

FCC PART 15.249
EMI MEASUREMENT AND TEST REPORT
For

Boostnatics
808 McPhaul St, Austin, TEXAS,USA

FCC ID:2AG5JBTSV01

Trade:N/A

This Report Concerns: Original Report	Equipment Type: turbo speaker
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Report No.:	BSL20160106-1
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1. GENERAL INFORMATION

1.1. Report information

- 1.1.1. This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that BSL approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that BSL in any way guarantees the later performance of the product/equipment.
- 1.1.2. The sample/s mentioned in this report is/are supplied by Applicant, BSL therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.
- 1.1.3. Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through BSL, unless the applicant has authorized BSL in writing to do so.

Test Facility -

FCC – Registration No.: 934118

Shenzhen SEM.Test Technology 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 and the Registration is 934118.

1.2. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	+/-2.88dB
2	RF Power, Conducted	+/-0.20dB
3	Spurious emissions, conducted	+/-0.33dB
4	All emissions, radiated (<1G)	+/-5.10dB
5	All emissions, radiated (>1G)	+/-5.10dB
6	Temperature	+/-0.5°CdB
7	Humidity	+/-2%

2. PRODUCT DESCRIPTION

2.1. EUT Description

Description	:	turbo speaker
Applicant	:	Boostnatics 808 McPhaul St, Austin, TEXAS,USA
Manufacturer	:	Wenzhou Tany Light Industry Electronic CO., Ltd No.23,EXing RD,Ehu industry Area, South BaiXiang, Wenzhou,Zhejiang,China
Model Number	:	BTSV01
Modulation type	:	GFSK
Antenna gain	:	0dBi
BT version	:	V4.0 (no Support EDR and BLE Because of the firmware limitation)
Antenna type	:	PCB Antenna
Frequency	:	2402-2480MHz
Number of Channels	:	79 Channels
Power Supply	:	DC 3.7V Battery
Hardware version	:	main PCB V05,BT PCB V1.0
Software version	:	V1
Serial Number	:	20161006

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

2.2. Block Diagram of EUT Configuration

Radiated test :



Conducted test:

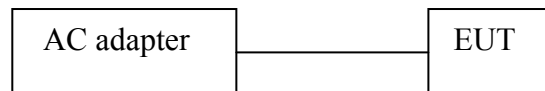


Figure 1 EUT Setup

2.3. Support Equipment List

Name	Model No	S/N	Manufacturer	Used (Y/N)
AC adapter	GEO101U-050100W	-	I.T.E	Y
-	-	-	-	-

2.4. Test Conditions

It must provide an operational voltage (3.7V DC by Battery) to turn on the turbo speaker and on one certain channel in service mode by means of company proprietary software.

the test software name: CSR8615 test Software.

After the preliminary test, we found to emit the worst emissions and therefore had been tested under operating condition.

during the test the eut use the fully-charged battery

The EUT Themselves can enter the test mode.

Power setting parameters For mode:

GFSK (PK Power:0dbm).

For the EUT was tested with Channel Frequency 2402MHz, 2440MHz and 2480MHz.

3. TEST RESULTS SUMMARY

FCC 15 Subpart C, Paragraph 15.249:2015

FCC Rules	Description of Test	Result
Section 15.207	Conducted Emission	Compliant
Section 15.249(a)	The fundamental field strength and the harmonics	Compliant
Section 15.209 Section 15.249(d)	Radiated Emission	Compliant
Section 15.249(d)	Band Edge	Compliant
Section 15.203	Antenna Requirement	Compliant
Section 15.249	20dB Bandwidth	Compliant

Remark: "N/A" means "Not applicable".

Statement: All testing was performed using the test procedures found in ANSI C63.4-2003.

Modifications

No modification was made.

4. TEST EQUIPMENT USED

EQUIPMENT/FACILITIES	MANUFACTURER	MODEL	SERIAL NO.	DATE OF CAL.	CAL. INTERVAL
Spectrum Analyzer	Rohde & Schwarz	FSP	836079/035	2015-06-17	1 Year
EMI Test Receiver	Rohde & Schwarz	ESCI	101611	2015-05-07	1 Year
EMI Test Receiver	Rohde & Schwarz	ESPI7	101391	2015-07-30	1 Year
L.I.S.N.	SCHWARZBECK	NSLK8126	8126-224	2015-05-07	1 Year
Pulse Limiter	ROHDE&SCHWARZ	ESH3-Z2	100919	2015-05-07	1 Year
Pre-Amplifier	HP	8447F OPT H64	3113A06724	2015-05-07	1 Year
Pre-Amplifier	Compliance Direction	PAP-1G18	2002	2015-05-07	1 Year
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-635	2015/08/01	1 Year
Low Loss Coaxial Cable	SCHWARZBECK	AK 9513	9513-13	2015/08/01	1 Year
Positioning Controller	YOU CHERNG CO	EM1000	10001MT04	2015/08/01	1 Year
Horn Antenna	ETS	3117	00086197	2015-06-17	1 Year
Horn Antenna	ETS	3116B	00088203	2015-06-17	1 Year
Loop Antenna	Schwarz beck	FMZB 1516	9773	2015-06-17	1 Year
Cable	PUTIANLE	Ant Cable	Cable 1	2015-07-30	1 Year
Cable	PUTIANLE	Amp Cable	Cable 2	2015-07-30	1 Year
Cable	PUTIANLE	Receiver Cable	Cable 3	2015-07-30	1 Year
Cable	PUTIANLE	L.I.S.N. Cable	Cable 4	2015-07-30	1 Year

5. ANTENNA REQUIREMENT

5.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.

5.2. Antenna Connected Construction

According to § 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The antenna used for this product is a PCB ANT .The antenna is permanently attached. Refer to the product photo.

5.3. Result

Compliance

6. CONDUCTED POWER LINE TEST

6.1. Test Equipment

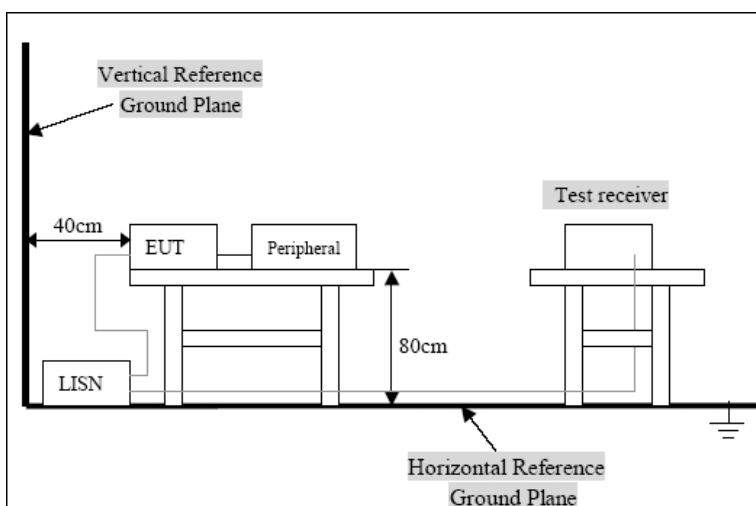
Please refer to section 4 this report.

6.2. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uh coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uh coupling impedance with 50ohm termination.

Both sides of A.C. Line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ASIN C63.4:2003 on conducted measurement. Conducted emissions were measured over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

6.3. Test Setup



For the actual test configuration, Please refer to the related items-Photos of testing

6.4. Conducted Power line Emission Limits

FCC Part 15 Paragraph 15.207 (dBuV)		
Frequency Range (MHZ)	Class A QP/AV	Class B QP/AV
0.15-0.5	79/66	65-56/56-46
0.5-5.0	73/60	56-46
5.0-3.0	73/60	60-50

Note: In the above table, the tighter limit applies at the band edges.

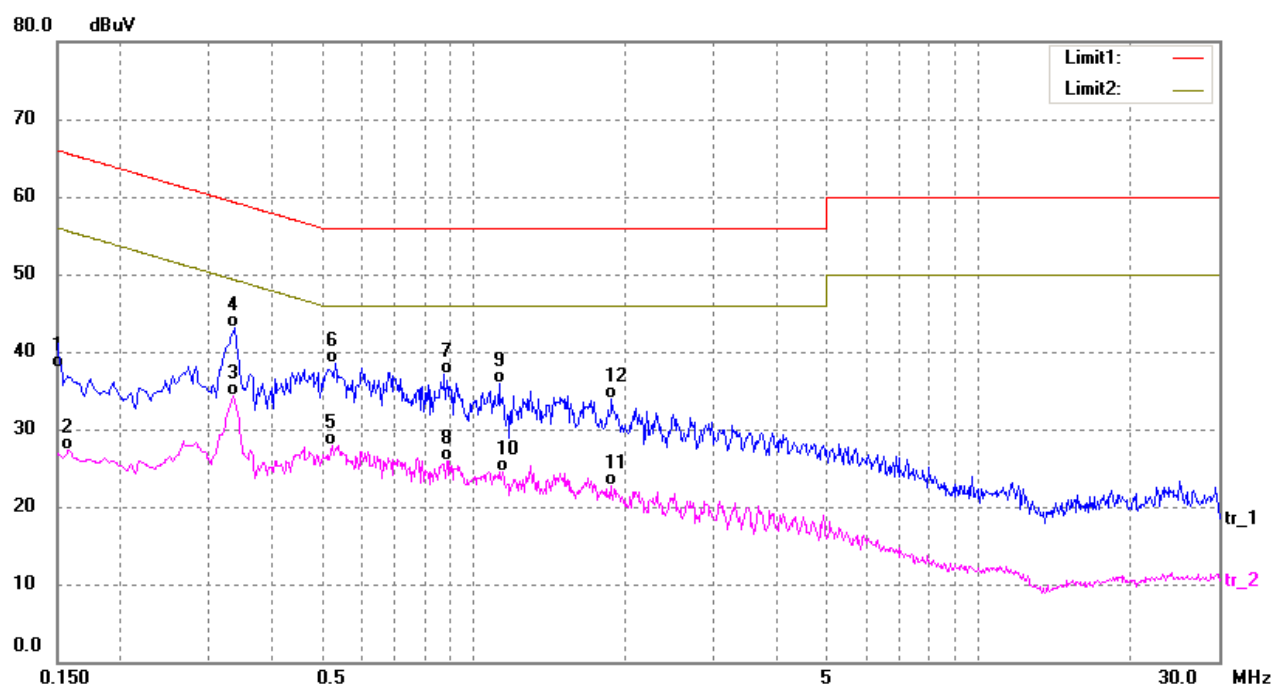
6.5. Conducted Power Line Test Result

Pass

2402MHz Transmitting(Worst case mode)

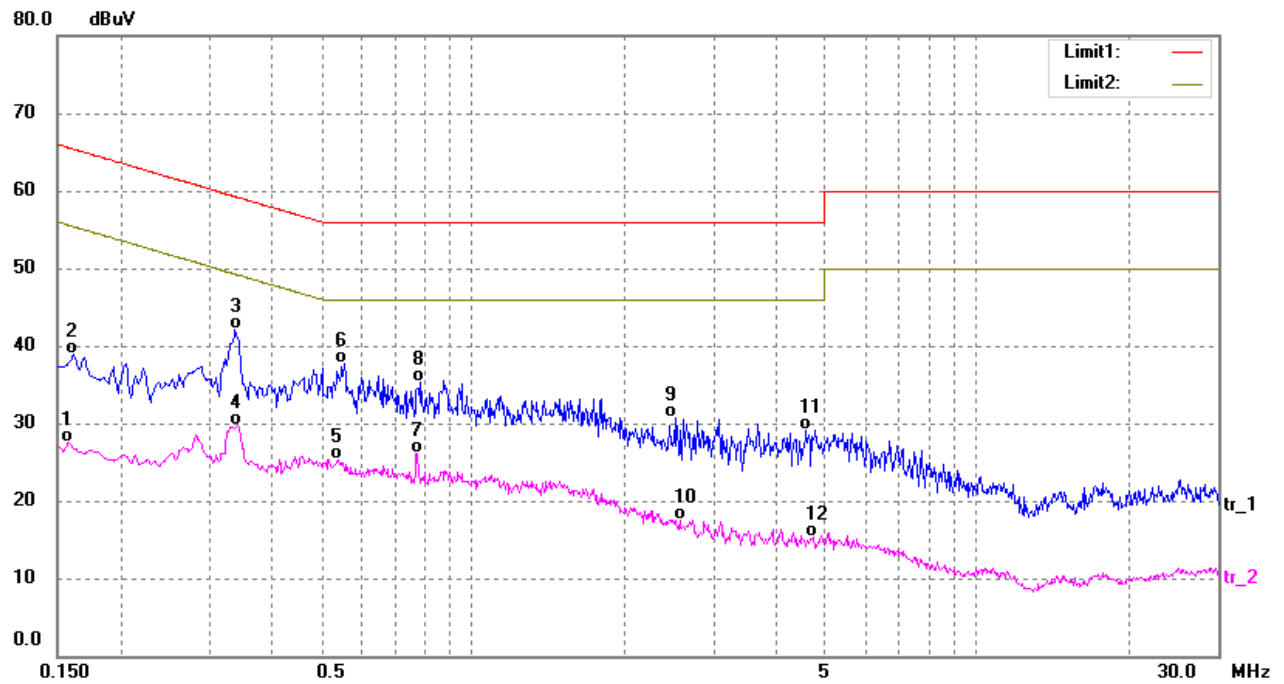
power test voltage:AC 120V/60Hz

Phase:L



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1524	25.41	12.50	37.91	65.86	-27.95	QP
2	0.1580	14.84	12.50	27.34	55.56	-28.22	AVG
3*	0.3339	21.82	12.50	34.32	49.35	-15.03	AVG
4	0.3379	30.52	12.50	43.02	59.25	-16.23	QP
5	0.5260	15.43	12.53	27.96	46.00	-18.04	AVG
6	0.5340	26.05	12.53	38.58	56.00	-17.42	QP
7	0.8780	24.14	12.88	37.02	56.00	-18.98	QP
8	0.8860	13.04	12.89	25.93	46.00	-20.07	AVG
9	1.1260	23.00	13.00	36.00	56.00	-20.00	QP
10	1.1420	11.54	13.00	24.54	46.00	-21.46	AVG
11	1.8700	9.64	13.00	22.64	46.00	-23.36	AVG
12	1.8860	20.89	13.00	33.89	56.00	-22.11	QP

Phase:N



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1580	15.01	12.50	27.51	55.56	-28.05	AVG
2	0.1620	26.32	12.50	38.82	65.36	-26.54	QP
3*	0.3379	29.59	12.50	42.09	59.25	-17.16	QP
4	0.3420	17.25	12.50	29.75	49.15	-19.40	AVG
5	0.5420	12.67	12.54	25.21	46.00	-20.79	AVG
6	0.5580	25.13	12.56	37.69	56.00	-18.31	QP
7	0.7780	13.34	12.78	26.12	46.00	-19.88	AVG
8	0.7900	22.60	12.79	35.39	56.00	-20.61	QP
9	2.5140	17.62	13.00	30.62	56.00	-25.38	QP
10	2.5780	4.56	13.00	17.56	46.00	-28.44	AVG
11	4.5739	16.18	13.00	29.18	56.00	-26.82	QP
12	4.7420	2.33	13.00	15.33	46.00	-30.67	AVG

7. RADIATED EMISSION TEST

7.1. Test Equipment

Please refer to section 4 this report.

7.2. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level.

Calibrated Loop antenna is used as receiving antenna for frequencies below 30MHz, Calibrated Bilog antenna is used as receiving antenna for frequencies between 30 MHz and 1 GHz, Calibrated Horn antenna is used as receiving antenna for frequencies above 1000MHz. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.4: 2003 on radiated emission measurement.

The bandwidth of test receiver is set at 9kHz in below 30MHz. and set at 120kHz in 30-1000MHz, and 1MHz in above 1000MHz.

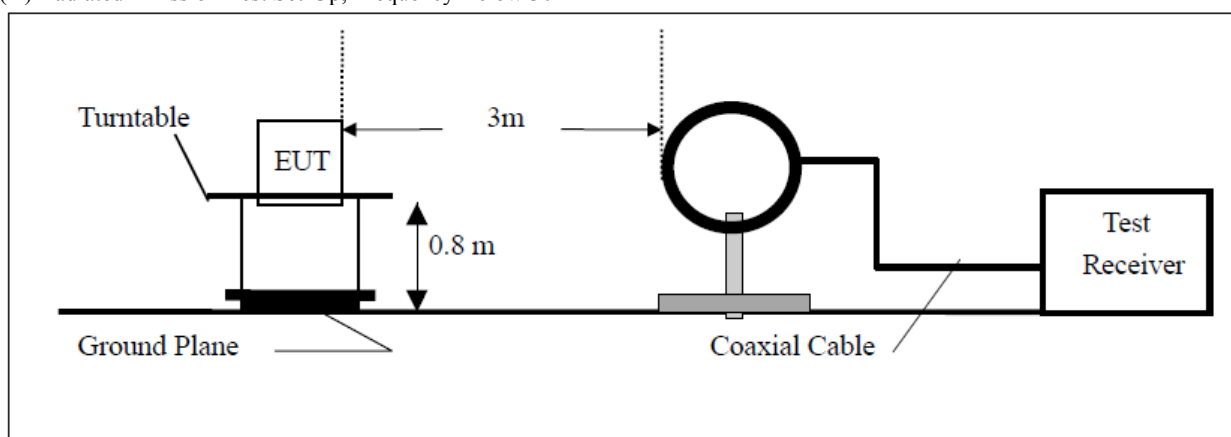
The frequency range from 9kHz to 25GHz is checked.

The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Peak detector and Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.

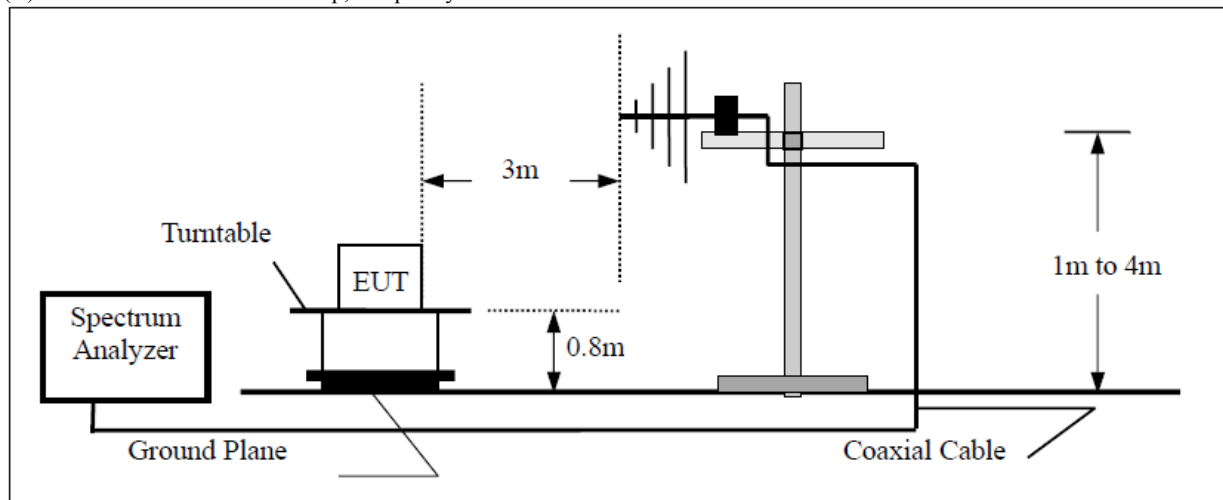
Through three orthogonal axes to determine which attitude and equipment arrangement produces the highest emission relative to the limit. And X direction is worst mode.

7.3. Radiated Test Setup

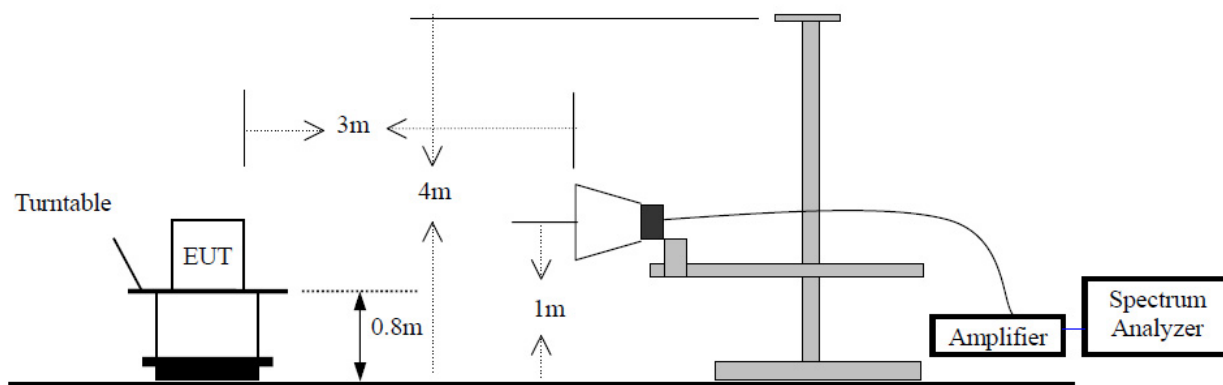
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



7.4. Radiated Emission Limit

All emission from a digital device,including any network of conductors and apparatus connected thereto,shall not exceed the level of field strength specified below :

A. Fundamental and Harmonics Radiated Emissions 15.249(a) Limit

Fundamental Frequency (MHZ)	Field as trength of Fundamental(3m)			Field as trength of Harmonics(3m)		
	mV/m	dBuV/m		uV/m	dBuV/m	
902-928	50	94(QP)	114(Peak)	500	54(AV)	74(Peak)
2400-2483.5	50	94(AV)	114(Peak)	500	54(AV)	74(Peak)

Note: (1) RF Voltage (dBuV)=20 log Voltage(uV)

(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

(3) The emission limit in this paragraph os based on measurement instrumentation employing an average detector.Measurement using instrumentation with a peak detector function,corresponding to 20dB above the maximum permitted average limit.

B. Spurious Radiated Emissions.

Frequency (MHz)	Limit			
	Field Strength of Quasi-peak Value (microvolts/m)	Field Strength of Quasi-peak Value (dBμV/m)	Measurement distance (m)	The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.
0.009 - 0.490	2400/F(kHz)	/	300	
0.490 - 1.705	24000/F(kHz)	/	30	
1.705-30	30	29.5	30	
30 - 88	100	40	3	
88 - 216	150	43.5	3	
216 - 960	200	46	3	
Above 960	500	54	3	

Note: (1) RF Voltage (dBuV)=20 log Voltage(uV)

(2) In the Above Table,the tighter limit applies at the band edges.

(3) Distaqnce refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

7.5. Radiated Emission Test Result

Pass

A. Fundamental Radiated Emissions Data

CH Low

Freq. (MHz)	Read Level (dBuV) AV/PK	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission (dBuV/m) AV/PK	HORIZ/ VERT	Limits (dBuV/m) AV/PK	Margin (dB)
2402	81.9/91.97	27.47	5.42	30.17	84.62/94.69	VERT	94/114	-9.38/-19.31
2402	84.01/93.86	27.47	5.42	30.17	86.73/96.58	HORIZ	94/114	-7.27/-17.42

CH Middle

Freq. (MHz)	Read Level (dBuV) AV/PK	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission (dBuV/m) AV/PK	HORIZ/ VERT	Limits (dBuV/m) AV/PK	Margin (dB)
2440	83.17/92.58	27.40	5.40	30.15	85.82/95.23	VERT	94/114	-8.18/-18.77
2440	84.35/94.19	27.40	5.40	30.15	87/96.84	HORIZ	94/114	-7/-17.16

CH High

Freq. (MHz)	Read Level (dBuV) AV/PK	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission (dBuV/m) AV/PK	HORIZ/ VERT	Limits (dBuV/m) AV/PK	Margin (dB)
2480	81.65/91.09	27.50	5.46	29.98	84.63/92.96	VERT	94/114	-9.37/-19.93
2480	83.59/93.04	27.50	5.46	29.98	86.57/96.02	HORIZ	94/114	-7.43/-17.98

Remark:

Final Emission = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

B. General Radiated Emissions Data

For below 9kHz-30MHz Spurious

Freq. (MHz)	Emission(dBuV/m) PK / AV	Limits(dBuV/m) PK / AV	Margin (dB)
-	-	-	-
-	-	-	-

Note:

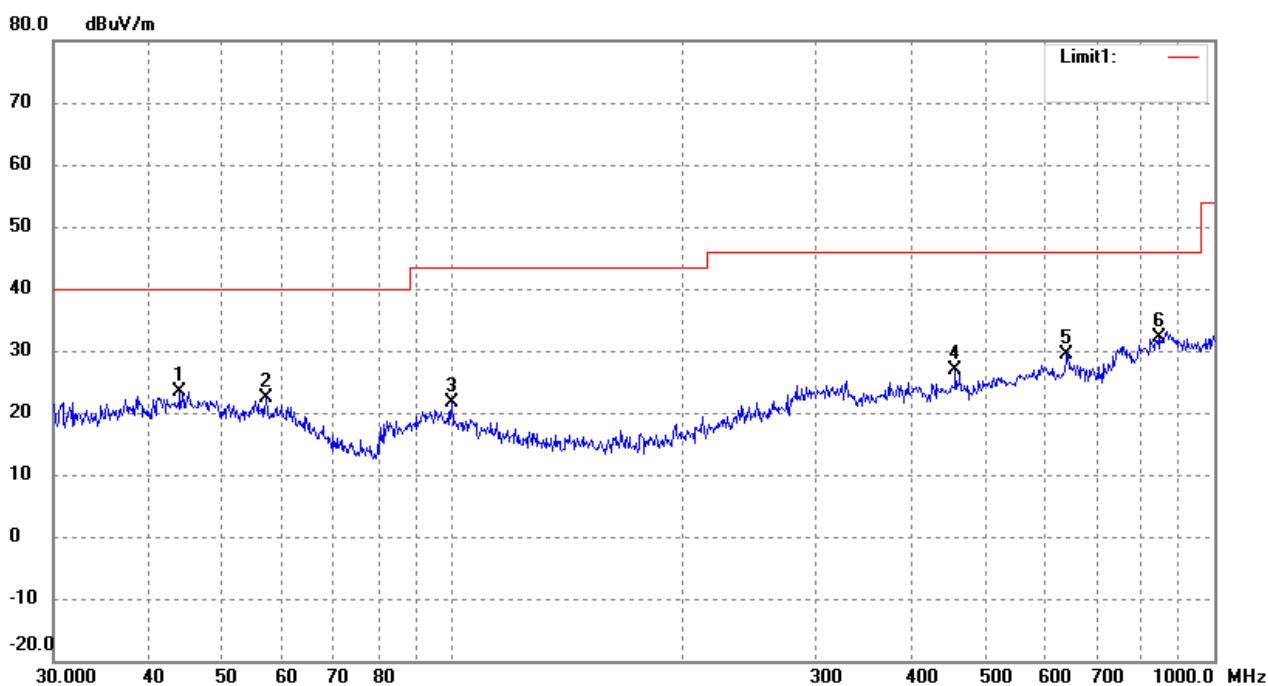
1. Emissions attenuated more than 20 dB below the permissible value are not reported.

For 30M-1000MHz Spurious

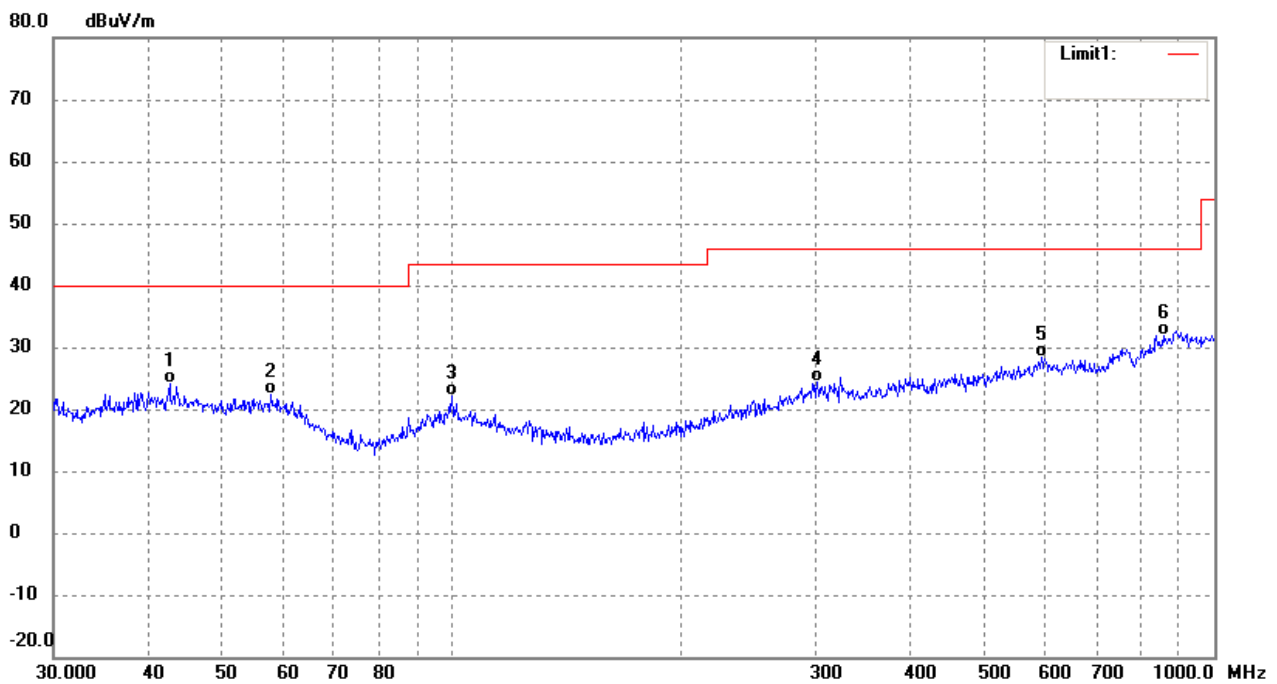
$$\text{Corrected Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

2402MHz Transmitting(Worst case mode)

Polarization: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	43.9658	18.23	5.26	23.49	40.00	-16.51	QP
2	56.9912	17.16	5.34	22.50	40.00	-17.50	QP
3	99.8777	16.52	5.11	21.63	43.50	-21.87	QP
4	457.5073	13.33	13.49	26.82	46.00	-19.18	QP
5	640.6110	10.68	18.60	29.28	46.00	-16.72	QP
6	848.0563	14.70	17.46	32.16	46.00	-13.84	QP

Polarization: Vertical

No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	42.6000	18.93	5.25	24.18	40.00	-15.82	QP
2	57.7962	17.07	5.35	22.42	40.00	-17.58	QP
3	99.8777	17.12	5.11	22.23	43.50	-21.27	QP
4	301.4224	12.31	12.18	24.49	46.00	-21.51	QP
5	593.0497	10.34	18.01	28.35	46.00	-17.65	QP
6	857.0247	14.54	17.32	31.86	46.00	-14.14	QP

For 1000MHz-25000MHz Spurious**CH Low**

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
4804	40.28/50.21	VERT	54.0/74.0	-13.72/-23.79
7206	44.24/54.21		54.0/74.0	-9.76/-19.79
9608	42.23/52.23		54.0/74.0	-11.77/-21.77
4804	39.15/50.82	HORIZ	54.0/74.0	-14.85/-23.18
7206	46.69/56.69		54.0/74.0	-7.31/-17.31
9608	48.18/58.18		54.0/74.0	-5.82/-15.82

CH Middle

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
4880	35.48/45.56	VERT	54.0/74.0	-18.52/-28.44
7320	41.37/51.32		54.0/74.0	-12.63/-22.68
9760	40.3/50.33		54.0/74.0	-13.7/-23.67
4880	35.56/45.59	HORIZ	54.0/74.0	-18.44/-28.41
7320	43.63/53.63		54.0/74.0	-10.37/-20.37
9760	48.37/58.36		54.0/74.0	-5.63/-15.64

CH High

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
4960	38.41/48.45	VERT	54.0/74.0	-15.59/-25.55
7440	42.28/52.28		54.0/74.0	-11.72/-21.72
9920	43.32/53.41		54.0/74.0	-10.68/-20.59
4960	37.68/47.68	HORIZ	54.0/74.0	-16.32/-26.32
7440	42.37/51.22		54.0/74.0	-11.63/-22.78
9920	44.37/53.3		54.0/74.0	-9.63/-20.7

Note:

1. The average measurement was not performed when the peak measured data under the limit of average detection.
2. Emissions attenuated more than 20 dB below the permissible value are not reported.

8. BAND EDGE

8.1. Test Equipment

Please refer to Section 4 this report.

8.2. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters. The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4: 2003 on radiated measurement. The bandwidth of test receiver is set at 9kHz in below 30MHz. and set at 120kHz in 30-1000MHz, and non-restricted band:RBW=100kHz, restricted band:RBW=1MHz in above 1000MHz. The frequency range from 9kHz to 25GHz is checked.

8.3. Band Edge FCC 15.249(d) Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

8.4. Band Edge Test Result

Pass

ALL of the restriction bands were tested, and only the data of worst case was exhibited.

CH Low

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
2390	44.82/52.61	VERT	54.0/74.0	-9.18/-21.39
2400	50.09/59.51		54.0/74.0	-3.91/-14.49
2390	45.55/54.62	HORIZ	54.0/74.0	-8.45/-19.38
2400	47.78/60.73		54.0/74.0	-6.22/-13.27

CH High

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
2483.5	46.18/57.51	VERT	54.0/74.0	-7.82/-16.49
2500.00	43.21/53.1		54.0/74.0	-10.79/-20.9
2483.5	47.54/58.1	HORIZ	54.0/74.0	-6.46/-15.9
2500.00	44.1/52.25		54.0/74.0	-9.9/-21.75

Remark:

- Factor = Antenna Factor + Cable Loss – Pre-amplifier.

9. 20-DB BANDWIDTH

9.1. Test Equipment

Please refer to Section 4 this report.

9.2. Test Procedure

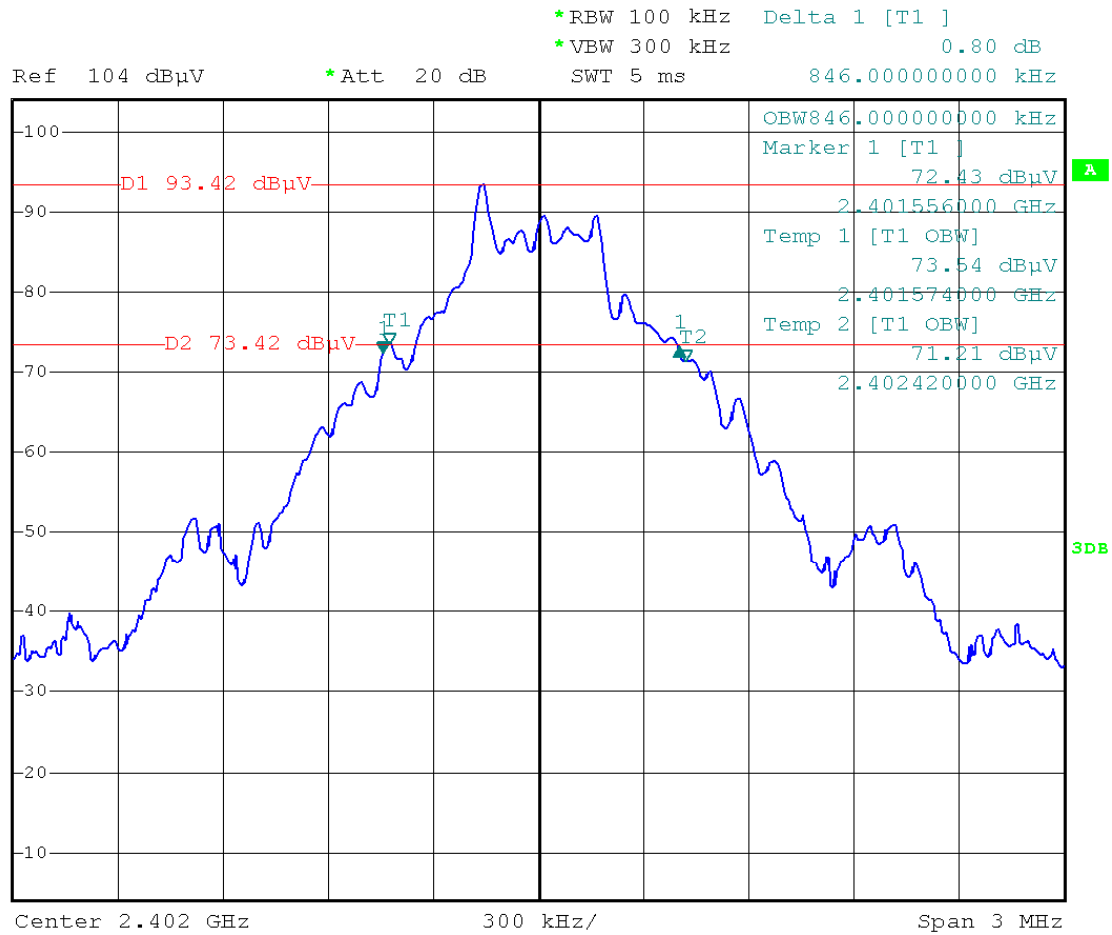
1. The EUT was positioned such that the distance from antenna to the EUT was 3 meters. all of the interface cables must be manipulated according to ANSI C63.4: 2003 on radiated measurement.
2. Set center frequency of spectrum analyzer = operating frequency.
3. The spectrum analyzer as RBW=100 KHz, VBW=300 KHz, Sweep=5ms.
4. Mark the peak frequency and -20dB (upper and lower) frequency.

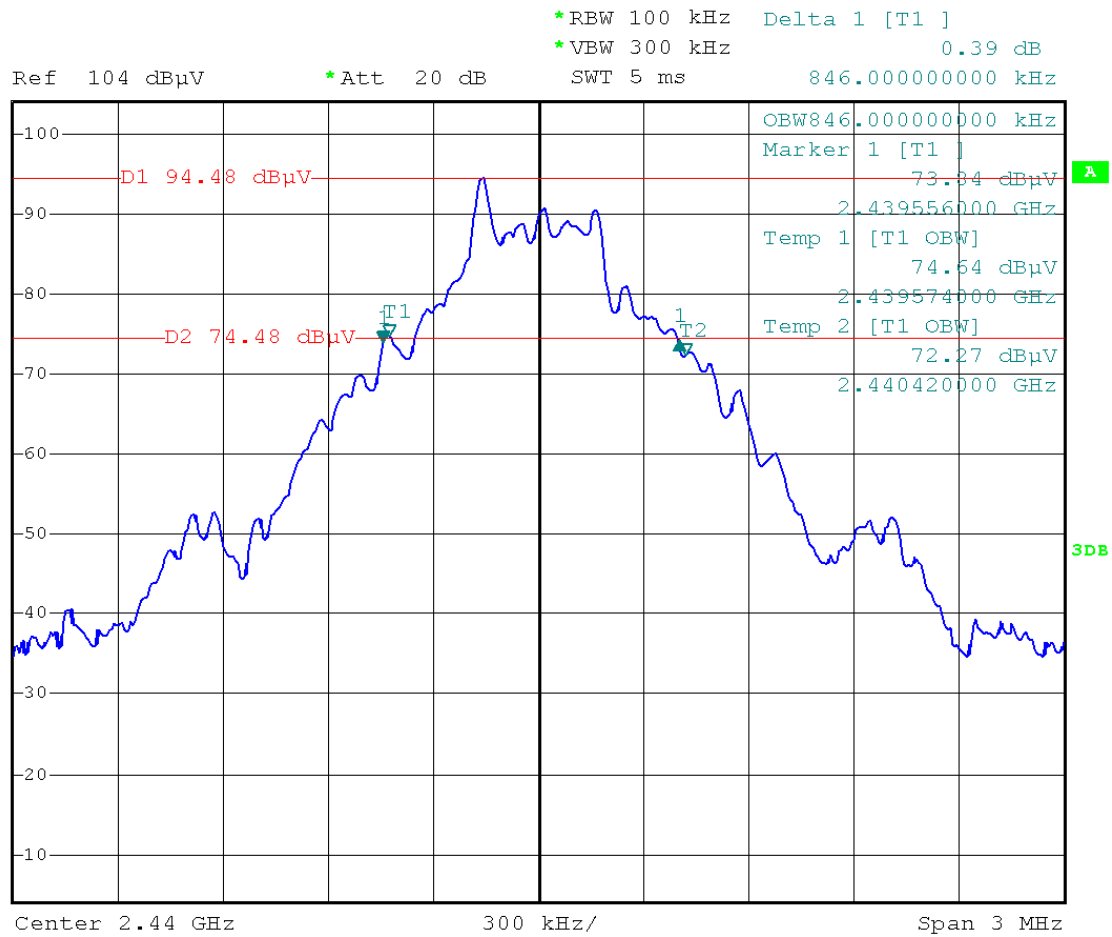
9.3. Limit

Please refer section15.249

9.4. Test Result /Plots

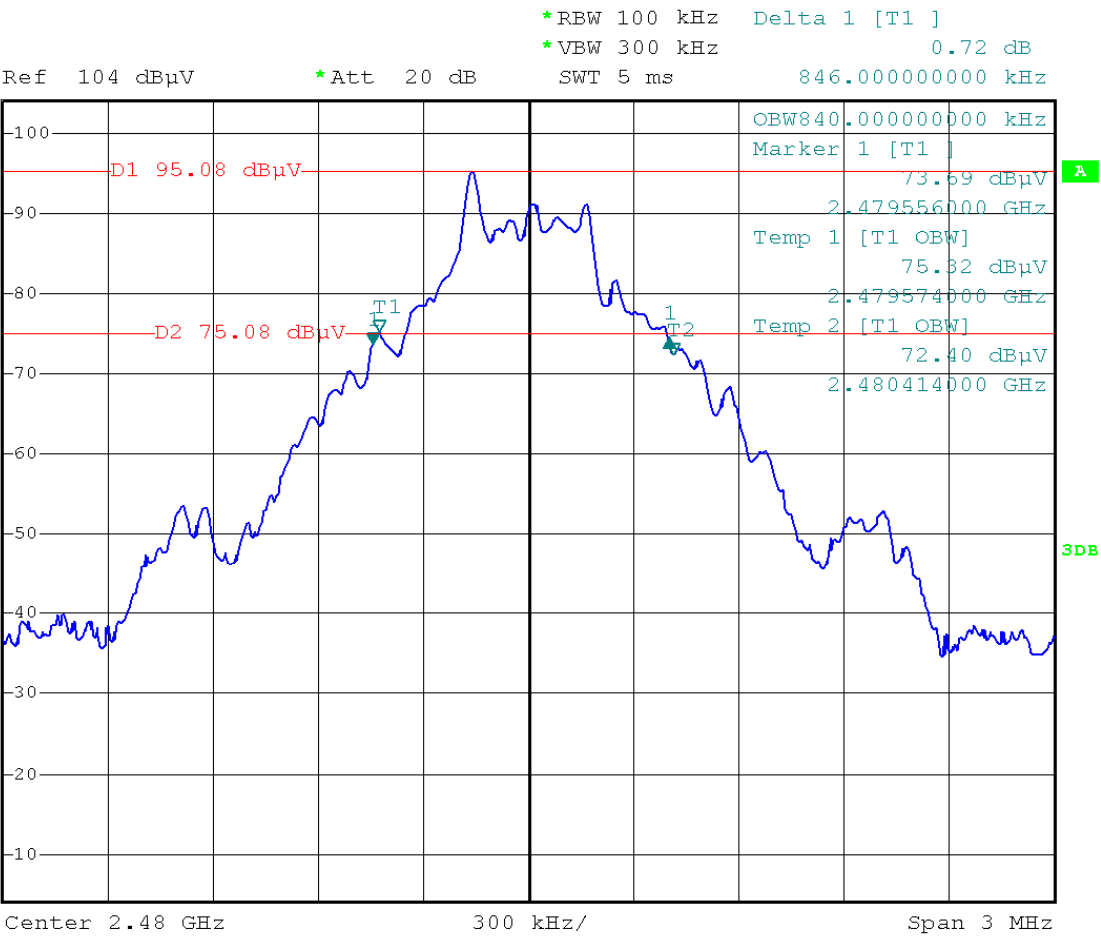
Limit	Channel Frequency (MHz)	20dB Bandwidth (MHz)
/	2402	0.846
/	2441	0.846
/	2480	0.846

1 PK
MAXH

1 PK
MAXH



1 PK
MAXH



End Of The Report