

FCC & ISED CANADA CERTIFICATION TEST REPORT

for the

NA230951

FCC ID: YJ7-NA230951 IC ID: 9082A-NA230951

WLL REPORT# 18776-0951 REV 0

Prepared for:

Stanley Black & Decker, Inc. 701 East Joppa Road Towson, Maryland 21286

Prepared By:

Washington Laboratories, Ltd. 4840 Winchester Blvd. Suite #5 Frederick, Maryland 21703



Testing Certificate AT-1448



FCC & ISED Canada Certification Test Report

for the

Stanley Black & Decker, Inc. NA230951

FCC ID: YJ7-NA230951

ISED ID: 9082A-NA230951

July 31, 2024

WLL Report# 18776-0951 Rev 0

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Abstract

This report has been prepared on behalf of Stanley Black & Decker, Inc. to support the attached Application for Equipment Authorization. The test report and application are submitted for a Digital Transmission System (DTS) transmitter under Part 15.247 of the FCC Rules and under Innovation Science and Economic Development (ISED) Canada RSS-247, Issue 3 (8/2023). This certification test report documents the test configuration and test results for the Stanley Black & Decker, Inc., NA230951 Bluetooth LE, limited single-modular transmitter. The information provided in this report is only applicable to device herein documented as the EUT.

Radiated testing was performed in the Free-space Anechoic Chamber Test-site (FACT) 3m chamber of Washington Laboratories, Ltd., located at: 4840 Winchester Boulevard, Suite #5., Frederick, MD 21703. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by ANAB under Certificate AT-1448 as an independent FCC test laboratory. The ISED Canada number for Washington Laboratories is 3035A.

The Stanley Black & Decker, Inc., NA230951, BLE Module [FCC ID: YJ7-NA230951] complies with the requirements for a Digital Transmission System (DTS) transmitter device under FCC Part 15.247 and ISED Canada RSS-247 Issue 3 (8/2023). The device is a limited single-modular transmitter.

Revision History	Description of Change	Date
Rev 0	Initial Release	July 31, 2024
Rev 1	Removed Receiver spurious testing information	August 6, 2024



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1 Introduction

1.1 Compliance Statement

The Stanley Black & Decker, Inc., NA230951, BLE Module [FCC ID: YJ7-NA230951] complies with the requirements for a Digital Transmission System (DTS) transmitter device under FCC Part 15.247 and ISED Canada RSS-247 Issue 3 (8/2023). The device is a limited single-modular transmitter.

1.2 Test Scope

Tests for radiated and conducted (at antenna terminal) emissions were performed. All measurements were performed in accordance with ANSI C63.10-2020 "ANSI Procedures for Compliance Testing of Unlicensed Wireless Devices". The measurement equipment conforms to ANSI C63.2 "Specifications for Electromagnetic Noise and Field Strength Instrumentation". The modules were tested "stand alone" as required for modular testing and approval.

1.3 Contract Information

Customer:	Stanley Black & Decker, Inc.
Purchase Order Number:	M865624
Quotation Number:	74701

1.4 Test and Support Personnel

Washington Laboratories, LTD	Ryan Mascaro
Customer Representative	Kirwan Magdamo

1.5 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Frederick, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. The ISED Canada OATS number for Washington Laboratories, Ltd. is 3035A. Washington Laboratories, Ltd. has been accepted by the FCC and approved by ANAB under Testing Certificate AT-1448 as an independent FCC test laboratory.



2 Equipment Under Test

2.1 EUT Identification

Table 1: Device Summary

Manufacturer:	Stanley Black & Decker, Inc.			
FCC ID:	YJ7-NA230951			
IC ID:	9082A-NA230951			
Part Number:	NA230951			
HVIN:	NA230951			
Frequency Range:	2402 to 2480 MHz			
Peak Output Power:	0.89 dBm (1.23 mW)			
Antenna Type:	PCB meander trace, peak	gain: -6.48 dBi		
FCC Emission Designator:	714KG1D			
IC Emission Designator:	2M1G1D			
6dB Occupied Bandwidth:	714.1 kHz			
99% Occupied Bandwidth:	2.08 MHz			
Protocol:	Bluetooth Low Energy (BLE)			
Modulation and Data Pate:	GFSK (1Mbps)			
	$\pi/4DQPSK$ (2Mbps)			
Keying:	Automatic			
Type of Information:	Digital			
Number of Data Channels:	37			
Interface Cables:	N/A			
Power Source & Voltage:	3VDC, via coin-cell battery			
Worst-Case TX Spurious Emission:	Antenna Port Conducted	2.351 GHz @ -42.8 dBm (Figure 38)		
worst-Case TA Spurious Emission.	Radiated Emissions	83.1 MHz @ 31.65 dBuV/m (Table 13)		
Software/Firmware Version:	Not Declared by Applicant			
Testing Dates:	6/17/2024 to 7/9/2024			



2.2 EUT Description

The NA230951 is DeWalt's Gen2 Bluetooth Low Energy Module (BLEM). The BLE transmitter module is designed for tracking, locating, enabling/disabling, and customizing DeWalt professional power tools via the DeWalt Site Manger App., and via DeWalt Asset Gateway. The device can operate off the internal CR2450 coin cell battery or alternately the DeWalt battery pack, when present. Please note the device being certified is a limited single-modular transmitter. The module samples were tested stand-alone as required for modular testing and approval.

2.3 Test Configuration and Algorithm

The NA230951, 3.3V Gen2 BLEM was provided in a variety of engineering samples that were configured for testing. The EUT samples were loaded with test-mode software/firmware to allow individual samples to dwell, hop, sweep, and/or receive only as needed for required testing. The EUT was tested in a powered on, steady state. The 2.4GHz BLE radio was exercised as necessary to meet the requirements of the testing. For conducted measurements, the BLE radio was observed through the uFl antenna port. For radiated emissions below 1GHz, the EUT was set to transmit in a hopping enabled mode, sweeping through the ISM band. For radiated emissions above 1GHz, the EUT was set to transmit at the each of the Low, Center, and High Channels. Only the worst-case emissions are provided throughout this report. Additionally, for transmit power setting, or transmit gain setting, the test-mode software was set to a value of "0". This setting was maintained for all testing.

2.4 Deviations to the Test Standard

There were no deviations to the requirements of the standard(s).



2.5 EUT Configuration Details

The EUT was comprised of the following equipment, provided on the following page. All Modules, PCBs, etc. listed were considered as part of the EUT, as tested.

Name / Description	Model Number	Part Number	Serial Number	Rev. #
NA230951 Conducted		NA230951	Conducted	rF1
NA230951 Radiated Lo		NA230951	2402	rF1
NA230951 Radiated Mid		NA230951	2440	rF1
NA230951 Radiated High		NA230951	2480	rF1
NA230951 Radiated Hopping		NA230951	Нор	rF1
NA230951 Production		NA230951	Prod	rF1

Table 2: EUT System Configuration List

Table 3: Support Equipment

Name / Description	Manufacturer	Model Number	Calibration Data
USB to UART Cable	FTDI	TTL-232R-3V3	N/A
UMCC to SMA Cable Assembly	TE Connectivity	2032439-1	N/A
T3 Driver			N/A

Table 4: Cable Configuration

Ref. ID	EUT Port Name	Cable Description	Qty.	Length (m)	Shielded	Termination Port ID
1	DTM	V+, UART TX, UART RX, GND	1	0.2	No	PC
2	RF Out	Coax with SMA connector	1	1.8	Yes	EMC Receiver



Figure 1: EUT Testing Arrangement (Example Only)









3 Test Results

The table below shows the results of testing for compliance with a Digital Transmission System in accordance with FCC Part 15.247 and RSS-247 Issue 3. Full test results are shown in subsequent subsections.

FCC Rule Part	IC Rule Part	Description	Result
15.247(a)(2)	RSS-247 [5.2 (a)]	Occupied Channel Bandwidth	Pass
15.247 (b)(3)	RSS-247 [5.4 (d)]	Transmit Output Power	Pass
15.247 (e)	RSS-247 [5.2 (b)]	Power Spectral Density	Pass
15.247 (d)	RSS-247 [5.5]	Out-of-Band Emissions (Band Edge @ 20dB below)	Pass
15.205 15.209	RSS-Gen [8.9/8.10]	General Field Strength Limits (Restricted Bands & RE Limits)	Pass
15.207	RSS-Gen [8.8]	AC Conducted Emissions	N/A *

 Table 5: Testing and Results Summary

* the EUT is not subject to the provisions of 15.207 for powerline emissions. This device is powered by coin-cell battery, or the DC voltage will be supplied via the final host integration. The grantee will address this requirement on a case-by-case basis, through subsequent Supplier's Declaration of Conformity (SDoC) assessments, as the module is integrated into future host products.



3.1 Occupied (DTS) Bandwidth

For a DTS operating in the 2.4GHz band, FCC Rule Part 15.247(a)(2) and RSS-247, 5.2(a) require the minimum 6dB bandwidth be at least 500 kHz. The 99% BW shall also be recorded.

The transmitter occupied bandwidth was measured conducted at the antenna port, by coupling the output of the EUT transmitter to the input of a spectrum analyzer. The measurement level was corrected for any cable and attenuator losses.

3.1.1 Measurement Method

This test was performed in accordance with Clause 11.8.2, Option 2, of ANSI C63.10-2020.

3.1.2 Test Data

The EUT test data is provided below.

The EUT was configured to transmit a modulated signal, with channel hopping disabled.

Modulation	Mode (Data Rate)	Frequency (MHz)	6dB Bandwidth	99% Bandwidth
GFSK	DUS	2402	714.1 kHz	1.07 MHz
	(1Mbps)	2440	721.6 kHz	1.08 MHz
		2480	705.0 kHz	1.08 MHz
π/4DQPSK	20115	2402	1.14 MHz	2.08 MHz
	2DH3	2440	1.14 MHz	2.08 MHz
	(2101008)	2480	1.13 MHz	2.08 MHz

Table 6: Occupied Bandwidth Results



Figure 3: Occupied Bandwidth, Low Channel, 1Mbps (DH5)





Figure 4: Occupied Bandwidth, Center Channel, 1Mbps (DH5)





Figure 5: Occupied Bandwidth, High Channel, 1Mbps (DH5)





Figure 6: Occupied Bandwidth, Low Channel, 2Mbps (2DH5)





Figure 7: Occupied Bandwidth, Center Channel, 2Mbps (2DH5)





Figure 8: Occupied Bandwidth, High Channel, 2Mbps (2DH5)





3.2 Conducted Peak Output Power

For a DTS operating in the 2.4GHz band, FCC Rule Part 15.247(b)(3) and RSS-247, 5.4(d) require that the maximum peak conducted output power shall not exceed 30 dBm, or 1W. Additionally, the EIRP shall not exceed 36 dBm, or 4W.

The transmitter power was measured conducted at the antenna port, by coupling the output of the EUT transmitter to the input of a spectrum analyzer. The measurement level was corrected for any cable and attenuator losses.

3.2.1 Measurement Method

This test was performed in accordance with Clause 11.9.1.1 of ANSI C63.10-2020.

3.2.2 Test Data

The EUT test data is provided below.

The EUT was configured to transmit a modulated signal, with channel hopping disabled.

The EUT employs a PCB trace antenna with a peak gain of -6.48 dBi.

Modulation	Mode (Data Rate)	Frequency (MHz)	Peak Power (dBm)	EIRP (dBm)
GFSK	DUS	2402	0.89	-5.59
	(1Mbps)	2440	0.76	-5.72
		2480	0.41	-6.07
π/4DQPSK	20115	2402	0.80	-5.68
	2DHJ	2440	0.66	-5.82
	(21010ps)	2480	0.34	-6.14

Table 7: Conducted Output Power Results



Figure 9: Peak Output Power, Low Channel, 1Mbps (DH5)

Spectrum An Swept SA	alyzer 1	Spectrum Ar Swept SA	nalyzer 2	+					
KEYSIGH	Input: RF Coupling: DC Align: Auto	Input Ζ: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast I Gate: Off IF Gain: Low Sig Track: Off	Avg Type: Lo Avg Hold:>1 Trig: Free R	og-Power 00/100 un	1 2 3 4 5 6 M W W W W W P N N N N N		
1 Spectrum Scale/Div 10	v dB			Ref LvI Offset 2 Ref Level 10.00	21.83 dB) dBm			Mkr1 2.40	1 945 6 GHz 0.89 dBm
Log					1				
-10.0									
-20.0									
-30.0									
-40.0									
-60.0									
-70.0									
-80.0									
Center 2.402 #Res BW 3.0	2000 GHz) MHz			#Video BW 5	0 MHz			Sweep 1	Span 8.000 MHz 00 ms (5001 pts)
		Jun 17, 2024 2:14:57 PM							



Figure 10: Peak Output Power, Center Channel, 1Mbps (DH5)





Figure 11: Peak Output Power, High Channel, 1Mbps (DH5)





Figure 12: Peak Output Power, Low Channel, 2Mbps (2DH5)

Spectrum Analy Swept SA	yzer 1	• +						
KEYSIGHT	Input: RF Coupling: DC Align: Auto	Input Ζ: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	Avg Type: Log-Power Avg Hold:>100/100 Trig: Free Run	1 2 3 4 5 6 M W W W W P N N N N N		
1 Spectrum	T			Ref LvI Offset 2	1.83 dB		Mkr1 2.402	051 2 GHz
Log	Б			Kei Level 10.00				0.00 0.011
0.00								
-10.0								
-20.0								
-30.0								
-40.0								
-50.0								
-60.0								
-70.0								
-80.0								
Center 2.40200 #Res BW 3.0 M	00 GHz /Hz			#Video BW 50) MHz		Sweep 1.0	Span 8.000 MHz 0 ms (5001 pts)
		Jul 03, 2024 12:37:30 PM						



Figure 13: Peak Output Power, Center Channel, 2Mbps (2DH5)

Spectrum Analy	yzer 1								
Swept SA KEYSIGHT	Input: RF Coupling: DC Align: Auto	Input Z: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast I Gate: Off IF Gain: Low Sig Track: Off	Avg Type: Log-P Avg Hold:>100/1 Trig: Free Run	Power <mark>1</mark> 100 M	L 2 3 4 5 6 1 ₩ ₩ ₩ ₩ ₩ P N N N N N N		
1 Spectrum Scale/Div 10 d	۲			Ref Lvi Offset Ref Level 10.0	21.83 dB 0 dBm			Mkr1 2.439) 688 0 GHz 0.66 dBm
Log				▲1					
0.00									
-10.0									
-20.0									
-30.0									
-40.0									
-50.0									
-60.0									
-70.0									
-80.0									
Center 2.4400 #Res BW 3.0 M	00 GHz /IHz			#Video BW \$	50 MHz			Sweep 1.0	Span 8.000 MHz 00 ms (5001 pts)
15	C □ ?	Jul 03, 2024 12:44:12 PM							



Figure 14: Peak Output Power, High Channel, 2Mbps (2DH5)

Spectrum Anal Swept SA	yzer 1	• +							
KEYSIGHT	Input: RF Coupling: DC Align: Auto	Input Ζ: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast I Gate: Off IF Gain: Low Sig Track: Off	Avg Type: Avg Hold:> Trig: Free	Log-Power ∘100/100 Run	1 2 3 4 5 6 M ₩ ₩ ₩ ₩ ₩ P N N N N N		
1 Spectrum Scale/Div 10 d	, 1B		I	Ref Lvi Offset Ref Level 10.0	21.83 dB 0 dBm			Mkr1 2.47	79 667 2 GHz 0.34 dBm
Log				<u> </u>					
0.00				•					
-10.0									
-20.0									
20.0									
-30.0									
-40.0									
-50.0									
-60.0									
-70.0									
-80.0									
Center 2.4800 #Res BW 3.0 I	00 GHz MHz			#Video BW	50 MHz			Sweep 1	Span 8.000 MHz .00 ms (5001 pts)
15		Jul 03, 2024 12:45:59 PM							



3.3 Power Spectral Density

For a DTS operating in the 2.4GHz band, FCC Rule Part 15.247(e) and RSS-247, 5.2(b) require that the maximum peak power spectral density shall not exceed 8 dBm in any 3 kHz band.

The transmitter peak power spectral density was measured conducted at the antenna port, by coupling the output of the EUT transmitter to the input of a spectrum analyzer. The measurement level was corrected for any cable and attenuator losses.

3.3.1 Measurement Method

This test was performed in accordance with Clause 11.10.2 of ANSI C63.10-2020.

3.3.2 Test Data

The EUT test data is provided below.

The EUT was configured to transmit a modulated signal, with channel hopping disabled.

Modulation	Mode (Data Rate)	Frequency (MHz)	Measured PSD (dBm)	Result
GFSK	DUS	2402		Pass
	(1Mbps)	2440	0.58	Pass
		2480	0.24	Pass
π/4DQPSK	20115	2402	0.68	Pass
	2DHO	2440	0.55	Pass
	(2Mbps)	2480	0.21	Pass

Table 8: Power Spectral Density



Figure 15: Power Spectral Density, Low Channel, 1Mbps (DH5)





Figure 16: Power Spectral Density, Center Channel, 1Mbps (DH5)





Figure 17: Power Spectral Density, High Channel, 1Mbps (DH5)





Figure 18: Power Spectral Density, Low Channel, 2Mbps (2DH5)





Figure 19: Power Spectral Density, Center Channel, 2Mbps (2DH5)





Figure 20: Power Spectral Density, High Channel, 2Mbps (2DH5)





3.4 Conducted Band-edge

This section provides close-up band-edge plots of the low and high channel, with respect to the nearest authorized band-edge.

For a DTS operating in the 2.4GHz band, FCC Rule Part 15.247(d) and RSS-247, 5.5 require that in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the unwanted radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Band-edge measurements were made conducted at the antenna port, by coupling the output of the EUT transmitter to the input of a spectrum analyzer. The measurement level was corrected for any cable and attenuator losses.

3.4.1 Measurement Method

This test was performed in accordance with Clause 6.10 through Clause 6.10.4 of ANSI C63.10-2020.

3.4.2 Test Data

The EUT test data is provided below.

The EUT was configured to transmit a modulated signal. The EUT was evaluated in two modes, channel hopping enabled and channel hopping disabled. The hopping/sweeping function had no impact on the results of this test. The worst-case bandedge is reported below.



Figure 21: Low Channel Band-Edge, 1Mbps (DH5)




Figure 22: High Channel Band-Edge, 1Mbps (DH5)





Figure 23: Low Channel Band-Edge, 2Mbps (2DH5)





Figure 24: High Channel Band-Edge, 2Mbps (2DH5)





3.5 Conducted Unwanted Spurious Emissions

For a DTS operating in the 2.4GHz band, FCC Rule Part 15.247(d) and RSS-247, 5.5 require that in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the unwanted radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

The transmitter unwanted spurious emissions were evaluated and measured conducted at the antenna port, by coupling the output of the EUT transmitter to the input of a spectrum analyzer. The measurement level was corrected for any cable and attenuator losses.

3.5.1 Measurement Method

This test was performed in accordance with Clause 11.11 of ANSI C63.10-2020.

3.5.2 Test Data

The EUT test data for the low, center, and high channels are provided below.

The EUT was configured to transmit a modulated signal, at both 1Mbps (GFSK) and 2Mbps ($\pi/4DQPSK$).

The worst-case conducted spurious emission is -42.80 dBm; the limit here is -19.67 dBm (see Figure 38).



Figure 25: Low Channel 1Mbps (DH5) Conducted Spurious Plot 1

Specti Swept	Spectrum Analyzer 1 Swept SA KEYSIGHT Input: RF Input Z: 50 Ω			strum Analyzer 2 ot SA 0 Ω #Atten: 10 dB PNO: Fast						
KEY	SIGHT Inp Co Aliç PASS	out: RF upling: DC gn: Auto	Input Z: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	#Atten: 10 dB μW Path: Standard Source: Off	PNO: Fast I Gate: Off IF Gain: Low Sig Track: Off	Avg Type: L Avg Hold:> [:] Trig: Free F	.og-Power 100/100 Run	1 2 3 4 5 6 M \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		
1 Spece Scale	ctrum /Div 10 dB	T			Ref LvI Offset Ref Level -10.0	21.83 dB 00 dBm			Mkr1 841.4	448 71 MHz -59.41 dBm
Log	Trace 1	Pass								DL1 -19.25 dBm
-30.0										
-40.0									. 1	
-60.0	an an the large last sectors large	nyn hill mennen filmfiling (m) and an General a staat dat die staat die staat	de din pris (polizon nel a bien din bien din bien) Nel comenzation (bien din bien din bien din bien din bien)	tini lagga setitipan akapita kapitaka in	n far fille star ^f rifte til bere star fille for I far fille star fille til bere star fille for	dentrative part of the second states				and design the second
-70.0 -80.0										
-90.0										
-100					#Video BW/					
#Res	BW 100 kHz				#video Bw				Sweep ~7.14 r	ns (10000 GH2
E 5 C I ? Jun 17, 2024 2:38:34 PM										



Figure 26: Low Channel 1Mbps (DH5) Conducted Spurious Plot 2

Spectr Swept	um Analy SA	zer 1	,	Spectrum A Swept SA	nalyzer 2	+							
KEY:	Sight Pass	Input: RF Coupling: DC Align: Auto	Inp Coi Fre	ut Ζ: 50 Ω r CCorr RCal q Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast I Gate: Off IF Gain: Low Sig Track: Off	Avg Type: I Avg Hold:> Trig: Free I	Log-Power 100/100 Run	1 2 3 4 5 M ₩ ₩ ₩ ₩ ₩ P N N N N	6 ₩ N			
1 Spec Scale	ctrum /Div 10 dl	▼ 3				Ref Lvi Offset Ref Level 5.00	21.83 dB) dBm				Mkr1 2.2	74 00 44.17	0 GHz 7 dBm
Log	Trace	1 Pass											
-15.0													
-25.0 -35.0													
-45.0											1		
-55.0	in al land the part of the	a da a seconda da d	a da bi lin	lan Mid Andrea Midda Malana an	ant de la test provide de la constant de la constan				an ha ha a thuas da phaisidh a s				<mark>hadde br</mark>
-65.0	a dek filosofi (san di kati kati kati kati kati kati kati kat												
-85.0													
Start ′ #Res	1.0000 GH BW 100 k	lz Hz				#Video BW 3	300 kHz			s	S weep ~7.14 n	top 2.4 ns (100	835 GHz 1001 pts)
	5		? Ju 2	n 17, 2024 :39:40 PM									



Figure 27: Low Channel 1Mbps (DH5) Conducted Spurious Plot 3





Figure 28: Low Channel 1Mbps (DH5) Conducted Spurious Plot 4

Spec Swep	trum Analyzer 1 ot SA	Spectrum Ar Swept SA	rum Analyzer 2 t SA 0 #Atten: 10 dB PNO: Fast						
KE)	SIGHT Input: RF Coupling: DC Align: Auto	Input Ζ: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast I Gate: Off IF Gain: Low Sig Track: Off	Avg Type: L Avg Hold:>1 Trig: Free R	og-Power 100/100 ¦un	1 2 3 4 5 6 M W W W W W P N N N N N		
1 Spe Scale	ectrum v e/Div 10 dB			Ref Lvl Offset Ref Level -10.0	23.21 dB 00 dBm			Mkr1 6.6	33 35 GHz 52.95 dBm
Log -20.0	Trace 1 Pass				/				DL1 -19.25 dBm
-30.0									
-40.0 -50.0			1						
-60.0	india di Antonia Interneta da Antonia di Antonia di Antonia Antonia di Antonia di A Antonia di Antonia di A	(Chang George Change Chang Cha		al ya ana ana ana ana ana ana ana ana ana	Nates of the State State State of the State St	illen filte te begregete feldet de relies en en en en en en en en	an di kala di dan yan da sa di gana di sa sa sa sa sa sa sa sa An ang ang ang ang ang ang ang ang ang an	die Heerste Heerste voor die die Heerste Gewennen werden voor gewennen voor die seelen v	
-70.0									
-90.0									
Start	5.000 GHz			#Video BW 3	00 kHz			St	op 10.000 GHz
#Res		? Jun 17, 2024 2:42:18 PM						Sweep ~21.9 m	IS (100001 pts)



Figure 29: Low Channel 1Mbps (DH5) Conducted Spurious Plot 5





Figure 30: Low Channel 1Mbps (DH5) Conducted Spurious Plot 6

Spectrum Analyzer 1 Swept SA KEYSIGHT Input: RF		, s	pectrum An wept SA	alyzer 2	+						
KEYS	Sight Sight Pass	Input: RF Coupling: DC Align: Auto	Input Z Corr C Freq R	:: 50 Ω Corr RCal lef: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast d Gate: Off IF Gain: Low Sig Track: Off	Avg Type: Avg Hold:> Trig: Free	Log-Power 100/100 Run	1 2 3 4 5 6 M W W W W W P N N N N N		
1 Spec Scale/	trum Div 10 dl	▼ B				Ref LvI Offset Ref Level -10.	25.45 dB 00 dBm			Mkr1 26	.311 6 GHz 44.62 dBm
Log -20.0	Trace	1 Pass									DL1 -19.67 dBm
-30.0											
-40.0 - -50.0					ية ولم يوالية قام وقاطينية مسلماته المراجع والمراجع المراجع من مراجع المسلمات المراجع المراجع	affiliation of a bolic states					
-60.0											
-70.0 - -80.0 -											
-90.0											
Start 2	0.000 GI	Hz				#Video BW (800 kHz			S	top 30.000 GHz
#Res E	3W 100 k		Jun 1 3:41	17, 2024 :36 PM						Sweep ~36.3 n	ns (100001 pts)



Figure 31: Center Channel 1Mbps (DH5) Conducted Spurious Plot 1

Spec Swep	Spectrum Analyzer 1 Swept SA KEVSIGHT Input RF Input Z: 50 Ω			Spectrum An Swept SA	ctrum Analyzer 2 pt SA 0.0 #Atten: 10 dB PNO: Fast Av						
KEY	'Sight PASS	Input: RF Coupling: DC Align: Auto	Input Corr Freq	t Ζ: 50 Ω CCorr RCal Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast d Gate: Off IF Gain: Low Sig Track: Off	Avg Ty; Avg Ho Trig: Fr	pe: Log-Power ld:>100/100 ree Run	1 2 3 4 5 6 M \vee vee vee vee vee vee vee vee vee ve		
1 Spe Scale	ectrum e/Div 10 d	₹ B				Ref LvI Offset Ref Level -10.	21.83 dB 00 dBm			Mkr1 7	07.772 52 MHz -59.55 dBm
Log -20.0	Trace	1 Pass					•				DL1 -19.25 dBm
-30.0											
-40.0 -50.0											
-60.0	<mark>Talqilina soo sabadar</mark>	samut gan be even with belevilled	(Nordal Science of Science)	llago anti la bata di lata	phenetic between the other states and a	the angled and the lattice from the set of the	r den beskedense givi der til	daada dag kana saata	↓ 1 National II, Instituted	n die gehanden die ster stal die Wielen	en den kalenda antikalijeren da <mark>b</mark> en da allen en gerine y da ar A da den antikalijeren da gerine da artikalijeren da artikalijeren da artikalijeren da artikalijeren da artikalijer
-70.0	di ta da sunda sa kuja t	n han an san an a	iten ditibiliti instala otta	_{n an a} n an Anna		n ling i de li da i da de fonse i ing de stig par pa					
-90.0											
-100											
Start #Res	1 MHz BW 100 k	(Hz				#Video BW 3	300 kHz			Sweep ~7	Stop 1.0000 GHz .14 ms (100001 pts)
			? Jun 2:5	17, 2024 59:38 PM							



Figure 32: Center Channel 1Mbps (DH5) Conducted Spurious Plot 2

Spect Swept	Spectrum Analyzer 1 Swept SA KEVSICHT Input: RE Input 2:50.0			ctrum Anal pt SA	lyzer 2	+								
KEY	SIGHT	Input: RF Coupling: DC Align: Auto	Input Z: 50 Corr CCor Freq Ref:)Ω # rRCal μ Int (S) S	#Atten: 10 dB μW Path: Standard Source: Off	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	Avg Type: Avg Hold:> Trig: Free	Log-Power ∍100/100 Run	1 2 3 4 M₩₩₩ P N N N	↓ 5 6 ∀₩₩ ↓ N N				
1 Spe Scale	ctrum /Div 10 d	v B				Ref LvI Offset Ref Level 5.00	21.83 dB dBm				Mkr1 2.31	12 245 44.12	GHz dBm	
∟og -5.00	Trace	1 Pass												
-15.0														
-25.0														
-45.0											• 1 • • • •	 		
-55.0	lland Manifelina de para di	ten production and the second	låpejo per besed for transporter blev blev	alfost continent	uddi yw yddiadau yn diana bidian d	en al station and in an al fair that								
-05.0														
-85.0														
Start 1.0000 GHz #Res BW 100 kHz					#Video BW 300 kHz						Stop 2.4835 GHz Sweep ~7.14 ms (100001 pts)			
	5		Jun 17, 2 3:01:06	2024 PM										



Figure 33: Center Channel 1Mbps (DH5) Conducted Spurious Plot 3





Figure 34: Center Channel 1Mbps (DH5) Conducted Spurious Plot 4

Spec Swep	Spectrum Analyzer 1 Swept SA Swept S/ KEYSIGHT Input: RF Input Z: 50 Ω				alyzer 2	+					
KEY	'SIGHT PASS	Input: RF Coupling: DC Align: Auto	Inp Co Fre	ut Z: 50 Ω rr CCorr RCal q Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast d Gate: Off IF Gain: Low Sig Track: Off	Avg Type: I Avg Hold:> Trig: Free F	₋og-Power 100/100 Run	1 2 3 4 5 6 M₩₩₩₩₩₩ P N N N N N		
1 Spe Scale	ectrum e/Div 10 d	▼ B				Ref LvI Offset Ref Level -10.	23.21 dB 00 dBm			Mkr1 5.4	116 55 GHz 53.08 dBm
Log -20.0	Trace	1 Pass					Y				DL1 -19.25 dBm
-30.0											
-40.0 -50.0	1										
-60.0	a a da ka da ka		la falore di per pre- nancia su con pre-	i de la constante de la consta Constante de la constante de la Constante de la constante de la		is had not a shirt of the filleness of the second			filelusia meneratione leanna di subarta di su Nationa di subarta di su	and a state of the Hall David of the state o	ika pada na na kada da kata na ili na pangana na kata ngana na kata na ili
-70.0 -80.0											
-90.0											
-100											
Start #Res	5.000 GH BW 100 I	lz kHz				#Video BW 3	300 kHz			Steep ~21.9 n	top 10.000 GHz ns (100001 pts)
	5	C []	? Ju	in 17, 2024 :03:31 PM							



Figure 35: Center Channel 1Mbps (DH5) Conducted Spurious Plot 5

Spectrum Analyzer 1 Swept SA Swept S KEVSIGHT Input: RE Input 7:50.0			ectrum Analyzer 2 ept SA 50.0 #Atten: 10.dB PNO						
KEY	SIGHT Input: RF Coupling: DC Align: Auto PASS	Input Ζ: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast d Gate: Off IF Gain: Low Sig Track: Off	Avg Type: L Avg Hold:>1 Trig: Free R	.og-Power 100/100 Run	1 2 3 4 5 6 M₩₩₩₩₩₩ P N N N N N		
1 Spe Scale	ctrum ▼ √Div 10 dB			Ref LvI Offset Ref Level -10.	25.23 dB 00 dBm			Mkr1 19	.203 9 GHz -47.73 dBm
Log	Trace 1 Pass								DL1 -19.25 dBm
-30.0									
-40.0									1
-50.0		a dan baran Maray Anjin da papatan bara dalam Manya da mangana da sa	er digte og hat og fange in Milike siden dår Storgenes som er stande som	en de statistica de la secta sera de la seconda de la s Recença de la seconda de la	ala han kirildi sin di sa da da da da da sa sa k Na kirildi sin di sa da da da sa				
-60.0									
-80.0									
-90.0									
-100	40.000.011-								
Start #Res	10.000 GHz BW 100 kHz	hur 47, 0004	~~ ^	#Video BW 3	300 kHz			Sweep ~36.5 n	top 20.000 GHz ns (100001 pts)
	う ペ ニ ?	3:04:50 PM							



Figure 36: Center Channel 1Mbps (DH5) Conducted Spurious Plot 6

Spec Swep	trum Analy It SA	zer 1		Spectrum An Swept SA	vept SA 50 Ω #Atten: 10 dB PNO: Fast			Ava Type: Log-Power 122456			
KEY	'Sight PASS	Input: RF Coupling: DC Align: Auto	Inp Co Fre	out Z: 50 Ω rr CCorr RCal eq Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast d Gate: Off IF Gain: Low Sig Track: Off	Avg Type: Avg Hold:> Trig: Free	Log-Power ⊳100/100 Run	1 2 3 4 5 6 M \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		
1 Spe Scale	ectrum e/Div 10 d	▼ B				Ref Lvi Offset Ref Level -10.	25.45 dB 00 dBm			Mkr1 26	.200 3 GHz -44.07 dBm
Log -20.0	Trace	1 Pass					Y				DL1 -19.25 dBm
-30.0								. 1			
-40.0 -50.0	Polo di ta balanci	and the second states of the				th discuss a latent point to pay a latent of			telen die keine des die die State (1990) Die seine geweine ander die state (1990) Die seine geweine ander die state (1990)	hou hate on the first state of the second stat	la, lakinen Manageratur Jarak
-60.0											
-70.0 -80.0											
-90.0											
-100											
Start #Res	20.000 GI BW 100 k	Hz (Hz		in 17, 2024		#Video BW 3	300 KHZ			Sweep ~36.3 r	top 30.000 GHz ns (100001 pts)
	<u>ا (ا</u>		? 3	3:13:48 PM							



Figure 37: High Channel 1Mbps (DH5) Conducted Spurious Plot 1





Figure 38: High Channel 1Mbps (DH5) Conducted Spurious Plot 2

Spect Swep	Spectrum Analyzer 1 Swept SA Swept SA Swept SA Swept SA Swept SA Swept SA				alyzer 2								
KEY	SIGHT	Input: RF Coupling: DC Align: Auto	Inpu Corr Frec	ıt Ζ: 50 Ω r CCorr RCal q Ref: Int (S)	#Atten: 10 dB μW Path: Standarc Source: Off	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	Avg Type: I Avg Hold:> Trig: Free I	₋og-Power 100/100 Run	1 2 3 4 5 6 M \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \				
1 Spe Scale	ctrum e/Div 10 de	т В				Ref LvI Offset Ref Level 5.00	21.83 dB dBm			Μ	kr1 2.35	i1 99 42.8	15 GHz 0 dBm
Log -5.00	Trace	1 Pass											
-15.0													
-25.0 -35.0													
-45.0													
-55.0	a Tille I Million I an an Ann		, ile is del	termed film the entry light and relations					na fer and the second in the other states	e le le			
-75.0													
-85.0													
Start #Res	1.0000 G⊦ BW 100 k	lz Hz			#Video BW 300 kHz					Stop 2.5000 GHz Sweep ~7.14 ms (100001 pts			
	5		Jui 3:	n 17, 2024 27:59 PM									



Figure 39: High Channel 1Mbps (DH5) Conducted Spurious Plot 3





Figure 40: High Channel 1Mbps (DH5) Conducted Spurious Plot 4





Figure 41: High Channel 1Mbps (DH5) Conducted Spurious Plot 5





Figure 42: High Channel 1Mbps (DH5) Conducted Spurious Plot 6

Spectrum Analyzer 1 Swept SA Swept SA			Spectrum Ar Swept SA	trum Analyzer 2 tt SA Ω #Atten: 10 dB PNO: Fast								
KEY:	Sight PASS	Input: RF Coupling: DC Align: Auto	Inp Co Fre	ut Ζ: 50 Ω rr CCorr RCal lq Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast I Gate: Off IF Gain: Low Sig Track: Off	Avg Type: Avg Hold:> Trig: Free	Log-Power ∍100/100 Run	1 2 3 4 M₩₩₩ P N N I	4 5 6 ₩₩₩ N N N		
1 Spec Scale	ctrum /Div 10 d	T B				Ref LvI Offset Ref Level -10.	25.45 dB 00 dBm				Mkr1 26.	311 6 GHz 44.62 dBm
Log -20.0	Trace	1 Pass					•					DL1 -19.67 dBm
-30.0												
-40.0 -50.0		ter ble støkner og te stårde [1]				deterritien attentionen er en bet						
-60.0												
-70.0 -80.0												
-90.0												
-100												00 000 011-
Start : #Res	20.000 GI BW 100 F	HZ (HZ			#Video BW 300 kHz						Stop 30.000 GH: Sweep ~36.3 ms (100001 pts	
	5		? Ju	in 17, 2024 :41:36 PM								



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Figure 43: Low Channel 2Mbps (2DH5) Conducted Spurious Plot 1

Spect Swep	rum Analyzer 1 t SA	Spectrum Ar Swept SA	nalyzer 2	+				
KEY	SIGHT Input: RF Coupling: I Align: Auto	DC Corr CCorr RCal Freq Ref: Int (S)	#Atten: 10 dB PNC µW Path: Standard Gate Source: Off IF G Sig): Fast Avg e: Off Avg aain: Low Trig Track: Off	g Type: Log-Power g Hold:>100/100 g: Free Run	1 2 3 4 5 6 M₩₩₩₩₩₩ P N N N N P		
1 Spe Scale	ctrum v e/Div 10 dB		Ref L Ref L	vl Offset 21.83 d evel -10.00 dBm	В		Mkr1 929.3	80 69 MHz 59.22 dBm
Log	Trace 1 Pass	3						DL1 -19.11 dBm
-30.0								
-40.0								
-50.0								↓ 1
-70.0	in a mod di bilance pod baj na navna se zaprila je navna se da na Navna za navna se zaprila se zaprila pod pod pod pod navna se zaprila se zaprila se zaprila se zaprila se zapri		a production (1999). But is no a fair provide a fair (1999) and the only on		s, s. tijski kost i latik (i i i se semedati na ži na najveda se stanov se stanov se			
-80.0								
-90.0								
-100								
Start #Res	1 MHz BW 100 kHz		#Vi	deo BW 300 kHz			St Sweep ~7.14 m	op 1.0000 GHz is (100001 pts)
	5 6	Jul 09, 2024 10:29:18 AM						



Figure 44: Low Channel 2Mbps (2DH5) Conducted Spurious Plot 2

Spect Swep	trum Analy t SA	zer 1	v s	Spectrum Ai Swept SA	nalyzer 2	+						
KEY	'Sight PASS	Input: RF Coupling: DC Align: Auto	Input Corr (Freq I	Z: 50 Ω CCorr RCal Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast d Gate: Off IF Gain: Low Sig Track: Off	Avg Type: L Avg Hold:> Trig: Free F	.og-Power 100/100 Run	1 2 3 4 5 6 M ₩ ₩ ₩ ₩ ₩ P N N N N P			
1 Spe Scale	ectrum e/Div 10 d	v B				Ref LvI Offset Ref Level 10.0	21.83 dB 0 dBm			Mkr1 2.2	73 99 -43.9	95 GHz 12 dBm
Log 0.00	Trace	1 Pass										
-10.0												
-20.0 -30.0												
-40.0										1		
-50.0 -60.0						. A. t. conductor at the se			والماما والمراجع المراجع المراجع ال			
-70.0		kan ng kang bana kan ang kang bana kang Kang bang bana kang ba	ta hida na dhidin an ing tang talang talang		an a la gran de la compagna de la serie de la definita de la definita de la compañía de la definita de la defin	and and an		<mark>y de perda, la centra de parte de parte En la constante de parte de par</mark>	ay a an tao ann an tao an t	anna an an Airth Airth Anna Airth Airth Anna Airth Anna Airth Anna Airth Anna Airth Anna Airth Anna Airth Anna Airtheann an Airtheann Anna Airtheann Airtheann Airtheann Airtheann Airtheann Airtheann Airtheann Airtheann Air		iron to in the order of the second
-80.0												
Start #Res	1.0000 GI BW 100 k	Hz (Hz				#Video BW 3	300 kHz	1		Sweep ~7.14	top 2. ms (10	5000 GHz 00001 pts)
	5		Jul (10:3	09, 2024 0:04 AM								



Figure 45: Low Channel 2Mbps (2DH5) Conducted Spurious Plot 3





Figure 46: Low Channel 2Mbps (2DH5) Conducted Spurious Plot 4





Figure 47: Low Channel 2Mbps (2DH5) Conducted Spurious Plot 5





Figure 48: Low Channel 2Mbps (2DH5) Conducted Spurious Plot 6

Spect Swep	rum Analy t SA	yzer 1	•	Spectrum Ar Swept SA	nalyzer 2	+					
KEY	sight F	Input: RF Coupling: DC Align: Auto	Inpu Corr Freq	t Ζ: 50 Ω ·CCorr RCal Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast d Gate: Off IF Gain: Low Sig Track: Off	Avg Type: I Avg Hold:> Trig: Free F	.og-Power 100/100 Run	1 2 3 4 5 6 M ₩ ₩ ₩ ₩ ₩ P N N N N P		
1 Spe Scale	ctrum e/Div 10 d	▼ B				Ref LvI Offset Ref Level -10.	25.45 dB 00 dBm			Mkr1 29	.475 8 GHz -44.98 dBm
Log -20.0	Trace	1 Pass					Y				DL1 -19.11 dBm
-30.0											
-40.0 -50.0	kelen der Arbeiten gebeure	, bei en an blei blei en dat e fer	warde Hinder	un an airte an an an Airte Marsain an	in the providence of the second s				terila y cettora de la sectorión de la cettorio de sectorio de la completa		
-60.0	ind and it fold from the party	y yez (, , madina, , y), and its ary branks it the Mildine, _{y is}	a de la militar des ant l'anna								
-70.0 -80.0											
-90.0											
-100											
Start #Res	20.000 G BW 100 I	Hz kHz				#Video BW 3	300 kHz			S Sweep ~36.3 r	top 30.000 GHz ns (100001 pts)
	5		? Jul 10:	09, 2024 37:18 AM							



Figure 49: Center Channel 2Mbps (2DH5) Conducted Spurious Plot 1 of 2

Spec	trum Analy	zer 1	Spectrum A	nalyzer 2	4					
KEY	ot SA /SIGHT PASS	Input: RF Coupling: DC Align: Auto	Swept SA Input Ζ: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	Avg Type: L Avg Hold:> Trig: Free F	og-Power 100/100 tun	1 2 3 4 5 6 M W W W W M P N N N N P		
1 Spe Scal	ectrum e/Div 10 d	, B			Ref LvI Offset 2 Ref Level 10.00	21.83 dB) dBm			Mkr1 2.4	140 00 GHz 0.63 dBm
Log 0.00	Trace	1 Pass			↓ 1					
-10.0										
-20.0 -30.0										
-40.0										
-50.0 -60.0) a _{ndi o} ray kalah sika bida	an ha dan ta pada a ta a da da da da se	and and advantage to make the same of the same							
-70.0) 	an a								
-60.0	1 MHz				#Video BW 3	00 kHz				Stop 5.000 GHz
#Res	BW 100 F		? Jul 09, 2024 10:44:43 AM						Sweep ~21.3 n	ns (100001 pts)



Figure 50: Center Channel 2Mbps (2DH5) Conducted Spurious Plot 2 of 2

Spect Swep	rum Analyzer 1 t SA	Spectrum Ar Swept SA	nalyzer 2	+					
KEY	SIGHT Input: RF Coupling: DC Align: Auto	Input Ζ: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast d Gate: Off IF Gain: Low Sig Track: Off	Avg Type: L Avg Hold:>1 Trig: Free R	og-Power 100/100 tun	1 2 3 4 5 6 M W W W W M P N N N N P		
1 Spe Scale	ctrum v MDiv 10 dB			Ref Lvi Offset Ref Level -10.0	25.45 dB 00 dBm			Mkr1 26.3	360 75 GHz 44.13 dBm
Log -20.0	Trace 1 Pass								DL1 -19.11 dBm
-30.0									
-40.0 -50.0				Statistic - second - Milit		let all a population of the start of			
-60.0					a an an Anna a Anna an Anna an	allen allen og som en som e			
-70.0									
-90.0									
-100									
Start #Res	5.00 GHz BW 100 kHz			#Video BW 3	00 kHz			Sweep ~93.6 n	Stop 30.00 GHz ns (100001 pts)
	う ペ 🗖 ?	Jul 09, 2024 10:48:46 AM							



Figure 51: High Channel 2Mbps (2DH5) Conducted Spurious Plot 1

Spectr Swept	rum Analyzei SA	r 1	• +						
KEY:	SIGHT Inf Ali PASS	out: RF oupling: DC ign: Auto	Input Ζ: 50 Ω Corr CCorr RCa Freq Ref: Int (S	#Atten: 10 dB al µW Path: Standard i) Source: Off	PNO: Fast Gate: Off F Gain: Low Sig Track: Off	Avg Type: Log-Pow Avg Hold:>100/100 Trig: Free Run	er 123456 MWWWWW PNNNNN		
1 Spec Scale	ctrum /Div 10 dB	T			Ref LvI Offset : Ref Level -10.0	21.83 dB 00 dBm		Mkr1 869.3	390 74 MHz -58.56 dBm
Log -20.0	Trace 1	Pass							DL1 -19.11 dBm
-30.0									
-40.0									
-60.0	iste model an using the set of sec.	uya cana a ang dana dapat ipi datuna	type of a last in a directive transmissional	Definition of the particulation of the test of a	seelististististe ooseatalida ta		n fålla sola junke och gjörne den protosta junk junk junker		र (ता सुप्रे के प्रमाद का काल करता जातर का जात
-70.0	n Midm. i.ed ,		nden mennel kan bester (og eksen til state i Anmenford Annelling)		(Al-18) Martin B. Bardel Martin H Addition				
-80.0 -90.0									
-100 -									
Start 1 #Res	1 MHz BW 100 kHz	2			#Video BW 3	00 kHz		S Sweep ~7.14 r	top 1.0000 GHz ns (100001 pts)
	50		Jul 09, 2024 10:16:19 AM						



Figure 52: High Channel 2Mbps (2DH5) Conducted Spurious Plot 2

_										
Spect Swep	trum Analy t SA	zer 1	• +							
KEY	'SIGHT	Input: RF Coupling: DC Align: Auto	Input Ζ: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast Gate: Off F Gain: Low Sig Track: Off	Avg Type: L Avg Hold:>1 Trig: Free R	og-Power 00/100 un	1 2 3 4 5 6 M \ W W W W P N N N N N		
1 Spe	ctrum	T			Ref LvI Offset	21.83 dB 0 dBm			Mkr1 2.3	51 995 GHz -43.28 dBm
Log	Trace	- 1 Pass								
0.00										
-10.0										
-20.0										
-30.0										
-40.0										• 1
-50.0									hill.	
-60.0	lis tiste metrole s	(alation profile a bill blin a basis)	ulaharah karateran tarakara <mark>h k</mark> arangan di a			an an an ann an Annaichte an Annaichte An an Annaichte an Annaichte an Annaichte	dout, es a tratag	الاسرية أو مادر بين الدورية والقدير والمثلول باليور الرسم ومحمد والمركز معرف معرف المحمول والمنافع		
-70.0										
-80.0										
Start #Res	1.0000 G BW 100 I	Hz <hz< td=""><td></td><td></td><td>#Video BW 3</td><td>00 kHz</td><td></td><td></td><td>Sweep ~7.14</td><td>Stop 2.5000 GHz ms (100001 pts)</td></hz<>			#Video BW 3	00 kHz			Sweep ~7.14	Stop 2.5000 GHz ms (100001 pts)
	5		Jul 09, 2024 10:17:43 AM							



Figure 53: High Channel 2Mbps (2DH5) Conducted Spurious Plot 3





Figure 54: High Channel 2Mbps (2DH5) Conducted Spurious Plot 4

Specti Swept	rum Analy : SA	zer 1	• +							
KEY.	SIGHT PASS	Input: RF Coupling: DC Align: Auto	Input Z: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	Avg Type: L Avg Hold:>1 Trig: Free R	og-Power 00/100 un	1 2 3 4 5 6 M₩₩₩₩₩₩ P N N N N N		
1 Spec Scale	ctrum / Div 10 d	₹ B			Ref LvI Offset 2 Ref Level -10.0	23.21 dB 0 dBm			Mkr1 5.	134 70 GHz -52.75 dBm
Log -20.0	Trace	1 Pass								DL1 -19.11 dBm
-30.0										
-40.0	1									
-60.0			diffest to an electron and a second statements		, and a start of the start of the Start of the start of		a billio da seda parte Referencia parte sente	den yn ffeddy <mark>de fernen sy ny gyn yn ferdd de fernen y</mark> 19 mae yn gener a seren yn yn yn yn yn yn yn yn yn artefer ar yn	لمرد والولية ويردون فأنه وأوار والرائل وي معروف في يروي عند ومعمور ويروي	
-70.0										
-90.0										
-100										
Start #Res	5.000 GH BW 100 I	z (Hz			#Video BW 3	00 kHz			S Sweep ~21.9 r	top 10.000 GHz ms (100001 pts)
	5		Jul 09, 2024 10:20:31 AM							



Figure 55: High Channel 2Mbps (2DH5) Conducted Spurious Plot 5




Figure 56: High Channel 2Mbps (2DH5) Conducted Spurious Plot 6

Spectrum Ar Swept SA	alyzer 1	• +							
Keysigh	IT Input: RF Coupling: DC Align: Auto	Input Ζ: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	#Atten: 10 dB µW Path: Standard Source: Off	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	Avg Type: L Avg Hold: 9 Trig: Free F	.og-Power 4/100 Run	1 2 3 4 5 6 M₩₩₩₩₩₩ P N N N N P		
1 Spectrum Scale/Div 1	▼ 0 dB		F	Ref Lvl Offset Ref Level -10.0	25.45 dB 00 dBm			Mkr1 29	.214 1 GHz -44.90 dBm
Log -20.0	ce 1 Pass								DL1 -19.11 dBm
-30.0									
-40.0	n ya ya ka sa	a characteristic in the foreign and	us (au dha a dhaan dhiji a maa dha dhu da dhu	llerster til det for been setter at bester	le adde fearaig at diffeter a de Miller	a official data	let, Jackson, production and Mileson leave	nal fallen ser en lle skel få førstere der skredere	1
-60.0	e,	n yn Llwefer yn yn llwy y fel yn fel yn yn deffennau (fel mar ann yn yn fel a fel a fel		Mara (Malantia Iga, and Buta, an an Albar	and the second secon		hilling milling of a cold filling and plantic for the filling of a filling of the filling of the filling of the	(para) an ann an Annaich, paraithe a Mabhair an cuil bean denh	
-70.0									
-90.0									
-100									
Start 20.000 #Res BW 10	GHz 0 kHz			#Video BW 3	300 kHz			Sweep ~36.3 r	top 30.000 GHz ns (100001 pts)
1 5		Jul 09, 2024 10:23:54 AM							



3.6 Radiated Emissions

3.6.1 Requirements

Compliance Standard: FCC Part 15.247, 15.209, 15.205

Radiated Emissions, Compliance Limits								
Frequency Range	Class B Equivalent (3-meters)							
30 – 88 MHz	100 µV/m							
88 – 216 MHz	150 µV/m							
216 – 960 MHz	200 µV/m							
> 960 MHz	500 µV/m							

3.6.2 Test Procedure

The requirements of FCC Part 15 and ICES-003 call for the EUT to be placed on a 1 X 1.5 meters nonconductive motorized turntable for radiated testing on a 3-meter open air test site. The height of the table is 80cm for testing below 1GHz. The height of the table is 150cm for testing above 1GHz.

The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Biconical and log periodic broadband antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The output of the antenna was connected to the input of the spectrum analyzer and the emissions in the frequency range of 30 MHz to 26.5 GHz were measured. Both the horizontal and vertical field components were measured.

The output from the antenna was connected, via a preamplifier, to the input of the spectrum analyzer. The detector function was set to quasi-peak or peak, as appropriate. Above 1GHz average measurement are recorded. The measurement bandwidth of the spectrum analyzer system was set to at least 120 kHz, with all post-detector filtering no less than 10 times the measurement bandwidth. Frequencies above 1GHz were performed using a measurement bandwidth of 1 MHz with a video bandwidth setting of 10 Hz for the average measurement.

3.6.3 Test Results Summary

The EUT complies with the Class B Radiated Emissions requirements.



3.6.4 Radiated Data Reduction and Reporting

To convert the raw spectrum analyzer radiated data into a form that can be compared with the FCC limits, it is necessary to account for various calibration factors that are supplied with the antennas and other measurement accessories. These factors are included into the antenna factor (AF) column of the table and in the cable factor (CF) column of the table. The AF (in dB/m) and the CF (in dB) is algebraically added to the raw Spectrum Analyzer Voltage in dB μ V to obtain the Radiated Electric Field in dB μ V/m. This logarithm amplitude is converted to a linear amplitude, then compared to the FCC limit.

Example:

Spectrum Analyzer Voltage: $VdB\mu V$ Antenna Correction Factor: AFdB/mCable Correction Factor: CFdBPre-Amplifier Gain (if applicable): GdBElectric Field: $EdB\mu V/m = V dB\mu V + AFdB/m + CFdB - GdB$ To convert to linear units of measure:: $EdB\mu V/m/20$ Inv log

3.6.5 Test Data

The EUT is fully compliant, and the final test data, for both modes, is provided on the pages below.

There were no EUT emissions detected in the frequency range of 8 GHz to 26.5 GHz.

A complete investigation of the radiated fundamental field strength was performed. The EUT was evaluated in three orthogonal axes (x, y, z). The EUT position the produced the highest radiated power was maintained during all testing.

The EUT was configured to transmit a modulated signal as follows:

- a) for testing of 30 MHz to 1 GHz, the EUT was set to a transmitter enabled mode, the BLE transceiver was set to sweep the 2.4GHz ISM band, in an active advertising mode.
- b) for testing of 1 GHz to 26.5 GHz, the EUT was set to a transmitter enabled mode, the BLE transceiver was set to dwell on the low, center, and high channels.

Please accept the 30MHz to 1GHz data to cover the digital portion under the provisions of 15.109(a).



Frequency (MHz)	Detector	Corr. Meas (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Table (deg)	Antenna (cm)
82.220	Peak	38.502			270	Horiz, 225
83.220	QP	31.637	40	-8.363	270	Horiz, 225
84.605	Peak	39.978			180	Vert, 100
	QP	30.581	40	-9.419	180	Vert, 100

Table 9: Radiated Emissions Test Data, 1Mbps (DH5) 30MHz to 1GHz









Frequency (MHz)	Detector	Corr. Meas (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
2390.0^{1}	Peak	46.136	74	-27.864	315	Horiz, 160
2370.0	Avg	32.583	54	-21.417	315	Horiz, 160
2402.0^{2}	Peak	90.927			315	Horiz, 160
2402.0	Avg	79.974			315	Horiz, 160
5217.0	Peak	52.901	74	-21.099	315	Horiz, 160
5217.0	Avg	39.953	54	-14.047	315	Horiz, 160
7222.0	Peak	57.05	74	-16.95	315	Horiz, 160
7222.0	Avg	42.296	54	-11.704	315	Horiz, 160
83/3 0 ³	Peak	57.68	74	-16.32	145	Vert, 155
0343.0	Avg	43.299	54	-10.701	145	Vert, 155
103150^{3}	Peak	64.602	74	-9.398	315	Horiz, 160
10315.0	Avg	48.558	54	-5.442	315	Horiz, 160
11682 0 ³	Peak	63.381	74	-10.619	315	Horiz, 160
11002.0	Avg	48.71	54	-5.290	315	Horiz, 160

Table 10: Radiated Emissions Test Data, Low Channel, 1Mbps (DH5)

¹ Restricted BE

² Low Chan TX

³ Ambient









Figure 57: Radiated Emissions, Low Channel, 1Mbps, DH5, (12GHz to 26.5GHz)

🔤 Key	sight Spectrum	Analyzer - Swept SA								
L <mark>XI</mark>	T R	= 50 Ω AC			SENSE:INT	AL	IGN AUTO		04:20:49	AM Jun 29, 2024
			F	PNO: Fast 😱 Gain:High	Trig: Free #Atten: 0 d	Run IB	Avg Type:	Log-Pwr	זו ד	ACE 1 2 3 4 5 6 TYPE M M WWWW DET P P N N N N
5 dB/ Log	div Re	f 55.00 dBµ	V							
50.0										
45.0										
40.0	li i ni consel su		a Winned as he							Ц
	lashti alkidana	والأماني وريادا ويستعملون	a dalar	i manini Manini ana ang	and whether the second	V ^{ari} di, Manyan	Notes and the second	il a dai	hidi dela di second	
35.0	and taken a second	ten la	1	in the second	and a second second second	haddan adalah dari	Non-Million Physics	للقادي أراي	A MARINE MARINE	
30.0								74 191 F		Land Contract of the second se
25.0										
25.0										
20.0										
15.0										
10.0										
Star	12 000 4	Ч-							Stop	6 500 CH-
#Res	S BW 100	kHz		#VB	W 300 kHz			Sweep	1.387 s (1	00001 pts)
MSG							STATUS			

- EUT emissions are not detected in this frequency range.
- Trace 1 = EUT Low Chan. TX On
- **Trace 2** = Ambient



Frequency (MHz)	Detector	Corr. Meas (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
2312.0^{-1}	Peak	47.512	74	-26.488	145	Vert, 165
2012.0	Avg	33.775	54	-20.225	145	Vert, 165
6117.0	Peak	54.033	74	-19.967	145	Vert, 165
0117.0	Avg	40.536	54	-13.464	145	Vert, 165
7210.0	Peak	57.576	74	-16.424	245	Horiz, 155
7210.0	Avg	42.465	54	-11.535	145	Horiz, 165
10312.0^{2}	Peak	62.287	74	-11.713	245	Vert, 155
10312.0	Avg	46.991	54	-7.009	145	Vert, 165
11600.0^{2}	Peak	60.028	74	-13.972	315	Horiz, 165
11000.0	Avg	47.251	54	-6.749	315	Horiz, 165

Table 11: Radiated Emissions Test Data, Center Channel, 1Mbps (DH5)

¹Emission in a Restricted Band

² Ambient









Figure 58: Radiated Emissions, Center Channel, 1Mbps, DH5, (12GHz to 26.5GHz)



- EUT emissions are not detected in this frequency range.
- Trace 1 = EUT Center Chan. TX On
- Trace 2 = Ambient



Frequency (MHz)	Detector	Corr. Meas (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
2480.0^{-1}	Peak	90.43			245	Horiz, 155
2100.0	Avg	77.097			145	Horiz, 165
2483 5 ²	Peak	51.271	74	-22.729	145	Horiz, 165
2-03.5	Avg	29.611	54	-24.389	145	Horiz, 165
7217.0	Peak	56.891	74	-17.109	245	Vert, 155
7217.0	Avg	42.023	54	-11.977	145	Vert, 165
9440 0 ³	Peak	61.363	74	-12.637	245	Vert, 155
2440.0	Avg	46.474	54	-7.526	145	Vert, 165
10201 0 ³	Peak	64.011	74	-9.989	245	Horiz, 155
10201.0	Avg	47.875	54	-6.125	315	Horiz, 155
10902 0 3	Peak	63.664	74	-10.336	245	Vert, 155
10702.0	Avg	47.784	54	-6.216	145	Vert, 165

Table 12: Radiated Emissions Test Data, High Channel, 1Mbps (DH5)

¹ High Chan TX

² Restricted BE

³ Ambient







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Figure 59: Radiated Emissions, High Channel, 1Mbps, DH5, (12GHz to 26.5GHz)

🔤 Key	/sight Spectrun	n Analyzer - Swept S/	4							
L <mark>XI</mark>	TF	RF 50Ω A	C		SENSE:INT	AL	IGN AUTO		02:57:55	AM Jun 29, 2024
			F	PNO: Fast 😱 Gain:High	Trig: Free #Atten: 0 d	Run IB	Avg Type:	Log-Pwr	TR T	ACE 1 2 3 4 5 6 YPE MMWWWW DET P P N N N N
5 dB/	div Re	ef 55.00 dBµ	v							
50.0										
45.0										
40.0	liter of the second second		and ^{and} apply and a	WMM WWW			en			<mark>ارب</mark>
35.0	hhqqq _a ntaria	and the state of the	ha ^{dadh} haddaadhaa	OPPArt and a second	and a state of the	hainy kylpohen Katura	a dhana an	an a analasi	n an particular de la compañía de la Nativa de la compañía	
30.0						A. a. B. I. Manuer .				
25.0										
20.0										
15.0										
10.0										
Star #Res	t 12.000 s BW 100	GHz) kHz		#VBW	300 kHz			Sweep	Stop 2 1.340 s (1	6.500 GHz 00001 pts)
MSG							STATUS			

- EUT emissions are not detected in this frequency range.
- Trace 1 = EUT High Chan. TX On
- **Trace 2** = Ambient



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Frequency (MHz)	Detector	Corr. Meas (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Table (deg)	Antenna (cm)
20.60	Peak	39.058			220	Horiz, 190
30.00	QP	32.029	40	-7.971	220	Horiz, 190
82.025	Peak	39.801			180	Horiz, 155
82.923	QP	31.395	40	-8.605	180	Horiz, 155
92.10	Peak	40.209			180	Vert, 100
85.10	QP	31.649	40	-8.351	180	Vert, 100
110.92	Peak	38.713			180	Vert, 100
110.82	QP	29.899	43.5	-13.601	180	Vert, 100
050 770	Peak	43.52			180	Horiz, 155
030.220	QP	36.157	46	-9.843	180	Horiz, 155
011 095	Peak	44.87			180	Horiz, 155
911.085	QP	37.128	46	-8.872	180	Horiz, 155
022.004	Peak	45.493			180	Horiz, 155
922.004	QP	37.709	46	-8.291	180	Horiz, 155

Table	13: Radiated	Emissions	Test Data.	2Mbps	(2DH5)	30MHz to	1GHz
1 4010	15. Itudiatea	Limbolono	rest Data,	21110pb	(20113)	50101112 00	TOTIL

* please note that during this portion of the testing, the mechanical attenuation setting in the spectrum analyzer was unintentionally set to 20dB. This artificially inflated the noise floor. Nevertheless, the measurement system and the EUT unwanted emissions still passed. This note only applies to the frequency range of 30MHz to 1GHz and the 2Mbps EUT mode and explains the "visually close margins" of the plots provided on the following page.











Frequency (MHz)	Detector	Corr. Meas (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
2390.0^{1}	Peak	47.009	74	-26.991	315	Vert, 165
2370.0	AVG	29.184	54	-24.816	315	Vert, 165
2402.0^{2}	Peak	95.583			245	Horiz, 155
2402.0	AVG	74.456			315	Horiz, 165
7122.0	Peak	56.388	74	-17.612	245	Vert, 155
/122.0	AVG	42.194	54	-11.806	315	Vert, 165
9898 0 ³	Peak	60.62	74	-13.38	245	Vert, 155
2020.0	AVG	46.908	54	-7.092	315	Vert, 165
10294 0 3	Peak	62.605	74	-11.395	245	Vert, 155
10294.0	AVG	47.256	54	-6.744	315	Vert, 165
11513 0 ³	Peak	63.179	74	-10.821	315	Horiz, 165
11313.0	AVG	49.012	54	-4.988	315	Horiz, 165

Table 14: Radiated Emissions Test Data, Low Channel, 2Mbps (2DH5)

¹ Restricted BE

² Low Chan TX

³ Ambient











Figure 60: Radiated Emissions, Low Channel, 2Mbps, 2DH5, (12GHz to 26.5GHz)

_										
Spectr Swept	rum Analy : SA	zer 1	• +							
KEY: T	Sight Sight	Input: RF Coupling: DC Align: Auto	Input Ζ: 50 Ω Corr CCorr RCal Freq Ref: Int (S)	Atten: 6 dB µW Path: Standard Source: Off	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	Avg Type: L Trig: Free F	₋og-Power Run	123456 MM₩₩₩₩₩ PPNNNN		
1 Spec	ctrum	•								
Scale	/Div 5 dE				Ref Level 55.00	0 dBµV				
50.0										
45.0 -										
40.0	lin, allate		Konstan parter distances and		h alta a second			al hourseland and an a final	l. donut laka donut shiri ba oo	
25.0	hilandation	n an	and a particular and a second second	r arrent i gen Angelen (der en generation (der einer Angelen (der einer ein	an a	a ta	an dan falika san s	ana ang sagara sa	energeneense of the base of the schedule of the second second second second second second second second second	and the second second second
30.0						a and a second product of the second seco	And and a state of the second			Martin alter atter
25.0										
20.0										
15.0 -										
10.0 -										
Start 1 #Res	12.000 GI BW 100 I	Hz KHz			#Video BW 1.	0 MHz			Sweep ~56.7	Stop 26.500 GHz ms (100001 pts)
	5		? Jul 02, 2024 3:20:17 PM	\odot						

- EUT emissions are not detected in this frequency range.
- Trace 1 = EUT Low Chan. TX On
- Trace 2 = Ambient



Table 15: Radiated Emissions Test Data, Center Channel, 2Mbps (2DH5)

Frequency (MHz)	Detector	Corr. Meas (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
2440.0^{-1}	Peak	90.191			180	Horiz, 175
2440.0	AVG	74.17			180	Horiz, 175
7086.0	Peak	57.082	74	-16.918	165	Vert, 160
	AVG	40.911	54	-13.089	165	Vert, 160
9899 0 ²	Peak	62.30	74	-11.70	165	Vert, 160
7077.0	AVG	46.244	54	-7.756	165	Vert, 160
11/19 0 2	Peak	63.69	74	-10.31	165	Vert, 160
11117.0	AVG	48.093	54	-5.907	165	Vert, 160

¹ Center Chan TX

² Ambient





Center Chan., 2Mbps (π/4DQPSK) Pre-scan and Final Data (Horizontal)





Figure 61: Radiated Emissions, Center Channel, 2Mbps, 2DH5, (12GHz to 26.5GHz)

🔤 Ke	ysight Sp	ectrum A	nalyzer - Swept SA	ł							
L X I	T	RF	50 Ω A			SENSE:INT	AL	IGN AUTO		06:07:45	AM Jul 10, 2024
				IF	PNO: Fast 🖵 -Gain:High	Trig: Free #Atten: 0 d	Run IB	Avg Type:	Log-Pwr	T	ACE 123456 YPE MMWWWW DET PPNNNN
5 dBi Log	/div	Ref	55.00 dBµ	v							
50.0											
45.0											
40.0	n in the second se	il a tribuye	atoriadaa edilita waxaa aha	a <mark>lan Mahappen Aphilan</mark> An Anna an Anna Anna Anna Anna Anna Ann	Haathadd Ardelaa Taalaad a ar ahaan ah	The second second	e etektoria tomak	l e gligana felingan tek ^{a ki}	^A lukodu _{nte, die}	¹⁹⁷⁴ Marine (n. 1	al ada a s
35.0	Ակիլն	li ^{ali} li de la contra	and and the second second	HIL	((I I I I I I I I I I I I I I I I I I	han an taise an an taise an ta	an and a second second	They are a straight the	, per film part di anta a	and the product of the second s	
30.0											
25.0											
20.0											
15.0											
10.0											
Star #Re:	t 12.0 s BW	000 GI 100 k	Hz (Hz		#VB	W 1.0 MHz			Sweep	Stop 2 1.340 s (1	6.500 GHz 00001 pts)
MSG								STATUS			

- EUT emissions are not detected in this frequency range.
- Trace 1 = EUT Center Chan. TX On
- **Trace 2** = Ambient



Frequency (MHz)	Detector	Corr. Meas (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Turn Table (deg)	Antenna (cm)
2480.0^{-1}	Peak	91.935			165	Vert, 170
2400.0	AVG	74.411			165	Vert, 170
2483.5 ²	Peak	51.504	74	-22.496	165	Vert, 170
	AVG	31.17	54	-22.83	165	Vert, 170
6844.0	Peak	56.866	74	-17.134	165	Vert, 170
001110	AVG	39.199	54	-14.801	165	Vert, 170
11509 0 ³	Peak	63.78	74	-10.22	165	Vert, 170
11507.0	AVG	48.013	54	-5.987	165	Vert, 170

Table 16: Radiated Emissions Test Data, High Channel, 2Mbps (2DH5)

¹ High Chan TX

²Restricted BE

³ Ambient











Figure 62: Radiated Emissions, High Channel, 2Mbps, 2DH5, (18GHz to 26.5GHz)

🛄 Key	ysight Spectrur	n Analyz	er - Swept SA								
LXI	T	RF	50 Ω AC			SENSE:INT	AL	IGN AUTO		05:40:26	AM Jul 10, 2024
				F	PNO: Fast 🕞 Gain:High	Trig: Free #Atten: 0 d	Run IB	Avg Type:	Log-Pwr	TR 1	ACE 1 2 3 4 5 6 TYPE MMWWWW DET PPNNNN
5 dB/ Log i	/div R	ef 55	.00 dBµ\	/							
50.0											
45.0											
40.0	Willersbler Alter betreve	Harah Halan Ang ang A	elalena aller mansa	ang	lan nation <mark>a suit</mark> Internation	the the state of the second	a lana ya ka sala da	alikateri an estatu Alikateri an estatu	A. III AMARANA MARA		
35.0	. see fi Hawke	· • • • • •	ייי יווי.		10,000	Water restation the super	Personal products and the second	and the second sec	, pain air an tha air an tha air air air air air air air air air ai	i dina piada pagi	
30.0											
25.0											
15.0											
10.0											
Star	t 12.000	GHz								Stop 2	6.500 GHz
#Re	s BW 10	0 kHz			#VE	3W 1.0 MHz			Sweep	1.340 s (1	00001 pts)
MSG								STATUS			

- EUT emissions are not detected in this frequency range.
- Trace 1 = EUT High Chan. TX On
- Trace 2 = Ambient



4 Test Equipment

The table below provides a list of the test equipment used for measurements along with the calibration information.

Table 17: 1	Test Equipmen	t List
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Test Name:	Radiated Emissions	Testing Dates: 6/17/2024 – 7/9/2024	
Asset #	Manufacturer/Model	Description	Cal. Due
00942	AGILENT, MXA	SPECTRUM ANALYZER	12/19/2024
00993 ¹	KEYSIGHT, MXA	SPECTRUM ANALYZER	11/6/2025
00382	SUNOL SCIENCES CORP.	ANTENNA, LOGPERIOD	6/12/2027
00004	ARA, DRG-118/A	ANTENNA, HORN	6/7/2027
00066	AGILENT	RF PRE-AMPLIFIER	3/29/2025
00065	ELECTRO-METRICS	RF PRE-AMPLIFIER	3/29/2025
00806	MINI-CIRCUITS, 3061	HF COAX CABLE, SMA	12/26/2024
00825	CABLE ASSOCIATES, MTC10	6-METER COAX CABLE, SMA	6/14/2025
00847	ASTROLABS, K-48TG	HF COAX CABLE, SMA	6/14/2025
00731	NARDA, 4779-3	2W, 3DB ATTENUATOR	6/20/2025

¹ the N9020B, MXA has the following instrument software version installed: A.33.03 (2023)



Test Equipment List, Continued

Test Name:	Conducted RF Emissions	Conducted RF Emissions Testing Dates: 6/17/2024 – 7/9/2024	
Asset #	Manufacturer/Model	Description	Cal. Due
00993 1	KEYSIGHT, MXA	SPECTRUM ANALYZER	11/6/2025
00992	KEYSIGHT N5173B	EXG SIGNAL GENERATOR	11/24/2024
00885	ULTIFLEX, UFA2108-0-360	1-METER SMA CABLE	6/25/2025
N/A	WEINSCHEL, 3.5MM	20DB ATTENUATOR	Cal. Before Use

¹ the N9020B, MXA has the following instrument software version installed: A.33.03 (2023)



5 Measurements

5.1.1 References

ANSI C63.2 (1/2016) Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 (1/2014) American National Standard for 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 (9/2020) American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

5.2 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The basis for uncertainty calculation uses ANSI/NCSL Z540-2-1997 (R2002) with a type B evaluation of the standard uncertainty. Elements contributing to the standard uncertainty are combined using the method described in Equation 1. to arrive at the total standard uncertainty. The standard uncertainty is multiplied by the coverage factor to determine the expanded uncertainty which is generally accepted for use in commercial, industrial, and regulatory applications and when health and safety are concerned (see Equation 2). A coverage factor was selected to yield a 95% confidence in the uncertainty estimation.

Equation 1: Standard Uncertainty

$$u_{c} = \pm \sqrt{\frac{a^{2}}{div_{a}^{2}} + \frac{b^{2}}{div_{b}^{2}} + \frac{c^{2}}{div_{c}^{2}} + \dots}$$

where,

uc	= standard uncertainty
a, b, c,	= individual uncertainty elements
Diva, b, c	= the individual uncertainty element divisor based on the
	probability distribution
Divisor	= 1.732 for rectangular distribution
Divisor	= 2 for normal distribution
Divisor	= 1.414 for trapezoid distribution



Equation 2: Expanded Uncertainty

$$U = ku_c$$

where,

The measurement uncertainty complies with the maximum allowed uncertainty from CISPR 16-4-2. Measurement uncertainty is not used to adjust the measurements to determine compliance. The expanded uncertainty values for the various scopes in the WLL accreditation are provided in the table below.

Scope	Standard(s)	Expanded Uncertainty
Conducted Emissions	CISPR11, CISPR32, CISPR14, FCC Part 15	± 2.63 dB
Radiated Emissions	CISPR11, CISPR32, CISPR14, FCC Part 15	± 4.55 dB

5.3 Environmental Conditions

Environmental Conditions During All Measurements

Ambient Temperature:	Between 19.9 and 23.9 °C
Relative Humidity:	Between 45 and 60 %