TEST REPORT

Report No.:	**E201508117208-4**	**Application No.:**	**E201508117208**
Client:	Harman International Industries, Incorporated		
Address:	8500 Balboa Blvd, Northridge, CA 91329, United States		
Sample Description:	Bluetooth headset		
Model:	V100BT		
Adding Model:	/		
FCC ID	APIJBLV100BT		
Test Specification:	FCC Part 15,Subpart C:2014 (Section 15.247)		
Test Date:	2015-08-11 to 2015-08-27		
Issue Date:	2015-08-27		
Test Result:	*Pass.*		

Prepared By:	**Reviewed By:**	**Approved By:**
Bruce Li / Test Engineer	Lynn Xiao /Technical Manager	Yong Dai /Technical Manager
Bruce Li		Yong Dai
Date:2015-08-27	Date:2015-08-27	Date:2015-08-27

Other Aspects:

/

Abbreviations: *ok / P = passed; fail / F = failed; n.a. / N = not applicable*

The test result in this test report refers exclusively to the presented test sample. This report shall not be reproduced except in full, without the written approval of GRGT.

DIRECTIONS OF TEST

1. This station carries out test task according to the national regulation of verifications which can be traced to National Primary Standards and BIPM.

2. The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

3. If there is any objection concerning the test, the client should inform the laboratory within 15 days from the date of receiving the test report.

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1. TEST RESULT SUMMARY

FCC Part 15.247:2014			
Standard	**Item**	**Limit / Severity**	**Result**
FCC Part 15,Subpart C (15.247)	Antenna Requirement	Section 15.247 (c)	PASS
	Occupied Bandwidth	Section 15.247 (a1)	PASS
	Carrier Frequencies Separated	Section 15.247(a)(1)	PASS
	Hopping Channel Number	Section 15.247(a)(1)(iii)	PASS
	Dwell Time	Section 15.247(a)(1)(iii)	PASS
	Maximum Peak Output Power	Section 15.247(b)(1)	PASS
	Conducted Emission	Section 15.207	N/A
	Conducted Spurious Emission (30MHz to 25GHz)	Section 15.209 &15.247(d)	PASS
	Radiated Spurious Emission (30MHz to 25GHz)	Section 15.209 &15.247(d)	PASS
	Band Edges Measurement	Section 15.247 (d) &15.205	PASS

2. GENERAL DESCRIPTION OF EUT

2.1 APPLICANT

Name:	Harman International Industries, Incorporated
Address:	8500 Balboa Blvd, Northridge, CA 91329, United States

2.2 MANUFACTURER

Name:	Harman International Industries, Incorporated
Address:	8500 Balboa Blvd, Northridge, CA 91329, United States

2.3 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment:	Bluetooth headset
Model No.:	V100BT
Trade Name:	harman
Power supply	DC USB 5V
Battery:	Model:ICR10120 3.7V/60mAh*2
Frequency Range	2402MHz~2480MHz
Type of Modulation	GFSK
Channels:	Channels with 2MHz step
Antenna Gain:	-2.6dBi
Antenna Type	Internal antenna

3. LABORATORY AND ACCREDITATIONS

3.1 LABORATORY

The tests and measurements refer to this report were performed by Guangzhou GRG Metrology and Test CO., LTD.

Add. : 163 Pingyun Rd, West of Huangpu Ave, Guangzhou, 510656, P. R. China

Telephone: +86-20-38699959, 38699960, 38699961

Fax : +86-20-38695185

3.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA	FCC Listed Lab (No. 688188)
Canada	Registration No.:8355A-1

3.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement		**Frequency**	**Uncertainty**
Radiated Emission	Horizontal	30MHz～1000MHz	4.2dB
		1GHz～26.5GHz	4.2dB
	Vertical	30MHz～1000MHz	4.4dB
		1GHz～26.5GHz	4.4dB
Conducted Emission		9kHz～30MHz	3.1 dB

This uncertainty represents an expanded uncertainty factor of *k*=2 and the Confidence Level is 95%.

3.4 LIST OF USED TEST EQUIPMENT AT GRGT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
6 dB bandwidth/ carrier frequencies separated/ hopping channel number/ dwell time/ maximum peak output power/100kHz bandwidth of frequency band edge/ Spurious Emissions at Antenna Port/ Restricted Bands				
EMI Receiver	R&S	ESCI	100529	2016-03-24
Conducted Emissions				
EMI Receiver	R&S	ESCI	100529	2016-03-24
L.I.S.N	SCHWARZBECK	NSLK 8127	8127450	2016-07-20
Radiated Spurious Emissions				
Receiver	R&S	ESU26	100526	2016-03-08
Signal Generator	Agilent	N5183A-540	MY50142096	2015-09-28
Biconical Log-periodic Antenna	ETS.LINDGREN	3142C	00075971	2016-04-17
Horn antenna	SCHWARZBECK	BBHA9120D	D752	2015-11-25
Horn antenna	ETS.LINDGREN	3117C	00075824	2017-05-05
Per-Amplifier (0.1-26.5GHz)	Compliance Directions systems Inc.	PAP-0126	25002	2016-01-02
Semi-anechoic chamber	ETS	966(RFD-F/A-100)	3730	2016-02-25

4. TEST RESULTS

4.1 E.U.T. TEST CONDITIONS

Type of antenna: **Internal**

Temperature: **22.7 °C**

Humidity: **59% RH**

Atmospheric Pressure: **1011 mbar**

Test frequencies: **According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and. if required. reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:**

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top. 1 near middle and 1 near bottom

EUT channels and frequencies list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	14	2430	28	2458
1	2404	15	2432	29	2460
2	2406	16	2434	30	2462
3	2408	17	2436	31	2464
4	2410	18	2438	32	2466
5	2412	19	2440	33	2468
6	2414	20	2442	34	2470
7	2416	21	2444	35	2472
8	2418	22	2446	36	2474
9	2420	23	2448	37	2476
10	2422	24	2450	38	2478
11	2424	25	2452	39	2480
12	2426	26	2454	/	/
13	2428	27	2456	/	/

Test frequency is the lowest channel: 0 channel(2402MHz), middle channel: 19 channel(2440MHz) and highest channel: 39 channel(2480MHz)

4.2 ANTENNA REQUIREMENT

The EUT antenna is Internal antenna. Antenna gain is -2.6dBi .which accordance 15.203.is considered sufficient to comply with the provisions of this section.

detail refer to internal photo

5. CONDUCTED EMISSION MEASUREMENT

5.1 LIMITS

Frequency range	Limits (dBμV)	
	Quasi-peak	Average
150kHz ～ 0.5MHz	66～56	56～46
0.5 MHz ～ 5 MHz	56	46
5 MHz ～ 30 MHz	60	50

NOTE: (1) The lower limit shall apply at the transition frequencies.
(2) The limit decreases in line with the logarithm of the frequency in the range of 150 kHz to 0.5MHz.

5.2 TEST PROCEDURES

Procedure of Preliminary Test

Test procedures follow ANSI C63.4:2009.
For measurement of the disturbance voltage the equipment under test (EUT) is connected to the power supply mains and any other extended network via one or more artificial network(s). An EUT, whether intended to be grounded or not, and which is to be used on a table is configured as follows:

– Either the bottom or the rear of the EUT shall be at a controlled distance of 40 cm from a reference ground plane. This ground plane is normally the wall or floor of a shielded room. It may also be a grounded metal plane of at least 2 m by 2 m. This is physically accomplished as follows:

1) place the EUT on a table of non-conducting material which is at least 80 cm high. Place the EUT so that it is 40 cm from the wall of the shielded room, or

2) place the EUT on a table of non-conducting material which is 40 cm high so that the bottom of the EUT is 40 cm above the ground plane;

– All other conductive surfaces of the EUT shall be at least 80 cm from the reference ground plane;

– The EUT are placed on the floor that one side of the housings is 40 cm from the vertical reference ground plane and other metallic parts;

– Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth forming a bundle 30 cm to 40 cm long, hanging approximately in the middle between the ground plane and the table.

– I/O cables that are connected to a peripheral shall be bundled in the centre. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 1 m.

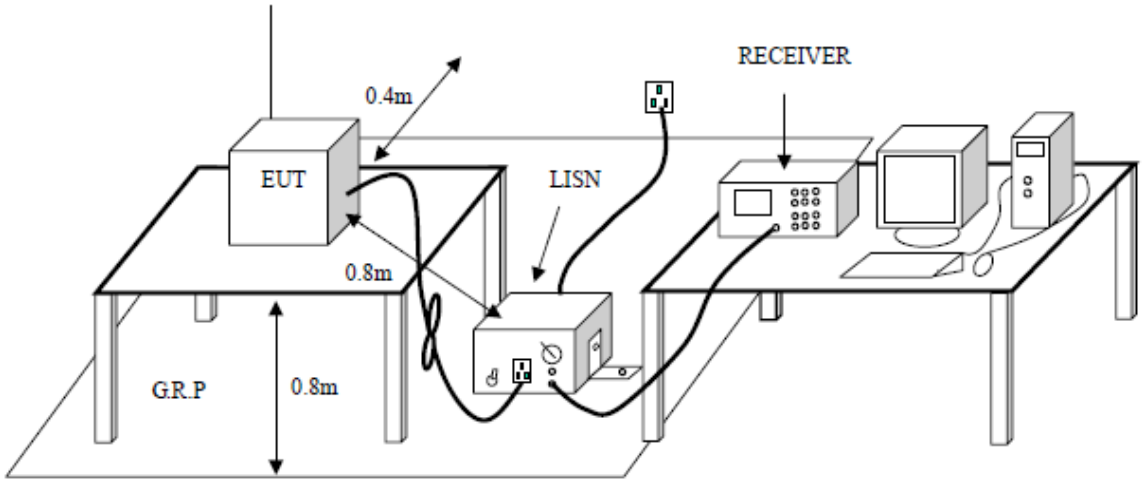
The test mode(s) described in Item 2.4 were scanned during the preliminary test. After the preliminary scan, we found the test mode described in Item 2.4 producing the highest emission level. The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

Procedure of Final Test

EUT and support equipment were set up on the test bench as per the configuration with

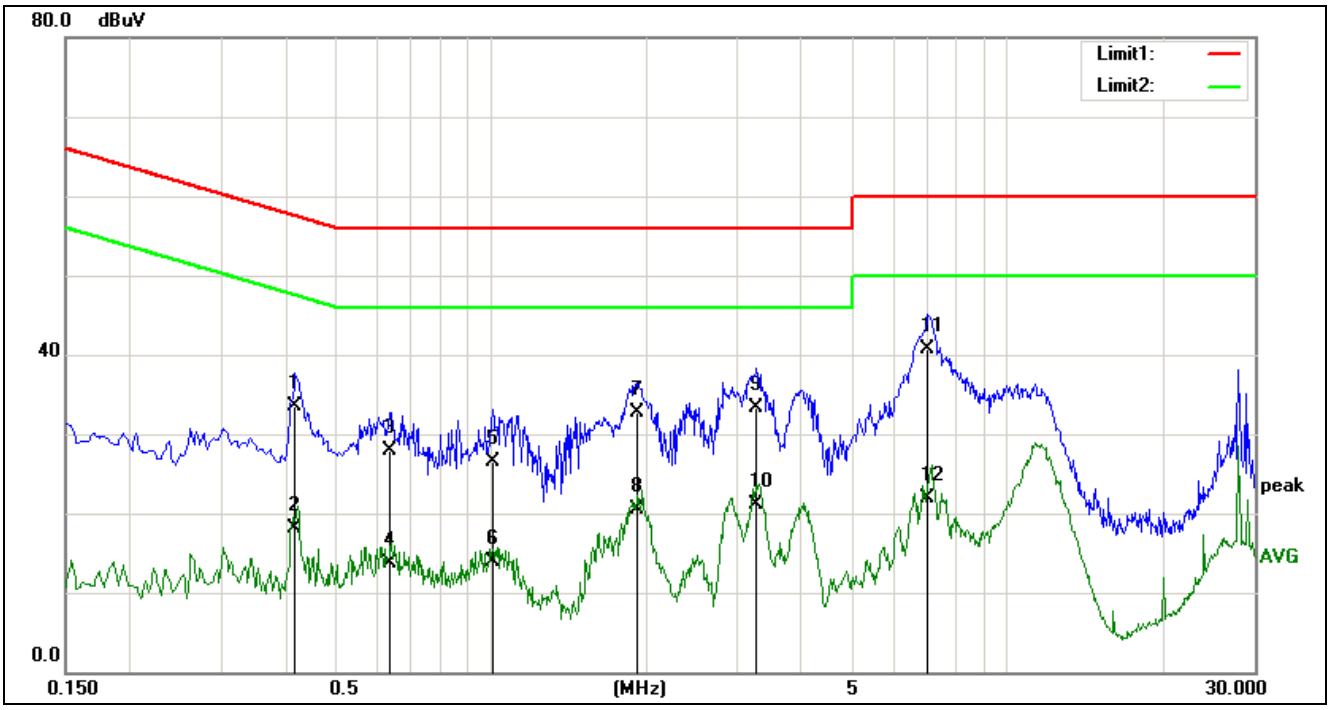
highest emission level in the preliminary test. A scan was taken on both power lines, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. The test data of the worst-case condition(s) was recorded.

5.3 TEST SETUP



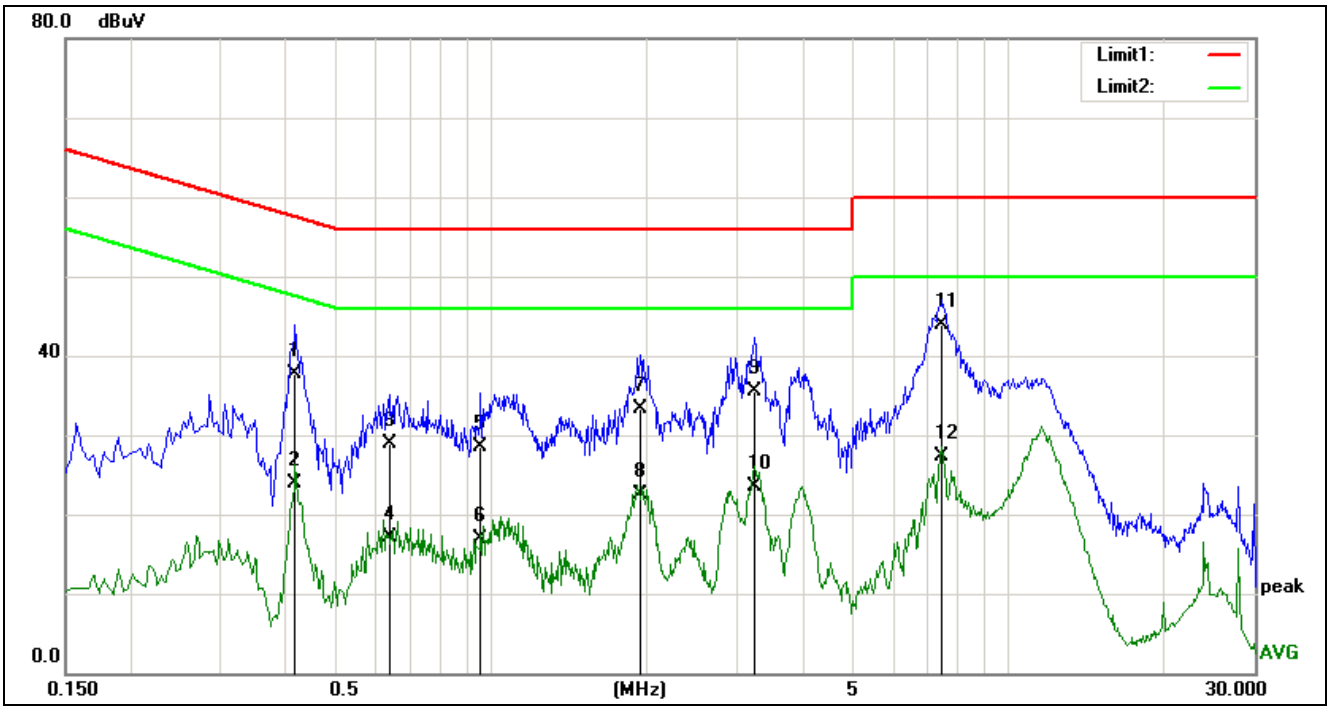
5.4 TEST RESULTS

Project No.:	**E201508117208**	**Probe:**	**L1**
Standard:	**(CE)FCC PART 15 class B_QP**	**Power Source:**	**AC 120V/60Hz**
Test item:	**Conduction Test**	**Date:**	**2015-8-24**
Temp./Hum.(%RH):	**23.3/61.1%RH**	**Time:**	**10:25:12**
EUT:	**Bluetooth headset**		
Model:	**V100BT**	**Test Result:**	**Pass**
Note:			



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.4180	26.99	6.51	33.50	57.49	-23.99	QP
2	0.4180	11.69	6.51	18.20	47.49	-29.29	AVG
3	0.6340	21.41	6.49	27.90	56.00	-28.10	QP
4	0.6340	7.31	6.49	13.80	46.00	-32.20	AVG
5	1.0100	20.14	6.46	26.60	56.00	-29.40	QP
6	1.0100	7.44	6.46	13.90	46.00	-32.10	AVG
7	1.9220	26.21	6.59	32.80	56.00	-23.20	QP
8	1.9220	14.01	6.59	20.60	46.00	-25.40	AVG
9	3.2659	26.76	6.64	33.40	56.00	-22.60	QP
10	3.2659	14.56	6.64	21.20	46.00	-24.80	AVG
11	7.0180	33.93	6.87	40.80	60.00	-19.20	QP
12	7.0180	15.13	6.87	22.00	50.00	-28.00	AVG

Project No.:	**E201508117208**	**Probe:**	**N**
Standard:	**(CE)FCC PART 15 class B_QP**	**Power Source:**	**AC 120V/60Hz**
Test item:	**Conduction Test**	**Date:**	**2015-8-24**
Temp./Hum.(%RH):	**23.3/61.1%RH**	**Time:**	**10:29:40**
EUT:	**Bluetooth headset**		
Model:	**V100BT**	**Test Result:**	**Pass**
Note:			



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.4180	31.29	6.51	37.80	57.49	-19.69	QP
2	0.4180	17.49	6.51	24.00	47.49	-23.49	AVG
3	0.6340	22.51	6.49	29.00	56.00	-27.00	QP
4	0.6340	10.71	6.49	17.20	46.00	-28.80	AVG
5	0.9540	22.14	6.46	28.60	56.00	-27.40	QP
6	0.9540	10.54	6.46	17.00	46.00	-29.00	AVG
7	1.9460	26.71	6.59	33.30	56.00	-22.70	QP
8	1.9460	16.01	6.59	22.60	46.00	-23.40	AVG
9	3.2340	28.88	6.62	35.50	56.00	-20.50	QP
10	3.2340	16.98	6.62	23.60	46.00	-22.40	AVG
11	7.4500	37.04	6.85	43.89	60.00	-16.11	QP
12	7.4500	20.45	6.85	27.30	50.00	-22.70	AVG

6. RADIATED ELECTROMAGNETIC DISTURBANCE

6.1 LIMITS

Frequency (MHz)	Quasi-peak(dBμV/m)
30 ~ 88	40
88~216	43.5
216 ~ 960	46
Above 960	54

NOTE: (1) The lower limit shall apply at the transition frequencies.

Frequency (GHz)	Quasi-peak(dBμV/m)
1 ~ 26.5	74
1~ 26.5	54

6.2 TEST PROCEDURES

Test procedures follow ANSI C63.4:2009.

Procedure of Preliminary Test

Radiated emission tests shall be made with the receive or transmit antenna located at a horizontal distance of 3 m plus half of the maximum width of the EUT being tested, measured from the centre of the EUT. The tests shall be performed with the equipment configured as closely as possible to its typical, practical operation. Unless stated otherwise, cables and wiring shall be as specified by the manufacturer and the equipment shall be in its housing (or cabinet) with all covers and access panels in place. Any deviation from normal EUT operating conditions shall be included in the test report.

The EUT (on a non-conductive support structure, where applicable) shall be placed on a remotely operated turntable, to allow the EUT to be rotated. The height of the EUT above the ground plane shall be according to the following requirements.

• Table-top equipment is placed on a non-conductive set-up table with height 0,8 m ± 0,01 m, ANSI C63.4 specifies the method to determine the impact of the non-conductive set-up table on test results.

• Floor-standing equipment is placed on a non-conductive support, as specified in the applicable product standard. If there are no EUT height placement requirements in the product standard, the EUT shall be placed on a non-conductive support at a height of 5 cm to 15 cm above the ground plane.

Interface cables, loads, and devices should be connected to at least one of each type of the interface ports of the EUT and, where practical, each cable shall be terminated in a device typical for its actual use. Where there are multiple interface ports of the same type, a typical number of these devices shall be connected to devices or loads. It is sufficient to connect only one of the loads, provided that it can be shown, for example by preliminary testing, that the connection of further ports would not significantly increase the level of disturbance (that is, more than 2 dB) or significantly degrade the immunity level.

The test mode(s) described in Item 2.4 were scanned during the preliminary test. After the preliminary scan, we found the test mode described in Item 2.4 producing the highest emission level. The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

Procedure of Final Test

EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test. The Analyzer / Receiver scanned from 30MHz to 1000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level. Record at least six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only QP reading is presented. The test data of the worst-case condition(s) was recorded.

Procedure of Final Test

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test. A scan was taken on both power lines, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. The test data of the worst-case condition(s) was recorded.

Below 1GHz Set the spectrum analyzer: RBW =100KHz VBW >= RBW, Span = enough to captch the trace. Sweep = auto; Detector Function = Peak. Trace = Max,hold.

Above 1GHz Set the spectrum analyzer: RBW =1MHz VBW >= RBW, Span = enough to captch the trace. Sweep = auto; Detector Function = Peak. Trace = Max,hold.

Pre-test for normal mode and EDR mode, to find the normal is the worst case.

Pre-test the EUT in X, Y, Z axis, found the X axis it the worst case.
The worst case emissions were reported.

6.3 TEST SETUP

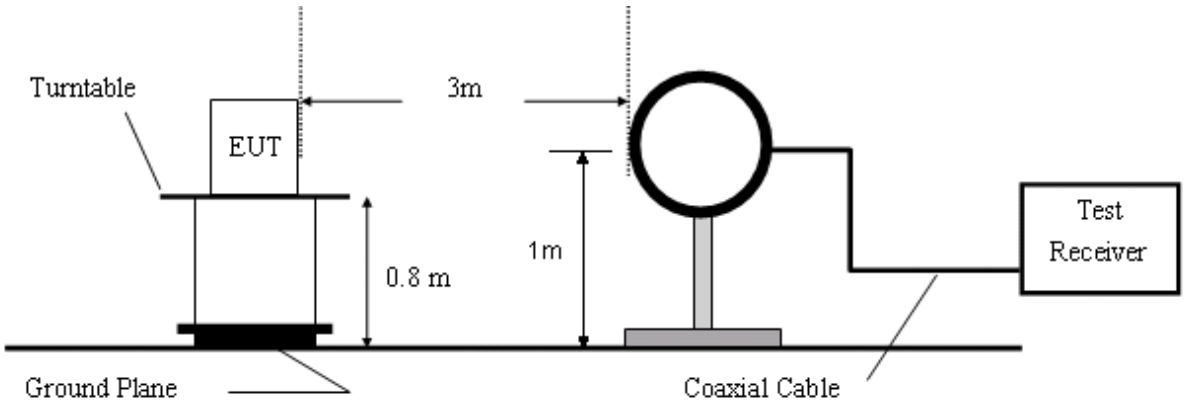


Figure 1. 9KHz to 30MHz radiated emissions test configuration

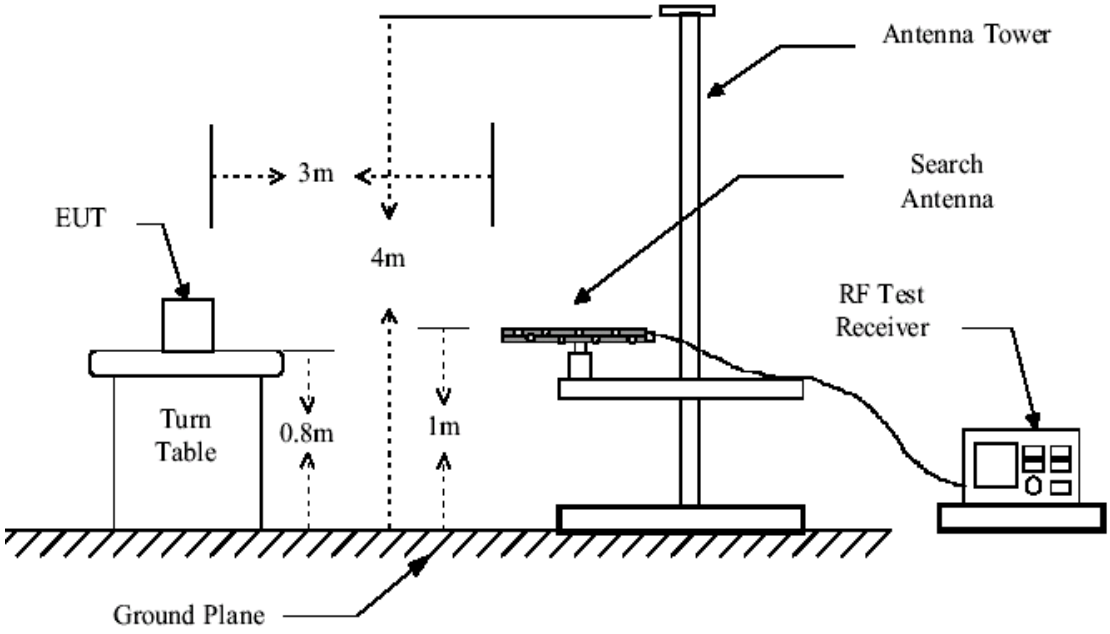


Figure 2. 30MHz to 1GHz radiated emissions test configuration

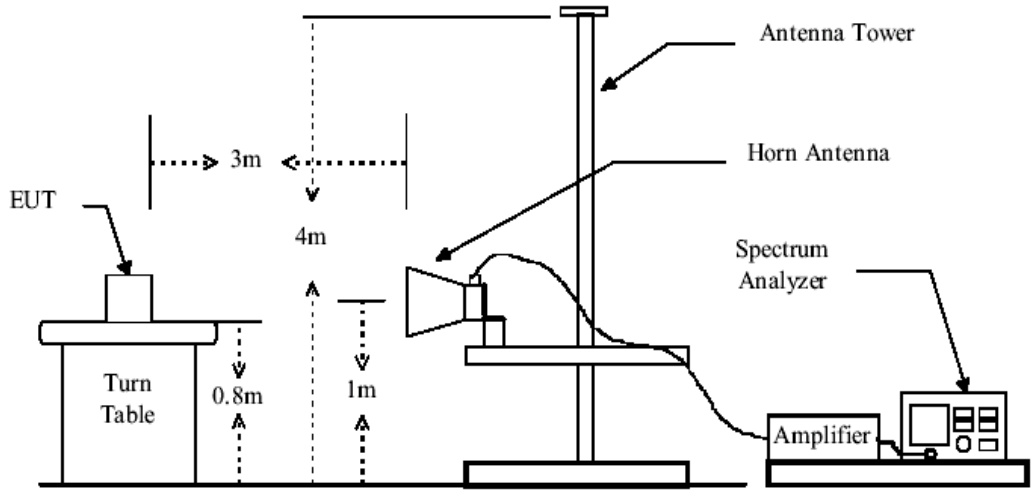


Figure 3. Above 1GHz radiated emissions test configuration

6.4 TEST RESULTS

1. Low Frequency 2402MHz

30MHz~1GHz Spurious Emissions .Quasi-Peak Measurement

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	45.2145	21.67	11.47	33.14	40.00	-6.86	Vertical
2	72.0841	22.42	7.83	30.25	40.00	-9.75	Vertical
3	90.2527	21.00	9.63	30.63	43.50	-12.87	Vertical
4	124.3284	18.02	8.77	26.79	43.50	-16.71	Vertical
5	181.1692	15.16	11.11	26.27	43.50	-17.23	Vertical
6	484.3664	19.12	19.94	39.06	46.00	-6.94	Vertical
7	45.7255	15.98	11.28	27.26	40.00	-12.74	Horizontal
8	87.7524	22.02	9.39	31.41	40.00	-8.59	Horizontal
9	110.4892	24.94	9.46	34.40	43.50	-9.10	Horizontal
10	181.1693	25.23	11.11	36.34	43.50	-7.16	Horizontal
11	199.3303	27.05	11.39	38.44	43.50	-5.06	Horizontal
12	376.1414	14.83	17.72	32.55	46.00	-13.45	Horizontal

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	1419.853	26.07	0.70	26.77	74.00	-47.23	Vertical
2	6590.377	26.84	9.81	36.65	74.00	-37.35	Vertical
3	8345.923	25.72	14.82	40.54	74.00	-33.46	Vertical
4	14887.552	26.64	17.34	43.98	74.00	-30.02	Vertical
5	16841.941	27.38	17.79	45.17	74.00	-28.83	Vertical
6	18339.191	27.27	18.97	46.24	74.00	-27.76	Vertical
7	1732.934	29.88	-0.14	29.74	74.00	-44.26	Horizontal
8	4833.869	29.35	5.14	34.49	74.00	-39.51	Horizontal
9	8820.898	26.73	15.27	42.00	74.00	-32.00	Horizontal
10	13102.111	26.23	19.88	46.11	74.00	-27.89	Horizontal
11	16354.515	25.92	17.96	43.88	74.00	-30.12	Horizontal
12	18997.023	27.56	18.54	46.10	74.00	-27.90	Horizontal

NOTE：

Above 1GHz, the tested values of Peak are lower than the correspondingly limited values of AVG.So don’t read the values of AVG.

The field strength is calculated by adding the Antenna Factor. Correct Factor.

The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Correct Factor

2. Middle Frequency 2440MHz

30MHz~1GHz Spurious Emissions .Quasi-Peak Measurement

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	39.2885	16.14	13.75	29.89	40.00	-10.11	Vertical
2	94.4029	22.53	9.79	32.32	43.50	-11.18	Vertical
3	239.9442	15.57	13.28	28.85	46.00	-17.15	Vertical
4	378.2611	20.52	17.76	38.28	46.00	-7.72	Vertical
5	481.6523	16.55	19.97	36.52	46.00	-9.48	Vertical
6	830.7362	10.43	25.27	35.70	46.00	-10.30	Vertical
7	43.9619	11.05	11.93	22.98	40.00	-17.02	Horizontal
8	77.1129	15.34	8.30	23.64	40.00	-16.36	Horizontal
9	100.9884	27.22	9.94	37.16	43.50	-6.34	Horizontal
10	110.4892	25.17	9.46	34.63	43.50	-8.87	Horizontal
11	192.7216	21.70	11.44	33.14	43.50	-10.36	Horizontal
12	484.3665	9.91	19.94	29.85	46.00	-16.15	Horizontal

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	1739.341	33.16	-0.14	33.02	74.00	-40.98	Vertical
2	7638.583	29.47	12.05	41.52	74.00	-32.48	Vertical
3	9673.351	26.74	15.96	42.70	74.00	-31.30	Vertical
4	13393.903	26.62	20.20	46.82	74.00	-27.18	Vertical
5	16841.941	26.78	17.79	44.57	74.00	-29.43	Vertical
6	18583.165	27.94	18.81	46.75	74.00	-27.25	Vertical
7	1732.934	28.99	-0.14	28.85	74.00	-45.15	Horizontal
8	4248.202	29.31	4.16	33.47	74.00	-40.53	Horizontal
9	9186.308	26.37	15.50	41.87	74.00	-32.13	Horizontal
10	13121.365	26.43	19.90	46.33	74.00	-27.67	Horizontal
11	13915.153	26.49	18.51	45.00	74.00	-29.00	Horizontal
12	16669.711	26.48	18.00	44.48	74.00	-29.52	Horizontal

NOTE：

Above 1GHz, the tested values of Peak are lower than the correspondingly limited values of AVG.So don’t read the values of AVG.

The field strength is calculated by adding the Antenna Factor. Correct Factor.

The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Correct Factor

3. High Frequency 2480MHz

30MHz~1GHz Spurious Emissions .Quasi-Peak Measurement

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	43.9619	14.31	11.93	26.24	40.00	-13.76	Vertical
2	93.3479	24.03	9.74	33.77	43.50	-9.73	Vertical
3	166.5241	14.62	10.58	25.20	43.50	-18.30	Vertical
4	378.2611	14.53	17.76	32.29	46.00	-13.71	Vertical
5	484.3665	15.34	19.94	35.28	46.00	-10.72	Vertical
6	961.4272	8.87	26.43	35.30	54.00	-18.70	Vertical
7	43.9619	11.07	11.93	23.00	40.00	-17.00	Horizontal
8	98.7437	23.52	9.97	33.49	43.50	-10.01	Horizontal
9	107.4279	24.54	9.62	34.16	43.50	-9.34	Horizontal
10	179.1446	24.99	11.02	36.01	43.50	-7.49	Horizontal
11	239.9442	21.26	13.28	34.54	46.00	-11.46	Horizontal
12	830.7362	8.55	25.27	33.82	46.00	-12.18	Horizontal

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement
Peak Measurement:

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	1419.853	27.05	0.70	27.75	74.00	-46.25	Vertical
2	5500.278	29.44	6.57	36.01	74.00	-37.99	Vertical
3	8438.826	26.31	15.03	41.34	74.00	-32.66	Vertical
4	11684.195	25.49	17.42	42.91	74.00	-31.09	Vertical
5	13140.647	25.43	19.91	45.34	74.00	-28.66	Vertical
6	16306.555	27.60	17.87	45.47	74.00	-28.53	Vertical
7	1732.934	28.59	-0.14	28.45	74.00	-45.55	Horizontal
8	4710.608	28.67	5.01	33.68	74.00	-40.32	Horizontal
9	9566.856	27.39	15.89	43.28	74.00	-30.72	Horizontal
10	13354.625	26.06	20.15	46.21	74.00	-27.79	Horizontal
11	14887.552	26.47	17.34	43.81	74.00	-30.19	Horizontal
12	16499.243	26.69	18.21	44.90	74.00	-29.10	Horizontal

NOTE：
Above 1GHz, the tested values of Peak are lower than the correspondingly limited values of AVG.So don’t read the values of AVG.
The field strength is calculated by adding the Antenna Factor. Correct Factor.
The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading + Correct Factor

Remark:

1). No any other emissions level which are attenuated less than 20dB below the limit. According to 15.31(o), The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this Part.

Hence there no other emissions have been reported.

2). As shown in Section, for frequencies above 1000 MHz. the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

3). The test only perform the EUT in transmitting status since the test frequencies were over 1GHz only required transmitting status.

Test result: The unit does meet the requirements.

7. 6dB BANDWIDTH TESTING

7.1 LIMITS

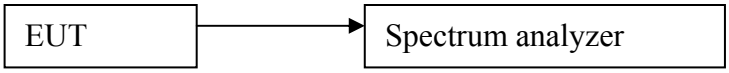
Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

7.2 TEST PROCEDURES

Test procedures follow ANSI C63.4:2009 and KDB 558074 D01 DTS Measurement Guidance v03r01.

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. Set resolution bandwidth (RBW) = 100kHz.Set the video bandwidth (VBW) ≥ 3 x RBW. Detector = Peak. Trace mode = max hold. Sweep = auto couple. Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Compare the resultant bandwidth with the RBW setting of the analyzer.
5. Repeat above procedures until all frequencies measured were complete.

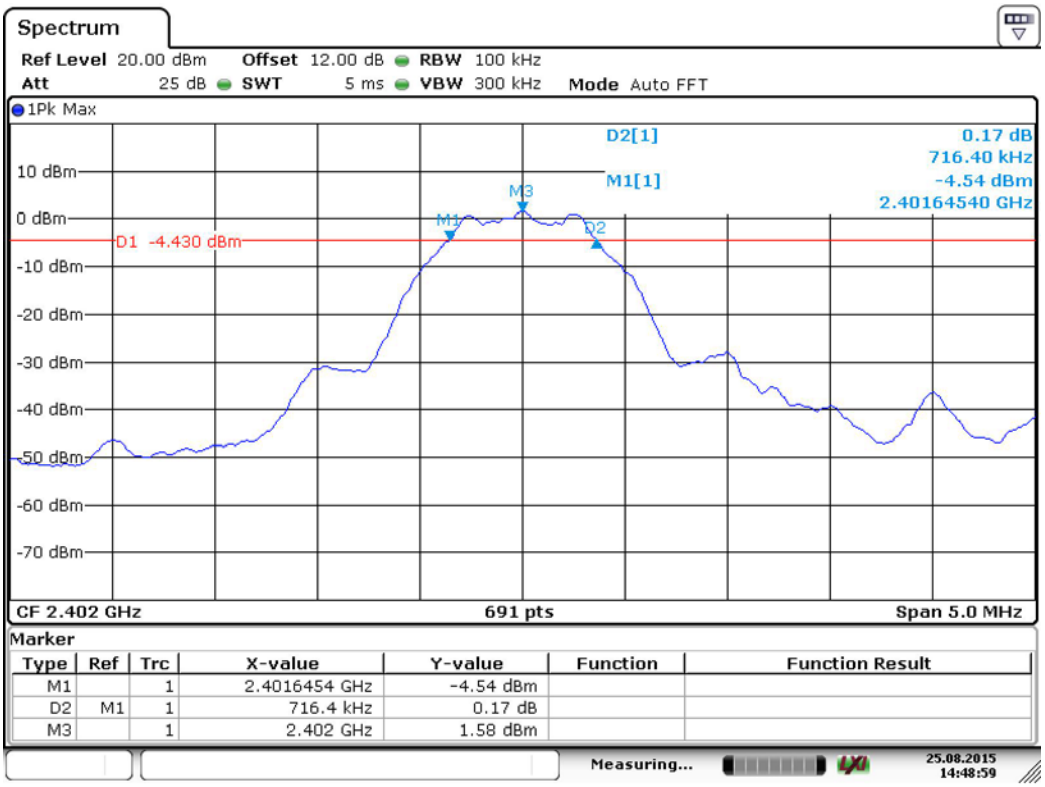
7.3 TEST SETUP



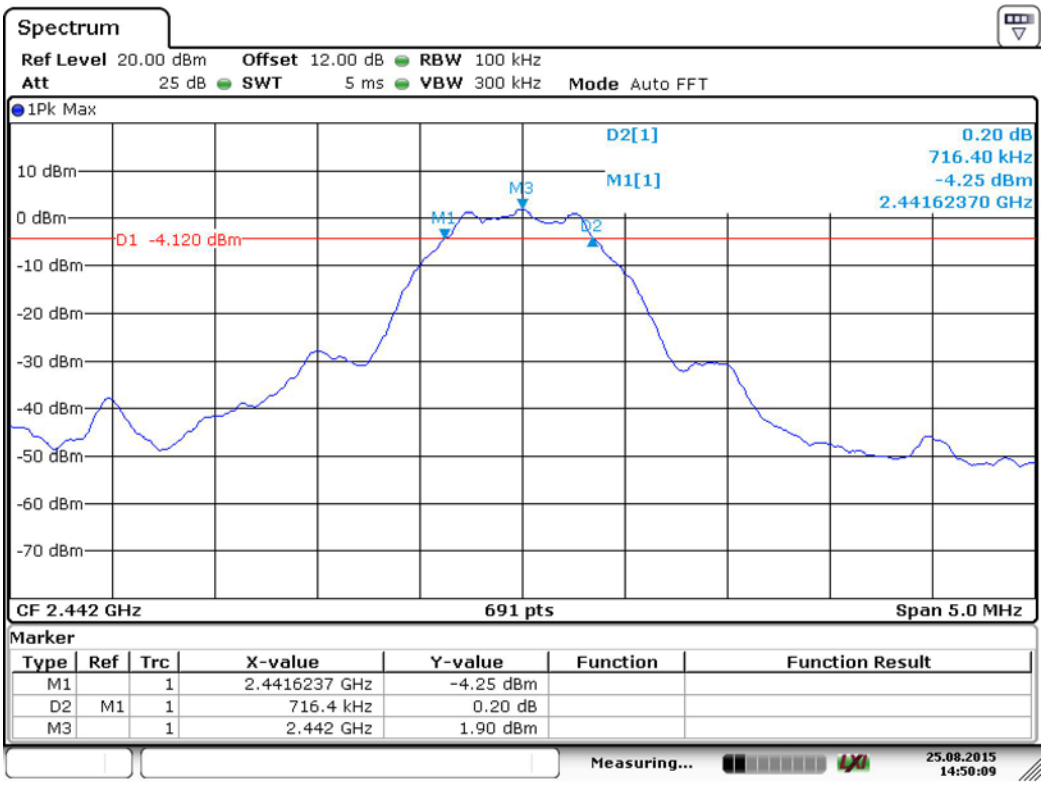
7.4 TEST RESULTS

Channel	Channel Frequency (MHz)	6dB Bandwidth (KHz)	Limit (kHz)
Low Channel	2402	716.40	＞500
Middle Channel	2442	716.40	＞500
High Channel	2480	716.40	＞500

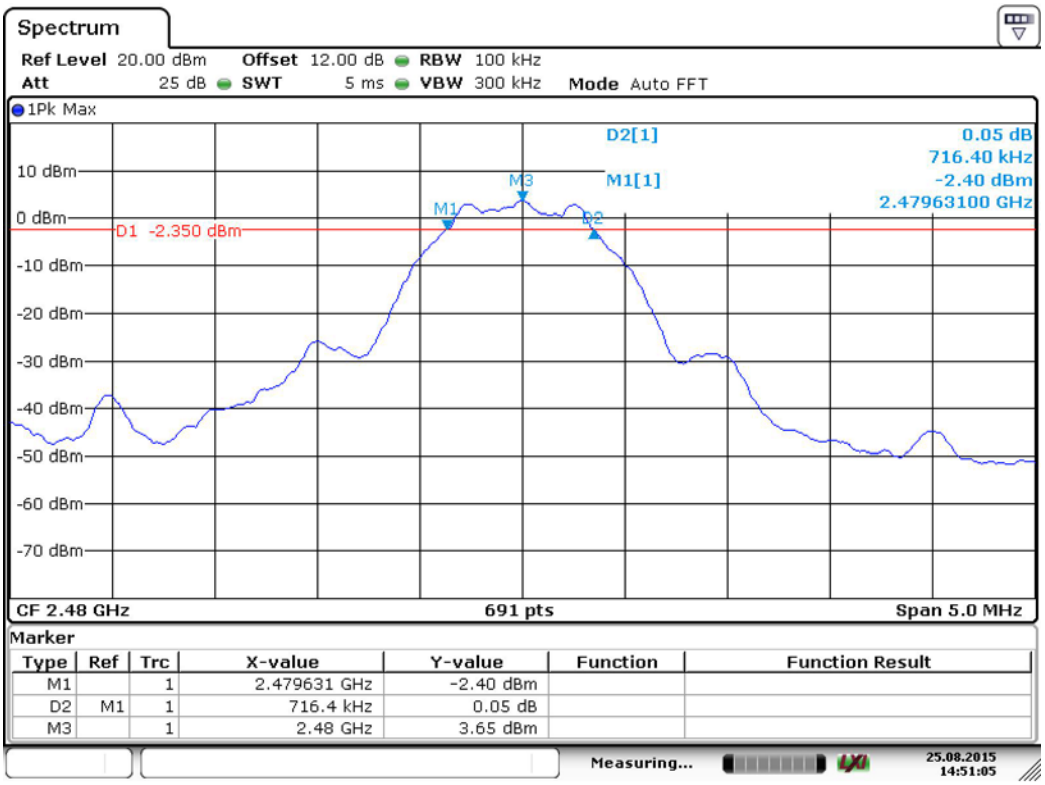
Channel 0 2402MHz



Channel 22 2442MHz



Channel 39 2480MHz



8. MAXIMUM PEAK OUTPUT POWER

8.1 LIMITS

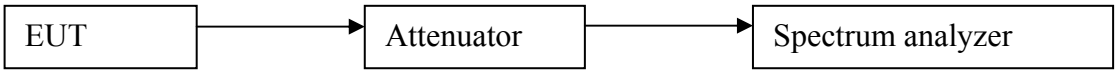
The maximum Peak output power measurement is 1W

8.2 TEST PROCEDURES

Test procedures follow KDB 558074 D01 DTS Measurement Guidance v03r01.

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to an EMI Test Receiver.
3. The spectrum analyzer resolution bandwidth that is ≤EBW. So we test the Maximum Conducted Output Power
4. Set the analyzer span≥ 1.5 x DTS bandwidth. Set the RBW = 3 MHz. Set the VBW ≥ 3 MHz. Sweep time = auto couple. Detector = peak. Allow trace to fully stabilize.

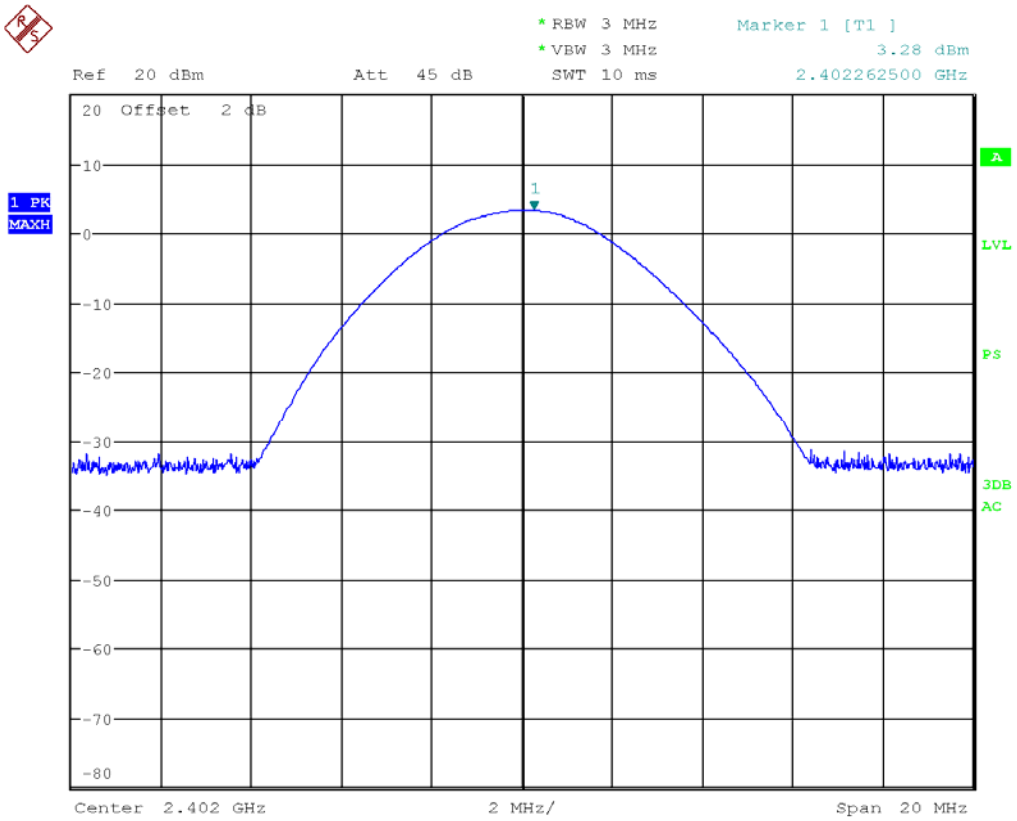
8.3 TEST SETUP



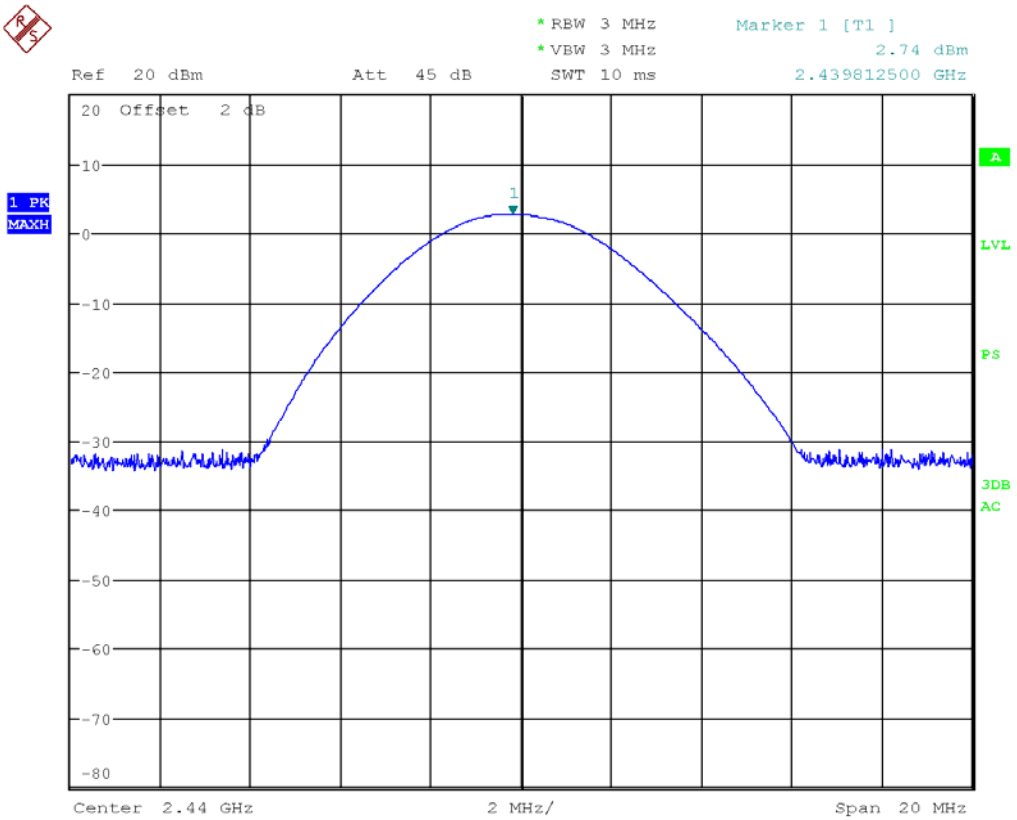
8.4 TEST RESULTS

Test Channel	Fundamental Frequency (GHz)	Max Output Power(dBm)	Limit (dBm)	Pass/Fail
Lowest	2.402	3.28	30.0	**Pass**
Middle	2.440	2.74	30.0	**Pass**
Highest	2.480	2.98	30.0	**Pass**

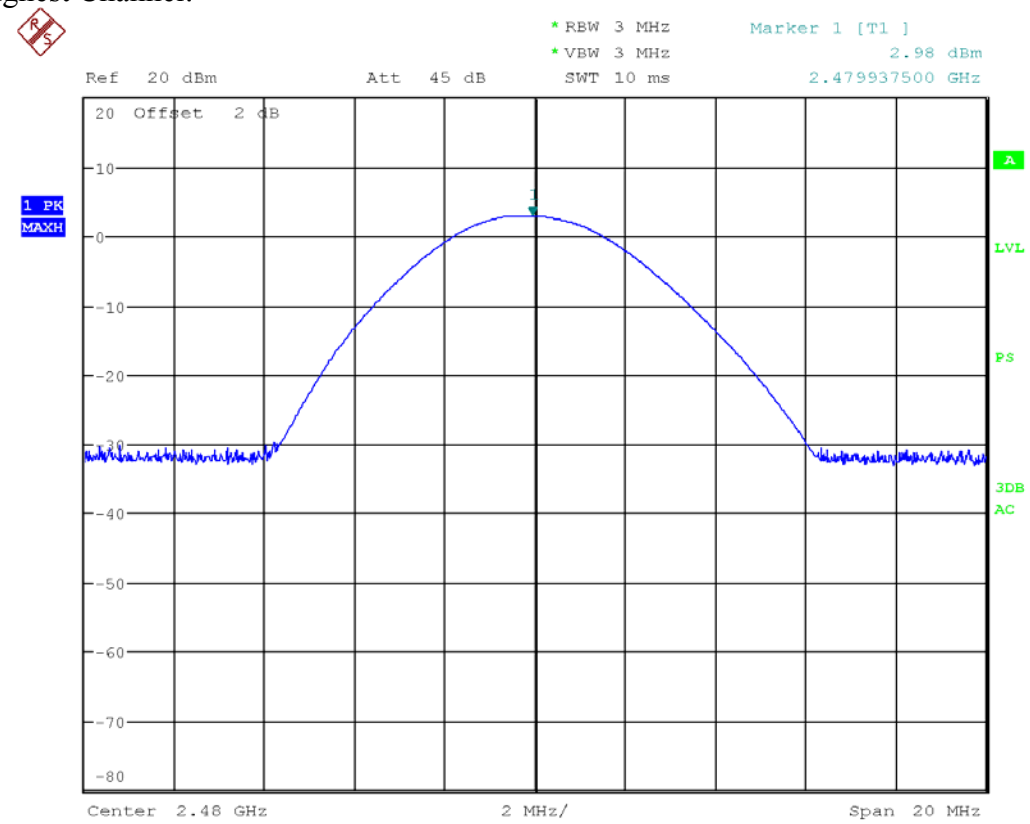
GFSK Lowest Channel:



GFSK Middle Channel:



GFSK Highest Channel:



9. POWER SPECTRAL DENSITY

9.1 LIMITS

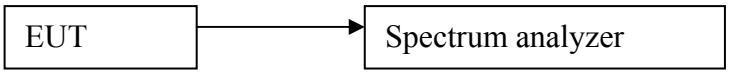
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

9.2 TEST PROCEDURES

Test procedures follow KDB 558074 D01 DTS Measurement Guidance v03r01.

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 was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the analyzer span to 1.5 times the DTS bandwidth. Set the RBW = 3 kHz. Set the VBW ≥3 RBW. Detector = peak. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW (use of a greater number of measurement points than this minimum requirement is recommended).
4. Repeat above procedures until all frequencies measured were complete.

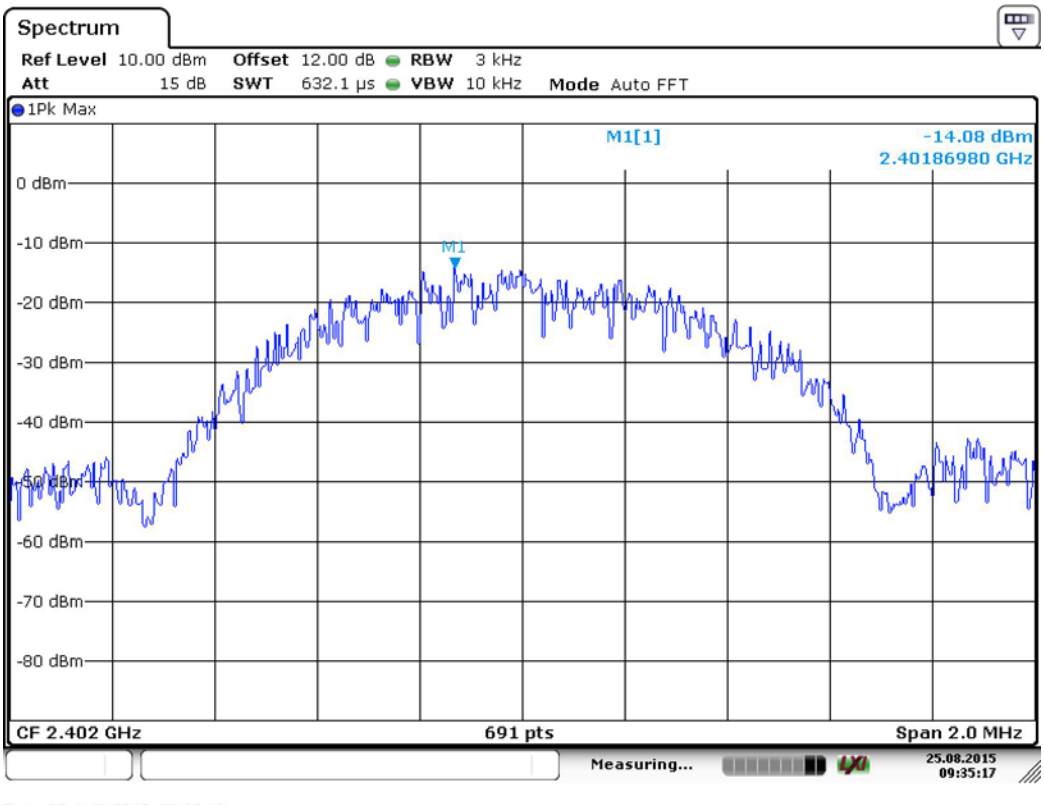
9.3 TEST SETUP



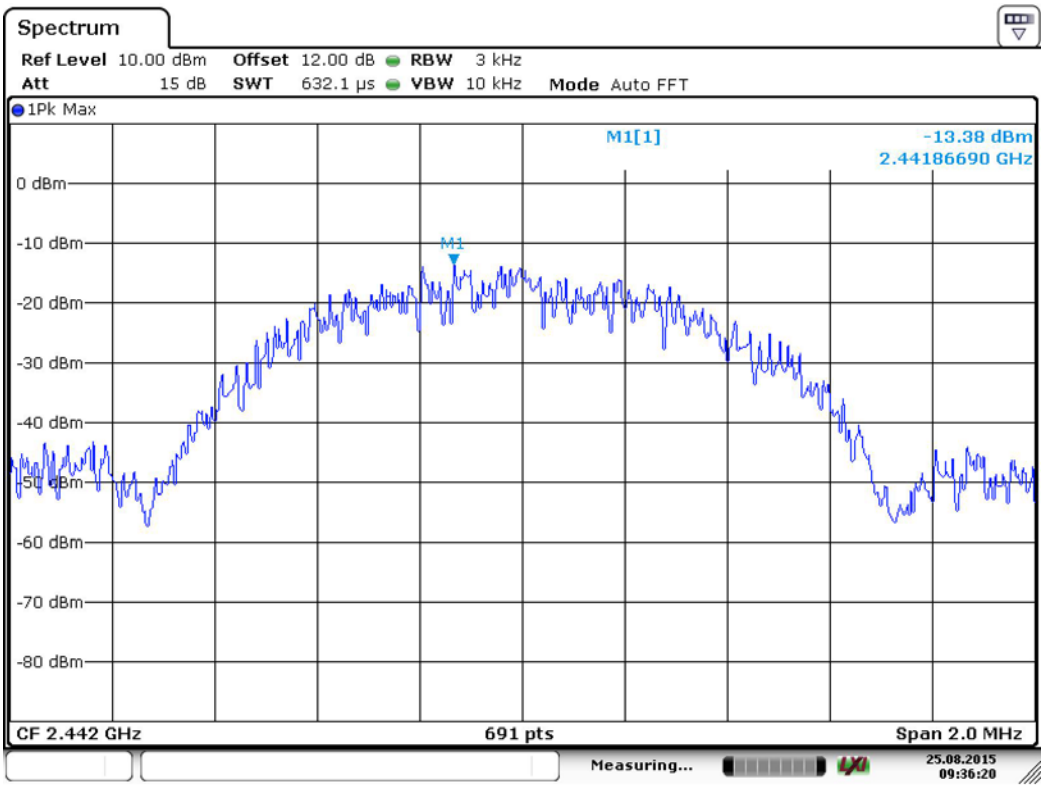
9.4 TEST RESULTS

Channel No.	Frequency (MHz)	Mode	PSD (dBm/3KHz)	Limit	Result
0	2402	BLE	-14.08	8dBm/3KHz	Pass
19	2441		-13.38		Pass
39	2480		-13.12		Pass

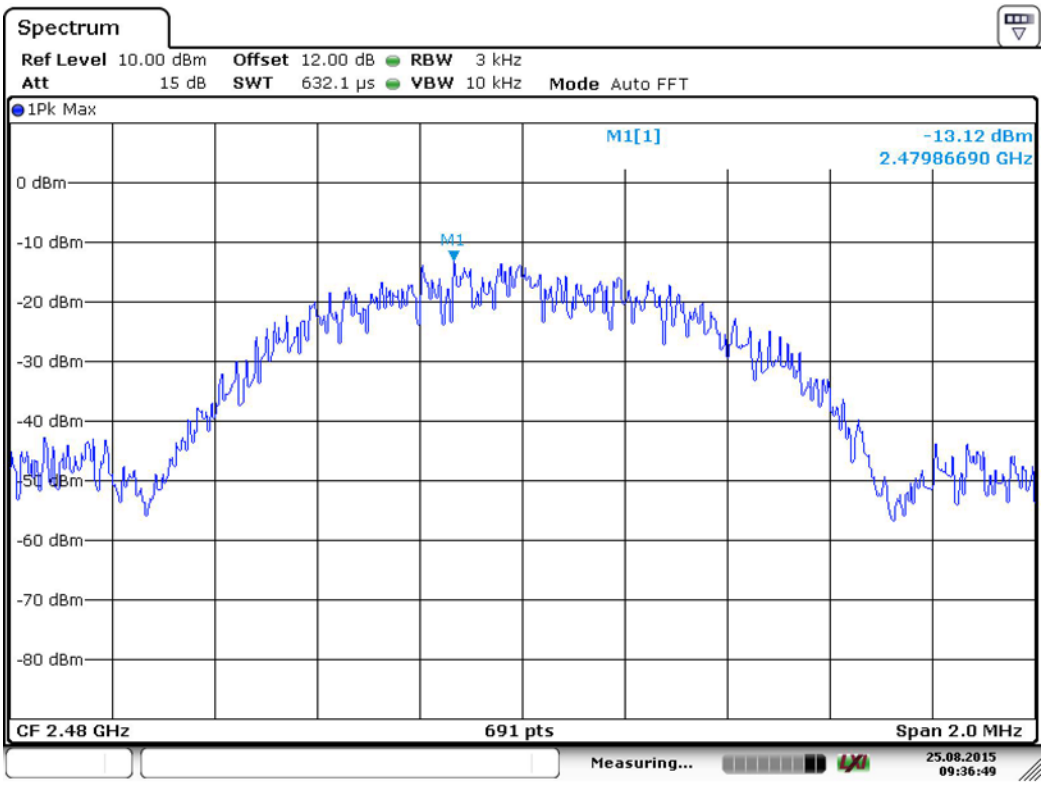
Channel 0 2402MHz



Channel 19 2440MHz



Channel 39 2480MHz



10. EMISSIONS IN RESTRICTED FREQUENCY BANDS

10.1 LIMITS

The DTS rules specify that emissions which fall into restricted frequency bands shall comply with the general radiated emission limits..

10.2 TEST PROCEDURES

Test procedures follow KDB 558074 D01 DTS Meas Guidance v03r01.

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 its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the analyzer span to encompass the entire unwanted emission bandwidth above the measurement system noise level.
4. When Detector = peak, Set the RBW = 1 MHz. Set the VBW ≥ 3 MHz. Ensure that the number of measurement points in the sweep ≥ 2 x (span/RBW). Set sweep time = auto couple.When Detector = average. Set the RBW = 1 MHz. Set the VBW =10Hz. Ensure that the number of measurement points in the sweep ≥ 2 x (span/RBW). Set sweep time = auto couple. Employ trace averaging over a minimum of 100 traces.
5. Use the peak marker function to determine the maximum average power level in any 1 MHz of the unwanted emission.
6. Repeat above procedures until all measured frequencies were complete.

10.3 TEST SETUP

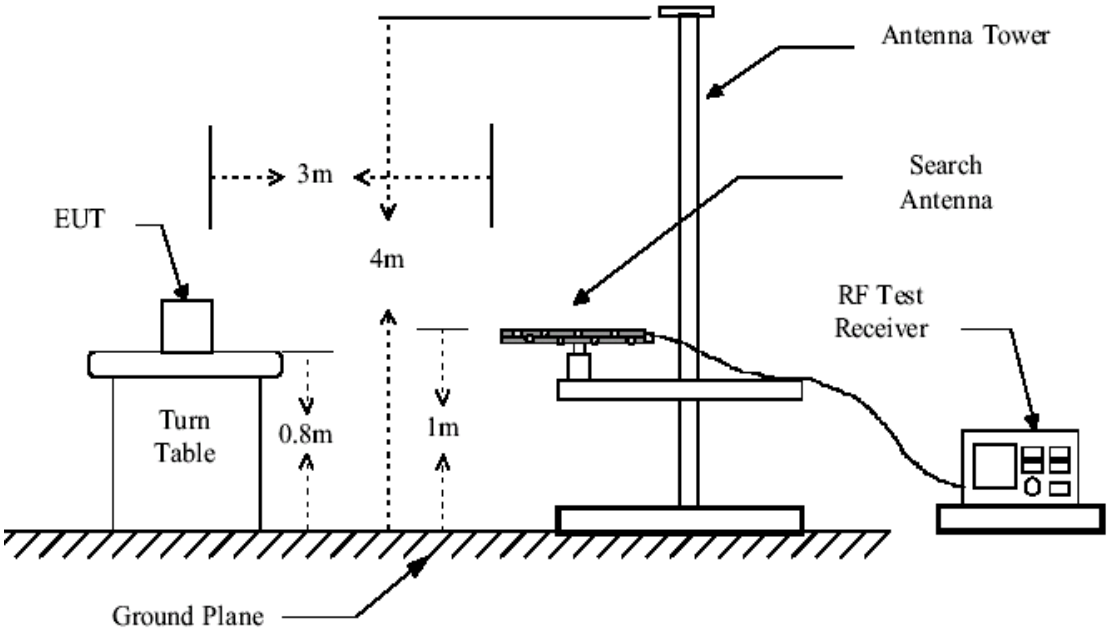


Figure 1. 30MHz to 1GHz radiated emissions test configuration

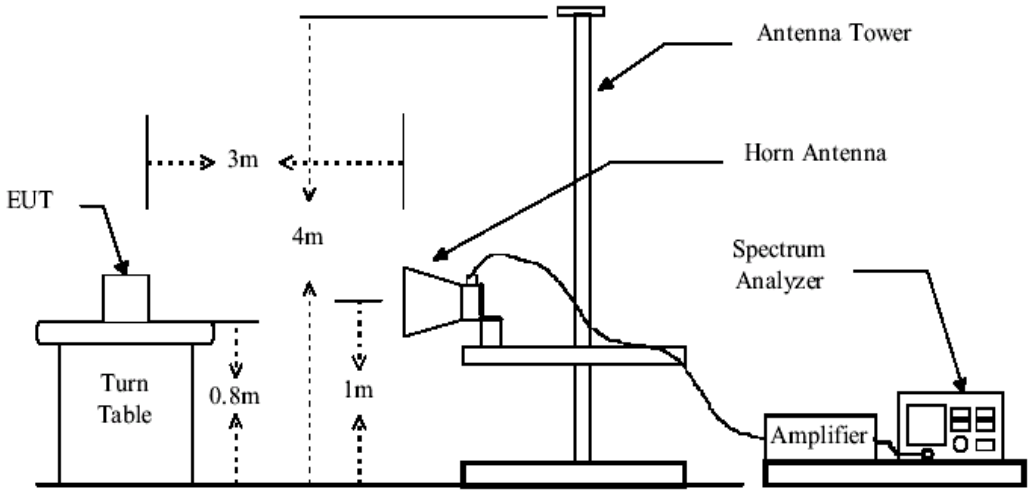


Figure 2. Above 1GHz radiated emissions test configuration

10.4 TEST RESULTS

Channel Low

No.	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2310.000	26.41	0.43	26.84	74.00	-47.16	peak	VERTICAL
2	2390.000	27.49	0.55	28.04	74.00	-45.96	peak	VERTICAL
3	2310.000	14.94	0.43	15.37	54.00	-38.63	AVG	VERTICAL
4	2390.000	15.71	0.55	16.26	54.00	-37.74	AVG	VERTICAL
1	2310.000	26.41	0.43	26.84	74.00	-47.16	peak	HORIZONTAL
2	2390.000	27.19	0.55	27.74	74.00	-46.26	peak	HORIZONTAL
3	2310.000	14.78	0.43	15.21	54.00	-38.79	AVG	HORIZONTAL
4	2390.000	15.34	0.55	15.89	54.00	-38.11	AVG	HORIZONTAL

Channel High

No.	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2483.500	28.13	0.61	28.74	74.00	-45.26	peak	VERTICAL
2	2500.000	26.31	0.62	26.93	74.00	-47.07	peak	VERTICAL
3	2483.500	16.45	0.61	17.06	54.00	-36.94	AVG	VERTICAL
4	2500.000	15.50	0.62	16.12	54.00	-37.88	AVG	VERTICAL
1	2483.500	27.02	0.61	27.63	74.00	-46.37	peak	HORIZONTAL
2	2500.000	26.79	0.62	27.41	74.00	-46.59	peak	HORIZONTAL
3	2483.500	15.85	0.61	16.46	54.00	-37.54	AVG	HORIZONTAL
4	2500.000	15.54	0.62	16.16	54.00	-37.84	AVG	HORIZONTAL

Remark: Max field strength in 3m distance. No any other emission which falls in restricted bands can be detected and be reported.

11. BAND-EDGE MEASUREMENTS

11.1 LIMITS

FCC 15.247(d) & 15.209

11.2 TEST PROCEDURES

Test procedures follow KDB 558074 D01 DTS Measurement Guidance v03r01.

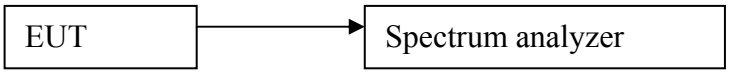
Remove the antenna from the EUT and then connect a low attenuation cable from the antenna port to the spectrum.

1. Reference level measurement

Below 1GHz Set the spectrum analyzer: RBW =100KHz VBW >= 3*RBW, Set the span to ≥ 1.5 times the DTS bandwidth. Sweep = auto; Detector Function = peak. Trace = Max-hold. Allow the trace to stabilize.

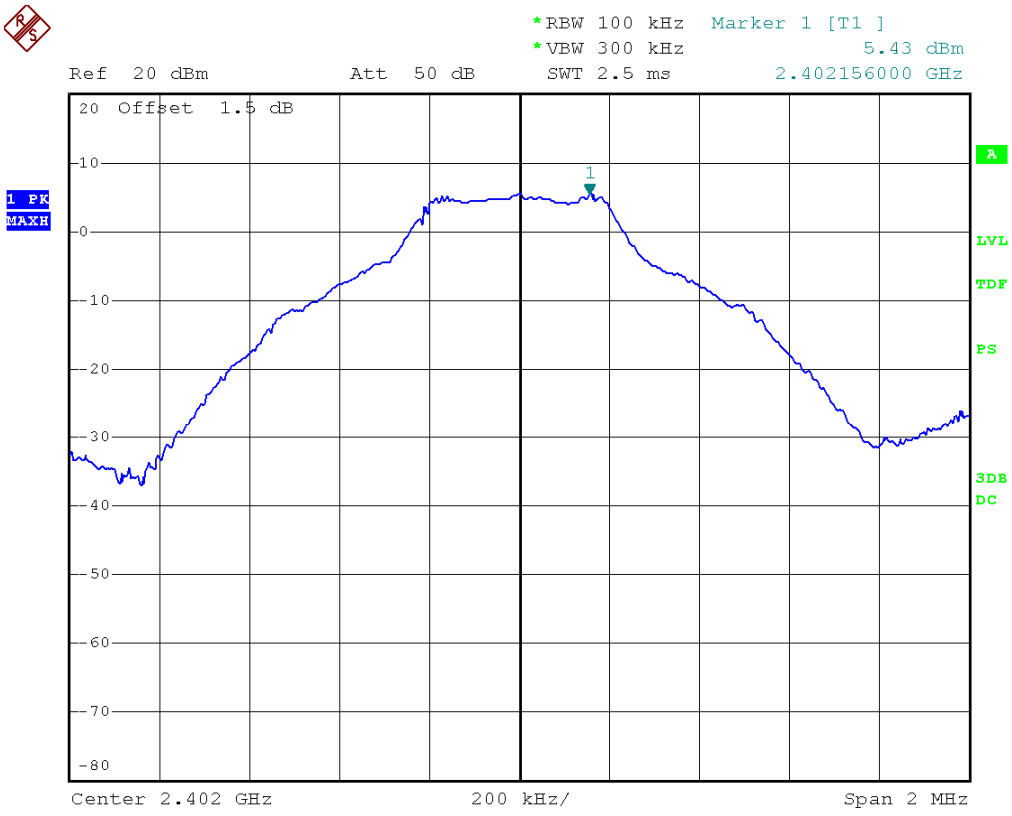
2. Set the spectrum analyzer: RBW =100KHz VBW >= 3*RBW, Set the span to ≥ 1.5 times the DTS bandwidth. Sweep = auto; Detector Function = peak. Trace = Max-hold. Allow the trace to stabilize.

11.3 TEST SETUP

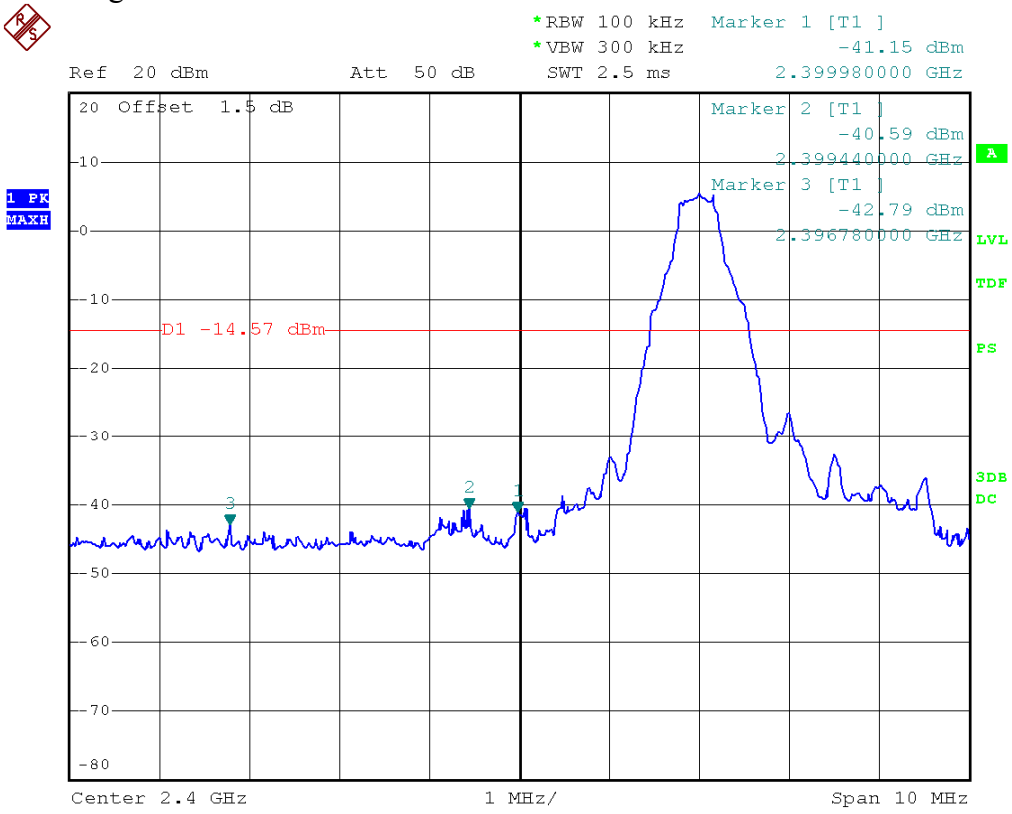


11.4 TEST RESULTS

Channel 0 2402MHz
reference level：

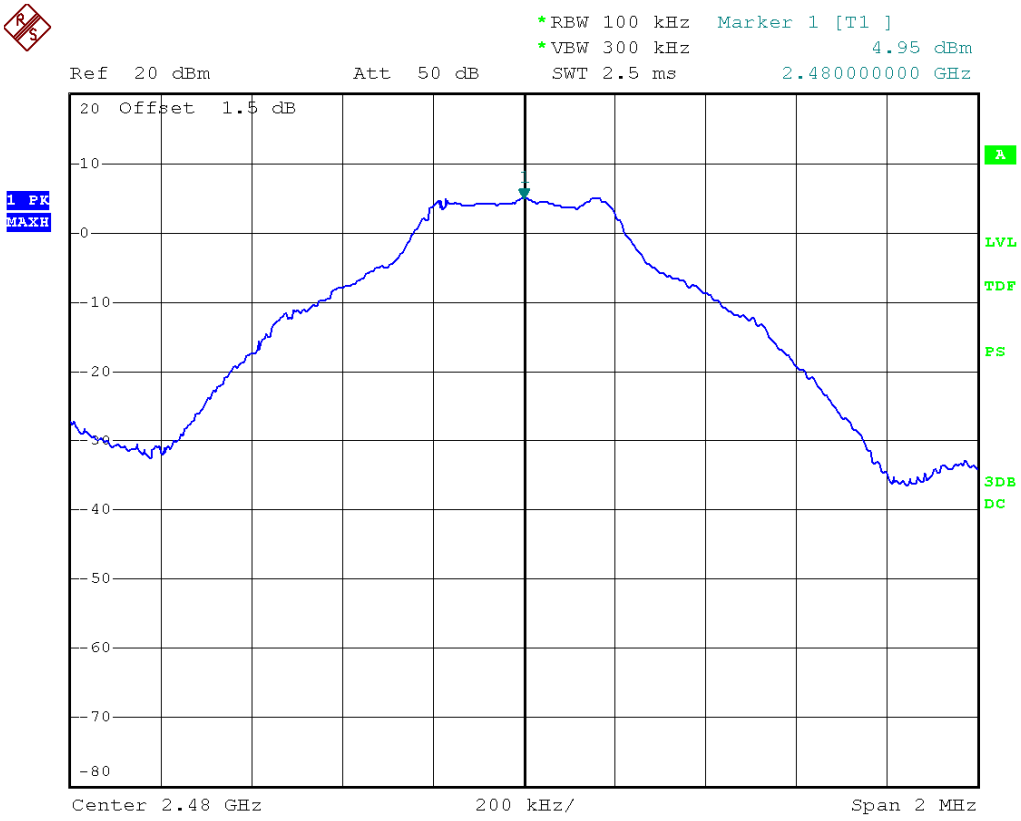


Band edge:

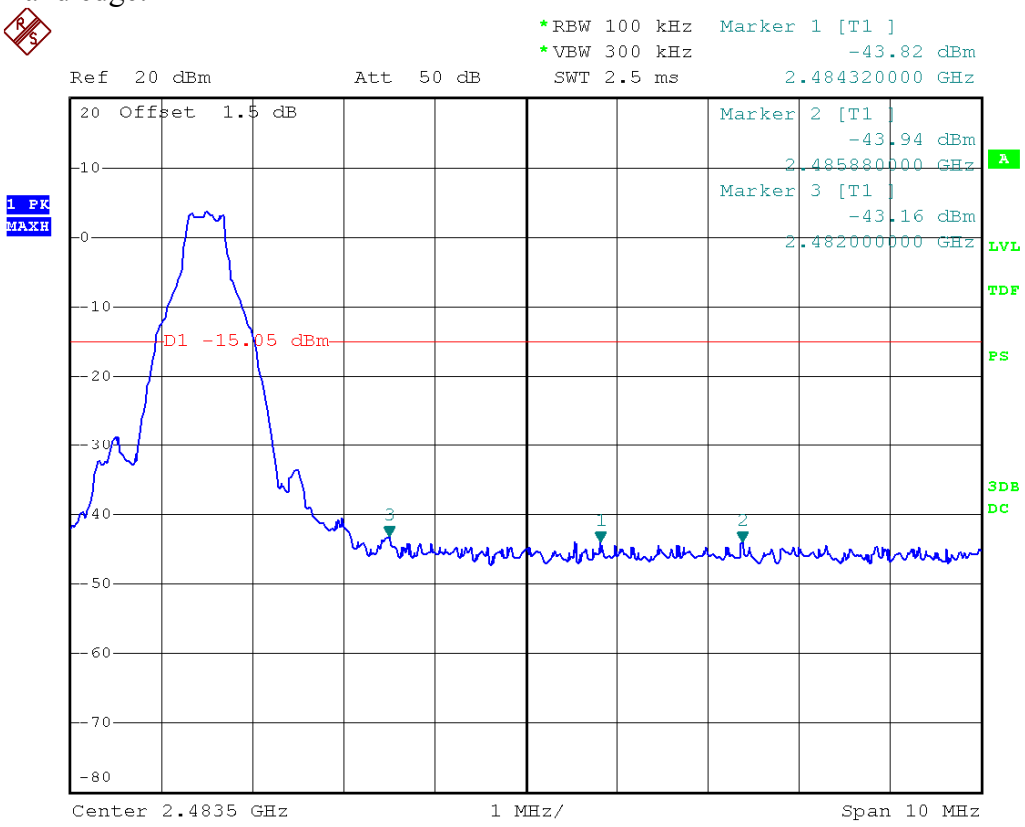


Channel 39 2480MHz

reference level：



Band edge:



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