

MEASUREMENT REPORT

FCC PART 15.247 / ISD RSS-247

Applicant Name:

SMC Corporation
4-2-2, Kinunodai, Tsukubamirai-shi
Ibaraki-ken, 300-2493
Japan

Date of Testing:

2/26/2021 - 3/2/2021

Test Site/Location:

PCTEST Lab. Columbia, MD, USA

Test Report Serial No.:

1M2102080008-01.AJE7

FCC ID: 2AJE7SMC-WEX05

IC ID: 21344-WEX05

APPLICANT: SMC Corporation

Application Type:

Certification

Model/HVIN:

EX600-WLXB1

Additional Model(s)/HVIN(s):

EX600-WLYB1

EUT Type:

Wireless I/O Device

Max. RF Output Power:

6.324 mW (8.01 dBm) Peak Conducted

Frequency Range:

2403 – 2481MHz

Modulation Type:

CCK/DSSS/OFDM

FCC Classification:

FCC Part 15 Spread Spectrum Transmitter (DSS)

FCC Rule Part(s):

Part 15 Subpart C (15.247)

ISED Specification:

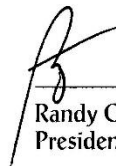
RSS-247 Issue 2

Test Procedure(s):

ANSI C63.10-2013, KDB 558074 D01 v05

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 C63.10-2013 and KDB 558074 D01 v05. 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.


Randy Ortanez
President

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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 and the Innovation, Science and Economic Development Canada.

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST facility located at 18855 Adams Court, Morgan Hill, CA 95037. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014 and KDB 414788 D01 v01.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.02 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISSED Standards (RSS).
- PCTEST facility is a registered (22831) test laboratory with the site description on file with ISSED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **SMC Wireless I/O Device FCC ID: 2AJE7SMC-WEX05**. The test data contained in this report pertains only to the emissions due to the EUT's 2.4GHz transmitter.

Test Device Serial No.: EX600-WLXB1, EX600-WLYB1

2.2 Device Capabilities

This device contains the following capabilities:

2.4GHz Frequency Hopper

Ch.	Frequency (MHz)
0	2403
.	.
39	2442
.	.
78	2481

Table 2-1. Frequency/ Channel Operations

2.3 Antenna Description

Following antenna was used for the testing.

Frequency [GHz]	Antenna Gain [dBi]
2.403 – 2.481	2.96

Table 2-2. Antenna Peak Gain

2.4 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2013. ANSI C63.10-2013 was also used to reference the appropriate EUT setup for radiated spurious emissions testing. See 3.2 for radiated emissions test setups, and 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, and 7.8 for antenna port conducted emissions test setups. The worst case radiated emissions data is shown in this report.

The EUT was connected to a power supply. The EUT's operation is initiated by the NFC device controlled by a laptop. The NFC device is then removed from the test set up. All equipment is placed on the test table top and arranged in a typical configuration in accordance with ANSI C63.4-2014.

For more information please see Section 7.0 for test data and the test setup photos document for the test setup photographs.

2.5 Software and Firmware

The test was conducted with firmware version installed on the EUT.

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2.6 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 558074 D01 v05 were used in the measurement of the EUT.

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. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. 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 above 1GHz. An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

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 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 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, mode of operation, 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 changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 474788 D01.

3.3 Environmental Conditions

The temperature is controlled within range of 15°C to 35°C. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

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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 antennas of the EUT are **permanently attached**.
- There are no provisions for connections to an external antenna.

Conclusion:

The EUT unit complies with the requirement of §15.203.

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5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty ($\pm$ dB)
Conducted Bench Top Measurements	1.13
Line Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	WL25-1	Conducted Cable Set (25GHz)	2/23/2021	Annual	2/23/2022	WL25-1
-	WL25-2	WLAN Cable Set (25GHz)	2/23/2021	Annual	2/23/2022	WL25-2
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
Emco	3116	Horn Antenna (18 - 40GHz)	8/7/2018	Triennial	8/7/2021	9203-2178
Espec	ESX-2CA	Environmental Chamber	8/27/2020	Biennial	8/27/2022	17620
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	8/17/2020	Annual	8/17/2021	MY52350166
Keysight Technologies	N9020A	MXA Signal Analyzer	9/22/2020	Annual	9/22/2021	MY54500644
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	3/3/2020	Annual	3/3/2021	100040
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	7/15/2020	Annual	7/15/2021	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/9/2020	Annual	9/9/2021	100348
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	8/10/2020	Annual	8/10/2021	103200
Sunol Science	JB5	Bi-Log Antenna (30M - 5GHz)	7/27/2020	Biennial	7/27/2022	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

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7.0 TEST RESULTS

7.1 Summary

Company Name: SMC Corporation

FCC ID: 2AJE7SMC-WEX05

FCC Classification: FCC Part 15 Spread Spectrum Transmitter (DSS)

Number of Channels: 79

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(1)(iii)	RSS-247 [5.1(1)]	20dB Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
15.247(b)(1)	RSS-247 [5.4(2)]	Peak Transmitter Output Power	< 1 Watt if ≥ 75 non-overlapping channels used		PASS	Section 7.3
15.247(a)(1)	RSS-247 [5.1(2)]	Channel Separation	> 2/3 of 20 dB BW for systems with Output Power < 125mW		PASS	Section 7.5
15.247(a)(1)(iii)	RSS-247 [5.1(4)]	Number of Channels	> 15 Channels		PASS	Section 7.7
15.247(a)(1)(iii)	RSS-247 [5.1(4)]	Time of Occupancy	< 0.4 sec in 31.6 sec period		PASS	Section 7.6
15.247(d)	RSS-247 [5.5]	Band Edge / Out-of-Band Emissions	Conducted > 20dBc		PASS	Section 7.4, Section 7.8
15.205 15.209	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-247 limits)	RADIATED	PASS	Section 7.9, Section 7.10

Table 7-1. Summary of Test Results

Notes:

- 1) All modes of operation and data rates were investigated. 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.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "WLAN Automation," Version 3.5.
- 5) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "Chamber Automation," Version 1.3.1.

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7.2 20dB Bandwidth Measurement

§15.247 (a.1.iii); RSS-247 [5.1(1)]

Test Overview and Limit

The bandwidth at 20dB 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.

Test Procedure Used

ANSI C63.10-2013 – Section 6.9.2

Test Settings

1. The signal analyzers' automatic bandwidth measurement capability of the spectrum analyzer was used to perform the 20dB bandwidth measurement. The "X" dB bandwidth parameter was set to $X = 20$. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% OBW
3. VBW $\geq 3 \times$ RBW
4. Reference level set to keep signal from exceeding maximum input mixer level for linear operation.
5. Detector = Peak
6. Trace mode = max hold
7. Sweep = auto couple
8. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None

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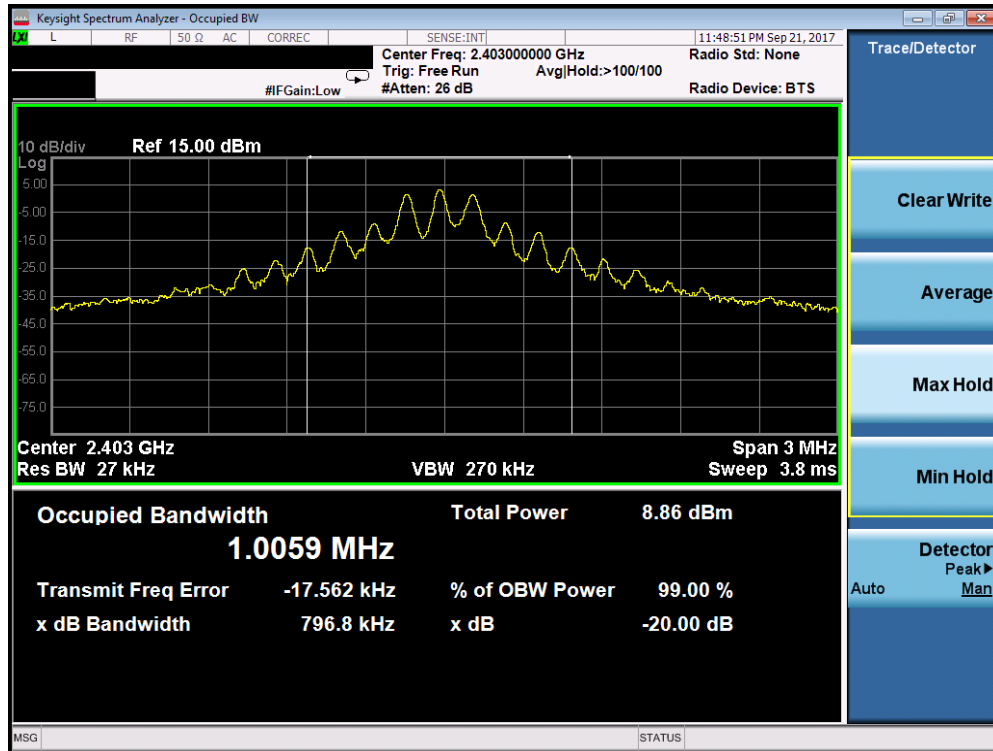
Frequency [MHz]	Channel No.	20dB Bandwidth Test Results	
		Measured Bandwidth [kHz]	Pass/Fail
2403	0	796.80	Pass
2442	39	801.30	Pass
2481	78	905.50	Pass

Table 7-2. Conducted 20dB Bandwidth Measurements (EX600-WLXB1)

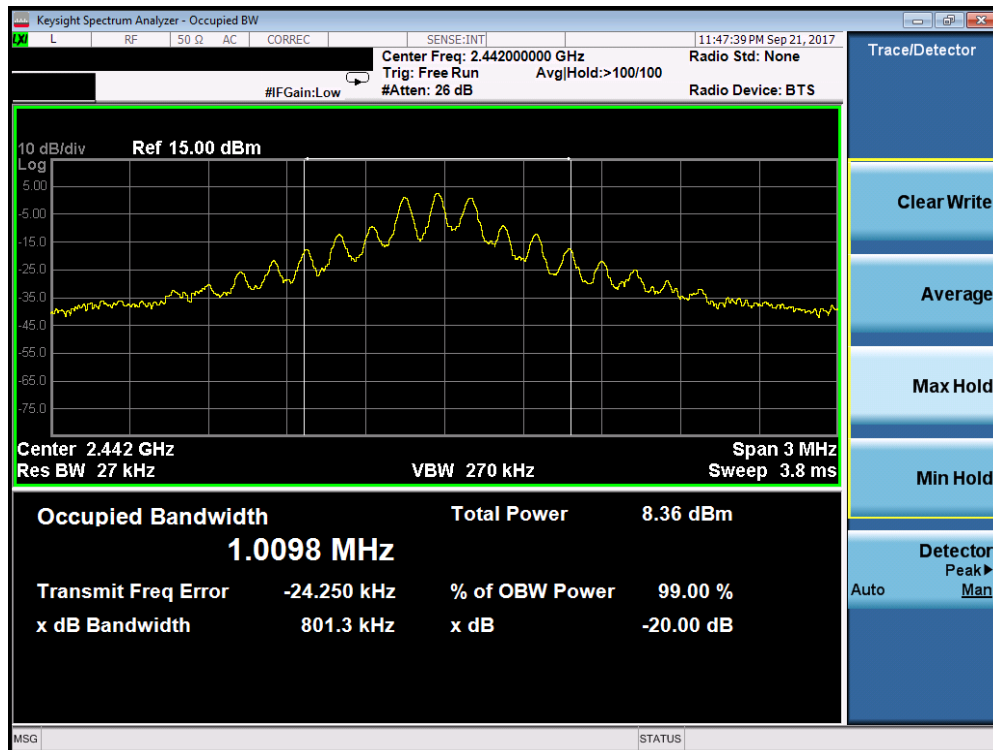
Frequency [MHz]	Channel No.	20dB Bandwidth Test Results	
		Measured Bandwidth [kHz]	Pass/Fail
2403	0	774.20	Pass
2442	39	785.70	Pass
2481	78	779.00	Pass

Table 7-3. Conducted 20dB Bandwidth Measurements (EX600-WLYB1)

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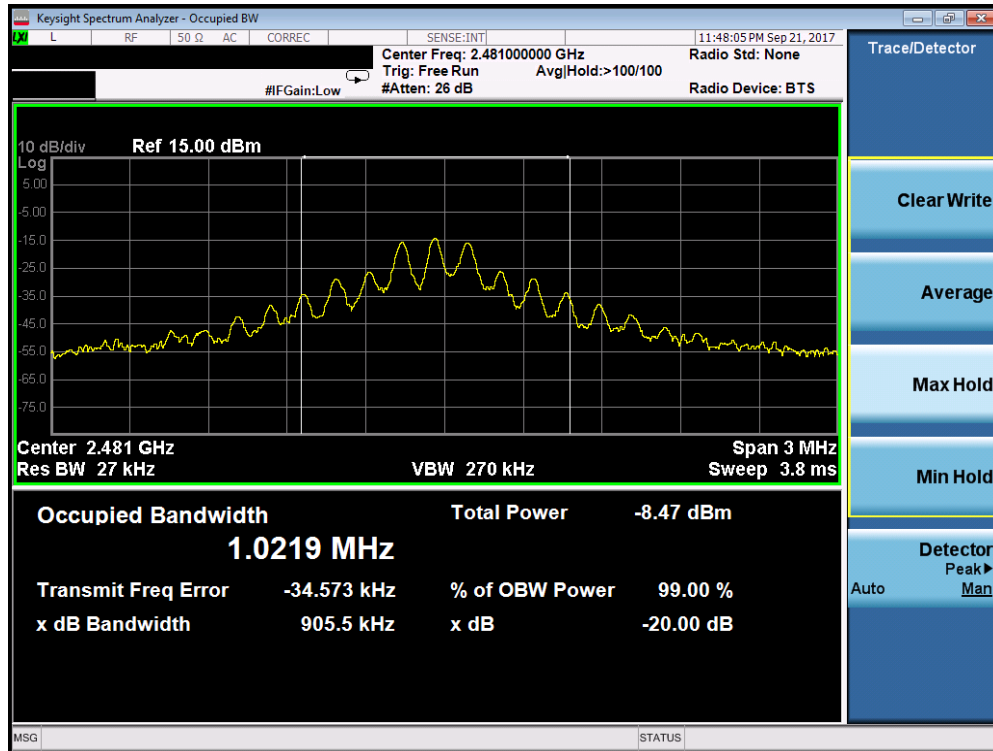


Plot 7-1. 20dB Bandwidth Plot (EX600-WLXB1, Ch. 0)



Plot 7-2. 20dB Bandwidth Plot (EX600-WLXB1, Ch. 39)

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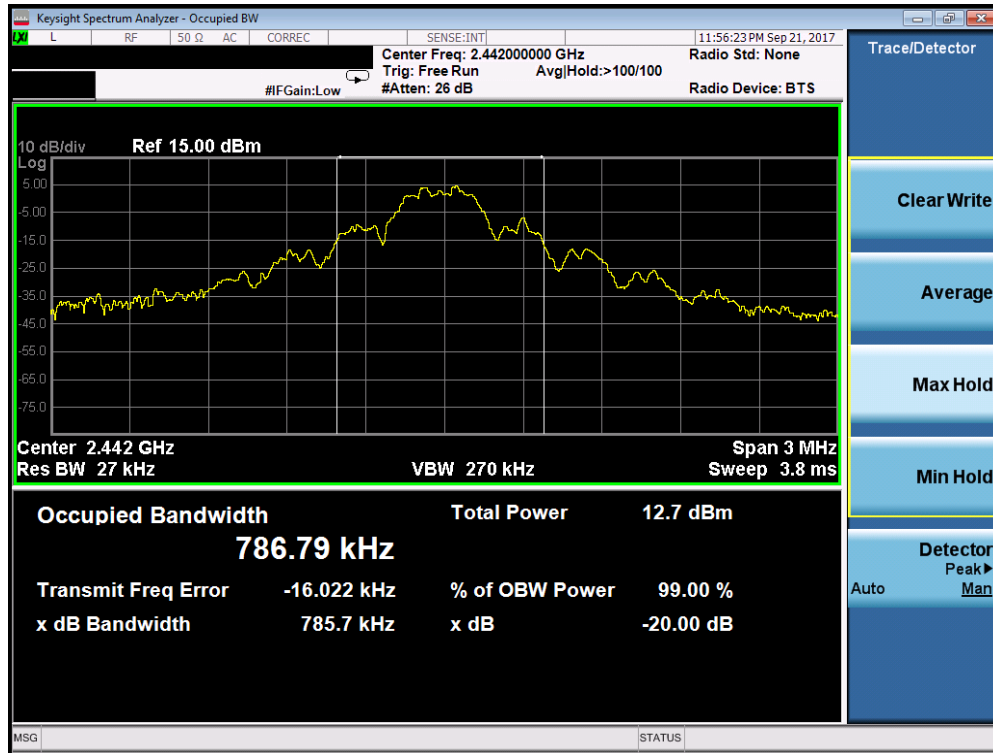


Plot 7-3. 20dB Bandwidth Plot (EX600-WLXB1, Ch. 78)



Plot 7-4. 20dB Bandwidth Plot (EX600-WLYB1, Ch. 0)

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Plot 7-5. 20dB Bandwidth Plot (EX600-WLYB1, Ch. 39)



Plot 7-6. 20dB Bandwidth Plot (EX600-WLYB1, Ch. 78)

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7.3 Output Power Measurement

§15.247(b.3); RSS-247 [5.4]

Test Overview and Limits

A transmitter antenna terminal of EUT is connected to the input of an RF power sensor. Measurement is made using a broadband power meter capable of making peak and average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

The maximum permissible conducted output power is 1 Watt.

Test Procedure Used

ANSI C63.10-2013 – Section 11.9.1.3 PKPM1 Peak Power Method
KDB 558074 D01 v05 – Section 8.3.1.3 PKPM1 Peak-reading Power Meter Method
ANSI C63.10-2013 – Section 11.9.2.3.2 Method AVGPM-G
KDB 558074 D01 v05 – Section 8.3.2.3 Measurement using a Power Meter (PM)
ANSI C63.10-2013 – Section 14.2 Measure-and-Sum Technique
KDB 662911 D01 v02r01 – Section E)1) Measure-and-Sum Technique

Test Settings

Method PKPM1 (Peak Power Measurement)

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

Method AVGPM-G (Average Power Measurement)

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

Test Setup

The EUT and measurement equipment were set up as shown in the diagrams below.



Figure 7-2. Test Instrument & Measurement Setup for Power Meter Measurements

Test Notes

None

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7.3.1 Peak Output Power Measurement

§15.247(b.3); RSS-247 [5.4]

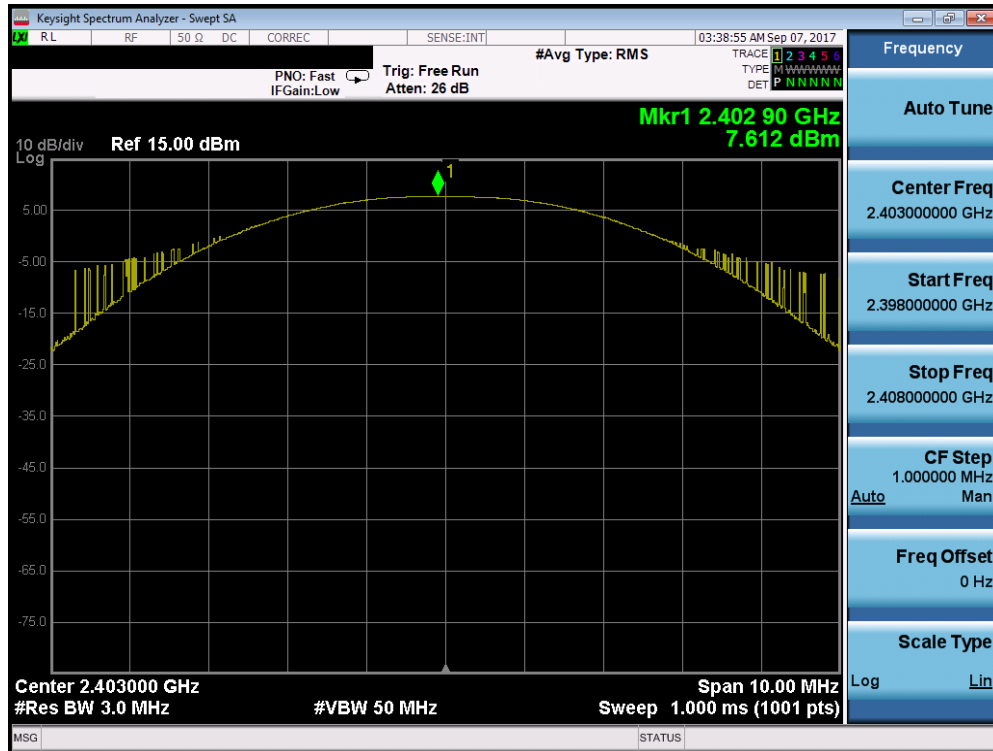
Frequency [MHz]	Channel No.	Peak Conducted Power	
		[dBm]	[mW]
2403	0	7.61	5.770
2442	39	6.99	5.000
2481	78	-9.37	0.116

Table 7-3. Conducted Output Power Measurements (EX600-WLXB1)

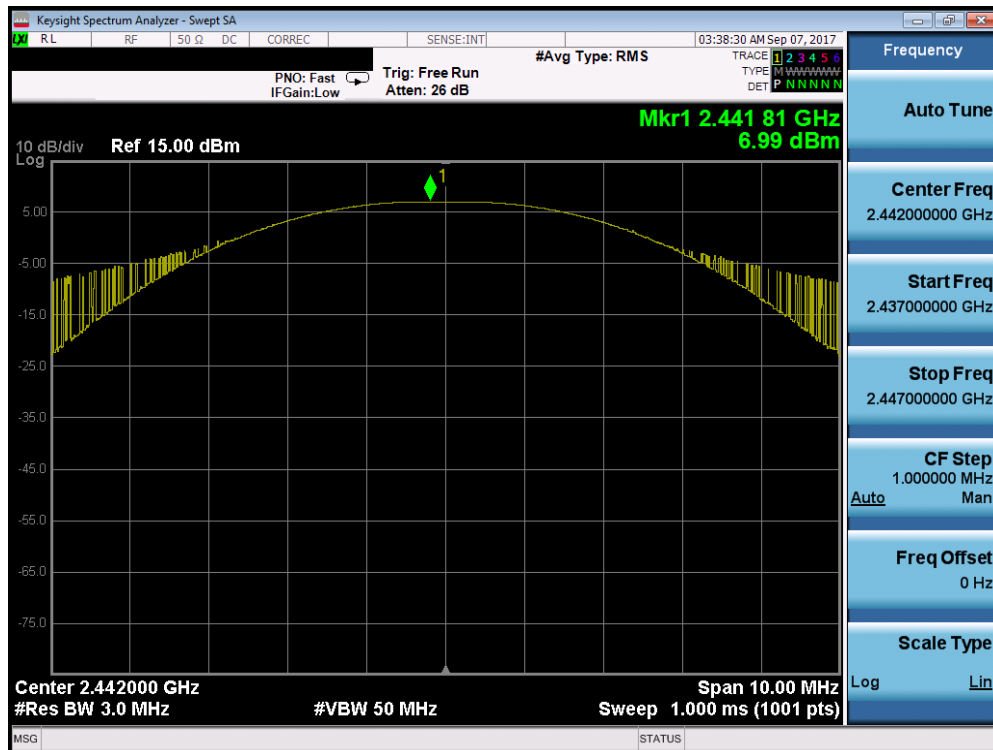
Frequency [MHz]	Channel No.	Peak Conducted Power	
		[dBm]	[mW]
2403	0	8.01	6.324
2442	39	7.41	5.502
2481	78	-8.85	0.130

Table 7-4. Conducted Output Power Measurements (EX600-WLYB1)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 17 of 61



Plot 7-7. Peak Conducted Power (EX600-WLXB1, Ch. 0)

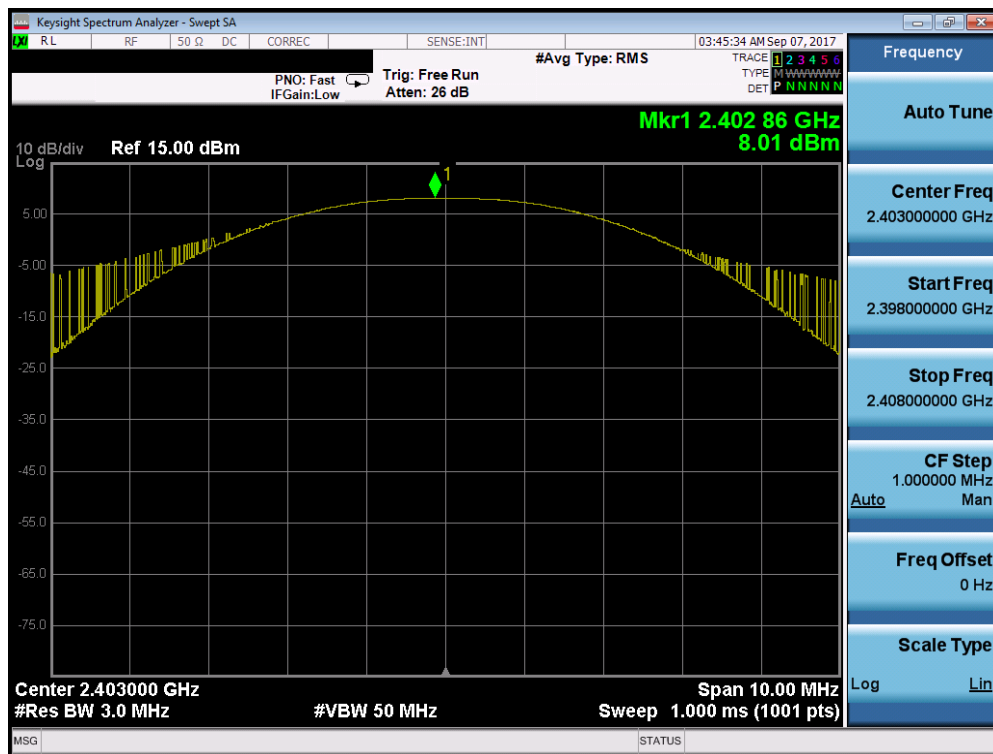


Plot 7-8. Peak Conducted Power (EX600-WLXB1, Ch. 39)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 18 of 61

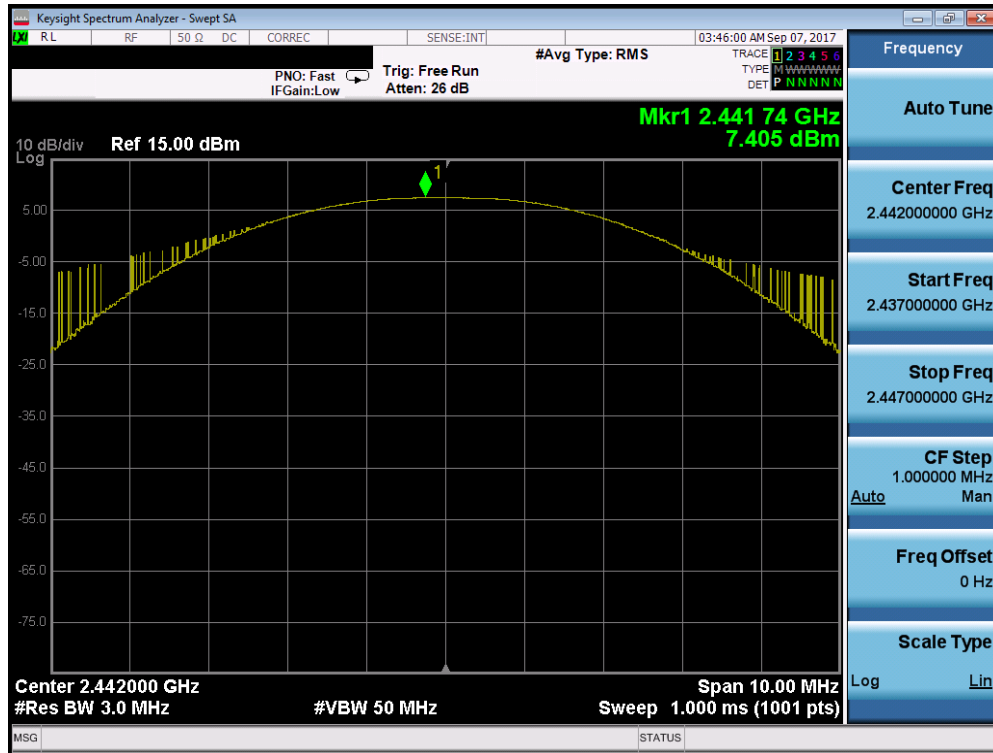


Plot 7-9. Peak Conducted Power (EX600-WLXB1, Ch. 78)

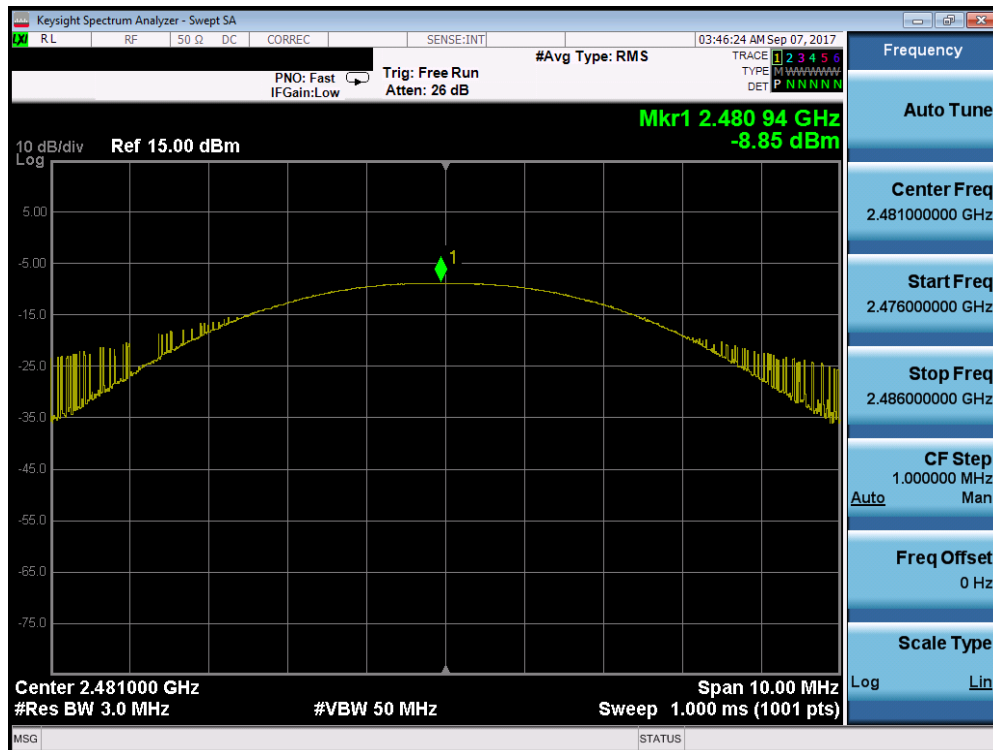


Plot 7-10. Peak Conducted Power (EX600-WLYB1, Ch. 0)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 19 of 61



Plot 7-11. Peak Conducted Power (EX600-WLYB1, Ch. 39)



Plot 7-12. Peak Conducted Power (EX600-WLYB1, Ch. 78)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 20 of 61

7.4 Conducted Emissions at the Band Edge

§15.247(d); RSS-247 [5.5]

Test Overview and Limit

EUT operates in hopping and non-hopping transmission mode. Measurement is taken at the highest point located outside of the emission bandwidth. **The maximum permissible out-of-band emission level is 20 dBc.**

Test Procedure Used

ANSI C63.10-2013 – Section 6.10.4

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW = 100kHz
4. VBW = 300kHz
5. Detector = Peak
6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
7. Trace mode = max hold
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

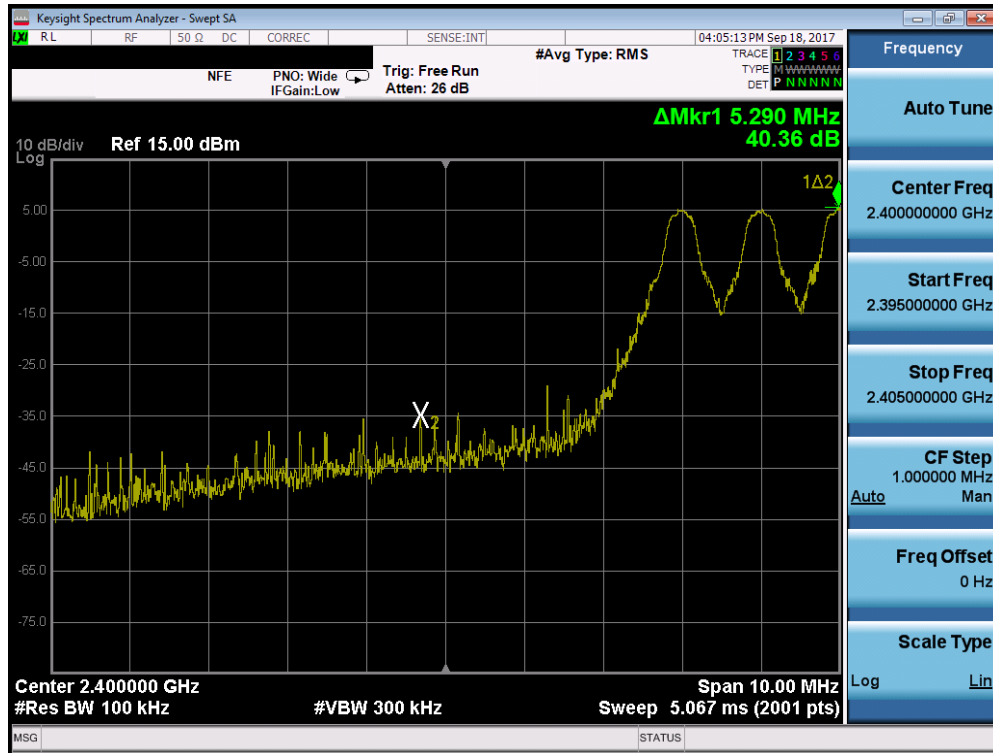


Figure 7-3. Test Instrument & Measurement Setup

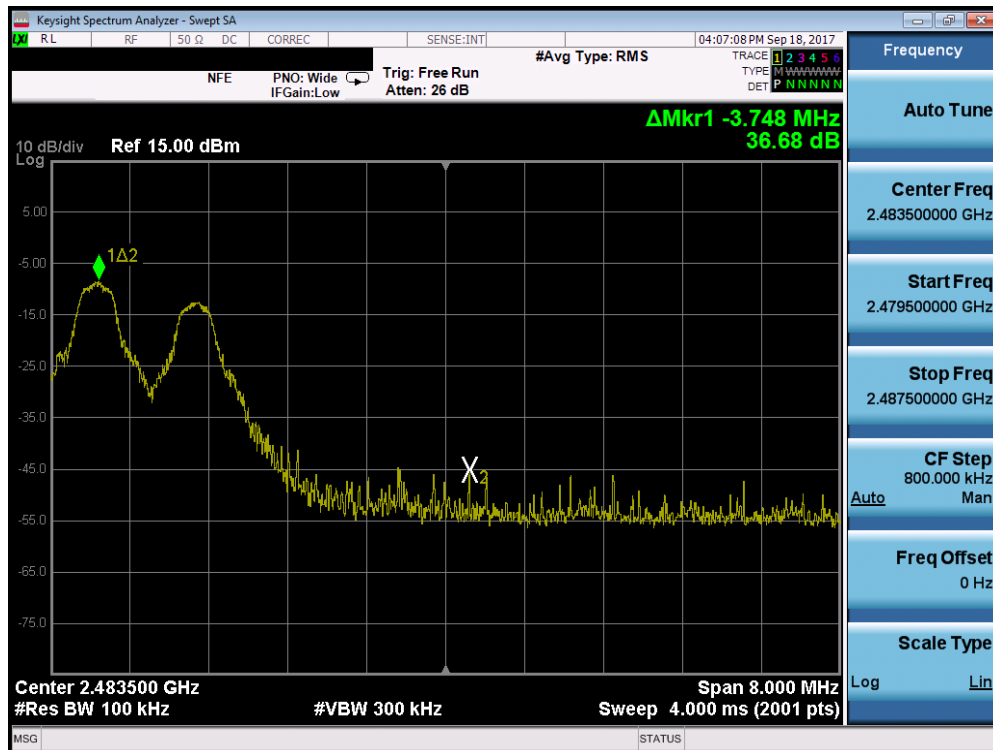
Test Notes

Out of band conducted spurious emissions at the band edge were investigated in hopping and non-hopping modes.

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 21 of 61

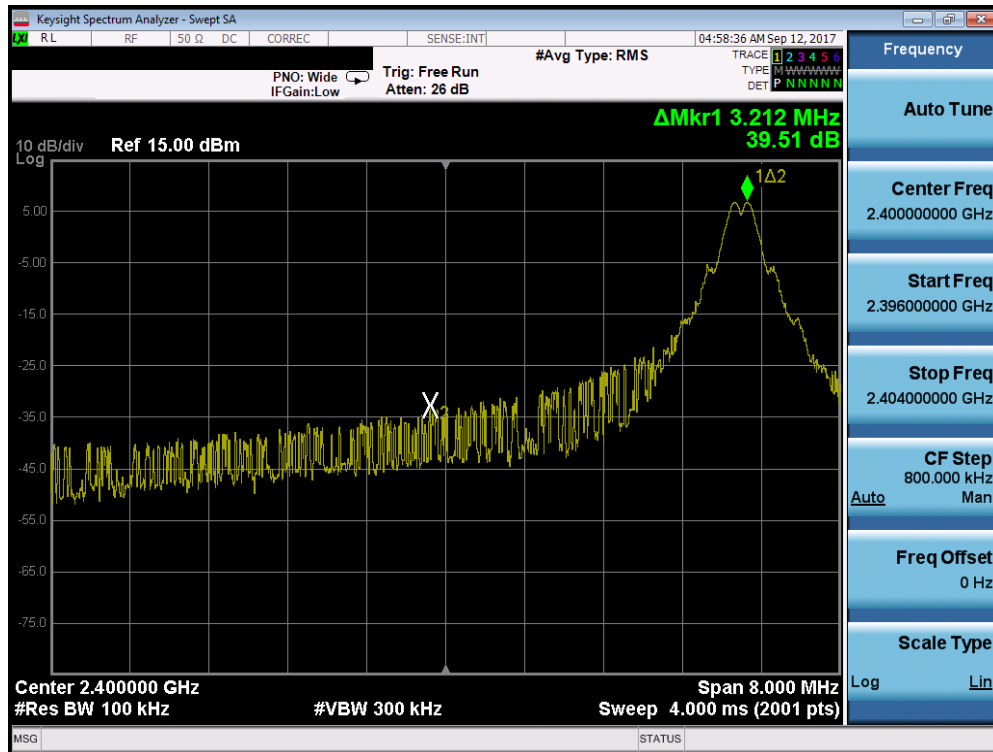


Plot 7-15. Band Edge Plot (EX600-WLXB1 with Hopping Enabled)

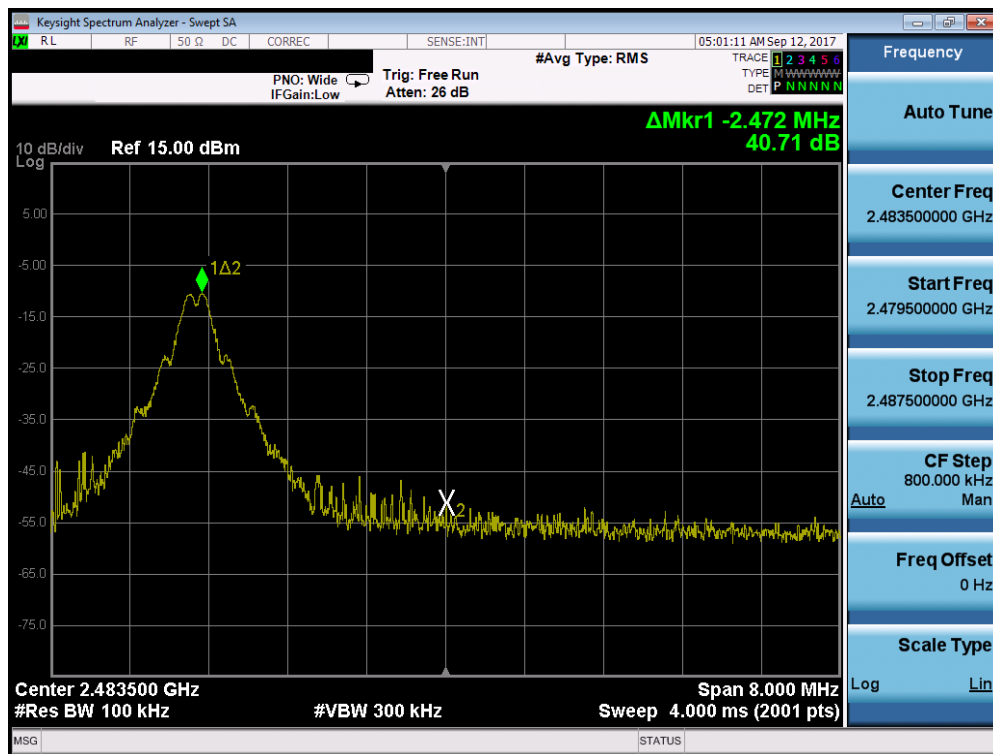


Plot 7-16. Band Edge Plot (EX600-WLXB1 with Hopping Enabled)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01.AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 23 of 61

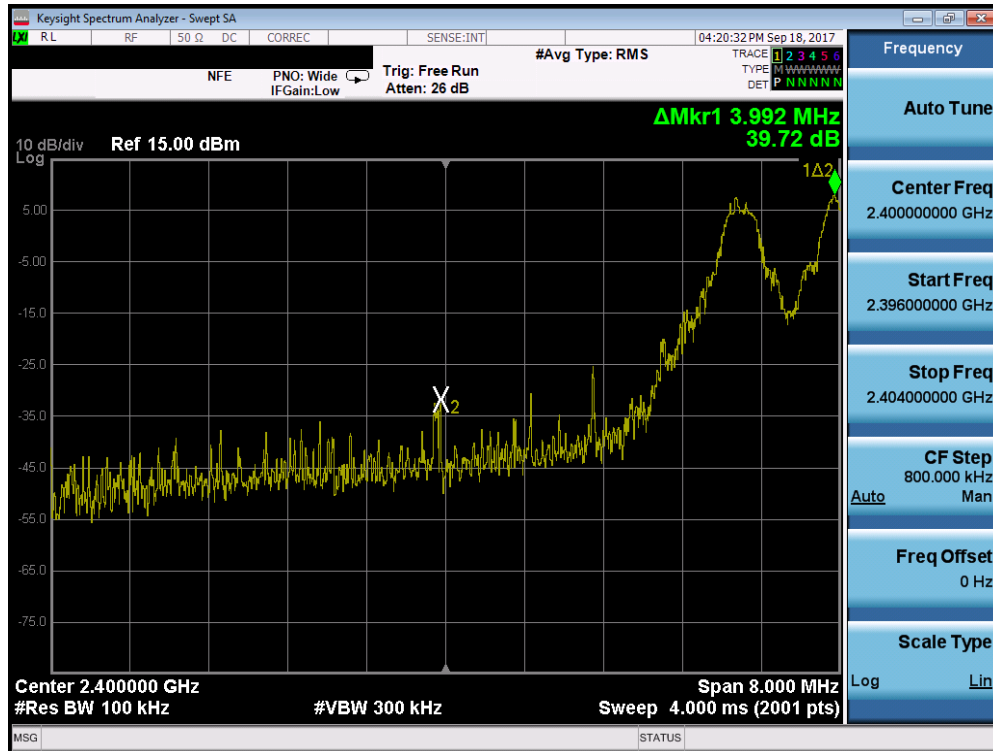


Plot 7-17. Band Edge Plot (EX600-WLYB1, Ch. 0)

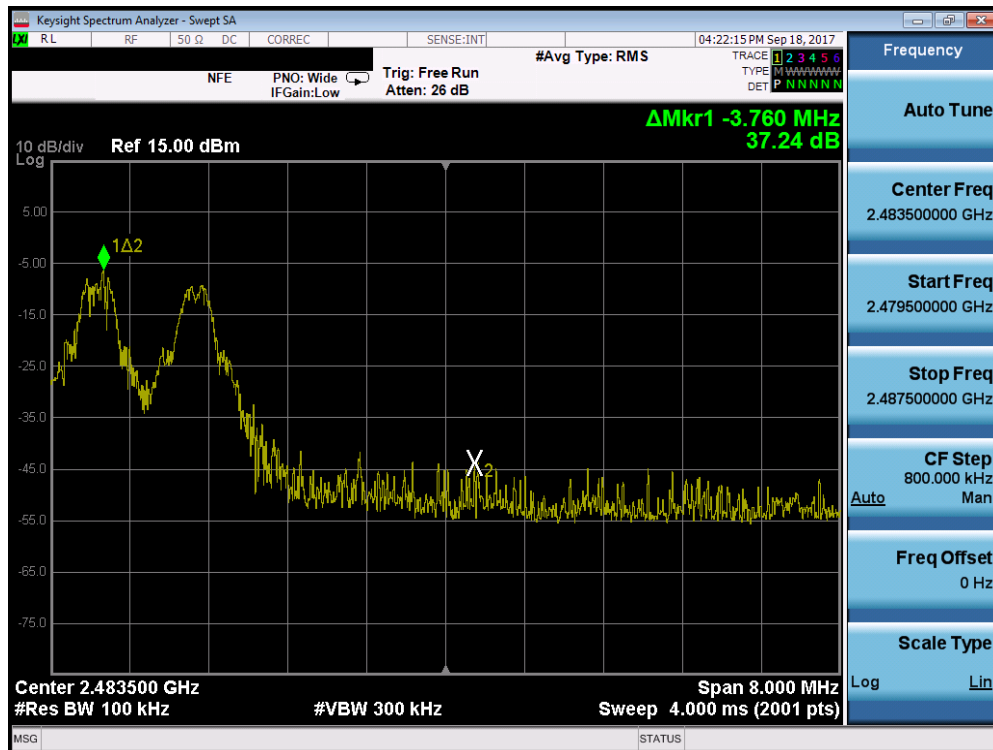


Plot 7-18. Band Edge Plot (EX600-WLYB1, Ch. 78)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 24 of 61



Plot 7-19. Band Edge Plot (EX600-WLYB1 with Hopping Enabled)



Plot 7-20. Band Edge Plot (EX600-WLYB1 with Hopping Enabled)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 25 of 61

7.5 Carrier Frequency Separation

§15.247 (a.1); RSS-247 [5.1(2)]

Test Overview and Limit

Measurement is made with EUT operating in hopping mode. ***The minimum permissible channel separation for this system is 2/3 the value of the 20dB BW.***

Test Procedure Used

ANSI C63.10-2013 – Section 7.8.2

Test Settings

1. Span = Wide enough to capture peaks of two adjacent channels
2. RBW = 30% of channel spacing. Adjust as necessary to best identify center of each individual channel
3. VBW $\geq$ RBW
4. Sweep = Auto
5. Detector = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize.
8. Marker-delta function used to determine separation between peaks of the adjacent channels

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None.

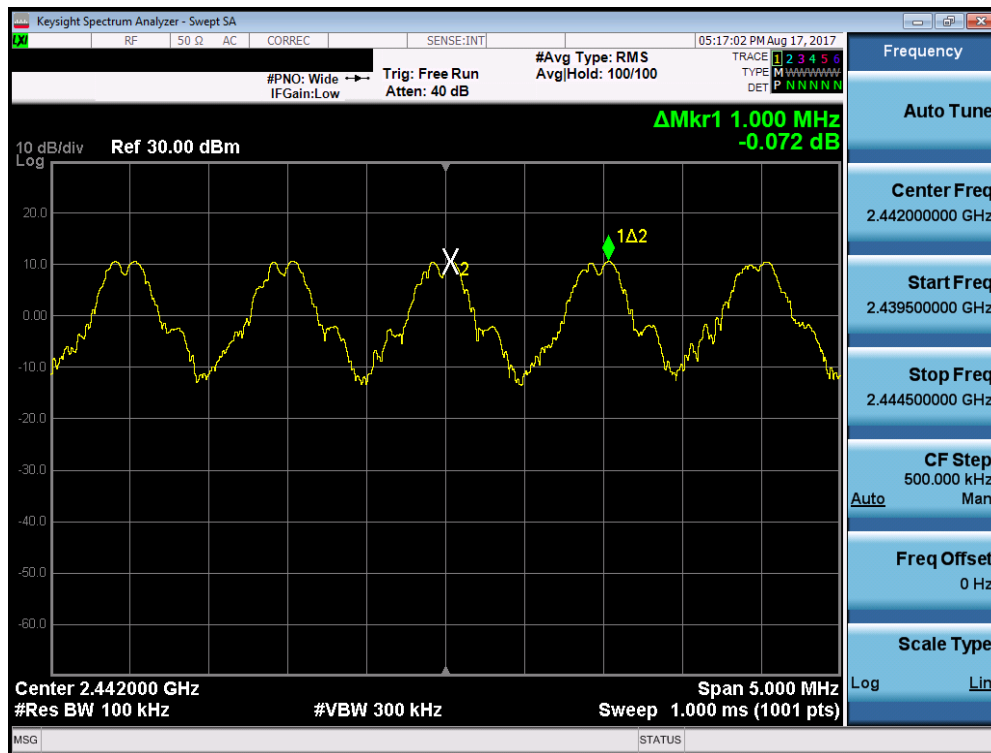
FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 26 of 61

Frequency [MHz]	Channel No.	Min. Channel Separation [MHz]
2403	0	0.531
2442	39	0.534
2481	78	0.604

Table 7-5. Minimum Channel Separation (EX600-WLXB1)

Frequency [MHz]	Channel No.	Min. Channel Separation [MHz]
2403	0	0.516
2442	39	0.524
2481	78	0.519

Table 7-6. Minimum Channel Separation(EX600-WLYB1)



Plot 7-21. Channel Spacing Plot (EX600-WLXB1)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 27 of 61

7.6 Time of Occupancy

§15.247 (a.1.iii)

Test Overview and Limit

Measurement is made while EUT is operating in hopping mode with the spectrum analyzer set to zero span. ***The maximum permissible time of occupancy is 400 ms within a period of 400ms multiplied by the number of hopping channels employed.***

Test Procedure Used

ANSI C63.10-2013 – Section 7.8.4

Test Settings

1. Span = zero span, centered on a hopping channel
2. RBW $\leq$ channel spacing and $\gg 1/T$, where T is expected dwell time per channel
3. Sweep = as necessary to capture entire dwell time.
4. Trigger is set with appropriate trigger delay to place pulse near the center of the plot
5. Detector = peak
6. Trace mode = max hold
7. Marker-delta function used to determine transmit time per hop

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

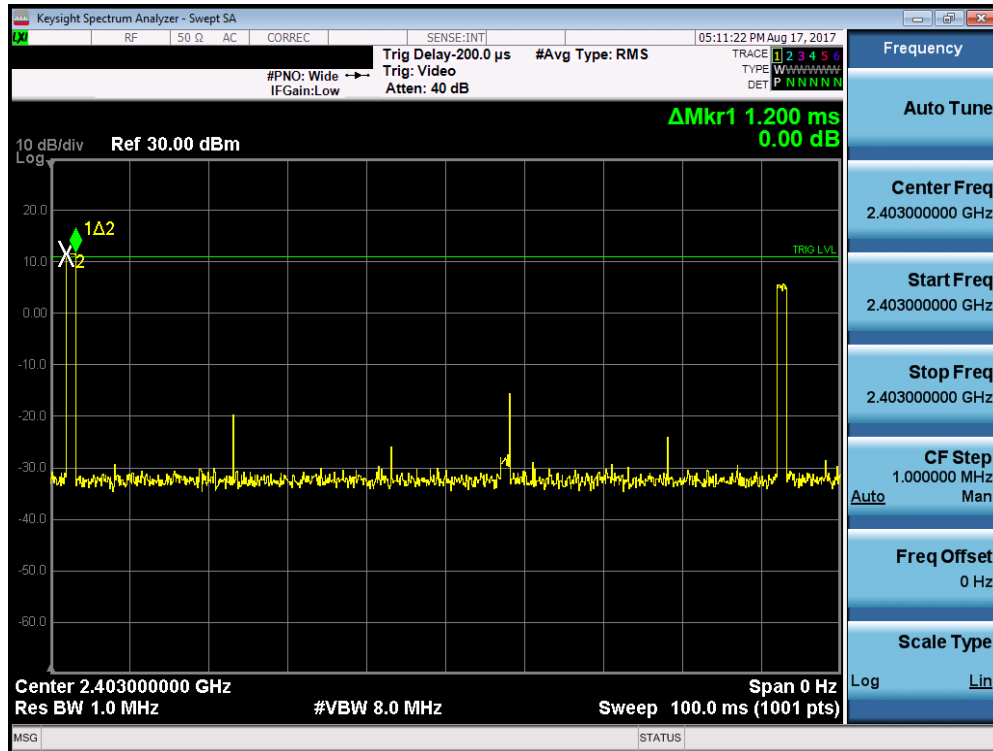


Figure 7-5. Test Instrument & Measurement Setup

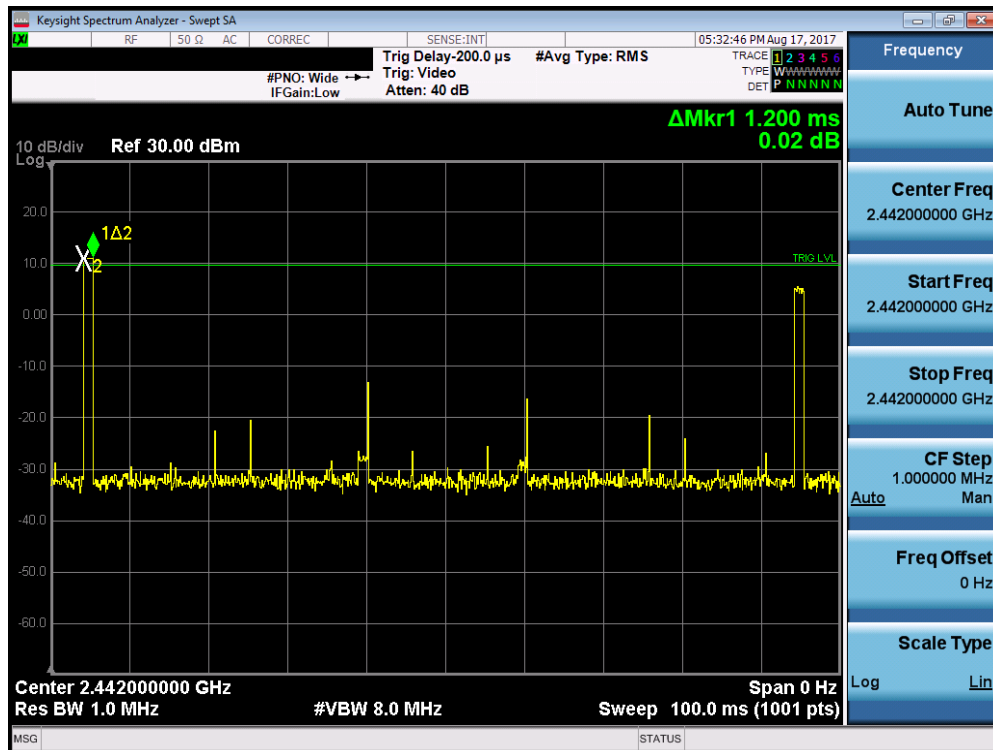
Test Notes

None

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 29 of 61

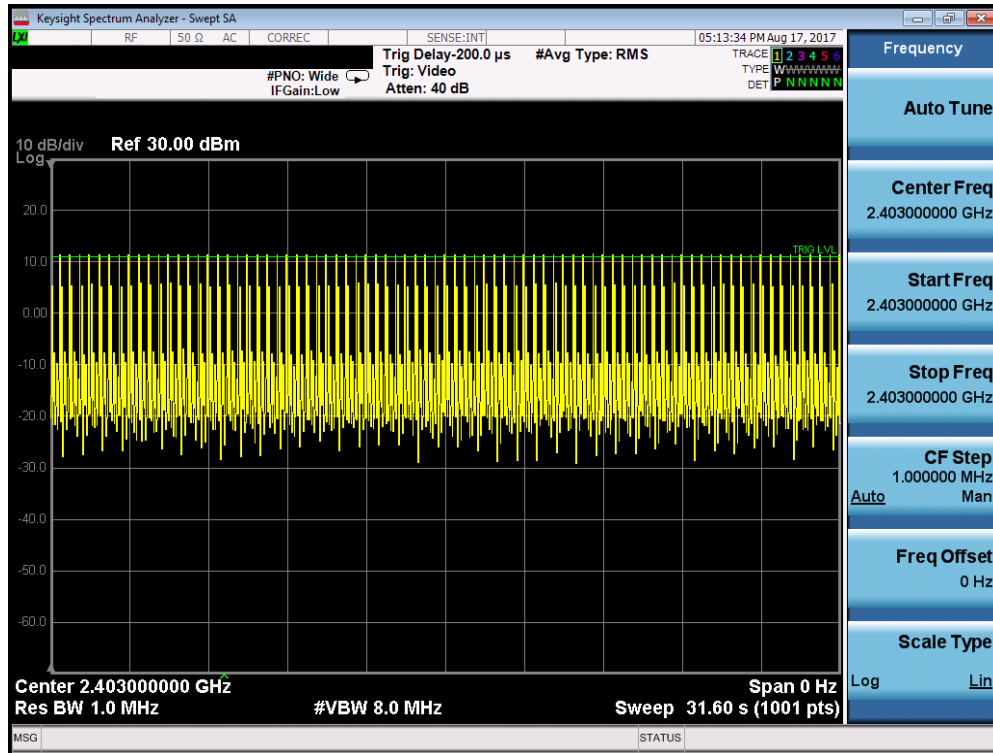


Plot 7-23. Time of Occupancy Plot (EX600-WLXB1)

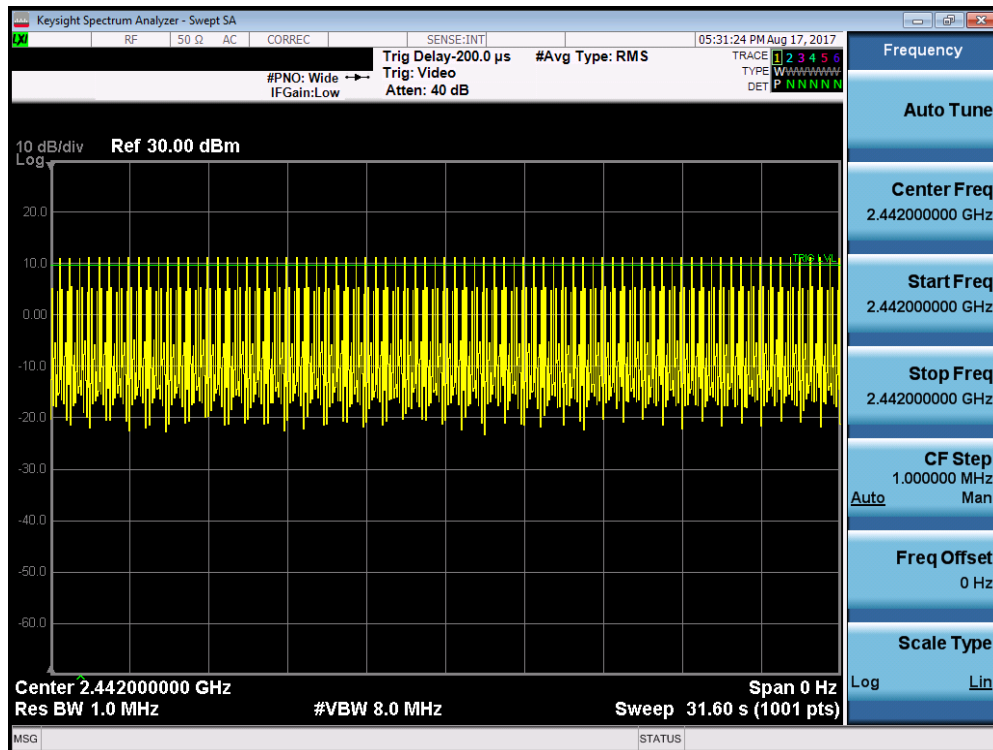


Plot 7-24. Time of Occupancy Plot (EX600-WLYB1)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 30 of 61



Plot 7-25. Dwell Time Plot (EX600-WLXB1)



Plot 7-26. Dwell Time Plot (EX600-WLYB1)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 31 of 61

Time of Occupancy Calculation

Base on the previous plots, the time of occupancy can be determined as follows:

- Pulse Width = 1.2 ms (See Plot 7-23)
- 400ms x 79 hopping channels = 31.6 sec (Time of Occupancy Limit)
- Number of times that one particular channel appears in a 31.6 second period = 81 (see Plot 7-25)
- Time of Occupancy = 1.2 ms/pulse x 81 pulses/31.6 sec = 97.2 ms/31.6 sec = 3.07 ms/sec
- Above calculations show the devices are compliant with the Time of Occupancy requirement

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	 Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)			Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 32 of 61	

7.7 Number of Hopping Channels

§15.247 (a.1.iii); RSS-247 [5.1(4)]

Test Overview and Limit

Measurement is made while EUT is operating in hopping mode. ***This frequency hopping system must employ a minimum of 15 hopping channels.***

Test Procedure Used

ANSI C63.10-2013 – Section 7.8.3

Test Settings

1. Span = frequency of band of operation (divided into two plots)
2. RBW < 30% of channel spacing or 20dB bandwidth, whichever is smaller.
3. VBW ≥ RBW
4. Sweep = auto
5. Detector = peak
6. Trace mode = max hold
7. Trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

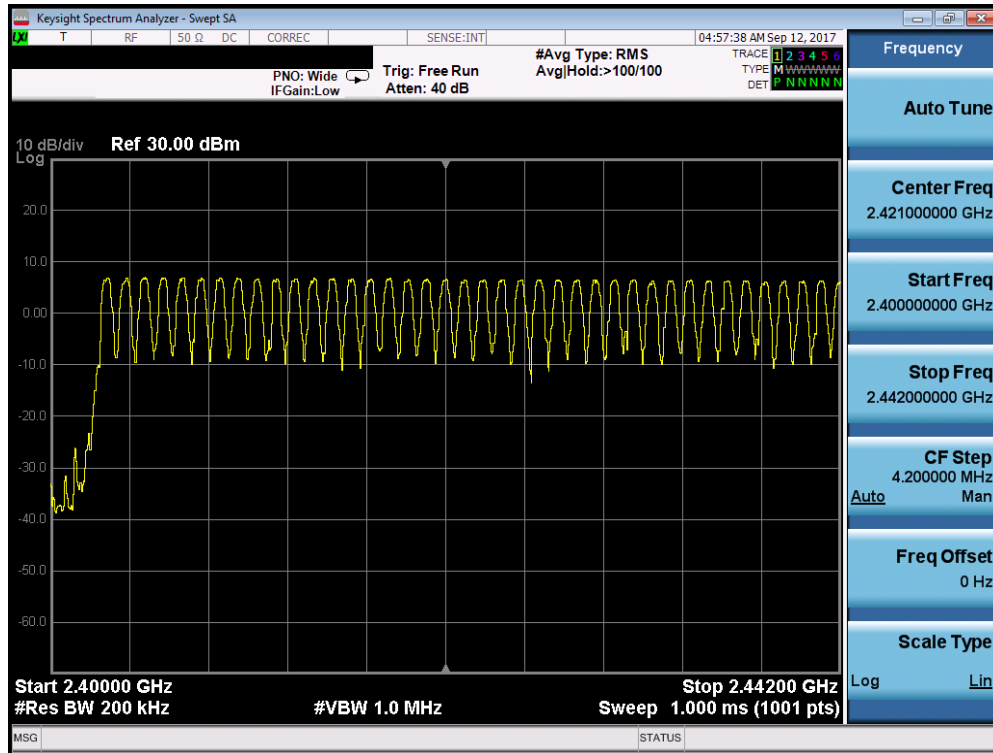


Figure 7-6. Test Instrument & Measurement Setup

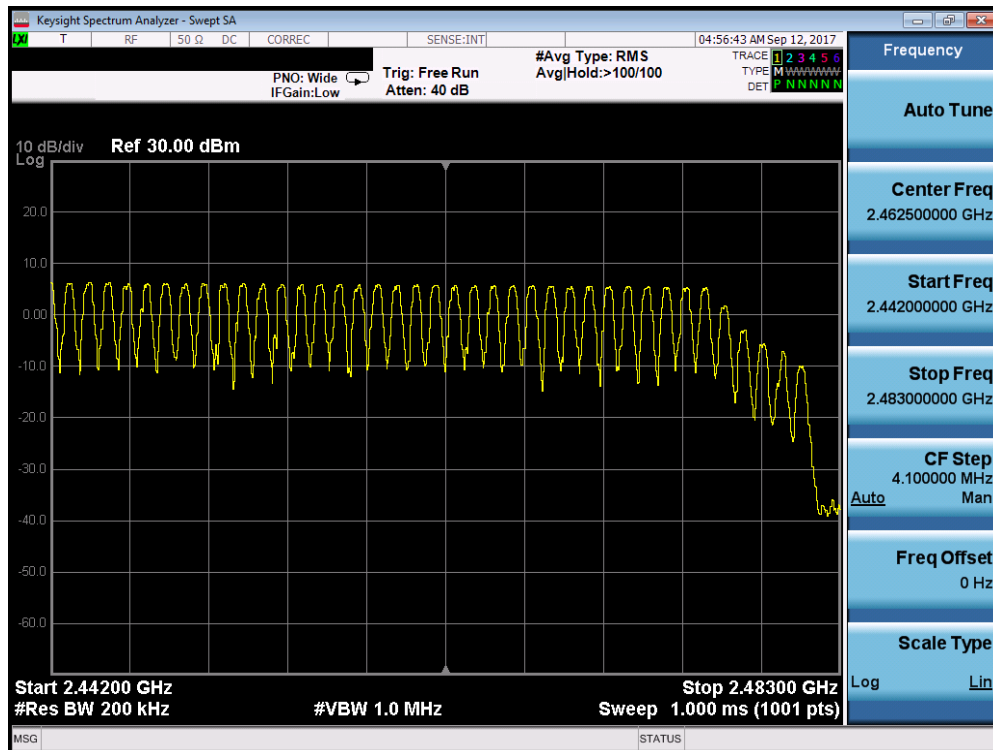
Test Notes

None.

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 33 of 61



Plot 7-29. Low End Spectrum Channel Hopping Plot (EX600-WLYB1)



Plot 7-30. High End Spectrum Channel Hopping Plot (EX600-WLYB1)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2102080008-01.AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 35 of 61

7.8 Conducted Spurious Emissions

§15.247 (d); RSS-247 [5.5]

Test Overview and Limit

Conducted out-of-band spurious emissions were investigated from 30MHz up to 25GHz to include the 10th harmonic of the fundamental transmit frequency. **The maximum permissible out-of-band emission level is 20 dBc.**

Test Procedure Used

ANSI C63.10-2013 – Section 7.8.8

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 25GHz (separated into two plots per channel)
2. RBW = 1MHz* (See note below)
3. VBW = 3MHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

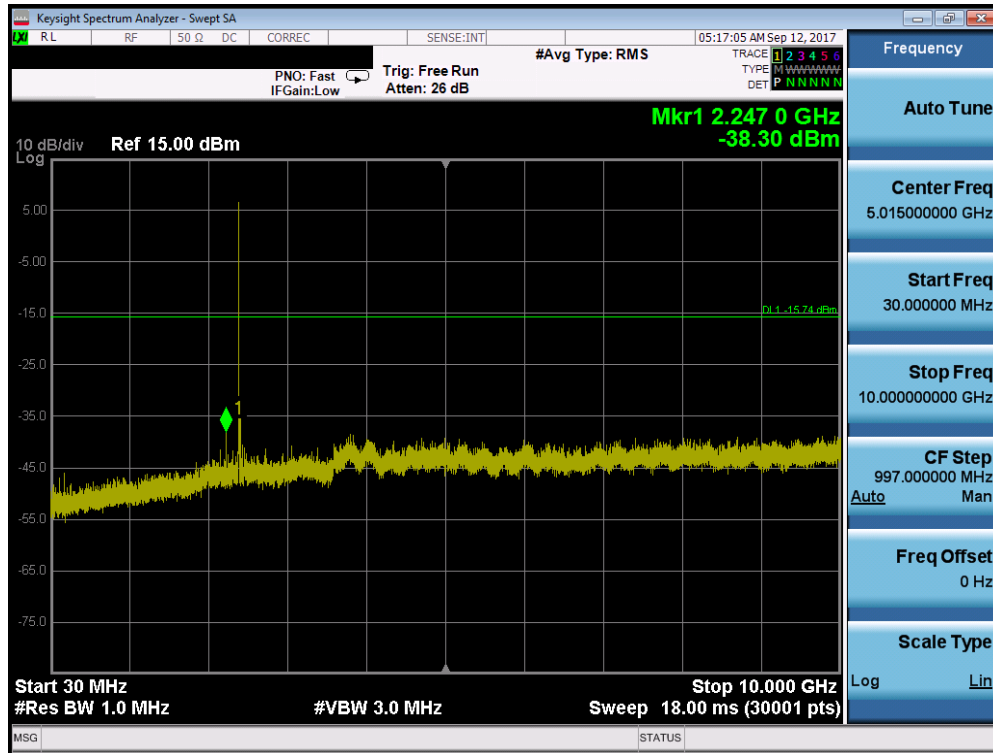


Figure 7-7. Test Instrument & Measurement Setup

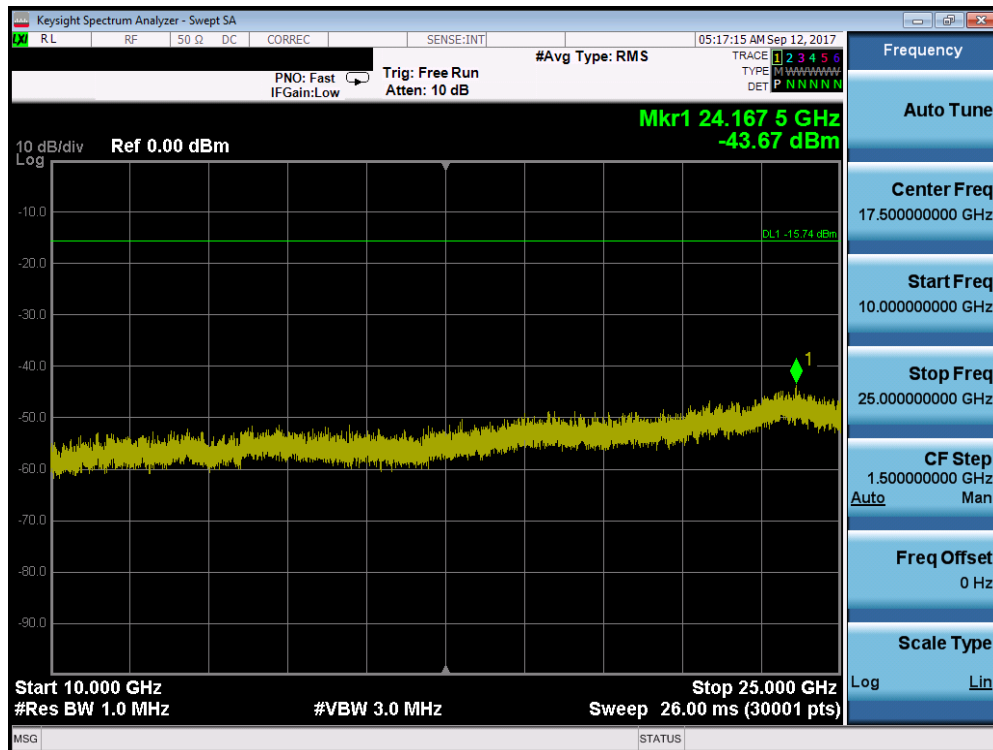
Test Notes

Out-of-band conducted spurious emissions were investigated for all data rates and the worst case emissions were found with the EUT transmitting in non-hopping. The display line shown in the following plots is the limit at 20dB below the fundamental emission level measured in a 100kHz bandwidth. However, the traces in the following plots are measured with a 1MHz RBW to reduce test time, so the display line may not necessarily appear to be 20dB below the level of the fundamental in a 1MHz bandwidth.

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 36 of 61

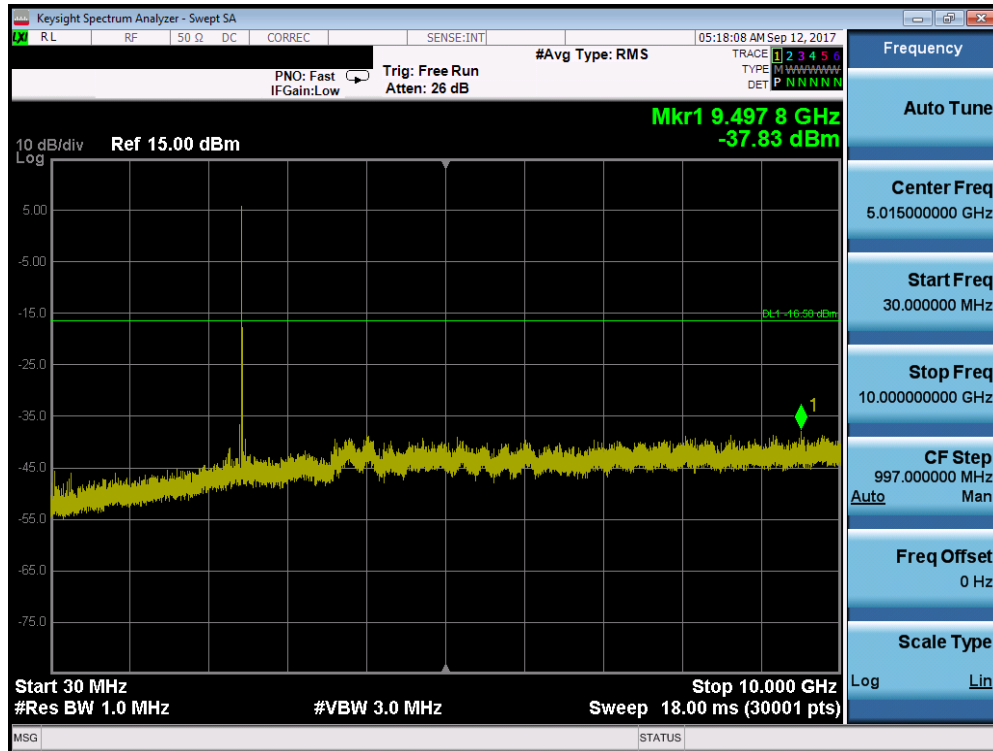


Plot 7-31. Conducted Spurious Plot (EX600-WLXB1, Ch. 0)

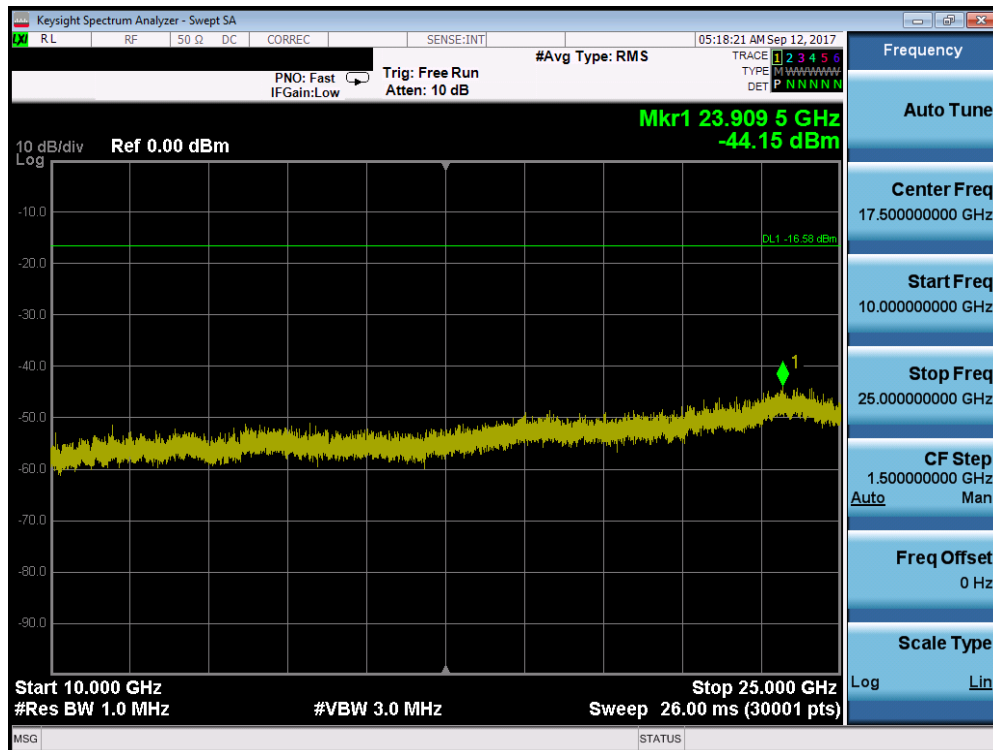


Plot 7-32. Conducted Spurious Plot (EX600-WLXB1, Ch. 0)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 37 of 61

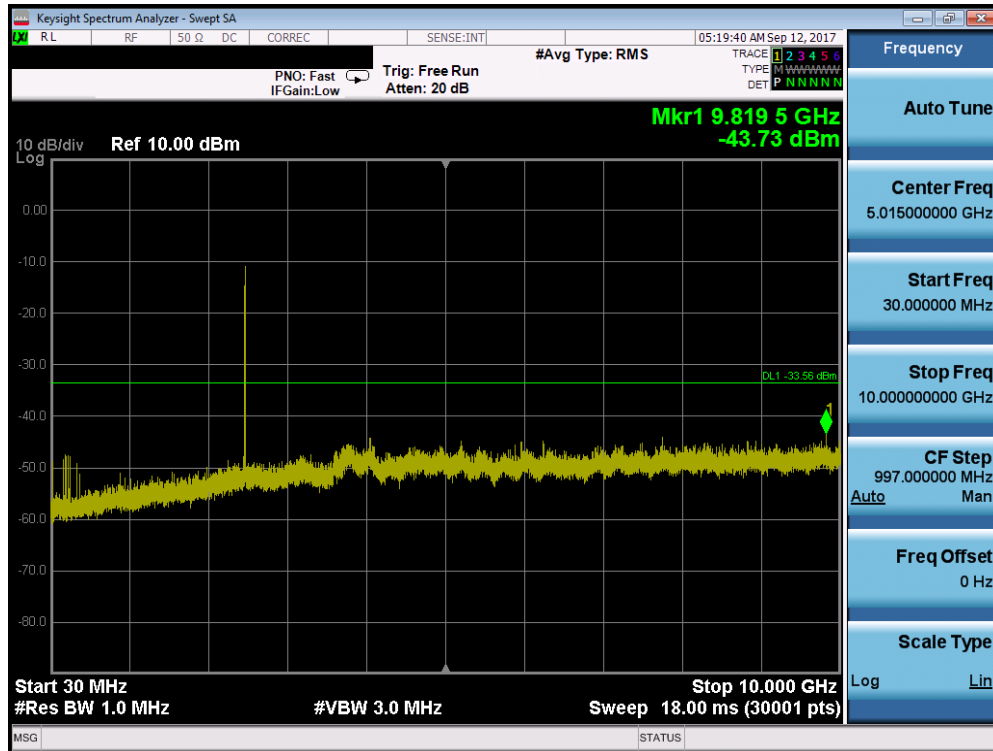


Plot 7-33. Conducted Spurious Plot (EX600-WLXB1, Ch. 39)

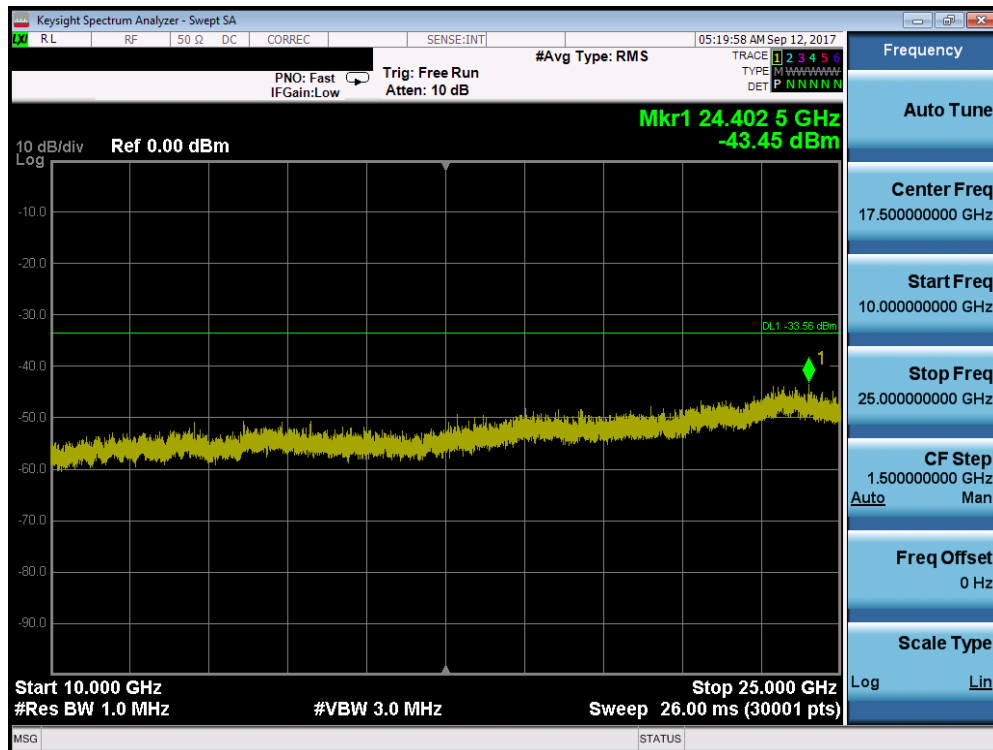


Plot 7-34. Conducted Spurious Plot (EX600-WLXB1, Ch. 39)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 38 of 61

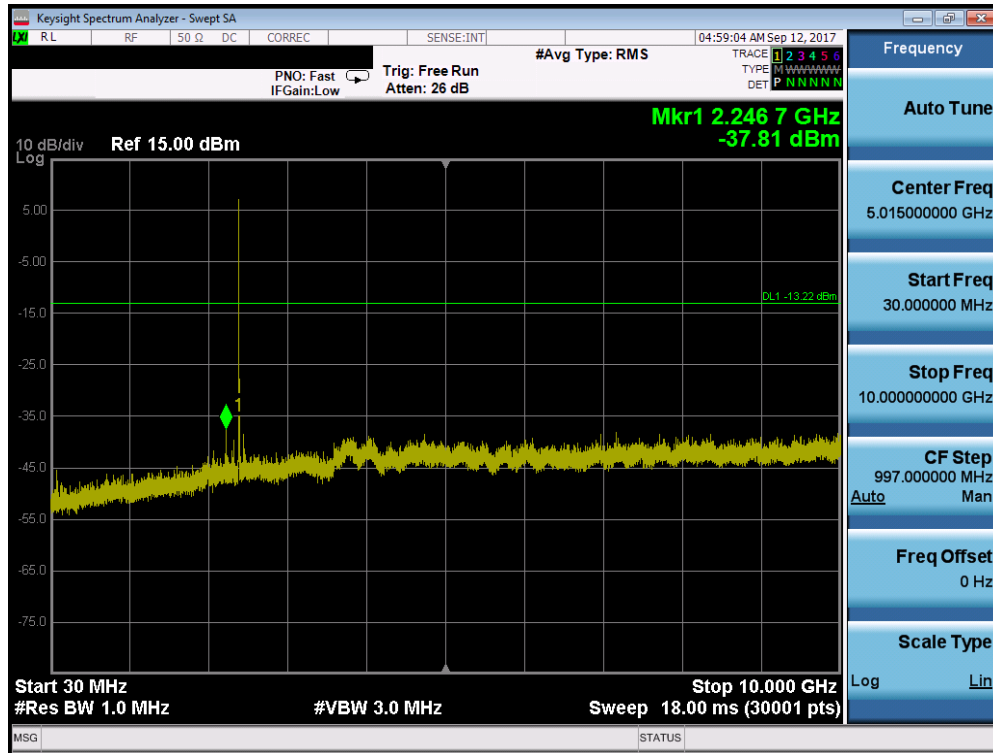


Plot 7-35. Conducted Spurious Plot (EX600-WLXB1, Ch. 78)

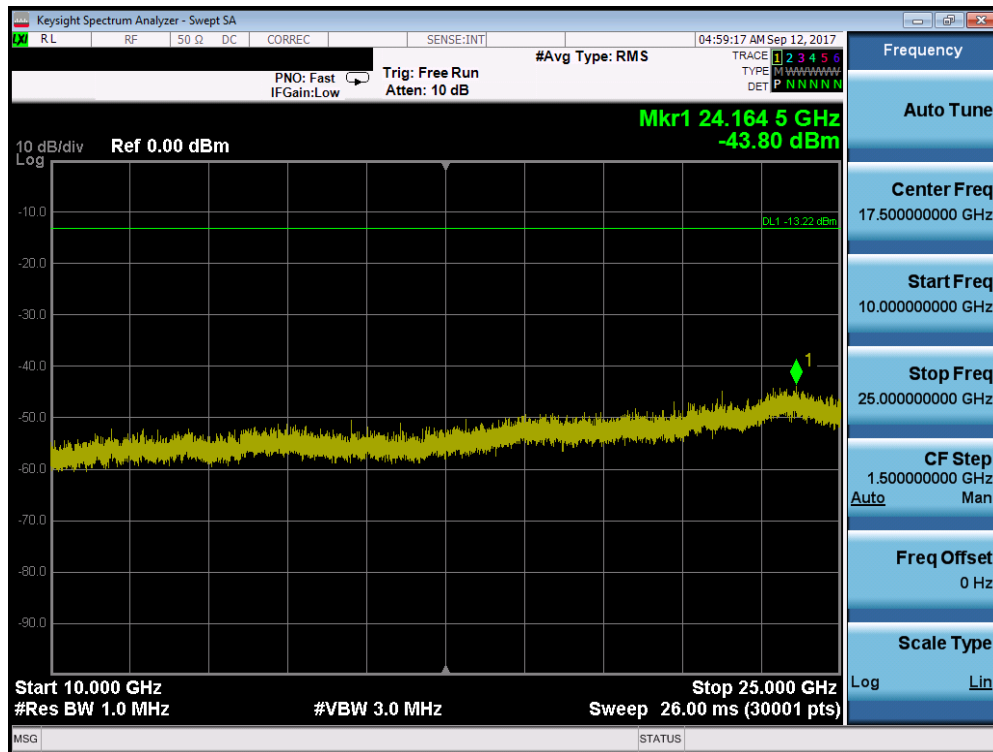


Plot 7-36. Conducted Spurious Plot (EX600-WLXB1, Ch. 78)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01.AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 39 of 61

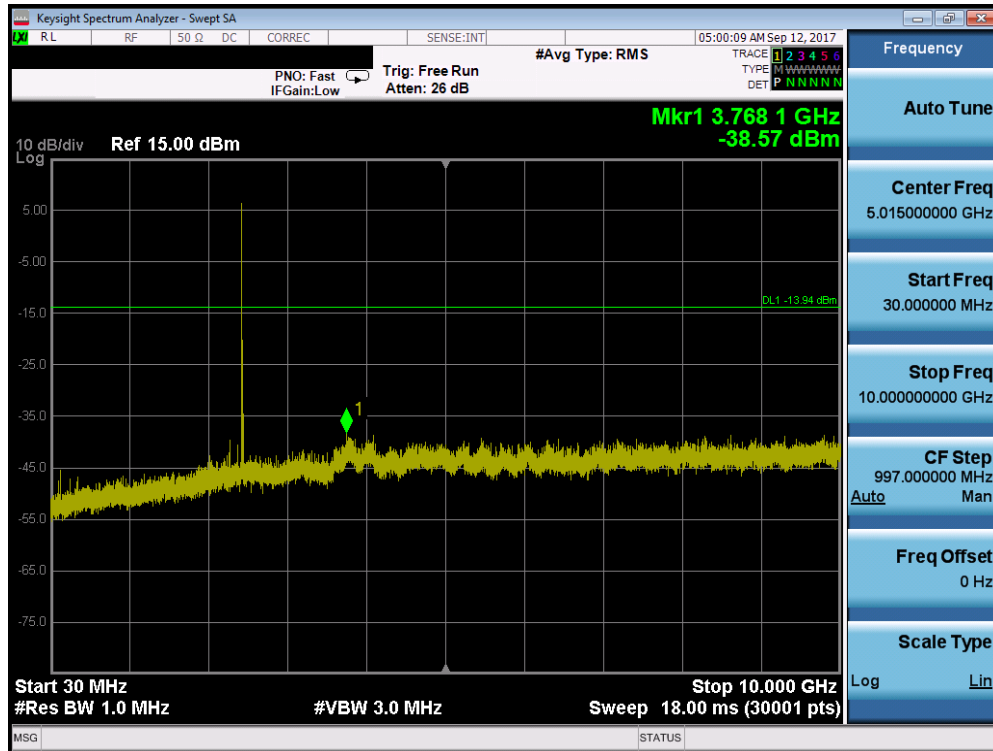


Plot 7-37. Conducted Spurious Plot (EX600-WLYB1, Ch. 0)

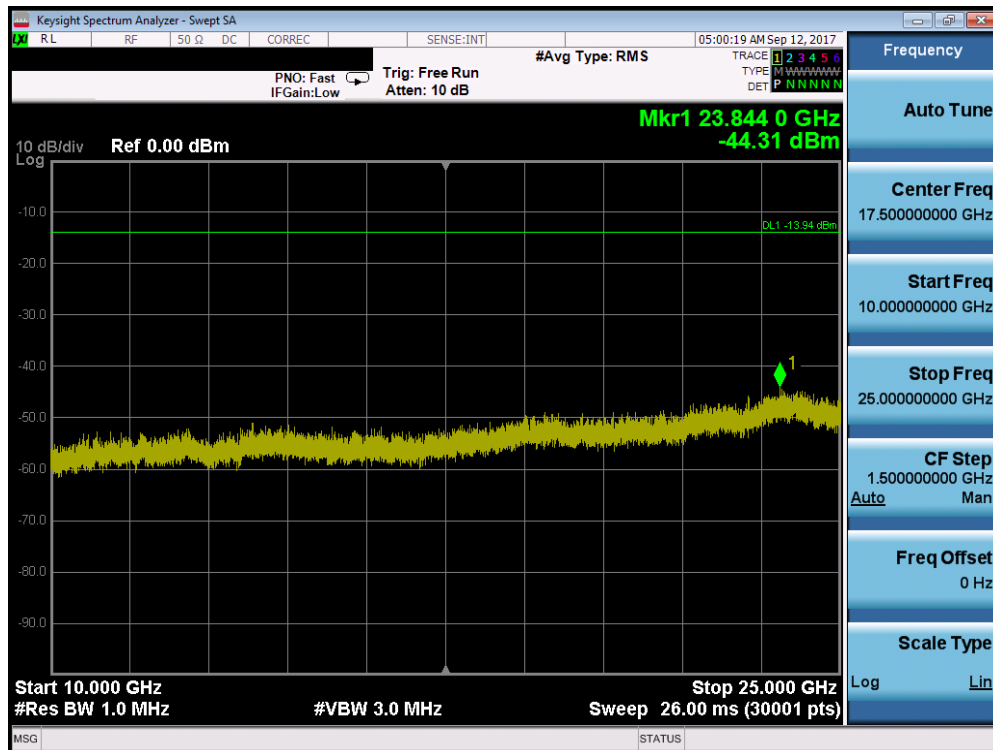


Plot 7-38. Conducted Spurious Plot (EX600-WLYB1, Ch. 0)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2102080008-01.AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 40 of 61

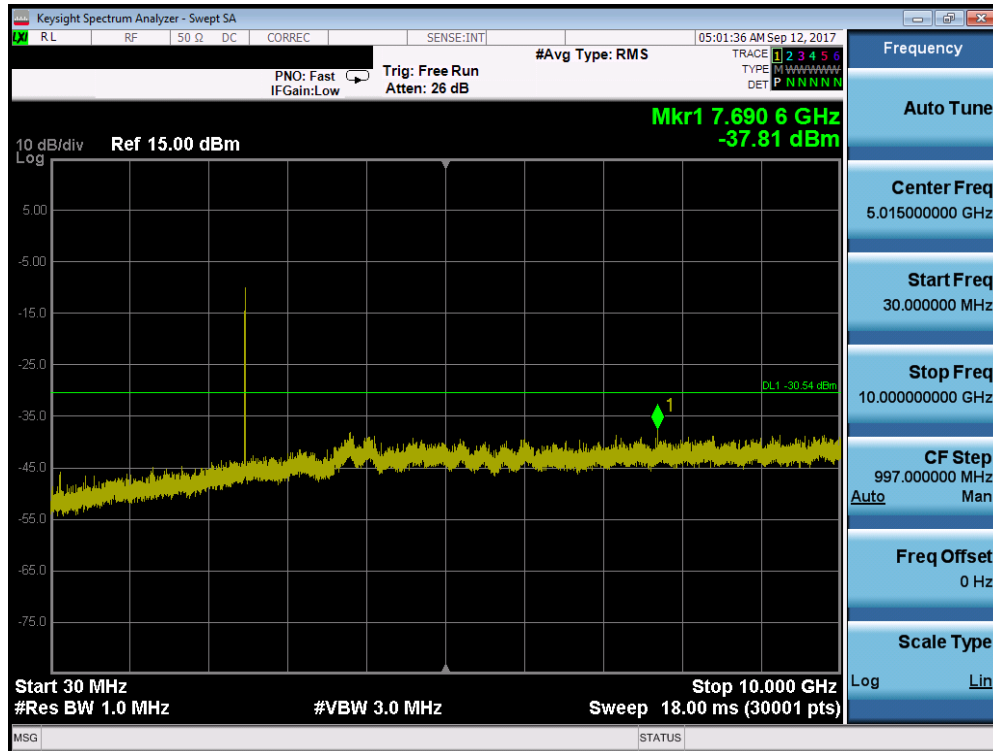


Plot 7-39. Conducted Spurious Plot (EX600-WLYB1, Ch. 39)

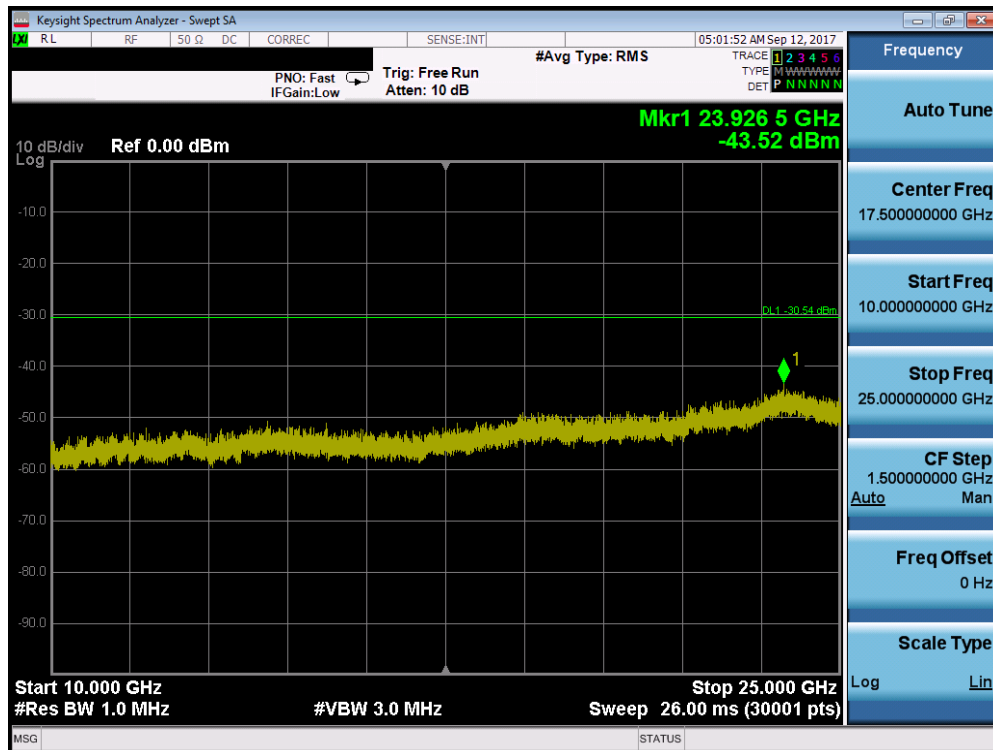


Plot 7-40. Conducted Spurious Plot (EX600-WLYB1, Ch. 39)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 41 of 61



Plot 7-41. Conducted Spurious Plot (EX600-WLYB1, Ch. 78)



Plot 7-42. Conducted Spurious Plot (EX600-WLYB1, Ch. 78)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01.AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 42 of 61

7.9 Radiated Spurious Emission Measurements – Above 1 GHz

§15.247(d) §15.205 & §15.209; RSS-Gen [8.9]

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-7 per Section 15.209 and RSS-Gen (8.9).

Frequency	Field Strength [$\mu\text{V/m}$]	Measured Distance [Meters]
Above 960.0 MHz	500	3

Table 7-7. Radiated Limits

Test Procedures Used

ANSI C63.10-2013 – Section 6.6.4.3
KDB 558074 D01 v05 – Sections 8.6, 8.7

Test Settings

Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = power average (RMS)
5. Number of measurement points = 1001 (Number of points must be $\geq 2 \times \text{span/RBW}$)
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 43 of 61

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

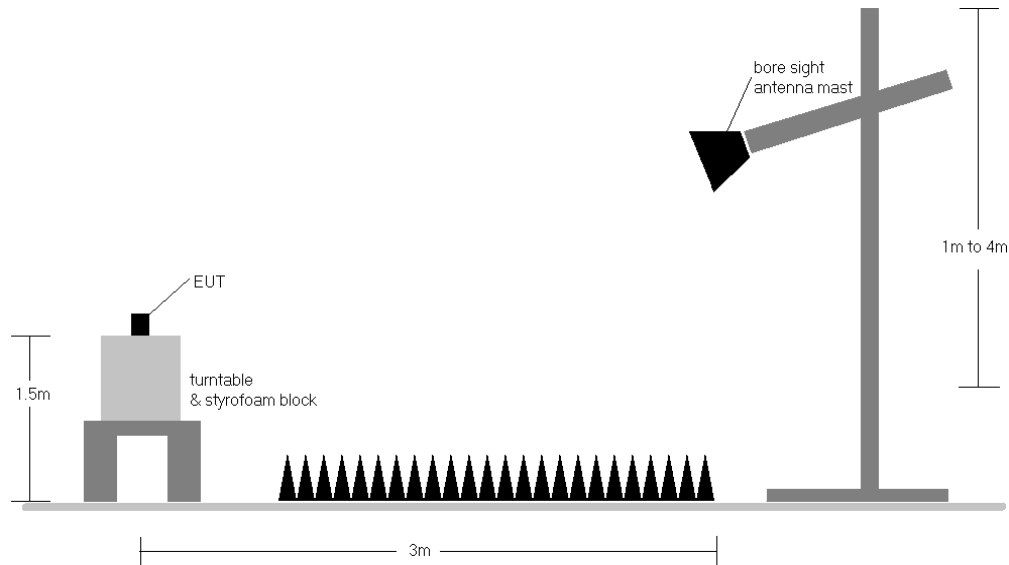


Figure 7-8. Test Instrument & Measurement Setup

Test Notes

1. The optional test procedures for antenna port conducted measurements of unwanted emissions per the guidance of KDB 558074 D01 v05 were not used to evaluate this device for compliance to radiated limits. All radiated spurious emissions levels were measured in a radiated test setup.
2. All emissions lying in restricted bands specified in Section 15.205 and Section 8.10 of RSS-Gen are below the limit shown in Table 7-7.
3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
4. This unit was tested while powered by an DC power source.
5. The spectrum is measured from 9kHz to the 10th 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. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
6. Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
7. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section.
8. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

Sample Calculations

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2102080008-01.AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 44 of 61

Determining Spurious Emissions Levels

- Field Strength Level $[\text{dB}\mu\text{V/m}] = \text{Analyzer Level } [\text{dBm}] + 107 + \text{AFCL } [\text{dB/m}] + \text{Duty Cycle Correction } [\text{dB}]$
- $\text{AFCL } [\text{dB/m}] = \text{Antenna Factor } [\text{dB/m}] + \text{Cable Loss } [\text{dB}]$
- $\text{Margin } [\text{dB}] = \text{Field Strength Level } [\text{dB}\mu\text{V/m}] - \text{Limit } [\text{dB}\mu\text{V/m}]$

Radiated Band Edge Measurement Offset

- The amplitude offset shown in the radiated restricted band edge plots in Section 7.9 was calculated using the formula:

$$\text{Offset (dB)} = (\text{Antenna Factor} + \text{Cable Loss} + \text{Attenuator}) - \text{Preamplifier Gain}$$

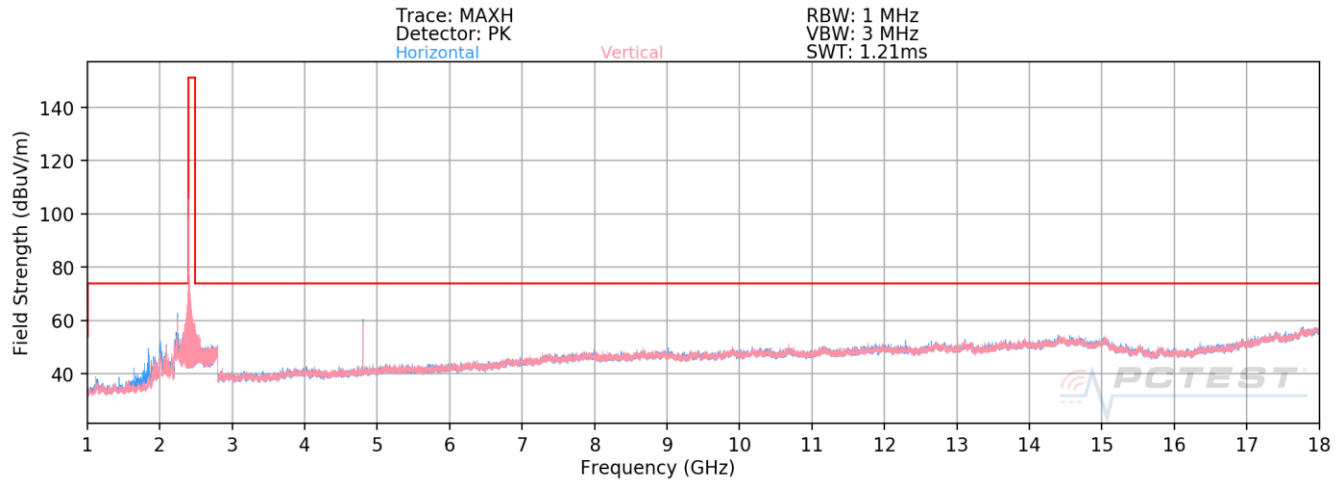
Duty Cycle Correction Factor Calculation

- Number of times transmitter hits on one channel = 1 time(s) / 100ms
- Worst case dwell time = 1.2ms
- Duty Cycle Correction Factor = $20\log_{10}(1.2\text{ms}/100\text{ms}) = -38.42 \text{ dB}$

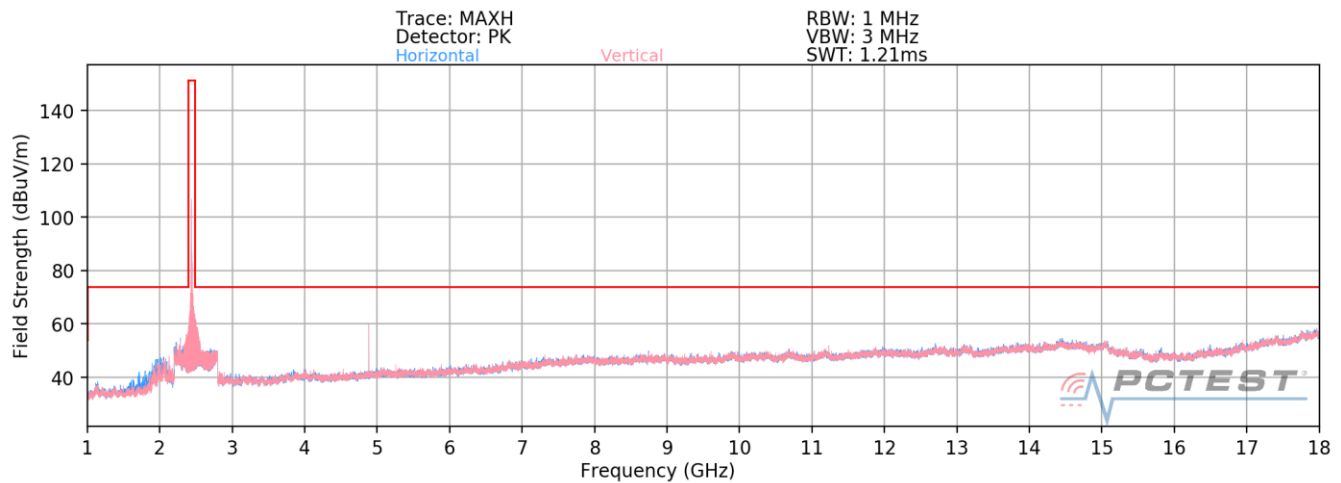
FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 45 of 61

7.9.1 EX600-WLXB1 Radiated Spurious Emission Measurements

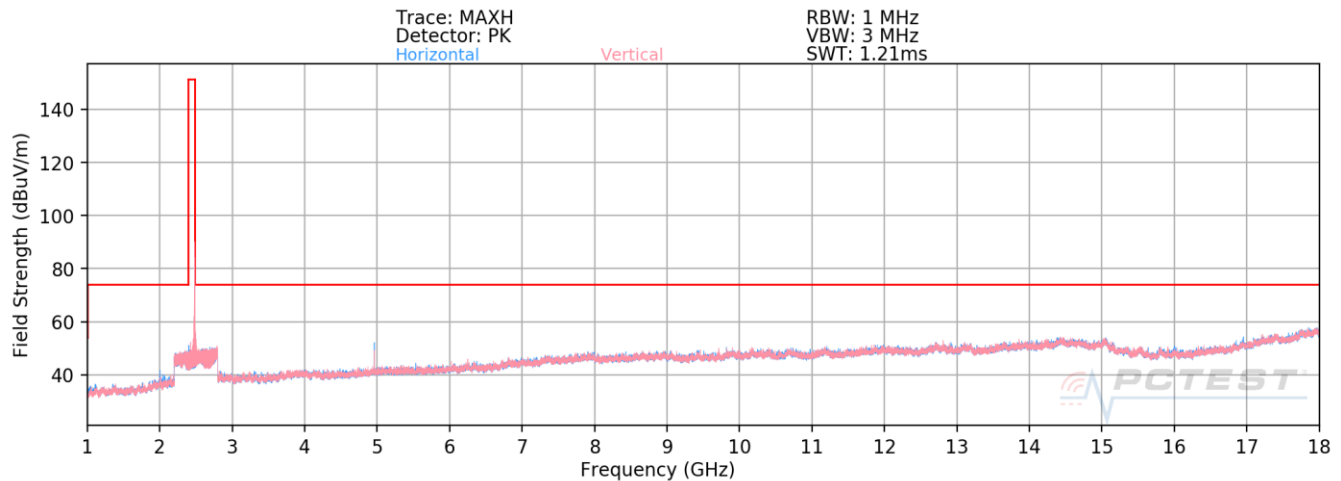
§15.247(d) §15.205 & §15.209; RSS-Gen [8.9]



Plot 7-43. Radiated Spurious Plot above 1GHz (EX600-WLXB1 – CH0)



Plot 7-44. Radiated Spurious Plot above 1GHz (EX600-WLXB1 – CH39)

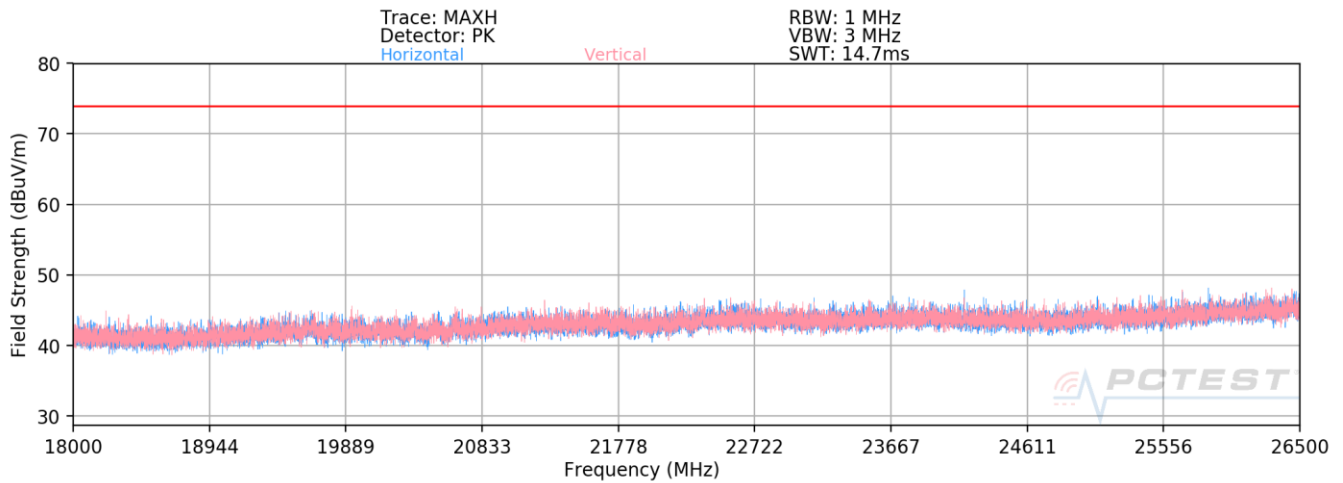


Plot 7-45. Radiated Spurious Plot above 1GHz (WLXB1 – CH78)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 46 of 61

EX600-WLXB1 Radiated Spurious Emissions Measurements (Above 18GHz)

§15.209; RSS-Gen [8.9]



Plot 7-46. Radiated Spurious Plot above 18GHz EX600-WLXB1

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 47 of 61

EX600-WLXB1 Radiated Spurious Emission Measurements

§15.247(d) §15.205 & §15.209; RSS-Gen [8.9]

Distance of Measurements: 3 Meters
Operating Frequency: 2403MHz
Channel: 0

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	DCCF [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4806.00	Avg	H	107	38	-57.57	6.53	-38.42	17.55	53.98	-36.43
4806.00	Peak	H	107	38	-50.88	6.53	-38.42	24.24	73.98	-49.74
12015.00	Avg	H	-	-	-80.88	17.66	0.00	43.78	53.98	-10.20
12015.00	Peak	H	-	-	-68.73	17.66	0.00	55.93	73.98	-18.05
19224.00	Avg	H	-	-	-66.98	-6.13	0.00	33.89	53.98	-20.09
19224.00	Peak	H	-	-	-56.88	-6.13	0.00	43.99	73.98	-29.99

Table 7-8. Radiated Measurements EX600-WLXB1

Distance of Measurements: 3 Meters
Operating Frequency: 2442MHz
Channel: 39

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	DCCF [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4884.00	Avg	H	102	313	-59.97	6.89	-38.42	15.51	53.98	-38.47
4884.00	Peak	H	102	313	-51.92	6.89	-38.42	23.56	73.98	-50.42
7326.00	Avg	H	-	-	-80.05	12.42	0.00	39.37	53.98	-14.61
7326.00	Peak	H	-	-	-69.44	12.42	0.00	49.98	73.98	-24.00
12210.00	Avg	H	-	-	-80.83	18.47	0.00	44.64	53.98	-9.34
12210.00	Peak	H	-	-	-69.76	18.47	0.00	55.71	73.98	-18.27
19536.00	Avg	H	-	-	-66.47	-5.84	0.00	34.69	53.98	-19.29
19536.00	Peak	H	-	-	-56.02	-5.84	0.00	45.14	73.98	-28.84

Table 7-9. Radiated Measurements EX600-WLXB1

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	 PCTEST [®] Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 48 of 61

Distance of Measurements: 3 Meters
Operating Frequency: 2481MHz
Channel: 78

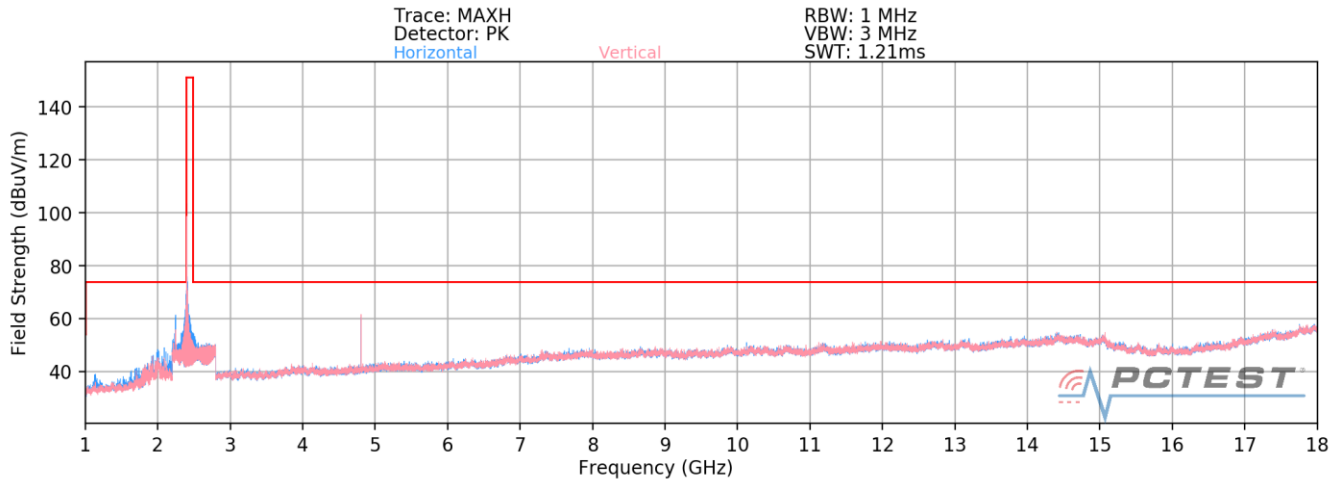
Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	DCCF [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4962.00	Avg	H	115	23	-68.49	6.79	-38.42	6.88	53.98	-47.10
4962.00	Peak	H	115	23	-59.62	6.79	-38.42	15.75	73.98	-58.23
7443.00	Avg	H	-	-	-80.20	12.48	0.00	39.28	53.98	-14.70
7443.00	Peak	H	-	-	-67.69	12.48	0.00	51.79	73.98	-22.19
12405.00	Avg	H	-	-	-81.27	18.31	0.00	44.04	53.98	-9.94
19848.00	Avg	H	-	-	-67.39	-5.96	0.00	33.65	53.98	-20.33
19848.00	Peak	H	-	-	-56.84	-5.96	0.00	44.20	73.98	-29.78

Table 7-10. Radiated Measurements EX600-WLXB1

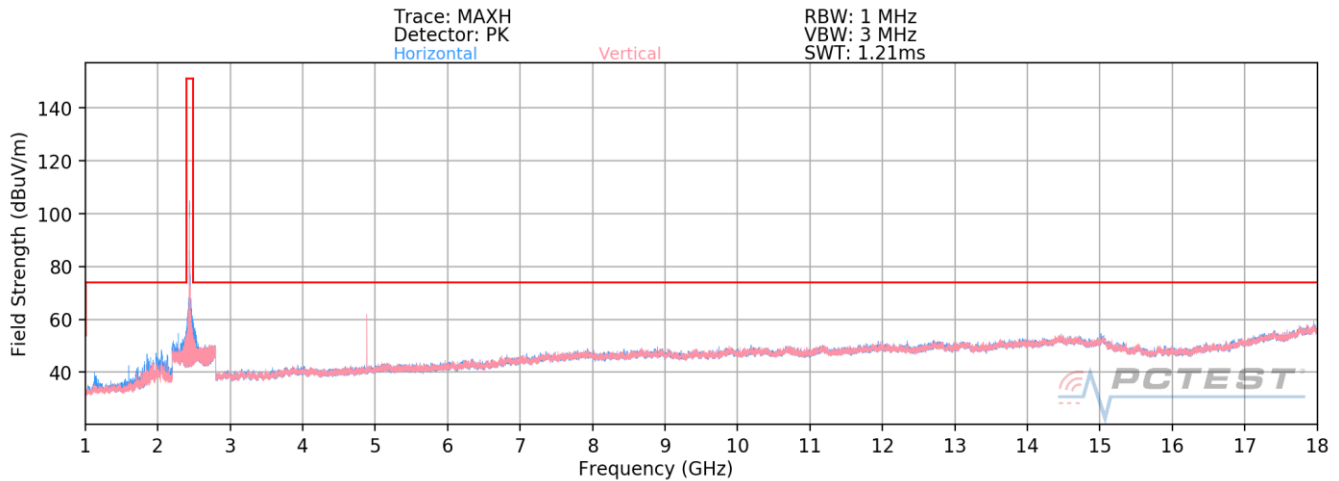
FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 49 of 61

7.9.2 EX600-WLYB1 Radiated Spurious Emission Measurements

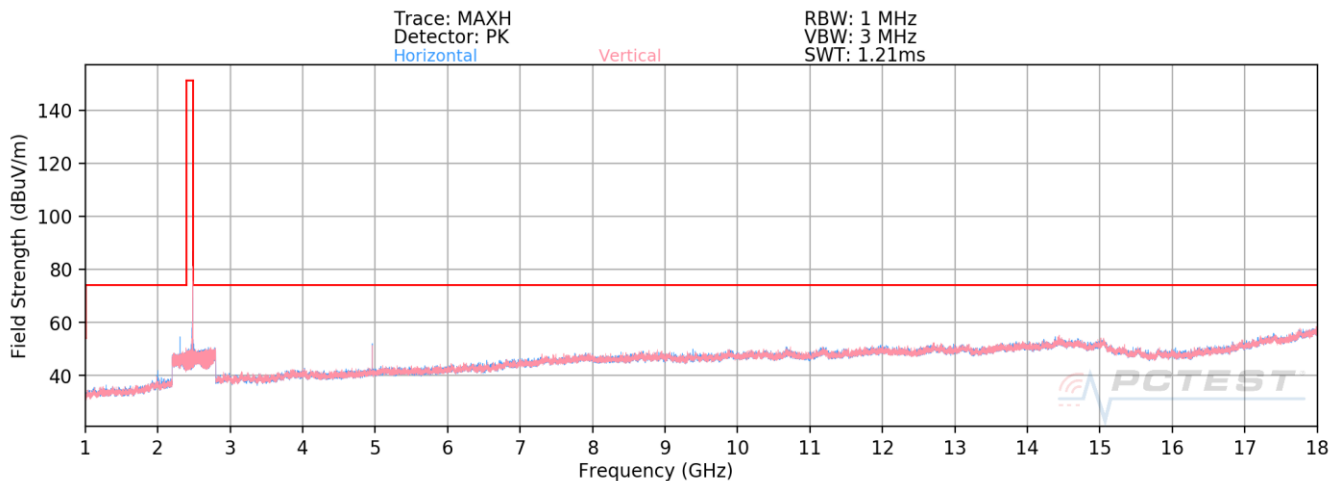
\$15.247(d) \$15.205 & \$15.209; RSS-Gen [8.9]



Plot 7-47. Radiated Spurious Plot above 1GHz (EX600-WLYB1 – CH0)



Plot 7-48. Radiated Spurious Plot above 1GHz (EX600-WLYB1 – CH39)

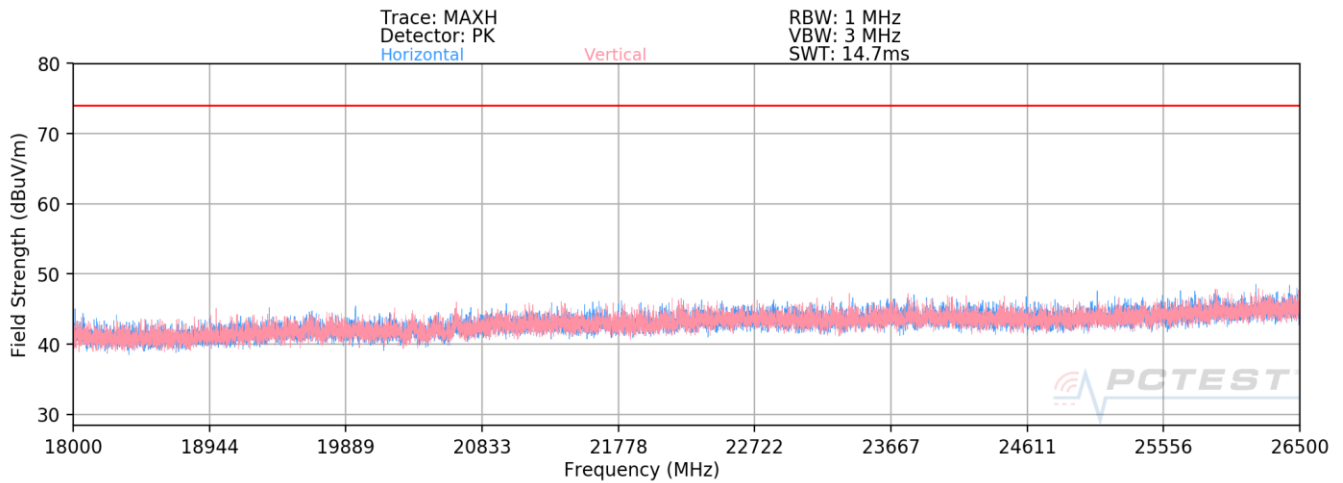


Plot 7-49. Radiated Spurious Plot above 1GHz (EX600-WLYB1 – CH78)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01.AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 50 of 61

EX600-WLYB1 Radiated Spurious Emissions Measurements (Above 18GHz)

§15.209; RSS-Gen [8.9]



Plot 7-50. Radiated Spurious Plot above 18GHz EX600-WLYB1

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 51 of 61

EX600-WLYB1 Radiated Spurious Emission Measurements

§15.247(d) §15.205 & §15.209; RSS-Gen [8.9]

Distance of Measurements: 3 Meters
Operating Frequency: 2403MHz
Channel: 0

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	DCCF [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4806.00	Avg	H	323	179	-57.28	3.39	-38.42	14.69	53.98	-39.29
4806.00	Peak	H	323	179	-50.31	3.39	-38.42	21.66	73.98	-52.32
12015.00	Avg	H	-	-	-81.36	14.62	0.00	40.26	53.98	-13.72
12015.00	Peak	H	-	-	-70.61	14.62	0.00	51.01	73.98	-22.97
19224.00	Avg	H	-	-	-66.42	-6.13	0.00	34.45	53.98	-19.53
19224.00	Peak	H	-	-	-56.52	-6.13	0.00	44.35	73.98	-29.63

Table 7-11. Radiated Measurements EX600-WLYB1

Distance of Measurements: 3 Meters
Operating Frequency: 2442MHz
Channel: 39

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	DCCF [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4884.00	Avg	H	111	339	-53.52	3.45	-38.42	18.51	53.98	-35.47
4884.00	Peak	H	111	339	-46.44	3.45	-38.42	25.59	73.98	-48.39
7326.00	Avg	H	-	-	-79.60	9.37	0.00	36.77	53.98	-17.21
7326.00	Peak	H	-	-	-67.95	9.37	0.00	48.42	73.98	-25.56
12210.00	Avg	H	-	-	-80.99	13.86	0.00	39.87	53.98	-14.11
12210.00	Peak	H	-	-	-70.56	13.86	0.00	50.30	73.98	-23.68
19536.00	Avg	H	-	-	-66.65	-5.84	0.00	34.51	53.98	-19.47
19536.00	Peak	H	-	-	-55.86	-5.84	0.00	45.30	73.98	-28.68

Table 7-12. Radiated Measurements EX600-WLYB1

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	 PCTEST [®] Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 52 of 61

Distance of Measurements: 3 Meters
Operating Frequency: 2481MHz
Channel: 78

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	DCCF [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4962.00	Avg	H	134	154	-68.56	3.80	-38.42	3.83	53.98	-50.15
4962.00	Peak	H	134	154	-60.03	3.80	-38.42	12.36	73.98	-61.62
7443.00	Avg	H	-	-	-79.68	9.00	0.00	36.32	53.98	-17.66
7443.00	Peak	H	-	-	-68.21	9.00	0.00	47.79	73.98	-26.19
12405.00	Avg	H	-	-	-81.54	13.63	0.00	39.09	53.98	-14.89
12405.00	Peak	H	-	-	-70.66	13.63	0.00	49.97	73.98	-24.01
19848.00	Avg	H	-	-	-67.28	-5.96	0.00	33.76	53.98	-20.22
19848.00	Peak	H	-	-	-57.78	-5.96	0.00	43.26	73.98	-30.72

Table 7-13. Radiated Measurements EX600-WLYB1

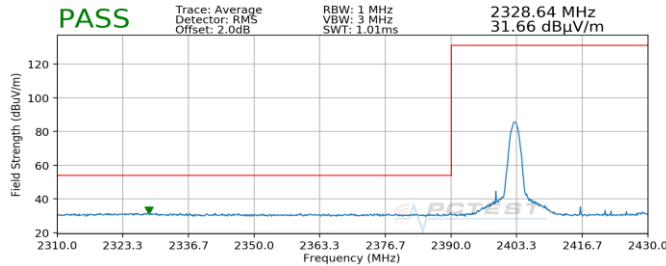
FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	 PCTEST Proud to be part of  element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 53 of 61

7.9.3 EX600-WLXB1 Radiated Restricted Band Edge Measurements

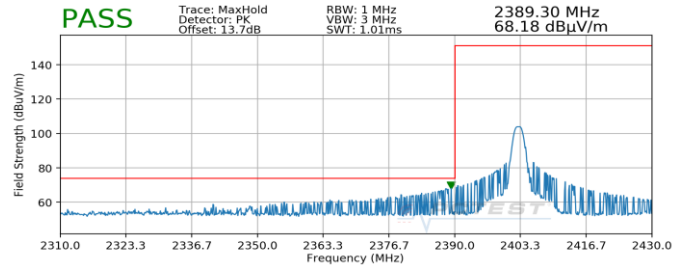
\$15.205 \$15.209; RSS-Gen [8.9]

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.

Distance of Measurements: 3 Meters
Operating Frequency: 2403MHz
Channel: 0

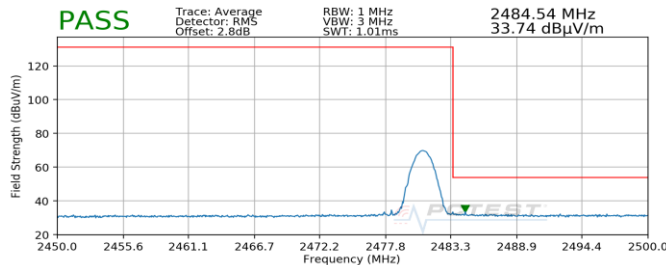


Plot 7-51. Radiated Restricted Lower Band Edge Measurement (Average)

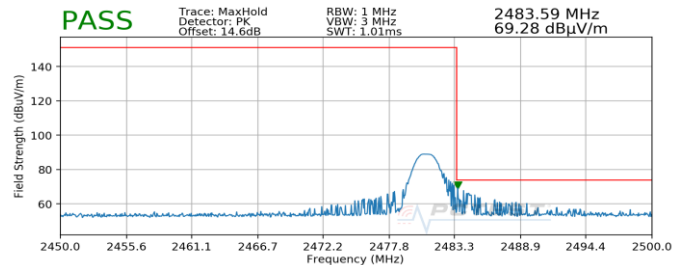


Plot 7-52. Radiated Restricted Lower Band Edge Measurement (Peak)

Distance of Measurements: 3 Meters
Operating Frequency: 2481MHz
Channel: 78



Plot 7-53. Radiated Restricted Upper Band Edge Measurement (Average)



Plot 7-54. Radiated Restricted Upper Band Edge Measurement (Peak)

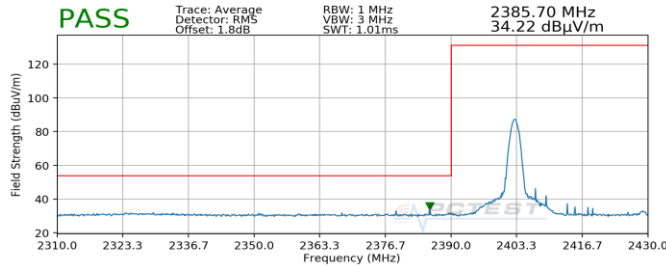
FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
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7.9.4 EX600-WLYB1 Radiated Restricted Band Edge Measurements

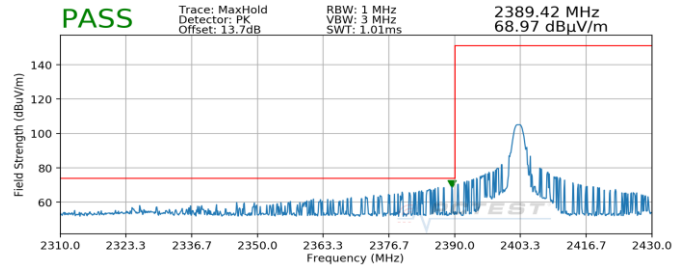
\$15.205 \$15.209; RSS-Gen [8.9]

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.

Distance of Measurements: 3 Meters
Operating Frequency: 2403MHz
Channel: 0

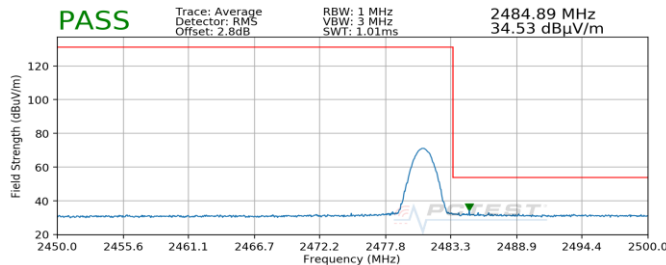


Plot 7-55. Radiated Restricted Lower Band Edge Measurement (Average)

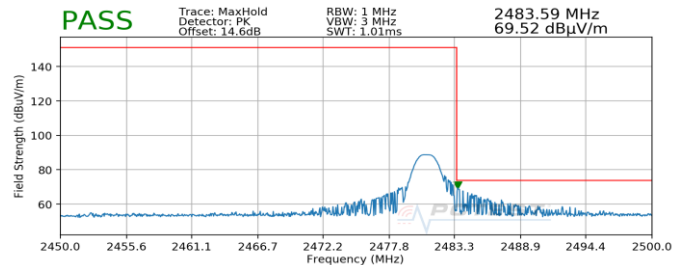


Plot 7-56. Radiated Restricted Lower Band Edge Measurement (Peak)

Distance of Measurements: 3 Meters
Operating Frequency: 2481MHz
Channel: 78



Plot 7-57. Radiated Restricted Upper Band Edge Measurement (Average)



Plot 7-58. Radiated Restricted Upper Band Edge Measurement (Peak)

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 55 of 61

7.10 Radiated Spurious Emissions Measurements – Below 1GHz

§15.205 §15.209; RSS-Gen [8.9]

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-14 per Section 15.209 and RSS-Gen (8.9).

Frequency	Field Strength [μV/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 7-14. Radiated Limits

Test Procedures Used

ANSI C63.10-2013

Test Settings

Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	 PCTEST [®] Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Test Setup

The EUT and measurement equipment were set up as shown in the diagrams below.

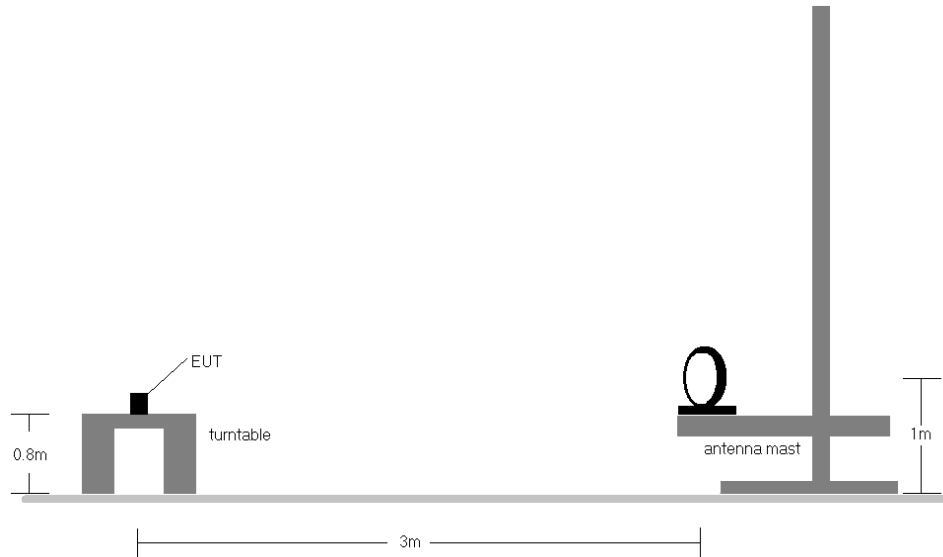


Figure 7-9. Radiated Test Setup < 30Mhz

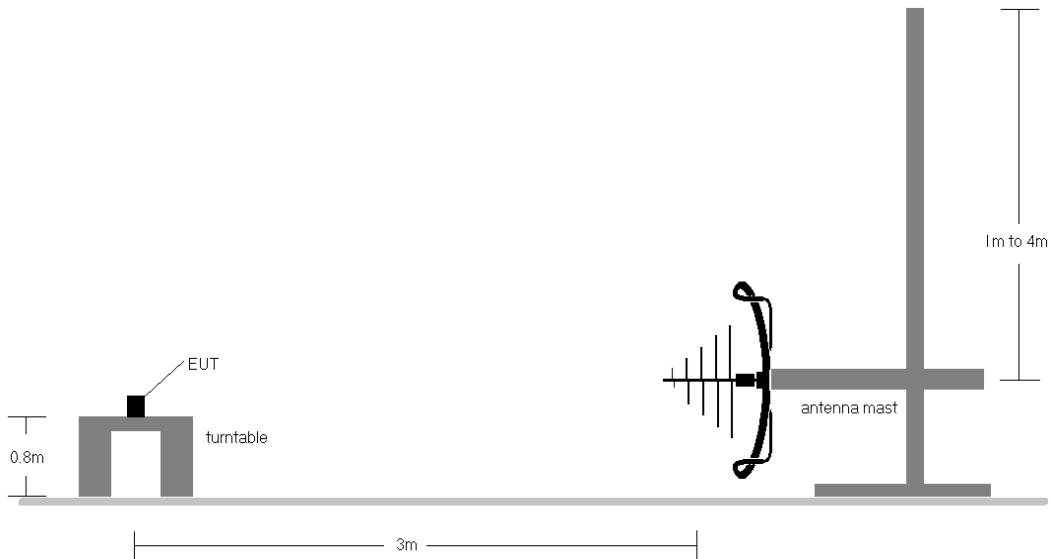


Figure 7-10. Radiated Test Setup < 1GHz

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 57 of 61

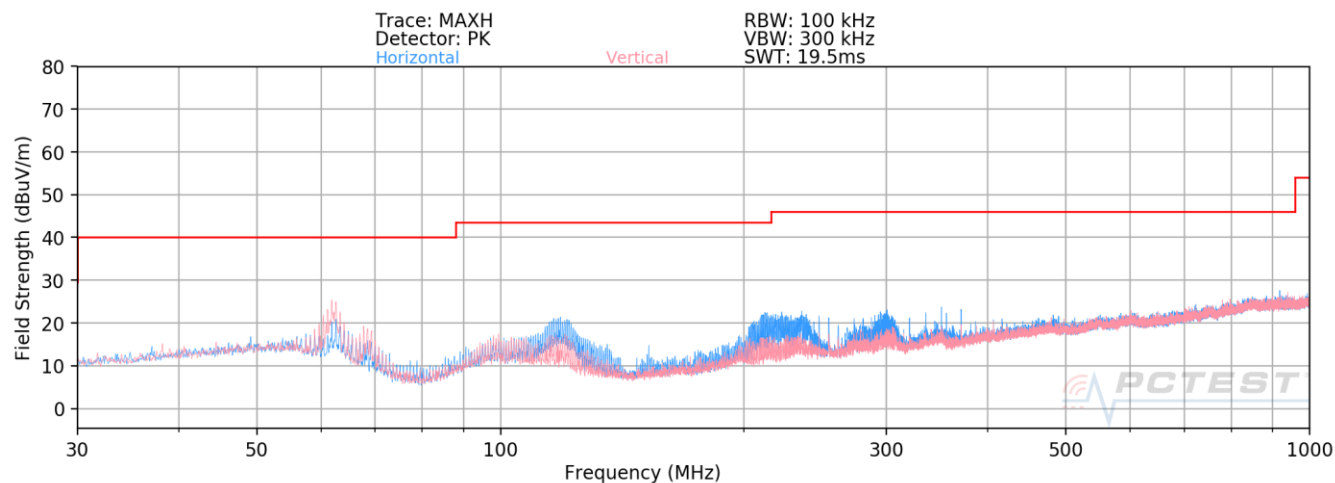
Test Notes

1. All emissions lying in restricted bands specified in §15.205 and RSS-Gen(8.10) are below the limit shown in Table 7-14.
2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes.
3. This unit was tested while powered by an DC power source.
4. The spectrum is investigated using a peak detector and final measurements are recorded using CISPR quasi peak detector. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
5. Emissions were measured at a 3 meter test distance.
6. Emissions are investigated while operating on the center channel of the mode, band, and modulation that produced the worst case results during the transmitter spurious emissions testing.
7. No spurious emissions were detected within 20dB of the limit below 30MHz.
8. The results recorded using the broadband antenna is known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.
9. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. There were no emissions detected in the 30MHz – 1GHz frequency range, as shown in the subsequent plots.

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)			Approved by: Technical Manager
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EX600-WLXB1 Radiated Spurious Emissions Measurements (Below 1GHz)

§15.205 §15.209; RSS-Gen [8.9]



Plot 7-59. Radiated Spurious Plot below 1GHz EX600-WLXB1

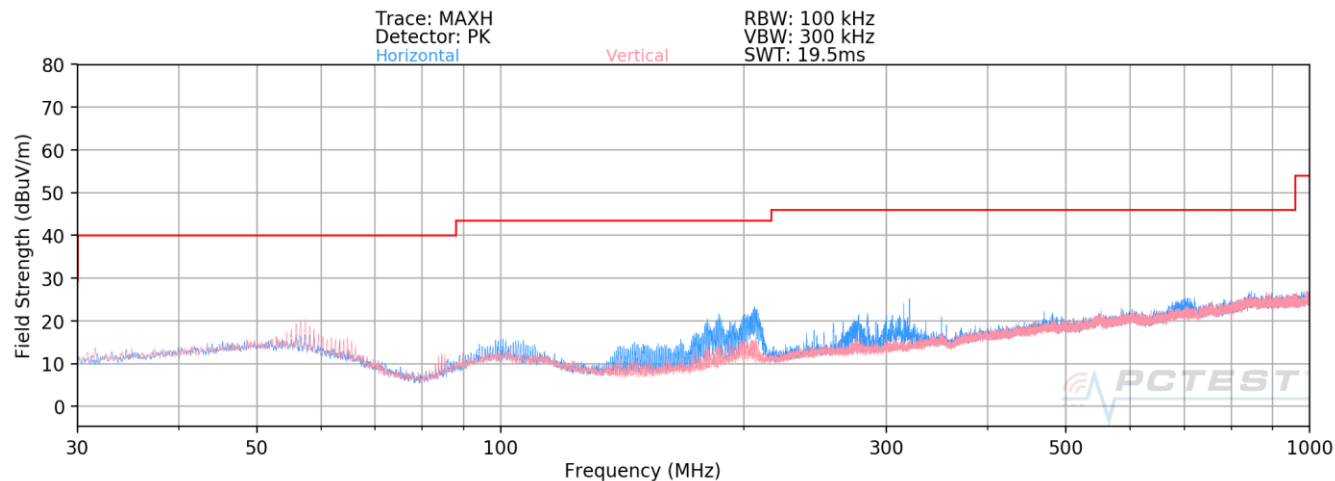
Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
62.52	Quasi-Peak	V	102	139	-68.32	-15.86	22.82	40.00	-17.18
118.62	Quasi-Peak	H	141	114	-65.22	-17.76	24.02	43.52	-19.50
213.77	Quasi-Peak	H	-	-	-84.73	-16.01	6.26	43.52	-37.26
300.61	Quasi-Peak	H	122	261	-71.83	-13.61	21.56	46.02	-24.46
355.76	Quasi-Peak	H	104	87	-78.14	-12.41	16.45	46.02	-29.57
918.48	Quasi-Peak	H	-	-	-87.57	-2.82	16.61	46.02	-29.41

Table 7-15. Radiated Spurious Emissions below 1GHz EX600-WLXB1

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 59 of 61

EX600-WLYB1 Radiated Spurious Emissions Measurements (Below 1GHz)

§15.205 §15.209; RSS-Gen [8.9]



Plot 7-60. Radiated Spurious Plot below 1GHz EX600-WLYB1

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
57.37	Quasi-Peak	V	106	127	-74.61	-14.68	17.71	40.00	-22.29
186.11	Quasi-Peak	H	151	202	-73.16	-17.14	16.70	43.52	-26.83
206.02	Quasi-Peak	H	127	217	-75.43	-16.52	15.05	43.52	-28.48
277.26	Quasi-Peak	H	104	75	-83.30	-14.26	9.44	46.02	-36.58
320.21	Quasi-Peak	H	104	102	-74.55	-13.11	19.34	46.02	-26.68
701.74	Quasi-Peak	H	112	259	-78.53	-5.84	22.63	46.02	-23.39

Table 7-16. Radiated Spurious Emissions below 1GHz EX600-WLYB1

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SMC	Approved by: Technical Manager
Test Report S/N: 1M2102080008-01-AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 60 of 61

8.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **SMC Wireless I/O Device FCC ID: 2AJE7SMC-WEX05** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules and RSS-247 of the Innovation, Science and Economic Development Canada Rules.

FCC ID: 2AJE7SMC-WEX05 IC ID: 21344-WEX05		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2102080008-01.AJE7	Test Dates: 2/26/2021 - 3/2/2021	EUT Type: Wireless I/O Device		Page 61 of 61