

TEST REPORT

Report Number: 15496245-E7V3

Applicant : APPLE INC.
1 APPLE PARK WAY
CUPERTINO, CA 95014, U.S.A.

Model : A3523, A3524

Brand : APPLE

FCC ID : BCG-E8958A, BCG-E8959A

EUT Description : SMARTPHONE

Test Standard(s) : FCC 47 CFR PART 15 SUBPART E

Date Of Issue:
2025-08-14

Prepared by:
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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2025-07-22	Initial Review	Tony Li
V2	2025-08-02	Addressed TCB Feedback for Sections 6, 9	Benjamin Dobbins
V3	2025-08-14	Addressed TCB feedback for sections 1, 3, 6 & Appendix A	Tony Li

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1. ATTESTATION OF TEST RESULTS

Applicant Name and Address	APPLE INC. 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	A3523, A3524
Brand	APPLE
FCC ID	BCG-E8958A, BCG-E8959A
EUT Description	SMARTPHONE
Serial Number (Variant)	C07HGM0008K0000X9L (Conducted) K9NM9Q21T2 (Radiated)
Serial Number (Reference)	C07HC90002Z0000X9L (Conducted) HC6YLC6QDY (Radiated)
Sample Receipt Date	2025-06-20
Date Tested	2025/03/07 to 2025/07/22
Applicable Standards	CFR 47 Part 15 Subpart E
Test Results	COMPLIES

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested can demonstrate compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not considered unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document

Approved & Released By:	Prepared & Reviewed By:
	
Francisco de Anda Staff Engineer UL Verification Services, Inc.	Tony Li, Benjamin Dobbins Lead Test Engineer, Senior Test Engineer UL Verification Services, Inc.

2. TEST RESULT SUMMARY

This report contains data provided by the customer which can impact the validity of results. UL Verification Services Inc. is only responsible for correctly integrating customer-provided data with measurements performed by UL Verification Services Inc.

Below is a list of the data provided by the customer:

1. Antenna gain and type (see section 6.3)
2. Cable loss (see section 6.3)

FCC Clause	Requirement	Result	Comment
See Comment	Duty Cycle	Reporting purposes only	Per ANSI C63.10, Section 12.2.
See Comment	26dB BW/99% OBW	Reporting purposes only	Per ANSI C63.10 Sections 6.9.2 and 6.9.3
15.407 (e)	6 dB BW	Complies	Per ANSI C63.10, Section 12.5.1
15.407 (a) (1 & 3)	Output Power	Complies	Per ANSI C63.10, Section 12.4.3.2
15.407 (a) (1 & 3)	PSD	Complies	Per ANSI C63.10, Section 12.6
15.209, 15.205, 15.407 (b)	Radiated Emissions	Complies	Per ANSI C63.10, Section 12.7
15.207	AC Mains Conducted Emissions	Complies	Per ANSI C63.10, Section 6.2

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with:

- *ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024
- FCC 47 CFR Part 2
- FCC 47CFR Part 15
- FCC KDB 414788 D01 Radiated Test Site
- FCC KDB 662911 D01 Multiple Transmitter Output
- FCC KDB 789033 D02 General UNII Test Procedures New Rules

*Note: The use of ANSI C63.10-2020 + Cor. 1-2023 + C63.10a-2024 does not deviate from the testing procedures of ANSI C63.10-2020

4. FACILITIES AND ACCREDITATION

UL Verification Services Inc. is accredited by A2LA, certification #0751.05, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
☒	Building 1: 47173 Benicia Street, Fremont, CA 94538, USA	US0104	2324A	550739
☒	Building 2: 47266 Benicia Street, Fremont, CA 94538, USA			
☐	Building 3: 843 Auburn Court, Fremont, CA 94538, USA			
☒	Building 4: 47658 Kato Rd, Fremont, CA 94538, USA			
☒	Building 5: 47670 Kato Rd, Fremont, CA 94538, USA			

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U _{LAB}
Conducted Antenna Port Emission Measurement	1.94 dB
Power Spectral Density	2.47 dB
Time Domain Measurements Using SA	3.39 %
RF Power Measurement Direct Method Using Power Meter	1.3 dB (Peak), 0.45 dB (Ave)
Radio Frequency (Spectrum Analyzer)	141.16 Hz
Occupied Bandwidth	1.22%
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.78 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.40 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.87 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	6.01 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.73 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.51 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.29 dB

Uncertainty figures are valid to a confidence level of 95%.

5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.

$36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The Apple iPhone is a smartphone with cellular GSM, GPRS, EGPRS, WCDMA, LTE, 5G NR1, IEEE 802.11a/b/g/n/ac/ax/be, Bluetooth (BT), Ultra-Wideband (UWB), Global Positioning System (GPS), Near-Field Communication (NFC), Narrow-Band (NB) UNII, 802.15.4, 802.15.4ab-Narrow Band (NB), Wireless Power Transfer (WPT) and Mobile Satellite Service (MSS) technologies. The rechargeable battery is not user accessible.

This report covers the NB UNII-1 and UNII-3 bands.

6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

UNII-1 Frequency Range (MHz)	Mode	Antenna	Configuration	Output Power (dBm)	Output Power (mW)
5162 - 5245	BDR	Ant 6	High Power	10.18	10.42
			Low Power	2.44	1.75
		Ant 5	High Power	10.17	10.40
			Low Power	2.68	1.85
		BF, Ant 6 + Ant 5	High Power	10.19	10.45
			Low Power	5.55	3.59
5162 - 5245	LE1M	Ant 6	High Power	10.23	10.54
			Low Power	2.46	1.76
		Ant 5	High Power	10.27	10.64
			Low Power	2.68	1.85
		BF, Ant 6 + Ant 5	High Power	10.27	10.64
			Low Power	5.56	3.60
5162 - 5245	LE2M	Ant 6	High Power	11.15	13.03
			Low Power	2.45	1.76
		Ant 5	High Power	11.17	13.09
			Low Power	2.68	1.85
		BF, Ant 6 + Ant 5	High Power	11.17	13.09
			Low Power	5.59	3.62
5162 - 5245	HDT4	Ant 6	High Power	12.68	18.54
			Low Power	-0.55	0.88
		Ant 5	High Power	11.45	13.96
			Low Power	-0.32	0.93
		BF, Ant 6 + Ant 5	High Power	12.59	18.16
			Low Power	2.59	1.82
5162 - 5245	HDT6	Ant 6	High Power	10.97	12.50
			Low Power	-3.53	0.44
		Ant 5	High Power	12.47	17.66
			Low Power	-3.32	0.47
		BF, Ant 6 + Ant 5	High Power	12.54	17.95
			Low Power	-0.42	0.91
5162 - 5245	HDRPS2	Ant 6	High Power	12.26	16.83
			Low Power	-0.51	0.89
		Ant 5	High Power	12.25	16.79
			Low Power	-0.33	0.93
		BF, Ant 6 + Ant 5	High Power	12.28	16.90
			Low Power	2.60	1.82
5162 - 5245	XHDRPM8	Ant 6	High Power	13.95	24.83
			Low Power	-0.51	0.89
		Ant 5	High Power	14.46	27.93
			Low Power	-0.31	0.93
		BF, Ant 6 + Ant 5	High Power	15.17	32.89
			Low Power	2.60	1.82
5164 - 5242	HDRPL16	Ant 6	High Power	13.97	24.95
			Low Power	-0.51	0.89
		Ant 5	High Power	14.47	27.99
			Low Power	-0.32	0.93
		BF, Ant 6 + Ant 5	High Power	17.21	52.60
			Low Power	2.60	1.82

UNII-3 Frequency Range (MHz)	Worst-Case Mode	Antenna	Configuration	Output Power (dBm)	Output Power (mW)
5733 - 5844	BDR	Ant 6	High Power	19.14	82.04
			Low Power	2.98	1.99
		Ant 5	High Power	19.46	88.31
			Low Power	3.18	2.08
		BF, Ant 6 + Ant 5	High Power	22.26	168.27
			Low Power	6.09	4.06
5733 - 5844	LE1M	Ant 6	High Power	19.14	82.04
			Low Power	2.98	1.99
		Ant 5	High Power	19.48	88.72
			Low Power	3.18	2.08
		BF, Ant 6 + Ant 5	High Power	22.30	169.82
			Low Power	6.06	4.04
5733 - 5844	LE2M	Ant 6	High Power	19.14	82.04
			Low Power	2.97	1.98
		Ant 5	High Power	19.48	88.72
			Low Power	3.11	2.05
		BF, Ant 6 + Ant 5	High Power	22.29	169.43
			Low Power	6.04	4.02
5733 - 5844	HDT4	Ant 6	High Power	14.13	25.88
			Low Power	-0.03	0.99
		Ant 5	High Power	14.48	28.05
			Low Power	0.14	1.03
		BF, Ant 6 + Ant 5	High Power	17.31	53.83
			Low Power	3.06	2.02
5733 - 5844	XHDRPS2	Ant 6	High Power	14.15	26.00
			Low Power	-0.02	1.00
		Ant 5	High Power	14.47	27.99
			Low Power	0.18	1.04
		BF, Ant 6 + Ant 5	High Power	17.32	53.95
			Low Power	3.08	2.03
5733 - 5844	XHDRPM8	Ant 6	High Power	14.18	26.18
			Low Power	-0.01	1.00
		Ant 5	High Power	14.45	27.86
			Low Power	0.16	1.04
		BF, Ant 6 + Ant 5	High Power	17.32	53.95
			Low Power	3.08	2.03
5733 - 5844	HDRPL16	Ant 6	High Power	14.13	25.88
			Low Power	-0.02	1.00
		Ant 5	High Power	14.46	27.93
			Low Power	0.13	1.03
		BF, Ant 6 + Ant 5	High Power	17.32	53.95
			Low Power	3.09	2.04

6.3. DESCRIPTION OF AVAILABLE ANTENNAS AND CABLE LOSS

The antenna(s) gain and type (PIFA), as provided by the manufacturer' are as follows:

Frequency Range (MHz)	Antenna 6 (dBi)	Antenna 5 (dBi)	Uncorrelated Chains (dBi)	Correlated Chains (dBi)
5150 - 5250 UNII - 1	-2.90	-7.80	-4.69	-2.00
5725 - 5825 UNII 3	2.00	-6.40	-0.42	1.79

Note: antenna C0 and antenna C1 indicated in power tune-up document pertain to Ant 6 and ANT 5 of this report respectively.

The SMA Cable Loss as provided by the manufacturer' are as follows:

Frequency Range (MHz)	Cable Loss	
	Antenna 6 (dBi)	Antenna 5 (dBi)
5150 - 5250 UNII - 1	-3.00	-2.60
5725 - 5825 UNII 3	-3.20	-2.80

Cable loss used for RF antenna port tests was included in offset of the test equipment during testing.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was Luck23A256.

6.5. WORST-CASE CONFIGURATION AND MODE

The EUT was investigated in three orthogonal orientations X, Y and Z on ANT 6, ANT 5 and 2TX, it was determined that Y (Landscape) was the worst-case orientation for both ANT 6 and ANT 5. And Z (Portrait) orientation for 2TX beamforming.

For Radiated band edge test all test modes have been investigated with power setting equal or higher than FCC conducted SISO modes as worst-case scenario and no emissions at both lower and upper band edges were found.

For the radiation spurious harmonics testing, we have investigated both SISO and MIMO modes under low power and high power, only high power mode data is included in report, as this represents the worst case.

For radiated harmonics spurious below 1GHz, 1-18GHz L/M/H channels, 18-26GHz, 26-40GHz and power line conducted emissions were performed with the EUT set at the 2TX BF at high power mode with power setting equal or higher than SISO modes as worst-case scenario.

Below 1GHz tests were performed with EUT connected to AC power adapter as the worst case; and for above 1GHz tests, the worst-case configuration reported was with EUT only. There were no emissions found below 30MHz within 20dB of the limit. For AC line conducted emission, test was investigated with AC power adapter and with laptop.

After the investigation, the worst case of power and PSD modes selecting for test are as table shown below.

5G		UNII-1			UNII-3		
Mode	Modulation	Frequency Range (MHz)	Worst Case Tone		Frequency Range (MHz)	Worst Case Tone	
			Power	PSD		Power	PSD
BT5G	BDR	5162-5245	X	X	5733-5844	X	X
	EDR2	N5			N5		
	EDR3						
LE	LE Adv	5162-5245			5733-5844		
	LE1M		X	X		X	X
	LELR8						
	LELR2						
	LE2M	5162-5245	X	X	5733-5844	X	X
	HDT2	5162-5245			5733-5844		
	HDT3						
	HDT4		X	X		X	X
	HDT6		X	X			
	HDT8						
	HDR4	5162-5245			5733-5844		
HDR	HDRPS2		X	X			
	XHDRPS2					X	X
	HDR8	5162-5245			5733-5844		
	HDRPM4						
	HDRPM6						
	HDRPM8						
	XHDRPM4						
	XHDRPM6						
	XHDRPM8		X	X		X	X
	HDRPM12						
	HDRPM16						
	XHDRPM12						
	XHDRPM16						
	HDRPL8	5164-5242			5733-5844		
	HDRPL12						
	HDRPL16		X	X		X	X
	XHDRPL8						
	XHDRPL12						
	XHDRPL16						
	HDRPL24						
	HDRPL32						
	XHDRPL24						
	XHDRPL32						

6.5.1. REUSE STATEMENT AND COMPARISON TABLE

The maximum output power for reference model A3522 (FCC ID: BCG-E8957A) and variant models A3523/A3524 are identical across all power tables for ANT6 and ANT5. The only difference is antenna gain decrease on ANT5 in UNII-1.

As there is no change in output power between parent model and variant model and antenna gains are equal or lower than the reference model, all conducted and radiated data from the reference model is reused for this variant model. Spotchecks to verify output power and radiated test results is the same for the variant model compared reference model are included in Appendix A.

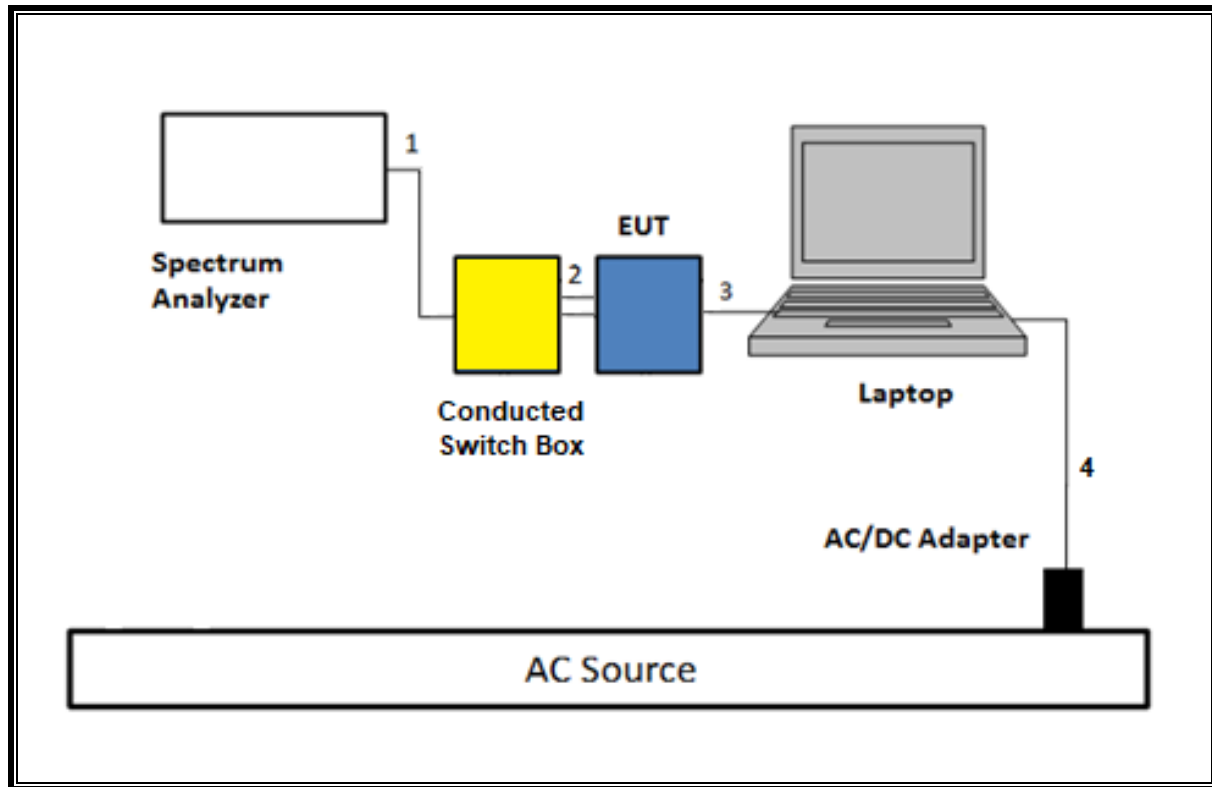
After investigation, it was confirmed that the emissions remained the same as those for the reference model and were either below the noise floor (above 18GHz) or were limited to non-transmitter-related emissions (below 1GHz).

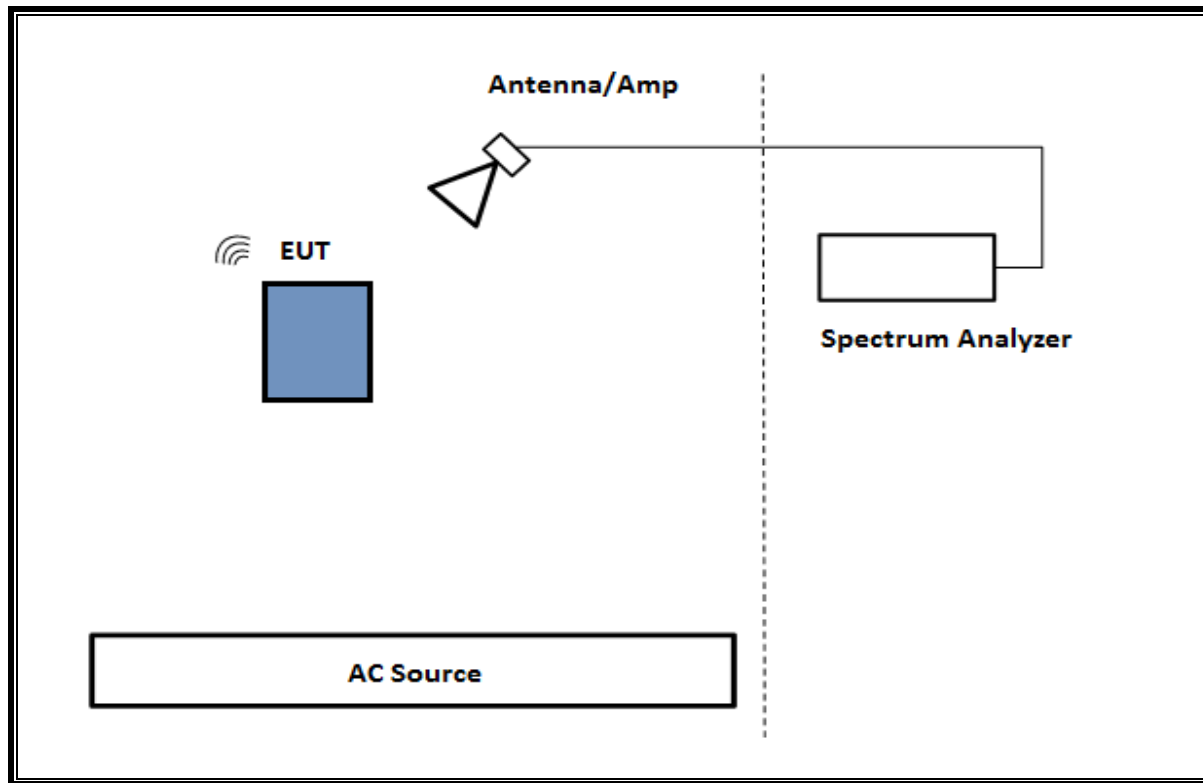
6.6. DESCRIPTION OF TEST SETUP

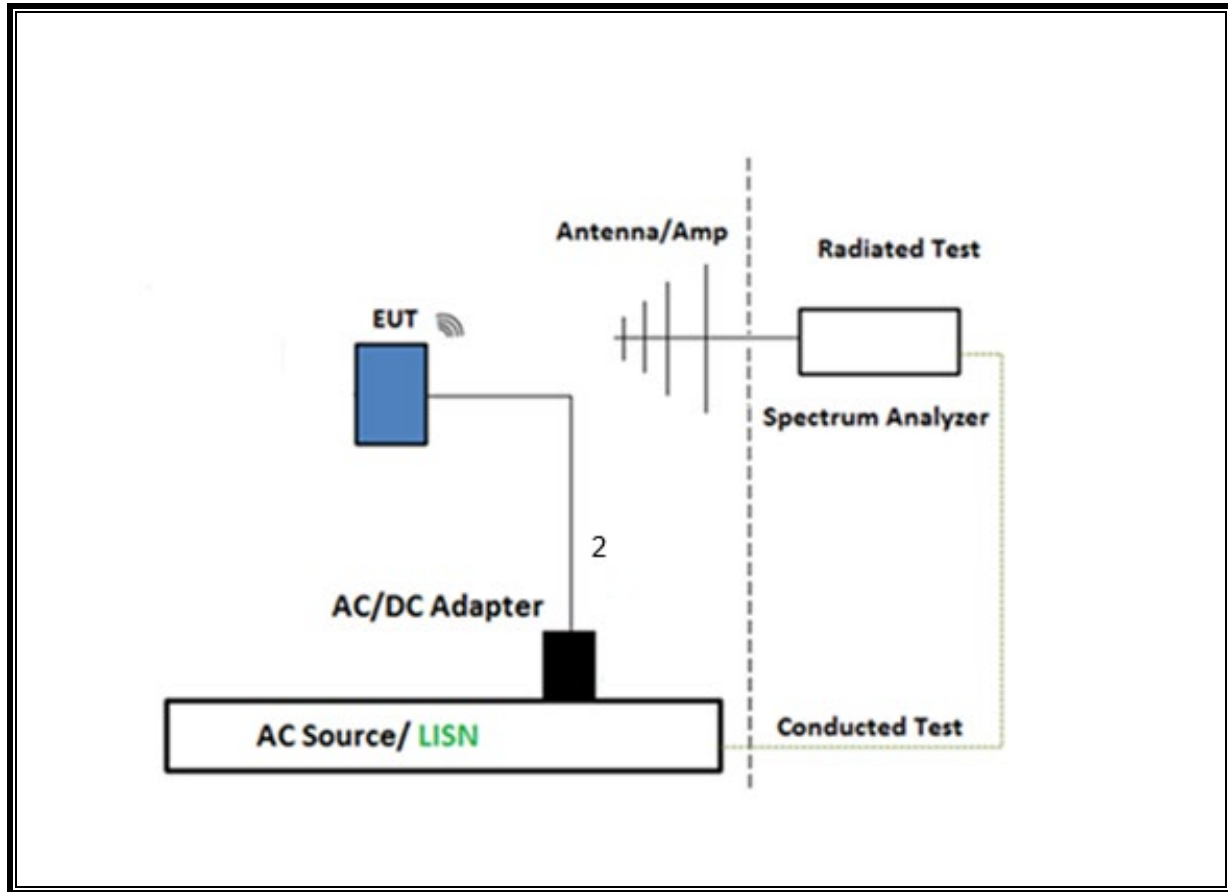
SUPPORT TEST EQUIPMENT						
Description		Manufacturer	Model	Serial Number		FCC ID/ DoC
Laptop		Apple	Macbook	G2YKJ9LWH5		N/A
Laptop AC/DC adapter		Apple	N/A	C4H238408AEPM0WAS		DoC
EUT AC/DC adapter		Apple	N/A	C4H238505ARPM0WAP		DoC
Conducted Switch Box		UL	N/A	245782		N/A
I/O CABLES (RF CONDUCTED TEST)						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	SMA	1	SMA	Shielded	0.2	To spectrum Analyzer
2	Antenna	2	SMA	Shielded	0.2	EUT to Switchbox
3	USB	1	USB-C	Shielded	1.0	N/A
4	DC	1	DC	Shielded	2	N/A
I/O CABLES (RF RADIATED AND AC LINE CONDUCTED TEST)						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC	1	DC	Shielded	2	N/A
2	USB	1	USB-C	Shielded	1	N/A

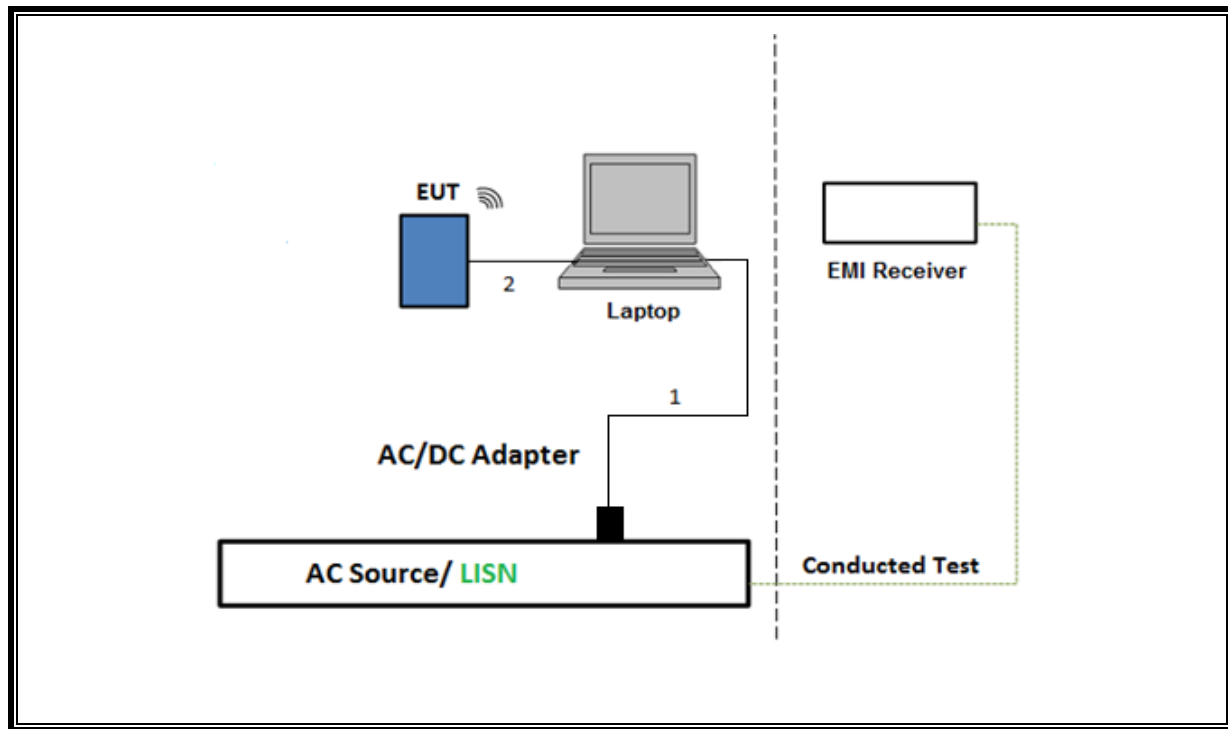
TEST SETUP

The EUT setup is shown as below. Test software exercised the radio card.

SETUP DIAGRAM FOR CONDUCTED TESTS

SETUP DIAGRAM FOR RADIATED TESTS Above 1 GHz

SETUP DIAGRAM FOR Below 1GHz and AC LINE CONDUCTED TEST

TEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION

7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Description	Manufacturer	Model	ID Num	Cal Due
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight Technologies Inc	N9030A-544	90238	2026-01-31
Spectrum Analyzer, PXA, 3Hz to 50GHz w/Ext. Mixer	Keysight Technologies Inc	N9030A	80400	2026-01-31
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	90718	2026-03-31
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	257704	2026-03-31
RF Device, Switch	UL	CSB	245262	2026-04-30
RF Device, Switch	UL	CSB	262287	2026-04-30
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight Technologies Inc	N9030A-544	90238	2026-03-31
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	84797	2026-10-31
RF Filter Box, 1-18GHz	UL-FR1	Frankenstein	225079	2026-05-31
EMI Test Receiver	Rohde & Schwarz	ESW44	235670	2026-02-28
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	79834	2026-07-31
RF Filter Box, 1-18GHz	UL-FR1	Frankenstein	237597	2025-10-31
EMI Test Receiver	Rohde & Schwarz	ESW44	169935	2026-02-27
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	226674	2027-03-31
RF Filter Box, 1-18GHz	UL-FR1	RATS 1.0	250156	2025-10-31
EMI Test Receiver	Rohde & Schwarz	ESW44	225683	2026-02-28
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	80430	2026-09-30
RF Filter Box, 1-18GHz	UL-FR1	Frankenstein	224478	2026-01-31
EMI Test Receiver	Rohde & Schwarz	ESW44	201499	2026-02-28
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	222741	2026-09-30
RF Filter Box, 1-18GHz	UL-FR1	Frankenstein	217521	2025-08-31
EMI Test Receiver	Rohde & Schwarz	ESW44	223461	2026-02-28
Antenna, Broadband Hybrid 30 MHz - 2 or 3 GHz	Sunol Sciences Corp.	JB3	204044	2026-03-31
Link File, @3m, 9kHz-1000MHz Hybrid Path Loss	UL-FR1	Port 0 Factors	226862	2026-05-31
Antenna, Horn 18-26.5GHz	A.R.A	MWH-1826/B	81139	2025-08-31
Link File, RF Amplifier Assembly, 18-26.5GHz, 60dB Gain	Amplical	AMP18G26.5-60	220194	2026-04-29
Antenna, Horn 26.5-40GHz	A.R.A	MWH-2640/B	172367	2026-07-31
Link File, RF Amplifier Assembly, 26.5-40GHz, 65dB Gain	Amplical	AMP26G40-65	220537	2025-07-31
Antenna, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	41112	2025-10-31
RF Filter Box, 1-18GHz, 7 port Simplified	UL-FR1	F3A, 3Amplifier, Rats3 simplified version	243707	2026-04-30
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	169927	2026-02-28
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	222740	2026-09-26
RF Filter Box, 1-18GHz	UL-FR1	NA	171389	2026-03-30
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	201497	2026-02-28
Antenna, Passive Loop 30Hz-1MHz	Electro-Metrics	EM-6871	170013	2026-09-30
Antenna, Passive Loop 100kHz-30MHz	Electro-Metrics	EM-6872	170015	2026-09-30

AC Line Conducted				
Description	Manufacturer	Model	ID Num	Cal Due
EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESR	171646	2026-02-28
LISN for Conducted Emissions CISPR-16	Fischer Custom Communications	FCC-LISN-50/250-25- 2-01-480V	175765	2026-01-31
Transient Limiter	TE	TBFL1	207996	2025-09-30
UL AUTOMATION SOFTWARE				
Conducted Software	UL	Antenna Port	Ver 2022.8.16	
Conducted Software	UL	Station Tool	Ver 1.0, 4.1, 5.2, & 5.3	
Radiated Software	UL	UL EMC	Ver 9.5, May 1 , 2023	
AC Line Conducted Software	UL	UL EMC	Ver 9.5, Mar 3, 2023	

*Testing was completed before equipment calibration date

8. MEASUREMENT METHODS

On Time and Duty Cycle: KDB 789033 D02, Section B.

6 dB Emission BW: KDB 789033 D02, Section C.2

26 dB Emission BW: KDB 789033 D02, Section C.1

99% Occupied BW: KDB 789033 D02, Section D.

Conducted Output Power: KDB 789033 D02

Power Spectral Density: KDB 789033 D02, Section F

Unwanted emissions in restricted bands: KDB 789033 D02, Sections G.3, G.4, G.5, and G.6.

Unwanted emissions in non-restricted bands: KDB 789033 D02, Sections G.3, G.4, and G.5.

AC Power Line Conducted Emissions: ANSI C63.10-2020, Section 6.2.

Radiated Spurious Emissions Below 30MHz: ANSI C63.10-2020 Section 6.4

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

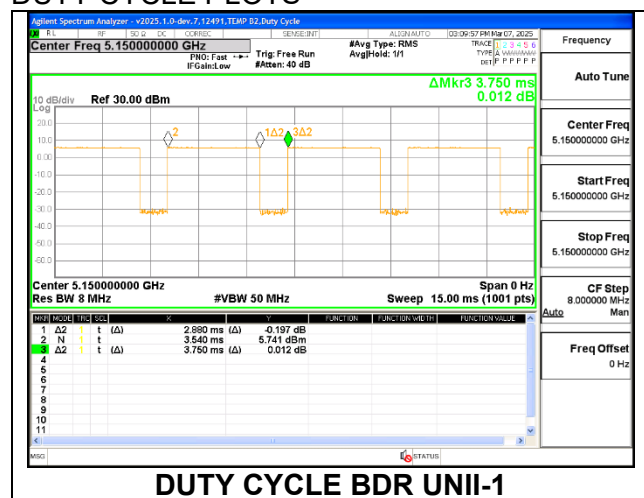
ANSI C63.10, Section 12.2: Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time T (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
BDR	2.88	3.75	0.768	76.8	1.15	0.347
LE1M	2.12	2.50	0.848	84.8	0.72	0.472
LE2M	1.07	1.88	0.571	57.1	2.44	0.935
HDT4	1.10	1.18	0.934	93.4	0.30	0.908
HDT6	0.76	0.83	0.906	90.6	0.43	1.323
HDRPS2	16.15	17.50	0.923	92.3	0.35	0.062
XHDRPS2	32.30	32.50	0.994	99.4	0.00	0.010
XHDRPM8	8.07	8.76	0.921	92.1	0.36	0.124
HDRPL16	3.62	3.75	0.964	96.4	0.16	0.277

Note: The same DCCF is used for both 1TX and 2TX.

DUTY CYCLE PLOTS



9.2. 26 dB AND 99% BANDWIDTH**LIMITS**

None; for reporting purposes only.

TEST PROCEDURE

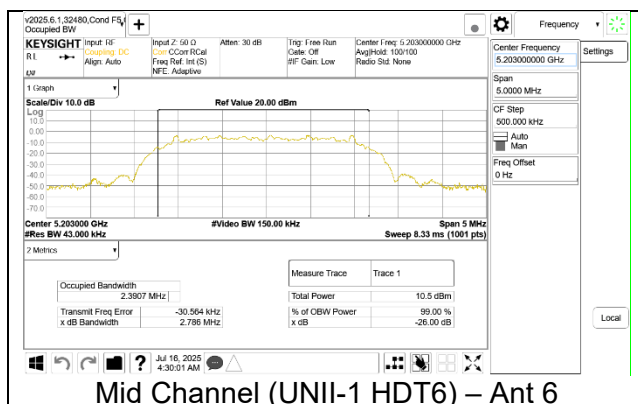
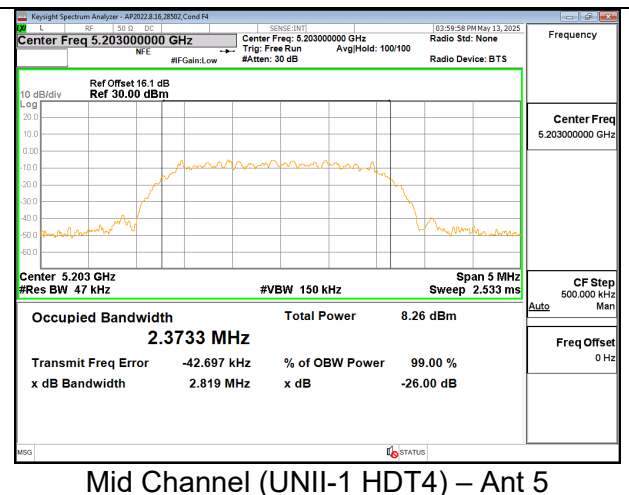
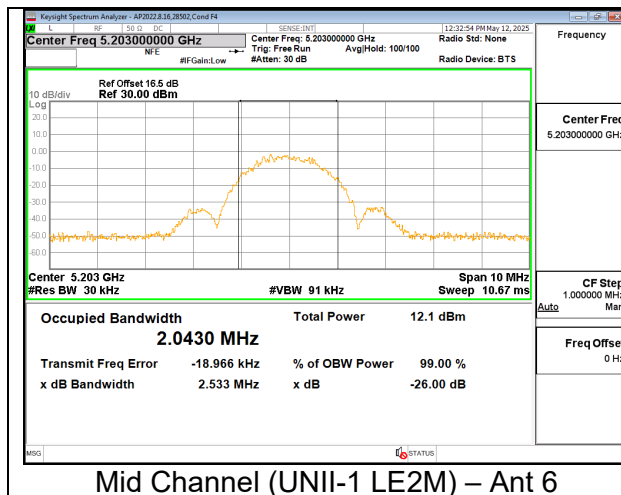
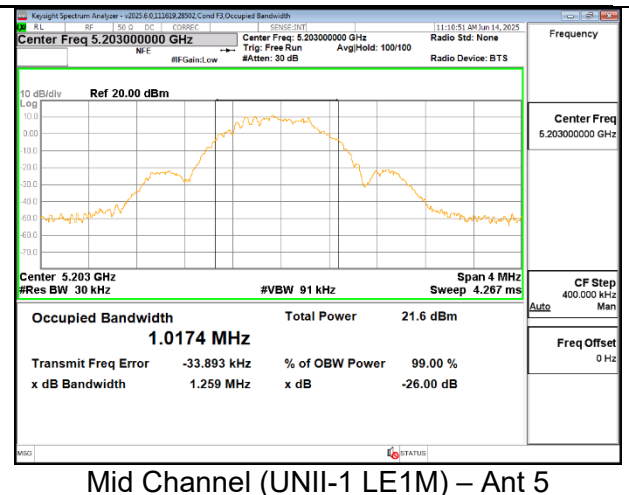
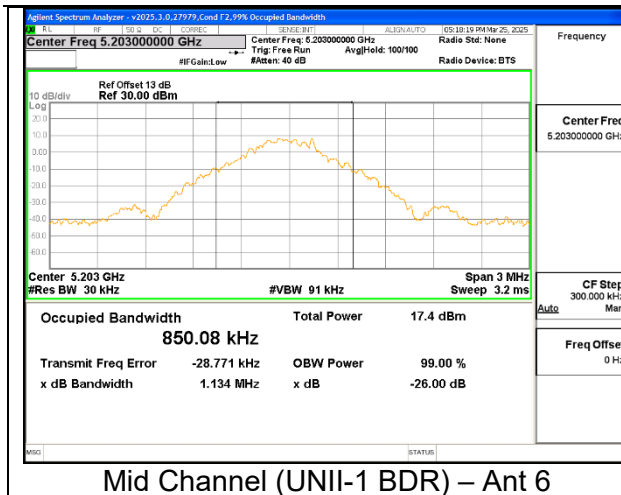
The transmitter output is connected to a spectrum analyzer. The RBW is set to $\geq 1\%$ of the 20 dB bandwidth. The VBW is set to $\geq 3 \times \text{RBW}$. The sweep time is coupled.

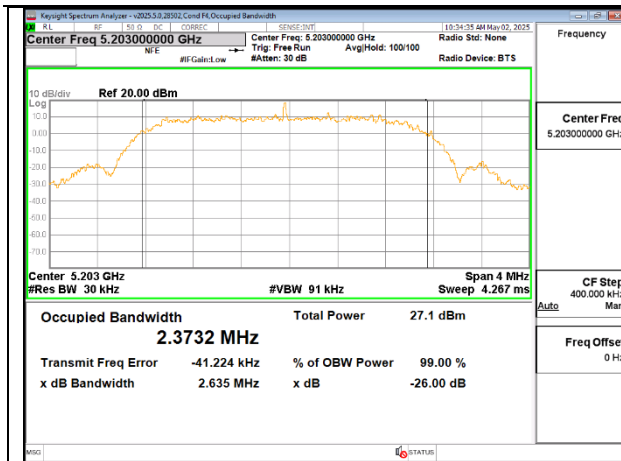
RESULTS

Only High Power modes result is reported, it covers all Low Power modes. Only Mid channel plot is reported to show setting parameter complies with testing method/procedure.

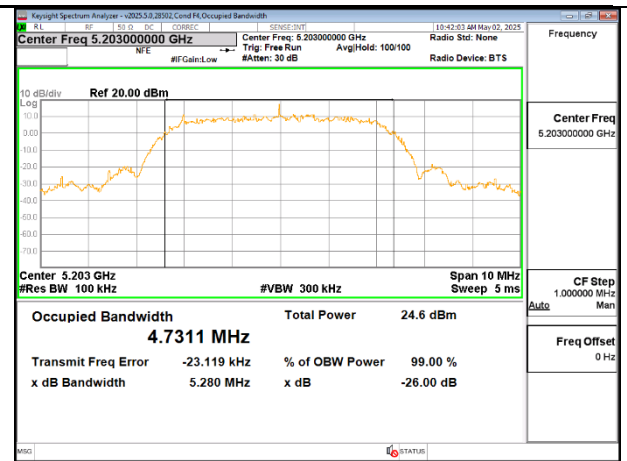
9.2.1. HIGH POWER SISO MODE

Worst-Case Mode (SISO)	Frequency (MHz)	Channel Number	26 dB Bandwidth (MHz)		99% Bandwidth (MHz)	
			Ant 6	Ant 5	Ant 6	Ant 5
BDR	5162	Low	1.133	1.137	0.8657	0.8475
	5203	Mid	1.134	1.138	0.8500	0.8375
	5245	High	1.134	1.141	0.8556	0.8491
LE1M	5162	Low	1.260	1.259	1.0222	1.0138
	5203	Mid	1.262	1.259	1.0178	1.0174
	5245	High	1.256	1.261	1.0193	1.0182
LE2M	5162	Low	2.514	2.536	2.0353	2.0397
	5203	Mid	2.533	2.516	2.0430	2.0411
	5245	High	2.513	2.511	2.0323	2.0350
HDT4	5162	Low	2.817	2.816	2.3717	2.3760
	5203	Mid	2.813	2.819	2.3685	2.3733
	5245	High	2.815	2.816	2.3749	2.3730
HDT6	5162	Low	2.788	2.791	2.3954	2.3932
	5203	Mid	2.786	2.786	2.3907	2.3966
	5245	High	2.783	2.783	2.3915	2.3914
HDRPS2	5162	Low	2.673	2.758	2.3771	2.3650
	5203	Mid	2.635	2.745	2.3732	2.3625
	5245	High	2.725	2.759	2.3766	2.3734
XHDRPM8	5162	Low	5.396	5.492	4.7457	4.7394
	5203	Mid	5.539	5.280	4.7174	4.7311
	5245	High	5.325	5.527	4.7057	4.7257
HDRPL16	5164	Low	10.930	10.430	9.3929	9.3455
	5203	Mid	10.490	10.470	9.3034	9.3616
	5242	High	10.490	11.060	9.3566	9.4181

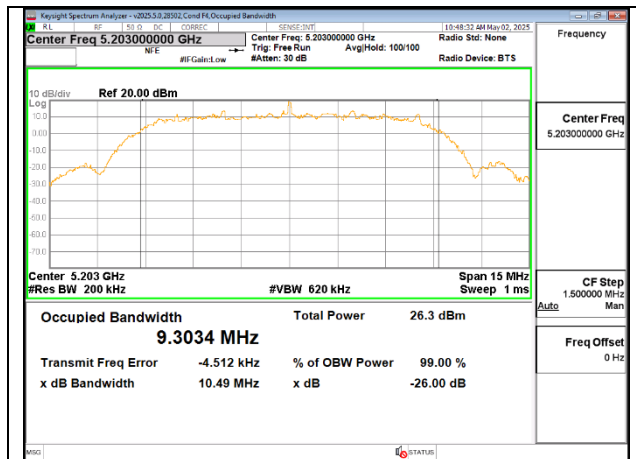




Mid Channel (UNII-1 HDRPS2) – Ant 6



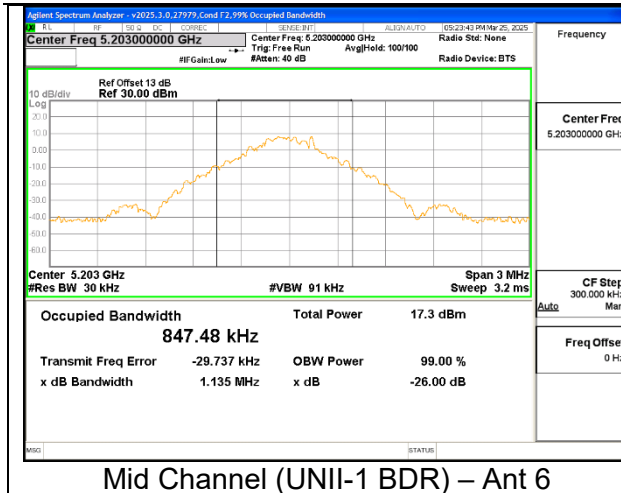
Mid Channel (UNII-1 XHDRPM8) – Ant 5



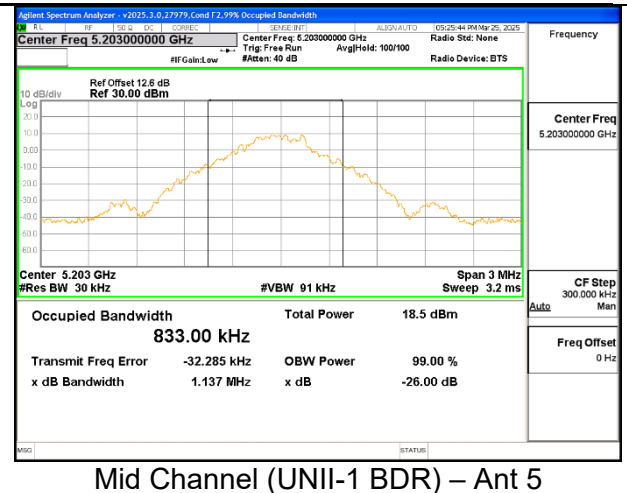
Mid Channel (UNII-1 HDRPL16) – Ant 6

9.2.2. HIGH POWER TXBF MODE

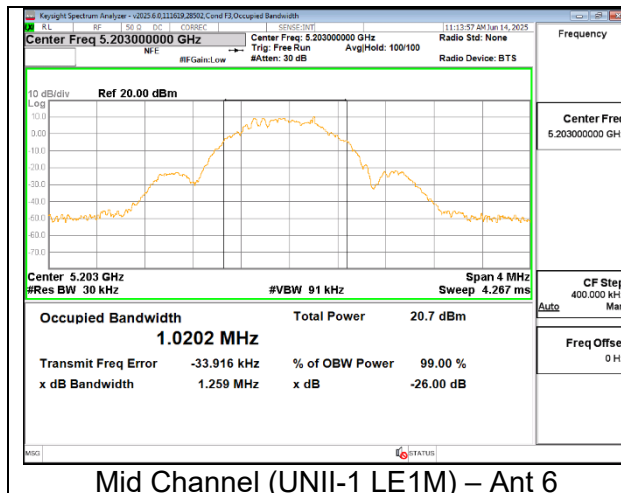
Worst-Case Mode (TxBF)	Frequency (MHz)	Channel Number	26 dB Bandwidth (MHz)		99% Bandwidth (MHz)	
			Ant 6	Ant 5	Ant 6	Ant 5
BDR	5162	Low	1.144	1.390	0.8560	0.8516
	5203	Mid	1.135	1.137	0.8474	0.8330
	5245	High	1.134	1.139	0.8648	0.8560
LE1M	5162	Low	1.258	1.257	1.0185	1.0220
	5203	Mid	1.259	1.261	1.0202	1.0148
	5245	High	1.259	1.260	1.0157	1.0195
LE2M	5162	Low	2.516	2.513	2.0349	2.0356
	5203	Mid	2.515	2.521	2.0367	2.0359
	5245	High	2.518	2.521	2.0380	2.0430
HDT4	5162	Low	2.821	2.812	2.3729	2.3743
	5203	Mid	2.812	2.824	2.3727	2.3723
	5245	High	2.823	2.818	2.3724	2.3709
HDT6	5162	Low	2.787	2.789	2.3928	2.3949
	5203	Mid	2.785	2.793	2.3910	2.3902
	5245	High	2.786	2.789	2.3918	2.3942
HDRPS2	5162	Low	2.742	2.765	2.3889	2.3783
	5203	Mid	2.762	2.770	2.3802	2.3838
	5245	High	2.641	2.749	2.3548	2.3808
XHDRPM8	5162	Low	5.533	5.317	4.7200	4.7117
	5203	Mid	5.418	5.544	4.7327	4.7459
	5245	High	5.533	5.333	4.7251	4.7186
HDRPL16	5164	Low	10.460	10.990	9.3495	9.4394
	5203	Mid	10.410	10.680	9.3270	9.3698
	5242	High	10.970	10.910	9.4417	9.4220



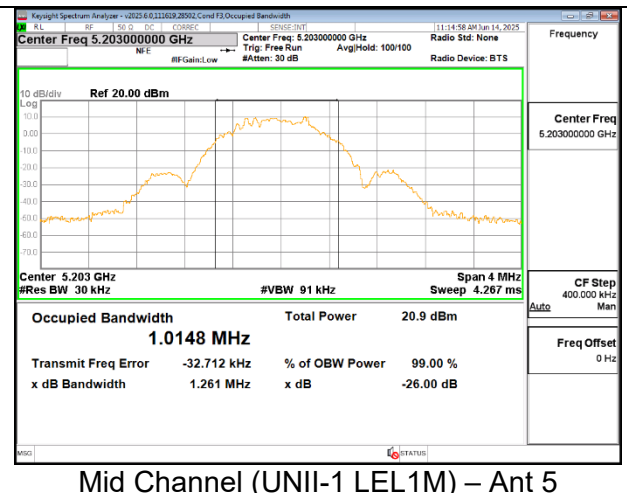
Mid Channel (UNII-1 BDR) – Ant 6



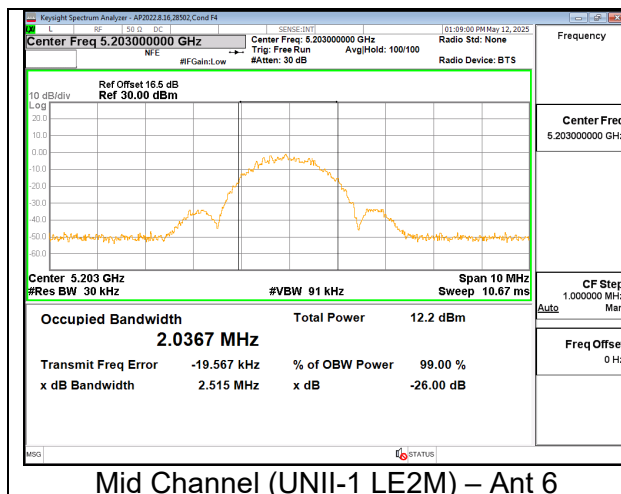
Mid Channel (UNII-1 BDR) – Ant 5



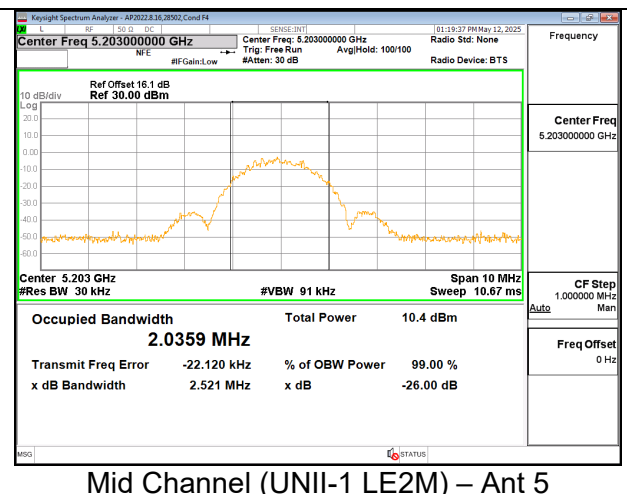
Mid Channel (UNII-1 LE1M) – Ant 6



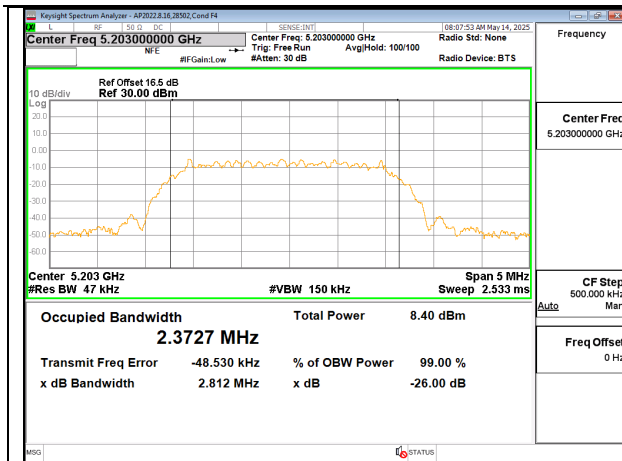
Mid Channel (UNII-1 LEL1M) – Ant 5



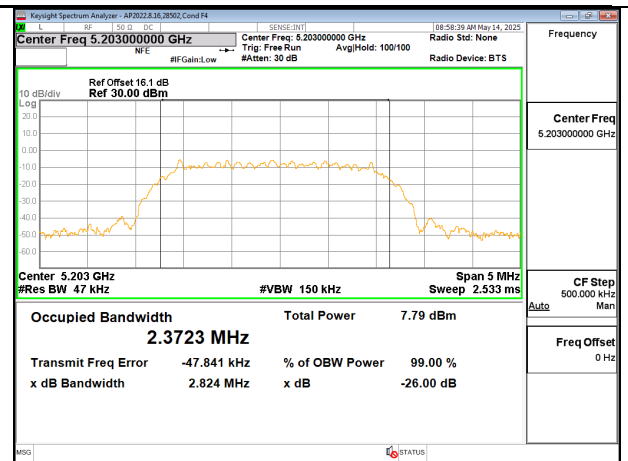
Mid Channel (UNII-1 LE2M) – Ant 6



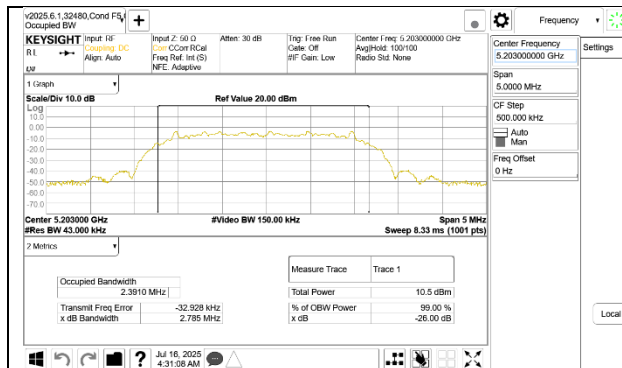
Mid Channel (UNII-1 LE2M) – Ant 5



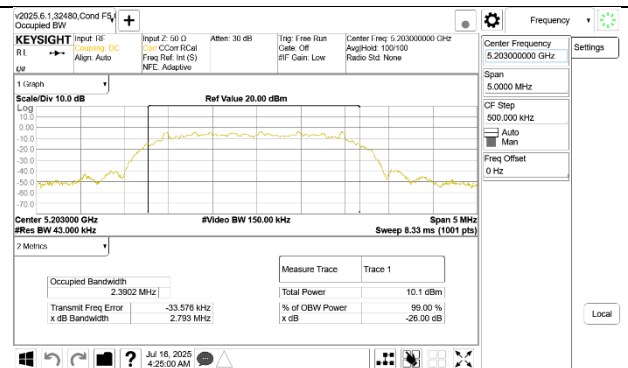
Mid Channel (UNII-1 HDT4) – Ant 6



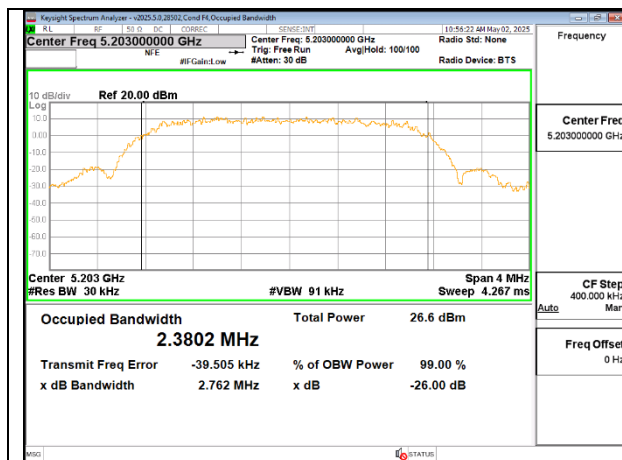
Mid Channel (UNII-1 HDT4) – Ant 5



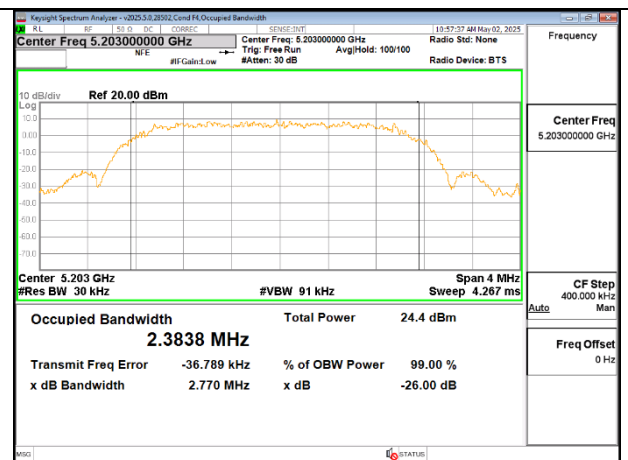
Mid Channel (UNII-1 HDT6) – Ant 6



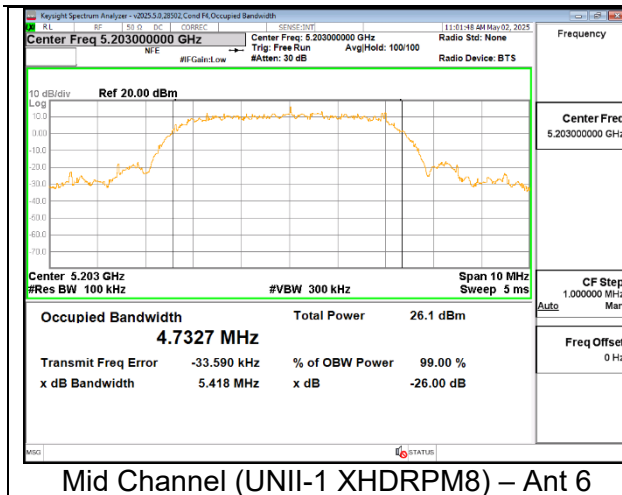
Mid Channel (UNII-1 HDT6) – Ant 5



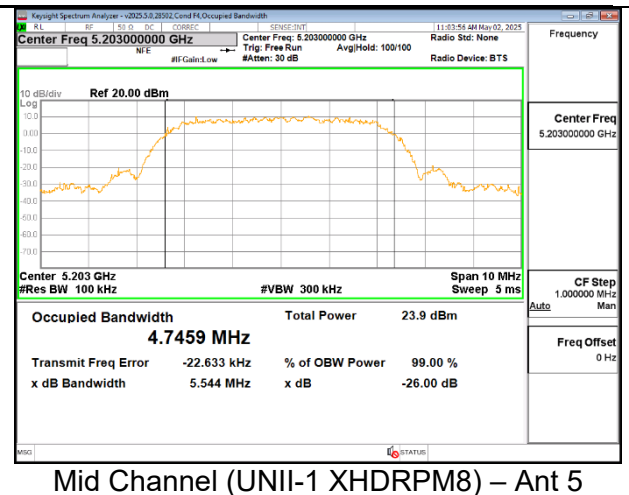
Mid Channel (UNII-1 HDRPS2) – Ant 6



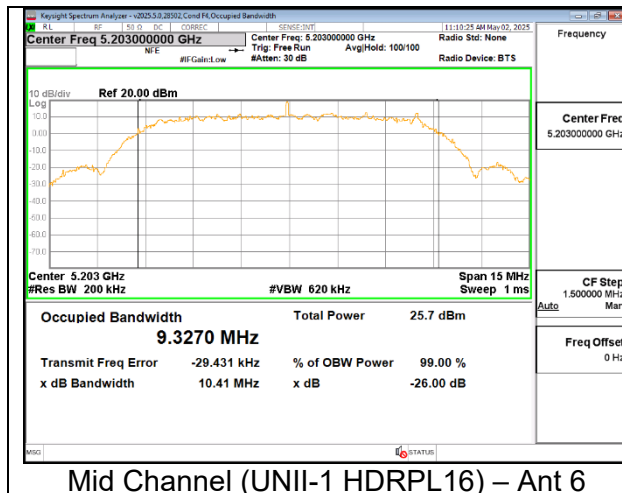
Mid Channel (UNII-1 HDRPS2) – Ant 5



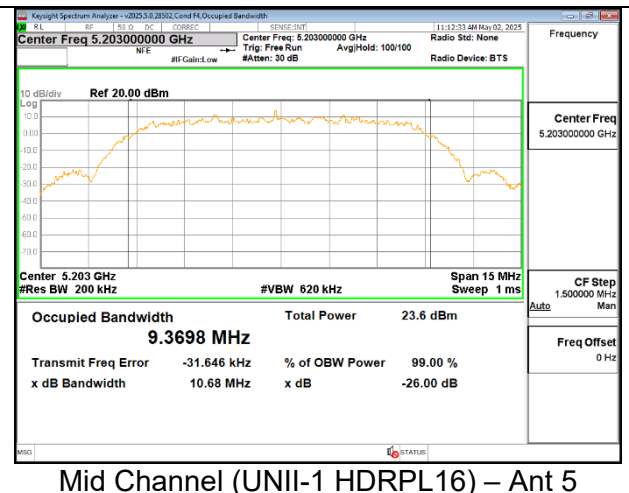
Mid Channel (UNII-1 XHDRPM8) – Ant 6



Mid Channel (UNII-1 XHDRPM8) – Ant 5



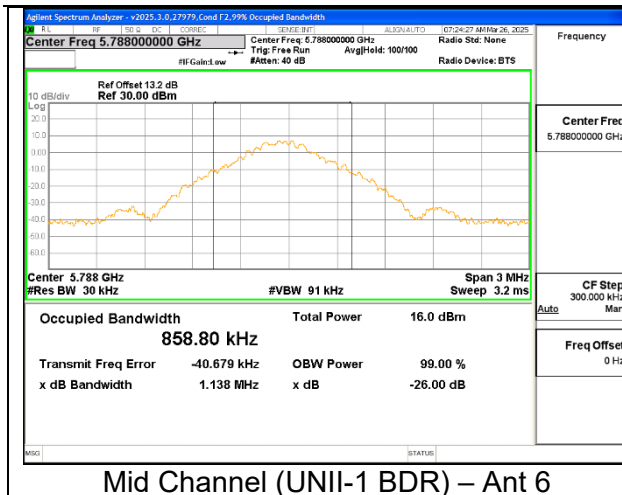
Mid Channel (UNII-1 HDRPL16) – Ant 6



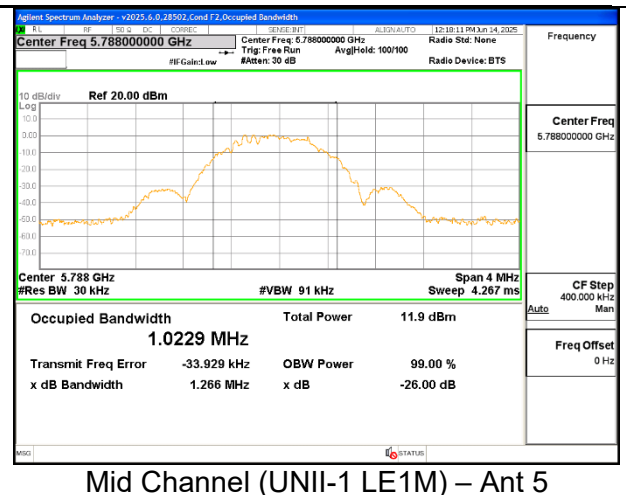
Mid Channel (UNII-1 HDRPL16) – Ant 5

9.2.3. UNII-3 HIGH POWER SISO MODE

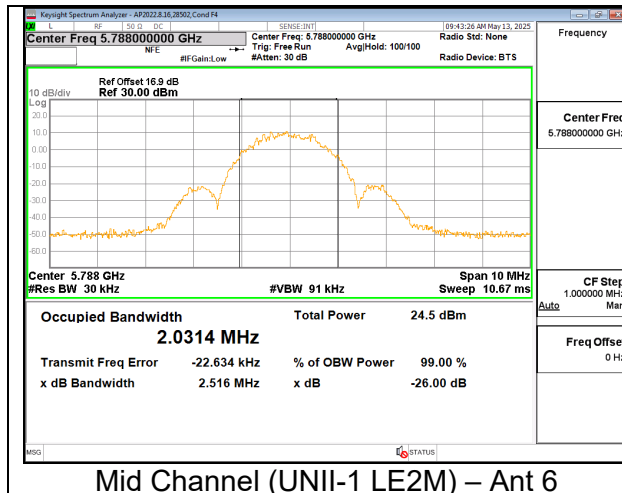
Worst-Case Mode (SISO)	Frequency (MHz)	Channel Number	26 dB Bandwidth (MHz)		99% Bandwidth (MHz)	
			Ant 6	Ant 5	Ant 6	Ant 5
BDR	5733	Low	1.198	1.143	0.8595	0.8646
	5788	Mid	1.138	1.142	0.8588	0.8488
	5844	High	1.135	1.145	0.8510	0.8579
LE1M	5733	Low	1.260	1.259	1.0217	1.0191
	5788	Mid	1.265	1.266	1.0221	1.0229
	5844	High	1.259	1.265	1.0206	1.0207
LE2M	5733	Low	2.519	2.510	2.0308	2.0288
	5788	Mid	2.516	2.507	2.0314	2.0303
	5844	High	2.512	2.501	2.0319	2.0297
HDT4	5733	Low	2.815	2.806	2.3747	2.3723
	5788	Mid	2.819	2.814	2.3727	2.3721
	5844	High	2.816	2.818	2.3730	2.3686
XHDRPS2	5733	Low	2.775	2.658	2.3755	2.3698
	5788	Mid	2.779	2.774	2.3921	2.3711
	5844	High	2.676	2.796	2.3714	2.3910
XHDRPM8	5733	Low	5.536	5.337	4.7277	4.7087
	5788	Mid	5.419	5.539	4.7257	4.7355
	5844	High	5.355	5.320	4.7317	4.7170
HDRPL16	5733	Low	11.010	10.960	9.3973	9.4429
	5788	Mid	11.120	11.060	9.3975	9.4269
	5844	High	11.070	10.590	9.3977	9.3469



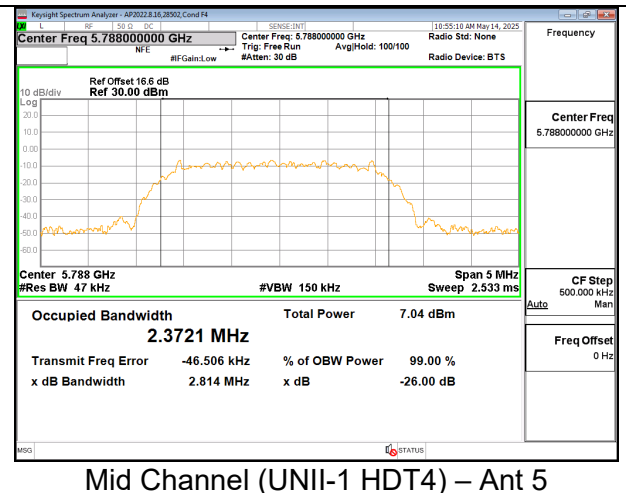
Mid Channel (UNII-1 BDR) – Ant 6



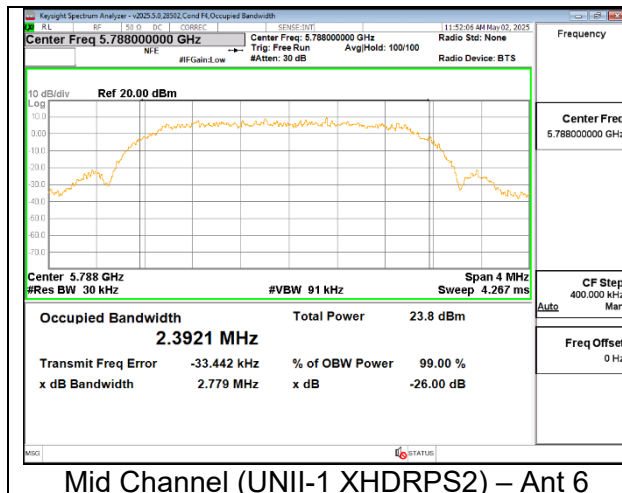
Mid Channel (UNII-1 LE1M) – Ant 5



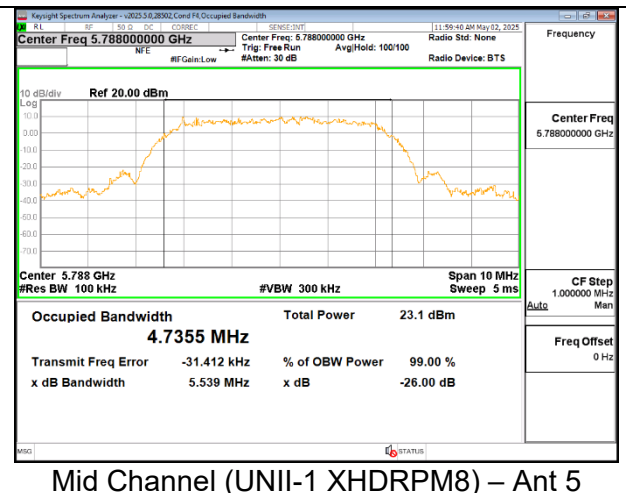
Mid Channel (UNII-1 LE2M) – Ant 6



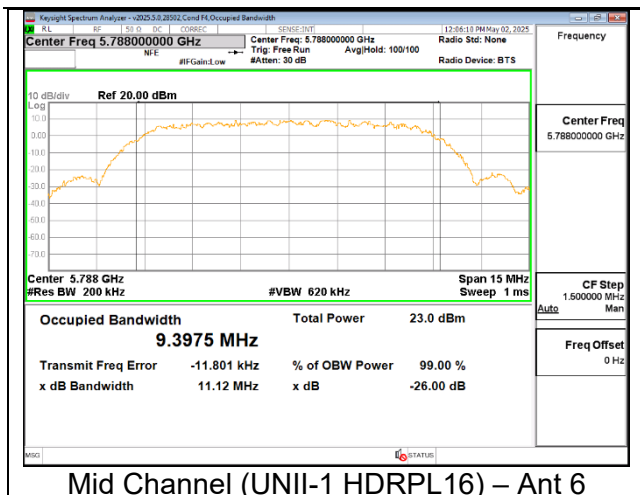
Mid Channel (UNII-1 HDT4) – Ant 5



Mid Channel (UNII-1 XHDRPS2) – Ant 6

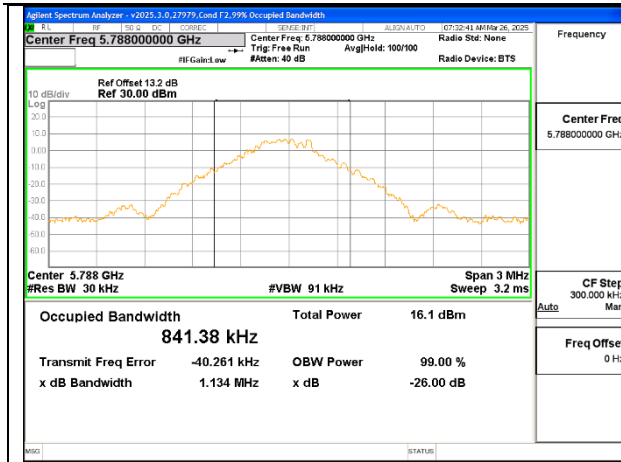


Mid Channel (UNII-1 XHDRPM8) – Ant 5

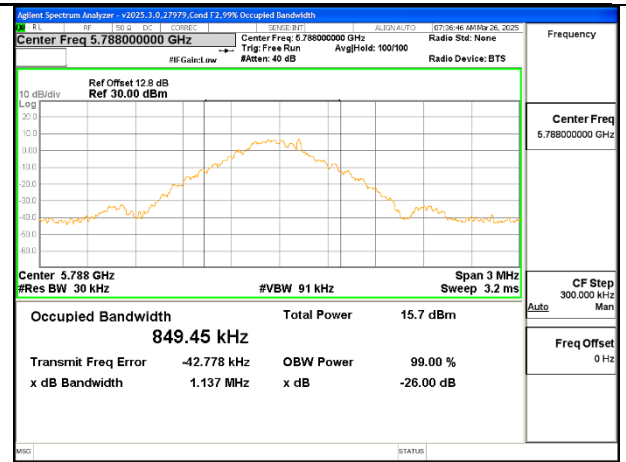


9.2.4. UNII-3 HIGH POWER TXBF MODE

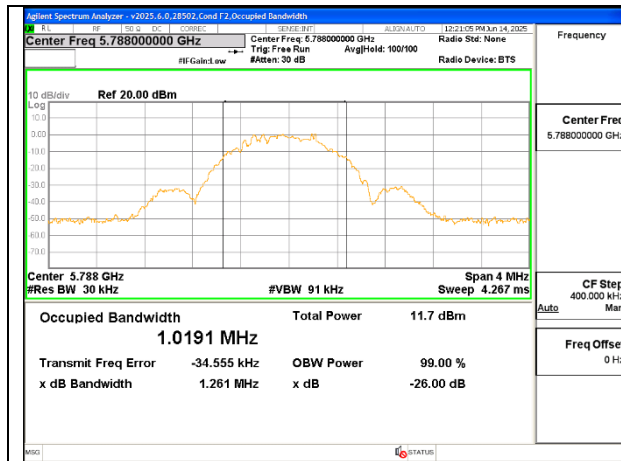
Worst-Case Mode (TxBF)	Frequency (MHz)	Channel Number	26 dB Bandwidth (MHz)		99% Bandwidth (MHz)	
			Ant 6	Ant 5	Ant 6	Ant 5
BDR	5733	Low	1.146	1.143	0.8513	0.8580
	5788	Mid	1.134	1.137	0.8413	0.8494
	5844	High	1.133	1.142	0.8469	0.8620
LE1M	5733	Low	1.262	1.260	1.0188	1.0174
	5788	Mid	1.261	1.261	1.0191	1.0209
	5844	High	1.256	1.260	1.0203	1.0242
LE2M	5733	Low	2.512	2.505	2.0309	2.0271
	5788	Mid	2.507	2.517	2.0298	2.0294
	5844	High	2.512	2.501	2.0292	2.0299
HDT4	5733	Low	2.824	2.824	2.3713	2.3690
	5788	Mid	2.827	2.816	2.3688	2.3779
	5844	High	2.817	2.823	2.3762	2.3724
XHDRPS2	5733	Low	2.773	2.763	2.3853	2.3872
	5788	Mid	2.772	2.774	2.3618	2.3620
	5844	High	2.762	2.728	2.3695	2.3745
XHDRPM8	5733	Low	5.383	5.312	4.7227	4.7220
	5788	Mid	5.349	5.535	4.7388	4.7545
	5844	High	5.382	5.475	4.5110	4.7447
HDRPL16	5733	Low	10.540	11.000	9.3549	9.3944
	5788	Mid	11.040	10.670	9.4333	9.4101
	5844	High	10.900	11.040	9.3541	9.3963



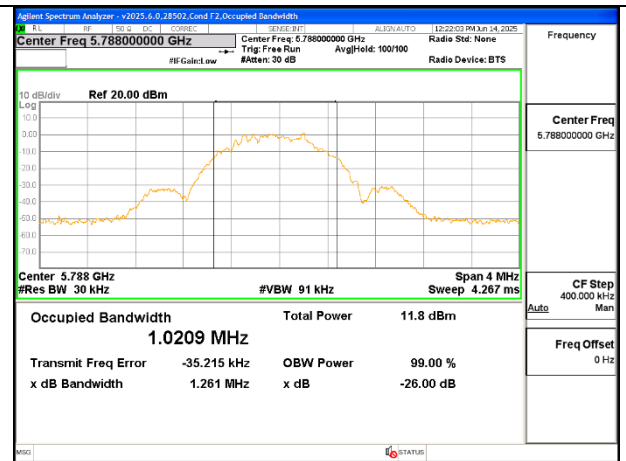
Mid Channel (UNII-1 BDR) – Ant 6



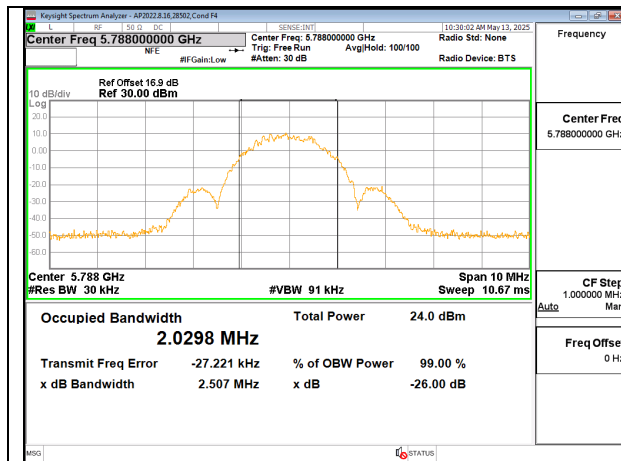
Mid Channel (UNII-1 BDR) – Ant 5



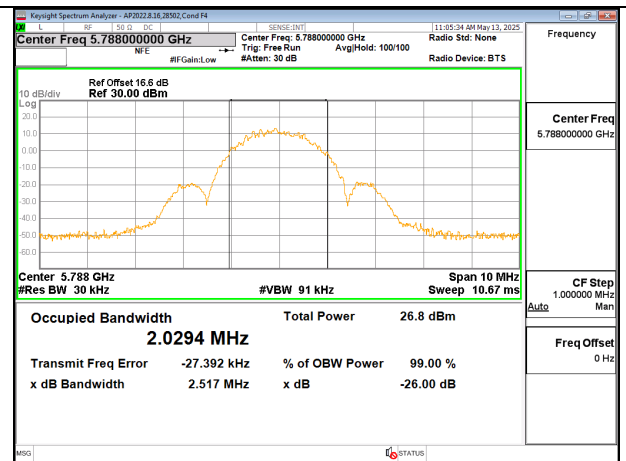
Mid Channel (UNII-1 LE1M) – Ant 6



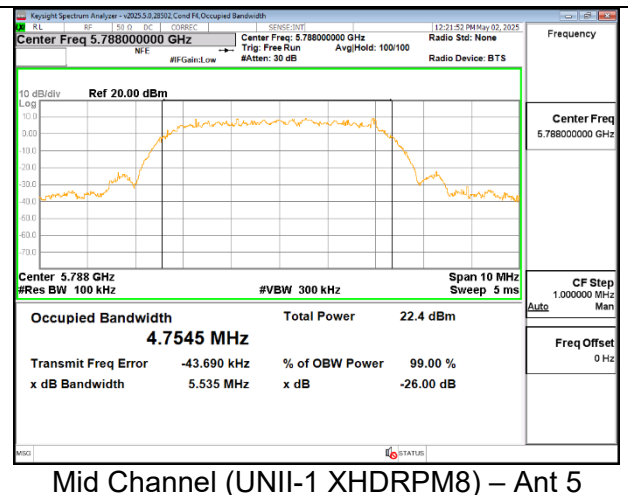
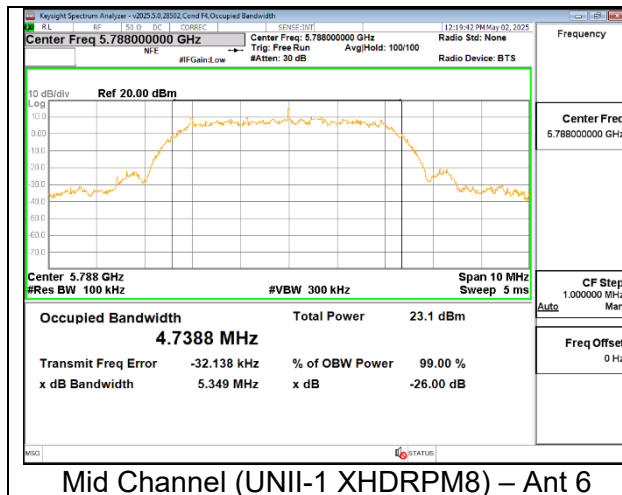
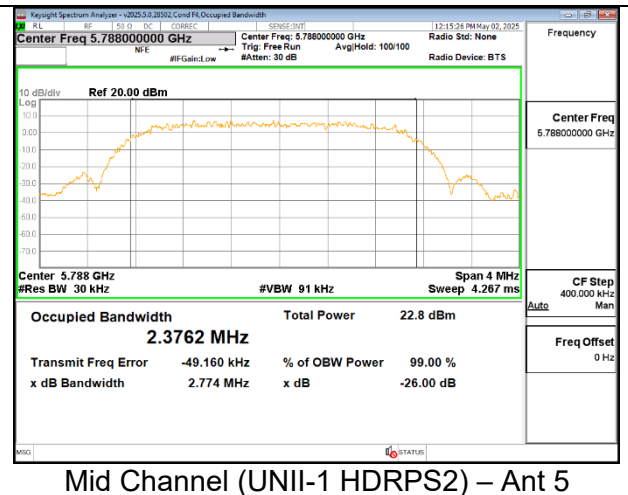
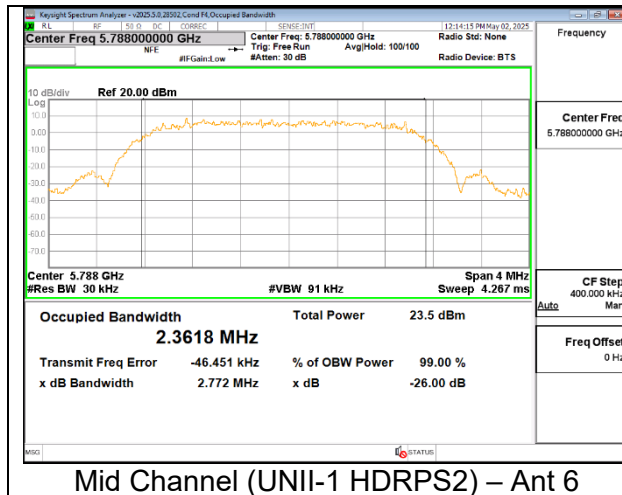
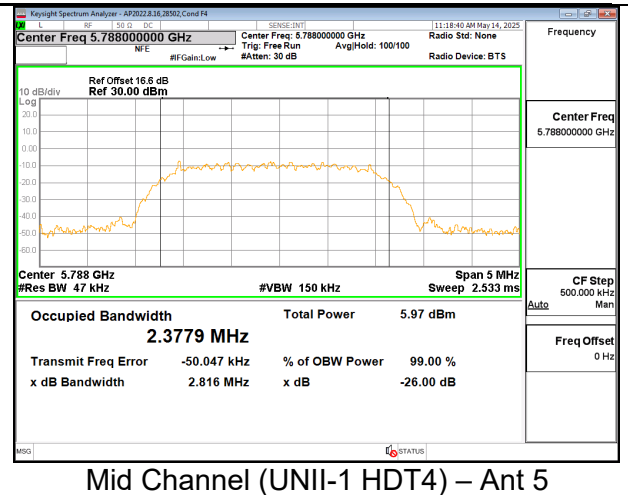
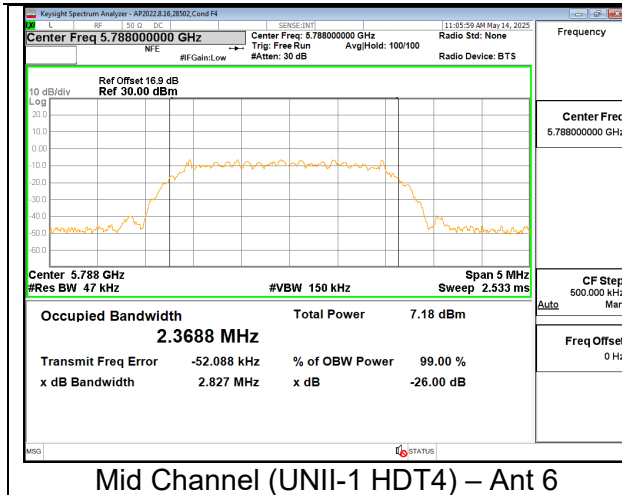
Mid Channel (UNII-1 LEL1M) – Ant 5

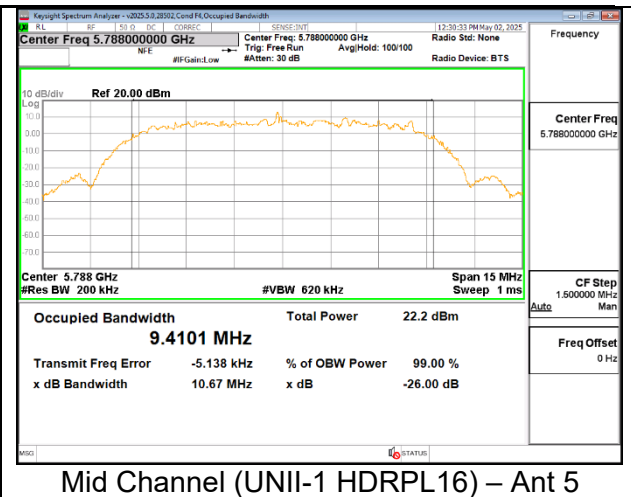
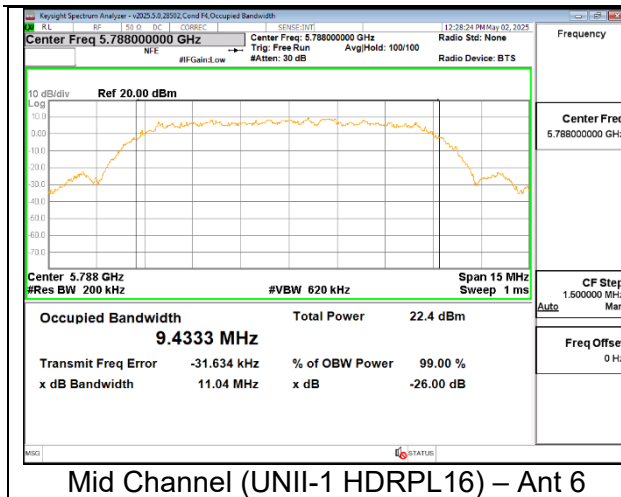


Mid Channel (UNII-1 LE2M) – Ant 6



Mid Channel (UNII-1 LE2M) – Ant 5





9.3. 6 dB BANDWIDTH**LIMITS**

FCC §15.407 (e)

The minimum 6 dB bandwidth shall be at least 500 kHz.

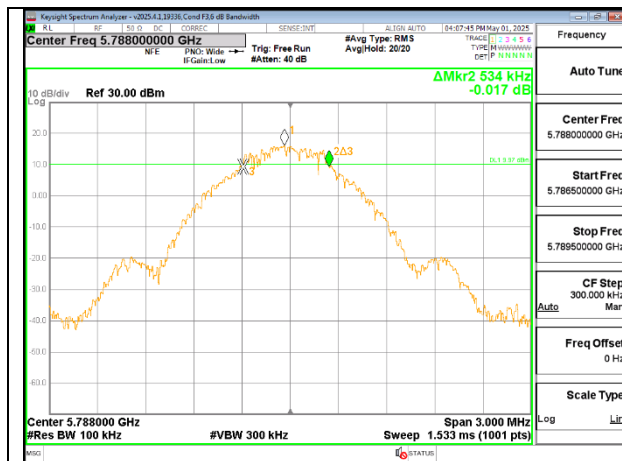
RESULTS

For 6dB bandwidth measurements, the narrowest bandwidths of BDR mode was set to test as the worst-case scenario.

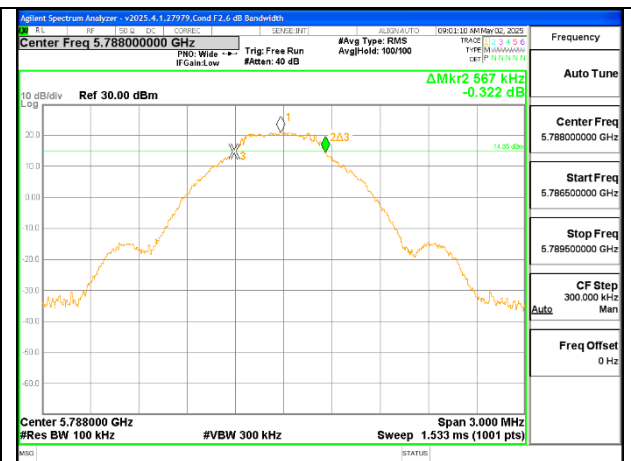
Only High Power at BDR mode result is reported, it covers all Low Power modes. Only Mid channel plot is reported to show setting parameter complies with testing method/procedure.

9.3.1. HIGH OUTPUT BDR SISO MODE IN THE UNII-3 BAND

UNII-3 (SISO)	Frequency (MHz)	Channel Number	6 dB BW (MHz)	
			Ant 6	Ant 5
BDR	5733	Low	0.549	0.549
	5788	Mid	0.534	0.567
	5844	High	0.555	0.540



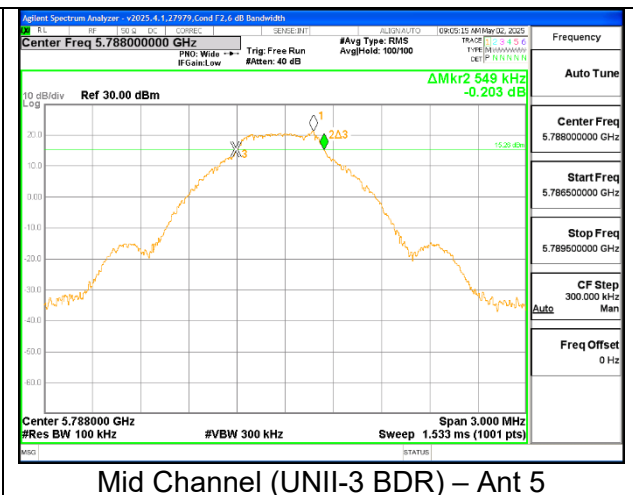
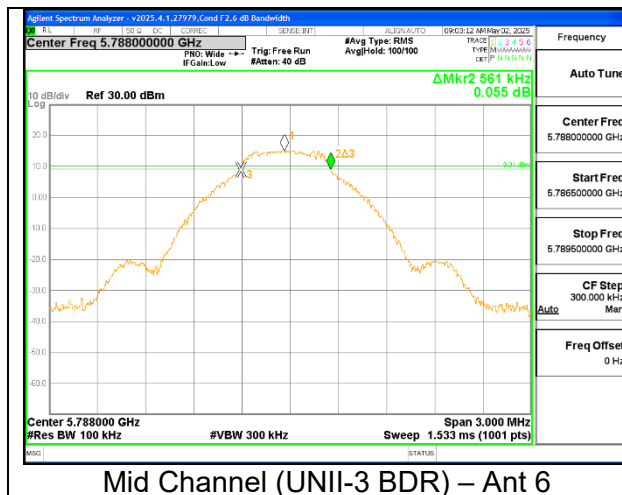
Mid Channel (UNII-3 BDR) – Ant 6



Mid Channel (UNII-3 BDR) – Ant 5

9.3.2. HIGH OUTPUT BDR TXBF MODE IN THE UNII-3 BAND

UNII-3 (TxBF)	Frequency (MHz)	Channel Number	6 dB BW (MHz)	
			Ant 6	Ant 5
BDR	5733	Low	0.558	0.540
	5788	Mid	0.561	0.549
	5844	High	0.561	0.549



9.4. OUTPUT POWER AND PSD**LIMITS****FCC §15.407****Band 5.15–5.25 GHz**

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Band 5.725-5.85 GHz

The maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

TEST PROCEDURE

The measurement method used for output power is KDB 789033 D02, Section E.3.b (Method PM-G).

The measurement method used for power spectral density is KDB 789033 D02, Section F.

DIRECTIONAL ANTENNA GAIN

For 1 TX:

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

For 2 TX:

Tx chains are correlated for power and correlated for PSD due to the device supporting TX BF in all MIMO modes. The directional gains are as follows:

Frequency Range (MHz)	Antenna 6 (dBi)	Antenna 5 (dBi)	Uncorrelated Chains (dBi)	Correlated Chains (dBi)
5150 - 5250 UNII - 1	-2.90	-7.80	-4.69	-2.00
5725 - 5825 UNII 3	2.00	-6.40	-0.42	1.79

RESULTS:**DIRECTIONAL GAIN CALCULATION:**

ANSI C63.10 section 14.6.3

Uncorrelated directional gain= $10 \cdot \log((10^{(\text{Ant1}/10)} + 10^{(\text{Ant2}/10)})/2)$

Correlated directional Gain= $10 \cdot \log(((10^{(\text{Ant1}/20)} + 10^{(\text{Ant2}/20)})^2/2)$

Sample Calculation:

Ant6=-2.90, Ant5=-7.80

Uncorrelated Antenna gain= $10 \log[(10^{(-2.90/10)} + 10^{(-7.80/10)})/2] = -4.69 \text{ dBi}$

Correlated Antenna gain= $10 \log[(10^{(-2.90/20)} + 10^{(-7.80/20)})^2/2] = -2.00 \text{ dBi}$

9.4.1. UNII-1 BAND SISO MODE

UNII-1 (SISO) (5162 - 5245MHz)	
Ant 6 (dBi)	-2.90
Ant 5 (dBi)	-7.80

UNII-1 (SISO)	Power Config.	Freq (MHz)	Ch. #	Duty Cycle (dB)	Minimum Bandwidth (MHz)		Power Limit (dBm)		Output Power (Gated) (dBm)		Total Corrected Power (dBm)		PSD Limit (dBm/MHz)		PSD (dBm/MHz)		Total Corrected PSD (dBm/MHz)	
					Ant 6	Ant 5	Ant 6	Ant 5	Ant 6	Ant 5	Ant 6	Ant 5	Ant 6	Ant2	Ant 6	Ant 5	Ant 6	Ant 5
BDR	High	5162	Low	1.15	--	24	24	10.16	10.13	10.16	10.13	11	11	7.676	7.932	8.826	9.082	
		5203	Mid					10.18	10.17	10.18	10.17			7.782	7.546	8.932	8.696	
		5245	High					10.13	10.13	10.13	10.13			7.764	7.752	8.914	8.902	
	5162	Low	2.44					2.65	2.44	2.65	0.577			0.796	1.727	1.946		
	Low	5203	Mid					2.44	2.66	2.44	2.66			0.590	0.739	1.740	1.889	
		5245	High					2.43	2.68	2.43	2.68			0.455	0.727	1.605	1.877	
LE1M		High	5162	Low				10.23	10.17	10.23	10.17			4.995	6.990	5.715	7.710	
	5203		Mid	10.20				10.27	10.20	10.27	4.857			7.330	5.577	8.050		
	5245		High	10.23				10.19	10.23	10.19	4.873			6.962	5.593	7.682		
	Low	5162	Low	2.41				2.64	2.41	2.64	-3.083			0.067	-2.363	0.787		
		5203	Mid	2.45				2.60	2.45	2.60	-2.898			-0.152	-2.178	0.568		
		5245	High	2.46				2.68	2.46	2.68	-2.795			-0.384	-2.075	0.336		
LE2M	High	5162	Low	11.13				11.15	11.13	11.15	3.561			5.632	6.001	8.072		
		5203	Mid	11.15				11.17	11.15	11.17	3.228			5.588	5.668	8.028		
		5245	High	11.11				11.16	11.11	11.16	3.583			5.861	6.023	8.301		
	Low	5162	Low	2.45				2.66	2.45	2.66	-5.584			-2.601	-3.144	-0.161		
		5203	Mid	2.42				2.68	2.42	2.68	-5.182			-2.274	-2.742	0.166		
		5245	High	2.41				2.67	2.41	2.67	-5.261			-2.760	-2.821	-0.320		
HDT4	High	5162	Low	12.62				11.45	12.62	11.45	10.388			9.89	10.688	10.192		
		5203	Mid	12.68				11.45	12.68	11.45	10.493			10.17	10.793	10.473		
		5245	High	12.66				11.44	12.66	11.44	10.632			10.10	10.932	10.399		
	Low	5162	Low	-0.55				-0.43	-0.55	-0.43	-4.520			-4.299	-4.220	-3.999		
		5203	Mid	-0.55				-0.32	-0.55	-0.32	-4.284			-4.508	-3.984	-4.208		
		5245	High	-0.63				-0.32	-0.63	-0.32	-4.195			-4.507	-3.895	-4.207		
HDT6	High	5162	Low	10.95				12.42	10.95	12.42	9.380			10.194	9.810	10.624		
		5203	Mid	10.95				12.47	10.95	12.47	9.200			9.968	9.630	10.398		
		5245	High	10.97				12.45	10.97	12.45	8.953			9.765	9.383	10.195		
	Low	5162	Low	-3.55				-3.33	-3.55	-3.33	-5.954			-5.678	-5.524	-5.248		
		5203	Mid	-3.55				-3.32	-3.55	-3.32	-5.922			-5.736	-5.492	-5.306		
		5245	High	-3.53				-3.37	-3.53	-3.37	-6.047			-5.948	-5.617	-5.518		
HDRPS2	High	5162	Low	12.25				12.25	12.25	12.25	9.579			9.582	9.929	9.932		
		5203	Mid	12.26				12.23	12.26	12.23	9.524			9.422	9.874	9.772		
		5245	High	12.19				12.21	12.19	12.21	9.398			9.469	9.748	9.819		
	Low	5162	Low	-0.53				-0.33	-0.53	-0.33	-3.952			-3.400	-3.602	-3.050		
		5203	Mid	-0.51				-0.35	-0.51	-0.35	-3.985			-3.686	-3.635	-3.336		
		5245	High	-0.53				-0.33	-0.53	-0.33	-3.988			-3.423	-3.638	-3.073		
XHDRPM8	High	5162	Low	13.92				14.42	13.92	14.42	9.535			10.009	9.895	10.369		
		5203	Mid	13.92				14.45	13.92	14.45	9.303			9.813	9.663	10.173		
		5245	High	13.95				14.46	13.95	14.46	9.102			9.676	9.462	10.036		
	Low	5162	Low	-0.51				-0.32	-0.51	-0.32	-6.782			-6.604	-6.422	-6.244		
		5203	Mid	-0.52				-0.31	-0.52	-0.31	-7.000			-6.201	-6.640	-5.841		
		5245	High	-0.53				-0.33	-0.53	-0.33	-6.898			-6.622	-6.538	-6.262		
HDRPL16	High	5164	Low	13.97				14.42	13.97	14.42	3.356			4.374	3.516	4.534		
		5203	Mid	13.91				14.47	13.91	14.47	3.612			4.200	3.772	4.360		
		5242	High	13.92				14.41	13.92	14.41	3.279			4.580	3.439	4.740		
	Low	5164	Low	-0.51				-0.32	-0.51	-0.32	-9.016			-8.743	-8.856	-8.583		
		5203	Mid	-0.51				-0.32	-0.51	-0.32	-8.783			-8.692	-8.623	-8.532		
		5242	High	-0.52				-0.42	-0.52	-0.42	-9.267			-8.606	-9.107	-8.446		