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TEST REPORT

Report Reference No. ..... :	**TRE1406000901**	R/C…….: 36906
FCC ID. ..... :	**UFK-IC3510C**	
Applicant's name ..... :	**Gajah International (HK) Co.,Ltd**	
Address.....:	18/F Bel Trade Commercial Building, 1-3, Burrows Street, Wan Chai, Hong Kong	
Manufacturer.....:	Gajah International (HK) Co.,Ltd	
Address.....:	18/F Bel Trade Commercial Building, 1-3, Burrows Street, Wan Chai, Hong Kong	
Test item description ..... :	**InkCase**	
Trade Mark .....:	/	
Model/Type reference.....:	IC3510C	
Listed Model(s) .....:	InkCase Plus, IC3510	
Standard ..... :	**FCC CFR Title 47 Part 15 Subpart C Section 15.247**	
Date of receipt of test sample.....:	Jun 04 2014	
Date of testing .....:	Jun 05 ~ Aug 07, 2014	
Date of issue.....:	Aug 07, 2014	
Result..... ……..:	**PASS**	

Compiled by (position+printed name+signature)..:	File administrators Any Yang	Any Yang
Supervised by (position+printed name+signature)..:	Project Engineer Lion Cai	Lion Cai
Approved by (position+printed name+signature)..:	RF Manager Hans Hu	Hans Hu

Testing Laboratory Name ..... :	**Shenzhen Huatongwei International Inspection Co., Ltd**
Address.....:	Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China

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1. TEST STANDARDS AND TEST DESCRIPTION

1.1. Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devicese

1.2. Test Description

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Peak Output Power	15.247 (b)(1)	Pass
20dB Occupied Bandwidth	15.247 (a)(1)	Pass
Carrier Frequencies Separation	15.247 (a)(1)	Pass
Hopping Channel Number	15.247 (a)(1)	Pass
Dwell Time	15.247 (a)(1)	Pass
Pseudorandom Frequency Hopping Sequence	15.247(b)(4)&TCB Exclusion List (7 July 2002)	Pass
Band Edge	15.247(d)	Pass
Radiated Emission	15.205/15.209	Pass

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

2. SUMMARY

2.1. Client Information

Applicant:	Gajah International (HK) Co.,Ltd
Address:	18/F Bel Trade Commercial Building, 1-3, Burrows Street, Wan Chai, Hong Kong
Manufacturer:	Gajah International (HK) Co.,Ltd
Address:	18/F Bel Trade Commercial Building, 1-3, Burrows Street, Wan Chai, Hong Kong

2.2. Product Description

Name of EUT	InkCase
Trade Mark:	/
Model No.:	IC3510C
Listed Model(s):	InkCase Plus, IC3510
Power supply:	DC 3.7V From Internal Battery
Adapter information:	/
Bluetooth	
Version:	Supported BT2.1+EDR
Modulation:	GFSK, π/4DQPSK, 8DPSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	1MHz
Antenna type:	Internal Antenna
Antenna gain:	2.0dBi

Operation Frequency List:

Channel	Frequency (MHz)
0	**2402**
1	2403
⋮	. . .
38	2440
39	**2441**
40	2442
⋮	⋮
77	2479
78	**2480**

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the above gray bottom.

2.3. EUT operation mode

The EUT has been tested under typical operating condition. The Applicant provides software to control the EUT for staying in continous transmitting and receiving mode for testing.

2.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
○	Multimeter	Manufacturer :	/
		Model No. :	/

2.5. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Laboratory:Shenzhen Huatongwei International Inspection Co., Ltd.
Address: Bldg3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China
Phone: 86-755-26748019 Fax: 86-755-26748089

3.2. Test Facility

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

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: Mar. 01, 2012. Valid time is until February 28, 2015.

A2LA-Lab Cert. No. 2243.01

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time is until Sept 30, 2015.

FCC-Registration No.: 662850

Shenzhen Huatongwei International Inspection 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 662850, Renewal date Jul. 01, 2012, valid time is until Jun. 01, 2015.

FCC-Registration No.: 317478

Shenzhen Huatongwei International Inspection Co., Ltd. (Gongming 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 317478, Renewal date July 18, 2014, valid time is until July. 18, 2017.

IC-Registration No.: 5377A

The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377A on Dec. 31, 2013, valid time is until Dec. 31, 2016.

IC-Registration No.: 5377B

The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. (Gongming EMC Laboratory) has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B on September 3, 2014, valid time is until September 3, 2017.

ACA

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

VCCI

The 3m Semi-anechoic chamber (12.2m×7.95m×6.7m) of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.:R-2484. Date of Registration: Dec. 20, 2012. Valid time is until Dec. 29, 2015.
Radiated disturbance above 1GHz measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-292. Date of Registration: Dec. 24, 2013. Valid time is until Dec. 23, 2016.
Main Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-2726. Date of Registration: Dec. 20, 2012. Valid time is until Dec. 19, 2015.
Telecommunication Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: T-1837. Date of Registration: May 07, 2013. Valid time is until May 06, 2016.

DNV

Shenzhen Huatongwei International Inspection Co., Ltd. has been found to comply with the requirements of DNV towards subcontractor of EMC and safety testing services in conjunction with the EMC and Low voltage Directives and in the voluntary field. The acceptance is based on a formal quality Audit and follow-ups according to relevant parts of ISO/IEC Guide 17025 (2005), in accordance with the requirements of the DNV Laboratory Quality Manual towards subcontractors. Valid time is until Aug. 24, 2016.

3.3. Environmental conditions

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

Temperature:	15~35°C
lative Humidity:	30~60 %
Air Pressure:	950~1050mba

3.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics;Part 1" and TR-100028-02 "Electromagnetic compatibilityand Radio spectrum Matters (ERM);Uncertainties in the measurementof mobile radio equipment characteristics;Part 2 " and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Huatongwei laboratory is reported:

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

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

3.5. Equipments Used during the Test

AC Power Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal Due
1	Artificial Mains	Rohde&Schwarz	ESH2-Z5	100028	2014/10/25
2	EMI Test Receiver	Rohde&Schwarz	ESCI3	100038	2014/10/25
3	Pulse Limiter	Rohde&Schwarz	ESHSZ2	100044	2014/10/25
4	EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	N/A

Radiated Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal Due
1	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	538	2014/10/25
2	EMI TEST RECEIVER	Rohde&Schwarz	ESI 26	100009	2014/10/25
3	EMI TEST Software	Audix	E3	N/A	N/A
4	TURNTABLE	ETS	2088	2149	N/A
5	ANTENNA MAST	ETS	2075	2346	N/A
6	EMI TEST Software	Rohde&Schwarz	ESK1	N/A	N/A
7	HORN ANTENNA	ShwarzBeck	9120D	1011	2014/10/25
8	Amplifer	Sonoma	310N	E009-13	2014/10/25
9	JS amplifer	Rohde&Schwarz	JS4-00101800-28-5A	F201504	2014/10/25
10	High pass filter	Compliance Direction systems	BSU-6	34202	2014/10/25
11	HORN ANTENNA	ShwarzBeck	9120D	1012	2014/10/25
12	Amplifer	Compliance Direction systems	PAP1-4060	120	2014/10/25
13	Loop Antenna	Rohde&Schwarz	HFH2-Z2	100020	2014/10/25
14	TURNTABLE	MATURO	TT2.0	----	N/A
15	ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A
16	Horn Antenna	SCHWARZBECK	BBHA9170	25841	2014/10/25
17	ULTRA-BROADBAND ANTENNA	Rohde&Schwarz	HL562	100015	2014/10/25

Maximum Peak Output Power / Power Spectral Density / 6dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal Due
1	Spectrum Analyzer	Rohde&Schwarz	FSP	1164.4391.40	2014/10/25

The Cal.Interval was one year

4. TEST CONDITIONS AND RESULTS

4.1. Antenna requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 15.203:

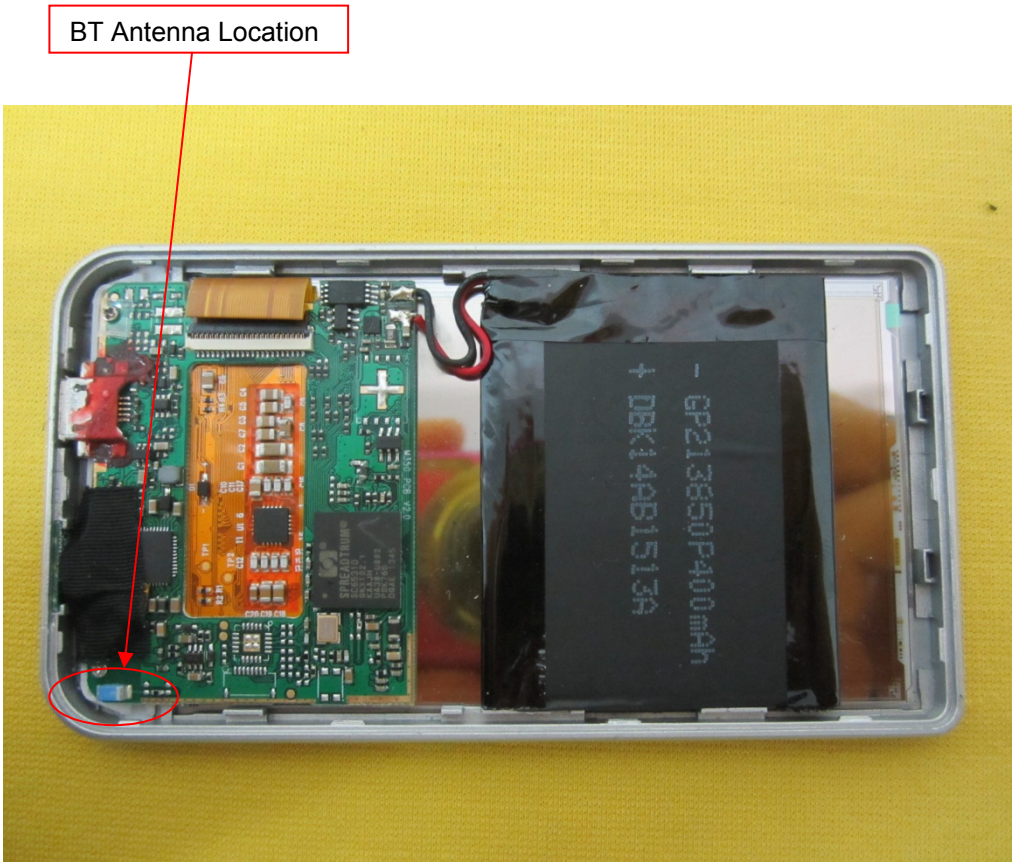
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

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

Test Result:

The antenna is integral antenna, the best case gain of the antenna is 2.0dBi



4.2. Conducted Emission (AC Main)

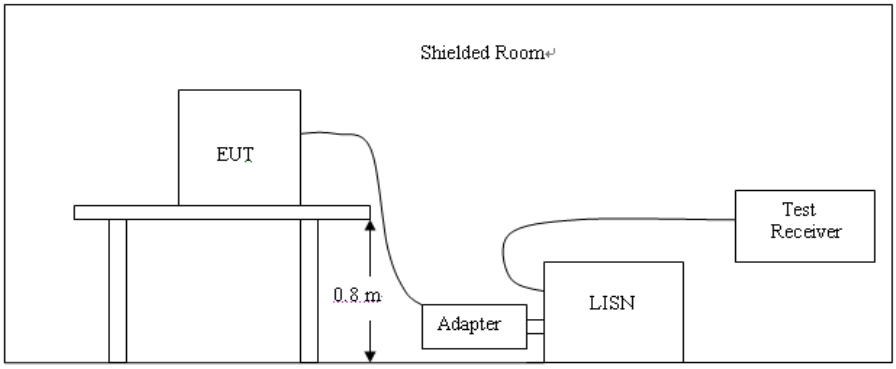
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

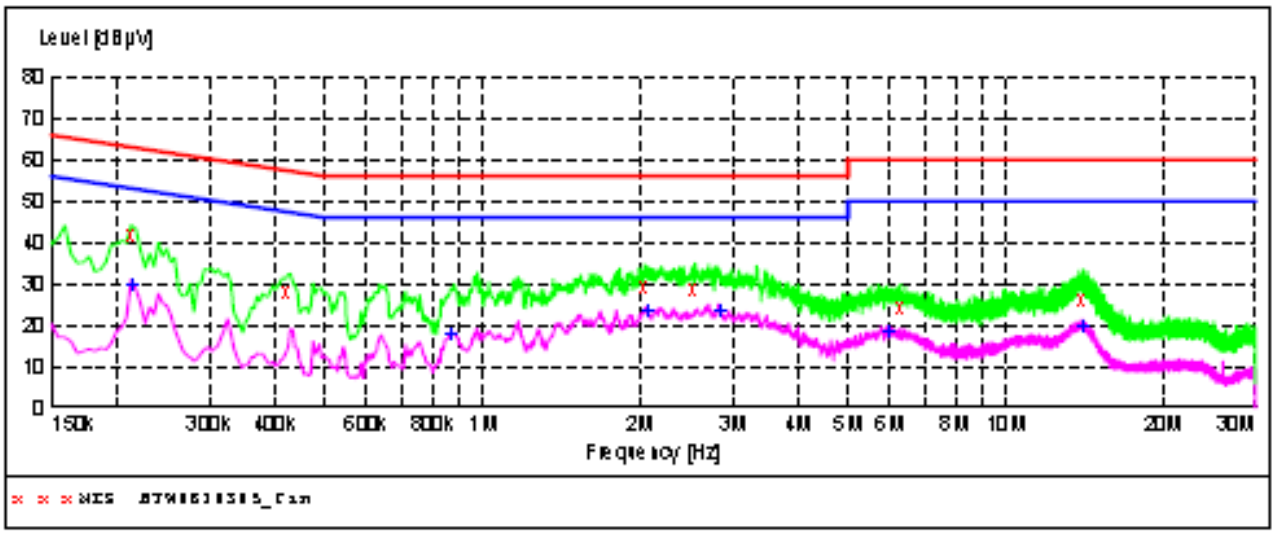
1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2009.
2. Support equipment, if needed, was placed as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

TEST RESULTS

Test mode:	Bluetooth mode	Polarization	L

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "HIND610305_fin"

6/10/2014 9:56AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.213000	41.90	10.4	63	21.2	QP	L1	GND
0.420000	28.20	10.4	57	29.2	QP	L1	GND
2.031000	29.40	10.3	56	26.6	QP	L1	GND
2.517000	28.40	10.3	56	27.6	QP	L1	GND
6.310500	24.40	10.4	60	35.6	QP	L1	GND
14.023500	26.10	10.7	60	33.9	QP	L1	GND

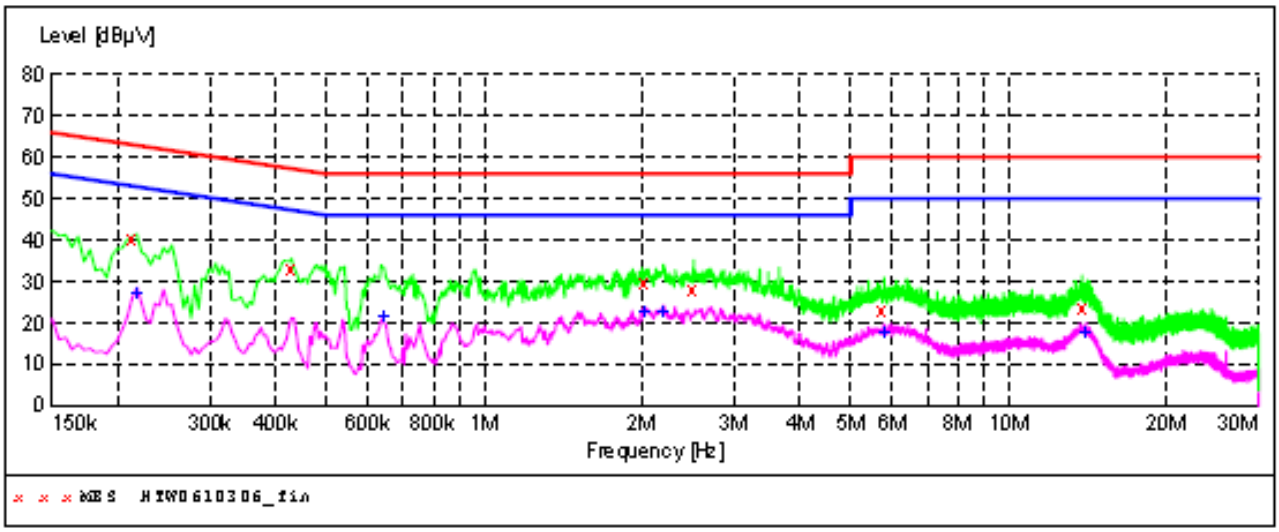
MEASUREMENT RESULT: "HIND610305_fin2"

6/10/2014 9:56AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.213000	30.20	10.4	53	22.9	AV	L1	GND
0.865500	18.10	10.2	46	27.9	AV	L1	GND
2.058000	23.40	10.3	46	22.6	AV	L1	GND
2.836500	23.60	10.3	46	22.4	AV	L1	GND
5.937000	18.50	10.3	50	31.5	AV	L1	GND
14.028000	20.00	10.7	50	30.0	AV	L1	GND

Test mode:	Bluetooth mode	Polarization	N

SCAN TABLE: "Voltage (9K-30M)FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "HTW0610306_fin"

6/10/2014 10:00AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.213000	40.50	10.4	63	22.6	QP	N	GND
0.429000	32.90	10.4	57	24.4	QP	N	GND
2.013000	29.50	10.3	56	26.5	QP	N	GND
2.503500	28.00	10.3	56	28.0	QP	N	GND
5.739000	23.30	10.3	60	36.7	QP	N	GND
13.789500	23.60	10.7	60	36.4	QP	N	GND

MEASUREMENT RESULT: "HTW0610306_fin2"

6/10/2014 10:00AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.217500	27.80	10.4	53	25.1	AV	N	GND
0.640500	21.70	10.3	46	24.3	AV	N	GND
2.022000	22.90	10.3	46	23.1	AV	N	GND
2.197500	23.30	10.3	46	22.7	AV	N	GND
5.811000	18.10	10.3	50	31.9	AV	N	GND
14.028000	18.20	10.7	50	31.8	AV	N	GND

4.3. Conducted Peak Output Power

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(3): **30dBm**

TEST CONFIGURATION

TEST PROCEDURE

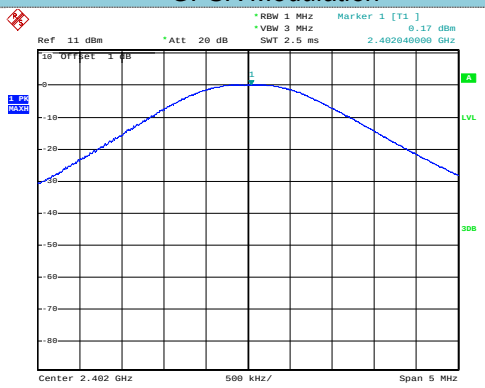
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum.

TEST RESULTS

Modulation type	Channel	Output power (dBm)	Limit (dBm)	Result
GFSK	0	0.17	30	Pass
	39	0.39		
	78	0.70		
π/4DQPSK	0	-1.73	21	Pass
	39	-1.39		
	78	-0.93		
8DPSK	0	-1.85	21	Pass
	39	-1.45		
	78	-1.60		

Test plot as follows:

GFSK Modulation



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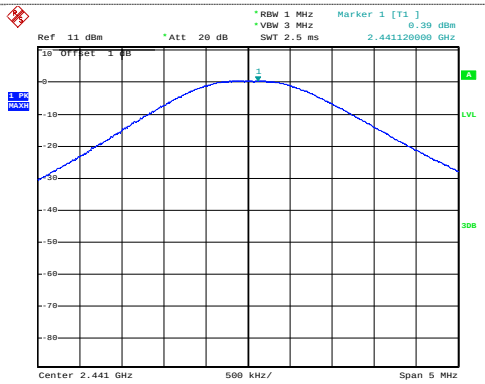
CH0



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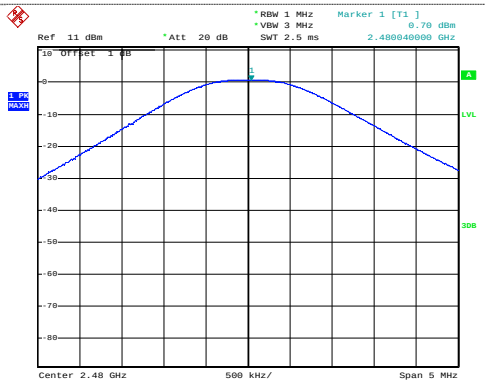
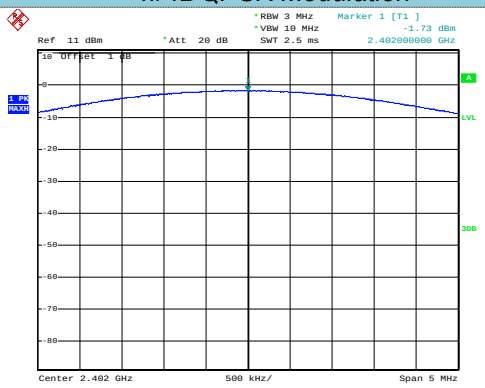
CH39



Date: 6.AUG.2014 21:15:43

CH78

π/4DQPSK Modulation



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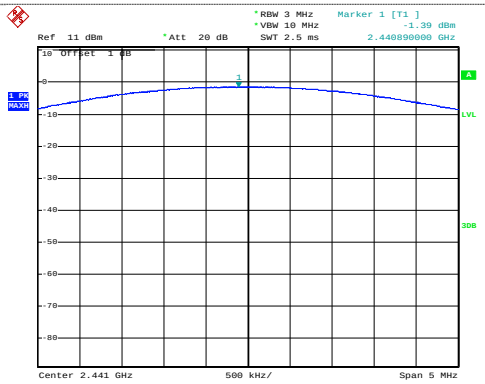
CH0



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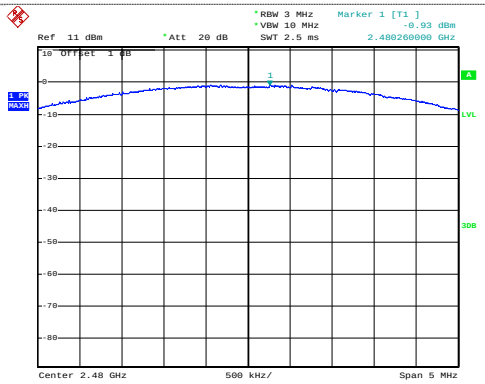
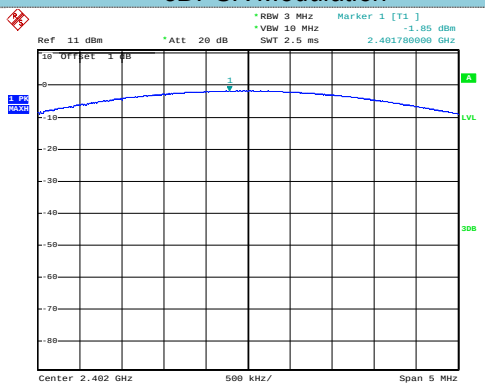
CH39



Date: 6.AUG.2014 21:17:47

CH78

8DPSK Modulation



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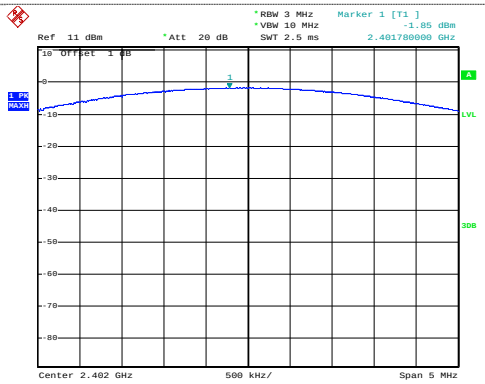
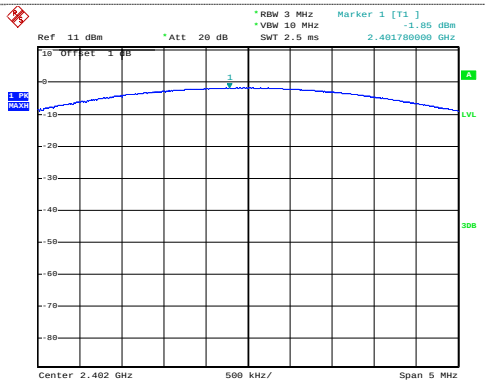
CH0



Date: 6.AUG.2014 21:19:18

CH39



Date: 6.AUG.2014 21:19:18

CH78

4.4. 20dB Emission Bandwidth

LIMIT

N/A

TEST CONFIGURATION

TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator.

The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW≥1% of the 20 dB bandwidth and VBW≥ RBW

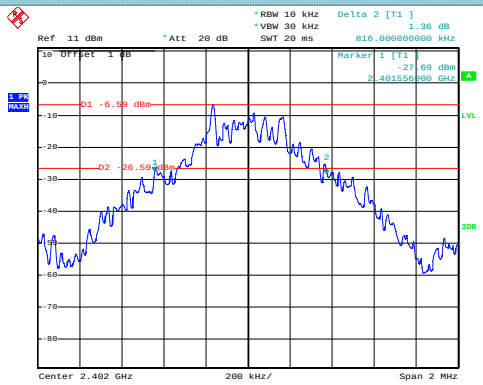
The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

TEST RESULTS

Modulation type	Channel	20dB Bandwidth (MHz)	Limit (MHz)	Result
GFSK	0	0.816	/	Pass
	39	0.816		
	78	0.812		
π/4DQPSK	0	1.134	/	Pass
	39	1.134		
	78	1.140		
8DPSK	0	1.164	/	Pass
	39	1.164		
	78	1.164		

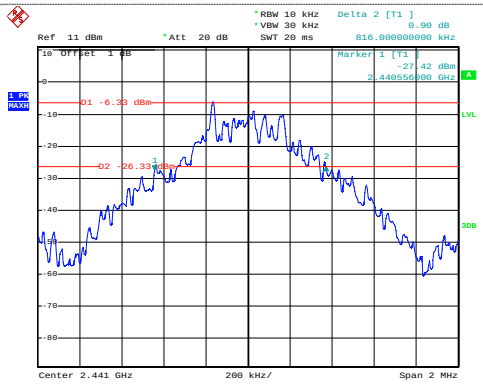
Test plot as follows:

GFSK Modulation



Date: 6.AUG.2014 20:50:18

CH0



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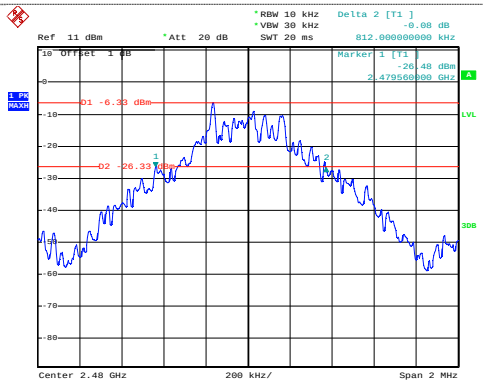
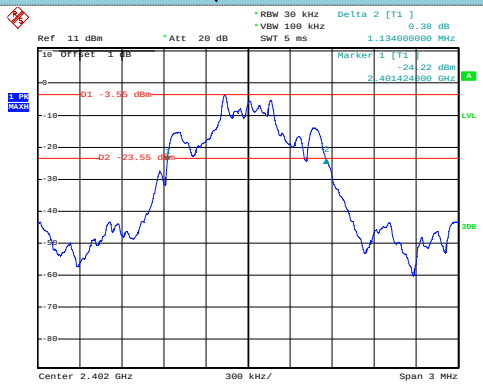
CH39



Date: 6.AUG.2014 20:52:16

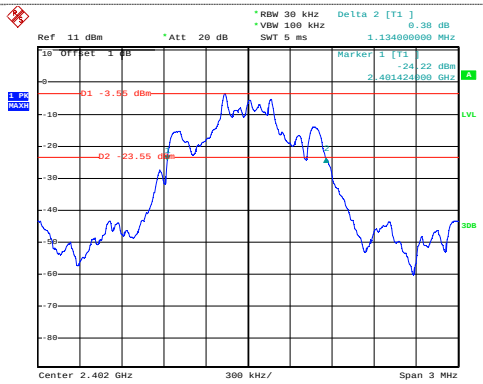
CH78

π/4DQPSK Modulation



Date: 6.AUG.2014 20:59:02

CH0



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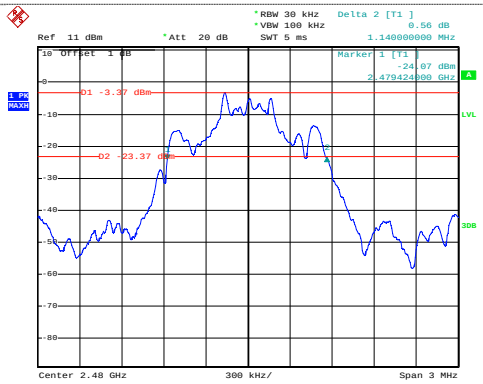
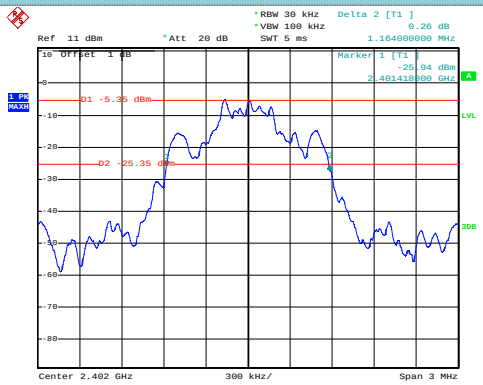
CH39



Date: 6.AUG.2014 20:57:56

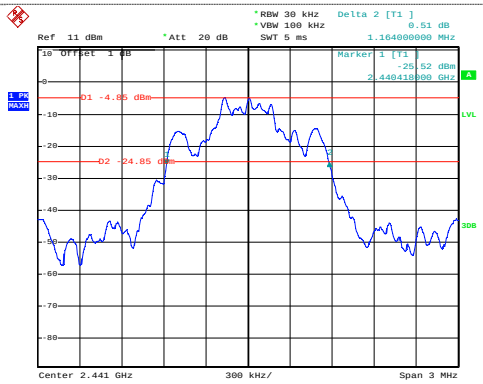
CH78

8DPSK Modulation



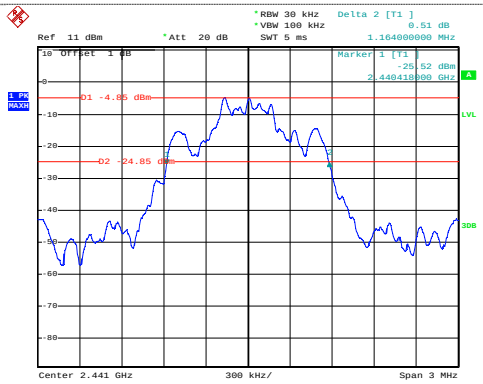
Date: 6.AUG.2014 21:00:13

CH0



Date: 6.AUG.2014 21:01:32

CH39



Date: 6.AUG.2014 21:01:32

CH78

4.5. Carrier Frequencies Separation

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):
frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

TEST CONFIGURATION

TEST PROCEDURE

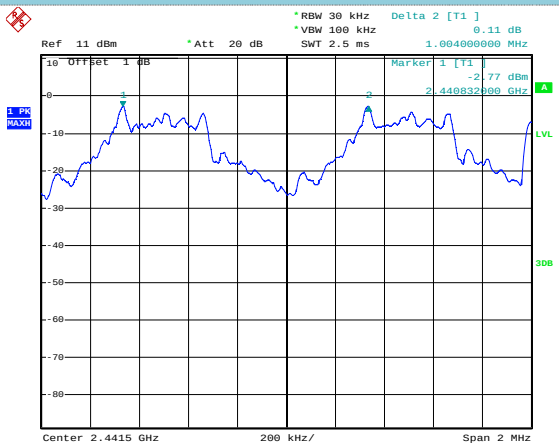
The transmitter output was connected to the spectrum analyzer through an attenuator.
The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=30 KHz and VBW=100KHz.

TEST RESULTS

Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
GFSK	39	1.004	0.816	Pass
π/4DQPSK	39	1.004	0.760	Pass
8DPSK	39	1.004	0.776	Pass

Test plot as follows:

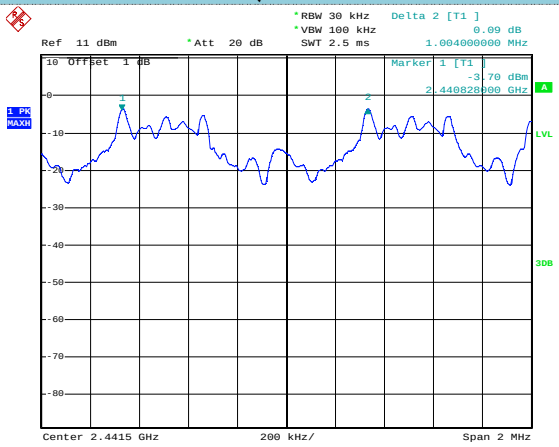
GFSK Modulation



Date: 6.AUG.2014 21:37:59

CH39

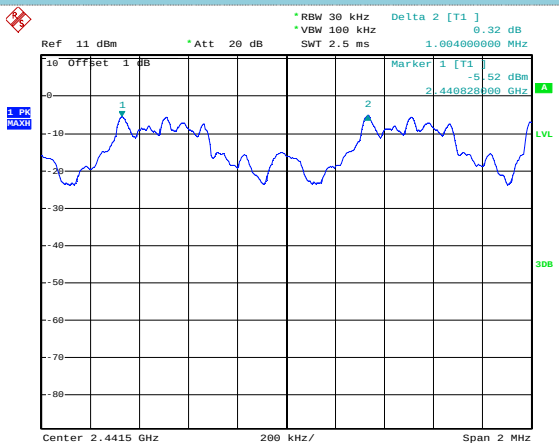
π/4DQPSK Modulation



Date: 6.AUG.2014 21:41:58

CH39

8DPSK Modulation



Date: 6.AUG.2014 21:44:50

CH39

4.6. Hopping Channel Number

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):
Frequency hopping systems in the 2400–2483.5 MHz band shall use at least **15** channels.

TEST CONFIGURATION

TEST PROCEDURE

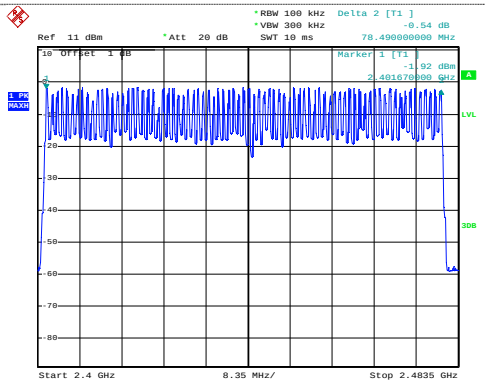
The transmitter output was connected to the spectrum analyzer through an attenuator.

The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 KHz and VBW=300KHz.

TEST RESULTS

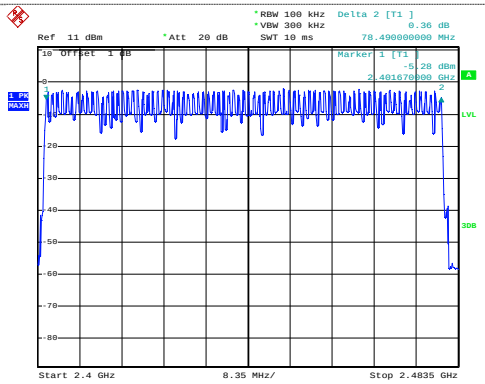
Modulation type	Channel number	Limit (MHz)	Result
GFSK	79	15	Pass
π/4DQPSK	79		
8DPSK	79		

Test plot as follows:



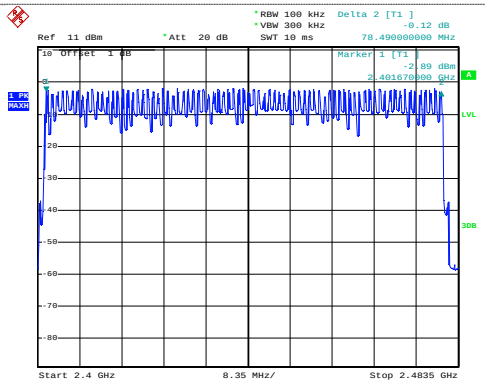
Date: 6.AUG.2014 22:00:56

GFSK



Date: 6.AUG.2014 21:58:52

π/4DQPSK



Date: 6.AUG.2014 21:53:12

8DPSK

4.7. Dwell Time

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

TEST CONFIGURATION

TEST PROCEDURE

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

TEST RESULTS

Modulation type	Channel	Dwell time (Second)	Limit (Second)	Result
GFSK	DH1	0.134	0.40	Pass
	DH3	0.270		
	DH5	0.316		
π/4DQPSK	2-DH1	0.136	0.40	Pass
	2-DH3	0.272		
	2-DH5	0.316		
8DPSK	3-DH1	0.136	0.40	Pass
	3-DH3	0.270		
	3-DH5	0.316		

Note:

We have tested all mode at high,middle and low channel,and recoreded worst case at middle channel.

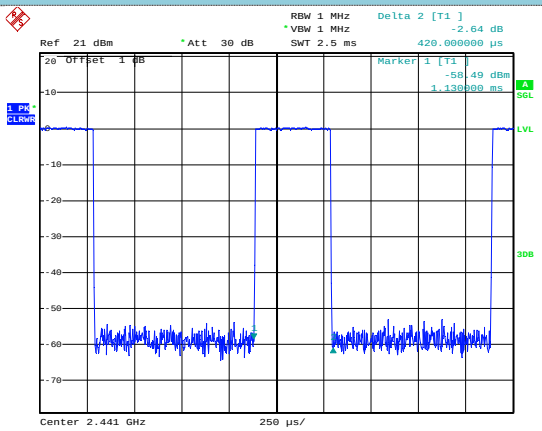
Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second for DH1, 2-DH1, 3-DH1

Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second for DH3, 2-DH3, 3-DH3

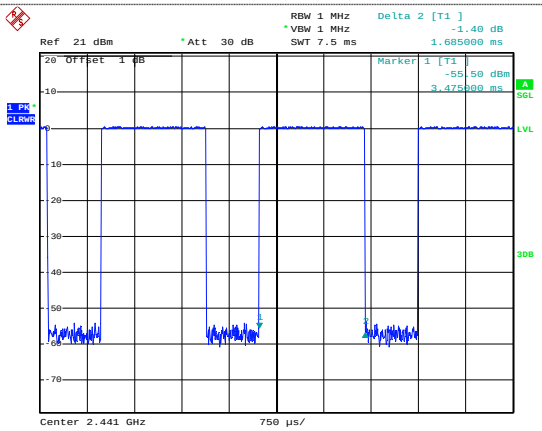
Dwell time=Pulse time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second for DH5, 2-DH5, 3-DH5

Test plot as follows:

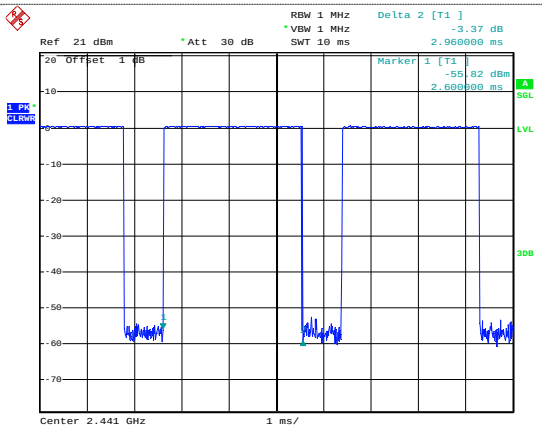
GFSK Modulation



DH1

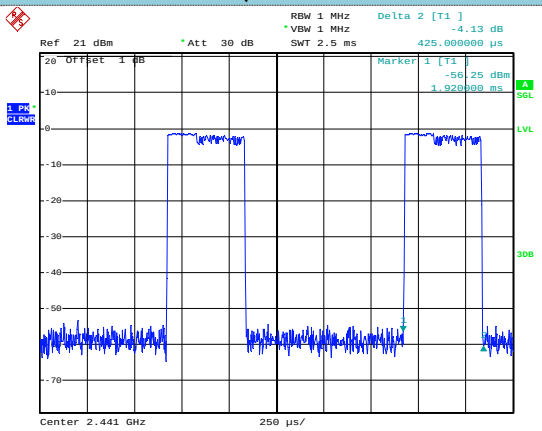


DH3

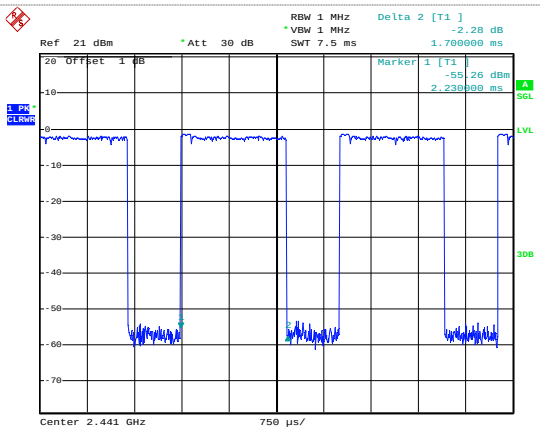


DH5

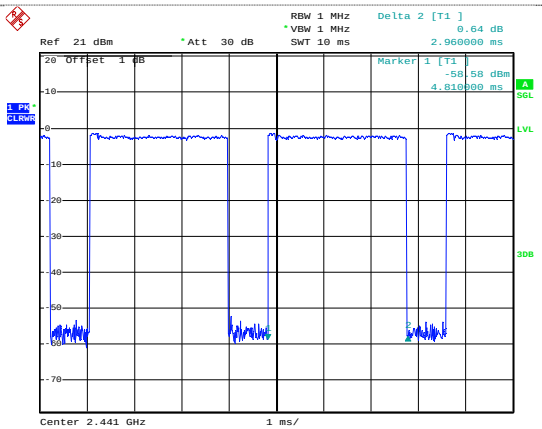
π/4DQPSK Modulation



2-DH1

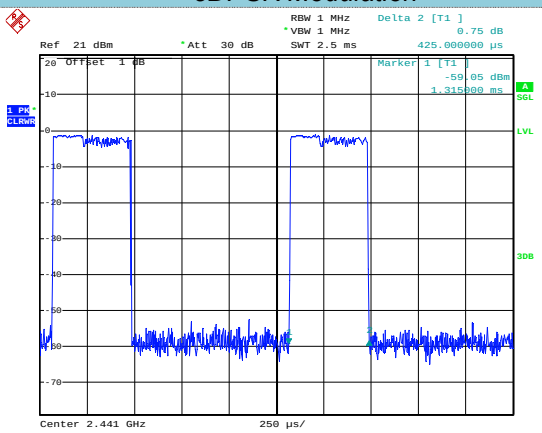


2-DH3

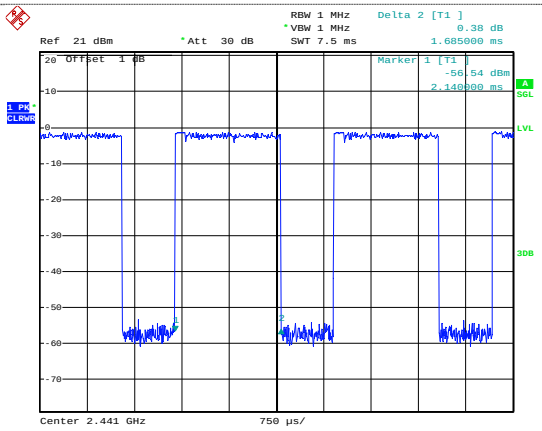


2-DH5

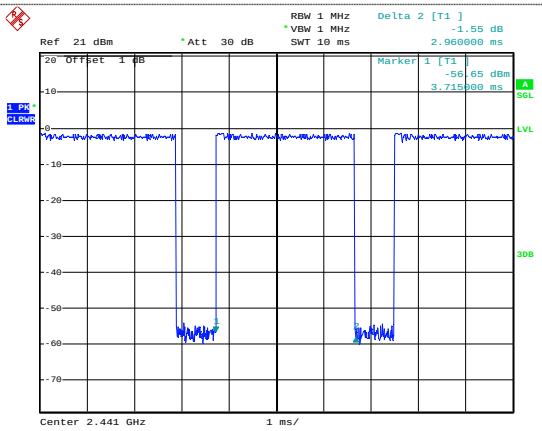
8DPSK Modulation



3-DH1



3-DH3



3-DH5

4.8. Pseudorandom Frequency Hopping Sequence

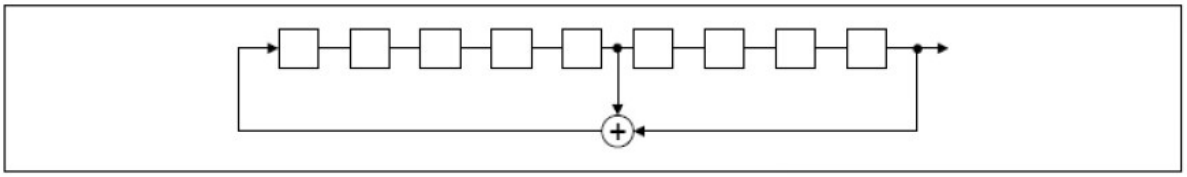
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):
Frequency hopping systems shall have hopping channel carrier fre-quencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Al-ternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier fre-quencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to chan-nel frequencies that are selected at the system hopping rate from a pseudo ran-domly ordered list of hopping fre-quencies. Each frequency must be used equally on the average by each trans-mitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their cor-responding transmitters and shall shift frequencies in synchronization with the transmitted signals.

TEST RESULTS

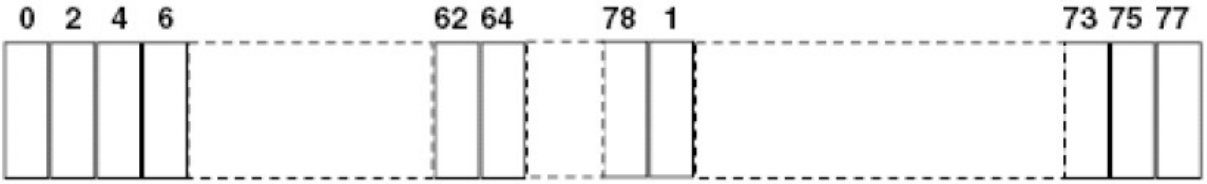
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage.And the result is fed back to the input of the frist stage.The sequence begins with the frist one of 9 consecutive ones,for example:the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An explame of pseudorandom frequency hopping sequence as follows:



Each frequency used equally one the average by each transmitter.
The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

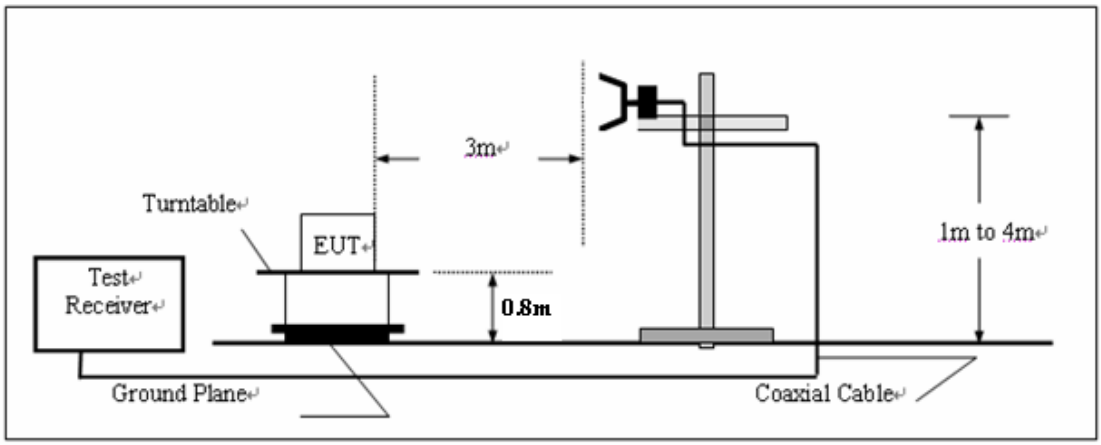
4.9. Band Edge

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):

In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

TEST CONFIGURATION



TEST PROCEDURE

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT

And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

Repeat above procedures until all frequency measurements have been completed.

For Frequencies below 1 GHz, RBW= 100 kHz, testing was performed with CISPR16 compliant test receiver with QP detector. Above 1 GHz tests were performed using a spectrum analyser using the following settings:

Peak RBW=VBW= 1MHz

Average RBW 1MHz , VBW=10Hz

These settings as per ANSI C63.10

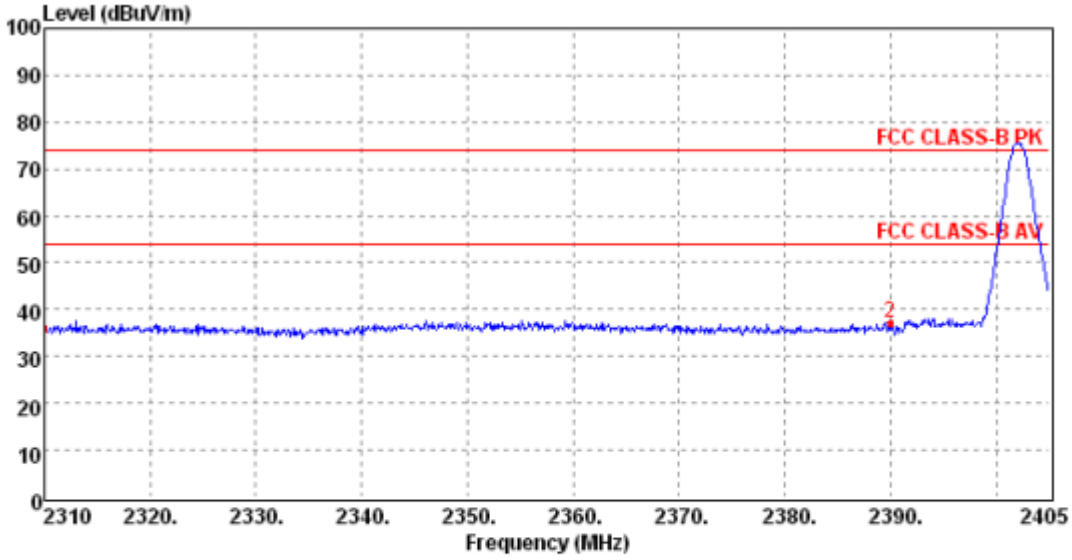
TEST RESULTS

Noted:

Have pre-scan all modulation mode, found the 8DPSK modulation which it was worst case, so only the worst case's data on the test report.

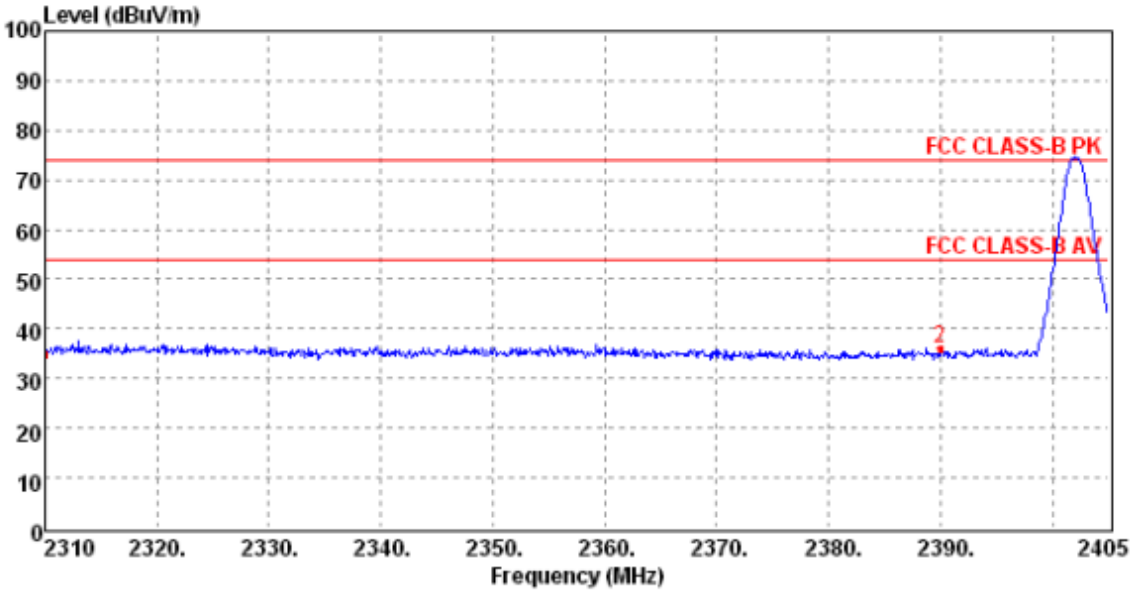
For Radiated Bandedge Measurement

Worst mode:	*8DPSK Modulation*	*Test Channel:*	*0*
Deteccter:	*Peak*	*Polarization:*	*Horizontal*



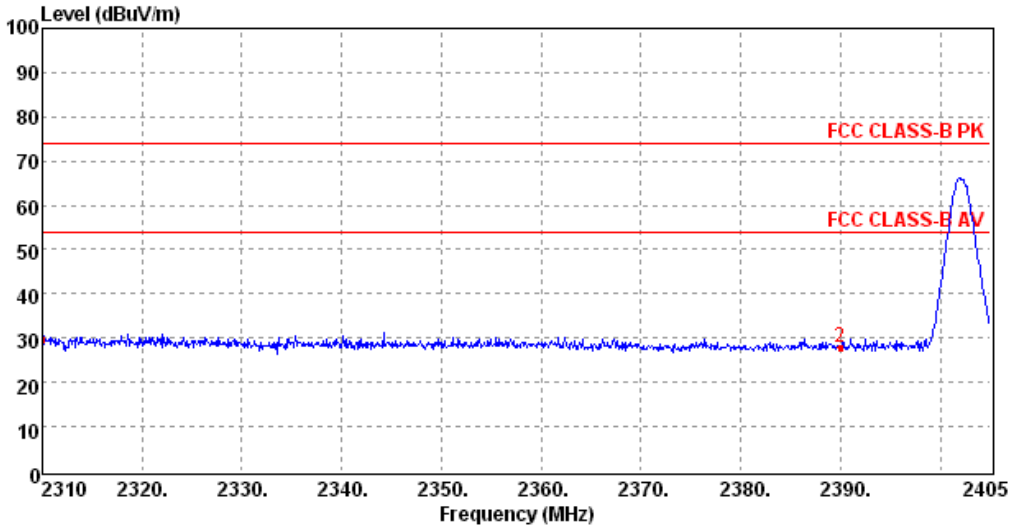
Mark	Frequency MHz	Reading dBuV	Antenna dB	Cable dB	Preamp dB	Level dBuV	Limit dBuV	Over limit	Remark
1	2310.00	39.79	26.99	6.68	37.51	35.95	74.00	-38.05	Peak
2	2389.99	40.76	27.23	6.81	37.57	37.23	74.00	-36.77	Peak

Worst mode:	*8DPSK Modulation*	*Test Channel:*	*0*
Deteccter:	*Peak*	*Polarization:*	*Vertical*



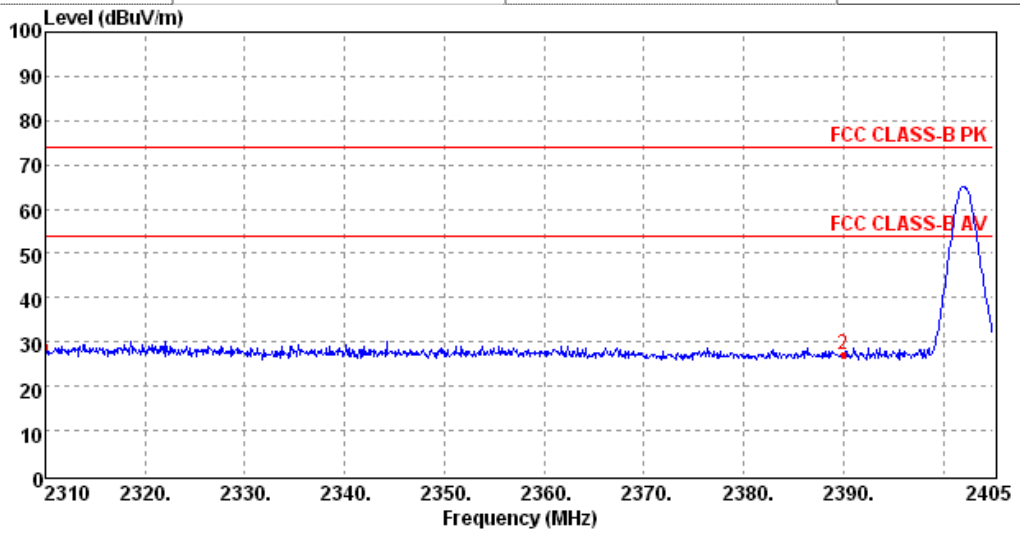
Mark	Frequency MHz	Reading dBuV	Antenna dB	Cable dB	Preamp dB	Level dBuV	Limit dBuV	Over limit	Remark
1	2310.00	38.79	26.99	6.68	37.51	34.95	74.00	-39.05	Peak
2	2389.99	39.76	27.23	6.81	37.57	36.23	74.00	-37.77	Peak

Worst mode:	*8DPSK Modulation*	*Test Channel:*	*0*
Deteccter:	*Average*	*Polarization:*	*Horizontal*



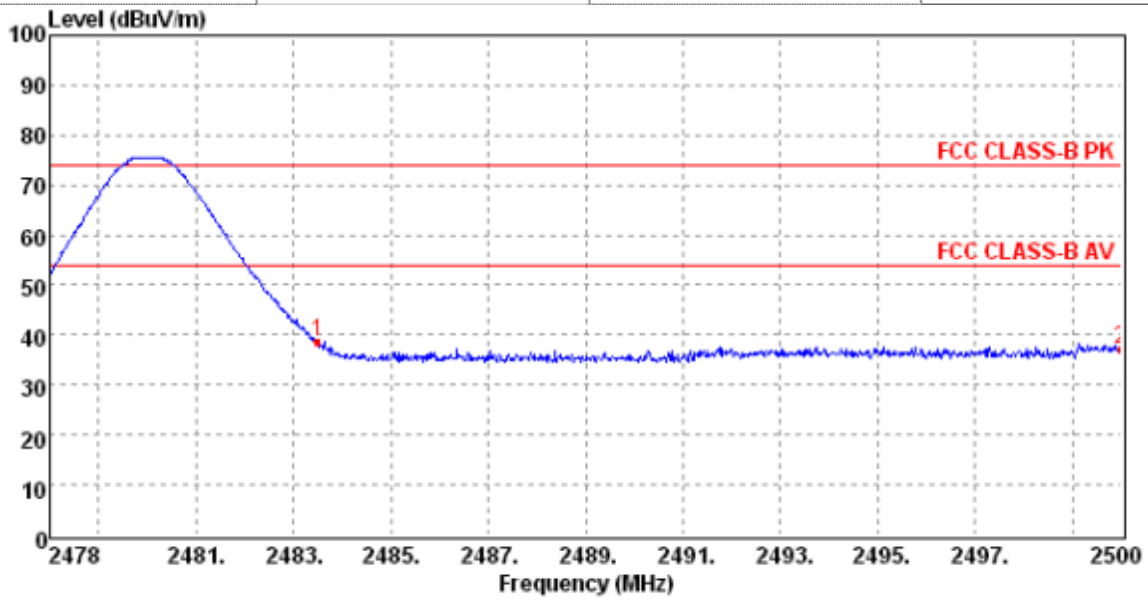
Mark	Frequency MHz	Reading dBuV	Antenna dB	Cable dB	Preamp dB	Level dBuV	Limit dBuV	Over limit	Remark
1	2310.00	33.73	26.92	6.68	37.51	29.82	54.00	-24.18	Average
2	2389.99	31.13	27.23	6.81	37.14	28.03	54.00	-25.97	Average

Worst mode:	*8DPSK Modulation*	*Test Channel:*	*0*
Deteccter:	*Average*	*Polarization:*	*Vertical*



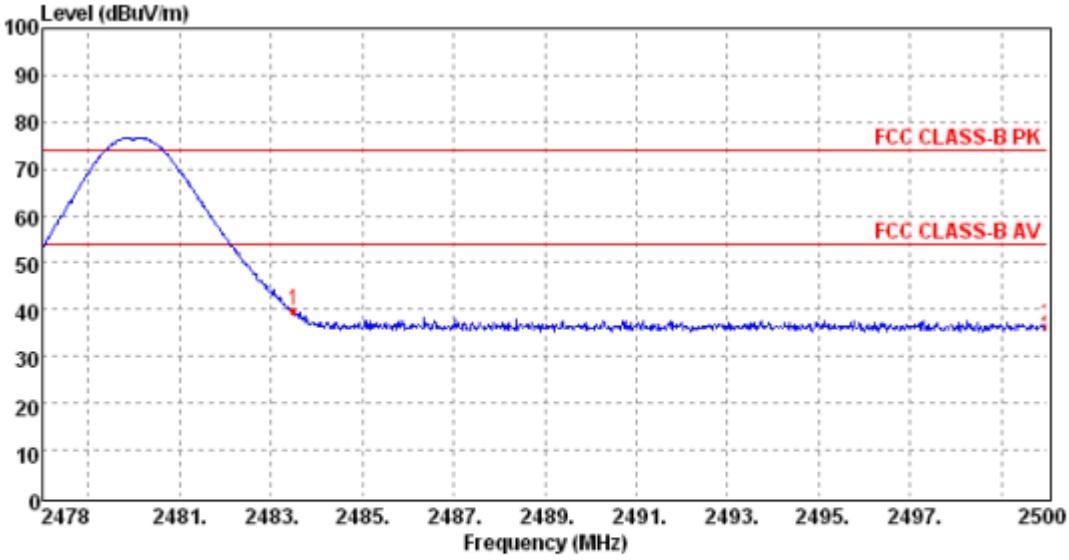
Mark	Frequency MHz	Reading dBuV	Antenna dB	Cable dB	Preamp dB	Level dBuV	Limit dBuV	Over limit	Remark
1	2310.00	32.66	26.99	6.68	37.51	28.82	54.00	-25.18	Average
2	2389.99	30.56	27.23	6.81	37.57	27.03	54.00	-26.97	Average

Worst mode:	*8DPSK Modulation*	*Test Channel:*	*78*
Deteccter:	*Peak*	*Polarization:*	*Horizontal*



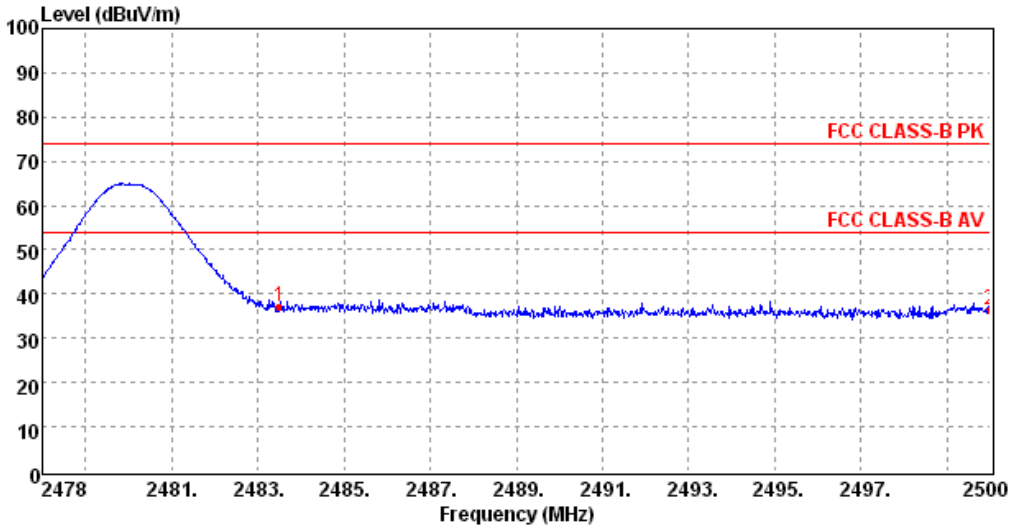
Mark	Frequency MHz	Reading dBuV	Antenna dB	Cable dB	Preamp dB	Level dBuV	Limit dBuV	Over limit	Remark
1	2483.50	41.81	27.54	6.96	37.65	38.66	74.00	-35.34	Peak
2	2500.00	40.35	27.58	6.98	37.66	37.25	74.00	-36.75	Peak

Worst mode:	*8DPSK Modulation*	*Test Channel:*	*78*
Deteccter:	*Peak*	*Polarization:*	*Vertical*



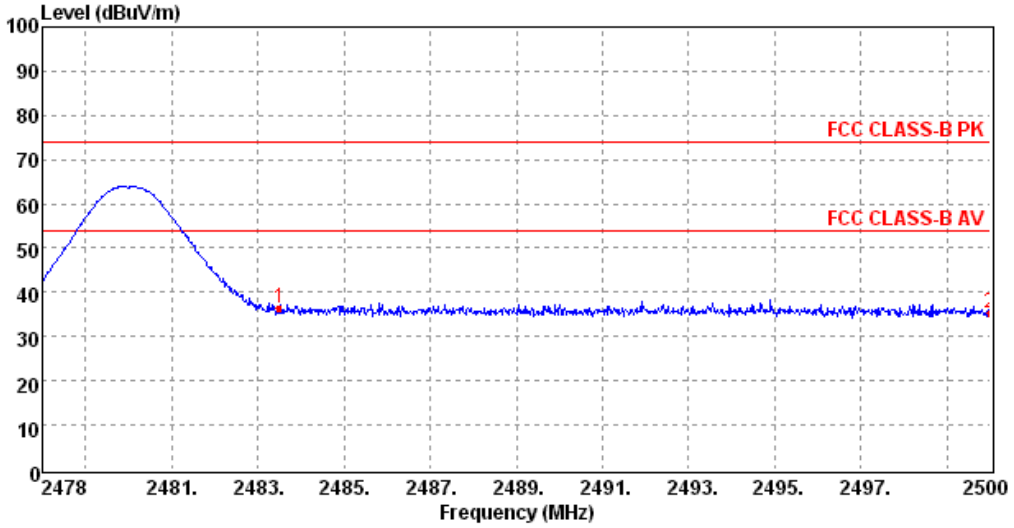
Mark	Frequency MHz	Reading dBuV	Antenna dB	Cable dB	Preamp dB	Level dBuV	Limit dBuV	Over limit	Remark
1	2483.50	42.81	27.54	6.96	37.65	39.66	74.00	-34.34	Peak
2	2500.00	39.35	27.58	6.98	37.66	36.25	74.00	-37.75	Peak

Worst mode:	*8DPSK Modulation*	*Test Channel:*	*78*
Deteccter:	*Average*	*Polarization:*	*Horizontal*



Mark	Frequency MHz	Reading dBuV	Antenna dB	Cable dB	Preamp dB	Level dBuV	Limit dBuV	Over limit	Remark
1	2483.50	40.46	27.54	6.96	37.65	37.31	54.00	-16.69	Average
2	2500.00	39.59	27.58	6.98	37.66	36.49	54.00	-17.51	Average

Worst mode:	*8DPSK Modulation*	*Test Channel:*	*78*
Deteccter:	*Average*	*Polarization:*	*Vertical*



Mark	Frequency MHz	Reading dBuV	Antenna dB	Cable dB	Preamp dB	Level dBuV	Limit dBuV	Over limit	Remark
1	2483.50	39.46	27.54	6.96	37.65	36.31	54.00	-17.69	Average
2	2500.00	38.59	27.58	6.98	37.66	35.49	54.00	-18.51	Average

4.10. Spurious Emission (conducted)

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):

In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

TEST CONFIGURATION

TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator.

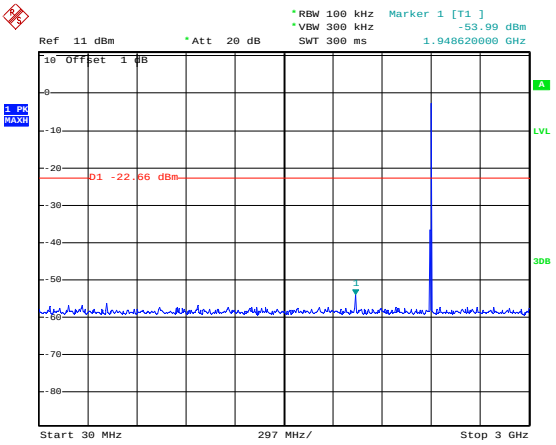
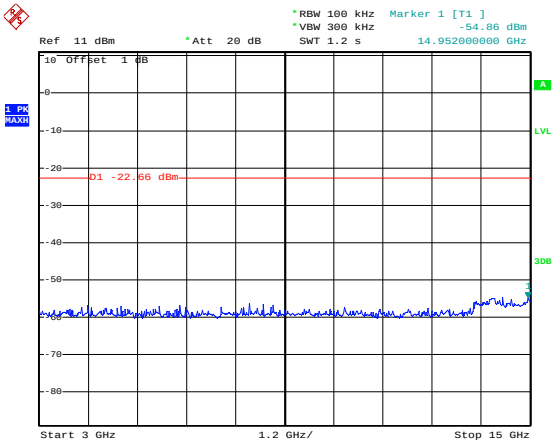
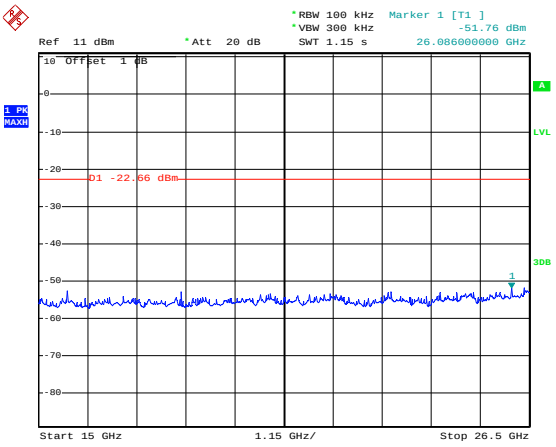
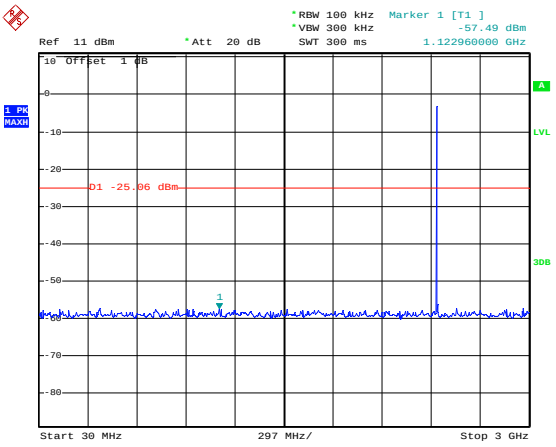
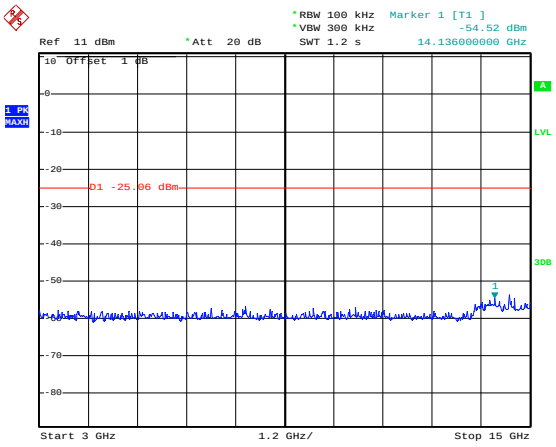
The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 KHz and VBW=300KHz.

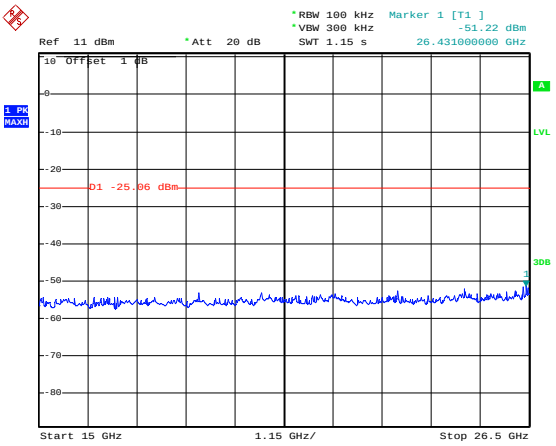
Below -20dB of the highest emission level in operating band.

TEST RESULTS

Noted:
Have pre-scan all modulation mode, found the 8DPSK modulation which it was worst case, so only the worst case's data on the test report.

Test plot as follows:

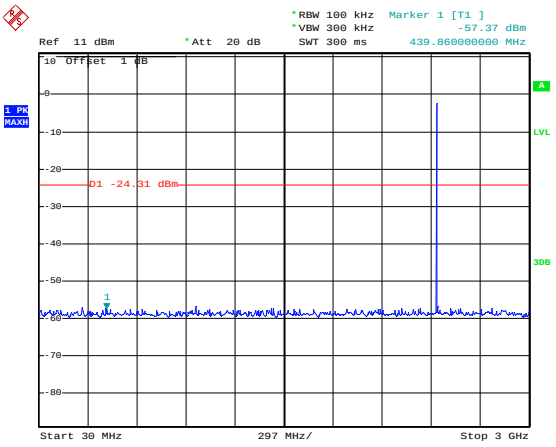
Test channel	0
 Date: 6.AUG.2014 22:36:42	 Date: 6.AUG.2014 22:37:10
30MHz~3GHz	3GHz~15GHz
 Date: 6.AUG.2014 22:37:36	
15GHz~26.5GHz	
Test channel	39
 Date: 6.AUG.2014 22:38:54	 Date: 6.AUG.2014 22:39:12
30MHz~3GHz	3GHz~15GHz



Date: 6.AUG.2014 22:39:39

15GHz~26.5GHz

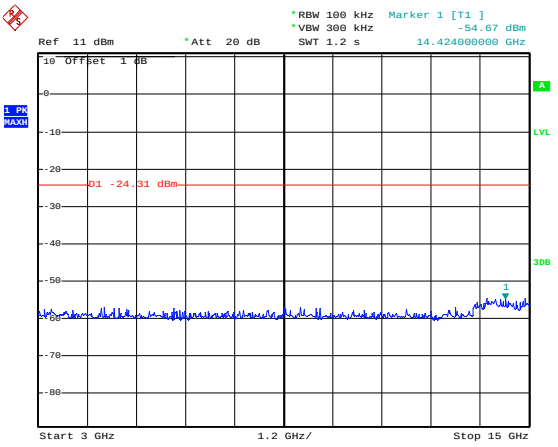
Test channel



Date: 6.AUG.2014 22:41:18

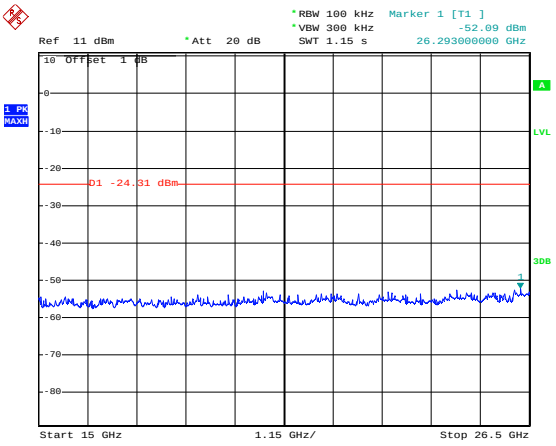
30MHz~3GHz

78



Date: 6.AUG.2014 22:41:45

3GHz~15GHz



Date: 6.AUG.2014 22:42:07

15GHz~25GHz

4.11. Spurious Emission (radiated)

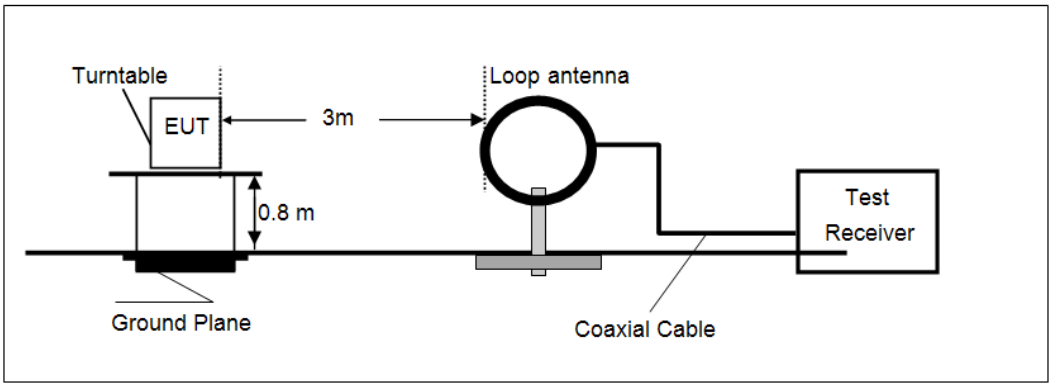
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

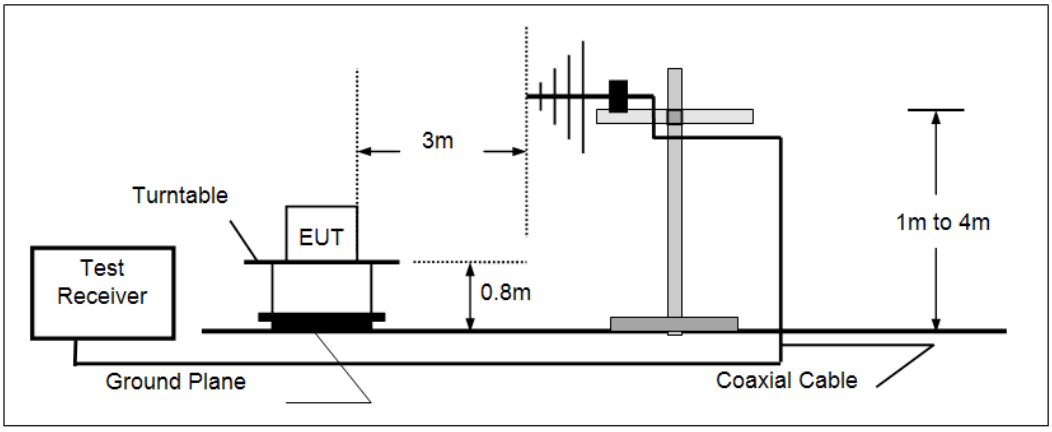
Frequency	Limit (dBuV/m @3m)	Value
30MHz-88MHz	40.00	Quasi-peak
88MHz-216MHz	43.50	Quasi-peak
216MHz-960MHz	46.00	Quasi-peak
960MHz-1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

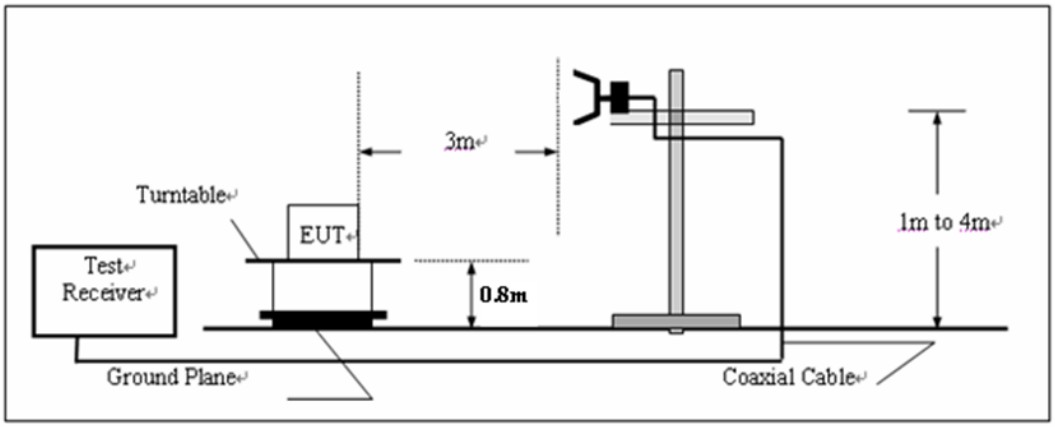
Below 30MHz



30MHz~1000MHz



Above 1GHz



TEST PROCEDURE

The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.

The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

The antenna height 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.

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 rota 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.

For Frequencies below 1 GHz, RBW= 100 kHz, testing was performed with CISPR16 compliant test receiver with QP detector. Above 1 GHz tests were performed using a spectrum analyser using the following settings:

Peak RBW=VBW= 1MHz

Average RBW 1MHz , VBW=10Hz

These settings as per ANSI C63.10

TEST RESULTS

Noted:
Have pre-scan all modulation mode, found the GFSK modulation which it was worst case, so only the worst case's data on the test report.

For 9KHz to 30MHz

Frequency (MHz)	Level (dBuV/m))@3m	Limit Line (dBuV/m)@3m	Margin (dB)	Detector	Result
13.67	41.67	69.54	-27.87	QP	PASS
24.38	41.85	69.54	-27.69	QP	PASS

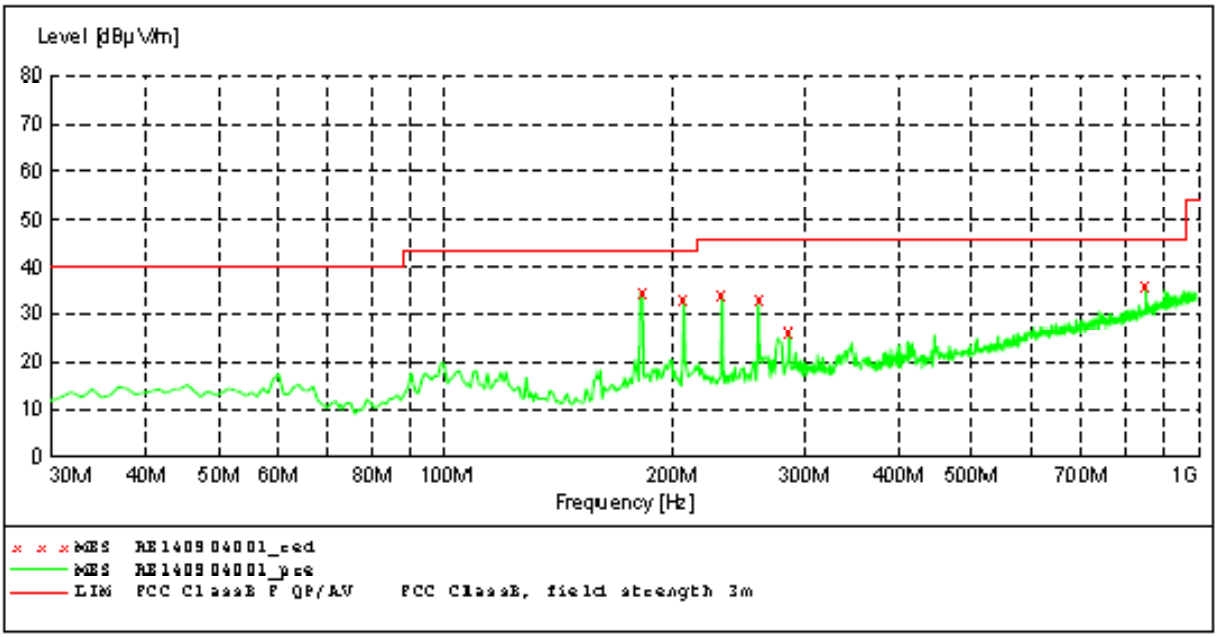
Measurement data:

- **Below 1GHz**

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

Short Description: Field Strength

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.1 GHz	MaxPeak	Coupled	100 kHz	VULB9163



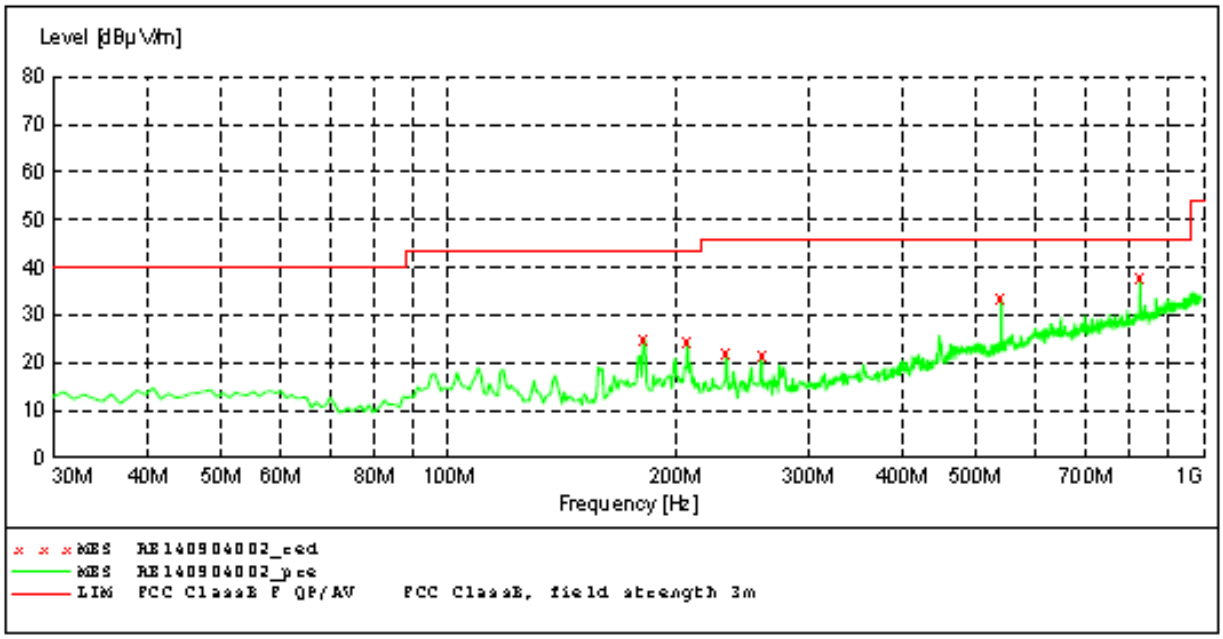
MEASUREMENT RESULT: "RE140904001_red"

9/4/2014 1:54PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
182.290000	34.80	-15.7	43.5	8.7	QP	100.0	159.00	HORIZONTAL
207.510000	33.20	-14.9	43.5	10.3	QP	100.0	148.00	HORIZONTAL
233.700000	34.20	-15.2	46.0	11.8	QP	100.0	9.00	HORIZONTAL
259.890000	33.30	-15.6	46.0	12.7	QP	100.0	43.00	HORIZONTAL
286.080000	26.40	-14.3	46.0	19.6	QP	100.0	54.00	HORIZONTAL
849.650000	35.80	1.4	46.0	10.2	QP	100.0	134.00	HORIZONTAL

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

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.1 GHz	MaxPeak	Coupled	100 kHz	VULB9163



MEASUREMENT RESULT: "RE140904002_red"

9/4/2014 2:00PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
181.320000	24.90	-15.8	43.5	18.6	QP	100.0	26.00	VERTICAL
207.510000	24.40	-14.9	43.5	19.1	QP	100.0	63.00	VERTICAL
233.700000	22.30	-15.2	46.0	23.7	QP	100.0	360.00	VERTICAL
259.890000	21.80	-15.6	46.0	24.2	QP	100.0	144.00	VERTICAL
540.220000	33.40	-5.6	46.0	12.6	QP	100.0	26.00	VERTICAL
824.430000	38.00	0.7	46.0	8.0	QP	100.0	3.00	VERTICAL

■ **Above 1GHz**

Test channel:	0

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4804	40.12	31.28	5.66	35.29	41.77	74	-32.23	Vertical
7206	43.14	36.22	6.87	35.15	51.08	74	-22.92	Vertical
9608	31.28	37.85	8.8	35.55	42.38	74	-31.62	Vertical
12010	29.38	38.25	8.9	35.84	40.69	74	-33.31	Vertical
14412	28.44	39.25	9.2	36.15	40.74	74	-33.26	Vertical
4804	41.09	31.28	5.66	35.29	42.74	74	-31.26	Horizontal
7206	40.85	36.22	6.87	35.15	48.79	74	-25.21	Horizontal
9608	29.98	37.85	8.8	35.55	41.08	74	-32.92	Horizontal
12010	29.38	38.25	8.9	35.84	40.69	74	-33.31	Horizontal
14412	28.43	39.25	9.2	36.15	40.73	74	-33.27	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4804	34.6	31.28	5.66	35.29	36.25	54	-17.75	Vertical
7206	37.8	36.22	6.87	35.15	45.74	54	-8.26	Vertical
9608	25.63	37.85	8.8	35.55	36.73	54	-17.27	Vertical
12010	25.13	38.25	8.9	35.84	36.44	54	-17.56	Vertical
14412	23.39	39.25	9.2	36.15	35.69	54	-18.31	Vertical
4804	34.09	31.28	5.66	35.29	35.74	54	-18.26	Horizontal
7206	32.84	36.22	6.87	35.15	40.78	54	-13.22	Horizontal
9608	25.29	37.85	8.8	35.55	36.39	54	-17.61	Horizontal
12010	25.27	38.25	8.9	35.84	36.58	54	-17.42	Horizontal
14412	24.47	39.25	9.2	36.15	36.77	54	-17.23	Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

Test channel:	39

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4882	41.05	30.88	5.7	35.27	42.36	74	-31.64	Vertical
7323	43.25	35.82	6.91	35.13	50.85	74	-23.15	Vertical
9764	31.98	37.45	8.84	35.53	42.74	74	-31.26	Vertical
12205	30.91	38.78	8.95	35.95	42.69	74	-31.31	Vertical
14412	29.31	39.64	9.27	36.74	41.48	74	-32.52	Vertical
4882	40.48	30.88	5.7	35.27	41.79	74	-32.21	Horizontal
7323	41.98	35.82	6.91	35.13	49.58	74	-24.42	Horizontal
9764	30.93	37.45	8.84	35.53	41.69	74	-32.31	Horizontal
12205	28.86	38.78	8.95	35.95	40.64	74	-33.36	Horizontal
14412	28.41	39.64	9.27	36.74	40.58	74	-33.42	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4882	35.47	30.88	5.7	35.27	36.78	54	-17.22	Vertical
7323	38.74	35.82	6.91	35.13	46.34	54	-7.66	Vertical
9764	25.83	37.45	8.84	35.53	36.59	54	-17.41	Vertical
12205	24.47	38.78	8.95	35.95	36.25	54	-17.75	Vertical
14412	23.57	39.64	9.27	36.74	35.74	54	-18.26	Vertical
4882	35.38	30.88	5.7	35.27	36.69	54	-17.31	Horizontal
7323	33.76	35.82	6.91	35.13	41.36	54	-12.64	Horizontal
9764	25.99	37.45	8.84	35.53	36.75	54	-17.25	Horizontal
12205	25	38.78	8.95	35.95	36.78	54	-17.22	Horizontal
14412	24.62	39.64	9.27	36.74	36.79	54	-17.21	Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

Test channel:	78

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4960	41.06	30.98	5.73	35.32	42.45	74	-31.55	Vertical
7440	44.01	35.92	6.94	35.18	51.69	74	-22.31	Vertical
9920	31.92	37.55	8.87	35.58	42.76	74	-31.24	Vertical
12400	30.58	38.95	8.98	36.05	42.46	74	-31.54	Vertical
14880	29.34	39.87	9.34	36.88	41.67	74	-32.33	Vertical
4960	39.99	30.98	5.73	35.32	41.38	74	-32.62	Horizontal
7440	41.78	35.92	6.94	35.18	49.46	74	-24.54	Horizontal
9920	30.91	37.55	8.87	35.58	41.75	74	-32.25	Horizontal
12400	28.5	38.95	8.98	36.05	40.38	74	-33.62	Horizontal
14880	28.31	39.87	9.34	36.88	40.64	74	-33.36	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4960	35.5	30.98	5.73	35.32	36.89	54	-17.11	Vertical
7440	39.08	35.92	6.94	35.18	46.76	54	-7.24	Vertical
9920	25.85	37.55	8.87	35.58	36.69	54	-17.31	Vertical
12400	24.37	38.95	8.98	36.05	36.25	54	-17.75	Vertical
14880	23.06	39.87	9.34	36.88	35.39	54	-18.61	Vertical
4960	35.35	30.98	5.73	35.32	36.74	54	-17.26	Horizontal
7440	33.84	35.92	6.94	35.18	41.52	54	-12.48	Horizontal
9920	25.52	37.55	8.87	35.58	36.36	54	-17.64	Horizontal
12400	24.55	38.95	8.98	36.05	36.43	54	-17.57	Horizontal
14880	23.92	39.87	9.34	36.88	36.25	54	-17.75	Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

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