

FCC/IC- TEST REPORT

Report Number : **68.950.15.098.01** Date of Issue: October 23, 2015

Model : **82 29 2 405 851, 82 29 2 420 091**

Product Type : BMW Keyfinder

Applicant : Elgato Systems LLC

Address : 900 Keamy St. Suite 750 ,San Francisco, CA, USA

manufacturer : Elgato Systems LLC

Address : 900 Keamy St. Suite 750 ,San Francisco, CA, USA

Test Result : **Positive** **Negative**

Total pages including
Appendices : 23

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch is a subcontractor to TÜV SÜD Product Service GmbH according to the principles outlined in ISO 17025.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch reports apply only to the specific samples tested under stated test conditions. Construction of the actual test samples has been documented. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. The manufacturer/importer is responsible to the Competent Authorities in Europe for any modifications made to the production units which result in non-compliance to the relevant regulations. TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval.



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	6dB bandwidth	11
9.3	Power spectral density.....	13
9.4	Spurious RF conducted emissions	14
9.5	Band edge	18
9.6	Spurious radiated emissions for transmitter	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
Building 12&13, Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052,
P. R. China

Telephone: 86 755 8828 6998
Fax: 86 755 8828 5299
FCC Registration No.: 502708
IC Registration No: 10320A-1

Test Site 2

Company name: Global United Technology Services Co., Ltd.
2nd Floor, Block No.2, Laodong Industrial Zone,
Xixiang Road Baoan District,
Shenzhen, China 518102

FCC Registration No.: 600491
IC Registration No: 9079A-2
Telephone: 86 755 2779 8480
Fax: 86 755 2779 8960

Remark: All test items are performed at site 2.

3 Description of the Equipment under Test

Description of the Equipment Under Test

Product:	BMW Keyfinder
Model no.:	82 29 2 405 851, 82 29 2 420 091
Brand Name:	BMW
FCC ID:	SNE-SMA-002
IC ID:	11192A-SMA002
Options and accessories:	NIL
Rating:	DC 3.0V by button cell
RF Transmission Frequency:	2402-2480MHz
No. of Operated Channel:	40
Modulation:	GFSK
Antenna Type:	PCB Antenna
Antenna Gain:	-1.3dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Bluetooth Low Energy Module operated at 2.4GHz

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2014 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 4 November 2014	General Requirements for the Certification of Radio Apparatus
RSS-247 Issue 1 May 2015	RSS-247 —Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

All the test methods were according to KDB558074 D01 DTS Meas Guidance v03r02 and ANSI C63.10 (2013).

5 Summary of Test Results

Technical Requirements							
FCC Part 15 Subpart C, RSS-Gen, RSS-247							
Test Condition			Pages	Test Site	Test Result		
					Pass	Fail	N/A
§15.207	RSS-GEN A8.8	Conducted emission AC power port	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247 (b) (1)	RSS-247 5.4(4)	Conducted peak output power	10	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(a)(1)	RSS-247 5.1(2)	20dB bandwidth	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)	RSS-247 5.1(2)	Carrier frequency separation	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)(iii)	RSS-247 5.1(3)	Number of hopping frequencies	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)(iii)	RSS-247 5.1(3)	Dwell Time	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(2)	RSS-247 5.2 (1)	6dB bandwidth	11	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(e)	RSS-247 5.2 (2)	Power spectral density	13	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d)	RSS-247 5.5	Spurious RF conducted emissions	14	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d)	RSS-247 5.5	Band edge	18	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d) & §15.209	RSS-247 5.5 & RSSGEN 6.13	Spurious radiated emissions for transmitter	20	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.203	RSSGEN 8.3	Antenna requirement	See note 1		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses an Embedded Type antenna, which gain is -1.3dBi. According to §15.203 and RSSGEN 8.3, 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: SNE-SMA-002, IC: 11192A-SMA002 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules and RSS-247.

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: May 27, 2015

Testing Start Date: May 28, 2015

Testing End Date: July 1, 2015

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

Reviewed by:

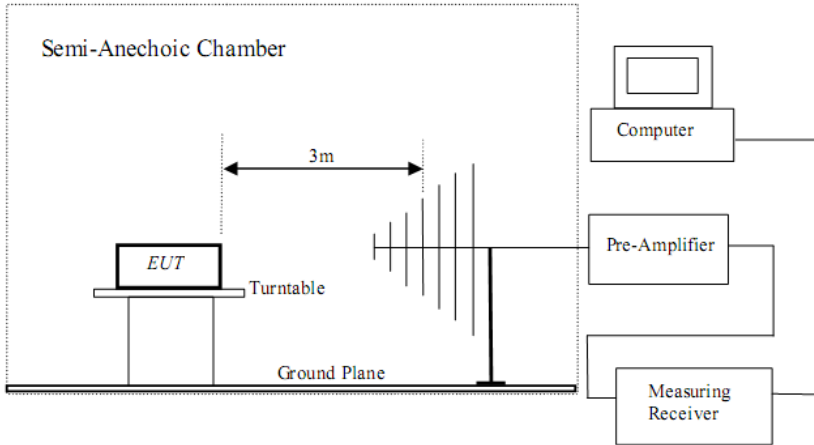
Prepared by:

John Zhi
EMC Project Manager

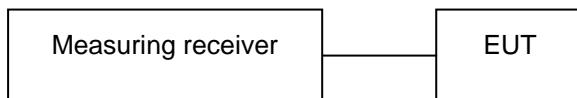
Alan Xiong
EMC Project Engineer

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)
Notebook	IBM	X220	---

Test software: SmartRF_Studio_7_2.1.0.

The system was configured to channel 0, 19, and 39 for the test.

9 Technical Requirement

9.1 Conducted peak output power

Test Method

1. Use the following spectrum analyzer settings:
RBW > the 6 dB bandwidth of the emission being measured, VBW \geq 3RBW, Span \geq 3RBW
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) & RSS-247 5.4(4), conducted peak output power limit as below:

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

Test result as below table

Frequency MHz	Conducted Peak Output Power dBm	Result
Top channel 2402MHz	-3.41	Pass
Middle channel 2440MHz	-4.30	Pass
Bottom channel 2480MHz	-5.10	Pass

9.2 6dB 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

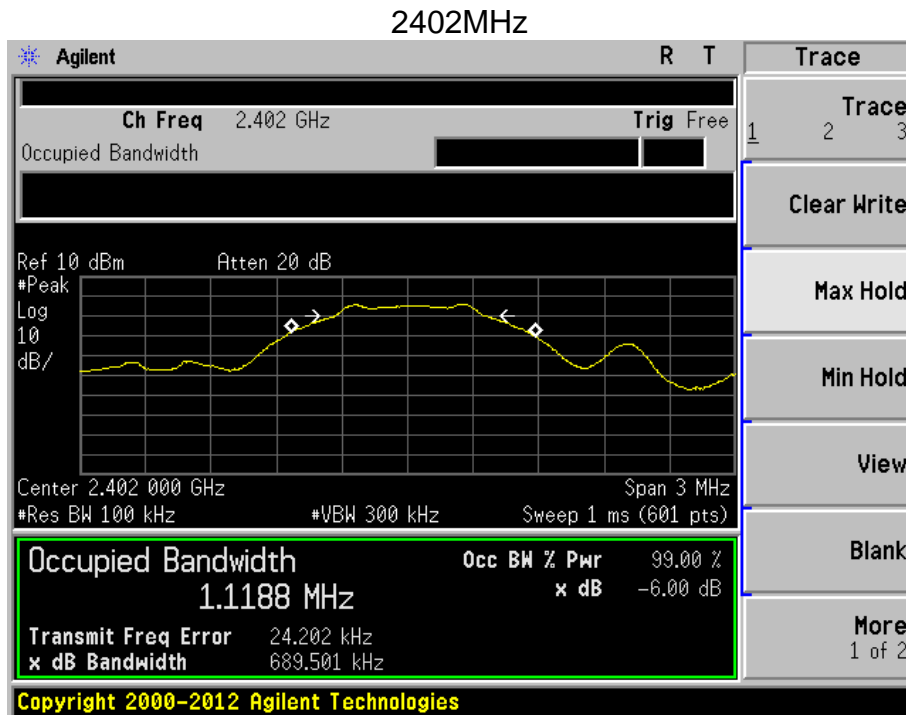
According to §15.247 (a) (2) & RSS-247 5.2 (1), 6dB bandwidth limit as below:

Limit [kHz]

≥500

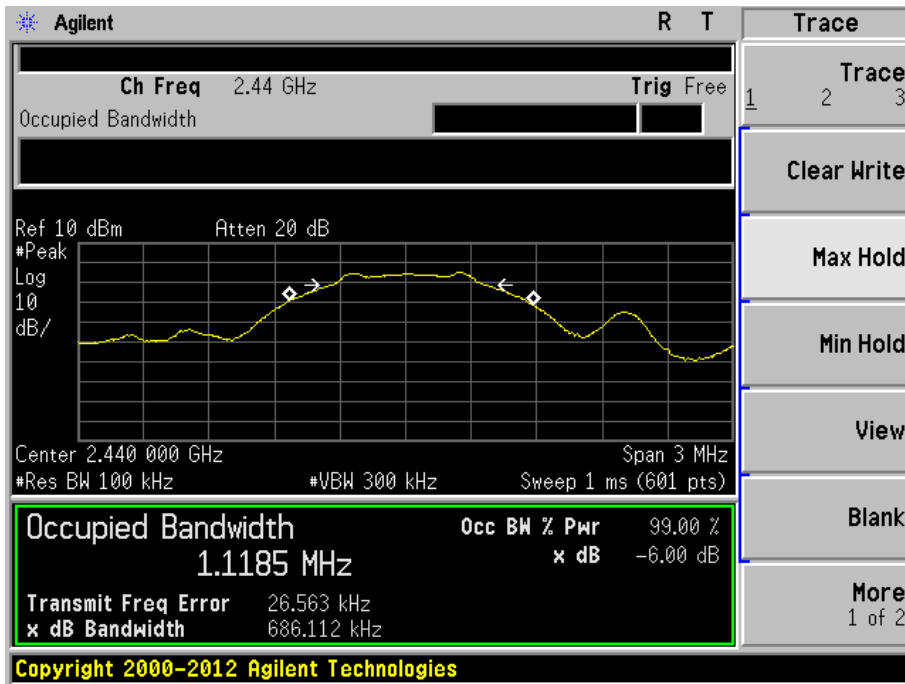
Test result

Frequency MHz	6dB bandwidth kHz	Result
Top channel 2402MHz	689.5	Pass
Middle channel 2440MHz	686.1	Pass
Bottom channel 2480MHz	679.8	Pass

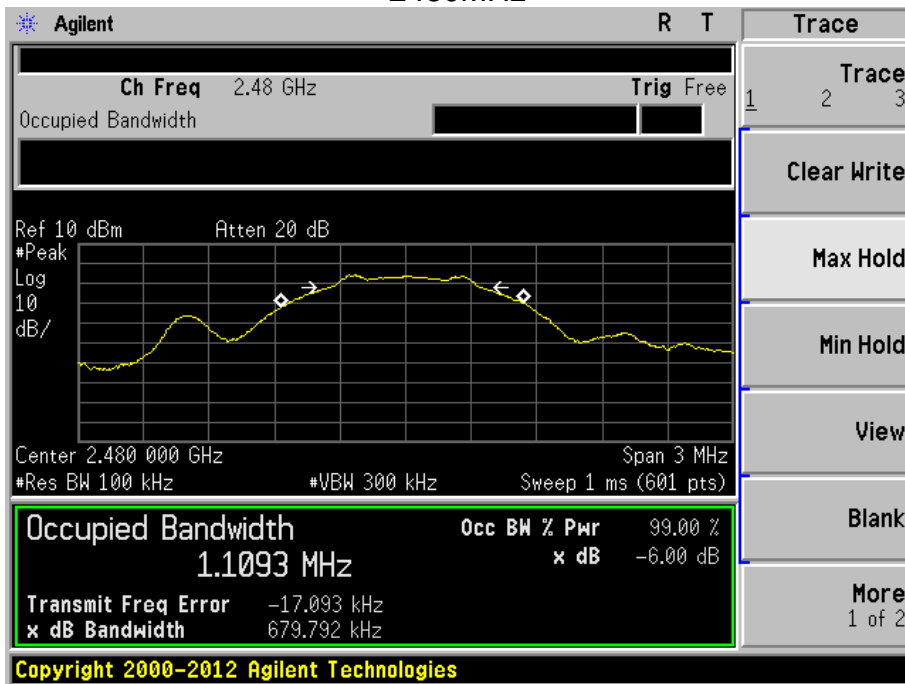




2440MHz



2480MHz



9.3 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

According to §15.247 (e) (2) & RSS-247 5.2 (2), power spectral density limit as below:

Limit [dBm]

≤8

Test result

Frequency MHz	Power spectral density dBm	Result
Top channel 2402MHz	-10.17	Pass
Middle channel 2440MHz	-10.27	Pass
Bottom channel 2480MHz	-10.70	Pass

9.4 Spurious RF conducted emissions

Test Method

1. Establish a reference level by using the following procedure:
 - a. Set RBW=100 kHz. VBW \geq 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
 - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
 - a. Set the center frequency and span to encompass frequency range to be measured.
 - b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

Limit

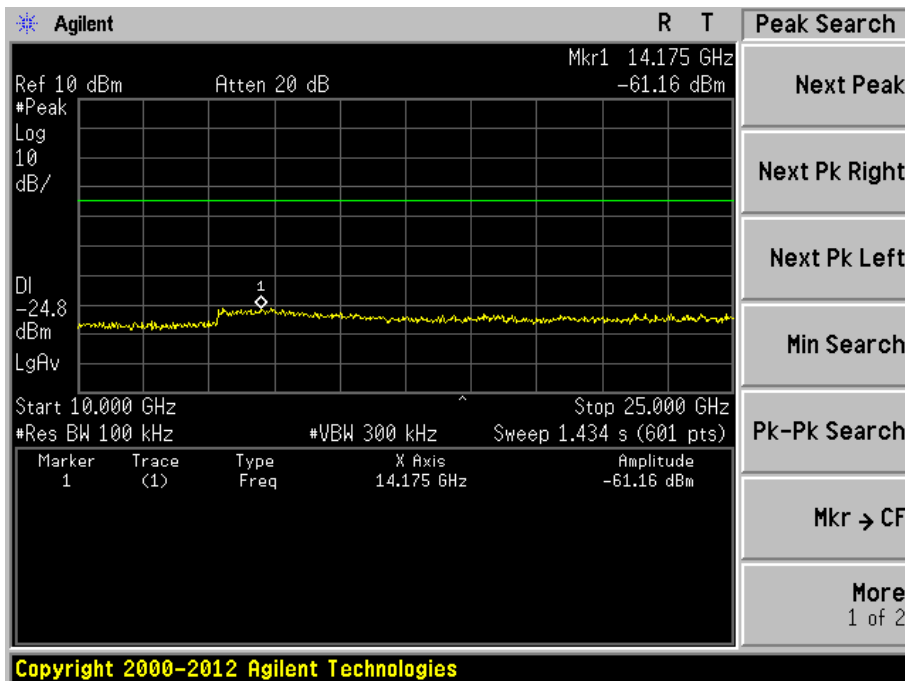
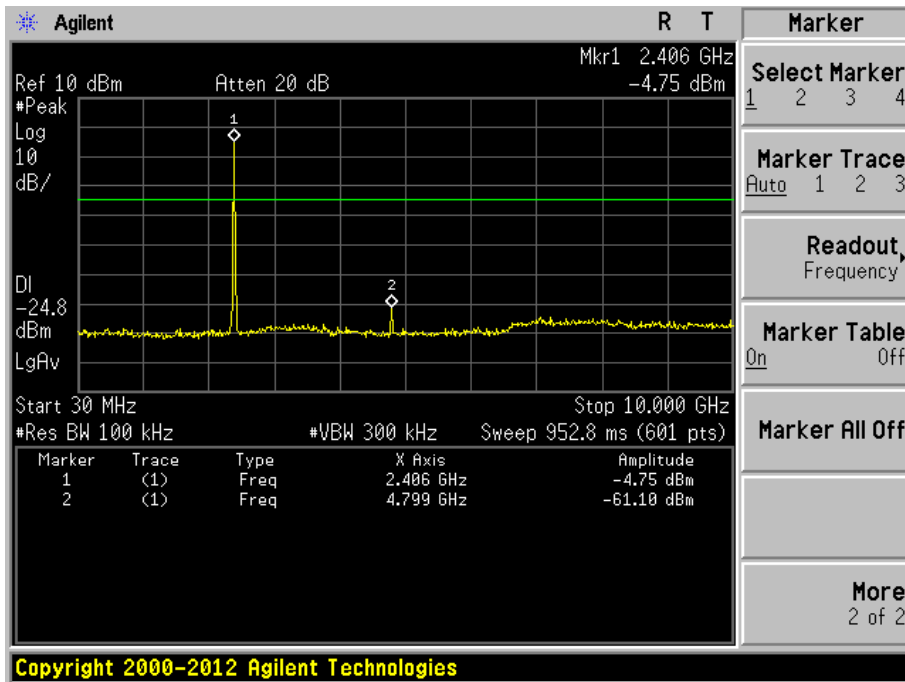
According to §15.247 (d) & RSS-247 5.5, spurious RF conducted emissions limit as below:

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



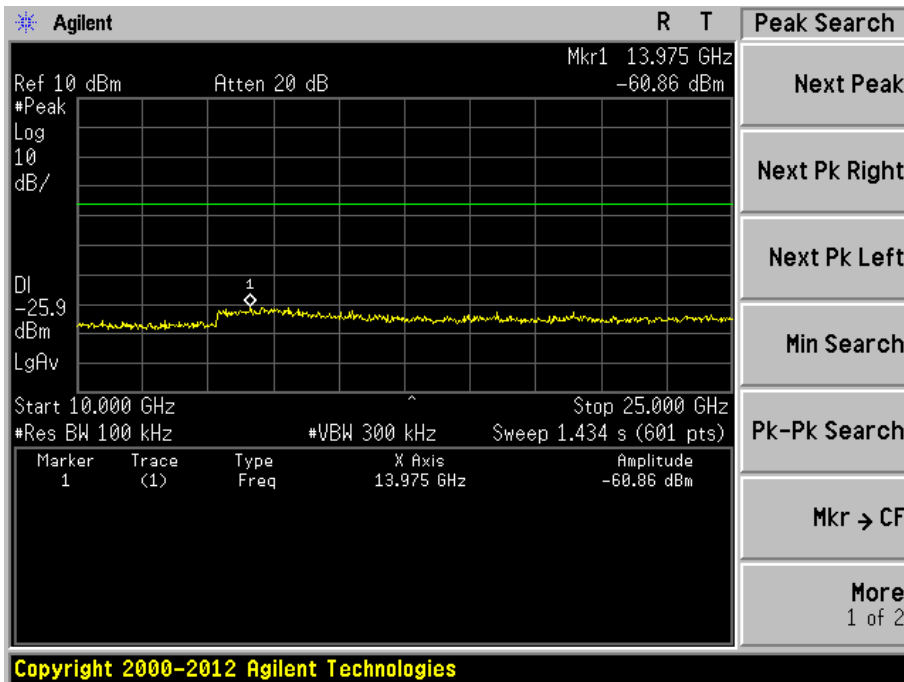
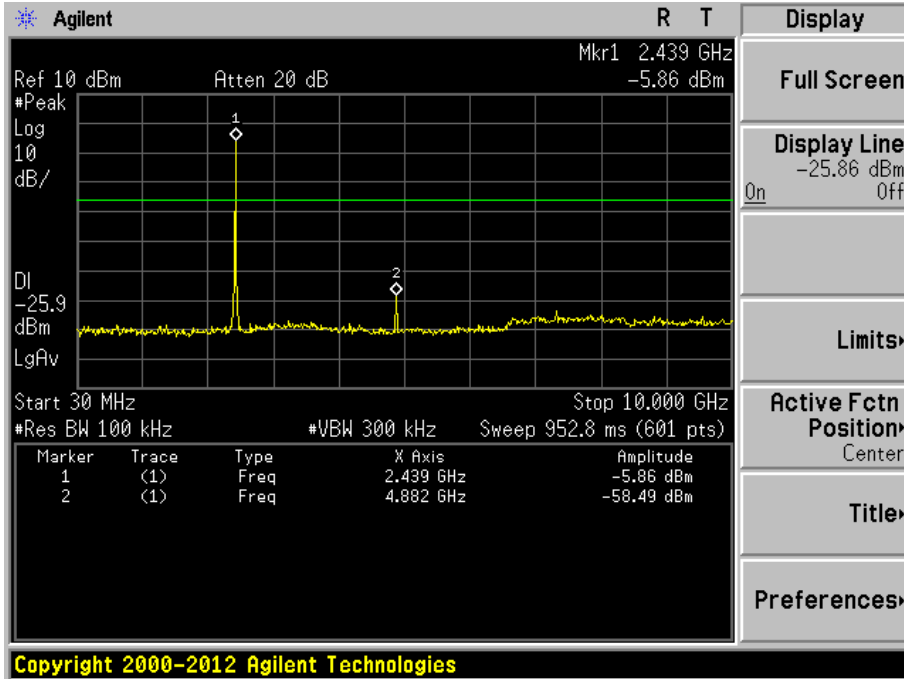
Spurious RF conducted emissions

2402MHz

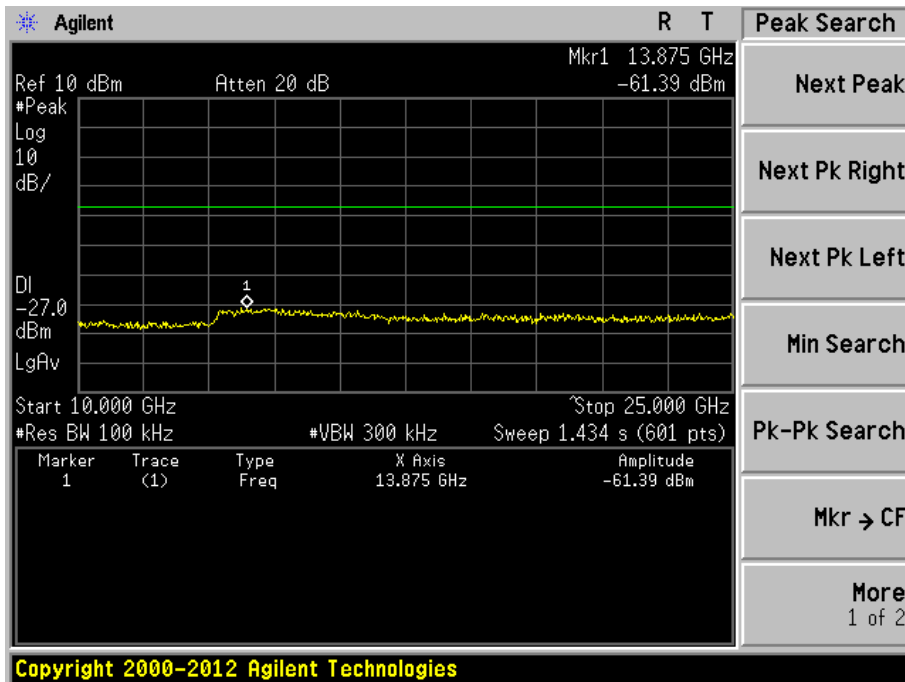
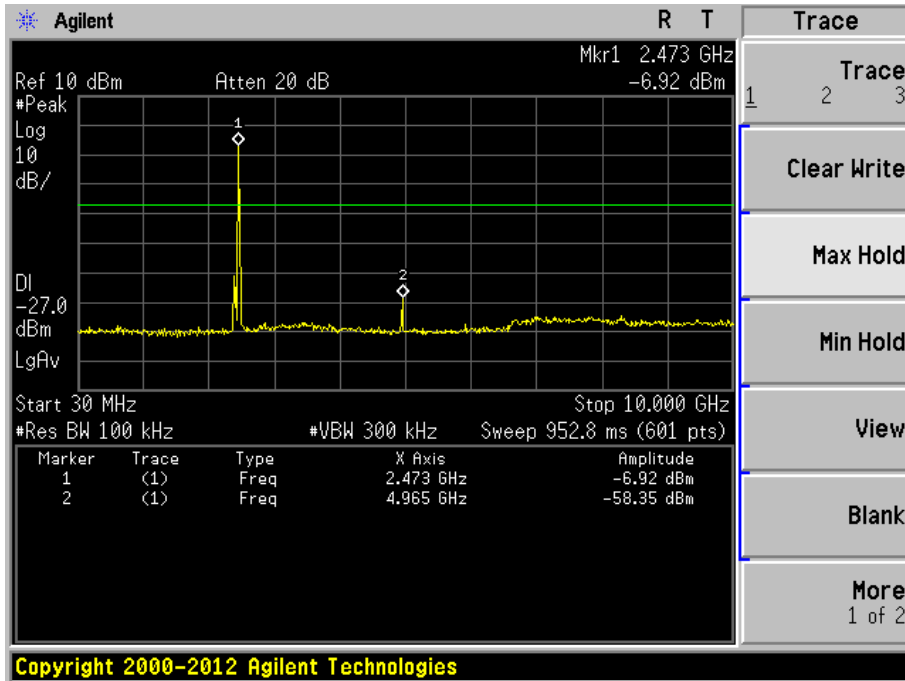




2440MHz



2480MHz



9.5 Band edge

Test Method

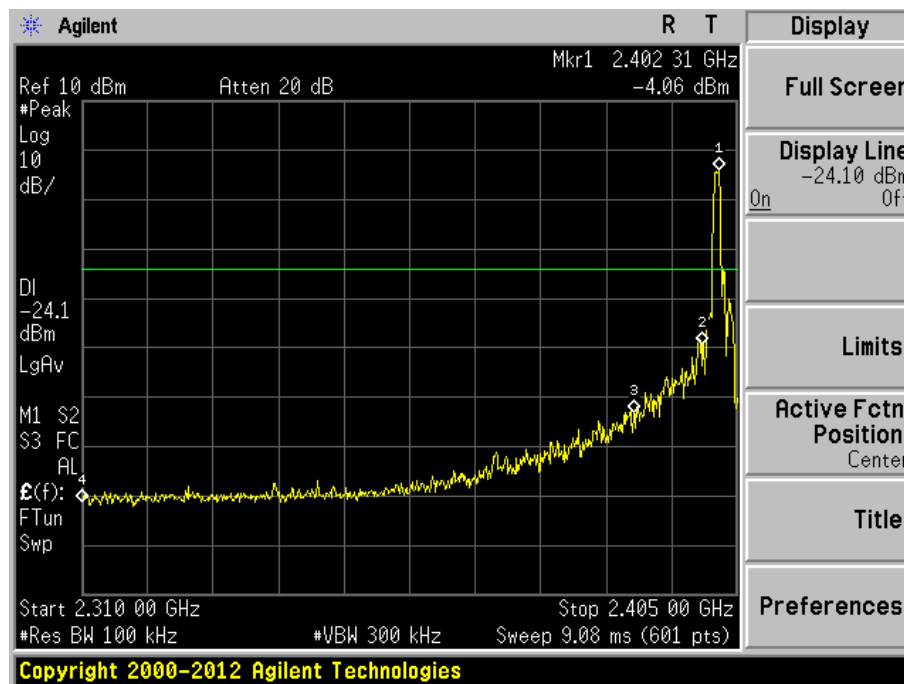
- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold.
- 2 Allow the trace to stabilize, use the peak and delta measurement to record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

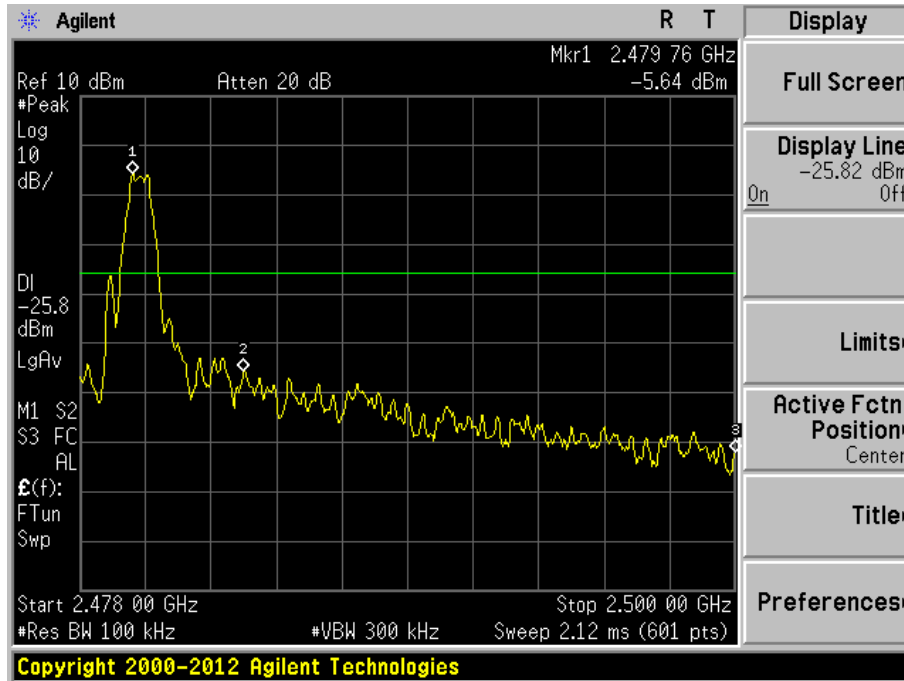
Limit

According to §15.247 (d) & RSS-247 5.5, band edge limit as below:

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

Test result





9.6 Spurious radiated emissions for transmitter

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) & RSS-247 5.5, 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 μ 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

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.

Transmitting spurious emission test result as below:

2402MHz

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Margin dBuV/m	Result
35.128	18.36	Horizontal	40	QP	21.64	Pass
36.895	28.06	Vertical	40	QP	11.94	Pass
*2310	37.93	Horizontal	74	PK	36.07	Pass
*2310	37.89	Vertical	74	PK	36.11	Pass
*2390	45.53	Horizontal	74	PK	28.47	Pass
*2390	45.24	Vertical	74	PK	28.76	Pass
2402	88.77	Horizontal	-	PK	-	-
2402	90.25	Vertical	-	PK	-	-
*4804	49.53	Horizontal	74	PK	24.47	Pass
*4804	49.62	Vertical	74	PK	24.38	Pass

2440MHz

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Margin dBuV/m	Result
2440	88.56	Horizontal	-	PK	-	-
2440	90.19	Vertical	-	PK	-	-
*4880	46.17	Horizontal	74	PK	27.83	Pass
*4880	46.71	Vertical	74	PK	27.29	Pass

2480MHz

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Margin dBuV/m	Result
2480	88.38	Horizontal	-	PK	-	-
2480	90.40	Vertical	-	PK	-	-
*2483.5	50.80	Horizontal	74	PK	23.20	Pass
*2483.5	51.46	Vertical	74	PK	22.54	Pass
*2500	39.67	Horizontal	74	PK	34.33	Pass
*2500	39.09	Vertical	74	PK	34.91	Pass
*4960	47.42	Horizontal	74	PK	26.58	Pass
*4960	46.17	Vertical	74	PK	27.83	Pass

Remark:

- (1) AV Emission Level= PK Emission Level+20log (duty cycle)
- (2) Data of measurement within 30-1000MHz frequency range shown "--" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (3) "*" 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.	CAL. DUE DATE
C	Spectrum	Rohde & Schwarz	FSV40	101030
RE	3m Semi- Anechoic Chamber	ZhongYu Electron	9.0(L)*6.0(W)* 6.0(H)	Mar. 28 2016
	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	N/A
	ESU EMI Test Receiver	R&S	ESU26	June 30 2016
	BiConiLog Antenna	SCHWARZBECK	VULB9163	June 30 2016
	Double -ridged waveguide horn	SCHWARZBECK	9120D	June 30 2016
	RF Amplifier	HP	8347A	June 30 2016
	Preamplifier	HP	8349B	June 30 2016
	EMI Test Software	AUDIX	E3	N/A
	Coaxial cable	GTS	N/A	Mar. 28 2016
	Coaxial Cable	GTS	N/A	Mar. 28 2016
	Thermo meter	N/A	N/A	July 03 2015

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth
- 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
Radiation emission	U=4.32dB (30MHz-25GHz)
Output power test	0.94 dB
Power density test	2.10 dB
Bandwidth	1x10 ⁻⁹