EMC TEST REPORT	
PRODUCT NAME	Wootch
PRODUCT MODEL NUMBER	QL-FND-WW02
MANUFACTURER	QL London
TEST REPORT NUMBER	RMM 1402TEL533-A
TEST REPORT DATE	19th Feb 2014
TEST REPORT VERSION	1.0
ISSUED TO	QL London, 12-50, Kingsgate house, Kingston –Upon-Thames-KT2-5AA
ISSUED BY	**TARANG** Wipro Technologies, SJP2, Survey#70,77,78/8A, Dodda Kanelli, Sarjapur road, Bangalore-560 035. Karnataka. India. Tel: +91-80-30292929 Fax: +91-80-30298200 Email: tarang.planet@wipro.com Web: www.wipro.com

AMMENDMENT HISTORY

Amendment Number	Amendment Date	Author of Amendment	Previous Report Version	Previous Report Date
Amendment Details				

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1 TEST DESCRIPTION & RESULT

Applicant	QL London, 12-50, Kingsgate house, Kingston –Upon-Thames-KT2-5AA
Manufacturer	QL, London
Equipment Under Test	Wootch
Model	QL-FND-WW02
No. of samples tested	01
Date of Test	08th Jan 2014 to 29th Jan 2014
Date of Submission	19th Feb 2014
Venue of Test	**Tarang,** Wipro Technologies, SJP2, Survey#70, 77, 78/8A, Dodda Kanelli, Sarjapur road, Bangalore-560 035. Karnataka. India.

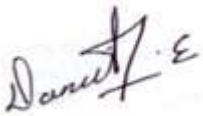
Applicable Standard	Description	Results
FCC 47 CFR, Part 15, Subpart C, 10.1.11 edition, Section 15.207	Conducted Emission	Pass
FCC 47 CFR, Part 15, Subpart C, 10.1.11 edition, Section 15.209	Radiated Emission	Pass
FCC 47 CFR, Part 15, Subpart C, 10.1.11 edition, Section 15.247	Operation within the bands 2400 - 2483.5 MHz (Conducted)	Pass
FCC 47 CFR, Part 15, Subpart C, 10.1.11 edition, Section 15.249	Operation within the bands 2400 - 2483.5 MHz (Radiated)	Pass
FCC 47 CFR, Part 15, Subpart C, 10.1.11 edition, Section 15.247 (b) (1)	Maximum Peak Output Power	Pass
FCC 47 CFR, Part 15, Subpart C, 10.1.11 edition, Section 15.247 (c)	Conducted Spurious Emission	Pass
FCC 47 CFR, Part 15, Subpart C, 10.1.11 edition, Section 15.247 (c)	Band Edge measurement (Conducted)	Pass
FCC 47 CFR, Part 15, Subpart C, 10.1.11 edition, Section 15.203	Antenna Requirement	Complied

Applicable Standard	Description	Results
Industry Canada RSS-210, Issue 8 RSS-Gen, Issue 2, Section 7.2.2	Conducted Emission	Pass
Industry Canada RSS-210, Issue 8, Section 2.9 RSS-Gen, Issue 2, Section 6	Radiated Emission	Pass
Industry Canada RSS-210, Issue 8, Section A8.1 (b)	Operation within the bands 2400 - 2483.5 MHz (Conducted)	Pass
Industry Canada RSS-210, Issue 8, Section A2.9	Operation within the bands 2400 - 2483.5 MHz (Radiated)	Pass
Industry Canada RSS-210, Issue 8, Section A8.4 (2)	Peak Conducted Output Power	Pass
Industry Canada RSS-210, Issue 8, Section A8.5	Conducted Spurious Emission	Pass
Industry Canada RSS-210, Issue 8, Section A8.5	Band Edge measurement (Conducted)	Pass
Industry Canada RSS-Gen, Issue 2, Section 4.6.1	Occupied Bandwidth	Pass

Wootch was tested by Tarang Lab as per the standards that are listed in the table above. Based on the observations during the test and interpretations by Tarang lab, results have been indicated. The test results produced by in this report shall apply only to the sample that has been tested under the specific conditions and modes of testing as described in the report. Other similar equipment may not necessarily reproduce same result due to production tolerances and measurement uncertainties. Any measurement uncertainties listed in this report are for information only.

The results shall stand invalid, in case there are any modifications / additions / removals to the hardware or software or end use atmosphere to the product tested. This report shall not be modified or in any way revised unless it is expressly permitted and endorsed by Tarang through a duly authorized representative. Particulars on Manufacturer / Supplier / EUT configuration / performance criteria, given in this report, are based on the information given by the customer, along with test request. Tarang does not assume any responsibility for the correctness of that information for the above mentioned equipment under test.

Customer acknowledges that this is a test report and not a certificate to gain market access for the product. To gain market access, Customer needs appropriate clearance from the Government or authorized agency for the target market. For markets that allow self-declaration, customer needs to follow the procedure defined by the target market.

Prepared by	Reviewed by	Approved by
		
Arun Kumar .N.C	Daniel E	
Test Engineer	**Test Engineer**	**Function Head**

2 SUMMARY OF TESTS, FACILITY AND ACCREDITATION

2.1 TEST DETAILS

The tests documented in this report are performed according to the following standards:

- ANSI C63.4-2009
- FCC CFR 47, Part 15
- RSS-210 Issue 8
- RSS-Gen Issue 2

2.2 TEST FACILITY DETAILS

All the tests were carried out at Tarang –Product Qualification and Compliance Planet located at Wipro Limited, SJP2, Dodda Kanelli, Sarjapur road, Bangalore. Karnataka. India. 560 035.

Following are the accreditation and listing details for Tarang.

Accreditation / Listing body	Registration / Company / Certificate Number
ISO 17025 Accreditation	Certificate Number :T-1533 and T-1534(NABL) http://www.nabl- india.org
FCC (Federal Communications Commission)	Registration Number: 799247 http://www.fcc.gov/
IC (Industry Canada)	Company Number: 9023A http://www.ic.gc.ca
TEC Approval	Certificate Number: TEC/MRA/CAB/IND-D/3 CAB Identification: IND003
DGAQA Approval	1415/F-15/DGAQA/Aircraft

2.3 CALIBRATION

All measuring instruments used to perform the tests listed and reported in this document are calibrated as per the manufacturer recommendation and are traceable to ISO17025.

2.4 MEASUREMENT UNCERTAINTY

The following measurement uncertainties are applicable to the relevant tests that are mentioned below:

Test	Uncertainty
Radiated Emission (30 MHz to 1 GHz), 10 meter	±4.61475dB (95% confidence)
Radiated Emission (1 GHz to 18 GHz), 3 meter	±4.36 dB (95% confidence)
Radiated Emission (18 GHz to 26 GHz), 3 meter	±4.73 dB (95% confidence)
Conducted Emission (150kHz to 30MHz)	±2.723 dB (95% confidence)

2.5 ENVIRONMENTAL CONDITION

All measurements are carried out in controlled environment in the lab as follows:

Temperature (deg C)	**22°C ± 3°C**
Relative Humidity (% RH)	**55% ± 5%**
Pressure(mbar)	**860 to 1060**

3 EQUIPMENT UNDER TEST (EUT)

3.1 DESCRIPTION OF THE EUT

Wootch is an app enabled security accessory for children, camouflaged as a rechargeable digital watch, which alerts you when your child is more than five meters (16 feet) up to 20 meters away from you. The product is designed to give proximity alert triggers when devices separated from the range & alert can be given by pressing push button switch present in Wootch. Wootch can be pared with Bluetooth 4.0 Smartphones/Tablets.

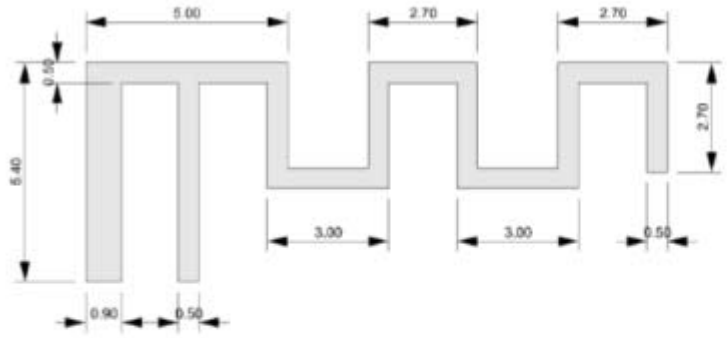
There is also a near/far (similar to hot and cold) gauge you can use to assist you with locating your child. **Wootch** also has added security features, such as the '***Device Lock***'. This prevents the **Wootch** from being turned off without your permission.

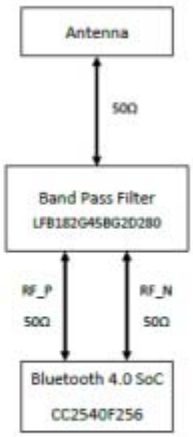
Wootch uses the latest Bluetooth 4.0 technology to connect to your Smartphone/Tablet. This version of Bluetooth is designed for extreme low power devices to ensure maximum battery life. Dependent on usage, **Wootch** battery will last up to one month after each time being fully charged.

3.2 SOFTWARE AND FIRMWARE DETAILS

QL-Find I-OS Application.

3.3 ANTENNA DETAILS





Frequency Range	2400—2480 MHz
Peak Antenna Gain	4.4 dBi
Average Transmit Power	-6 dBm
Minimum Transmit Power	-23 dBm
Maximum Transmit Power	4 dBm
Typical Spurious Emissions	-41 dBm

Figure 1: Antenna Specification of Wootch

3.4 PRODUCT CONFIGURATION DETAILS

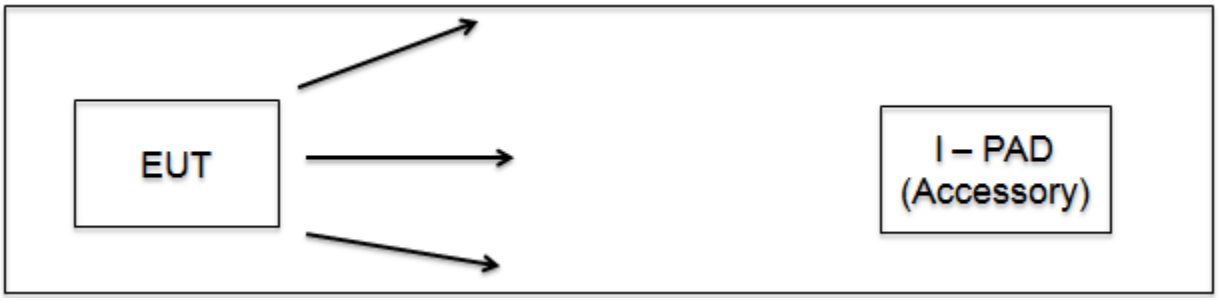


Figure 2: EUT Configuration

Figure 2 shows the product configuration during the tests. EUT (Wootch) was programmed to continuously communicate with the iPad (Accessory). EUT was connected to iPad using **'QL-Find'** I-OS Application.

During Radiated Emission measurements, iPad was kept away from the Receiving antenna, at a distance of 11 m to 12m from the EUT and connection was established.

During all the other tests, iPad was kept in proximity to the EUT and connection was established.

3.5 TEST SETUP DETAILS

3.5.1 SUPPORTING EQUIPMENT

Item	Manufacturer	Model Number	Serial Number	FCC ID
Laptop	Lenovo	S10-3	QB00332921	NA
iPad-3	Apple	MC705B/A	DYVHHMH8DJ8T	NA

3.5.2 I/O CABLES AND CONNECTORS

Item	Connector	Cable type	Cable length
USB cable	Type A to Micro USB	Unshielded	0.8m

3.5.3 TEST SETUP DETAILS

3.5.3.1 RADIATED EMISSION

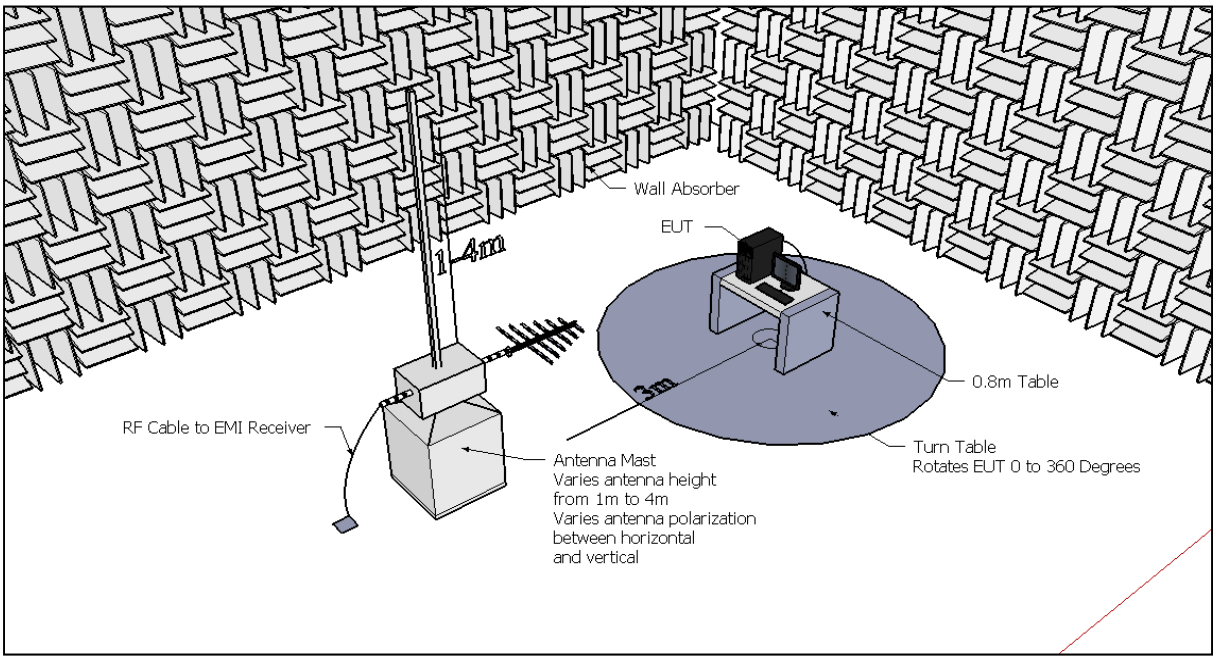


Figure 3: Sample test setup for Radiated measurements

3.5.3.2 CONDUCTED MEASUREMENT

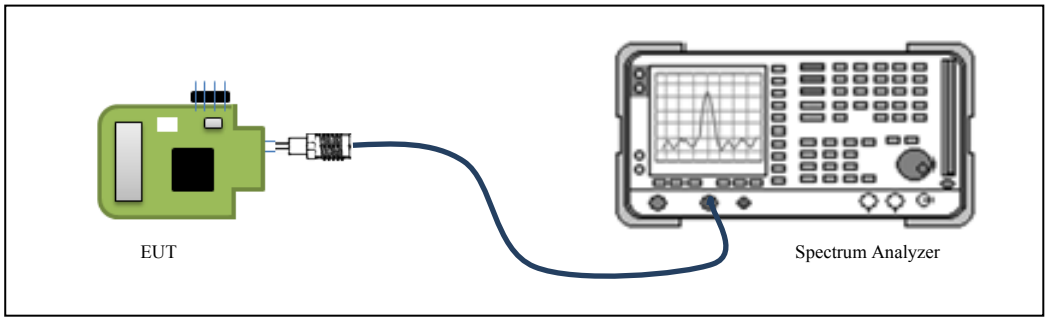


Figure 4: Test setup for Conducted measurements on the EUT Antenna port

3.5.3.3 CONDUCTED EMISSION MEASUREMENT

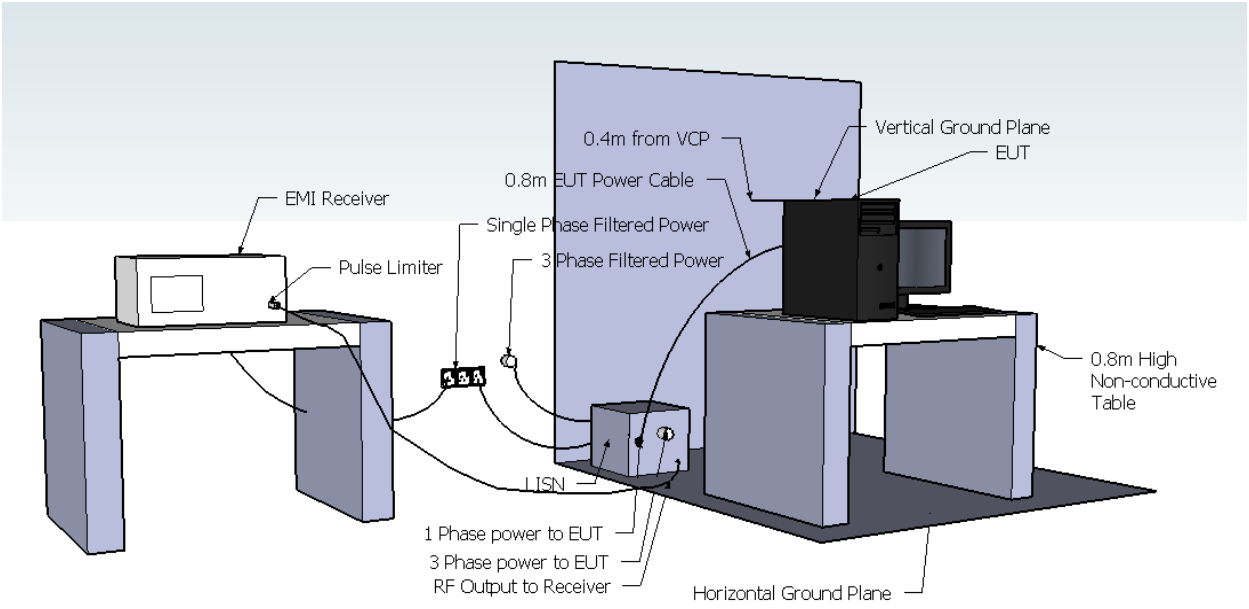


Figure 5: Sample test setup for Conducted Emission measurements

4 INSTRUMENTATION AND CALIBRATION

4.1 TEST AND MEASURING EQUIPMENT

The following list contains measuring equipment's used for testing. The equipment's confirm to the required standards. Calibration of all test and measuring equipment's including any accessories that may affect such calibration are checked frequently to ensure the accuracy. Adjustments are made and correction factors are applied in accordance with the instructions contained in the respective manual.

4.2 EQUIPMENTS USED

Name of Equipment	Manufacturer	Model No	Serial No	Calibration Due
EMI Test Receiver	R&S	ESIB40	100306	25th Sep 2014
Spectrum Analyzer	Agilent Technologies	E4407B	MY45112947	01st Apr 2014
Hybrid Log Periodic Antenna	TDK	HLP-3003C	130334	17th Jul 2014
Double Ridge Broadband Horn Antenna	Schwarzbeck Mess Elektronik	BBHA9120D	9120D-687	23rd Jul 2014
Broadband Horn Antenna	Schwarzbeck Mess Elektronik	BBHA9170	9170-344	05th Apr 2014
Pre-Amplifier	SONOMA	310	270817	30th May2014
Pre-Amplifier	TDK	PA-02	100008	30th May 2014
Pre-Amplifier	TDK	PA-02-2	2007331	05th Apr 2014
V-LISN	Schwarzbeck Mess Elektronik	NSLK 8128	8128-243	11th Jul 2014

5 APPLICABILITY OF TESTS

The following table summarizes and provides reference to the tests that are applicable and carried out for this product.

5.1 APPLICABLE TESTS FOR BLUETOOTH PORT

S. No	Standard	Name of the test	Section of standard	Applicability	Port
1	FCC 47 CFR, Part 15	Conducted Emission	15.207	Yes	Product
2	FCC 47 CFR, Part 15	Radiated Emission	15.209	Yes	Product
3	FCC 47 CFR, Part 15	Operation within the bands 2400 - 2483.5 MHz (Conducted)	15.247	Yes	Antenna Port
4	FCC 47 CFR, Part 15	Operation within the bands 2400 - 2483.5 MHz (Radiated)	15.249	Yes	Product
5	FCC 47 CFR, Part 15	Maximum Peak Output Power	15.247 (b) (1)	Yes	Antenna Port
6	FCC 47 CFR, Part 15	Conducted Spurious Emission	15.247 (c)	Yes	Antenna Port
7	FCC 47 CFR, Part 15	Band Edge measurement (Conducted)	15.247 (c)	Yes	Antenna Port
8	FCC 47 CFR, Part 15	Antenna Requirement	15.203	Yes	Complied

S. No	Standard	Name of the test	Section of standard	Applicability	Port
1	RSS-GEN	Conducted Emission	7.2.2	Yes	Product
2	RSS-210, Issue 8 RSS-Gen, Issue 2	Radiated Emission	2.9 6	Yes	Product
3	RSS-210, Issue 8	Operation within the bands 2400 - 2483.5 MHz (Conducted)	A8.1 (b)	Yes	Antenna Port
4	RSS-210, Issue 8	Operation within the bands 2400 - 2483.5 MHz (Radiated)	A2.9	Yes	Product
5	RSS-210, Issue 8	Peak Conducted Output Power	A8.4 (2)	Yes	Antenna Port
6	RSS-210, Issue 8	Conducted Spurious Emission	A8.5	Yes	Antenna Port
7	RSS-210, Issue 8	Band Edge measurement (Conducted)	A8.5	Yes	Antenna Port
8	RSS-GEN	Occupied Bandwidth	4.6.1	Yes	Antenna Port

6 TEST RESULTS

6.1 CONDUCTED EMISSION

6.1.1 REFERENCE SECTION & LIMITS

Standard	Reference section	Frequency range	Quasi Peak Limit (dBµV/m)	Average Limit (dBµV/m)
FCC Part 15, Subpart C	15.207	150kHz to 500kHz 500kHz to 5MHz 5MHz to 30MHz	66.0 to 56.0* 56.0 60.0	56.0 to 46.0* 46.0 50.0

* indicates the value to be decreasing logarithmically with respect to frequency.

Standard	Reference section	Frequency range	Quasi Peak Limit (dBµV/m)	Average Limit (dBµV/m)
RSS-GEN	7.2.4	150kHz to 500kHz 500kHz to 5MHz 5MHz to 30MHz	66.0 to 56.0* 56.0 60.0	56.0 to 46.0* 46.0 50.0

6.1.2 TEST PROCEDURE

S. No	Procedure
1	Test procedure is as per ANSI C63.4: 2009
2	EUT is placed on a 0.8m non-conductive table with vertical & horizontal ground plane bonded together.
3	EUT is powered through USB port of the Laptop connected via LISN (50Ω/50µH), with an AC supply of 230V/50Hz.
4	EUT is configured to function with the normal mode of operation
5	Average & peak scan was carried out from 150 kHz to 30 MHz
6	The highest level of Conducted Emission was recorded
7	Quasi-peak and final Average measurements were carried out at the identified peaks for <30MHz
8	These values are compared against the limit specified by the standard

6.1.3 RESULT

Parameter	Limit	Measured	Result
Conducted Emission	Refer 6.2.1	Refer 6.2.4	Pass

6.1.4 RESULT (SUPPORTING GRAPHS / DATA)

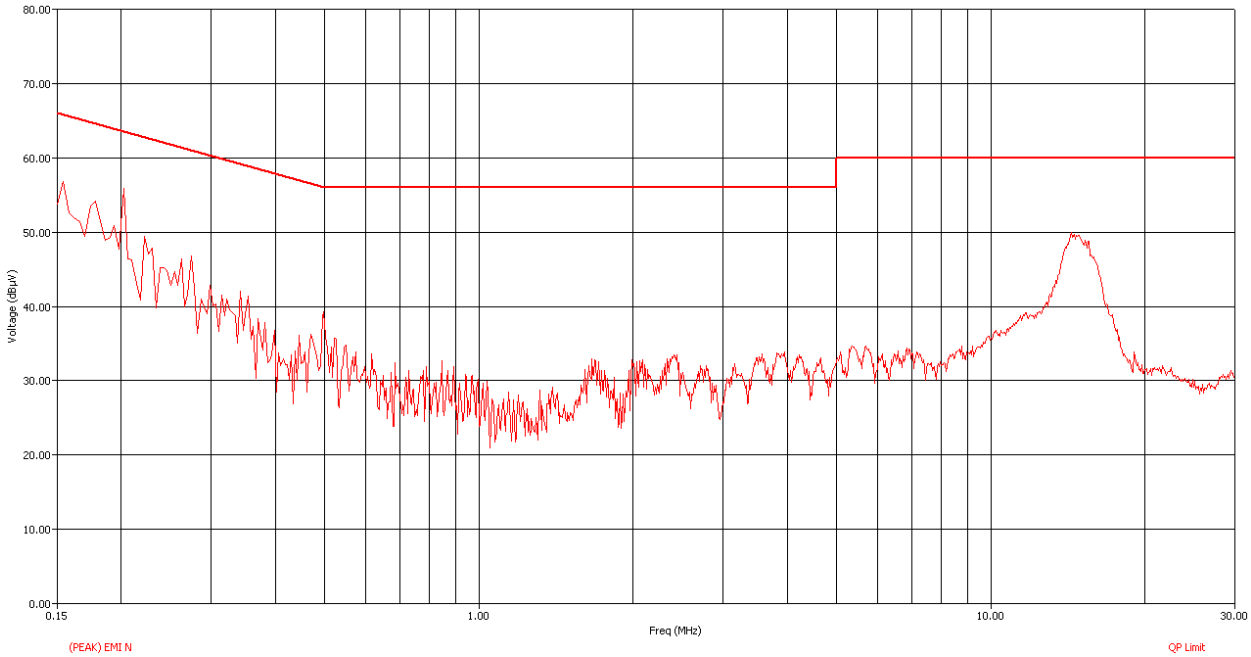


Figure 6: Conducted Emission -Peak – Neutral – 150 kHz to 30 MHz

Freq (MHz)	Freq (Max) (MHz)	Line	(QP) Trace (dBµV)	Cable + Pulse Limiter (dB)	Transducer N (dB)	(QP) EMI (dBµV)	QP Limit (dBµV)	(QP) Margin (dB)
0.15	0.15	N	42.24	9.81	0.15	52.20	66.00	-13.80
0.25	0.26	N	28.37	9.70	0.14	38.21	61.53	-23.33
0.28	0.28	N	23.39	9.69	0.14	33.22	60.81	-27.59
0.29	0.29	N	21.36	9.69	0.14	31.19	60.54	-29.34
0.30	0.30	N	25.80	9.69	0.14	35.63	60.23	-24.60
0.34	0.33	N	20.92	9.76	0.14	30.82	59.47	-28.65
0.37	0.38	N	16.94	9.80	0.14	26.88	58.27	-31.39
0.39	0.39	N	15.18	9.80	0.14	25.12	58.07	-32.95
0.50	0.50	N	26.58	9.86	0.14	36.58	56.00	-19.42
14.67	14.67	N	33.18	10.23	2.66	46.07	60.00	-13.93

Figure 7: Conducted Emission - Quasi Peak Table – Neutral – 150 kHz to 30 MHz

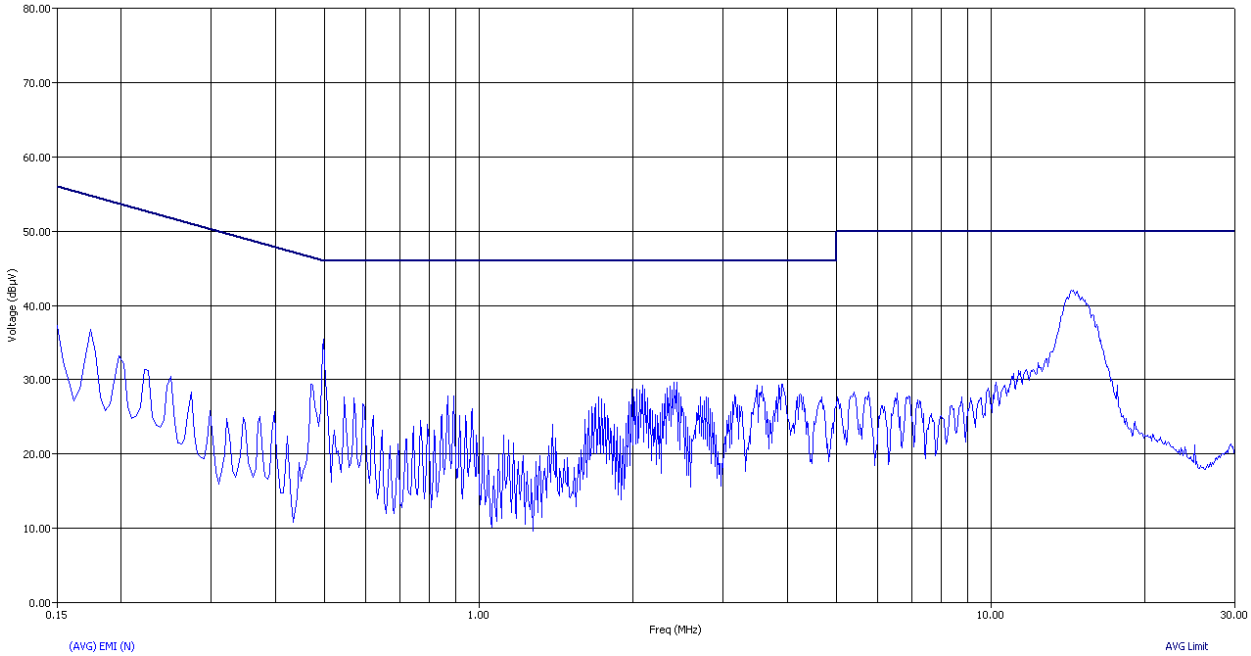


Figure 8: Conducted Emission – Average – Neutral – 150 kHz to 30 MHz

Freq (MHz)	Freq (Max) (MHz)	Line	(AVG) Trace (dBµV)	Cable + Pulse Limiter (dB)	Transducer N (dB)	(AVG) EMI (dBµV)	Avg Limit (dBµV)	(AVG) Margin (dB)
0.15	0.15	N	27.00	9.81	0.15	36.96	56.00	-19.04
0.25	0.26	N	11.51	9.70	0.14	21.35	51.53	-30.19
0.28	0.28	N	10.22	9.69	0.14	20.05	50.81	-30.76
0.29	0.29	N	7.39	9.69	0.14	17.22	50.54	-33.32
0.30	0.30	N	15.03	9.69	0.14	24.87	50.23	-25.37
0.34	0.33	N	8.00	9.76	0.14	17.90	49.47	-31.57
0.37	0.38	N	6.72	9.80	0.14	16.66	48.27	-31.61
0.39	0.39	N	6.78	9.80	0.14	16.72	48.07	-31.35
0.50	0.50	N	23.73	9.86	0.14	33.73	46.00	-12.27
14.67	14.67	N	27.56	10.23	2.66	40.45	50.00	-9.55

Figure 9: Conducted Emission – Average Table – Neutral – 150 kHz to 30 MHz

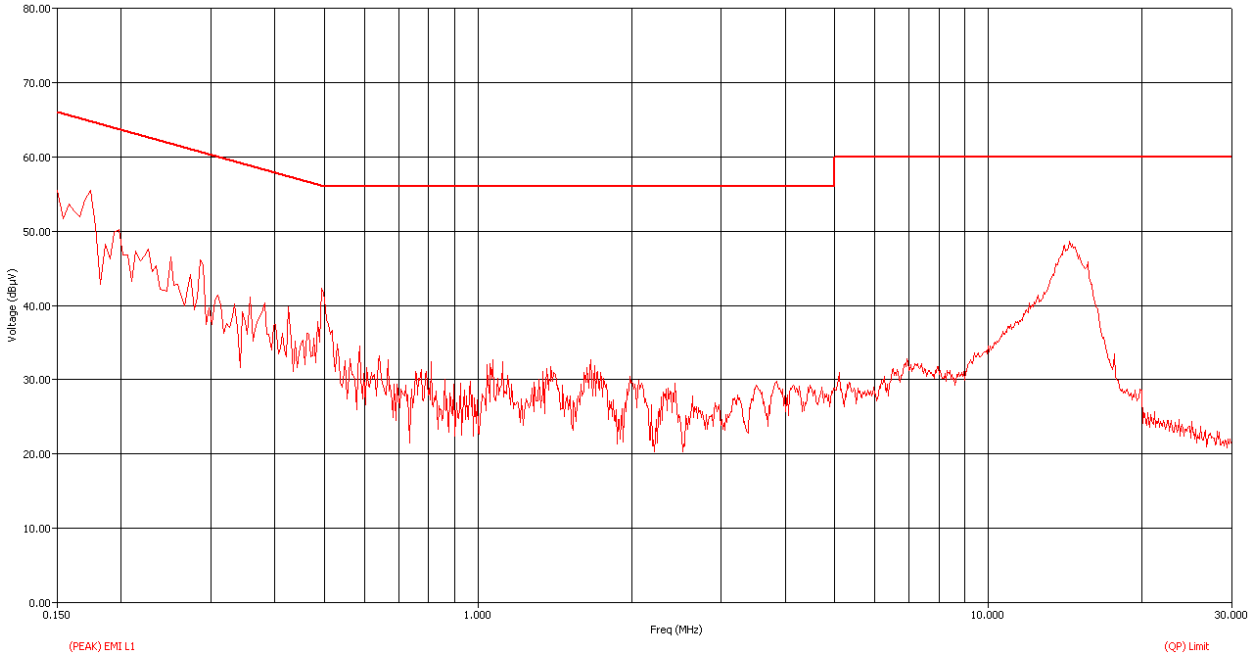


Figure 10: Conducted Emission -Peak – Line – 150 kHz to 30 MHz

Freq (MHz)	Freq (Max) (MHz)	Line	(QP) Trace (dBµV)	Cable + Pulse Limiter (dB)	Transducer L1 (dB)	(QP) EMI (dBµV)	(QP) Limit (dBµV)	(QP) Margin QPL (dB)
0.17	0.18	L1	30.79	9.83	0.09	40.71	64.52	-23.81
0.36	0.36	L1	16.48	9.80	0.08	26.36	58.79	-32.43
0.49	0.50	L1	26.01	9.86	0.09	35.95	56.01	-20.05
0.59	0.59	L1	8.24	9.85	0.09	18.18	56.00	-37.82
0.81	0.79	L1	15.35	9.87	0.09	25.31	56.00	-30.69
1.07	1.08	L1	14.90	9.92	0.10	24.92	56.00	-31.08
1.39	1.39	L1	17.42	9.93	0.12	27.47	56.00	-28.53
1.66	1.66	L1	15.97	9.95	0.13	26.05	56.00	-29.95
1.99	1.99	L1	14.00	9.96	0.14	24.10	56.00	-31.90
14.39	14.38	L1	29.59	10.23	1.02	40.83	60.00	-19.17

Figure 11: Conducted Emission - Quasi Peak Table – Line – 150 kHz to 30 MHz

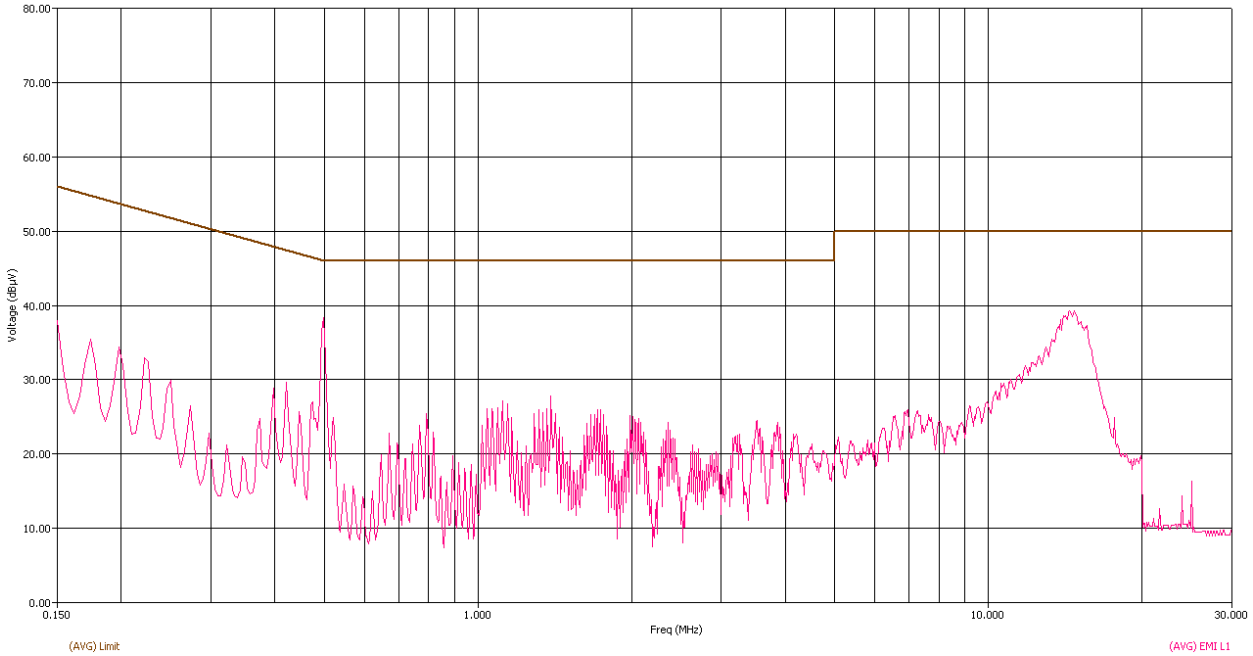


Figure 12: Conducted Emission -Average – Line – 150 kHz to 30 MHz

Freq (MHz)	Freq (Max) (MHz)	Line	(AVG) Trace (dBµV)	Cable + Pulse Limiter (dB)	Transducer L1 (dB)	(AVG) EMI (dBµV)	(AVG) Limit (dBµV)	(AVG) Margin (dB)
0.17	0.18	L1	16.26	9.83	0.09	26.18	54.52	-28.34
0.36	0.36	L1	4.72	9.80	0.08	14.60	48.79	-34.19
0.49	0.50	L1	22.33	9.86	0.09	32.28	46.01	-13.73
0.59	0.59	L1	-2.57	9.85	0.09	7.38	46.00	-38.62
0.81	0.79	L1	11.44	9.87	0.09	21.40	46.00	-24.60
1.07	1.08	L1	10.54	9.92	0.10	20.56	46.00	-25.44
1.39	1.39	L1	14.65	9.93	0.12	24.70	46.00	-21.30
1.66	1.66	L1	12.05	9.95	0.13	22.12	46.00	-23.88
1.99	1.99	L1	9.47	9.96	0.14	19.58	46.00	-26.42
14.39	14.38	L1	23.09	10.23	1.02	34.34	50.00	-15.66

Figure 13: Conducted Emission – Average Table – Line – 150 kHz to 30 MHz

Note:

(QP) EMI (dBµV) = (QP) Trace (dBµV) + Transducer (dB) + {Cable + Pulse limiter} (dB)
QP Margin QPL (dB) = (QP) EMI (dBµV) – (QP) Limit (dBµV)
(AVG) EMI (dBµV) = (AVG) Trace (dBµV) + Transducer (dB) + {Cable + Pulse limiter} (dB)
AVG Margin AVL (dB) = (AVG) EMI (dBµV) – (AVG) Limit (dBµV)

6.2 RADIATED EMISSION

6.2.1 REFERENCE SECTION & LIMITS

6.2.1.1 LIMITS FOR RADIATED EMISSIONS

Standard	Reference section	Frequency range	Limit (dBµV/m) at 3 meter
FCC 47 CFR, Part 15	15.209	9kHz to 490kHz 490kHz to 1.705MHz 1.705MHz to 30MHz	128.5 to 93.8 73.8 to 62.79 69.542

Standard	Reference section	Frequency range	Limit (dBµV/m) at 3 meter
FCC 47 CFR, Part 15	15.209	30 MHz to 88 MHz 88 MHz to 216 MHz 216 MHz to 960 MHz 960 MHz to 1 GHz	29.55 33.05 35.55 43.55

Standard	Reference section	Frequency range	Limit (dBµV/m) at 3 meter
FCC 47 CFR, Part 15	15.209	Above 1GHz	54

6.2.1.2 LIMITS FOR RECEIVER SPURIOUS

Standard	Reference section	Frequency range	Limit (dBµV/m) at 3 meter
RSS-GEN	6	30 MHz to 88 MHz 88 MHz to 216 MHz 216 MHz to 960 MHz 960 MHz to 1 GHz	29.55 33.05 35.55 43.55

Standard	Reference section	Frequency range	Limit (dBµV/m) at 3 meter
RSS-GEN	6	Above 1GHz	54

6.2.2 TEST PROCEDURE

S. No	Procedure
1	Test procedure is as per ANSI C63.4: 2009
2	EUT is placed on a 0.8m non-conductive table. This table is positioned on an automated turn table.
3	Antennas are positioned 10m away from the EUT for frequency between 30MHz to 1GHz and at 3m for frequencies above 1GHz and below 30MHz.
4	EUT is configured to function with the normal mode of operation
5	A peak scan and average scan was carried out at various azimuth angles and antenna heights ranging from 1m to 4m.
6	The highest level of Radiated Emission was recorded
7	Quasi-peak measurements were carried out at the identified peaks for 30MHz to 1GHz and Average measurements were carried out above 1GHz and below 30MHz
8	These values are compared against the limit specified by the standard

6.2.3 RESULT

Parameter	Limit	Measured	Result
Radiated Emission	Refer 6.3.1	Refer 6.3.4	Pass

6.2.4 RESULT (SUPPORTING GRAPHS / DATA)

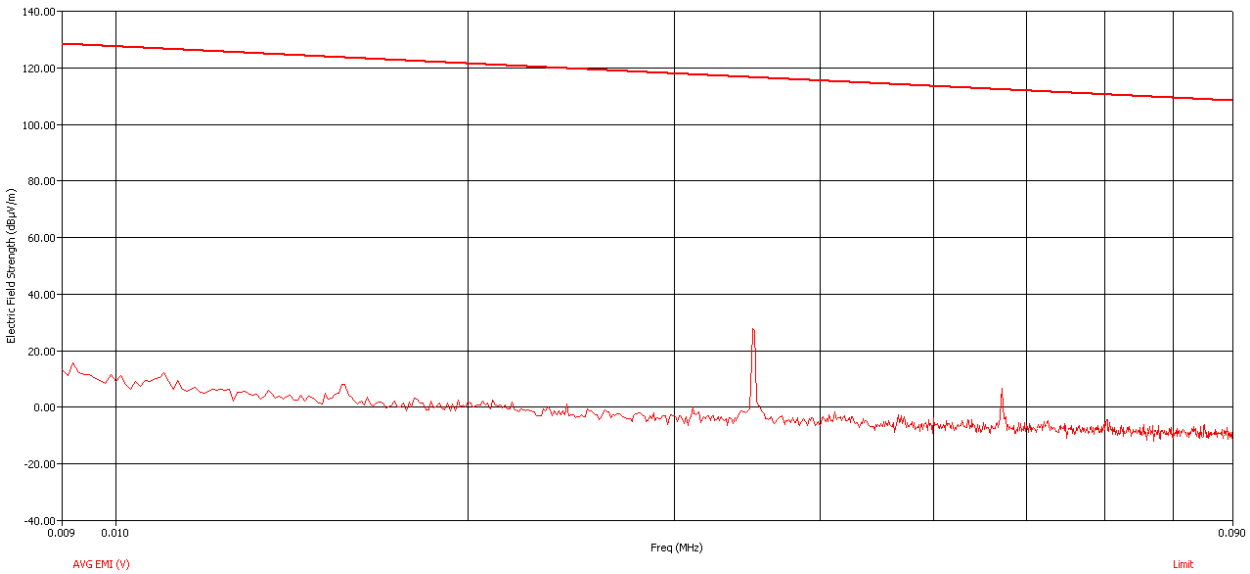


Figure 14: Radiated Emission (Average) – Vertical polarization – 9 kHz to 90 kHz

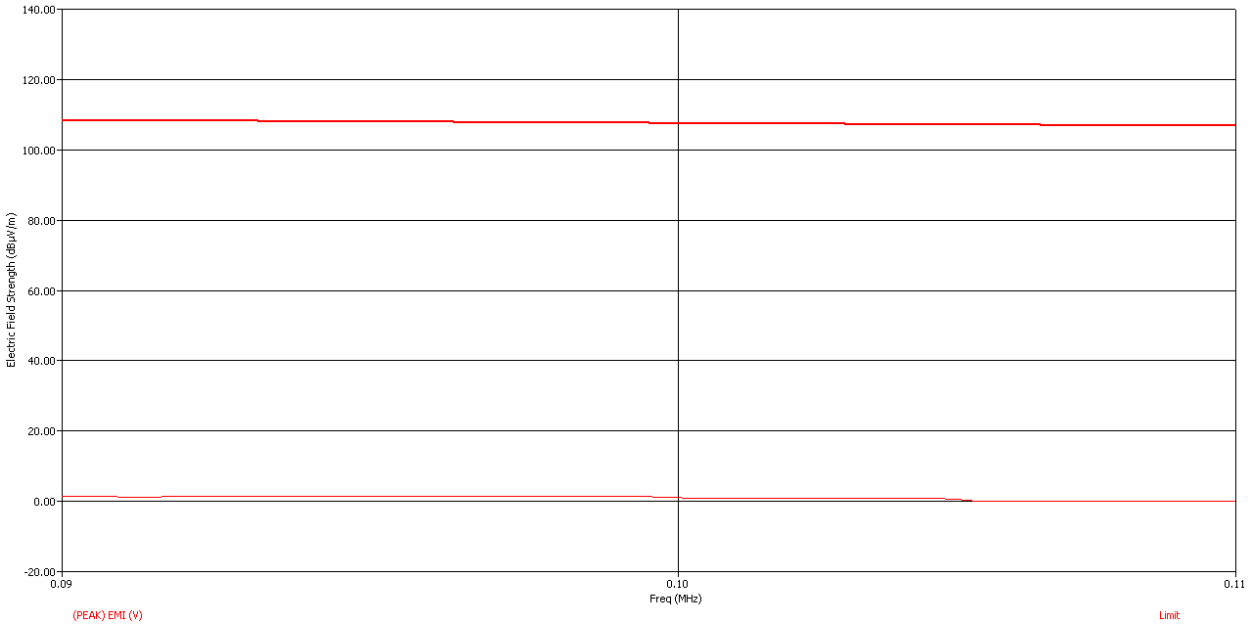


Figure 15: Radiated Emission (Peak) – Vertical polarization – 90 kHz to 110 kHz

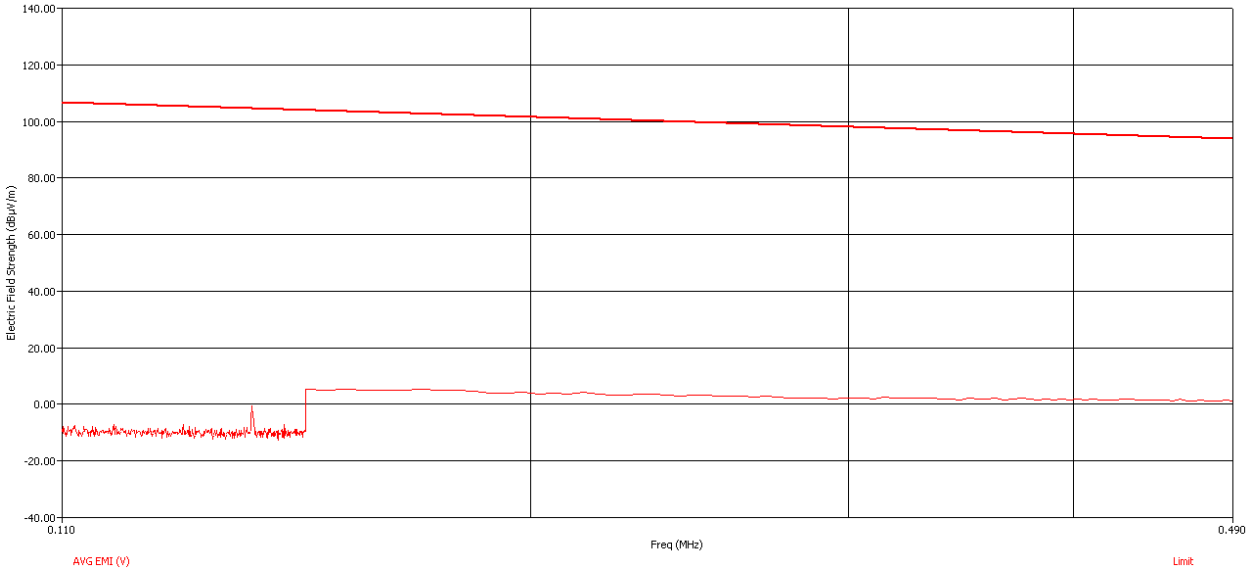


Figure 16: Radiated Emission (Average) – Vertical polarization – 110 kHz to 490 kHz

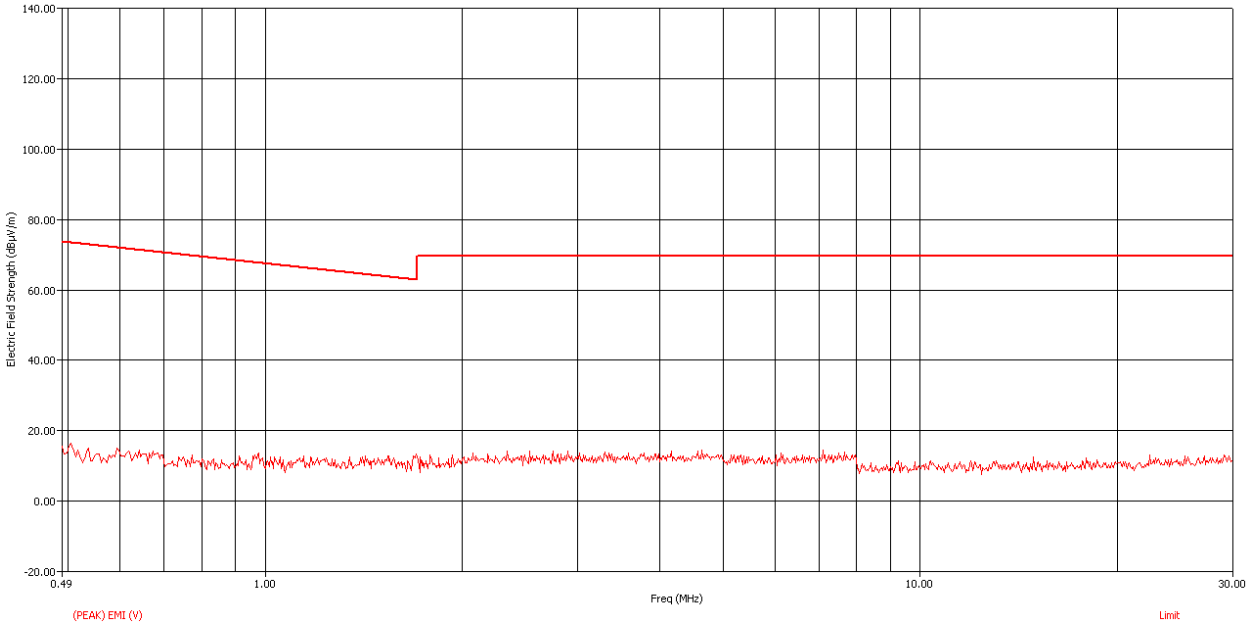


Figure 17: Radiated Emission (Peak) – Vertical polarization – 490 kHz to 30 MHz

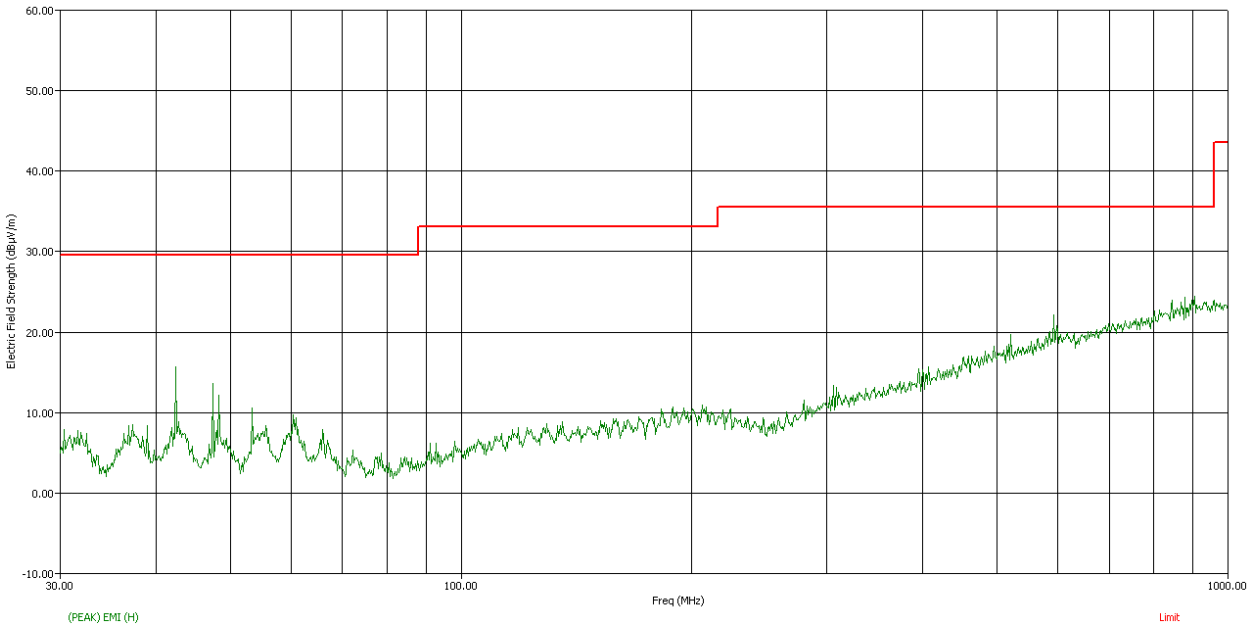


Figure 18: Radiated Emission (Peak) – Horizontal polarization – 30 MHz to 1 GHz

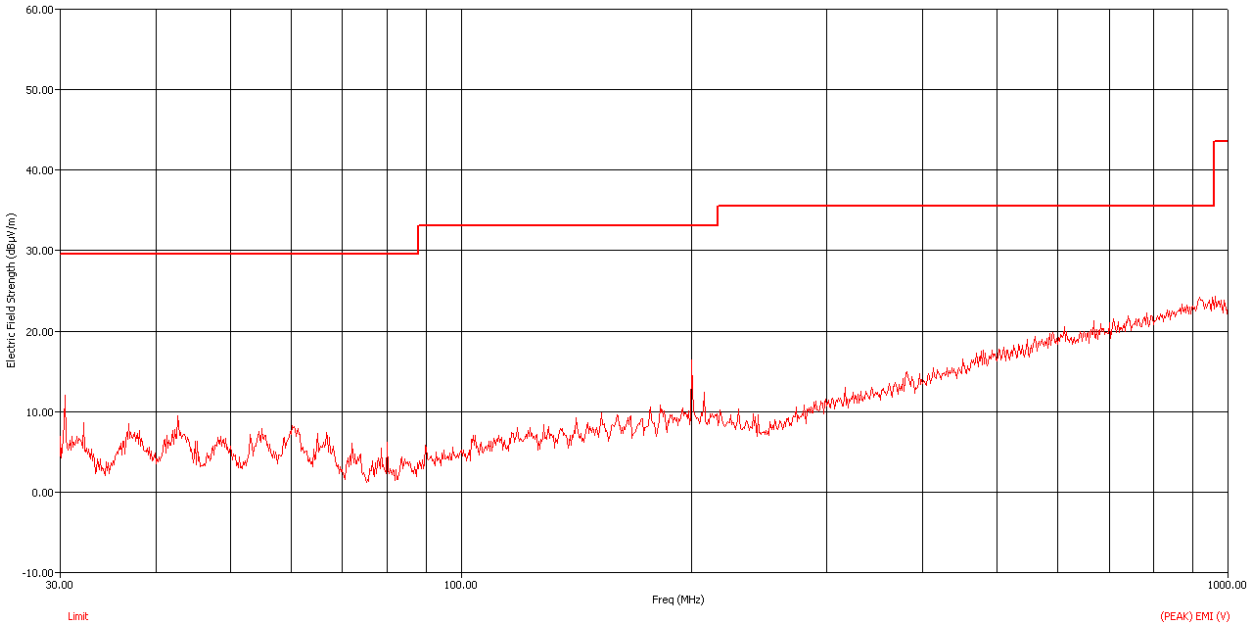


Figure 19: Radiated Emission (Peak) – Vertical polarization – 30 MHz to 1 GHz

Freq (MHz)	Freq (Max) (MHz)	Pol	EUT Ttbl Agl (deg)	Twr Ht (cm)	(QP) Trace (dBµV)	Cable (dB)	Transducer (dB)	Preamp (dB)	(QP) EMI (dBµV/m)	Limit (dBµV/m)	(QP) Margin (dB)
30.48	30.56	V	267.60	347.00	25.32	1.07	11.21	32.04	5.56	29.54	-23.98
42.44	42.49	H	31.40	129.00	22.90	1.25	11.73	32.08	3.80	29.54	-25.74
47.52	47.52	H	7.40	111.00	21.88	1.33	10.88	32.09	2.00	29.54	-27.54
48.32	48.33	H	122.10	393.00	24.34	1.34	10.75	32.10	4.33	29.54	-25.21
200.00	200.04	V	313.00	343.00	22.35	2.70	13.07	32.00	6.12	33.06	-26.94
207.24	207.29	V	324.60	298.00	22.54	2.76	12.67	32.00	5.97	33.06	-27.09
592.16	592.08	H	182.60	313.00	25.67	4.68	19.51	32.10	17.76	35.56	-17.80
756.90	756.99	H	317.30	160.00	25.32	5.27	20.73	31.98	19.34	35.56	-16.22

Figure 20: Radiated Emission – Quasi-peak table - 30 MHz to 1 GHz

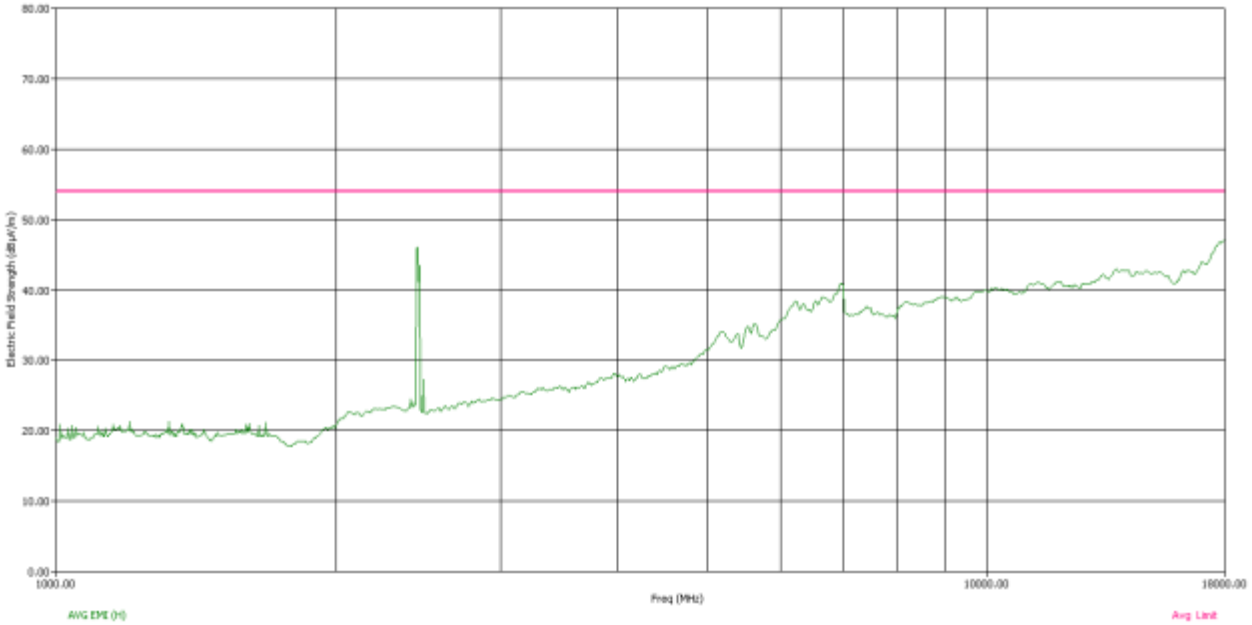


Figure 21: Radiated Emission (Average) – Horizontal polarization 1 GHz to 18 GHz

Note: The peak seen in the above graph is from the carrier, which is intentional

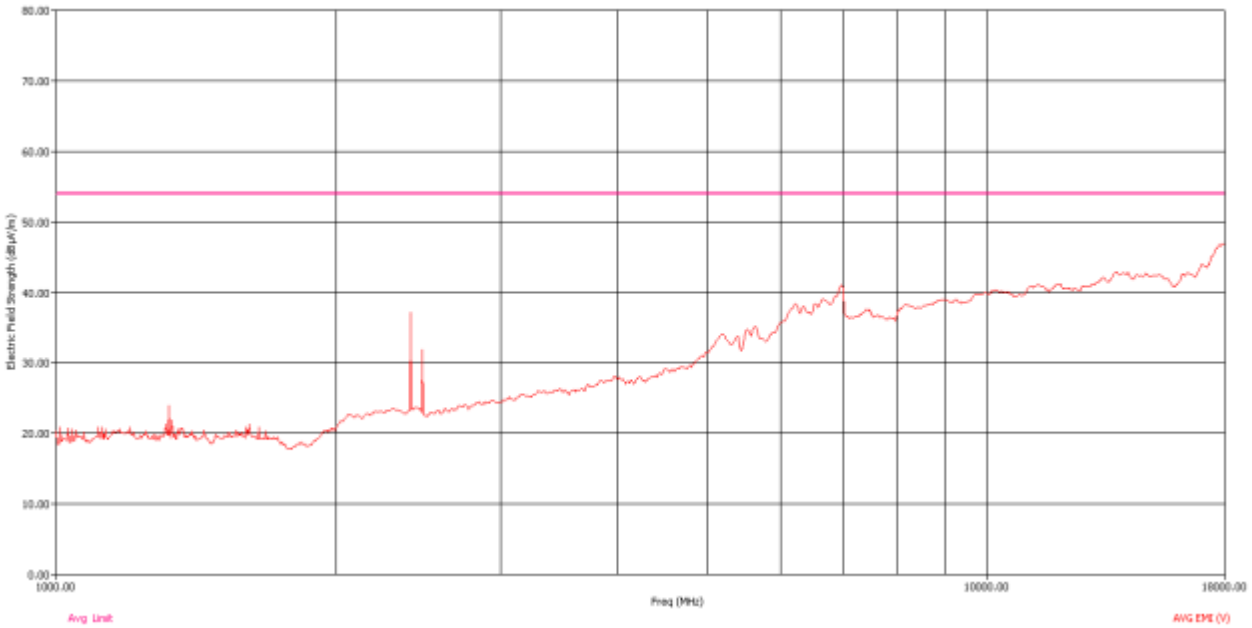


Figure 22: Radiated Emission (Average) – Vertical polarization – 1 GHz to 18 GHz

Note: The peak seen in the above graph is from the carrier, which is intentional

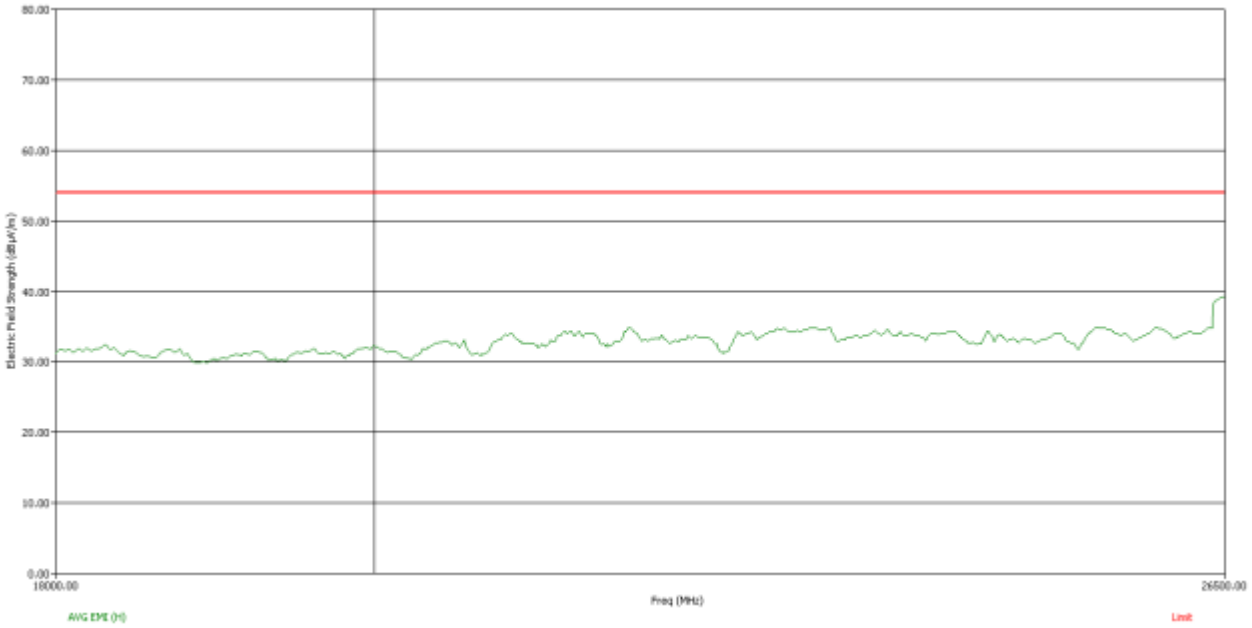


Figure 23: Radiated Emission (Average) – Horizontal polarization 18 GHz to 26.5 GHz

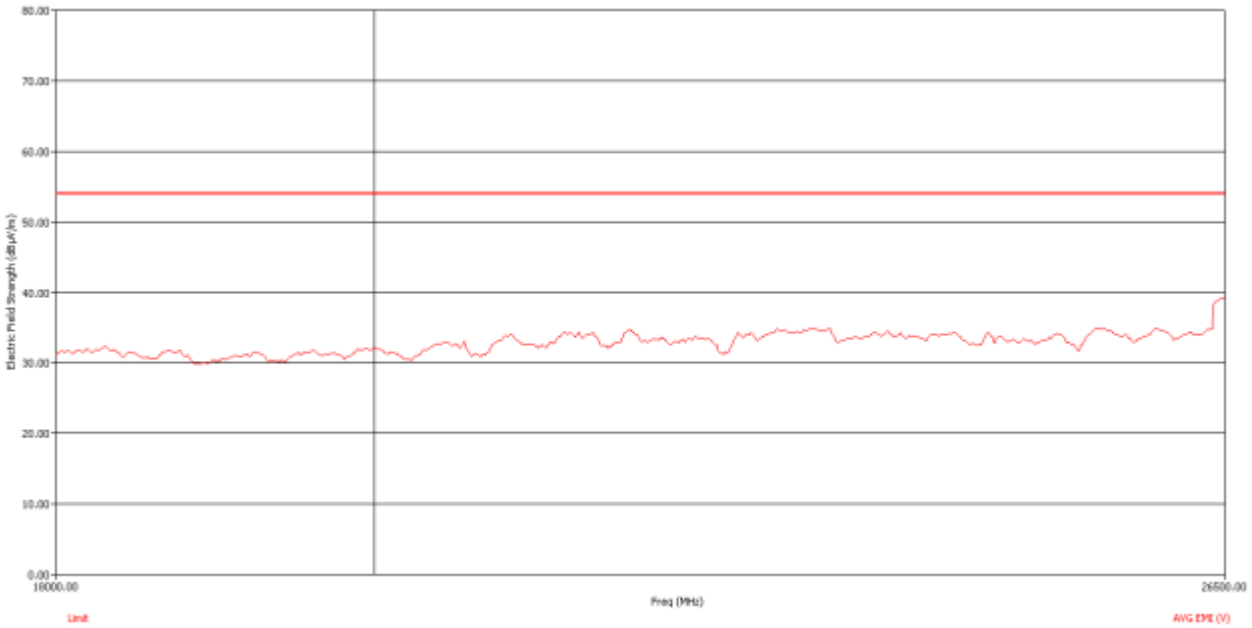


Figure 24: Radiated Emission (Average) – Vertical polarization – 18 GHz to 26.5 GHz

Note:

QP EMI (dBµV/m) = QP Trace (dBµV) + Cable (dB) + Transducer (dB/m) – Preamp (dB)

QP Margin (dB) = QP EMI (dBµV) – Limit (dBµV/m)

6.3 OPERATION WITHIN THE BANDS (CONDUCTED)

6.3.1 REFERENCE SECTION & LIMITS

Standard	Reference section	Limits
FCC 47 CFR, Part 15	15.247 (a) (1)	25 kHz or two thirds of 20 dB bandwidth of the hopping channel, whichever is greater

Standard	Reference section	Limits
RSS-210	A8.1 (b)	25 kHz or two thirds of 20 dB bandwidth of the hopping channel, whichever is greater

6.3.2 TEST PROCEDURE

S. No	Procedure
1	Connect the transmitter output to a Spectrum Analyzer
2	Select an identified hop channel and identify the carrier envelop in the Spectrum Analyzer
3	Record the peak frequency and identify the 20db bandwidth of this envelop
4	Record the frequency
5	If the calculated 20dB bandwidth of channel is greater than 25 kHz, then compare the calculated separation between the 2 channels with the 20dB bandwidth and declare the result.

6.3.3 RESULT

Channel No	Lower Frequency (GHz)	Higher Frequency (GHz)	Measured 20dB B/W	Result
37	2.402	2.403	1.192 MHz	Pass
38	2.426	2.412	1.183 MHz	Pass
39	2.480	2.422	1.108 MHz	Pass

6.3.4 RESULT (SUPPORTING GRAPHS / DATA)

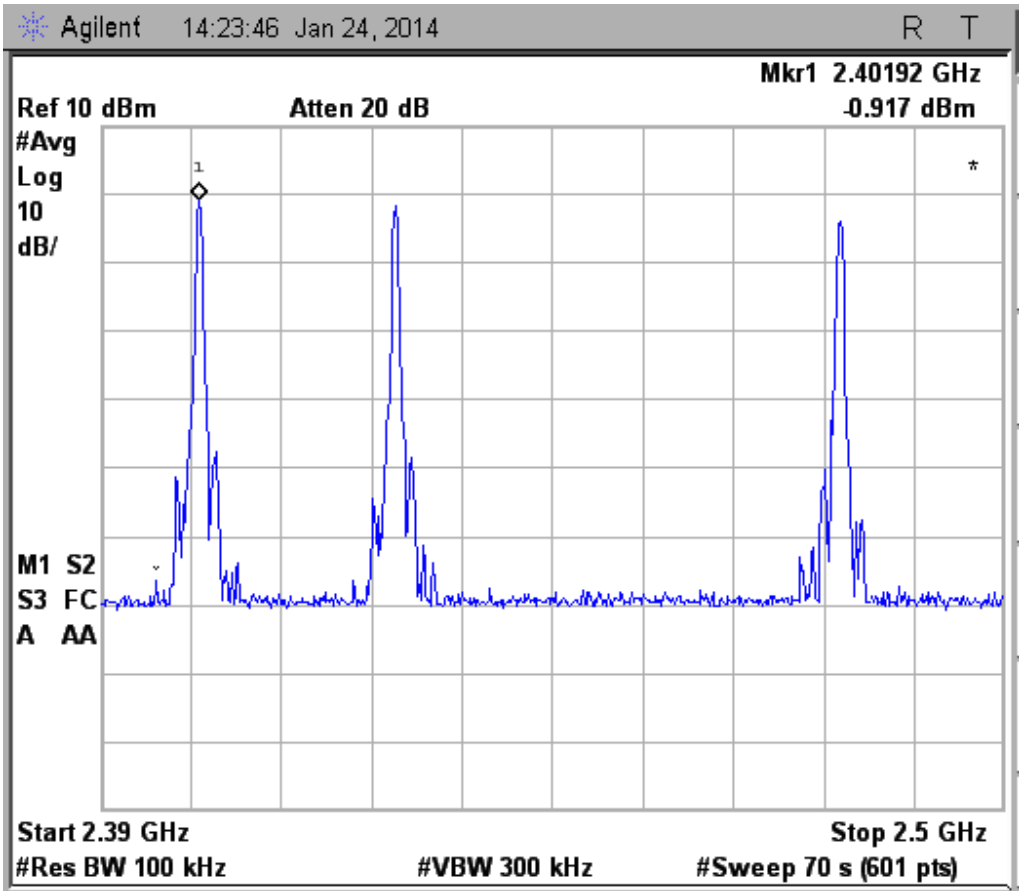


Figure 25: Operation within the bands – Channel 37, 38 &39

Note: *The Equipment is capable of using only 3 advertising channel for hopping, no data channels.*

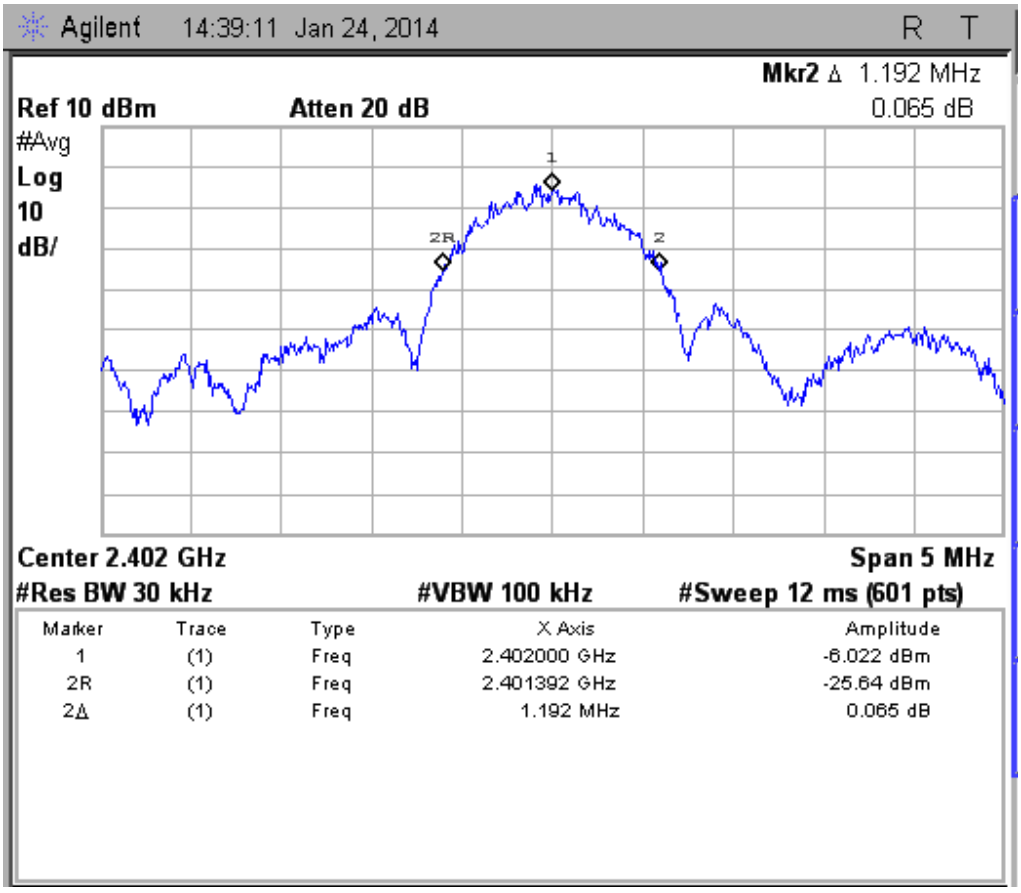


Figure 26: Operation within the bands – Channel 37

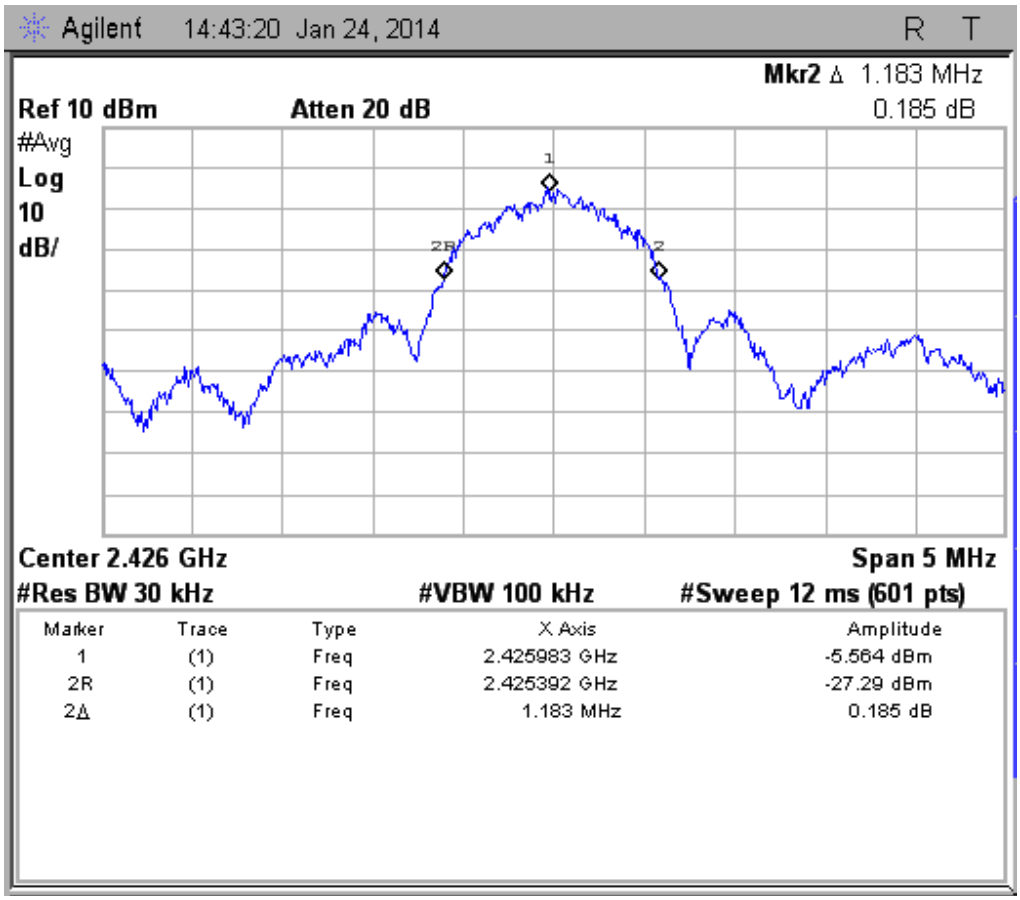


Figure 27: Operation within the bands – Channel 38

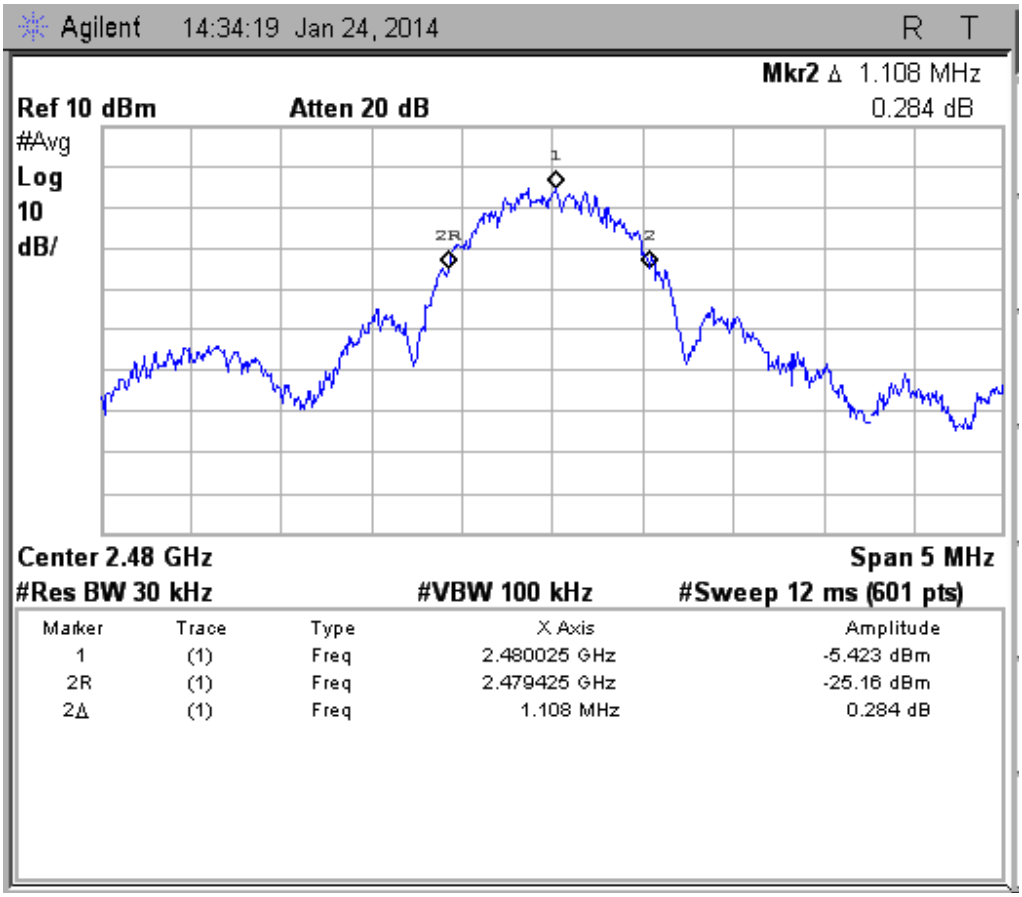


Figure 28: Operation within the bands – Channel 39

6.4 OPERATION WITHIN THE BANDS (RADIATED)

6.4.1 REFERENCE SECTION & LIMITS

Standard	Reference section	Limits
FCC Part 15, Subpart C	15.249 (a)	50 mV/m (93.97 dBµV/m) for Fundamental 500 µV/m (53.97dBµV/m) for Harmonics.

Standard	Reference section	Limits
RSS-210	A2.9	50 mV/m (93.97 dBµV/m) for Fundamental 500 µV/m (53.97dBµV/m) for Harmonics

6.4.2 TEST PROCEDURE

S. No	Procedure
1	The Radiated Emission test was performed inside a Shielded Semi-Anechoic chamber
2	The EUT was placed on a 0.8m height nonmetallic table on a rotating turn table to enable 0 to 360 degrees rotation
3	The receiving antenna was mounted on an antenna mast to enable height variation from 1 to 2 meter above the ground plane.
4	The EUT is configured via link establishment between EUT and auxiliary equipment
5	The measurement is taken by rotating the turn table from 0 to 360 degree and with the antenna height variation of 1 mtr to 2 mtr in both vertical and horizontal polarization
6	Record the peak frequency and identify the level

6.4.3 RESULT

Frequency Range (MHz)	Result
2400 to 2483.5	Pass
Harmonics	Pass (No Harmonics were observed)

6.4.4 RESULT (SUPPORTING GRAPHS / DATA)

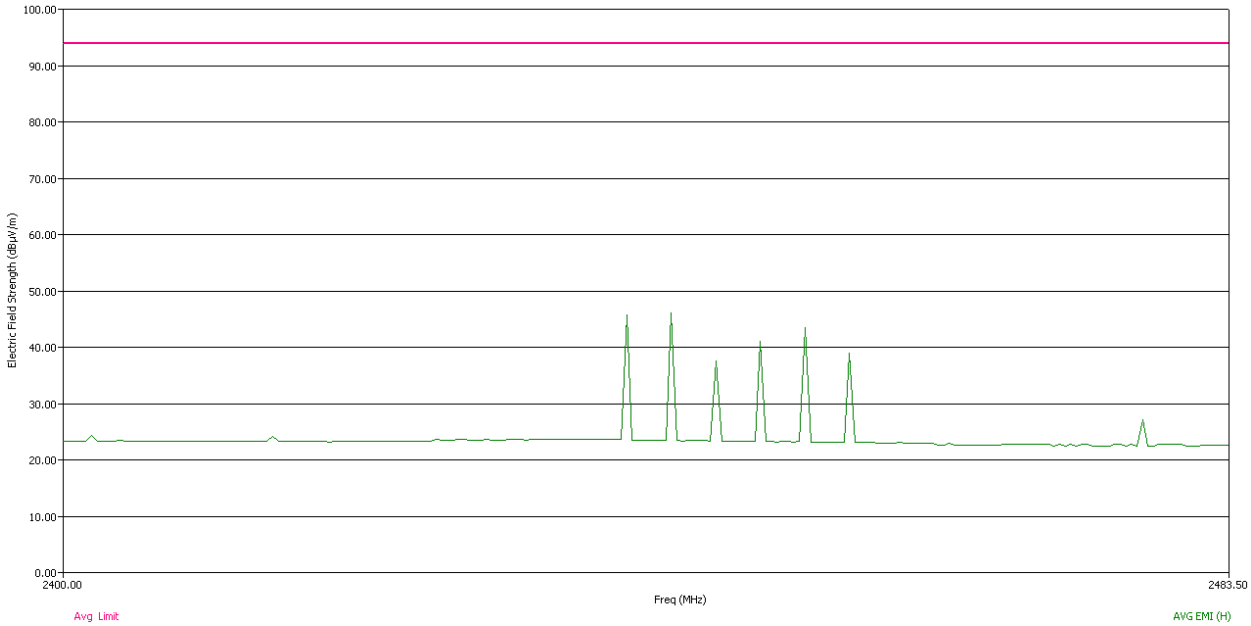


Figure 29: Operation within the bands (Fundamental radiators) – Horizontal Polarization

Figure 30: Operation within the bands (Fundamental radiators) – Vertical Polarization

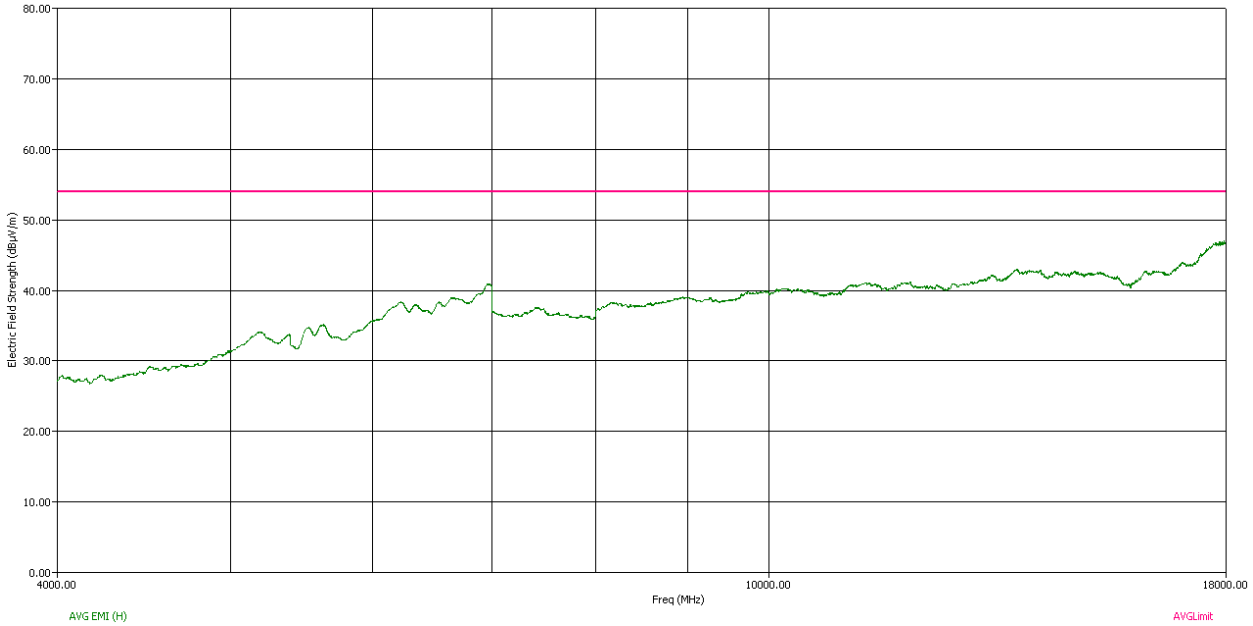


Figure 31: Operation within the bands (Harmonics radiators) – Horizontal Polarization

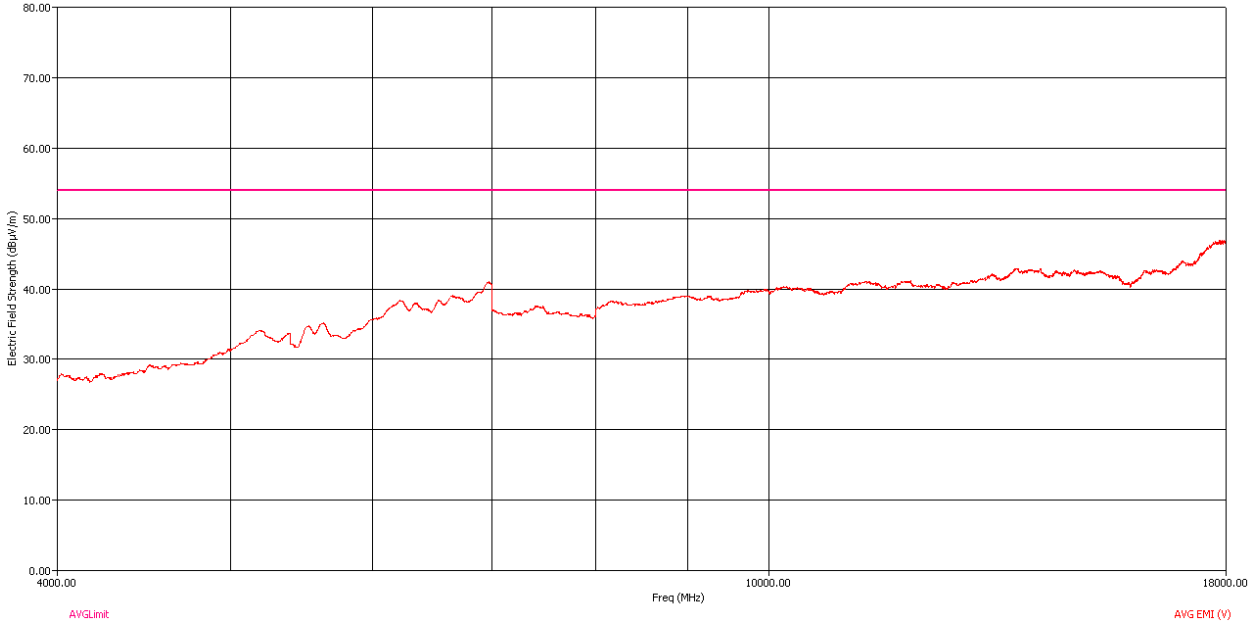


Figure 32: Operation within the bands (Harmonics radiators) – Vertical Polarization

6.5 PEAK CONDUCTED OUTPUT POWER

6.5.1 REFERENCE SECTION

Standard	Reference section	Limits
FCC Part 15, Subpart C	15.247 (b) (1)	Peak conducted output power of hopping systems using less than 50 hop channels < 125 mW

Standard	Reference section	Limits
RSS-210	A8.4 (2)	Peak conducted output power of hopping systems using less than 50 hop channels < 125 mW

6.5.2 TEST PROCEDURE

S. No	Procedure
1	This test was carried out for few selected channels of the Bluetooth band
2	Connect the transmitter output to a Spectrum Analyzer. Select an appropriate channel on the EUT.
3	Detect the carrier envelop in the Spectrum Analyzer
4	Measure the peak power of the envelop in the Spectrum Analyzer
5	Cable loss (0.67 dB) correction factor is added in Spectrum Analyzer.
6	This measured value is compared against the limit and the result declared

6.5.3 RESULT

Channel No	Frequency (GHz)	Measured power (dBm)	Measured power (mW)	Limit (mW)	Result
37	2.402	-0.238	0.946	125	Pass
38	2.426	-0.334	0.925	125	Pass
39	2.480	-0.766	0.838	125	Pass

Note: Transmit duty cycle considered is = 1
No antenna gain is considered as this is conducted measurement without antenna
Cable Loss correction factor is added in Spectrum analyzer.

6.5.4 RESULT (SUPPORTING GRAPHS / DATA)

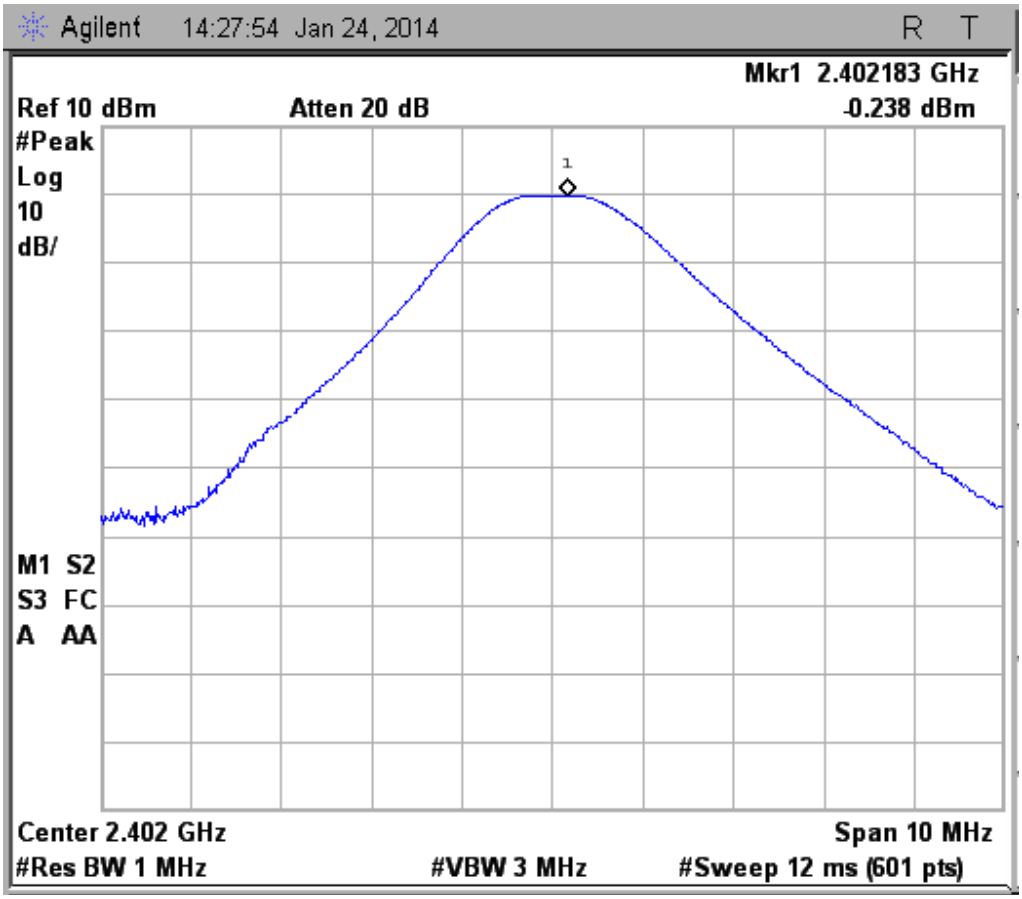


Figure 33: Peak conducted output power – Channel 37

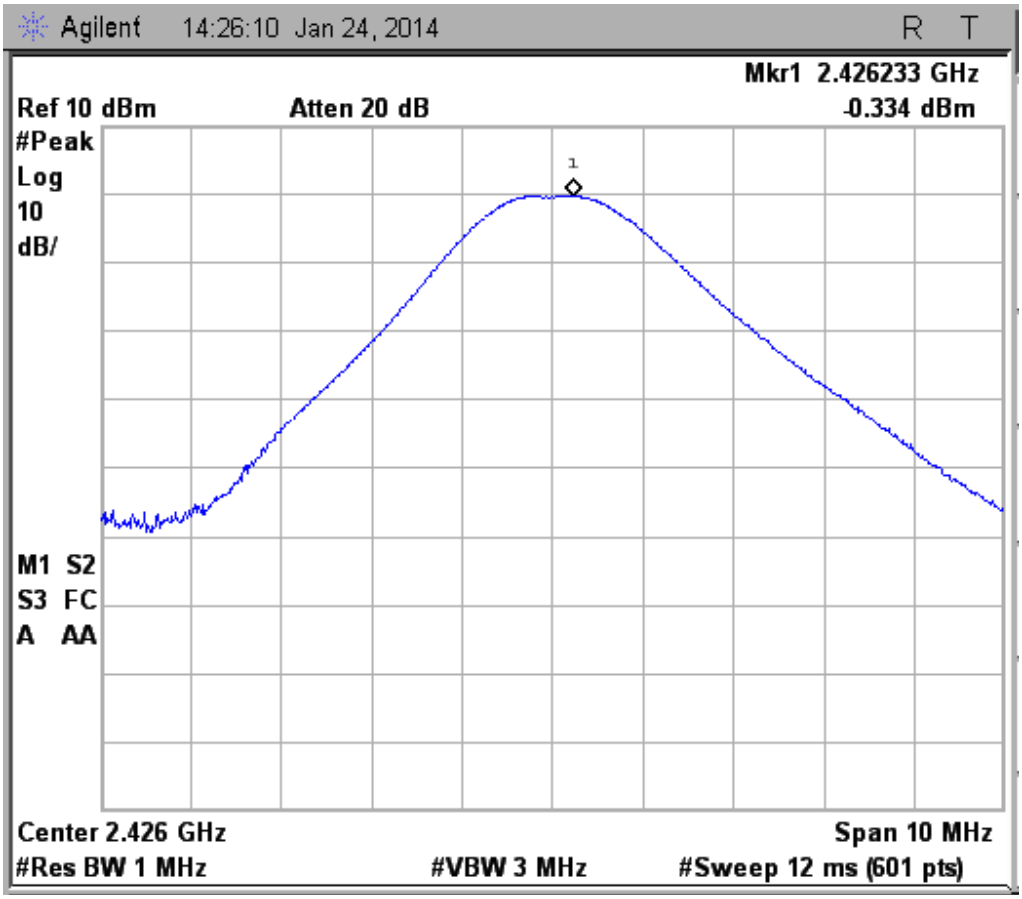


Figure 34: Peak conducted output power – Channel 38

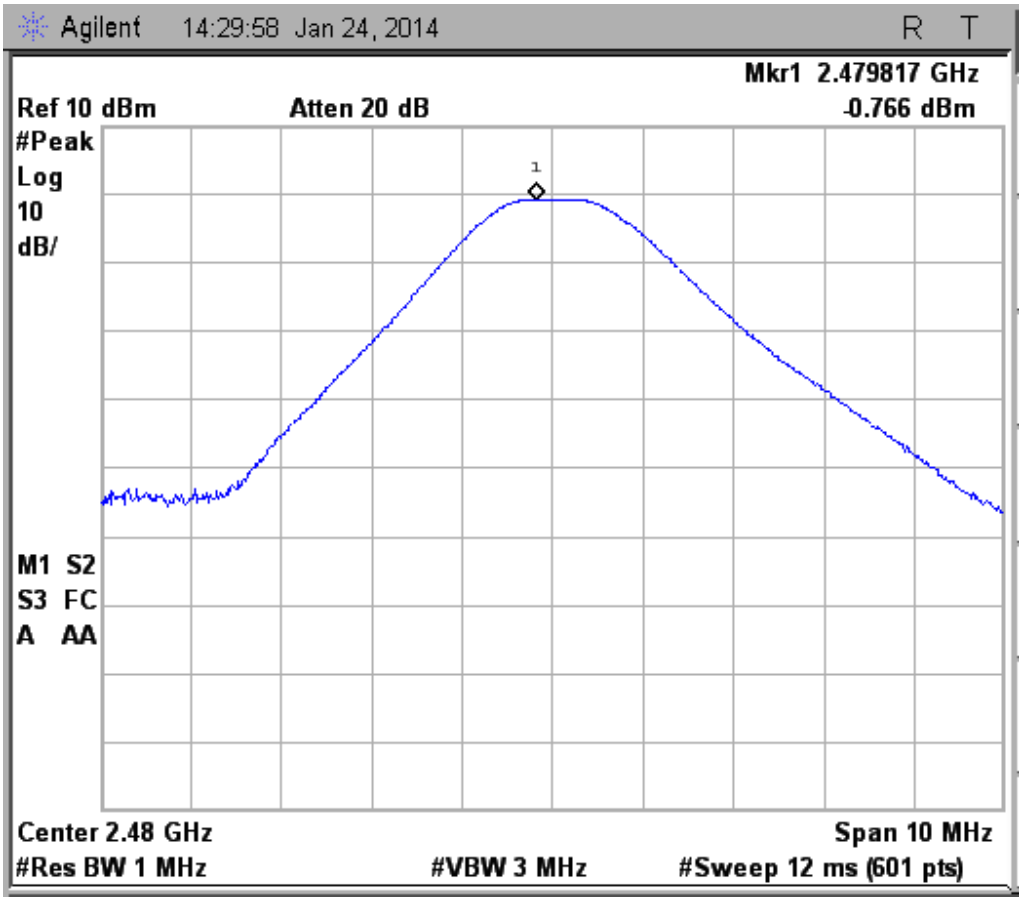


Figure 35: Peak conducted output power – Channel 39

6.6 CONDUCTED SPURIOUS EMISSION

6.6.1 REFERENCE SECTION & LIMITS

Standard	Reference section	Limit
FCC Part 15, Subpart C	15.247 (d)	In any 100kHz band outside the intentional band, emissions shall be 20dB below the peak power

Standard	Reference section	Limit
RSS-210	A8.5	In any 100kHz band outside the intentional band, emissions shall be 20dB below the peak power

6.6.2 TEST PROCEDURE

S. No	Procedure
1	This test was carried out for selected channels of the Bluetooth band
2	Connect the transmitter output to a Spectrum Analyzer. Select an appropriate channel on the EUT.
3	Set the start frequency on the Spectrum Analyzer as 20 MHz
4	Set the stop frequency on the Spectrum Analyzer as 26.5 GHz
5	Examine the complete band for any spurious emissions that exceed the value that is 20dB below the peak power in the intentional band
6	Based on the measured spurious emissions outside the intentional band, the result is declared

6.6.3 RESULT

Hop Channel	Frequency (GHz)	Measured peak in the intentional band	Limit	Result
37	2.402	-1.728 dBm	< 20dB below measured peak (limit line)	Pass
38	2.426	-1.75 dBm	< 20dB below measured peak (limit line)	Pass

6.6.4 RESULT (SUPPORTING GRAPHS / DATA)

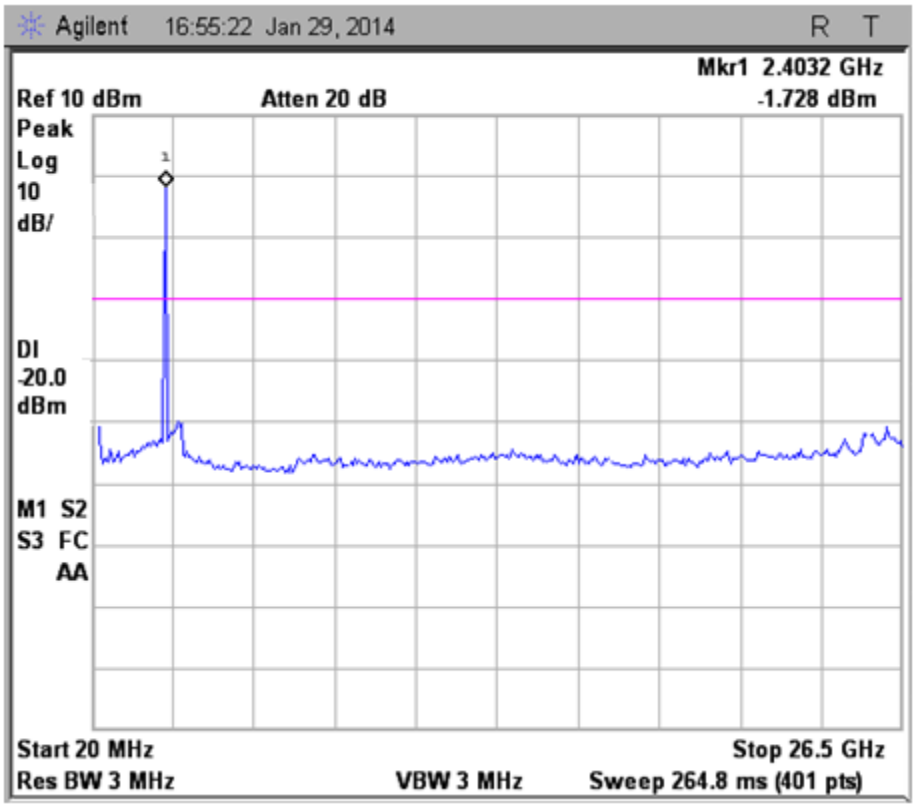


Figure 36: Conducted Spurious Emission – Channel 37

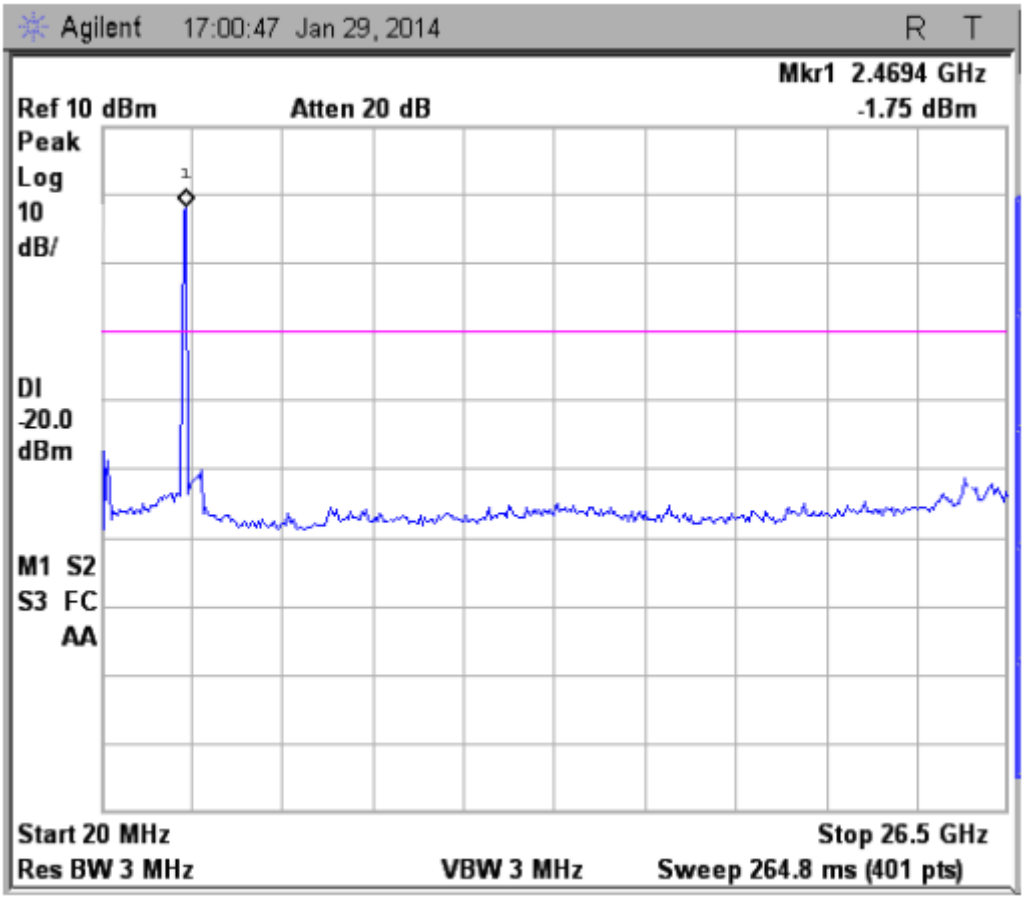


Figure 37: Conducted Spurious Emission – Channel 38

6.7 BAND EDGE MEASUREMENTS CONDUCTED

6.7.1 REFERENCE SECTION & LIMITS

Standard	Reference section	Limit
FCC Part 15, Subpart C	15.247 (d)	Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

Standard	Reference section	Limit
RSS-210	A8.5	Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

6.7.2 TEST PROCEDURE

S. No	Procedure
1	Connect the transmitter output to a Spectrum Analyzer. Select an appropriate channel on the EUT.
2	In the Spectrum Analyzer set Resolution Bandwidth to 100 kHz and Video Bandwidth to 100kHz
3	Select appropriate Span and Sweep time in the Spectrum Analyzer
4	Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5	Based on the recorded value, the result is declared

6.7.3 RESULT (SUPPORTING GRAPHS / DATA)

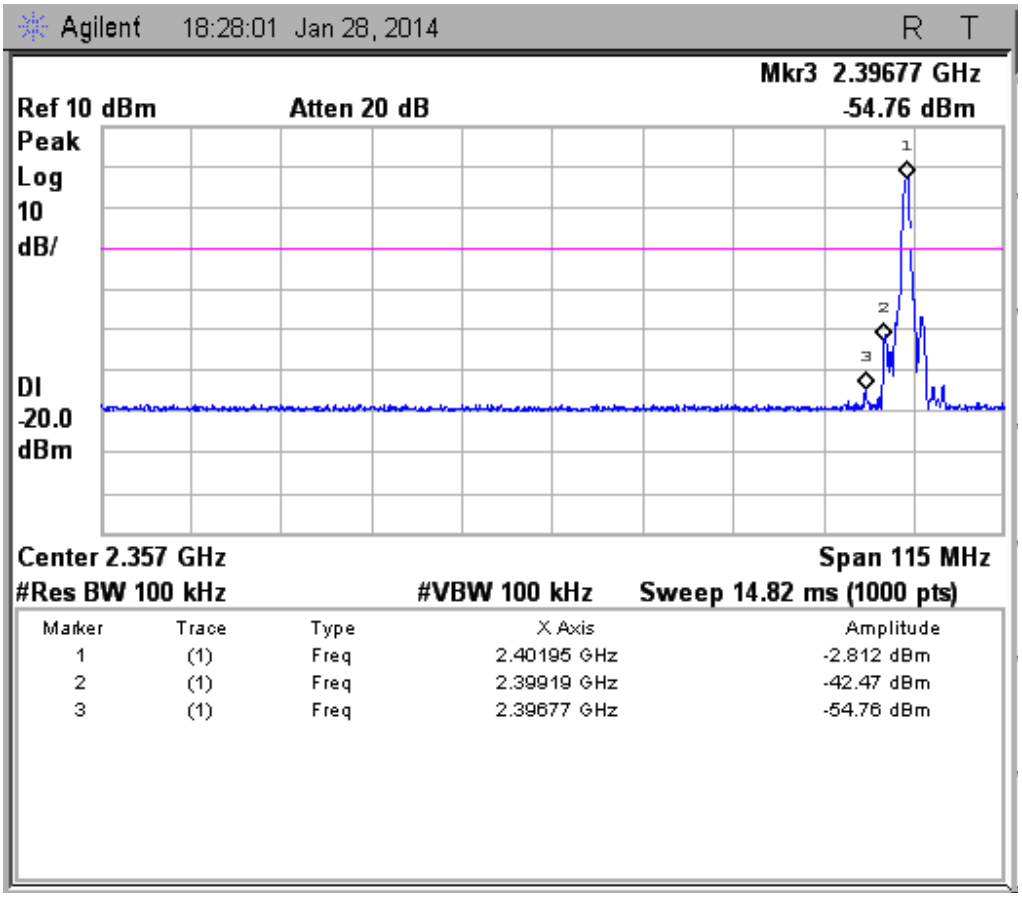


Figure 38: Low Band Edge – Channel 37

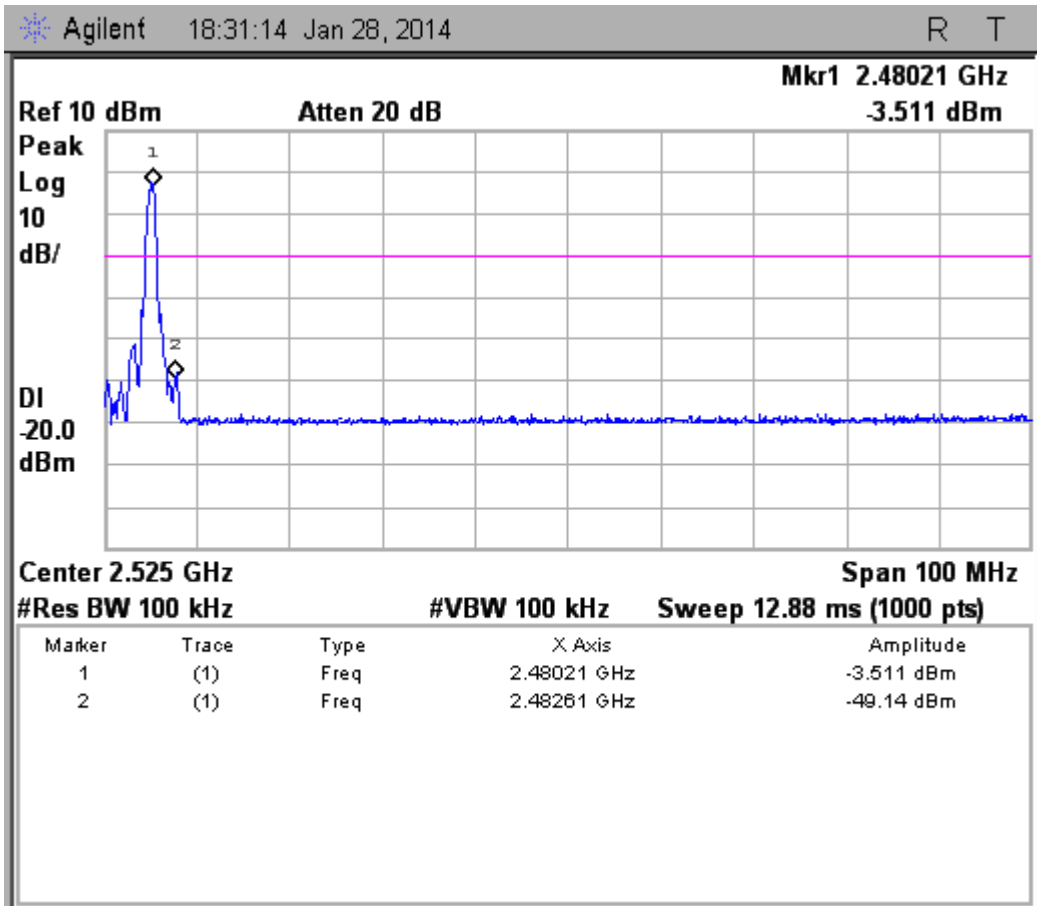


Figure 39: High Band Edge – Channel 39

6.8 ANTENNA REQUIREMENT

6.8.1 REFERENCE SECTION & LIMITS

Standard	Reference section
FCC 47 CFR, Part 15	15.203

Wootch uses a permanently fixed onboard antenna, it is a part of the PCB and as shown in figure below:

Figure 40: Photograph showing onboard Antenna

6.8.2 RESULT (SUPPORTING GRAPHS / DATA)

Complied

6.9 OCCUPIED BANDWIDTH MEASURMENTS

6.9.1 REFERENCE SECTION & LIMITS

Standard	Reference section	Limit
RSS-GEN	4.6.1	Occupied Bandwidth (OBW) is the bandwidth containing 99% of the total integrated power of the transmitted spectrum, centered on the assigned channel frequency.

6.9.2 TEST PROCEDURE

S. No	Procedure
1	This test was carried out for Low(37), Mid(38) and High(39) channels of the Bluetooth band
2	Connect the transmitter output to a Spectrum Analyzer. Select an appropriate channel on the EUT.
3	In the Spectrum Analyzer set Resolution Bandwidth to 100 kHz and Video Bandwidth to 300kHz
4	Select Span of 1.5MHz and Sweep time of 1s in the Spectrum Analyzer and sampling detector should be used
5	The EUT shall be operated in its maximum carrier power.
6	Based on the recorded value, the result is declared

6.9.3 RESULT (SUPPORTING GRAPHS / DATA)

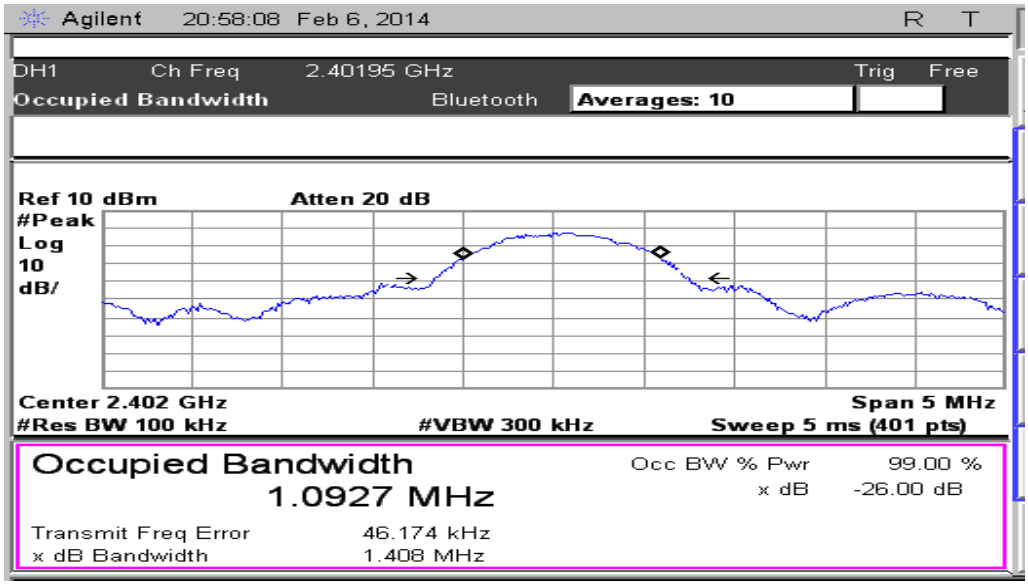


Figure 41: Occupied Bandwidth Measurement – Channel no 37

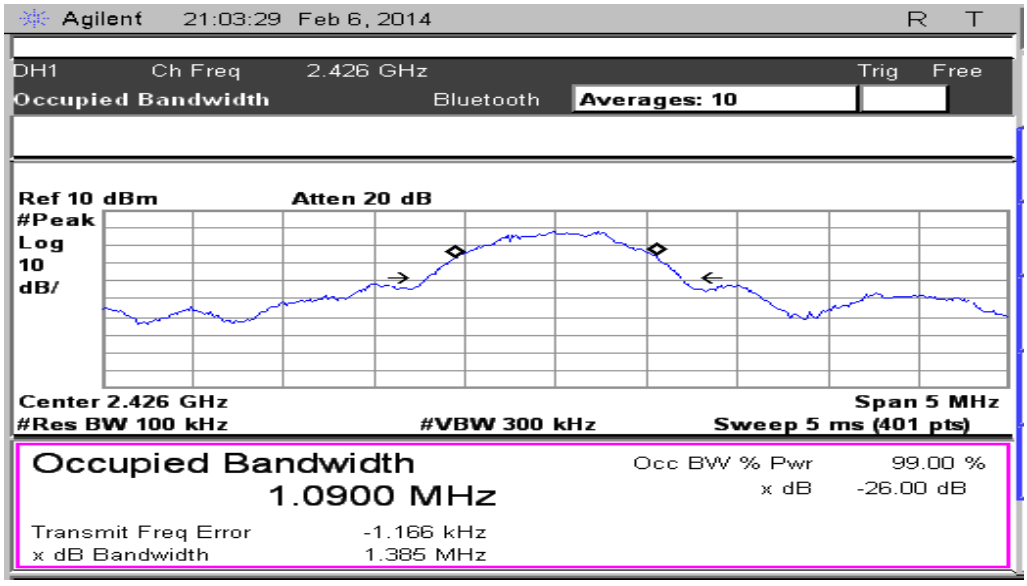


Figure 42: Occupied Bandwidth Measurement – Channel 38

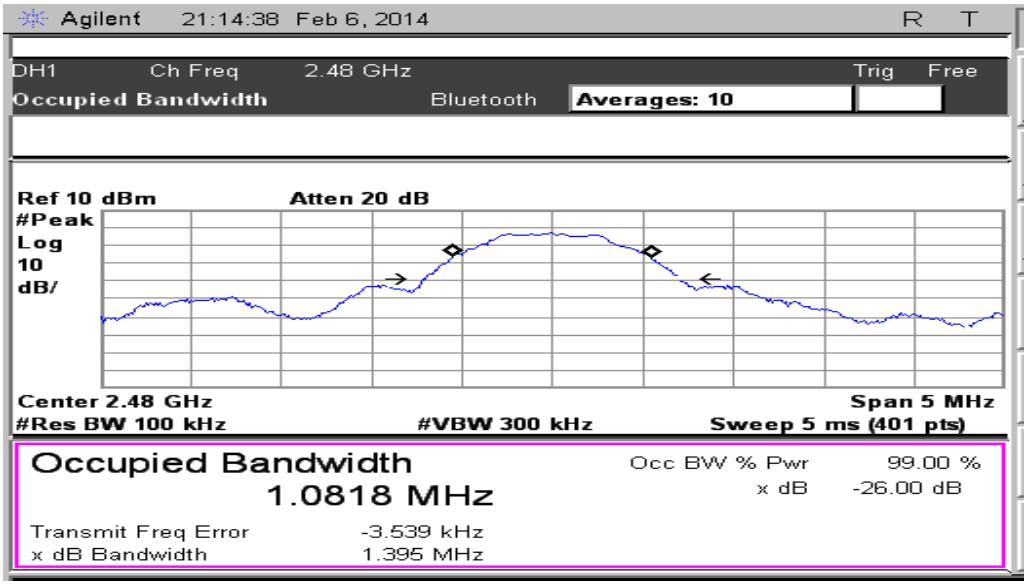


Figure 43: Occupied Bandwidth Measurement – Channel no 39

7 APPENDIX 2 – ACRONYMS

CFR	Code of Federal Regulations
dBm	Decibel milliWatt
dBi	Decibel Isotropic
dbµV	Decibel microVolts
EUT	Equipment Under Test
FCC	Federal Communications Commission
GHz	Giga Hertz
IC	Industry Canada
kHz	Kilo Hertz
MHz	Mega Hertz
mW	milliWatt
NABL	National Accreditation Board for Testing and Calibration Laboratories, India
USB	Universal Serial Bus