TEST REPORT

Report Number. : 14586572-E3V3

Applicant	:	SAMSUNG ELECTRONICS CO., LTD. 129, SAMSUNG-RO, YEONGTONG-GU, SUWON-SI, GYEONGGI-DO, 16677, KOREA
Model	:	SM-A145M/DS, SM-A145M, SM-A145MB/DS and SM-A145MB
FCC ID	:	A3LSMA145M
EUT Description	:	GSM/WCDMA/LTE Phone with BT/BLE, DTS/UNII a/b/g/n/ac
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C

Date Of Issue:
2023-01-31

Prepared by:
UL VERIFICATION SERVICES
47173 Benicia Street
Fremont, CA 94538 U.S.A.
TEL: (510) 319-4000
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CERT #0751.05

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2023-01-18	Initial Issue	
V2	2023-01-26	Updated Section 9.3, 9.4 and 10.3	Kiya Kedida
V3	2023-01-31	Updated Section 7	Kiya Kedida

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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 Phone with BT/BLE, DTS/UNII a/b/g/n/ac
MODEL:	SM-A145M/DS, SM-A145M, SM-A145MB/DS and SM-A145MB
SERIAL NUMBER:	Conducted: R93TA00067A Radiated: R93TA0007MT and R93TA0007NZ
DATE TESTED:	2022-12-02 TO 2023-01-13

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.

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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		None.
15.247 (b) (3)	Output Power		None.
See Comment	Average power	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (e)	PSD		None.
15.247 (d)	Conducted Spurious Emissions		None.
15.209, 15.205	Radiated Emissions		None.
15.207	AC Mains Conducted Emissions		None.

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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	FCC Registration
☐	Building 1: 47173 Benicia Street Fremont, CA 94538, U.S.A	US0104	550739
☐	Building 2: 47266 Benicia Street Fremont, CA 94538, U.S.A	US0104	550739
☒	Building 4: 47658 Kato Rd Fremont, CA 94538, U.S.A	US0104	550739

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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%.

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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 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 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 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

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6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a GSM/WCDMA/LTE Phone with BT/BLE, DTS/UNII a/b/g/n/ac.
The model SM-A145M/DS was used for final testing and is representative of the test results in this report.

The models are electronically equivalent the only differences is as follows:

1) SM-A145M/DS : Dual SIM

2) SM-A145M : Single SIM

3) SM-A145MB/DS : Dual SIM with KNOX Security Platform

4) SM-A145MB : Single SIM with KNOX Security Platform

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)	6.21	4.18
2402 - 2480	BLE (2Mbps)	6.34	4.31
2402 - 2480	BLE (125kbps)	6.22	4.19
2402 - 2480	BLE (500kbps)	6.25	4.22

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6.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

The radio utilizes an LDS antenna, with a maximum gain:

Frequency Band (GHz)	Antenna Gain (dBi)
2402-2480	-4.51

6.4. SOFTWARE

The test utility software used during testing was A145M.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

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6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC Adapter	Samsung	EP-TA800	R37MAMT21J2SE3	N/A
Earphone	Samsung	N/A	N/A	N/A

I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	Antenna	1	RF	Shielded	0.2	To spectrum Analyzer
2	USB	1	USB	Un-shielded	1	EUT to AC Mains

I/O CABLES (RADIATED AND CONDUCTED EMISSIONS)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	USB	1	USB	Shielded	1	N/A
2	Earphone	1	3.5mm	Un-shielded	1	N/A

TEST SETUP

The EUT is a stand-alone unit. Test software exercised the radio card.

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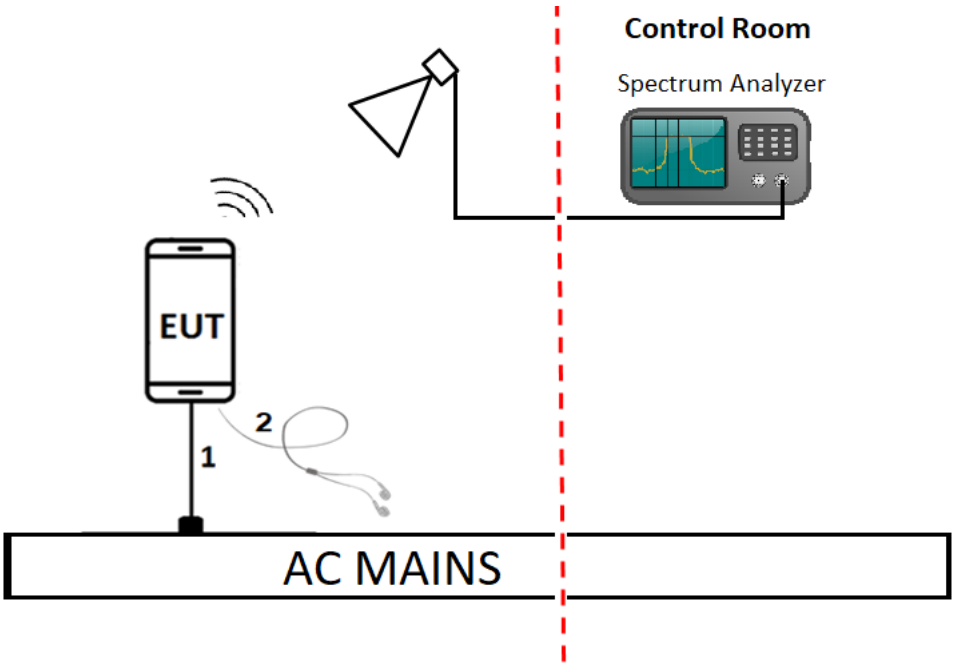
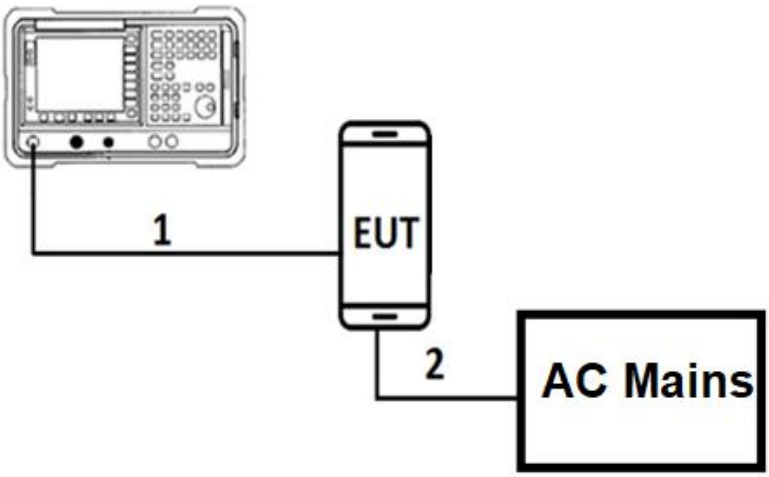
SETUP DIAGRAM

Radiated Configuration



Conducted Configuration



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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 ≥ 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)

PSD: 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

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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**
Antenna, Broadband Hybrid, 30MHz to 3GHz	Sunol Sciences Corp.	JB3	80706	2023-07-28	2022-07-28
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	175953	2023-02-03	2022-02-08
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310N	29654	2023-04-24	2022-04-24
Antenna, Horn 1-18GHz	ETS-Lindgren (Cedar Park, Texas)	3117	223083	2023-07-05	2022-07-05
RF Filter Box, 1-18GHz	UL-FR1	n/a	171875	2023-08-12	2022-08-12
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	169937	2023-02-20	2022-02-20
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	169927	2023-02-13	2022-02-13
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	172364	2023-03-08	2023-03-08
Amplifier 18-26.5GHz, +5Vdc, 60dB min	AMPLICAL	AMP18G26.5-60	215705	2023-02-26	2022-02-26
Antenna, Horn 26 to 40GHz	ARA	MWH-2640/B	172365	2023-03-08	2023-03-08
Amplifier 26-40GHz, +5Vdc, -62dBm P1dB	AMPLICAL	AMP26G40-65	220537	2023-06-12	2022-06-12
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO METRICS	EM-6871	219909	2023-05-10	2022-05-10
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO METRICS	EM-6872	219911	2023-05-10	2022-05-10
Spectrum Analyzer, PSA, 3Hz to 44GHz	Agilent Technologies	N4440A	80386	2023-03-02	2022-03-02
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	T1268	2023-02-03	2022-02-03
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	90419	2023-03-02	2022-03-02
10dB Fixed Attenuator	Pasternack Enterprises	PE7087-10	N/A	Verified	Verified
AC Line Conducted					
LISN	Fischer Custom Communications, Inc	FCC-LISN-50/250-25-2-01-480V	175765	2023-01-25	2022-01-25
EMI TEST RECEIVER	Rohde & Schwarz	ESR	93091	2023-02-21	2022-02-21
Transient Limiter	Com-Power	LIT-930	127455	2023-02-02	2022-02-02
UL TEST SOFTWARE LIST					
Radiated Software	UL	UL EMC	Ver 2022-10-25, 2022-05-18, 2020-06-04, 2020-06-05, 2020-06-14, 2014-07-15,		
Antenna Port Software	UL	UL RF	Ver 2022.8.16		
AC Line Software	UL	UL EMC	Ver. 2022-02-17		

NOTES:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

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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)	0.198	0.626	0.316	31.63	5.00	5.051
BLE(125kbps)	3.090	3.750	0.824	82.40	0.84	0.324
BLE(500kbps)	1.060	1.875	0.565	56.53	2.48	0.943

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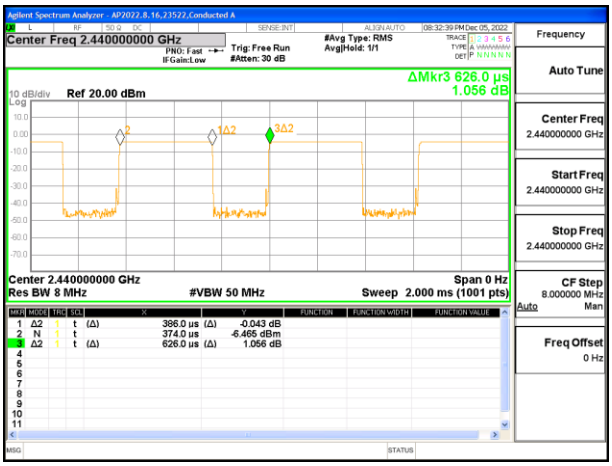
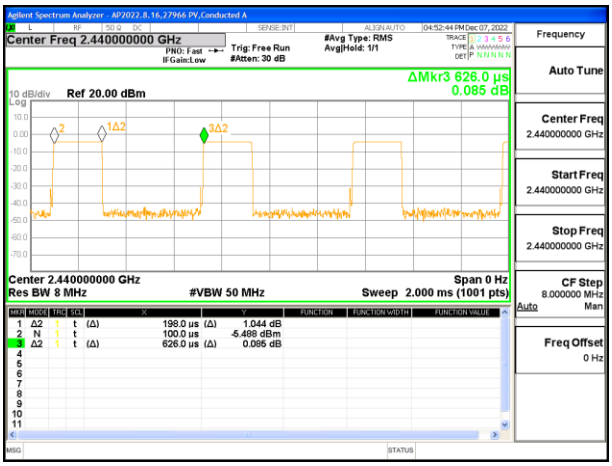
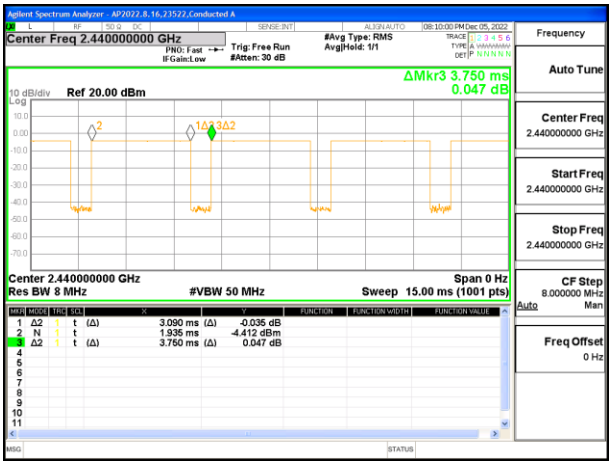
DUTY CYCLE PLOTS



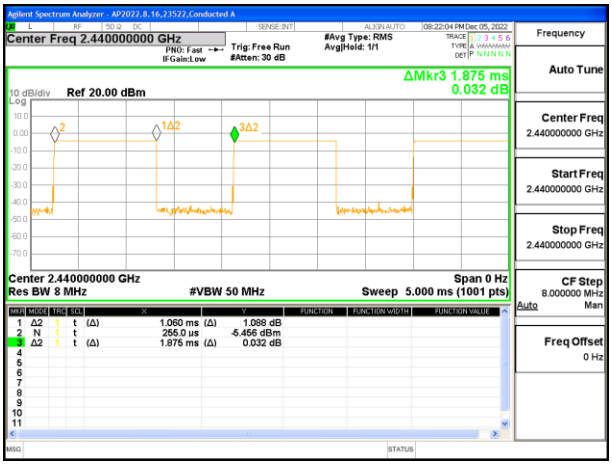
BLE (1Mbps) MODE



BLE (2Mbps) MODE



BLE (500kbps) MODE



BLE (125kbps) MODE

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9.2. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

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

RESULTS

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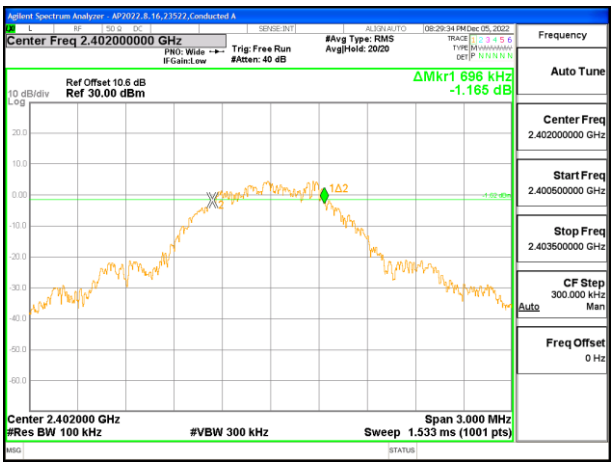
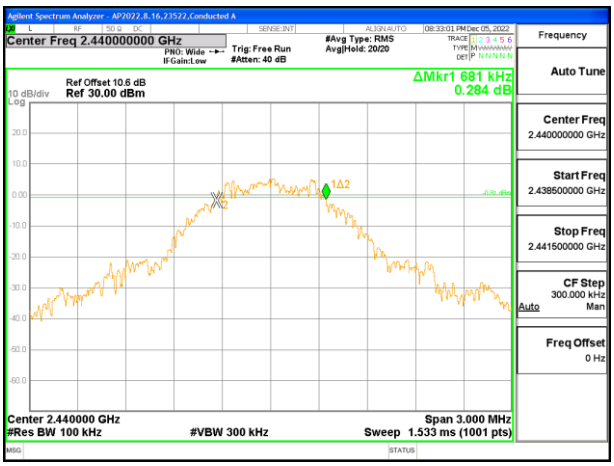
9.2.1. BLE (1Mbps)

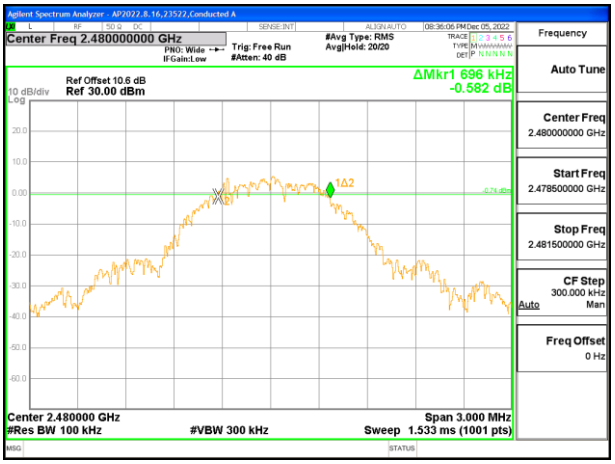
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.696	0.5
Middle	2440	0.681	0.5
High	2480	0.696	0.5



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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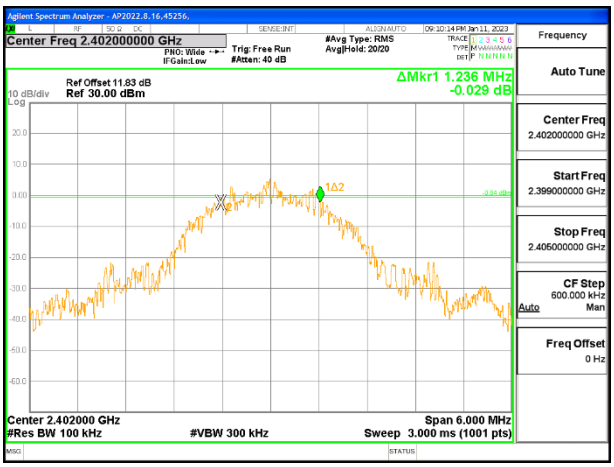
9.2.2. BLE (2Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	1.236	0.5
Middle	2440	1.122	0.5
High	2480	1.242	0.5



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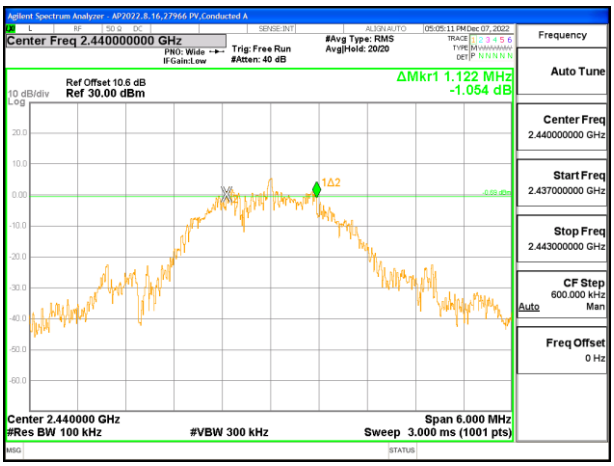

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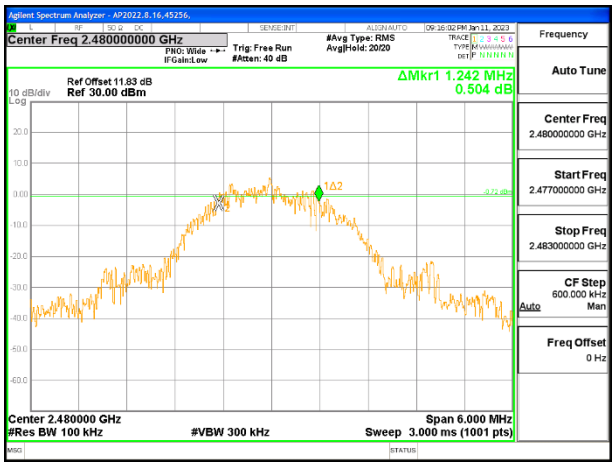

HIGH CHANNEL

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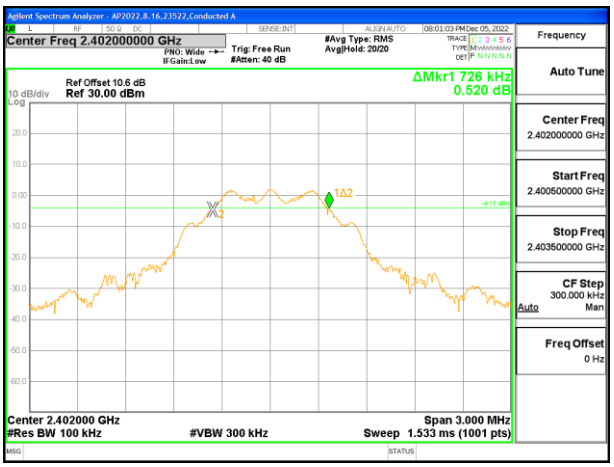
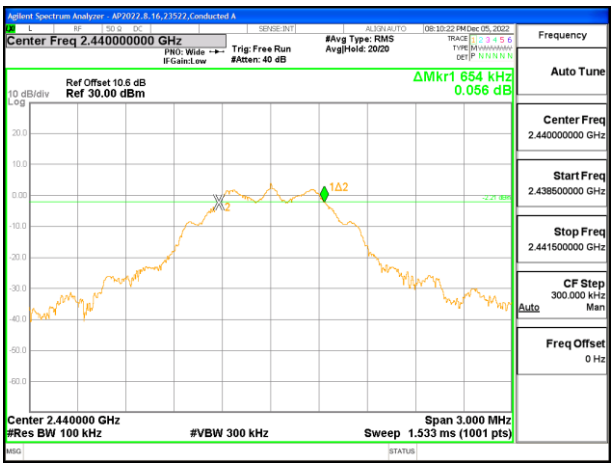
9.2.3. BLE (125Kbps)

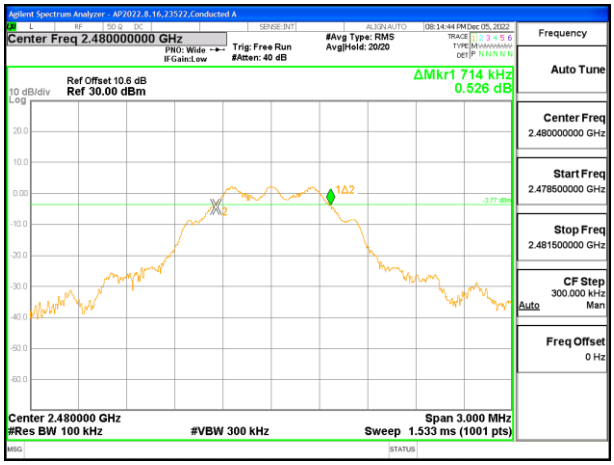
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.726	0.5
Middle	2440	0.654	0.5
High	2480	0.714	0.5



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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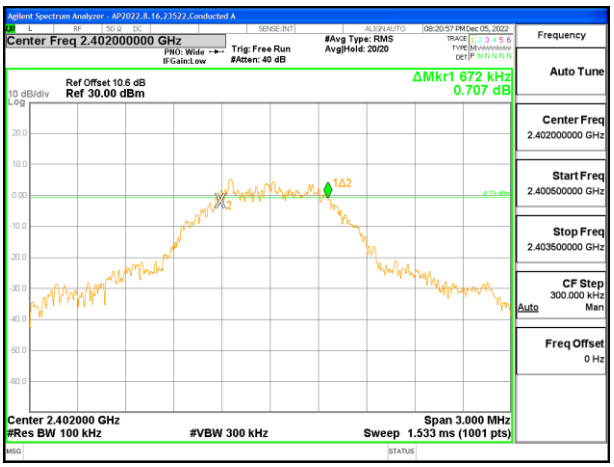
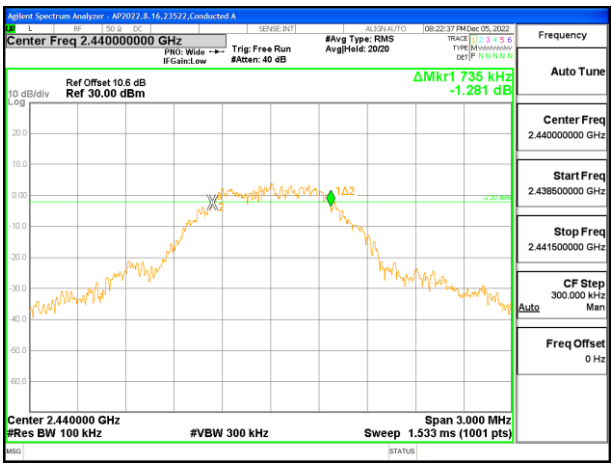
9.2.4. BLE (500Kbps)

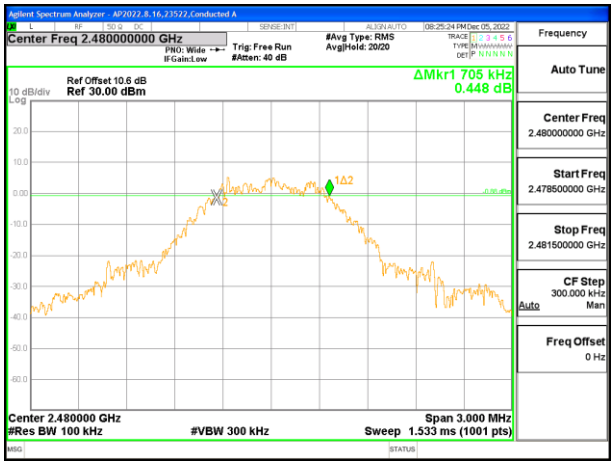
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.672	0.5
Middle	2440	0.735	0.5
High	2480	0.705	0.5



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

UL VERIFICATION SERVICES
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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

UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

9.3.1. BLE (1Mbps)

Tested By:	PV27966
Date:	2022-12-02

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.90	30	-24.10
Middle	2440	6.13	30	-23.87
High	2480	6.21	30	-23.79

9.3.2. BLE (2Mbps)

Tested By:	PV27966
Date:	2022-12-02

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.94	30	-24.06
Middle	2440	6.31	30	-23.69
High	2480	6.34	30	-23.66

9.3.3. BLE (125Kbps)

Tested By:	PV27966
Date:	2022-12-02

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.96	30	-24.04
Middle	2440	6.11	30	-23.89
High	2480	6.22	30	-23.78

UL VERIFICATION SERVICES
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9.3.4. BLE (500Kbps)

Tested By:	PV27966
Date:	2022-12-02

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	5.91	30	-24.09
Middle	2440	6.15	30	-23.85
High	2480	6.25	30	-23.75

UL VERIFICATION SERVICES
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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

UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

9.4.1. BLE (1Mbps)

Tested By:	PV27966
Date:	2022-12-02

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	5.22
Middle	2440	5.55
High	2480	5.64

9.4.2. BLE (2Mbps)

Tested By:	PV27966
Date:	2022-12-02

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	5.22
Middle	2440	5.68
High	2480	5.71

9.4.3. BLE (125Kbps)

Tested By:	PV27966
Date:	2022-12-02

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	5.15
Middle	2440	5.46
High	2480	5.56

UL VERIFICATION SERVICES
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9.4.4. BLE (500Kbps)

Tested By:	PV27966
Date:	2022-12-02

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	5.17
Middle	2440	5.49
High	2480	5.59

UL VERIFICATION SERVICES
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9.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

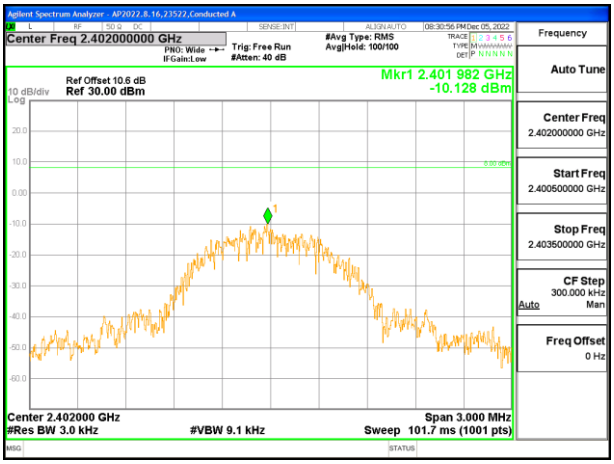
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

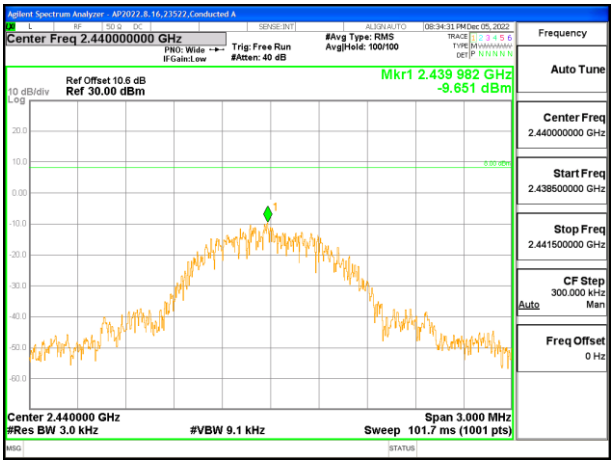
UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

9.5.1. BLE (1Mbps)

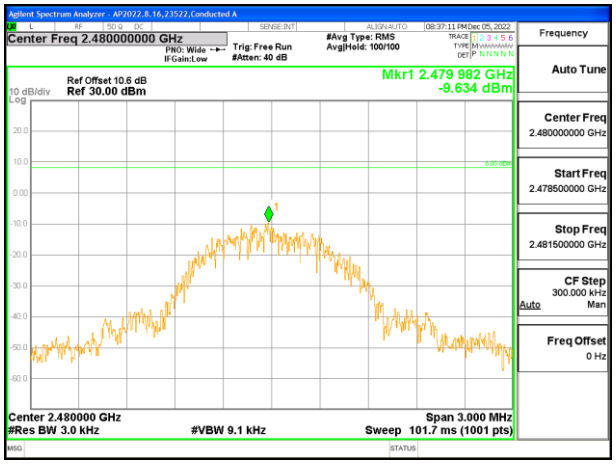
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-10.128	8	-18.13
Middle	2440	-9.651	8	-17.65
High	2480	-9.634	8	-17.63



LOW CHANNEL



MID CHANNEL

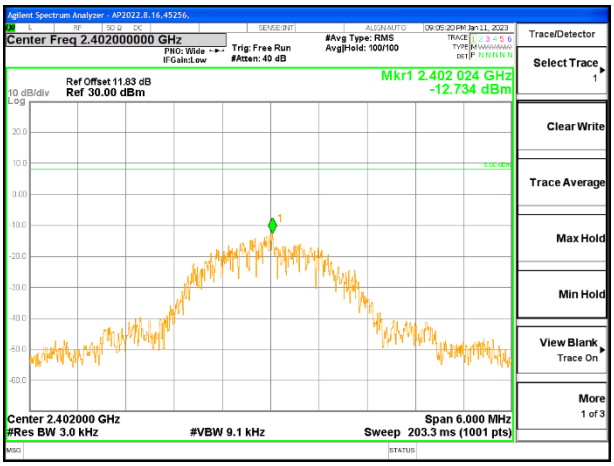


HIGH CHANNEL

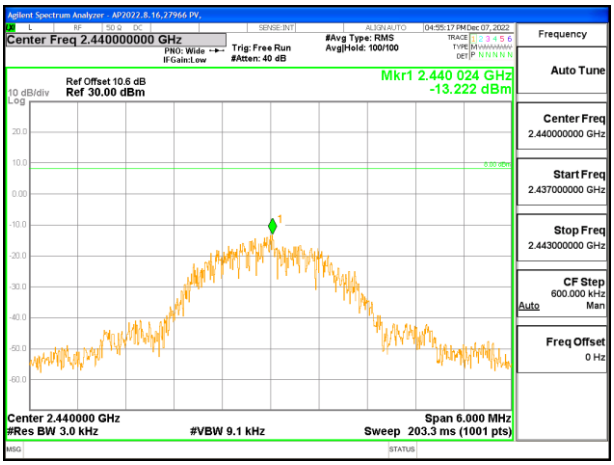
UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

9.5.2. BLE (2Mbps)

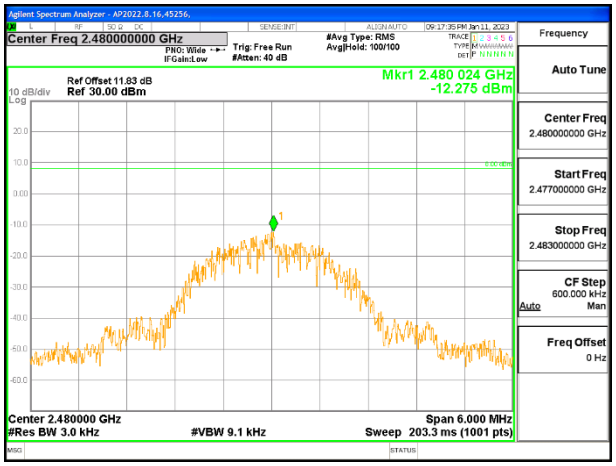
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-12.734	8	-20.73
Middle	2440	-13.222	8	-21.22
High	2480	-12.275	8	-20.28



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

UL VERIFICATION SERVICES
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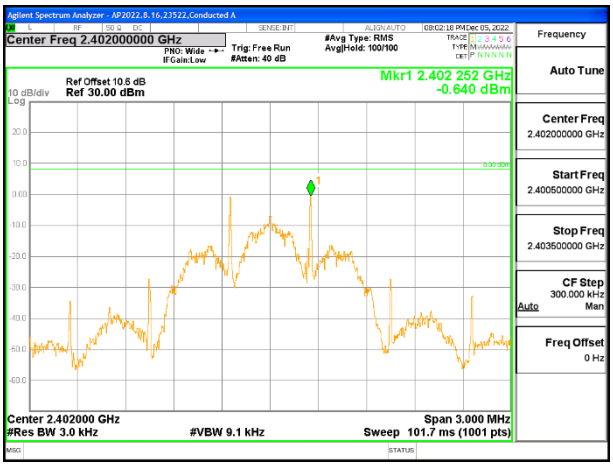
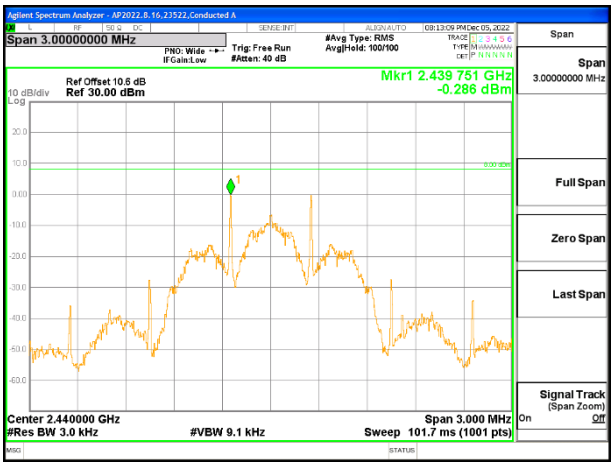
9.5.3. BLE (125Kbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-0.640	8	-8.64
Middle	2440	-0.286	8	-8.29
High	2480	-0.234	8	-8.23



LOW CHANNEL



MID CHANNEL

HIGH CHANNEL

UL VERIFICATION SERVICES
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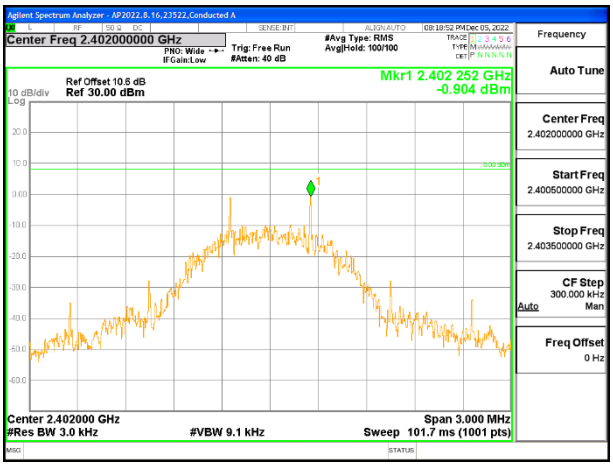
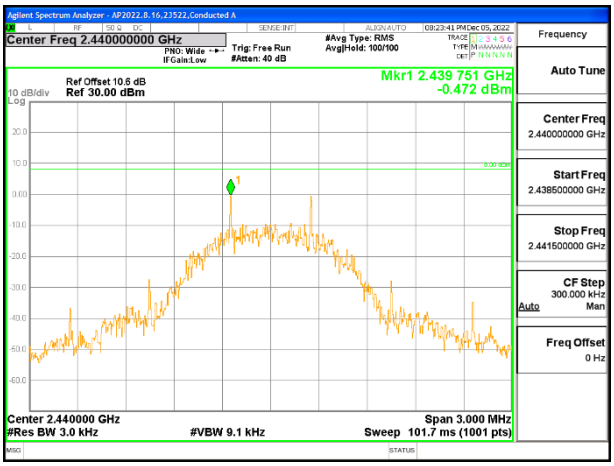
9.5.4. BLE (500Kbps)

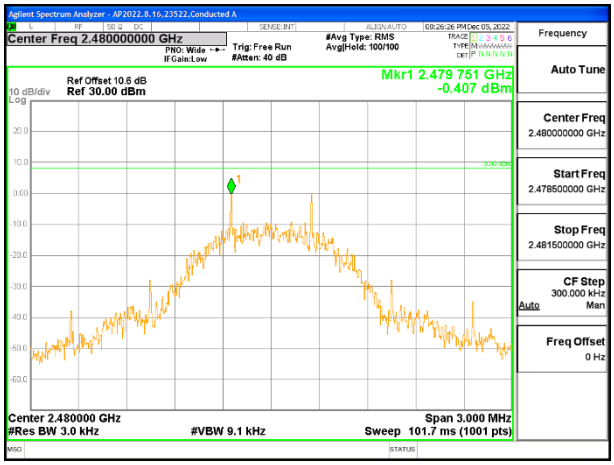
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-0.904	8	-8.90
Middle	2440	-0.472	8	-8.47
High	2480	-0.407	8	-8.41



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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9.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

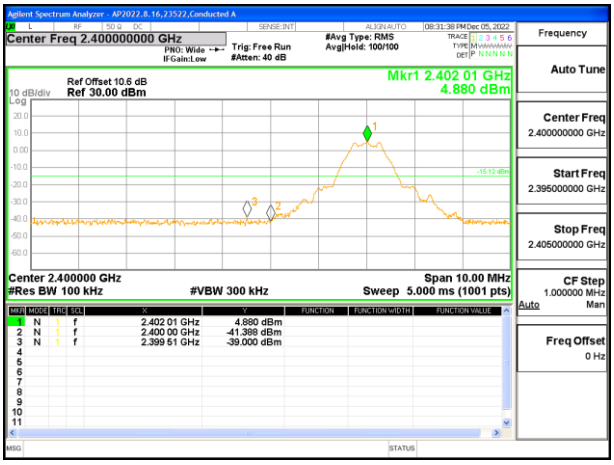
FCC §15.247 (d)

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

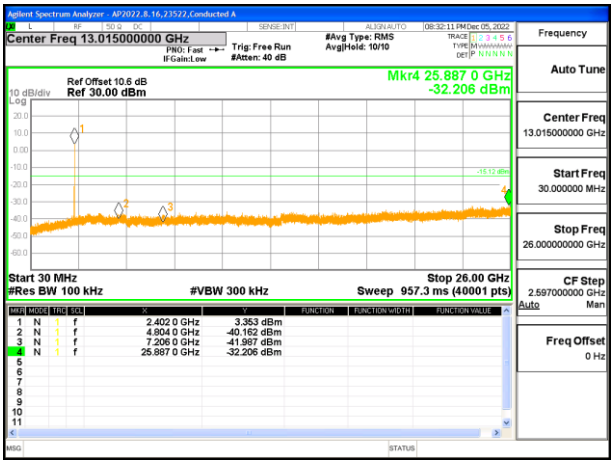
RESULTS

UL VERIFICATION SERVICES
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

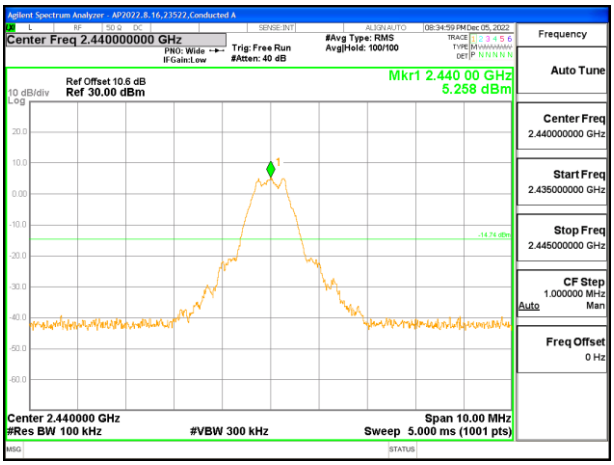
9.6.1. BLE (1Mbps)



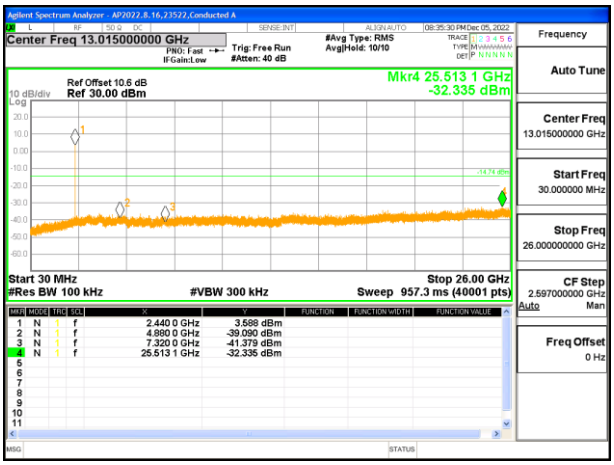
LOW CHANNEL BANDEDGE



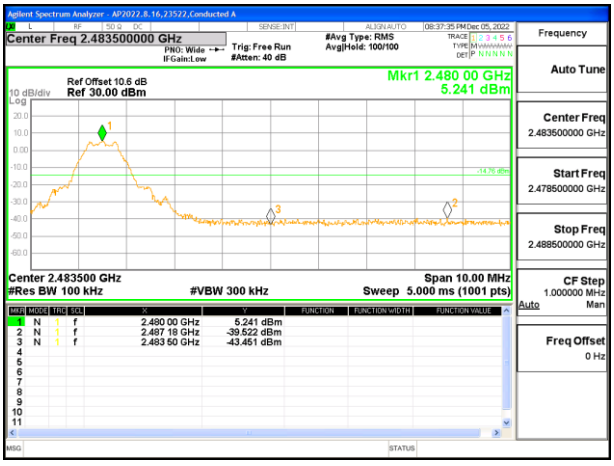
OUT-OF-BAND LOW CHANNEL



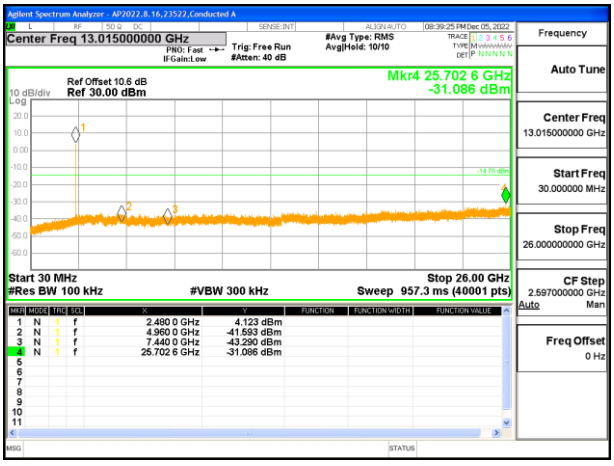
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

UL VERIFICATION SERVICES
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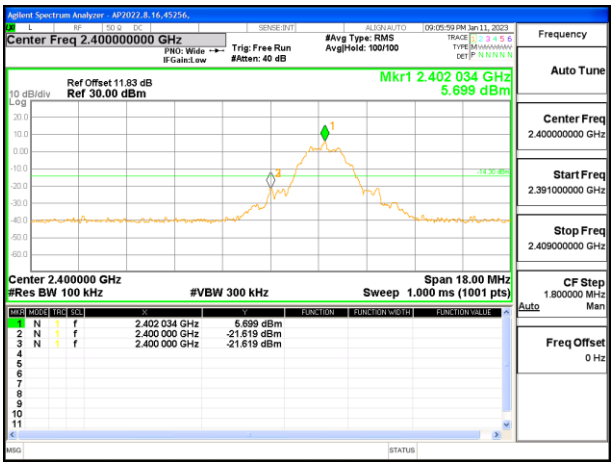
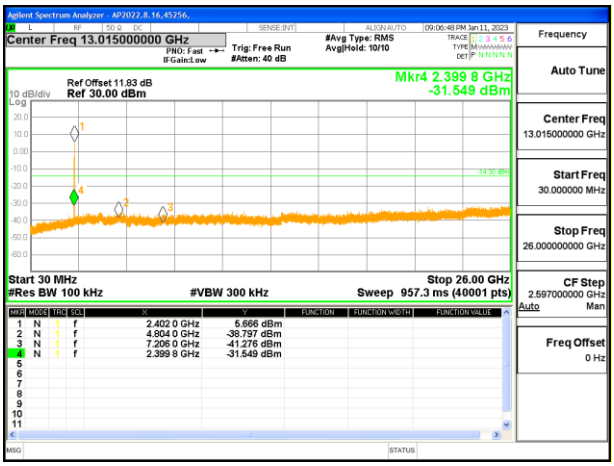
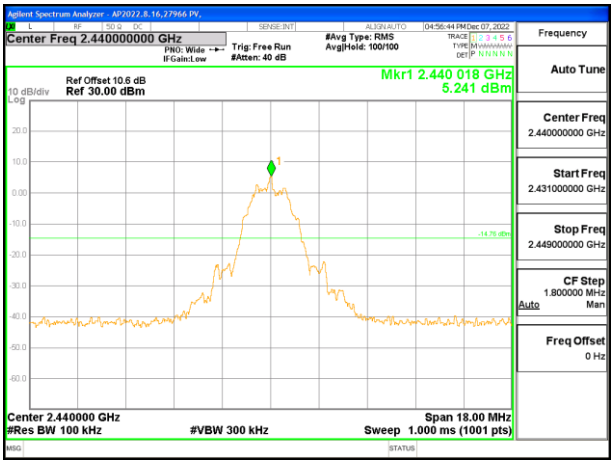
9.6.2. BLE (2Mbps)



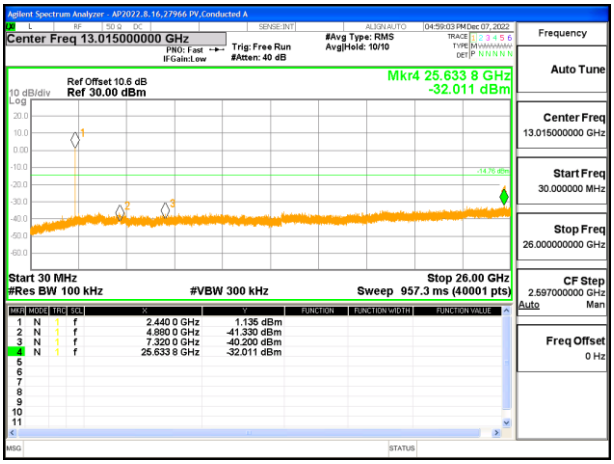
LOW CHANNEL BANDEDGE



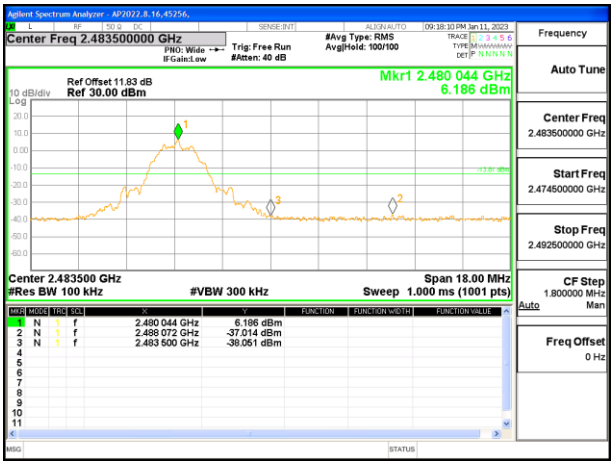
OUT-OF-BAND LOW CHANNEL



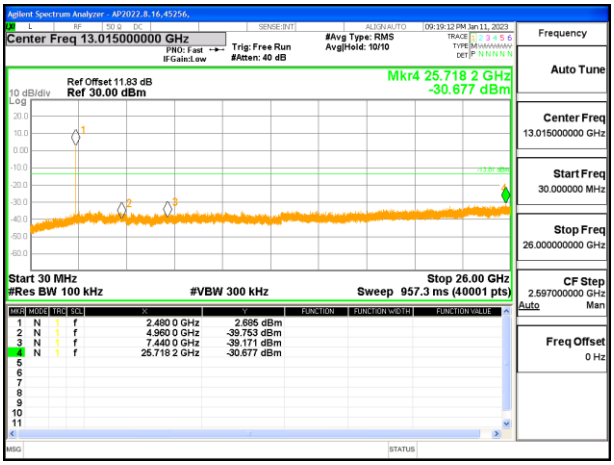
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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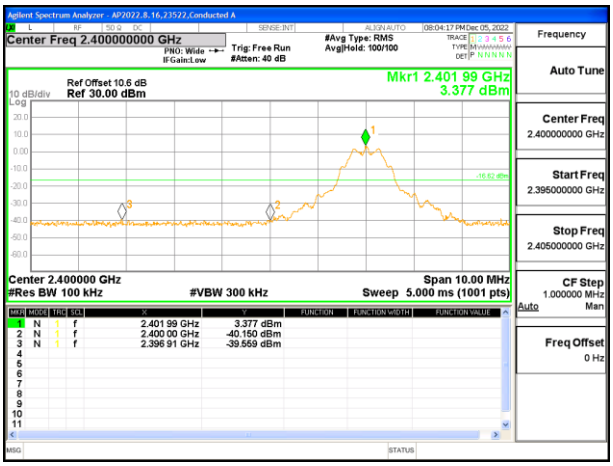
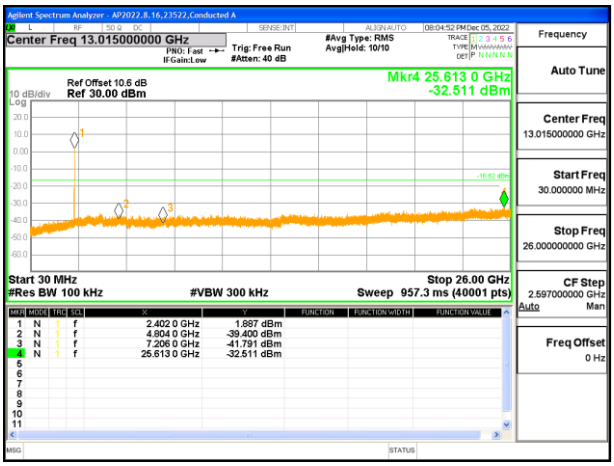
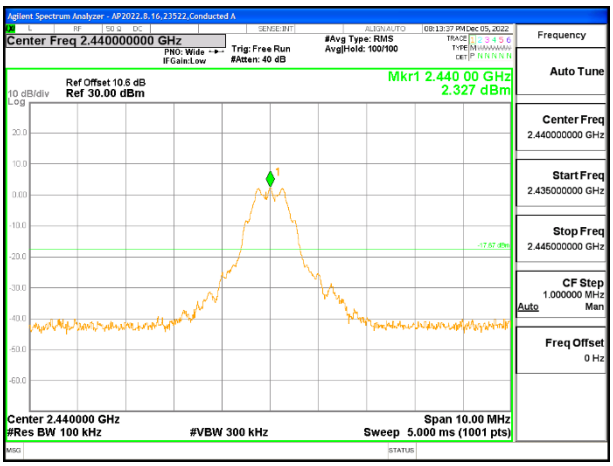
9.6.3. BLE (125Kbps)



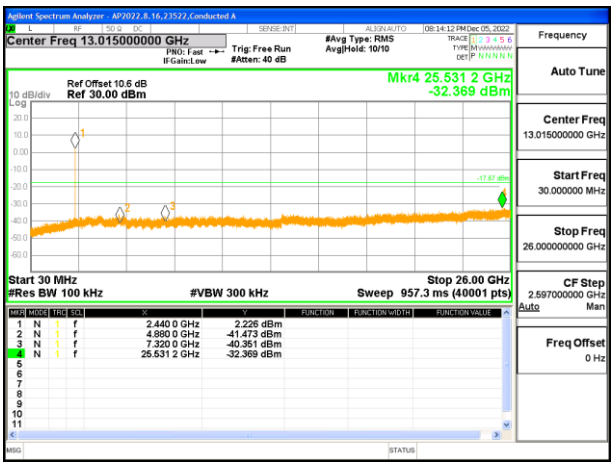
LOW CHANNEL BANDEDGE



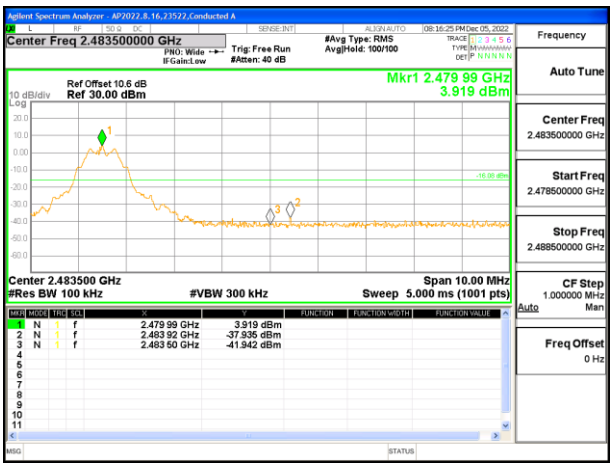
OUT-OF-BAND LOW CHANNEL



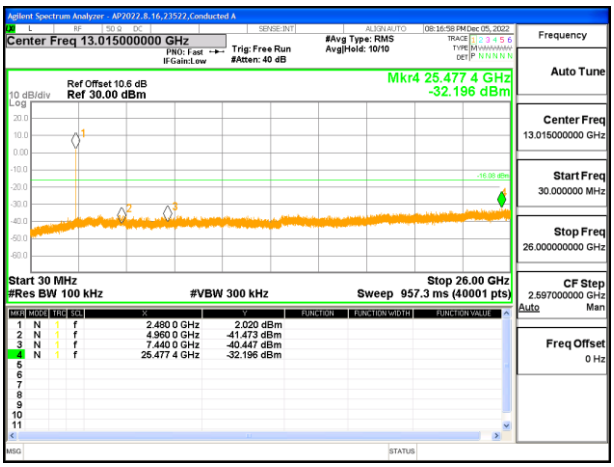
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

UL VERIFICATION SERVICES
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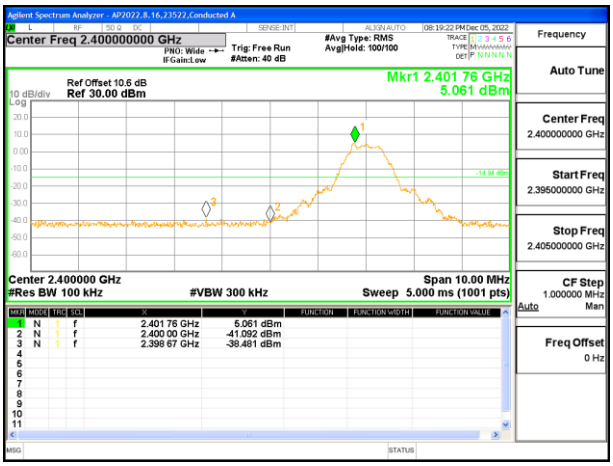
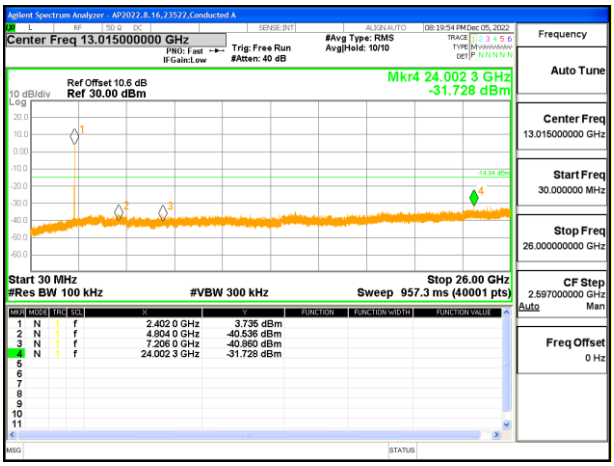
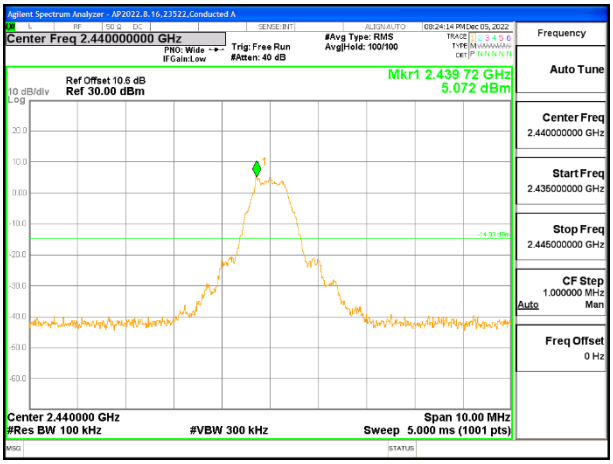
9.6.4. BLE (500Kbps)



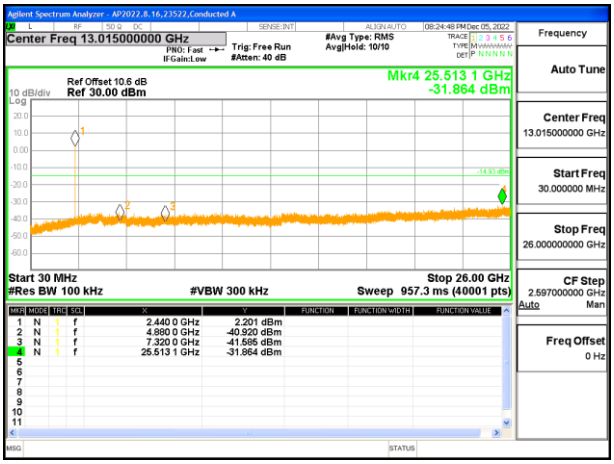
LOW CHANNEL BANDEDGE



OUT-OF-BAND LOW CHANNEL

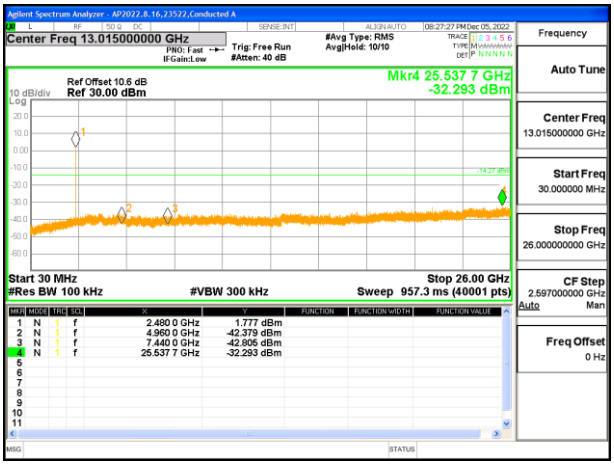


IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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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.

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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.

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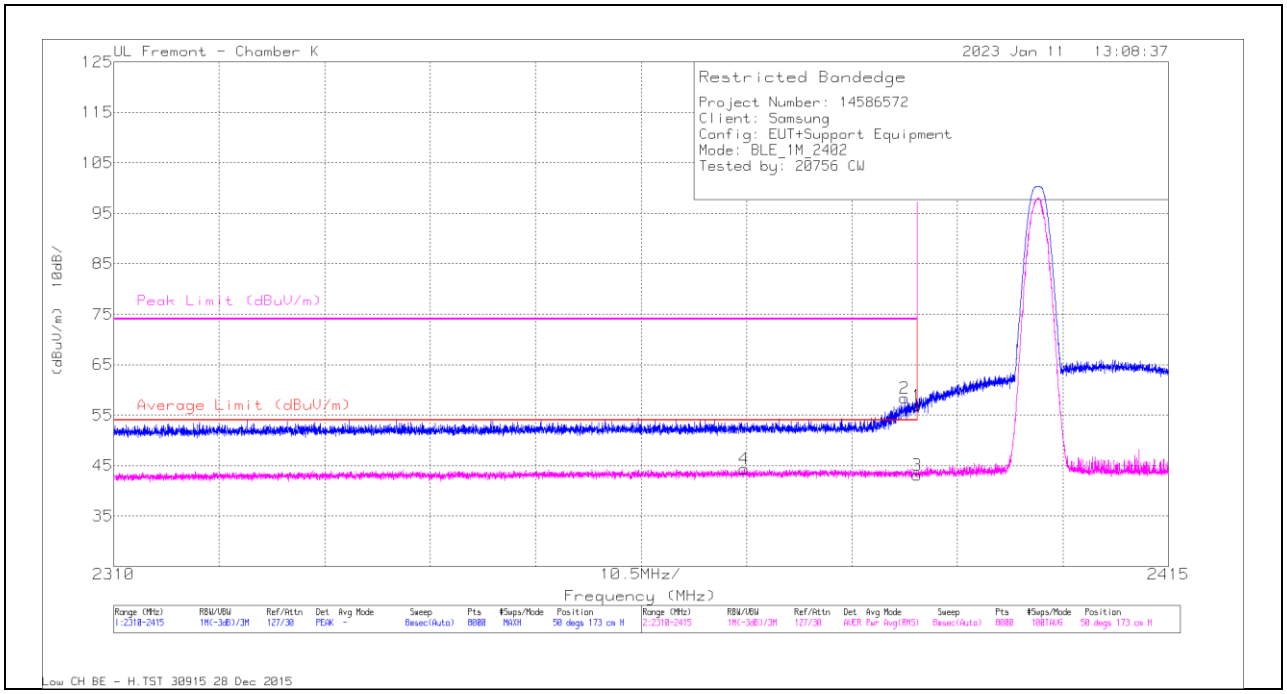
10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BLE (1Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	223083 ACF (dB) 3mH	Amp/Cbl/Pad (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	* 2390	60.01	Pk	31.8	-34.9	0	56.91	-	-	74	-17.09	50	173	H
2	* 2388.749	61.4	Pk	31.8	-34.8	0	58.4	-	-	74	-15.6	50	173	H
3	* 2390	44.25	RMS	31.8	-34.9	2.1	43.25	54	-10.75	-	-	50	173	H
4	* 2372.786	45.56	RMS	31.7	-34.9	2.1	44.46	54	-9.54	-	-	50	173	H

* - indicates frequency in CFR47 Pt 15
Pk - Peak detector
RMS - RMS detection

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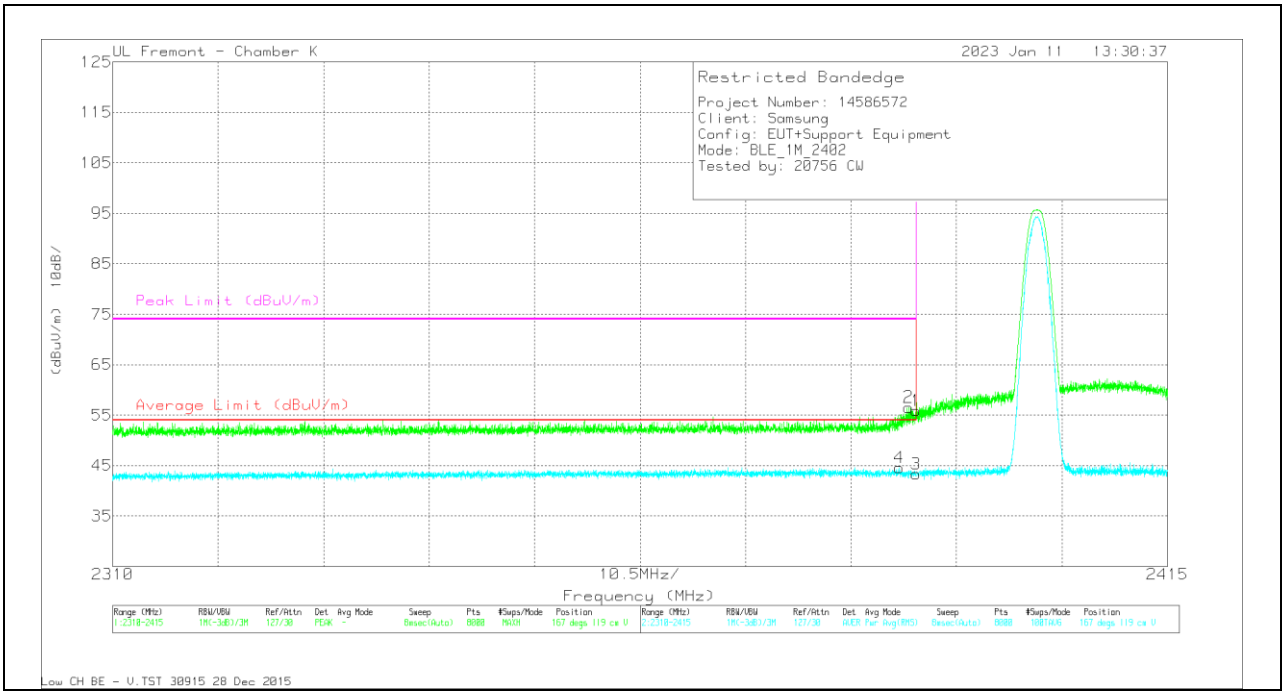
VERTICAL RESULT



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	223083 ACF (dB) 3mH	Amp/Cbl/Pad (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	* 2390	58.97	Pk	31.8	-34.9	0	55.87	-	-	74	-18.13	167	119	V
2	* 2389.221	59.66	Pk	31.8	-34.9	0	56.56	-	-	74	-17.44	167	119	V
3	* 2390	44.34	RMS	31.8	-34.9	2.1	43.34	54	-10.66	-	-	167	119	V
4	* 2388.316	45.52	RMS	31.8	-34.8	2.1	44.62	54	-9.38	-	-	167	119	V

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RMS - RMS detection

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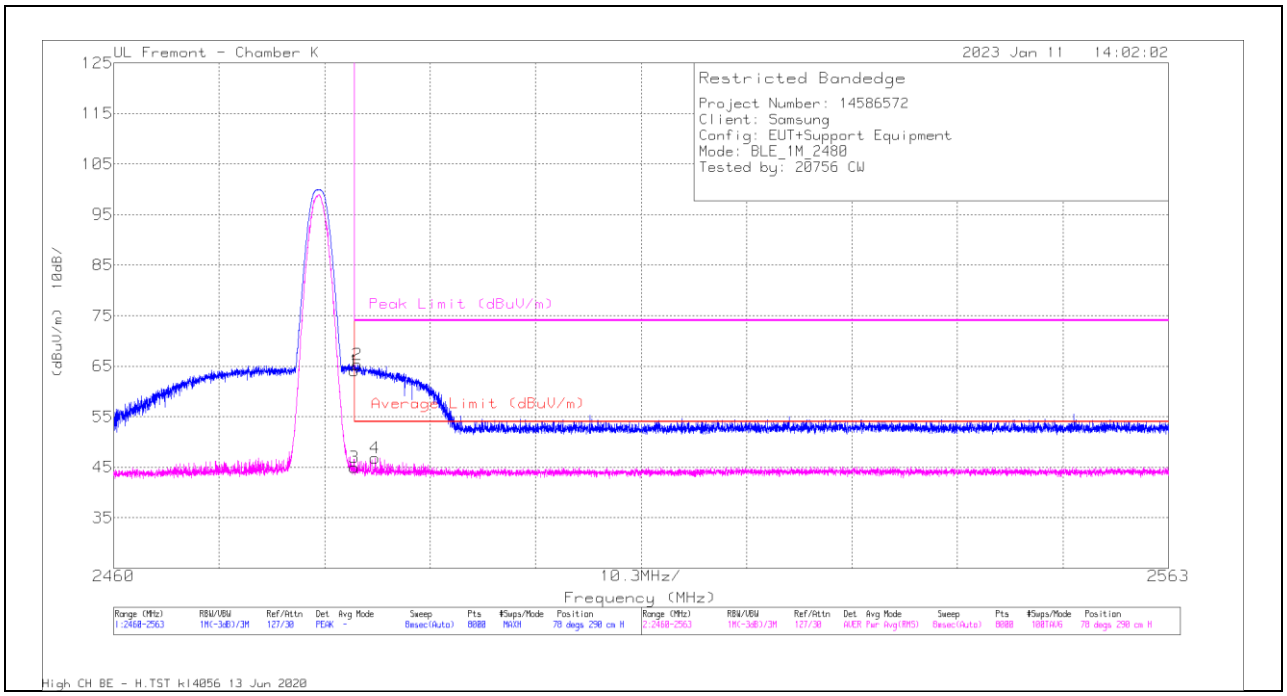
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	223083 ACF (dB) 3mH	Amp/Cbl/Pad (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	* 2483.5	66.41	Pk	32.2	-34.5	0	64.11	-	-	74	-9.89	78	290	H
2	* 2483.81	67.6	Pk	32.2	-34.5	0	65.3	-	-	74	-8.7	78	290	H
3	* 2483.5	45.22	RMS	32.2	-34.5	2.1	45.02	54	-8.98	-	-	78	290	H
4	* 2485.522	47.09	RMS	32.2	-34.5	2.1	46.89	54	-7.11	-	-	78	290	H

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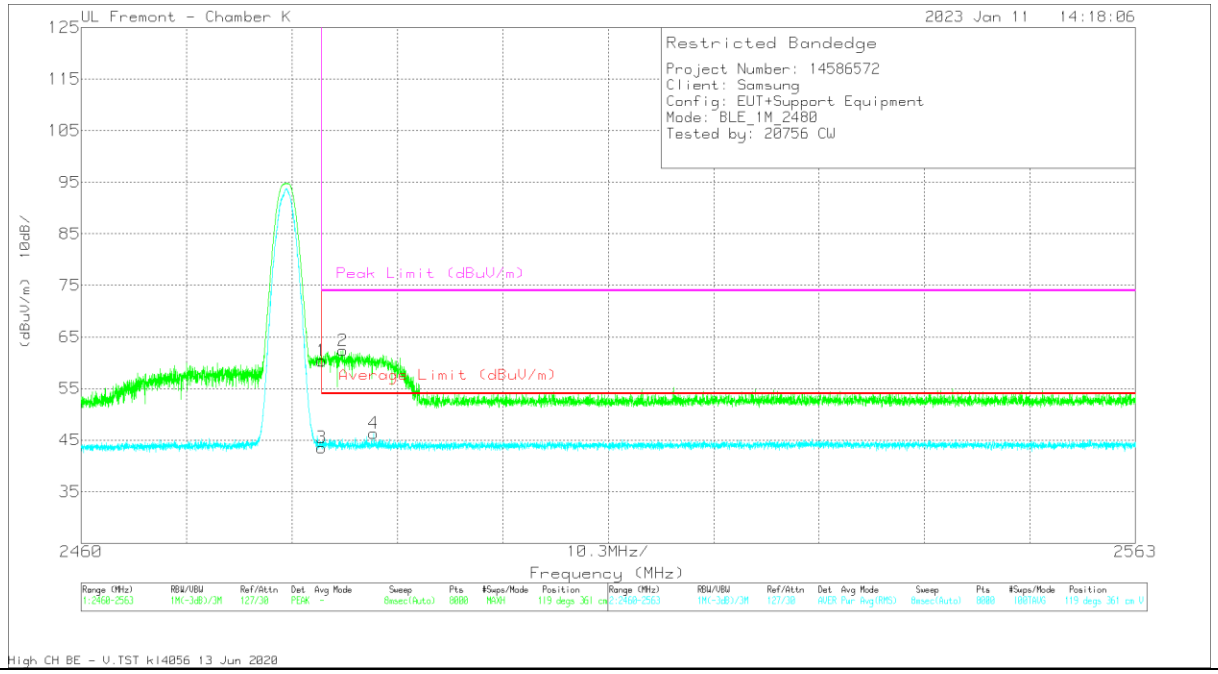
VERTICAL RESULT



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	223083 ACF (dB) 3mH	Amp/Cbl/Pad (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	* 2483.5	62.68	Pk	32.2	-34.5	0	60.38	-	-	74	-13.62	119	361	V
2	* 2485.574	64.68	Pk	32.2	-34.5	0	62.38	-	-	74	-11.62	119	361	V
3	* 2483.5	43.86	RMS	32.2	-34.5	2.1	43.66	54	-10.34	-	-	119	361	V
4	* 2488.587	46.53	RMS	32.2	-34.4	2.1	46.43	54	-7.57	-	-	119	361	V

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