

PLOT OF TEST DATA

LE 1M mode

Maximum Peak Output Power, Lowest Channel (2402 MHz)

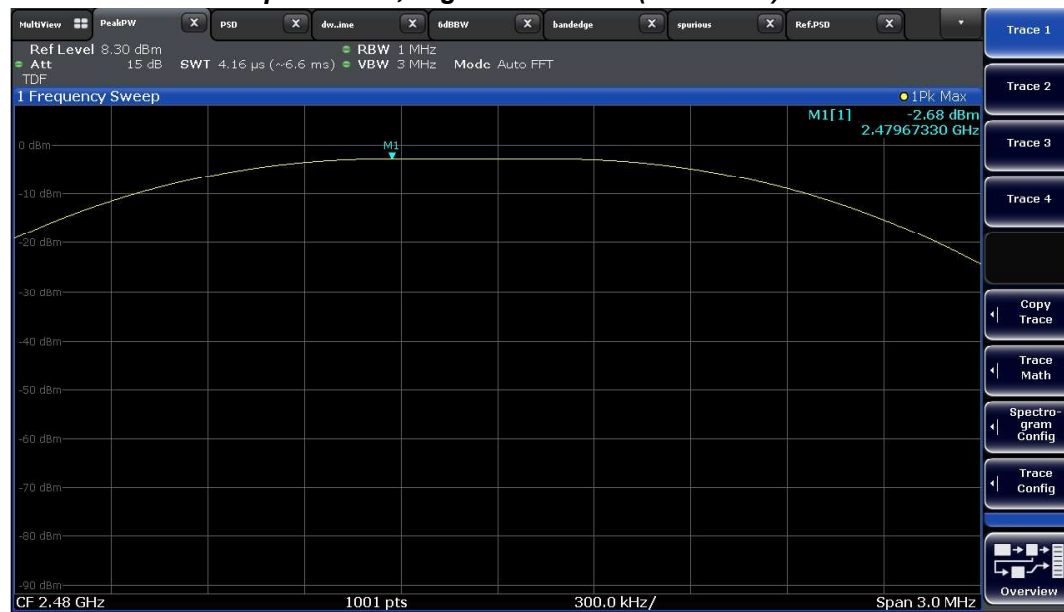


Maximum Peak Output Power, Middle Channel (2442 MHz)



PLOT OF TEST DATA

Maximum Peak Output Power, Highest Channel (2480 MHz)



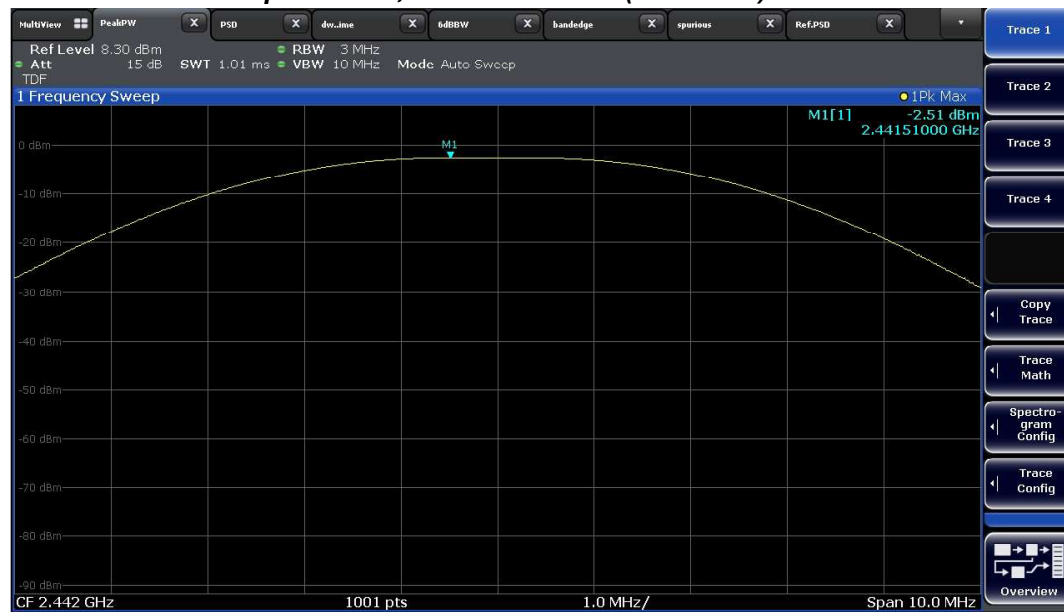
LE 2M mode

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:

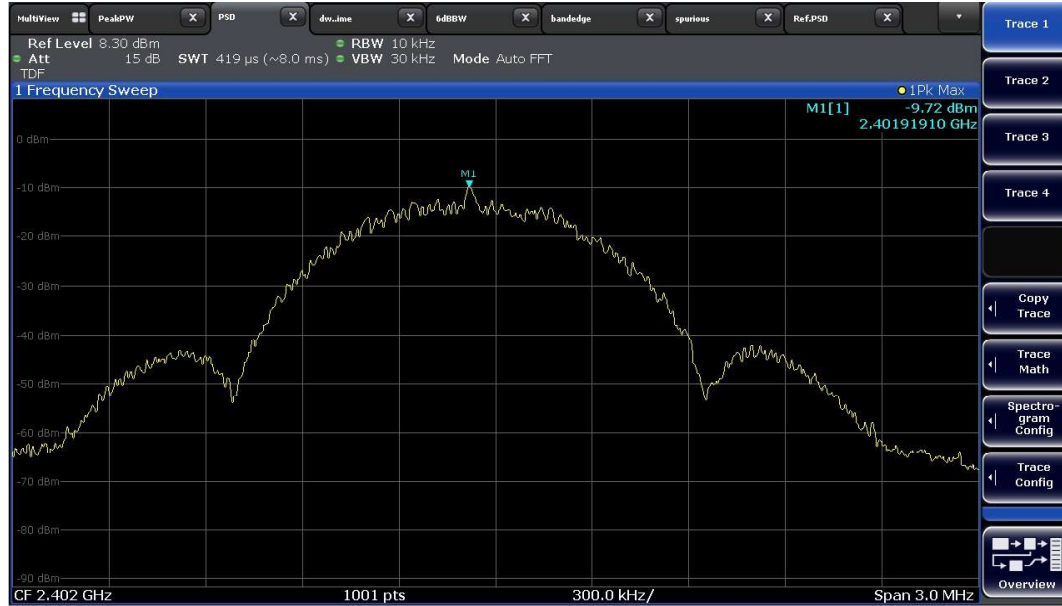
The following equation was used for spectrum offset:

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

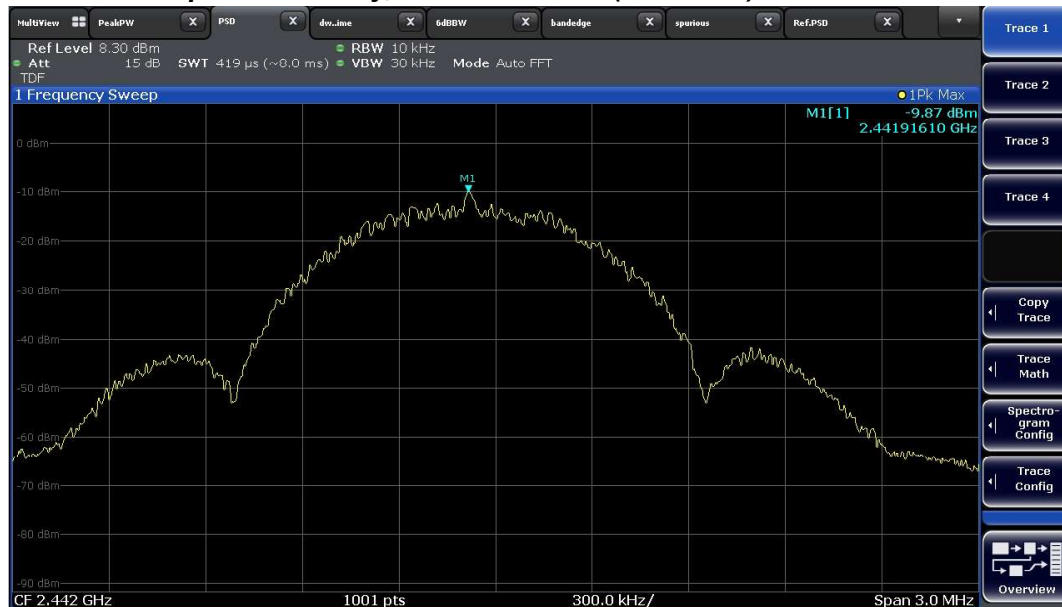
PLOT OF TEST DATA

LE 1M mode

Peak Power Spectral Density, Lowest Channel (2402 MHz)

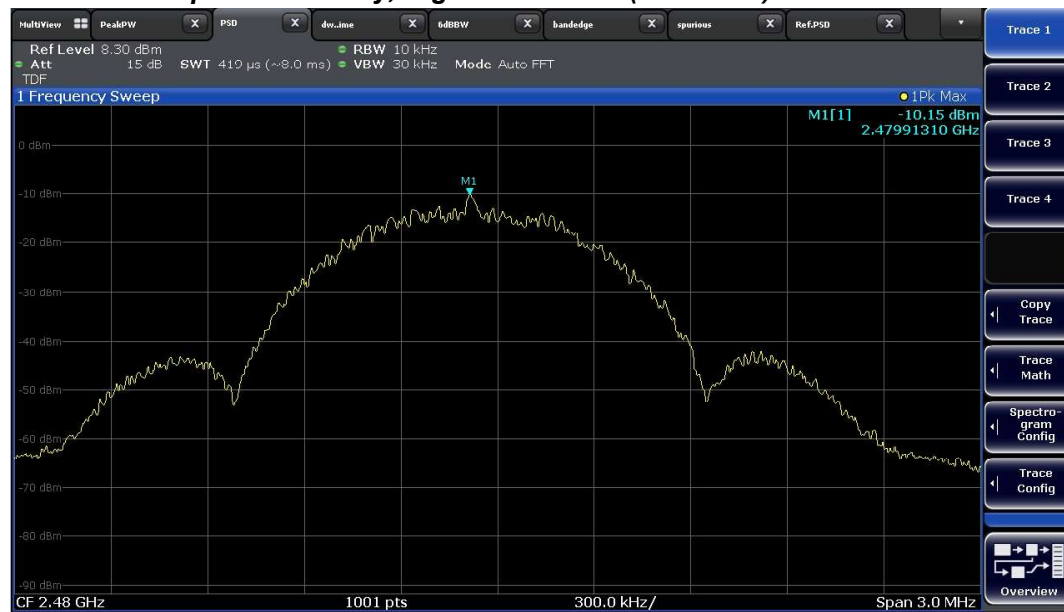


Peak Power Spectral Density, Middle Channel (2442 MHz)



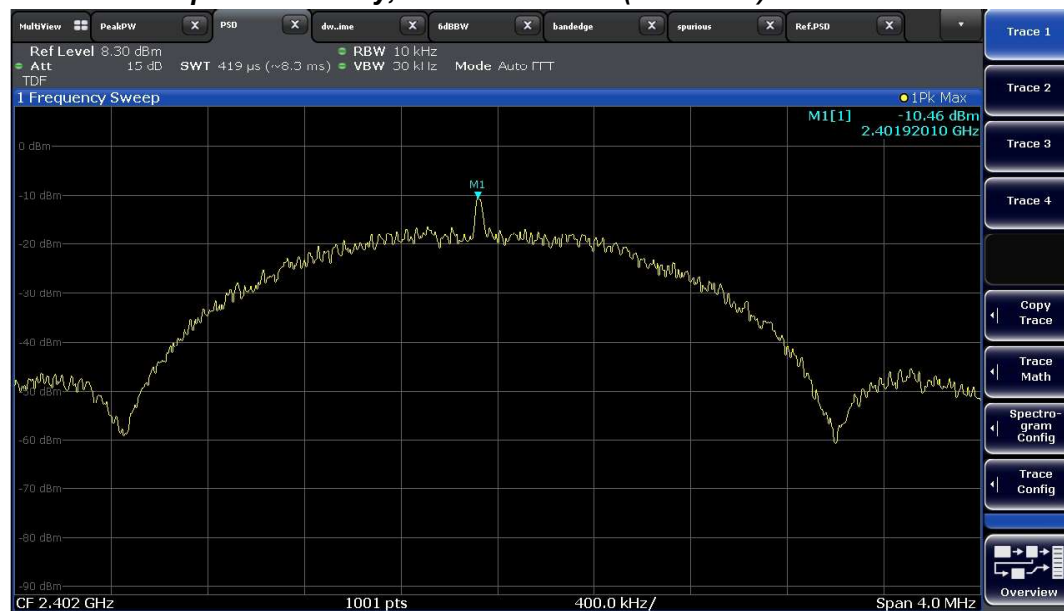
PLOT OF TEST DATA

Peak Power Spectral Density, Highest Channel (2480 MHz)



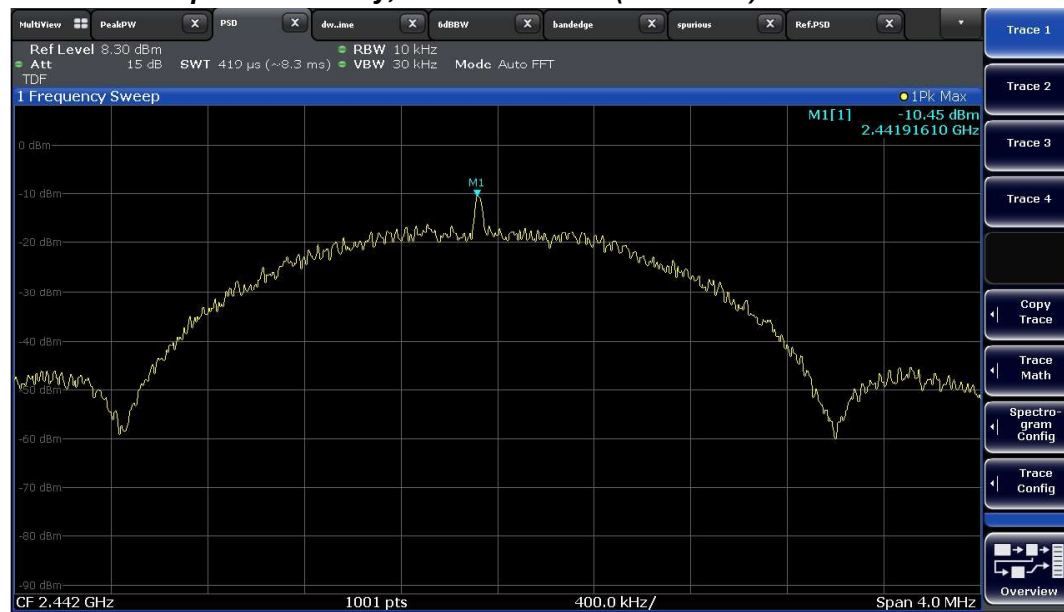
LE 2M mode

Peak Power Spectral Density, Lowest Channel (2402 MHz)

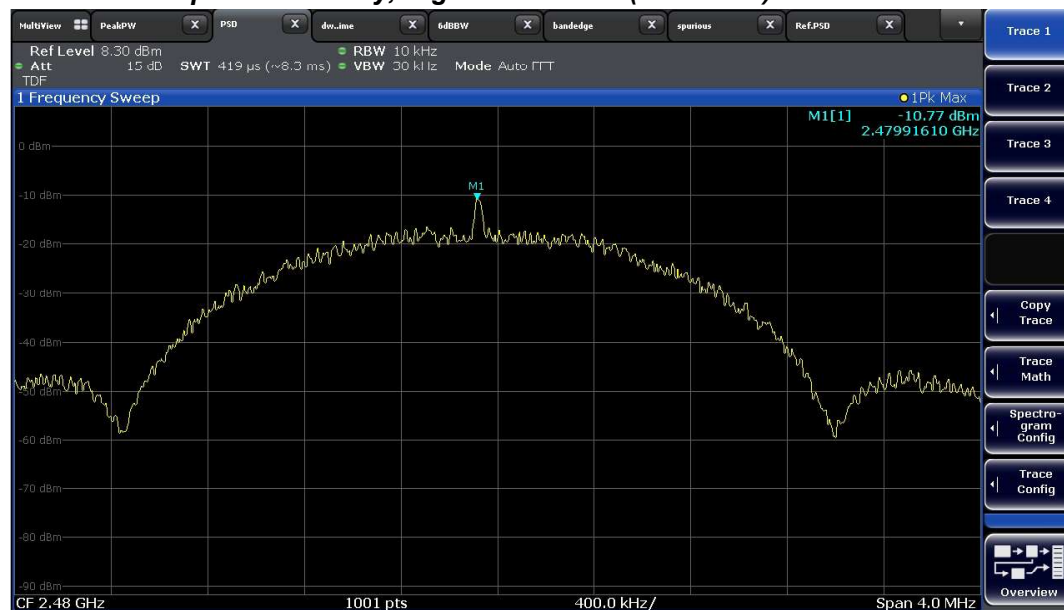


PLOT OF TEST DATA

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.

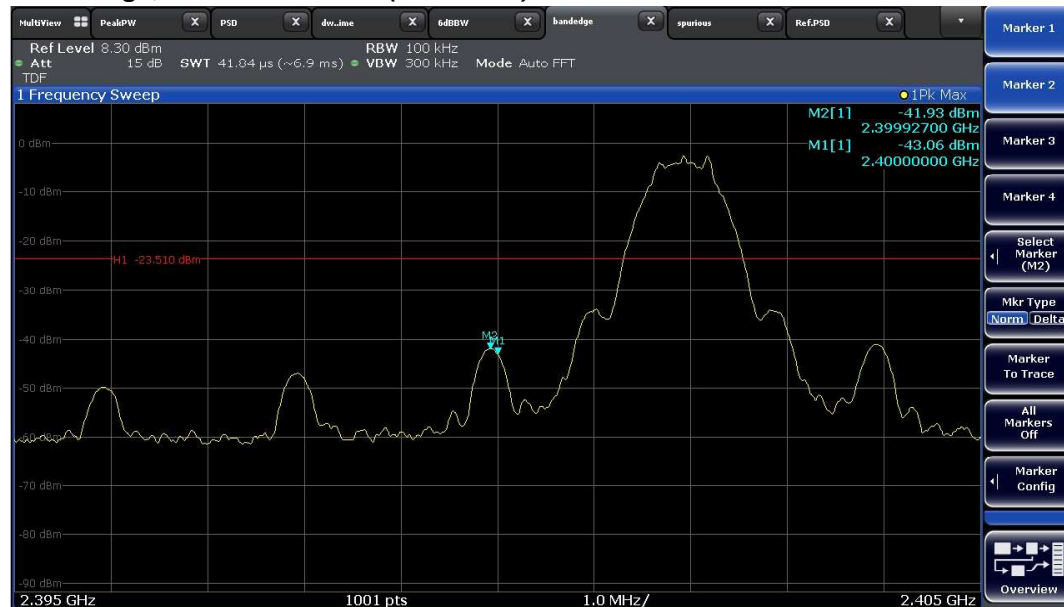
PLOT OF TEST DATA

LE 1M mode

Reference Power Spectral Density, Lowest Channel (2402 MHz)

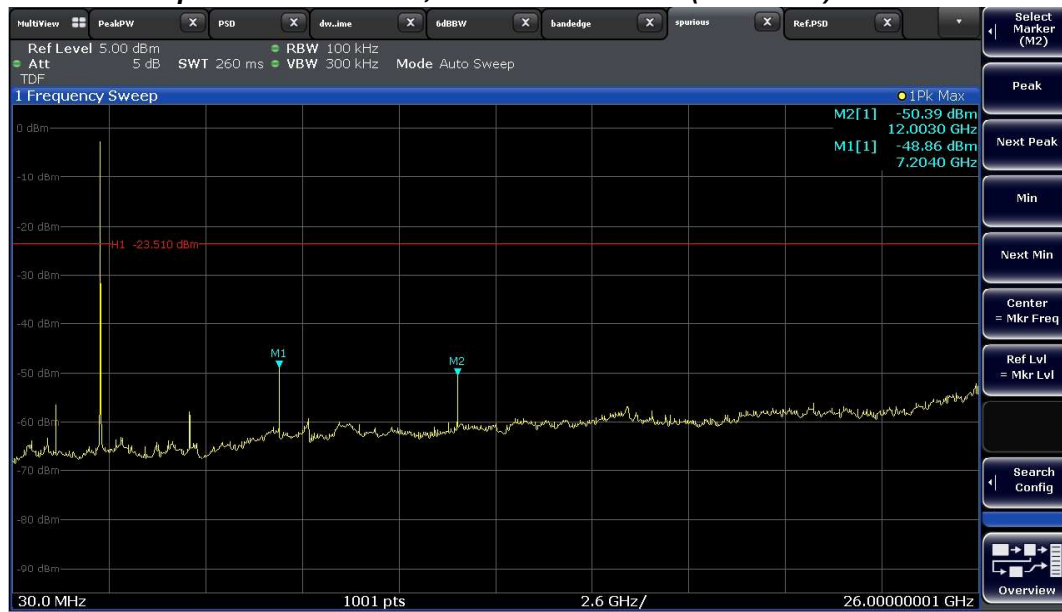


Band Edge, Lowest Channel (2402 MHz)



PLOT OF TEST DATA

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

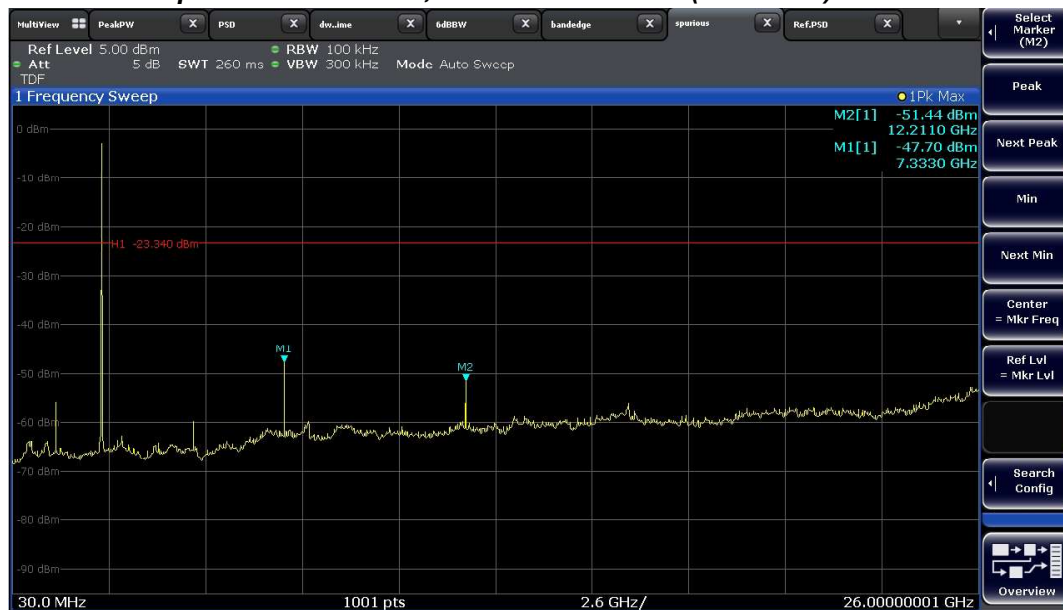


Reference Power Spectral Density, Middle Channel (2442 MHz)

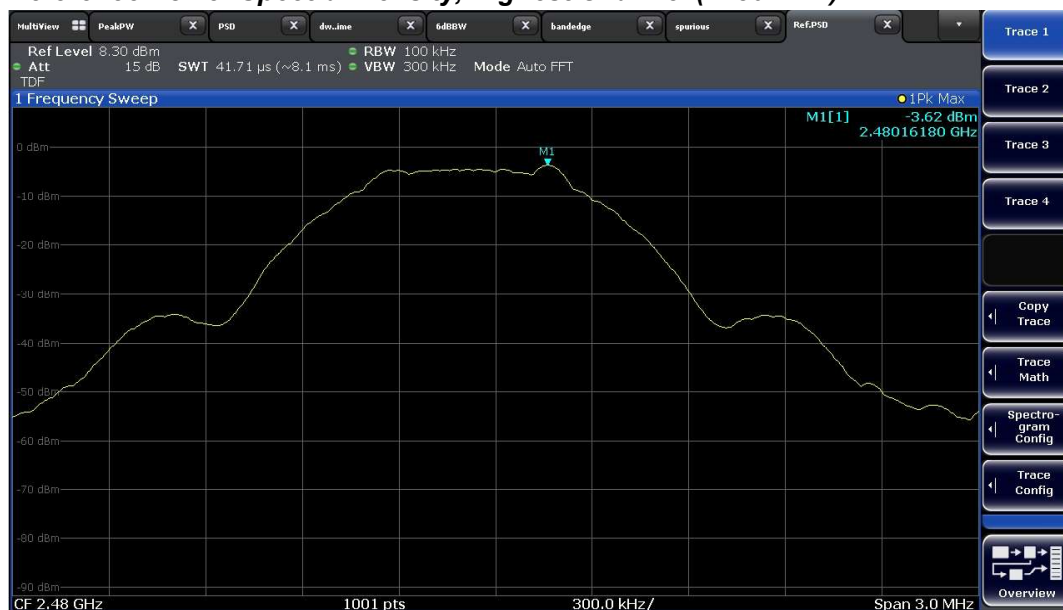


PLOT OF TEST DATA

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

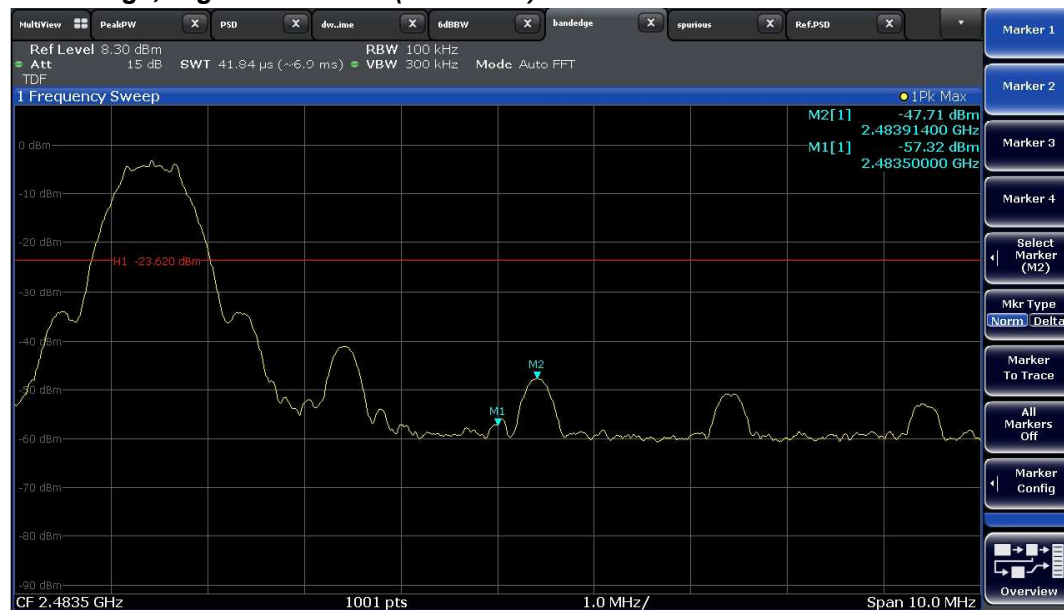


Reference Power Spectral Density, Highest Channel (2480 MHz)



PLOT OF TEST DATA

Band Edge, Highest Channel (2480 MHz)



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



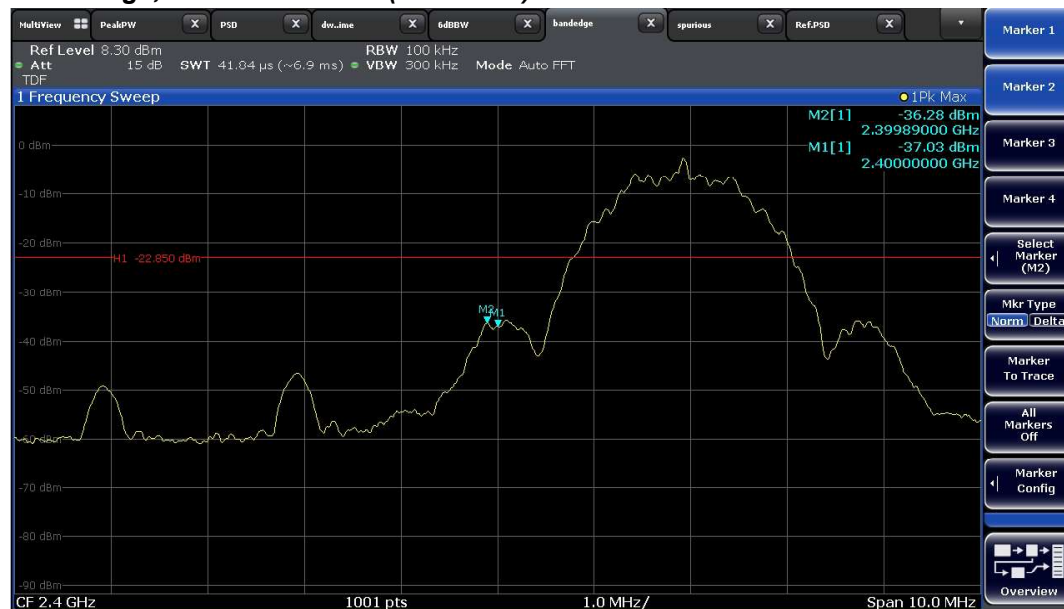
PLOT OF TEST DATA

LE 2M mode

Reference Power Spectral Density, Lowest Channel (2402 MHz)

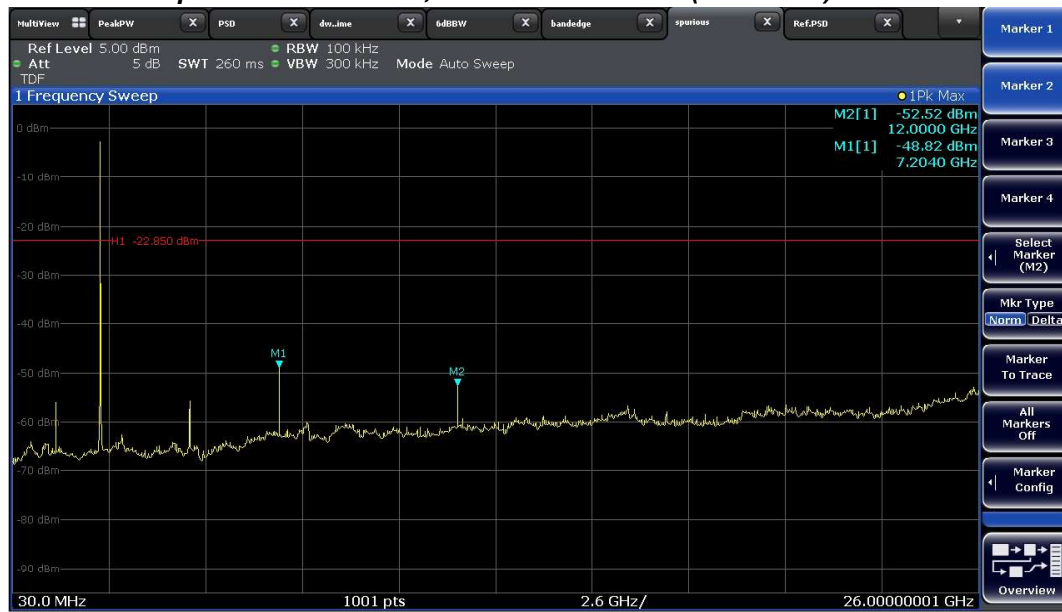


Band Edge, Lowest Channel (2402 MHz)



PLOT OF TEST DATA

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

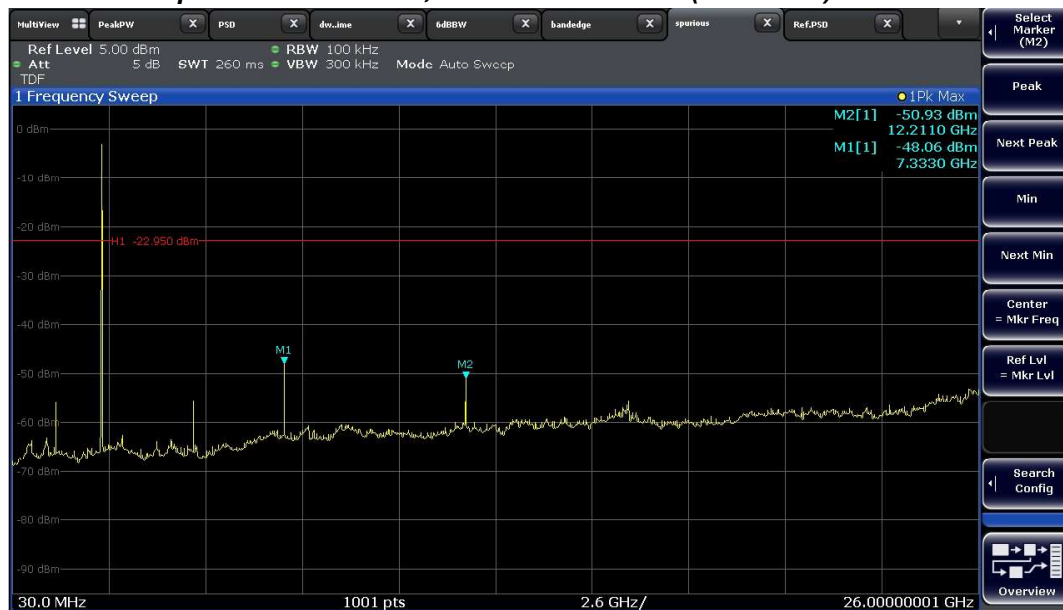


Reference Power Spectral Density, Middle Channel (2442 MHz)



PLOT OF TEST DATA

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

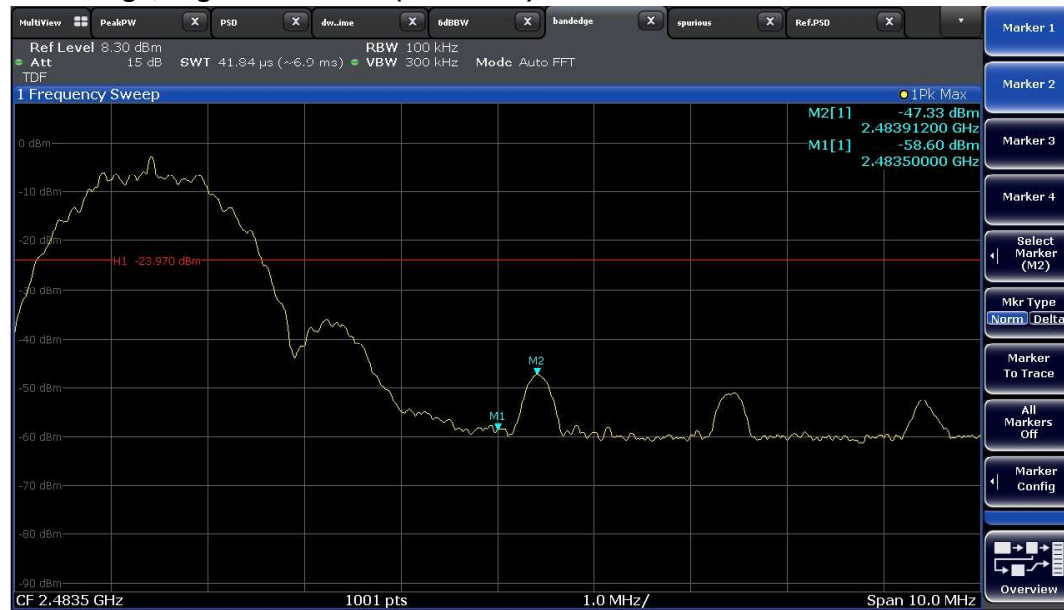


Reference Power Spectral Density, Highest Channel (2480 MHz)

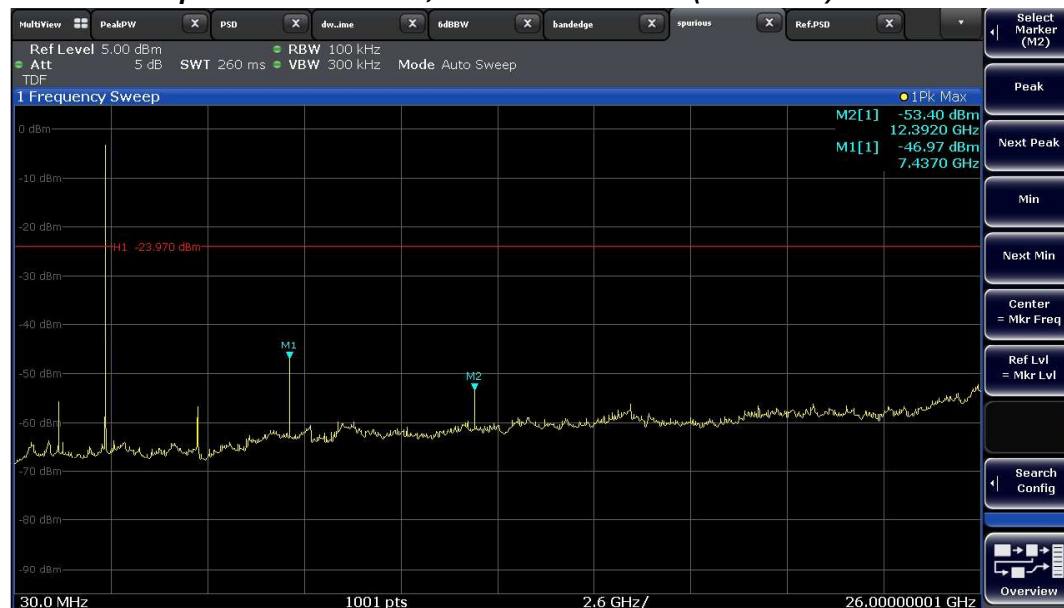


PLOT OF TEST DATA

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 (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/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 (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/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 (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/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 (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/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 (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/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

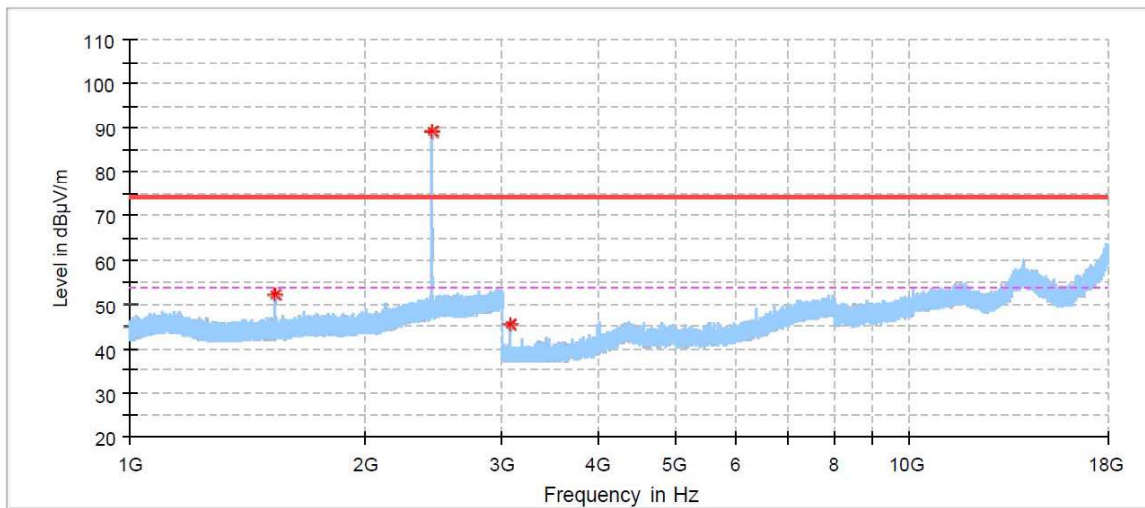
Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1536.80	62.3	V	peak	-11.6	50.7	74.0	23.3
3328.50	49.6	V	peak	-4.6	45.0	74.0	29.0

Note:

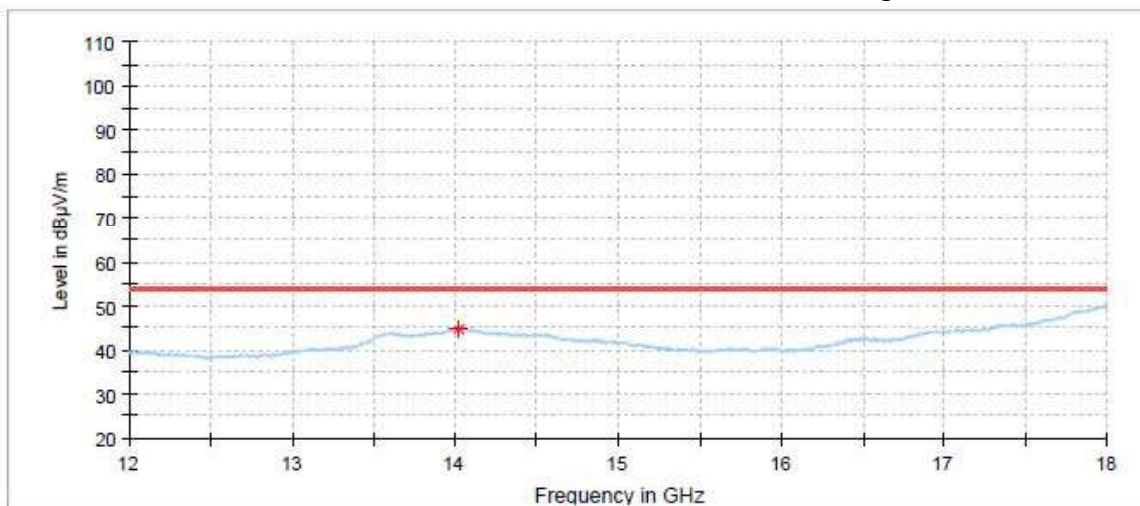
- *Pol. H = Horizontal V = Vertical
- **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
- Average measurement was not performed because peak-detected emission complies with the average limit.
- Other spurious was under 20 dB below Fundamental.
- Middle channel (2442MHz) in LE 2M mode is the 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 10th 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

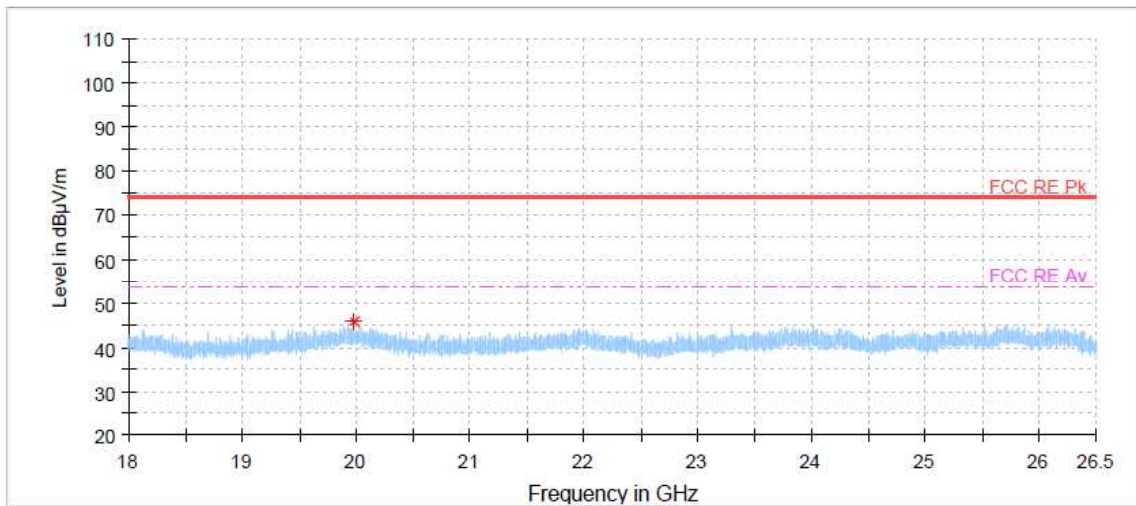


Worst Case : 2442 MHz GFSK modulation : 12 GHz to 18 GHz Average



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 (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/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 (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/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

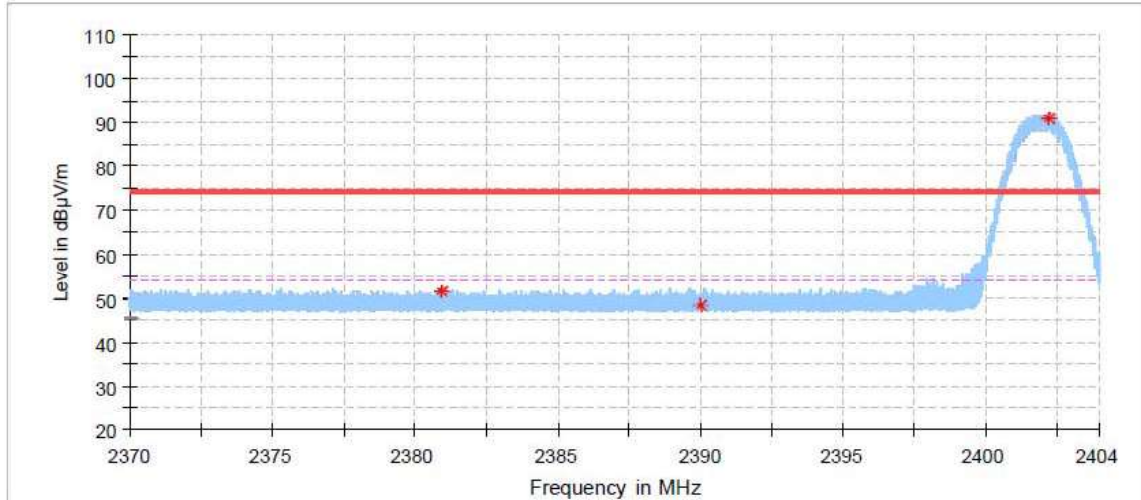
Note:

- *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.

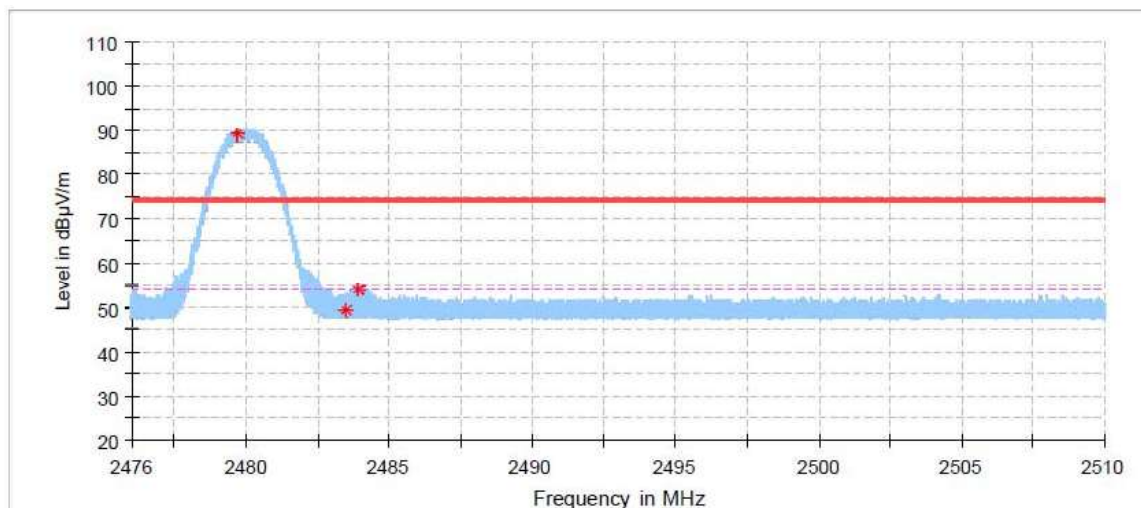
PLOT OF TEST DATA

LE 1M mode

Restricted Band Spurious Emissions, Lowest channel (Peak)



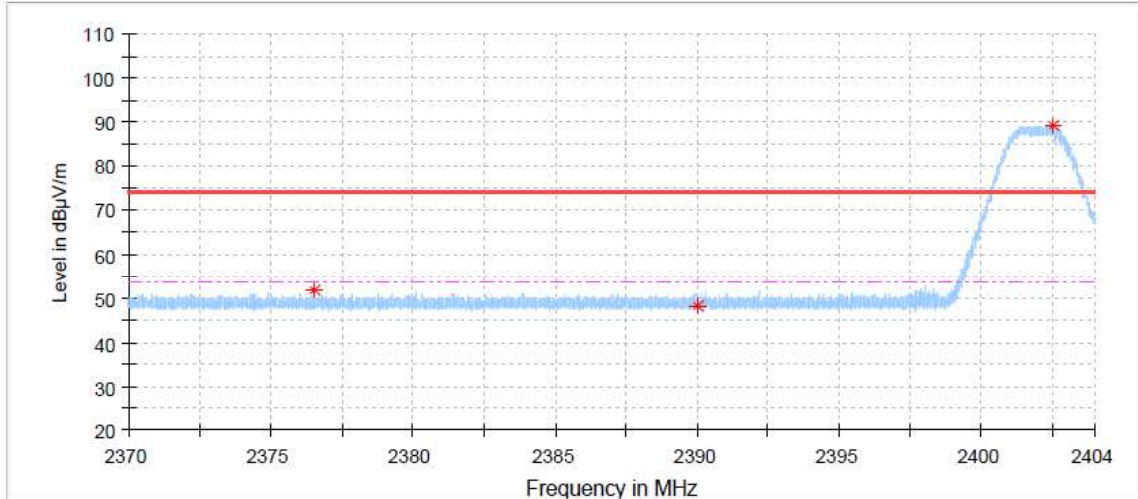
Restricted Band Spurious Emissions, Highest channel (Peak)



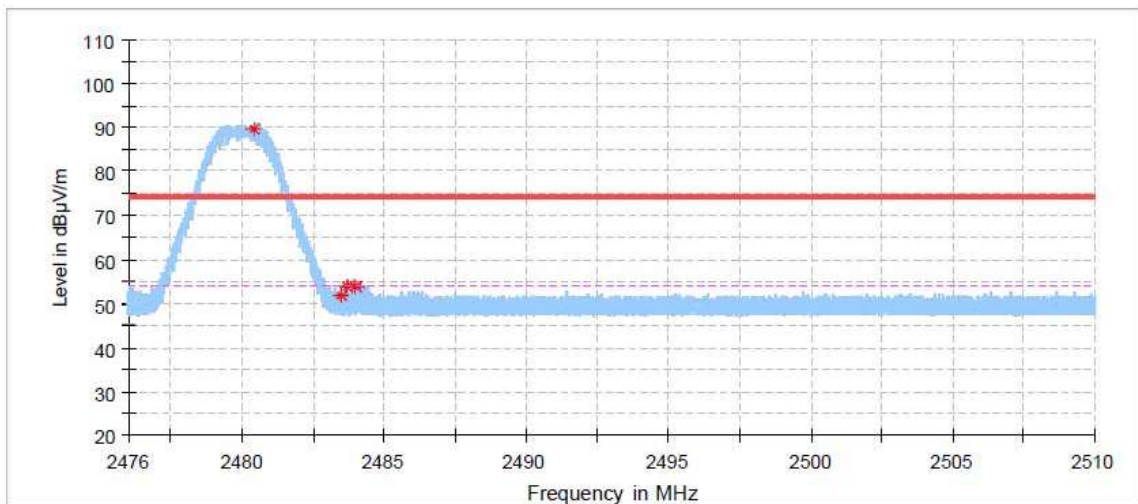
PLOT OF TEST DATA

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	WEINSCHL	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	RI	± 0.1	normal 1	1.000	0.1	1	0.1
Attenuation AMN-Receiver	LC	± 0.08	normal 2	2.000	0.04	1	0.04
AMN Voltage division factor	LAMN	± 0.8	normal 2	2.000	0.4	1	0.4
Sine wave voltage	dVSW	± 2.00	normal 2	2.000	1.00	1	1.00
Pulse amplitude response	dVPA	± 1.50	rectangular	1.732	0.87	1	0.87
Pulse repetition rate response	dVPR	± 1.50	rectangular	1.732	0.87	1	0.87
Noise floor proximity	dVNF	± 0.00	-	-	0.00	1	0.00
AMN Impedance	dZ	± 1.80	triangular	2.449	0.73	1	0.73
Ⓐ Mismatch	M	+ 0.70	U-Shaped	1.414	0.49	1	0.49
Ⓑ Mismatch	M	- 0.80	U-Shaped	1.414	- 0.56	1	- 0.56
Measurement System Repeatability	RS	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	RI	0.34	normal 1	1.00	0.34	1	0.34
Receiver reading	dVsw	± 0.02	normal 2	2.00	0.01	1	0.01
Sine wave voltage	dVpa	± 0.17	normal 2	2.00	0.09	1	0.09
Pulse amplitude response	dVpr	± 0.92	normal 2	2.00	0.46	1	0.46
Pulse repetition rate response	dVnf	± 0.35	normal 2	2.00	0.18	1	0.18
Noise floor proximity	AF	± 0.50	normal 2	2.00	0.25	1	0.25
Antenna Factor Calibration	CL	± 2.00	rectangular	$\sqrt{3}$	1.15	1	1.15
Cable Loss	AD	± 1.00	normal 2	2.00	0.50	1	0.50
Antenna Directivity	AH	± 0.00	rectangular	$\sqrt{3}$	0.00	1	0.00
Antenna Factor Height Dependence	AP	± 2.00	rectangular	$\sqrt{3}$	1.15	1	1.15
Antenna Phase Centre Variation	AI	± 0.20	rectangular	$\sqrt{3}$	0.12	1	0.12
Antenna Factor Frequency Interpolation	SI	± 0.25	rectangular	$\sqrt{3}$	0.14	1	0.14
Site Imperfections	DV	± 4.00	triangular	$\sqrt{6}$	1.63	1	1.63
Measurement Distance Variation	Dbal	± 0.60	rectangular	$\sqrt{3}$	0.35	1	0.35
Antenna Balance	DCross	± 0.90	rectangular	$\sqrt{3}$	0.52	1	0.52
Cross Polarisation	M	± 0.00	rectangular	$\sqrt{3}$	0.00	1	0.18
Mismatch	M	+ 0.98 - 1.11	U-Shaped	$\sqrt{2}$	0.74	1	0.74
EUT Volume Diameter	M	0.33	normal 1	1.00	0.33	1	0.11
Remark							
Combined Standard Uncertainty	Normal						
Expanded Uncertainty U	Normal ($k = 2$)						