Amber Helm Development L.C.
92723 Michigan Hwy-152
Sister Lakes, Michigan 49047 USA
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PBCRCM-WR2422TXA
Issued: **August 22, 2024**

DTS Test Report

regarding

USA: CFR Title 47, Part 15.247 (Emissions)
Canada: ISED RSS-247v3 (Emissions)

for

CRCM1101B1

Category: Reader Control Module

Judgments:
Aligns with FCC Part 15.247 and ISED RSS-247v3
Testing Completed: July 1, 2024

TESTING
NVLAP LAB CODE 200129-0

Prepared for:

PassiveBolt, Inc.

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Date of Issue: August 22, 2024

Revision History

Rev. No.	Date	Details	Revised By
r0	August 22, 2024	Initial Draft.	J. Nantz
r1	September 10, 2024	Minor changes.	J. Brunett
r2	October 7, 2024	Minor changes.	J. Nantz

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1 Test Report Scope and Limitations

1.1 Laboratory Authorization

Test Facility description and attenuation characteristics are on file with the FCC Laboratory, Columbia, Maryland (FCC Reg. No: US5348 and US5356) and with ISED Canada, Ottawa, ON (File Ref. No: 3161A and 24249). Amber Helm Development L.C. holds accreditation under NVLAP Lab Code 200129-0.

1.2 Report Retention

For equipment verified to comply with the regulations herein, the manufacturer is obliged to retain this report with the product records for the life of the product, and no less than ten years. A copy of this Report will remain on file with this laboratory until September 2034.

1.3 Subcontracted Testing

This report does not contain data produced under subcontract.

1.4 Test Data

This test report contains data included within the laboratory's scope of accreditation. Any data in this report that is not covered under the laboratory's scope is clearly identified.

1.5 Limitation of Results

The test results contained in this report relate only to the item(s) tested. Any electrical or mechanical modification made to the test item subsequent to the test date shall invalidate the data presented in this report. Any electrical or mechanical modification made to the test item subsequent to this test date shall require reevaluation.

1.6 Copyright

1.7 Endorsements

This report shall not be used to claim product endorsement by any accrediting, regulatory, or governmental agency.

1.8 Test Location

The EUT was fully tested by **Amber Helm Development L.C.**, headquartered at 92723 Michigan Hwy-152, Sister Lakes, Michigan 49047 USA. Table 1.8.0 lists all sites employed herein. Specific test sites utilized are also listed in the test results sections of this report where needed.

Table 1.8.0 Test Site List.

Description	Location	Quality Num.
OATS (3 meter)	3615 E Grand River Rd., Williamston, Michigan 48895	OATSC

1.9 Traceability and Equipment Used

Pertinent test equipment used for measurements at this facility is listed in Table 1.9.0 . The quality system employed at Amber Helm Development L.C. has been established to ensure all equipment has a clearly identifiable classification, calibration expiry date, and that all calibrations are traceable to the SI through NIST, other recognized national laboratories, accepted fundamental or natural physical constants, ratio type of calibration, or by comparison to consensus standards. All equipment is evaluated on a cycle no greater than 12 months following laboratory validation procedures and is calibrated following manufacturer recommended intervals.

Table 1.9.0 Equipment List.

Description	Manufacturer/Model	SN	Quality Num.	Cal/Ver By / Date Due
Biconical	EMCO / 93110B	9802-3039	BICEMCO01	Keysight / Aug-2025
Log Periodic Antenna	EMCO / 3146	9305-3614	LOGEMCO01	Keysight / Aug-2025
BNC-BNC Coax	WRTL / RG58/U	001	CAB001-BLACK	AHD / March-2025
3.5-3.5MM Coax	Coax / Coax	001	CAB018-WHT	AHD / March-2025
Spectrum Analyzer	R & S / FSV30	101660	RSFSV3001	RS / Apr-2025
Spectrum Analyzer	R & S / FPC1500	101692	RSFPC15001	RS / Feb-2025
Quad Ridge Horn	Singer / A6100	C35200	HQR1TO18S01	Keysight / Aug-2025
K-Band Horn	JEF / NRL Std.	001	HRNK01	AHD / On Use
6dB Attenuator	Pasternack / PE7087-6	1	ATTEN01	AHD / On-Use
LISN	Solar / 8012-50-R-24-BNC	970917	LISNB	AHD / March-2025

2 Test Specifications and Procedures

2.1 Test Specification and General Procedures

The goal of PassiveBolt, Inc. is to demonstrate that the Equipment Under Test (EUT) complies with the Rules and/or Directives below. Detailed in this report are the results of testing the PassiveBolt, Inc. CRCM1101B1 for compliance to:

Country/Region/Manu.	**Rules or Directive**	**Referenced Section(s)**
United States	Code of Federal Regulations	CFR Title 47, Part 15.247
Canada	ISED Canada	ISED RSS-247v3

It has been determined that the equipment under test is subject to the rules and directives above at the date of this testing. In conjunction with these rules and directives, the following specifications and procedures are followed herein to demonstrate compliance (in whole or in part) with these regulations.

ANSI C63.4:2014	"Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"
ANSI C63.10:2013	"American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices"
KDB 558074 D01 v05r02	"GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES "
KDB 662911 D01v02r01	"Emissions Testing of Transmitters with Multiple Outputs in the Same Band"
KDB 662911 D02 v01	"MIMO with Cross-Polarized Antenna"
WR-ITP0102RA	"AHD Internal Document - Radiated Emissions Test Method"
WR-ITP0101LC	"AHD Internal Document - Conducted Emissions Test Method"
ICES-003; Issue 7 (2020)	"Information Technology Equipment (ITE) - Limits and methods of measurement"

3 Configuration and Identification of the Equipment Under Test

3.1 Description and Declarations

The EUT is radio gateway module for use in electronic access systems. The EUT is approximately 4.5 x 4.5 x 1 cm in dimension, and is depicted in Figure 3.1.0 . It is powered by 5 Vdc host power system. This device is a modular radio intended to be installed into electronic access products. Table 3.1.0 outlines provider declared EUT specifications.

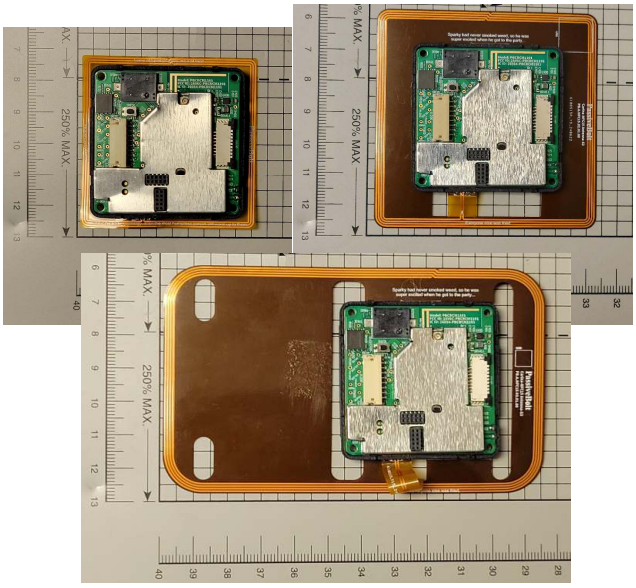


Figure 3.1.0 Photos of EUT.

Table 3.1.0 EUT Declarations.

General Declarations	
Equipment Type:	Reader Control Module
Country of Origin:	USA
Nominal Supply:	5 Vdc
Oper. Temp Range:	Not Declared
Frequency Range:	2402 – 2480 MHz
Antenna Dimension:	Not Declared
Antenna Type:	Integral PCB Trace
Antenna Gain:	Not declared
Number of Channels:	40
Channel Spacing:	2 MHz
Alignment Range:	Not Declared
Type of Modulation:	GFSK (0.125, 0.500, 1, and 2Mbps)
United States	
FCC ID Number:	2AV6C-CRCM1101B1
Classification:	DTS
Canada	
IC Number:	26054-CRCM1101B1
Classification:	Remote Control Device

3.1.1 EUT Configuration

The EUT is configured for testing as depicted in Figure 3.1.1 .

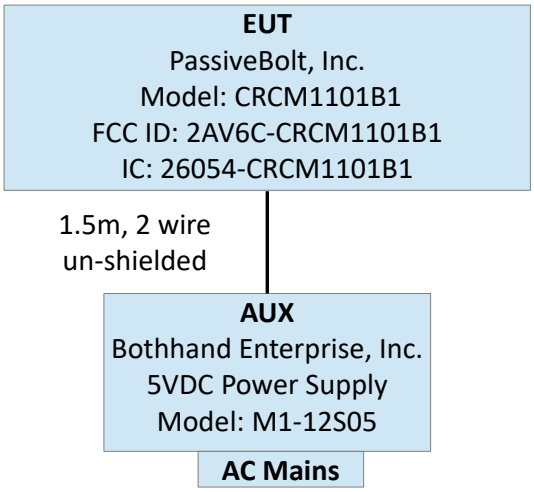


Figure 3.1.1 EUT Test Configuration Diagram.

3.1.2 Modes of Operation

The EUT includes a single onboard DTS BLE radio capable of 125k LE Coded, 500k LE Coded, 1 MBps, and 2 MBps modulations, all of which are tested herein. In addition to its BLE radio functionality, the EUT is also co-located with an onboard 13.56 MHz NFC radio (addressed in AHD Report No.PBCRCM-WR2422TXB) and a 125 kHz LF radio (addressed in AHD Report No.PBCRCM-WR2422TXC). Spurious emissions from the EUT's digital electronics as well as AC conducted emissions when employing a representative AC power adapter are reported herein with all radios active. The integral BLE + NFC or BLE + LF radios are all capable of simultaneous transmission, however the NFC and LF radios are not capable of simultaneous operation. All radios are set to actively transmit while the EUT is fully tested.

3.1.3 Variants

There is only a single version of the EUT, but the NFC tag reader may be populated by 3 different NFC antennas. All three were evaluated and the worst case emissions including all antenna variants are reported herein.

3.1.4 Test Samples

Two samples of the EUT were provided for testing, one modified for BLE conducted measurements via a u.fl. connection (SN: 2CA7742EE299) and one normal sample without modification (SN: 7446B3EB8FE8). Both samples were capable of CW and modulated BLE radio transmissions via a paired mobile application (PDQ Dev, version 2.1.2). This product also includes an NFC 13.56 MHz and a LF 125kHz tag reader circuit. Emissions with all three NFC antenna variants and the LF reader antenna populated are reported herein.

3.1.5 Functional Exerciser

Normal operating EUT functionality was verified by observation of transmitted signal.

3.1.6 Modifications Made

There were no modifications made to the EUT by this laboratory. Manufacturer specified 5 dBm BLE power setting was used for testing.

3.1.7 Production Intent

The EUT appears to be a production ready sample.

3.1.8 Declared Exemptions and Additional Product Notes

The EUT is a module, subject to further compliance evaluation in every host access product into which it may be employed. The manufacturer provides host integration instructions in compliance with FCC KDB 996369 D04 Module Integration Guide v02.

4 Emissions

4.1 General Test Procedures

4.1.1 Radiated Test Setup and Procedures

Radiated electromagnetic emissions from the EUT are first pre-scanned in our screen room. Spectrum and modulation characteristics of all emissions are recorded. Instrumentation, including spectrum analyzers and other test equipment as detailed in Section 1.8 are employed. After pre-scan, emission measurements are made on the test site of record. If the EUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in relevant test standards are followed. Alternatively, a layout closest to normal use (as declared by the provider) is employed if the resulting emissions appear to be worst-case in such a configuration. See Figure 4.1.1 . All intentionally radiating elements that are not fixed-mounted in use are placed on the test table lying flat, on their side, and on their end (3-axes) and the resulting worst case emissions are recorded. If the EUT is fixed-mounted in use, measurements are made with the device oriented in the manner consistent with installation and then emissions are recorded. If the EUT exhibits spurious emissions due to internal receiver circuitry, such emissions are measured with an appropriate carrier signal applied.

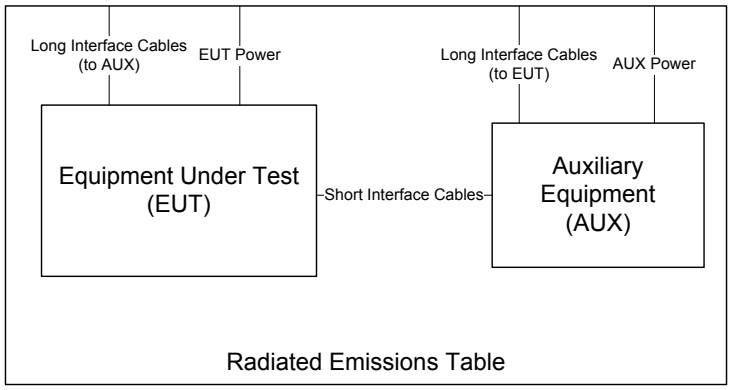


Figure 4.1.1 Radiated Emissions Diagram of the EUT.

For devices with intentional emissions below 30 MHz, a shielded loop antenna and/or E-field and H-Field broadband probes are used depending on the regulation. Shielded loops are placed at a 1 meter receive height at the desired measurement distance. For exposure in this band, 10cm diameter single-axis broadband probes meeting the requirements of ISED SPR-002 section 5.2 are employed. Measurements are repeated and summed over three axes, and the entire frequency range is measured with and without the EUT transmitting.

Emissions between 30 MHz and 1 GHz are measured using calibrated broadband antennas. For both horizontal and vertical polarizations, the test antenna is raised and lowered from 1 to 4 m in height until a maximum emission level is detected. The EUT is then rotated through 360^o in azimuth until the highest emission is detected. The test antenna is then raised and lowered one last time from 1 to 4 m and the worst case value is recorded. Emissions above 1 GHz are characterized using standard gain or broadband ridge-horn antennas on our OATS with a 4×5 m rectangle of ECCOSORB absorber covering the OATS ground screen and a 1.5m table height. Care is taken to ensure that test receiver resolution and video bandwidths meet the regulatory requirements, and that the emission bandwidth of the EUT is not reduced. Photographs of the test setup employed are depicted in Figure 4.1.1 .

Where regulations allow for direct measurement of field strength, power values (dBm) measured on the test receiver / analyzer are converted to dBμV/m at the regulatory distance, using

$$E_{dist} = 107 + P_R + K_A - K_G + K_E - C_F$$

where P_R is the power recorded on spectrum analyzer, in dBm, K_A is the test antenna factor in dB/m, K_G is the combined pre-amplifier gain and cable loss in dB, K_E is duty correction factor (when applicable) in dB, and C_F is a distance conversion (employed only if limits are specified at alternate distance) in dB. This field strength value is then compared with the regulatory limit. If effective isotropic radiated power (EIRP) is computed, it is computed as

$$EIRP(dBm) = E_{3m}(dB\mu V/m) - 95.2.$$

When presenting data at each frequency, the highest measured emission under all possible EUT orientations (3-axes) is reported.

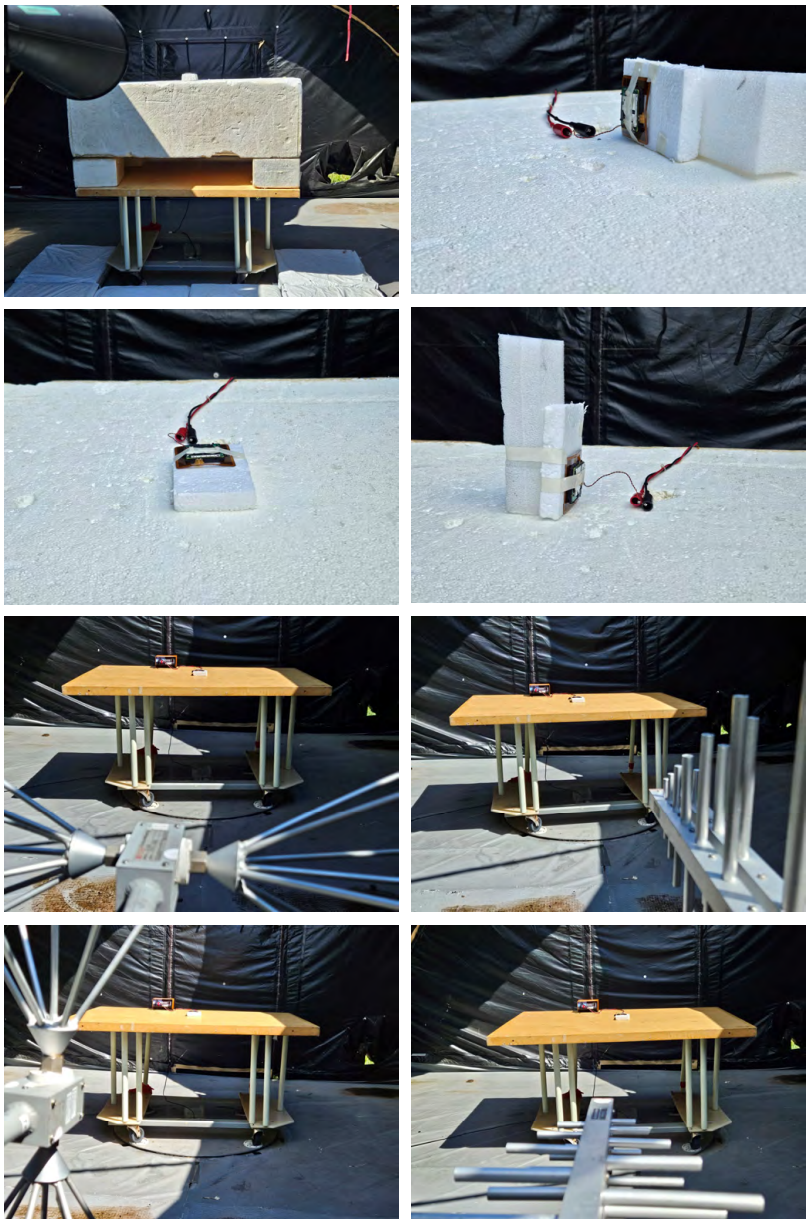


Figure 4.1.1 Radiated Emissions Test Setup Photograph(s).

4.1.2 Conducted Emissions Test Setup and Procedures

AC Port Conducted Spurious Spurious emissions from the EUT AC power port(s) are measured in our screen room. The EUT and auxiliary equipment are configured as prescribed by the standard. A layout most representative of actual use may be employed if the resulting emissions appear to be worst-case in such a configuration. Conducted emissions are measured and recorded for each AC mains port over the range of frequencies mandated in the standard, and on each conductor. The test receiver first measures peak emissions, after which worst case emissions are measured using quasi-peak and average detection if emissions approach the regulatory limit. See Figure 4.1.2 . Photographs of the test setup employed are depicted in Figure 4.1.2 .

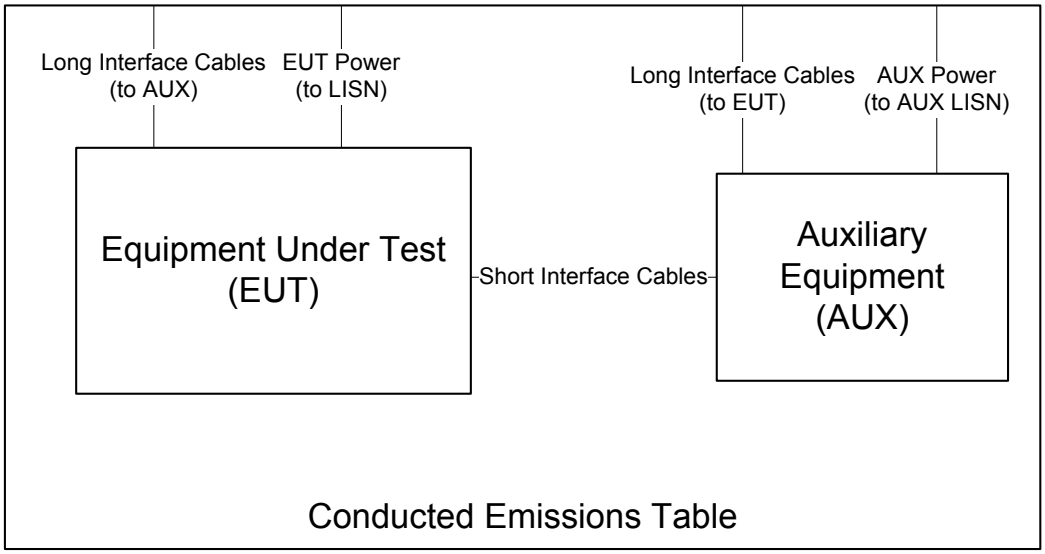


Figure 4.1.2 AC Conducted Emissions Setup Diagram of the EUT.

Figure 4.1.2 AC Conducted Emissions Test Setup Photograph(s).

4.1.3 Power Supply Variation

Tests at extreme supply voltages are made if required by the procedures specified in the test standard, and results of this testing are detailed in this report.

In the case of this EUT, measurements of the worst-case radiated emissions are performed with the supply voltage varied by no less than 85% and 115% of the nominal rated value for devices connecting to AC power mains.

4.2 Intentional Emissions

4.2.1 Duty and Transmission Cycle, Pulsed Operation

The details and results of testing the EUT for pulsed operation are summarized in Table 4.2.1 . Plots showing the measurements made to obtain these values are provided in Figure 4.2.1 .

Table 4.2.1 Pulsed Emission Characteristics (Duty Cycle).

Test Date: 1-Jul-24
Test Engineer: John Nantz
EUT PassiveBolt CRCM1101B1
Meas. Distance: Conducted

	Test Mode Pulsed Operation / Average Measurement Duty Cycle							
R0	Mode	Data Rate Mbps	Voltage V	Oper. Freq MHz	Pulse Length	Pulse Period	Duty Cycle %	Power Duty Correction dB
R1	BLE	0.125	5.0	2440.0	1.0	1.0	100.0	0.0
R2		0.500	5.0	2440.0	1.0	1.0	100.0	0.0
R3		1.000	5.0	2440.0	1.0	1.0	100.0	0.0
R4		2.000	5.0	2440.0	1.0	1.0	100.0	0.0
#	C1	C3	C4	C5	C6	C7	C8	C9

(ROW)	(COLUMN)	NOTE
R0	C8	Duty Cycle is measured in line with DTS guidance 558074 D01 v5 r02 section 6(b) for averaging only over full-power transmission pulses.

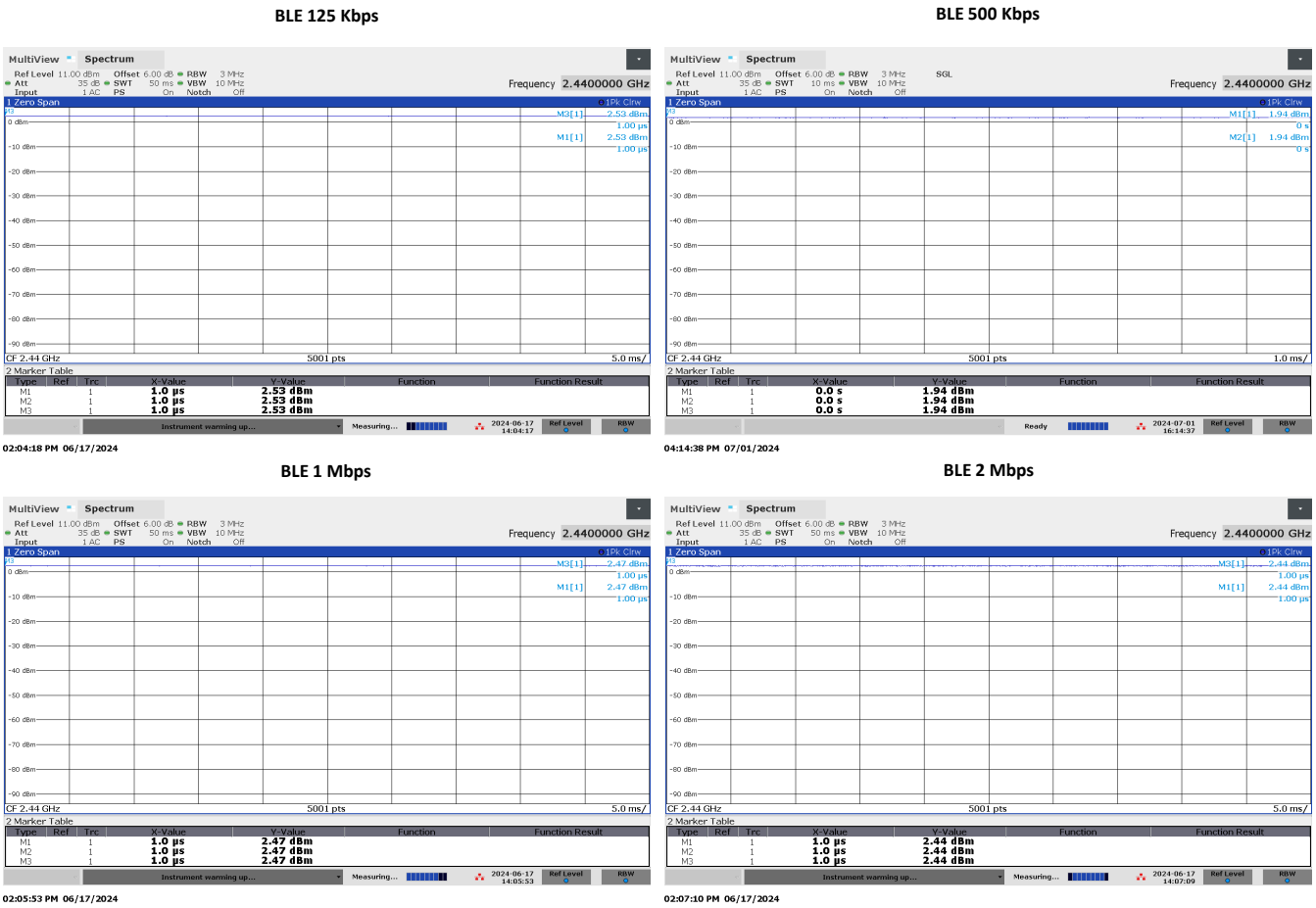


Figure 4.2.1 Example Pulsed Emission Characteristics (Duty Cycle).

4.2.2 Fundamental Emission Bandwidth

Emission bandwidth (EBW) of the EUT is measured with the device placed in the test mode(s) with the shortest available packet length and minimum packet spacing. Radiated emissions are recorded following the test procedures listed in Section 2.1. The 6 dB bandwidth is measured for the lowest, middle, and highest channels available. The 99% emission bandwidth per IC test procedures is also reported. The results of this testing are summarized in Table 4.2.2 . Plots showing measurements employed obtain the emission bandwidths reported are provided in Figure 4.2.2 .

Table 4.2.2 Intentional Emission Bandwidth.

Test Date: 1-Jul-24
Test Engineer: John Nantz
EUT: PassiveBolt CRCM1101B1
Meas. Distance: Conducted

	Occupied Bandwidth								
R0	Transmit Mode	Data Rate (Mbps)	Voltage (V)	Oper. Freq (MHz)	6 dB BW (MHz)	6 dB BW Limit (MHz)	99% OBW (MHz)	20 dB BW (MHz)	Pass/Fail
R1	BLE-LR	0.125	6.0	2402.0	0.718	0.500	1.086	1.228	Pass
R2				2440.0	0.718	0.500	1.082	1.224	Pass
R3				2480.0	0.722	0.500	1.087	1.222	Pass
R4	BLE-LR	0.500	6.0	2402.0	0.694	0.500	1.106	1.269	Pass
R5				2440.0	0.704	0.500	1.107	1.274	Pass
R6				2480.0	0.704	0.500	1.113	1.279	Pass
R7	BLE	1.000	6.0	2402.0	0.716	0.500	1.103	1.273	Pass
R8				2440.0	0.719	0.500	1.101	1.269	Pass
R9				2480.0	0.727	0.500	1.111	1.280	Pass
R10	BLE	2.000	6.0	2402.0	1.412	0.500	2.062	2.418	Pass
R11				2440.0	1.395	0.500	2.053	2.400	Pass
R12				2480.0	1.395	0.500	2.050	2.410	Pass
#	C1	C2	C3	C4	C5	C6	C7	C8	C9

ROW	COLUMN	NOTE
R1-R12	C5	DTS Bandwidth measured with RBW = 100 kHz per ANSI C63.10, section 11.8.1

BLE 125 Kbps **BLE 500 Kbps**

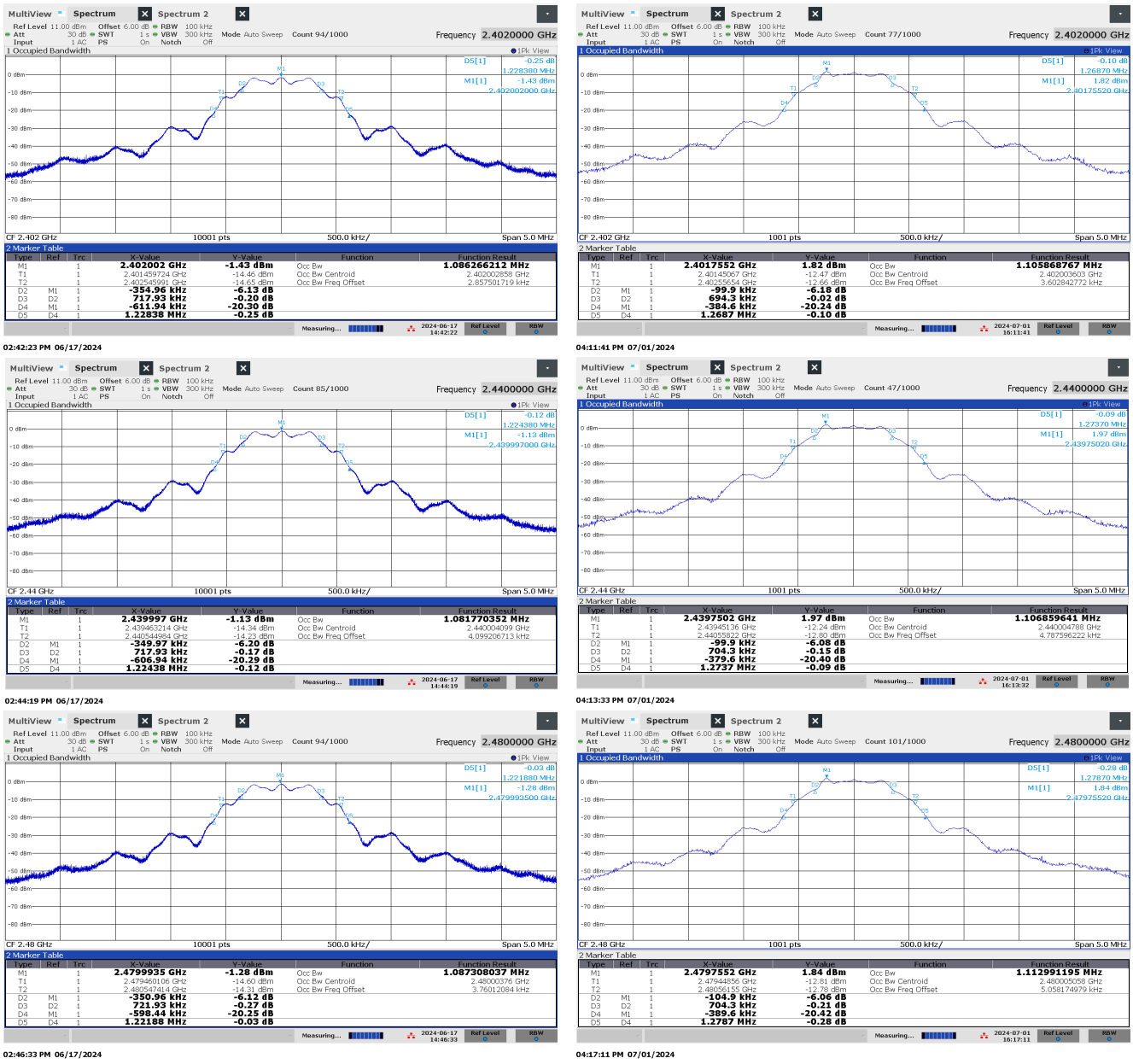
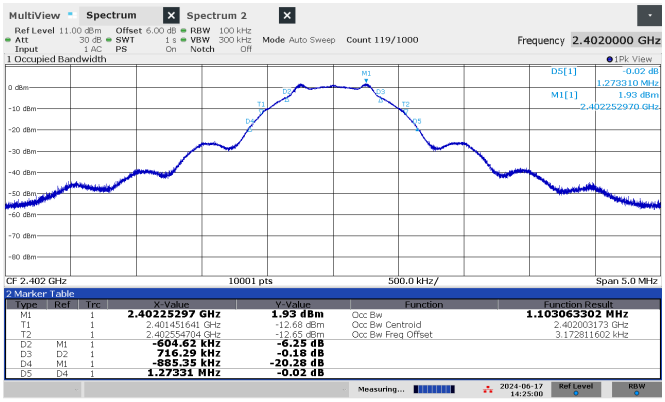
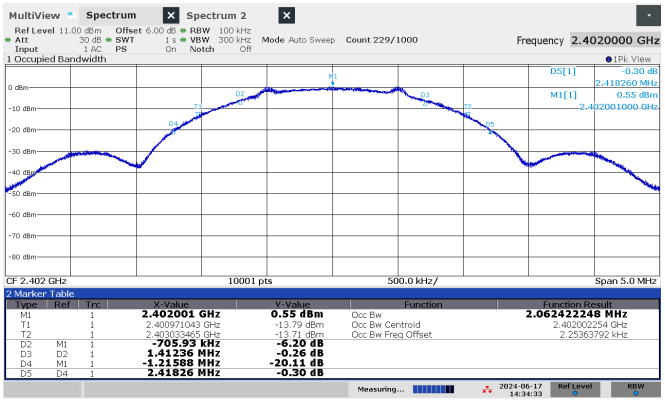
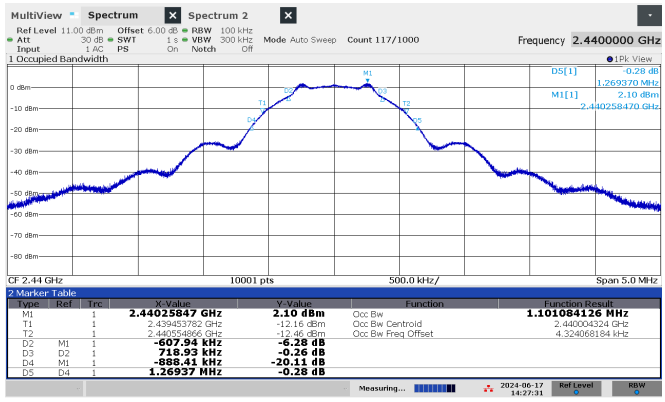


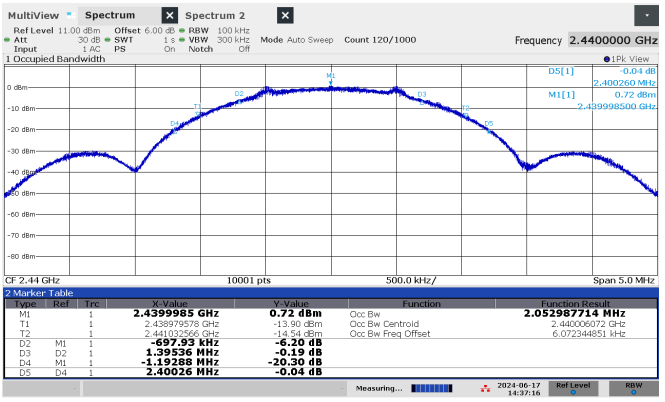
Figure 4.2.2 (i) Example Intentional Emission Bandwidth Plots.

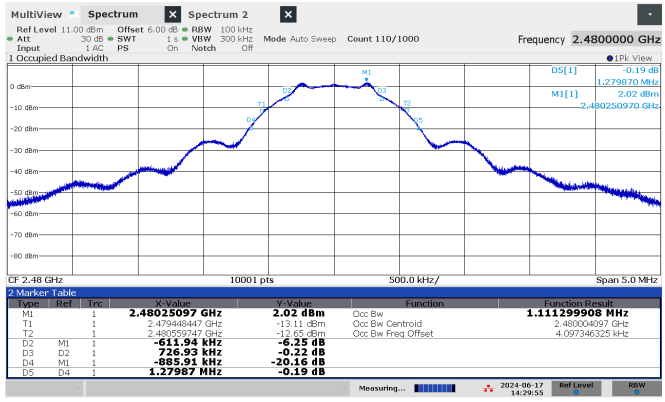
BLE 1 Mbps **BLE 2 Mbps**











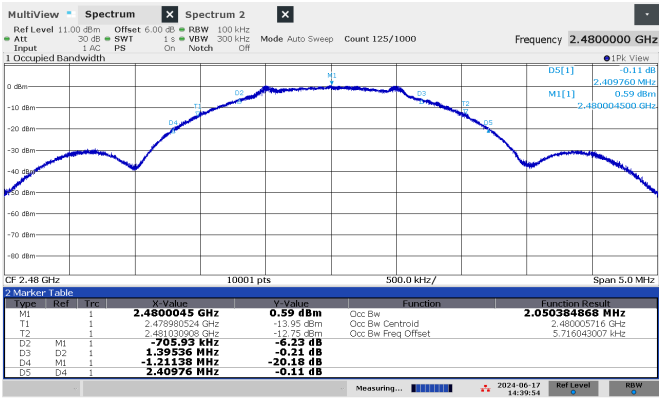


Figure 4.2.2 (ii) Example Intentional Emission Bandwidth Plots.

4.2.3 Effective Isotropic Radiated Power

The EUT's radiated power is computed from antenna port conducted power measurements and the gain of the EUT antenna(s). Where the EUT is not sold with an antenna connector, a modified product has been provided including such. The results of this testing are summarized in Table 4.2.3 . Peak conducted output power was

Table 4.2.3 Radiated Power Results.

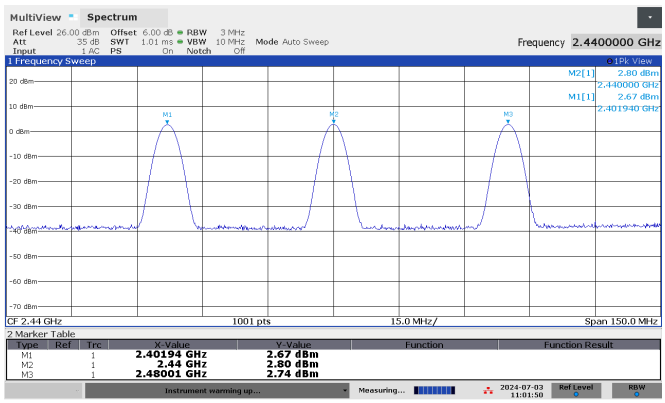
Test Date: 1-Jul-24
Test Engineer: John Nantz
EUT: PassiveBolt CRCM1101B1
Meas. Distance: Radiated 3m

	Fundamental Power															
R0	Mode	Channel	Freq. MHz	Ant Used	Ant Pol.	Ka dB/m	Kg dB	E3m (Pk) dBuV/m	EIRP (Pk) dBm	Pout (Pk) dB	Ant Gain (Measured) dBi	Duty dBm	EIRP (Avg) dBm	EIRP (Avg) Limit dBm	Pass dB	Comments
R1	BLE (125KBPS)	0	2402.0	HQR1TO18S01	H/V	21.5	-0.3	98.5	3.3	2.7	0.6	0.0	3.3	36.0	32.7	Max all orientations
R2		19	2440.0	HQR1TO18S01	H/V	21.5	-0.3	97.4	2.2	2.8	-0.6	0.0	2.2	36.0	33.8	Max all orientations
R3		39	2480.0	HQR1TO18S01	H/V	21.5	-0.3	96.0	0.8	2.7	-2.0	0.0	.8	36.0	35.2	Max all orientations
R4	BLE (500KBPS)	0	2402.0	HQR1TO18S01	H/V	21.5	-0.3	98.4	3.2	2.5	0.7	0.0	3.2	36.0	32.8	Max all orientations
R5		19	2440.0	HQR1TO18S01	H/V	21.5	-0.3	97.4	2.2	2.6	-0.4	0.0	2.2	36.0	33.8	Max all orientations
R6		39	2480.0	HQR1TO18S01	H/V	21.5	-0.3	96.0	0.8	2.5	-1.8	0.0	.8	36.0	35.2	Max all orientations
R7	BLE (1MBPS)	0	2402.0	HQR1TO18S01	H/V	21.5	-0.3	98.5	3.3	2.6	0.7	0.0	3.3	36.0	32.7	Max all orientations
R8		19	2440.0	HQR1TO18S01	H/V	21.5	-0.3	97.7	2.5	2.7	-0.2	0.0	2.5	36.0	33.5	Max all orientations
R9		39	2480.0	HQR1TO18S01	H/V	21.5	-0.3	96.7	1.5	2.6	-1.2	0.0	1.5	36.0	34.5	Max all orientations
R10	BLE (2MBPS)	0	2402.0	HQR1TO18S01	H/V	21.5	-0.3	98.8	3.6	2.5	**1.1**	0.0	3.6	36.0	**32.4**	Max all orientations
R11		19	2440.0	HQR1TO18S01	H/V	21.5	-0.3	98.1	2.9	2.7	0.2	0.0	2.9	36.0	33.1	Max all orientations
R12		39	2480.0	HQR1TO18S01	H/V	21.5	-0.3	96.0	0.8	2.6	-1.8	0.0	.8	36.0	35.2	Max all orientations
#	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16

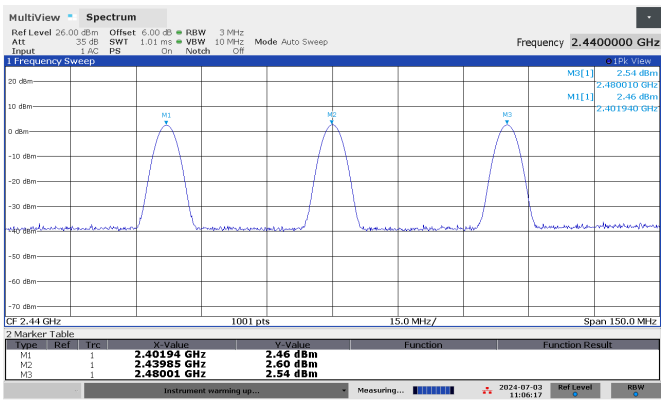
(ROW)	(COLUMN)	NOTE
R0	C8	Peak measured field strength at 3 meters on OATS. Antenna and cable factors are included in SA reported data.
R0	C9	EIRP (Pk) is computed from measured field strength: FS (3m Pk) - 95.2 = EIRP (Pk)
R0	C10	Maximum peak conducted output power measured following DTS Guidance 558074 D01 v5 r02 Section 8.3.1.1
R0	C11	Antenna gain measured following ANSI C63.10, section 11.3 procedure. Worst case measured antenna gain is 1.1dBi.
R0	C13	EIRP (Avg) is computed measured radiated EIRP (Pk) - Duty factor
R0	C8	Peak measured field strength at 3 meters on OATS. Antenna and cable factors are included in SA reported data.
R0	C9	EIRP (Pk) computed from measured field strength: (FS (3m) - 95.2 = EIRP (Pk)

measured directly from the EUT at the port where the antenna attaches. The test receiver bandwidth was set to be greater than the measured emission bandwidth of the EUT to capture the true peak. Antenna gain is either provided directly by the manufacturer or measured by comparison between calculated EIRP and conducted output power. Plots showing conducted measurements made are depicted in Figure 4.2.3 .

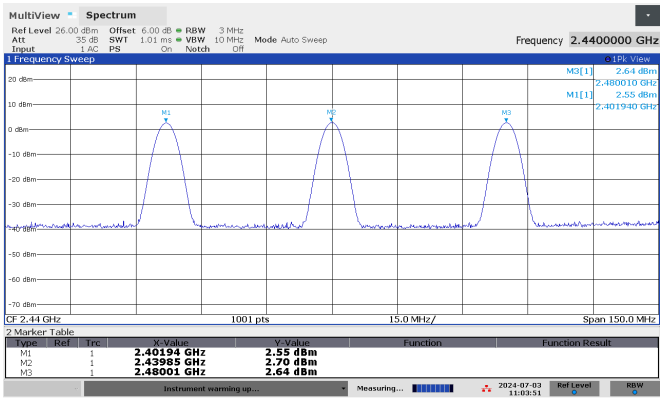
BLE 125 Kbps



BLE 500 Kbps



BLE 1 Mbps



BLE 2 Mbps

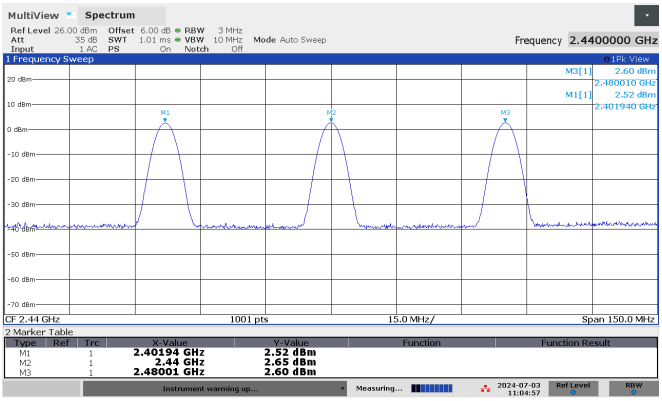


Figure 4.2.3 Conducted RF Power Plots

4.2.4 Power Spectral Density

For this test, the EUT was attached directly to the test receiver. Following FCC DTS measurement procedures, the emission spectrum is first scanned for maximum spectral peaks, the span and receiver bandwidth are then reduced until the power spectral density is measured in the prescribed receiver bandwidth. The results of this testing are summarized in Table 4.2.4 . Plots showing how these measurements were made are depicted in Figure 4.2.4 .

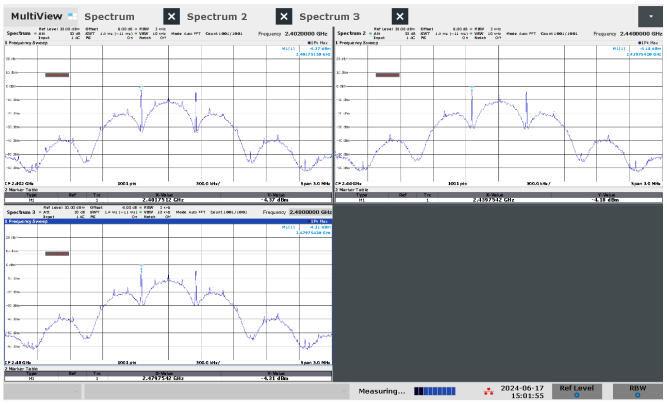
Table 4.2.4 Power Spectral Density Results.

Frequency Range	**Detector**	**IF Bandwidth**	**Video Bandwidth**	**Test Date:**	1-Jul-24
2400-2483.5	Pk	3 kHz	10 kHz	**Test Engineer:**	John Nantz
				EUT:	PassiveBolt CRCM1101B1
				Meas. Distance:	Conducted

3kHz Power Spectral Density							
R0	Mode	Channel	Frequency (MHz)	Ant. Used	PSDcond (meas) (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass By (dB)
R1	BLE (125KBPS)	0	2402.0	Cond.	-4.4	8.00	12.4
R2		19	2440.0	Cond.	-4.2	8.00	12.2
R3		39	2480.0	Cond.	-4.3	8.00	12.3
R4	BLE (500KBPS)	0	2402.0	Cond.	-7.7	8.00	15.7
R5		19	2440.0	Cond.	-7.5	8.00	15.5
R6		39	2480.0	Cond.	-8.4	8.00	16.4
R7	BLE (1MBPS)	0	2402.0	Cond.	-8.1	8.00	16.1
R8		19	2440.0	Cond.	-7.9	8.00	15.9
R9		39	2480.0	Cond.	-8.0	8.00	16.0
R10	BLE (2MBPS)	0	2402.0	Cond.	-11.5	8.00	19.5
R11		19	2440.0	Cond.	-11.4	8.00	19.4
R12		39	2480.0	Cond.	-11.2	8.00	19.2
#	C1	C2	C3	C4	C5	C6	C7

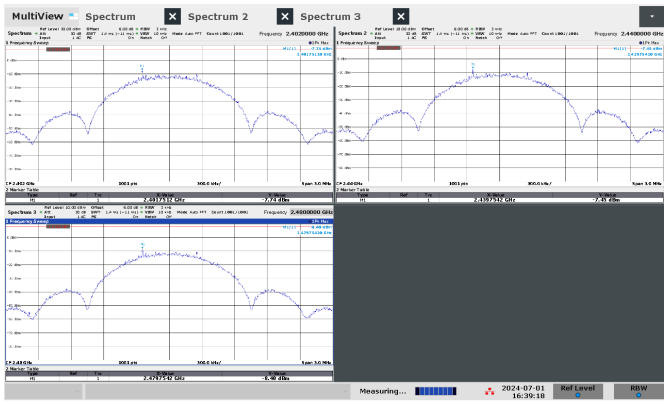
(ROW)	(COLUMN)	NOTES
R0	C5	PSD measured conducted out the EUT antenna port following ANSI C63.10, 11.10.2

BLE 125 Kbps



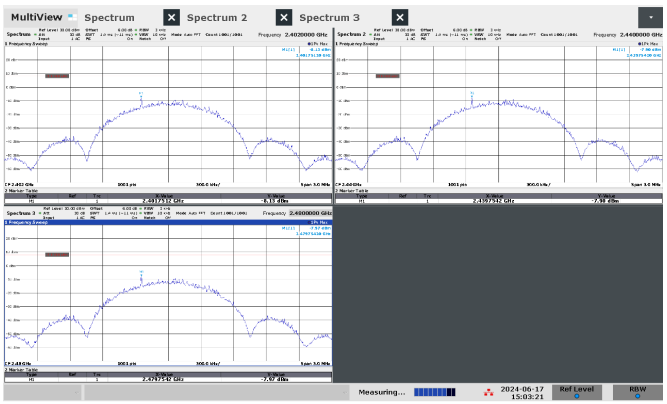
03:01:56 PM 06/17/2024

BLE 500 Kbps



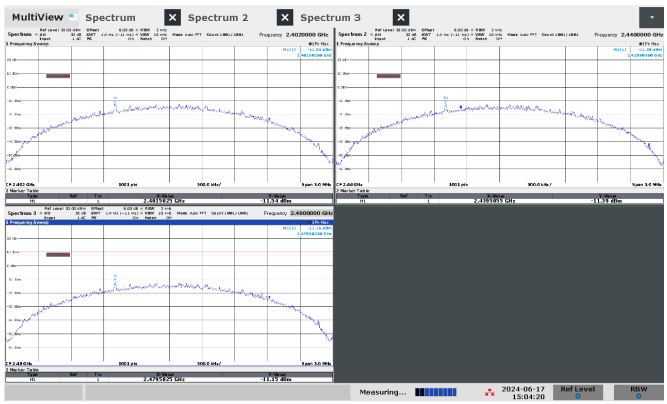
04:39:18 PM 07/01/2024

BLE 1 Mbps



03:03:21 PM 06/17/2024

BLE 2 Mbps



03:04:21 PM 06/17/2024

Figure 4.2.4 Power Spectral Density Plots.

4.3 Unintentional Emissions

4.3.1 Restricted Band Transmit Chain Spurious Emissions

The results for the measurement of transmit chain spurious emissions at the nominal voltage and temperature are provided in Table 4.3.1 . Measurements are performed to 10 times the highest fundamental operating frequency.

Table 4.3.1 (i) Transmit Chain Spurious Emissions.

	Frequency Range	Det	IF Bandwidth	Video Bandwidth		
Restricted Band Emissions	30 MHz< f < 1 000 MHz	Pk/Qpk	100 KHz	300 KHz	**Test Date:**	1-Jul-24
Restricted Band Emissions	f > 1 000 MHz	Pk/Avg	1 MHz	3 MHz	**Test Engineer:**	John Nantz
Restricted Band Edge	f > 1 000 MHz	Pk/Avg	100 Khz	300 KHz	**EUT:**	PassiveBolt CRCM1101B1
					Meas. Distance:	See Notes

Transmitter Spurious														FCC/IC
		Frequency		Output Power Meas.		Ant	GR Factor	Duty	Electric Field @ 3m				Pass	
	Mode	Start	Stop	Pk	Qpk/Avg	Gain		Factor	Pk (Calc.)	Limit Pk	Avg (Calc.)	Limit Avg		
R0		MHz	MHz	dBm	dBm	dBi	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	Comments
R1	Fundamental Restricted Band Edge (Low Side)													
R2	BLE (125Kbps)	2390.0	2390.0	-51.2	-54.8	1.1	0.0	0.0	45.1	74.0	41.5	54.0	12.5	max L,M,H channels or noise
R3	Fundamental Restricted Band Edge (High Side)													
R4	BLE (125Kbps)	2483.5	2483.5	-63.6	-67.4	1.1	0.0	0.0	32.7	74.0	28.9	54.0	25.1	max L,M,H channels or noise
R5	Restricted Bands Emissions													
		Frequency						Duty	Electric Field @ 3m				Pass	
		Start	Stop	Ant.	Ant.	Ka	Kg	Factor	Pk (Meas.)	Limit Pk	Qpk/Avg (Meas.)	Limit Avg		
R6	Mode	MHz	MHz	Used	Pol.	dB/m	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	Comments
R7	BLE (125Kbps)	30.0	88.0	BICEMCO01	H/V	13.3	-0.3	0.0	33.6			40	6.4	max L,M,H channels or noise
R8	BLE (125Kbps)	88.0	216.0	BICEMCO01	H/V	7.8	-0.5	0.0	34.4			43.5	9.1	max L,M,H channels or noise
R9	BLE (125Kbps)	216.0	960.0	LOGEMCO01	H/V	11.3	-0.9	0.0	36.1			46	9.9	max L,M,H channels or noise
R10	BLE (125Kbps)	960.0	4000.0	HQR1TO18S01	H/V	21.5	-0.2	0.0	45.1	74.0	41.5	54.0	12.5	max L,M,H channels or noise
R11	BLE (125Kbps)	4804.0	4804.0	HQR1TO18S01	H/V	24.6	-0.5	0.0	50.3	74.0	46.4	54.0	7.6	CH Low - max or noise
R12	BLE (125Kbps)	4880.0	4880.0	HQR1TO18S01	H/V	24.6	-0.5	0.0	51.7	74.0	46.5	54.0	7.5	CH Mid - max or noise
R13	BLE (125Kbps)	4960.0	4960.0	HQR1TO18S01	H/V	24.6	-0.5	0.0	51.7	74.0	47.1	54.0	6.9	CH High - max or noise
R14	BLE (125Kbps)	4000.0	6000.0	HQR1TO18S01	H/V	24.9	-0.4	0.0	51.7	74.0	47.1	54.0	6.9	max L,M,H channels or noise
R15	BLE (125Kbps)	6000.0	8400.0	HQR1TO18S01	H/V	27.1	-0.6	0.0	51.8	74.0	48.1	54.0	5.9	max L,M,H channels or noise
R16	BLE (125Kbps)	7320.0	7320.0	HQR1TO18S01	H/V	25.2	-0.7	0.0	51.8	74.0	48.1	54.0	**5.9**	CH Mid - max or noise
R17	BLE (125Kbps)	7440.0	7440.0	HQR1TO18S01	H/V	25.3	-0.7	0.0	50.5	74.0	45.4	54.0	8.6	CH High - max or noise
R18	BLE (125Kbps)	8400.0	12500.0	HQR1TO18S01	H/V	32.0	-0.8	0.0	50.9	74.0	45.5	54.0	8.5	max L,M,H channels or noise
R19	BLE (125Kbps)	12500.0	18000.0	HQR1TO18S01	H/V	35.4	-1.1	0.0	52.2	74.0	47.3	54.0	6.7	max L,M,H channels or noise
R20	BLE (125Kbps)	18000.0	26000.0	HRNK001	H/V	33.6	0.0	0.0	52.5	74.0	47.8	54.0	6.2	max L,M,H channels or noise
#	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14

(ROW)	(COLUMN)	NOTES
R2/R4	C4/C5	Conducted measurements were made in line with ANSI C63-10-2013 section 11.13.3.3
R2/R4	C9/C11	Computed according to ANSI C63.10-2013 section 11.12.2.2e
R7-R20	C9/C11	Radiated measurements were made in line with ANSI C63-10-2013 section 11.12.1. Antenna and cable factors are included in reported SA data.
R7-R9	C11	Peak numbers are used to demonstrate compliance.

Table 4.3.1 (ii) Transmit Chain Spurious Emissions.

	Frequency Range	Det	IF Bandwidth	Video Bandwidth		
Restricted Band Emissions	30 MHz< f < 1 000 MHz	Pk/Qpk	100 KHz	300 KHz	**Test Date:**	1-Jul-24
Restricted Band Emissions	f > 1 000 MHz	Pk/Avg	1 MHz	3 MHz	**Test Engineer:**	John Nantz
Restricted Band Edge	f > 1 000 MHz	Pk/Avg	100 Khz	300 KHz	**EUT:**	PassiveBolt CRCM1101B1
					Meas. Distance:	See Notes

Transmitter Spurious FCC/IC

	Mode	Frequency		Output Power Meas.		Ant	GR Factor	Duty	Electric Field @ 3m				Pass	
		Start	Stop	Pk	Qpk/Avg	Gain		Factor	Pk (Calc.)	Limit Pk	Avg (Calc.)	Limit Avg		
R0		MHz	MHz	dBm	dBm	dBi	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	Comments
R1	Fundamental Restricted Band Edge (Low Side)													
R2	BLE (500Kbps)	2390.0	2390.0	-52.6	-57.2	1.1	0.0	0.0	43.7	74.0	39.1	54.0	14.9	max L,M,H channels or noise
R3	Fundamental Restricted Band Edge (High Side)													
R4	BLE (500Kbps)	2483.5	2483.5	-64.2	-68.8	1.1	0.0	0.0	32.1	74.0	27.5	54.0	26.5	max L,M,H channels or noise
R5	Restricted Bands Emissions													
		Frequency						Duty	Electric Field @ 3m				Pass	
		Start	Stop	Ant.	Ant.	Ka	Kg	Factor	Pk (Meas.)	Limit Pk	Qpk/Avg (Meas.)	Limit Avg		
R6	Mode	MHz	MHz	Used	Pol.	dB/m	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	Comments
R7	BLE (500Kbps)	30.0	88.0	BICEMCO01	H/V	13.3	-0.3	0.0	33.6			40	6.4	max L,M,H channels or noise
R8	BLE (500Kbps)	88.0	216.0	BICEMCO01	H/V	7.8	-0.5	0.0	34.4			43.5	9.1	max L,M,H channels or noise
R9	BLE (500Kbps)	216.0	960.0	LOGEMCO01	H/V	11.3	-0.9	0.0	36.1			46	9.9	max L,M,H channels or noise
R10	BLE (500Kbps)	960.0	4000.0	HQR1TO18S01	H/V	21.5	-0.2	0.0	43.7	74.0	39.1	54.0	14.9	max L,M,H channels or noise
R11	BLE (500Kbps)	4804.0	4804.0	HQR1TO18S01	H/V	24.6	-0.5	0.0	49.6	74.0	45.3	54.0	8.7	CH Low - max or noise
R12	BLE (500Kbps)	4880.0	4880.0	HQR1TO18S01	H/V	24.6	-0.5	0.0	51.0	74.0	45.8	54.0	8.2	CH Mid - max or noise
R13	BLE (500Kbps)	4960.0	4960.0	HQR1TO18S01	H/V	24.6	-0.5	0.0	52.3	74.0	47.7	54.0	6.3	CH High - max or noise
R14	BLE (500Kbps)	4000.0	6000.0	HQR1TO18S01	H/V	24.9	-0.4	0.0	52.3	74.0	47.7	54.0	6.3	max L,M,H channels or noise
R15	BLE (500Kbps)	6000.0	8400.0	HQR1TO18S01	H/V	27.1	-0.6	0.0	51.4	74.0	47.4	54.0	6.6	max L,M,H channels or noise
R16	BLE (500Kbps)	7320.0	7320.0	HQR1TO18S01	H/V	25.2	-0.7	0.0	51.1	74.0	47.4	54.0	6.6	CH Mid - max or noise
R17	BLE (500Kbps)	7440.0	7440.0	HQR1TO18S01	H/V	25.3	-0.7	0.0	51.4	74.0	46.3	54.0	7.7	CH High - max or noise
R18	BLE (500Kbps)	8400.0	12500.0	HQR1TO18S01	H/V	32.0	-0.8	0.0	52.2	74.0	46.8	54.0	7.2	max L,M,H channels or noise
R19	BLE (500Kbps)	12500.0	18000.0	HQR1TO18S01	H/V	35.4	-1.1	0.0	52.8	74.0	47.9	54.0	**6.1**	max L,M,H channels or noise
R20	BLE (500Kbps)	18000.0	26000.0	HRNK001	H/V	33.6	0.0	0.0	50.2	74.0	45.5	54.0	8.5	max L,M,H channels or noise
#	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14

(ROW)	(COLUMN)	NOTES
R2/R4	C4/C5	Conducted measurements were made in line with ANSI C63-10-2013 section 11.13.3.3
R2/R4	C9/C11	Computed according to ANSI C63.10-2013 section 11.12.2.2e
R7-R20	C9/C11	Radiated measurements were made in line with ANSI C63-10-2013 section 11.12.1. Antenna and cable factors are included in reported SA data.
R7-R9	C11	Peak numbers are used to demonstrate compliance.

Table 4.3.1 (iii) Transmit Chain Spurious Emissions.

	Frequency Range	Det	IF Bandwidth	Video Bandwidth		
Restricted Band Emissions	30 MHz< f < 1 000 MHz	Pk/Qpk	100 KHz	300 KHz	**Test Date:**	1-Jul-24
Restricted Band Emissions	f > 1 000 MHz	Pk/Avg	1 MHz	3 MHz	**Test Engineer:**	John Nantz
Restricted Band Edge	f > 1 000 MHz	Pk/Avg	100 Khz	300 KHz	**EUT:**	PassiveBolt CRCM1101B1
					Meas. Distance:	See Notes

Transmitter Spurious FCC/IC

	Mode	Frequency		Output Power Meas.		Ant	GR Factor	Duty	Electric Field @ 3m				Pass	
		Start	Stop	Pk	Qpk/Avg	Gain		Factor	Pk (Calc.)	Limit Pk	Avg (Calc.)	Limit Avg		
R0		MHz	MHz	dBm	dBm	dBi	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	Comments
R1	Fundamental Restricted Band Edge (Low Side)													
R2	BLE (1Mbps)	2390.0	2390.0	-53.1	-57.6	1.1	0.0	0.0	43.2	74.0	38.7	54.0	15.3	max L,M,H channels or noise
R3	Fundamental Restricted Band Edge (High Side)													
R4	BLE (1Mbps)	2483.5	2483.5	-62.5	-68.1	1.1	0.0	0.0	33.8	74.0	28.2	54.0	25.8	max L,M,H channels or noise
R5	Restricted Bands Emissions													
		Frequency						Duty	Electric Field @ 3m				Pass	
		Start	Stop	Ant.	Ant.	Ka	Kg	Factor	Pk (Meas.)	Limit Pk	Qpk/Avg (Meas.)	Limit Avg		
R6	Mode	MHz	MHz	Used	Pol.	dB/m	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	Comments
R7	BLE (1Mbps)	30.0	88.0	BICEMCO01	H/V	13.3	-0.3	0.0	33.6			40	6.4	max L,M,H channels or noise
R8	BLE (1Mbps)	88.0	216.0	BICEMCO01	H/V	7.8	-0.5	0.0	34.4			43.5	9.1	max L,M,H channels or noise
R9	BLE (1Mbps)	216.0	960.0	LOGEMCO01	H/V	11.3	-0.9	0.0	36.1			46	9.9	max L,M,H channels or noise
R10	BLE (1Mbps)	960.0	4000.0	HQR1TO18S01	H/V	21.5	-0.2	0.0	43.2	74.0	38.7	54.0	15.3	max L,M,H channels or noise
R11	BLE (1Mbps)	4804.0	4804.0	HQR1TO18S01	H/V	24.6	-0.5	0.0	49.8	74.0	45.9	54.0	8.1	CH Low - max or noise
R12	BLE (1Mbps)	4880.0	4880.0	HQR1TO18S01	H/V	24.6	-0.5	0.0	50.1	74.0	44.9	54.0	9.1	CH Mid - max or noise
R13	BLE (1Mbps)	4960.0	4960.0	HQR1TO18S01	H/V	24.6	-0.5	0.0	51.0	74.0	46.4	54.0	7.6	CH High - max or noise
R14	BLE (1Mbps)	4000.0	6000.0	HQR1TO18S01	H/V	24.9	-0.4	0.0	51.0	74.0	46.4	54.0	7.6	max L,M,H channels or noise
R15	BLE (1Mbps)	6000.0	8400.0	HQR1TO18S01	H/V	27.1	-0.6	0.0	52.9	74.0	47.8	54.0	6.2	max L,M,H channels or noise
R16	BLE (1Mbps)	7320.0	7320.0	HQR1TO18S01	H/V	25.2	-0.7	0.0	50.9	74.0	47.2	54.0	6.8	CH Mid - max or noise
R17	BLE (1Mbps)	7440.0	7440.0	HQR1TO18S01	H/V	25.3	-0.7	0.0	52.9	74.0	47.8	54.0	**6.2**	CH High - max or noise
R18	BLE (1Mbps)	8400.0	12500.0	HQR1TO18S01	H/V	32.0	-0.8	0.0	50.9	74.0	45.5	54.0	8.5	max L,M,H channels or noise
R19	BLE (1Mbps)	12500.0	18000.0	HQR1TO18S01	H/V	35.4	-1.1	0.0	52.2	74.0	47.3	54.0	6.7	max L,M,H channels or noise
R20	BLE (1Mbps)	18000.0	26000.0	HRNK001	H/V	33.6	0.0	0.0	51.8	74.0	47.1	54.0	6.9	max L,M,H channels or noise
#	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14

(ROW)	(COLUMN)	NOTES
R2/R4	C4/C5	Conducted measurements were made in line with ANSI C63-10-2013 section 11.13.3.3
R2/R4	C9/C11	Computed according to ANSI C63.10-2013 section 11.12.2.2e
R7-R20	C9/C11	Radiated measurements were made in line with ANSI C63-10-2013 section 11.12.1. Antenna and cable factors are included in reported SA data.
R7-R9	C11	Peak numbers are used to demonstrate compliance.

Table 4.3.1 (iv) Transmit Chain Spurious Emissions.

	Frequency Range	Det	IF Bandwidth	Video Bandwidth		
Restricted Band Emissions	30 MHz< f < 1 000 MHz	Pk/Qpk	100 KHz	300 KHz	**Test Date:**	1-Jul-24
Restricted Band Emissions	f > 1 000 MHz	Pk/Avg	1 MHz	3 MHz	**Test Engineer:**	John Nantz
Restricted Band Edge	f > 1 000 MHz	Pk/Avg	100 Khz	300 KHz	**EUT:**	PassiveBolt CRCM1101B1
					Meas. Distance:	See Notes

Transmitter Spurious FCC/IC

	Mode	Frequency		Output Power Meas.		Ant	GR Factor	Duty	Electric Field @ 3m				Pass	
		Start	Stop	Pk	Qpk/Avg	Gain		Factor	Pk (Calc.)	Limit Pk	Avg (Calc.)	Limit Avg		
R0		MHz	MHz	dBm	dBm	dBi	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	Comments
R1	Fundamental Restricted Band Edge (Low Side)													
R2	BLE (2Mbps)	2390.0	2390.0	-47.8	-52.7	1.1	0.0	0.0	48.5	74.0	43.6	54.0	10.4	max L,M,H channels or noise
R3	Fundamental Restricted Band Edge (High Side)													
R4	BLE (2Mbps)	2483.5	2483.5	-63.6	-67.4	1.1	0.0	0.0	32.7	74.0	28.9	54.0	25.1	max L,M,H channels or noise
R5	Restricted Bands Emissions													
		Frequency						Duty	Electric Field @ 3m				Pass	
		Start	Stop	Ant.	Ant.	Ka	Kg	Factor	Pk (Meas.)	Limit Pk	Qpk/Avg (Meas.)	Limit Avg		
R6	Mode	MHz	MHz	Used	Pol.	dB/m	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	Comments
R7	BLE (2Mbps)	30.0	88.0	BICEMCO01	H/V	13.3	-0.3	0.0	33.6			40	6.4	max L,M,H channels or noise
R8	BLE (2Mbps)	88.0	216.0	BICEMCO01	H/V	7.8	-0.5	0.0	34.4			43.5	9.1	max L,M,H channels or noise
R9	BLE (2Mbps)	216.0	960.0	LOGEMCO01	H/V	11.3	-0.9	0.0	36.1			46	9.9	max L,M,H channels or noise
R10	BLE (2Mbps)	960.0	4000.0	HQR1TO18S01	H/V	21.5	-0.2	0.0	48.5	74.0	43.6	54.0	10.4	max L,M,H channels or noise
R11	BLE (2Mbps)	4804.0	4804.0	HQR1TO18S01	H/V	24.6	-0.5	0.0	50.3	74.0	46.4	54.0	7.6	CH Low - max or noise
R12	BLE (2Mbps)	4880.0	4880.0	HQR1TO18S01	H/V	24.6	-0.5	0.0	51.7	74.0	46.5	54.0	7.5	CH Mid - max or noise
R13	BLE (2Mbps)	4960.0	4960.0	HQR1TO18S01	H/V	24.6	-0.5	0.0	51.7	74.0	47.1	54.0	6.9	CH High - max or noise
R14	BLE (2Mbps)	4000.0	6000.0	HQR1TO18S01	H/V	24.9	-0.4	0.0	51.7	74.0	47.1	54.0	6.9	max L,M,H channels or noise
R15	BLE (2Mbps)	6000.0	8400.0	HQR1TO18S01	H/V	27.1	-0.6	0.0	51.8	74.0	48.1	54.0	5.9	max L,M,H channels or noise
R16	BLE (2Mbps)	7320.0	7320.0	HQR1TO18S01	H/V	25.2	-0.7	0.0	51.8	74.0	48.1	54.0	**5.9**	CH Mid - max or noise
R17	BLE (2Mbps)	7440.0	7440.0	HQR1TO18S01	H/V	25.3	-0.7	0.0	51.7	74.0	46.6	54.0	7.4	CH High - max or noise
R18	BLE (2Mbps)	8400.0	12500.0	HQR1TO18S01	H/V	32.0	-0.8	0.0	51.3	74.0	45.9	54.0	8.1	max L,M,H channels or noise
R19	BLE (2Mbps)	12500.0	18000.0	HQR1TO18S01	H/V	35.4	-1.1	0.0	52.6	74.0	47.7	54.0	6.3	max L,M,H channels or noise
R20	BLE (2Mbps)	18000.0	26000.0	HRNK001	H/V	33.6	0.0	0.0	52.2	74.0	47.5	54.0	6.5	max L,M,H channels or noise
#	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14

(ROW)	(COLUMN)	NOTES
R2/R4	C4/C5	Conducted measurements were made in line with ANSI C63-10-2013 section 11.13.3.3
R2/R4	C9/C11	Computed according to ANSI C63.10-2013 section 11.12.2.2e
R7-R20	C9/C11	Radiated measurements were made in line with ANSI C63-10-2013 section 11.12.1. Antenna and cable factors are included in reported SA data.
R7-R9	C11	Peak numbers are used to demonstrate compliance.

Table 4.3.1 (v) Transmit Chain Spurious Emissions.

Frequency Range	Det	IF Bandwidth	Video Bandwidth		
30 >= f > 1000 MHz	Pk/QPk	100 kHz	300 kHz	**Test Date:**	1-Jul-24
f < 1000 MHz	Pk/Avg	1 MHz	3 MHz	**Test Engineer:**	John Nantz
				EUT:	PassiveBolt CRCM1101B1
				Meas. Distance:	3 m, Radiated

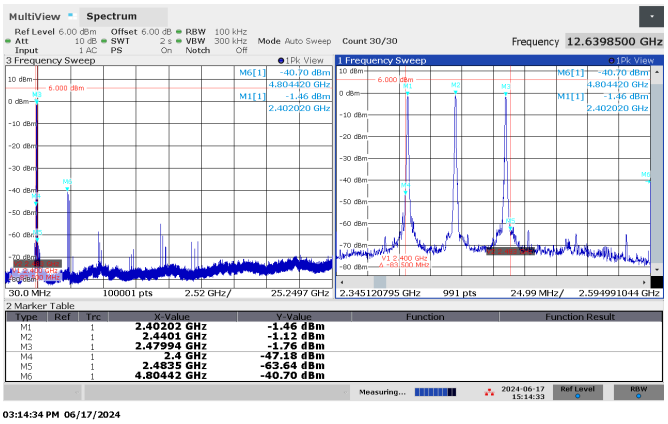
Simultaneous Transmitter - Inter-modulation Measurements FCC/IC

	Mode	Frequency		OATS Table		Test Antenna				Electric Field @ 3m				Pass	
		Start	Stop	Ht	Angle	QN	Pol	Ka	Kg	Meas. Pk	Limit Pk	Meas. Avg	Limit Avg		
#		MHz	MHz	m	deg		H/V	dBm	dBm	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	Comments
R1	Intermod - Restricted Band (Low Side / High Side)														
R2	BLE + NFC	2386.0	2386.0	1.5	.0	HQR1TO18S01	H/V	21.5	-0.3	51.9	74.0	42.5	54.0	**11.5**	max L,M,H channels or noise
R3	BLE + NFC	2495.0	2495.0	1.5	.0	HQR1TO18S01	H/V	21.5	-0.3	50.7	74.0	41.7	54.0	12.3	max L,M,H channels or noise
R4	Intermod - Restricted Band (Low Side / High Side)														
R5	BLE + LF	2306.0	2306.0	1.5	.0	HQR1TO18S01	H/V	21.5	-0.3	50.5	74.0	40.7	54.0	13.3	max L,M,H channels or noise
R6	BLE + LF	2528.0	2528.0	1.5	.0	HQR1TO18S01	H/V	21.5	-0.3	52.1	74.0	42.4	54.0	11.6	max L,M,H channels or noise
#	C1	C2	C3	C4	C5	C6		C7	C8	C9	C10	C11	C12	C13	C14

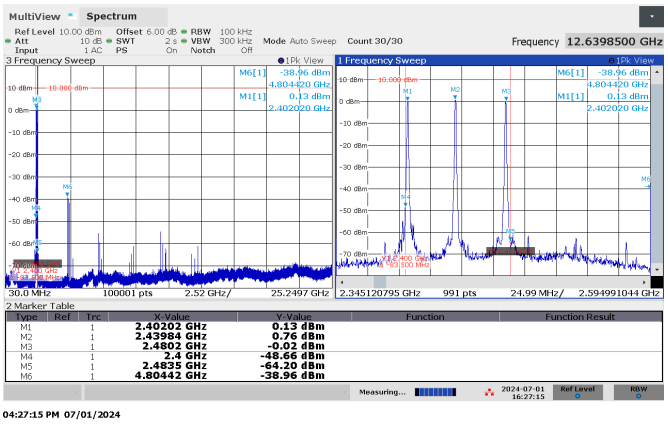
4.3.2 OOB Transmit Chain Spurious Emissions

The results for the measurement of transmit chain spurious emissions relative to the fundamental in a 100 kHz receiver bandwidth (at the nominal voltage and temperature) in the worst cases are provided in Figure 4.3.2 below.

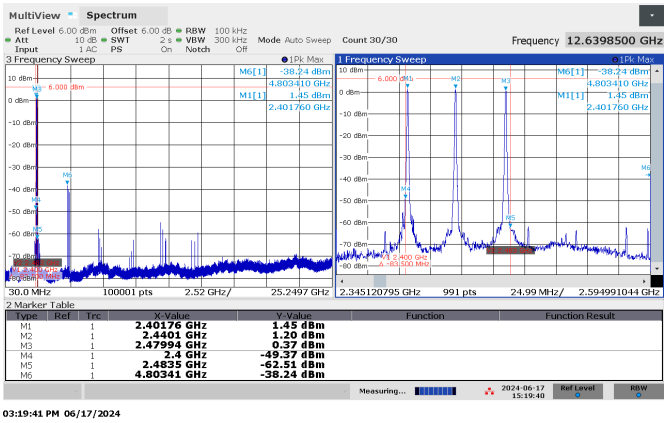
BLE 125 Kbps



BLE 500 Kbps



BLE 1 Mbps



BLE 2 Mbps

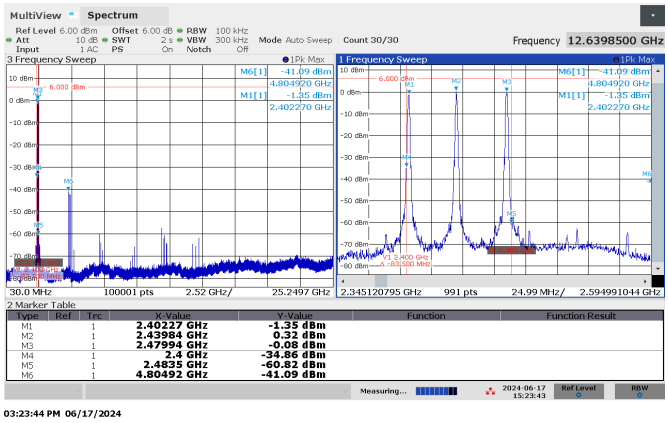


Figure 4.3.2 Worst Case Transmitter OOB Emissions Measured.

4.3.3 Radiated Digital and Cabinet Spurious

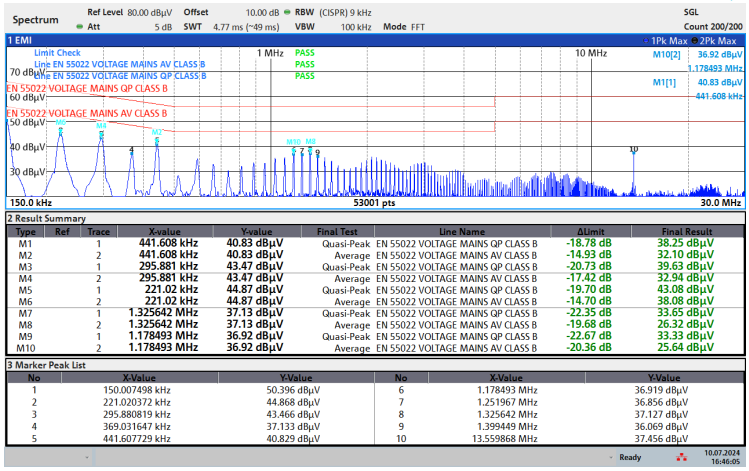
The results for the measurement of digital and cabinet spurious emissions are not reported herein as all emissions were greater than 20 dB below the regulatory limit. Emissions from digital components are measured to 1 GHz, or to five times the maximum crystal or oscillator operating frequency, whichever is greater. Cabinet emissions are measured up to the highest frequency tested during conducted measurements.

4.3.4 Conducted Emissions Test Results - AC Power Port(s)

The results of emissions from the EUT's AC mains power port(s) are reported in Table 4.3.4 .

Table 4.3.4 AC Mains Power Conducted Emissions Results.

AC PORT CONDUCTED EMISSIONS – LINE 1



2 Result Summary

Type	Ref	Trace	X-value	Y-value	Final Test	Line Name	ΔLimit	Final Result
M1		1	441.608 kHz	40.83 dBµV	Quasi-Peak	EN 55022 VOLTAGE MAINS QP CLASS B	-18.78 dB	38.25 dBµV
M2		2	441.608 kHz	40.83 dBµV	Average	EN 55022 VOLTAGE MAINS AV CLASS B	-14.93 dB	32.10 dBµV
M3		1	295.881 kHz	43.47 dBµV	Quasi-Peak	EN 55022 VOLTAGE MAINS QP CLASS B	-20.73 dB	39.63 dBµV
M4		2	295.881 kHz	43.47 dBµV	Average	EN 55022 VOLTAGE MAINS AV CLASS B	-17.42 dB	32.94 dBµV
M5		1	221.02 kHz	44.87 dBµV	Quasi-Peak	EN 55022 VOLTAGE MAINS QP CLASS B	-19.70 dB	43.08 dBµV
M6		2	221.02 kHz	44.87 dBµV	Average	EN 55022 VOLTAGE MAINS AV CLASS B	-14.70 dB	38.08 dBµV
M7		1	1.325642 MHz	37.13 dBµV	Quasi-Peak	EN 55022 VOLTAGE MAINS QP CLASS B	-22.35 dB	33.65 dBµV
M8		2	1.325642 MHz	37.13 dBµV	Average	EN 55022 VOLTAGE MAINS AV CLASS B	-19.68 dB	26.32 dBµV
M9		1	1.178493 MHz	36.92 dBµV	Quasi-Peak	EN 55022 VOLTAGE MAINS QP CLASS B	-22.67 dB	33.33 dBµV
M10		2	1.178493 MHz	36.92 dBµV	Average	EN 55022 VOLTAGE MAINS AV CLASS B	-20.36 dB	25.64 dBµV

3 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	150.007498 kHz	50.396 dBµV	6	1.178493 MHz	36.919 dBµV
2	221.020372 kHz	44.868 dBµV	7	1.251967 MHz	36.856 dBµV
3	295.880819 kHz	43.466 dBµV	8	1.325642 MHz	37.127 dBµV
4	369.031647 kHz	37.133 dBµV	9	1.399449 MHz	36.069 dBµV
5	441.607729 kHz	40.829 dBµV	10	13.559868 MHz	37.456 dBµV

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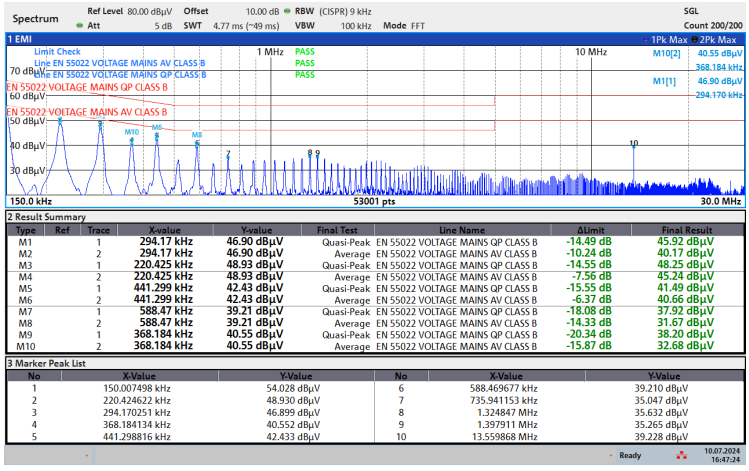
AC PORT CONDUCTED EMISSIONS – LINE 2



2 Result Summary

Type	Ref	Trace	X-value	Y-value	Final Test	Line Name	ΔLimit	Final Result
M1		1	294.17 kHz	46.90 dBµV	Quasi-Peak	EN 55022 VOLTAGE MAINS QP CLASS B	-14.49 dB	45.92 dBµV
M2		2	294.17 kHz	46.90 dBµV	Average	EN 55022 VOLTAGE MAINS AV CLASS B	-10.24 dB	40.17 dBµV
M3		1	220.425 kHz	48.93 dBµV	Quasi-Peak	EN 55022 VOLTAGE MAINS QP CLASS B	-14.55 dB	48.25 dBµV
M4		2	220.425 kHz	48.93 dBµV	Average	EN 55022 VOLTAGE MAINS AV CLASS B	-7.56 dB	45.24 dBµV
M5		1	441.299 kHz	42.43 dBµV	Quasi-Peak	EN 55022 VOLTAGE MAINS QP CLASS B	-15.55 dB	41.49 dBµV
M6		2	441.299 kHz	42.43 dBµV	Average	EN 55022 VOLTAGE MAINS AV CLASS B	-6.37 dB	40.66 dBµV
M7		1	588.47 kHz	39.21 dBµV	Quasi-Peak	EN 55022 VOLTAGE MAINS QP CLASS B	-18.08 dB	37.92 dBµV
M8		2	588.47 kHz	39.21 dBµV	Average	EN 55022 VOLTAGE MAINS AV CLASS B	-14.33 dB	31.67 dBµV
M9		1	368.184 kHz	40.55 dBµV	Quasi-Peak	EN 55022 VOLTAGE MAINS QP CLASS B	-20.34 dB	38.20 dBµV
M10		2	368.184 kHz	40.55 dBµV	Average	EN 55022 VOLTAGE MAINS AV CLASS B	-15.87 dB	32.68 dBµV

3 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	150.007498 kHz	54.028 dBµV	6	588.469677 kHz	39.210 dBµV
2	220.424622 kHz	48.930 dBµV	7	735.941153 kHz	35.047 dBµV
3	294.170251 kHz	46.899 dBµV	8	1.324847 MHz	35.632 dBµV
4	368.184134 kHz	40.552 dBµV	9	1.397911 MHz	35.265 dBµV
5	441.298816 kHz	42.433 dBµV	10	13.559868 MHz	39.228 dBµV

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5 Measurement Uncertainty and Accreditation Documents

The maximum values of measurement uncertainty for the laboratory test equipment and facilities associated with each test are given in the table below. This uncertainty is computed for a 95.45% confidence level based on a coverage factor of $k = 2$.

Table 5.0.0 Measurement Uncertainty.

Measured Parameter	Measurement Uncertainty†
Radio Frequency	$\pm(f_{Mkr}/10^7 + RBW/10 + (SPN/(PTS-1))/2 + 1\,\text{Hz})$
Conducted Emm. Amplitude	$\pm 1.9\,\text{dB}$
Radiated Emm. Amplitude ($f < 30\,\text{MHz}$)	$\pm 3.1\,\text{dB}$
Radiated Emm. Amplitude ($30 - 200\,\text{MHz}$)	$\pm 4.0\,\text{dB}$
Radiated Emm. Amplitude ($200 - 1000\,\text{MHz}$)	$\pm 5.2\,\text{dB}$
Radiated Emm. Amplitude ($f > 1000\,\text{MHz}$)	$\pm 3.7\,\text{dB}$

†Ref: CISPR 16-4-2:2011+A1:2014


United States Department of Commerce
National Institute of Standards and Technology

NVLAP® ilac-MRA

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 200129-0

AHD (Amber Helm Development, L.C.)
Sister Lakes, MI

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2023-06-20 through 2024-06-30
Effective Dates

For the National Voluntary Laboratory Accreditation Program

Figure 5.0.0 Accreditation Documents