

## FCC/IC - TEST REPORT

Report Number : **68.950.16.428.01** Date of Issue: May 26, 2016

Model : Mini, SMR-02-1608, SMR-xx(xx=01~99, indicating different colours), SMR-y(y=A~Z, indicating different countries), SMR-BK, Beam

Product Type : Smart Remote

Applicant : Ultra Creation Limited

Address : Unit 10, 32/F., Tower 1, Millennium City 1, 388 Kwun Tong,  
Kowloon, Hong Kong

Production Facility : Shenzhen Guiqi Technology Co., LTD.

Address : Floor 3 ,Building B , Lonsung Industry Park, Chuangye Road ,  
The 3th Industry Estate Fenghuang, Fuyong Town, Baoan,  
Shenzhen, China

Test Result :  Positive  Negative

Total pages including Appendices : 23

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# 1 Table of Contents

1	Table of Contents .....	2
2	Details about the Test Laboratory.....	3
3	Description of the Equipment Under Test.....	4
4	Summary of Test Standards .....	5
5	Summary of Test Results .....	6
6	General Remarks .....	7
7	Test Setups.....	8
8	Systems test configuration .....	9
9	Technical Requirement .....	10
9.1	Conducted peak output power.....	10
9.2	Power spectral density.....	11
9.3	6 dB Bandwidth and 99% Occupied Bandwidth.....	12
9.4	Spurious RF conducted emissions.....	14
9.5	Band edge testing.....	18
9.6	Spurious radiated emissions for transmitter and receiver .....	20
10	Test Equipment List.....	22
11	System Measurement Uncertainty.....	23



## 2 Details about the Test Laboratory

### Details about the Test Laboratory

#### Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch  
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Nantou Checkpoint Road 2, Nanshan District,  
Shenzhen City, 518052,  
P. R. China

Telephone: 86 755 8828 6998

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### 3 Description of the Equipment Under Test

Product:	Smart Remote
Model no.:	Mini, SMR-02-1608, SMR-xx(xx=01~99, indicating different colours), SMR-y(y=A~Z, indicating different countries), SMR-BK, Beam
FCC ID:	2AICB-SMR001
Brand Name:	Otopus, MODECOM
Options and accessories:	NIL
Rating:	DC 3V
RF Transmission Frequency:	2402-2480MHz
No. of Operated Channel:	40
Modulation:	GFSK
Antenna Type:	PCB
Antenna Gain:	0dBi
Description of the EUT:	The EUT is a smart remote with Bluetooth 4.0 that operation frequency is 2400MHz-2483.5MHz.



## 4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2015 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to FCC KDB 558074 D01 DTS Meas Guidance and ANSI C63.10-2013.



## 5 Summary of Test Results

Technical Requirements			
FCC Part 15 Subpart C, RSS-Gen, RSS-210			
Test Condition		Test Site	Test Result
§15.207	Conducted emission AC power port	---	N/A
§15.247(b)(1)	Conducted peak output power	Site 1	Pass
§15.247(e)	Power spectral density*	Site 1	Pass
§15.247(a)(2)	6dB bandwidth	Site 1	Pass
§15.247(a)(1)	20dB bandwidth and 99% Occupied Bandwidth	---	N/A
§15.247(a)(1)	Carrier frequency separation	---	N/A
§15.247(a)(1)(iii)	Number of hopping frequencies	---	N/A
§15.247(a)(1)(iii)	Dwell Time	---	N/A
§15.247(d)	Spurious RF conducted emissions	Site 1	Pass
§15.247(d)	Band edge	Site 1	Pass
§15.247(d) & §15.209 &	Spurious radiated emissions for transmitter and receiver	Site 1	Pass
§15.203	Antenna requirement	See note 2	Pass

Note 1: N/A=Not Applicable.

Note 2: The EUT uses a PCB antenna, which gain is 0dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

## 6 General Remarks

### Remarks

This submittal(s) (test report) is intended for FCC ID: 2AICB-SMR001, complies with Section 15.207, 15.209, 15.247 of the FCC Part 15,

### SUMMARY:

All tests according to the regulations cited on page 5 were

- Performed

- Not Performed

The Equipment Under Test

- **Fulfills** the general approval requirements.

- **Does not** fulfill the general approval requirements.

Sample Received Date: April 14, 2016

Testing Start Date: April 15, 2016

Testing End Date: May 26, 2016

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch

Prepared by:

  
Simon Wang  
Project Engineer



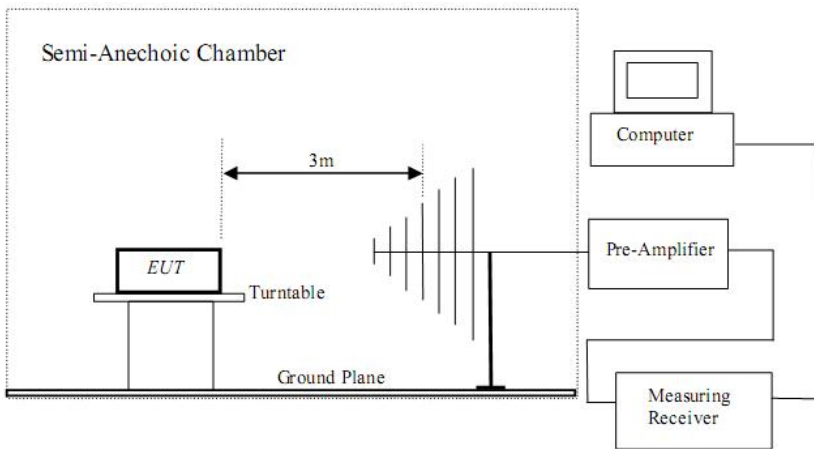
Tested by:

  
John Zhi  
Project Manager

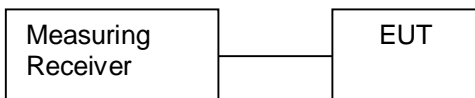


## 7 Test Setups

### 7.1 Radiated test setups



### 7.2 Conducted RF test setups





## 8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
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## 9 Technical Requirement

### 9.1 Conducted peak output power

#### Test Method

1. Use the following spectrum analyzer settings:  
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,  
Sweep = auto, Detector function = peak, Trace = max hold
2. Add a correction factor to the display.
3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power

#### Limits

According to §15.247 (b) (1) and RSS-210 A8.4, conducted peak output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

### Conducted peak output power

#### BT 4.0 Bluetooth Mode GFSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	0.66	Pass
Middle channel 2440MHz	0.39	Pass
High channel 2480MHz	0.49	Pass



## 9.2 Power spectral density

### Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency.  
RBW=3kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed

### Limit

Limit [dBm]

---

≤8

### BT 4.0 Bluetooth Mode GFSK modulation Test Result

Frequency MHz	Power spectral density	Limit dBm	Result
2402	-3.42	8	Pass
2440	-2.95	8	Pass
2480	-2.87	8	Pass

### 9.3 6 dB Bandwidth and 99% Occupied Bandwidth

#### Test Method

1. Use the following spectrum analyzer settings:  
RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

#### Limit

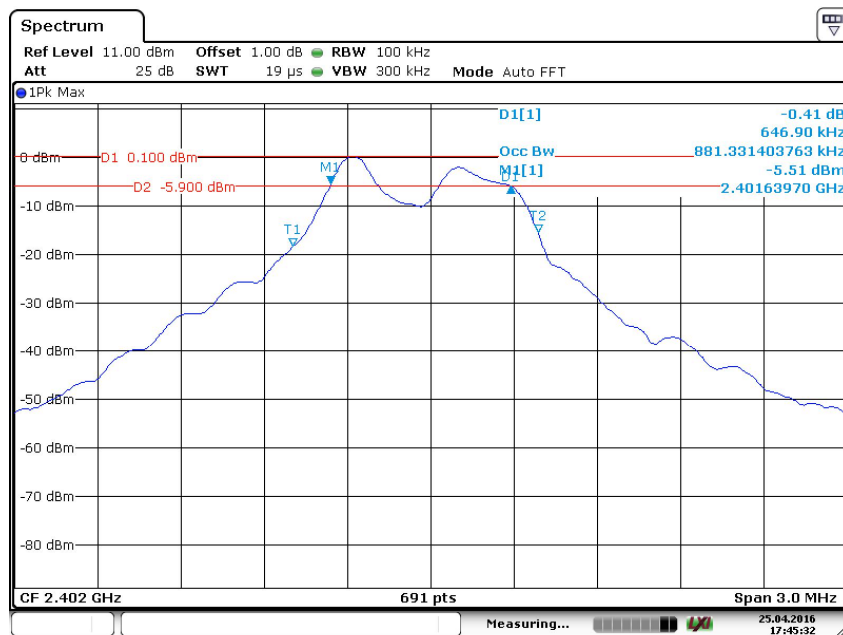
Limit [kHz]

≥500

#### BT 4.0 Bluetooth Mode GFSK modulation Test Result

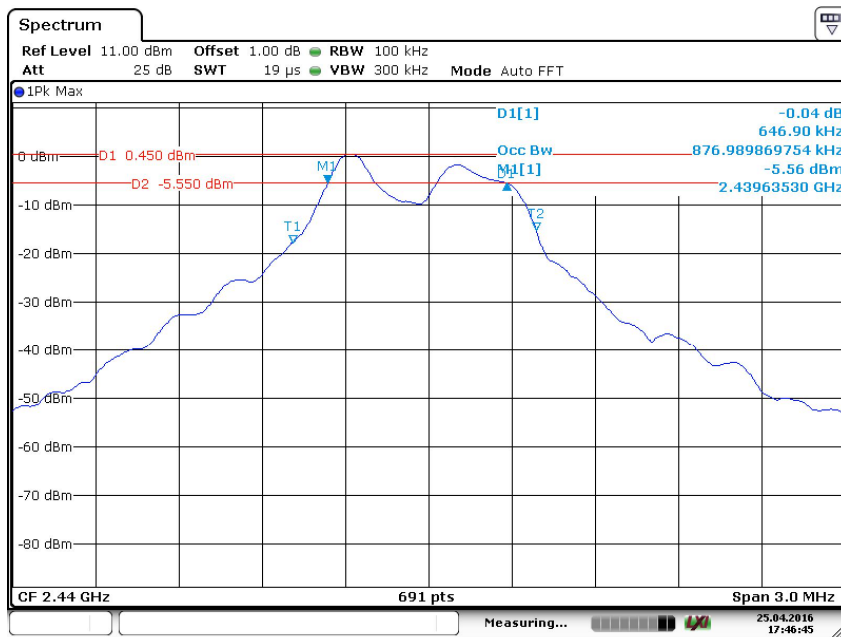
Frequency MHz	6 dB Bandwidth kHz	Limit kHz	Result
2402	646.90	500	Pass
2440	646.90	500	Pass
2480	612.20	500	Pass

#### 6 dB Bandwidth

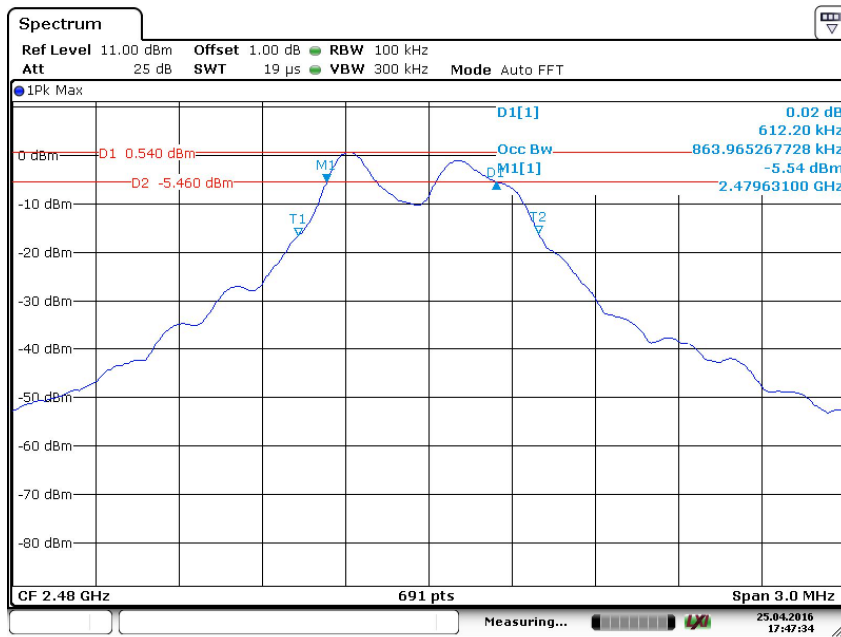


Date: 25.APR.2016 17:45:32

## 6 dB Bandwidth



Date: 25.APR.2016 17:46:45



Date: 25.APR.2016 17:47:34



## 9.4 Spurious RF conducted emissions

### Test Method

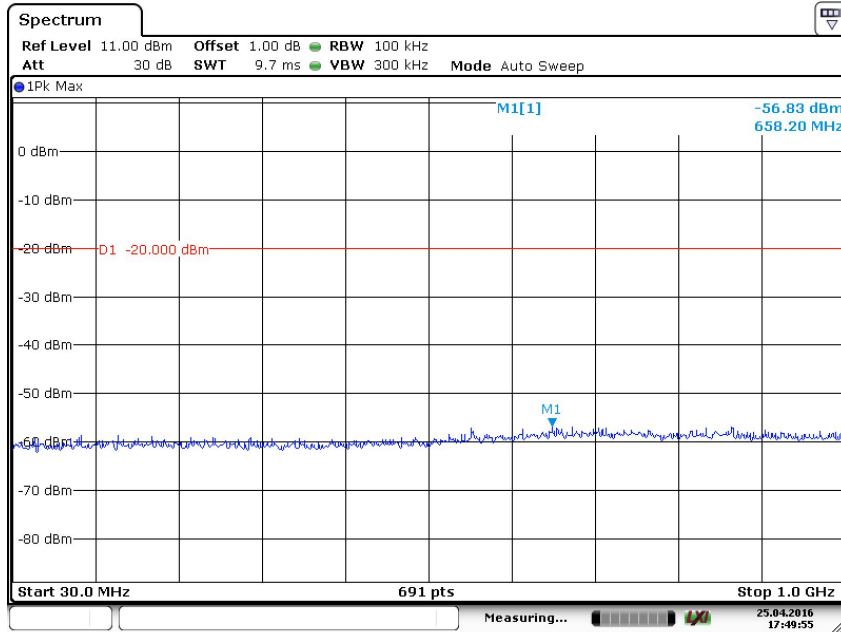
1. Use the following spectrum analyzer settings:  
 Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10<sup>th</sup> harmonic. Typically, several plots are required to cover this entire span.  
 RBW = 100 kHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
3. The level displayed must comply with the limit specified in this Section. Submit these plots.
4. Repeat above procedures until all frequencies measured were complete.

### Limit

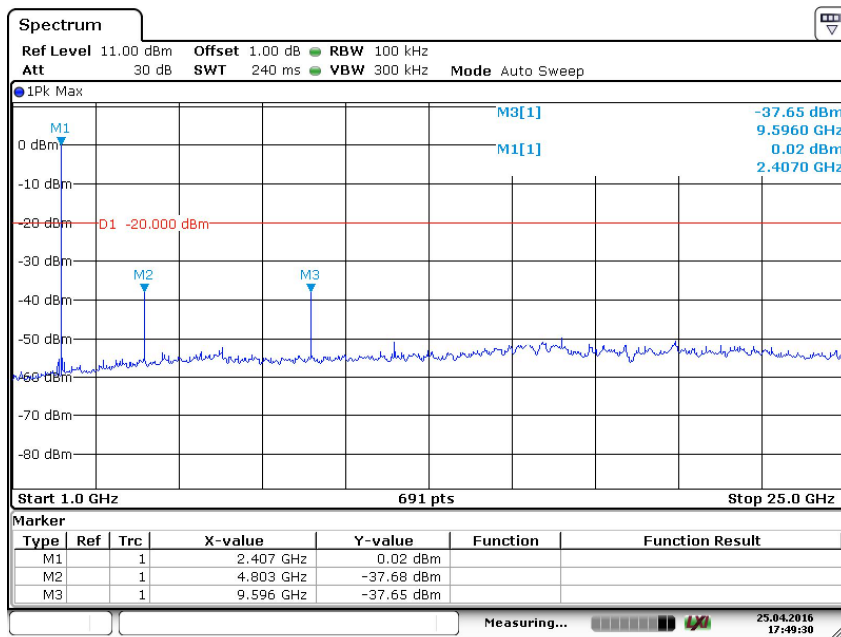
Frequency Range MHz	Limit (dBc)
30-25000	-20

## Spurious RF conducted emissions

BT4.0 GFSK Modulation:  
2402MHz

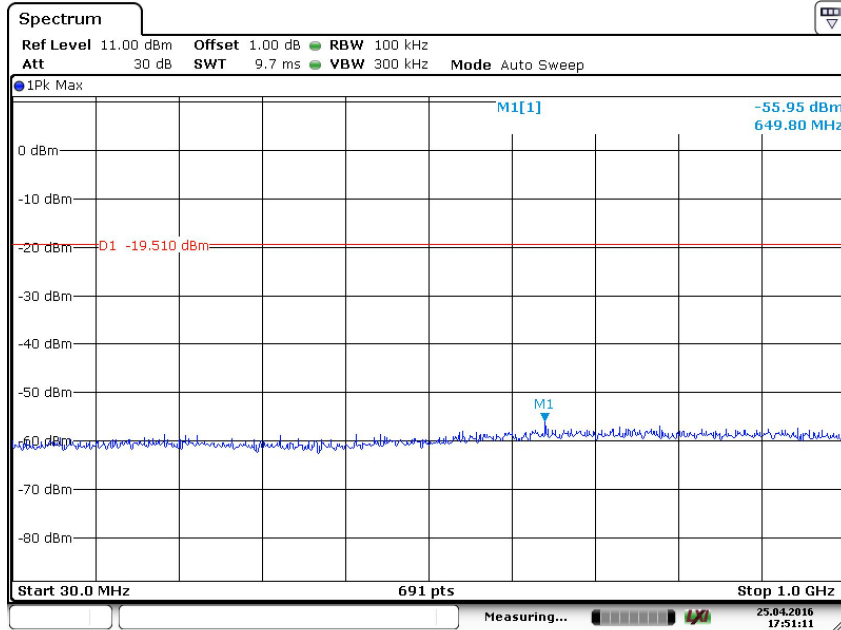


Date: 25.APR.2016 17:49:55

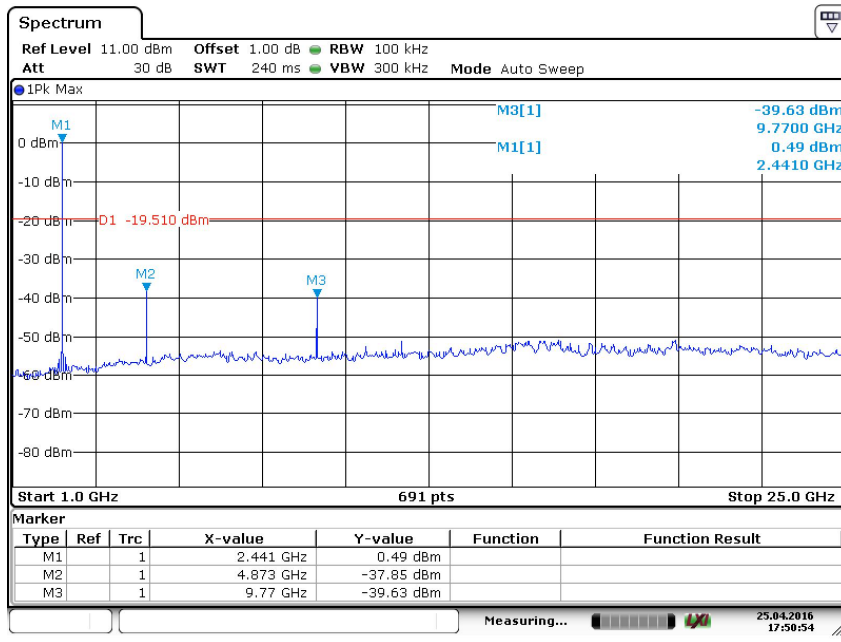


Date: 25.APR.2016 17:49:31

2440MHz



Date: 25.APR.2016 17:51:11

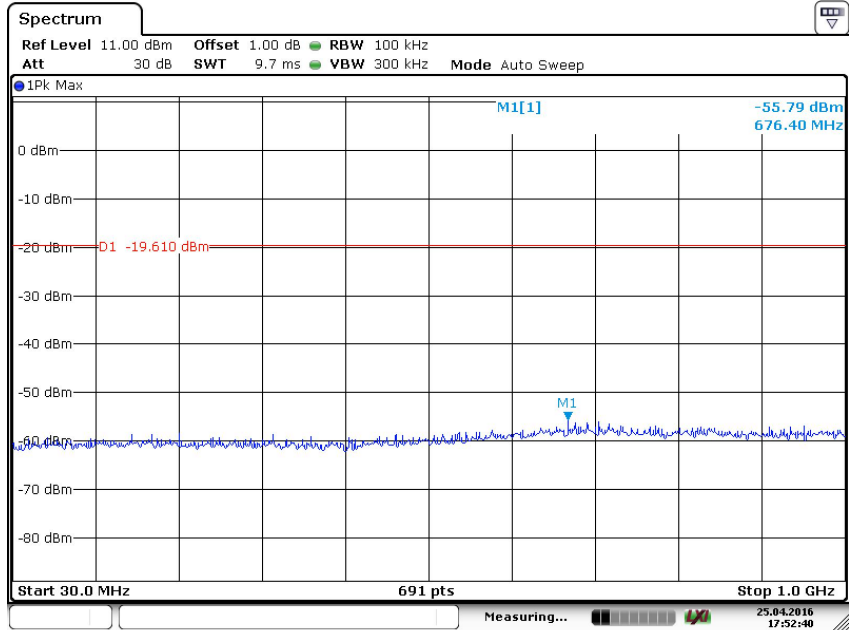


Date: 25.APR.2016 17:50:53

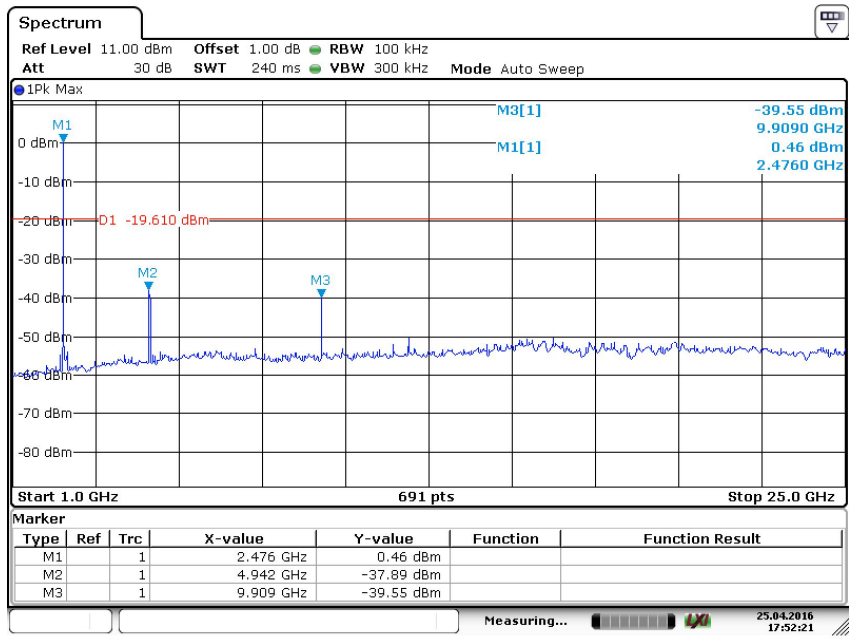




2480MHz



Date: 25.APR.2016 17:52:40



Date: 25.APR.2016 17:52:21

## 9.5 Band edge testing

### Test Method

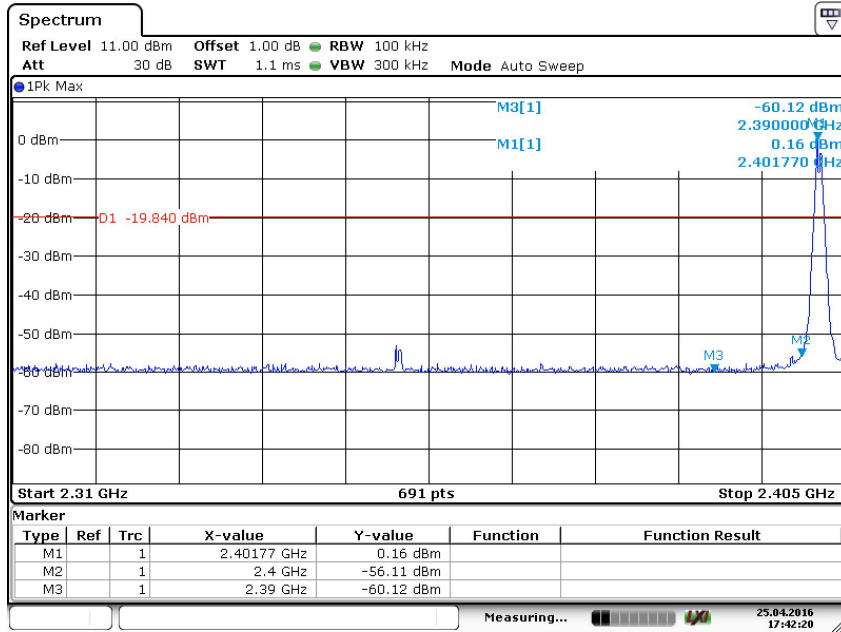
- 1 Use the following spectrum analyzer settings:  
Span = wide enough to capture the peak level of the in-band emission and all spurious  
RBW = 100 kHz, VBW  $\geq$  RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section. .
- 4 Repeat the test at the hopping off and hopping on mode, submit all the plots.

### Limit:

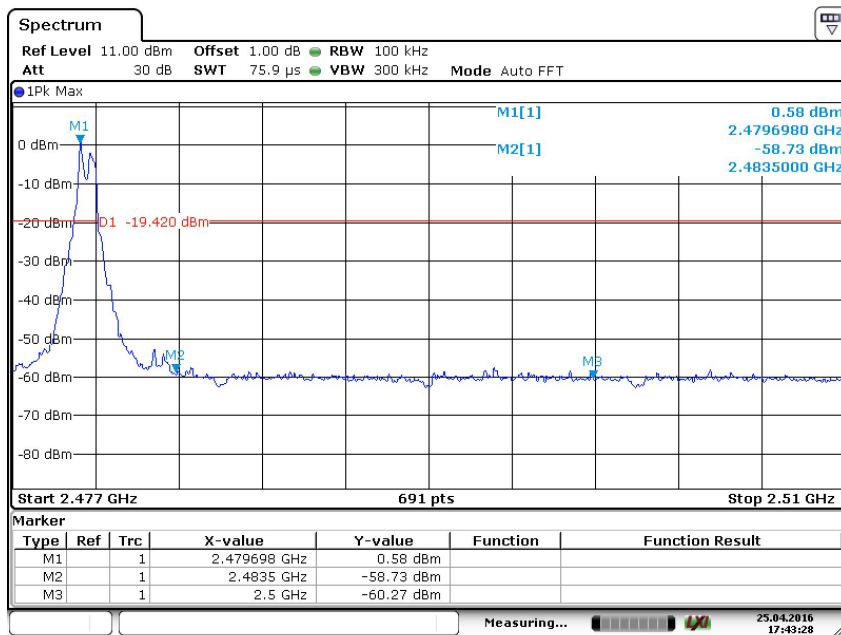
According to §15.247(d) and RSS-210 A8.5, in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) and RSS-Gen7.2.2, must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)) and RSS-Gen.

## Band edge testing

### BT4.0 GFSK Modulation Test Result



Date: 25.APR.2016 17:42:21



Date: 25.APR.2016 17:43:29

## 9.6 Spurious radiated emissions for transmitter and receiver

### Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:  
Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for  $f \geq 1$ GHz, 100 kHz for  $f < 1$  GHz, VBW  $\geq$  RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Follow the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc.  
The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from  $20\log(\text{duty cycle}/100 \text{ ms})$ , in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

### Limit

According to part 15.247(d), the radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section 15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dB $\mu$ V/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

## Spurious radiated emissions for transmitter and receiver

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

The only worse case (which is subject to the maximum EIRP, GFSK mode) test result is listed in the report.

### Transmitting spurious emission test result as below:

#### BT4.0 GFSK Modulation 2402MHz Test Result

Frequency band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	MHz	dBuV/m		dB $\mu$ V/m		dBuV/m	
1000-25000MHz	*4803.50	43.08	H	74	PK	30.92	Pass
	*9607.00	52.51	H	74	PK	21.49	Pass
	*4803.50	53.05	V	74	PK	20.95	Pass
	*9607.00	48.99	V	74	PK	25.01	Pass

#### BT4.0 GFSK Modulation 2440MHz Test Result

Frequency band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	MHz	dBuV/m		dB $\mu$ V/m		dBuV/m	
30-1000MHz	*851.11	32.56	H	46	PK	13.44	Pass
	*60.82	26.23	V	40	PK	13.77	Pass
1000-25000MHz	*4879.50	42.81	H	74	PK	31.19	Pass
	*9759.00	49.92	H	74	PK	24.08	Pass
	*4879.50	39.87	V	74	PK	34.13	Pass
	*9759.00	47.57	V	74	PK	26.43	Pass

#### BT4.0 GFSK Modulation 2480MHz Test Result

Frequency band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	MHz	dBuV/m		dB $\mu$ V/m		dBuV/m	
1000-25000MHz	*4959.50	42.17	H	74	PK	31.83	Pass
	*9919.00	49.65	H	74	PK	24.35	Pass
	*5198.50	37.44	V	74	PK	36.56	Pass
	*9919.00	46.21	V	74	PK	27.79	Pass

Remark:

- (1) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.



## 10 Test Equipment List

### List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
C	EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2016-7-24
	LISN	Rohde & Schwarz	ENV4200	100249	2016-7-24
	LISN	Rohde & Schwarz	ENV216	100326	2016-7-24
	ISN	Rohde & Schwarz	ENY81	100177	2016-7-24
	ISN	Rohde & Schwarz	ENY81-CA6	101664	2016-7-24
	High Voltage Probe	Rohde & Schwarz	TK9420(VT9 420)	9420-58	2016-7-24
RE	Signal Analyzer	Rohde & Schwarz	FSV40	101031	2016-7-24
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	708	2016-7-31
	Horn Antenna	Rohde & Schwarz	HF907	102295	2016-7-24
	Wideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	12827	2017-10-21
	Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2016-7-24
	Pre-amplifier	Rohde & Schwarz	SCU 40A	100432	2016-7-24
	Fully Anechoic Chamber	TDK	8X4X4	--	2019-5-29

#### C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth
- Carrier frequency separation
- Power spectral density\*
- Spurious RF conducted emissions
- Band edge

## 11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

**System Measurement Uncertainty**

Items	Extended Uncertainty
Radiated spurious emission	Horizontal:4.98dB;Vertical:5.06dB (30MHz-3GHz) Horizontal:4.95dB;Vertical:4.94dB; (3GHz-18GHz)
Conducted spurious emission	2.06dB(30MHz-25GHz)
Bandwidth test	$1 \times 10^{-9}$