RF TEST REPORT

Report No.:	SET2014-00736
Product Name:	Tonino Lamborghini TL66
FCC ID:	2ABTLTL66
Model No. :	TL66
Applicant:	Tonino Lamborghini S.R.L.
Address:	Via San Giacomo 25, 41121 Modena, Italy
Issued by:	CCIC-SET
Lab Location:	Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055, P. R. China
	Tel: 86 755 26627338 **Fax:** 86 755 26627238

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Test Report

Product Name.....:	Tonino Lamborghini TL66
Brand Name.....:	Tonino Lamborghini
Trade Name.....:	DBI Innovations Ltd
Applicant.....:	Tonino Lamborghini S.R.L.
Applicant Address.....:	Via San Giacomo 25, 41121 Modena, Italy
Manufacturer.....:	DBI Innovations Ltd
Manufacturer Address .....:	3905 Two Exchange Square, 8 Connaught Place, Hong Kong
Test Standards.....:	47 CFR Part 15 Subpart C：Radio Frequency Devices ANSI C63.10:2009：American National Standard for Testing Unlicensed Wireless Devices DA 00-705: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
Test Result.....:	PASS
Tested by .....:	2014-01-20 Lu Lei，Test Engineer
Reviewed by .....:	2014-01-20 Shuangwen Zhang, Senior Egineer
Approved by .....:	2014-01-20 Wu Li'an，Manager

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Change History		
Issue	Date	Reason for change
1.0	2014-01-20	First edition

1. General Information

1.1. EUT Description

EUT Type	:	Tonino Lamborghini TL66
Serial No.	:	(n.a, marked #1 by test site)
FCC ID	:	2ABTLTL66
Hardware Version	:	QW20_MAINPCB_V1.1_20130723
Software Version	:	0502H029_20131203
Frequency Range	:	The frequency range used is 2402MHz - 2480MHz (79 channels, at intervals of 1MHz); The frequency block is 2400MHz to 2483.5MHz.
Modulation Type	:	Bluetooth: FHSS (GFSK(1Mbps), π /4-DQPSK(EDR 2Mbps), 8-DPSK(EDR 3Mbps))
Antenna Type	:	PIFA Antenna
Antenna Gain	:	-1dBi

Note 1: The EUT is a Tonino Lamborghini TL66, it contains Bluetooth Module operating at 2.4GHz ISM band; the frequencies allocated for the Bluetooth Module is F(MHz)=2402+1*n (0<=n<=78). The lowest, middle, highest channel numbers of the Bluetooth Module used and tested in this report are separately 0 (2402MHz), 39 (2441MHz) and 78 (2480MHz).

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

Note 3: a. When power on, the EUT will scan the whole frequency until a Connection command from the other BT devices.

b. When receiving the signal from the other BT devices, The EUT transmit are sponse signal.

c. The other devices receive the response signal and recognize it, then send a connection command to establish the connection.

d. After the connection establish successfully, the data transmission is beginning. At the same time, the both devices will shift frequencies in synchronization per a same pseudo randomly ordered list of hopping frequencies, the hopping rate is1600 times per second. This device conforms to the criteria in FCC Public Notice DA 00-705.

e. The bandwidth of the receiver, which is set to a fixed width by the software.

Note 4: Bluetooth signal has 9 packages DH1, DH3, DH5, 3DH1, 3DH3, 3DH5, 5DH1, 5DH3, 5DH5, DH5 package is largest, we are testing DH5 in the document.

Note5: The antenna of EUT is designed with permanent attachment and no consideration of replacement, it is printed on the circuit board with a maximum gain of -1dBi, and it is used to radiate the RF emissions

1.2. Test Standards and Results

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

No.	Identity	Document Title
1	47 CFR Part 15 Subpart C 2012	Radio Frequency Devices
2	ANSI C63.102009	American National Standard for Testing Unlicensed Wireless Devices

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

No.	Section in CFR 47	Description	Result
1	15.203	Antenna Requirement	PASS
2	15.247(a)	Number of Hopping Frequency	PASS
3	15.247(b)	Peak Output Power	PASS
4	15.247(a)	20dB Bandwidth	PASS
5	15.247(a)	Carrier Frequency Separation	PASS
6	15.247(a)	Time of Occupancy (Dwell time)	PASS
7	15.247(d)	Conducted Spurious Emission	PASS
8	15.247(d)	Band Edge	PASS
9	15.207	Conducted Emission	PASS
10	15.209 15.247(c)	Radiated Emission	PASS

Note 1: The tests were performed according to the method of measurements prescribed in DA-00-705.

Note 2: The test of Radiated Emission was performed according to the method of measurements prescribed in ANSI C63.4 2009.

1.3. Facilities and Accreditations

1.3.1. Facilities

CNAS-Lab Code: L1659

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

FCC-Registration No.: 406086

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 406086, Renewal date Nov. 19, 2011, valid time is until Nov. 18, 2014.

IC-Registration No.: 11185A-1

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

1.3.2. Test Environment Conditions

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

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

2. 47 CFR Part 15C Requirements

2.1. Antenna requirement

2.1.1. Applicable Standard

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

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

2.1.2. Antenna Information

Antenna Category: External antenna
An External antenna was soldered to the antenna port of EUT via an adaptor cable, can't be removed.
Antenna General Information:

No.	EUT Model	Ant. Cat.	Ant. Type	Gain(dBi)
1	Tonino Lamborghini TL66	External	PIFA	-1

2.1.3. Result: comply

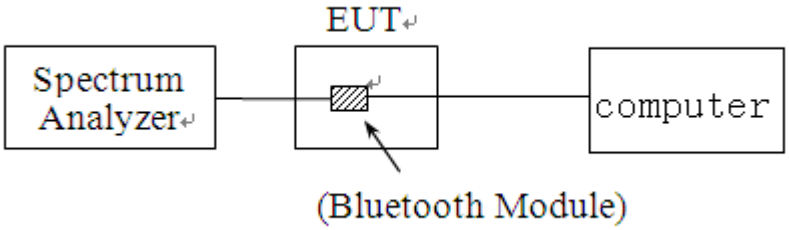
2.2. Number of Hopping Frequency

2.2.1. Requirement

According to FCC §15.247(a)(1)(iii), frequency hopping systems operating in the 2400MHz to 2483.5MHz bands shall use at least 15 hopping frequencies.

2.2.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT, which is powered by the Battery, is connected to the Spectrum Analyzer (SA), the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the PC, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal.Due Date
Spectrum Analyzer	R&S	FSP40	1164.4391.40	2014.06.10

2.2.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW ≥ 1% of the span

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

2.2.4. Test Result

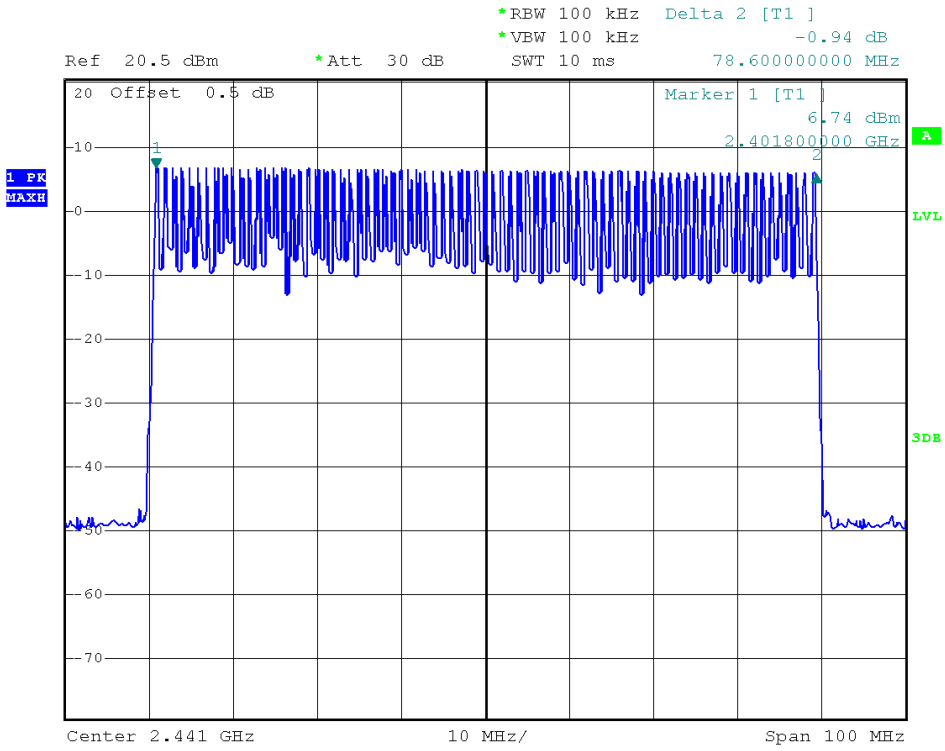
The Bluetooth Module operates at hopping-on test mode; the frequencies number employed is

counted to verify the Module's using the number of hopping frequency.

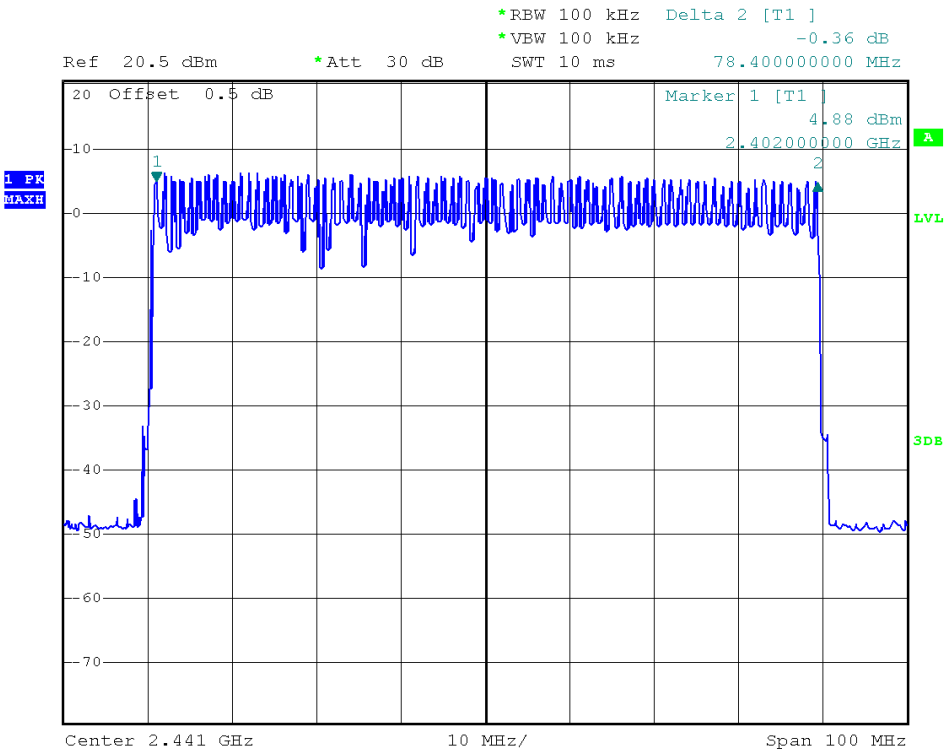
A. Test Verdict:

Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Refer to Plot	Verdict
GFSK	2400 - 2483.5	79	15	Plot A	PASS
π /4-DQPSK	2400 - 2483.5	79	15	Plot B	PASS
8-DPSK	2400 - 2483.5	79	15	Plot C	PASS

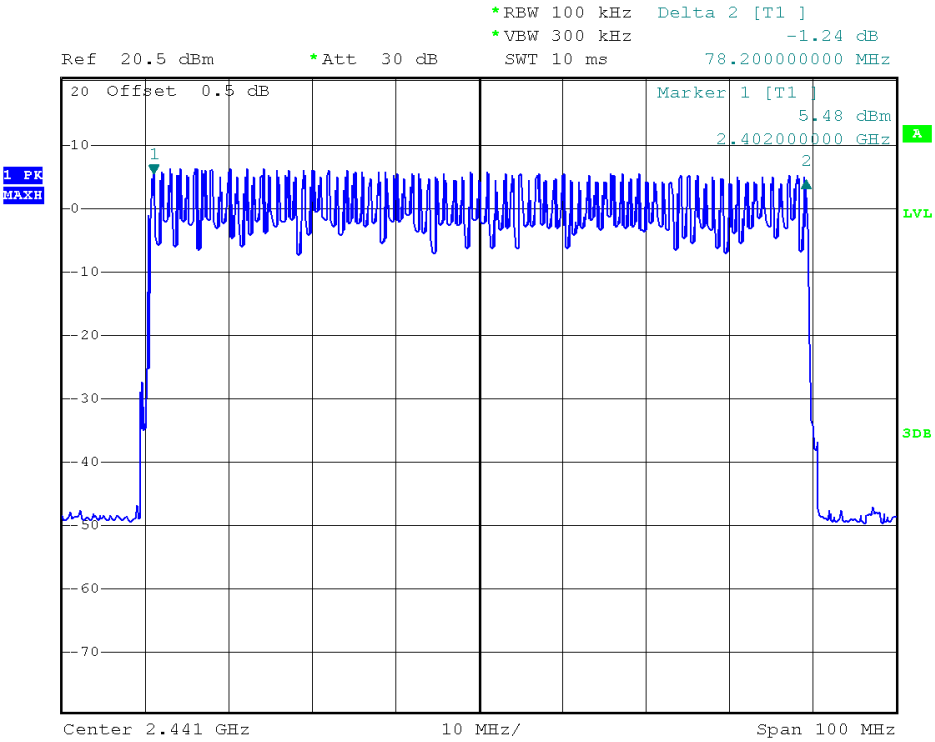
B. Test Plots:



(Plot A: GFSK)



(Plot B: π /4-DQPSK)


*RBW 100 kHz
*VBW 300 kHz
SWT 10 ms
Delta 2 [T1]
-1.24 dB
78.200000000 MHz
Ref 20.5 dBm
*Att 30 dB
20 Offset 0.5 dB
Marker 1 [T1]
5.48 dBm
2.402000000 GHz
1 PK
MAXH
LVL
3DB
Center 2.441 GHz
10 MHz/
Span 100 MHz

(Plot C: 8- DPSK)

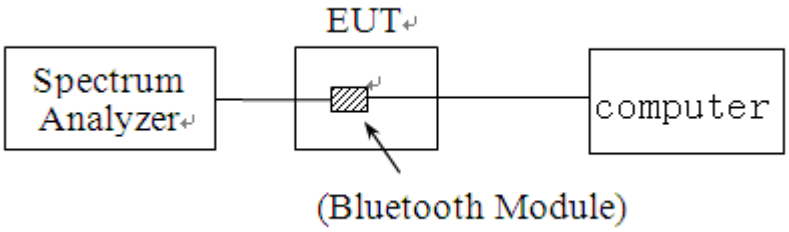
2.3. Peak Output Power

2.3.1. Requirement

According to FCC §15.247(b)(1), for frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other frequency hopping systems in the 2400MHz to 2483.5MHz band, it is 0.125Watts.

2.3.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT, which is powered by the Battery, is connected to the Spectrum Analyzer (SA), the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the PC, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal.Due Date
Spectrum Analyzer	R&S	FSP40	1164.4391.40	2014.06.10

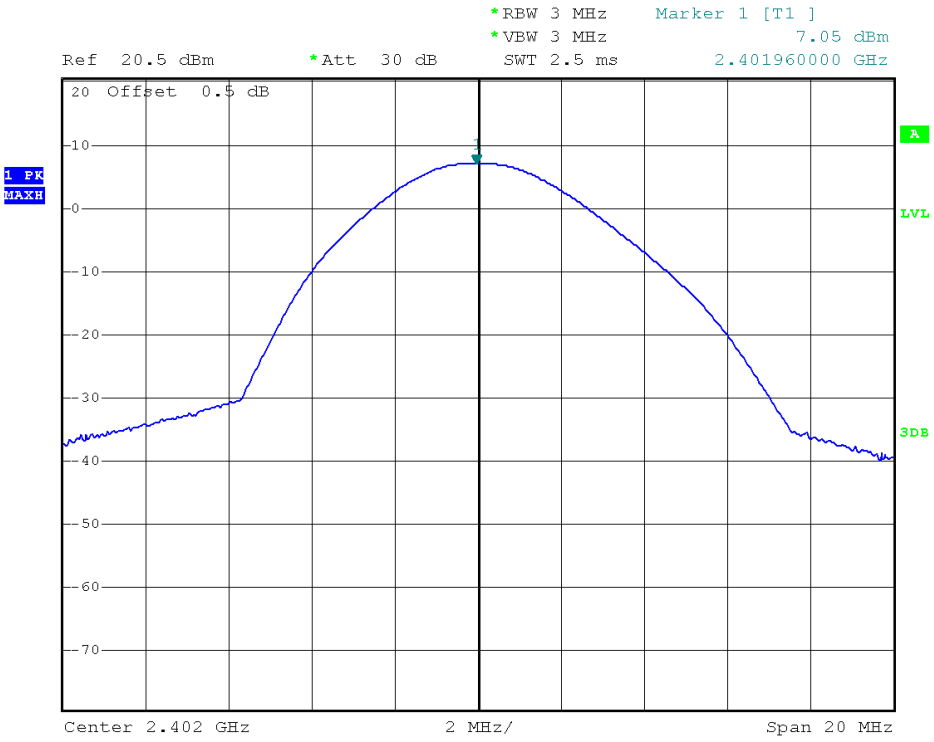
2.3.3. Test Result

The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module. The lowest, middle and highest channel were tested by Spectrum Analyzer.

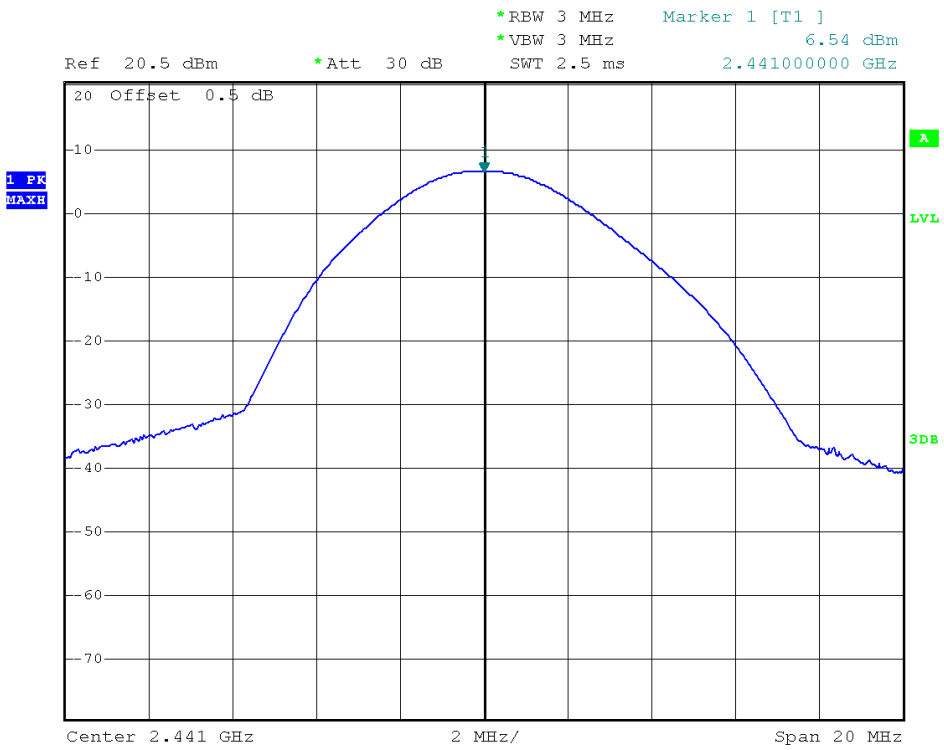
2.3.3.1. GFSK Mode

A. Test Verdict:

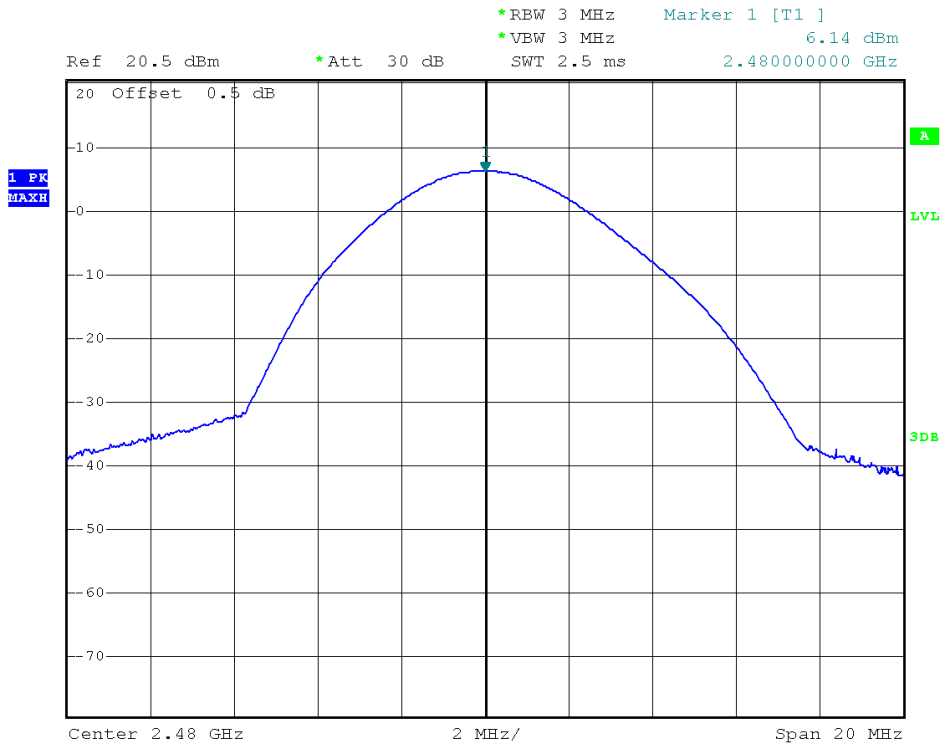
Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Refer to Plot	Verdict
		dBm	W	dBm	W		
0	2402	7.05	0.00501	30	1	Plot A1	PASS
39	2441	6.54	0.00451			Plot A2	PASS
78	2480	6.14	0.00411			Plot A3	PASS



Plot A1: GFSK



Plot A2: GFSK

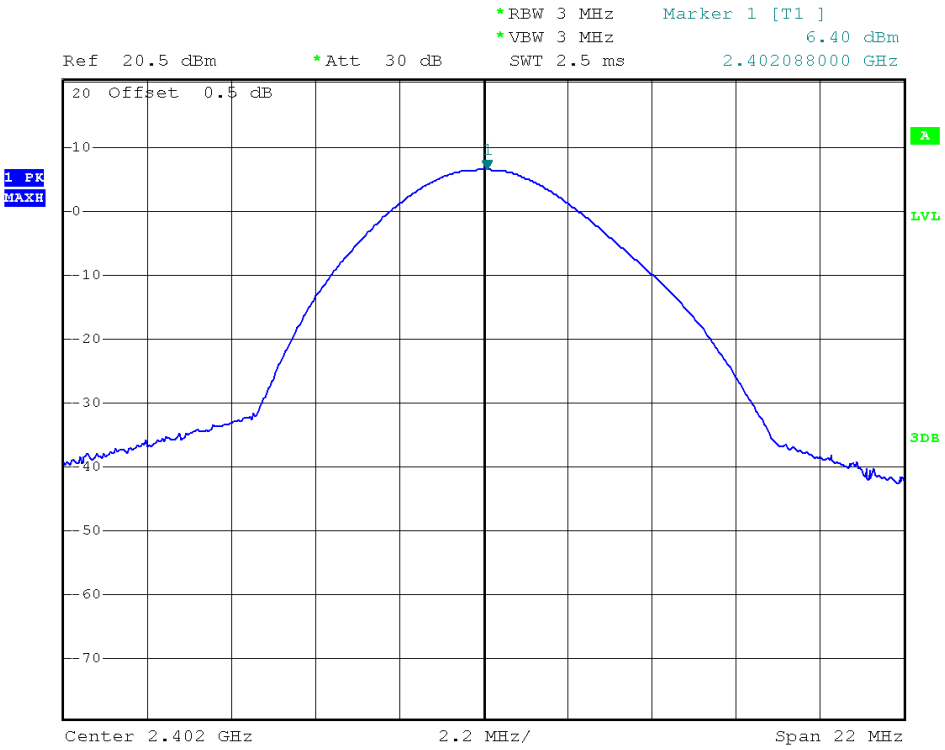


Plot A3: GFSK

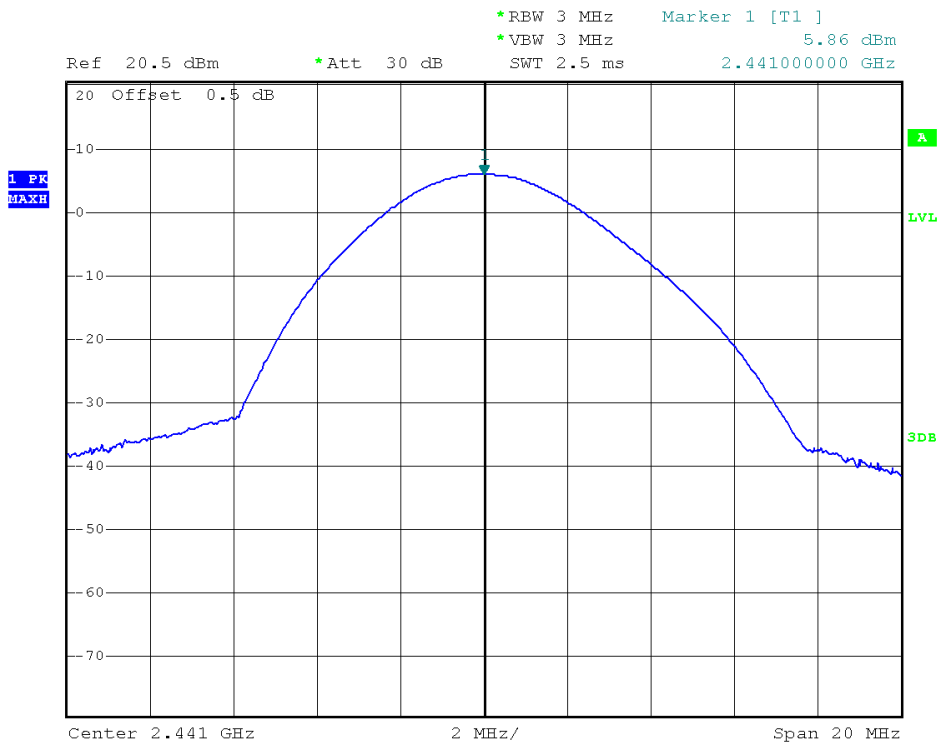
2.3.3.2. π /4-DQPSK Mode

A. Test Verdict:

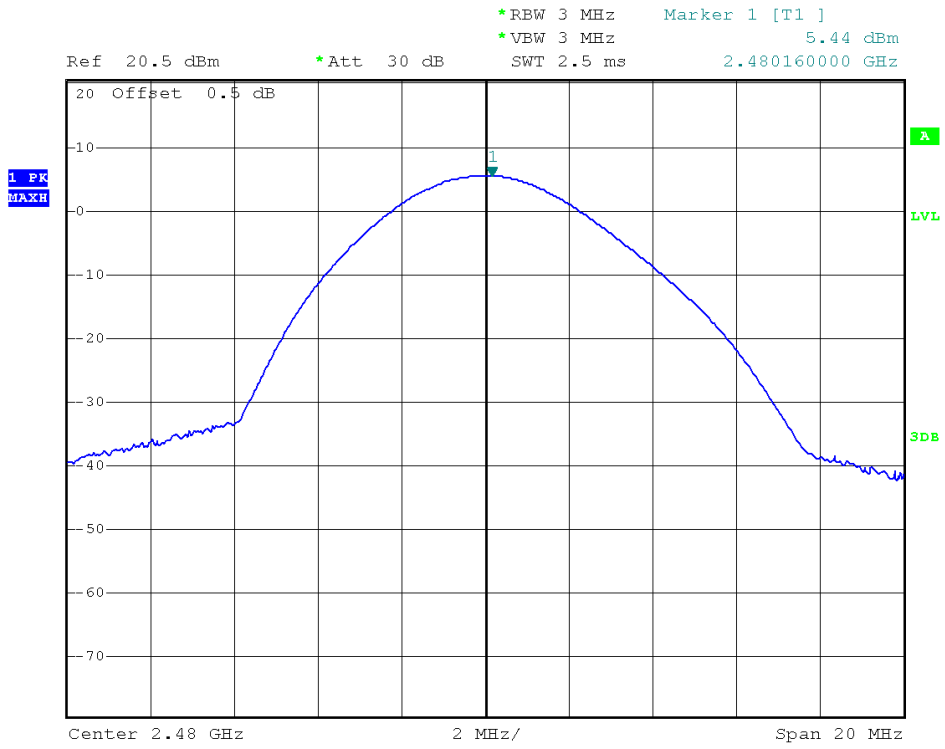
Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Refer to Plot	Verdict
		dBm	W	dBm	W		
0	2402	6.40	0.00437	30	1	Plot B1	PASS
39	2441	5.86	0.00386			Plot B2	PASS
78	2480	5.44	0.00350			Plot B3	PASS



Plot B1: π /4-DQPSK



Plot B2: π /4-DQPSK

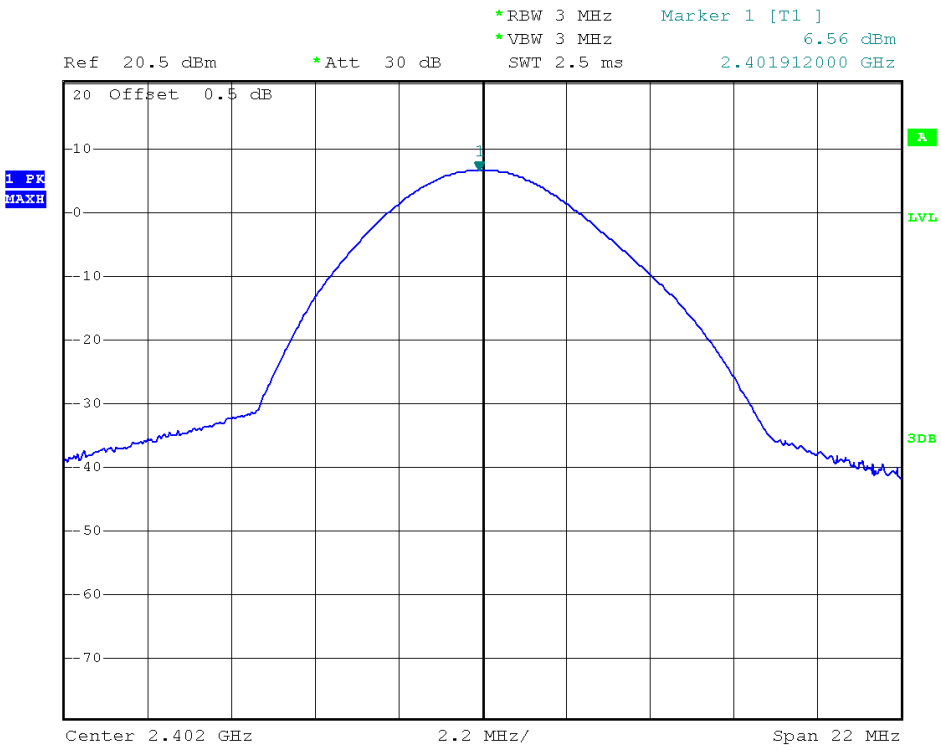


Plot B3: π /4-DQPSK

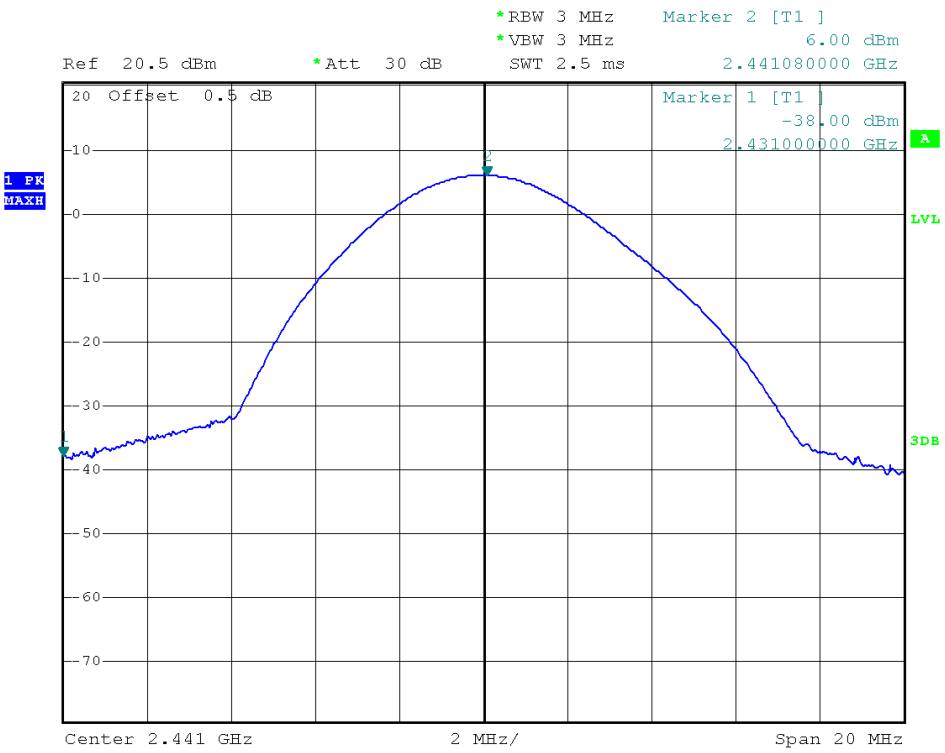
2.3.3.3. 8-DPSK Mode

A. Test Verdict:

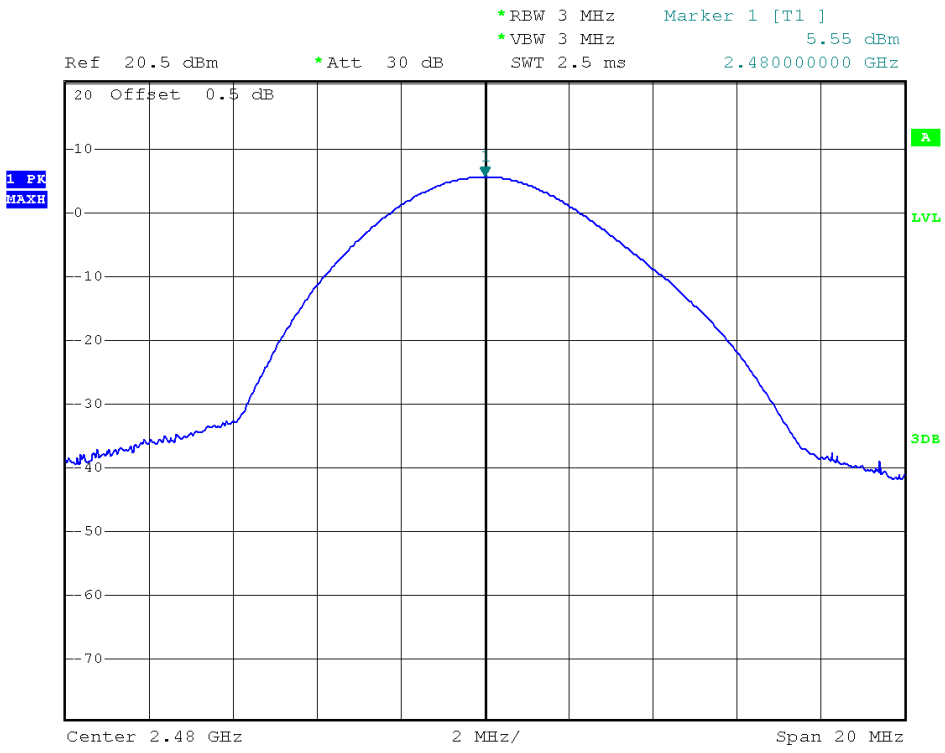
Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Refer to Plot	Verdict
		dBm	W	dBm	W		
0	2402	6.56	0.00453	30	1	Plot C1	PASS
39	2441	6.00	0.00398			Plot C2	PASS
78	2480	5.55	0.00359			Plot C3	PASS



Plot C1: 8-DPSK



Plot C2: 8-DPSK



Plot C3: 8-DPSK

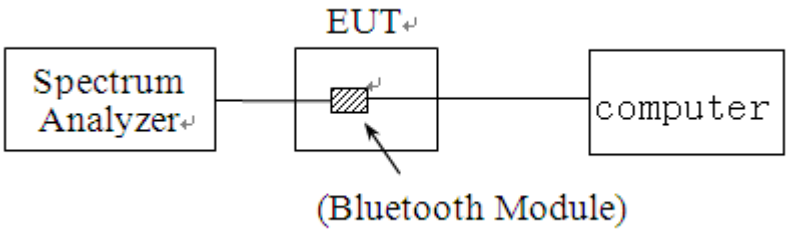
2.4. 20dB Bandwidth

2.4.1. Definition

According to FCC §15.247(a)(1), the 20dB bandwidth is known as the 99% emission bandwidth, or 20dB bandwidth (10*log1% = 20dB) taking the total RF output power.

2.4.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT, which is powered by the Battery, is connected to the Spectrum Analyzer (SA), the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the PC, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal.Due Date
Spectrum Analyzer	R&S	FSP40	1164.4391.40	2014.06.10

2.4.1. Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW ≥ 1% of the 20 dB bandwidth

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

2.4.2. Test Result

The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to record the 20dB bandwidth of the Module.

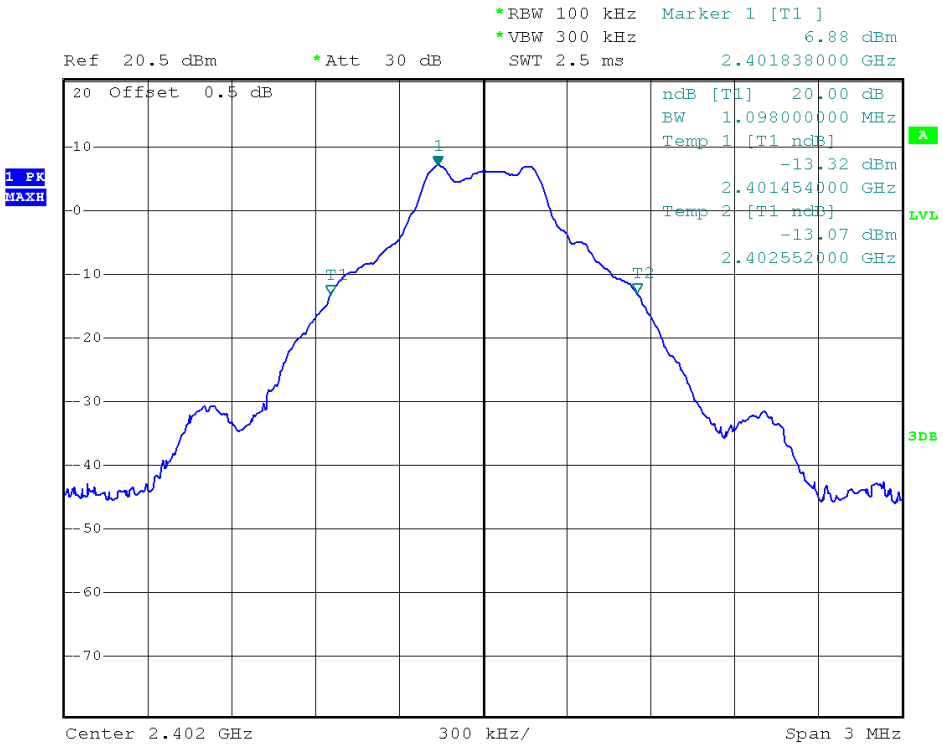
2.4.2.1. GFSK Mode

A. Test Verdict:

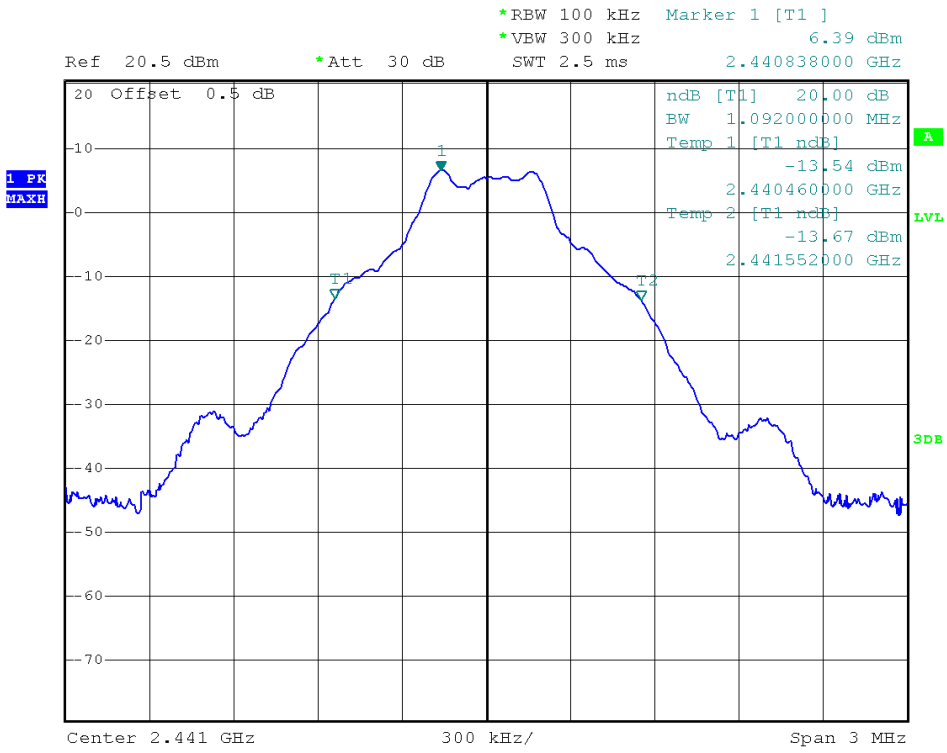
The maximum 20dB bandwidth measured is 1.120MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.098	Plot A
39	2441	1.092	Plot B
78	2480	1.092	Plot C

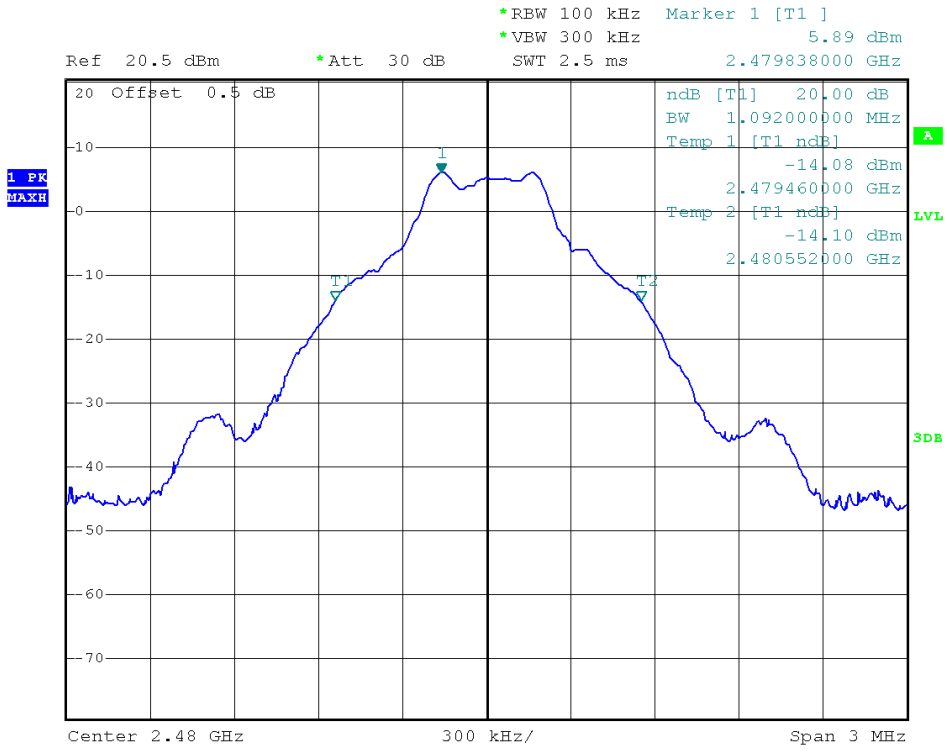
Test Plots:



(Plot A: Channel = 2402 @ GFSK)



(Plot B: Channel = 2441 @ GFSK)



(Plot C: Channel = 2480 @ GFSK)

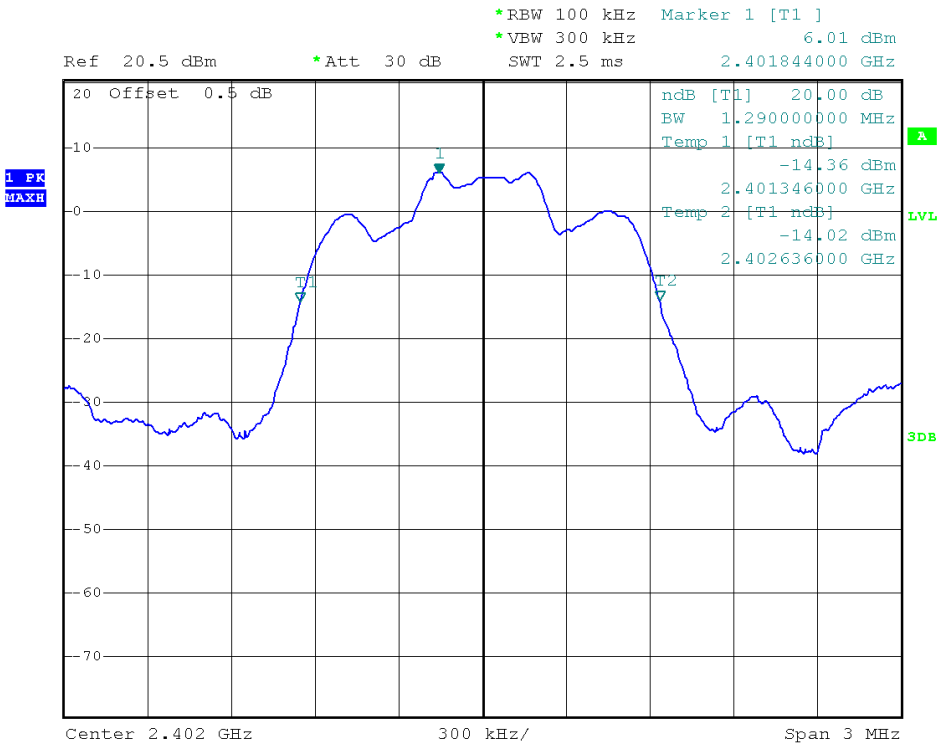
2.4.2.2. π /4-DQPSK Mode

A. Test Verdict:

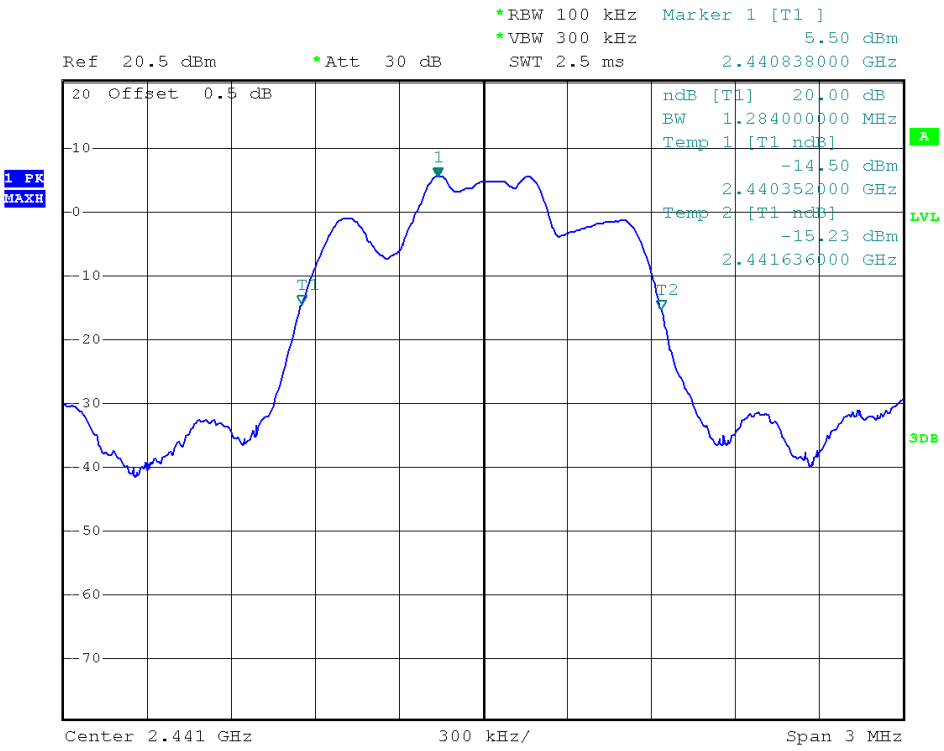
The maximum 20dB bandwidth measured is 1.404MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.290	Plot D
39	2441	1.284	Plot E
78	2480	1.296	Plot F

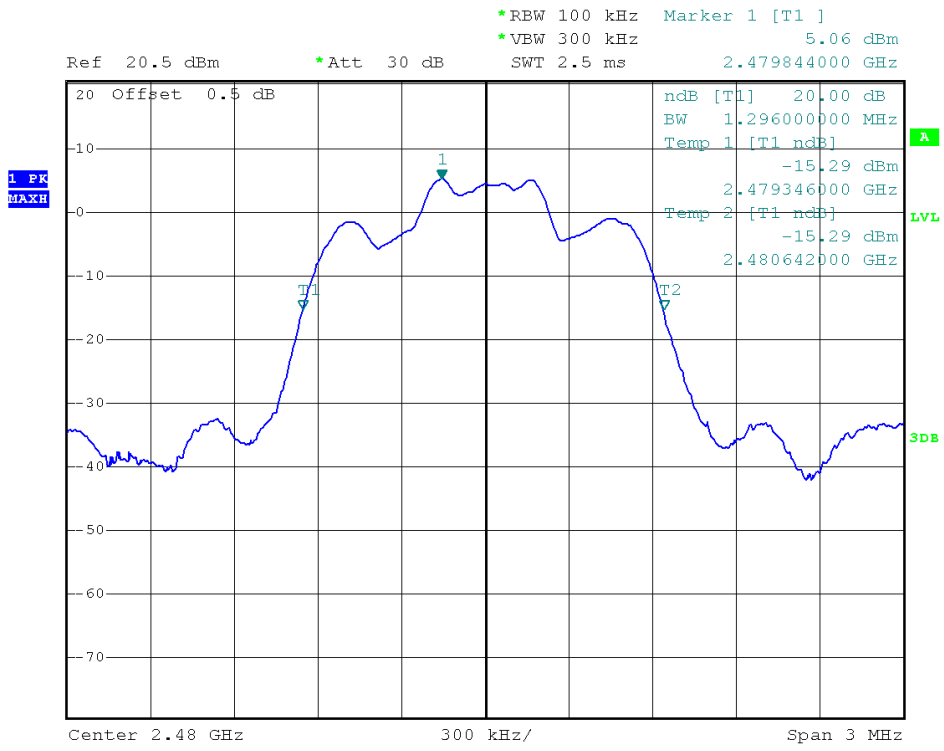
Test Plots:



(Plot D: Channel = 2402 @π /4-DQPSK)



(Plot E: Channel = 2441 @π /4-DQPSK)



(Plot F: Channel = 2480 @π /4-DQPSK)

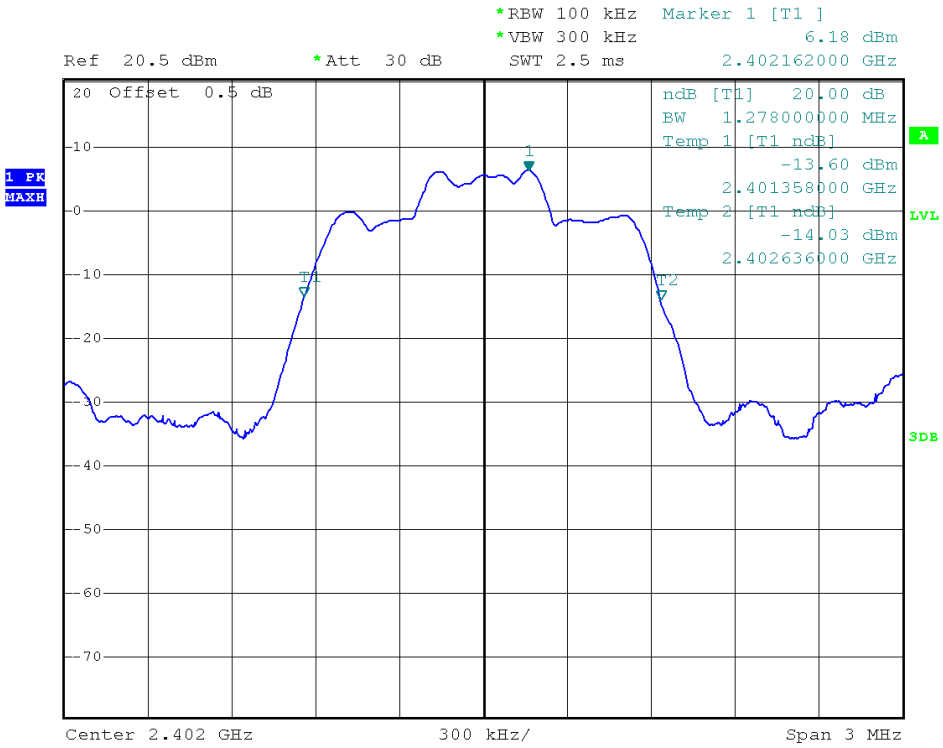
2.4.2.3. 8-DPSK Mode

A. Test Verdict:

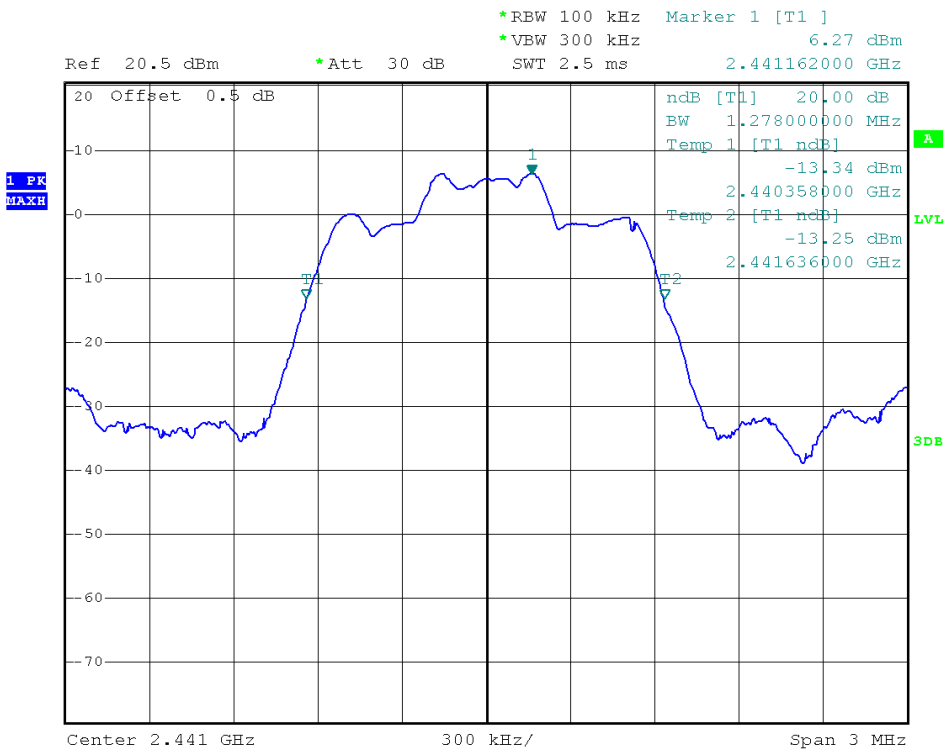
The maximum 20dB bandwidth measured is 1.416MHz according to the table below.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot
0	2402	1.278	Plot G
39	2441	1.278	Plot H
78	2480	1.284	Plot I

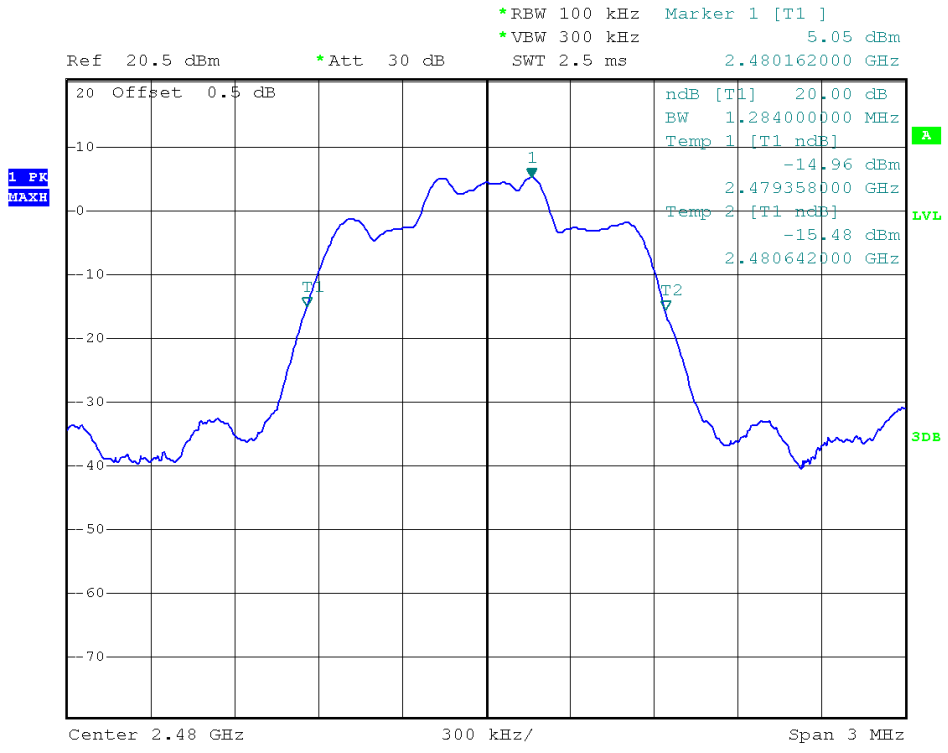
B. Test Plots:



(Plot G: Channel = 2402 @ 8-DPSK)



(Plot H: Channel = 2441 @ 8-DPSK)



(Plot I: Channel = 2480 @ 8-DPSK)

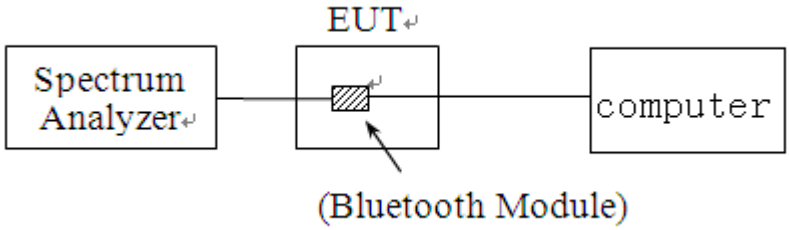
2.5. Carried Frequency Separation

2.5.1. Definition

According to FCC §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

2.5.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT, which is powered by the Battery, is connected to the Spectrum Analyzer (SA), the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the PC, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal.Due Date
Spectrum Analyzer	R&S	FSP40	1164.4391.40	2014.06.10

2.5.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span

Video (or Average) Bandwidth (VBW) ≥ RBW

Sweep = auto

Detector function = peak

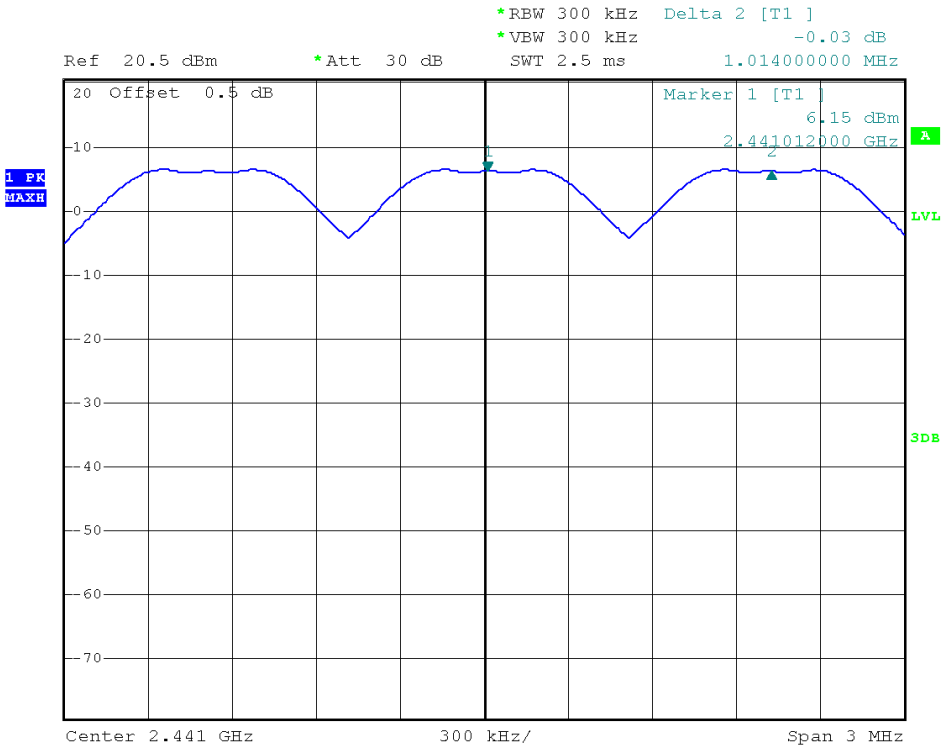
Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

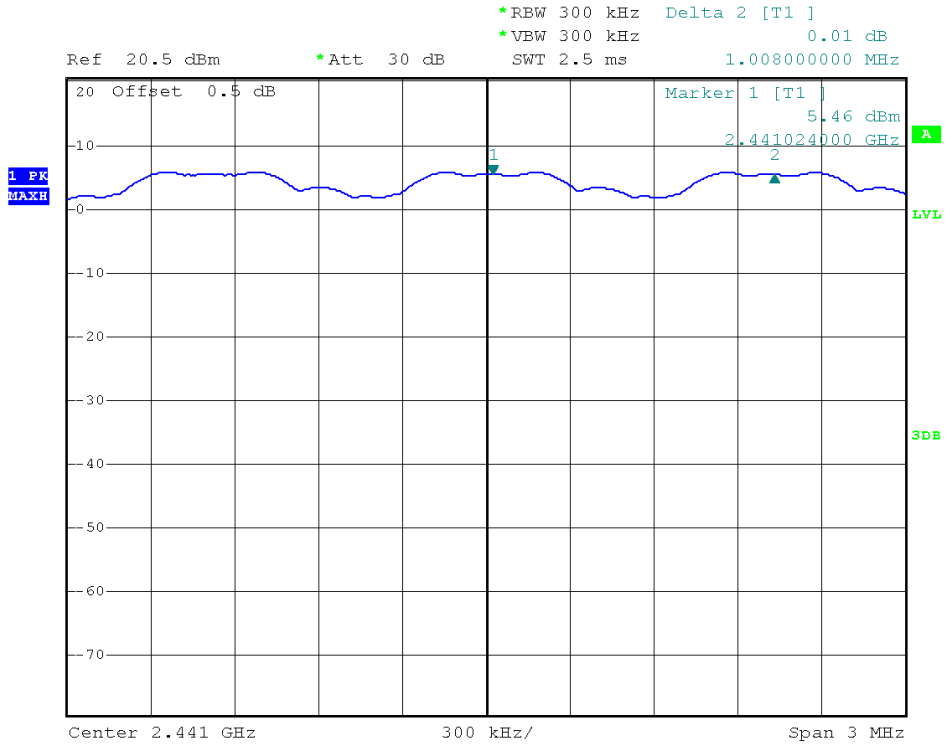
2.5.4. Test Result

The Bluetooth Module operates at hopping-on test mode.

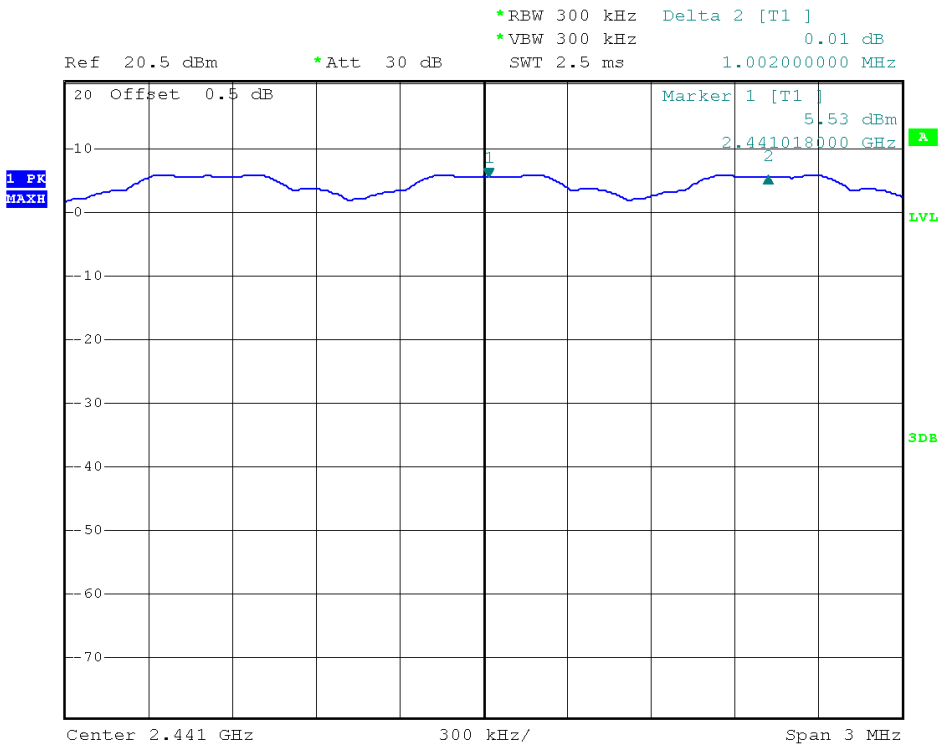
For any adjacent channels (e.g. the channel 39 and 40 as showed in the Plot A), the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel (1.098MHz for GFSK mode, 1.296MHz for π /4-DQPSK mode and 1.284MHz for 8-DPSK mode, refer to section 2.4.1), whichever is greater. So, the verdict is PASSING



(Plot A: GFSK)



(Plot B: π /4-DQPSK)



(Plot C: 8-DPSK)

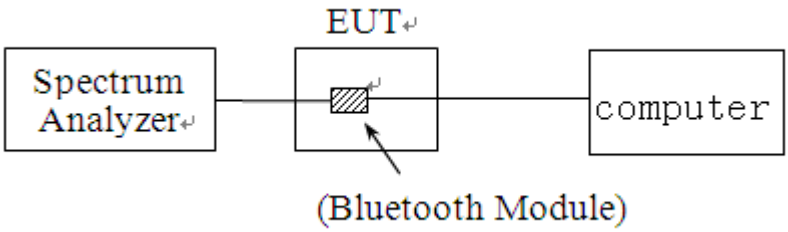
2.6. Time of Occupancy (Dwell time)

2.6.1. Requirement

According to FCC §15.247(a) (1) (iii), frequency hopping systems in the 2400 - 2483.5MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

2.6.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT, which is powered by the Battery, is connected to the Spectrum Analyzer (SA), the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the PC, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal.Due Date
Spectrum Analyzer	R&S	FSP40	1164.4391.40	2014.06.10

2.6.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = zero span, centered on a hopping channel

RBW = 1 MHz

VBW ≥ RBW

Sweep = as necessary to capture the entire dwell time per hopping channel

Detector function = peak

Trace = max hold

2.6.4. Test Result

The average time of occupancy on any channel within the Period can be calculated with formulas (for DH5 package type):

{Total of Dwell} = {Pulse Time} * (1600 / 6) / {Number of Hopping Frequency} * {Period}
{Period} = 0.4s * {Number of Hopping Frequency}

The lowest, middle and highest channels are selected to perform testing to record the dwell time of each occupation measured in this channel, which is called Pulse Time here.

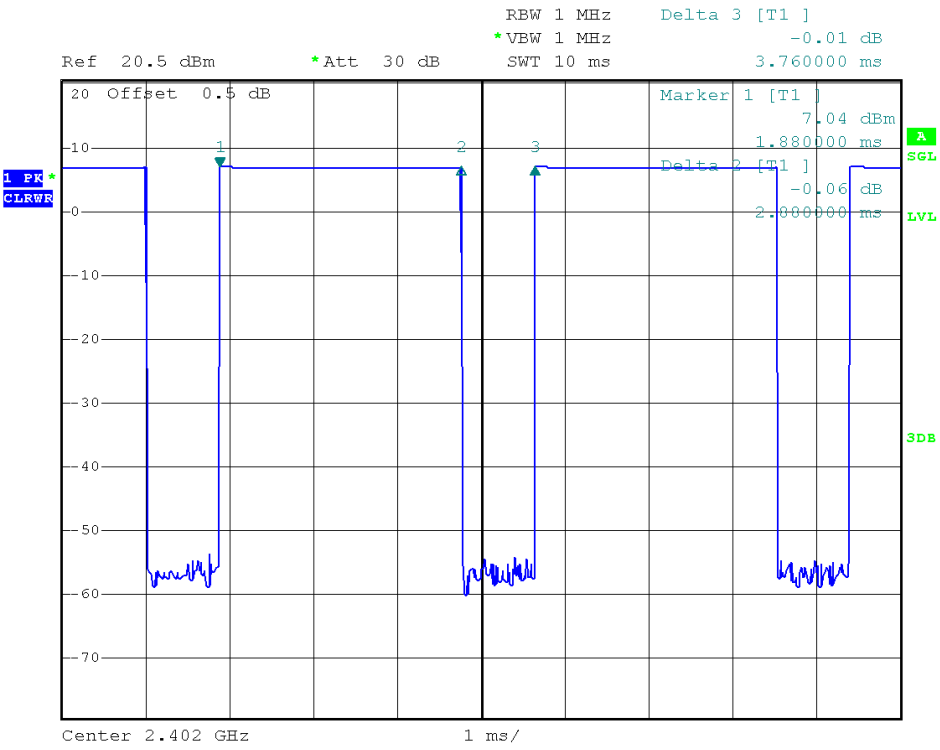
2.6.4.1. GFSK Mode

A. Test Verdict:

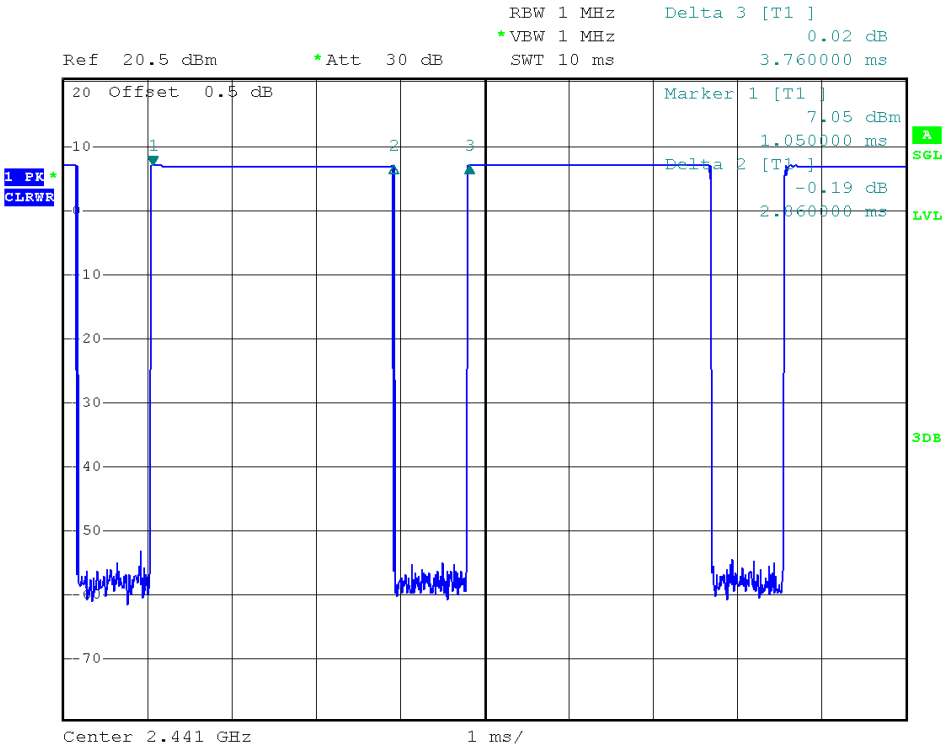
Channel	Frequency (MHz)	Pulse Time		Total of Dwell (ms)	Limit (ms)	Verdict
		ms	Refer to Plot			
0	2402	2.880	Plot A	307.200	400	PASS
39	2441	2.860	Plot B	305.067		PASS
78	2480	2.880	Plot C	307.200		PASS

Test Plots:

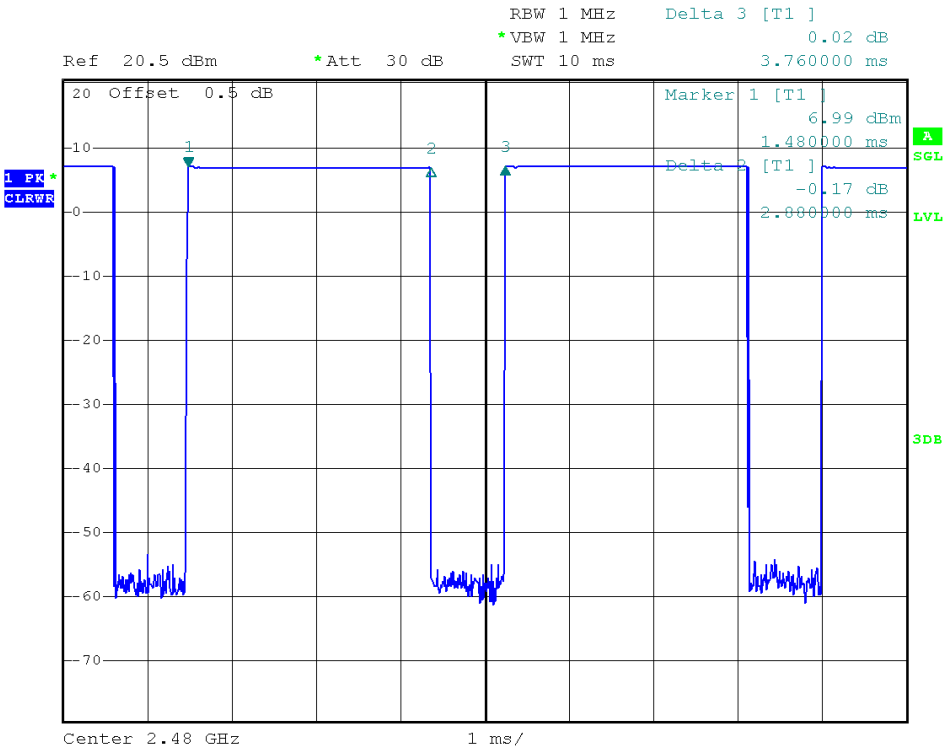
Note: the following plots record the Pulse Time of the Module carrier.



(Plot A: Channel = 2402 @ GFSK)



(Plot B: Channel = 2441 @ GFSK)



(Plot C: Channel = 2480 @ GFSK)

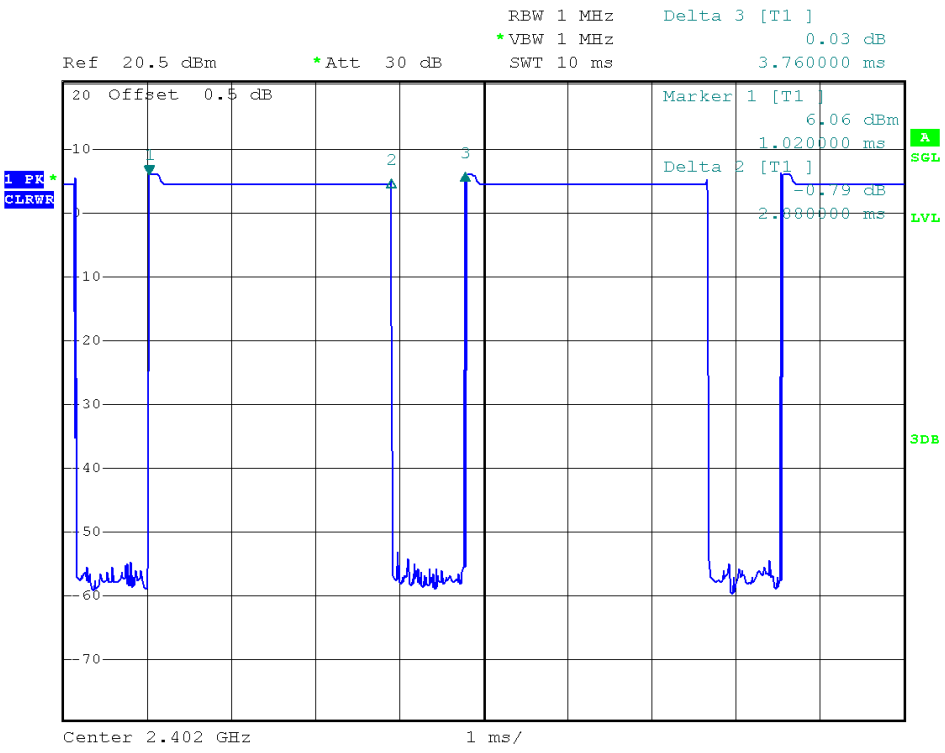
2.6.4.2. π /4-DQPSK Mode

A. Test Verdict:

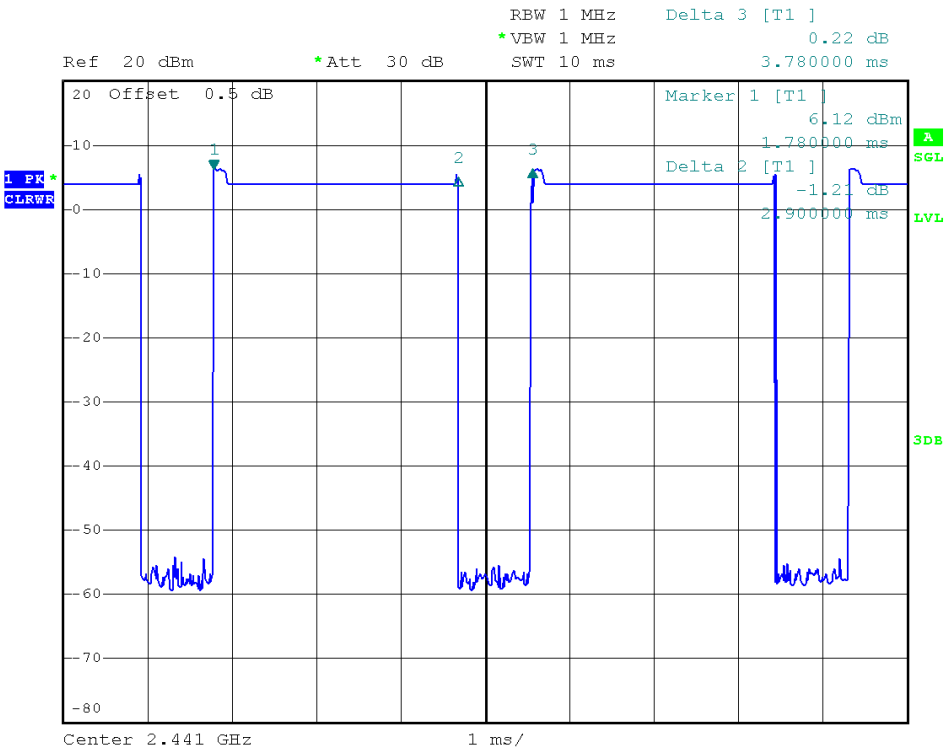
Channel	Frequency (MHz)	Pulse Time		Total of Dwell (ms)	Limit (ms)	Verdict
		ms	Refer to Plot			
0	2402	2.880	Plot D	307.200	400	PASS
39	2441	2.900	Plot E	309.333		PASS
78	2480	2.900	Plot F	309.333		PASS

Test Plots:

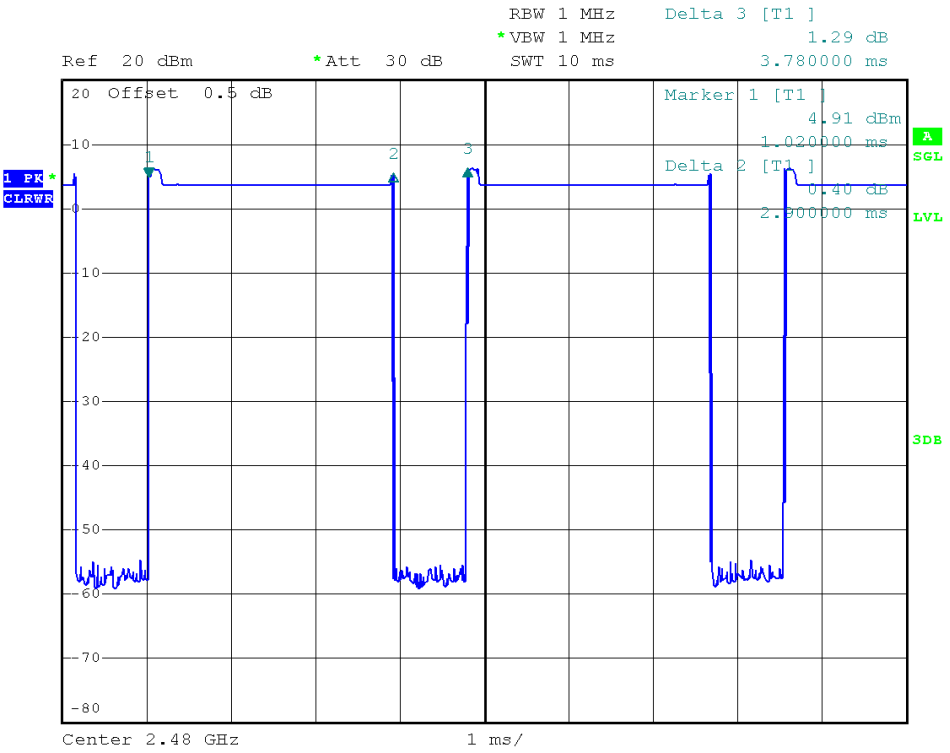
Note: the following plots record the Pulse Time of the Module carrier.



(Plot D: Channel = 2402 @π /4-DQPSK)



(Plot E: Channel = 2441 @π /4-DQPSK)



(Plot F: Channel = 2480 @π /4-DQPSK)

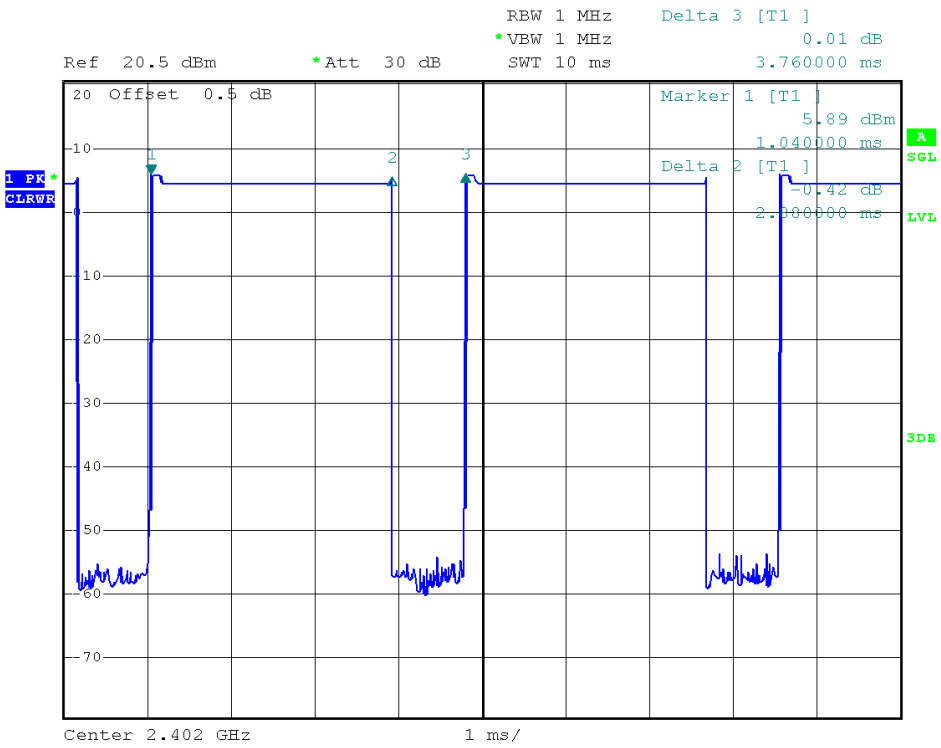
2.6.4.3. 8-DPSK mode

A. Test Verdict:

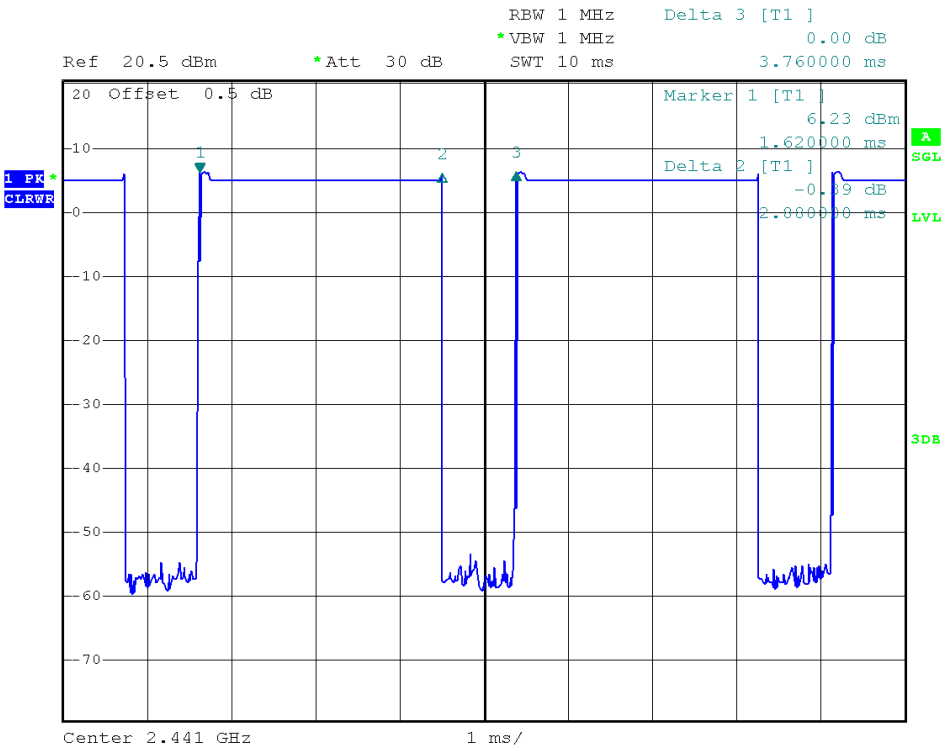
Channel	Frequency (MHz)	Pulse Time		Total of Dwell (ms)	Limit (ms)	Verdict
		ms	Refer to Plot			
0	2402	2.880	Plot G	307.200	400	PASS
39	2441	2.880	Plot H	307.200		PASS
78	2480	2.900	Plot I	309.333		PASS

Test Plots:

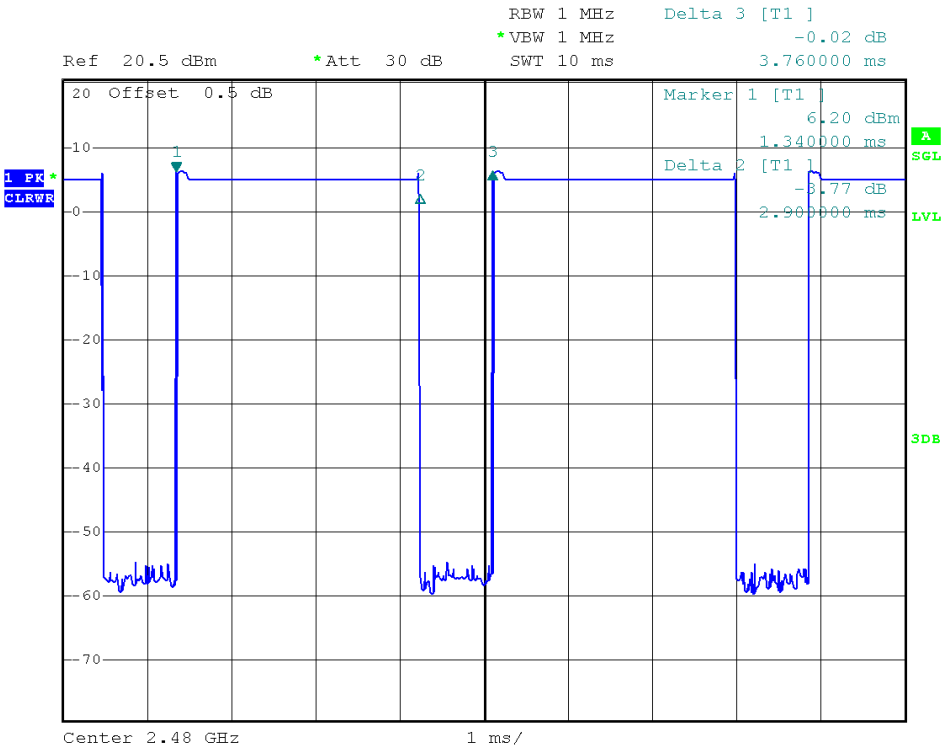
Note: the following plots record the Pulse Time of the Module carrier.



(Plot G: Channel = 2402 @ 8-DPSK)



(Plot H: Channel = 2441 @ 8-DPSK)



(Plot I: Channel = 2480 @ 8-DPSK)

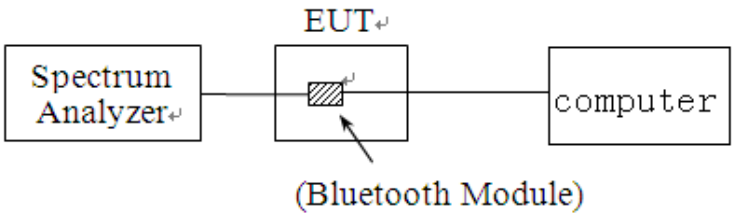
2.7. Conducted Spurious Emissions

2.7.1. Requirement

According to FCC §15.247(d), in any 100kHz 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 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.

2.7.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT, which is powered by the Battery, is connected to the Spectrum Analyzer (SA), the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the PC, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal.Due Date
Spectrum Analyzer	R&S	FSP40	1164.4391.40	2014.06.10

2.7.3. Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

2.7.4. Test Result

The Bluetooth Module operates at hopping-off test mode. The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.

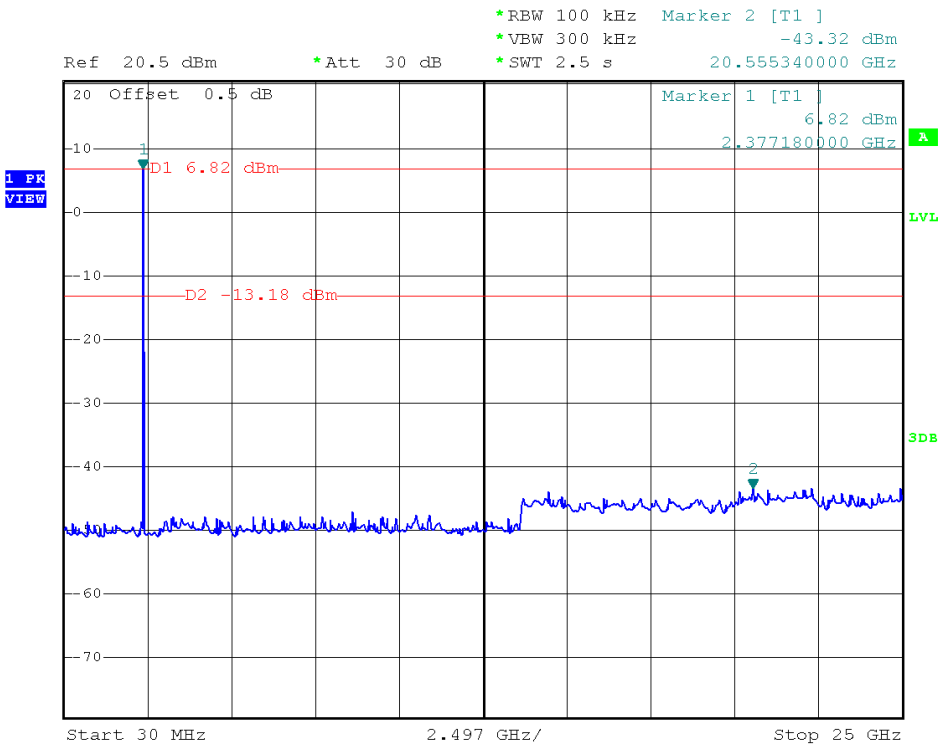
2.7.4.1. GFSK Mode

A. Test Verdict:

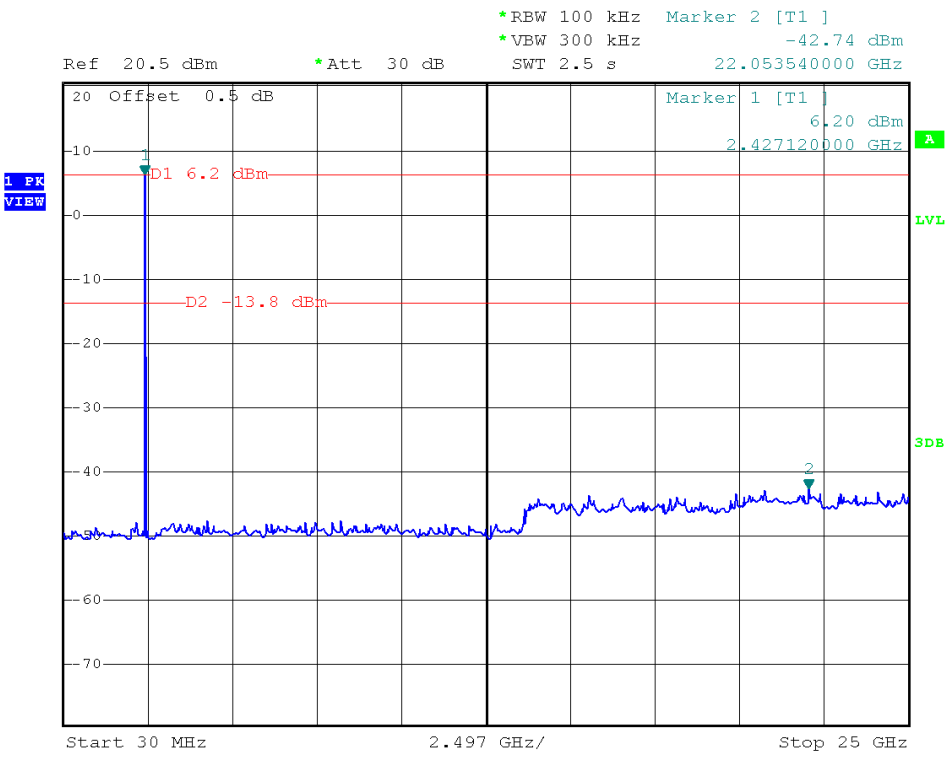
Channel	Frequency (MHz)	Measured Max. Out of Band EmissiondBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-43.32	Plot A.1	6.82	-13.18	PASS
39	2441	-42.74	Plot B.1	6.20	-13.80	PASS
78	2480	-42.08	Plot C.1	5.79	-14.21	PASS

B. Test Plots:

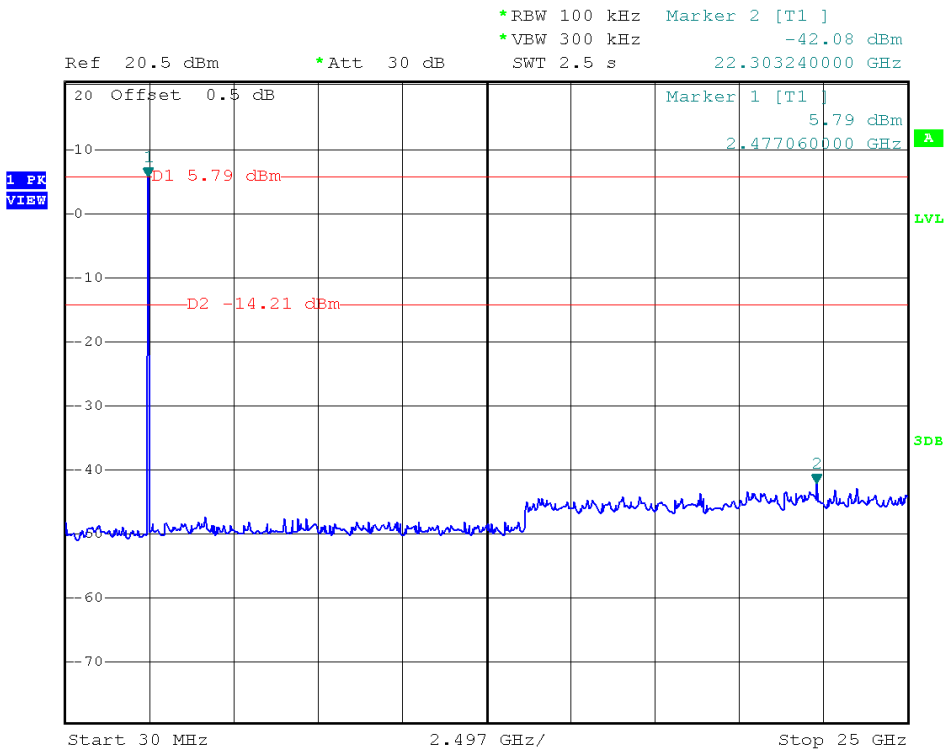
Note: the power of the Module transmitting frequency should be ignored.



(Plot A.1: Channel = 0, 30MHz to 25GHz @ GFSK Mode)



(Plot B.1: Channel = 39, 30MHz to 25GHz @ GFSK Mode)



(Plot C.1: Channel = 78, 30MHz to 25GHz @ GFSK Mode)

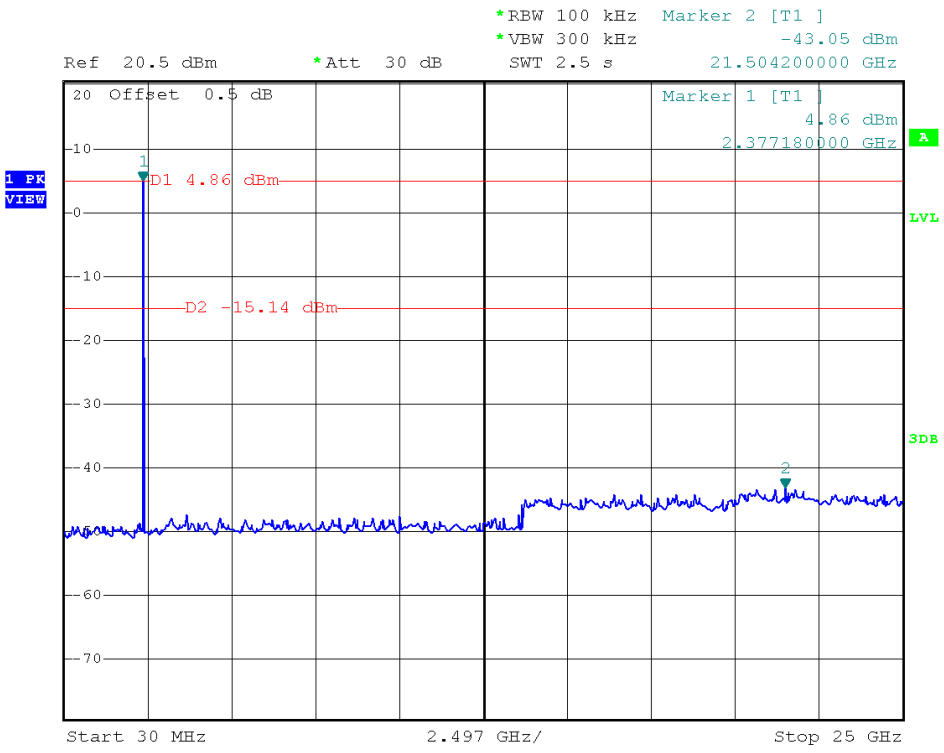
2.7.4.2. π /4-DQPSK Mode

A. Test Verdict:

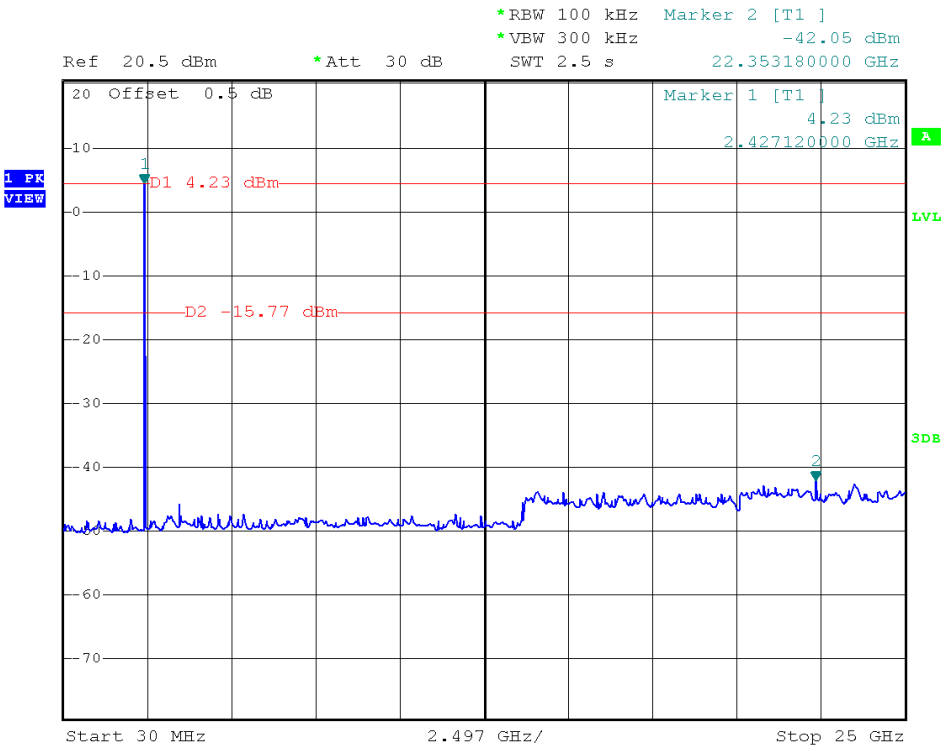
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-43.05	Plot D.1	4.86	-15.14	PASS
39	2441	-42.05	Plot E.1	4.23	-15.77	PASS
78	2480	-42.97	Plot F.1	3.66	-16.34	PASS

B. Test Plots:

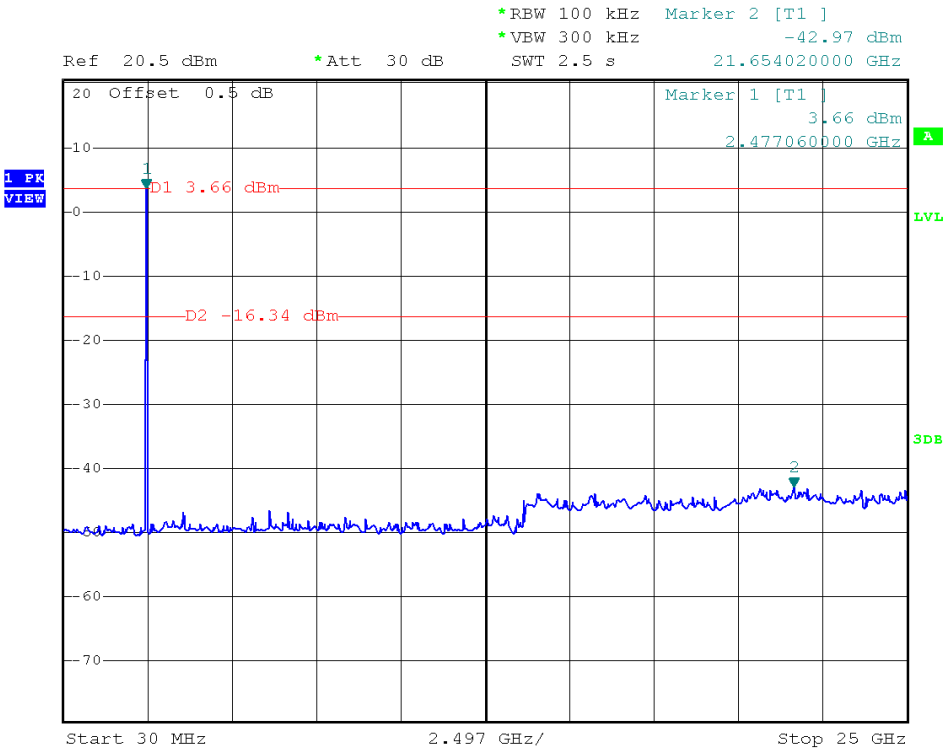
Note: the power of the Module transmitting frequency should be ignored.



(Plot D.1: Channel = 0, 30MHz to 25GHz @π /4-DQPSK)



(Plot E.1: Channel = 39, 30MHz to 25GHz @π /4-DQPSK)



(Plot F.1: Channel = 78, 30MHz to 25GHz @π /3-DQPSK)

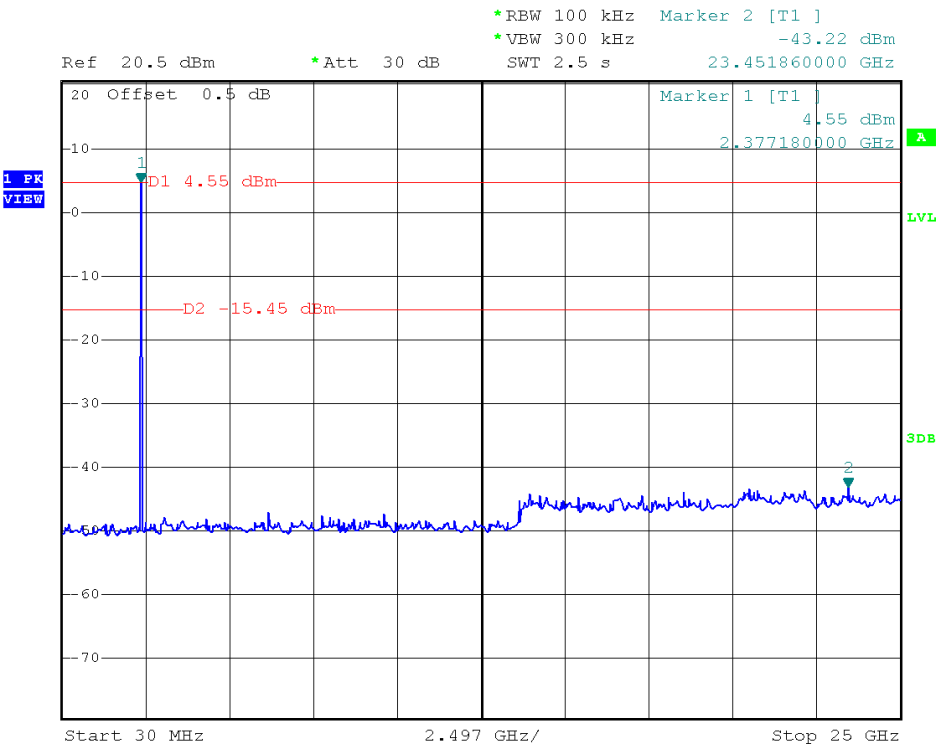
2.7.4.3. 8-DPSK Mode

A. Test Verdict:

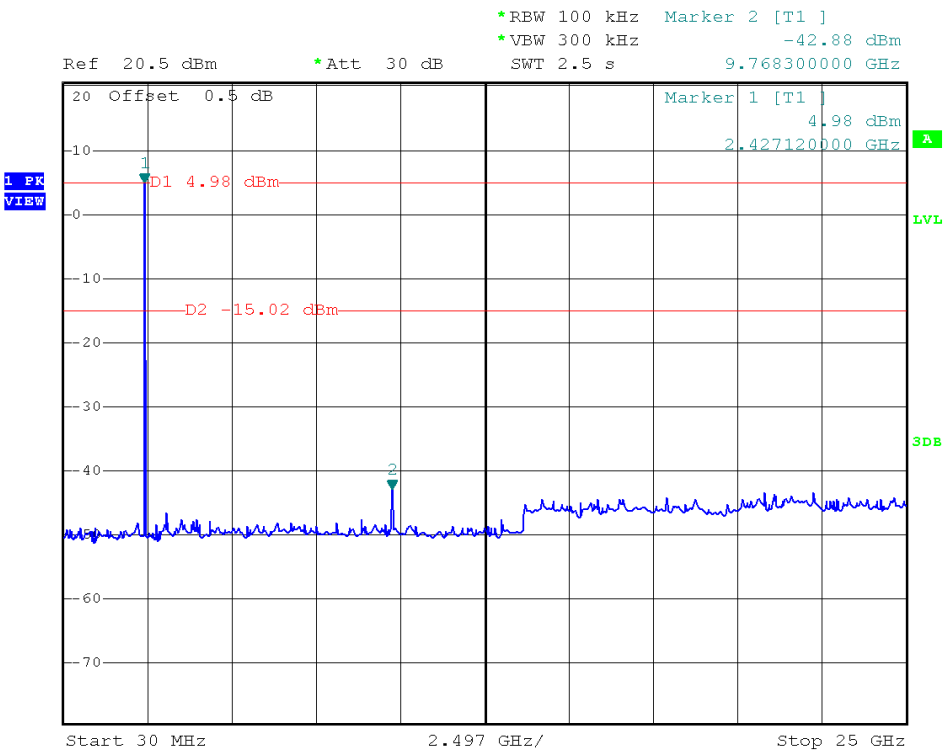
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Refer to Plot	Limit (dBm)		Verdict
				Carrier Level	Calculated -20dBc Limit	
0	2402	-43.22	Plot G.1	4.55	-15.45	PASS
39	2441	-42.88	Plot H.1	4.98	-15.02	PASS
78	2480	-42.71	Plot I.1	4.94	-15.06	PASS

B. Test Plots:

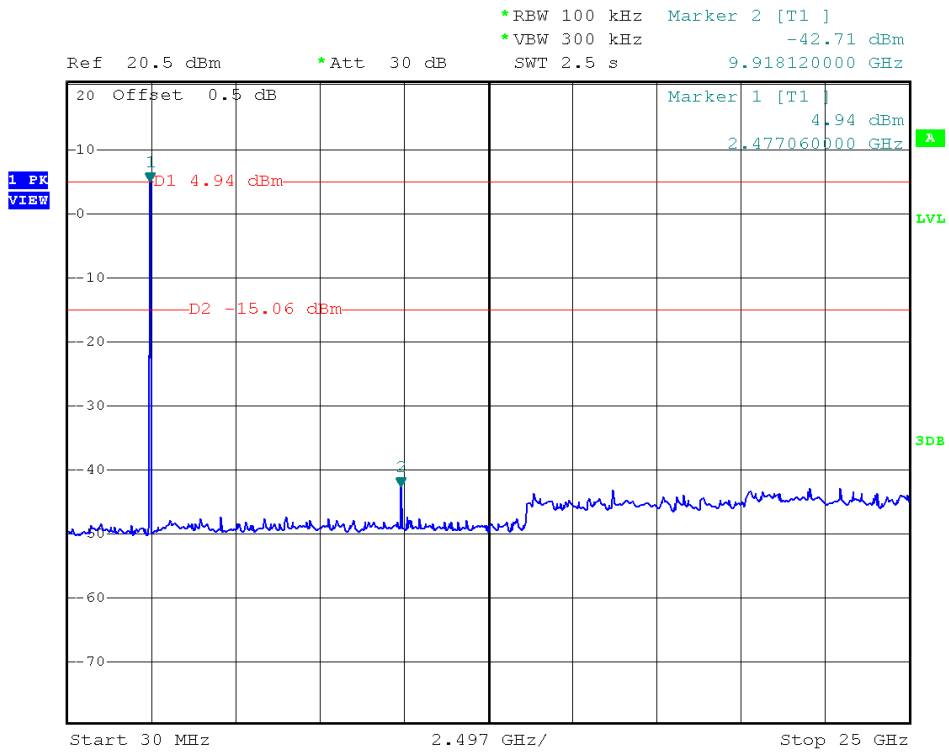
Note: the power of the Module transmitting frequency should be ignored.



(Plot G.1: Channel = 0, 30MHz to 25GHz @ 8-DPSK)



(Plot H.1: Channel = 39, 30MHz to 25GHz @ 8-DPSK)



(Plot I.1: Channel = 78, 30MHz to 25GHz @ 8-DPSK)

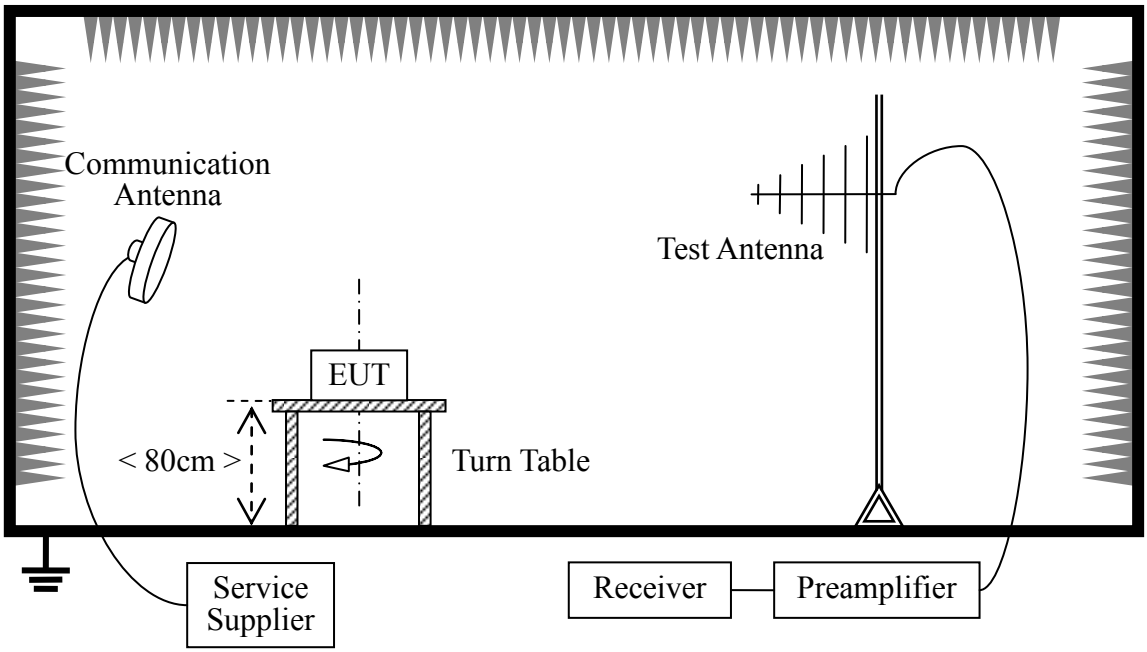
2.8. Band Edge

2.8.1. Requirement

According to FCC section 15.247(d), in any 100kHz 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 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.

2.8.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT is powered by the Battery. The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the Bluetooth Module is activated and controlled by the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under hopping-on test mode transmitting 339 bytes DH5 packages at maximum power.

For the Test Antenna:

Horn Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal.Due Date
Receiver	R&S	FSP40	1164.4391.40	2014.06.10
Full-Anechoic Chamber	Albatross	12.8m*6.8m*6.4m	A0412372	2014.06.10
Double ridge horn antenna	R&S	HF906	100150	2014.06.10

Description	Manufacturer	Model	Serial No.	Cal.Due Date
Ultra-wideband antenna	R&S	HL562	A0304224	2014.06.10
Ampilier 1G~18GHz	R&S	MITEQ AFS42-00101800	25-S-42	2014.06.10

2.8.3. Test Procedure

Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation

RBW ≥ 1% of the span

VBW ≥ RBW

Sweep = auto

Detector function = peak /AV

Trace = max hold

Allow the trace to stabilize.

2.8.4. Test Result

The Bluetooth Module operates at hopping-off test mode. The lowest and highest channels are tested to verify the band edge emissions.

The measurement results are obtained as below:
$E\ [dB\mu V/m] = U_R + A_T + A_{Factor}\ [dB]$; $A_T = L_{Cable\ loss}\ [dB] - G_{preamp}\ [dB]$
A_T: Total correction Factor except Antenna
U_R: Receiver Reading
G_{preamp}: Preamplifier Gain
A_{Factor}: Antenna Factor at 3m

Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

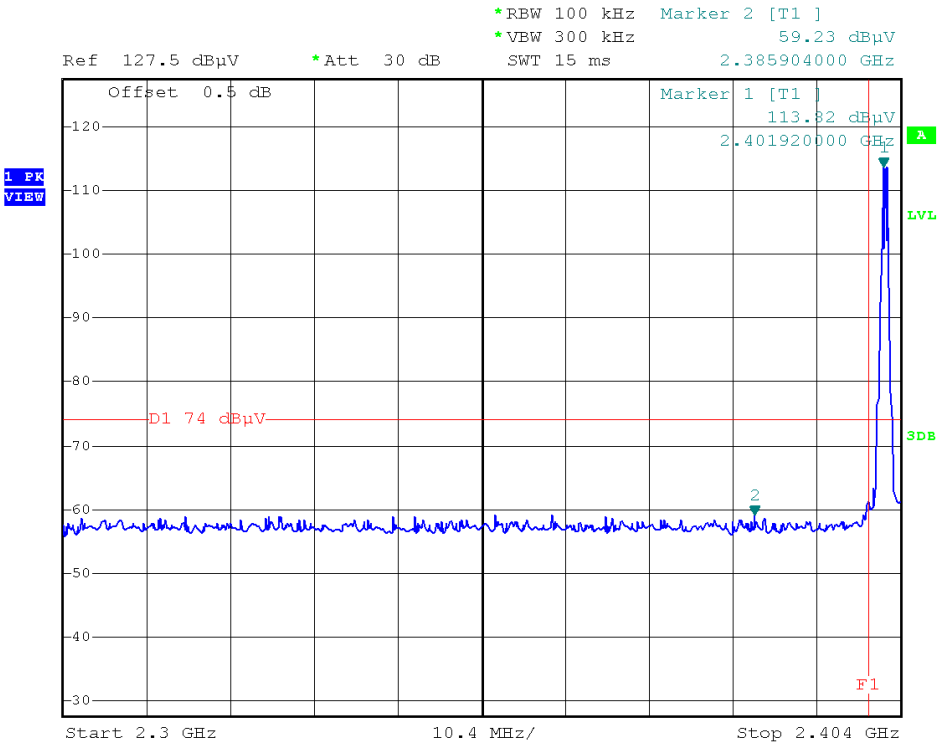
2.8.4.1. GFSK Mode

A. Test Verdict:

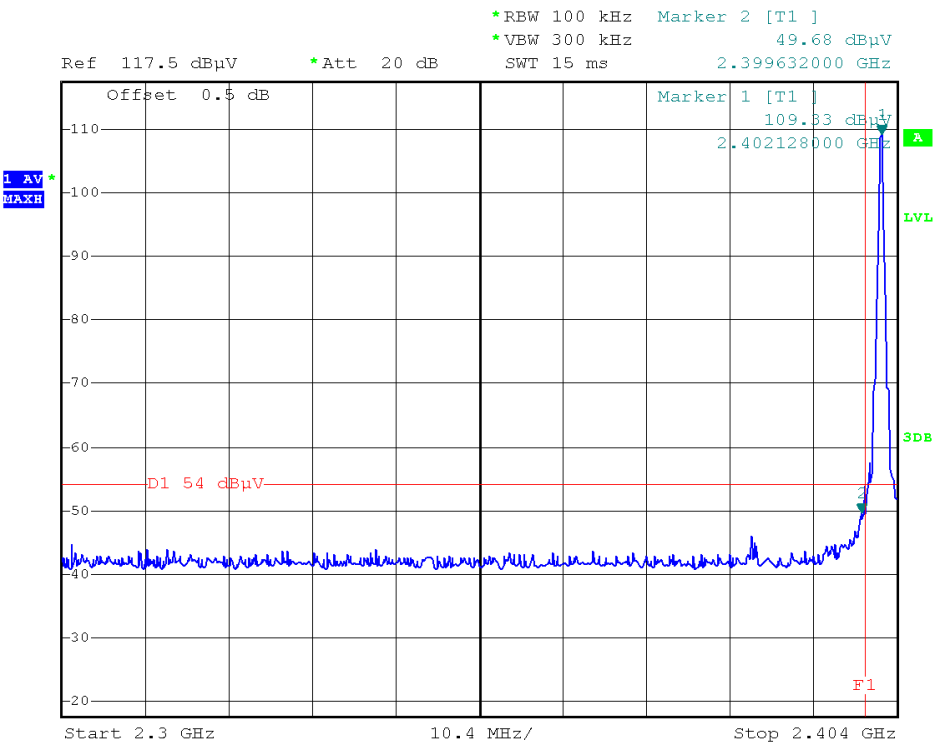
(Un-hopping)

Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
		PK/ AV						
0	2385.904	PK	59.23	-31.70	28.3	55.83	74	Pass
0	2399.632	AV	49.68	-31.70	28.3	46.28	54	Pass
78	2495.820	PK	58.79	-29.45	29.2	58.54	74	Pass
78	2495.864	AV	51.84	-29.45	29.2	51.59	54	Pass

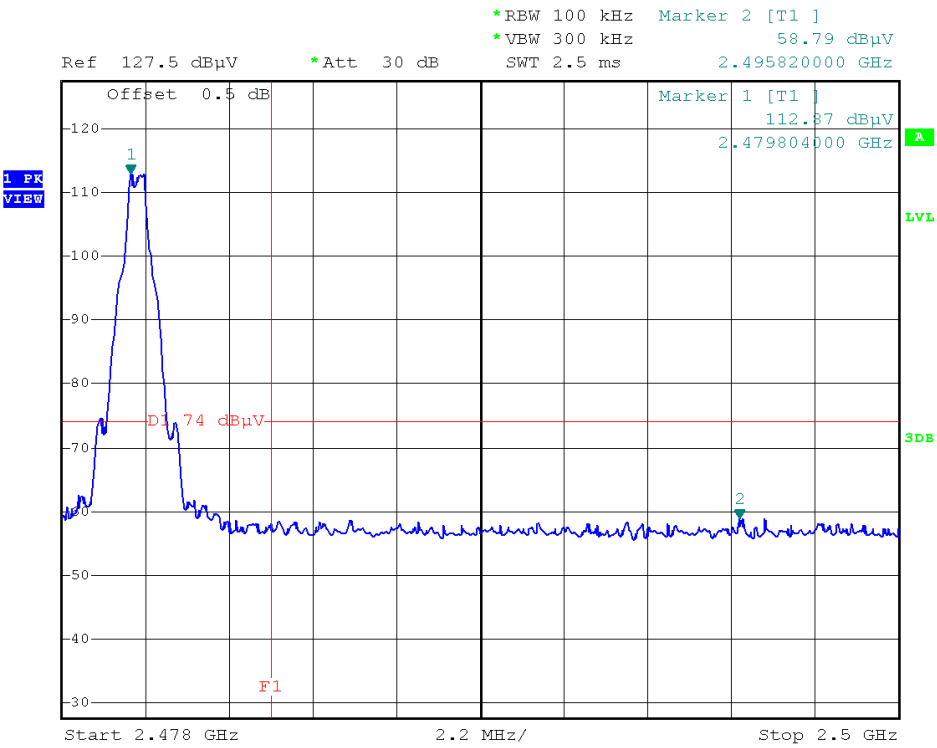
B. Test Plots:



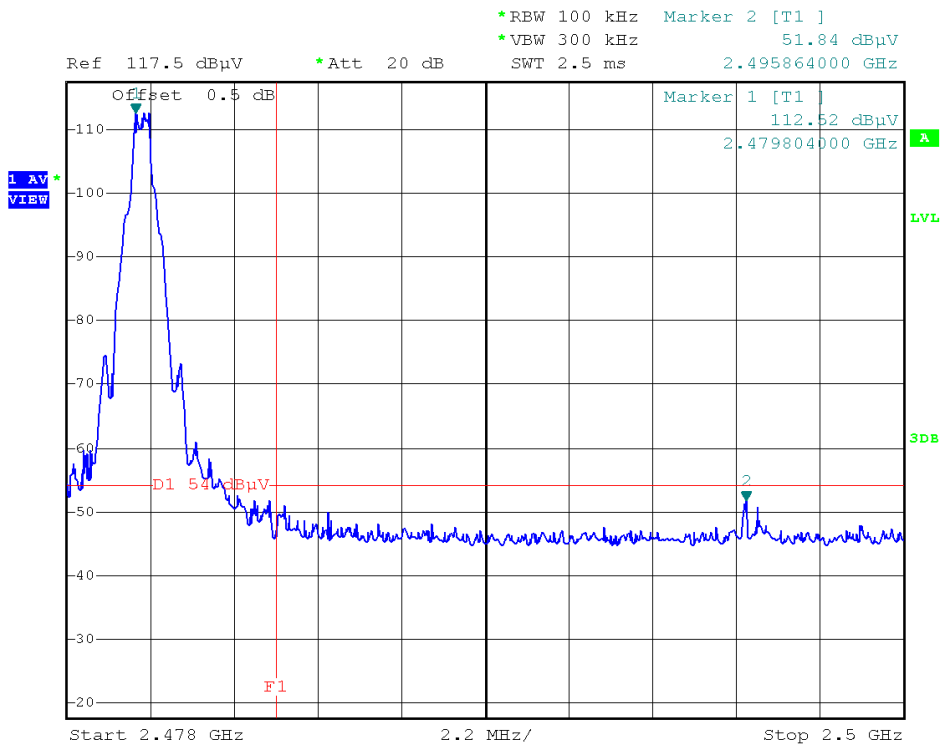
(Plot A1: Channel = 0 PEAK @ GFSK)



(Plot A2: Channel = 0 AVERAGE @ GFSK)



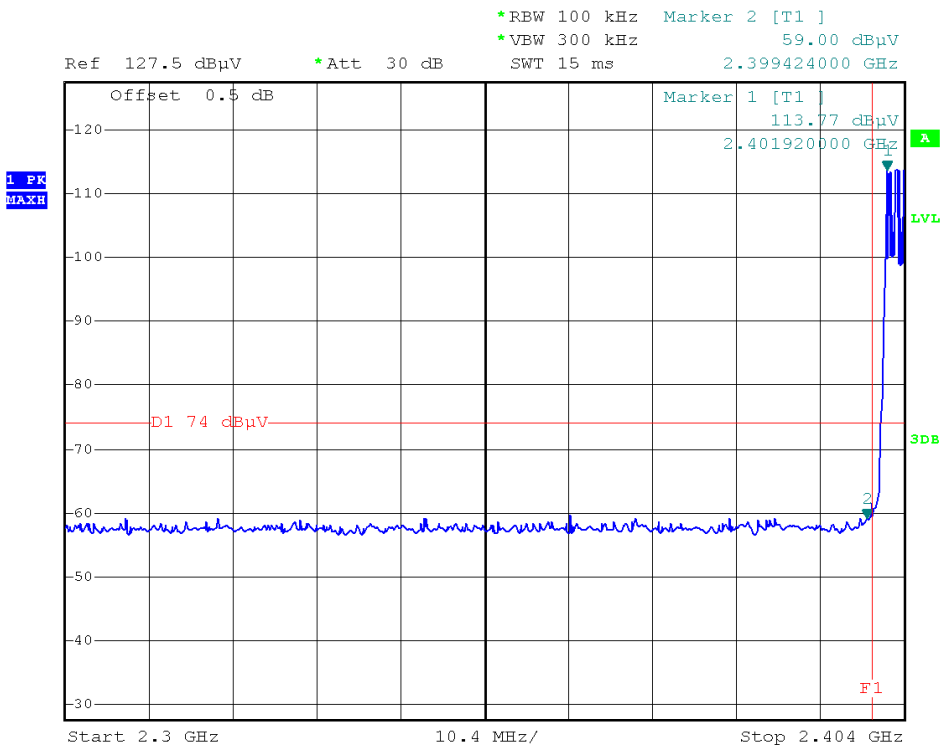
(Plot B1: Channel = 78 PEAK @ GFSK)



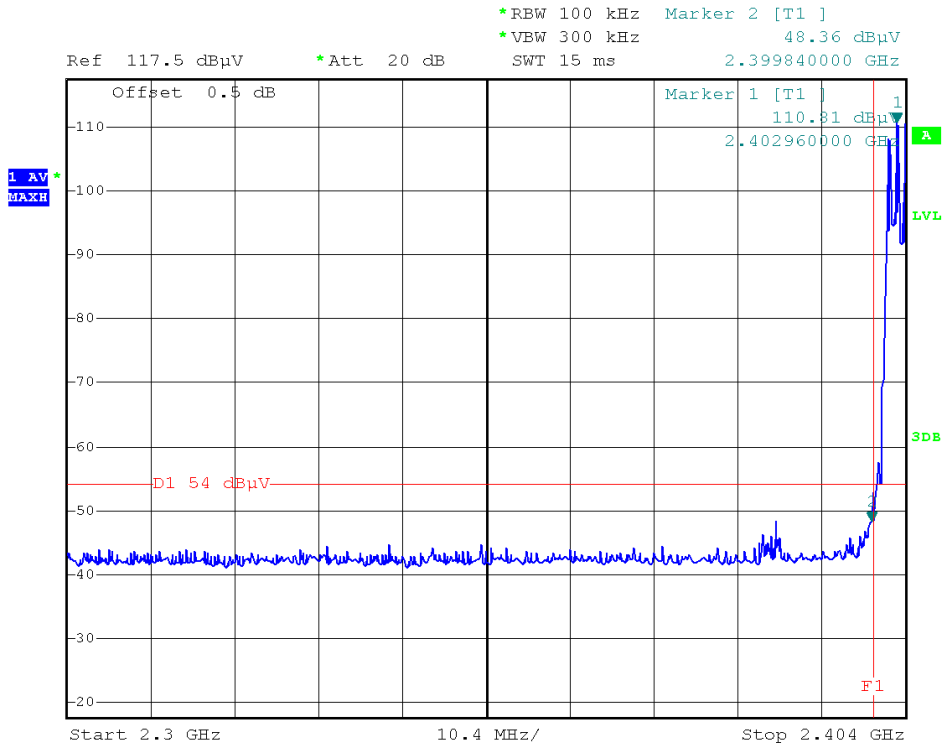
(Plot B2: Channel = 78 AVERAGE @ GFSK)

(hopping)

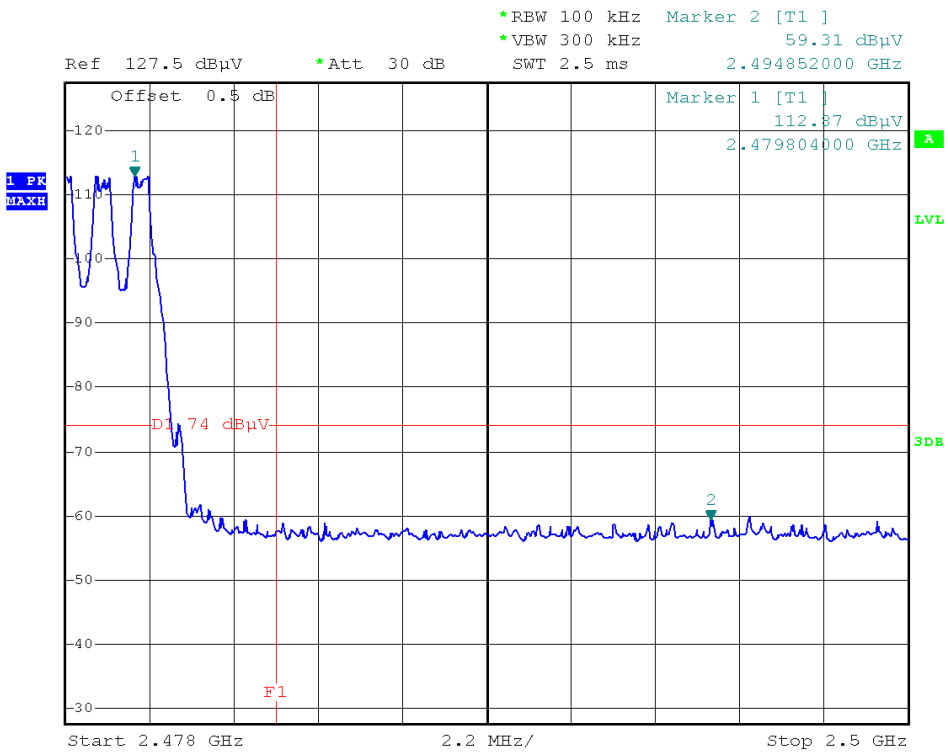
Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
		PK/ AV						
0	2399.424	PK	59.00	-31.70	28.3	55.60	74	Pass
0	2399.840	AV	48.36	-31.70	28.3	44.96	54	Pass
78	2494.850	PK	59.31	-29.45	29.2	59.06	74	Pass
78	2495.864	AV	51.21	-29.45	29.2	50.96	54	Pass



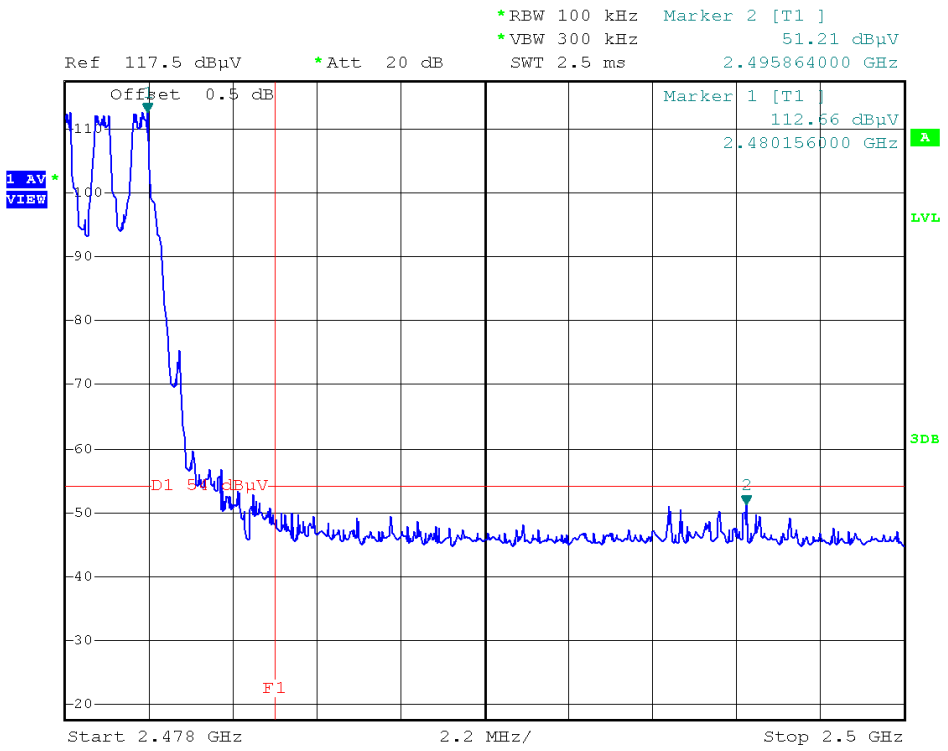
(Plot A1-1: Channel = 0 PEAK)



(Plot A2-1: Channel = 0 AVERAGE)



(Plot B1-1: Channel = 78 PEAK)



(Plot B2-1: Channel = 78 AVERAGE)

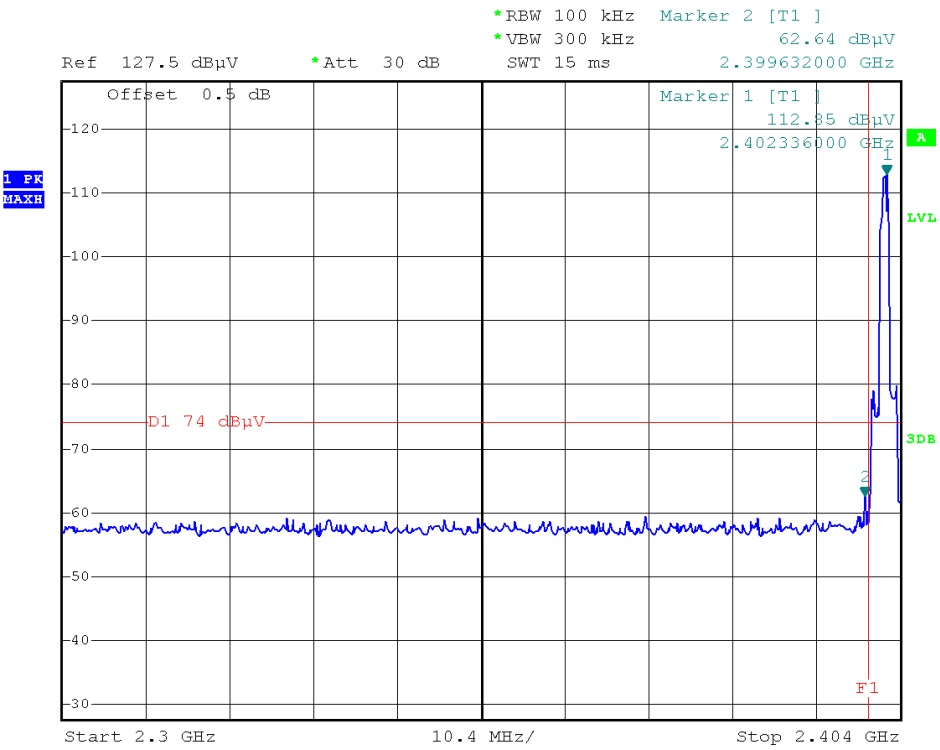
2.8.4.2. π /4-DQPSK Mode

A. Test Verdict:

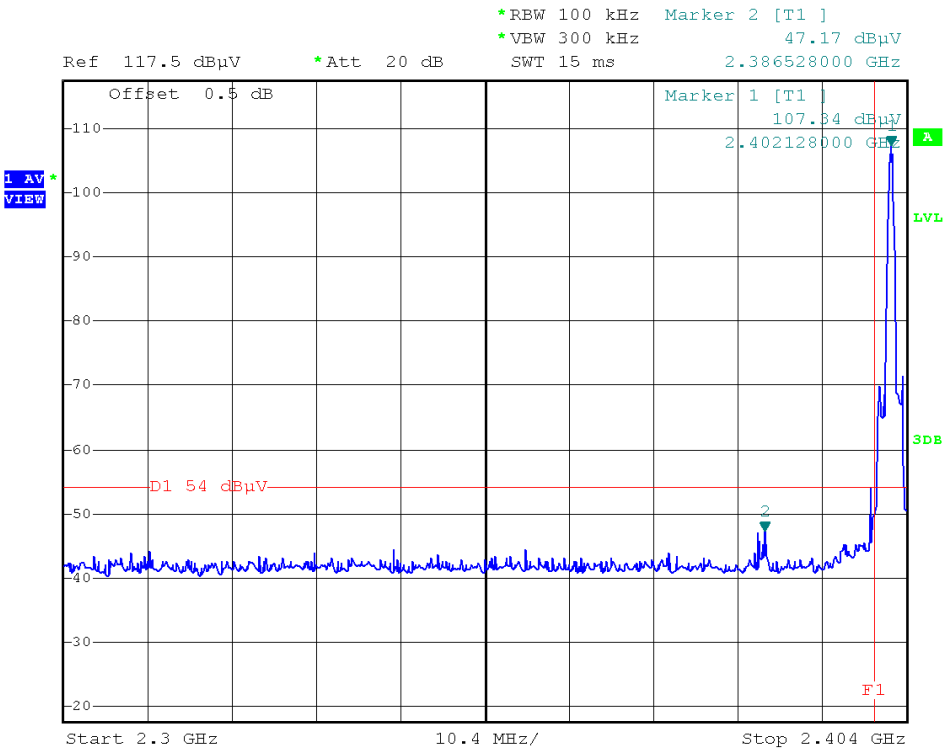
(Un-hopping)

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
0	2399.632	PK	62.64	-31.70	28.3	59.24	74	Pass
0	2386.528	AV	47.17	-31.70	28.3	43.77	54	Pass
78	2493.048	PK	59.35	-29.45	29.2	59.10	74	Pass
78	2495.556	AV	51.44	-29.45	29.2	51.19	54	Pass

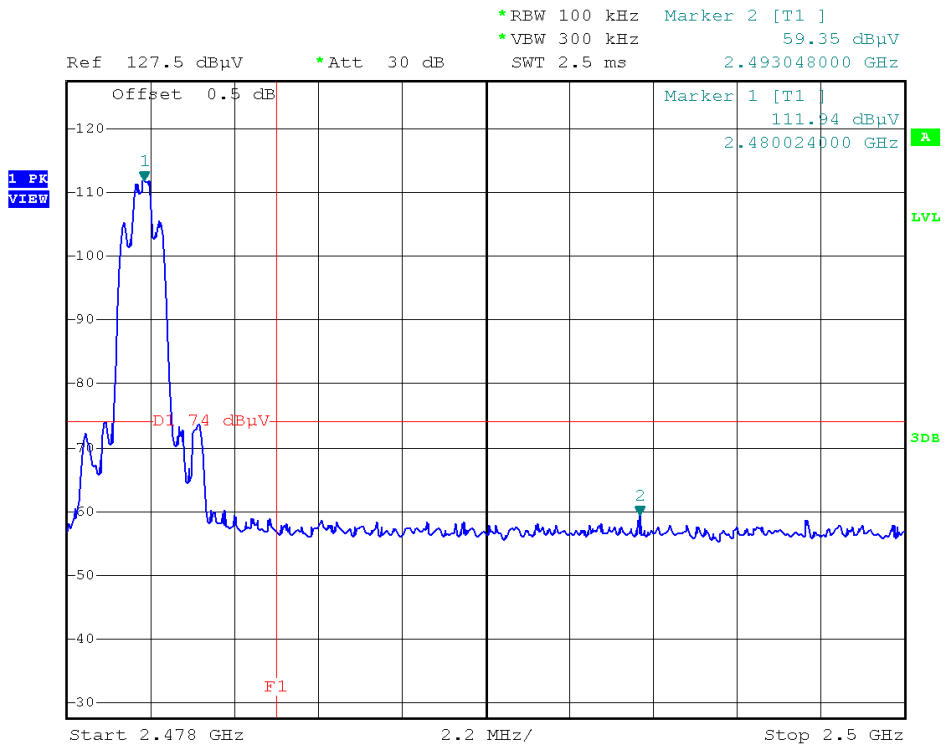
B. Test Plots:



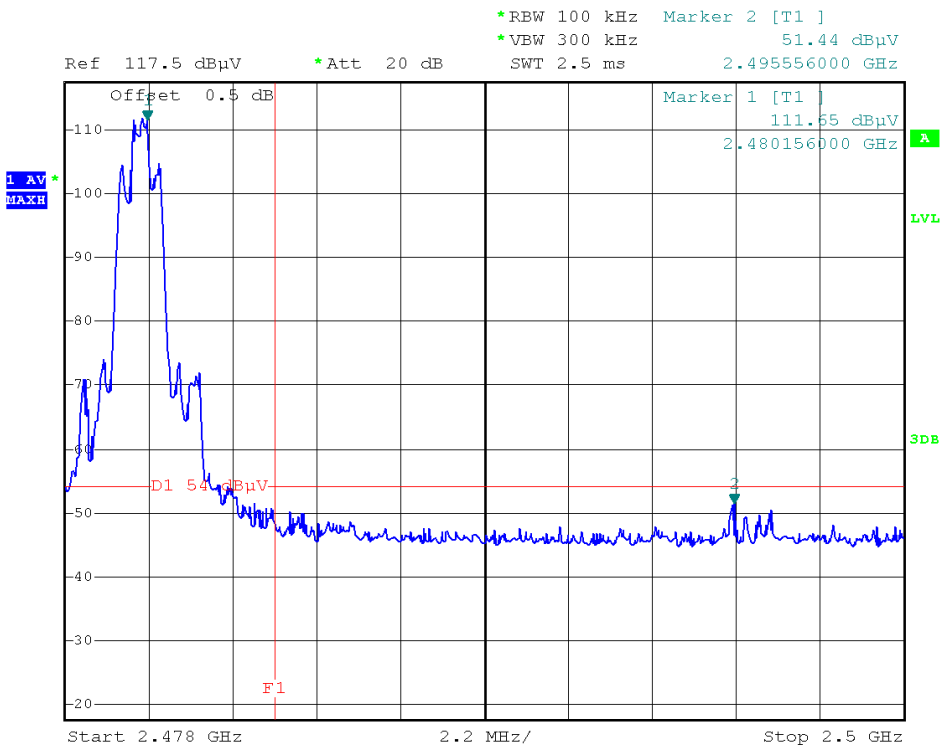
(Plot C1: Channel = 0 PEAK @π /4-DQPSK)



(Plot C2: Channel = 0 AVERAGE @π /4-DQPSK)



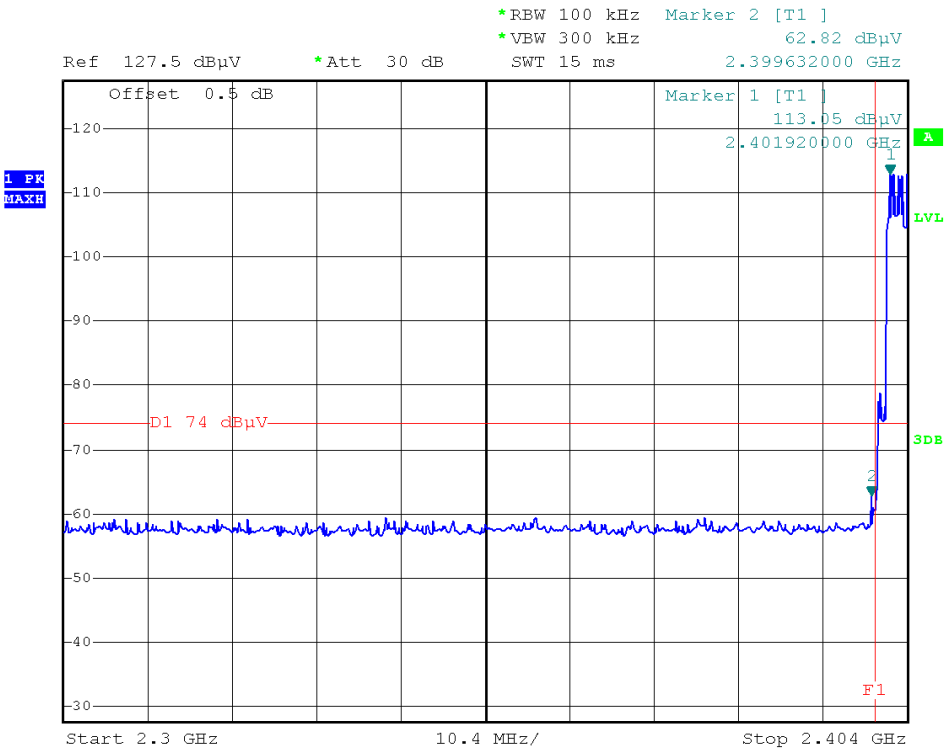
(Plot D1: Channel = 78 PEAK @π /4-DQPSK)



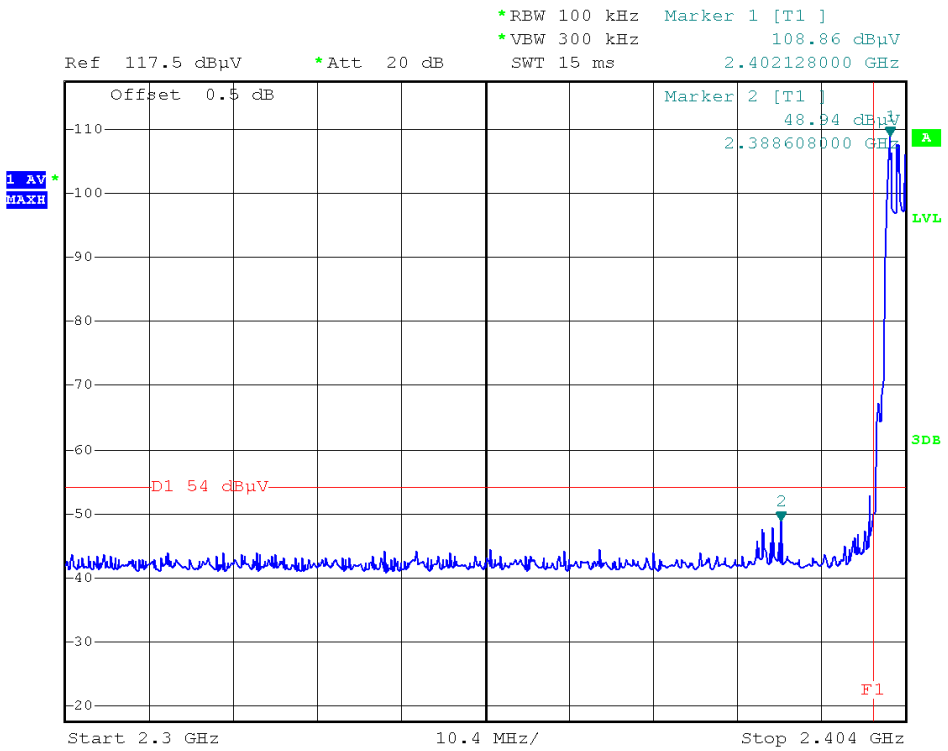
(Plot D2: Channel = 78 AVERAGE @π /4-DQPSK)

(hopping)

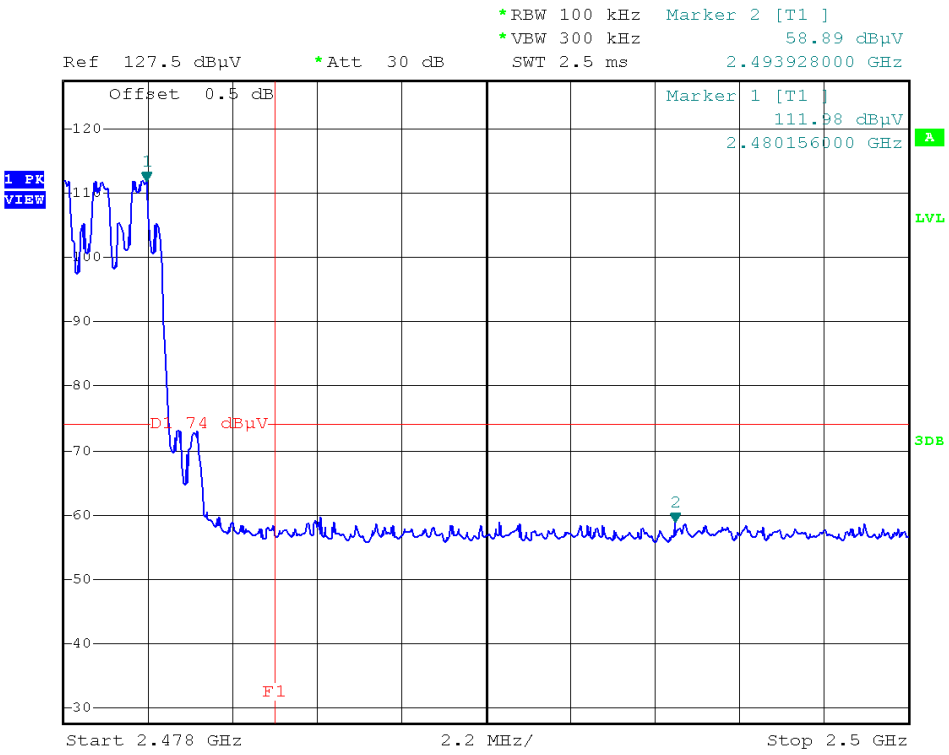
Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
		PK/ AV						
0	2399.632	PK	62.82	-31.70	28.3	59.42	74	Pass
0	2388.608	AV	48.94	-31.70	28.3	45.54	54	Pass
78	2493.928	PK	58.89	-29.45	29.2	58.54	74	Pass
78	2495.512	AV	52.49	-29.45	29.2	52.24	54	Pass



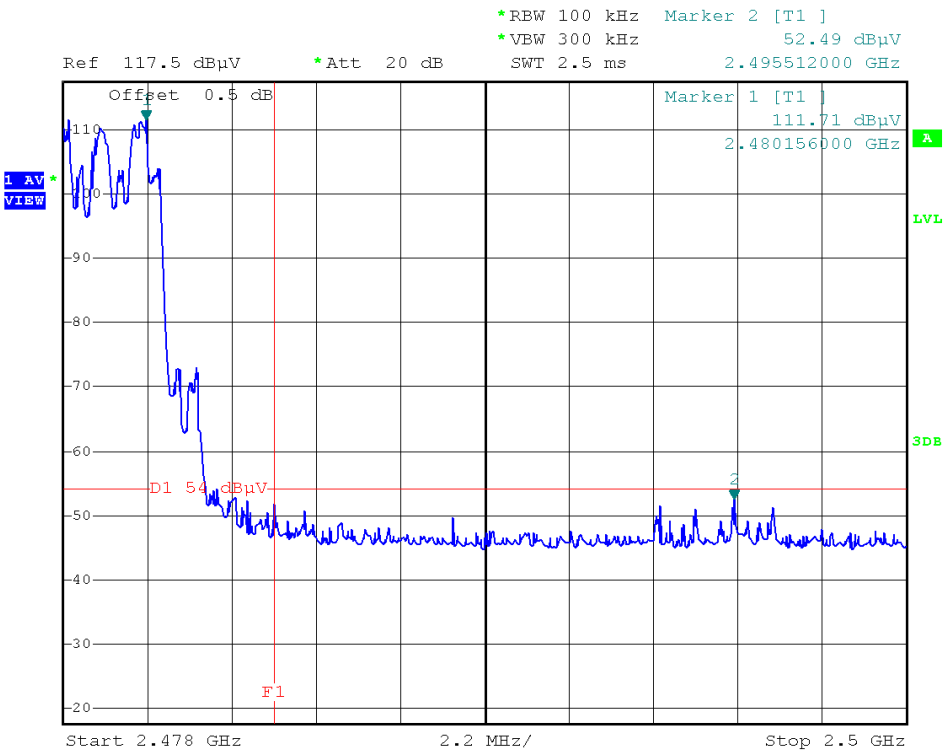
(Plot C1-1: Channel = 0 PEAK)



(Plot C2-1: Channel = 0 AVERAGE)



(Plot D1-1: Channel = 78 PEAK)



(Plot D2-1: Channel = 78 AVERAGE)

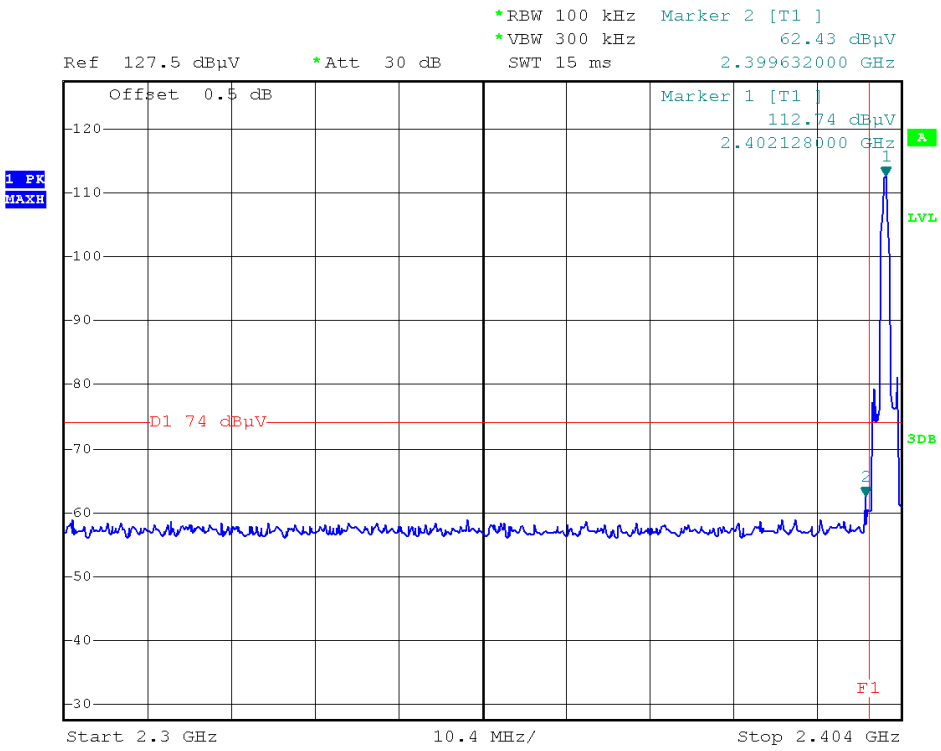
2.8.4.3. 8-DPSK Mode

A. Test Verdict:

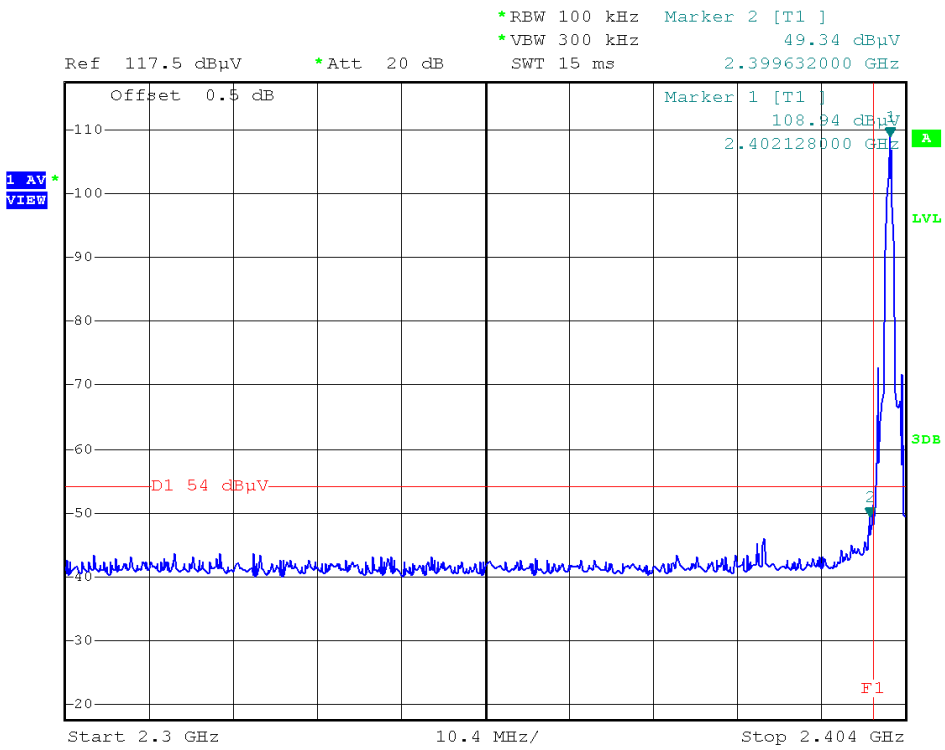
(Un-hopping)

Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
		PK/ AV						
0	2399.632	PK	62.43	-31.70	28.3	59.03	74	Pass
0	2399.632	AV	49.34	-31.70	28.3	45.94	54	Pass
78	2484.688	PK	59.31	-29.45	29.2	59.06	74	Pass
78	2496.480	AV	51.69	-29.45	29.2	51.44	54	Pass

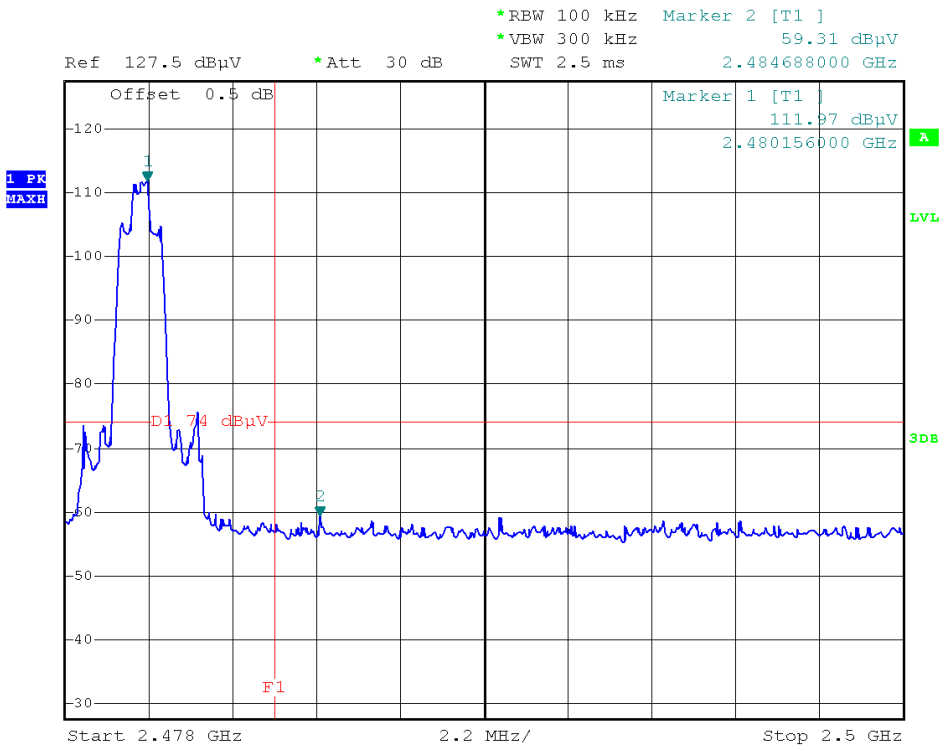
B. Test Plots:



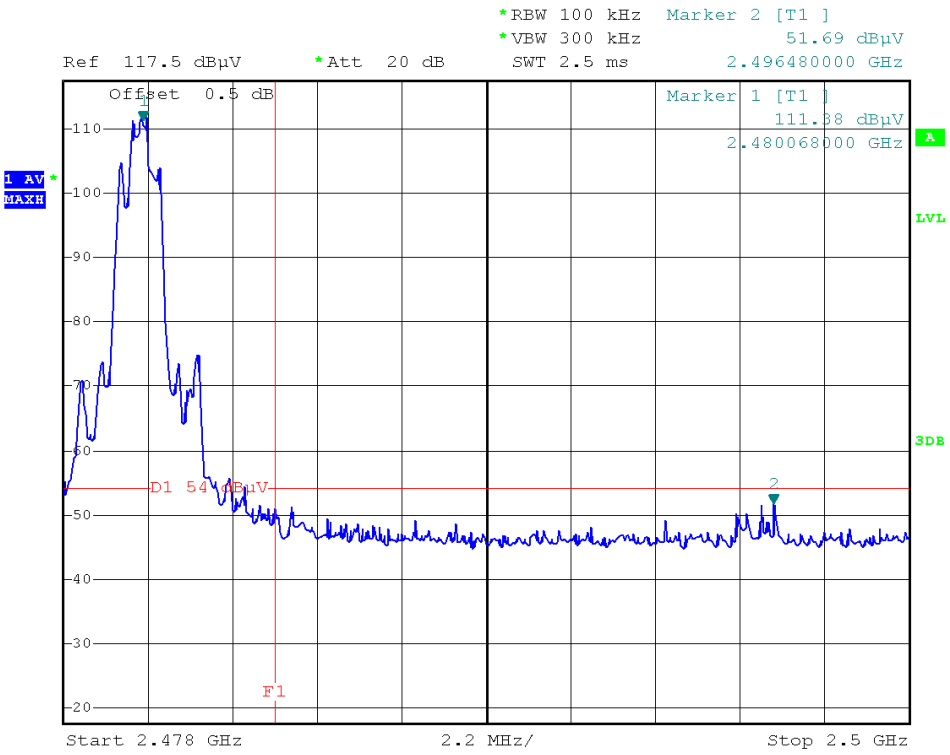
(Plot E1: Channel = 0 PEAK @ 8-DPSK Mode)



(Plot E2: Channel = 0 AVERAGE @ 8-DPSK Mode)



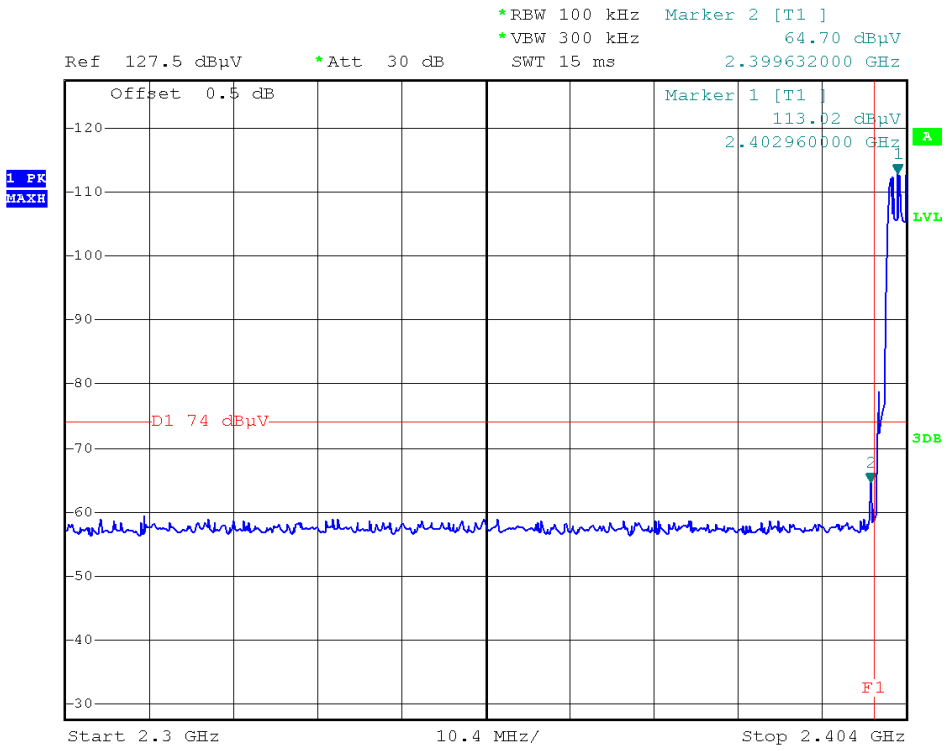
(Plot F1: Channel = 78 PEAK @ 8-DPSK Mode)



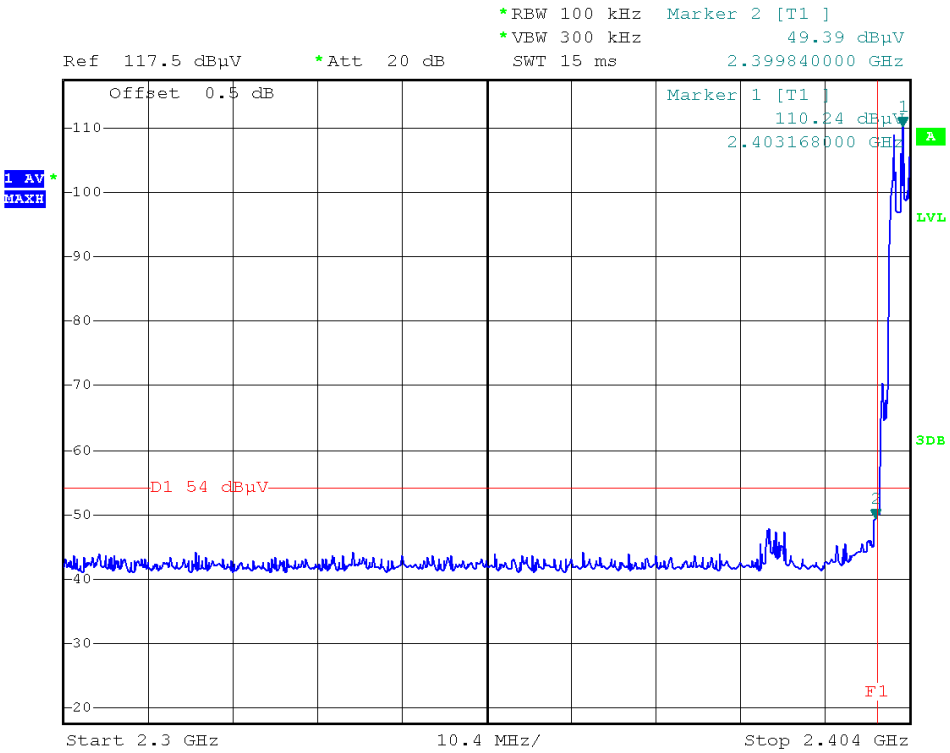
(Plot F2: Channel = 78 AVERAGE @ 8-DPSK Mode)

(hopping)

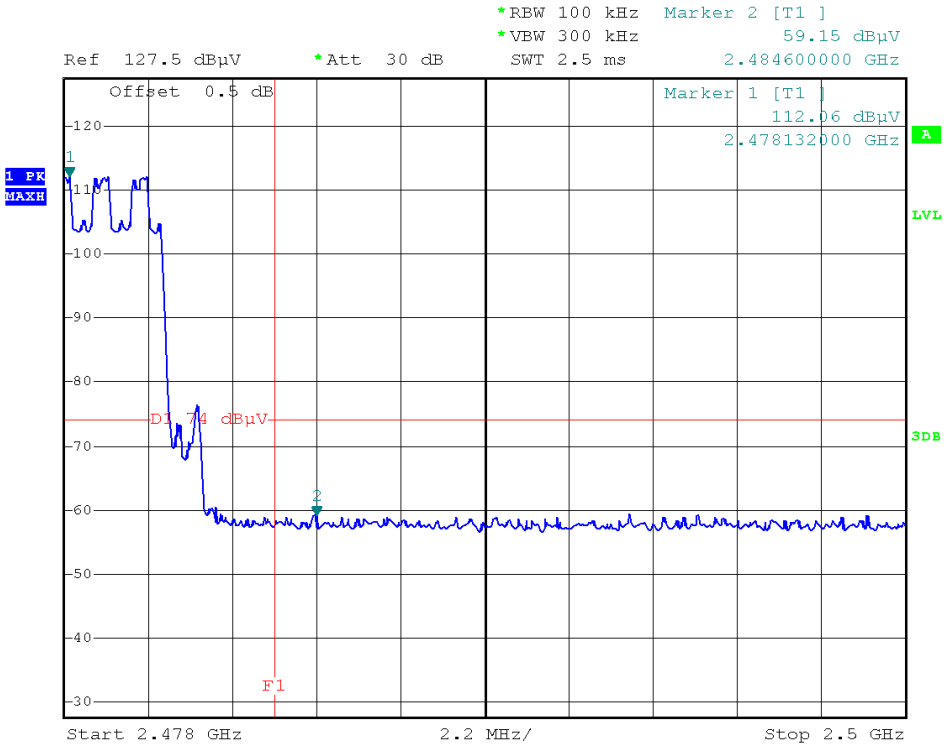
Channel	Frequency (MHz)	Detector	Receiver Reading UR (dBuV)	AT (dB)	AFactor (dB@3m)	Max. Emission E (dBµV/m)	Limit (dBµV/m)	Verdict
		PK/ AV						
0	2399.632	PK	64.70	-31.70	28.3	61.30	74	Pass
0	2399.840	AV	49.39	-31.70	28.3	45.99	54	Pass
78	2484.600	PK	59.15	-29.45	29.2	58.90	74	Pass
78	2494.500	AV	52.27	-29.45	29.2	52.02	54	Pass



(Plot E1-1: Channel = 0 PEAK)



(Plot E2-1: Channel = 0 AVERAGE)



(Plot F1-1: Channel = 78 PEAK)

(Plot F2-1: Channel = 78 AVERAGE)

2.9. Conducted Emission

2.9.1. Requirement

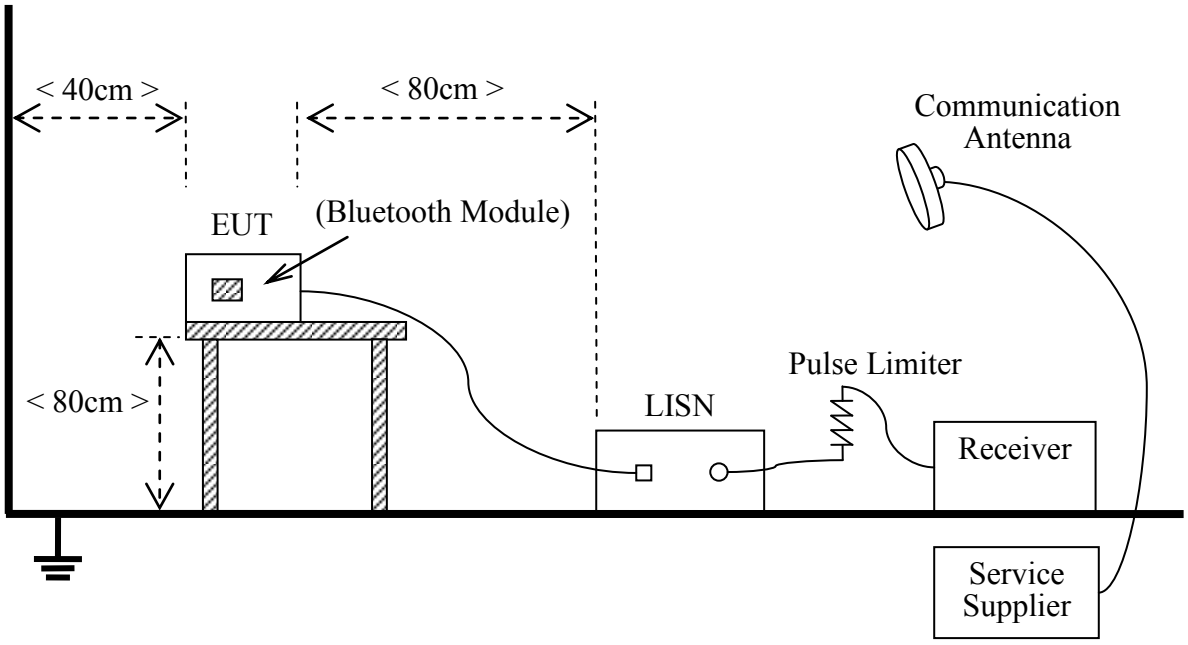
According to FCC section 15.207 and RSS- Gen section 7.2.4, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

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

NOTE:
(a) The lower limit shall apply at the band edges.
(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.9.2. Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4:2009

The Bluetooth Module of the EUT is powered by the Battery charged with USB port of PC, PC is powered by 120V, 60Hz AC mains supply. The factors of the site are calibrated to correct the reading. During the measurement, the Bluetooth Module is activated and controlled by the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under hopping-on test mode transmitting 339 bytes DH5 packages at maximum power.

Equipments List:

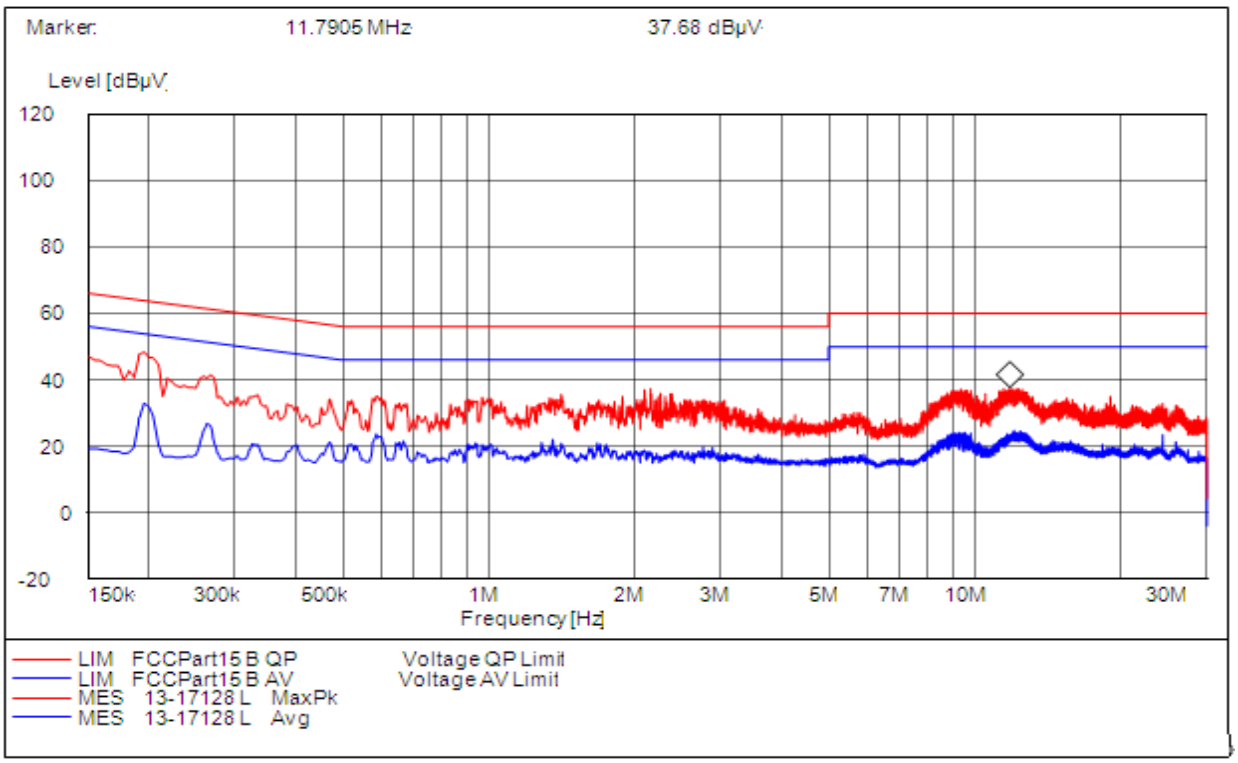
Description	Manufacturer	Model	Serial No.	Cal.Due Date
Test Receiver	ROHDE&SCHWARZ	ESCS30	A0304260	2014.06.10
LISN	ROHDE&SCHWARZ	ESH2-Z5	A0304221	2014.06.10
Service Supplier	ROHDE&SCHWARZ	CMU200	A0304252	2014.06.10
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	A0304291	(n.a.)

2.9.3. Test Result

A. Test setup:

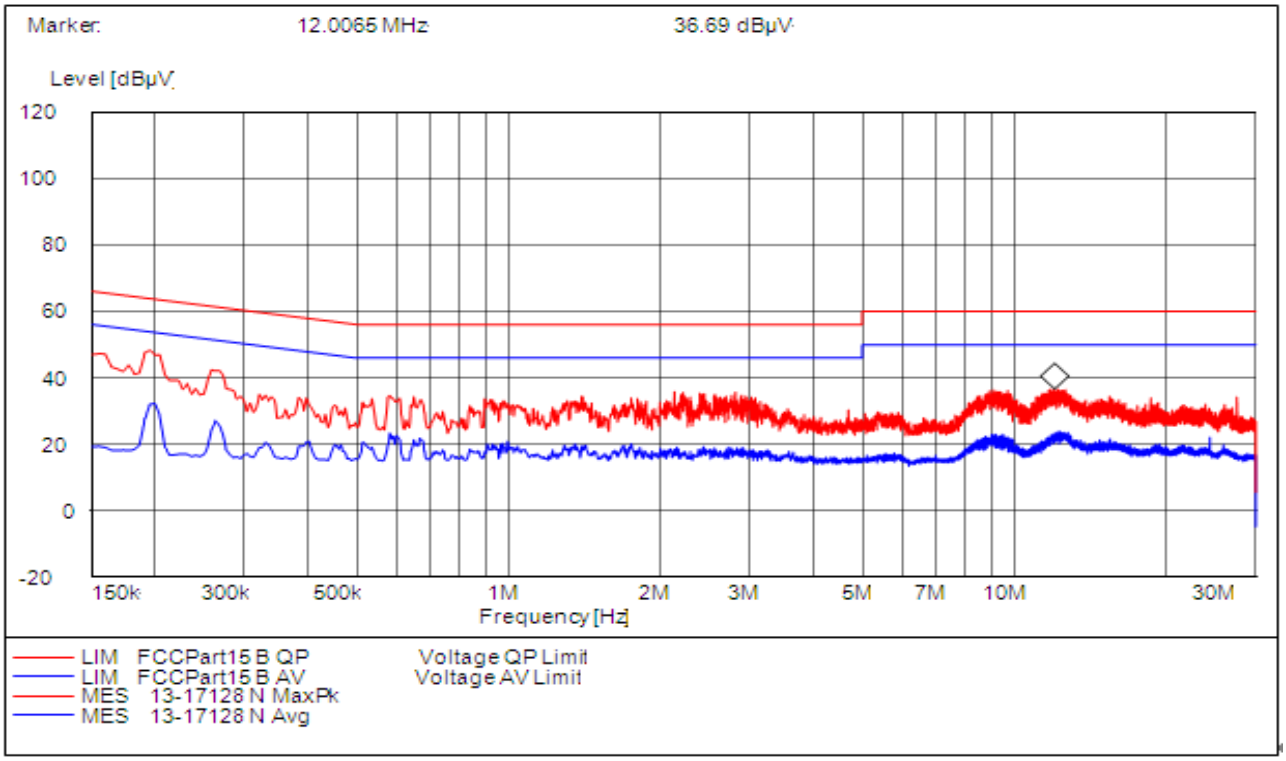
The EUT configuration of the emission tests is EUT + PC.

B. Test Plots:



Conducted Disturbance at Mains Terminals							
L Test Data							
QP				AV			
Frequency (MHz)	Limits (dBµV)	Measurement Value (dBµV)	Margin (dB)	Frequency (MHz)	Limits (dBµV)	Measurement Value (dBµV)	Margin (dB)
0.1950	63.80	45.34	8.46	0.1950	53.80	34.20	19.60
0.2670	61.20	39.51	21.69	0.2670	51.20	27.40	23.80
11.7905	60	34.68	25.32	11.7905	50	21.10	28.90
L Test Curve							

(Plot A: L Phase)



Conducted Disturbance at Mains Terminals							
N Test Data							
QP				**AV**			
Frequency (MHz)	**Limits (dBµV)**	**Measurement Value (dBµV)**	**Margin (dB)**	**Frequency (MHz)**	**Limits (dBµV)**	**Measurement Value (dBµV)**	**Margin (dB)**
0.1950	63.80	46.29	17.51	0.1950	53.80	32.90	20.90
0.2580	61.50	39.40	12.10	0.2580	51.50	24.80	26.70
12.0065	60	33.69	26.31	12.0065	50	30.70	19.30
N Test Curve							

(Plot B: N Phase)

Test Result: PASS

2.10. Radiated Emission

2.10.1. Requirement

According to FCC section 15.247(c) and RSS-A8.5, radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

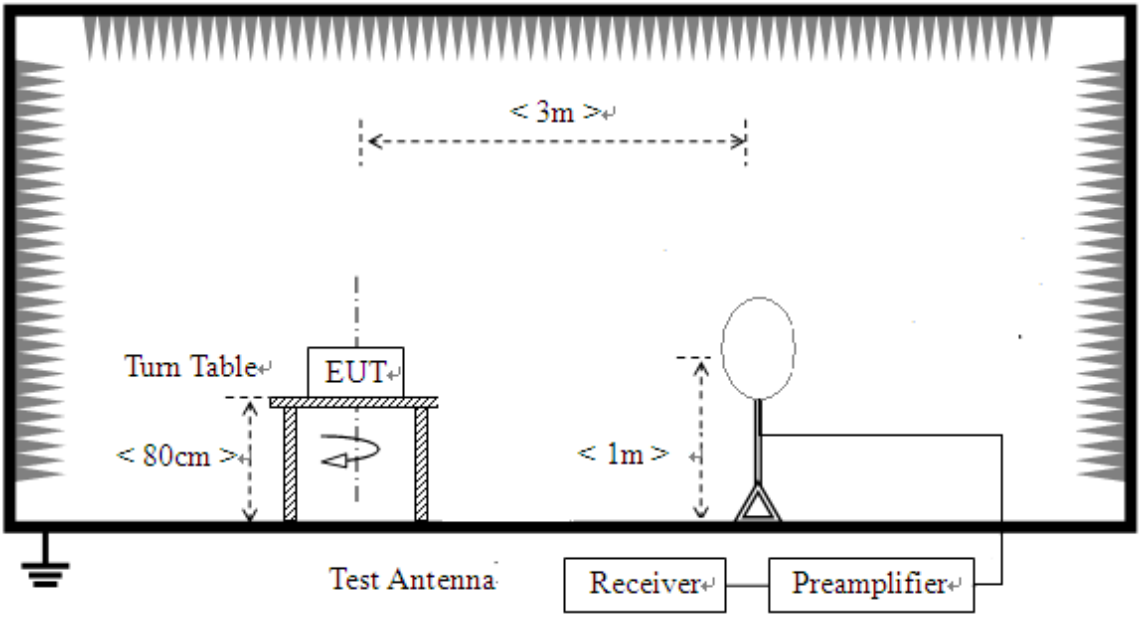
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

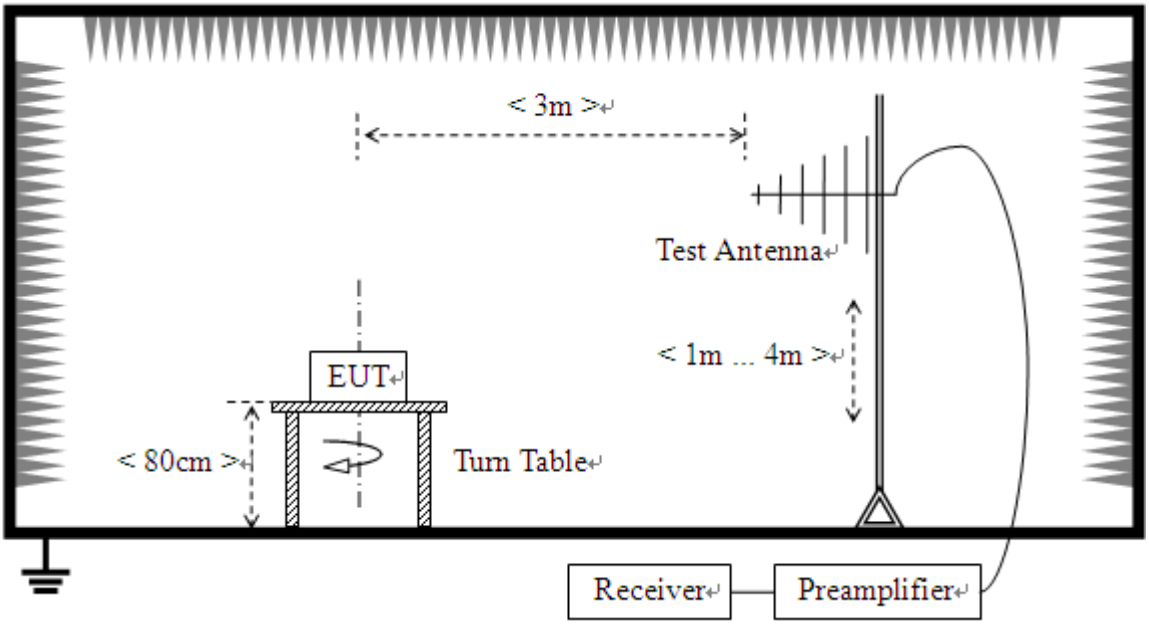
2.10.2. Test Description

A. Test Setup:

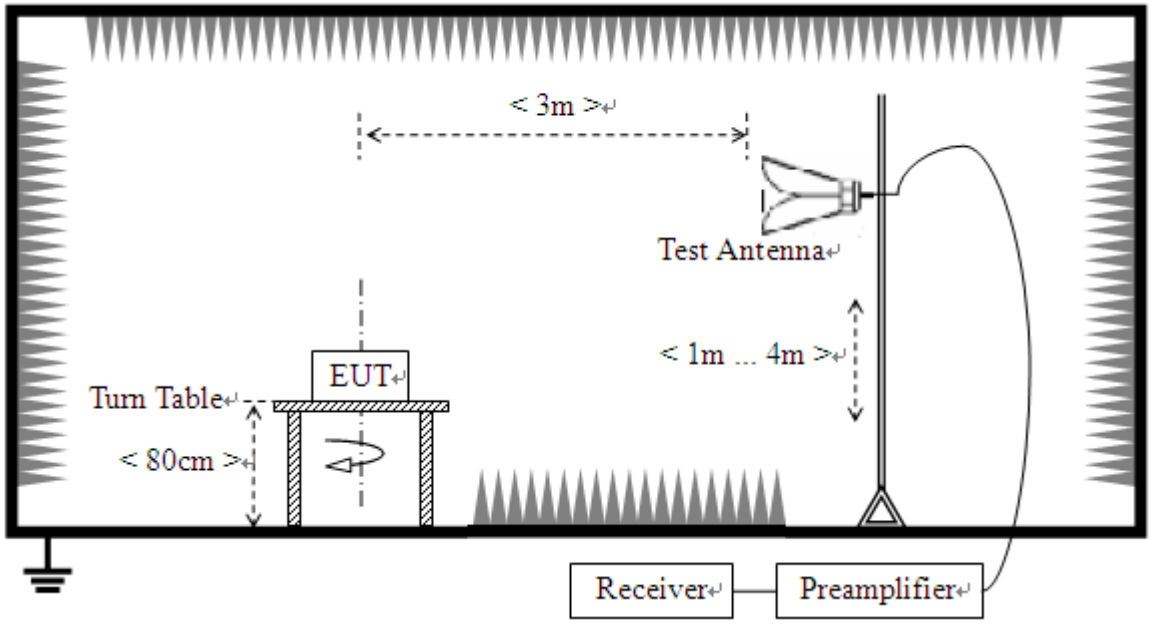
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2009). The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.4.

The Bluetooth Module of the EUT is powered by the Battery. The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the Bluetooth Module is activated and controlled by the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under hopping-on test mode transmitting 339 bytes DH5 packages at maximum power.

For the Test Antenna:

(a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 2GHz) and Horn Test Antenna (above 2GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

B. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal.Due Date
System Simulator	R&S	CMU200	100448	2014.06.10
Receiver	R&S	E7405A	US44210471	2014.06.10
Full-Anechoic Chamber	Albatross	12.8m*6.8m*6.4m	A0412372	2014.01.04
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-274	2014.06.10
Test Antenna - Horn	Schwarzbeck	BBHA 9120D	9120C-963	2014.06.10

Description	Manufacturer	Model	Serial No.	Cal.Due Date
Test Antenna - Horn	R&S	HL050S7	71688	2014.06.10
Test Antenna -Loop	Schwarzbeck	HFH2-Z2	100047	2014.06.10
Ampilier 1G~18GHz	R&S	MITEQ AFS42-00101800	25-S-42	2014.06.10
amplifier 20M~3GHz	R&S	PAP-0203H	22018	2014.06.10

2.10.3. Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

2.10.4. Test Result

According to ANSI C63.4 selection 4.2.2, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

$E\ [dB\mu V/m] = U_R + A_T + A_{Factor}\ [dB]$; $A_T = L_{Cable\ loss}\ [dB] - G_{preamp}\ [dB]$

A_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

During the test, the total correction Factor AT and A_{Factor} were built in test software.

Note: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Note: 1.The radiated measurement are performed the each test mode (GFSK/ π /4-DQPSK /8-DPSK) and channel (low/mid/high), the datum recorded below (GFSK mode, the middle channel) is the worst case for all the test mode and channel.

2. ULTRA-BROADBAND ANTENNA for the radiation emission test below 1G.

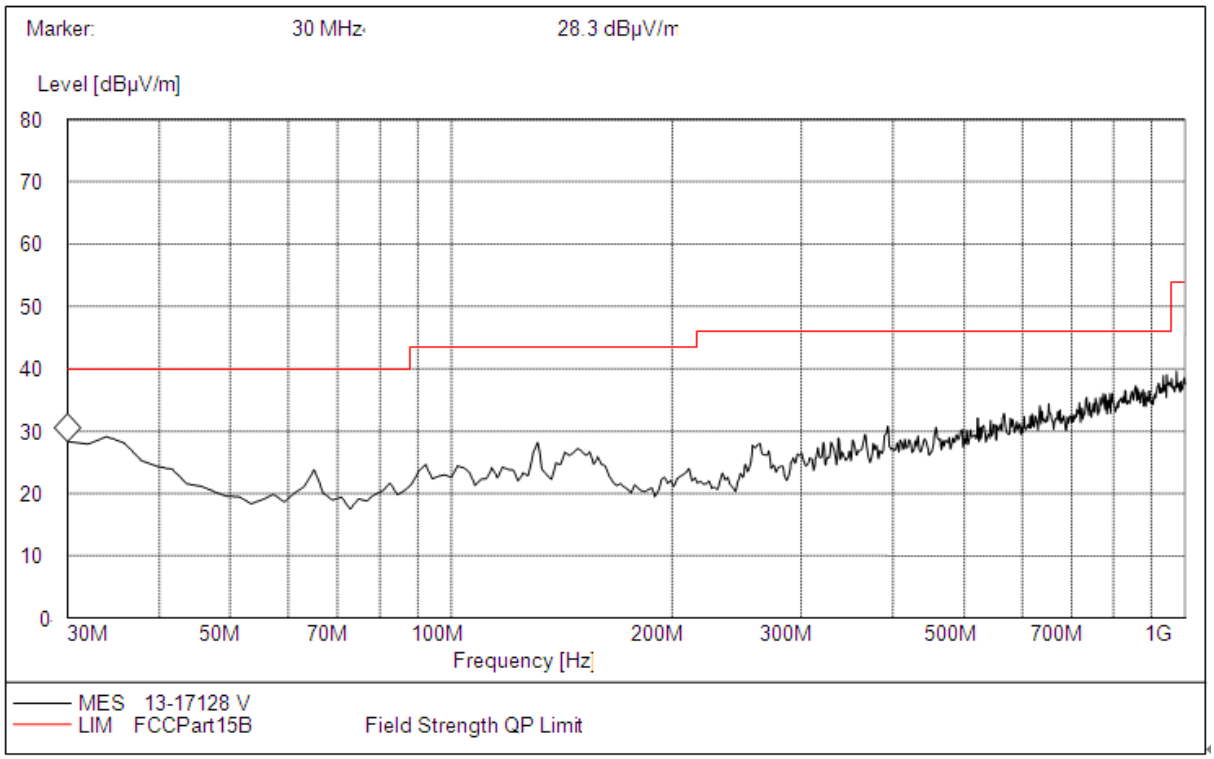
3. HORN ANTENNA for the radiation emission test above 1G.

Test plots for the whole measurement frequency range：

For 9KHz to 30MHz

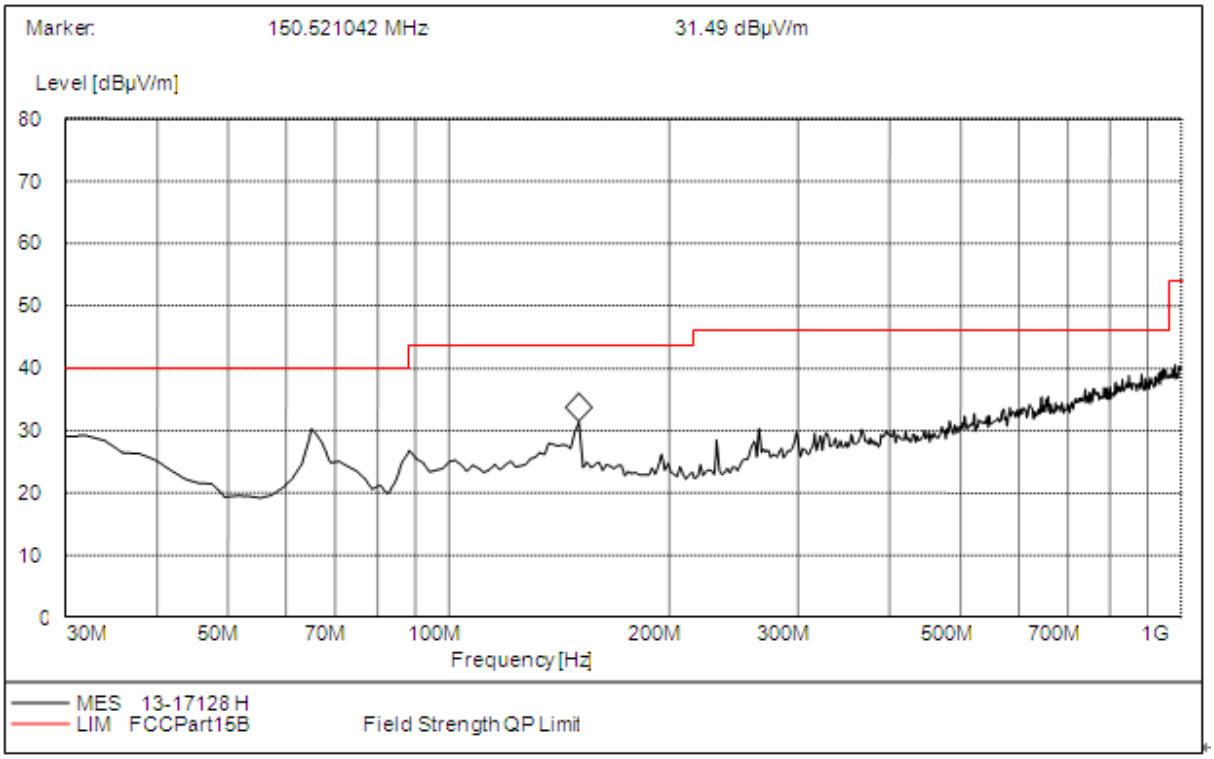
The test has been performed， and the Radiated Emission level is too low to the limit.

For 30MHz to 1000MHz



Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµV/m)	Margin (dB)	Antenna	Verdict
30.000000	28.30	120.000	100.0	40.00	11.70	Vertical	Pass
143.2463406	28.25	120.000	100.0	43.50	15.25	Vertical	Pass
561.1415243	32.76	120.000	100.0	46.00	13.24	Vertical	Pass

(Plot A: 30MHz to 1GHz, Antenna Vertical)



Frequency (MHz)	QuasiPeak (dBµ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµ V/m)	Margin (dB)	Antenna	Verdict
65.102204	30.12	120.000	100.0	40.00	9.88	Horizontal	Pass
150.521042	31.49	120.000	100.0	43.50	12.02	Horizontal	Pass
569.293425	33.01	120.000	100.0	46.00	12.99	Horizontal	Pass

(Plot B: 30MHz to 1GHz, Antenna Horizontal)

For 1GHz to 25GHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M（GFSK-2402MHz）											
No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2402.00	103.62	PK	/	/	1.00 H	360	106.72	28.3	4.90	-36.6
1	*2402.00	93.85	AV	/	/	1.00 H	360	96.21	28.3	4.90	-36.6
2	4804.00	49.18	PK	74.00	24.82	1.00 H	359	45.98	32.7	7.00	-36.5
2	4804.00	40.06	AV	54.00	13.94	1.00 H	359	36.86	32.7	7.00	-36.5
3	7206.00	51.94	PK	74.00	22.06	1.00 H	152	42.54	35.8	8.90	-35.3
3	7206.00	43.92	AV	54.00	10.08	1.00 H	152	34.52	35.8	8.90	-35.3
4	9608.00	50.02	PK	74.00	23.98	1.00 H	140	37.42	37.2	10.20	-34.8
4	9608.00	45.42	AV	54.00	8.58	1.00 H	140	32.82	37.2	10.20	-34.8

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M（GFSK_2402MHz）											
No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2402.00	101.35	PK	/	/	1.00 V	124	105.15	28.3	4.90	-36.6
1	*2402.00	91.59	AV	/	/	1.00 V	124	93.84	28.3	4.90	-36.6
2	4804.00	49.85	PK	74.00	24.15	1.00 V	339	46.65	32.7	7.00	-36.5
2	4804.00	44.02	AV	54.00	9.98	1.00 V	339	40.82	32.7	7.00	-36.5
3	7206.00	50.06	PK	74.00	23.94	1.00 V	340	40.66	35.8	8.90	-35.3
3	7206.00	41.82	AV	54.00	12.18	1.00 V	340	32.42	35.8	8.90	-35.3
4	9608.00	52.26	PK	74.00	21.74	1.00 V	20	39.66	37.2	10.20	-34.8
4	9608.00	44.84	AV	54.00	9.16	1.00 V	20	32.24	37.2	10.20	-34.8

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M（GFSK_2441MHz）											
No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2441.00	104.41	PK	/	/	1.00 H	153	107.69	28.3	5.10	-36.6
1	*2441.00	92.18	AV	/	/	1.00 H	153	95.28	28.3	5.10	-36.6
2	4882.00	46.22	PK	74.00	27.78	1.00 H	202	42.82	32.3	7.60	-36.5
2	4882.00	35.12	AV	54.00	18.88	1.00 H	202	31.72	32.3	7.60	-36.5
3	7323.00	50.08	PK	74.00	23.92	1.00 H	355	40.68	36.1	8.60	-35.3
3	7323.00	42.44	AV	54.00	11.56	1.00 H	355	33.04	36.1	8.60	-35.3
4	9764.00	50.16	PK	74.00	23.84	1.00 H	28	37.56	37.2	10.20	-34.8
4	9764.00	41.96	AV	54.00	12.04	1.00 H	28	29.36	37.2	10.20	-34.8

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M（GFSK_2441MHz）											
No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2441.00	103.50	PK	/	/	1.00 V	121	106.53	28.3	5.10	-36.6
1	*2441.00	92.28	AV	/	/	1.00 V	121	95.28	28.3	5.10	-36.6
2	4882.00	47.94	PK	74.00	26.06	1.00 V	97	44.54	32.3	7.60	-36.5
2	4882.00	37.04	AV	54.00	16.96	1.00 V	97	33.64	32.3	7.60	-36.5
3	7323.00	56.88	PK	74.00	17.12	1.00 V	288	47.48	36.1	8.60	-35.3
3	7323.00	42.73	AV	54.00	11.27	1.00 V	288	33.33	36.1	8.60	-35.3
4	9764.00	50.08	PK	74.00	23.92	1.00 V	89	37.48	37.2	10.20	-34.8
4	9764.00	35.01	AV	54.00	18.99	1.00 V	89	22.41	37.2	10.20	-34.8

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M（GFSK_2480MHz）											
No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2480.00	104.18	PK	/	/	1.00 H	154	107.4	28.6	4.70	-36.6
1	*2480.00	91.88	AV	/	/	1.00 H	154	93.39	28.6	4.70	-36.6
2	4960.00	50.02	PK	74.00	23.98	1.00 H	100	46.22	33.0	7.00	-36.2
2	4960.00	35.27	AV	54.00	18.73	1.00 H	100	31.47	33.0	7.00	-36.2
3	7440.00	51.22	PK	74.00	22.78	1.00 H	190	41.82	36.2	8.50	-35.3
3	7440.00	42.17	AV	54.00	11.83	1.00 H	190	32.77	36.2	8.50	-35.3
4	9920.00	50.14	PK	74.00	23.86	1.00 H	113.	37.54	37.2	10.20	-34.8
4	9920.00	37.16	AV	54.00	16.84	1.00 H	113	24.56	37.2	10.20	-34.8

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M（GFSK_2480MHz）											
No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2480.00	99.19	PK	/	/	1.00 V	247	102.41	28.6	4.70	-36.6
1	*2480.00	87.37	AV	/	/	1.00 V	247	90.67	28.6	4.70	-36.6
2	4960.00	52.19	PK	74.00	21.81	1.00 V	90	48.39	33.0	7.00	-36.2
2	4960.00	47.02	AV	54.00	6.98	1.00 V	90	43.22	33.0	7.00	-36.2
3	7440.00	53.29	PK	74.00	20.71	1.00 V	29	43.89	36.2	8.50	-35.3
3	7440.00	42.12	AV	54.00	11.88	1.00 V	29	32.72	36.2	8.50	-35.3
4	9920.00	51.05	PK	74.00	22.95	1.00 V	222	38.45	37.2	10.20	-34.8
4	9920.00	40.55	AV	54.00	13.45	1.00 V	222	27.95	37.2	10.20	-34.8

For 1GHz to 25GHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M（π /4-DQPSK_2402MHz）											
No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2402.00	101.32	PK	/	/	1.00 H	360	104.72	28.3	4.90	-36.6
1	*2402.00	87.89	AV	/	/	1.00 H	360	91.29	28.3	4.90	-36.6
2	4804.00	48.11	PK	74.00	25.89	1.00 H	359	44.91	32.7	7.00	-36.5
2	4804.00	39.96	AV	54.00	14.04	1.00 H	359	36.76	32.7	7.00	-36.5
3	7206.00	50.24	PK	74.00	23.76	1.00 H	152	40.84	35.8	8.90	-35.3
3	7206.00	40.91	AV	54.00	13.09	1.00 H	152	31.51	35.8	8.90	-35.3
4	9608.00	50.12	PK	74.00	23.88	1.00 H	140	37.52	37.2	10.20	-34.8
4	9608.00	42.92	AV	54.00	11.08	1.00 H	140	30.32	37.2	10.20	-34.8

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M（π /4-DQPSK_2402MHz）											
No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2402.00	99.92	PK	/	/	1.00 V	124	103.39	28.3	4.90	-36.6
1	*2402.00	85.98	AV	/	/	1.00 V	124	89.38	28.3	4.90	-36.6
2	4804.00	49.45	PK	74.00	24.55	1.00 V	339	46.25	32.7	7.00	-36.5
2	4804.00	40.37	AV	54.00	13.63	1.00 V	339	37.17	32.7	7.00	-36.5
3	7206.00	50.16	PK	74.00	23.84	1.00 V	340	40.76	35.8	8.90	-35.3
3	7206.00	42.33	AV	54.00	11.67	1.00 V	340	32.93	35.8	8.90	-35.3
4	9608.00	50.21	PK	74.00	23.79	1.00 V	20	37.61	37.2	10.20	-34.8
4	9608.00	43.64	AV	54.00	10.36	1.00 V	20	31.04	37.2	10.20	-34.8

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M（π /4-DQPSK_2441MHz）											
No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2441.00	102.41	PK	/	/	1.00 H	153	105.61	28.3	5.10	-36.6
1	*2441.00	90.16	AV	/	/	1.00 H	153	93.36	28.3	5.10	-36.6
2	4882.00	46.13	PK	74.00	27.87	1.00 H	202	42.73	32.3	7.60	-36.5
2	4882.00	35.87	AV	54.00	18.13	1.00 H	202	32.47	32.3	7.60	-36.5
3	7323.00	50.18	PK	74.00	23.82	1.00 H	355	40.78	36.1	8.60	-35.3

3	7323.00	41.09	AV	54.00	12.91	1.00 H	355	31.69	36.1	8.60	-35.3
4	9764.00	50.90	PK	74.00	23.1	1.00 H	28	38.3	37.2	10.20	-34.8
4	9764.00	43.16	AV	54.00	10.84	1.00 H	28	30.56	37.2	10.20	-34.8

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M（π /4-DQPSK_2441MHz）

No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2441.00	100.18	PK	/	/	1.00 V	121	103.38	28.3	5.10	-36.6
1	*2441.00	89.78	AV	/	/	1.00 V	121	92.98	28.3	5.10	-36.6
2	4882.00	46.24	PK	74.00	27.76	1.00 V	97	42.84	32.3	7.60	-36.5
2	4882.00	33.21	AV	54.00	20.79	1.00 V	97	29.81	32.3	7.60	-36.5
3	7323.00	52.81	PK	74.00	21.19	1.00 V	288	43.41	36.1	8.60	-35.3
3	7323.00	41.71	AV	54.00	12.29	1.00 V	288	32.31	36.1	8.60	-35.3
4	9764.00	51.18	PK	74.00	22.82	1.00 V	89	38.58	37.2	10.20	-34.8
4	9764.00	39.71	AV	54.00	14.29	1.00 V	89	27.11	37.2	10.20	-34.8

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M（π /4-DQPSK_2480MHz）

No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2480.00	99.19	PK	/	/	1.00 H	154	102.49	28.6	4.70	-36.6
1	*2480.00	85.82	AV	/	/	1.00 H	154	89.18	28.6	4.70	-36.6
2	4960.00	49.07	PK	74.00	24.93	1.00 H	100	45.27	33.0	7.00	-36.2
2	4960.00	34.26	AV	54.00	19.74	1.00 H	100	30.46	33.0	7.00	-36.2
3	7440.00	52.08	PK	74.00	21.92	1.00 H	190	42.68	36.2	8.50	-35.3
3	7440.00	43.61	AV	54.00	10.39	1.00 H	190	34.21	36.2	8.50	-35.3
4	9920.00	50.51	PK	74.00	23.49	1.00 H	113.	37.91	37.2	10.20	-34.8
4	9920.00	38.60	AV	54.00	15.4	1.00 H	113	26.00	37.2	10.20	-34.8

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M（π /4-DQPSK_2480MHz）

No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2480.00	102.51	PK	/	/	1.00 V	247	105.31	28.6	4.70	-36.6
1	*2480.00	91.31	AV	/	/	1.00 V	247	94.61	28.6	4.70	-36.6
2	4960.00	51.09	PK	74.00	22.91	1.00 V	90	47.29	33.0	7.00	-36.2
2	4960.00	43.82	AV	54.00	10.18	1.00 V	90	40.02	33.0	7.00	-36.2
3	7440.00	56.09	PK	74.00	17.91	1.00 V	29	46.69	36.2	8.50	-35.3
3	7440.00	43.64	AV	54.00	10.36	1.00 V	29	34.24	36.2	8.50	-35.3
4	9920.00	52.27	PK	74.00	21.73	1.00 V	222	39.67	37.2	10.20	-34.8
4	9920.00	43.78	AV	54.00	10.22	1.00 V	222	31.18	37.2	10.20	-34.8

For 1GHz to 25GHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M（8-DPSK_2402MHz）											
No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2402.00	101.32	PK	/	/	1.00 H	360	104.42	28.3	4.90	-36.6
1	*2402.00	90.84	AV	/	/	1.00 H	360	94.24	28.3	4.90	-36.6
2	4804.00	50.11	PK	74.00	23.89	1.00 H	359	46.91	32.7	7.00	-36.5
2	4804.00	40.16	AV	54.00	13.84	1.00 H	359	36.96	32.7	7.00	-36.5
3	7206.00	50.04	PK	74.00	23.96	1.00 H	152	40.64	35.8	8.90	-35.3
3	7206.00	44.19	AV	54.00	9.81	1.00 H	152	34.79	35.8	8.90	-35.3
4	9608.00	50.12	PK	74.00	23.88	1.00 H	140	37.52	37.2	10.20	-34.8
4	9608.00	44.02	AV	54.00	9.98	1.00 H	140	31.42	37.2	10.20	-34.8

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M（8-DPSK_2402MHz）											
No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2402.00	101.15	PK	/	/	1.00 V	124	104.55	28.3	4.90	-36.6
1	*2402.00	93.15	AV	/	/	1.00 V	124	96.45	28.3	4.90	-36.6
2	4804.00	51.27	PK	74.00	22.73	1.00 V	339	48.07	32.7	7.00	-36.5
2	4804.00	41.87	AV	54.00	12.13	1.00 V	339	38.67	32.7	7.00	-36.5
3	7206.00	50.76	PK	74.00	23.24	1.00 V	340	41.36	35.8	8.90	-35.3
3	7206.00	40.99	AV	54.00	13.01	1.00 V	340	31.59	35.8	8.90	-35.3
4	9608.00	51.84	PK	74.00	22.16	1.00 V	20	39.24	37.2	10.20	-34.8
4	9608.00	44.24	AV	54.00	9.76	1.00 V	20	31.64	37.2	10.20	-34.8

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M（8-DPSK_2441MHz）											
No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2441.00	99.97	PK	/	/	1.00 H	153	103.17	28.3	5.10	-36.6
1	*2441.00	90.06	AV	/	/	1.00 H	153	93.26	28.3	5.10	-36.6
2	4882.00	48.13	PK	74.00	25.87	1.00 H	202	44.73	32.3	7.60	-36.5
2	4882.00	37.07	AV	54.00	16.93	1.00 H	202	33.67	32.3	7.60	-36.5
3	7323.00	50.18	PK	74.00	23.82	1.00 H	355	40.78	36.1	8.60	-35.3
3	7323.00	41.41	AV	54.00	12.59	1.00 H	355	32.01	36.1	8.60	-35.3
4	9764.00	50.06	PK	74.00	23.94	1.00 H	28	37.46	37.2	10.20	-34.8
4	9764.00	43.06	AV	54.00	10.94	1.00 H	28	30.46	37.2	10.20	-34.8

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M（8-DPSK_2441MHz）											
No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2441.00	100.61	PK	/	/	1.00 V	121	103.21	28.3	5.10	-36.6
1	*2441.00	90.78	AV	/	/	1.00 V	121	93.98	28.3	5.10	-36.6
2	4882.00	47.74	PK	74.00	26.26	1.00 V	97	44.34	32.3	7.60	-36.5
2	4882.00	35.42	AV	54.00	18.58	1.00 V	97	32.02	32.3	7.60	-36.5
3	7323.00	50.64	PK	74.00	23.36	1.00 V	288	41.24	36.1	8.60	-35.3
3	7323.00	41.09	AV	54.00	12.91	1.00 V	288	31.69	36.1	8.60	-35.3
4	9764.00	50.01	PK	74.00	23.99	1.00 V	89	37.41	37.2	10.20	-34.8
4	9764.00	36.31	AV	54.00	17.69	1.00 V	89	23.71	37.2	10.20	-34.8

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M（8-DPSK_2480MHz）											
No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2480.00	99.79	PK	/	/	1.00 H	154	103.09	28.6	4.70	-36.6
1	*2480.00	85.34	AV	/	/	1.00 H	154	85.64	28.6	4.70	-36.6
2	4960.00	50.00	PK	74.00	24.00	1.00 H	100	46.2	33.0	7.00	-36.2
2	4960.00	36.12	AV	54.00	17.88	1.00 H	100	32.32	33.0	7.00	-36.2
3	7440.00	52.08	PK	74.00	21.92	1.00 H	190	42.68	36.2	8.50	-35.3
3	7440.00	41.97	AV	54.00	12.03	1.00 H	190	32.57	36.2	8.50	-35.3
4	9920.00	50.31	PK	74.00	23.69	1.00 H	113.	37.71	37.2	10.20	-34.8
4	9920.00	36.65	AV	54.00	17.35	1.00 H	113	24.05	37.2	10.20	-34.8

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M（8-DPSK_2480MHz）											
No.	Frequency (MHz)	Emssion Level		Limit (dBuV/m)	Margin (dB)	Antenna Height	Table Angle	Raw Value	Antenna Factor	Cable Factor	Pre-amplifier
1	*2480.00	99.19	PK	/	/	1.00 V	247	102.49	28.6	4.70	-36.6
1	*2480.00	90.37	AV	/	/	1.00 V	247	93.37	28.6	4.70	-36.6
2	4960.00	51.19	PK	74.00	22.81	1.00 V	90	47.39	33.0	7.00	-36.2
2	4960.00	47.02	AV	54.00	6.98	1.00 V	90	43.22	33.0	7.00	-36.2
3	7440.00	52.17	PK	74.00	21.83	1.00 V	29	42.77	36.2	8.50	-35.3
3	7440.00	43.92	AV	54.00	10.08	1.00 V	29	34.52	36.2	8.50	-35.3
4	9920.00	51.01	PK	74.00	22.99	1.00 V	222	38.41	37.2	10.20	-34.8
4	9920.00	42.31	AV	54.00	11.69	1.00 V	222	29.71	37.2	10.20	-34.8

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. The other emission levels were very low against the limit.

4. Margin value = Limit value- Emission level.

5. The limit value is defined as per 15.247

6. " * " : Fundamental frequency

Annex A Accreditation Certificate

China National Accreditation Service for Conformity Assessment

LABORATORY ACCREDITATION CERTIFICATE

(Registration No. CNAS L1659)

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

Building 28/29, Shigudong, Xili Industrial Area, Xili Street,

Nanshan District, Shenzhen, Guangdong, China

is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence of testing and calibration.

The scope of accreditation is detailed in the attached appendices bearing the same registration number as above. The appendices form an integral part of this certificate.

Date of Issue: 2012-09-29

Date of Expiry: 2015-09-28

Date of Initial Accreditation: 1999-08-03

Date of Update: 2012-09-29

Signed on behalf of China National Accreditation Service for Conformity Assessment

China National Accreditation Service for Conformity Assessment (CNAS) is authorized by Certification and Accreditation Administration of the People's Republic of China (CNCA) to operate the national accreditation schemes for conformity assessment. CNAS is the signatory to International Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (ILAC MRA) and Asia Pacific Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (APLAC MRA).

No.CNAS AL 2

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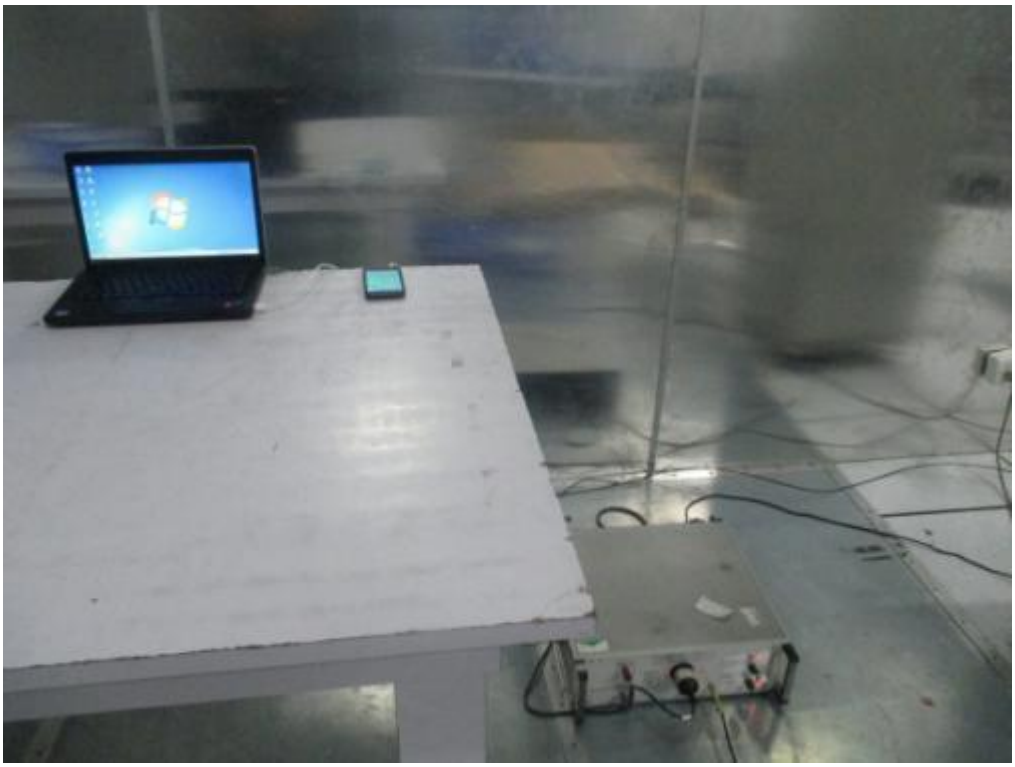
Annex B PHOTOGRAPHS OF THE EUT

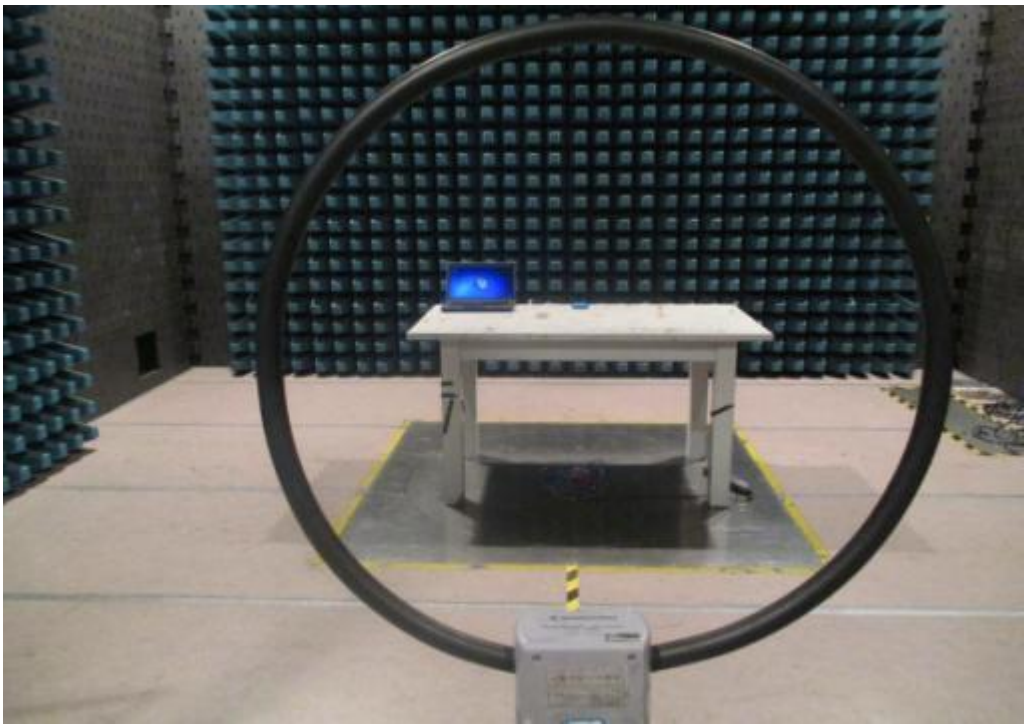
Annex C PHOTOGRAPHS OF THE TEST SETUP

1. Conducted Measurement Setup

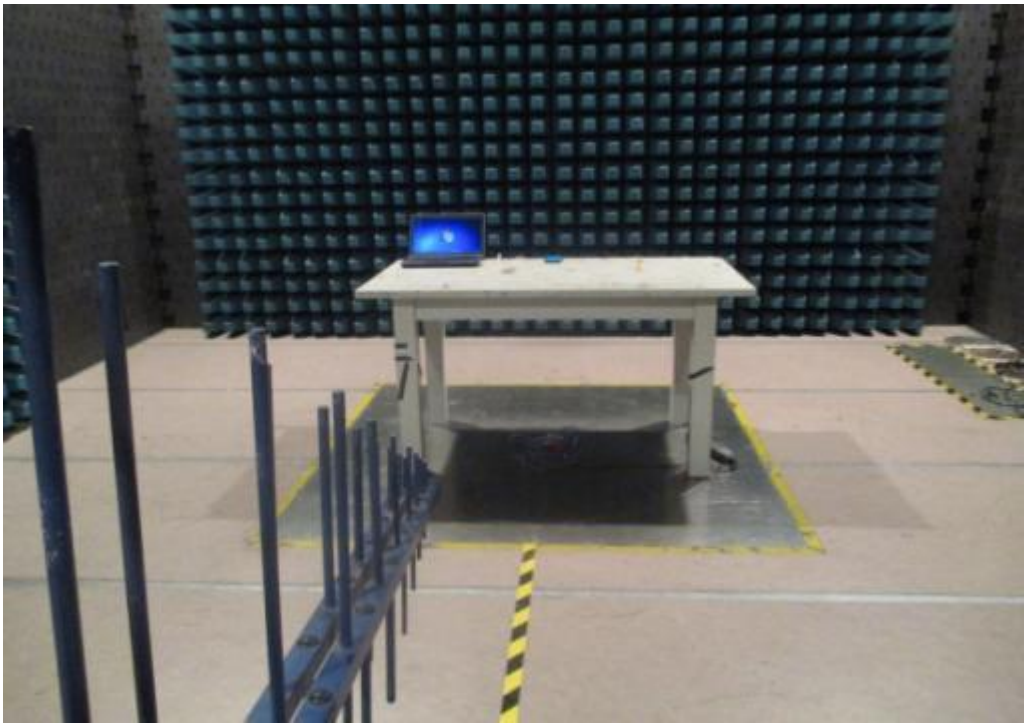


Conducted Emission

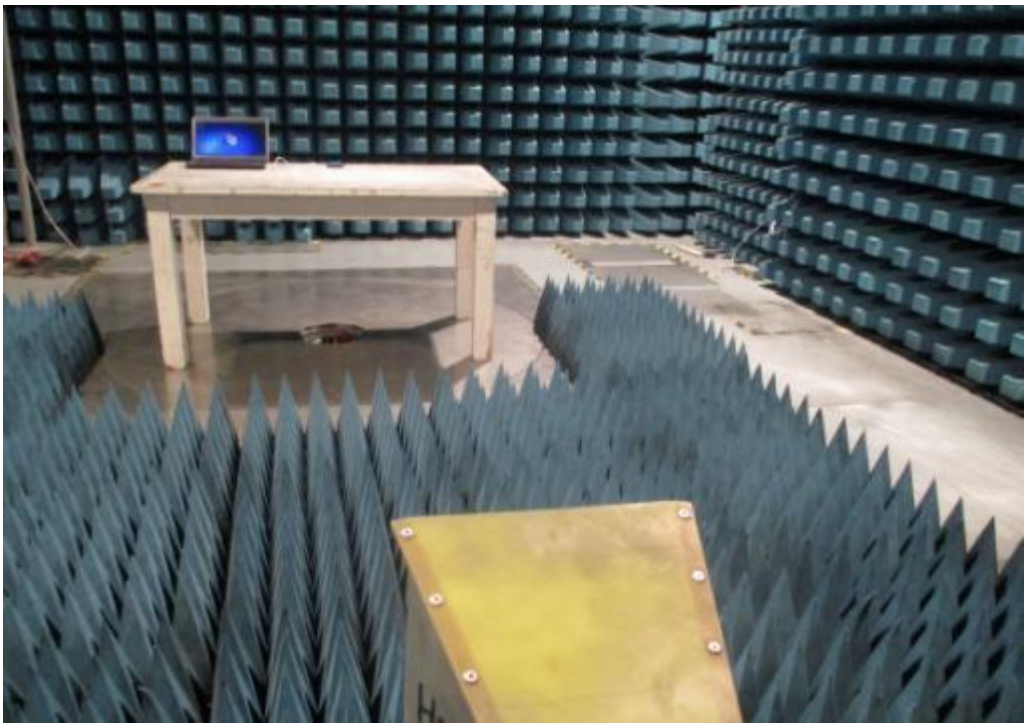
2. Radiated Measurement Setup



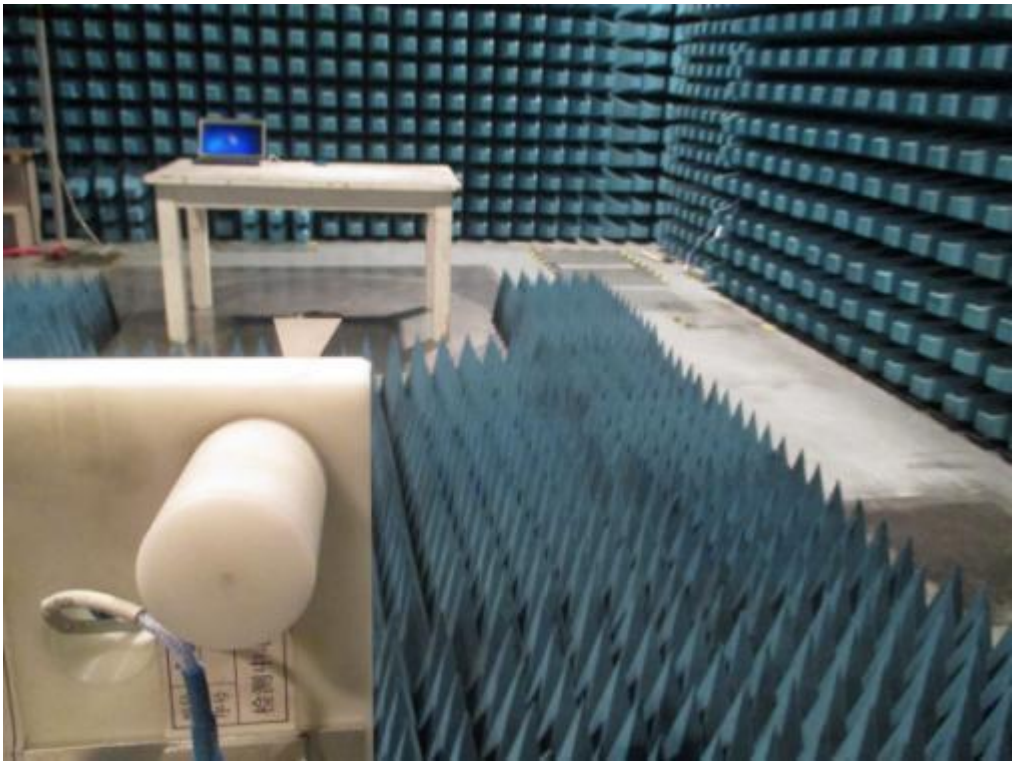
Radiated Emission of 9k-30M



Radiated Emission of 30M-1G



Radiated Emission of 1-18G



Radiated Emission of 18-26.5G

** END OF REPORT **