EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 102743203BOX-001
Project Number: G102743203

Report Issue Date: 11/10/2016

Model(s) Tested: WHOOP Strap 2.0
Model(s) Partially Tested: None
Model(s) Not Tested but declared equivalent by the client: None

Standards: CFR47 FCC Part 15 Subpart C (15.247): 10/2016
RSS-247 Issue 1: 05/2015
CFR47 FCC Part 15 Subpart B: 10/2016
ICES 003: 01/2016 updated 06/2016

Tested by:
Intertek Testing Services NA, Inc.
70 Codman Hill Road
Boxborough, MA 01719
USA

Client:
Whoop
1325 Boylston Street Suite 401
Boston, MA 02215
USA

Report prepared by

Vathana Ven / Staff Engineer, EMC

Report reviewed by

Michael F. Murphy / Team Leader, EMC

Table of Contents

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
3	Client Information	
4	Description of Equipment Under Test and Variant Models	
5	System Setup and Method	
6	Output Power and Human RF Exposure (CFR47 FCC Part 15 Subpart C (15.247): 10/2016 RSS-247 Issue 1: 05/2015 RSS-102 Issue 5: 03/2015)	Pass
7	Occupied (99%) and 20 dB Bandwidth (CFR47 FCC Part 15 Subpart C (15.247): 10/2016 RSS-247 Issue 1: 05/2015)	Pass
8	Channel Separation (CFR47 FCC Part 15 Subpart C (15.247): 10/2016 RSS-247 Issue 1: 05/2015)	Pass
9	Number of Hopping Channels (CFR47 FCC Part 15 Subpart C (15.247): 10/2016 RSS-247 Issue 1: 05/2015)	Pass
10	Average Channel Occupancy Time (CFR47 FCC Part 15 Subpart C (15.247): 10/2016 RSS-247 Issue 1: 05/2015	Pass
11	Band Edge Compliance (CFR47 FCC Part 15 Subpart C (15.247): 10/2016 RSS-247 Issue 1: 05/2015)	Pass
12	Transmitter Spurious Emissions (CFR47 FCC Part 15 Subpart C (15.247): 10/2016 RSS-247 Issue 1: 05/2015)	Pass

13	Radiated Emissions from Digital parts and Receiver (CFR47 FCC Part 15 (15.109): 10/2016 ICES 003: 01/2016 and updated 06/2016)	Pass
14	AC Mains Conducted Emissions (FCC Part 15 Subpart B: 10/2016 ICES 003: 01/2016 and updated 06/2016)	Pass
15	Revision History	

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3 Client Information

This EUT was tested at the request of:

Client: Whoop
1325 Boylston Street Suite 401
Boston, MA 02215
USA

Contact: Michael Costa
Telephone: (617) 670-1074 x153
Fax: None
Email: costa@whoop.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: Whoop
1325 Boylston Street Suite 401
Boston, MA 02215
USA

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Wrist worn strap	Whoop	WhoopStrap 2.0	20D125 6

Receive Date:	10/11/2016	Test start Date:	10/12/2016
Received Condition:	Good	Test end Date:	11/10/2016
Type:	Production		

Description of Equipment Under Test (provided by client)
Wrist worn strap that measures strain and recovery

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
120VAC	2.1A	50/60Hz	1

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Transmit mode with Frequency hopping enabled.
2	Transmit mode with Frequency hopping disabled. Transmitting in single channel.
3	Receive mode

Software used by the EUT:

No.	Descriptions of EUT Exercising
1	None

Radio/Receiver Characteristics	
Frequency Band(s)	2402 – 2480 MHz
Modulation Type(s)	GFSK, pi/4-DQPSK, 8DPSK
Maximum Output Power	0.000284 W
Test Channels	CH0 – 2400 MHz, CH 39 – 2441 MHz, CH 78 – 2480 MHz
Occupied Bandwidth	See section 7.3
Frequency Hopper: Number of Hopping Channels	79
Frequency Hopper: Channel Occupancy Time	See section 10.3
MIMO Information (# of Transmit and Receive antenna ports)	1 – Integral antenna
Equipment Type	Bluetooth
ETSI LBT/Adaptivity	N/A
ETSI Adaptivity Type	N/A
ETSI Temperature Category (I, II, III)	N/A
ETSI Receiver Category (1, 2, 3)	N/A
Antenna Type and Gain	Integral – 0.5 dBi

Variant Models:

The following variant models were not tested as part of this evaluation, but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

None

5 System Setup and Method

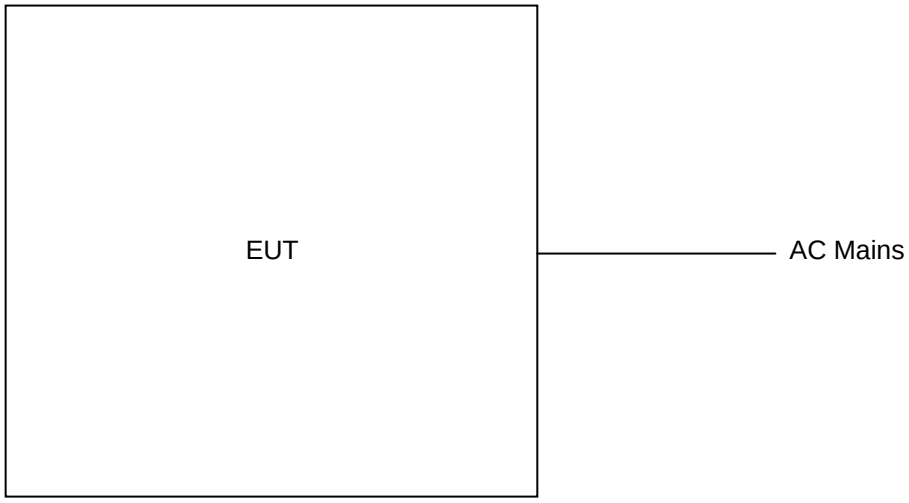
Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
1	USB cable	1	None	None	AC mains

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop	HP	T60M283.00	N/L

5.1 Method:

Configuration as required by FCC CFR47 Part 15 Subpart C (15.247): 10/2016, RSS-247 Issue 1: 05/2015 FCC CDR47 Part 15 Subpart B: 10/2016. ICES 003: 01/2016 updated 06/2016 and ANSI C63.10: 2013.

5.2 EUT Block Diagram:



6 Output Power and Human RF Exposure

6.1 Method

Tests are performed in accordance with CFR47 FCC Part 15 Subpart C (15.247), RSS-247 Issue 1 May 2016 and ANSI C 63.10.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	4.6 Db	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	5.3 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.5 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	5.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	5.0 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	5.0 dB	- dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample 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
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61 A	05/02/2016	05/02/2017
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/10/2016	03/10/2017
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	02/10/2016	02/10/2017
145014'	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	05/27/2016	05/27/2017
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	07/30/2016	07/30/2017

Software Utilized:

Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

Note: Your Laptop may use a different version of Excel. Record the version you actually used!

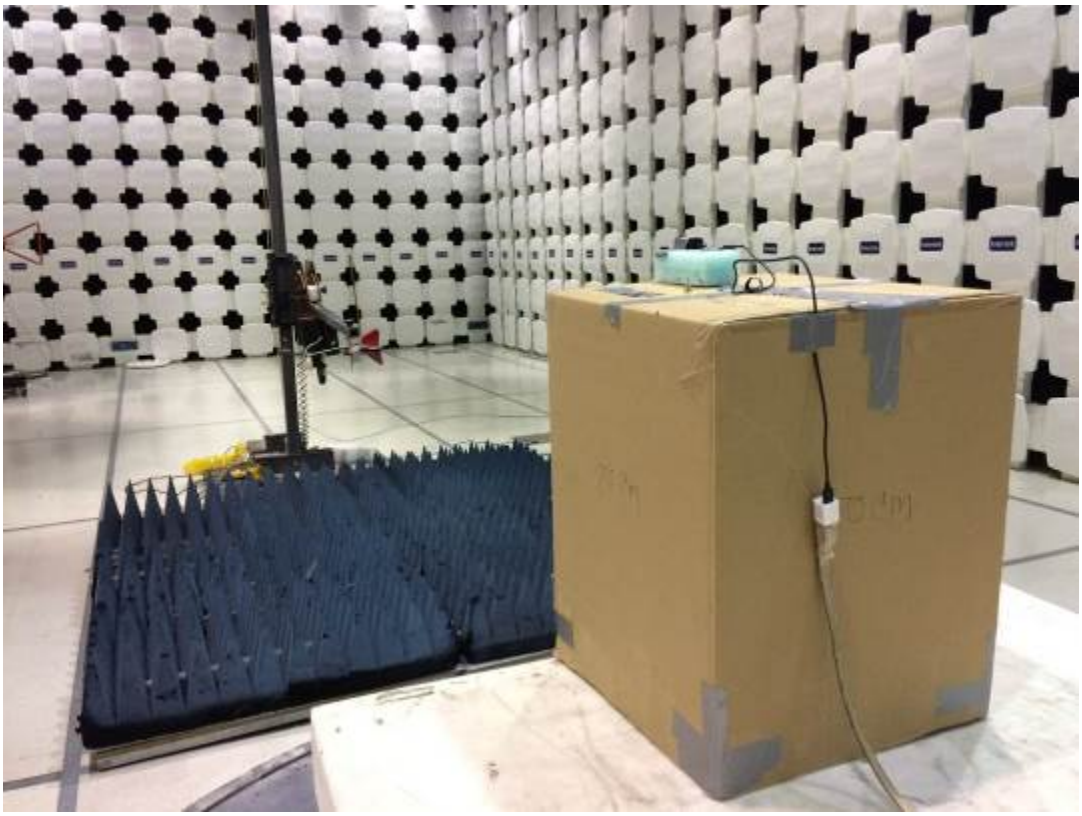
6.3 Results:

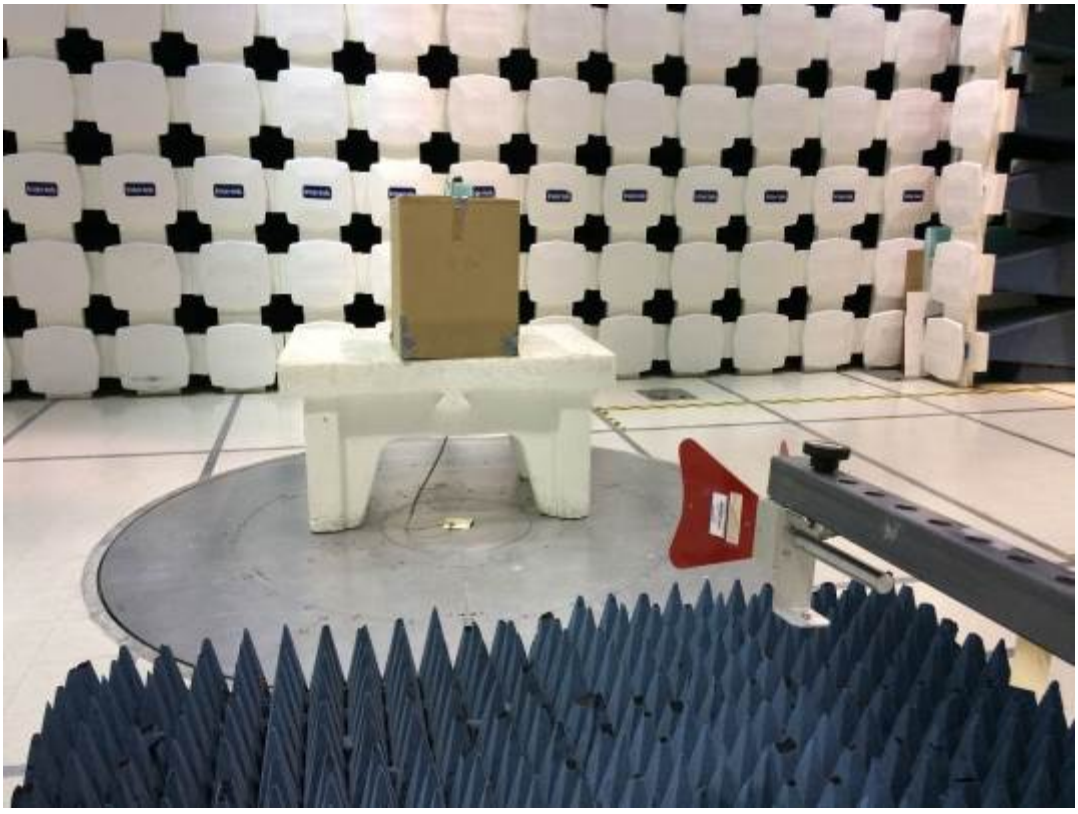
The sample tested was found to Comply. The EIRP must not exceed 30 dBm. The Human RF Exposure limit is 1 mW/cm^2.

AC and battery modes tested to determined worst-case output power. Final scans were performed on the modulation which produced worst-case output power. It was determined that the AC mode with GFSK modulation was the worst-case.

6.4 Setup Photographs:

AC mode

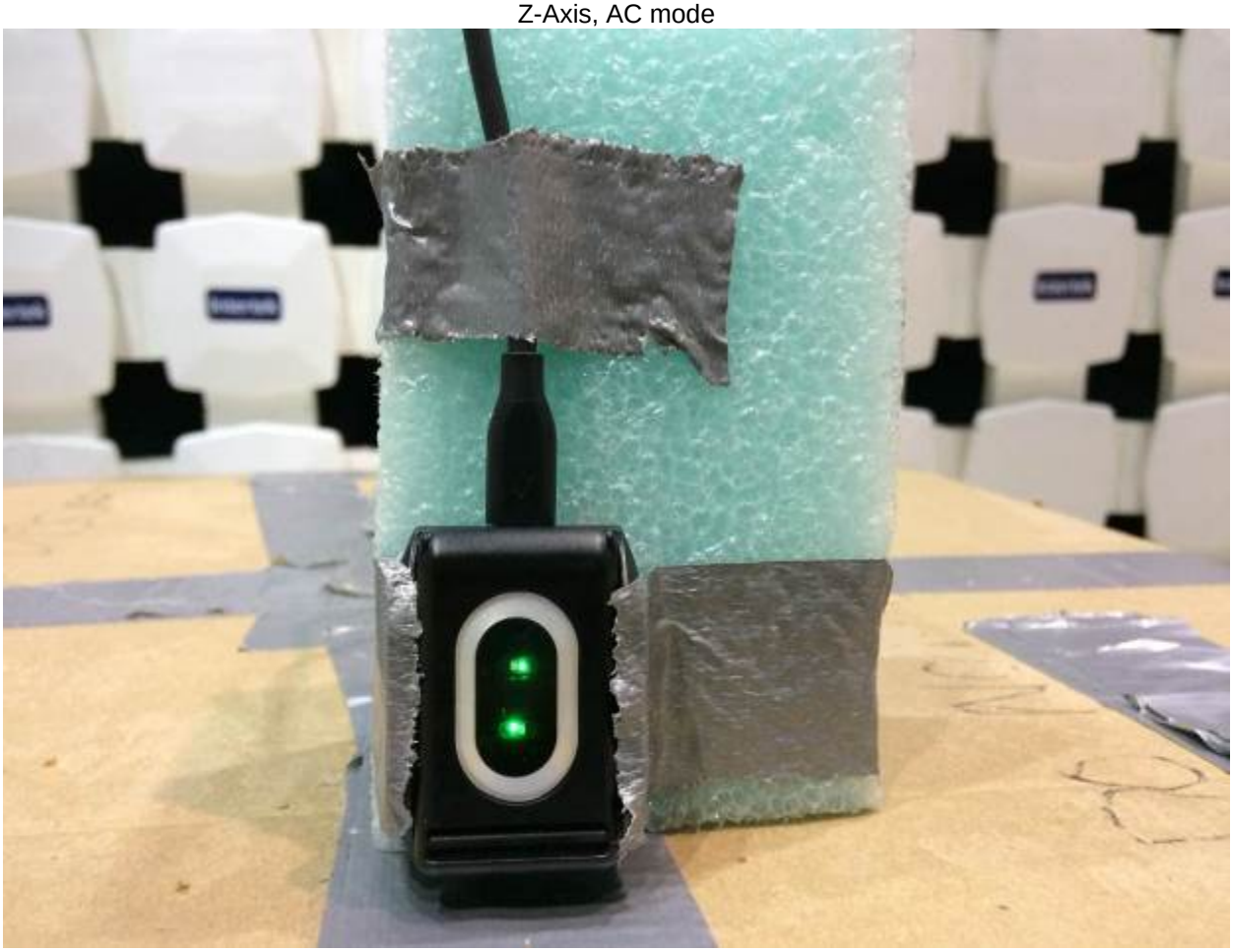




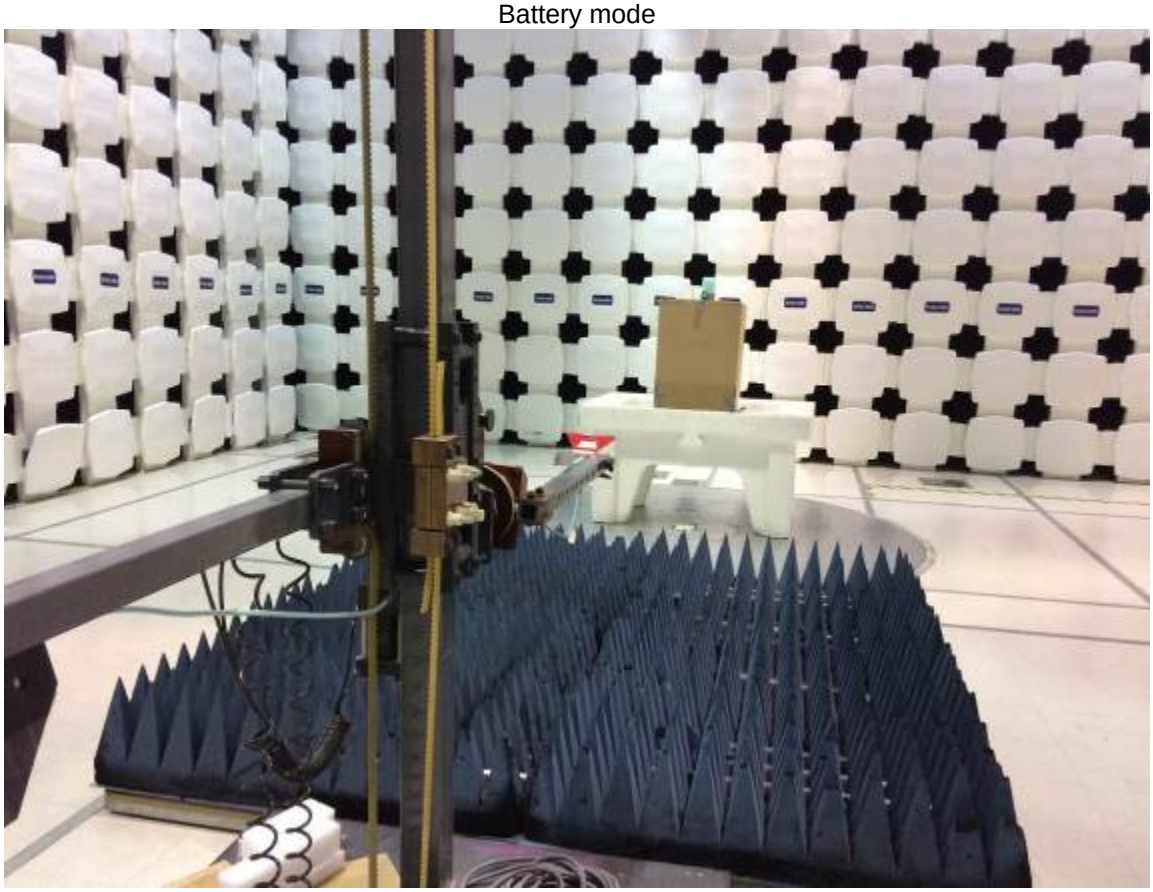
X-Axis, AC mode

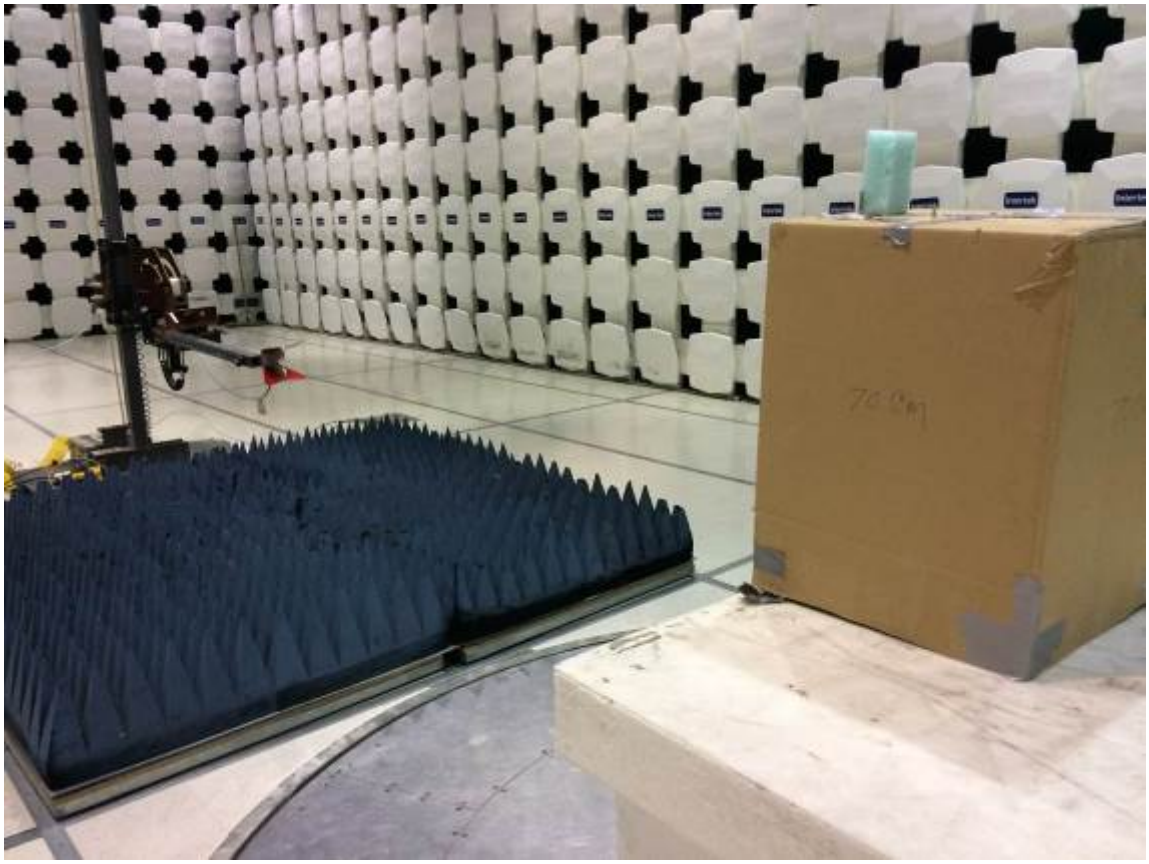
Y-Axis, AC mode

Z-Axis, AC mode



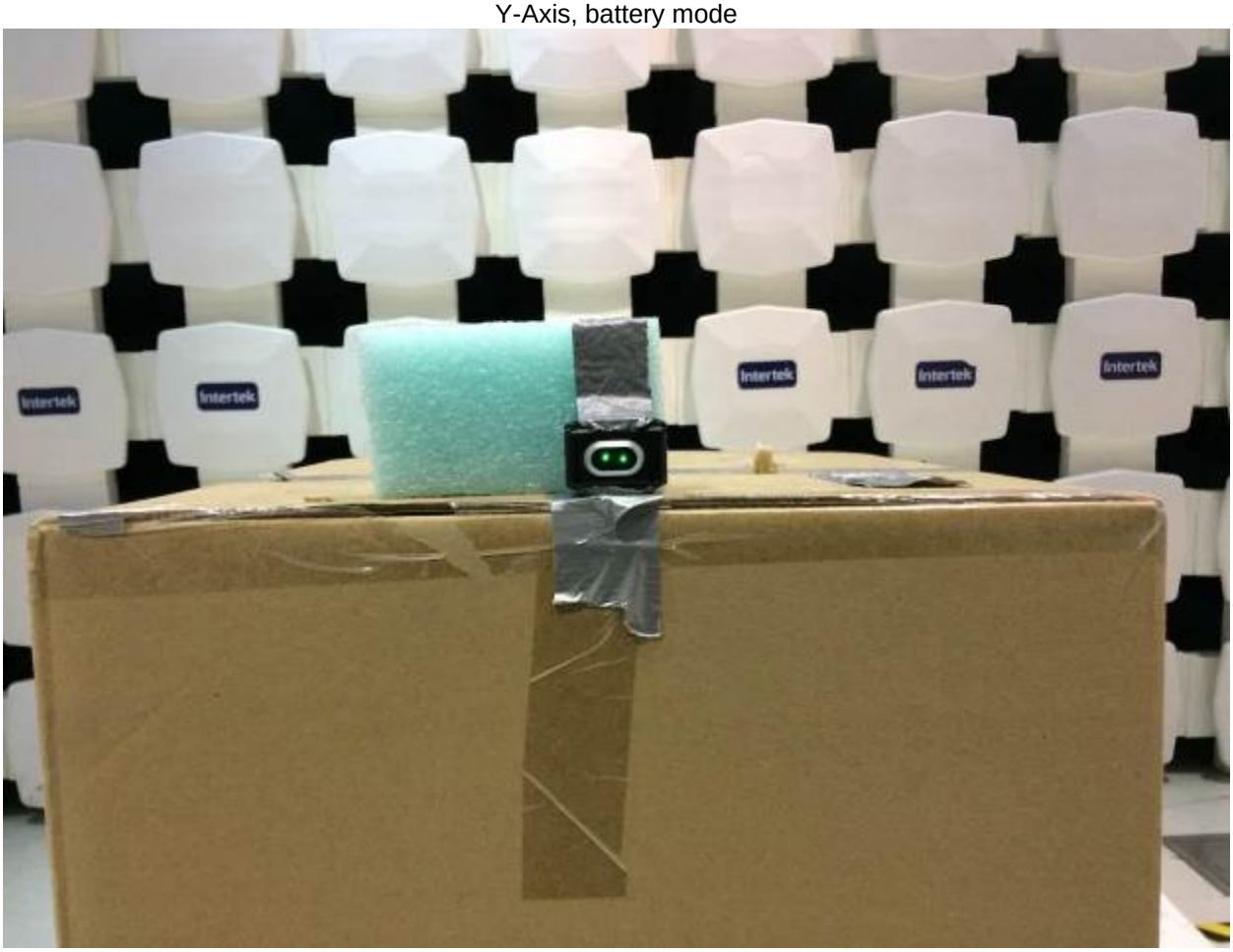
Battery mode





X-Axis, battery mode

Y-Axis, battery mode



Z-Axis, battery mode

6.5 Test Data:

Radiated Emissions

Company: Whoop
Model #: WhoopStrap 2.0
Serial #: 20D125 6
Engineers: Vathana Ven
Project #: G102743203
Standard: FCC Part 15 Subpart C 15.247
Receiver: R&S ESI (145-128) 03-10-2017
PreAmp: 145014 05-13-16.txt

Date(s): 10/20/16
Location: 10M
Limit Distance (m): 3
Test Distance (m): 3

Antenna & Cables: HF
Antenna: ETS001 02-10-17.txt
Cable(s): 145-416 1-18 GHz 10-08-17.txt
Barometer: DAV004
Temp/Humidity/Pressure: 22c

Bands: N, LF, HF, SHF
ETS001 02-10-17.txt
NONE.
Filter: NONE
42%
1010mB

PreAmp Used? (Y or N): N
Voltage/Frequency: 120VAC 60Hz
Frequency Range: Frequencies Shown

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	EIRP Net dBm	EIRP Limit dBm	Margin dB	Bandwidth	FCC	IC	Harmonic?
Note: RF Output Power, Channel 0, GFSK, X-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	49.35	32.29	3.67	0.00	0.00	-9.91	30.00	-39.91	5/10 MHz			
PK	H	2402.000	53.80	32.29	3.67	0.00	0.00	-5.46	30.00	-35.46	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	49.22	32.29	3.67	0.00	0.00	-10.04	30.00	-40.04	1/3 MHz			
PK	H	2402.000	50.30	32.29	3.67	0.00	0.00	-8.96	30.00	-38.96	1/3 MHz			
Note: RF Output Power, Channel 0, GFSK, Y-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	47.66	32.29	3.67	0.00	0.00	-11.60	30.00	-41.60	5/10 MHz			
PK	H	2402.000	53.50	32.29	3.67	0.00	0.00	-5.76	30.00	-35.76	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	47.50	32.29	3.67	0.00	0.00	-11.76	30.00	-41.76	1/3 MHz			
PK	H	2402.000	52.90	32.29	3.67	0.00	0.00	-6.36	30.00	-36.36	1/3 MHz			
Note: RF Output Power, Channel 0, GFSK, Z-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	50.00	32.29	3.67	0.00	0.00	-9.26	30.00	-39.26	5/10 MHz			
PK	H	2402.000	51.00	32.29	3.67	0.00	0.00	-8.26	30.00	-38.26	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	49.65	32.29	3.67	0.00	0.00	-9.61	30.00	-39.61	1/3 MHz			
PK	H	2402.000	50.90	32.29	3.67	0.00	0.00	-8.36	30.00	-38.36	1/3 MHz			
Note: RF Output Power, Channel 39, GFSK, X-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	46.05	32.26	3.73	0.00	0.00	-13.18	30.00	-43.18	5/10 MHz			
PK	H	2441.000	53.71	32.26	3.73	0.00	0.00	-5.52	30.00	-35.52	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	45.28	32.26	3.73	0.00	0.00	-13.95	30.00	-43.95	1/3 MHz			
PK	H	2441.000	53.45	32.26	3.73	0.00	0.00	-5.78	30.00	-35.78	1/3 MHz			
Note: RF Output Power, Channel 39, GFSK, Y-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	49.88	32.26	3.73	0.00	0.00	-9.35	30.00	-39.35	5/10 MHz			
PK	H	2441.000	52.11	32.26	3.73	0.00	0.00	-7.12	30.00	-37.12	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	49.01	32.26	3.73	0.00	0.00	-10.22	30.00	-40.22	1/3 MHz			
PK	H	2441.000	51.70	32.26	3.73	0.00	0.00	-7.53	30.00	-37.53	1/3 MHz			
Note: RF Output Power, Channel 39, GFSK, Z-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	48.14	32.26	3.73	0.00	0.00	-11.09	30.00	-41.09	5/10 MHz			
PK	H	2441.000	50.27	32.26	3.73	0.00	0.00	-8.96	30.00	-38.96	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	47.20	32.26	3.73	0.00	0.00	-12.03	30.00	-42.03	1/3 MHz			
PK	H	2441.000	49.46	32.26	3.73	0.00	0.00	-9.77	30.00	-39.77	1/3 MHz			
Note: RF Output Power, Channel 78, GFSK, X-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	50.14	32.23	3.78	0.00	0.00	-9.07	30.00	-39.07	5/10 MHz			
PK	H	2480.000	53.20	32.23	3.78	0.00	0.00	-6.01	30.00	-36.01	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	49.38	32.23	3.78	0.00	0.00	-9.83	30.00	-39.83	1/3 MHz			
PK	H	2480.000	52.80	32.23	3.78	0.00	0.00	-6.41	30.00	-36.41	1/3 MHz			
Note: RF Output Power, Channel 78, GFSK, Y-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	46.20	32.23	3.78	0.00	0.00	-13.01	30.00	-43.01	5/10 MHz			
PK	H	2480.000	49.46	32.23	3.78	0.00	0.00	-9.75	30.00	-39.75	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	45.16	32.23	3.78	0.00	0.00	-14.05	30.00	-44.05	1/3 MHz			
PK	H	2480.000	48.68	32.23	3.78	0.00	0.00	-10.53	30.00	-40.53	1/3 MHz			
Note: RF Output Power, Channel 78, GFSK, Z-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	50.87	32.23	3.78	0.00	0.00	-8.34	30.00	-38.34	5/10 MHz			
PK	H	2480.000	47.21	32.23	3.78	0.00	0.00	-12.00	30.00	-42.00	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	46.83	32.23	3.78	0.00	0.00	-12.38	30.00	-42.38	1/3 MHz			
PK	H	2480.000	44.85	32.23	3.78	0.00	0.00	-14.36	30.00	-44.36	1/3 MHz			

Radiated Emissions

Company: Whoop
Model #: WhoopStrap 2.0
Serial #: 20D125 6
Engineers: Vathana Ven Naga Suryadevara Location: 10M
Project #: G102743203 Date(s): 10/21/16
Standard: FCC Part 15 Subpart C 15.247
Receiver: R&S ESI (145-128) 03-10-2017 Limit Distance (m): 3
PreAmp: 145014 05-13-16.txt Test Distance (m): 3
PreAmp Used? (Y or N): N Voltage/Frequency: Battery power Frequency Range: Frequencies Shown
Antenna & Cables: HF Bands: N, LF, HF, SHF
Antenna: ETS001 02-10-17.txt ETS001 02-10-17.txt
Cable(s): 145-416 1-18 GHz 10-08-17.txt NONE.
Barometer: DAV004 Filter: NONE
Temp/Humidity/Pressure: 22, 21 C 40, 29% 1005, 1016 mB

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	EIRP Net dBm	EIRP Limit dBm	Margin dB	Bandwidth	FCC	IC	Harmonic?
Note: RF Output Power, Channel 0, GFSK, X-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	50.92	32.29	3.67	0.00	0.00	-8.34	30.00	-38.34	5/10 MHz			
PK	H	2402.000	51.98	32.29	3.67	0.00	0.00	-7.28	30.00	-37.28	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	50.33	32.29	3.67	0.00	0.00	-8.93	30.00	-38.93	1/3 MHz			
PK	H	2402.000	51.55	32.29	3.67	0.00	0.00	-7.71	30.00	-37.71	1/3 MHz			
Note: RF Output Power, Channel 0, GFSK, Y-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	48.65	32.29	3.67	0.00	0.00	-10.61	30.00	-40.61	5/10 MHz			
PK	H	2402.000	53.60	32.29	3.67	0.00	0.00	-5.66	30.00	-35.66	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	47.87	32.29	3.67	0.00	0.00	-11.39	30.00	-41.39	1/3 MHz			
PK	H	2402.000	53.22	32.29	3.67	0.00	0.00	-6.04	30.00	-36.04	1/3 MHz			
Note: RF Output Power, Channel 0, GFSK, Z-axis														
PK	V	2402.000	50.01	32.29	3.67	0.00	0.00	-9.25	30.00	-39.25	5/10 MHz			
PK	H	2402.000	46.31	32.29	3.67	0.00	0.00	-12.95	30.00	-42.95	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	48.92	32.29	3.67	0.00	0.00	-10.34	30.00	-40.34	1/3 MHz			
PK	H	2402.000	45.34	32.29	3.67	0.00	0.00	-13.92	30.00	-43.92	1/3 MHz			
Note: RF Output Power, Channel 39, GFSK, X-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	47.88	32.26	3.73	0.00	0.00	-11.35	30.00	-41.35	5/10 MHz			
PK	H	2441.000	50.14	32.26	3.73	0.00	0.00	-9.09	30.00	-39.09	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	47.10	32.26	3.73	0.00	0.00	-12.13	30.00	-42.13	1/3 MHz			
PK	H	2441.000	49.71	32.26	3.73	0.00	0.00	-9.52	30.00	-39.52	1/3 MHz			
Note: RF Output Power, Channel 39, GFSK, Y-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	46.57	32.26	3.73	0.00	0.00	-12.66	30.00	-42.66	5/10 MHz			
PK	H	2441.000	46.18	32.26	3.73	0.00	0.00	-13.05	30.00	-43.05	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	45.60	32.26	3.73	0.00	0.00	-13.63	30.00	-43.63	1/3 MHz			
PK	H	2441.000	45.62	32.26	3.73	0.00	0.00	-13.61	30.00	-43.61	1/3 MHz			
Note: RF Output Power, Channel 39, GFSK, Z-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	48.13	32.26	3.73	0.00	0.00	-11.10	30.00	-41.10	5/10 MHz			
PK	H	2441.000	45.30	32.26	3.73	0.00	0.00	-13.93	30.00	-43.93	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	42.99	32.26	3.73	0.00	0.00	-16.24	30.00	-46.24	1/3 MHz			
PK	H	2441.000	41.08	32.26	3.73	0.00	0.00	-18.15	30.00	-48.15	1/3 MHz			
Note: RF Output Power, Channel 78, GFSK, X-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	44.21	32.23	3.78	0.00	0.00	-15.00	30.00	-45.00	5/10 MHz			
PK	H	2480.000	49.60	32.23	3.78	0.00	0.00	-9.61	30.00	-39.61	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	42.85	32.23	3.78	0.00	0.00	-16.36	30.00	-46.36	1/3 MHz			
PK	H	2480.000	48.45	32.23	3.78	0.00	0.00	-10.76	30.00	-40.76	1/3 MHz			
Note: RF Output Power, Channel 78, GFSK, Y-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	47.35	32.23	3.78	0.00	0.00	-11.86	30.00	-41.86	5/10 MHz			
PK	H	2480.000	49.18	32.23	3.78	0.00	0.00	-10.03	30.00	-40.03	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	46.24	32.23	3.78	0.00	0.00	-12.97	30.00	-42.97	1/3 MHz			
PK	H	2480.000	48.13	32.23	3.78	0.00	0.00	-11.08	30.00	-41.08	1/3 MHz			
Note: RF Output Power, Channel 78, GFSK, Z-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	49.32	32.23	3.78	0.00	0.00	-9.89	30.00	-39.89	5/10 MHz			
PK	H	2480.000	44.35	32.23	3.78	0.00	0.00	-14.86	30.00	-44.86	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	48.45	32.23	3.78	0.00	0.00	-10.76	30.00	-40.76	1/3 MHz			
PK	H	2480.000	42.43	32.23	3.78	0.00	0.00	-16.78	30.00	-46.78	1/3 MHz			

Radiated Emissions

Company: Whoop
Model #: WhoopStrap 2.0
Serial #: 20D125 6
Engineers: Vathana Ven
Project #: G102743203
Standard: FCC Part 15 Subpart C 15.247
Receiver: R&S ESI (145-128) 03-10-2017
PreAmp: 145014 05-13-16.txt
Date(s): 10/20/16
Location: 10M
Limit Distance (m): 3
Test Distance (m): 3
Antenna & Cables: HF
Antenna: ETS001 02-10-17.txt
Cable(s): 145-416 1-18 GHz 10-08-17.txt
Barometer: DAV004
Temp/Humidity/Pressure: 22c 42% 1010mB
Bands: N, LF, HF, SHF
ETS001 02-10-17.txt
NONE.
Filter: NONE

PreAmp Used? (Y or N): N
Voltage/Frequency: 120VAC 60Hz
Frequency Range: Frequencies Shown

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	EIRP Net dBm	EIRP Limit dBm	Margin dB	Bandwidth	FCC	IC	Harmonic?
Note: RF Output Power, Channel 0, pi/4-DQPSK, X-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	46.67	32.29	3.67	0.00	0.00	-12.59	30.00	-42.59	5/10 MHz			
PK	H	2402.000	48.30	32.29	3.67	0.00	0.00	-10.96	30.00	-40.96	5/10 MHz			
Peak Power Spectral Density, normalized from 100kHz to 3 kHz using Bandwidth Correction Factor 10LOG(3/100 kHz)=-15.2 dB														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	46.50	32.29	3.67	0.00	0.00	-27.96	30.00	-57.96	1/3 MHz			
PK	H	2402.000	38.90	32.29	3.67	0.00	0.00	-35.56	30.00	-65.56	1/3 MHz			
Note: RF Output Power, Channel 0, pi/4-DQPSK, Y-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	44.30	32.29	3.67	0.00	0.00	-14.96	30.00	-44.96	5/10 MHz			
PK	H	2402.000	46.50	32.29	3.67	0.00	0.00	-12.76	30.00	-42.76	5/10 MHz			
Peak Power Spectral Density, normalized from 100kHz to 3 kHz using Bandwidth Correction Factor 10LOG(3/100 kHz)=-15.2 dB														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	44.10	32.29	3.67	0.00	0.00	-15.16	30.00	-45.16	1/3 MHz			
PK	H	2402.000	46.50	32.29	3.67	0.00	0.00	-12.76	30.00	-42.76	1/3 MHz			
Note: RF Output Power, Channel 0, pi/4-DQPSK, Z-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	48.40	32.29	3.67	0.00	0.00	-10.86	30.00	-40.86	5/10 MHz			
PK	H	2402.000	45.60	32.29	3.67	0.00	0.00	-13.66	30.00	-43.66	5/10 MHz			
Peak Power Spectral Density, normalized from 100kHz to 3 kHz using Bandwidth Correction Factor 10LOG(3/100 kHz)=-15.2 dB														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	48.10	32.29	3.67	0.00	0.00	-11.16	30.00	-41.16	1/3 MHz			
PK	H	2402.000	45.20	32.29	3.67	0.00	0.00	-14.06	30.00	-44.06	1/3 MHz			
Note: RF Output Power, Channel 39, pi/4-DQPSK, X-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	41.35	32.26	3.73	0.00	0.00	-17.88	30.00	-47.88	5/10 MHz			
PK	H	2441.000	46.80	32.26	3.73	0.00	0.00	-12.43	30.00	-42.43	5/10 MHz			
Peak Power Spectral Density, normalized from 100kHz to 3 kHz using Bandwidth Correction Factor 10LOG(3/100 kHz)=-15.2 dB														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	40.58	32.26	3.73	0.00	0.00	-33.85	30.00	-63.85	1/3 MHz			
PK	H	2441.000	46.10	32.26	3.73	0.00	0.00	-28.33	30.00	-58.33	1/3 MHz			
Note: RF Output Power, Channel 39, pi/4-DQPSK, Y-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	43.90	32.26	3.73	0.00	0.00	-15.33	30.00	-45.33	5/10 MHz			
PK	H	2441.000	45.50	32.26	3.73	0.00	0.00	-13.73	30.00	-43.73	5/10 MHz			
Peak Power Spectral Density, normalized from 100kHz to 3 kHz using Bandwidth Correction Factor 10LOG(3/100 kHz)=-15.2 dB														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	43.20	32.26	3.73	0.00	0.00	-16.03	30.00	-46.03	1/3 MHz			
PK	H	2441.000	45.10	32.26	3.73	0.00	0.00	-14.13	30.00	-44.13	1/3 MHz			
Note: RF Output Power, Channel 39, pi/4-DQPSK, Z-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	45.50	32.26	3.73	0.00	0.00	-13.73	30.00	-43.73	5/10 MHz			
PK	H	2441.000	43.20	32.26	3.73	0.00	0.00	-16.03	30.00	-46.03	5/10 MHz			
Peak Power Spectral Density, normalized from 100kHz to 3 kHz using Bandwidth Correction Factor 10LOG(3/100 kHz)=-15.2 dB														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	44.50	32.26	3.73	0.00	0.00	-14.73	30.00	-44.73	1/3 MHz			
PK	H	2441.000	42.60	32.26	3.73	0.00	0.00	-16.63	30.00	-46.63	1/3 MHz			
Note: RF Output Power, Channel 78, pi/4-DQPSK, X-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	44.50	32.23	3.78	0.00	0.00	-14.71	30.00	-44.71	5/10 MHz			
PK	H	2480.000	45.70	32.23	3.78	0.00	0.00	-13.51	30.00	-43.51	5/10 MHz			
Peak Power Spectral Density, normalized from 100kHz to 3 kHz using Bandwidth Correction Factor 10LOG(3/100 kHz)=-15.2 dB														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	43.60	32.23	3.78	0.00	0.00	-30.81	30.00	-60.81	1/3 MHz			
PK	H	2480.000	48.00	32.23	3.78	0.00	0.00	-26.41	30.00	-56.41	1/3 MHz			
Note: RF Output Power, Channel 78, pi/4-DQPSK, Y-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	45.66	32.23	3.78	0.00	0.00	-13.55	30.00	-43.55	5/10 MHz			
PK	H	2480.000	46.90	32.23	3.78	0.00	0.00	-12.31	30.00	-42.31	5/10 MHz			
Peak Power Spectral Density, normalized from 100kHz to 3 kHz using Bandwidth Correction Factor 10LOG(3/100 kHz)=-15.2 dB														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	45.12	32.23	3.78	0.00	0.00	-14.09	30.00	-44.09	1/3 MHz			
PK	H	2480.000	46.80	32.23	3.78	0.00	0.00	-12.41	30.00	-42.41	1/3 MHz			
Note: RF Output Power, Channel 78, pi/4-DQPSK, Z-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	48.00	32.23	3.78	0.00	0.00	-11.21	30.00	-41.21	5/10 MHz			
PK	H	2480.000	46.33	32.23	3.78	0.00	0.00	-12.88	30.00	-42.88	5/10 MHz			
Peak Power Spectral Density, normalized from 100kHz to 3 kHz using Bandwidth Correction Factor 10LOG(3/100 kHz)=-15.2 dB														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	47.30	32.23	3.78	0.00	0.00	-11.91	30.00	-41.91	1/3 MHz			
PK	H	2480.000	44.45	32.23	3.78	0.00	0.00	-14.76	30.00	-44.76	1/3 MHz			

Company:	Whoop						Antenna & Cables:	HF	Bands: N, LF, HF, SHF	
Model #:	WhoopStrap 2.0						Antenna:	ETS001 02-10-17.txt	ETS001 02-10-17.txt	
Serial #:	20D125 6						Cable(s):	145-416 1-18 GHz 10-08-17.txt	NONE.	
Engineers:	Naga Suryadevara			Location:	10M		Barometer:	DAV004	Filter:	NONE
Project #:	G102743203	Date(s):	10/20/16							
Standard:	FCC Part 15 Subpart C 15.247						Temp/Humidity/Pressure:	21C	29%	1016mB
Receiver:	R&S ESI (145-128) 03-10-2017		Limit Distance (m):	3						
PreAmp:	145014 05-13-16.txt		Test Distance (m):	3						
	PreAmp Used? (Y or N):	N	Voltage/Frequency:	Battery			Frequency Range:		Frequencies Shown	

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	EIRP Net dBm	EIRP Limit dBm	Margin dB	Bandwidth
Note: RF Output Power, Channel 0, pi/4-DQPSK, X-axis											
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2402.000	52.25	32.29	3.67	0.00	0.00	-7.01	30.00	-37.01	5/10 MHz
PK	H	2402.000	52.12	32.29	3.67	0.00	0.00	-7.14	30.00	-37.14	5/10 MHz
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2402.000	51.84	32.29	3.67	0.00	0.00	-7.42	30.00	-37.42	1/3 MHz
PK	H	2402.000	51.71	32.29	3.67	0.00	0.00	-7.55	30.00	-37.55	1/3 MHz
Note: Power Density measured in a 100 kHz RBW											
PK	V	2402.000	51.01	32.29	3.67	0.00	0.00	-8.25	8.00	-16.25	100/300 kHz
PK	H	2402.000	51.54	32.29	3.67	0.00	0.00	-7.72	8.00	-15.72	100/300 kHz
Note: RF Output Power, Channel 0, pi/4-DQPSK, Y-axis											
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2402.000	48.79	32.29	3.67	0.00	0.00	-10.47	30.00	-40.47	5/10 MHz
PK	H	2402.000	51.59	32.29	3.67	0.00	0.00	-7.67	30.00	-37.67	5/10 MHz
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2402.000	48.00	32.29	3.67	0.00	0.00	-11.26	30.00	-41.26	1/3 MHz
PK	H	2402.000	51.18	32.29	3.67	0.00	0.00	-8.08	30.00	-38.08	1/3 MHz
Note: Power Density measured in a 100 kHz RBW											
PK	V	2402.000	47.73	32.29	3.67	0.00	0.00	-11.53	8.00	-19.53	100/300 kHz
PK	H	2402.000	50.87	32.29	3.67	0.00	0.00	-8.39	8.00	-16.39	100/300 kHz
Note: RF Output Power, Channel 0, pi/4-DQPSK, Z-axis											
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2402.000	49.74	32.29	3.67	0.00	0.00	-9.52	30.00	-39.52	5/10 MHz
PK	H	2402.000	46.31	32.29	3.67	0.00	0.00	-12.95	30.00	-42.95	5/10 MHz
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2402.000	49.11	32.29	3.67	0.00	0.00	-10.15	30.00	-40.15	1/3 MHz
PK	H	2402.000	45.16	32.29	3.67	0.00	0.00	-14.10	30.00	-44.10	1/3 MHz
Note: Power Density measured in a 100 kHz RBW											
PK	V	2402.000	48.79	32.29	3.67	0.00	0.00	-10.47	8.00	-18.47	100/300 kHz
PK	H	2402.000	44.71	32.29	3.67	0.00	0.00	-14.55	8.00	-22.55	100/300 kHz
Note: RF Output Power, Channel 39, pi/4-DQPSK, X-axis											
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2441.000	46.57	32.26	3.73	0.00	0.00	-12.66	30.00	-42.66	5/10 MHz
PK	H	2441.000	50.40	32.26	3.73	0.00	0.00	-8.83	30.00	-38.83	5/10 MHz
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2441.000	45.52	32.26	3.73	0.00	0.00	-13.71	30.00	-43.71	1/3 MHz
PK	H	2441.000	49.99	32.26	3.73	0.00	0.00	-9.24	30.00	-39.24	1/3 MHz
Note: Power Density measured in a 100 kHz RBW											
PK	V	2441.000	45.14	32.26	3.73	0.00	0.00	-14.09	8.00	-22.09	100/300 kHz
PK	H	2441.000	49.80	32.26	3.73	0.00	0.00	-9.43	8.00	-17.43	100/300 kHz
Note: RF Output Power, Channel 39, pi/4-DQPSK, Y-axis											
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2441.000	46.44	32.26	3.73	0.00	0.00	-12.79	30.00	-42.79	5/10 MHz
PK	H	2441.000	46.57	32.26	3.73	0.00	0.00	-12.66	30.00	-42.66	5/10 MHz
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2441.000	45.90	32.26	3.73	0.00	0.00	-13.33	30.00	-43.33	1/3 MHz
PK	H	2441.000	45.66	32.26	3.73	0.00	0.00	-13.57	30.00	-43.57	1/3 MHz

Note: Power Density measured in a 100 kHz RBW											
PK	V	2441.000	45.43	32.26	3.73	0.00	0.00	-13.80	8.00	-21.80	100/300 kHz
PK	H	2441.000	45.40	32.26	3.73	0.00	0.00	-13.83	8.00	-21.83	100/300 kHz
Note: RF Output Power, Channel 39, pi/4-DQPSK, Z-axis											
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2441.000	48.39	32.26	3.73	0.00	0.00	-10.84	30.00	-40.84	5/10 MHz
PK	H	2441.000	44.76	32.26	3.73	0.00	0.00	-14.47	30.00	-44.47	5/10 MHz
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2441.000	47.67	32.26	3.73	0.00	0.00	-11.56	30.00	-41.56	1/3 MHz
PK	H	2441.000	43.97	32.26	3.73	0.00	0.00	-15.26	30.00	-45.26	1/3 MHz
Note: Power Density measured in a 100 kHz RBW											
PK	V	2441.000	47.19	32.26	3.73	0.00	0.00	-12.04	8.00	-20.04	100/300 kHz
PK	H	2441.000	42.92	32.26	3.73	0.00	0.00	-16.31	8.00	-24.31	100/300 kHz
Note: RF Output Power, Channel 78, pi/4-DQPSK, X-axis											
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2480.000	44.35	32.23	3.78	0.00	0.00	-14.86	30.00	-44.86	5/10 MHz
PK	H	2480.000	48.79	32.23	3.78	0.00	0.00	-10.42	30.00	-40.42	5/10 MHz
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2480.000	41.89	32.23	3.78	0.00	0.00	-17.32	30.00	-47.32	1/3 MHz
PK	H	2480.000	47.67	32.23	3.78	0.00	0.00	-11.54	30.00	-41.54	1/3 MHz
Note: Power Density measured in a 100 kHz RBW											
PK	V	2480.000	41.30	32.23	3.78	0.00	0.00	-17.91	8.00	-25.91	100/300 kHz
PK	H	2480.000	47.09	32.23	3.78	0.00	0.00	-12.12	8.00	-20.12	100/300 kHz
Note: RF Output Power, Channel 78, pi/4-DQPSK, Y-axis											
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2480.000	46.96	32.23	3.78	0.00	0.00	-12.25	30.00	-42.25	5/10 MHz
PK	H	2480.000	47.68	32.23	3.78	0.00	0.00	-11.53	30.00	-41.53	5/10 MHz
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2480.000	45.66	32.23	3.78	0.00	0.00	-13.55	30.00	-43.55	1/3 MHz
PK	H	2480.000	46.37	32.23	3.78	0.00	0.00	-12.84	30.00	-42.84	1/3 MHz
Note: Power Density measured in a 100 kHz RBW											
PK	V	2480.000	44.99	32.23	3.78	0.00	0.00	-14.22	8.00	-22.22	100/300 kHz
PK	H	2480.000	45.70	32.23	3.78	0.00	0.00	-13.51	8.00	-21.51	100/300 kHz
Note: RF Output Power, Channel 78, pi/4-DQPSK, Z-axis											
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2480.000	49.60	32.23	3.78	0.00	0.00	-9.61	30.00	-39.61	5/10 MHz
PK	H	2480.000	41.23	32.23	3.78	0.00	0.00	-17.98	30.00	-47.98	5/10 MHz
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2480.000	48.78	32.23	3.78	0.00	0.00	-10.43	30.00	-40.43	1/3 MHz
PK	H	2480.000	37.74	32.23	3.78	0.00	0.00	-21.47	30.00	-51.47	1/3 MHz

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	EIRP Net dBm	EIRP Limit dBm	Margin dB	Bandwidth	FCC	IC	Harmonic?
Note: RF Output Power, Channel 0, 8DPSK, X-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	52.80	32.29	3.67	0.00	0.00	-6.46	30.00	-36.46	5/10 MHz			
PK	H	2402.000	52.11	32.29	3.67	0.00	0.00	-7.15	30.00	-37.15	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	49.53	32.29	3.67	0.00	0.00	-9.73	30.00	-39.73	1/3 MHz			
PK	H	2402.000	49.98	32.29	3.67	0.00	0.00	-9.28	30.00	-39.28	1/3 MHz			
Note: RF Output Power, Channel 0, 8DPSK, Y-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	52.25	32.29	3.67	0.00	0.00	-7.01	30.00	-37.01	5/10 MHz			
PK	H	2402.000	53.00	32.29	3.67	0.00	0.00	-6.26	30.00	-36.26	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	50.07	32.29	3.67	0.00	0.00	-9.19	30.00	-39.19	1/3 MHz			
PK	H	2402.000	50.40	32.29	3.67	0.00	0.00	-8.86	30.00	-38.86	1/3 MHz			
Note: RF Output Power, Channel 0, 8DPSK, Z-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	53.73	32.29	3.67	0.00	0.00	-5.53	30.00	-35.53	5/10 MHz			
PK	H	2402.000	50.51	32.29	3.67	0.00	0.00	-8.75	30.00	-38.75	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	51.59	32.29	3.67	0.00	0.00	-7.67	30.00	-37.67	1/3 MHz			
PK	H	2402.000	51.90	32.29	3.67	0.00	0.00	-7.36	30.00	-37.36	1/3 MHz			
Note: RF Output Power, Channel 39, 8DPSK, X-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	50.20	32.26	3.73	0.00	0.00	-9.03	30.00	-39.03	5/10 MHz			
PK	H	2441.000	51.00	32.26	3.73	0.00	0.00	-8.23	30.00	-38.23	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	51.07	32.26	3.73	0.00	0.00	-8.16	30.00	-38.16	1/3 MHz			
PK	H	2441.000	51.77	32.26	3.73	0.00	0.00	-7.46	30.00	-37.46	1/3 MHz			
Note: RF Output Power, Channel 39, 8DPSK, Y-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	52.39	32.26	3.73	0.00	0.00	-6.84	30.00	-36.84	5/10 MHz			
PK	H	2441.000	52.50	32.26	3.73	0.00	0.00	-6.73	30.00	-36.73	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	49.98	32.26	3.73	0.00	0.00	-9.25	30.00	-39.25	1/3 MHz			
PK	H	2441.000	52.24	32.26	3.73	0.00	0.00	-6.99	30.00	-36.99	1/3 MHz			
Note: RF Output Power, Channel 39, 8DPSK, Z-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	53.07	32.26	3.73	0.00	0.00	-6.16	30.00	-36.16	5/10 MHz			
PK	H	2441.000	50.98	32.26	3.73	0.00	0.00	-8.25	30.00	-38.25	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	50.98	32.26	3.73	0.00	0.00	-8.25	30.00	-38.25	1/3 MHz			
PK	H	2441.000	48.71	32.26	3.73	0.00	0.00	-10.52	30.00	-40.52	1/3 MHz			
Note: RF Output Power, Channel 78, 8DPSK, X-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	49.74	32.23	3.78	0.00	0.00	-9.47	30.00	-39.47	5/10 MHz			
PK	H	2480.000	50.83	32.23	3.78	0.00	0.00	-8.38	30.00	-38.38	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	47.33	32.23	3.78	0.00	0.00	-11.88	30.00	-41.88	1/3 MHz			
PK	H	2480.000	51.58	32.23	3.78	0.00	0.00	-7.63	30.00	-37.63	1/3 MHz			
Note: RF Output Power, Channel 78, 8DPSK, Y-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	51.27	32.23	3.78	0.00	0.00	-7.94	30.00	-37.94	5/10 MHz			
PK	H	2480.000	50.75	32.23	3.78	0.00	0.00	-8.46	30.00	-38.46	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	52.11	32.23	3.78	0.00	0.00	-7.10	30.00	-37.10	1/3 MHz			
PK	H	2480.000	48.12	32.23	3.78	0.00	0.00	-11.09	30.00	-41.09	1/3 MHz			
Note: RF Output Power, Channel 78, 8DPSK, Z-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	48.79	32.23	3.78	0.00	0.00	-10.42	30.00	-40.42	5/10 MHz			
PK	H	2480.000	45.79	32.23	3.78	0.00	0.00	-13.42	30.00	-43.42	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	46.17	32.23	3.78	0.00	0.00	-13.04	30.00	-43.04	1/3 MHz			
PK	H	2480.000	43.32	32.23	3.78	0.00	0.00	-15.89	30.00	-45.89	1/3 MHz			

Radiated Emissions

Company: Whoop
Model #: WhoopStrap 2.0
Serial #: 20D125 6
Engineers: Vathana Ven
Project #: G102743203
Standard: FCC Part 15 Subpart C 15.247
Receiver: R&S ESI (145-128) 03-10-2017
PreAmp: 145014 05-13-16.txt
Date(s): 10/20/16
Location: 10M
Limit Distance (m): 3
Test Distance (m): 3
PreAmp Used? (Y or N): N
Voltage/Frequency: Battery mode
Antenna & Cables: HF
Antenna: ETS001 02-10-17.txt
Cable(s): 145-416 1-18 GHz 10-08-17.txt
Barometer: DAV004
Temp/Humidity/Pressure: 22c
Bands: N, LF, HF, SHF
ETS001 02-10-17.txt
NONE.
Filter: NONE
40%
1005mB
Frequency Range: Frequencies Shown

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	EIRP Net dBm	EIRP Limit dBm	Margin dB	Bandwidth	FCC	IC	Harmonic?
Note: RF Output Power, Channel 0, 8DPSK, X-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	50.66	32.29	3.67	0.00	0.00	-8.60	30.00	-38.60	5/10 MHz			
PK	H	2402.000	54.90	32.29	3.67	0.00	0.00	-4.36	30.00	-34.36	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	48.10	32.29	3.67	0.00	0.00	-11.16	30.00	-41.16	1/3 MHz			
PK	H	2402.000	53.06	32.29	3.67	0.00	0.00	-6.20	30.00	-36.20	1/3 MHz			
Note: RF Output Power, Channel 0, 8DPSK, Y-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	50.27	32.29	3.67	0.00	0.00	-8.99	30.00	-38.99	5/10 MHz			
PK	H	2402.000	53.09	32.29	3.67	0.00	0.00	-6.17	30.00	-36.17	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	47.95	32.29	3.67	0.00	0.00	-11.31	30.00	-41.31	1/3 MHz			
PK	H	2402.000	51.08	32.29	3.67	0.00	0.00	-8.18	30.00	-38.18	1/3 MHz			
Note: RF Output Power, Channel 0, 8DPSK, Z-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	54.87	32.29	3.67	0.00	0.00	-4.39	30.00	-34.39	5/10 MHz			
PK	H	2402.000	46.83	32.29	3.67	0.00	0.00	-12.43	30.00	-42.43	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2402.000	53.13	32.29	3.67	0.00	0.00	-6.13	30.00	-36.13	1/3 MHz			
PK	H	2402.000	44.59	32.29	3.67	0.00	0.00	-14.67	30.00	-44.67	1/3 MHz			
Note: RF Output Power, Channel 39, 8DPSK, X-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	47.87	32.26	3.73	0.00	0.00	-11.36	30.00	-41.36	5/10 MHz			
PK	H	2441.000	52.26	32.26	3.73	0.00	0.00	-6.97	30.00	-36.97	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	45.26	32.26	3.73	0.00	0.00	-13.97	30.00	-43.97	1/3 MHz			
PK	H	2441.000	49.87	32.26	3.73	0.00	0.00	-9.36	30.00	-39.36	1/3 MHz			
Note: RF Output Power, Channel 39, 8DPSK, Y-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	48.26	32.26	3.73	0.00	0.00	-10.97	30.00	-40.97	5/10 MHz			
PK	H	2441.000	48.65	32.26	3.73	0.00	0.00	-10.58	30.00	-40.58	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	45.75	32.26	3.73	0.00	0.00	-13.48	30.00	-43.48	1/3 MHz			
PK	H	2441.000	46.29	32.26	3.73	0.00	0.00	-12.94	30.00	-42.94	1/3 MHz			
Note: RF Output Power, Channel 39, 8DPSK, Z-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	49.87	32.26	3.73	0.00	0.00	-9.36	30.00	-39.36	5/10 MHz			
PK	H	2441.000	46.31	32.26	3.73	0.00	0.00	-12.92	30.00	-42.92	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2441.000	48.08	32.26	3.73	0.00	0.00	-11.15	30.00	-41.15	1/3 MHz			
PK	H	2441.000	44.18	32.26	3.73	0.00	0.00	-15.05	30.00	-45.05	1/3 MHz			
Note: RF Output Power, Channel 78, 8DPSK, X-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	45.70	32.23	3.78	0.00	0.00	-13.51	30.00	-43.51	5/10 MHz			
PK	H	2480.000	50.40	32.23	3.78	0.00	0.00	-8.81	30.00	-38.81	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	43.24	32.23	3.78	0.00	0.00	-15.97	30.00	-45.97	1/3 MHz			
PK	H	2480.000	48.23	32.23	3.78	0.00	0.00	-10.98	30.00	-40.98	1/3 MHz			
Note: RF Output Power, Channel 78, 8DPSK, Y-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	48.66	32.23	3.78	0.00	0.00	-10.55	30.00	-40.55	5/10 MHz			
PK	H	2480.000	50.27	32.23	3.78	0.00	0.00	-8.94	30.00	-38.94	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	48.13	32.23	3.78	0.00	0.00	-11.08	30.00	-41.08	1/3 MHz			
PK	H	2480.000	48.21	32.23	3.78	0.00	0.00	-11.00	30.00	-41.00	1/3 MHz			
Note: RF Output Power, Channel 78, 8DPSK, Z-axis														
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	48.79	32.23	3.78	0.00	0.00	-10.42	30.00	-40.42	5/10 MHz			
PK	H	2480.000	43.80	32.23	3.78	0.00	0.00	-15.41	30.00	-45.41	5/10 MHz			
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP														
PK	V	2480.000	47.87	32.23	3.78	0.00	0.00	-11.34	30.00	-41.34	1/3 MHz			
PK	H	2480.000	41.29	32.23	3.78	0.00	0.00	-17.92	30.00	-47.92	1/3 MHz			

Human RF Exposure/SAR Exemption

Maximum measured output power is 0.000284 Watts @ 2402 MHz

FCC SAR Exemption per KDB 447498

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

[(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR,[30] where

- $f_{(GHz)}$ is the RF channel transmit frequency in GHz

= (0.000284*10^3/5)*(sqrt(2.402))

= 0.4401 < 3.0 (below the limit SAR Exempt per FCC)

RSS 102 SAR Exemption

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 ≤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
≤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

The exemption limits in Table 1 are based on measurements and simulations of half-wave dipole antennas at separation distances of 5 mm to 25 mm from a flat phantom, providing a SAR value of approximately 0.4 W/kg for 1 g of tissue. For low frequencies (300 MHz to 835 MHz), the exemption limits are derived from a linear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from a third order polynomial fit.

The measured maximum output power "0.284 mW" is less than the limit (4 mW) specified in the above table, hence the device is SAR exempt.

Test Personnel:	Vathana Ven VSV	Test Date:	10/20/2016
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15C, 15.247, RSS-247	Limit Applied:	Below specified limit
Input Voltage:	120VAC/60Hz	Ambient Temperature:	20 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**Yes**	Relative Humidity:	48 %
		Atmospheric Pressure:	1000 mbars

Deviations, Additions, or Exclusions: None

7 20 dB and Occupied (99%) Bandwidth

7.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C (15.247) and RSS 247.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV001'	Weather Station	Davis Instruments	7400	PE80519A61	10/23/2015	10/23/2016
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	06/09/2016	06/09/2017
CBLHF2012-2M-1'	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252675001	02/09/2016	02/09/2017
HORN2'	HORN ANTENNA	EMCO	3115	9602-4675	02/18/2016	02/18/2017

Software Utilized:

Name	Manufacturer	Version
None		

7.3 Results:

The sample tested was found to Comply.

GFSK Modulation

Frequency	Occupied Bandwidth (99%)	20 dB Bandwidth
2402	1.2384 MHz	1.078 MHz
2441	1.0821 MHz	1.076 MHz
2480	1.090 MHz	1.078 MHz

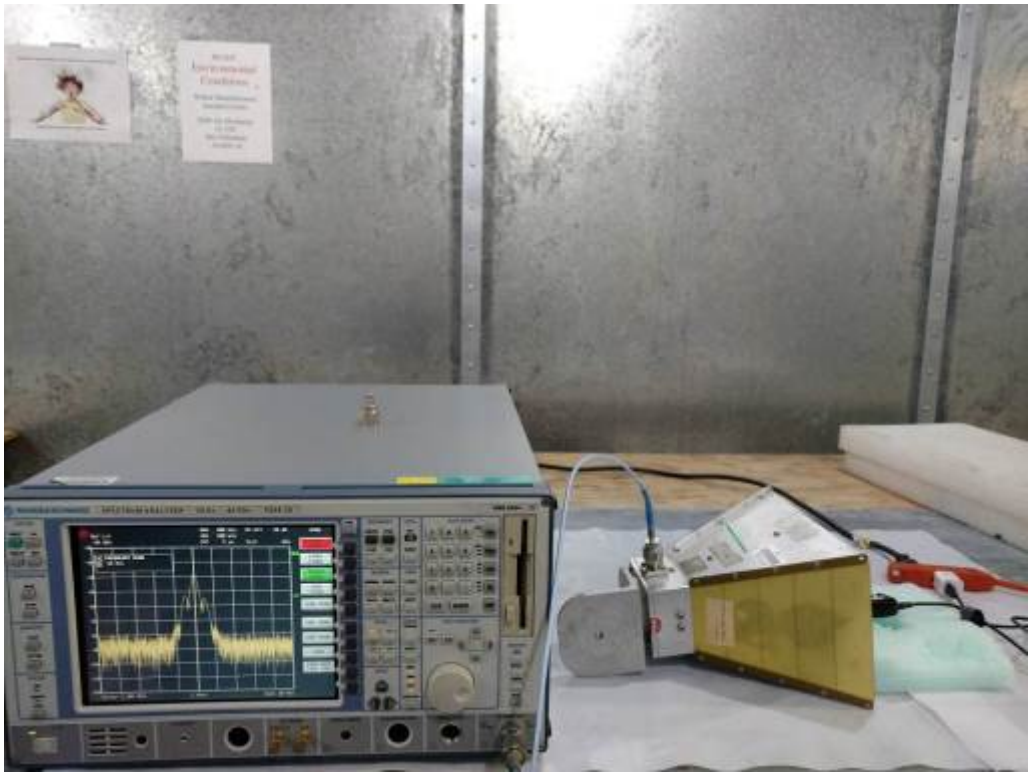
Pi/4-DQPSK Modulation

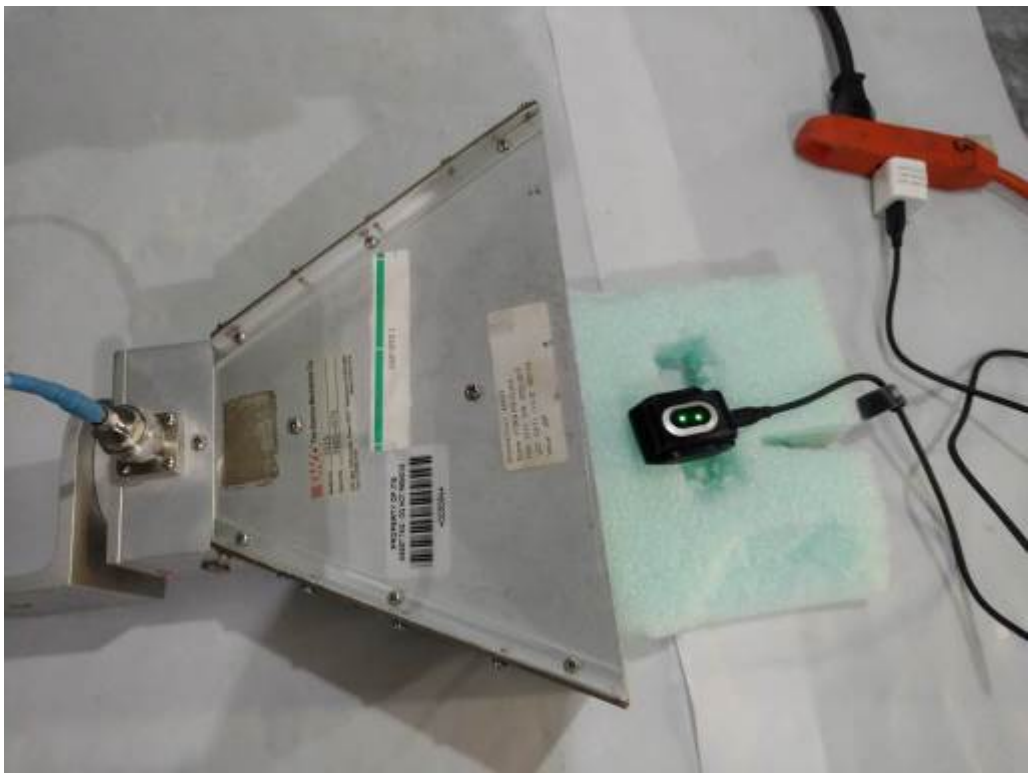
Frequency	Occupied Bandwidth (99%)	20 dB Bandwidth
2402	43.58 kHz	66.12 kHz
2441	53.10 kHz	66.12 kHz
2480	60.62 kHz	66.12 kHz

8DPSK Modulation

Frequency	Occupied Bandwidth (99%)	20 dB Bandwidth
2402	1.14 MHz	1.178 MHz
2441	1.53 MHz	1.192 MHz
2480	2.42 MHz	1.192 Mhz

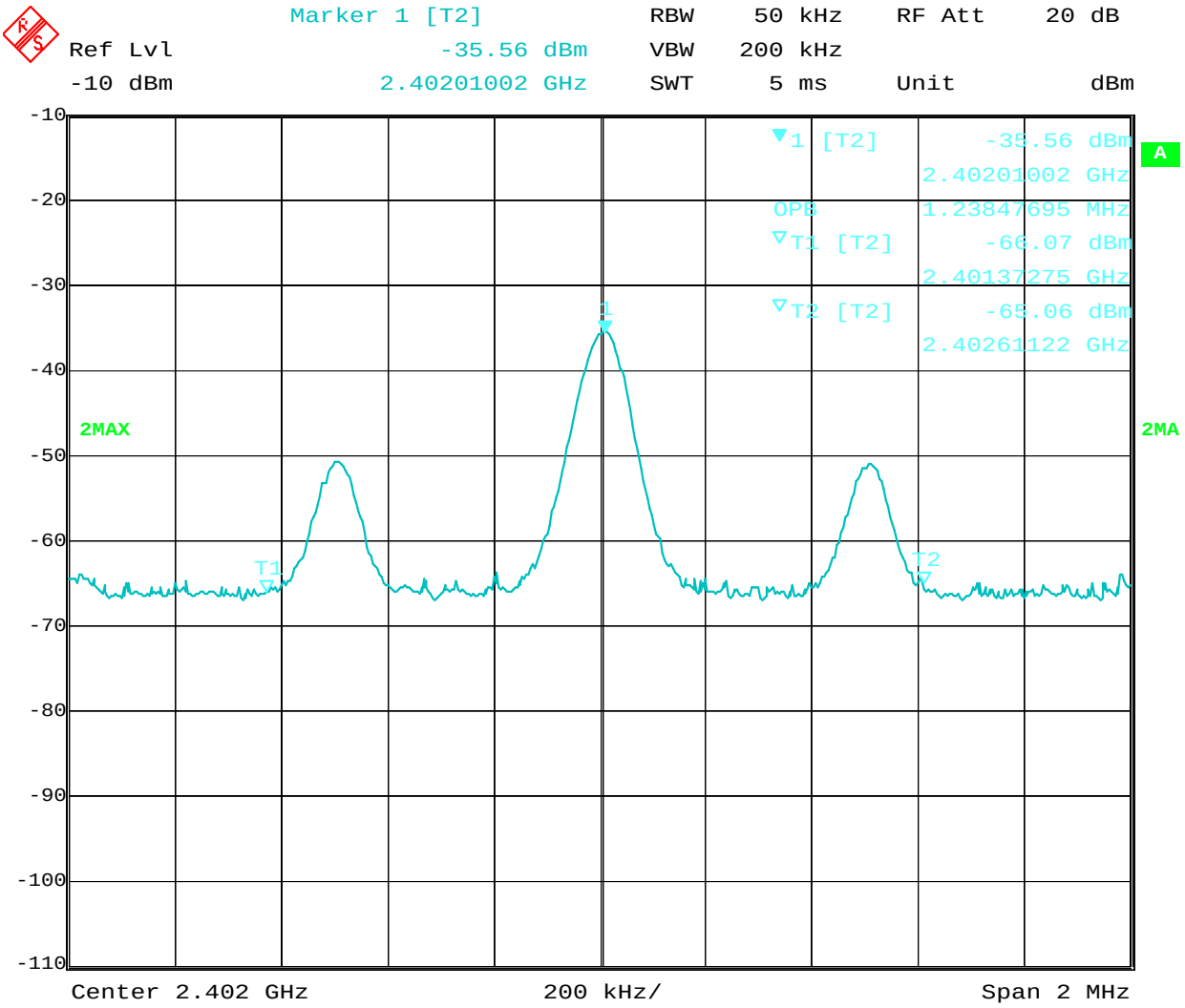
7.4 Setup Photographs:



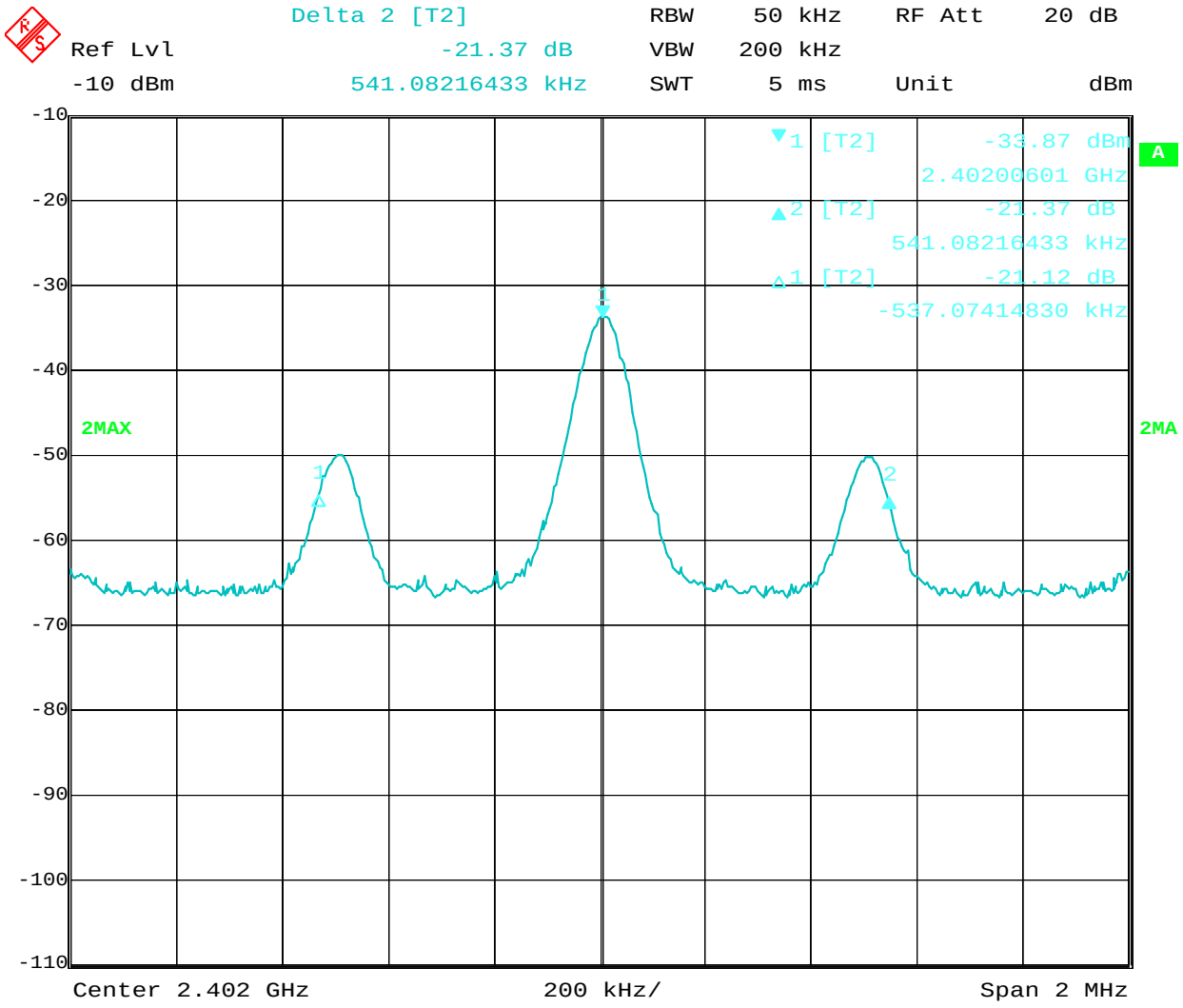


7.5 Plots/Data:

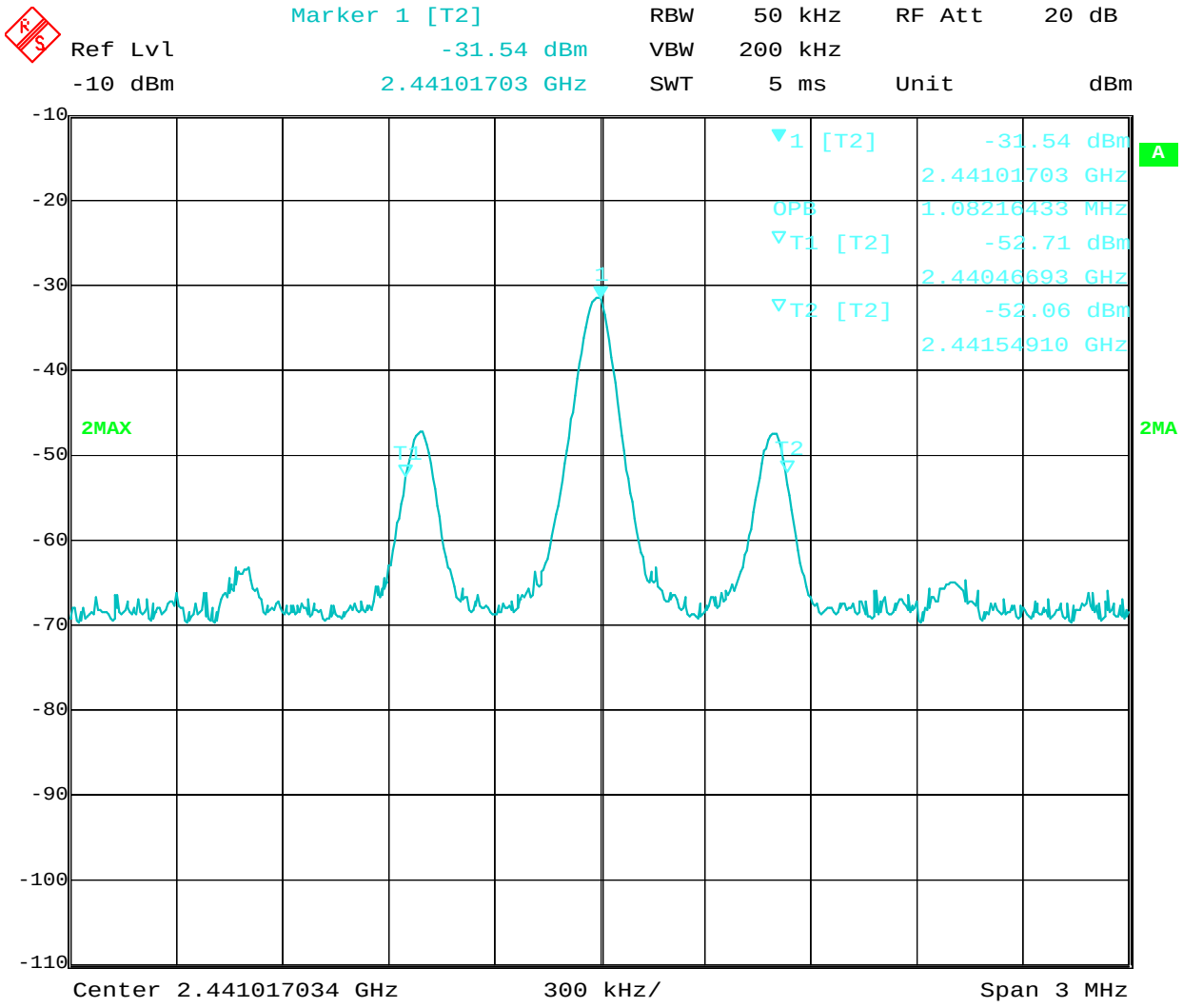
Device set to GFSK Modulation, Tx at CH0 - 2402 MHz, Occupied Bandwidth = 1.2384 MHz



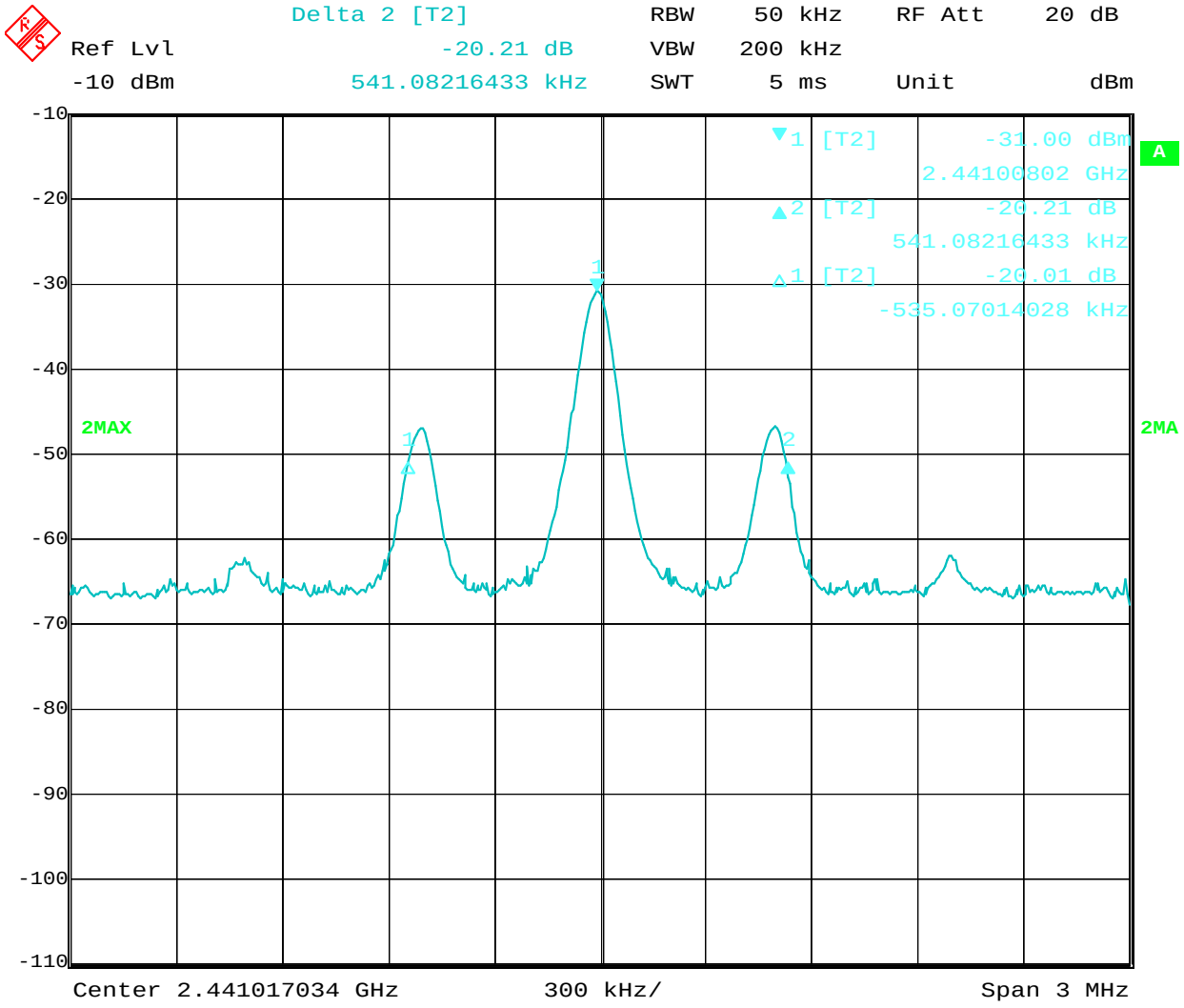
Device set to GFSK Modulation, Tx at CH0 - 2402 MHz, 20dB Bandwidth = 1.078 MHz



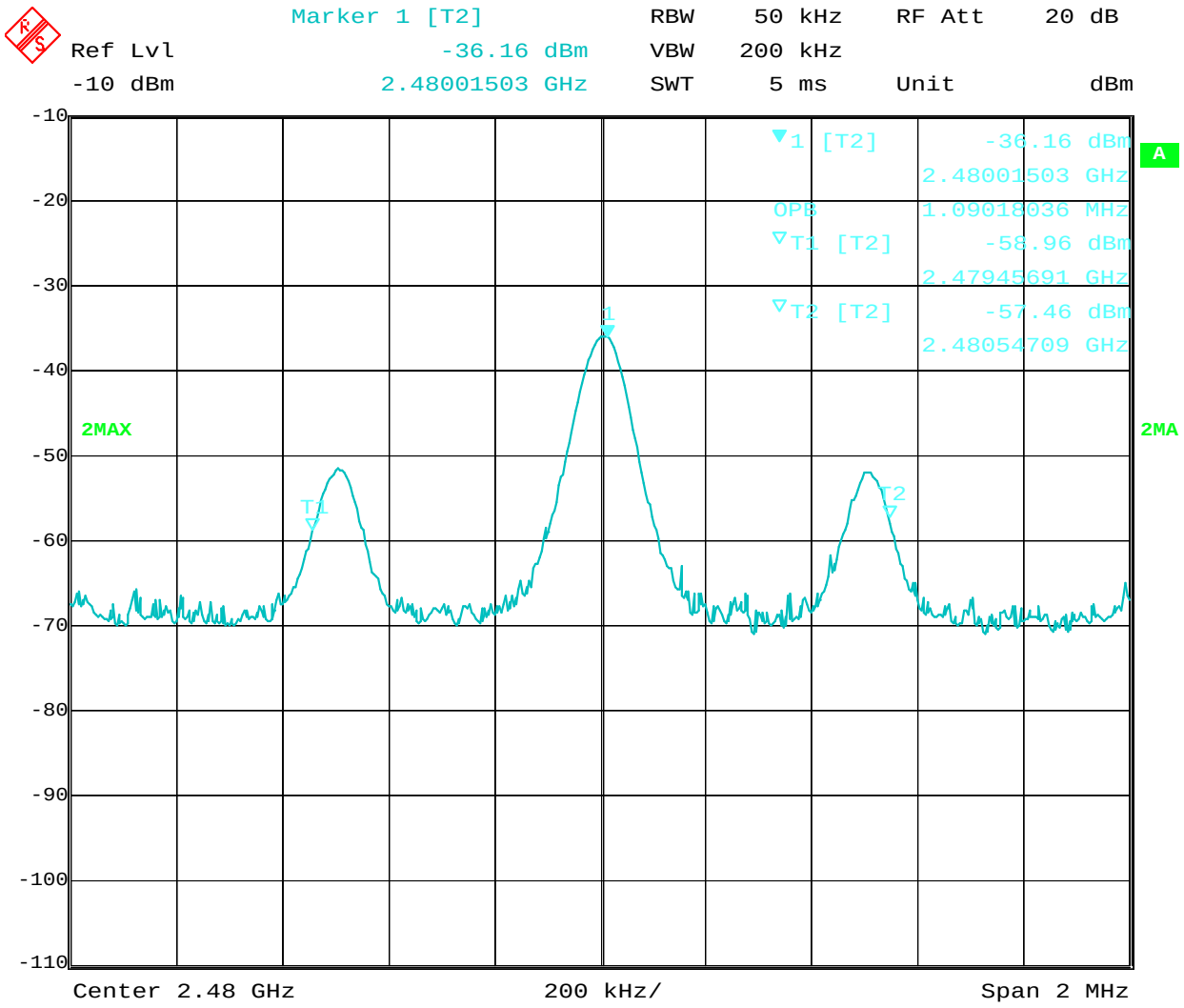
Device set to GFSK Modulation, Tx at CH39 - 2441 MHz, Occupied Bandwidth = 1.0821 MHz



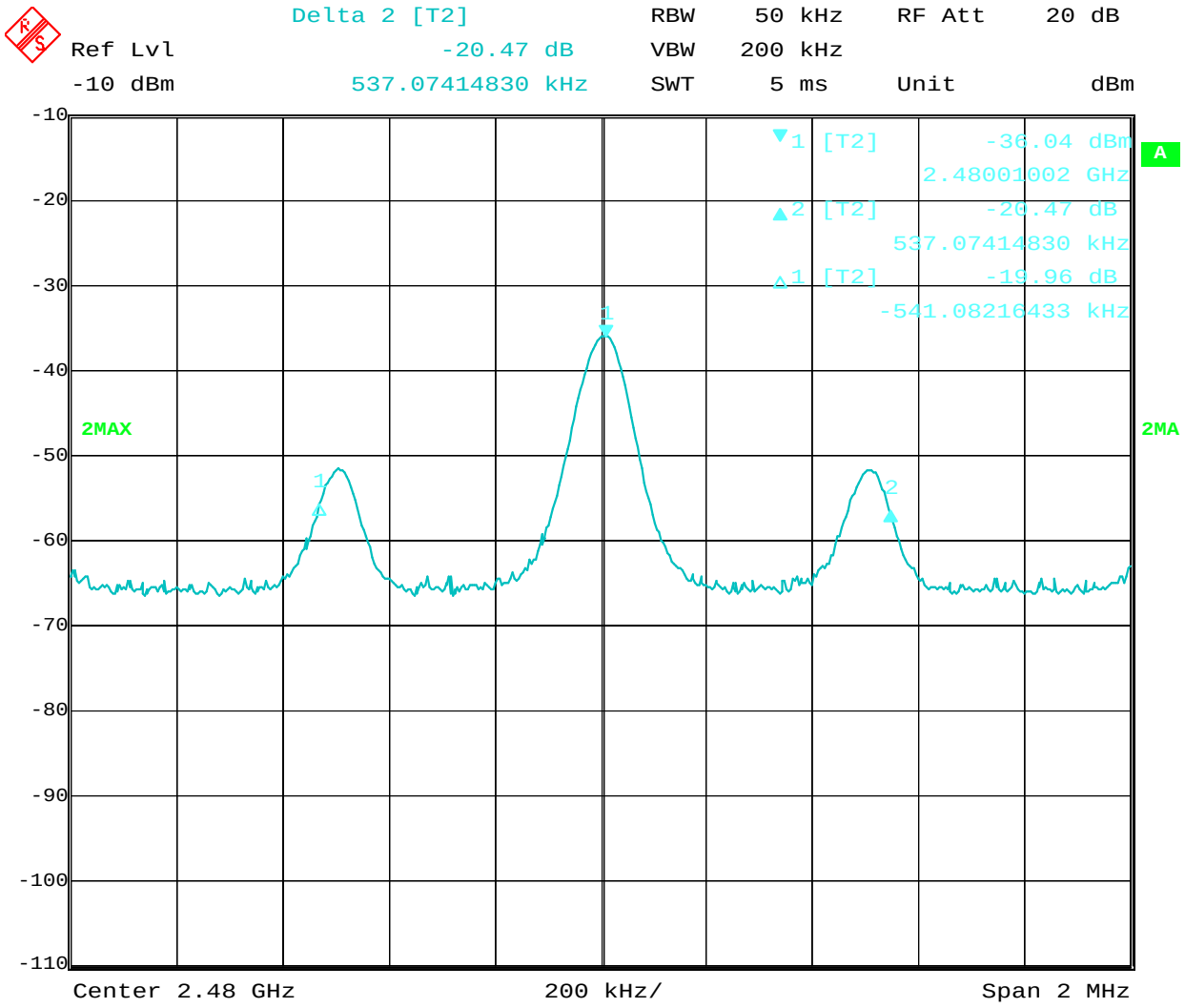
Device set to GFSK Modulation, Tx at CH39 - 2441 MHz, 20dB Bandwidth = 1.076 MHz



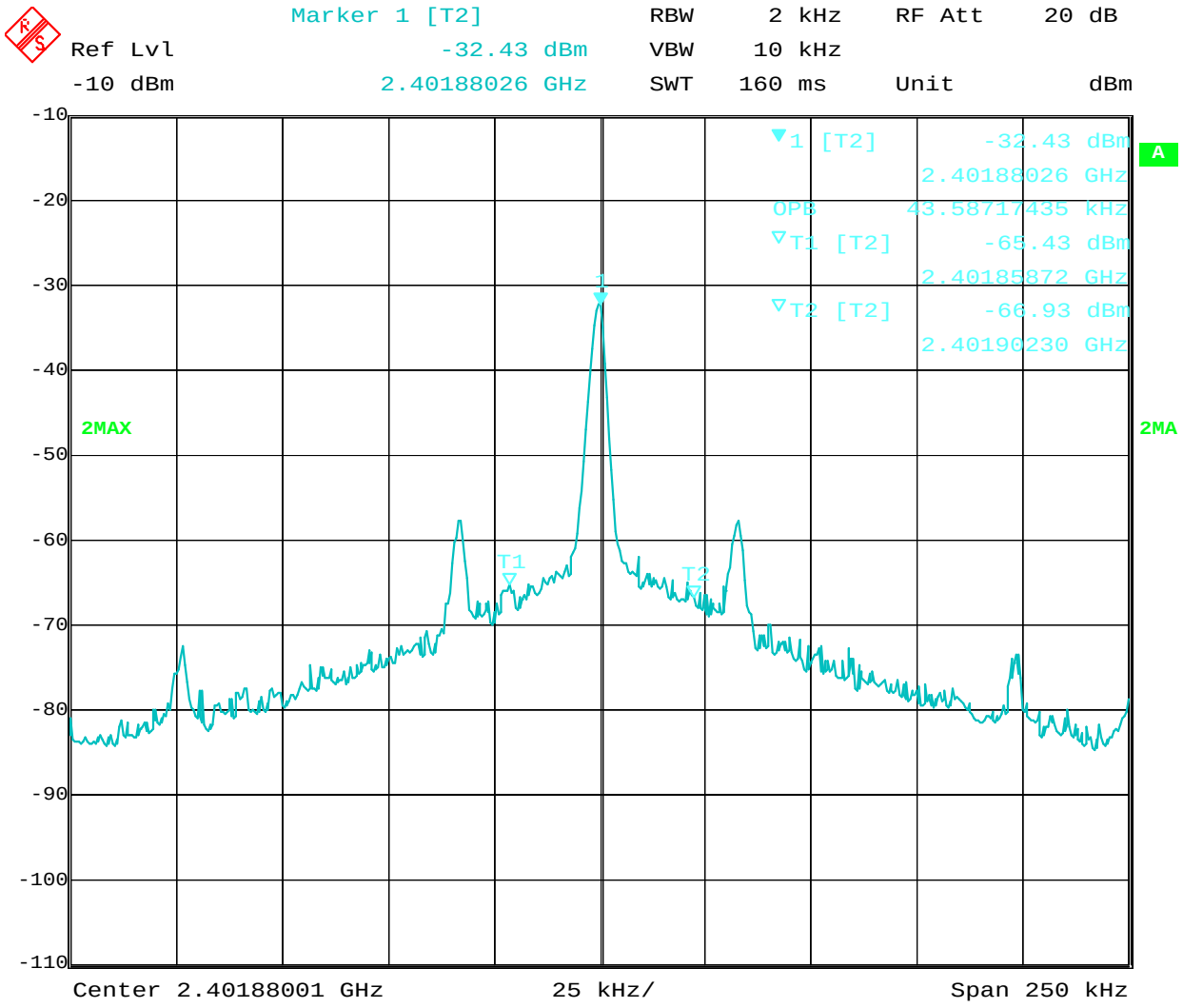
Device set to GFSK Modulation, Tx at CH78 - 2480 MHz, Occupied Bandwidth = 1.090 MHz



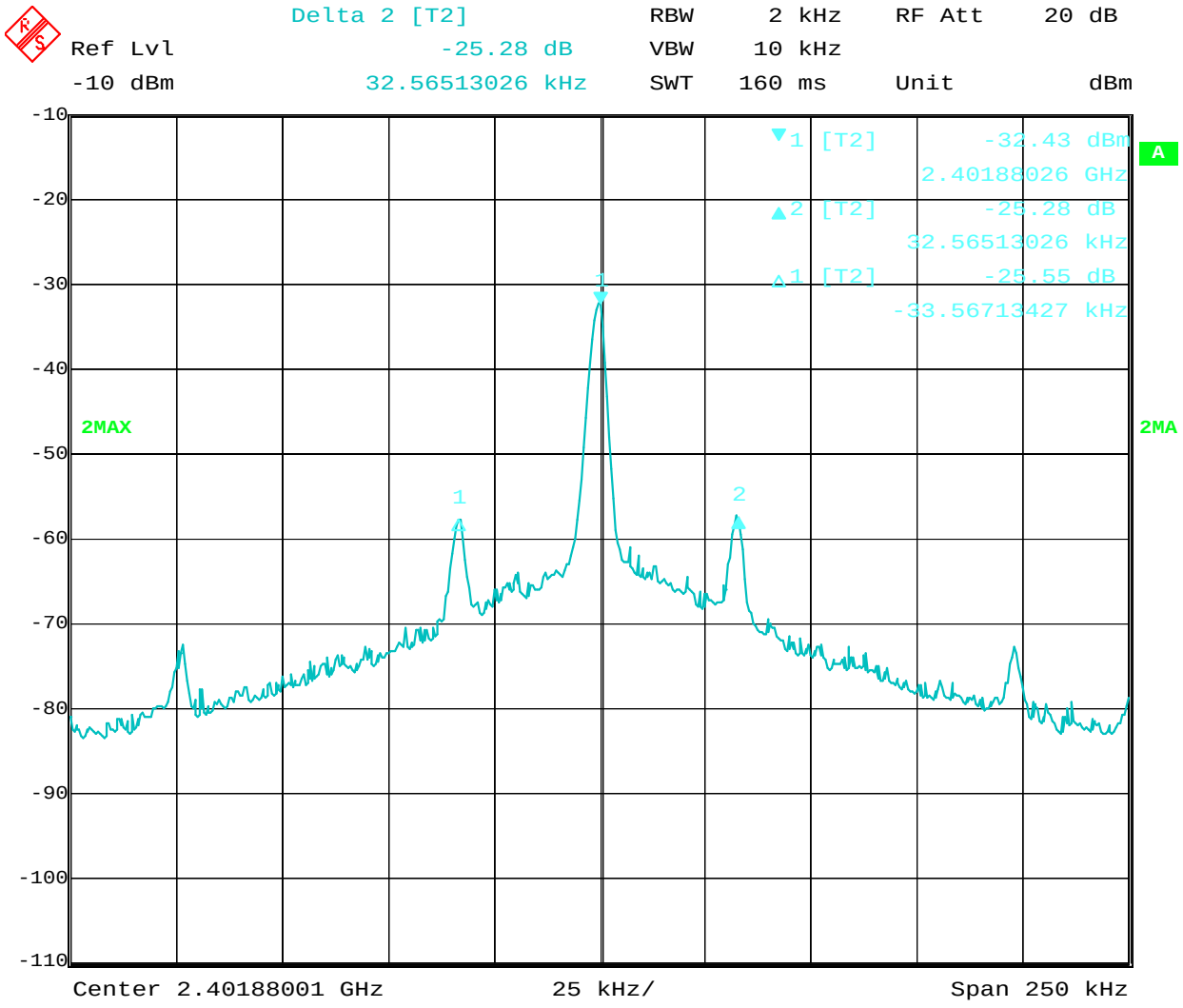
Device set to GFSK Modulation, Tx at CH78 - 2480 MHz, 20dB Bandwidth = 1.078 MHz



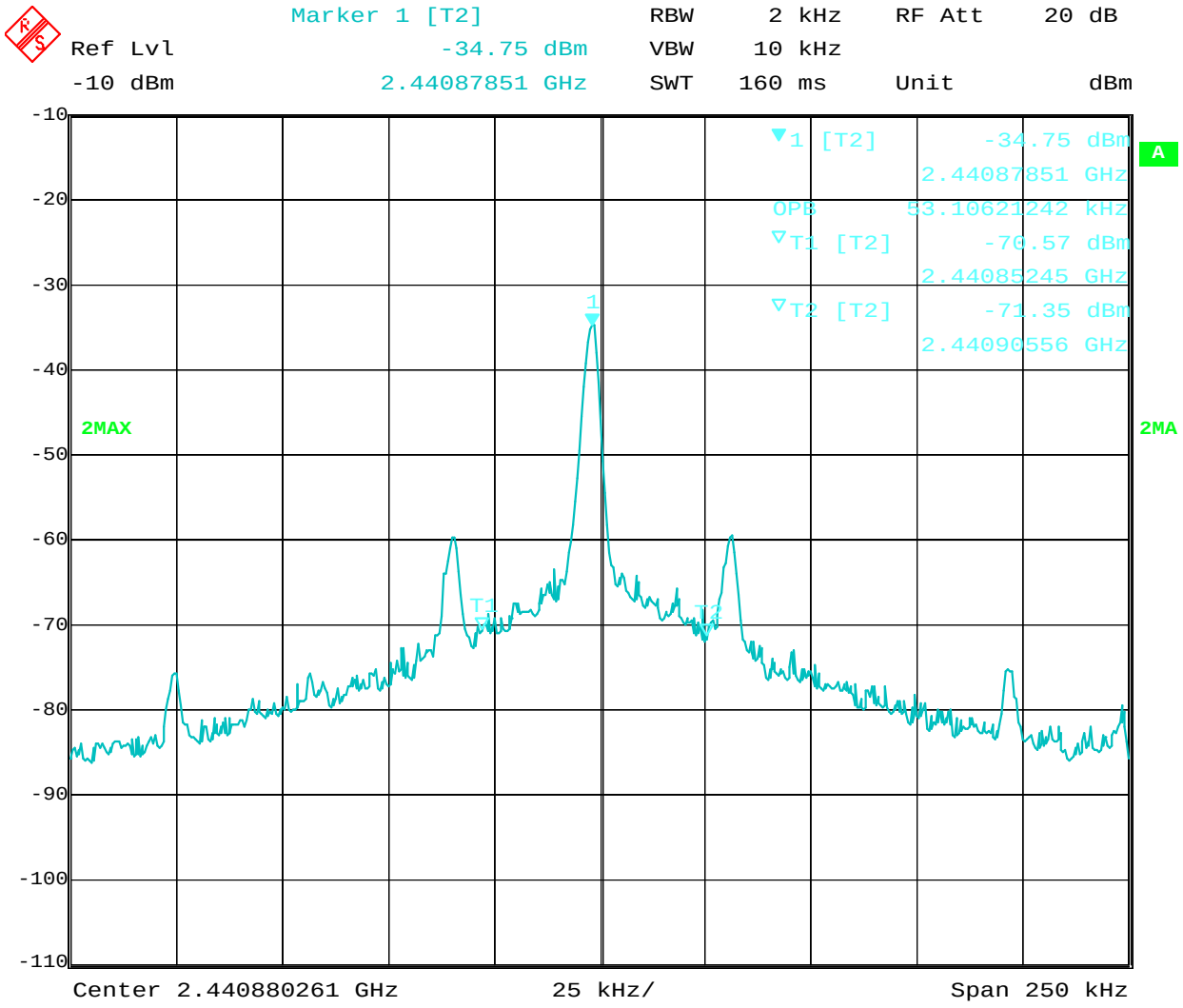
Device set to pi/4-DQPSK Modulation, Tx at CH0 - 2402 MHz, Occupied Bandwidth = 43.58 kHz



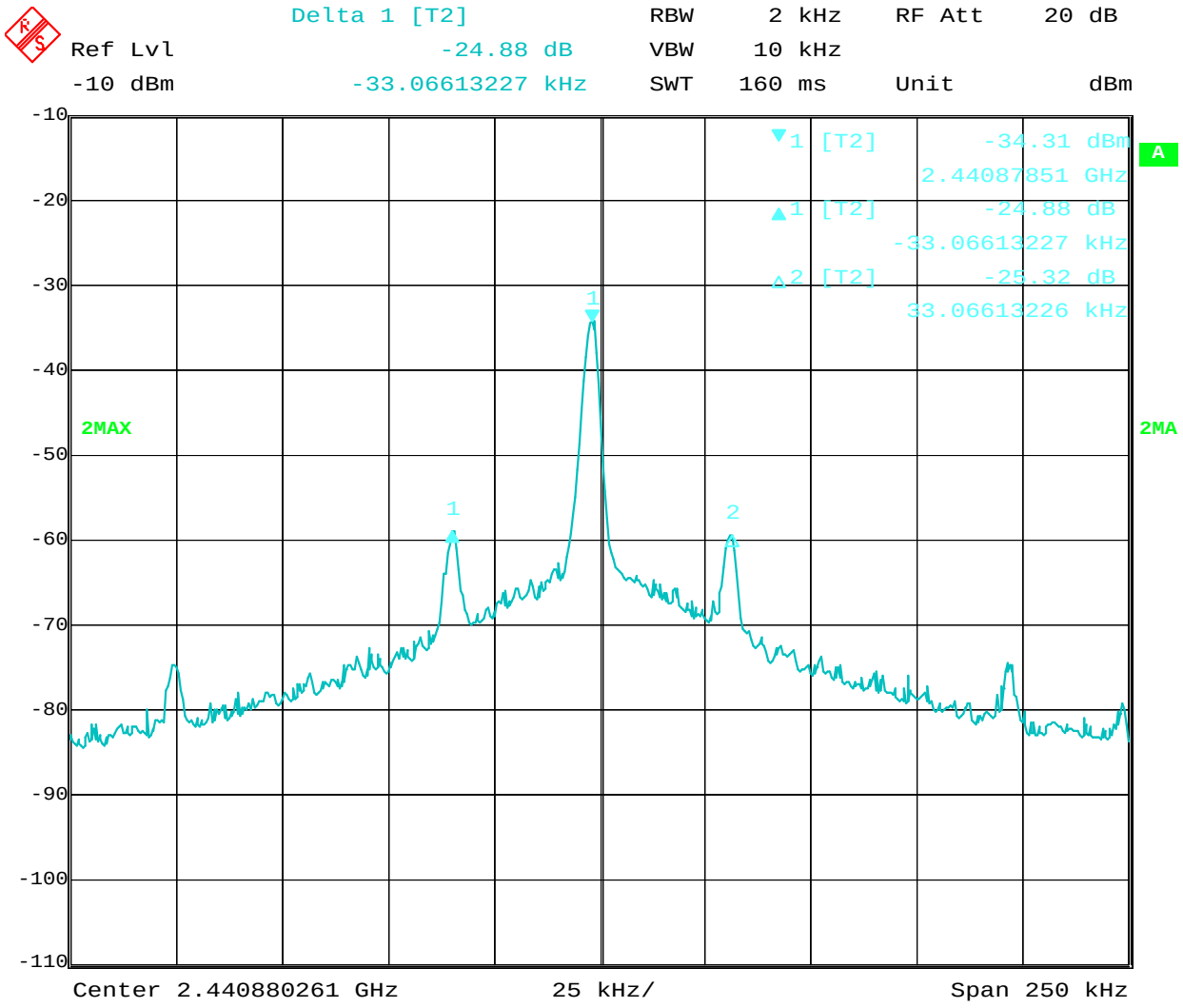
Device set to pi/4-DQPSK Modulation, Tx at CH0 - 2402 MHz, 20dB Bandwidth = 66.12 kHz



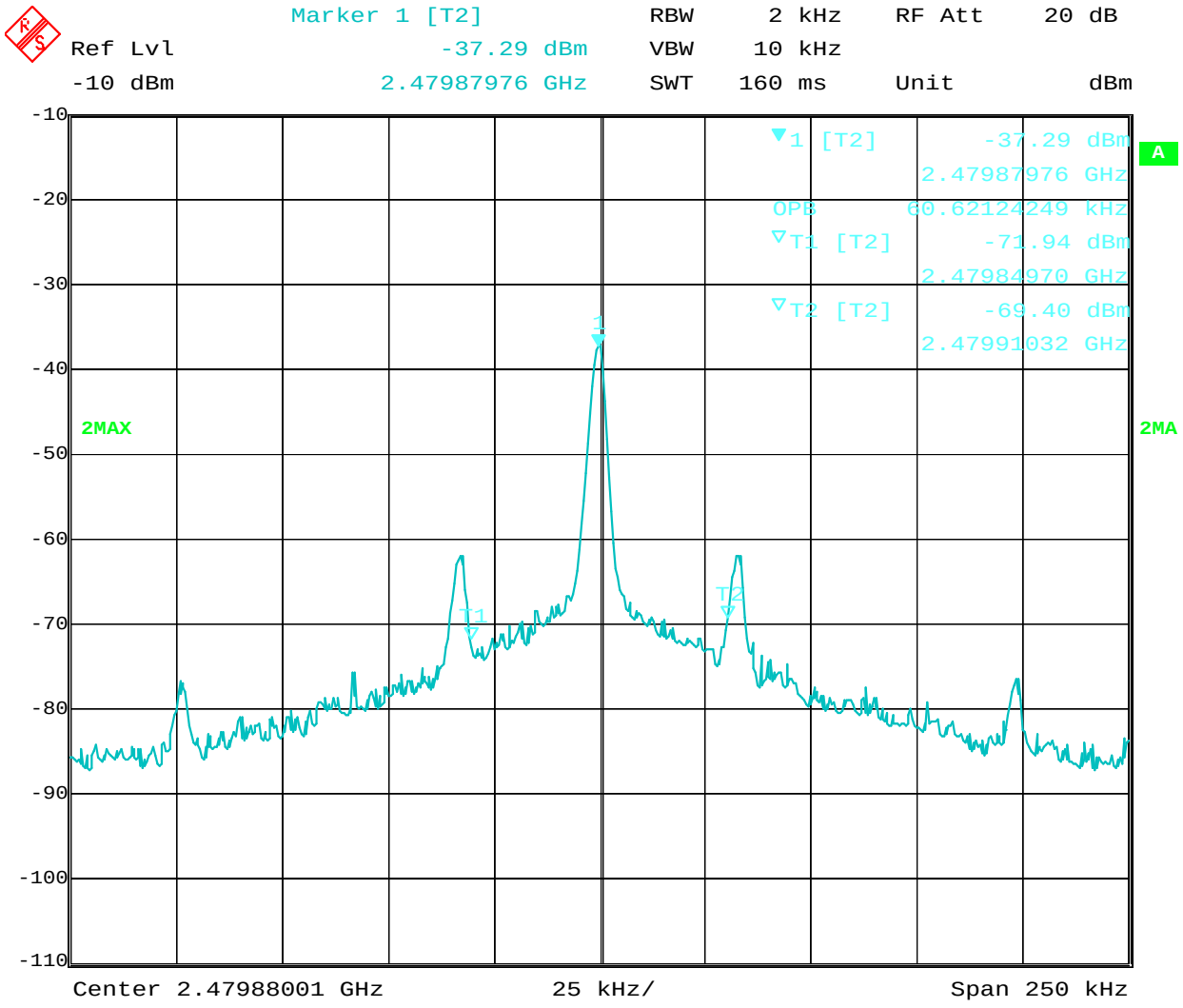
Device set to pi/4-DQPSK Modulation, Tx at CH39 - 2441 MHz, Occupied Bandwidth = 53.10 kHz



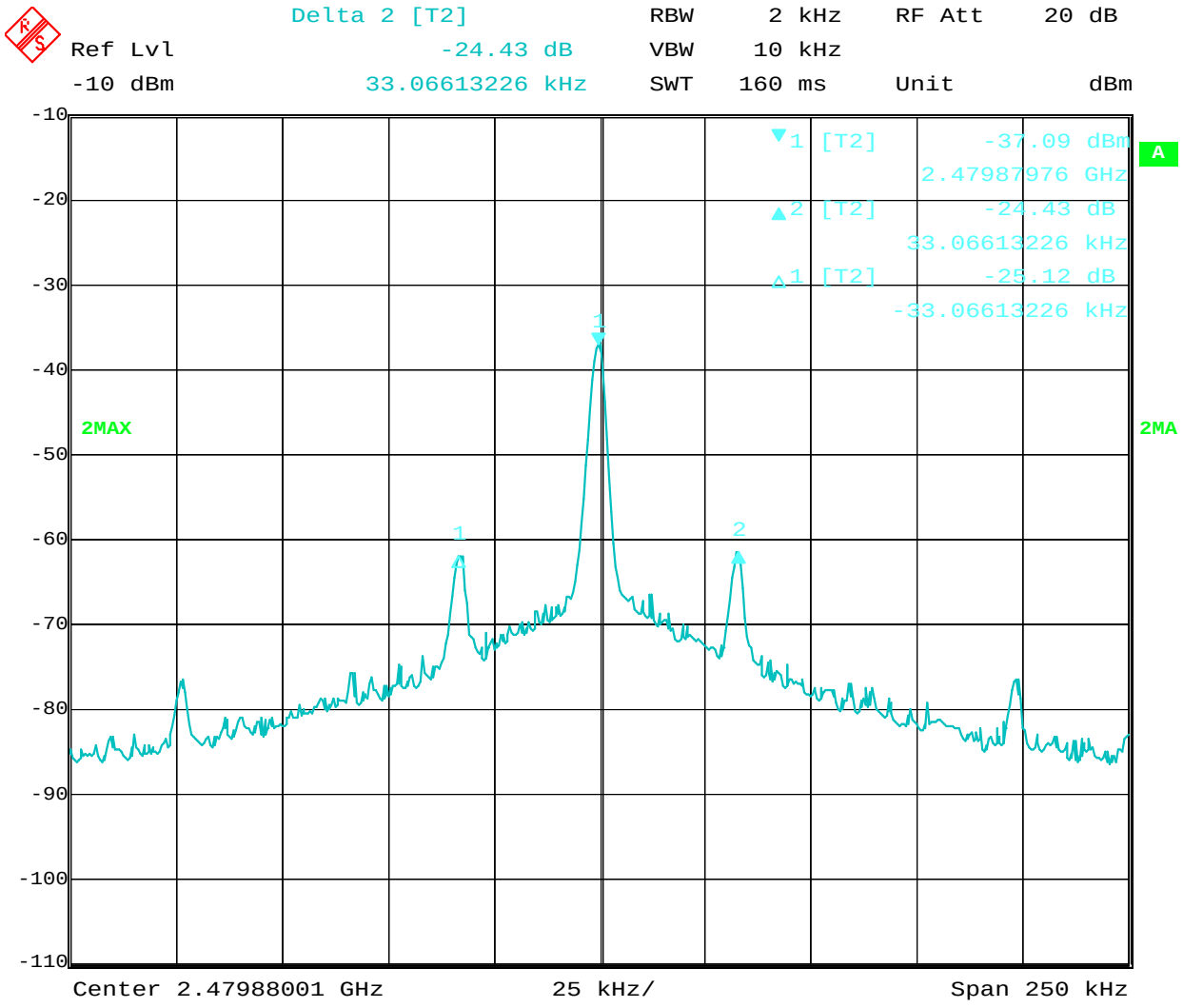
Device set to pi/4-DQPSK Modulation, Tx at CH39 - 2441 MHz, 20dB Bandwidth = 66.12 kHz



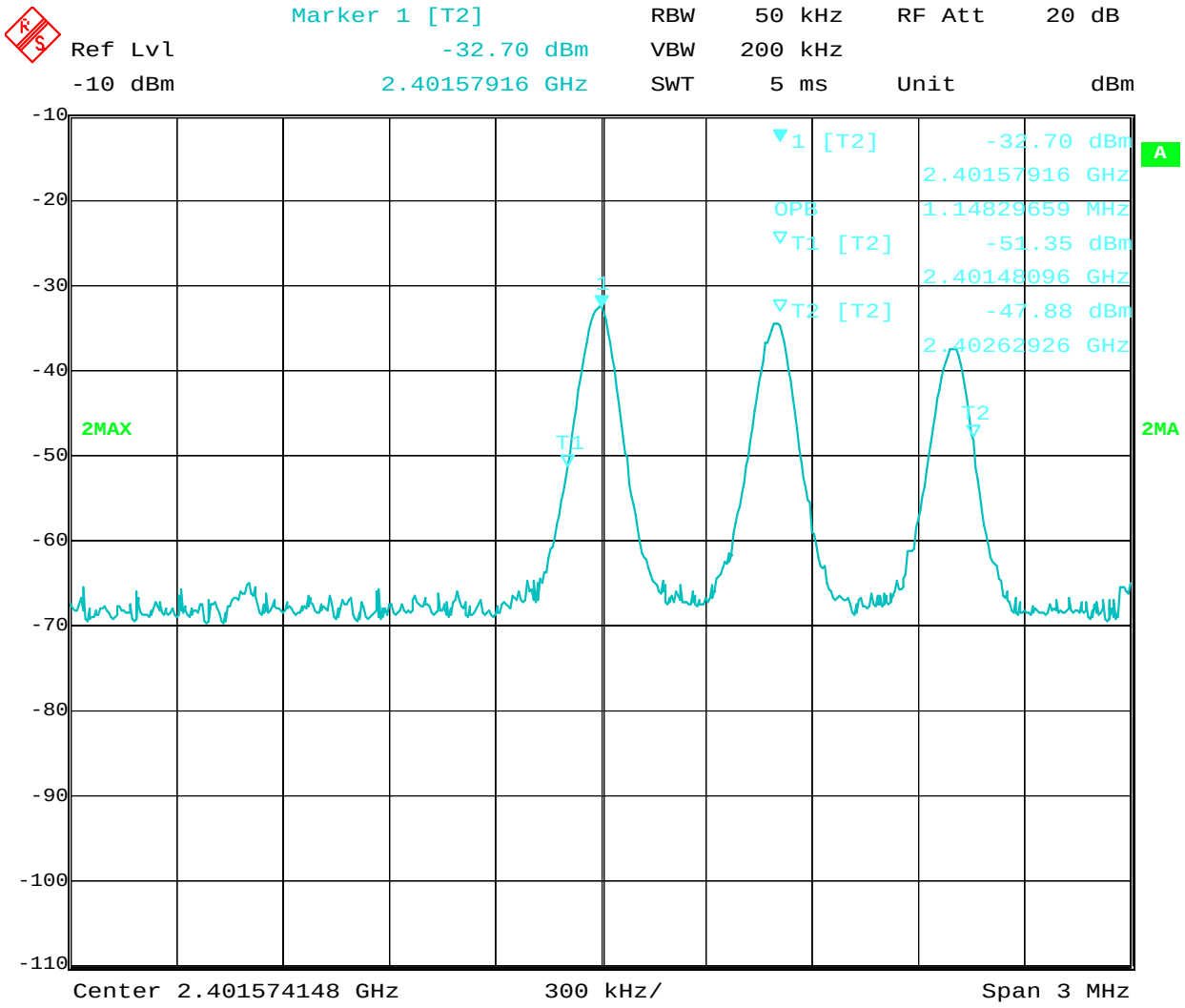
Device set to pi/4-DQPSK Modulation, Tx at CH78 - 2480 MHz, Occupied Bandwidth = 60.62 kHz



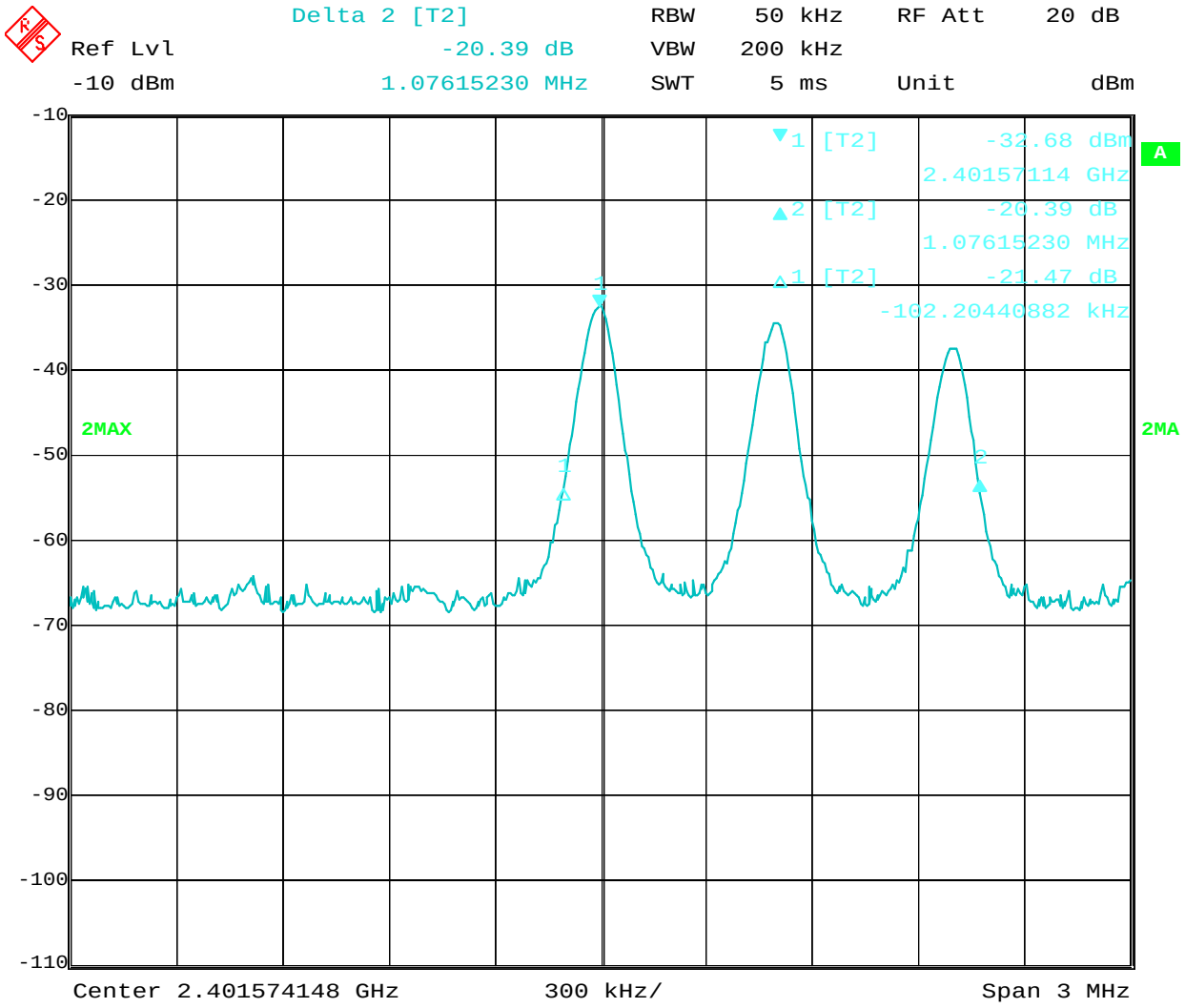
Device set to pi/4-DQPSK Modulation, Tx at CH78 - 2480 MHz, Occupied Bandwidth = 66.12 kHz



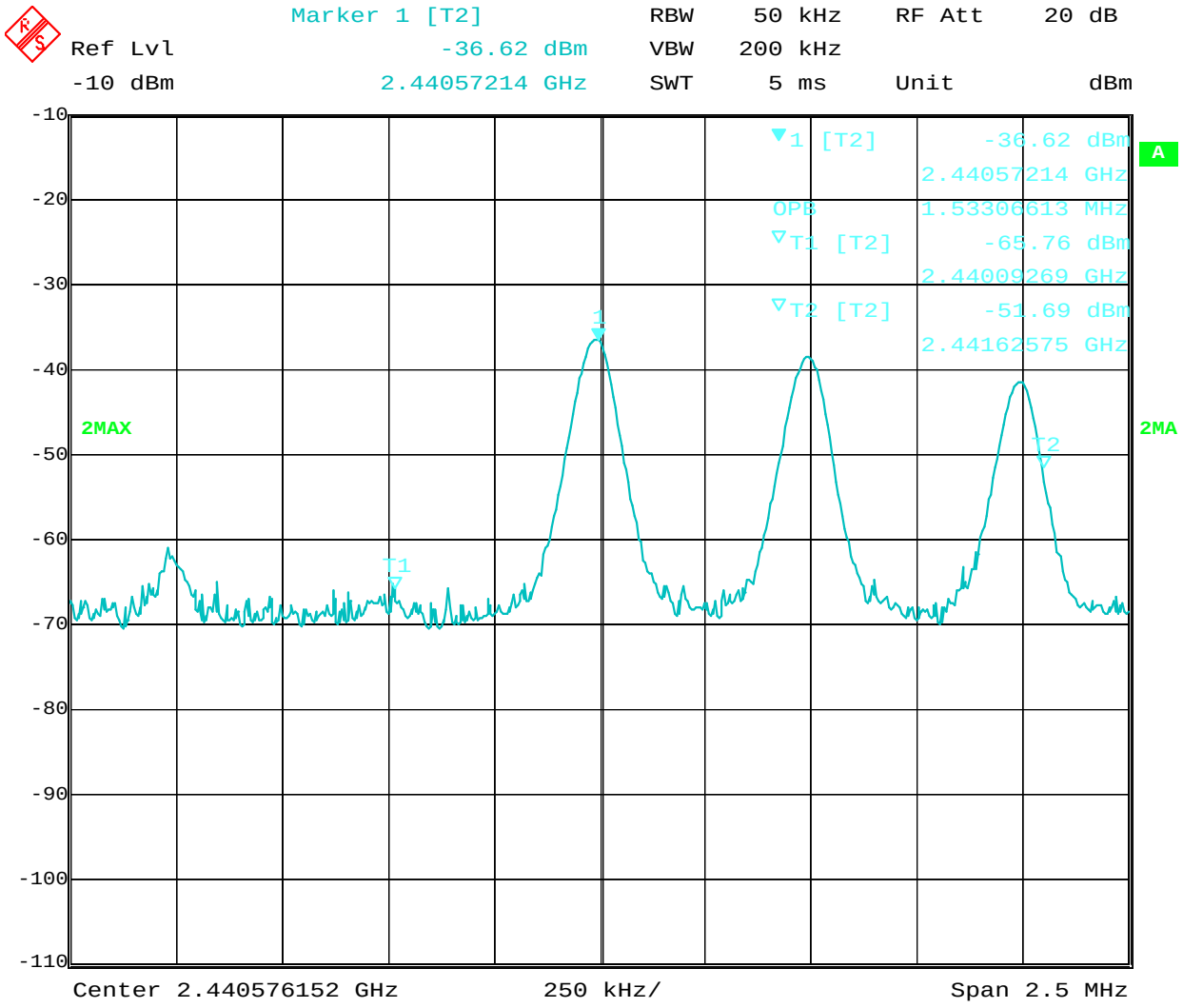
Device set to 8DPSK Modulation, Tx at CH0 - 2402 MHz, Occupied Bandwidth = 1.14 MHz



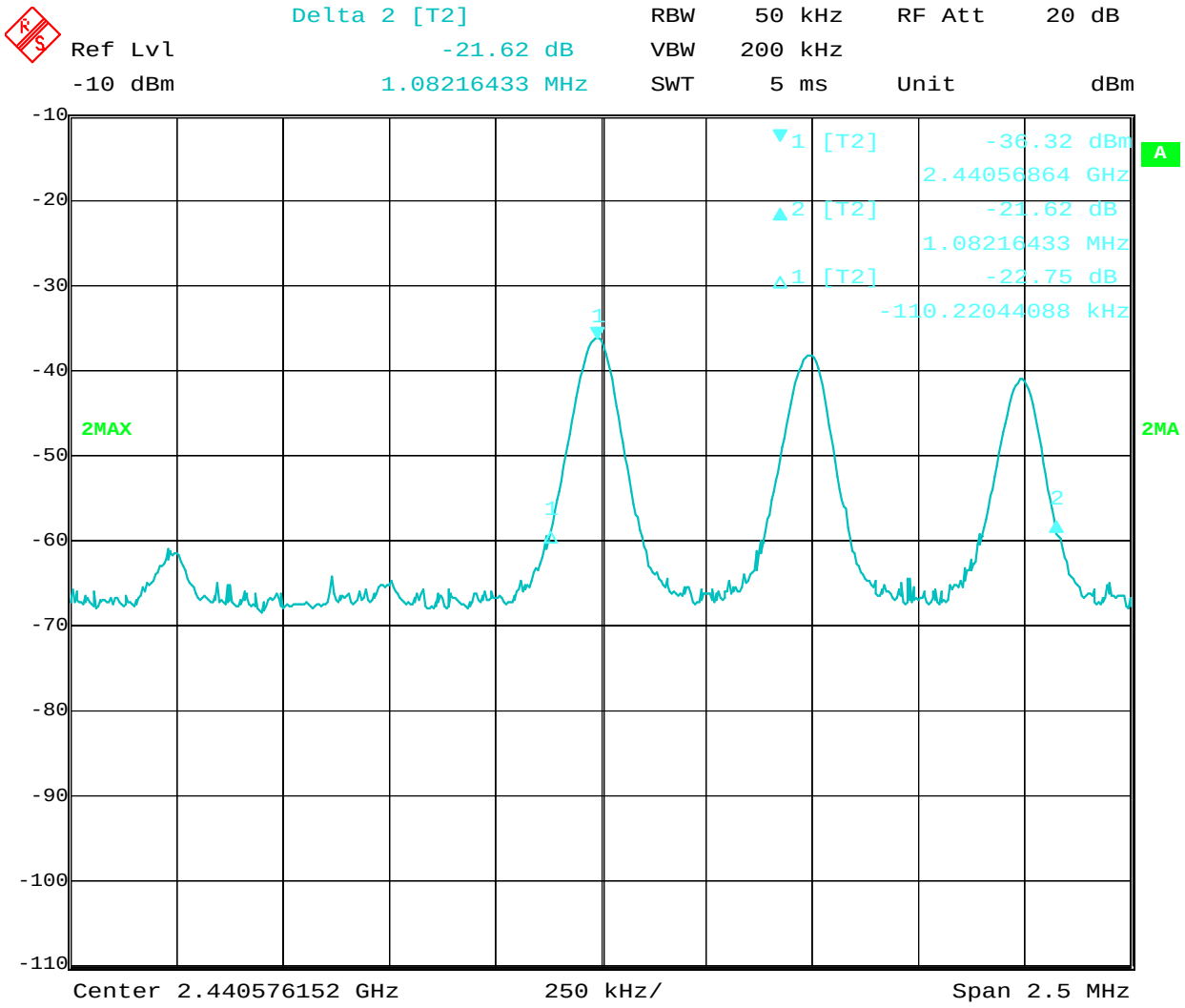
Device set to 8DPSK Modulation, Tx at CH0 - 2402 MHz, 20dB Bandwidth = 1.178 MHz



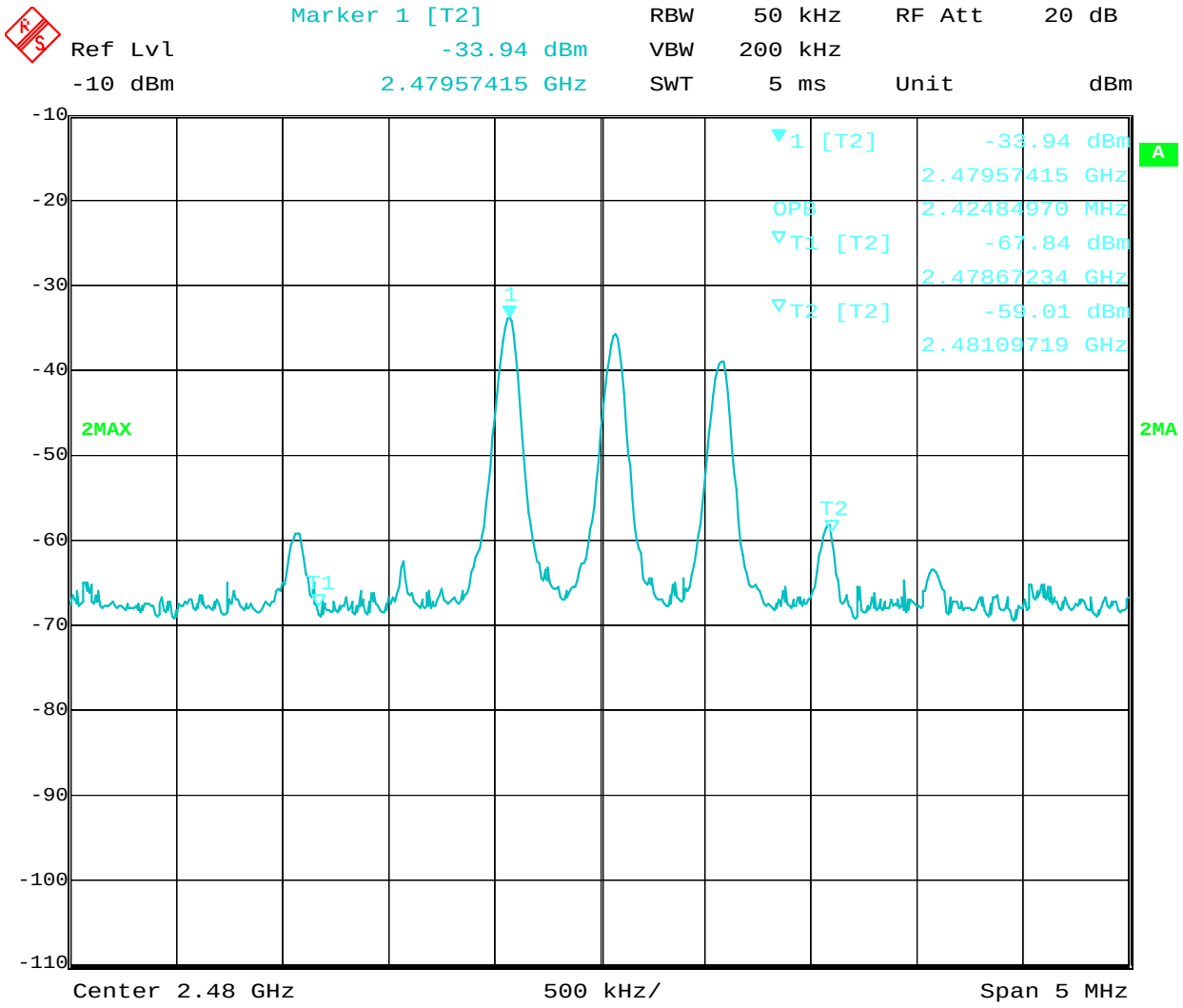
Device set to 8DPSK Modulation, Tx at CH39 - 2441 MHz, Occupied Bandwidth = 1.53 MHz



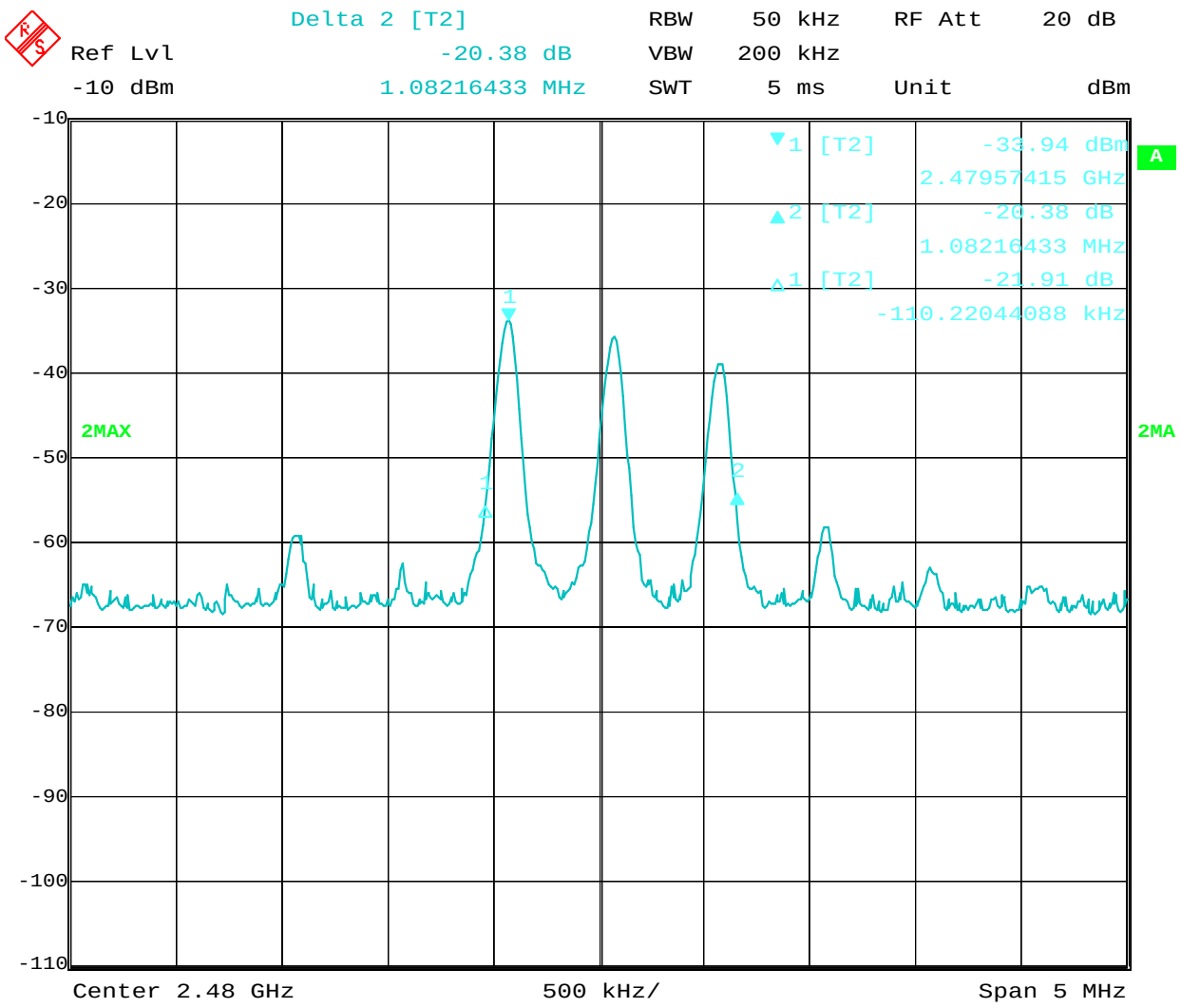
Device set to 8DPSK Modulation, Tx at CH39 - 2441 MHz, 20dB Bandwidth = 1.192 MHz



Device set to 8DPSK Modulation, Tx at CH78 - 2480 MHz, Occupied Bandwidth = 2.424 MHz



Device set to 8DPSK Modulation, Tx at CH78 - 2480 MHz, 20dB Bandwidth = 1.192 MHz



Test Personnel:	Naga Suryadevara NS	Test Date:	10/12/2016
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15 Subpart C (15.247) and RSS-247	Limit Applied:	Below specified limit
Input Voltage:	120VAC 60Hz	Ambient Temperature:	22 ºC
Pretest Verification:	Yes	Relative Humidity:	44 %
		Atmospheric Pressure:	1003 mbars

Deviations, Additions, or Exclusions: None

8 Channel Separation

8.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C (15.247) and RSS 247.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

8.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV001'	Weather Station	Davis Instruments	7400	PE80519A61	10/23/2015	10/23/2016
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	06/09/2016	06/09/2017
CBLHF2012-2M-1'	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252675001	02/09/2016	02/09/2017
HORN2'	HORN ANTENNA	EMCO	3115	9602-4675	02/18/2016	02/18/2017

Software Utilized:

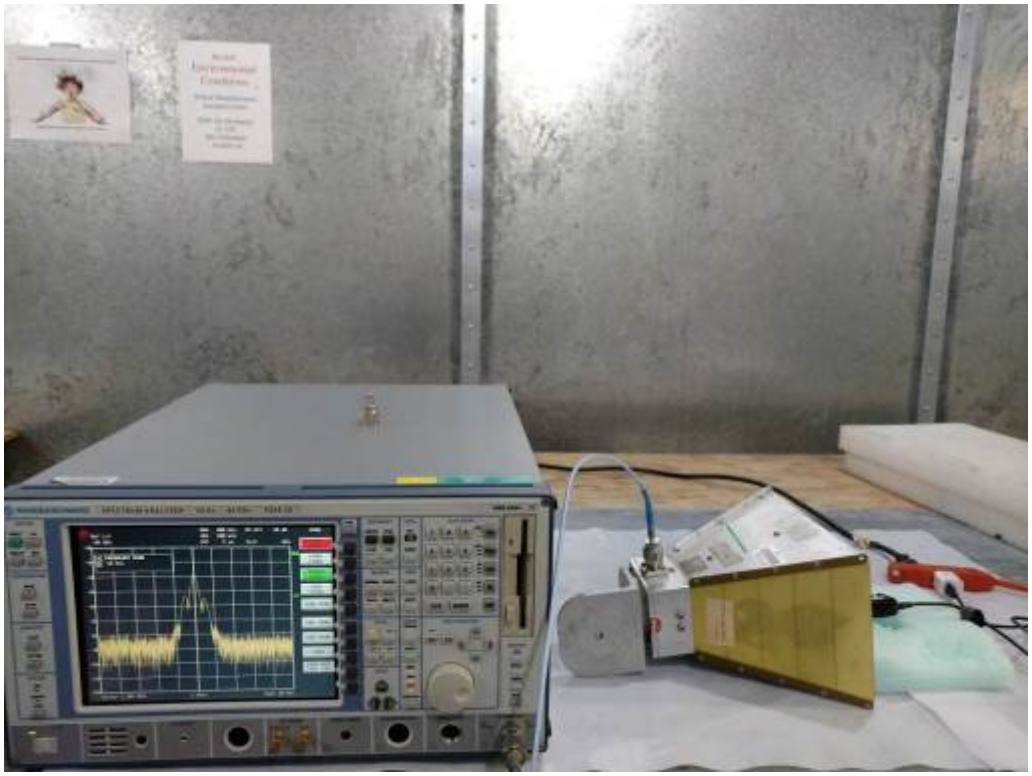
Name	Manufacturer	Version
None		

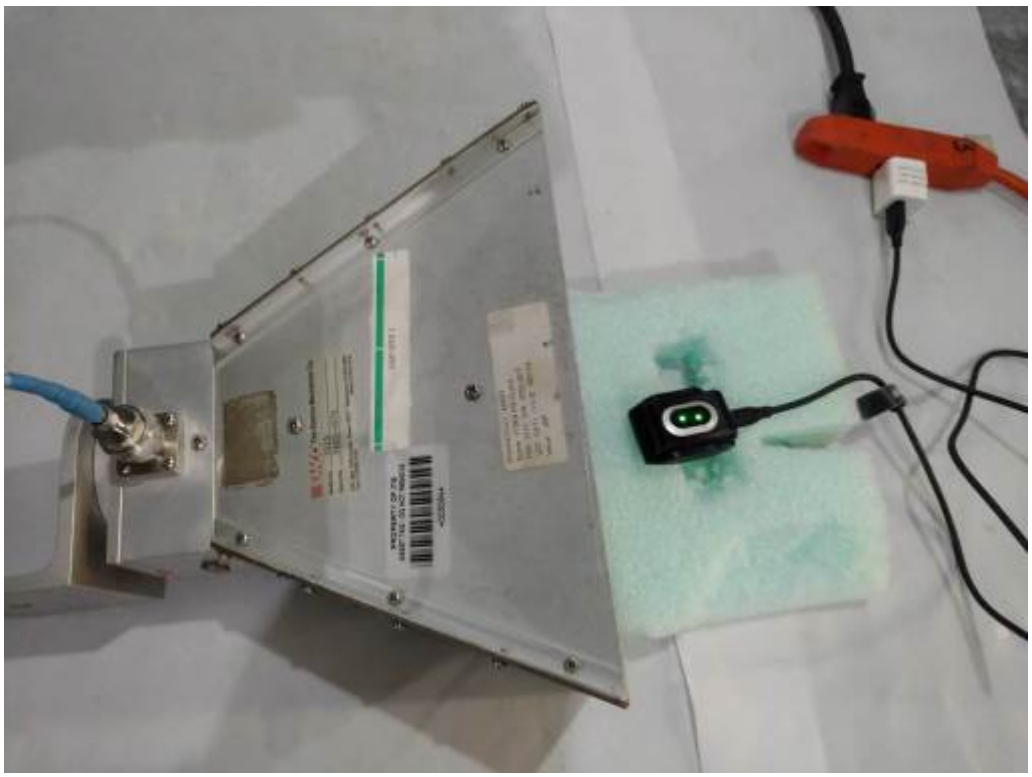
8.3 Results:

The sample tested was found to Comply. Systems shall have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20-dB bandwidth of the hopping channel, whichever is greater.

The measured channel frequency separation is 973.94 kHz which is greater than two thirds of 20dB band width (794.66 kHz)

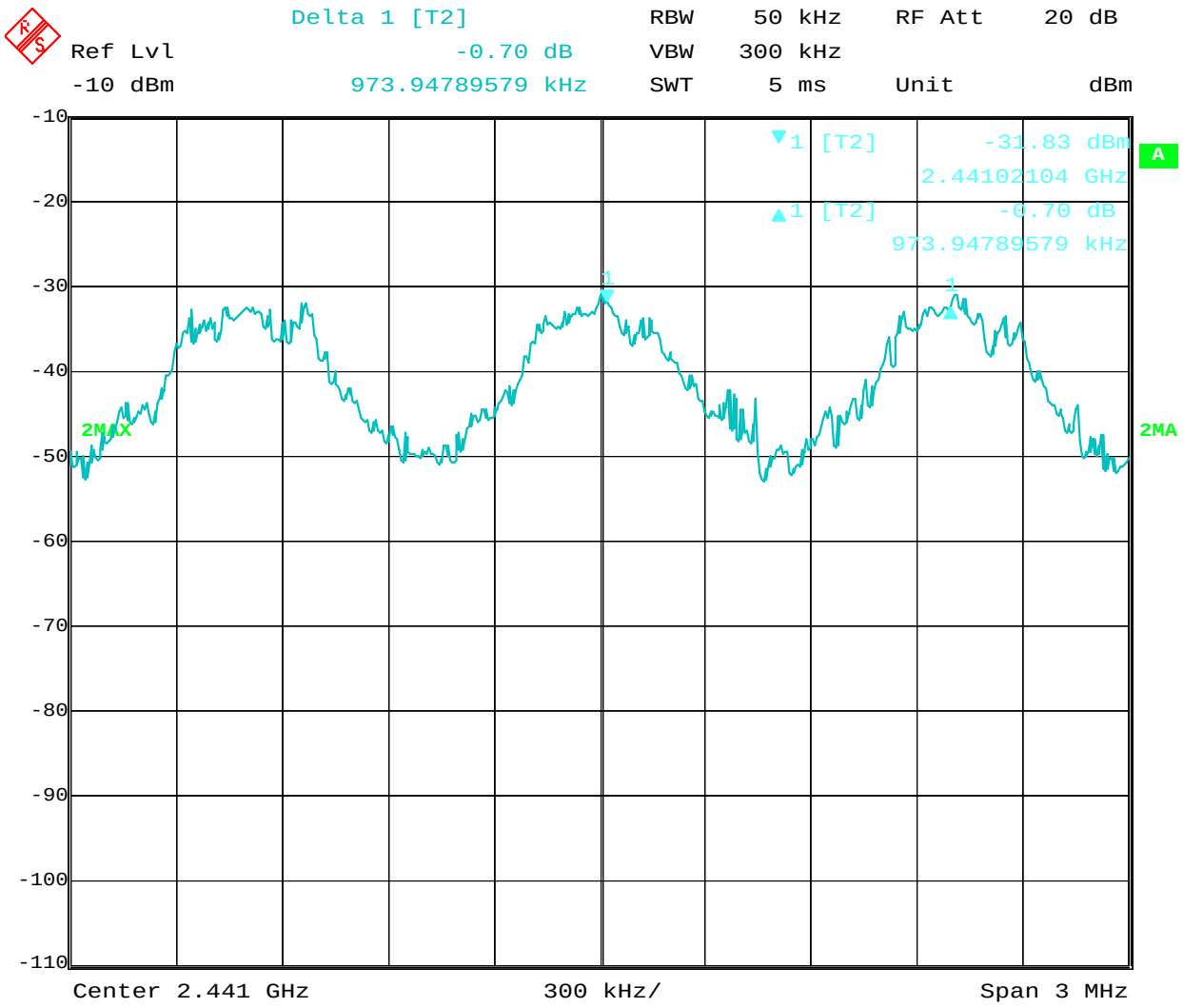
8.4 Setup Photographs:





8.5 Plots/Data:

Channel Frequency Separation



Test Personnel:	Naga Suryadevara NS	Test Date:	10/12/2016
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15 Subpart C (15.247) and RSS-247	Limit Applied:	Below Specified Limit
Input Voltage:	120VAC 60Hz		
		Ambient Temperature:	22 ºC
Pretest Verification:	Yes	Relative Humidity:	44 %
		Atmospheric Pressure:	1003 mbars

Deviations, Additions, or Exclusions: None

9 Number of Hopping Channels

9.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C (15.247) and RSS 247.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

9.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV001'	Weather Station	Davis Instruments	7400	PE80519A61	10/23/2015	10/23/2016
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	06/09/2016	06/09/2017
CBLHF2012-2M-1'	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252675001	02/09/2016	02/09/2017
HORN2'	HORN ANTENNA	EMCO	3115	9602-4675	02/18/2016	02/18/2017

Software Utilized:

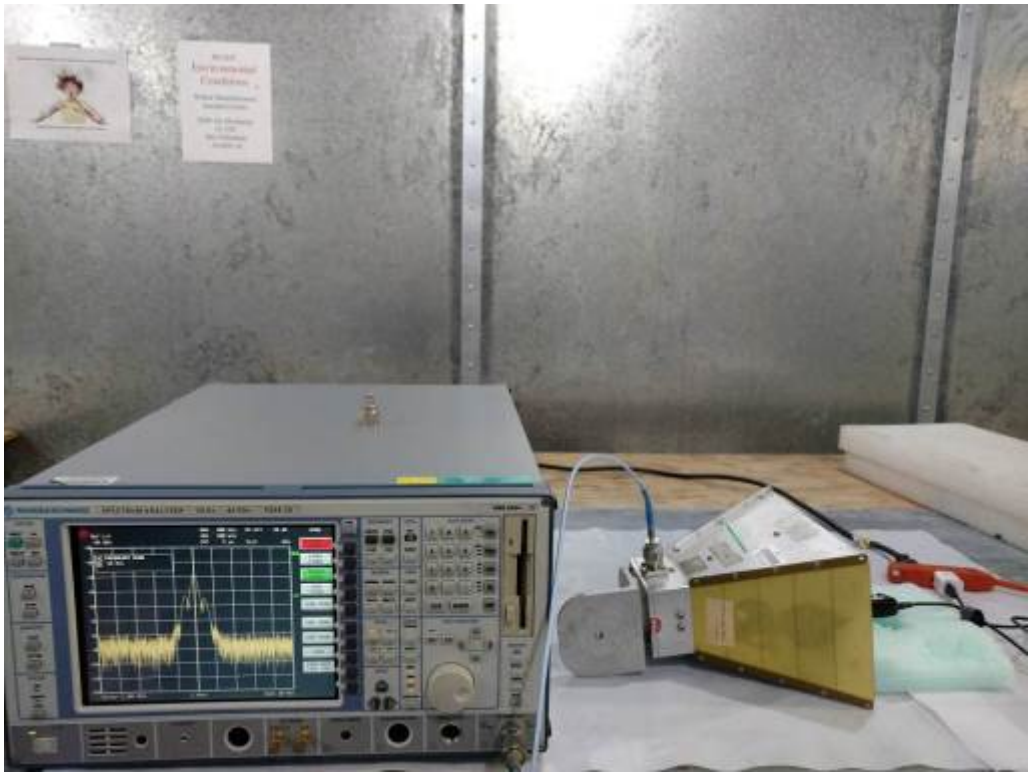
Name	Manufacturer	Version
None		

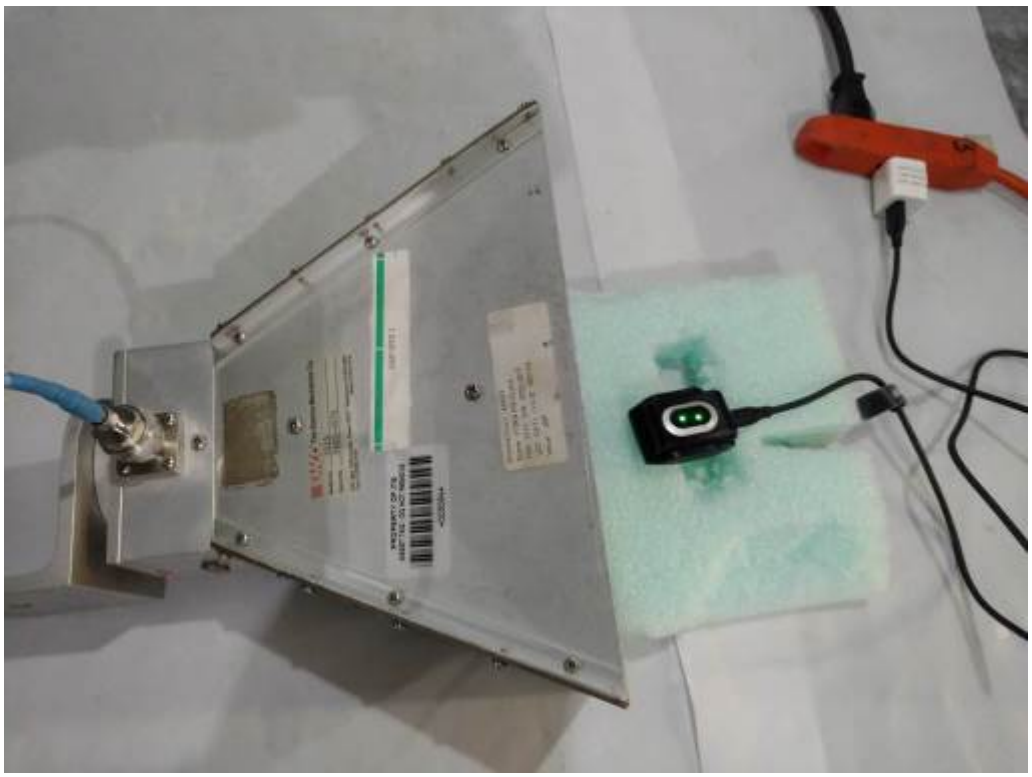
9.3 Results:

The sample tested was found to Comply. Systems operating in the 2400-2483.5 MHz band shall use at least 15 hopping channels.

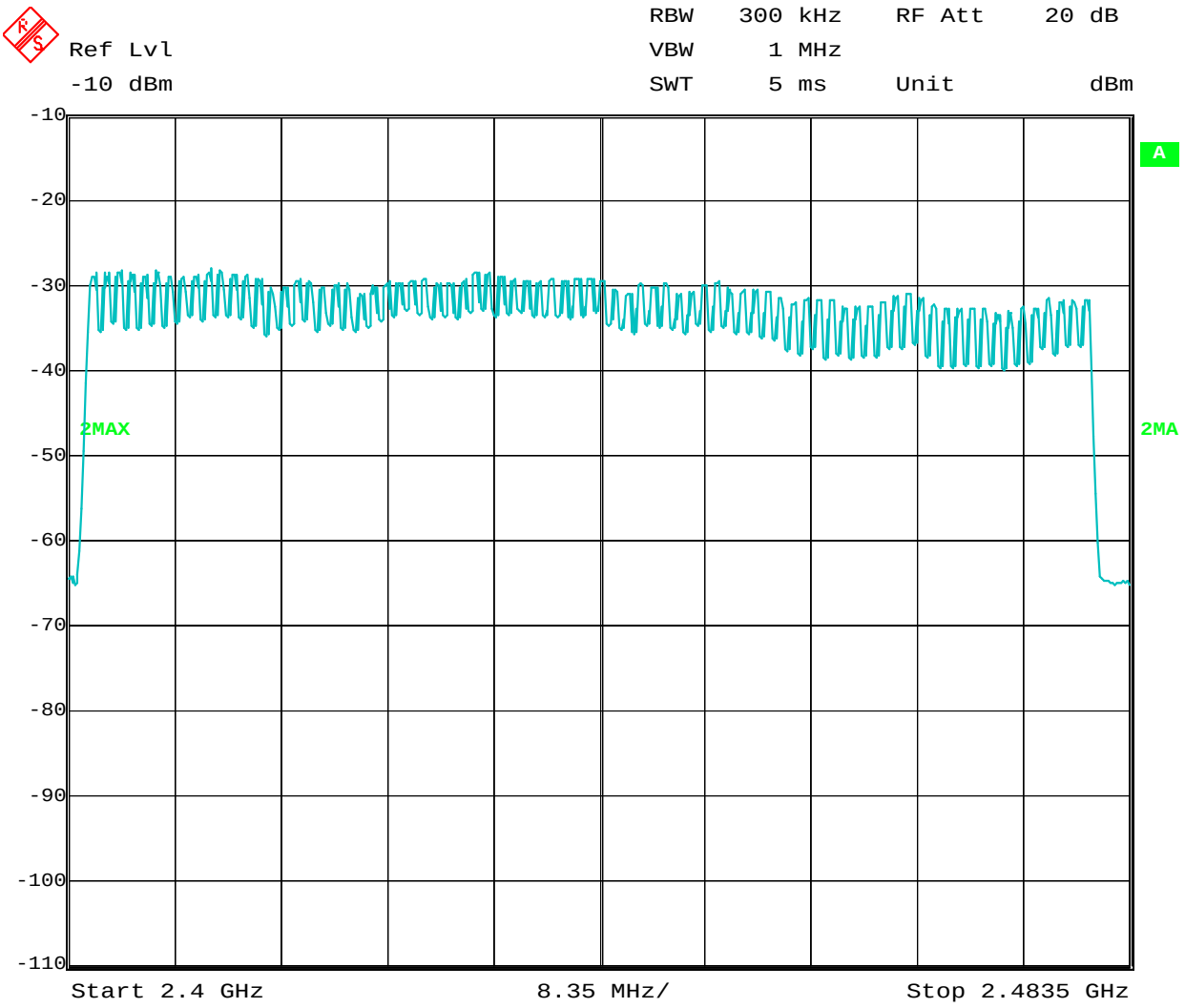
The System has 79 hopping channels.

9.4 Setup Photographs:





9.5 Plots/Data:



Test Personnel:	Naga Suryadevara NS	Test Date:	10/12/2016
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15 Subpart C (15.247) and RSS-247	Limit Applied:	Below Specified Limit
Input Voltage:	120VAC 60Hz		
		Ambient Temperature:	22 ºC
Pretest Verification:	Yes	Relative Humidity:	44 %
		Atmospheric Pressure:	1003 mbars

Deviations, Additions, or Exclusions: None

10 Average Channel Occupancy Time

10.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C (15.247) and RSS 247.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

10.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV001'	Weather Station	Davis Instruments	7400	PE80519A61	10/23/2015	10/23/2016
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	06/09/2016	06/09/2017
CBLHF2012-2M-1'	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252675001	02/09/2016	02/09/2017
HORN2'	HORN ANTENNA	EMCO	3115	9602-4675	02/18/2016	02/18/2017

Software Utilized:

Name	Manufacturer	Version
None		

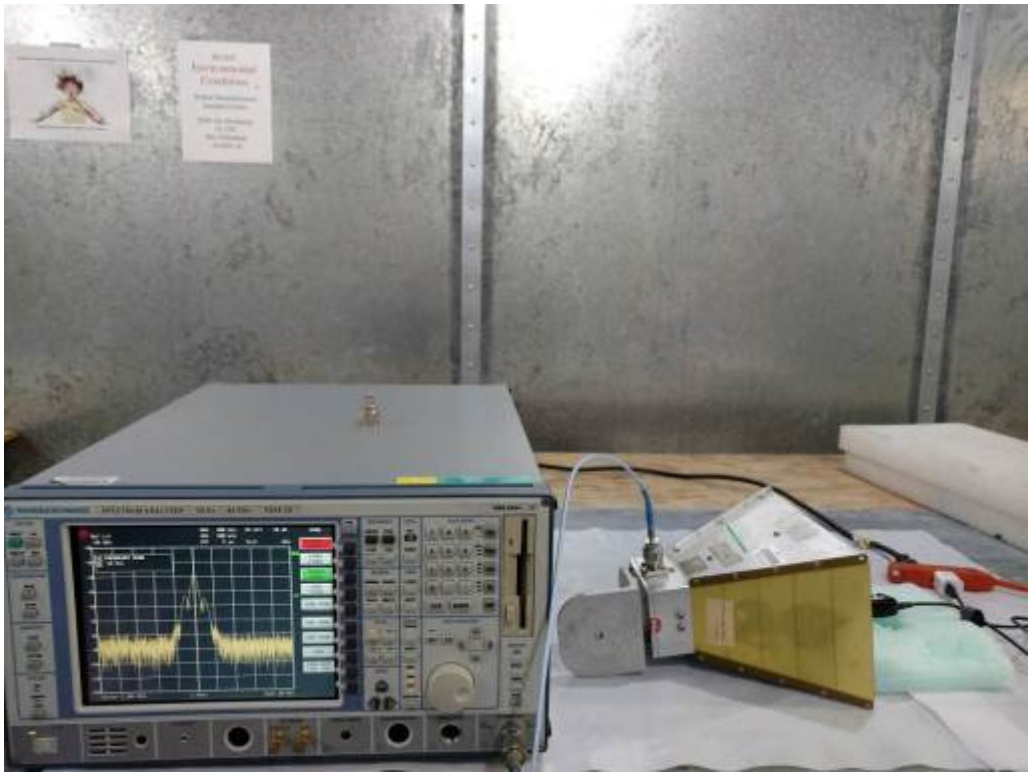
10.3 Results:

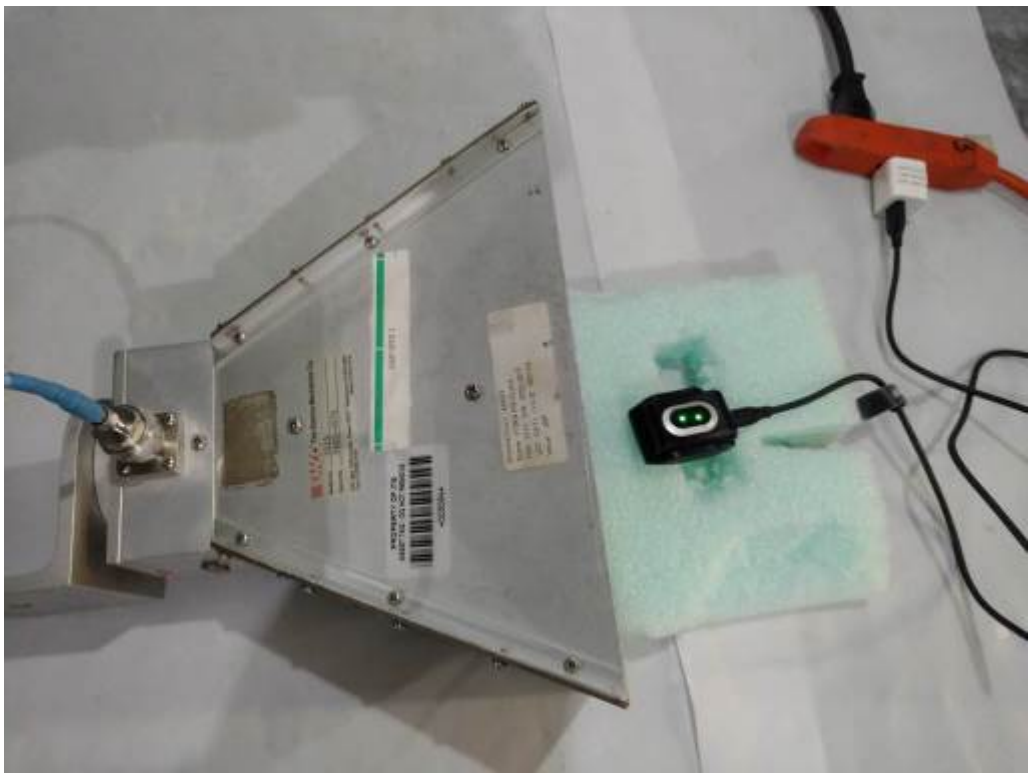
The sample tested was found to Comply. For systems operating in the 2400-2483.5 MHz band, the average time of occupancy on any channel shall not be greater than 0.4 second within a period of 0.4 second multiplied by the number of hopping channels employed

Since the radio employs 79 channels, Occupancy time was calculated during the period of 0.4 * 79 = 31.6 sec.

GFSK Occupancy Time @ Low speed = 0.000381 * 32 *(31.6/3.2) = 0.12192 sec
GFSK Occupancy Time @ High speed = 0.000381 * 32 *(31.6/3.2) = 0.12192 sec
Pi/4-DQPSK Occupancy Time @ Low speed = 0.000380 * 32 *10 = 0.12192 sec
Pi/4-DQPSK Occupancy Time @ High speed = 0.00286*29*(31.6/8) = 0.327613 sec
8DPSK Occupancy time @ Low speed = 0.000381*32*(31.6/3.2) = 0.12192 sec
8DPSK Occupancy time @ High speed = 0.002905812*34*(31.6/8) = 0.390254 sec

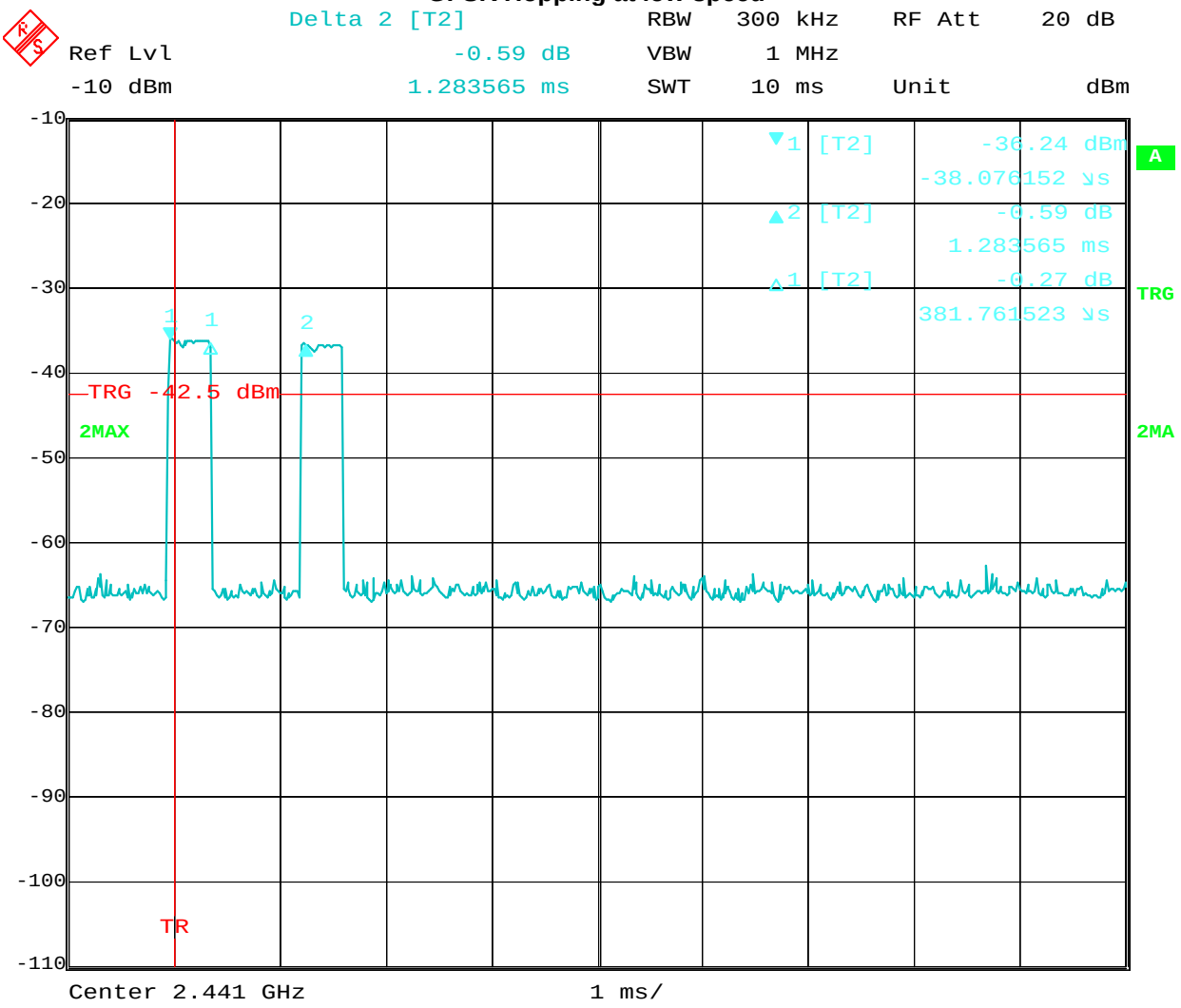
10.4 Setup Photographs:



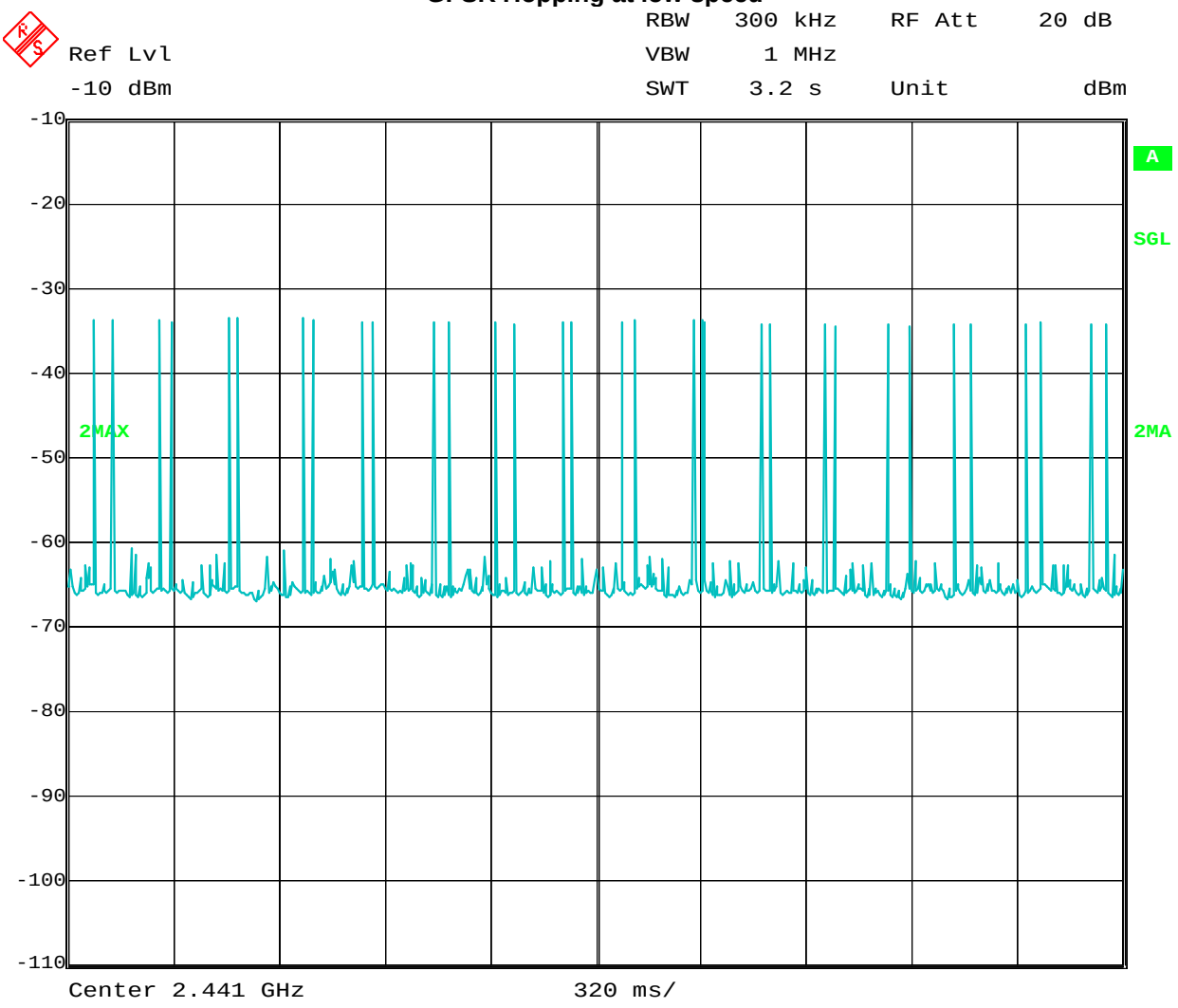


10.5 Plots/Data:

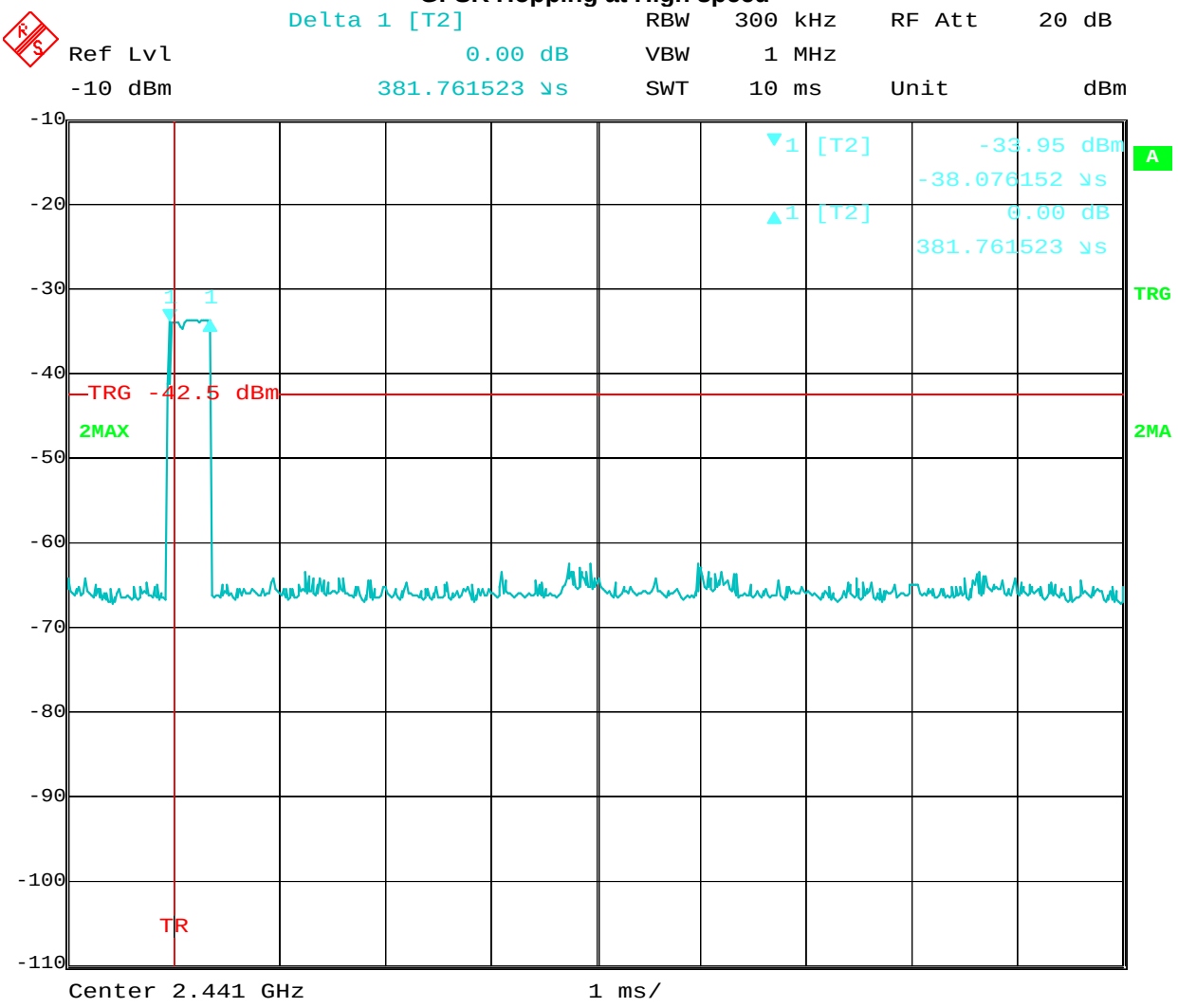
GFSK Hopping at low speed



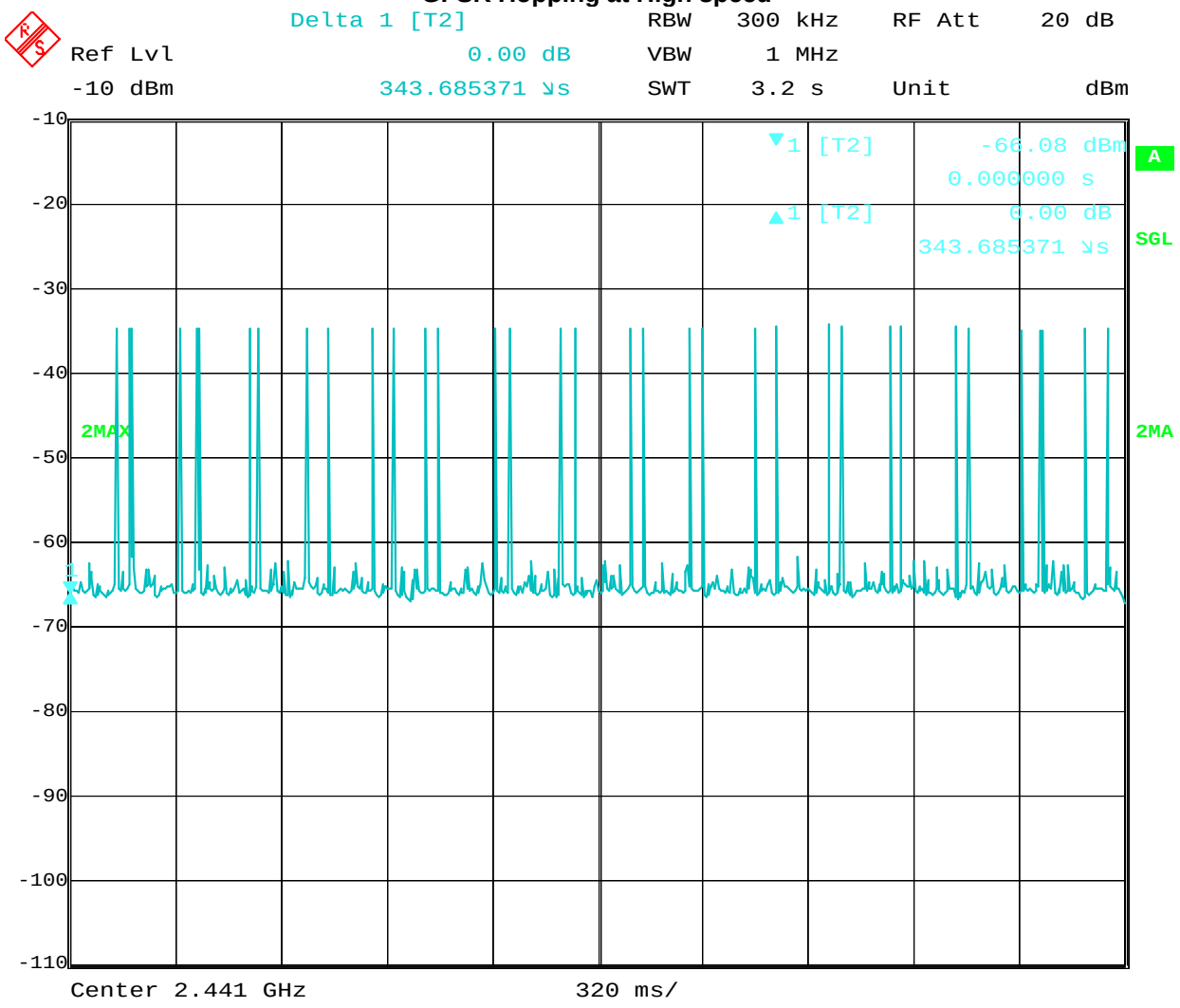
GFSK Hopping at low speed



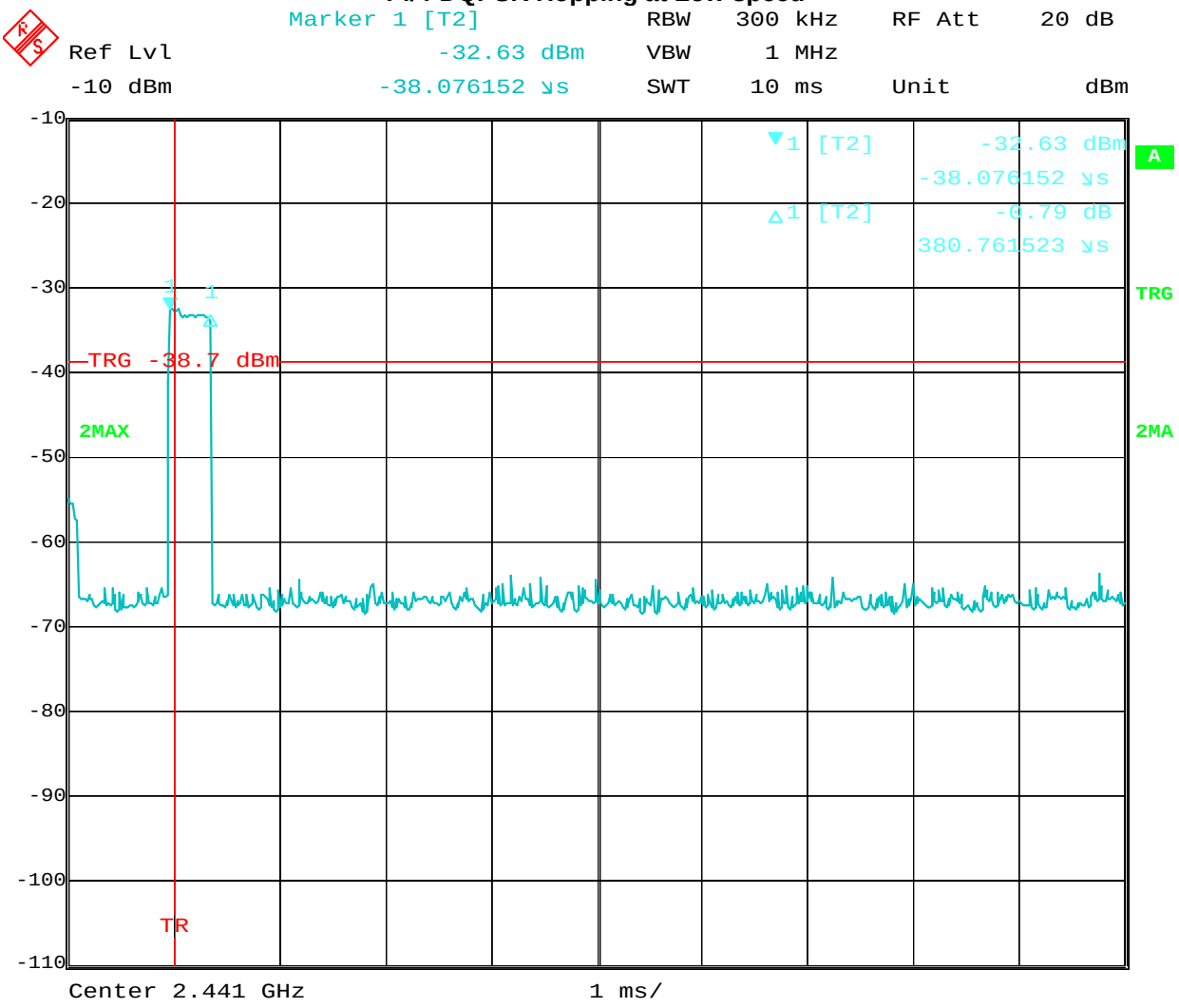
GFSK Hopping at High speed



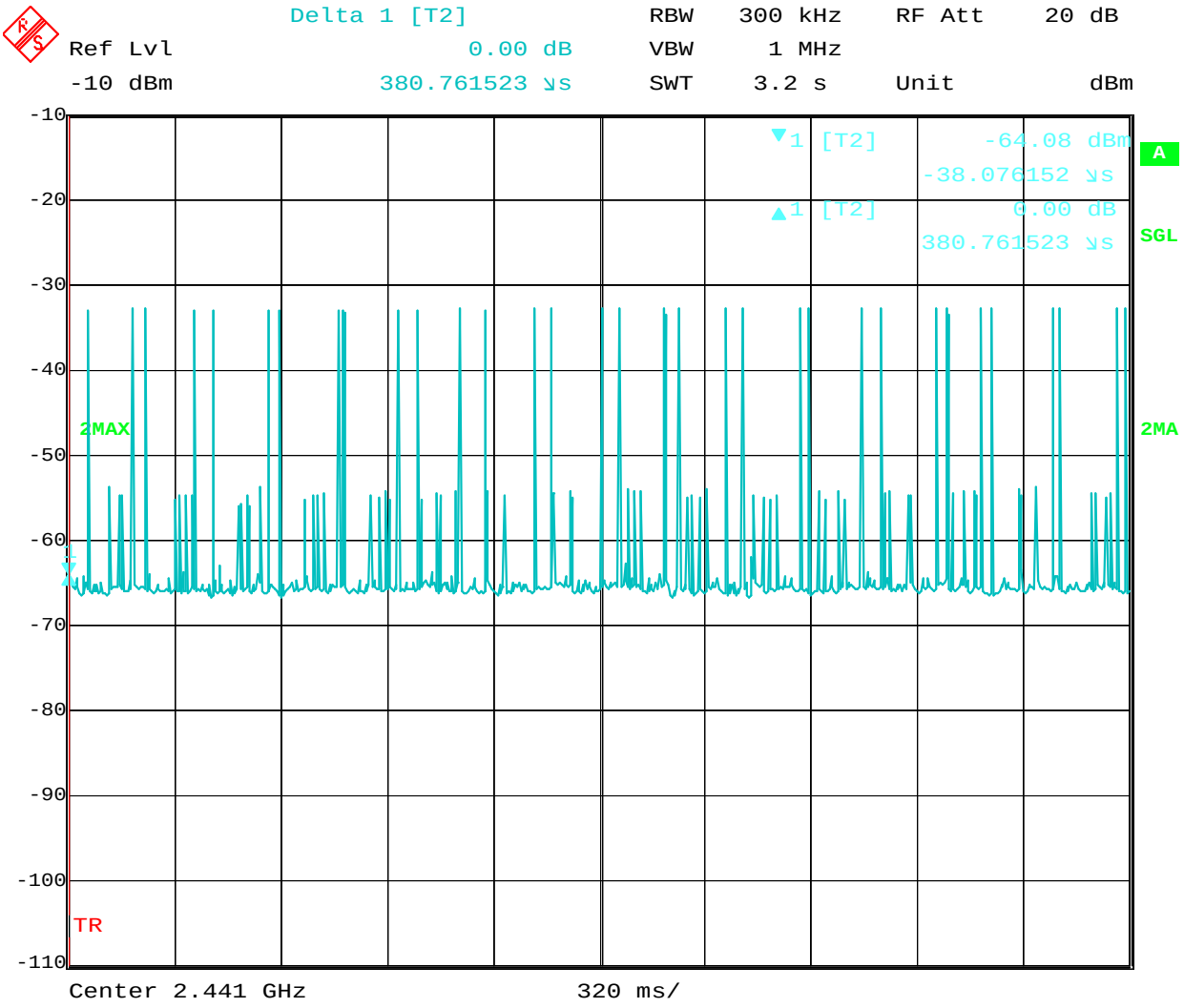
GFSK Hopping at High speed



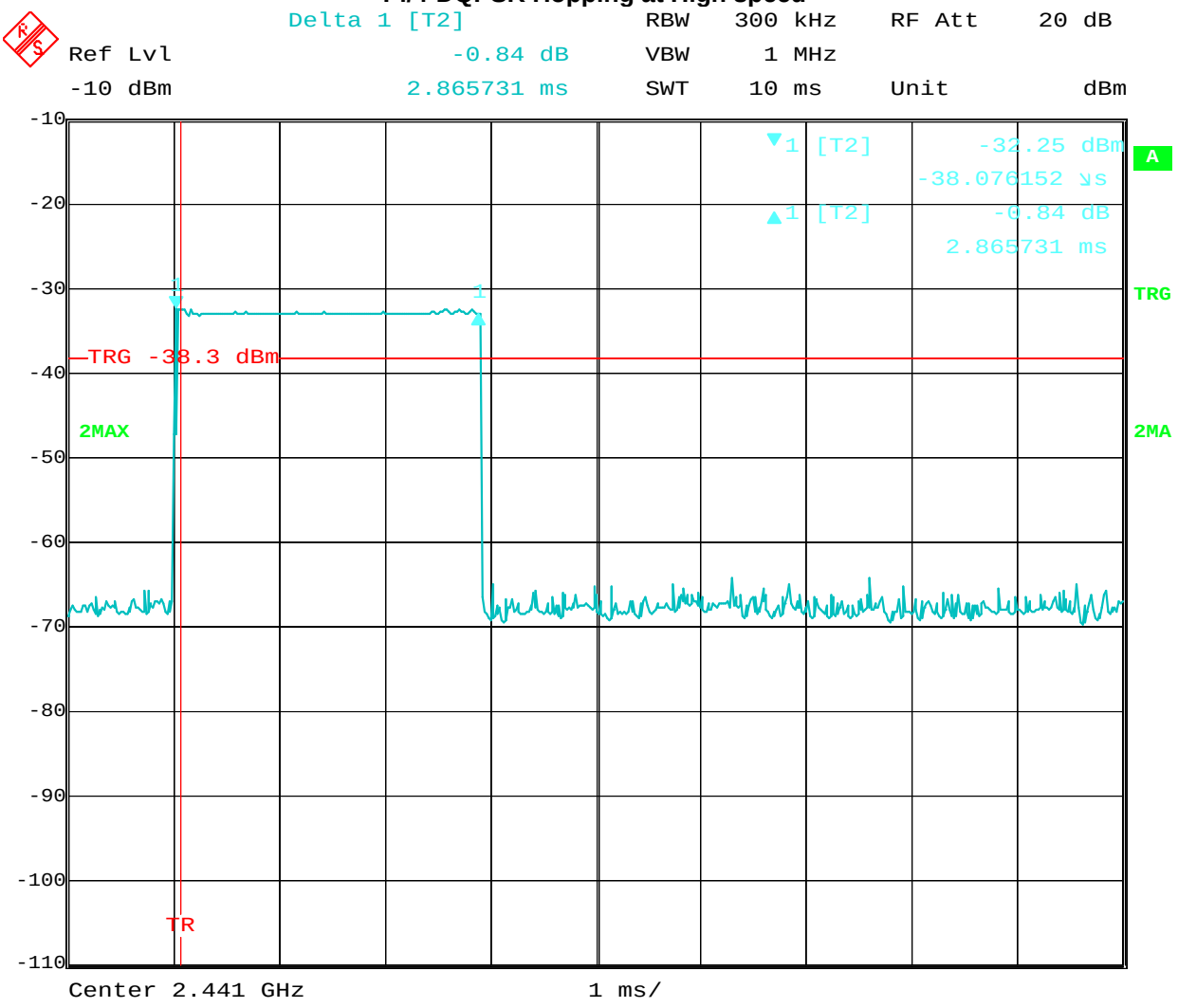
Pi/4-DQPSK Hopping at Low speed



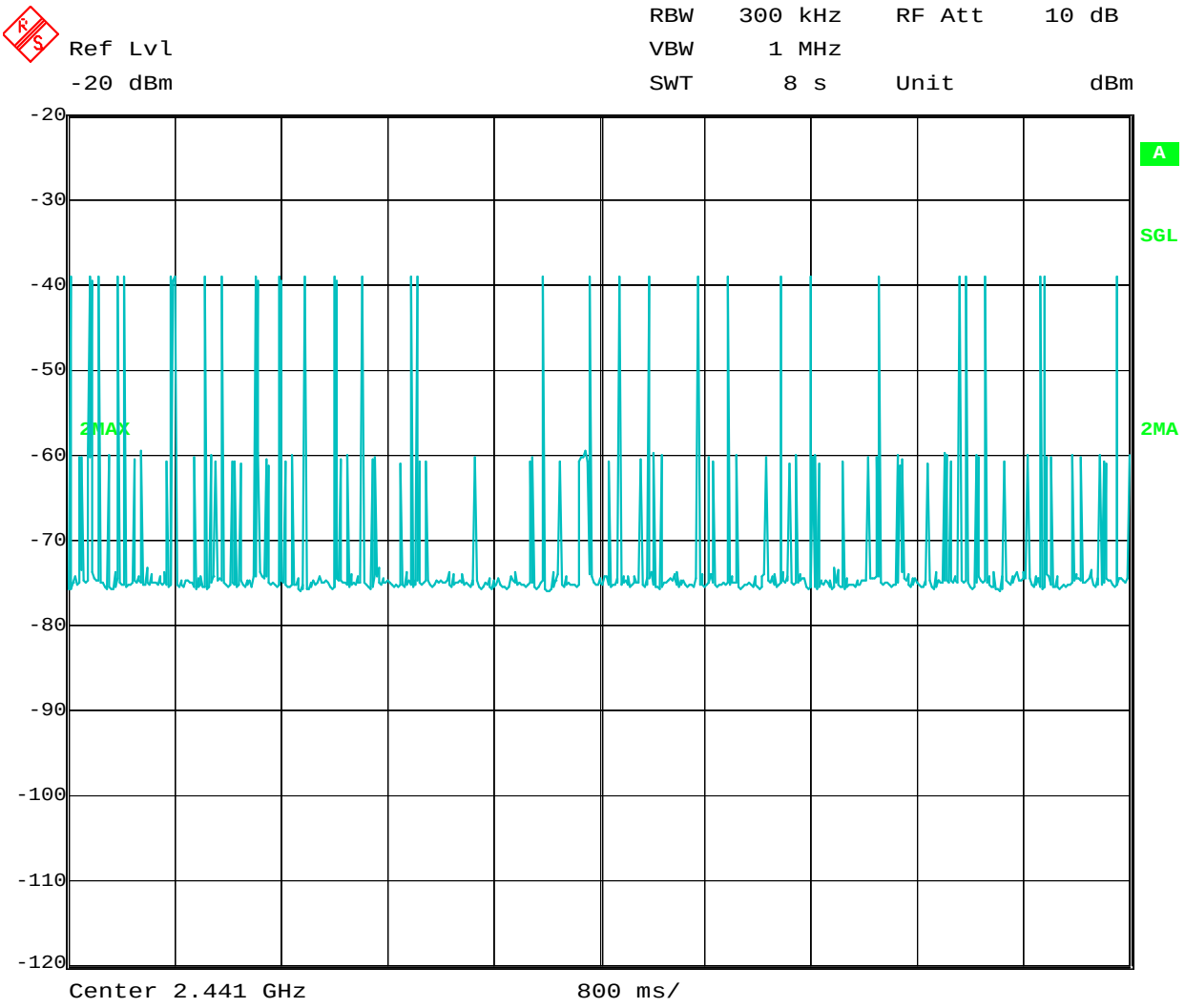
Pi/4-DQPSK Hopping at Low speed



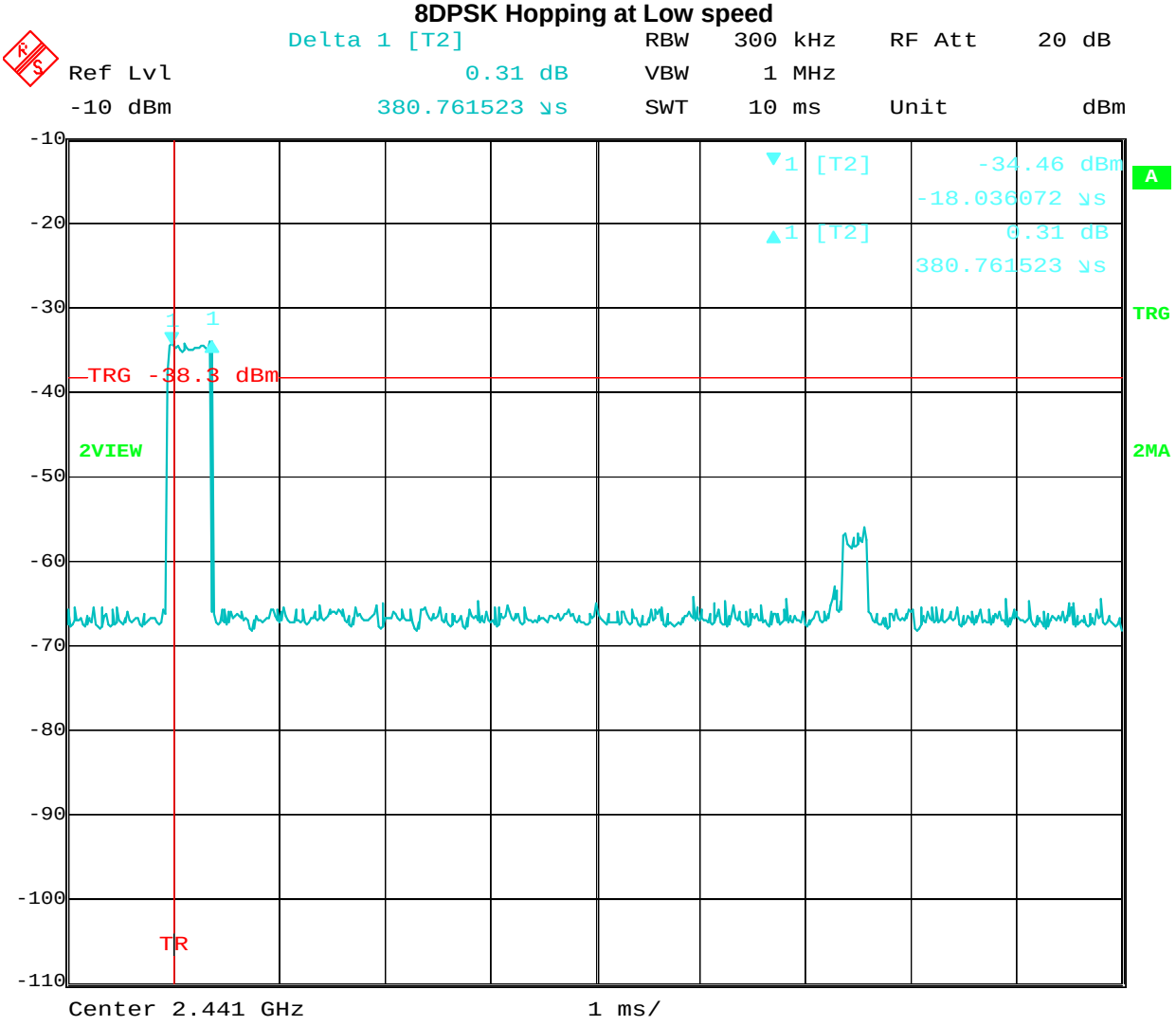
Pi/4-DQPSK Hopping at High speed



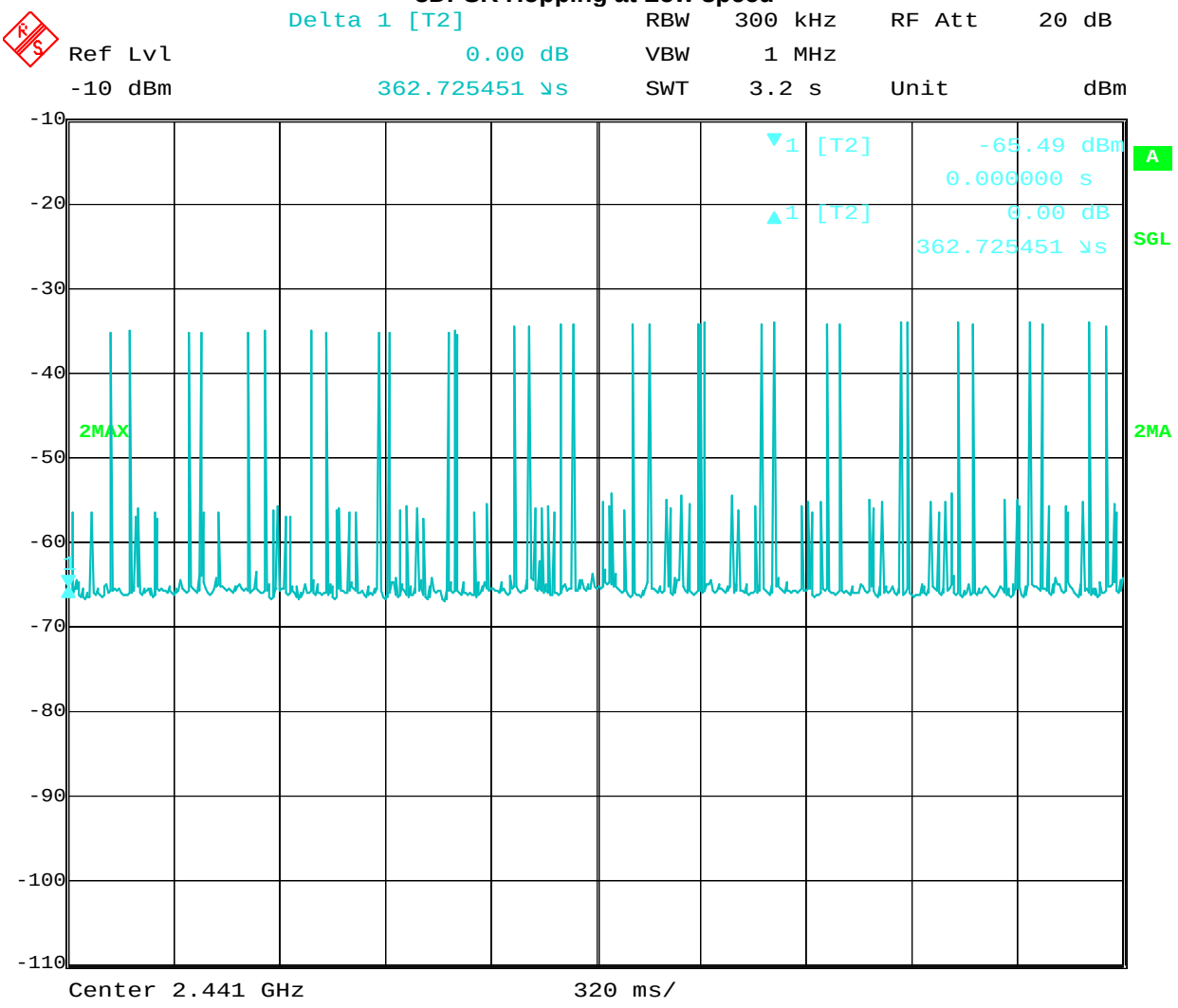
Pi/4-DQPSK Hopping at High speed



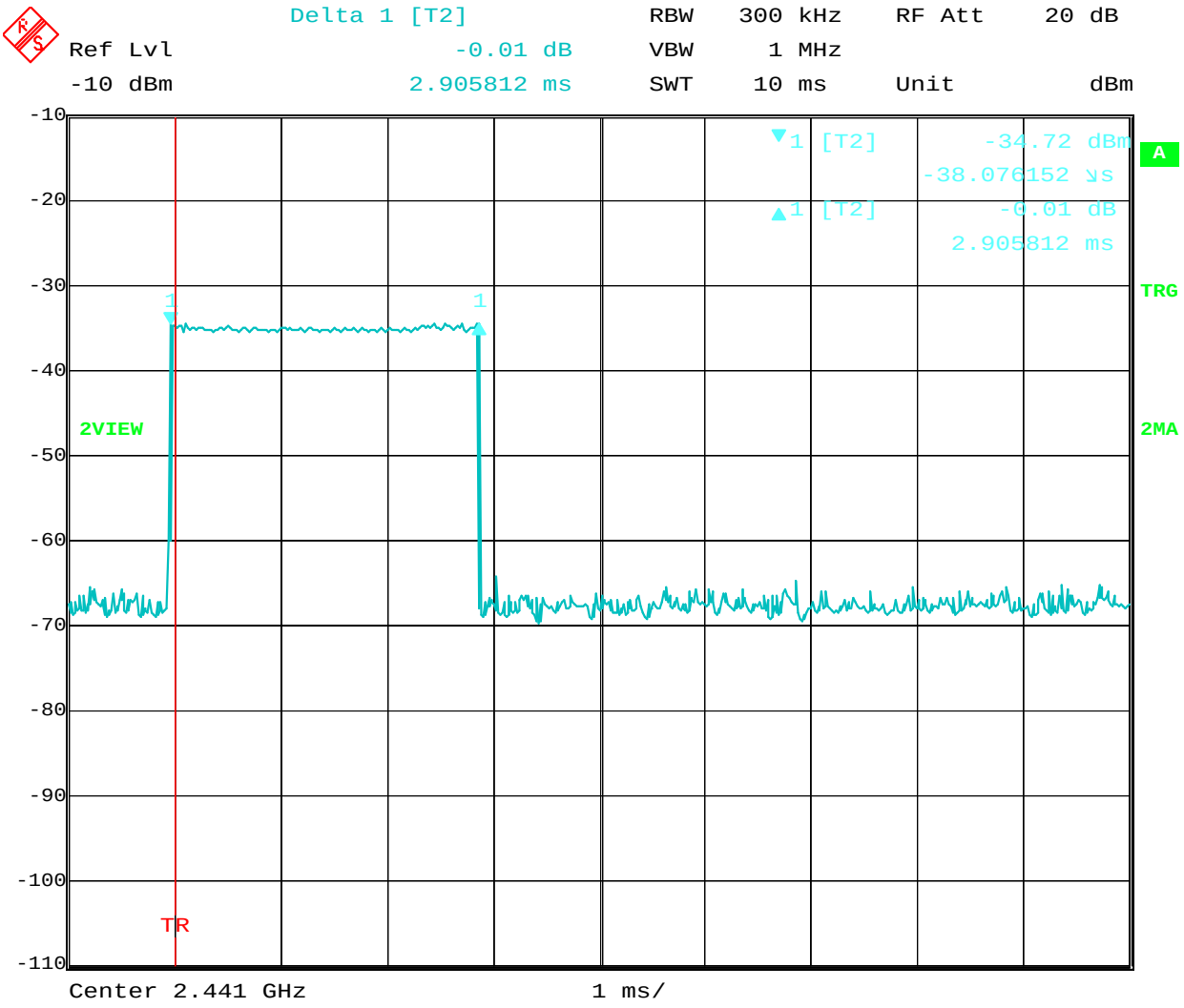
8DPSK Hopping at Low speed



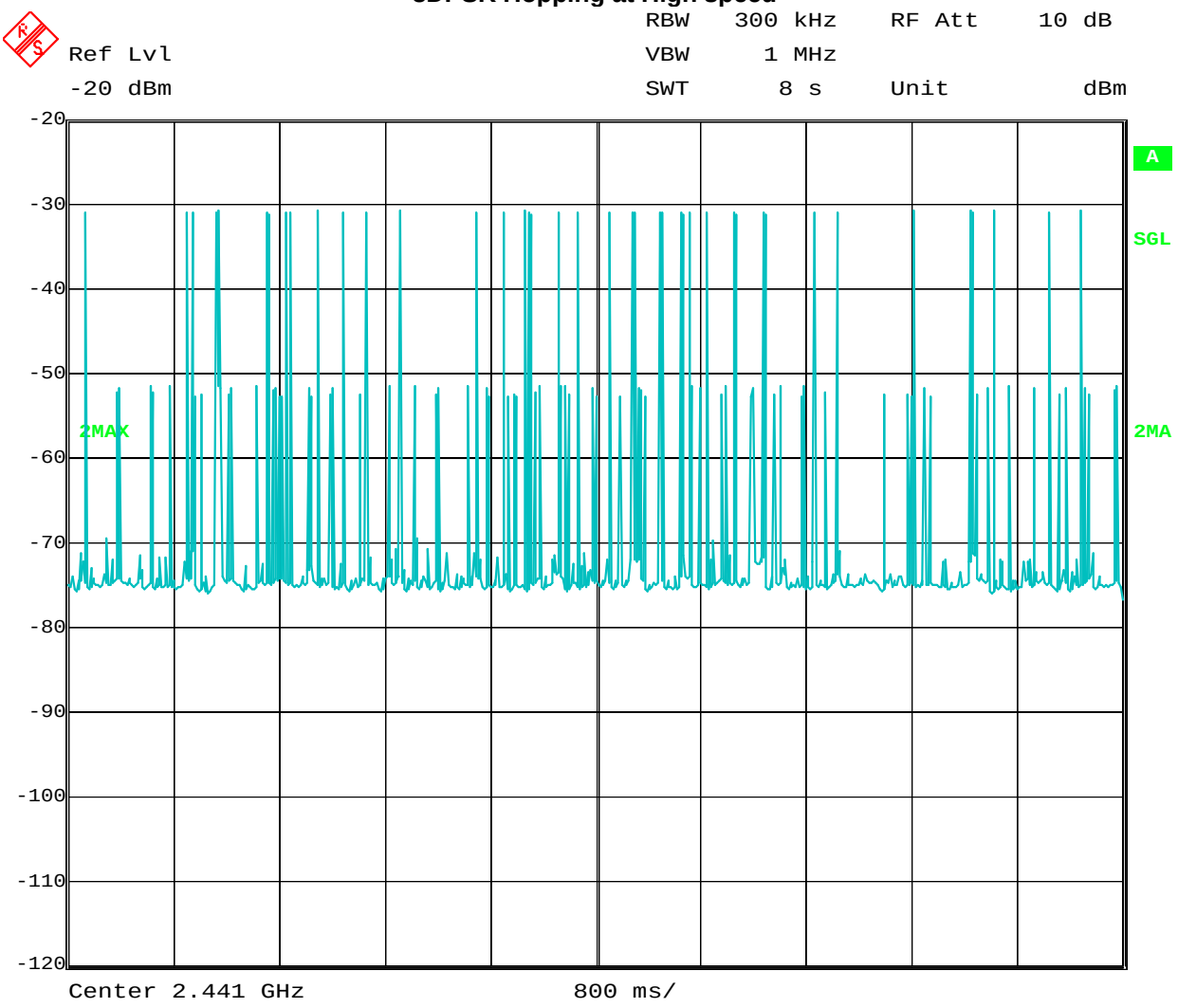
8DPSK Hopping at Low speed



8DPSK Hopping at High speed



8DPSK Hopping at High speed



Test Personnel:	Naga Suryadevara NS	Test Date:	10/12/2016
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15 Subpart C (15.247) and RSS-247	Limit Applied:	Below Specified Limit
Input Voltage:	120VAC 60Hz		
		Ambient Temperature:	22 ºC
Pretest Verification:	Yes	Relative Humidity:	44 %
		Atmospheric Pressure:	1003 mbars

Deviations, Additions, or Exclusions: None

11 Band Edge Compliance

11.1 Method

Tests are performed in accordance with CFR47 FCC Part 15 Subpart C (15.247), RSS-247 Issue 1 May 2016 and ANSI C 63.10.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	4.6 dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	5.3 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.5 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	5.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	5.0 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	5.0 dB	- dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample 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
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

11.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61 A	05/02/2016	05/02/2017
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/10/2016	03/10/2017
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	02/10/2016	02/10/2017
145014'	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	05/27/2016	05/27/2017
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	07/30/2016	07/30/2017

Software Utilized:

Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

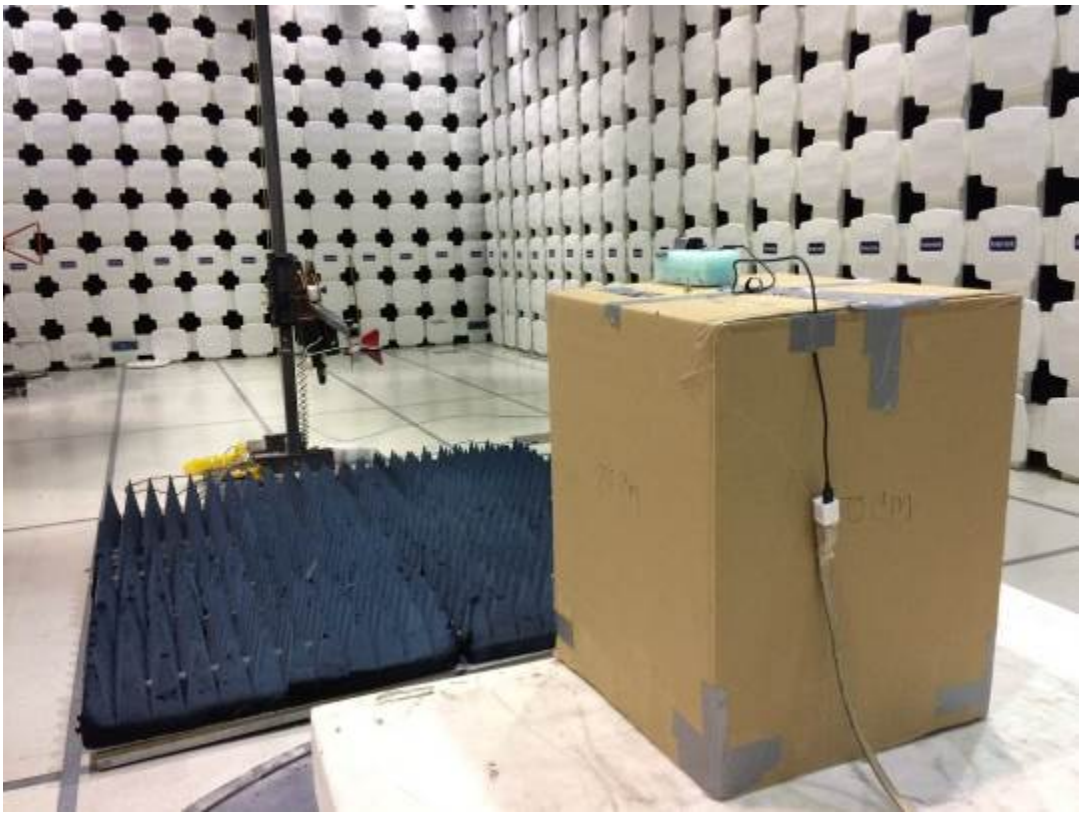
Note: Your Laptop may use a different version of Excel. Record the version you actually used!

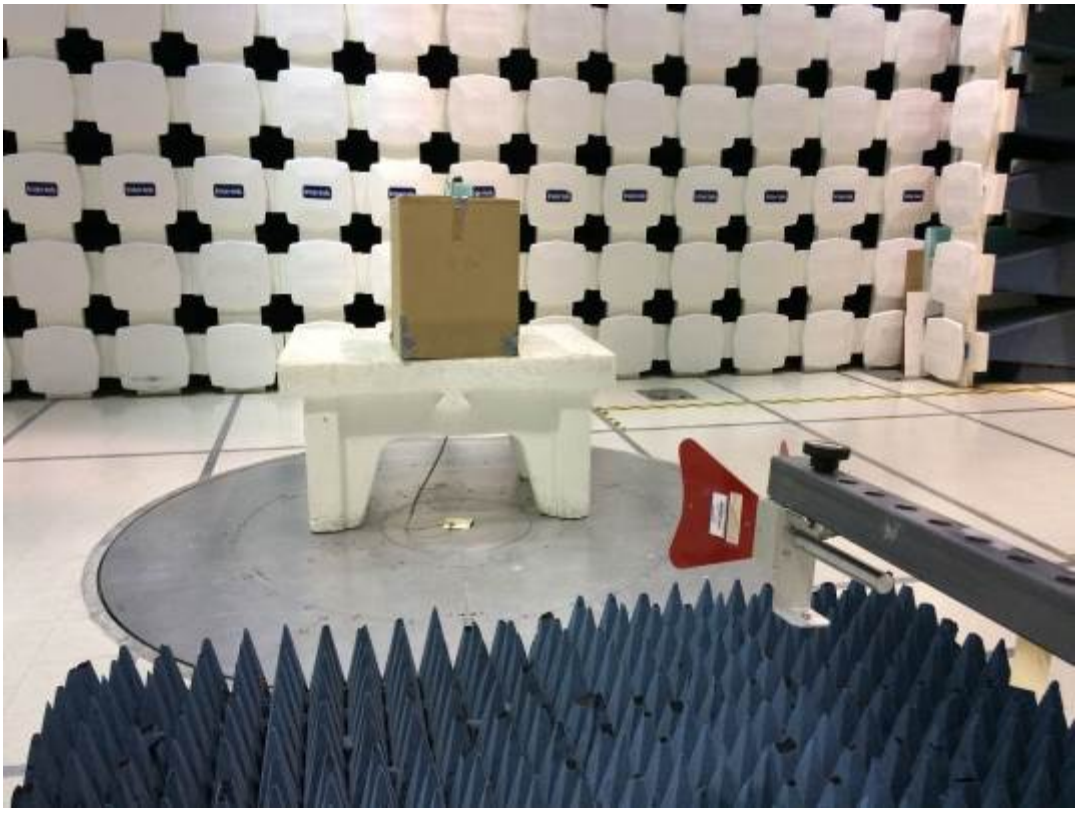
11.3 Results:

The sample tested was found to Comply.

11.4 Setup Photographs:

AC mode





11.5 Test Data:

Special Radiated Emissions

Company: Whoop
Model #: WhoopStrap 2.0
Serial #: 20D125 6
Engineers: Vathana Ven
Project #: G102743203
Standard: FCC Part 15 Subpart C 15.247
Receiver: R&S ESI (145-128) 03-10-2017
PreAmp: 145014 05-13-16.txt
Location: 10M
Date(s): 11/10/16
Limit Distance (m): 3
Test Distance (m): 3
PreAmp Used? (Y or N): Y
Voltage/Frequency: 2(3V) batteries
Antenna & Cables: HF
Antenna: ETS001 02-10-17.txt
Cable(s): 145-416 1-18 GHz 10-08-17.txt
Barometer: DAV004
Temp/Humidity/Pressure: 21c 29% 999 mB
Bands: N, LF, HF, SHF
ETS001 02-10-17.txt
Filter:
Frequency Range: See frequencies

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC	Harmonic?
Note: Lower Band Edge Compliance, 8DPSK none hopping														
PK	H	2390.000	26.90	32.21	3.66	0.00	0.00	62.77	74.00	-11.23	1/3 MHz	RB	RB	
AVG	H	2390.000	16.50	32.21	3.66	0.00	0.00	52.37	54.00	-1.63	1/3 MHz	RB	RB	
Note: Upper Band Edge Compliance, 8DPSK hopping														
PK	H	2390.000	28.90	32.21	3.66	0.00	0.00	64.77	74.00	-9.23	1/3 MHz	RB		No Pre-Amp
AVG	H	2390.000	15.90	32.21	3.66	0.00	0.00	51.77	54.00	-2.23	1/3 MHz	RB		No Pre-Amp
Note: Upper Band Edge Compliance, 8DPSK none hopping														
PK	H	2483.500	27.90	32.22	3.79	0.00	0.00	63.91	74.00	-10.09	1/3 MHz	RB		
AVG	H	2483.500	16.90	32.22	3.79	0.00	0.00	52.91	54.00	-1.09	1/3 MHz	RB		
Note: Upper Band Edge Compliance, 8DPSK hopping														
PK	H	2483.500	30.50	32.22	3.79	0.00	0.00	66.51	74.00	-7.49	1/3 MHz	RB		No Pre-Amp
AVG	H	2483.500	17.80	32.22	3.79	0.00	0.00	53.81	54.00	-0.19	1/3 MHz	RB		No Pre-Amp

Test Personnel: Vathana Ven VJV
Test Date: 11/10/2016
Supervising/Reviewing Engineer: (Where Applicable) N/A
Product Standard: FCC Part 15C, 15.247, RSS-247
Limit Applied: Below specified limit
Input Voltage: 120VAC/60Hz
Ambient Temperature: 21 ºC
Pretest Verification w/ Ambient Signals or BB Source: **Yes**
Relative Humidity: 29 %
Atmospheric Pressure: 999 mbars

Deviations, Additions, or Exclusions: None

12 Transmitter Spurious Emissions

12.1 Method

Tests are performed in accordance with CFR47 FCC Part 15 Subpart C (15.247), RSS-247 Issue 1 May 2016 and ANSI C 63.10.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	4.6 dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	5.3 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.5 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	5.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	5.0 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	5.0 dB	- dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample 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
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

12.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61 A	05/02/2016	05/02/2017
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/10/2016	03/10/2017
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	02/10/2016	02/10/2017
145014'	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	05/27/2016	05/27/2017
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	07/30/2016	07/30/2017
145-410'	Cables 145-420 145-421 145-422 145-406	Huber + Suhner	10m Track A Cables	multiple	07/30/2016	07/30/2017
145013	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2944A07027	05/02/2016	05/02/2017
REA004'	3GHz High Pass Filter	Reactel, Inc	7HSX-3G/18G-S11	06-1	01/25/2016	01/25/2017
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	06/09/2016	06/09/2017
PRE8'	PREAMPLFIER 1- 40 GHz	MITEQ	NSP4000-NF	507145	09/14/2016	09/14/2017
EMC04'	ANTENNA, RIDGED GUIDE, 18-40 GHZ	EMCO	3116	2090	05/13/2016	05/13/2017
145145'	Broadband Hybrid Antenna 30 MHz - 3 GHz	Sunol Sciences Corp.	JB3	A122313	03/09/2016	03/09/2017

Software Utilized:

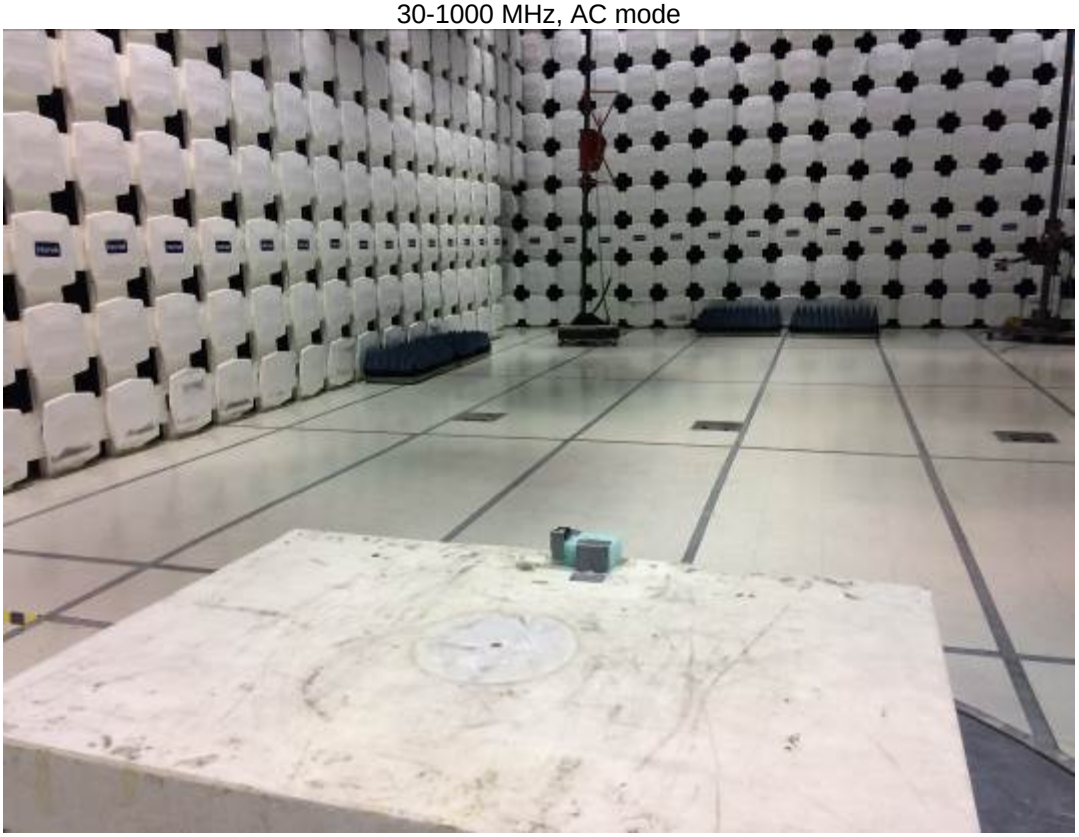
Name	Manufacturer	Version
Compliance 5	Teseq	5.26.46.46

12.3 Results:

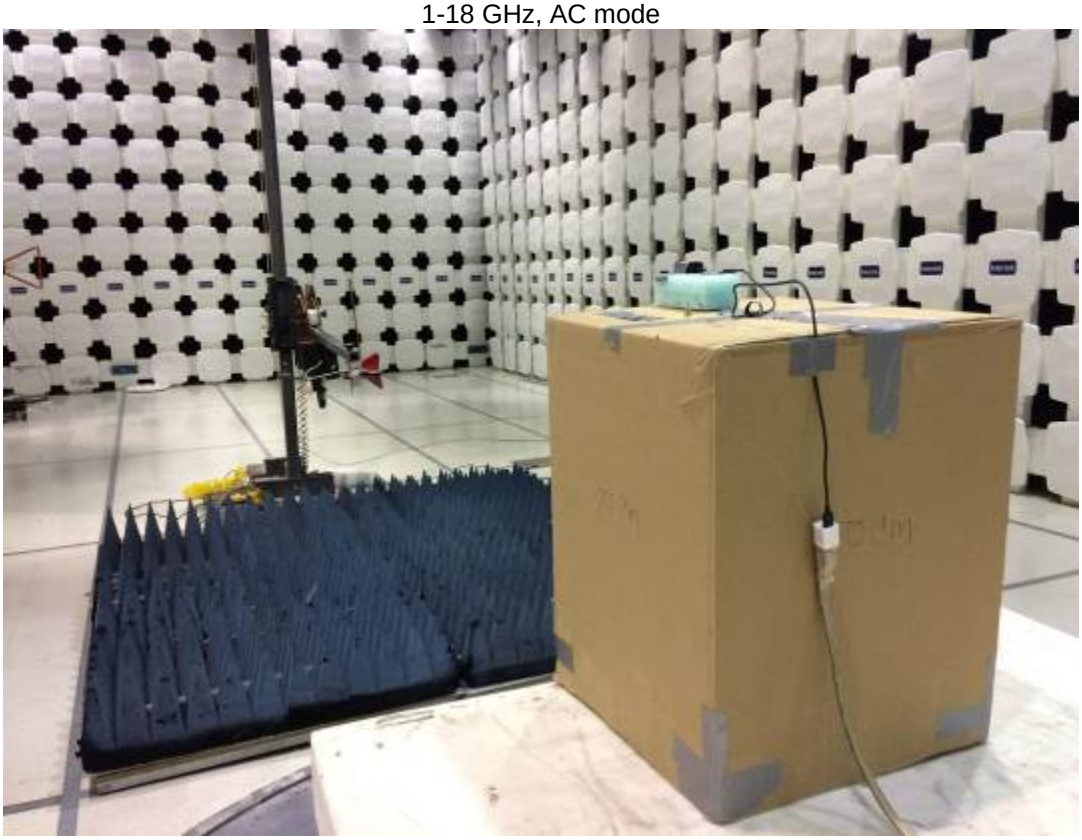
The sample tested was found to Comply.

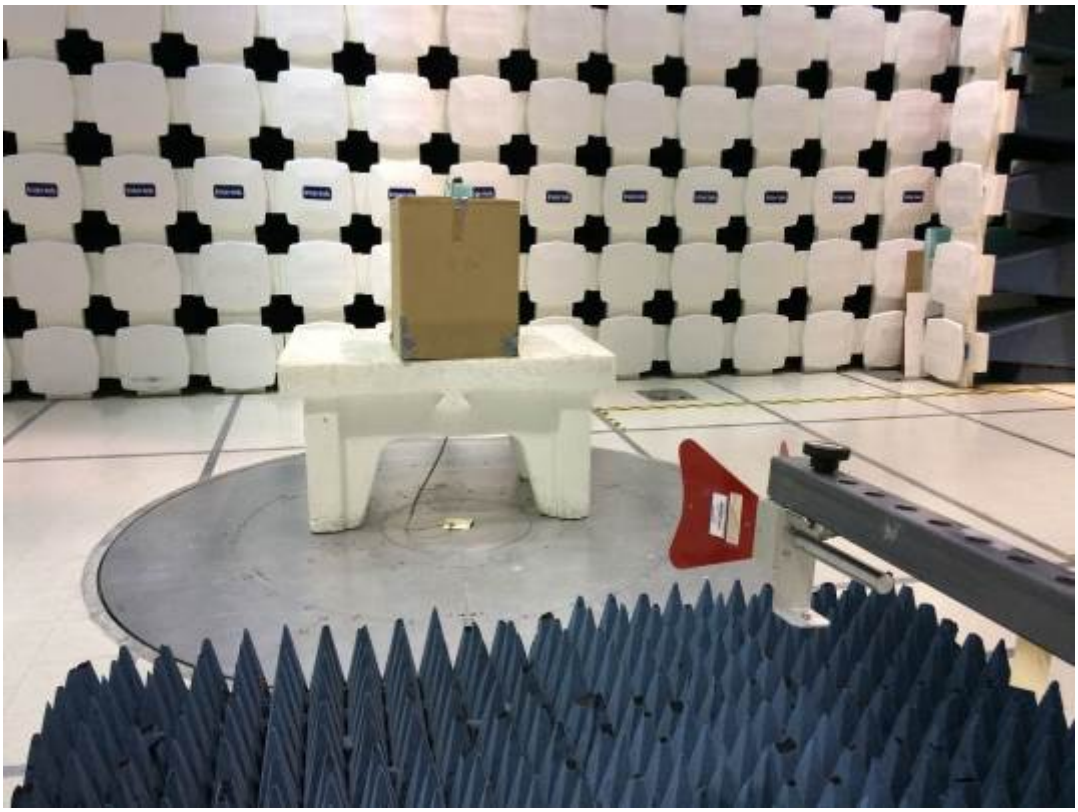
12.4 Setup Photographs:

30-1000 MHz, AC mode

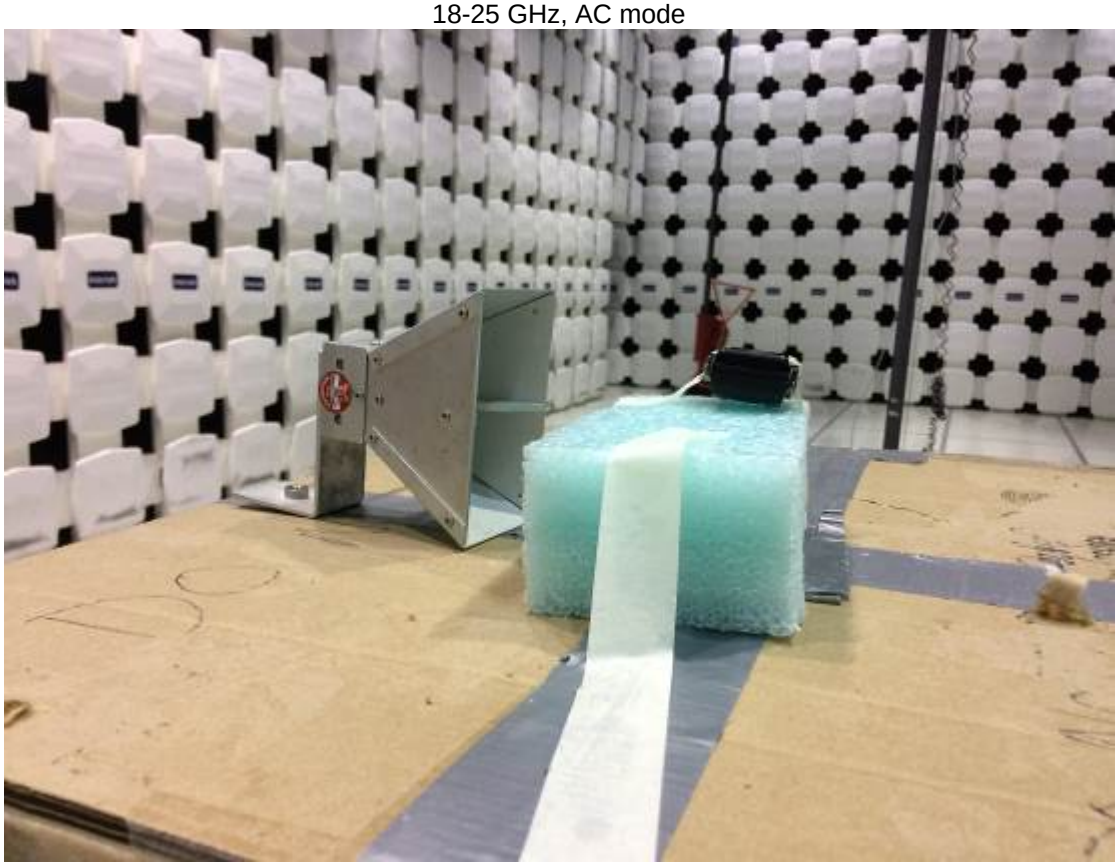


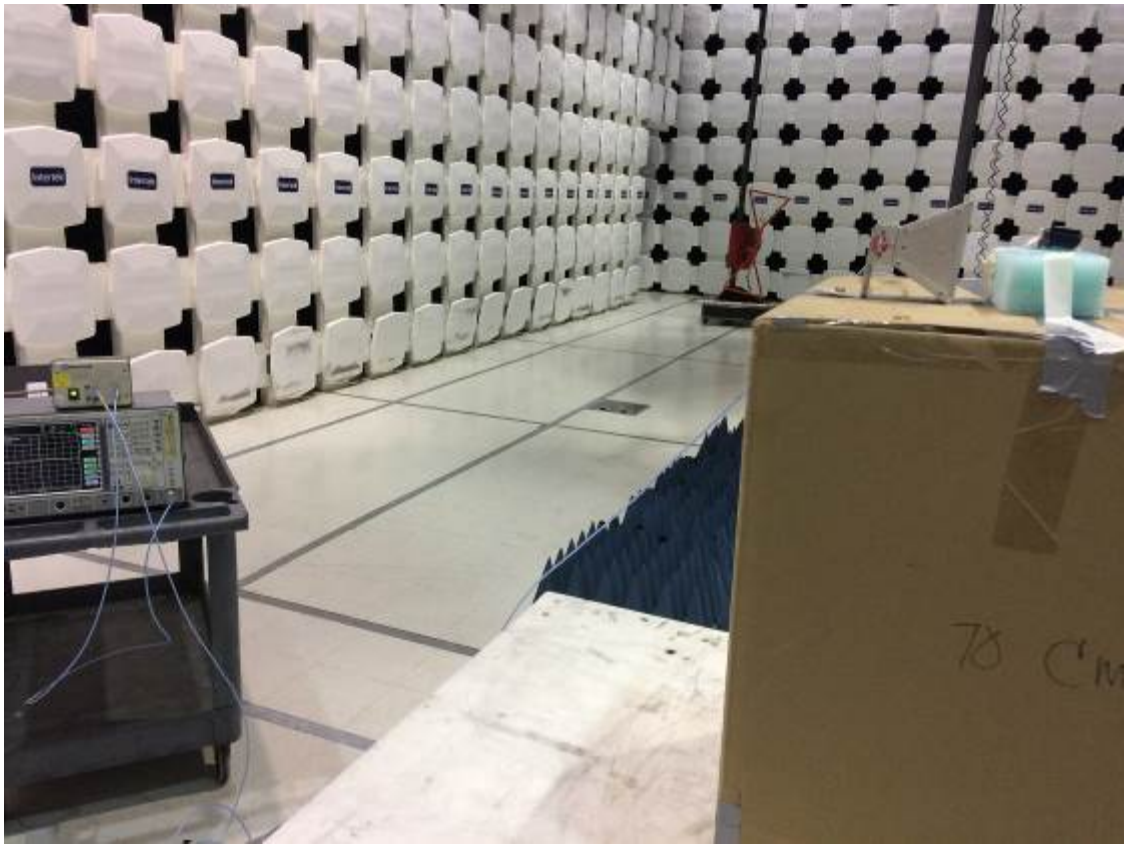
1-18 GHz, AC mode





18-25 GHz, AC mode

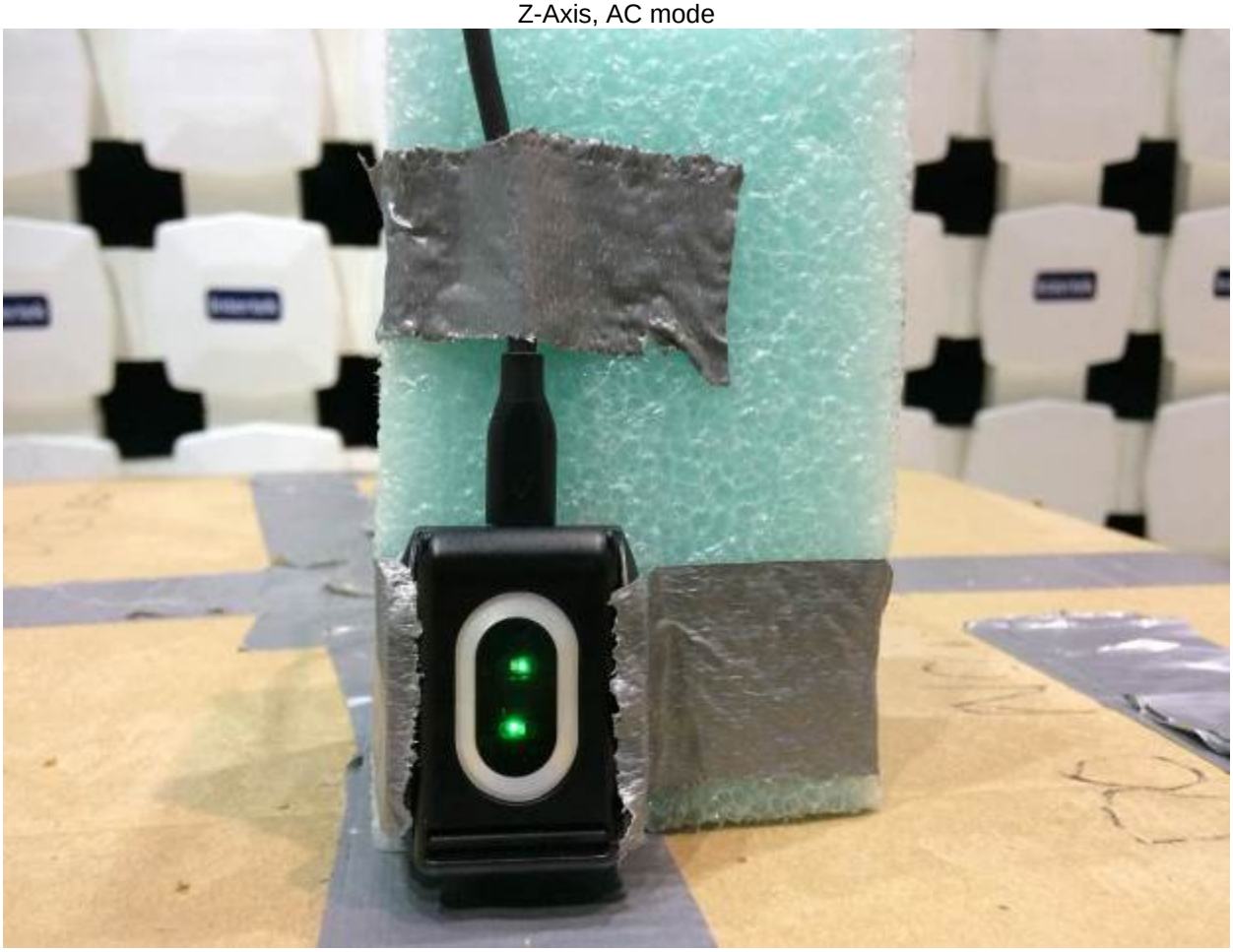




X-Axis, AC mode

Y-Axis, AC mode

Z-Axis, AC mode

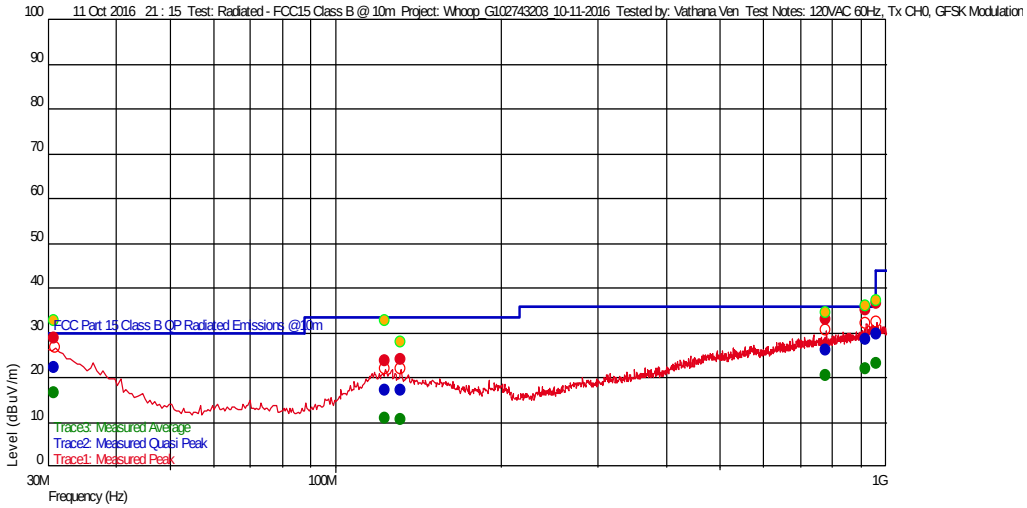


12.5 Test Data:

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15.247 @ 10m	
Project:	Whoop_G102743203_10-11-2016	
Test Notes:	120VAC 60Hz, Tx CH0, GFSK Modulation X-axis	
Temperature:	21 deg C	
Humidity:	34%, 1018 mB	
Tested by:	Vathana Ven	
Test Started:	11 Oct 2016 21 : 15	

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable
- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

Trace1: Measured Peak

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
123.002003782 M	23.66	20.200	-26.552	33.520	-9.86	|	134	3.87	120 k	
131.819839407 M	24.05	19.918	-26.456	33.520	-9.47	|	259	2.19	120 k	
960.704608729 M	36.46	29.886	-22.870	43.980	-7.52	|	88	2.79	120 k	
780.225851285 M	32.93	27.500	-23.669	36.020	-3.09	|	78	1.35	120 k	
30.853306725 M	28.93	26.817	-27.757	30.000	-1.07	--	319	2.33	120 k	
920.266332519 M	35.18	29.205	-23.074	36.020	-0.84	|	141	1.82	120 k	

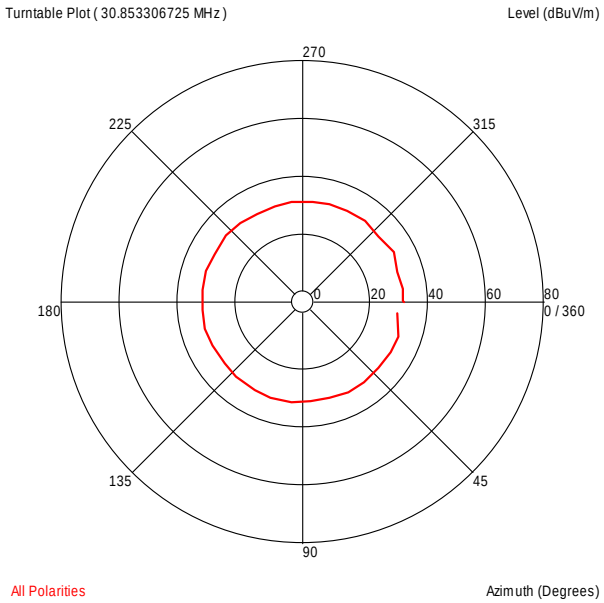
Trace2: Measured Quasi Peak

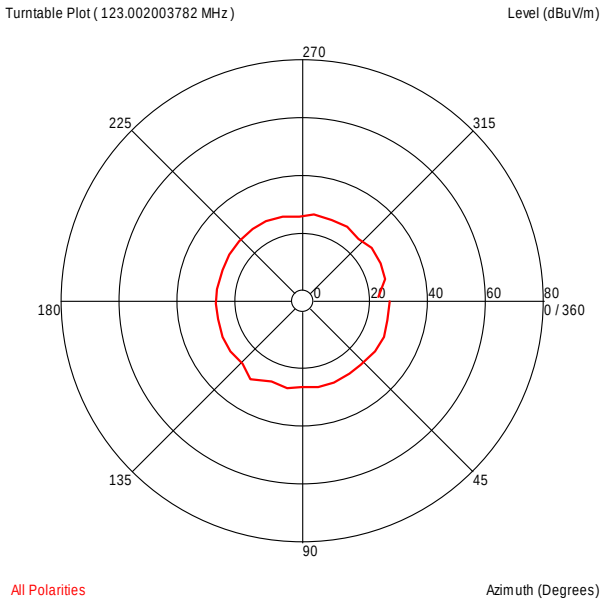
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
123.002003782 M	17.17	20.200	-26.552	33.520	-16.35	|	134	3.87	120 k	
131.819839407 M	17.17	19.918	-26.456	33.520	-16.35	|	259	2.19	120 k	
960.704608729 M	29.62	29.886	-22.870	43.980	-14.36	|	88	2.79	120 k	
780.225851285 M	26.22	27.500	-23.669	36.020	-9.80	|	78	1.35	120 k	
30.853306725 M	22.29	26.817	-27.757	30.000	-7.71	--	319	2.33	120 k	
920.266332519 M	28.41	29.205	-23.074	36.020	-7.61	|	141	1.82	120 k	

Trace3: Measured Average

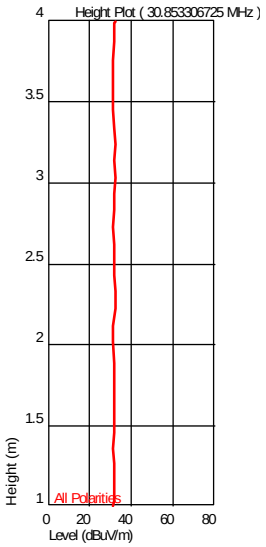
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
131.819839407 M	10.57	19.918	-26.456	--	--	|	259	2.19	120 k	
123.002003782 M	10.75	20.200	-26.552	--	--	|	134	3.87	120 k	
30.853306725 M	16.56	26.817	-27.757	--	--	--	319	2.33	120 k	
780.225851285 M	20.31	27.500	-23.669	--	--	|	78	1.35	120 k	
920.266332519 M	21.93	29.205	-23.074	--	--	|	141	1.82	120 k	
960.704608729 M	23.27	29.886	-22.870	--	--	|	88	2.79	120 k	

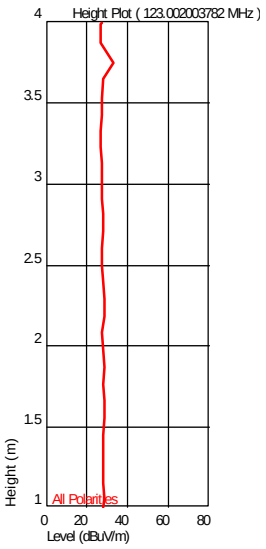
Azimuth Plots

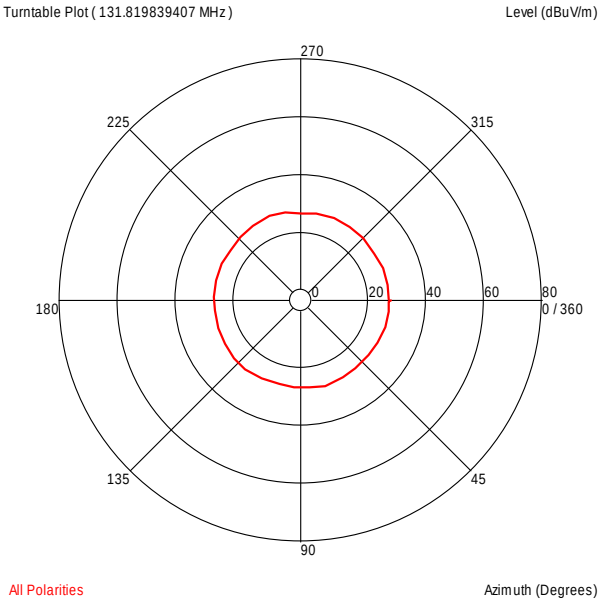


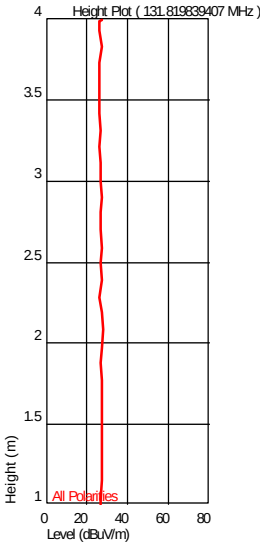


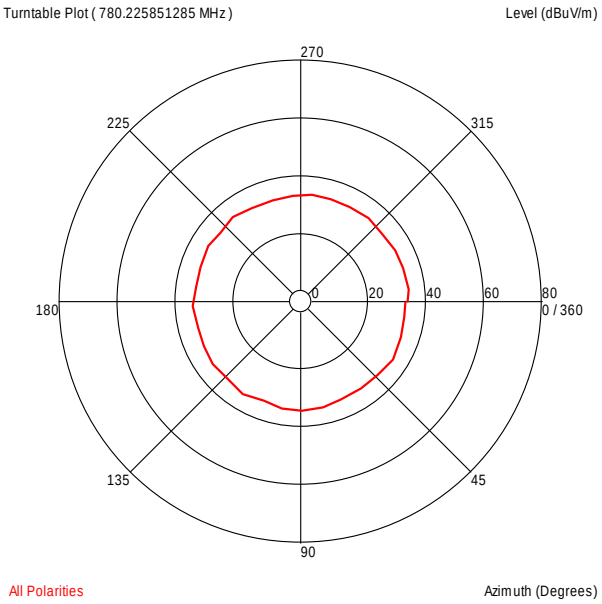
Turntable Plots

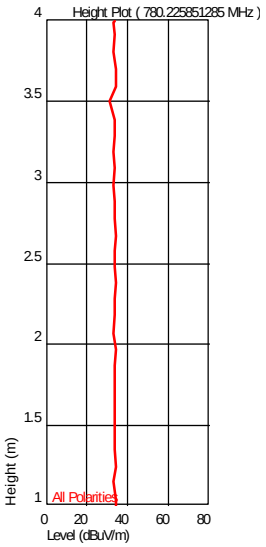


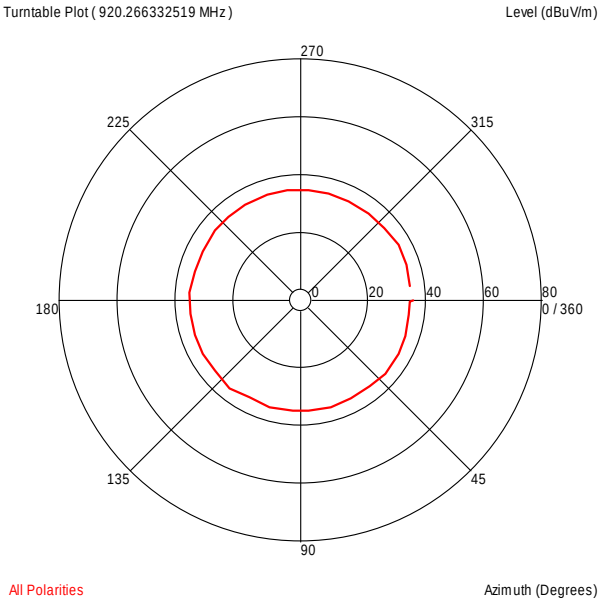


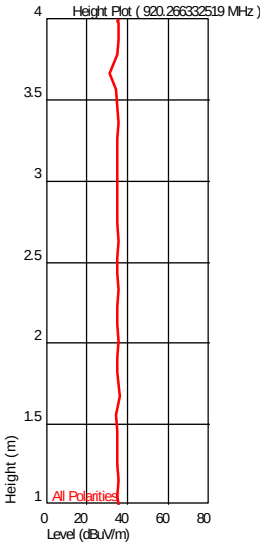

Turntable Plot (131.819839407 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

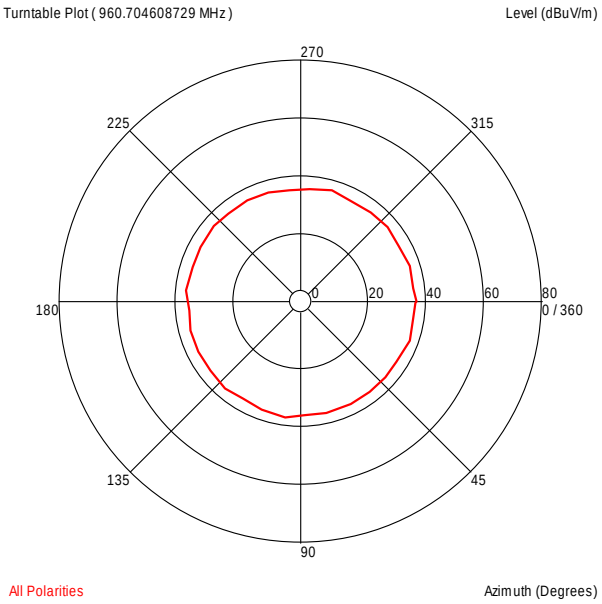

Height Plot (131.819839407 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

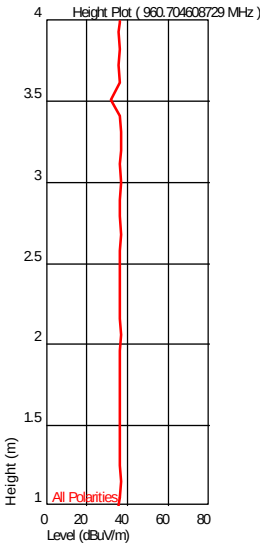

Turntable Plot (780.225851285 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (780.225851285 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (920.266332519 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (920.266332519 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

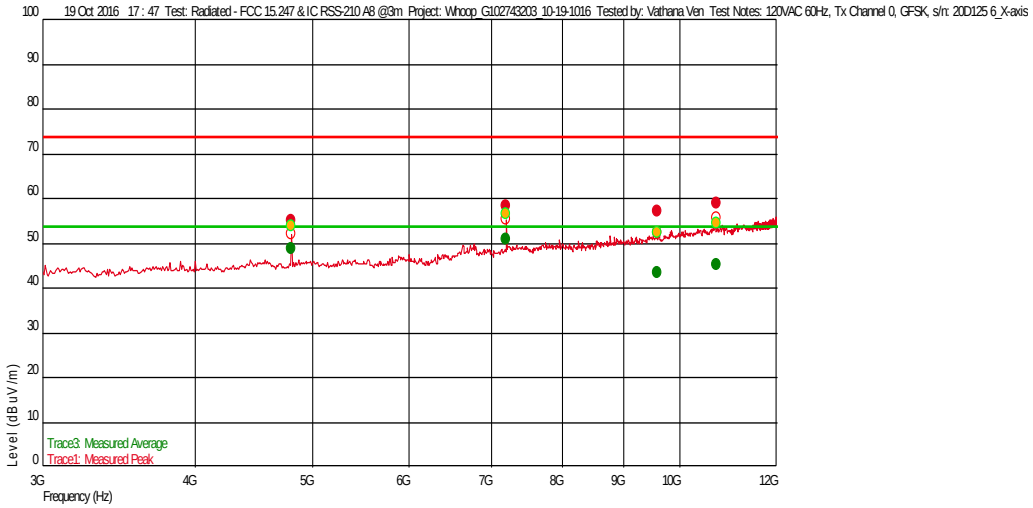

Turntable Plot (960.704608729 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (960.704608729 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC 15.247 & IC RSS-210 A8 @3m	
Project:	Whoop_G102743203_10-19-1016	
Test Notes:	120VAC 60Hz, Tx Channel 0, GFSK, s/n: 20D125 6_X-axis	
Temperature:	22 deg C	
Humidity:	42%, 1006 mB	
Tested by:	Vathana Ven	
Test Started:	19 Oct 2016 17 : 47	

Prescan Emission Graph



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable

Swept Peak Data
Swept Quasi Peak Data
Swept Average Data

Emissions Test Data

Trace1: Measured Peak

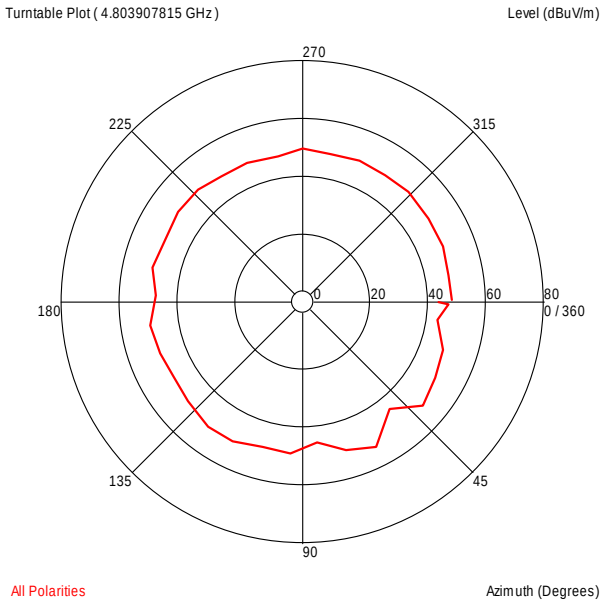
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.803907815 G	55.87	34.192	-25.631	74.000	-18.13	|	73	1.16	1 M	
9.587929192 G	58.10	36.681	-22.105	74.000	-15.90	|	104	1.16	1 M	
7.206165665 G	59.20	35.644	-23.884	74.000	-15.90	--	28	1.16	1 M	
10.72243153 G	59.61	37.697	-20.277	74.000	-14.39	--	240	1.16	1 M	

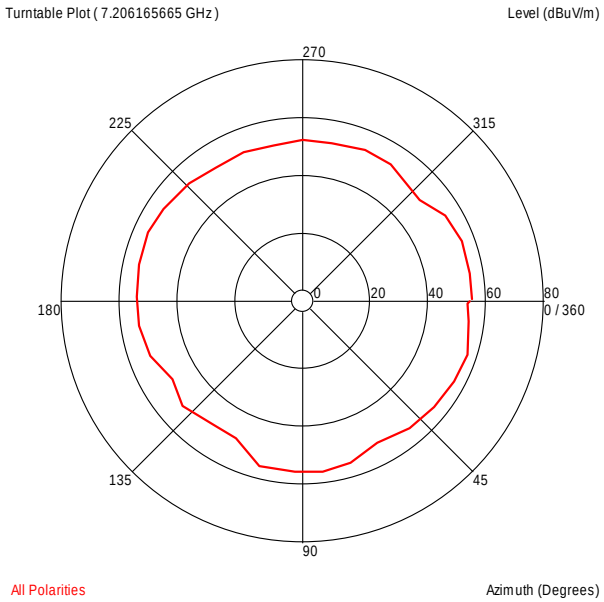
Trace3: Measured Average

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
9.587929192 G	44.12	36.681	-22.105	54.000	-9.88	|	104	1.16	1 M	
10.72243153 G	45.90	37.697	-20.277	54.000	-8.10	--	240	1.16	1 M	
4.803907815 G	49.72	34.192	-25.631	54.000	-4.28	|	73	1.16	1 M	
7.206165665 G	51.75	35.644	-23.884	54.000	-2.25	--	28	1.16	1 M	

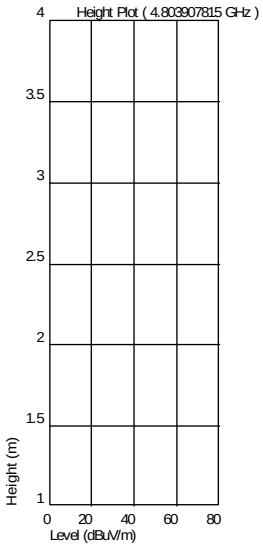
Insertion loss of the high pass filter of 0.79 dB was added to the reading.

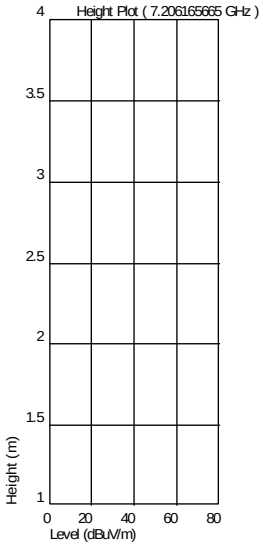
Azimuth Plots

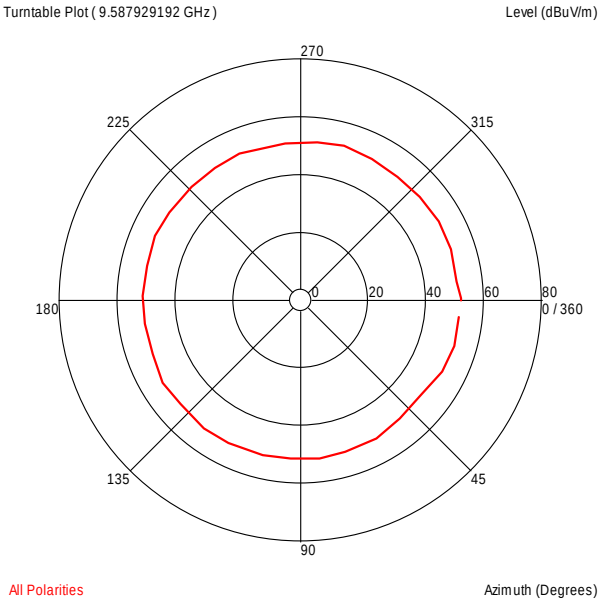


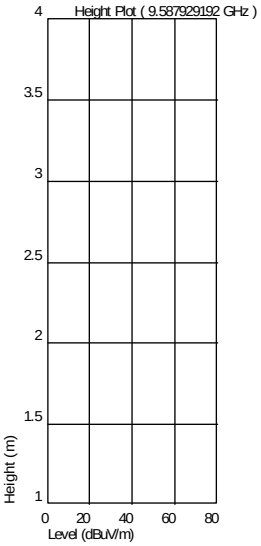


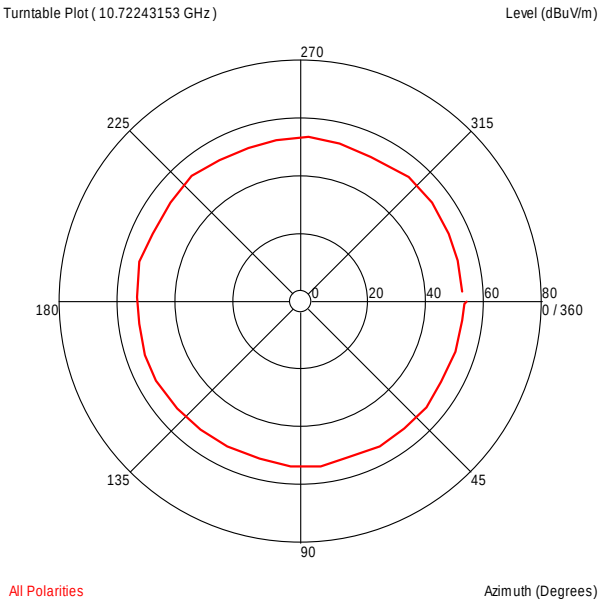
Turntable Plots

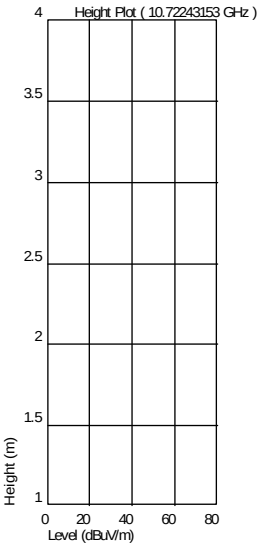





Turntable Plot (9.587929192 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (9.587929192 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)

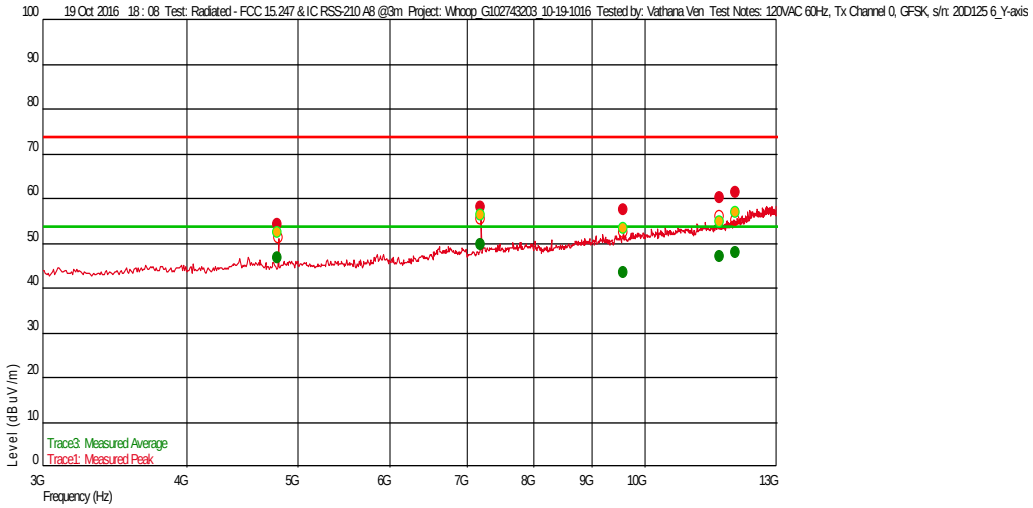

Turntable Plot (10.72243153 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (10.72243153 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC 15.247 & IC RSS-210 A8 @3m	
Project:	Whoop_G102743203_10-19-1016	
Test Notes:	120VAC 60Hz, Tx Channel 0, GFSK, s/n: 20D125 6_Y-axis	
Temperature:	22 deg C	
Humidity:	42%, 1006 mB	
Tested by:	Vathana Ven	
Test Started:	19 Oct 2016 18 : 08	

Prescan Emission Graph



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable

Swept Peak Data
Swept Quasi Peak Data
Swept Average Data

Emissions Test Data

Trace1: Measured Peak

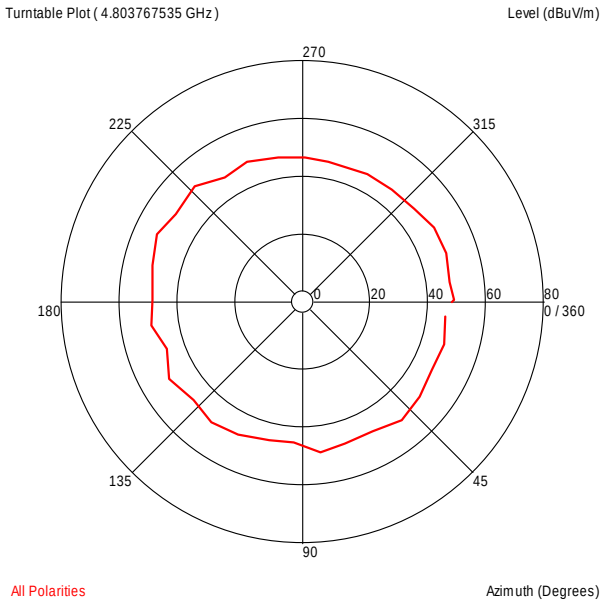
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.803767535 G	54.91	34.192	-25.631	74.000	-19.09	|	194	1.16	1 M	
9.577842352 G	58.22	36.681	-22.120	74.000	-15.78	--	283	1.16	1 M	
7.206118905 G	58.81	35.644	-23.884	74.000	-15.19	--	18	1.16	1 M	
11.617728791 G	61.06	38.337	-19.472	74.000	-12.94	--	7	1.16	1 M	
11.987955912 G	62.28	38.784	-18.964	74.000	-11.72	--	34	1.16	1 M	

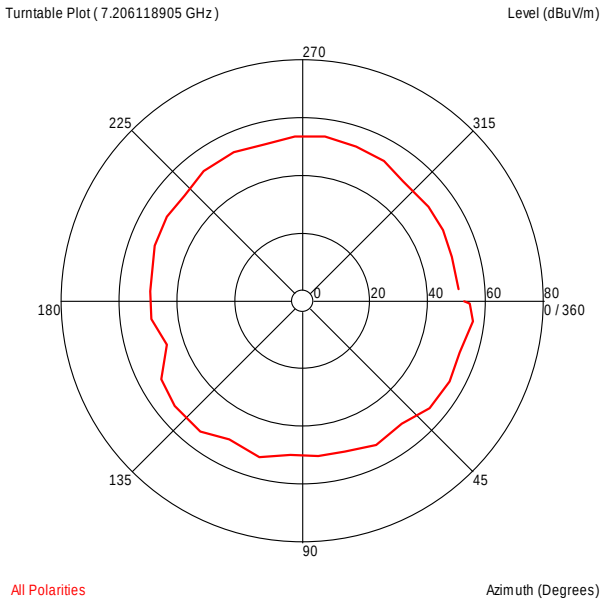
Trace3: Measured Average

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
9.577842352 G	44.11	36.681	-22.120	54.000	-9.09	--	283	1.16	1 M	
4.803767535 G	47.37	34.192	-25.631	54.000	-5.84	|	194	1.16	1 M	
11.617728791 G	47.72	38.337	-19.472	54.000	-6.28	--	7	1.16	1 M	
11.987955912 G	48.67	38.784	-18.964	54.000	-6.12	--	34	1.16	1 M	
7.206118905 G	50.62	35.644	-23.884	54.000	-4.17	--	18	1.16	1 M	

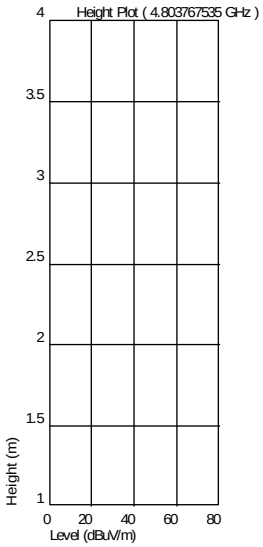
Insertion loss of the high pass filter of 0.79 dB was added to the reading.

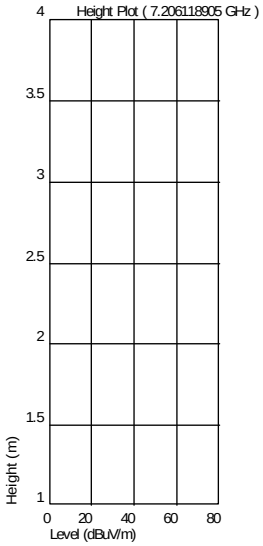
Azimuth Plots

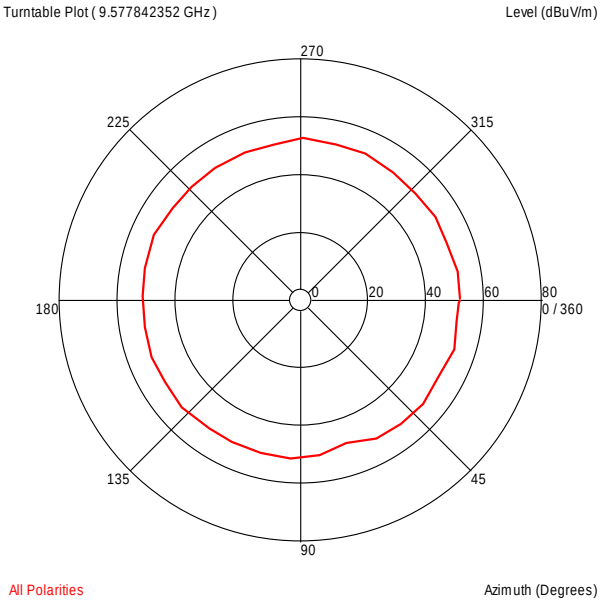


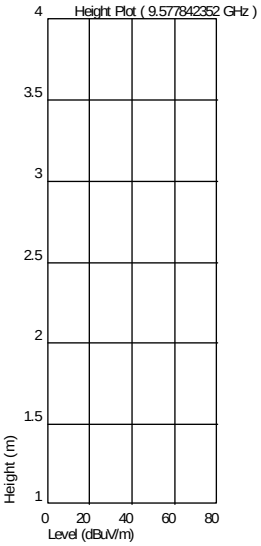


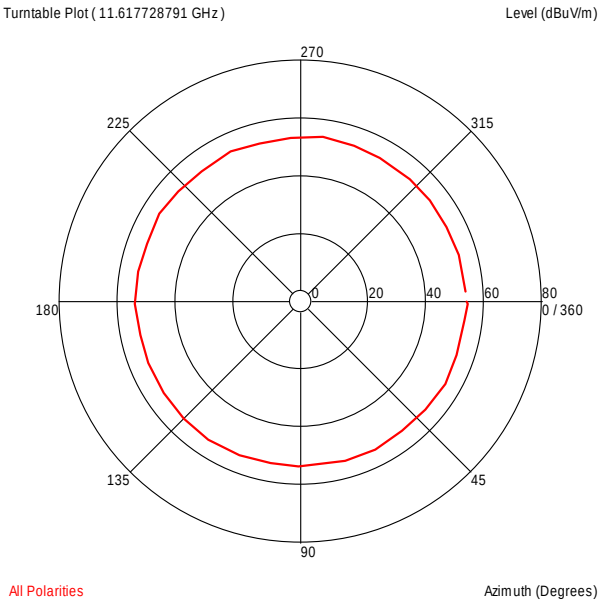
Turntable Plots

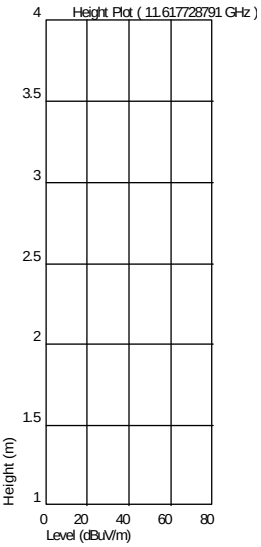


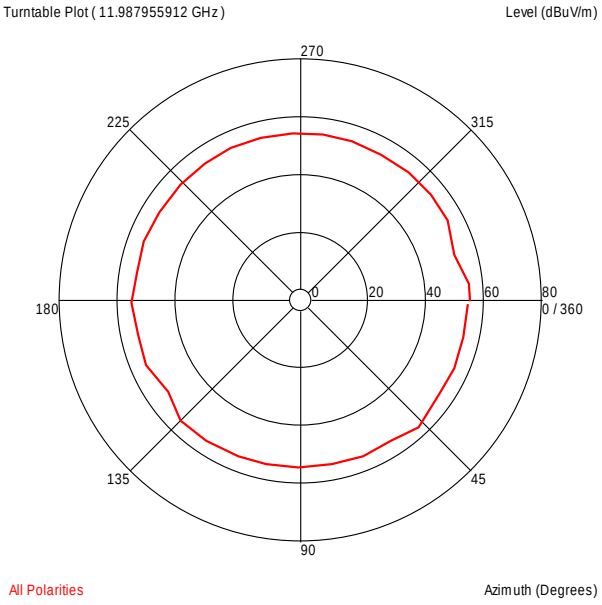


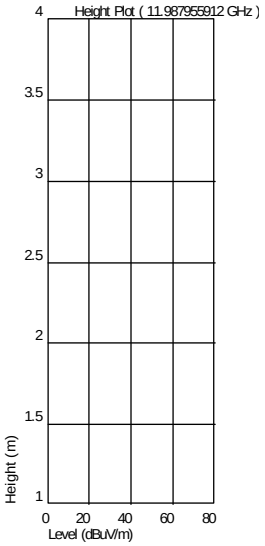

Turntable Plot (9.577842352 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (9.577842352 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (11.617728791 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (11.617728791 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)

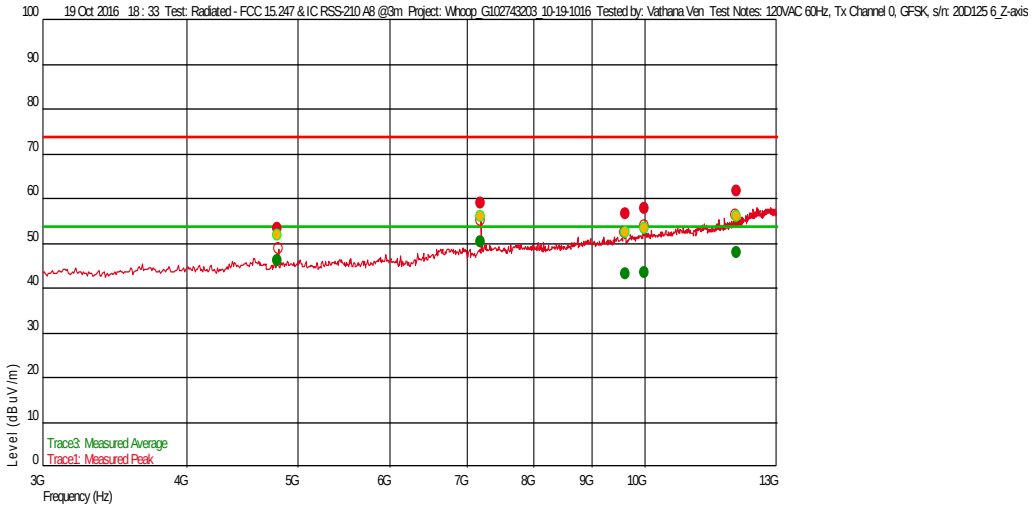

Turntable Plot (11.987955912 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (11.987955912 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC 15.247 & IC RSS-210 A8 @3m	
Project:	Whoop_G102743203_10-19-1016	
Test Notes:	120VAC 60Hz, Tx Channel 0, GFSK, s/n: 20D125 6_Z-axis	
Temperature:	22 deg C	
Humidity:	42%, 1006 mB	
Tested by:	Vathana Ven	
Test Started:	19 Oct 2016 18 : 33	

Prescan Emission Graph



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable

Swept Peak Data
Swept Quasi Peak Data
Swept Average Data

Emissions Test Data

Trace1: Measured Peak

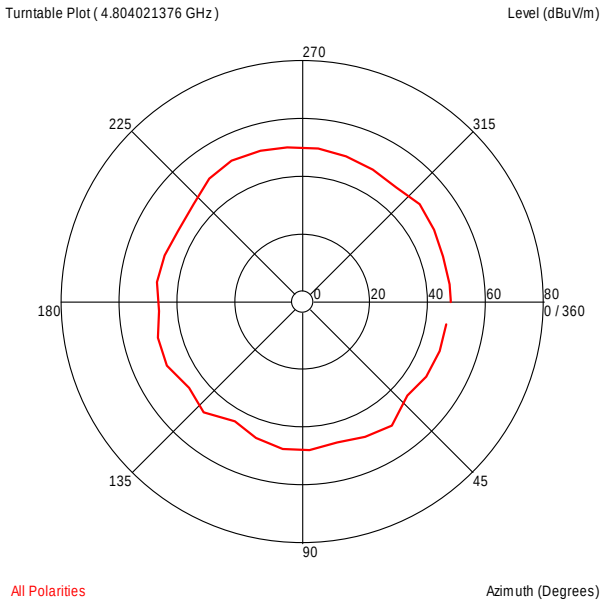
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.804021376 G	54.21	34.192	-25.630	74.000	-19.79	--	233	1.16	1 M	
9.610126921 G	57.48	36.690	-22.070	74.000	-16.52	--	19	1.16	1 M	
10.002785571 G	58.53	37.220	-21.697	74.000	-15.47	--	215	1.16	1 M	
7.206212425 G	59.85	35.644	-23.884	74.000	-14.15	|	41	1.16	1 M	
12.000567802 G	62.32	38.799	-18.939	74.000	-11.68	|	360	1.16	1 M	

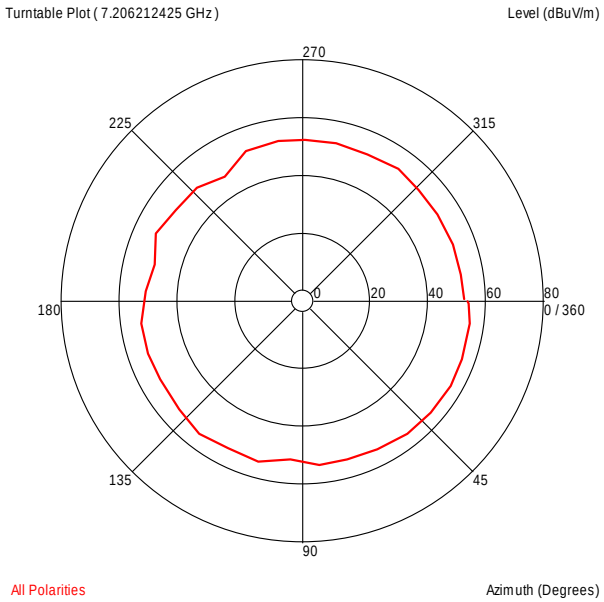
Trace3: Measured Average

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
9.610126921 G	44.00	36.690	-22.070	54.000	-9.21	--	19	1.16	1 M	
10.002785571 G	44.37	37.220	-21.697	54.000	-9.63	--	215	1.16	1 M	
4.804021376 G	46.95	34.192	-25.630	54.000	-7.05	--	233	1.16	1 M	
12.000567802 G	48.71	38.799	-18.939	54.000	-5.29	|	360	1.16	1 M	
7.206212425 G	51.17	35.644	-23.884	54.000	-2.83	|	41	1.16	1 M	

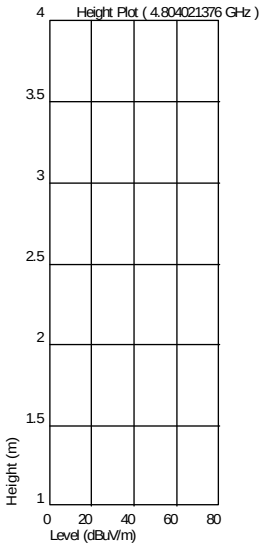
Insertion loss of the high pass filter of 0.79 dB was added to the reading.

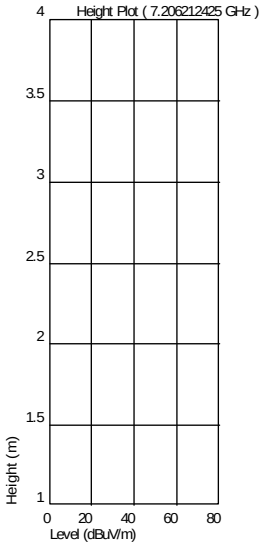
Azimuth Plots

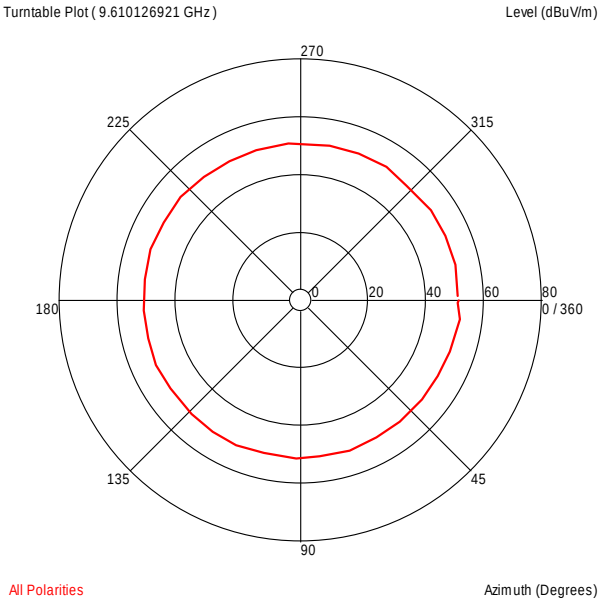


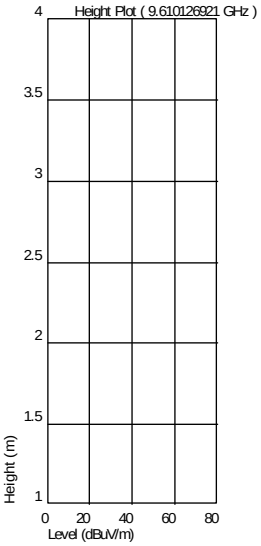


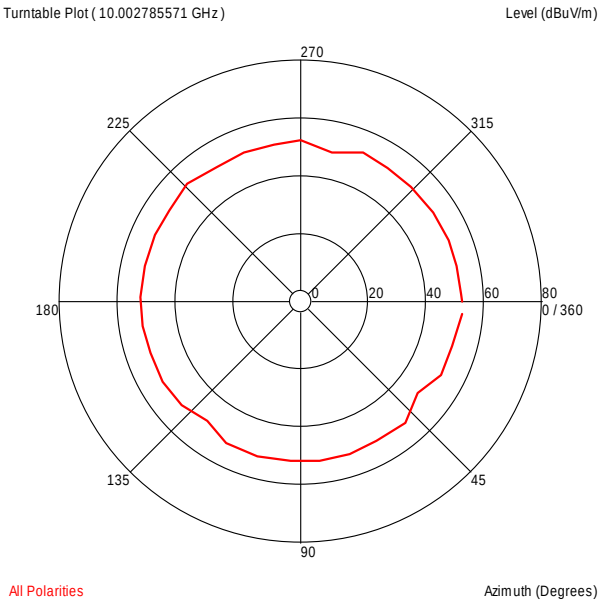
Turntable Plots

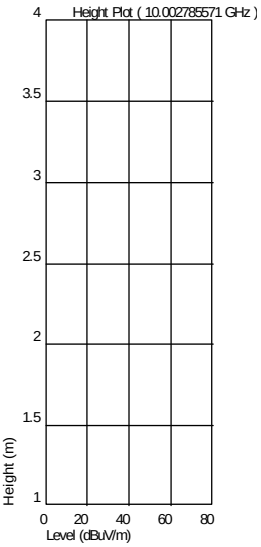


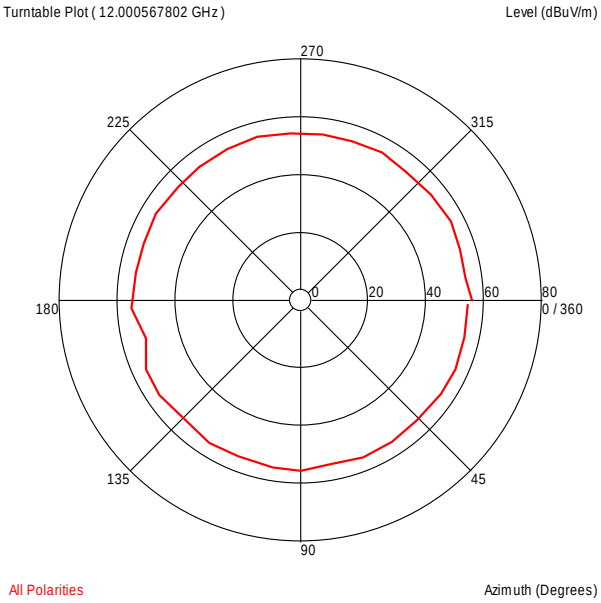


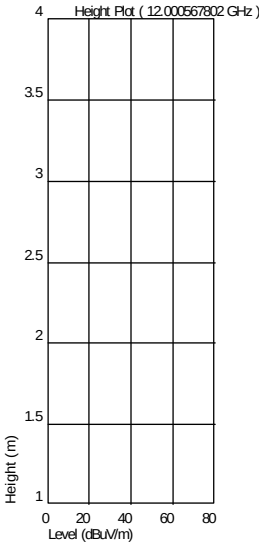

Turntable Plot (9.610126921 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (9.610126921 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (10.002785571 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (10.002785571 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)

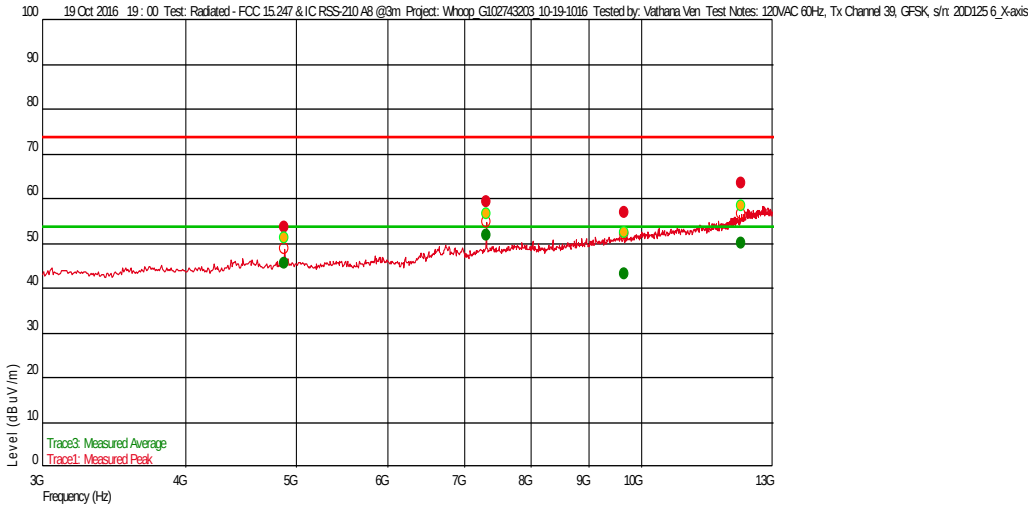

Turntable Plot (12.000567802 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (12.000567802 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC 15.247 & IC RSS-210 A8 @3m	
Project:	Whoop_G102743203_10-19-1016	
Test Notes:	120VAC 60Hz, Tx Channel 39, GFSK, s/n: 20D125 6_X-axis	
Temperature:	22 deg C	
Humidity:	42%, 1006 mB	
Tested by:	Vathana Ven	
Test Started:	19 Oct 2016 19 : 00	

Prescan Emission Graph



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable

Swept Peak Data
Swept Quasi Peak Data
Swept Average Data

Emissions Test Data

Trace1: Measured Peak

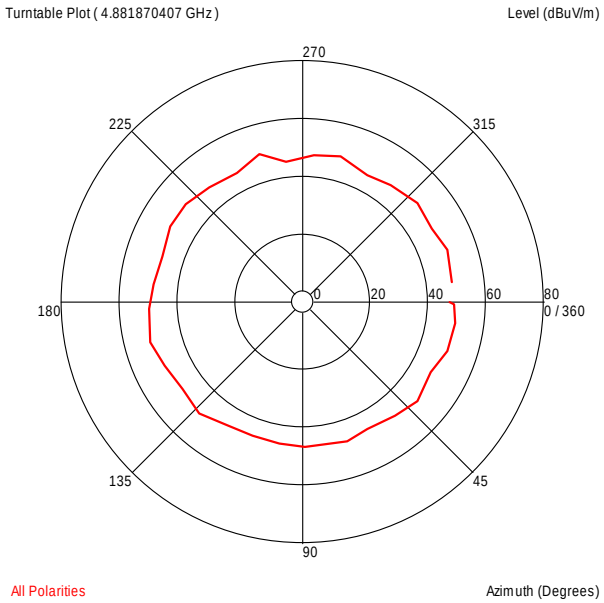
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.881870407 G	54.33	34.238	-25.483	74.000	-20.39	--	177	1.16	1 M	
9.661710086 G	57.68	36.738	-21.991	74.000	-17.04	--	210	1.16	1 M	
7.323152973 G	59.85	35.622	-23.659	74.000	-14.87	|	22	1.16	1 M	
12.205277221 G	64.19	39.001	-18.402	74.000	-10.53	--	7	1.16	1 M	

Trace3: Measured Average

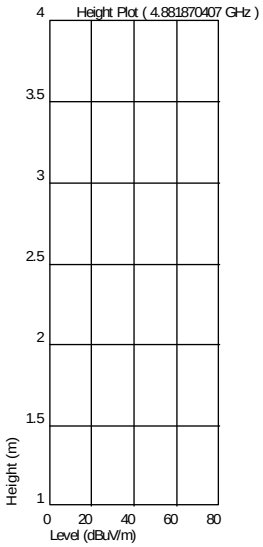
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
9.661710086 G	43.88	36.738	-21.991	54.000	-10.12	--	210	1.16	1 M	
4.881870407 G	46.12	34.238	-25.483	54.000	-7.88	--	177	1.16	1 M	
12.205277221 G	50.72	39.001	-18.402	54.000	-3.28	--	7	1.16	1 M	
7.323152973 G	52.46	35.622	-23.659	54.000	-1.54	|	22	1.16	1 M	

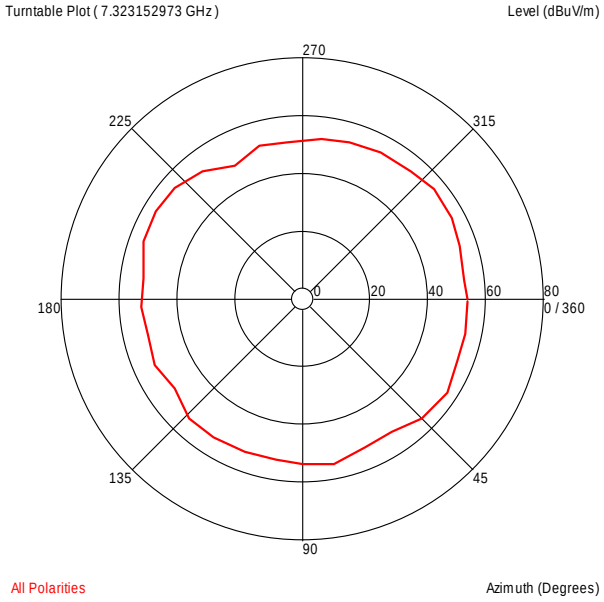
Insertion loss of the high pass filter of 0.72 dBwas added to the reading.

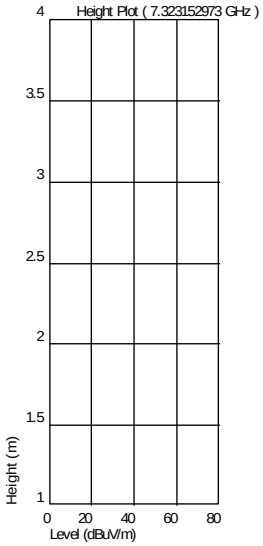
Azimuth Plots

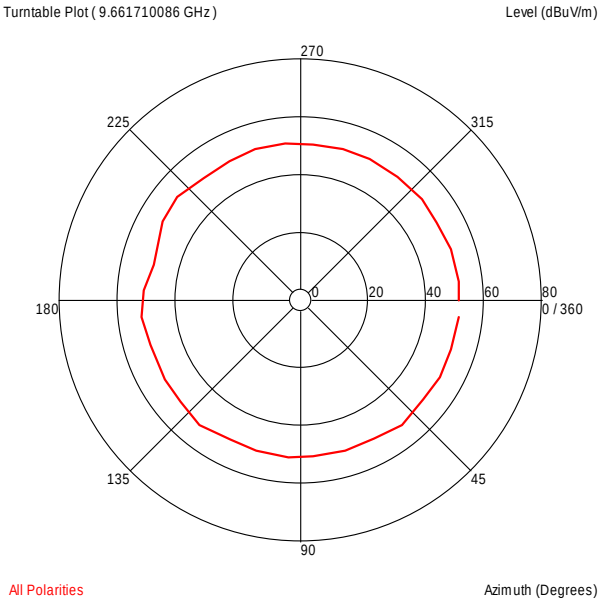


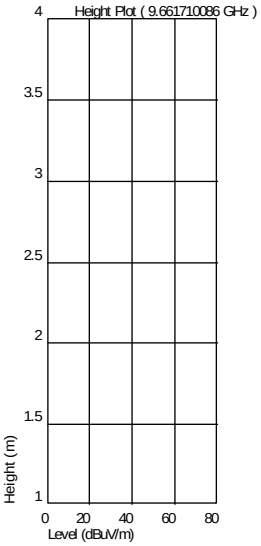
Turntable Plots

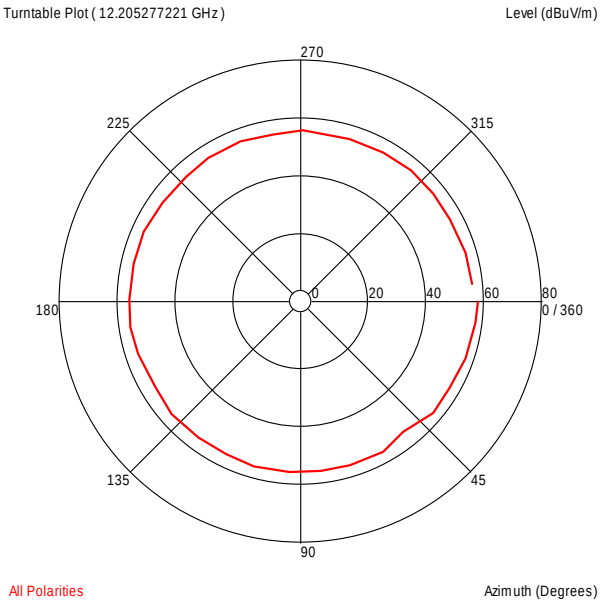


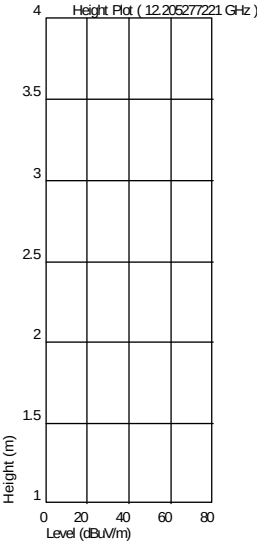





Turntable Plot (9.661710086 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (9.661710086 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)

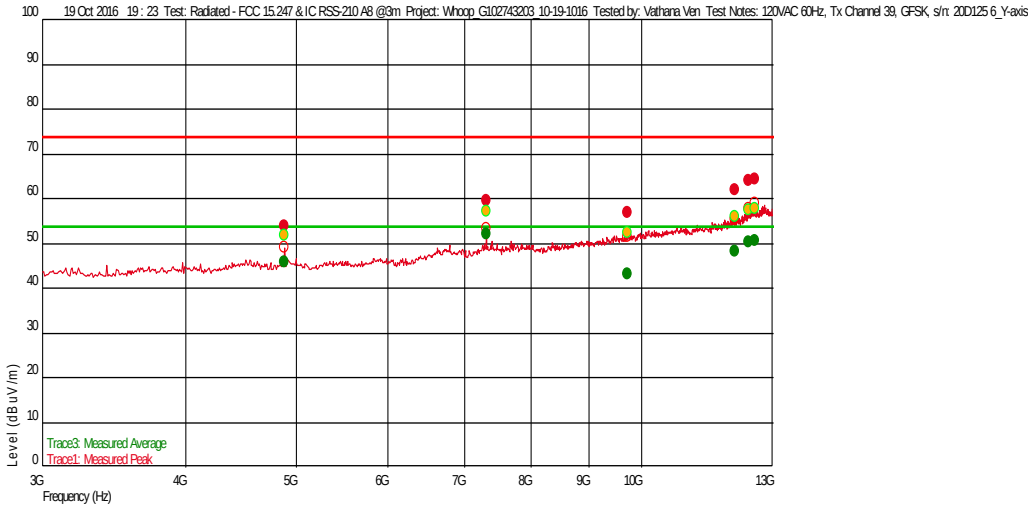

Turntable Plot (12.205277221 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (12.205277221 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC 15.247 & IC RSS-210 A8 @3m	
Project:	Whoop_G102743203_10-19-1016	
Test Notes:	120VAC 60Hz, Tx Channel 39, GFSK, s/n: 20D125 6_Y-axis	
Temperature:	22 deg C	
Humidity:	42%, 1006 mB	
Tested by:	Vathana Ven	
Test Started:	19 Oct 2016 19 : 23	

Prescan Emission Graph



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable

Swept Peak Data
Swept Quasi Peak Data
Swept Average Data

Emissions Test Data

Trace1: Measured Peak

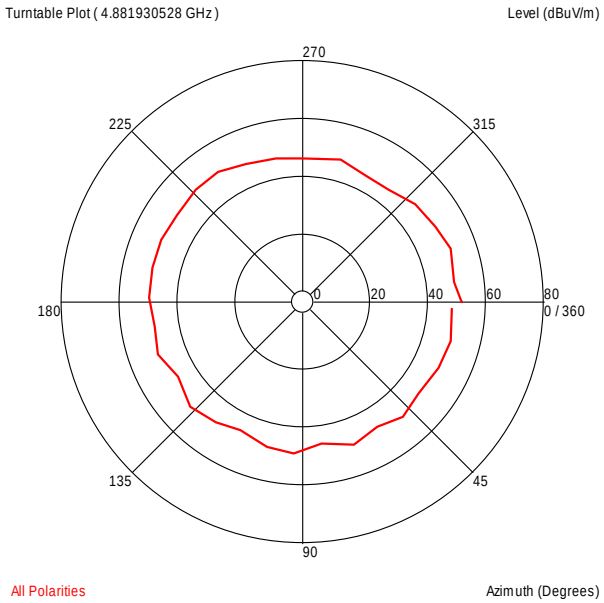
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.881930528 G	54.49	34.238	-25.483	74.000	-19.51	--	352	1.16	1 M	
9.731249165 G	57.71	36.802	-21.884	74.000	-16.29	--	83	1.16	1 M	
7.323206413 G	60.26	35.622	-23.659	74.000	-13.74	|	176	1.16	1 M	
12.06985972 G	62.63	38.843	-18.757	74.000	-11.37	--	309	1.16	1 M	
12.396733467 G	64.82	39.120	-17.889	74.000	-9.18	--	331	1.16	1 M	
12.549498998 G	64.95	39.135	-17.502	74.000	-9.05	--	94	1.16	1 M	

Trace3: Measured Average

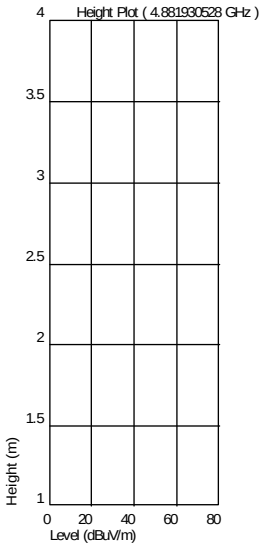
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
9.731249165 G	43.88	36.802	-21.884	54.000	-10.84	--	83	1.16	1 M	
4.881930528 G	46.64	34.238	-25.483	54.000	-8.08	--	352	1.16	1 M	
12.06985972 G	48.87	38.843	-18.757	54.000	-5.85	--	309	1.16	1 M	
12.396733467 G	50.87	39.120	-17.889	54.000	-3.85	--	331	1.16	1 M	
12.549498998 G	51.27	39.135	-17.502	54.000	-3.45	--	94	1.16	1 M	
7.323206413 G	52.83	35.622	-23.659	54.000	-1.89	|	176	1.16	1 M	

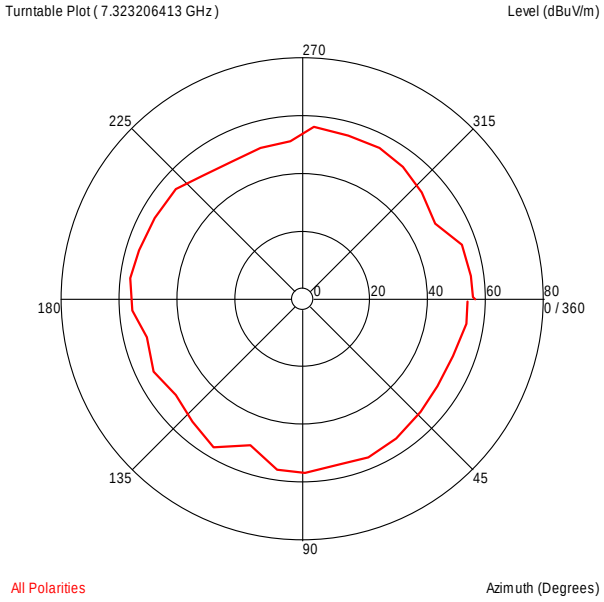
Insertion loss of the high pass filter of 0.72 dBwas added to the reading.

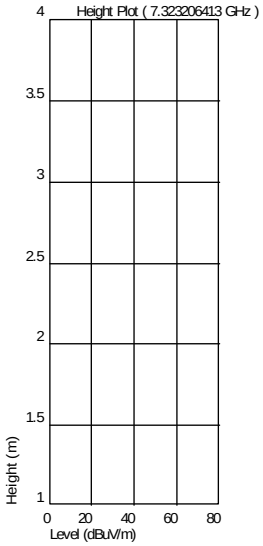
Azimuth Plots

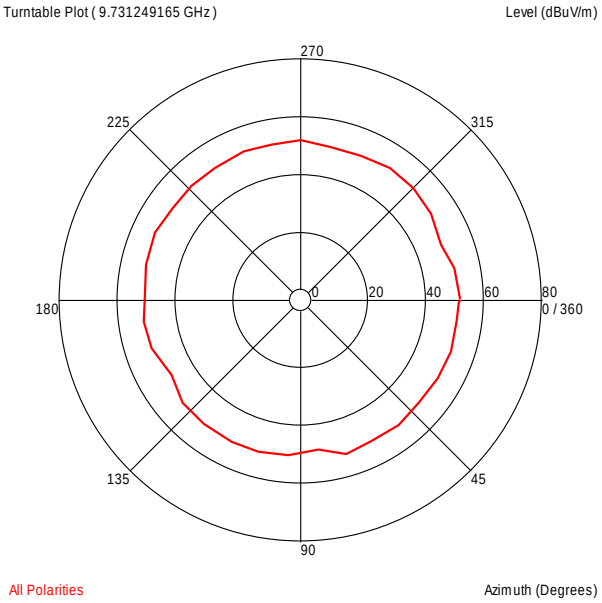


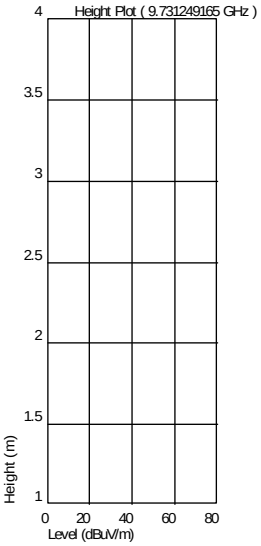
Turntable Plots

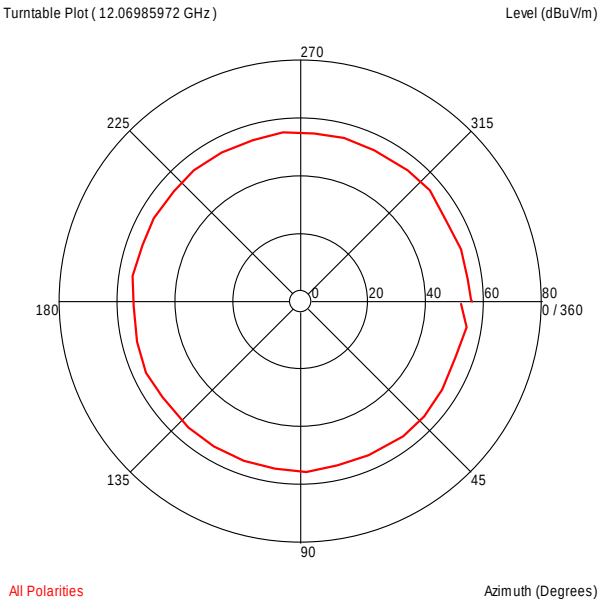


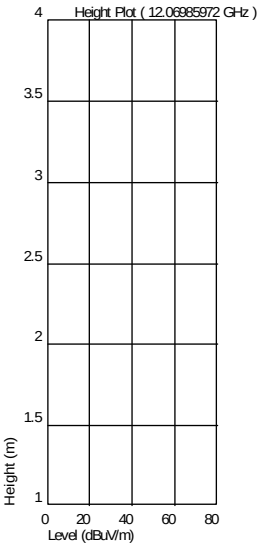


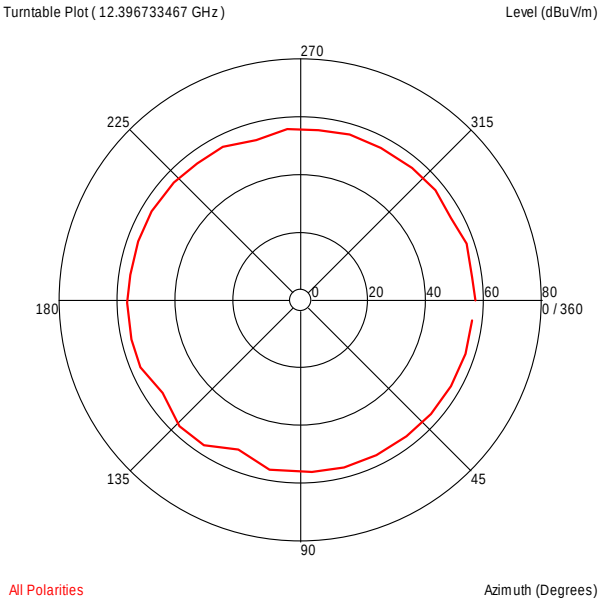


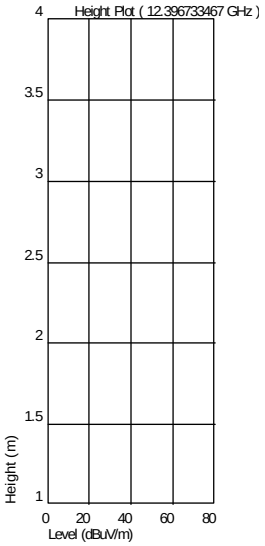

Turntable Plot (9.731249165 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

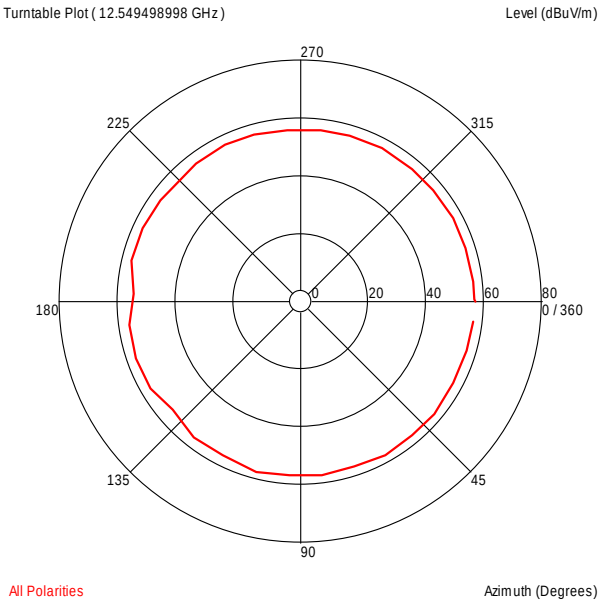

Height Plot (9.731249165 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)

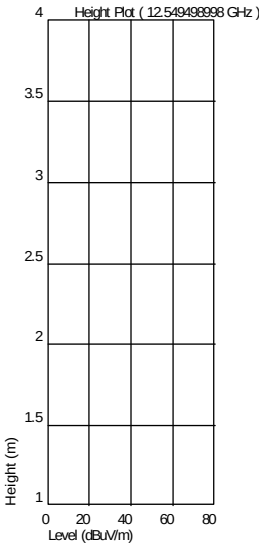

Turntable Plot (12.06985972 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (12.06985972 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (12.396733467 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (12.396733467 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)

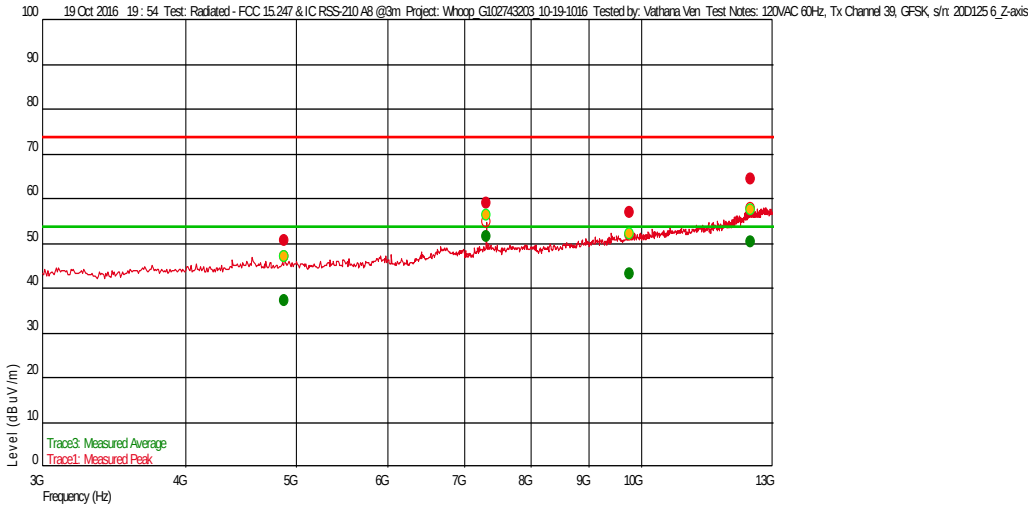

Turntable Plot (12.549498998 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (12.549498998 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC 15.247 & IC RSS-210 A8 @3m	
Project:	Whoop_G102743203_10-19-1016	
Test Notes:	120VAC 60Hz, Tx Channel 39, GFSK, s/n: 20D125 6_Z-axis	
Temperature:	22 deg C	
Humidity:	42%, 1006 mB	
Tested by:	Vathana Ven	
Test Started:	19 Oct 2016 19 : 54	

Prescan Emission Graph



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable

Swept Peak Data
Swept Quasi Peak Data
Swept Average Data

Emissions Test Data

Trace1: Measured Peak

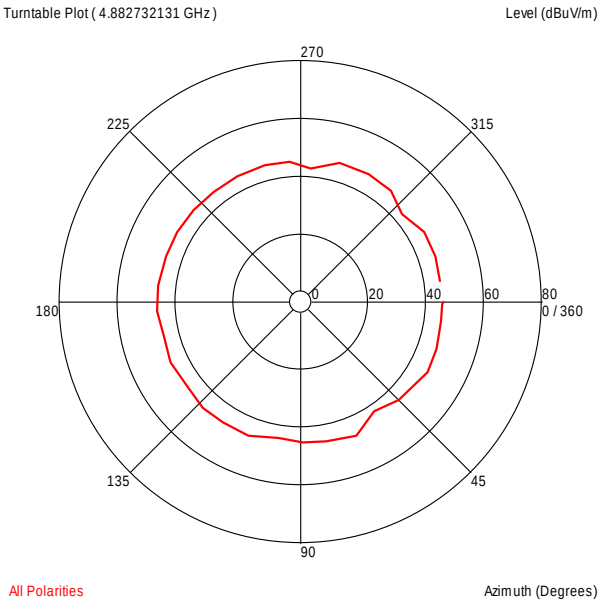
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.882732131 G	51.41	34.239	-25.482	74.000	-22.59	--	45	1.16	1 M	
9.757120909 G	57.63	36.827	-21.851	74.000	-16.37	--	207	1.16	1 M	
7.322932532 G	59.58	35.622	-23.659	74.000	-14.42	--	35	1.16	1 M	
12.452618571 G	64.95	39.105	-17.738	74.000	-9.05	|	192	1.16	1 M	

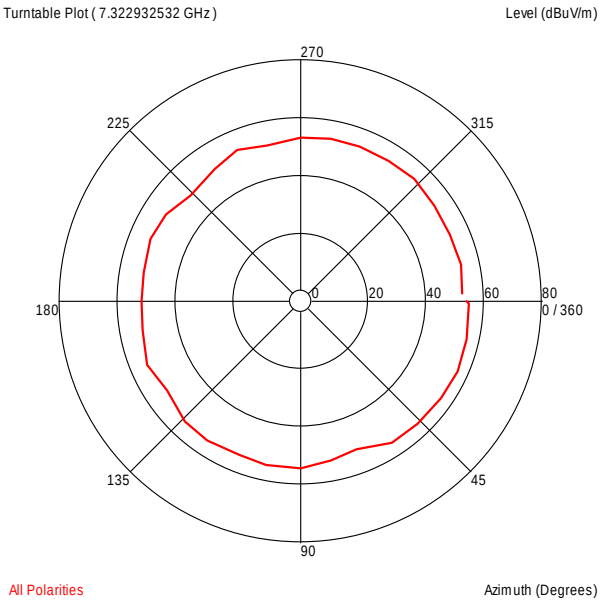
Trace3: Measured Average

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.882732131 G	37.89	34.239	-25.482	54.000	-16.11	--	45	1.16	1 M	
9.757120909 G	43.76	36.827	-21.851	54.000	-10.24	--	207	1.16	1 M	
12.452618571 G	51.01	39.105	-17.738	54.000	-2.99	|	192	1.16	1 M	
7.322932532 G	52.22	35.622	-23.659	54.000	-1.78	--	35	1.16	1 M	

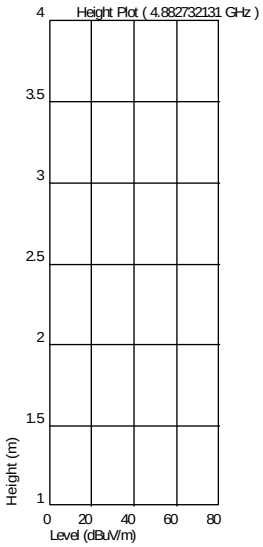
Insertion loss of the high pass filter of 0.72 dBwas added to the reading.

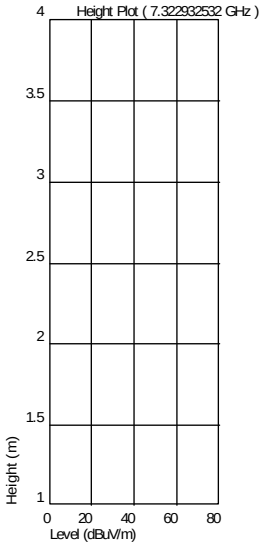
Azimuth Plots

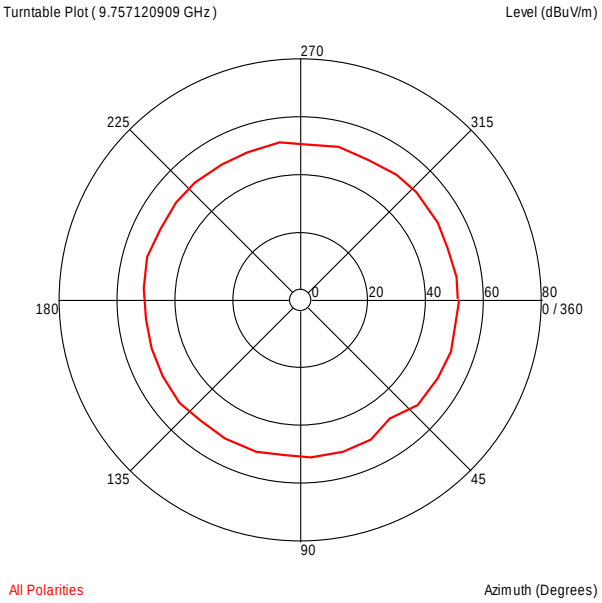


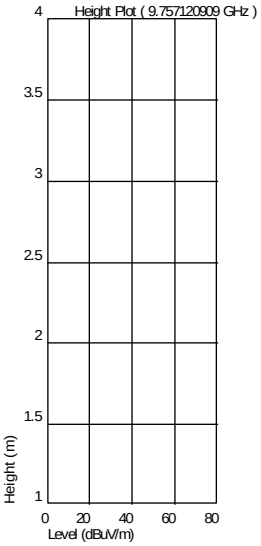


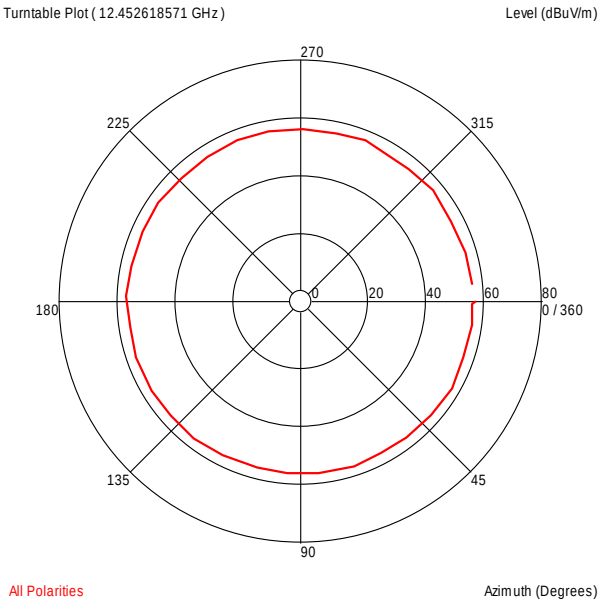
Turntable Plots

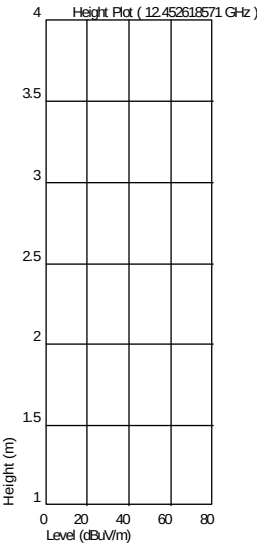





Turntable Plot (9.757120909 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (9.757120909 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)

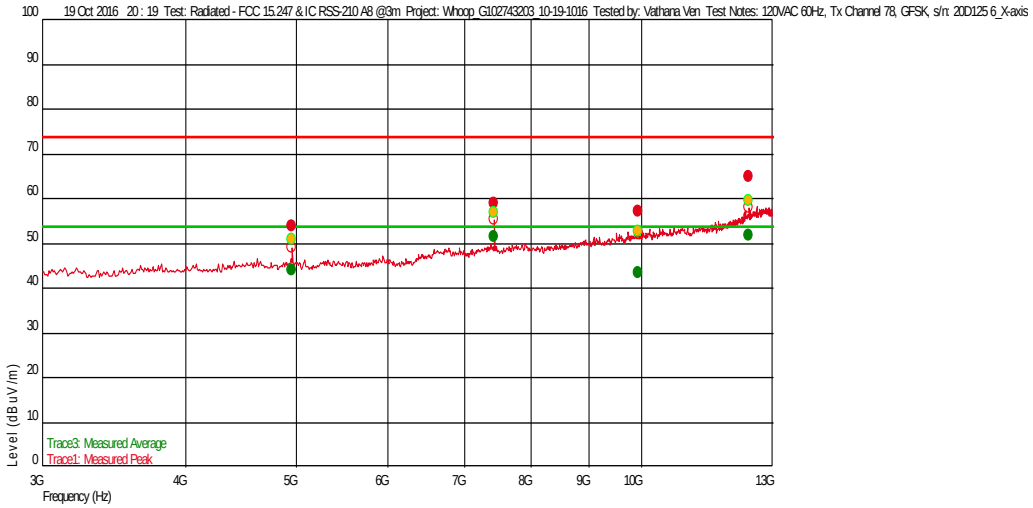

Turntable Plot (12.452618571 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (12.452618571 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC 15.247 & IC RSS-210 A8 @3m	
Project:	Whoop_G102743203_10-19-1016	
Test Notes:	120VAC 60Hz, Tx Channel 78, GFSK, s/n: 20D125 6_X-axis	
Temperature:	22 deg C	
Humidity:	42%, 1006 mB	
Tested by:	Vathana Ven	
Test Started:	19 Oct 2016 20 : 19	

Prescan Emission Graph



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable

Swept Peak Data
Swept Quasi Peak Data
Swept Average Data

Emissions Test Data

Trace1: Measured Peak

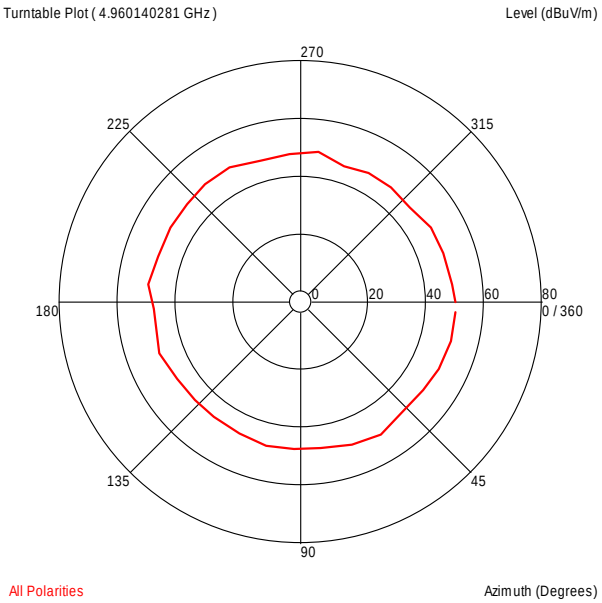
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.960140281 G	54.78	34.213	-25.335	74.000	-19.22	--	0	1.16	1 M	
9.938784236 G	58.07	37.098	-21.738	74.000	-15.93	--	64	1.16	1 M	
7.44019372 G	59.82	35.628	-23.593	74.000	-14.18	|	194	1.16	1 M	
12.399539078 G	65.90	39.121	-17.881	74.000	-8.10	|	8	1.16	1 M	

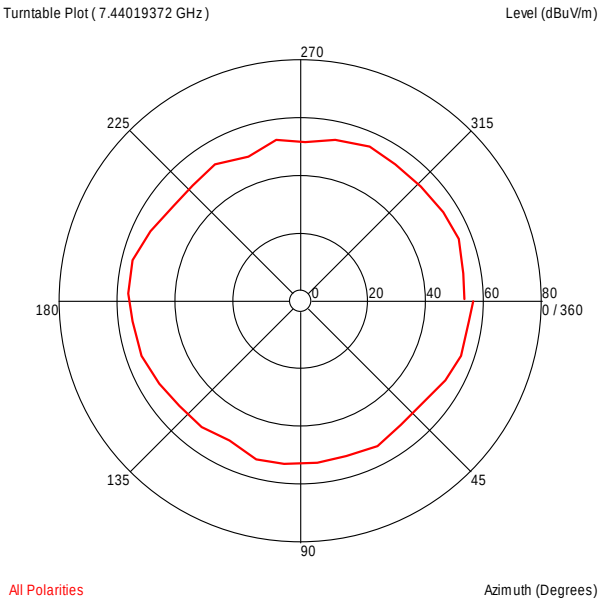
Trace3: Measured Average

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
9.938784236 G	44.31	37.098	-21.738	54.000	-9.69	--	64	1.16	1 M	
4.960140281 G	44.95	34.213	-25.335	54.000	-9.05	--	0	1.16	1 M	
7.44019372 G	52.27	35.628	-23.593	54.000	-1.73	|	194	1.16	1 M	
12.399539078 G	52.82	39.121	-17.881	54.000	-1.18	|	8	1.16	1 M	

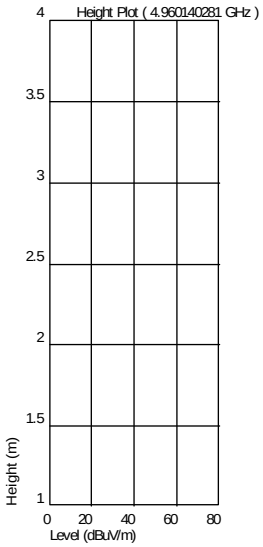
Insertion loss of the high pass filter of 0.89 dBwas added to the reading.

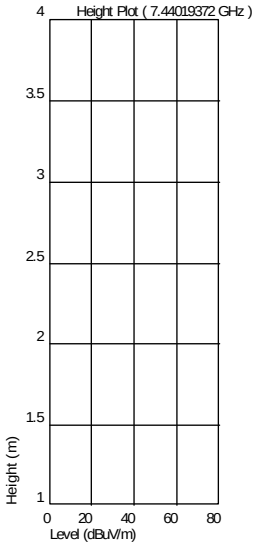
Azimuth Plots



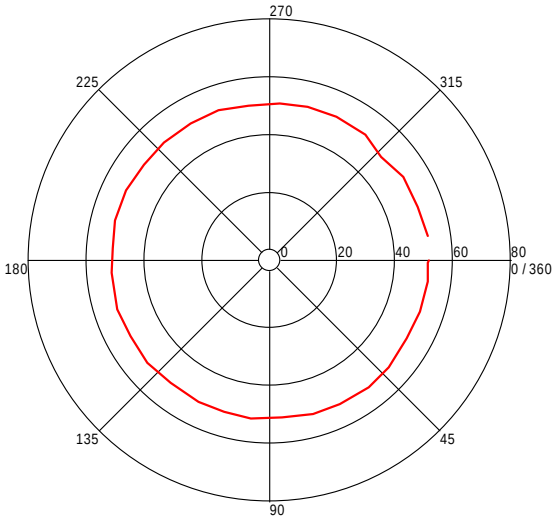


Turntable Plots

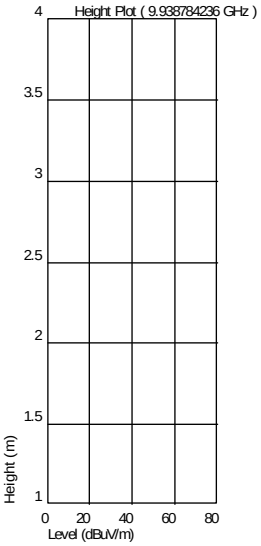




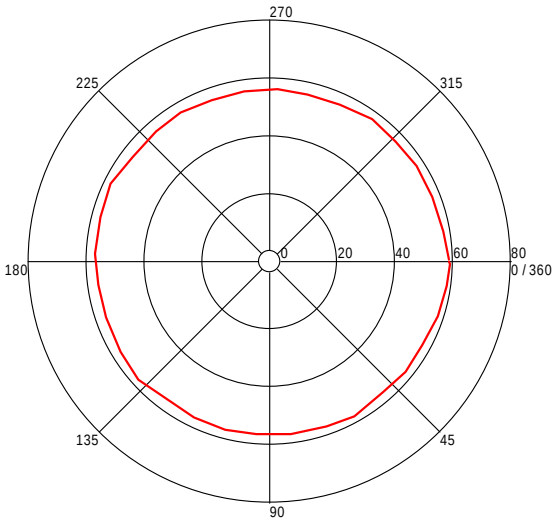
Turntable Plot (9.938784236 GHz) Level (dBuV/m)



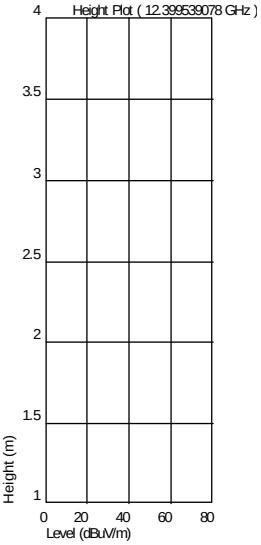
All Polarities Azimuth (Degrees)



Turntable Plot (12.399539078 GHz) Level (dBuV/m)



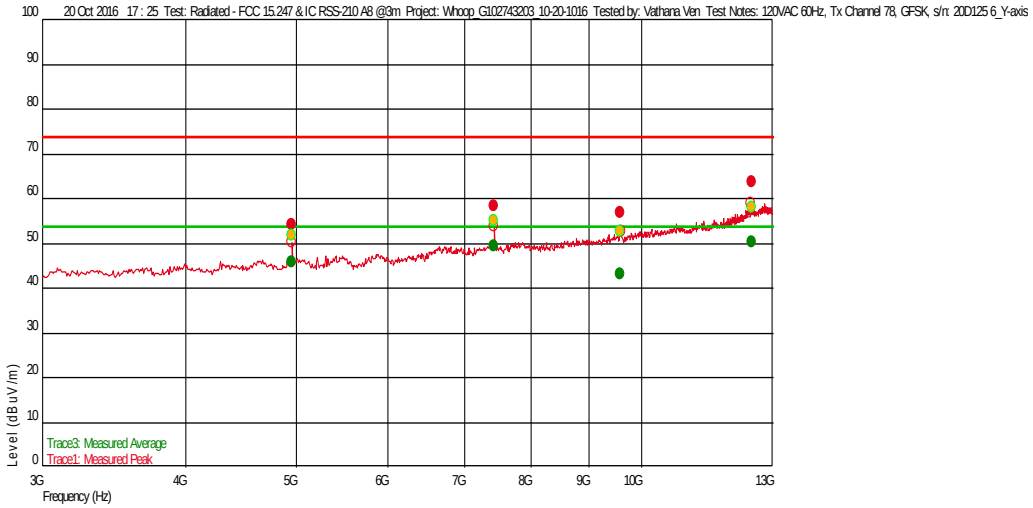
All Polarities Azimuth (Degrees)



Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC 15.247 & IC RSS-210 A8 @3m	
Project:	Whoop_G102743203_10-20-1016	
Test Notes:	120VAC 60Hz, Tx Channel 78, GFSK, s/n: 20D125 6_Y-axis	
Temperature:	22 deg C	
Humidity:	42%, 1010 mB	
Tested by:	Vathana Ven	
Test Started:	20 Oct 2016 17 : 25	

Prescan Emission Graph



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable

Swept Peak Data
Swept Quasi Peak Data
Swept Average Data

Emissions Test Data

Trace1: Measured Peak

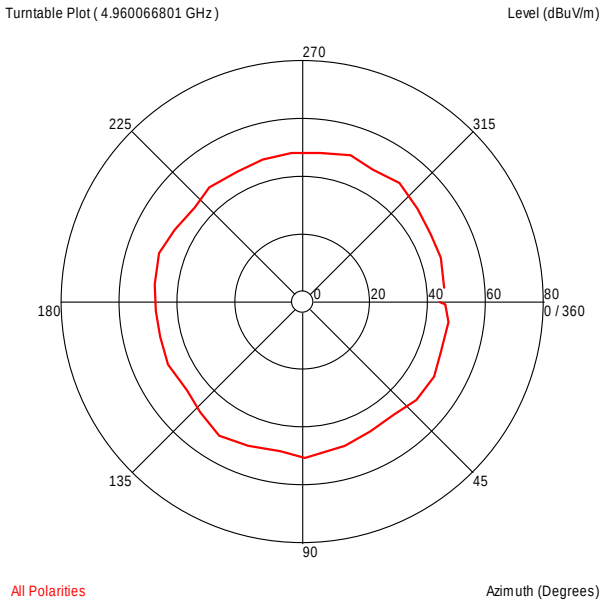
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.960066801 G	54.98	34.213	-25.335	74.000	-19.02	|	133	1.16	1 M	
9.588376754 G	57.76	36.681	-22.104	74.000	-16.24	--	360	1.16	1 M	
7.439953239 G	59.22	35.628	-23.594	74.000	-14.78	|	233	1.16	1 M	
12.468162993 G	64.72	39.100	-17.696	74.000	-9.28	--	199	1.16	1 M	

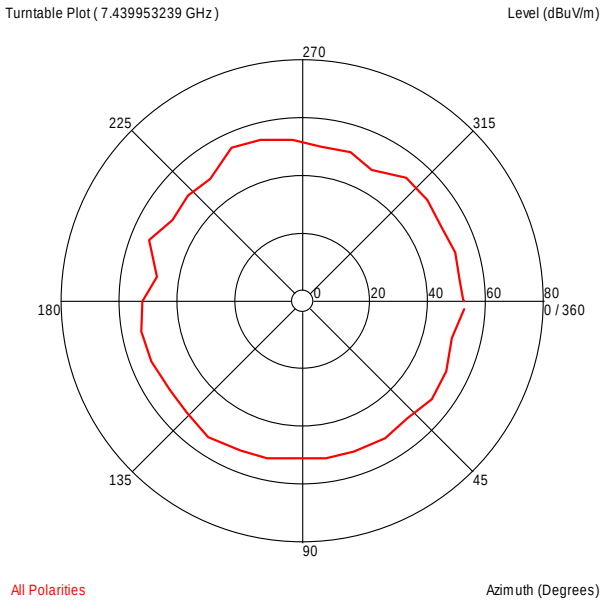
Trace3: Measured Average

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
9.588376754 G	44.05	36.681	-22.104	54.000	-9.95	--	360	1.16	1 M	
4.960066801 G	46.74	34.213	-25.335	54.000	-7.26	|	133	1.16	1 M	
7.439953239 G	50.22	35.628	-23.594	54.000	-3.78	|	233	1.16	1 M	
12.468162993 G	51.05	39.100	-17.696	54.000	-2.95	--	199	1.16	1 M	

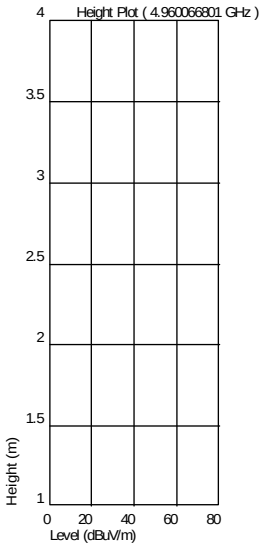
Insertion loss of the high pass filter of 0.89 dBwas added to the reading.

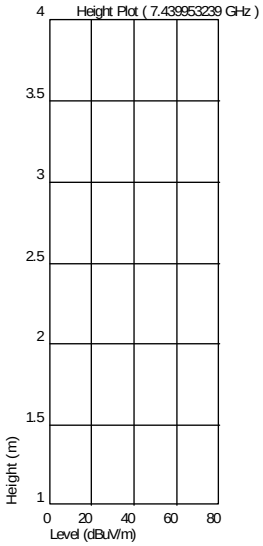
Azimuth Plots

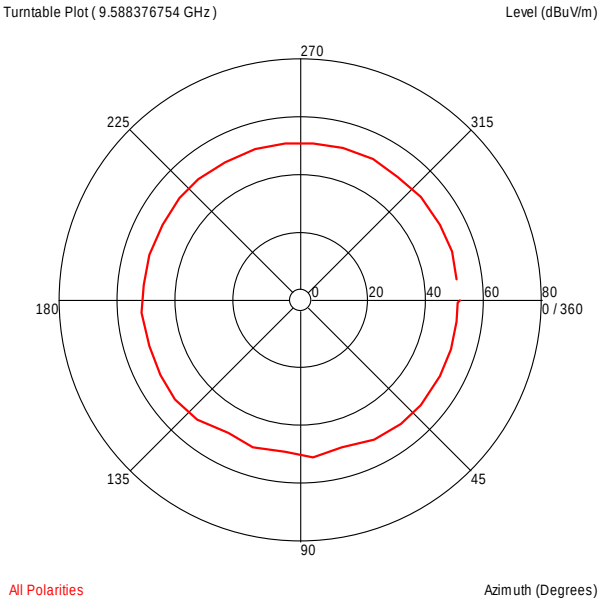


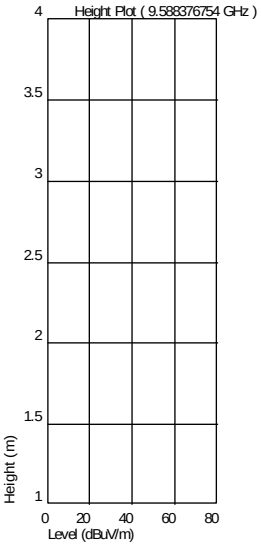


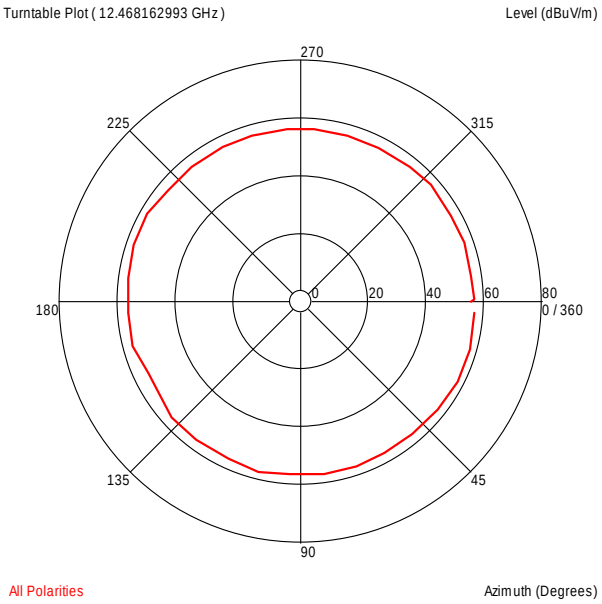
Turntable Plots

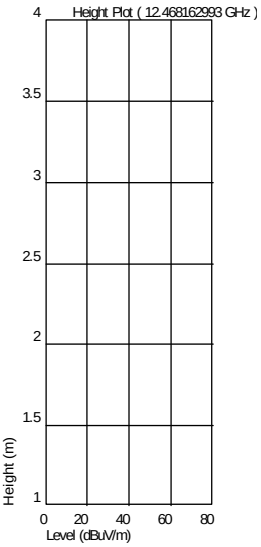





Turntable Plot (9.588376754 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (9.588376754 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)

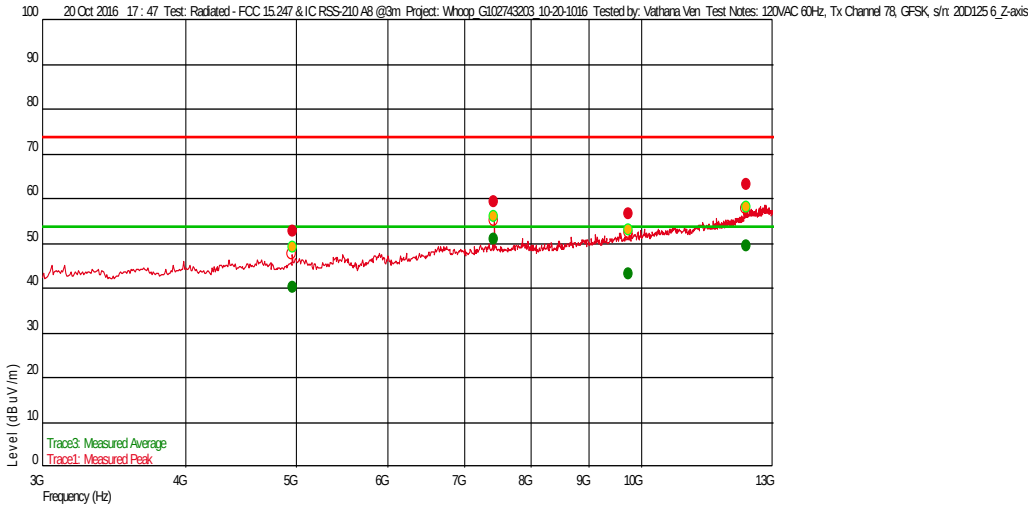

Turntable Plot (12.468162993 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (12.468162993 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
0
20
40
60
80
Level (dBuV/m)

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC 15.247 & IC RSS-210 A8 @3m	
Project:	Whoop_G102743203_10-20-1016	
Test Notes:	120VAC 60Hz, Tx Channel 78, GFSK, s/n: 20D125 6_Z-axis	
Temperature:	22 deg C	
Humidity:	42%, 1010 mB	
Tested by:	Vathana Ven	
Test Started:	20 Oct 2016 17 : 47	

Prescan Emission Graph



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable

Swept Peak Data
Swept Quasi Peak Data
Swept Average Data

Emissions Test Data

Trace1: Measured Peak

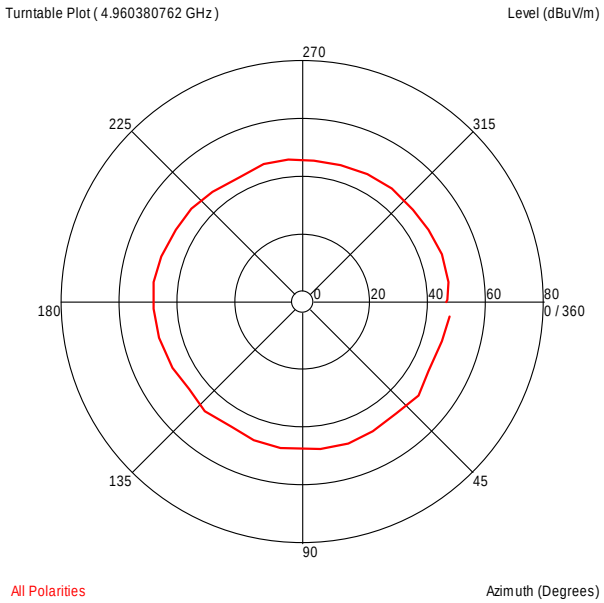
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.960380762 G	53.63	34.213	-25.335	74.000	-20.37	|	177	1.16	1 M	
9.748056112 G	57.48	36.818	-21.858	74.000	-16.52	--	281	1.16	1 M	
7.4402004 G	60.03	35.628	-23.593	74.000	-13.97	|	343	1.16	1 M	
12.333500334 G	63.97	39.098	-18.060	74.000	-10.03	--	74	1.16	1 M	

Trace3: Measured Average

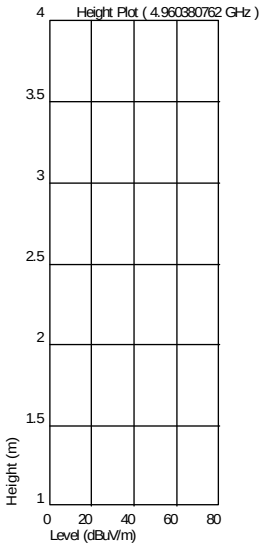
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.960380762 G	40.98	34.213	-25.335	54.000	-13.02	|	177	1.16	1 M	
9.748056112 G	43.91	36.818	-21.858	54.000	-10.09	--	281	1.16	1 M	
12.333500334 G	50.34	39.098	-18.060	54.000	-4.66	--	74	1.16	1 M	
7.4402004 G	51.81	35.628	-23.593	54.000	-2.19	|	343	1.16	1 M	

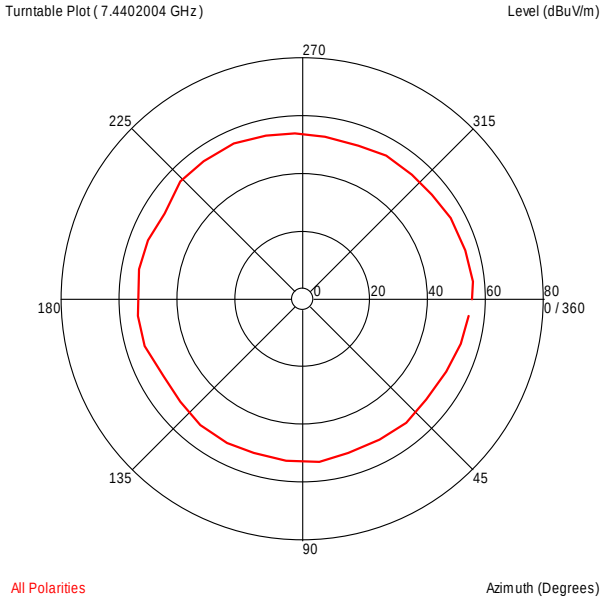
Insertion loss of the high pass filter of 0.89 dBwas added to the reading.

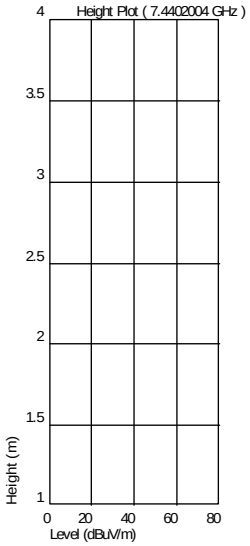
Azimuth Plots



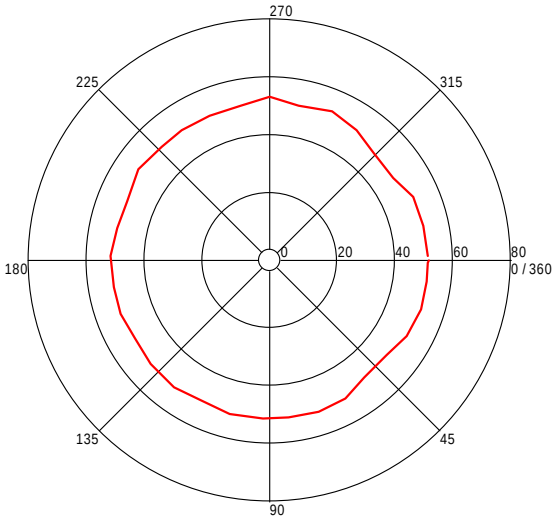
Turntable Plots



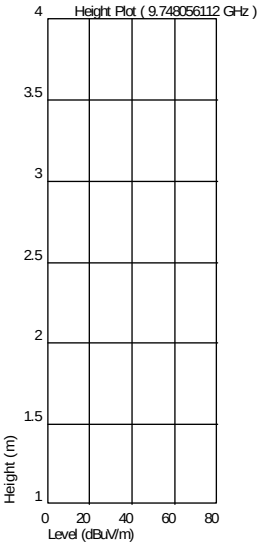




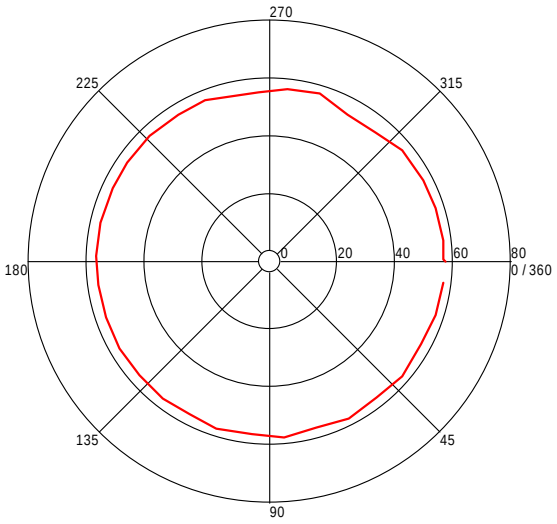
Turntable Plot (9.748056112 GHz) Level (dBuV/m)



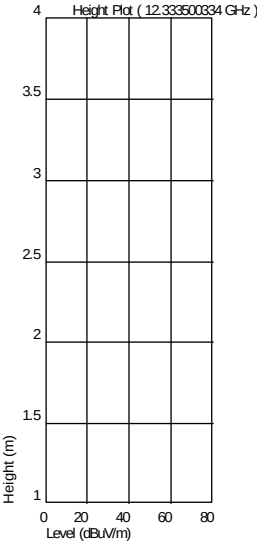
All Polarities Azimuth (Degrees)



Turntable Plot (12.333500334 GHz) Level (dBuV/m)



All Polarities Azimuth (Degrees)



Test Personnel:	Vathana Ven VSV	Test Date:	10/11/2016, 10/20/2016
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15C, 15.247, RSS-247	Limit Applied:	Below specified limit
Input Voltage:	120VAC/60Hz	Ambient Temperature:	21, 20 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**Yes**	Relative Humidity:	34, 48 %
		Atmospheric Pressure:	1018, 1000 mbars

Deviations, Additions, or Exclusions: Manual scans were performed between 1-3 GHz and 18-25 GHz, no emissions were detected above the measuring equipment noise floor.

13 Radiated Emissions from Digital device and Receiver

13.1 Method

Tests are performed in accordance with CFR47 FCC Part 15B, ICES-003.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	4.6 dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	5.3 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.5 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	5.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	5.0 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	5.0 dB	- dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample 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
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

13.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61 A	05/02/2016	05/02/2017
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/10/2016	03/10/2017
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	02/10/2016	02/10/2017
145014'	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	05/27/2016	05/27/2017
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	07/30/2016	07/30/2017
145-410'	Cables 145-420 145-421 145-422 145-406	Huber + Suhner	10m Track A Cables	multiple	07/30/2016	07/30/2017
145013	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2944A07027	05/02/2016	05/02/2017

Software Utilized:

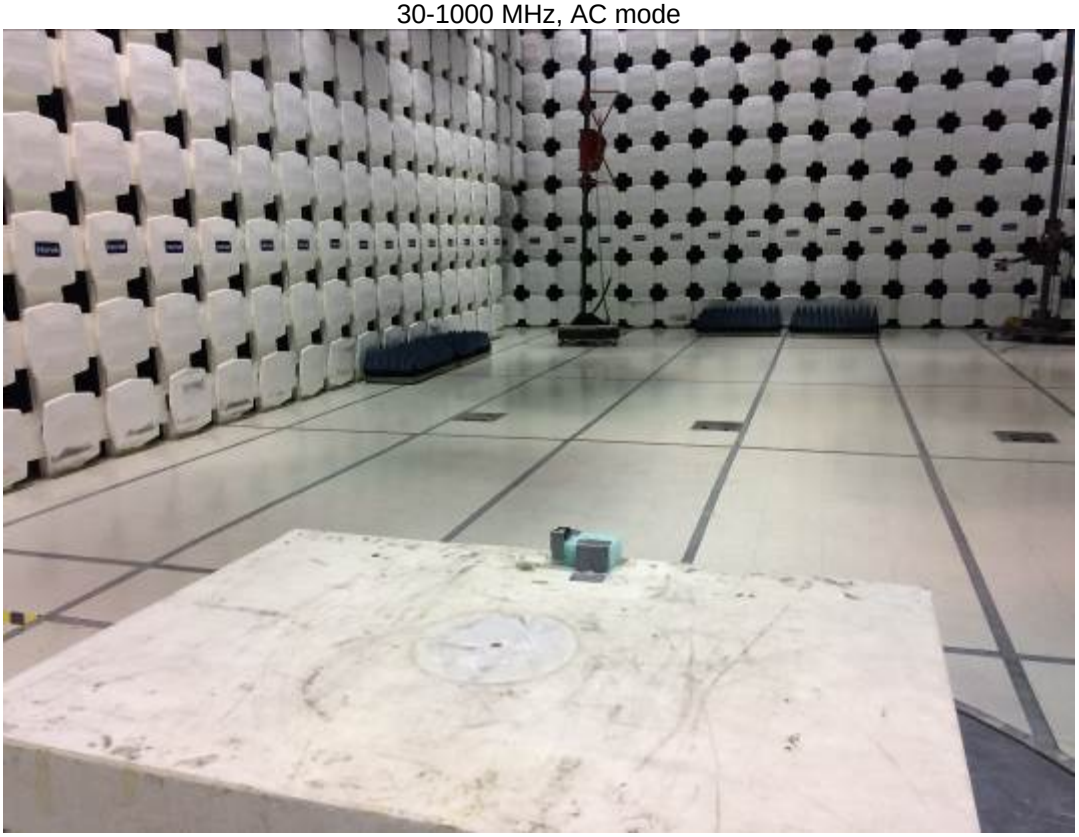
Name	Manufacturer	Version
Compliance 5	Teseq	5.26.46.46

13.3 Results:

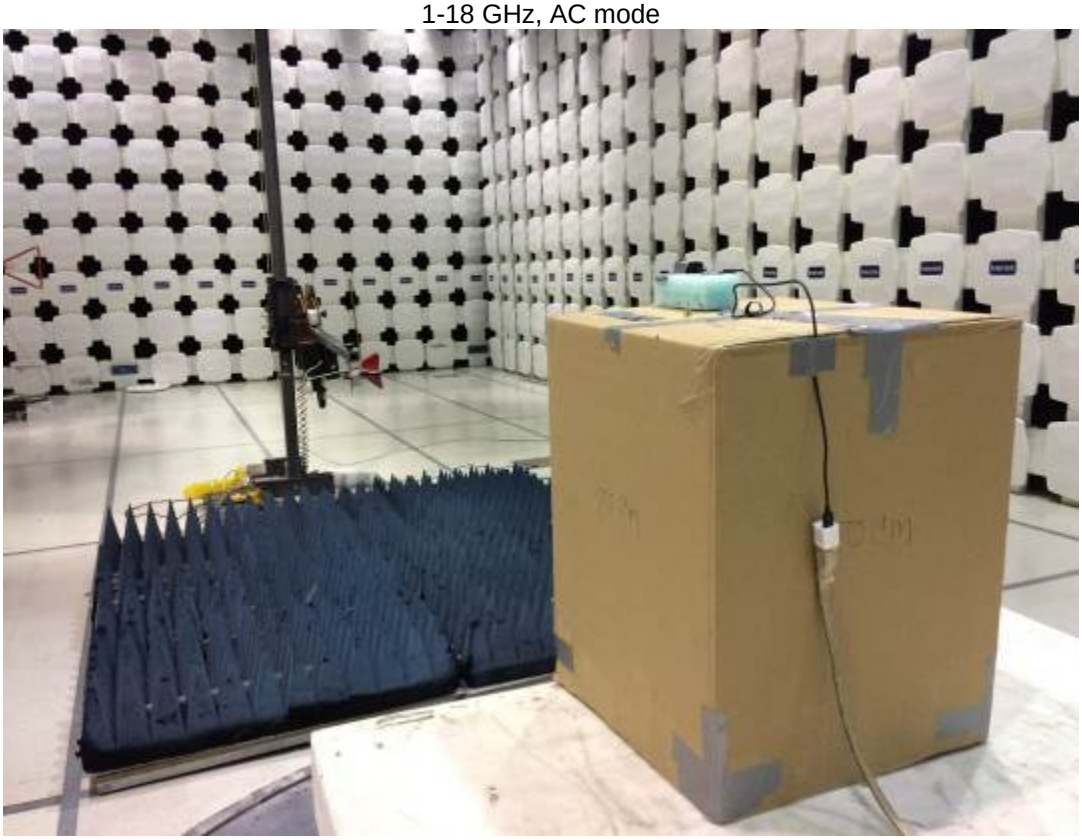
The sample tested was found to Comply.

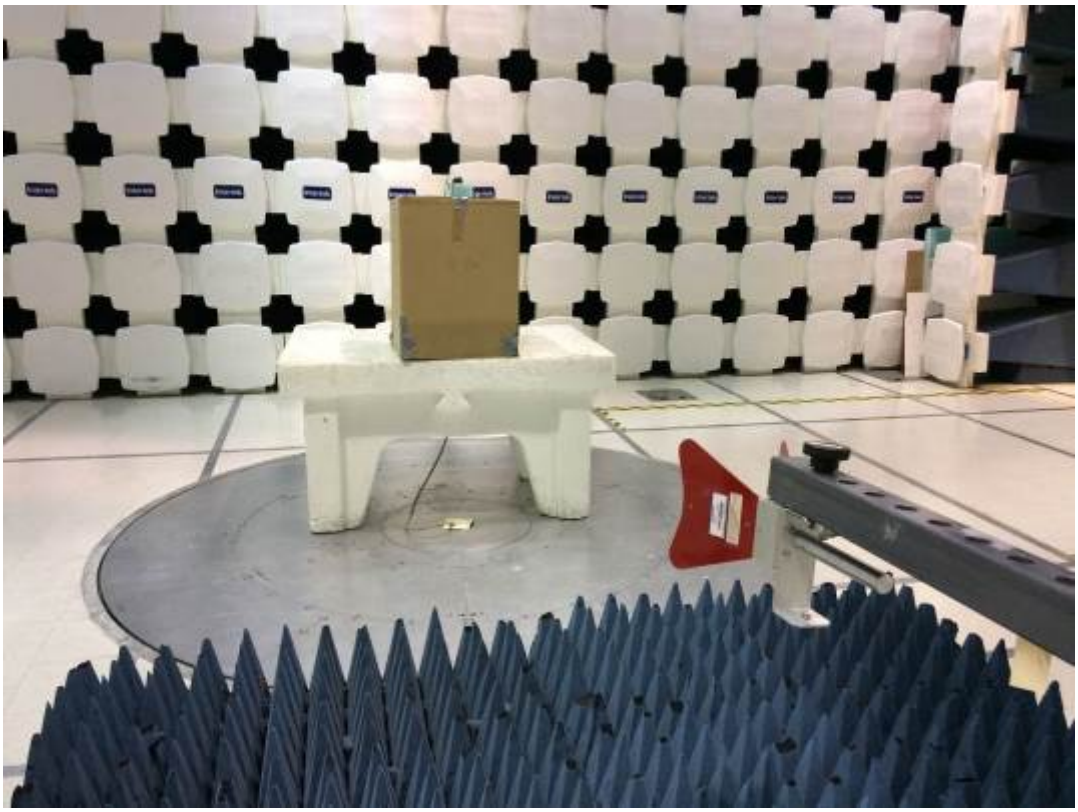
13.4 Setup Photographs:

30-1000 MHz, AC mode



1-18 GHz, AC mode



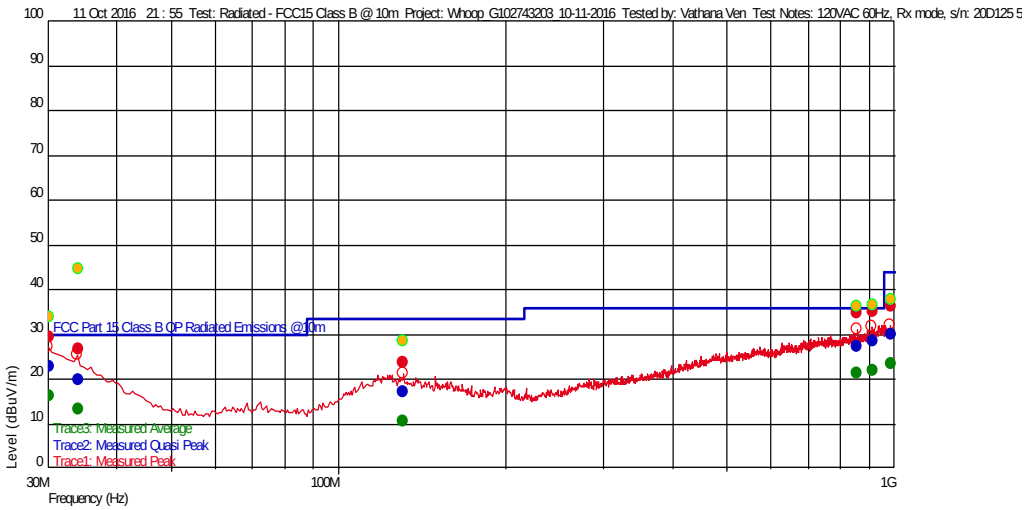


13.5 Test Data:

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15 Class B @ 10m	
Project:	Whoop_G102743203_10-11-2016	
Test Notes:	120VAC 60Hz, Rx mode, s/n: 20D125 6	
Temperature:	21 deg C	
Humidity:	34%, 1018 mB	
Tested by:	Vathana Ven	
Test Started:	11 Oct 2016 21 : 55	

Prescan Emission Graph



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable
Swept Peak Data
Swept Quasi Peak Data
Swept Average Data

Emissions Test Data

Trace1: Measured Peak

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
130.766332337 M	23.68	20.000	-26.468	33.520	-9.84	|	197	2.41	120 k	
985.220240741 M	36.15	29.600	-22.746	43.980	-7.83	|	360	3.98	120 k	
34.177956361 M	26.84	24.340	-27.693	30.000	-3.16	|	282	3.99	120 k	
856.199599589 M	34.70	28.148	-23.370	36.020	-1.32	--	96	3.98	120 k	
913.709218393 M	34.96	29.074	-23.107	36.020	-1.06	--	345	4.00	120 k	
30.287775551 M	29.42	27.270	-27.768	30.000	-0.58	--	97	3.11	120 k	

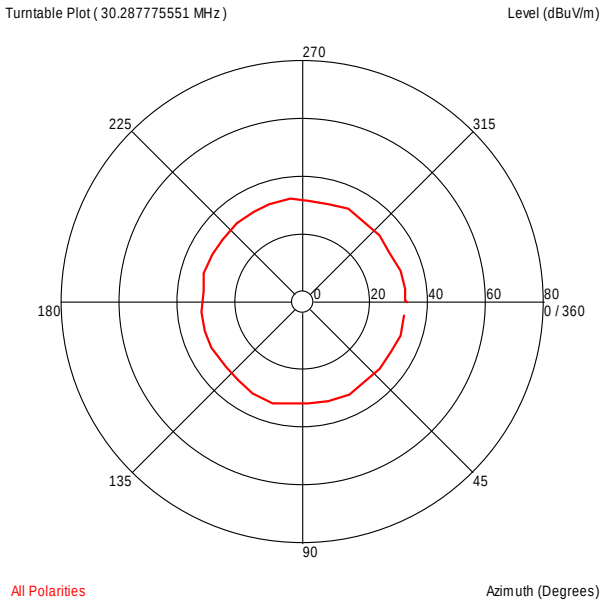
Trace2: Measured Quasi Peak

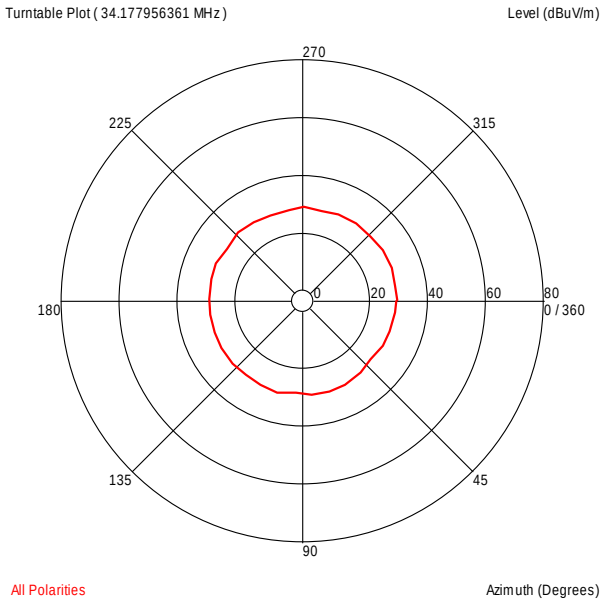
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
130.766332337 M	17.05	20.000	-26.468	33.520	-16.47	|	197	2.41	120 k	
985.220240741 M	29.88	29.600	-22.746	43.980	-14.10	|	360	3.98	120 k	
34.177956361 M	19.77	24.340	-27.693	30.000	-10.23	|	282	3.99	120 k	
856.199599589 M	27.16	28.148	-23.370	36.020	-8.86	--	96	3.98	120 k	
913.709218393 M	28.46	29.074	-23.107	36.020	-7.56	--	345	4.00	120 k	
30.287775551 M	22.73	27.270	-27.768	30.000	-7.27	--	97	3.11	120 k	

Trace3: Measured Average

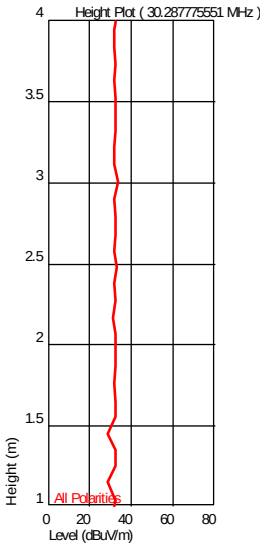
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
130.766332337 M	10.64	20.000	-26.468	--	--	|	197	2.41	120 k	
34.177956361 M	13.34	24.340	-27.693	--	--	|	282	3.99	120 k	
30.287775551 M	16.19	27.270	-27.768	--	--	--	97	3.11	120 k	
856.199599589 M	21.25	28.148	-23.370	--	--	--	96	3.98	120 k	
913.709218393 M	22.00	29.074	-23.107	--	--	--	345	4.00	120 k	
985.220240741 M	23.54	29.600	-22.746	--	--	|	360	3.98	120 k	

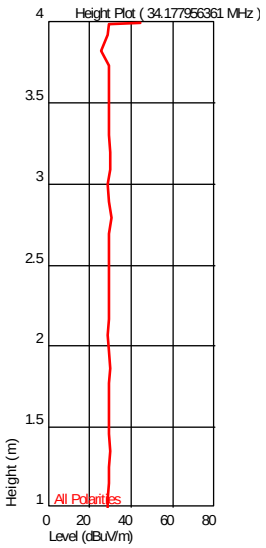
Azimuth Plots

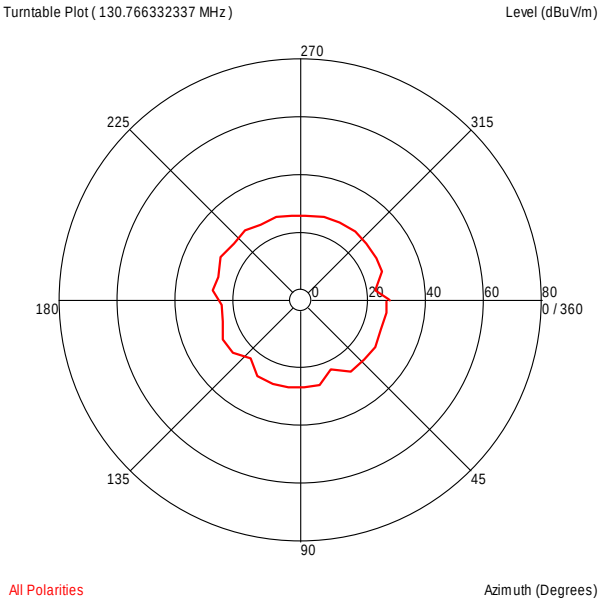


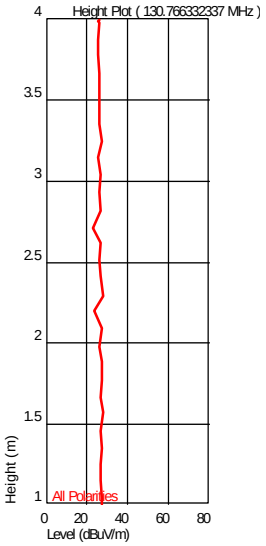


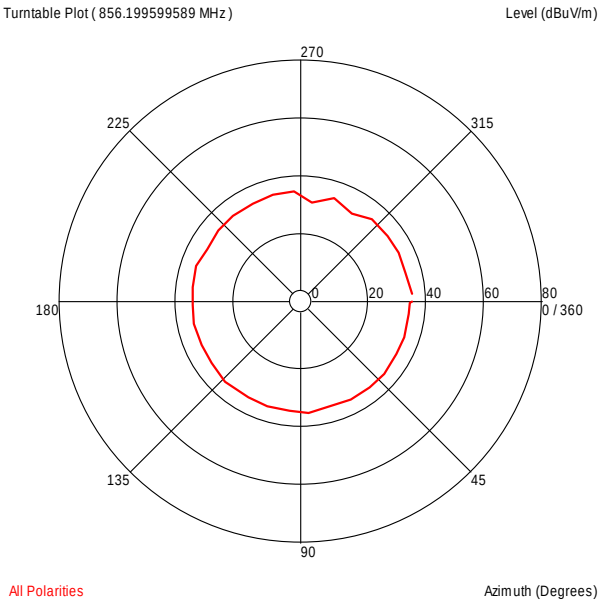
Turntable Plots

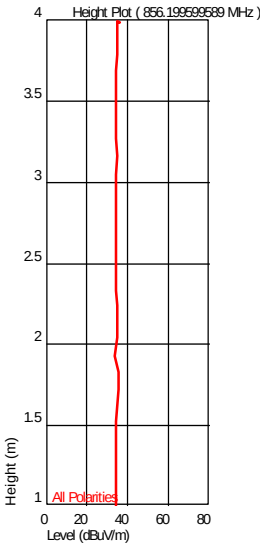


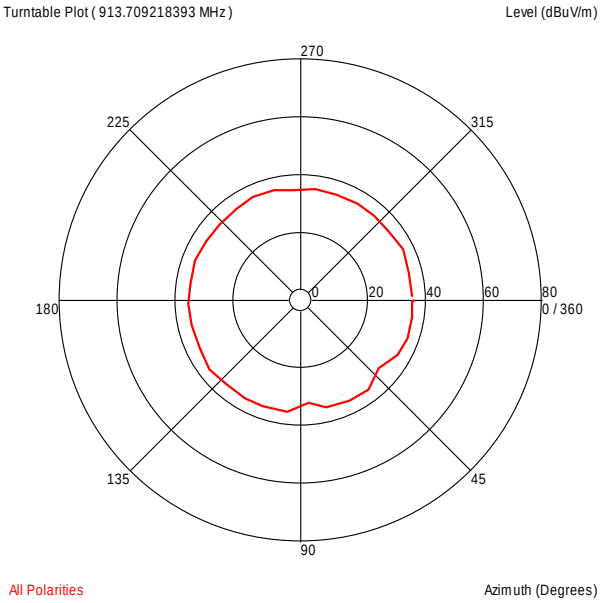


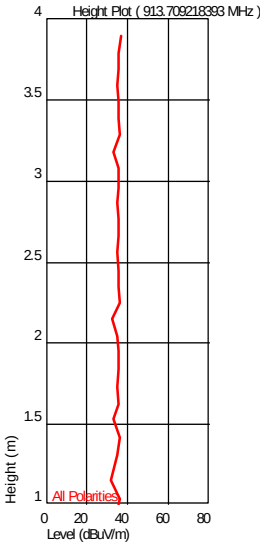

Turntable Plot (130.766332337 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

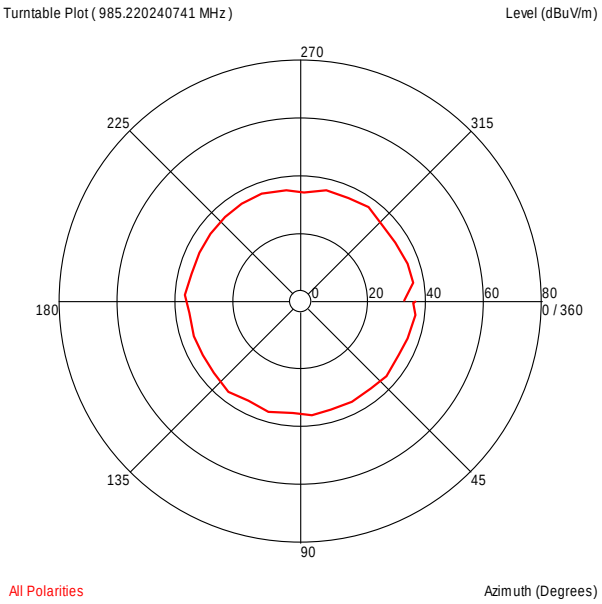

Height Plot (130.766332337 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

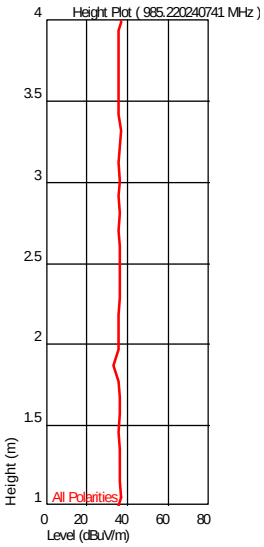

Turntable Plot (856.199599589 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (856.199599589 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (913.709218393 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (913.709218393 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

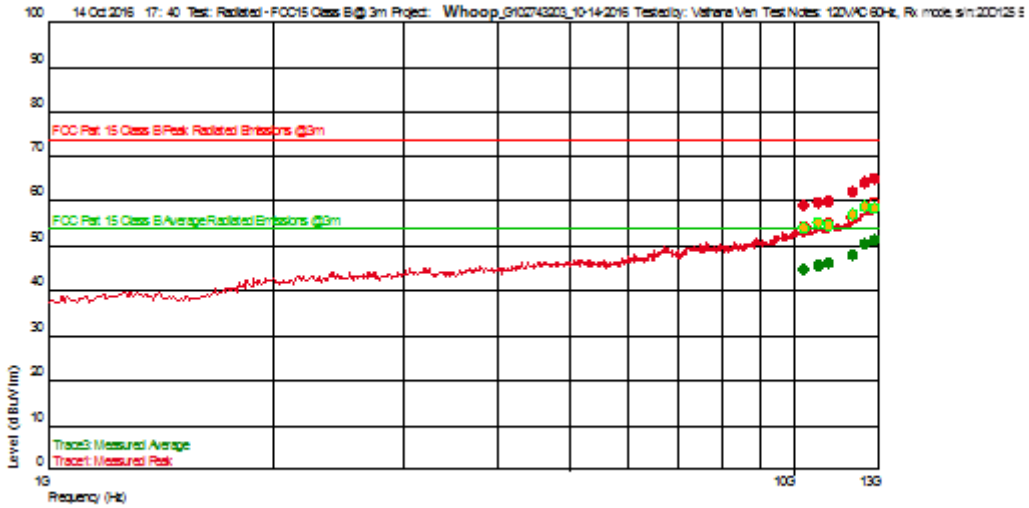

Turntable Plot (985.220240741 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (985.220240741 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15 Class B @ 3m	
Project:	Whoop_G102743203_10-14-2016	
Test Notes:	120VAC 60Hz, Rx mode, s/n:20D125 6	
Temperature:	22 deg C	
Humidity:	42%, 1015 mB	
Tested by:	Vathana Ven	
Test Started:	14 Oct 2016 17 : 40	

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

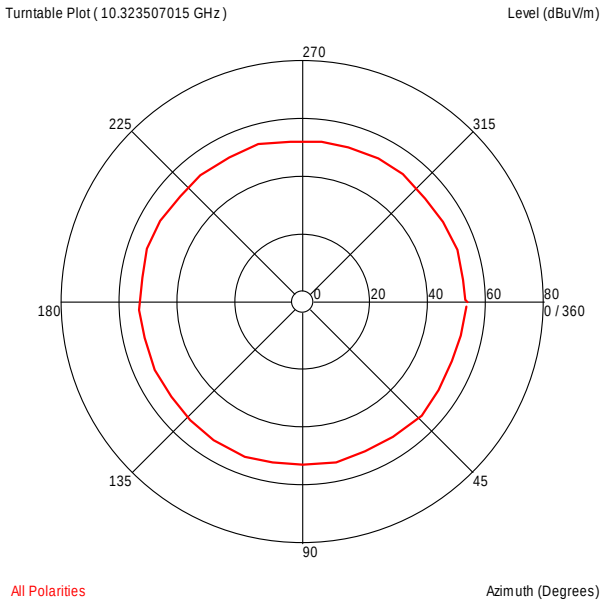
Trace1: Measured Peak

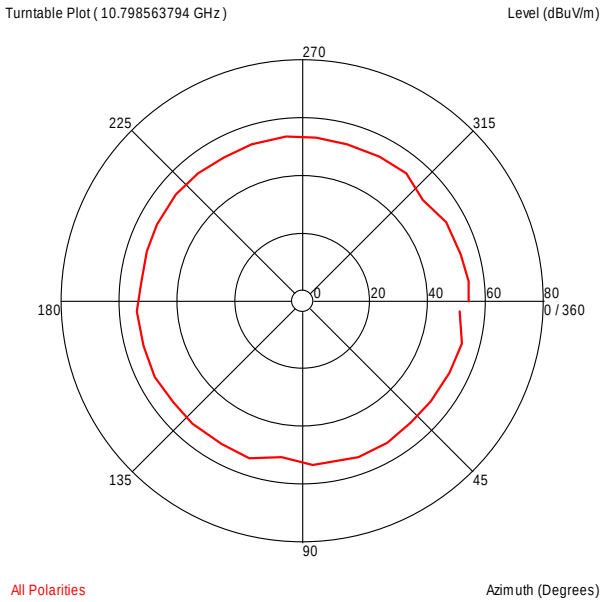
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
10.323507015 G	59.03	37.428	-21.264	74.000	-14.97	--	101	1.10	1 M	
10.798563794 G	59.52	37.715	-20.128	74.000	-14.48	|	343	2.08	1 M	
11.163620574 G	59.94	37.858	-19.473	74.000	-14.06	|	71	1.22	1 M	
11.988076152 G	61.90	38.784	-18.964	74.000	-12.10	|	70	2.78	1 M	
12.43998664 G	64.07	39.109	-17.772	74.000	-9.93	|	332	3.21	1 M	
12.818650635 G	64.92	39.387	-16.930	74.000	-9.08	|	85	3.92	1 M	

Trace3: Measured Average

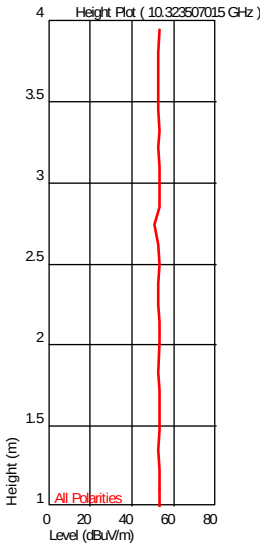
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
10.323507015 G	44.75	37.428	-21.264	54.000	-9.25	--	101	1.10	1 M	
10.798563794 G	45.65	37.715	-20.128	54.000	-8.35	|	343	2.08	1 M	
11.163620574 G	46.26	37.858	-19.473	54.000	-7.74	|	71	1.22	1 M	
11.988076152 G	48.06	38.784	-18.964	54.000	-5.94	|	70	2.78	1 M	
12.43998664 G	50.26	39.109	-17.772	54.000	-3.74	|	332	3.21	1 M	
12.818650635 G	51.21	39.387	-16.930	54.000	-2.79	|	85	3.92	1 M	

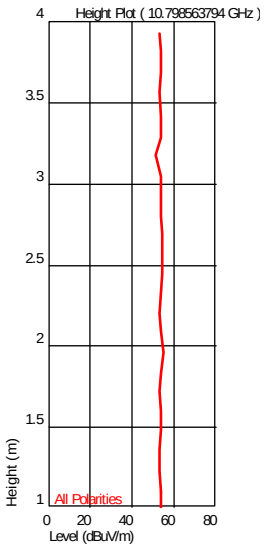
Azimuth Plots

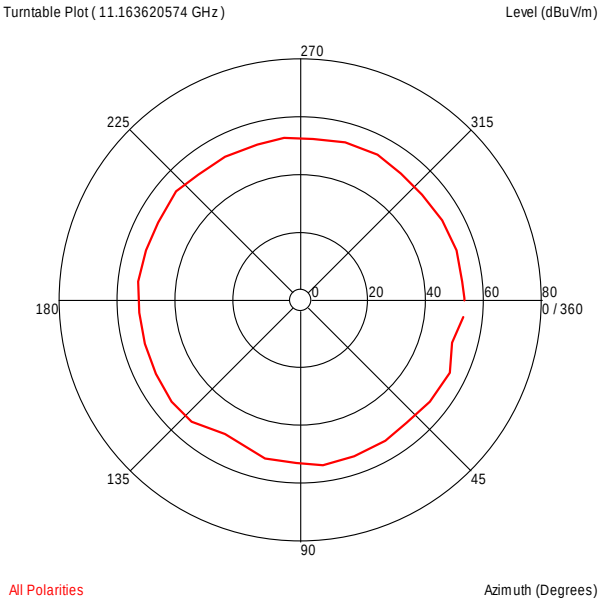


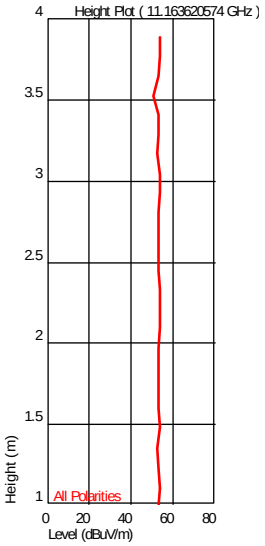


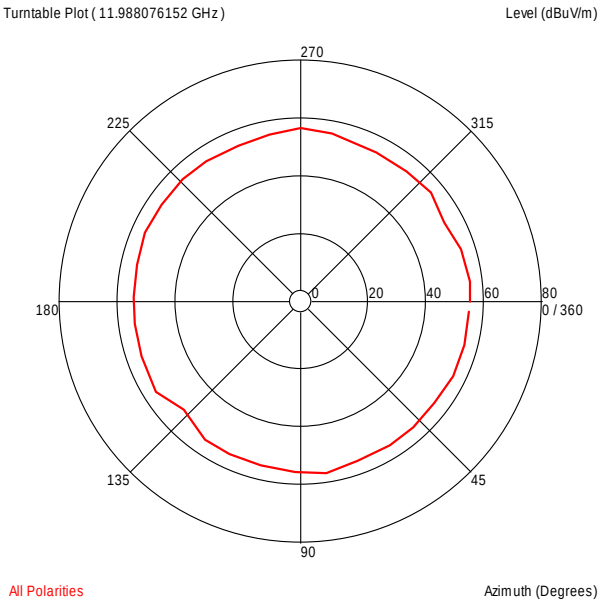
Turntable Plots

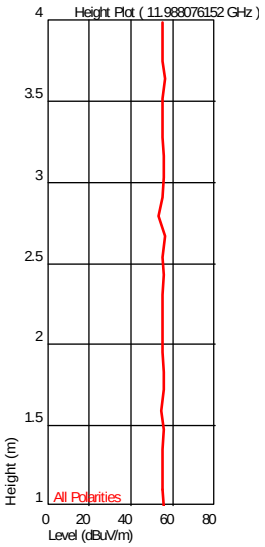


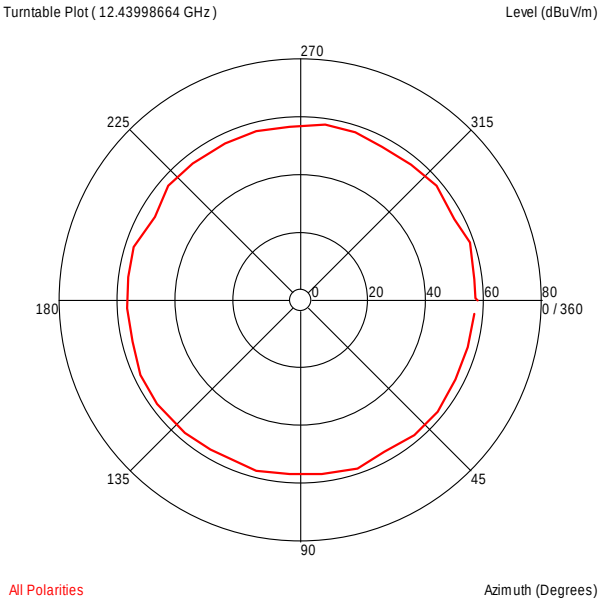


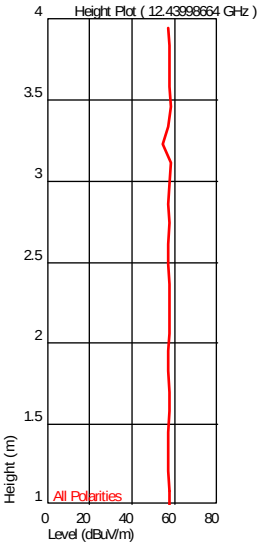

Turntable Plot (11.163620574 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

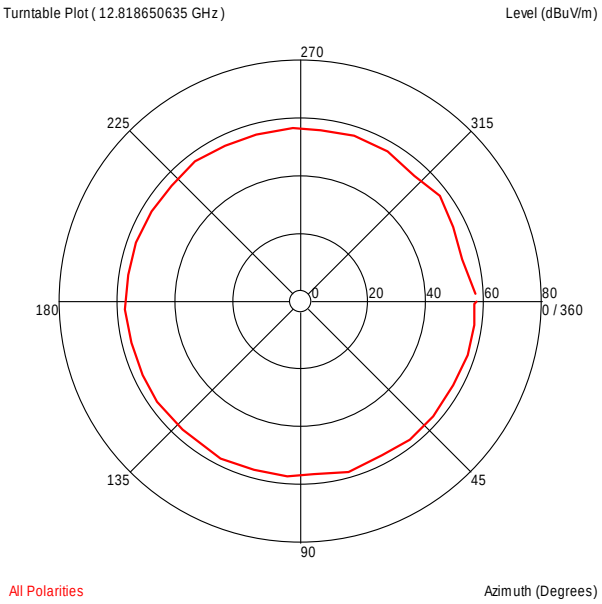

Height Plot (11.163620574 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

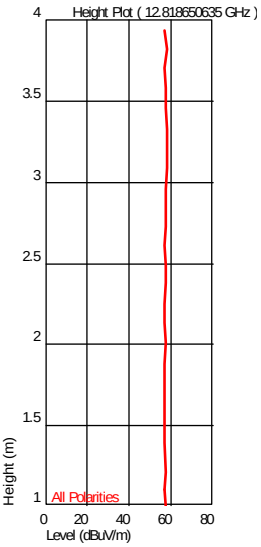

Turntable Plot (11.988076152 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (11.988076152 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (12.43998664 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (12.43998664 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (12.818650635 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (12.818650635 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

Test Personnel:	Vathana Ven VSV	Test Date:	10/11/2016, 10/14/2016
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15C, 15.247, RSS-247	Limit Applied:	Below specified limit
Input Voltage:	120VAC/60Hz	Ambient Temperature:	21, 22 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**Yes**	Relative Humidity:	34, 42 %
		Atmospheric Pressure:	1018, 1015 mbars

Deviations, Additions, or Exclusions: None

14 AC Mains Conducted Emissions

14.1 Method

Tests are performed in accordance with FCC Part 15 Subpart B and ICES 003.

TEST SITE: EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
AC Line Conducted Emissions	150 kHz - 30 MHz	2.8dB	3.4dB
Telco Port Emissions	150 kHz - 30 MHz	3.2dB	5.0dB

As shown in the table above our conducted emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculations

The following is how net line-conducted readings were determined:

NF = RF + LF + CF + AF
Where NF = Net Reading in dBμV
RF = Reading from receiver in dBμV
LF = LISN or ISN Correction Factor in dB
CF = Cable Correction Factor in dB
AF = Attenuator Loss Factor in dB

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 dBμV
$UF = 10^{(49.1\ dB\mu V / 20)}$ = 285.1 μV/m

Alternately, when C5 Software is used, the “Level” includes all losses and gains and is compared directly in the “Margin” column to the “Limit”. “TF” is the Transducer Factor; in this case LISN or ISN loss.

14.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV001'	Weather Station	Davis Instruments	7400	PE80519A61	10/23/2015	10/23/2016
ROS002'	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	07/29/2016	07/29/2017
CBLBNC 2012-1'	50 Ohm Coaxial Cable	Pomona	RG-58 C/U	CBLBNC2012-1	12/11/2015	12/11/2016
LISN31'	LISN - CISPR16 Compliant 9kHz-30MHz	Com-Power	LI-215A	191957	03/14/2016	03/14/2017
DS23A'	Attenuator, 20dB	Mini Circuits	20dB, 50 ohm	DS23A	10/15/2015	10/15/2016

Software Utilized:

Name	Manufacturer	Version
Compliance5	Teseq	5.26.46.46

14.3 Results:

The sample tested was found to Comply.

14.4 Setup Photographs:

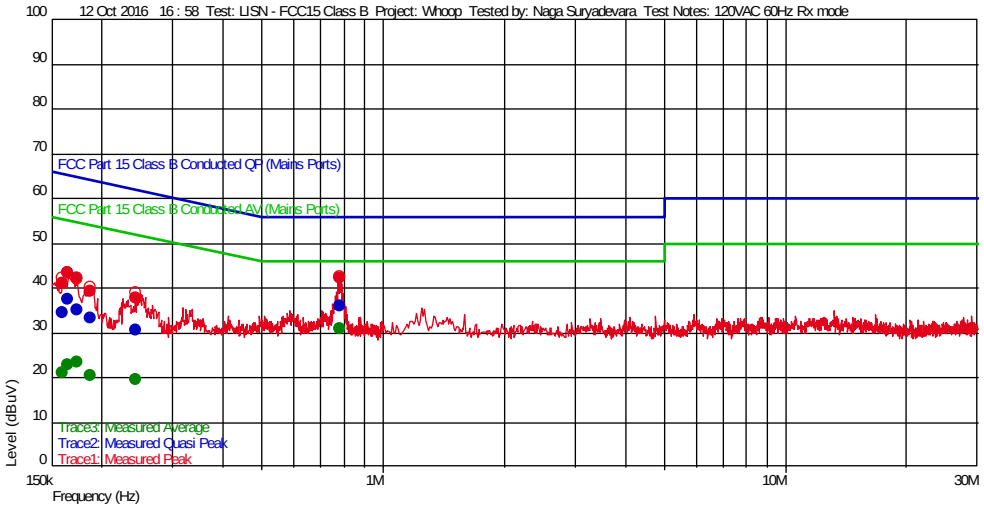
14.5 Plots/Data:

Operating @ 120VAC 60Hz Rx Mode

Test Information

Test:	LISN - FCC15 Class B
Project:	Whoop
Test Notes:	120VAC 60Hz Rx mode
Temperature:	22 C
Humidity:	33% 1014 mbars
Tested by:	Naga Suryadevara
Test Started:	12 Oct 2016 16 : 58

Prescan Emission Graph



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable
Swept Peak Data
Swept Quasi Peak Data
Swept Average Data

Emissions Test Data

Trace2: Measured Quasi Peak

Frequency(Hz)	Level(dBuV)	TF	PA+CL	Limit(dBuV)	Margin(dBuV)	RBW(Hz)	LINE
244.35 k	30.47	0.036	20.007	61.947	-31.48	9 k	N
160.2 k	34.45	0.072	20.003	65.454	-31.00	9 k	N
188.25 k	33.19	0.049	20.005	64.113	-30.92	9 k	N
173.8 k	34.97	0.061	20.004	64.777	-29.80	9 k	N
165.3 k	37.41	0.068	20.003	65.193	-27.78	9 k	N
784.1 k	35.83	0.020	20.031	56.000	-20.17	9 k	L1

Trace3: Measured Average

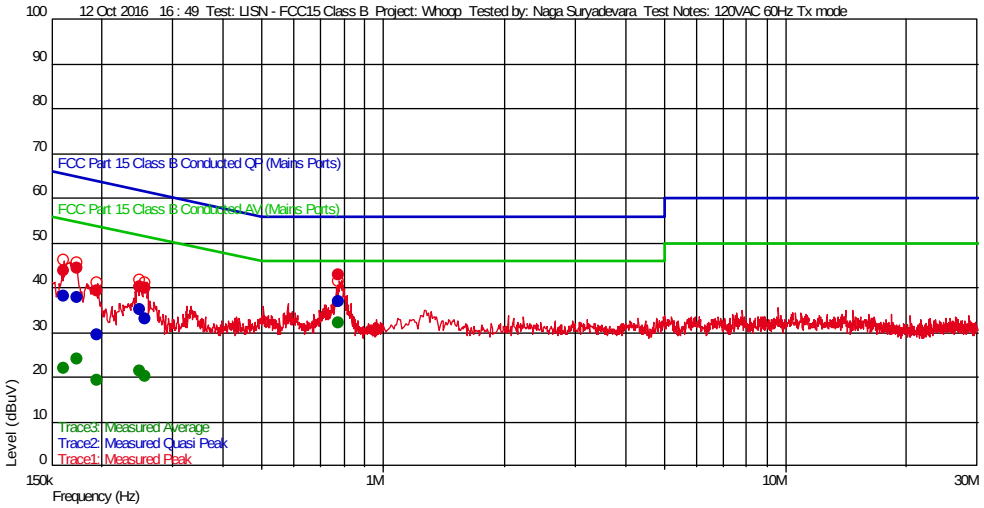
Frequency(Hz)	Level(dBuV)	TF	PA+CL	Limit(dBuV)	Margin(dBuV)	RBW(Hz)	LINE
160.2 k	21.03	0.072	20.003	55.454	-34.42	9 k	N
188.25 k	20.52	0.049	20.005	54.113	-33.60	9 k	N
244.35 k	19.52	0.036	20.007	51.947	-32.43	9 k	N
165.3 k	22.89	0.068	20.003	55.193	-32.30	9 k	N
173.8 k	23.53	0.061	20.004	54.777	-31.24	9 k	N
784.1 k	31.04	0.020	20.031	46.000	-14.96	9 k	L1

Operating @ 120VAC 60Hz Tx Mode

Test Information

Test Details	User Entry
Test:	LISN - FCC15 Class B
Project:	Whoop
Test Notes:	120VAC 60Hz Tx mode
Temperature:	22 C
Humidity:	33% 1014 mbars
Tested by:	Naga Suryadevara
Test Started:	12 Oct 2016 16 : 49

Prescan Emission Graph



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable
Swept Peak Data
Swept Quasi Peak Data
Swept Average Data

Emissions Test Data

Trace2: Measured Quasi Peak

Frequency(Hz)	Level(dBuV)	TF	PA+CL	Limit(dBuV)	Margin(dBuV)	RBW(Hz)	LINE
195.9 k	29.54	0.043	20.005	63.783	-34.25	9 k	N
256.25 k	32.89	0.034	20.008	61.552	-28.67	9 k	N
161.05 k	37.94	0.071	20.003	65.410	-27.47	9 k	N
173.8 k	37.84	0.061	20.004	64.777	-26.94	9 k	N
248.6 k	34.96	0.035	20.008	61.804	-26.84	9 k	N
778.15 k	36.87	0.020	20.031	56.000	-19.13	9 k	L1

Trace3: Measured Average

Frequency(Hz)	Level(dBuV)	TF	PA+CL	Limit(dBuV)	Margin(dBuV)	RBW(Hz)	LINE
195.9 k	19.18	0.043	20.005	53.783	-34.61	9 k	N
161.05 k	21.90	0.071	20.003	55.410	-33.51	9 k	N
256.25 k	20.06	0.034	20.008	51.552	-31.49	9 k	N
173.8 k	24.11	0.061	20.004	54.777	-30.66	9 k	N
248.6 k	21.48	0.035	20.008	51.804	-30.32	9 k	N
778.15 k	31.96	0.020	20.031	46.000	-14.04	9 k	L1

Test Personnel:	Naga Suryadevara NS	Test Date:	10/12/2016
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part15 Subpart B ICES 003	Limit Applied:	Class A
Input Voltage:	120VAC 60Hz		
Pretest Verification w/ Ambient Signals or BB Source:	BB Source	Ambient Temperature:	22 ºC
		Relative Humidity:	33 %
		Atmospheric Pressure:	1014 mbars

Deviations, Additions, or Exclusions: None

15 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	10/28/2016	102675709BOX-001	VFV	MFM	Original Issue
1	11/10/2016	102675709BOX-001	VFV	MFM	Updated Block Diagram, updated bandwidth on page 41, Updated measurement uncertainty limit in section 6.1, 11.1 and 12.1, updated table size on page 22