



RF TEST REPORT

Report No.: SET2015-04054

Product Name: Bluetooth Low Energy Module

FCC ID: ZLZTDBTFE

Model No. : Panlink

Applicant: Shenzhen Mindray Bio-Medical Electronics Co.,Ltd.

Address: Mindray Buiding,Keji 12th Road South,High-tech Industrial
Park,Nanshan,Shenzhen,P.R.China

Dates of Testing: 03/20/2015 — 03/30/2015

Issued by: CCIC-SET

Lab Location: Electronic Testing Building, Shahe Road, Xili, Nanshan
District, Shenzhen, 518055, P. R. China

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Test Report

Product Name : Bluetooth Low Energy Module

Brand Name : Mindray

Trade Name : **mindray** 迈瑞

Applicant : Shenzhen Mindray Bio-Medical Electronics Co.,Ltd.


Applicant Address : Mindray Buiding,Keji 12th Road South,High-tech Industrial
Park,Nanshan,Shenzhen,P.R.China


Manufacturer : Shenzhen Mindray Bio-Medical Electronics Co.,Ltd.

Manufacturer Address : Mindray Buiding,Keji 12th Road South,High-tech Industrial
Park,Nanshan,Shenzhen,P.R.China

Test Standards : 47 CFR Part 15 Subpart C: Radio Frequency Devices
ANSI C63.10-2009 : American National Standard for
Testing Unlicensed Wireless Devices
KDB558074 D01 DTS Meas Guidance v03r02

Test Result : PASS

Tested by : 
2015.03.30
Haigang He, Test Engineer

Reviewed by : 
2015.03.30
Zhu Qi, Senior EGINEER


Approved by : 
2015.03.30
Wu Li'an, Manager



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Change History		
Issue	Date	Reason for change
1.0	2015-03-30	First edition

1. General Information

1.1. EUT Description

EUT Type	Bluetooth Low Energy Module	
Hardware Version	01-01-/	
Software Version	1.0	
EUT supports Radios application	Bluetooth V4.0 BLE	
Frequency Range	Bluetooth BLE 4.0	2402MHz~2480MHz
Channel Number	Bluetooth BLE 4.0	40
Bit Rate of Transmitter	Bluetooth BLE 4.0	1Mbps
Modulation Type	Bluetooth BLE 4.0	GFSK
Antenna Type	Tape Antenna(short) Tape Antenna(long)	
Antenna Gain	Tape Antenna(short): 1dBi Tape Antenna(long): 2dBi	

Note 1: The EUT is Bluetooth Low Energy Module, it contain Bluetooth 4.0 BLE Module operating at 2.4GHz ISM band; the frequencies allocated for the Bluetooth 4.0 BLE is $F(\text{MHz})=2402+2*n$ ($0 \leq n \leq 39$). The lowest, middle, highest channel numbers of the Bluetooth Module used and tested in this report are separately 0 (2402MHz), 20(2442MHz) and 39 (2480MHz).

Note 2: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

Note 3: The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.”

1.2. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (Bluetooth, 2.4GHz ISM band radiators) for the EUT FCC Certification:

No.	Identity	Document Title
1	47 CFR Part 15 Subpart C 2013	Radio Frequency Devices
2	ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section in CFR 47	Description	Result
1	15.203	Antenna Requirement	PASS
2	15.247(b)	Peak Output Power	PASS
3	15.247(a)	Bandwidth	PASS
4	15.247(d)	Conducted Band Edges and Spurious Emission	PASS
5	15.247(e)	Power spectral density (PSD)	PASS
6	15.207	Conducted Emission	PASS
7	15.209 15.247(d)	Radiated Band Edges and Spurious Emission	PASS
8	1.1307(b)	RF exposure evaluation	PASS

The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10-2009.

These RF tests were performed according to the method of measurements prescribed in KDB558074 D01 V03r02 (04/09/2013).

1.3. Facilities and Accreditations

1.3.1. Facilities

CNAS-Lab Code: L1659

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. CCIC is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659. A 12.8*6.8*6.4 (m) fully anechoic chamber was used for the radiated spurious emissions test.

FCC-Registration No.: 406086

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 406086, valid time is until October 28, 2017.

IC-Registration No.: 11185A-1

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A-1 on July. 15, 2013, valid time is until July. 15, 2016.

1.3.2. Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15°C - 35°C
Relative Humidity (%):	30% -60%
Atmospheric Pressure (kPa):	86KPa-106KPa

2. 47 CFR Part 15C Requirements

2.1. Antenna requirement

2.1.1. Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

And according to FCC 47 CFR Section 15.247(c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

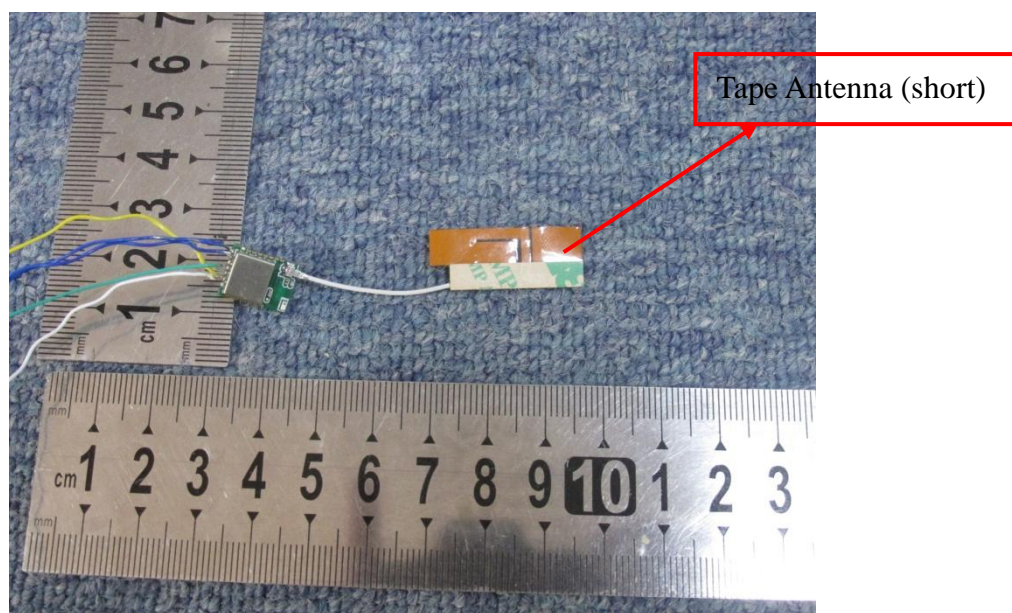
2.1.2. Antenna Information

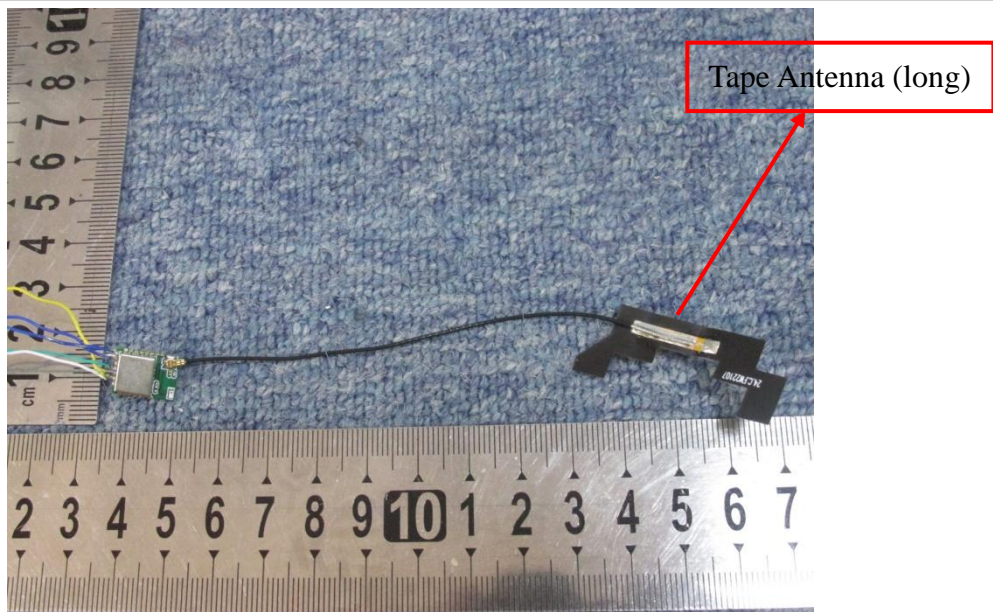
Antenna Category: External antenna

This device uses a unique antenna coupling to the device, which is designed by the responsible party based on the fillings you submitted.

Antenna General Information:

No.	EUT Model	Ant. Cat.	Ant. Type	Gain(dBi)
1	Bluetooth Low Energy Module	External	Tape (short)	1
1	Bluetooth Low Energy Module	External	Tape (long)	2





2.1.3. Result: comply

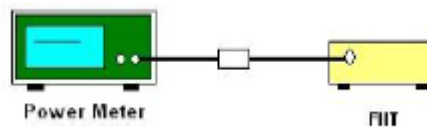
The module contain a unique antenna connector, and be marketed and operated only with specific antenna(s).

2.2. Peak Output Power

2.2.1. Limit of Peak Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

2.2.2. Test Setup



2.2.3. Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v03r02.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

2.2.4. Test Result

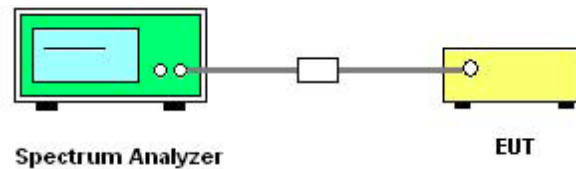
Channel	Frequency (MHz)	RF Power(dBm)	Limit (dBm)	Verdict
		GFSK/1Mbps		
0	2402	0.35	30	PASS
20	2442	-0.51		PASS
39	2480	-1.69		PASS

2.3. 6dB & 99%Bandwidth

2.3.1. Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

2.3.2. Test Setup

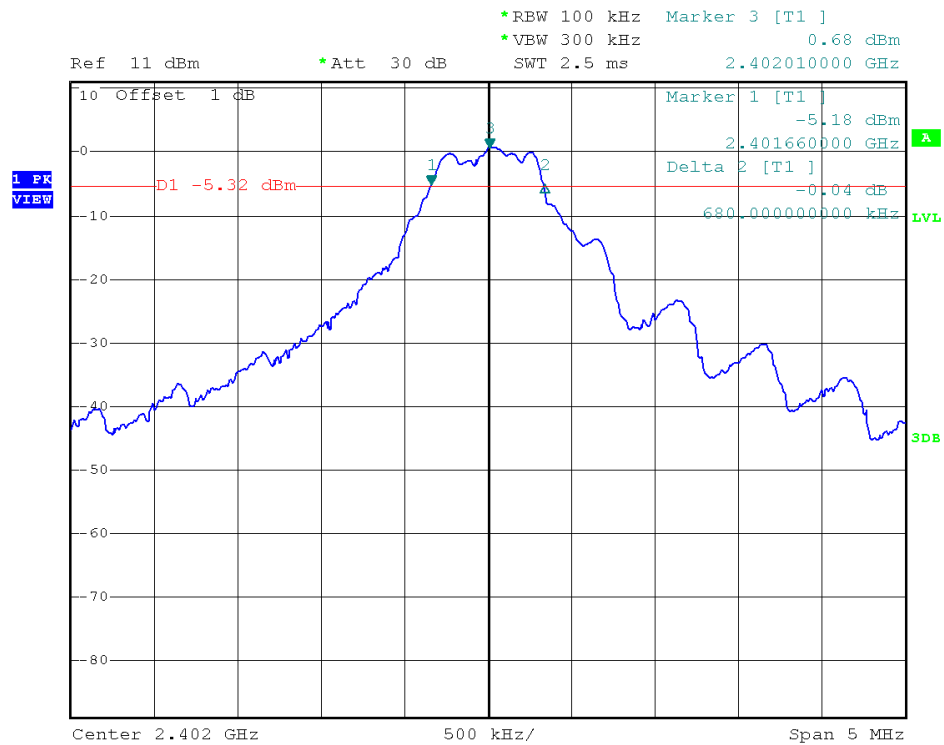
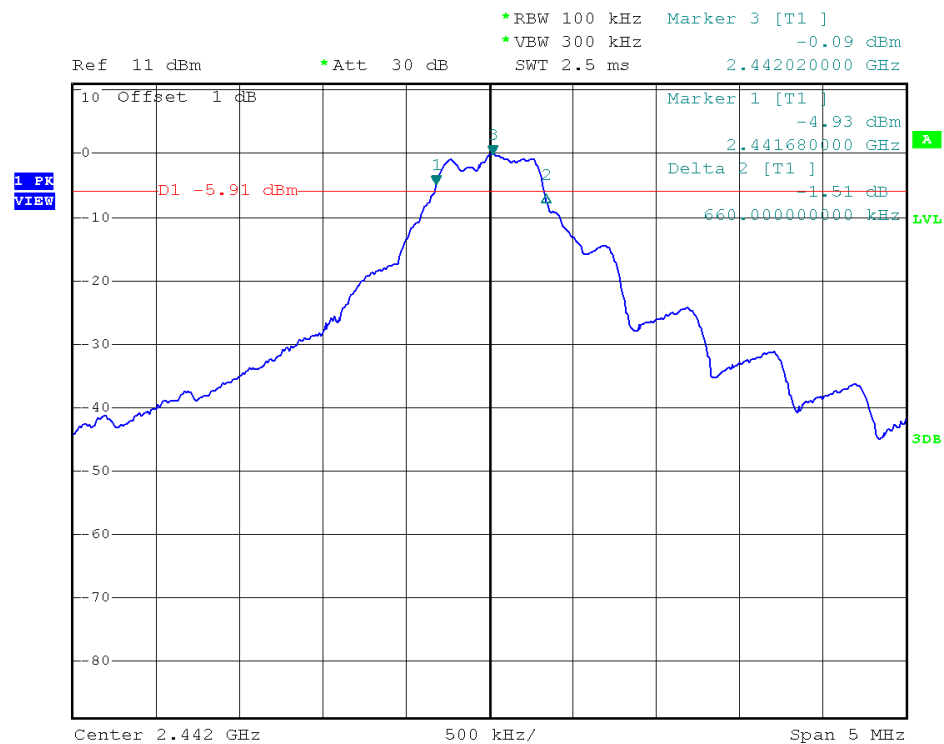


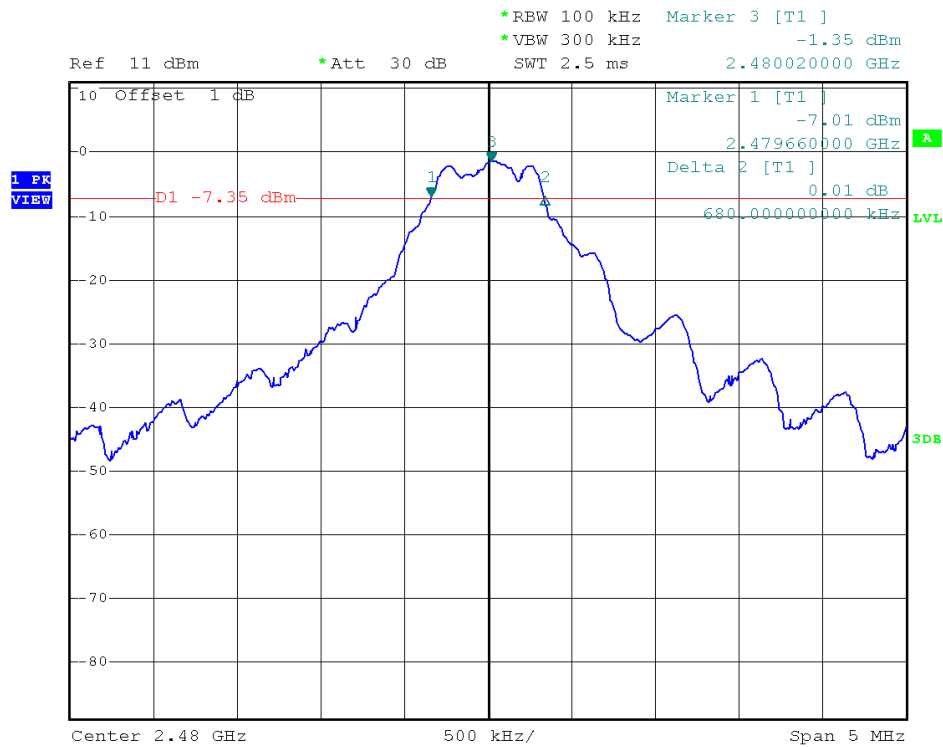
2.3.3. Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 30kHz and set the Video bandwidth (VBW) = 100kHz.
6. Measure and record the results in the test report.

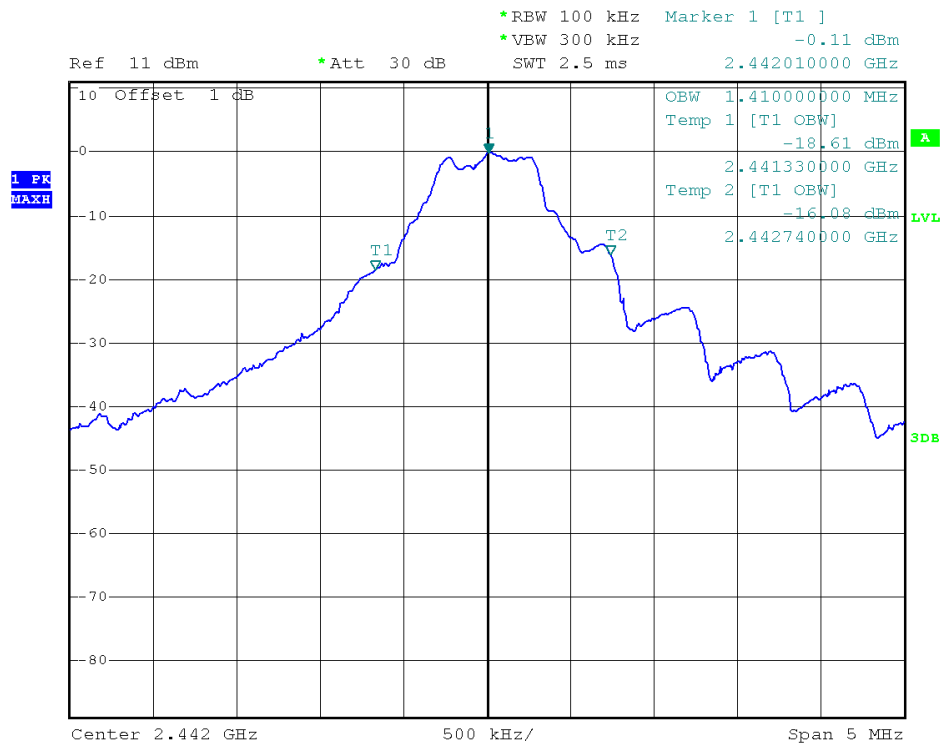
2.3.4. Test Result

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limits (MHz)	Result
0	2402	0.680	1.310	≥ 0.5	PASS
20	2444	0.660	1.410	≥ 0.5	PASS
39	2480	0.680	1.240	≥ 0.5	PASS

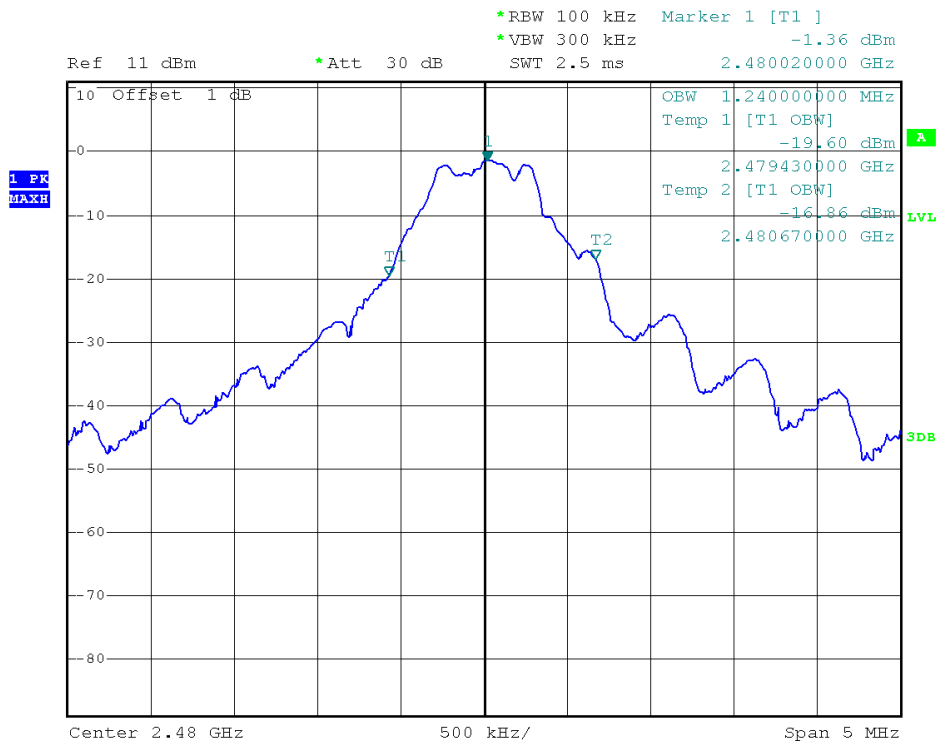
**6 dB Bandwidth Plot on channel 0****6 dB Bandwidth Plot on channel 20**

**6 dB Bandwidth Plot on channel 39****99% Bandwidth Plot on channel 0**

99% Bandwidth Plot on channel 20



99% Bandwidth Plot on channel 39

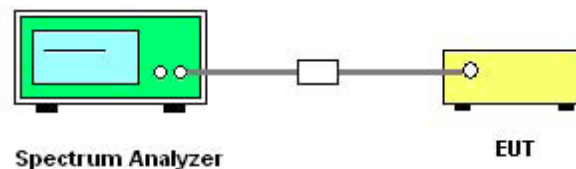


2.4. Conducted Band Edges and Spurious Emissions

2.4.1. Limit of Conducted Band Edges and Spurious Emissions

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

2.4.2. Test Setup

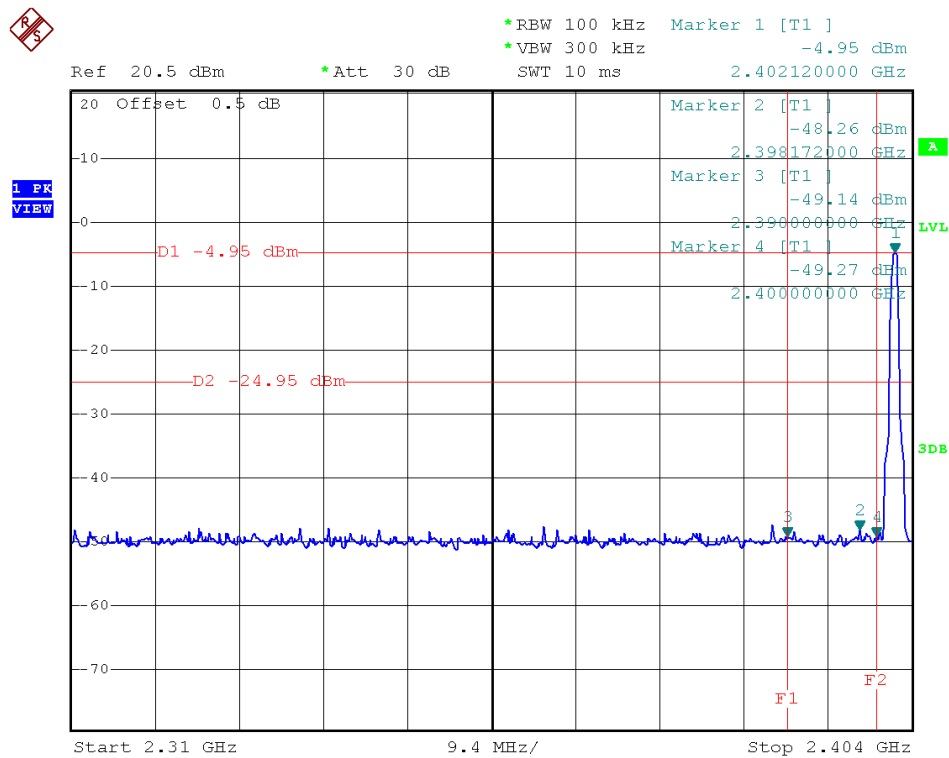


2.4.3. Test Procedure

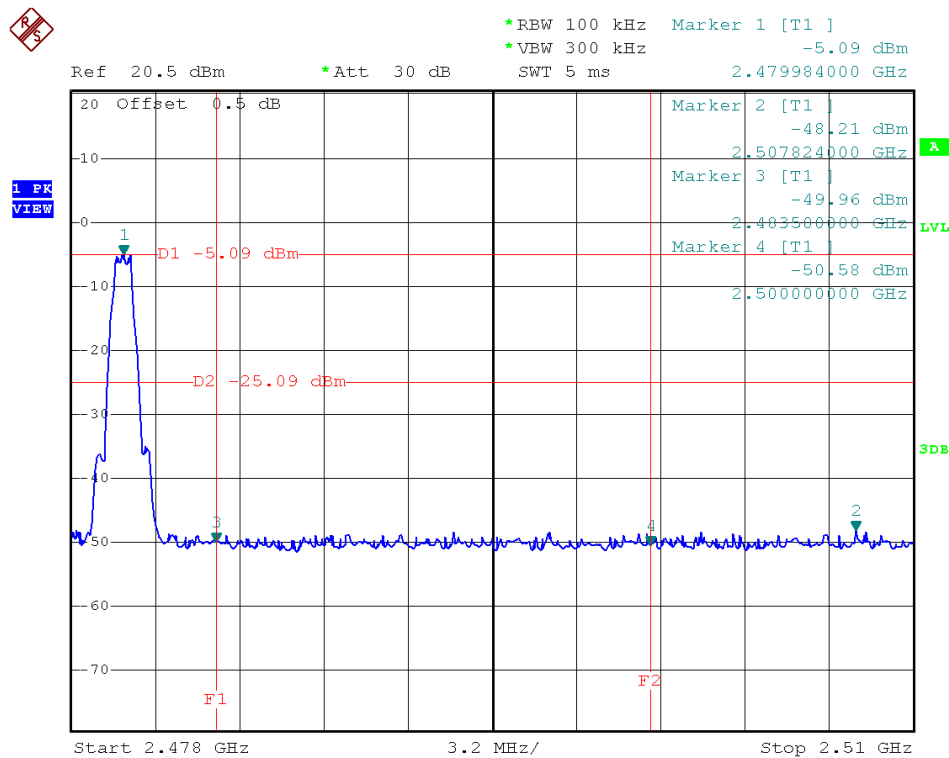
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

2.4.4. Test Result of Conducted Band Edges

Low Band Edge Plot on Channel 0

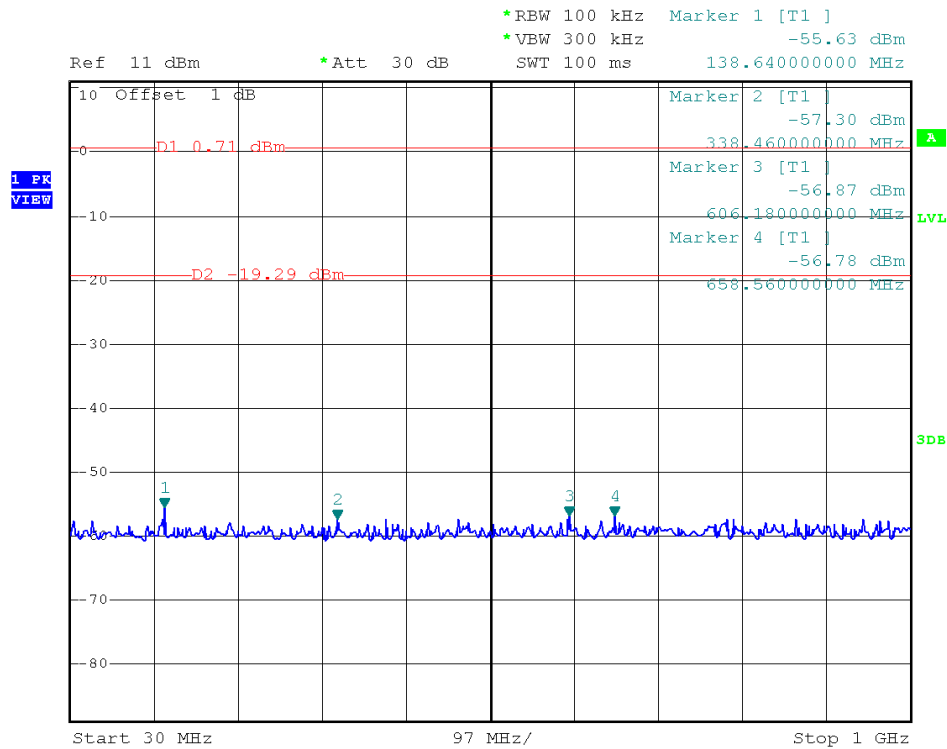


High Band Edge Plot on Channel 39

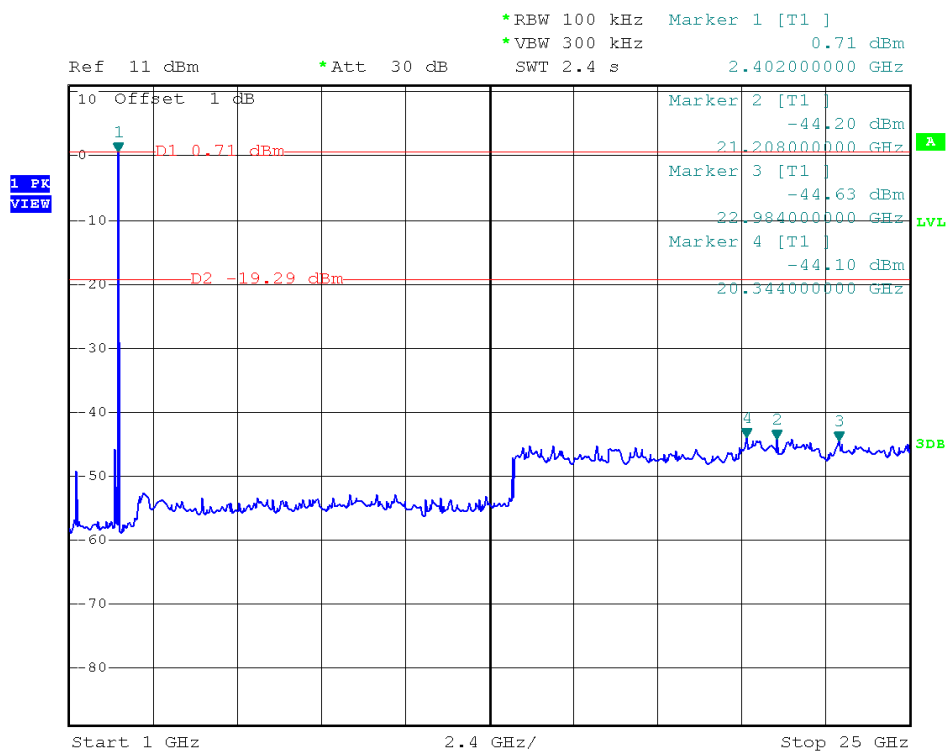


2.4.5. Test Result of Conducted Spurious Emission

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

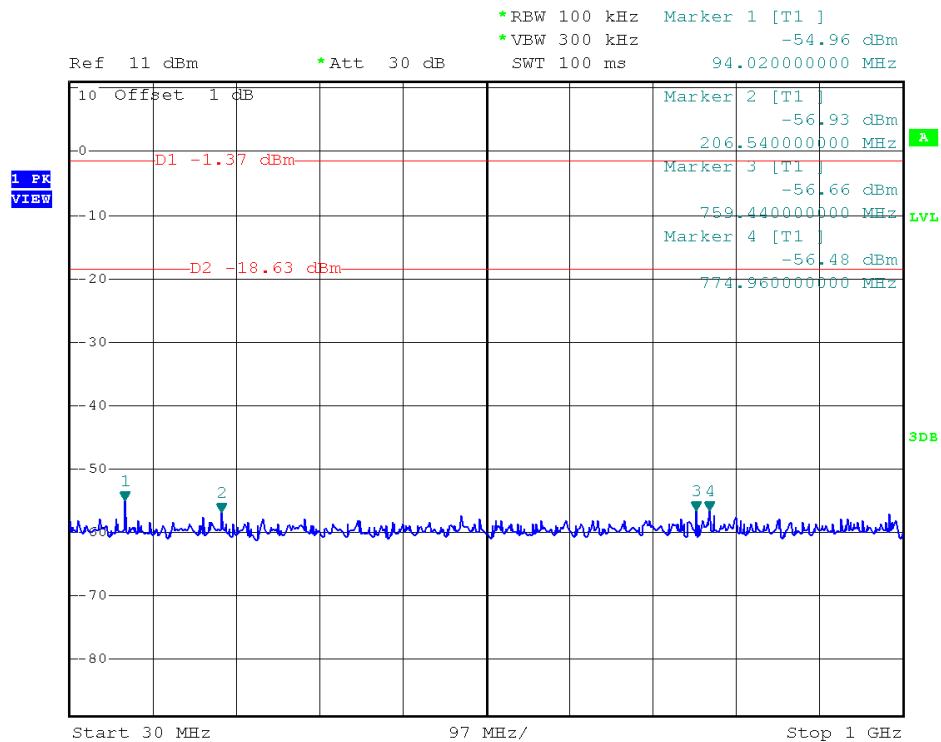


Channel = 0, 30MHz to 1GHz

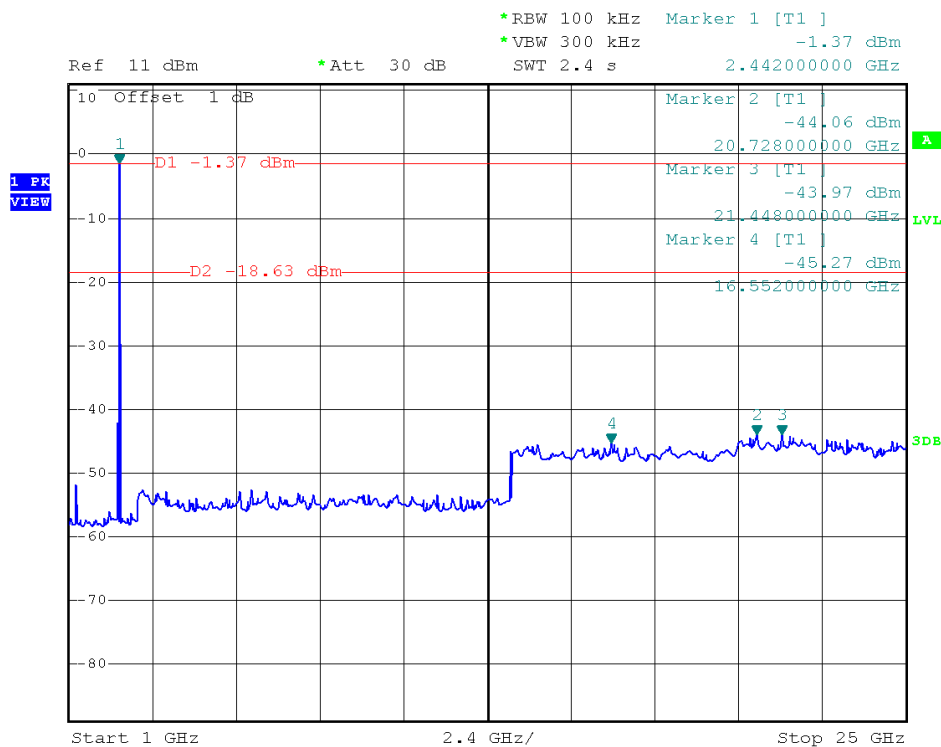


Channel = 0, 1GHz to 25GHz

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps



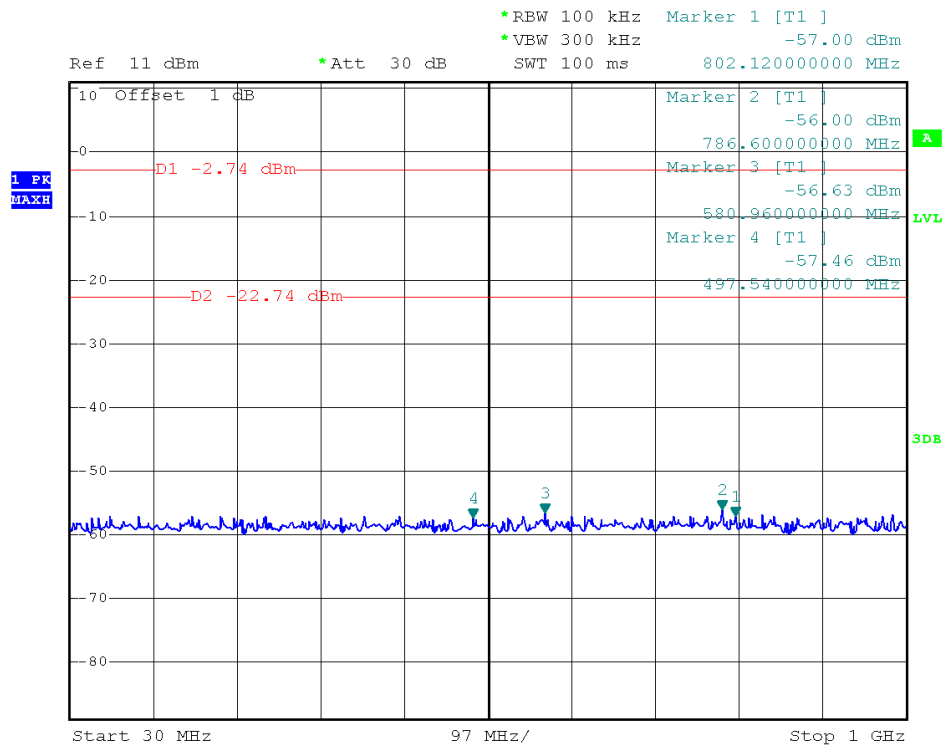
Channel = 20, 30MHz to 1GHz



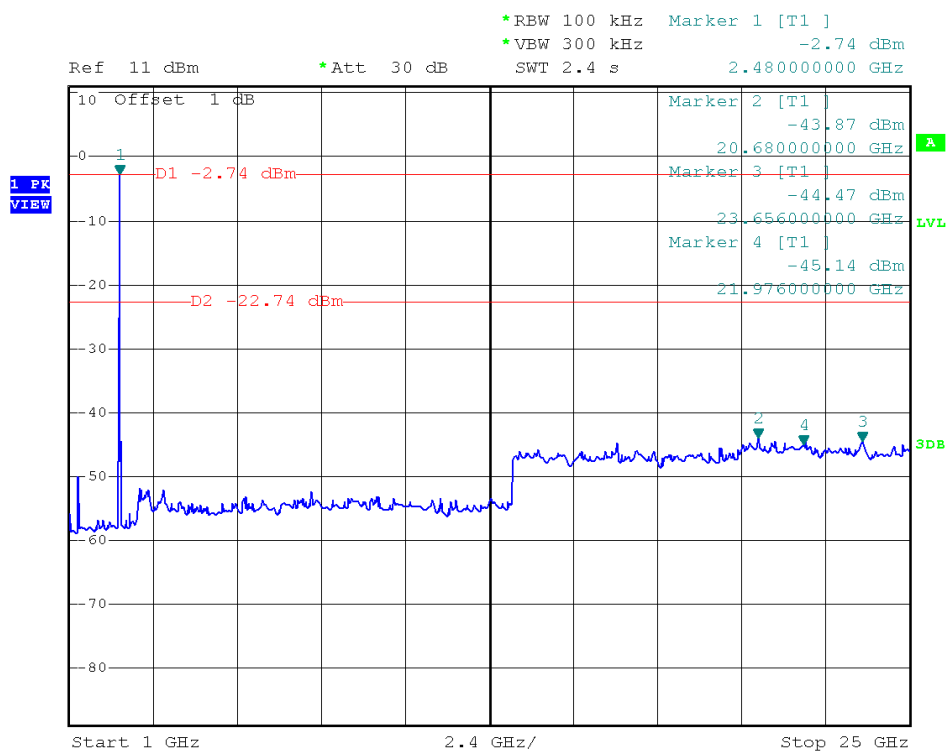
Channel = 20, 1GHz to 25GHz



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps



Channel = 39, 30MHz to 25GHz



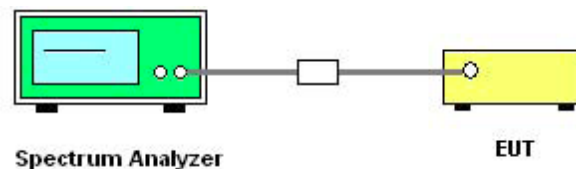
Channel = 39, 30MHz to 25GHz

2.5. Power spectral density (PSD)

2.5.1. Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

2.5.2. Test Setup



2.5.3. Test Procedures

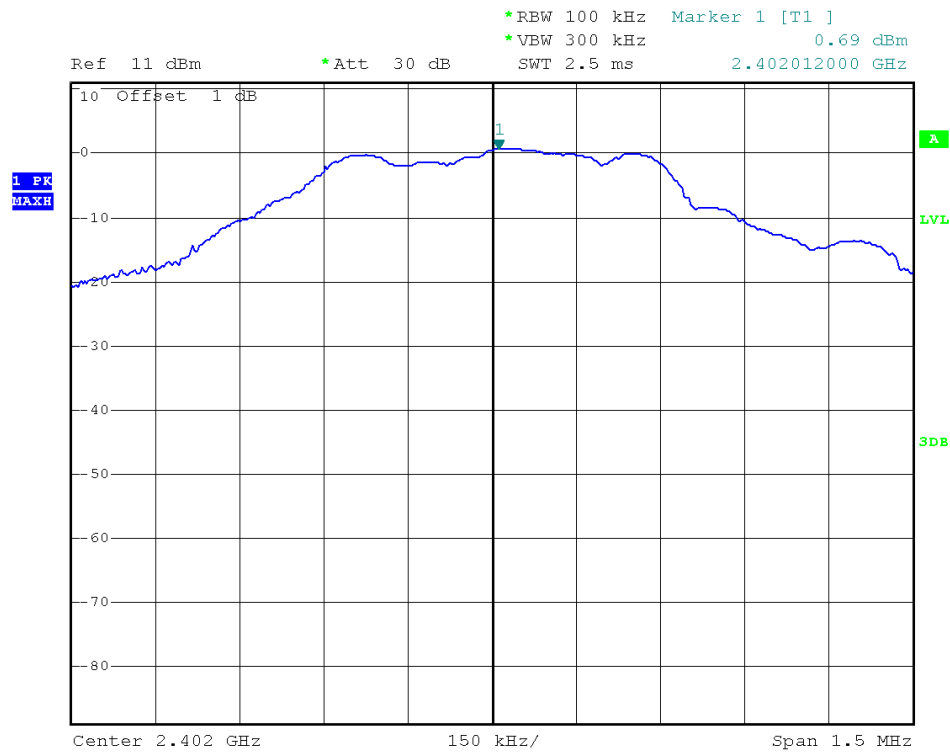
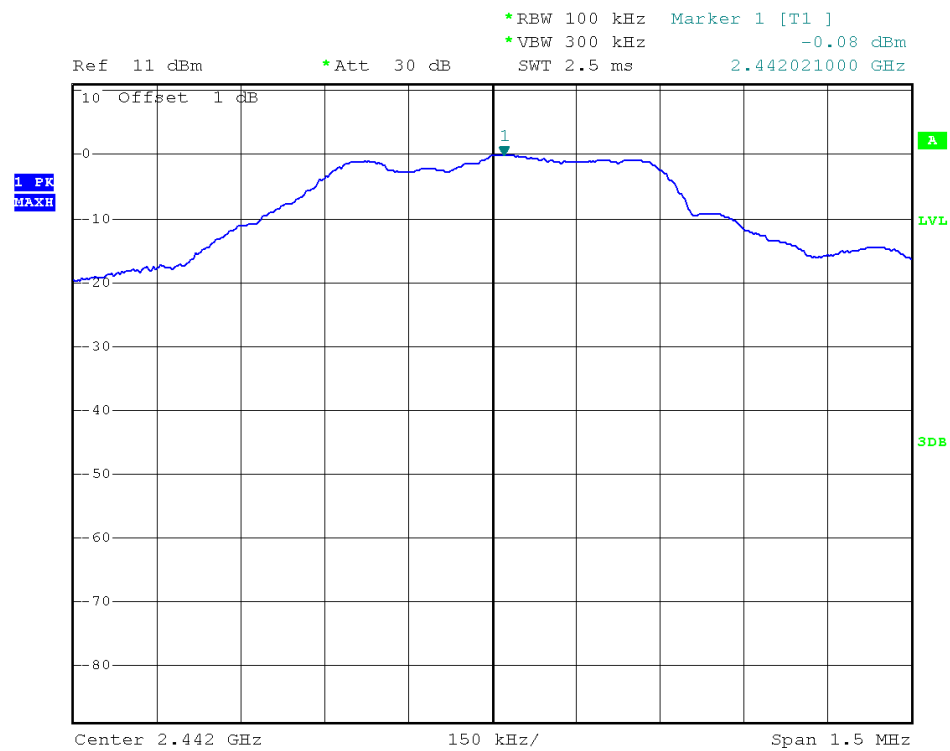
1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No.558074 D01 DTS Meas. Guidance v03r02
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. The Measured power density (dBm)/ 100kHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

2.5.4. Test Result

Spectral power density (dBm)					
Channel	Frequency (MHz)	PSD/100kHz (dBm)	PSD/3kHz (dBm)	Limit (dBm/3kHz)	Verdict
0	2402	0.69	-14.51	8	PASS
20	2442	-0.08	-15.28	8	PASS
39	2480	-1.60	-16.80	8	PASS
Measurement uncertainty: ± 1.3 dB					

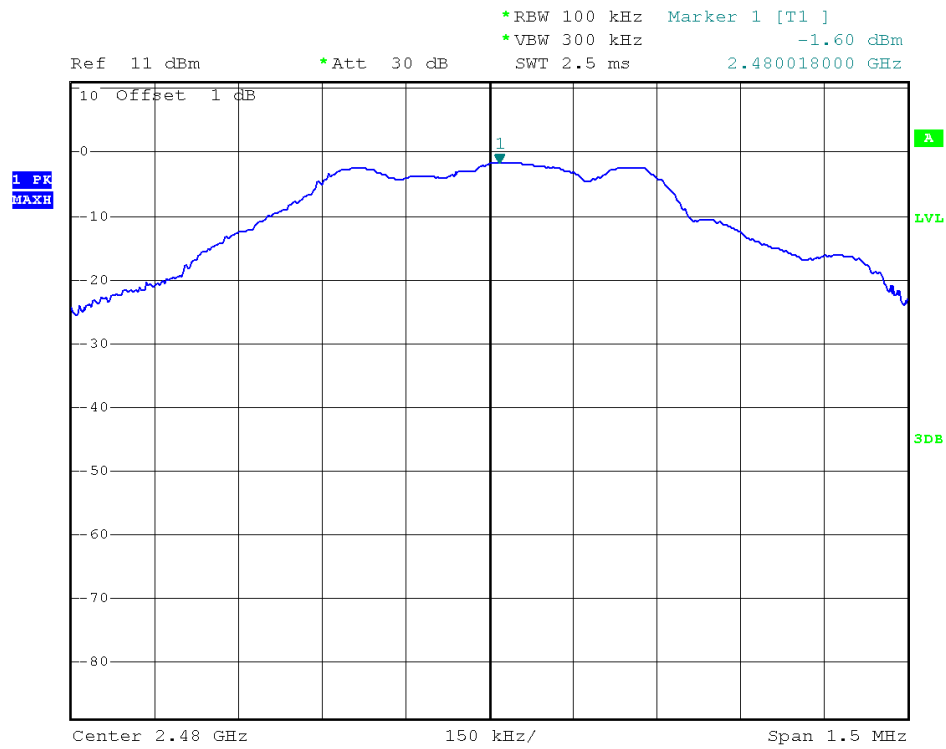
Note:

1. Measured power density (dBm) has offset with cable loss.
2. Bandwidth correction: $10\log(3\text{kHz}/100\text{kHz}) = -15.2\text{dB}$

**Test Plots:****PSD Plot on Channel 0****PSD Plot on Channel 20**



PSD Plot on Channel 39



2.6. Radiated Band Edge and Spurious Emission

2.6.1. Limit of Radiated Band Edges and Spurious Emission

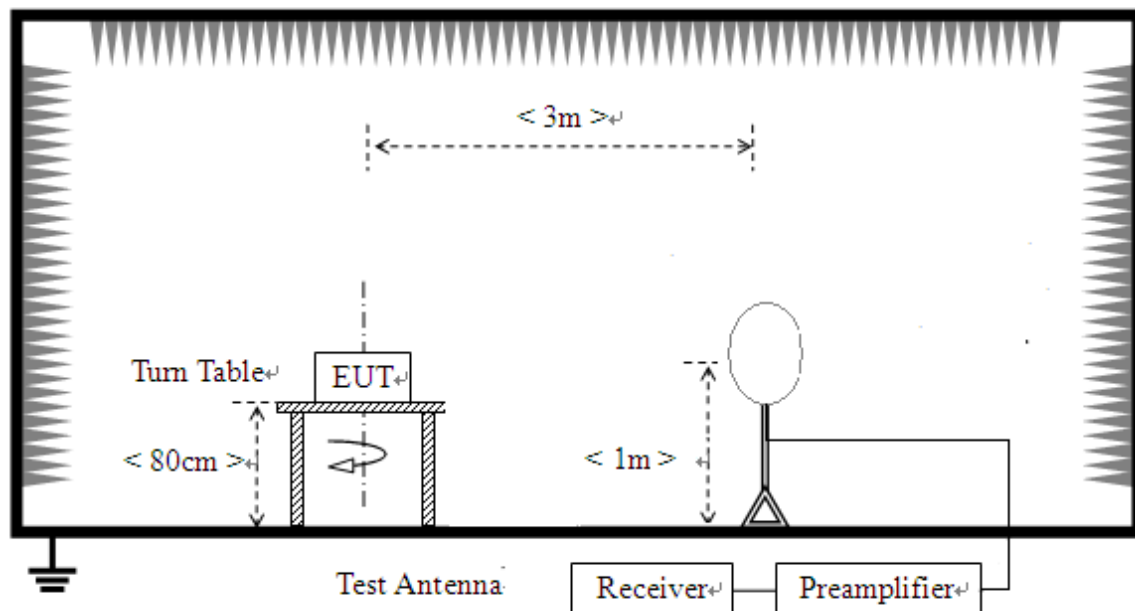
In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Note: Wireless charger configuration was evaluated.

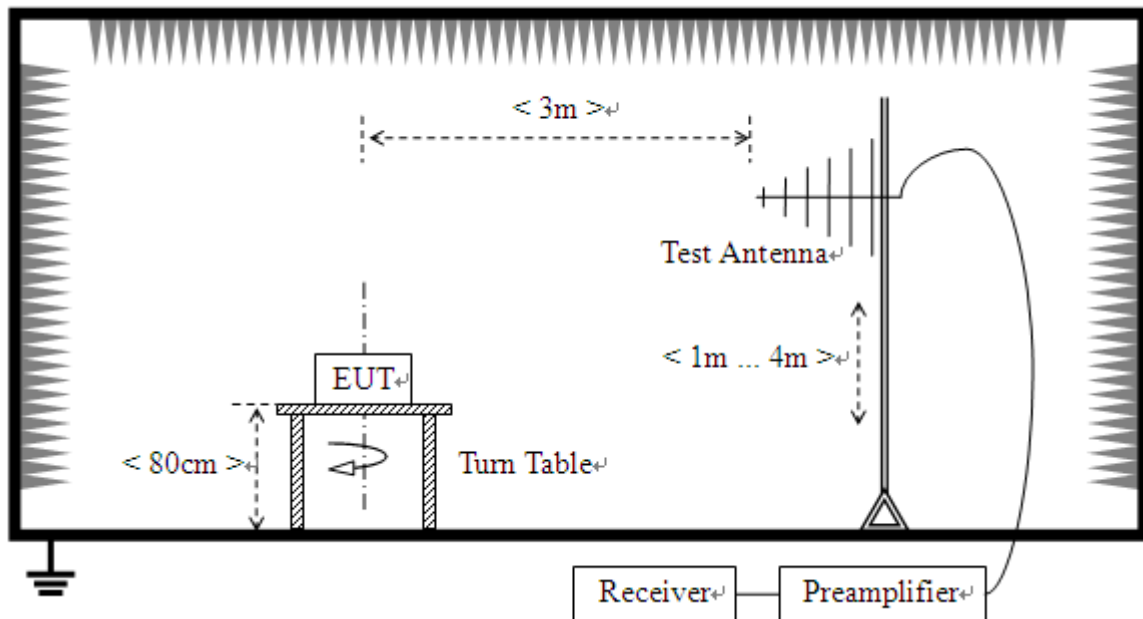
Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009 - 0.490	$2400/F(\text{kHz})$	300
0.490 - 1.705	$24000/F(\text{kHz})$	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

2.6.2. Test Setup

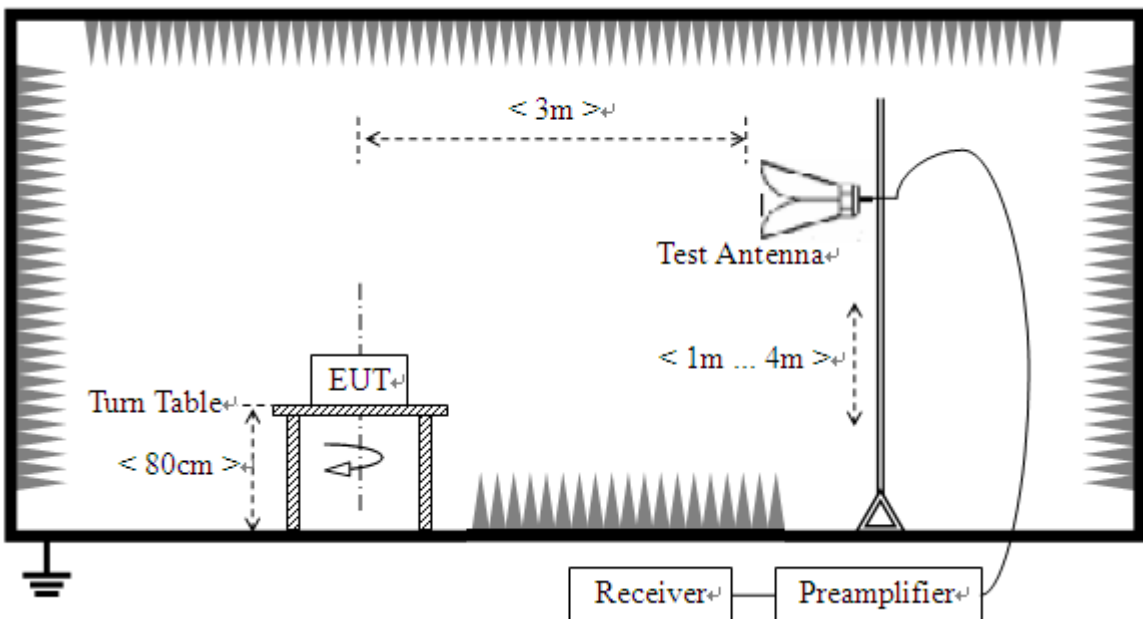
For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



2.6.3. Test Procedures

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. Height of receiving antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported.
Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10Hz (Duty cycle $> 98\%$) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

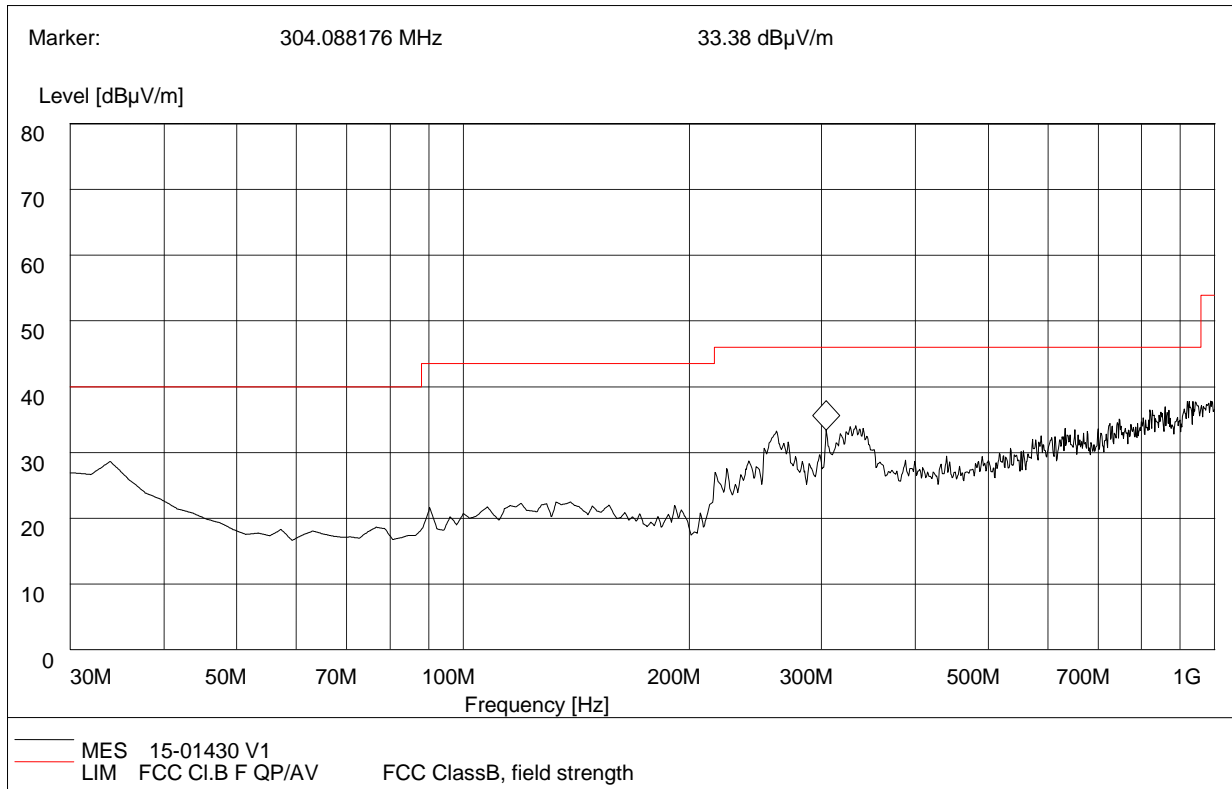
2.6.4. Test Result

Tape Antenna (short)

For 9kHz to 30MHz

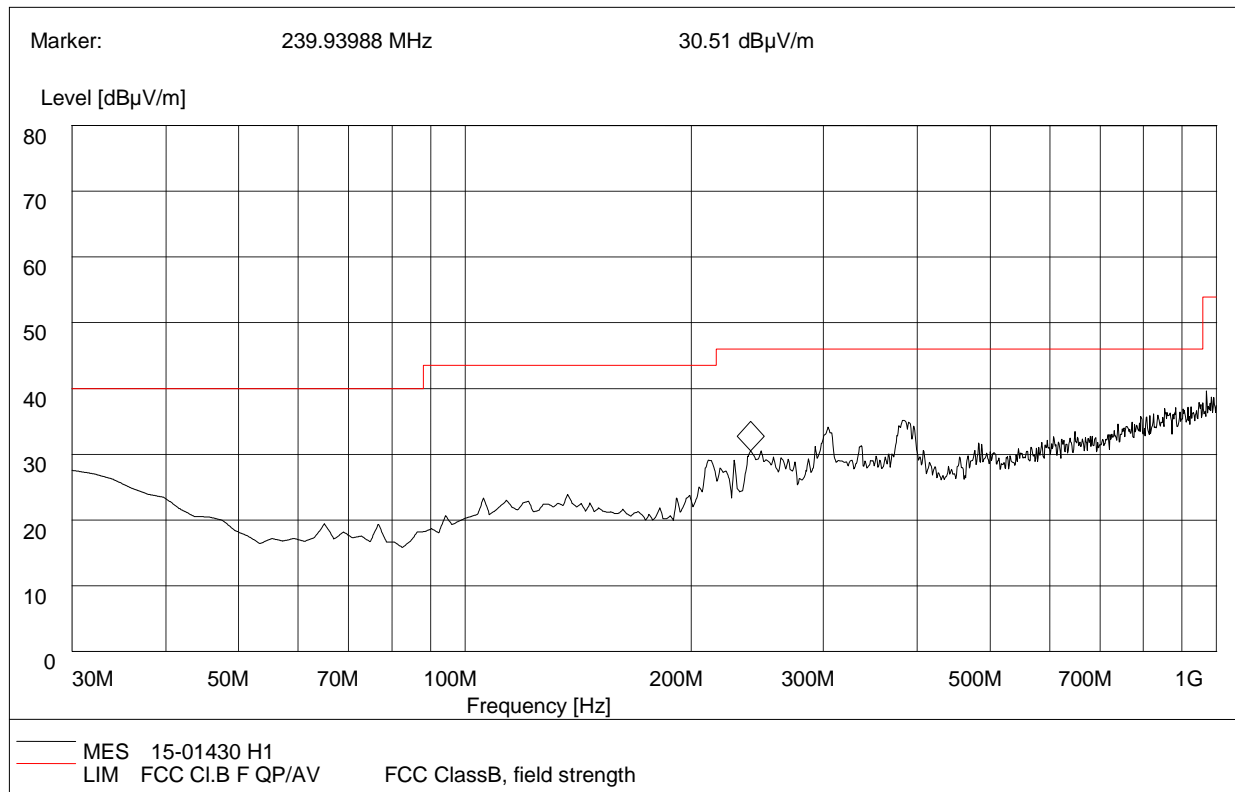
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

For 30MHz to 1000 MHz



Plot A: 30MHz to 1GHz, Antenna Vertical

Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB μ V/m)	Antenna	Verdict
33.160	37.49	120.000	100.0	40.00	Vertical	Pass
261.340	31.56	120.000	100.0	46.00	Vertical	Pass
304.088	33.38	120.000	100.0	46.00	Vertical	Pass



Plot B: 30MHz to 1GHz, Antenna Horizontal

Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB μ V/m)	Antenna	Verdict
30.000	28.22	120.000	100.0	40.00	Horizontal	Pass
239.940	30.51	120.000	100.0	46.0	Horizontal	Pass
304.150	33.16	120.000	100.0	46.0	Horizontal	Pass
383.260	33.67	120.000	100.0	46.0	Horizontal	Pass

For 1GHz to 25GHz
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (0CH_2402MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	56.7	PK	74.0	-17.3	1.01 H	228	24.50	32.20
2	2390.00	43.9	AV	54.0	-10.1	1.01 H	228	11.70	32.20
3	*2402.00	103.92	PK	/	/	1.03 H	112	69.20	32.20
4	*2402.00	97.03	AV	/	/	1.03 H	112	65.80	32.20
5	4804.00	51.8	PK	74.00	-22.2	1.00 H	254	46.50	5.30
6	4804.00	48.6	AV	54.00	-5.4	1.00 H	254	43.30	5.30

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (0CH_2402MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	57.0	PK	74.0	-17.0	1.11 V	228	24.80	32.20
2	2390.00	44.2	AV	54.0	-9.8	1.11 V	228	12.00	32.20
3	*2402.00	117.1	PK	/	/	1.09 V	112	84.90	32.20
4	*2402.00	113.6	AV	/	/	1.03 V	112	81.40	32.20
5	4804.00	54.4	PK	74.00	-19.6	1.21 V	254	49.10	5.30
6	4804.00	44.3	AV	54.00	-9.7	1.21 V	254	39.00	5.30

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (20CH 2442MHz)

No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2442.00	107.3	PK	/	/	1.01 H	210	75.10	32.20
2	*2442.00	104.1	AV	/	/	1.01 H	210	71.90	32.20
3	4884.00	53.8	PK	74.00	-20.2	1.03 H	272	48.50	5.30
4	4884.00	46.2	AV	54.00	-7.8	1.03 H	272	40.90	5.30

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (20CH 2442MHz)

No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2442.00	109.0	PK	/	/	1.09 V	112	76.80	32.20
2	*2442.00	105.3	AV	/	/	1.09 V	112	73.10	32.20
3	4884.00	56.8	PK	74.00	-17.2	1.21 V	254	51.50	5.30
4	4884.00	46.5	AV	54.00	-7.5	1.21 V	254	41.20	5.30

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (39CH_2480MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	106.2	PK	/	/	1.05 V	215	73.90	32.30
2	*2480.00	102.3	AV	/	/	1.05 V	215	70.00	32.30
3	2483.50	57.3	PK	74.0	-16.7	1.05 V	211	24.90	32.40
4	2483.50	45.0	AV	54.0	-9.0	1.05 V	211	12.60	32.40
5	4960.00	52.4	PK	74.0	-11.6	1.45 V	320	46.90	5.50
6	4960.00	48.3	AV	54.0	-5.7	1.45 V	320	42.80	5.50

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (39CH_2480MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	120.3	PK	/	/	1.05 V	174	88.00	32.30
2	*2480.00	116.8	AV	/	/	1.05 V	174	84.50	32.30
3	2483.50	55.5	PK	74.0	-18.5	1.05 V	177	23.10	32.40
4	2483.50	45.7	AV	54.0	-8.3	1.05 V	177	13.30	32.40
5	4960.00	55.9	PK	74.0	-18.1	1.45 V	201	50.40	5.50
6	4960.00	46.9	AV	54.0	-7.1	1.45 V	201	41.40	5.50

REMARKS:

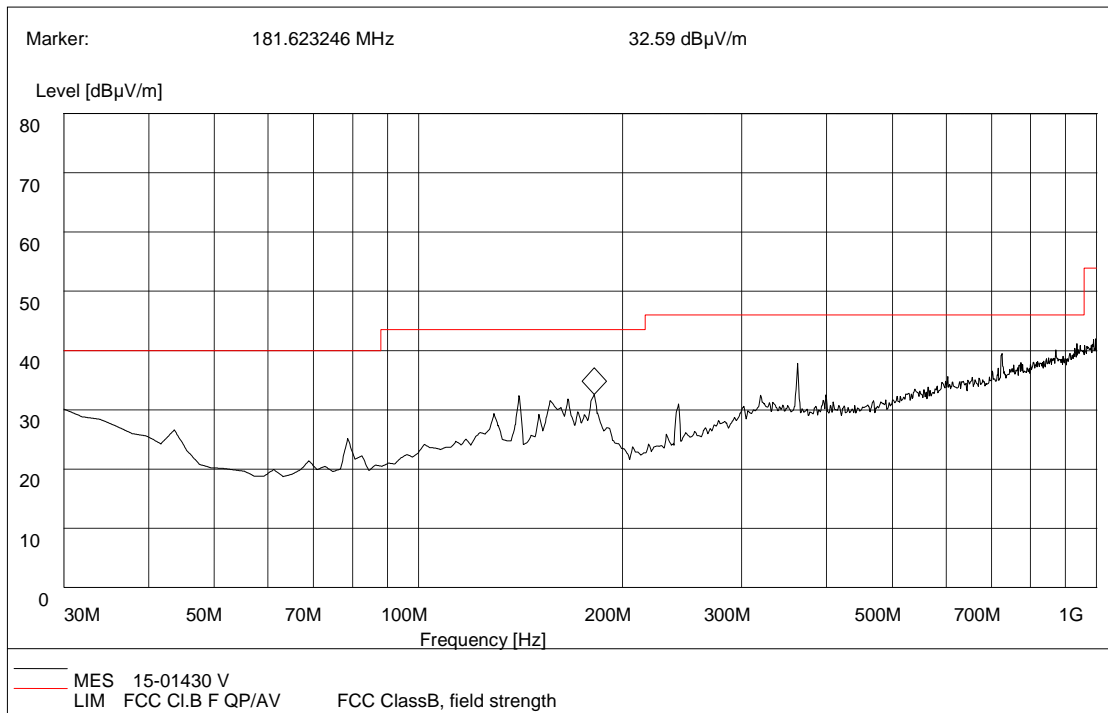
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
- Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level - Limit value
5. " * ": Fundamental frequency.

Tape Antenna (short)

For 9kHz to 30MHz

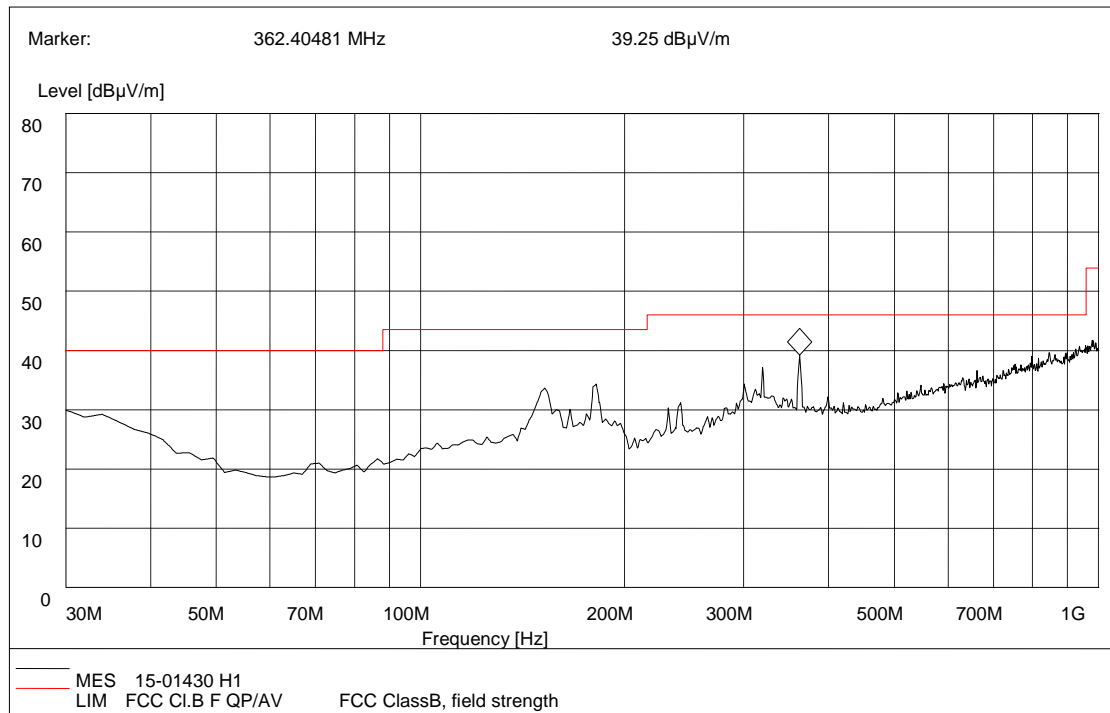
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

For 30MHz to 1000MHz



Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB μ V/m)	Antenna	Verdict
30.000	30.00	120.000	100.0	40.00	Vertical	Pass
181.623	32.59	120.000	100.0	43.50	Vertical	Pass
368.088	38.31	120.000	100.0	46.00	Vertical	Pass

Plot A: 30MHz to 1GHz, Antenna Vertical



Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB μ V/m)	Antenna	Verdict
30.000	30.00	120.000	100.0	40.00	Horizontal	Pass
319.520	37.09	120.000	100.0	46.0	Horizontal	Pass
362.405	39.25	120.000	100.0	46.0	Horizontal	Pass

Plot B: 30MHz to 1GHz, Antenna Horizontal

For 1GHz to 25GHz
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (0CH_2402MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	56.4	PK	74.0	-17.6	1.01 H	228	24.20	32.20
2	2390.00	43.7	AV	54.0	-10.3	1.01 H	228	11.50	32.20
3	*2402.00	104.4	PK	/	/	1.03 H	112	72.20	32.20
4	*2402.00	102.0	AV	/	/	1.03 H	112	69.80	32.20
5	4804.00	50.8	PK	74.00	-23.2	1.00 H	254	45.50	5.30
6	4804.00	42.6	AV	54.00	-11.4	1.00 H	254	37.30	5.30

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (0CH_2402MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	56.7	PK	74.0	-17.3	1.11 V	228	24.50	32.20
2	2390.00	43.9	AV	54.0	-10.1	1.11 V	228	11.70	32.20
3	*2402.00	107.4	PK	/	/	1.09 V	112	75.20	32.20
4	*2402.00	107.0	AV	/	/	1.03 V	112	74.80	32.20
5	4804.00	51.8	PK	74.00	-22.2	1.21 V	254	46.50	5.30
6	4804.00	44.6	AV	54.00	-9.4	1.21 V	254	39.30	5.30

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (20CH 2442MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2442.00	107.5	PK	/	/	1.01 H	210	75.30	32.20
2	*2442.00	105.9	AV	/	/	1.01 H	210	73.70	32.20
3	4884.00	53.8	PK	74.00	-20.2	1.03 H	272	48.50	5.30
4	4884.00	43.2	AV	54.00	-10.8	1.03 H	272	37.90	5.30

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (20CH 2442MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2442.00	108.9	PK	/	/	1.09 V	112	76.70	32.20
2	*2442.00	105.4	AV	/	/	1.09 V	112	73.20	32.20
3	4884.00	56.5	PK	74.00	-17.5	1.21 V	254	51.20	5.30
4	4884.00	41.5	AV	54.00	-12.5	1.21 V	254	36.20	5.30

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (39CH_2480MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	108.2	PK	/	/	1.05 V	215	75.90	32.30
2	*2480.00	106.8	AV	/	/	1.05 V	215	74.50	32.30
3	2483.50	57.3	PK	74.0	-16.7	1.05 V	211	24.90	32.40
4	2483.50	45.0	AV	54.0	-9.0	1.05 V	211	12.60	32.40
5	4960.00	52.4	PK	74.0	-21.6	1.45 V	320	46.90	5.50
6	4960.00	45.3	AV	54.0	-8.7	1.45 V	320	39.80	5.50

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (39CH_2480MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	118.7	PK	/	/	1.05 V	174	86.40	32.30
2	*2480.00	116.8	AV	/	/	1.05 V	174	84.50	32.30
3	2483.50	55.5	PK	74.0	-18.5	1.05 V	177	23.10	32.40
4	2483.50	45.7	AV	54.0	-8.3	1.05 V	177	13.30	32.40
5	4960.00	55.9	PK	74.0	-18.1	1.45 V	201	50.40	5.50
6	4960.00	40.9	AV	54.0	-13.1	1.45 V	201	35.40	5.50

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
- Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level - Limit value
5. " * ": Fundamental frequency.

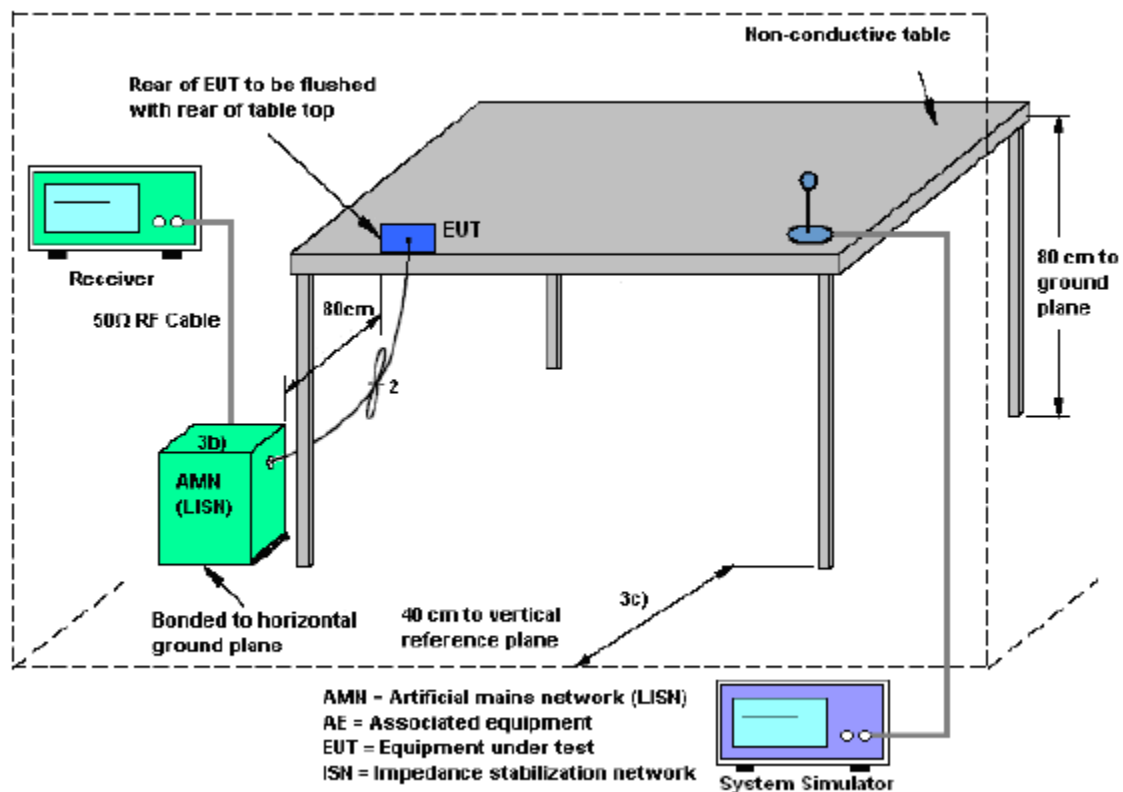
2.7. Conducted Emission

2.7.1. Limit of Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

2.7.2. Test Setup



Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due Date
Test Receiver	R&S	ESCS30	A0304260	2014.06.11	2015.06.10
LISN	R&S	ESH2-Z5	A0304221	2014.06.11	2015.06.10
Service Supplier	R&S	CMU200	A0304252	2014.06.11	2015.06.10
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	A0304291	(n.a.)	(n.a.)
Cable	MATCHING PAD	W7	/	2014.06.05	2015.06.04

2.7.3. Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

2.7.4. Test Result

There is a BT module, which is powered by the Battery, the requirement does not apply for equipment.

3. List of measuring equipment

Description	Manufacturer	Model	Serial No.	Test Date	Due Date	Remark
EMI Test Receiver	R&S	ESIB26	A0304218	2014.06.11	2015.06.10	Radiation
Loop Antenna	Schwarz beck	HFH2-Z2	100047	2014.06.11	2015.06.10	Radiation
Bilog Antenna	Schwarzbeck	VULB 9163	9163-274	2014.06.10	2015.06.09	Radiation
Double ridge horn antenna	R&S	HF960	100150	2014.06.11	2015.06.10	Radiation
Ultra-wideband antenna	R&S	HL562	100089	2014.06.10	2015.06.09	Radiation
Test Antenna – Horn (18-25GHz)	ETS	UG-596A/U	A0902607	2014.06.11	2015.06.10	Radiation
Amplifier 20M~3GHz	R&S	PAP-0203H	22018	2014.06.10	2015.06.09	Radiation
Amplifier 1G~18GHz	R&S	MITEQ AFS42-001 01800	25-S-42	2014.06.05	2015.06.04	Radiation
Amplifier 18G~40GHz	R&S	JS42-18002 600-28-5A	12111.0980.00	2014.06.05	2015.06.04	Radiation
Full-Anechoic Chamber	Albatross	12.8m*6.8m*6.4m	A0412372	2014.06.11	2015.06.10	Radiation
Spectrum Analyzer	R&S	FSP40	1164.4391.40	2014.06.11	2015.06.10	Conducted
Power Meter	R&S	NRVS	1020.1809.02	2014.06.08	2015.06.07	Conducted
Power Sensor	R&S	NRV-Z4	823.3618.03	2014.06.08	2015.06.07	Conducted
Test Receiver	R&S	ESCS30	A0304260	2014.06.11	2015.06.10	Conducted
LISN	ROHDE&SCHWARZ	ESH2-Z5	A0304221	2014.06.11	2015.06.10	Conducted
Cable	SUNHNER	SUCOFLEX 100	/	2014.06.05	2015.06.04	Radiation
Cable	SUNHNER	SUCOFLEX 104	/	2014.06.05	2015.06.04	Radiation

** END OF REPORT **