



**ADR TESTING SERVICES
EMC LABORATORY
EMC TEST REPORT**

Test Report Number – 26015-1 BT LE

The test results and statements contained herein relate only to the model(s) identified and tested. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics.

As the responsible EMC Engineer, I hereby declare that the equipment tested as specified in this report conforms to the requirements indicated.

Signature:

Name: Thanigaiselvan Palaniswami

Title: EMC Engineer

Date: July 27, 2015

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TESTING CERT# 3465.01

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Test Report Details

Tests Performed By: ADR Testing Services
 Motorola Mobility LLC
 Product Safety and Compliance Group
 222 W. Merchandise Mart, Suite 1800
 Chicago, IL 60654

Tests Requested By: Motorola Mobility LLC
 222 W. Merchandise Mart, Suite 1800
 Chicago, IL 60654

Product Type : Smart Watch

Signaling Capability: Bluetooth V3.0, Bluetooth LE V4.0 + EDR,
 802.11b/g/n HT20

FCC ID: IHDT6UA1

Serial Numbers: LD4X310148, LD4X310171, LD4X240119

Testing Complete Date: July 22, 2015

Applicable Standards

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

X Part 15 Subpart C – Intentional Radiators

Applicable Standards: ANSI C63.4 2009, ANSI 63.10 2009

All testing was performed according to KDB 558074 v03r03 and KDB 648474 D03 v01r02

Revision History

Revision Version	Date	Notes
Rev. 0	07/23/15	Initial issue of report.
Rev. 1	07/27/15	Updated KDB version and FCC ID.

Summary of Testing

Test	Test Name	Pass/Fail
1	6 dB Bandwidth	Pass
2	Peak Power	Pass
3	Peak Power Spectral Density	Pass
4	Spurious RF Conducted Emissions	Pass
5	Radiated Spurious Emissions	Pass
6	AC Line Conducted Emissions	Pass

Test	Test Name	Results
1	6 dB Bandwidth	See plots
2	Peak Power	See tables
3	Peak Power Spectral Density	See tables
4	Spurious RF Conducted Emissions	See plots
5	Radiated Spurious Emissions	See tables
6	AC Line Conducted Emissions	See Plots

General and Special Conditions

This product utilizes an internal battery that is not removable. All EMC radiated testing was performed with the internal battery fully charged. All Conducted testing was performed with a board level pigtail unit which was powered using an external power supply.

All testing was done in an indoor controlled environment. The temperature and the relative humidity were maintained within the ANSI C63.4 2009 Standard requirements during the entire duration of testing.

Equipment and Cable Configurations

For all radiated testing the EUT was tested in a standalone and while charging in a Wireless Charger configuration that is representative of typical use. In standalone configuration the EUT was evaluated in X, Y and Z orientation.

Measuring Equipment and Calibration Information

Manufacturer	Equipment Type	Model No.	Serial Number	Calibration Due Date
Rohde & Schwarz	Receiver	ESU40	100286	10/04/15
Agilent	Signal Generator	83623B	3844A00935	04/03/16
ETS-Lindgren	Horn Antenna	3115	6222	09/10/15
ETS-Lindgren	Horn Antenna	3116	00071568	03/12/16
TDK RF Solutions	Biconical Antenna	MBA-2060	130401	03/12/16
ETS	Log-Periodic Antenna	PLP-3003	130395	03/12/16
Weinschel	Attenuator	AS-6	7074	NCR
Agilent	Attenuator	8491A	50772	02/09/16
Agilent	Attenuator	8491A	56248	02/09/16
ETS-Lindgren	LISN	3810/2NM	00023630	09/12/15
ETS-Lindgren	Loop Antenna	6507	00049471	03/11/16
Agilent	Call Box	N1912A	MY45100116	04/03/16
Agilent	Signal Analyzer	N9020A	US46470586	01/13/16
Rohde & Schwarz	Signal Generator	SMF100A	102150	10/14/15
Agilent	Power Meter	N1912A	MY45100116	04/03/16
Agilent	Power Sensor	N1912A	MY45240662	04/03/16
Tektronix	Power Supply	PS282C	TW50294	NCR
Rohde & Schwarz	Preamplifier	TS-PR18	100068	10/01/15
Rohde & Schwarz	Preamplifier	TS-PR26	100039	10/01/15

Note that the signal analyzer and power meter are on a two-year calibration cycle. All test equipment was within their calibration date during the time of testing. When equipment went out of calibration during testing it was replaced using a similar piece of calibrated equipment. All these equipments are listed in the equipment list. All other equipment is on a one-year calibration cycle.

Description of BT LE Transmitter

The EUT offers BT LE as a feature. The BT LE antenna is mounted inside of the EUT. The antenna installation is permanent. For a more thorough description of the functionality please refer to Exhibit 12 of this package.

As a BT LE transmitter, it is designed operate with other BT LE devices as defined by the industrial standard. In this application, the device is battery operated.

De Facto EIRP Limit – Pursuant 47 CFR 15.247(b) (4)

Criterion: The conducted output power limit of 1-watt is based on the use of antennas with directional gains that do not exceed 6dB_i. If transmitting antennas of directional gain greater than 6dB_i are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dB_i.

The peak antenna gain of the antenna employed by this transmitter is less than 6dB_i.

Measurement Procedures and Data

6 dB Bandwidth

CFR 47 Part 15.247(a)(2)

Measurement Procedure

The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 20 dB passive attenuator.

The spectrum analyzer used the following settings:

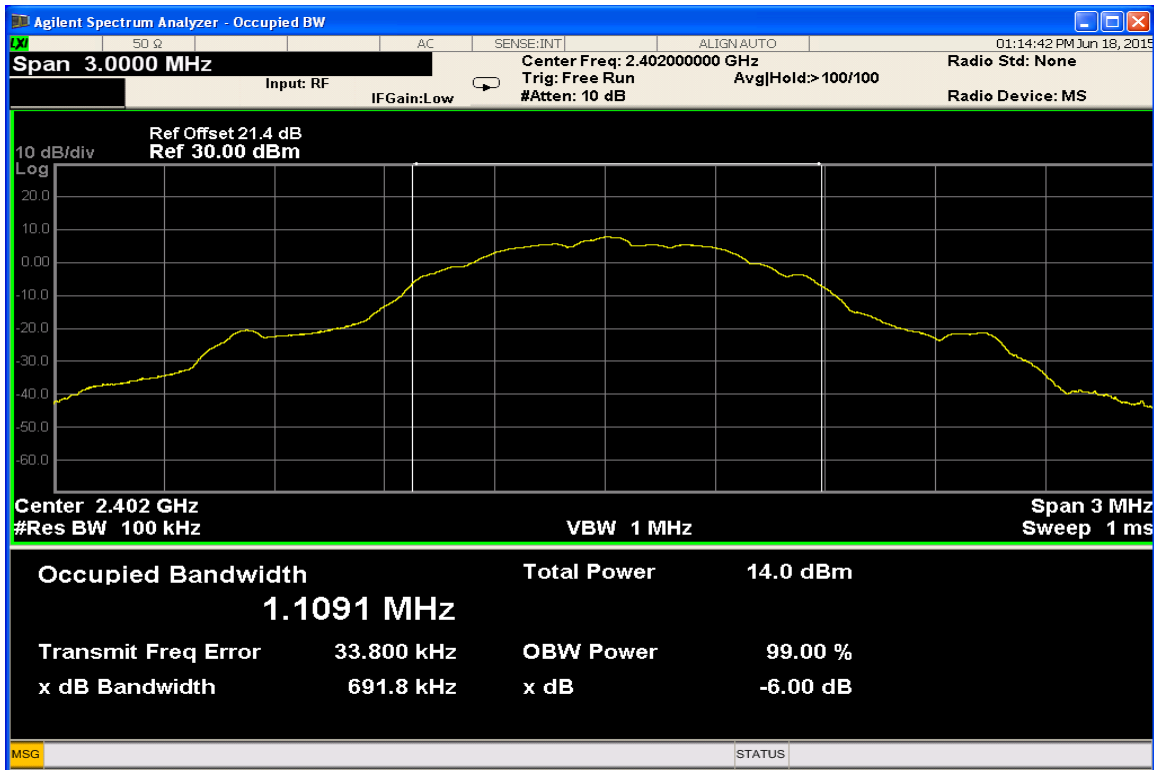
1. RBW \geq 100 kHz
2. VBW \geq 3 X RBW
3. Sweep = auto couple
4. Detector function = peak
5. Trace = max hold
6. Span = 30 MHz

The trace was allowed to stabilize. The automatic occupied bandwidth measurement function of the spectrum analyzer, set to 6dB or 26dB, is used.

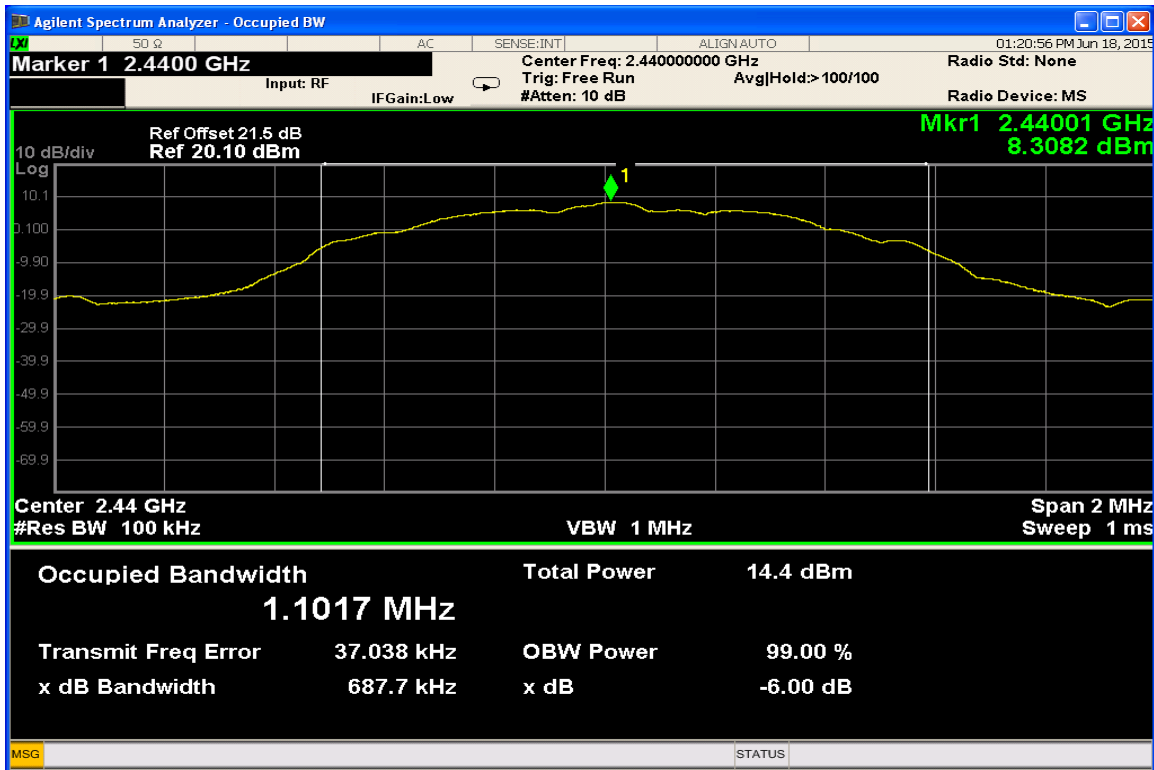
The test results shown below represent the worst case condition.

Measurement Results

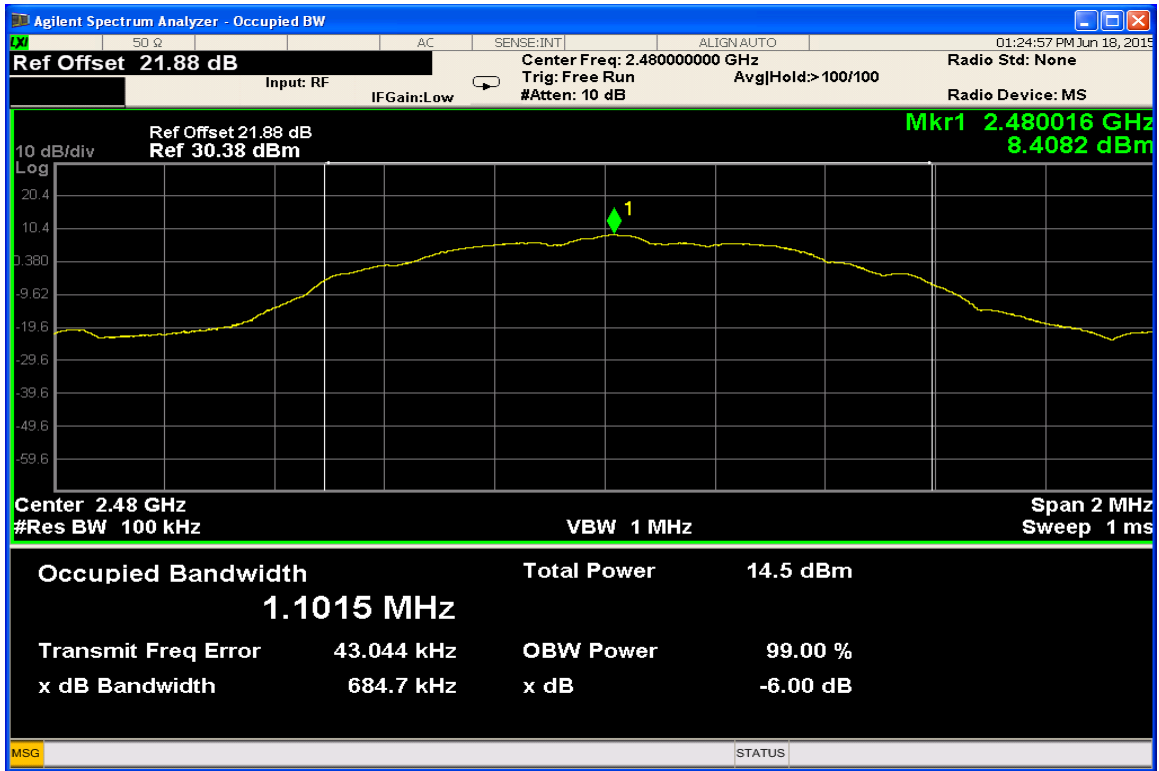
See attached



6dB Bandwidth Channel 0



6dB Bandwidth Channel 19



6dB Bandwidth Channel 39

Peak Output Power

CFR 47 Part 15.247(b)

Measurement Procedure

The RF output port of the Equipment-Under-Test is directly coupled to the input of the broad band power meter through a specialized RF connector and a 20dB passive attenuator. . The power meter is capable of measuring both peak and average power measurements.

Measurement Results

See Attached

Channel	Peak power (dBm)
	BT LE
0	8.72
19	9.25
39	9.54

Channel	Average power (dBm)
	BT LE
0	8.5
19	8.66
39	8.55

Peak Power Spectral Density

CFR 47 Part 15.247(e)

Measurement Procedure

The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 20 dB passive attenuator.

The spectrum analyzer used the following settings:

1. Span = 1.5 x DTS BW (6 dB Bandwidth)
2. RBW = 3 kHz
3. VBW= 10 kHz
4. Sweep = auto couple
5. Detector function = Peak
6. Trace = max hold

The trace was allowed to stabilize. The peak power is measured by the spectrum analyzer, using the peak marker function to determine the maximum amplitude level.

Measurement Results

See Attached

BT LE

2402 MHz	2440 MHz	2480 MHz
7.027 dBm	7.43 dBm	7.683 dBm

Spurious RF Conducted Emissions

CFR 47 Part 15.247(d)

Measurement Procedure

The RF output port of the Equipment-Under-Test is directly coupled to the input of the spectrum analyzer through a specialized RF connector and a 20 dB passive attenuator.

The reference level for 20 dB down is established using Power Spectral Density measurement using the below settings.

1. Span = 1.5 x DTS BW (6 dB Bandwidth)
2. RBW = 100 kHz
3. VBW = 300 kHz
4. Sweep = auto couple
5. Detector function = Peak
6. Trace = max hold

The trace was allowed to stabilize. The peak marker function is used to determine the maximum amplitude level.

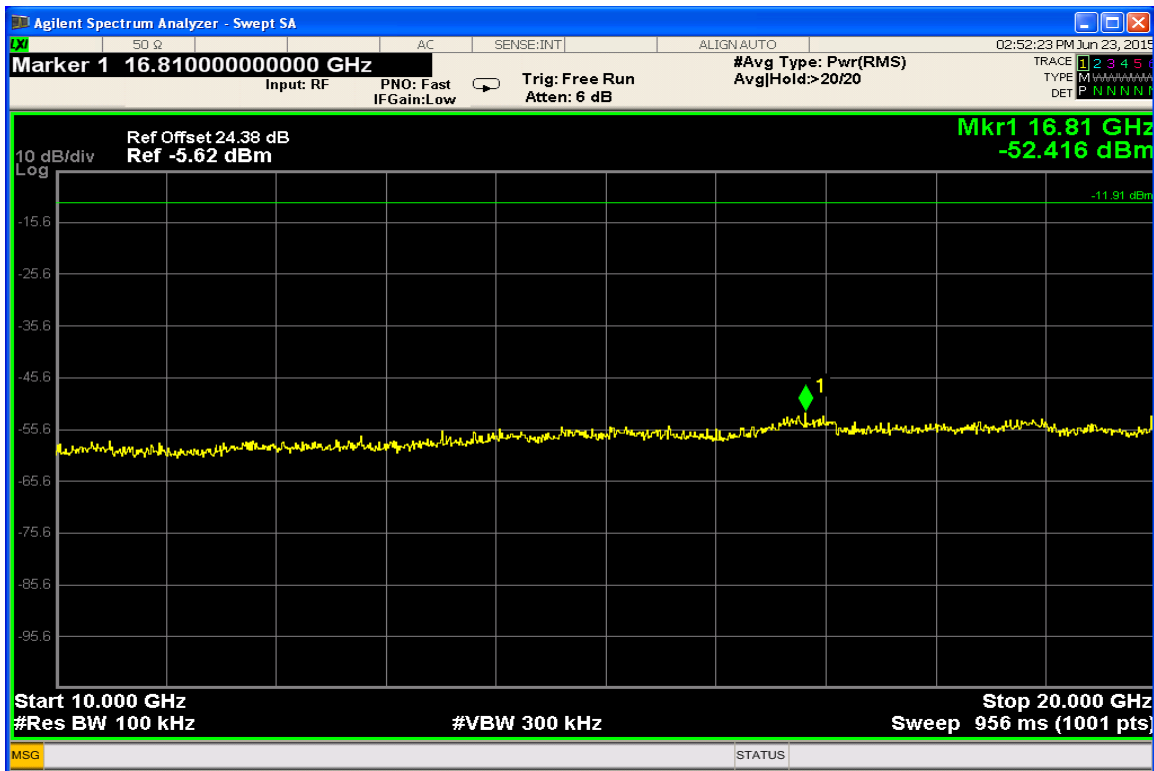
The emission level measurement is performed using the below Spectrum Analyzer Settings.

1. RBW = 100 kHz
2. VBW \geq 300 kHz
3. Detector function = Peak
4. Sweep = auto couple
5. Trace = max hold

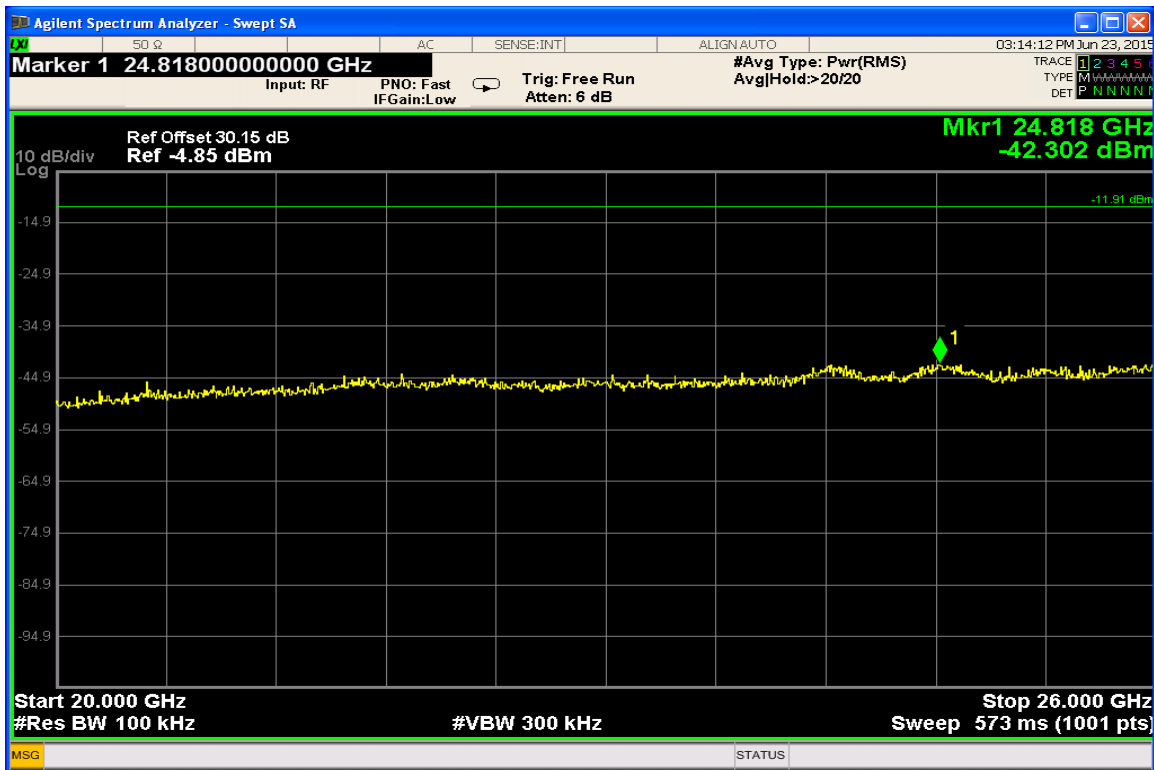
The trace was allowed to stabilize. The peak marker function is used to determine the maximum amplitude level.

Measurement Results

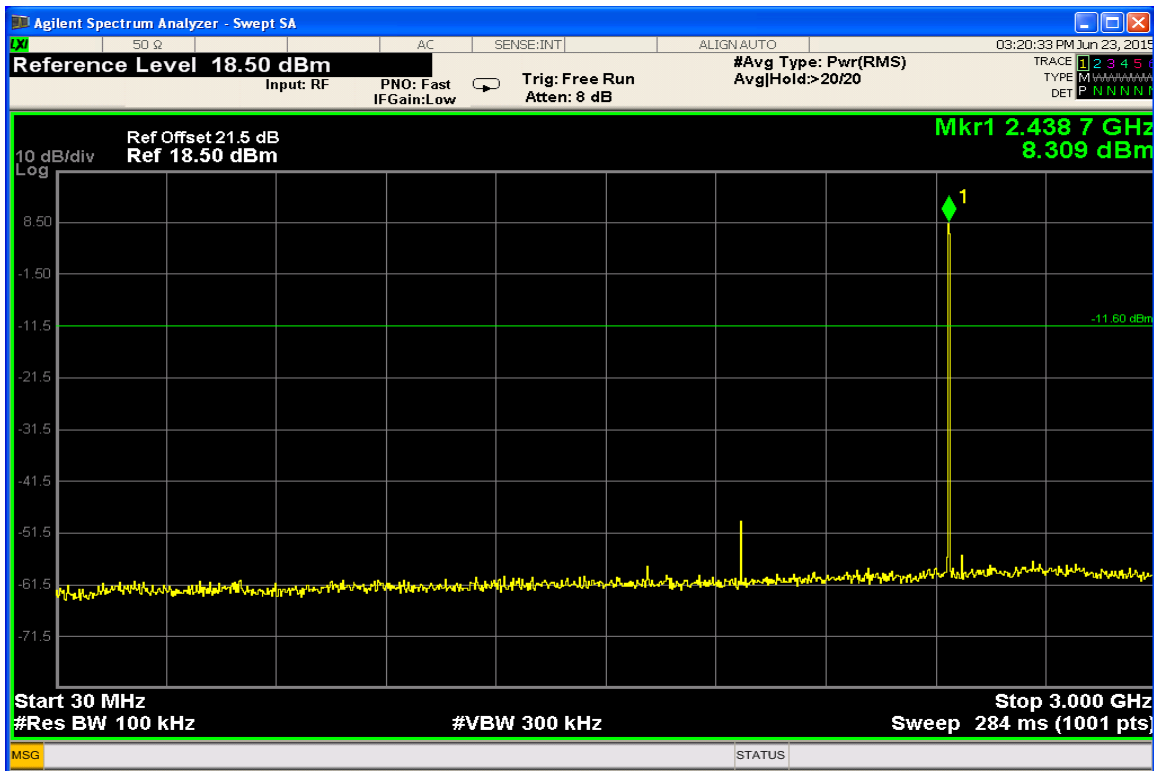
See attached:



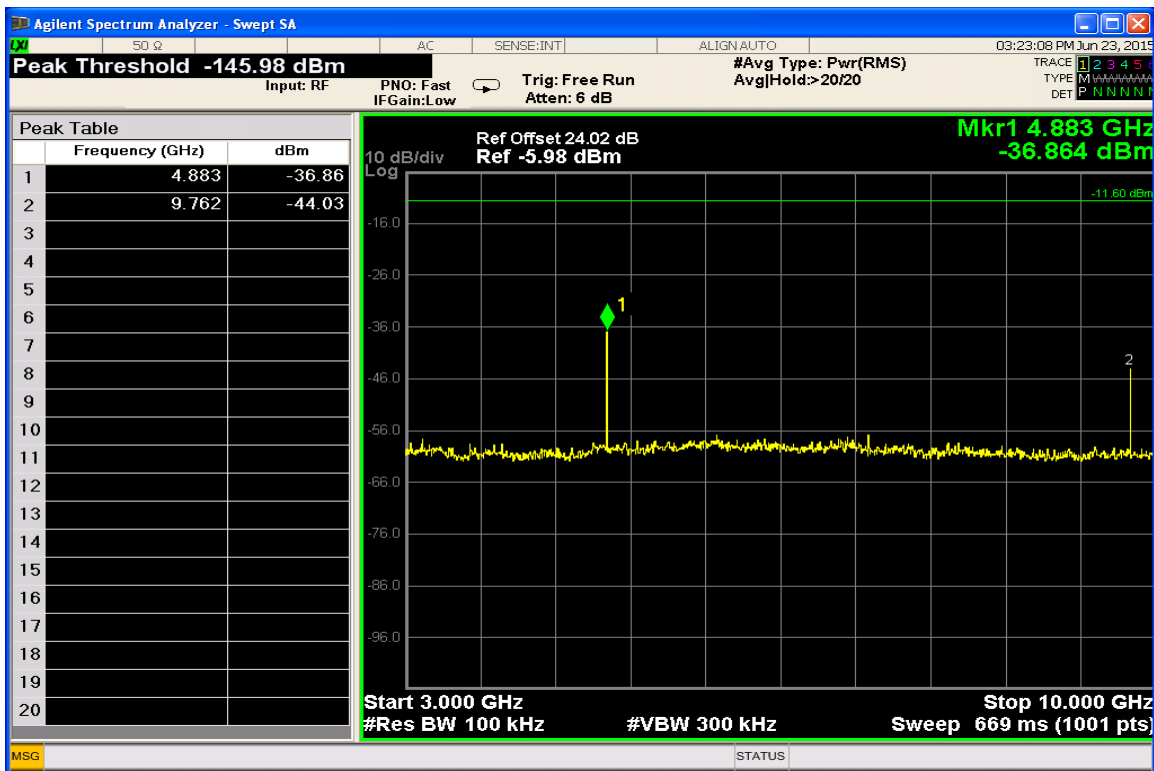
Conducted Spurious Emissions 10 GHz-20 GHz (Low Channel)



Conducted Spurious Emissions 20 GHz-26 GHz (Low Channel)



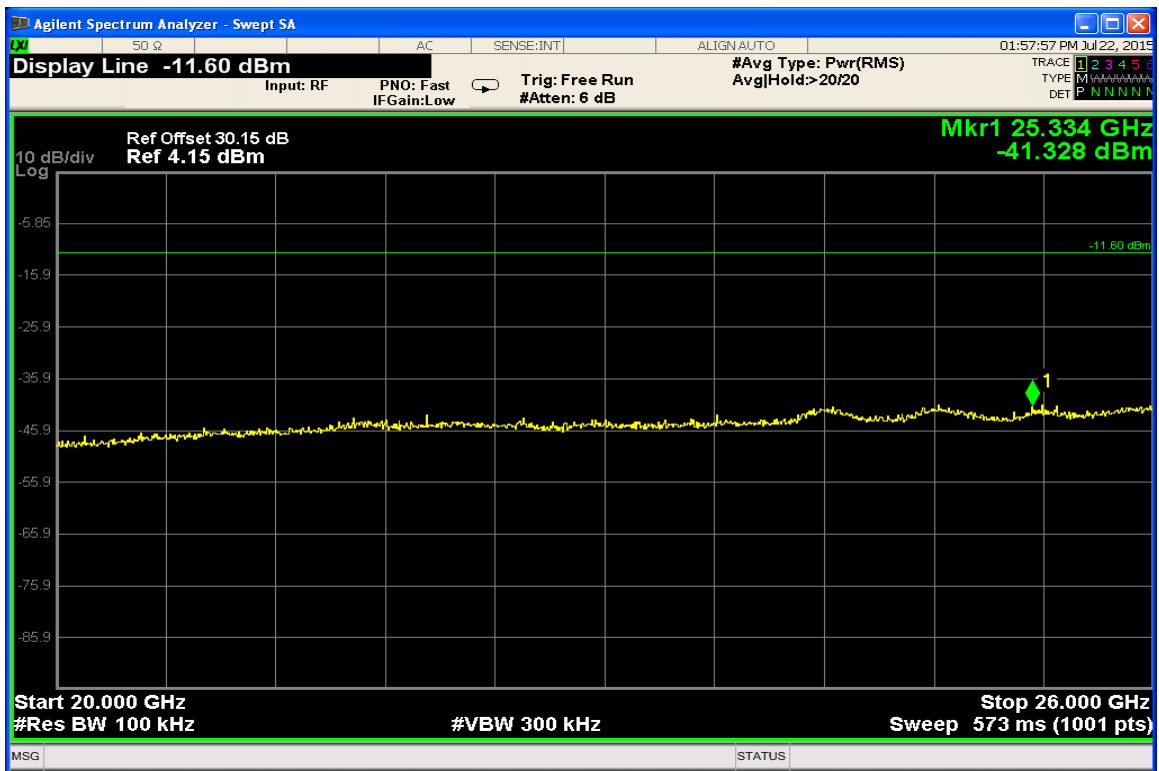
Conducted Spurious Emissions 30 MHz-3000 MHz (Mid Channel)



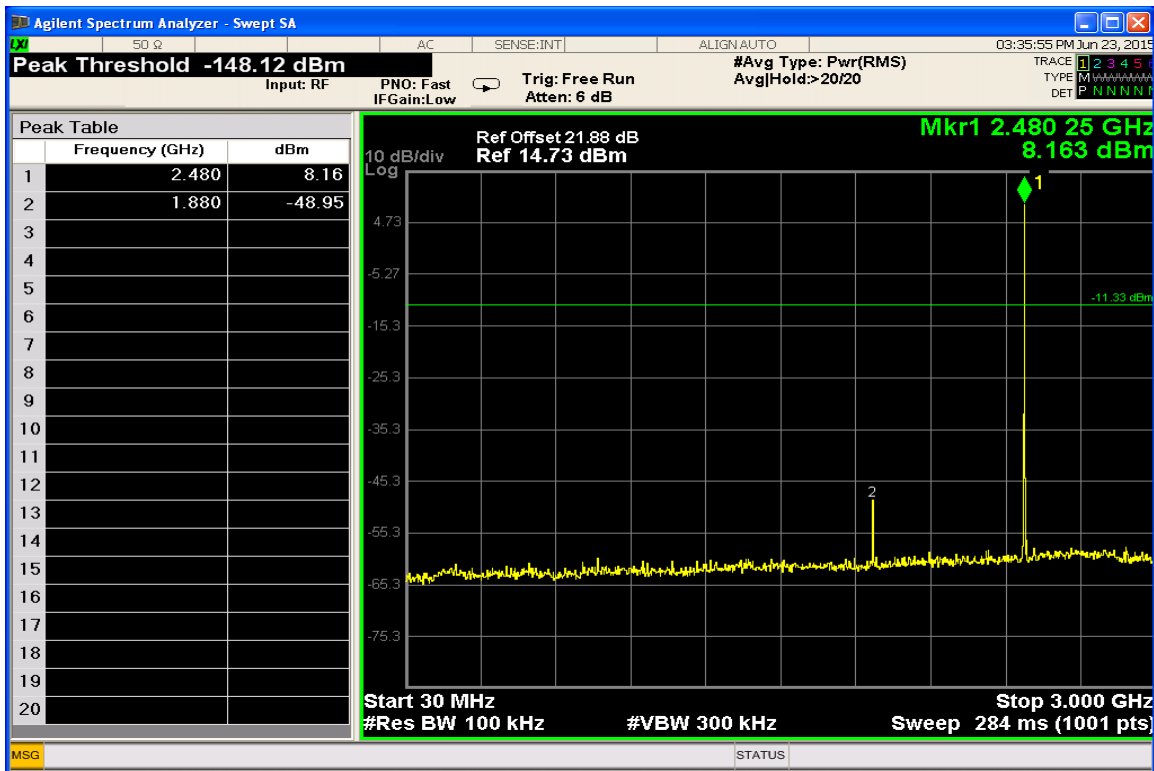
Conducted Spurious Emissions 3 GHz-10 GHz (Mid Channel)



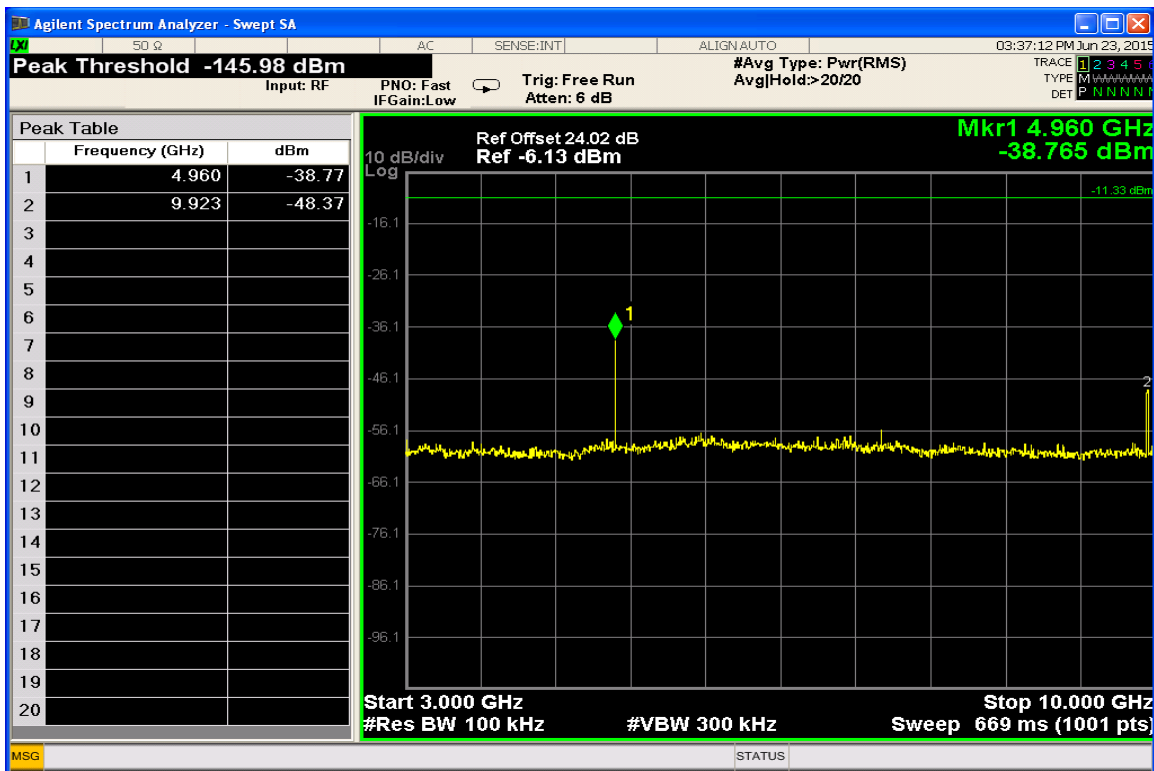
Conducted Spurious Emissions 10 GHz-20 GHz (Mid Channel)



Conducted Spurious Emissions 20 GHz-26 GHz (Mid Channel)



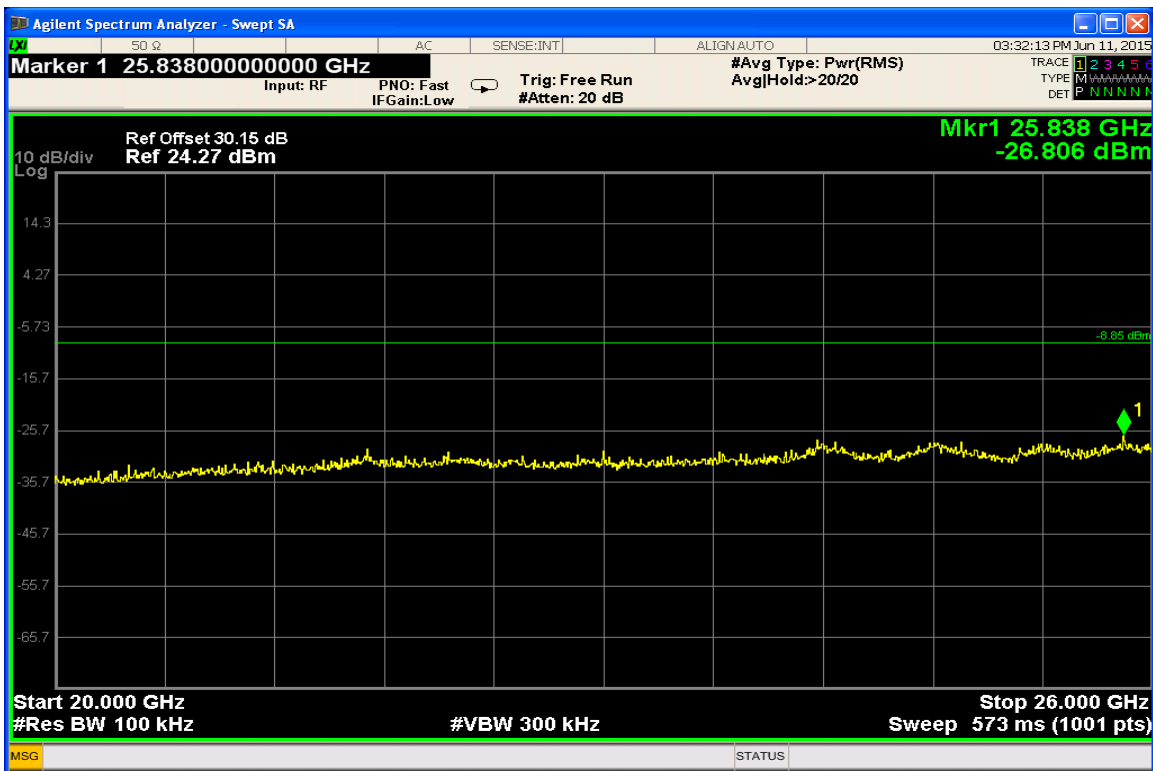
Conducted Spurious Emissions 30 MHz-3000 MHz (High Channel)



Conducted Spurious Emissions 3 GHz-10 GHz (High Channel)



Conducted Spurious Emissions 10 GHz-20 GHz (High Channel)



Conducted Spurious Emissions 20 GHz-26 GHz (High Channel)

Conducted Spurious Emissions at the Band Edge

CFR 47 Part 15.247(d)

Measurement Procedure

The RF output port of the Equipment-Under-Test is directly coupled to the input of the spectrum analyzer through a specialized RF connector and a 20dB passive attenuator.

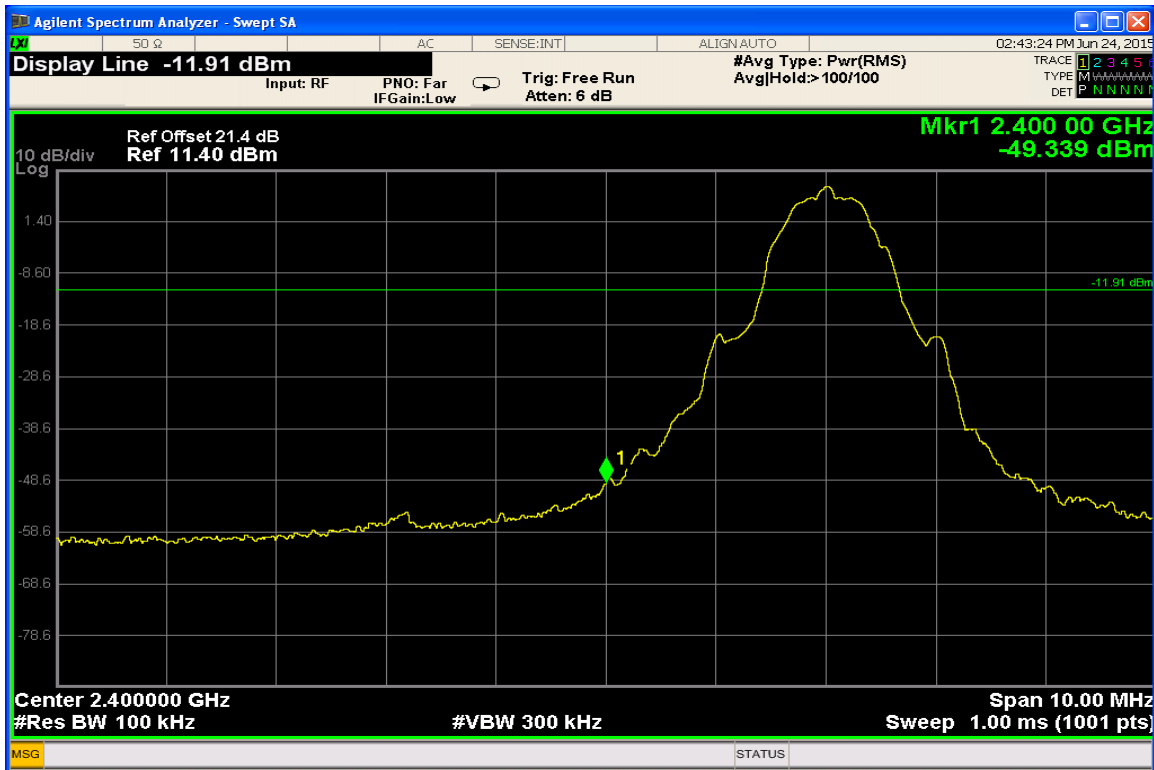
The Spectrum Analyzer used the following settings:

1. Center Frequency = 2.4 GHz (lower band edge) or 2.4835 GHz (upper band edge)
2. RBW = 100kHz
3. VBW \geq 300kHz
4. Detector function = peak
5. Sweep = auto couple
6. Trace = max hold
7. Sweep = Auto

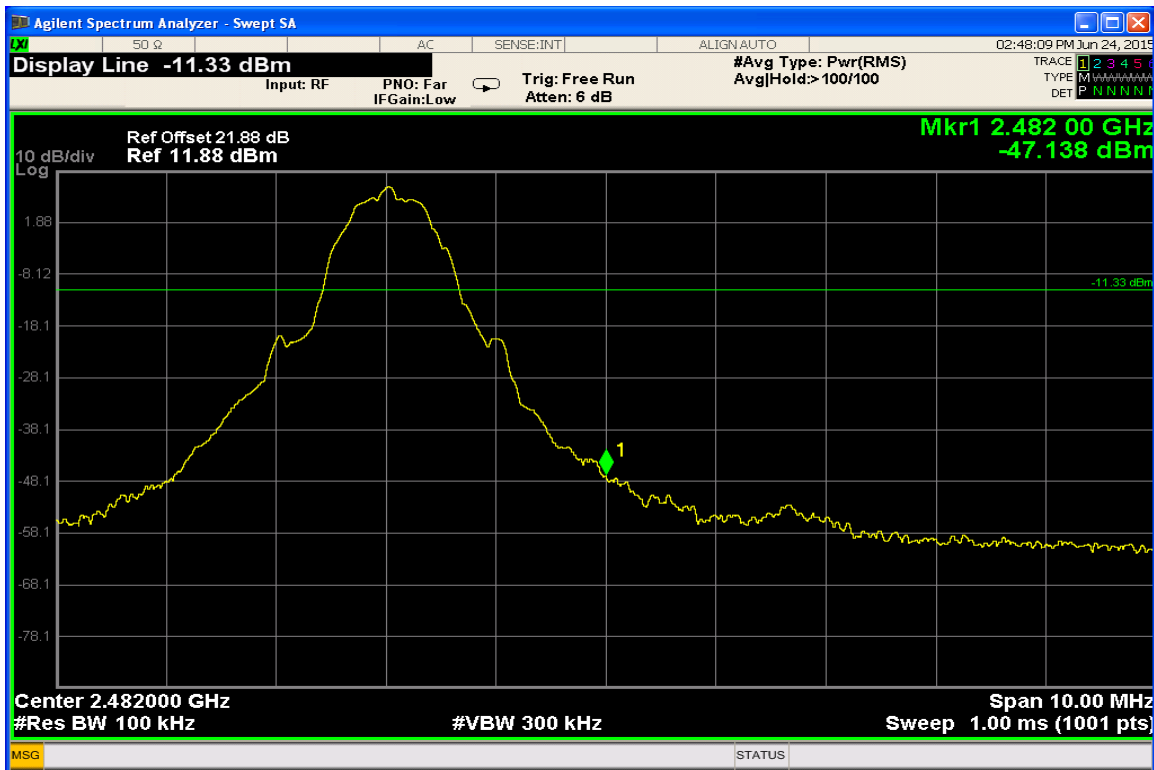
Measurement Results

See attached:

BT LE



Channel 0 – Lower Band Edge



Channel 39 – Upper Band Edge

Radiated Spurious Emissions – Restricted Band

CFR 47 Part 15.247(d) 15.209(a)

Measurement Procedure

The EUT is placed inside the semi-anechoic chamber on a Styrofoam table at the turntable center. The Styrofoam table is 0.8 meter above the ground plane. For each spurious frequency, the antenna mast is raised and lowered from 1 to 4 meters and the turntable is rotated 360 degrees to obtain a maximum reading on the spectrum analyzer. This is repeated for both horizontal and vertical polarizations of the receive antenna.

For all measurements up to 12 GHz the EUT was 3 meters from the measuring antenna. All emissions above 12 GHz were measured at 1 meter measuring distance.

The EUT was tested in a standalone and while charging in a Wireless Charger configuration that is representative of typical use. In standalone configuration the EUT was evaluated in X, Y and Z orientation.

Field Strength dBuV/m = Measured Level + Antenna Factor + Cable Loss – Preamp Gain

The below Spectrum Analyzer settings were used for measurements

RBW = 100 kHz for $f < 1$ GHz and 1 MHz for $f > 1$ GHz

VBW \geq RBW for $F < 1$ GHz

VBW – 3 MHz for Peak Measurements for $f > 1$ GHz

VBW – 3 kHz for Average Measurements for $f > 1$ GHz

Detector – Peak

Sweep – auto couple

Trace – max hold

Measurement Results

See attached:

No significant emissions were found in the below frequency range.

9 kHz – 30 MHz

30 MHz – 1 GHz

12 GHz – 26.5 GHz

Worst case emissions reported.

BT LE

Channel 0

Frequency	Peak Level	Average Level	Peak Measured	Average Measured	Peak Limit	Average Limit	Peak Margin	Average Margin	Pol
MHz	dBµV/m	dBµV/m	dBµV	dBµV	dBµV/m	dBµV/m	dB	dB	
4804	55.73	45.59	42.59	32.45	74.00	54.00	-18.27	-8.41	H
	55.77	46.02	42.63	32.88	74.00	54.00	-18.23	-7.98	V
7206	56.64	43.78	38.21	25.35	74.00	54.00	-17.36	-10.22	H
	56.71	43.64	38.28	25.21	74.00	54.00	-17.29	-10.36	V
9608	60.11	47.58	37.84	25.31	74.00	54.00	-13.89	-6.42	H
	60.16	47.29	37.89	25.02	74.00	54.00	-13.84	-6.71	V
12010	62.98	49.94	37.62	24.58	74.00	54.00	-11.02	-4.06	H
	62.83	50.13	37.47	24.77	74.00	54.00	-11.17	-3.87	V

Channel 19

Frequency	Peak Level	Average Level	Peak Measured	Average Measured	Peak Limit	Average Limit	Peak Margin	Average Margin	Pol
MHz	dBµV/m	dBµV/m	dBµV	dBµV	dBµV/m	dBµV/m	dB	dB	
4882	55.112	45.392	41.52	31.8	74.00	54.00	-18.89	-8.61	H
	55.722	46.222	42.13	32.63	74.00	54.00	-18.28	-7.78	V
7323	56.92	43.75	38.49	25.32	74.00	54.00	-17.08	-10.25	H
	56.35	43.66	37.92	25.23	74.00	54.00	-17.65	-10.34	V
9764	60.5	47.17	38.23	24.9	74.00	54.00	-13.50	-6.83	H
	60.33	47.25	38.06	24.98	74.00	54.00	-13.67	-6.75	V
12205	63.925	50.975	38.23	25.28	74.00	54.00	-10.08	-3.03	H
	63.995	50.885	38.3	25.19	74.00	54.00	-10.01	-3.11	V

Channel 39

Frequency	Peak Level	Average Level	Peak Measured	Average Measured	Peak Limit	Average Limit	Peak Margin	Average Margin	Pol
MHz	dBµV/m	dBµV/m	dBµV	dBµV	dBµV/m	dBµV/m	dB	dB	
4960	56.715	49.135	43.04	35.46	74.00	54.00	-17.29	-4.87	H
	56.075	48.195	42.4	34.52	74.00	54.00	-17.93	-5.81	V
7440	56.52	43.62	38.09	25.19	74.00	54.00	-17.48	-10.38	H
	56.97	43.67	38.54	25.24	74.00	54.00	-17.03	-10.33	V
9920	64.75	48.5	42.48	26.23	74.00	54.00	-9.25	-5.50	H
	63.89	49.87	41.62	27.6	74.00	54.00	-10.11	-4.13	V
12400	67.444	52.424	41.52	26.5	74.00	54.00	-6.56	-1.58	H
	67.614	52.244	41.69	26.32	74.00	54.00	-6.39	-1.76	V

Radiated Band Edge

BT LE

Channel 0 and 39

Frequency	Peak Level	Average Level	Peak Measured	Average Measured	Peak Limit	Average Limit	Peak Margin	Average Margin	Pol
MHz	dB μ V/m	dB μ V/m	dB μ V	dB μ V	dB μ V/m	dB μ V/m	dB	dB	
2310-2390	49.01	36.04	42.79	29.82	74.00	54.00	-24.99	-17.96	H
	53.28	40.06	47.06	33.84	74.00	54.00	-20.72	-13.94	V
2483.5-2500	52.73	43.3	46.03	36.6	74.00	54.00	-21.27	-10.70	H
	58.21	46.35	51.51	39.65	74.00	54.00	-15.79	-7.65	V

AC Line Conducted Emissions

CFR 47 Part 15.207(a)

Measurement Procedure

AC power-line conducted emission measurements are made over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from all of the EUT current-carrying power input terminals that are directly or indirectly connected to a public power network. The measurements are made on each current-carrying conductor at the plug end of the EUT power cord or calibrated extension cord by the use of mating plugs and receptacles on the EUT and LISN.

Preliminary measurements are made using a peak detector and final measurements are performed using Quasi Peak and Average Detectors. The RBW of the EMI receiver is set to 9 kHz for all final measurements. If there is enough margin using the peak detector then no final measurements are performed.

Conducted Emission (dBuV) = EMI Receiver Level (dBuV) + Loss (dB)

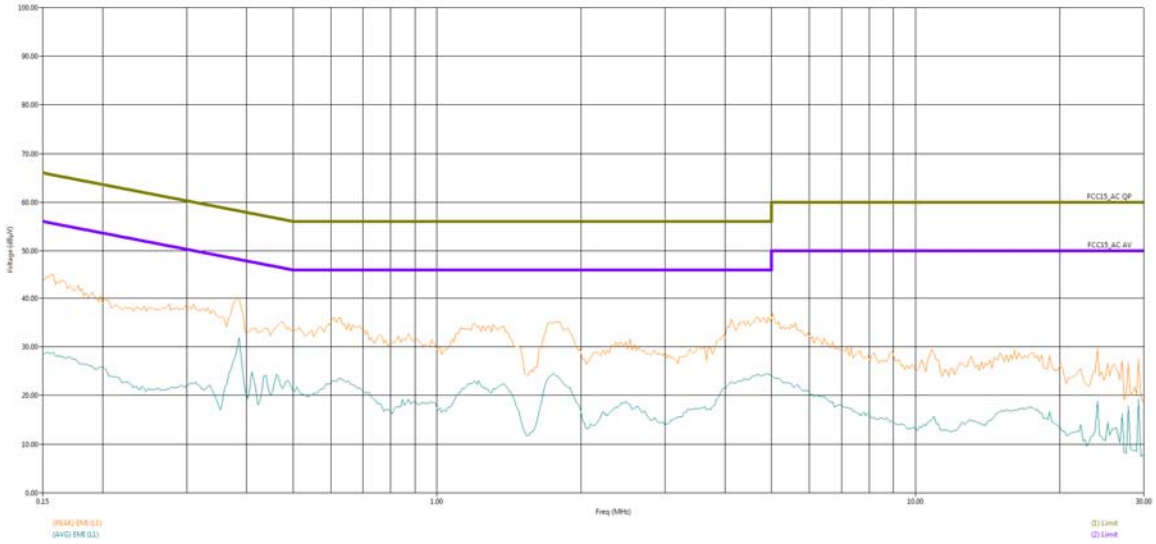
The EUT is setup according to the procedures in ANSI C63.10-2009. The test is performed with the EUT connected to the LISN while charging in the Wireless Charger.

Measurement Results

See attached:

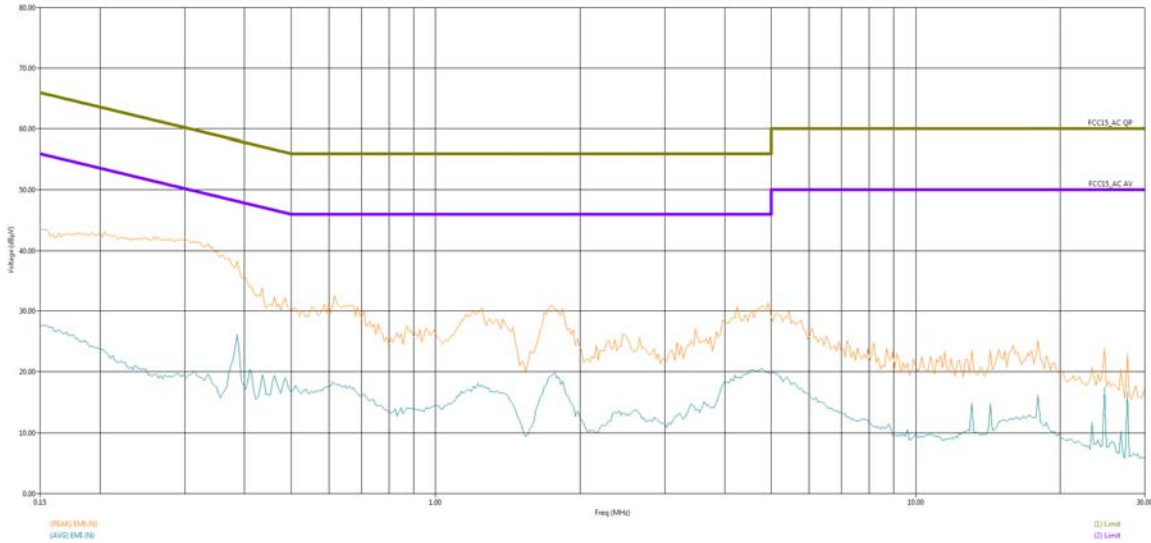
BT LE

BT LE Channel 0 - TX Mode - Line Coupling



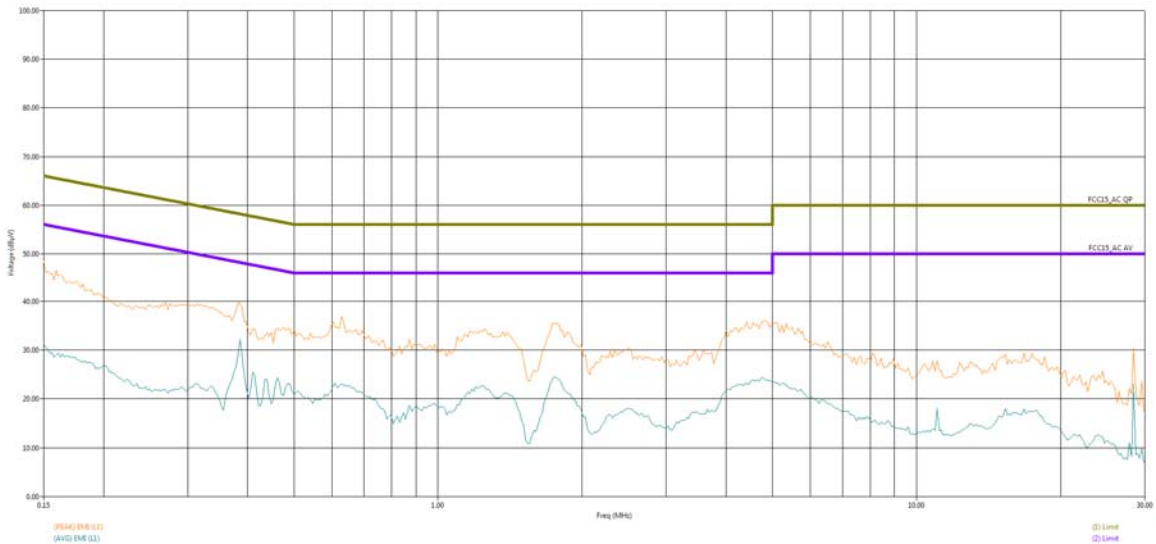
Freq	(PEAK) EMI (L1)	(AVG) EMI (L1)	QP Limit	AVG Limit	QP Margin	AVG Margin
MHz	dBuV	dBuV	dBuV	dBuV	dB	dB
0.16	44.93	28.59	65.67	55.67	20.74	27.08
0.38	40.27	30.04	58.23	48.23	17.96	18.19
0.63	35.92	23.5	56	46	20.08	22.5
1.2	34.9	22.98	56	46	21.1	23.02
1.79	35.15	23.94	56	46	20.85	22.06
4.12	35.71	22.72	56	46	20.29	23.28
5.03	37.04	23.88	60	50	22.96	26.12
10.8	29.6	15.21	60	50	30.4	34.79
24	29.66	18.83	60	50	30.34	31.17
29.3	27.49	19.23	60	50	32.51	30.77

BT LE Channel 0 - TX Mode – Neutral Coupling



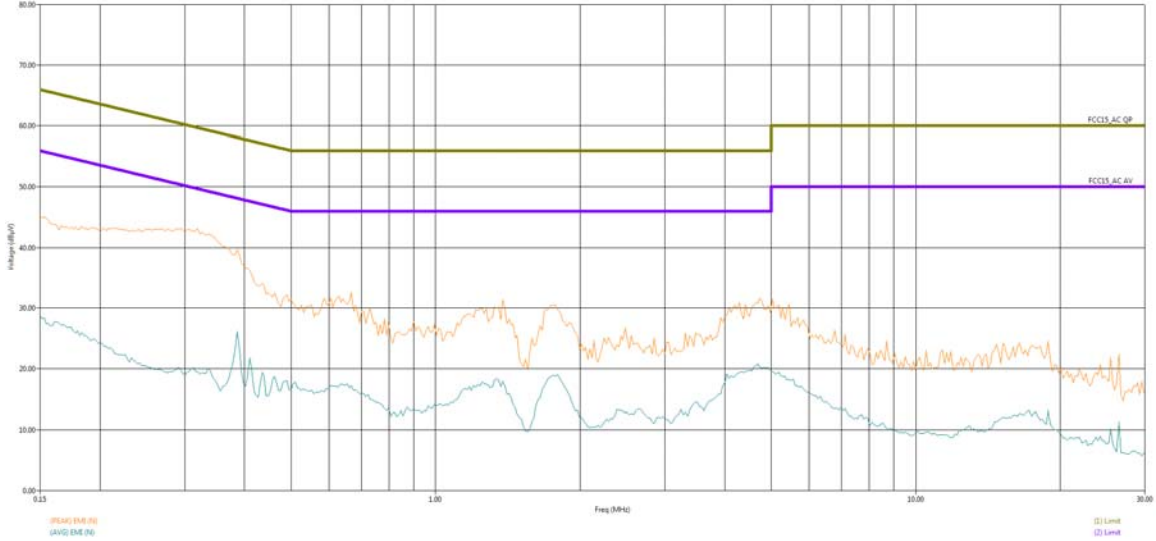
Freq	(PEAK) EMI (N)	(AVG) EMI (N)	QP Limit	AVG Limit	QP Margin	AVG Margin
MHz	dBuV	dBuV	dBuV	dBuV	dB	dB
0.2	43.09	23.2	63.44	53.44	20.35	30.24
0.33	40.66	18.54	59.47	49.47	18.81	30.93
0.39	38.31	26.1	58.15	48.15	19.84	22.05
1.25	30.42	17.69	56	46	25.58	28.31
1.73	30.86	19.3	56	46	25.14	26.7
4.25	30.63	18.86	56	46	25.37	27.14
4.93	31.27	19.89	56	46	24.73	26.11
13.07	23.58	14.88	60	50	36.42	35.12
14.3	23.47	14.71	60	50	36.53	35.29
15.95	24.31	12.26	60	50	35.69	37.74
17.98	25.12	16.13	60	50	34.88	33.87
24.71	23.72	17.38	60	50	36.28	32.62
27.57	22.94	16.66	60	50	37.06	33.34

BT LE Channel 19 - TX Mode - Line Coupling



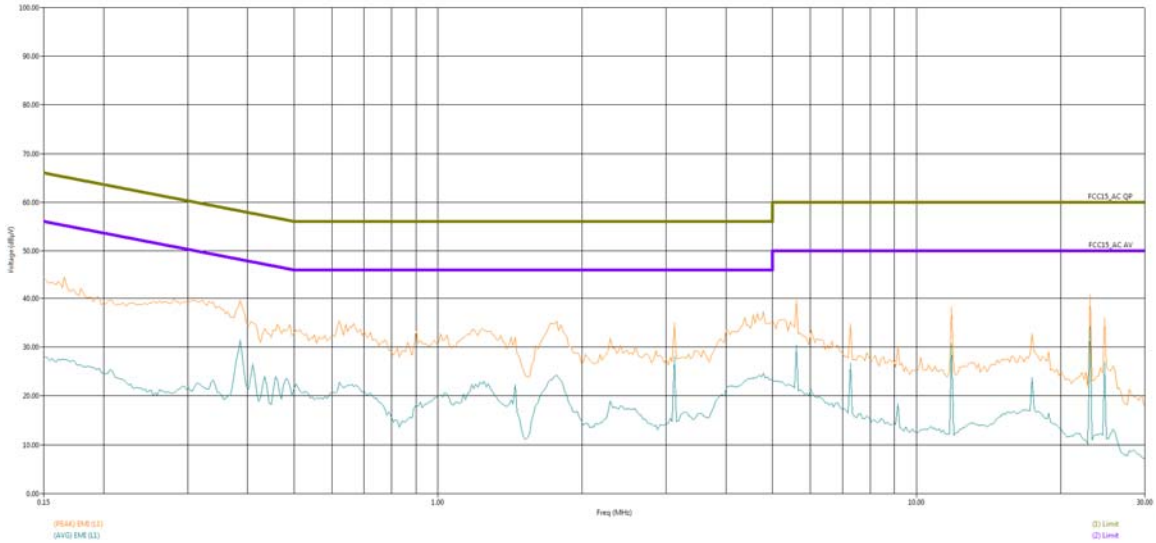
Freq	(PEAK) EMI (L1)	(AVG) EMI (L1)	QP Limit	AVG Limit	QP Margin	AVG Margin
MHz	dBuV	dBuV	dBuV	dBuV	dB	dB
0.16	46.6	29.06	65.5	55.5	18.9	26.44
0.39	39.52	32.25	58.15	48.15	18.63	15.9
0.63	36.99	22.94	56	46	19.01	23.06
1.73	35.53	24.13	56	46	20.47	21.87
4.83	36.22	23.82	56	46	19.78	22.18
10.82	27.67	13.97	60	50	32.33	36.03
16.77	29.47	17.89	60	50	30.53	32.11
28.41	30.55	23.05	60	50	29.45	26.95

BT LE Channel 19 - TX Mode - Neutral Coupling



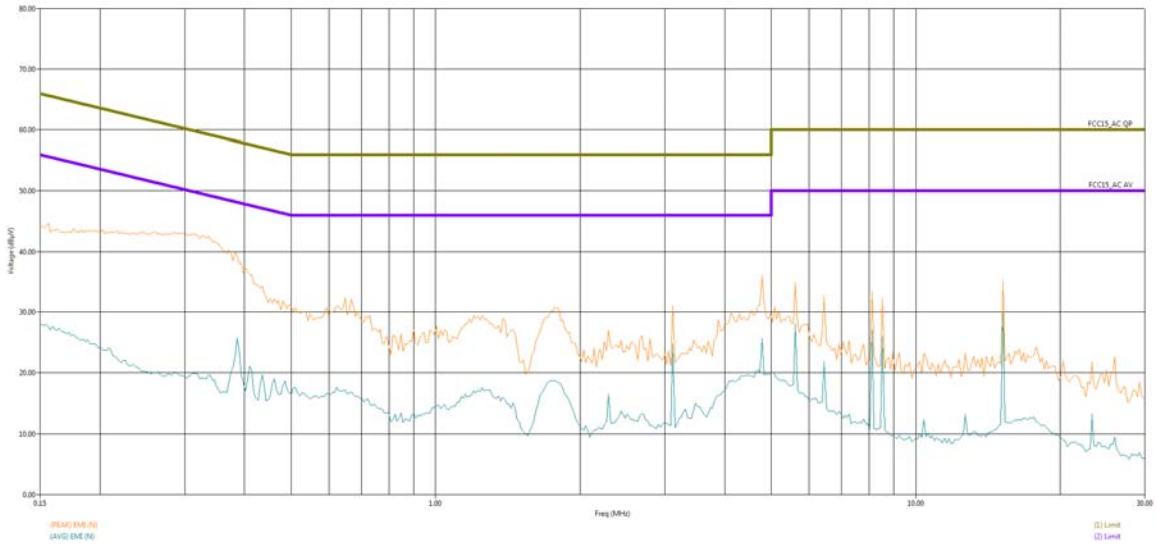
Freq	(PEAK) EMI (N)	(AVG) EMI (N)	QP Limit	AVG Limit	QP Margin	AVG Margin
MHz	dBuV	dBuV	dBuV	dBuV	dB	dB
0.15	44.88	27.39	65.75	55.75	20.87	28.36
0.32	43.07	19.52	59.72	49.72	16.65	30.2
0.39	39.69	26.16	58.15	48.15	18.46	21.99
0.67	32.53	17.17	56	46	23.47	28.83
1.38	31.35	17.88	56	46	24.65	28.12
1.77	30.41	18.69	56	46	25.59	27.31
4.74	31.52	20.15	56	46	24.48	25.85
6.78	26.28	13.47	60	50	33.72	36.53
8.69	24.54	10.25	60	50	35.46	39.75
18.89	24.5	13.11	60	50	35.5	36.89
25.46	21.89	10.2	60	50	38.11	39.8
26.5	22.33	11.28	60	50	37.67	38.72

BT LE Channel 39 - TX Mode - Line Coupling



Freq MHz	(PEAK) EMI (L1) dBuV	(AVG) EMI (L1) dBuV	QP Limit dBuV	AVG Limit dBuV	QP Margin dB	AVG Margin dB
0.17	44.41	27.45	65.17	55.17	20.76	27.72
0.39	39.68	31.57	58.15	48.15	18.47	16.58
0.62	35.49	22.76	56	46	20.51	23.24
0.9	33.24	18	56	46	22.76	28
1.24	33.87	22.38	56	46	22.13	23.62
1.77	35.4	24.22	56	46	20.6	21.78
3.12	35.01	28.09	56	46	20.99	17.91
5.61	39.67	30.42	60	50	20.33	19.58
7.27	34.84	26.65	60	50	25.16	23.35
11.84	38.17	30.64	60	50	21.83	19.36
17.45	32.8	23.72	60	50	27.2	26.28
23.05	40.76	34.18	60	50	19.24	15.82
24.71	35.95	26.82	60	50	24.05	23.18

BT LE Channel 39 - TX Mode - Neutral Coupling



Freq MHz	(PEAK) EMI (N) dBuV	(AVG) EMI (N) dBuV	QP Limit dBuV	AVG Limit dBuV	QP Margin dB	AVG Margin dB
0.16	44.67	27.44	65.67	55.67	21	28.23
0.38	39.81	22.92	58.23	48.23	18.42	25.31
0.65	32.35	17.1	56	46	23.65	28.9
1.25	29.5	17.54	56	46	26.5	28.46
1.77	30.74	18.74	56	46	25.26	27.26
3.12	30.94	24.68	56	46	25.06	21.32
4.79	35.93	25.59	56	46	20.07	20.41
5.61	34.79	27.95	60	50	25.21	22.05
6.45	32.55	21.79	60	50	27.45	28.21
8.11	33.38	27.01	60	50	26.62	22.99
8.52	32.19	25.93	60	50	27.81	24.07
15.18	35.14	29.75	60	50	24.86	20.25
23.28	21.73	13.14	60	50	38.27	36.86
25.98	22.68	9.49	60	50	37.32	40.51

End of Test Report