

TEST REPORT

Report Number: 14938215-E3V2

Applicant: SAMSUNG ELECTRONICS CO., LTD.
129, SAMSUNG-RO, YEONGTONG-GU,
SUWON-SI, GYEONGGI-DO, 16677, KOREA

Model: SM-A256E/DSN and SM-A256E/N

FCC ID: A3LSMA256E

EUT Description: GSM/WCDMA/LTE/5G Phone with BT/BLE,
DTS/UNII a/b/g/n/ac, NFC

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

Date Of Issue:
2023-10-23

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2023-10-17	Initial Issue	
V2	2023-10-23	Updated Sections 10, 11, 12	Benjamin D.

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.
129, SAMSUNG-RO, YEONGTONG-GU,
SUWON-SI, GYEONGGI-DO, 16677, KOREA

EUT DESCRIPTION: GSM/WCDMA/LTE/5G Phone with BT/BLE, DTS/UNII a/b/g/n/ac, NFC

MODEL: SM-A256E/DSN and SM-A256E/N

SERIAL NUMBER: Conducted: R3CW50B1BPM
Radiated: R3CW50B1C2V, R3CW50B1C0J

DATE TESTED: 2023-09-13 – 2023-10-03

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	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 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 Verification Services Inc. and all revisions are duly 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. This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, any agency of the Federal Government, or any agency of the U.S. government.

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2. TEST RESULTS SUMMARY

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

FCC Clause	Requirement	Result	Comment
See Comment	Duty Cycle	Reporting purposes only	ANSI C63.10 Section 11.6.
15.247 (a) (2)	6dB BW	Complies	None.
15.247 (b) (3)	Output Power	Complies	None.
See Comment	Average power	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (e)	PSD	Complies	None.
15.247 (d)	Conducted Spurious Emissions	Complies	None.
15.209, 15.205	Radiated Emissions	Complies	None.
15.207	AC Mains Conducted Emissions	Complies	None.

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 C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02, and KDB 414788 D01 Radiated Test Site v01r01.

4. FACILITIES AND ACCREDITATION

UL Verification Services Inc. is accredited by A2LA, Certificate Number 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
<input type="checkbox"/>	Building 1: 47173 Benicia Street, Fremont, CA 94538 USA	US0104	2324A	550739
<input checked="" type="checkbox"/>	Building 2: 47266 Benicia Street, Fremont, CA 94538 USA			
<input checked="" type="checkbox"/>	Building 3: 843 Auburn Court, Fremont, CA 94538 USA			
<input checked="" type="checkbox"/>	Building 4: 47658 Kato Rd, Fremont, CA 94538 USA			
<input type="checkbox"/>	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}
Radio Frequency (Spectrum Analyzer)	141.16 Hz
Occupied Bandwidth	1.22%
Power Spectral Density	2.47 dB
RF Power Measurement Direct Method Using Power Meter	1.3 dB (PK) / 0.45 dB (AV)
Unwanted Emissions, Conducted	1.94 dB
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
Time Domain Measurements	3.39%
Temperature	0.57°C
Humidity	3.39%
DC Supply Voltages	0.57%

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 EUT is a GSM/WCDMA/LTE/5G Phone with BT/BLE, DTS/UNII a/b/g/n/ac and NFC.

The model SM-A256E/DSN was used for final testing and is representative of the test results in this report.

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 (1Mbps)	5.28	3.37
2402 - 2480	BLE (2Mbps)	5.56	3.60
2402 - 2480	BLE (125kbps)	5.13	3.26
2402 - 2480	BLE (500kbps)	5.20	3.31

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

The radio utilizes a MFA antenna, with a maximum gain:

Frequency Band (GHz)	Antenna Gain (dBi)
2402 - 2480	-7.29

6.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was A256E.001.

6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle and high channels.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

Worst-case data rates as provided by the client were:

- BLE (1Mbps): 1Mbps
- BLE (2Mbps): 2Mbps
- BLE (125kbps): 125kbps
- BLE (500kbps): 500kbps

6.6. DESCRIPTION OF TEST SETUP

SUPPORT TEST EQUIPMENT				
Description	Manufacturer	Model	Serial Number	FCC ID/ DoC
AC Adapter	Samsung	EP-TA800	R37TC7A00EBDKA	N/A

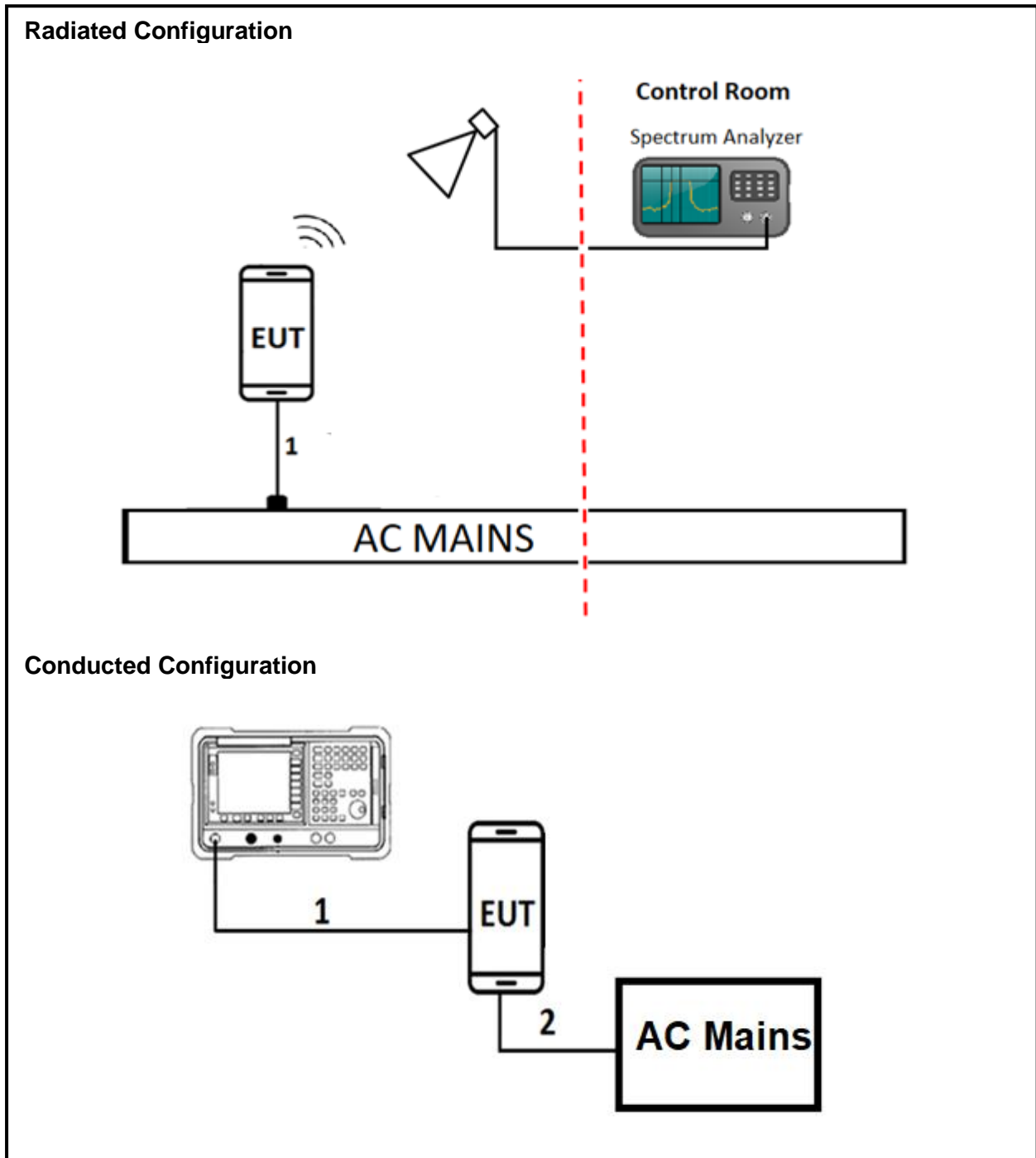
I/O CABLES (RF CONDUCTED TEST)						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	1	RF	Shielded	0.2	To PXA
2	USB-C	1	USB-C	Un-Shielded	1	EUT to AC Mains

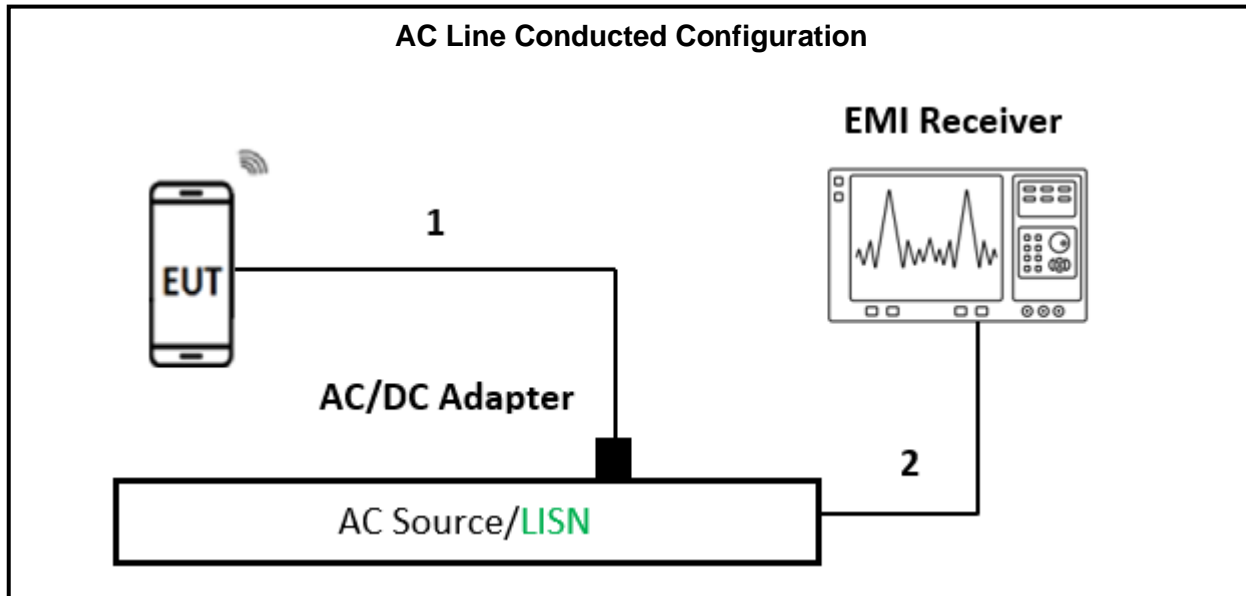
I/O CABLES (RF RADIATED and AC LINE CONDUCTED TEST)						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB-C	1	USB-C	Shielded	1	N/A

TEST SETUP

The EUT is a stand-alone device configured and tested in a worst-case setup. Worst case is using worst case orientation with AC charger attached to the EUT. Test software exercised the radio card.

SETUP DIAGRAM





7. MEASUREMENT METHOD

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

6 dB BW: ANSI C63.10 Subclause -11.8.1 RBW \geq DTS BW

Output Power: ANSI C63.10 Subclause -11.9.1.3 Method PKPM1 Peak-reading power meter

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

Power Spectral Density: ANSI C63.10 Subclause -11.10.2 Method PKPSD (peak PSD)

Radiated emissions non-restricted frequency bands: ANSI C63.10 Subclause -11.11

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

Conducted emissions in restricted frequency bands: ANSI C63.10 Subclause -11.12.2

Band-edge: ANSI C63.10 Subclause -11.13.3.2 Integration method -Peak detection
Band-edge: ANSI C63.10 Subclause -11.13.3.3 Integration method -Trace averaging with continuous transmission at full power

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

Radiated Spurious Emissions Below 30MHz: ANSI C63.10-2013 Section 6.4

8. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST					
Description	Manufacturer	Model	ID Num	Cal Due	Last Cal
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight Technologies Inc	N9030A	85214	02/29/2024	02/06/2023
10dB Fixed Attenuator, 2 Watts Up to 26.5 GHz	Pasternack Enterprises	PE7024-10	236358	Verified/Characterized before use	
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	191428	02/29/2024	02/15/2023
Antenna, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	206807	02/28/2024	02/14/2023
RF Filter Box, 1-18GHz, 12 Port.	UL-FR1	Frankenstein	230878	02/29/2024	02/06/2023
Antenna, BroadBand Hybrid 30 MHz - 3 GHz	SUNOL SCIENCES CORP.	JB3	230635	01/31/2024	01/23/2023
Amplifier 9 KHz - 1 GHz	SONOMA INSTRUMENT	310N	230310	02/02/2024	02/02/2023
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	235266	03/31/2024	03/30/2023
Antenna, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	206808	03/31/2024	03/07/2023
RF Filter Box, 1-18GHz	UL-FR1	NA	PRE0183207	03/31/2024	03/13/2023
89831EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179372	02/29/2024	02/17/2023
Antenna, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	230299	01/12/2024	01/12/2023
RF Filter Box, 1-18GHz, 12 Port.	UL-FR1	Frankenstein	231874	08/30/2024	08/23/2023
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	235670	04/30/2024	04/06/2023
Antenna, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	226672	01/09/2024	01/09/2023
RF Filter Box, 1-18GHz, 17 Ports	UL-FR1	RATS 2	225079	04/30/2024	04/21/2023
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	201499	02/29/2024	02/27/2023
Antenna, Horn 18 to 26.5GHz	A.R.A.	MWH-1826/B	172363	01/31/2024	01/27/2023
Amplifier Assembly, 18-26.5GHz, 60dB Gain	AMPLICAL	AMP18G26.5-60	171580	05/31/2025	05/19/2023
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO-METRICS	EM-6871	170013	07/31/2024	07/28/2022
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO-METRICS	EM-6872	170015	07/31/2024	07/28/2022
Power Meter, P-series single channel	Keysight Technologies Inc	N1912A	90630	01/31/2024	01/24/2023
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	90391	01/31/2024	01/25/2023

AC Line Conducted					
Description	Manufacturer	Model	ID Num	Cal Due	Last Cal
EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESR	93091	02/29/2024	02/29/2023
LISN for Conducted Emissions CISPR-16	FISCHER CUSTOM COMMUNICATIONS	FCC-LISN-50/250-25-2-01-480V	175764	01/31/2024	01/31/2023
Transient Limiter	TE	TBFL1	207996	08/31/2024	08/10/2023

Radiated Software			
Description	Manufacturer	Model	Version
Conducted Software	UL	UL EMC	2022.8.16
AC Line Conducted Software	UL	UL EMC	Version 9.5, 03 March 2023
Radiated Software	UL	UL EMC	Version 9.5, 01 May 2023

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 (1Mbps)	0.386	0.626	0.617	61.66	2.10	2.591
BLE (2Mbps)	0.200	0.626	0.319	31.95	4.96	5.000
BLE (125kbps)	3.105	3.750	0.828	82.80	0.82	0.322
BLE (500kbps)	1.060	1.875	0.565	56.53	2.48	0.943

DUTY CYCLE PLOTS



9.2. 6 dB BANDWIDTH

LIMITS

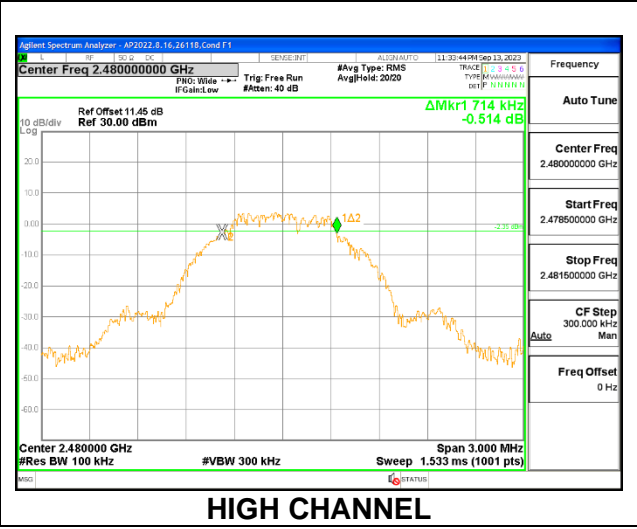
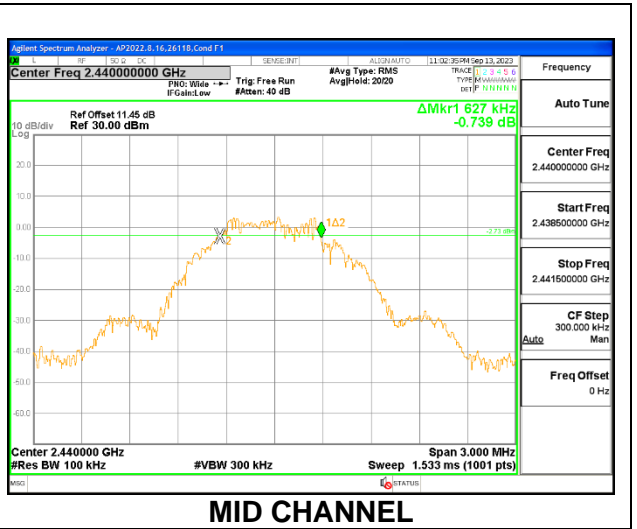
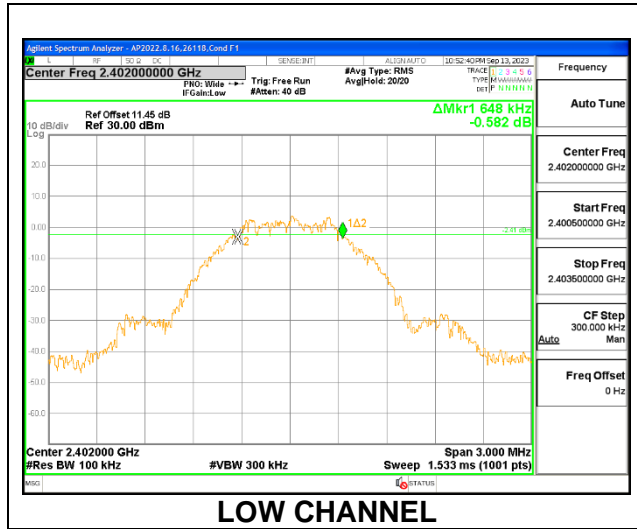
FCC §15.247 (a) (2)

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

RESULTS

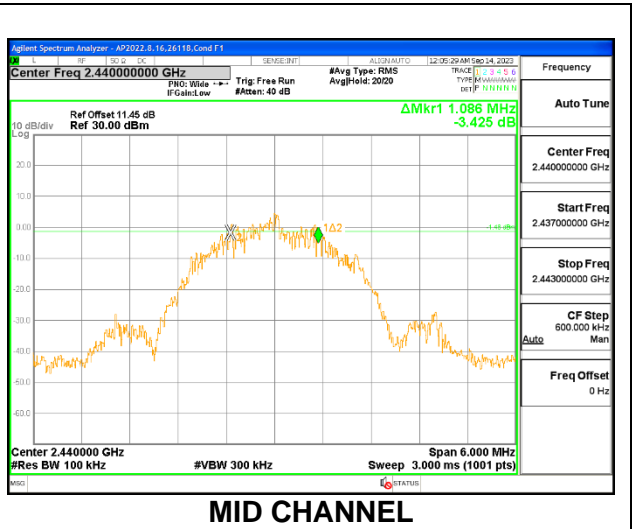
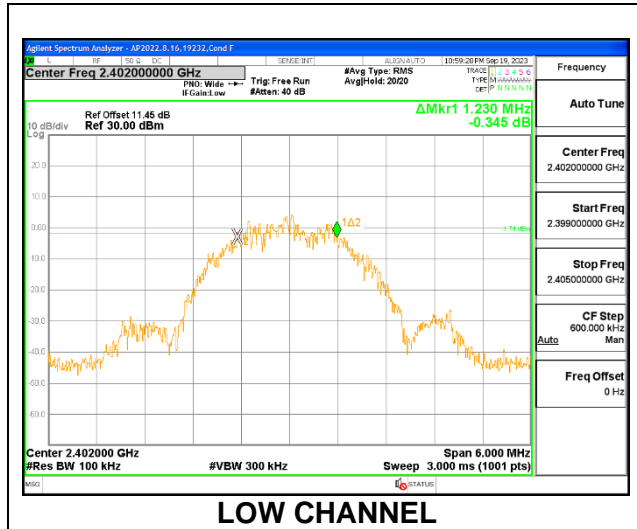
9.2.1. BLE (1Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.648	0.5
Middle	2440	0.627	0.5
High	2480	0.714	0.5



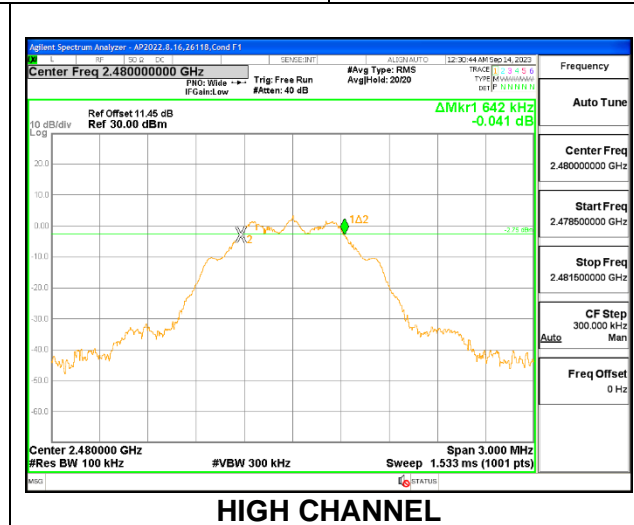
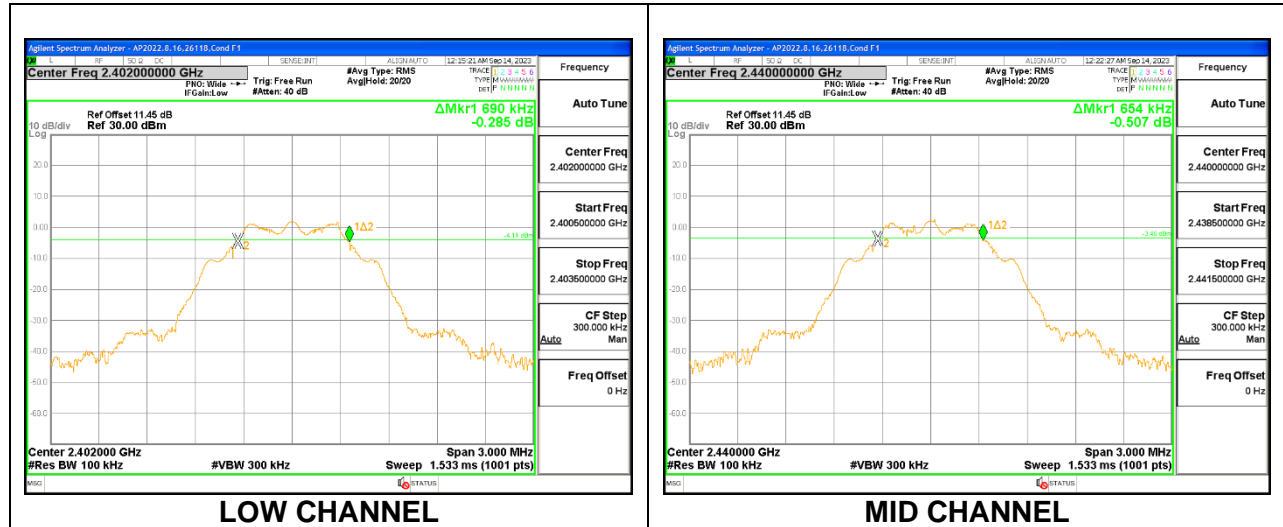
9.2.2. BLE (2Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	1.230	0.5
Middle	2440	1.086	0.5
High	2480	1.380	0.5



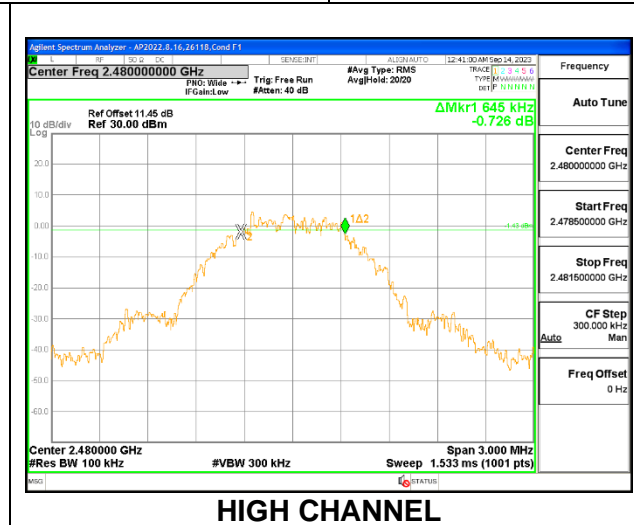
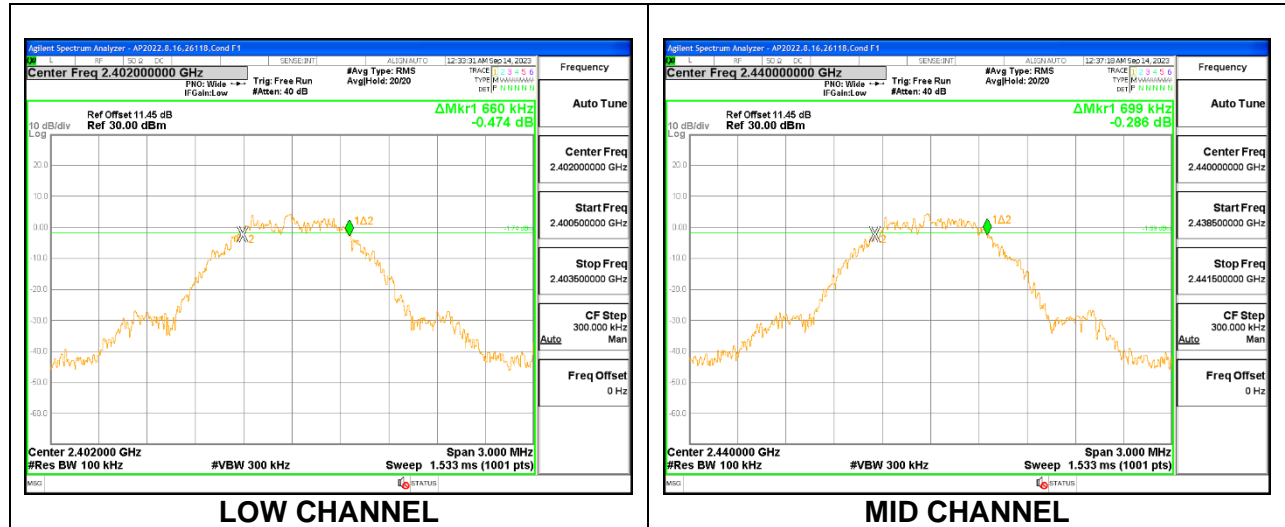
9.2.3. BLE (125Kbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.690	0.5
Middle	2440	0.654	0.5
High	2480	0.642	0.5



9.2.4. BLE (500Kbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.660	0.5
Middle	2440	0.699	0.5
High	2480	0.645	0.5



9.3. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

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 power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband power sensor. Peak output power was read directly from power meter.

RESULTS

9.3.1. BLE (1Mbps)

Tested By:	26118
Date:	2023-09-13

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.06	30	-24.94
Middle	2440	5.28	30	-24.72
High	2480	5.23	30	-24.77

9.3.2. BLE (2Mbps)

Tested By:	26118
Date:	2023-09-19

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.56	30	-24.44
Middle	2440	5.30	30	-24.70
High	2480	5.41	30	-24.59

9.3.3. BLE (125Kbps)

Tested By:	26118
Date:	2023-09-13

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.04	30	-24.96
Middle	2440	5.13	30	-24.87
High	2480	5.12	30	-24.88

9.3.4. BLE (500Kbps)

Tested By:	26118
Date:	2023-09-13

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.05	30	-24.95
Middle	2440	5.20	30	-24.80
High	2480	5.15	30	-24.85

9.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband power sensor. Gated average output power was read directly from power meter.

RESULTS

9.4.1. BLE (1Mbps)

Tested By:	26118
Date:	2023-09-13

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.83
Middle	2440	5.09
High	2480	5.04

9.4.2. BLE (2Mbps)

Tested By:	26118
Date:	2023-09-19

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	5.41
Middle	2440	5.16
High	2480	5.22

9.4.3. BLE (125Kbps)

Tested By:	26118
Date:	2023-09-13

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.81
Middle	2440	4.94
High	2480	4.93

9.4.4. BLE (500Kbps)

Tested By:	26118
Date:	2023-09-13

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.76
Middle	2440	4.82
High	2480	4.95

9.5. POWER SPECTRAL DENSITY

LIMITS

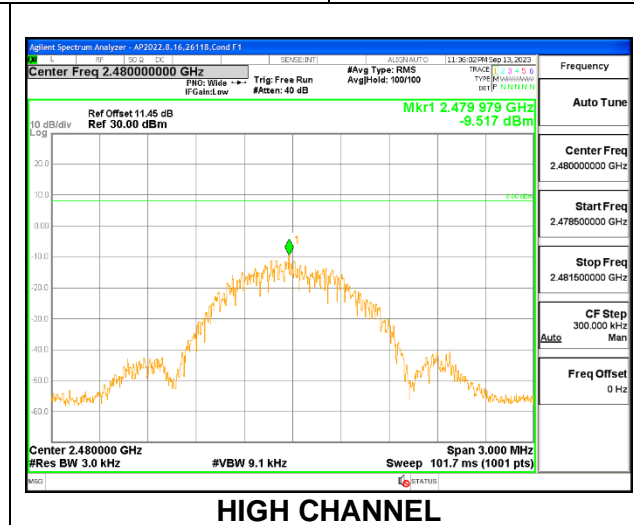
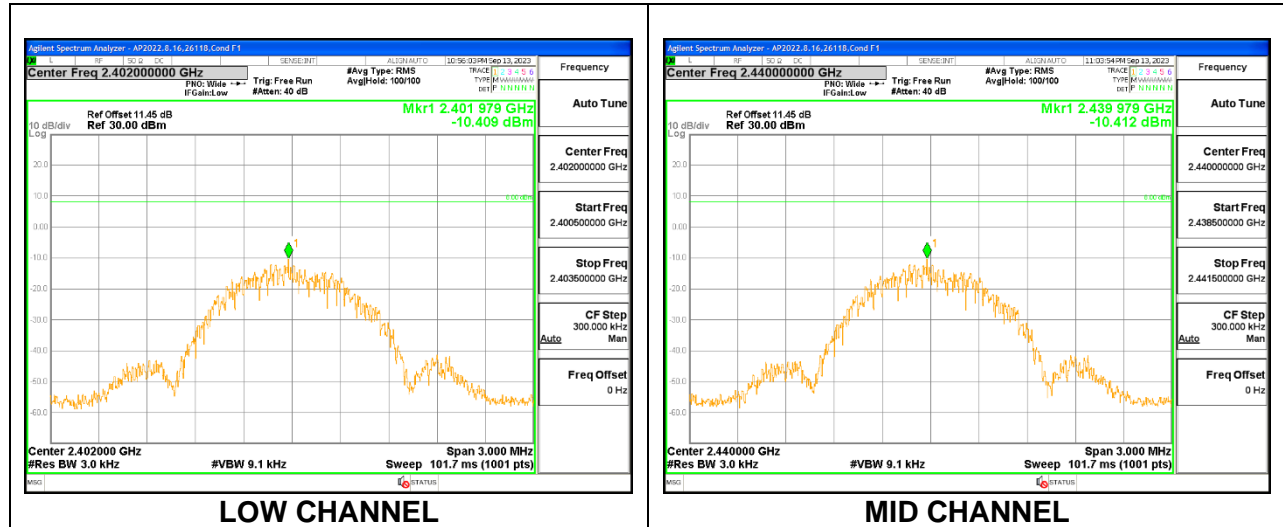
FCC §15.247 (e)

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

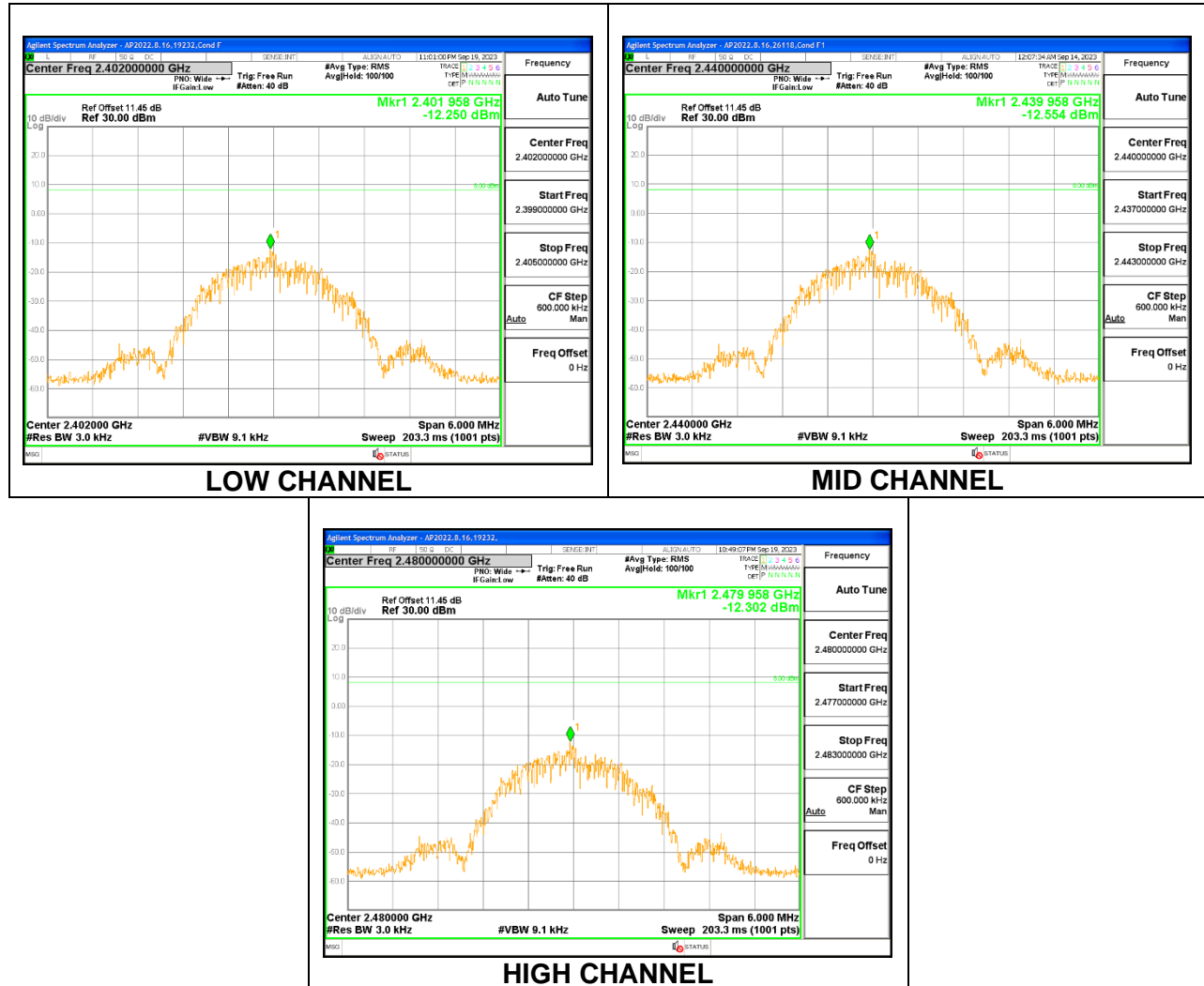
9.5.1. BLE (1Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-10.409	8	-18.41
Middle	2440	-10.412	8	-18.41
High	2480	-9.517	8	-17.52



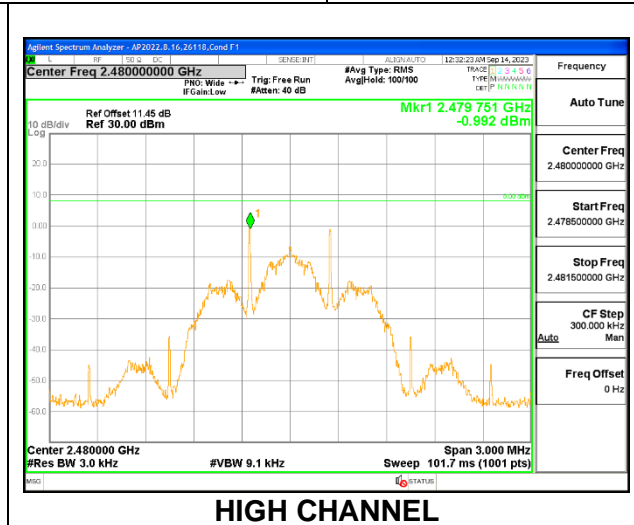
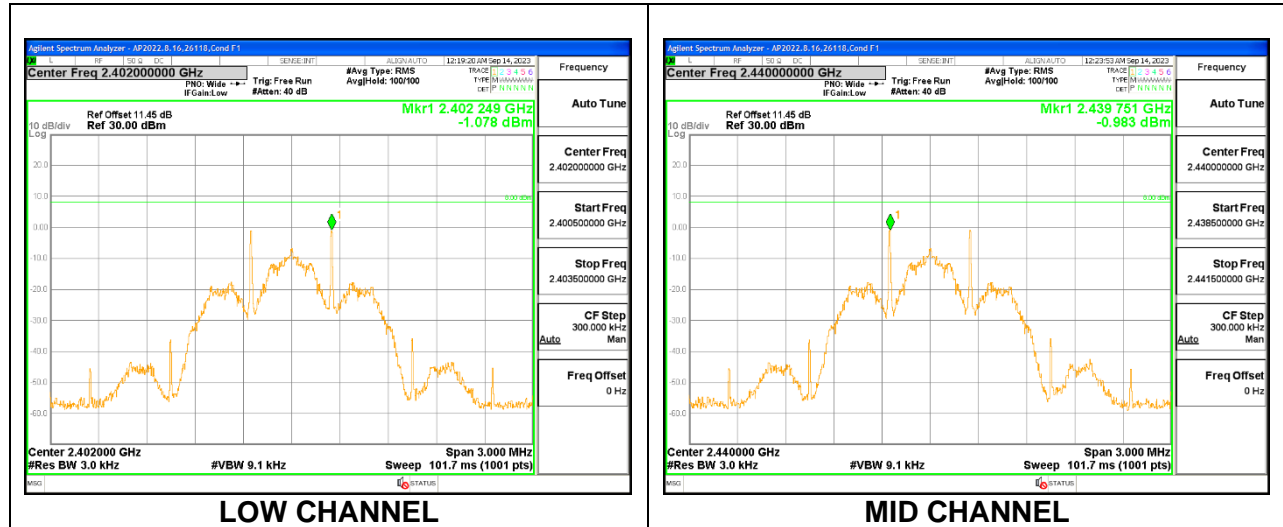
9.5.2. BLE (2Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-12.250	8	-20.25
Middle	2440	-12.554	8	-20.55
High	2480	-12.302	8	-20.30



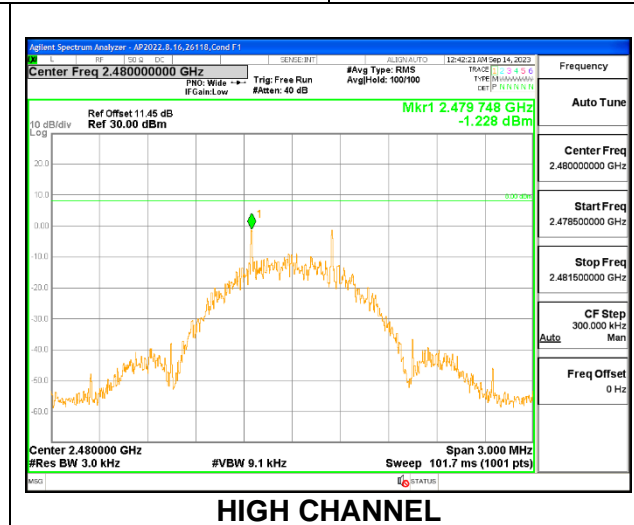
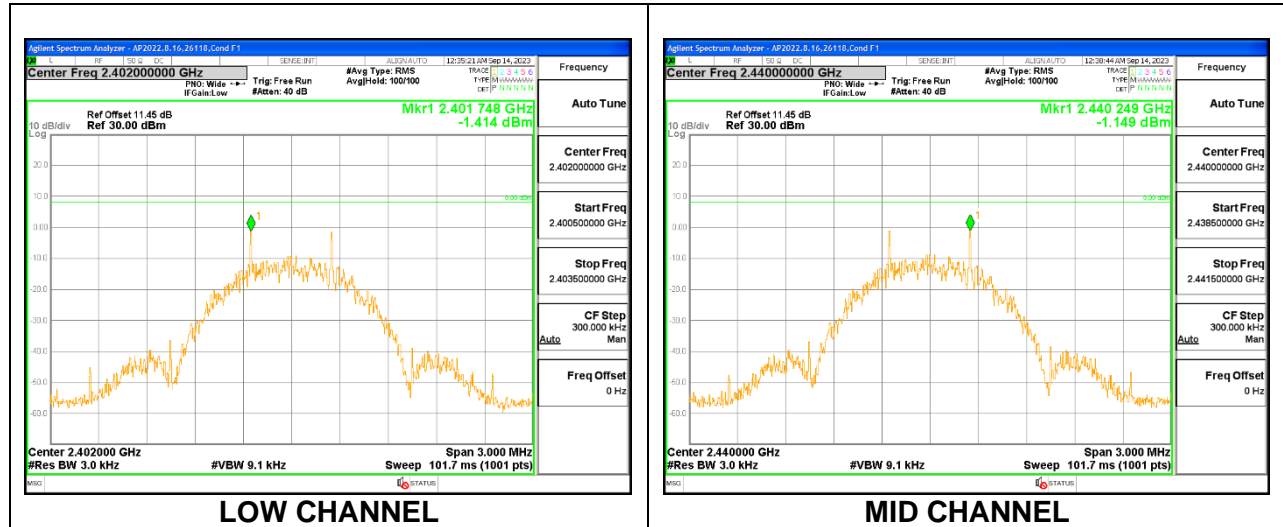
9.5.3. BLE (125Kbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-1.078	8	-9.08
Middle	2440	-0.983	8	-8.98
High	2480	-0.992	8	-8.99



9.5.4. BLE (500Kbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-1.414	8	-9.41
Middle	2440	-1.149	8	-9.15
High	2480	-1.228	8	-9.23



9.6. CONDUCTED SPURIOUS EMISSIONS

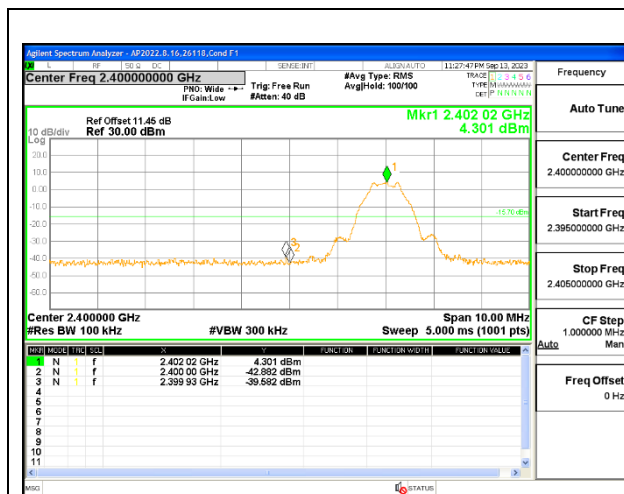
LIMITS

FCC §15.247 (d)

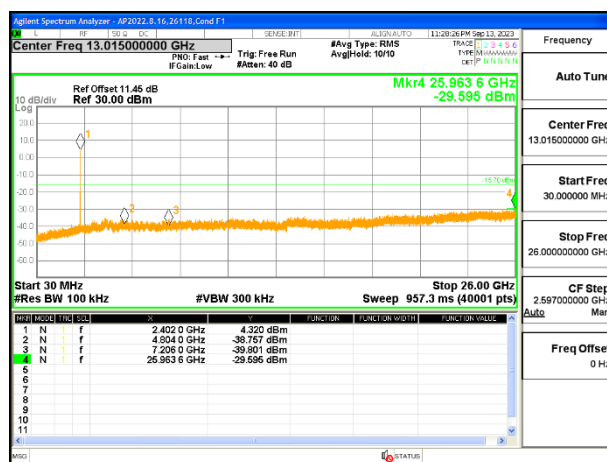
Output power was measured based on the use of a peak measurement; therefore, the required attenuation is 20 dB.

RESULTS

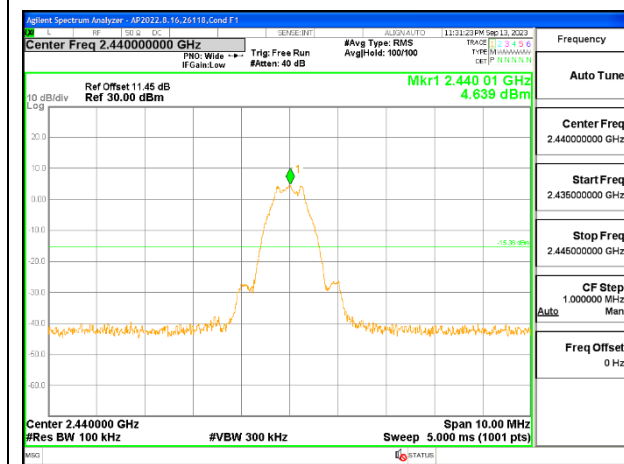
9.6.1. BLE (1Mbps)



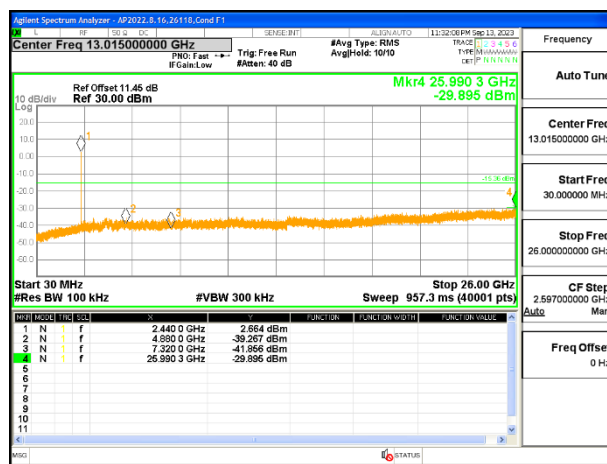
LOW CHANNEL BANDEDGE



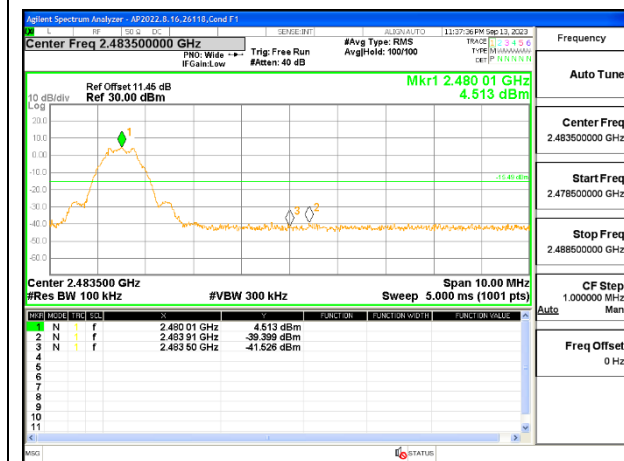
OUT-OF-BAND LOW CHANNEL



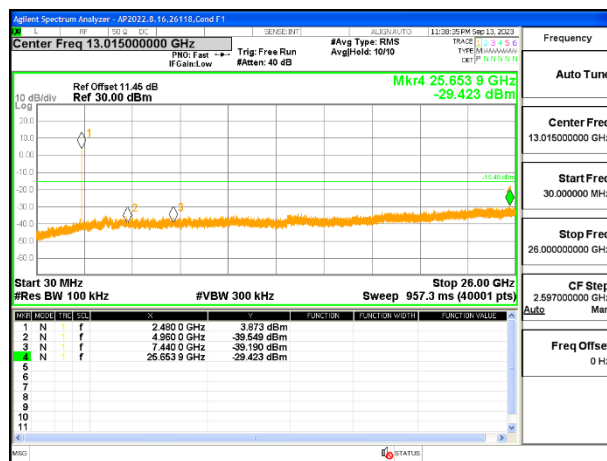
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

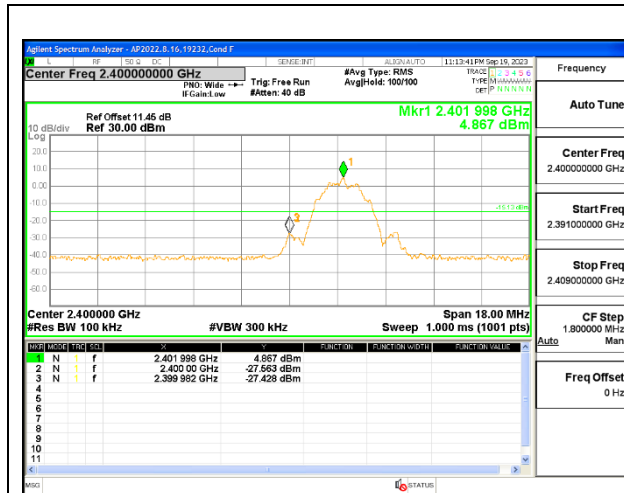


HIGH CHANNEL BANDEDGE

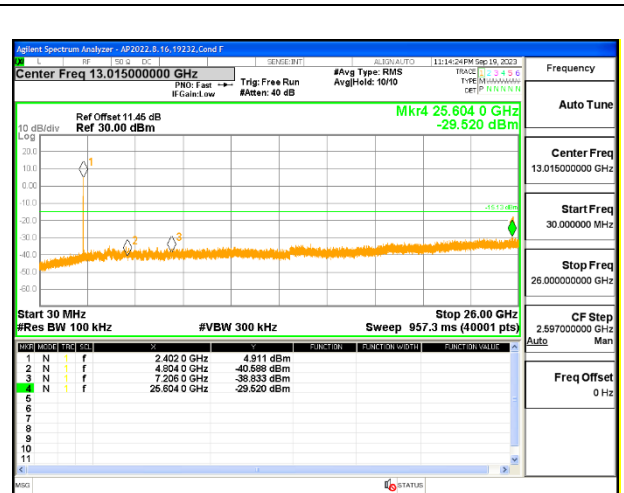


OUT-OF-BAND HIGH CHANNEL

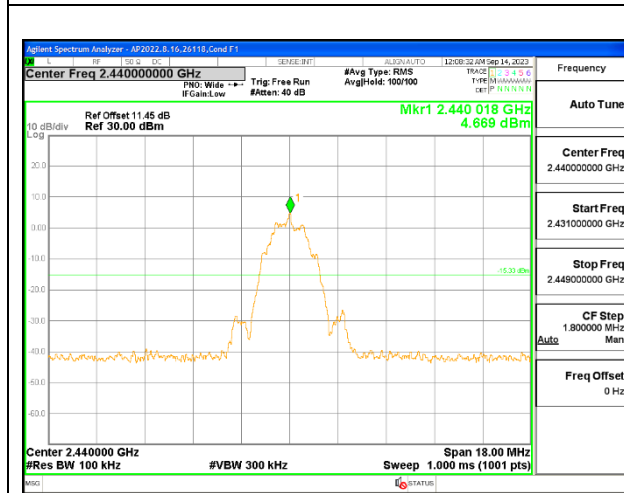
9.6.2. BLE (2Mbps)



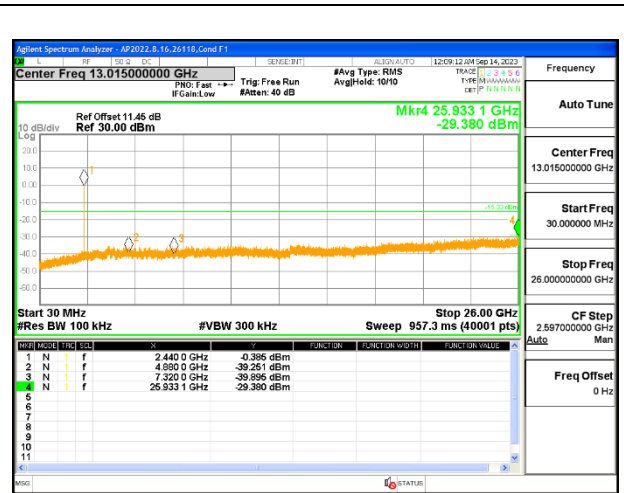
LOW CHANNEL BANDEDGE



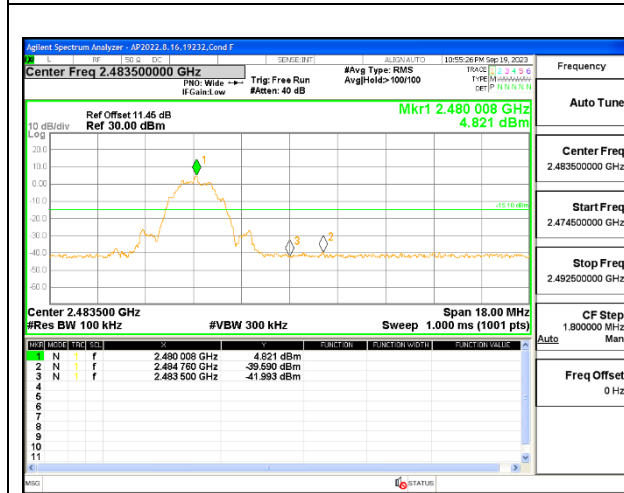
OUT-OF-BAND LOW CHANNEL



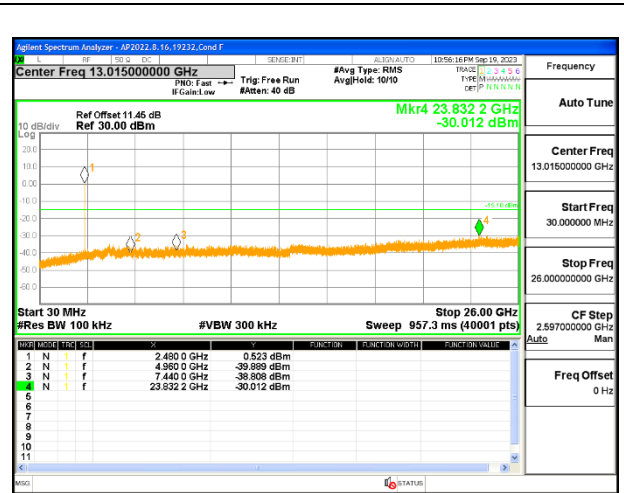
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

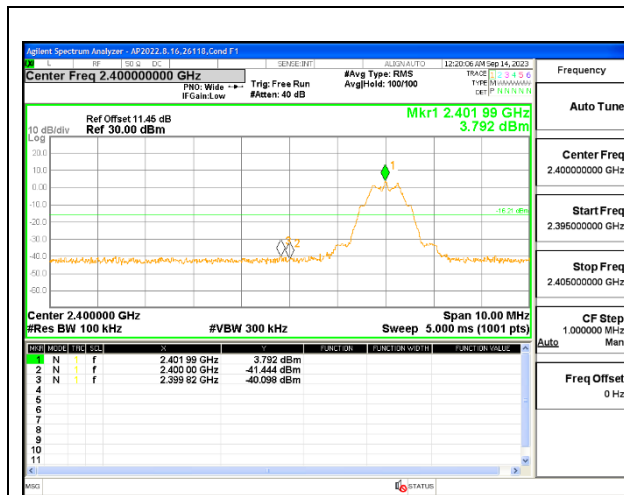


HIGH CHANNEL BANDEDGE

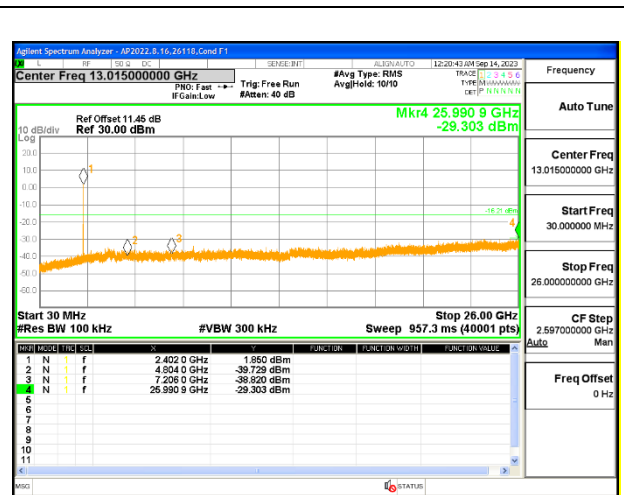


OUT-OF-BAND HIGH CHANNEL

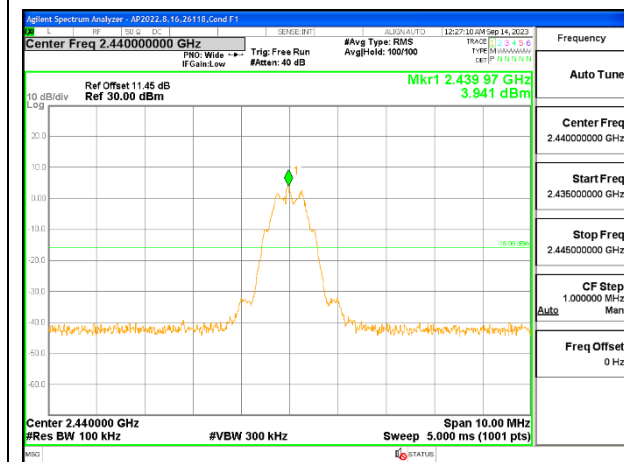
9.6.3. BLE (125Kbps)



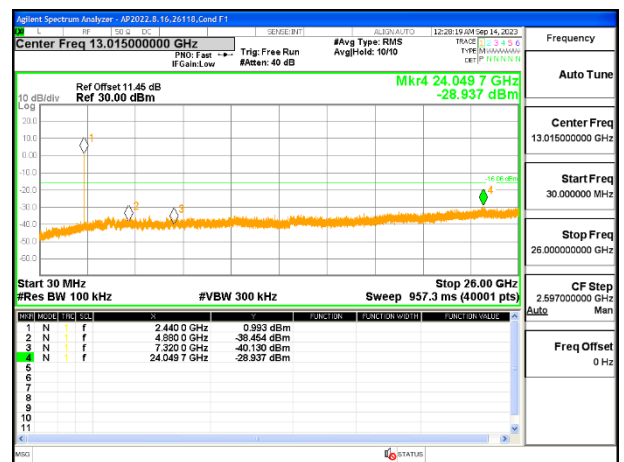
LOW CHANNEL BANDEDGE



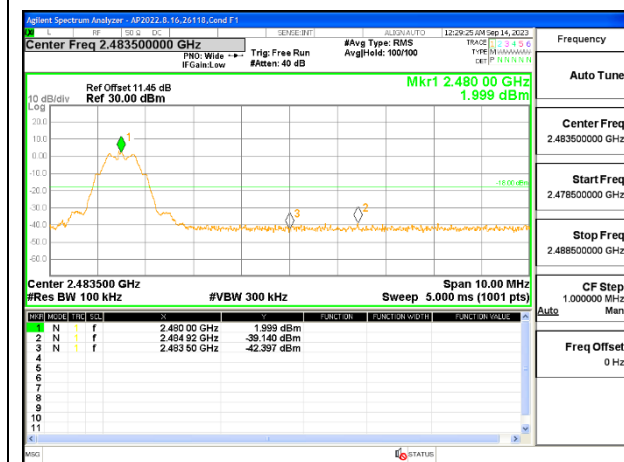
OUT-OF-BAND LOW CHANNEL



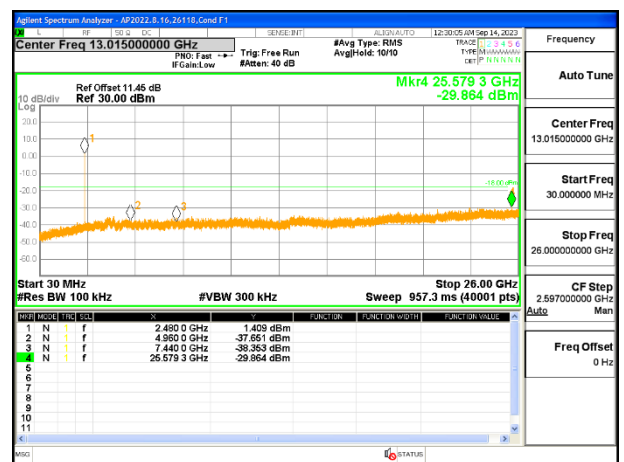
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

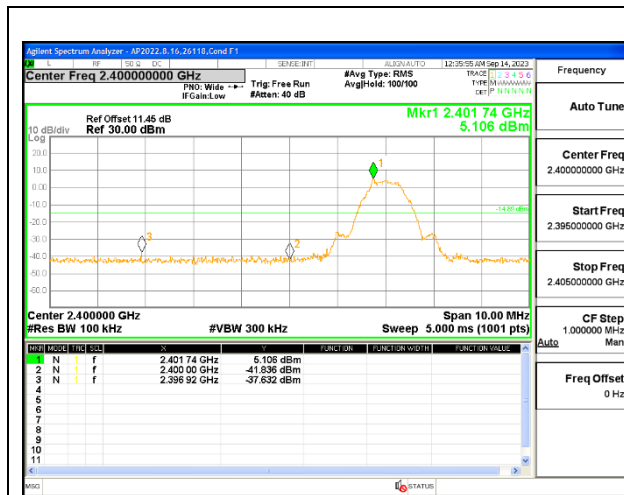


HIGH CHANNEL BANDEDGE

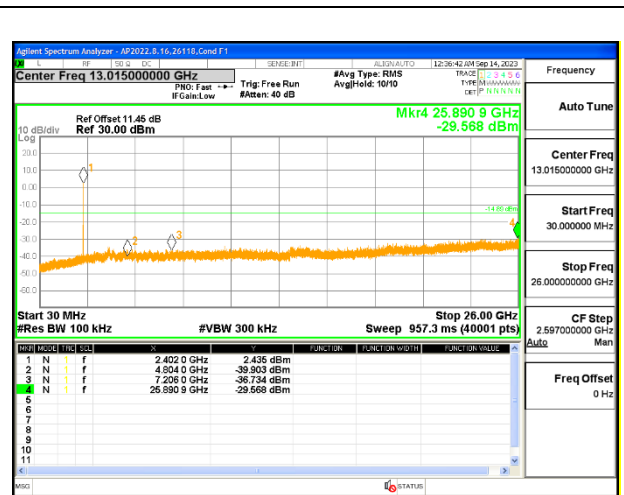


OUT-OF-BAND HIGH CHANNEL

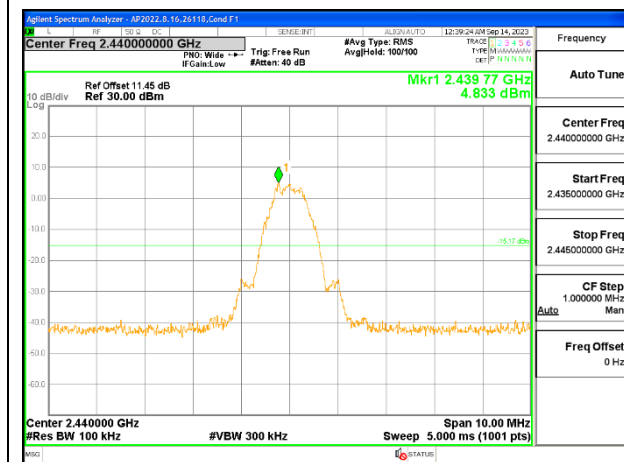
9.6.4. BLE (500Kbps)



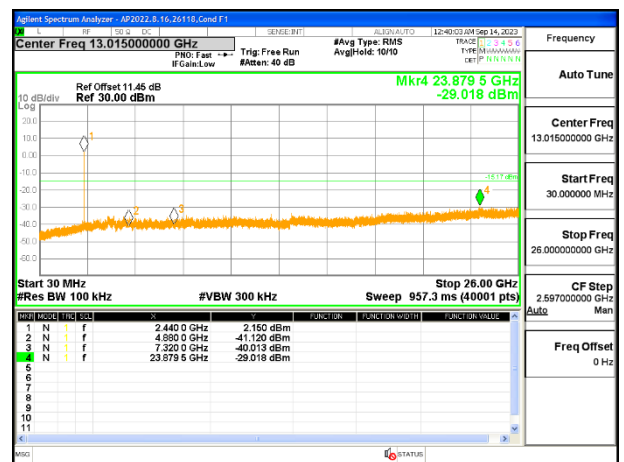
LOW CHANNEL BANDEDGE



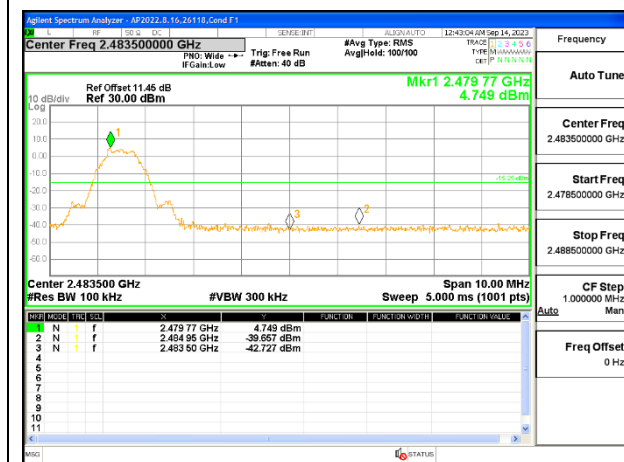
OUT-OF-BAND LOW CHANNEL



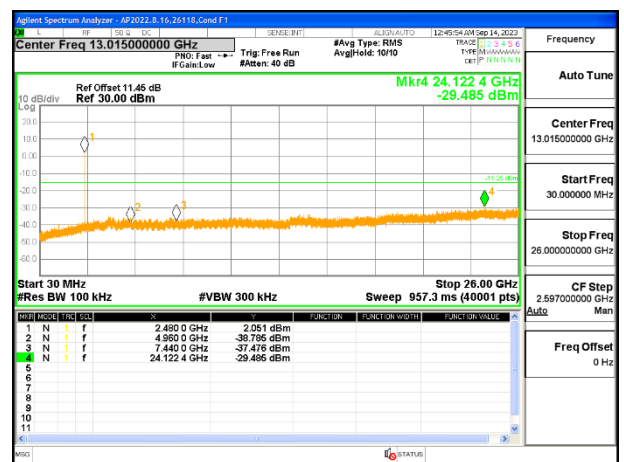
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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

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 30 KHz 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 and as applicable for average measurements.

The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power 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.

2D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only.

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

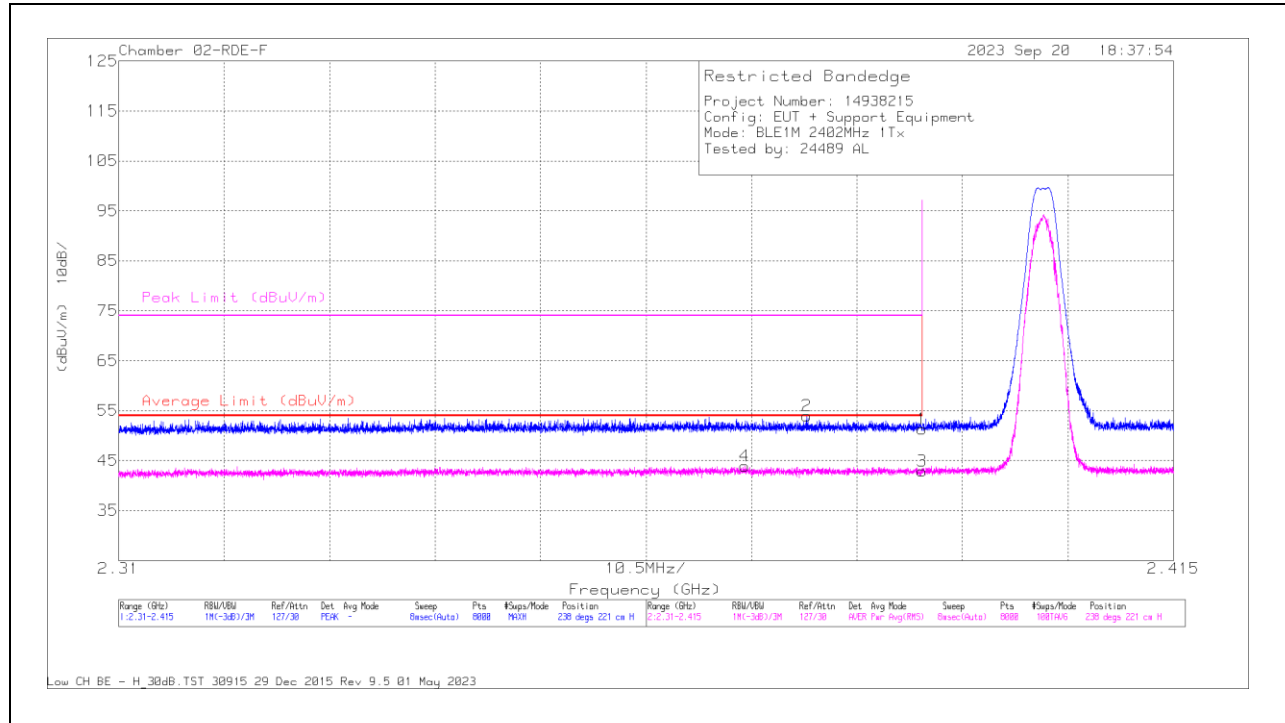
OFS and chamber correlation testing had been performed and chamber measured test result is the worst-case test result.

10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BLE (1Mbps)

BANDEDGE (LOW CHANNEL)

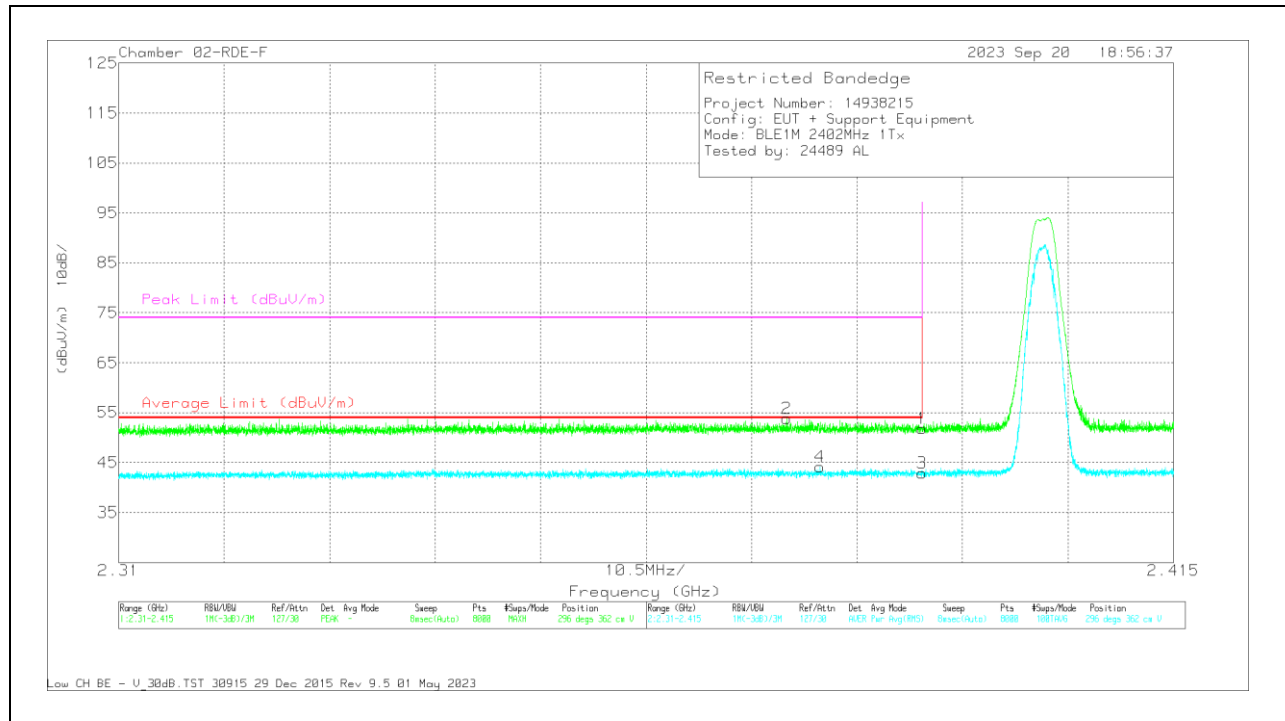
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206808 ACF (dB) 3mH	Amp/Cbl (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	58.04	Pk	32.1	-38.8	0	51.34	-	-	74	-22.66	238	221	H
2	* 2.37847	60.56	Pk	32.1	-38.7	0	53.96	-	-	74	-20.04	238	221	H
3	* 2.39	47.55	RMS	32.1	-38.8	2.1	42.95	54	-11.05	-	-	238	221	H
4	* 2.372327	48.48	RMS	32.1	-38.8	2.1	43.88	54	-10.12	-	-	238	221	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 RMS - RMS detection

VERTICAL RESULT

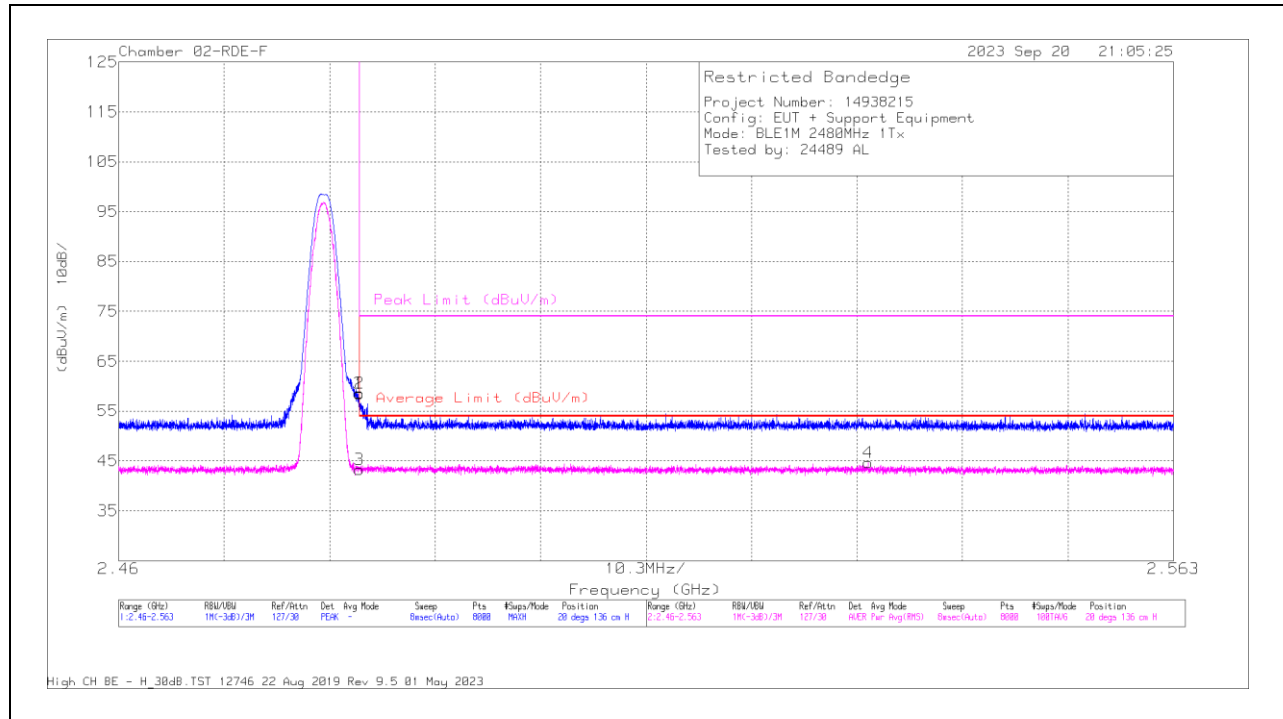


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206808 ACF (dB) 3mH	Amp/Cbl (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	58.49	Pk	32.1	-38.8	0	51.79	-	-	74	-22.21	296	362	V
2	* 2.376475	60.52	Pk	32.1	-38.8	0	53.82	-	-	74	-20.18	296	362	V
3	* 2.39	47.48	RMS	32.1	-38.8	2.1	42.88	54	-11.12	-	-	296	362	V
4	* 2.379809	48.61	RMS	32.1	-38.7	2.1	44.11	54	-9.89	-	-	296	362	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 RMS - RMS detection

BANDEDGE (HIGH CHANNEL)

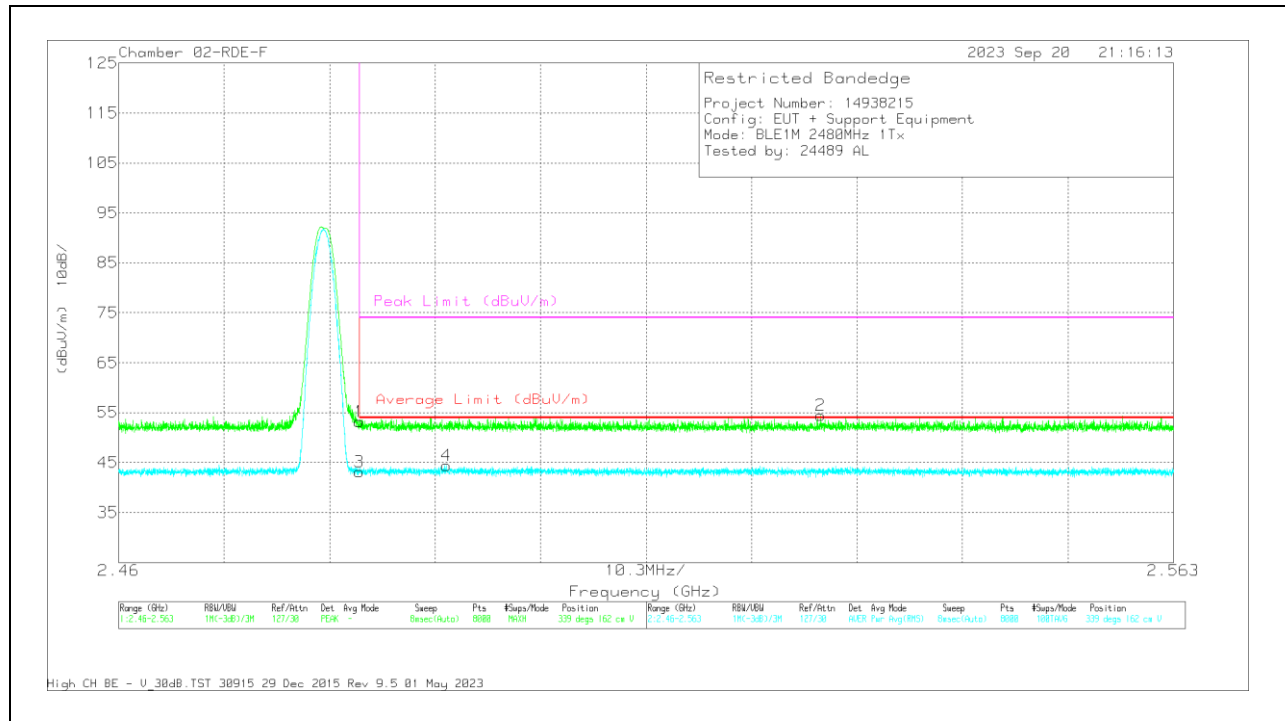
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206808 ACF (dB) 3mH	Amp/Cbl (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	64.5	Pk	32.4	-38.4	0	58.5	-	-	74	-15.5	20	136	H
2	* 2.483501	64.55	Pk	32.4	-38.4	0	58.55	-	-	74	-15.45	20	136	H
3	* 2.4835	47.15	RMS	32.4	-38.4	2.1	43.25	54	-10.75	-	-	20	136	H
4	2.53318	48.32	RMS	32.5	-38.3	2.1	44.62	54	-9.38	-	-	20	136	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 RMS - RMS detection

VERTICAL RESULT

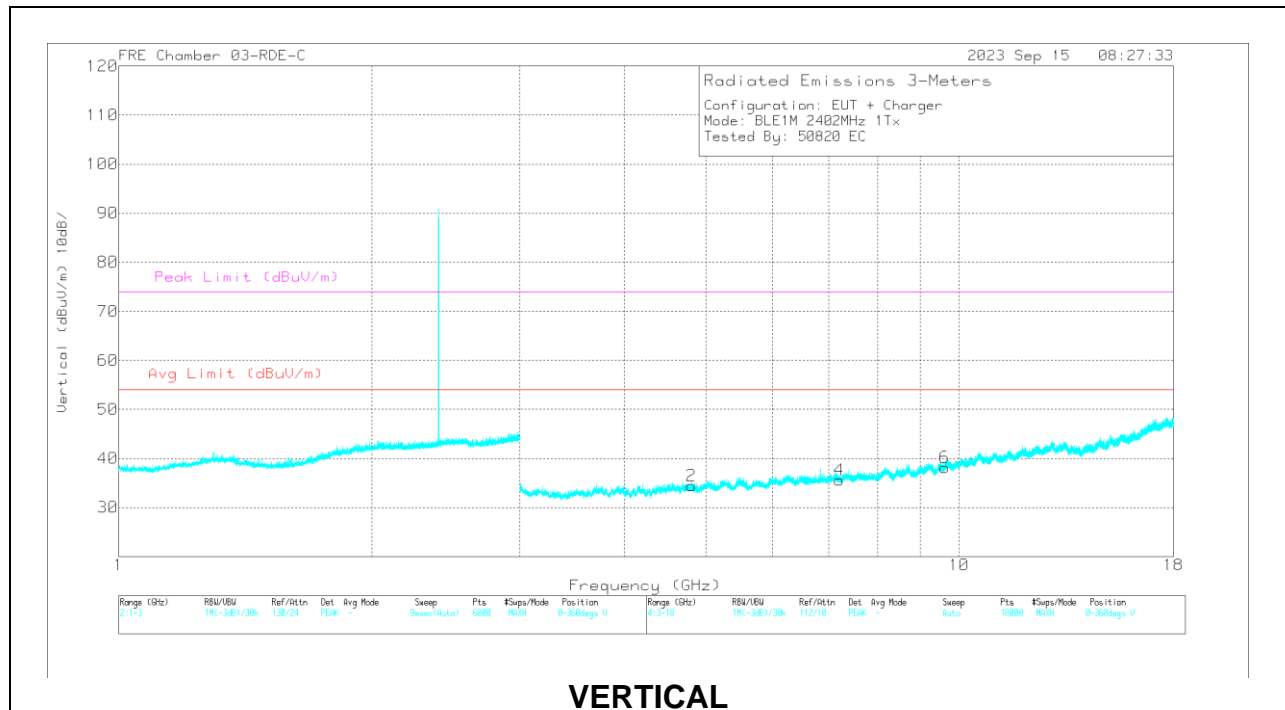
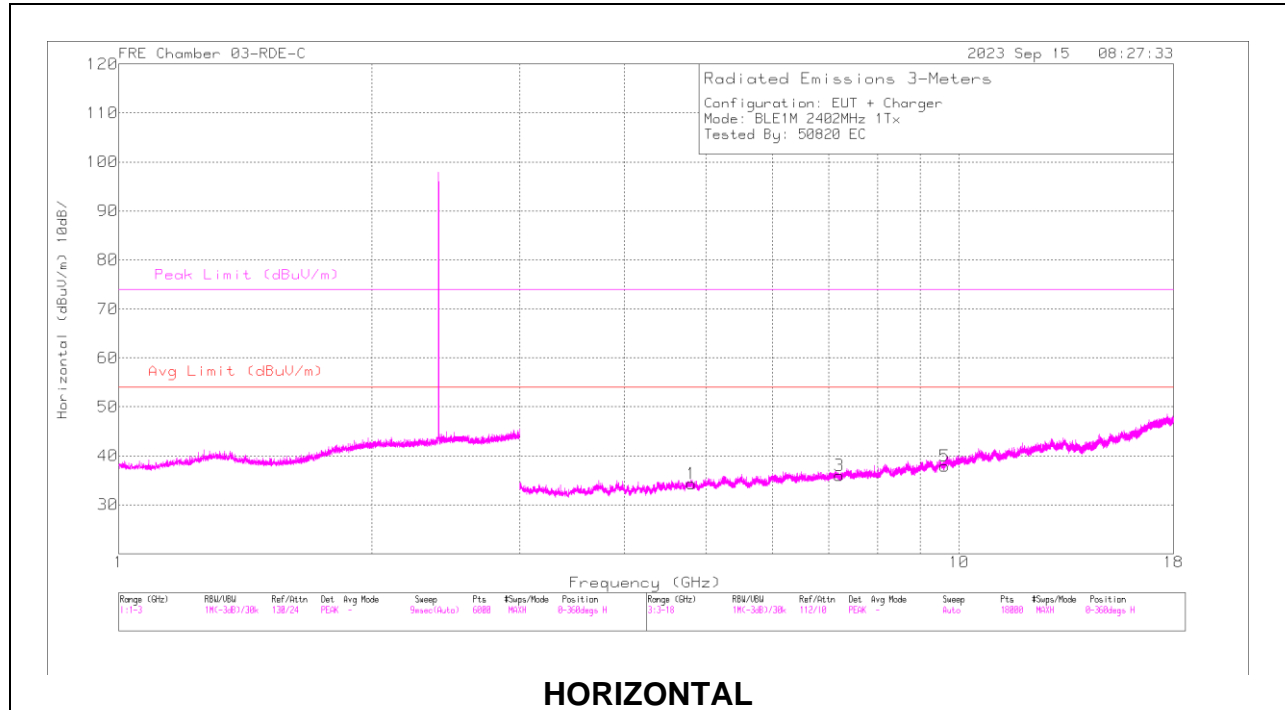


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206808 ACF (dB) 3mH	Amp/Cbl (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	59.15	Pk	32.4	-38.4	0	53.15	-	-	74	-20.85	339	162	V
2	2.528531	60.23	Pk	32.5	-38.3	0	54.43	-	-	74	-19.57	339	162	V
3	* 2.4835	47.11	RMS	32.4	-38.4	2.1	43.21	54	-10.79	-	-	339	162	V
4	* 2.491974	48.09	RMS	32.5	-38.3	2.1	44.39	54	-9.61	-	-	339	162	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS

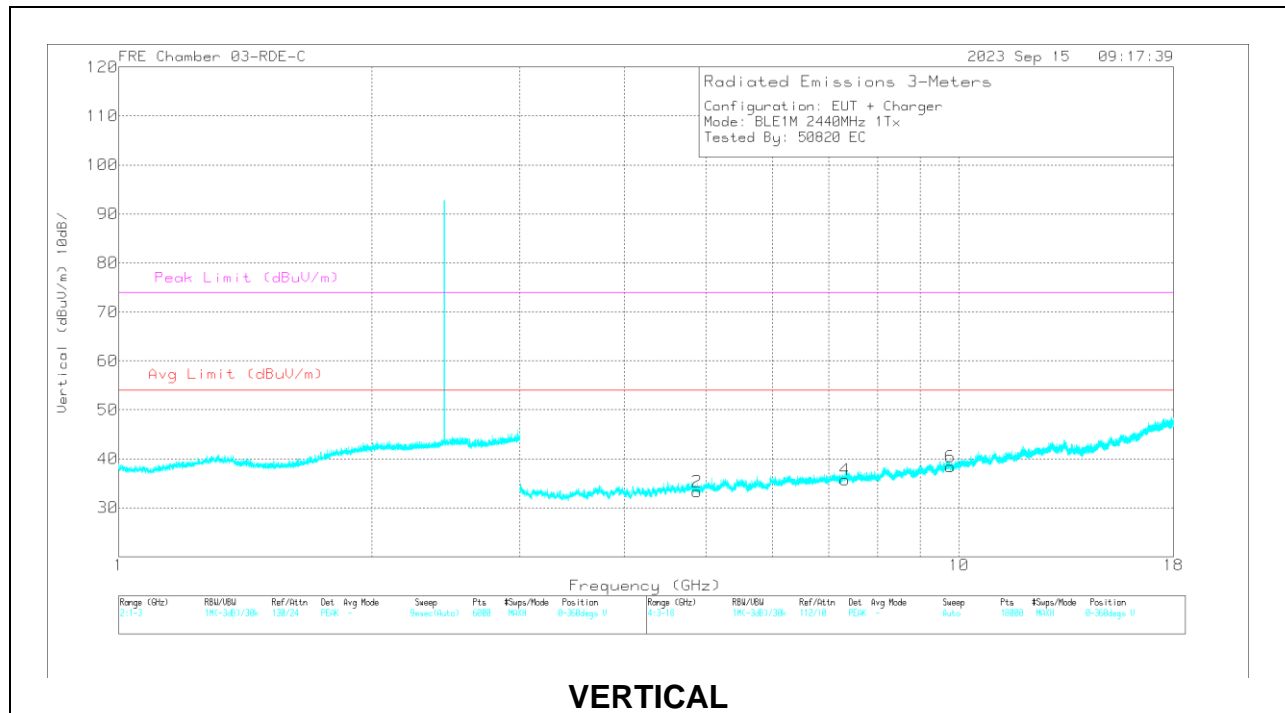
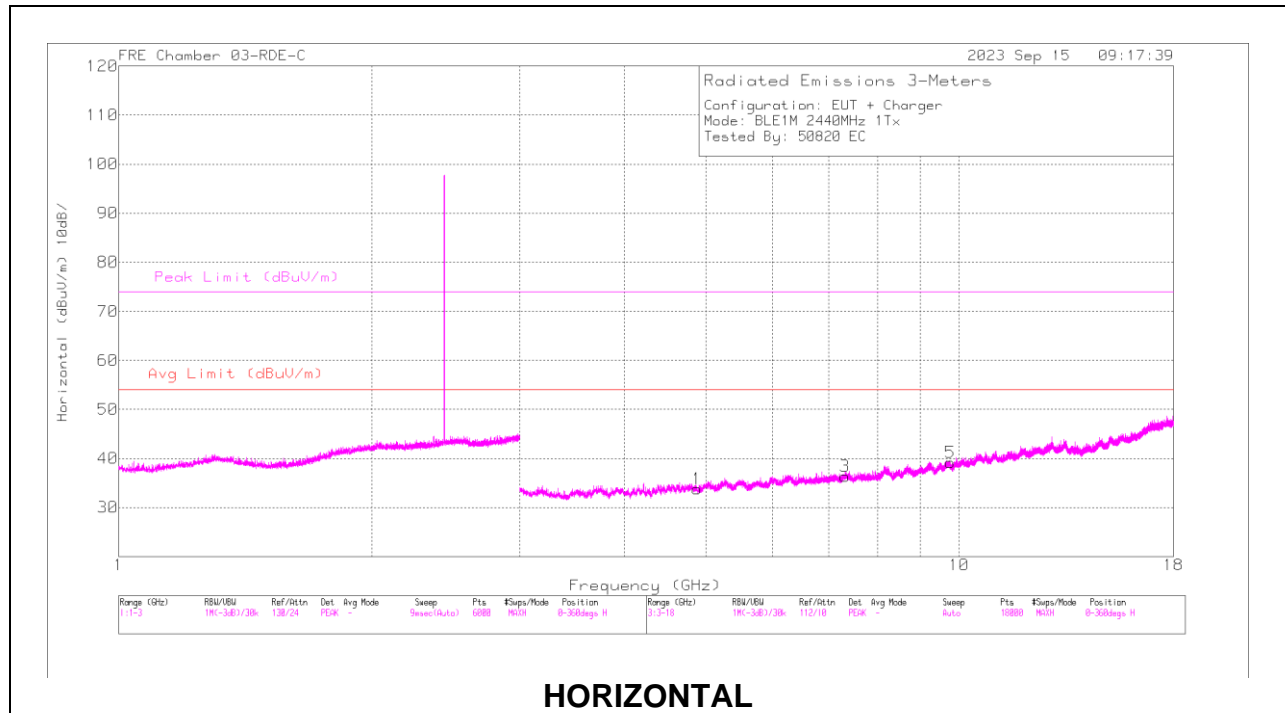


RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	226672 ACF (dB) 3mH	DCCF (dB)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.803979	58.23	PK2	34	0	-47.4	44.83	-	-	74	-29.17	358	338	H
	* 4.80353	46.64	MAv1	34	2.1	-47.4	35.34	54	-18.66	-	-	358	338	H
2	* 4.805175	58.26	PK2	34	0	-47.5	44.76	-	-	74	-29.24	177	321	V
	* 4.805169	46.65	MAv1	34	2.1	-47.5	35.25	54	-18.75	-	-	177	321	V
3	7.206293	56.86	PK2	35.7	0	-46.4	46.16	-	-	-	-	334	277	H
	7.206665	57.01	PK2	35.7	0	-46.4	46.31	-	-	-	-	175	195	V
5	9.615553	58.04	PK2	36.7	0	-45.76	48.98	-	-	-	-	205	169	H
6	9.616125	58.36	PK2	36.7	0	-45.8	49.26	-	-	-	-	135	243	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 PK2 - KDB558074 Method: Maximum Peak
 MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL RESULTS

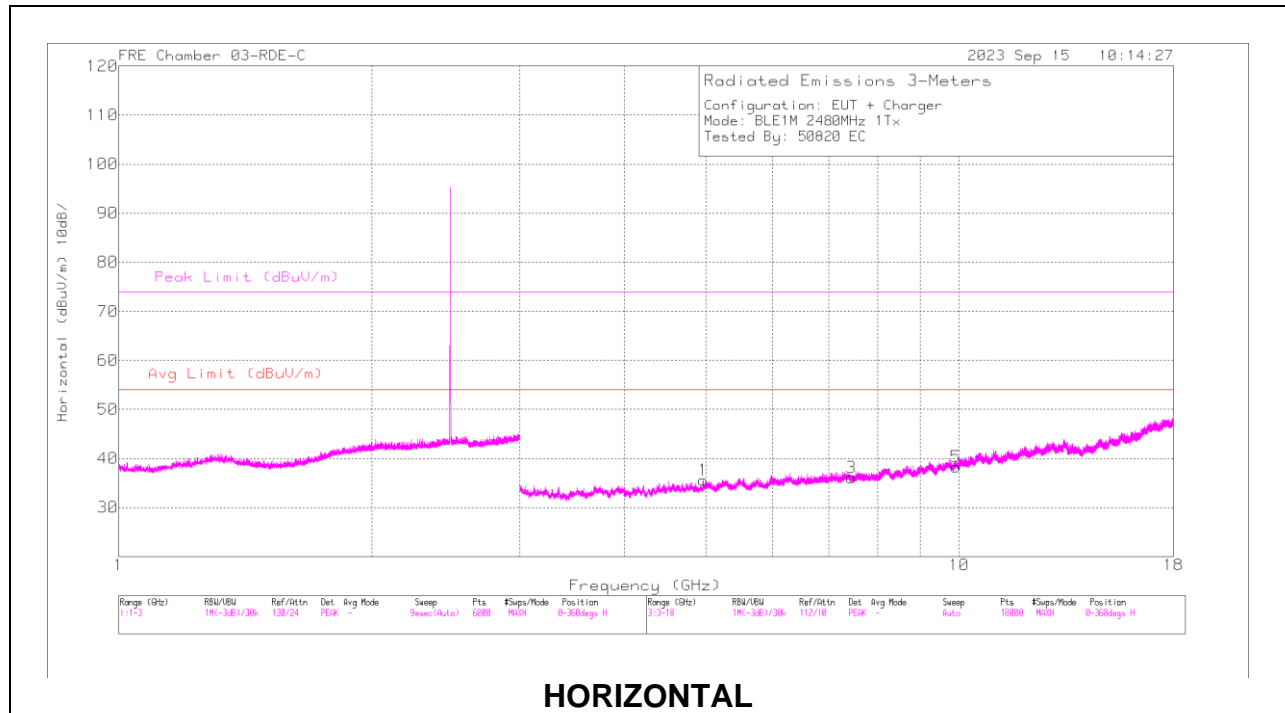


RADIATED EMISSIONS

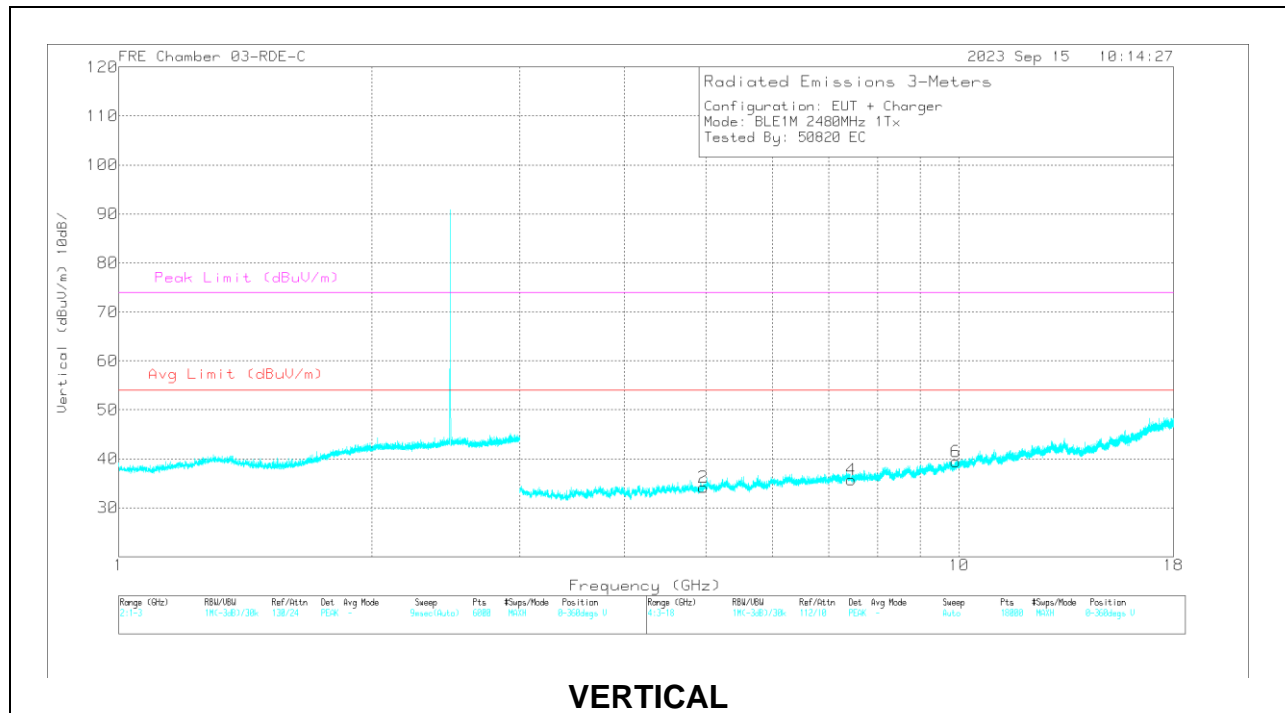
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	226672 ACF (dB) 3mH	DCCF (dB)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.882556	57.55	PK2	34	0	-47.5	44.05	-	-	74	-29.95	261	237	H
	* 4.885372	46.39	MAv1	34	2.1	-47.6	34.89	54	-19.11	-	-	261	237	H
3	* 7.322965	57.35	PK2	35.7	0	-45.7	47.35	-	-	74	-26.65	130	181	H
	* 7.320963	45.37	MAv1	35.7	2.1	-45.7	37.47	54	-16.53	-	-	130	181	H
2	* 4.8767	57.36	PK2	34	0	-47.5	43.86	-	-	74	-30.14	187	170	V
	* 4.879903	46.35	MAv1	34	2.1	-47.59	34.86	54	-19.14	-	-	187	170	V
4	* 7.318494	57.05	PK2	35.7	0	-45.8	46.95	-	-	74	-27.05	113	113	V
	* 7.320073	45.38	MAv1	35.7	2.1	-45.7	37.48	54	-16.52	-	-	113	113	V
5	9.761104	57.37	PK2	36.9	0	-44.8	49.47	-	-	-	-	208	126	V
6	9.762525	57.86	PK2	36.9	0	-44.8	49.96	-	-	-	-	45	316	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 PK2 - KDB558074 Method: Maximum Peak
 MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

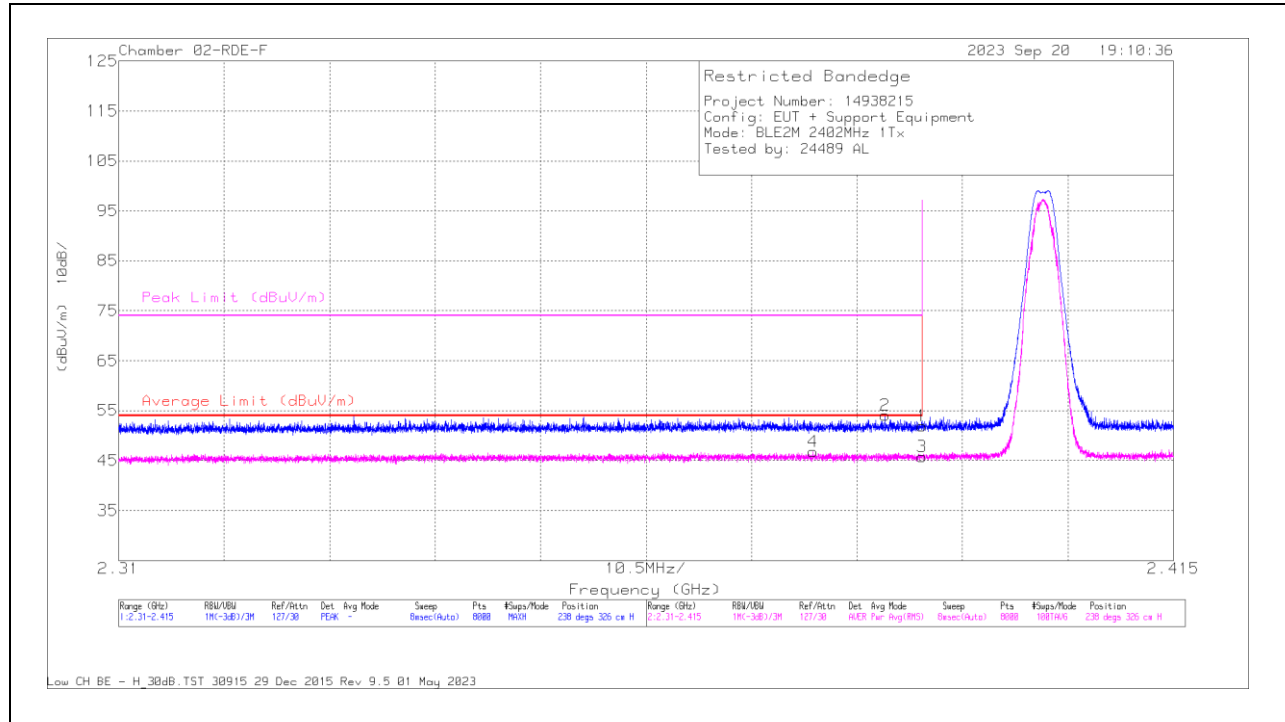
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	226672 ACF (dB) 3mH	DCCF (dB)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.959943	58.58	PK2	34.1	0	-47.5	45.18	-	-	74	-28.82	78	242	H
	* 4.959677	46.93	MAv1	34.1	2.1	-47.5	35.63	54	-18.37	-	-	78	242	H
3	* 7.438352	57.02	PK2	35.7	0	-46.26	46.46	-	-	74	-27.54	279	333	H
	* 7.439652	45.36	MAv1	35.7	2.1	-46.13	37.03	54	-16.97	-	-	279	333	H
2	* 4.959731	58.22	PK2	34.1	0	-47.5	44.82	-	-	74	-29.18	126	357	V
	* 4.963116	46.29	MAv1	34.1	2.1	-47.4	35.09	54	-18.91	-	-	126	357	V
4	* 7.440467	57.46	PK2	35.7	0	-46.15	47.01	-	-	74	-26.99	36	326	V
	* 7.439993	45.64	MAv1	35.7	2.1	-46.1	37.34	54	-16.66	-	-	36	326	V
5	9.920375	57.65	PK2	37	0	-45.2	49.45	-	-	-	-	3	103	V
6	9.921012	57.36	PK2	37	0	-45.2	49.16	-	-	-	-	169	196	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 PK2 - KDB558074 Method: Maximum Peak
 MAv1 - KDB558074 Option 1 Maximum RMS Average

10.2.2. BLE (2Mbps)

BANDEDGE (LOW CHANNEL)

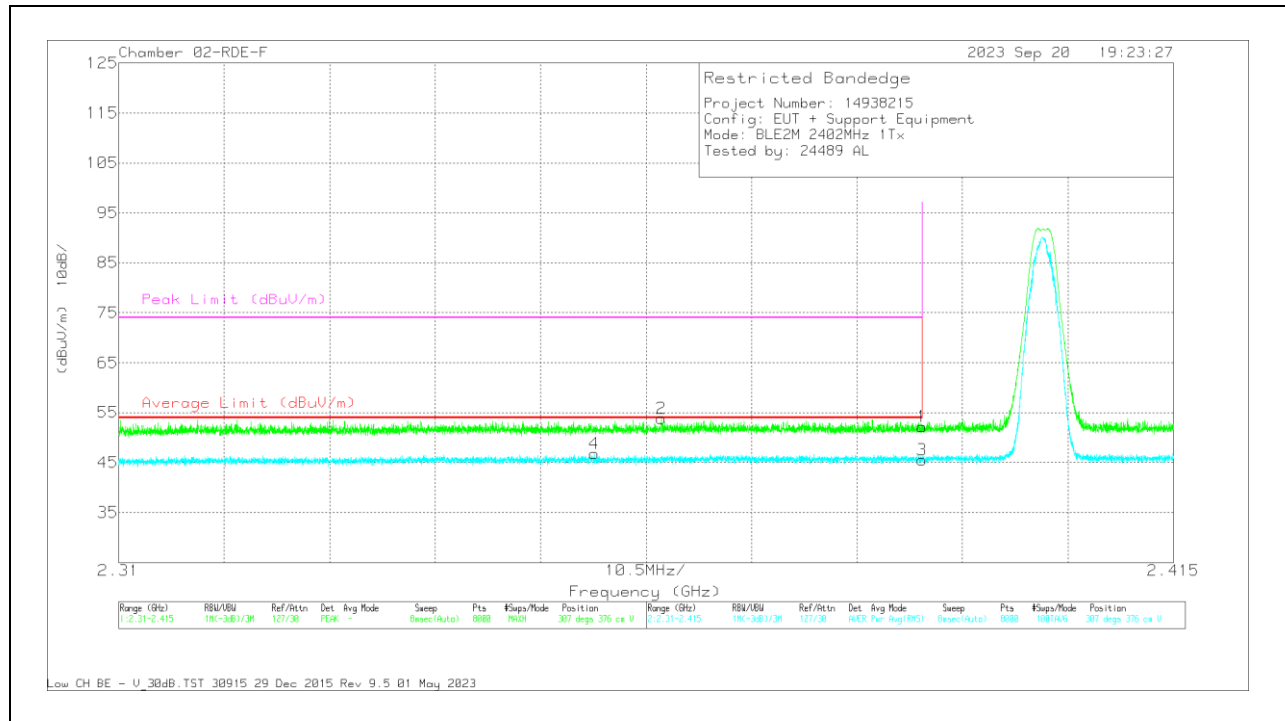
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206808 ACF (dB) 3mH	Amp/Cbl (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	58.6	Pk	32.1	-38.8	0	51.9	-	-	74	-22.1	238	326	H
2	* 2.386281	60.66	Pk	32.1	-38.7	0	54.06	-	-	74	-19.94	238	326	H
3	* 2.39	47.49	RMS	32.1	-38.8	4.96	45.75	54	-8.25	-	-	238	326	H
4	* 2.379114	48.38	RMS	32.1	-38.7	4.96	46.74	54	-7.26	-	-	238	326	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 RMS - RMS detection

VERTICAL RESULT

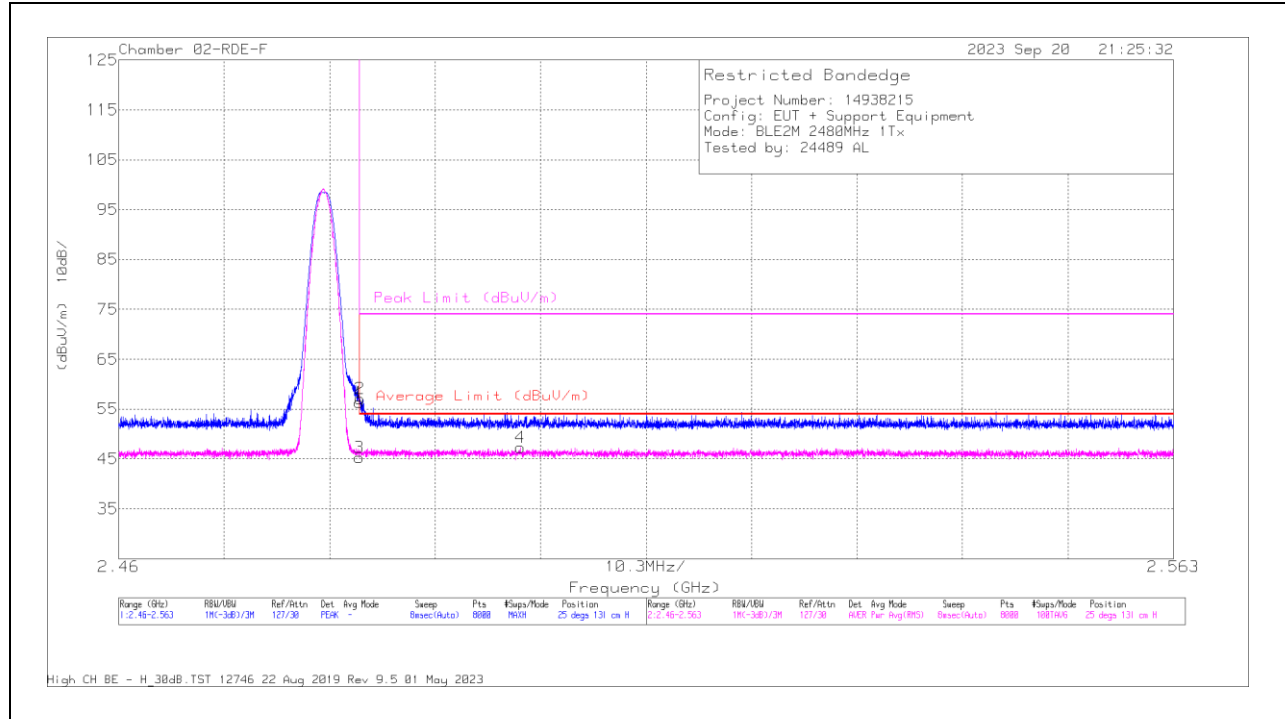


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206808 ACF (dB) 3mH	Amp/Cbl (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	58.9	Pk	32.1	-38.8	0	52.2	-	-	74	-21.8	307	376	V
2	* 2.364004	60.55	Pk	32.1	-38.8	0	53.85	-	-	74	-20.15	307	376	V
3	* 2.39	47.27	RMS	32.1	-38.8	4.96	45.53	54	-8.47	-	-	307	376	V
4	* 2.357323	48.73	RMS	32	-38.9	4.96	46.79	54	-7.21	-	-	307	376	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 RMS - RMS detection

BANDEDGE (HIGH CHANNEL)

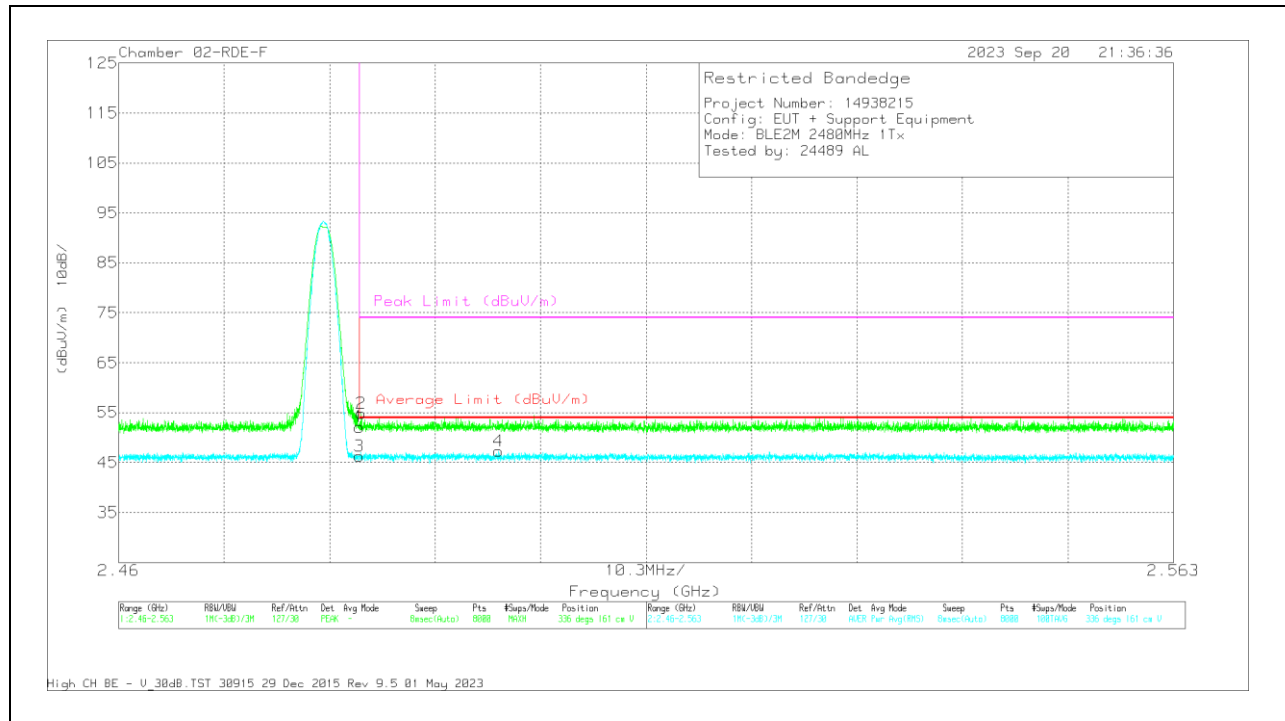
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	20dB ACQ (dB) 3mH	Amp/Cbl (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	62.33	Pk	32.4	-38.4	0	56.33	-	-	74	-17.67	25	131	H
2	* 2.483539	63.05	Pk	32.4	-38.4	0	57.05	-	-	74	-16.95	25	131	H
3	* 2.4835	46.38	RMS	32.4	-38.4	4.96	45.34	54	-8.66	-	-	25	131	H
4	* 2.499198	48.25	RMS	32.5	-38.4	4.96	47.31	54	-6.69	-	-	25	131	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 RMS - RMS detection

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206808 ACF (dB) 3mH	Amp/Cbl (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	58.13	Pk	32.4	-38.4	0	52.13	-	-	74	-21.87	336	161	V
2	* 2.483655	60.8	Pk	32.4	-38.4	0	54.8	-	-	74	-19.2	336	161	V
3	* 2.4835	47.35	RMS	32.4	-38.4	4.96	46.31	54	-7.69	-	-	336	161	V
4	* 2.497112	48.2	RMS	32.5	-38.4	4.96	47.26	54	-6.74	-	-	336	161	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 RMS - RMS detection