

FCC/IC - TEST REPORT

Report Number : **68.850.15.005.01F** Date of Issue: May 8, 2015

Model : MBP854CONNECTPU

Product Type : Digital Video Baby Monitor (Parent Unit)

Applicant : Binatone Electronics International Limited

Address : Floor 23A, 9 Des Voeux Road West, Sheung Wan

Production Facility : Vtech (Dongguan) Telecommunication Limited

Address : VTech Science Park, Xia Ling Bei Management Zone, Liaobu,
Dongguan, Guangdong, China

Test Result : Positive Negative

Total pages including
Appendices : 39

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052,
P. R. China

Telephone: 86 755 8828 6998

Fax: 86 755 8828 5299

3 Description of the Equipment Under Test

Product:	Digital Video Baby Monitor (Parent Unit)
Model no.:	MBP854CONNECTPU
FCC ID:	VLJ-MBP854HDSPU
IC:	4522A-MBP854HDSPU
Options and accessories:	Adapter
Rating:	DC5V, 1500mA powered by AC/DC power adaptor OR DC 3.7V, 1880mAh (Li-ion package rechargeable battery)
RF Transmission Frequency:	2402MHz – 2479MHz
No. of Operated Channel:	23
Modulation:	GFSK
Antenna Type:	Integral
Antenna Gain:	1 dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Monitor of Wireless Monitoring System, which include of a FHSS Module

Channel list (MHz)				
CH 1 = 2402	CH 2 = 2404	CH 3 = 2406	CH 4 = 2408	CH 5 = 2410
CH 6 = 2415	CH 7 = 2420	CH 8 = 2425	CH 9 = 2430	CH 10 = 2435
CH 11 = 2440	CH 12 = 2445	CH 13 = 2450	CH 14 = 2455	CH 15 = 2460
CH 16 = 2465	CH 17 = 2467	CH 18 = 2469	CH 19 = 2471	CH 20 = 2473
CH 21 = 2475	CH 22 = 2477	CH 23 = 2479	---	---



4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2014 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 4 November 2014	General Requirements for the Certification of Radio Apparatus
RSS-247 Issue 1 May 2015	RSS-247 – Digital Transmission Systems (DTSs), Frequency Hopping systems (FHSs) and License-exempt Local Area Network (LE-LAN) Devices

All the test methods were according to Public Notice DA 00-705 -Frequency Hopper Spread Spectrum Test Procedure released by FCC on March 30, 2000 and C63.10 (2013).

5 Summary of Test Results

Technical Requirements					
FCC Part 15 Subpart C, RSS-Gen, RSS-247, RSS-102					
Test Condition			Pages	Test Site	Test Result
§15.207	RSS-Gen Section 8.8	Conducted emission AC power port	10	Site 1	Pass
§15.247(b)(1)	RSS-247 Section 5.4(2)	Conducted peak output power	13	Site 1	Pass
§15.247(a)(2)	RSS-247 Section 5.2(1)	6dB bandwidth	---	---	N/A
§15.247(a)(1)	RSS-247 Section 5.1(1)	20dB bandwidth	16	Site 1	Pass
§15.247(a)(1)	RSS-247 Section 5.1(2)	Carrier frequency separation	19	Site 1	Pass
§15.247(a)(1)(iii) R	SS-247 Section 5.1(4)	Number of hopping frequencies	22	Site 1	Pass
§15.247(a)(1)(iii) R	SS-247 Section 5.1(4)	Dwell Time	24	Site 1	Pass
§15.247(e)	RSS-247 Section 5.2(2)	Power spectral density*	---	---	N/A
§15.247(d)	RSS-247 Section 5.5	Spurious RF conducted emissions	27	Site 1	Pass
§15.247(d)	RSS-247 Section 5	Band edge	30	Site 1	Pass
§15.247(d) & §15.209 &	RSS-247 Section 5.5 & RSS-Gen 6.13	Spurious radiated emissions for transmitter	32	Site 1	Pass
§15.203	RSS-Gen 8.3	Antenna requirement	See note 1		Pass

Note 1: N/A=Not Applicable.

Note 2: The EUT uses a patch antenna, which gain is 0 dBi. In accordance to §15.203 and RSS-Gen 8.3 , It is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: VLJ-MBP854HDSPU, IC: 4522A-MBP854HDSPU complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules and RSS-247.

SUMMARY:

All tests according to the regulations cited on page 5 were

- Performed

- **Not** Performed

The Equipment Under Test

- **Fulfills** the general approval requirements.

- **Does not** fulfill the general approval requirements.

Sample Received Date: April 21, 2015

Testing Start Date: April 22, 2015

Testing End Date: May 7, 2015


TÜV SÜD HONG KONG LTD.

Prepared by:

Reviewed by:

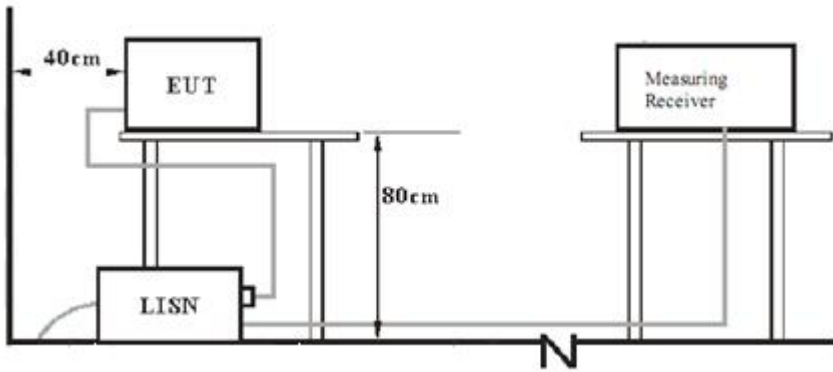

Ray Cheung
Project Engineer



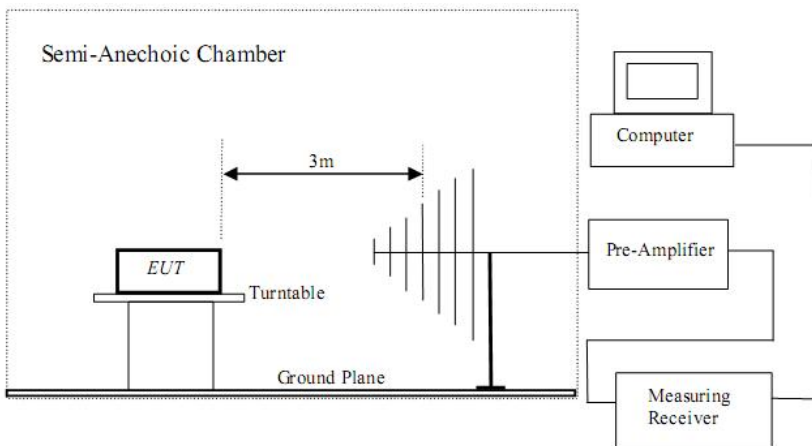

Nicolas Cheng
Project Manager

7 Test Setups

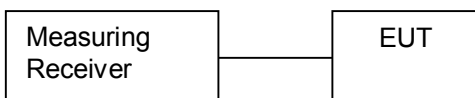
7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups



7.3 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Digital Video Baby Monitor	Vtech (DG) Telecommunications Ltd	MBP854CONNECTBU	---

The system was configured to hopping mode and non-hopping mode.

Hopping mode: typical working mode (normal hopping status)

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power

9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

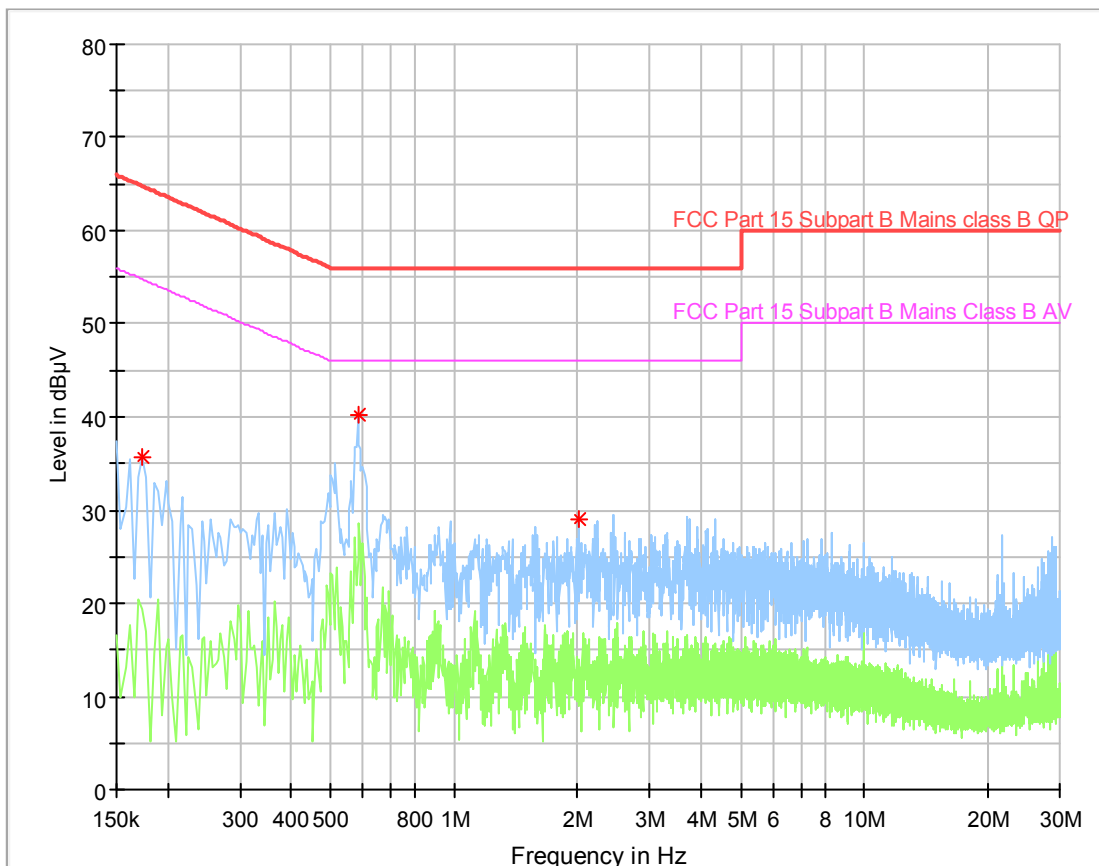
Frequency MHz	QP Limit dB μ V	AV Limit dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linearly with logarithm of the frequency

Conducted Emission

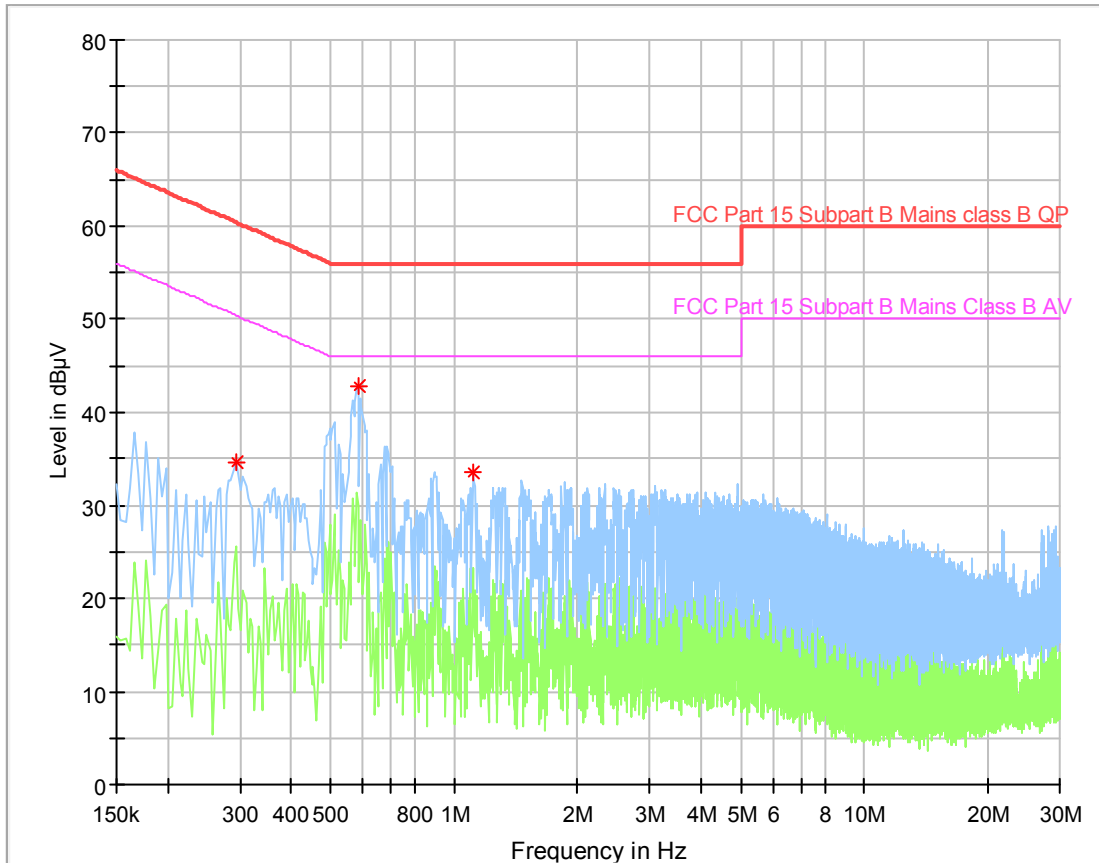
Product Type : Digital Video Baby Monitor
 M/N : MBP854CONNECTPU
 Operating Condition : Transmitting mode
 Test Specification : FCC part 15 Section 15.207 Class B
 RSS-GEN Issue 4 section 8.8
 Comment : ---

Phase L



Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.174000	35.74	64.77	29.03	L1	9.6
0.582000	40.18	56.00	15.82	L1	10.0
2.010000	29.02	56.00	26.98	L1	9.8

Phase N



Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.294000	34.66	60.41	25.75	N	10.1
0.582000	42.71	56.00	13.29	N	10.0
1.110000	33.55	56.00	22.45	N	9.8

9.2 Conducted peak output power

Test Method

1. Use the following spectrum analyzer settings:
Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
RBW > the 20 dB bandwidth of the emission being measured, VBW ≥ RBW,
Sweep = auto, Detector function = peak, Trace = max hold
2. Add a correction factor to the display.
3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power

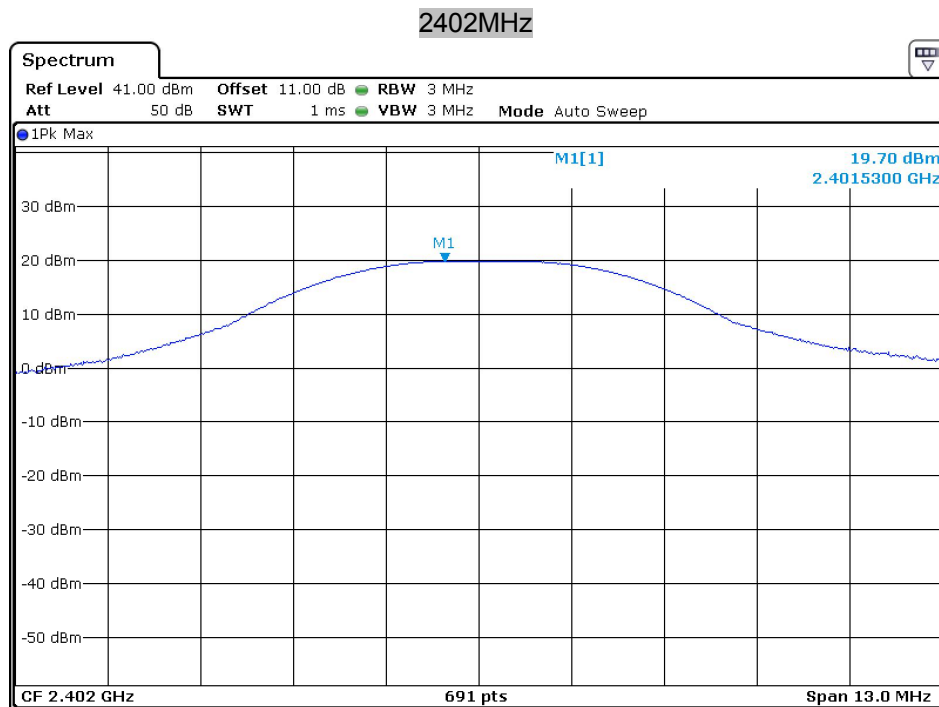
Limits

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤0.125	≤21

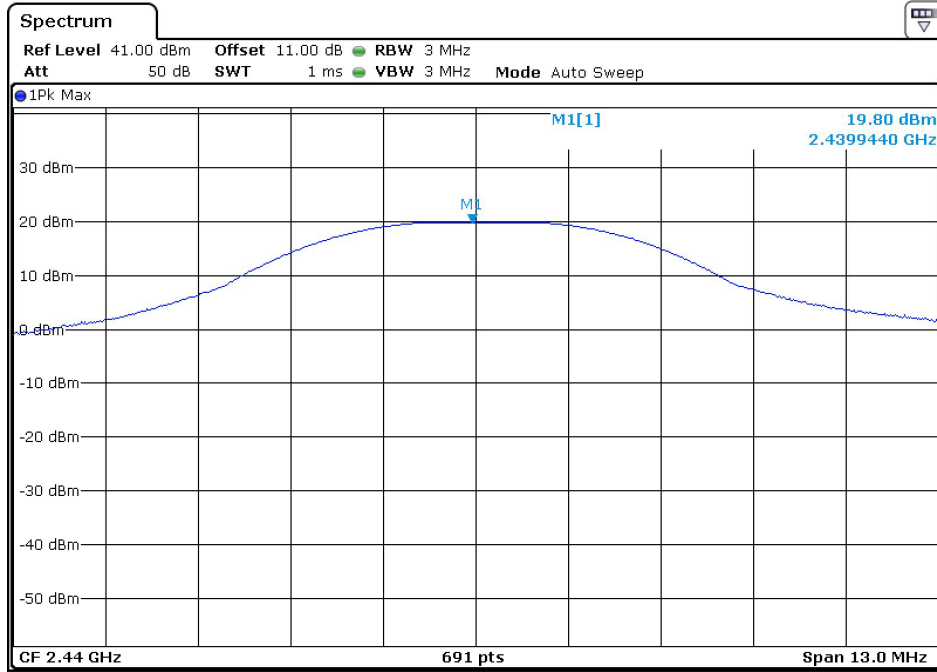
Conducted peak output power

Test Result

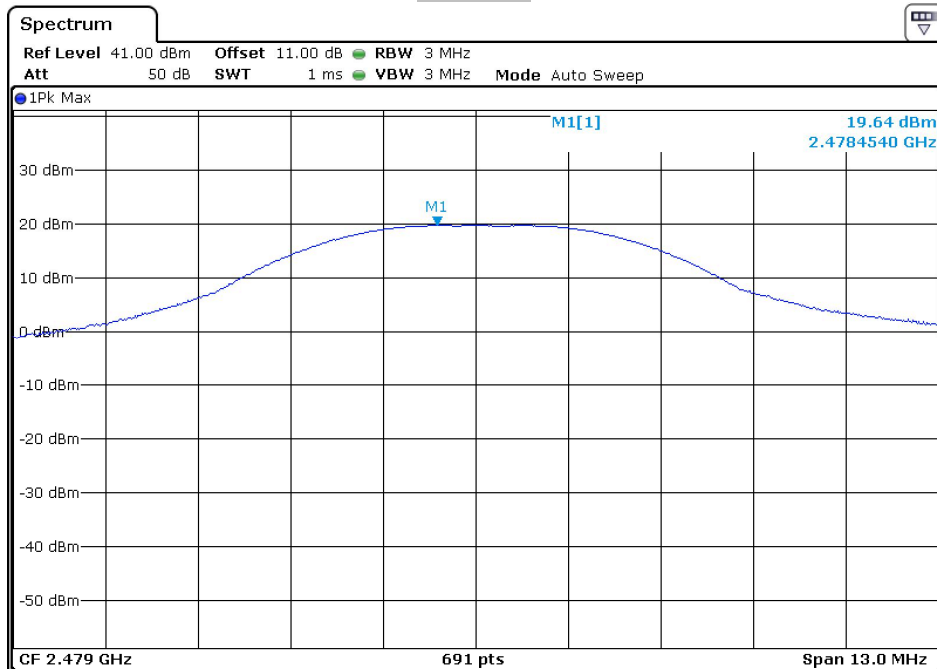
Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	19.70	Pass
Middle channel 2440MHz	19.80	Pass
High channel 2479MHz	19.28	Pass



2440MHz



2479MHz





9.3 20 dB bandwidth

Test Method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Limit

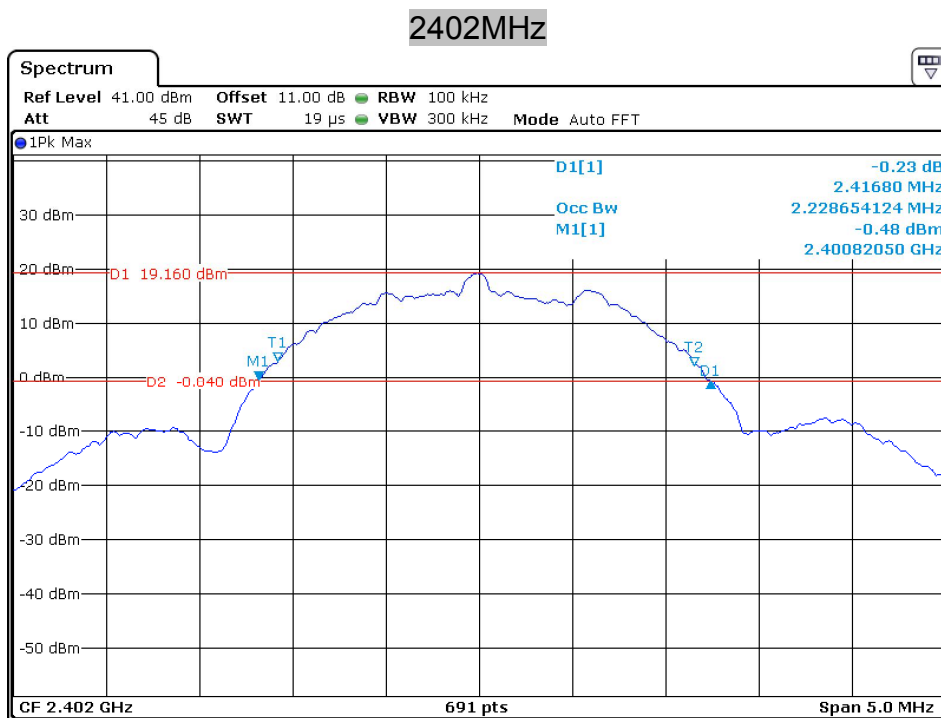
Limit [kHz]

N/A

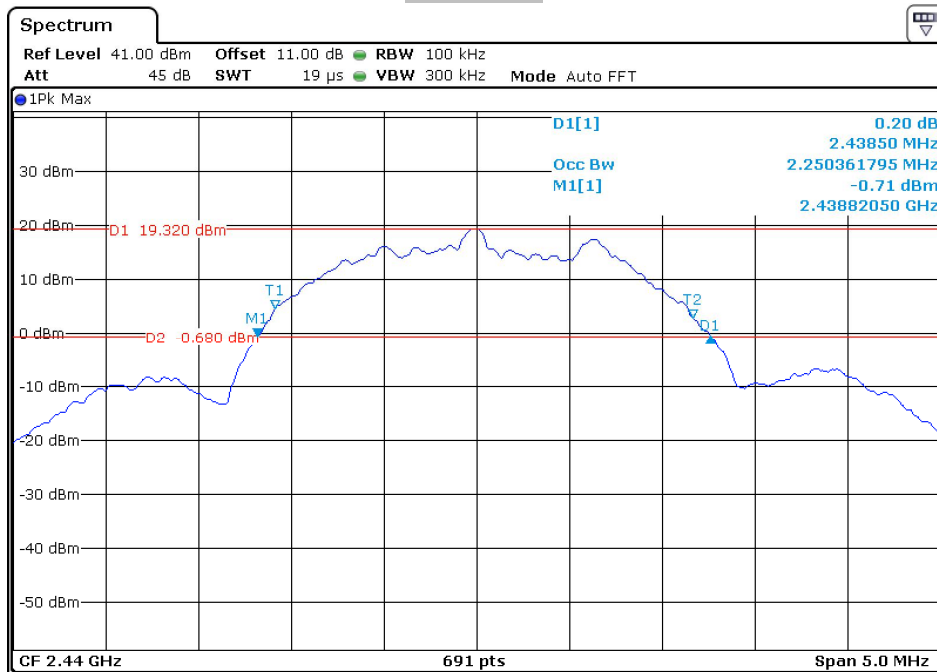
20 dB bandwidth

Bluetooth Mode GFSK Modulation test result

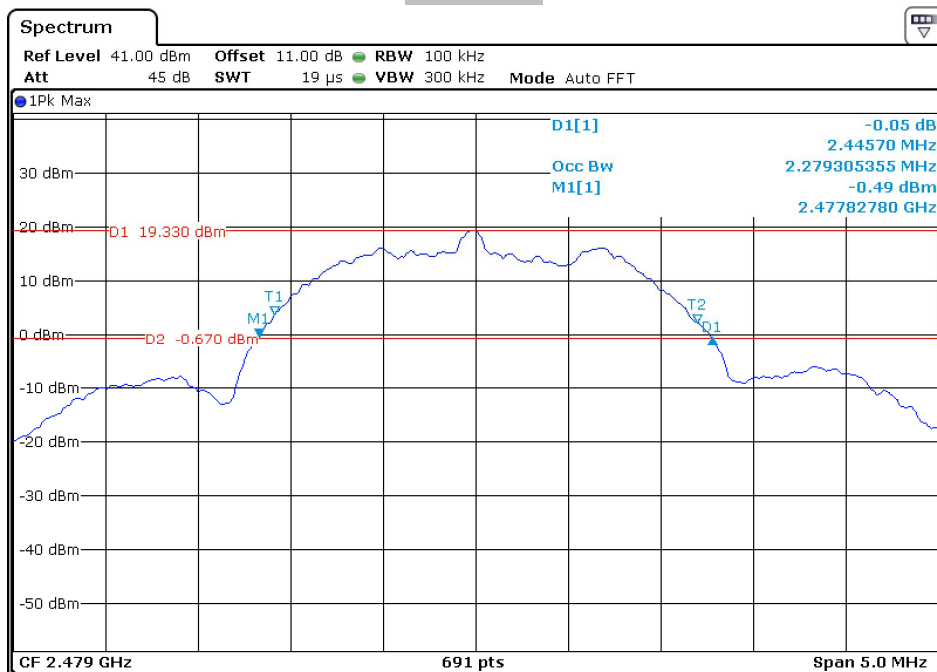
Frequency MHz	20 dB Bandwidth MHz	Result
2402	2.229	Pass
2440	2.250	Pass
2479	2.279	Pass



2440MHz



2479MHz



9.4 Carrier Frequency Separation

Test Method

1. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels, $RBW \geq 1\%$ of the span, $VBW \geq RBW$, Sweep = auto, Detector function = peak
2. By using the Max-Hold function record the separation of two adjacent channels.
3. Measure the frequency difference of these two adjacent channels by spectrum analyzer marker function.
4. Repeat above procedures until all frequencies measured were complete.

Limit

Limit
kHz

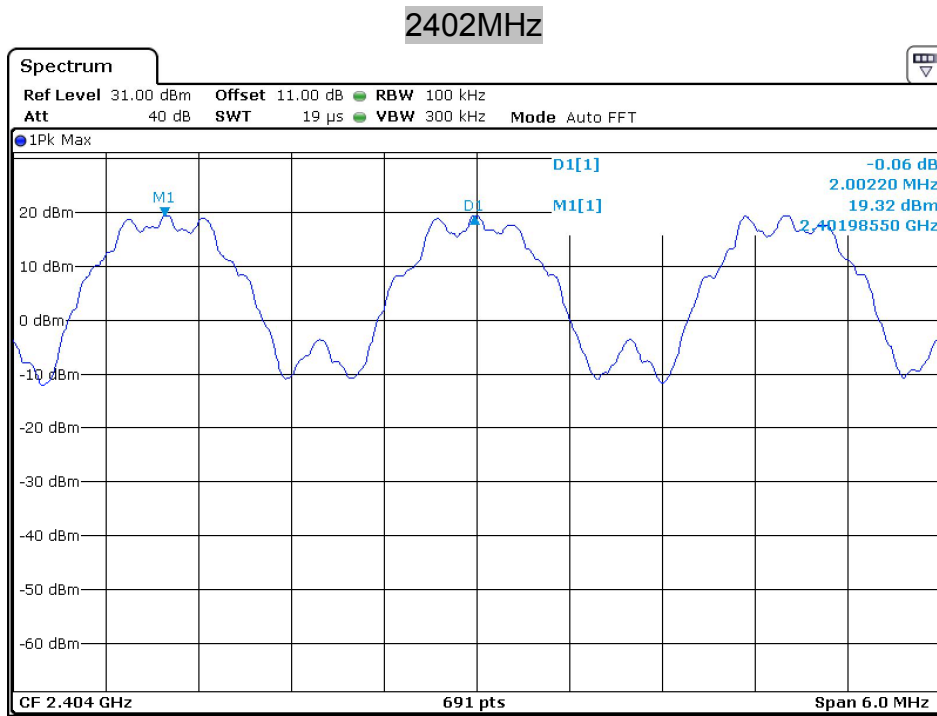
$\geq 25\text{kHz}$ or $2/3$ of the 20 dB bandwidth which is greater

Carrier Frequency Separation

Test result: The measurement was performed with the typical configuration (normal hopping status), here GFSK modulation mode was used to show compliance.

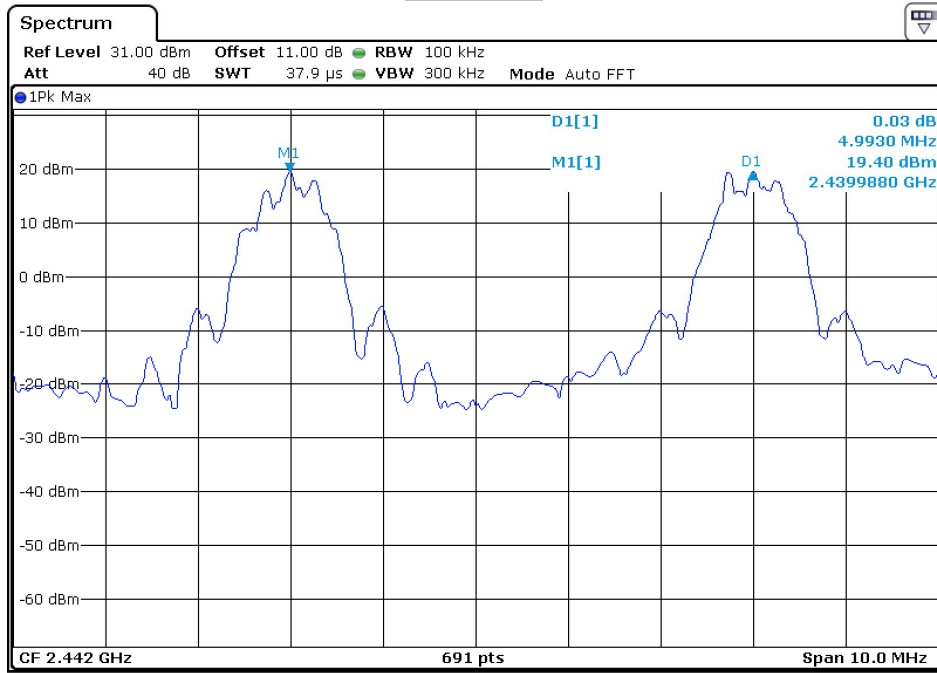
GFSK Modulation test result

Frequency MHz	Carrier Frequency Separation MHz	Result
2402	2.00	Pass
2440	4.99	Pass
2479	2.00	Pass

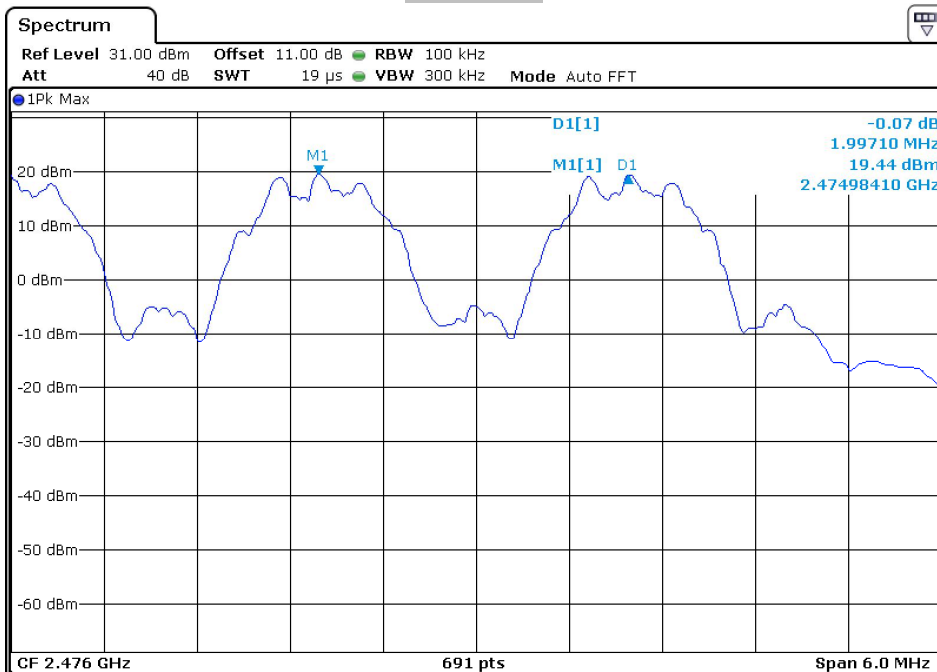




2440MHz



2479MHz



9.5 Number of hopping frequencies

Test Method

1. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels, $RBW \geq 1\%$ of the span, $VBW \geq RBW$, Sweep = auto, Detector function = peak
2. Set the spectrum analyzer on Max-Hold Mode, and then keep the EUT in hopping mode.
3. Record all the signals from each channel until each one has been recorded.
4. Repeat above procedures until all frequencies measured were complete.

Limit

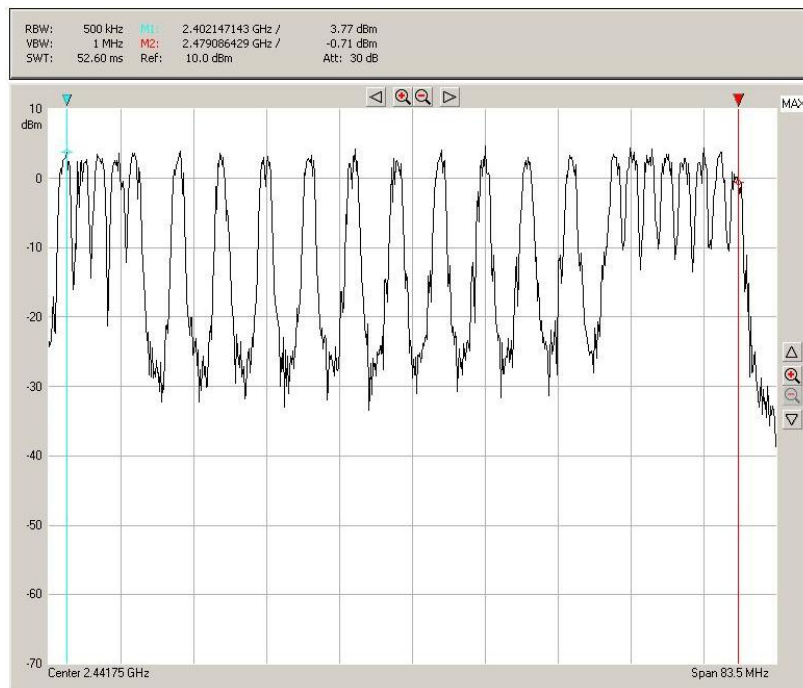
Limit
number

≥ 15

Number of hopping frequencies

Test result: The measurement was performed with the typical configuration (normal hopping status , here GFSK modulation mode was used to show compliance.

Number of hopping frequencies	Result
23	Pass



9.6 Dwell Time

Test Method

1. Connect EUT antenna terminal to the spectrum analyzer with a low loss cable.
Equipment mode: Spectrum analyzer
2. RBW: 1MHz; VBW: 1MHz; SPAN: Zero Span
3. Adjust the center frequency of spectrum analyzer on any frequency be measured.
4. Measure the Dwell Time by spectrum analyzer Marker function.
5. Repeat above procedures until all frequencies measured were complete.

Limit

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Dwell Time

Dwell time

Each transmission only 23 channels will be used.

Observe time = 23 channels × 0.4s = 9.2s

There are 36 pulses within 500ms

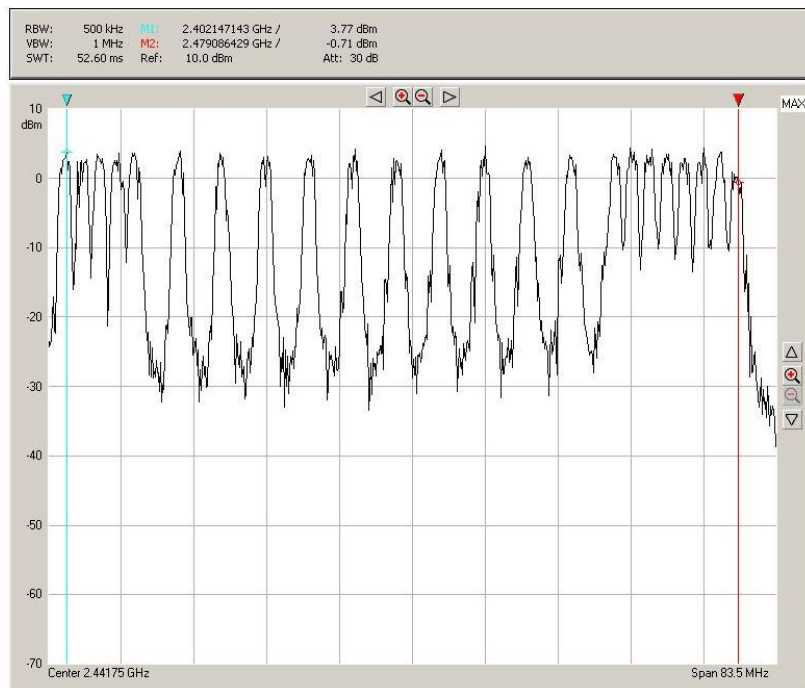
And one set of pulses = 159.42us

Therefore, the average channel occupancy times (ms)

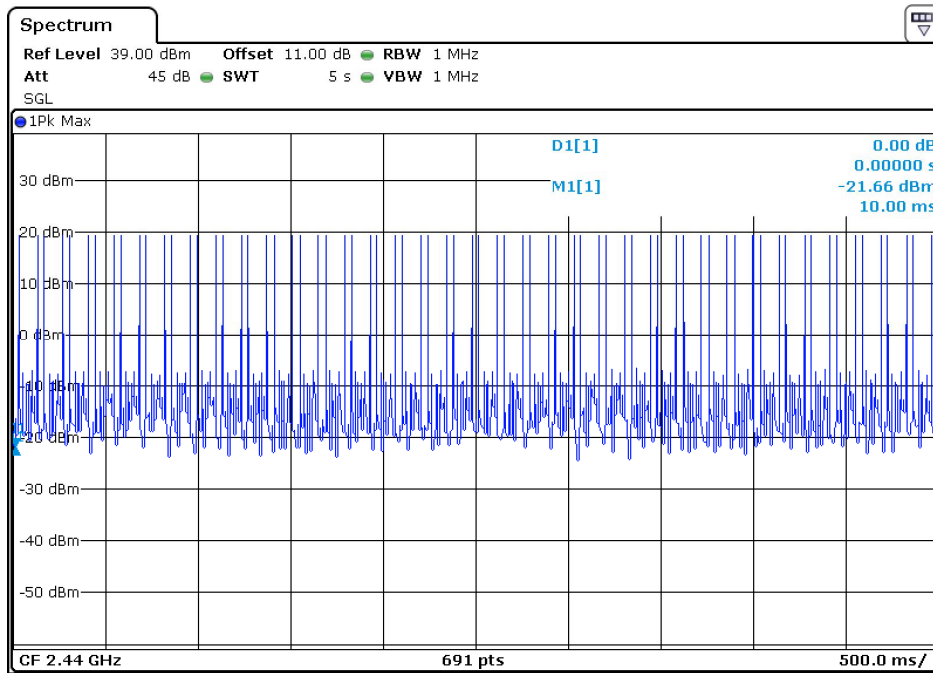
$$= 159.42\mu\text{s} \times 36 \times 9.2\text{s} / 500\text{ms}$$

So, total transmitting time is 0.106s. (<0.4s).

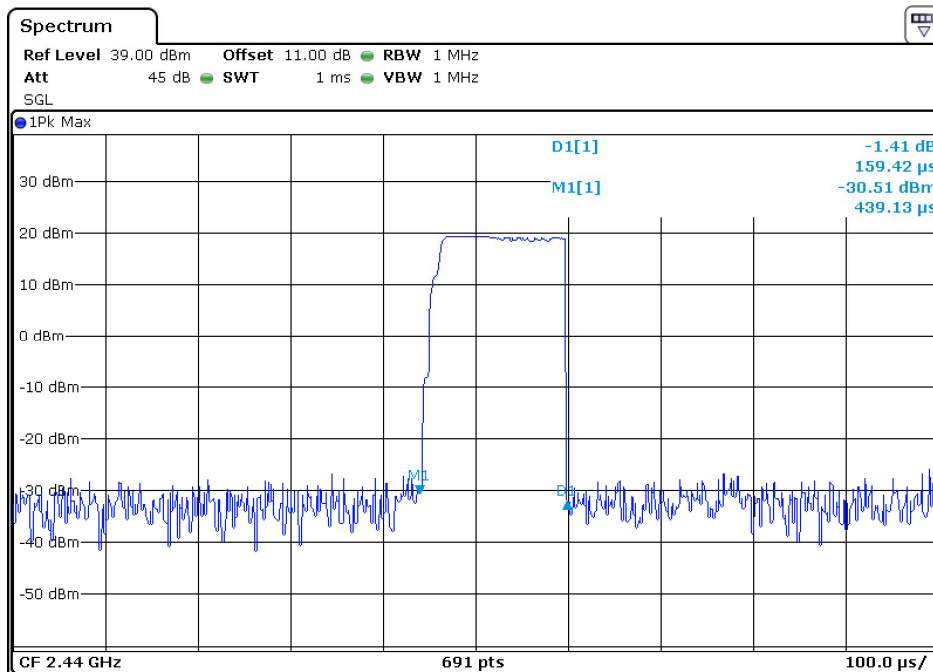
Result data graph shows total 23 channels are used.



Result data graph shows total 4 pulses with 500ms.



Result data graph zooms into detail, one pulse period is 159.42us.



9.7 Spurious RF conducted emissions

Test Method

1. Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
RBW = 100 kHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
3. The level displayed must comply with the limit specified in this Section. Submit these plots.
4. Repeat above procedures until all frequencies measured were complete.

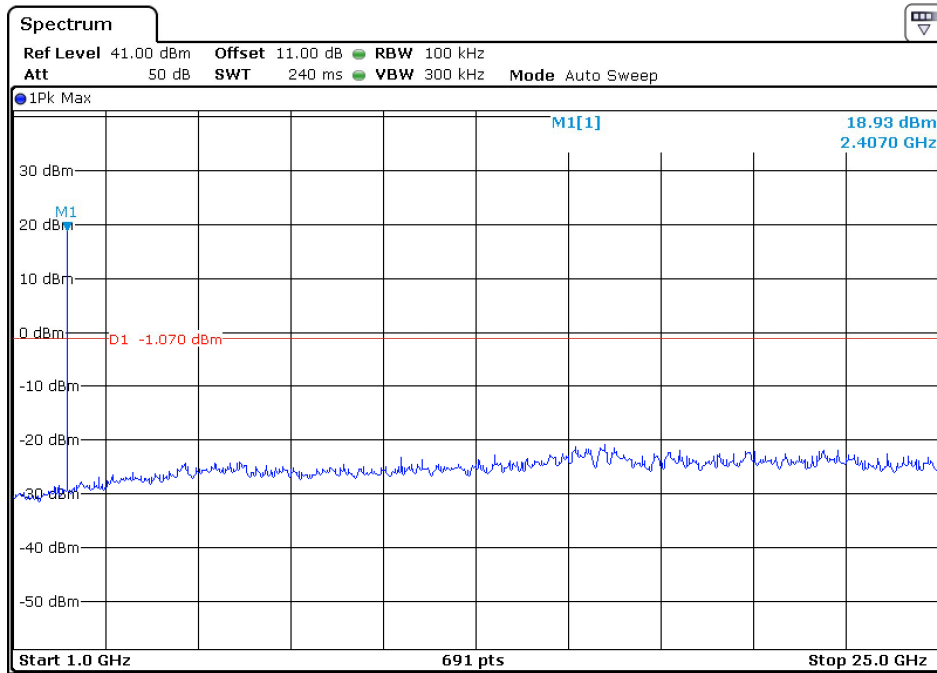
Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

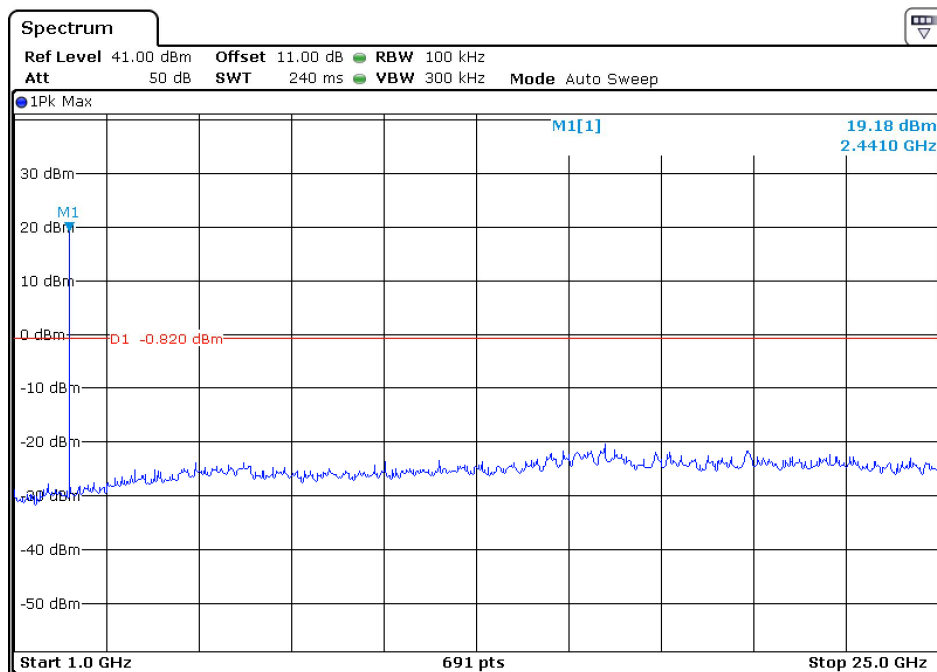
Spurious RF conducted emissions

Only the worse case (which is subject to the maximum EIRP, GFSK mode) test result is listed in the report.

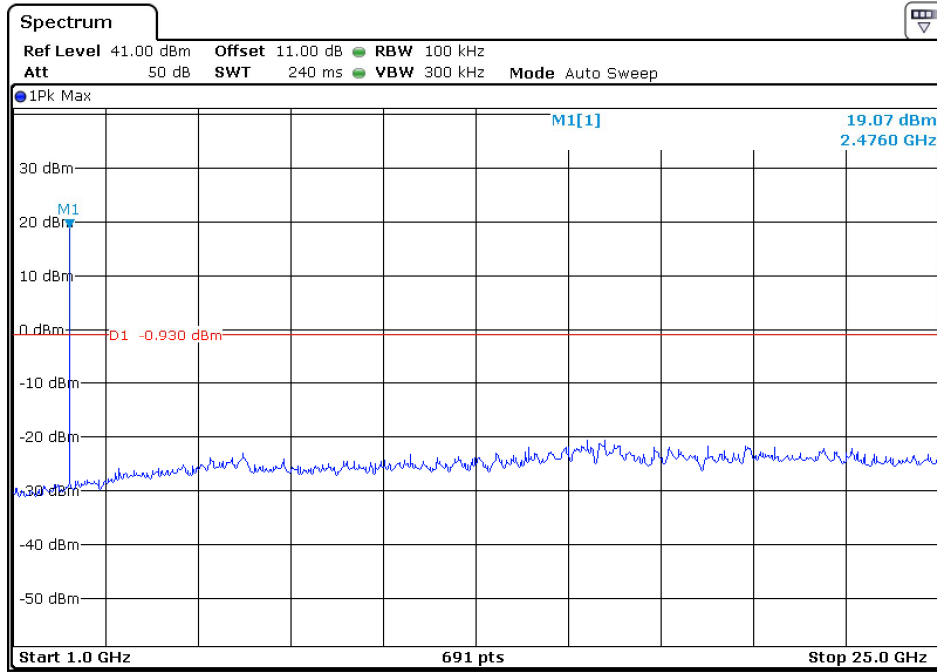
2402MHz



2440MHz



2479MHz



9.8 Band edge testing

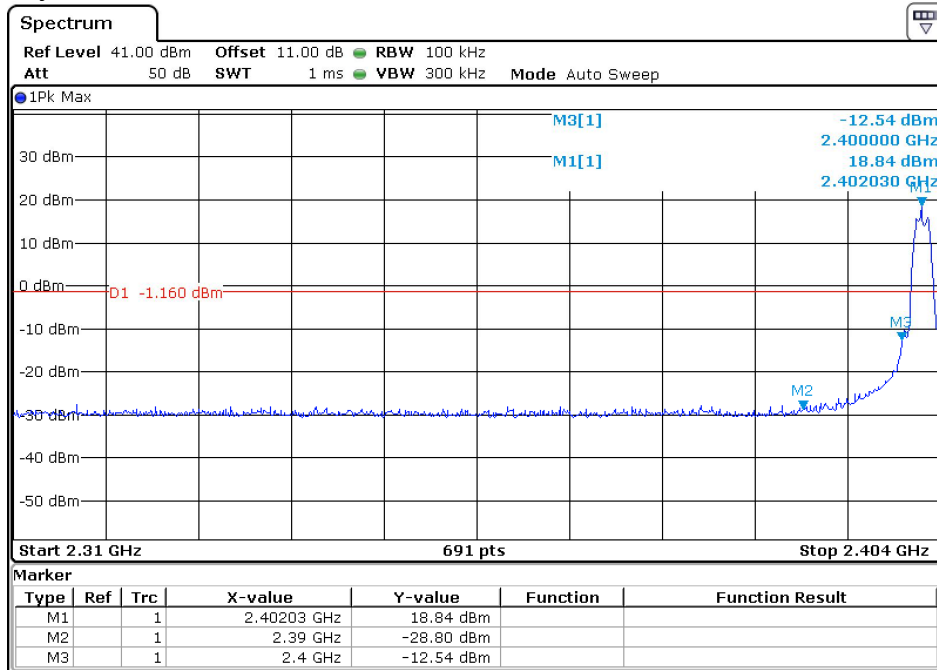
Test Method

- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section. .
- 4 Repeat the test at the hopping off and hopping on mode, submit all the plots.

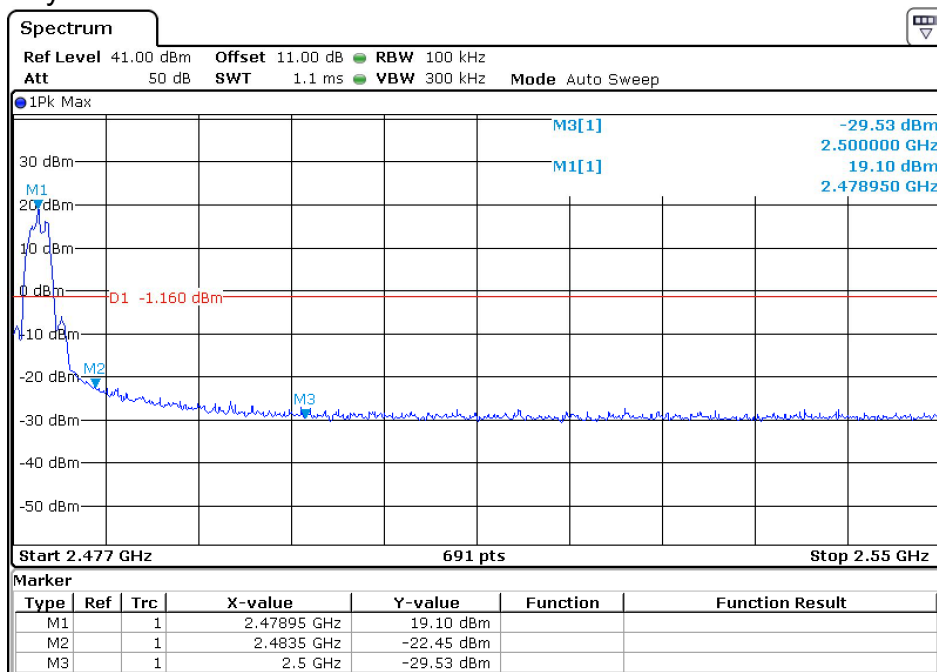
Band edge testing

Test Result:

Lowest Frequency:



Highest Frequency:



9.9 Spurious radiated emissions for transmitter

Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for $f \geq 1\text{GHz}$, 100 kHz for $f < 1\text{GHz}$, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Follow the guidelines in ANSI C63.4-2009 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc.
The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from $20\log(\text{duty cycle}/100\text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Limit

The radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section 15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dB μ V/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

The only worse case (which is subject to the maximum EIRP, GFSK mode) test result is listed in the report.

Transmitting spurious emission test result as below:

Remark:

- (1) AV Emission Level= PK Emission Level+20log(dutycycle)
- (2) Data of measurement within this frequency range shown “-” in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (3) “*” means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

Frequency (Vertical – 30MHz to 3GHz)

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
35.941250	24.61	40.00	15.39	100.0	V	0.0	13.1
120.998125	23.83	43.50	19.67	100.0	V	0.0	12.0
194.354375	25.67	43.50	17.83	100.0	V	351.0	13.0
300.023750	34.56	46.00	11.44	100.0	V	26.0	15.6
600.117500	41.96	46.00	4.04	100.0	V	328.0	21.7

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
2418.000000	68.43	36.12	74.00	5.57	100.0	V	342.0
2440.000000	104.51	---	74.00	-30.51	100.0	V	53.0
2484.500000	68.88	35.87	74.00	5.12	100.0	V	260.0

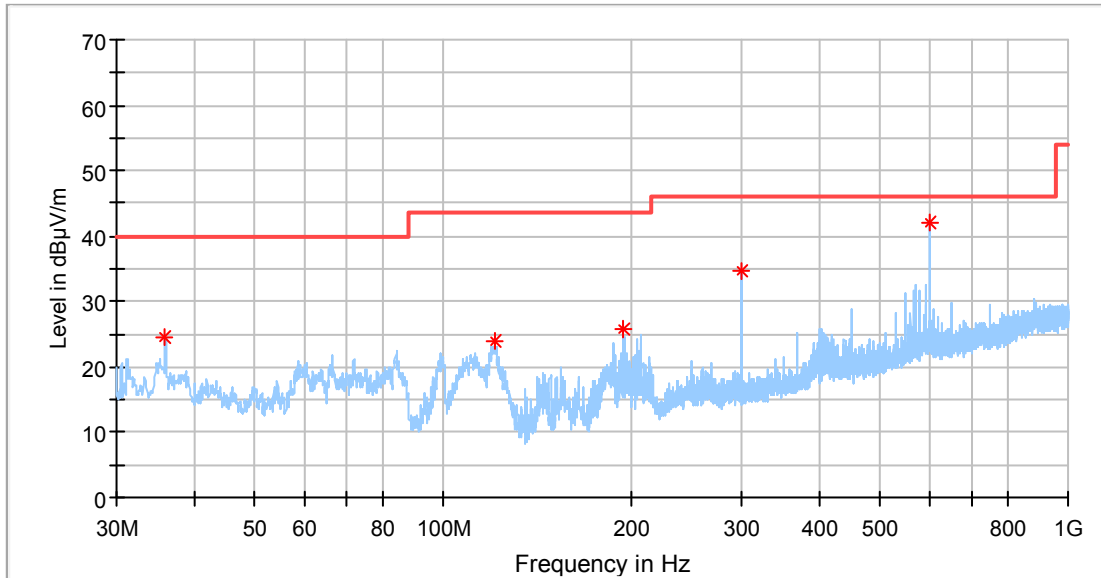
Frequency (Horizontal – 30MHz to 3GHz)

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
111.176875	25.75	43.50	17.75	100.0	H	234.0	13.5
202.599375	28.73	43.50	14.77	100.0	H	99.0	13.4
300.084375	44.08	46.00	1.92	100.0	H	332.0	15.6
600.117500	32.77	46.00	13.23	100.0	H	234.0	21.7
750.164375	35.46	46.00	10.54	100.0	H	10.0	23.4

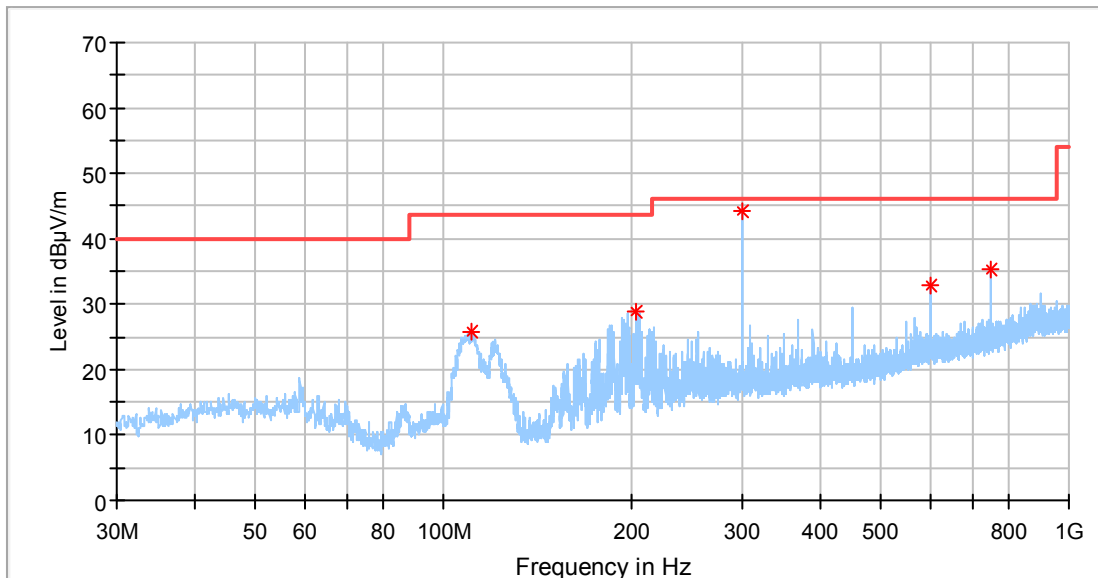
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
2407.500000	62.97	32.61	74.00	11.03	100.0	H	134.0
2440.000000	104.51	---	74.00	-30.51	100.0	H	142.0
2473.000000	64.25	33.75	74.00	9.75	100.0	H	8.0

Spurious radiated emissions for transmitter

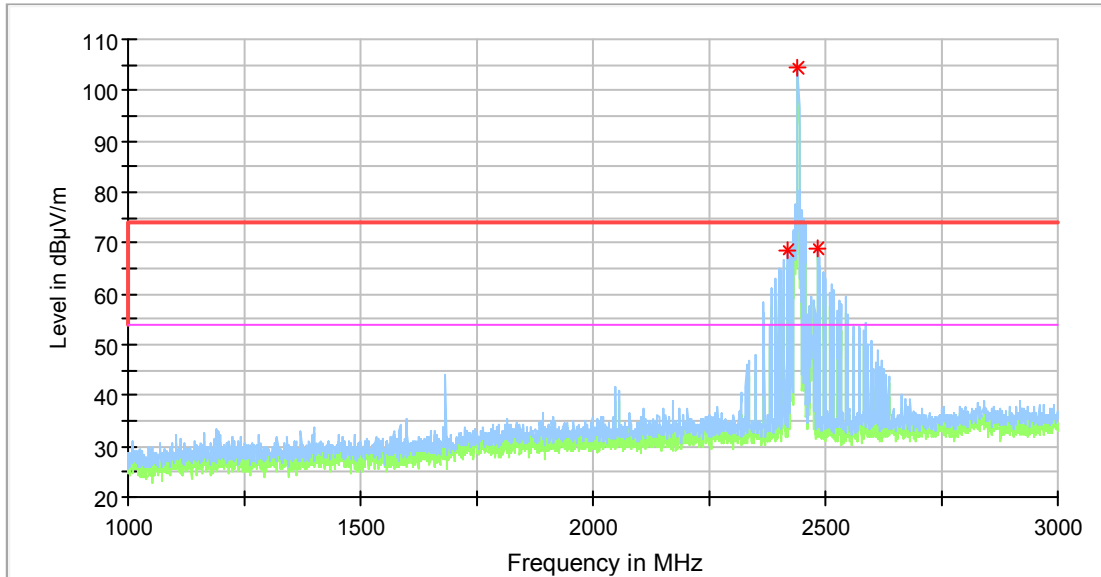
Radiated emission data graph (Vertical polarization, 30MHz-1GHz)



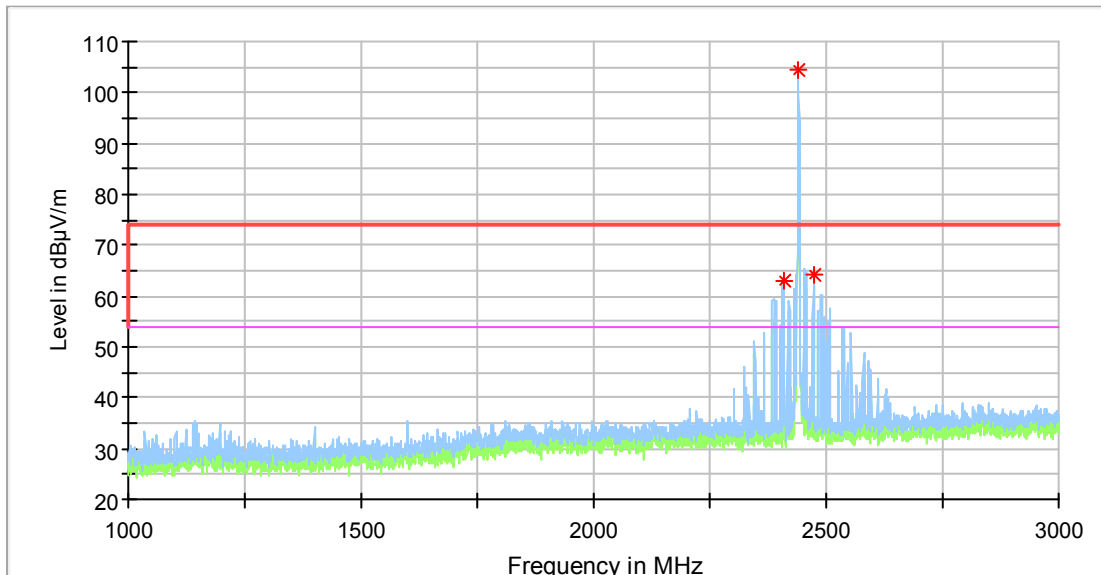
Radiated emission data graph (Horizontal polarization, 30MHz-1GHz)



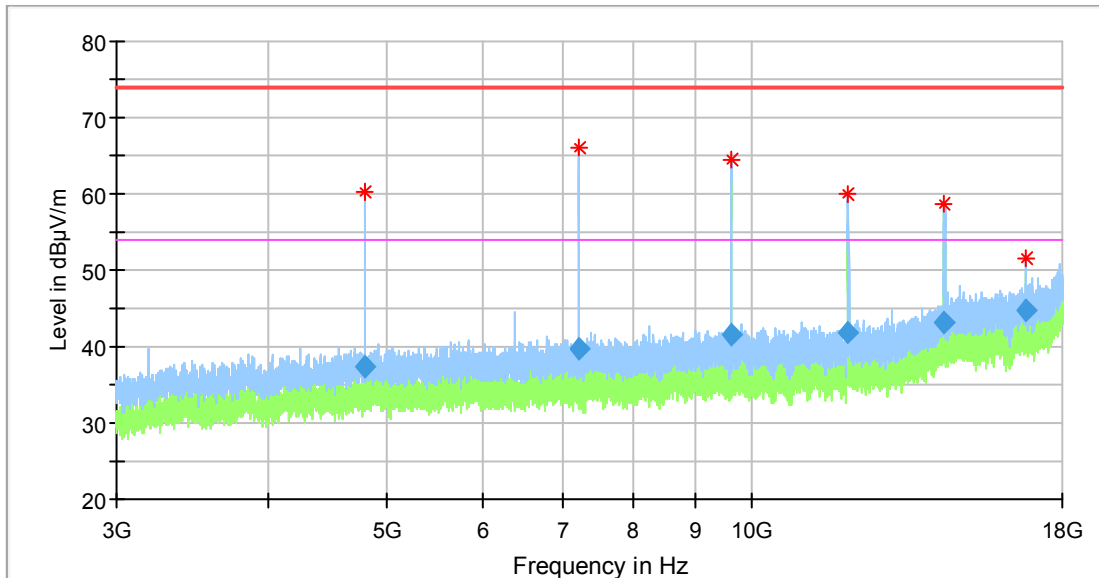
Radiated emission data graph (Vertical polarization, 1GHz-3GHz)



Radiated emission data graph (Horizontal polarization, 1GHz-3GHz)



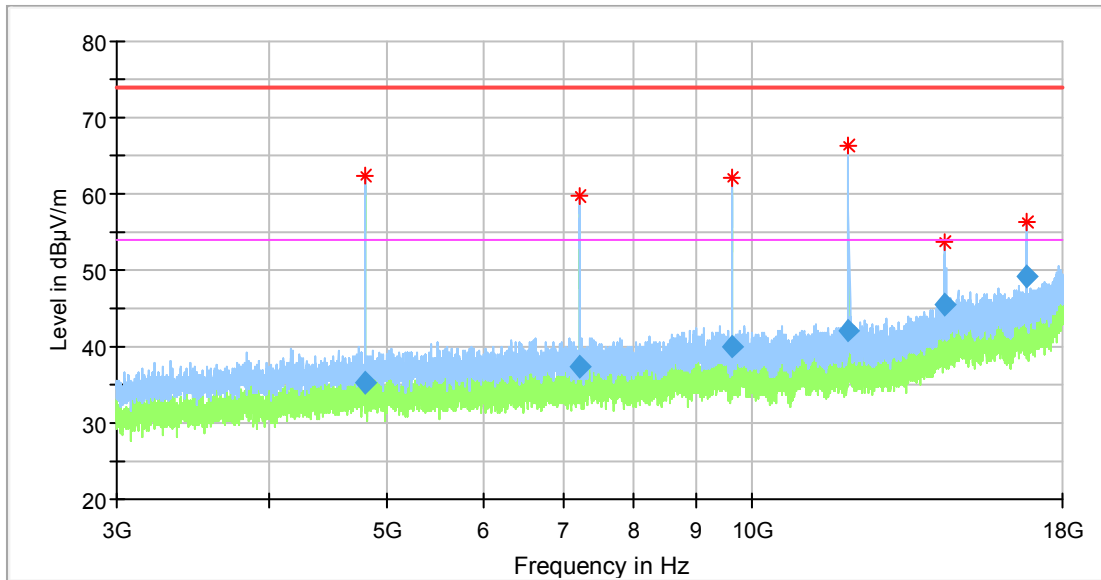
Radiated emission data graph (Vertical polarization, 3GHz-18GHz)



Remark: Only background noise was measured from 18GHz-26GHz.

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	PoI	Azimuth (deg)
4805.000000	60.33	37.25	74.00	13.67	100.0	V	0.0
7207.500000	65.97	39.75	74.00	8.03	100.0	V	0.0
9608.125000	64.46	41.70	74.00	9.54	100.0	V	0.0
12013.125000	60.06	41.90	74.00	13.94	100.0	V	136.0
14412.500000	58.64	43.20	74.00	15.36	100.0	V	0.0
16815.000000	51.71	44.63	74.00	22.29	100.0	V	0.0

Radiated emission data graph (Horizontal polarization, 3GHz-18GHz)



Remark: Only background noise was measured from 18GHz-26GHz.

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
4803.125000	62.40	35.28	74.00	11.60	100.0	H	0.0
7206.250000	59.84	37.35	74.00	14.16	100.0	H	150.0
9608.750000	62.10	39.93	74.00	11.90	100.0	H	35.0
12010.000000	66.39	42.22	74.00	7.61	100.0	H	50.0
14413.125000	53.66	45.63	74.00	20.34	100.0	H	0.0
16811.250000	56.44	49.15	74.00	17.56	100.0	H	50.0

10 Test Equipment List

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
CE	EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2015-8-17
	LISN	Rohde & Schwarz	ENV4200	100249	2015-8-17
	LISN	Rohde & Schwarz	ENV216	100326	2015-8-17
	ISN	Rohde & Schwarz	ENY81	100177	2015-8-17
	ISN	Rohde & Schwarz	ENY81-CAT6	101664	2015-8-17
	High Voltage Probe	Rohde & Schwarz	TK9420(VT9420)	9420-58	2015-8-17
	RF Current probe	Rohde & Schwarz	EZ-17	100816	2015-8-17
C	Signal Generator	Rohde & Schwarz	SMB100A	108272	2015-8-17
	Signal Analyzer	Rohde & Schwarz	FSV40	101030	2015-8-17
	Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	2015-8-17
	RF Switch Module	Rohde & Schwarz	OSP120/OS P-B157	101226/100851	2015-8-17
RE	EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2015-8-17
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2017-8-17
	Horn Antenna	Rohde & Schwarz	HF907	102294	2017-8-17
	Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2015-8-17
	3m Semi-anechoic chamber	TDK	9X6X6	----	2019-5-29

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth
- 20dB bandwidth and 99% Occupied Bandwidth
- Carrier frequency separation
- Number of hopping frequencies
- Dwell Time
- Power spectral density*
- Spurious RF conducted emissions
- Band edge

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.83dB; Vertical: 4.91dB;
Uncertainty for Radiated Emission in 3m chamber 1000MHz-18000MHz	Horizontal: 4.89dB; Vertical: 4.88dB;
Uncertainty for Conducted Emission 9kHz-150KHz	3.88dB