

Radio Frequency TEST REPORT

Report No.: 180200293TWN-001

Model No.: OYOPGPRO01

Issued Date: Mar. 30, 2018

Applicant: OYO Fitness, LLC
330 W 47th St. Suite 201 Kansas City, MO 64112

Test Method/ Standard: 47 CFR FCC Part 15.249 & ANSI C63.10 2013

Test By: Intertek Testing Services Taiwan Ltd.
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,
Shiang-Shan District, Hsinchu City, Taiwan

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The test report was prepared by:


Sunny Liu/ Senior Officer



These measurements were taken by:


Durant Wei/ Engineer

The test report was reviewed by:


Name Rico Deng
Title Supervisor

Revision History

Report No.	Issue Date	Revision Summary
180200293TWN-001	Mar. 30, 2018	Original report

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Summary of Tests

Test	Reference	Results
20dB Bandwidth	15.215(c)	Pass
Radiated Emission test	15.249(c), 15.209	Pass
Emission on the Band Edge	15.249(d)	Pass
Conducted Emission of AC Power	15.207	Pass

1. General information

1.1 Identification of the EUT

Product: DoubleFlex Black PRO/Personal Gym PRO
Model No.: OYOPGPRO01
Brand Name: NIL
Operating Frequency: 2402 MHz ~ 2480 MHz
Channel Number: 2402+2k , k = 0~39, 40 channels
Rated Power: DC 5 V
Access scheme: FHSS
Power Cord: N/A
Sample Received: Feb. 26, 2018
Sample condition: Workable
Testing date: Mar. 22, 2018 ~ Mar. 26, 2018

Note 1: The test report only allows to be revised within three years from its original issued date unless further standard or the requirement was noticed.

Note 2: When determining the test conclusion, the Measurement Uncertainty of test has been considered.

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1.2 Antenna description

The chip antenna is fixed to the EUT, not allow for replacement of a broken antenna.

Antenna Gain : 1.6 dBi

Antenna Type : PCB Antenna

Connector Type : Fixed

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Paragraph 15.249 for non-spread spectrum devices.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

2.2 Operation mode

The EUT was supplied with DC 5 V from Notebook PC (Test voltage: 230 Vac, 50 Hz).

The signal is maximized through rotation and placement in the three orthogonal axes.



X axis



Y axis



Z axis

After verifying three axes, we found the maximum electromagnetic field was occurred at Y axis. The final test data was executed under this configuration.

2.3 Peripherals equipment

Peripherals	Brand	Model No.	Serial No.	Description of Data Cable
Notebook PC	DELL	Laitude D610	5YWZK1S	USB shielded cable 0.5 meter × 1

3. 20dB Bandwidth test

3.1 Operating environment

Temperature: 25 °C
Relative Humidity: 50 %
Atmospheric Pressure: 1008 hPa

3.2 Test setup & procedure

Step 1: The 20dB bandwidth was measured using a 50 ohm spectrum analyzer

Step 2: The span range for the SA display shall be between two times and five times the OBW.

Step 3: The nominal IF filter bandwidth (3 dB RBW) should be approximately 1 % to 5 % of the OBW, unless otherwise specified, depending on the applicable requirement.

Step 4: The test was performed at 1 channel. The maximum 20dB modulation bandwidth is in the following Table.

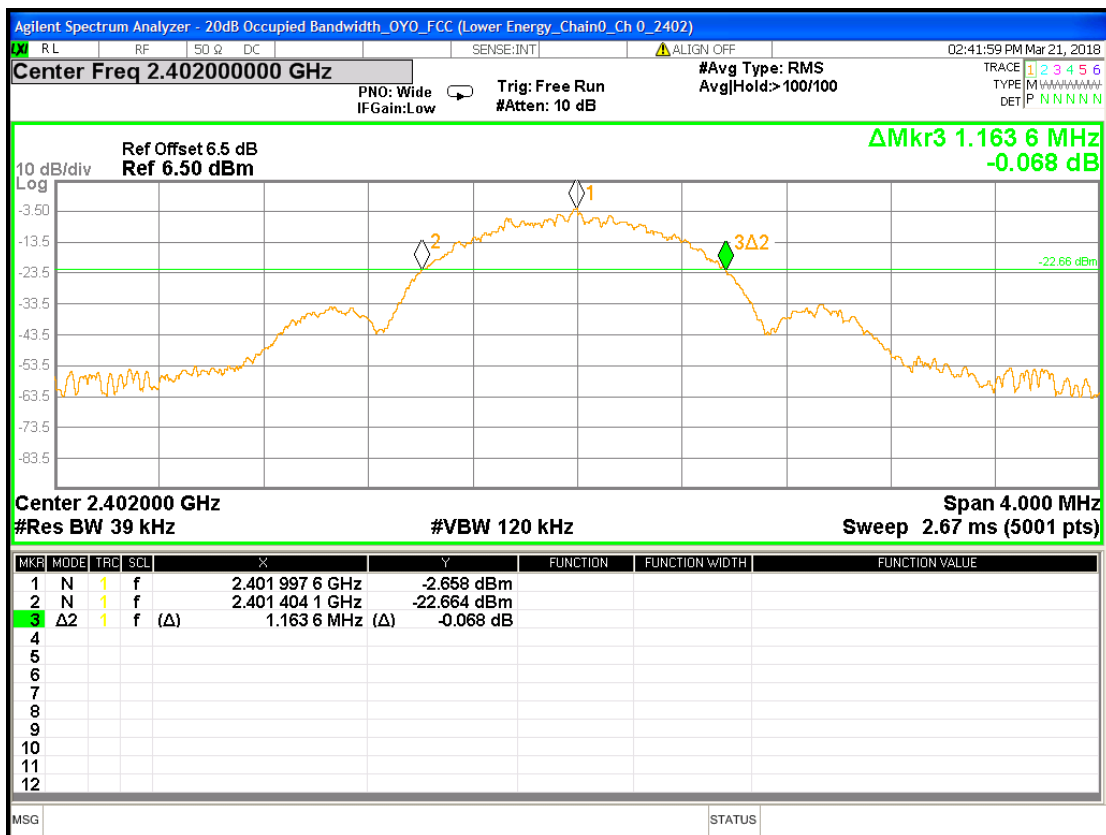
3.3 Measured data of modulated bandwidth test results

Single TX

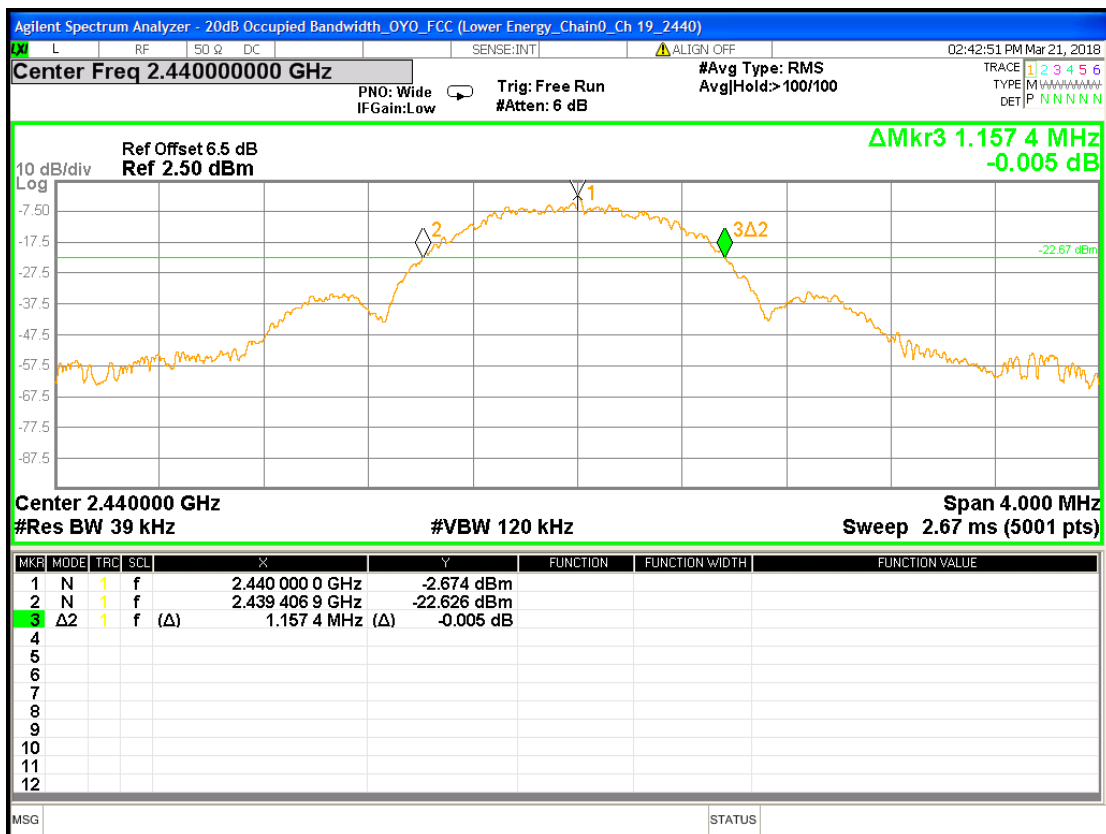
Mode	Frequency (MHz)	20dB Occupied Bandwidth (MHz)
BLE	2402	1.1636
	2440	1.1574
	2480	1.1519

Please see the plot below.

Chain0 : 20dB Bandwidth @ Channel Low



Chain0 : 20dB Bandwidth @ Channel Mid



[illegible]

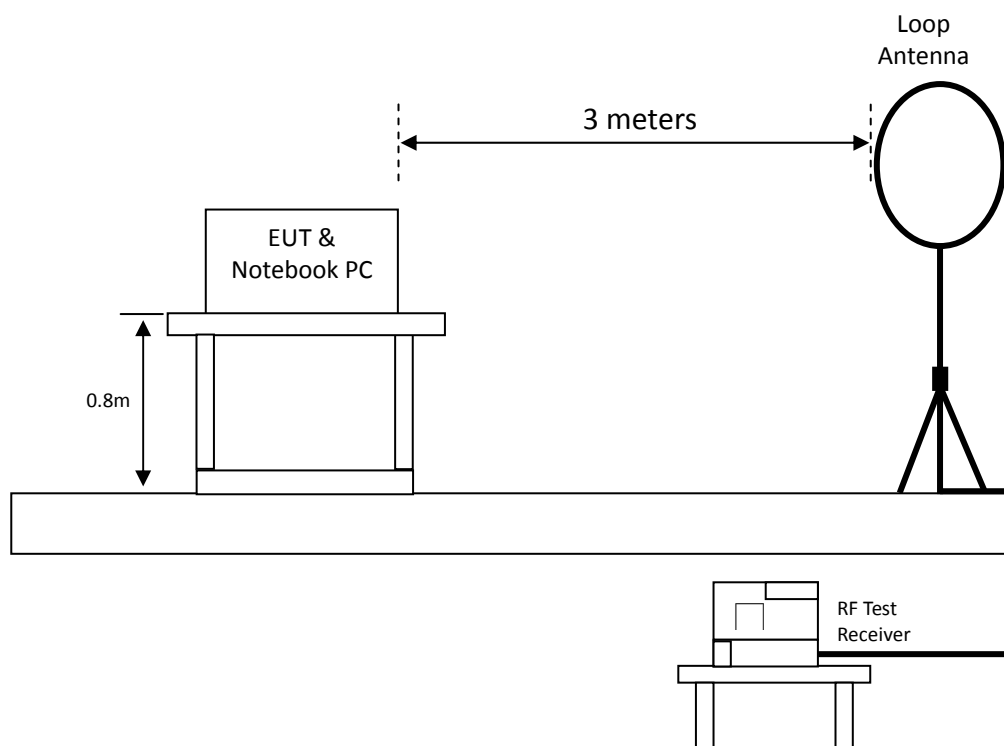
4. Radiated emission test FCC 15.249 (C)

4.1 Operating environment

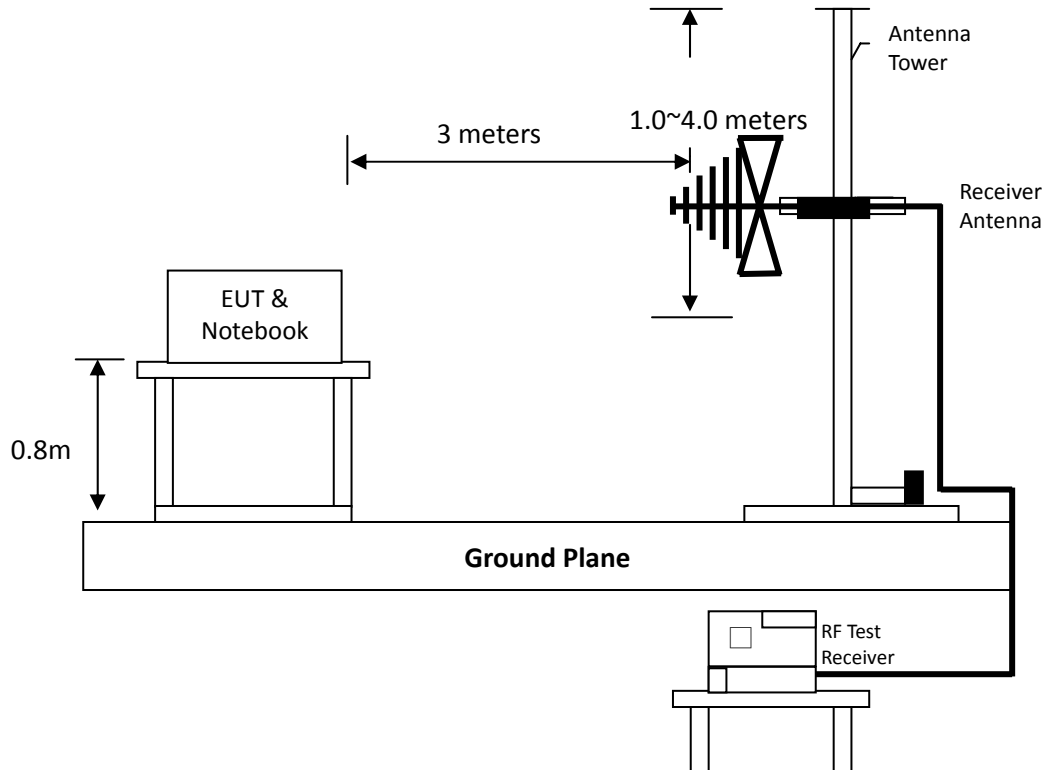
Temperature: 25 °C
Relative Humidity: 50 %
Atmospheric Pressure: 1008 hPa

4.2 Test setup & procedure

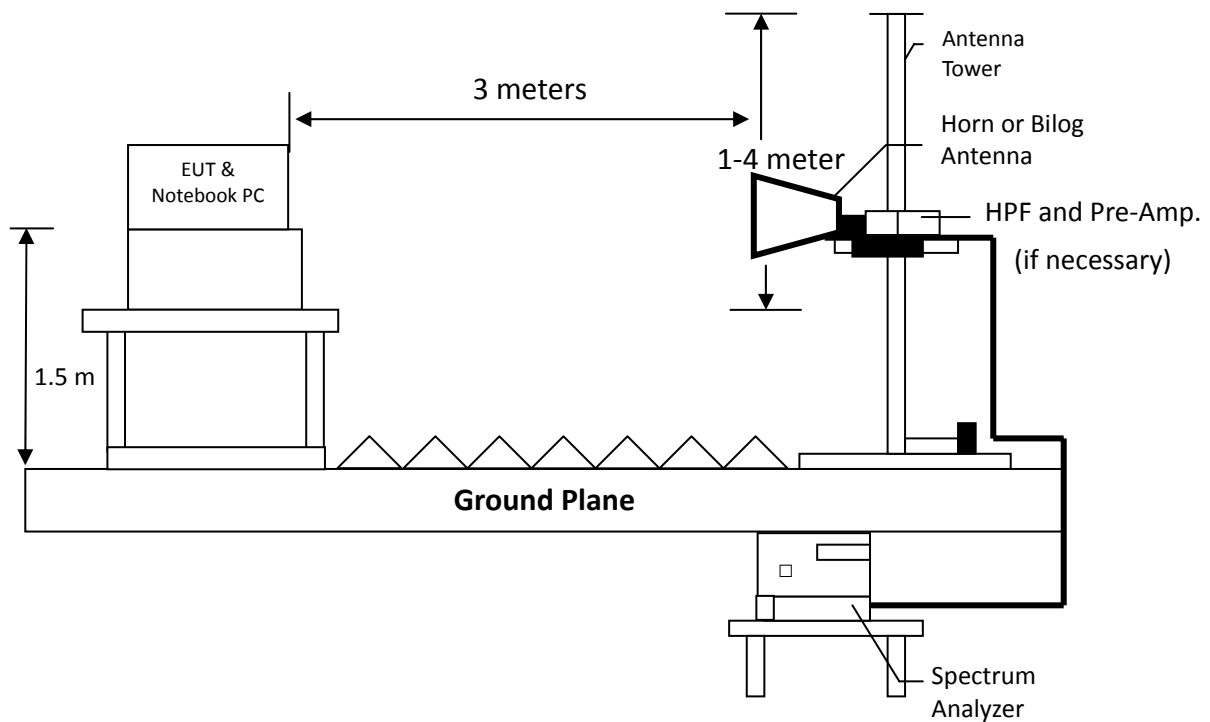
Radiated emission from 9kHz to 30MHz uses Loop Antenna:



Radiated emission below 1GHz using Bilog Antenna



Radiated emission above 1GHz using Horn Antenna



Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/ 3 MHz VBW) recorded also on the report.

The EUT for testing is arranged on a turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

The EUT configuration please refers to the “Spurious set-up photo.pdf”.

4.3 Emission limit

4.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m@3m)	(dBuV/m@3m)	(uV/m@3m)	(dBuV/m@3m)
2400-2483.5	50	94	500	54

4.3.2 General radiated emission limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

Frequency MHz	15.209 Limits (dBμV/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

4.4 Radiated spurious emission test data

4.4.1 Measurement results: frequency range from 9 kHz to 30 MHz

The test was performed on EUT under continuously transmitting mode. The worst case occurred at channel 0.

EUT: OYOPGPRO01

Mode	Chain	Channel	Detector	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit (dBμV/m)	Margin (dB)
BLE	Ch0	0	PK	0.02	20.3	20.27	40.57	121.58	-81.01
BLE	Ch0	0	PK	0.03	20.27	22.49	42.75	118.06	-75.31
BLE	Ch0	0	PK	0.06	19.57	25.11	44.67	112.04	-67.37
BLE	Ch0	0	PK	0.09	19.25	23.6	42.85	108.52	-65.67
BLE	Ch0	0	QP	0.10	19.17	25.35	44.52	107.6	-63.08
BLE	Ch0	0	PK	0.12	19.11	22.85	41.96	106.02	-64.06
BLE	Ch0	0	PK	0.15	19.09	28.91	47.99	104.08	-56.09
BLE	Ch0	0	PK	0.45	18.95	23.5	42.44	94.54	-52.1
BLE	Ch0	0	QP	0.69	18.99	27.23	46.21	70.83	-24.62
BLE	Ch0	0	QP	1.64	18.96	15.27	34.22	63.31	-29.09
BLE	Ch0	0	QP	2.00	18.87	15.89	34.76	69.54	-34.78
BLE	Ch0	0	QP	2.18	18.83	15.83	34.66	69.54	-34.88

4.4.2 Measurement results: frequencies equal to or less than 1 GHz

The test was performed on EUT under continuously transmitting mode. The worst case occurred at channel 0.

EUT: OYOPGPRO01

Mode	Channel	Ant Polarity	Detector	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit (dBμV/m)	Margin (dB)
BLE	0	V	QP	41.64	20.16	0.2	20.36	40	-19.64
BLE	0	V	QP	150.28	20.55	0.32	20.87	43.5	-22.63
BLE	0	V	QP	297.72	21.7	0.8	22.49	46	-23.51
BLE	0	V	QP	472.32	26.34	1.38	27.73	46	-18.27
BLE	0	V	QP	555.74	28.19	1.5	29.7	46	-16.3
BLE	0	V	QP	732.28	31.25	2.33	33.58	46	-12.42
BLE	0	H	QP	41.64	20.16	0.17	20.33	40	-19.67
BLE	0	H	QP	152.22	20.58	0.27	20.85	43.5	-22.65
BLE	0	H	QP	439.34	25.54	1	26.54	46	-19.46
BLE	0	H	QP	582.9	28.77	1.56	30.33	46	-15.67
BLE	0	H	QP	732.28	31.25	2.97	34.21	46	-11.79
BLE	0	H	QP	751.68	31.61	1.92	33.53	46	-12.47

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

4.4.3 Measurement results: frequency above 1GHz

EUT: OYOPGPRO01

Mode	Chain	Ch	Ant Polarity	Detector	Freq. (MHz)	Preamp (dB)	Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)
BLE	Chain0	0	H	PK	1328	37.33	29.68	11.39	41.07	74	-32.93
BLE	Chain0	0	H	PK	2274	37.37	35.53	16	51.53	74	-22.47
BLE	Chain0	0	H	PK	2530	37.37	35.31	18.17	53.48	74	-20.52
BLE	Chain0	0	H	PK	4804	37.14	5.68	38.15	43.82	74	-30.18
BLE	Chain0	0	V	PK	1332	37.33	29.69	18.92	48.6	74	-25.4
BLE	Chain0	0	V	PK	2274	37.37	35.53	18.87	54.41	74	-19.59
BLE	Chain0	0	V	AV	2274	37.37	35.53	15.83	51.36	54	-2.64
BLE	Chain0	0	V	PK	2530	37.37	35.31	18.07	53.38	74	-20.62
BLE	Chain0	0	V	PK	4804	37.14	5.68	40.03	45.7	74	-28.3
BLE	Chain0	19	H	PK	1328	37.33	29.68	11.56	41.24	74	-32.76
BLE	Chain0	19	H	PK	2312	37.37	35.48	16.2	51.68	74	-22.32
BLE	Chain0	19	H	PK	2570	37.38	35.45	17.79	53.24	74	-20.76
BLE	Chain0	19	H	PK	4962	37.09	6.33	33.37	39.71	74	-34.29
BLE	Chain0	19	H	PK	7440	36.42	13.14	28.62	41.76	74	-32.24
BLE	Chain0	19	V	PK	1064	37.26	29.2	17.5	46.69	74	-27.31
BLE	Chain0	19	V	PK	1328	37.33	29.68	17.36	47.04	74	-26.96
BLE	Chain0	19	V	PK	1728	37.37	32.7	13.02	45.73	74	-28.27
BLE	Chain0	19	V	PK	2312	37.37	35.48	16.81	52.28	74	-21.72
BLE	Chain0	19	V	PK	2570	37.38	35.45	15.65	51.1	74	-22.9
BLE	Chain0	19	V	PK	4880	37.12	5.99	36.5	42.49	74	-31.51
BLE	Chain0	19	V	PK	7320	36.47	12.68	31.93	44.61	74	-29.39
BLE	Chain0	39	H	PK	1328	37.33	29.68	17.47	47.15	74	-26.85
BLE	Chain0	39	H	PK	2352	37.37	35.42	17.01	52.43	74	-21.57
BLE	Chain0	39	H	PK	2608	37.39	35.58	16.31	51.89	74	-22.11
BLE	Chain0	39	H	PK	4962	37.09	6.33	33.37	39.71	74	-34.29
BLE	Chain0	39	H	PK	7440	36.42	13.14	28.62	41.76	74	-32.24
BLE	Chain0	39	V	PK	1064	37.26	29.2	13.37	42.57	74	-31.43
BLE	Chain0	39	V	PK	1248	37.3	29.53	13.03	42.56	74	-31.44
BLE	Chain0	39	V	PK	1328	37.33	29.68	15.98	45.66	74	-28.34
BLE	Chain0	39	V	PK	2352	37.37	35.42	16.2	51.62	74	-22.38
BLE	Chain0	39	V	PK	2608	37.39	35.58	15.48	51.06	74	-22.94
BLE	Chain0	39	V	PK	4960	37.09	6.32	36.55	42.87	74	-31.13
BLE	Chain0	39	V	PK	7440	36.42	13.14	32.09	45.23	74	-28.77

Remark:

1. Correction Factor = Antenna Factor + Cable Loss– Preamp. Gain
2. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

4.4.4 Measurement results: Fundamental

EUT : OYOPGPRO01

Mode	Chain	Ch	Ant Polarity	Detector	Freq. (MHz)	Preamp (dB)	Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)
BLE	Chain0	0	H	PK	2402	37.37	35.35	60.42	95.77	114	-18.23
BLE	Chain0	0	H	AV	2402	37.37	35.35	56.35	91.7	94	-2.3
BLE	Chain0	0	V	PK	2402	37.37	35.35	61.01	96.35	114	-17.65
BLE	Chain0	0	V	AV	2402	37.37	35.35	56.67	92.02	94	-1.98
BLE	Chain0	19	H	PK	2440	37.37	35.29	59.26	94.54	114	-19.46
BLE	Chain0	19	H	AV	2440	37.37	35.29	55.01	90.3	94	-3.7
BLE	Chain0	19	V	PK	2440	37.37	35.29	57.74	93.03	114	-20.97
BLE	Chain0	19	V	AV	2440	37.37	35.29	54.05	89.34	94	-4.66
BLE	Chain0	39	H	PK	2480	37.37	35.23	59.93	95.16	114	-18.84
BLE	Chain0	39	H	AV	2480	37.37	35.23	56.05	91.28	94	-2.72
BLE	Chain0	39	V	PK	2480	37.37	35.23	56.67	91.9	114	-22.1
BLE	Chain0	39	V	AV	2480	37.37	35.23	53.15	88.38	94	-5.62

Remark:

1. Correction Factor = Antenna Factor + Cable Loss– Preamp. Gain
2. The frequency measured ranges from 1GHz to 25GHz.The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

5. Radiated emission on the band edge FCC 15.249(d)

5.1 Operating environment

Temperature: 25 °C
Relative Humidity: 50 %
Atmospheric Pressure: 1008 hPa

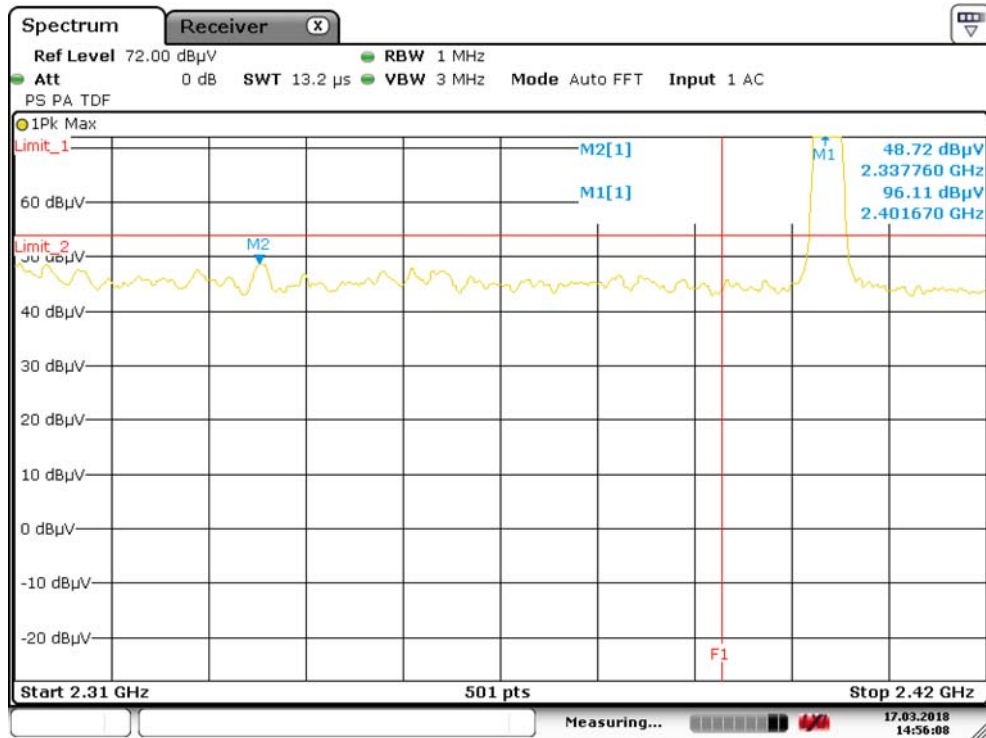
5.2 Radiated emission on the band edge test data

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental (2470MHz) or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)	Restricted band (MHz)
BT4.0	2337.76	PK	V	35.44	13.28	48.72	74	-25.28	2310~2390
	2337.98	AV	V	35.44	8.04	43.48	54	-10.52	
	2490.54	PK	V	35.21	12.17	47.38	74	-26.62	2483.5~2500
	2499.93	AV	V	35.20	0.09	35.29	54	-18.71	

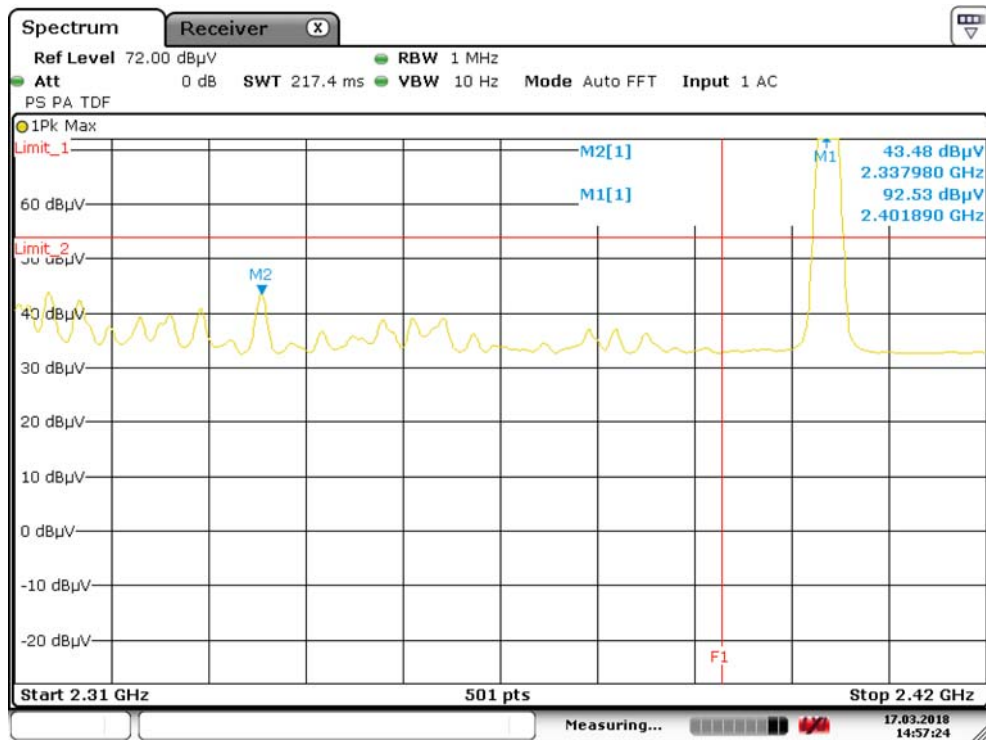
Remark: Correction Factor = Antenna Factor + Cable Loss

Chain0 : Restricted Band Bandedge @ BLE Mode Ch0 PK



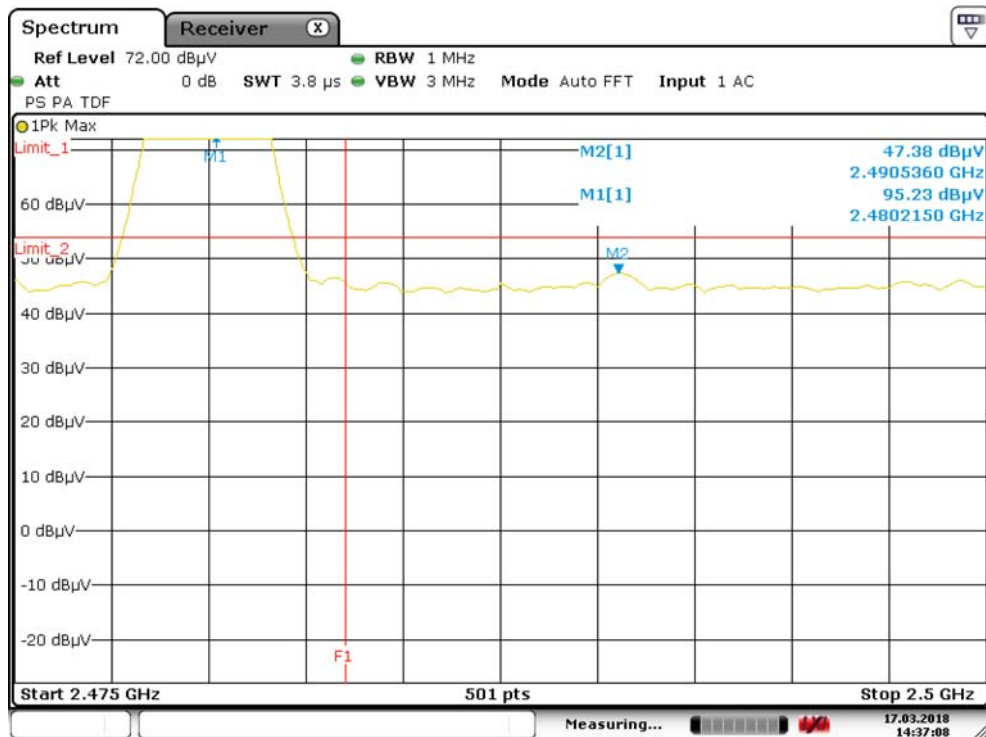
Date: 17.MAR.2018 14:56:08

Chain0 : Restricted Band Bandedge @ BLE Mode Ch0 AV



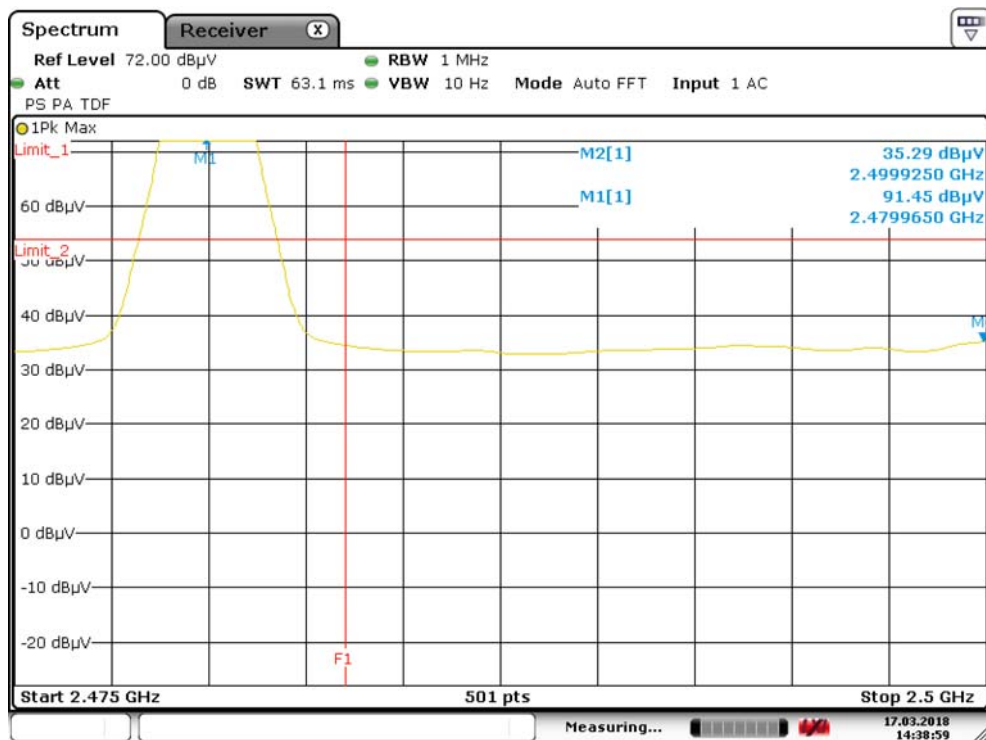
Date: 17.MAR.2018 14:57:24

Chain0 : Restricted Band Bandedge @ BLE Mode Ch39 PK



Date: 17.MAR.2018 14:37:08

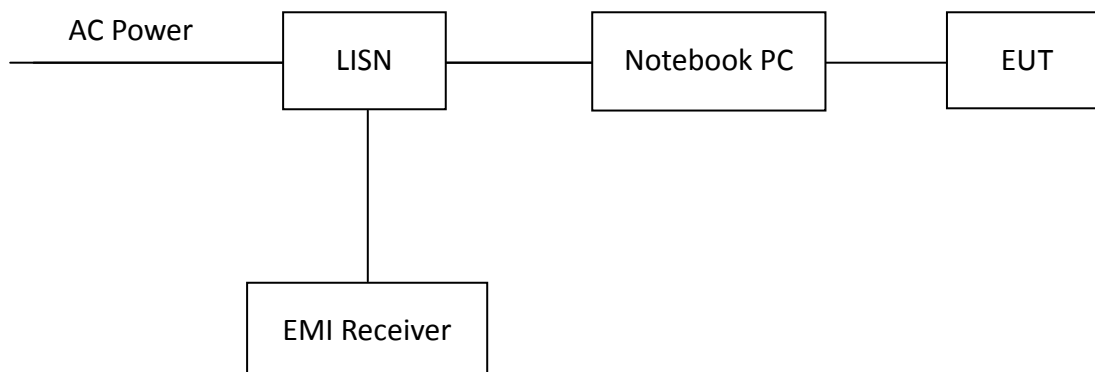
Chain0 : Restricted Band Bandedge @ BLE Mode Ch39 AV



Date: 17.MAR.2018 14:38:59

6. Conducted emission test FCC 15.207

6.1 Test Procedure



The EUT along with its peripherals were placed on a 1.0 meter(W)×1.5meter(L) and 0.8 meter in height wooden table and the EUT was adjusted to maintain a 0.4meter space from a vertical reference plane. The EUT was connected to power mains through a Artificial Mains Network (LISN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.

The excess power cable between the EUT and the AMN was bundled. All connecting cables of EUT and peripherals were moved to find the maximum emission

6.2 Conducted Emission Limit

Frequency (MHz)	Maximum RF Line Voltage	
	Class B equipment (dBμV)	
	Q.P.	Avg.
0.15~0.50	66~56	56~46
0.50~5.00	56	46
5.00~30.0	60	50

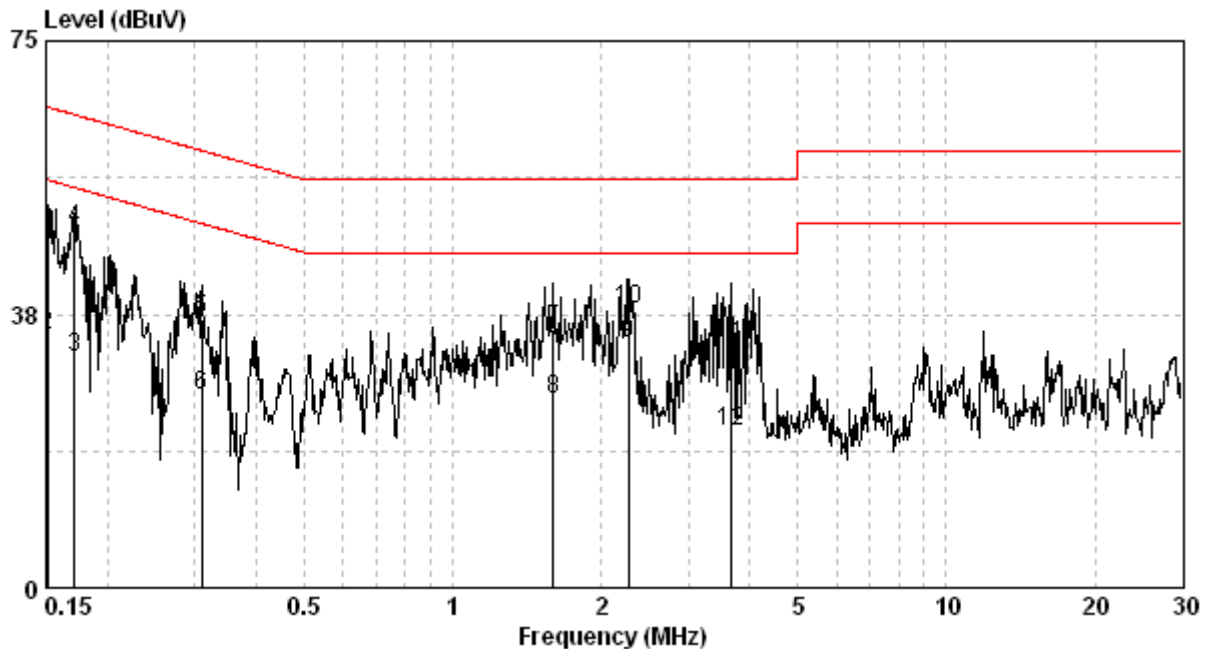
6.3 Conducted Emission Data

Phase:	Live Line			
Temperature:	22	°C	Model No.:	OYOPGPRO01
Relative Humidity:	51	%	Test Date:	Mar.19, 2018
Atmospheric Pressure:	1008	hPa	Remark:	N/A

Frequency (MHz)	Corr. Factor (dB)	Reading QP (dBuV)	Level QP (dBuV)	Limit QP (dBuV)	Reading AV (dBuV)	Level AV (dBuV)	Limit AV (dBuV)	Margin (dB)	
								QP	AV
0.151	9.36	39.58	48.94	65.96	25.22	34.58	55.96	-17.02	-21.38
0.171	9.36	39.75	49.11	64.90	22.22	31.57	54.90	-15.79	-23.33
0.310	9.37	27.44	36.81	59.97	17.12	26.49	49.97	-23.16	-23.48
1.602	9.48	26.05	35.52	56.00	16.46	25.94	46.00	-20.48	-20.06
2.273	9.52	28.59	38.10	56.00	23.89	33.40	46.00	-17.90	-12.60
3.661	9.53	23.67	33.21	56.00	11.97	21.50	46.00	-22.79	-24.50

Remark:

1. Corr. Factor (dB) = AMN Factor (dB) + Cable Loss (dB)
2. Level (dBuV) = Corr. Factor (dB) + Reading (dBuV)
3. Margin (dB) = Level (dBuV) – Limit (dBuV)

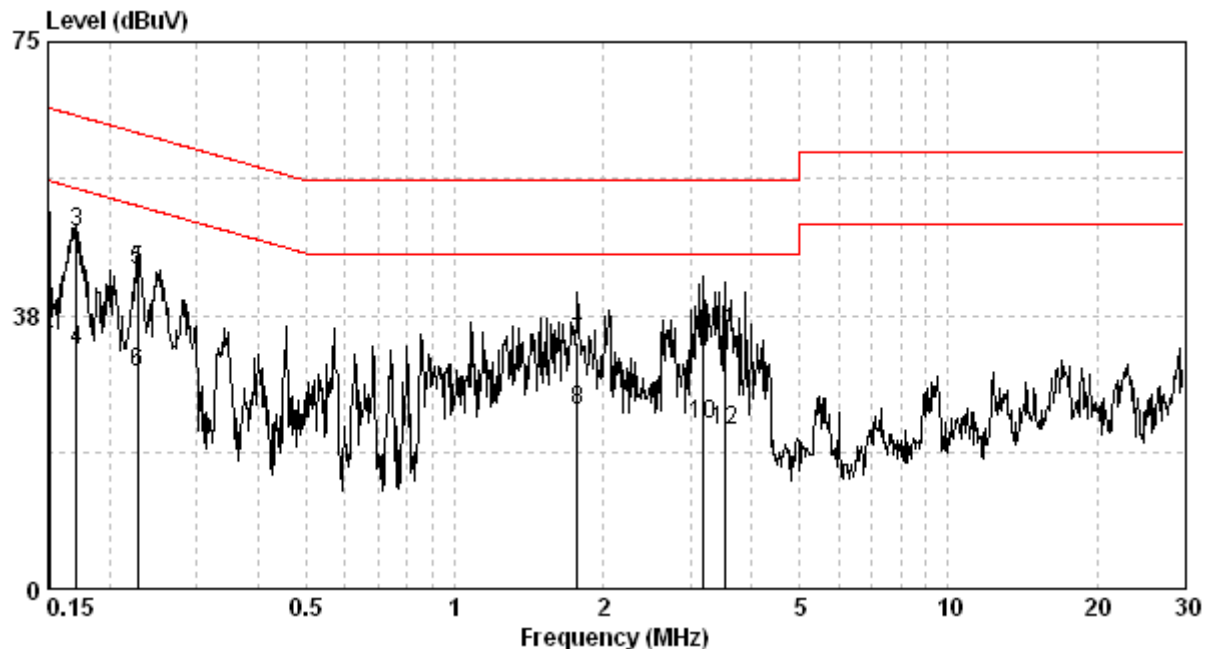


Phase:	Neutral Line			
Temperature:	22	°C	Model No.:	OYOPGPRO01
Relative Humidity:	51	%	Test Date:	Mar.19, 2018
Atmospheric Pressure:	1008	hPa	Remark:	N/A

Frequency (MHz)	Corr. Factor (dB)	Reading QP (dBuV)	Level QP (dBuV)	Limit QP (dBuV)	Reading AV (dBuV)	Level AV (dBuV)	Limit AV (dBuV)	Margin (dB)	
								QP	AV
0.151	9.62	39.04	48.66	65.96	25.26	34.87	55.96	-17.30	-21.09
0.171	9.62	39.29	48.91	64.90	23.04	32.66	54.90	-15.99	-22.24
0.228	9.62	33.97	43.59	62.52	20.02	29.64	52.52	-18.93	-22.88
1.772	9.74	23.93	33.67	56.00	14.65	24.39	46.00	-22.33	-21.61
3.190	9.78	23.52	33.30	56.00	12.80	22.58	46.00	-22.70	-23.42
3.528	9.78	25.54	35.32	56.00	12.01	21.79	46.00	-20.68	-24.21

Remark:

1. Corr. Factor (dB) = AMN Factor (dB) + Cable Loss (dB)
2. Level (dBuV) = Corr. Factor (dB) + Reading (dBuV)
3. Margin (dB) = Level (dBuV) – Limit (dBuV)



Appendix A: Test equipment list

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
ESCI EMI Test Receiver	Rohde & Schwarz	ESCI	100018	2017/11/21	2018/11/20
Spectrum Analyzer	Rohde & Schwarz	FSP30	100245	2018/02/23	2019/02/22
Horn Antenna (1-18G)	SHWARZBECK	BBHA 9120 D	9120D-456	2018/01/23	2019/01/22
Horn Antenna (14-42G)	SHWARZBECK	BBHA 9170	BBHA9170159	2017/09/04	2020/09/02
Broadband Antenna	SHWARZBECK	VULB 9168	9168-172	2017/04/05	2018/04/04
Pre-Amplifier	EMC Co.	EMC12635SE	980205	2017/11/28	2018/11/27
Pre-Amplifier	MITEQ	JS4-26004000--27-8A	828825	2017/08/23	2018/08/22
Power Meter	Anritsu	ML2495A	0844001	2017/10/18	2018/10/17
Power Sensor	Anritsu	MA2411B	0738452	2017/05/23	2018/05/22
Signal Analyzer	Agilent	N9030A	MY51380492	2017/08/29	2018/08/28
966-2(A) Cable 9kHz~26.5GHz	SUHNER	SMA / EX 100	N/A	2017/08/15	2018/08/14
966-2(B) Cable 9kHz~26.5GHz	SUHNER	SUCOFLEX 104P	CB0005	2017/08/15	2018/08/14
RF Cable 9kHz~26.5GHz	SUHNER	SUCOFLEX 102	CB0006	2017/05/04	2018/05/03
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2017/03/29	2018/03/28
High Pass Filter	Wainwright	WHKX3.0/18G-12SS	N/A	2017/06/02	2018/06/01
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONIC	FMZB1519	1519-067	2017/03/30	2018/03/29

Note: No Calibration Required (NCR).

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Receiver	R&S	ESCI	100059	2017/11/13	2018/11/12
Two-Line V-Network	R&S	ENV216	101159	2017/06/03	2018/06/02
Artificial Mains Network (LISN)	SCHAFFNER	MN2050D	1586	2017/05/31	2018/05/30
CON-1 Shielded Room	N/A	N/A	N/A	NCR	NCR
CON-1 Cable	SUHNER	SUCOFLEX-104	26438414	2017/05/04	2018/05/03
Test software	Audix	e3	4.20040112L	NCR	NCR

Note: No Calibration Required (NCR).

Appendix B: Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of $k=2$.

Item	Uncertainty
Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.14 dB
Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.22 dB
Vertically polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	3.64 dB
Horizontally polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	3.64 dB
Vertically polarized Radiated disturbances from 18GHz~40GHz in a semi-anechoic chamber at a distance of 3m	2.68 dB
Horizontally polarized Radiated disturbances from 18GHz~40GHz in a semi-anechoic chamber at a distance of 3m	2.68 dB
Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m	3.54 dB
Emission on the Band Edge Test	3.64 dB
20dB Bandwidth	1.22 dB
AC Power Line Conducted Emission	2.48 dB