CERTIFICATION TEST REPORT

Report Number. : 12204447-E2V3

Applicant	:	APPLE, INC. 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	:	A2097
FCC ID	:	BCG-E3232A
IC	:	579C-E3232A
EUT Description	:	SMARTPHONE
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C IC RSS-247 ISSUE 2

Date Of Issue:
August 10, 2018

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	7/13/2018	Initial Issue	Chin Pang
V2	7/16/2018	Address TCB's Questions	Chin Pang
V3	8/10/2018	Address TCB's Questions	Jingang Li

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: SMARTPHONE

MODEL: A2097

SERIAL NUMBER: C39WP04UK95F

DATE TESTED: JANUARY 31, 2018 – MAY 08, 2018

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5	Complies

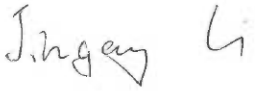
UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. 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 NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For
UL Verification Services Inc. By:

Chin Pang
CONSUMER TECHNOLOGY DIVISION
Senior Engineer
UL Verification Services Inc.

Prepared By:



Jingang Li
CONSUMER TECHNOLOGY DIVISION
TEST ENGINEER
UL Verification Services Inc.

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, KDB 558074 D01 v04, ANSI C63.10-2013, RSS-GEN Issue 5, and RSS-247 Issue 2.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
☐ Chamber A (ISED:2324B-1)	☒ Chamber D (ISED:22541-1)
☐ Chamber B (ISED:2324B-2)	☐ Chamber E (ISED:22541-2)
☐ Chamber C (ISED:2324B-3)	☐ Chamber F (ISED:22541-3)
	☒ Chamber G (ISED:22541-4)
	☐ Chamber H (ISED:22541-5)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through C are covered under ISED company address code 2324B with site numbers 2324B -1 through 2324B-3, respectively. Chambers D through H are covered under ISED company address code 22541 with site numbers 22541 -1 through 22541-5, respectively.

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at NVLAP Lab Search.

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4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.24 dB

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

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5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The Apple iPhone, is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, TD-SCDMA, CDMA, IEEE 802.11a/b/g/n/ac, Bluetooth, GPS and NFC. All models support at least one UICC based SIM. The second SIM is either UICC based, electronic SIM (e-SIM), or second SIM is not present. The device has a built-in inductive charging receiver which is not user accessible. The rechargeable battery is not user accessible.

5.2. MAXIMUM OUTPUT POWER

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

Antenna	Configuration	Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
Ant 4	Pstandalone	2402 - 2480	BLE 1M	16.89	48.87
	Plow			10.37	10.89
	Pstandalone		BLE 2M	16.89	48.87
	Plow			10.39	10.94
Ant 3	Pstandalone	2402 - 2480	BLE 1M	20.37	108.89
	Plow			10.43	11.04
	Pstandalone		BLE 2M	20.37	108.89
	Plow			10.31	10.74

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Range (GHz)	Ant. 4 (dBi)	Ant. 3 (dBi)
2.4	-2.8	-4.1

5.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was v16.1.69.1066

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5.5. WORST-CASE CONFIGURATION AND MODE

The EUT was investigated in three orthogonal orientations X, Y and Z on ANT 4 (Antenna 4) and ANT 3 (Antenna 3). It was determined that Z (Portrait) orientation was the worst-case orientation on both ANT 4 and ANT 3.

Pstandalone is high power, Plow is low power.

Radiated band edge, harmonic, and spurious emissions from 1GHz to 18GHz were performed with the EUT was set to transmit at highest power on Low/Middle/High channels.

Radiated emissions below 30MHz, below 1GHz, 18-26GHz and power line conducted emissions were performed with the EUT transmits at the channel with the highest output power as worst-case scenario.

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

For simultaneous transmission of multiple channels in the 2.4GHz BLE and 5GHz bands. No noticeable new emission was found.

There are two vendors of the WiFi/Bluetooth radio modules: variant 1 and variant 2. The Wi-Fi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

Baseline testing was performed on the two variants to determine the worst case on all conducted power and radiated emissions.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
laptop	Apple	Macbook Pro	C02P41RZG086	FCC Doc
Laptop AC/DC adapter	Liteon Technology	PA-1450-BA1	B123	NA
EUT AC Adapter	Apple	A1385	D293062F3WVDHLHCF	NA

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	SMA	Un-Shielded	0.2	To spectrum Analyzer
2	USB	1	USB	Shielded	1	N/A
3	AC	1	AC	Un-shielded	2	N/A

I/O CABLES (RADIATED ABOVE 1 GHZ)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
None Used						

I/O CABLES (BELOW 1GHz AND AC POWER LINE TEST WITH ADAPTER AND LAPTOP)

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

TEST SETUP

The EUT is connected to a test laptop during the tests. Test software exercised the EUT.

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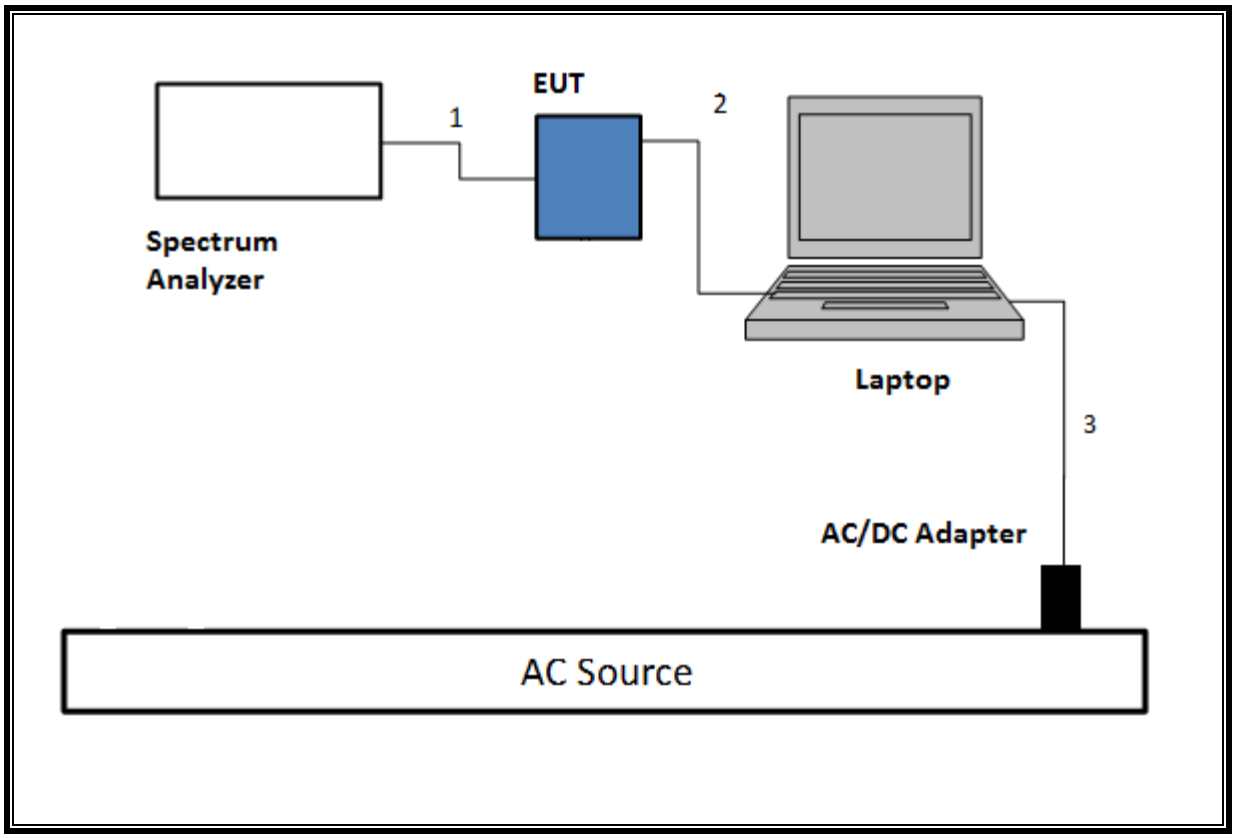
SETUP DIAGRAM FOR CONDUCTED TESTS



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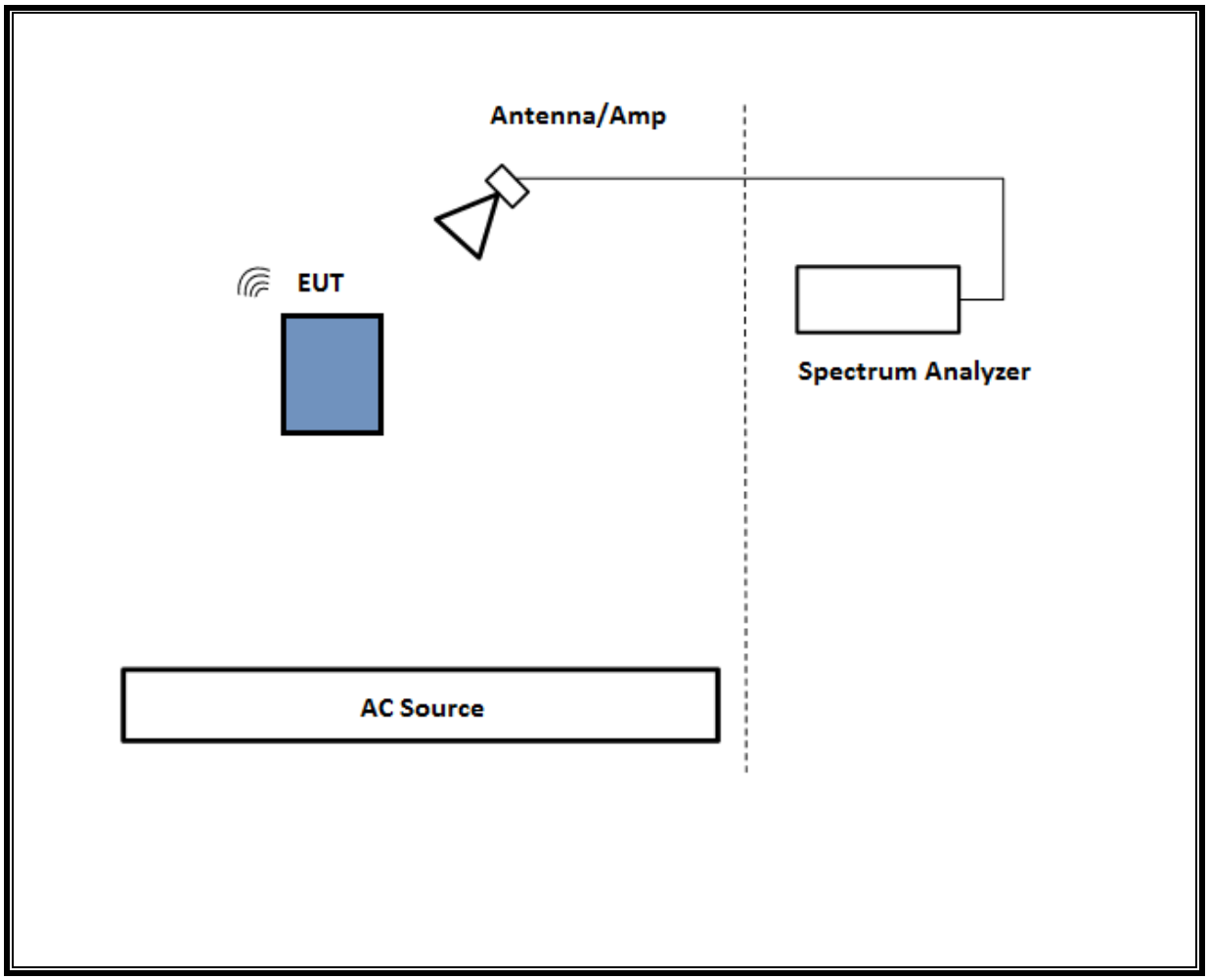
SETUP DIAGRAM FOR RADIATED TESTS Above 1GHz



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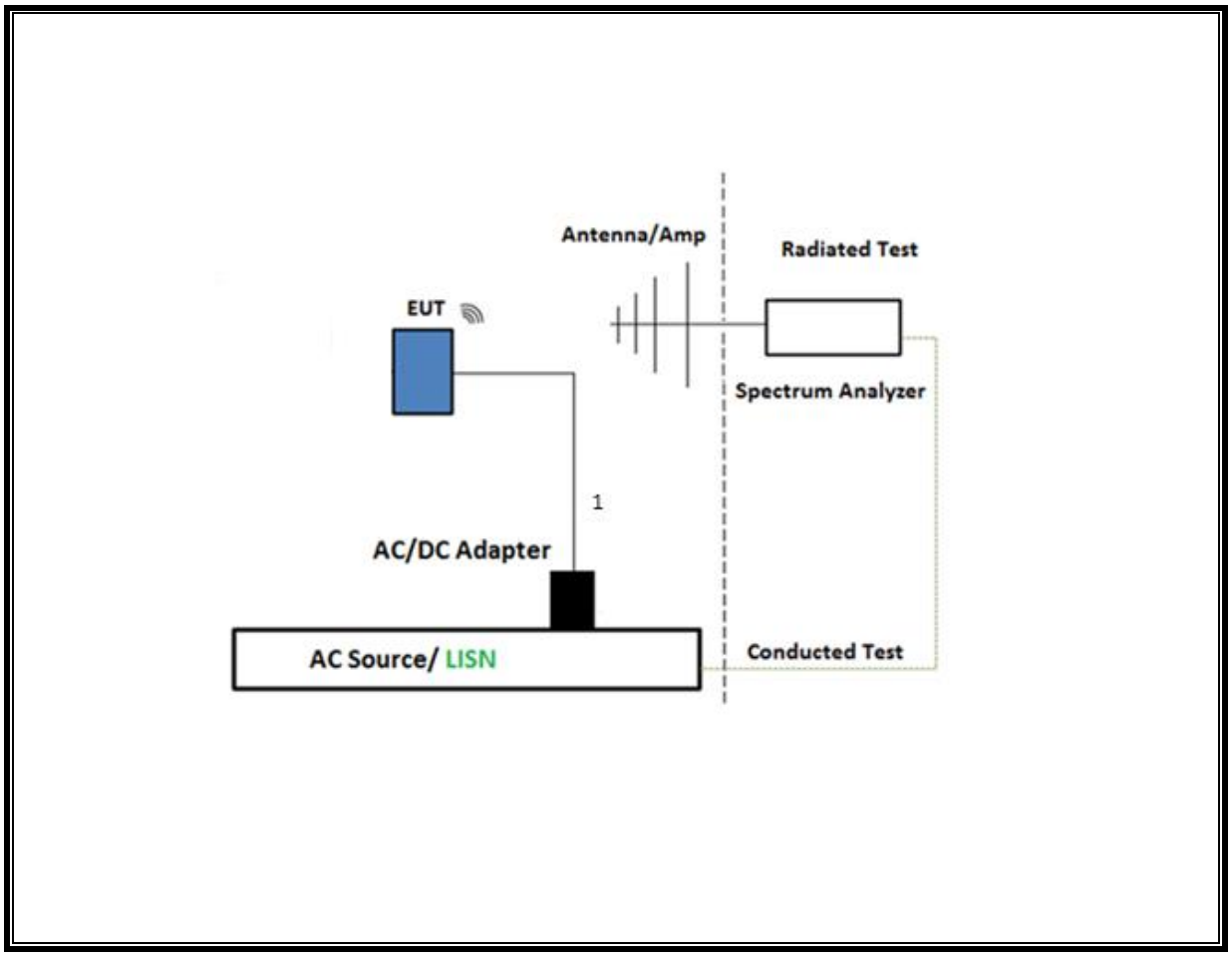
SETUP DIAGRAM FOR Below 1GHz and AC LINE CONDUCTED TEST



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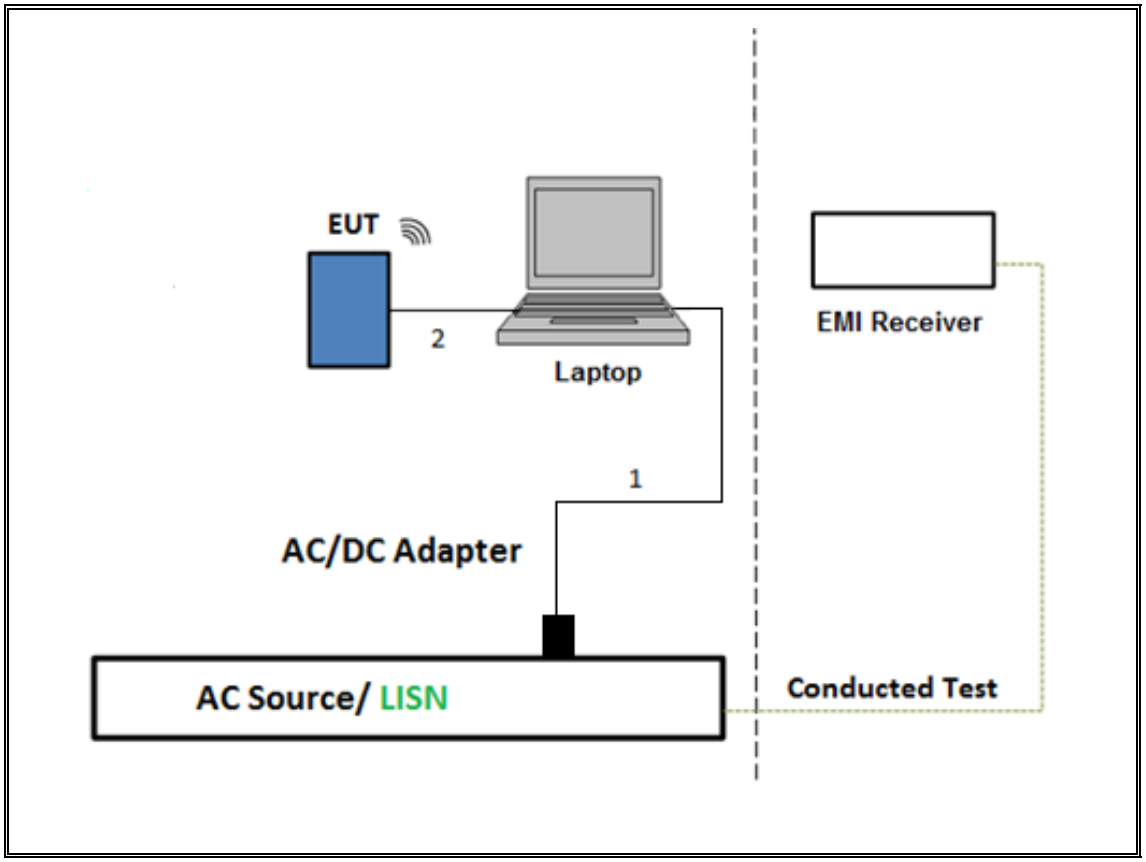
TEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION



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6. MEASUREMENT METHOD

On Time and Duty Cycle: KDB 558074 D01 v04, Section 6.

6 dB BW: KDB 558074 D01 v04, Section 8.1.

Output Power: KDB 558074 D01 v04, Section 9.1.3.

Power Spectral Density: KDB 558074 D01 v04, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v04, Section 11.0.

Out-of-band emissions in restricted bands: KDB 558074 D01 v04, Section 12.1.

Band-edge: KDB 558074 D01 v04, Section 12.1.

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

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7. TEST AND MEASUREMENT EQUIPMENT

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

Description	Manufacturer	Model	ID Num	Cal Due
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T136	06/26/2018
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T740	12/30/2018
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A	T340	12/15/2018
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T345	04/14/2019
*Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T407	04/14/2018
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T491	06/01/2018
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T834	06/01/2018
Spectrum Analyzer, PXA 3Hz to 44GHz	Keysight	N9030A-544	T341	11/12/2018
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T119	04/03/2019
Power Meter, P-series single channel	Keysight	N1912A	T1272	05/1/2019
Pre-Amp 18-26GHz	Agilent Technology	8449B	T404	07/23/2018
Antenna Horn, 18 to 26GHz	ARA	MWH-1826	T89	01/18/2019
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T1454	01/08/2019
Antenna, Active Loop 9KHz to 30MHz	EMCO	6502	T35	12/15/2018
Antenna Horn 18 to 26.5GHz	ARA	MWH-1826/B	T449	06/12/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T342	02/22/2019

AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	T1436	01/25/2019
LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2-01	T1310	06/15/2018
Power Cable, Line Conducted Emissions	UL	PG1	T861	08/31/2018
LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2-01	T1310	06/15/2018
UL AUTOMATION SOFTWARE				
Radiated Software	UL	UL EMC	Ver 9.5, April 26, 2016	
Conducted Software	UL	UL EMC	Ver 5.4, October 13, 2016	
AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015	

Note: *Testing is completed before equipment expiration date.

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8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

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 1M	1.400	1.400	1.000	100.00%	0.00	0.010
BLE 2M	0.700	0.700	1.000	100.00%	0.00	0.010

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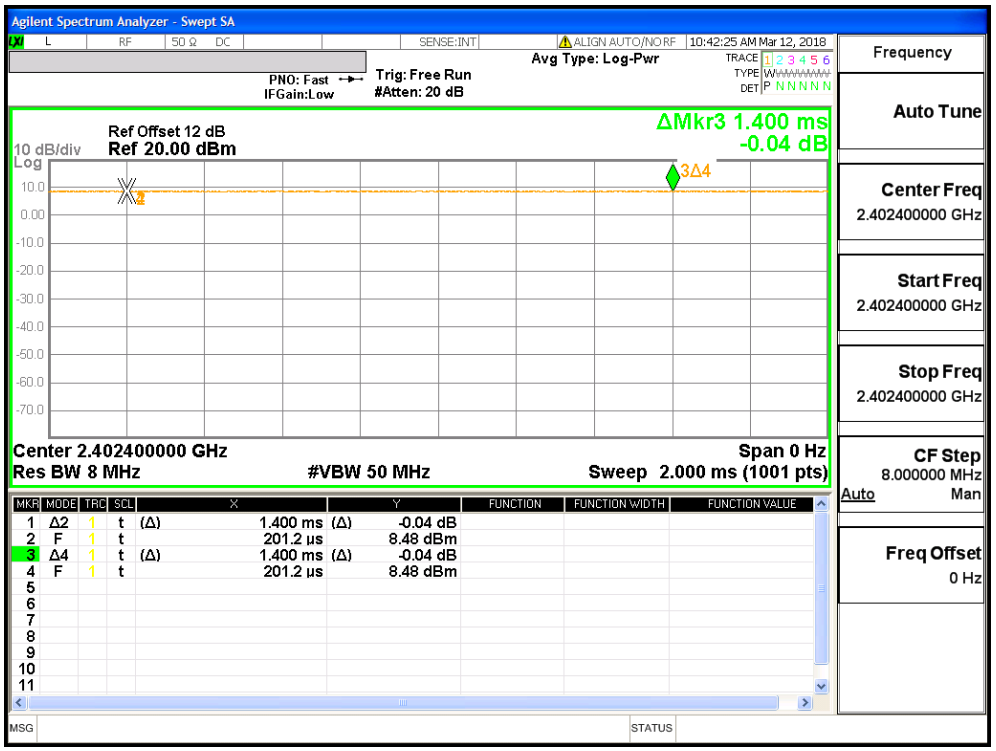
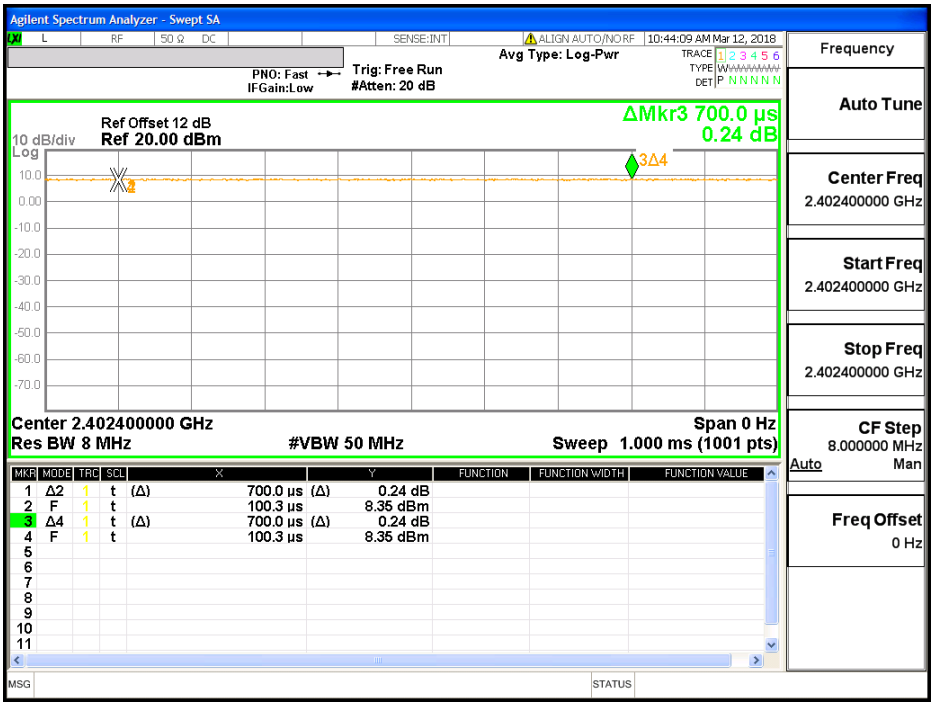
DUTY CYCLE PLOTS



DUTY CYCLE BLE



DUTY CYCLE BLE

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8.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

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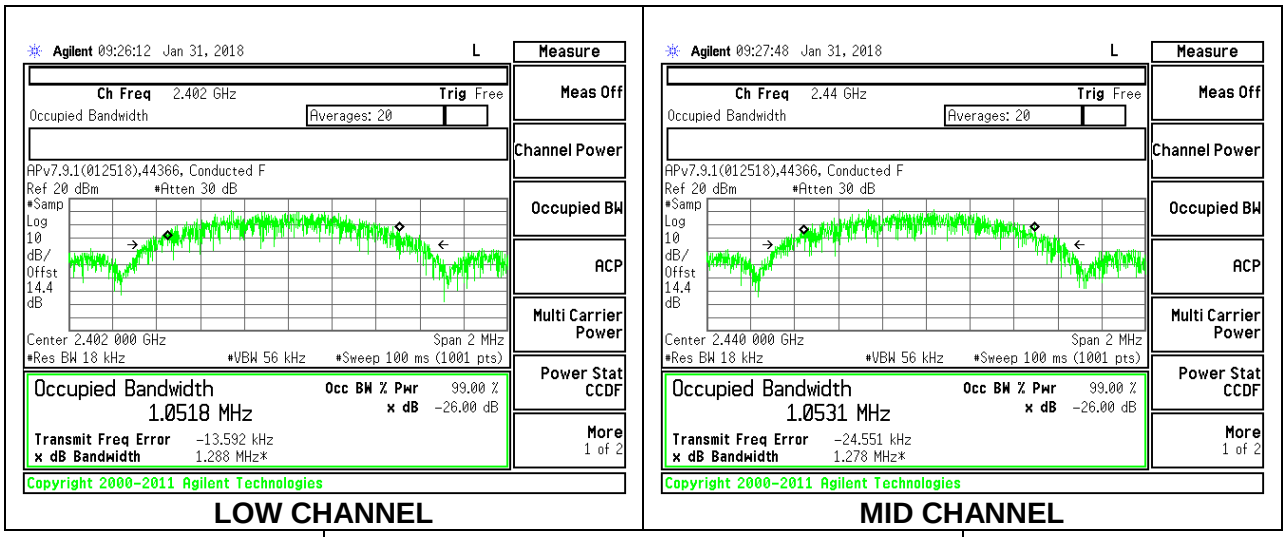
8.2.1. HIGH POWER BLE (1Mbps)

ANTENNA 4

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0518
Middle	2440	1.0531
High	2480	1.0505



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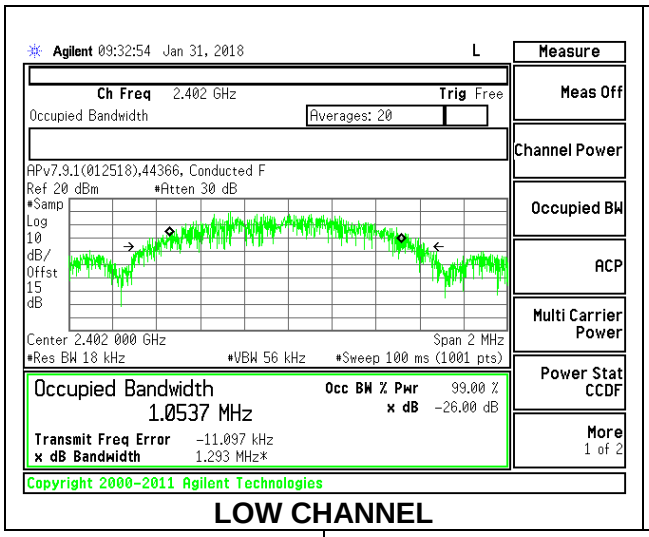
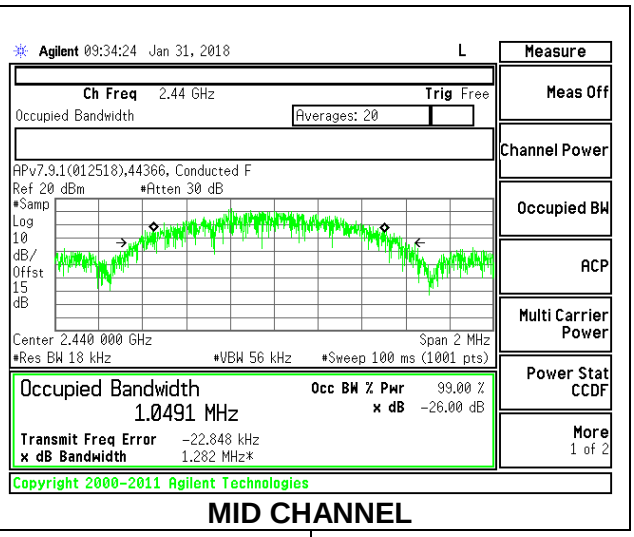
ANTENNA 3

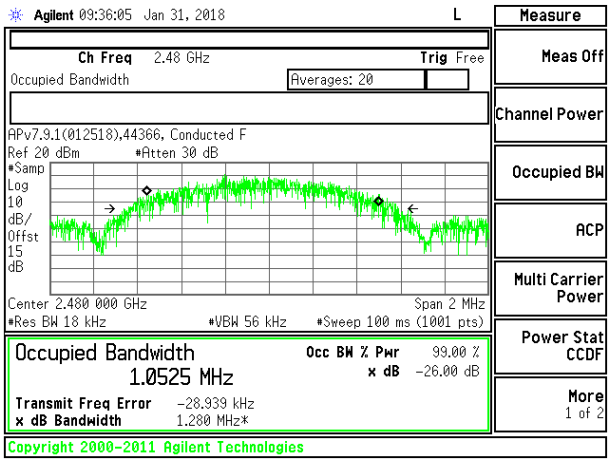
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0537
Middle	2440	1.0491
High	2480	1.0525



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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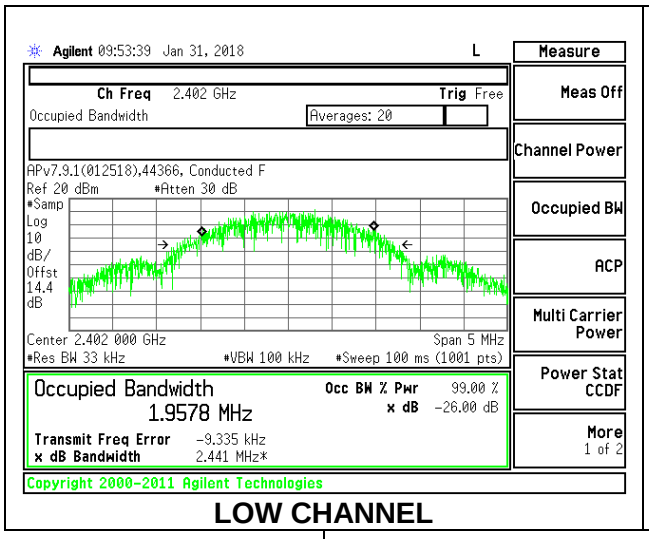
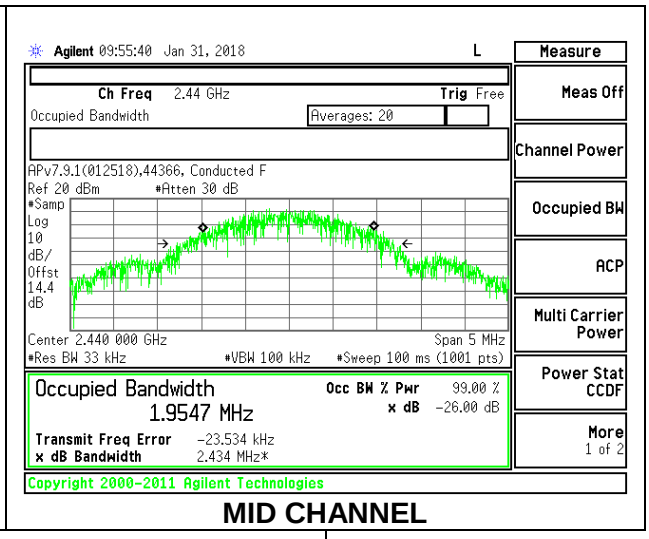
8.2.2. HIGH POWER BLE (2Mbps)

ANTENNA 4

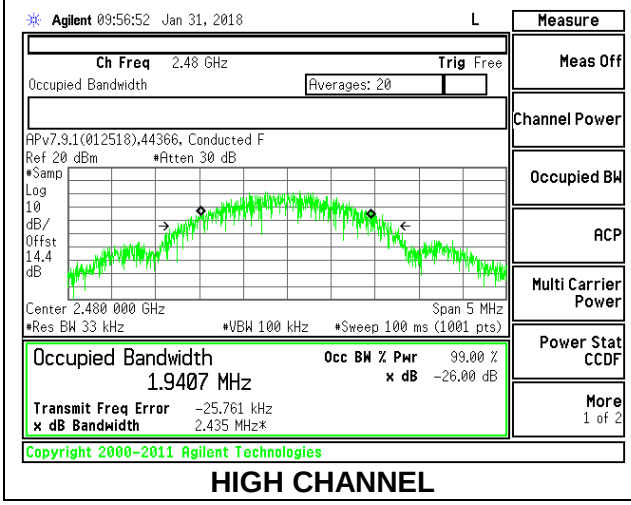
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.9578
Middle	2440	1.9547
High	2480	1.9407



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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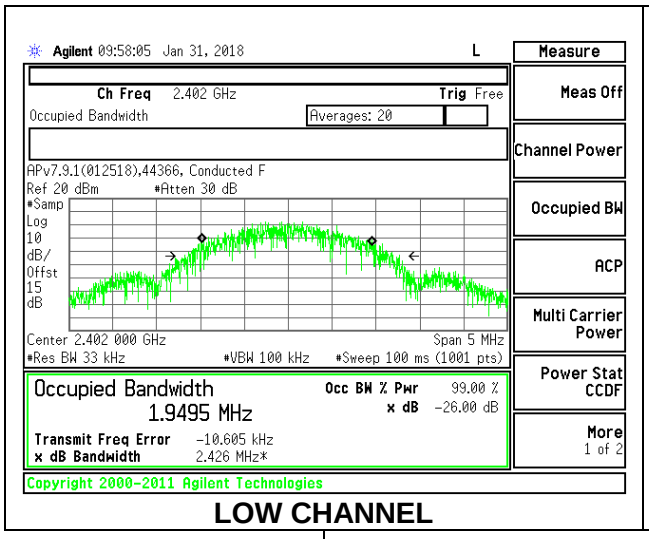
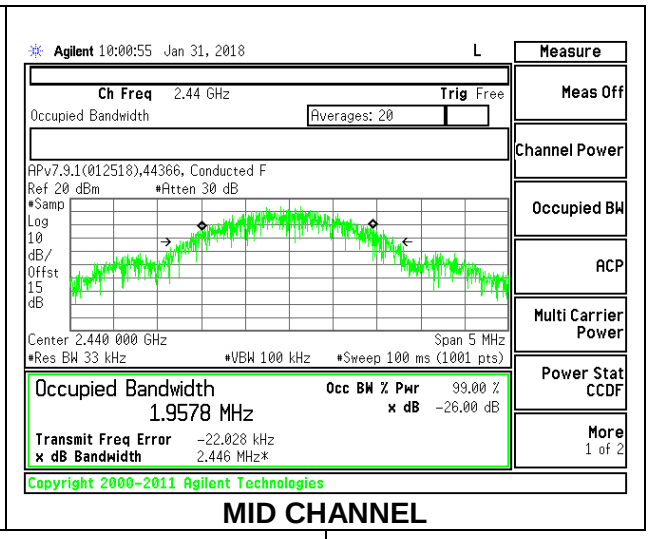
ANTENNA 3

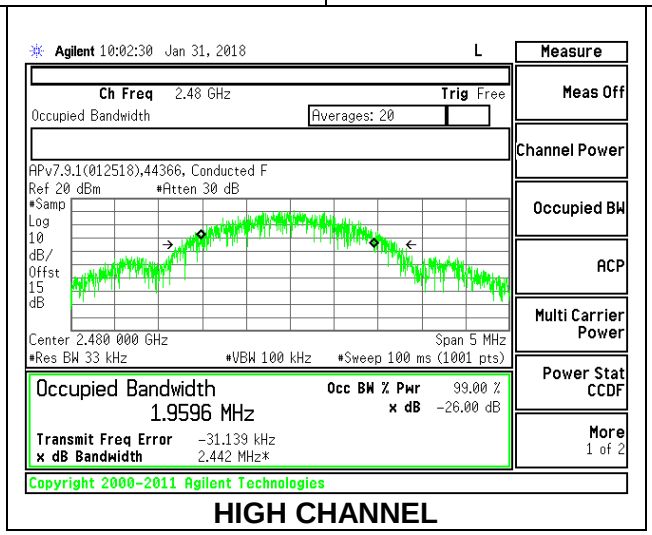
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.9495
Middle	2440	1.9578
High	2480	1.9596



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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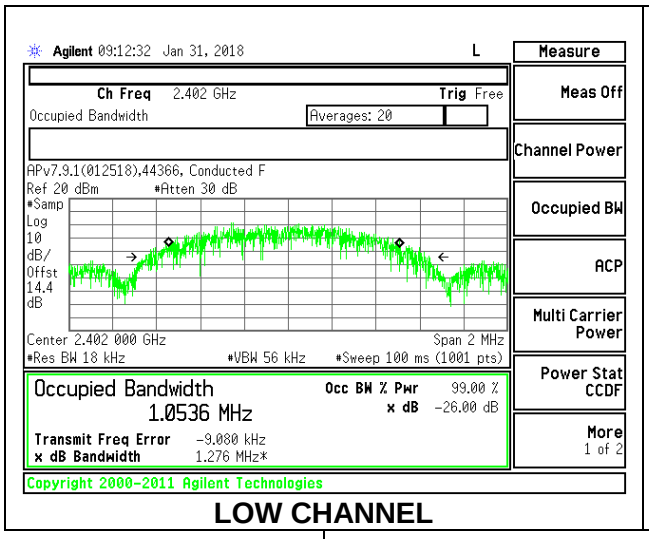
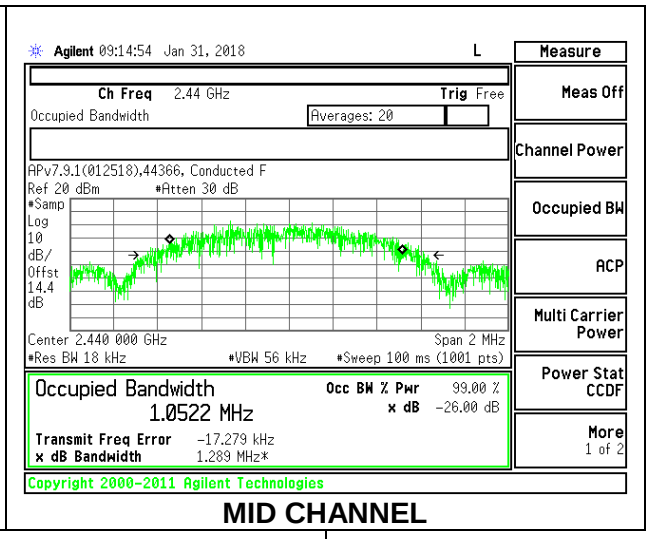
8.2.3. LOW POWER BLE (1Mbps)

ANTENNA 4

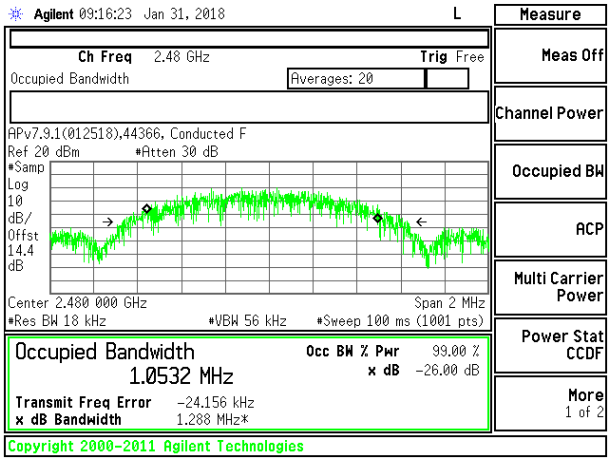
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0536
Middle	2440	1.0522
High	2480	1.0532



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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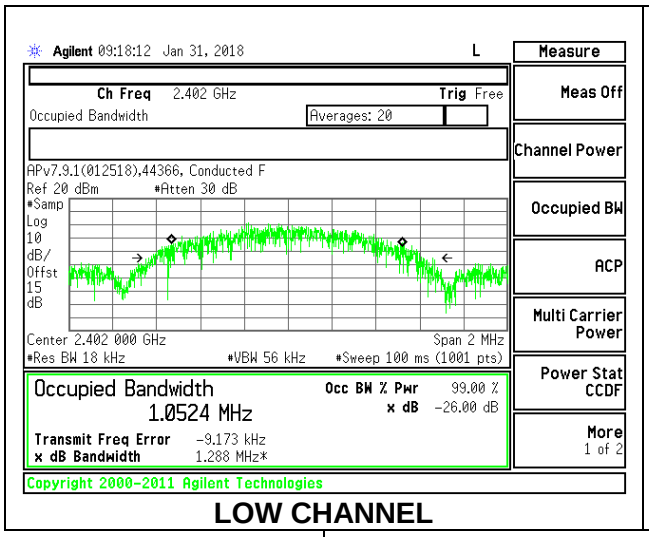
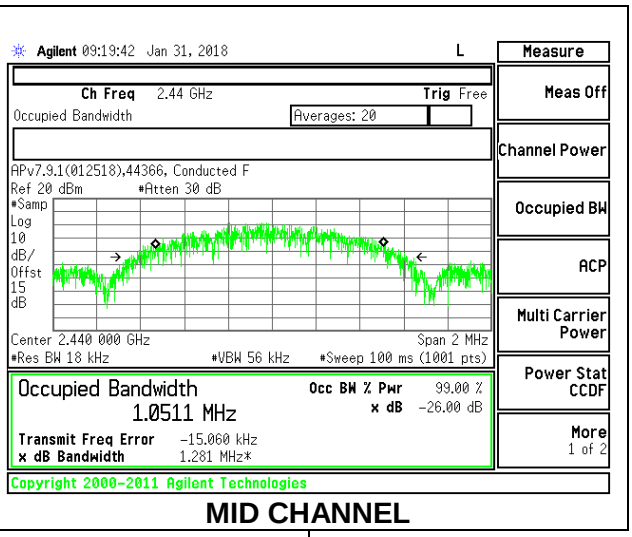
ANTENNA 3

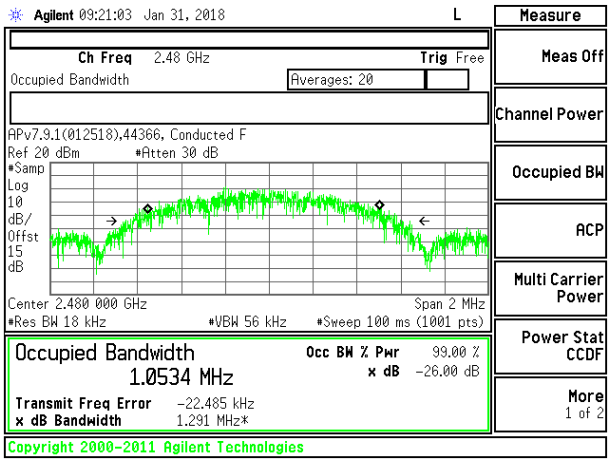
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0524
Middle	2440	1.0511
High	2480	1.0534



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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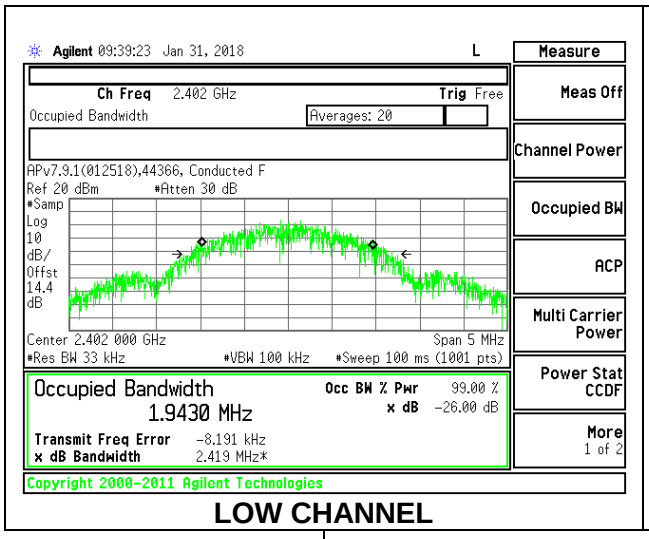
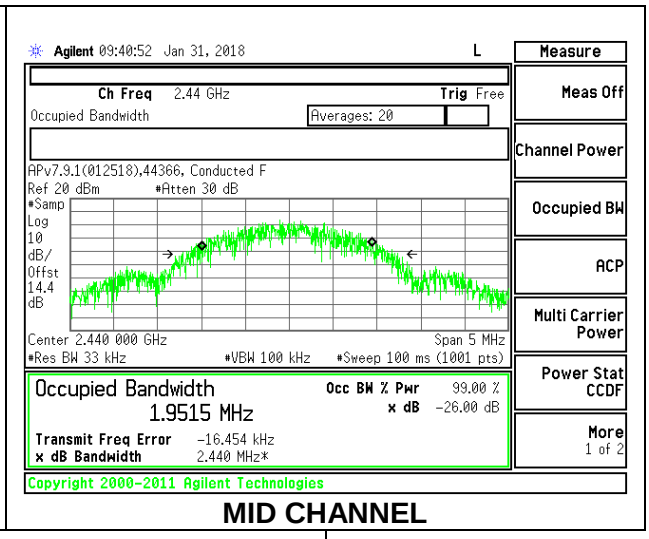
8.2.4. LOW POWER BLE (2Mbps)

ANTENNA 4

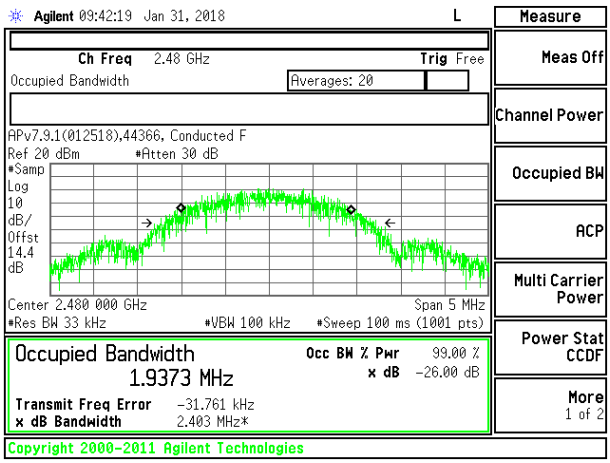
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.9430
Middle	2440	1.9515
High	2480	1.9373



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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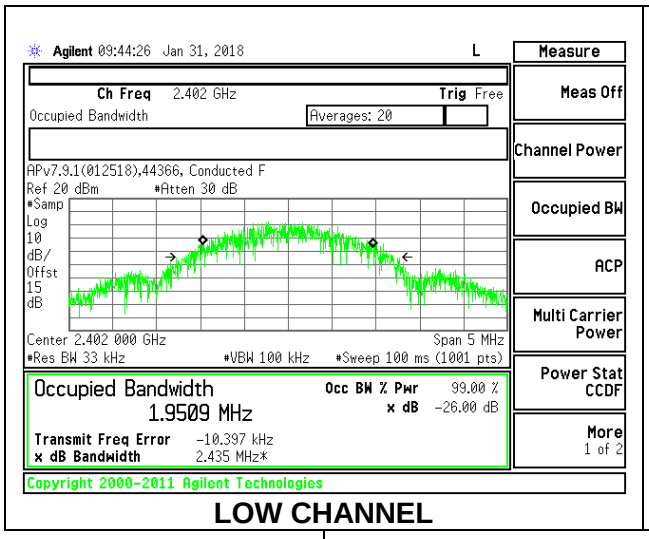
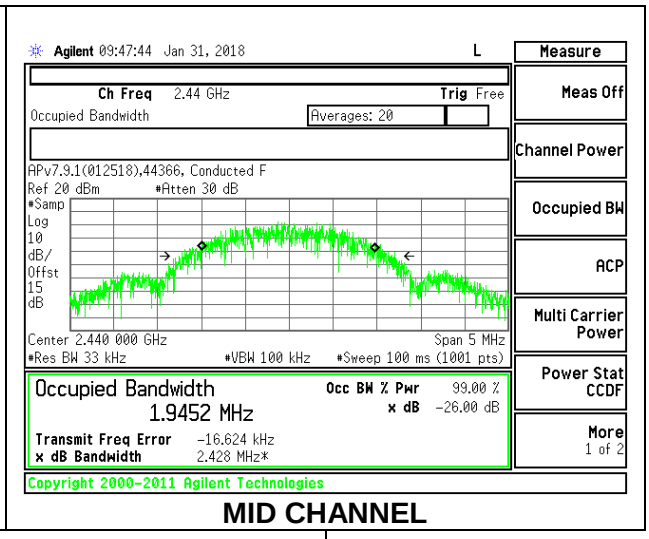
ANTENNA 3

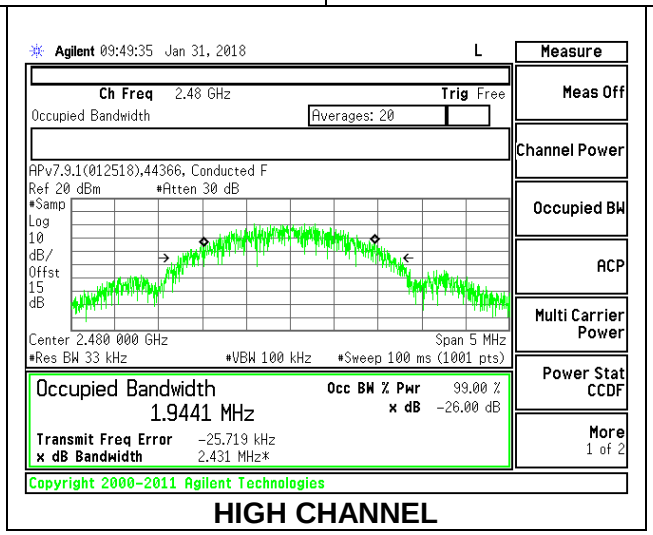
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.9509
Middle	2440	1.9452
High	2480	1.9441



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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8.3. 6 dB BANDWIDTH

LIMITS

FCC §15.407 (e)

RSS-247 5.2 (a)

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

RESULTS

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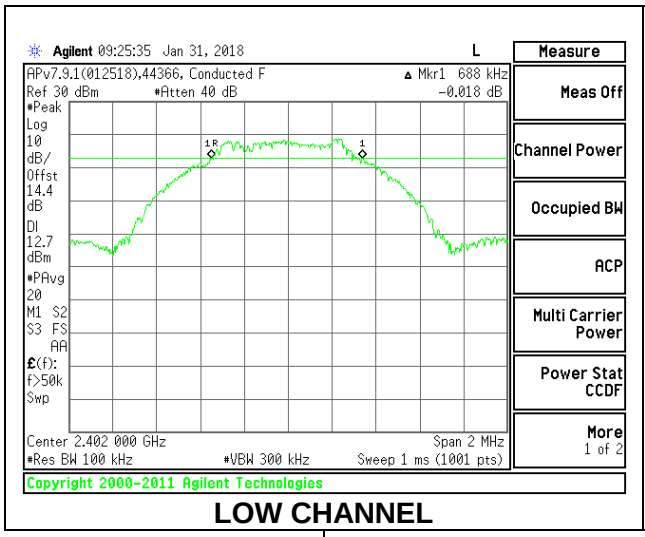
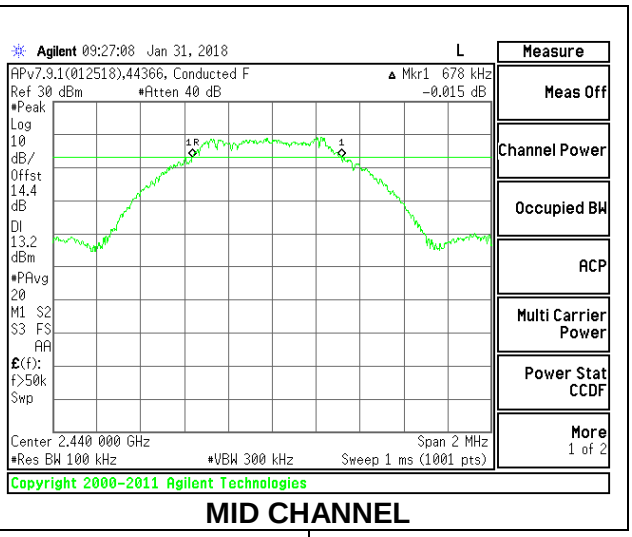
8.3.1. HIGH POWER BLE (1Mbps)

ANTENNA 4

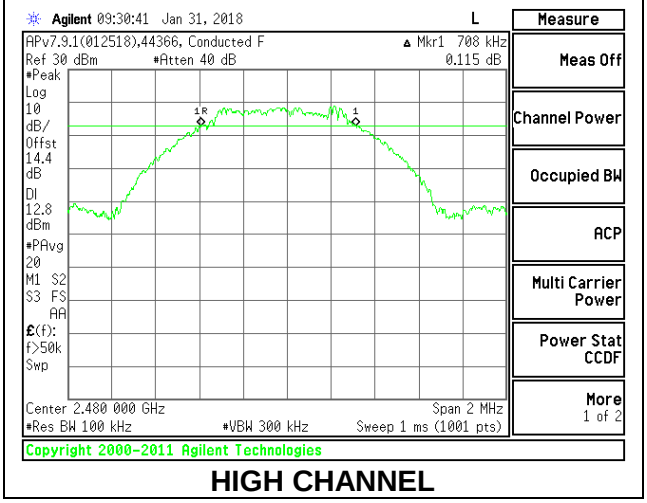
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.6880	0.5
Middle	2440	0.6780	0.5
High	2480	0.7080	0.5



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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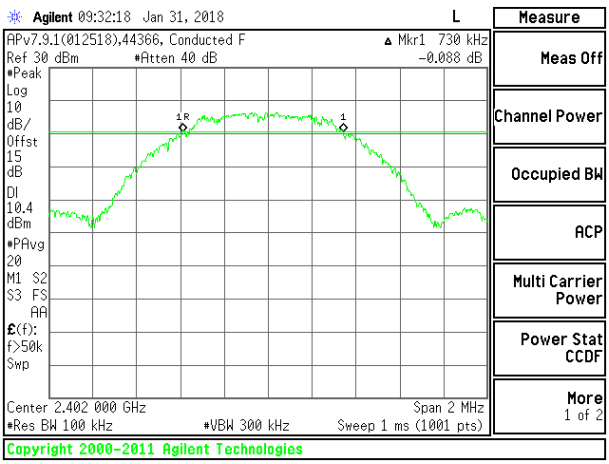
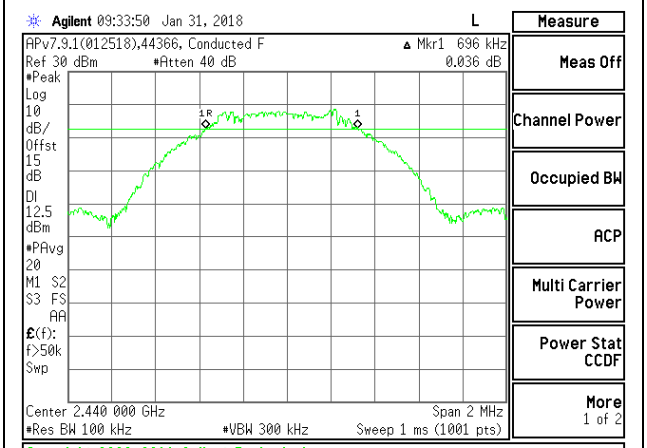
ANTENNA 3

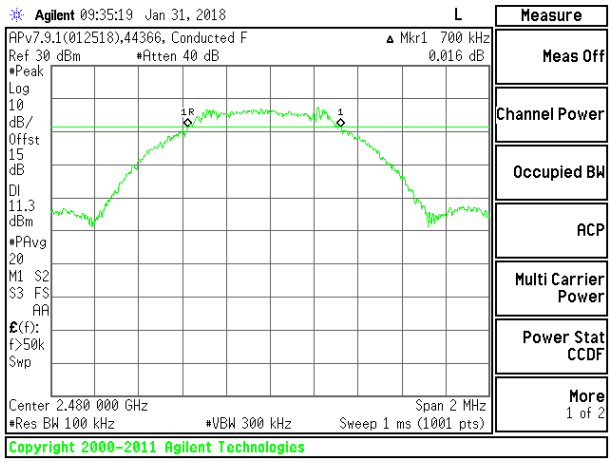
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.7300	0.5
Middle	2440	0.6960	0.5
High	2480	0.7000	0.5



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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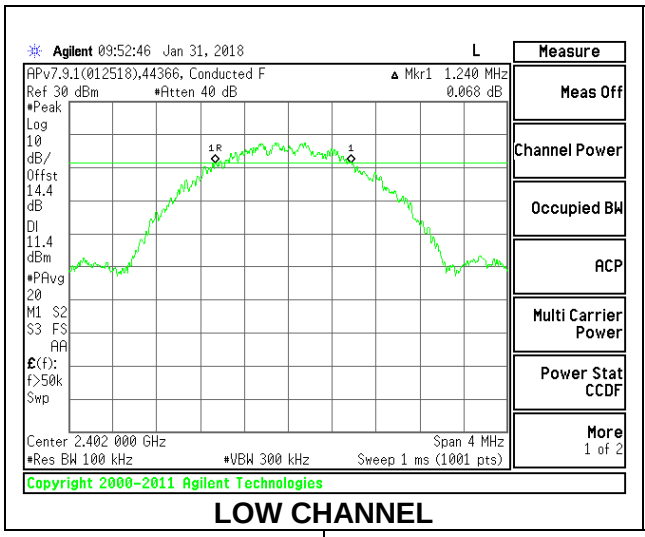
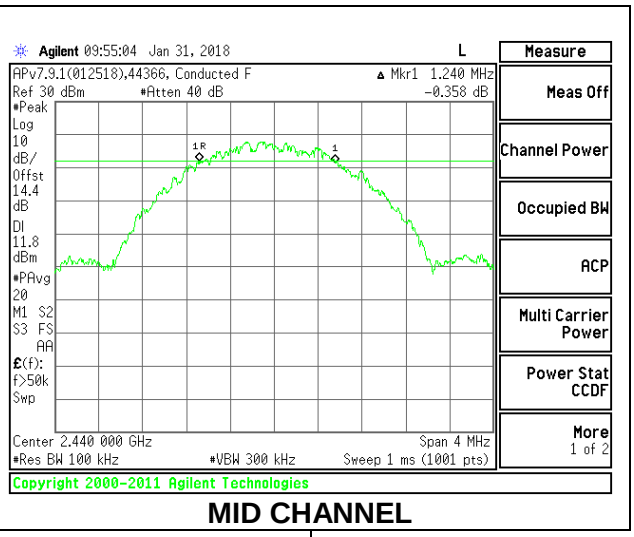
8.3.2. HIGH POWER BLE (2Mbps)

ANTENNA 4

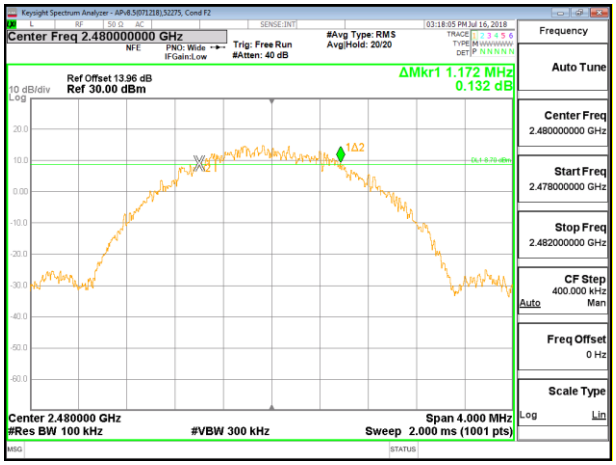
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	1.2400	0.5
Middle	2440	1.2400	0.5
High	2480	1.1720	0.5



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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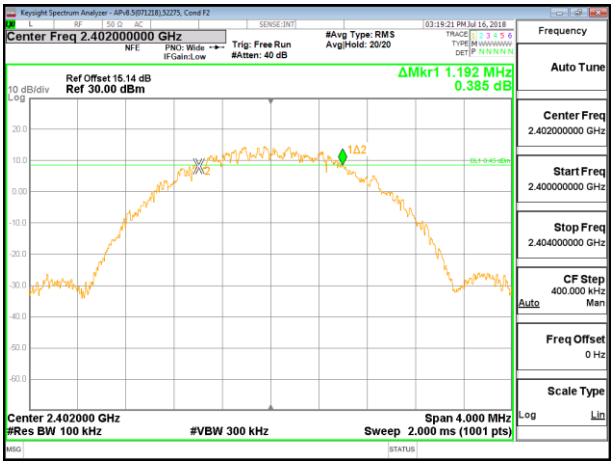
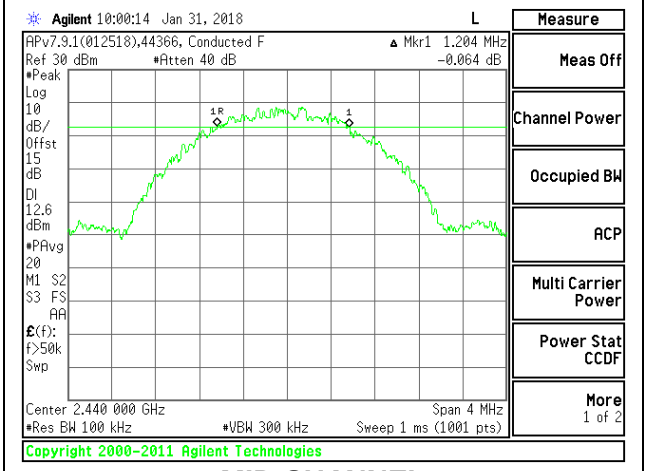
ANTENNA 3

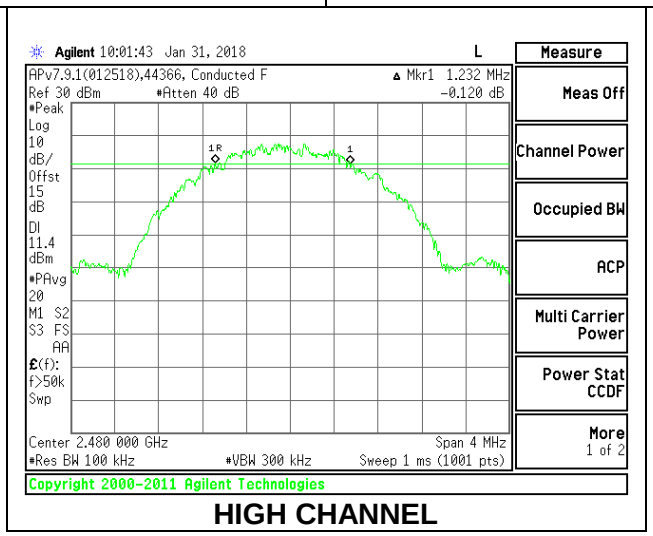
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	1.1920	0.5
Middle	2440	1.2040	0.5
High	2480	1.2320	0.5



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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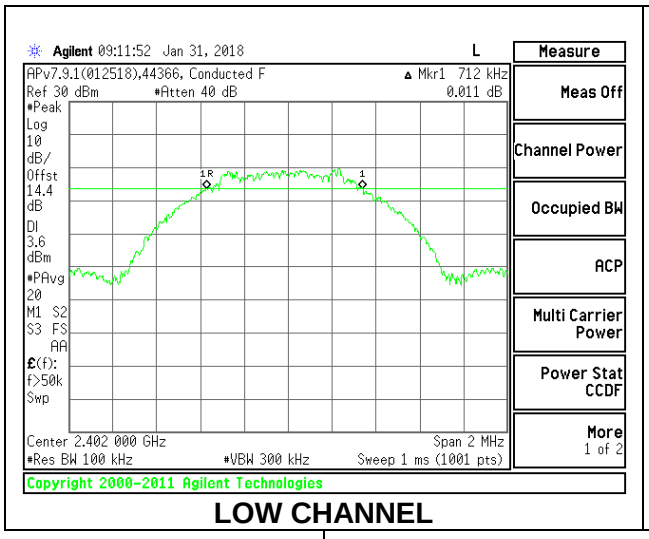
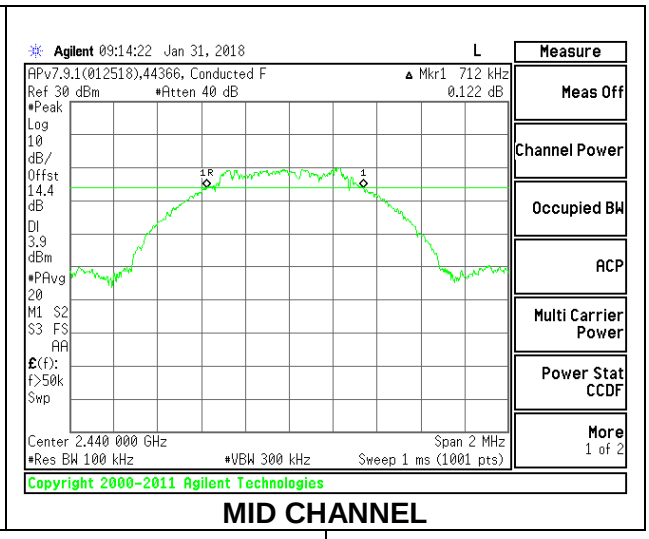
8.3.3. LOW POWER BLE (1Mbps)

ANTENNA 4

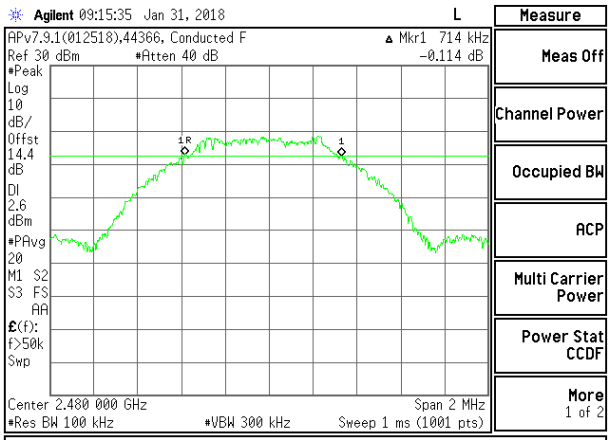
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.7120	0.5
Middle	2440	0.7120	0.5
High	2480	0.7140	0.5



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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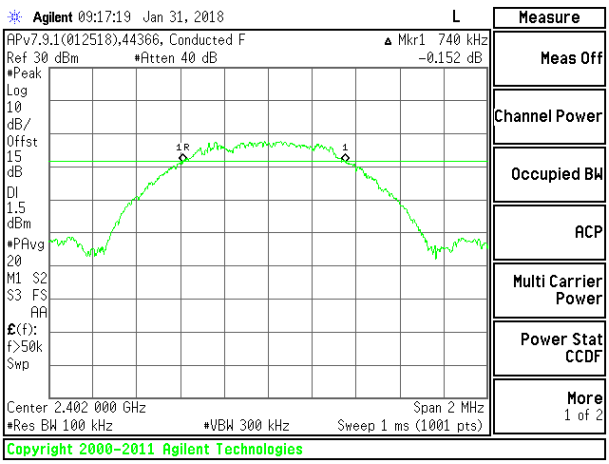
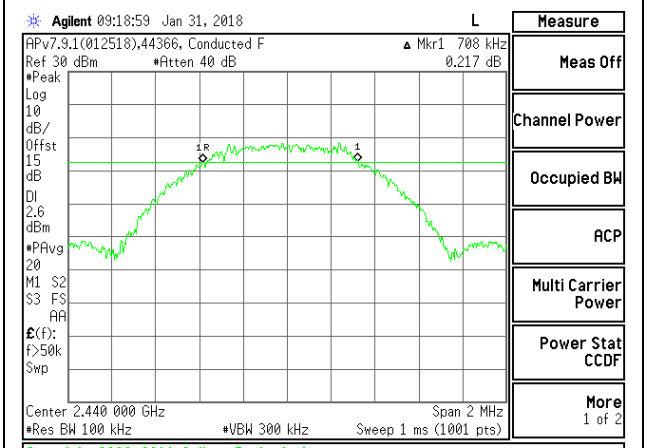
ANTENNA 3

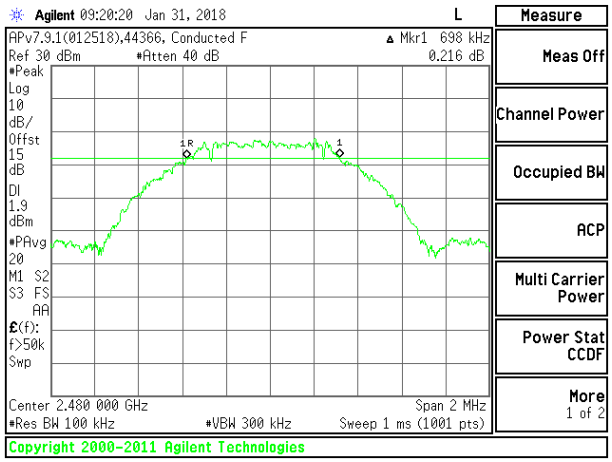
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.7400	0.5
Middle	2440	0.7080	0.5
High	2480	0.6980	0.5



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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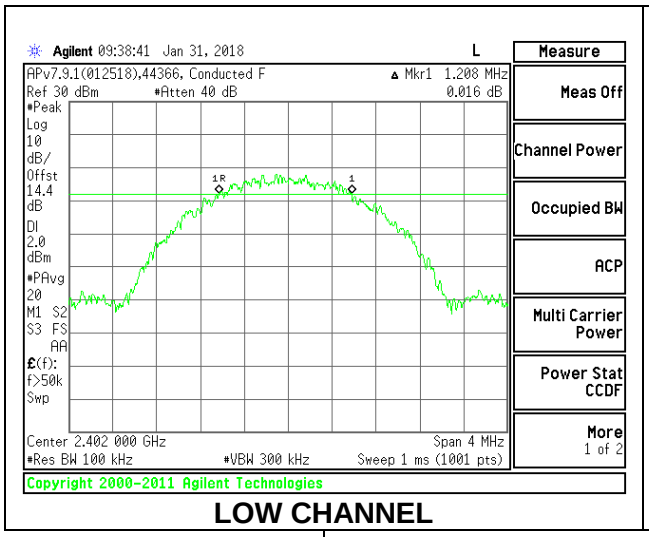
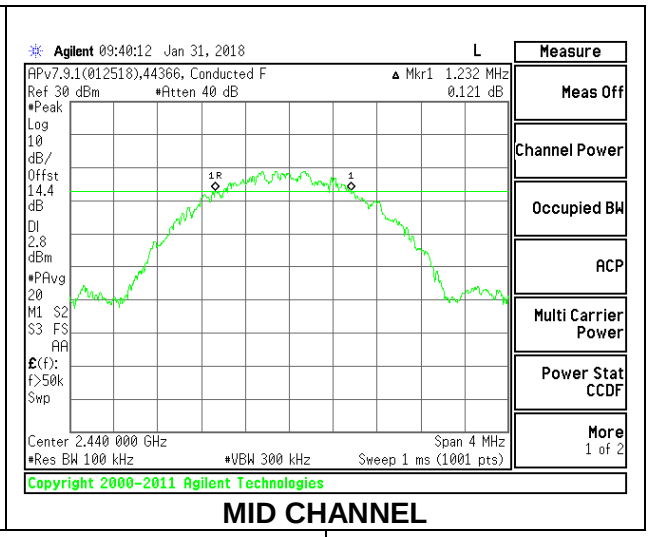
8.3.4. LOW POWER BLE (2Mbps)

ANTENNA 4

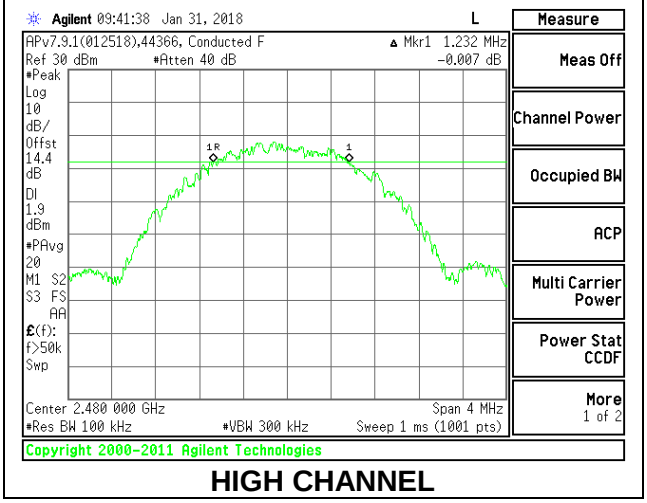
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	1.2080	0.5
Middle	2440	1.2320	0.5
High	2480	1.2320	0.5



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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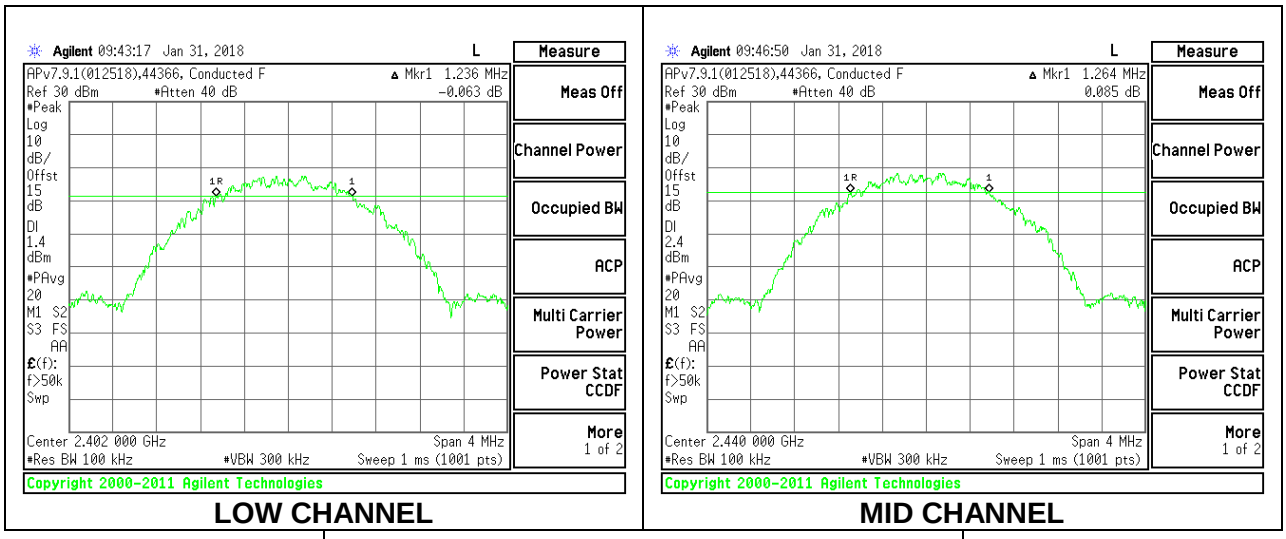
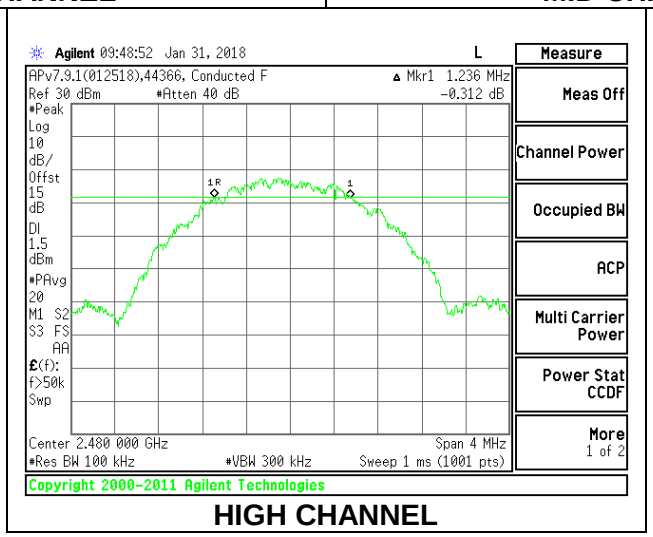
ANTENNA 3

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	1.2360	0.5
Middle	2440	1.2640	0.5
High	2480	1.2360	0.5





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8.4. 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 broadband gated Peak/average RF power meter

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for a gated peak reading of power.

RESULTS

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8.4.1. HIGH POWER BLE (1Mbps)

ANTENNA 4

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	16.88	30	-13.12
Middle	2440	16.89	30	-13.11
High	2480	16.89	30	-13.11

ANTENNA 3

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	20.10	30	-9.90
Middle	2440	20.37	30	-9.63
High	2480	20.25	30	-9.75

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8.4.2. HIGH POWER BLE (2Mbps)

ANTENNA 4

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	16.85	30	-13.15
Middle	2440	16.89	30	-13.11
High	2480	16.88	30	-13.12

ANTENNA 3

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	20.11	30	-9.89
Middle	2440	20.37	30	-9.63
High	2480	20.32	30	-9.68

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8.4.3. LOW POWER BLE (1Mbps)

ANTENNA 4

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.27	30	-19.73
Middle	2440	10.37	30	-19.63
High	2480	10.31	30	-19.69

ANTENNA 3

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.31	30	-19.69
Middle	2440	10.43	30	-19.57
High	2480	10.34	30	-19.66

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8.4.4. LOW POWER BLE (2Mbps)

ANTENNA 4

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.26	30	-19.74
Middle	2440	10.39	30	-19.61
High	2480	10.29	30	-19.71

ANTENNA 3

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.15	30	-19.85
Middle	2440	10.31	30	-19.69
High	2480	10.22	30	-19.78

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8.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a broadband gated Peak/average RF power meter

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for a gated average reading of power.

RESULTS

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8.5.1. HIGH POWER BLE (1Mbps)

ANTENNA 4

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	16.44
Middle	2440	16.49
High	2480	16.37

ANTENNA 3

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	19.61
Middle	2440	19.94
High	2480	19.79

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8.5.2. HIGH POWER BLE (2Mbps)

ANTENNA 4

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	16.37
Middle	2440	16.41
High	2480	16.40

ANTENNA 3

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	19.68
Middle	2440	19.97
High	2480	19.91

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8.5.3. LOW POWER BLE (1Mbps)

ANTENNA 4

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	9.82
Middle	2440	9.96
High	2480	9.89

ANTENNA 3

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	9.85
Middle	2440	9.98
High	2480	9.87

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8.5.4. LOW POWER BLE (2Mbps)

ANTENNA 4

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	9.78
Middle	2440	9.95
High	2480	9.83

ANTENNA 3

Tested By:	39919
Date:	5/8/2018

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	9.72
Middle	2440	9.89
High	2480	9.75

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8.6. 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

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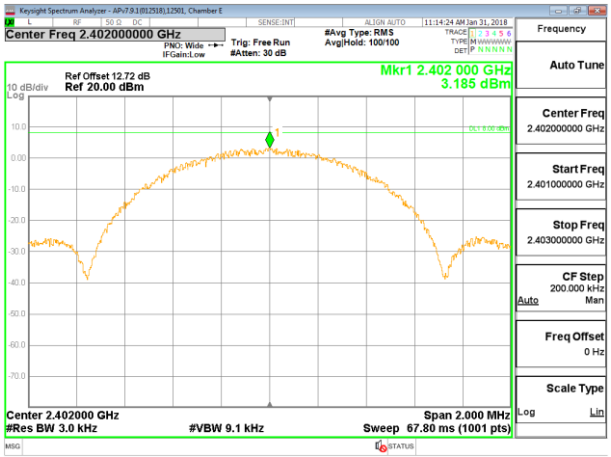
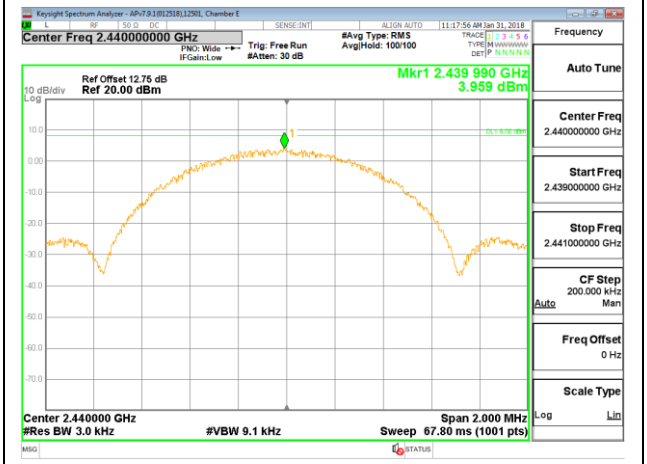
8.6.1. HIGH POWER BLE (1Mbps)

ANTENNA 4

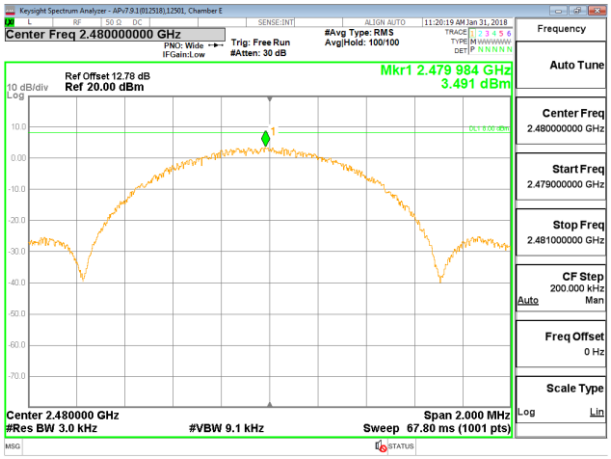
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	3.19	8	-4.82
Middle	2440	3.96	8	-4.04
High	2480	3.49	8	-4.51



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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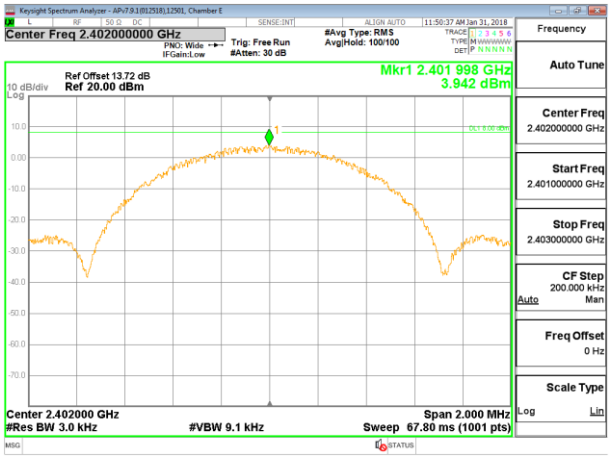
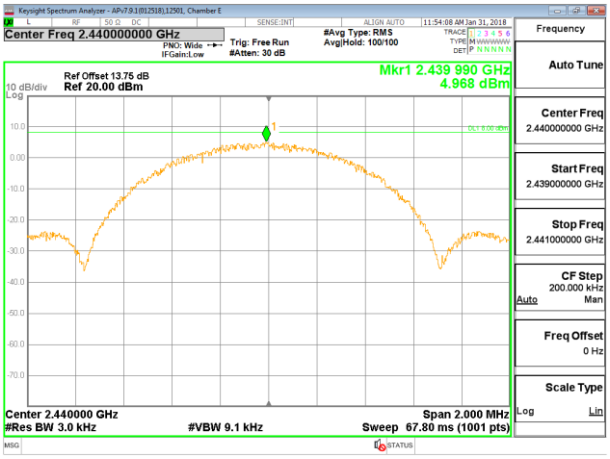
ANTENNA 3

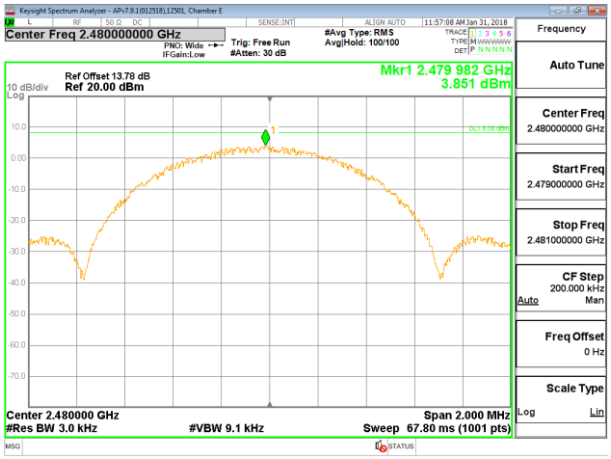
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	3.94	8	-4.06
Middle	2440	4.97	8	-3.03
High	2480	3.85	8	-4.15



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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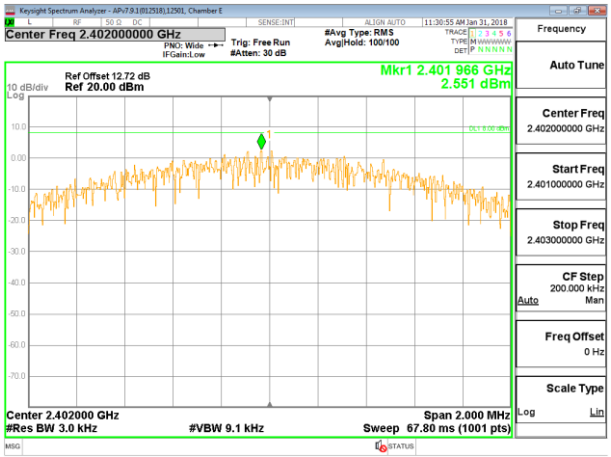
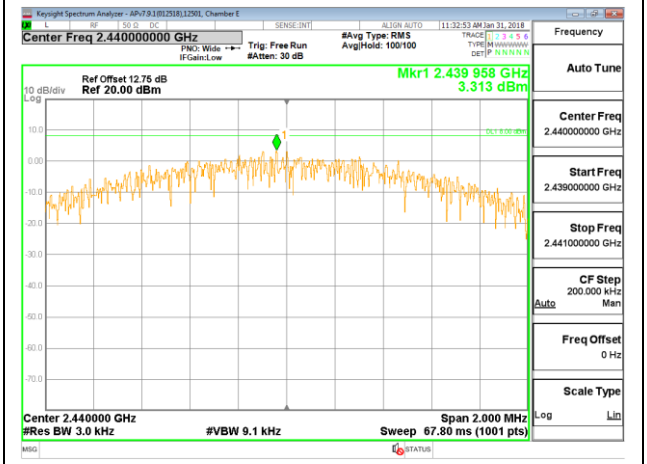
8.6.2. HIGH POWER BLE (2Mbps)

ANTENNA 4

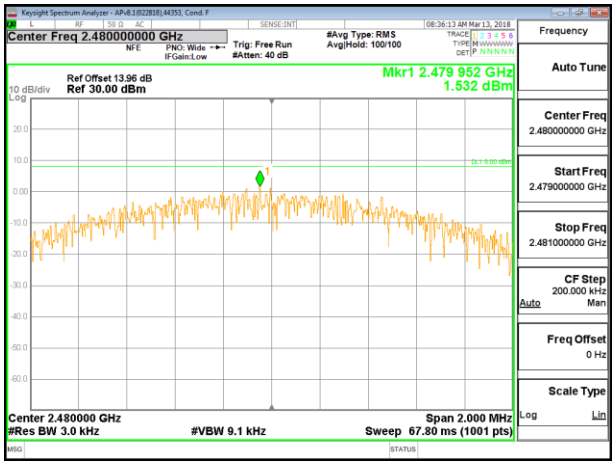
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	2.55	8	-5.45
Middle	2440	3.31	8	-4.69
High	2480	1.53	8	-6.47



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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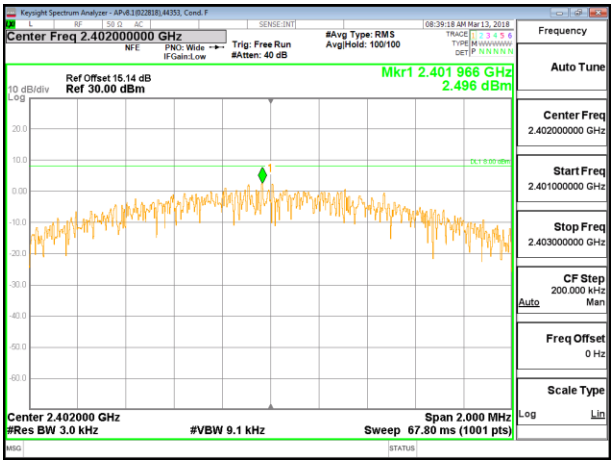
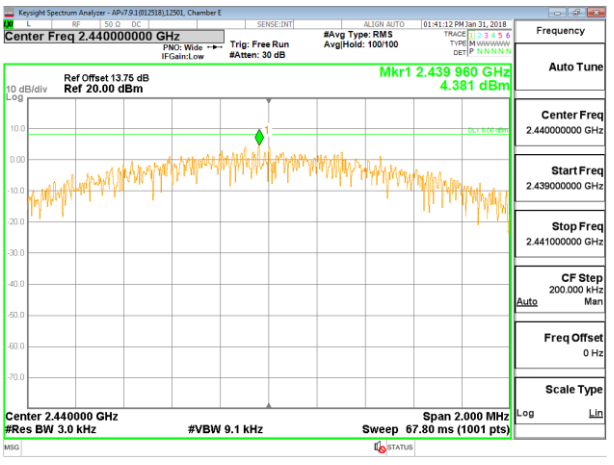
ANTENNA 3

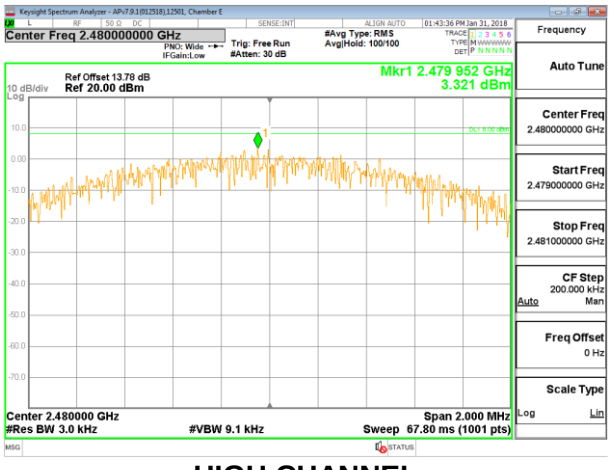
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	2.50	8	-5.50
Middle	2440	4.38	8	-3.62
High	2480	3.32	8	-4.68



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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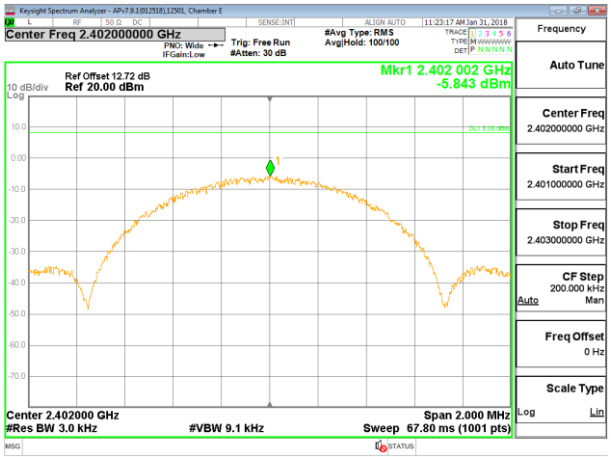
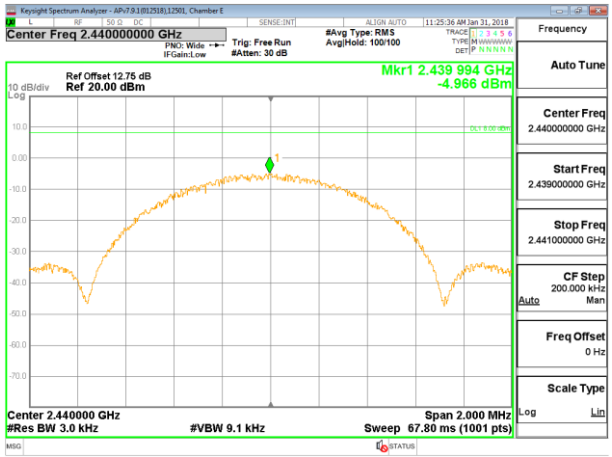
8.6.3. LOW POWER BLE (1Mbps)

ANTENNA 4

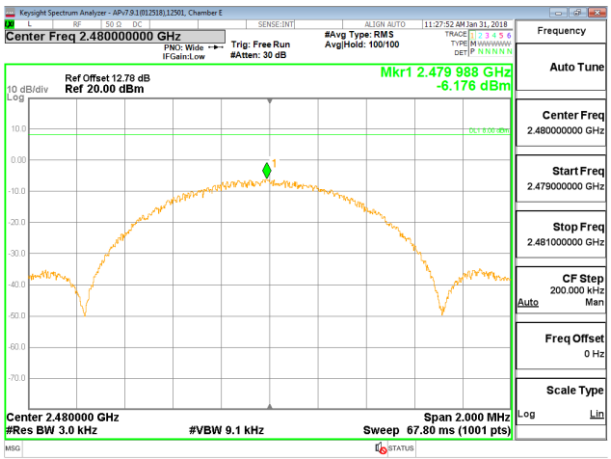
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-5.84	8	-13.84
Middle	2440	-4.97	8	-13.84
High	2480	-6.18	8	-14.18



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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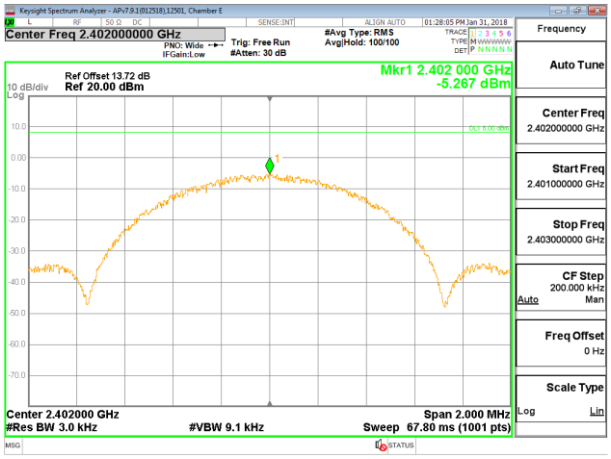
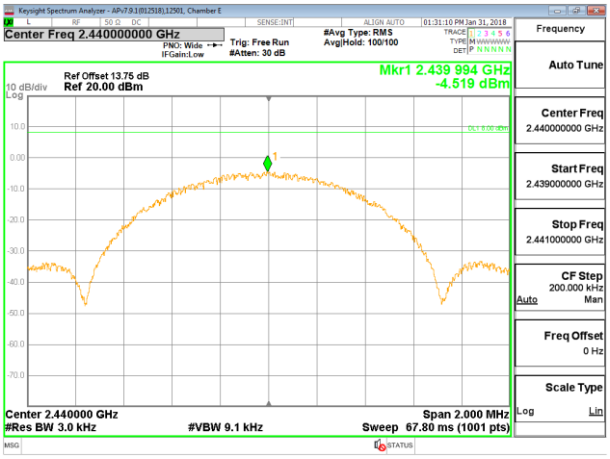
ANTENNA 3

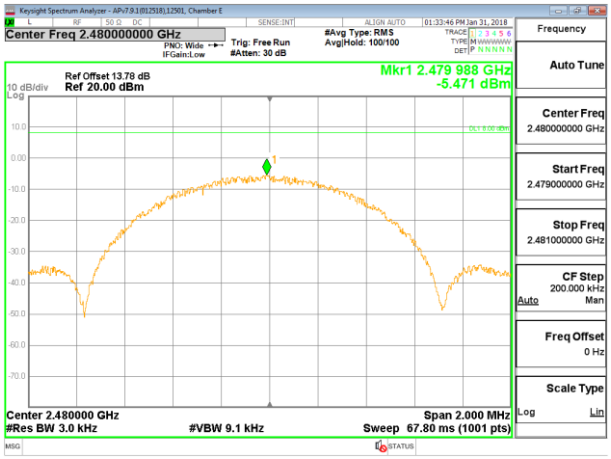
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-5.27	8	-13.27
Middle	2440	-4.52	8	-12.52
High	2480	-5.47	8	-13.47



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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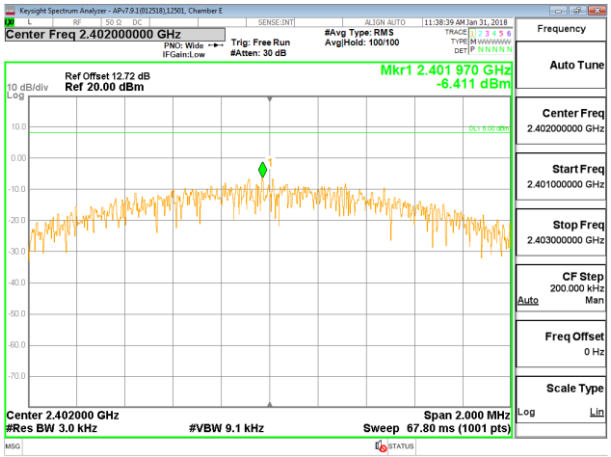
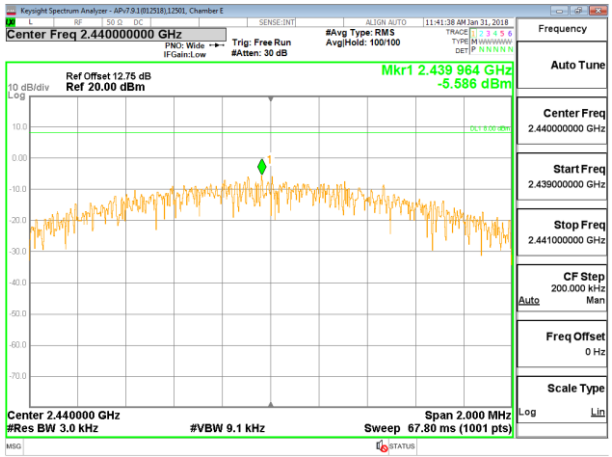
8.6.4. LOW POWER BLE (2Mbps)

ANTENNA 4

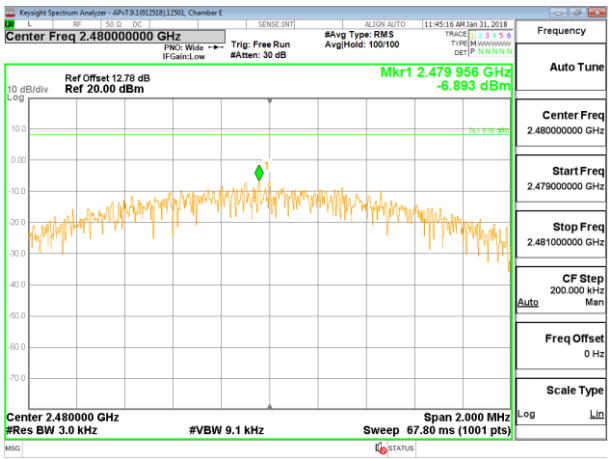
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-6.41	8	-14.41
Middle	2440	-5.59	8	-13.59
High	2480	-6.89	8	-14.89



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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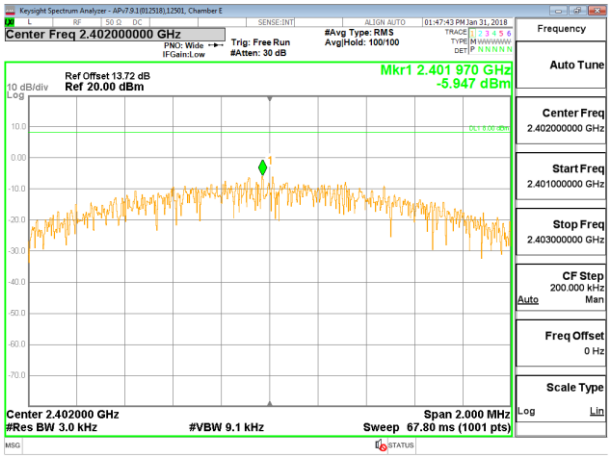
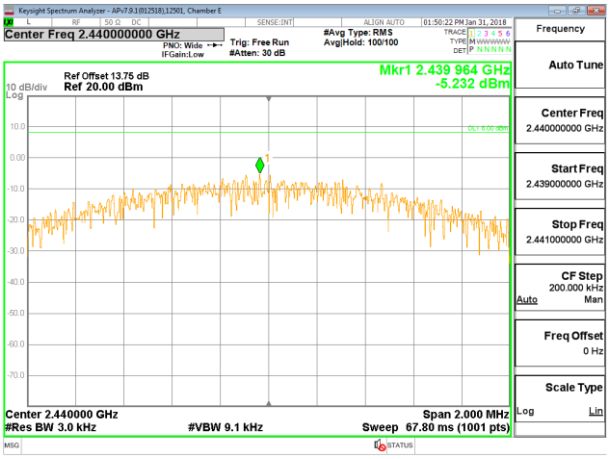
ANTENNA 3

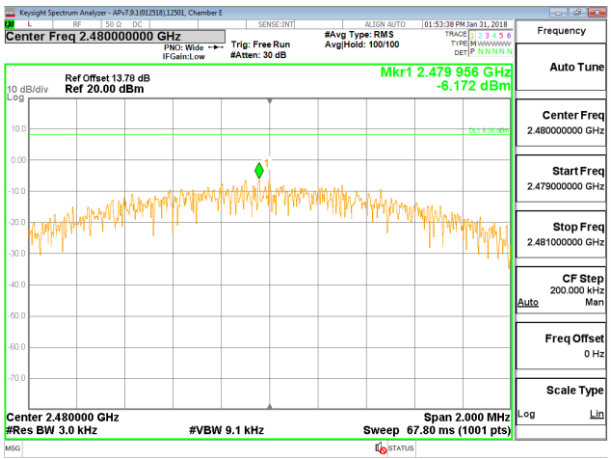
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-5.95	8	-13.95
Middle	2440	-5.23	8	-13.23
High	2480	-6.17	8	-14.17



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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8.7. 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 dB.

RESULTS

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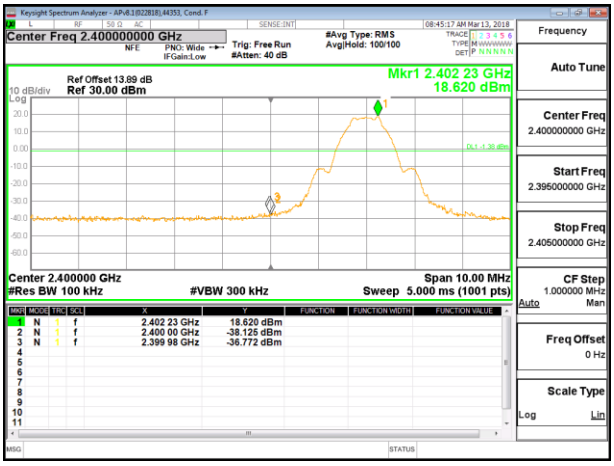
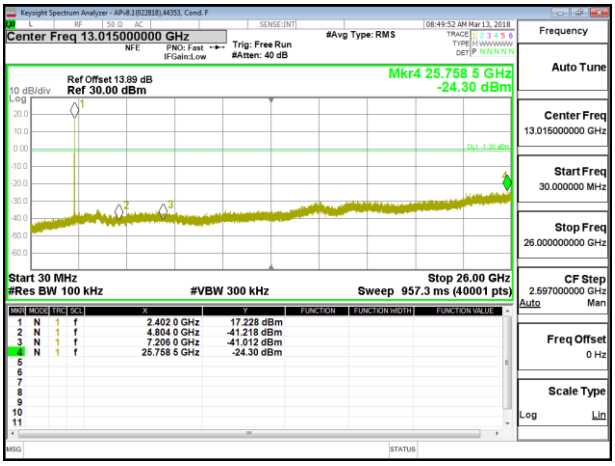
8.7.1. HIGH POWER BLE (1Mbps)

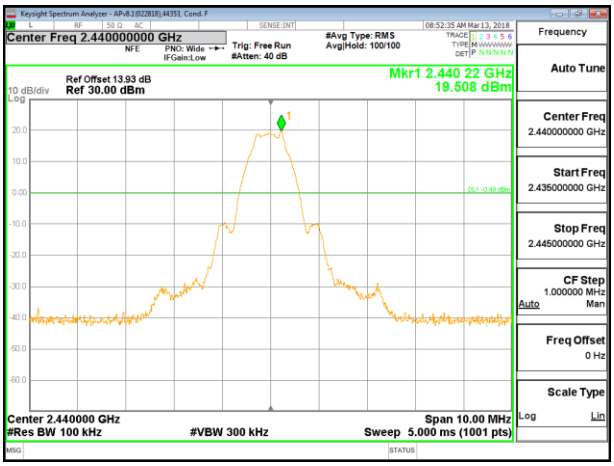
ANTENNA 4



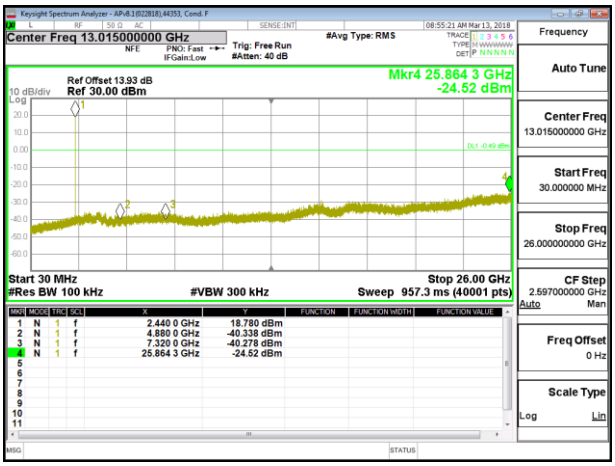
LOW CHANNEL BANDEDGE



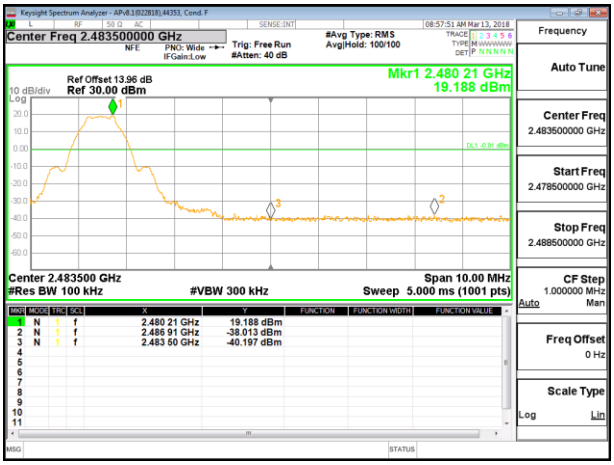
OUT-OF-BAND LOW CHANNEL



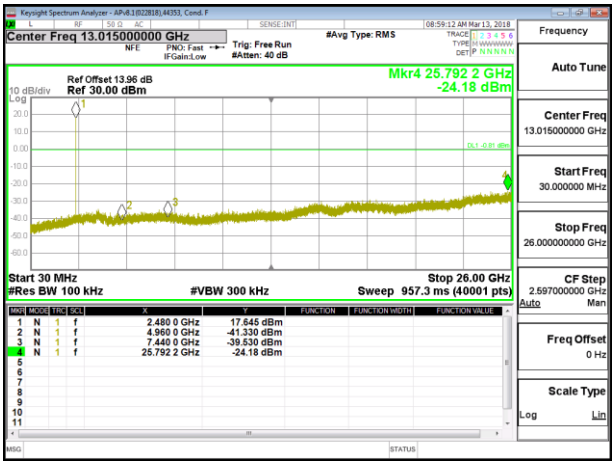
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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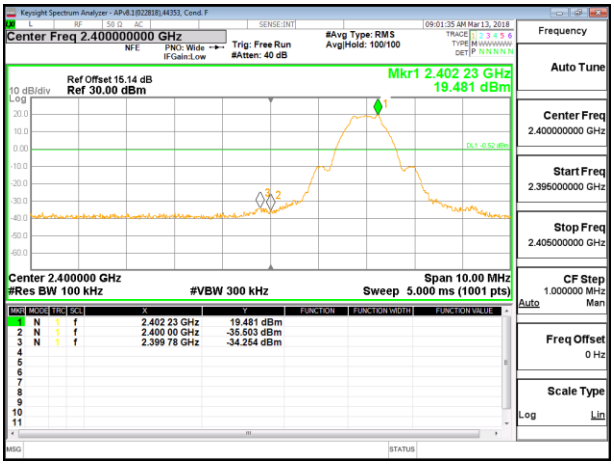
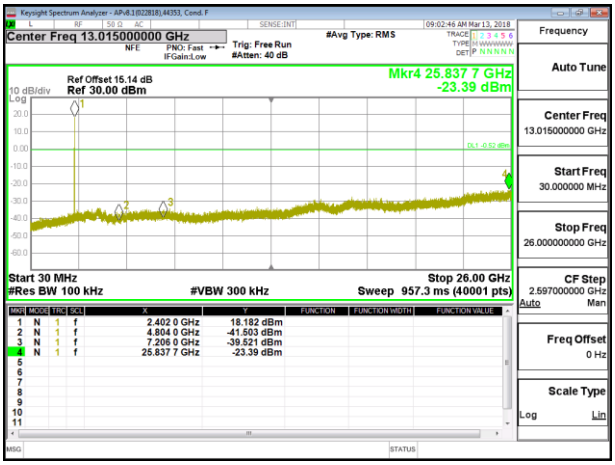
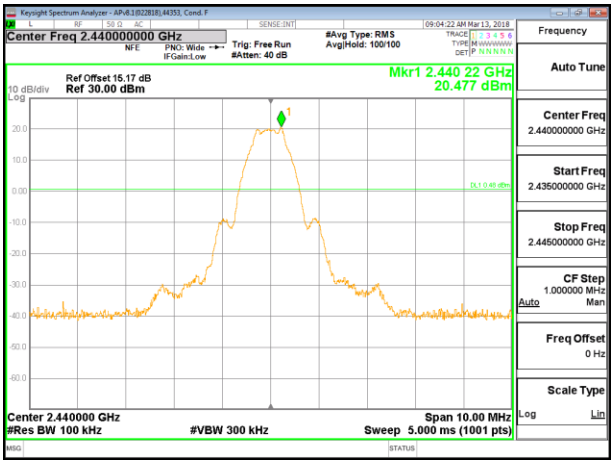
ANTENNA 3



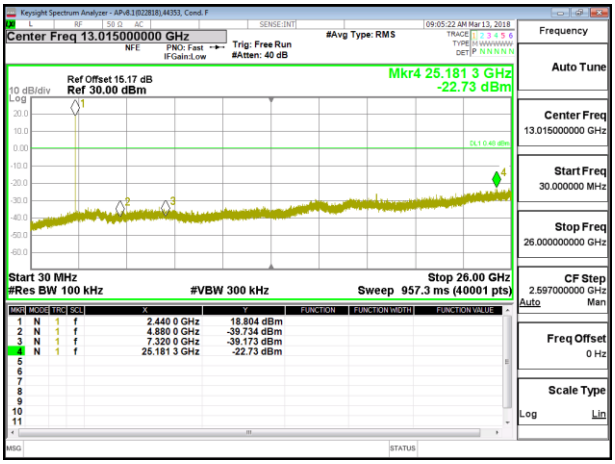
LOW CHANNEL BANDEDGE



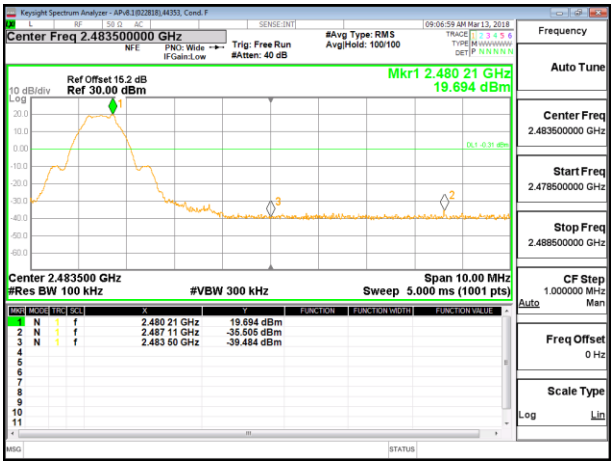
OUT-OF-BAND LOW CHANNEL



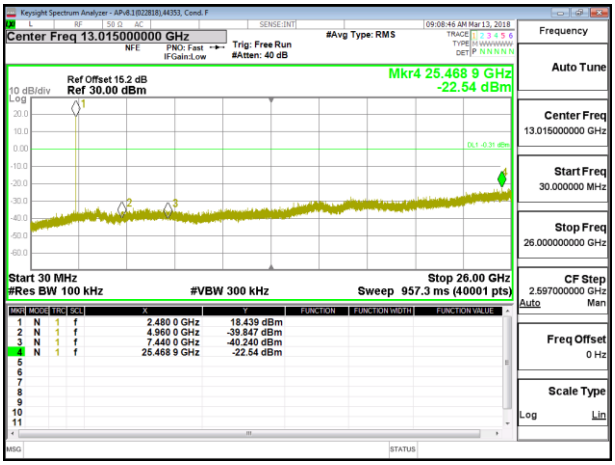
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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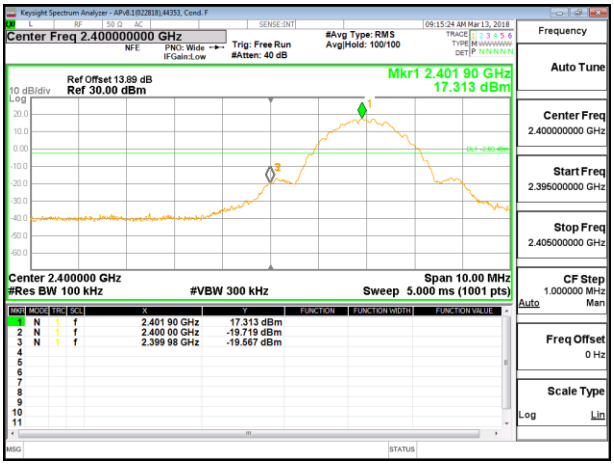
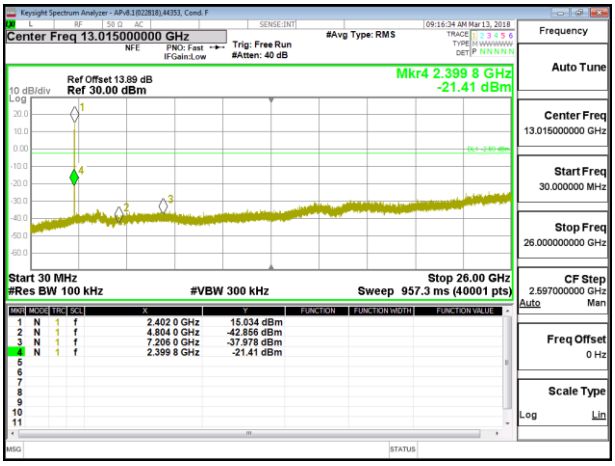
8.7.2. HIGH POWER BLE (2Mbps)

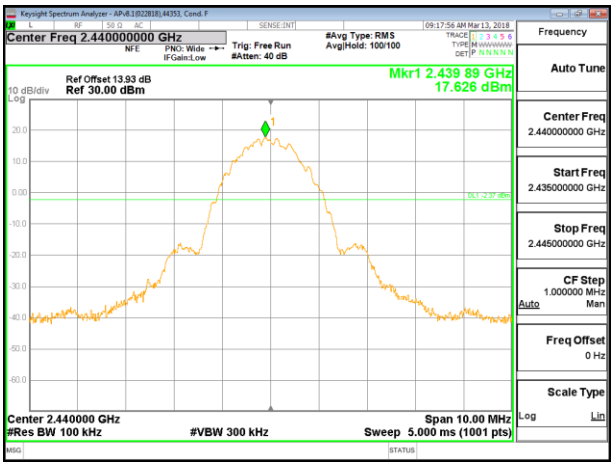
ANTENNA 4



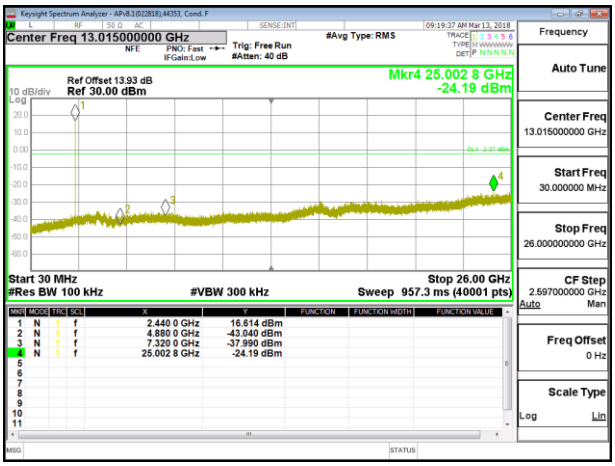
LOW CHANNEL BANDEDGE



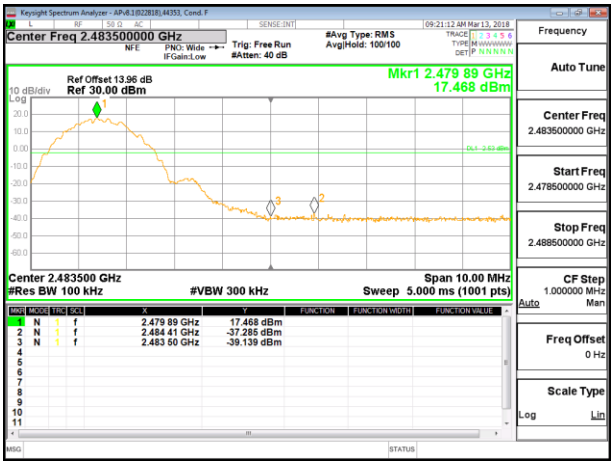
OUT-OF-BAND LOW CHANNEL



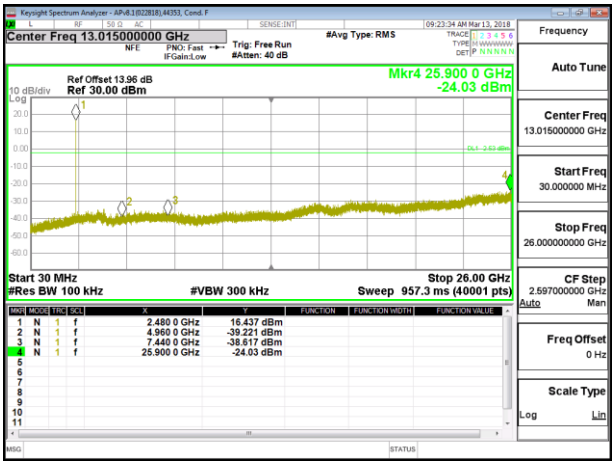
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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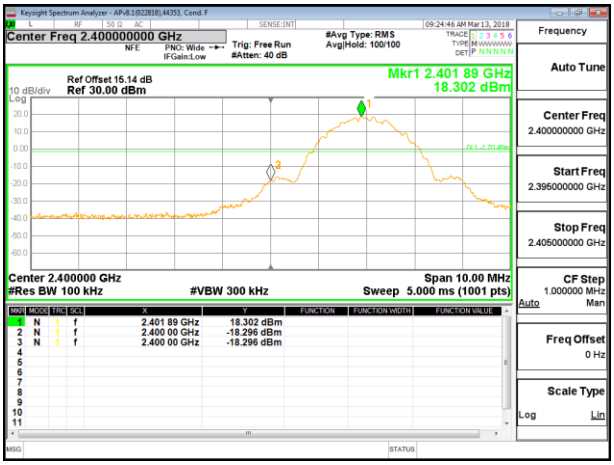
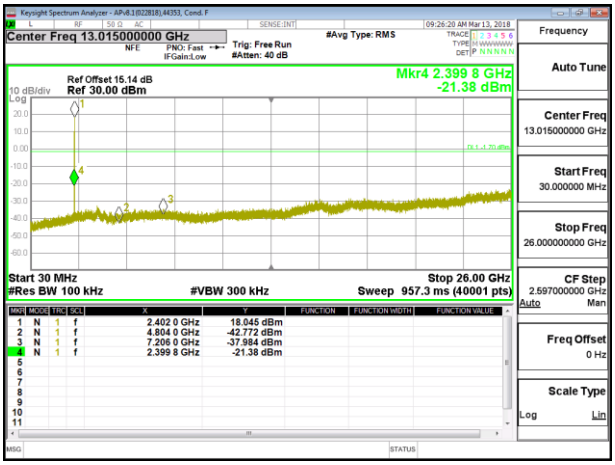
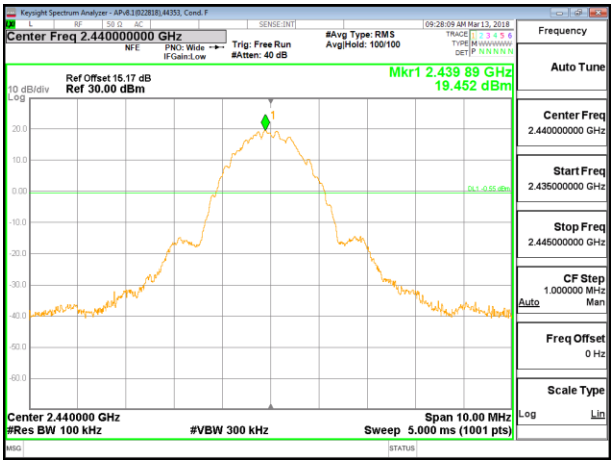
ANTENNA 3



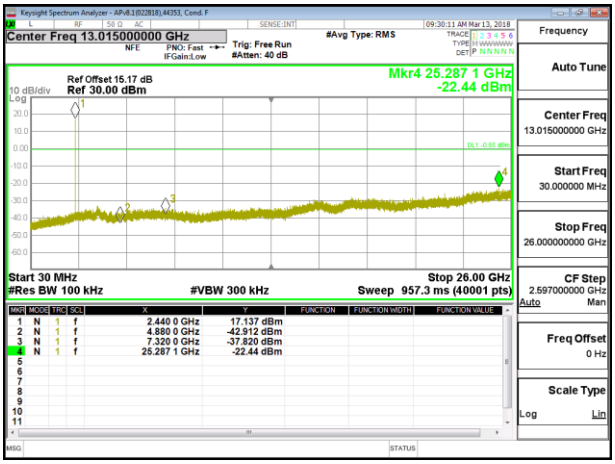
LOW CHANNEL BANDEDGE



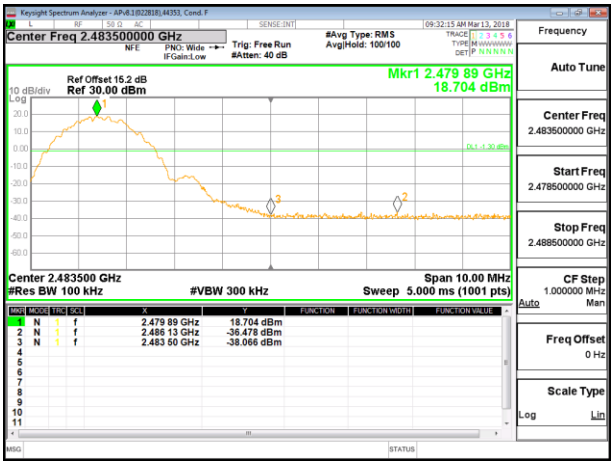
OUT-OF-BAND LOW CHANNEL



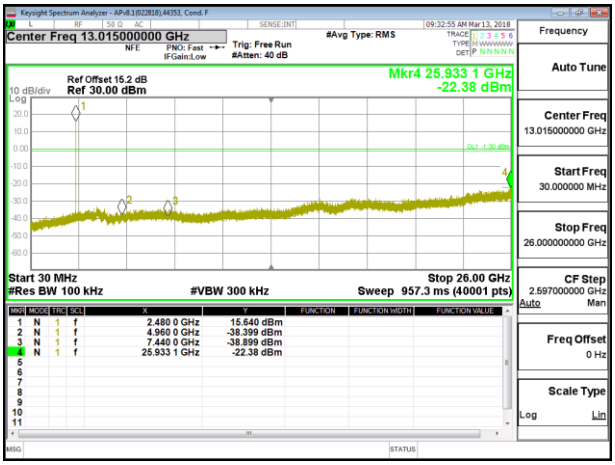
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

UL VERIFICATION SERVICES INC.
47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888
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