

TEST REPORT

Report Number: R15560239-E1

Applicant : Garmin International Inc.
1200 East 151st Street
Olathe, KS 66062-3426, USA

Model : AA4870

FCC ID : IPH-A4870

IC : 1792A-A4870

EUT Description : Digital Transceiver

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C
ISED RSS-247 ISSUE 3
ISED RSS-GEN ISSUE 5 + A1 + A2

Date Of Issue:
2025-04-01

Prepared by:
UL LLC
12 Laboratory Dr.
Research Triangle Park, NC 27709 U.S.A.
TEL: (919) 549-1400



REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2025-04-01	Initial Issue	Chandler Stanley

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Garmin International Inc.
1200 East 151st Street
Olathe, KS 66062-3426, USA

EUT DESCRIPTION: Digital Transceiver

MODEL: AA4870

SERIAL NUMBER: E139956-I / 17608296 / Xxx000650

SAMPLE RECEIPT DATE: 2025-01-02, 2025-01-14, and 2025-02-11

DATE TESTED: 2025-01-16 TO 2025-03-20

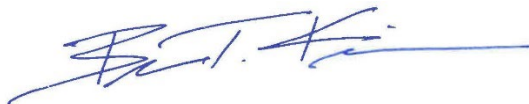
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Refer to Section 2
ISED RSS-247 Issue 3	Refer to Section 2
ISED RSS-GEN Issue 5 + A1 + A2	Refer to Section 2

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating 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 taken into account unless noted otherwise.

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

Approved & Released
For UL LLC By:



Brian Kiewra
Project Engineer
Consumer, Medical and IT Segment
UL LLC

Prepared By:



Chandler Stanley
Engineer
Consumer, Medical and IT Segment
UL LLC

2. TEST RESULTS SUMMARY

This report contains info provided by the customer which can impact the validity of results. UL LLC is only responsible for the validity of results after the integration of the data provided by the customer.

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

- 1) Antenna gain and type (see section 6.3)
- 2) Worst-case data rates (see section 6.5)

FCC Clause	ISED Clause	Requirement	Result	Comment
See Comment		Duty Cycle	Reporting purposes only	ANSI C63.10 Section 11.6.
-	RSS-GEN 6.7	99% OBW	Reporting purposes only	ANSI C63.10 Section 6.9.3.
15.247 (a) (2)	RSS-247 5.2 (a)	6dB BW	Compliant	None
15.247 (b) (3)	RSS-247 5.4 (d)	Output Power		
See Comment		Average power	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (e)	RSS-247 5.2 (b)	PSD	Compliant	None
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions		
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions		
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions	Not Applicable	The EUT does not interact with AC Mains

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5 + A1 + A2, and RSS-247 Issue 3.

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, certification # 0751.06, 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: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
☒	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A		27265	

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	UNCERTAINTY
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	1.22%
RF output power, conducted	1.3 dB (PK) 0.45 dB (AV)
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	1.94 dB
All emissions, radiated	6.01 dB
Conducted Emissions (0.150-30MHz) - LISN	3.40 dB
Temperature	0.57°C
Humidity	3.39%
DC Supply voltages	1.70%
Time	3.39%

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

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a digital transceiver that contains a BLE radio. This report covers full testing of the BLE radio.

6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	BLE 125 kbps	7.99	6.30
2402 - 2480	BLE 1 Mbps	7.94	6.22

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna(s) gain and type, as provided by the manufacturer' are as follows:
The radio utilizes an antenna with the following type and maximum gain:

Antenna #	Type	Frequency Range (MHz)	Maximum Gain (dBi)
Antenna 1	Inverted F	2402-2480	1.33
Antenna 2	Inverted F	2402-2480	2.2
External Antenna	Monopole	2402-2480	0.961

6.4. SOFTWARE AND FIRMWARE

Software Version: 1.64

6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz and above 18GHz were performed on the highest gain internal antenna as well as the external antenna. These measurements were made with the EUT set to transmit at the channel with highest PSD as worst-case scenario. All PSD was taken at max power.

Radiated emissions between 1GHz and 18GHz were performed on the data-rate with the highest power and PSD on low, middle and high channels. Band edge was performed on both data-rates: 125 kbps and 1 Mbps.

Each EUT antenna was investigated in three orthogonal axes, X, Y, and Z. The worst-case orientation was determined to be the X-orientation for antenna 1, and Y-orientation for the other 2 antennas. Therefore, all testing was performed with the EUT in the X-orientation for antenna 1 and Y-orientation for the remaining antennas.

The client has declared an operational duty cycle of 47% and 63.5% for 1 Mbps and 125 kbps respectively which corresponds to duty cycle correction factors of -6.56 dB and -3.94 dB respectively. These are applied to peak measurements where applicable to provide RMS average values.

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	Thinkpad T14 Gen 3	PF4FKVY8	NA
NMEA 2000 T-Connector	Garmin	330-00563-20	NA	NA

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Mini-USB	1	USB	Shielded	<3m	Laptop to adapter
2	N2K	2	N2K	Shielded	<3m	T-Connector to Hub
3	N2K	2	N2K	Shielded	<3m	T-Connector to Power Supply
4	N2K	1	Banana Jack	Shielded	<3m	Hub to Power Supply
5	N2K	2	N2k	Shielded	<3m	4x cable extension for USB to T-Connector under chamber

TEST SETUP

The EUT is connected to a test laptop during the tests. Test software exercised the radio card and the laptop was left outside the chamber during tests.

SETUP DIAGRAMS

Please refer to 15560239-EP1 for setup diagrams

7. MEASUREMENT METHOD

On Time and Duty Cycle: ANSI C63.10-2020 Section 11.6

6 dB BW: ANSI C63.10-2020 Subclause -11.8.2

Occupied BW (99%): ANSI C63.10-2020 Section 6.9.3

Output Power: ANSI C63.10-2020 Subclause -11.9.1.2 Method PKPM1 Peak-reading power meter
ANSI C63.10-2020 Subclause -11.9.2.3.2 Method AVGPM-G (Measurement using a gated RF average-reading power meter)

PSD: ANSI C63.10-2020 Subclause -11.10.2 Method PKPSD (peak PSD)

Conducted emissions non-restricted frequency bands: ANSI C63.10-2020 Subclause -11.11 and 6.10.4

Radiated emissions restricted frequency bands: ANSI C63.10-2020 Subclause -11.12.1 and 6.10.5

General radiated emissions: ANSI C63.10 Subclause - 6.3-6.6

8. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
Common Equipment					
Conducted Room 2					
90410	Spectrum Analyzer	Keysight Technologies	N9030A	2024-06-14	2025-06-14
Power Software	Boonton Power Analyzer	Boonton	Version 3.0.13.0	NA	NA
SOFTEMI	Antenna Port Software	UL	Version 2024.2.23	NA	NA
211057	Real-Time Peak Power Sensor 50MHz to 8GHz	Boonton	RTP5000	2024-08-01	2025-08-01
CBL091	Micro-Coax UTiFLEX Cable Assembly, Low Loss,40Ghz	Carlisle Interconnect Technologies	UFA147A-2-0360-200200	2024-03-01	2025-03-01
226561	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2024-02-29	2025-02-28
248881	Environmental Meter	Control Company	06-662-4	2024-04-10	2026-04-10
NA	DC Power Supply	Elektro-Automatik GmbH & Co	EA-PSI 9040-60 T	NA	NA

NOTE*: All equipment was in calibration at the time of use.

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 4)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
0.009-30MHz					
135144	Active Loop Antenna	ETS-Lindgren	6502	2024-10-02	2025-10-02
30-1000 MHz					
90628	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2024-01-02	2026-01-02
1-18 GHz					
89509	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2023-05-23	2025-05-23
18-26.5 GHz					
204704	Horn Antenna, 18-26.5GHz	Com-Power	AH-826	2023-07-20	2025-07-20
Gain-Loss Chains					
207638	Gain-loss string: 0.009-30MHz	Various	Various	2024-05-22	2025-05-22
207639	Gain-loss string: 25-1000MHz	Various	Various	2024-05-22	2025-05-22
207640	Gain-loss string: 1-18GHz	Various	Various	2024-05-22	2025-05-22
225795	Gain-loss string: 18-40GHz	Various	Various	2024-05-22	2025-05-22
Receiver & Software					
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-04-16	2025-04-16
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
241204	Environmental Meter	Fisher Scientific	15-077-963	2023-09-05	2025-09-05

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 1)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
0.009-30MHz					
135144	Active Loop Antenna	ETS-Lindgren	6502	2024-10-02	2025-10-02
30-1000 MHz					
90629	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2024-01-30	2026-01-30
1-18 GHz					
135143	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2024-02-07	2026-02-07
18-26.5 GHz					
204704	Horn Antenna, 18-26.5GHz	Com-Power	AH-826	2023-07-20	2025-07-20
Gain-Loss Chains					
91974	Gain-loss string: 0.009-30MHz	Various	Various	2024-05-08	2025-05-08
91976	Gain-loss string: 25-1000MHz	Various	Various	2024-05-08	2025-05-08
91979	Gain-loss string: 1-18GHz	Various	Various	2024-05-08	2025-05-08
135999	Gain-loss string: 18-40GHz	Various	Various	2024-05-08	2025-05-08
Receiver & Software					
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-08-29	2025-08-29
81018	Spectrum Analyzer	Agilent	E4446A	2024-07-31	2025-07-31
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
241205	Environmental Meter	Fisher Scientific	15-077-963	2023-09-05	2025-09-05
220155	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	NA	NA

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4GHz Band						
BLE - 125 kbps	3.100	3.750	0.827	82.67	1.65	0.323
BLE - 1 Mbps	0.343	0.626	0.548	54.79	5.23	2.915

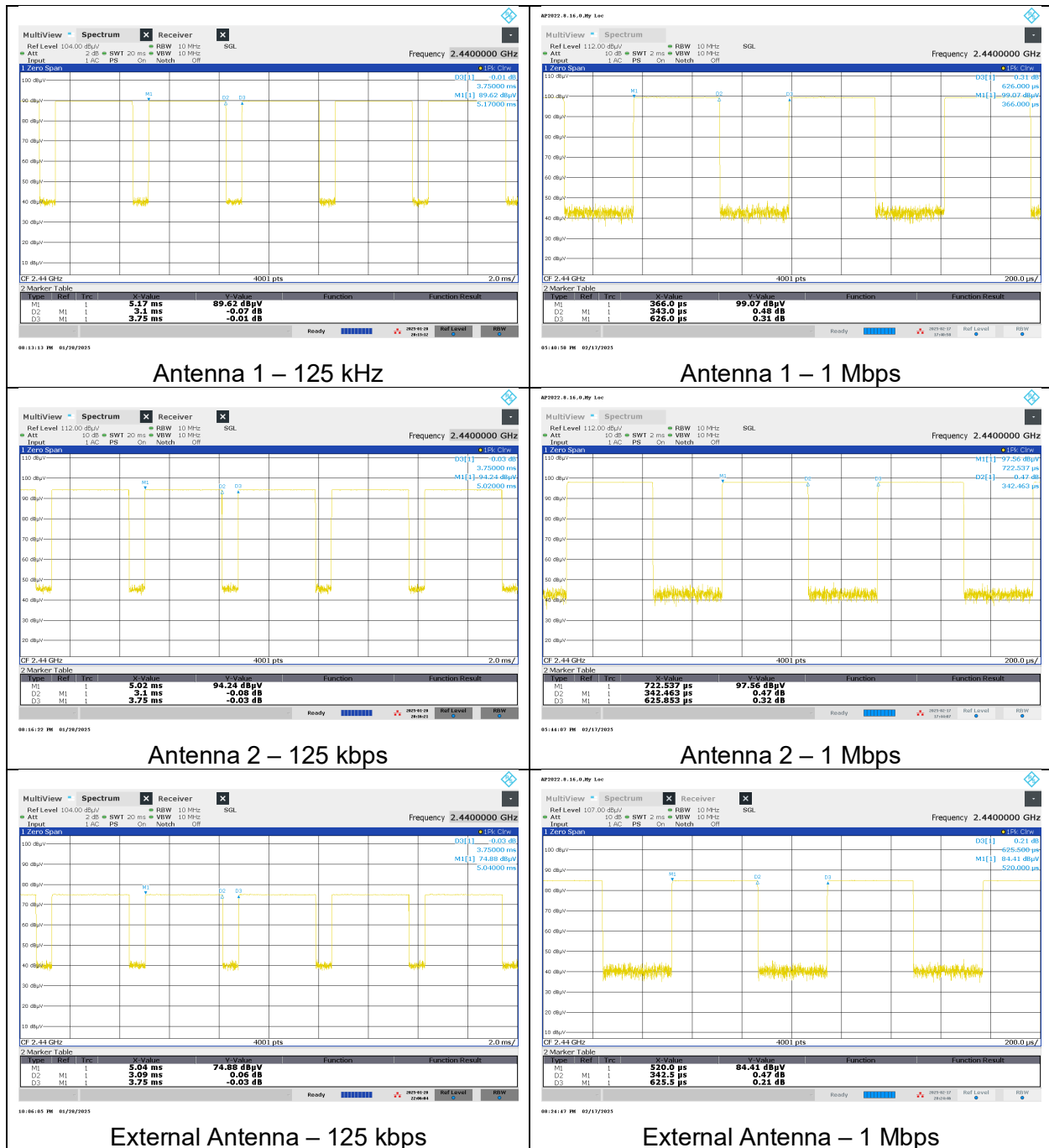
The client has declared an operational duty cycle of 47% and 63.5% for 1 Mbps and 125 kbps respectively:

1 Mbps DCCF = $20\log(0.47) = -6.56$ dB

125 kbps DCCF = $20\log(0.635) = -3.94$ dB

DUTY CYCLE PLOTS

Tested By: 11993



9.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

9.2.1. BLE (1Mbps)

Antenna 1

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0558
Middle	2440	1.0597
High	2480	1.0540



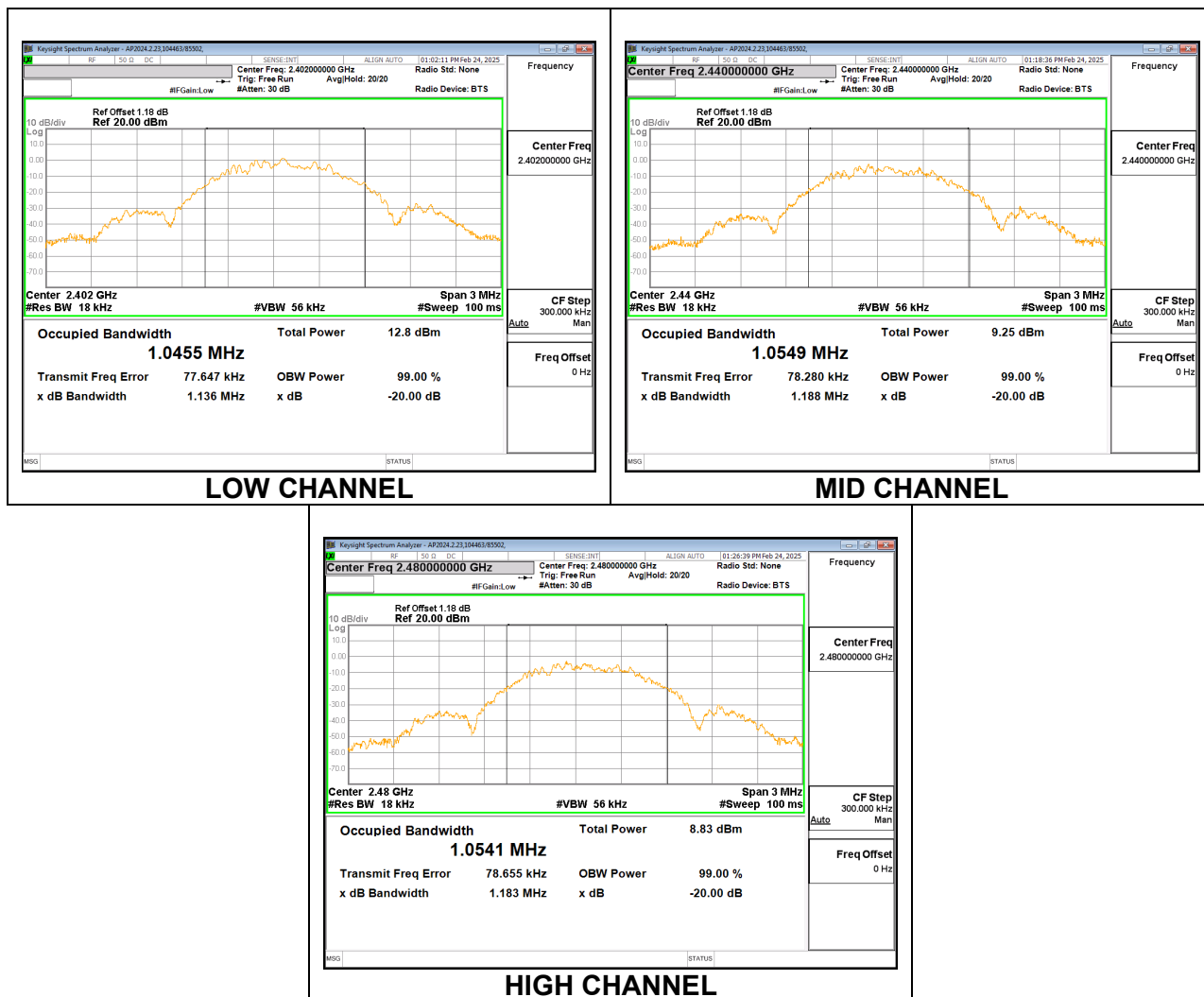
Antenna 2

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0547
Middle	2440	1.0552
High	2480	1.0551



External Antenna

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0455
Middle	2440	1.0549
High	2480	1.0541



9.2.2. BLE (125Kbps)

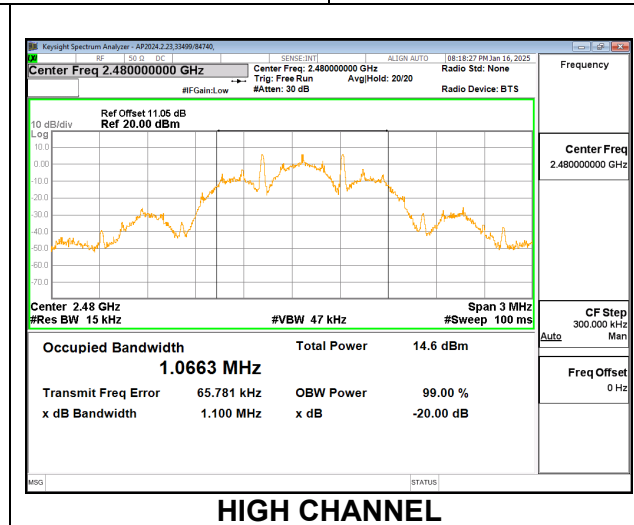
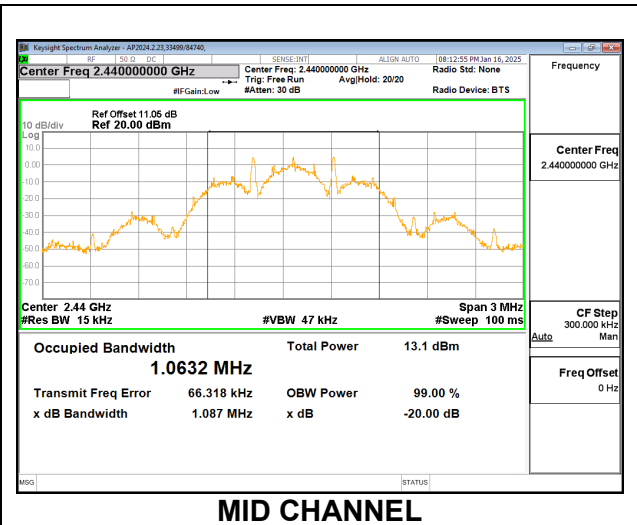
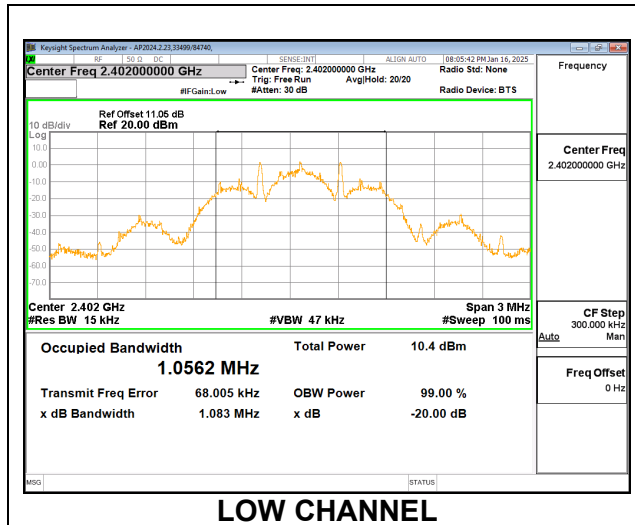
Antenna 1

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0654
Middle	2440	1.0644
High	2480	1.0649



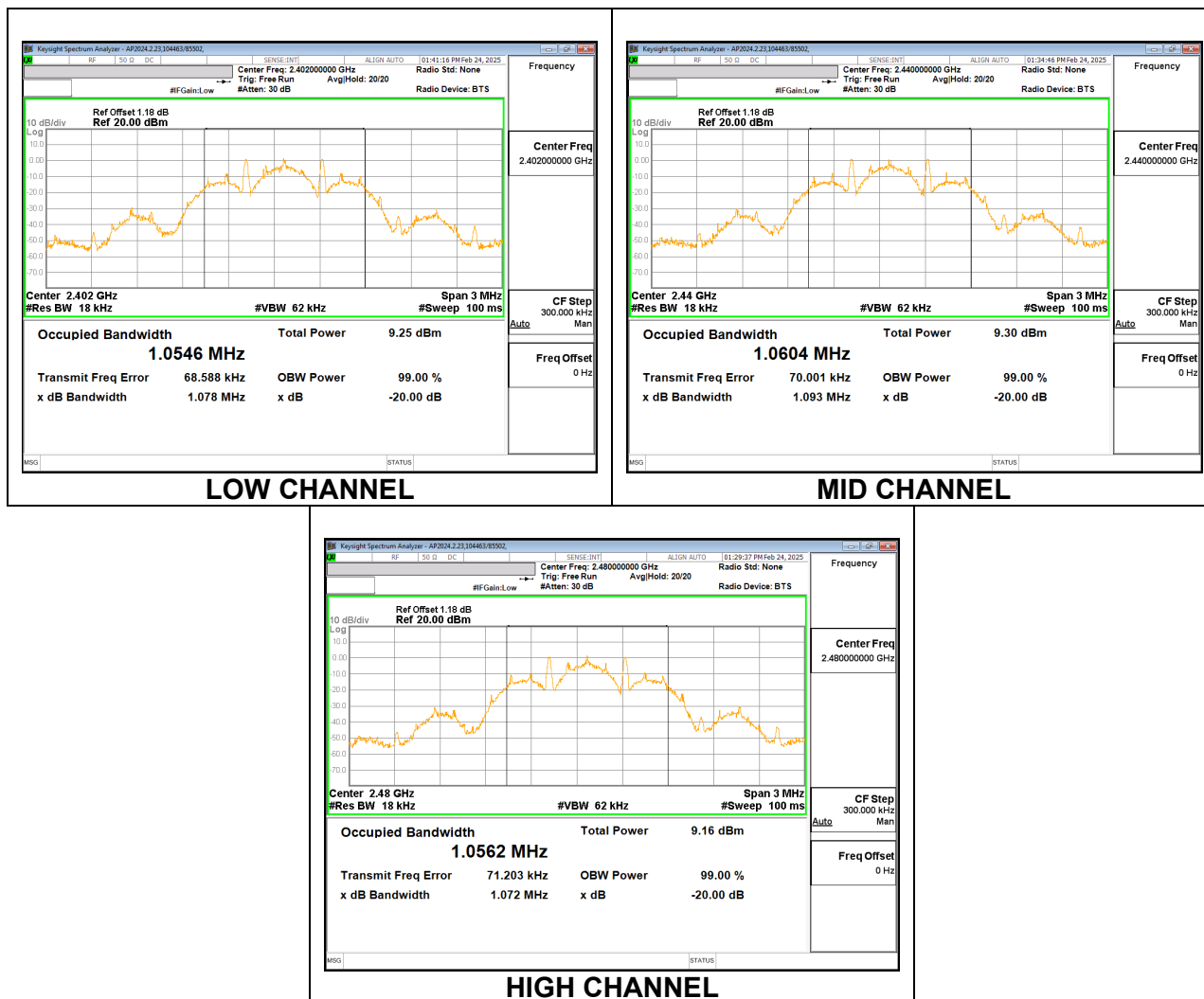
Antenna 2

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0562
Middle	2440	1.0632
High	2480	1.0663



External Antenna

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0546
Middle	2440	1.0604
High	2480	1.0562



9.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

RSS-247 5.2 (a)

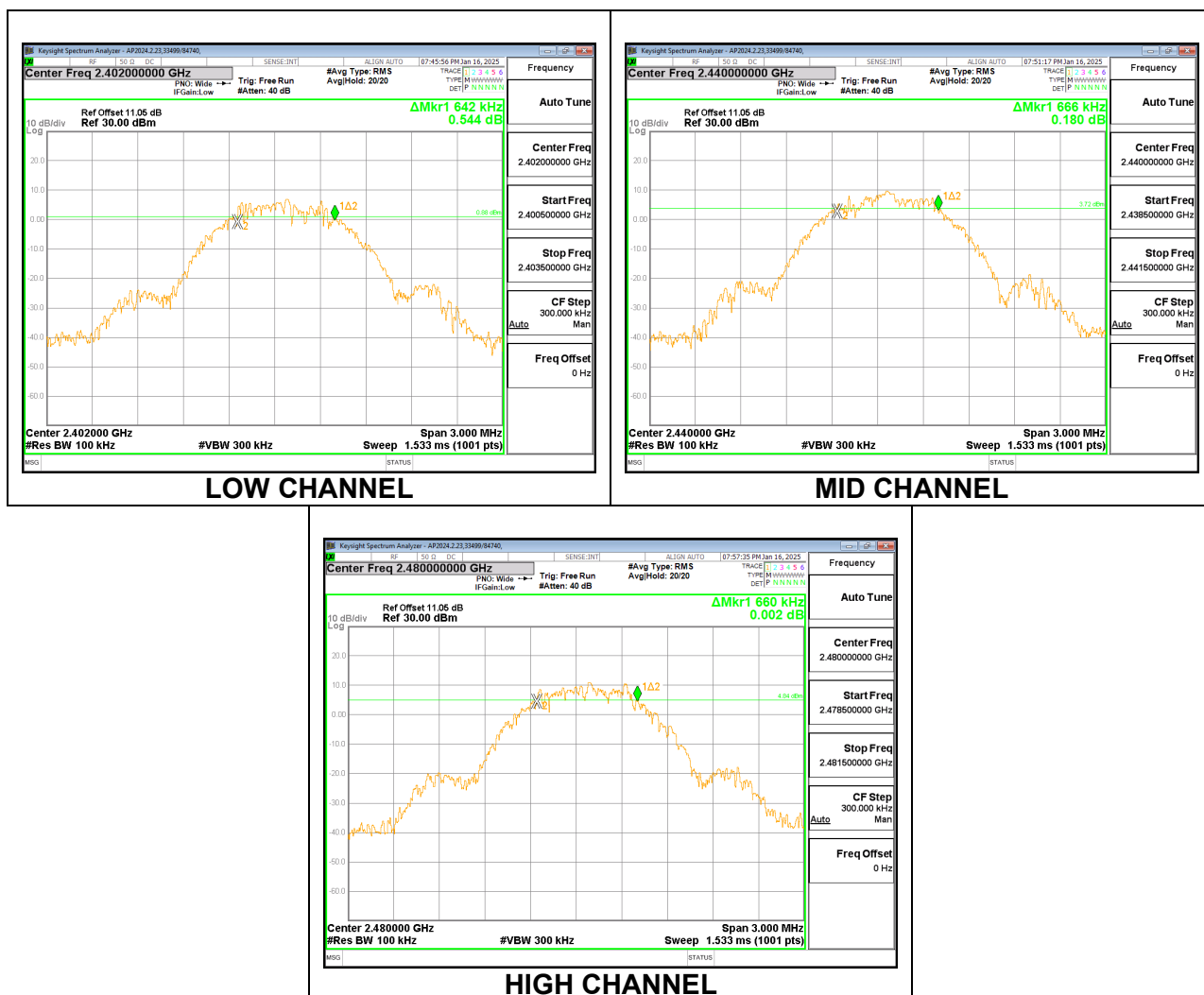
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

9.3.1. BLE (1Mbps)

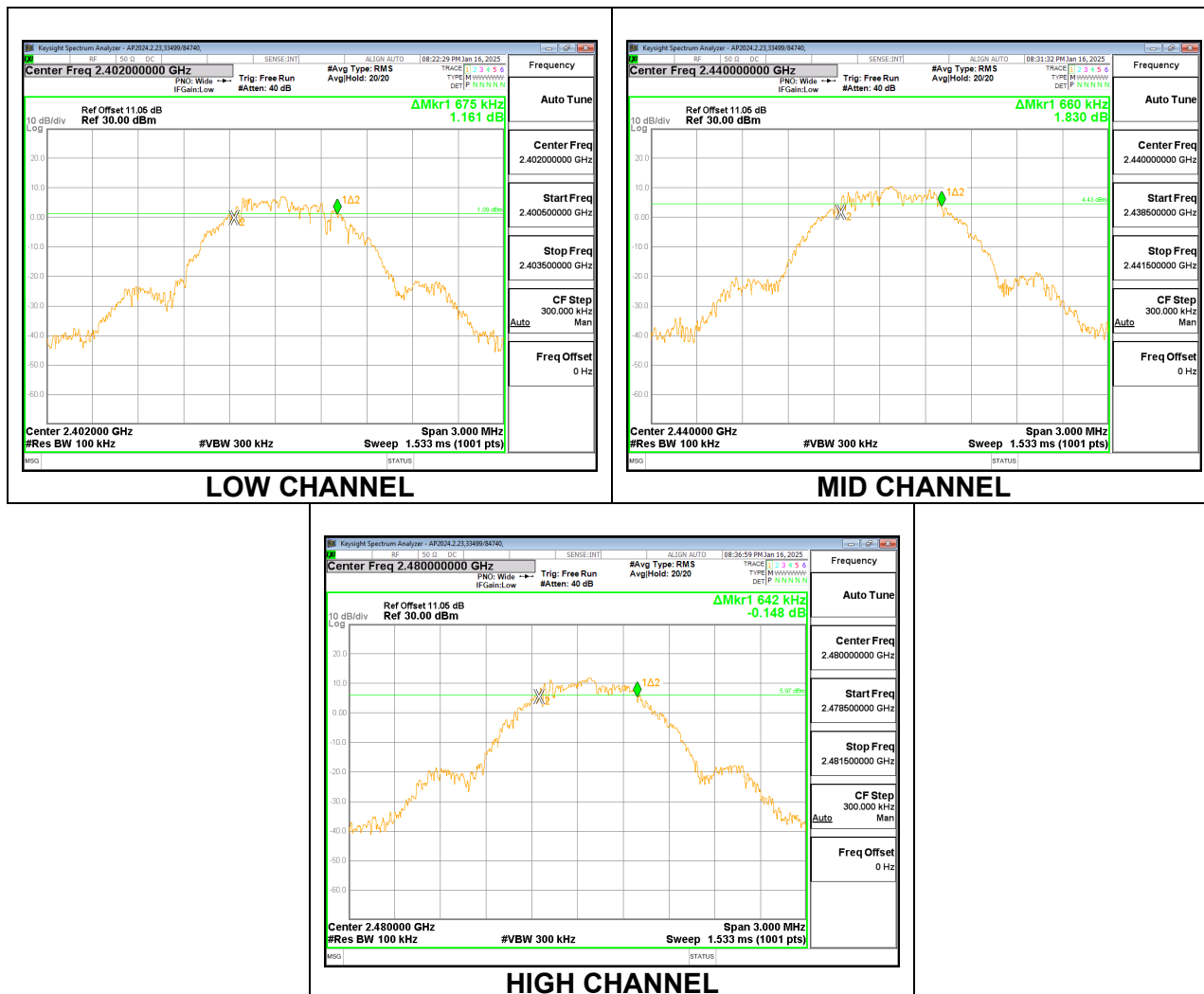
Antenna 1

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.6420	0.5
Middle	2440	0.6660	0.5
High	2480	0.6600	0.5



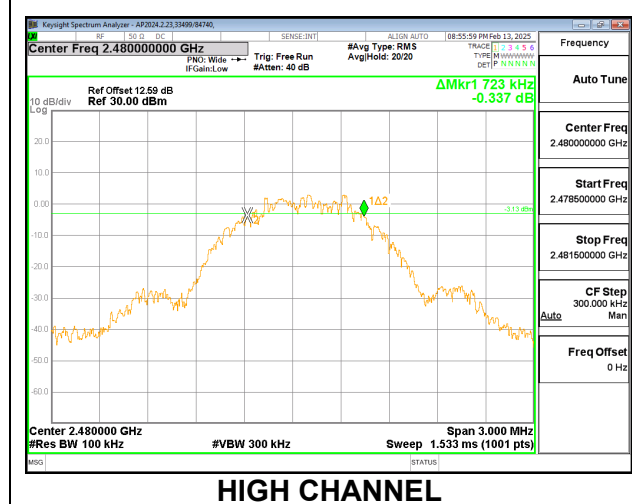
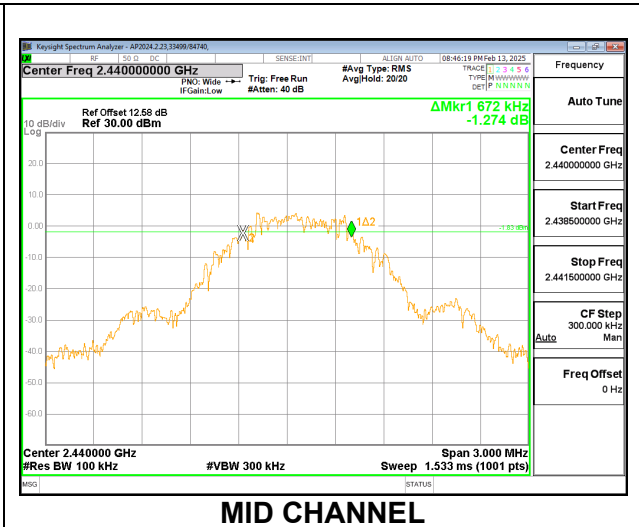
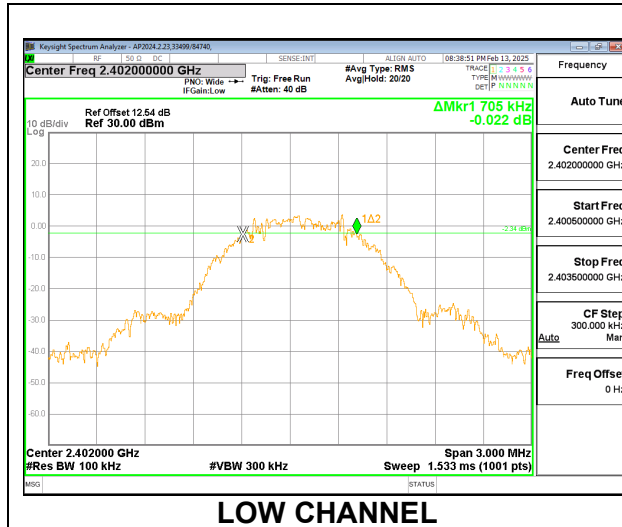
Antenna 2

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.6750	0.5
Middle	2440	0.6600	0.5
High	2480	0.6420	0.5



External Antenna

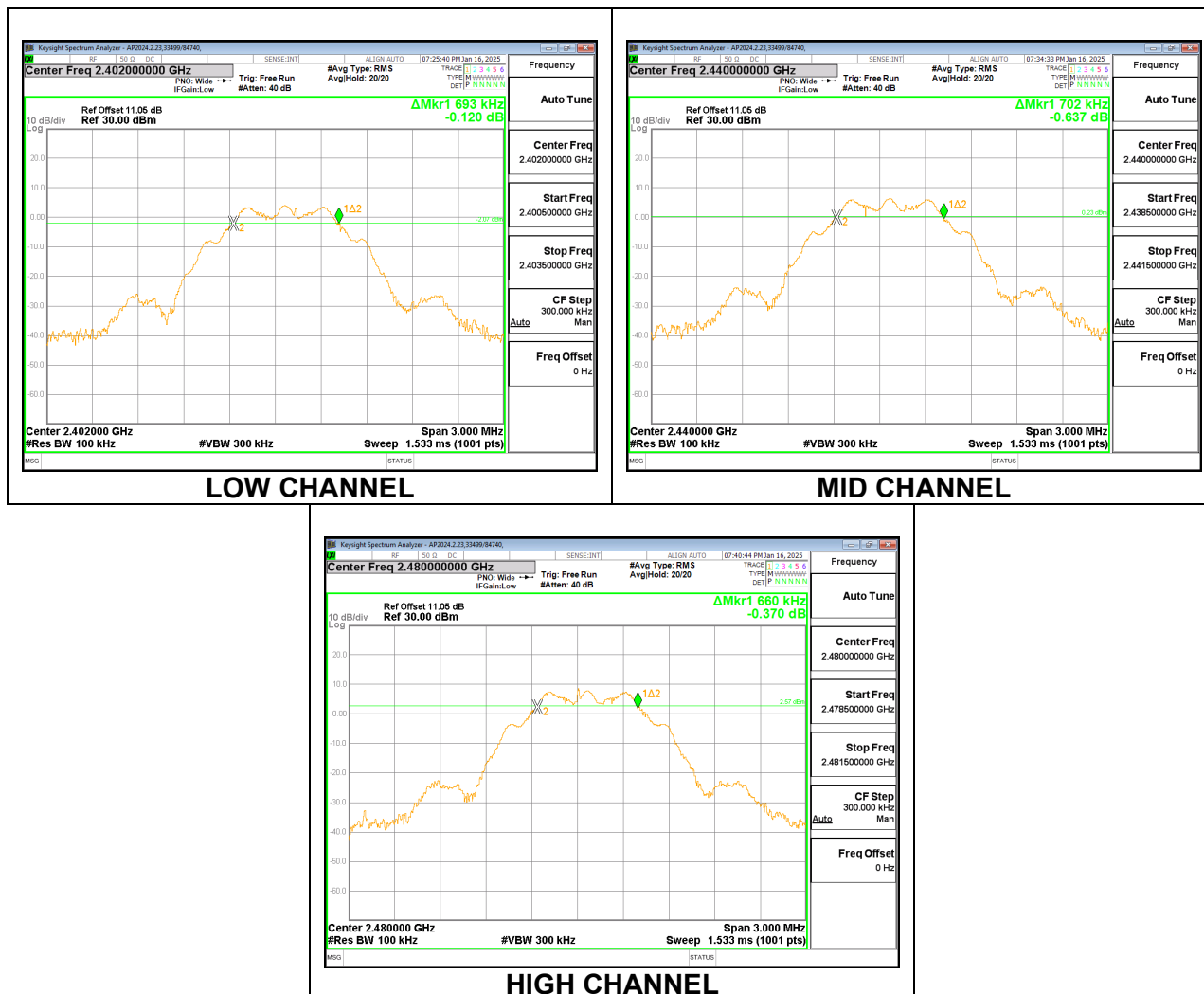
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.7050	0.5
Middle	2440	0.6720	0.5
High	2480	0.7230	0.5



9.3.2. BLE (125Kbps)

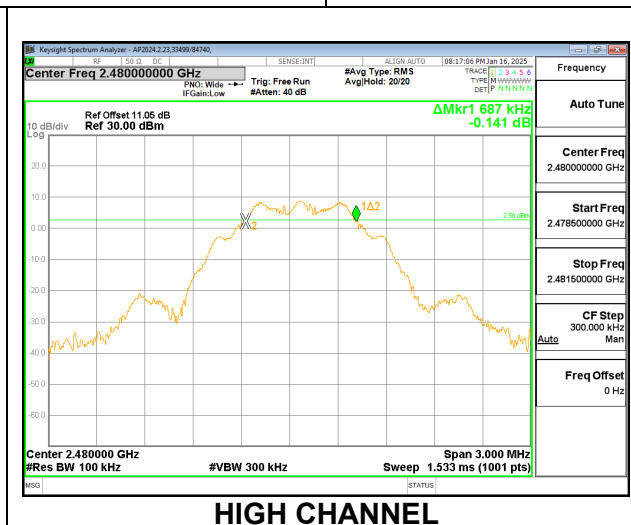
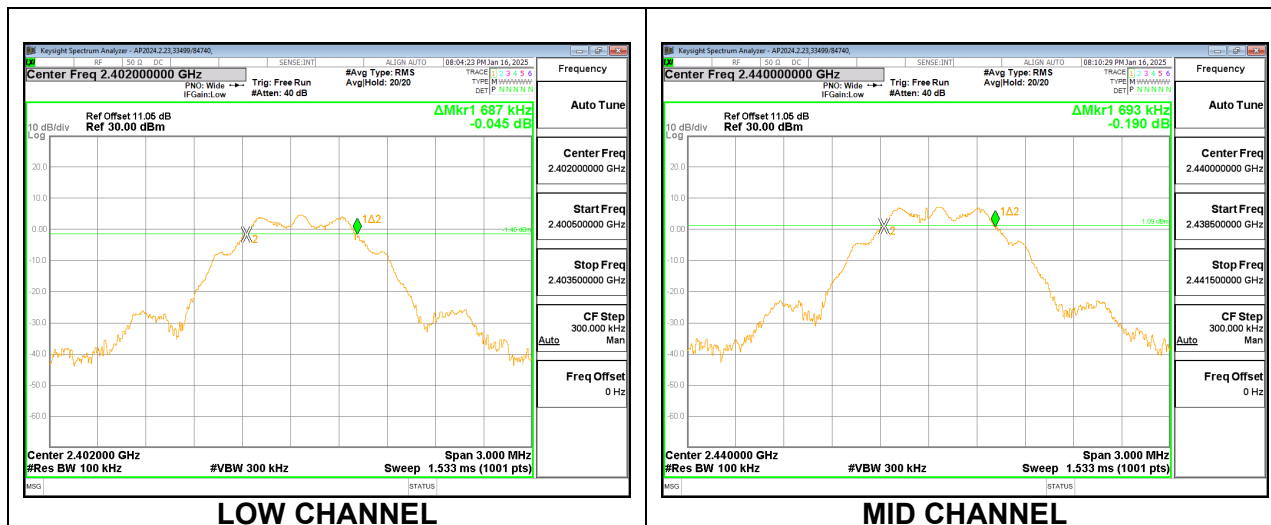
Antenna 1

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.6930	0.5
Middle	2440	0.7020	0.5
High	2480	0.6600	0.5



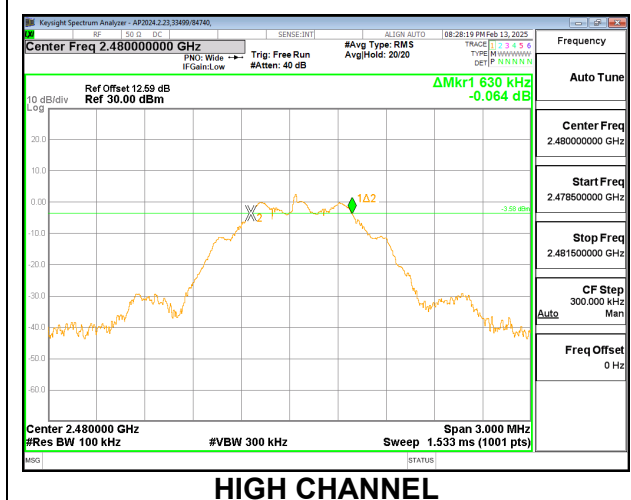
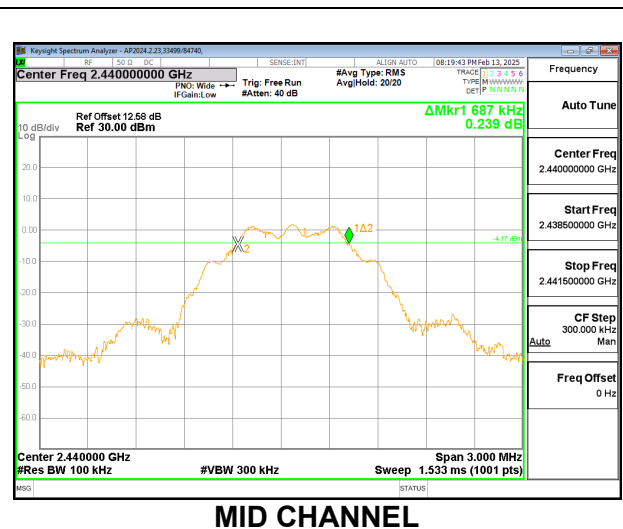
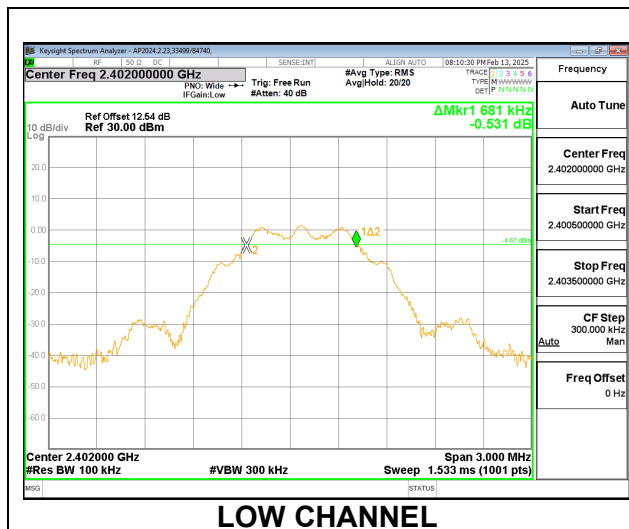
Antenna 2

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.6870	0.5
Middle	2440	0.6930	0.5
High	2480	0.6870	0.5



External Antenna

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.6810	0.5
Middle	2440	0.6870	0.5
High	2480	0.6300	0.5



9.4. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)
RSS-247 5.4 (d)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 0.7 dB (EUT cable) was entered as an offset in the power meter.

The power output was measured on the EUT antenna port using an SMA cable connected to a power meter via wideband power sensor. Peak output power was read directly from power meter.

RESULTS

9.4.1. BLE (1Mbps)

Antenna 1

Tested By:	104463/85502
Date:	2025-02-18

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.940	30	-22.060
Middle	2440	7.300	30	-22.700
High	2480	6.590	30	-23.410

Antenna 2

Tested By:	104463/85502
Date:	2025-02-18

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.460	30	-22.540
Middle	2440	7.330	30	-22.670
High	2480	7.490	30	-22.510

External Antenna

Tested By:	104463/85502
Date:	2025-02-18

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	6.640	30	-23.360
Middle	2440	6.750	30	-23.250
High	2480	6.580	30	-23.420

9.4.2. BLE (125Kbps)

Antenna 1

Tested By:	104463/85502
Date:	2025-02-18

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.990	30	-22.010
Middle	2440	7.360	30	-22.640
High	2480	6.620	30	-23.380

Antenna 2

Tested By:	104463/85502
Date:	2025-02-18

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.440	30	-22.560
Middle	2440	7.420	30	-22.580
High	2480	7.580	30	-22.420

External Antenna

Tested By:	104463/85502
Date:	2025-02-18

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	6.700	30	-23.300
Middle	2440	6.760	30	-23.240
High	2480	6.590	30	-23.410

9.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 0.7 dB (EUT cable) was entered as an offset in the power meter.

The power output was measured on the EUT antenna port using an SMA cable connected to a power meter via wideband average power sensor. Gated average output power was read directly from power meter.

RESULTS

9.5.1. BLE (1Mbps)

Antenna 1

Tested By:	104463/85502
Date:	2025-02-18

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	7.493
Middle	2440	6.841
High	2480	6.146

Antenna 2

Tested By:	104463/85502
Date:	2025-02-18

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	6.986
Middle	2440	6.846
High	2480	7.047

External Antenna

Tested By:	104463/85502
Date:	2025-02-18

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	6.200
Middle	2440	6.291
High	2480	6.116

9.5.2. BLE (125Kbps)

Antenna 1

Tested By:	104463/85502
Date:	2025-02-18

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	7.714
Middle	2440	7.064
High	2480	6.347

Antenna 2

Tested By:	104463/85502
Date:	2025-02-18

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	7.219
Middle	2440	7.101
High	2480	7.281

External Antenna

Tested By:	104463/85502
Date:	2025-02-18

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	6.388
Middle	2440	6.510
High	2480	6.339

9.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)
RSS-247 (5.2) (b)

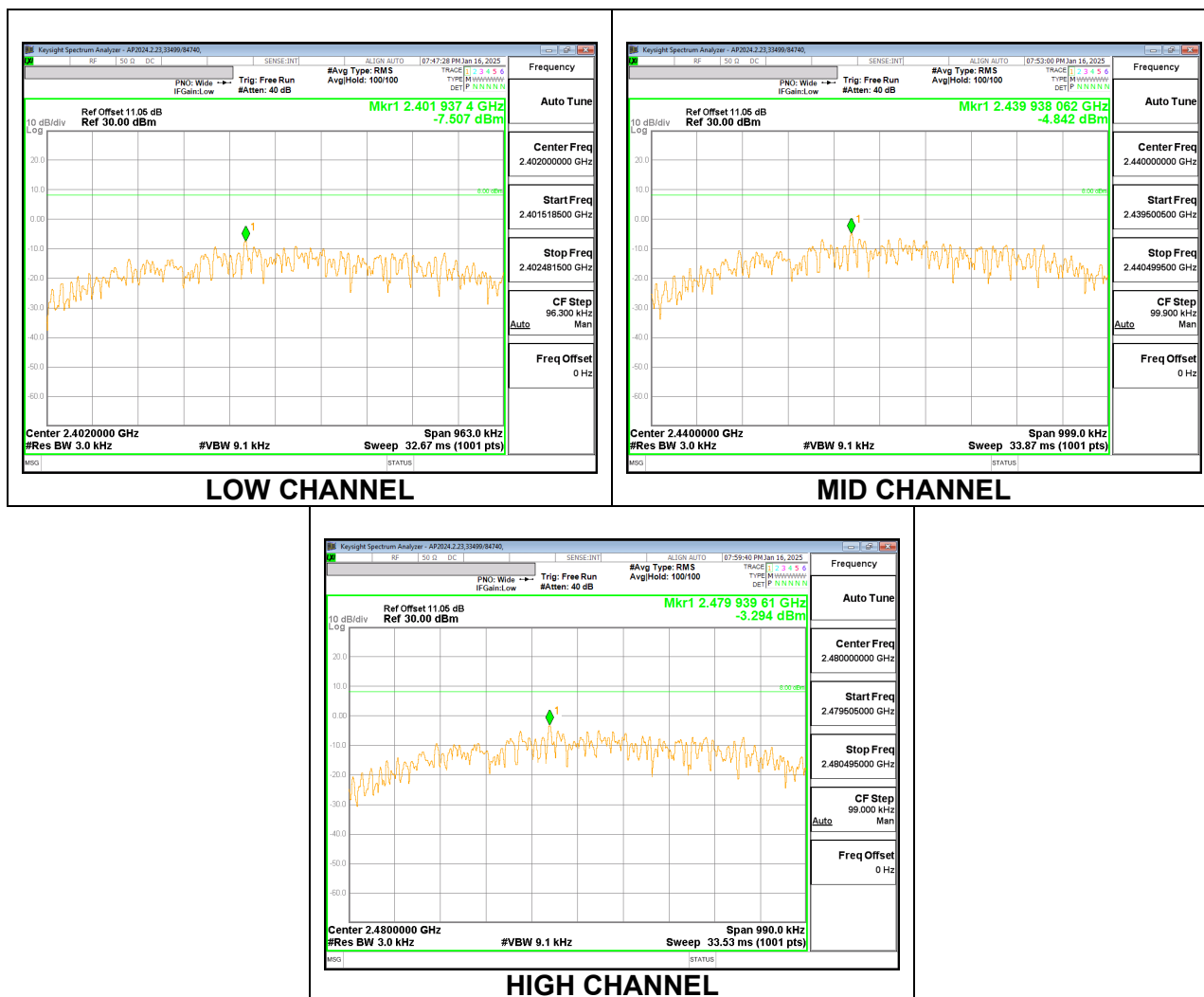
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

9.6.1. BLE (1Mbps)

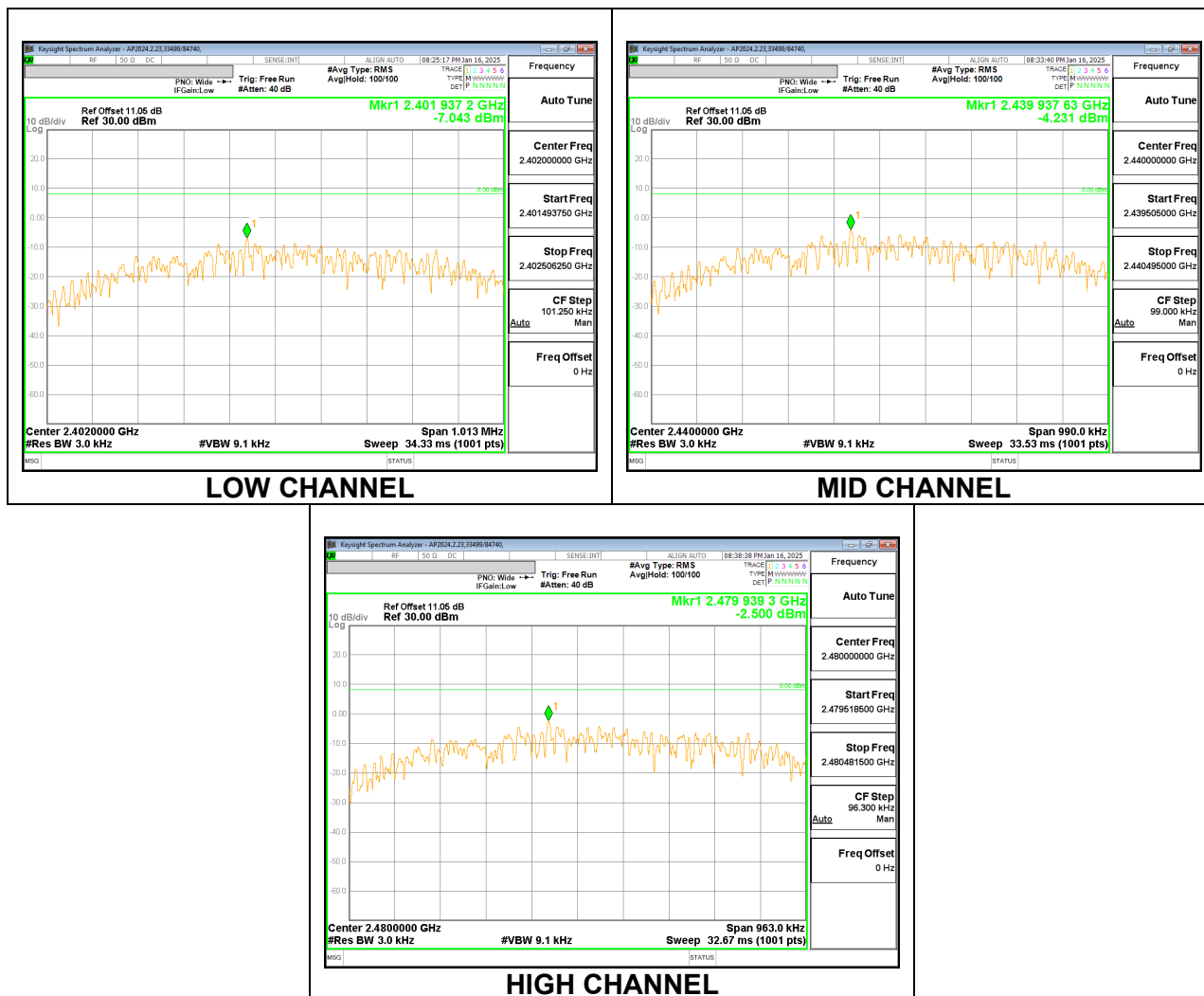
Antenna 1

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-7.507	8	-15.507
Middle	2440	-4.842	8	-12.842
High	2480	-3.294	8	-11.294



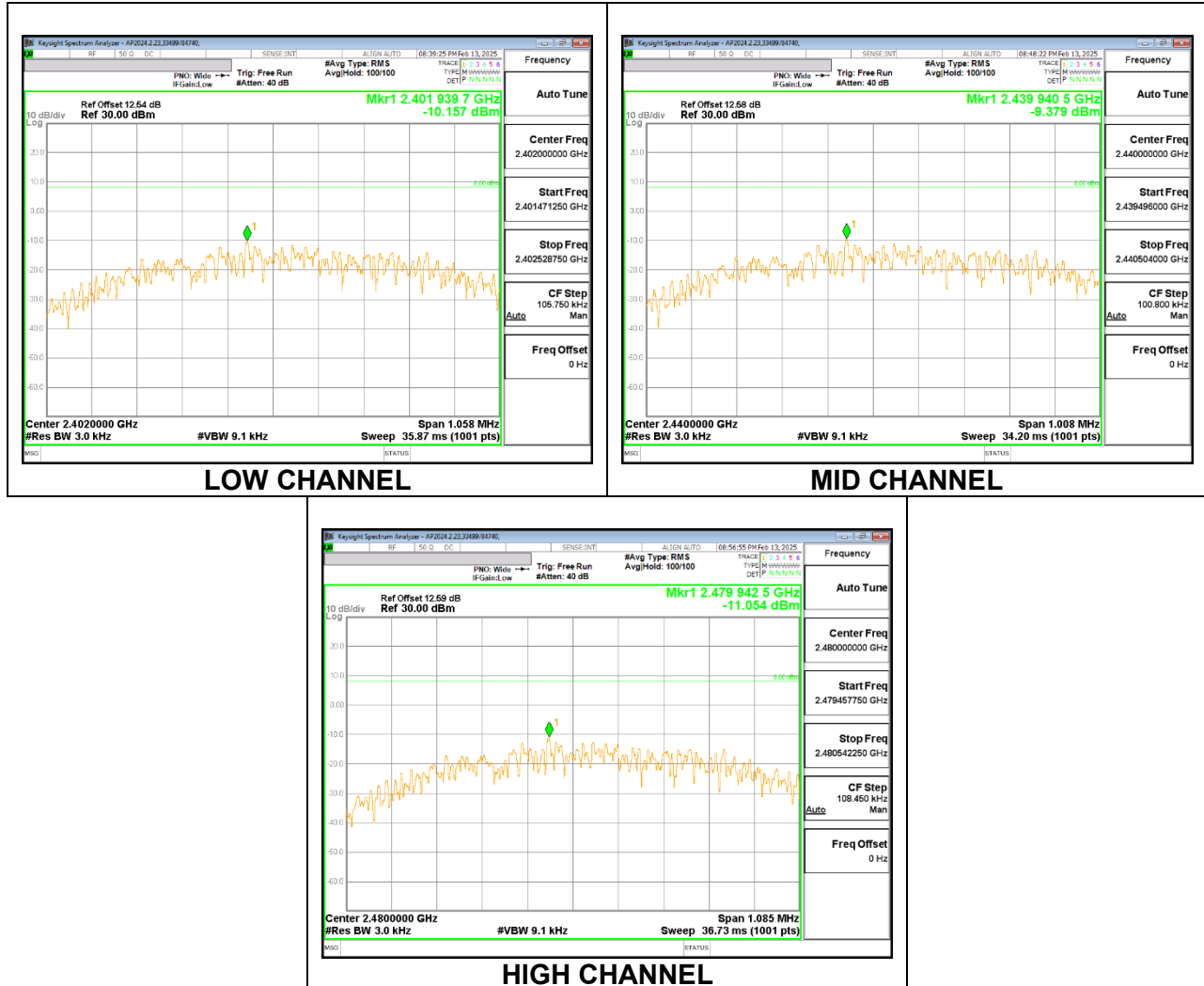
Antenna 2

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-7.043	8	-15.043
Middle	2440	-4.231	8	-12.231
High	2480	-2.500	8	-10.500



External Antenna

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-10.157	8	-18.157
Middle	2440	-9.379	8	-17.379
High	2480	-11.054	8	-19.054



9.6.2. BLE (125Kbps)

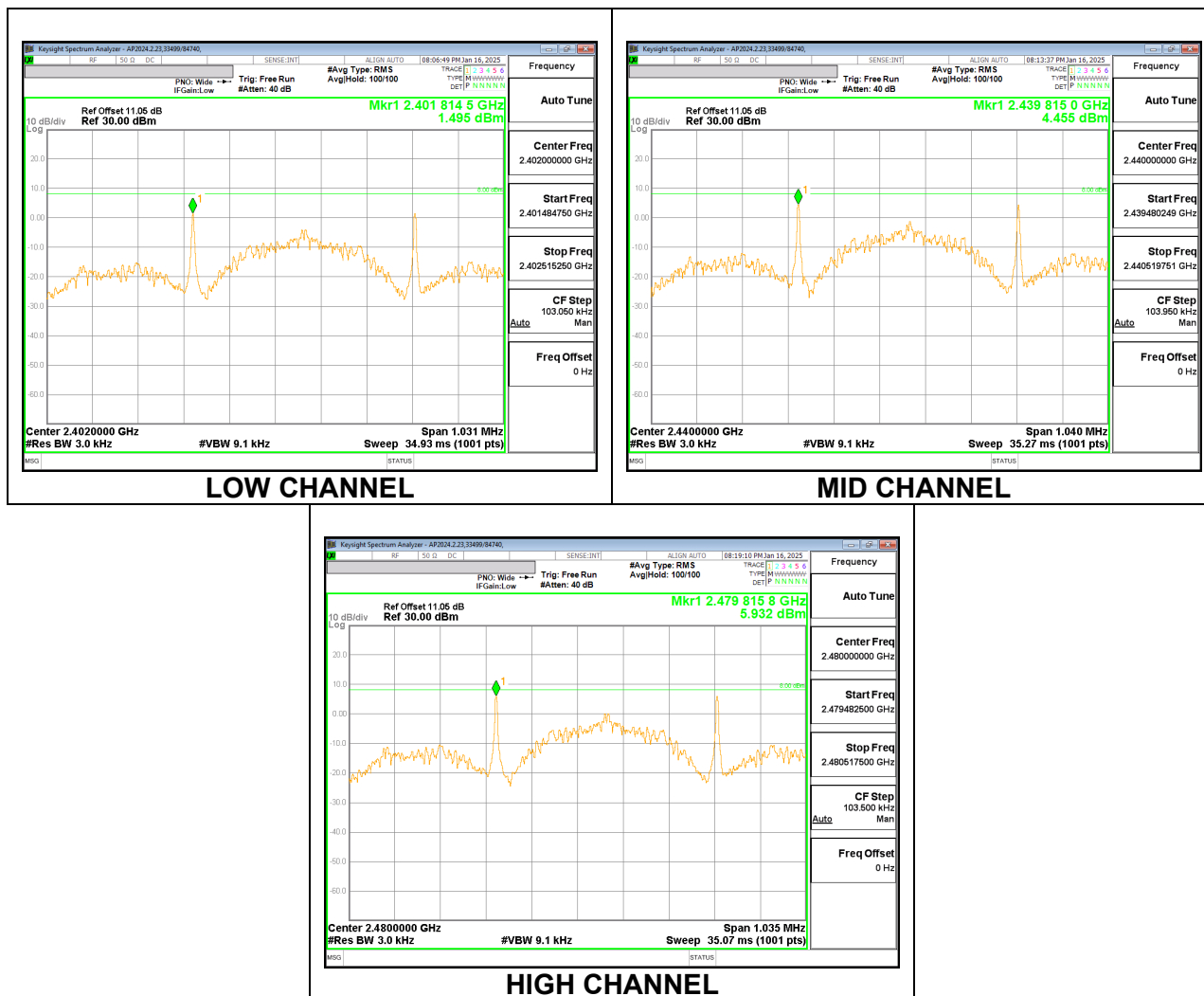
Antenna 1

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	0.993	8	-7.007
Middle	2440	3.605	8	-4.395
High	2480	5.022	8	-2.978



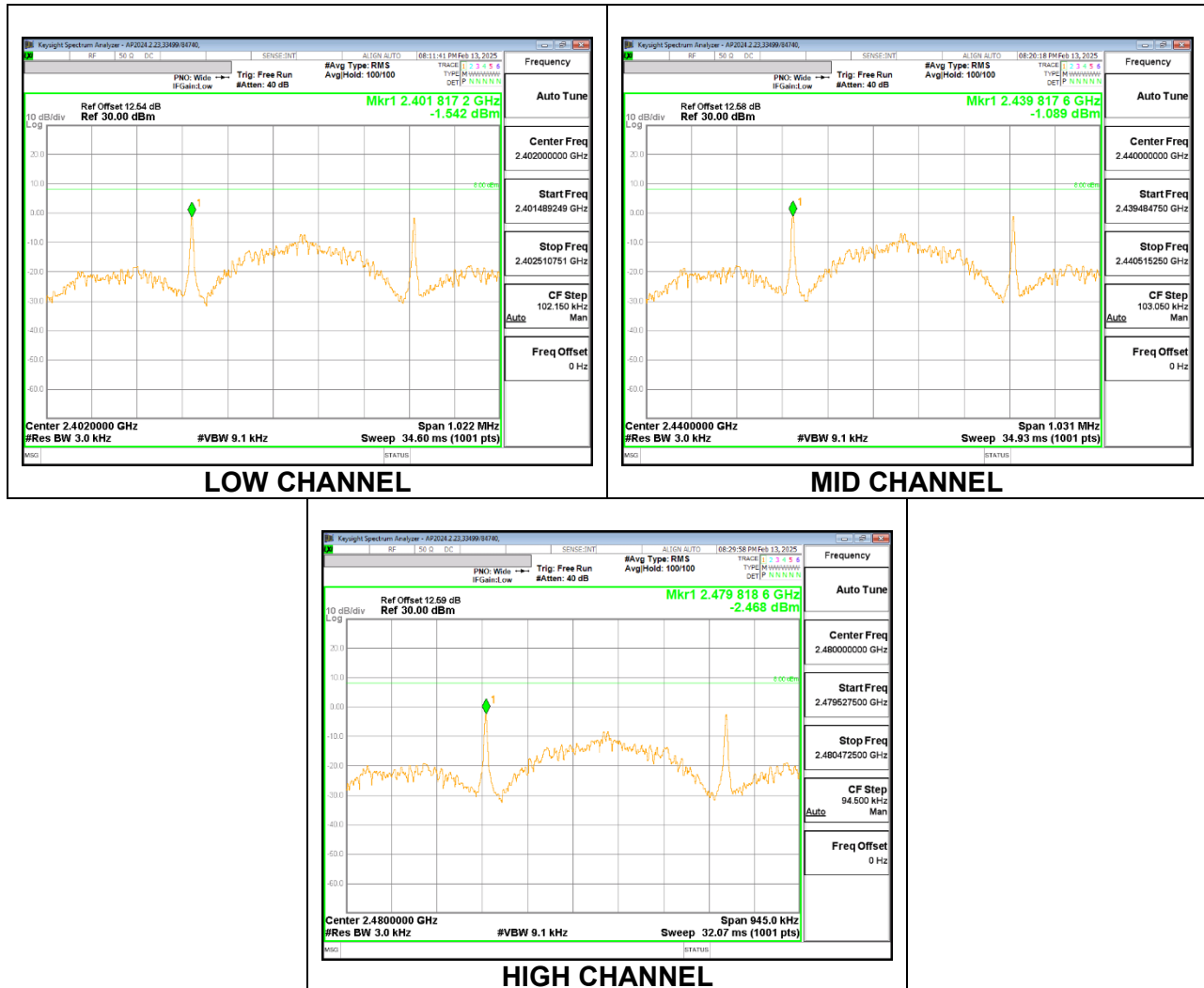
Antenna 2

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	1.495	8	-6.505
Middle	2440	4.455	8	-3.545
High	2480	5.932	8	-2.068



External Antenna

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-1.542	8	-9.542
Middle	2440	-1.089	8	-9.089
High	2480	-2.468	8	-10.468



9.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

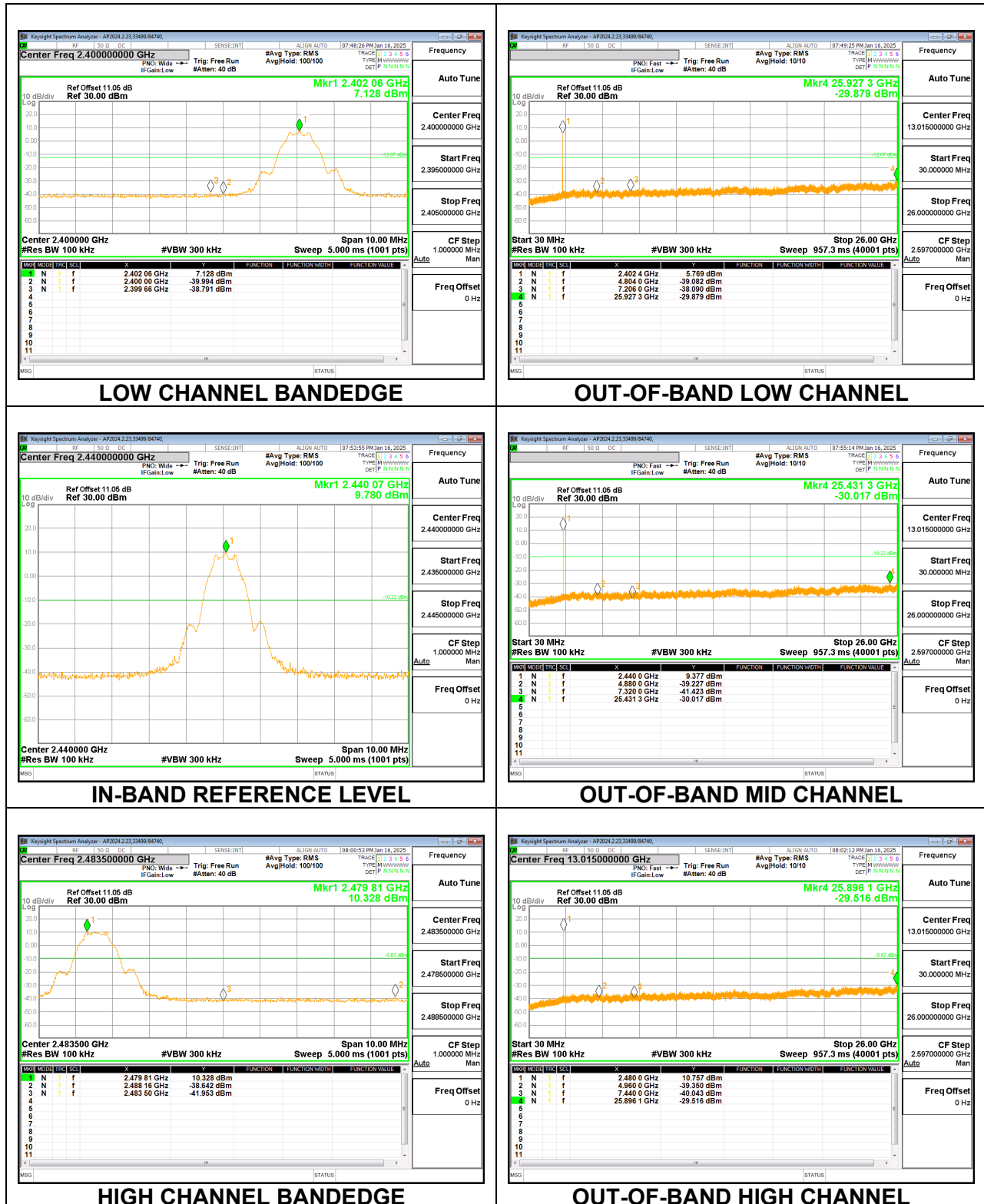
FCC §15.247 (d)
RSS-247 5.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is -20 dBc.

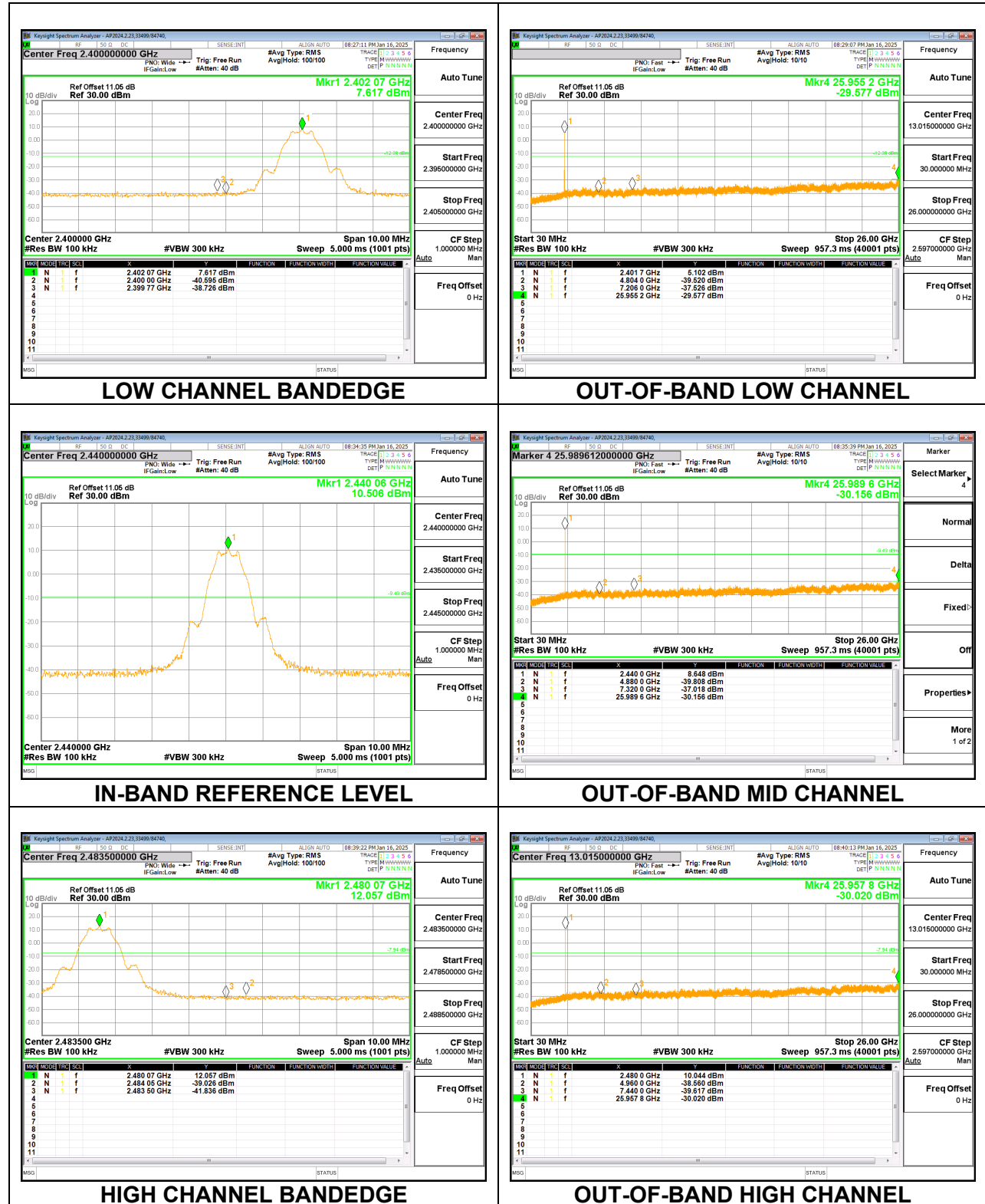
RESULTS

9.7.1. BLE (1Mbps)

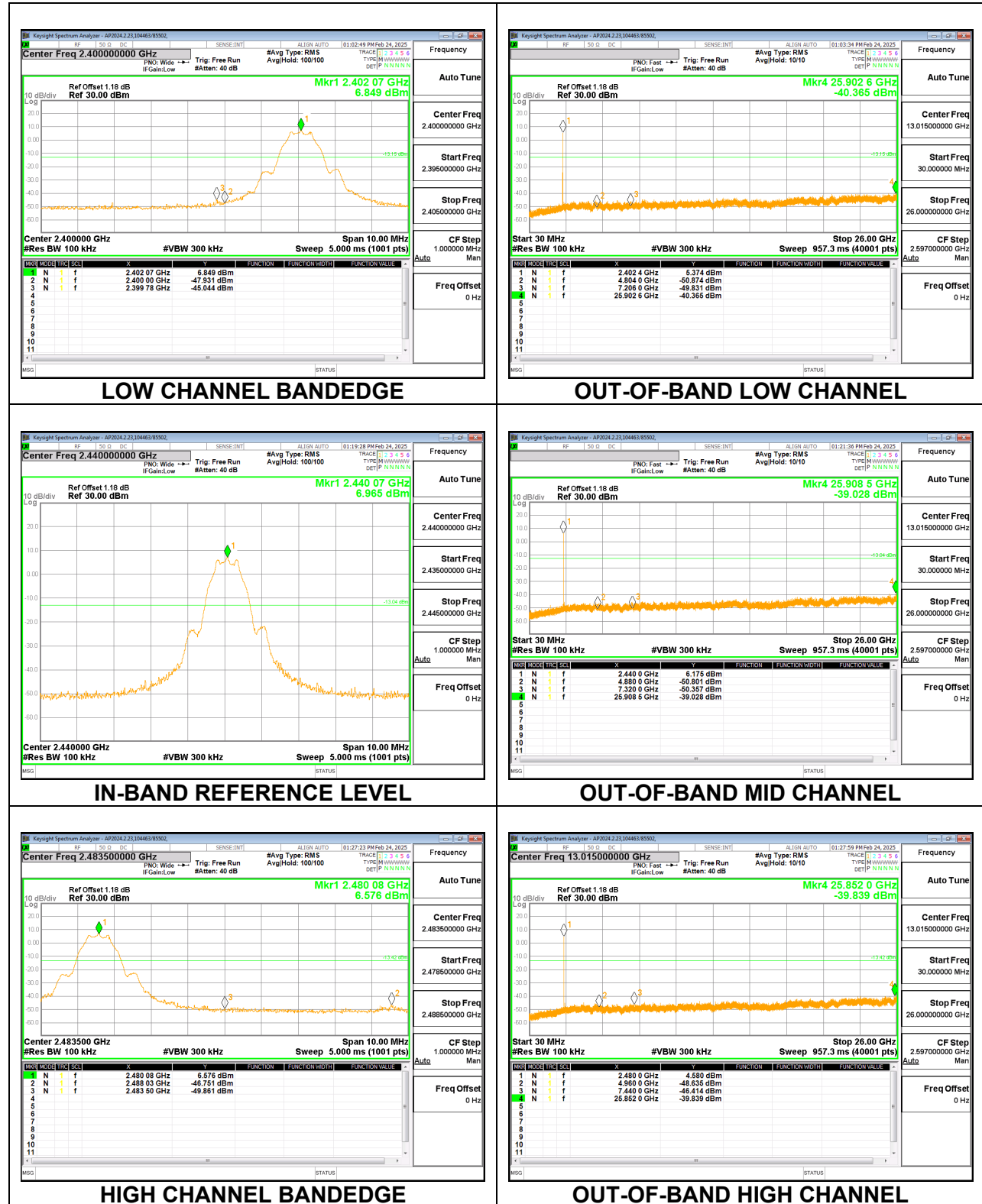
Antenna 1



Antenna 2

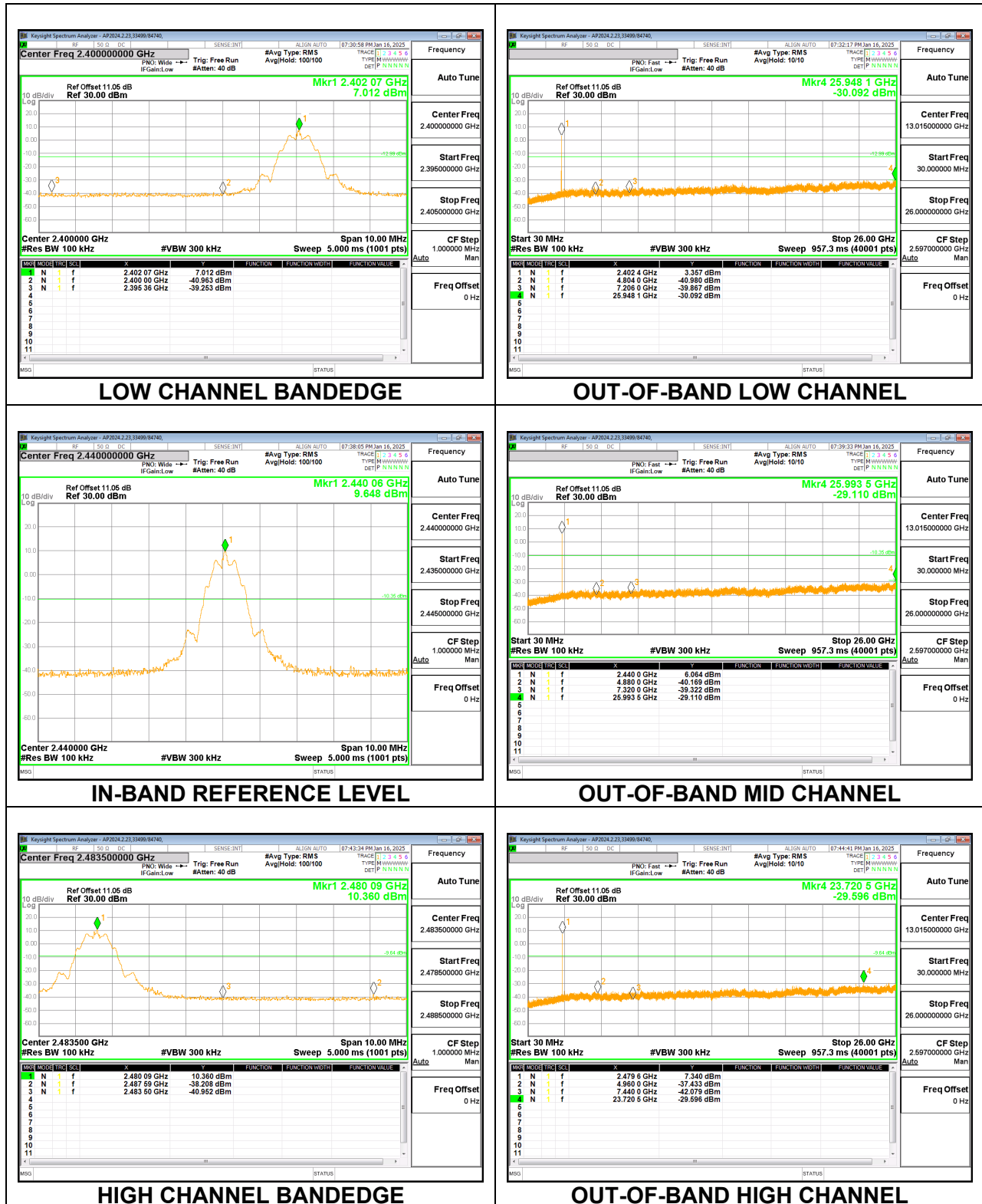


External Antenna

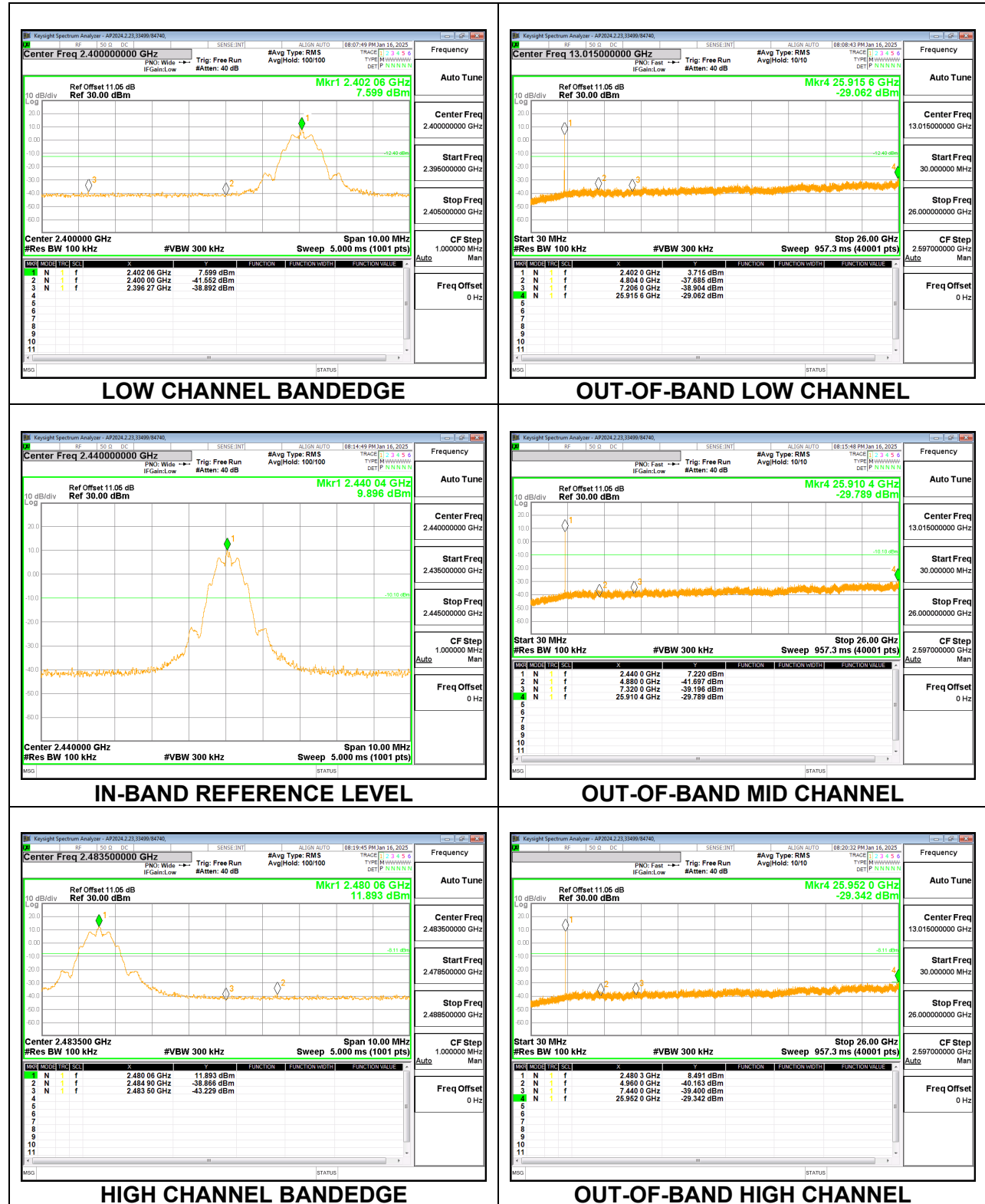


9.7.2. BLE (125Kbps)

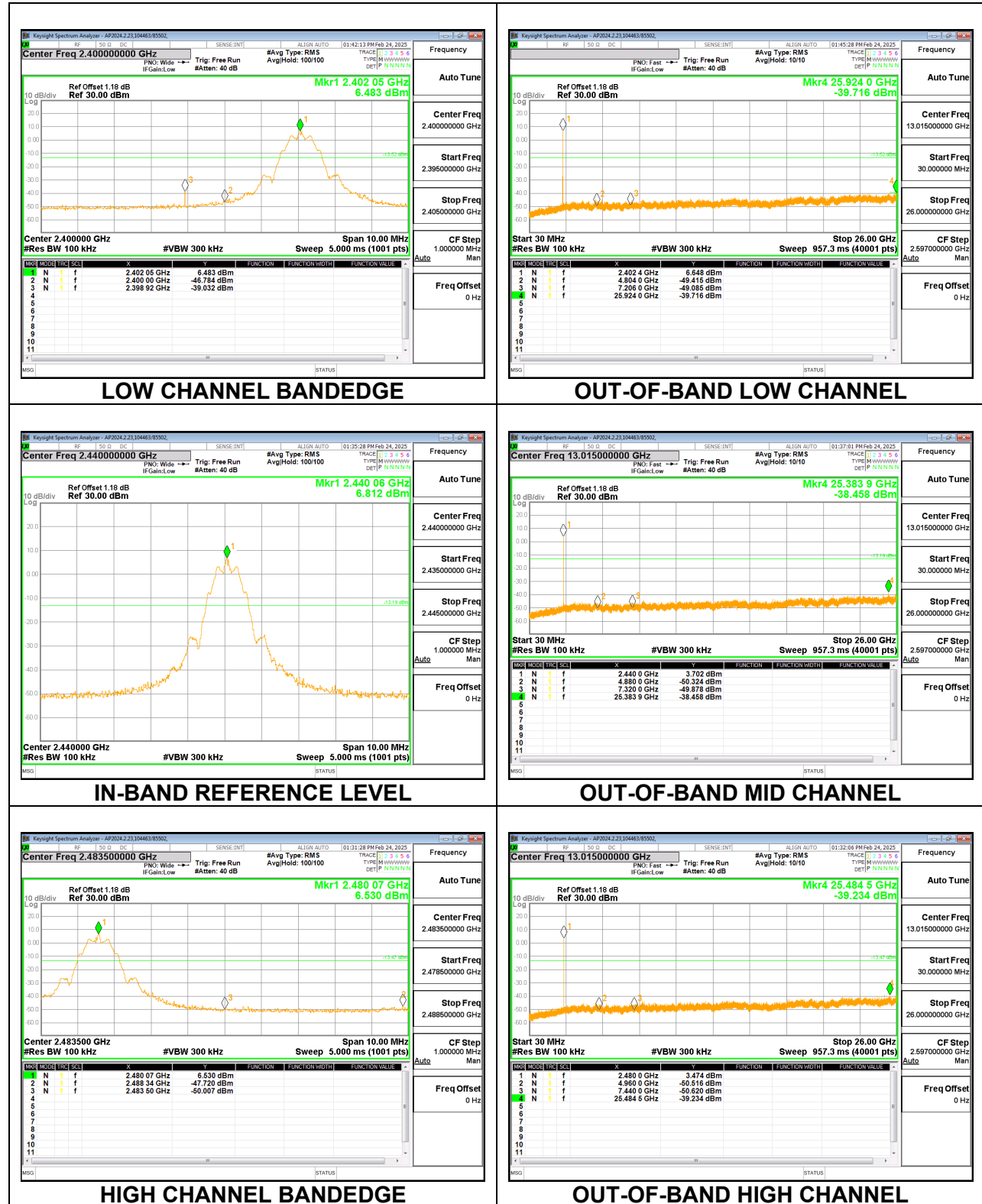
Antenna 1



Antenna 2



External Antenna



10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

RSS-GEN Clause 8.9 and 8.10

Frequency Range (kHz)	Field Strength Limit (uA/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	6.37/F(kHz) @ 300 m	-
0.490-1.705	63.7/F(kHz) @ 30 m	-
1.705 - 30	0.08 @ 30m	-
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range and 200Hz for peak and/or quasi-peak detection measurements in the 9 to 150kHz range. Peak detection is used unless otherwise noted as quasi-peak or average (9-90kHz and 110-490kHz).

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3MHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements. Where applicable, RMS average values are determined using FAQ#3a from KDB 558074.

The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to low, middle, and high channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest PSD was tested.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

3D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel).

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

KDB 414788 Open Field Site (OFS) and Chamber Correlation Justification

OFS and chamber correlation testing had been performed and chamber measured test result is the worst-case test result.

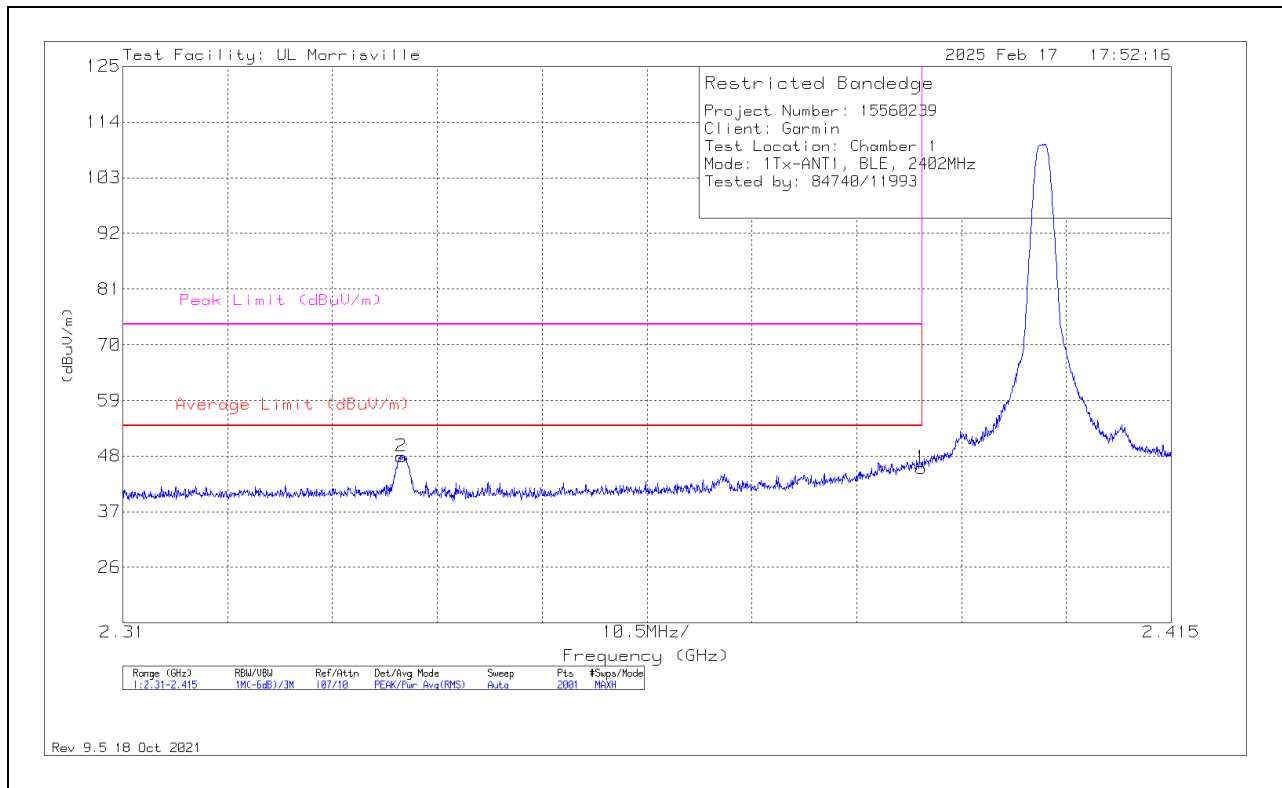
10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BLE (1Mbps)

Antenna 1

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



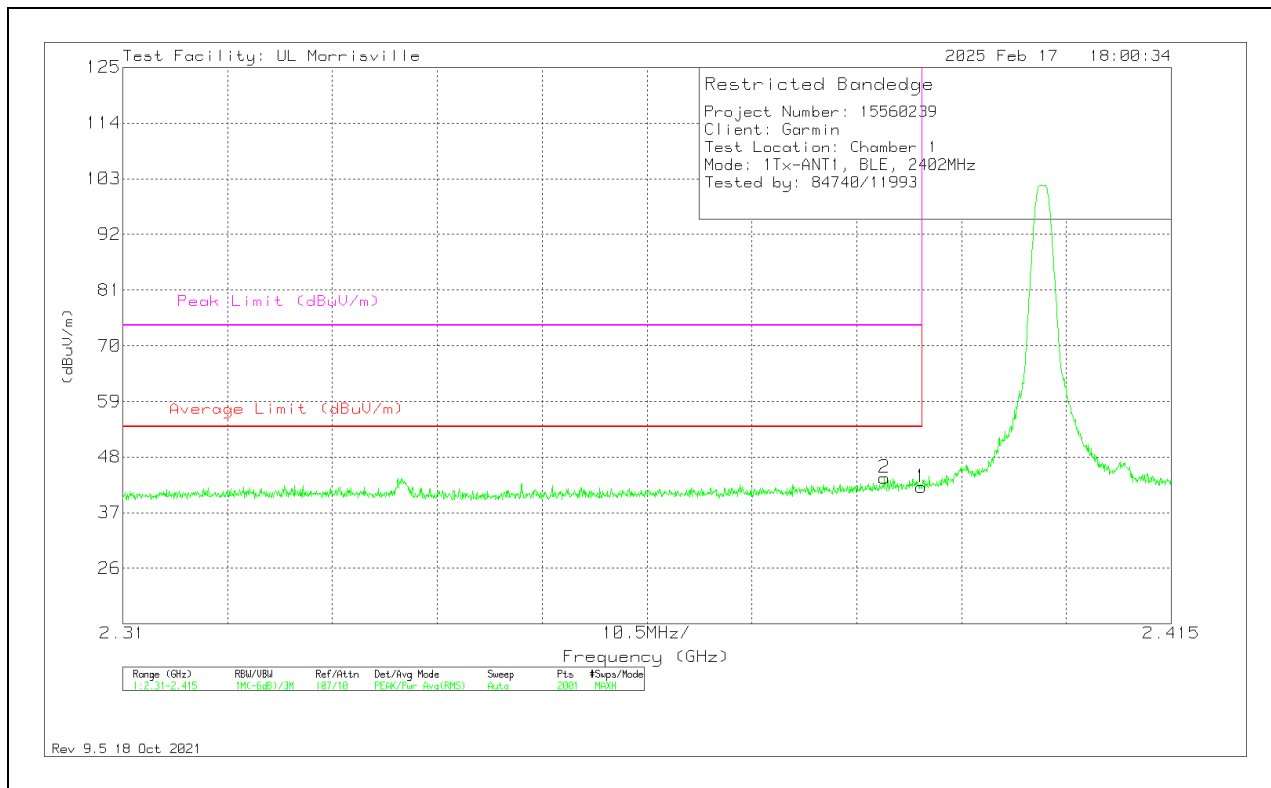
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38996	37.72	Pk	31.9	-24	0	45.62	-	-	74	-28.38	317	133	H
	* 2.38996	37.72	Pk	31.9	-24	-6.56	39.06	54	-14.94	-	-	317	133	H
2	* 2.33788	40.5	Pk	31.8	-24.4	0	47.9	-	-	74	-26.1	317	133	H
	* 2.33788	40.5	Pk	31.8	-24.4	-6.56	41.34	54	-12.66	-	-	317	133	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Note: AV measurements are calculated as PK + DCCF as declared by manufacturer.

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38996	34.17	Pk	31.9	-24	0	42.07	-	-	74	-31.93	62	384	V
	* 2.38996	34.17	Pk	31.9	-24	-6.56	35.51	54	-18.49	-	-	62	384	V
2	* 2.38628	35.87	Pk	31.9	-23.9	0	43.87	-	-	74	-30.13	62	384	V
	* 2.38628	35.87	Pk	31.9	-23.9	-6.56	37.31	54	-16.69	-	-	62	384	V

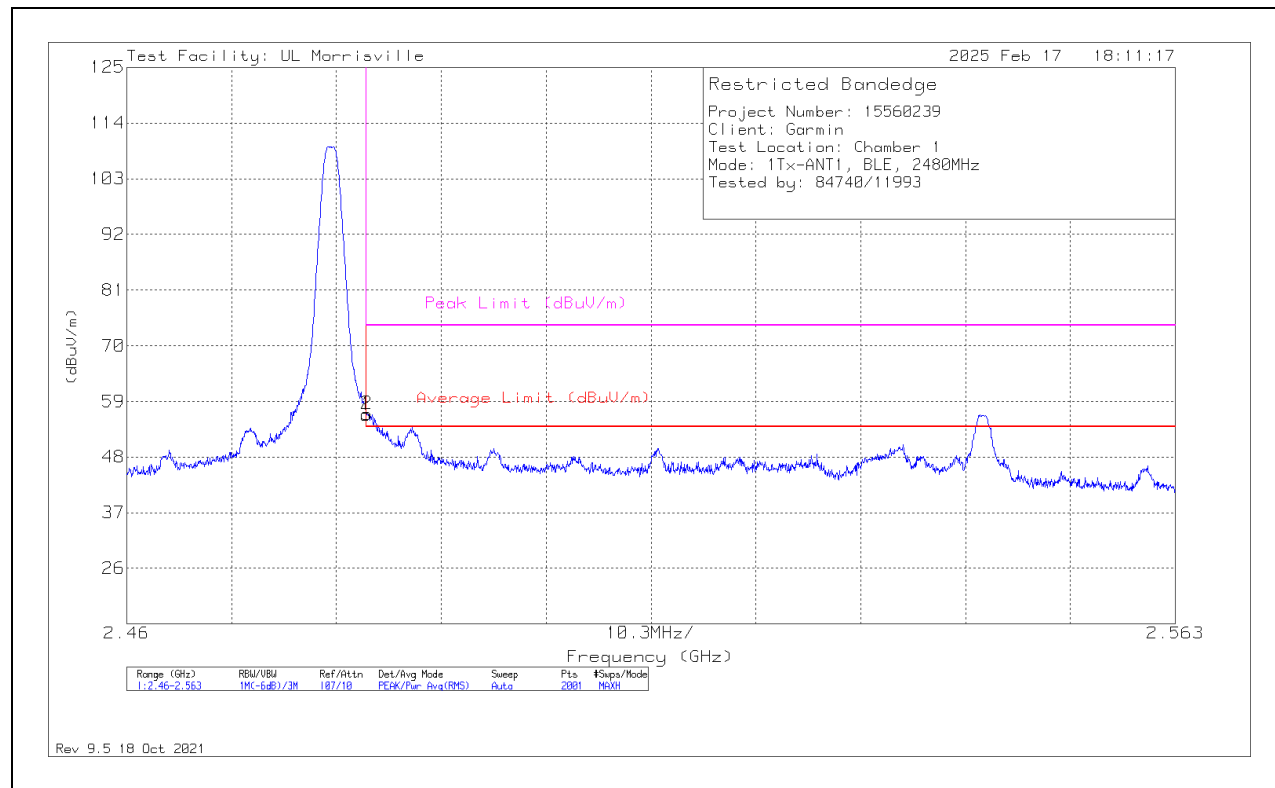
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Note: AV measurements are calculated as PK + DCCF as declared by manufacturer.

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



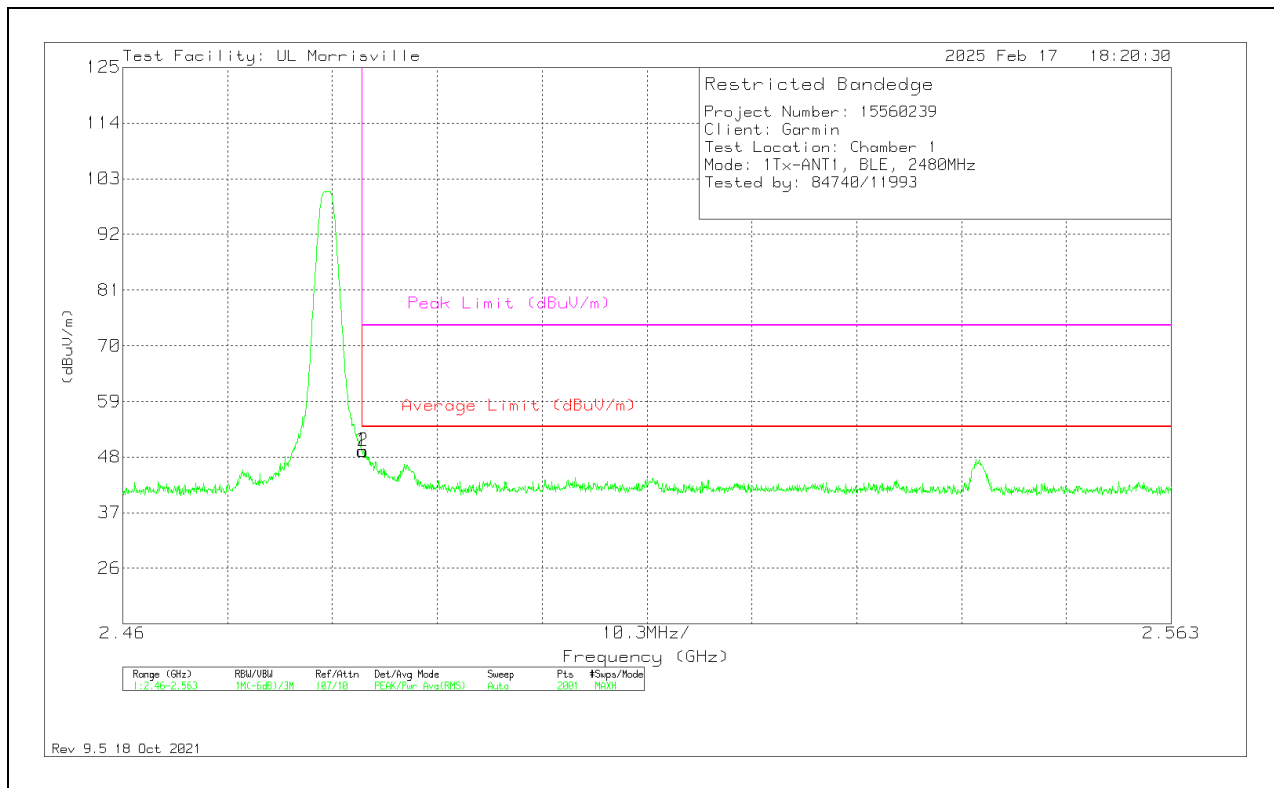
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48354	47.88	Pk	32.2	-23.7	0	56.38	-	-	74	-17.62	323	144	H
	* 2.48354	47.88	Pk	32.2	-23.7	-6.56	49.82	54	-4.18	-	-	323	144	H
2	* 2.48359	48.02	Pk	32.2	-23.7	0	56.52	-	-	74	-17.48	323	144	H
	* 2.48359	48.02	Pk	32.2	-23.7	-6.56	49.96	54	-4.04	-	-	323	144	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Note: AV measurements are calculated as PK + DCCF as declared by manufacturer.

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48354	40.72	Pk	32.2	-23.7	0	49.22	-	-	74	-24.78	356	137	V
	* 2.48354	40.72	Pk	32.2	-23.7	-6.56	42.66	54	-11.34	-	-	356	137	V
2	* 2.48364	40.68	Pk	32.2	-23.7	0	49.18	-	-	74	-24.82	356	137	V
	* 2.48364	40.68	Pk	32.2	-23.7	-6.56	42.62	54	-11.38	-	-	356	137	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Note: AV measurements are calculated as PK + DCCF as declared by manufacturer.