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Amended

Wireless Test Report

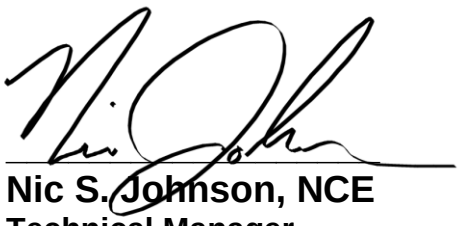
Prepared for: **Savox Communications**

Address: **2025 SW 5th Street**
Lincoln, NE 68522

Product: **Wireless Intercom Control (WIC)**

Test Report No: **R20160216-27-01A**

Approved By:



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ilac-MRA A2LA ACCREDITED TESTING LABORATORY CERTIFICATE NO. 1953.01

Revision Page

Rev. No.	Date	Description
Original	20 March 2018	Original release –NJ
A	4 April 2018	Added limits from FCC Part 15.249 and RSS-210 Annex B at the fundamental frequency to Section 4.2. Corrected date of original report to 2018. -NJ

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1.0 Summary of test results

1.1 Applied standards

The EUT uses digital modulation and operates between 2400.0MHz and 2483.5MHz. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

(1) FCC Part 15, Subpart C (15.207, 15.209, 15.249)
(2) ANSI C63.10:2013
(3) Industry Canada RSS-Gen Issue 4
(4) Industry Canada RSS-210 Issue 9

All test items have been performed and recorded as per the above.

1.2 Test Results Summary

The EUT has been tested according to the following specifications:

APPLIED STANDARDS			
Standard Section	**Test Type and Limit**	**Result**	**Remark**
FCC Part 15.203	Unique Antenna Requirement	Pass	Permanently attached antenna
FCC Part 15.207 RSS-Gen Section 8.8	Conducted Emissions	NA	EUT uses non-rechargeable battery
RSS-Gen Section 6.6 RSS-Gen Section 6.12	Bandwidth and peak EIRP	NA	Informational only
FCC Part 15.209 RSS-Gen Section 7.0	Receiver Radiated Emissions,	Pass	Meets the requirement of the limit.
FCC Part 15.249 RSS-Gen Section 8.9 RSS-210 B.10	Transmitter Radiated Emissions,	Pass	Meets the requirement of the limit.
FCC Part 15.249 RSS-Gen Section 8.9 RSS-210 B.10	Band Edge Measurement	Pass	Meets the requirement of the limit.

2.0 EUT Details

2.1 Equipment under test

The Equipment Under Test (EUT) was a small wireless PTT device for use with the SR100 Rescue communication device and the Savox SearchCam3000. It operates from 2402 to 2471 MHz and has transmit and receive capabilities.

EUT Received Date: 6 February 2017
EUT Tested Dates: 6 February 2017 – 22 February 2017

Verified EIRP measurements March 15, 2018. The EUT has not changed since testing in 2017.

MODEL	Wireless Intercom Control (WIC)
Part No.	K13611
Serial No.	NCEE Test 1 (assigned) *The serial number was assigned by the lab as the test sample was not serialized. However PCB number was K13493_B_WIC
POWER SUPPLY	Internal 3VDC (CR 2032)
ANTENNA TYPE	Internal PCB antenna

NOTE: For more detailed features description, please refer to the manufacturer's specifications or user's manual.

2.2 Laboratory description

All testing was performed at the following Facility:

The Nebraska Center for Excellence in Electronics (NCEE Labs)
4740 Discovery Drive
Lincoln, NE 68521

A2LA Certificate Number : 1953.01
FCC Accredited Test Site Designation No: US1060
Industry Canada Test Site Registration No: 4294A-1
NCC CAB Identification No: US0177

Environmental conditions varied slightly throughout the tests:
Relative humidity of 32 ± 4%
Temperature of 23 ± 3° Celsius

2.3 Description of test modes

The EUT operates on, and was tested at the frequencies below:

Channel	Frequency
Low	2402
Middle	2435
High	2471

These are the only three representative channels tested in the frequency range according to FCC Part 15.31 and RSS-Gen Table A1. See the operational description for a list of all channel frequency and designations.

2.4 Description of support units

None

2.5 Configuration of system under test

This EUT was set to transmit in a worse-case scenario with modulation on. The manufacturer modified the unit to transmit continuously on the lowest, highest and one channel in the middle. The EUT was tested with a CR2032 coin cell for the measurements below 1 GHz and it was tested with 3 VDC continuous power source (KORAD MN: KA3005D SN: 08250091977) for all the measurements over 1 GHz.

3.0 Test Laboratory

3.1 Laboratory description

All testing was performed at the following Facility:

The Nebraska Center for Excellence in Electronics (NCEE Labs)
4740 Discovery Drive
Lincoln, NE 68521

A2LA Certificate Number :	1953.01
FCC Accredited Test Site Designation No:	US1060
Industry Canada Test Site Registration No:	4294A-1
NCC CAB Identification No:	US0177

Environmental conditions varied slightly throughout the tests:
Relative humidity of 32 ± 4%
Temperature of 23 ± 3° Celsius

3.2 Test Equipment

DESCRIPTION AND MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CALIBRATION DATE	CALIBRATION DUE DATE
Rohde & Schwarz Test Receiver	ES126	100037	24 Jan 2017	24 Jan 2018
Rohde & Schwarz Test Receiver	ES126	100037	30 Jan 2018	30 Jan 2019
EMCO Biconilog Antenna	3142B	1647	02 Aug 2016	02 Aug 2017
EMCO Horn Antenna	3115	6416	25 Jan 2016	25 Jan 2018
EMCO Horn Antenna	3115	6416	1 Feb 2016	1 Feb 2018
EMCO Horn Antenna	3116	2576	26 Jan 2016	26 Jan 2018
Rohde & Schwarz Preamplifier	TS-PR18	3545700803	9 Feb 2017*	9 Feb 2018*
Trilithic High Pass Filter	6HC330	23042	9 Feb 2017*	9 Feb 2018*
Rohde & Schwarz LISN	ESH3-Z5	100023	23 Jan 2017	23 Jan 2018

*Internal Characterization

4.0 Detailed results

4.1 Unique antenna requirement

4.1.1 Standard applicable

For intentional device, according to FCC 47 CFR Section 15.203, 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.

4.1.2 Antenna description

The antenna is internal to the EUT. It is a PCB antenna and not replaceable.

4.2 Radiated emissions

4.2.1 Limits for radiated emissions measurements

Emissions radiated outside of the specified bands shall be applied to the limits in 15.209 as followed:

FREQUENCIES (MHz)	FIELD STRENGTH (μV/m)	MEASUREMENT DISTANCE (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	3
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 * log * Emission level (μV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits by more than 20dB under any condition of modulation.

4.2.2 Test procedures

a. The EUT was placed on the top of a rotating table 0.8 meters and 1.5 meters above the ground plane in a 10 meter semi-anechoic chamber for measurements 30MHz - 1GHz and 1GHz -25 GHz respectively. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna was a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are used to make the measurement.

d. For each suspected emission, the EUT was arranged to maximize its emissions and then the antenna height was varied from 1 meter to 4 meters and the rotating table was turned from 0 degrees to 360 degrees to find the maximum emission reading.

e. The test-receiver system was set to use a peak detector with a specified resolution bandwidth. For spectrum analyzer measurements, the composite maximum of several analyzer sweeps was used for final measurements.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. The EUT was measured while orientated in all three orthogonal axis as seen in Figure 2 on the following page. It was found that the position 2 produced the highest emissions, and this orientation was used for all testing.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequencies below 1GHz.

2. The resolution bandwidth 1 MHz for all measurements and at frequencies above 1GHz, A peak detector was used for all

measurements above 1GHz. Measurements were made with an EMI Receiver.

4.2.3 Deviations from test standard

No deviation.

4.2.4 Test setup

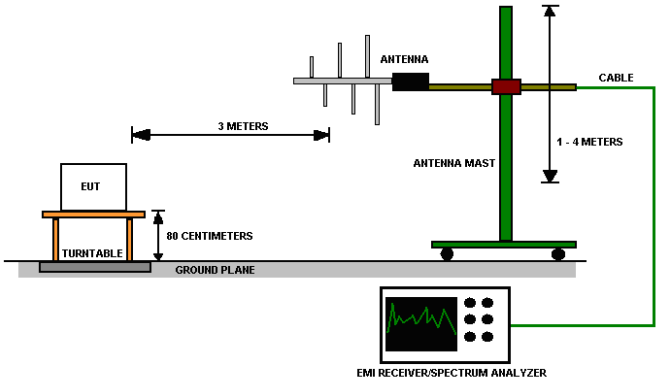

Figure 1 - Radiated Emissions Test Setup

The EUT was tested in both the vertical and horizontal in all 3 positions shown in Figure 2 below in order to measure emissions in all **3 orthogonal axis** of the EUT and meet the requirements from **ANSI C63.10 Section 5.10.1**.

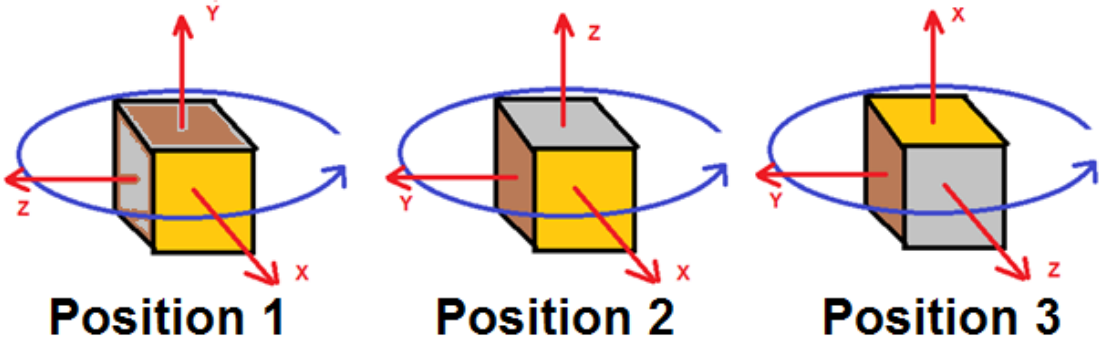

Figure 2 - EUT Orientation for Radiated Emissions Tests

It was found that position 2 produced the highest emissions and this orientation was used for final measurements.

4.2.5 EUT operating conditions

The EUT was powered by 3 VDC unless specified and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

4.2.6 Test results

EUT	Wireless Intercom Control (WIC)	MODE	Receive
INPUT POWER	3 VDC	FREQUENCY RANGE	30MHz – 26GHz
ENVIRONMENTAL CONDITIONS	30 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

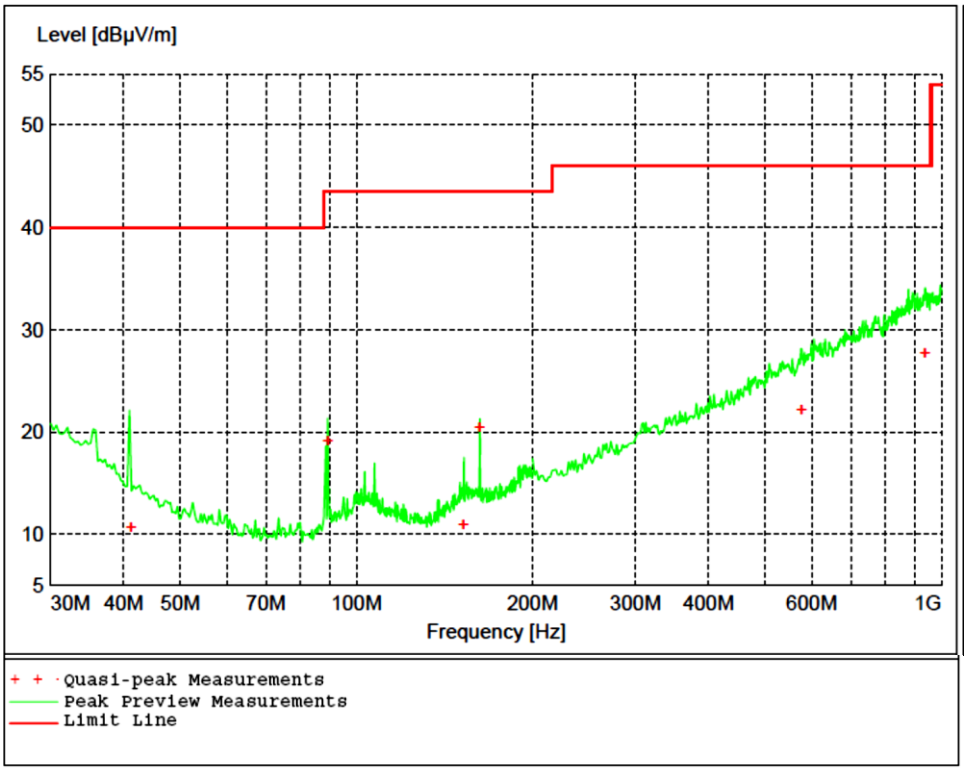

Figure 3 - Radiated Emissions Plot, Receive
Vertical orientation was found to be the worse-case

REMARKS:
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. Since peak measurements were compliant with the average limit, average measurements were not required.

Table 1 - Radiated Emissions Quasi-peak Measurements, Receive

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
41.160000	10.70	40.00	29.30	99	312	VERT
89.280000	19.09	43.50	24.40	399	92	VERT
152.460000	10.87	43.50	32.70	257	349	HORI
162.480000	20.47	43.50	23.10	151	227	HORI
576.480000	22.16	46.00	23.80	216	359	HORI
937.740000	27.72	46.00	18.30	233	170	HORI

Table 2 - Radiated Emissions Peak Measurements, Receive

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
1855.200000	35.34	54.00	18.70	284	226	VERT
2434.600000	37.05	54.00	17.00	369	253	VERT
4883.200000	42.12	54.00	11.90	398	360	HORI
7353.200000	43.36	54.00	10.60	398	317	VERT
9779.000000	45.99	54.00	8.00	397	353	HORI

Peak measurements were compared to average limit and found to be compliant so average measurements were not performed

EUT	Wireless Intercom Control (WIC)	MODE	Low Channel
INPUT POWER	3 VDC	FREQUENCY RANGE	30MHz – 26GHz
ENVIRONMENTAL CONDITIONS	30 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

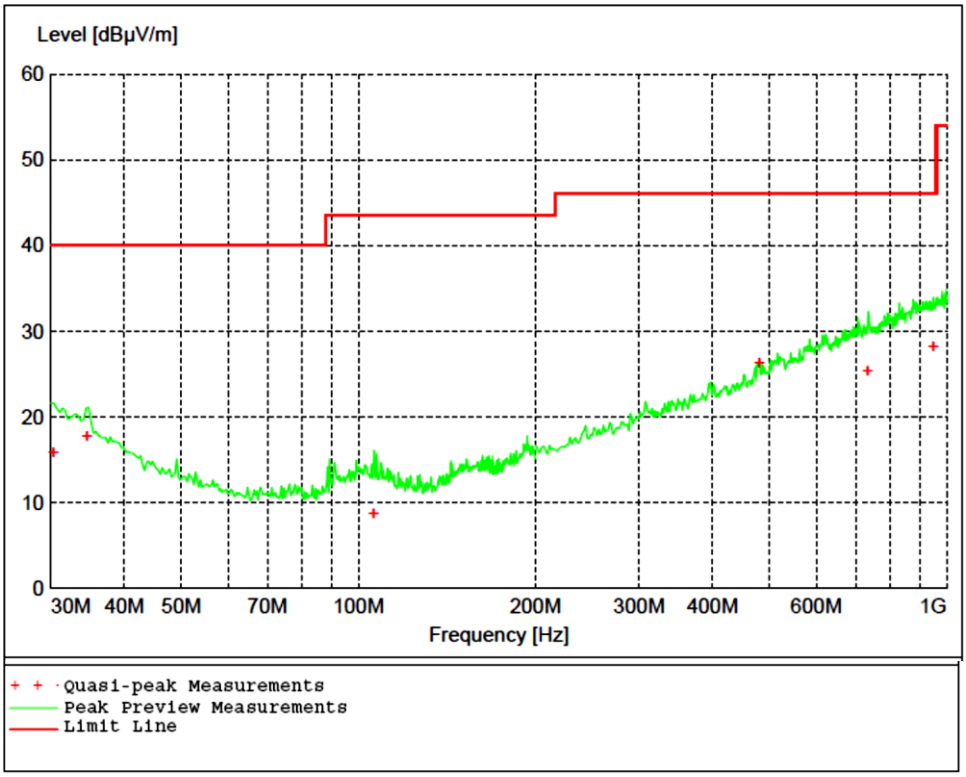

Figure 4 - Radiated Emissions Plot, Channel 1
Vertical orientation was found to be the worse-case

Table 3 - Radiated Emissions Quasi-peak Measurements, Channel 1

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
30.300000	15.82	40.00	24.20	336	29	VERT
34.560000	17.76	40.00	22.20	155	263	VERT
106.080000	8.74	43.50	34.80	107	357	VERT
480.840000	26.27	46.00	19.70	354	360	HORI
734.640000	25.32	46.00	20.70	400	90	VERT
949.140000	28.24	46.00	17.80	100	106	VERT

Table 4 - Radiated Emissions Peak Measurements, Channel 1

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
2402.000000	88.22	93.98	5.76	177	359	VERT
4804.000000	43.39	54.00	10.60	140	163	VERT
7206.000000	43.91	54.00	10.10	99	152	VERT
9608.000000	46.62	54.00	7.40	366	116	HORI
12010.000000	43.23	54.00	10.80	101	181	HORI
14412.000000	51.87	54.00	2.10	390	360	VERT
16814.000000	50.75	54.00	3.20	284	0	HORI

Peak measurements were compared to average limit and found to be compliant so average measurements were not performed

All other emissions were at least 10dB below the limit

EUT	Wireless Intercom Control (WIC)	MODE	Mid Channel
INPUT POWER	3 VDC	FREQUENCY RANGE	30MHz – 26GHz
ENVIRONMENTAL CONDITIONS	30 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

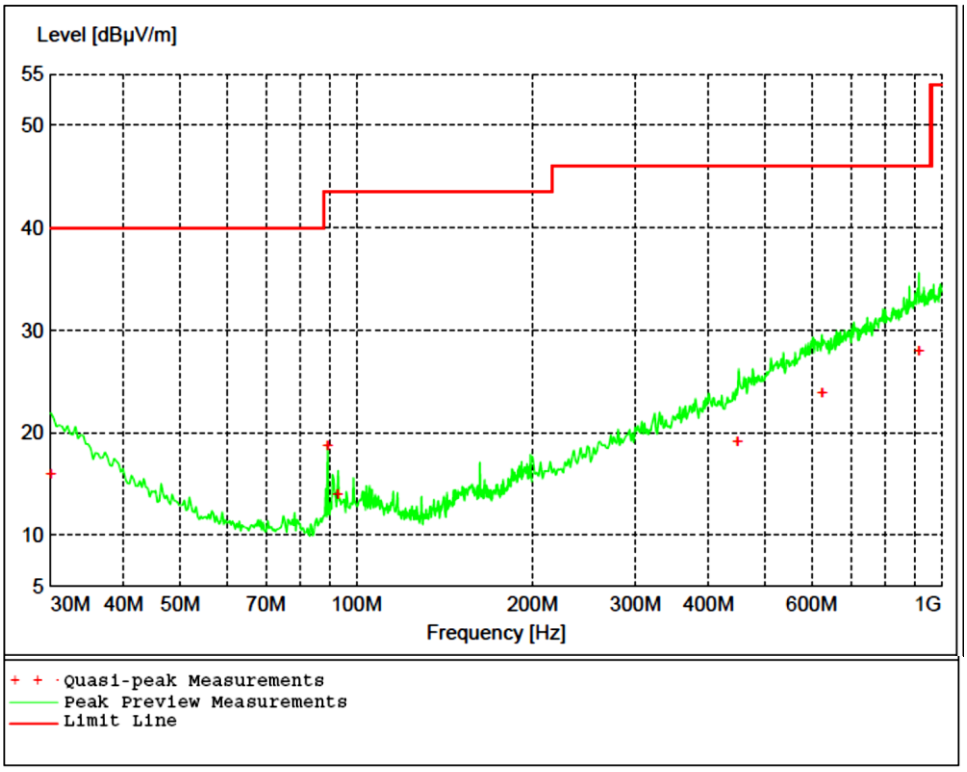

Figure 5 - Radiated Emissions Plot, Channel 2

Vertical orientation was found to be the worse-case

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

Table 5 - Radiated Emissions Quasi-peak Measurements, Channel 2

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
30.060000	15.99	40.00	24.00	182	106	VERT
89.340000	18.68	43.50	24.80	156	50	VERT
92.940000	13.93	43.50	29.60	153	94	VERT
448.500000	19.18	46.00	26.80	117	325	HORI
625.680000	23.92	46.00	22.10	387	309	VERT
915.600000	27.96	46.00	18.00	132	182	HORI

Table 6 - Radiated Emissions Peak Measurements, Channel 2

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
2435.000000	88.99	93.98	4.99	150	63	VERT
4870.000000	48.11	54.00	5.90	197	275	VERT
7305.000000	48.60	54.00	5.40	100	255	VERT
9740.000000	48.12	54.00	5.90	100	344	HORI
12175.600000	43.22	54.00	10.80	115	237	HORI
14610.200000	51.63	54.00	2.40	348	0	HORI
17045.400000	52.40	54.00	1.60	275	221	VERT

Peak measurements were compared to average limit and found to be compliant so average measurements were not performed

All other emissions were at least 10dB below the limit

EUT	Wireless Intercom Control (WIC)	MODE	High Channel
INPUT POWER	3 VDC	FREQUENCY RANGE	30MHz – 26GHz
ENVIRONMENTAL CONDITIONS	30 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

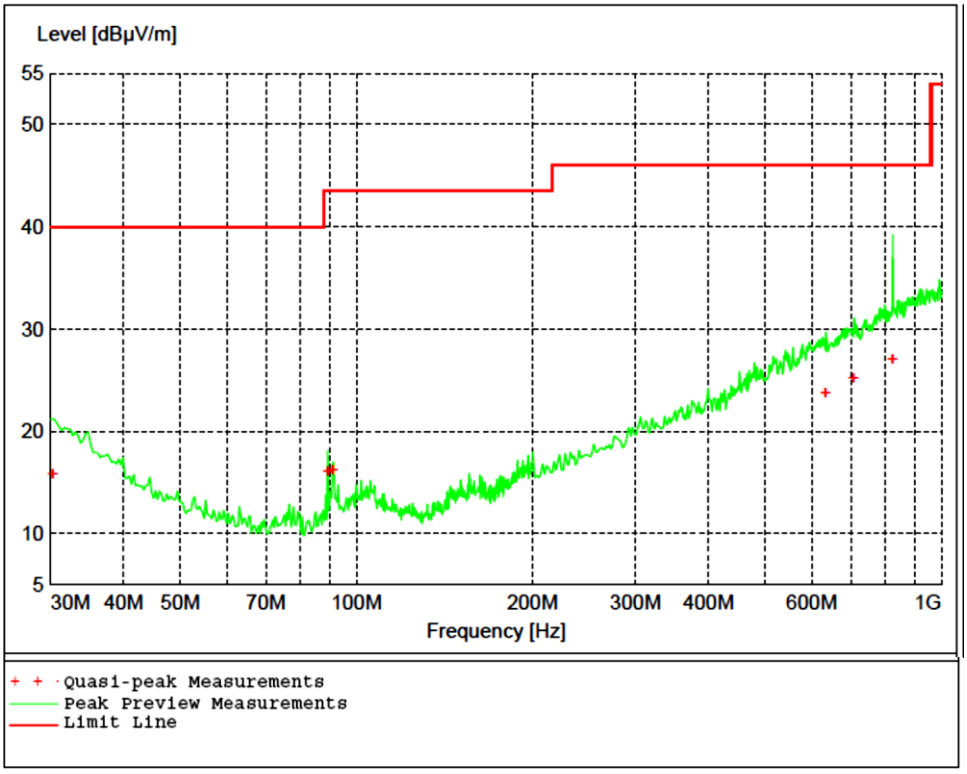

Figure 6 - Radiated Emissions Plot, Channel 3
Vertical orientation was found to be the worse-case

REMARKS:
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

Table 7 - Radiated Emissions Quasi-peak Measurements, Channel 3

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
30.240000	15.79	40.00	24.20	153	358	HORI
89.340000	16.02	43.50	27.50	160	258	VERT
91.080000	16.21	43.50	27.30	173	348	VERT
633.900000	23.71	46.00	22.30	165	0	VERT
706.740000	25.16	46.00	20.80	101	138	HORI
824.880000	27.04	46.00	19.00	99	325	VERT

Table 8 - Radiated Emissions Peak Measurements, Channel 3

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB	cm.	deg.	
2471.000000	89.88	93.98	4.1	154	247	VERT
4940.000000	46.17	54.00	7.80	99	307	VERT
7410.000000	44.03	54.00	10.00	342	0	HORI
9880.000000	46.42	54.00	7.60	308	172	HORI
12340.000000	43.97	54.00	10.00	99	360	VERT
14820.000000	50.61	54.00	3.40	219	7	HORI
17290.000000	52.98	54.00	1.00	100	33	HORI

Peak measurements were compared to average limit and found to be compliant so average measurements were not performed

REMARKS:
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

4.3 Occupied Bandwidth and EIRP

Test Method: ANSI C63.10, Section(s) 6.9

4.3.1 Limits of bandwidth measurements

The 99% occupied bandwidth and peak EIRP are displayed for informational purposes only. The peak EIRP was measured using a 10 MHz RBW, which was over-laid on the plot showing the bandwidth using a 100 kHz RBW.

4.3.2 Test procedures

All measurements were taken at a distance of 3m from the EUT. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 kHz RBW and 300 kHz VBW.

The 99% occupied is defined as the bandwidth at which 99% of the signal power is found. This corresponds to 20dB down from the maximum power level. The maximum power was measured with the largest resolution bandwidth possible (10MHz) and this value was recorded. The signal was then captured with a 100 kHz resolution bandwidth and the frequencies where the measurements were 20dB below the maximum power were marked. The bandwidth between these frequencies was recorded as the 99% occupied bandwidth.

4.3.3 Deviations from test standard

No deviation.

4.3.4 Test setup

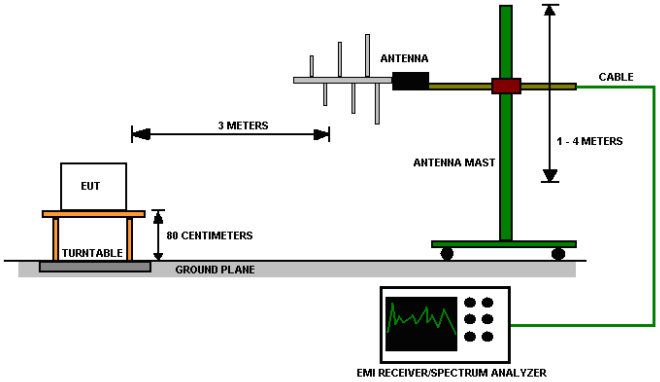

Figure 7 - Bandwidth Measurements Test Setup

4.3.5 EUT operating conditions

The EUT was powered by 3 VDC unless specified and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

4.3.6 Test results

EUT	Wireless Intercom Control (WIC)	MODE	Transmit
INPUT POWER	3 VDC	FREQUENCY RANGE	2400.0MHz - 2483.5MHz
ENVIRONMENTAL CONDITIONS	30 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

99% Occupied Bandwidth

CHANNEL	CHANNEL FREQUENCY (MHz)	99% Occupied BW (MHz)
1	2402	1.71
2	2435	1.77
3	2471	1.91

REMARKS:
None

Peak EIRP
(For informational purposes only)

CHANNEL	CHANNEL FREQUENCY (MHz)	EIRP PEAK POWER OUTPUT (dBm)	RESULT
1	2402	-3.91	PASS
2	2435	-4.16	PASS
3	2471	-3.65	PASS

All measurements were taken from the 99% occupied bandwidth screen captures. Peak EIRP values were measured with a 10MHz RBW, and 10MHz VBW with a peak detector and max hold mode.

REMARKS:
None

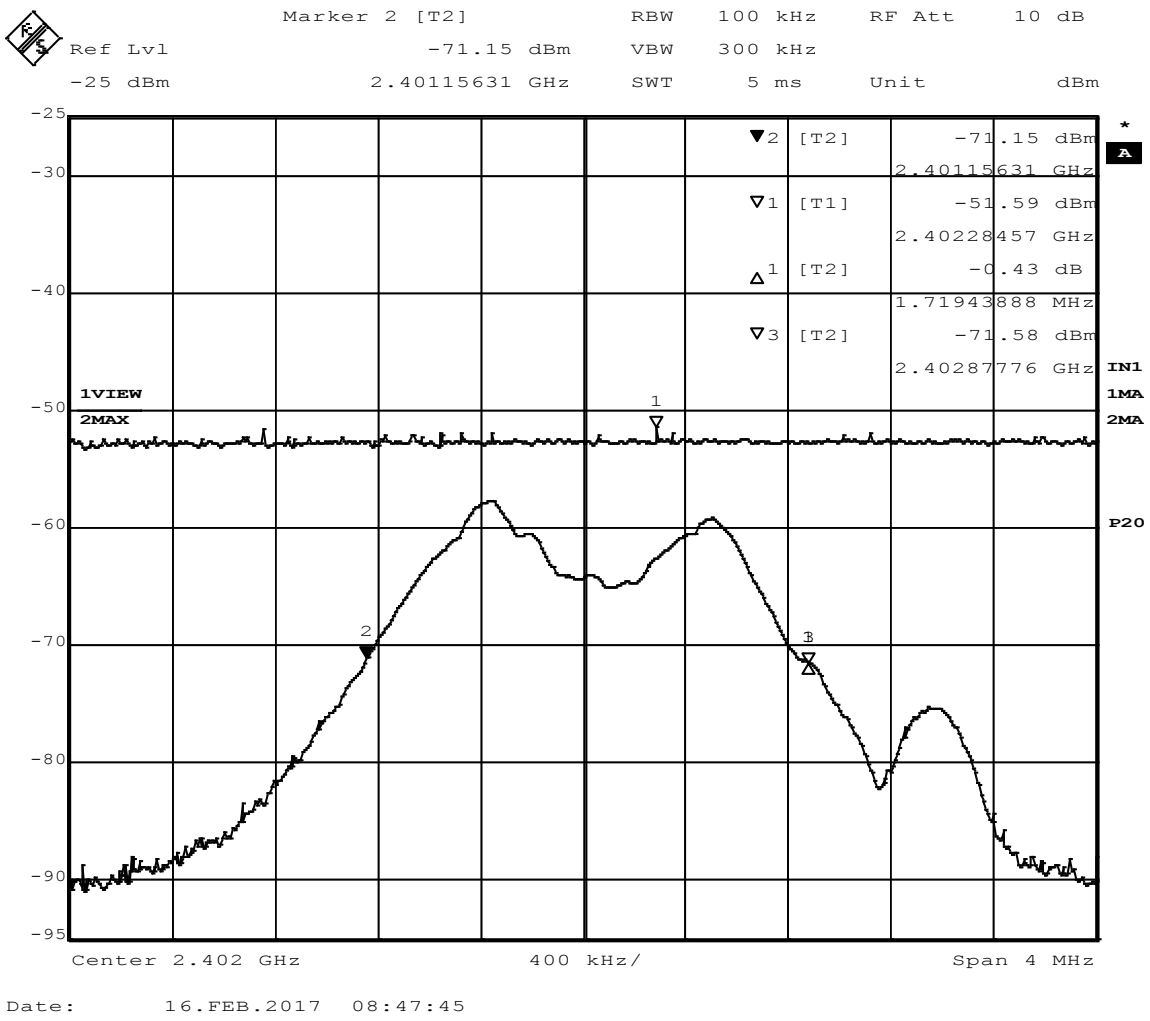

Figure 8 - 99% Occupied Bandwidth, Low Channel. 1.71 MHz

Maximum power = -51.59 dBm + 107 + CL + AF - 95.23 = -3.91 dBm

CF = cable loss = 7.20 dB
AF = antenna factor = 28.47 dB
107 = conversion from dBm to dBµV on a 50Ω measurement system
-95.23 = Conversion from field strength (dBµV/m) to EIRP (dBm) at a 3m measurement distance.

Note: the trace at the top where Marker 1 is located was made with a 10MHz resolution bandwidth and saved on the screen. This is used to measure the reference value.

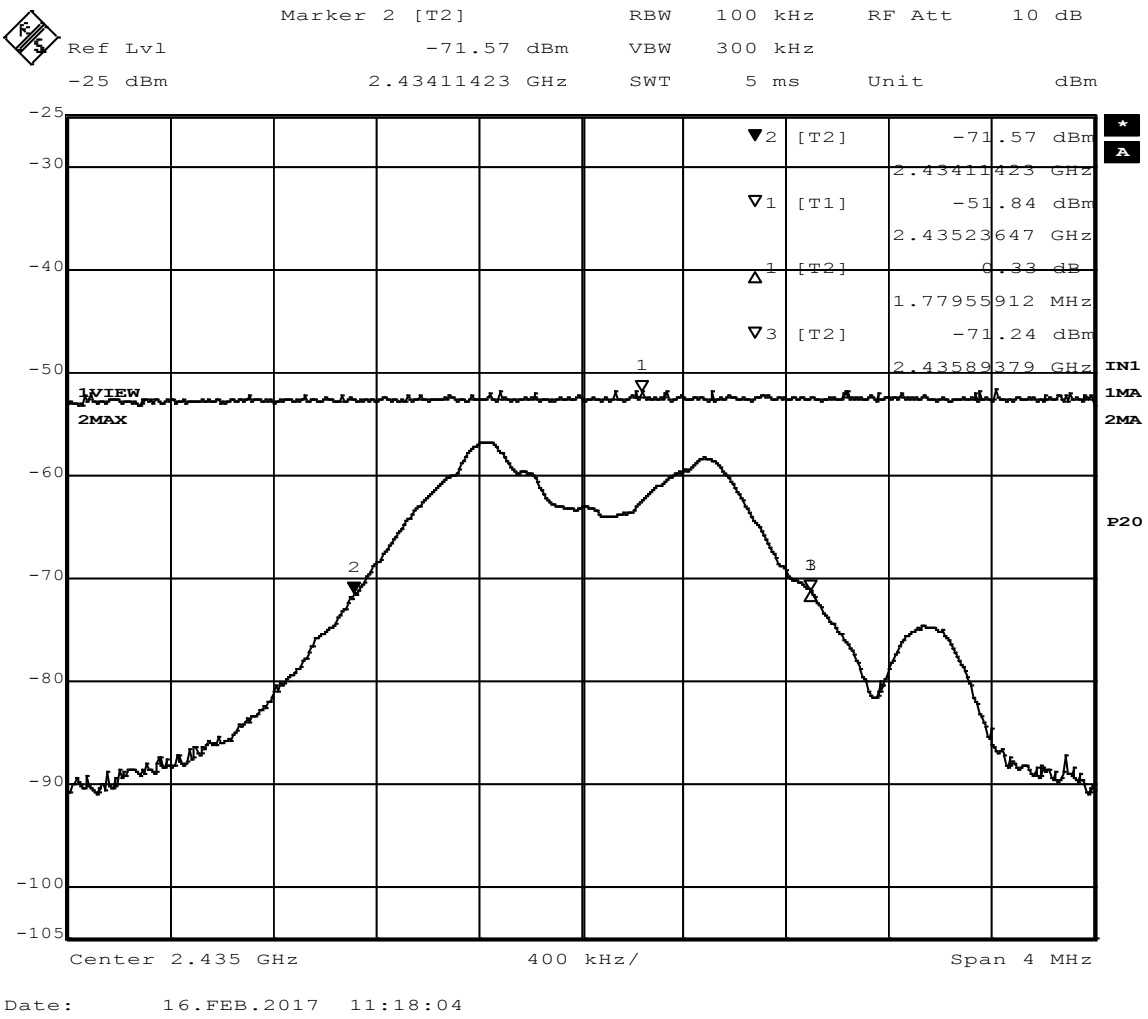

Figure 9 - 99% Occupied Bandwidth, Mid Channel, 1.77 MHz

Maximum power = -51.84 dBm + 107 + CL + AF - 95.23 = -4.16 dBm

CF = cable loss = 7.60 dB
AF = antenna factor = 28.31 dB
107 = conversion from dBm to dBµV on a 50Ω measurement system
-95.23 = Conversion from field strength (dBµV/m) to EIRP (dBm) at a 3m measurement distance.

Note: the trace at the top where Marker 1 is located was made with a 10MHz resolution bandwidth and saved on the screen.

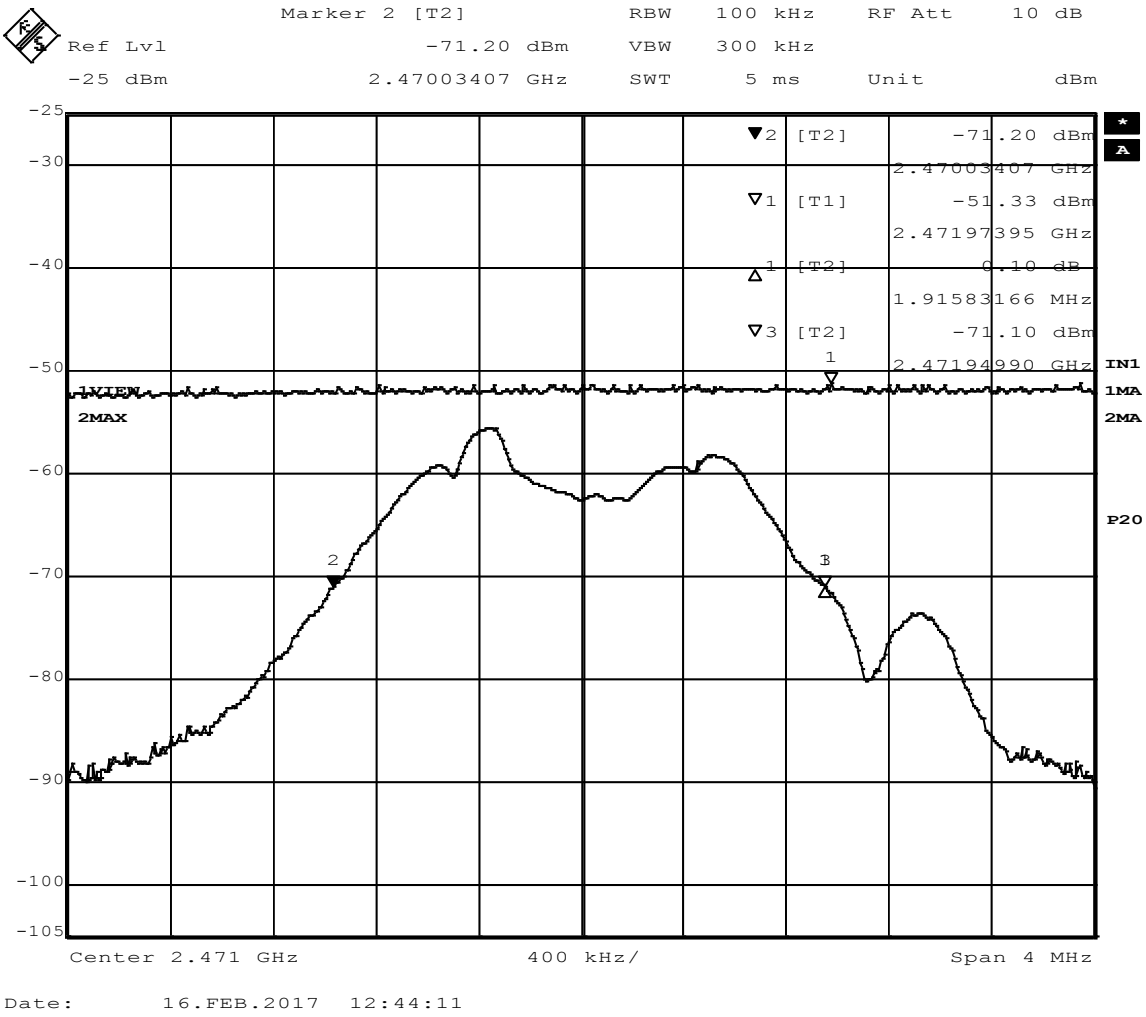

Figure 10 - 99% Occupied Bandwidth, High Channel, 1.91 MHz

Maximum power = -51.33 dBm + 107 + CL + AF - 95.23 = -3.65 dBm

CF = cable loss = 7.60 dB
AF = antenna factor = 28.31 dB
107 = conversion from dBm to dBµV on a 50Ω measurement system
-95.23 = Conversion from field strength (dBµV/m) to EIRP (dBm) at a 3m measurement distance.

Note: the trace at the top where Marker 1 is located was made with a 10MHz resolution bandwidth and saved on the screen.

4.4 Bandedges

Test Method: ANSI C63.10, Section(s) 6.10.5.2

4.4.1 Limits of bandedge measurements

For emissions outside of the allowed band of operation (2400.0MHz – 2483.5MHz), the emission level needs to be 20dB under the maximum fundamental field strength. However, if the emissions fall within one of the restricted bands from 15.205 the field strength levels need to be under that of the limits in 15.209.

4.4.2 Test procedures

The EUT was tested in the same method as described in section *4.3 - Bandwidth*. The EUT was oriented as to produce the maximum emission levels. The resolution bandwidth was set to 30kHz and the EMI receiver was used to scan from the bandedge to the fundamental frequency with a quasi-peak detector. The highest emissions level beyond the bandedge was measured and recorded. All band edge measurements were evaluated to the general limits in Part 15.209.

4.4.3 Deviations from test standard

No deviation.

4.4.4 Test setup

See Section 4.3

4.4.5 EUT operating conditions

The EUT was powered by 3 VDC unless specified and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

4.4.6 Test results

EUT	Wireless Intercom Control (WIC)	MODE	Transmit
INPUT POWER	3 VDC	FREQUENCY RANGE	2400.0MHz - 2483.5MHz
ENVIRONMENTAL CONDITIONS	30 % ± 5% RH 23 ± 3ºC	TECHNICIAN	KVepuri

Highest Band-edge Emissions in Restricted Bands

CHANNEL	Band edge /Measurement Frequency (MHz)	Relative Highest out of band level dBm	Relative Fundamental Level (dBm)	Delta	Min (dBc)	Result
1	2390.0	-98.23	-63.23	35.00	34.22	PASS
3	2483.5	-105.18	-62.21	42.97	35.88	PASS

*Minimum delta = [highest fundamental peak field strength from Section 4.2] – [Part 15.209 radiated emissions limit.]

From Section 4.2

Fundamental average field strength at 2405MHz for low channel= 76.51dBµV/m
Fundamental average field strength at 2480MHz for high channel= 77.34dBµV/m

Channel 1 minimum delta = 88.22 – 54.0 dBµV/m = 34.22 dBc
Channel 3 minimum delta = 89.88 – 54.0 dBµV/m = 35.88 dBc

Measurements do not include correction factors and are intended to be relative measurements only.

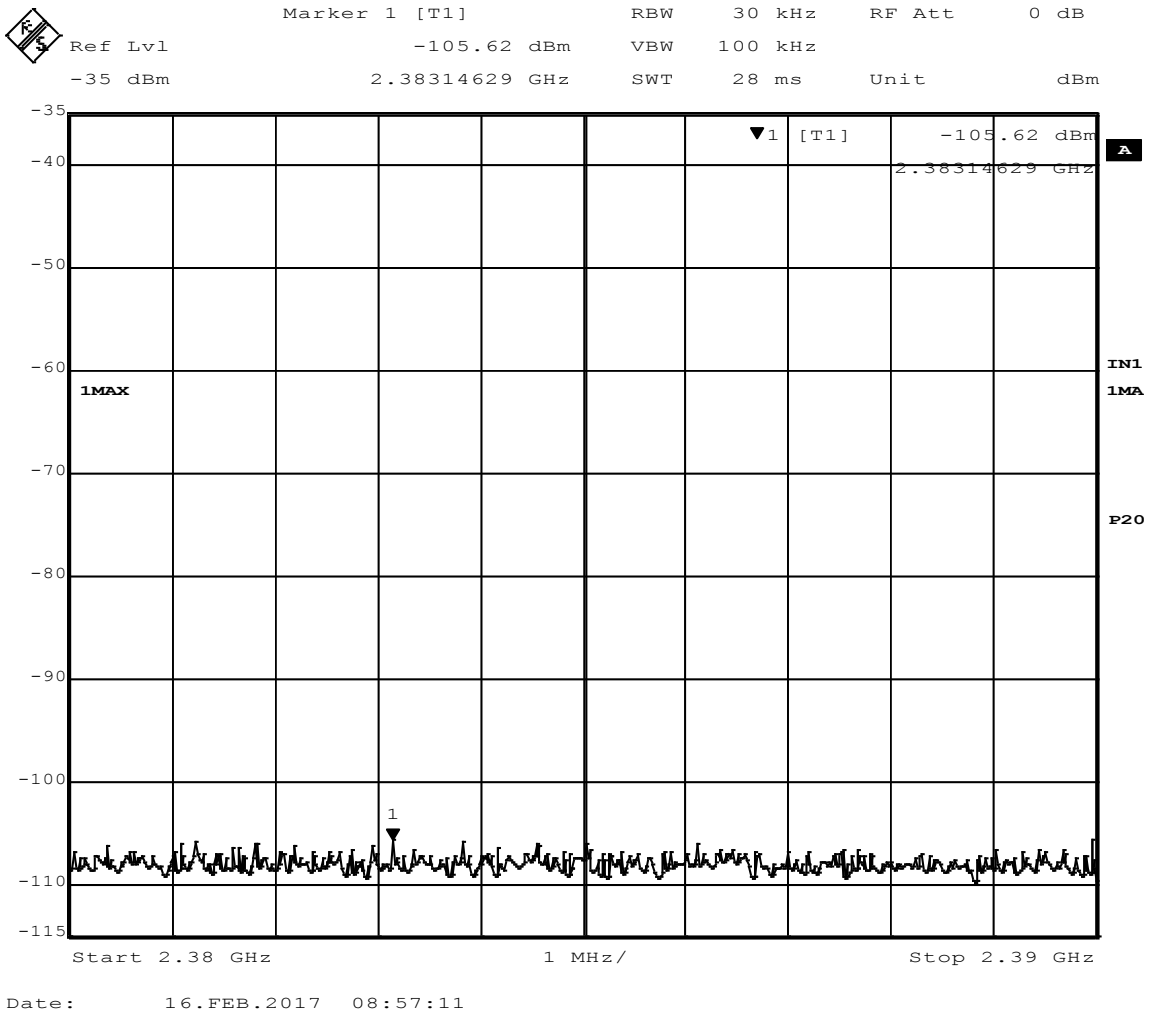

Figure 11 - Band-edge Measurement, Low Channel, Restricted Frequency

The plot shows an uncorrected measurement, used for relative measurements only.

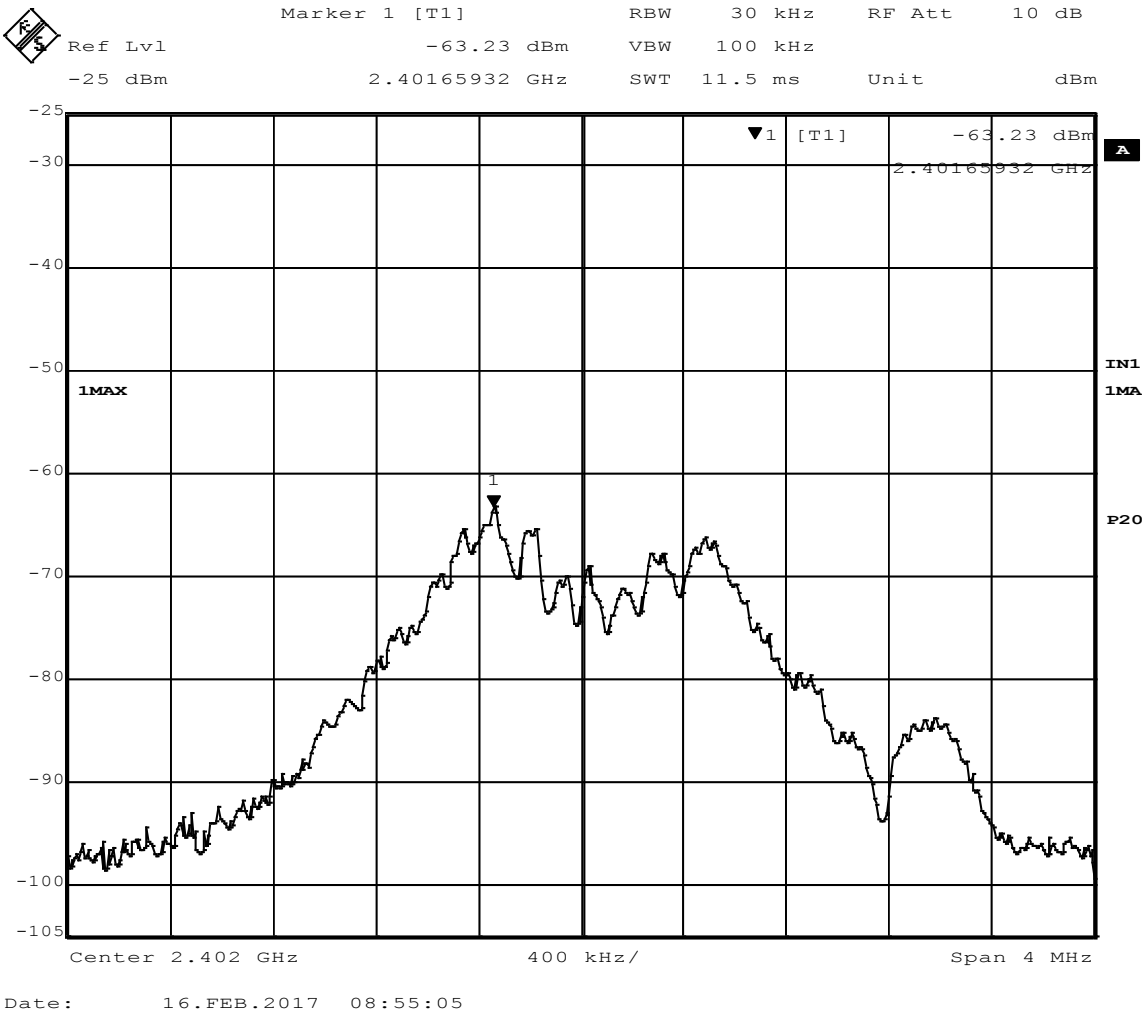

Figure 12 - Band-edge Measurement, Low Channel, Fundamental

The plot shows an uncorrected measurement, used for relative measurements only.

Show

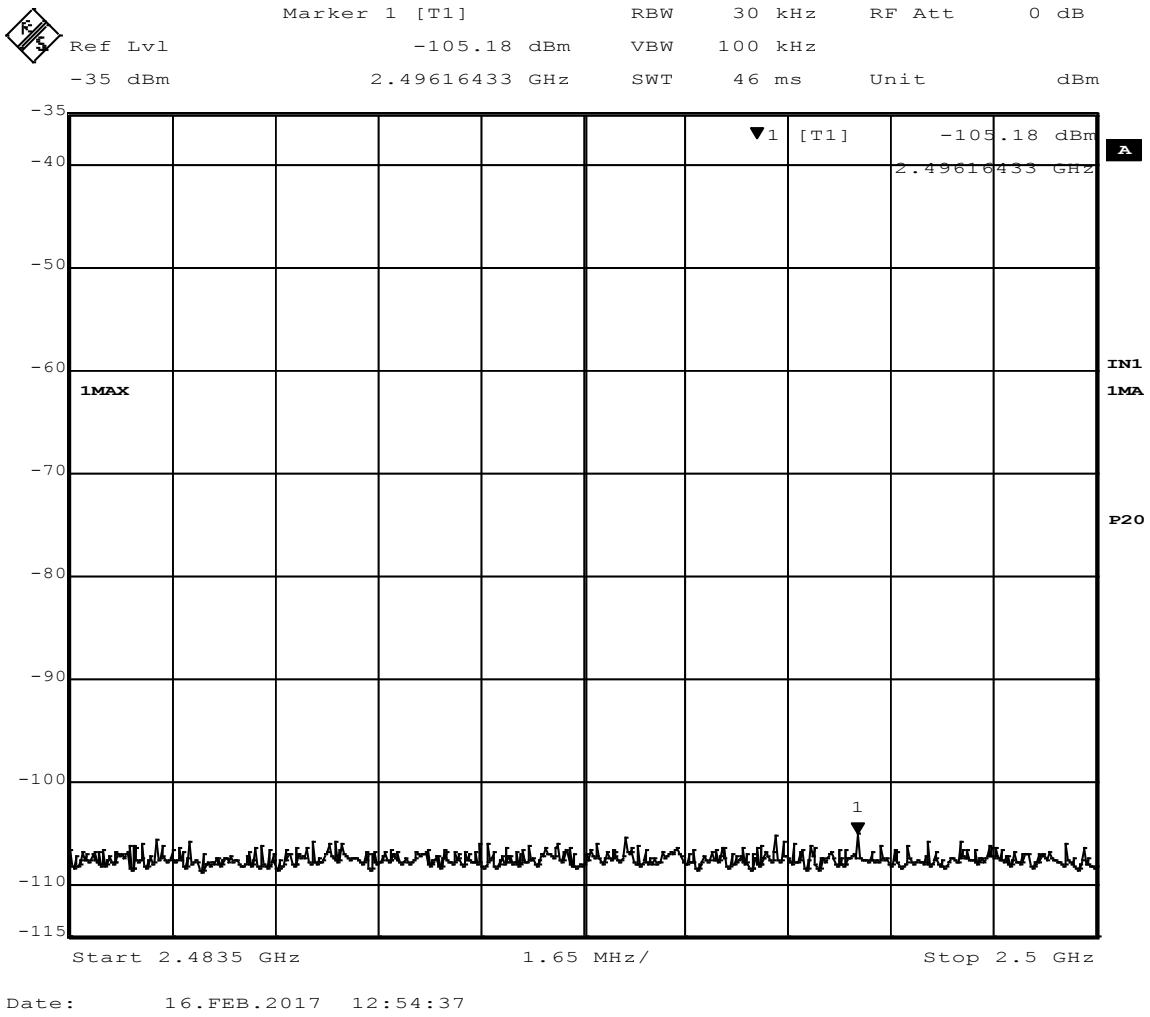

Figure 13 - Band-edge Measurement, High Channel, Restricted Frequency

The plot shows an uncorrected measurement, used for relative measurements only.

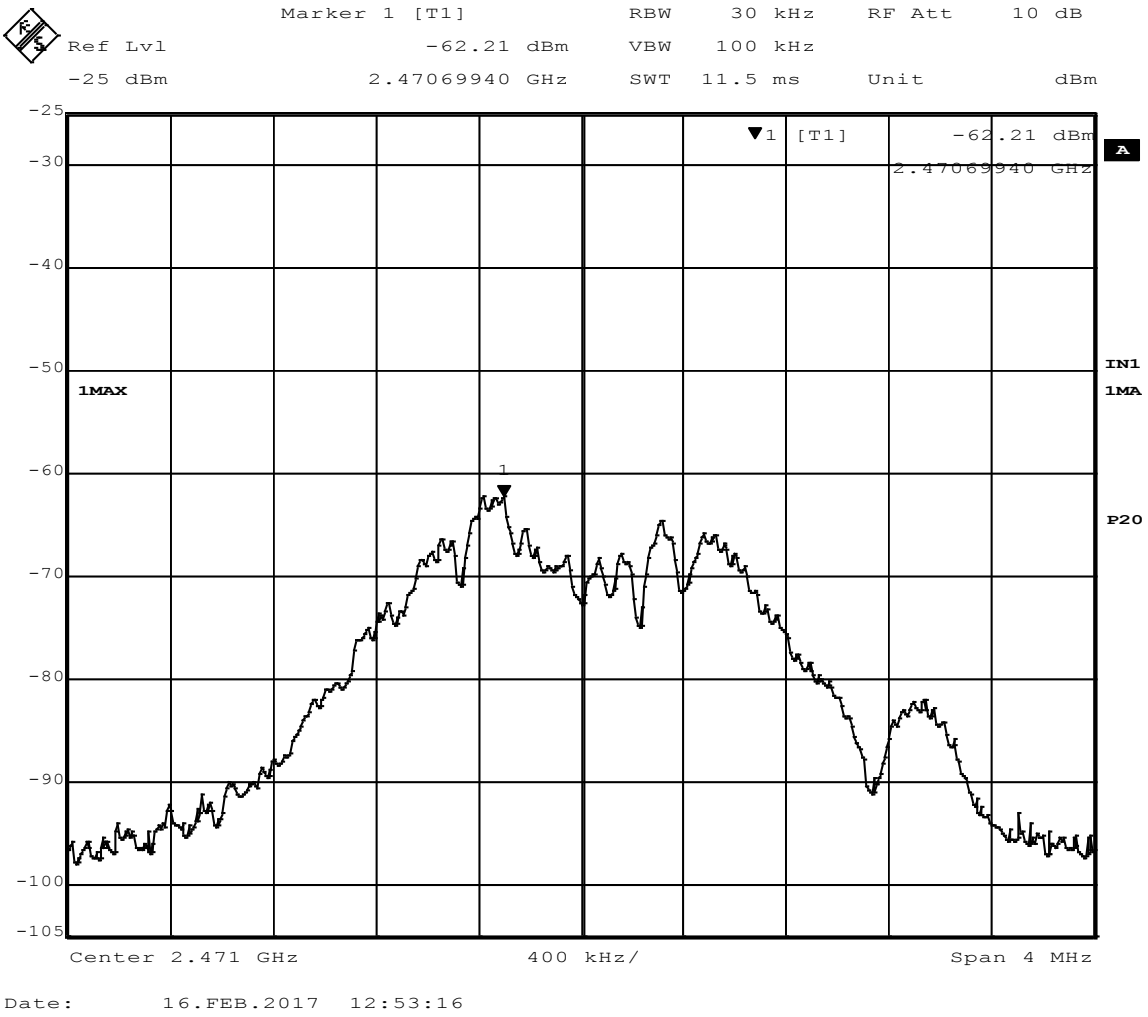

Figure 14 - Band-edge Measurement, High Channel, Fundamental

The plot shows an uncorrected measurement, used for relative measurements only.

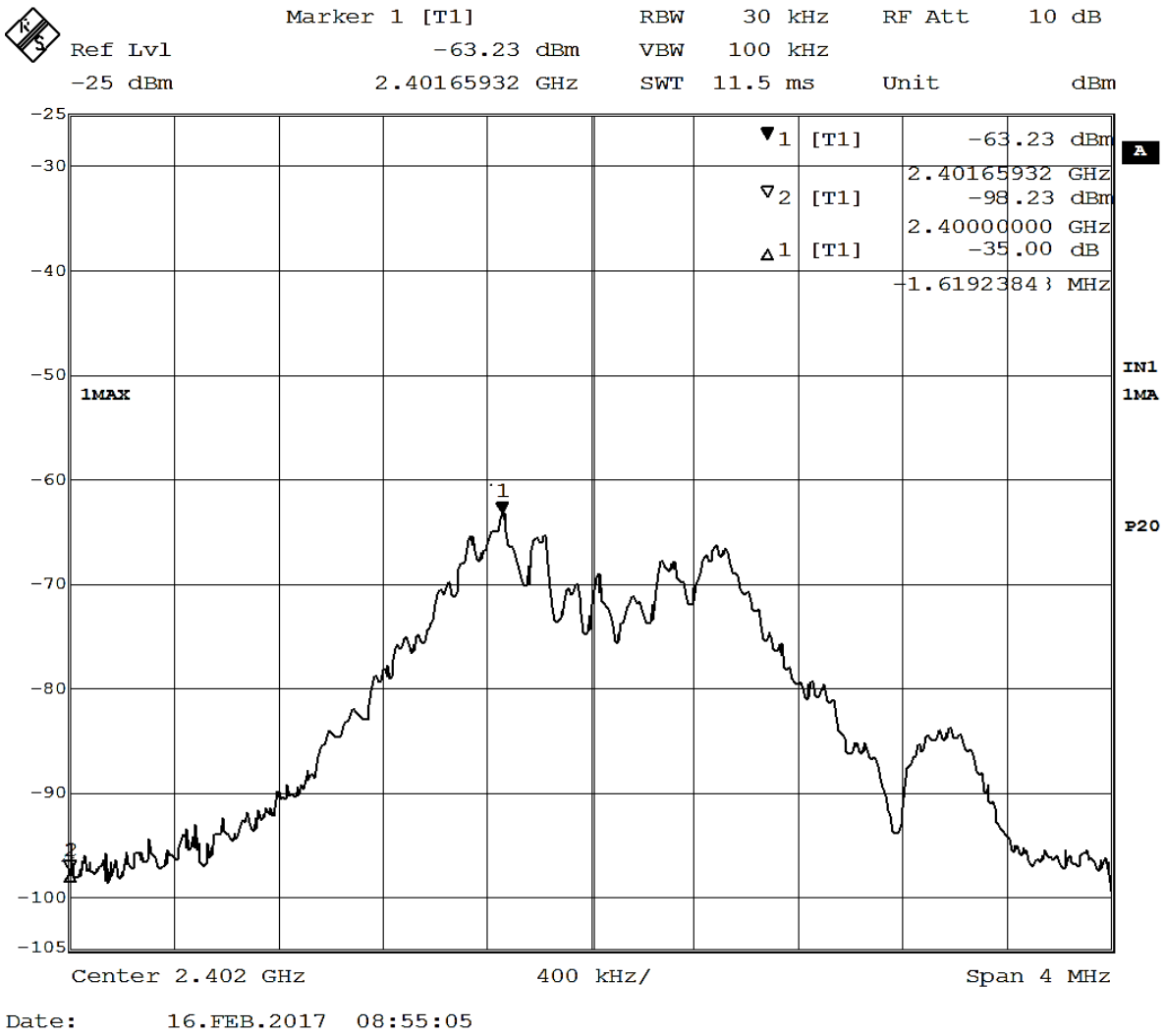

Figure 15 - Band-edge Measurement, Low Channel, unrestricted band

Delta = 33.40 dB; Minimum = 20 dB

Annex A – Measurement Uncertainty

Where relevant, the following measurement uncertainty levels apply to tests performed in this test report:

Test	Frequency Range	NCEE Labs Uncertainty Value (dB)	Maximum Uncertainty Values per CISPR 16-4-2:2011
AC Line Conducted Emissions	150kHz - 30MHz	3.30	3.40
Radiated Emissions, 10m	30MHz - 1GHz	3.82	5.30
Radiated Emissions, 3m	30MHz – 1GHz	4.25	5.30
Radiated Emissions, 3m	1GHz – 18GHz	5.08	5.20
Radiated Emissions, 3m	6GHz – 18GHz	5.08	5.50

Expanded uncertainty values are calculated to a confidence level of 95%.

NCEE Labs meets the maximum uncertainty requirements per CISPR 16-4-2:2011, and therefore does not require a minimum passing margin to state that an EUT is less than the field strength limits of the applicable CISPR, IEC or EN limit per CISPR 16-4-2:2011, Section 4.1.

Annex B: Sample Calculation

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:
FS = RA + AF – (-CF + AG) + AV

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

AV = Averaging Factor (if applicable)

Assume a receiver reading of 55 dBμV is obtained. The Antenna Factor of 12 and a Cable Factor of 1.1 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.1 dBμV/m.

FS = 55 + 12 – (-1.1 + 20) + 0 = 48.1 dBμV/m

The 48.1 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

Level in μV/m = Common Antilogarithm [(48.1 dBμV/m)/20]= 254.1 μV/m

AV is calculated by the taking the 20*log(T_{on}/100) where T_{on} is the maximum transmission time in any 100ms window.

EIRP Calculations

In cases where direct antenna port measurement is not possible or would be inaccurate, output power is measured in EIRP. The maximum field strength is measured at a specified distance and the EIRP is calculated using the following equation;

EIRP (Watts) = [Field Stregnth (V/m) x antenna distance (m)]^2 / [30 x Gain (numeric)]

Power (watts) = 10^[Power (dBm)/10] x 1000

Field Strength (dBµV/m) = Field Stregth (dBm) = 107 (for 50Ω measurement systems)

Field Stregnth (V/m) = 10^[Field Stregnth (dBµV/m) / 20] / 10^6

Gain = 1 (numeric gain for isotropic radiator

REPORT END