



PCTEST ENGINEERING LABORATORY, INC.

7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6554
http://www.pctestlab.com



MEASUREMENT REPORT FCC PART 15.247 WPAN 802.15.4 Zigbee

Applicant Name:
Samsung Electronics, Co. Ltd.
416 Maetan 3-Dong, Yeongtong-gu
Suwon-si, Gyeonggi-do
443-742, Republic of Korea

Date of Testing:
April 23-26, 2012
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0Y1204200530.A3L

FCC ID:	A3LEBCS10RBE
APPLICANT:	Samsung Electronics, Co. Ltd.

Application Type: Certification
Model(s): EBC-S10RBE
EUT Type: Wireless Charging Cover Module
Max. RF Output Power: 0.376 mW (-4.25 dBm) Peak Conducted
Frequency Range: 2405 - 2470 MHz
FCC Classification: Digital Transmission System (DTS)
FCC Rule Part(s): Part 15.247

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C-63.4-2003. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

PCTEST certifies that no party to this application has been subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.


 Randy Ortanez
 President







FCC ID: A3LEBCS10RBE		FCC Pt. 15.247 802.15.4 ZIGBEE TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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MEASUREMENT REPORT

FCC Part 15.247



§ 2.1033 General Information

APPLICANT: Samsung Electronics, Co. Ltd.

APPLICANT ADDRESS: 416 Maetan 3-Dong, Yeongtong-gu
Suwon-si, Gyeonggi-do, 443-742 , Republic of Korea

TEST SITE: PCTEST ENGINEERING LABORATORY, INC.

TEST SITE ADDRESS: 7185 Oakland Mills Road, Columbia, MD 21046 USA

FCC RULE PART(S): Part 15.247

MODEL NAME: EBC-S10RBE

FCC ID: A3LEBCS10RBE

Test Device Serial No.: N/A Production Pre-Production Engineering

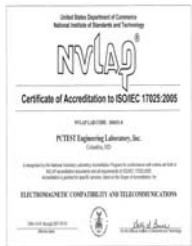
FCC CLASSIFICATION: Digital Transmission System (DTS)

DATE(S) OF TEST: April 23-26, 2012



TEST REPORT S/N: 0Y1204200530.A3L

Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21045, U.S.A.



- PCTEST facility is an FCC registered (PCTEST Reg. No. 90864) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC.
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

1.2 PCTEST Test Location

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity, the Baltimore-Washington Intern't'l (BWI) airport, the city of Baltimore and the Washington, DC area. (See Figure 1-1).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The site coordinates are 39° 10'23" N latitude and 76° 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2003 on February 15, 2012.

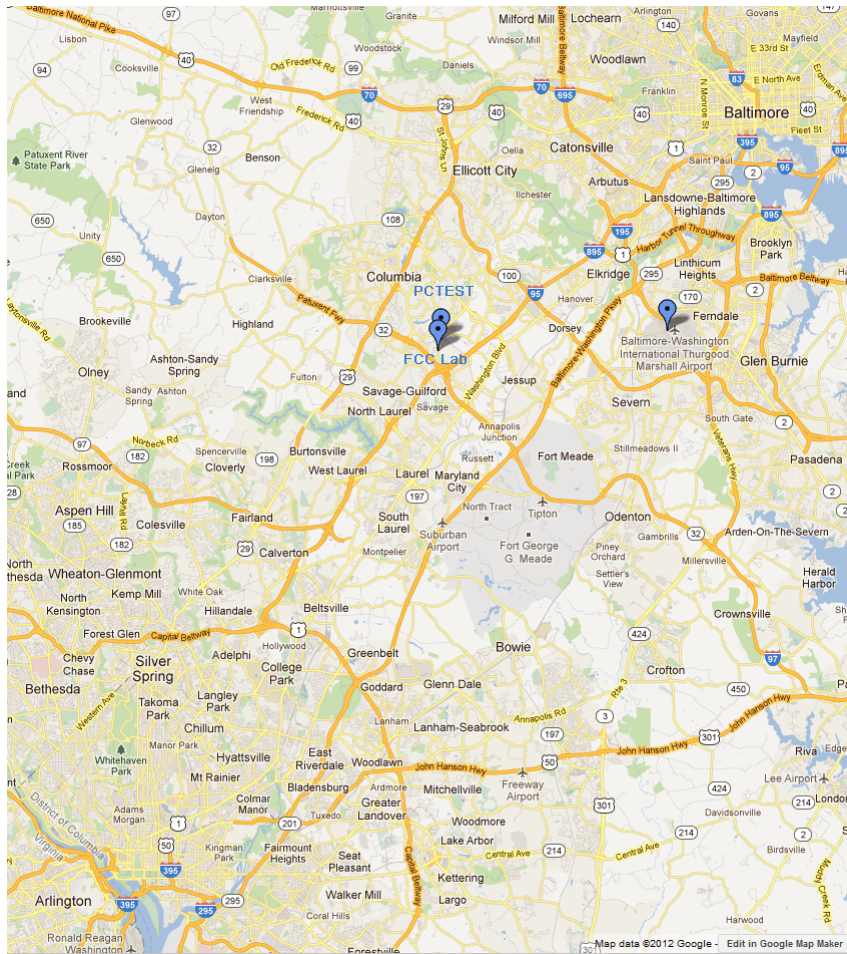


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Wireless Charging Cover Module (WCC) FCC ID: A3LEBCS10RBE**. The data included in this report pertains to the Zigbee operations of the Wireless Charging Cover Module. The EUT was tested stand-alone while set to transmit at maximum power and maximum duty cycle. Radiated and conducted emissions were investigated with and without the wireless charging pad (FCC ID: A3LEADS10EBE) and handset (Model: SCH-I535). It is determined that the worst case emissions were produced with the WCC in the stand-alone setup.

The Wireless Charging Cover Zigbee Module is designed to be used with battery covers for various Samsung phones. This module supports Zigbee communications that will be part of a wireless charging system when it is integrated with a cover that is designed to fit the particular handset. For each handset that is to be fitted with a battery cover that utilizes this Zigbee module, the appropriate testing and Class II Permissive Change will be filed.

2.2 EUT Capabilities

Zigbee

2.3 EMI Suppression Device(s)/Modifications



No EMI suppression device(s) were added and/or no modifications were made during testing.

2.4 Labeling Requirements

Per 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the trade name and FCC ID must be displayed on the device per Section 15.19(b)(2).

Please see attachment for FCC ID label and label location.

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3.0 DESCRIPTION OF TEST

3.1 Evaluation Procedure

The measurement procedure described in the *American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz* (ANSI C63.4-2003) and the guidance provided in KDB 558074 were used in the measurement of the **Samsung Wireless Charging Cover Module FCC ID: A3LEBCS10RBE**.



Deviation from measurement procedure.....None

3.2 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. An ETS Lindgren Model 2188 raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. A 78cm high PVC support structure is placed on top of the turntable. A ¾" (~1.9cm) sheet of high density polyethylene is used as the table top and is placed on top of the PVC supports to bring the total height of the table to 80cm.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 0.8 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by varying: the mode of operation or resolution, clock or data rate, scrolling H pattern to the EUT and/or support equipment, and changing the polarity of the receive antenna, whichever produced the worst-case emissions. To record the final measurements, the analyzer detector function was set to CISPR quasi-peak mode and the bandwidth of the spectrum analyzer was set to 120kHz for frequencies below 1GHz or 1MHz for frequencies above 1GHz. For average measurements above 1GHz, the analyzer was set to peak detector with a reduced VBW setting (RBW = 1MHz, VBW = 10Hz).

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4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

“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 antenna(s) of the Wireless Charging Cover Module are **permanently attached**.
- There are no provisions for connection to an external antenna for the Zigbee module.

Conclusion:

The **Samsung Wireless Charging Cover Module FCC ID: A3LEBCS10RBE** unit complies with the requirement of §15.203.

Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
11	2405	19	2445
12	2410	20	2450
13	2415	21	2455
14	2420	22	2460
15	2425	23	2465
16	2430	24	2470
17	2435		
18	2440		

Table 4-1. Frequency / Channel Operations



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5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	6/7/2011	Annual	6/7/2012	N/A
-	WL25-1	WLAN Cable Set (25GHz)	2/13/2012	Annual	2/13/2013	N/A
-	RE2	Radiated Emissions Cable Set (VHF/UHF)	2/13/2012	Annual	2/13/2013	N/A
-	40G-1R	40GHz Radiated Cable Set	2/23/2012	Annual	2/23/2013	N/A
-	WL40-1	WLAN Cable Set (40GHz)	2/24/2012	Annual	2/24/2013	N/A
Agilent	8447D	Broadband Amplifier	5/17/2011	Annual	5/17/2012	2443A01900
Agilent	8449B	(1-26.5GHz) Pre-Amplifier	2/15/2012	Annual	2/15/2013	3008A00985
Agilent	E4448A	PSA (3Hz-50GHz) Spectrum Analyzer	2/15/2012	Annual	2/15/2013	US42510244
Agilent	E8257D	(250kHz-20GHz) Signal Generator	5/8/2011	Annual	5/8/2012	MY45470194
Agilent	N9020A	MXA Signal Analyzer	10/10/2011	Annual	10/10/2012	US46470561
Anritsu	MA2411B	Power Sensor	3/5/2012	Annual	3/5/2013	846215
Anritsu	ML2495A	Power Meter	10/13/2011	Annual	10/13/2012	1039008
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	7/22/2011	Annual	7/22/2012	125518
ETS Lindgren	3160-09	18-26.5 GHz Standard Gain Horn	5/31/2011	Annual	5/31/2012	135427
Mini-Circuits	VHF-3100+	High Pass Filter	2/7/2012	Annual	2/7/2013	31144
Mini-Circuits	VHF-8400+	3.4GHz - 9.9GHz High Pass Filter	2/28/2012	Annual	2/28/2013	31048
Rohde & Schwarz	RS-PR18	1-18 GHz Pre-Amplifier	6/9/2011	Annual	6/9/2012	100071
Rohde & Schwarz	RS-PR26	18-26.5 GHz Pre-Amplifier	6/9/2011	Annual	6/9/2012	100040
Rohde & Schwarz	ESU26	EMI Test Receiver	4/27/2011	Annual	4/27/2012	100342
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	1/26/2012	Biennial	1/26/2014	A051107

Table 5-1. Annual Test Equipment Calibration Schedule

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6.0 TEST RESULTS

6.1 Summary



Company Name: Samsung Electronics, Co. Ltd.
 FCC ID: A3LEBCS10RBE
 FCC Classification: Digital Transmission System (DTS)

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
TRANSMITTER MODE (TX)					
15.247(a)(2)	6dB Bandwidth	> 500kHz	CONDUCTED	PASS	Section 6.2
15.247(b)(3)	Transmitter Output Power	< 1 Watt		PASS	Sections 6.3
15.247(e)	Transmitter Power Spectral Density	< 8dBm / 3kHz Band		PASS	Section 6.4
15.247(d)	Band Edge / Out-of-Band Emissions	Conducted < 20dBc		PASS	Sections 6.5, 6.6
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-210 table 3 limits)	RADIATED	PASS	Sections 6.7, 6.8

Table 6-1. Summary of Test Results

Notes:

- 1) The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

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6.2 6dB Bandwidth Measurement

§15.247(a)(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.**

Frequency [MHz]	Channel No.	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
2405	11	1.250	0.500	Pass
2425	15	1.330	0.500	Pass
2450	20	1.254	0.500	Pass
2470	24	1.302	0.500	Pass

Table 6-2. Conducted Bandwidth Measurements

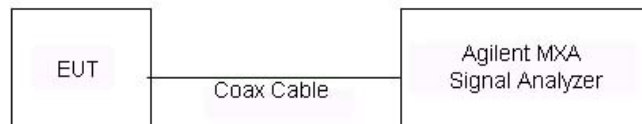


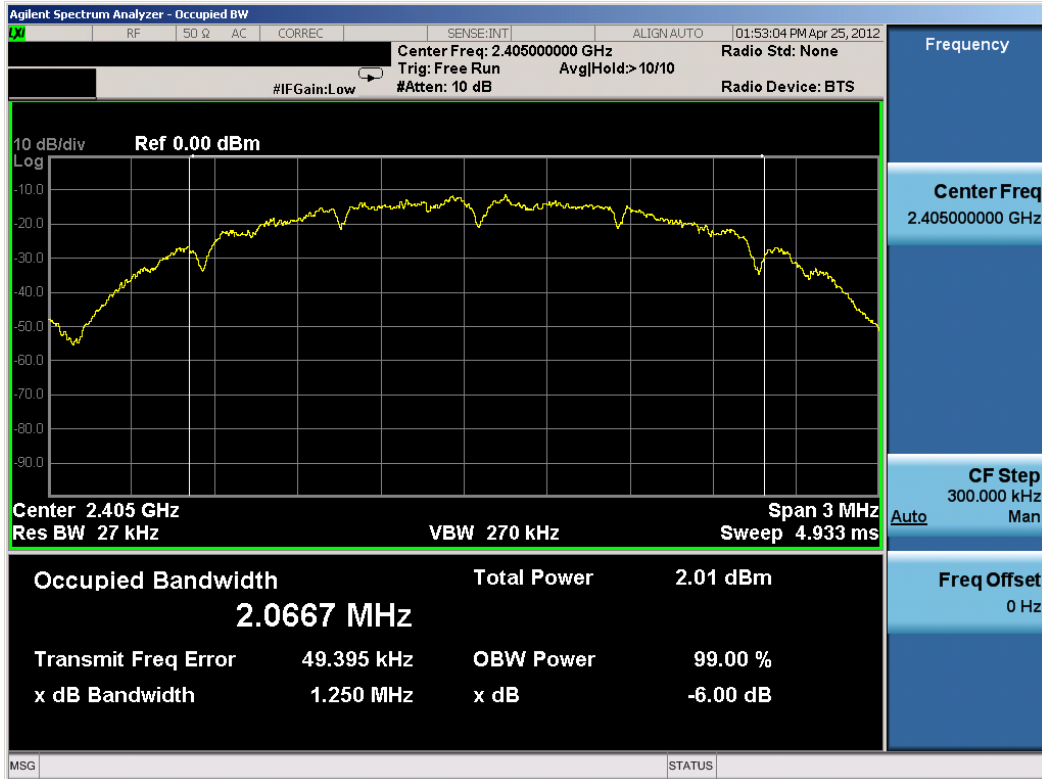


Figure 6-1. Test Instrument & Measurement Setup

FCC ID: A3LEBCS10RBE		FCC Pt. 15.247 802.15.4 ZIGBEE TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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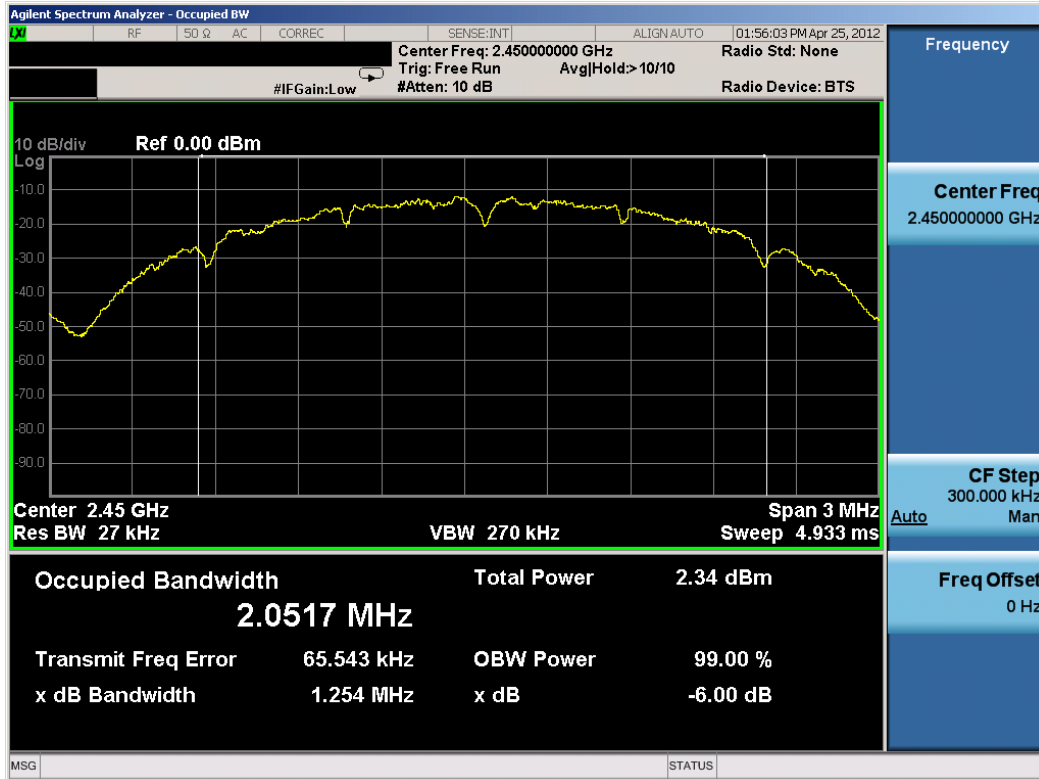


Plot 6-1. 6dB Bandwidth Plot (802.15.4 – Ch. 11)



Plot 6-2. 6dB Bandwidth Plot (802.15.4 – Ch. 15)

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Plot 6-3. 6dB Bandwidth Plot (802.15.4 – Ch. 20)



Plot 6-4. 6dB Bandwidth Plot (802.15.4 – Ch. 24)

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6.3 Output Power Measurement

§15.247(b)(3)

A transmitter antenna terminal of EUT is connected to the input of a spectrum analyzer. Measurement on the spectrum analyzer is made using Peak Detector, Span = 0Hz, Sweep Time = Auto, RBW = 3MHz, and VBW = 50MHz while the EUT is operating in transmission mode at the appropriate frequencies. The trace was set to max hold until the trace has fully stabilized. Peak Search function was utilized to set the marker at the maximum. The correction table loaded into the analyzer accounts for all insertion loss for this setup. **The maximum permissible conducted output power is 1 Watt.**

Freq [MHz]	Channel	Measured Peak Power [dBm]
2405	11	-4.32
2425	15	-4.25
2450	20	-4.72
2470	24	-5.21

Table 6-3. Conducted Output Power Measurements

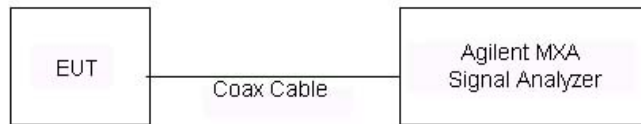




Figure 6-2. Test Instrument & Measurement Setup

FCC ID: A3LEBCS10RBE		FCC Pt. 15.247 802.15.4 ZIGBEE TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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6.4 Power Spectral Density

§15.247(e)

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. **The maximum permissible power spectral density is 8 dBm in any 3 kHz band.**

Per the guidance on power spectral density measurements given in KDB 558074, the spectrum is measured with a 100kHz bandwidth using a peak detector. The measured spectrum is compared to the 8dBm/3kHz limit given in 15.247(e) by applying a bandwidth correction factor equal to $10\log(3\text{kHz}/100\text{kHz}) = -15.23\text{dB}$.

Frequency [MHz]	Channel No.	Measured Power Spectral Density [dBm]	Bandwidth Correction Factor [dB]	Corrected Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]
2405	11	-6.81	-15.23	-22.04	8.0	-30.04
2425	15	-6.87	-15.23	-22.10	8.0	-30.10
2450	20	-8.22	-15.23	-23.45	8.0	-31.45
2470	24	-8.27	-15.23	-23.50	8.0	-31.50

Table 6-4. Conducted Power Density Measurements

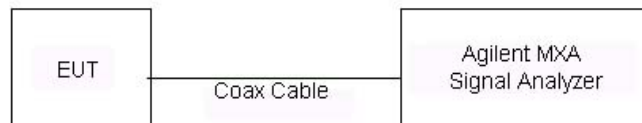


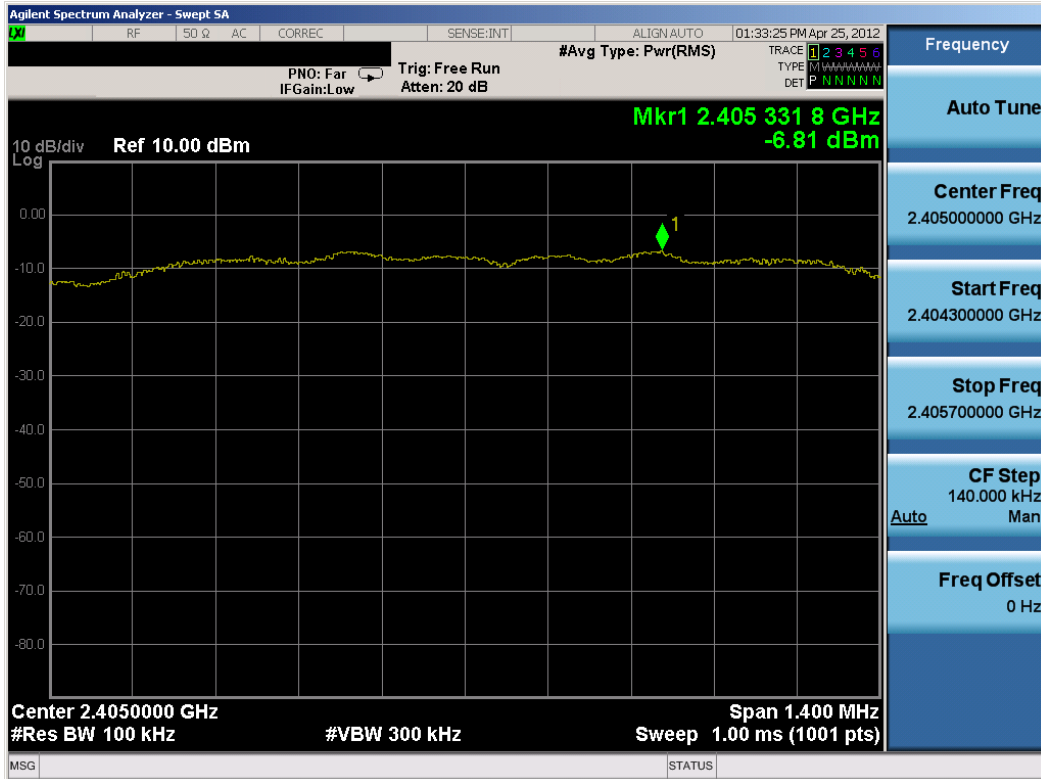
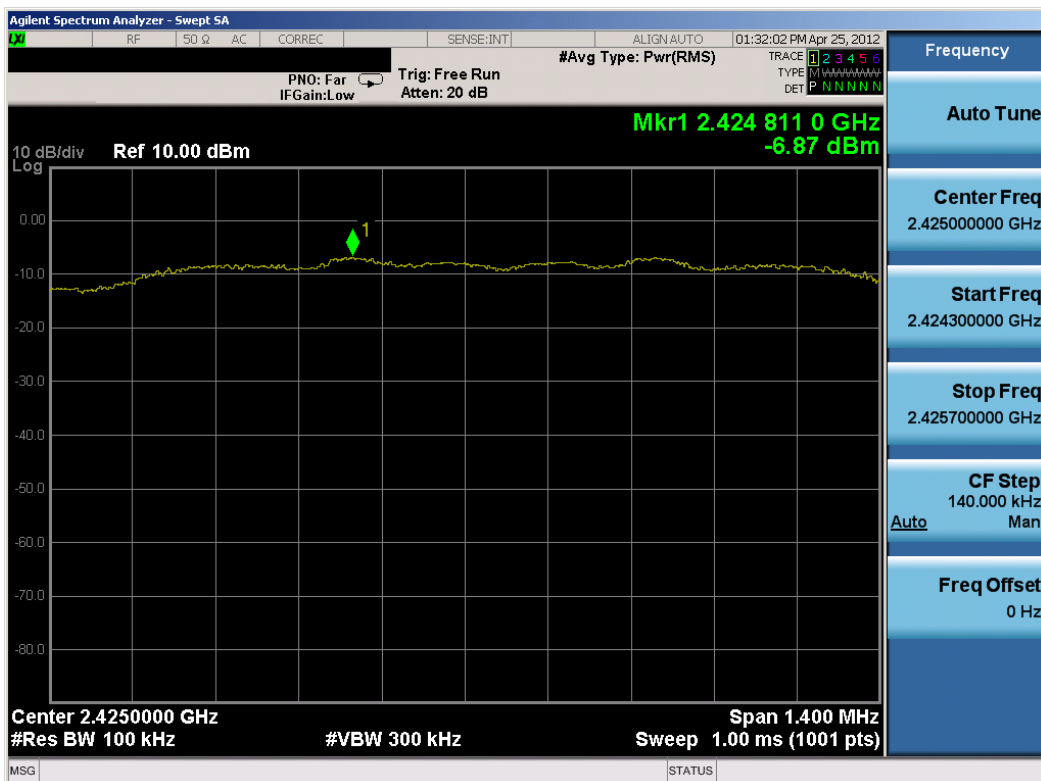


Figure 6-3. Test Instrument & Measurement Setup

FCC ID: A3LEBCS10RBE		FCC Pt. 15.247 802.15.4 ZIGBEE TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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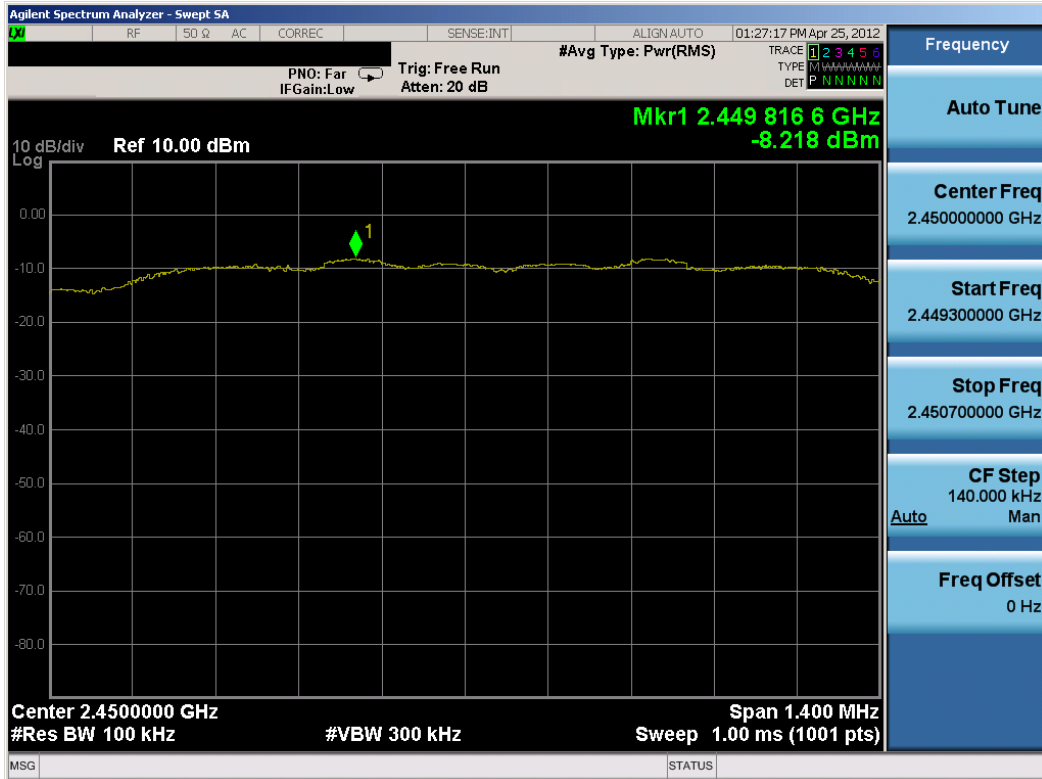


Plot 6-5. Power Spectral Density Plot (802.15.4 – Ch. 11)

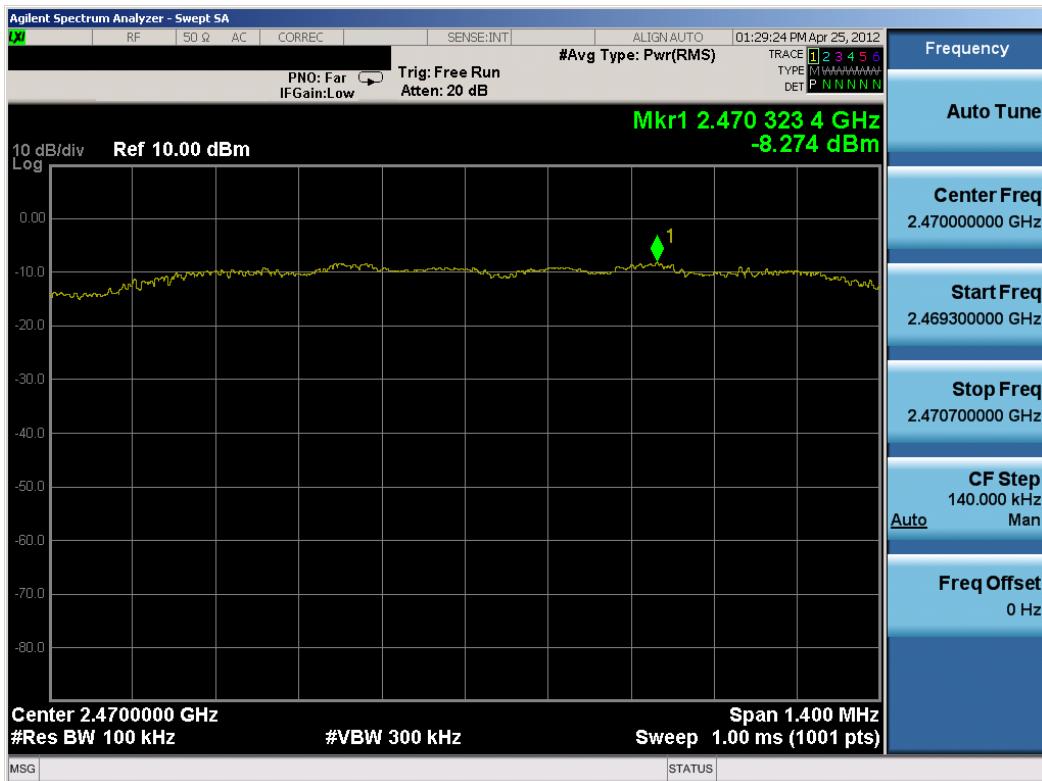


Plot 6-6. Power Spectral Density Plot (802.15.4 – Ch. 15)

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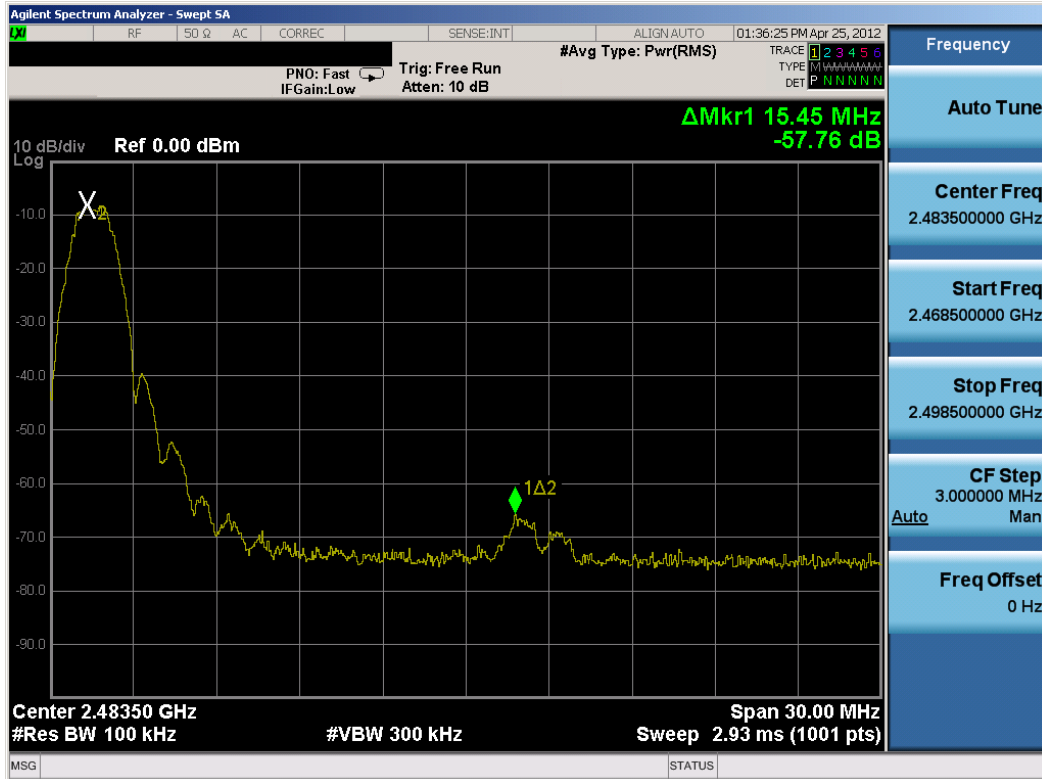


Plot 6-7. Power Spectral Density Plot (802.15.4 – Ch. 20)



Plot 6-8. Power Spectral Density Plot (802.15.4 – Ch. 24)

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Plot 6-10. Band Edge Plot (802.15.4 – Ch. 24)

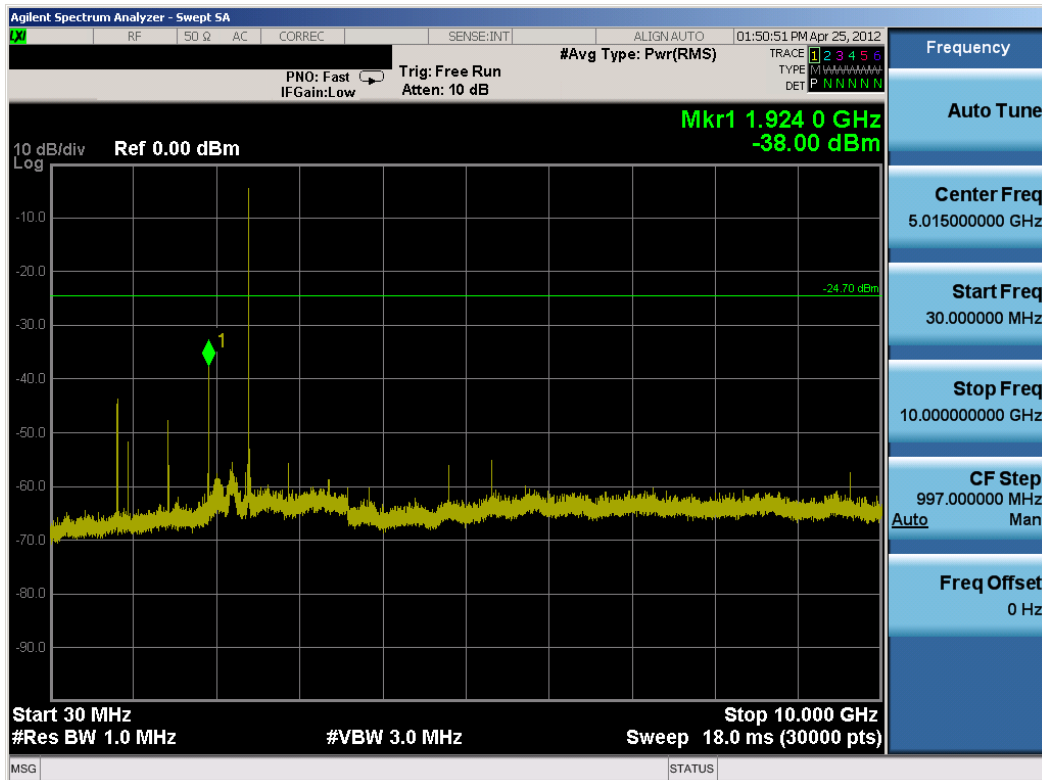
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6.6 Conducted Spurious Emissions

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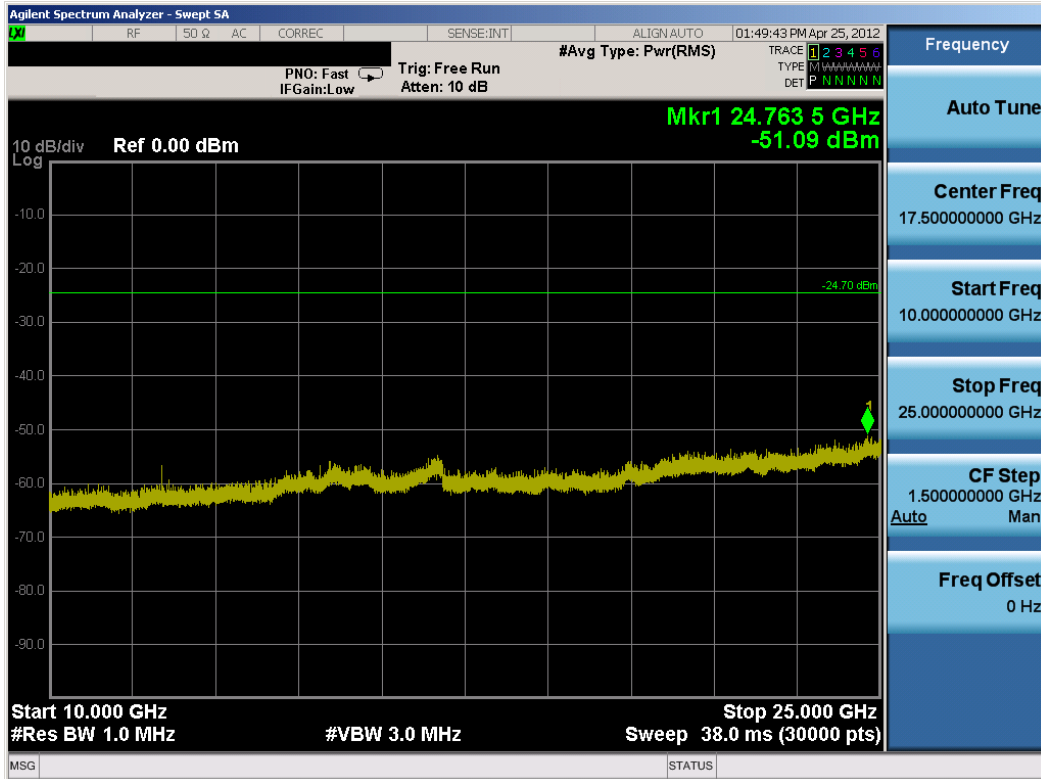
For the following out of band conducted spurious emissions plots, the EUT was set to transmit at maximum power and duty cycle. For plots showing conducted spurious emissions near the limit, the frequencies were investigated with a reduced RBW to ensure that no emissions were present.

The display line shown in the following plots denotes the limit at 20dB below the fundamental emission level measured in a 100kHz bandwidth. However, since the traces in the following plots are measured with a 1MHz RBW, the display line may not necessarily appear to be 20dB below the level of the fundamental in a 1MHz bandwidth.

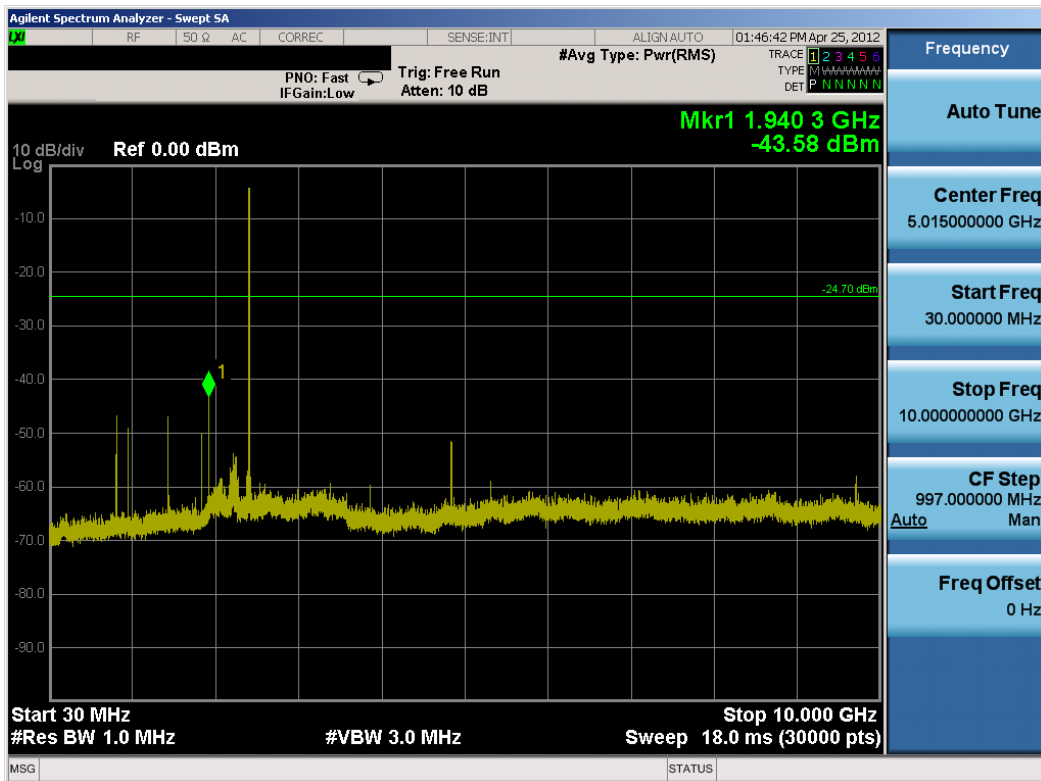


Plot 6-11. Conducted Spurious Plot (802.15.4 – Ch. 11)

FCC ID: A3LEBCS10RBE		FCC Pt. 15.247 802.15.4 ZIGBEE TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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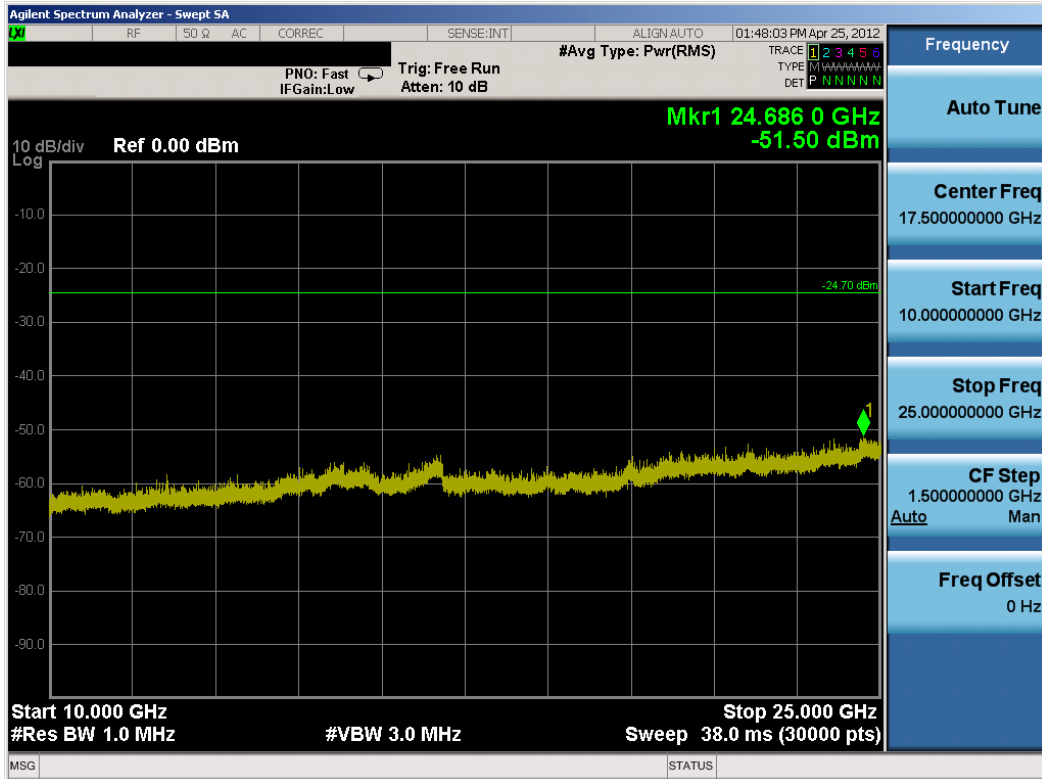


Plot 6-12. Conducted Spurious Plot (802.15.4 – Ch. 11)

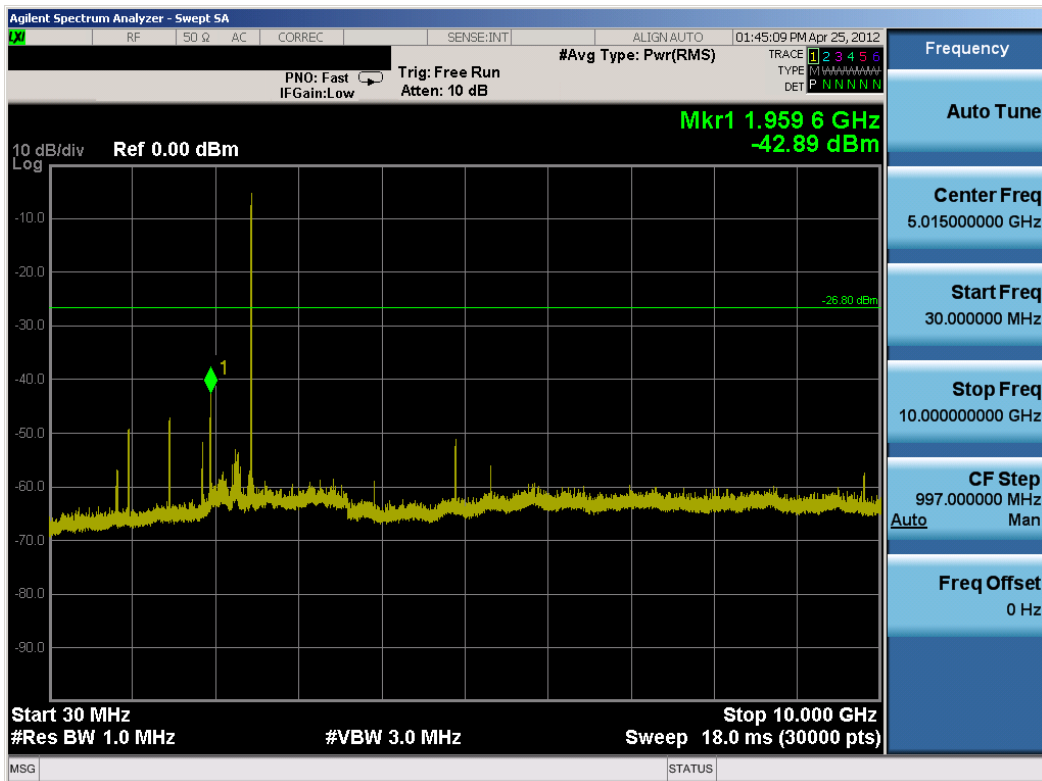


Plot 6-13. Conducted Spurious Plot (802.15.4 – Ch. 15)

FCC ID: A3LEBCS10RBE		FCC Pt. 15.247 802.15.4 ZIGBEE TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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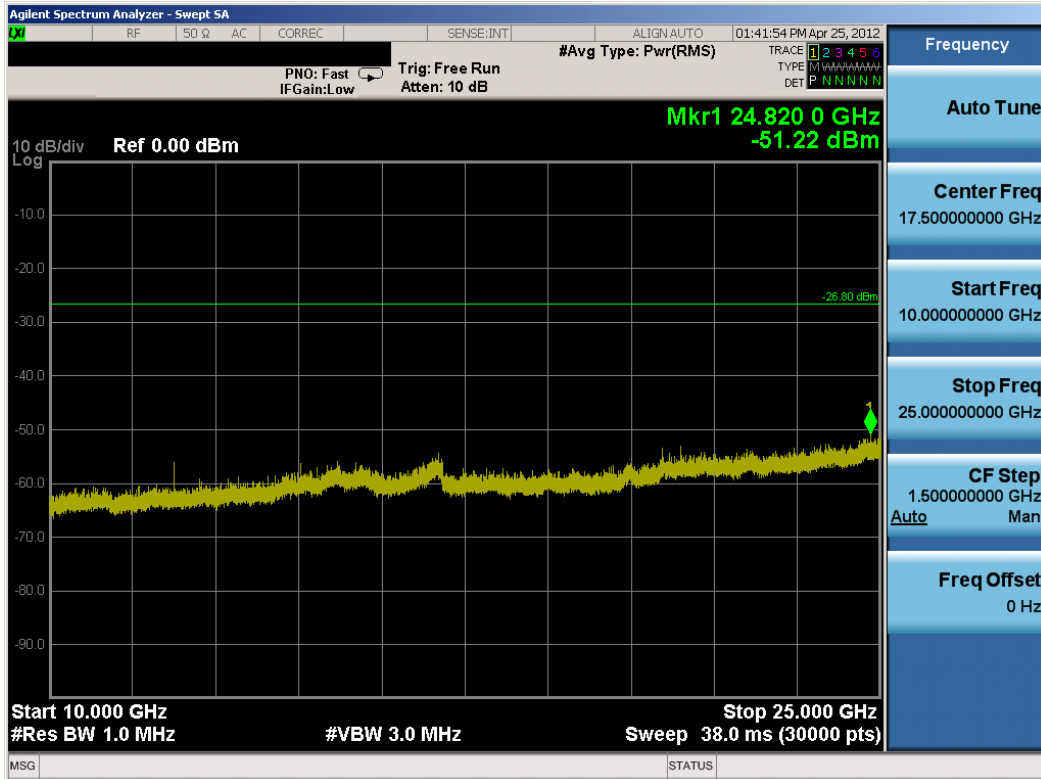


Plot 6-14. Conducted Spurious Plot (802.15.4 – Ch. 15)

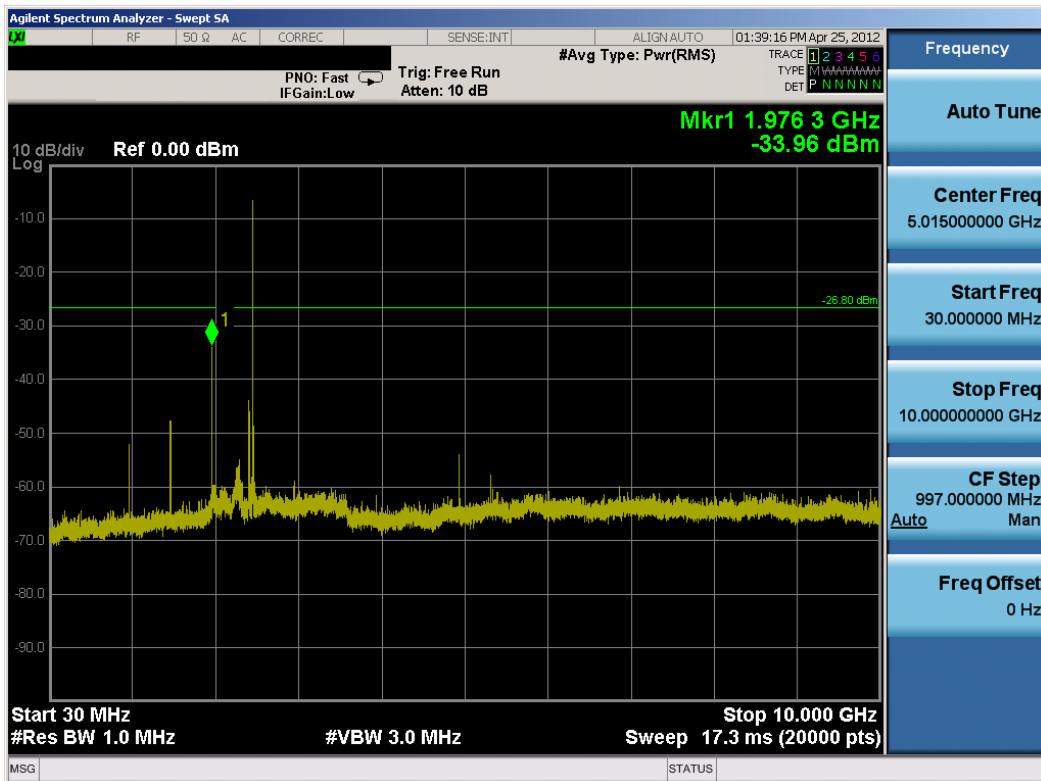


Plot 6-15. Conducted Spurious Plot (802.15.4 – Ch. 20)

FCC ID: A3LEBCS10RBE		FCC Pt. 15.247 802.15.4 ZIGBEE TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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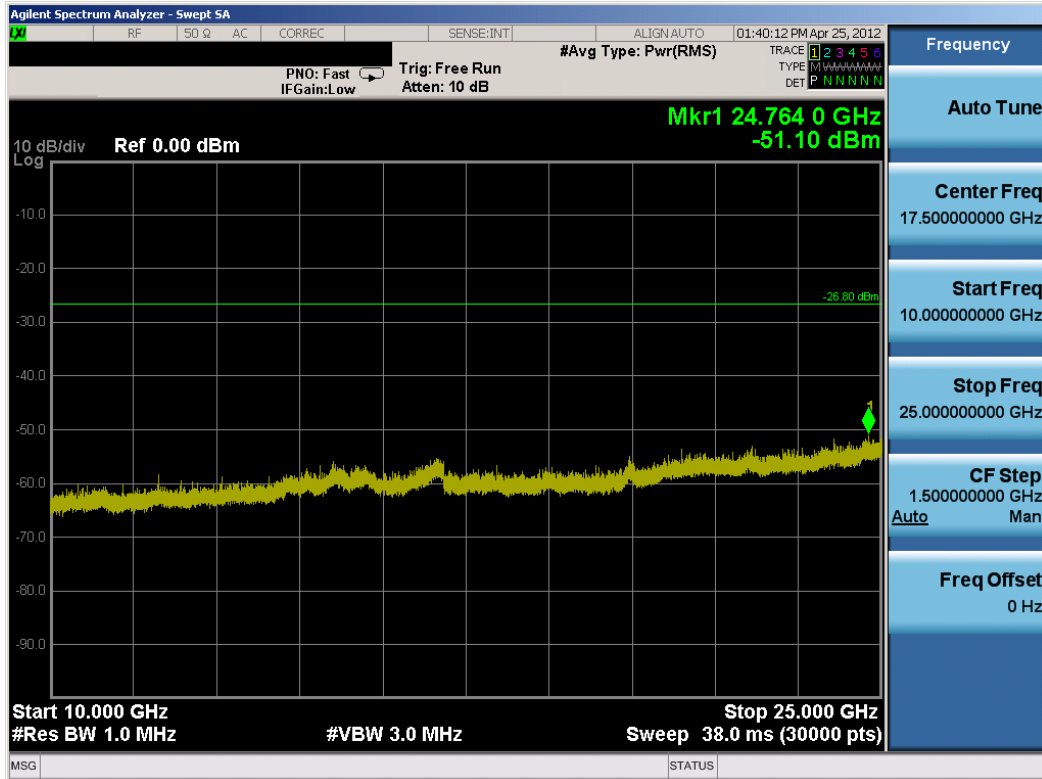


Plot 6-16. Conducted Spurious Plot (802.15.4 – Ch. 20)



Plot 6-17. Conducted Spurious Plot (802.15.4 – Ch. 24)

FCC ID: A3LEBCS10RBE	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 802.15.4 ZIGBEE TEST REPORT (CERTIFICATION)	SAMSUNG	Reviewed by: Quality Manager
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Plot 6-18. Conducted Spurious Plot (802.15.4 – Ch. 24)

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6.7 Radiated Spurious Emission Measurements

§15.247(d) / §15.205

The EUT was tested from 9kHz up to the tenth harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas. All out of band emissions appearing in a restricted band must not exceed the limits as specified in Section 15.205 of the Title 47 CFR.

Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section. The optional test procedures for antenna port conducted measurements of unwanted emissions per the guidance of KDB 558074 were not used to evaluate this device.

Note: Radiated Emissions were checked between 1940MHz and 1980MHz but no significant emissions were found.

Frequency	Field Strength [μ V/m]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3



Table 6-5. Radiated Limits

Sample Calculation

- Field Strength Level $_{[dB, \mu V/m]} = \text{Analyzer Level }_{[dBm]} + 107 + \text{AFCL }_{[dB]}$

Notes:

- AFCL = Antenna Factor $_{[dB]} + \text{Cable Loss }_{[dB]}$

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Radiated Spurious Emission Measurements (Cont'd)

§15.247(d) / §15.205



Distance of Measurements: 3 Meters
 Operating Frequency: 2405MHz
 Channel: 11

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Field Strength [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
4810.00	-96.80	Avg	H	39.04	49.24	53.98	-4.74
4810.00	-93.70	Peak	H	39.04	52.34	73.98	-21.64
7215.00	-135.00	Avg	H	42.12	14.12	53.98	-39.86
7215.00	-125.00	Peak	H	42.12	24.12	73.98	-49.86
9620.00	-135.00	Avg	H	44.69	16.69	53.98	-37.29
9620.00	-125.00	Peak	H	44.69	26.69	73.98	-47.29
12025.00	-135.00	Avg	H	50.08	22.08	53.98	-31.90
12025.00	-125.00	Peak	H	50.08	32.08	73.98	-41.90

Table 6-6. Radiated Measurements @ 3 meters

NOTES:

- All emissions shown lie in the restricted bands specified in §15.205 and RSS-210 section 2.7, Table 1 and are below the limit shown in Table 6-5.
- Average Measurements > 1GHz using RBW = 1MHz VBW = 10Hz. Peak measurements above 1 GHz utilized RBW=1MHz, VBW=3MHz.
- The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
- The EUT is supplied with nominal AC voltage.
- The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.
- Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.
- Above 960MHz the limit is 500 μ V/m (54dB μ /m) at 3 meters radiated.

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Radiated Spurious Emission Measurements (Cont'd)

§15.247(d) / §15.205

Distance of Measurements: 3 Meters

Operating Frequency: 2425MHz



Channel: 15

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Field Strength [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
4850.00	-102.73	Avg	H	39.09	43.37	53.98	-10.61
4850.00	-99.83	Peak	H	39.09	46.27	73.98	-27.71
7275.00	-110.91	Avg	H	42.18	38.27	53.98	-15.71
7275.00	-107.81	Peak	H	42.18	41.37	73.98	-32.61
9700.00	-135.00	Avg	H	44.91	16.91	53.98	-37.07
9700.00	-125.00	Peak	H	44.91	26.91	73.98	-47.07
12125.00	-135.00	Avg	H	50.34	22.34	53.98	-31.64
12125.00	-125.00	Peak	H	50.34	32.34	73.98	-41.64

Table 6-7. Radiated Measurements @ 3 meters

NOTES:

- All emissions shown lie in the restricted bands specified in §15.205 and RSS-210 section 2.7, Table 1 and are below the limit shown in Table 6-5.
- Average Measurements > 1GHz using RBW = 1MHz VBW = 10Hz. Peak measurements above 1 GHz utilized RBW=1MHz, VBW=3MHz.
- The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
- The EUT is supplied with nominal AC voltage.
- The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.
- Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.
- Above 960MHz the limit is 500 μ V/m (54dB μ /m) at 3 meters radiated.

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Radiated Spurious Emission Measurements (Cont'd)

§15.247(d) / §15.205

Distance of Measurements: 3 Meters

Operating Frequency: 2450MHz



Channel: 20

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Field Strength [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
4900.00	-103.92	Avg	H	39.08	42.16	53.98	-11.82
4900.00	-101.42	Peak	H	39.08	44.66	73.98	-29.32
7350.00	-109.76	Avg	H	42.22	39.47	53.98	-14.51
7350.00	-106.86	Peak	H	42.22	42.37	73.98	-31.61
9800.00	-110.52	Avg	H	45.16	41.64	53.98	-12.34
9800.00	-107.52	Peak	H	45.16	44.64	73.98	-29.34
12250.00	-135.00	Avg	H	50.60	22.60	53.98	-31.38
12250.00	-125.00	Peak	H	50.60	32.60	73.98	-41.38

Table 6-8. Radiated Measurements @ 3 meters

NOTES:

1. All emissions shown lie in the restricted bands specified in §15.205 and RSS-210 section 2.7, Table 1 and are below the limit shown in Table 6-5.
2. Average Measurements > 1GHz using RBW = 1MHz VBW = 10Hz. Peak measurements above 1 GHz utilized RBW=1MHz, VBW=3MHz.
3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
4. The EUT is supplied with nominal AC voltage.
5. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.
6. Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.
7. Above 960MHz the limit is 500 μ V/m (54dB μ /m) at 3 meters radiated.

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Radiated Spurious Emission Measurements (Cont'd)

§15.247(d) / §15.205

Distance of Measurements: 3 Meters

Operating Frequency: 2470MHz



Channel: 24

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Field Strength [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
4940.00	-98.90	Avg	H	39.10	47.20	53.98	-6.78
4940.00	-96.20	Peak	H	39.10	49.90	73.98	-24.08
7410.00	-111.94	Avg	H	42.29	37.35	53.98	-16.63
7410.00	-108.94	Peak	H	42.29	40.35	73.98	-33.63
9880.00	-135.00	Avg	H	45.35	17.35	53.98	-36.63
9880.00	-125.00	Peak	H	45.35	27.35	73.98	-46.63
12350.00	-135.00	Avg	H	50.84	22.84	53.98	-31.14
12350.00	-125.00	Peak	H	50.84	32.84	73.98	-41.14

Table 6-9. Radiated Measurements @ 3 meters

NOTES:

- All emissions shown lie in the restricted bands specified in §15.205 and RSS-210 section 2.7, Table 1 and are below the limit shown in Table 6-5.
- Average Measurements > 1GHz using RBW = 1MHz VBW = 10Hz. Peak measurements above 1 GHz utilized RBW=1MHz, VBW=3MHz.
- The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
- The EUT is supplied with nominal AC voltage.
- The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.
- Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.
- Above 960MHz the limit is 500 μ V/m (54dB μ /m) at 3 meters radiated.

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6.8 Radiated Restricted Band Edge Measurements

§15.205 / §15.209

Distance of Measurements: 3 Meters

Operating Frequency: 2405 MHz



Channel: 11

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Field Strength [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
2382.00	-114.51	Avg	H	35.39	27.88	53.98	-26.10
2382.00	-102.37	Peak	H	35.39	40.02	73.98	-33.96
2385.10	-112.54	Avg	H	35.42	29.89	53.98	-24.09
2385.10	-98.40	Peak	H	35.42	44.03	73.98	-29.95
2387.20	-112.69	Avg	H	35.44	29.75	53.98	-24.23
2387.20	-94.92	Peak	H	35.44	47.52	73.98	-26.46

Table 6-10. Radiated Restricted Band Edge Measurements (2310 – 2390 MHz)

NOTES:

- All emissions shown lie in the restricted bands specified in §15.205 and RSS-210 section 2.7, Table 1 and are below the limit shown in Table 6-5.
- Average Measurements > 1GHz using RBW = 1MHz VBW = 10Hz. Peak measurements above 1 GHz utilized RBW=1MHz, VBW=3MHz.
- The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
- The EUT is supplied with nominal AC voltage.
- The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.
- Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.
- Above 960MHz the limit is 500 μ V/m (54dB μ /m) at 3 meters radiated.

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Radiated Restricted Band Edge Measurements (Cont'd)

§15.205 / §15.209

Distance of Measurements: 3 Meters

Operating Frequency: 2470MHz



Channel: 24

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Field Strength [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
2483.50	-114.27	Avg	H	36.39	29.12	53.98	-24.86
2483.50	-107.07	Peak	H	36.39	36.32	73.98	-37.66
2485.50	-108.37	Avg	H	36.44	35.07	53.98	-18.91
2485.50	-101.07	Peak	H	36.44	42.37	73.98	-31.61
2486.80	-111.59	Avg	H	36.53	31.94	53.98	-22.04
2486.80	-105.89	Peak	H	36.53	37.64	73.98	-36.34

Table 6-11. Radiated Restricted Band Edge Measurements (2483.5 – 2500 MHz)

NOTES:



- All emissions shown lie in the restricted bands specified in §15.205 and RSS-210 section 2.7, Table 1 and are below the limit shown in Table 6-5.
- Average Measurements > 1GHz using RBW = 1MHz VBW = 10Hz. Peak measurements above 1 GHz utilized RBW=1MHz, VBW=3MHz.
- The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
- The EUT is supplied with nominal AC voltage.
- The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.
- Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.
- Above 960MHz the limit is 500 μ V/m (54dB μ /m) at 3 meters radiated.

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7.0 RF EXPOSURE



The WCC Zigbee Module has a maximum output power of 0.376 mW (-4.25 dBm) with a peak antenna gain of 2.32 dBi. The total radiated output power is $-4.25 \text{ dBm} + 2.32 = -1.93 \text{ dBm}$ (0.64 mW).

The threshold for requiring SAR measurements at 2.4GHz operations is $= 60/f = 60/2.4 = 25\text{mW}$. Therefore the device is exempt from the SAR evaluations and complies with the RF Exposure requirements.

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8.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Samsung Wireless Charging Cover Module FCC ID: A3LEBCS10RBE** is in compliance with Part 15C of the FCC Rules.

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