ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

CAR DVD/NAVIGATION Player

Model No.: Philadelphia 845, CE6KM5

Trade Mark: BLAUPUNKT

FCC ID: RPL-PHILA845

Report No.: KAD140925078E

Issue Date: October 14, 2014

Prepared for

Blaupunkt Europe GmbH
Robert Bosch Str. 200 31139 Hildesheim, Niedersachsen Germany

Prepared by

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VERIFICATION OF COMPLIANCE

Applicant:	Blaupunkt Europe GmbH Robert Bosch Str. 200 31139 Hildesheim, Niedersachsen Germany
Manufacturer:	HUIZHOU FORYOU GENERAL ELECTRONICS CO., LTD. Building 2, A Zone, Foryou Industrial Park, 1# North Shangxia Road, Dongjiang Hi-tech Industry Park, Huizhou, Guangdong, China
Product Description:	CAR DVD/NAVIGATION Player
Trade Mark:	BLAUPUNKT
Model Number:	Philadelphia 845, CE6KM5 (Note: The samples are the same except appearance and model no. So we prepare Philadelphia 845 for test.)
Kind of Device:	Bluetooth Ver.3.0+EDR
File Number:	KAD140925078E
Date of Test:	September 25, 2014 to October 10, 2014

We hereby certify that:

The above equipment was tested by DONGGUAN EMTEK CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2009) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247(2013).

The test results of this report relate only to the tested sample identified in this report.

Approved By

Sam Lv / Q.A. Manager
DONGGUAN EMTEK CO., LTD.

Modified Information

Version	Summary	Revision Date	Report No.
Ver.1.0	Original Report	/	KAD140925078E

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1. GENERAL INFORMATION

1.1 Product Description

The Blaupunkt Europe GmbH, Model: Philadelphia 845 (referred to as the EUT in this report) The EUT is a short range, lower power transmitter. It is designed by way of utilizing the following modulation achieves the system operating.

A major technical descriptions of EUT is described as following:

A). Operation Frequency: 2402-2480MHz
B). Modulation: GFSK, π/4-DQPSK, 8DPSK
C). Number of Channel: 79
D). Channel space: 1MHz
E). Rated RF Output Power: 3.60dBm(2.291 mW)
F). Antenna Type: Internal PCB antenna
G). Antenna GAIN: 0dBi
H). Power Supply: DC 12.0-14.4V

The basic data rate of 1Mbps uses GFSK modulation and the enhanced data rate uses PSK modulation. For the enhanced data rate of 3Mbps 8DPSK modulation and of 2Mbps π/4-DQPSK modulation is used.

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: RPL-PHILA845 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules and FCC Public Notice DA 00-705.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2009). Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Special Accessories

Not available for this EUT intended for grant.

1.5 Equipment Modifications

Not available for this EUT intended for grant.

1.6 Test Facility

Site Description

EMC Lab. :

Accredited by FCC, June 18, 2014
The Certificate Number is 247565

Accredited by Industry Canada, February 19, 2014
The Certificate Number is 9444A.

Name of Firm : DONGGUAN EMTEK CO., LTD.

Site Location : No.281, Guantai Road, Nancheng District, Dongguan, Guangdong, China

2. System Test Configuration

2.1 EUT Configuration

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

2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. the Tx frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-2009. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-2009.

2.4 Limitation

(1) Channel Separation test

FCC Part 15, Subpart C Section 15.247(a)(1). Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20 Bandwidth of the hopping channel, whichever is greater.

Frequency Range (MHz)	Limit(kHz)
902-928	>25kHz
2400-2483.5	>25kHz
5725-5850	>25kHz

(2) 20dB Bandwidth

Frequency Range(MHz)	Quantity of Hopping Channel	Limit(kHz) 50	25	15	75
902-928		<250	>250	NA	NA
2400-2483.5		NA	NA	>1000	<1000

(3) Quantity of Hopping Channel

FCC Part 15, Subpart C Section 15.247

Frequency Range (MHz)	Limit(Quantity of Hopping Channel) 20dB bandwidth <250kHz	20dB bandwidth >250kHz	20dB bandwidth <1MHz	20dB bandwidth >1MHz
902-928	50	25	NA	NA
2400-2483.5	NA	NA	15	15
5725-5850	NA	NA	75	NA

(4) Time of Occupancy(Dwell Time)

FCC Part 15, Subpart C Section 15.247

Frequency Range (MHz)	LIMIT(rms) 20dB bandwidth <250kHz(50Channel)	20dB bandwidth >250kHz(25Channel)	20dB bandwidth <1MHz(75Channel)
902-928	400(20S)	400(10S)	NA
2400-2483.5	NA	NA	400(30S)
5725-5850	NA	NA	400(30S)

Note: The "()"is all channel's average time of occupancy.

(5) Maximum Peak Output Power

FCC Part 15, Subpart C Section 15.247

Frequency Range (MHz)	Quantity of Hopping Channel	LIMIT(W) 50	25	15	75
902-928		1(30dBm)	0.125(21dBm)	NA	NA
2400-2483.5		NA	NA	0.125(21dBm)	1(30dBm)
5725-5850		NA	NA	NA	1(30dBm)

(6) Band edge

FCC Part15, Subpart C Section 15.247, In any 100kHz bandwidth outside the frequency band in with the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, attenuation below the general limits specified in section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a).

Operating Frequency Range(MHz)	Spurious emission frequency	Limit	
		Peak power ration to emission(dBc)	Emission level(dBuV/m)
902-928	<902	>20	NA
	>928	>20	NA
	960-1240	NA	54
2400-2483.5	<2400	>20	NA
	>2483.5-2500	NA	54
5725-5850	<5350-5460	NA	54
	<5725	>20	NA
	>5850	>20	NA

(7) Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

(8) Radiated Emission

FCC Part 15, Subpart C Section 15.209 limit of radiated emission for frequency below 1000GHz. The emissions from an intentional radiator shall not exceed the field strength level specified in the following table:

Frequency (MHz)	Field strength μV/m	Distance(m)	Field strength at 3m dBμV/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	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

Remark : 1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

FCC Part 15, Section 15.35(b) limit of radiated emission for frequency above 1000MHz

Frequency(MHz)	Class A(dBμV/m)(at 3m)		Class B(dBμV/m)(at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
Above 1000	80.0	60.0	74.0	54.0

FCC Part 15, Subpart C Section 15.249. The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequency(MHz)	Filed Strength of Fundamental(at 3m)		Filed Strength of Harmonics(at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
902-928	114	94	74.0	54.0
2400-2483.5	114	94	74.0	54.0
5725-5875	114	94	74.0	54.0
24000-24250	128	108	88.0	68.0

2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

EUT

Table 2-1 Equipment Used in Tested System

Item	Equipment	Trade Mark	Model No.	FCC ID	Note
1.	CAR DVD/NAVIGATION Player	BLAUPUNKT	Philadelphia	RPL-PHILA845	***EUT***

Note:

(1) Unless otherwise denoted as EUT in『Remark』column , device(s) used in tested system is a support equipment.

3. Summary of Test Results

FCC Rules	Description Of Test	Result
§15.247(a)(1)	Channel Separation test	Compliant
§15.247(a)(1)	20dB Bandwidth	Compliant
§15.247(a)(1)(iii)	Quantity of Hopping Channel	Compliant
§15.247(a)(1)(iii)	Time of Occupancy(Dwell Time)	Compliant
§15.247(b)	Max Peak output Power test	Compliant
§15.247(d)	Band edge test	Compliant
§15.207	AC Power Conducted Emission	N/A
§15.247(d),§15.209	Radiated Emission	Compliant
§15.203	Antenna Requirement	Compliant
§1.1310	RF Exposure	Compliant

Remark: The EUT is supplied by Battery, there is no need for AC Power Conducted Emission test to be performed on this product.

4. Description of test modes

The EUT has been tested under TX operating condition.
This EUT is a FHSS system, were conducted to determine the final configuration from all possible combinations. We use software control the EUT, Let EUT hopping on and transmit with highest power, All the modes GFSK,Π/4-DQPSK, 8DPSK have been tested. 79 Channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for test.

Channel	Frequency(MHz)
1	2402
40	2441
79	2480

5. Radiated Emission Test

5.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.
5. For range 9KHz~30MHz, The measured value is really too low to be recorded.

When spectrum scanned from 30MHz to 1GHz setting resolution bandwidth 120KHz and video bandwidth 300KHz:

EMI Test Receiver	Setting
Attenuation	Auto
RB	120KHz
VB	300KHz
Detector	QP
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz:

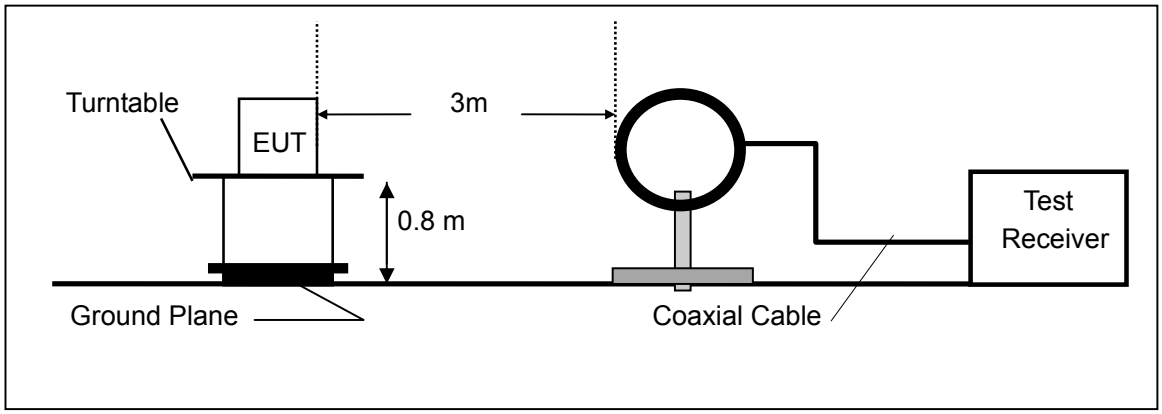
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	3MHz
Detector	Peak
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 10Hz:

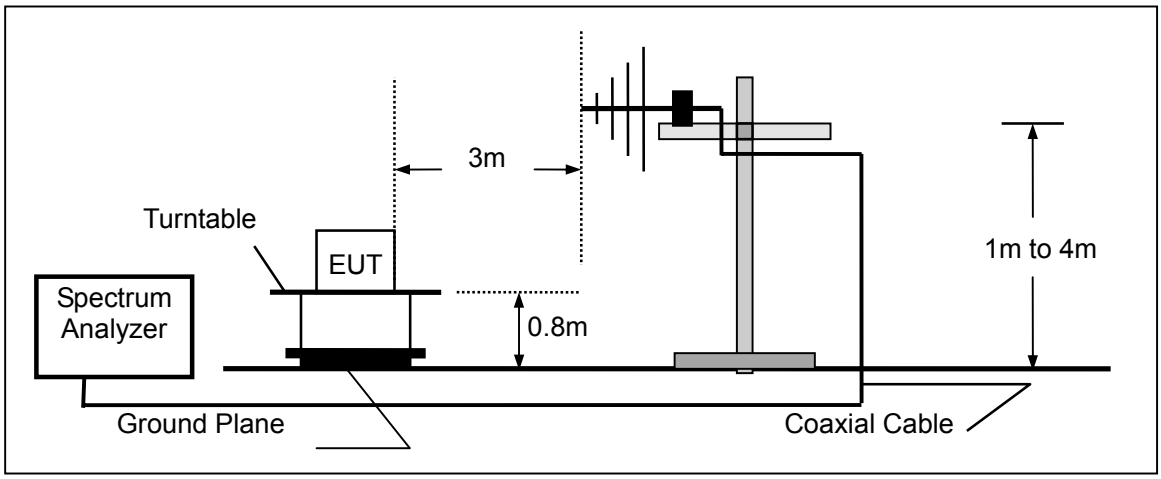
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	10Hz
Detector	Peak
Trace	Max hold

5.2 Test SET-UP (Block Diagram of Configuration)

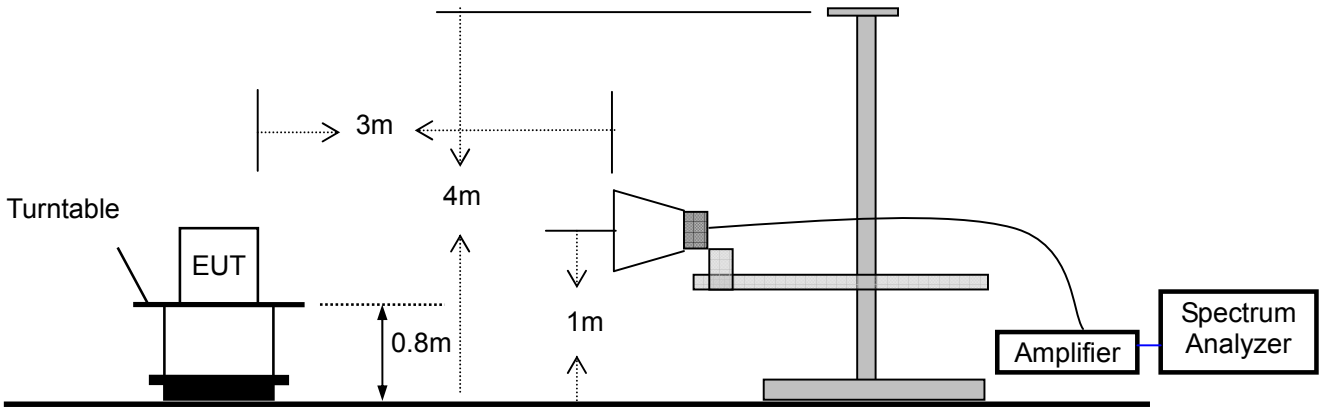
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



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



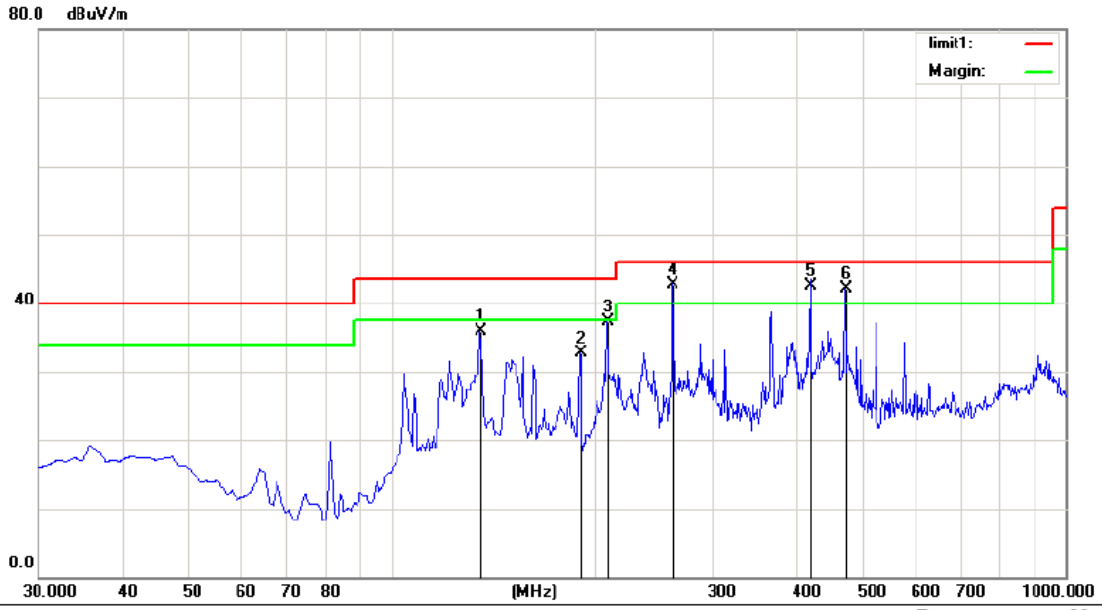
5.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSV30	1321.3008K	May 16, 2014	May 15, 2015
Spectrum Analyzer	HP	E4407B	839840481	May 16, 2014	May 15, 2015
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	May 16, 2014	May 15, 2015
Pre-Amplifier	HP	8447D	2944A07999	May 16, 2014	May 15, 2015
Bilog Antenna	Schwarzbeck	VULB9163	142	May 19, 2014	May 18, 2015
Loop Antenna	ARA	PLA-1030/B	1029	May 19, 2014	May 18, 2015
Horn Antenna	Electro-Metrics	EM-6961	103314	May 19, 2014	May 18, 2015
Horn Antenna	Schwarzbeck	BBHA 9120	D143	May 19, 2014	May 18, 2015

5.4 Measurement Result

Pass.

Please refer to the following data.



Site site #1 Polarization: ***Horizontal*** Temperature: 26

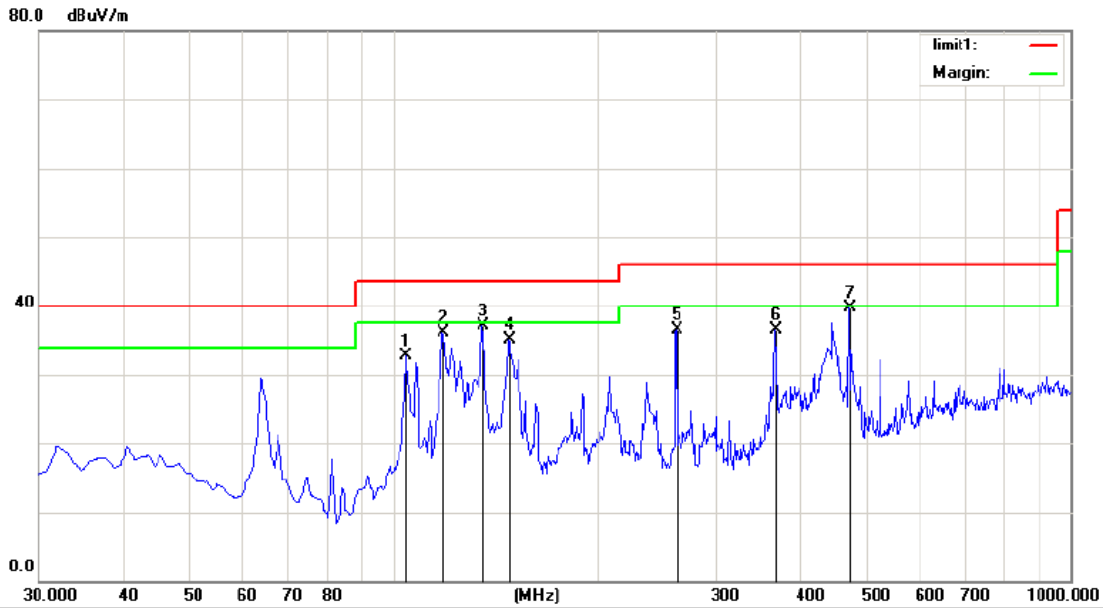
Limit: (RE)FCC PART 15 class C 3m Power: DC 12V Humidity: 55 %

Mode:TX2402

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		135.7300	52.39	-16.58	35.81	43.50	-7.69	QP		0	
2		191.0200	50.86	-18.24	32.62	43.50	-10.88	QP		0	
3		209.4500	54.46	-17.06	37.40	43.50	-6.10	QP		0	
4	*	261.8300	58.05	-15.36	42.69	46.00	-3.31	QP		0	
5	!	419.9400	53.96	-11.39	42.57	46.00	-3.43	QP		0	
6	!	472.3200	52.89	-10.71	42.18	46.00	-3.82	QP		0	

*:Maximum data x:Over limit !:over margin Operator: QIU



Site site #1 Polarization: ***Vertical*** Temperature: 26

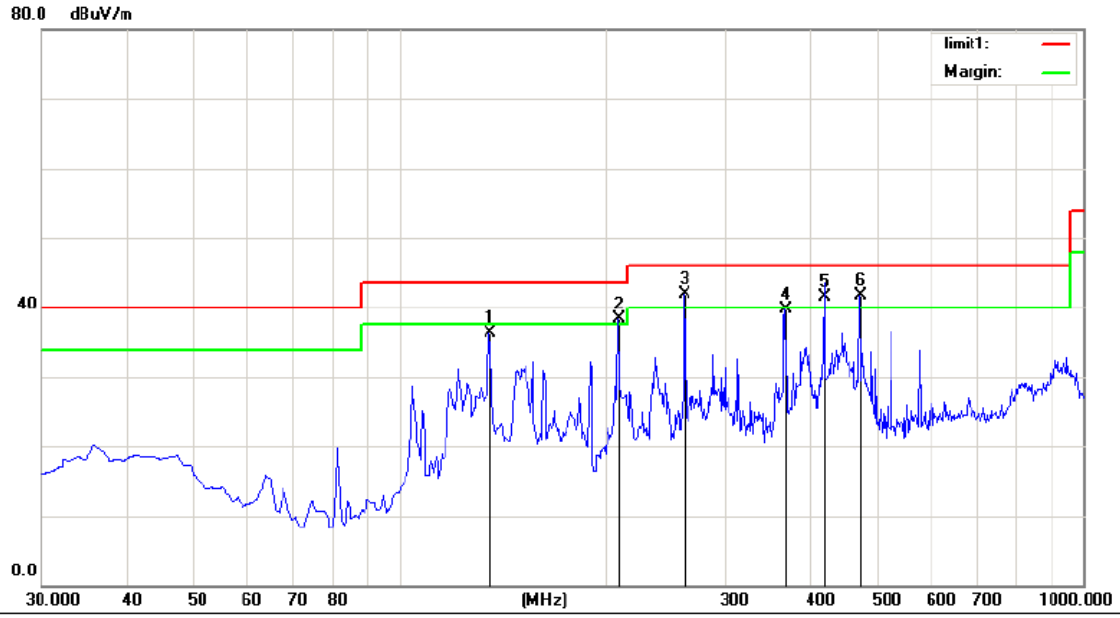
Limit: (RE)FCC PART 15 class C 3m Power: DC 12V Humidity: 55 %

Mode:TX2402

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		104.6900	50.90	-18.26	32.64	43.50	-10.86	QP		0	
2		118.2700	53.10	-17.07	36.03	43.50	-7.47	QP		0	
3		135.7300	53.62	-16.58	37.04	43.50	-6.46	QP		0	
4		148.3400	52.73	-17.63	35.10	43.50	-8.40	QP		0	
5		262.8000	51.89	-15.36	36.53	46.00	-9.47	QP		0	
6		367.5600	49.03	-12.50	36.53	46.00	-9.47	QP		0	
7	*	472.3200	50.45	-10.72	39.73	46.00	-6.27	QP		0	

*:Maximum data x:Over limit !:over margin Operator: QIU



Site site #1 Polarization: ***Horizontal*** Temperature: 26

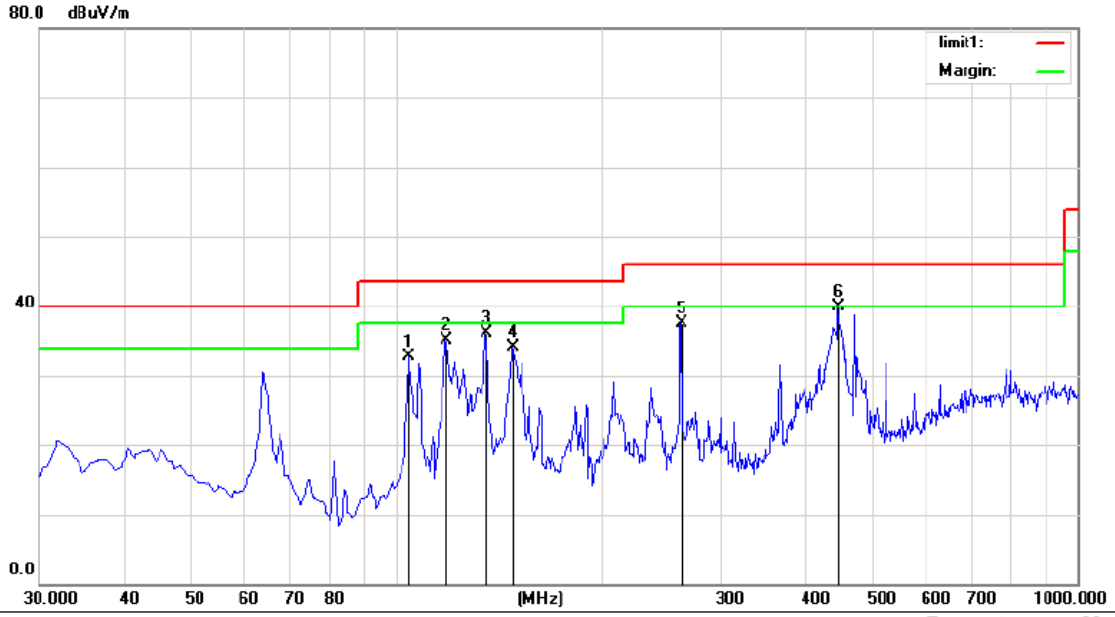
Limit: (RE)FCC PART 15 class C 3m Power: DC 12V Humidity: 55 %

Mode:TX2441

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		135.7300	52.89	-16.58	36.31	43.50	-7.19	QP		0	
2	!	209.4500	55.46	-17.06	38.40	43.50	-5.10	QP		0	
3	*	261.8300	57.25	-15.36	41.89	46.00	-4.11	QP		0	
4		367.5600	52.13	-12.50	39.63	46.00	-6.37	QP		0	
5	!	419.9400	52.96	-11.39	41.57	46.00	-4.43	QP		0	
6	!	472.3200	52.39	-10.71	41.68	46.00	-4.32	QP		0	

*:Maximum data x:Over limit !:over margin Operator: QIU



Site site #1 Polarization: ***Vertical*** Temperature: 26

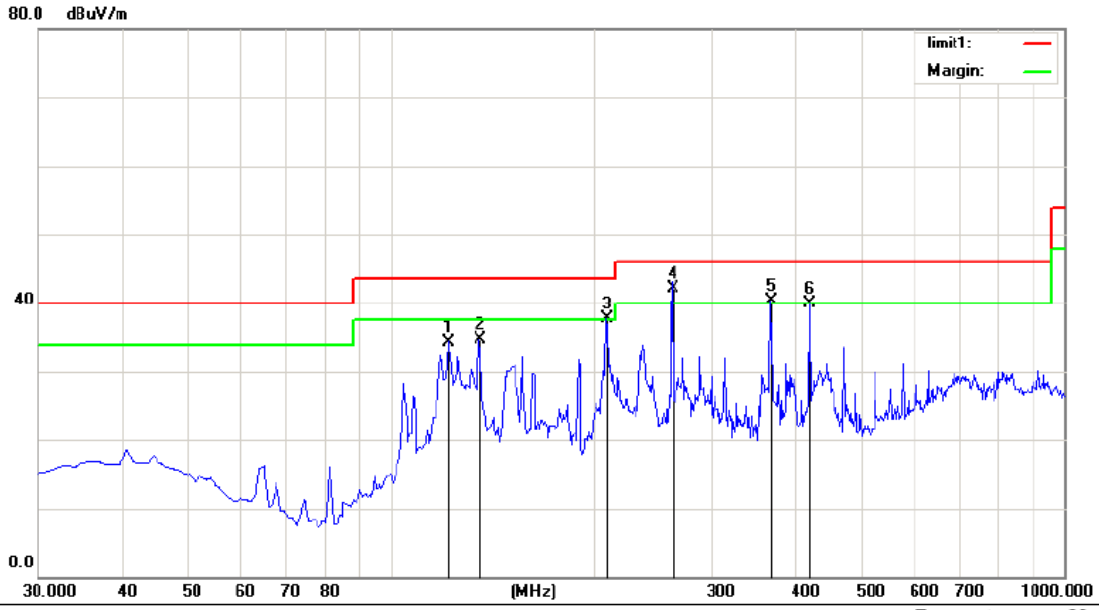
Limit: (RE)FCC PART 15 class C 3m Power: DC 12V Humidity: 55 %

Mode:TX2441

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		104.6900	50.90	-18.26	32.64	43.50	-10.86	QP		0	
2		118.2700	52.10	-17.07	35.03	43.50	-8.47	QP		0	
3		135.7300	52.62	-16.58	36.04	43.50	-7.46	QP		0	
4		148.3400	51.73	-17.63	34.10	43.50	-9.40	QP		0	
5		262.8000	52.89	-15.36	37.53	46.00	-8.47	QP		0	
6	*	446.1300	51.29	-11.29	40.00	46.00	-6.00	QP		0	

*:Maximum data x:Over limit !:over margin Operator: QIU



Site site #1 Polarization: ***Horizontal*** Temperature: 26

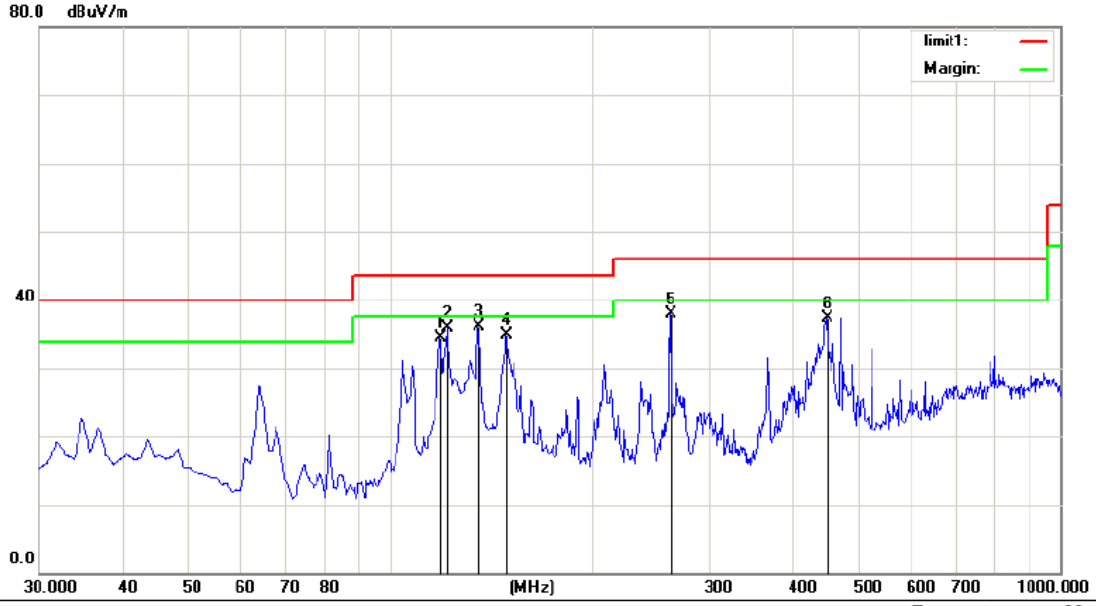
Limit: (RE)FCC PART 15 class C 3m Power: DC 12V Humidity: 55 %

Mode:TX2480

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		122.1500	51.12	-16.72	34.40	43.50	-9.10	QP		0	
2		135.7300	51.27	-16.58	34.69	43.50	-8.81	QP		0	
3	!	209.4500	54.86	-17.06	37.80	43.50	-5.70	QP		0	
4	*	262.8000	57.44	-15.36	42.08	46.00	-3.92	QP		0	
5	!	367.5600	52.88	-12.50	40.38	46.00	-5.62	QP		0	
6		419.9400	51.34	-11.39	39.95	46.00	-6.05	QP		0	

*:Maximum data x:Over limit !:over margin Operator: QIU



Site site #1 Polarization: ***Vertical*** Temperature: 26

Limit: (RE)FCC PART 15 class C 3m Power: DC 12V Humidity: 55 %

Mode:TX2480

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		119.2400	51.55	-17.01	34.54	43.50	-8.96	QP		0	
2		122.1500	52.61	-16.72	35.89	43.50	-7.61	QP		0	
3	*	135.7300	52.70	-16.58	36.12	43.50	-7.38	QP		0	
4		149.3100	52.61	-17.68	34.93	43.50	-8.57	QP		0	
5		262.8000	53.35	-15.36	37.99	46.00	-8.01	QP		0	
6		448.0700	48.59	-11.25	37.34	46.00	-8.66	QP		0	

*:Maximum data x:Over limit !:over margin Operator: QIU

Operation Mode:	TX Mode (CH1: 2402MHz)	Test Date :	September 26, 2014
Frequency Range:	1-25GHz	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %
Measured Distance:	3m	Test By:	Andy

Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV/m		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4804	V	66.23	45.22	74	54	-7.77	-8.78
7206	V	65.18	44.13	74	54	-8.82	-9.87
9608	V	64.05	43.32	74	54	-9.95	-10.68
12010	V	63.95	42.17	74	54	-10.05	-11.83
14412	V	62.17	41.09	74	54	-11.83	-12.91
16814	V	61.07	40.33	74	54	-12.93	-13.67
4804	H	65.95	46.62	74	54	-8.05	-7.38
7206	H	64.03	45.85	74	54	-9.97	-8.15
9608	H	63.85	44.13	74	54	-10.15	-9.87
12010	H	62.75	43.62	74	54	-11.25	-10.38
14412	H	61.07	42.58	74	54	-12.93	-11.42
16814	H	60.88	41.07	74	54	-13.12	-12.93

Other harmonics emissions are lower than 20dB below the allowable limit.

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss.
(3) The average measurement was not performed when the peak measured data under the limit of average detection.
(4) The results of worst cased was recorded.

Operation Mode:	TX Mode (CH40: 2441MHz)	Test Date :	September 26, 2014
Frequency Range:	1-25GHz	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %
Measured Distance:	3m	Test By:	Andy

Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV/m		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4882	V	65.33	46.29	74	54	-8.67	-7.71
7323	V	64.22	45.95	74	54	-9.78	-8.05
9764	V	63.28	44.13	74	54	-10.72	-9.87
12205	V	62.39	43.72	74	54	-11.61	-10.28
14646	V	61.09	42.68	74	54	-12.91	-11.32
17087	V	60.85	41.63	74	54	-13.15	-12.37
4882	H	66.39	45.82	74	54	-7.61	-8.18
7323	H	65.79	44.19	74	54	-8.21	-9.81
9764	H	64.13	43.68	74	54	-9.87	-10.32
12205	H	63.38	42.95	74	54	-10.62	-11.05
14646	H	62.19	41.07	74	54	-11.81	-12.93
17087	H	61.49	40.72	74	54	-12.51	-13.28

Other harmonics emissions are lower than 20dB below the allowable limit.

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss.
(3) The average measurement was not performed when the peak measured data under the limit of average detection.
(4) The results of worst cased was recorded.

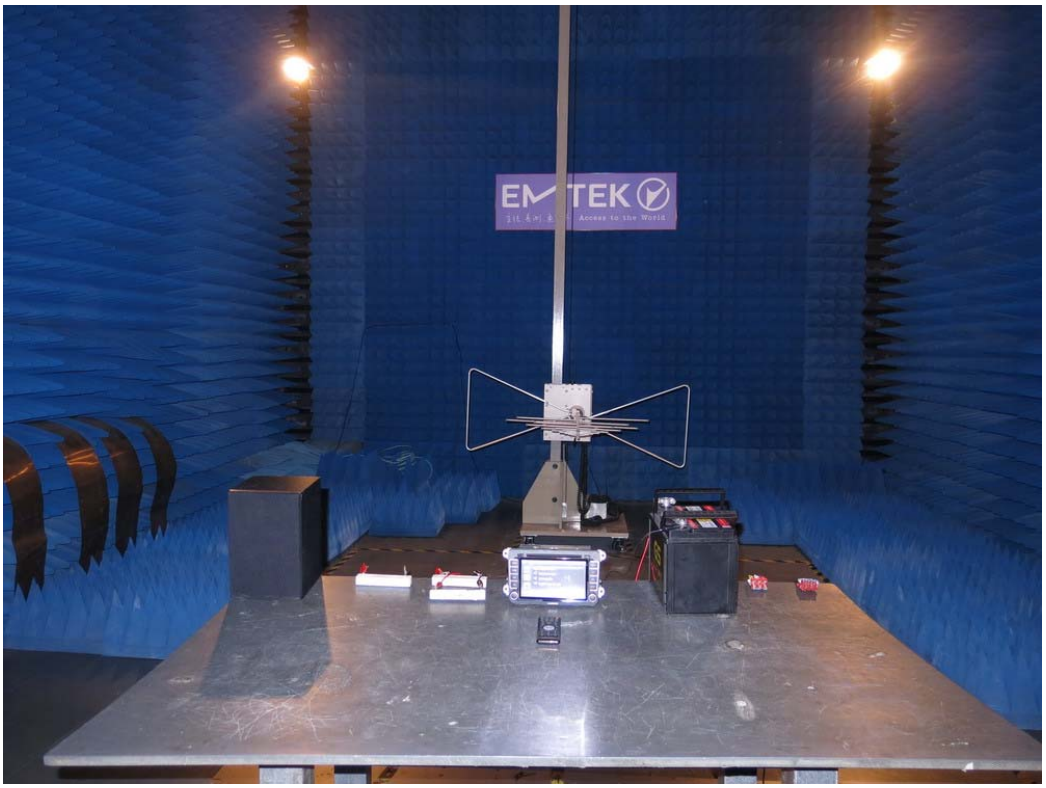
Operation Mode:	TX Mode (CH79: 2480MHz)	Test Date :	September 26, 2014
Frequency Range:	1-25GHz	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %
Measured Distance:	3m	Test By:	Andy

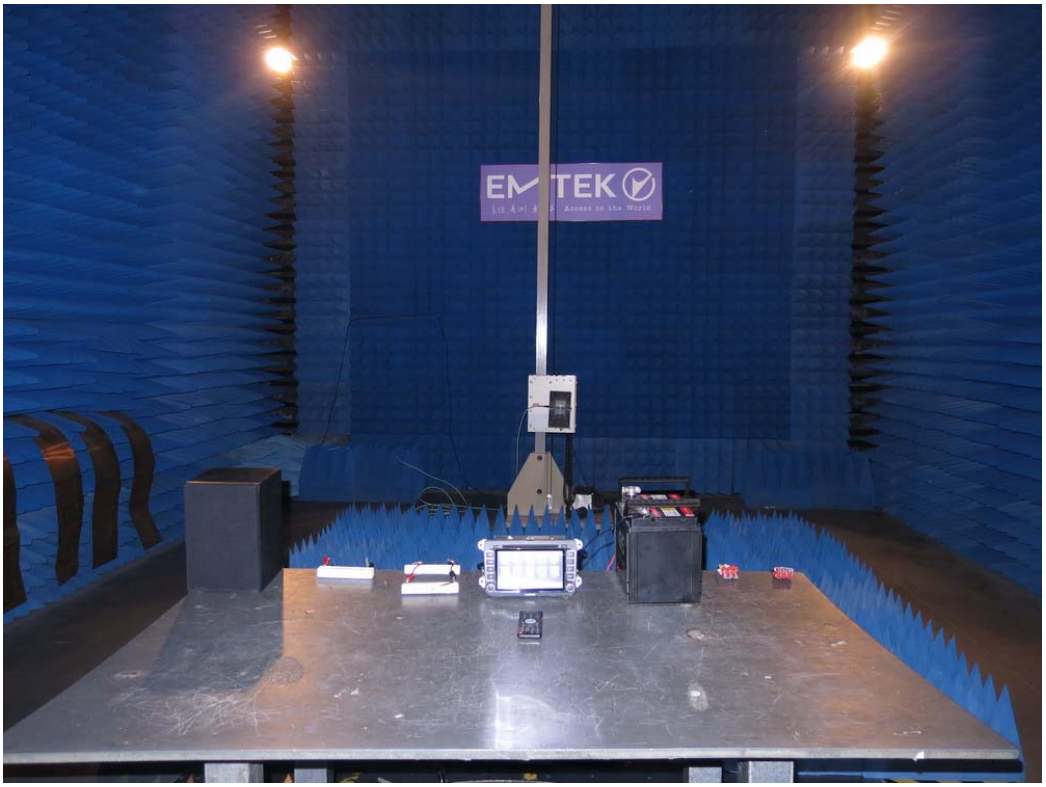
Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV/m		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4960	V	64.00	45.33	74	54	-10	-8.67
7440	V	63.23	44.28	74	54	-10.77	-9.72
9920	V	62.17	43.59	74	54	-11.83	-10.41
12400	V	61.71	42.13	74	54	-12.29	-11.87
14880	V	60.22	41.07	74	54	-13.78	-12.93
17360	V	59.72	40.59	74	54	-14.28	-13.41
4960	H	65.33	46.25	74	54	-8.67	-7.75
7440	H	64.08	45.72	74	54	-9.92	-8.28
9920	H	63.17	44.19	74	54	-10.83	-9.81
12400	H	62.53	43.59	74	54	-11.47	-10.41
14880	H	61.02	42.07	74	54	-12.98	-11.93
17360	H	60.39	41.29	74	54	-13.61	-12.71

Other harmonics emissions are lower than 20dB below the allowable limit.

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss.
(3) The average measurement was not performed when the peak measured data under the limit of average detection.
(4) The results of worst cased was recorded.

5.5 Radiated Measurement Photos:



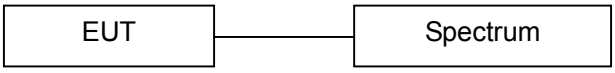


6. Channel Separation test

6.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

6.2 Test SET-UP (Block Diagram of Configuration)



6.3 Measurement Equipment Used:

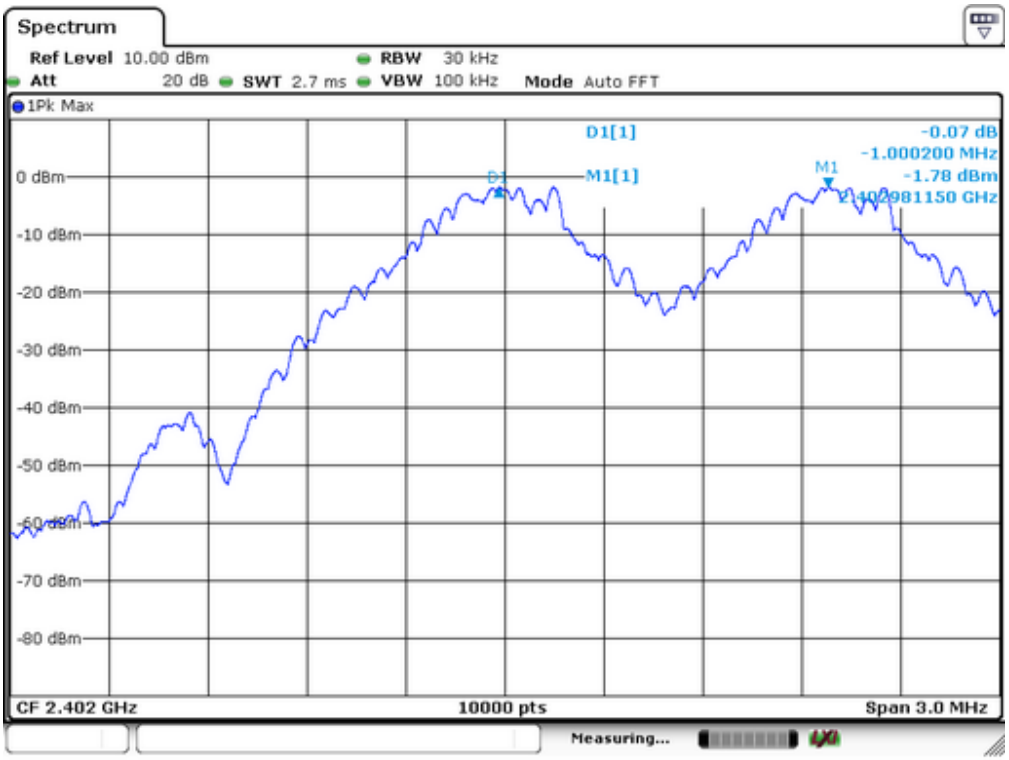
Same as 5.3 Radiated Emission Measurement.

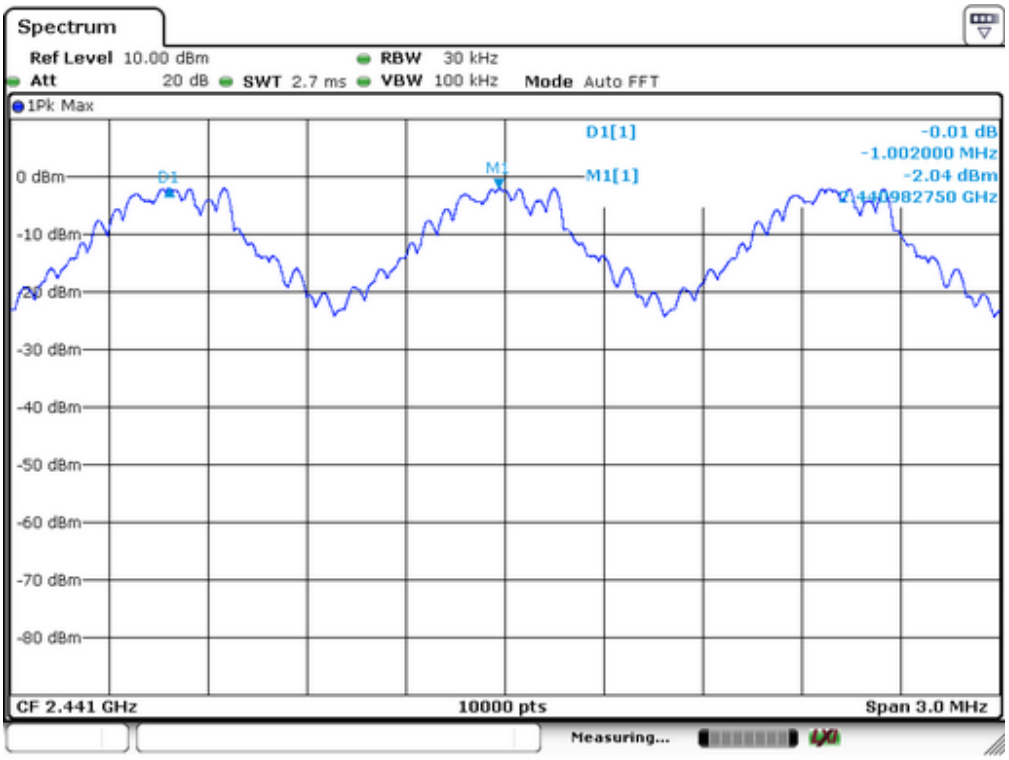
6.4 Measurement Results:

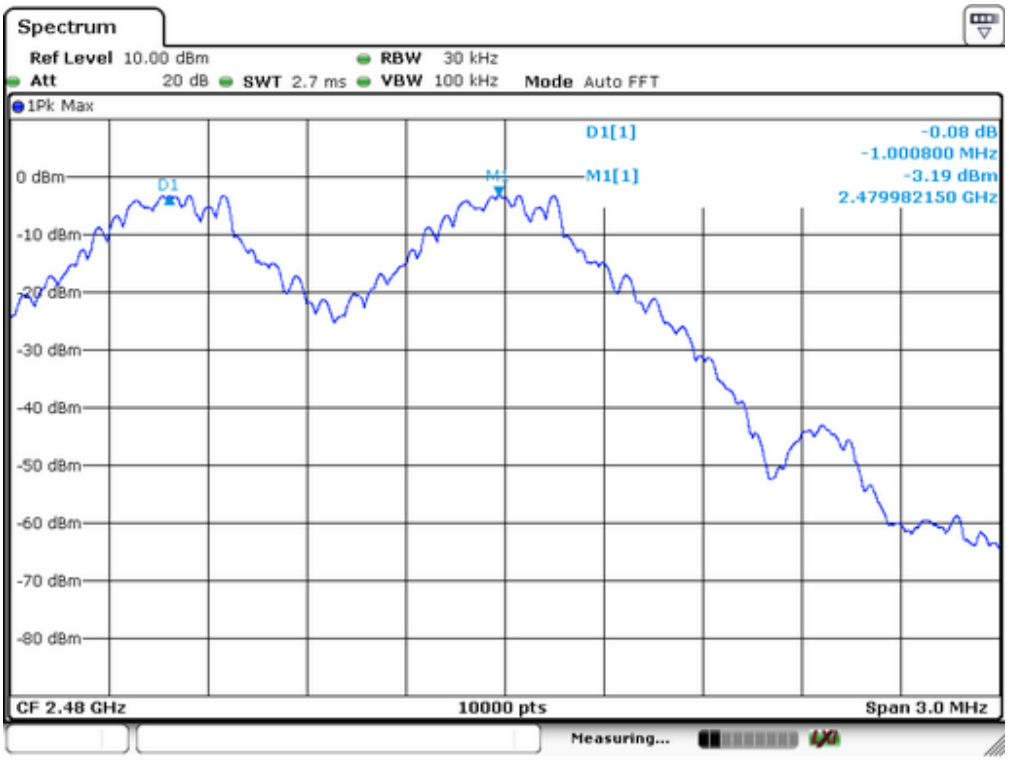
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	September 28, 2014
Test By:	Andy	Temperature :	24℃
Test Result:	PASS	Humidity :	53 %
Modulation:	GFSK		

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 20dB Down BW(kHz)
1	2402	1000	>907
40	2441	1002	>911
79	2480	1000	>955

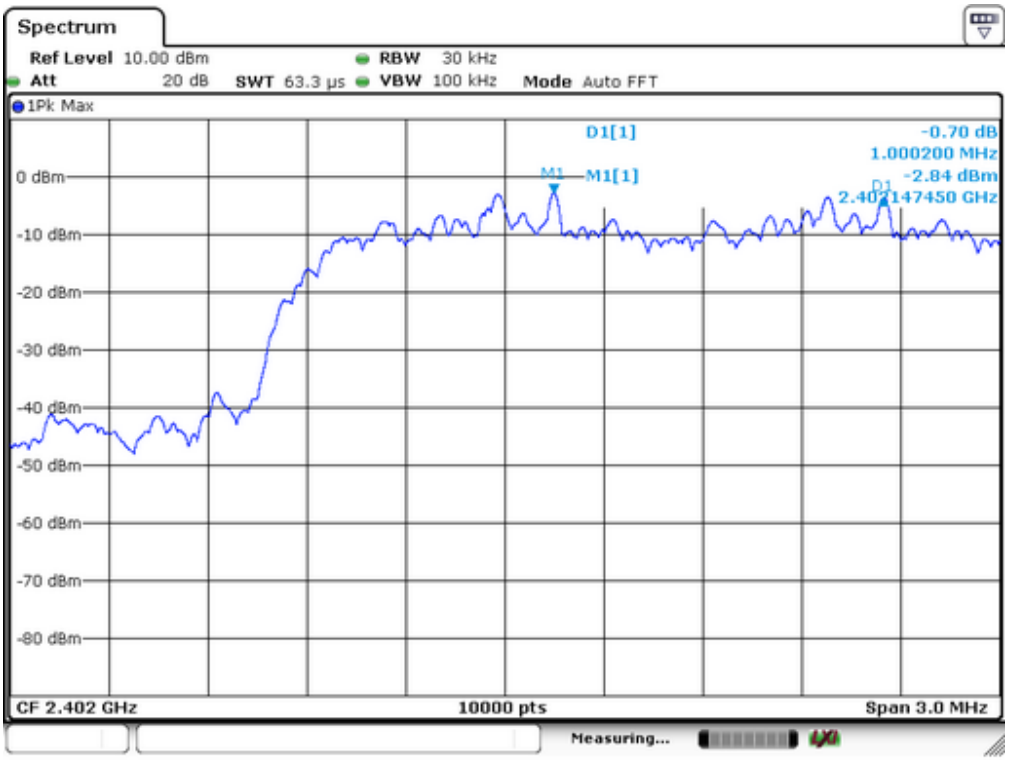

Spectrum
Ref Level 10.00 dBm
RBW 30 kHz
Att 20 dB
SWT 2.7 ms
VBW 100 kHz
Mode Auto FFT
1Pk Max
D1[1]
-0.07 dB
-1.000200 MHz
M1[1]
-1.78 dBm
2.400981150 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.402 GHz
10000 pts
Span 3.0 MHz
Measuring...

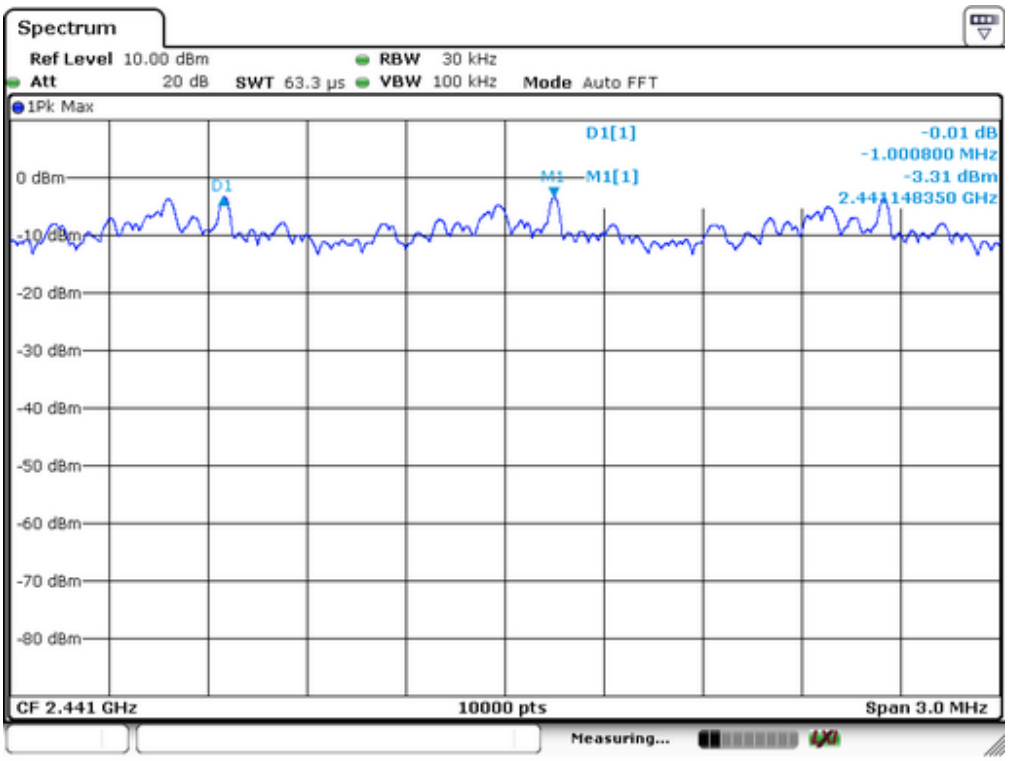

Spectrum
Ref Level 10.00 dBm
RBW 30 kHz
Att 20 dB
SWT 2.7 ms
VBW 100 kHz
Mode Auto FFT
1Pk Max
D1[1]
-0.01 dB
-1.002000 MHz
M1[1]
-2.04 dBm
2.440982750 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
10000 pts
Span 3.0 MHz
Measuring...

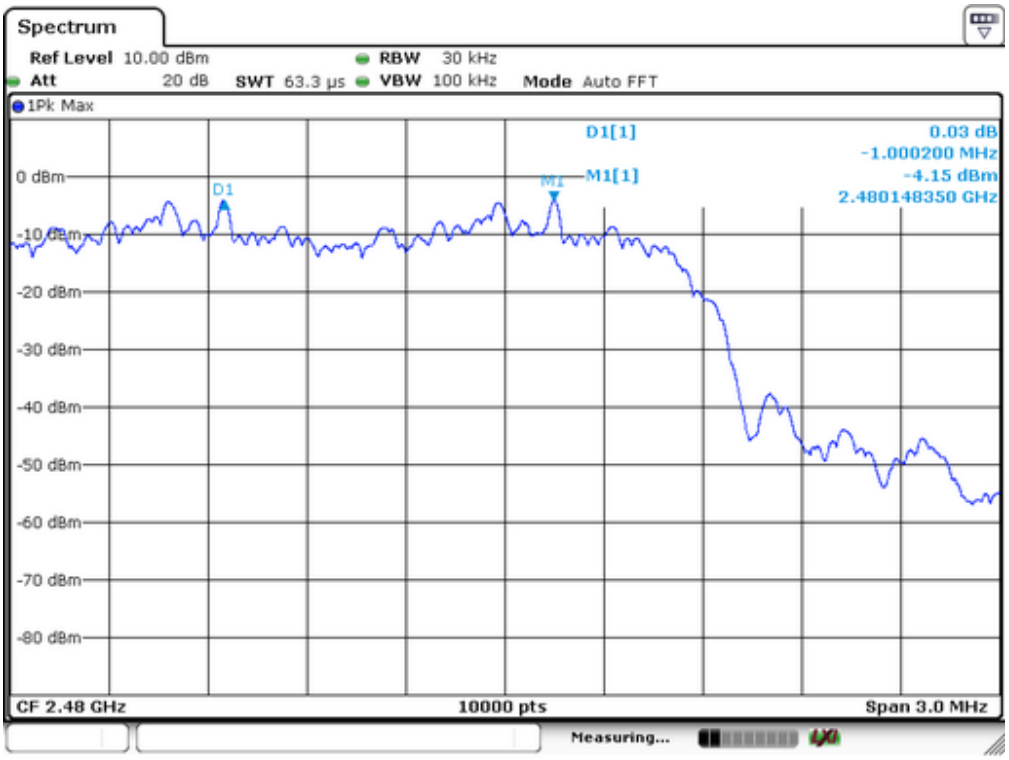


Spectrum Detector:	PK	Test Date :	September 28, 2014
Test By:	Andy	Temperature :	24℃
Test Result:	PASS	Humidity :	53 %
Modulation:	1/4Π-DQPSK		

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
1	2402	1000	>889
40	2441	1000	>888
79	2480	1000	>890

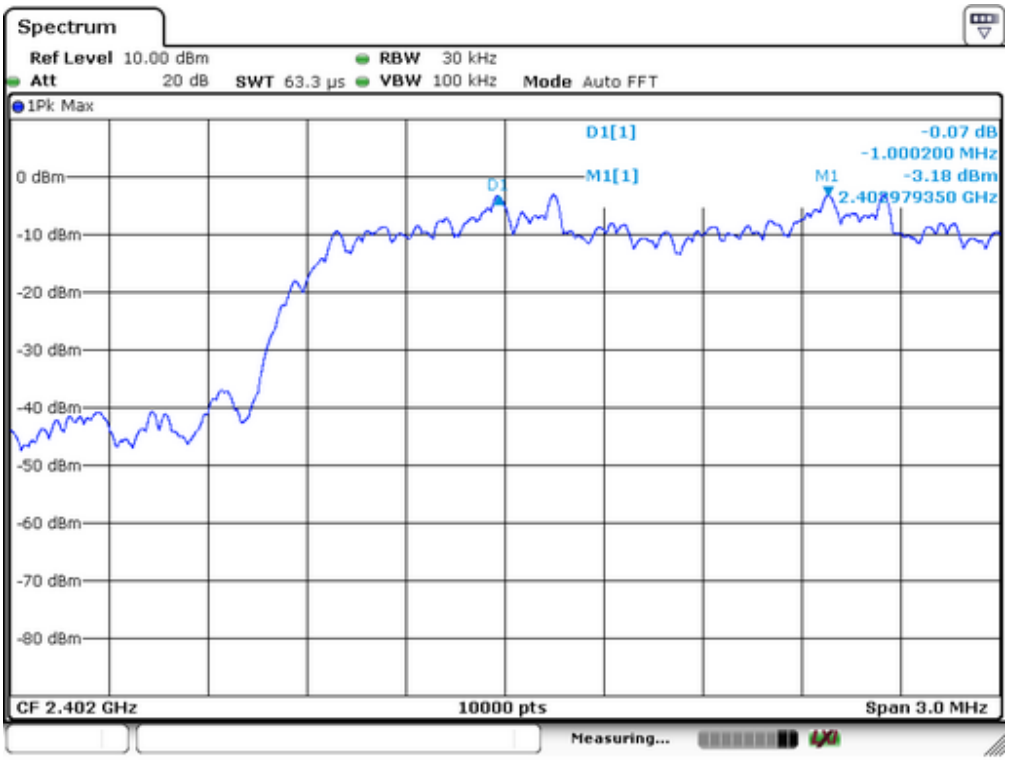

Spectrum
Ref Level 10.00 dBm
RBW 30 kHz
Att 20 dB
SWT 63.3 µs
VBW 100 kHz
Mode Auto FFT
1Pk Max
D1[1]
-0.70 dB
1.000200 MHz
M1[1]
-2.84 dBm
2.402147450 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.402 GHz
10000 pts
Span 3.0 MHz
Measuring...

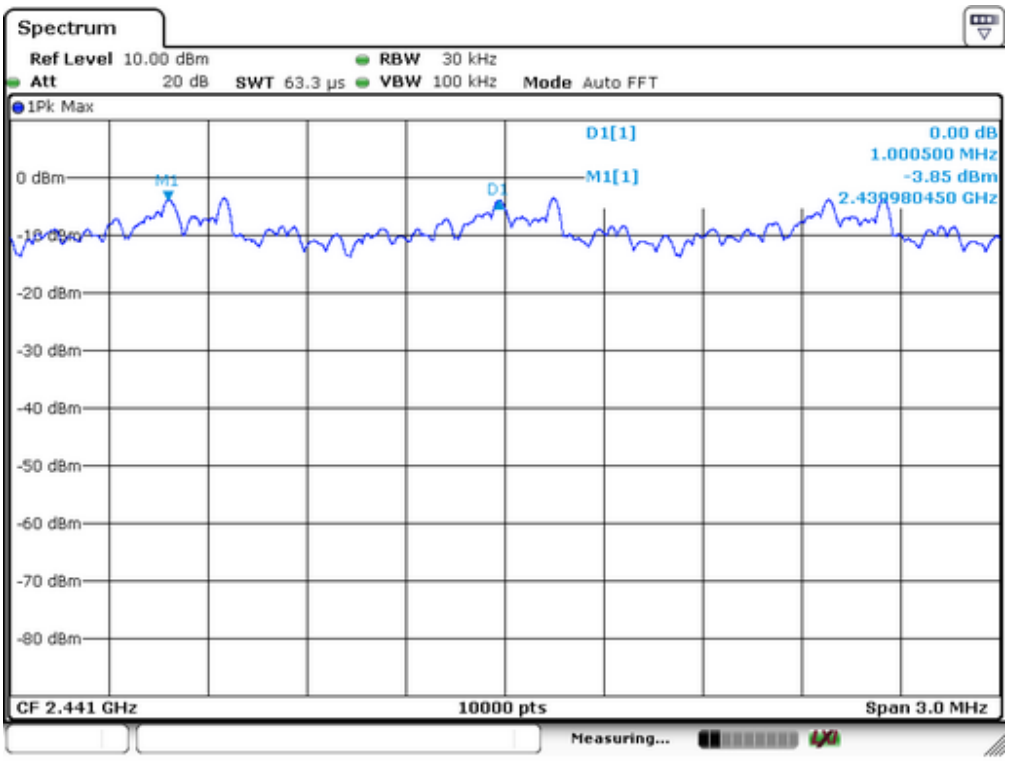

Spectrum
Ref Level 10.00 dBm
RBW 30 kHz
Att 20 dB
SWT 63.3 µs
VBW 100 kHz
Mode Auto FFT
1Pk Max
D1[1]
-0.01 dB
-1.000800 MHz
M1[1]
-3.31 dBm
2.441148350 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
10000 pts
Span 3.0 MHz
Measuring...

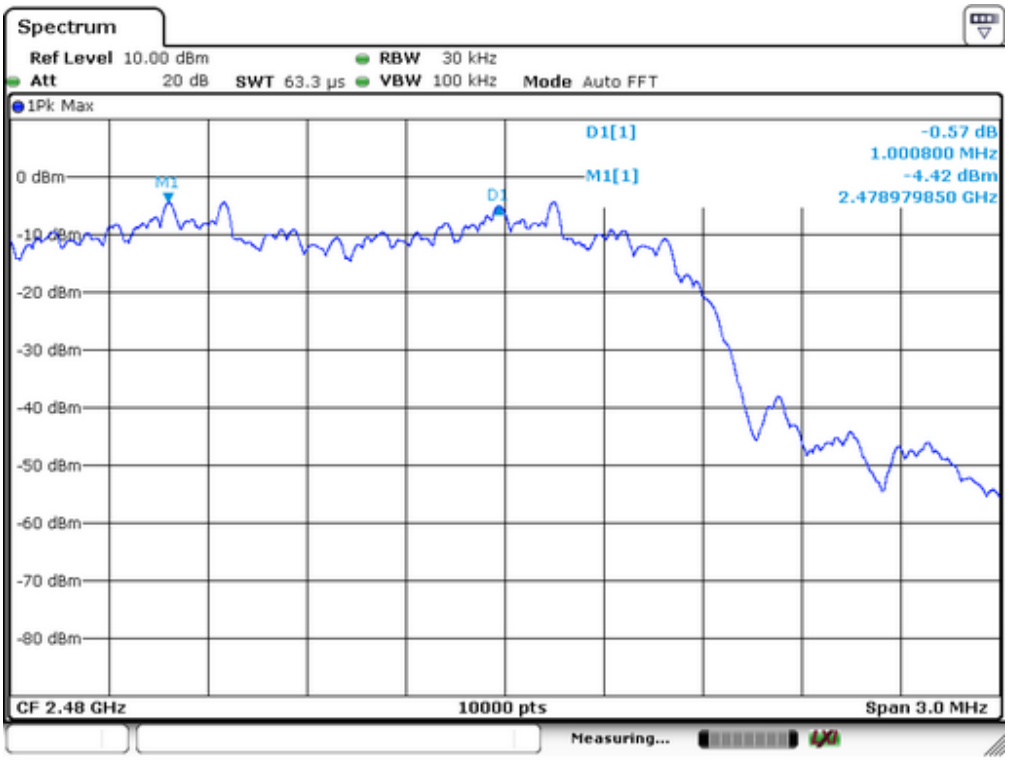


Spectrum Detector:	PK	Test Date :	September 28, 2014
Test By:	Andy	Temperature :	24℃
Test Result:	PASS	Humidity :	53 %
Modulation:	8DPSK		

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
1	2402	1000	>888
40	2441	1000	>886
79	2480	1000	>888


Spectrum
Ref Level 10.00 dBm
RBW 30 kHz
Att 20 dB
SWT 63.3 µs
VBW 100 kHz
Mode Auto FFT
1Pk Max
D1[1]
-0.07 dB
-1.000200 MHz
M1[1]
-3.18 dBm
2.402979350 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.402 GHz
10000 pts
Span 3.0 MHz
Measuring...


Spectrum
Ref Level 10.00 dBm
RBW 30 kHz
Att 20 dB
SWT 63.3 µs
VBW 100 kHz
Mode Auto FFT
1Pk Max
D1[1]
0.00 dB
1.000500 MHz
M1[1]
-3.85 dBm
2.439980450 GHz
0 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
10000 pts
Span 3.0 MHz
Measuring...


Spectrum
Ref Level 10.00 dBm
RBW 30 kHz
Att 20 dB
SWT 63.3 µs
VBW 100 kHz
Mode Auto FFT
1Pk Max
D1[1]
-0.57 dB
1.000800 MHz
M1[1]
-4.42 dBm
2.478979850 GHz
M1
D1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.48 GHz
10000 pts
Span 3.0 MHz
Measuring...

7. 20dB Bandwidth test

7.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

7.2 Test SET-UP (Block Diagram of Configuration)

EUT —— Spectrum

7.3 Measurement Equipment Used:

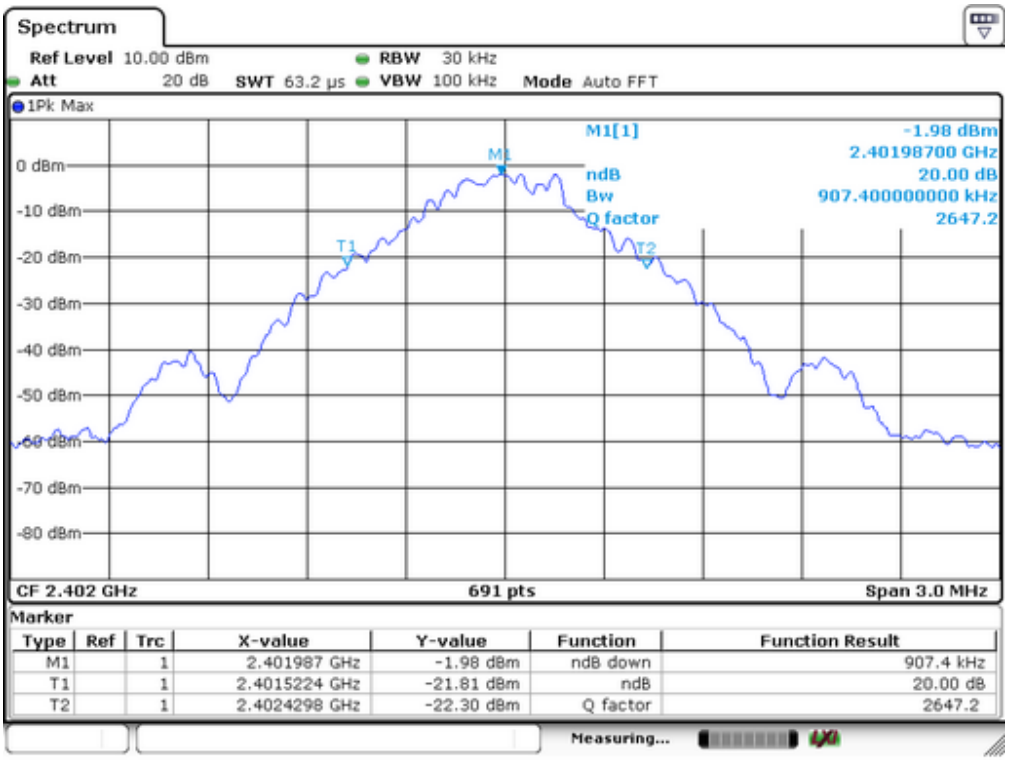
Same as 5.3 Radiated Emission Measurement.

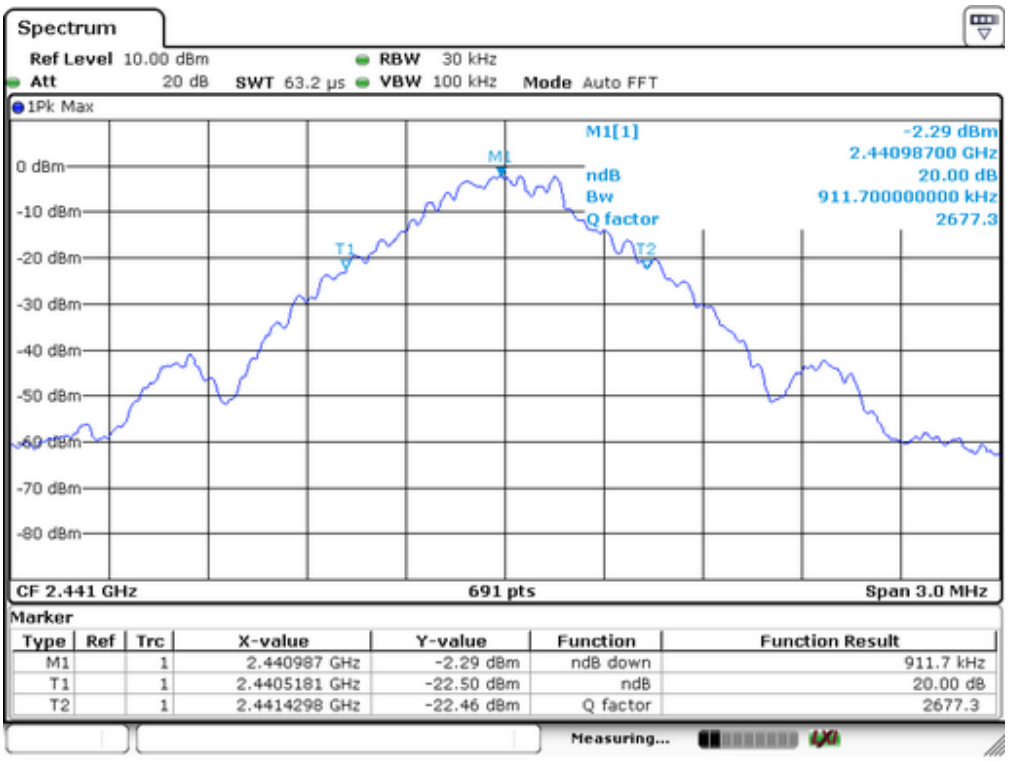
7.4 Measurement Results:

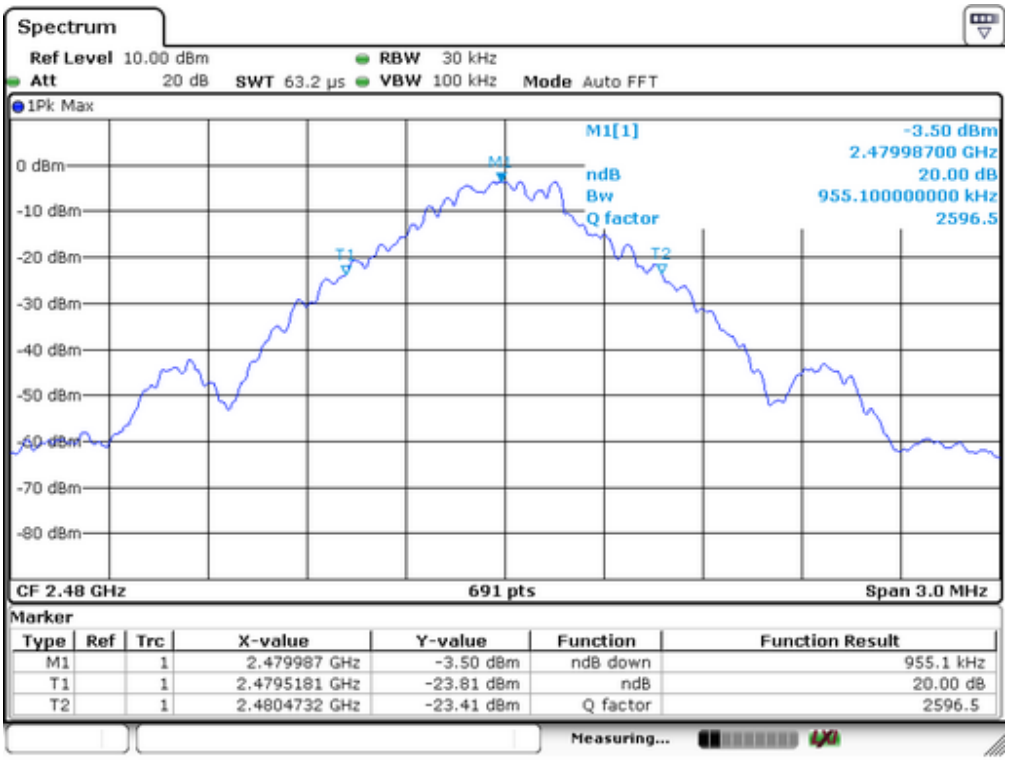
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	September 28, 2014
Test By:	Andy	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %
Modulation:	GFSK		

Channel number	Channel frequency (MHz)	20dB Down BW(KHz)
1	2402	907
40	2441	911
79	2480	955

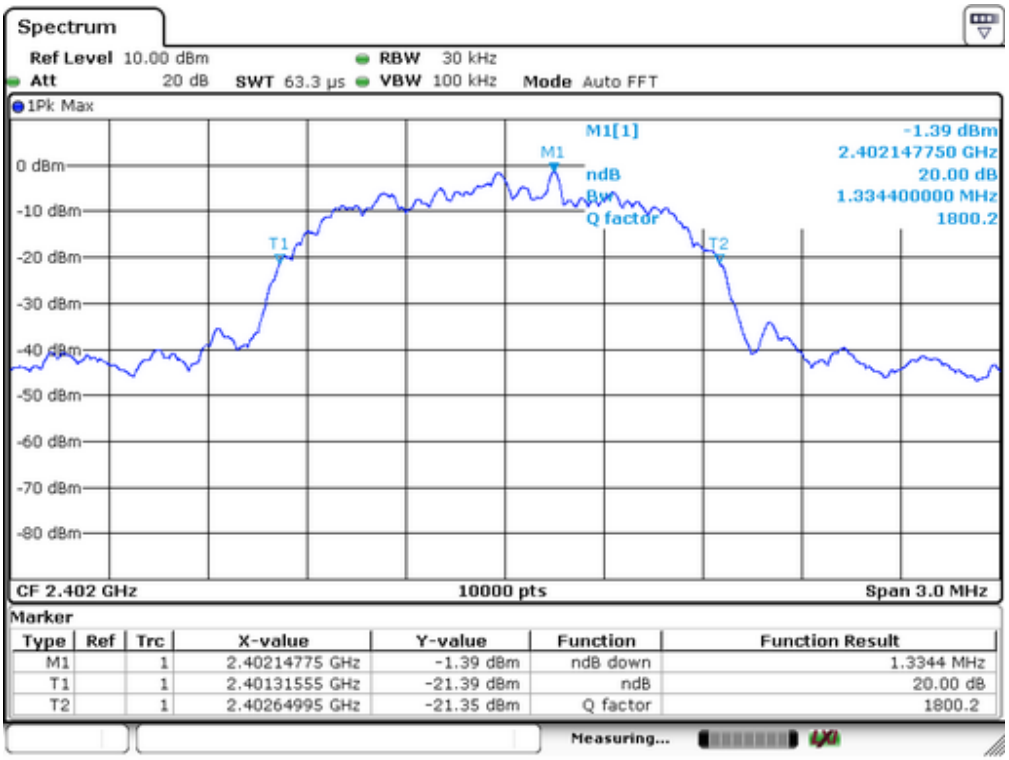

Spectrum
Ref Level 10.00 dBm
RBW 30 kHz
Att 20 dB
SWT 63.2 µs
VBW 100 kHz
Mode Auto FFT
1Pk Max
M1[1]
-1.98 dBm
2.40198700 GHz
ndB
20.00 dB
Bw
907.400000000 kHz
Q factor
2647.2
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.402 GHz
691 pts
Span 3.0 MHz
Marker
Type | Ref | Trc | X-value | Y-value | Function | Function Result
M1 | | 1 | 2.401987 GHz | -1.98 dBm | ndB down | 907.4 kHz
T1 | | 1 | 2.4015224 GHz | -21.81 dBm | ndB | 20.00 dB
T2 | | 1 | 2.4024298 GHz | -22.30 dBm | Q factor | 2647.2
Measuring...

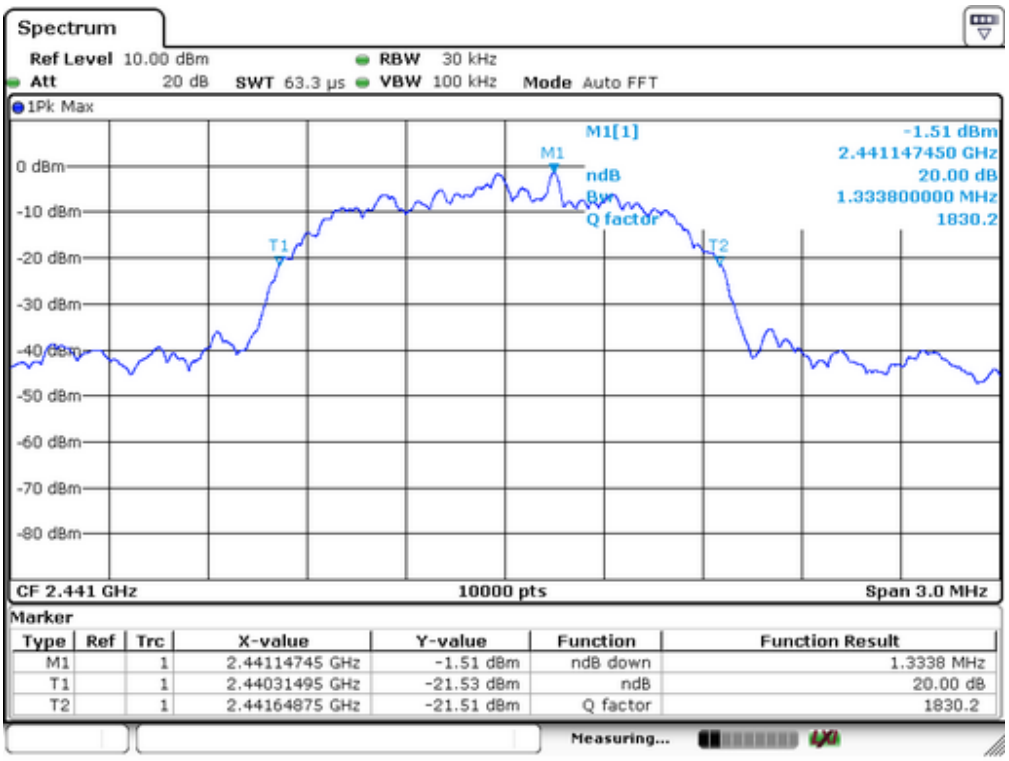

Spectrum
Ref Level 10.00 dBm
RBW 30 kHz
Att 20 dB
SWT 63.2 µs
VBW 100 kHz
Mode Auto FFT
1Pk Max
M1[1]
-2.29 dBm
2.44098700 GHz
ndB
20.00 dB
Bw
911.700000000 kHz
Q factor
2677.3
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
691 pts
Span 3.0 MHz
Marker
Type | Ref | Trc | X-value | Y-value | Function | Function Result
M1 | | 1 | 2.440987 GHz | -2.29 dBm | ndB down | 911.7 kHz
T1 | | 1 | 2.4405181 GHz | -22.50 dBm | ndB | 20.00 dB
T2 | | 1 | 2.4414298 GHz | -22.46 dBm | Q factor | 2677.3
Measuring...

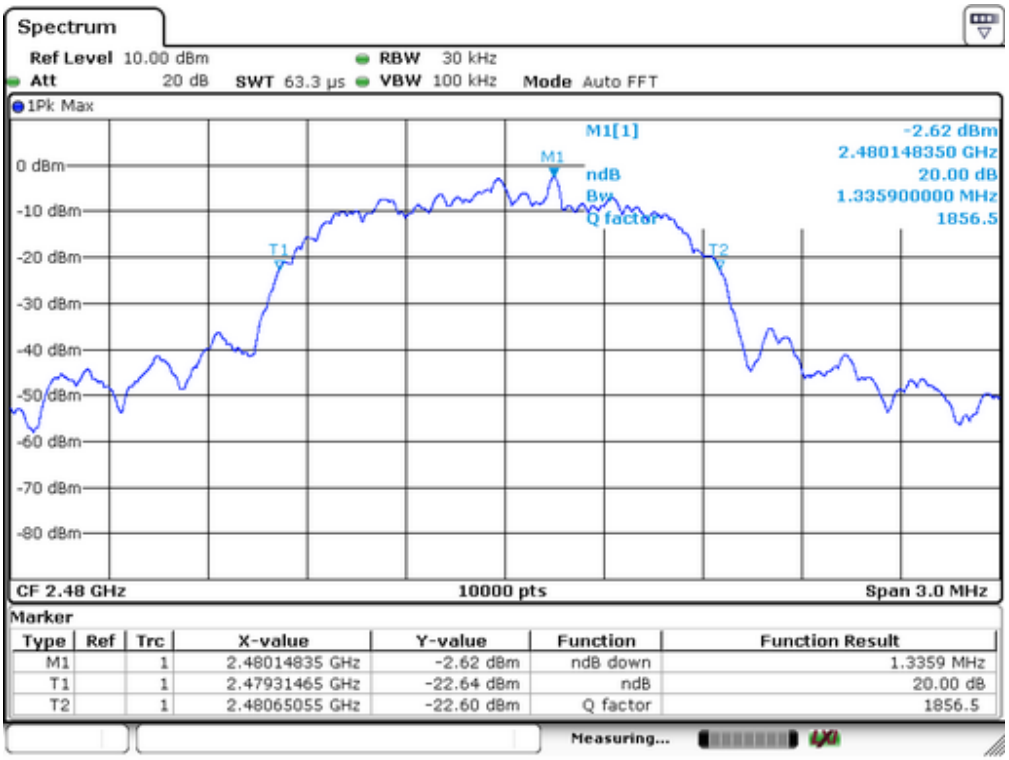


Spectrum Detector:	PK	Test Date :	September 28, 2014
Test By:	Andy	Temperature :	24℃
Test Result:	PASS	Humidity :	53 %
Modulation:	Π/4-DQPSK		

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
1	2402	1334
40	2441	1333
79	2480	1335

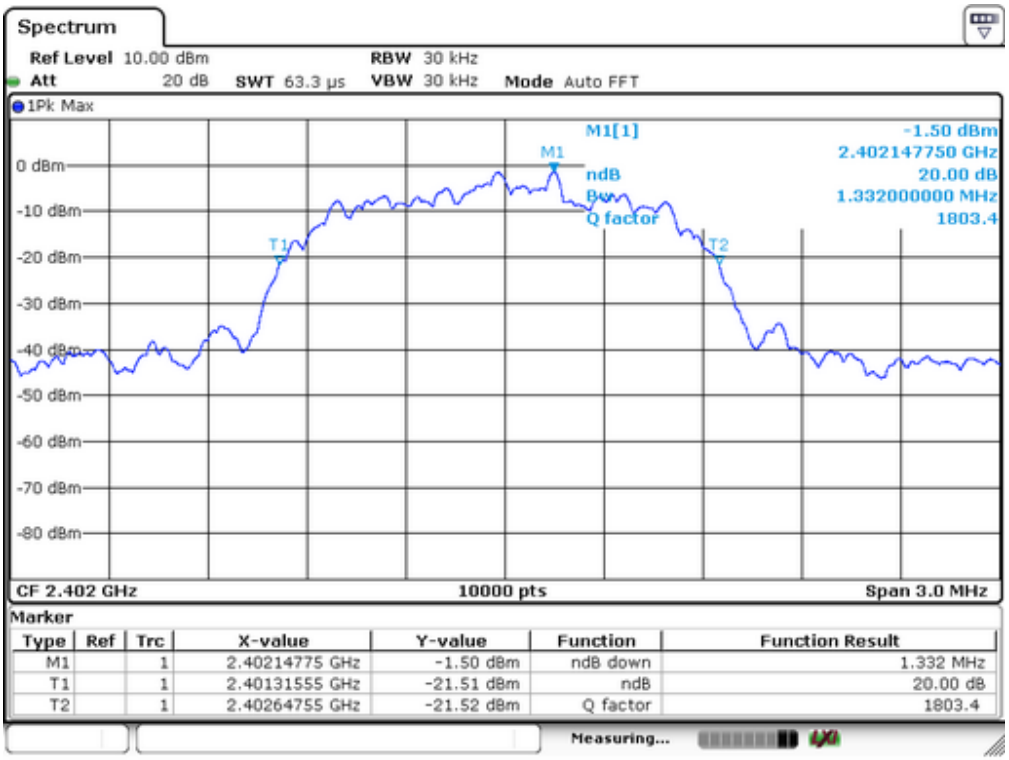

Spectrum
Ref Level 10.00 dBm
RBW 30 kHz
Att 20 dB
SWT 63.3 µs
VBW 100 kHz
Mode Auto FFT
1Pk Max
M1[1]
-1.39 dBm
2.402147750 GHz
ndB 20.00 dB
Bw 1.334400000 MHz
Q factor 1800.2
M1
T1
T2
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.402 GHz
10000 pts
Span 3.0 MHz
Marker
Type | Ref | Trc | X-value | Y-value | Function | Function Result
M1 | | 1 | 2.40214775 GHz | -1.39 dBm | ndB down | 1.3344 MHz
T1 | | 1 | 2.40131555 GHz | -21.39 dBm | ndB | 20.00 dB
T2 | | 1 | 2.40264995 GHz | -21.35 dBm | Q factor | 1800.2
Measuring...

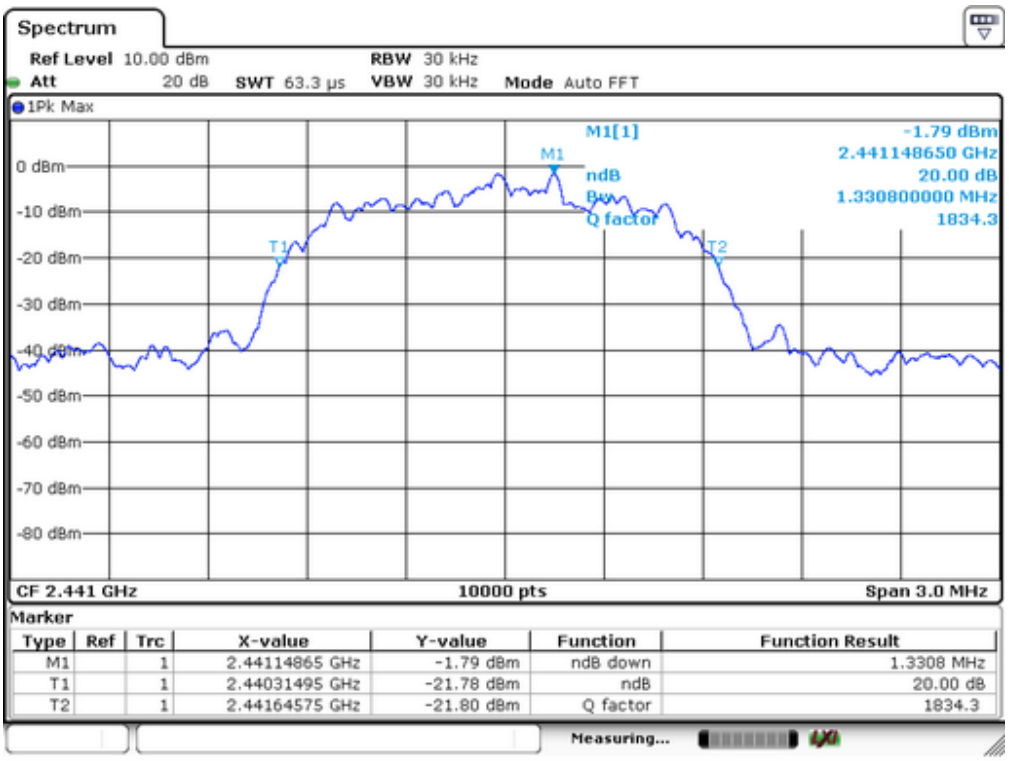

Spectrum
Ref Level 10.00 dBm
RBW 30 kHz
Att 20 dB
SWT 63.3 µs
VBW 100 kHz
Mode Auto FFT
1Pk Max
M1[1]
-1.51 dBm
2.441147450 GHz
ndB 20.00 dB
Bw 1.333800000 MHz
Q factor 1830.2
M1
T1
T2
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
10000 pts
Span 3.0 MHz
Marker
Type | Ref | Trc | X-value | Y-value | Function | Function Result
M1 | | 1 | 2.44114745 GHz | -1.51 dBm | ndB down | 1.3338 MHz
T1 | | 1 | 2.44031495 GHz | -21.53 dBm | ndB | 20.00 dB
T2 | | 1 | 2.44164875 GHz | -21.51 dBm | Q factor | 1830.2
Measuring...

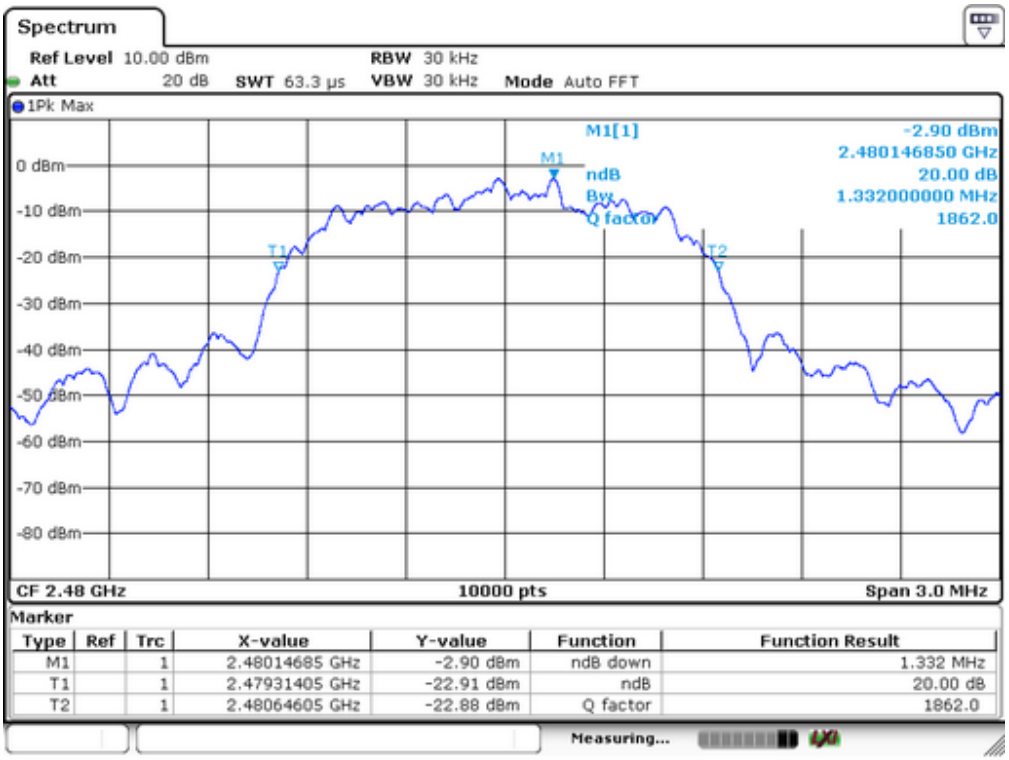


Spectrum Detector:	PK	Test Date :	September 28, 2014
Test By:	Andy	Temperature :	24℃
Test Result:	PASS	Humidity :	53 %
Modulation:	8DPSK		

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
1	2402	1332
40	2441	1330
79	2480	1332


Spectrum
Ref Level 10.00 dBm RBW 30 kHz
Att 20 dB SWT 63.3 µs VBW 30 kHz Mode Auto FFT
1Pk Max
M1[1] -1.50 dBm
2.402147750 GHz
ndB 20.00 dB
Bw 1.332000000 MHz
Q factor 1803.4
M1
T1
T2
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.402 GHz
10000 pts
Span 3.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.40214775 GHz -1.50 dBm ndB down 1.332 MHz
T1 1 2.40131555 GHz -21.51 dBm ndB 20.00 dB
T2 1 2.40264755 GHz -21.52 dBm Q factor 1803.4
Measuring...


Spectrum
Ref Level 10.00 dBm RBW 30 kHz
Att 20 dB SWT 63.3 µs VBW 30 kHz Mode Auto FFT
1Pk Max
M1[1] -1.79 dBm
2.441148650 GHz
ndB 20.00 dB
Bw 1.330800000 MHz
Q factor 1834.3
M1
T1
T2
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
10000 pts
Span 3.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.44114865 GHz -1.79 dBm ndB down 1.3308 MHz
T1 1 2.44031495 GHz -21.78 dBm ndB 20.00 dB
T2 1 2.44164575 GHz -21.80 dBm Q factor 1834.3
Measuring...


Spectrum
Ref Level 10.00 dBm
RBW 30 kHz
Att 20 dB
SWT 63.3 µs
VBW 30 kHz
Mode Auto FFT
1Pk Max
M1[1]
-2.90 dBm
2.480146850 GHz
ndB 20.00 dB
Bw 1.332000000 MHz
Q factor 1862.0
M1
T1
T2
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.48 GHz
10000 pts
Span 3.0 MHz
Marker
Type | Ref | Trc | X-value | Y-value | Function | Function Result
M1 | | 1 | 2.48014685 GHz | -2.90 dBm | ndB down | 1.332 MHz
T1 | | 1 | 2.47931405 GHz | -22.91 dBm | ndB | 20.00 dB
T2 | | 1 | 2.48064605 GHz | -22.88 dBm | Q factor | 1862.0
Measuring...

8. Quantity of Hopping Channel Test

8.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

8.2 Test SET-UP (Block Diagram of Configuration)

8.3 Measurement Equipment Used:

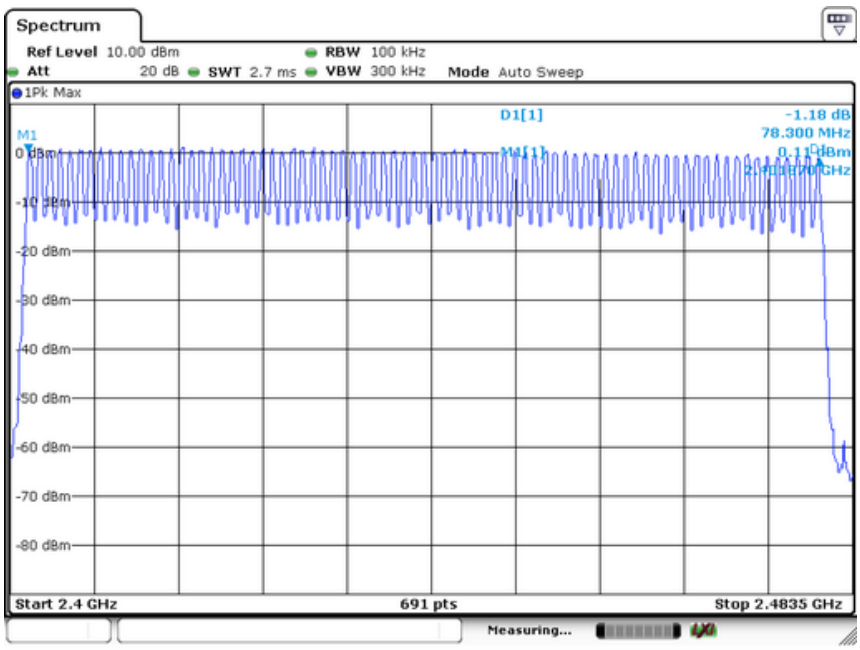
Same as 5.3 Radiated Emission Measurement.

8.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	September 26, 2014
Test By:	Andy	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %

Hopping Channel Frequency Range	Quantity of Hopping Channel	Quantity of Hopping Channel
2402-2480	79	＞15



9. Time of Occupancy (Dwell Time) test

9.1 Test Description

The Equipment Under Test (EUT) was set up to perform the dwell time measurements. The EUT was connected to the spectrum analyzer via a short coax cable. The dwell time is calculated by:

Dwell time = time slot length * hop rate / number of hopping channels * 31.6s

with:
- hop rate = 1600/2 * 1/s for DH1 packets = 1600 s^{-1}
- hop rate = 1600/4 * 1/s for DH3 packets = 533.33 s^{-1}
- hop rate = 1600/6 * 1/s for DH5 packets = 320 s^{-1}
- number of hopping channels = 79
- 31.6 s = 0.4 seconds multiplied by the number of hopping channels = 0.4 s * 79

The highest value of the dwell time is reported.

9.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (a) (1) (iii)

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 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. Since the Bluetooth technology uses 79 channels this period is calculated to be 31.6seconds.Refer to attached data chart.

9.3 Test Protocol

Packet type	Time slot length(ms)	Dwell time	Dwell time(ms)
DH1	0.388	time slot length *1600/2 /79 * 31.6	124.16
DH3	1.645	time slot length *1600/4 /79 * 31.6	263.20
DH5	2.893	time slot length *1600/6 /79 * 31.6	308.59

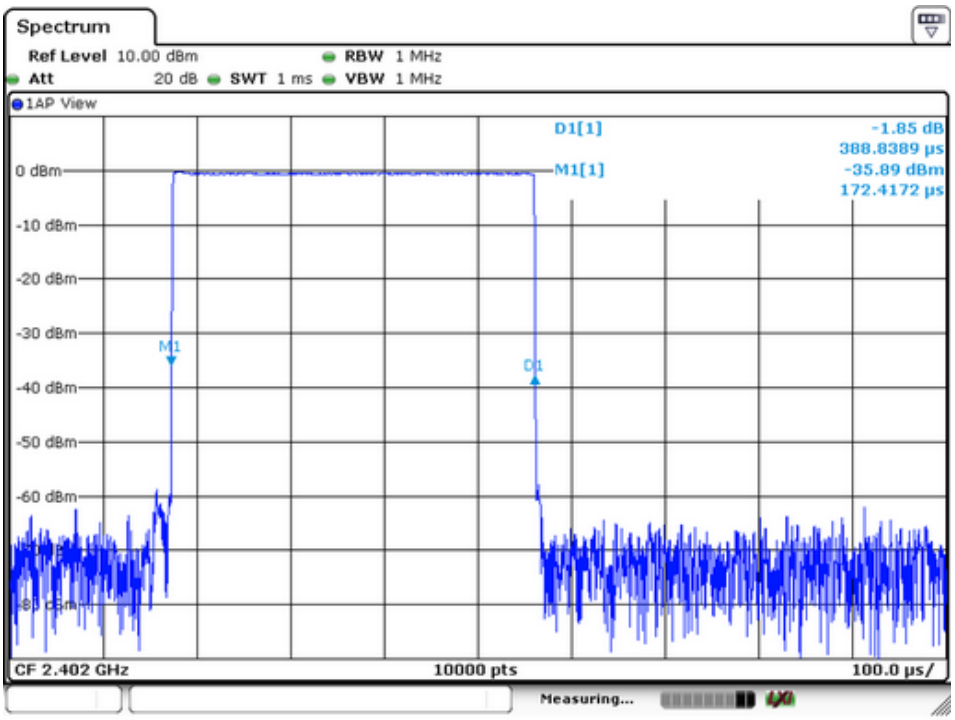
Remark:

1.The results of worst cased was recorded.

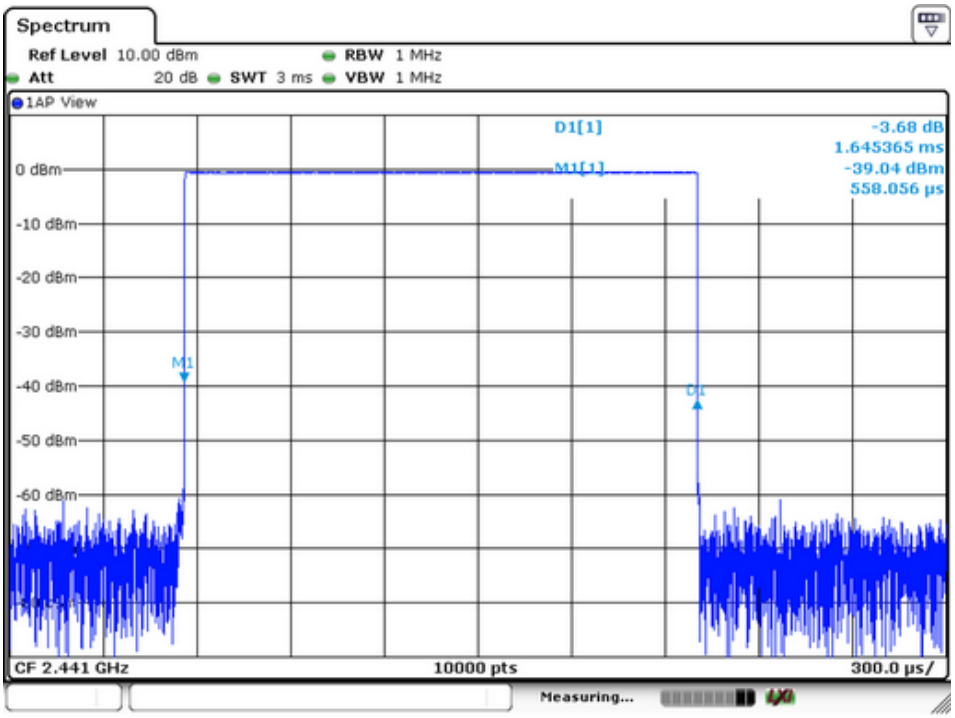
9.4 Test result: Dwell time

PASS.

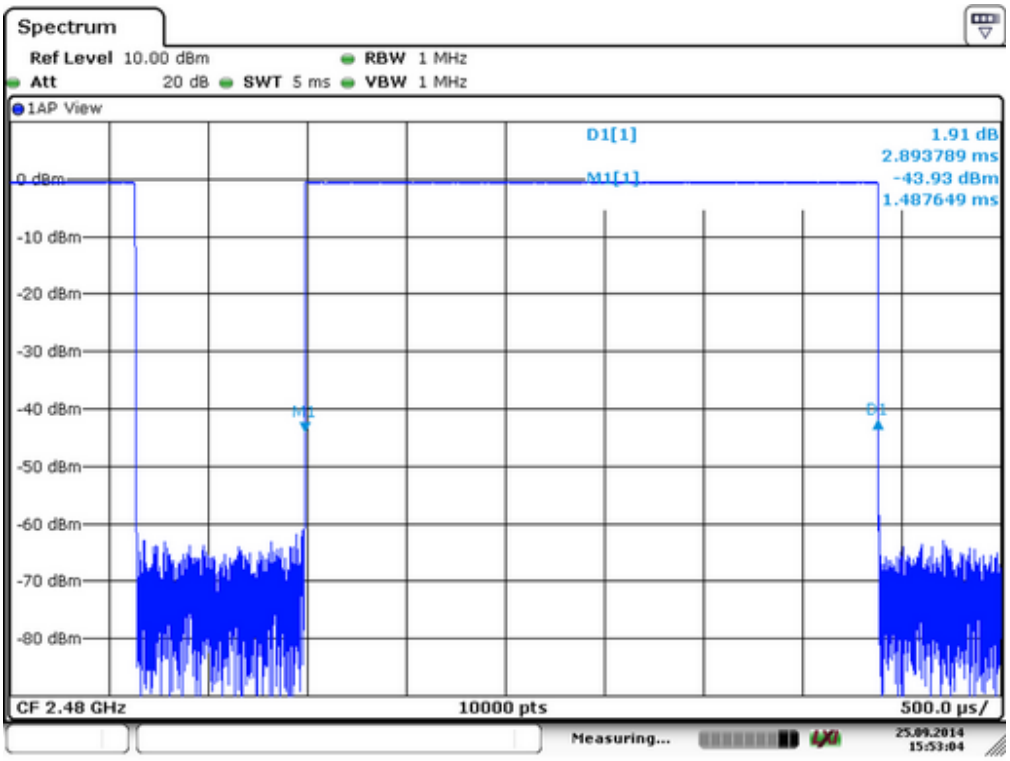
DH1:



DH3:



DH5:


Spectrum
Ref Level 10.00 dBm
RBW 1 MHz
Att 20 dB
SWT 5 ms
VBW 1 MHz
1AP View
D1[1]
1.91 dB
2.893789 ms
M1[1]
-43.93 dBm
1.487649 ms
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
M1
D1
CF 2.48 GHz
10000 pts
500.0 µs/
Measuring...
25.09.2014
15:53:04

10. MAXIMUM PEAK OUTPUT POWER TEST

10.1 Measurement Procedure

a. Check the calibration of the measuring instrument(SA) using either an internal calibrator or a known signal from an external generator.

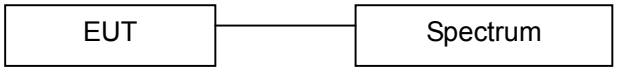
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using proper RBW and VBW setting.

d. Measure the captured power within the band and recording the plot.

e. Repeat above procedures until all frequencies required were complete.

10.2 Test SET-UP (Block Diagram of Configuration)



10.3 Measurement Equipment Used:

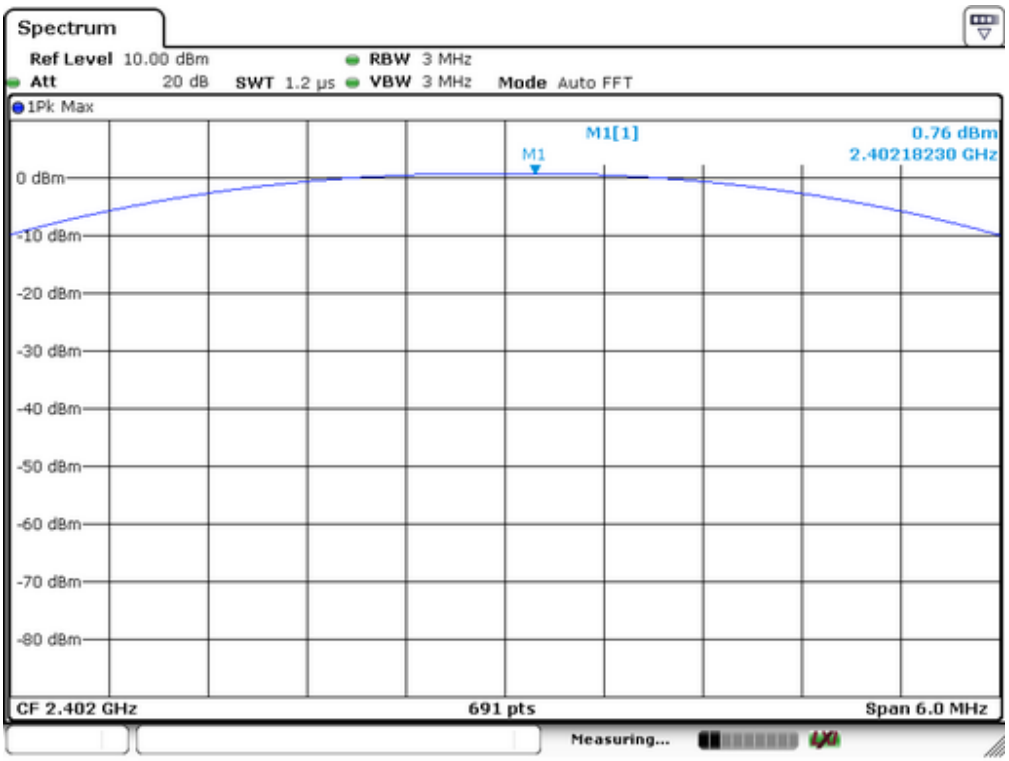
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSV30	1321.3008K	05/18/2014	05/17/2015

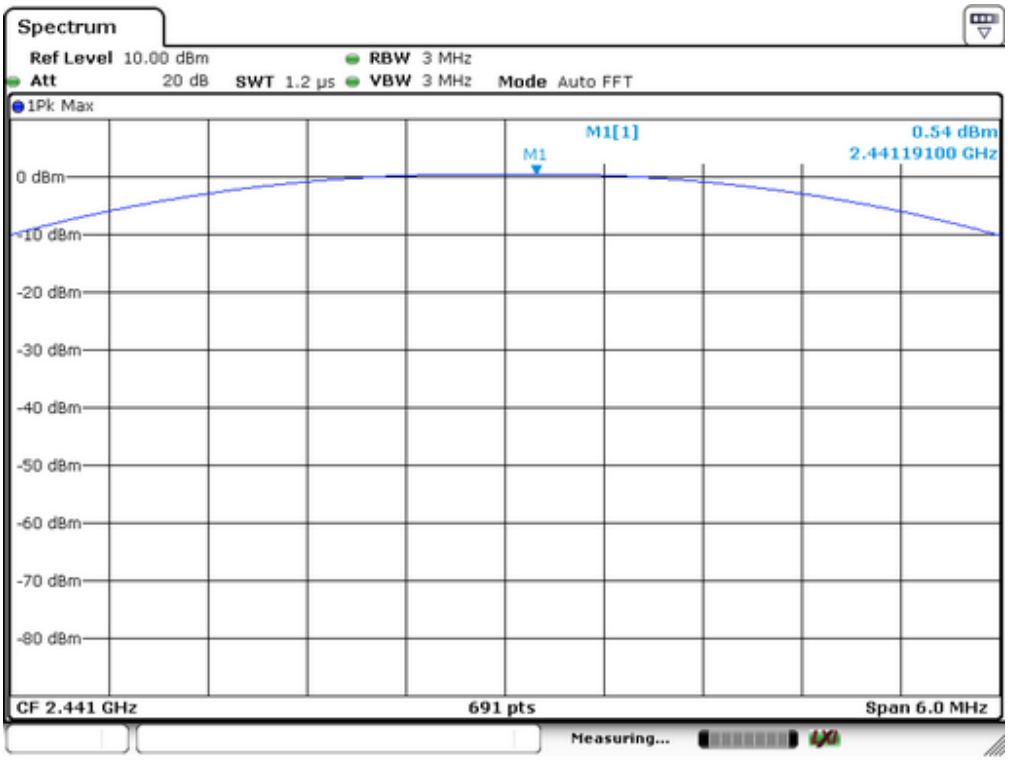
10.4 Measurement Results:

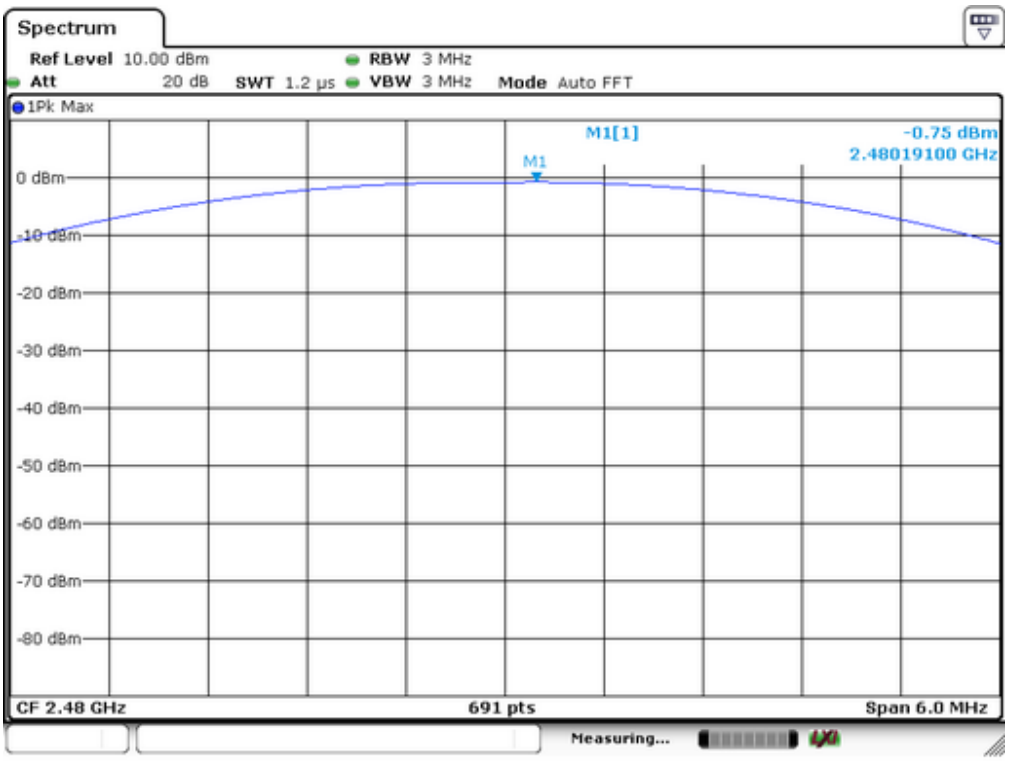
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	September 28, 2014
Test By:	Andy	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %
Modulation:	GFSK		

Channel number	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power output(mW)	Peak Power Limit(mW)	Pass/Fail
1	2402	0.76	1.191	1000	PASS
40	2441	0.54	1.132	1000	PASS
79	2480	-0.75	0.841	1000	PASS

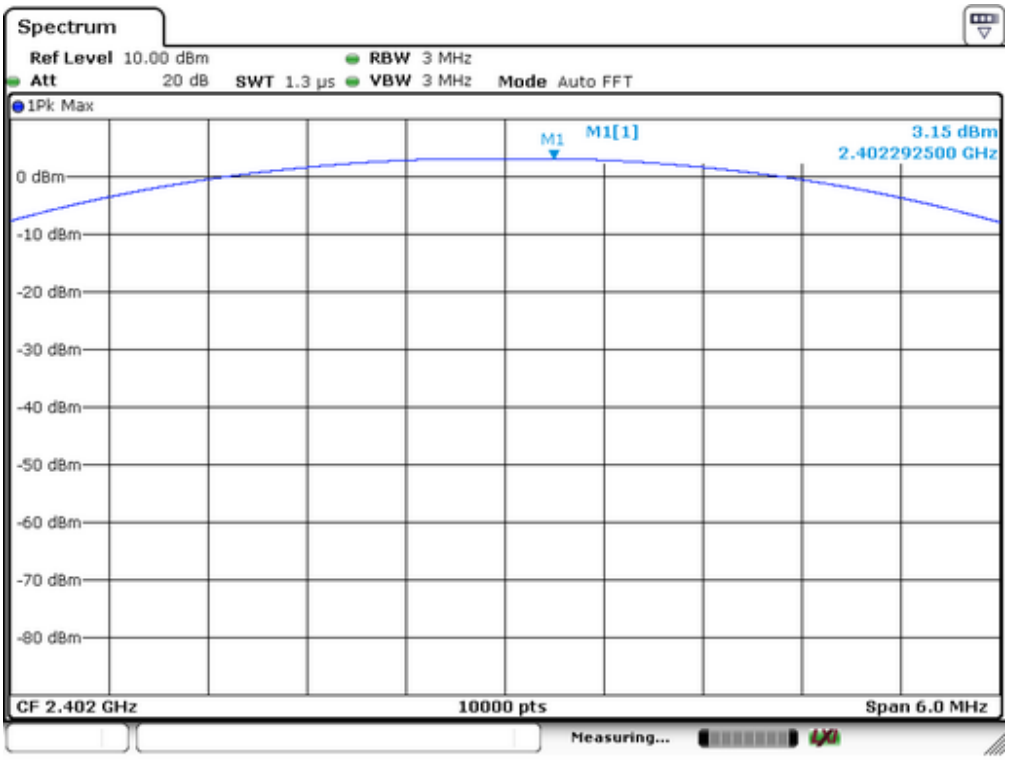


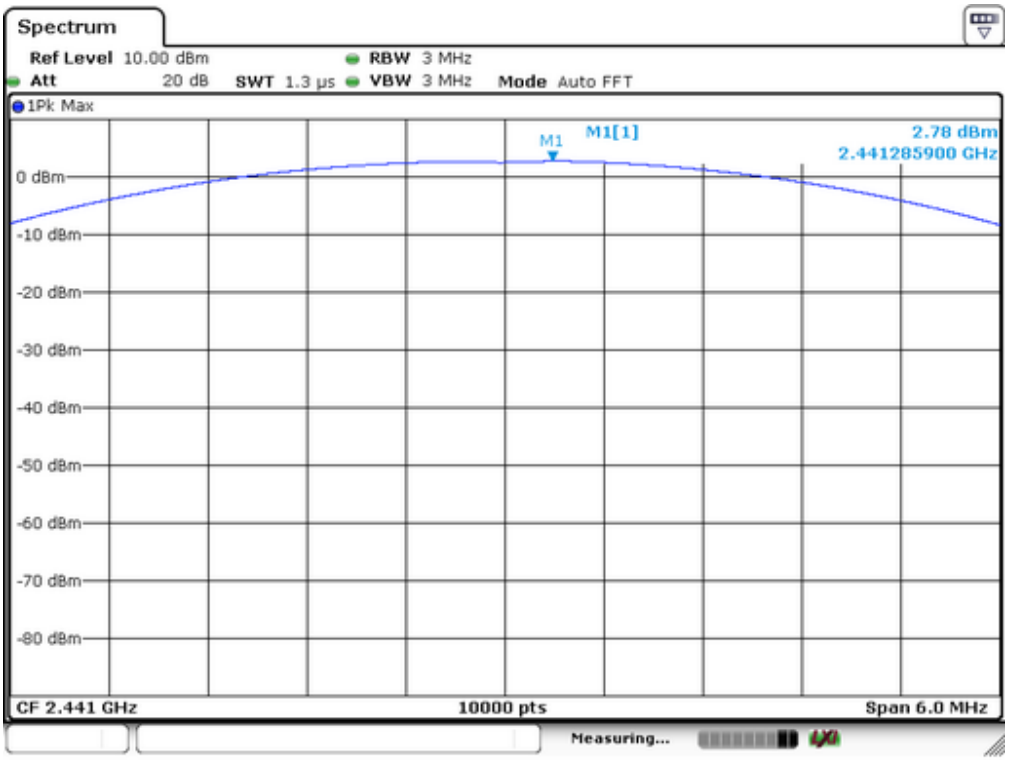

Spectrum
Ref Level 10.00 dBm
RBW 3 MHz
Att 20 dB
SWT 1.2 µs
VBW 3 MHz
Mode Auto FFT
1Pk Max
M1[1]
0.54 dBm
2.44119100 GHz
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
691 pts
Span 6.0 MHz
Measuring...

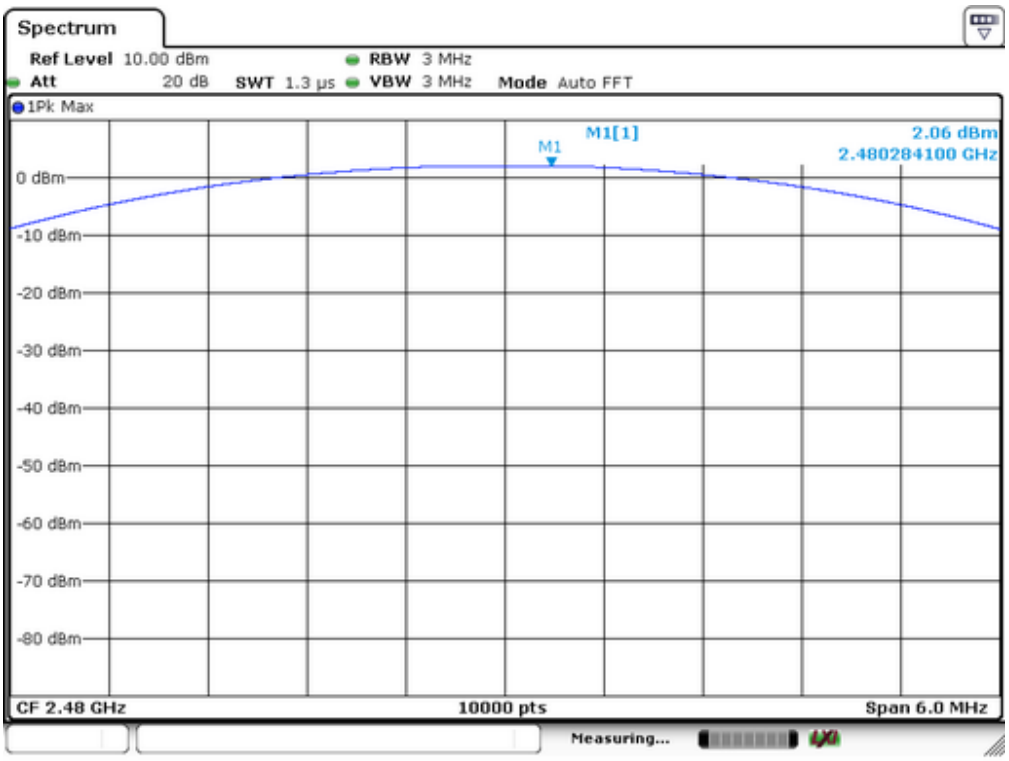

Spectrum
Ref Level 10.00 dBm
RBW 3 MHz
Att 20 dB
SWT 1.2 µs
VBW 3 MHz
Mode Auto FFT
1Pk Max
M1[1]
-0.75 dBm
2.48019100 GHz
M1
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.48 GHz
691 pts
Span 6.0 MHz
Measuring...

Spectrum Detector:	PK	Test Date :	September 28, 2014
Test By:	Andy	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %
Modulation:	Π/4-DQPSK		

Channel number	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power output(mW)	Peak Power Limit(mW)	Pass/Fail
1	2402	3.15	2.065	125	PASS
40	2441	2.78	1.897	125	PASS
79	2480	2.06	1.607	125	PASS

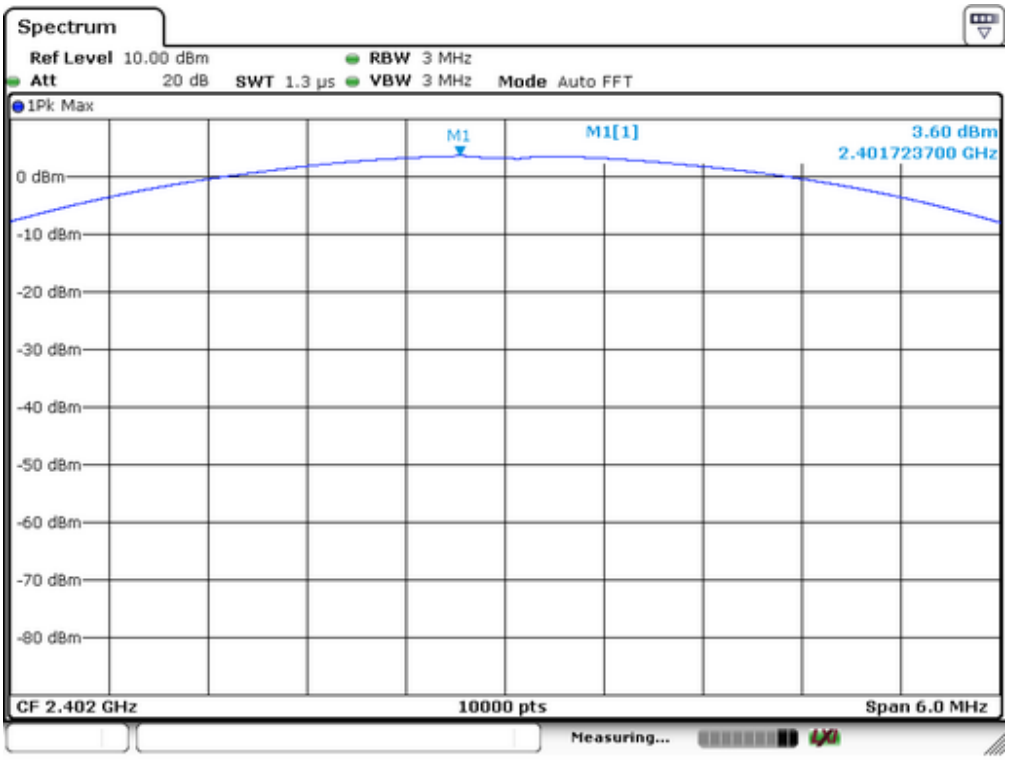


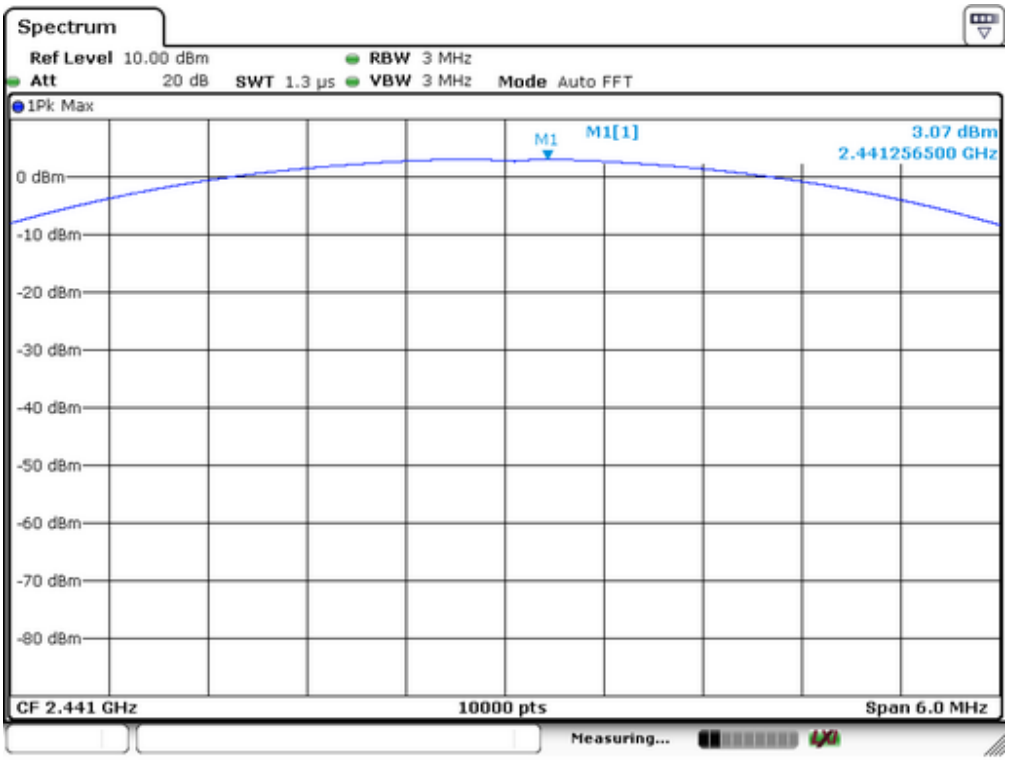

Spectrum
Ref Level 10.00 dBm
RBW 3 MHz
Att 20 dB
SWT 1.3 µs
VBW 3 MHz
Mode Auto FFT
1Pk Max
M1
M1[1]
2.78 dBm
2.441285900 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
10000 pts
Span 6.0 MHz
Measuring...

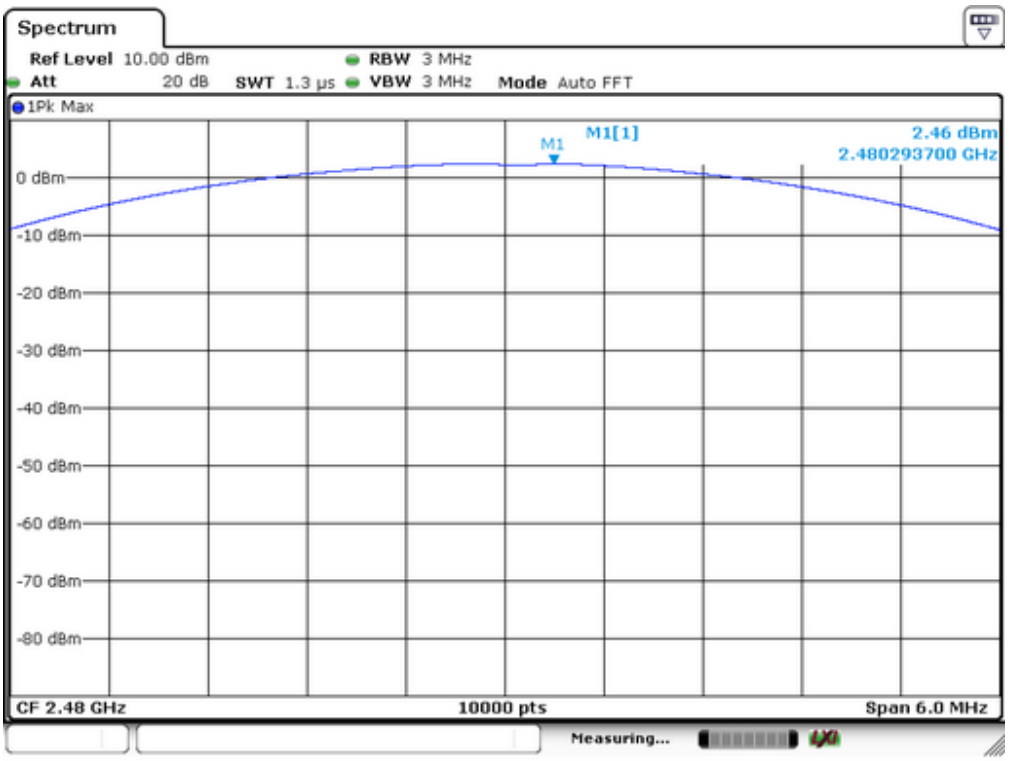

Spectrum
Ref Level 10.00 dBm
RBW 3 MHz
Att 20 dB
SWT 1.3 µs
VBW 3 MHz
Mode Auto FFT
1Pk Max
M1
M1[1]
2.06 dBm
2.480284100 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.48 GHz
10000 pts
Span 6.0 MHz
Measuring...

Spectrum Detector:	PK	Test Date :	September 28, 2014
Test By:	Andy	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %
Modulation:	8DPSK		

Channel number	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power output(mW)	Peak Power Limit(mW)	Pass/Fail
1	2402	**3.60**	**2.291**	125	PASS
40	2441	3.07	2.028	125	PASS
79	2480	2.46	1.762	125	PASS




Spectrum
Ref Level 10.00 dBm
RBW 3 MHz
Att 20 dB
SWT 1.3 µs
VBW 3 MHz
Mode Auto FFT
1Pk Max
M1
M1[1]
3.07 dBm
2.441256500 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.441 GHz
10000 pts
Span 6.0 MHz
Measuring...


Spectrum
Ref Level 10.00 dBm
RBW 3 MHz
Att 20 dB
SWT 1.3 µs
VBW 3 MHz
Mode Auto FFT
1Pk Max
M1
M1[1]
2.46 dBm
2.480293700 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.48 GHz
10000 pts
Span 6.0 MHz
Measuring...

11. Band EDGE test

11.1 Measurement Procedure

1. The EUT was Operating in hopping mode or could be controlled its channel. Printed out test result from the spectrum by hard copy function.
2. The EUT was placed on a turn table which is 0.8m above ground plane.
3. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
4. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Repeat above procedures until all frequency measured were complete.

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz:

EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	3MHz
Detector	Peak
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 10Hz:

EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	10Hz
Detector	Peak
Trace	Max hold

11.2 Test SET-UP (Block Diagram of Configuration)

Same as 5.2 Radiated Emission Set-up.

11.3 Measurement Equipment Used:

Same as 5.3 Radiated Emission Measurement.

11.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	September 26, 2014
Test By:	Andy	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %

1. Conducted Test

For Non-Hopping mode:

Frequency (MHz)	Peak Power Output(dBm)	Emission read Value(dBm)	Result of Band edge(dBc)	Band edge Limit(dBc)
<2400	0.97	-59.51	60.48	>20dBc
	1.21	-49.37	50.58	>20dBc
	1.23	-49.49	50.72	>20dBc
>2483.5	-0.79	-58.03	57.24	>20dBc
	-0.13	-55.99	55.86	>20dBc
	-0.05	-56.49	56.44	>20dBc

For Hopping mode:

Frequency (MHz)	Peak Power Output(dBm)	Emission read Value(dBm)	Result of Band edge(dBc)	Band edge Limit(dBc)
<2400	0.86	-60.20	61.06	>20dBc
	1.08	-52.40	53.48	>20dBc
	1.19	-50.23	51.42	>20dBc
>2483.5	-0.43	-55.88	55.45	>20dBc
	-0.14	-58.93	58.79	>20dBc
	-0.14	-58.37	58.23	>20dBc

2.Radiated emission Test

For Non-Hopping mode:

Frequency (MHz)	Antenna polarization (H/V)	Emission (dBuV/m)		Band edge Limit (dBuV/m)	
		PK	AV	PK	AV
<2400	V	66.59	48.25	74.00	54.00
	H	60.49	45.61	74.00	54.00
>2483.5	V	65.21	47.23	74.00	54.00
	H	60.09	44.05	74.00	54.00

For Hopping mode:

Frequency (MHz)	Antenna polarization (H/V)	Emission (dBuV/m)		Band edge Limit (dBuV/m)	
		PK	AV	PK	AV
<2400	V	65.13	47.18	74.00	54.00
	H	60.22	43.29	74.00	54.00
>2483.5	V	66.33	46.38	74.00	54.00
	H	62.79	40.19	74.00	54.00

12. Antenna Application

12.1 Antenna requirement

The EUT'S antenna is met the requirement of FCC part 15C section 15.203 and 15.247.

FCC part 15C section 15.247 requirements:
Systems operating in the 2402-2480MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

12.2 Result

The EUT's antenna used a PCB antenna. The antenna's gain is 0dBi and meets the requirement.

13. RF EXPOSURE EVALUATION

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in §1.1307(b)

Limits for Maximum Permissible Exposure(MPE)

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm^2)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	**--**	**--**	**F/300**	**6**
1500-100000	**--**	**--**	**5**	**6**
(B) Limits for General Population/Uncontrol Exposures				
300-1500	**--**	**--**	**F/1500**	**6**
1500-100000	**--**	**--**	**1**	**30**

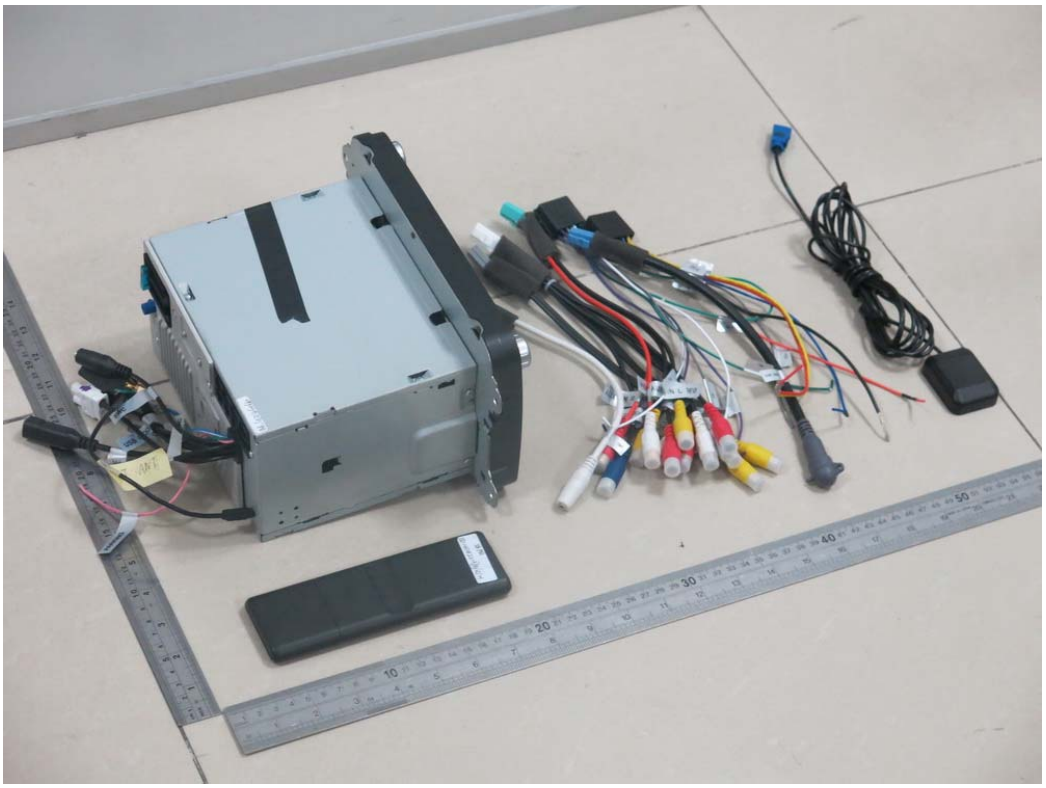
13.1 Friis transmission formula: Pd=(Pout*G)\(4*pi*R^2)

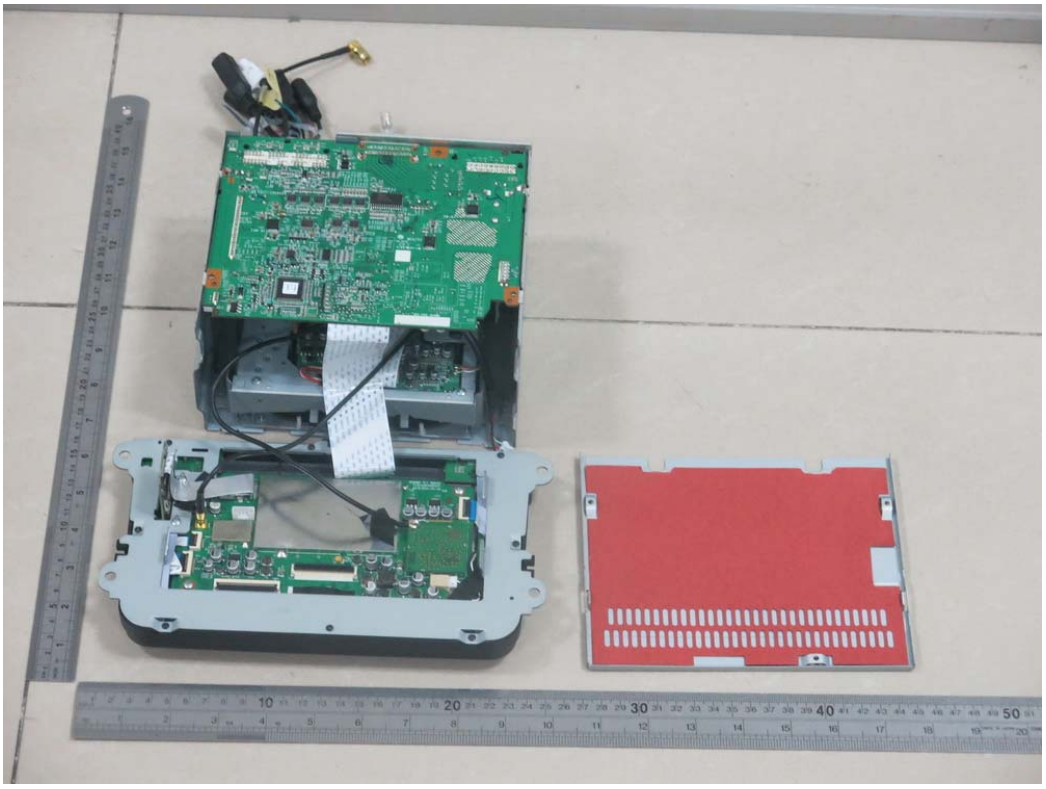
Where
Pd= Power density in mW/cm^2
Pout=output power to antenna in Mw
G= gain of antenna in linear scale
Pi=3.1416
R= distance between observation point and center of the radiator in cm
Pd the limit of MPE, 1mW/cm2. If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

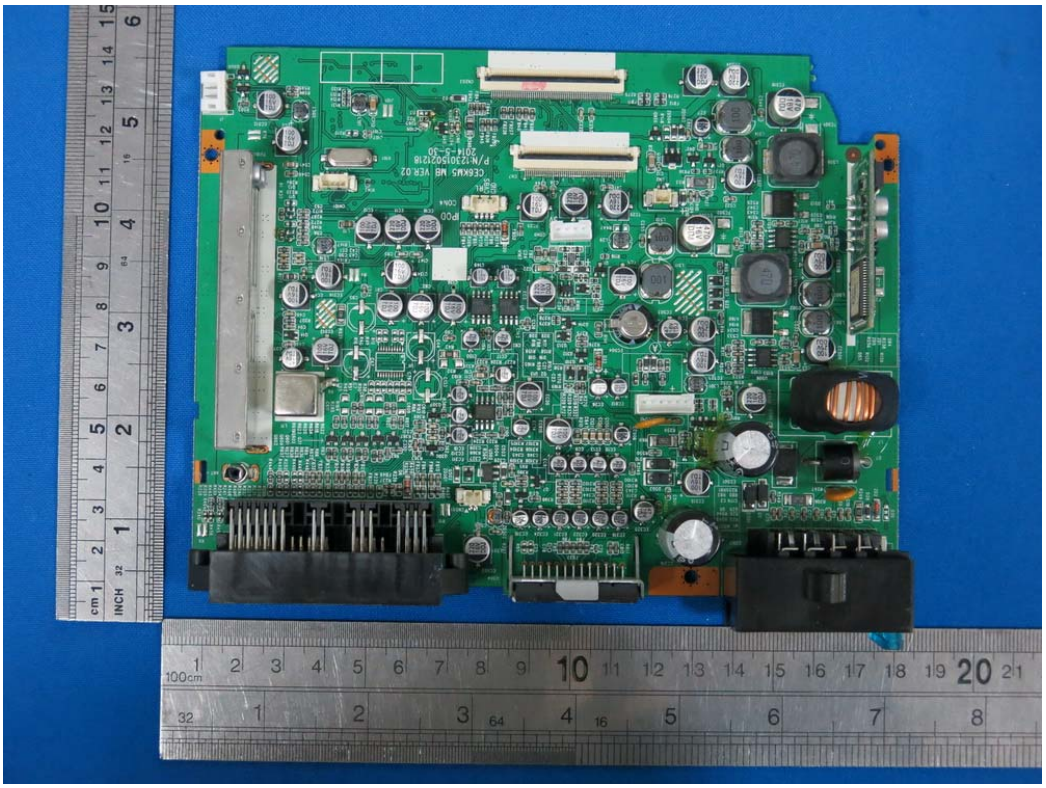
13.2 Measurement Result.

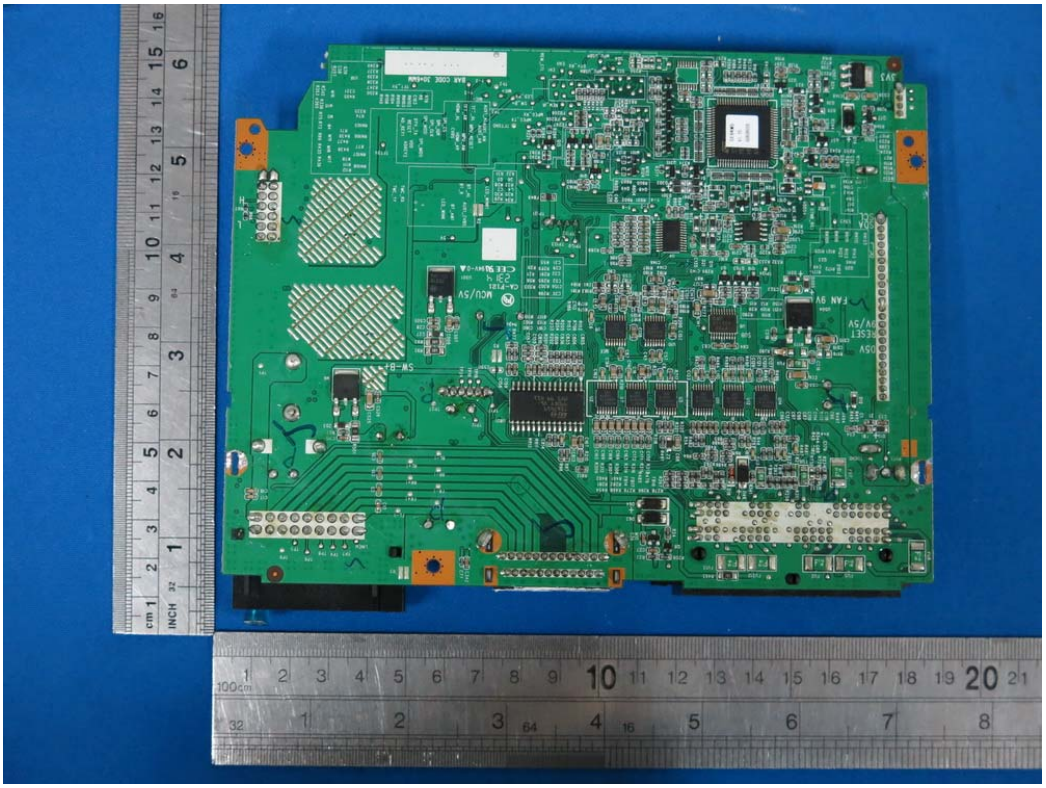
Channel Frequency (MHz)	Output Peak power (mW)	Antenna Gain (dBi)	Antenna Gain (numeric)	Power density at 20cm (mW/ cm2)	Power density Limits (mW/cm^2)
2402	1.191	0	1	0.0002369	1
2441	1.132	0	1	0.0002252	1
2480	0.841	0	1	0.0001673	1
2402	2.065	0	1	0.0004108	1
2441	1.897	0	1	0.0003774	1
2480	1.607	0	1	0.0003197	1
2402	2.291	0	1	0.0004558	1
2441	2.028	0	1	0.0004035	1
2480	1.762	0	1	0.0003505	1

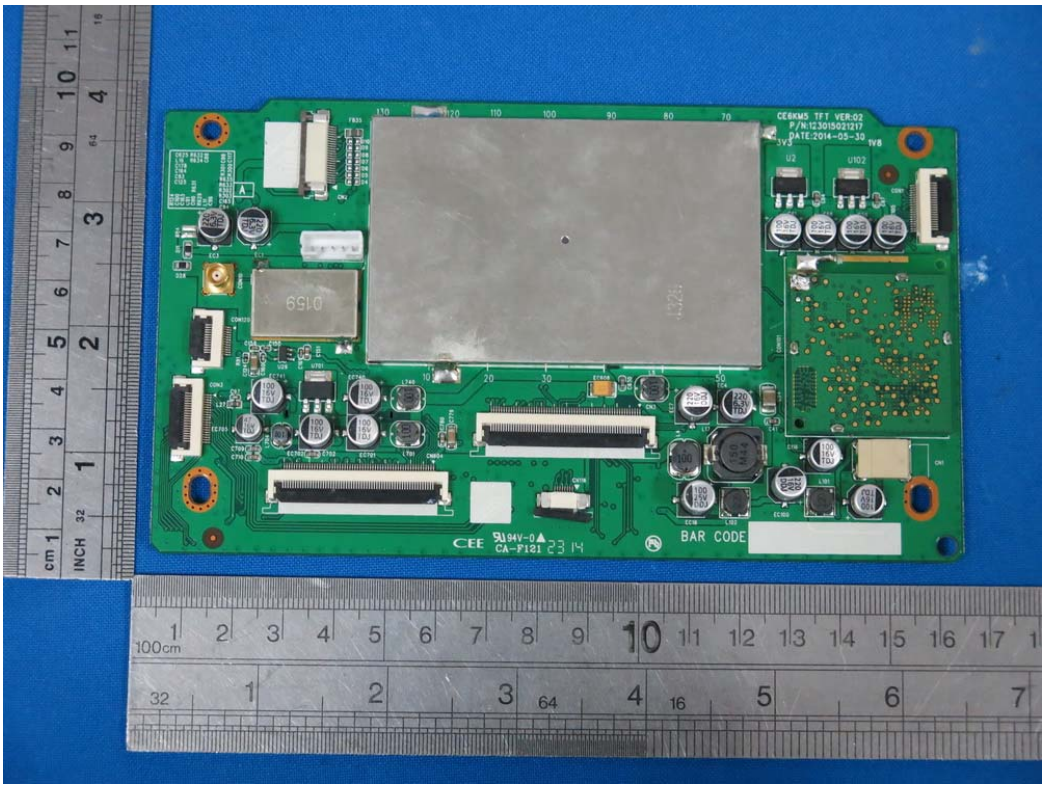
General Appearance of the EUT

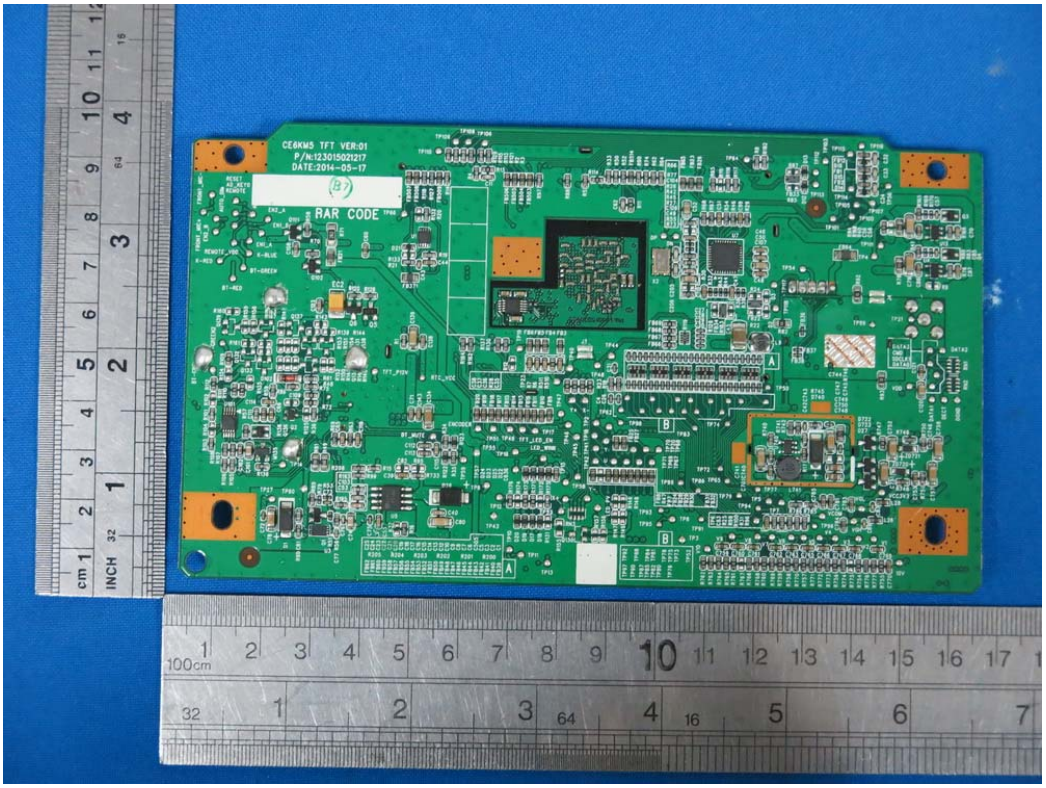









CE6KM5 TFT VER:02
P/N:123015021217
DATE:2014-05-30
CEE
BAR CODE


CE6KW5 TFT VER:01
P/N:12301502127
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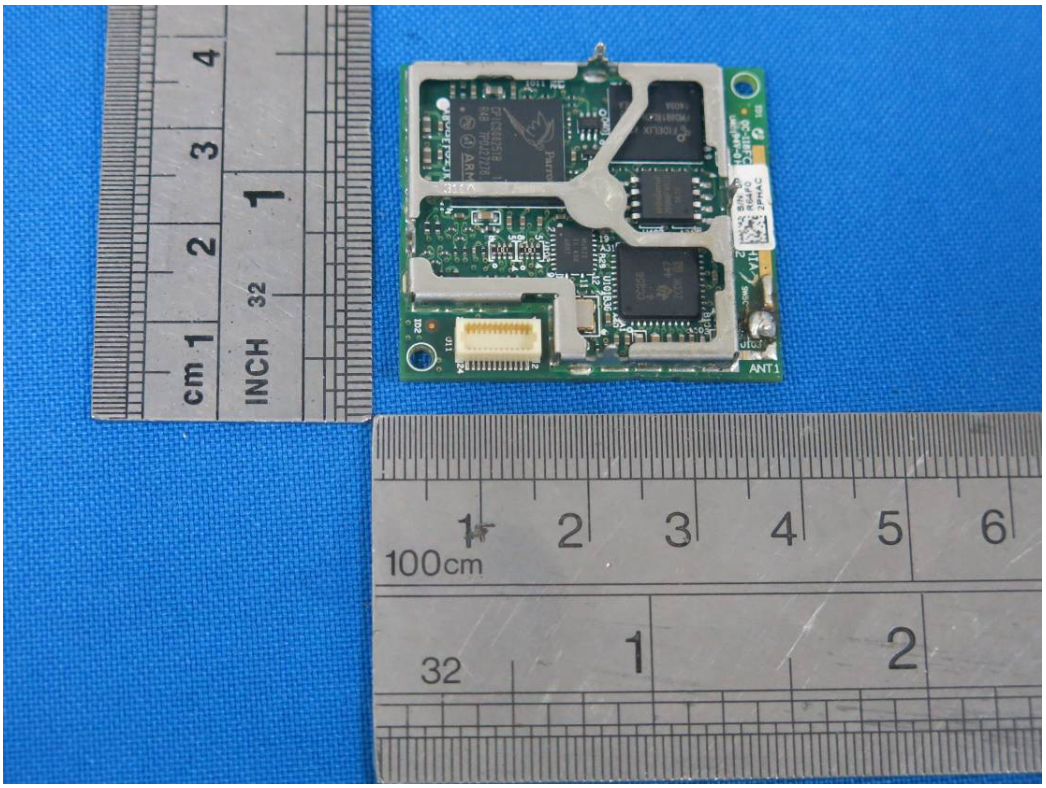
BAR CODE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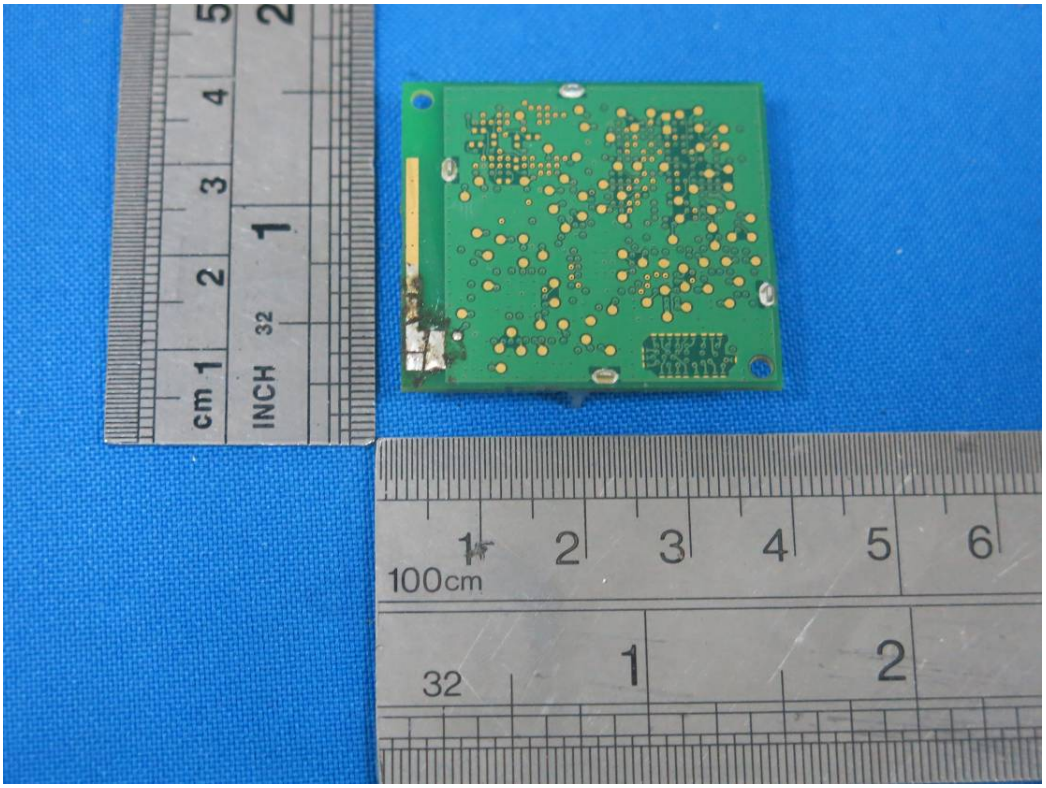

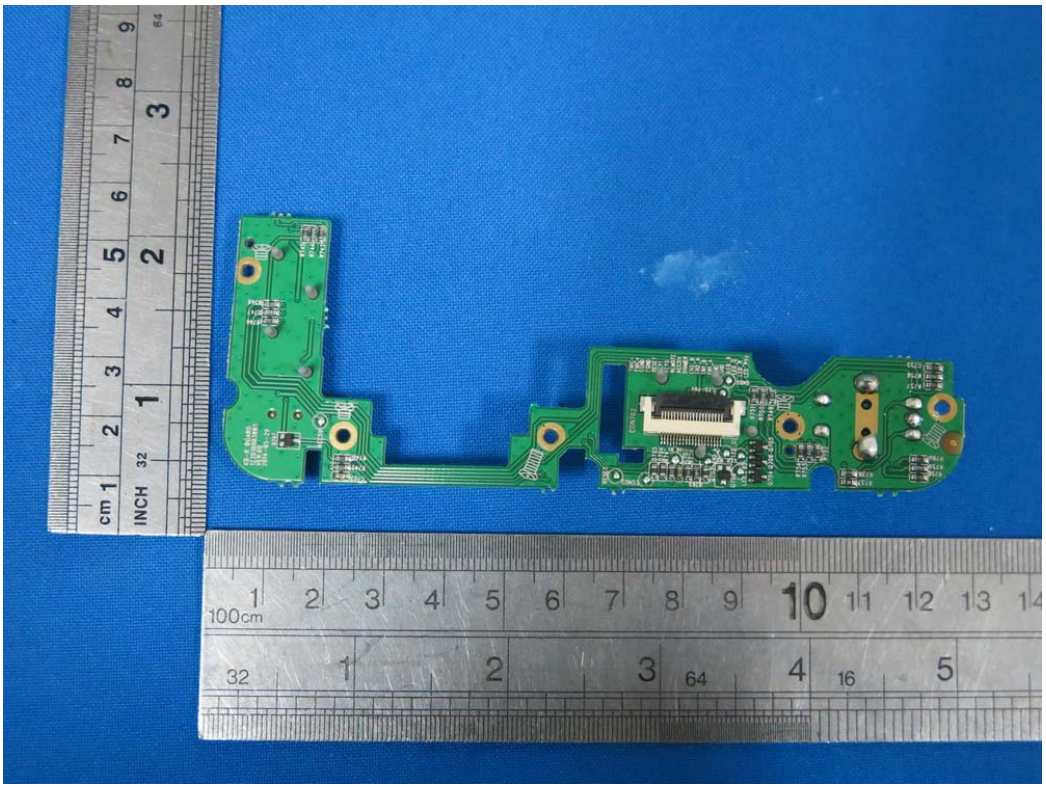

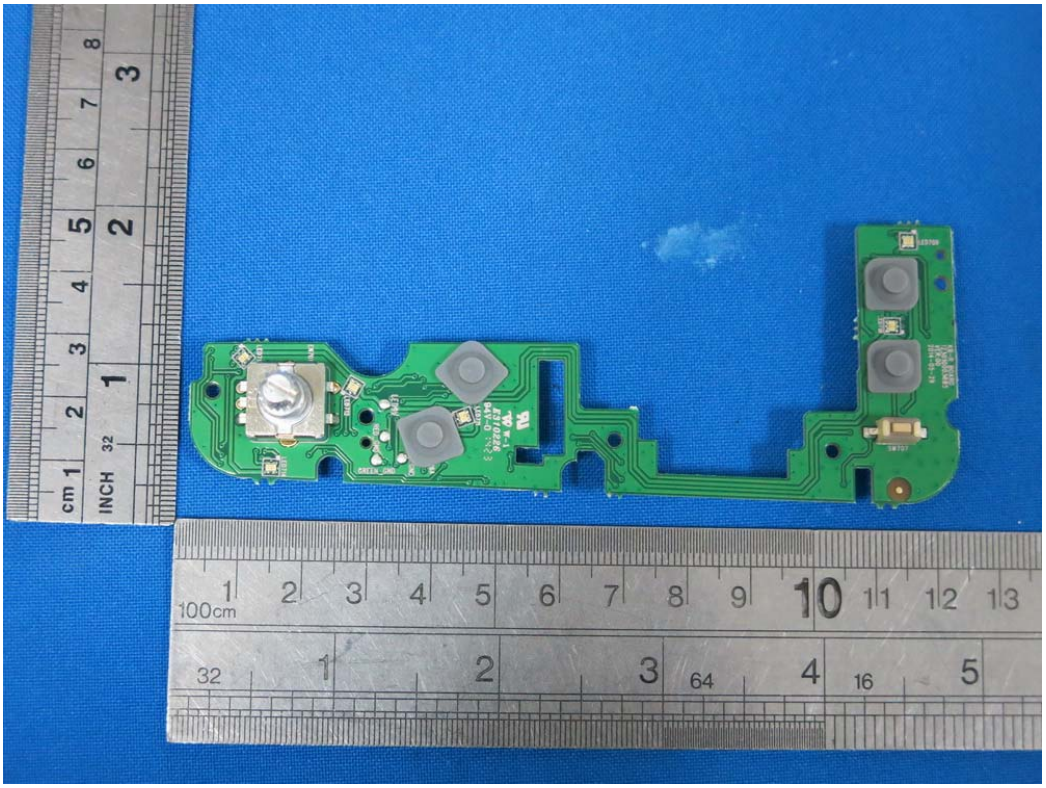

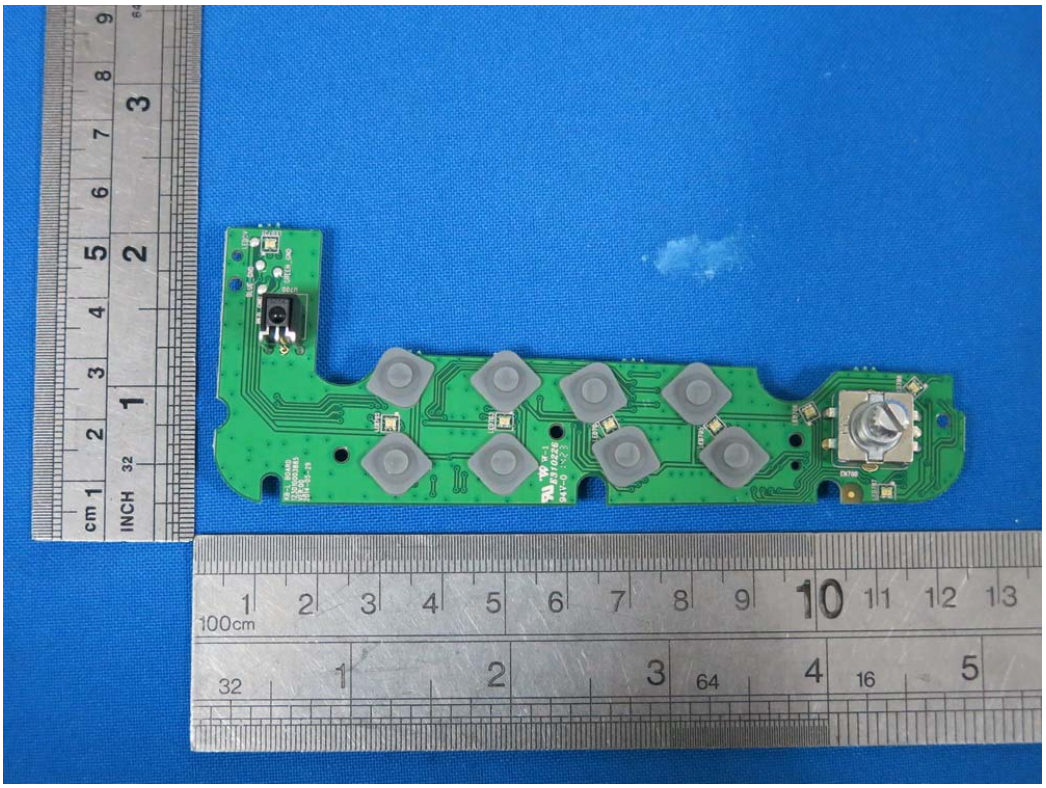

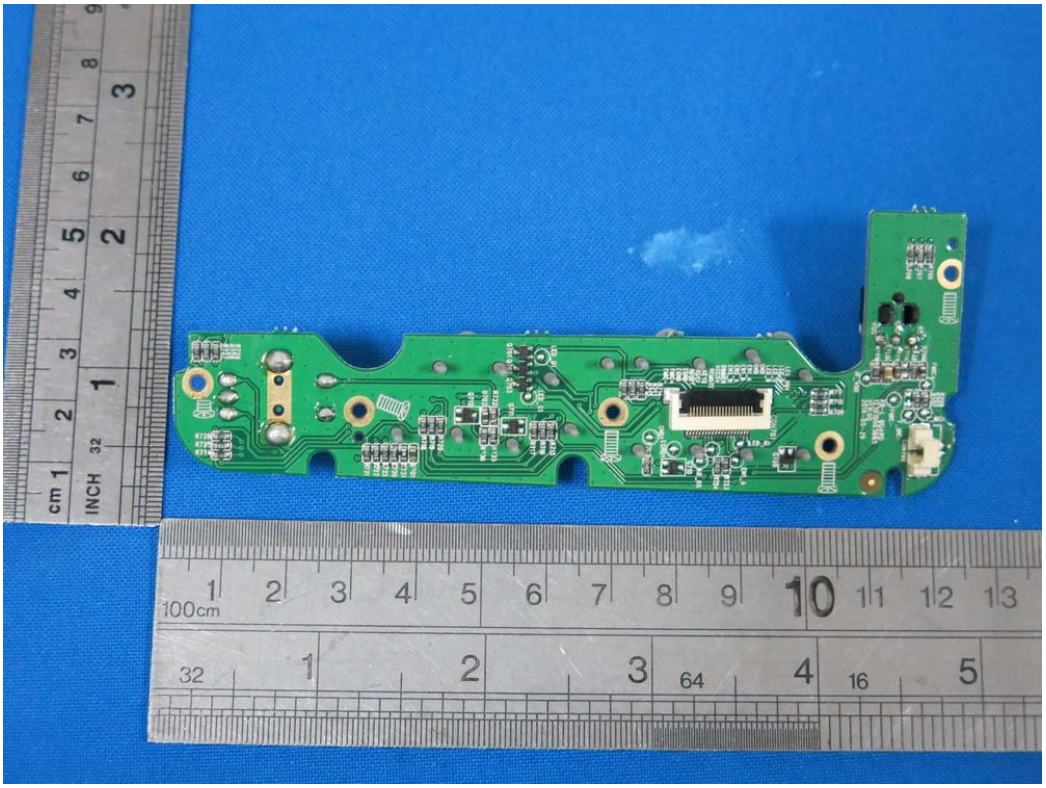

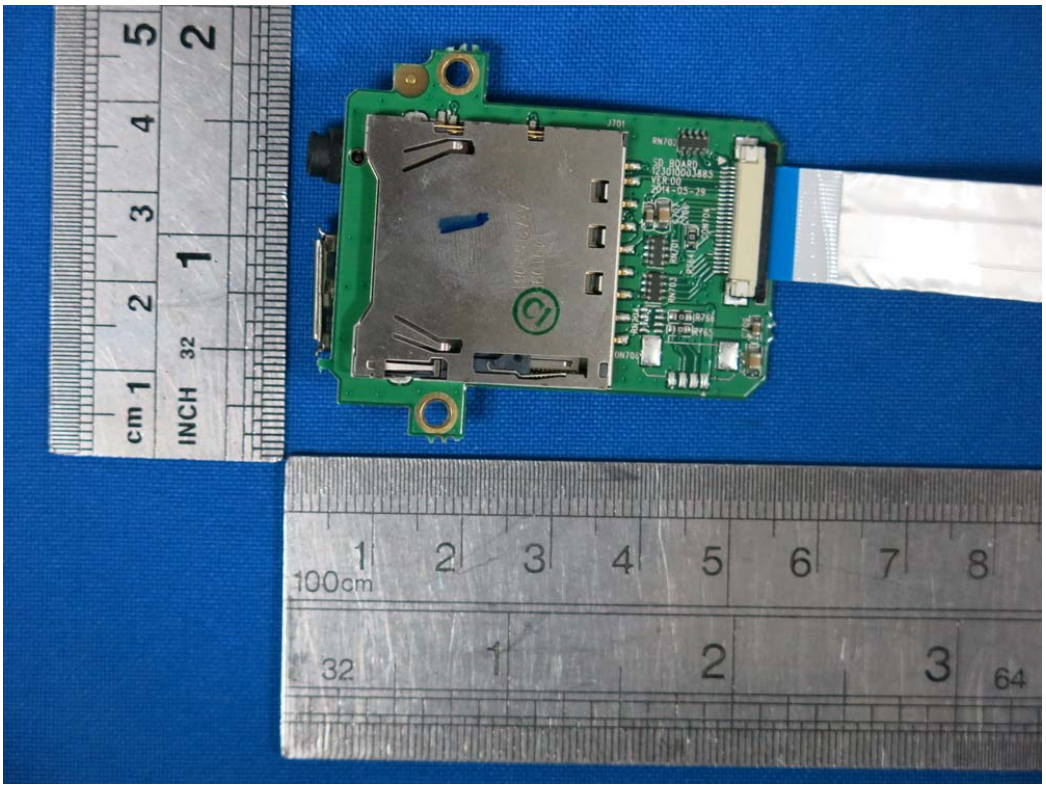

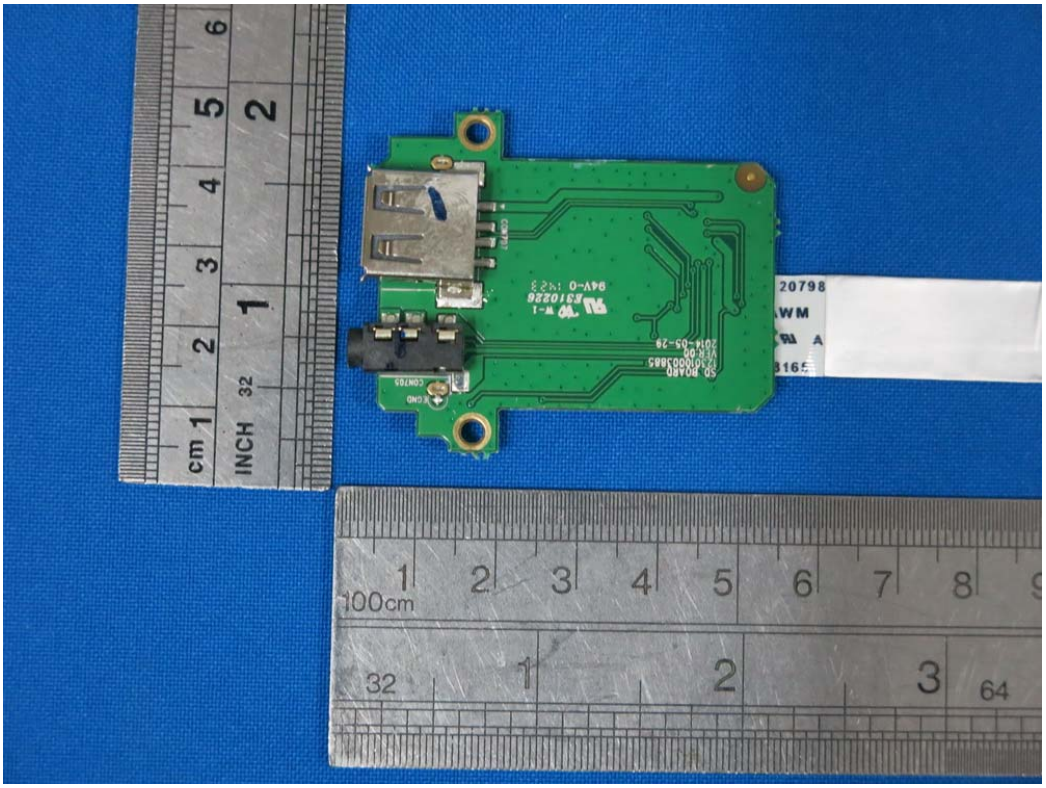

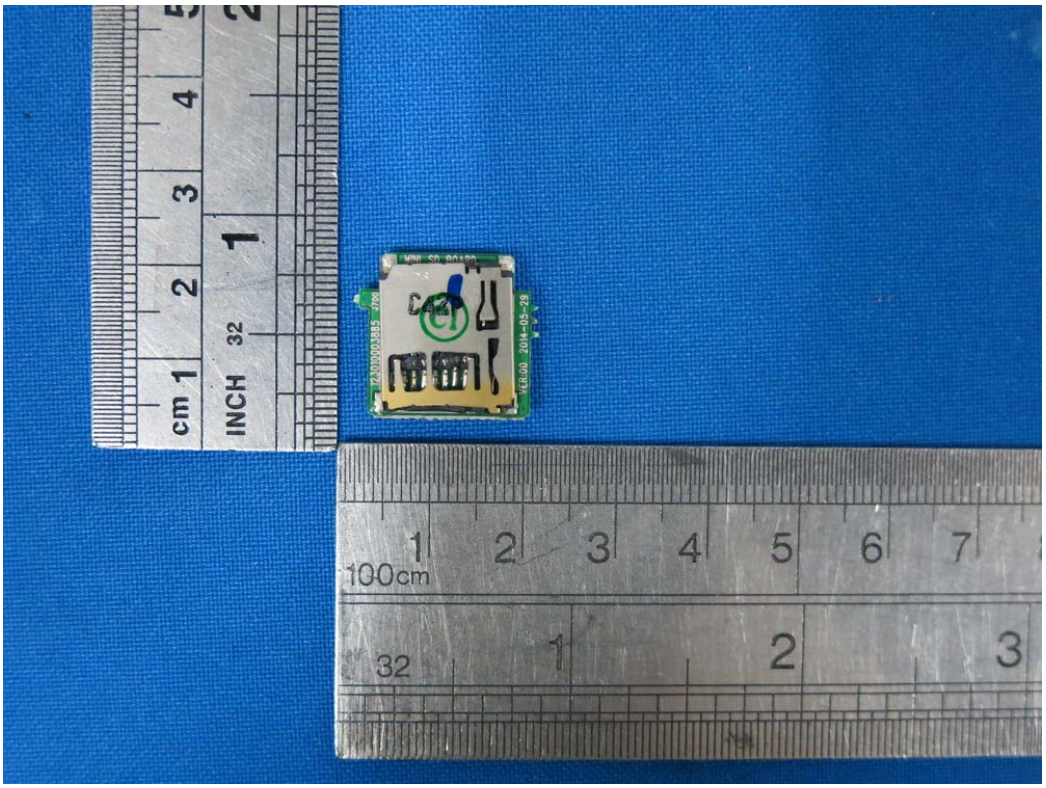

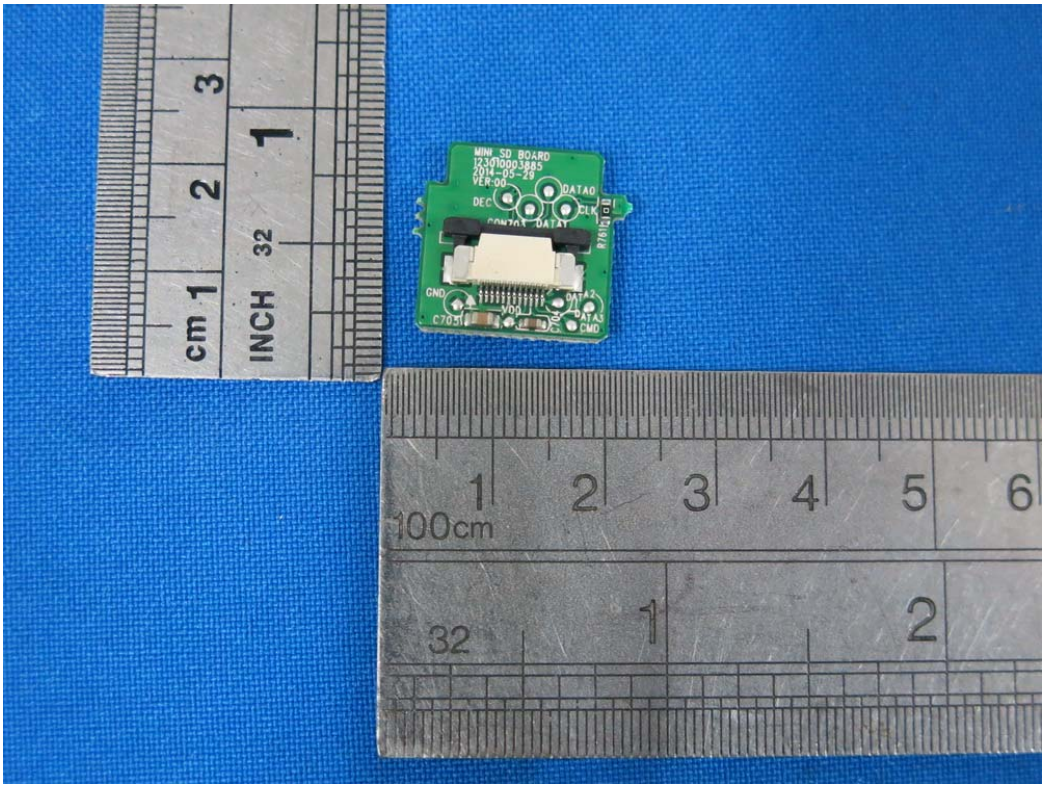
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