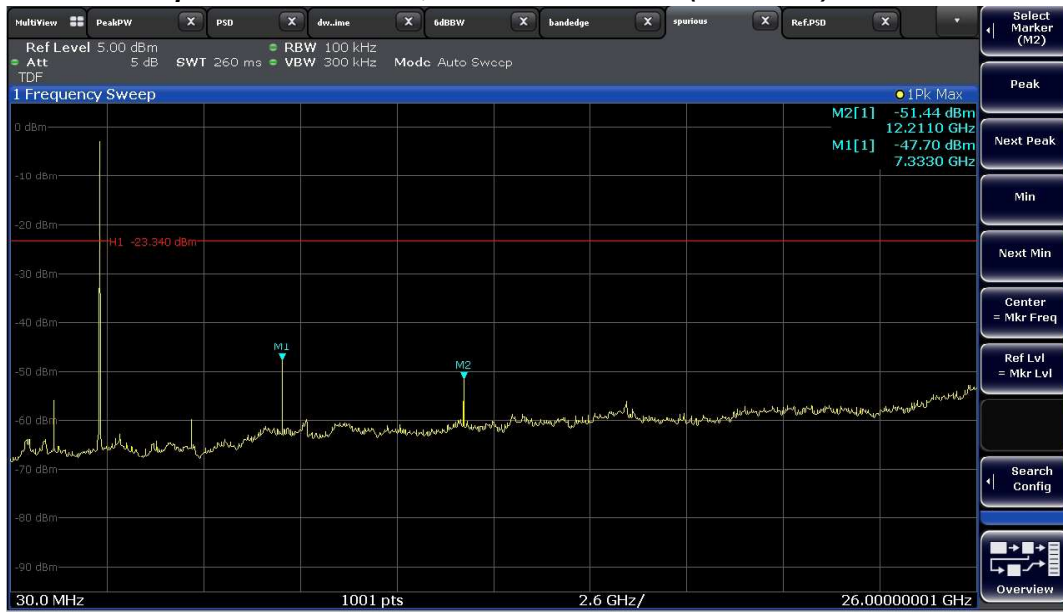


## Reference Power Spectral Density, Middle Channel (2442 MHz)

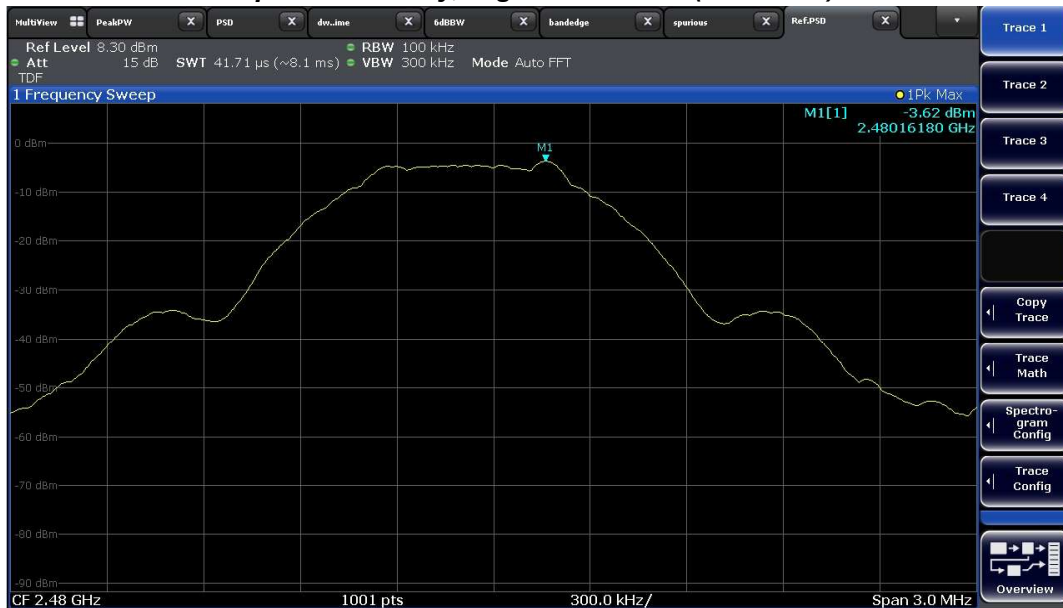


# PLOT OF TEST DATA

## Conducted Spurious Emissions, 30 MHz ~ 26.5 GHz (2442 MHz)

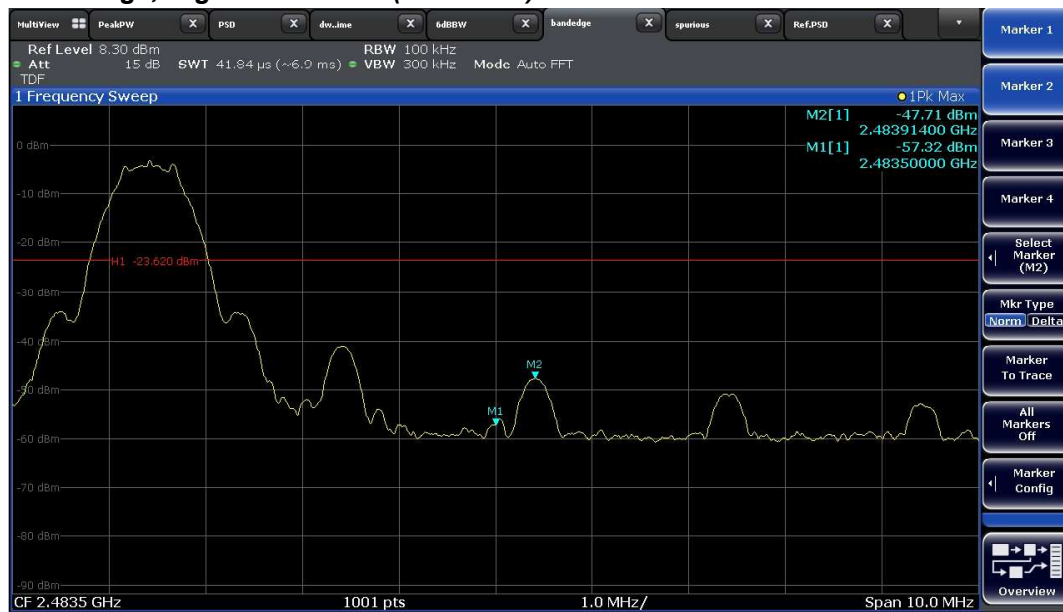


## Reference Power Spectral Density, Highest Channel (2480 MHz)

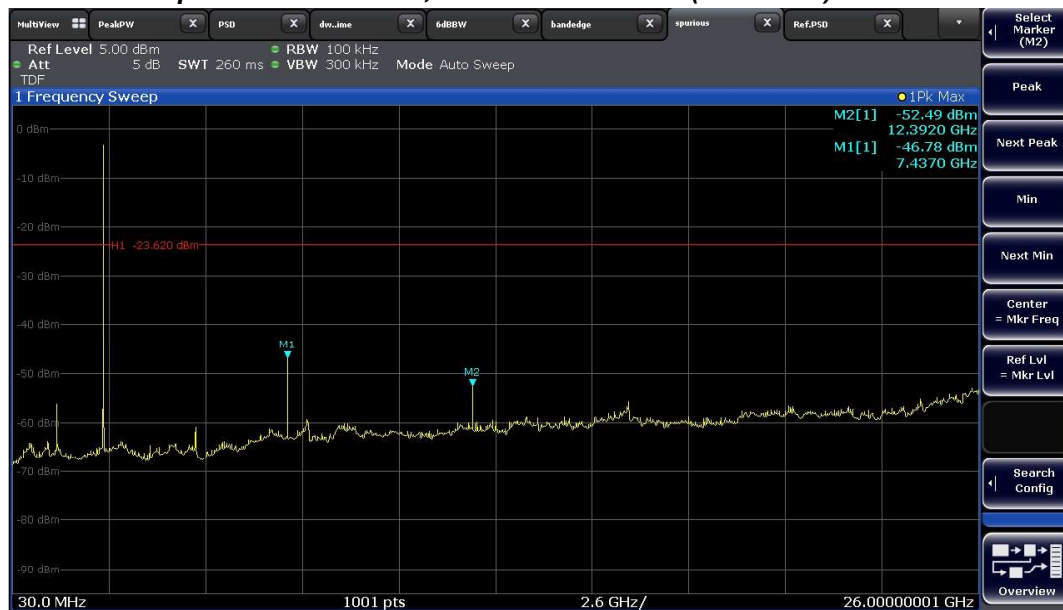


# PLOT OF TEST DATA

## Band Edge, Highest Channel (2480 MHz)



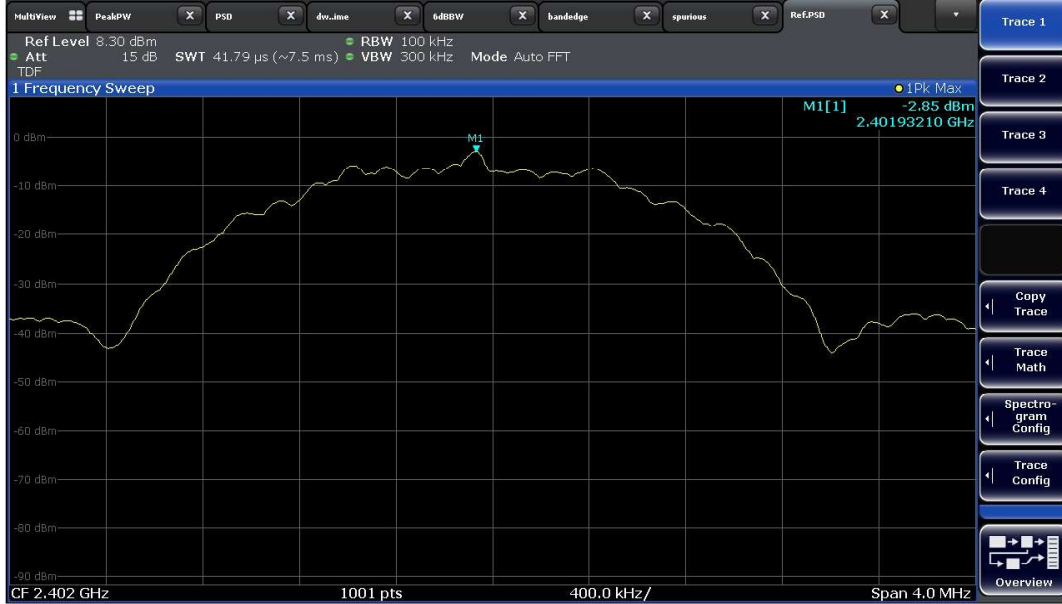
## Conducted Spurious Emissions, 30 MHz ~ 26.5 GHz (2480 MHz)



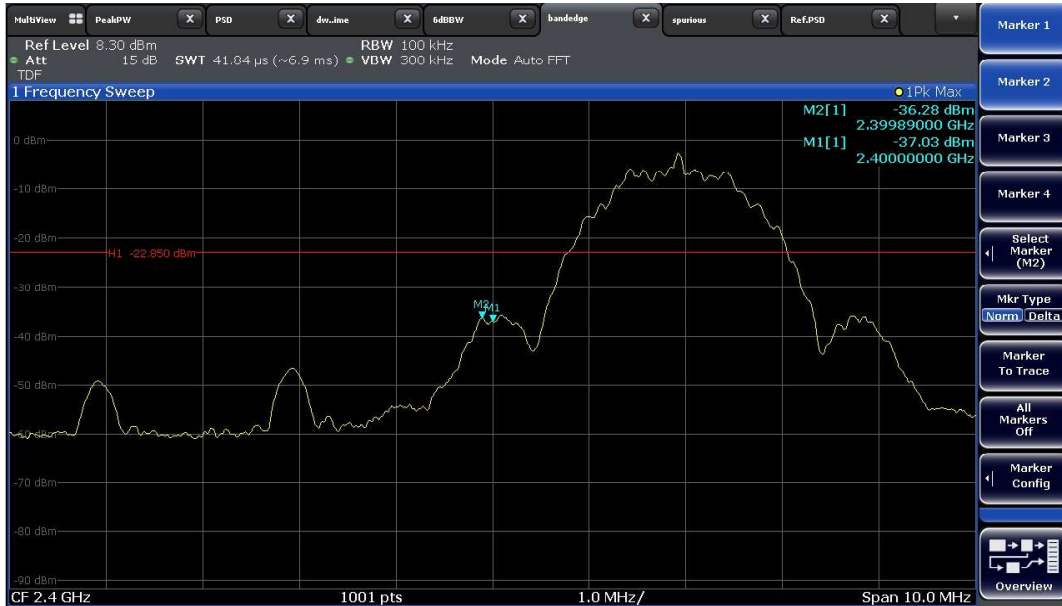
# PLOT OF TEST DATA

## LE 2M mode

### Reference Power Spectral Density, Lowest Channel (2402 MHz)

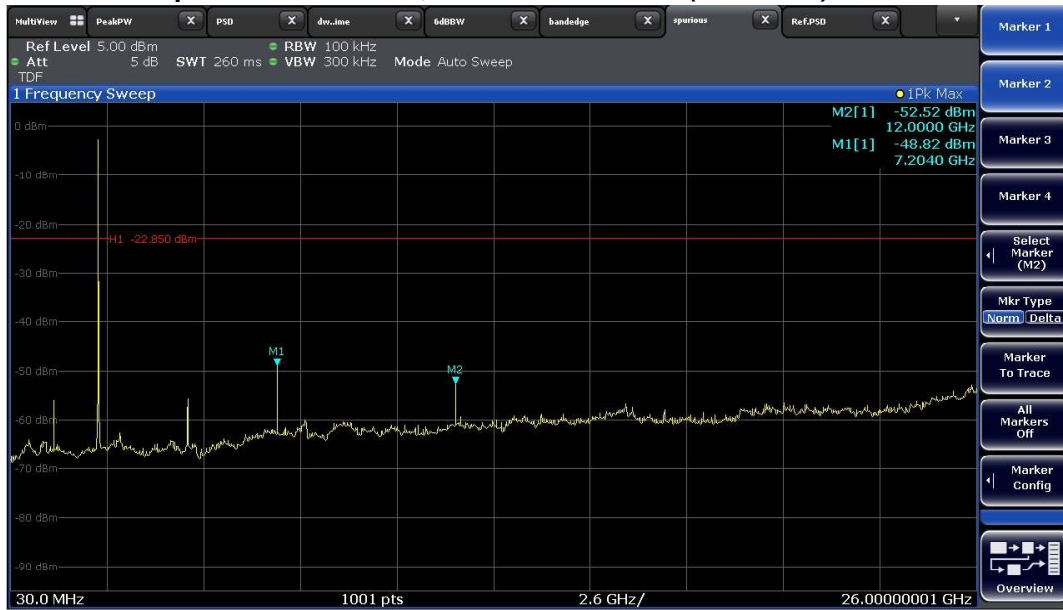


### Band Edge, Lowest Channel (2402 MHz)



# PLOT OF TEST DATA

## Conducted Spurious Emissions, 30 MHz ~ 26.5 GHz (2402 MHz)

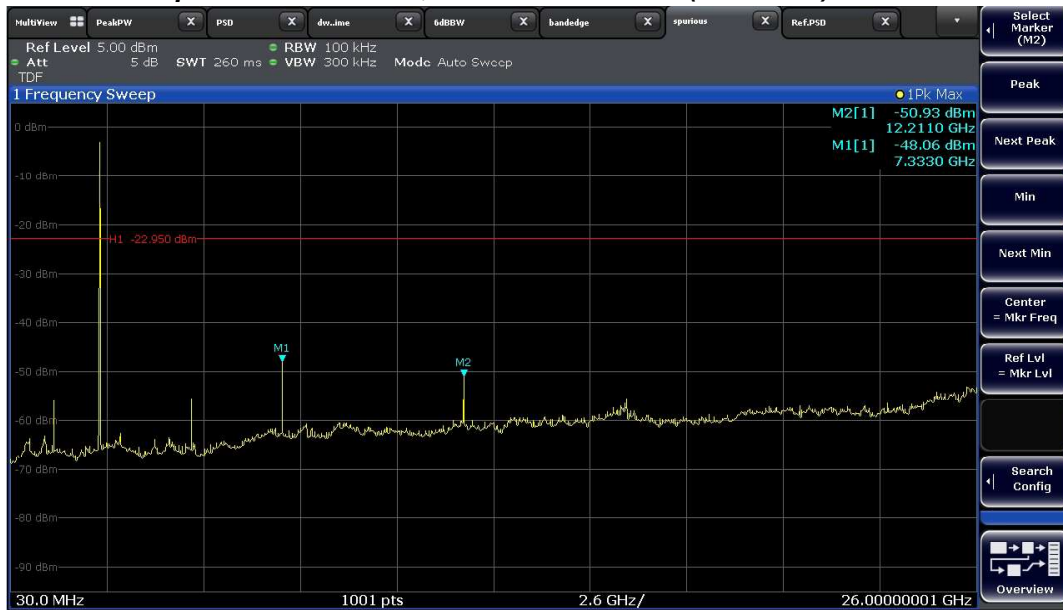


## Reference Power Spectral Density, Middle Channel (2442 MHz)

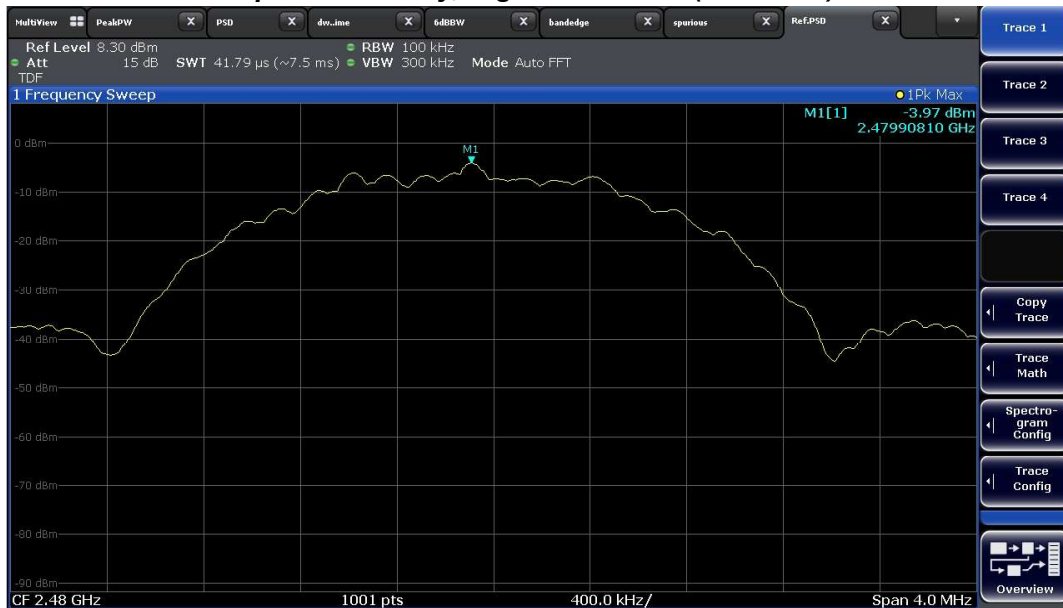


# PLOT OF TEST DATA

## Conducted Spurious Emissions, 30 MHz ~ 26.5 GHz (2442 MHz)



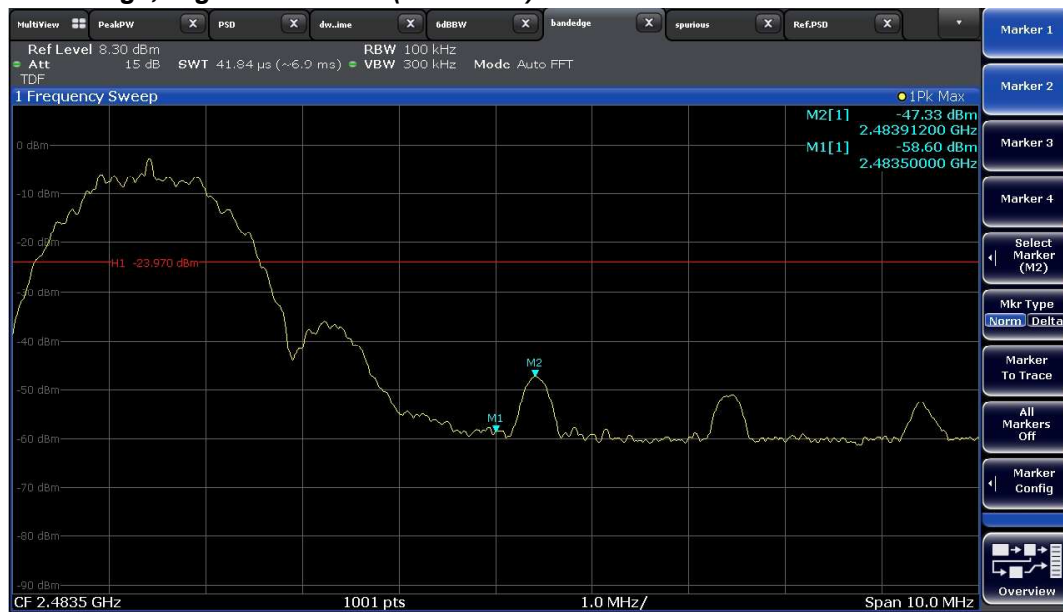
## Reference Power Spectral Density, Highest Channel (2480 MHz)



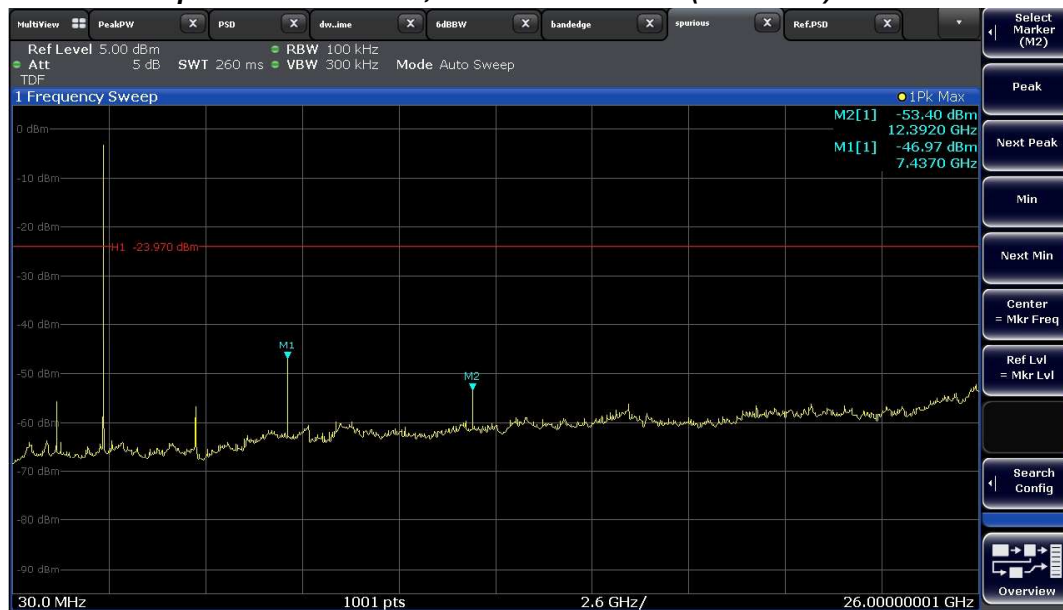


# PLOT OF TEST DATA

## Band Edge, Highest Channel (2480 MHz)



## Conducted Spurious Emissions, 30 MHz ~ 26.5 GHz (2480 MHz)





## TEST DATA

### 8.6 Radiated Spurious Emissions

#### FCC §15.247(d), IC RSS-247 Issue 2 5.5

#### Test Mode : Set to Lowest channel, Middle channel and Highest channel

#### LE 1M mode

##### **Lowest Channel**

Frequency (MHz)	Reading (dB $\mu$ V)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1536.73	61.7	H	peak	-11.6	50.1	74.0	23.9
3073.50	50.9	V	peak	-4.7	46.2	74.0	27.8

##### **Middle Channel**

Frequency (MHz)	Reading (dB $\mu$ V)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1536.93	61.9	V	peak	-11.6	50.3	74.0	23.7
3993.00	48.6	V	peak	-1.6	47.0	74.0	27.1

##### **Highest Channel**

Frequency (MHz)	Reading (dB $\mu$ V)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1536.93	62.4	V	peak	-11.6	50.8	74.0	23.2
3327.50	51.6	V	peak	-4.6	47.0	74.0	27.0

#### LE 2M mode

##### **Lowest Channel**

Frequency (MHz)	Reading (dB $\mu$ V)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1536.87	62.4	V	peak	-11.6	50.8	74.0	23.2
3073.50	50.9	V	peak	-4.7	46.2	74.0	27.8

## TEST DATA

### Middle Channel

Frequency (MHz)	Reading (dB $\mu$ V)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1536.87	62.7	H	peak	-11.6	51.1	74.0	22.9
3073.50	50.1	V	peak	-4.7	45.4	74.0	28.6

### Highest Channel

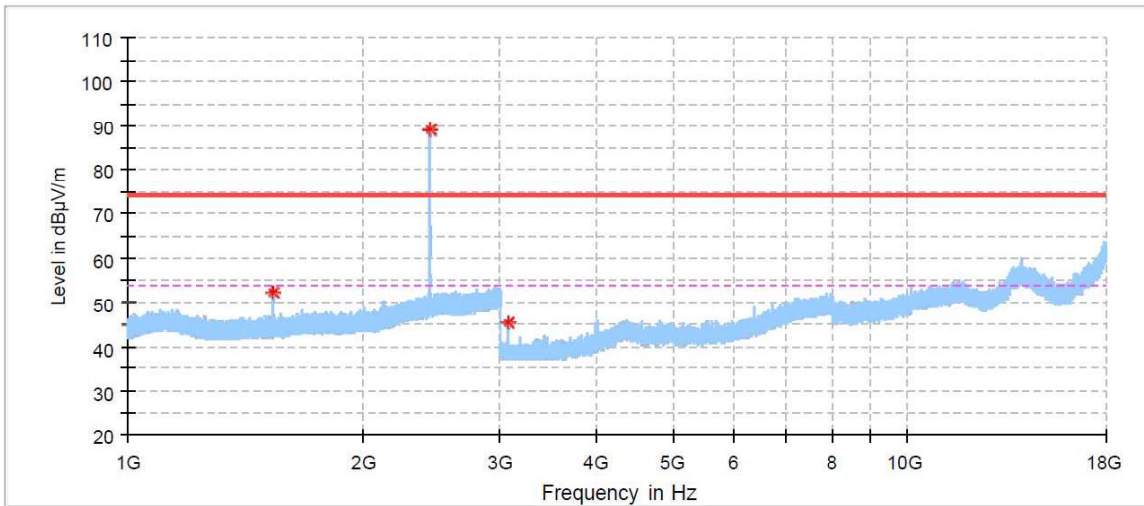
Frequency (MHz)	Reading (dB $\mu$ V)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1536.80	62.3	V	peak	-11.6	50.7	74.0	23.3
3328.50	49.6	V	peak	-4.6	45.0	74.0	29.0

#### Note:

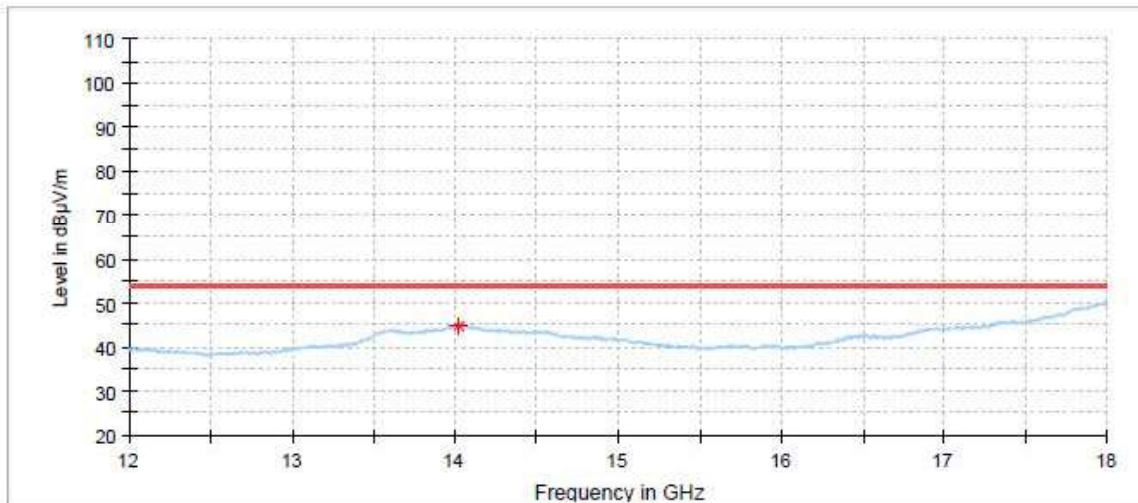
- \*Pol. H = Horizontal V = Vertical
- \*\*AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
- Average measurement was not performed because peak-detected emission complies with the average limit.
- Other spurious was under 20 dB below Fundamental.
- Middle channel (2442MHz) in LE 2M mode is the worst case.
- The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization. The worst data was recorded.
- Peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.
- The spectrum was measured from 9 kHz to 10<sup>th</sup> harmonic and the worst-case emissions were reported. No significant emissions were found beyond the 3rd harmonic for this device.

# PLOTS OF EMISSIONS

**Worst Case : 2442 MHz GFSK modulation : 1 GHz to 18 GHz Peak**

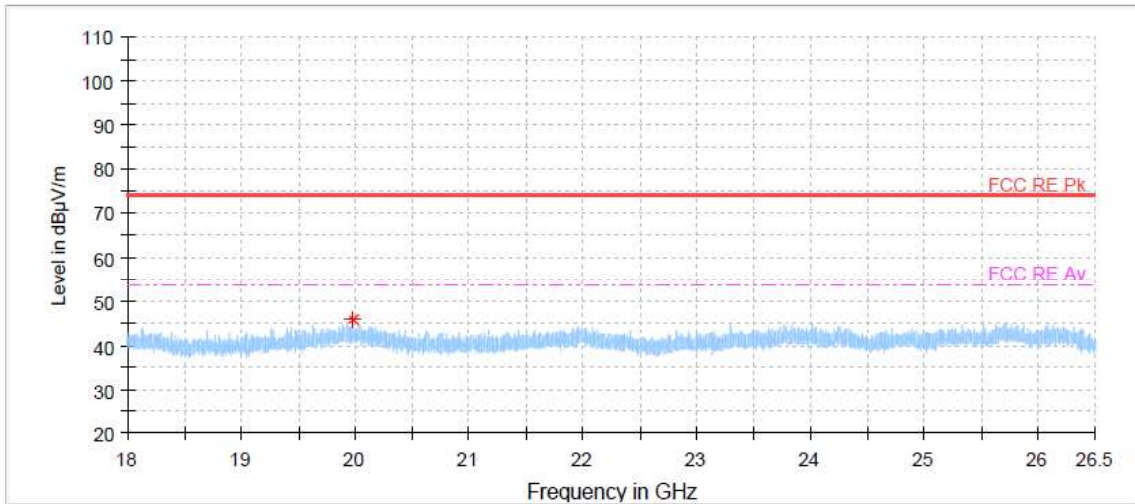


**Worst Case : 2442 MHz GFSK modulation : 12 GHz to 18 GHz Average**



# PLOTS OF EMISSIONS

**Worst Case : 2442 MHz GFSK modulation : 18 GHz to 26.5 GHz Peak**



## TEST DATA

### 8.7 Radiated Band Edge

#### FCC §15.247(d), IC RSS-247 Issue 2, 5.5

Test Mode : Set to Lowest channel and Highest channel

#### LE 1M mode

##### Lowest and Highest Channels

Frequency (MHz)	Reading (dB $\mu$ V)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
2380.96	59.0	V	peak	-7.9	51.1	74.0	22.9
2390.00	56.0	V	peak	-7.9	48.1	74.0	25.9
2483.50	56.8	V	peak	-7.6	49.2	74.0	24.8
2483.91	59.6	V	peak	-7.6	52.0	74.0	22.0

#### LE 2M mode

##### Lowest and Highest Channels

Frequency (MHz)	Reading (dB $\mu$ V)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
2376.51	59.7	V	peak	-7.9	51.8	74.0	22.2
2390.00	56.2	V	peak	-7.9	48.3	74.0	25.7
2483.50	59.6	H	peak	-7.6	52.0	74.0	22.0
2484.02	60.2	H	peak	-7.6	52.6	74.0	21.5

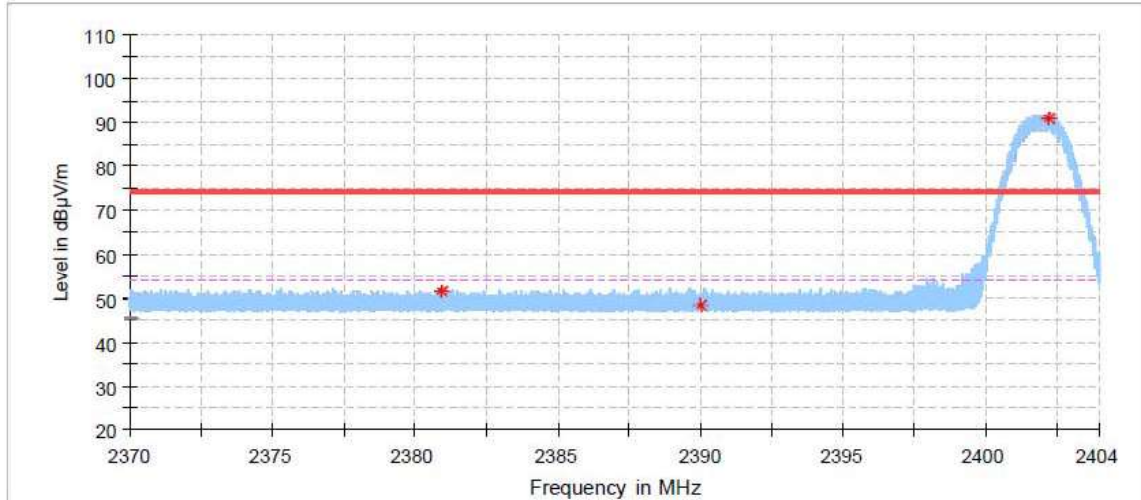
#### Note:

- \*Pol. H = Horizontal V = Vertical
- \*\*AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
- Average measurement was not performed because peak-detected emission complies with the average limit.
- Other spurious was under 20 dB below Fundamental.
- The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization. The worst data was recorded.
- Peak emissions were measured using RBW = 1 MHz, VBW = 3 MHz, Detector = Peak.

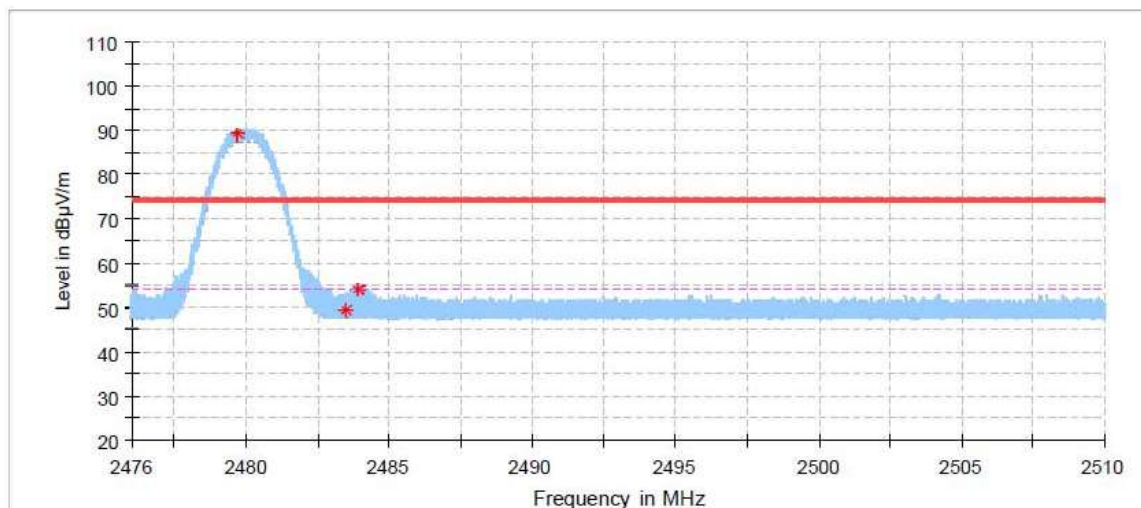
# PLOT OF TEST DATA

## LE 1M mode

### **Restricted Band Spurious Emissions, Lowest channel (Peak)**



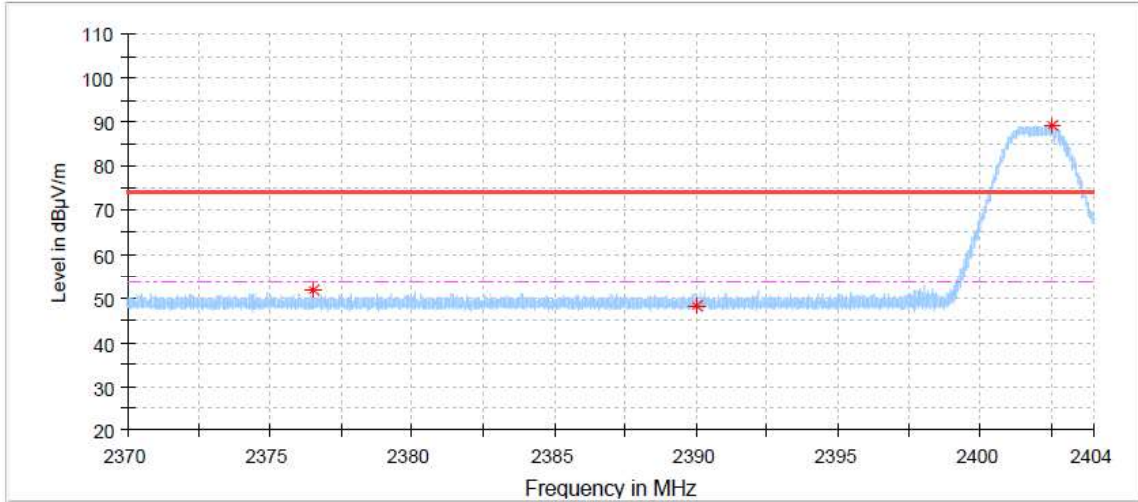
### **Restricted Band Spurious Emissions, Highest channel (Peak)**



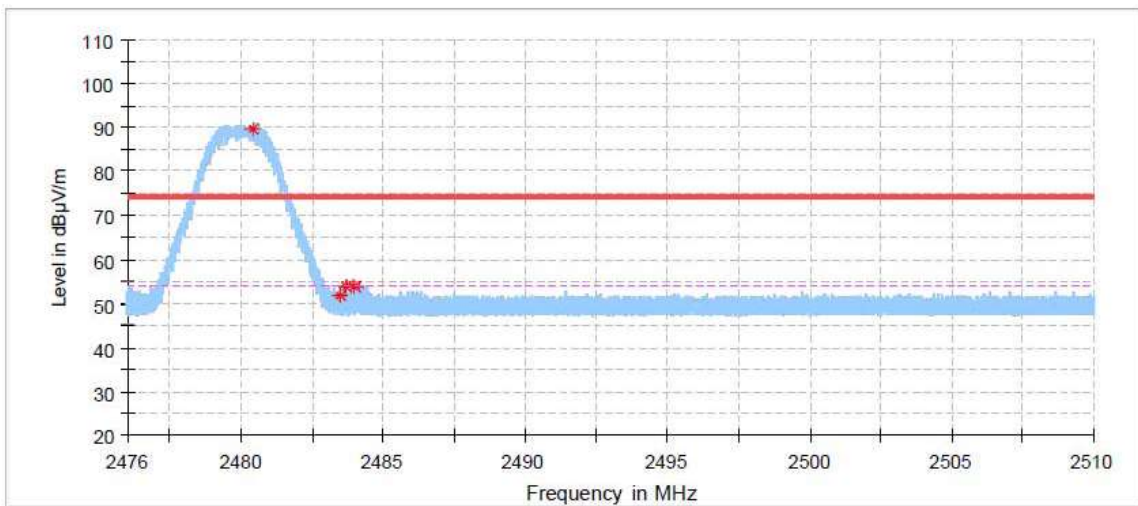
# PLOT OF TEST DATA

## LE 2M mode

### **Restricted Band Spurious Emissions, Lowest channel (Peak)**



### **Restricted Band Spurious Emissions, Highest channel (Peak)**





## 9. TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Serial No.	Calibration Date	Calibration Interval
1	*Test Receiver	R & S	ESU 40	100202	May. 24 2018	1 year
2	Test Receiver	R & S	ESCS30	100302	Oct. 11 2018	1 year
3	Attenuator	PASTERNAK	PE7395-10	1441-1	Jul. 07 2018	1 year
4	Attenuator	FAIRVIEW	SA3N5W-06	N/A	Jun. 14 2018	1 year
5	Attenuator	FAIRVIEW	SA3N5W-10	N/A	Apr. 03 2019	1 year
6	*Attenuator	WEINSCHEL	56-10	58765	Oct. 12 2018	1 year
7	*Amplifier	R & S	SCU 01	10029	Apr. 02 2019	1 year
8	*Amplifier	R & S	SCU18F	180025	Apr. 02 2019	1 year
9	*Amplifier	R & S	SCU26D	1984522	Apr. 02 2019	1 year
10	Amplifier	R & S	SCU40	100380	Jul. 16 2018	1 year
11	Pre Amplifier	HP	8449B	3008A00107	Jan. 08 2019	1 year
12	*Spectrum Analyzer	R & S	FSW43	100732	Apr. 02 2019	1 year
13	Spectrum Analyzer	Agilent	E4440A	MY44022567	Oct. 11 2018	1 year
14	*Spectrum Analyzer	R & S	FSW43	104084	Apr. 02 2019	1 year
15	*Loop Antenna	R & S	HFH2-Z2	100279	Feb.13 2019	2 year
16	*Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-474	Jun. 28 2017	2 year
17	*Horn Antenna	Q-par Angus	QSH20S20	8179	Aug. 01 2017	2 year
18	Horn Antenna	Q-par Angus	QSH22K20	8180	Aug. 02 2017	2 year
19	*Trilog-Broadband Antenna	SCHWARZBECK	VULB 9163	946	May. 18 2017	2 year
20	LISN	R & S	ESH3-Z5	833874/006	Oct. 12 2018	1 year
21	*Position Controller	INNCO	CO2000	12480406/L	N/A	N/A
22	*Controller	INNCO	CO3000	CO3000/937/38	N/A	N/A
23	*Turn Table	INNCO	DS1200S	N/A	N/A	N/A
24	*Turn Table	INNCO	DT2000-2t	N/A	N/A	N/A
25	*Antenna Mast	INNCO	MA4000	N/A	N/A	N/A
26	*TILT Antenna Mast	INNCO	MA4640-XP-EP	N/A	N/A	N/A
27	*Open Switch And Control Unit	R & S	OSP-120	100081	N/A	N/A
28	*Open Switch And Control Unit	R & S	OSP-120	101766	N/A	N/A
29	*Shielded Room	Seo-Young EMC	N/A	N/A	N/A	N/A
30	*Anechoic Chamber	Seo-Young EMC	N/A	N/A	N/A	N/A
31	*WiFi Filter Bank	R & S	U083	N/A	N/A	N/A
32	*WiFi Filter Bank	R & S	U082	N/A	N/A	N/A

\*) Test equipment used during the test



## 10. ACCURACY OF MEASUREMENT

The Measurement Uncertainties stated were calculated in accordance with the requirements of measurement uncertainty contained in CISPR 16-4-2 with the confidence level of 95%

### 1. Conducted Uncertainty Calculation

Source of Uncertainty	$X_i$	Uncertainty of $X_i$		Coverage factor $k$	$u(X_i)$ (dB)	$C_i$	$C_i u(X_i)$ (dB)
		Value (dB)	Probability Distribution				
Receiver reading	<b>RI</b>	± 0.1	normal 1	1.000	0.1	1	0.1
Attenuation AMN-Receiver	<b>LC</b>	± 0.08	normal 2	2.000	0.04	1	0.04
AMN Voltage division factor	<b>LAMN</b>	± 0.8	normal 2	2.000	0.4	1	0.4
Sine wave voltage	<b>dVSW</b>	± 2.00	normal 2	2.000	1.00	1	1.00
Pulse amplitude response	<b>dVPA</b>	± 1.50	rectangular	1.732	0.87	1	0.87
Pulse repetition rate response	<b>dVPR</b>	± 1.50	rectangular	1.732	0.87	1	0.87
Noise floor proximity	<b>dVNF</b>	± 0.00	-	-	0.00	1	0.00
AMN Impedance	<b>dZ</b>	± 1.80	triangular	2.449	0.73	1	0.73
Ⓐ Mismatch	<b>M</b>	+ 0.70	U-Shaped	1.414	0.49	1	0.49
Ⓑ Mismatch	<b>M</b>	- 0.80	U-Shaped	1.414	- 0.56	1	- 0.56
Measurement System Repeatability	<b>RS</b>	0.05	normal 1	1.000	0.05	1	0.05
Remark	Ⓐ: AMN-Receiver Mismatch : + Ⓑ: AMN-Receiver Mismatch : -						
Combined Standard Uncertainty	Normal			± 1.88			
Expanded Uncertainty U	Normal ( $k = 2$ )			± 3.76			

## 2. Radiation Uncertainty Calculation

Source of Uncertainty	$X_i$	Uncertainty of $X_i$		Coverage factor $k$	$u(X_i)$ (dB)	$C_i$	$C_i u(X_i)$ (dB)
		Value (dB)	Probability Distribution				
Measurement System Repeatability	<b>RI</b>	0.34	normal 1	1.00	0.34	1	0.34
Receiver reading	<b>dVsw</b>	± 0.02	normal 2	2.00	0.01	1	0.01
Sine wave voltage	<b>dVpa</b>	± 0.17	normal 2	2.00	0.09	1	0.09
Pulse amplitude response	<b>dVpr</b>	± 0.92	normal 2	2.00	0.46	1	0.46
Pulse repetition rate response	<b>dVnf</b>	± 0.35	normal 2	2.00	0.18	1	0.18
Noise floor proximity	<b>AF</b>	± 0.50	normal 2	2.00	0.25	1	0.25
Antenna Factor Calibration	<b>CL</b>	± 2.00	rectangular	$\sqrt{3}$	1.15	1	1.15
Cable Loss	<b>AD</b>	± 1.00	normal 2	2.00	0.50	1	0.50
Antenna Directivity	<b>AH</b>	± 0.00	rectangular	$\sqrt{3}$	0.00	1	0.00
Antenna Factor Height Dependence	<b>AP</b>	± 2.00	rectangular	$\sqrt{3}$	1.15	1	1.15
Antenna Phase Centre Variation	<b>AI</b>	± 0.20	rectangular	$\sqrt{3}$	0.12	1	0.12
Antenna Factor Frequency Interpolation	<b>SI</b>	± 0.25	rectangular	$\sqrt{3}$	0.14	1	0.14
Site Imperfections	<b>DV</b>	± 4.00	triangular	$\sqrt{6}$	1.63	1	1.63
Measurement Distance Variation	<b>Dbal</b>	± 0.60	rectangular	$\sqrt{3}$	0.35	1	0.35
Antenna Balance	<b>DCross</b>	± 0.90	rectangular	$\sqrt{3}$	0.52	1	0.52
Cross Polarisation	<b>M</b>	± 0.00	rectangular	$\sqrt{3}$	0.00	1	0.18
Mismatch	<b>M</b>	+ 0.98 - 1.11	U-Shaped	$\sqrt{2}$	0.74	1	0.74
EUT Volume Diameter	<b>M</b>	0.33	normal 1	1.00	0.33	1	0.11
Remark							
Combined Standard Uncertainty	Normal						
Expanded Uncertainty U	Normal ( $k = 2$ )						