

CLIENT:

Safelet BV
Hasebroekstraat 28 HS
Amsterdam, Netherland 1053VC

Test Report No: EJ0062 Rev 3.0	Date: 11-August-2016
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SAMPLE ID: Safelet Safety Bracelet with BLE transmitter

IC NUMBER: 20716 -SFLTPV1A

FCC ID: 2AJA2SFLTPV1A

SAMPLING DETAIL: The Test Samples were submitted to the laboratory directly by the client. No special sampling conditions or sample preparation were observed by QAI Laboratories.

DATE OF RECEIPT: The EUT was received at QAI Laboratories, Inc. in Everett WA on 01 September 2015.

TESTING PERIOD: 02-Sep to 13-Nov 2015.

AUTHORIZATION: QAI laboratories Proposal # PL-2015-052101 Rev. 1.

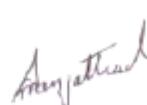
SUB-CONTRACT: Not Applicable

TEST PROCEDURES: FCC 47 CFR Part 15 Subpart B Emissions
FCC 47 CFR Part 15 Subpart C 15.247 Emissions
IC ICES-003 Emissions
IC RSS-247 Emissions

TEST RESULTS: The EUT **COMPLIED** with FCC 47 CFR Part 15 Subpart B
The EUT **COMPLIED** with FCC 47 CFR Part 15 Subpart C 15.247
The EUT **COMPLIED** with IC ICES-003
The EUT **COMPLIED** with IC RSS-247


X

Written by Jack Qin
RF/EMC Test Engineer/Technical Writer


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Reviewed by Aman Jathaul,
EMC Project Manager

Revision History

Date	Report Number	Rev #	Details	Authors Initials
16-Dec-2015	EJ0062	0.0	Draft Release	DJ
29-Apr-2016	EJ0062	1.0	Added corrections per customer's request	DJ
02-Jun-2016	EJ0062	2.0	Report Formatting Updated	MT
11-Aug-2016	EJ0062	3.0	Updated for Filing Requirements	JQ

All previous versions of this Report have been superseded by the latest dated Revision as listed in the above table. Please dispose of all previous electronic and paper printed revisions accordingly.

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Section 1: Purpose of this Test Report and Summary of Test Results

The purpose of this Test Report is to document the results of EMC tests performed in accordance with the applicable standards for the "Safelet Safety Bracelet". This Test Report references the applicable Electromagnetic Emissions and Immunity requirements.

A summary of the test results is presented in the tables below.

Test / Requirement Description	Applicable FCC Rule Parts	Applicable Industry Canada Rule Parts	Results		Pass / Fail
			Limit	Measured	
Antenna Requirement	15.203	RSS-Gen (7.1.2)	Approved Antenna	Wire Antenna	Pass
Maximum Peak Conducted Output Power Level	15.247 (b)(3)	RSS-210 A8.4(4)	Max Peak: 1W Max Peak EIRP 4W	-0.07dBm 0.984mW	Pass
Emission Bandwidth (EBW)	15.247(a)(2);	RSS-210 A8.2(a)	Min. 500kHz	0.71MHz (6dB) 1.09MHz (99%)	Pass
Spurious Emissions at antenna terminals	15.247 (d)	RSS-210 A8.5	Min 20dBc	>30dBc	Pass
Spurious Emissions Radiated Field Strength	15.247 (d) 15.205 (c)	RSS-210 A8.5 RSS-Gen	Min 20dBc and 54dBuv	>30dBc	Pass
Maximum Power Spectral Density Level in Fundamental Emission	15.247 (e)	RSS-210 A8.2(b)	8dBm	-6.0 dBm	Pass
Frequency Stability	15.215 (c)	RSS-Gen	-	+/-35ppm	Pass
RF Exposure Evaluation	1.1307(b) 15.247 (b)(5) KDB 447498 D01	RSS-102 (2.5)	>0.62mm, 4mW	1.5mm, 1.2mW	Pass

The signed original of this Test Report, supplied to the Client represents the only "official" copy. The Client has made the determination that the Condition, Characterization, Channel selections and Mode of Operation of the Equipment Under Test (EUT) is representative of production units, and meet the requirements of the Standards referenced herein. The Client is solely responsible for the tested product configuration, continued product compliance with the standards listed herein, and for the appropriate auditing of subsequent products, as required.

Consistent with Industry practice, the effects of measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) are collected into the "Correction Factor" documented in certain test results. Instrumentation employed for testing meets tolerances consistent with the applicable Industry Standards.

The measurements contained in this Test Report were made in accordance with the referenced standards. QAI Laboratories assumes responsibility only for the accuracy and completeness of this data as it pertains to the samples tested.

Section 2: Report Reviews and Approvals

The data in this Test Report was collected and compiled by:

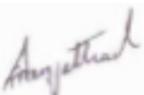
David Johanson
EMC Technician

By our signatures below, we certify that the data contained and stated in this Test Report are true and correct to the best of our knowledge.



David Johanson
EMC Technician

I certify that I have reviewed this Test Report, and have approved it for final release:



Aman Jathaul
EMC Manager

Section 3: Relevant Site Registrations and Accreditations

USA EMC Test Laboratory:	QAI Laboratories Inc. 834 80 TH Street SW,
Location/Address Suite 200, Everett, WA 98203-7008	
Tel:	+1-425-512-8419
Fax:	+1-425-322-3011
3 m Semi-Anechoic Chamber Test Site and AC Line Conduction Site FCC Test Site Address:	Same as above.
3 m Semi-Anechoic Chamber Test Site Industry Canada Test Site # 11876A-1 Address:	Same as above.
3 m Semi-Anechoic Chamber Test Site and AC Line Conduction Site FCC Test Site Registration Number:	307482
3 m Semi-Anechoic Chamber Test Site Industry Canada Test Site Registration File Number:	11876A-1
Canadian Laboratory Headquarters:	QAI Laboratories Ltd.
Headquarters Location/Address:	3980 North Fraser Way Burnaby, BC, V5J 5K5, Canada
Canadian Associated EMC Test Laboratories:	QAI Laboratories Ltd. (Remote Locations)
EMC Test Laboratory Location/Address:	19473 Fraser Way, Pitt Meadows, BC, V3Y 2V4, Canada
3 m /10 m Open Area Test Site [OATS] Address:	UBC Malcolm Knapp Research Forest, QAI Laboratories EMC, 14500 Silver Valley Road, Maple Ridge, B.C V4R 2R3
3 m /10 m Open Area Test Site [OATS] FCC Test Site Registration Number:	CA9543
3 m /10 m Open Area Test Site [OATS] Industry Canada Test Site Registration File Number:	21146-1
ISO/IEC 17025:2005 Accreditation:	Standard Council of Canada Accredited Laboratory No. 743

Section 4: Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1,5 \times 10^{-5}$ MHz
Total RF power, conducted	± 1 dB
RF power density, conducted	± 2.75 dB
Spurious emissions, conducted	± 3 dB
All emissions, radiated	± 3.5 dB
Temperature	$\pm 1^{\circ}\text{C}$
Humidity	± 5 %
DC and low frequency voltages	± 3 %

Section 5: Environmental Conditions

Indoor environment only

Typical Temperature: 20°C R.H.: 46%

Section 6: Equipment Lists

Emissions Equipment List

Manufacturer	Model	Description	Serial No.	Last Cal	Cal Due Date
ETS Lindgren	2165	Turntable	None	N/A	N/A
Sunol Sciences	TWR-MB/99	Mast	051204-3	N/A	N/A
Solar	7930-8.0	High Pass Filter	863945	15-Oct-14	15-Oct-17
Fischer	FCC-450B-2.4N	RF Fuse	None	15-Oct-14	15-Oct-16
EMCO	93110B	Biconical Antenna	9903-3260	07-May-14	07-May-17
EMCO	93146	Log Periodic Antenna	9510-4213	08-Sep-14	08-Sep-17
Hewlett Packard	8447F	Dual Amplifier 0.1 to 1000MHz	123101	06-Mar-15	06-Mar-16
Rohde & Schwarz	FSP 40	Spectrum Analyzer	100184	03-Nov-14	03-Nov-17

Section 7: Product Description

The Safelet Safety Bracelet is designed to be worn on the wrist in the same way as a wrist watch. It is Bluetooth linked to your cell phone and is used to contact help in emergency situations by just pressing a button on the Bracelet.

The Safelet contains an internal radio transmitter with a short single wire antenna for Bluetooth Low Energy (BLE).

The Safelet contains an internal rechargeable battery that is charged using a standard USB interface cable connected to a PC or appropriate wall charger.

Equipment Under Test

Description	Safelet Safety Bracelet
Manufacturer	Safelet BV
Model No.	Safelet
Revision	Rev 1
Serial No.	A00112016150001
FCC ID	2AJA2SFLTPV1A
IC Number	20716 -SFLTPV1A
HVIN	Indra201501

EUT Cabling Configuration

Number	Description	Number of Lines	Connection Type	Load or Termination	Shielded	Ferrites
1	Communication and Power Charge Port	4	USB	Computer	Yes	None

EUT Monitoring Procedure during Immunity

The support laptop is connected via the USB/Power cable. The EUT was programmed for continuous transmission. The Radiated emissions were monitored for any deviation in the transmission.

Support Equipment

Name	Manufacturer	Model Number	Serial Number
Laptop	Lenovo	T420	Unknown

EUT Photograph



Section 8: AC Mains Conducted Emissions

DATE: 28 August 2015
 TEST STANDARD: FCC 47 CFR Part 15.107
 TEST METHOD: ANSI 63.4:2009, CISPR 11
 TEST VOLTAGE: 120Vac, 60Hz
 MINIMUM STANDARD: Class B Limit:

Frequency (MHz)	Conducted Limit (dB μ V)	
	Quasi-Peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.5 - 5	56	46
5 - 30	60	50

Note 1 The lower limit shall apply at the transition frequencies
Note 2 The limit decreases linearly with the logarithm of the frequency in the 0.15 to 0.50 MHz..

METHOD OF MEASUREMENT: Measurements were made using a test receiver with 9 kHz bandwidth, CISPR Quasi-Peak and Average detector. Bandwidths used on the test receiver are those specified in CISPR 16-1-1.
 DEVICE DESCRIPTIONS: Refer to the Equipment Under Test Section for EUT Descriptions.
 CABLING DETAILS: The EUT was set up using the manufacturer's specified normal cabling configuration. Refer to Equipment Under Test Section for Cabling Descriptions.
 MEASUREMENT DATA: Measurements were done while both transmitters were in quiescent mode as well as while each transmitter was in continuous transmission mode. See Appendix A, Section A for Conducted Emissions data.
 PERFORMANCE: Complied with standard.

Section 9: Radiated Emissions – Standby/Receive Mode

DATE: 31 August 2015

TEST STANDARD: FCC 47 CFR Part 15.109,

TEST METHOD: ANSI 63.4:2009,

TEST VOLTAGE: 120Vac, 60Hz

TESTED TO: Class B Limit

Frequency (MHz)	Field Strength	
	uV/m @ 3-m	dB μ V/m at 3m
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
960 - above	500	54.0

TEST SETUP: The equipment was set up in 3m Semi Anechoic Chamber for preliminary and final measurements. All cables over 1 meter in length were bundled at 1 meter and retained from the floor. A typical application was tested. Emissions in both horizontal and vertical polarizations were measured while rotating the EUT on a turntable to maximize the emissions signal strength. In cases where the presence of high ambient noise makes it impossible to measure an emission at the required distance, the measurement is performed at a closer distance and the limit is adjusted per EN 55011:2009/A1:2010

20 Log (D1/D2)
Where D1 = New Distance
D2 = Required Distance
The result is added or subtracted to the required emission level to ensure compliance at the new distance.

OBSERVATION: Radiated emissions pre-scans were performed with an input voltage of 120VAC/60Hz. The emissions were verified with the transmitter in Standby Mode.

MODIFICATIONS: No modification is required to comply for this test.

MEASUREMENT DATA: See Appendix A, Section D for Radiated Emissions data.

PERFORMANCE: Complies with standard.

Section 10: Antenna Requirements

DATE: 31 August 2015

TEST STANDARD: FCC 15.203; IC RSS-Gen (7.1.2)

APPLICABLE REGULATIONS: "An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited." "The installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded."

RESULT: This unit meets this requirement. The antenna is a Single Wire antenna that is soldered to the PCB.

It is installed by the manufacturer into the final product.

The End User will have no access to change the antenna.

- Estimated Peak Gain (dBi) 1.0

Section 11: Maximum Peak Conducted Output Power Level

DATE(s): 09 November, 2015
 TEST STANDARD: FCC Part 15.247 (b)(3); IC RSS-210 (A8.2(a))
 TEST PROCEDURE: ANSI c63.10
 TEST VOLTAGE: 3.3Vdc Battery
 MINIMUM STANDARD: 1 Watt (30dBm) maximum
 TEST SETUP: Each Module was modified with an antenna port cable ending with an SMA connector. The EUT was programmed for maximum output. The antenna port of EUT was directly connected to an RF Power Meter through a 10dB Attenuator.
 MEASUREMENT METHOD: As called by the standards above.
 DEVICE DESCRIPTIONS: As described in the above EUT description and set up section.
 EMISSIONS DATA:

BLE at 20°Cel

Frequency (GHz)	Pwr meter (dBm)	Correction Factor (dB)	Corrected Power (dBm)
2404	-11.25	11.18	-0.07
2440	-11.30	11.20	-0.10
2480	-11.34	11.25	-0.09

OBSERVATIONS: The EUTs performed as expected.

PERFORMANCE: Complies.

Section 12: Occupied Bandwidth

DATE(s): 11 September 2015

TEST STANDARD: FCC Part 15.247(a)(2) RSS-210 (A8.2(a))

TEST VOLTAGE: 3.3Vdc Battery

MINIMUM STANDARD: The 6dB bandwidth must be greater than 500kHz

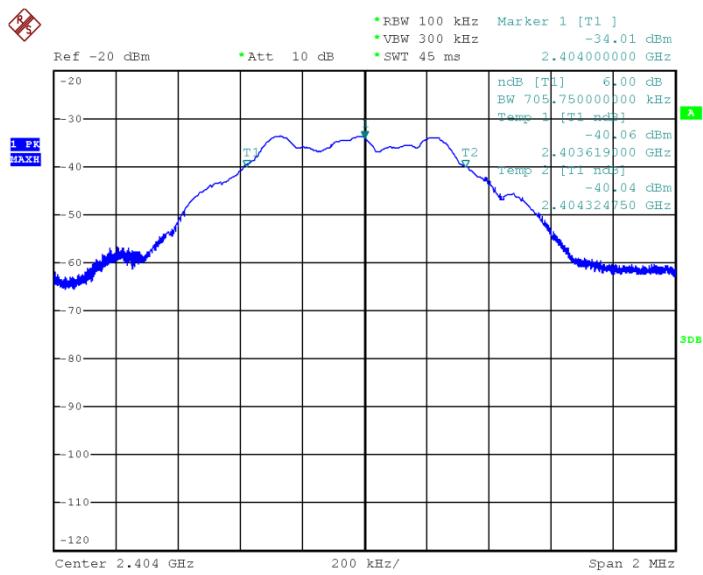
TEST SETUP: The antenna port of EUT was directly connected to a Spectrum Analyzer through a 30dB Attenuator.

MEASUREMENT METHOD: As called by the standards above.

DEVICE DESCRIPTIONS: As described in the above EUT description and set up section.

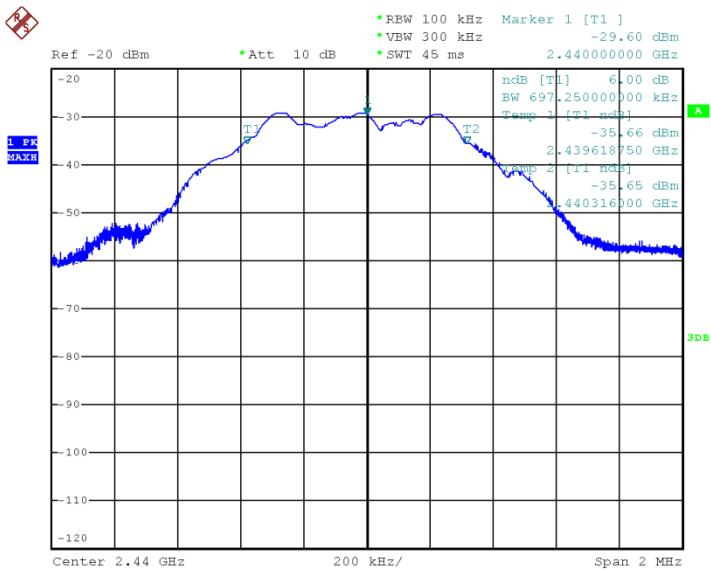
BLE Transmitter Module

Frequency (GHz)	Measured 6dB (MHz)	Measured 99% (MHz)
2.404	0.705	1.08
2.440	0.697	1.09
2.480	0.709	1.08



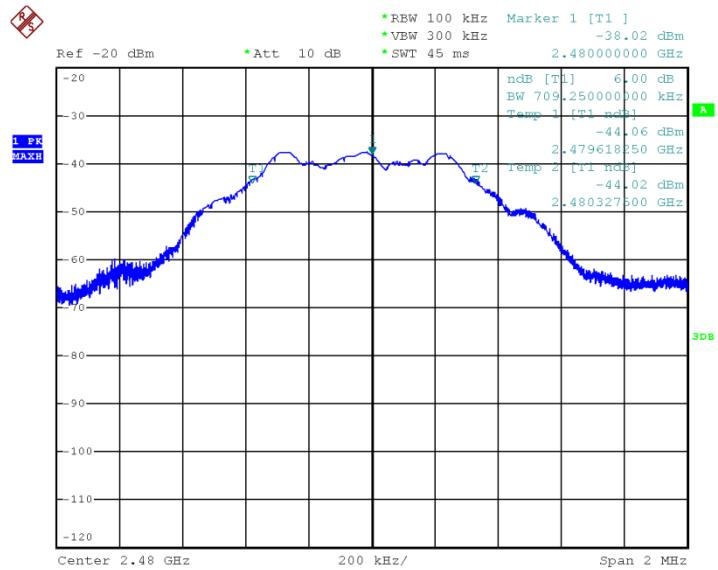
Date: 31.AUG.2015 17:59:29

6dB Occupied Band Width – Low Channel



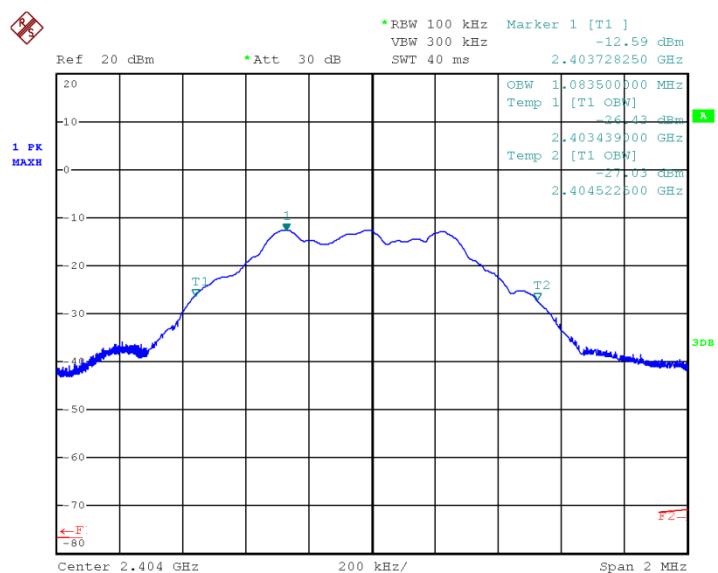
Date: 31.AUG.2015 17:48:07

6dB Occupied Band Width – Middle Channel



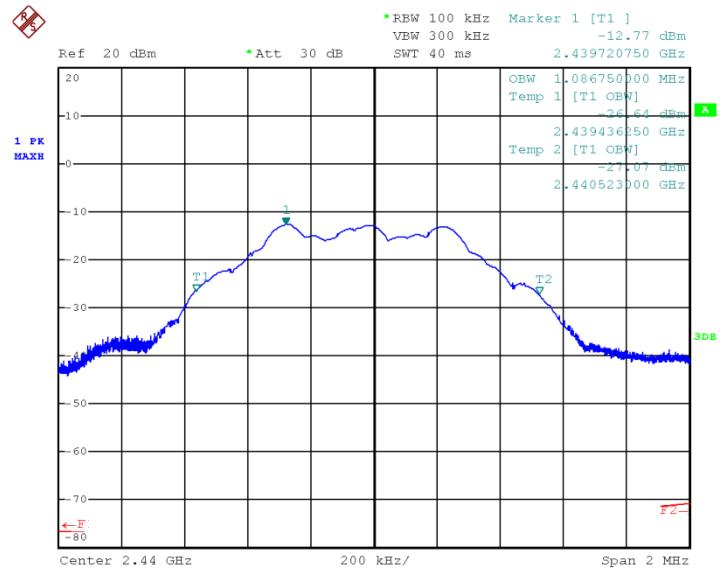
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6dB Occupied Band Width – High Channel



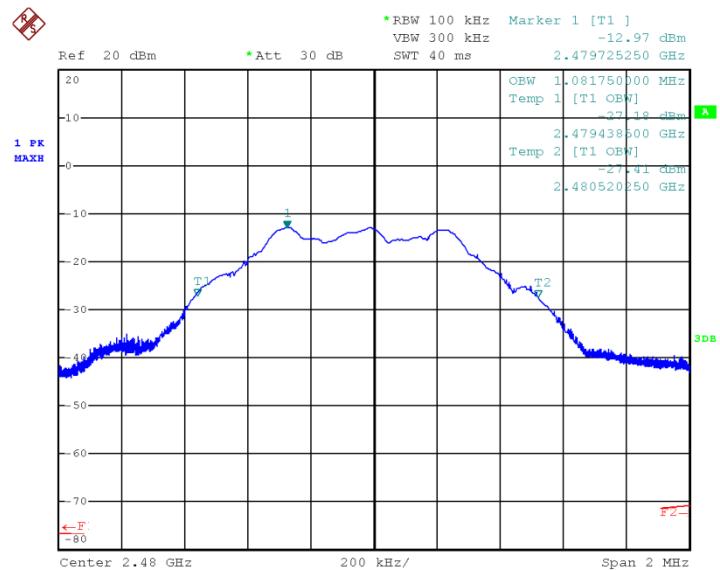
Date: 11.NOV.2015 19:18:06

99% Occupied Band Width – Low Channel



Date: 11.NOV.2015 19:26:24

99% Occupied Band Width – Middle Channel



Date: 11.NOV.2015 19:38:38

99% Occupied Band Width – High Channel

Section 13: Out Of Band Spurious Emissions Conducted

DATE: 31 August 2015

TEST STANDARD: FCC Part 15.247(d) RSS-210(A8.5)

TEST VOLTAGE: 120Vac 60Hz AC to 3.3Vdc Power Adapter

MINIMUM STANDARD: Emissions must be at least 20dB down from the highest emission level within the authorized band as measured with a 100kHz RBW

TEST SETUP: The antenna port of EUT was directly connected to a Spectrum Analyzer through a 20dB Attenuator and appropriated RF Filters.
Conversion Formulas used: For the frequency measurement:
$$E(\text{dBm}) = \text{Meas}(\text{dBm}) + \text{Cable Loss}(\text{dB}) + \text{Attenuator/Filter Loss}(\text{dB})$$

MEASUREMENT METHOD: Measurements were made using spectrum analyser and receiver using the appropriate attenuators and filters to optimize the reading. The settings used were:
200Hz RBW average detector for the frequency range 9kHz-150kHz
9kHz RBW average detector for the Frequency range 150kHz to 30MHz
120kHz RBW quasi-peak detector for the frequency range 30MHz to 1GHz
1MHz RBW Average detector for the frequency range 1GHz to 20GHz

DEVICE DESCRIPTIONS: As described in the above EUT description and setup section.

EMISSIONS DATA: Only Radiated Emissions test was performed.

Section 14: Out Of Band Spurious Emissions Radiated

DATE: 09 November 2015

TEST STANDARD: FCC Part 15.247(d) RSS-210(A8.5)

TEST VOLTAGE: 120Vac 60Hz AC to 3.3Vdc Power Adapter

MINIMUM STANDARD: All emissions that fall in the restricted bands (15.205 or RSS-Gen (7.2.2)) must comply with the limits as listed in 15.209 and RSS-Gen (7.2.5). All other emissions must be at least 20dB down from the highest emission level within the authorized band as measured with a 100kHz RBW

TEST SETUP: The EUT was tested in our 3 m SAC and was positioned on the center of the turntable and powered up. The Transmitter Output was connected to its standard antenna. The transmitter was set for continuous transmission. The lowest, middle and highest channels were measured for all radiated emissions 10kHz to 25 GHz. The EUT was verified in 3 orthogonal orientations and the worst orientation was used for the final measurements. The EUT was tested and placed in the Vertical orientation on the table top as indicated in the test photos.

MEASUREMENT METHOD: Measurements were made using spectrum analyser and receiver using the appropriate antennas, amplifiers, attenuators and filters as per ANSI c63.10 and FCC KDB 558074 D01 DTS Meas Guidance v03r03

DEVICE DESCRIPTIONS: As described in the above EUT description and setup section.

EMISSIONS DATA: No transmitter Radiated Spurious Emissions were detected 9kHz to 2.4GHz and above 5GHz. Only the known harmonics of each transmitter were detectable.

BLE Low Channel – Streaming Mode

Frequency (GHz)	Uncorr-Avg (dB μ V/m)	Uncorr-Peak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Antenna Factors	Correction Factors Cables and Amp (-xx = gain)	Corr. Avg (dB μ V/m)	Corr. Peak (dB μ V/m)
2.404000	48.72	49.92	1000.00	175.00	V	183.30	28.50	3.80	81.02	82.22
2.404000	54.39	54.96	1000.00	174.00	H	201.60	28.50	3.80	86.69	87.26
4.808000	49.57	52.73	1000.00	200.00	V	20.00	32.40	-28.35	53.62	56.78
4.808000	48.06	50.68	1000.00	171.00	H	182.20	32.40	-28.35	52.11	54.73

BLE Middle Channel – Streaming Mode

Frequency (GHz)	Uncorr-Avg (dB μ V/m)	Uncorr-Peak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Antenna Factors	Correction Factors Cables and Amp (-xx = gain)	Corr. Avg (dB μ V/m)	Corr. Peak (dB μ V/m)
2.440000	42.84	44.88	1000.00	174.00	V	103.00	28.50	3.80	75.14	77.18
2.440000	45.99	47.42	1000.00	165.00	H	203.20	28.50	3.80	78.29	79.72
4.880000	45.17	49.77	1000.00	109.00	V	325.00	32.40	-28.35	49.22	53.82
4.880000	49.76	52.42	1000.00	120.00	H	180.00	32.40	-28.35	53.81	56.47

BLE High Channel – Streaming Mode

Frequency (GHz)	Uncorr-Avg (dB μ V/m)	Uncorr-Peak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Antenna Factors	Correction Factors Cables and Amp (-xx = gain)	Corr. Avg (dB μ V/m)	Corr. Peak (dB μ V/m)
2.480000	45.98	51.09	1000.00	160.00	V	190.70	28.90	3.90	78.78	83.89
2.480000	55.25	55.84	1000.00	158.00	H	0.00	28.90	3.90	88.05	88.64
4.960000	46.14	50.20	1000.00	160.00	V	183.80	32.60	-27.80	50.94	55.00
4.960000	47.97	51.48	1000.00	164.00	H	188.50	32.60	-27.80	52.77	56.28

Section 15: Power Spectral Density

DATE(s): 17 October 2015

TEST STANDARD: FCC Part 15.247(e) RSS-210 (A8.2(b))

TEST VOLTAGE: 120Vac 60Hz AC to 3.3Vdc Power Adapter

MINIMUM STANDARD: Maximum of 8dBm in any 3kHz band

TEST SETUP: The antenna port of EUT was directly connected to a Spectrum Analyzer through a 10dB Attenuator.

MEASUREMENT METHOD: As called by the standards above.

DEVICE DESCRIPTIONS: As described in the above EUT description and set up section.

EMISSIONS DATA:

BLE transmitter

Frequency (GHz)	Measured (dBm)
2.40400	-6.0
2.44000	-6.1
2.48000	-6.3

Section 16: Frequency Stability

DATE:	01 November 2015
TEST STANDARD:	FCC Part 15.215(c) and RSS-Gen Section (6.11) and (8.11)
TEST VOLTAGE:	2.6-5Vdc
MINIMUM STANDARD:	<p>Not specified.</p> <p>RSS-Gen (6.11) With the transmitter installed in an environment test chamber, the unmodulated carrier frequency shall be measured under the conditions specified below:</p> <ul style="list-style-type: none">(a) at temperatures of -30°C, +20°C and +55°C, at the manufacturer's rated supply voltage of the battery.(b) at a temperature of +20°C and at ±15 percent of the manufacturer's rated supply voltage. <p>RSS-Gen (8.11) Transmitter frequency stability for licence-exempt radio apparatus shall be measured in accordance with Section 6.11. Also, for licence-exempt radio apparatus, the frequency stability shall be measured at temperatures of -20°C, +20°C and +55°C instead of at the temperatures specified in Section 6.11(a). If the frequency stability of the licence-exempt radio apparatus is not specified in the applicable standards, measurement of the frequency stability is not required provided that the occupied bandwidth of the licence-exempt radio apparatus lies entirely outside the restricted bands and the prohibited TV bands of 54-72 MHz, 76-88 MHz, 174-216 MHz, 470-608 MHz and 614-806 MHz.</p> <p>FCC (15.215(c))</p> <p>The 20dB bandwidth must remain within the designated frequency band over the expected variations in temperature and voltage range</p>
TEST SETUP:	The EUT was bench tested and in our temperature chamber. The transmitter was set for Carrier Wave (CW) mode and the lowest and highest channel Frequency was measured at each Temperature setting, after the Transmitter stabilized at the temperature.
MEASUREMENT METHOD:	Measurements were made using a Spectrum Analyzer with 120kHz RBW Average detector while directly connected to the EUT through the antenna port.
DEVICE DESCRIPTIONS:	As described in the above EUT description and setup section.

DATA:

BLE Transmitter

Low Channel

Temp (C)	Power Level (dBm)	Voltage	Frequency (GHz)	Drift (kHz)
20	-0.1	3.7	2.404000	Ref
20	-6.3	3.2	2.404016	16
20	-3.7	4.2	2.404024	24
-30	4.1	3.7	2.403960	-40
-20	5.3	3.7	2.403988	-12
-10	5.3	3.7	2.404008	8
0	1.7	3.7	2.404020	20
10	2.1	3.7	2.404028	28
20	-0.1	3.7	2.404000	0
30	3.3	3.7	2.404012	12
40	-4.3	3.7	2.404012	12
50	-6.2	3.7	2.404016	16

Mid Channel

Temp (C)	Power Level (dBm)	Voltage	Frequency (GHz)	Drift (kHz)
20	-0.1	3.7	2.440000	Ref
20	-1.0	3.2	2.440004	4
20	-0.8	4.2	2.440008	8
-30	6.1	3.7	2.440084	84
-20	8.4	3.7	2.440020	20
-10	6.0	3.7	2.440024	24
0	0.7	3.7	2.440016	16
10	0.0	3.7	2.440012	12
20	-0.1	3.7	2.440000	0
30	0.1	3.7	2.440004	4
40	-2.7	3.7	2.439996	-4
50	-9.0	3.7	2.440000	0

High Channel 2.4800000

Temp (C)	Power Level (dBm)	Voltage	Frequency (GHz)	Drift (kHz)
20	-0.1	3.7	2.480000	Ref
20	-0.4	3.2	2.479988	-12
20	0.7	4.2	2.479992	-8
-30	-0.1	3.7	2.480060	60
-20	1.0	3.7	2.480058	56
-10	1.4	3.7	2.480020	20
0	2.2	3.7	2.480004	4
10	1.0	3.7	2.479996	-4
20	-0.1	3.7	2.480000	0
30	-1.6	3.7	2.479980	-20
40	-10.2	3.7	2.479980	-20
50	-10.0	3.7	2.479980	-20

Section 17: RF Exposure Evaluation

DATE: August 10, 2016

STANDARD: FCC part 15 1.1307(b), 15.247 (b)(5); KDB-447498 D01 General RF Exposure Guidance v06; RSS-102 (2.5.1)

KDB 447498 D01: a) For 100 MHz to 6 GHz and test separation distances \leq 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR, and } \leq 7.5 \text{ for 10-g extremity SAR,}$$

RSS-102 (2.5.1):

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance^{4,5}

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of \leq 5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
\leq 300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

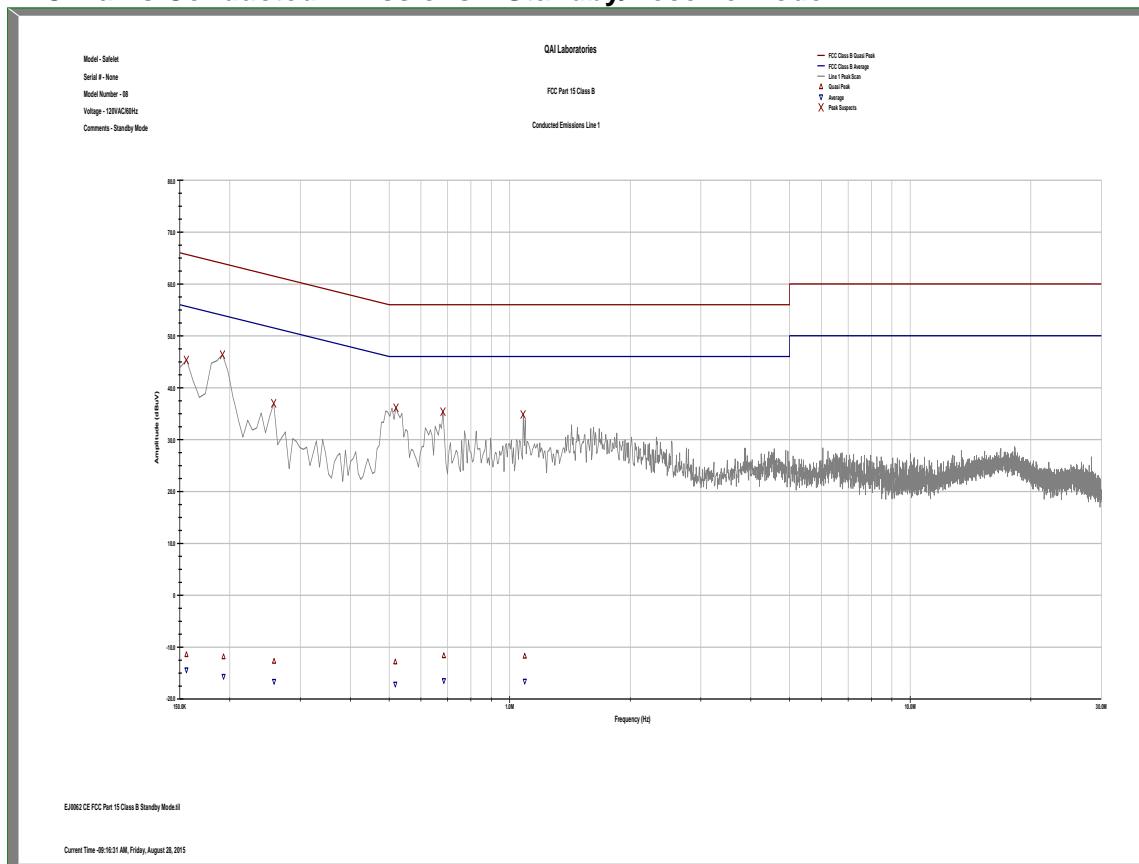
Evaluation:

BLE Transmitter:

- 1.) The highest conducted power was -0.07 dBm
- 2.) The antenna gain is 1.0 dBi (peak)
- 3.) E.I.R.P. = $-0.07\text{dBm} + 1.0\text{ dBi} = 0.93\text{ dBm} = 1.2\text{ mW}$
- 4.) Frequency: 2.4GHz
- 5.) Min Distance: $\text{EIRP(mW)} \times \sqrt{f(\text{GHz})} / 3 = 1.2 \times \sqrt{2.4} / 3 = 0.62\text{ mm}$
- 6.) As the thickness of the shell of the EUT is at least 1.5mm which is much great than 0.62mm, therefore the EUT is qualified for SAR test exclusion as per FCC standard FCC part 15 1.1307(b), 15.247 (b)(5) and KDB-447498 D01
- 7.) As EIPR of this EUT is 1.2mW which is less than 4mW, therefore the EUT is qualified for SAR test exclusion as per IC standard RSS-102 (2.5.1)

Appendix A: Emissions Data

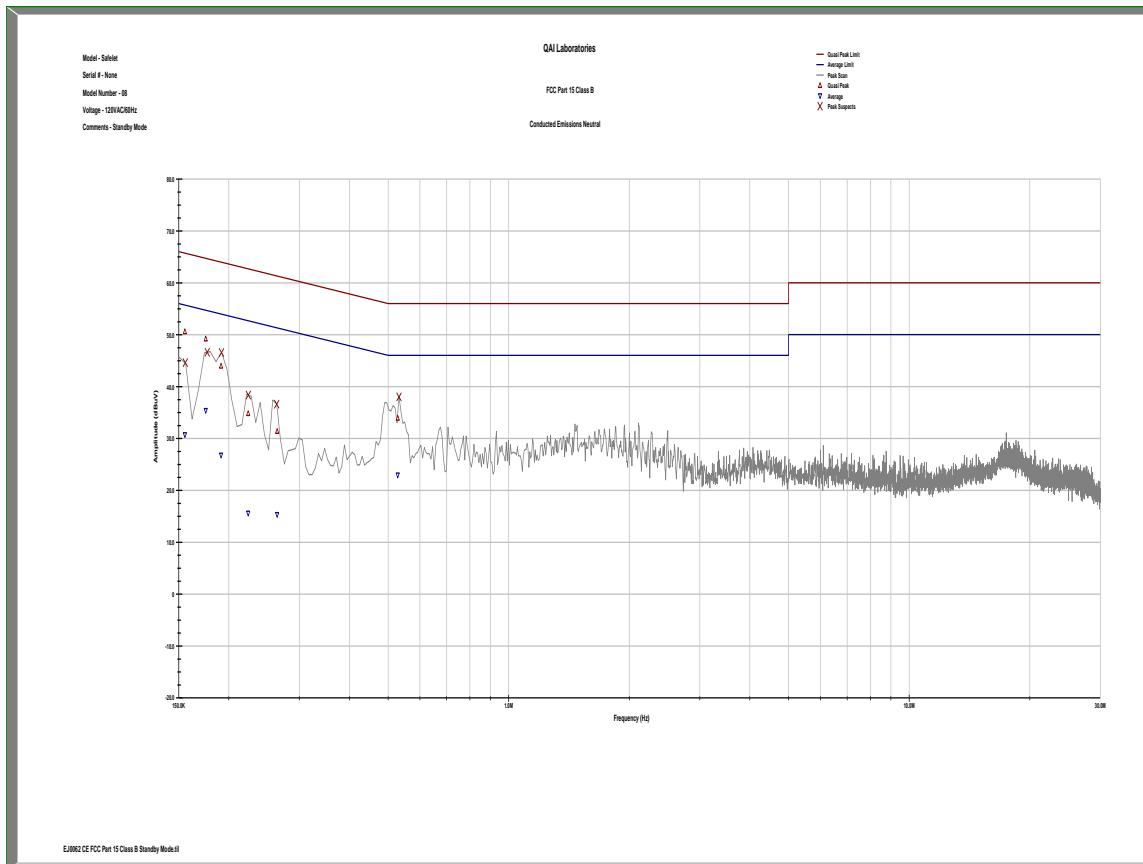
Section A: AC Mains Conducted Emissions – Standby/Receive Mode



Plot 1: AC Mains Conducted Emissions-Line 1- 120Vac/60Hz

Freq (MHz)	QP Meas (dBuV)	AVG Meas (dBuV)	Total Corr (dB)	QP Actual (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AVG Actual (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
0.156	-10.93	-13.91	-0.26	-11.44	65.68	-77.12	-14.42	55.68	-70.1
0.193	-11.7	-15.51	0.01	-11.87	63.91	-75.77	-15.67	53.91	-69.58
0.258	-12.62	-16.52	0	-12.73	61.5	-74.23	-16.64	51.5	-68.13
0.518	-12.65	-16.98	-0.13	-12.83	56	-68.83	-17.16	46	-63.16
0.685	-11.31	-16.15	-0.3	-11.65	56	-67.65	-16.5	46	-62.5
1.09	-11.7	-16.55	0	-11.74	56	-67.74	-16.59	46	-62.59

Table 1: Conducted Emissions- AC Mains Line 1

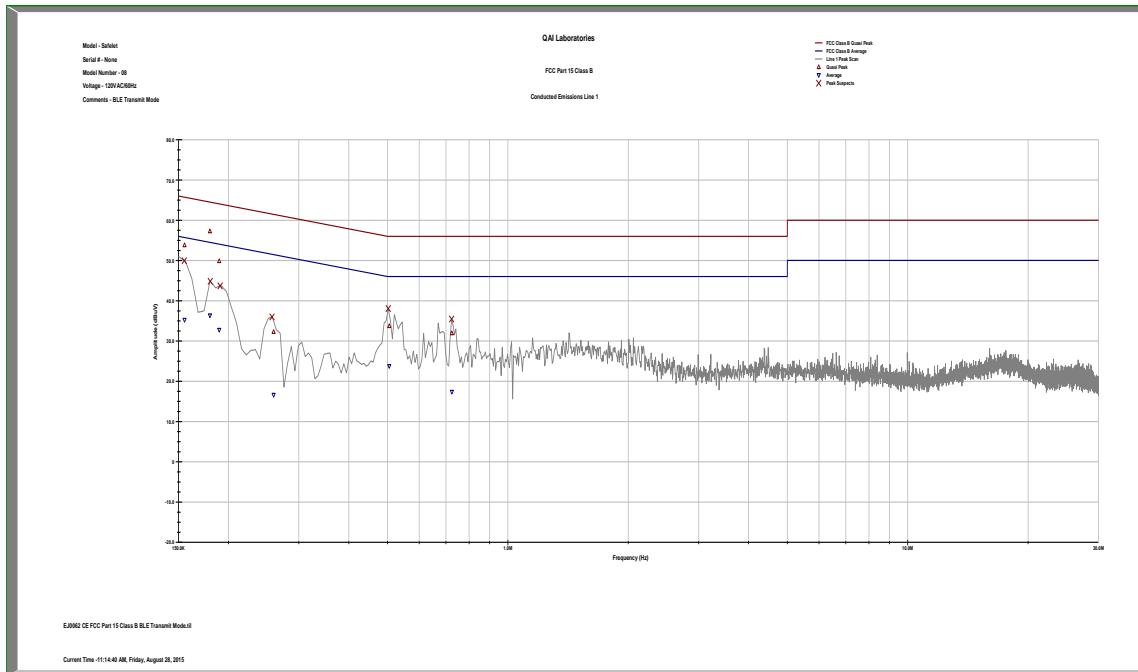


Plot 2: AC Mains Conducted Emissions-Line 2- 120Vac/60Hz

Freq (MHz)	QP Meas (dBuV)	AVG Meas (dBuV)	Total Corr (dB)	QP Actual (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AVG Actual (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
0.155	51.11	31.23	-0.28	50.58	65.7	-15.13	30.69	55.7	-25.01
0.175	49.38	35.56	0	49.18	64.71	-15.54	35.35	54.71	-19.36
0.191	44.06	26.9	0.04	43.93	63.98	-20.05	26.76	53.98	-27.21
0.224	35.18	15.95	-0.25	34.8	62.69	-27.89	15.57	52.69	-37.12
0.264	31.47	15.43	0	31.37	61.3	-29.94	15.32	51.3	-35.98
0.528	34.01	23.06	-0.08	33.89	56	-22.11	22.94	46	-23.06

Table 2: Conducted Emissions AC Mains Line 2

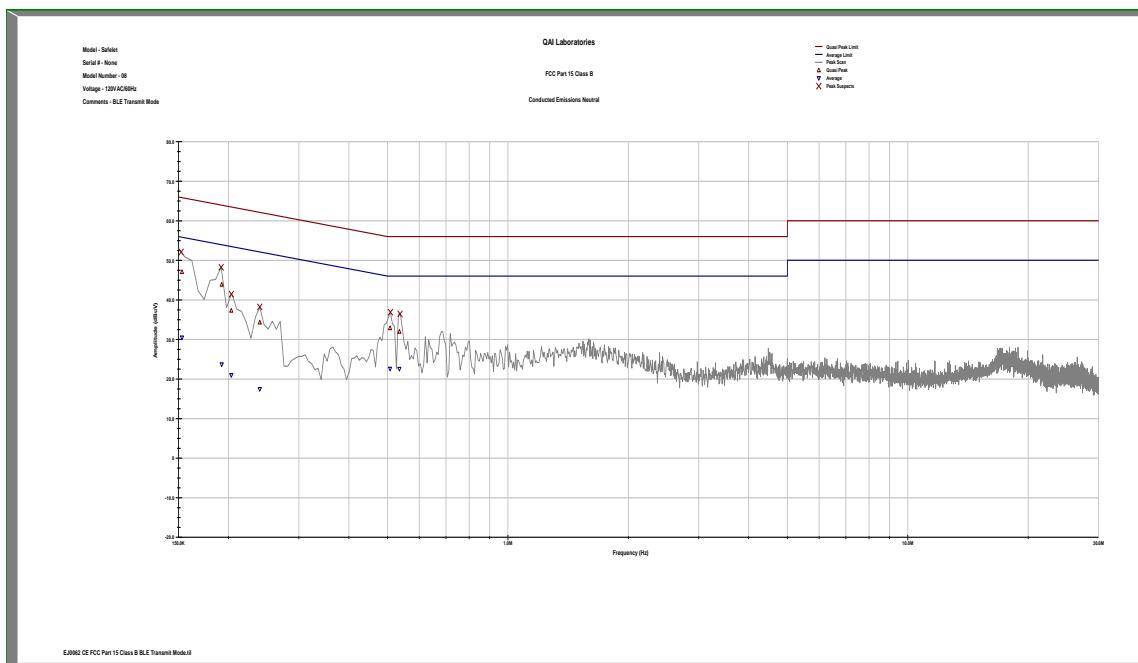
Section B: AC Mains Conducted Emissions – BLE Transmit Mode



Plot 5: Conducted Emissions AC Mains -Line 1 120Vac/60Hz

Freq (MHz)	QP Meas (dBuV)	AVG Meas (dBuV)	Total Corr (dB)	QP Actual (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AVG Actual (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
0.155	54.34	35.74	-0.29	53.8	65.71	-11.9	35.21	55.71	-20.5
0.18	57.47	36.51	0	57.28	64.5	-7.22	36.32	54.5	-18.18
0.19	49.97	32.83	0.08	49.87	64.05	-14.18	32.73	54.05	-21.32
0.259	32.37	16.72	0	32.26	61.45	-29.19	16.61	51.45	-34.84
0.505	33.96	23.98	-0.18	33.73	56	-22.27	23.74	46	-22.26
0.724	32.15	17.57	-0.18	31.93	56	-24.07	17.34	46	-28.66

Table 5: Conducted Emissions AC Mains -Line 1

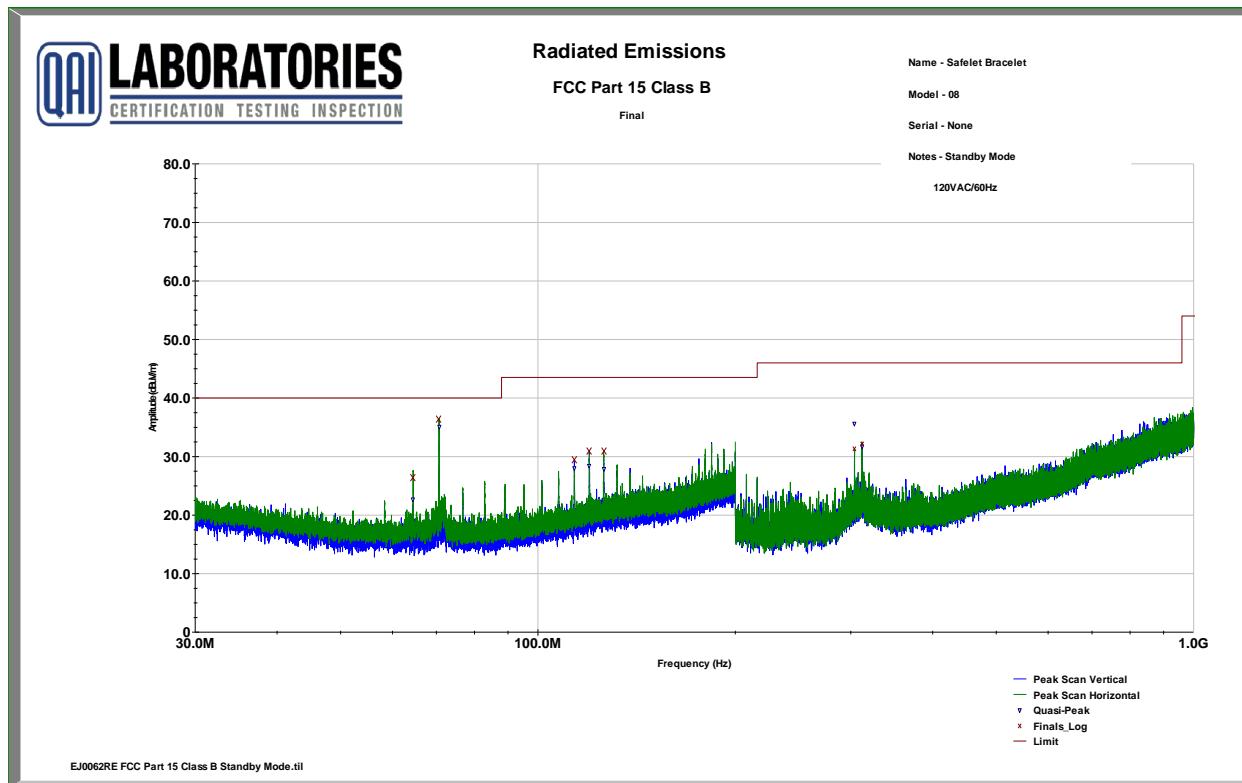


Plot 6: Conducted Emissions AC Mains -Line 2 120Vac/60Hz

Freq (MHz)	QP Meas (dBuV)	AVG Meas (dBuV)	Total Corr (dB)	QP Actual (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AVG Actual (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)
0.153	47.47	30.89	-0.16	47.05	65.83	-18.78	30.47	55.83	-25.36
0.192	43.99	23.83	0.02	43.84	63.93	-20.1	23.67	53.93	-30.26
0.203	37.38	21.06	0.06	37.28	63.48	-26.2	20.96	53.48	-32.52
0.239	34.27	17.4	0.15	34.3	62.11	-27.82	17.43	52.11	-34.68
0.507	33.07	22.79	-0.17	32.85	56	-23.15	22.57	46	-23.43
0.535	32.03	22.62	-0.02	31.96	56	-24.04	22.56	46	-23.44

Table 6: Conducted Emissions- AC Mains Line 2

Section C: Radiated Emissions

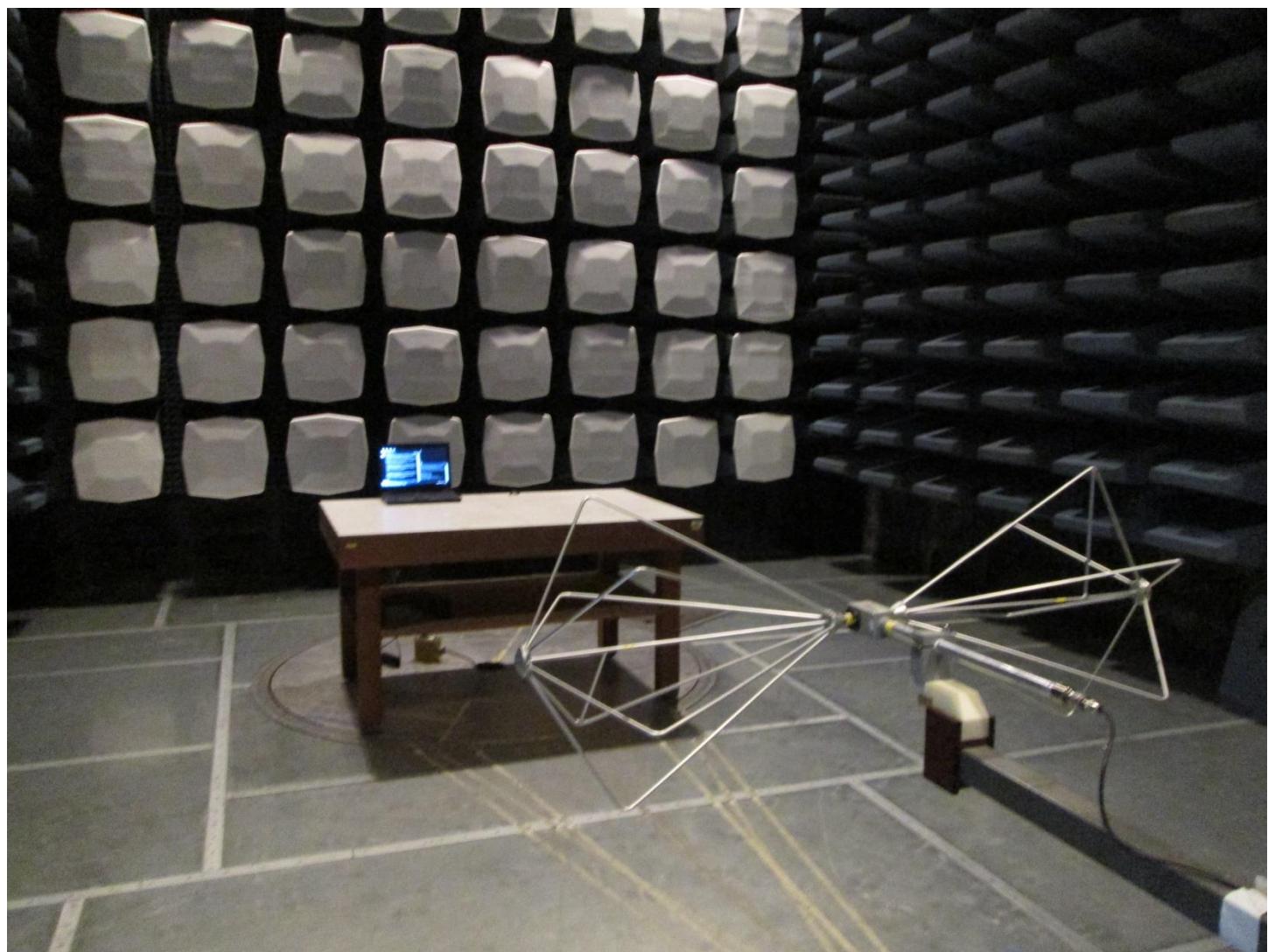


Plot 1: FCC Part 15/B Radiated Emissions Class B at 3m

Frequency (MHz)	QP Meas (dBuV/m)	Corr (dB)	QP Actual (dBuV/m)	Limit (dBuV/m)	Polarity	Height (cm)	Azimuth (deg)	Margin (dB)
64.505	38.0	-15.4	22.6	40.0	V	218.0	205.7	-17.4
70.656	50.5	-15.5	35.0	40.0	V	274.0	186.7	-5.0
113.653	40.8	-12.8	28.0	43.5	V	311.0	71.9	-15.5
119.805	40.5	-12.1	28.4	43.5	H	203.0	47.9	-15.1
125.947	39.5	-11.6	27.9	43.5	V	203.0	67.9	-15.6
304.001	37.8	-2.2	35.6	46.0	H	125.0	185.0	-10.4
312.002	37.7	-5.9	31.7	46.0	V	105.0	82.0	-14.3

Table 1: FCC Part 15/B Radiated Emissions Class B

Appendix B: EUT Photos during testing



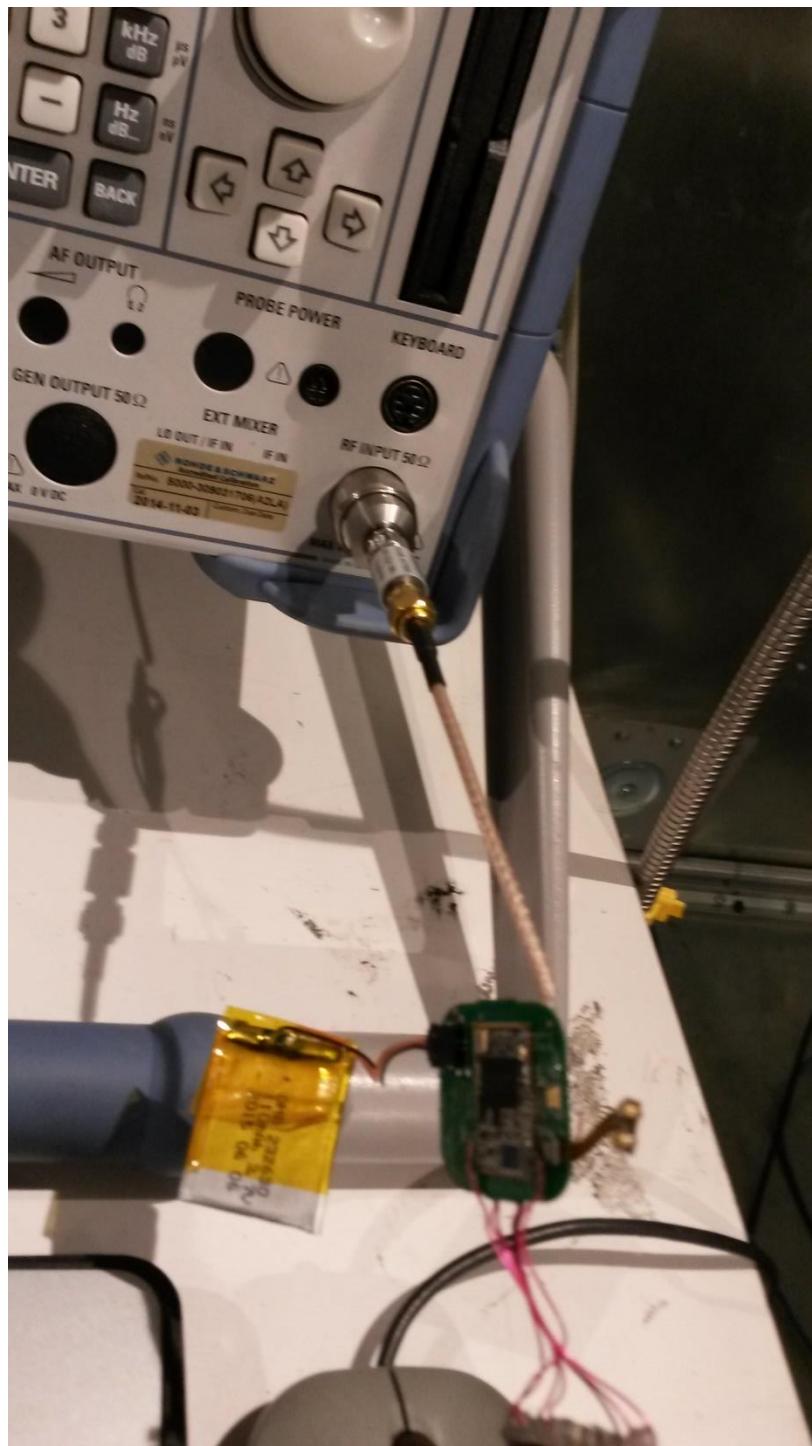
Radiated Emission test setup in Semi Anechoic Chamber



Radiated Emission test setup in Semi Anechoic Chamber



AC Conducted Emissions



RF Conducted Emissions



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END OF REPORT