FCC PART 15 SUBPART C MEASURMENT AND TEST REPORT

For

Harmonic International Ltd

Room 1201-02, C-Bons International Centre, 108 Wai Yip Street, Kwun Tong, Kowloon, Hong Kong

E.U.T.: Hidden Radio Wireless Speaker

Model Name: HS002

Brand Name: HIDDEN

FCC ID: OGWHS002

Report Number: NTC1503044F-1

Test Date(s): March 10, 2015 to April 17, 2015

Report Date(s): April 17, 2015

Prepared by

Dongguan Nore Testing Center Co., Ltd.

Building D, Gaosheng Science and Technology Park, Hongtu Road, Nancheng District,Dongguan City, Guangdong, China

Tel: +86-769-22022444 Fax: +86-769-22022799

Prepared By	Approved & Authorized Signer
Rose Hu / Engineer	Sunm Lv / Q.A. Director

Note: This test report is for the customer shown above and their specific product only. It may not be duplicated or used in part without prior written consent from Dongguan Nore Testing Center Co., Ltd.The test results referenced from this report are relevant only to the sample tested.

Table of Contents

1. GENERAL INFORMATION 4

1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST 4
1.2 RELATED SUBMITTAL(S) / GRANT (S) 4
1.3 TEST METHODOLOGY 5
1.4 EQUIPMENT MODIFICATIONS 5
1.5 SUPPORT DEVICE 5
1.6 TEST FACILITY AND LOCATION 6
1.7 SUMMARY OF TEST RESULTS 6

2. SYSTEM TEST CONFIGURATION 7

2.1 EUT CONFIGURATION 7
2.2 SPECIAL ACCESSORIES 7
2.3 DESCRIPTION OF TEST MODES 7
2.4 EUT EXERCISE 7

3. CONDUCTED EMISSIONS TEST 8

3.1 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 8
3.2 TEST CONDITION 8
3.3 MEASUREMENT RESULTS 8

4. MAX. CONDUCTED OUTPUT POWER 11

4.1 MEASUREMENT PROCEDURE 11
4.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 11
4.3 MEASUREMENT RESULTS 12

5. 6DB & 20DB BANDWIDTH 14

5.1 MEASUREMENT PROCEDURE 14
5.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 14
5.3 MEASUREMENT RESULTS 14

6. POWER SPECTRAL DENSITY 18

6.1 MEASUREMENT PROCEDURE 18
6.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 18
6.3 MEASUREMENT RESULTS 18

7. BAND EDGE AND CONDUCTED SPURIOUS EMISSIONS 21

7.1 REQUIREMENT AND MEASUREMENT PROCEDURE 21
7.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 21
7.3 MEASUREMENT RESULTS 21

8. RADIATED SPURIOUS EMISSIONS AND RESTRICTED BANDS 31

8.1 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 31
8.2 MEASUREMENT PROCEDURE 32
8.3 LIMIT 33
8.4 MEASUREMENT RESULTS 34
9. ANTENNA APPLICATION 36
9.1 ANTENNA REQUIREMENT 36
9.2 MEASUREMENT RESULTS 36
10. TEST EQUIPMENT LIST 37

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test

This device is a BT speaker, it's powered by DC 7.4V Li-Polymer battery or DC 5V come from USB Port. For more details features, please refer to User's Manual.

Manufacturer	:	Harmonic International Ltd
Address	:	Room 1201-02, C-Bons International Centre, 108 Wai Yip Street, Kwun Tong, Kowloon, Hong Kong
Factory	:	Dongguan Homania Electronic Products Co., Ltd
Address	:	Chung Kou Manage Area, Shijie Town, Dongguan City, Guangdong, China
Power Supply	:	DC5V 1000mA from external USB port, DC7.4V 1500mAh rechargeable Li-Polymer battery
Model name	:	HS002
Hardware version	:	PCB-2 V2.5
Software version	:	001
Serial number	:	N/A

For BT function
BT Version:
BLE(V4.0) and backward compatible 3.0HS, 2.1+EDR version.
We prepare version BLE(V4.0) and 2.1+EDR for RF test.

Item	BT2.1+EDR	BLE(V4.0)
Frequency	2402-2480MHz	2402-2480MHz
Modulation	GFSK, π/4-DQPSK, 8DPSK	GFSK
Number of Channel	79	40
Channel space	1MHz	2MHz
Antenna Type	PCB antenna	PCB antenna
Antenna Gain	-0.61 dBi (declared by manufacturer)	-0.61 dBi (declared by manufacturer)

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **OGWHS002** filing to comply with Section 15.247 of the FCC Part 15(2014), Subpart C Rule.

1.3 Test Methodology

AC mains line-conducted, antenna port conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4-2014 and KDB558074 (v03r02). Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters. All other measurements were made in accordance with the procedures in 47 CFR part 2.

1.4 Equipment Modifications

Not available for this EUT intended for grant.

1.5 Support Device

PC	:	Manufacturer: IBM Corporation M/N: R50e S/N: L3-HZNGO P/N: 1834KDC
Adapter	:	Manufacturer: IBM Corporation M/N: 08K8210 Input: AC100-240V 50/60Hz 0.5-1.0A Output: DC 16V 4.5A

1.6 Test Facility and Location

Listed by FCC, August 02, 2011
The Certificate Registration Number is 665078.
Listed by Industry Canada, July 01, 2011
The Certificate Registration Number is 46405-9743.

Dongguan NTC Co., Ltd.
(Full Name: Dongguan Nore Testing Center Co., Ltd.)

Building D, Gaosheng Science and Technology Park, Hongtu Road, Nancheng District, Dongguan City, Guangdong, China
(Full Name: Building D, Gaosheng Science & Technology Park, Zhouxi Longxi Road, Nancheng District, Dongguan, Guangdong, China.

1.7 Summary of Test Results

FCC Rules	Description Of Test	Result
§15.207 (a)	AC Power Conducted Emission	Compliance
§15.247(b)(3)	Max. Conducted Output Power	Compliance
§15.247(a)(2)	6dB &20dB Bandwidth	Compliance
§15.247(e)	Power Spectral Density	Compliance
§15.247(d)	Band Edge and Conducted Spurious Emissions	Compliance
§15.247(d),§15.209, §15.205	Radiated Spurious Emissions and Restricted Bands	Compliance
§15.203	Antenna Requirement	Compliance

2. System Test Configuration

EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 Special Accessories

Not available for this EUT intended for grant.

2.3 Description of test modes

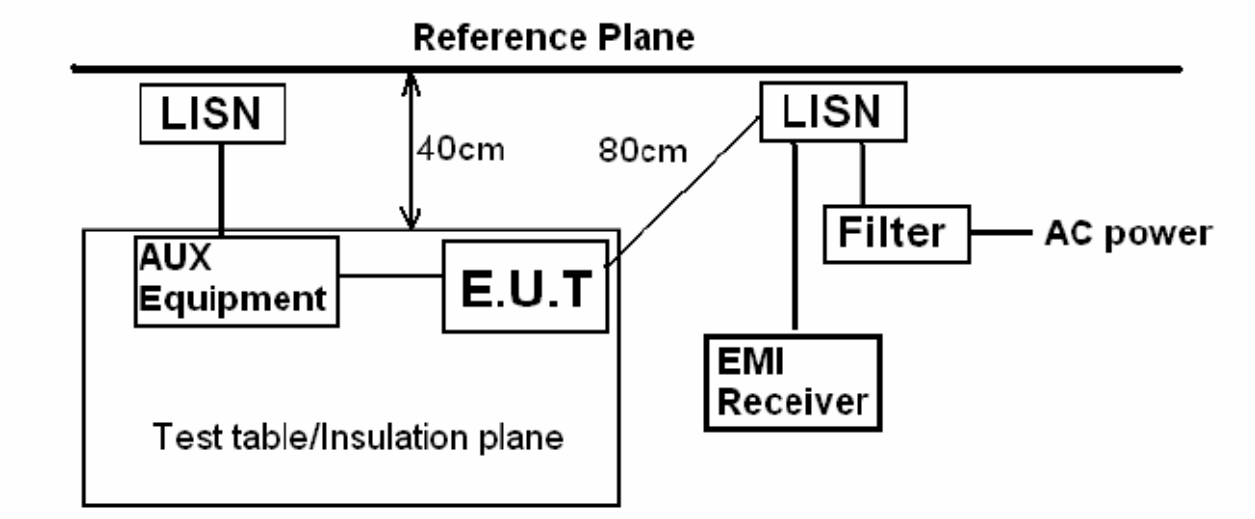
The EUT has been tested under continuous operating condition (The duty cycle >98%). Test program used to control the EUT staying in continuous transmitting mode. The Lowest, middle and highest channel were chosen for testing, and modulation type GFSK was tested, but only the worst case data is shown in this report.

2.4 EUT Exercise

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

3. Conducted Emissions Test

3.1 Test SET-UP (Block Diagram of Configuration)



3.2 Test Condition

Test Requirement: FCC Part 15.207

Frequency Range: 150KHz ~ 30MHz

Detector: RBW 9KHz, VBW 30KHz

Operation Mode: Charging+BT Mode

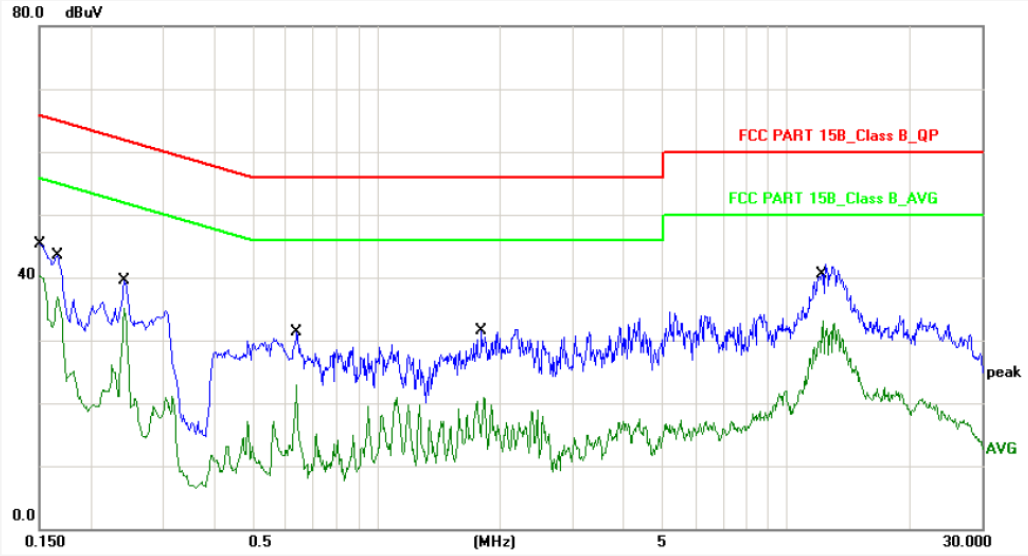
3.3 Measurement Results

Please refer to following plots.

Dongguan NTC Co., Ltd.
Tel: +86-769-22022444 Fax: +86-769-22022799
Web: Http://www.ntc-c.com

Site: Conduction

Test Time: 2015-3-16 10:44:02



Report No.:	HS002		
Test Standard:	FCC PART 15B_Class B_QP		
Test item:	Conducted Emission	Phase:	L1
Applicant:	Harmonic International Ltd.	Temp.( )/Hum.(%):	24(C) / 53 %
Product:	Hidden Radio Wireless Speaker	Power Rating:	AC 120V/60Hz
Model No.:	HS002	Test Engineer:	Jason

Test Mode: Charging+BT Mode

Remark:

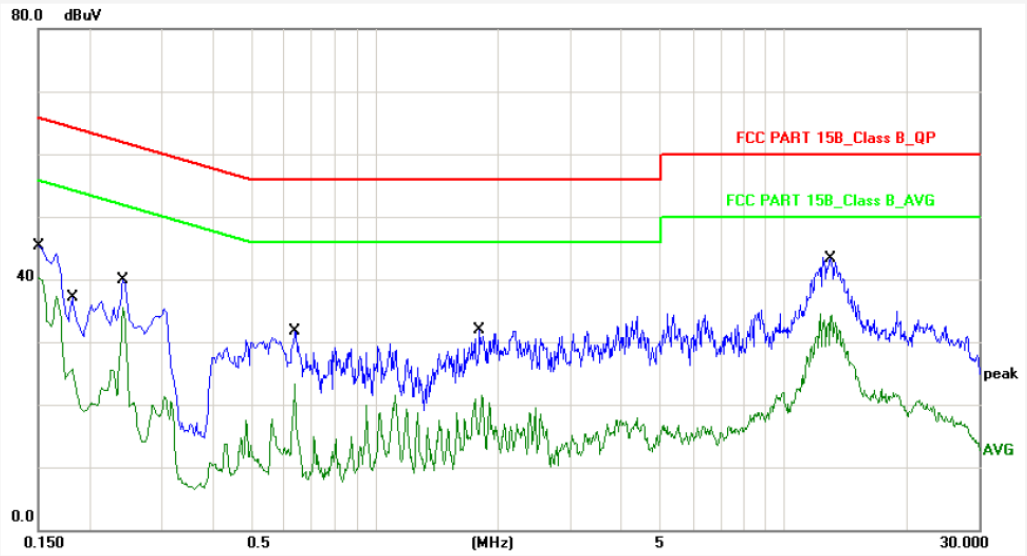
No.	Frequency (MHz)	Factor (dBuV)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1500	10.80	32.52	43.32	65.99	-22.67	QP	P	
2	0.1500	10.80	27.41	38.21	55.99	-17.78	AVG	P	
3	0.1660	10.80	30.75	41.55	65.15	-23.60	QP	P	
4	0.1660	10.80	24.06	34.86	55.15	-20.29	AVG	P	
5	0.2420	10.80	26.64	37.44	62.02	-24.58	QP	P	
6	0.2420	10.80	22.25	33.05	52.02	-18.97	AVG	P	
7	0.6380	10.80	18.43	29.23	56.00	-26.77	QP	P	
8	0.6380	10.80	10.06	20.86	46.00	-25.14	AVG	P	
9	1.8060	10.80	18.60	29.40	56.00	-26.60	QP	P	
10	1.8060	10.80	8.10	18.90	46.00	-27.10	AVG	P	
11	12.2858	10.80	29.20	40.00	60.00	-20.00	QP	P	
12	12.2858	10.80	20.25	31.05	50.00	-18.95	AVG	P	

Note: Level=Reading+Factor.
Margin=Limit-Level.

Dongguan NTC Co., Ltd.
Tel: +86-769-22022444 Fax: +86-769-22022799
Web: Http://www.ntc-c.com

Site: Conduction

Test Time: 2015-3-16 10:41:35



Report No.: HS002
Test Standard: FCC PART 15B_Class B_QP
Test item: Conducted Emission
Phase: N
Applicant: Harmonic International Ltd.
Temp.( )/Hum.(%): 24(C) / 53 %
Product: Hidden Radio Wireless Speaker
Power Rating: AC 120V/60Hz
Model No.: HS002
Test Engineer: Jason

Test Mode: Charging+BT Mode
Remark:

No.	Frequency (MHz)	Factor (dBuV)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1500	10.80	32.52	43.32	65.99	-22.67	QP	P	
2	0.1500	10.80	27.41	38.21	55.99	-17.78	AVG	P	
3	0.1819	10.80	24.28	35.08	64.39	-29.31	QP	P	
4	0.1819	10.80	12.83	23.63	54.39	-30.76	AVG	P	
5	0.2420	10.80	27.14	37.94	62.02	-24.08	QP	P	
6	0.2420	10.80	21.75	32.55	52.02	-19.47	AVG	P	
7	0.6380	10.80	18.93	29.73	56.00	-26.27	QP	P	
8	0.6380	10.80	10.56	21.36	46.00	-24.64	AVG	P	
9	1.8060	10.80	19.10	29.90	56.00	-26.10	QP	P	
10	1.8060	10.80	8.60	19.40	46.00	-26.60	AVG	P	
11	13.0579	10.80	30.71	41.51	60.00	-18.49	QP	P	
12	13.0579	10.80	21.46	32.26	50.00	-17.74	AVG	P	

Note: Level=Reading+Factor.
Margin=Limit-Level.

4. Max. Conducted Output Power

4.1 Measurement Procedure

Maximum Conducted Output power at Antenna Terminals, FCC Rules 15.247(b)(3):

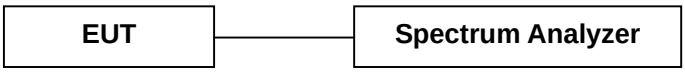
§15.247 permits the maximum conducted (average) output power to be measured as an alternative to the maximum peak conducted output power for demonstrating compliance to the limit. When this option is exercised, the measured power is to be referenced to the OBW rather than the DTS bandwidth (see ANSIC63.10-2013 for measurement guidance).

When using a spectrum analyzer to EMI receiver to perform these measurements, it shall be capable of utilizing a number of measurement points in each sweep that is greater than or equal to twice the span/RBW to set a bin-to-bin spacing of ⩽RBW/2 so that narrowband signals are not lost between frequency bins.

Method AVGSA-1(trace averaging with the EUT transmitting at full power throughout each sweep)

1. Set span to at least 1.5 times the OBW.
2. Set RBW=1-5% of the OBW, not to exceed 1MHz.
3. Set VBW⩾3 x RBW.
4. Number of points in sweep⩾2 x span/ RBW. (This gives bin-to-bin spacing⩽ RBW/2, so that narrowband signals are not lost between frequency bins.)
5. Sweep time= auto.
6. Detector=RMS(i.e., power averaging), if available. Otherwise, use sample detector mode.
7. If transmit duty cycle<98%, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously(i.e., with no off intervals) or at duty cycle⩾98%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run”.
8. Trace average at least 100 traces in power averaging(i.e.,RMS) mode.
9. Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels(in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

4.2 Test SET-UP (Block Diagram of Configuration)



4.3 Measurement Results

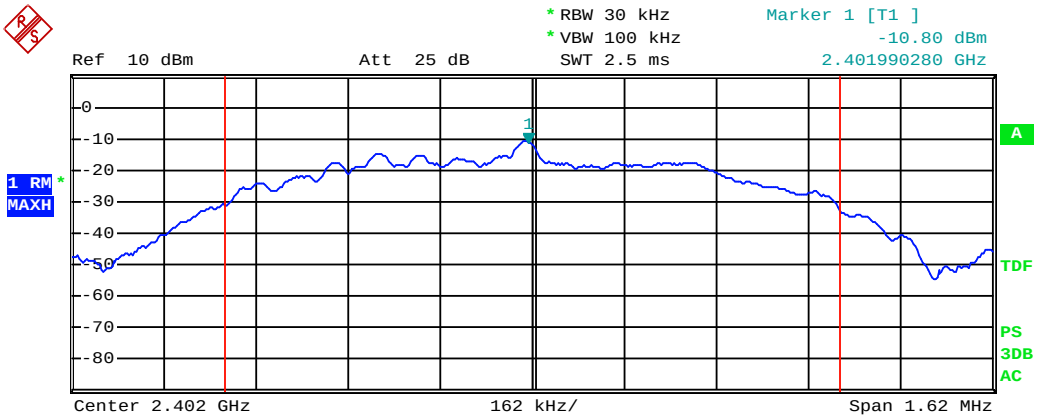
Please refer to following table and plots.

Modulation:	GFSK		
Temperature :	24 ℃	Humidity :	50 %
Test By:	Sance	Test Date :	March 27, 2015
Test Result:	PASS		

Frequency MHz	Data Rate Mbps	AV Output Power dBm	Limit dBm
Low Channel: 2402	1	-3.29	30
Middle Channel: 2442	1	-0.95	30
High Channel: 2480	1	0.61	30

Maximum Average Conducted Output Power

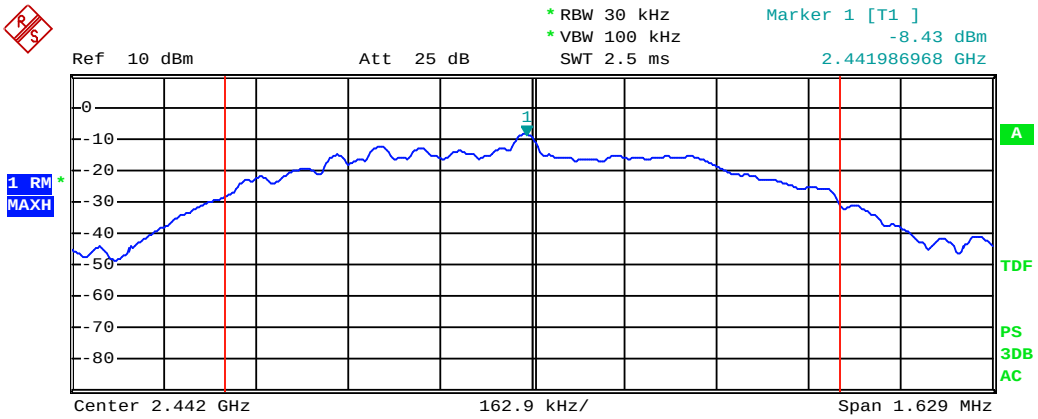
Low Channel



Tx Channel

Bandwidth	1.08 MHz	Power	-3.29 dBm

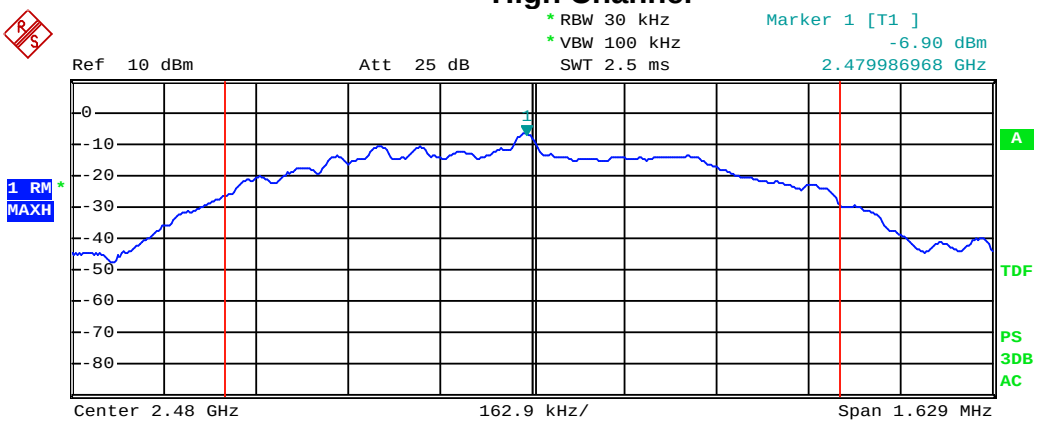
Middle Channel



Tx Channel

Bandwidth	1.086 MHz	Power	-0.95 dBm

High Channel



Tx Channel

Bandwidth	1.086 MHz	Power	0.61 dBm

5. 6dB & 20dB Bandwidth

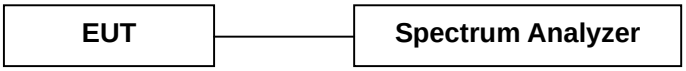
5.1 Measurement Procedure

DTS 6dB &20dB Channel Bandwidth, FCC Rule 15.247(a)(2):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer was set as below according to FCC KDB558074(v03r02):

1. Set the RBW = 100KHz.
2. Set the VBW ≥ 3 x RBW
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB& 20dB relative to the maximum level measured in the fundamental emission.

5.2 Test SET-UP (Block Diagram of Configuration)



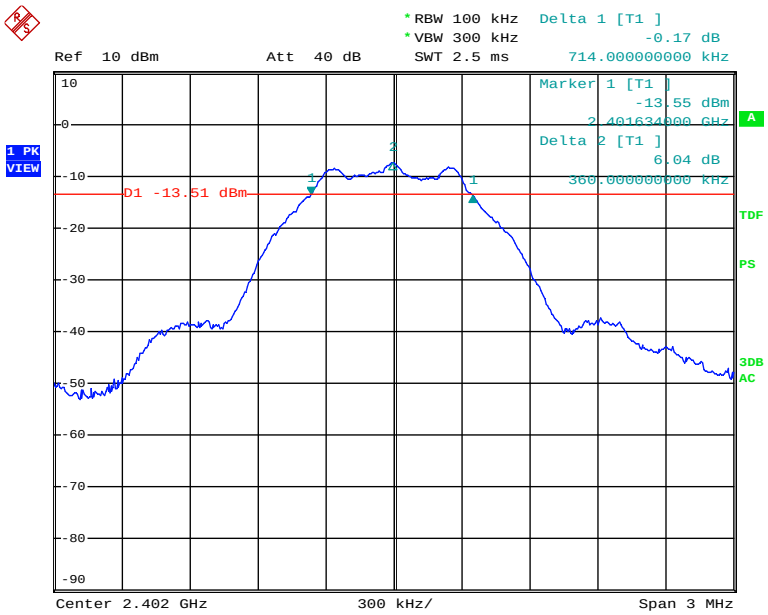
5.3 Measurement Results

Please refer to following table and plots.

Modulation:	GFSK		
Temperature :	24 ℃	Humidity :	50 %
Test By:	Sance	Test Date :	March 27, 2015
Test Result:	PASS		

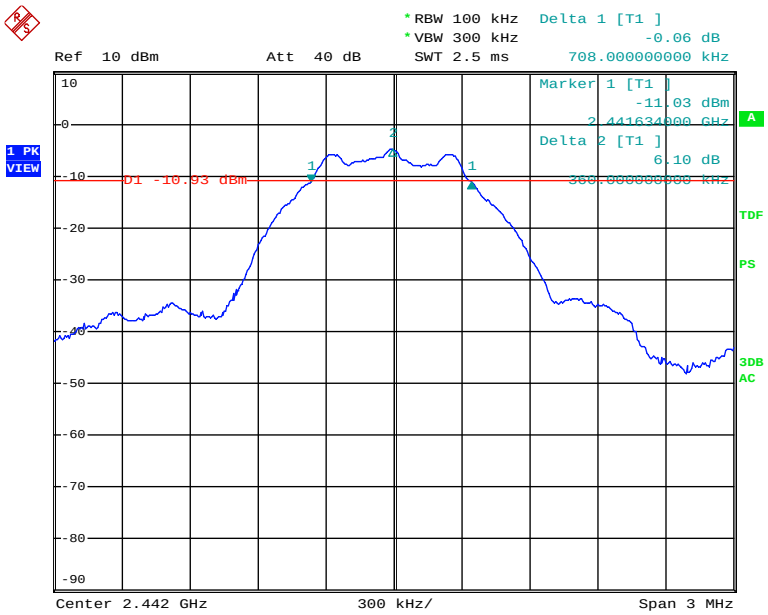
Frequency MHz	Data Rate Mbps	6dB Bandwidth KHz	20dB Bandwidth KHz	Limit
Low Channel: 2402	1	714	1080	>500KHz
Middle Channel: 2442	1	708	1086	>500KHz
High Channel: 2480	1	732	1086	>500KHz

6dB bandwidth Low Channel



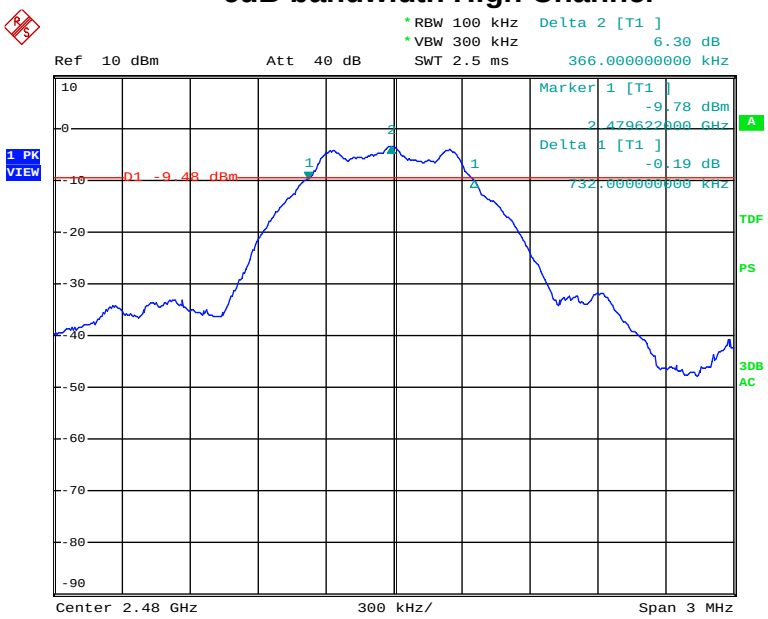
Date: 27.MAR.2015 17:04:36

6dB bandwidth Middle Channel



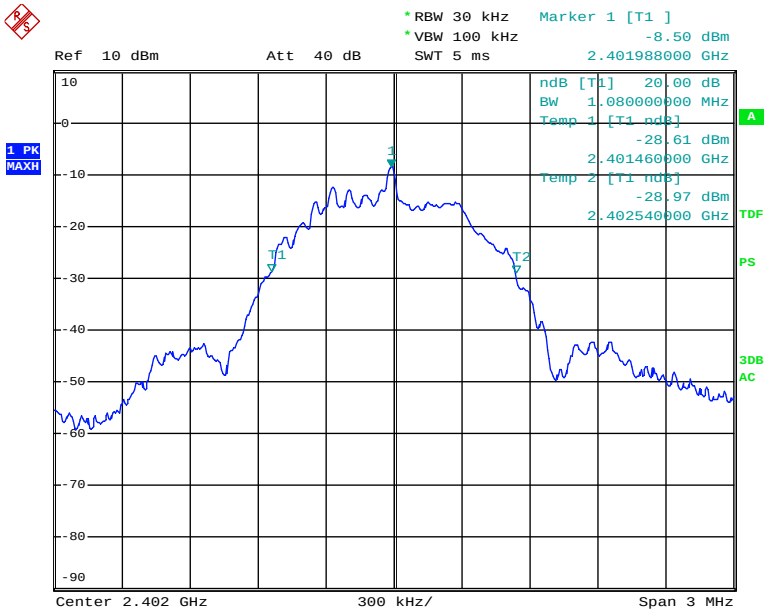
Date: 27.MAR.2015 17:05:59

6dB bandwidth High Channel



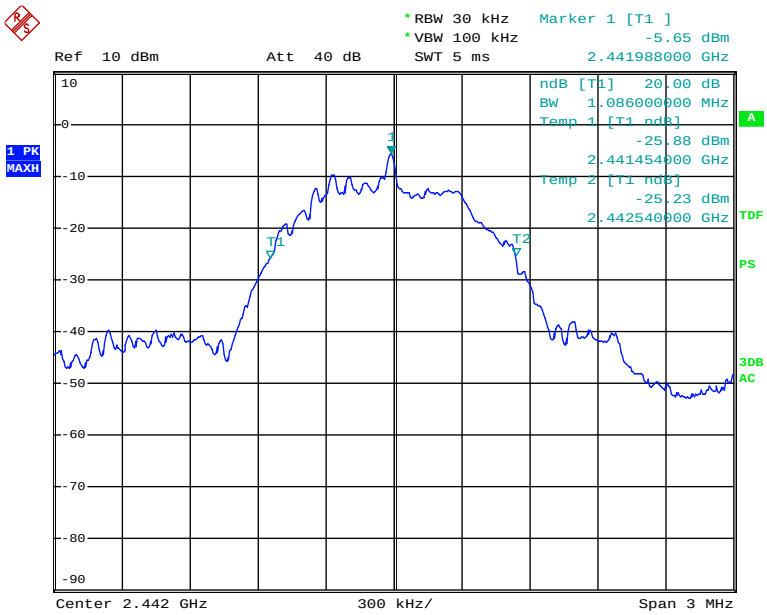
Date: 27.MAR.2015 17:07:33

20dB bandwidth Low Channel



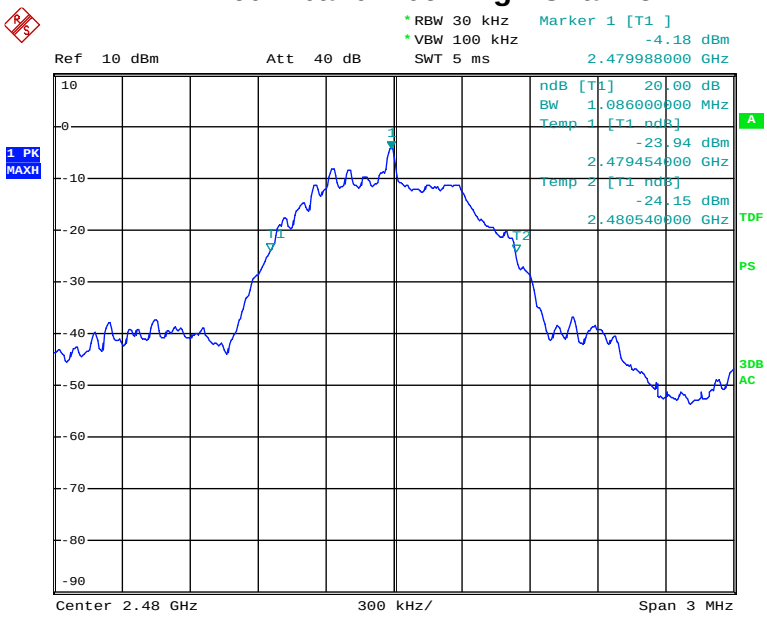
Date: 27.MAR.2015 17:23:12

20dB bandwidth Middle Channel



Date: 27.MAR.2015 17:23:45

20dB bandwidth High Channel



Date: 27.MAR.2015 17:24:23

6. Power Spectral Density

6.1 Measurement Procedure

DTS 6dB Channel Bandwidth, FCC Rule 15.247(a)(2):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer was set as below according to FCC KDB558074(v03r02):

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: 3 kHz≤RBW≤100KHz
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

6.2 Test SET-UP (Block Diagram of Configuration)

EUT —— **Spectrum Analyzer**

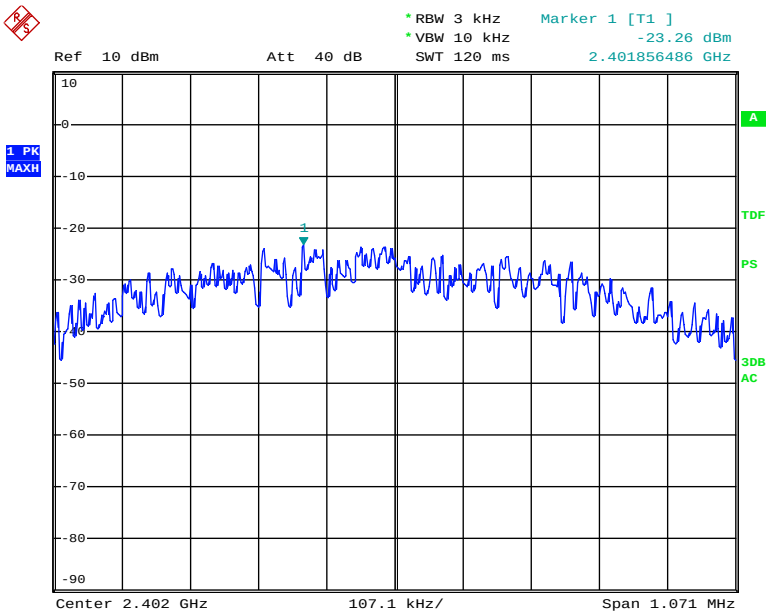
6.3 Measurement Results

Please refer to following table and plots.

Modulation:	GFSK		
Temperature :	24 ℃	Humidity :	50 %
Test By:	Sance	Test Date :	March 27, 2015
Test Result:	PASS		

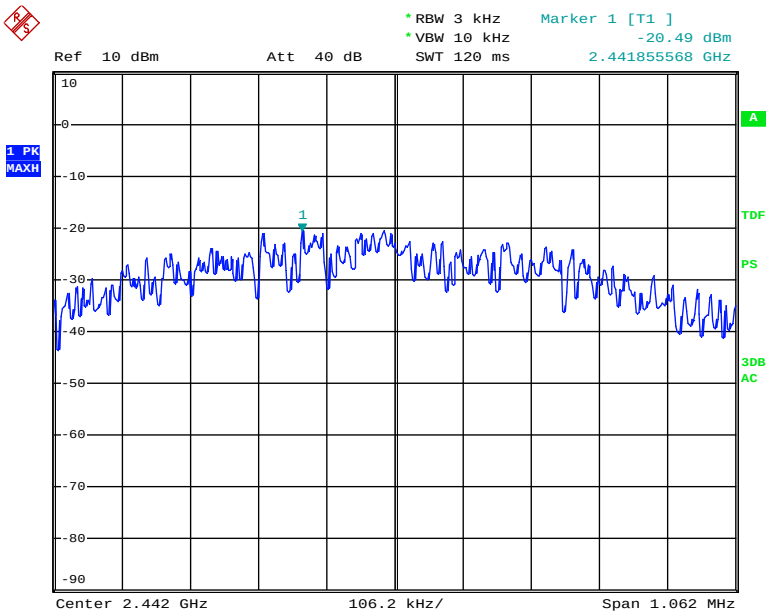
Frequency MHz	Data Rate Mbps	PSD dBm/3kHz	Limit dBm/3kHz
Low Channel: 2402	1	-23.26	8
Middle Channel: 2442	1	-20.49	8
High Channel: 2480	1	-19.16	8

Low Channel



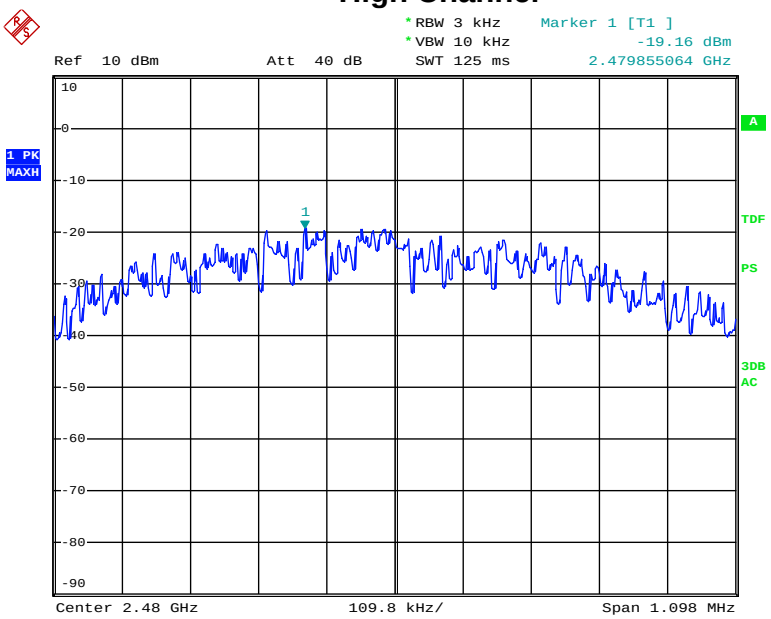
Date: 27.MAR.2015 17:09:49

Middle Channel



Date: 27.MAR.2015 17:10:29

High Channel



Date: 27.MAR.2015 17:11:00

7. Band Edge and Conducted Spurious Emissions

7.1 Requirement and Measurement Procedure

In any 100KHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer was set according to FCC KDB558074(v03r02) clause 11.3.

A Quasi-peak measurement was then made for that frequency point for below 1GHz test. PK and AV for above 1GHz emission test.

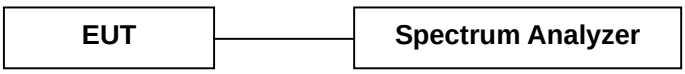
For 30MHz to 1GHz:
Sept the spectrum analyzer as: RBW=120kHz, VBW=300kHz, Detector=Quasi-Peak

For Above 1GHz:
Set the spectrum analyzer as: RBW=1MHz, VBW=3MHz, Detector=Peak.
Set the spectrum analyzer as: RBW=1MHz, VBW=10Hz, Detector=Peak.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Frequency Band (MHz)	Level	Resolution Bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	3 MHz
	Average	1 MHz	10 Hz

7.2 Test SET-UP (Block Diagram of Configuration)



7.3 Measurement Results

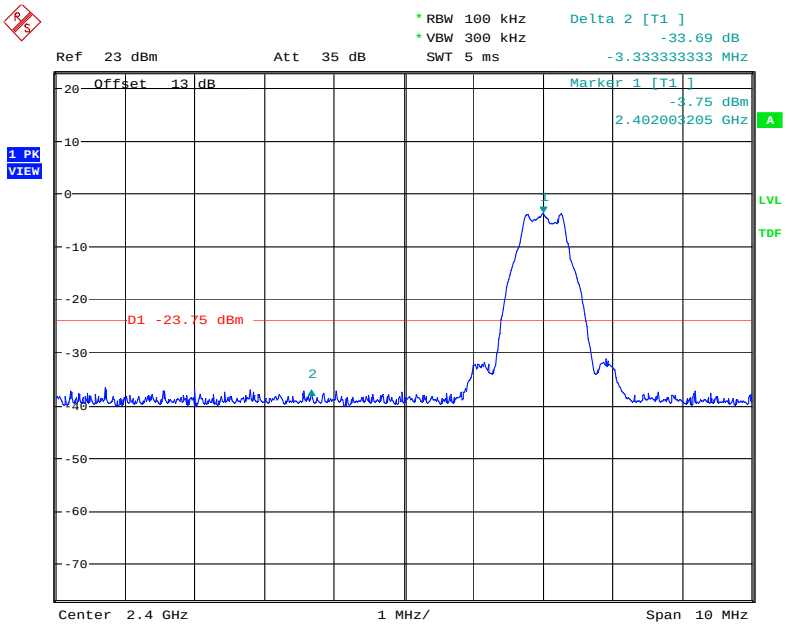
The test plots and table showed all spurious emission and up to the tenth harmonic was measured and they were found to be at least 20dB below the highest level of the desired power in the passband. Please refer to below plots.

Hopping-on mode

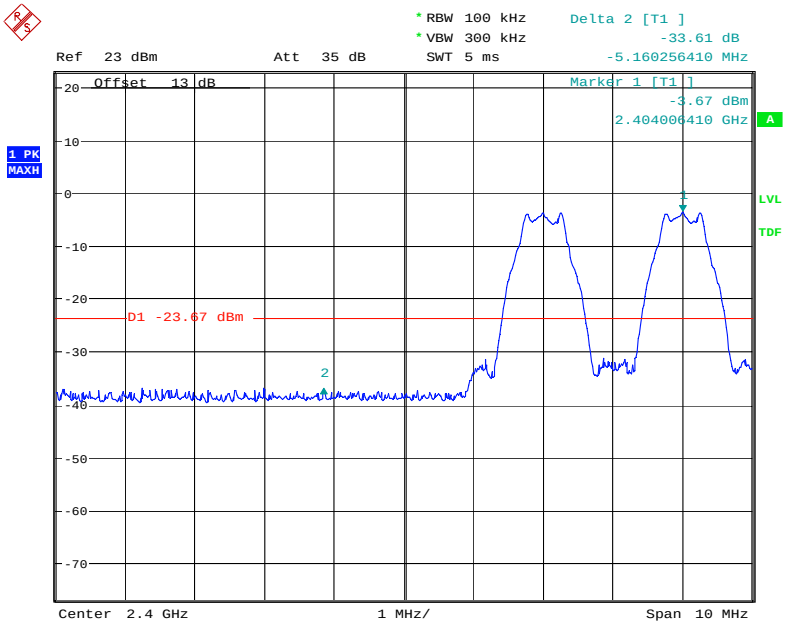
Freq. (MHz)	Ant.Pol. (H/V)	Reading Level(dBuV)		Factor (dB/m)	Emission Level (dBuV)		Limit 3m (dBuV/m)		Margin (dB)	
		PK	AV		PK	AV	PK	AV	PK	AV
2399.990	H	44.73	34.56	8.09	52.82	42.65	74.00	54.00	-21.18	-11.35
2399.990	V	41.13	30.41	8.09	49.22	38.50	74.00	54.00	-24.78	-15.50
2483.660	H	39.40	26.78	8.36	47.76	35.14	74.00	54.00	-26.24	-18.86
2483.660	V	40.27	27.50	8.36	48.63	35.86	74.00	54.00	-25.37	-18.14

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+Probe Factor +Cable Loss
(3) Measurement uncertainty : ±3.7dB

Band Edge
Low Channel

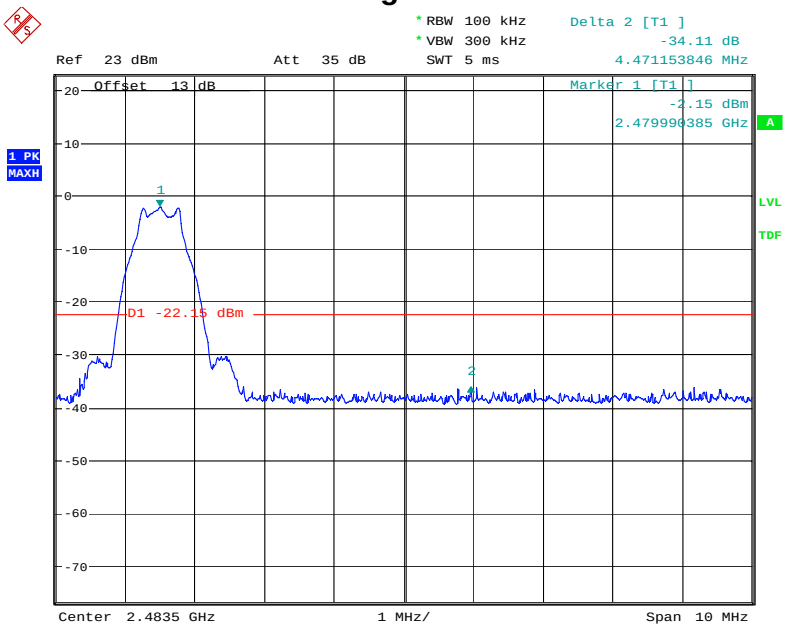


Date: 8.APR.2015 07:19:16

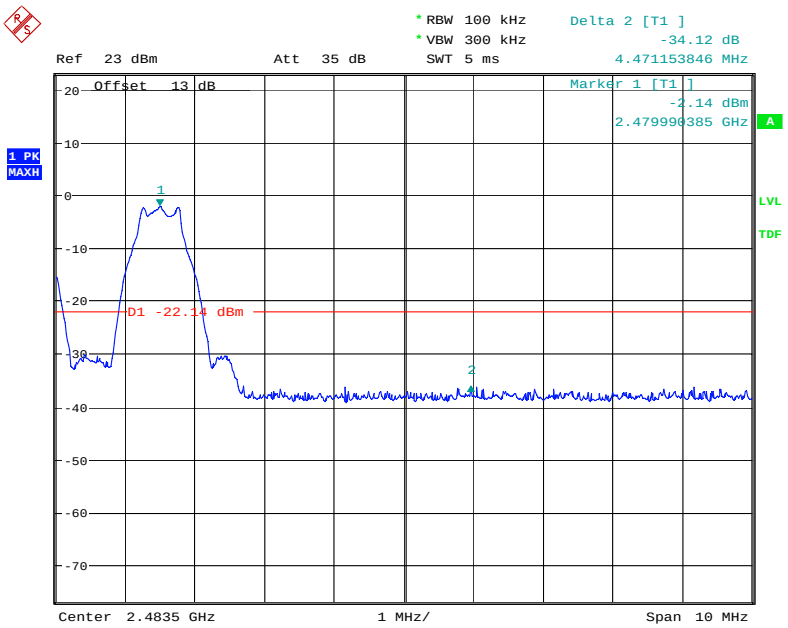


Date: 8.APR.2015 07:21:34

High Channel



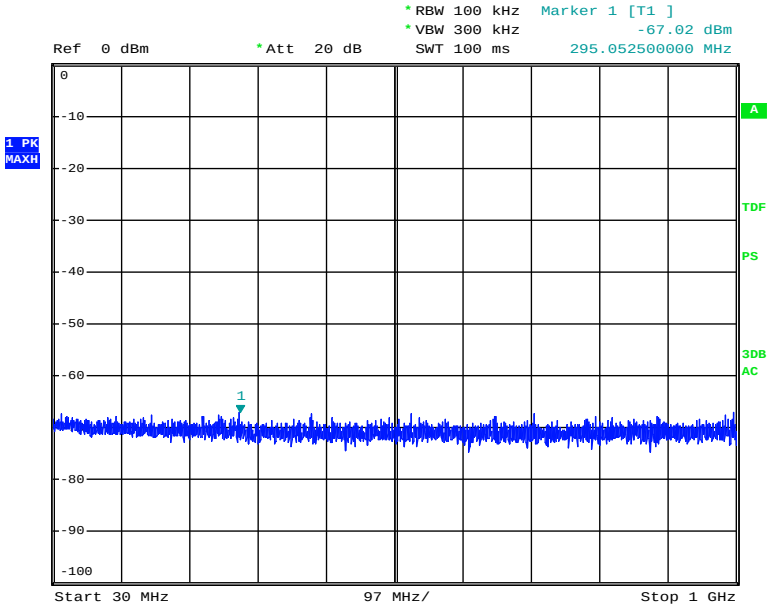
Date: 8.APR.2015 07:22:53



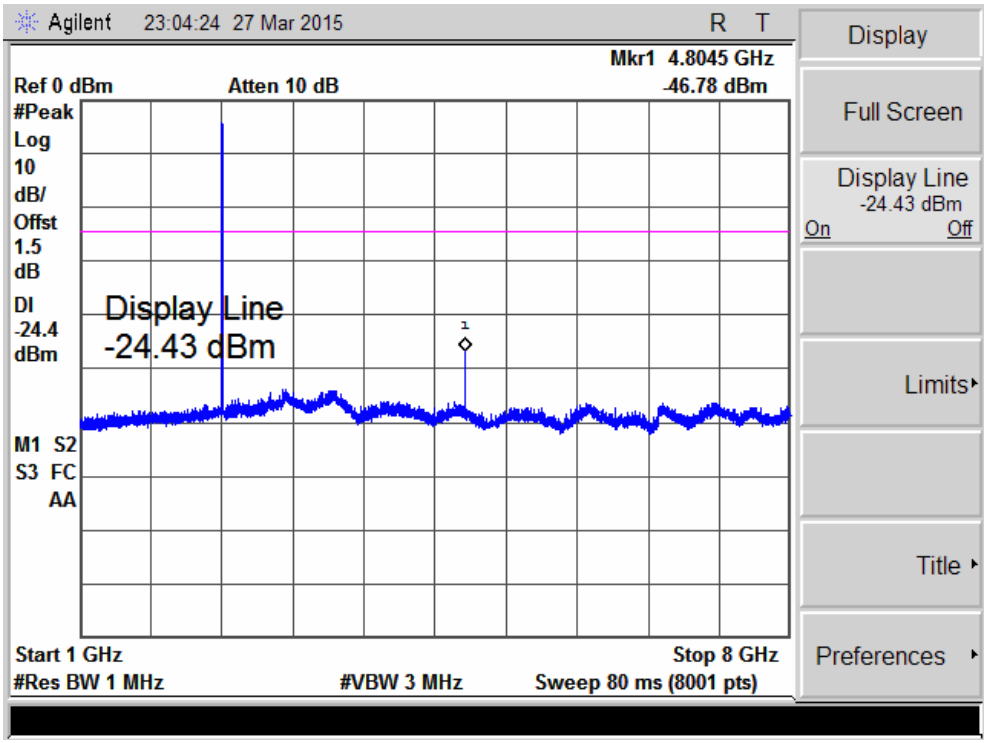
Date: 8.APR.2015 07:23:40

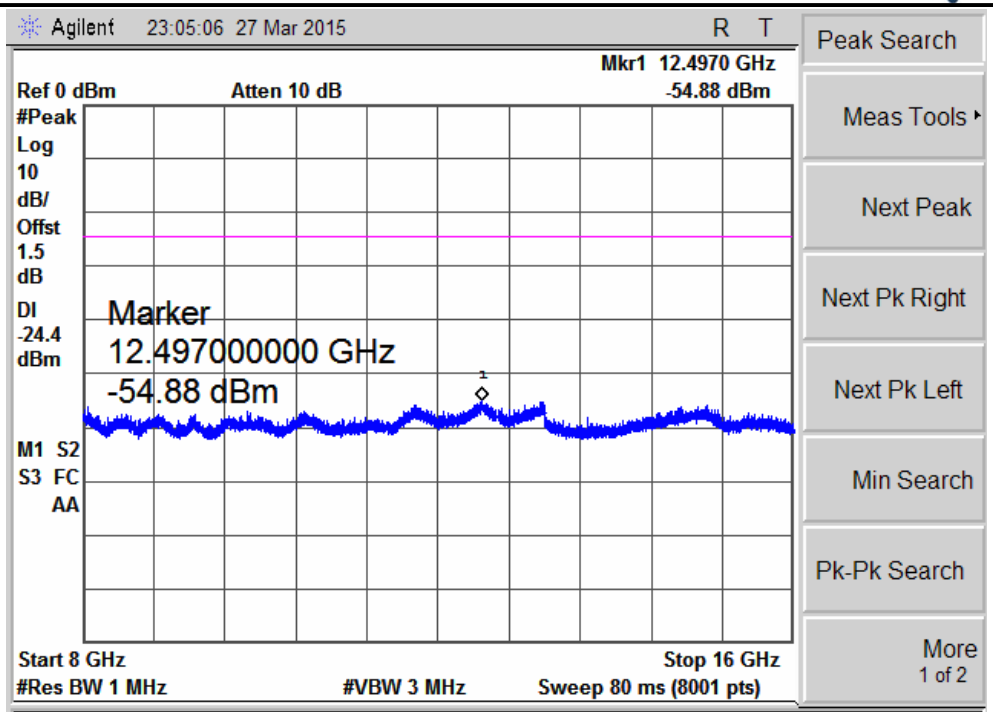
Conducted Spurious Emissions

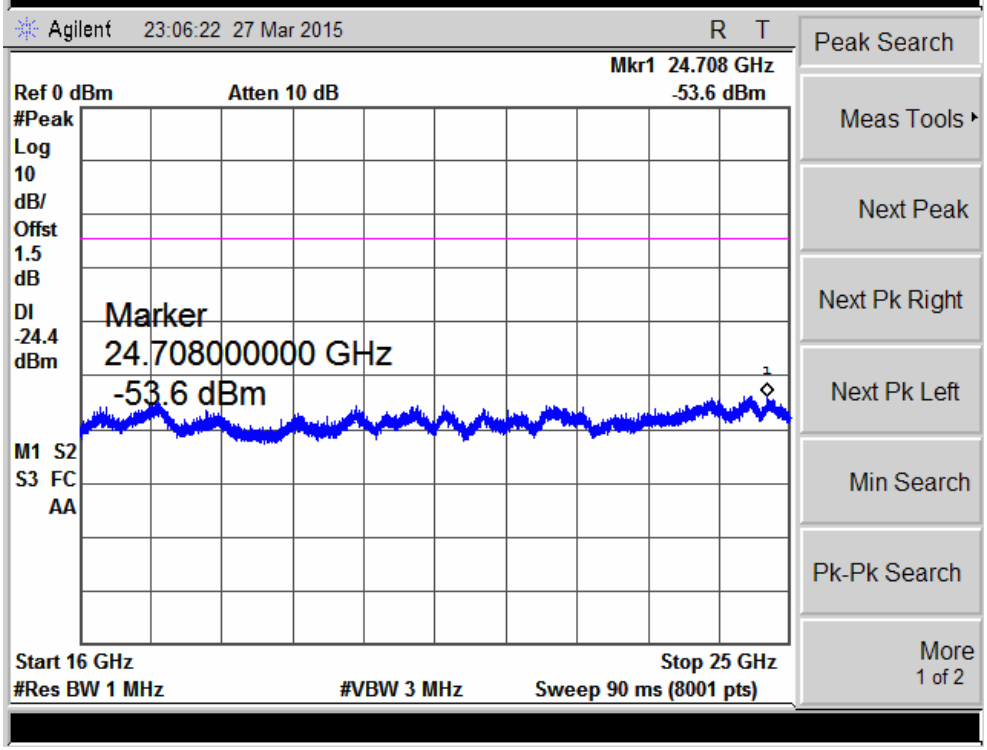
Low Channel



Date: 27.MAR.2015 22:34:44

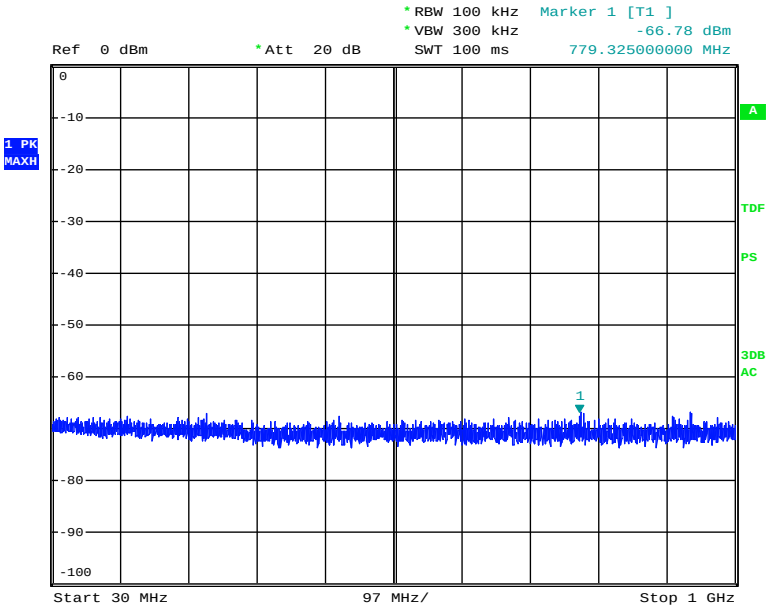




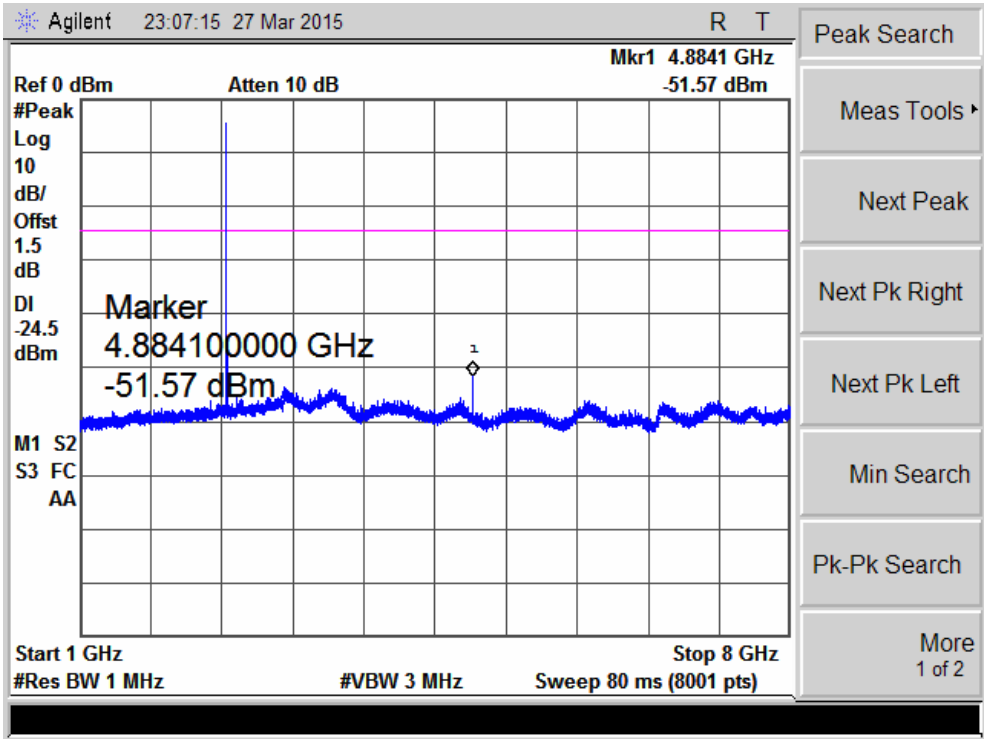


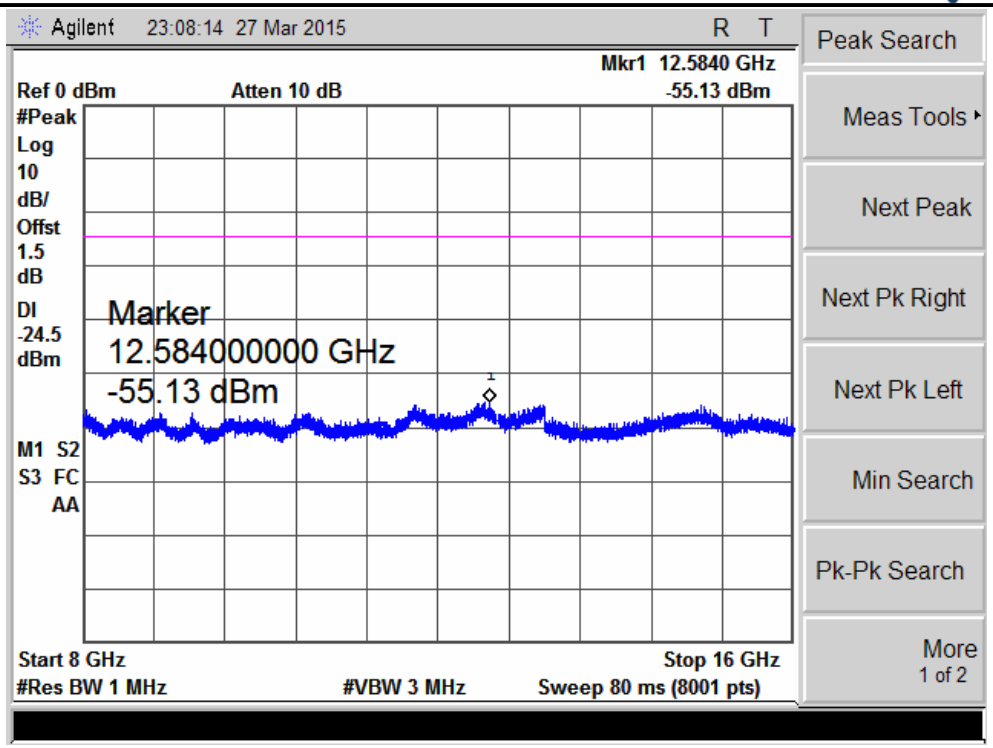
Note: Sweep points=8001pts

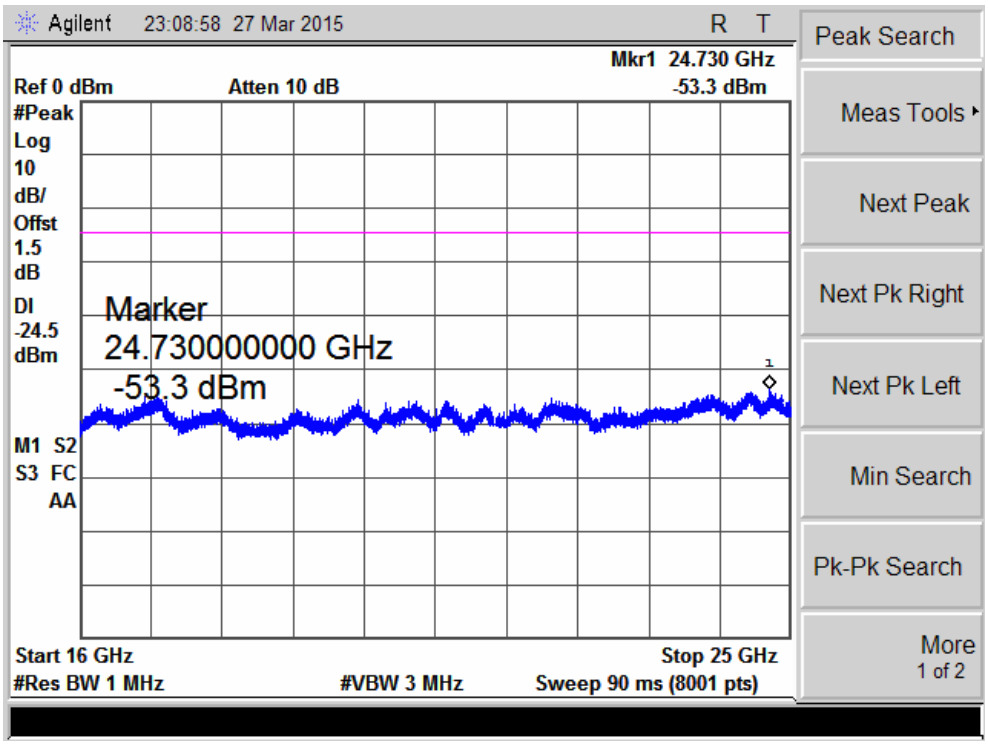
Middle Channel



Date: 27.MAR.2015 22:34:55

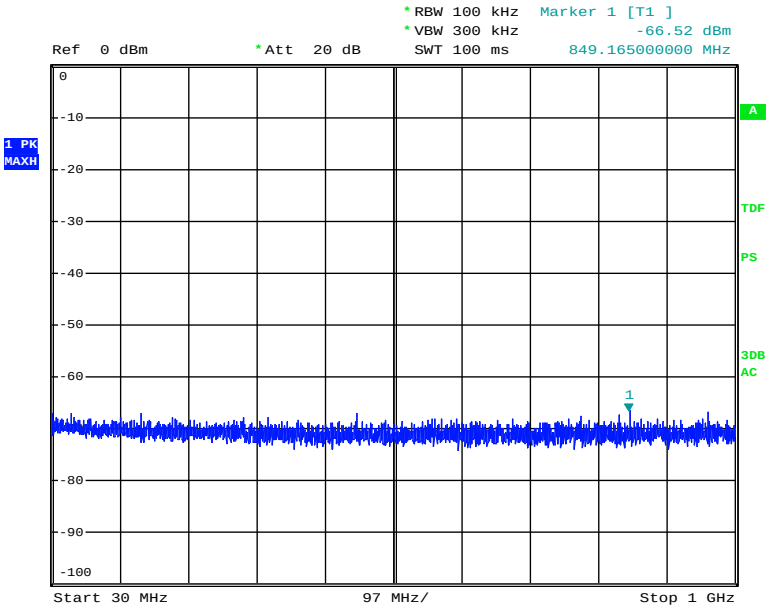




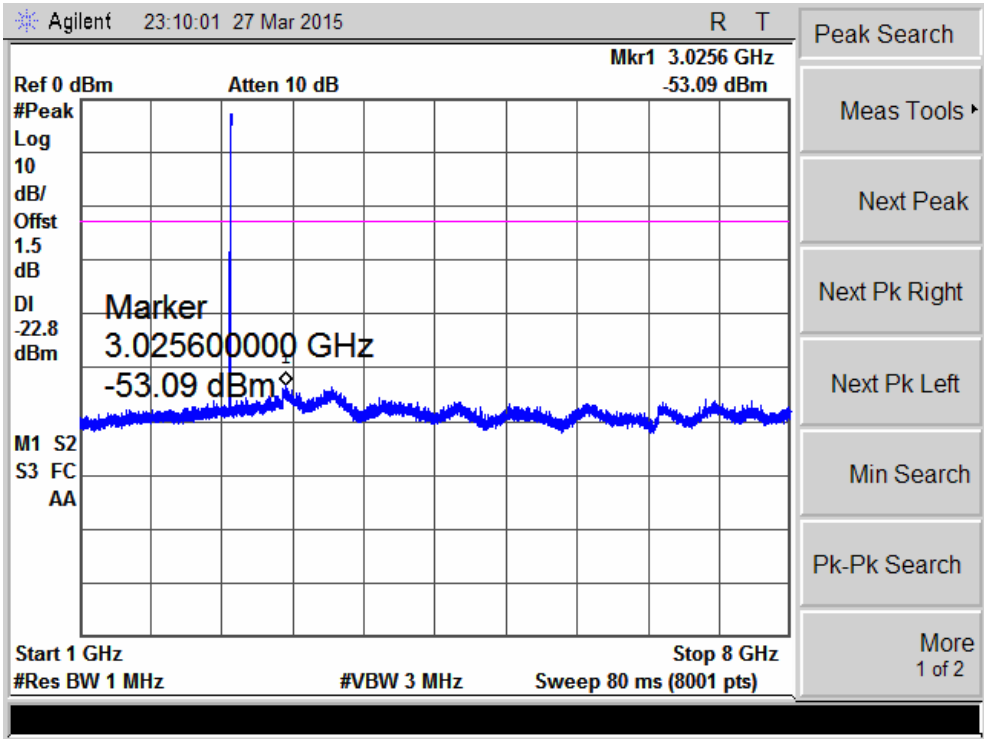


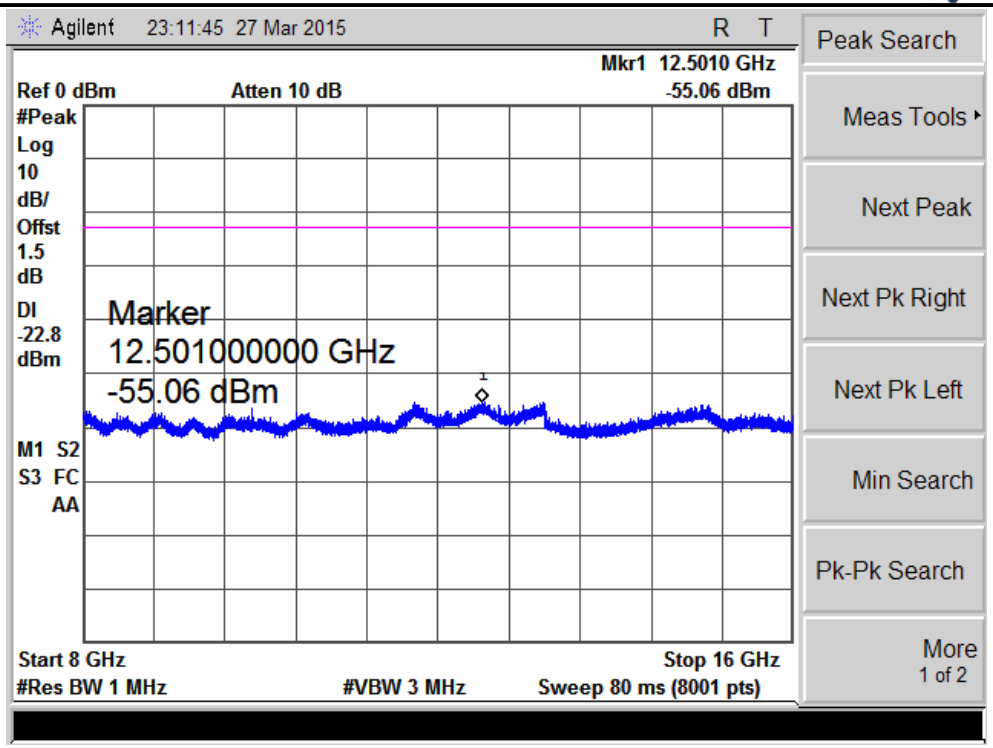
Note: Sweep points=8001pts

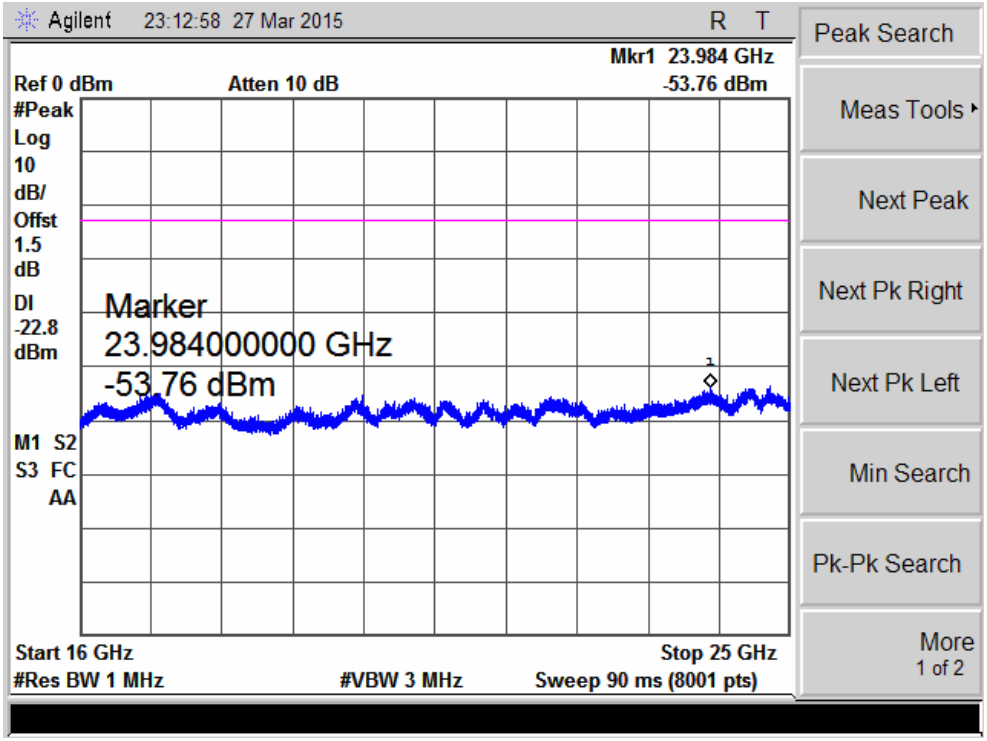
High Channel



Date: 27.MAR.2015 22:35:03





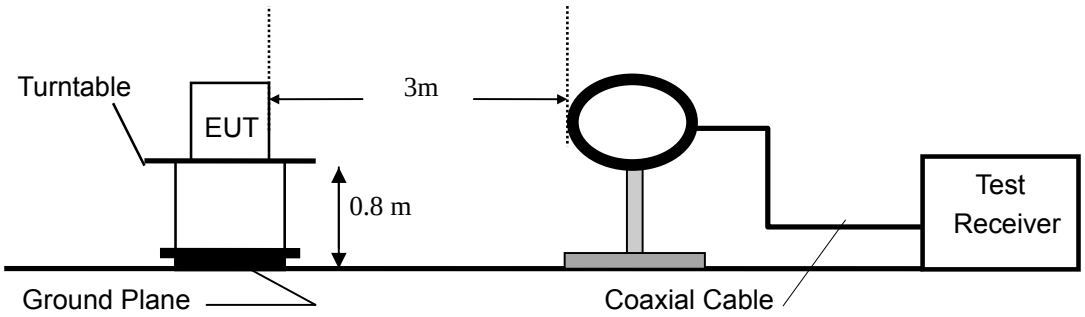


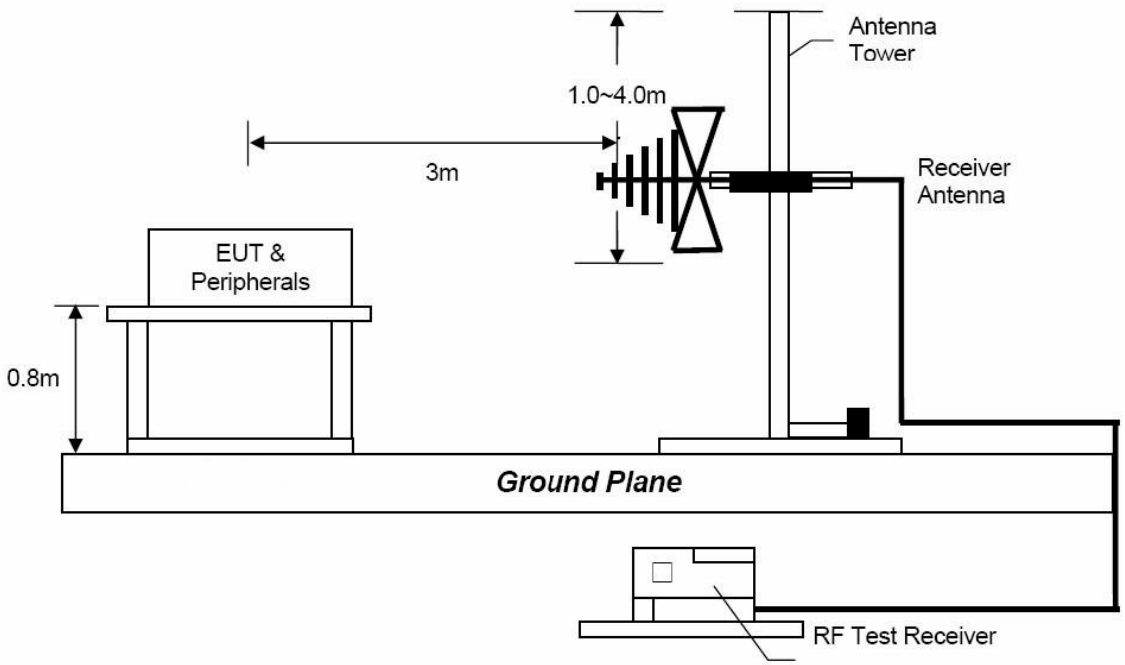
Note: Sweep points=8001pts

8. Radiated Spurious Emissions and Restricted Bands

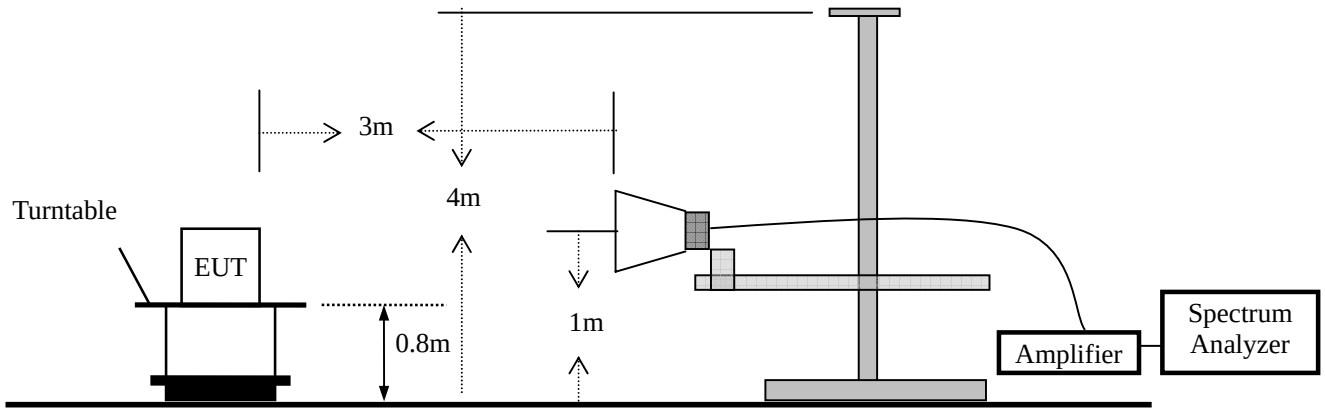
8.1 Test SET-UP (Block Diagram of Configuration)

8.1.1 Radiated Emission Test Set-Up, Frequency Below 30MHz





8.1.2 Radiated Emission Test Set-Up, Frequency above 1GHz



8.2 Measurement Procedure

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi- anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to peak detect function and specified bandwidth with maximum hold mode.
e. A Quasi-peak measurement was then made for that frequency point for below 1GHz test. PK and AV for above 1GHz emission test.

For 30MHz to 1GHz:
Sept the spectrum analyzer as: RBW=120kHz, VBW=300kHz, Detector=Quasi-Peak

For Above 1GHz:
Set the spectrum analyzer as: RBW=1MHz, VBW=3MHz, Detector=Peak.
Set the spectrum analyzer as: RBW=1MHz, VBW=10Hz, Detector=Peak.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Frequency Band (MHz)	Level	Resolution Bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	3 MHz
	Average	1 MHz	10 Hz

8.3 Limit

Frequency range MHz	Distance Meters	Field Strengths Limit (15.209) μV/m
0.009 ~ 0.490	300	2400/F(kHz)
0.490 ~ 1.705	30	24000/F(kHz)
1.705 ~ 30	30	30
30 ~ 88	3	100
88 ~ 216	3	150
216 ~ 960	3	200
Above 960	3	500

Remark：(1) Emission level (dB)μV = 20 log Emission level μV/m
(2) The smaller limit shall apply at the cross point between two frequency bands.
(3) As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.
(4) The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.
(5) §15.247(d) specifies that emissions which fall in the restricted bands, as defined in §15.205 comply with radiated emission limits specified in §15.209.

8.4 Measurement Results

Operation Mode:	TX		
Frequency Range:	9KHz~1GHz	Temperature :	22 ℃
Test Result:	PASS	Humidity :	54 %
Measured Distance:	3m	Test By:	Sance
Test Date :	March 29, 2015		

Freq. (MHz)	Ant.Pol. H/V	Factor (dB/m)	Reading (dBuV)	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Note
130.8797	V	-18.20	44.10	25.90	43.50	-17.60	QP
182.2898	V	-17.00	43.90	26.90	43.50	-16.60	QP
208.4798	V	-16.28	44.78	28.50	43.50	-15.00	QP
360.7699	V	-11.13	40.23	29.10	46.00	-16.90	QP

191.9900	H	-13.51	41.41	27.90	43.50	-15.60	QP
209.4400	H	-13.26	41.06	27.80	43.50	-15.70	QP
294.8100	H	-10.61	39.41	28.80	46.00	-17.20	QP
263.7099	H	-9.15	40.55	31.40	46.00	-14.60	QP

Other emissions are lower than 10dB below the allowable limit.

Note:
(1) Emission Level= Reading Level + Factor
(2) Factor= Antenna Gain + Cable Loss – Amplifier Gain
(3) Measurement uncertainty : ±3.4dB
(4) Loop antenna used for the emission below 30MHz.
(5) Data of measurement within this frequency range shown " ---" in the table above means the reading of emissions are attenuated more than 10dB below the permissible limits.

Modulation:	GFSK		
Frequency Range:	1-25GHz	Test Date :	Mar. 29, 2015
Test Result:	PASS	Temperature :	24 ℃
Measured Distance:	3m	Humidity :	50 %
Test By:	Sance		

Freq. (MHz)	Ant.Pol. (H/V)	Reading Level(dBuV)		Factor (dB/m)	Emission Level (dBuV)		Limit 3m (dBuV/m)		Margin (dB)	
		PK	AV		PK	AV	PK	AV	PK	AV
Operation Mode: TX Mode (Low)										
4804	V	38.02	31.24	14.63	52.65	45.87	74.00	54.00	-21.35	-8.13
7206	V	32.54	23.32	20.68	53.22	44.00	74.00	54.00	-20.78	-10.00

4804	H	40.87	31.93	14.63	55.50	46.56	74.00	54.00	-18.50	-7.44
7206	H	32.00	23.02	20.68	52.68	43.70	74.00	54.00	-21.32	-10.30

Operation Mode: TX Mode (Mid)										
4884	V	37.16	28.88	14.98	52.14	43.86	74.00	54.00	-21.86	-10.14
7326	V	30.57	19.47	20.93	51.50	40.40	74.00	54.00	-22.50	-13.60

4884	H	33.92	23.69	14.98	48.90	38.67	74.00	54.00	-25.10	-15.33
7326	H	32.73	21.38	20.93	53.66	42.31	74.00	54.00	-20.34	-11.69

Operation Mode: TX Mode (High)										
4960	V	36.13	29.32	15.30	51.43	44.62	74.00	54.00	-22.57	-9.38
7440	V	30.55	23.44	21.16	51.71	44.60	74.00	54.00	-22.29	-9.40

4960	H	36.85	25.00	15.30	52.15	40.30	74.00	54.00	-21.85	-13.70
7440	H	31.77	20.33	21.16	52.93	41.49	74.00	54.00	-21.07	-12.51

Other harmonics emissions are lower than 10dB below the allowable limit.

Note:
(1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level + Factor
(3) Factor= Antenna Gain + Cable Loss – Amplifier Gain
(4) Data of measurement within this frequency range shown " ---" in the table above means the reading of emissions are attenuated more than 10dB below the permissible limits.
(5) Measurement uncertainty : ±3.7dB.
(6) Horn antenna used for the emission over 1000MHz.

9. Antenna Application

9.1 Antenna requirement

According to of FCC part 15C section 15.203 and 15.240:

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, 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.
Systems operating in the 2400-2483.5MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

9.2 Measurement Results

The antenna is integrated on the main PCB and no consideration of replacement, and the best case gain of the antenna is -0.61dBi. So, the antenna is consider meet the requirement.

10. Test Equipment List

Description	Manufacturer	Model Number	Serial Number	Characteristics	Calibration Date	Calibration Due Date
Test Receiver	Rohde & Schwarz	ESCI7	100837	9KHz~7GHz	Nov. 24, 2014	Nov. 23, 2015
Antenna	Schwarzbeck	VULB9162	9162-010	30MHz~7GHz	Nov. 27, 2014	Nov. 26, 2015
Positioning Controller	UC	UC 3000	N/A	0~360°, 1-4m	N/A	N/A
Color Monitor	SUNSPO	SP-140A	N/A	N/A	N/A	N/A
Single Phase Power Line Filter	SAEMC	PF201A-32	110210	32A	N/A	N/A
3 Phase Power Line Filter	SAEMC	PF401A-200	110318	200A	N/A	N/A
DC Power Filter	SAEMC	PF301A-200	110245	200A	N/A	N/A
Cable	Huber+Suhner	CBL2-NN-1M	22390001	9KHz~7GHz	Nov. 08, 2014	Nov. 07, 2015
Cable	Huber+Suhner	CIL02	N/A	9KHz~7GHz	Nov. 08, 2014	Nov. 07, 2015
Power Amplifier	HP	HP 8447D	1145A00203	100KHz~1.3GHz	Nov. 08, 2014	Nov. 07, 2015
Horn Antenna	Schwarzbeck	BBHA9170	9170-372	15GHz~26.5GHz	Oct.24, 2014	Oct.23, 2015
Horn Antenna	Com-Power	AH-118	071078	1GHz~18GHz	Nov. 06, 2014	Nov. 05, 2015
Loop antenna	Daze	ZA30900A	0708	9KHz~30MHz	Oct.11, 2014	Oct.10, 2015
Spectrum Analyzer	Rohde & Schwarz	FSU26	200409/026	20Hz~26.5GHz	Sep. 02, 2014	Sep. 01, 2015
Pre-Amplifier	Agilent	8449B	3008A02964	1GHz~26.5GHz	Nov. 04, 2014	Nov. 03, 2015
L.I.S.N.	Rohde & Schwarz	ENV 216	101317	9KHz~30MHz	Nov. 08, 2014	Nov. 07, 2015
Temporary antenna connector	TESCOM	SS402	N/A	1G-18GHz	N/A	N/A

---End---