

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

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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.

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

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Company: Whoop Model: WHOOP Strap 2.0

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Radiated Emissions from Digital parts and Receiver

13 (CFR47 FCC Part 15 (15.109): 10/2016 Pass ICES 003: 01/2016 and updated 06/2016)

AC Mains Conducted Emissions

14 (FCC Part 15 Subpart B: 10/2016 Pass

ICES 003: 01/2016 and updated 06/2016)

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

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:

Opci	ating modes of the Lot.
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
Γ	1	None

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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			

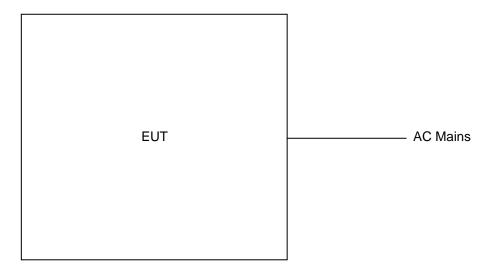
5.1 Method:

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.

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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 $U_{\it lab}$ is less than the corresponding $U_{\it CISPR}$ 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.

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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 $FS = Field Strength in dB\mu V/m$

RA = Receiver Amplitude (including preamplifier) in $dB\mu V$

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 dB μ V 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 dB_µV/m. This value in $dB\mu V/m$ was converted to its corresponding level in $\mu V/m$.

 $RA = 52.0 dB\mu V$ AF = 7.4 dB/mCF = 1.6 dBAG = 29.0 dBFS = 32 dBuV/m

To convert from $dB\mu V$ to μV or mV the following was used:

UF =
$$10^{(NF/20)}$$
 where UF = Net Reading in μ V
NF = Net Reading in dB μ V

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 $\mu V/m$

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6.2 **Test Equipment Used:**

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
				PE80529A61		
DAV004'	Weather Station	Davis Instruments	7400	Α	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
			3m Track B			
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	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!

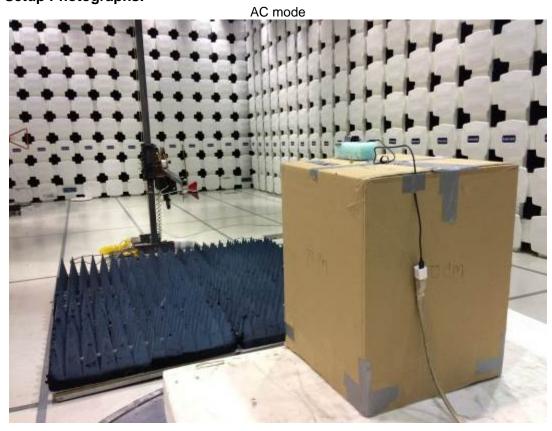
6.3 Results:

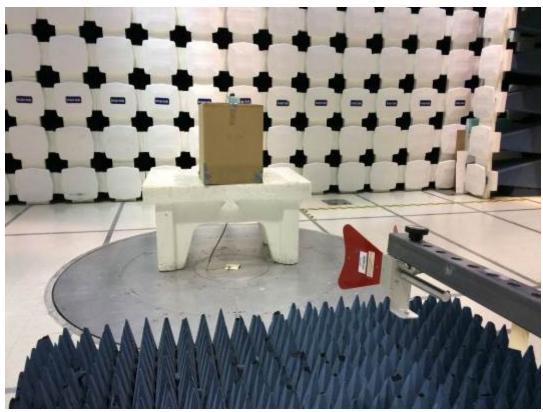
The sample tested was found to Comply. The EIRP must not exceed 30 dBm. The Human RF Exposure limit is 1 mW/cm².

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.

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6.4 Setup Photographs:



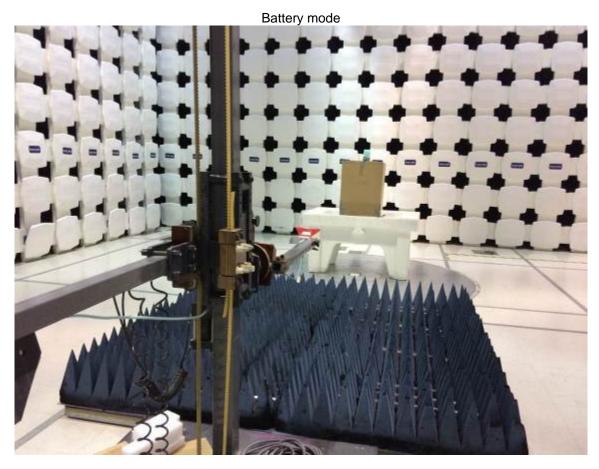


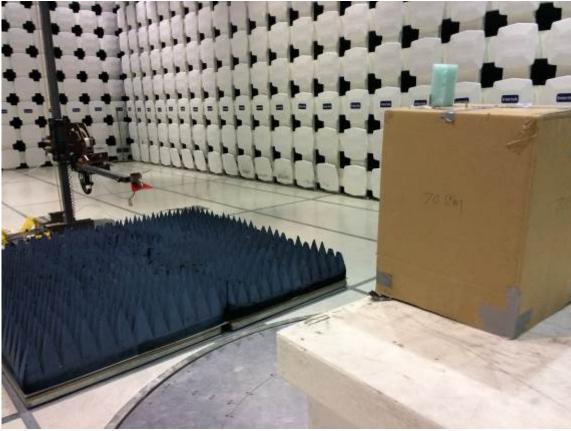




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6.5 Test Data:

Radiated Emissions

 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
 ETS001 02-10-17.txt

 Serial #: 20D125 6
 Cable(s): 145-416-118 GHz 10-08-17.txt
 NONE.

 Engineers: Vathana Ven
 Location: 10M
 Barometer: DAV004
 * Filter:
 NONE

 Project #: G102743203
 Date(s): 10/20/16

 Standard: FCC Part 15 Subpart C 15.247
 Temp/Humidity/Pressure: 22c
 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-F	eak: QP Av	erage: AVG	RMS: RMS	S; NF = Nois			d Band; Ba	ndwidth den	oted as RB	W/VBW
_	Ant.	_		Antenna		Pre-amp		EIRP	EIRP		
Detector	Pol.	Frequency	Reading	Factor	Loss	Factor	Factor	Net	Limit	Margin	Bandwidth
Type	(V/H)	MHz	dB(uV)	dB(1/m) ote: RF Out	dB	dB Channel 0	dB	dBm is	dBm	dB	
	Note: EIRP	Obtained by							3m - 95.22 =	= dBm EIRF)
PK	V	2402.000	49.35	32.29	3.67	0.00	0.00	-9.91	30.00	-39.91	5/10 MHz
PK	Н	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		e path loss						dBm EIRF	
PK	V	2402.000	49.22	32.29	3.67	0.00	0.00	-10.04	30.00	-40.04	1/3 MHz
PK	Н	2402.000	50.30	32.29	3.67	0.00	0.00	-8.96	30.00	-38.96	1/3 MHz
			N	ote: RF Out	put Power,	Channel 0,	GFSK, Y-ax	is			
	Note: EIRP	Obtained by	applying th	e path loss	correction for	or a 3m test	distance, E	(dBuV/m)@	3m - 95.22 =	dBm EIRF)
PK	V	2402.000	47.66	32.29	3.67	0.00	0.00	-11.60	30.00	-41.60	5/10 MHz
PK	Н	2402.000	53.50	32.29	3.67	0.00	0.00	-5.76	30.00	-35.76	5/10 MHz
		Obtained by									
PK	V	2402.000	47.50	32.29	3.67	0.00	0.00	-11.76	30.00	-41.76	1/3 MHz
PK	Н	2402.000	52.90	32.29	3.67	0.00	0.00	-6.36	30.00	-36.36	1/3 MHz
				ote: RF Out							
DIZ		Obtained by									
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 Nata: FIDD	2402.000	51.00	32.29	3.67	0.00	0.00	-8.26	30.00	-38.26	5/10 MHz
PK	Note: EIRP	Obtained by									1/3 MHz
PK PK	H	2402.000 2402.000	49.65 50.90	32.29 32.29	3.67 3.67	0.00	0.00	-9.61 -8.36	30.00 30.00	-39.61 -38.36	1/3 MHz
PN	п	2402.000		ote: RF Out					30.00	-36.36	1/3 IVITZ
	Note: FIRD	Obtained by							3m - 05 22 -	- dBm FIDE	>
PK	V	2441.000	46.05	32.26	3.73	0.00	0.00	-13.18	30.00	-43.18	5/10 MHz
PK	Н	2441.000	53.71	32.26	3.73	0.00	0.00	-5.52	30.00	-35.52	5/10 MHz
110		Obtained by									
PK	V	2441.000	45.28	32.26	3.73	0.00	0.00	-13.95	30.00	-43.95	1/3 MHz
PK	Н	2441.000	53.45	32.26	3.73	0.00	0.00	-5.78	30.00	-35.78	1/3 MHz
				ote: RF Out		•		•			
	Note: EIRP	Obtained by							3m - 95.22 =	= dBm EIRF	,
PK	V	2441.000	49.88	32.26	3.73	0.00	0.00	-9.35	30.00	-39.35	5/10 MHz
PK	Н	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									
PK	V	2441.000	49.01	32.26	3.73	0.00	0.00	-10.22	30.00	-40.22	1/3 MHz
PK	Н	2441.000	51.70	32.26	3.73	0.00	0.00	-7.53	30.00	-37.53	1/3 MHz
			No	ote: RF Outp	out Power, 0	Channel 39,	GFSK, Z-ax	cis .			
	Note: EIRP	Obtained by	applying th	e path loss	correction fo	or a 3m test	distance, E	(dBuV/m)@	3m - 95.22 =	= dBm EIRF	
PK	V	2441.000	48.14	32.26	3.73	0.00	0.00	-11.09	30.00	-41.09	5/10 MHz
PK	Н	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 th	e path loss	correction for	or a 3m test	distance, E	(dBuV/m)@	3m - 95.22 =	dBm EIRF	
PK	V	2441.000	47.20	32.26	3.73	0.00	0.00	-12.03	30.00	-42.03	1/3 MHz
PK	Н	2441.000	49.46	32.26	3.73	0.00	0.00	-9.77	30.00	-39.77	1/3 MHz
		6 1.1.1		ote: RF Outp							
		Obtained by									
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
DIC		Obtained by									
PK	V	2480.000	49.38	32.23	3.78	0.00	0.00	-9.83	30.00	-39.83	1/3 MHz
PK	Н	2480.000	52.80	32.23	3.78	0.00	0.00	-6.41	30.00	-36.41	1/3 MHz
	N-4 FIDD	Obta: b.		ote: RF Out					2 05.00	-ID FIDE	`
PK	V	Obtained by									5/10 MHz
PK	H	2480.000 2480.000	46.20 49.46	32.23	3.78	0.00	0.00	-13.01 -9.75	30.00	-43.01	
ΓN		Obtained by		32.23	3.78	0.00			30.00	-39.75 - dBm FIRE	5/10 MHz
PK	IVUIE. EIRP	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	-14.05	30.00	-44.05	1/3 MHz
гΛ		2400.000		ote: RF Out					30.00	-40.53	I/S IVI⊓Z
	Note: FIRD	Obtained by							3m - 95 22 -	= dBm FIPE	
		2480.000	50.87	32.23	3.78	0.00	0.00	-8.34	30.00	-38.34	5/10 MHz
PK	V		00.07	02.20	5.70	0.00	3.00				
PK PK	V H		47.21	32.23	3,78	0.00	0.00	-12.00	30.00	-42.00	5/10 MHz
PK PK	Н	2480.000 Obtained by	47.21 applying th	32.23 e path loss	3.78 correction fo	0.00 or a 3m test	0.00 distance, E	-12.00 (dBuV/m)@	30.00 3m - 95.22 =	-42.00 = dBm EIRF	5/10 MHz
	Н	2480.000									

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Harmonic?

IC

Harmonic?

Radiated Emissions

Antenna & Cables: HF Bands: N, LF, HF, SHF Company: Whoop 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: Vathana Ven Naga Suryadevara Location: 10M Barometer: DAV004 Filter: NONE Project #: G102743203 Date(s): 10/21/16

1005, Temp/Humidity/Pressure: 22, 21 C 40, 29% 1016 mB Standard: FCC Part 15 Subpart C 15.247

Limit Distance (m): 3 Receiver: R&S ESI (145-128) 03-10-2017 PreAmp: 145014 05-13-16.txt Test Distance (m): 3

PreAmp Used? (Y or N): Voltage/Frequency: Battery power Frequency Range: Frequencies Shown

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

		ading (dBuV/i									
Peak:		Peak: QP Av	erage: AVG							oted as RB	W/VBW
	Ant.			Antenna	Cable	Pre-amp	Distance	EIRP	EIRP		
Detector	Pol.	Frequency	-	Factor	Loss	Factor	Factor	Net	Limit	Margin	Bandwidth
Type	(V/H)	MHz	dB(uV)	dB(1/m)	dB	dB	dB	dBm	dBm	dB	
	No. FIDE	011111111		ote: RF Out					005.00	ID.: FID	
		Obtained by									_
PK	V	2402.000	50.92	32.29	3.67	0.00	0.00	-8.34	30.00	-38.34	5/10 MHz
PK	Н	2402.000	51.98	32.29	3.67	0.00	0.00	-7.28	30.00	-37.28	5/10 MHz
		Obtained by									
PK	V	2402.000	50.33	32.29	3.67	0.00	0.00	-8.93	30.00	-38.93	1/3 MHz
PK	Н	2402.000	51.55	32.29	3.67	0.00	0.00	-7.71	30.00	-37.71	1/3 MHz
				lote: RF Out							
	Note: EIRP	Obtained by	applying th	e path loss	correction for	or a 3m test	distance, E	(dBuV/m)@	3m - 95.22 =	dBm EIRI	
PK	V	2402.000	48.65	32.29	3.67	0.00	0.00	-10.61	30.00	-40.61	5/10 MHz
PK	Н	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 th	e path loss	correction for	or a 3m test	distance, E	(dBuV/m)@	3m - 95.22 =	dBm EIRI)
PK	V	2402.000	47.87	32.29	3.67	0.00	0.00	-11.39	30.00	-41.39	1/3 MHz
PK	Н	2402.000	53.22	32.29	3.67	0.00	0.00	-6.04	30.00	-36.04	1/3 MHz
			N	ote: RF Out	put Power,	Channel 0,	GFSK, Z-ax	is			
PK	V	2402.000	50.01	32.29	3.67	0.00	0.00	-9.25	30.00	-39.25	5/10 MHz
PK	Н	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 th				distance. E		3m - 95.22 =		
PK	V	2402.000	48.92	32.29	3.67	0.00	0.00	-10.34	30.00	-40.34	1/3 MHz
PK	Н	2402.000	45.34	32.29	3.67	0.00	0.00	-13.92	30.00	-43.92	1/3 MHz
- 110		2402.000		ote: RF Out					00.00	40.0 <u>2</u>	1/0 1/11 12
	Noto: EIDE	Obtained by							2m 05.22	dDm EIDI)
PK											5/10 MHz
	V	2441.000	47.88	32.26	3.73	0.00	0.00	-11.35	30.00	-41.35	
PK	H	2441.000	50.14	32.26	3.73	0.00	0.00	-9.09	30.00	-39.09	5/10 MHz
		Obtained by									1
PK	V	2441.000	47.10	32.26	3.73	0.00	0.00	-12.13	30.00	-42.13	1/3 MHz
PK	Н	2441.000	49.71	32.26	3.73	0.00	0.00	-9.52	30.00	-39.52	1/3 MHz
				ote: RF Outp							
	Note: EIRP	Obtained by	applying th	e path loss	correction for	or a 3m test	distance, E	(dBuV/m)@	3m - 95.22 =	dBm EIRI)
PK	V	2441.000	46.57	32.26	3.73	0.00	0.00	-12.66	30.00	-42.66	5/10 MHz
PK	Н	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 th	e path loss	correction fo	or a 3m test	distance, E	(dBuV/m)@	3m - 95.22 =	dBm EIRI)
PK	V	2441.000	45.60	32.26	3.73	0.00	0.00	-13.63	30.00	-43.63	1/3 MHz
PK	Н	2441.000	45.62	32.26	3.73	0.00	0.00	-13.61	30.00	-43.61	1/3 MHz
			N	ote: RF Outp	out Power, 0	Channel 39,	GFSK, Z-ax	ris			
	Note: EIRP	Obtained by	applying th	e path loss	correction fo	or a 3m test	distance, E	(dBuV/m)@	3m - 95.22 =	dBm EIRI)
PK	V	2441.000	48.13	32.26	3.73	0.00	0.00	-11.10	30.00	-41.10	5/10 MHz
PK	Н	2441.000	45.30	32.26	3.73	0.00	0.00	-13.93	30.00	-43.93	5/10 MHz
		Obtained by									
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
111	ь	2441.000		ote: RF Out					00.00	40.10	1/0 1/11 12
	Note: FIDE	Obtained by							2m 0F 22	dDm EIDI	,
DIZ		Obtained by									
PK	V	2480.000	44.21	32.23	3.78	0.00	0.00	-15.00	30.00	-45.00	5/10 MHz
PK	Н	2480.000	49.60	32.23	3.78	0.00	0.00	-9.61	30.00	-39.61	5/10 MHz
		Obtained by									
PK	V	2480.000	42.85	32.23	3.78	0.00	0.00	-16.36	30.00	-46.36	1/3 MHz
PK	Н	2480.000	48.45	32.23	3.78	0.00	0.00	-10.76	30.00	-40.76	1/3 MHz
			No	ote: RF Outp	out Power, (Channel 78,	GFSK, Y-ax	ris			
	Note: EIRP	Obtained by	applying th		correction for	or a 3m test	distance, E	(dBuV/m)@	3m - 95.22 =	dBm EIRI)
PK	V	2480.000	47.35	32.23	3.78	0.00	0.00	-11.86	30.00	-41.86	5/10 MHz
PK	Н	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 th	e path loss	correction fo	or a 3m test	distance, E	(dBuV/m)@	3m - 95.22 =	dBm EIRI	·
PK	V	2480.000	46.24	32.23	3.78	0.00	0.00	-12.97	30.00	-42.97	1/3 MHz
PK	Н	2480.000	48.13	32.23	3.78	0.00	0.00	-11.08	30.00	-41.08	1/3 MHz
	-			ote: RF Out							
	Note: FIPE	Obtained by							3m - 95 22 -	dBm FIPI)
	LII (I	2480.000	49.32	32.23	3.78	0.00	0.00	-9.89	30.00	-39.89	5/10 MHz
ÞΚ	\/		70.02					-14.86	30.00	-44.86	5/10 MHz
PK PK	V		11 25	32.22	2 70						
PK PK	V H	2480.000	44.35	32.23	3.78	0.00	0.00				
PK	Note: EIRP	2480.000 Obtained by	applying th	e path loss	correction fo	or a 3m test	distance, E	(dBuV/m)@	3m - 95.22 =	dBm EIRI	
		2480.000									

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Harmonic?

Radiated Emissions

HF Company: Whoop Antenna & Cables: 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: Vathana Ven Location: 10M Barometer: DAV004 Filter: NONE Project #: G102743203 Date(s): 10/20/16 Standard: FCC Part 15 Subpart C 15.247 Temp/Humidity/Pressure: 22c 1010mB Receiver: R&S ESI (145-128) 03-10-2017 Limit Distance (m): 3 PreAmp: 145014 05-13-16.txt Test Distance (m): 3 Frequency Range: Frequencies Shown 120VAC 60Hz PreAmp Used? (Y or N): N Voltage/Frequency: Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB) PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW Cable Distance requency Detecto Pol. Reading Factor Loss Factor Factor Net Limit Margin Bandwidth dB(uV) dB dB dB dBm FCC (V/H) MHz dB(1/m) dBm Type dB Note: RF Output Power, Channel 0, pi/4-DQPSK, X-axis 2402 000 46 67 32 29 3.67 0.00 0.00 30.00 PK 2402.000 48.30 32.29 3.67 0.00 30.00 -40.96 5/10 MHz 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 PΚ 2402 000 46.50 32 29 3.67 0.00 0.00 30.00 -57 96 1/3 MHz PK 2402.000 38.90 32.29 -35.56 30.00 -65.56 1/3 MHz ower, Channel 0, pi/4 applying the path loss PK 32.29 0.00 0.00 PK 2402.000 46.50 32.29 3.67 0.00 -12.76 30.00 -42.76 5/10 MHz Power Spectral Density, normalized from 100kHz to 3 kHz using Bandwidth Correction Factor 10LOG(3/100 kHz)=-15.2 dB lote: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRF PK 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 Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRf PK 2402.000 45.60 32.29 3.67 0.00 0.00 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 ote: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP PΚ 45.20 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 EIRF 46.80 0.00 0.00 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 46.10 32.26 3.73 0.00 0.00 -28.33 30.00 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 EIRF 2441.000 45.50 32.26 3.73 0.00 0.00 30.00 -43.73 5/10 MH ctral 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 EIRF PK 2441.000 0.00 0.00 -16.03 30.00 -46.03 1/3 MHz PΚ 45.10 32.26 -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 EIRF PΚ 2441.000 32.26 3.73 0.00 0.00 -13.73 30.00 -43.73 5/10 MHz 45.50 ral Density, normalized from 100kHz to 3 kHz using Band vidth Correction Factor 10LOG(3/100 kHz)=-15.2 dB Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP -14.73 -44.73 1/3 MHz 2441.000 32.26 3.73 0.00 0.00 30.00 44.50 Note: RE Output Power, Channel 78, pi/4-DOPSK, X-axis Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRF 2480.000 0.00 0.00 30.00 45.70 0.00 -43.51 5/10 MHz 0.00 normalized from 100kHz to 3 kHz using Bandy vidth 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 2480.000 0.00 0.00 -30.81 30.00 Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRF PK 2480.000 45.66 32.23 3.78 0.00 0.00 -13.55 30.00 3.78 0.00 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

Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP

0.00

0.00

3.78

Note: RF Output Power, Channel 78, pi/s

3.78

0.00

0.00

2480.000 45.12 32.23 3.78

2480.000 46.33 32.23

47.30

46.80 32.23

Spectral Density, normalized from 100kHz to 3 kHz using Bar

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0.00 -14.09

-12.88

-11.91

0.00

0.00

0.00

-DQPSK, Z-axis

30.00 -44.09 1/3 MHz

-42.88 5/10 MHz

-41.91 1/3 MHz

30.00

30.00

30.00

2480.000

PK

PK

Net = I Peak: PK A Detector F Type (V Note: EII PK PK PK PK PK PK	oopStrap 2.0 125 6 a Suryadevara 2743203 C Part 15 Subp S ESI (145-128	art C 15.247) 03-10-2017 kt N): N N/m) + Antenne Average: AVC ncy Reading dB(uV) Note: y applying the 00 52.25 00 52.12 y applying the 00 51.84	Test Dis Voltage/I a Factor (dE G RMS: RMS Antenna Factor dB(1/m) RF Output path loss of 32.29 path loss of	Cable Loss dB Power, Ch	3 Bat ble Loss (d e Floor, RB Pre-amp Factor dB annel 0, pi/-	Antenna: Cable(s): Barometer: Temp/Humic ttery B) - Pream = Restricted Distance Factor dB 4-DQPSK, t distance,	Frequer o Factor (dil Band; Band EIRP Net dBm X-axis	21C 21C 21C acy Range: 3) - Distance dwidth deno EIRP Limit dBm	ETS001 0: NONE. Filter: 29% Frequence e Factor (coted as RBW) Margin dB	NONE 1016mB ies Shown dB) V/VBW Bandwidth
Model #: Who Serial #: 20D Engineers: Naggi Project #: G10 Standard: FCC Receiver: R&S PreAmp: 1450 PreAmp Net = I Peak: PK Note: Ell PK PK PK PK PK	2005Strap 2.0 125 6 2005Strap 2.0 125 6 201405-128 2743203 2 Part 15 Subp 2 ESI (145-128 2014 05-13-16.t 2 p Used? (Y or 2 Reading (dBu\ 2 Quasi-Peak: Q 2 Ant. 2 Pol. Freque 2 Freque	art C 15.247) 03-10-2017 kt N): N N/m) + Antenne Average: AVC ncy Reading dB(uV) Note: y applying the 00 52.25 00 52.12 y applying the 00 51.84	Limit Dis Test Dis Voltage/I a Factor (dE G RMS: RMS Antenna Factor dB(1/m) RF Output path loss of 32.29 a path loss of	stance (m): stance (m): Frequency: B1/m) + Cals; KF = Nois Cable Loss dB Power, Ch: correction for	3 Bat ble Loss (d e Floor, RB Pre-amp Factor dB annel 0, pi/-	Antenna: Cable(s): Barometer: Temp/Humic ttery B) - Pream = Restricted Distance Factor dB 4-DQPSK, t distance,	ETS001 02 145-4161-18GHz DAV004 litty/Pressure: Frequer o Factor (dB Band; Band EIRP Net dBm X-axis E(dBuV/m)	2-10-17.txt 10-08-17.txt 21C 21C 21C 21C 21C 21C 21C 21	ETS001 0: NONE. Filter: 29% Frequence the Factor (cotted as RBW) Margin dB	2-10-17.txt NONE 1016mB ies Shown dB) V/VBW Bandwidth
Serial #: 20D Engineers: Nagg Project #: G10 Standard: FCC Receiver: R&S PreAmp: 1450 PreAmp Net = I Peak: PK Detector F Type (V Note: Ell PK PK PK PK PK	125 6 a Suryadevara 2743203 C Part 15 Subp S ESI (145-128 014 05-13-16.t p Used? (Y or Reading (dBu\ Quasi-Peak: Q \(\) MHz RP Obtained b \(\) 2402.0 H 2402.0 H 2402.0 H 2402.0	art C 15.247) 03-10-2017 kt N): N N/m) + Antenno Average: AVC ncy Reading dB(uV) Note: y applying the 00 52.25 00 52.12 y applying the 00 51.84	Limit Dis Test Dis Voltage/I a Factor (dE G RMS: RMS Antenna Factor dB(1/m) RF Output path loss of 32.29 a path loss of	stance (m): stance (m): Frequency: B1/m) + Cals; KF = Nois Cable Loss dB Power, Ch: correction for	3 Bat ble Loss (d e Floor, RB Pre-amp Factor dB annel 0, pi/- or a 3m tes	Cable(s): Barometer: Temp/Humic ttery B) - Pream = Restricted Distance Factor dB 4-DQPSK, t distance,	145-416 1-18 GHz DAV004 lity/Pressure: Frequer o Factor (dB Band; Band EIRP Net dBm X-axis E(dBuV/m)	21C 21C 21C 21C 21C 21C 21C 21C	NONE. Filter: 29% Frequence e Factor (cotted as RBW Margin dB	NONE 1016mB ies Shown dB) V/VBW Bandwidth
Engineers: Naga Project #: G10 Standard: FCC Receiver: R&S PreAmp: 1450 PreAmp Net = I Peak: PK Detector F Type (V Note: Ell PK PK PK PK PK	a Suryadevara 2743203 C Part 15 Subp E ESI (145-128 014 05-13-16.t p Used? (Y or Reading (dBu\ Quasi-Peak: Q Ant. Pol. Frequer ///H) MHz RP Obtained b V 2402.0 H 2402.0 H 2402.0	art C 15.247) 03-10-2017 kt N): N N/m) + Antenno Average: AVC ncy Reading dB(uV) Note: y applying the 00 52.25 00 52.12 y applying the 00 51.84	Limit Dis Test Dis Voltage/I a Factor (dE G RMS: RMS Antenna Factor dB(1/m) RF Output path loss of 32.29 32.29 path loss of	stance (m): stance (m): Frequency: B1/m) + Cals; KF = Nois Cable Loss dB Power, Ch: correction for	3 Bat ble Loss (d e Floor, RB Pre-amp Factor dB annel 0, pi/- or a 3m tes	Barometer: Temp/Humic ttery B) - Pream = Restricted Distance Factor dB 4-DQPSK, t distance,	DAV004 lity/Pressure: Frequer o Factor (dil Band; Band EIRP Net dBm X-axis E(dBuV/m)	21C acy Range: 3) - Distance dwidth deno EIRP Limit dBm @3m - 95.2	Filter: 29% Frequence the Factor (cotted as RBW) Margin dB 22 = dBm E	1016mB lies Shown dB) W/VBW Bandwidth
Project #: G10 Standard: FCC Receiver: R&S PreAmp: 1450 PreAmp Net = I Peak: PK Detector P Type (V Note: Ell PK PK PK PK PK	2743203 C Part 15 Subp C ESI (145-128 D14 05-13-16.t P Used? (Y or Reading (dBu\ Quasi-Peak: Q \text{\text{Nnt}} Pol. Frequer //H) MHz RP Obtained b V 2402.0 H 2402.0 H 2402.0 H 2402.0	art C 15.247) 03-10-2017 kt N): N N/m) + Antenno Average: AVC ncy Reading dB(uV) Note: y applying the 00 52.25 00 52.12 y applying the 00 51.84	Limit Dis Test Dis Voltage/I a Factor (dE G RMS: RMS Antenna Factor dB(1/m) RF Output path loss of 32.29 32.29 path loss of	stance (m): stance (m): Frequency: B1/m) + Cals; KF = Nois Cable Loss dB Power, Ch: correction for	3 Bat ble Loss (d e Floor, RB Pre-amp Factor dB annel 0, pi/- or a 3m tes	tery B) - Pream = Restricted Distance Factor dB 4-DQPSK, t distance,	Frequer o Factor (di Band; Band EIRP Net dBm X-axis E(dBuV/m)	ncy Range: 8) - Distand dwidth deno EIRP Limit dBm	Frequence se Factor (cotted as RBW Margin dB	1016mB lies Shown dB) W/VBW Bandwidth
Standard: FCC Receiver: R&S PreAmp: 1450 PreAmp: Net = I Peak: PK Detector P Type (V Note: Ell PK PK PK PK PK PK	C Part 15 Subp C Part 15 Subp C ESI (145-128 D14 05-13-16.t P Used? (Y or Reading (dBu\ Quasi-Peak: Q Ant. Frequel ///H) MHz RP Obtained b V 2402.0 RP Obtained b V 2402.0 H 2402.0 H 2402.0	art C 15.247) 03-10-2017 kt N): N N/m) + Antenno Average: AVC ncy Reading dB(uV) Note: y applying the 00 52.25 00 52.12 y applying the 00 51.84	Limit Dis Test Dis Voltage/I a Factor (dE G RMS: RMS Antenna Factor dB(1/m) RF Output path loss of 32.29 32.29 path loss of	stance (m): Frequency: 31/m) + Cai 5; NF = Nois Cable Loss dB Power, Chicorrection fo	Bat ble Loss (d e Floor, RB Pre-amp Factor dB annel 0, pi/-	ttery B) - Pream = Restricted Distance Factor dB 4-DQPSK, t distance,	Frequer p Factor (df l Band; Band EIRP Net dBm X-axis E(dBuV/m)	ncy Range: 8) - Distand dwidth deno EIRP Limit dBm	Frequenc ce Factor (conted as RBW Margin dB	ies Shown dB) V/VBW Bandwidth
Receiver: R&S PreAmp: 1450 PreAmp: 1450 Net = I Peak: PK Detector F Type (V Note: Ell PK PK PK PK PK PK	B ESI (145-128 D14 05-13-16.t p Used? (Y or Reading (dBu\ Quasi-Peak: Q Ant. Pol. Frequel (//H) MHz RP Obtained b V 2402.0 H 2402.0 H 2402.0 H 2402.0	03-10-2017 (t N): N N Normal	Test Dis Voltage/I a Factor (dE G RMS: RMS Antenna Factor dB(1/m) RF Output path loss of 32.29 path loss of	stance (m): Frequency: 31/m) + Cai 5; NF = Nois Cable Loss dB Power, Chicorrection fo	Bat ble Loss (d e Floor, RB Pre-amp Factor dB annel 0, pi/-	ttery B) - Pream = Restricted Distance Factor dB 4-DQPSK, t distance,	Frequer p Factor (df l Band; Band EIRP Net dBm X-axis E(dBuV/m)	ncy Range: 8) - Distand dwidth deno EIRP Limit dBm	Frequenc ce Factor (conted as RBW Margin dB	ies Shown dB) V/VBW Bandwidth
PreAmp: 1450 PreAmp Net = I Peak: PK Detector F Type (V Note: EII PK PK PK PK PK PK	D14 05-13-16.t p Used? (Y or Reading (dBu\ Quasi-Peak: Q Ant. Pol. Frequer (//H) MHz RP Obtained b V 2402.0 H 2402.0 H 2402.0 H 2402.0	tt N): N N/m) + Antenno P Average: AVC ncy Reading dB(uV) Note: y applying the 00 52.25 00 52.12 y applying the 00 51.84	Test Dis Voltage/I a Factor (dE G RMS: RMS Antenna Factor dB(1/m) RF Output path loss of 32.29 path loss of	stance (m): Frequency: 31/m) + Cai 5; NF = Nois Cable Loss dB Power, Chicorrection fo	Bat ble Loss (d e Floor, RB Pre-amp Factor dB annel 0, pi/-	B) - Pream = Restricted Distance Factor dB 4-DQPSK, t distance,	Pactor (dE) Band; Band; Band; Band; Band EIRP Net dBm X-axis E(dBuV/m)	3) - Distanc dwidth deno EIRP Limit dBm	ce Factor (conted as RBW) Margin dB 22 = dBm E	dB) V/VBW Bandwidth
PreAmy Net = I Peak: PK A Detector F Type (V Note: EII PK PK PK PK PK PK	p Used? (Y or Reading (dBu\) Quasi-Peak: Q Ant. Pol. Frequer (//H) MHz RP Obtained b V 2402.0 RP Obtained b V 2402.0 H 2402.0 H 2402.0	N): N N/m) + Antenne Average: AVC Reading dB(uV) Note: y applying the 00 52.25 00 52.12 y applying the 00 51.84	Voltage/It a Factor (dE G RMS: RMS Antenna Factor dB(1/m) RF Output path loss of 32.29 a path loss of path lo	Frequency: 31/m) + Cal 31/m) + Cal 5; NF = Nois Cable Loss dB Power, Che correction fo	Bat ble Loss (d e Floor, RB Pre-amp Factor dB annel 0, pi/- or a 3m tes	B) - Pream = Restricted Distance Factor dB 4-DQPSK, t distance,	Pactor (dE) Band; Band; Band; Band; Band EIRP Net dBm X-axis E(dBuV/m)	3) - Distanc dwidth deno EIRP Limit dBm	ce Factor (conted as RBW) Margin dB 22 = dBm E	dB) V/VBW Bandwidth
Net = I Peak: PK A Detector F Type (V Note: Ell PK PK PK PK PK	Reading (dBu\ Quasi-Peak: Q \text{Ant.} Pol. Frequer //H) MHz RP Obtained b V 2402.0 H 2402.0 H 2402.0 H 2402.0	Average: AVC Reading dB(uV) Note: y applying the composition of the	a Factor (dE RMS: RMS Antenna Factor dB(1/m) RF Output path loss of 32.29 path loss of	B1/m) + Cal B; NF = Nois Cable Loss dB Power, Characteristics	ble Loss (d e Floor, RB Pre-amp Factor dB annel 0, pi/or a 3m tes	B) - Pream = Restricted Distance Factor dB 4-DQPSK, t distance,	Pactor (dE) Band; Band; Band; Band; Band EIRP Net dBm X-axis E(dBuV/m)	3) - Distanc dwidth deno EIRP Limit dBm	ce Factor (conted as RBW) Margin dB 22 = dBm E	dB) V/VBW Bandwidth
Peak: PK A Detector P Type (V Note: Ell PK PK Note: Ell PK PK PK PK	Quasi-Peak: Q Ant. Pol. Freque Pol. Freque RP Obtained b V 2402.0 RP Obtained b V 2402.0 H 2402.0 H 2402.0	Average: AVC According dB(uV) Note: y applying the composition of 52.25 The composition of 52.25 are composition of 52.12 y applying the composition of 51.84	Antenna Factor dB(1/m) RF Output path loss of 32.29 path loss of	Cable Loss dB Power, Chaccorrection for 3.67	Pre-amp Factor dB annel 0, pi/or a 3m tes	= Restricted Distance Factor dB 4-DQPSK, t distance,	Band; Band EIRP Net dBm X-axis E(dBuV/m)	dwidth deno EIRP Limit dBm @3m - 95.2	Margin dB	W/VBW Bandwidth
Detector P Type (V Note: Ell PK PK Note: Ell PK PK PK PK	Ant. Frequence Frequence	Reading dB(uV) Note: y applying the 00 52.25 00 52.12 y applying the 00 51.84	Antenna Factor dB(1/m) RF Output path loss of 32.29 path loss of	Cable Loss dB Power, Chaccorrection for 3.67	Pre-amp Factor dB annel 0, pi/or a 3m tes	Distance Factor dB 4-DQPSK, t distance,	EIRP Net dBm X-axis E(dBuV/m)	EIRP Limit dBm @3m - 95.2	Margin dB 22 = dBm E	Bandwidth
Detector P Type (V Note: Ell PK PK Note: Ell PK PK PK PK	Pol. Frequei (7/H) MHz RP Obtained b V 2402.0 H 2402.0 RP Obtained b V 2402.0 H 2402.0	dB(uV) Note: y applying the 00 52.25 00 52.12 y applying the 00 51.84	Factor dB(1/m) RF Output path loss of 32.29 32.29 path loss of	Loss dB Power, Characteristics correction for 3.67	Factor dB annel 0, pi/or a 3m tes	Factor dB 4-DQPSK, t distance,	Net dBm X-axis E(dBuV/m)	Limit dBm @3m - 95.2	dB 22 = dBm E	IRP
Note: Ell PK PK Note: Ell PK PK PK PK PK	//H) MHz RP Obtained b V 2402.0 H 2402.0 RP Obtained b V 2402.0 H 2402.0	dB(uV) Note: y applying the 00 52.25 00 52.12 y applying the 00 51.84	dB(1/m) RF Output path loss of 32.29 32.29 spath loss of path loss of	dB Power, Characteristics of the correction for 3.67	dB annel 0, pi/or a 3m tes	dB 4-DQPSK, t distance,	dBm X-axis E(dBuV/m)	dBm @3m - 95.2	dB 22 = dBm E	IRP
Note: Ell PK PK Note: Ell PK PK PK	RP Obtained b V 2402.0 H 2402.0 RP Obtained b V 2402.0 H 2402.0	Note: y applying the 00 52.25 00 52.12 y applying the 00 51.84	RF Output path loss of 32.29 32.29 path loss of path loss	Power, Characteristics of the Correction for 3.67	annel 0, pi/or a 3m tes	4-DQPSK, t distance,	X-axis E(dBuV/m)	@3m - 95.2	22 = dBm E	
PK PK Note: Ell PK PK PK	V 2402.0 H 2402.0 RP Obtained b V 2402.0 H 2402.0	y applying the 00 52.25 00 52.12 y applying the 00 51.84	32.29 32.29 path loss o	orrection for 3.67	or a 3m tes	t distance,	E(dBuV/m)			
PK PK Note: Ell PK PK PK	V 2402.0 H 2402.0 RP Obtained b V 2402.0 H 2402.0	52.25 52.25 52.12 y applying the 51.84	32.29 32.29 path loss of	3.67			· /			
PK PK Note: Ell PK PK PK	V 2402.0 H 2402.0 RP Obtained b V 2402.0 H 2402.0	52.25 52.25 52.12 y applying the 51.84	32.29 32.29 path loss of	3.67			· /			
PK Note: Ell PK PK	H 2402.0 RP Obtained b V 2402.0 H 2402.0	00 52.12 y applying the 00 51.84	32.29 path loss of			0.00				5/10 MHz
Note: Ell PK PK PK	RP Obtained b V 2402.0 H 2402.0	y applying the	path loss of		0.00	0.00	-7.14	30.00	-37.14	5/10 MHz
PK PK	V 2402.0 H 2402.0	00 51.84		l .	l .		l e			1
PK PK	H 2402.0	_	32.29	3.67	0.00	0.00	-7.42	30.00	-37.42	1/3 MHz
PK		UUI ST/T								
	V 2402.0		32.29	3.67	0.00	0.00	-7.55	30.00	-37.55	1/3 MHz
	v 2402.0		te: Power D			1		0.0-	10	Т
PK		_	32.29	3.67	0.00	0.00	-8.25	8.00	-16.25	100/300 kHz
	H 2402.0		32.29	3.67	0.00	0.00	-7.72	8.00	-15.72	100/300 kHz
		Note:	RF Output	Power, Cha	annel 0, pi/	4-DQPSK,	Y-axis			
Note: Ell	RP Obtained b	y applying the	path loss o	correction for	or a 3m tes	t distance,	E(dBuV/m)	@3m - 95.2	22 = dBm E	∃IRP
PK	V 2402.0	00 48.79	32.29	3.67	0.00	0.00	-10.47	30.00	-40.47	5/10 MHz
PK	H 2402.0	00 51.59	32.29	3.67	0.00	0.00	-7.67	30.00	-37.67	5/10 MHz
Note: Ell	RP Obtained b	y applying the	path loss of	correction for	or a 3m tes	t distance,	E(dBuV/m)	@3m - 95.2	22 = dBm E	EIRP
PK	V 2402.0	00 48.00	32.29	3.67	0.00	0.00	-11.26	30.00	-41.26	1/3 MHz
PK	H 2402.0	00 51.18	32.29	3.67	0.00	0.00	-8.08	30.00	-38.08	1/3 MHz
			te: Power D							
PK	V 2402.0		32.29	3.67	0.00	0.00	-11.53	8.00	-19.53	100/300 kHz
	H 2402.0	_	32.29	3.67	0.00	0.00	-8.39	8.00	-16.39	100/300 kHz
- 110	11 2.102.0		RF Output	l	L	l	l	0.00	10.00	100/000 14 12
Note: Ell	RP Obtained b							@2m 0E 1	22 – dDm E	IDD
						1			1	1
	V 2402.0		32.29	3.67	0.00	0.00	-9.52	30.00	-39.52	5/10 MHz
	H 2402.0		32.29	3.67	0.00	0.00	-12.95	30.00	-42.95	5/10 MHz
	RP Obtained b	, ,, , ,	•				_ `			
PK	V 2402.0	_	32.29	3.67	0.00	0.00	-10.15	30.00	-40.15	1/3 MHz
PK	H 2402.0	00 45.16	32.29	3.67	0.00	0.00	-14.10	30.00	-44.10	1/3 MHz
		No	te: Power D	Density mea	asured in a	100 kHz RI	BW			
PK	V 2402.0	00 48.79	32.29	3.67	0.00	0.00	-10.47	8.00	-18.47	100/300 kHz
PK	H 2402.0	00 44.71	32.29	3.67	0.00	0.00	-14.55	8.00	-22.55	100/300 kHz
	-	Note:	RF Output	Power, Cha	annel 39, pi	/4-DQPSK,	X-axis			
Note: Ell	RP Obtained b							@3m - 95.2	22 = dBm E	EIRP
	V 2441.0		32.26	3.73	0.00	0.00	-12.66	30.00	-42.66	5/10 MHz
	H 2441.0	_	32.26	3.73	0.00	0.00	-8.83	30.00	-38.83	5/10 MHz
	RP Obtained b	_								
	V 2441.0	, ,, , , , , , , , , , , , , , , , , ,	32.26	3.73	0.00	0.00	-13.71	30.00	-43.71	1/3 MHz
	H 2441.0		32.26	3.73	0.00	0.00	-9.24	30.00	-39.24	1/3 MHz
FIX	2441.0			.			l	30.00	-33.24	1/3 IVITIZ
Di/	v I		te: Power D					0.00	00.00	T
	V 2441.0	_	32.26	3.73	0.00	0.00	-14.09	8.00	-22.09	100/300 kHz
PK	H 2441.0		32.26	3.73	0.00	0.00	-9.43	8.00	-17.43	100/300 kHz
			RF Output I							
	RP Obtained b	y applying the	path loss of	correction for	or a 3m tes	t distance,	E(dBuV/m)	@3m - 95.2	22 = dBm E	EIRP
PK	V 2441.0	00 46.44	32.26	3.73	0.00	0.00	-12.79	30.00	-42.79	5/10 MHz
PK	H 2441.0	00 46.57	32.26	3.73	0.00	0.00	-12.66	30.00	-42.66	5/10 MHz
Note: Ell	RP Obtained b	y applying the	path loss of	correction for	or a 3m tes	t distance,	E(dBuV/m)	@3m - 95.2	22 = dBm E	EIRP
PK	V 2441.0	00 45.90	32.26	3.73	0.00	0.00	-13.33	30.00	-43.33	1/3 MHz
	H 2441.0		32.26	3.73	0.00	0.00	-13.57	30.00	-43.57	1/3 MHz

Intertek

Report Number: 102743203BOX-001 Issued: 11/10/2016

			No	te: Power [Density mea	asured in a	100 kHz RI	BW			
PK	V	2441.000	45.43	32.26	3.73	0.00	0.00	-13.80	8.00	-21.80	100/300 kHz
PK	Н	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, Cha	annel 39, pi	/4-DQPSK,	Z-axis			
Not	e: EIRP Ob	tained by a	pplying the	path loss	correction fo	or a 3m tes	t distance,	E(dBuV/m)	@3m - 95.2	22 = dBm E	IRP
PK	V	2441.000	48.39	32.26	3.73	0.00	0.00	-10.84	30.00	-40.84	5/10 MHz
PK	Н	2441.000	44.76	32.26	3.73	0.00	0.00	-14.47	30.00	-44.47	5/10 MHz
Not	e: EIRP Ob	tained by a	pplying the	path loss	correction fo	or a 3m tes	t distance,	E(dBuV/m)	@3m - 95.2	22 = dBm E	IRP
PK	V	2441.000	47.67	32.26	3.73	0.00	0.00	-11.56	30.00	-41.56	1/3 MHz
PK	Н	2441.000	43.97	32.26	3.73	0.00	0.00	-15.26	30.00	-45.26	1/3 MHz
			No	te: Power [Density mea	asured in a	100 kHz RI	BW			
PK	V	2441.000	47.19	32.26	3.73	0.00	0.00	-12.04	8.00	-20.04	100/300 kHz
PK	Н	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, Cha	annel 78, pi	/4-DQPSK,	X-axis			
Not	e: EIRP Ob	tained by a	pplying the	path loss of	correction fo	or a 3m tes	t distance,	E(dBuV/m)	@3m - 95.2	22 = dBm E	IRP
PK	V	2480.000	44.35	32.23	3.78	0.00	0.00	-14.86	30.00	-44.86	5/10 MHz
PK	Н	2480.000	48.79	32.23	3.78	0.00	0.00	-10.42	30.00	-40.42	5/10 MHz
Not	e: EIRP Ob	tained by a	pplying the	path loss	correction fo	or a 3m tes	t distance,	E(dBuV/m)	@3m - 95.2	22 = dBm E	IRP
PK	V	2480.000	41.89	32.23	3.78	0.00	0.00	-17.32	30.00	-47.32	1/3 MHz
PK	Н	2480.000	47.67	32.23	3.78	0.00	0.00	-11.54	30.00	-41.54	1/3 MHz
			No	te: Power [Density mea	asured in a	100 kHz RI	BW			
PK	V	2480.000	41.30	32.23	3.78	0.00	0.00	-17.91	8.00	-25.91	100/300 kHz
PK	Н	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, Cha	nnel 78, pi	/4-DQPSK,	Y-axis			
Not	e: EIRP Ob	tained by a	pplying the	path loss of	correction fo	or a 3m tes	t distance,	E(dBuV/m)	@3m - 95.2	22 = dBm E	IRP
PK	V	2480.000	46.96	32.23	3.78	0.00	0.00	-12.25	30.00	-42.25	5/10 MHz
PK	Н	2480.000	47.68	32.23	3.78	0.00	0.00	-11.53	30.00	-41.53	5/10 MHz
Not	e: EIRP Ob	tained by a	pplying the	path loss of	correction fo	or a 3m tes	t distance,	E(dBuV/m)	@3m - 95.2	22 = dBm E	IRP
PK	V	2480.000	45.66	32.23	3.78	0.00	0.00	-13.55	30.00	-43.55	1/3 MHz
PK	Н	2480.000	46.37	32.23	3.78	0.00	0.00	-12.84	30.00	-42.84	1/3 MHz
			No	te: Power [Density mea	asured in a	100 kHz RI	BW			
PK	V	2480.000	44.99	32.23	3.78	0.00	0.00	-14.22	8.00	-22.22	100/300 kHz
PK	Н	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, Cha	nnel 78, pi	/4-DQPSK,	Z-axis			
Not	e: EIRP Ob	tained by a	pplying the	path loss	correction fo	or a 3m tes	t distance,	E(dBuV/m)	@3m - 95.2	22 = dBm E	IRP
PK	V	2480.000	49.60	32.23	3.78	0.00	0.00	-9.61	30.00	-39.61	5/10 MHz
PK	Н	2480.000	41.23	32.23	3.78	0.00	0.00	-17.98	30.00	-47.98	5/10 MHz
Not	e: EIRP Ob	tained by a	pplying the	path loss	correction fo	or a 3m tes	t distance,	E(dBuV/m)	@3m - 95.2	22 = dBm E	IRP
PK	V	2480.000	48.78	32.23	3.78	0.00	0.00	-10.43	30.00	-40.43	1/3 MHz
PK	Н	2480.000	37.74	32.23	3.78	0.00	0.00	-21.47	30.00	-51.47	1/3 MHz

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	Ant.		1	Antenna	Cable	Pre-amp	Distance	EIRP	EIRP			l	
etector	Pol.	Frequency	Reading	Factor	Loss	Factor	Factor	Net	Limit	Margin	Bandwidth		
уре	(V/H)	MHz	dB(uV)	dB(1/m)	dB	dB	dB	dBm	dBm	dB		FCC	
	Neter FIDD	Obtained by				Channel 0, 8			05.00	dD FIDD			
PK	V V	2402.000	52.80	32.29	3.67	0.00	0.00	-6.46	30.00	= dBm EIRP -36.46	5/10 MHz		
PK	H	2402.000	52.00	32.29	3.67	0.00	0.00	-7.15	30.00	-37.15	5/10 MHz	i	
		Obtained by											
PK	V	2402.000	49.53	32.29	3.67	0.00	0.00	-9.73	30.00	-39.73	1/3 MHz		
PK	Н	2402.000	49.98	32.29	3.67	0.00	0.00	-9.28	30.00	-39.28	1/3 MHz		
						Channel 0, 8							
	Note: EIRP									= dBm EIRP			
PK PK	H	2402.000	52.25	32.29	3.67	0.00	0.00	-7.01	30.00	-37.01	5/10 MHz		
		2402.000 Obtained by	53.00	32.29	3.67	0.00	0.00	-6.26	30.00	-36.26 = dBm EIRP	5/10 MHz		
PK	V	2402.000	50.07	32.29	3.67	0.00	0.00	-9.19	30.00	-39.19	1/3 MHz	i	
PK	Н	2402.000	50.40	32.29	3.67	0.00	0.00	-8.86	30.00	-38.86	1/3 MHz		
	•		No	ote: RF Out	out Power, 0	Channel 0, 8	DPSK, Z-a	kis					
	Note: EIRP	Obtained by	applying th	e path loss	correction for	or 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		
PK	Note: EIRP V	Obtained by 2402.000								= dBm EIRP		1	
PK	H	2402.000	51.59 51.90	32.29 32.29	3.67 3.67	0.00	0.00	-7.67 -7.36	30.00	-37.67 -37.36	1/3 MHz 1/3 MHz	ı	
I IX		2402.000				hannel 39, 8			30.00	-57.50	1/3 WII 12	1	
	Note: EIRP	Obtained by							3m - 95.22	= dBm EIRP)	i	
PK	V	2441.000	50.20	32.26	3.73	0.00	0.00	-9.03	30.00	-39.03	5/10 MHz		
PK	Н	2441.000	51.00	32.26	3.73	0.00	0.00	-8.23	30.00	-38.23	5/10 MHz		
										= 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	ı	
PK	Н	2441.000	51.77	32.26	3.73	0.00	0.00	-7.46	30.00	-37.46	1/3 MHz		
-	Note: FIRD	Ohtained hy				hannel 39, 8			3m - 05 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	i	
PK	Н	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 th	•			•			= 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	Н	2441.000	52.24	32.26	3.73	0.00	0.00	-6.99	30.00	-36.99	1/3 MHz		
	=:==					hannel 39, 8							
										= dBm EIRP		l	
PK PK	V H	2441.000 2441.000	53.07 50.98	32.26 32.26	3.73 3.73	0.00	0.00	-6.16 -8.25	30.00	-36.16 -38.25	5/10 MHz 5/10 MHz	ł	
					•					= dBm EIRP		i	
PK	V	2441.000	50.98	32.26	3.73	0.00	0.00	-8.25	30.00	-38.25	1/3 MHz	ĺ	
PK	Н	2441.000	48.71	32.26	3.73	0.00	0.00	-10.52	30.00	-40.52	1/3 MHz		
			No	te: RF Outp	ut Power, C	hannel 78, 8	BDPSK, X-a	ixis					
										= 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	1	
PK	H Note: FIRP	2480.000 Obtained by	50.83	32.23 e nath loss	3.78	0.00	0.00 distance F	-8.38 (dBu\//m)@:	30.00 3m - 95.22	-38.38 = dBm EIRP	5/10 MHz		
PK	V V	2480.000	47.33	32.23	3.78	0.00	0.00	-11.88	30.00	-41.88	1/3 MHz	1	
PK	H	2480.000	51.58	32.23	3.78	0.00	0.00	-7.63	30.00	-37.63	1/3 MHz	1	
						hannel 78, 8							
	Note: EIRP	Obtained by	applying th	e path loss	correction for	or 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	Н	2480.000	50.75	32.23	3.78	0.00	0.00	-8.46	30.00	-38.46	5/10 MHz		
										= dBm EIRP		ı	
PK	V	2480.000	52.11	32.23	3.78	0.00	0.00	-7.10	30.00	-37.10	1/3 MHz	1	
PK	Н	2480.000	48.12	32.23	3.78	0.00 channel 78, 8	0.00	-11.09	30.00	-41.09	1/3 MHz	1	
	Note: FIRP	Ohtained h							3m - 95 22	= dBm EIRP)	i	
PK	V	2480.000	48.79	32.23	3.78	0.00	0.00	-10.42	30.00	-40.42	5/10 MHz	İ	
PK	Н	2480.000	45.79	32.23	3.78	0.00	0.00	-13.42	30.00	-43.42	5/10 MHz		
		Obtained by											
PK	V	2480.000	46.17	32.23	3.78	0.00	0.00	-13.04	30.00	-43.04	1/3 MHz		
PK	Н	2480.000	43.32	32.23	3.78	0.00	0.00	-15.89	30.00	-45.89	1/3 MHz		

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40%

1005mB

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Harmonic?

Radiated Emissions

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: Vathana Ven Location: 10M Barometer: DAV004 Filter:

Project #: G102743203 Date(s): 10/20/16

Standard: FCC Part 15 Subpart C 15.247 Temp/Humidity/Pressure: 22c Receiver: R&S ESI (145-128) 03-10-2017 Limit Distance (m): 3

PreAmp: 145014 05-13-16.txt Test Distance (m): 3

Battery mode Frequency Range: Frequencies Shown PreAmp Used? (Y or N): Voltage/Frequency: Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak:	PK Quasi-F	eak: QP Av	erage: AVG	RMS: RM					ndwidth den	oted as RB\	W/VBW
	Ant.			Antenna			Distance		EIRP		
Detector		Frequency	-	Factor	Loss	Factor	Factor	Net	Limit	Margin	Bandwidth
Туре	(V/H)	MHz	dB(uV)	dB(1/m)	dB put Power, 0	dB	dB	dBm	dBm	dB	
	Note: FIRP	Obtained by							3m - 95 22 :	= dBm FIRE	·
PK	V	2402.000	50.66	32.29	3.67	0.00	0.00	-8.60	30.00	-38.60	5/10 MHz
PK	Н	2402.000		32.29	3.67	0.00	0.00	-4.36	30.00	-34.36	5/10 MHz
		Obtained by				•	•		•	•	
PK	V	2402.000	48.10	32.29	3.67	0.00	0.00	-11.16	30.00	-41.16	1/3 MHz
PK	Н	2402.000	53.06	32.29	3.67	0.00	0.00	-6.20	30.00	-36.20	1/3 MHz
			No	te: RF Out	put Power, (Channel 0, 8	BDPSK, Y-ax	xis			
	Note: EIRP	Obtained by	applying th	e path loss	correction fo	or a 3m test	distance, E	(dBuV/m)@	3m - 95.22 :	= dBm EIRF	•
PK	V	2402.000	50.27	32.29	3.67	0.00	0.00	-8.99	30.00	-38.99	5/10 MHz
PK	Н	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 th	e path loss	correction for	or a 3m test	distance, E	(dBuV/m)@	3m - 95.22 :	= dBm EIRF	
PK	V	2402.000	47.95	32.29	3.67	0.00	0.00	-11.31	30.00	-41.31	1/3 MHz
PK	Н	2402.000	51.08	32.29	3.67	0.00	0.00	-8.18	30.00	-38.18	1/3 MHz
					put Power, (
		Obtained by		e path loss	correction for	or a 3m test	distance, E		3m - 95.22 :	= dBm EIRF	
PK	V	2402.000		32.29	3.67	0.00	0.00	-4.39	30.00	-34.39	5/10 MHz
PK	Н	2402.000		32.29	3.67	0.00	0.00	-12.43	30.00	-42.43	5/10 MHz
		Obtained by									
PK	V	2402.000	53.13	32.29	3.67	0.00	0.00	-6.13	30.00	-36.13	1/3 MHz
PK	Н	2402.000	44.59	32.29	3.67	0.00	0.00	-14.67	30.00	-44.67	1/3 MHz
					out Power, C						
	Note: EIRP	Obtained by									
PK	V	2441.000		32.26	3.73	0.00	0.00	-11.36	30.00	-41.36	5/10 MHz
PK	H	2441.000		32.26	3.73	0.00	0.00	-6.97	30.00	-36.97	5/10 MHz
	Note: EIRP	Obtained by									
PK	V	2441.000	45.26	32.26	3.73	0.00	0.00	-13.97	30.00	-43.97	1/3 MHz
PK	Н	2441.000	49.87	32.26	3.73	0.00	0.00	-9.36	30.00	-39.36	1/3 MHz
	N. FIDD	014 : 11			out Power, C				0 05 00	ID FIDE	
DI		Obtained by									
PK	V	2441.000		32.26	3.73	0.00	0.00	-10.97	30.00	-40.97	5/10 MHz
PK	H H	2441.000	48.65	32.26	3.73	0.00	0.00	-10.58	30.00	-40.58	5/10 MHz
DIZ		Obtained by									
PK PK	V H	2441.000		32.26	3.73	0.00	0.00	-13.48	30.00	-43.48	1/3 MHz
PK	П	2441.000		32.26	3.73 out Power, C	0.00	0.00	-12.94	30.00	-42.94	1/3 MHz
	Note: FIRD	Obtained by							3m - 05 22 -	- dBm FIRE)
PK	V	2441.000		32.26	3.73	0.00	0.00	-9.36	30.00	-39.36	5/10 MHz
PK	H	2441.000		32.26	3.73	0.00	0.00	-12.92	30.00	-42.92	5/10 MHz
110		Obtained by									
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
	<u> </u>				out Power, C				. 55.00	.5.00	., 5 IVII IZ
	Note: FIRP	Obtained by							3m - 95 22 -	= dBm FIRE)
PK	V	2480.000	45.70	32.23	3.78	0.00	0.00	-13.51	30.00	-43.51	5/10 MHz
PK	Н	2480.000		32.23	3.78	0.00	0.00	-8.81	30.00	-38.81	5/10 MHz
		Obtained by									
PK	V	2480.000	43.24	32.23	3.78	0.00	0.00	-15.97	30.00	-45.97	1/3 MHz
PK	Н	2480.000		32.23	3.78	0.00		-10.98	30.00	-40.98	1/3 MHz
					out Power, C						
	Note: EIRP	Obtained by							3m - 95.22 :	= dBm EIRF)
PK		2480.000						-10.55			5/10 MHz
PK	Н	2480.000	50.27	32.23	3.78	0.00	0.00	-8.94	30.00	-38.94	5/10 MHz
		Obtained by									
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
					out Power, C						
	Note: EIRP	Obtained by							3m - 95.22 :	= dBm EIRF)
PK	V	2480.000	48.79	32.23	3.78	0.00	0.00	-10.42	30.00	-40.42	5/10 MHz
PK	Н	2480.000	43.80	32.23	3.78	0.00	0.00	-15.41	30.00	-45.41	5/10 MHz
		Obtained by				•	•		•	•	
PK	V	2480.000	47.87	32.23	3.78	0.00	0.00	-11.34	30.00	-41.34	1/3 MHz
PK	Н	2480.000	41.29	32.23	3.78	0.00	0.00	-17.92	30.00	-47.92	1/3 MHz

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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)] · $[\sqrt{f_{(GHz)}}] \le 3.0$ 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		Exe	mption Limits (n	nW)	
(MHz)	At separation	At separation	At separation	At separation	At separation
	distance of	distance of	distance of	distance of	distance of
	≤5 mm	10 mm	15 mm	20 mm	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.

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Intertek

Report Number: 102743203BOX-001 Issued: 11/10/2016

Test Personnel: Vathana Ven Test Date: 10/20/2016 Supervising/Reviewing Engineer: (Where Applicable) N/A FCC Part 15C, 15.247, RSS-247 Product Standard: Limit Applied: Below specified limit Input Voltage: 120VAC/60Hz Ambient Temperature: 20 °C 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

<u>The EMC Lab</u> 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-DOPSK Modulation

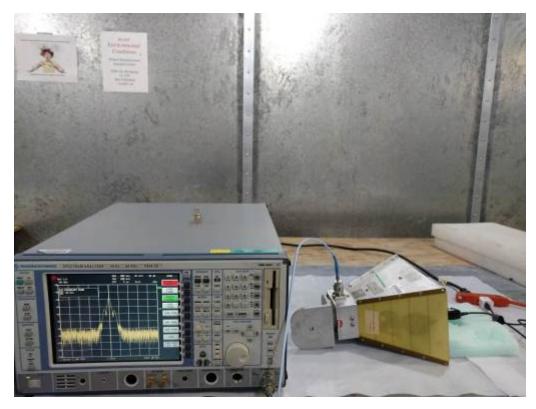
Frequency	Occupied Bandwidth (99%)	20 dB Bandwidth
2402	43.58 kHz	66.12 kHz
2441	53.10 kHz	66.12 kHz
2480	60.62 kHz	66.12 kHz

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

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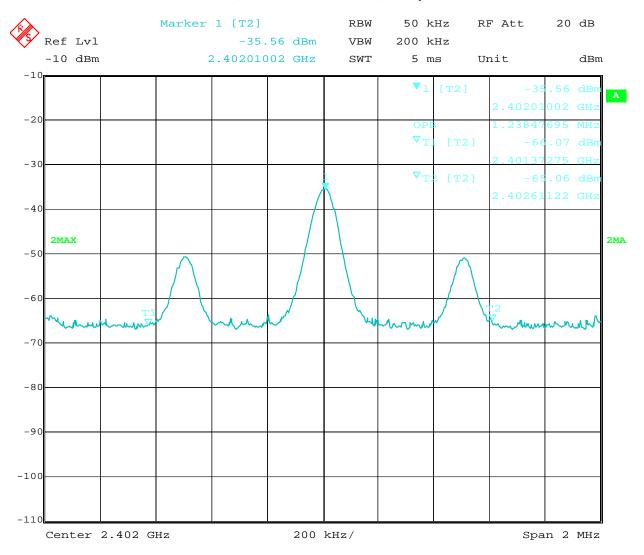
7.4 Setup Photographs:





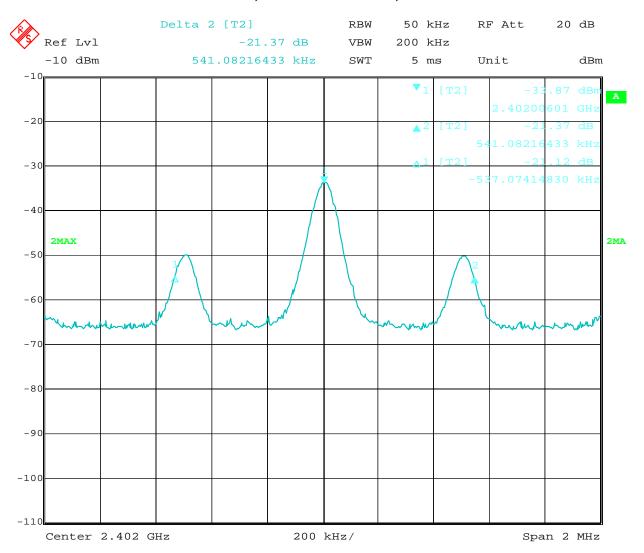
7.5 Plots/Data:

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



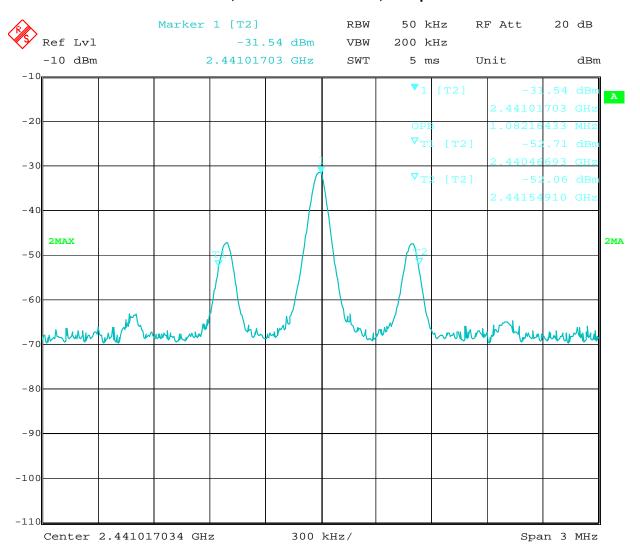
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Device set to GFSK Modulation, Tx at CH0 - 2402 MHz, 20dB Bandwidth = 1.078 MHz



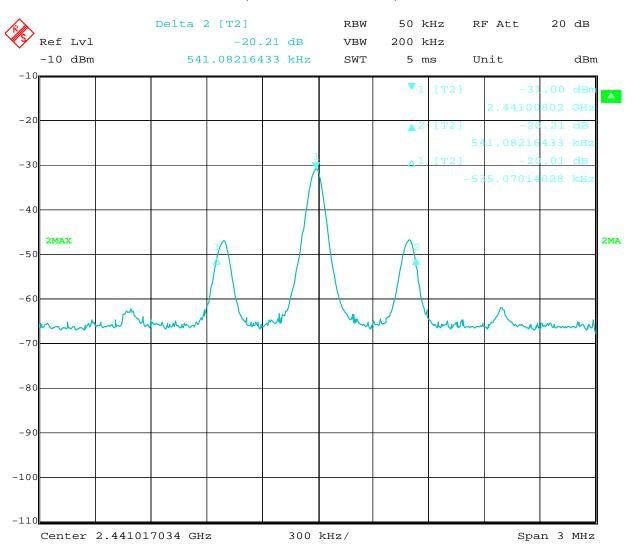
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Device set to GFSK Modulation, Tx at CH39 - 2441 MHz, Occupied Bandwidth = 1.0821 MHz



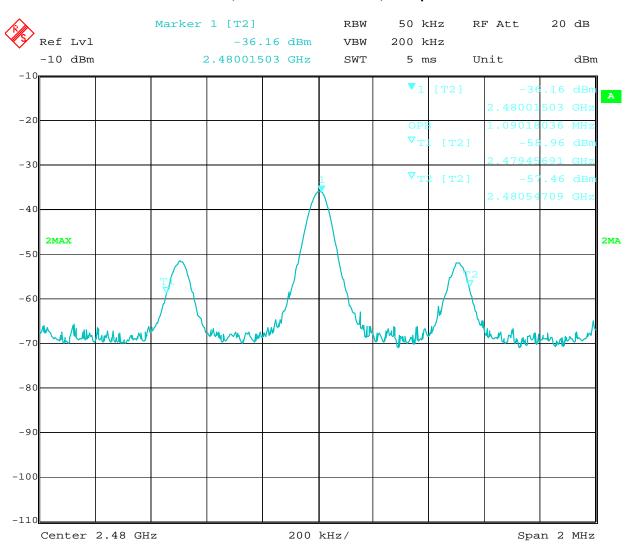
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Device set to GFSK Modulation, Tx at CH39 - 2441 MHz, 20dB Bandwidth = 1.076 MHz



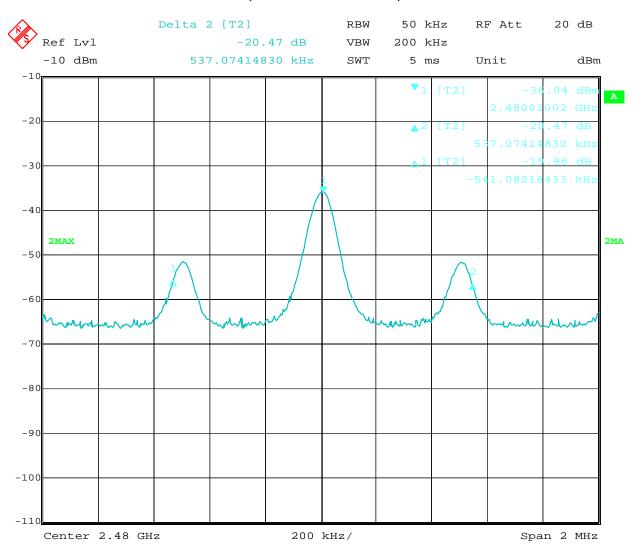
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Device set to GFSK Modulation, Tx at CH78 - 2480 MHz, Occupied Bandwidth = 1.090 MHz



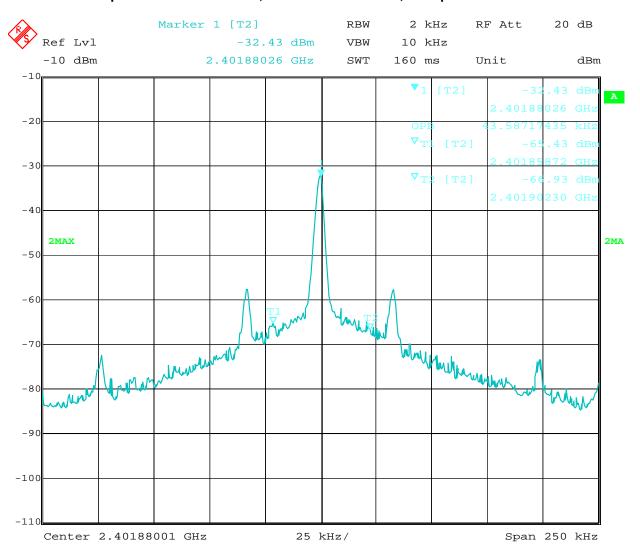
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Device set to GFSK Modulation, Tx at CH78 - 2480 MHz, 20dB Bandwidth = 1.078 MHz



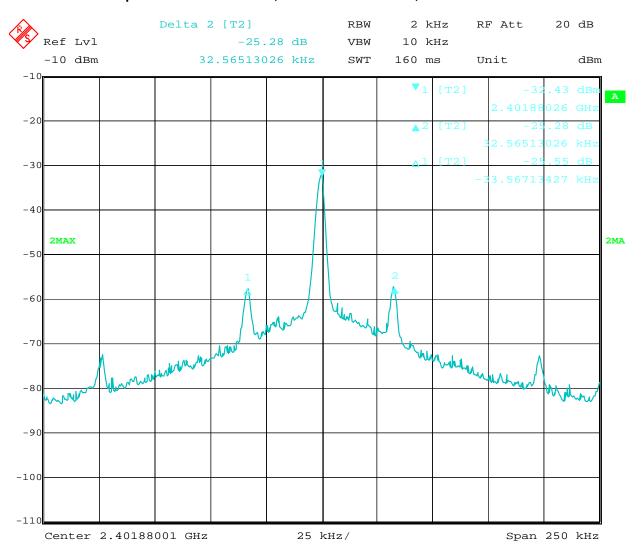
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Device set to pi/4-DQPSK Modulation, Tx at CH0 - 2402 MHz, Occupied Bandwidth = 43.58 kHz



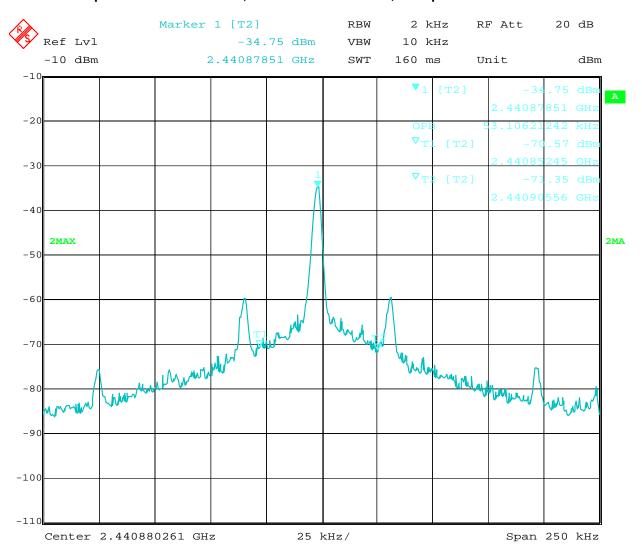
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Device set to pi/4-DQPSK Modulation, Tx at CH0 - 2402 MHz, 20dB Bandwidth = 66.12 kHz



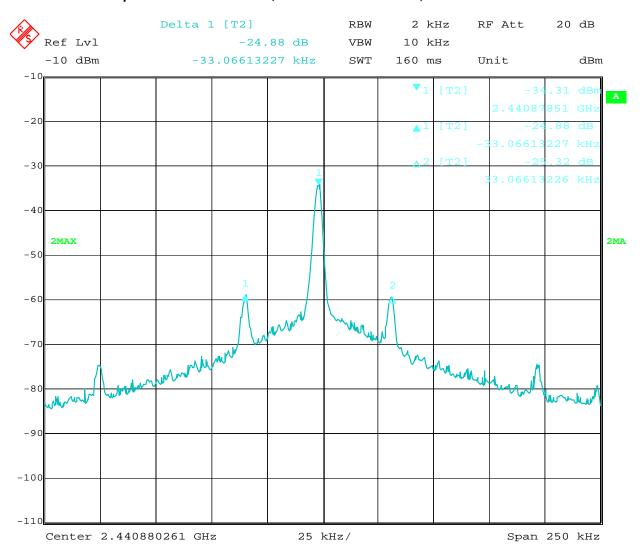
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Device set to pi/4-DQPSK Modulation, Tx at CH39 - 2441 MHz, Occupied Bandwidth = 53.10 kHz



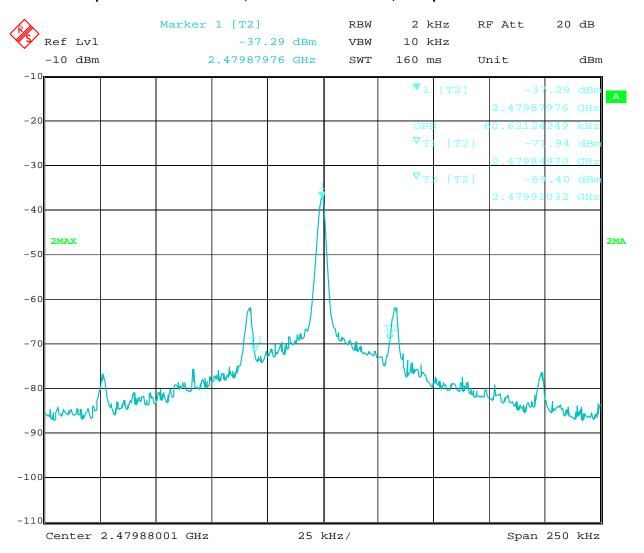
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Device set to pi/4-DQPSK Modulation, Tx at CH39 - 2441 MHz, 20dB Bandwidth = 66.12 kHz



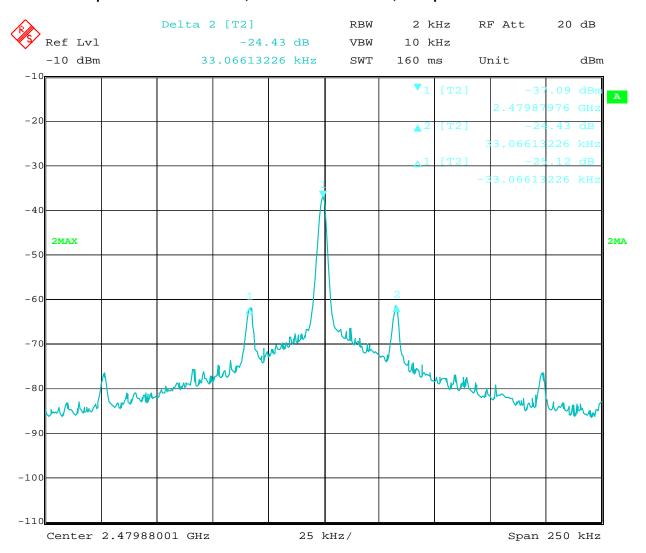
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Device set to pi/4-DQPSK Modulation, Tx at CH78 - 2480 MHz, Occupied Bandwidth = 60.62 kHz



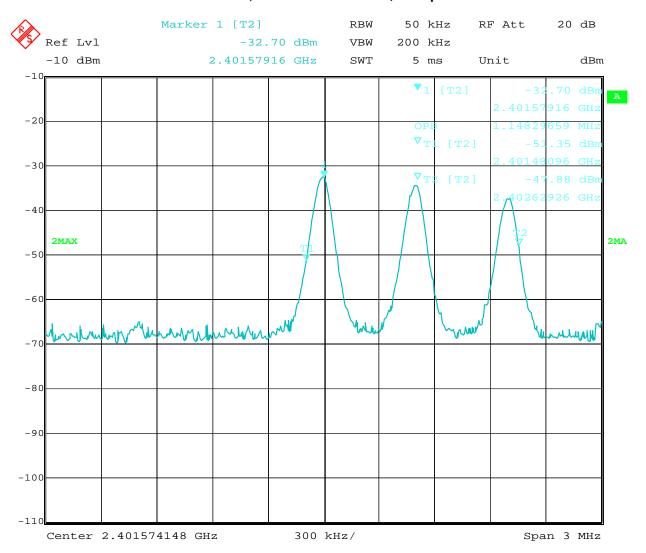
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Device set to pi/4-DQPSK Modulation, Tx at CH78 - 2480 MHz, Occupied Bandwidth = 66.12 kHz



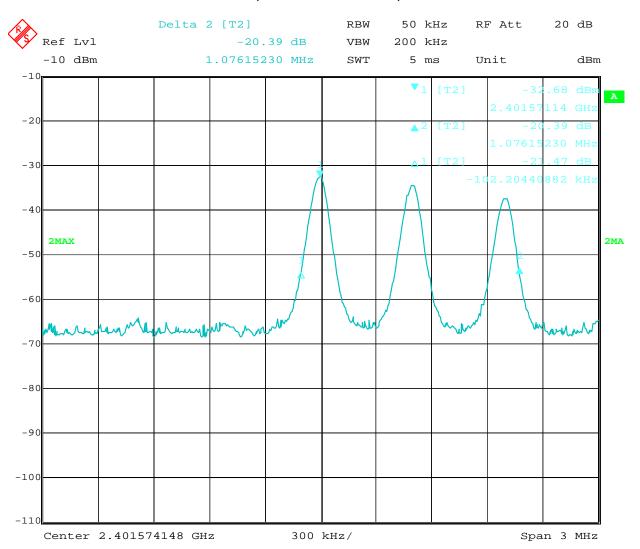
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Device set to 8DPSK Modulation, Tx at CH0 - 2402 MHz, Occupied Bandwidth = 1.14 MHz



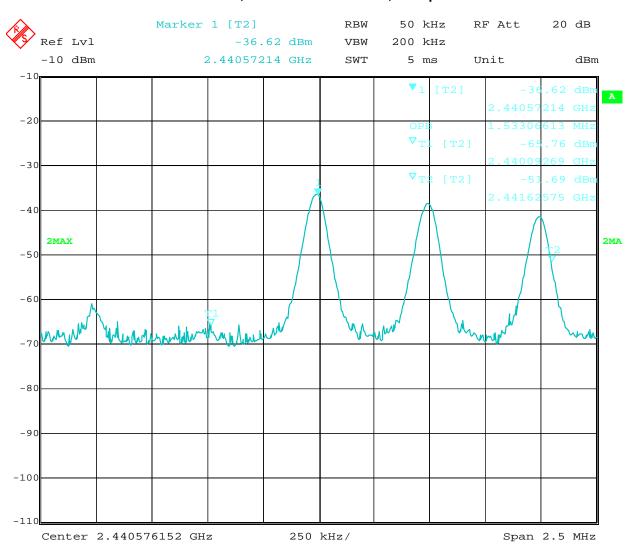
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Device set to 8DPSK Modulation, Tx at CH0 - 2402 MHz, 20dB Bandwidth = 1.178 MHz



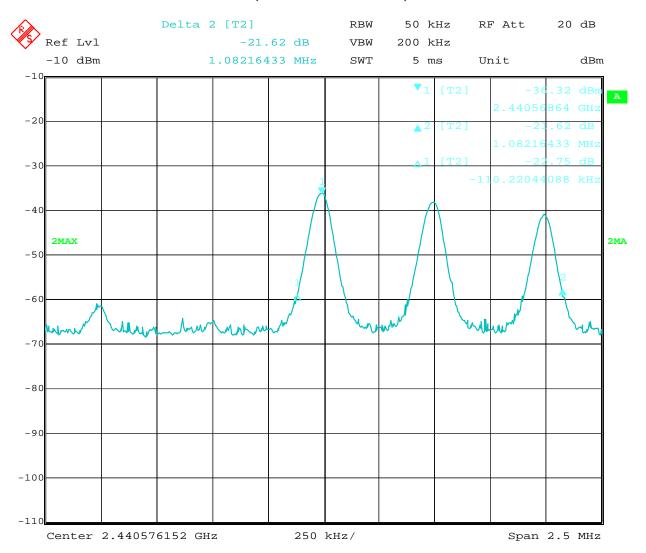
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Device set to 8DPSK Modulation, Tx at CH39 - 2441 MHz, Occupied Bandwidth = 1.53 MHz



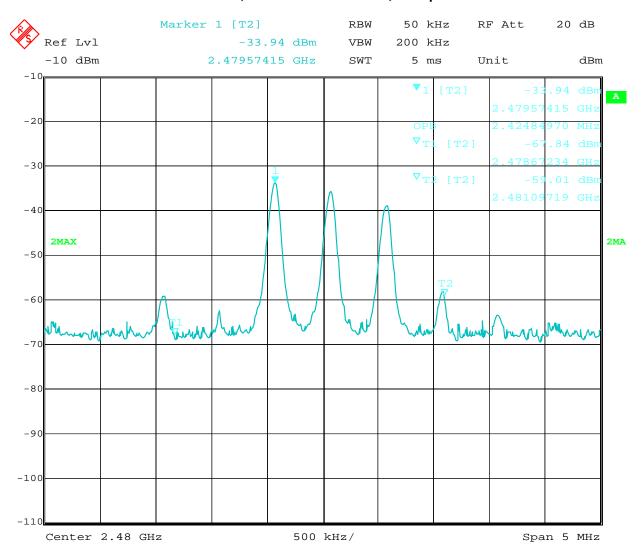
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Device set to 8DPSK Modulation, Tx at CH39 - 2441 MHz, 20dB Bandwidth = 1.192 MHz



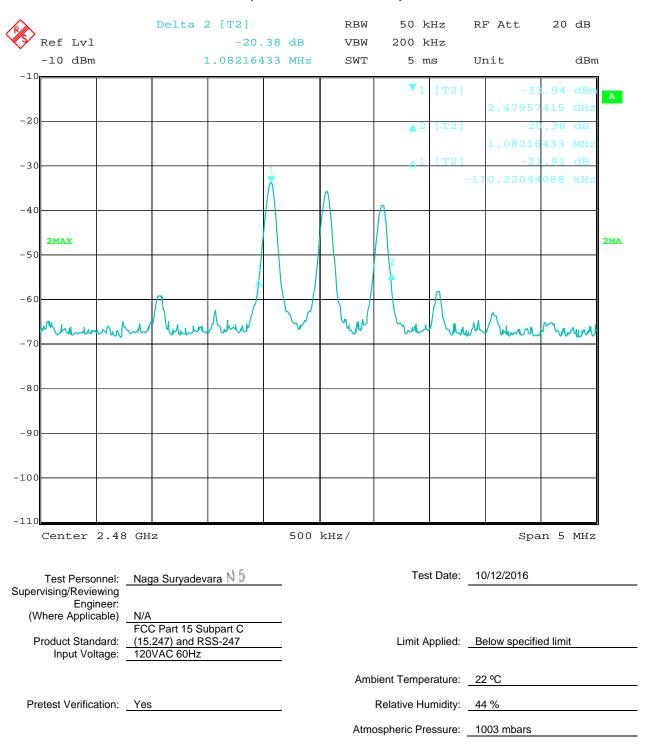
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Device set to 8DPSK Modulation, Tx at CH78 - 2480 MHz, Occupied Bandwidth = 2.424 MHz



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



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		

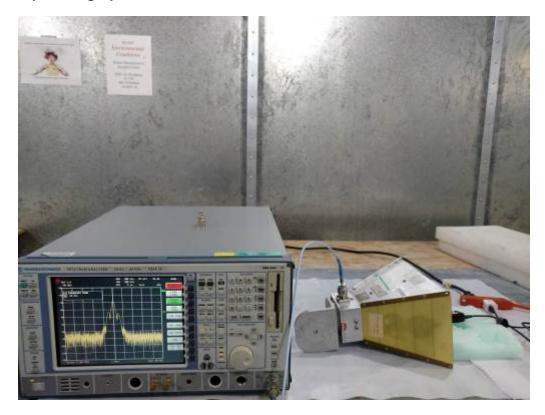
8.3 Results:

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)

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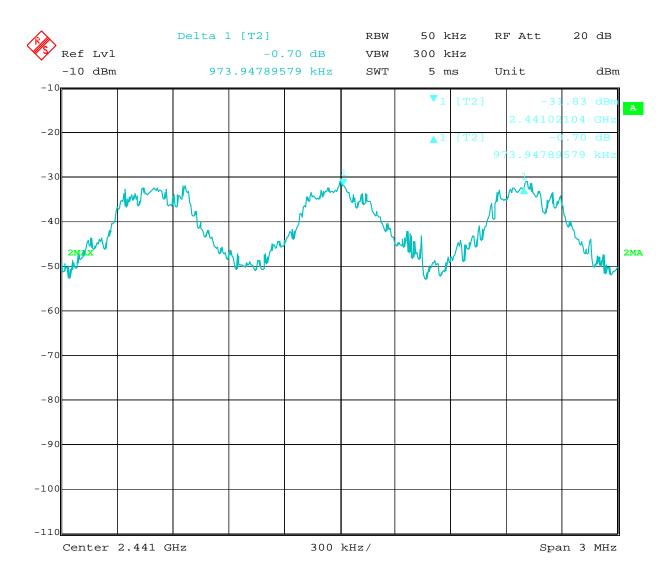
8.4 Setup Photographs:





Plots/Data: 8.5

Channel Frequency Separation



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Report Number: 102743203BOX-001 Issued: 11/10/2016

Test Personnel: Naga Suryadevara N 5 Test Date: 10/12/2016 Supervising/Reviewing Engineer: (Where Applicable) FCC Part 15 Subpart C Product Standard: (15.247) and RSS-247 Input Voltage: 120VAC 60Hz Limit Applied: Below Specified Limit Ambient Temperature: 22 °C Pretest Verification: Yes Relative Humidity: 44 % Atmospheric Pressure: 1003 mbars

Deviations, Additions, or Exclusions: None

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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		

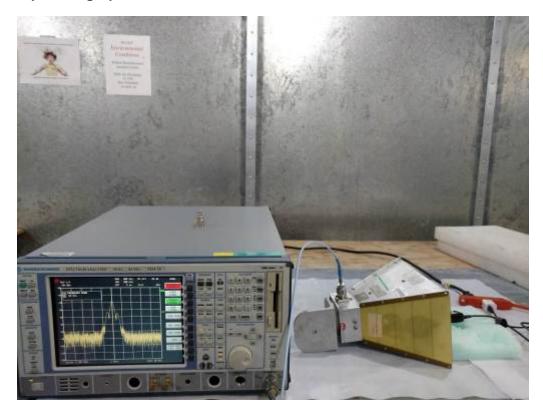
9.3 Results:

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.

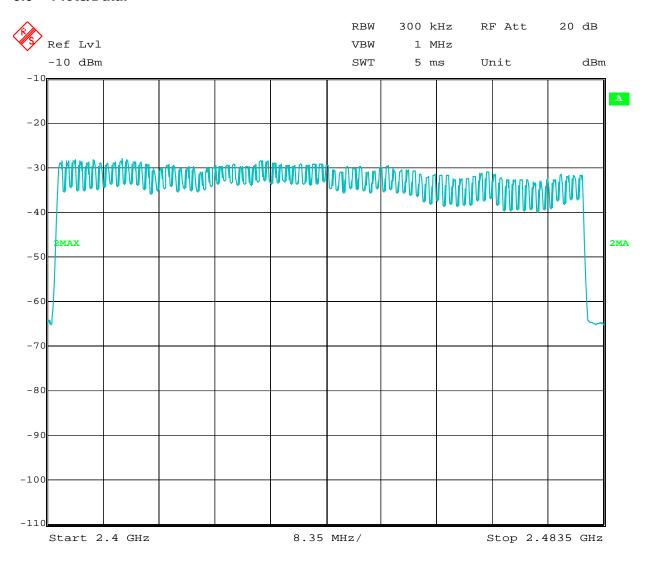
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9.4 Setup Photographs:





9.5 Plots/Data:



10/12/2016 Test Personnel: Naga Suryadevara N 5 Test Date: Supervising/Reviewing Engineer: (Where Applicable) FCC Part 15 Subpart C (15.247) and RSS-247 Limit Applied: Below Specified Limit Product Standard: Input Voltage: 120VAC 60Hz Ambient Temperature: 22 °C 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:

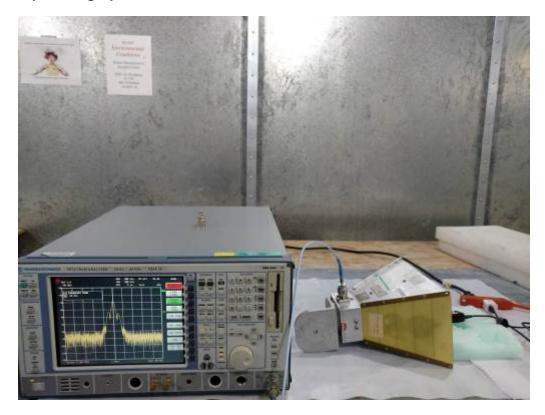
The sample tested was found to Comply. For systems operating in the 2400-2483.5 MHz band, the average time of occupancy on any channel shall not be greater than 0.4 second within a period of 0.4 second multiplied by the number of hopping channels employed

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

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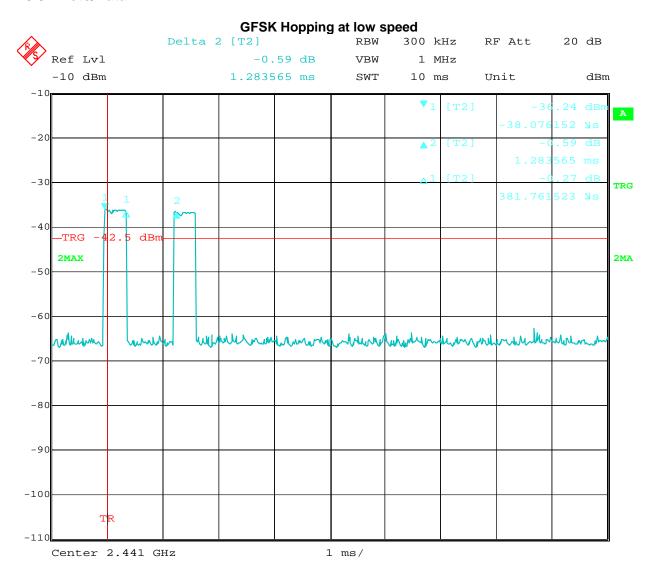
10.4 Setup Photographs:





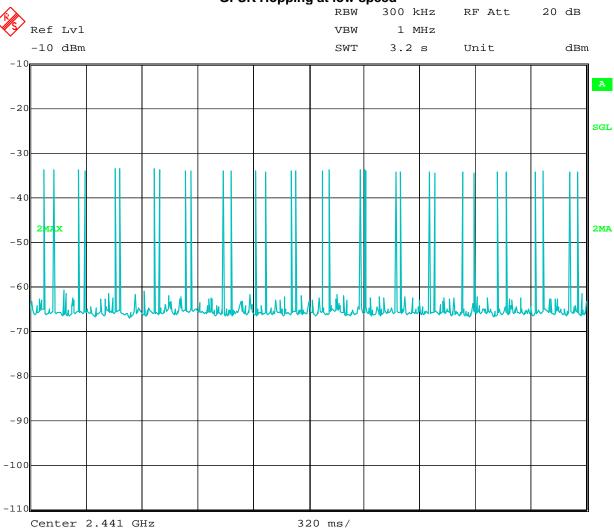
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10.5 Plots/Data:



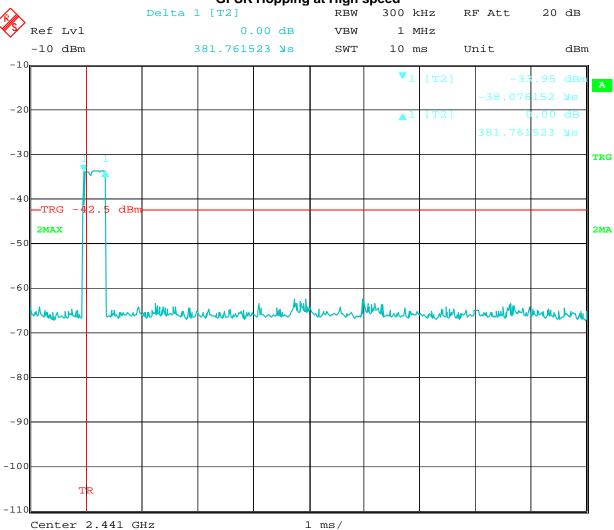
Report Number: 102743203BOX-001 Issued: 11/10/2016

GFSK Hopping at low speed



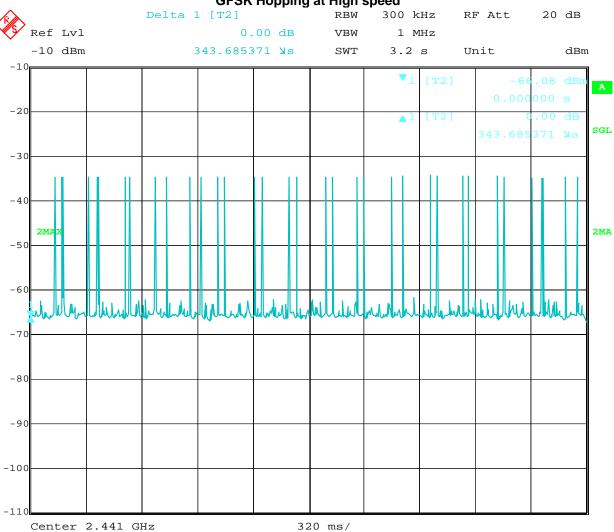
Report Number: 102743203BOX-001 Issued: 11/10/2016

GFSK Hopping at High speed



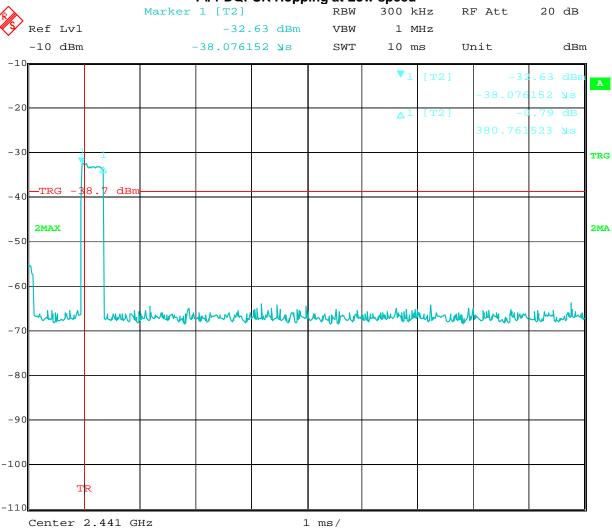
Report Number: 102743203BOX-001 Issued: 11/10/2016

GFSK Hopping at High speed

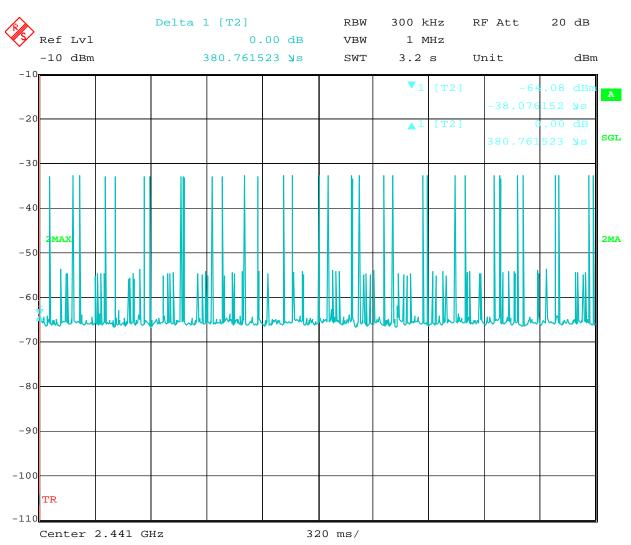


Report Number: 102743203BOX-001 Issued: 11/10/2016

Pi/4-DQPSK Hopping at Low speed

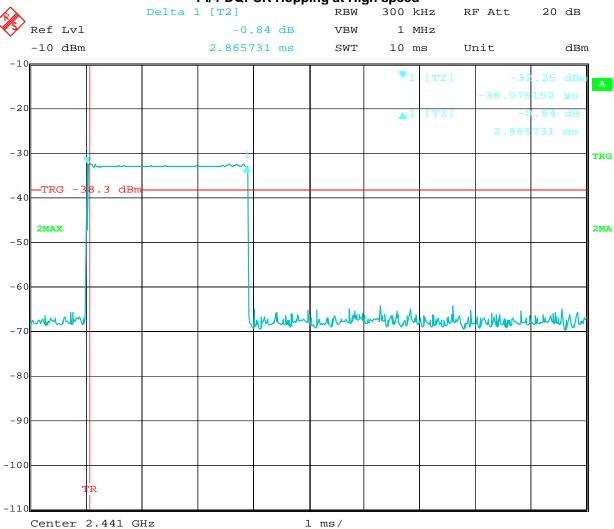


Pi/4-DQPSK Hopping at Low speed

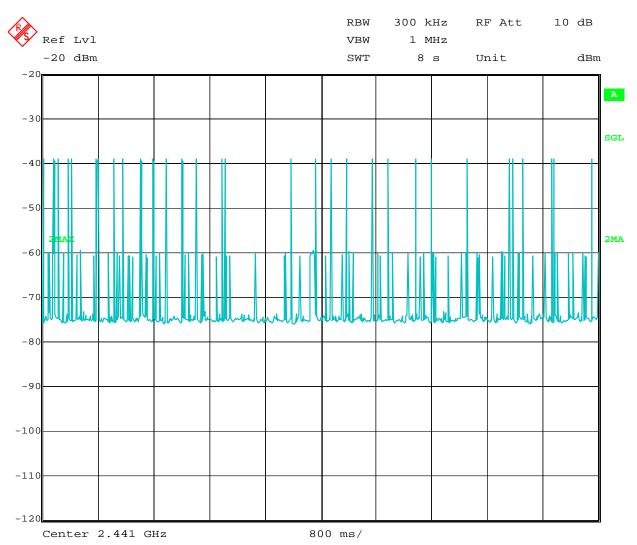


Report Number: 102743203BOX-001 Issued: 11/10/2016

Pi/4-DQPSK Hopping at High speed



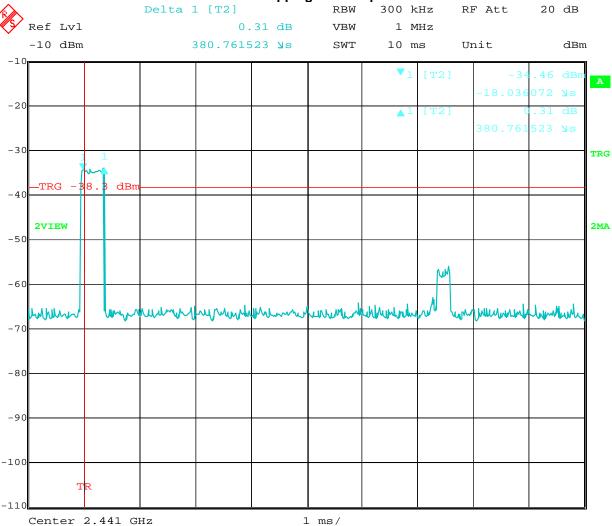
Pi/4-DQPSK Hopping at High speed



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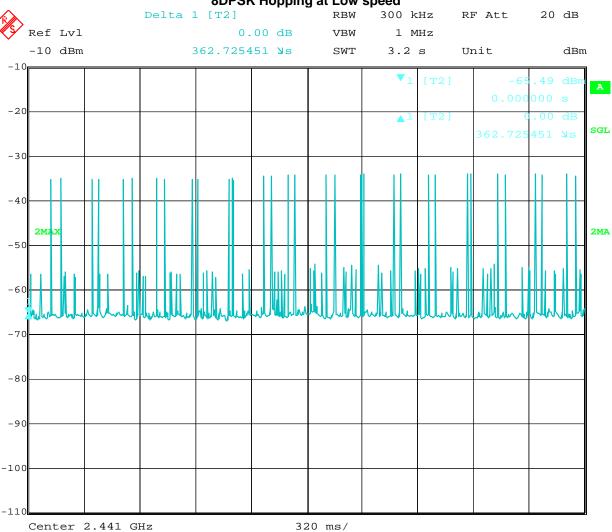
Report Number: 102743203BOX-001 Issued: 11/10/2016

8DPSK Hopping at Low speed

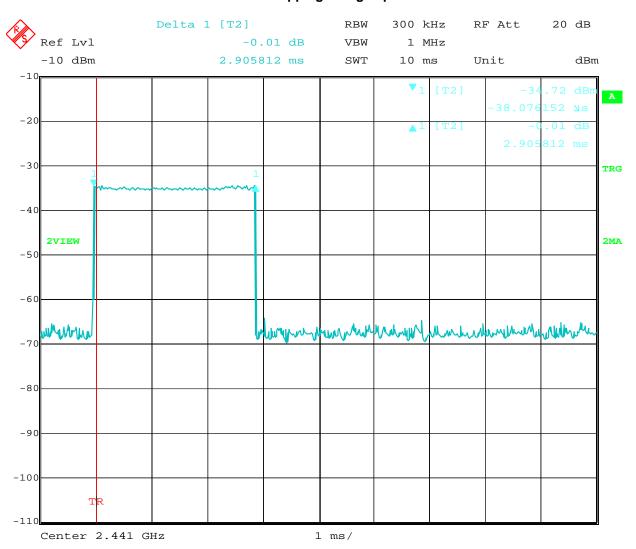


Report Number: 102743203BOX-001 Issued: 11/10/2016

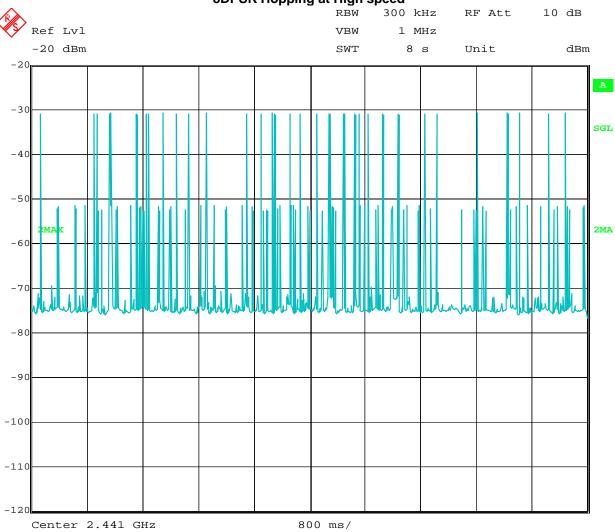
8DPSK Hopping at Low speed



8DPSK Hopping at High speed



8DPSK Hopping at High speed



Test Personnel:	Naga Suryadevara №5	Test Date:	10/12/2016
Supervising/Reviewing			
Engineer:			
(Where Applicable)	N/A		
	FCC Part 15 Subpart C		
Product Standard:	(15.247) and RSS-247	Limit Applied:	Below Specified Limit
Input Voltage:	120VAC 60Hz		
		Ambient Temperature:	22 °C
5	V	5 1 2 11 12	44.07
Pretest Verification:	Yes	Relative Humidity:	44 %
		At a same basis Bases and	4000
		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 $U_{\it lab}$ is less than the corresponding $U_{\it CISPR}$ 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.

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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 $FS = Field Strength in dB\mu V/m$

RA = Receiver Amplitude (including preamplifier) in $dB\mu V$

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 dB μ V 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 dB_µV/m. This value in $dB\mu V/m$ was converted to its corresponding level in $\mu V/m$.

 $RA = 52.0 dB\mu V$ AF = 7.4 dB/mCF = 1.6 dBAG = 29.0 dBFS = 32 dBuV/m

To convert from $dB\mu V$ to μV or mV the following was used:

UF =
$$10^{(NF/20)}$$
 where UF = Net Reading in μ V
NF = Net Reading in dB μ V

Example:

FS = RA + AF + CF - AG =
$$52.0 + 7.4 + 1.6 - 29.0 = 32.0$$

UF = $10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \text{ }\mu\text{V/m}$

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Report Number: 102743203BOX-001 Issued: 11/10/2016

11.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
				PE80529A61		
DAV004'	Weather Station	Davis Instruments	7400	Α	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
			3m Track B			
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	cables	multiple	07/30/2016	07/30/2017

Software Utilized:

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

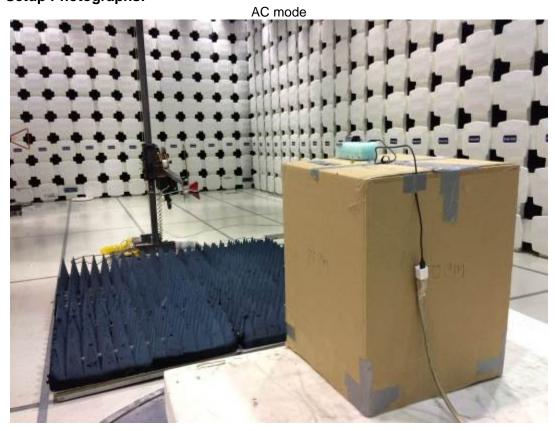
Note: Your Laptop may use a different version of Excel. Record the version you actually used!

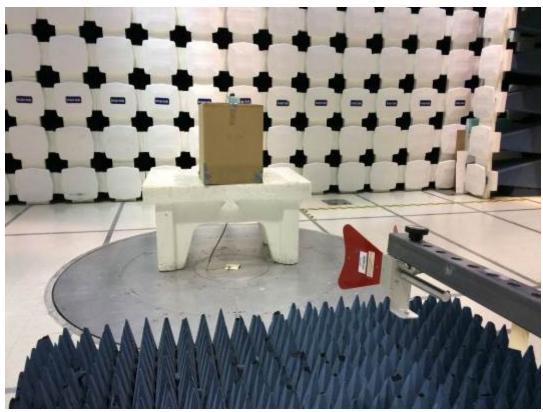
11.3 Results:

The sample tested was found to Comply.

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11.4 Setup Photographs:





11.5 Test Data:

Special Radiated Emissions

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

Engineers: Vathana Ven Location: 10M Barometer: DAV004 Filter: Project #: G102743203

Date(s): 11/10/16 Standard: FCC Part 15 Subpart C 15.247 Temp/Humidity/Pressure: 21c 29% 999 mB

Receiver: R&S ESI (145-128) 03-10-2017 Limit Distance (m): 3 PreAmp: 145014 05-13-16.txt Test Distance (m): 3

> Υ Voltage/Frequency: 2(3V) batteries PreAmp Used? (Y or N): 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

I can. I	N Quasi-i	can. Qi Av	erage. Avo	IXIVIO. IXIVI	3, INI - INUI	3C 1 1001, 11L	- 1103111010	a Dana, Dai	iawiatii aciit	ncu as ND	VV/VDVV			
	Ant.			Antenna	Cable	Pre-amp	Distance							
Detector	Pol.	Frequency	Reading	Factor	Loss	Factor	Factor	Net	Limit	Margin	Bandwidth			
Type	(V/H)	MHz	dB(uV)	dB(1/m)	dB	dB	dB	dB(uV/m)	dB(uV/m)	dB		FCC	IC	Harmonic?
			Note:	Lower Band	Edge Com	pliance, 8DF	SK none h	opping						
PK	Н	2390.000	26.90	32.21	3.66	0.00	0.00	62.77	74.00	-11.23	1/3 MHz	RB	RB	
AVG	Н	2390.000	16.50	32.21	3.66	0.00	0.00	52.37	54.00	-1.63	1/3 MHz	RB	RB	
			Not	e: Upper Ba	and Edge Co	ompliance, 8	DPSK hopp	oing						
PK	Н	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	Н	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 Com	pliance, 8DF	PSK none h	opping						
PK	Н	2483.500	27.90	32.22	3.79	0.00	0.00	63.91	74.00	-10.09	1/3 MHz	RB		
AVG	Н	2483.500	16.90	32.22	3.79	0.00	0.00	52.91	54.00	-1.09	1/3 MHz	RB		
			Not	e: Upper Ba	and Edge Co	ompliance, 8	DPSK hopp	oing						
PK	Н	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	Н	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
												-		

Vathana VenV5V Test Personnel: Test Date: 11/10/2016 Supervising/Reviewing Engineer: (Where Applicable) FCC Part 15C, 15.247, Product Standard: RSS-247 Below specified limit Limit Applied: Input Voltage: 120VAC/60Hz Ambient Temperature: 21 °C Pretest Verification w/ Ambient Signals or BB Source: Yes Relative Humidity: 29 % Atmospheric Pressure: 999 mbars

Deviations, Additions, or Exclusions: None

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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 $U_{\it lab}$ is less than the corresponding $U_{\it CISPR}$ 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.

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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 $FS = Field Strength in dB\mu V/m$

RA = Receiver Amplitude (including preamplifier) in $dB\mu V$

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 dB μ V 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 dB_µV/m. This value in $dB\mu V/m$ was converted to its corresponding level in $\mu V/m$.

 $RA = 52.0 dB\mu V$ AF = 7.4 dB/mCF = 1.6 dBAG = 29.0 dBFS = 32 dBuV/m

To convert from $dB\mu V$ to μV or mV the following was used:

UF =
$$10^{(NF/20)}$$
 where UF = Net Reading in μ V
NF = Net Reading in dB μ V

Example:

FS = RA + AF + CF - AG =
$$52.0 + 7.4 + 1.6 - 29.0 = 32.0$$

UF = $10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \text{ }\mu\text{V/m}$

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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	05/13/201
145145'	Broadband Hybrid Antenna 30 MHz - 3 GHz	Sunol Sciences Corp.	JB3	A122313	03/09/2016	03/09/2017

Software Utilized:

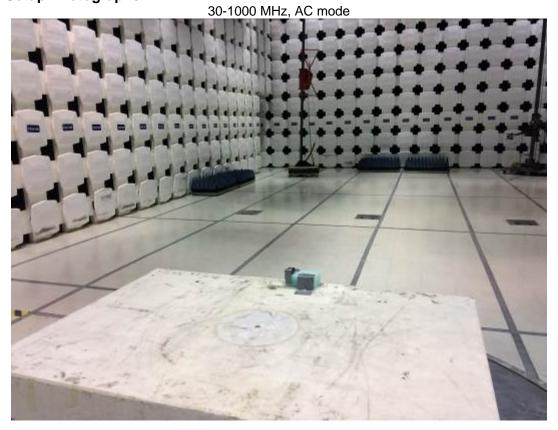
Name	Manufacturer	Version
Compliance 5	Teseq	5.26.46.46

12.3 Results:

The sample tested was found to Comply.

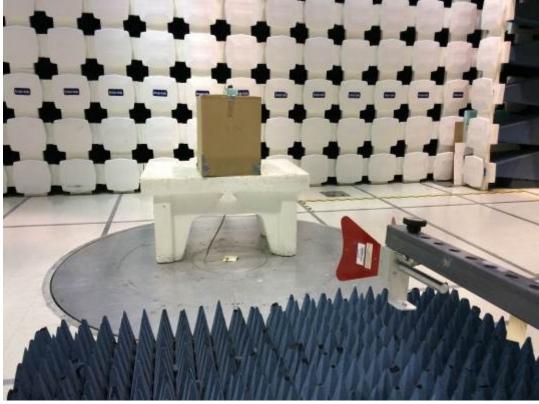
Page 76 of 139

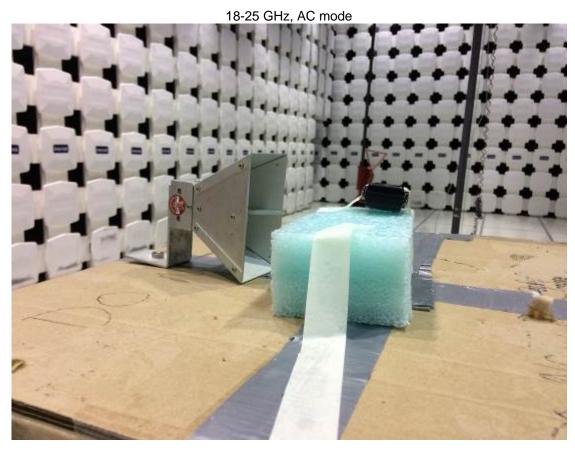
12.4 Setup Photographs:

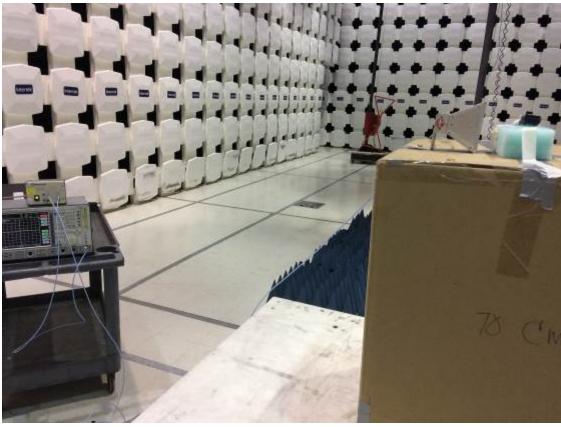


















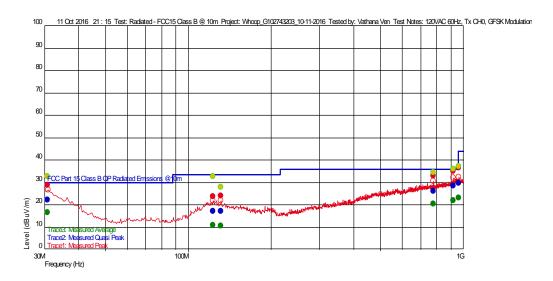
12.5 Test Data:

Test Information

User Entry
Radiated - FCC15.247 @ 10m
Whoop_G102743203_10-11-2016
120VAC 60Hz, Tx CH0, GFSK Modulation X-axis
21 deg C
34%, 1018 mB
Votbana Von Test Details Test: Project:

Test Notes: Temperature: Humidity: Tested by: Test Started: Vathana Ven 11 Oct 2016 21 : 15 Additional Information

Prescan Emission Graph



Measured Peak Value Measured Quasi Peak Value

Measured Average Value

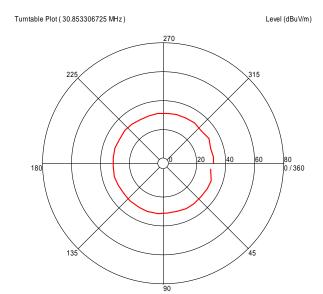
Maximum Value of Mast and Turntable

__ Swept Peak Data Swept Quasi Peak Data

__ Swept Average Data

Emissions Test I	Data									
Trace1: Measur	ed Peak									
Frequency	Level	AF	PA+CL	Limit	Margin	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
(Hz) 123.002003782 M	(dBuV/m) 23.66	20.200	-26.552	(dBuV/m) 33.520	(dBuV/m) -9.86	1	134	3.87	120 k	
131.819839407 M	24.05	19.918	-26.352	33.520	-9.47		259	2.19	120 k	
960.704608729 M	36.46	29.886	-20.430	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	<u>-</u>	319	2.33	120 k	
920.266332519 M	35.18	29.205	-23.074	36.020	-0.84		141	1.82	120 k	
						•				
Trace2: Measur	ed Quasi Pe	eak								
Frequency	Level	AF	PA+CL	Limit	Margin	Hor () Vor (1)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
(Hz)	(dBuV/m)	AF		(dBuV/m)	(dBuV/m)	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(III)	KDW(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	
T 2 M										
Trace3: Measur										
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	<u></u> ′	<u>-</u> ′		259	2.19	120 k	
123.002003782 M	10.75	20.200	-26.552			j	134	3.87	120 k	
30.853306725 M	16.56	26.817	-27.757			<u></u>	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	

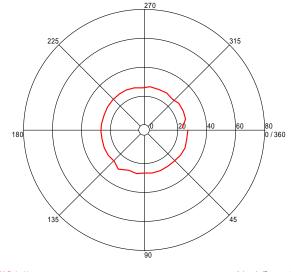
Azimuth Plots



All Polarities Azimuth (Degrees)

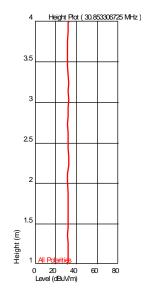
Turntable Plot (123.002003782 MHz)

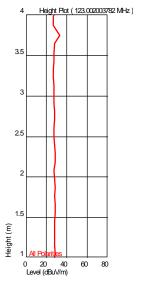


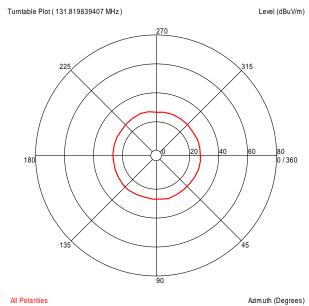


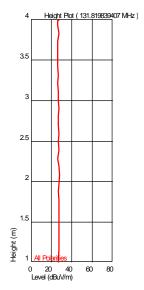
All Polarities Azimuth (Degrees)

Turntable Plots

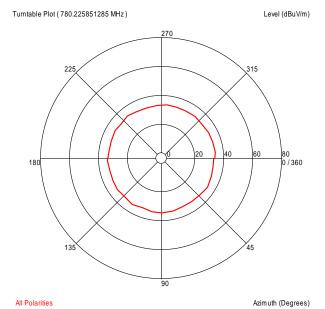


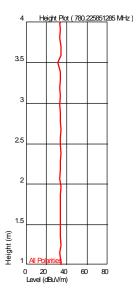


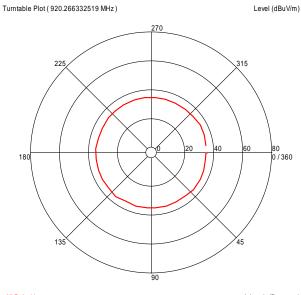


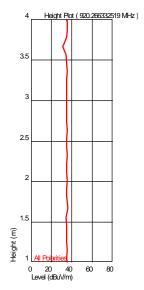


Tan Canado

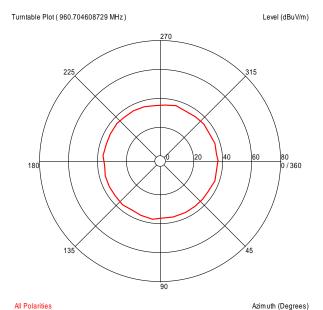


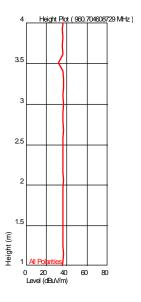






All Polarities Azimuth (Degrees)





Test Information

Test Details

Test:

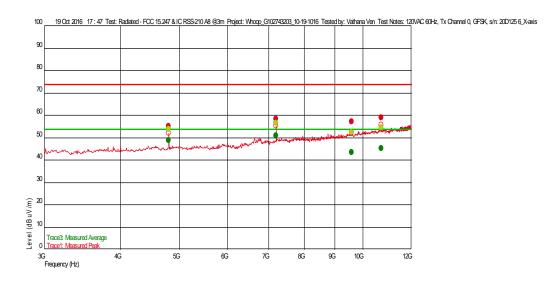
Project: Test Notes:

User Entry
Radiated - FCC 15.247 & IC RSS-210 A8 @3m
Whoop_G102743203_10-19-1016
120VAC 60Hz, Tx Channel 0, GFSK, s/n: 20D125 6_X-axis

22 deg C 42%, 1006 mB Vathana Ven 19 Oct 2016 17 : 47 Temperature: Humidity: Tested by: Test Started:

Additional Information

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	1	73	1.16	1 M	
9.587929192 G	58.10	36.681	-22.105	74.000	-15.90	j	104	1.16	1 M	
7.206165665 G	59.20	35.644	-23.884	74.000	-15.90	<u></u>	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

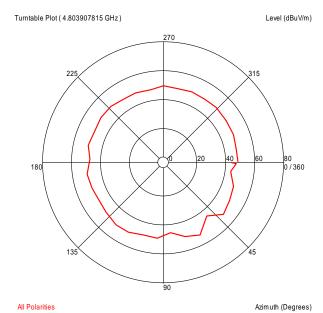
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	(
9.587929192 G	44.12	36.681	-22.105	54.000	-9.88	1	104	1.16	1 M	
10.72243153 G	45.90	37.697	-20.277	54.000	-8.10	·	240	1.16	1 M	
4.803907815 G	49.72	34.192	-25.631	54.000	-4.28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

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

Non-Specific Radio Report Shell Rev. August 2015 Company: Whoop Model: WHOOP Strap 2.0

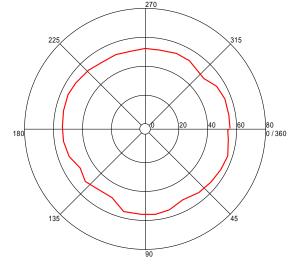
Comment

Azimuth Plots



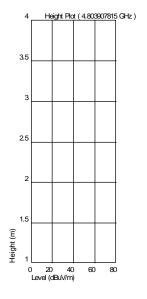
7411 Oldfilles 721110

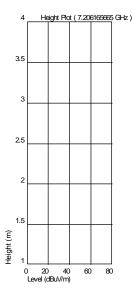


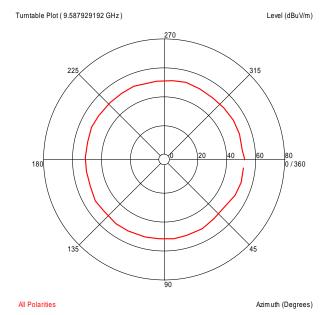


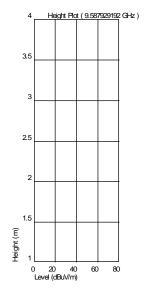
All Polarities Azimuth (Degrees)

Turntable Plots



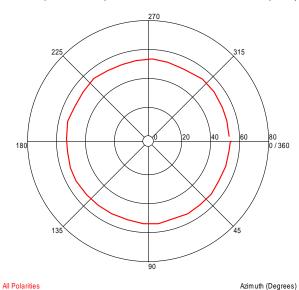


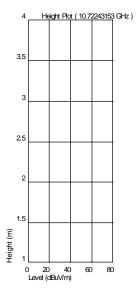




Turntable Plot (10.72243153 GHz)

Level (dBuV/m)





Test Information

Test Details

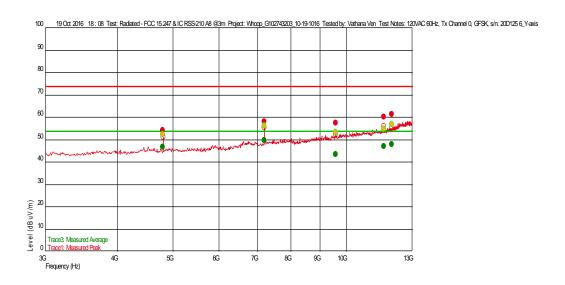
Test:

Project: Test Notes:

User Entry
Radiated - FCC 15.247 & IC RSS-210 A8 @3m
Whoop_G102743203_10-19-1016
120VAC 60Hz, Tx Channel 0, GFSK, s/n: 20D125 6_Y-axis

22 deg C 42%, 1006 mB Vathana Ven 19 Oct 2016 18:08 Temperature: Humidity: Tested by: Test Started:

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

	rucci. Mcusur	ou i cuit									
	requency 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	
1	1.617728791 G	61.06	38.337	-19.472	74.000	-12.94		7	1.16	1 M	
1	1.987955912 G	62.28	38.784	-18.964	74.000	-11.72		34	1.16	1 M	

Trace3: Measured Average

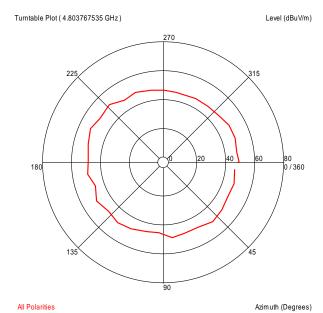
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
9.577842352 G	44.11	36.681	-22.120	54.000	-9.09		283	1.16	1 M	
4.803767535 G	47.37	34.192	-25.631	54.000	-5.84		194	1.16	1 M	
11.617728791 G	47.72	38.337	-19.472	54.000	-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.

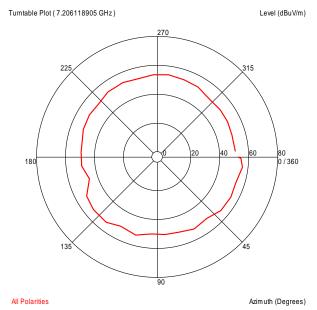
Non-Specific Radio Report Shell Rev. August 2015 Company: Whoop Model: WHOOP Strap 2.0

Additional Information

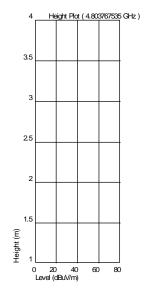
Azimuth Plots

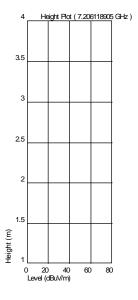


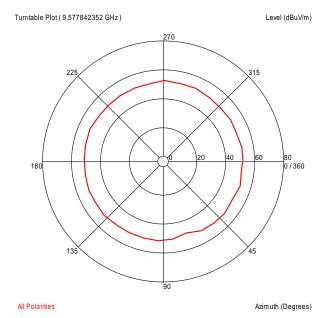
7 VIII Oldfillos

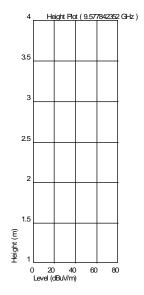


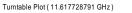
Turntable Plots



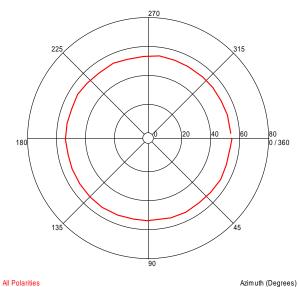


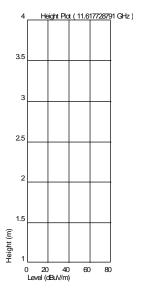


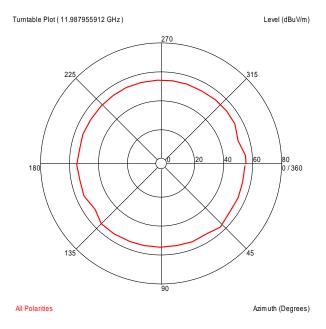


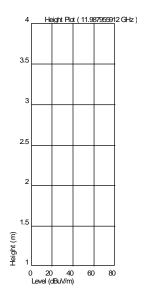












Test Information

Test Details

Test:

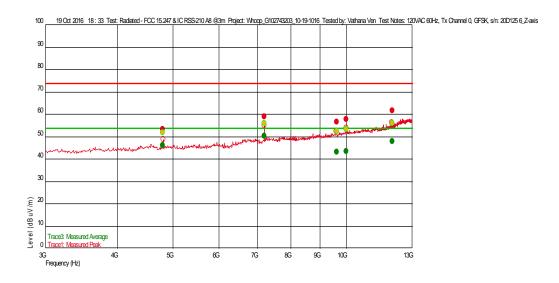
Project: Test Notes:

User Entry
Radiated - FCC 15.247 & IC RSS-210 A8 @3m
Whoop_G102743203_10-19-1016
120VAC 60Hz, Tx Channel 0, GFSK, s/n: 20D125 6_Z-axis

22 deg C 42%, 1006 mB Vathana Ven 19 Oct 2016 18 : 33 Temperature: Humidity: Tested by: Test Started:

Additional Information

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

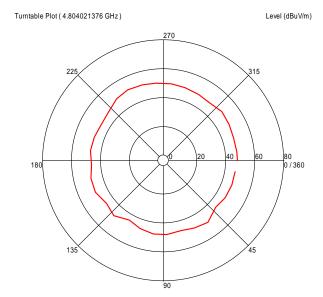
Trace I. Measar	ca i caix									
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.804021376 G	54.21	34.192	-25.630	74.000	-19.79		233	1.16	1 M	
9.610126921 G	57.48	36.690	-22.070	74.000	-16.52		19	1.16	1 M	
10.002785571 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	I	41	1.16	1 M	
12.000567802 G	62.32	38.799	-18.939	74.000	-11.68	1	360	1.16	1 M	

Trace3: Measured Average

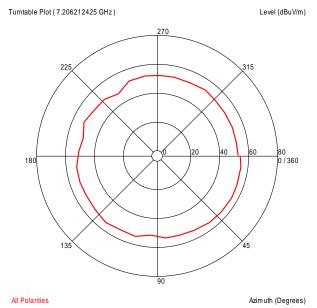
Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
44.00	36.690	-22.070	54.000	-9.21		19	1.16	1 M	
44.37	37.220	-21.697	54.000	-9.63		215	1.16	1 M	
46.95	34.192	-25.630	54.000	-7.05		233	1.16	1 M	
48.71	38.799	-18.939	54.000	-5.29	1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

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

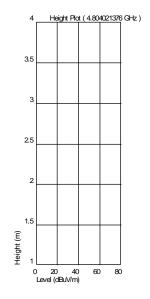
Azimuth Plots

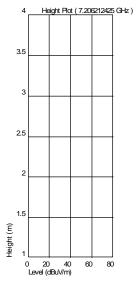


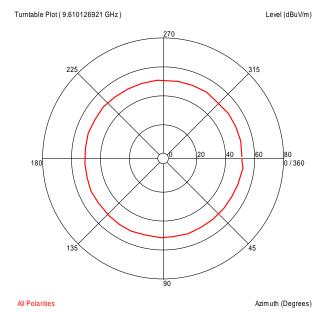
All Polarities Azimuth (Degrees)

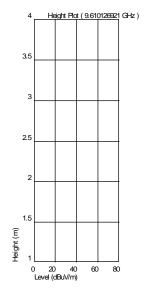


Turntable Plots



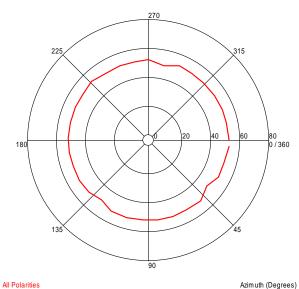


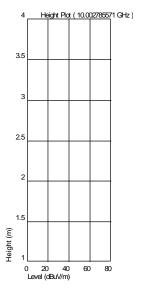


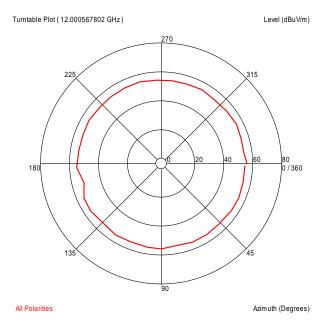


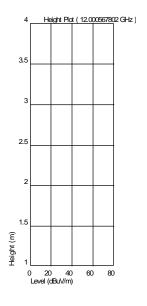












Test Information

Test Details

Test:

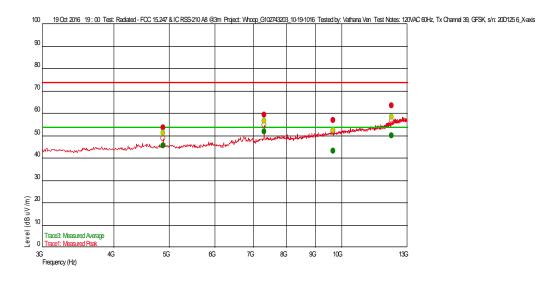
Project: Test Notes:

User Entry
Radiated - FCC 15.247 & IC RSS-210 A8 @3m
Whoop_G102743203_10-19-1016
120VAC 60Hz, Tx Channel 39, GFSK, s/n: 20D125 6_X-axis

22 deg C 42%, 1006 mB Vathana Ven 19 Oct 2016 19:00 Temperature: Humidity: Tested by: Test Started:

Additional Information

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	

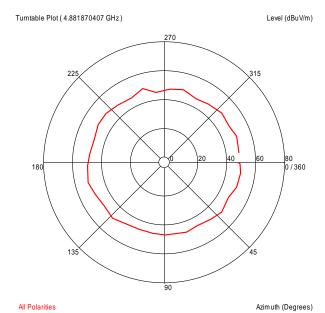
Trace3: Measured Average

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	1	22	1.16	1 M	

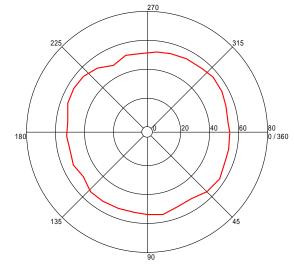
Insertion loss of the high pass filter of 0.72 dBwas added to the reading.

Non-Specific Radio Report Shell Rev. August 2015 Page 98 of 139

Azimuth Plots

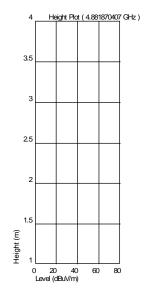


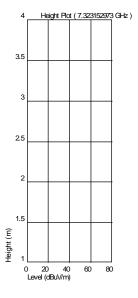


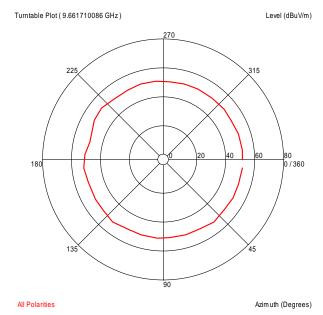


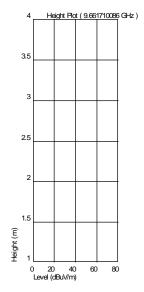
All Polarities Azimuth (Degrees)

Turntable Plots



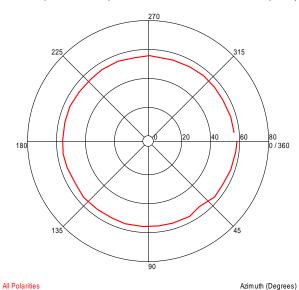


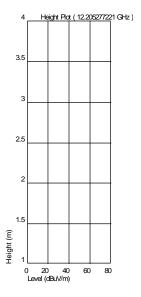




Turntable Plot (12.205277221 GHz)

Level (dBuV/m)





Test Information

Test Details

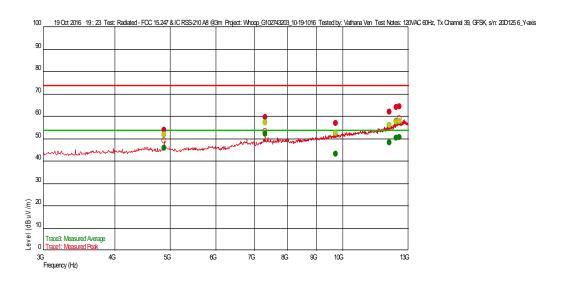
Test:

Project: Test Notes:

User Entry
Radiated - FCC 15.247 & IC RSS-210 A8 @3m
Whop_G102743203_10-19-1016
120VAC 60Hz, Tx Channel 39, GFSK, s/n: 20D125 6_Y-axis

22 deg C 42%, 1006 mB Vathana Ven 19 Oct 2016 19 : 23 Temperature: Humidity: Tested by: Test Started:

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

Trace I. Measar	ca i caix									
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

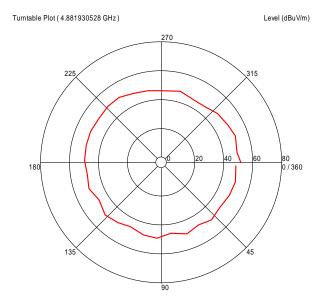
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
9.731249165 G	43.88	36.802	-21.884	54.000 ´	-10.84 ´		83	1.16	1 M	
4.881930528 G	46.64	34.238	-25.483	54.000	-8.08		352	1.16	1 M	
12.06985972 G	48.87	38.843	-18.757	54.000	-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.

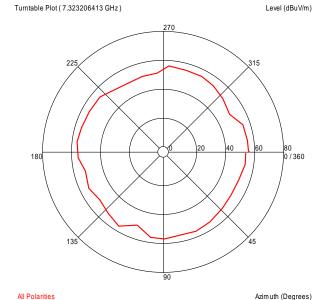
Non-Specific Radio Report Shell Rev. August 2015 Company: Whoop Model: WHOOP Strap 2.0

Additional Information

Azimuth Plots

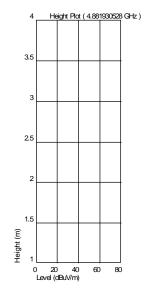


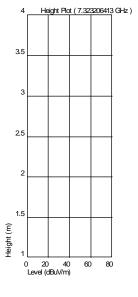
All Polarities Azimuth (Degrees)

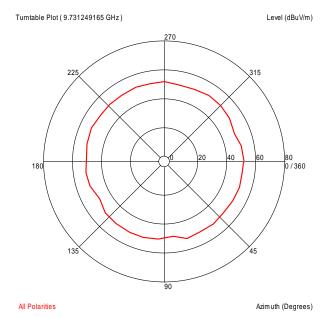


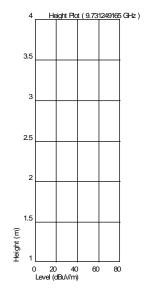
Azimuth (Degrees)

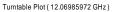
Turntable Plots



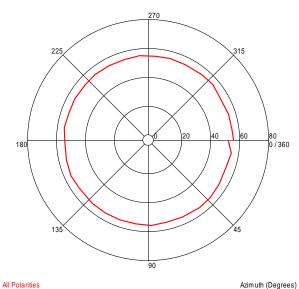


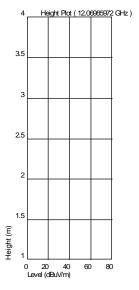


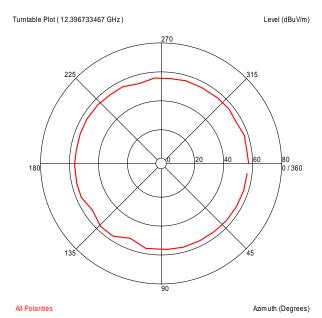


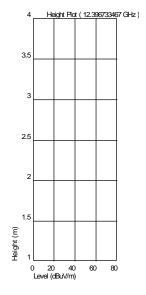






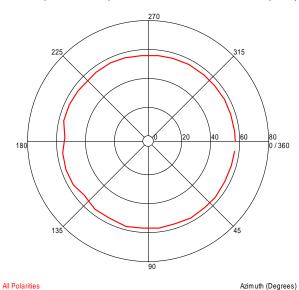


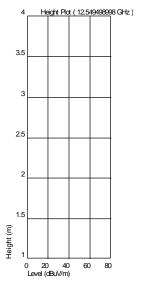












Test Information

Test Details

Test:

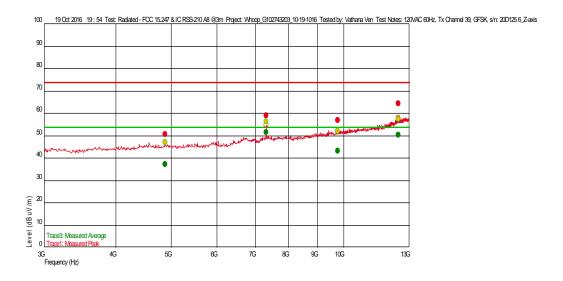
Project: Test Notes:

User Entry
Radiated - FCC 15.247 & IC RSS-210 A8 @3m
Whoop_G102743203_10-19-1016
120VAC 60Hz, Tx Channel 39, GFSK, s/n: 20D125 6_Z-axis

22 deg C 42%, 1006 mB Vathana Ven 19 Oct 2016 19 : 54 Temperature: Humidity: Tested by: Test Started:

Additional Information

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

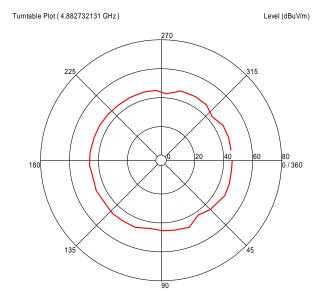
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.882732131 G	51.41	34.239	-25.482	74.000	-22.59		45	1.16	1 M	
9.757120909 G	57.63	36.827	-21.851	74.000	-16.37		207	1.16	1 M	
7.322932532 G	59.58	35.622	-23.659	74.000	-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: Measu	red Averag	е								

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	<u></u>	35	1.16	1 M	

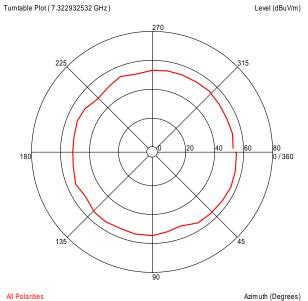
Insertion loss of the high pass filter of 0.72 dBwas added to the reading.

Azimuth Plots

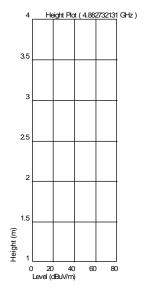


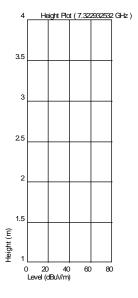
All Polarities Azimuth (Degrees)

Turntable Plot (7.322932532 GHz)

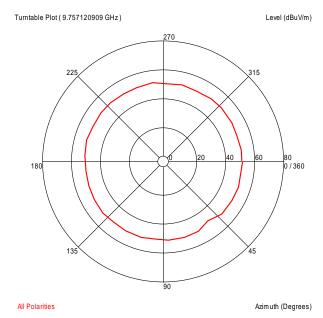


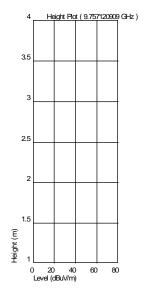
Turntable Plots



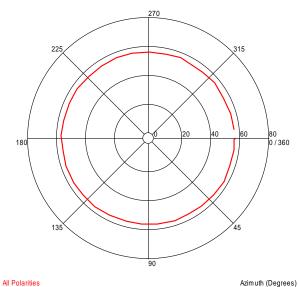


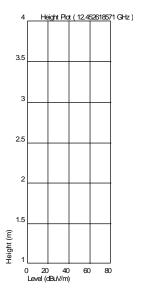
Level (dBuV/m)











Test Information

Test Details

Test:

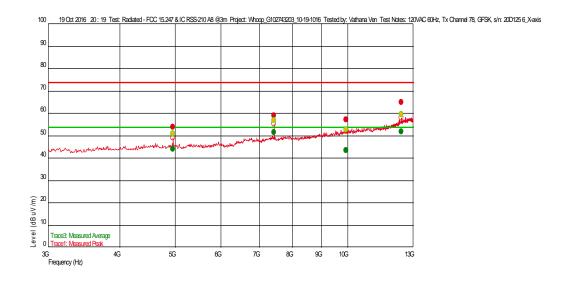
Project: Test Notes:

User Entry
Radiated - FCC 15.247 & IC RSS-210 A8 @3m
Whop_G102743203_10-19-1016
120VAC 60Hz, Tx Channel 78, GFSK, s/n: 20D125 6_X-axis

22 deg C 42%, 1006 mB Vathana Ven 19 Oct 2016 20 : 19 Temperature: Humidity: Tested by: Test Started:

Additional Information

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

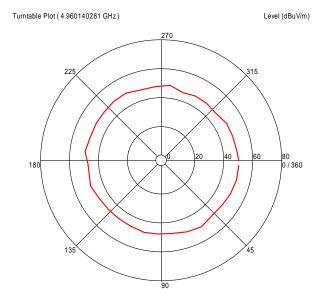
Trace1: Measured Peak

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	İ	8	1.16	1 M	
Trace3: Meas	ured Averag			Limit	Margin					
(Hz)	(dBu\//m)	AF	PA+CL	(dBuV/m)	(dBu\//m)	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz
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	I	194	1.16	1 M
12.399539078 G	52.82	39.121	-17.881	54.000	-1.18	į	8	1.16	1 M

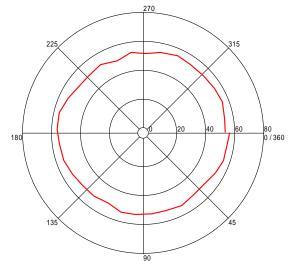
Insertion loss of the high pass filter of 0.89 dBwas added to the reading.

Azimuth Plots



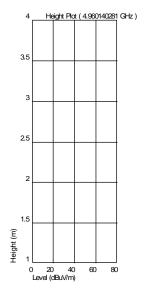
All Polarities Azimuth (Degrees)

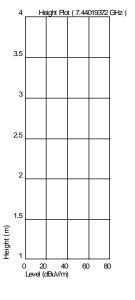
Turntable Plot (7.44019372 GHz) Level (dBuV/m)

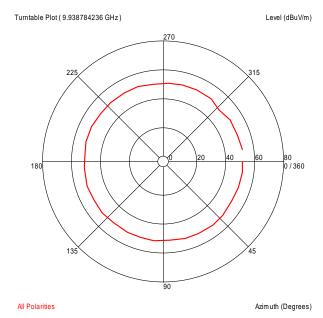


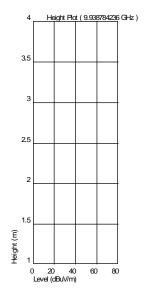
All Polarities Azimuth (Degrees)

Turntable Plots



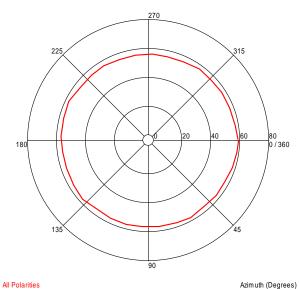


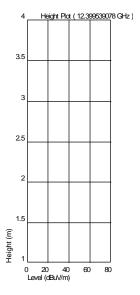












Test Information

Test Details

Test:

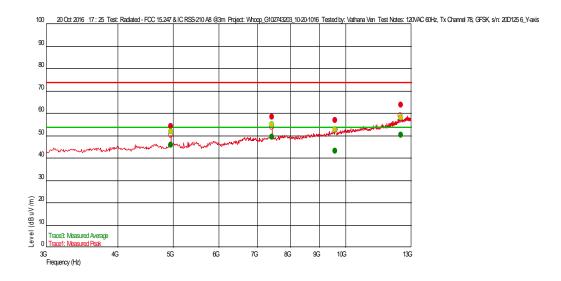
Project: Test Notes:

User Entry
Radiated - FCC 15.247 & IC RSS-210 A8 @3m
Whop_G102743203_10-20-1016
120VAC 60Hz, Tx Channel 78, GFSK, s/n: 20D125 6_Y-axis

22 deg C 42%, 1010 mB Vathana Ven 20 Oct 2016 17 : 25 Temperature: Humidity: Tested by: Test Started:

Additional Information

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

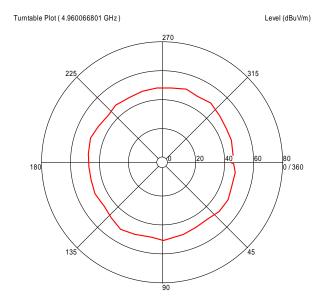
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.960066801	54.98	34.213	-25.335	74.000	-19.02		133	1.16	1 M	
9.588376754	57.76	36.681	-22.104	74.000	-16.24		360	1.16	1 M	
7.439953239	59.22	35.628	-23.594	74.000	-14.78		233	1.16	1 M	
12.468162993	G 64.72	39.100	-17.696	74.000	-9.28		199	1.16	1 M	
Trace3: Me	asured Averag	je								

rraces:	measured Average	
_	L accord	

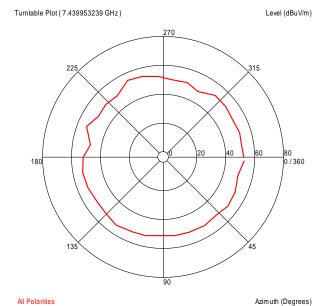
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
9.588376754 G	44.05	36.681	-22.104	54.000	-9.95		360	1.16	1 M	
4.960066801 G	46.74	34.213	-25.335	54.000	-7.26		133	1.16	1 M	
7.439953239 G	50.22	35.628	-23.594	54.000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

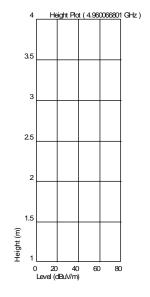
Azimuth Plots

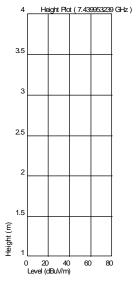


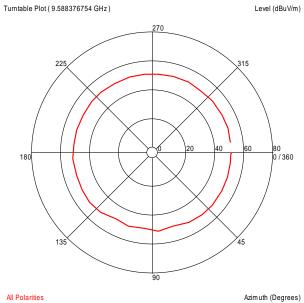
All Polarities Azimuth (Degrees)

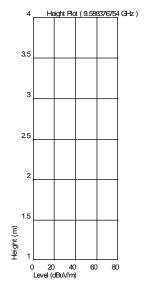


Turntable Plots

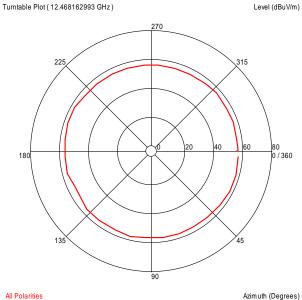


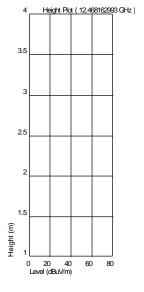






Level (dBuV/m)





Test Information

Test Details

Test:

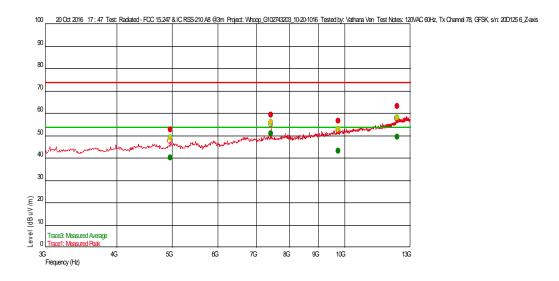
Project: Test Notes:

User Entry
Radiated - FCC 15.247 & IC RSS-210 A8 @3m
Whoop_G102743203_10-20-1016
120VAC 60Hz, Tx Channel 78, GFSK, s/n: 20D125 6_Z-axis

22 deg C 42%, 1010 mB Vathana Ven 20 Oct 2016 17 : 47 Temperature: Humidity: Tested by: Test Started:

Additional Information

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

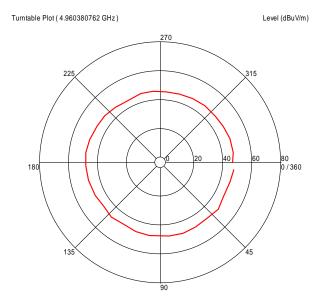
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.960380762 G	53.63	34.213	-25.335	74.000	-20.37		177	1.16	1 M	
9.748056112 G	57.48	36.818	-21.858	74.000	-16.52		281	1.16	1 M	
7.4402004 G	60.03	35.628	-23.593	74.000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

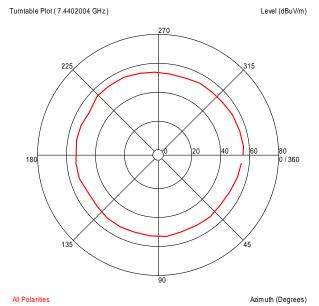
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
4.960380762 G	40.98	34.213	-25.335	54.000	-13.02	I	177	1.16	1 M	
9.748056112 G	43.91	36.818	-21.858	54.000	-10.09	<u></u>	281	1.16	1 M	
12.333500334 G	50.34	39.098	-18.060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

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

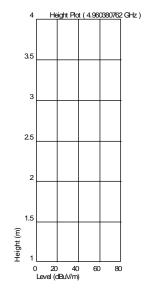
Azimuth Plots

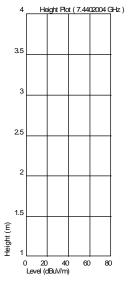


All Polarities Azimuth (Degrees)

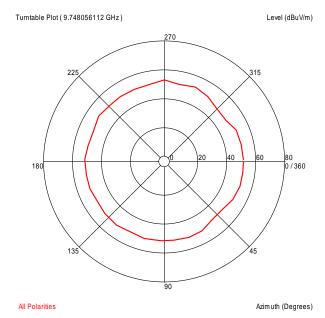


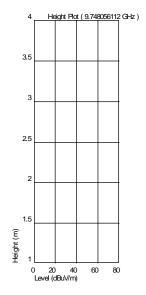
Turntable Plots

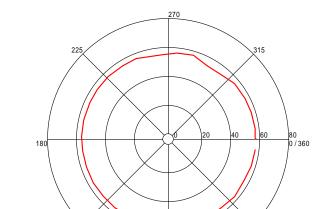




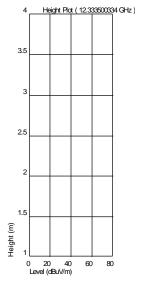
Level (dBuV/m)







Turntable Plot (12.333500334 GHz)



All Polarities Azimuth (Degrees)

Intertek

Report Number: 102743203BOX-001 Issued: 11/10/2016

Test Personnel:	Vathana Ven	Test Date:	10/11/2016, 10/20/2016
Supervising/Reviewing Engineer:			
(Where Applicable)	N/A		
	FCC Part 15C, 15.247,		
Product Standard:	RSS-247	Limit Applied:	Below specified limit
Input Voltage:	120VAC/60Hz		
Pretest Verification w/		Ambient Temperature:	21, 20 °C
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.

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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 $U_{\it lab}$ is less than the corresponding $U_{\it CISPR}$ 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.

Page 118 of 139

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 $FS = Field Strength in dB\mu V/m$

RA = Receiver Amplitude (including preamplifier) in $dB\mu V$

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 dB μ V 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 dB_µV/m. This value in $dB\mu V/m$ was converted to its corresponding level in $\mu V/m$.

 $RA = 52.0 dB\mu V$ AF = 7.4 dB/mCF = 1.6 dBAG = 29.0 dBFS = 32 dBuV/m

To convert from $dB\mu V$ to μV or mV the following was used:

UF =
$$10^{(NF/20)}$$
 where UF = Net Reading in μ V
NF = Net Reading in dB μ V

Example:

FS = RA + AF + CF - AG =
$$52.0 + 7.4 + 1.6 - 29.0 = 32.0$$

UF = $10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \text{ }\mu\text{V/m}$

Non-Specific Radio Report Shell Rev. August 2015 Page 119 of 139

Intertek

Report Number: 102743203BOX-001 Issued: 11/10/2016

13.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
				PE80529A61		
DAV004'	Weather Station	Davis Instruments	7400	Α	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

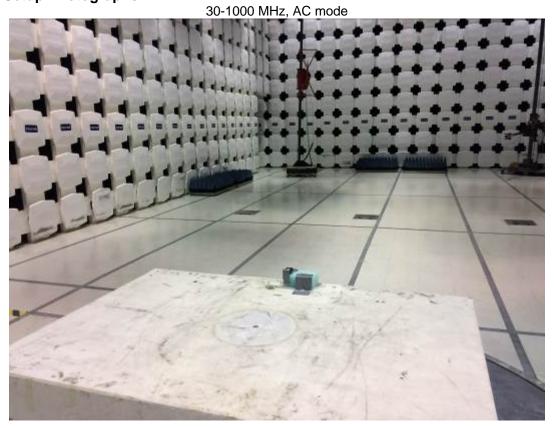
Software Utilized:

Name	Manufacturer	Version
Compliance 5	Teseq	5.26.46.46

13.3 Results:

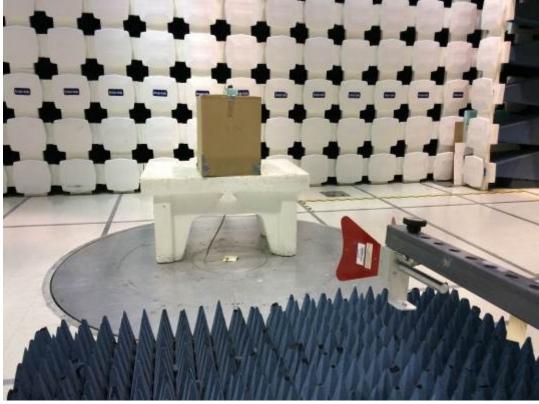
The sample tested was found to Comply.

13.4 Setup Photographs:









13.5 Test Data:

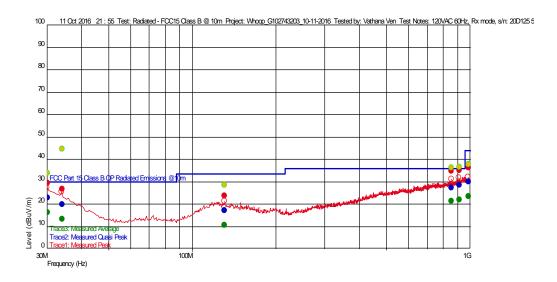
Test Information

User Entry Radiated - FCC15 Class B @ 10m Whoop_G102743203_10-11-2016 120VAC 60Hz, Rx mode, s/n: 20D125 6 Test Details Test: Project: Test Notes:

21 deg C 34%, 1018 mB Vathana Ven 11 Oct 2016 21 : 55 Temperature: Humidity: Tested by: Test Started:

Additional Information

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	
T 1 M	

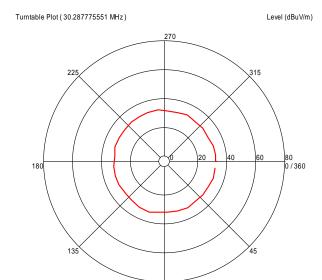
Trace1: Measure	ed Peak									
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
130.766332337 M	23.68	20.000	-26.468	33.520	-9.84		197	2.41	120 k	
985.220240741 M	36.15	29.600	-22.746	43.980	-7.83	İ	360	3.98	120 k	
34.177956361 M	26.84	24.340	-27.693	30.000	-3.16	ĺ	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: Measure	ed Quasi Pe	eak								
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 ´	1	197	2.41	120 k	

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	j	360	3.98	120 k	
34.177956361 M	19.77	24.340	-27.693	30.000	-10.23	j	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: Measure Frequency (Hz)	ed Average 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										
130.700332337 IVI	10.64	20.000	-26.468				197	2.41	120 k	
34.177956361 M	10.64 13.34	20.000 24.340	-26.468 -27.693				197 282	2.41 3.99	120 k 120 k	
34.177956361 M	13.34	24.340	-27.693			 - 	282	3.99	120 k	
34.177956361 M 30.287775551 M	13.34 16.19	24.340 27.270	-27.693 -27.768	 			282 97	3.99 3.11	120 k 120 k	
34.177956361 M 30.287775551 M 856.199599589 M	13.34 16.19 21.25	24.340 27.270 28.148	-27.693 -27.768 -23.370	 	 		282 97 96	3.99 3.11 3.98	120 k 120 k 120 k	

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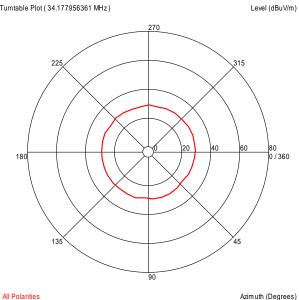
Company: Whoop Model: WHOOP Strap 2.0

Azimuth Plots

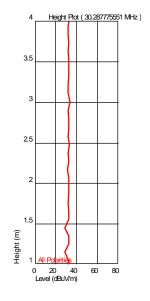


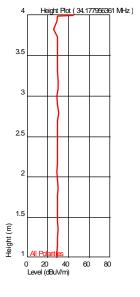
All Polarities Azimuth (Degrees)

Turntable Plot (34.177956361 MHz)

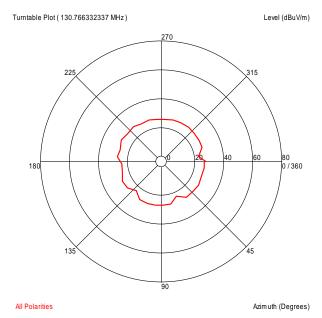


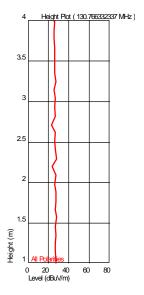
Turntable Plots





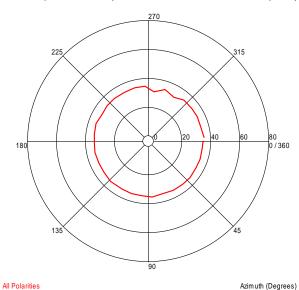
Azimuth (Degrees)

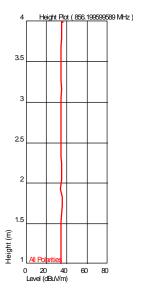


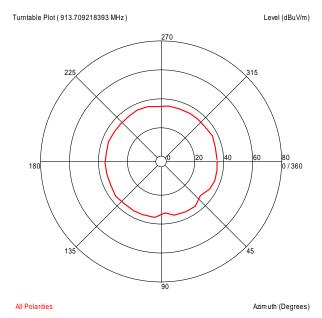


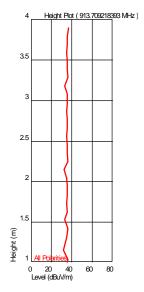
Turntable Plot (856.199599589 MHz)

Level (dBuV/m)



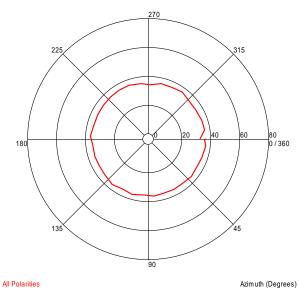


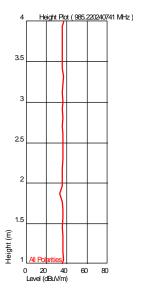




Turntable Plot (985.220240741 MHz)

Level (dBuV/m)





Test Information

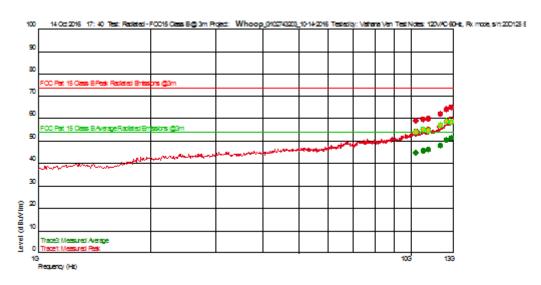
Test Details

User Entry
Radiated - FCC15 Class B @ 3m
Whoop_G102743203_10-14-2016
120VAC 60Hz, Rx mode, s/n:20D125 6 Test: Project: Test Notes:

22 deg C 42%, 1015 mB Vathana Ven 14 Oct 2016 17 : 40 Temperature: Humidity: Tested by: Test Started:

Additional Information

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	İ	71	1.22	1 M	
11.988076152 G	61.90	38.784	-18.964	74.000	-12.10	1	70	2.78	1 M	
12.43998664 G	64.07	39.109	-17.772	74.000	-9.93	İ	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

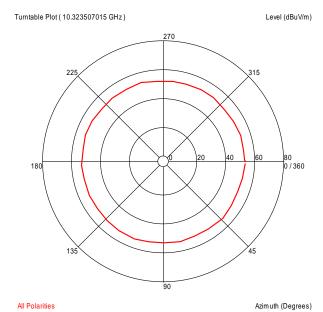
		-								
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
10.323507015 G	44.75	37.428	-21.264	54.000	-9.25		101	1.10	1 M	
10.798563794 G	45.65	37.715	-20.128	54.000	-8.35		343	2.08	1 M	
11.163620574 G	46.26	37.858	-19.473	54.000	-7.74	İ	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	

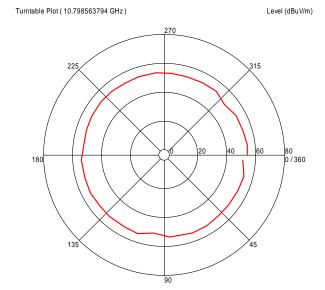
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Company: Whoop Model: WHOOP Strap 2.0

Azimuth Plots

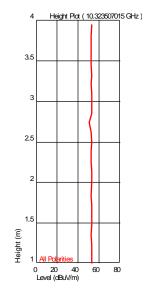
All Polarities

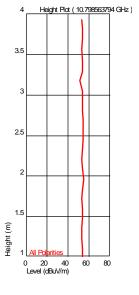


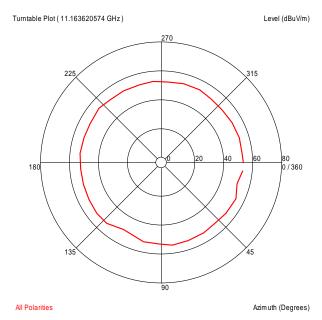


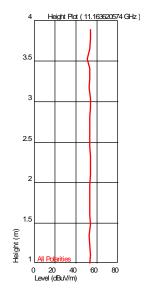
Azimuth (Degrees)

Turntable Plots



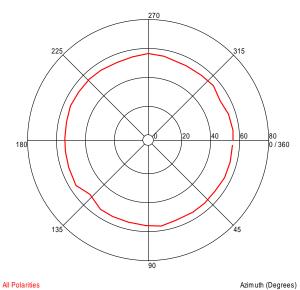


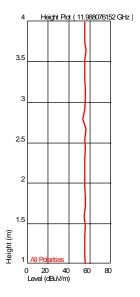


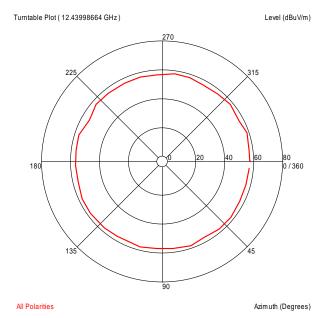


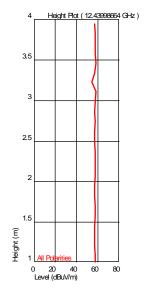






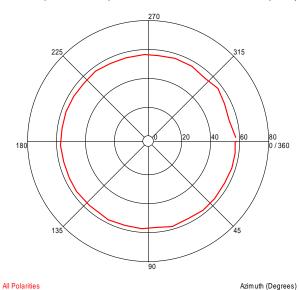


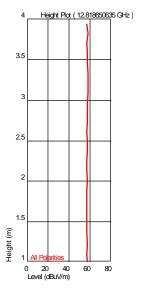












Intertek

Report Number: 102743203BOX-001 Issued: 11/10/2016

Test Personnel: Vathana Ven Test Date: 10/11/2016, 10/14/2016 Supervising/Reviewing Engineer: (Where Applicable) N/A FCC Part 15C, 15.247, RSS-247 Product Standard: Limit Applied: Below specified limit Input Voltage: 120VAC/60Hz Ambient Temperature: 21, 22 °C 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

<u>The EMC Lab</u> 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 $U_{\it lab}$ is less than the corresponding $U_{\it CISPR}$ 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.

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Sample Calculations

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

NF = RF + LF + CF + AFWhere NF = Net Reading in $dB\mu V$ RF = Reading from receiver in $dB\mu V$ LF = LISN or ISN Correction Factor in dB CF = Cable Correction Factor in dB AF = Attenuator Loss Factor in dB

To convert from $dB\mu V$ to μV or mV the following was used:

UF =
$$10^{(NF/20)}$$
 where UF = Net Reading in μV
NF = Net Reading in $dB\mu V$

Example:

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

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.

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Intertek

Report Number: 102743203BOX-001 Issued: 11/10/2016

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
			ESCI			
			1166.5950K0			
ROS002'	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	3	100067	07/29/2016	07/29/2017
CBLBNC				CBLBNC2012		
2012-1'	50 Ohm Coaxial Cable	Pomona	RG-58 C/U	-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.

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14.4 Setup Photographs:



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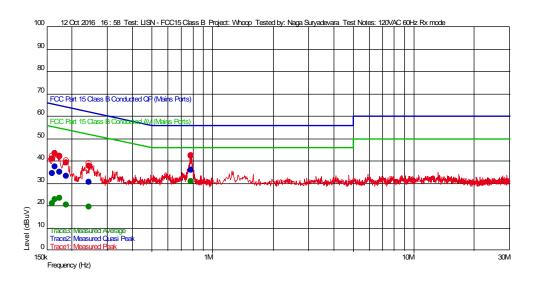
14.5 Plots/Data:

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

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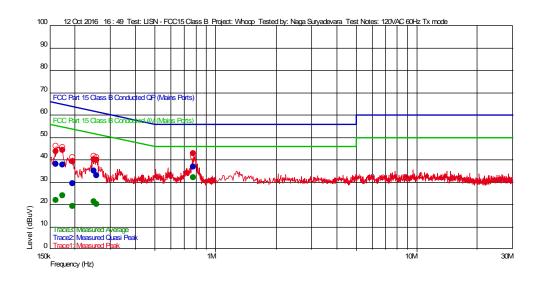
Company: Whoop Model: WHOOP Strap 2.0

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

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Intertek

Report Number: 102743203BOX-001 Issued: 11/10/2016

Test Personnel: Naga Suryadevara N 5 Test Date: 10/12/2016 Supervising/Reviewing Engineer: (Where Applicable) N/A FCC Part15 Subpart B Product Standard: ICES 003 Limit Applied: Class A Input Voltage: 120VAC 60Hz Pretest Verification w/ Ambient Temperature: 22 °C Ambient Signals or BB Source: BB Source Relative Humidity: 33 % Atmospheric Pressure: 1014 mbars

Deviations, Additions, or Exclusions: None

Intertek

Report Number: 102743203BOX-001 Issued: 11/10/2016

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 V5V	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

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