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FCC/IC Zigbee REPORT

FCC/IC Certification

Applicant Name:
LG Electronics USA

Address:
1000 Sylvan Avenue Englewood Cliffs, NJ 07632
United States

Date of Issue:
July 6, 2016
Test Site/Location:
HCT CO., LTD., 74,Seoicheon-ro 578beon-gil,Majang-myeo,Icheon-si, Gyeonggi-do, Korea
Report No.: HCT-R-1607-F004
HCT FRN: 0005866421
IC Recognition No.: 5944A-5

FCC ID	**: BEJ-ISC61-V1**
IC	**: 2703N-ISC61V1**
APPLICANT	**: LG Electronics USA**

FCC/IC Model(s):	ISC61G-ZB
EUT Type:	Smart ThinQ Sensor
Max. RF Output Power:	17.016 dBm (50.304 mW)
Frequency Range:	2405 MHz -2480 MHz (Zigbee Mode)
Modulation type	GFSK
FCC Classification:	Digital Transmission System(DTS)
FCC Rule Part(s):	Part 15.247
IC Rule Part(s):	RSS-GEN Issue 4 (November 2014), RSS-247 Issue 1 (May 2015)

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Report prepared by
: Seul Ki Lee
Test Engineer of RF Team

Approved by
: Jong Seok Lee
Manager of RF Team

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1607-F004	July 6, 2016	- First Approval Report

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1. GENERAL INFORMATION

Applicant:	LG Electronics USA
Address:	1000 Sylvan Avenue Englewood Cliffs, NJ 07632 United States
FCC ID:	BEJ-ISC61-V1
IC:	2703N-ISC61V1
EUT Type:	Smart ThinQ Sensor
FCC/IC Model name(s):	ISC61G-ZB
Date(s) of Tests:	June 09, 2016 ~ June 23, 2016
Place of Tests:	HCT Co., Ltd. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea (IC Recognition No. : 5944A-5)

2. EUT DESCRIPTION

FCC/IC Model Name	ISC61G-ZB	
EUT Type	Smart ThinQ Sensor	
Power Supply	DC 3.7 V	
Frequency Range	TX: 2405 MHz ~ 2480 MHz RX: 2405 MHz ~ 2480 MHz	
Max. RF Output Power	Peak	17.016 dBm (50.304 mW)
	Average	16.86 dBm (48.529 mW)
Operating Mode	Zigbee Mode	
Modulation Type	GFSK	
Antenna Specification	Antenna type: Internal Antenna Peak Gain : 2.76 dBi	

3. TEST METHODOLOGY

FCC KDB 558074 D01 DTS Meas Guidance v03r05 dated April 08, 2016 entitled “Guidance for Performing Compliance Measurements on Digital Transmission Systems(DTS) and the measurement procedure described in ANSI C63.10(Version : 2013) ‘the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices’.

3.1 EUT CONFIGURATION

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

3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C / the RSS-GEN issue 4, RSS-247 issue 1.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3.75 m away from the receiving antenna, which varied from 1 m to 4 m 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 hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 8 of ANSI C63.10. (Version: 2013)

Conducted Antenna Terminal

See Section from 9.1 to 9.2.(KDB 558074)

3.4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low, mid and high with highest data rate (worst case) is chosen for full testing.

4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.
Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2006).

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 07, 2015 (Registration Number: 90661) / June 22, 2015 (IC Registration Number: 5944A-5)

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.
All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

6. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203 / RSS-GEN(Issue 4) Section 8.3:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

* The antennas of this E.U.T are permanently attached.

*The E.U.T Complies with the requirement of §15.203 / RSS-GEN

7. SUMMARY TEST OF RESULTS

7.1 FCC Part

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	§15.247(a)(2)	> 500 kHz	CONDUCTED	PASS
Conducted Maximum Peak Output Power	§15.247(b)(3)	< 1 Watt		PASS
Power Spectral Density	§15.247(e)	< 8 dBm / 3 kHz Band		PASS
Band Edge(Out of Band Emissions)	§15.247(d)	Conducted < 20 dBc		PASS
AC Power line Conducted Emissions	§15.207	cf. Section 8.7		PASS
Radiated Spurious Emissions	§15.205, 15.209	cf. Section 8.6.1	RADIATED	PASS
Radiated Restricted Band Edge	§15.247(d), 15.205, 15.209	cf. Section 8.6.2		PASS

7.2 IC Part

Test Description	IC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	RSS-247, 5.2	> 500 kHz	CONDUCTED	PASS
99% Bandwidth	RSS-GEN, 6.6	NA		NA
Conducted Maximum Peak Output Power And e.i.r.p.	RSS-247, 5.4.4	< 1 Watt <4 Watt(e.i.r.p.)		PASS
Power Spectral Density	RSS-247, 5.2	< 8 dBm / 3 kHz Band		PASS
Band Edge(Out of Band Emissions)	RSS-247, 5.5	Conducted > 20 dBc		PASS
AC Power line Conducted Emissions	RSS-GEN, 8.8	RSS-GEN section 8.8 table 3		PASS
Radiated Spurious Emissions	RSS-GEN, 8.9	RSS-GEN section 8.9 table 4, 5	RADIATED	PASS
Receiver Spurious Emissions	RSS-GEN, 5 RSS-GEN, 7.1.2	RSS-GEN section 7.1.2 table 2		PASS
Radiated Restricted Band Edge	RSS-GEN, 8.10	RSS-GEN section 8.10 table 6		PASS

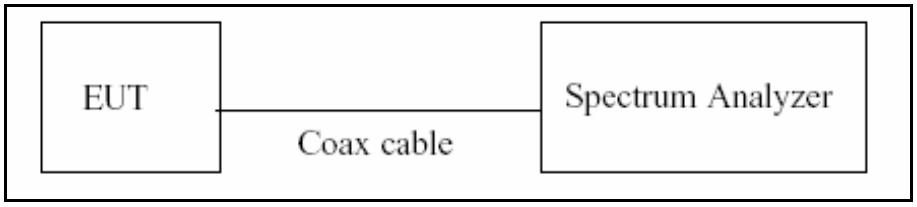
8. TEST RESULT

8.1 DUTY CYCLE

▣ TEST PROCEDURE

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. We tested accroding to the zero-span measurement method, 6.0)b) in KDB 558074 v03r05

The largest availble value of RBW is 8 MHz and VBW is 50 MHz. The zero-span method of measuring duty cycle shall not be used if T ≤ 6.25 microseconds. (50/6.25 = 8)

The zero-span method was used because all measured T data are > 6.25 microseconds and both RBW and VBW are > 50/*T*.

1. RBW = 8 MHz (the largest availble value)
2. VBW = 8 MHz (≥ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on}/ T_{total} and Duty Cycle Factor = 10*log(1/Duty Cycle)

Zigbee Mode	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor(dB)
	-	-	-	-

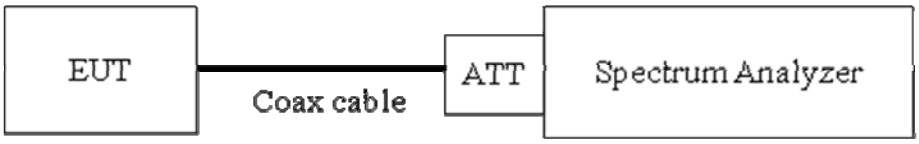
8.2 6dB BANDWIDTH MEASUREMENT

Test Requirements and limit, §15.247(a)(2) / RSS-247(Issue 1) Section 5.2

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

The minimum permissible 6dB bandwidth is 500 kHz.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to (Procedure 8.1 in KDB 558074 v03r05)

RBW = 100 kHz

VBW ≥ 3 x RBW

Detector = Peak

Trace mode = max hold

Sweep = auto couple

Allow the trace to stabilize

Note : We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

▣ TEST RESULTS

Zigbee Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency[MHz]	Channel No.			
2405	11	1.629	0.5	Pass
2445	19	1.634	0.5	Pass
2480	26	1.620	0.5	Pass

▣ RESULT PLOTS

6dB Bandwidth plot (CH 11)

6dB Bandwidth plot (CH 19)

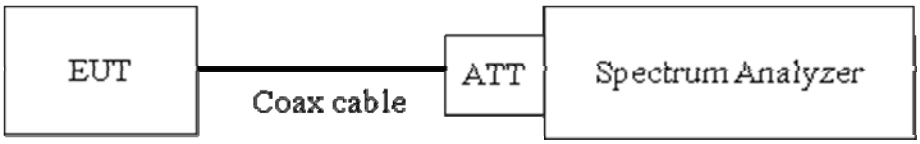
6dB Bandwidth plot (CH 26)

8.3 99% BANDWIDTH

limit

None; for IC reporting purposes only

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to as close to 5 % from 1 % of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99 % bandwidth function is utilized.

RBW = 1 ~ 5 % of the 99 % bandwidth

VBW ≥ 3 x RBW

Detector = Peak

Trace mode = max hold

Sweep = auto couple

Allow the trace to stabilize

▣ TEST RESULTS

Conducted 99% Bandwidth Measurements

Zigbee Mode		Measured Bandwidth [MHz]
Frequency [MHz]	Channel No.	
2405	11	2.4770
2445	19	2.4938
2480	26	2.4584

▣ RESULT PLOTS

99% Bandwidth plot (CH 11)

99% Bandwidth plot (CH 19)

99% Bandwidth plot (CH 26)

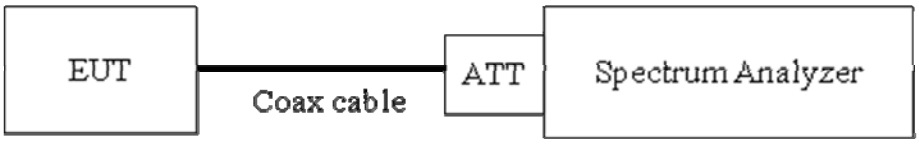
8.4 OUTPUT POWER MEASUREMENT

Test Requirements and limit, §15.247(b)(3) / RSS-247(Issue 1) Section 5.4.4

A transmitter antenna terminal of EUT is connected to the input of a Spectrum Analyzer. Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies.

The maximum permissible conducted output power is 1 Watt.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. We use the spectrum analyzer's integrated band power measurement function.

This EUT TX condition is continuous operating mode by Zigbee mode test program.

The Spectrum Analyzer is set to

▪ Peak Power (Procedure 9.1.1 in KDB 558074 v03r05)

RBW ≥ DTS Bandwidth

VBW ≥ 3 x RBW

SPAN ≥ 3 x RBW

Detector Mode = Peak

Sweep = auto couple

Trace Mode = max hold

Allow trace to fully stabilize.

Use peak marker function to determine the peak amplitude level

▪ Average Power (Procedure 9.2.2.4 in KDB 558074 v03r05)

Measure the duty cycle

Set span to at least 1.5 times the OBW

RBW = 1-5 % of the OBW, not to exceed 1 MHz.

VBW ≥ 3 x RBW.

Number of points in sweep ≥ 2 x span / RBW. (This gives bin-to-bin spacing ≤ RBW/2,

so that narrowband signals are not lost between frequency bins.)

Sweep time = auto.

Detector = RMS(i.e., power averaging)

Do not use sweep triggering. Allow the sweep to "free run".

Trace average at least 100 traces in power averaging(RMS) mode.
Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges.
Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

▣ Sample Calculation

Output Power = Reading Value + ATT loss + Cable loss(1 ea) + Duty Cycle Factor
Output Power = 10 dBm + 10 dB + 0.8 dB + 0.2 dB = 21.0 dBm

Note :

1. Spectrum reading values are not plot data. The power results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss
3. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB. So, 10.7 dB is offset for 2.4 GHz Band.

▣ TEST RESULTS-Peak

Conducted Output Power Measurements

Zigbee Mode		Measured Power(dBm)	Limit (dBm)
Frequency[MHz]	Channel No.		
2405	11	17.016	30
2445	19	15.246	30
2480	26	1.984	30

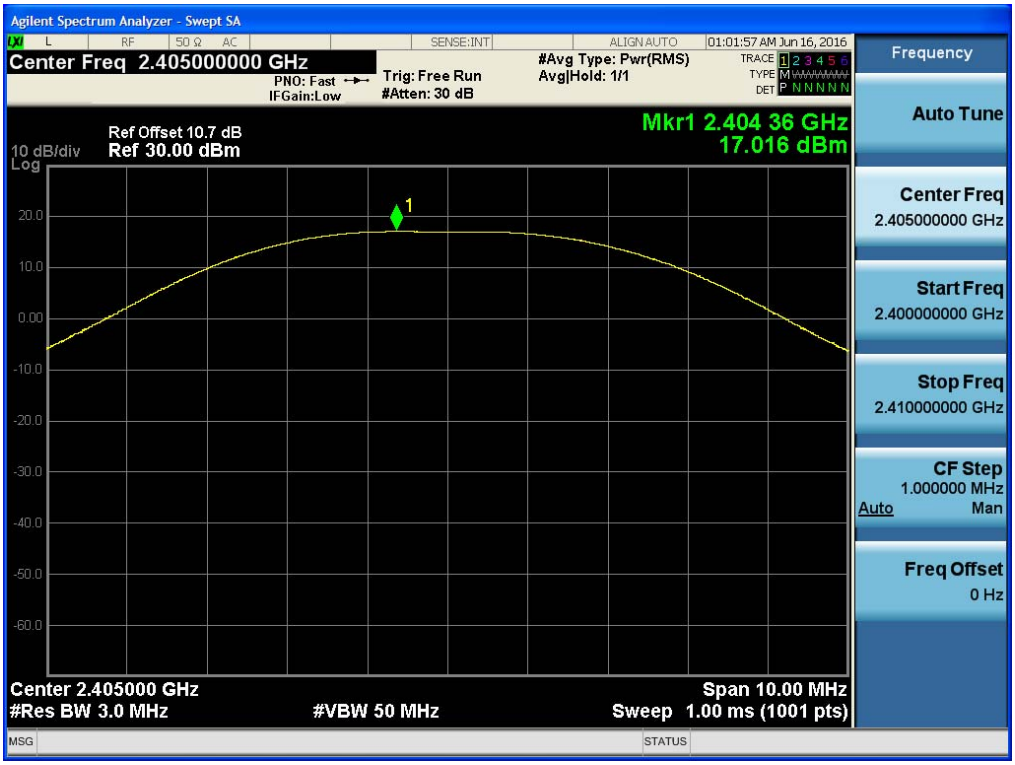
▣ TEST RESULTS-Average

Conducted Output Power Measurements

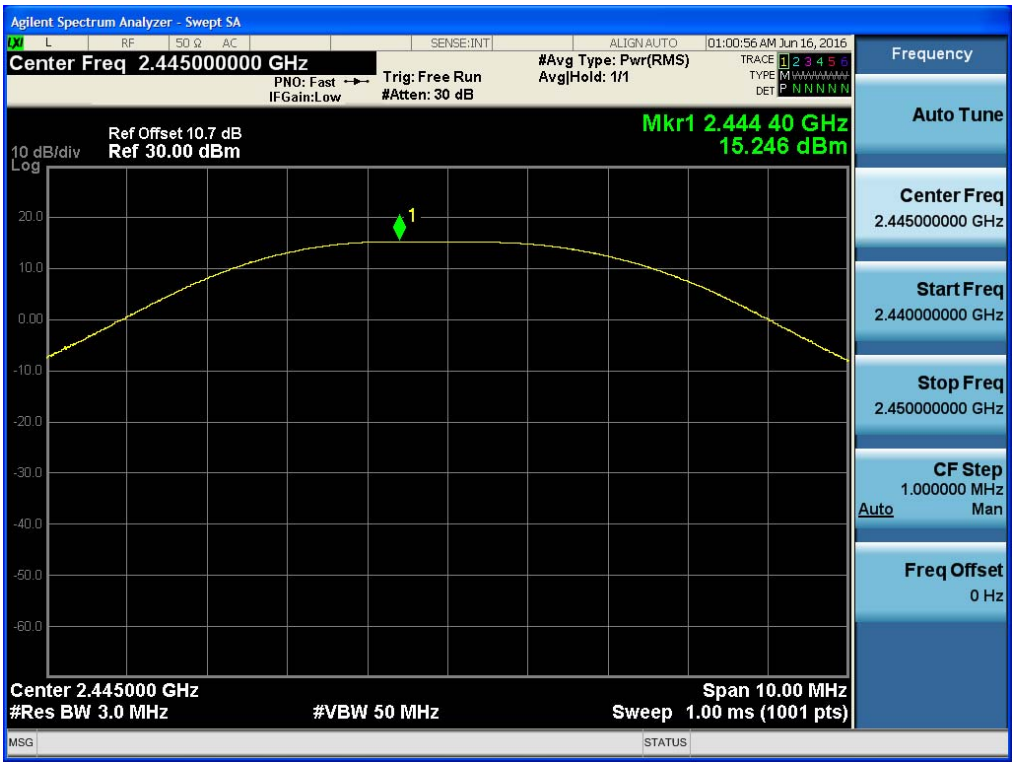
Zigbee Mode		Measured Power(dBm)	Limit (dBm)
Frequency[MHz]	Channel No.		
2405	11	16.86	30
2445	19	15.02	30
2480	26	1.73	30

▣ RESULT PLOTS-Peak

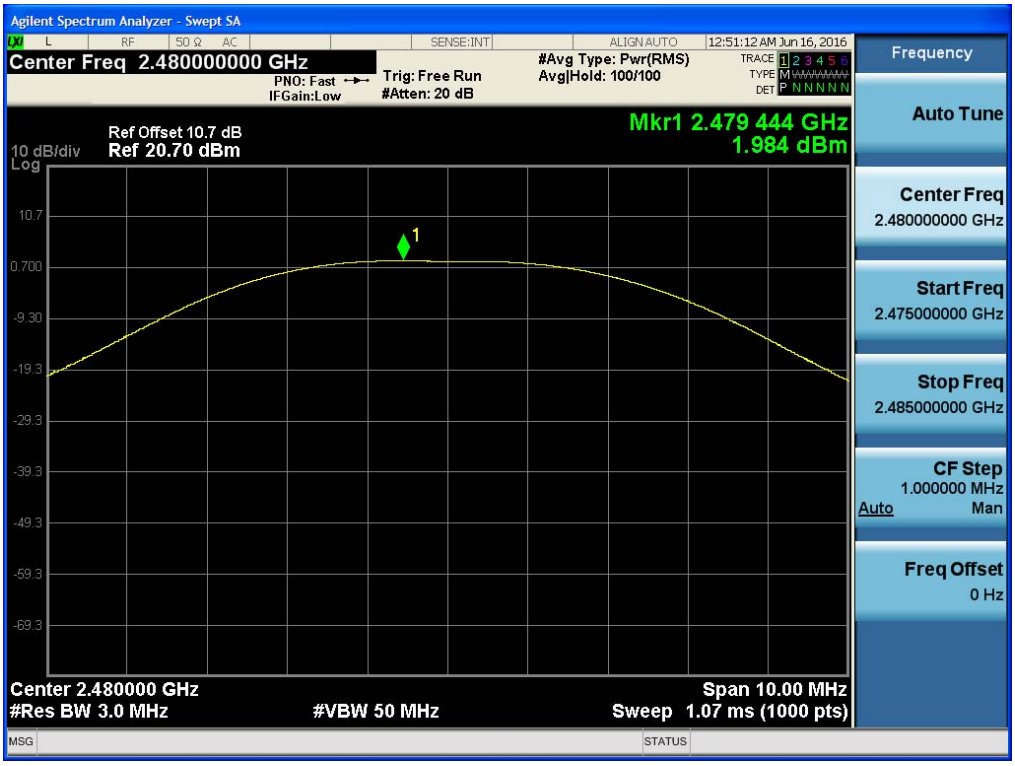
Conducted Output Power (CH 11)



Conducted Output Power (CH 19)



Conducted Output Power (CH 26)



▣ RESULT PLOTS-Average

Conducted Output Power (CH 11)

Conducted Output Power (CH 19)

Conducted Output Power (CH 26)

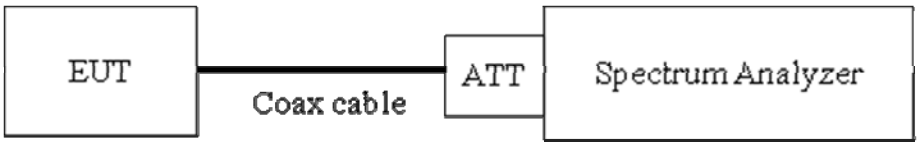
8.5 POWER SPECTRAL DENSITY

Test Requirements and limit, §15.247(e) / RSS-247(Issue 1) Section 5.2

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

Minimum Standard – The transmitter power density average over 1-second interval shall not be greater than 8dBm in any 3kHz BW.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

We tested according to Procedure 10.2 in KDB 558074 v03r05

The spectrum analyzer is set to :

Set analyzer center frequency to DTS channel center frequency.

Span = 1.5 times the DTS channel bandwidth.

RBW = 3 kHz ≤ RBW ≤ 100 kHz.

VBW ≥ 3 x RBW.

Sweep = auto couple

Detector = peak

Trace Mode = max hold

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

▣ Sample Calculation

PSD = Reading Value + ATT loss + Cable loss(1 ea)

Output Power = -5 dBm + 10 dB + 0.8 dB = 5.8 dBm

Note :

1. Spectrum reading values are not plot data. The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss
3. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB. So,10.7 dB is offset for 2.4 GHz Band.

▣ TEST RESULTS

Conducted Power Density Measurements

Zigbee Mode		Test Result		
Frequency[MHz]	Channel No.	PSD (dBm)	Limit (dBm)	Pass/Fail
2405	11	2.044	8	Pass
2445	19	-0.542	8	Pass
2480	26	-12.666	8	Pass

▣ RESULT PLOTS

Power Spectral Density (CH 11)

Power Spectral Density (CH 19)

Power Spectral Density (CH 26)

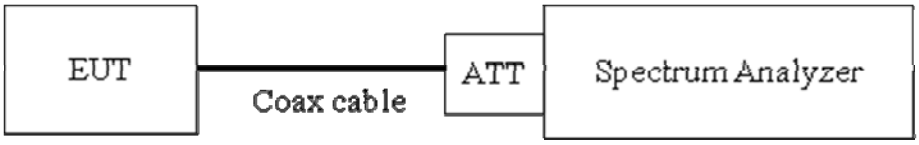
8.6 OUT OF BAND EMISSIONS AT THE BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

Test Requirements and limit, §15.247(d) / RSS-247(Issue 1) Section 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section / Section 5.4.4, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) / RSS-Gen is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

Limit : 20 dBc

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. (Procedure 11.0 in KDB 558074 v03r05)

RBW = 100 kHz

VBW ≥ 3 x RBW

Set span to encompass the spectrum to be examined

Detector = Peak

Trace Mode = max hold

Sweep time = auto couple

Ensure that the number of measurement points ≥ 2*Span/RBW

Allow trace to fully stabilize.

Use peak marker function to determine the maximum amplitude level.

Measurements are made over the 30 MHz to 10th harmonic range with the transmitter set to the lowest, middle, and highest channels.

Note :

1. The maximum peak conducted output power procedure was used to demonstrate compliance as described in 9.1(KDB558074 v03r05), so the peak output power measured in any 100 kHz bandwidth

outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).

2. The band edge results in plot is already including the actual values of loss for the attenuator and cable combination.
3. Spectrum offset = Attenuator loss + Cable loss
4. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB. So, 10.7 dB is offset for 2.4 GHz Band. Actual value of loss for the attenuator and cable combination is below table.

(Actual value of loss for the attenuator and cable combination)

5. In case of conducted spurious emissions test, please check factors blow table.
6. In order to simplify the report, attached plots were only the worst case channel.

▣ FACTORS FOR FREQUENCY

Freq(MHz)	Factor(dB)
30	11.30
100	9.83
200	10.19
300	10.13
400	10.23
500	10.25
600	10.32
700	10.35
800	10.35
900	10.34
1000	10.39
2000	10.64
2400*	10.65
2500*	10.67
3000	10.68
4000	10.89
5000	11.07
6000	11.06
7000	11.35
8000	11.32
9000	11.48
10000	11.56
11000	11.56
12000	11.68

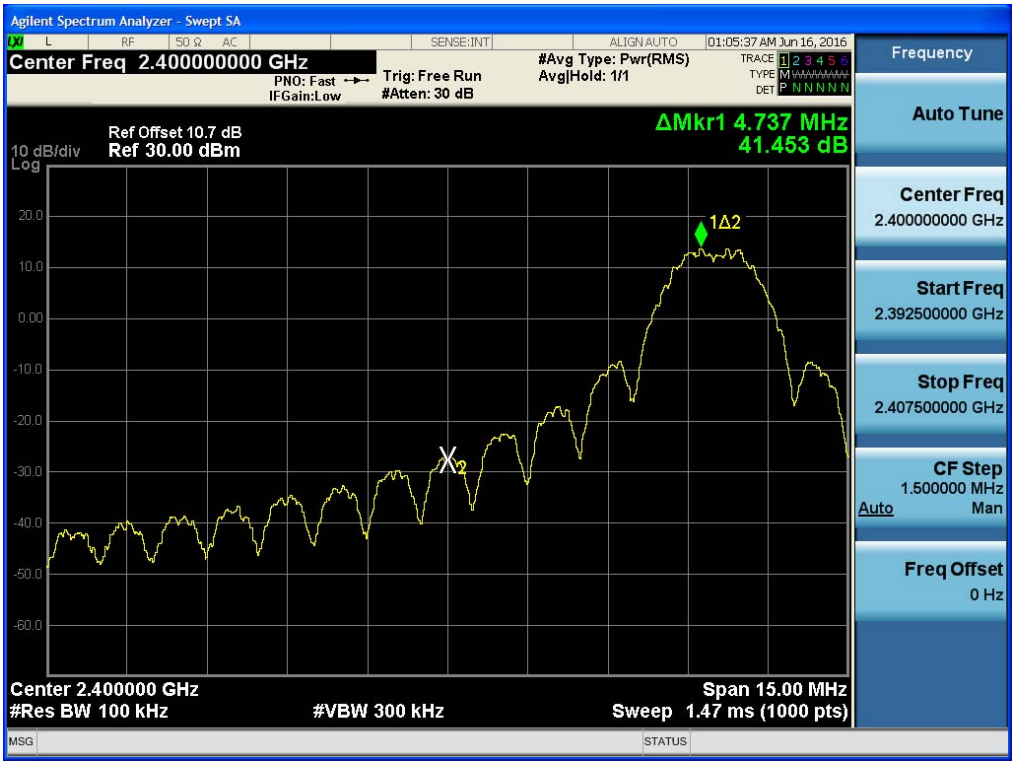
13000	11.83
14000	11.90
15000	11.98
16000	12.04
17000	12.02
18000	12.08
19000	12.07
20000	12.14
21000	12.17
22000	12.31
23000	12.60
24000	12.34
25000	12.53

Note : 1. '*' is fundamental frequency range.

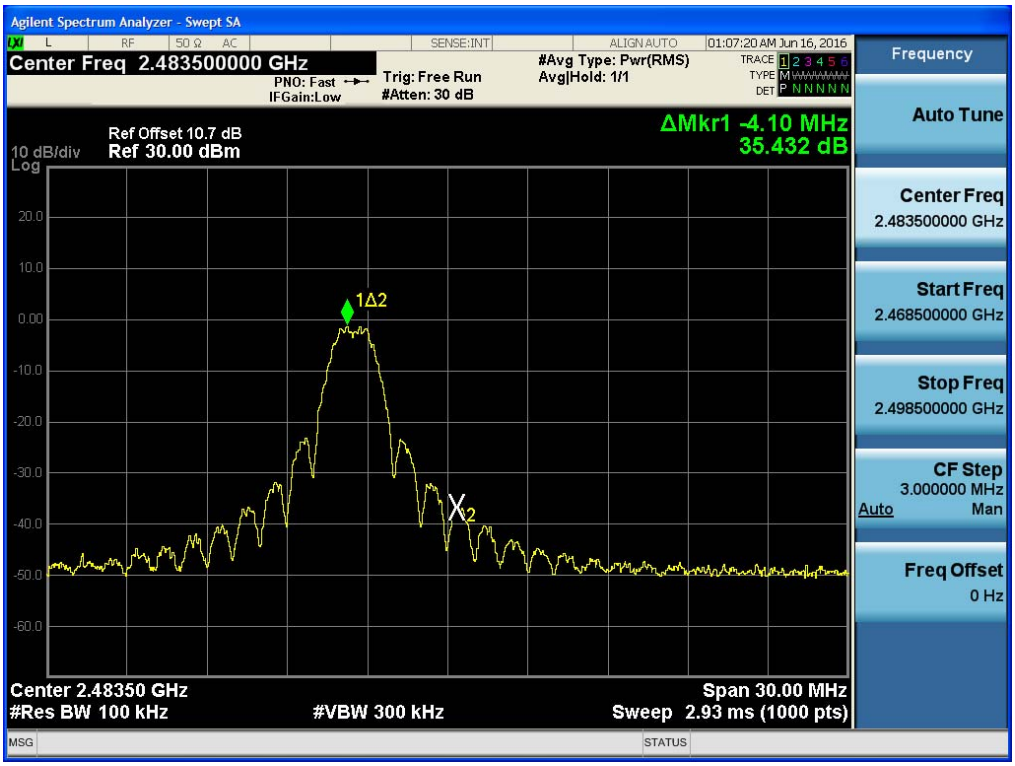
2. Factor = Cable loss + Attenuator loss

▣ RESULT PLOTS

BandEdge (CH 11)

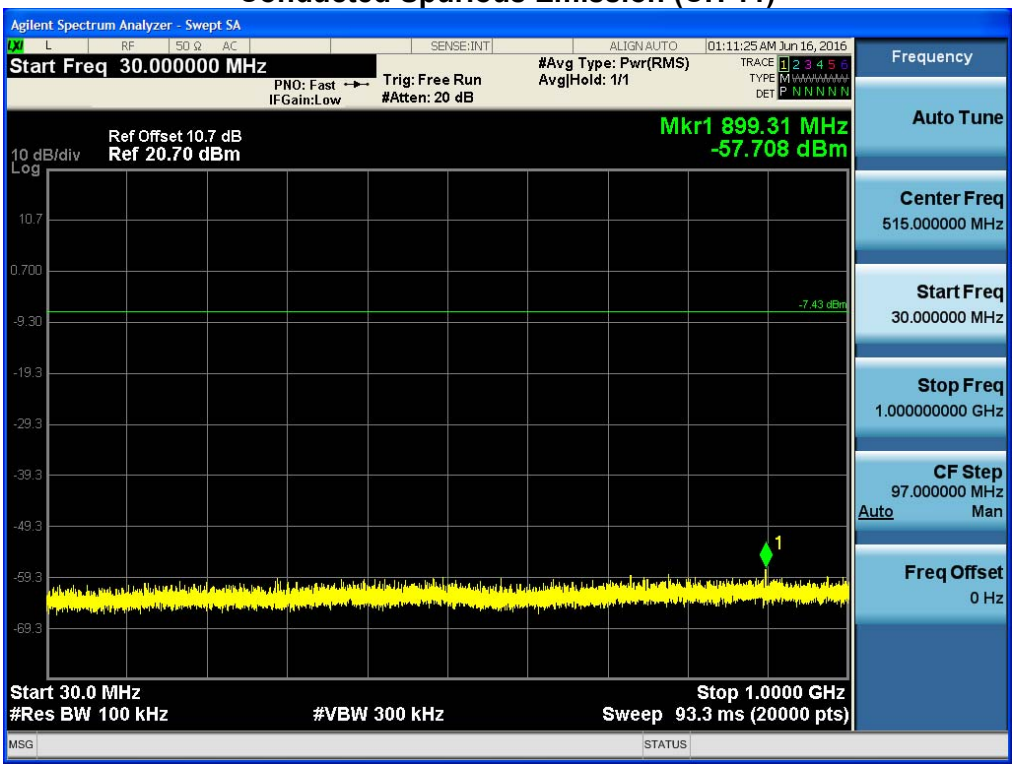


BandEdge (CH 26)



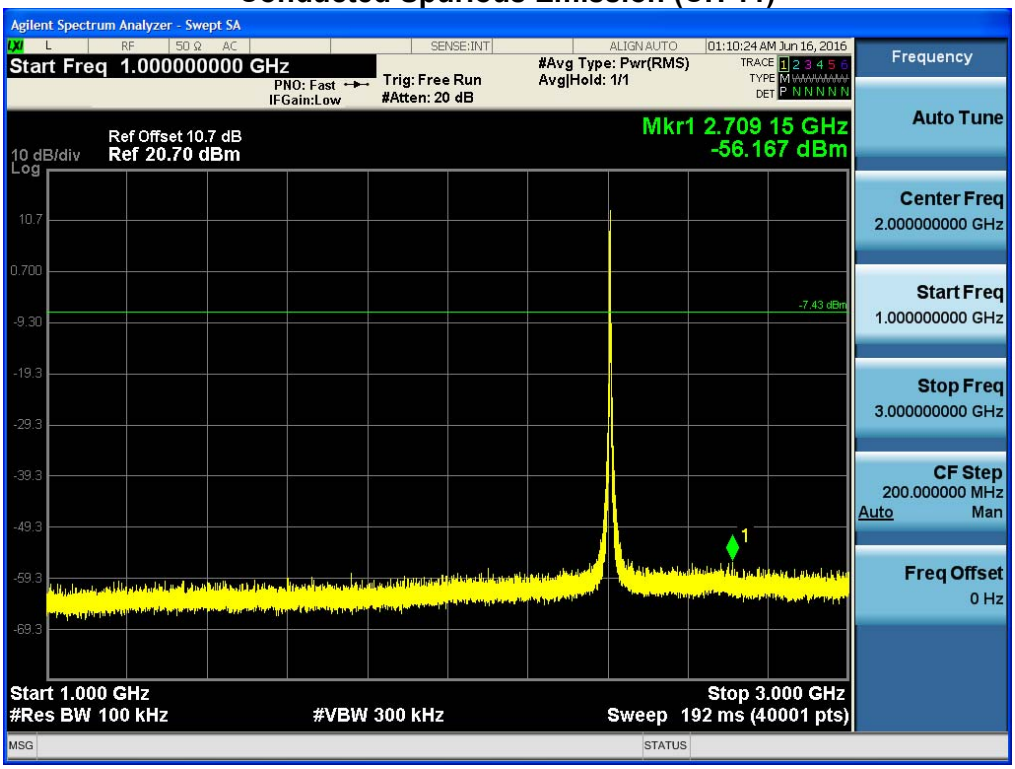
30 MHz ~ 1 GHz

Conducted Spurious Emission (CH 11)



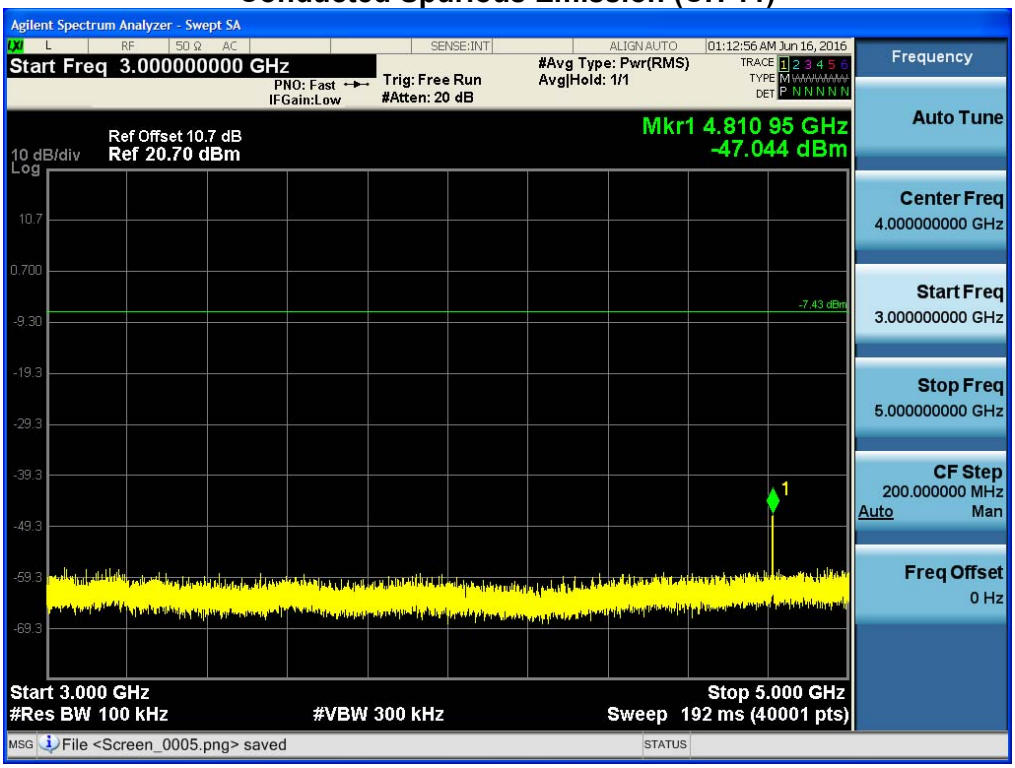
1 GHz ~ 3 GHz

Conducted Spurious Emission (CH 11)



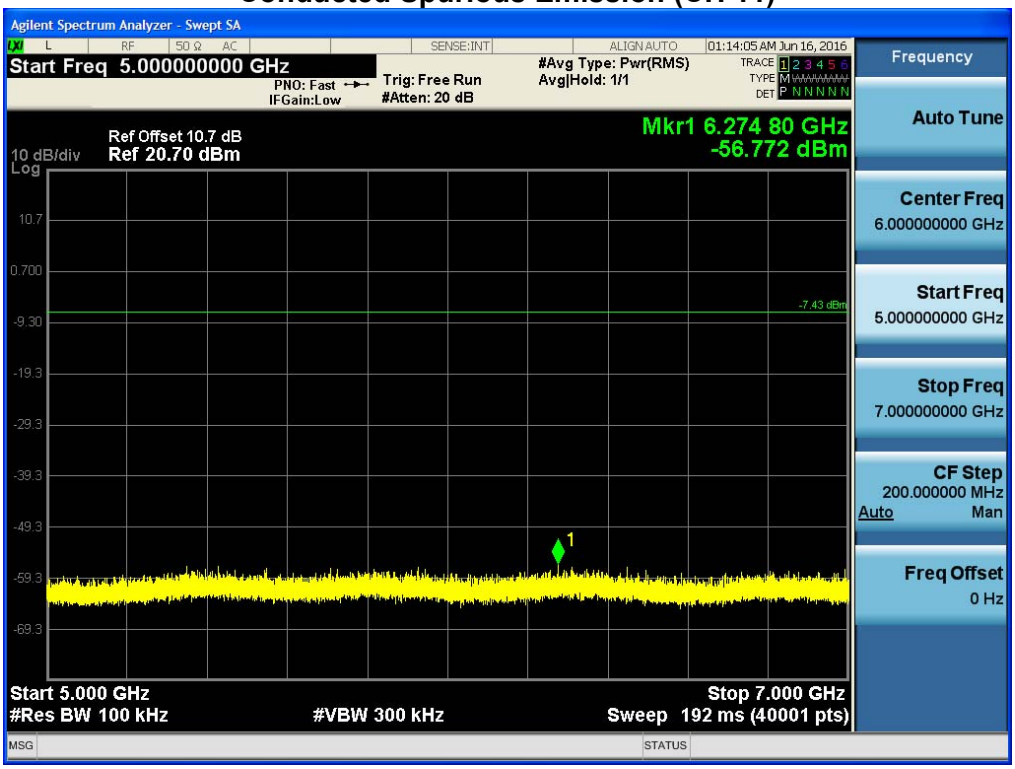
3 GHz ~ 5 GHz

Conducted Spurious Emission (CH 11)



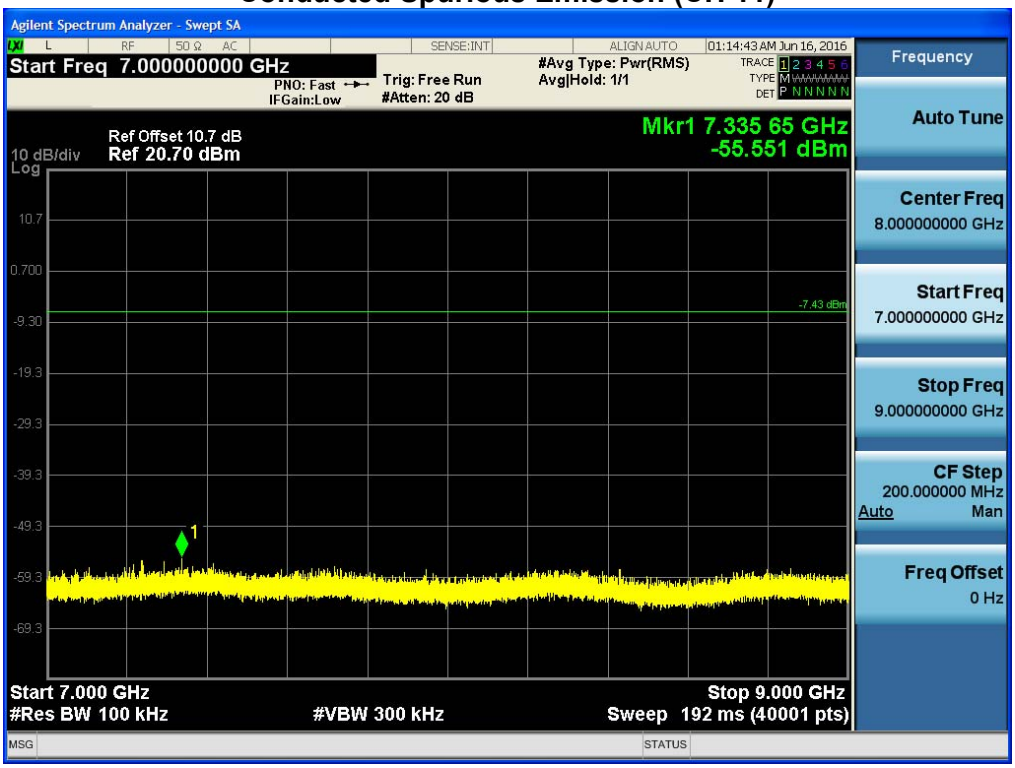
5 GHz ~ 7 GHz

Conducted Spurious Emission (CH 11)



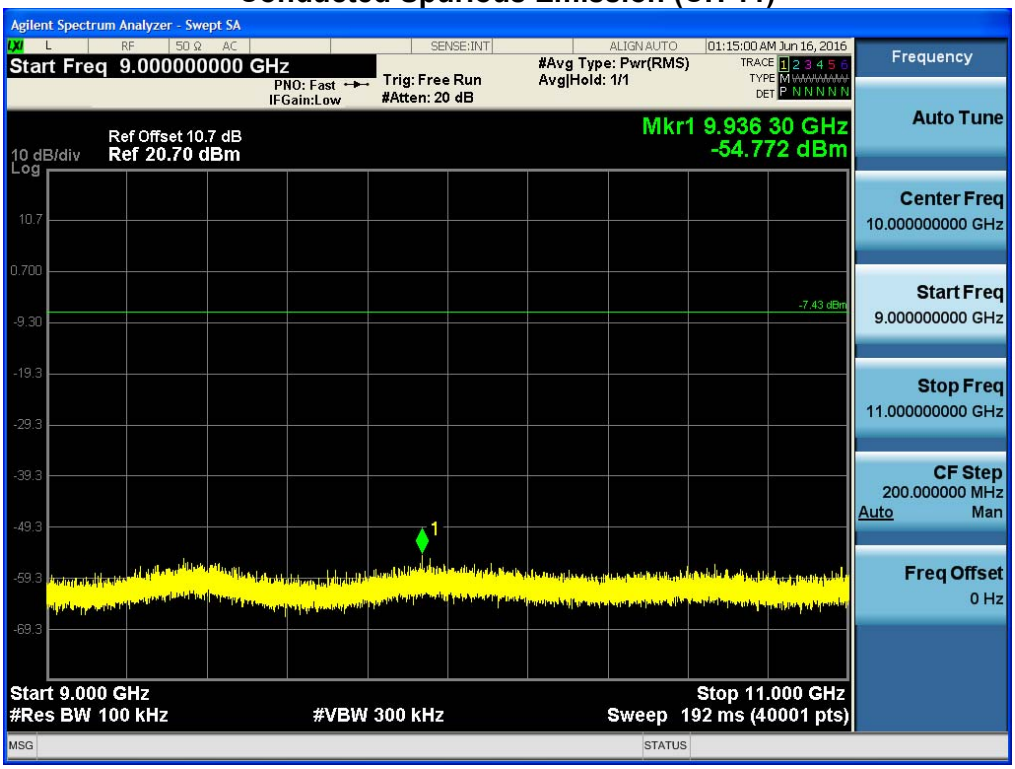
7 GHz ~ 9 GHz

Conducted Spurious Emission (CH 11)



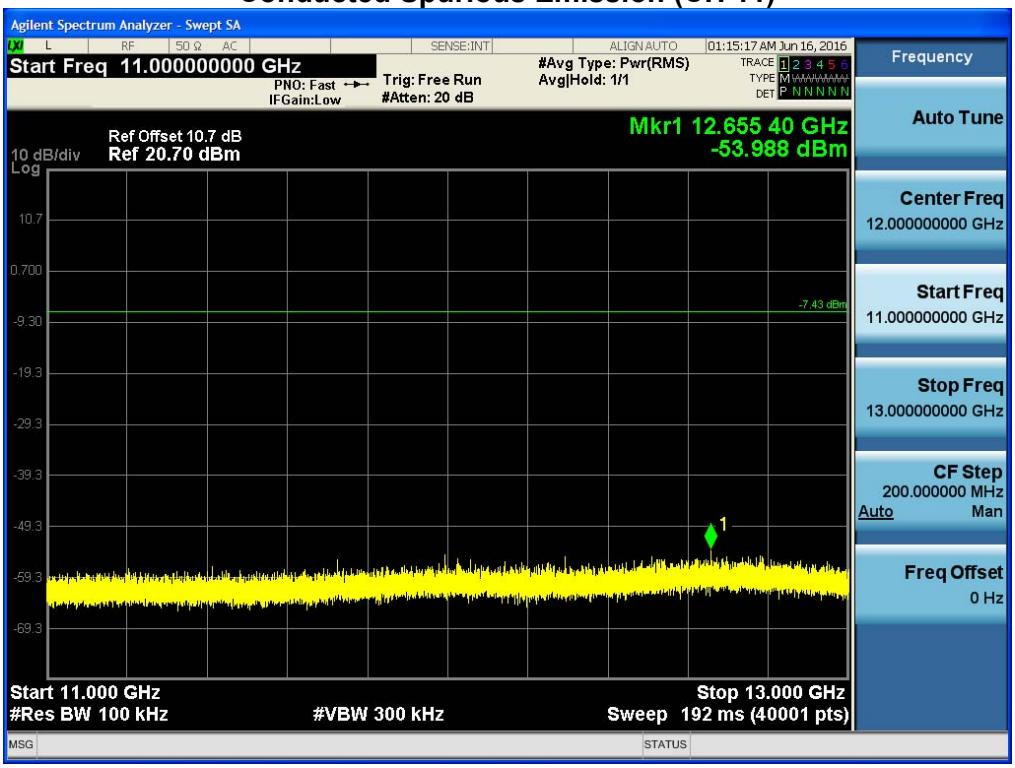
9 GHz ~ 11 GHz

Conducted Spurious Emission (CH 11)



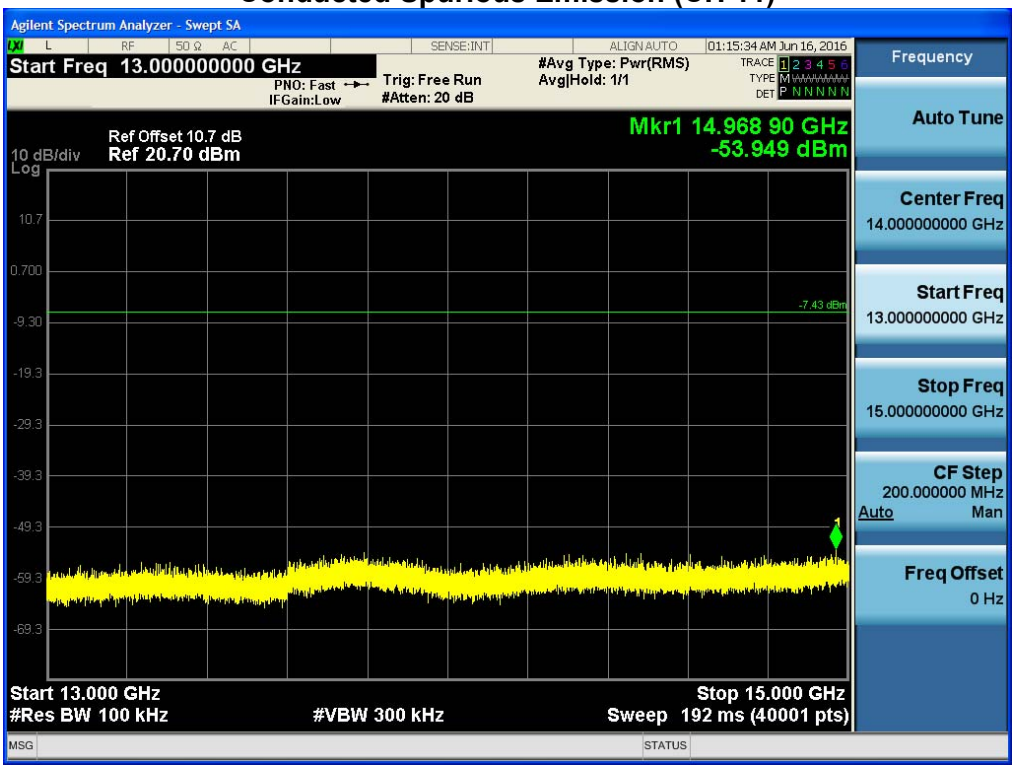
11 GHz ~ 13 GHz

Conducted Spurious Emission (CH 11)



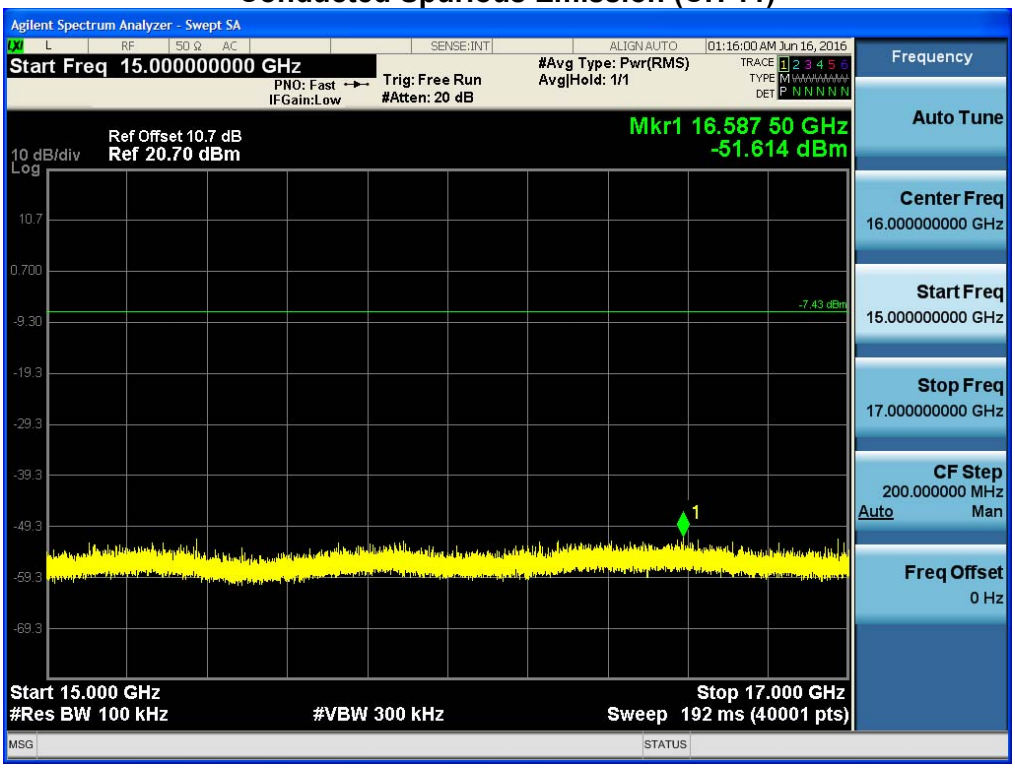
13 GHz ~ 15 GHz

Conducted Spurious Emission (CH 11)



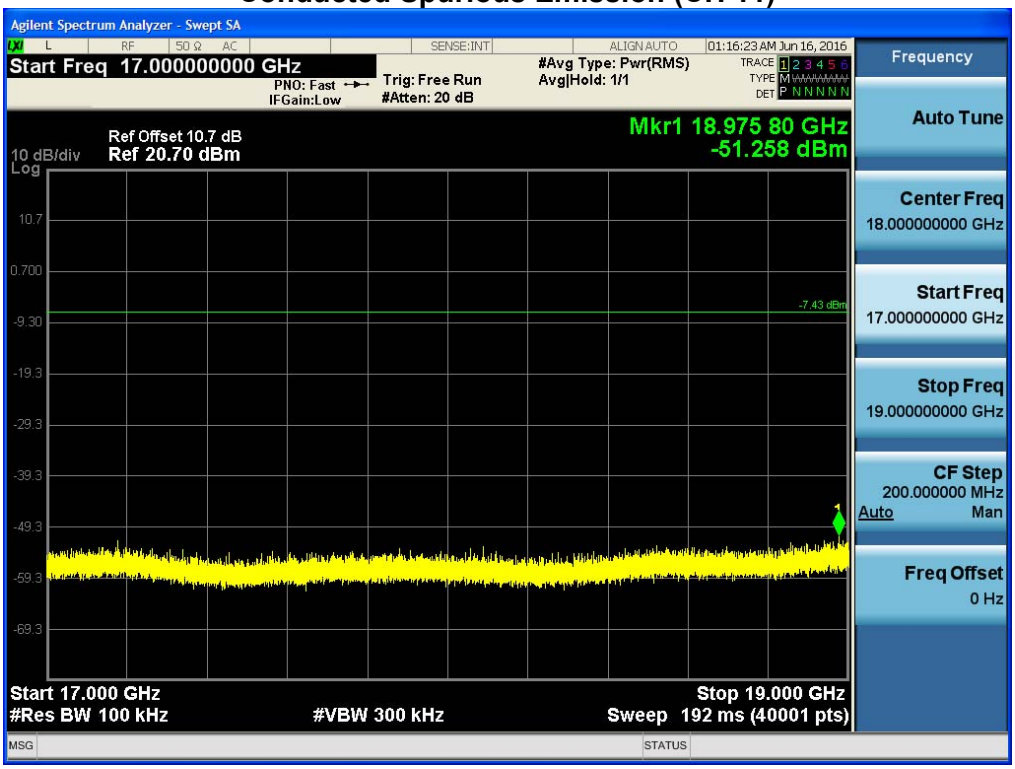
15 GHz ~ 17 GHz

Conducted Spurious Emission (CH 11)



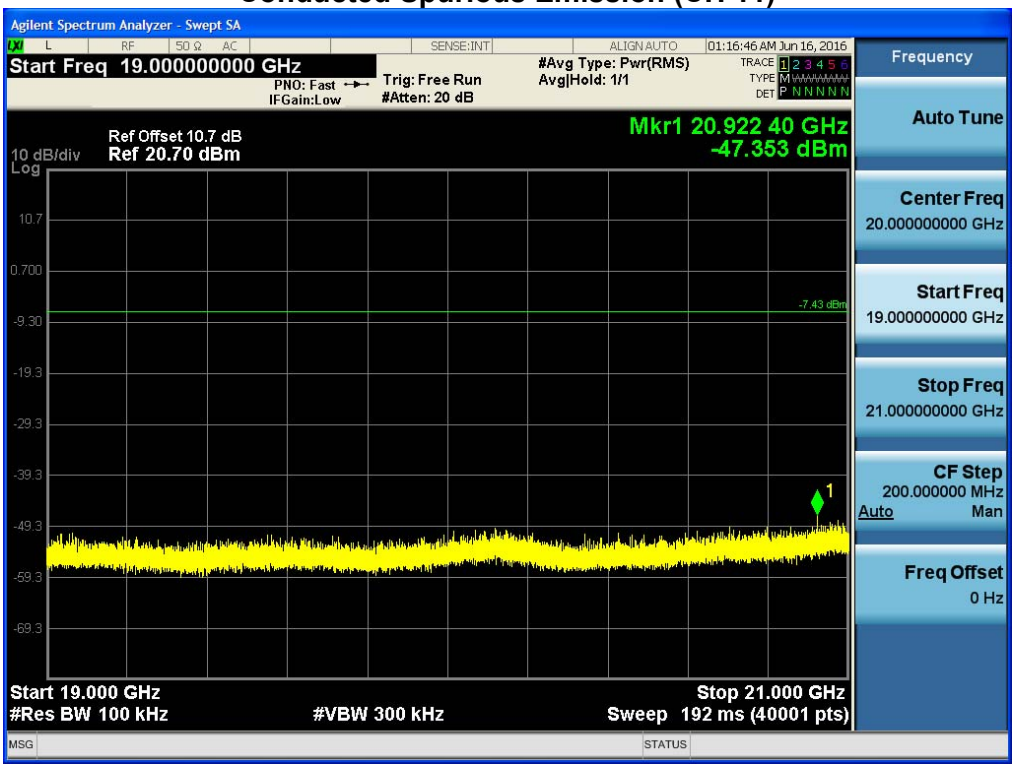
17 GHz ~ 19 GHz

Conducted Spurious Emission (CH 11)



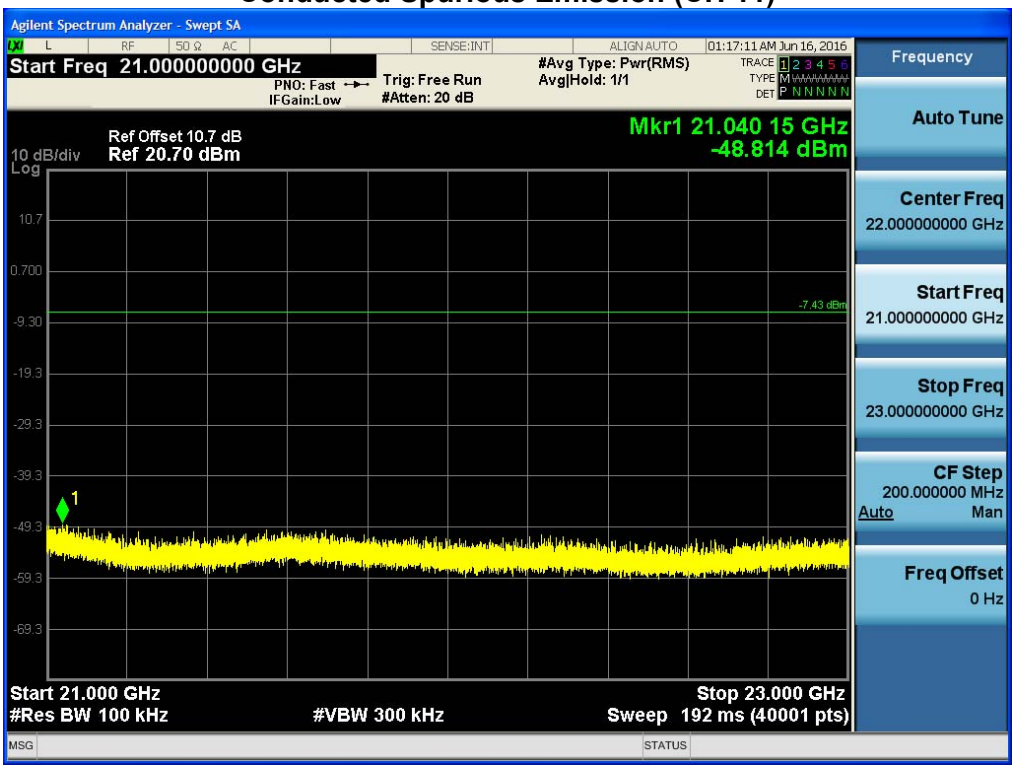
19 GHz ~ 21 GHz

Conducted Spurious Emission (CH 11)



21 GHz ~ 23 GHz

Conducted Spurious Emission (CH 11)



23 GHz ~ 25 GHz

Conducted Spurious Emission (CH 11)

8.7 RADIATED MEASUREMENT.

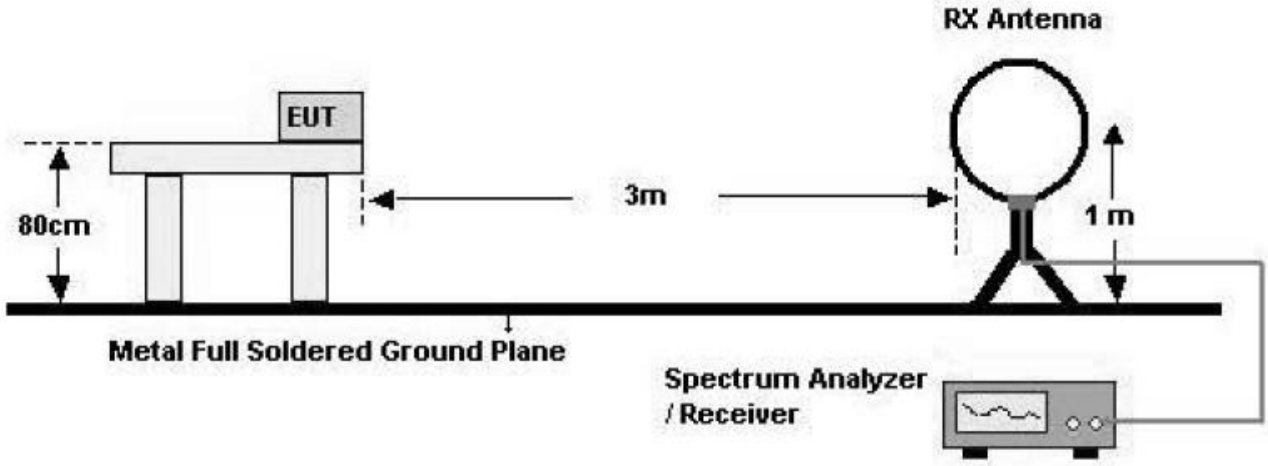
8.7.1 RADIATED SPURIOUS EMISSIONS.

Test Requirements and limit, §15.205, §15.209

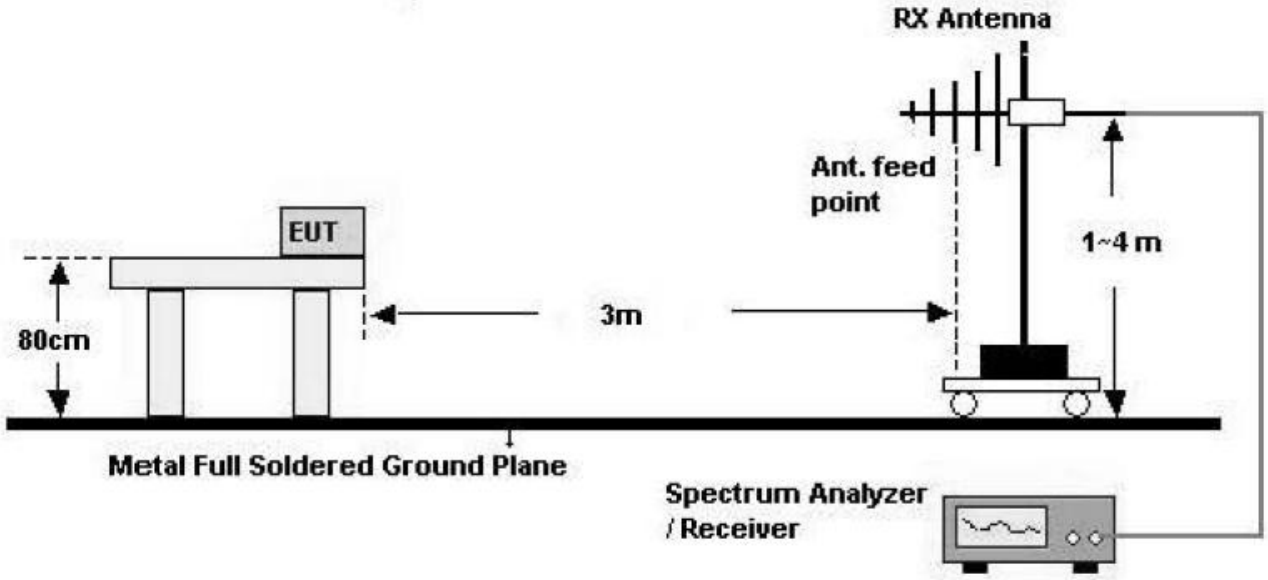
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

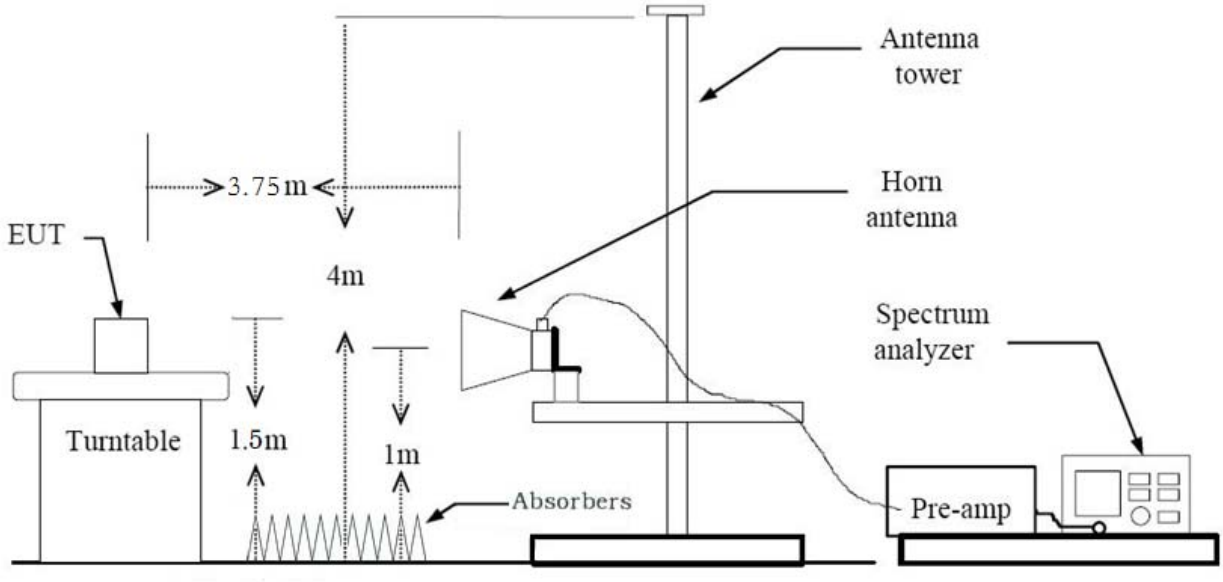
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



TEST PROCEDURE USED

Method 12.1 in KDB 558074 v03r05

Spectrum Setting

- Peak

Peak emission levels are measured by setting the instrument as follows:

RBW = cf. Table 1.

VBW ≥ 3 x RBW.

Detector = Peak.

Sweep time = auto.

Trace mode = max hold.

Allow sweeps to continue until the trace stabilizes.

(Note that the required measurement time may be longer for low duty cycle applications).

Table 1 —RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

- Average (duty cycle ≥ 98%)

Set RBW = 1 MHz

Set VBW ≥ 3 x RBW

Detector = RMS

Averaging type = power (*i.e.*, RMS).

Sweep time = auto.

Trace mode = average (at least 100 traces).

- Average (duty cycle < 98%, duty cycle variations are less than ±2%)

Set RBW = 1 MHz

Set VBW ≥ 3 x RBW

Detector = RMS.

Averaging type = power (*i.e.*, RMS).

Sweep time = auto.

Trace mode = average (at least 100 traces).

A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.

Note :

1. We are performed the RSE and radiated band edge using standard radiated method(RMS).
2. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor(reference distance : 3 m).
3. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Marker-delta method 6.10.6 in ANSI C63.10: 2013

The following procedure shall be used for the marker-delta method:

a) Perform an in-band field strength measurement of the fundamental emission using the RBW and detector function required for the frequency being measured. For example, for a device operating in the 902 MHz to 928 MHz band, use a 120 kHz RBW with a CISPR QP detector (a peak detector with 100 kHz RBW alternatively may be used). For transmitters operating above 1 GHz, use a 1 MHz RBW, a 3 MHz VBW, and a peak detector, as required. Repeat the measurement with an average detector (or alternatively, a peak detector and reduced VBW). For pulsed emissions, other factors shall be included; see 4.1.4.2.6.

b) Choose an EMI receiver or spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the instrument RBW to 1% of the total span (but never less than 30 kHz), with a VBW equal to or greater than three times the RBW. Record the peak levels of the fundamental emission and the relevant band-edge emission(i.e., run several sweeps in peak hold mode). Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not an absolute field strength measurement; it is only a relative measurement to determine the amount by which the emission drops at the band edge relative to the highest fundamental emission level.

c) Subtract the delta measured in step b) from the field strengths measured in step a). The resulting field strengths (CISPR QP, average, or peak, as appropriate) are then used to determine band-edge emissions compliance, where required.

TEST RESULTS

9 kHz – 30MHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBμV/m	dBm /m	dBm	(H/V)	dBμV/m	dBμV/m	dB
No Critical peaks found							

Notes:

1. Measuring frequencies from 9 kHz to the 30MHz.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
4. Limit line = specific Limits (dBuV) + Distance extrapolation factor
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

TEST RESULTS

Below 1 GHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
㎒	dB㎶/m	dBm /m	dBm	(H/V)	dB㎶/m	dB㎶/m	dB
No Critical peaks found							

Notes:

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Above 1 GHz

Operation Mode: CH 11

Frequency [MHz]	Reading [dBuV/m]	AN.+CL-AMP G+D.F. [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4810	61.39	-5.75	V	55.64	73.98	18.34	PK
4810	54.00	-5.75	V	48.25	53.98	5.73	AV
7215	57.77	0.31	V	58.08	73.98	15.90	PK
7215	48.67	0.31	V	48.98	53.98	5.00	AV
4810	60.92	-5.75	H	55.17	73.98	18.81	PK
4810	53.35	-5.75	H	47.60	53.98	6.38	AV
7215	58.35	0.31	H	58.66	73.98	15.32	PK
7215	49.10	0.31	H	49.41	53.98	4.57	AV

Operation Mode: CH 19

Frequency [MHz]	Reading [dBuV/m]	AN.+CL-AMP G+D.F. [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4890	58.78	-5.51	V	53.27	73.98	20.71	PK
4890	50.44	-5.51	V	44.93	53.98	9.05	AV
7335	58.05	0.32	V	58.37	73.98	15.61	PK
7335	49.13	0.32	V	49.45	53.98	4.53	AV
4890	59.61	-5.51	H	54.10	73.98	19.88	PK
4890	51.80	-5.51	H	46.29	53.98	7.69	AV
7335	58.37	0.32	H	58.69	73.98	15.29	PK
7335	49.11	0.32	H	49.43	53.98	4.55	AV

Operation Mode: CH 26

Frequency [MHz]	Reading [dBuV/m]	AN.+CL-AMP G+D.F. [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4960	54.77	-5.35	V	49.42	73.98	24.56	PK
4960	42.70	-5.35	V	37.35	53.98	16.63	AV
7440	53.41	0.86	V	54.27	73.98	19.71	PK
7440	41.35	0.86	V	42.21	53.98	11.77	AV
4960	55.46	-5.35	H	50.11	73.98	23.87	PK
4960	43.00	-5.35	H	37.65	53.98	16.33	AV
7440	53.76	0.86	H	54.62	73.98	19.36	PK
7440	41.38	0.86	H	42.24	53.98	11.74	AV

Operation Mode: CH 25

Frequency [MHz]	Reading [dBuV/m]	AN.+CL-AMP G+D.F. [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4950	57.95	-5.35	V	52.60	73.98	21.38	PK
4950	48.30	-5.35	V	42.95	53.98	11.03	AV
7425	58.17	0.86	V	59.03	73.98	14.95	PK
7425	49.30	0.86	V	50.16	53.98	3.82	AV
4950	60.36	-5.35	H	55.01	73.98	18.97	PK
4950	52.96	-5.35	H	47.61	53.98	6.37	AV
7425	57.00	0.86	H	57.86	73.98	16.12	PK
7425	47.80	0.86	H	48.66	53.98	5.32	AV

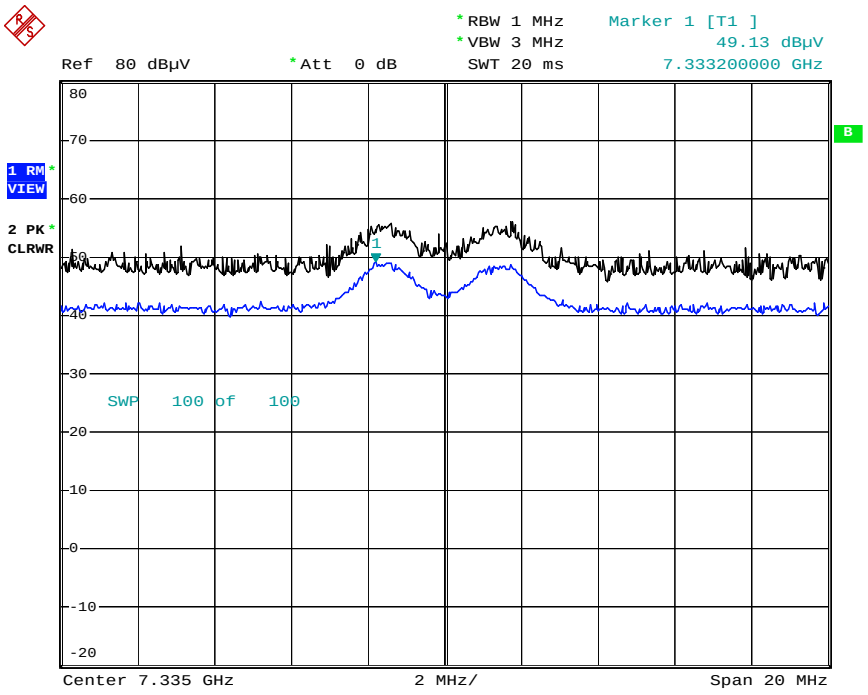
Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.

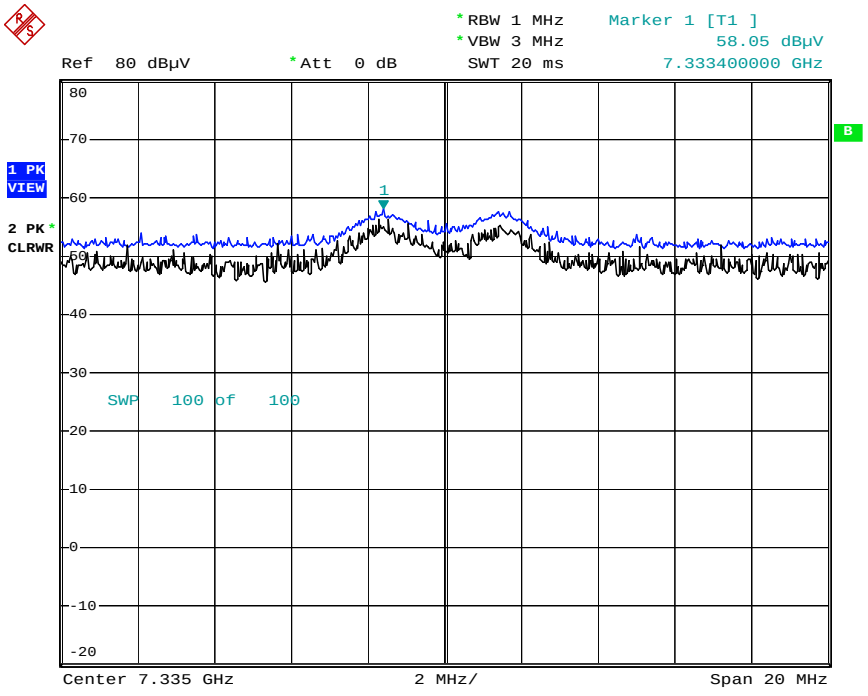
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain + Distance Factor
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
6. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

▣ RESULT PLOTS

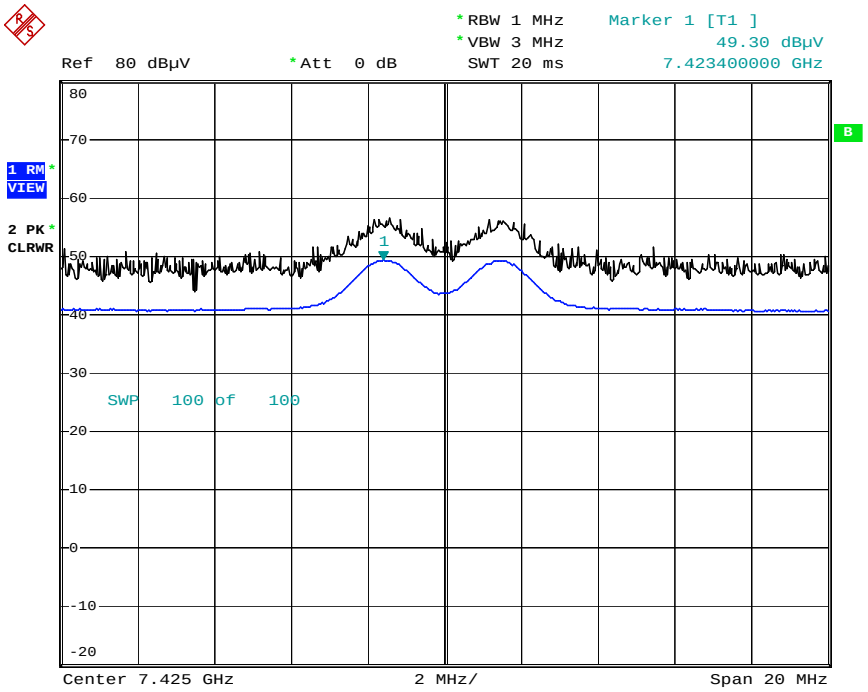
Radiated Spurious Emissions plot – Average Reading (Zigbee, Ch.19 3rd Harmonic, z-V)



Radiated Spurious Emissions plot – Peak Reading (Zigbee, Ch.19 3rd Harmonic, z-V)



Radiated Spurious Emissions plot – Average Reading (Zigbee, Ch.25 3rd Harmonic, y-V)



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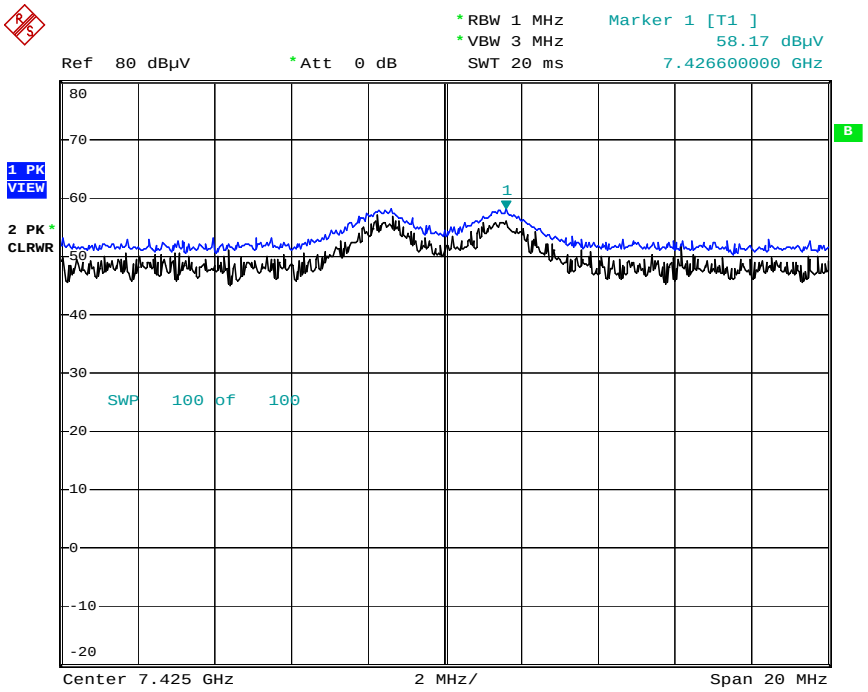
Radiated Spurious Emissions plot – Peak Reading (Zigbee, Ch.25 3rd Harmonic, y-V)



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Note : Only the worst case plots for Radiated Spurious Emissions

8.7.2 RECEIVER SPURIOUS EMISSIONS

IC Rule(s)	**RSS-GEN**
Test Requirements:	**Blow the table**
Operating conditions:	**Under normal test conditions**
Method of testing:	**Radiated**
S/A. Settings:	**F < 1 GHz: RBW: 120 kHz, VBW: 300 kHz (Quasi Peak)** **F > 1 GHz: RBW: 1 MHz, VBW: 1 MHz (Peak)**
Mode of operation:	**Receive**

Frequency (MHz)	Field Strength (microvolts/m at 3 meters)
30 – 88	100
88 - 216	150
216 – 960	200
Above 960	500

Operation Mode: Receive:

30 MHz ~ 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
㎒	dB㎶/m	dBm /m	dBm	(H/V)	dB㎶/m	dB㎶/m	dB
No Critical peaks found							

Above 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
㎒	dB㎶/m	dBm /m	dBm	(H/V)	dB㎶/m	dB㎶/m	dB
No Critical peaks found							

Note : The result using peak detect mode is lower than average limit. So, there is no data for average detect mode.

8.7.3 RADIATED RESTRICTED BAND EDGES

Test Requirements and limit, §15.247(d) §15.205, §15.209 / RSS-GEN(Issue 4) Section 8.10

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. 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) (See section 15.205(c)).

Operation Mode	Zigbee
Operating Frequency	2405 MHz
Channel No	11 Ch

Frequency [MHz]	Reading [dBuV/m]	A.F.+C.L.+D,F [dBm]	Ant. Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	28.65	33.22	H	61.87	73.98	12.11	PK
2390.0	17.42	33.22	H	50.64	53.98	3.34	AV
2390.0	27.75	33.22	V	60.97	73.98	13.01	PK
2390.0	17.70	33.22	V	50.92	53.98	3.06	AV

* D.C.C.F. = Duty Cycle Correction Factor

A.F = Antenna Facotr

Ant. Pol. = Antenna Polarization

D.F: Distance Factor

Notes:

1. Frequency range of measurement = 2310 MHz ~ 2390 MHz
2. Total = Reading Value + Antenna Factor + Cable Loss + Distance Factor
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

Operation Mode	Zigbee Mode
Operating Frequency	2480 MHz
Channel No	CH 26

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.+D,F [dBm]	Ant. Pol. [H/V]	Fundamental [dBuV/m]	Delta Value [dBuV/m]	D.C.C.F. [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2483.5	68.40	33.22	H	101.62	33.29	0	68.33	73.98	5.65	PK
2483.5	66.10	33.22	H	99.32	33.29	-20.00	46.03	53.98	7.95	AV
2483.5	67.22	33.22	V	100.44	31.57	0	68.87	73.98	5.11	PK
2483.5	65.03	33.22	V	98.25	31.57	-20.00	46.68	53.98	7.30	AV

Notes:

1. Frequency range of measurement = 2483.5 MHz ~ 2485.5 MHz
2. Total = Reading Value + Antenna Factor + Cable Loss + Distance Factor + Fundamental Value + Delta Value + D.C.C.F.
3. Duty Cycle Correction Factor

   : The manufacturer has declared a duty cycle of 10% and quotes IEEE 802.15.4.

   For a 10% duty clycle, the power measured would be reduced by 20 log (0.10) = -20 dB
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Operation Mode	Zigbee Mode
Operating Frequency	2480 MHz
Channel No	CH 26

Frequency [MHz]	Reading dBuV	A.F.+C.L.+D,F [dBm]	Ant. Pol. [H/V]	D.C.C.F. [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2485.5	32.24	33.22	H	0	65.46	73.98	8.52	PK
2485.5	22.76	33.22	H	-20.00	35.98	53.98	18.00	AV
2485.5	32.36	33.22	V	0	65.58	73.98	8.40	PK
2485.5	23.31	33.22	V	-20.00	36.53	53.98	17.45	AV

※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
D.C.C.F.: Duty Cycle Correction Factor
D.F: Distance Factor

Notes:

1. Frequency range of measurement = 2485.5 MHz ~ 2500 MHz
2. Total = Reading Value + Antenna Factor + Cable Loss + Distance Factor + Duty Cycle Correction Factor
3. Duty Cycle Correction Factor
   : The manufacturer has declared a duty cycle of 10% and quotes IEEE 802.15.4.
   For a 10% duty clycle, the power measured would be reduced by 20 log (0.10) = -20 dB
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Operation Mode	Zigbee Mode
Operating Frequency	2475 MHz
Channel No	CH 25

Frequency [MHz]	Reading [dBuV]	A.F.+C.L.+D,F [dBm]	Ant. Pol. [H/V]	Fundamental [dBuV/m]	Delta Value [dBuV/m]	D.C.C.F. [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2483.5	72.35	33.22	H	105.57	43.67	0	61.90	73.98	12.08	PK
2483.5	70.26	33.22	H	103.48	43.67	-20.00	39.81	53.98	14.17	AV
2483.5	79.45	33.22	V	112.67	48.96	0	63.71	73.98	10.27	PK
2483.5	77.21	33.22	V	110.43	48.96	-20.00	41.47	53.98	12.51	AV

Notes:

1. Frequency range of measurement = 2483.5 MHz ~ 2485.5 MHz
2. Total = Reading Value + Antenna Factor + Cable Loss + Distance Factor + Fundamental Value + Delta Value + D.C.C.F.
3. Duty Cycle Correction Factor

   : The manufacturer has declared a duty cycle of 10% and quotes IEEE 802.15.4.

   For a 10% duty clycle, the power measured would be reduced by 20 log (0.10) = -20 dB
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Operation Mode	Zigbee Mode
Operating Frequency	2475 MHz
Channel No	CH 25

Frequency [MHz]	Reading dBuV	A.F.+C.L.+D,F [dBm]	Ant. Pol. [H/V]	D.C.C.F. [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2485.5	27.02	33.22	H	0	60.24	73.98	13.74	PK
2485.5	17.14	33.22	H	-20.00	30.36	53.98	23.62	AV
2485.5	31.52	33.22	V	0	64.74	73.98	9.24	PK
2485.5	22.48	33.22	V	-20.00	35.70	53.98	18.28	AV

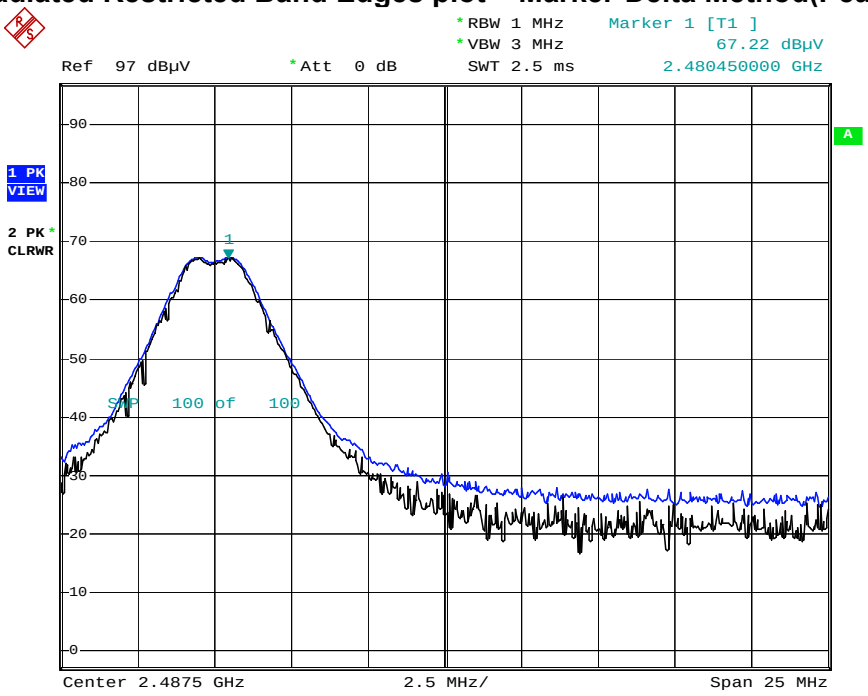
※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
D.C.C.F.: Duty Cycle Correction Factor
D.F: Distance Factor

Notes:

1. Frequency range of measurement = 2485.5 MHz ~ 2500 MHz
2. Total = Reading Value + Antenna Factor + Cable Loss + Distance Factor + Duty Cycle Correction Factor
3. Duty Cycle Correction Factor
   : The manufacturer has declared a duty cycle of 10% and quotes IEEE 802.15.4.
   For a 10% duty clycle, the power measured would be reduced by 20 log (0.10) = -20 dB
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna

▣ RESULT PLOTS

Radiated Restricted Band Edges plot – Marker-Delta Method(Peak)



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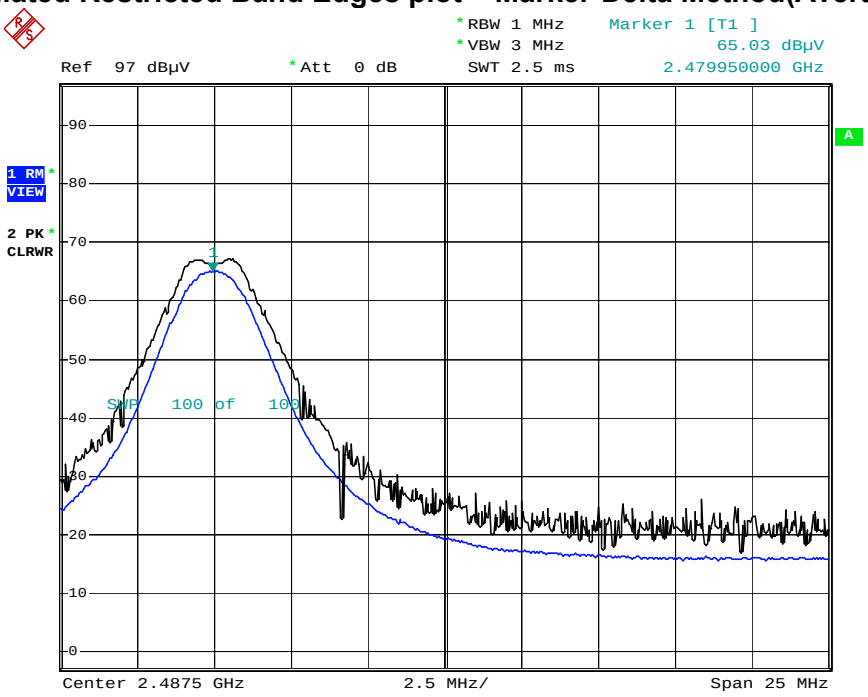
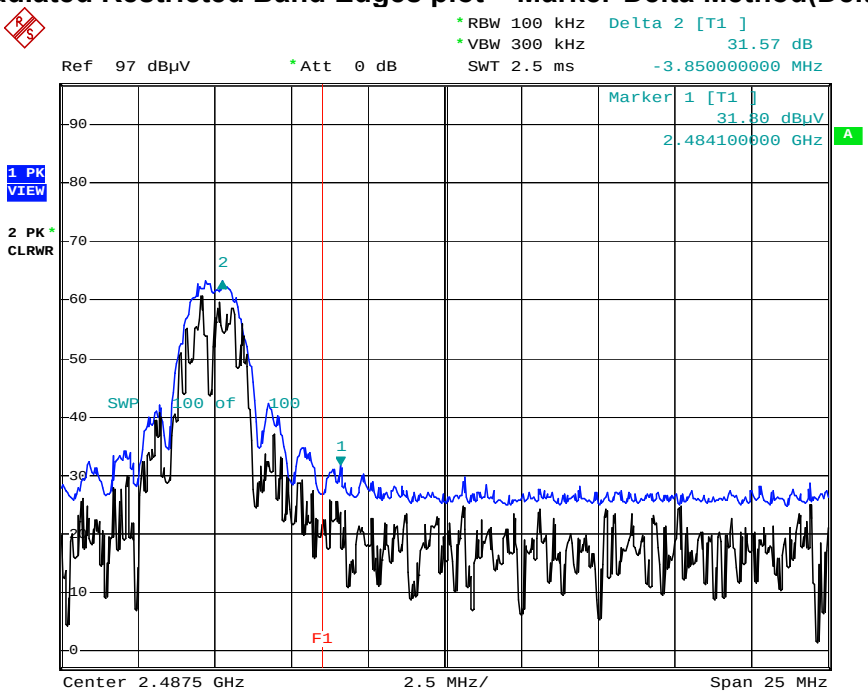
Radiated Restricted Band Edges plot – Marker-Delta Method(Average)



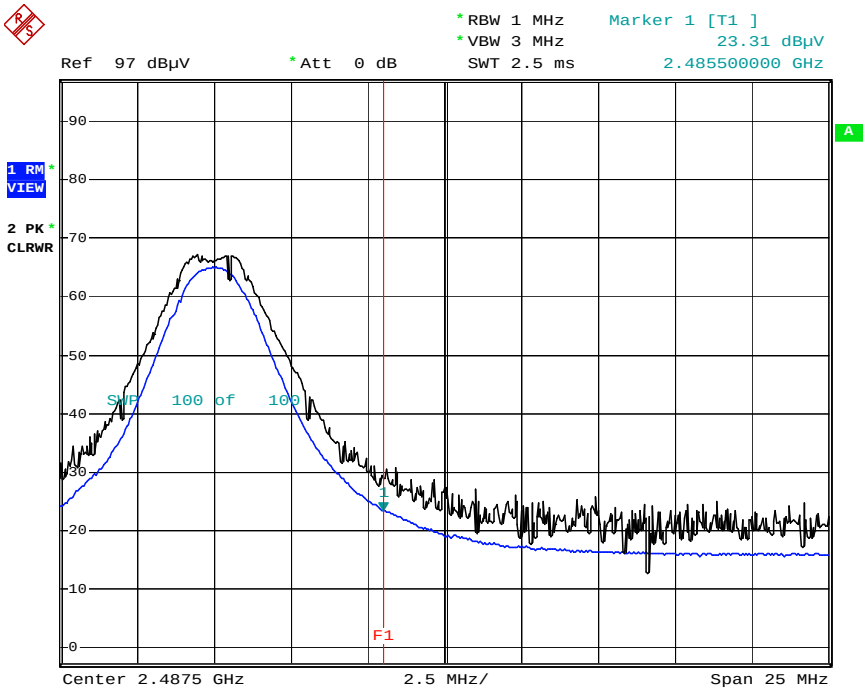
Date: 14.JUN.2016 10:04:44

Radiated Restricted Band Edges plot – Marker-Delta Method(Delta)



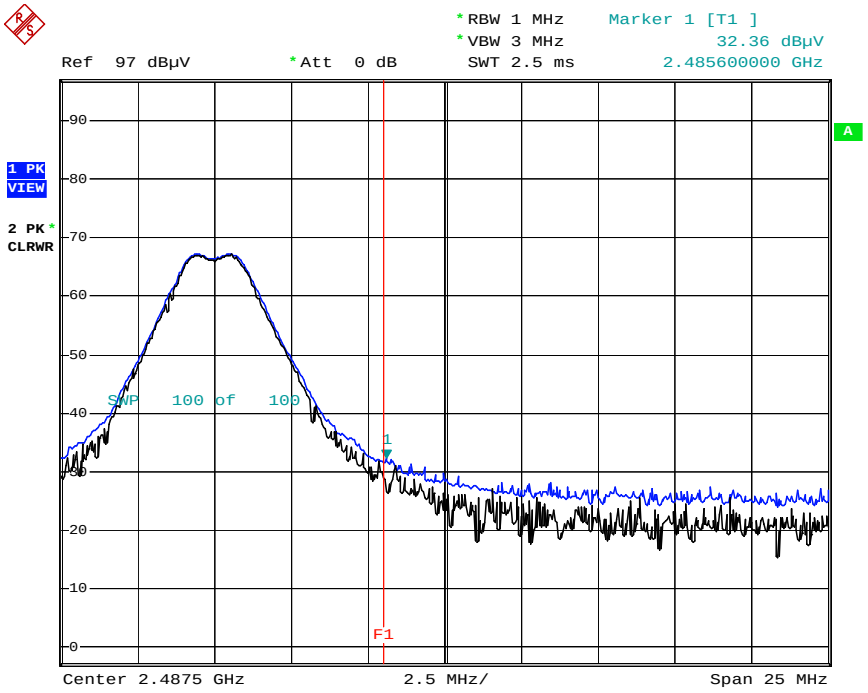
Date: 14.JUN.2016 10:05:49

Radiated Restricted Band Edges plot – Average Reading (Ch 26)

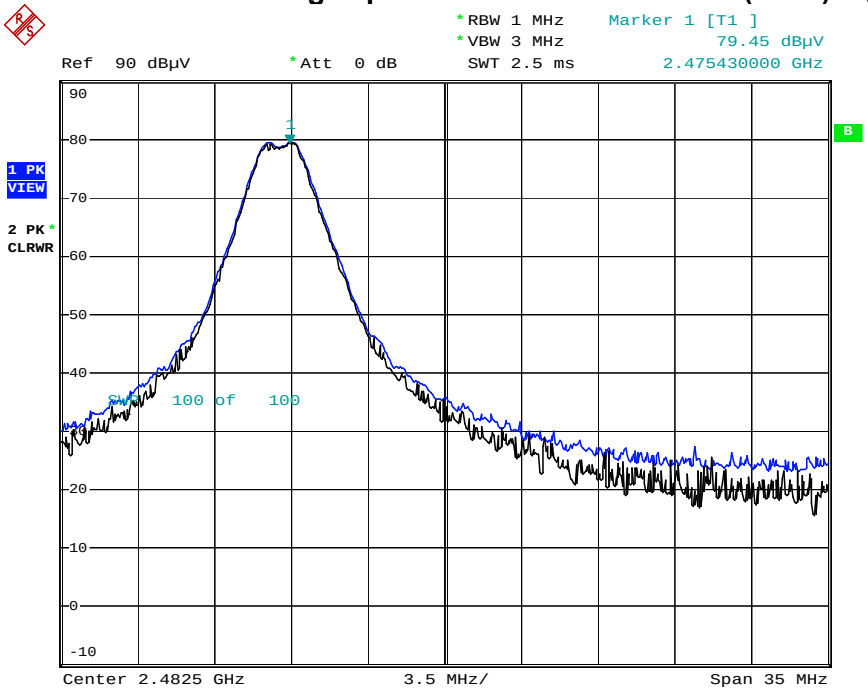


Date: 14.JUN.2016 10:07:09

Radiated Restricted Band Edges plot – Peak Reading (Ch 26)

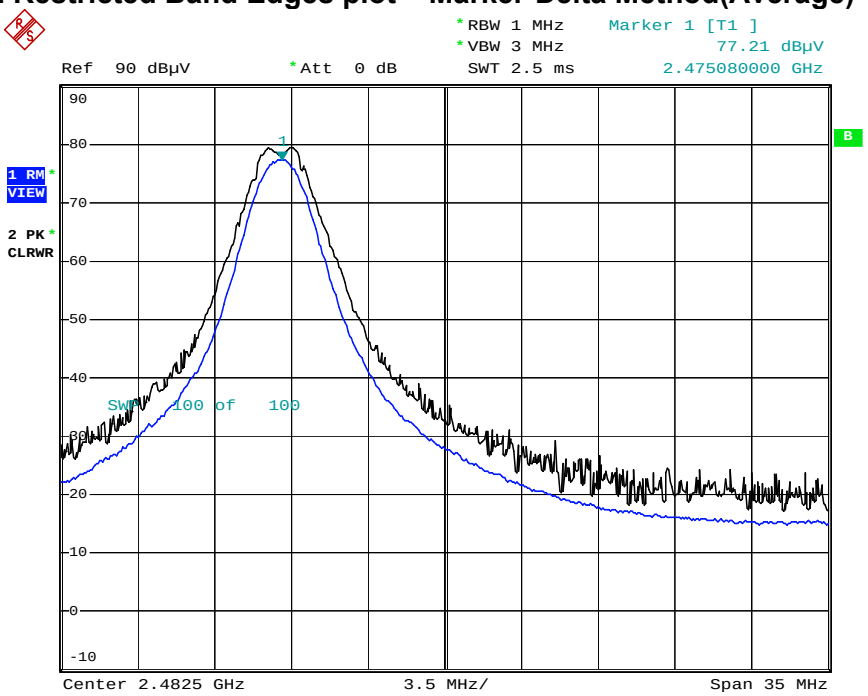


Radiated Restricted Band Edges plot – Marker-Delta Method(Peak) – (Ch 25)



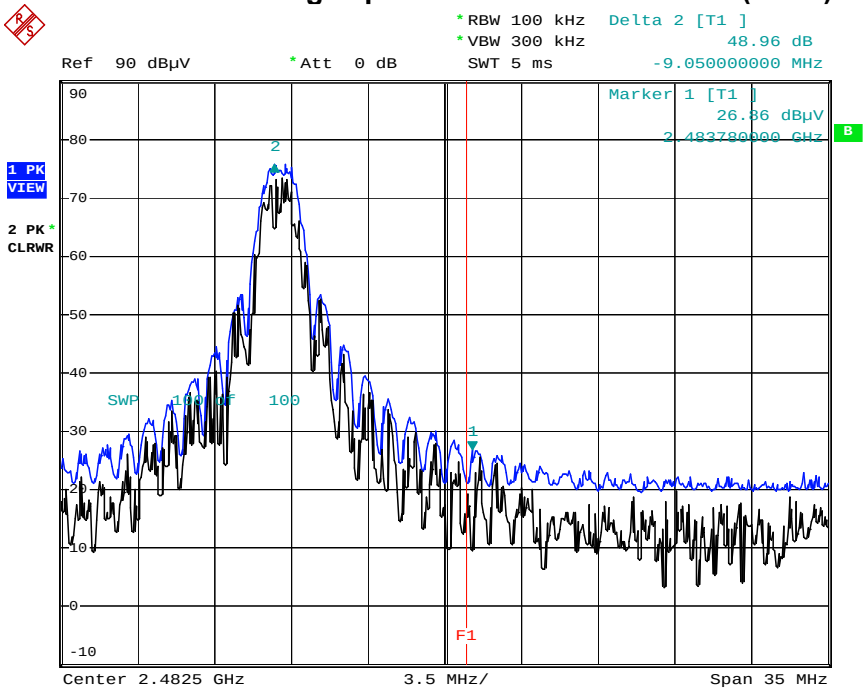
Date: 17.JUN.2016 03:42:17

Radiated Restricted Band Edges plot – Marker-Delta Method(Average) – (Ch 25)



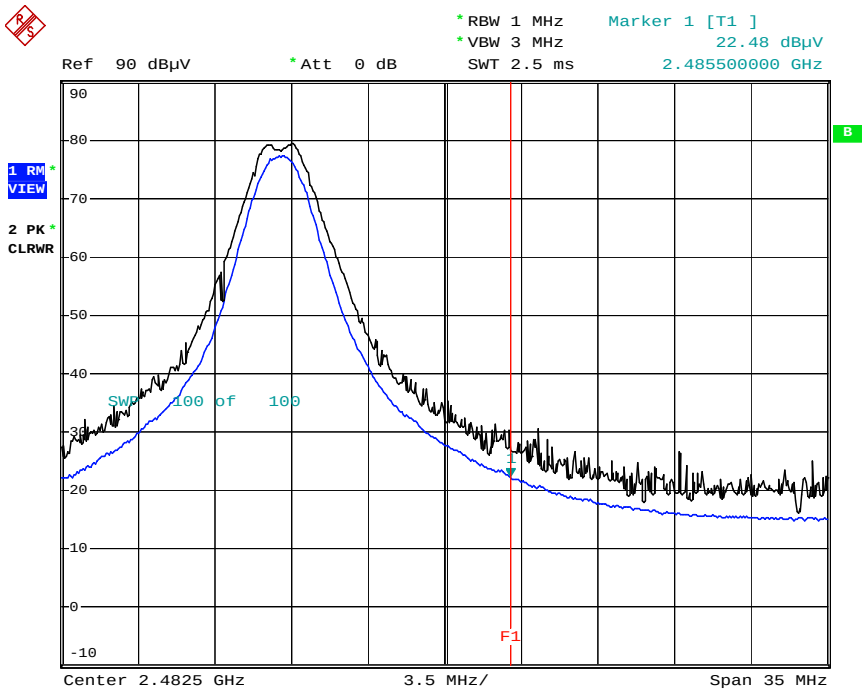
Date: 17.JUN.2016 03:41:21

Radiated Restricted Band Edges plot – Marker-Delta Method(Delta) – (Ch 25)



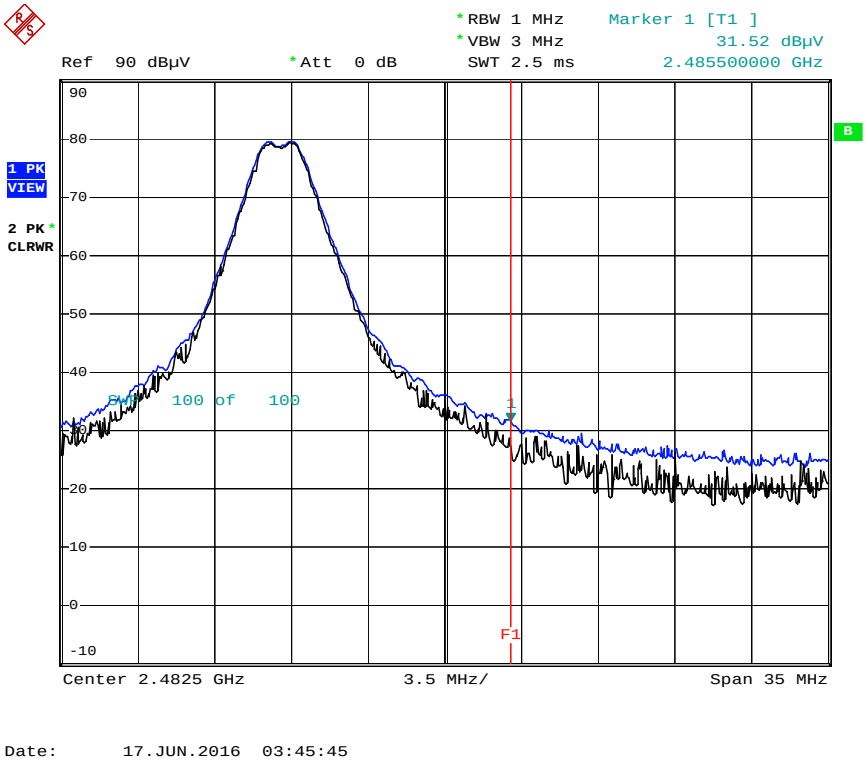
Date: 17.JUN.2016 03:43:44

Radiated Restricted Band Edges plot – Average Reading (Ch 25)



Date: 17.JUN.2016 03:44:55

Radiated Restricted Band Edges plot – Peak Reading (Ch 25)



Note : Only the worst case plots for Radiated Restricted Band Edges.

8.8 POWERLINE CONDUCTED EMISSIONS

Test Requirements and limit, §15.207

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.
5. We are performed the AC Power Line Conducted Emission test for Ch.1 on Zigbee mode. Because Ch.1 on Zigbee mode is worst case.

▣ RESULT PLOTS

Conducted Emissions (Line 1)

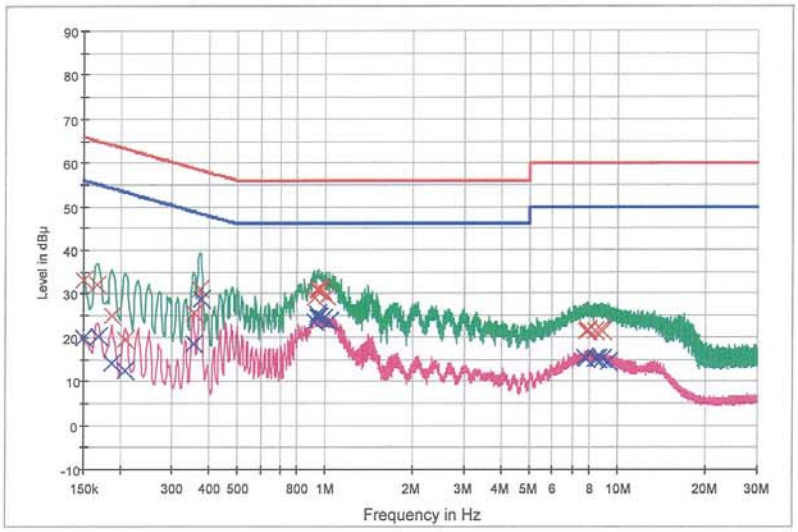
L1 1 / 2

HCT TEST Report

Common Information

EUT:	LG-ISC61G-ZB
Manufacturer:	LG
Test Site:	SHIELD ROOM
Operating Conditions:	ZIGBEE MODE

FCC CLASS B



Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	33.2	9.000	Off	L1	9.7	32.8	66.0
0.166000	32.3	9.000	Off	L1	9.6	32.9	65.2
0.188000	25.1	9.000	Off	L1	9.6	39.0	64.1
0.208000	19.7	9.000	Off	L1	9.6	43.6	63.3
0.356000	25.7	9.000	Off	L1	9.6	33.1	58.8
0.374000	31.1	9.000	Off	L1	9.6	27.3	58.4
0.914000	29.2	9.000	Off	L1	9.7	26.8	56.0
0.938000	30.7	9.000	Off	L1	9.7	25.3	56.0
0.946000	31.3	9.000	Off	L1	9.7	24.7	56.0
0.952000	30.9	9.000	Off	L1	9.7	25.1	56.0
0.970000	30.7	9.000	Off	L1	9.7	25.3	56.0
1.012000	29.6	9.000	Off	L1	9.7	26.4	56.0
7.822000	21.7	9.000	Off	L1	10.0	38.3	60.0
7.862000	21.7	9.000	Off	L1	10.0	38.3	60.0
7.882000	21.9	9.000	Off	L1	10.0	38.1	60.0
8.344000	21.6	9.000	Off	L1	10.0	38.4	60.0
8.760000	21.9	9.000	Off	L1	10.0	38.1	60.0
8.882000	21.7	9.000	Off	L1	10.0	38.3	60.0

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Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	20.0	9.000	Off	L1	9.7	36.0	56.0
0.168000	20.3	9.000	Off	L1	9.6	34.7	55.1
0.188000	14.3	9.000	Off	L1	9.6	39.9	54.1
0.208000	12.5	9.000	Off	L1	9.6	40.7	53.3
0.356000	18.6	9.000	Off	L1	9.6	30.2	48.8
0.376000	28.8	9.000	Off	L1	9.7	19.5	48.4
0.914000	23.6	9.000	Off	L1	9.7	22.4	46.0
0.940000	24.9	9.000	Off	L1	9.7	21.1	46.0
0.946000	25.4	9.000	Off	L1	9.7	20.6	46.0
0.954000	24.7	9.000	Off	L1	9.7	21.3	46.0
0.988000	24.2	9.000	Off	L1	9.7	21.8	46.0
1.036000	23.7	9.000	Off	L1	9.7	22.3	46.0
7.730000	15.3	9.000	Off	L1	10.0	34.7	50.0
7.822000	15.3	9.000	Off	L1	10.0	34.7	50.0
8.386000	15.2	9.000	Off	L1	10.0	34.8	50.0
8.590000	15.3	9.000	Off	L1	10.0	34.7	50.0
8.882000	15.1	9.000	Off	L1	10.0	34.9	50.0
9.312000	14.6	9.000	Off	L1	10.0	35.4	50.0

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Conducted Emissions (Line 2)

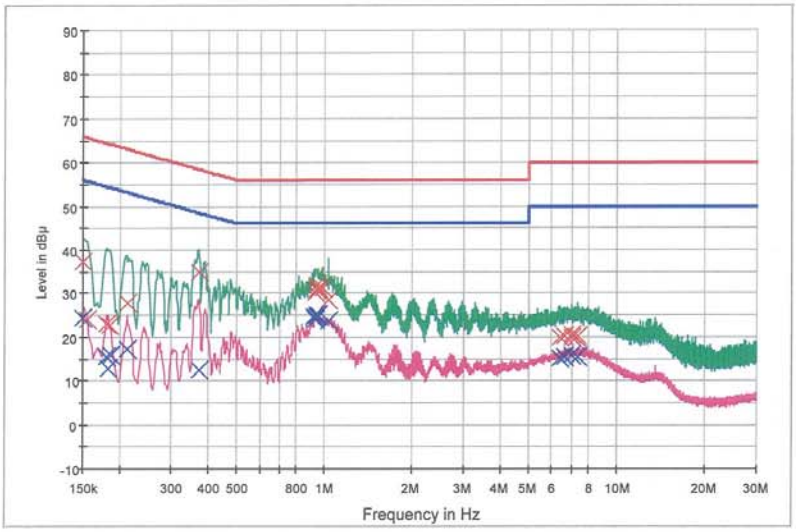
N 1 / 2

HCT TEST Report

Common Information

EUT:	LG-ISC61G-ZB
Manufacturer:	LG
Test Site:	SHIELD ROOM
Operating Conditions:	ZIGBEE MODE

FCC CLASS B



Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	37.3	9.000	Off	N	9.6	28.7	66.0
0.156000	24.0	9.000	Off	N	9.6	41.7	65.7
0.180000	22.8	9.000	Off	N	9.6	41.7	64.5
0.186000	22.6	9.000	Off	N	9.6	41.7	64.2
0.212000	27.6	9.000	Off	N	9.6	35.5	63.1
0.372000	34.8	9.000	Off	N	9.6	23.7	58.5
0.926000	30.1	9.000	Off	N	9.7	25.9	56.0
0.936000	31.9	9.000	Off	N	9.7	24.1	56.0
0.946000	30.7	9.000	Off	N	9.7	25.3	56.0
0.950000	31.0	9.000	Off	N	9.7	25.0	56.0
0.982000	31.0	9.000	Off	N	9.7	25.0	56.0
1.032000	28.6	9.000	Off	N	9.7	27.4	56.0
6.394000	19.9	9.000	Off	N	9.9	40.1	60.0
6.652000	20.3	9.000	Off	N	9.9	39.7	60.0
6.998000	20.5	9.000	Off	N	9.9	39.5	60.0
7.044000	19.8	9.000	Off	N	9.9	40.2	60.0
7.320000	20.0	9.000	Off	N	9.9	40.0	60.0
7.338000	20.1	9.000	Off	N	9.9	39.9	60.0

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Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	24.5	9.000	Off	N	9.6	31.5	56.0
0.180000	15.4	9.000	Off	N	9.6	39.1	54.5
0.184000	12.8	9.000	Off	N	9.6	41.5	54.3
0.188000	15.8	9.000	Off	N	9.6	38.3	54.1
0.212000	17.1	9.000	Off	N	9.6	36.0	53.1
0.372000	12.5	9.000	Off	N	9.6	35.9	48.5
0.924000	24.5	9.000	Off	N	9.7	21.5	46.0
0.928000	24.0	9.000	Off	N	9.7	22.0	46.0
0.938000	24.9	9.000	Off	N	9.7	21.1	46.0
0.944000	24.8	9.000	Off	N	9.7	21.2	46.0
0.950000	25.2	9.000	Off	N	9.7	20.8	46.0
1.032000	23.5	9.000	Off	N	9.7	22.5	46.0
6.394000	15.1	9.000	Off	N	9.9	34.9	50.0
6.652000	15.5	9.000	Off	N	9.9	34.5	50.0
6.998000	15.9	9.000	Off	N	9.9	34.1	50.0
7.014000	15.9	9.000	Off	N	9.9	34.1	50.0
7.044000	15.8	9.000	Off	N	9.9	34.2	50.0
7.338000	15.4	9.000	Off	N	9.9	34.6	50.0

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9 LIST OF TEST EQUIPMENT

9.1 LIST OF TEST EQUIPMENT(Conducted Test)

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	12/28/2015	Annual	100073
Rohde & Schwarz	ESCI / Test Receiver	12/28/2015	Annual	100584
Agilent	N9020A / Signal Analyzer	06/30/2015	Annual	MY51110085
Agilent	N9030A / Signal Analyzer	11/24/2015	Annual	MY49431210
Agilent	N1911A / Power Meter	03/11/2016	Annual	MY45100523
Agilent	N1921A / Power Sensor	03/11/2016	Annual	MY52260025
Agilent	87300B / Directional Coupler	11/30/2015	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	06/14/2016	Annual	05001
Hewlett Packard	E3632A / DC Power Supply	03/09/2016	Annual	KR75303962
Agilent	8493C / Attenuator(10 dB)	07/21/2015	Annual	07560

9.2 LIST OF TEST EQUIPMENT(Radiated Test)

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Innco system	MA4000-EP / Antenna Position Tower	N/A	N/A	N/A
Innco system	CT0800 / Turn Table	N/A	N/A	N/A
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
ETS	2090 / Controller(Turn table)	N/A	N/A	1646
Rohde & Schwarz	Loop Antenna	02/23/2016	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	04/15/2015	Biennial	255
Schwarzbeck	BBHA 9120D / Horn Antenna	08/26/2014	Biennial	9120D-1300
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	09/03/2015	Biennial	BBHA9170541
Rohde & Schwarz	FSP / Spectrum Analyzer	10/05/2015	Annual	836650/016
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	09/23/2015	Annual	101068-SZ
Wainwright Instruments	WHKX10-2700-3000-18000-40SS / High Pass Filter	08/20/2015	Annual	4
Wainwright Instruments	WHKX8-6090-7000-18000-40SS / High Pass Filter	08/03/2015	Annual	5
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	07/06/2015	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	01/26/2016	Annual	2
H.P.	8491A / Attenuator(10 dB)	08/11/2015	Annual	18593
CERNEX	CBLU1183540 / Power Amplifier	02/01/2016	Annual	24614
CERNEX	CBL06185030 / Power Amplifier	02/01/2016	Annual	24615
CERNEX	CBL18265035 / Power Amplifier	07/27/2015	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	07/09/2015	Annual	25956