FCC PART 15 SUBPART C TEST REPORT FCC PART 15.247

Report Reference No.....:	A1301096020-2
FCC ID .....:	**ZRD-D7**
Compiled by (position+printed name+signature)..:	File administrators Tony Li
Supervised by (position+printed name+signature)..:	Technique principal Robin Fang
Approved by (position+printed name+signature)..:	Manager James Wu
Date of issue.....:	May 8, 2013
Representative Laboratory Name .:	Shenzhen CTL Electron Technology Co., Ltd.
Address .....:	Room 405, The 3# of 4th Building, Zhuguang No.2 Industrial District, Xili Town, Nanshan, Shenzhen, China
Testing Laboratory Name .....:	DTT Services Co.,Ltd
Address .....:	1F,2 Block,Jiaquan Building,Guanlan High-tech Park,Bao'an District, Shenzhen,Guangdong,China. 518110
Applicant's name.....:	**Shenzhen livall Netwotk Technology Co ltd**
Address .....:	9/F, Jiuzhou Electric Building, Southern No.12 rd Technology Park, Shenzhen
Test specification:	
Standard .....:	**FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System**
TRF Originator.....:	Shenzhen CTL Electron Technology Co., Ltd.
Master TRF.....:	Dated 2012-06

Shenzhen CTL Electron Technology Co., Ltd. All rights reserved.

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen CTL Electron Technology Co., Ltd. is acknowledged as copyright owner and source of the material. Shenzhen CTL Electron Technology Co., Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Test item description .....:	TELPAD
Trade Mark .....:	Livall
Manufacturer .....:	Shenzhen livall Netwotk Technology Co ltd
Model/Type reference.....:	D7
Listed Models .....:	/
Operation Frequency .....:	From 2402MHz to 2480MHz
Modulation Type .....:	GFSK,8DPSK
Result.....:	**Positive**

TEST REPORT

Test Report No. :	A1301096020-2	May 8, 2013 Date of issue

Equipment under Test	:	TELPAD
Model /Type	:	D7
Listed Models	:	/
Applicant	:	**Shenzhen livall Netwotk Technology Co ltd**
Address	:	9/F, Jiuzhou Electric Building, Southern No.12 rd Technology Park, Shenzhen
Manufacturer	:	**Shenzhen livall Netwotk Technology Co ltd**
Address	:	9/F, Jiuzhou Electric Building, Southern No.12 rd Technology Park, Shenzhen

Test Result according to the standards on page 4:	**Positive**

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.

Contents

1. TEST STANDARDS 4

2. SUMMARY 5

2.1. General Remarks 5
2.2. Equipment Under Test 5
2.3. Short description of the Equipment under Test (EUT) 5
2.4. EUT operation mode 5
2.5. Configuration of Test System 6
2.6. Related Submittal(s) / Grant (s) 6
2.7. Modifications 6
2.8. NOTE 7

3. TEST ENVIRONMENT 8

3.1. Address of the test laboratory 8
3.2. Test Facility 8
3.3. Environmental conditions 8
3.4. Test Description 8
3.5. Statement of the measurement uncertainty 9
3.6. Equipments Used during the Test 9

4. TEST CONDITIONS AND RESULTS 10

4.1. AC Power Conducted Emission 10
4.2. Radiated Emission 13
4.3. Maximum Peak Output Power 21
4.4. 20dB Bandwidth 25
4.5. Band Edge 29
4.6. Frequency Separation 34
4.7. Number of hopping frequency 38
4.8. Time Of Occupancy(Dwell Time) 40
4.9. Antenna Requirement 44

5. TEST SETUP PHOTOS OF THE EUT 45

6. EXTERNAL AND INTERNAL PHOTOS OF THE EUT 47

1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Jan 21,2013
Testing commenced on	:	Jan 21,2013
Testing concluded on	:	Jan 30, 2013

2.2. Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	120V / 60 Hz	○	115V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 3.70V

2.3. Short description of the Equipment under Test (EUT)

2.4GHz (TELPAD)

For more details, refer to the user's manual of the EUT.

Serial number: Prototype

2.4. EUT operation mode

Bluetooth 2.0 and 3.1: 79 channels are provided to the EUT.

Channel	Frequency(MHz)	Channel	Frequency(MHz)
0	**2402**	40	2442
1	2403	41	2443
2	2404	42	2444
3	2405	43	2445
4	2406	44	2446
5	2407	45	2447
6	2408	46	2448
7	2409	47	2449
8	2410	48	2450
9	2411	49	2451
10	2412	50	2452
11	2413	51	2453
12	2414	52	2454
13	2415	53	2455
14	2416	54	2456
15	2417	55	2457
16	2418	56	2458
17	2419	57	2459
18	2420	58	2460
19	2421	59	2461
20	2422	60	2462

21	2423	61	2463
22	2424	62	2464
23	2425	63	2465
24	2426	64	2466
25	2427	65	2467
26	2428	66	2468
27	2429	67	2469
28	2430	68	2470
29	2431	69	2471
30	2432	70	2472
31	2433	71	2473
32	2434	72	2474
33	2435	73	2475
34	2436	74	2476
35	2437	75	2477
36	2438	76	2478
37	2439	77	2479
38	2440	**78**	**2480**
39	**2441**		

2.5. Configuration of Test System

Fig. 2-1 Configuration of Tested System

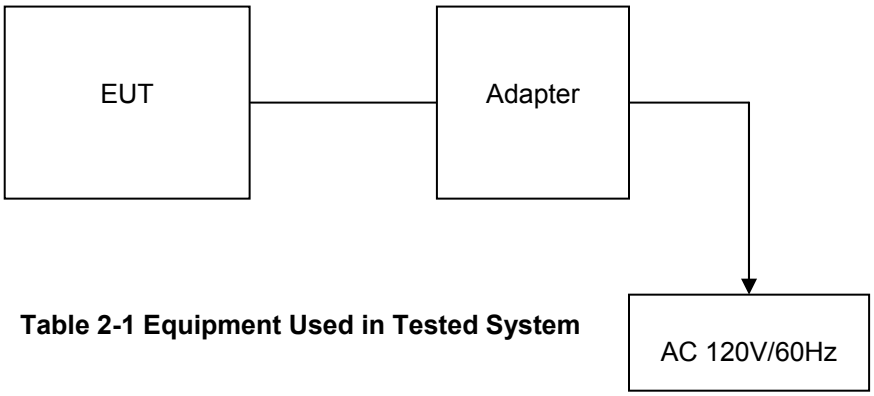


Table 2-1 Equipment Used in Tested System

Adapter:

Model:FR15WA-050250-US
Input:100-240V～50/60Hz 0.35A
Output: +5V DC 2.5A
Power Cable: 120cm
◇ Shielded ◆ Unshielded

2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID:ZRD-D7** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.7. Modifications

No modifications were implemented to meet testing criteria.

2.8. NOTE

1. The EUT including WLAN,Bluetooth function,The functions of the EUT listed as below:

	Test Standards	Reference Report
WLAN Radio	FCC Part 15 Subpart C (Section15.247)	A1301096020-1
Bluetooth	FCC Part 15 Subpart C (Section15.247)	A1301096020-2
SAR	OET 65	A1301096020-3
USB Port	FCC Part 15 Subpart B	A1301096020-4

2. The frequency bands used in this EUT are listed as follows:

Frequency Band(MHz)	2400-2483.5	5150-5350	5470-5725	5725-5850
EUT	√	—	—	—

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

DTT Services Co.,Ltd
1F,2 Block,Jiaquan Building,Guanlan High-tech Park,Bao'an District, Shenzhen,Guangdong,China. 518110

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2003) and CISPR Publication 22.

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

IC Registration No.: 9783A

The 3m alternate test site of DTT Services Co.,Ltd EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9783A on Aug, 2011.

FCC-Registration No.: 214666

DTT Services 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 214666, Sep 19, 2011.

3.3. Environmental conditions

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

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Test Description

FCC PART 15		
FCC Part 15.207	AC Power Conducted Emission	PASS
FCC Part 15.247(a)(2)	6dB Bandwidth(FCC)/ 20dB Bandwidth(IC)	PASS
FCC Part 15.247(d)	Spurious RF Conducted Emission	PASS
FCC Part 15.247(b)	Maximum Peak Output Power	PASS
FCC Part 15.247(a)(1)(iii)	Number of hopping frequency& Time of Occupancy	PASS
FCC Part 15.247(a)(1)	Frequency Separation	PASS
FCC Part 15.109/ 15.205/ 15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge Compliance of RF Emission	PASS
FCC Part 15.203/15.247 (b)	Antenna Requirement	PASS

Remark: The measurement uncertainty is not included in the test result.

3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the DTT Services Co.,Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for DTT Services Co.,Ltd is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	1.60 dB	(1)
Radiated spurious emission 9KHz-40 GHz	2.20 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 30~1000MHz	4.24 dB	(1)
Radiated Emissio 1~18GHz	5.16 dB	(1)
Radiated Emissio 18-40GHz	5.54 dB	(1)
Occupied Bandwidth	---------	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

3.6. Equipments Used during the Test

Maximum Peak Output Power / Frequency Separation / 20dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission/ Number of hopping frequency/ Time of Occupancy					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Spectrum Analyzer	AGILENT	E4407B	MY44210779	2012/4/23

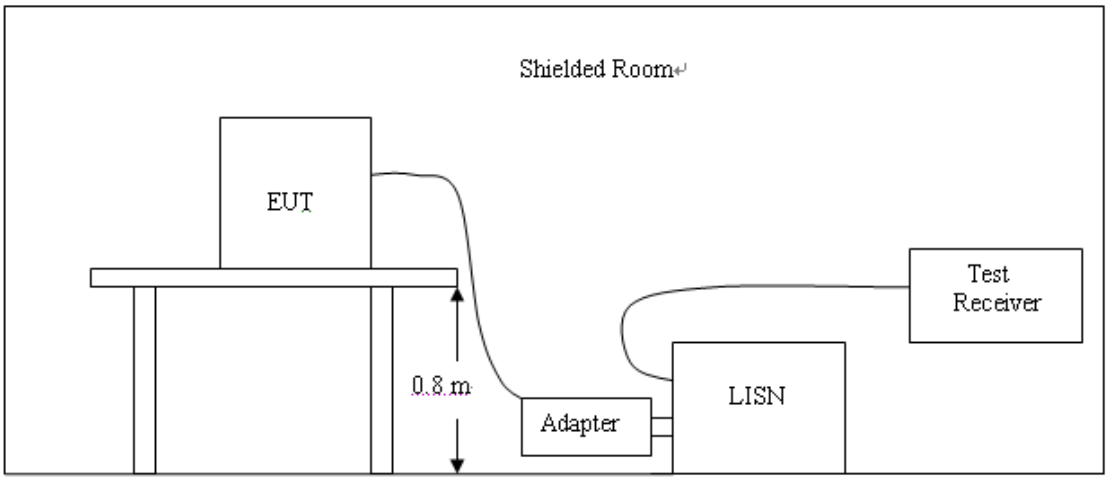
Radiated Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	ULTRA-BROADBAND ANTENNA	Rohde&Schwarz	HL562	100015	2012/4/23
2	EMI TEST OFTWARE	Audix	Z3	N/A	----
3	HORN ANTENNA	Rohde&Schwarz	HF906	100039	2012/4/23
4	Amplifer	Sonoma	310N	E009-13	2012/4/23
5	JS amplifer	Rohde&Schwarz	JS4-00101800-28-5A	F201504	2012/4/23
6	High pass filter	Compliance Direction systems	BSU-6	34202	2012/4/23
7	Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	470	2012/4/23
8	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	539	2012/4/23
9	HORN ANTENNA	ShwarzBeck	9120D	1011	2012/4/23
10	TURNTABLE	MATURO	TT2.0	----	2012/4/23
11	ANTENNA MAST	MATURO	TAM-4.0-P	----	2012/4/23

The Calibration Interval was one year.

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2009.
2 Support equipment, if needed, was placed as per ANSI C63.10-2009
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2009
4 The EUT received DC5V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

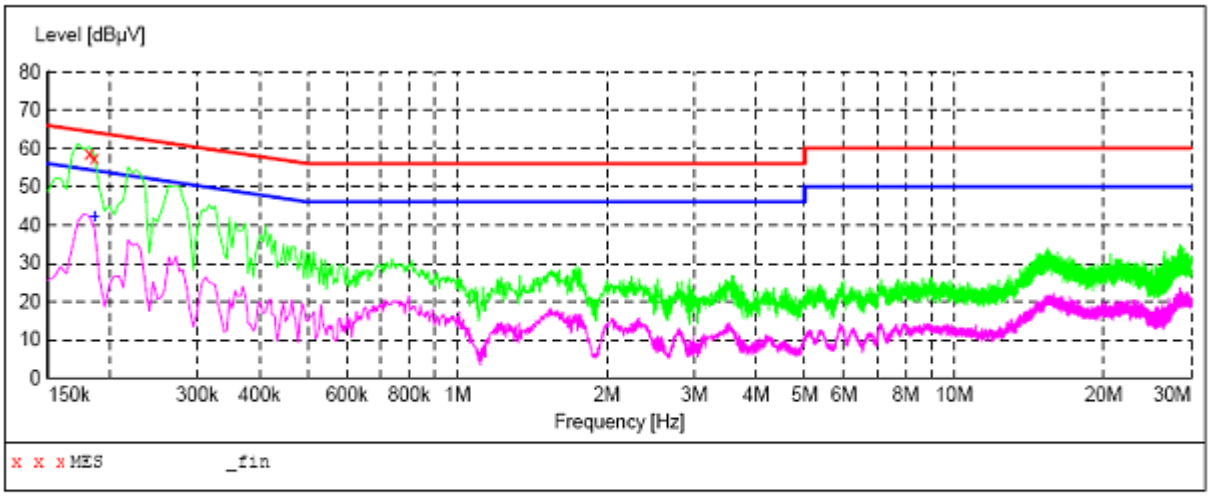
For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

TEST RESULTS

SCAN TABLE: "Voltage(150K-30M)FIN"
Short Description: 150K-30M Voltage



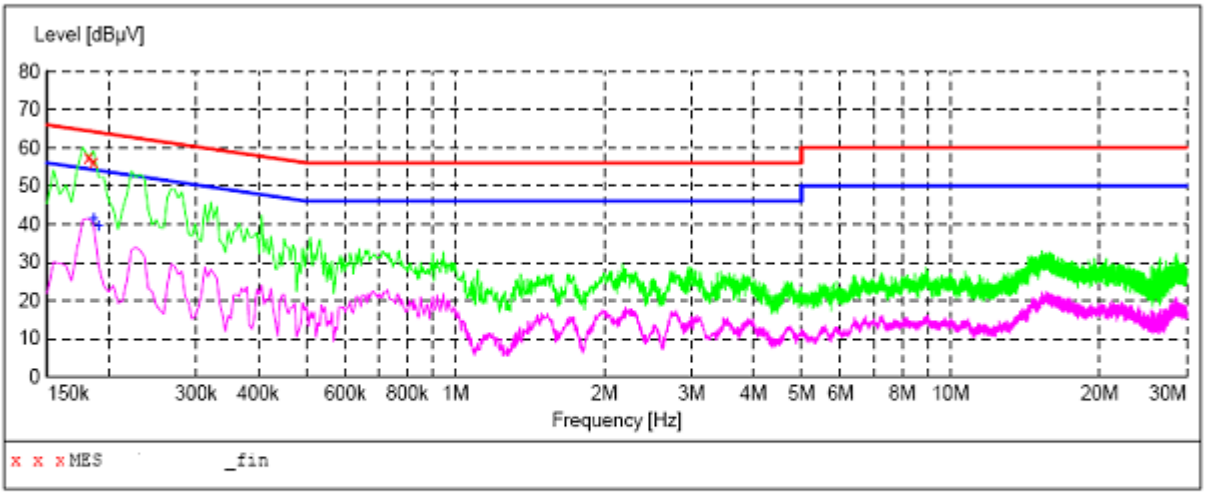
MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.181500	58.70	11.0	64	5.7	QP	L1	GND
0.186000	57.50	11.0	64	6.7	QP	L1	GND

MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.186000	42.30	11.0	54	11.9	AV	L1	GND

SCAN TABLE: "Voltage(150K-30M)FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.181500	57.60	11.0	64	6.8	QP	N	GND
0.186000	56.50	11.0	64	7.7	QP	N	GND

MEASUREMENT RESULT:

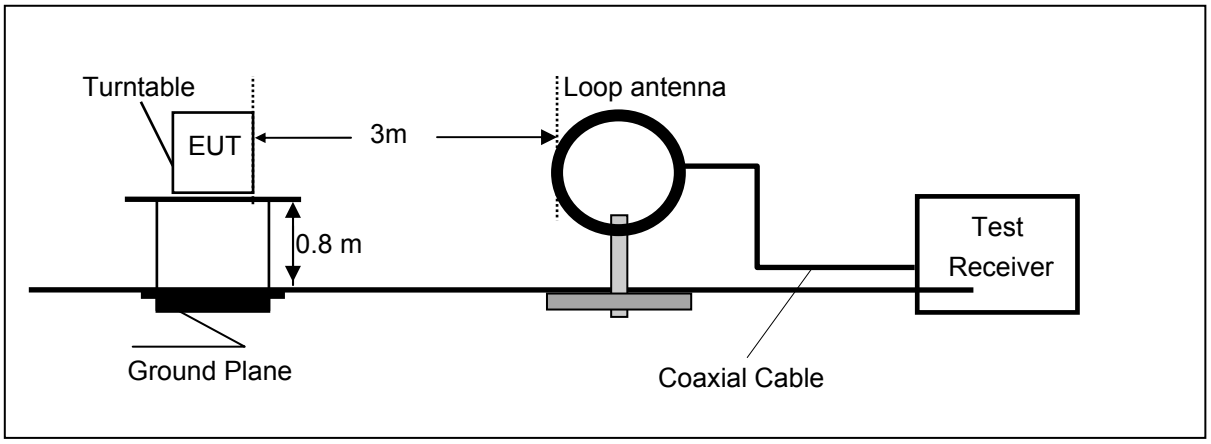
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.186000	41.60	11.0	54	12.6	AV	N	GND
0.190500	39.40	10.9	54	14.6	AV	N	GND

4.2. Radiated Emission

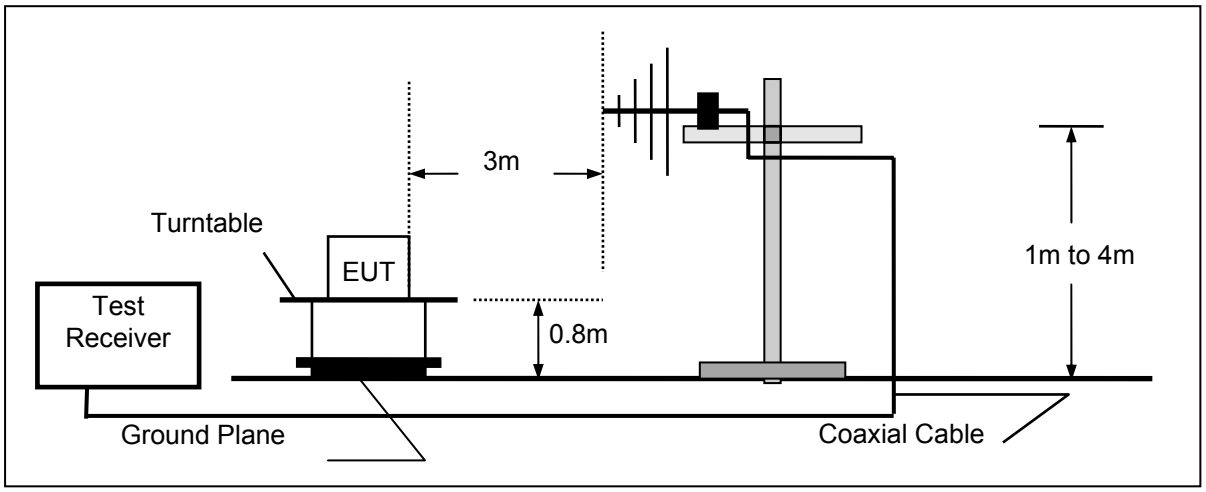
TEST CONFIGURATION

Radiated Emission Test Set-Up

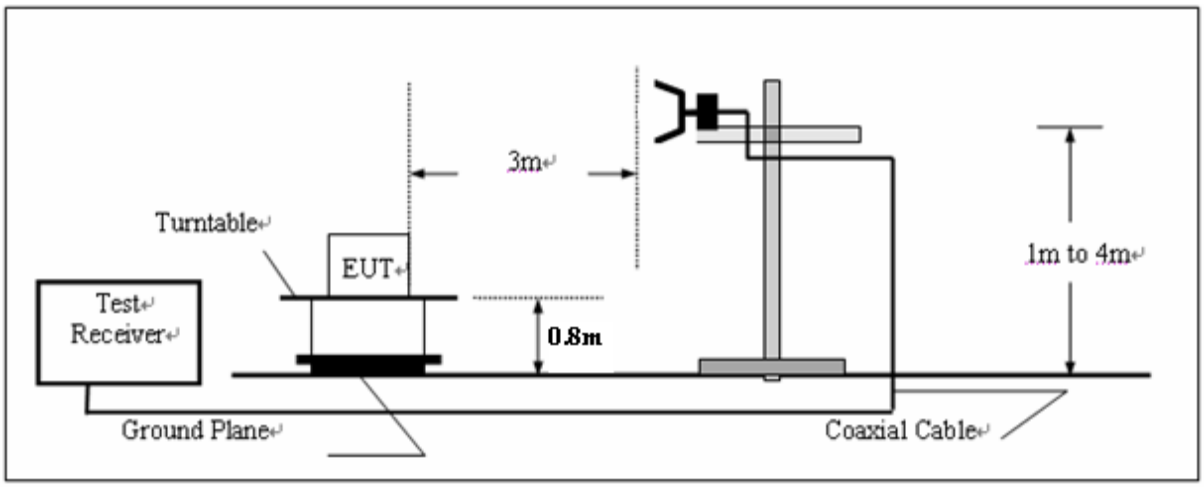
Frequency range 9KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1 The EUT was placed on a turn table which is 0.8m above ground plane.
2 Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The minimum clock frequency was 12MHz, So the radiation emissions frequency range were tested from 9KHz to 25GHz.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL – AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

For example

Frequency (MHz)	FS (dBμV/m)	RA (dBμV/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
300.00	40	58.1	12.2	1.6	31.90	-18.1

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST RESULTS

Radiated emission in frequency band below 30MHz

Frequency (MHz)	Corrected Reading (dBμV/m)@3m	FCC Limit (dBμV/m) @3m	Margin (dB)	Detector	Polari-zation
BDR					
24	41.50	49.54	8.04	QP	/
EDR					
24	40.54	49.54	9.00	QP	/

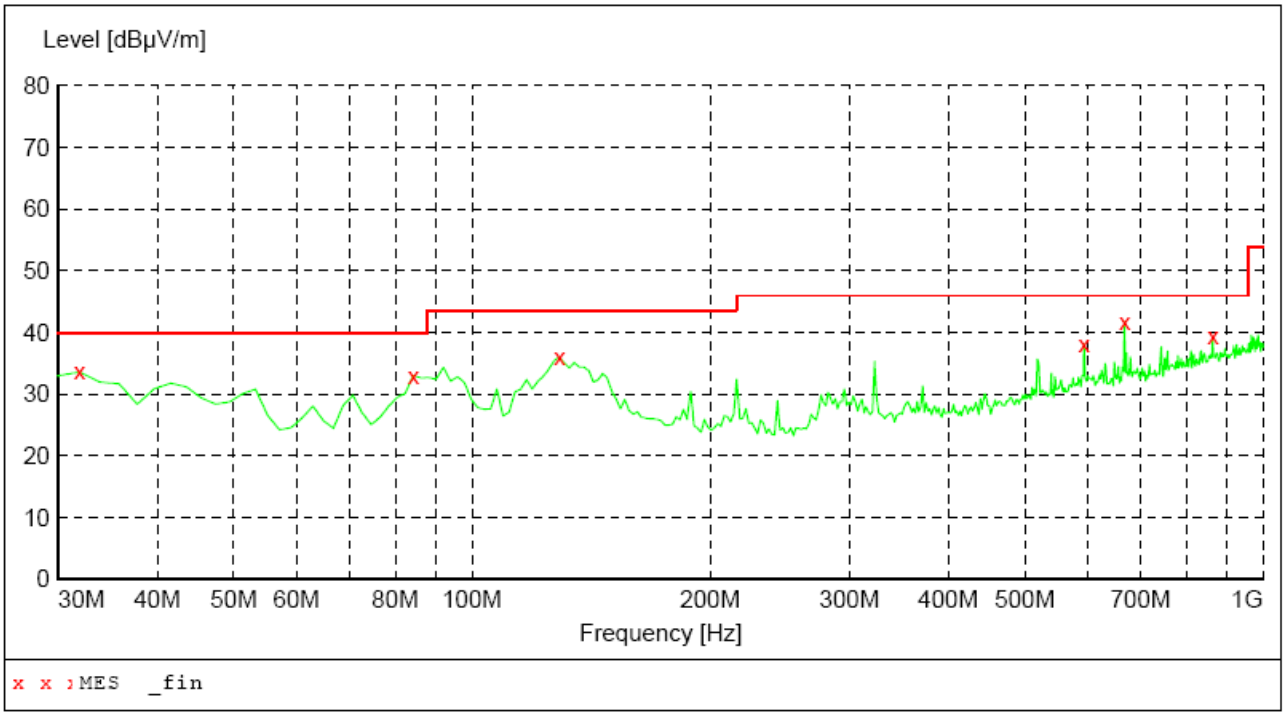
Note: 1.The radiated measurement are performed the each test mode(BDR and EDR), the datum recorded below (middler channel) is the worst case for all the test mode and channel.
2. Loop Antenna for the radiation emission test below 30MHz.

For 30MHz to 1000MHz（TX mode）

SWEEP TABLE: "test (30M-1G)"

Short Description: Field Strength

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VULB9163 NEW

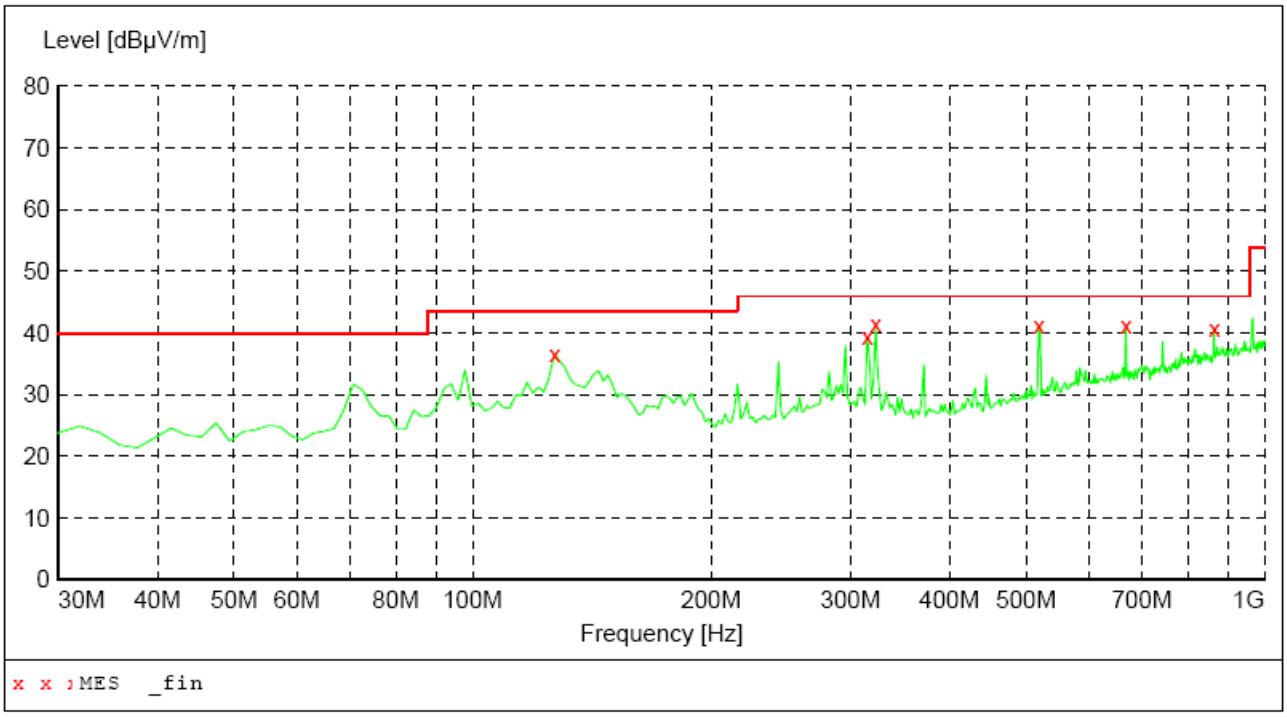


MEASUREMENT RESULT:

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
31.940000	33.60	14.4	40.0	6.4	QP	100.0	15.00	VERTICAL
84.320000	33.00	14.1	40.0	7.0	QP	100.0	124.00	VERTICAL
128.940000	36.00	13.9	43.5	7.5	QP	100.0	60.00	VERTICAL
594.540000	38.20	26.3	46.0	7.8	QP	100.0	238.00	VERTICAL
668.260000	41.80	27.2	46.0	4.2	QP	100.0	325.00	VERTICAL
864.200000	39.30	30.6	46.0	6.7	QP	100.0	75.00	VERTICAL

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VULB9163 NEW



MEASUREMENT RESULT:

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
127.000000	36.60	14.1	43.5	6.9	QP	300.0	25.00	HORIZONTAL
315.180000	39.40	19.1	46.0	6.6	QP	100.0	30.00	HORIZONTAL
322.940000	41.50	19.3	46.0	4.5	QP	100.0	125.00	HORIZONTAL
518.880000	41.30	24.4	46.0	4.7	QP	100.0	350.00	HORIZONTAL
668.260000	41.20	27.2	46.0	4.8	QP	100.0	272.00	HORIZONTAL
864.200000	40.80	30.6	46.0	5.2	QP	100.0	105.00	HORIZONTAL

Above 1G

The frequency spectrum above 1 GHz for Transmitter was investigated. All emission not reported are much lower than the prescribed limits. Set the RBW=1MHz,VBW=3MHz for Peak Detector while the RBW=1MHz,VBW=10Hz for Average Detector,Readings are both peak and average values. The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

BDR (Low channel)

ANTENNA POLARITY & TEST DISTANCE: VERTICAL 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	*2402.00	94.05	PK	---	---	1.00	126	93.80	29.44	7.43	36.62
1	*2402.00	89.00	AV	---	---	1.00	126	88.75	29.44	7.43	36.62
2	4804.00	61.98	PK	74.00	12.02	1.00	100	52.16	34.30	10.62	35.10
2	4804.00	52.98	AV	54.00	1.02	1.00	100	43.16	34.30	10.62	35.10

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	*2402.00	94.25	PK	---	---	1.00	23	94.00	29.44	7.43	36.62
1	*2402.00	88.82	AV	---	---	1.00	23	88.57	29.44	7.43	36.62
2	4804.00	61.38	PK	74.00	12.62	1.00	277	51.56	34.30	10.62	35.10
2	4804.00	52.38	AV	54.00	1.62	1.00	277	42.56	34.30	10.62	35.10

BDR (middle channel)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	*2441.00	96.19	PK	---	---	1.00	200	95.83	29.47	7.50	36.61
1	*2441.00	89.00	AV	---	---	1.00	200	88.64	29.47	7.50	36.61
2	4882.00	59.86	PK	74.00	14.14	1.00	124	49.77	34.41	10.71	35.03
2	4882.00	50.86	AV	54.00	3.14	1.00	124	40.77	34.41	10.71	35.03

ANTENNA POLARITY & TEST DISTANCE: VERTICAL 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	*2441.00	93.65	PK	---	---	1.00	165	93.29	29.47	7.50	36.61
1	*2441.00	87.85	AV	---	---	1.00	165	87.49	29.47	7.50	36.61
2	4882.00	59.11	PK	74.00	14.89	1.00	278	49.02	34.41	10.71	35.03
2	4882.00	50.11	AV	54.00	3.89	1.00	278	40.02	34.41	10.71	35.03

BDR (High channel)

ANTENNA POLARITY & TEST DISTANCE: VERTICAL 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	*2480.00	93.65	PK	---	---	1.00	325	93.29	29.49	7.58	36.60
1	*2480.00	89.00	AV	---	---	1.00	325	88.64	29.49	7.58	36.60
2	4960.00	59.11	PK	74.00	14.89	1.00	150	47.70	34.54	10.80	34.95
2	4960.00	50.11	AV	54.00	3.89	1.00	150	40.48	34.54	10.80	34.95

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	*2480.00	93.43	PK	---	---	1.00	14	92.96	29.49	7.58	36.60
1	*2480.00	89.12	AV	---	---	1.00	14	88.65	29.49	7.58	36.60
2	4960.00	55.96	PK	74.00	18.04	1.00	270	45.57	34.54	10.80	34.95
2	4960.00	46.96	AV	54.00	7.04	1.00	270	36.57	34.54	10.80	34.95

EDR (Low channel)

ANTENNA POLARITY & TEST DISTANCE: VERTICAL 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	*2402.00	94.84	PK	---	---	1.00	274	94.59	29.44	7.43	36.62
1	*2402.00	90.00	AV	---	---	1.00	274	89.75	29.44	7.43	36.62
2	4804.00	60.20	PK	74.00	13.80	1.00	155	50.38	34.30	10.62	35.10
2	4804.00	51.30	AV	54.00	2.70	1.00	155	41.48	34.30	10.62	35.10

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	*2402.00	92.81	PK	---	---	1.00	310	92.56	29.44	7.43	36.62
1	*2402.00	88.72	AV	---	---	1.00	310	88.47	29.44	7.43	36.62
2	4804.00	58.56	PK	74.00	15.44	1.00	282	58.74	34.30	10.62	35.10
2	4804.00	49.62	AV	54.00	4.38	1.00	282	39.80	34.30	10.62	35.10

EDR (middle channel)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	*2441.00	94.79	PK	---	---	1.00	125	94.43	29.47	7.50	36.61
1	*2441.00	88.17	AV	---	---	1.00	125	87.83	29.47	7.50	36.61
2	4882.00	56.61	PK	74.00	17.39	1.00	349	46.52	34.41	10.71	35.03
2	4882.00	47.71	AV	54.00	6.29	1.00	349	37.62	34.41	10.71	35.03

ANTENNA POLARITY & TEST DISTANCE: VERTICAL 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	*2441.00	90.37	PK	---	---	1.00	333	90.01	29.47	7.50	36.61
1	*2441.00	89.10	AV	---	---	1.00	333	88.74	29.47	7.50	36.61
2	4882.00	56.97	PK	74.00	17.03	1.00	169	46.88	34.41	10.71	35.03
2	4882.00	48.09	AV	54.00	5.91	1.00	169	38.00	34.41	10.71	35.03

EDR (High channel)

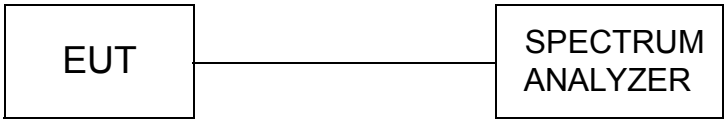
ANTENNA POLARITY & TEST DISTANCE: VERTICAL 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	*2480.00	92.46	PK	---	---	1.00	29	91.99	29.49	7.58	36.60
1	*2480.00	88.59	AV	---	---	1.00	29	88.12	29.49	7.58	36.60
2	4960.00	55.56	PK	74.00	18.44	1.00	350	45.17	34.54	10.80	34.95
2	4960.00	46.66	AV	54.00	7.34	1.00	350	36.27	34.54	10.80	34.95

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	*2480.00	89.86	PK	---	---	1.00	256	89.39	29.49	7.58	36.60
1	*2480.00	85.00	AV	---	---	1.00	256	84.53	29.49	7.58	36.60
2	4960.00	54.44	PK	74.00	19.56	1.00	178	44.05	34.54	10.80	34.95
2	4960.00	45.49	PK	54.00	8.46	1.00	178	33.15	34.54	10.80	34.95

REMARKS: 1. Emission level (dBuV/m) =Raw Value (dBuV) + Antenna Factor (dB/m) + Cable Factor (dB) -Pre-amplifier Factor
2. The other emission levels were very low against the limit.
3. Margin value = Limit value- Emission level.
4. The limit value is defined as per 15.247
5. " * " : Fundamental frequency
6. The average measurement was not performed when the peak measured data under the limit of average detection.

4.3. Maximum Peak Output Power

TEST CONFIGURATION



TEST PROCEDURE

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

LIMIT

The Maximum Peak Output Power Measurement is 30dBm.

TEST RESULTS

BDR Mode:

Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
2402	2.92	30.00	Pass
2441	1.89	30.00	Pass
2480	0.01	30.00	Pass

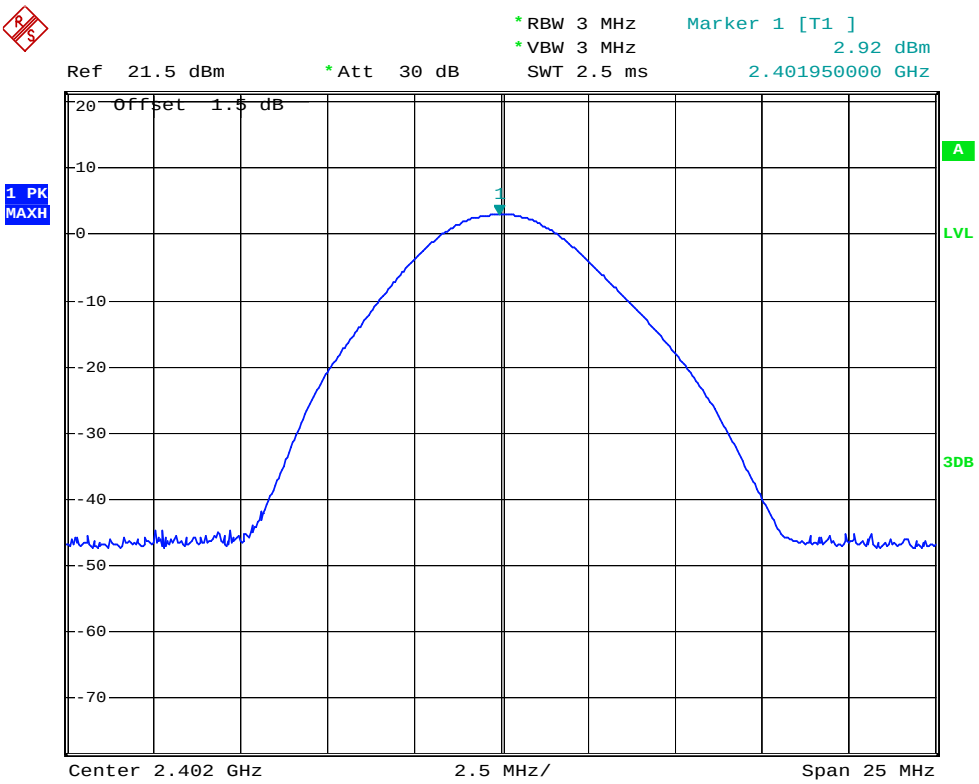
EDR Mode:

Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
2402	1.04	30.00	Pass
2441	0.58	30.00	Pass
2480	-1.66	30.00	Pass

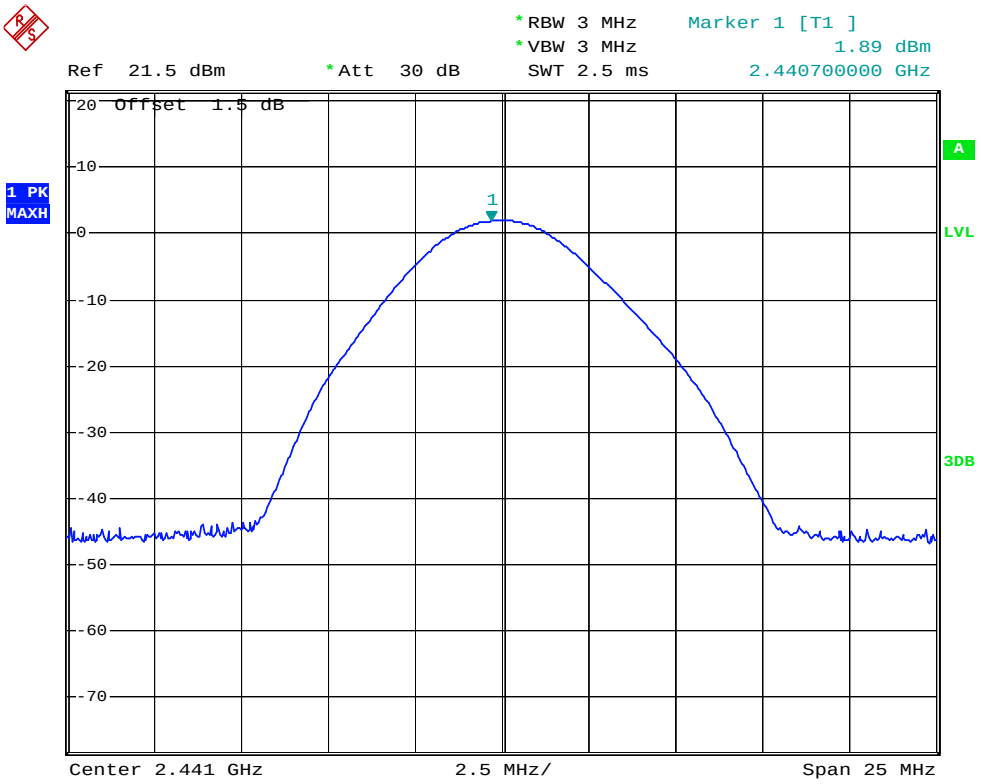
Note: The test results including the cable lose.

BDR Mode:

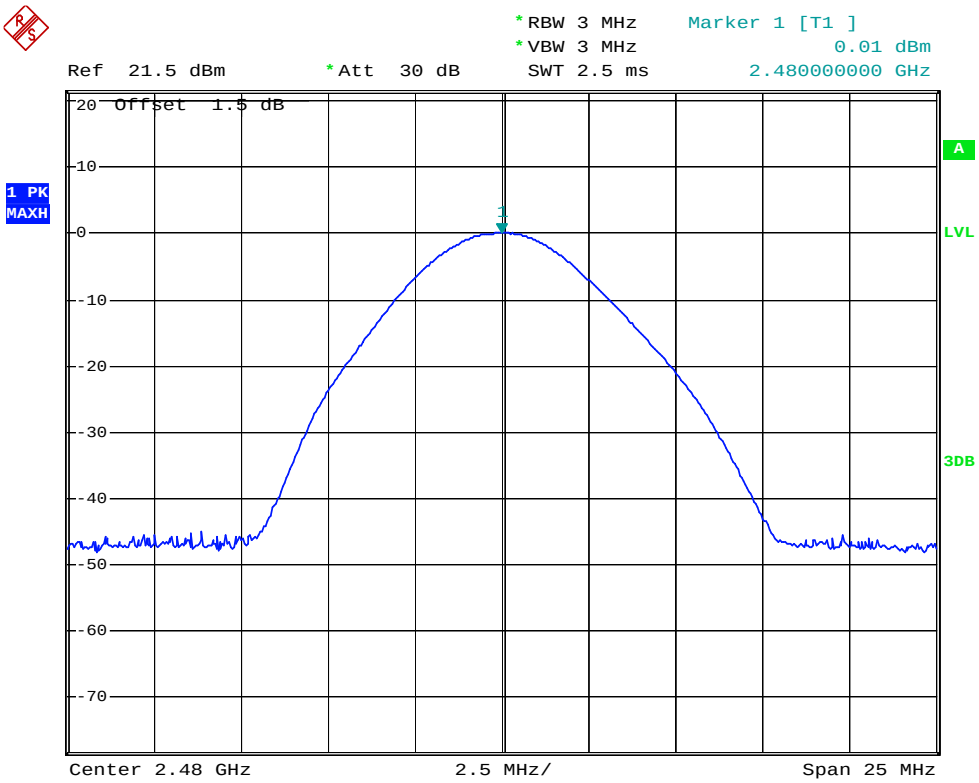
Low channel



Middle channel

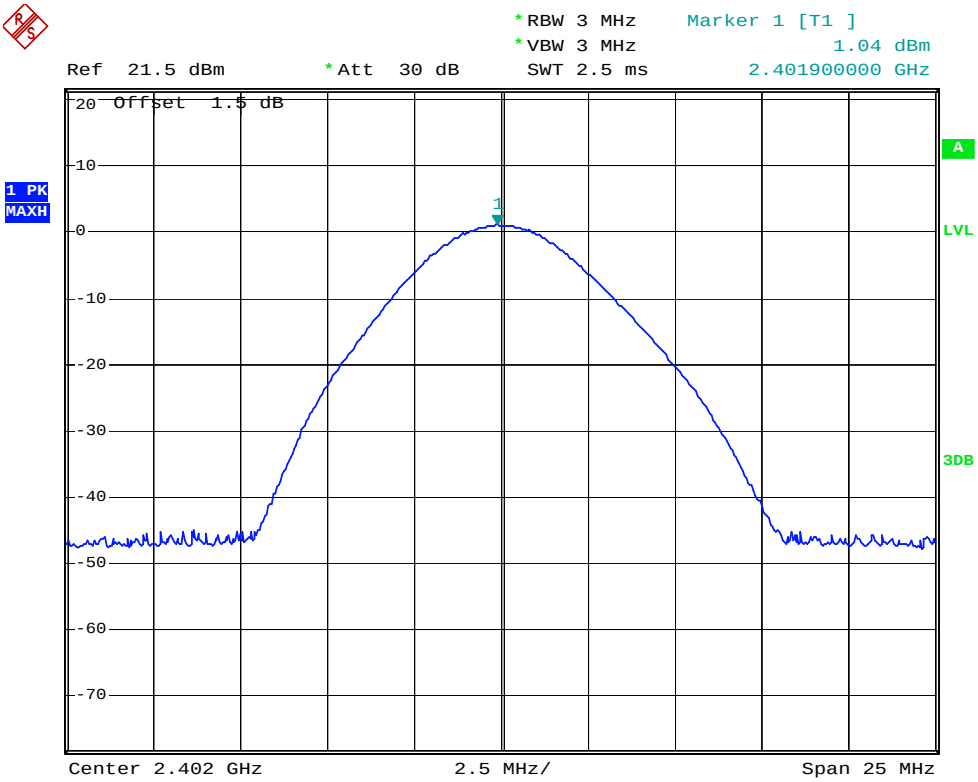


High channel

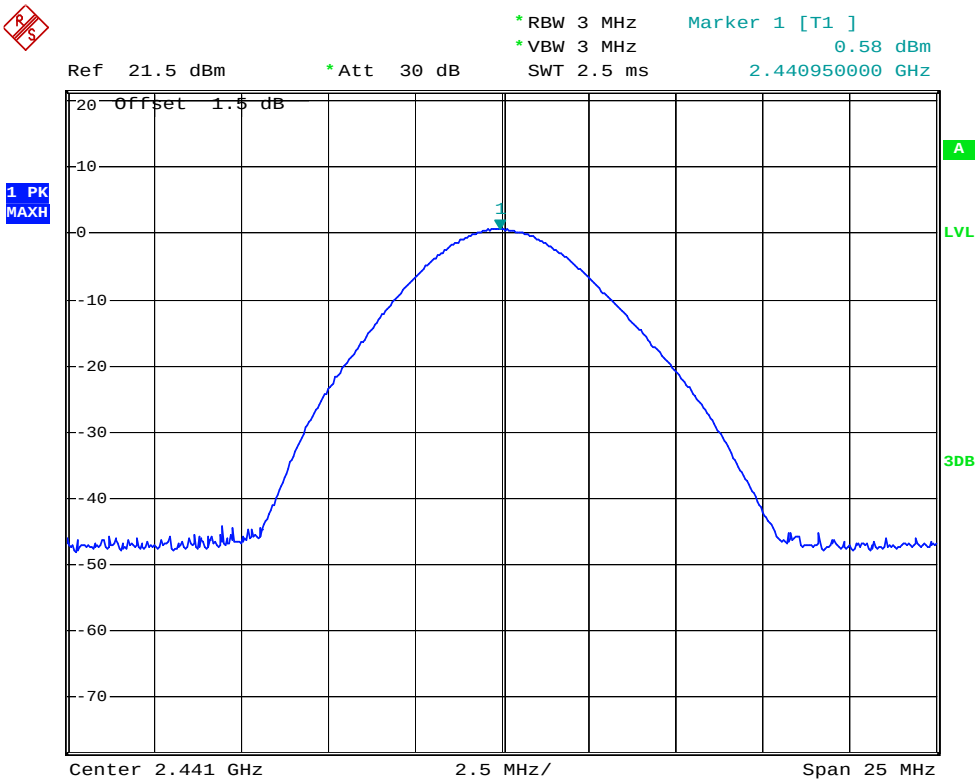


EDR Mode:

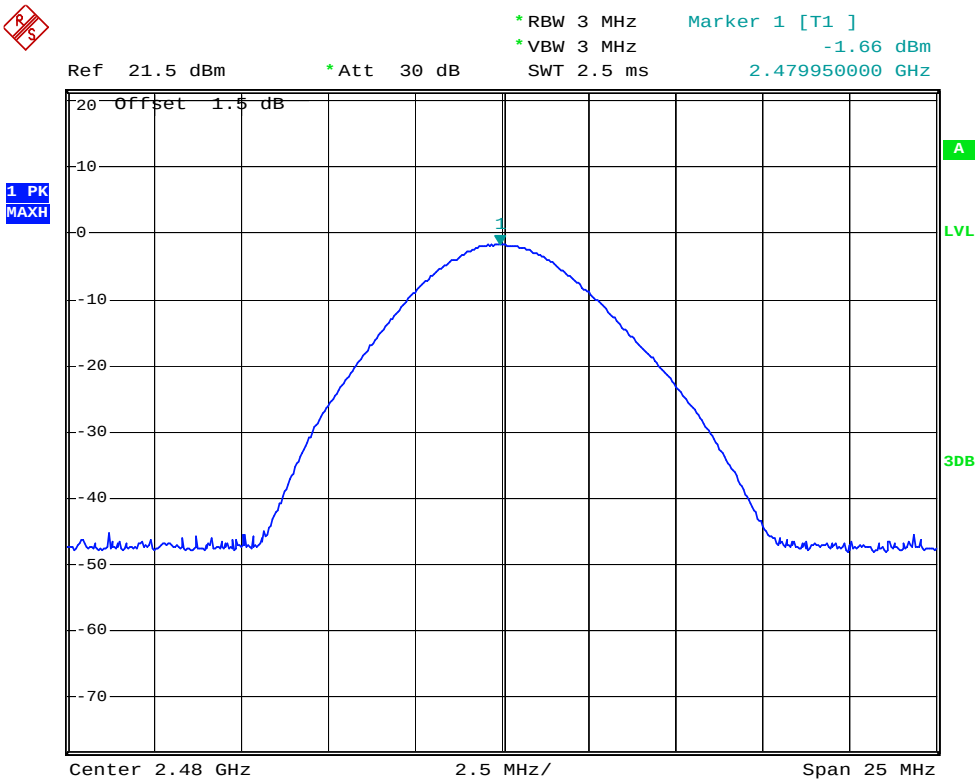
Low channel



Middle channel

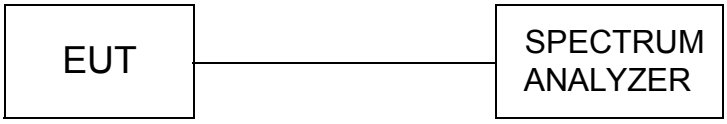


High channel



4.4. 20dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100KHz VBW.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

LIMIT

For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwith.

TEST RESULTS

BDR Mode:

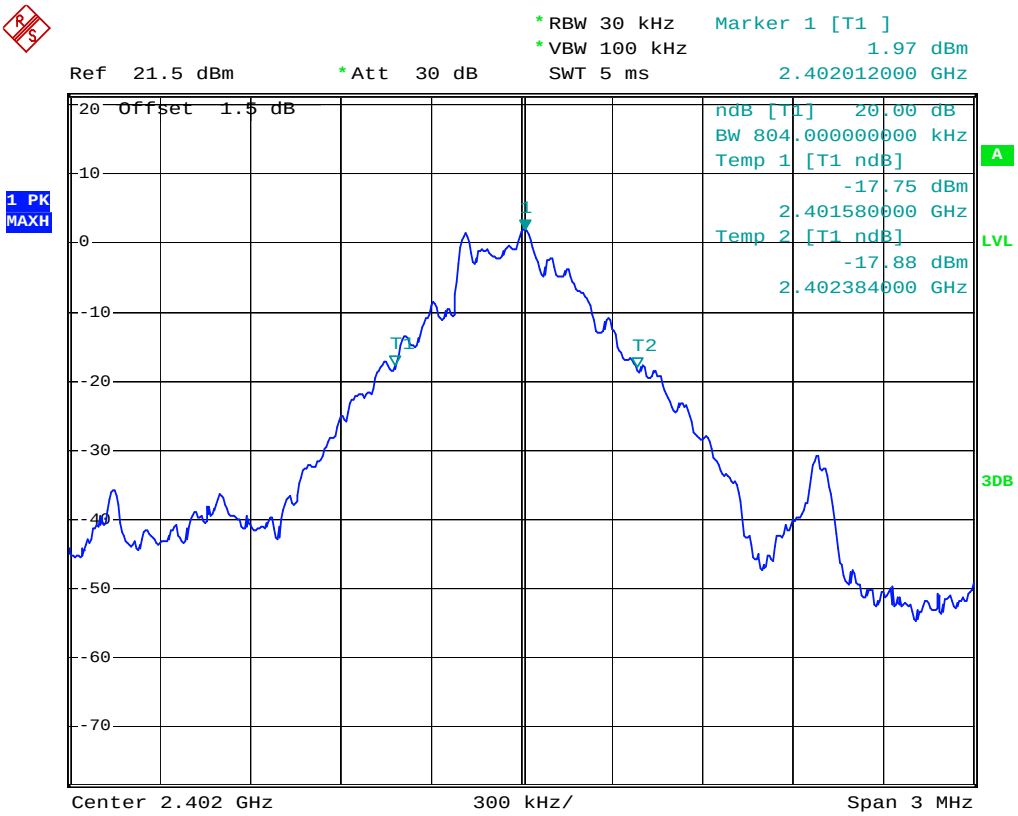
Channel Frequency (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	PASS/FAIL
2402	0.8040	/	PASS
2441	0.8760	/	PASS
2480	0.8040	/	PASS

EDR Mode:

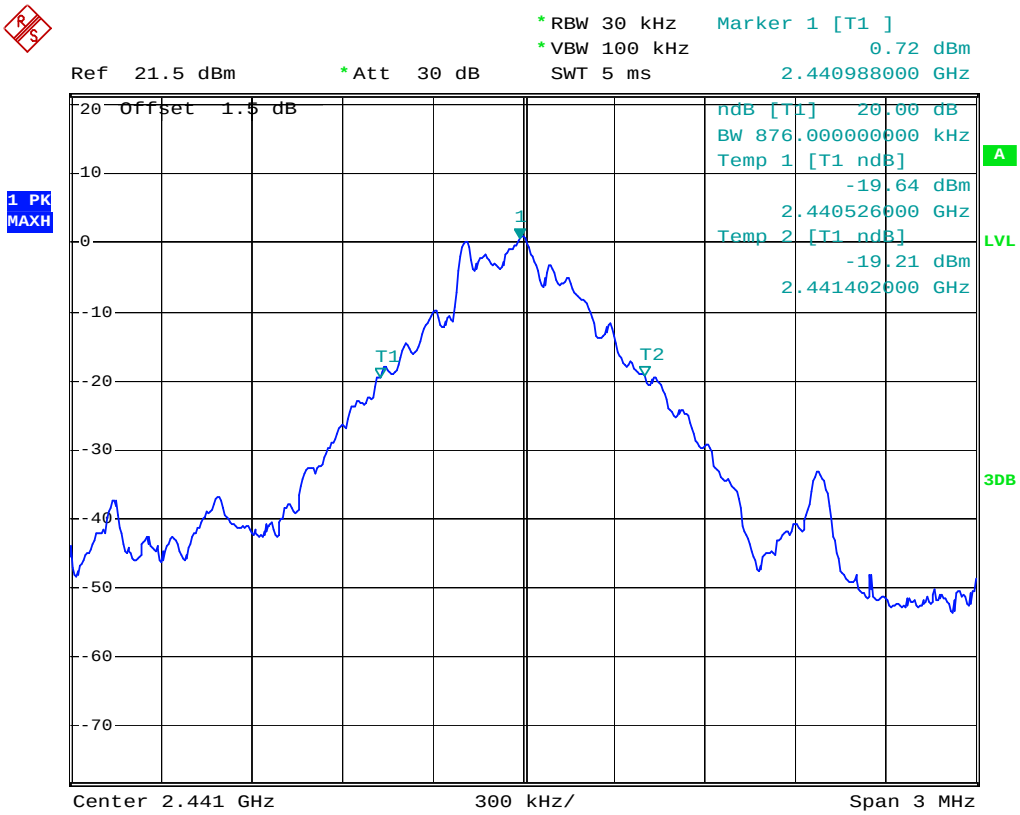
Channel Frequency (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	PASS/FAIL
2402	1.2120	/	PASS
2441	1.2180	/	PASS
2480	1.2120	/	PASS

Photos of 20dB Bandwidth Measurement(BDR Mode)

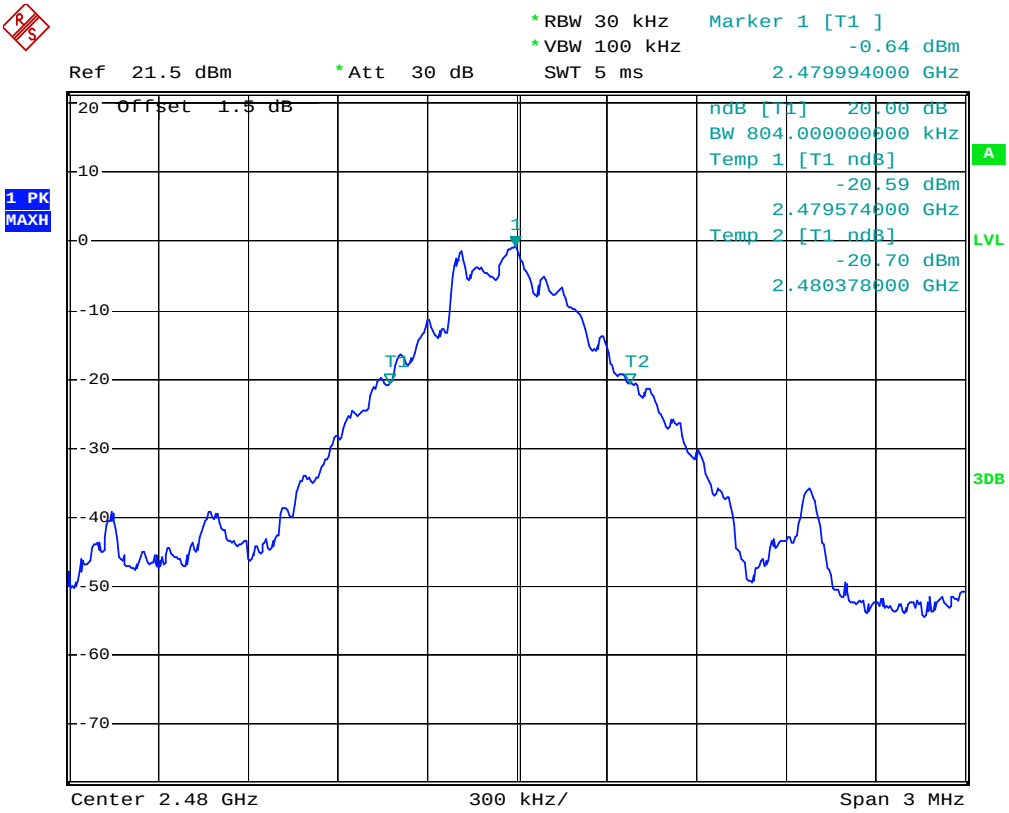
Low Channel



Middle Channel

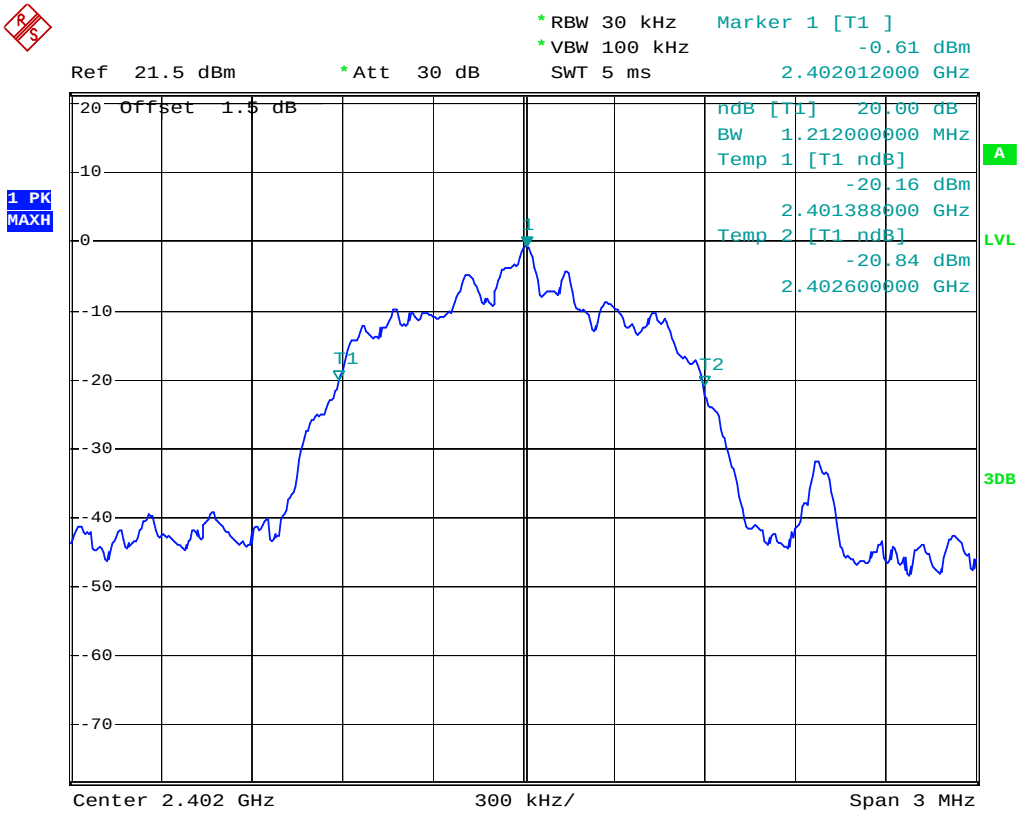


High Channel

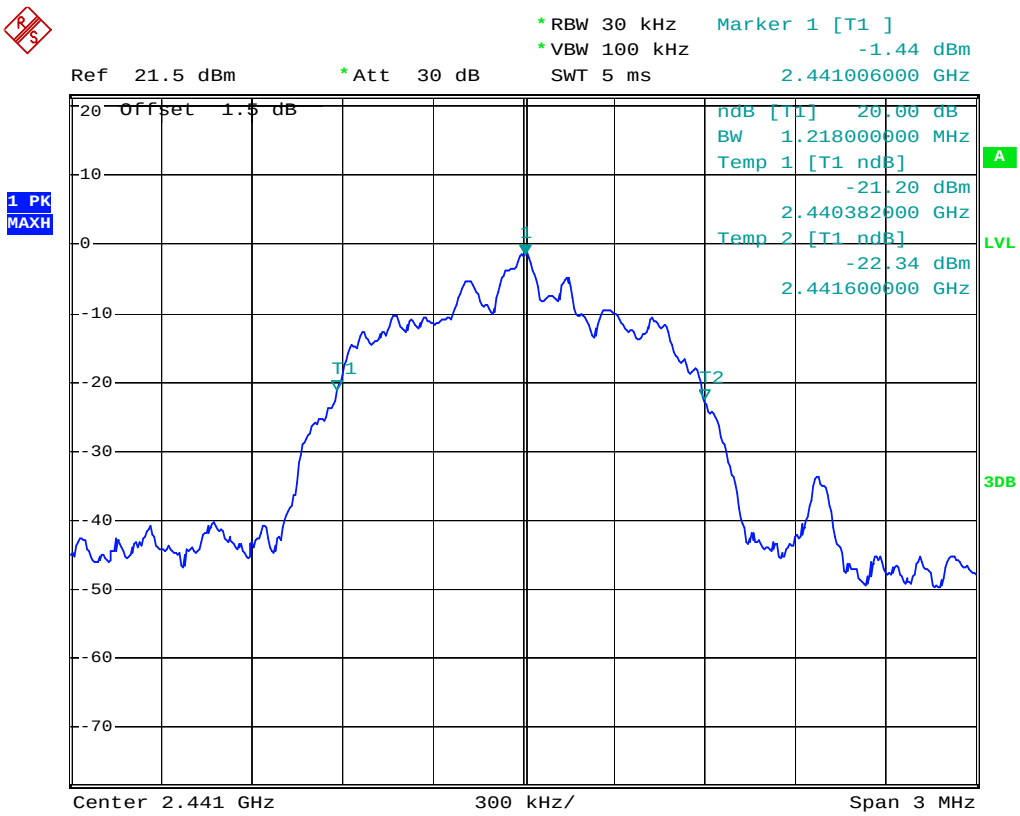


Photos of 20dB Bandwidth Measurement(EDR Mode)

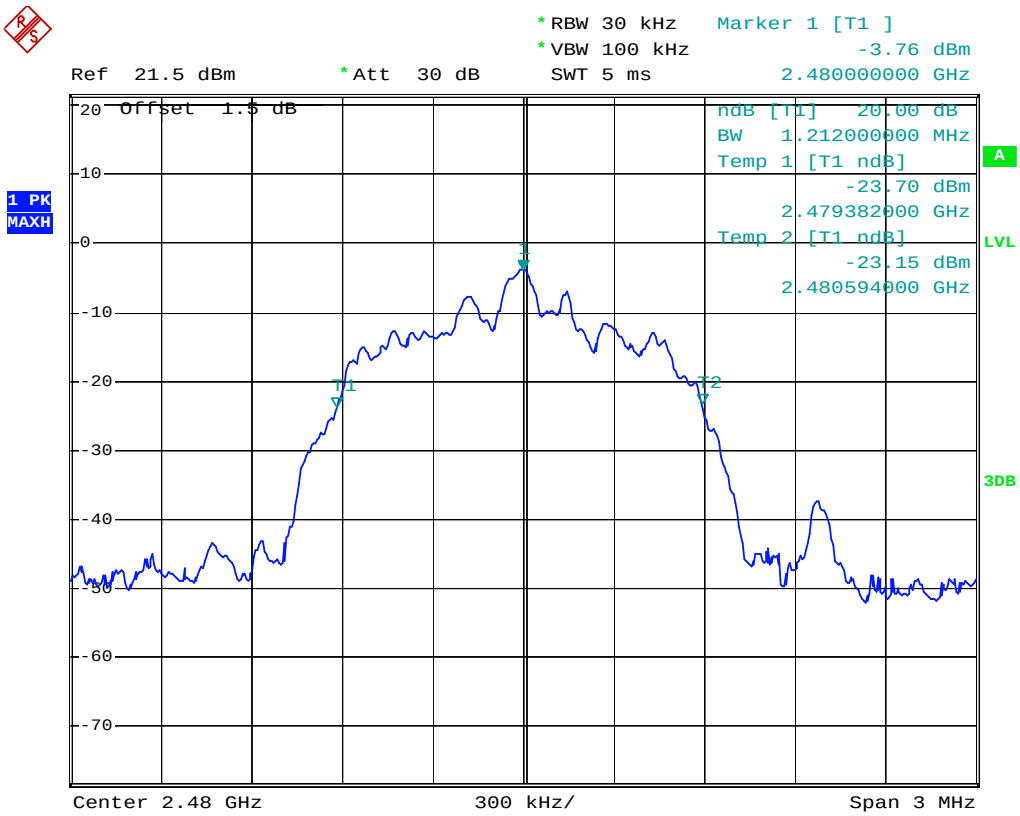
Low Channel



Middle Channel



High Channel



4.5. Band Edge

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

TEST RESULTS

Conducted Band Edge Measurement

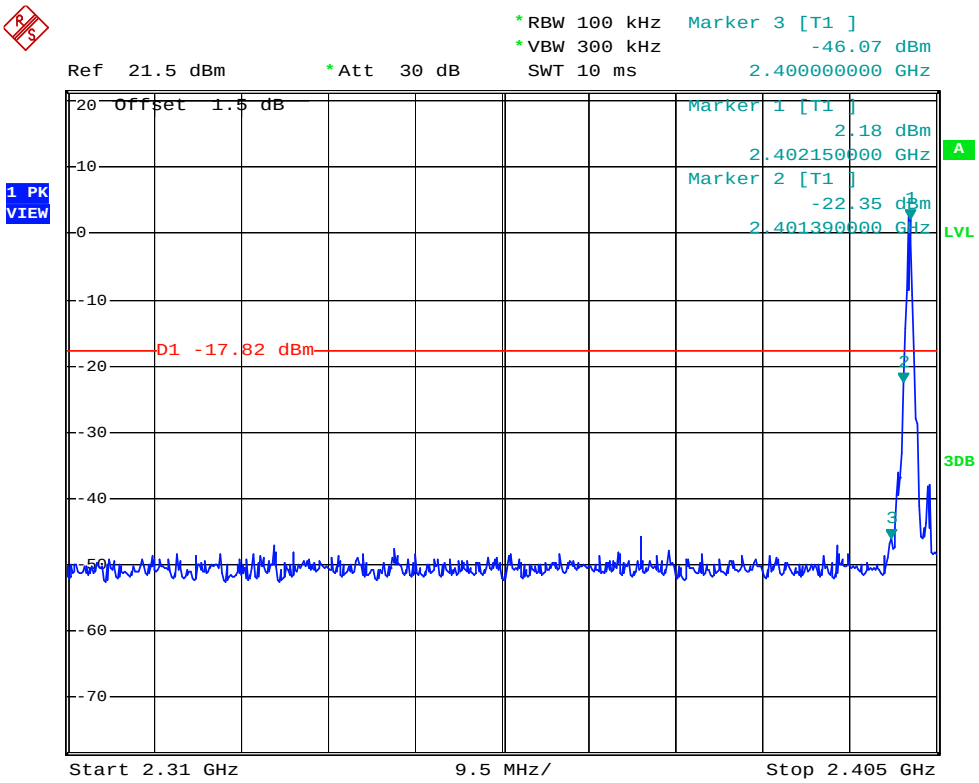
Photos of Band Edge Measurement（BDR Mode）

Frequency	Delta peak to band emission (dBc)	Limit (dBc)
2400.0MHz	-48.25	-20
2483.5MHz	-46.60	-20

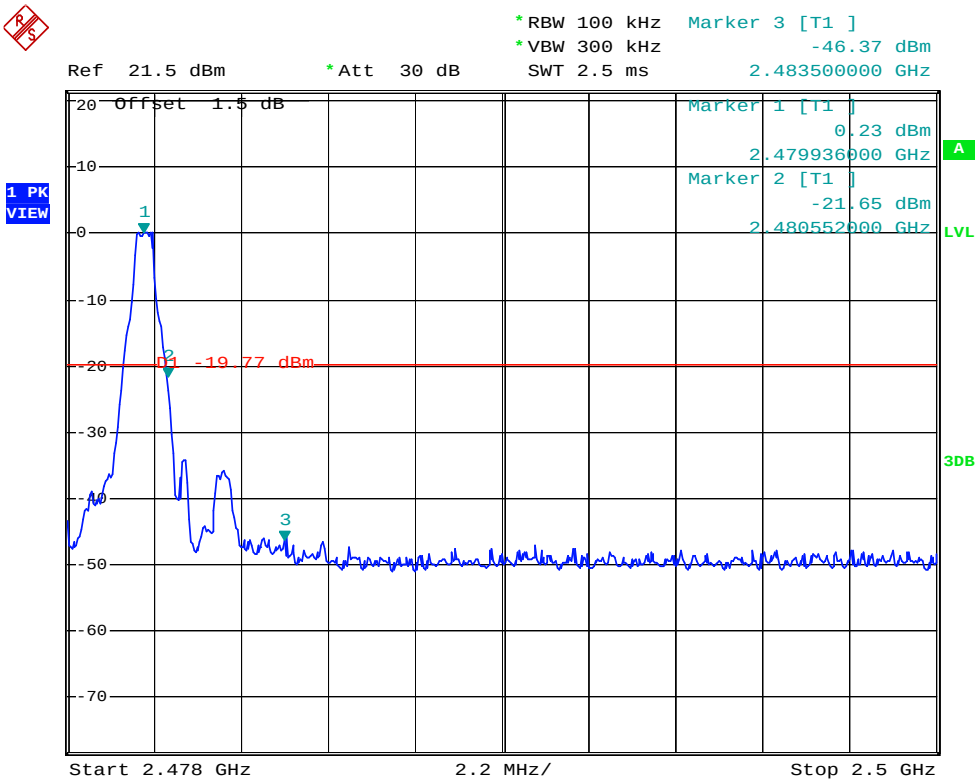
Photos of Band Edge Measurement（EDR Mode）

Frequency	Delta peak to band emission (dBc)	Limit(dBc)
2400.0MHz	-46.67	20
2483.5MHz	-47.88	20

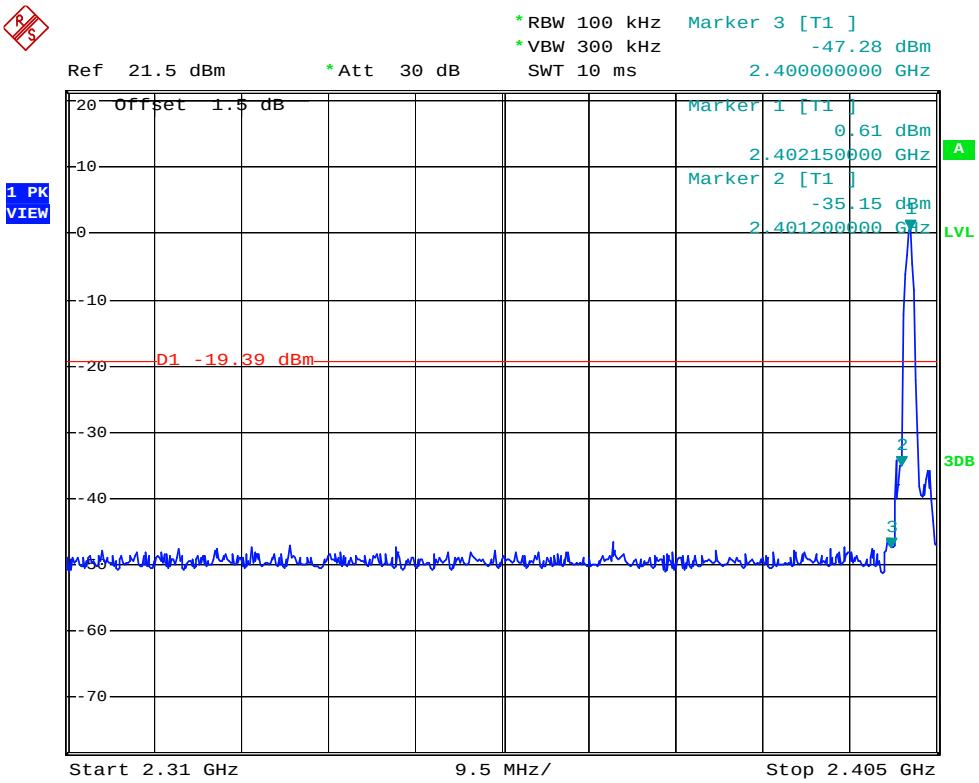
Band Edge: Left Side（BDR）



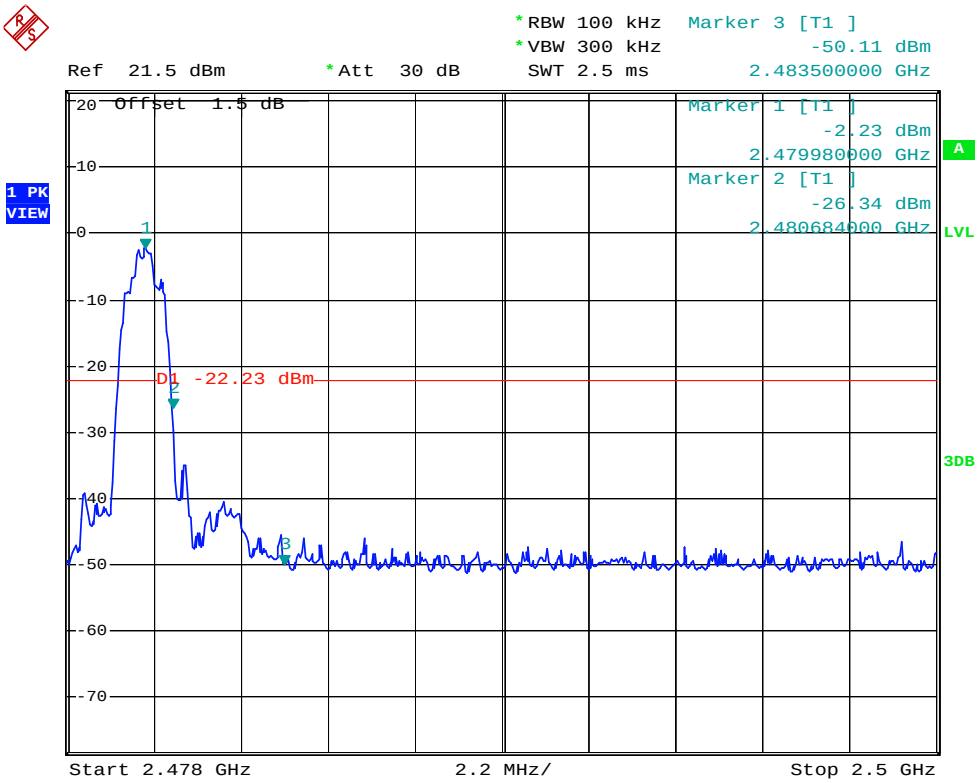
Band Edge: Right Side（BDR）



Band Edge: Left Side（EDR）



Band Edge: Right Side（EDR）



Radiated Band Edge Measurement

BDR (Low channel)

ANTENNA POLARITY & TEST DISTANCE: VERTICAL 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	2390.000	44.38	PK	54.00	9.62	1.00	233	44.17	29.44	7.43	36.62
2	2400.000	62.92	PK	74.00	11.08	1.00	301	62.67	29.44	7.43	36.62
3	2402.000	94.29	PK	---	---	1.00	300	94.04	29.44	7.43	36.62

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	2390.000	44.41	PK	54.00	9.59	1.00	105	44.20	29.44	7.43	36.62
2	2400.000	62.06	PK	74.00	11.94	1.00	296	61.81	29.44	7.43	36.62
3	2402.000	94.12	PK	---	---	1.00	177	93.87	29.44	7.43	36.62

BDR (High channel)

ANTENNA POLARITY & TEST DISTANCE: VERTICAL 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	2480.000	93.05	PK	---	---	1.00	356	92.58	29.49	7.58	36.60
2	2483.500	45.27	PK	54.00	8.73	1.00	189	44.80	29.49	7.58	36.60
3	2500.000	44.10	PK	54.00	9.90	1.00	25	43.58	29.49	7.58	36.60

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	2480.000	90.91	PK	---	---	1.00	222	90.44	29.49	7.58	36.60
2	2483.500	45.47	AV	54.00	8.53	1.00	207	45.00	29.49	7.58	36.60
3	2500.000	44.17	PK	54.00	9.83	1.00	199	43.65	29.49	7.58	36.60

EDR (Low channel)

ANTENNA POLARITY & TEST DISTANCE: VERTICAL 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	2439.000	43.95	PK	54.00	10.05	1.00	100	43.74	29.44	7.39	36.62
2	2400.000	70.07	PK	74.00	3.95	1.00	189	69.82	29.44	7.43	36.62
3	2402.000	94.87	PK	---	---	1.00	136	94.62	29.44	7.43	36.62

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	2439.000	44.90	PK	54.00	9.10	1.00	112	44.69	29.44	7.43	36.62
2	2400.000	66.28	PK	74.00	7.72	1.00	26	66.03	29.44	7.43	36.62
3	2402.000	92.84	PK	---	---	1.00	228	92.59	29.44	7.43	36.62

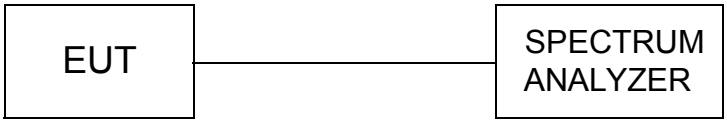
EDR (High channel)

ANTENNA POLARITY & TEST DISTANCE: VERTICAL 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	2480.000	89.91	PK	---	---	1.00	85	89.44	29.49	7.58	36.60
2	2483.500	44.72	PK	54.00	9.28	1.00	347	44.25	29.49	7.58	36.60
3	2500.000	45.22	PK	54.00	8.78	1.00	152	44.70	29.49	7.58	36.60

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M											
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)
1	2480.000	92.47	PK	---	---	1.00	244	92.00	29.49	7.58	36.60
2	2483.500	44.69	PK	54.00	9.31	1.00	39	44.22	29.49	7.58	36.60
3	2500.000	44.83	PK	54.00	9.17	1.00	182	44.31	29.49	7.58	36.60

4.6. Frequency Separation

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with30 KHz RBW and 100KHz VBW.

LIMIT

According to 15.247(a)(1),frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

TEST RESULTS

BDR Mode:

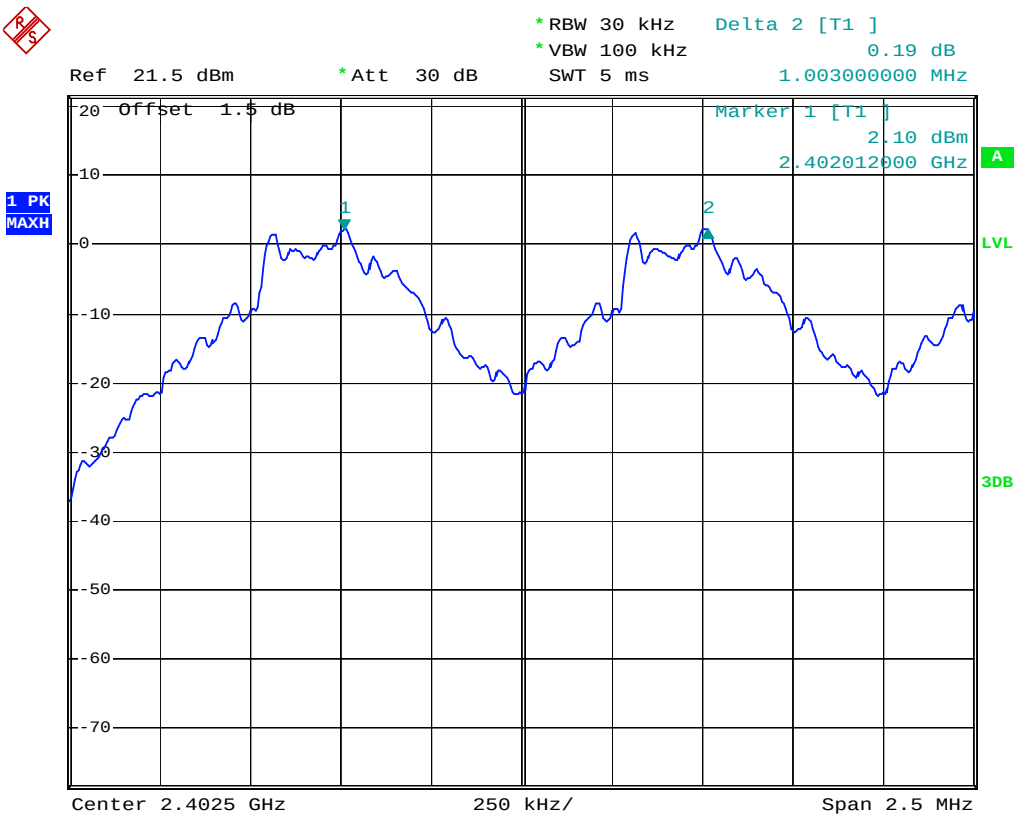
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.003	⩾1	Pass
Adjacency Channel	2403			
Mid Channel	2441	1.003	⩾1	Pass
Adjacency Channel	2442			
High Channel	2479	1.004	⩾1	Pass
Adjacency Channel	2480			

EDR Mode:

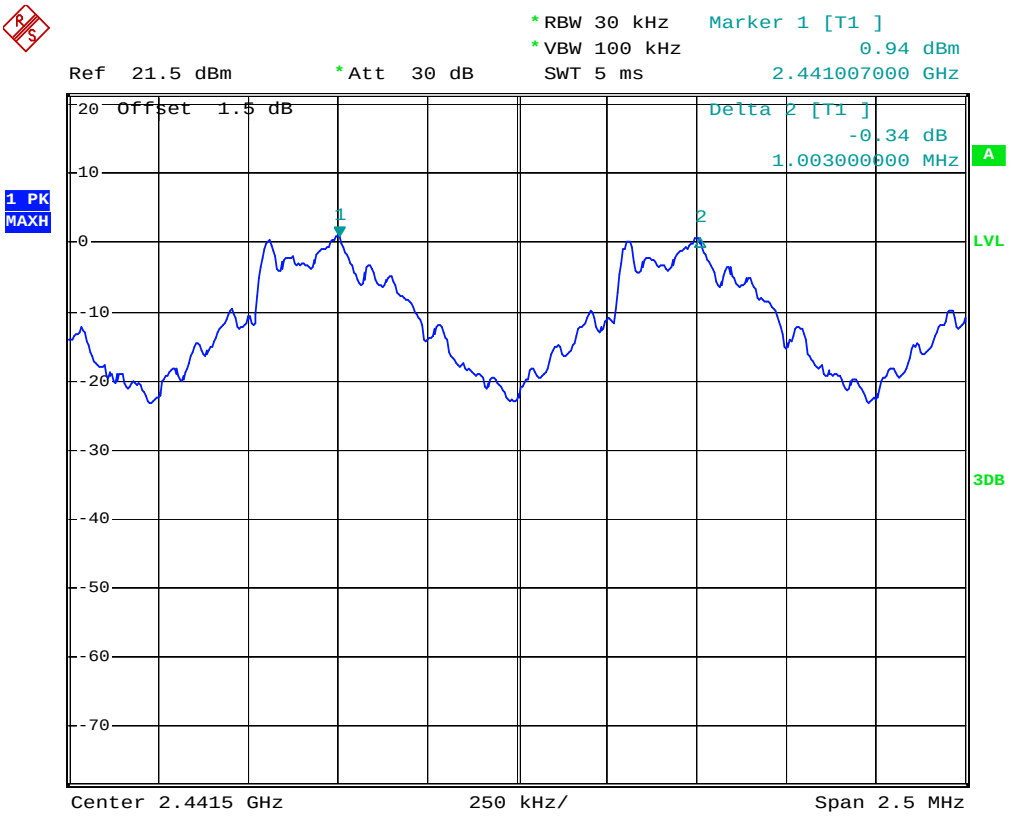
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.000	⩾1	Pass
Adjacency Channel	2403			
Mid Channel	2441	1.000	⩾1	Pass
Adjacency Channel	2442			
High Channel	2479	1.000	⩾1	Pass
Adjacency Channel	2480			

Photos of Frequency separation Measurement(BDR Mode)

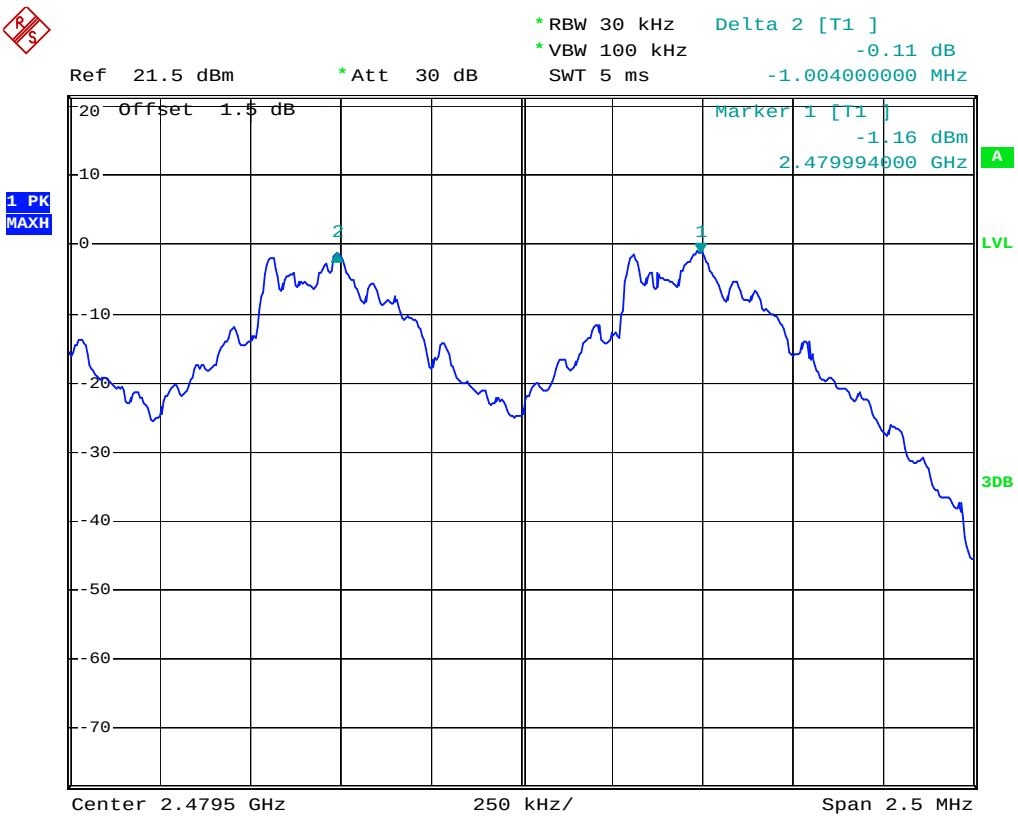
Low channel



Middle channel

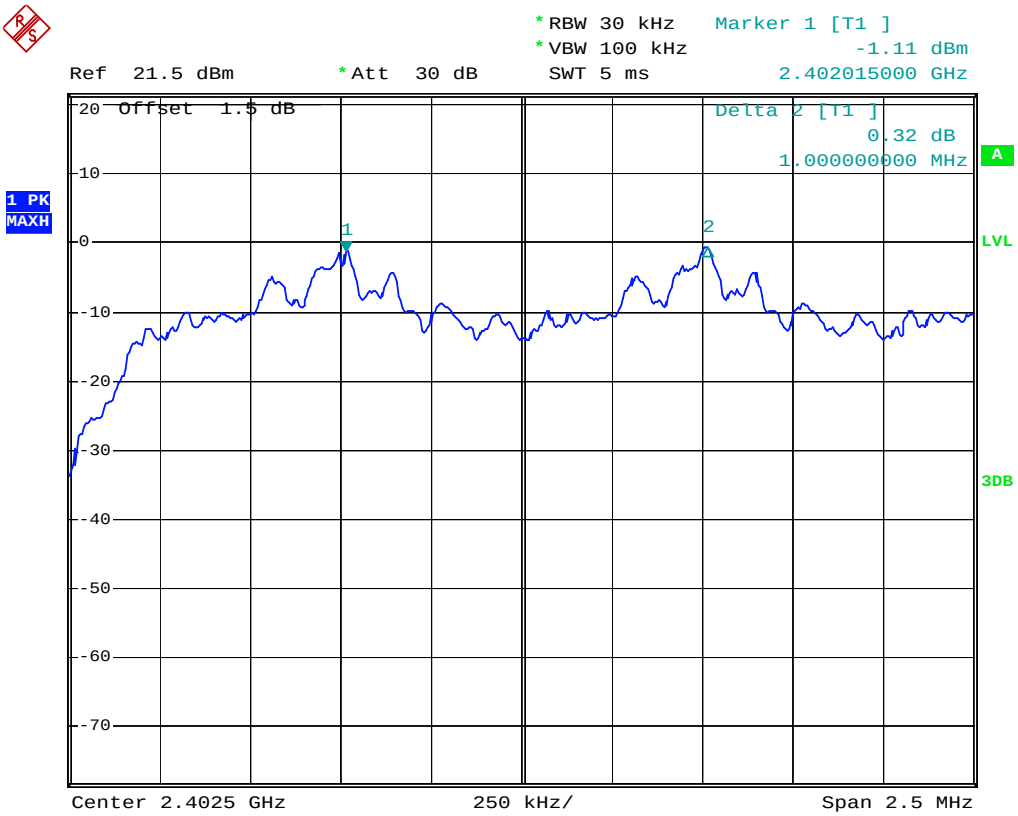


High channel

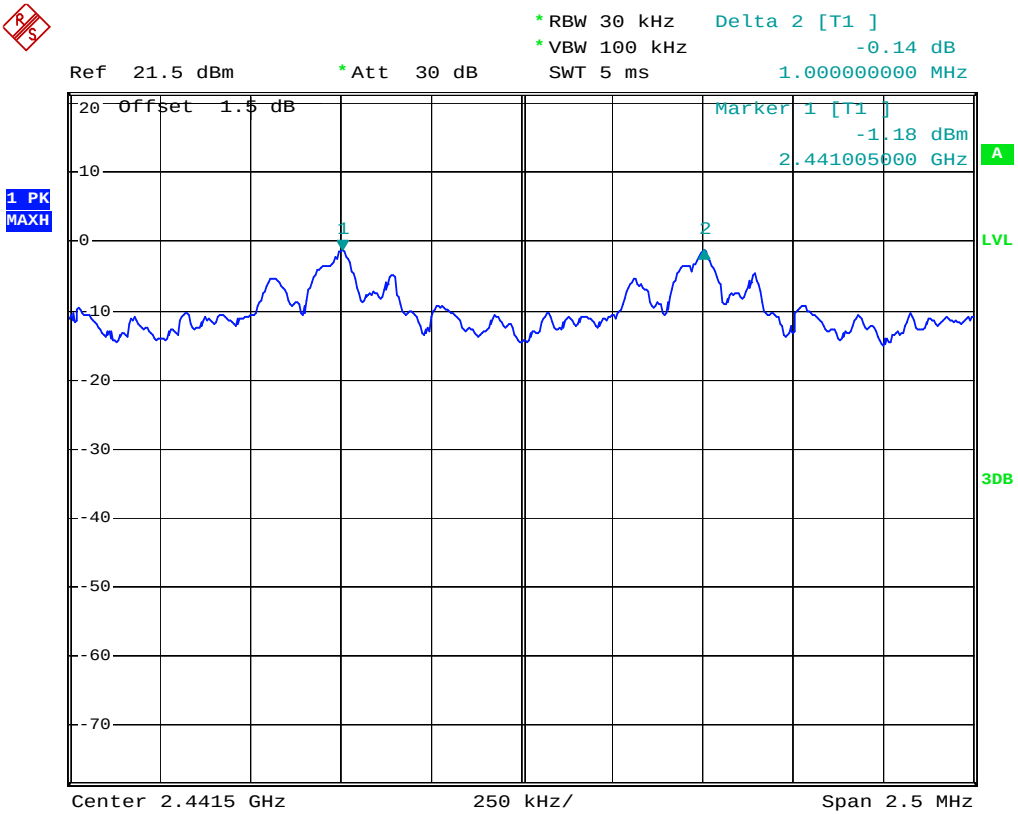


Photos of Frequency separation Measurement(EDR Mode)

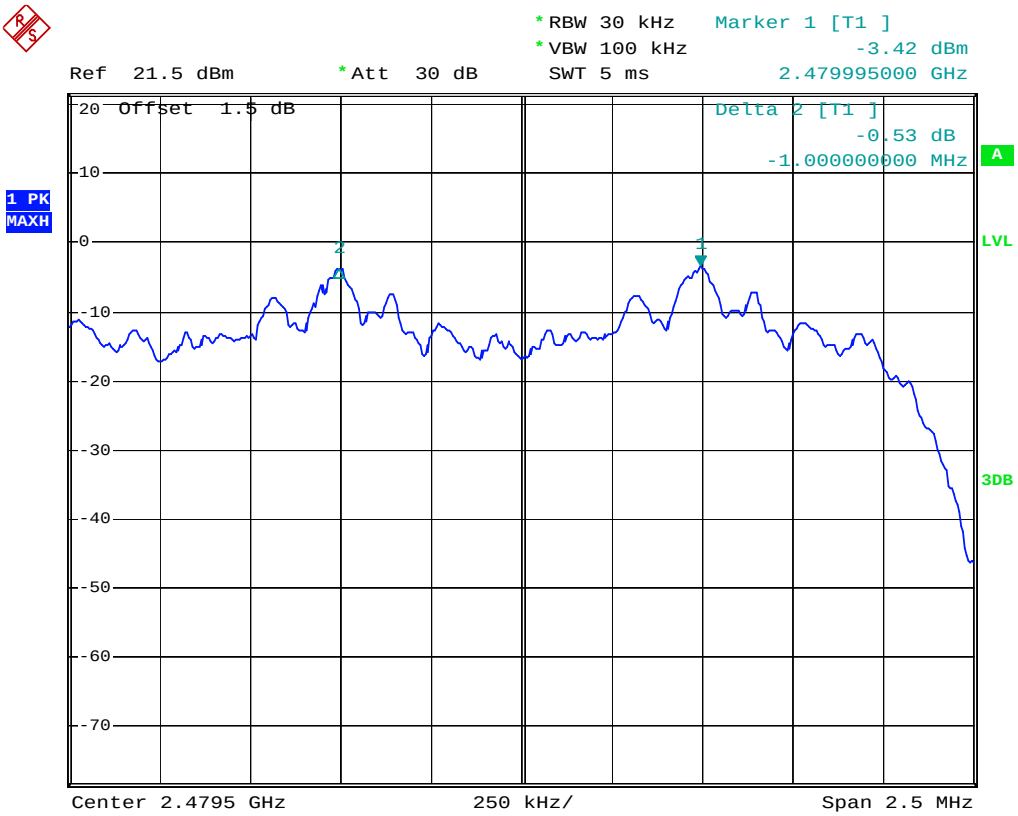
Low channel



Middle channel

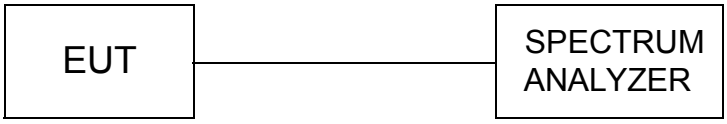


High channel



4.7. Number of hopping frequency

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator.Set spectrum analyzer start 2400MHz to 2483.5MHz with 30 KHz RBW and 100KHz VBW.

LIMIT

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

TEST RESULTS

BDR Mode:

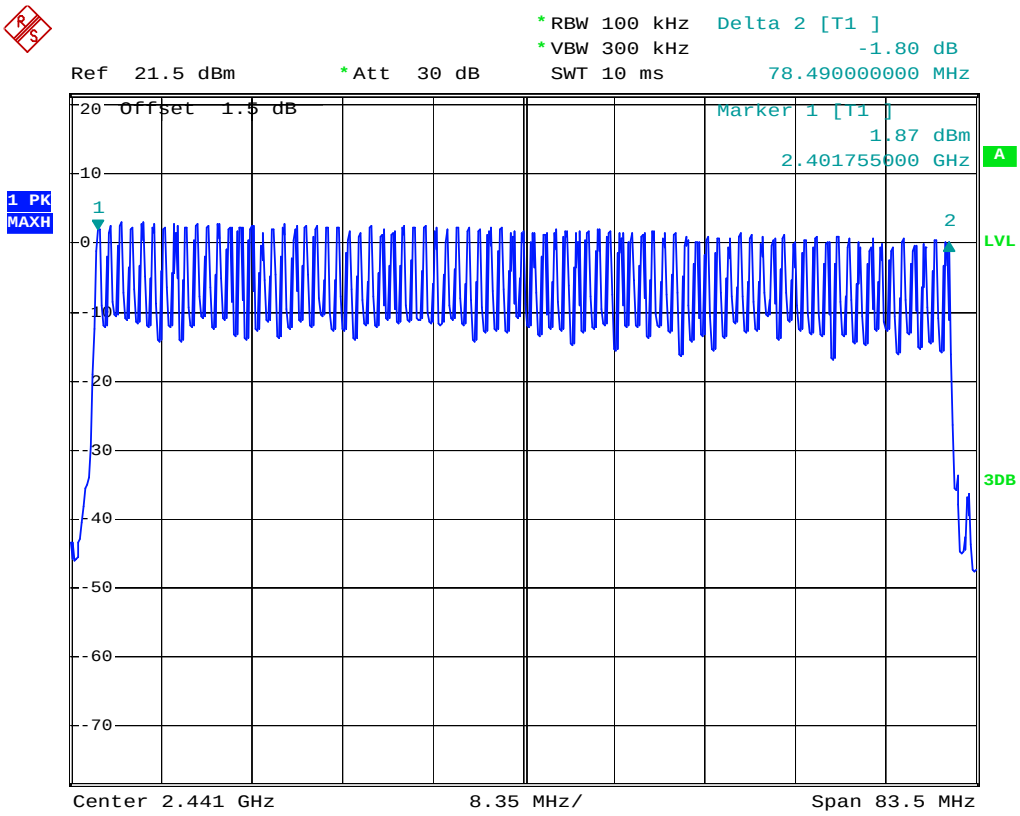
Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

EDR Mode:

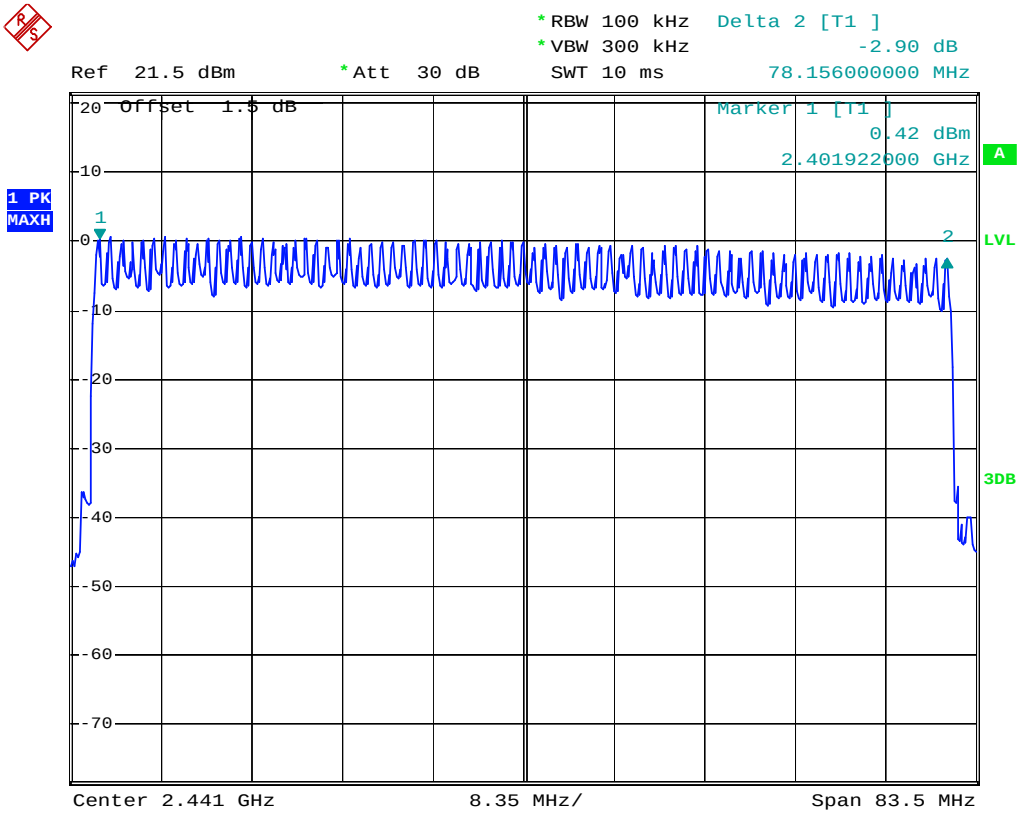
Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

Test Result: Pass

Photos of Number of hopping channel Measurement(BDR Mode)

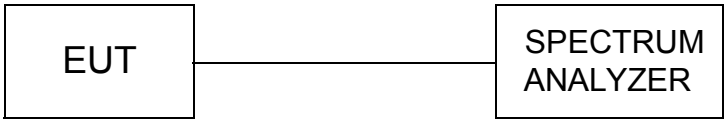


Photos of Number of hopping channel Measurement(EDR Mode)



4.8. Time Of Occupancy(Dwell Time)

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with 1MHz RBW and 3MHz VBW,Span 0Hz.

LIMIT

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

TEST RESULTS

BDR Mode:

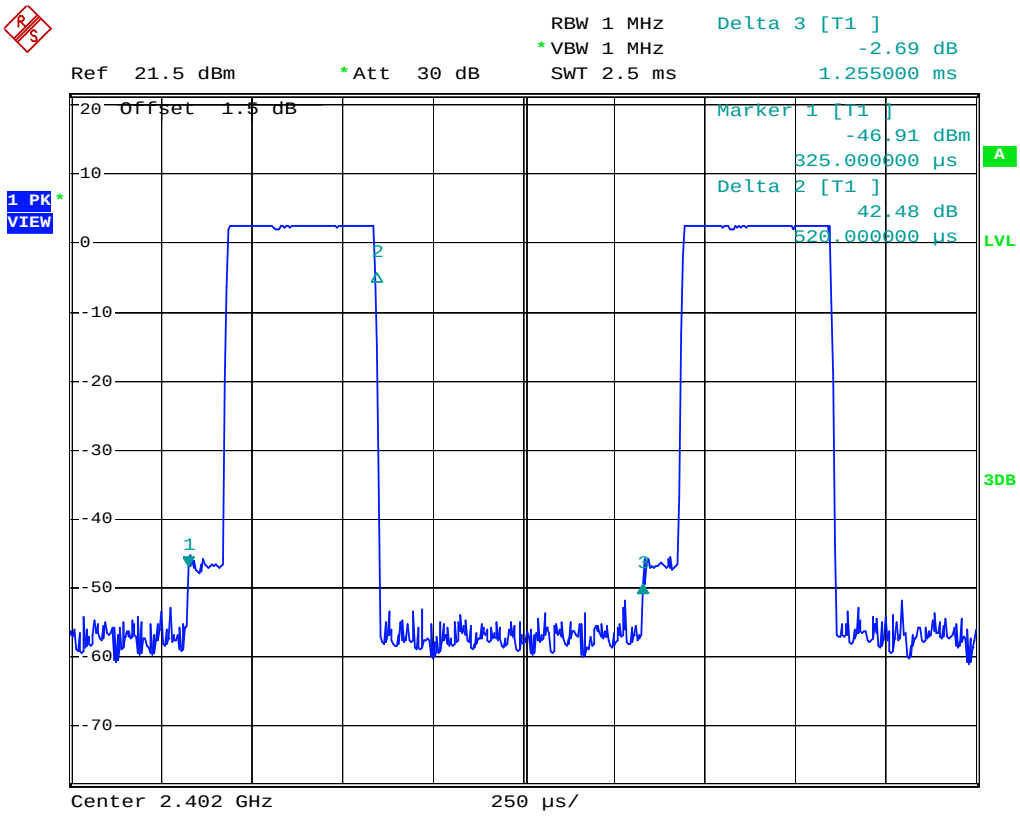
Mode	Channel	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
DH 1	Low	0.520	0.1664	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second				
DH 3	Low	1.780	0.2848	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second				
DH 5	Low	3.040	0.3243	0.4	Pass
	Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second				

EDR Mode:

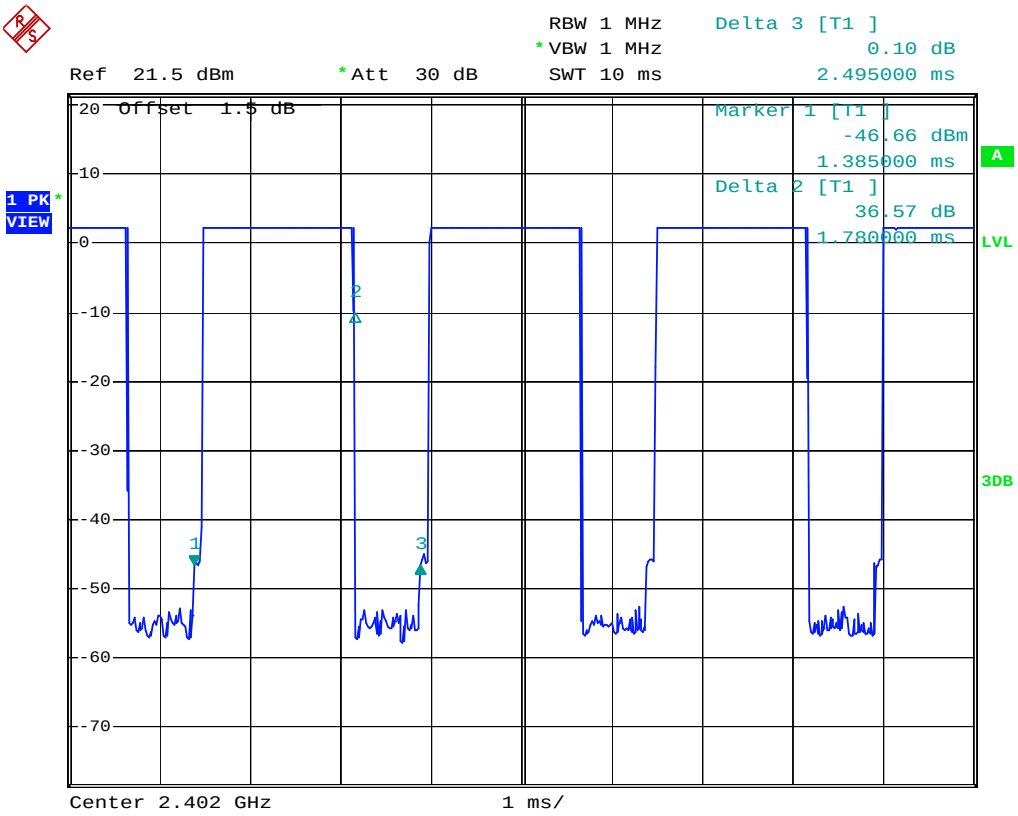
Mode	Channel	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Result
DH 1	Low	0.535	0.1712	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second				
DH 3	Low	1.795	0.2872	0.4	Pass
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second				
DH 5	Low	3.035	0.3273	0.4	Pass
	Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second				

Photos of Dwel time Measurement(BDR)

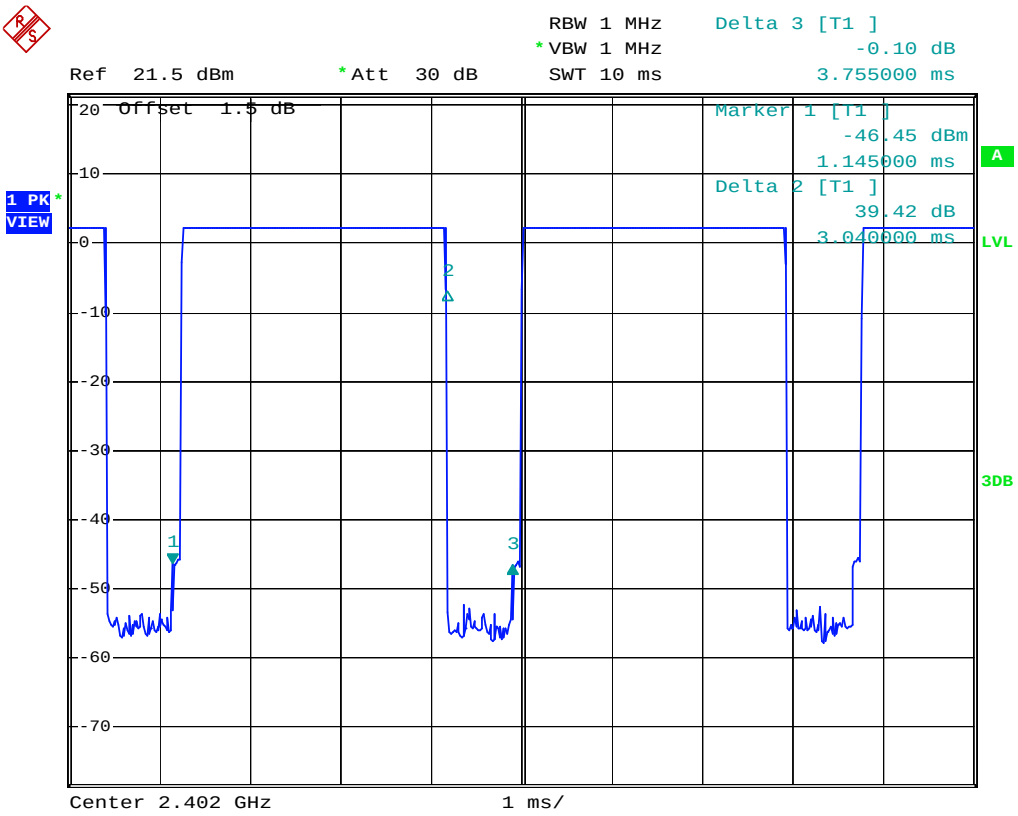
DH1-Low channel



DH3-Low channel

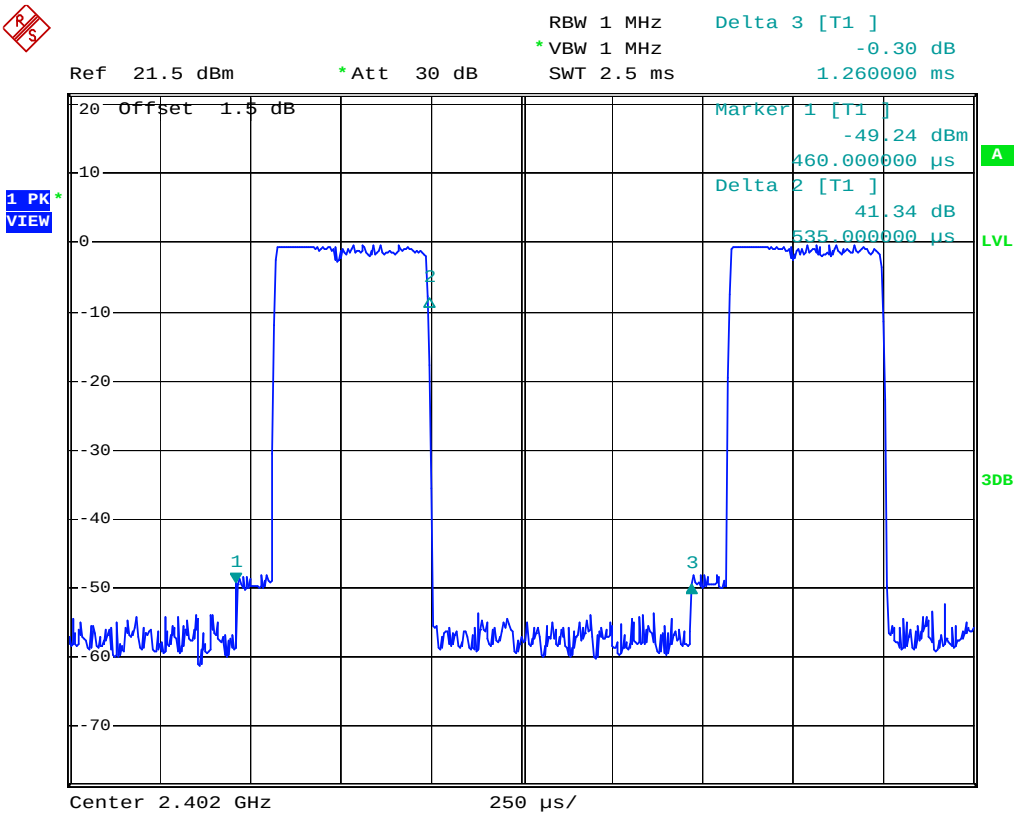


DH5-Low channel

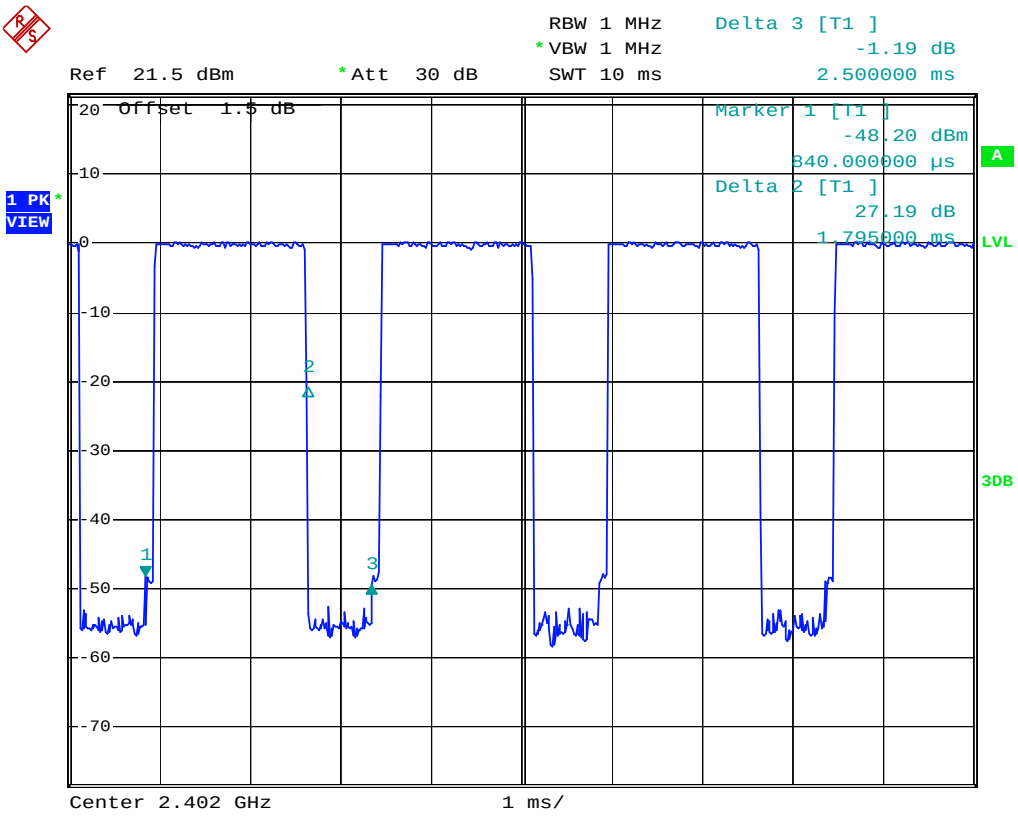


Photos of Dwel time Measurement(EDR)

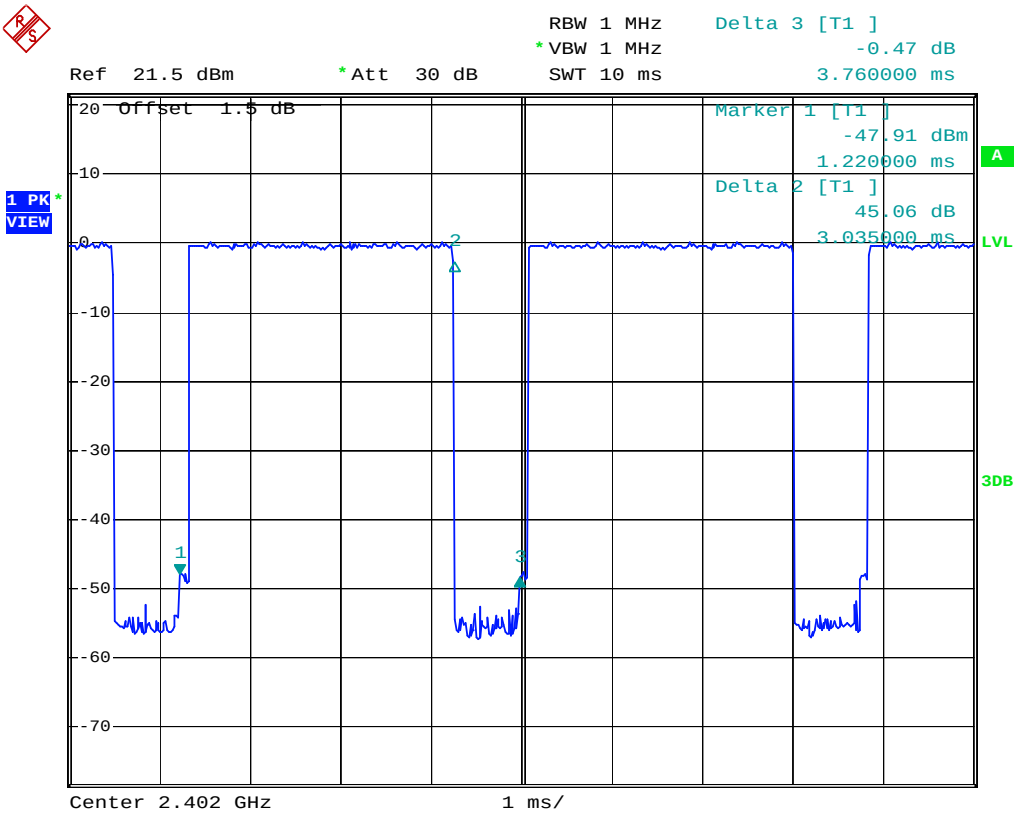
DH1-Low channel



DH3-Low channel



DH5-Low channel



4.9. Antenna Requirement

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.

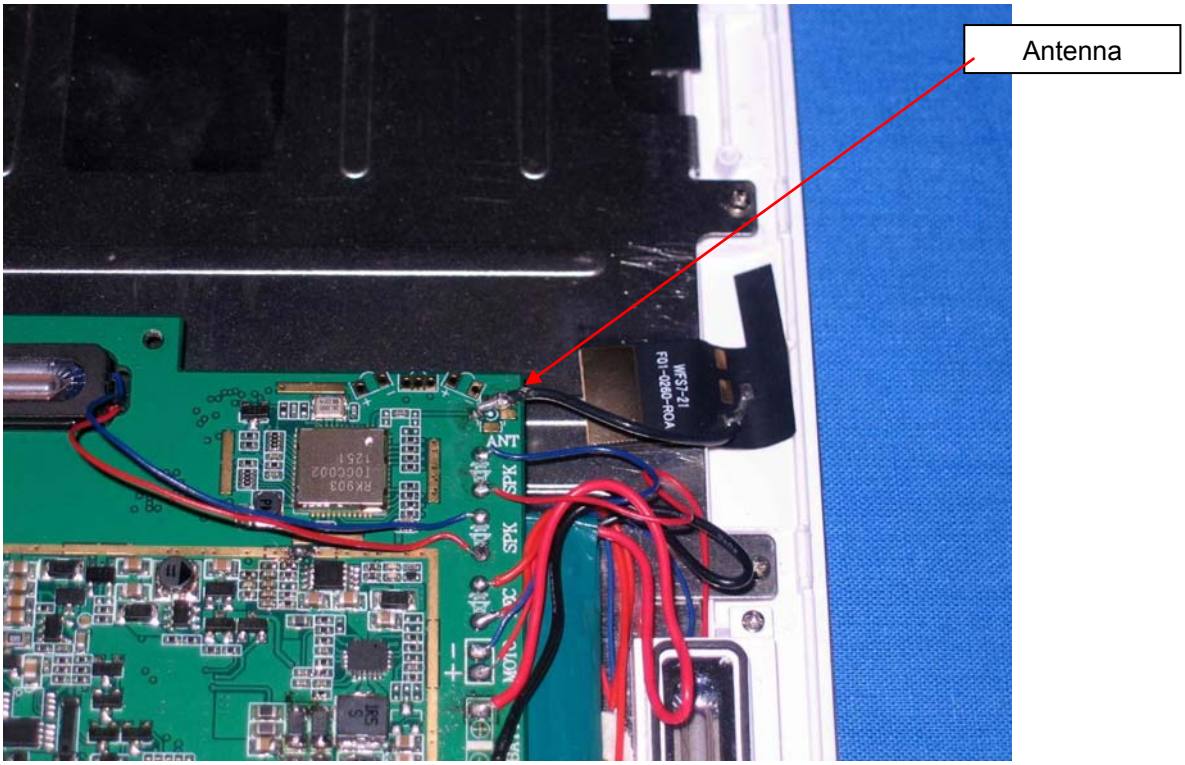
And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance.

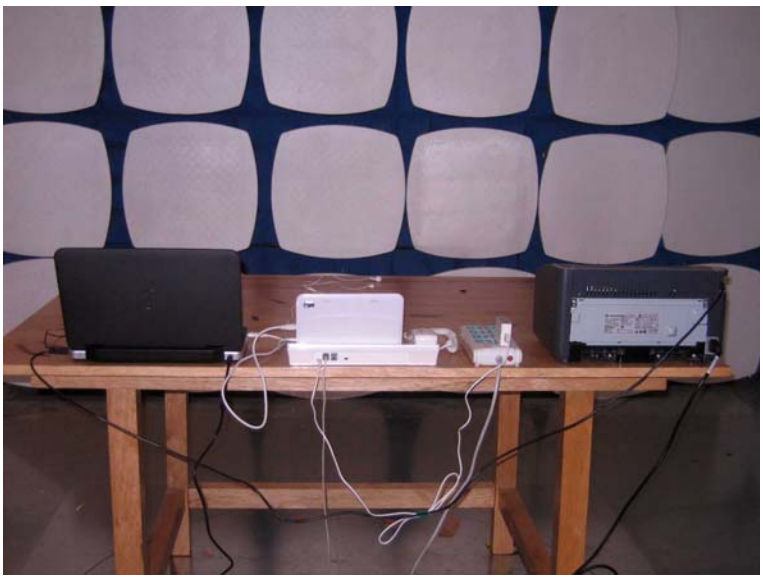
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The antenna used in this product is a PCB Antenna .The maximum Gain of the antenna only 1dBi. Detail please see the photos as following:



5. Test Setup Photos of the EUT



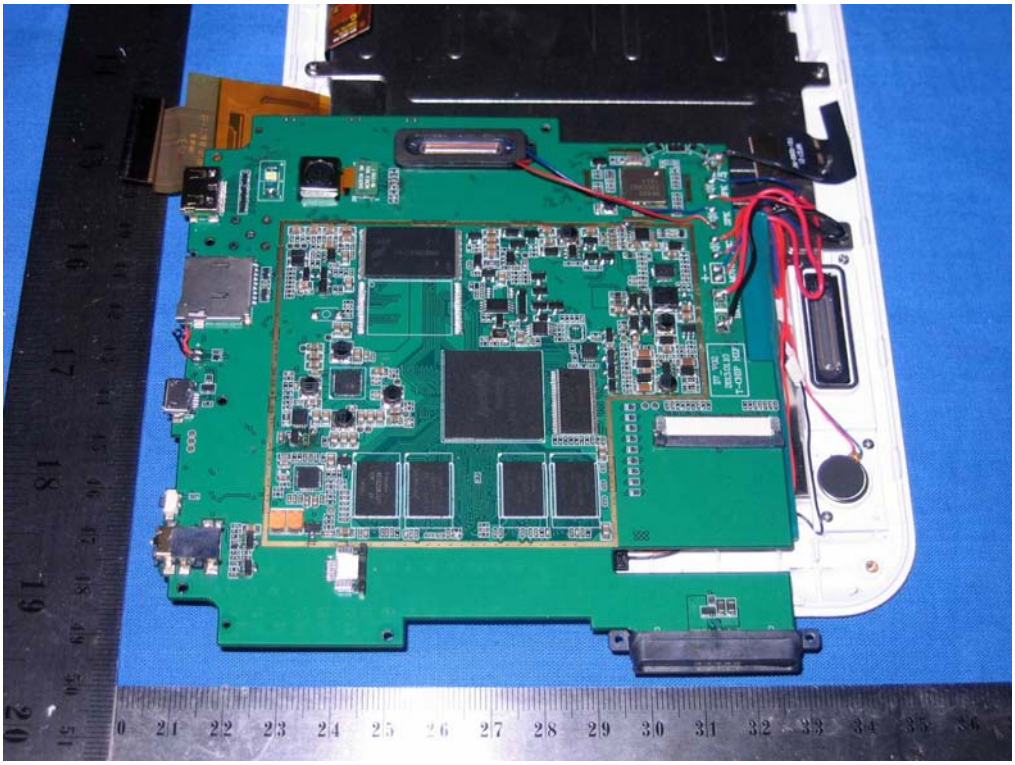
6. External and Internal Photos of the EUT

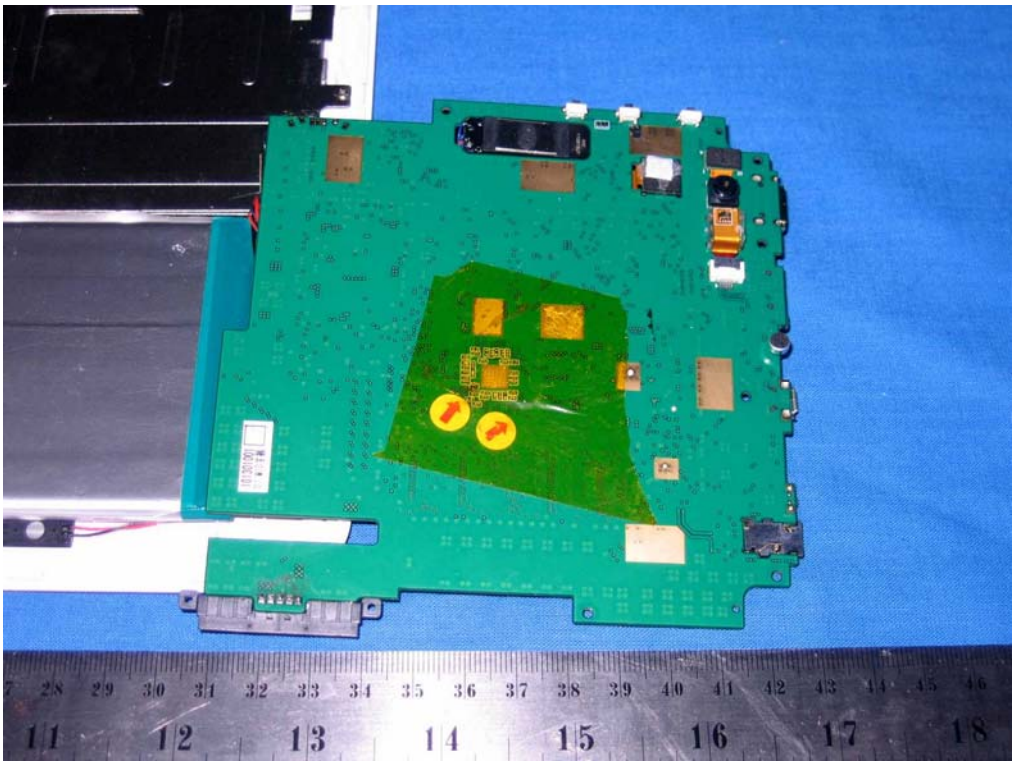
External Photos

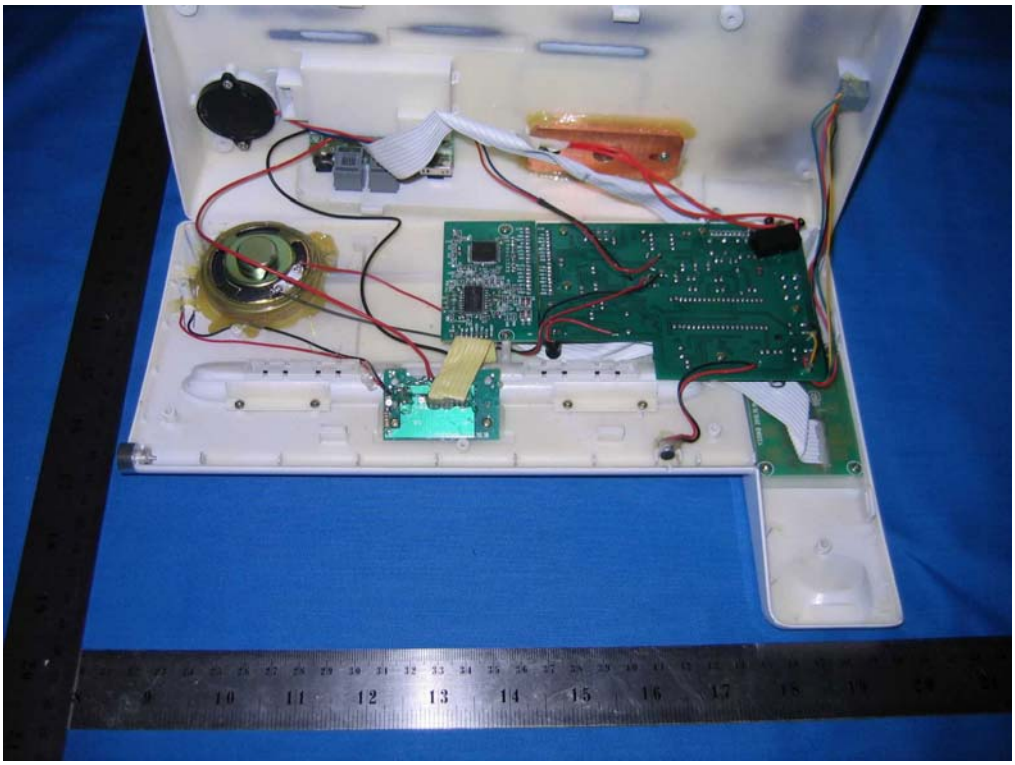
AC-DC ADAPTER
D7DP12W
MADE IN CHINA

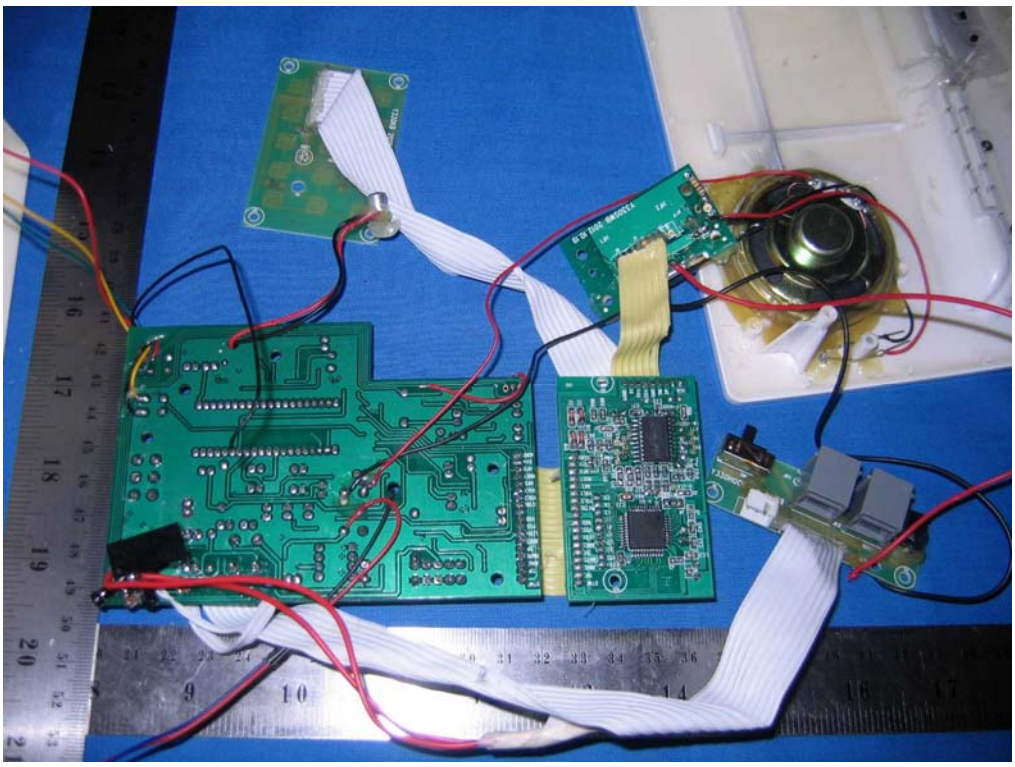
PLDT

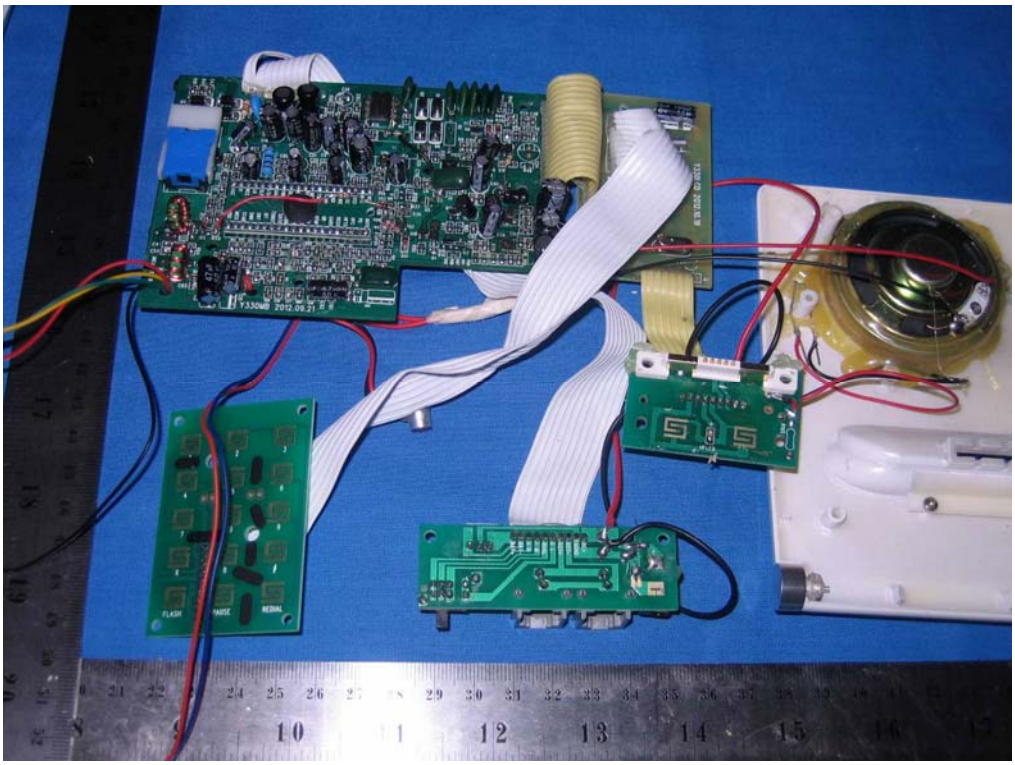
Internal Photos

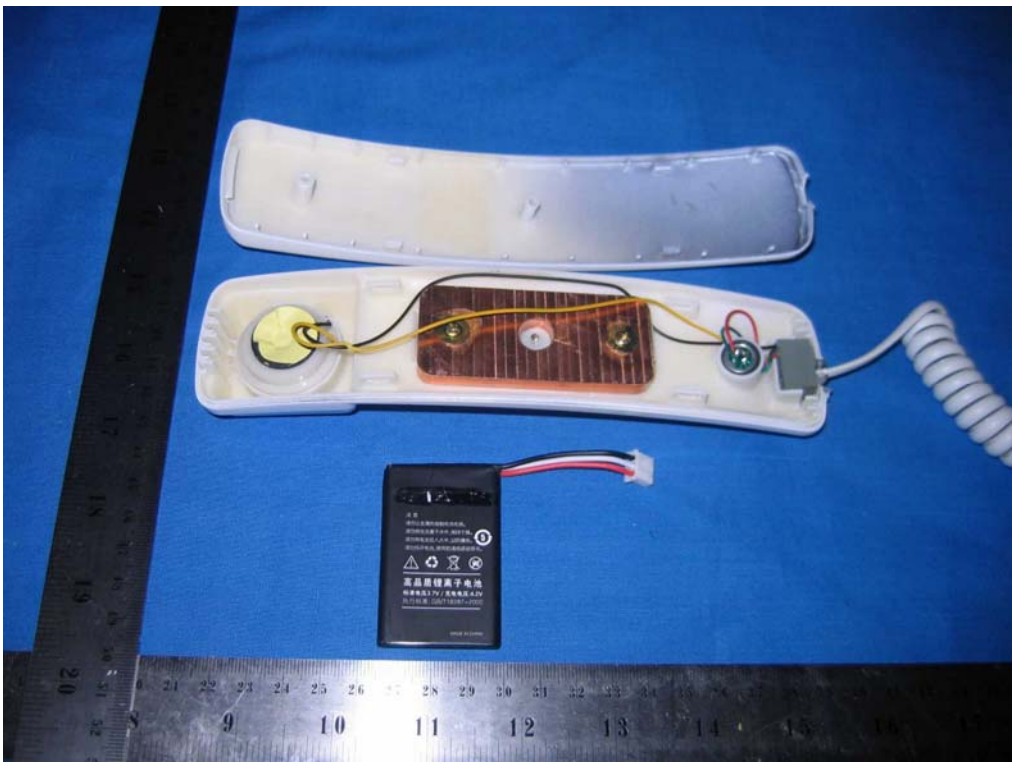












.....End of Report.....