







# ISO/IEC17025Accredited Lab.

Report No: FCC 1310099-01 File reference No: 2013-11-18

Applicant: Shenzhen Chaoming Industrial Co., LTD

Product: MID

Model No: M755, C755

Trademark: N/A

Test Standards: FCC Part 15 Subpart C, Paragraph 15.247

Test result:

It is herewith confirmed and found to comply with the

requirements set up by ANSI C63.4&FCC Part 15 Subpart C, Paragraph 15.247 regulations for the evaluation of

electromagnetic compatibility

Approved By

Jack Chung

Jack Chung Manager

Dated: November 18, 2013

Results appearing herein relate only to the sample tested

The technical reports is issued errors and omissions exempt and is subject to withdrawal at

# SHENZHEN TIMEWAY TECHNOLOGY CONSULTING CO LTD

5/F,Block 4, Anhua Industrial Zone.,No.8 TaiRan Rd.CheGongMiao,FuTian District, Shenzhen,CHINA.

Tel (755) 83448688 Fax (755) 83442996

Report No: 1310099-01 Page 2 of 83

Date: 2013-11-18



# **Special Statement:**

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.

The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

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

### **CNAS-LAB Code: L2292**

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:1999 General Requirements) for the Competence of testing Laboratories.

# FCC-Registration No.: 899988

The 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 No.:899988.

# IC- Registration No.: IC5205A-02

The EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration No.: IC 5205A-02.

Page 3 of 83

Report No: 1310099-01

Date: 2013-11-18



# **Test Report Conclusion** Content

1.0	General Details	4
1.1	Test Lab Details.	4
1.2	Applicant Details	4
1.3	Description of EUT	4
1.4	Submitted Sample	4
1.5	Test Duration.	4
1.6	Test Uncertainty	5
1.7	Test By	5
2.0	List of Measurement Equipment.	6
3.0	Technical Details	7
3.1	Summary of Test Results.	7
3.2	Test Standards	7
4.0	EUT Modification.	7
5.0	Power Line Conducted Emission Test.	8
5.1	Schematics of the Test.	8
5.2	Test Method and Test Procedure.	8
5.3	Configuration of the EUT	8
5.4	EUT Operating Condition.	9
5.5	Conducted Emission Limit.	9
5.6	Test Result.	9
6.0	Radiated Emission test.	12
6.1	Test Method and Test Procedure.	12
6.2	Configuration of the EUT.	12
6.3	EUT Operation Condition.	12
6.4	Radiated Emission Limit.	13
7.0	20dB Bandwidth Measurement.	22
8.0	Maximum Peak Output Power.	34
9.0	Carrier Frequency Separation.	37
10.0	Number of Hopping Channel	41
11.0	Time of Occupancy (Dwell Time)	45
12.0	Out of Band Measurement.	57
13.0	Antenna Requirement.	71
14.0	FCC Label.	72
15.0	Photo of Test Setup and EUT View.	73

Date: 2013-11-18



### 1.0 General Details

### 1.1 Test Lab Details

Name: SHENZHEN TIMEWAY TECHNOLOGY CONSULTING CO LTD

Address: 5/F,Block 4, Anhua Industrial Zone.,No.8 TaiRan Rd.CheGongMiao,FuTian District,

Shenzhen, CHINA.

Telephone: (755) 83448688 Fax: (755) 83442996

Site on File with the Federal Communications Commission – United Sates

Registration Number: 899988

For 3m & 10 m OATS

Site Listed with Industry Canada of Ottawa, Canada

Registration Number: IC: 5205A-02

For 3m & 10 m OATS

# 1.2 Applicant Details

Applicant: Shenzhen Chaoming Industrial Co., LTD

Address: Fl. 4, Block 1, Yujingtai Industrial Park, Huaxin Rd., Dalang, Longhua, Bao'an

District, Shenzhen518109, China

Telephone: 0755-83495999 Fax: 0755-83439899

### 1.3 Description of EUT

Product: MID

Manufacturer: Shenzhen Chaoming Industrial Co., LTD

Address: Fl. 4, Block 1, Yujingtai Industrial Park, Huaxin Rd., Dalang, Longhua, Bao'an

District, Shenzhen518109, China

Brand Name: N/A
Model Number: M755
Additional Model Name C755
Additional Trade Name N/A

Type of Modulation GFSK, Л/4QPSK, 8DPSK

Frequency range 2402-2480MHz

Number of Channel 79

Frequency Selection By software

Antenna type Integral Antenna used, the antenna gain is 2.0dBi

Power Supply: THX-050200KE Input: 100-240V, 50/60Hz, 0.65A MAX; Output: 5V, 2000mA

### 1.4 Submitted Sample: 2 Samples

The report refers only to the sample tested and does not apply to the bulk.

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Report No: 1310099-01 Page 5 of 83

Date: 2013-11-18



1.5 Test Duration:

2013-10-28 to 2013-11-18

1.6 Test Uncertainty

Conducted Emissions Uncertainty = 3.6dB Radiated Emissions Uncertainty = 4.7dB

1.7 Test Engineer

Terry Tang

The sample tested by

Print Name: Terry Tang

Date: 2013-11-18



2.0		Test Equip	ments		
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	ROHDE&SCHWARZ	ESPI 3	100379	2013-08-23	2014-08-22
TWO Line-V-NETW	ROHDE&SCHWARZ	EZH3-Z5	100294	2013-08-23	2014-08-22
TWO Line-V-NETW	ROHDE&SCHWARZ	EZH3-Z5	100253	2013-08-23	2014-08-22
Ultra Broadband ANT	ROHDE&SCHWARZ	HL562	100157	2013-08-25	2014-08-24
ESDV Test Receiver	ROHDE&SCHWARZ	ESDV	100008	2013-08-23	2014-08-22
Impuls-Begrenzer	ROHDE&SCHWARZ	ESH3-Z2	100281	2013-08-24	2014-08-23
System Controller	CT	SC100	-		
Printer	EPSON	РНОТО ЕХЗ	CFNH234850		
Computer	IBM	8434	1S8434KCE99BLXL O*	-	-
Loop Antenna	EMCO	6502	00042960	2013-08-23	2014-08-22
ESPI Test Receiver	ROHDE&SCHWARZ	ESI26	838786/013	2013-08-23	2014-08-22
3m OATS			N/A	2013-08-22	2014-08-21
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170265	2013-08-24	2014-08-23
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-631	2013-08-24	2014-08-23
Power meter	Anritsu	ML2487A	6K00003613	2013-08-24	2014-08-23
Power sensor	Anritsu	MA2491A	32263	2013-08-24	2014-08-23
Bilog Antenna	Schwarebeck	VULB9163	9163/340	2013-08-21	2014-08-20
LISN	AFJ	LS16C	10010947251	2013-08-21	2014-08-20
LISN (Three Phase)	Schwarebeck	NSLK 8126	8126453	2013-08-23	2014-08-22
9*6*6 Anechoic			N/A	2013-08-22	2014-08-21
EMI Test Receiver	RS	ESCS30	100139	2013-08-23	2014-08-22
LISN	AFJ	LS16C	10010947251	2013-08-23	2014-08-22
LISN (Three Phase)	Schwarebeck	NSLK 8126	8126453	2013-08-23	2014-08-22

### 2.1 Auxiliary Equipment

Name	Model No.	Serial No.	Manufacturer	Cable	FCC ID/DOC
TF Card			Kingston		
Passive Earphone				-	
LCD Monitor	PH2450		SAMSUNG		DOC

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Report No: 1310099-01 Page 7 of 83

Date: 2013-11-18



### 3.0 Technical Details

# 3.1 Summary of test results

The EUT has been tested according to the following specifications:

Requirement	CFR 47 Section	Result	Notes
Antenna Requirement	15.203, 15.247(b)(4)	PASS	Complies
Maximum Peak Out Power	15.247 (b)(1), (4)	PASS	Complies
Carrier Frequency Separation	15.247(a)(1)	PASS	Complies
20dB Channel Bandwidth	15.247 (a)(1)	PASS	Complies
Number of Hopping Channels	15.247(a)(iii), 15.247(b)(1)	PASS	Complies
Time of Occupancy (Dwell Time)	15.247(a)(iii)	PASS	Complies
Spurious Emission, Band Edge, and	15.247(d),15.205(a),	PASS	Complies
Restricted bands	15.209 (a),15.109		
Conducted Emissions	15.207(a), 15.107	PASS	Complies
RF Exposure	15.247(i), 1.1307(b)(1)	PASS	Complies

## 3.2 Test Standards

FCC Part 15 Subpart & Subpart C, Paragraph 15.247

# 4.0 EUT Modification

No modification by Shenzhen Timeway Technology Consulting Co., Ltd

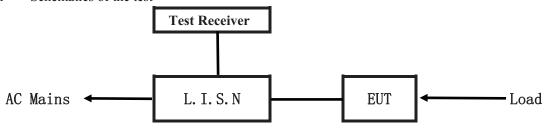
Report No: 1310099-01 Page 8 of 83

Date: 2013-11-18



### 5. Power Line Conducted Emission Test

### 5.1 Schematics of the test

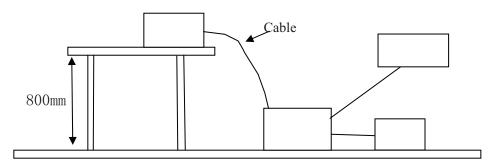


**EUT: Equipment Under Test** 

### 5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.4-2003. The Frequency spectrum From 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.4 –2003.

Test Voltage: 120V~60Hz Block diagram of Test setup



# 5.3 Configuration of The EUT

The EUT was configured according to ANSI C63.4-2003. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

79 channels are provided to the EUT

Page 9 of 83

Report No: 1310099-01

Date: 2013-11-18



### A. EUT

Device	Manufacturer	Model	FCC ID
MID	Shenzhen Chaoming Industrial Co., LTD	M755, C755	2AA7M-M755-M746

### B. Internal Device

Device	Manufacturer	Model	FCC ID/DOC
N/A			

# C. Peripherals

Device	Manufacturer	Model	FCC ID/DOC	Cable

# 5.4 EUT Operating Condition

Operating condition is according to ANSI C63.4 -2003.

- A Setup the EUT and simulators as shown on follow
- B Enable AF signal and confirm EUT active to normal condition

### 5.5 Power line conducted Emission Limit according to Paragraph 15.107,15.207

Frequency	Class A Limits (dB $\mu$ V)		Class B Limits (dB $\mu$ V)	
(MHz)	Quasi-peak Level	Average Level	Quasi-peak Level	Average Level
$0.15 \sim 0.50$	79.0	66.0	66.0~56.0*	56.0~46.0*
$0.50 \sim 5.00$	73.0	60.0	56.0	46.0
5.00 ~ 30.00	73.0	60.0	60.0	50.0

Notes:

- 1. \*Decreasing linearly with logarithm of frequency.
- 2. The tighter limit shall apply at the transition frequencies

### 5.6 Test Results

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz.

Report No: 1310099-01 Page 10 of 83

Date: 2013-11-18



# A: Conducted Emission on Live Terminal (150kHz to 30MHz)

# **EUT Operating Environment**

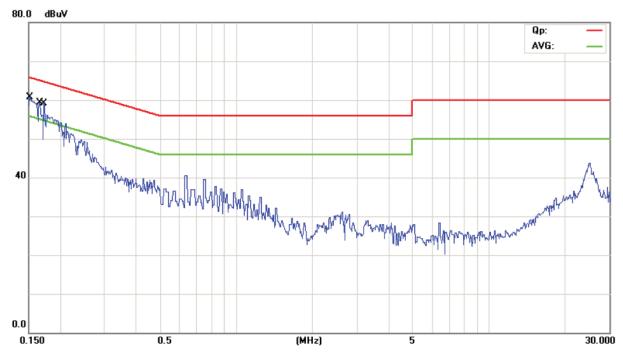
Temperature: 26°C Humidity: 65%RH Atmospheric Pressure: 101 KPa

**EUT set Condition: Charging and Keep Bluetooth Transmitting** 

**Equipment Level: Class B** 

**Results: PASS** 

Please refer to following diagram for individual



Frequency	Line	Reading(	dBμV)	Limit(	dBμV)
(MHz)	Line	Quasi-peak	Average	Quasi-peak	Average
0.150	Live	58.30	35.10	65.96	55.96
0.166	Live	39.52	8.32	65.16	55.16
0.170	Live	41.92	7.62	64.95	54.95

Date: 2013-11-18



# B: Conducted Emission on Neutral Terminal (150kHz to 30MHz)

# **EUT Operating Environment**

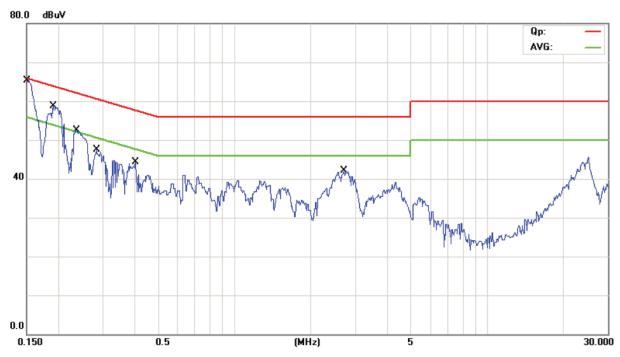
Temperature: 26°C Humidity: 65%RH Atmospheric Pressure: 101 KPa

**EUT set Condition: Charging and Keep Bluetooth Transmitting** 

**Equipment Level: Class B** 

**Results: Pass** 

Please refer to following diagram for individual



Frequency	Line	Reading(dBμV)		Limit(dBµV)	
(MHz)	Line	Quasi-peak	Average	Quasi-peak	Average
0.150	Neutral	63.60	40.10	65.96	55.96
0.190	Neutral	57.04	39.74	64.01	54.01
0.235	Neutral	49.79	29.09	62.25	52.25
0.282	Neutral	43.94	25.84	60.73	50.73
0.405	Neutral	40.77	14.47	57.74	47.74
2.701	Neutral	42.38	28.48	56.00	46.00

Report No: 1310099-01 Page 12 of 83

Date: 2013-11-18



### **6** Radiated Emission Test

- 6.1 Test Method and test Procedure:
- (1) The EUT was tested according to ANSI C63.4 –2003. The radiated test was performed at Timeway Laboratory. This site is on file with the FCC laboratory division, Registration No.899988
- (2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.4-2003.
- (3) The frequency spectrum from 30 MHz to 1 GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz. For measurement above 1GHz, peak values with RBW=VBW=1MHz and PK detector. AV value with RBW=1MHz, VBW=10Hz and PK detector. Measurements were made at 3 meters.
- (4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
- (5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "QP" in the data table.
- (6) The antenna polarization : Vertical polarization and Horizontal polarization.

# Block diagram of Test setup Distance = 3m Computer Pre -Amplifier EUT Turn-table Receiver

- 6.2 Configuration of The EUT

  Same as section 5.3 of this report
- 6.3 EUT Operating Condition
  Same as section 5.4 of this report.

Report No: 1310099-01 Page 13 of 83

Date: 2013-11-18



# 6.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

# Frequencies in restricted band are complied to limit on Paragraph 15.109. 15.209

Frequency Range (MHz)	Distance (m)	Field strength (dB $\mu$ V/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note:

- 1. RF Voltage  $(dBuV) = 20 \log RF \text{ Voltage } (uV)$
- 2. In the Above Table, the higher limit applies at the band edges.
- 3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT
- 4. This is a handhold device. The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.
- 5. After pre-scanning, GFSK was the worse case. The test data of this mode was recorded.

Report No: 1310099-01 Page 14 of 83

Date: 2013-11-18



### Test result

# General Radiated Emission Data and Harmonics Radiated Emission Data

Radiated Emission In Horizontal/ In Vertical (30MHz----1000MHz)

**EUT set Condition: Charging and Keep Bluetooth Transmitting** 

**Results: Pass** 

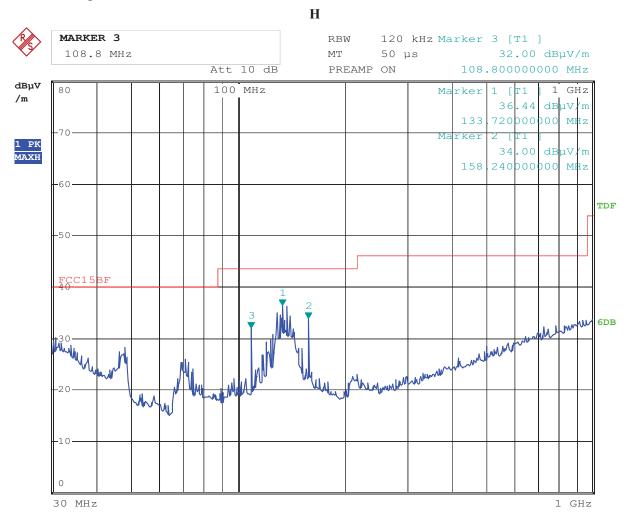
Frequency (MHz)	Level@3m (dB \u03b4 V/m)	Antenna Polarity	Limit@3m (dB \mu V/m)
133.720	36.44	Н	43.50
158.240	34.00	Н	43.50
108.800	32.00	Н	43.50
30.160	36.29	V	40.00
37.080	33.24	V	40.00
92.040	32.58	V	43.50
163.520	30.62	V	43.50

Report No: 1310099-01 Page 15 of 83

Date: 2013-11-18



# Test Figure:



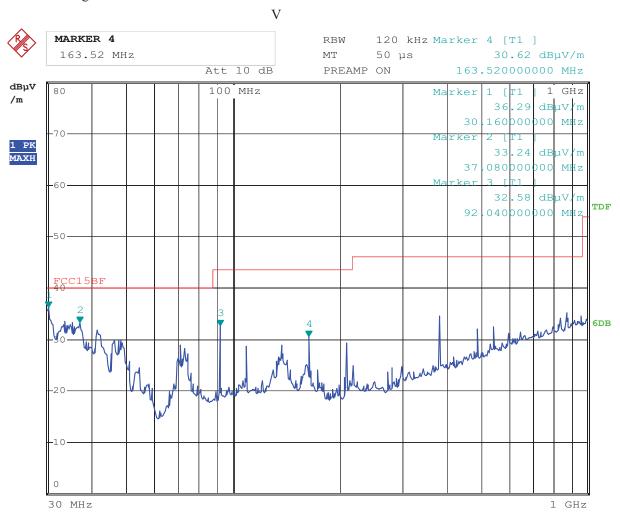
Date: 11.NOV.2013 10:08:39

Report No: 1310099-01 Page 16 of 83

Date: 2013-11-18



# Test Figure:



Date: 11.NOV.2013 10:03:57

Report No: 1310099-01 Page 17 of 83

Date: 2013-11-18



# **Operation Mode: Transmitting under Low Channel (2402MHz)**

Frequency (MHz)	Level@3m (dB \u03b4 V/m)	Antenna Polarity	Limit@3m (dB \( \mu \)V/m)
2402	91.92 (PK)	Н	Fundamental Frequency
2402	91.87 (PK)	V	Fundamental Frequency
4804		Н	74(Peak)/ 54(AV)
4804		V	74(Peak)/ 54(AV)
7206		H/V	74(Peak)/ 54(AV)
9608		H/V	74(Peak)/ 54(AV)
12010		H/V	74(Peak)/ 54(AV)
14412		H/V	74(Peak)/ 54(AV)
16814		H/V	74(Peak)/ 54(AV)
19216		H/V	74(Peak)/ 54(AV)
21618		H/V	74(Peak)/ 54(AV)
24020		H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark "---" means that the emissions level is too low to be measured

# **Operation Mode: Transmitting** under Middle Channel (2441MHz)

	8	•	<u> </u>
Frequency (MHz)	Level@3m (dB \u03b4 V/m)	Antenna Polarity	Limit@3m (dB \u03b4 V/m)
2441	92.36 (PK)	Н	Fundamental Frequency
2441	92.36 (PK)	V	Fundamental Frequency
4882		Н	74(Peak)/ 54(AV)
4882		V	74(Peak)/ 54(AV)
7323		H/V	74(Peak)/ 54(AV)
9764		H/V	74(Peak)/ 54(AV)
12205		H/V	74(Peak)/ 54(AV)
14646		H/V	74(Peak)/ 54(AV)
17087		H/V	74(Peak)/ 54(AV)
19528		H/V	74(Peak)/ 54(AV)
21969		H/V	74(Peak)/ 54(AV)
24410		H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark "---" means that the emissions level is too low to be measured

Report No: 1310099-01 Page 18 of 83

Date: 2013-11-18



# Operation Mode: Transmitting under High Channel (2480MHz)

Frequency (MHz)	Level@3m (dB \u03bc V/m)	Antenna Polarity	Limit@3m (dB µ V/m)
2480	90.98 (PK)	Н	Fundamental Frequency
2480	91.82 (PK)	V	Fundamental Frequency
4960	-	Н	74(Peak)/ 54(AV)
4960	-	V	74(Peak)/ 54(AV)
7440	-	H/V	74(Peak)/ 54(AV)
9920	-	H/V	74(Peak)/ 54(AV)
12400	-	H/V	74(Peak)/ 54(AV)
14880	-	H/V	74(Peak)/ 54(AV)
17360	-	H/V	74(Peak)/ 54(AV)
19840		H/V	74(Peak)/ 54(AV)
22320		H/V	74(Peak)/ 54(AV)
24800		H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

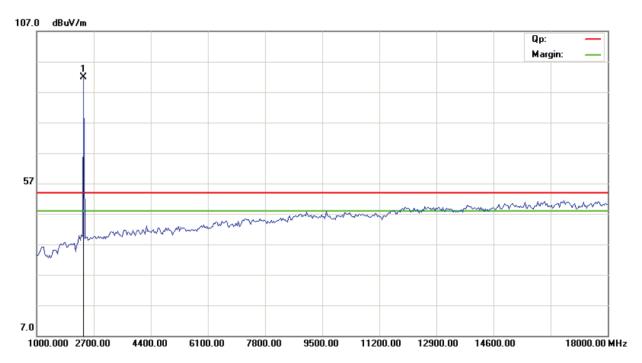
<sup>2.</sup> Remark "---" means that the emissions level is too low to be measured

Date: 2013-11-18

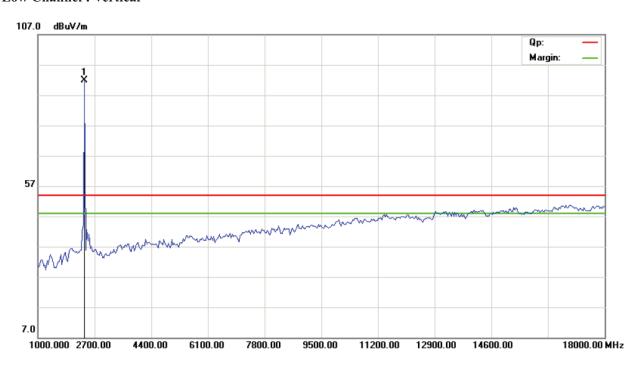


Please refer to the following test plots for details:

### Low Channel: Horizontal



### **Low Channel: Vertical**



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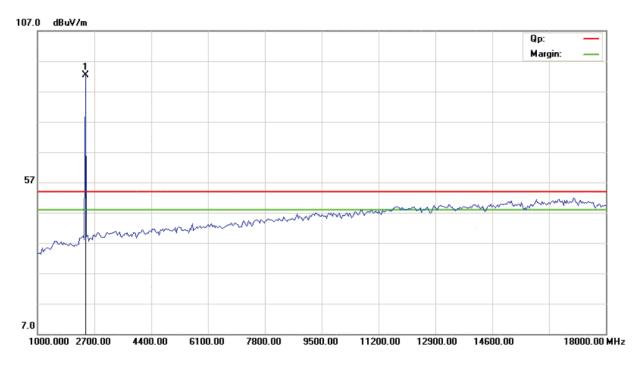
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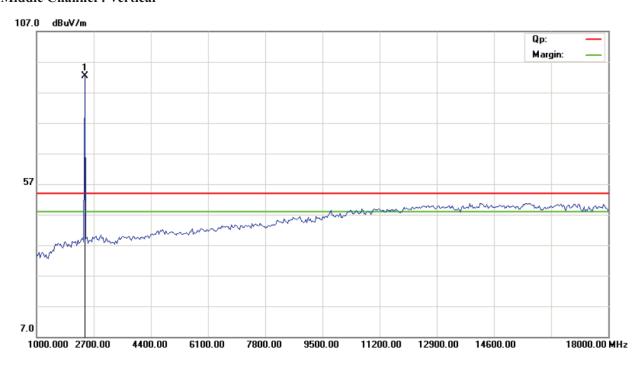
Date: 2013-11-18



### Middle Channel: Horizontal



# **Middle Channel: Vertical**



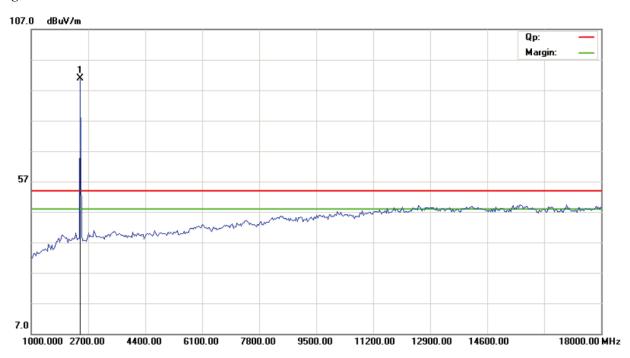
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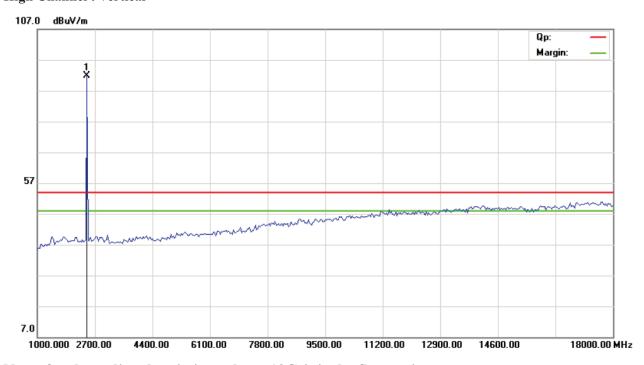
Date: 2013-11-18



# **High Channel: Horizontal**



# **High Channel: Vertical**



Note: for the radiated emissions above 18G, it is the floor noise.

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Report No: 1310099-01 Page 22 of 83

Date: 2013-11-18



### 7.0 20dB Bandwidth Measurement

# 7.1 Regulation

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

# 7.2 Limits of 20dB Bandwidth Measurement

N/A

### 7.3 Test Procedure.

- 1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
- 2. Set the spectrum analyzer as follows: Span =5MHz, VBW =30kHz, RBW=100kHz, Sweep = auto Detector function = peak ,Trace = max hold
- 3. Measure the highest amplitude appearing on spectral display and record the level to calculate results. 6. Repeat above procedures until all frequencies measured were complete.

### 7.4 Test Result

### **Type of Modulation: GFSK**

<i>.</i>	-JF					
EUT		MID		M755, C755		
Mode	K	Keep Transmitting		AC120V		
Temperat	ure	24 deg. C,	Humidity 56% RH			
Channel	Channel Frequency (MHz) 20 dB Bandwick (kHz)		Maximum Limit (kHz)	Pass/ Fail		
Low	2402	852		Pass		
Middle	2441 846			Pass		
High	2480 870			Pass		

Page 23 of 83

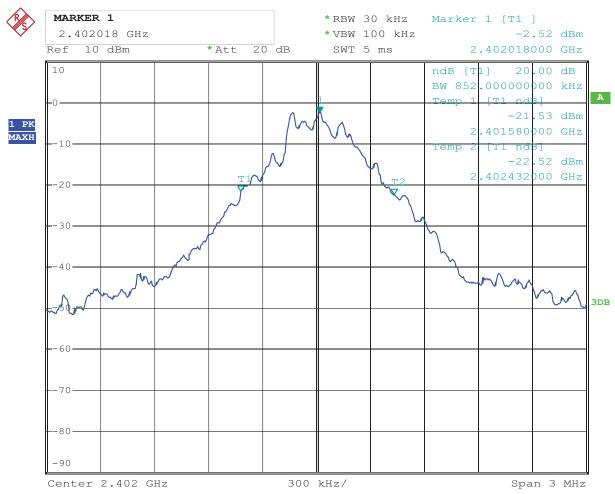
Report No: 1310099-01

Date: 2013-11-18



# Test Figure:

### 1. Condition: Low Channel



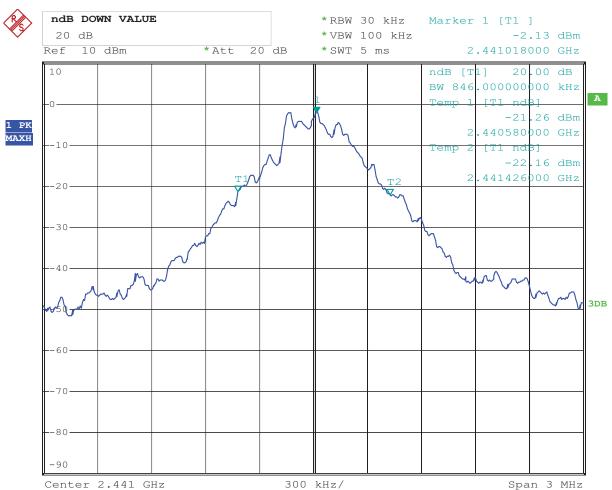
Date: 12.NOV.2013 16:47:01

Report No: 1310099-01 Page 24 of 83

Date: 2013-11-18



### 2. Condition: Middle Channel



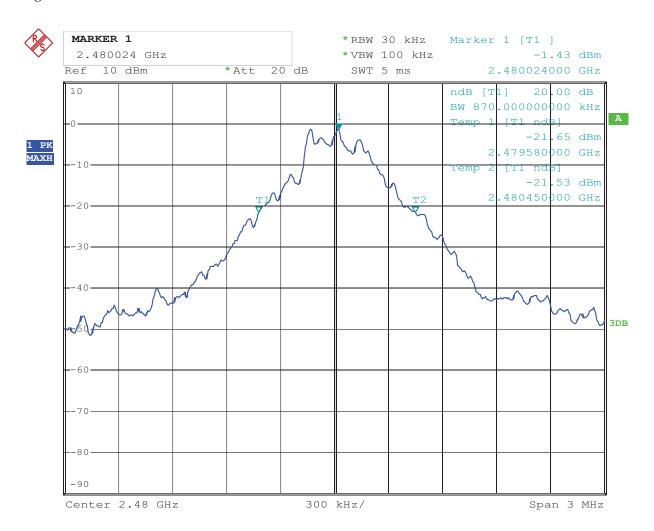
Date: 13.NOV.2013 10:07:48

Report No: 1310099-01 Page 25 of 83

Date: 2013-11-18



# 3. High Channel



Date: 12.NOV.2013 16:48:47

Report No: 1310099-01 Page 26 of 83

Date: 2013-11-18



# **Test Result**

Type of Modulation:  $\sqrt{J}/4QPSK$ 

EUT		MID		M755, C755
Mode	Ko	Keep Transmitting		AC120V
Temperat	ure	24 deg. C, Humidity		56% RH
Channel	Channel Frequency (MHz) 20 dB Bandwidth (kHz)		Maximum Limit (kHz)	Pass/ Fail
Low	2402	1230		Pass
Middle	2441	1224		Pass
High	2480	1218		Pass

Page 27 of 83

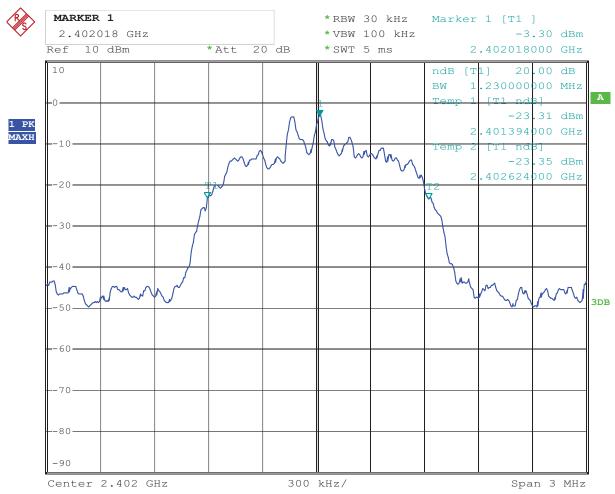
Report No: 1310099-01

Date: 2013-11-18



# Test Figure:

### 1. Condition: Low Channel



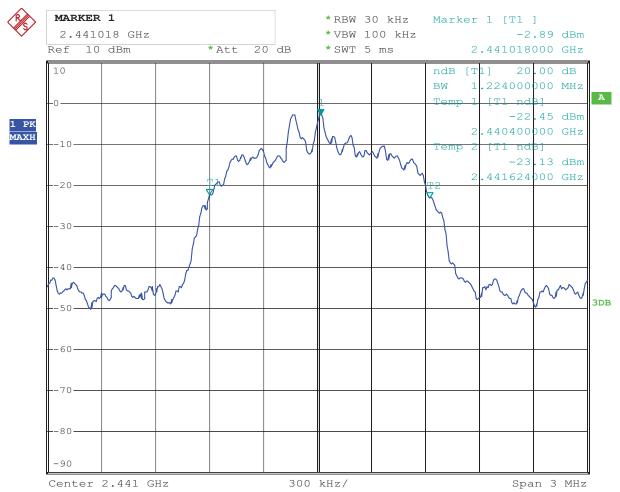
Date: 13.NOV.2013 09:49:18

Report No: 1310099-01 Page 28 of 83

Date: 2013-11-18



### 2. Condition: Middle Channel



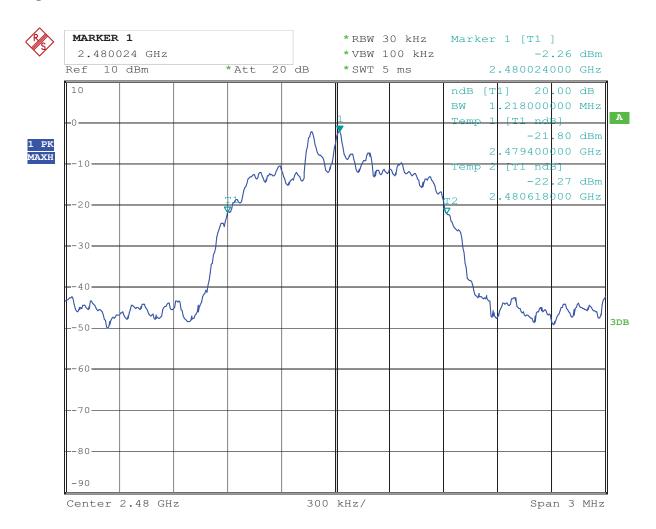
Date: 13.NOV.2013 09:51:05

Report No: 1310099-01 Page 29 of 83

Date: 2013-11-18



# 3. High Channel



Date: 13.NOV.2013 09:51:52

Report No: 1310099-01 Page 30 of 83

Date: 2013-11-18



# **Test Result**

**Type of Modulation: 8DPSK** 

EUT		MID		M755, C755
Mode	Ko	Keep Transmitting		AC120V
Temperat	ure	24 deg. C, Humidity		56% RH
Channel	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Maximum Limit (kHz)	Pass/ Fail
Low	2402	1212		Pass
Middle	2441	1212		Pass
High	2480	1212		Pass

Page 31 of 83

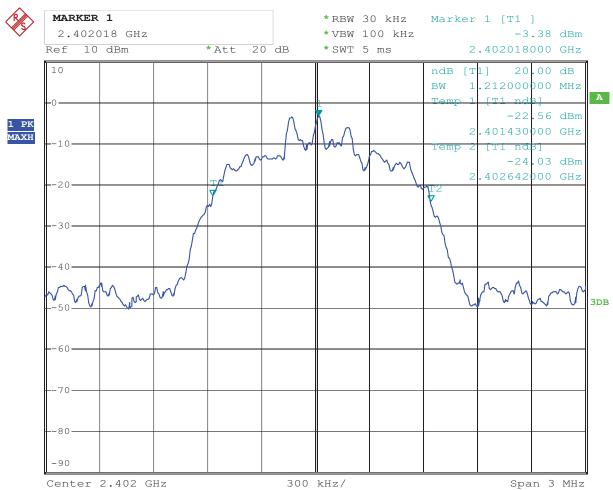
Report No: 1310099-01

Date: 2013-11-18



# Test Figure:

### 1. Condition: Low Channel



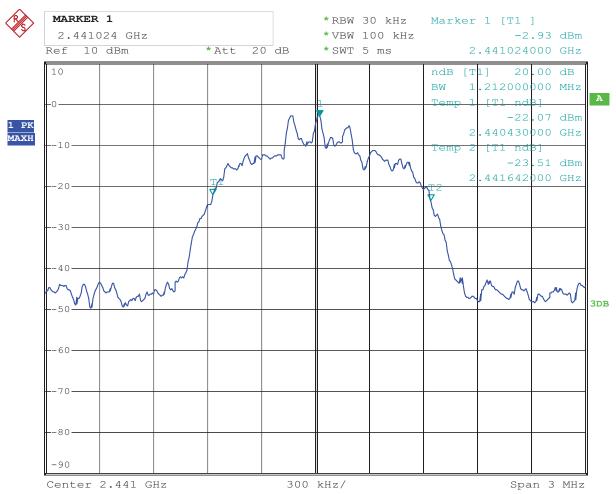
Date: 13.NOV.2013 09:54:36

Report No: 1310099-01 Page 32 of 83

Date: 2013-11-18



### 2. Condition: Middle Channel



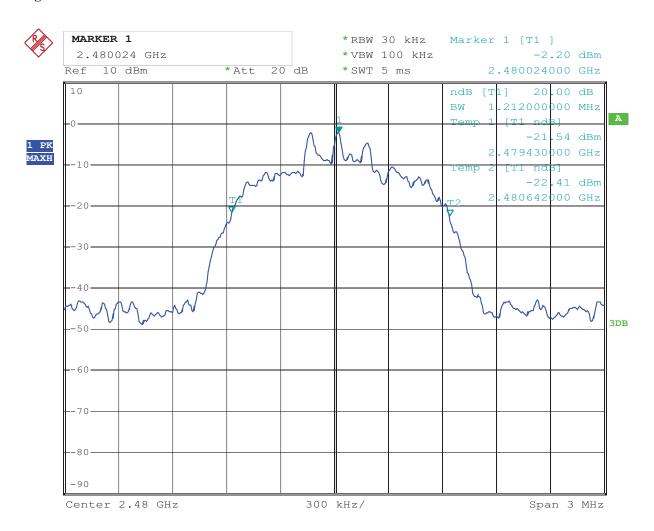
Date: 13.NOV.2013 09:53:48

Report No: 1310099-01 Page 33 of 83

Date: 2013-11-18



# 3. High Channel



Date: 13.NOV.2013 09:52:49

Report No: 1310099-01 Page 34 of 83

Date: 2013-11-18



# 8. Maximum Peak Output Power

### 8.1 Regulation

According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5MHz band:0.125 watts. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 8.2 Limits of Maximum Peak Output Power

The Maximum Peak Output Power Measurement is 30dBm.

### **8.3 Test Procedure**

- 1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
- 2. Set the spectrum analyzer as follows: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel; RBW > the 20 dB bandwidth of the emission being measured; VBW = RBW=3MHz; Sweep = auto; Detector function = peak; Trace = max hold
- 3. Measure the highest amplitude appearing on spectral display and record the level to calculate results.
- 4. Repeat above procedures until all frequencies measured were complete.

Page 35 of 83

Report No: 1310099-01

Date: 2013-11-18



### **8.4Test Results**

# Type of Modulation: GFSK

EUT		MID		Model	M755, C755
Mode	Ke	ep Transmitting	Input Voltage		AC120V
Temperatur	re	24 deg. C,		umidity	56% RH
Channel	Channel Frequency (MHz)	Peak Power Output (dBm)	)	Peak Power Limit (dBm)	Pass/ Fail
Low	2402	-0.56		30	Pass
Middle	2441	-0.07		30	Pass
High	2480	0.51		30	Pass

Note: 1. the result basic equation calculation as follow:

Peak Power Output = Peak Power Reading + Cable loss + Attenuator

2. Worse case was recorded

### Type of Modulation: J\(\textit{J}\)/4OPSK

1,100 01 110001111111111111111111111111					
EUT		MID	Model		M755, C755
Mode	Ke	ep Transmitting	Input Voltage		AC120V
Temperatur	re	24 deg. C, Humidity		umidity	56% RH
Channel	Channel Frequency (MHz)	Peak Power Output (dBm	)	Peak Power Limit (dBm)	Pass/ Fail
Low	2402	-1.32		30	Pass
Middle	2441	-0.83		30	Pass
High	2480	-0.25		30	Pass

Note: 1. the result basic equation calculation as follow:

Peak Power Output = Peak Power Reading + Cable loss + Attenuator

2. Worse case was recorded

Report No: 1310099-01 Page 36 of 83

Date: 2013-11-18



# **Type of Modulation: 8DPSK**

EUT		MID		Model	M755, C755
Mode	Ke	eep Transmitting Input		it Voltage	AC120V
Temperatur	re	24 deg. C,		umidity	56% RH
Channel	Channel Frequency (MHz)	Peak Power Output (dBm)	)	Peak Power Limit (dBm)	Pass/ Fail
Low	2402	-1.05		30	Pass
Middle	2441	-0.65		30	Pass
High	2480	-0.04		30	Pass

Note: 1. the result basic equation calculation as follow:

Peak Power Output = Peak Power Reading + Cable loss + Attenuator

2. Worse case was recorded

Report No: 1310099-01

Date: 2013-11-18



Page 37 of 83

# 9. Carrier Frequency Separation

### 9.1 Regulation

According to §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies 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.

### 9.2 Limits of Carrier Frequency Separation

The Maximum Power Spectral Density Measurement is 25kHz or two-thirds of the 20dB bandwidth of the hopping Channel which is great.

#### 9.3 Test Procedure

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Set the spectrum analyzer as follows: Span = wide enough to capture the peaks of two adjacent channels: Resolution (or IF) Bandwidth (RBW)  $\geq$  1% of the span; Video (or Average) Bandwidth (VBW)  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold
- 3. Measure the separation between the peaks of the adjacent channels using the marker-delta function.
- 4. Repeat above procedures until all frequencies measured were complete.

Page 38 of 83

Report No: 1310099-01

Date: 2013-11-18

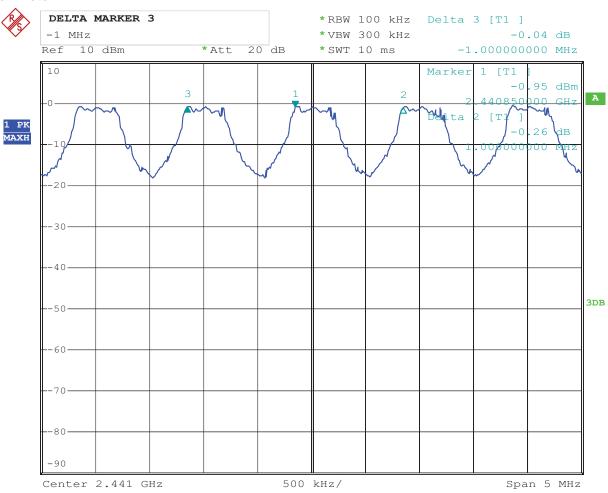


#### 9.4Test Result

#### Type of Modulation: GFSK

EUT	MID	Model		M755, C755			
Mode	Hopping On		Input Voltage		AC120V		
Temperature	24 deg. C,		Humidity		56% RH		
Carrier Frequency Separation		Limit			Pass/ Fail		
1000kHz		≥ 25 kHz or 2	2/3 of 20 dB bands	width	Pass		

## **Test Plots**



Date: 12.NOV.2013 17:07:03

Page 39 of 83

Report No: 1310099-01

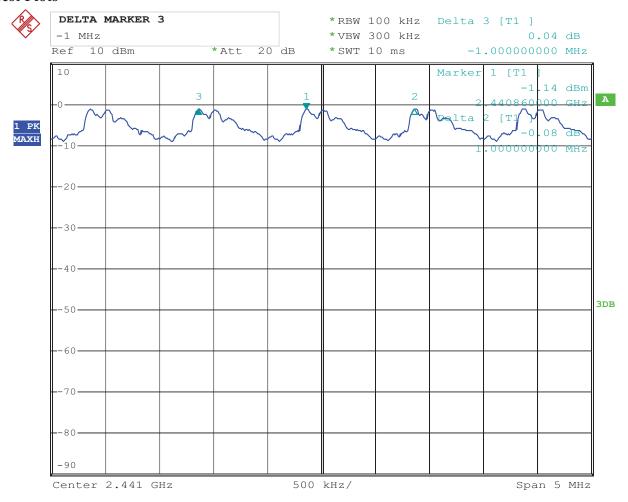
Date: 2013-11-18



### Type of Modulation: $\pi/4$ QPSK

EUT	MID	Model		M755, C755			
Mode	Hopping O	Input Voltage	AC120V				
Temperature	24 deg. C,		Humidity		56% RH		
Carrier Frequency Separation		Limit			Pass/ Fail		
1000kHz		≥ 25 kHz or 2/3 of 20 dB bandwidth		Pass			

#### **Test Plots**



Date: 13.NOV.2013 09:29:54

Page 40 of 83

Report No: 1310099-01

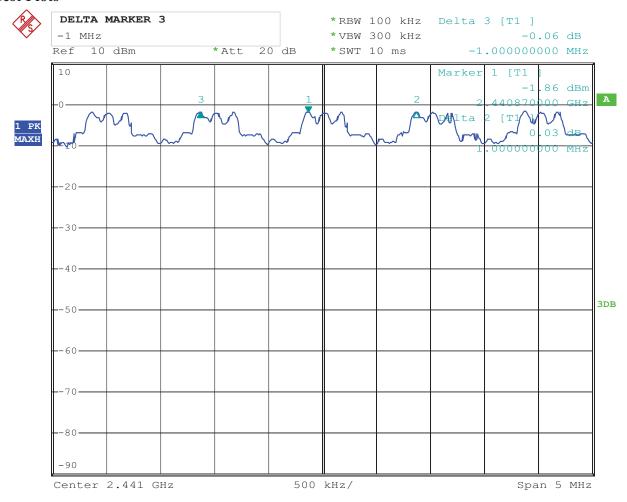
Date: 2013-11-18



### **Type of Modulation: 8DPSK**

EUT	MID	Model		M755, C755		
Mode	Hopping O	Input Voltage	AC120V			
Temperature	24 deg. C,	Humidity		56% RH		
Carrier Frequency Separation		Limit			Pass/ Fail	
1000kHz		≥ 25 kHz or 2	2/3 of 20 dB bandy	width	Pass	

#### **Test Plots**



Date: 12.NOV.2013 18:17:51

Report No: 1310099-01

Date: 2013-11-18



Page 41 of 83

# 10. Number of Hopping Channels

### 10.1 Regulation

According to §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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used. According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

### 10.2 Limits of Number of Hopping Channels

The frequency hopping systems in the 2400-2483.5MHz band shall use at least 15 channels.

#### **10.3 Test Procedure**

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Set the spectrum analyzer as follows: Span = the frequency band of operation; RBW=100 kHz, VBW= 100 kHz;

Sweep = auto; Detector function = peak; Trace = max hold

3. Record the number of hopping channels.

Page 42 of 83

Report No: 1310099-01

Date: 2013-11-18

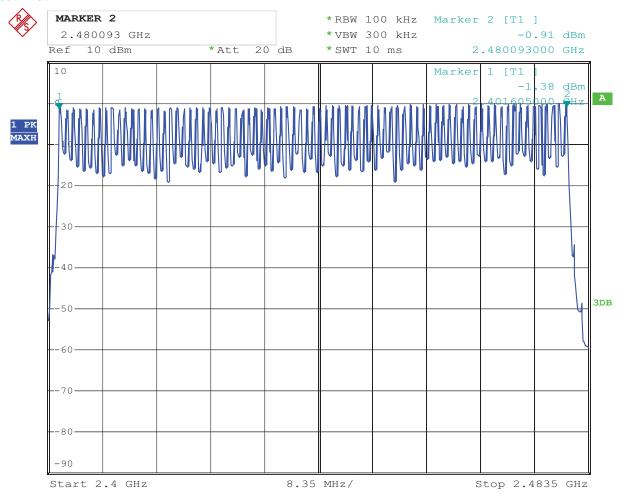


#### 10.4Test Result

Type of Modulation: GFSK

EUT		MID	M	odel		M755, C755
Mode	Hopping On		Input Voltage			AC120V
Temperature	24 deg. C,		Humidity		56% RH	
Operating Frequency		Number of hopp channels	ing	Lin	nit	Pass/ Fail
2402-2480MHz		79		≥ 1	.5	Pass

## **Test Plot**



Date: 12.NOV.2013 17:10:44

Page 43 of 83

Report No: 1310099-01

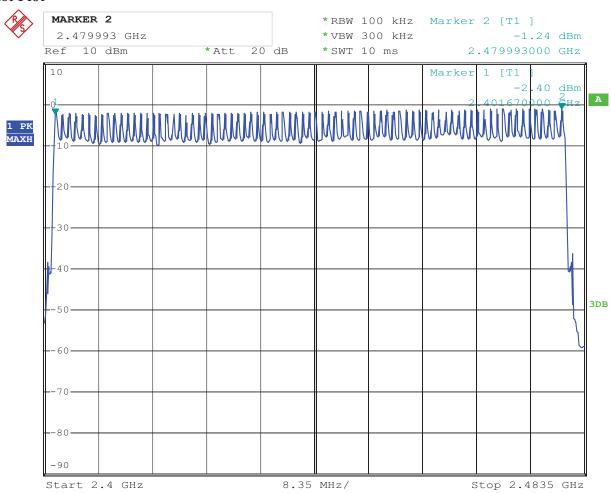
Date: 2013-11-18



### Type of Modulation: $\sqrt{J/4QPSK}$

EUT		MID	M	odel		M755, C755	
Mode	Hopping On		Input Voltage			AC120V	
Temperature	24 deg. C,		Humidity		56% RH		
Operating Frequ	Operating Frequency  Number of hop channels		ing	Lin	nit	Pass/ Fail	
2402-2480M	2402-2480MHz			≥ 1	5	Pass	

#### **Test Plot**



Date: 12.NOV.2013 18:06:40

Report No: 1310099-01 Page 44 of 83

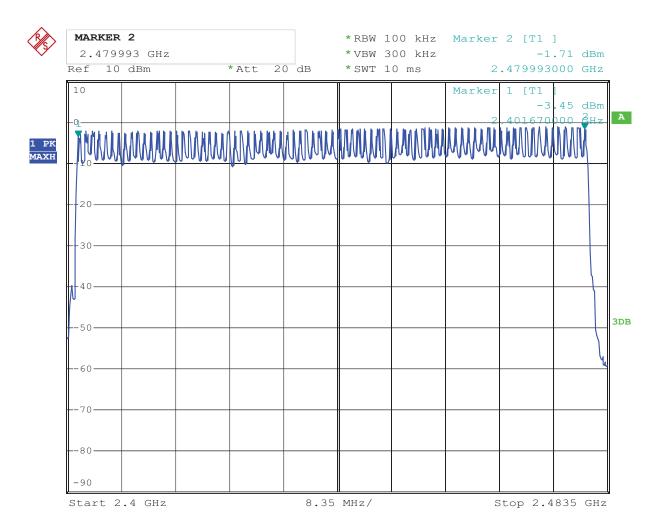
Date: 2013-11-18



### **Type of Modulation: 8DPSK**

EUT		MID	M	odel		M755, C755
Mode		Hopping On	Input	Voltage AC120V		AC120V
Temperature	24 deg. C,		Humidity		56% RH	
Operating Frequ	perating Frequency Number		ing	Lin	nit	Pass/ Fail
2402-2480MHz		79		≥ 1	.5	Pass

#### **Test Plot**



Date: 12.NOV.2013 18:11:19

Report No: 1310099-01

Date: 2013-11-18



Page 45 of 83

# 11. Time of Occupancy (Dwell Time)

#### 11.1 Regulation

According to §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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 11.2 Limits of Carrier Frequency Separation

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

#### 11.3 Test Procedure

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Set the spectrum analyzer as follows: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW  $\geq$  RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold
- 3. Measure the dwell time using the marker-delta function.
- 4. Repeat above procedures until all frequencies measured were complete.
- 5. Repeat this test for different modes of operation (e.g., data rate, modulation format, etc.), if applicable.

Report No: 1310099-01 Page 46 of 83

Date: 2013-11-18



#### 11.4 Test Result

Type of Modulation: GFSK

EUT		MID		Model		M755, C755	
Mode		Keep Transmitti	ng	Input Voltage		AC120V	
Temperatur	re	24 deg. C,		Humidity		56% RH	
Channel		Reading		Hoping Rate	Actu	al	Limit
Low		3.00		266.667 hop/s	0.32	0	0.4s
Middle		2.96		266.667 hop/s	0.31	6	0.4s
High		3.00		266.667 hop/s	0.32	0	0.4s

Actual = Reading  $\times$  (Hopping rate / Number of channels)  $\times$  Test period, Test period = 0.4 [seconds / channel]  $\times$  79 [channel] = 31.6 [seconds] NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625 $\mu$ s with 79 channels. A DH5 Packet needs 5 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 266.667 hops per second with 79 channels.

Note: DH5 was the worse case

Page 47 of 83

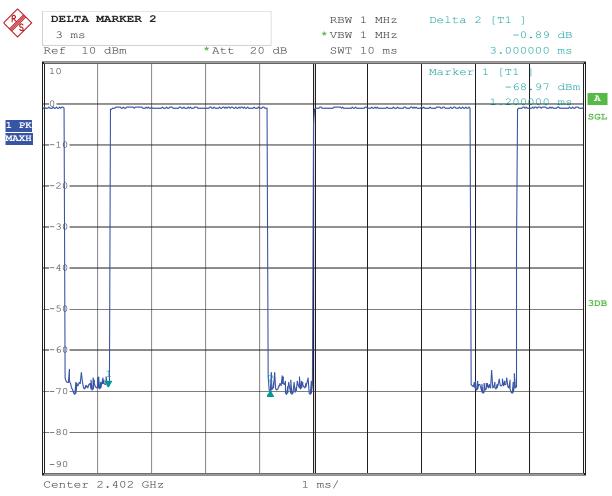
Report No: 1310099-01

Date: 2013-11-18



#### Test Plots:

#### Low Channel:



Date: 12.NOV.2013 16:51:48

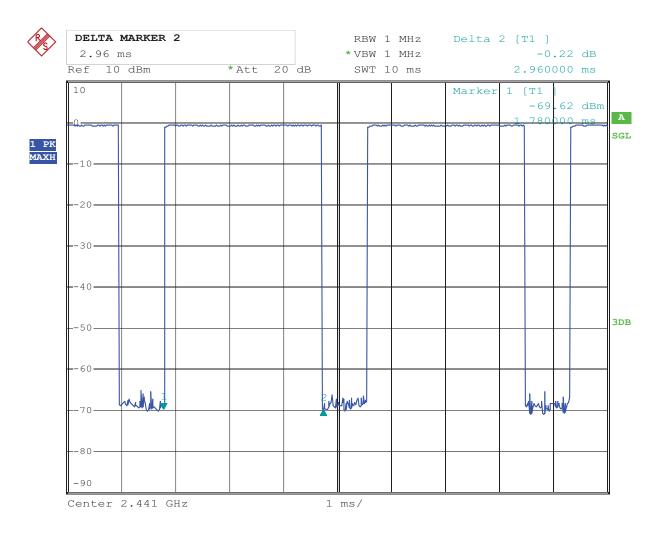
Page 48 of 83

Report No: 1310099-01

Date: 2013-11-18



#### Middle Channel:



Date: 12.NOV.2013 16:52:49

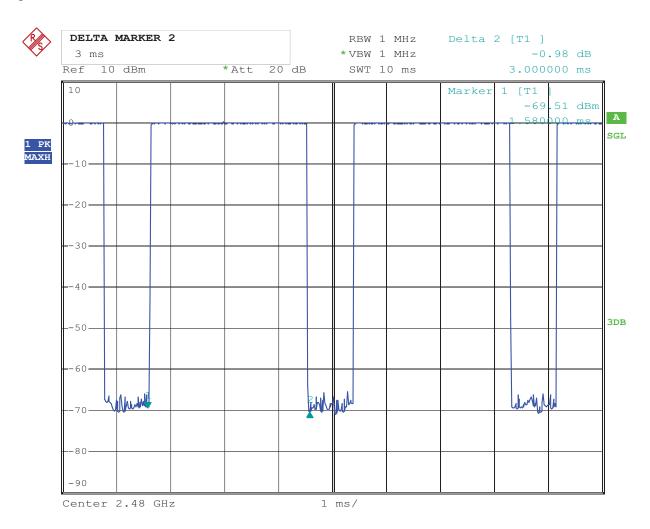
Page 49 of 83

Report No: 1310099-01

Date: 2013-11-18



## High Channel



Date: 12.NOV.2013 16:54:01

Report No: 1310099-01 Page 50 of 83

Date: 2013-11-18



#### **Test Result**

Type of Modulation:  $\pi/4$ QPSK

EUT		MID	MID			M755, C755	
Mode		Keep Transmitti	ng	Input Voltage		AC120V	
Temperatur	re	24 deg. C,		Humidity		56% RH	
Channel		Reading		Hoping Rate	Acti	ıal	Limit
Low		2.98		266.667 hop/s	0.3	18	0.4s
Middle		2.96		266.667 hop/s	0.3	16	0.4s
High		2.96		266.667 hop/s	0.3	16	0.4s

Actual = Reading  $\times$  (Hopping rate / Number of channels)  $\times$  Test period ,Test period = 0.4 [seconds / channel]  $\times$  79 [channel] = 31.6 [seconds] NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625 $\mu$ s with 79 channels. A DH5 Packet needs 5 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 266.667 hops per second with 79 channels.

Note: DH5 was the worse case

Page 51 of 83

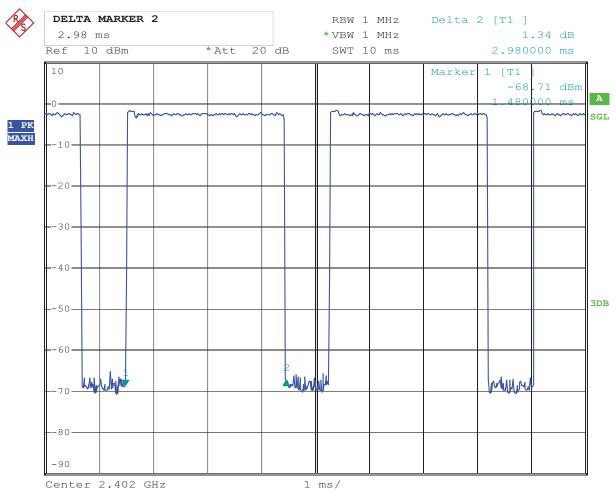
Report No: 1310099-01

Date: 2013-11-18



#### Test Plots:

#### Low Channel:



Date: 13.NOV.2013 09:59:48

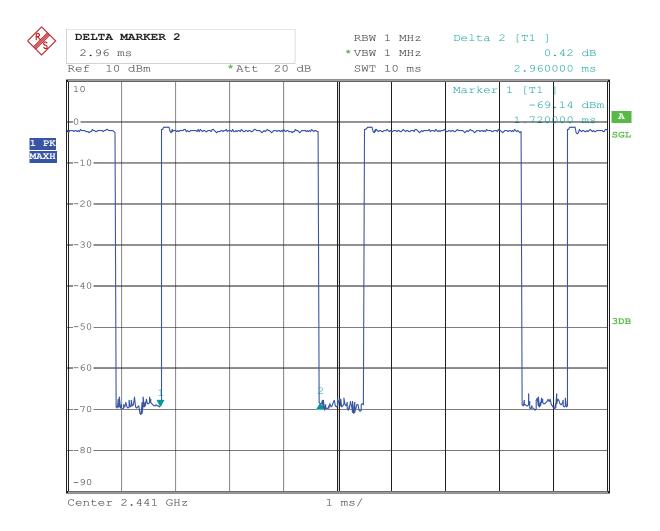
Page 52 of 83

Report No: 1310099-01

Date: 2013-11-18



#### Middle Channel:



Date: 13.NOV.2013 10:01:02

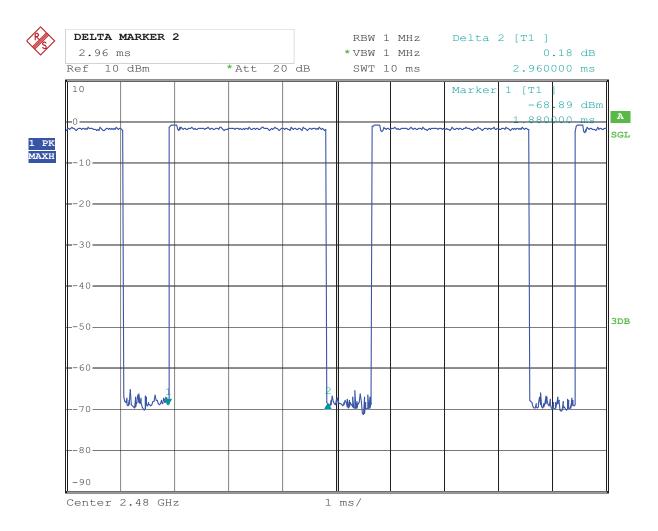
Page 53 of 83

Report No: 1310099-01

Date: 2013-11-18



### High Channel



Date: 13.NOV.2013 10:02:07

Report No: 1310099-01 Page 54 of 83

Date: 2013-11-18



### **Type of Modulation: 8DPSK**

EUT		MID	Model			M755, C755		
Mode		Keep Transmitting		Input Voltage		AC120V		
Temperatur	re	24 deg. C,		Humidity		56% RH		
Channel		Reading		Hoping Rate	Actual		Limit	
Low		3.00		266.667 hop/s	0.320		0.4s	
Middle		2.98		266.667 hop/s	0.318		0.4s	
High		3.00		266.667 hop/s	0.320		0.4s	

Actual = Reading  $\times$  (Hopping rate / Number of channels)  $\times$  Test period, Test period = 0.4 [seconds / channel]  $\times$  79 [channel] = 31.6 [seconds] NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625 $\mu$ s with 79 channels. A DH5 Packet needs 5 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 266.667 hops per second with 79 channels.

Note: DH5 was the worse case

Page 55 of 83

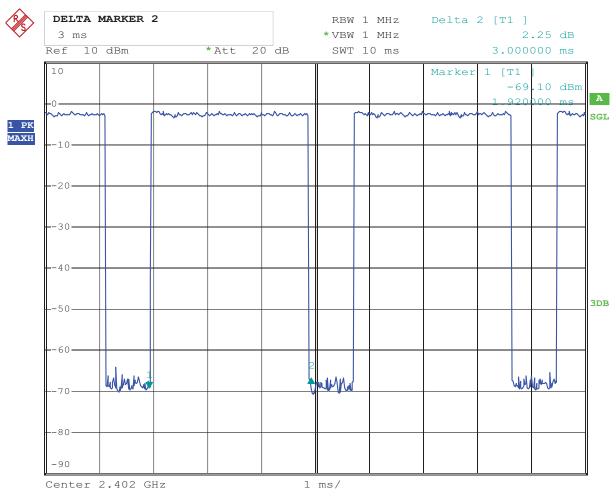
Report No: 1310099-01

Date: 2013-11-18



#### Test Plots:

#### Low Channel:



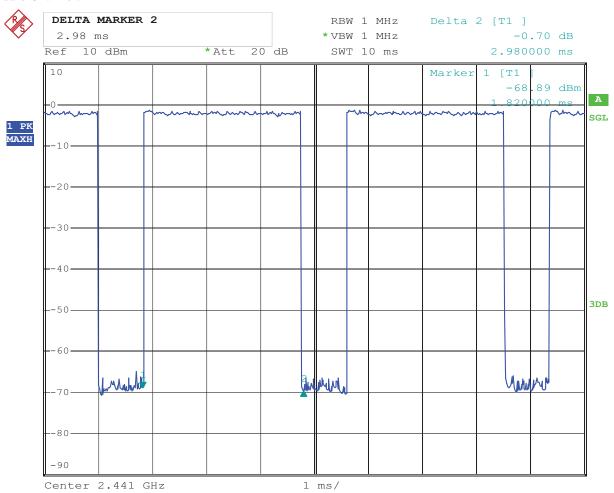
Date: 13.NOV.2013 10:05:34

Report No: 1310099-01 Page 56 of 83

Date: 2013-11-18



#### Middle Channel:



Date: 13.NOV.2013 10:04:36

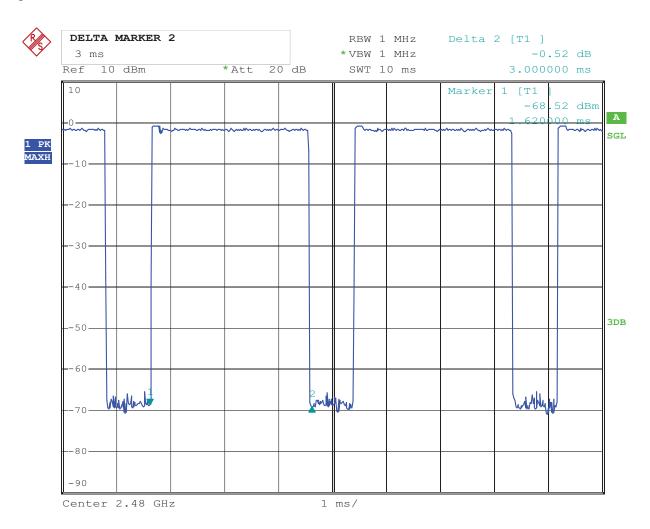
Page 57 of 83

Report No: 1310099-01

Date: 2013-11-18



## High Channel



Date: 13.NOV.2013 10:03:10

Report No: 1310099-01

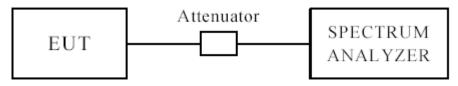
Date: 2013-11-18



Page 58 of 83

#### 12 Out of Band Measurement

### 12.1 Test Setup



The restricted band requirement based on radiated emission test; please see the clause 6 for the test setup

#### 12.2 Limits of Out of Band Emissions Measurement

- 1. Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).
- 2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

#### 12.3 Test Procedure

For signals in the restricted bands above and below the 2.4-2.483GHz allocated band a measurement was made of Radiated emission test. Peak values with RBW=VBW=1MHz and PK detector.

For bandage test, the spectrum set as follows: RBW=VBW=100 kHz. A conducted measurement used

Note: 1. For band-edge measurement, the frequency from 30MHz-25GHz was tested. And It met the FCC rule.

2. This is a handhold device. The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.

Page 59 of 83

Report No: 1310099-01

Date: 2013-11-18

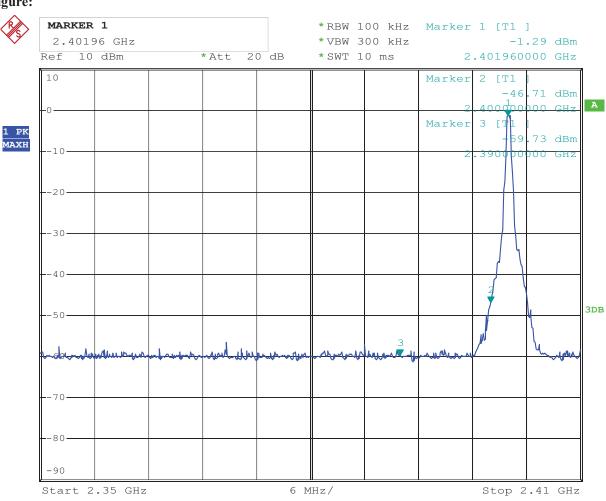


## Type of Modulation: GFSK

#### 12.4 Out of Band Test Result

Product:		MID	Test Mode:	Low Channel
Mode	Kee	ping Transmitting	Input Voltage	AC120V
Temperature		24 deg. C	Humidity	56% RH
Test Result:		Pass	Detector	PK
The Max. FS in	PK (dBµV/m)	37.6		$74(dB\mu V/m)$
Restrict Band	$AV(dB\mu V/m)$		Limit	$54(dB\mu V/m)$
2390MHz				

### **Test Figure:**



Date: 12.NOV.2013 16:56:47

Page 60 of 83

Report No: 1310099-01

Date: 2013-11-18

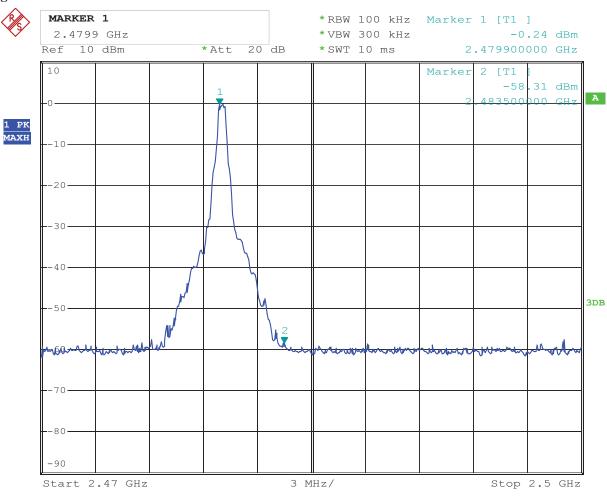


### Type of Modulation: GFSK

#### 12.4 Out of Band Test Result

Product:		MID	Test Mode:	High Channel
Mode	Keej	ping Transmitting	Input Voltage	AC120V
Temperature		24 deg. C,	Humidity	56% RH
Test Result:		Pass	Detector	PK
The Max. FS in	PK (dBμV/m)	K (dBμV/m) 38.9		$74(dB\mu V/m)$
Restrict Band	AV(dBμV/m)		Limit	$54(dB\mu V/m)$
2483.5MHz				

### **Test Figure:**



Date: 12.NOV.2013 17:03:15

Page 61 of 83

Report No: 1310099-01

Date: 2013-11-18



### Type of Modulation: GFSK

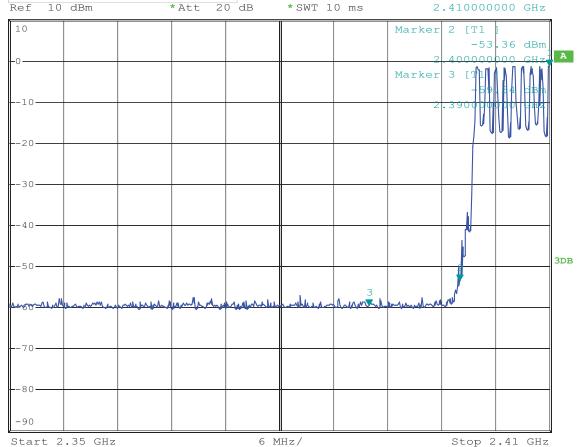
#### 12.4 Out of Band Test Result

Product:		MID	Test Mode:	Hopping mode
Mode	Норр	oing mode	Input Voltage	AC120V
Temperature		24 deg. C,	Humidity	56% RH
Test Result:		Pass	Detector	PK
The Max. FS in	PK (dBμV/m)	37.5		$74(dB\mu V/m)$
Restrict Band	AV(dBμV/m)		Limit	$54(dB\mu V/m)$
2390MHz				

### **Test Figure:**







Date: 12.NOV.2013 16:59:04

Report No: 1310099-01

Date: 2013-11-18

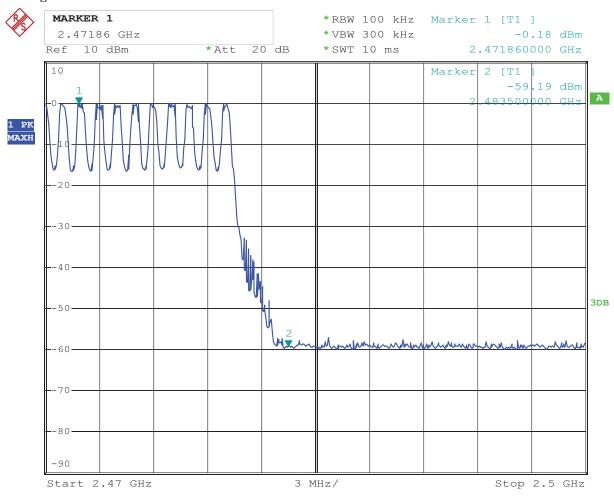


### **Type of Modulation: GFSK**

### 12.4 Out of Band Test Result

Product:	MID		Test Mode:	Hopping mode
Mode	Hopping mode I		Input Voltage	AC120V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in	PK (dBμV/m)	39.4		$74(dB\mu V/m)$
Restrict Band	AV(dBμV/m)		Limit	54(dBμV/m)
2483.5MHz				

### **Test Figure:**



Date: 12.NOV.2013 17:02:37

Page 63 of 83

Report No: 1310099-01

Date: 2013-11-18

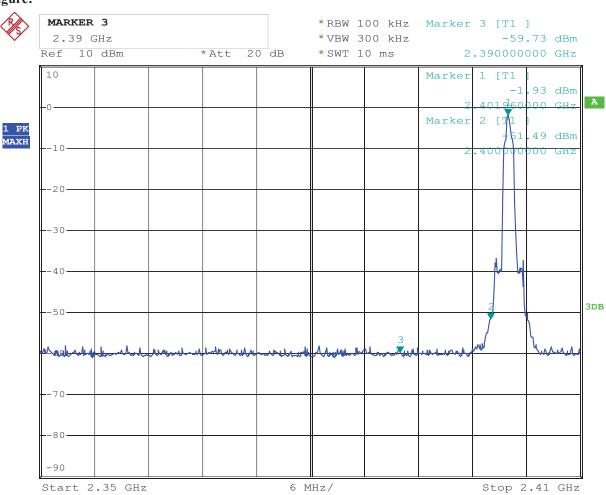


# Type of Modulation: JI/4QPSK

#### 12.4 Out of Band Test Result

Product:	MID		Test Mode:	Low Channel
Mode	Keeping Transmitting		Input Voltage	AC120V
Temperature	24 deg. C		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in	PK (dBμV/m) 38.2			$74(dB\mu V/m)$
Restrict Band	AV(dBμV/m)		Limit	$54(dB\mu V/m)$
2390MHz				

### **Test Figure:**



Date: 13.NOV.2013 09:40:28

Page 64 of 83

Report No: 1310099-01

Date: 2013-11-18

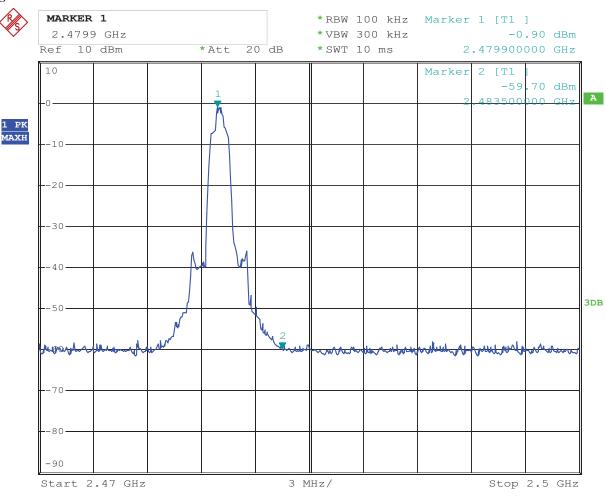


# Type of Modulation: $\sqrt{1/4}$ QPSK

#### 12.4 Out of Band Test Result

Product:	MID		Test Mode:	High Channel
Mode	Keeping Transmitting		Input Voltage	AC120V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in	PK (dBμV/m) 39.1			$74(dB\mu V/m)$
Restrict Band	AV(dBμV/m)		Limit	$54(dB\mu V/m)$
2483.5MHz				

### **Test Figure:**



Date: 13.NOV.2013 09:38:09

Page 65 of 83

Report No: 1310099-01

Date: 2013-11-18

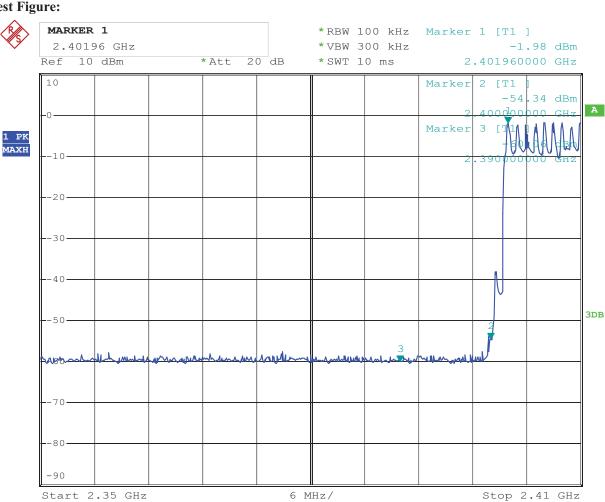


## Type of Modulation: Л/4QPSK

#### Out of Band Test Result

Product:	MID		Test Mode:	Hopping mode
Mode	Hopping mode		Input Voltage	AC120V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in	PK (dBμV/m)	36.8		$74(dB\mu V/m)$
Restrict Band	AV(dBμV/m)		Limit	54(dBμV/m)
2390MHz				

### **Test Figure:**



Date: 13.NOV.2013 09:47:19 Report No: 1310099-01

Date: 2013-11-18

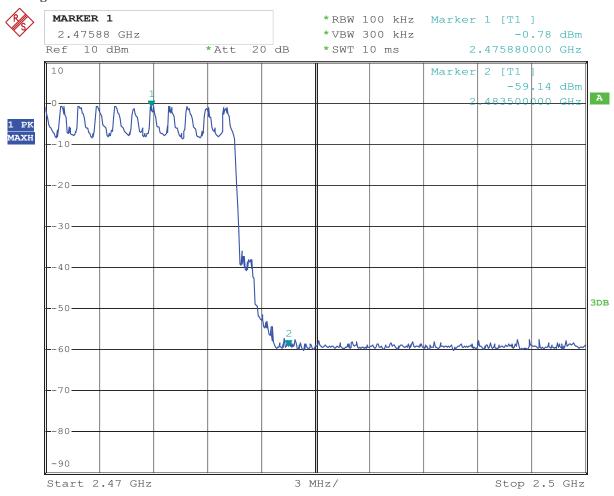


## Type of Modulation: JI/4QPSK

#### 12.4 Out of Band Test Result

Product:	MID		Test Mode:	Hopping mode
Mode	Hopping mode		Input Voltage	AC120V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in	PK (dBμV/m)	37.8		$74(dB\mu V/m)$
Restrict Band	AV(dBμV/m)		Limit	$54(dB\mu V/m)$
2483.5MHz				

### **Test Figure:**



Date: 13.NOV.2013 09:33:04

Page 67 of 83

Report No: 1310099-01

Date: 2013-11-18

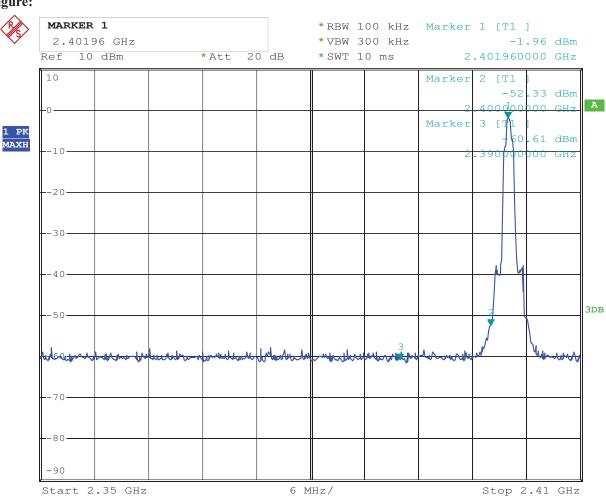


### **Type of Modulation: 8DPSK**

#### 12.4 Out of Band Test Result

Product:	MID		Test Mode:	Low Channel
Mode	Keeping Transmitting		Input Voltage	AC120V
Temperature	24 deg. C		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in	PK (dBμV/m)	37.2		$74(dB\mu V/m)$
Restrict Band	AV(dBμV/m)		Limit	54(dBµV/m)
2390MHz				

### **Test Figure:**



Date: 13.NOV.2013 09:41:17

Page 68 of 83

Report No: 1310099-01

Date: 2013-11-18

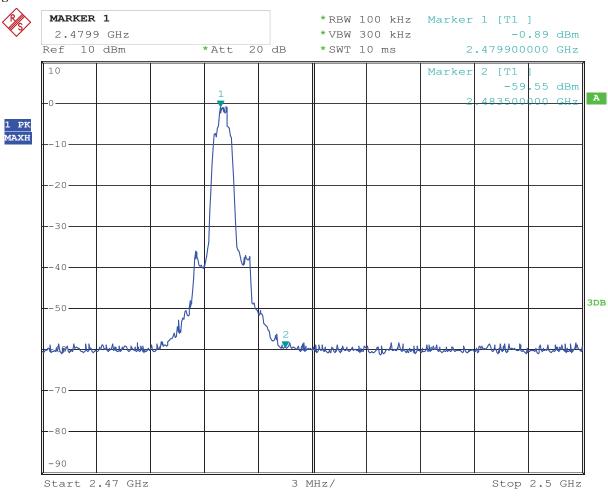


### **Type of Modulation: 8DPSK**

#### 12.4 Out of Band Test Result

Product:	MID		Test Mode:	High Channel
Mode	Keeping Transmitting		Input Voltage	AC120V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in	PK (dBμV/m) 39.4			$74(dB\mu V/m)$
Restrict Band	AV(dBμV/m)		Limit	$54(dB\mu V/m)$
2483.5MHz				

### **Test Figure:**



Date: 13.NOV.2013 09:37:27

Page 69 of 83

Report No: 1310099-01

Date: 2013-11-18

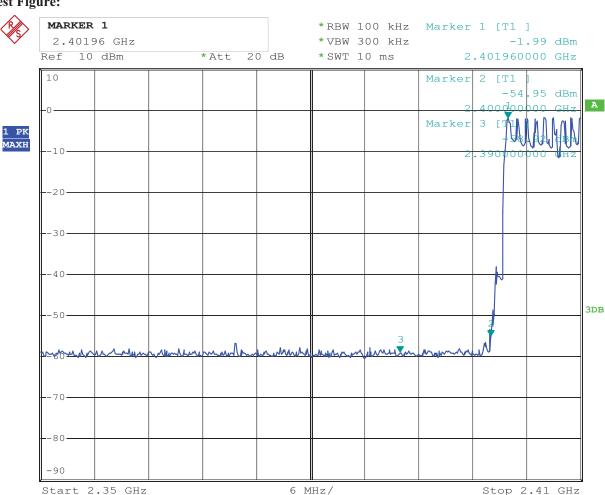


## **Type of Modulation: 8DPSK**

#### 12.4 Out of Band Test Result

Product:	MID		Test Mode:	Hopping mode
Mode	Hopping mode		Input Voltage	AC120V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in	PK (dBμV/m)	37.3		$74(dB\mu V/m)$
Restrict Band	AV(dBμV/m)		Limit	$54(dB\mu V/m)$
2390MHz				

### **Test Figure:**



Date: 13.NOV.2013 09:44:27

Report No: 1310099-01

Date: 2013-11-18

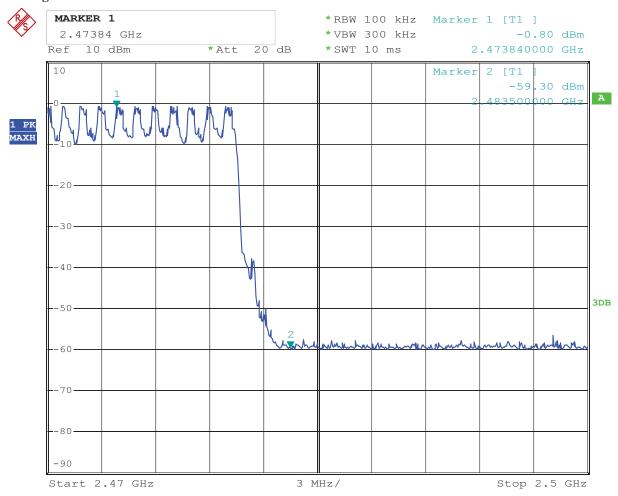


# **Type of Modulation: 8DPSK**

#### 12.4 Out of Band Test Result

Product:	MID		Test Mode:	Hopping mode
Mode	Hopping mode		Input Voltage	AC120V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in	PK (dBμV/m)	39.2		$74(dB\mu V/m)$
Restrict Band	AV(dBμV/m)		Limit	54(dBμV/m)
2483.5MHz				

### **Test Figure:**



Date: 13.NOV.2013 09:36:30

Report No: 1310099-01 Page 71 of 83

Date: 2013-11-18



### 13.0 Antenna Requirement

### 13.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

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

#### 13.2 Antenna Connected constructions

Integral Antenna used. The maximum Gain of this antenna is 2.0dBi

Report No: 1310099-01 Page 72 of 83

Date: 2013-11-18



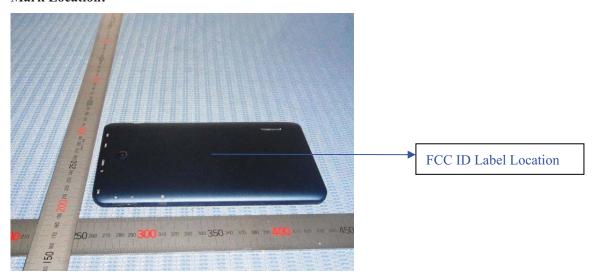
#### 14.0 FCC ID Label

#### FCC ID: 2AA7M-M755-M746

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

#### **Mark Location:**



Report No: 1310099-01 Page 73 of 83

Date: 2013-11-18



### 15.0 Photo of testing

Conducted Emission Test Setup:



Report No: 1310099-01

Date: 2013-11-18



# Radiated Emission Test Setup:





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Page 75 of 83

Report No: 1310099-01

Date: 2013-11-18



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Page 76 of 83

Report No: 1310099-01

Date: 2013-11-18



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Report No: 1310099-01 Page 77 of 83

Date: 2013-11-18



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Page 78 of 83

Report No: 1310099-01

Date: 2013-11-18



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Page 79 of 83

Report No: 1310099-01

Date: 2013-11-18



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Page 80 of 83

Report No: 1310099-01

Date: 2013-11-18



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Page 81 of 83

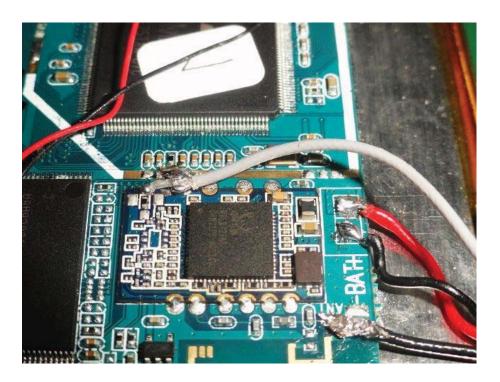
Report No: 1310099-01

Date: 2013-11-18



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Page 82 of 83

Report No: 1310099-01

Date: 2013-11-18



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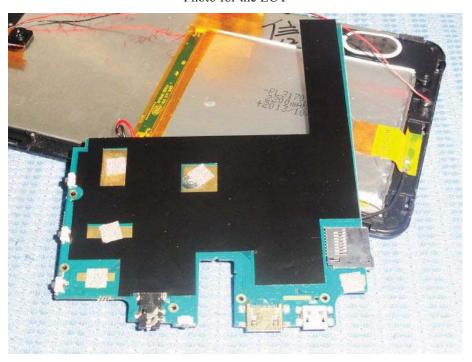
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Date: 2013-11-18



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