



EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 102218261BOX-001b

Project Number: G102218261

Report Issue Date: 09/16/2015

Model(s) Tested: M372

Model(s) Partially Tested: None

Model(s) Not Tested but declared equivalent by the client: TW2P81700 & TWG012600

Standards: FCC 47CFR Part 15 Subpart C 15.247 (8/2015),
FCC 47CFR Part 15 Subpart B (8/2015)

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

Client:
Timex Group USA, Inc.
555 Christian Road
Middlebury, CT 06762
USA

Report prepared by

Kouma Sinn / Staff Engineer, EMC

Report reviewed by

Michael F. Murphy / Sr. Staff Engineer, EMC

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1 Introduction and Conclusion

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

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

2 Test Summary

Section	Test full name	Result
3	Client Information	--
4	Description of Equipment Under Test	--
5	System Setup and Method	--
6	Maximum Peak Output Power, Human RF Exposure, & Duty Cycle CFR47 FCC Part 15:2015 Subpart C, Section 15.247 (b)(3)	Pass
7	Transmitter Radiated Spurious Emissions CFR47 FCC Part 15:2015 Subpart C Section 15.247 (d) CFR47 FCC Part 15:2015 Subpart C Section 15.209	Pass
8	6 dB Bandwidth & 99% Power Bandwidth CFR47 FCC Part 15:2015 Subpart C Section 15.247 (a)(2)	Pass
9	Power Spectral Density CFR47 FCC Part 15:2015 Subpart C Section 15.247 (e)	Pass
10	Band-edge Compliance CFR47 FCC Part 15:2015 Subpart C Section 15.247 (d)	Pass
11	Digital Devices Radiated Spurious Emissions CFR47 FCC Part 15:2015 Subpart B Section 15.109	Pass
--	Receiver Radiated Spurious Emissions CFR47 FCC Part 15:2015 Subpart B Section 15.109	Exempt, above 960 MHz
--	AC Mains Conducted Emissions CFR47 FCC Part 15:2013 Subpart B Section 15.207	N/A
12	Revision History	--

3 Client Information

This EUT was tested at the request of:

Client: Timex Group USA, Inc.
555 Christian Road
Middlebury, CT 06762
USA

Contact: Sam Everett
Telephone: 203-346-5603
Fax: 203-573-5139
Email: severett@timexgroup.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: Timex Group USA, Inc.
555 Christian Road
Middlebury, CT 06762
USA

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Watch	Timex Group USA, Inc.	M372	QC 009-10 (CCC)

Receive Date:	07/01/2015 & 08/03/2015
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)
<p>The equipment under test is a watch.</p> <p>FEATURES</p> <ul style="list-style-type: none"> • Bluetooth connection with your phone to track all day activity (steps, distance and calories) • Dial display shows - Step Count / Distance and % to Goal for each • App on phone to view detailed/historic data <ul style="list-style-type: none"> • Sleep feature to be added Spring 2016 <p>BENEFITS</p> <ul style="list-style-type: none"> • Aesthetic analog design • Quick-release straps to easily change for versatility – STRAP OPTIONS AVL. • Extra straps available on timex.com • 50 meters water resistant • 42mm Case • INDIGLO® Night-Light <p>BATTERY POWER CR2025 (life approx. 18 months/ Sleep Mode 16 months)</p> <p>COMPATABILITY iOS compatibility (8.12 or higher) iPhone (4S and above) iPod touch (5th generation or higher) Android compatibility (4.4.2 or higher) Requires a Bluetooth Low Energy smartphone</p>

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
3 V Lithium Coin Battery	N/A	N/A	N/A

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Transmit Mode: Low, Mid, and High Channels
2	Idle/Receive Mode

Software used by the EUT:

No.	Descriptions of EUT Exercising
1	None

Radio/Receiver Characteristics	
Frequency Band(s)	2400-2483.5 MHz
Modulation Type(s)	GFSK
Maximum Output Power	0.05mW
Test Channels	40 (BLE)
Occupied Bandwidth	1.165 MHz
Frequency Hopper: Number of Hopping Channels	N/A
Frequency Hopper: Channel Dwell Time	N/A
Frequency Hopper: Max interval between two instances of use of the same channel	N/A
MIMO Information (# of Transmit and Receive antenna ports)	N/A
Equipment Type	Standalone
ETSI LBT/Adaptivity	Non-Adaptive
ETSI Adaptivity Type	Non-LBT
ETSI Temperature Category (I, II, III)	I
ETSI Receiver Category (1, 2, 3)	3
Antenna Type and Gain	Integrated, 0 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.

- TW2P81700, Silver Tone Finish, Black Dial / Red Accents, Black Perforated Leather Strap.
- TWG012600, Black Finish, Black Dial / Orange Accents, Black Silicone Strap.

5 System Setup and Method

Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
	None				

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
None			

5.1 Method:

Configuration as required by FCC 47CFR Part 15.247:2015, ANSI C63.4-2014, ANSI C63.10-2013, and KDB558074 v03r03 DTS 06-09-2015.

5.2 EUT Block Diagram:



6 Maximum Peak Output Power, Human RF Exposure, & Duty Cycle

6.1 Method

Tests are performed in accordance with CFR47 FCC Part 15:2015 Subpart C, Section 15.247 (b)(3).

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)	Ucisp
Radiated Emissions, 10m	30-1000 MHz	4.6	6.3
Radiated Emissions, 3m	30-1000 MHz	5.3	6.3
Radiated Emissions, 3m	1-6 GHz	4.5	5.2
Radiated Emissions, 3m	6-15 GHz	5.2	5.5
Radiated Emissions, 3m	15-18 GHz	5.0	5.5
Radiated Emissions, 3m	18-40 GHz	5.0	5.5

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 μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ 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 μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

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

To convert from dB μ V to μ V or mV the following was used:

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

$$NF = \text{Net Reading in dB}\mu\text{V}$$

Example:

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

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

Alternately, when C5 Software is used, the "Level" includes all losses and gains and is compared directly in the "Margin" column to the "Limit". "AF" is the Antenna Factor; "PA+CL" are Preamp and Cable Loss. These are already accounted for in the "Level" column.

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	01/14/2015	01/14/2016
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2014	10/04/2015

Software Utilized:

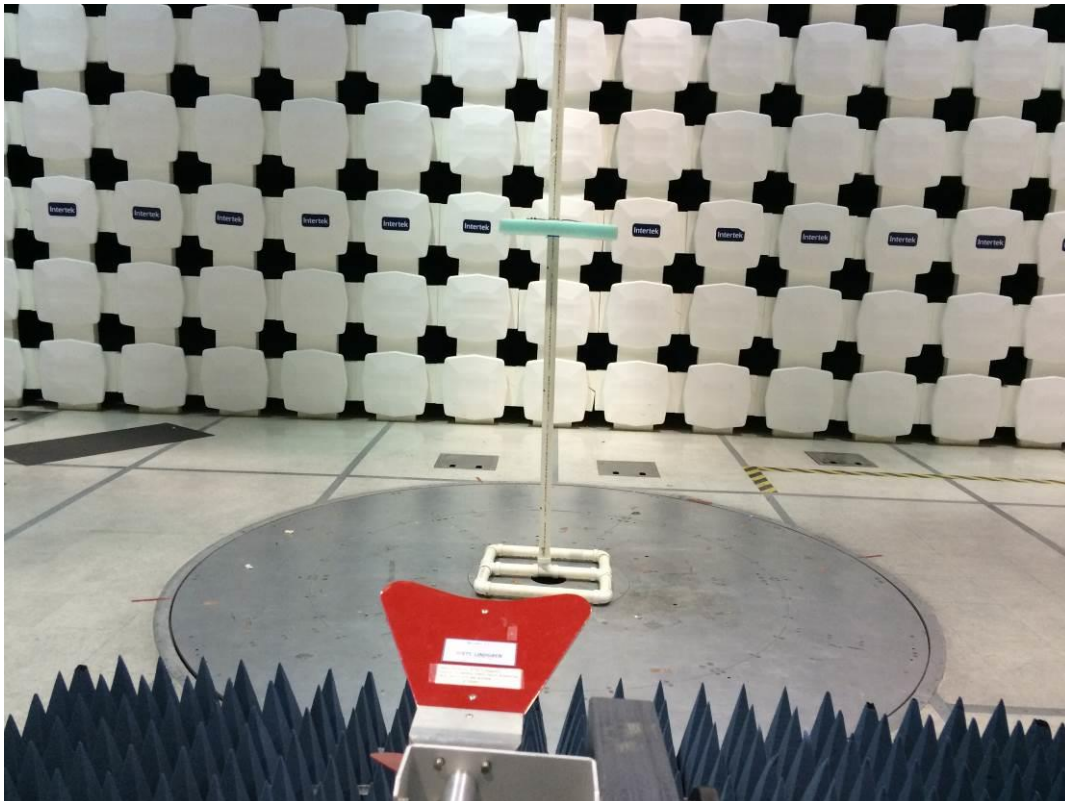
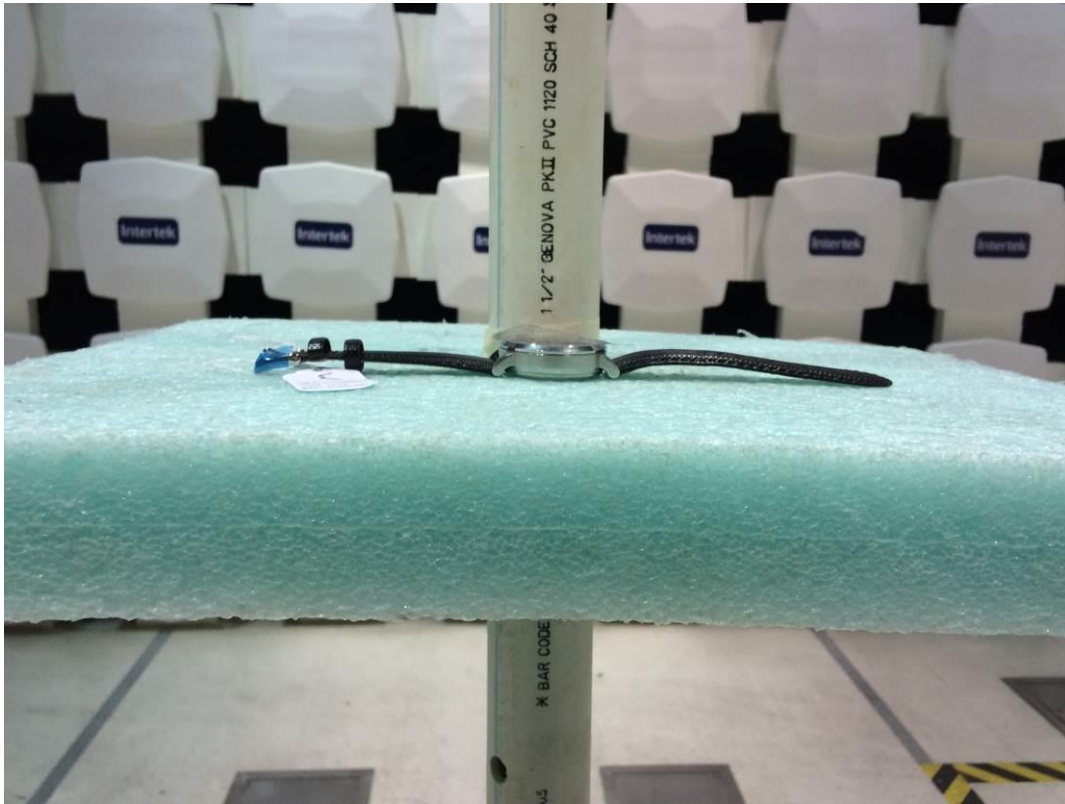
Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

6.3 Results:

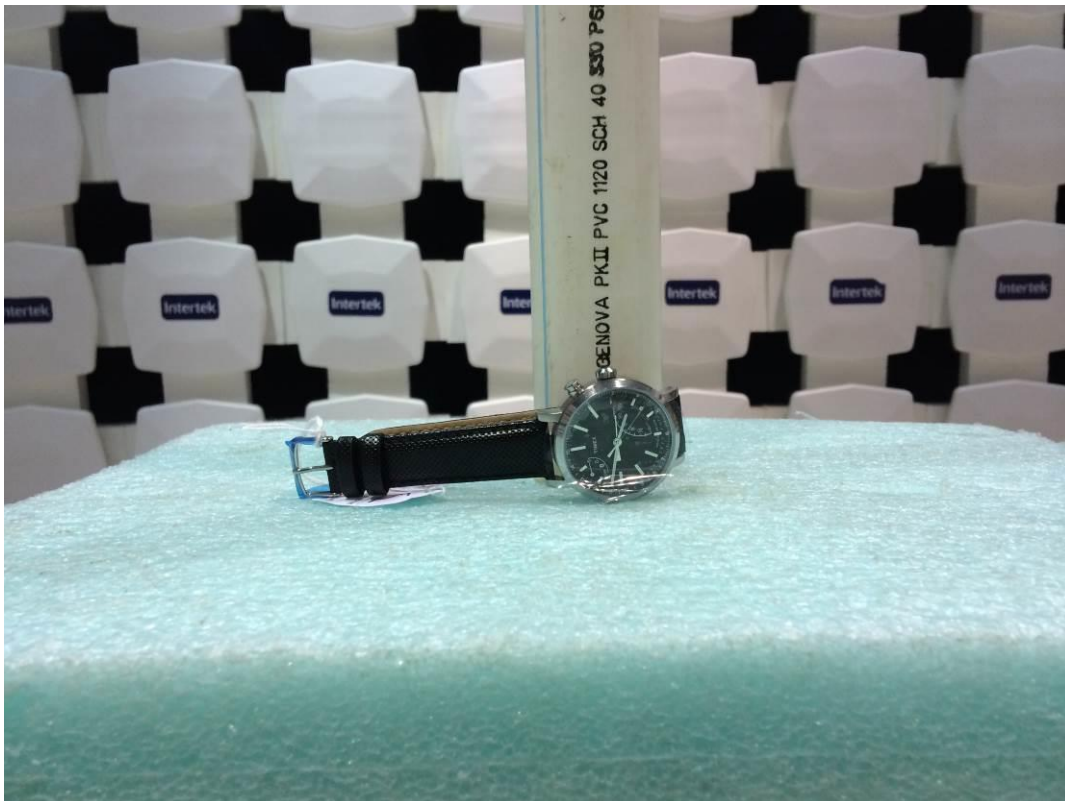
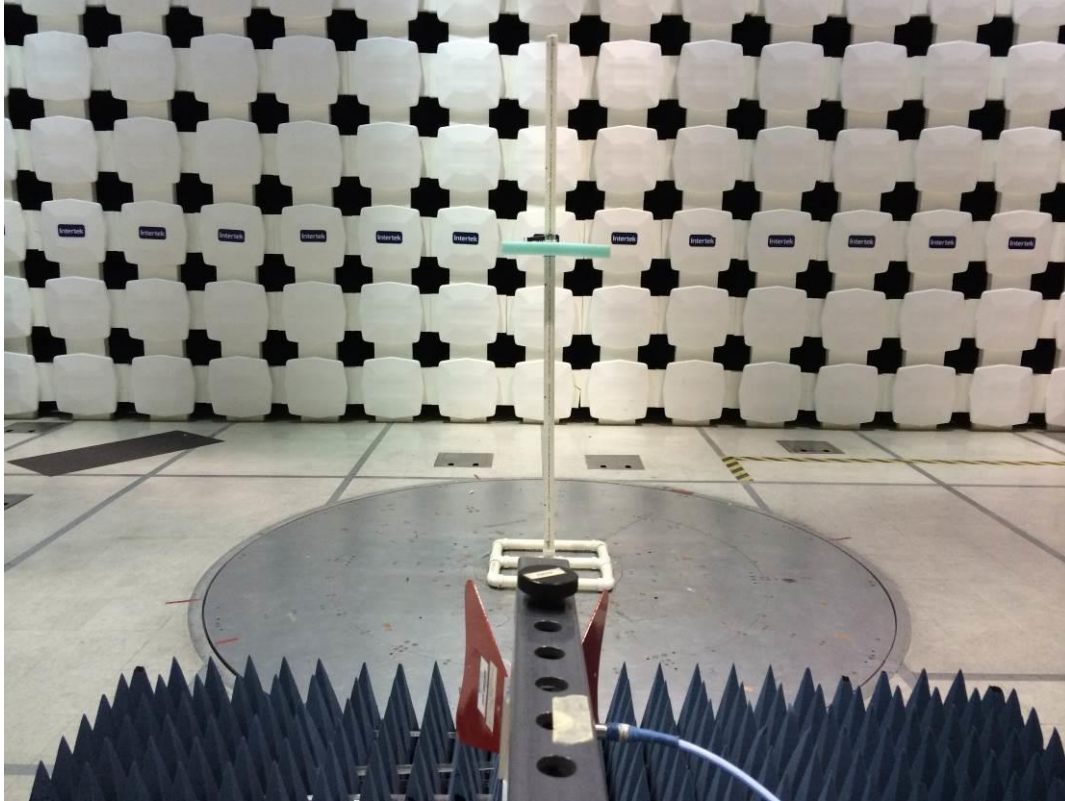
The sample tested was found to comply. The EIRP must not exceed 20.97 dBm. The Human RF Exposure limit is 1 mW/cm².

6.4 Setup Photographs:

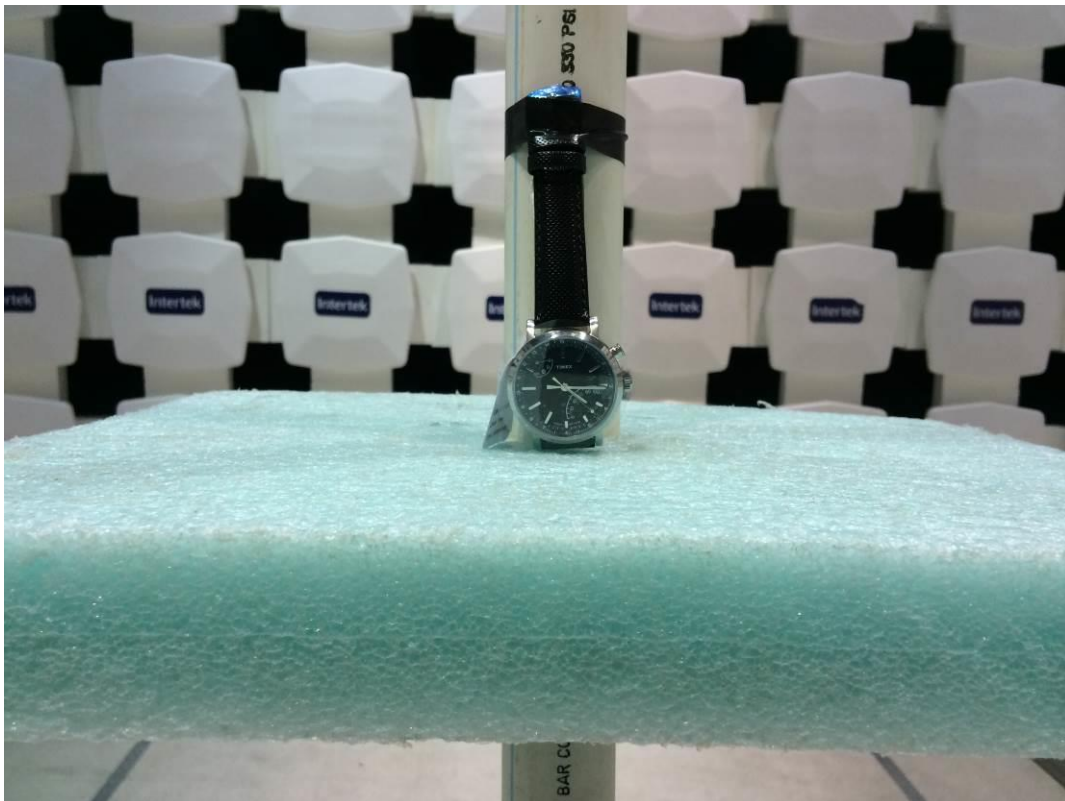
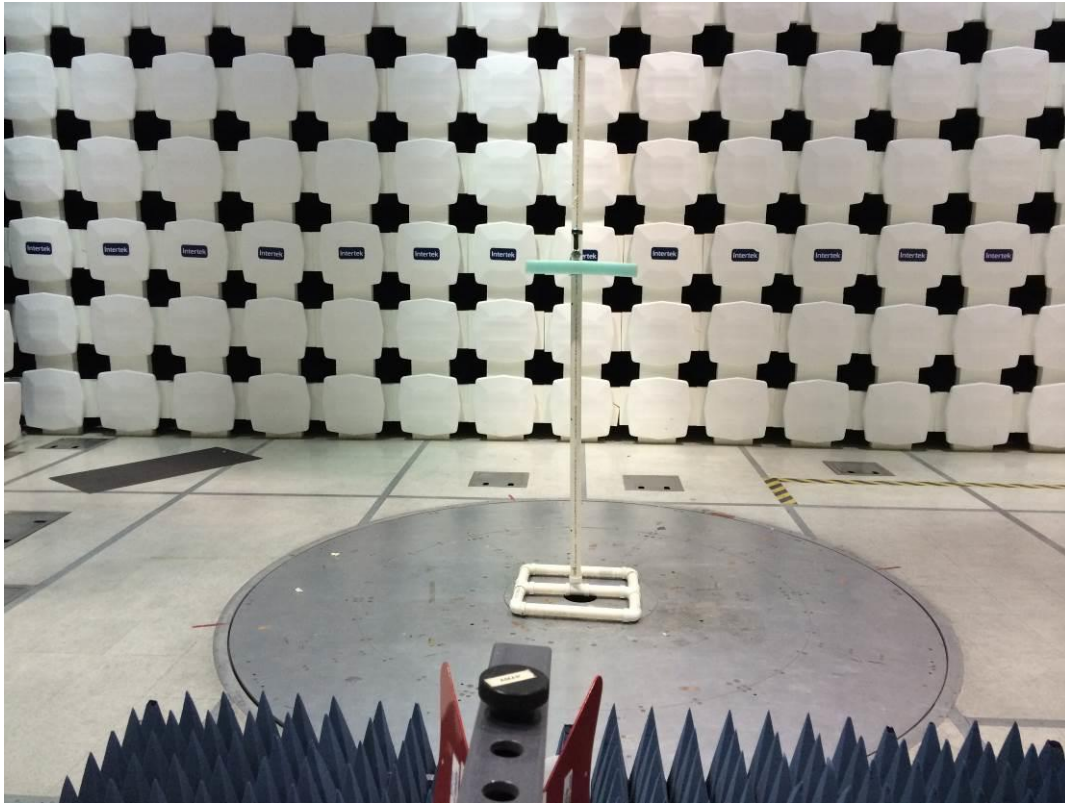
X-axis



Y-axis



Z-axis



Mid Channel Output Power (Radiated Emissions)

Company: Timex Group USA , Inc.

Antenna & Cables: N Bands: N, LF, HF, SHF

Model #: M372

Antenna: ETS001 01-14-16.txt ETS001 01-14-16.txt

Serial #: QC 009-10

Cable(s): 145-416 3m Track B 1-15GHz Cable 10-04-15.txt

Engineers: Kouma Sinn

Location: 10m Chamber Barometer: DAV004

Filter: NONE

Project #: G102218261

Date(s): 08/07/15

Standard: FCC Part 15 Subpart C 15.247

Temp/Humidity/Pressure: 22 deg C 42% 1004 mB

Receiver: R&S ESI (145-128) 03-14-2016

Limit Distance (m): 3

PreAmp: NONE.

Test Distance (m): 3

PreAmp Used? (Y or N): N

Voltage/Frequency: 3V Battery

Frequency Range: Fundamental

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

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

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dBm (EIRP)	Limit dBm	Margin dB	Bandwidth
X-Axis (Watch was flat on table, Mid Channel = 2440 MHz), Output power, no pre-amp											
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2440.000	29.70	32.11	5.92	0.00	0.00	-27.49	--	--	100/300 kHz
PK	H	2440.000	29.00	32.11	5.92	0.00	0.00	-28.19	--	--	100/300 kHz
PK	V	2440.000	32.92	32.11	5.92	0.00	0.00	-24.27	20.97	-45.24	1/3 MHz
PK	H	2440.000	33.17	32.11	5.92	0.00	0.00	-24.02	20.97	-44.99	1/3 MHz
PK	V	2440.000	39.79	32.11	5.92	0.00	0.00	-17.40	20.97	-38.37	5/10 MHz
PK	H	2440.000	37.88	32.11	5.92	0.00	0.00	-19.31	20.97	-40.28	5/10 MHz
Y-Axis (Watch was crown up, Mid Channel = 2440 MHz), Output power, no pre-amp											
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2440.000	28.57	32.11	5.92	0.00	0.00	-28.62	--	--	100/300 kHz
PK	H	2440.000	31.32	32.11	5.92	0.00	0.00	-25.87	--	--	100/300 kHz
PK	V	2440.000	32.53	32.11	5.92	0.00	0.00	-24.66	20.97	-45.63	1/3 MHz
PK	H	2440.000	34.87	32.11	5.92	0.00	0.00	-22.32	20.97	-43.29	1/3 MHz
PK	V	2440.000	39.52	32.11	5.92	0.00	0.00	-17.67	20.97	-38.64	5/10 MHz
PK	H	2440.000	39.66	32.11	5.92	0.00	0.00	-17.53	20.97	-38.50	5/10 MHz
Z-Axis (Watch was crown to right, Mid Channel = 2440MHz), Output power, no pre-amp											
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2440.000	31.92	32.11	5.92	0.00	0.00	-25.27	20.97	-46.24	100/300 kHz
PK	H	2440.000	31.63	32.11	5.92	0.00	0.00	-25.56	20.97	-46.53	100/300 kHz
PK	V	2440.000	34.81	32.11	5.92	0.00	0.00	-22.38	20.97	-43.35	1/3 MHz
PK	H	2440.000	35.11	32.11	5.92	0.00	0.00	-22.08	20.97	-43.05	1/3 MHz
PK	V	2440.000	39.79	32.11	5.92	0.00	0.00	-17.40	20.97	-38.37	5/10 MHz
PK	H	2440.000	41.09	32.11	5.92	0.00	0.00	-16.10	20.97	-37.07	5/10 MHz

Test Personnel:	<u>Vathana F. Ven <i>VFV</i></u>	Test Date:	<u>06/18/2015</u>
	<u>Kouma Sinn <i>KPS</i></u>		<u>08/07/2015</u>
Supervising/Reviewing Engineer:	<u>N/A</u>	Limit Applied:	<u>See Report Section 6.3</u>
(Where Applicable)		Ambient Temperature:	<u>22, 22 °C</u>
Product Standard:	<u>FCC 47CFR Part 15.247</u>	Relative Humidity:	<u>42, 43 %</u>
Input Voltage:	<u>Battery powered</u>	Atmospheric Pressure:	<u>1004, 1003 mbars</u>
Pretest Verification w/ Ambient Signals or BB Source:	<u>BB Source</u>		

Deviations, Additions, or Exclusions: None

Human RF Exposure, & Duty Cycle

§1.1310 The criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices shall be evaluated according to the provisions of §2.1093 of this chapter.

Part §1.1310 Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

(1) Occupational/controlled exposure limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when a person is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure. The phrase *fully aware* in the context of applying these exposure limits means that an exposed person has received written and/or verbal information fully explaining the potential for RF exposure resulting from his or her employment. With the exception of *transient* persons, this phrase also means that an exposed person has received appropriate training regarding work practices relating to controlling or mitigating his or her exposure. Such training is not required for *transient* persons, but they must receive written and/or verbal information and notification (for example, using signs) concerning their exposure potential and appropriate means available to mitigate their exposure. The phrase *exercise control* means that an exposed person is allowed to and knows how to reduce or avoid exposure by administrative or engineering controls and work practices, such as use of personal protective equipment or time averaging of exposure.

(2) General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

1.1 Test Procedure

The EUT was measured in a radiated fashion. The RF output power was measured using a resolution bandwidth which encompassed the entire emission bandwidth. The data obtained was adjusted for equipment losses and converted from a field strength reading to a power reading using the provisions of FCC KDB 558074.

1.2 Results:

The human RF exposure limit is 1 mW/cm^2 . The power density S generated by some value of EIRP at a given distance d is related by the equation:

$$S = \text{EIRP} / (4\pi d^2)$$

The distance, given a maximum EIRP of -13.02 dBm (0.050 mW), at which the radiated power density of the EUT is equal to the human RF exposure limit is 0.063 cm from the antenna. This result does not take averaging into account. The EUT is exempt from FCC SAR RF Exposure evaluation because the output power is below the KDB 447498 exemption threshold:

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

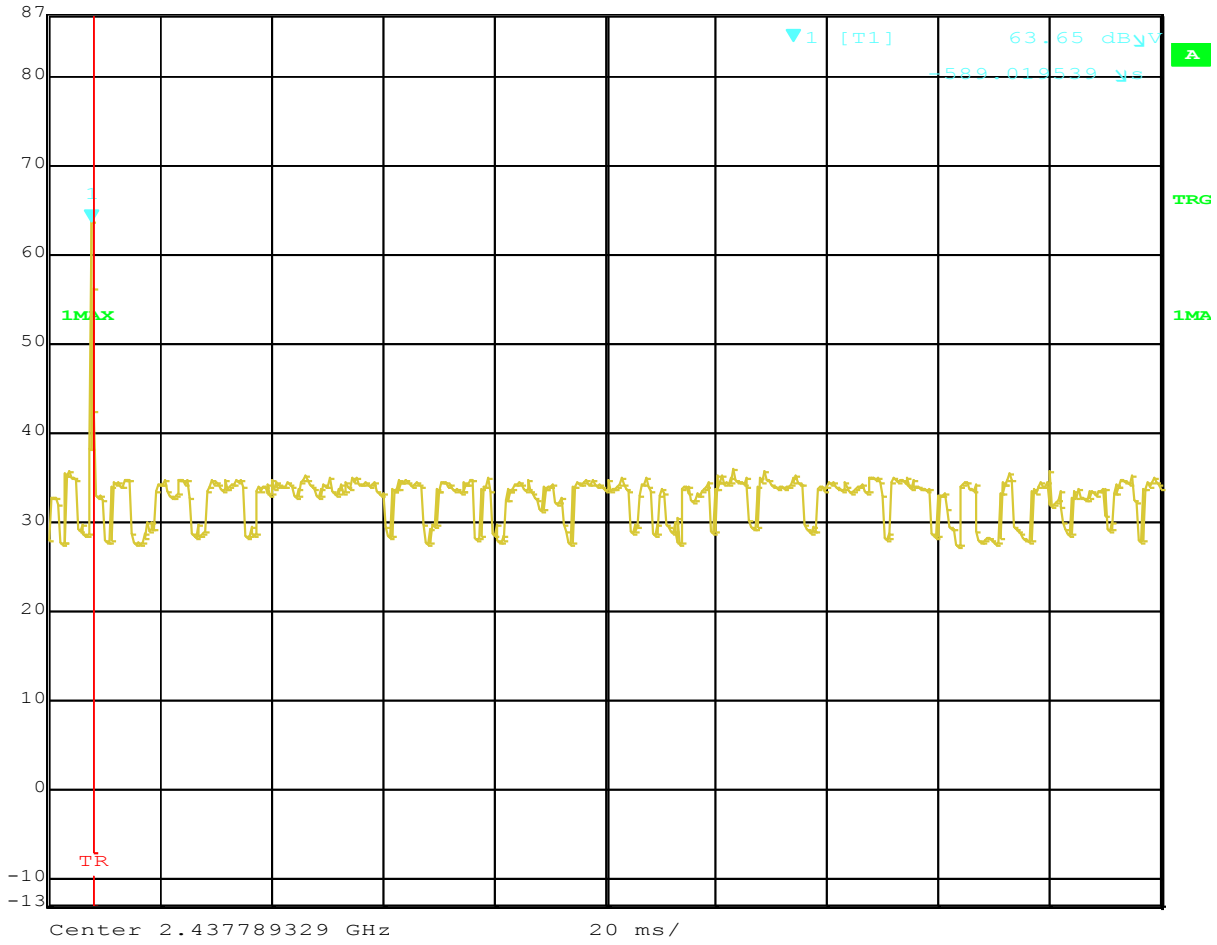
$$[0.05 \text{ mW} / 5 \text{ mm}] * [\sqrt{f(2.48 \text{ GHz})}] = \mathbf{0.0157} < \mathbf{3.0 \text{ and } 7.5}$$

Duty Cycle:

Pulse number within 200 ms



Marker 1 [T1] RBW 1 MHz RF Att 0 dB
Ref Lvl 63.65 dByV VBW 3 MHz
87 dByV -589.019539 μ s SWT 200 ms Unit dByV

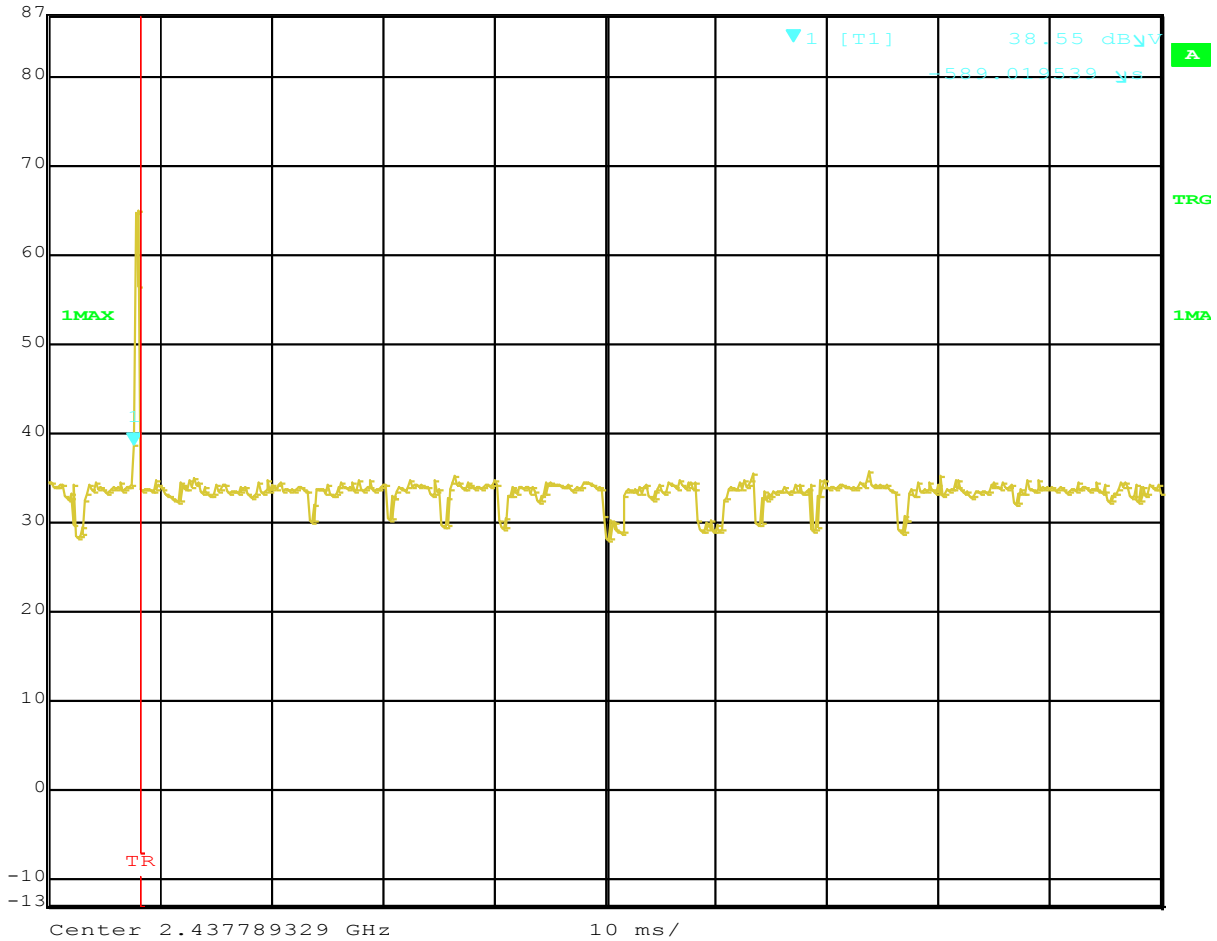


Date: 1.JAN.1997 06:04:09

Pulse number within 100 ms



Marker 1 [T1] RBW 1 MHz RF Att 0 dB
Ref Lvl 38.55 dBμV VBW 3 MHz
87 dBμV -589.019539 μs SWT 100 ms Unit dBμV

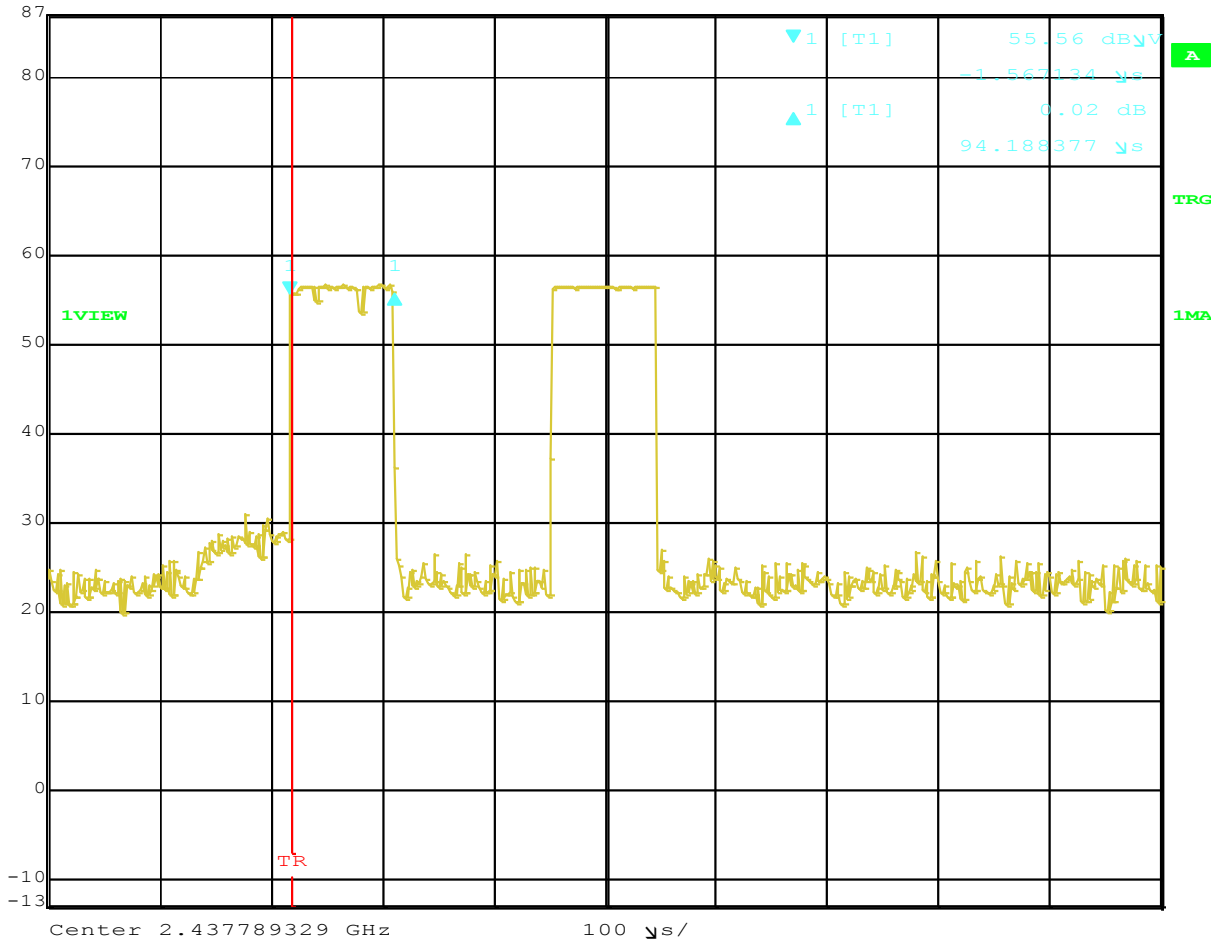


Date: 1.JAN.1997 06:04:40

Pulse on time (t_1)



Ref Lvl	Delta 1 [T1]	RBW	1 MHz	RF Att	0 dB
87 dB μ V	0.02 dB	VBW	3 MHz		
	94.188377 μ s	SWT	1 ms	Unit	dB μ V

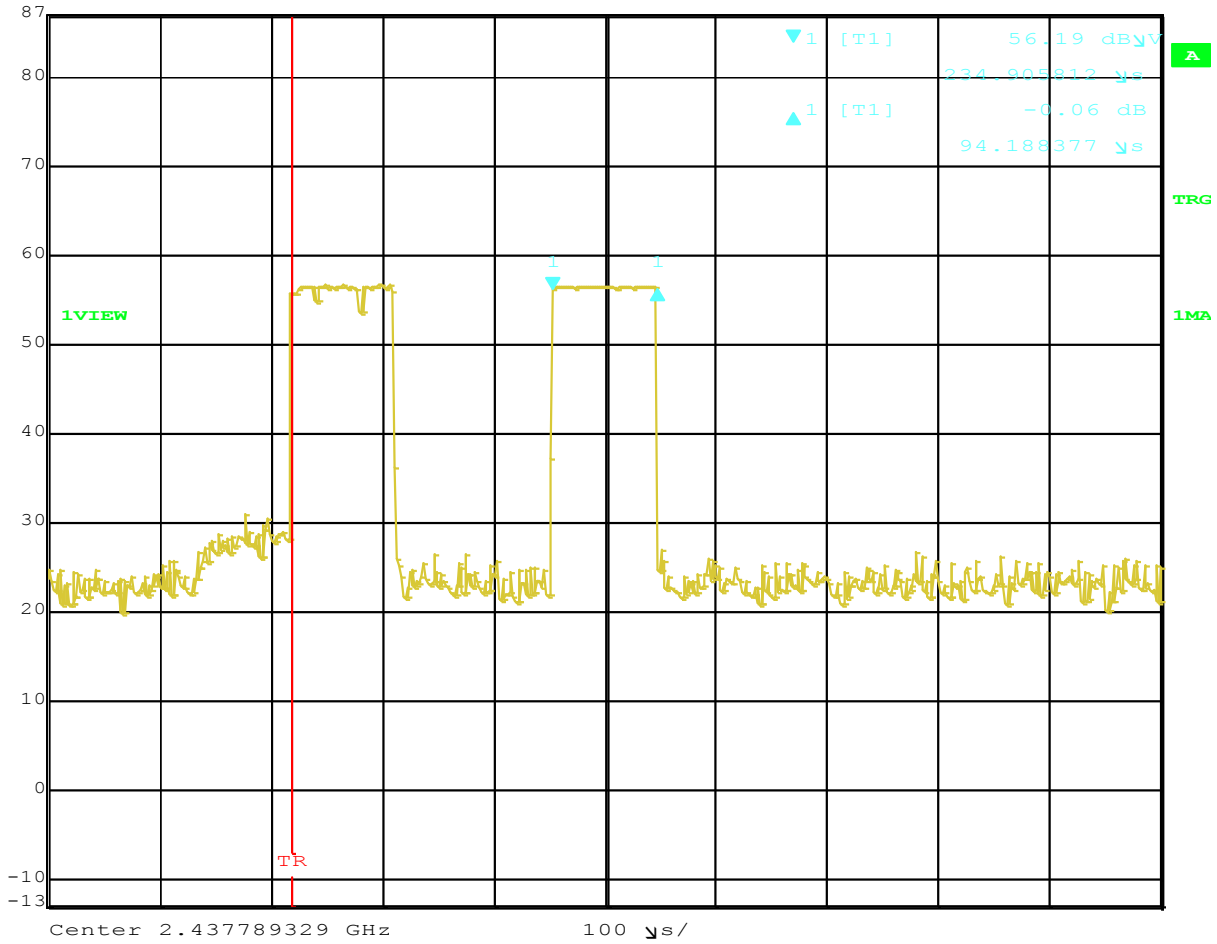


Date: 1.JAN.1997 06:17:43

Pulse on time (t₂)



	Delta 1 [T1]	RBW	1 MHz	RF Att	0 dB
Ref Lvl	-0.06 dB	VBW	3 MHz		
87 dB μ V	94.188377 μ s	SWT	1 ms	Unit	dB μ V



Date: 1.JAN.1997 06:18:54

Duty Cycle Calculation:

On time (t₁) = 0.0942 ms

On time (t₂) = 0.0942 ms

Duty Cycle = [(t₁) / (t₂)] / 100ms or 0.189%

Average Factor = 54.5 dB

Test Personnel: Kouma Sinn *KPS*
Supervising/Reviewing
Engineer:
(Where Applicable) N/A
Product Standard: FCC Part 15.247
Input Voltage: Battery Powered
Pretest Verification w/
Ambient Signals or
BB Source: **BB Source**

Test Date: 08/05/2015
Limit Applied: N/A
Ambient Temperature: 20 °C
Relative Humidity: 43 %
Atmospheric Pressure: 1008 mbars

Deviations, Additions, or Exclusions: None

7 Transmitter Radiated Spurious Emissions

7.1 Method

Tests are performed in accordance with CFR47 FCC Part 15:2015 Subpart C Section 15.247 (d) and CFR47 FCC Part 15:2015 Subpart C Section 15.209.

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)	Ucisp
Radiated Emissions, 10m	30-1000 MHz	4.6	6.3
Radiated Emissions, 3m	30-1000 MHz	5.3	6.3
Radiated Emissions, 3m	1-6 GHz	4.5	5.2
Radiated Emissions, 3m	6-15 GHz	5.2	5.5
Radiated Emissions, 3m	15-18 GHz	5.0	5.5
Radiated Emissions, 3m	18-40 GHz	5.0	5.5

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 μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ 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 μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

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

To convert from dB μ V to μ V or mV the following was used:

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

$$NF = \text{Net Reading in dB}\mu\text{V}$$

Example:

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

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

Alternately, when C5 Software is used, the "Level" includes all losses and gains and is compared directly in the "Margin" column to the "Limit". "AF" is the Antenna Factor; "PA+CL" are Preamp and Cable Loss. These are already accounted for in the "Level" column.

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
145106'	Bilog Antenna (30MHz - 5GHz)	Sunol Sciences	JB5	A111003	10/24/2014	10/24/2015
145013'	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2944A07027	10/11/2014	10/11/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-410'	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	10/04/2014	10/04/2015
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	01/14/2015	01/14/2016
145014'	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	05/05/2014	05/05/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2014	10/04/2015
EMC02'	ANTENNA, RIDGED GUIDE, 1-18 GHZ	EMCO	3115	2784	04/15/2015	04/15/2016
CBLHF201 2-2M-2'	2m 9kHz-40GHz Coaxial Cable - SET2	Huber & Suhner	SF102	252675002	02/05/2015	02/05/2016
REA006'	18GHz High Pass Filter	Reactel, Inc	7HS-18G/40G K11	(06)1	08/28/2014	08/28/2016
PRE9'	100MHz-40GHz Preamp	MITEQ	NSP4000-NFG	1260417	10/13/2014	10/13/2015
REA002'	2.5GHz High Pass Filter	Reactel, Inc	7HS-2.5G/18G-S11	06-1	12/30/2013	12/30/2015

Software Utilized:

Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010
C5	Teseq	5.02.00 Build 5.26.46.46.

7.3 Results:

The sample tested was found to Comply.

FCC Part 15.247(d) – Non Restricted Band Radiated Spurious/Harmonics Limits

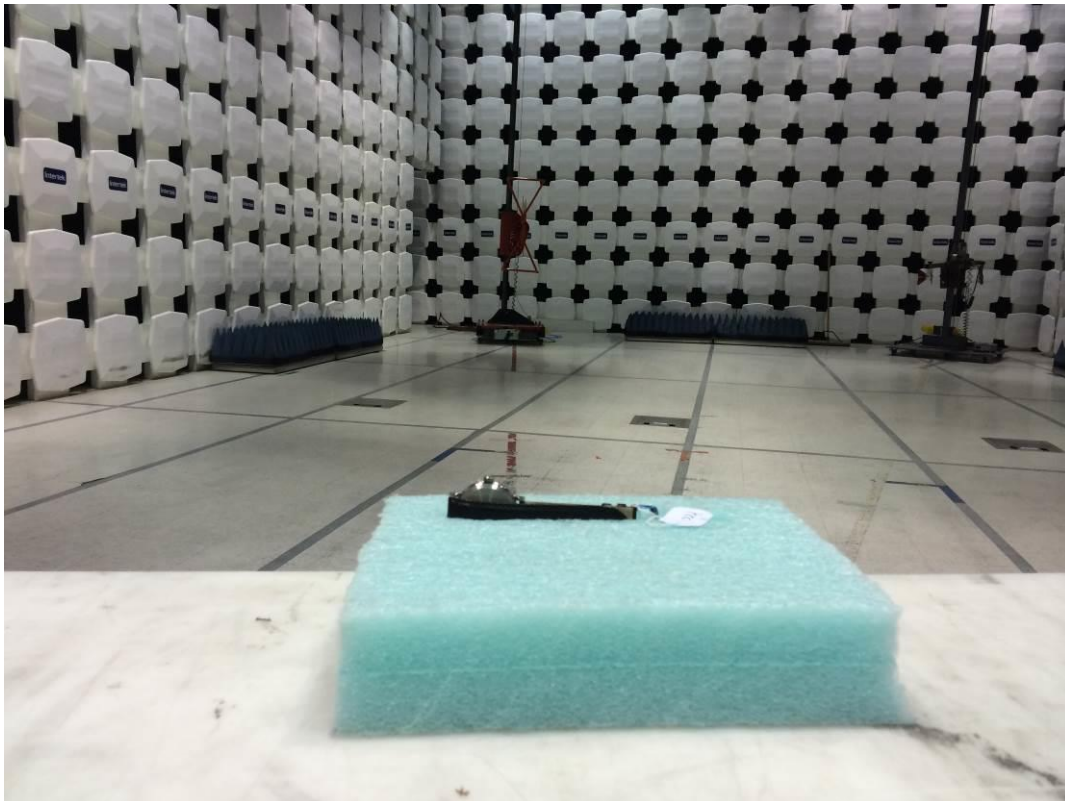
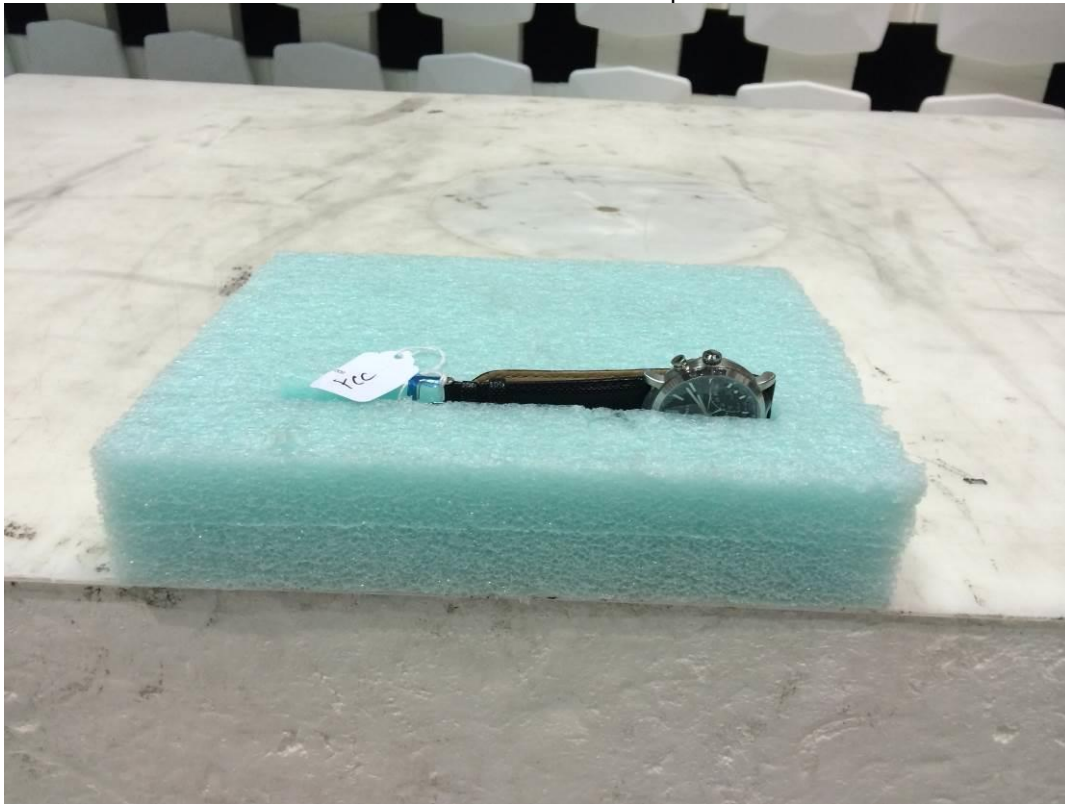
In any 100 kHz bandwidth outside the frequency band , the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

FCC Part 15.209(a)

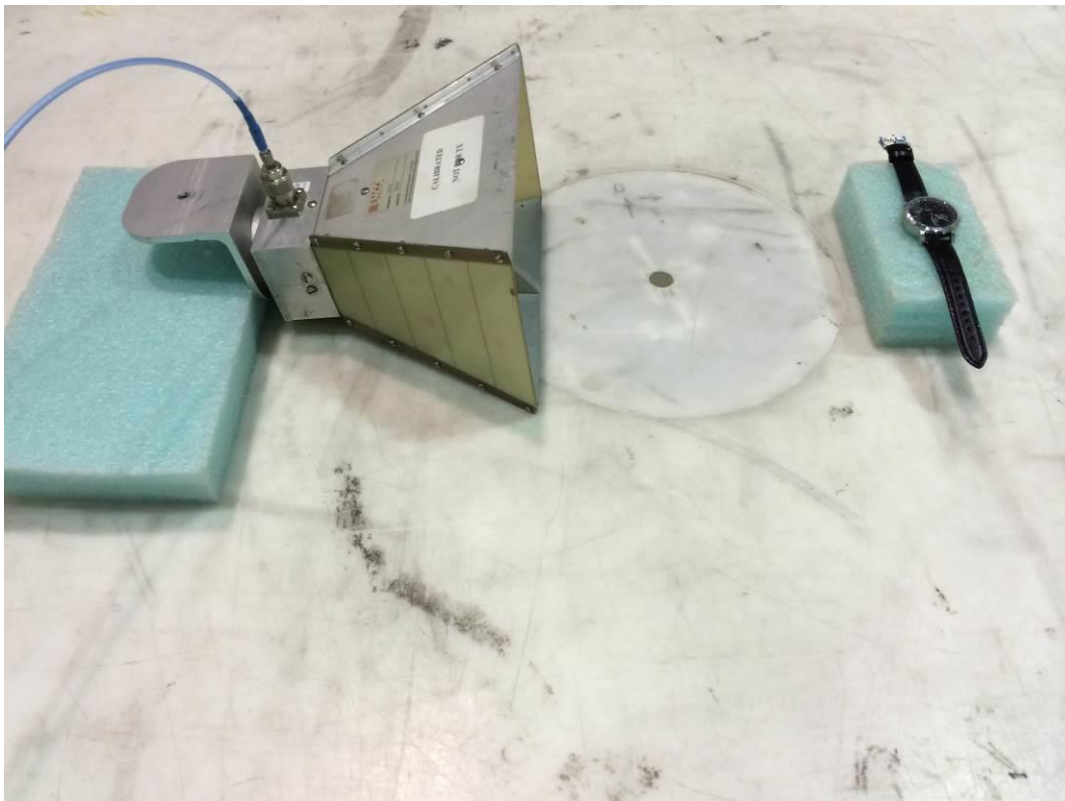
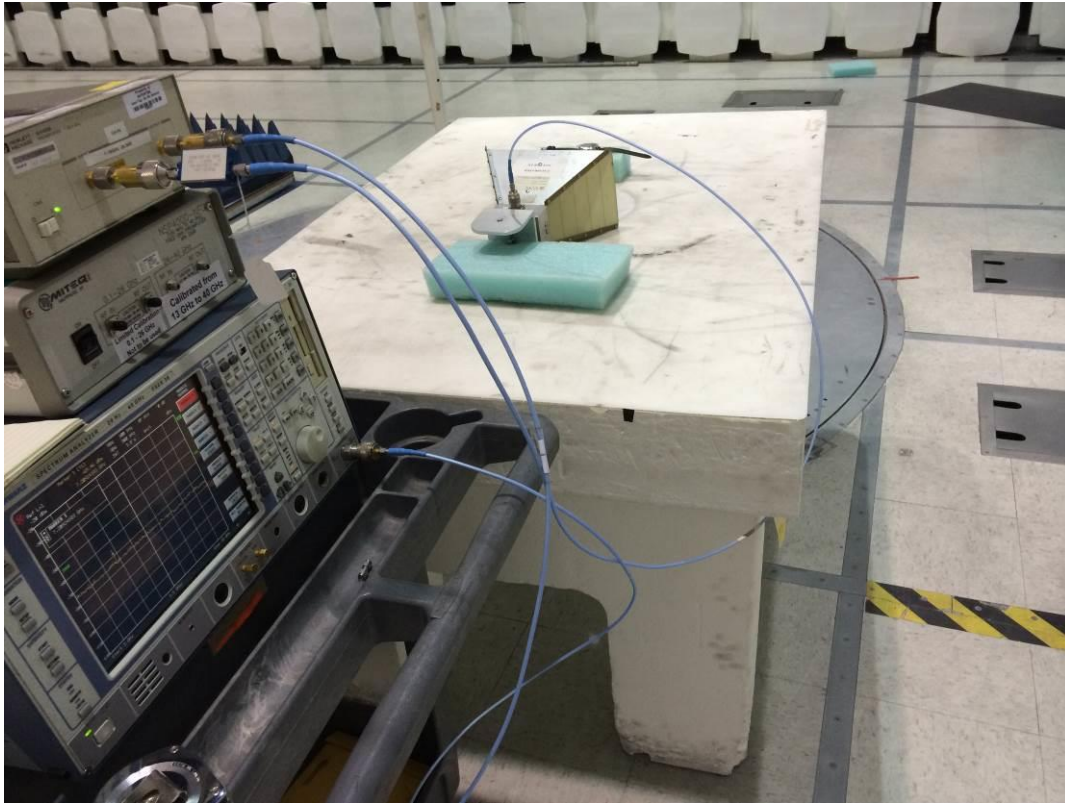
Frequency (MHz)	Field Strength		Test Distance (meters)
	μV/m	dBμV/m	
30–88	100	40.00	3
88–216	150	43.52	3
216–960	200	46.02	3
Above 960	500	53.98	3

7.4 Setup Photographs:

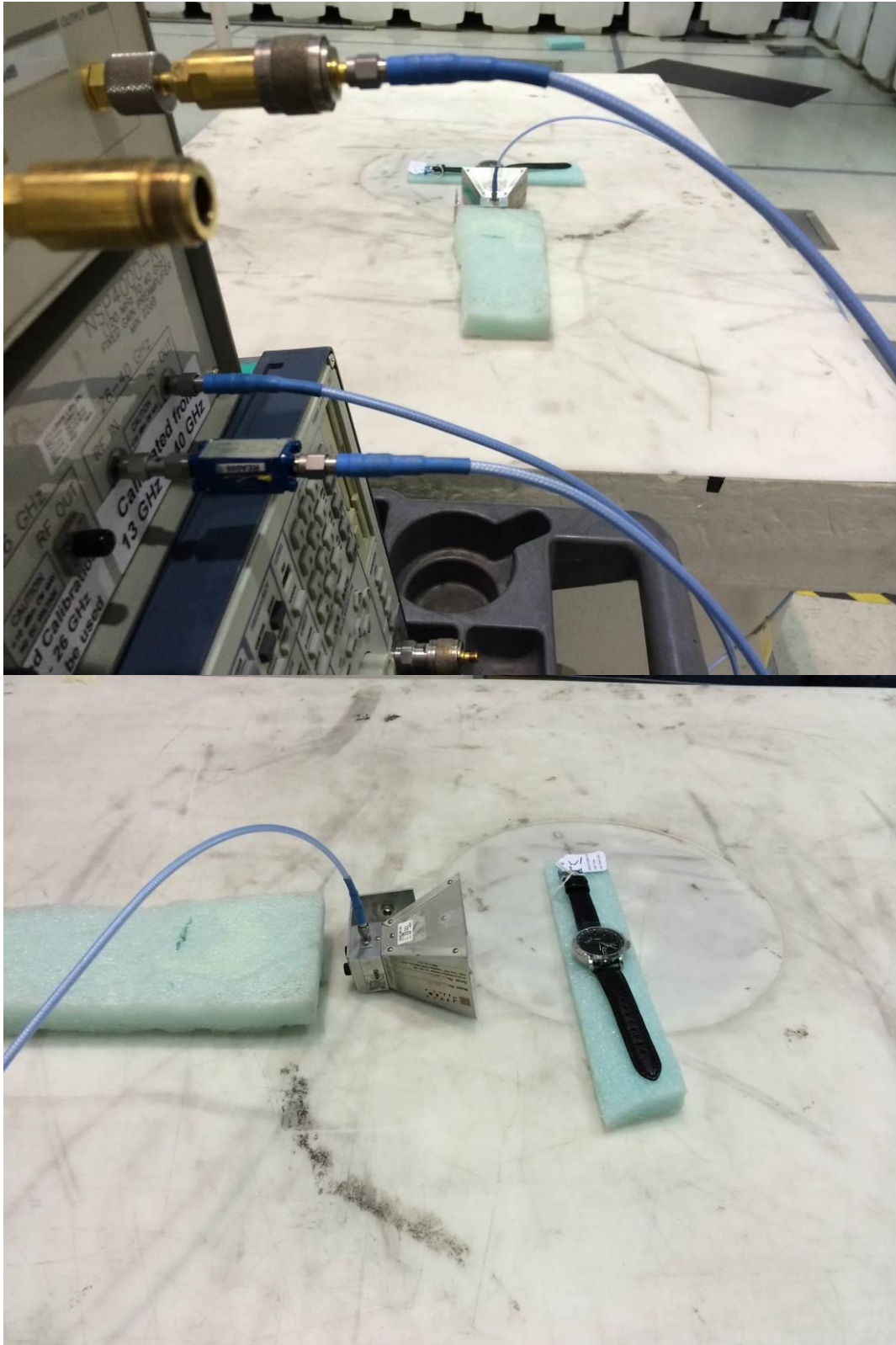
30-1000 MHz Test Setup



Hand Scan Above Third Harmonic



Hand Scans From 18-25 GHz



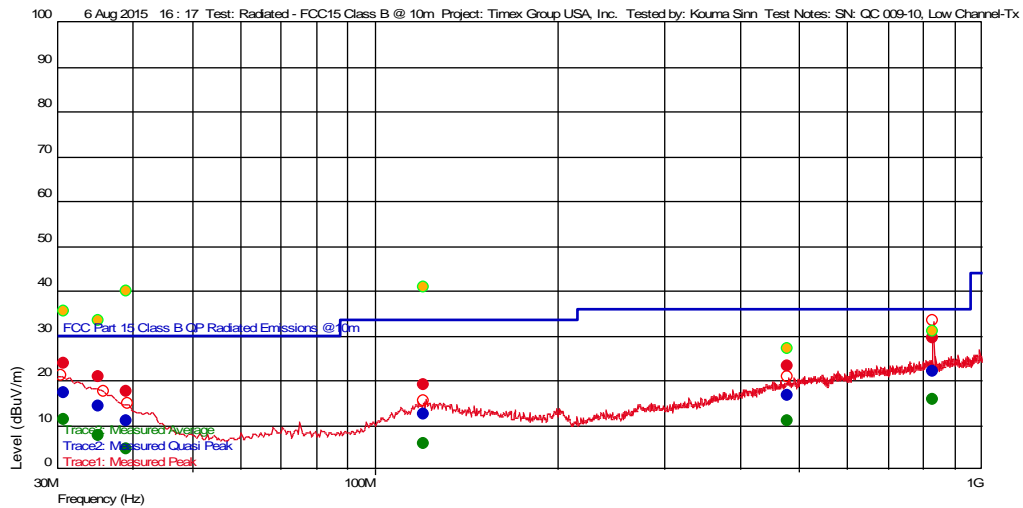
7.5 Plots/Data:

Tx Low Channel: 30-1000 MHz

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15 Class B @ 10m	
Project:	Timex Group USA, Inc.	
Test Notes:	SN: QC 009-10, Low Channel-Tx	
Temperature:	24C	
Humidity:	38%, DAV004mbar	
Tested by:	Kouma Sinn	
Test Started:	6 Aug 2015 16 : 17	

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
120.703407251 M	19.04	13.900	-24.689	--	--	--	277	1.66	120 k	
480.002204425 M	23.08	17.500	-22.544	--	--		0	3.93	120 k	
39.137274615 M	17.58	14.376	-26.045	--	--	--	353	3.91	120 k	
35.191983641 M	20.78	17.227	-26.038	--	--		330	3.70	120 k	
830.888777972 M	29.26	21.282	-21.463	--	--	--	254	3.34	120 k	
30.866733523 M	23.75	20.480	-26.029	--	--		135	3.59	120 k	

Trace2: Measured Quasi Peak

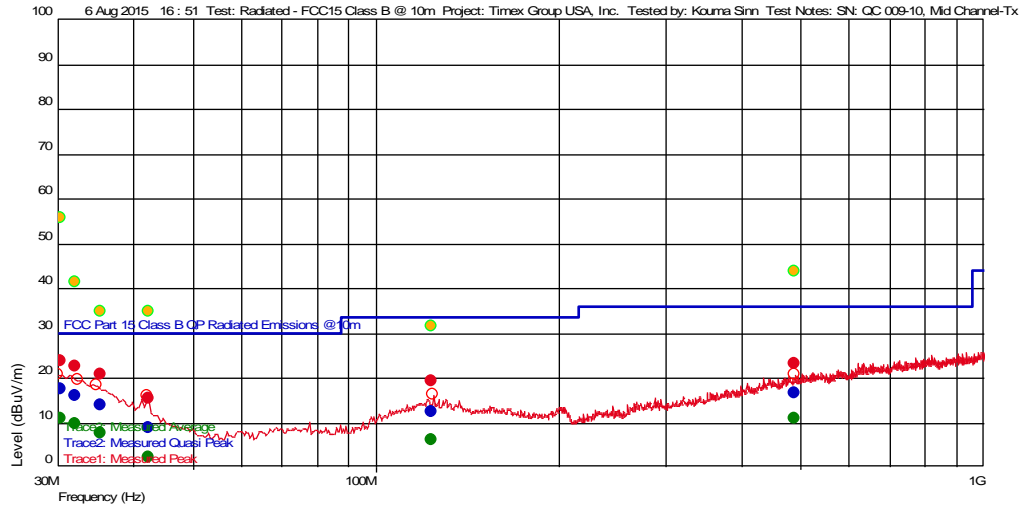
Frequency(Hz)	Level (dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin(dBuV/m)	Hor (--), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
120.703407251 M	12.44	13.900	-24.689	33.520	-21.08	--	277	1.66	120 k	
480.002204425 M	16.66	17.500	-22.544	36.020	-19.36		0	3.93	120 k	
39.137274615 M	10.94	14.376	-26.045	30.000	-19.06	--	353	3.91	120 k	
35.191983641 M	14.11	17.227	-26.038	30.000	-15.89		330	3.70	120 k	
830.888777972 M	21.98	21.282	-21.463	36.020	-14.04	--	254	3.34	120 k	
30.866733523 M	17.05	20.480	-26.029	30.000	-12.95		135	3.59	120 k	

Tx Mid Channel: 30-1000 MHz

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15 Class B @ 10m	
Project:	Timex Group USA, Inc.	
Test Notes:	SN: QC 009-10, Mid Channel-Tx	
Temperature:	24C	
Humidity:	38%, DAV004mbar	
Tested by:	Kouma Sinn	
Test Started:	6 Aug 2015 16 : 51	

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
42.478757918 M	15.45	11.913	-26.051	--	--		190	3.42	120 k	
124.044488864 M	19.15	13.996	-24.666	--	--	--	195	3.16	120 k	
489.559719577 M	23.01	17.400	-22.523	--	--		0	1.35	120 k	
35.34228413 M	20.88	17.092	-26.038	--	--		168	3.44	120 k	
32.17735499 M	22.61	19.394	-26.032	--	--		116	3.51	120 k	
30.435270541 M	23.75	20.739	-26.029	--	--	--	139	1.46	120 k	

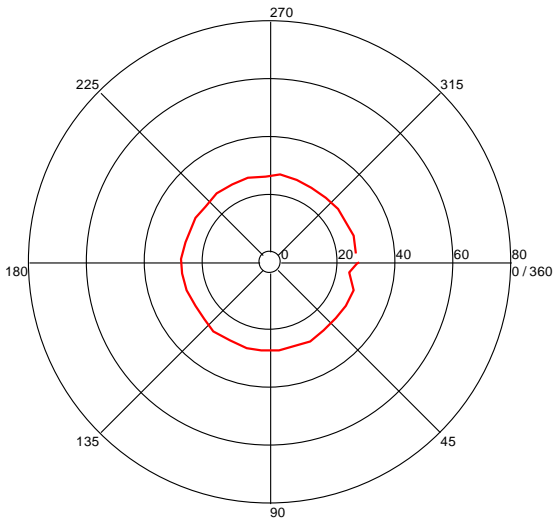
Trace2: Measured Quasi Peak

Frequency(Hz)	Level (dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin(dBuV/m)	Hor (--), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
124.044488864 M	12.35	13.996	-24.666	33.520	-21.17	--	195	3.16	120 k	
42.478757918 M	8.88	11.913	-26.051	30.000	-21.12		190	3.42	120 k	
489.559719577 M	16.58	17.400	-22.523	36.020	-19.44		0	1.35	120 k	
35.34228413 M	13.97	17.092	-26.038	30.000	-16.03		168	3.44	120 k	
32.17735499 M	16.07	19.394	-26.032	30.000	-13.93		116	3.51	120 k	
30.435270541 M	17.31	20.739	-26.029	30.000	-12.69	--	139	1.46	120 k	

Azimuth Plots

Turntable Plot (30.435270541 MHz)

Level (dBuV/m)

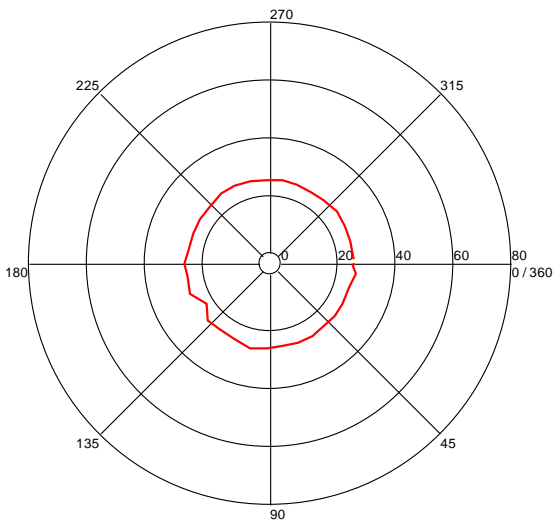


All Polarities

Azimuth (Degrees)

Turntable Plot (32.17735499 MHz)

Level (dBuV/m)

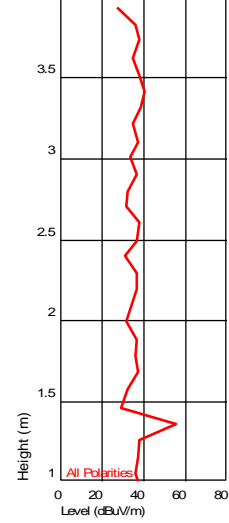


All Polarities

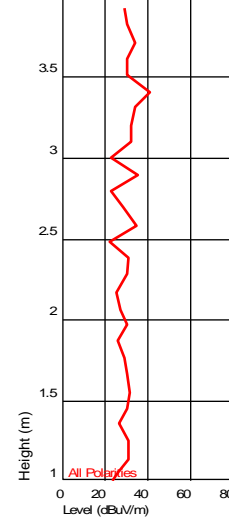
Azimuth (Degrees)

Turntable Plots

Height Plot (30.435270541 MHz)

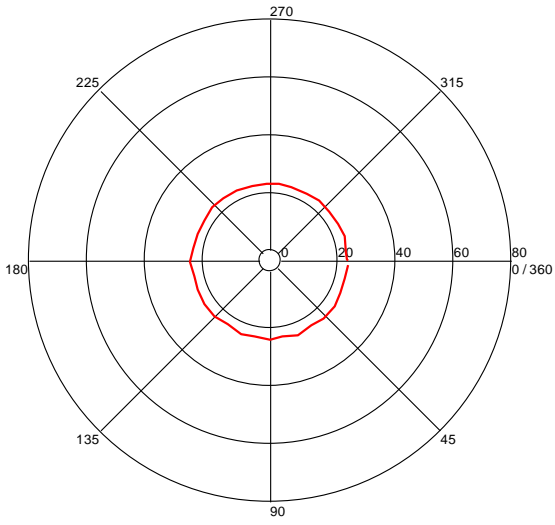


Height Plot (32.17735499 MHz)



Turntable Plot (35.34228413 MHz)

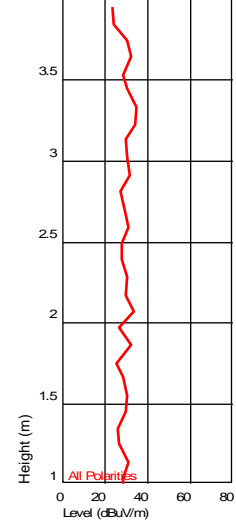
Level (dBuV/m)



All Polarities

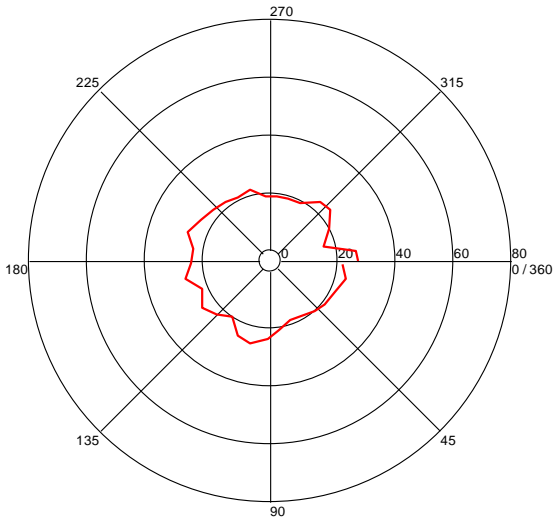
Azimuth (Degrees)

Height Plot (35.34228413 MHz)



Turntable Plot (42.478757918 MHz)

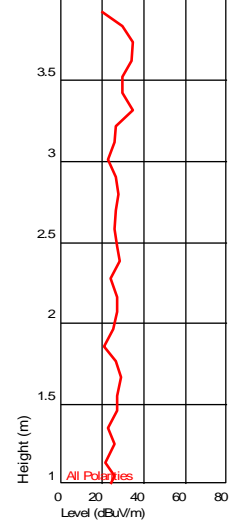
Level (dBuV/m)



All Polarities

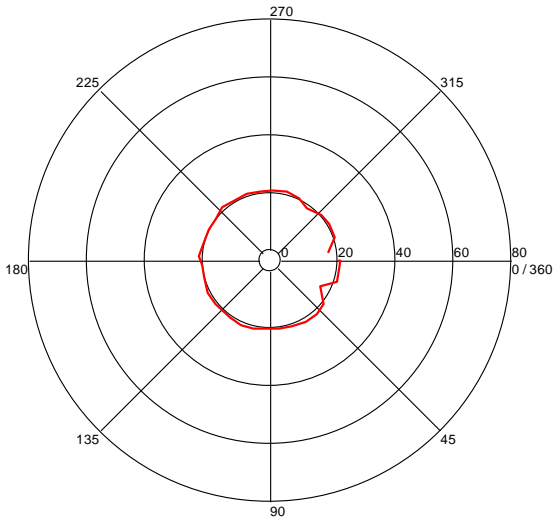
Azimuth (Degrees)

Height Plot (42.478757918 MHz)



Turntable Plot (124.04448864 MHz)

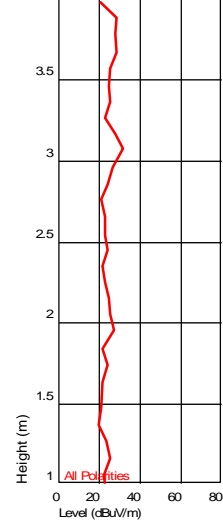
Level (dBuV/m)



All Polarities

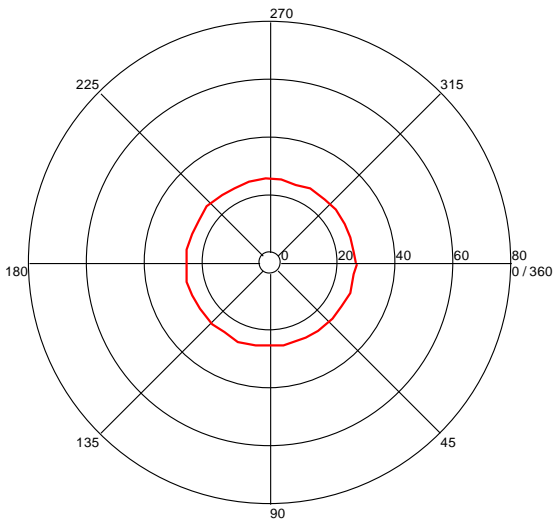
Azimuth (Degrees)

Height Plot (124.04448864 MHz)



Turntable Plot (489.559719577 MHz)

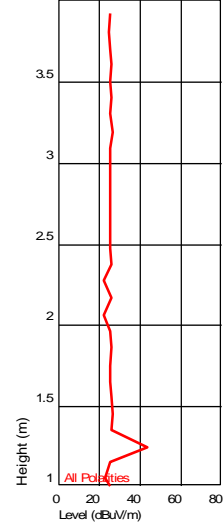
Level (dBuV/m)



All Polarities

Azimuth (Degrees)

Height Plot (489.559719577 MHz)

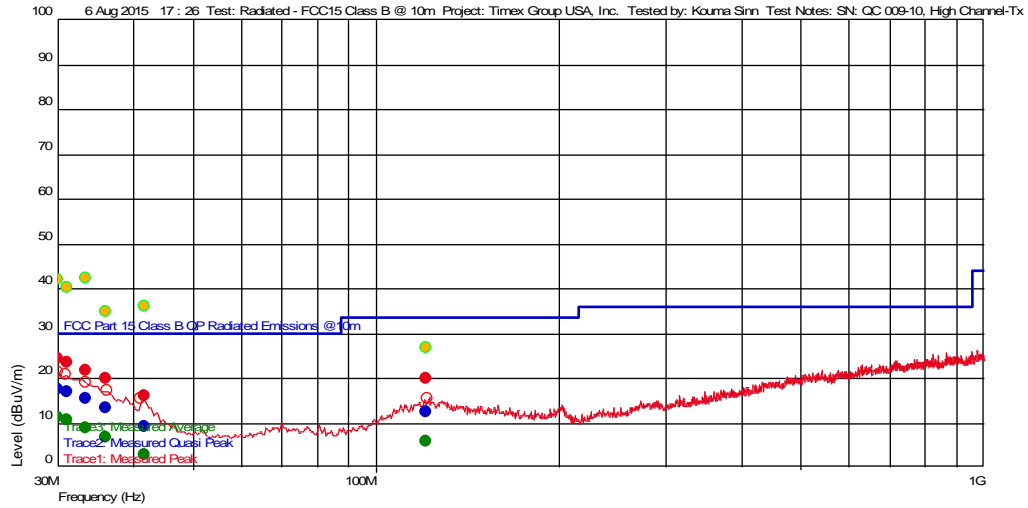


Tx High Channel: 30-1000 MHz

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15 Class B @ 10m	
Project:	Timex Group USA, Inc.	
Test Notes:	SN: QC 009-10, High Channel-Tx	
Temperature:	24C	
Humidity:	38%, DAV004mbar	
Tested by:	Kouma Sinn	
Test Started:	6 Aug 2015 17 : 26	

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

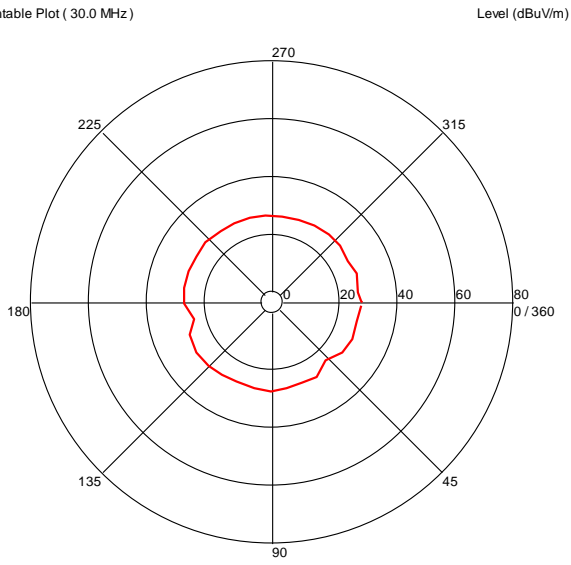
Frequency(Hz)	Level (dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin(dBuV/m)	Hor (--), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
41.830661613 M	15.97	12.335	-26.050	--	--		128	3.77	120 k	
121.356512631 M	19.71	13.936	-24.685	--	--		79	1.04	120 k	
36.166131994 M	19.80	16.400	-26.039	--	--		139	1.67	120 k	
33.493186766 M	21.57	18.456	-26.034	--	--	--	7	3.68	120 k	
31.165931976 M	23.47	20.251	-26.030	--	--		203	3.51	120 k	
30.0 M	24.32	21.000	-26.028	--	--	--	135	2.61	120 k	

Trace2: Measured Quasi Peak

Frequency(Hz)	Level (dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin(dBuV/m)	Hor (--), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
121.356512631 M	12.48	13.936	-24.685	33.520	-21.04		79	1.04	120 k	
41.830661613 M	9.10	12.335	-26.050	30.000	-20.90		128	3.77	120 k	
36.166131994 M	13.28	16.400	-26.039	30.000	-16.72		139	1.67	120 k	
33.493186766 M	15.24	18.456	-26.034	30.000	-14.76	--	7	3.68	120 k	
31.165931976 M	16.93	20.251	-26.030	30.000	-13.07		203	3.51	120 k	
30.0 M	17.58	21.000	-26.028	30.000	-12.42	--	135	2.61	120 k	

Azimuth Plots

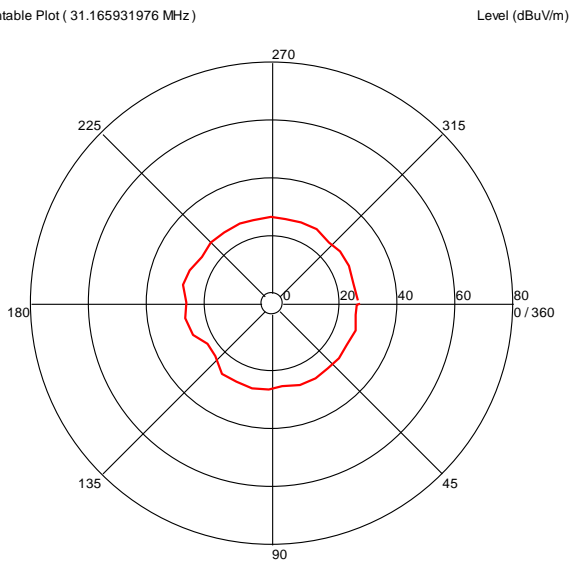
Turntable Plot (30.0 MHz)



All Polarities

Azimuth (Degrees)

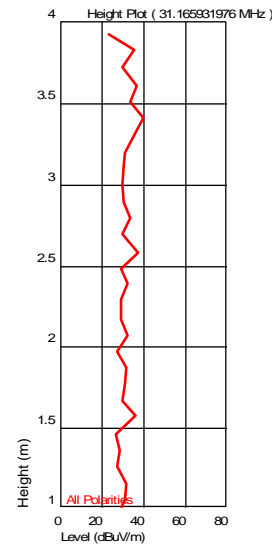
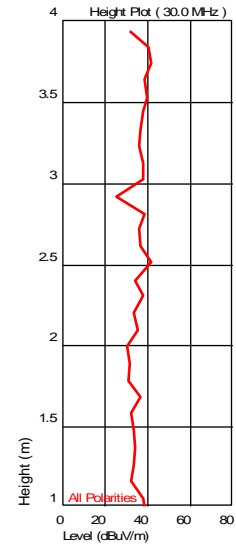
Turntable Plot (31.165931976 MHz)



All Polarities

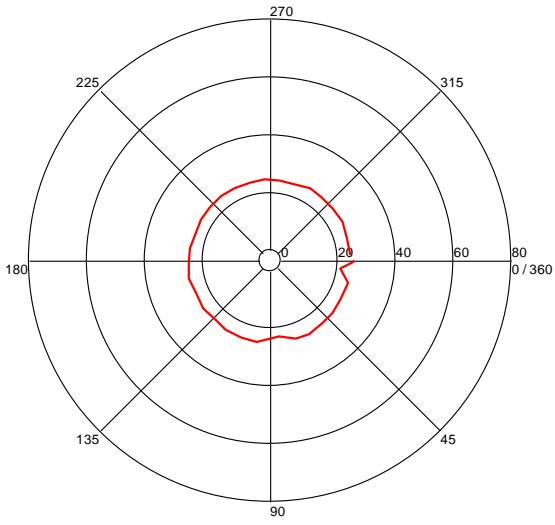
Azimuth (Degrees)

Turntable Plots



Turntable Plot (33.493186766 MHz)

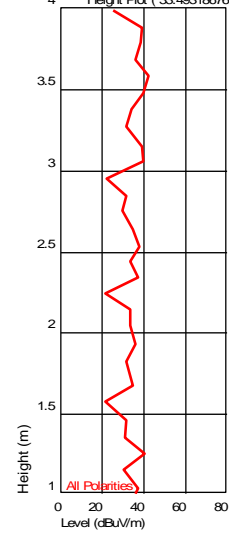
Level (dBuV/m)



All Polarities

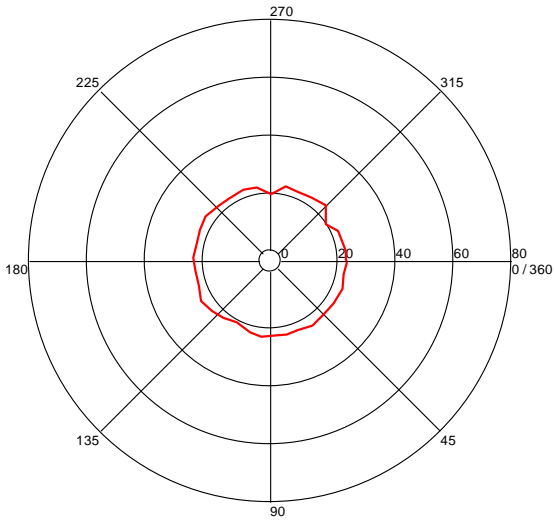
Azimuth (Degrees)

Height Plot (33.493186766 MHz)



Turntable Plot (36.166131994 MHz)

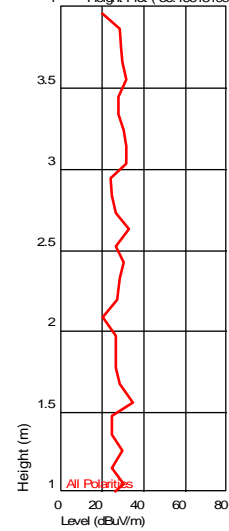
Level (dBuV/m)



All Polarities

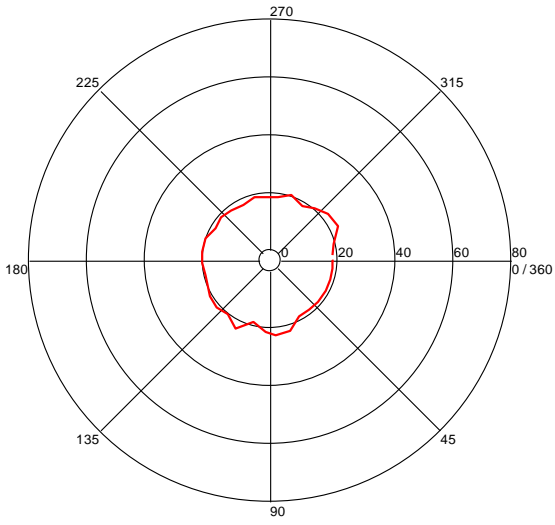
Azimuth (Degrees)

Height Plot (36.166131994 MHz)



Turntable Plot (41.830661613 MHz)

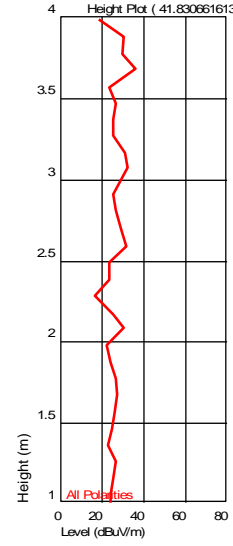
Level (dBuV/m)



All Polarities

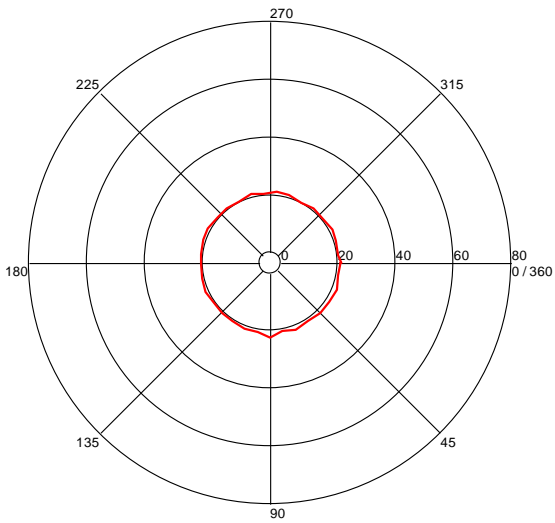
Azimuth (Degrees)

Height Plot (41.830661613 MHz)



Turntable Plot (121.356512631 MHz)

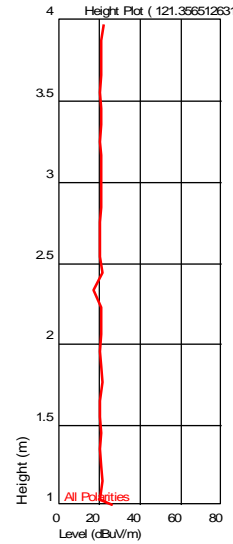
Level (dBuV/m)



All Polarities

Azimuth (Degrees)

Height Plot (121.356512631 MHz)



8 6 dB Bandwidth & 99% Power Bandwidth

8.1 Method

Tests are performed in accordance with CFR47 FCC Part 15:2015 Subpart C Section 15.247 (a)(2).

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	10/06/2014	10/06/2015
EMC02'	ANTENNA, RIDGED GUIDE, 1-18 GHZ	EMCO	3115	2784	04/15/2015	04/15/2016
CBLHF20 12-2M-1'	2m 9kHz-40GHz Coaxial Cable - SET1	Huber & Suhner	SF102	252675001	02/05/2015	02/05/2016
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	06/04/2015	06/04/2016

Software Utilized:

Name	Manufacturer	Version
None		

8.3 Results:

The sample tested was found to Comply. The 99% power bandwidth, or 6 dB bandwidth, must not be less than 500 kHz.

8.4 Setup Photograph:

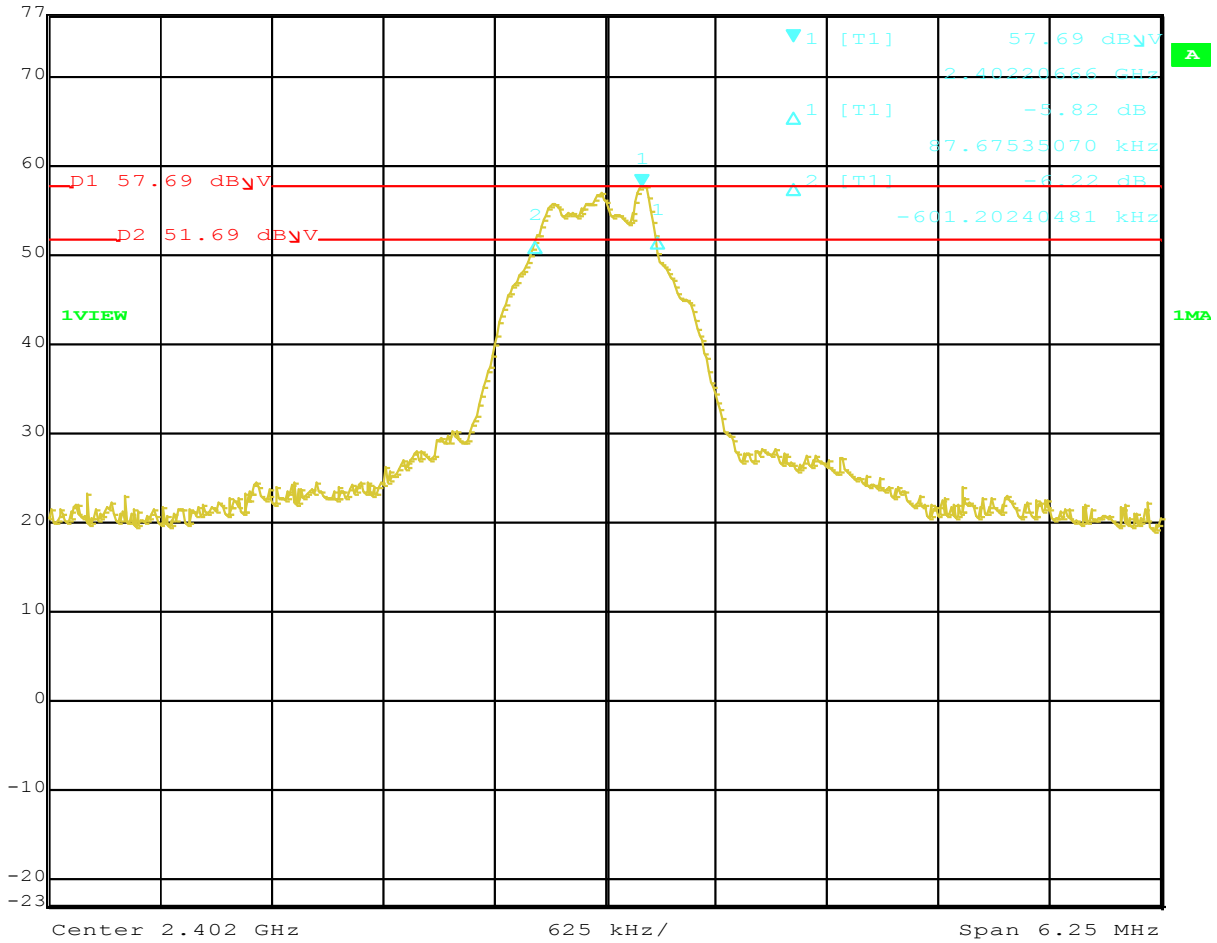


8.5 Plots/Data:

Low Channel: 2402 MHz, 6 dB Bandwidth: 688.877 kHz



Ref Lvl	57.69 dB μ V	RBW	100 kHz	RF Att	0 dB
77 dB μ V	2.40220666 GHz	VBW	300 kHz	SWT	5 ms
		Unit			dB μ V

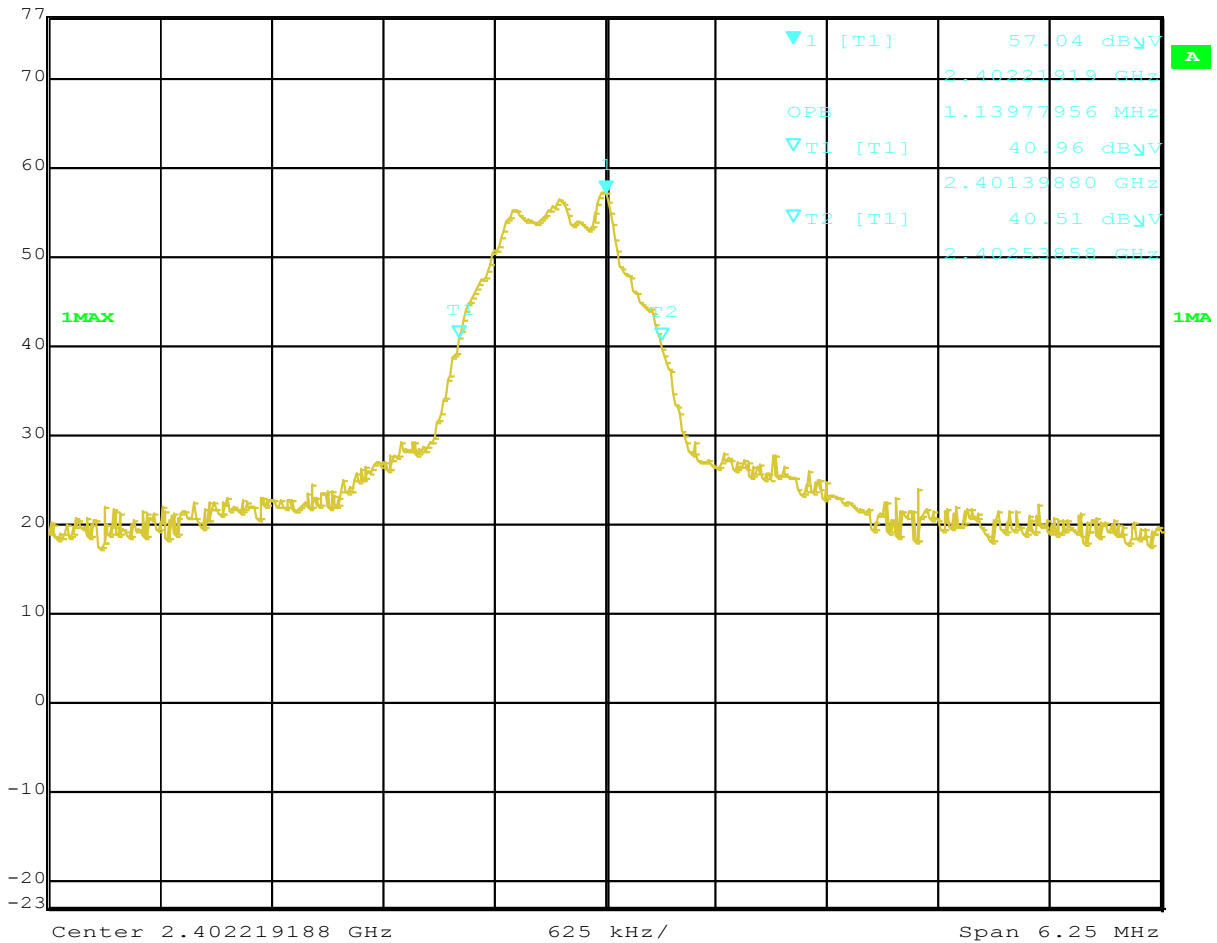


Date: 1.JAN.1997 04:22:43

Low Channel: 2402 MHz, 99% Bandwidth: 1.134 MHz



Ref Lvl	77 dB μ V	Marker 1 [T1]	57.04 dB μ V	RBW	100 kHz	RF Att	0 dB
				VBW	300 kHz		
				SWT	5 ms	Unit	dB μ V

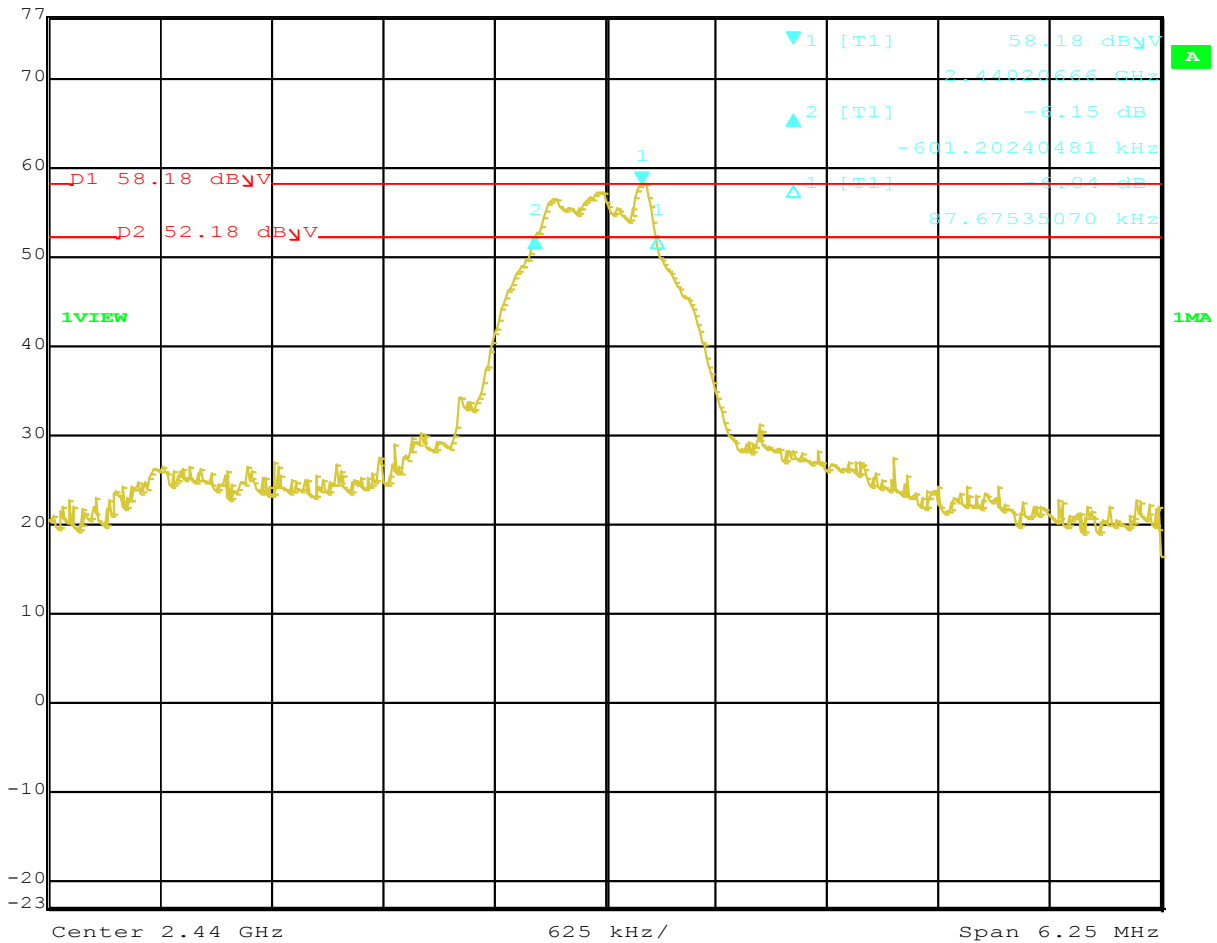


Date: 1.JAN.1997 04:26:21

Mid Channel: 2440 MHz, 6 dB Bandwidth: 388.877 kHz



Ref Lvl	Delta 2 [T1]	RBW	100 kHz	RF Att	0 dB
77 dB μ V	-6.15 dB	VBW	300 kHz		
	-601.20240481 kHz	SWT	5 ms	Unit	dB μ V

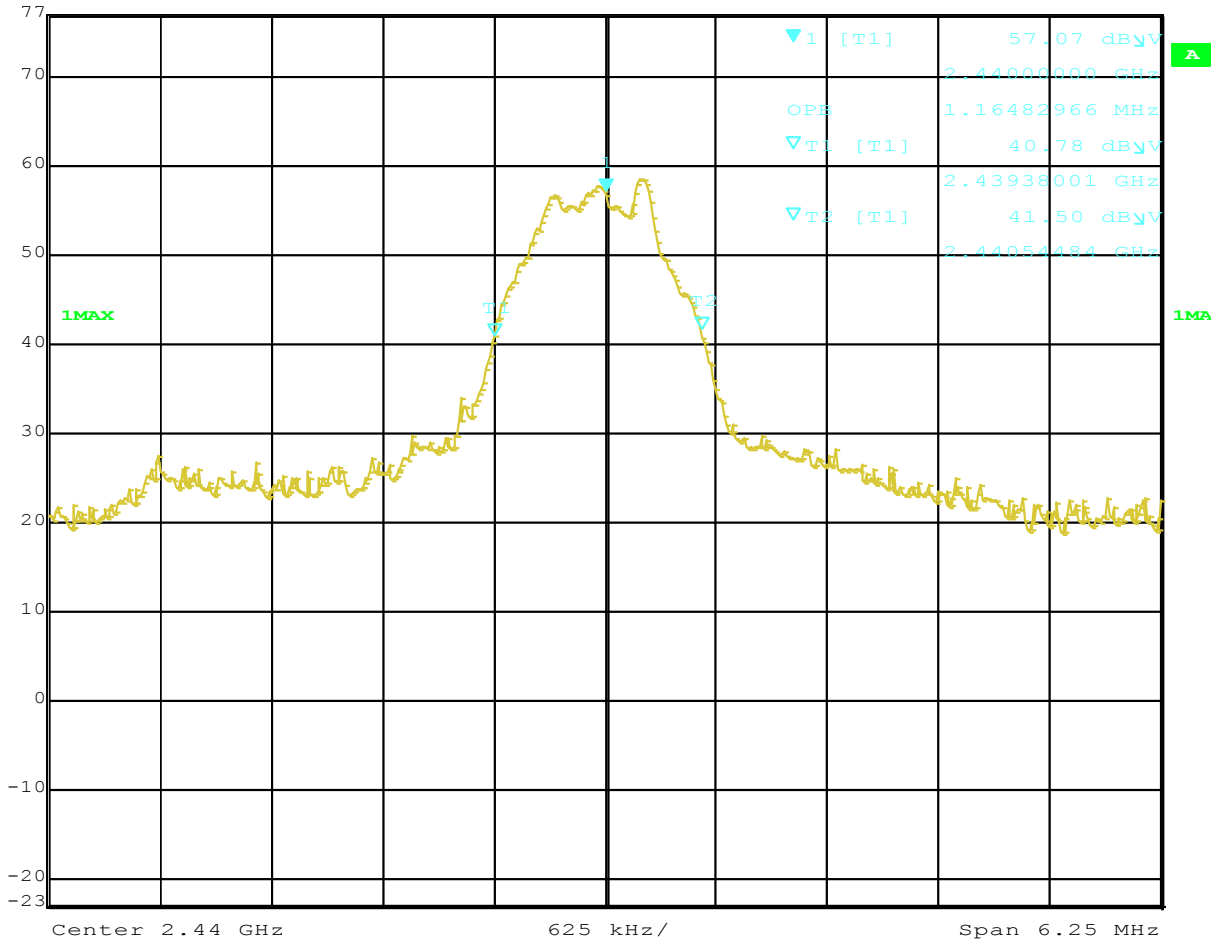


Date: 1.JAN.1997 04:33:10

Mid Channel: 2440 MHz, 99% Bandwidth: 1.165 MHz



Ref Lvl	Marker 1 [T1]	RBW	100 kHz	RF Att	0 dB
77 dBμV	57.07 dBμV	VBW	300 kHz		
	2.44000000 GHz	SWT	5 ms	Unit	dBμV

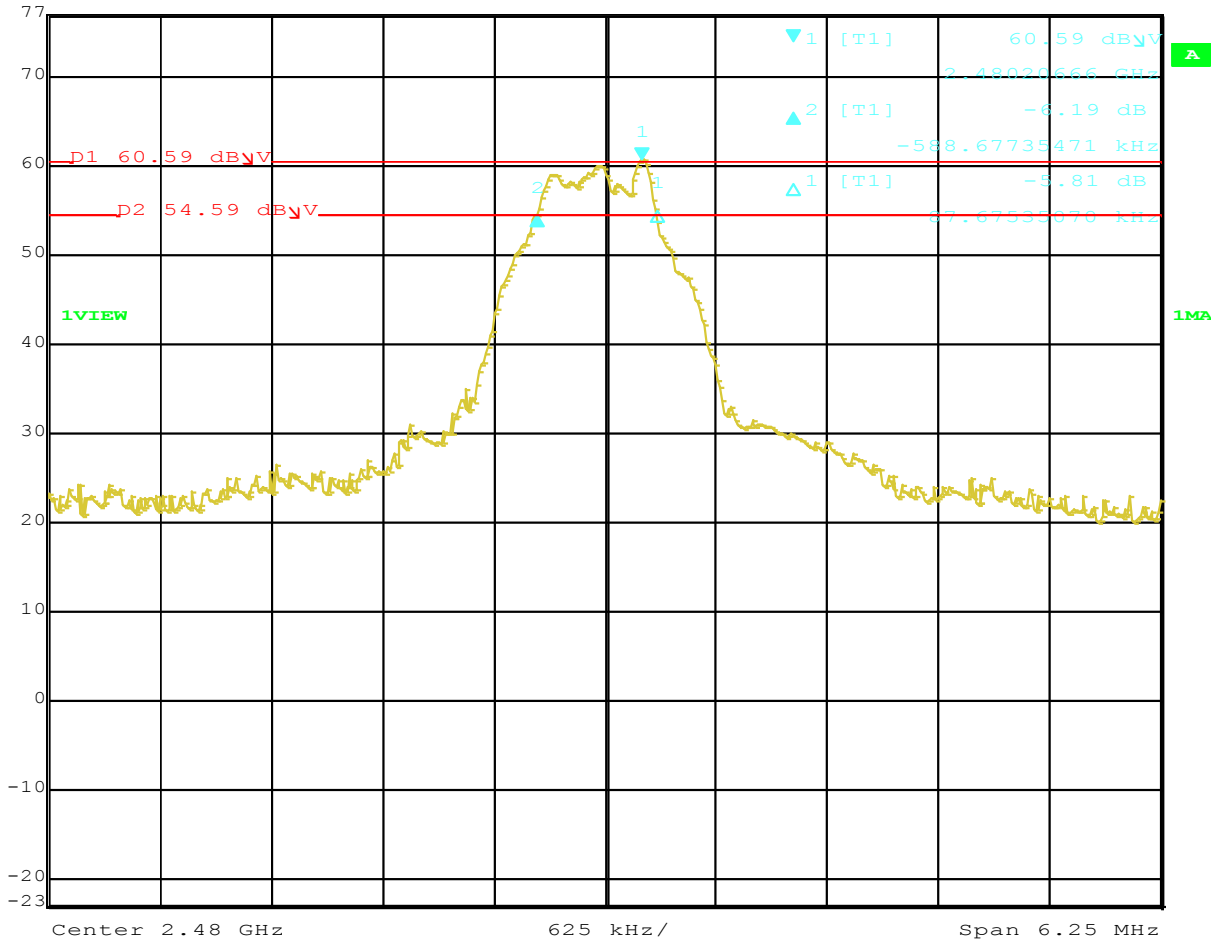


Date: 1.JAN.1997 04:28:32

High Channel: 2480 MHz, 6 dB Bandwidth: 656.352 kHz



Ref Lvl	Delta 2 [T1]	RBW	100 kHz	RF Att	0 dB
77 dB μ V	-6.19 dB	VBW	300 kHz		
	-588.67735471 kHz	SWT	5 ms	Unit	dB μ V

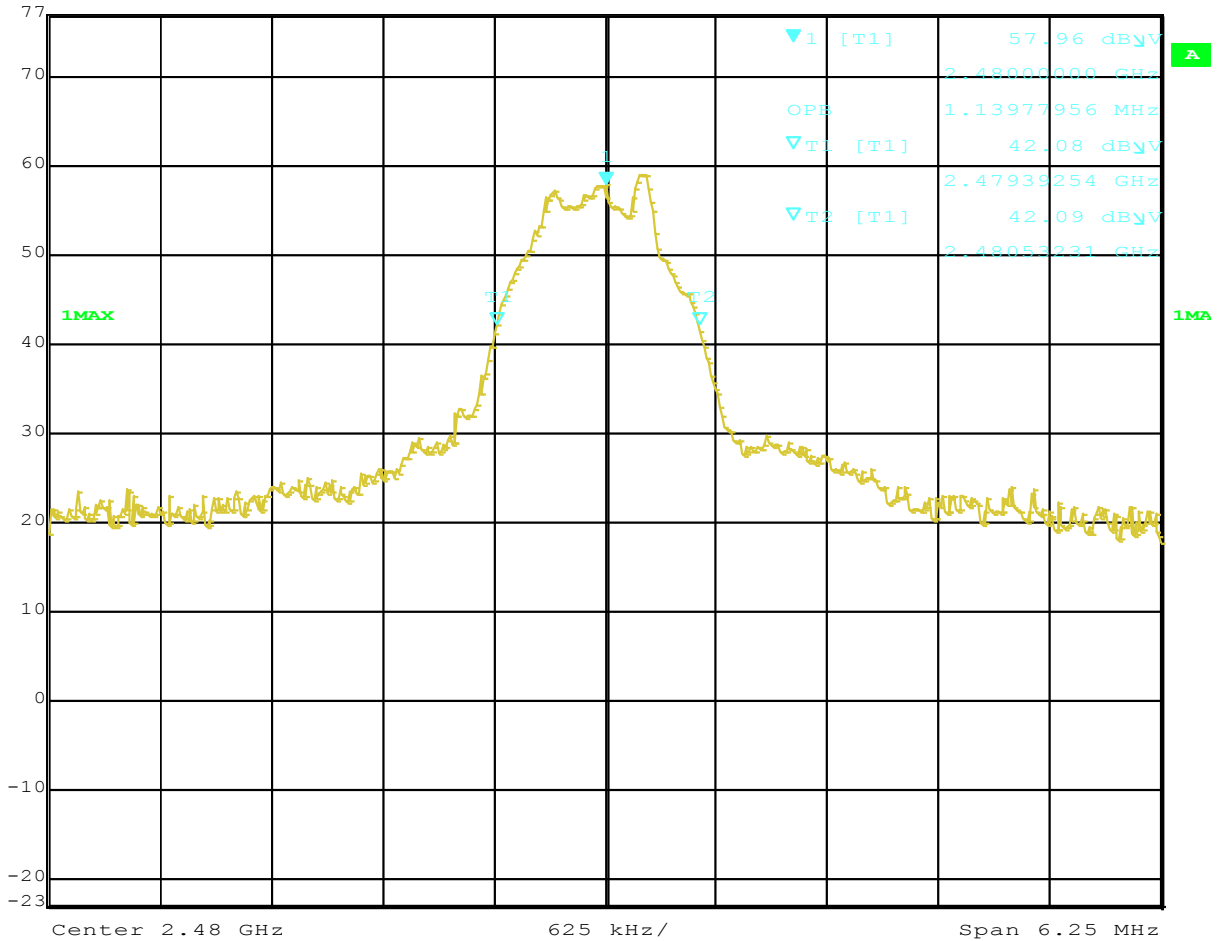


Date: 1.JAN.1997 04:35:35

High Channel: 2480 MHz, 99% Bandwidth: 1.140 MHz



Ref Lvl	Marker 1 [T1]	RBW	100 kHz	RF Att	0 dB
77 dBμV	57.96 dBμV	VBW	300 kHz		
	2.48000000 GHz	SWT	5 ms	Unit	dBμV



Date: 1.JAN.1997 04:48:55

Test Personnel: Kouma Sinn *KPS*
 Supervising/Reviewing Engineer: _____
 (Where Applicable) N/A
 Product Standard: FCC Part 15.247
 Input Voltage: Battery Powered
 Pretest Verification w/ Ambient Signals or BB Source: N/A

Test Date: 8/05/2015
 Limit Applied: See Report Section 8.3
 Ambient Temperature: 20 °C
 Relative Humidity: 54 %
 Atmospheric Pressure: 1000 mbars

Deviations, Additions, or Exclusions: None

9 Power Spectral Density

9.1 Method

Tests are performed in accordance with CFR47 FCC Part 15:2015 Subpart C Section 15.247(e).

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)	Ucisp
Radiated Emissions, 10m	30-1000 MHz	4.6	6.3
Radiated Emissions, 3m	30-1000 MHz	5.3	6.3
Radiated Emissions, 3m	1-6 GHz	4.5	5.2
Radiated Emissions, 3m	6-15 GHz	5.2	5.5
Radiated Emissions, 3m	15-18 GHz	5.0	5.5
Radiated Emissions, 3m	18-40 GHz	5.0	5.5

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 μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ 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 μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

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

To convert from dB μ V to μ V or mV the following was used:

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

$$NF = \text{Net Reading in dB}\mu\text{V}$$

Example:

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

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

Alternately, when C5 Software is used, the "Level" includes all losses and gains and is compared directly in the "Margin" column to the "Limit". "AF" is the Antenna Factor; "PA+CL" are Preamp and Cable Loss. These are already accounted for in the "Level" column.

9.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	01/14/2015	01/14/2016
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2014	10/04/2015

Software Utilized:

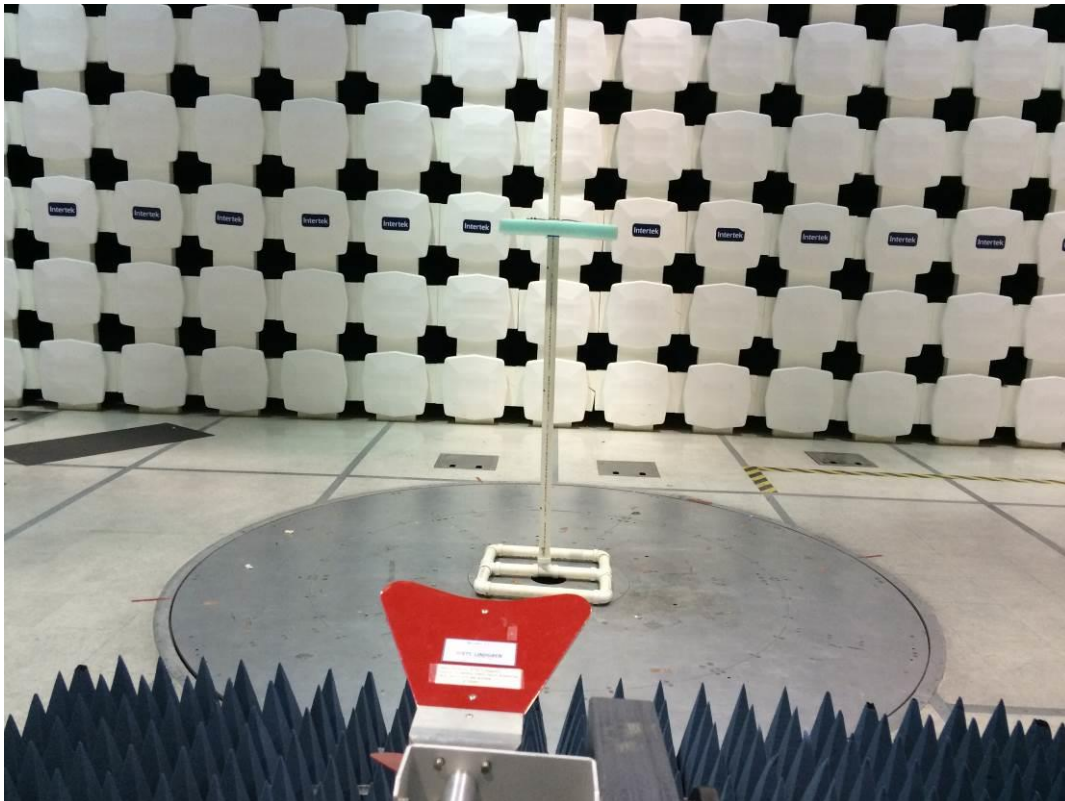
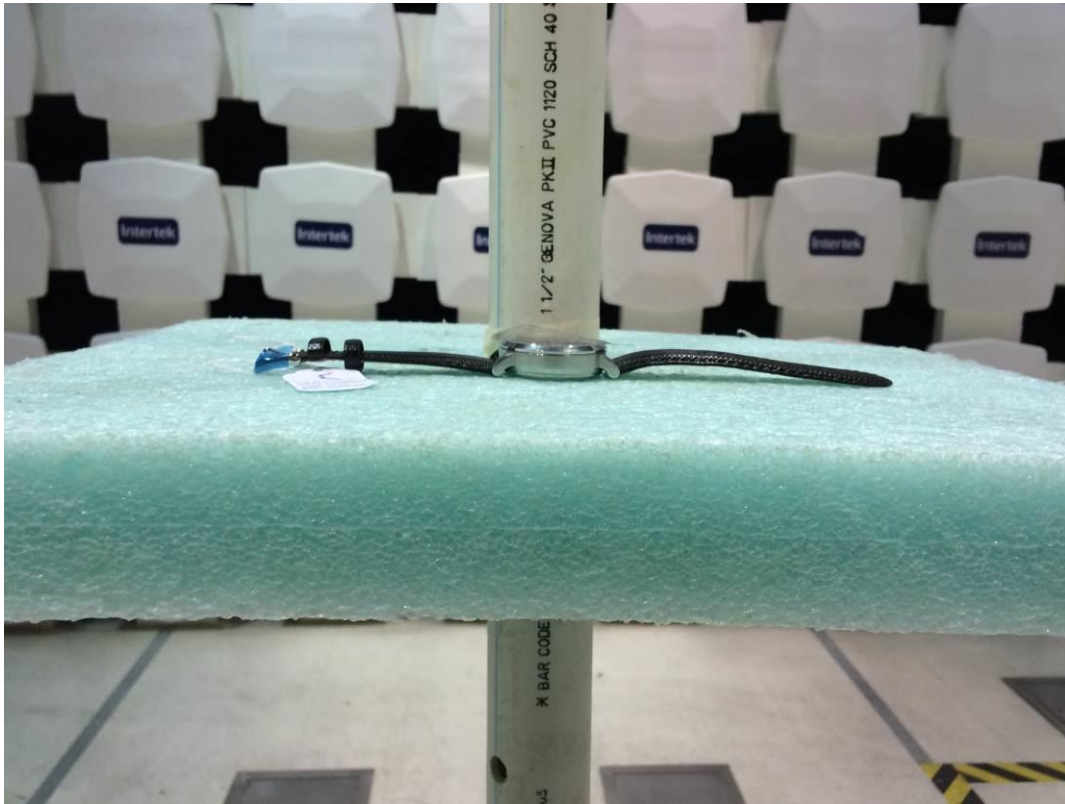
Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

9.3 Results:

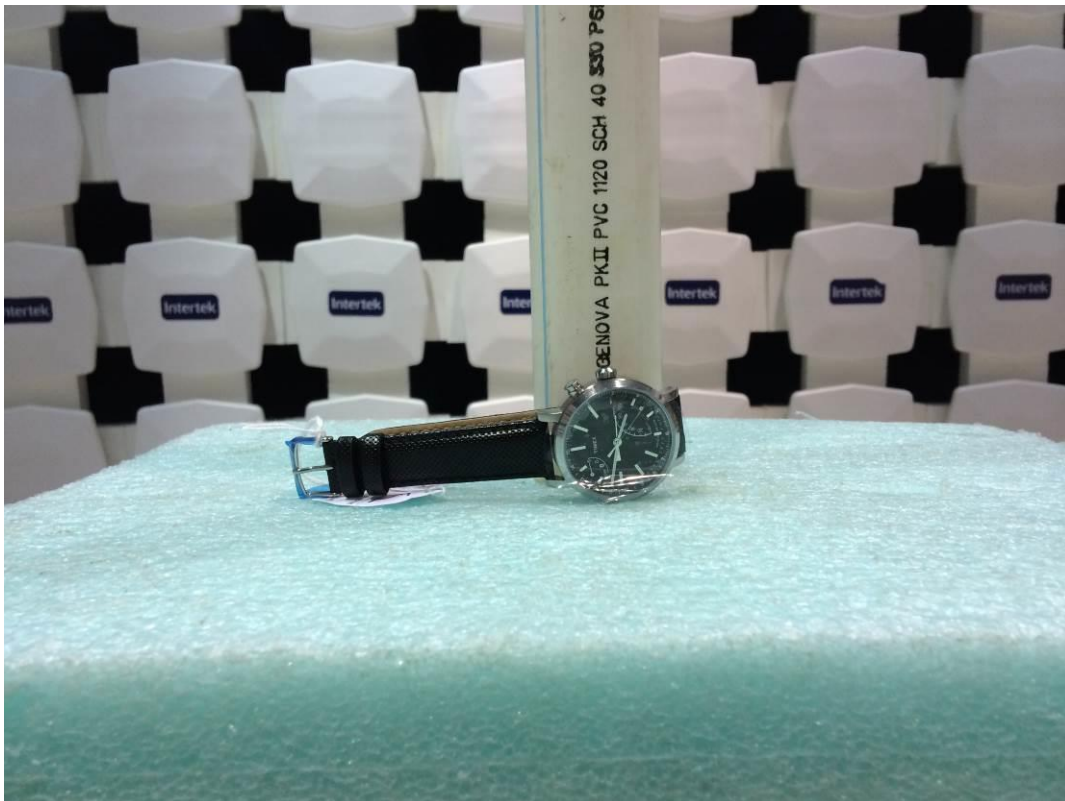
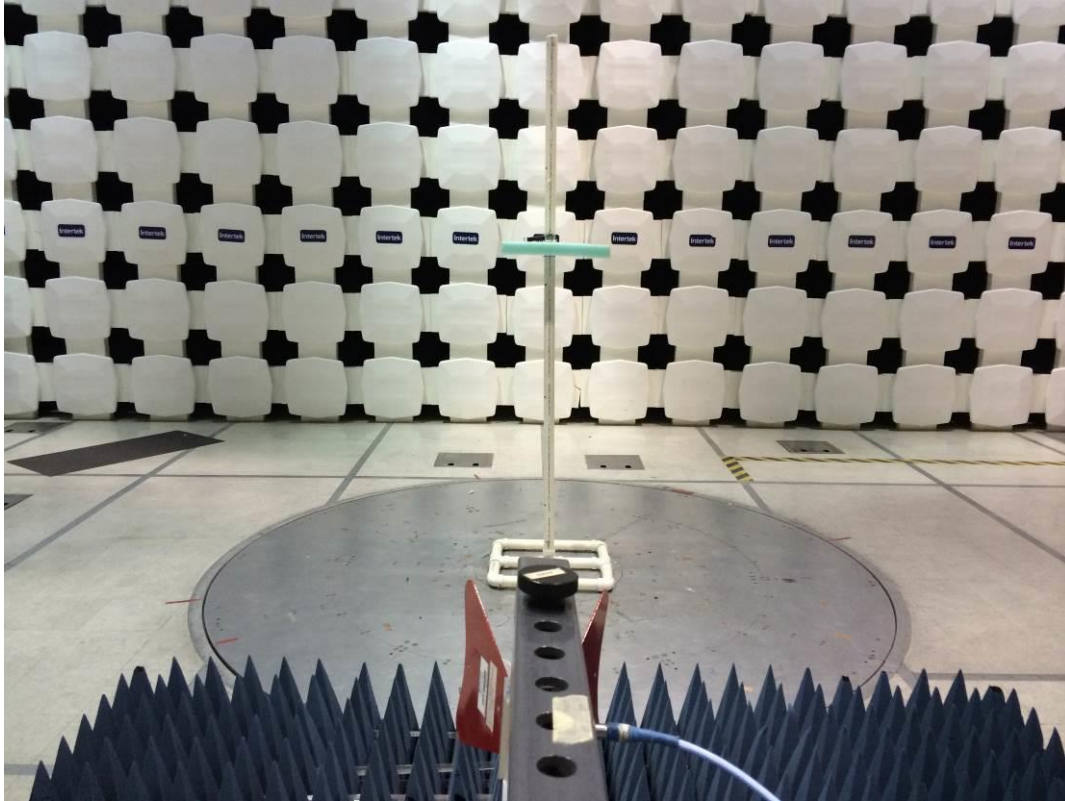
The sample tested was found to Comply. The peak power spectral density must not exceed 8 dBm in any 3 kHz bandwidth.

9.4 Setup Photographs:

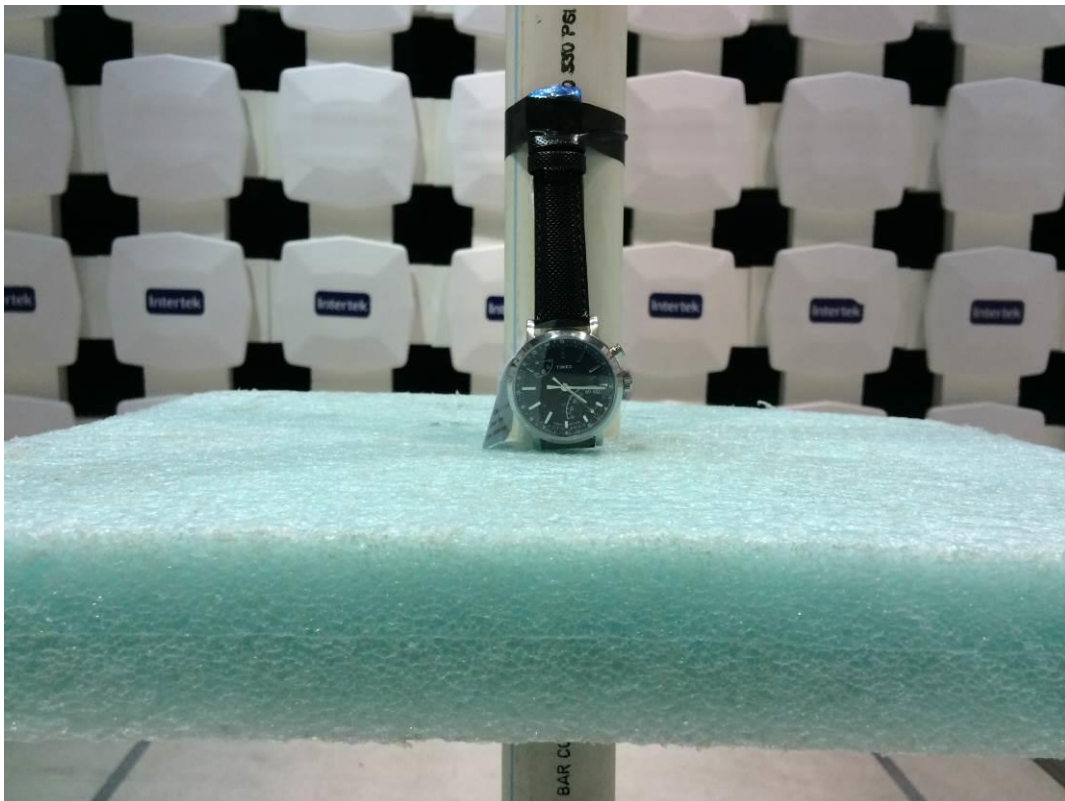
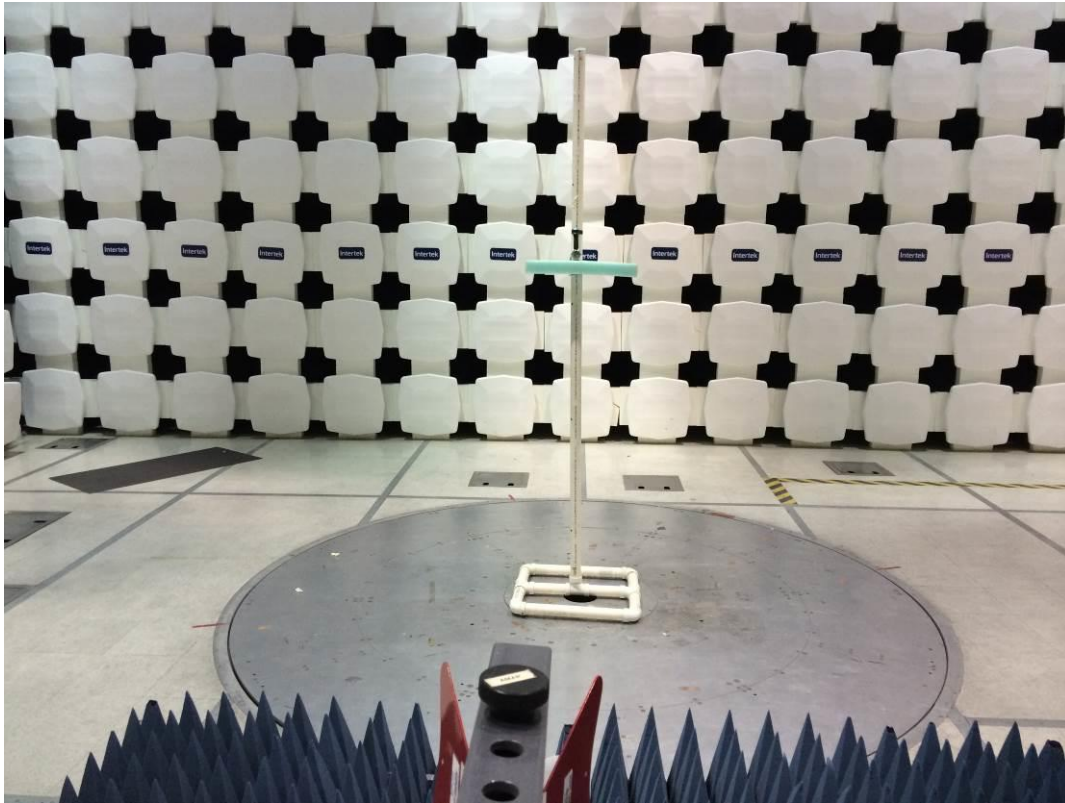
X-axis



Y-axis



Z-axis



10 Band-edge Compliance

10.1 Test Method

Tests are performed in accordance with CFR47 FCC Part 15:2015 Subpart C Section 15.247 (d).

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)	Ucisp
Radiated Emissions, 10m	30-1000 MHz	4.6	6.3
Radiated Emissions, 3m	30-1000 MHz	5.3	6.3
Radiated Emissions, 3m	1-6 GHz	4.5	5.2
Radiated Emissions, 3m	6-15 GHz	5.2	5.5
Radiated Emissions, 3m	15-18 GHz	5.0	5.5
Radiated Emissions, 3m	18-40 GHz	5.0	5.5

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 μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ 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 μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

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

To convert from dB μ V to μ V or mV the following was used:

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

$$NF = \text{Net Reading in dB}\mu\text{V}$$

Example:

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

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

Alternately, when C5 Software is used, the "Level" includes all losses and gains and is compared directly in the "Margin" column to the "Limit". "AF" is the Antenna Factor; "PA+CL" are Preamp and Cable Loss. These are already accounted for in the "Level" column.

10.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	01/14/2015	01/14/2016
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2014	10/04/2015

Software Utilized:

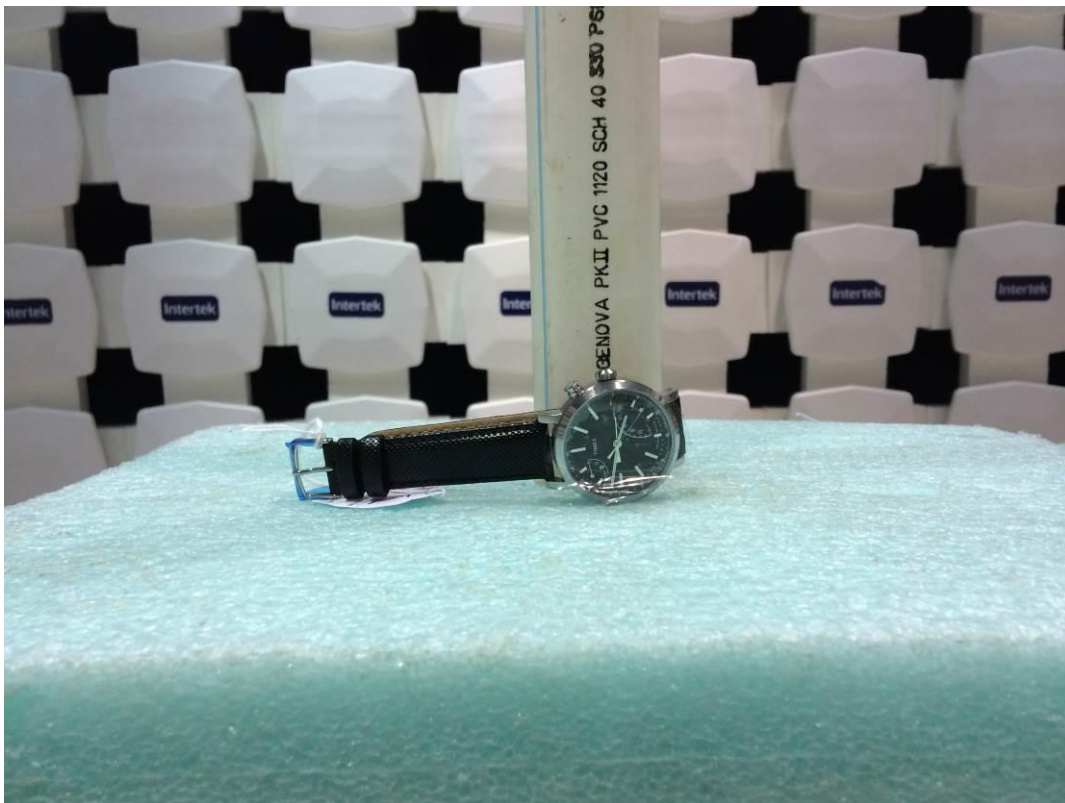
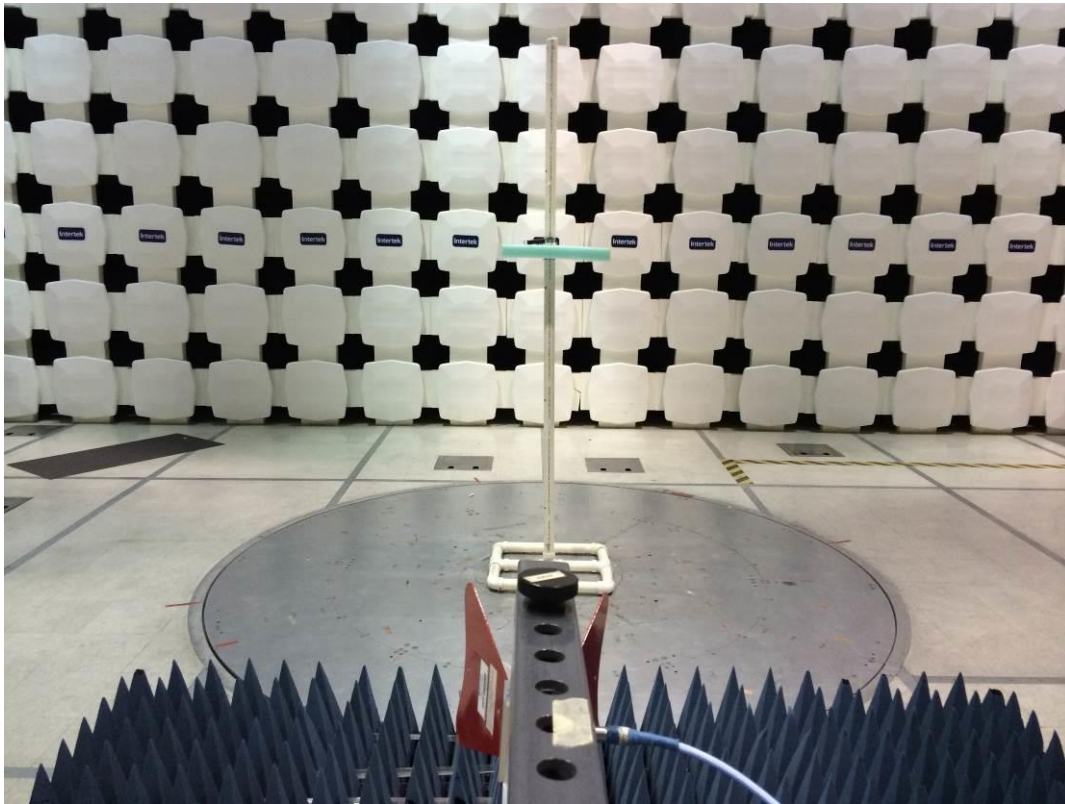
Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

10.3 Results:

The sample tested was found to Comply.

Spurious emissions at the band edges must be at least 20 dB lower than the fundamental field strength when measured with a 100 kHz bandwidth, without the need to be below the general limits of FCC Part 15 Section 15.209. Emissions in restricted bands must meet the general limits of FCC Part 15 Section 15.209.

10.4 Setup Photographs:



10.5 Plots/Data:

Special Radiated Emissions

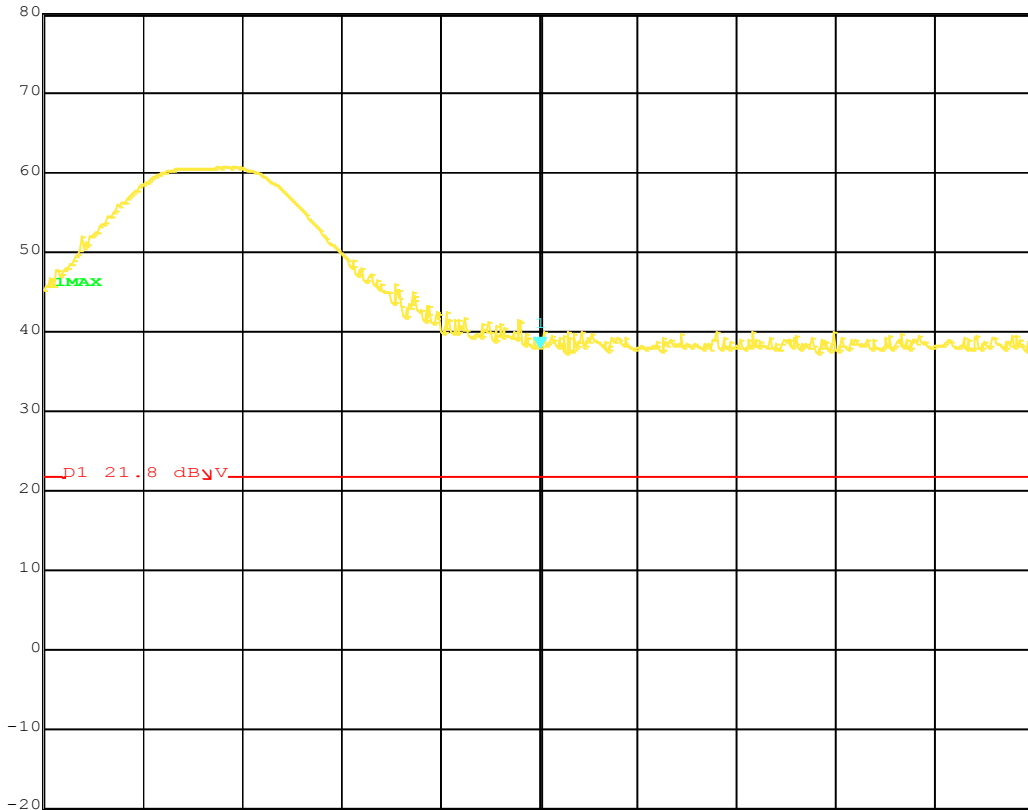
Company: Timex Group USA , Inc. Antenna & Cables: N Bands: N, LF, HF, SHF
 Model #: M372 Antenna: ETS001 01-14-16.txt ETS001 01-14-16.txt
 Serial #: QC 009-10 Cable(s): 145-416 3m Track B 1-15GHz Cable 10-04-15.txt NONE.
 Engineers: Vathana Ven Location: 10M Barometer: DAV004 Filter: NONE
 Project #: G102162220 Date(s): 08/07/15 Temp/Humidity/Pressure: 23 deg C 41% 1003 mB
 Standard: FCC Part 15 Subpart C 15.247
 Receiver: R&S ESI (145-128) 03-14-2016 Limit Distance (m): 3
 PreAmp: 145014 05-13-16.txt Test Distance (m): 3
 PreAmp Used? (Y or N): Y Voltage/Frequency: Battery Frequency Range: See below
 Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

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

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth
Upper Band Edge											
PK	V	2483.500	37.70	32.28	5.99	32.25	0.00	43.71	74.00	-30.29	1/3 MHz
AVG	V	2483.500	28.30	32.28	5.99	32.25	0.00	34.31	54.00	-19.69	1/3 MHz
PK	H	2483.500	39.68	32.28	5.99	32.25	0.00	45.69	74.00	-28.31	1/3 MHz
AVG	H	2483.500	28.00	32.28	5.99	32.25	0.00	34.01	54.00	-19.99	1/3 MHz

FCC IC

Marker 1 [T1] RBW 1 MHz RF Att 0 dB
 Ref Lvl 37.88 dBuV VBW 3 MHz
 80 dBuV 2.48350000 GHz SWT 5 ms Unit dBuV

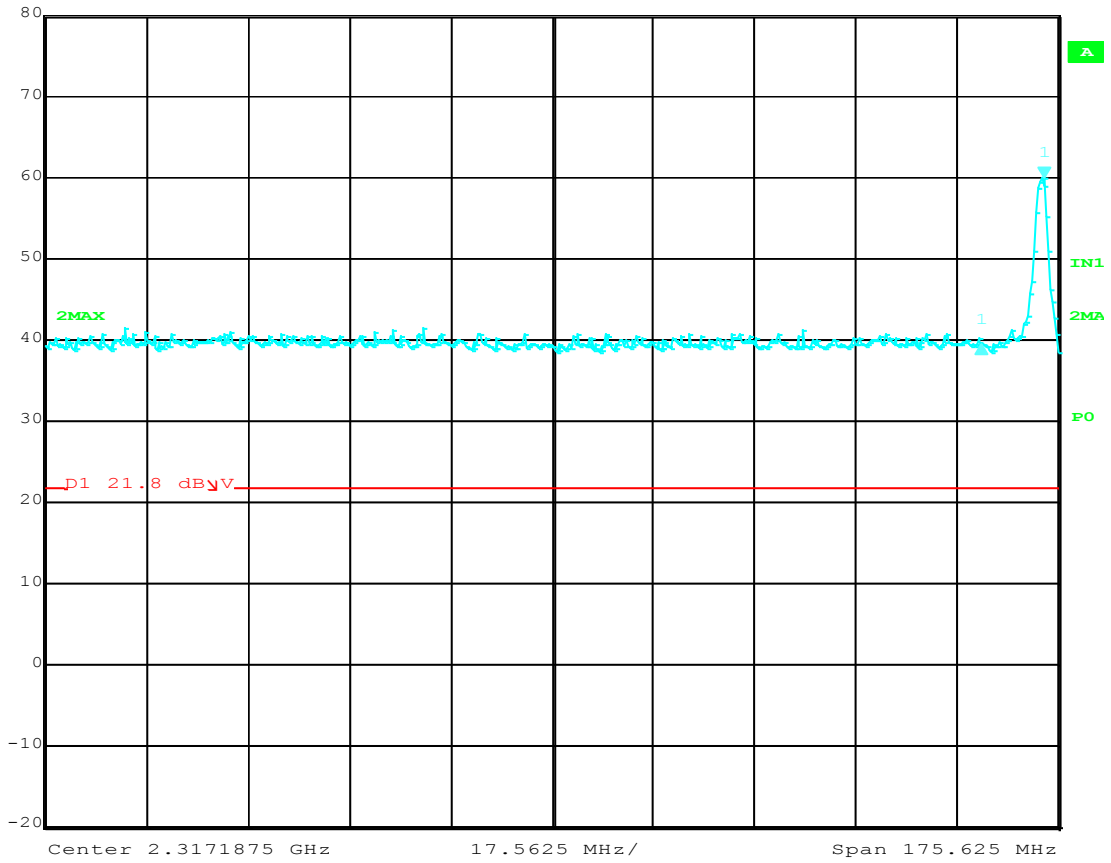


Center 2.4835 GHz 1.059080661 MHz/ Span 10.59080661 MHz

Date: 7.AUG.2015 20:34:44



	Delta 1 [T2]	RBW	1 MHz	RF Att	0 dB
Ref Lvl	-20.52 dB	VBW	3 MHz		
80 dB μ V	-10.91057114 MHz	SWT	5 ms	Unit	dB μ V



Date: 7.AUG.2015 20:48:46

Test Personnel: Vathana Ven *VSV*
 Supervising/Reviewing Engineer:
 (Where Applicable) N/A
 Product Standard: FCC Part 15 Subpart C
 Input Voltage: Battery Powered
 Pretest Verification w/ Ambient Signals or BB Source: BB Source

Test Date: 08/07/2015
 Limit Applied: Part 15.247
 Ambient Temperature: 22 °C
 Relative Humidity: 42 %
 Atmospheric Pressure: 1004 mbars

Deviations, Additions, or Exclusions: None

11 Digital Devices Radiated Spurious Emissions

11.1 Test Method

Tests are performed in accordance with CFR47 FCC Part 15:2015 Subpart C Section 15.247 (d) and CFR47 FCC Part 15:2015 Subpart C Section 15.209.

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)	Ucisp
Radiated Emissions, 10m	30-1000 MHz	4.6	6.3
Radiated Emissions, 3m	30-1000 MHz	5.3	6.3
Radiated Emissions, 3m	1-6 GHz	4.5	5.2
Radiated Emissions, 3m	6-15 GHz	5.2	5.5
Radiated Emissions, 3m	15-18 GHz	5.0	5.5
Radiated Emissions, 3m	18-40 GHz	5.0	5.5

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 μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ 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 μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

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

To convert from dB μ V to μ V or mV the following was used:

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

$$NF = \text{Net Reading in dB}\mu\text{V}$$

Example:

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

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

Alternately, when C5 Software is used, the "Level" includes all losses and gains and is compared directly in the "Margin" column to the "Limit". "AF" is the Antenna Factor; "PA+CL" are Preamp and Cable Loss. These are already accounted for in the "Level" column.

11.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
145106'	Bilog Antenna (30MHz - 5GHz)	Sunol Sciences	JB5	A111003	10/24/2014	10/24/2015
145013'	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2944A07027	10/11/2014	10/11/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-410'	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	10/04/2014	10/04/2015

Software Utilized:

Name	Manufacturer	Version
C5	Teseq	5.02.00 Build 5.26.46.46.

11.3 Results:

The sample tested was found to Comply.

FCC Part 15.247(d) – Non Restricted Band Radiated Spurious/Harmonics Limits

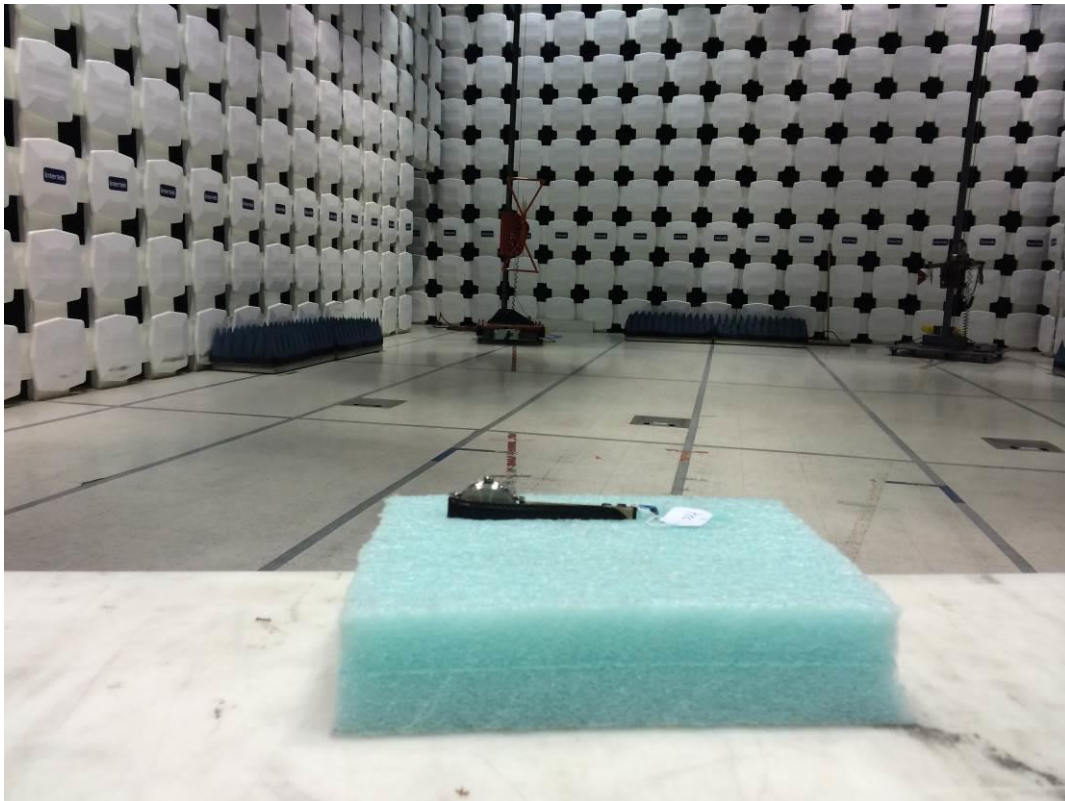
In any 100 kHz bandwidth outside the frequency band , the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

FCC Part 15.209(a)

Frequency (MHz)	Field Strength		Test Distance (meters)
	$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$	
30–88	100	40.00	3
88–216	150	43.52	3
216–960	200	46.02	3
Above 960	500	53.98	3

11.4 Setup Photographs:

30-1000 MHz Test Setup



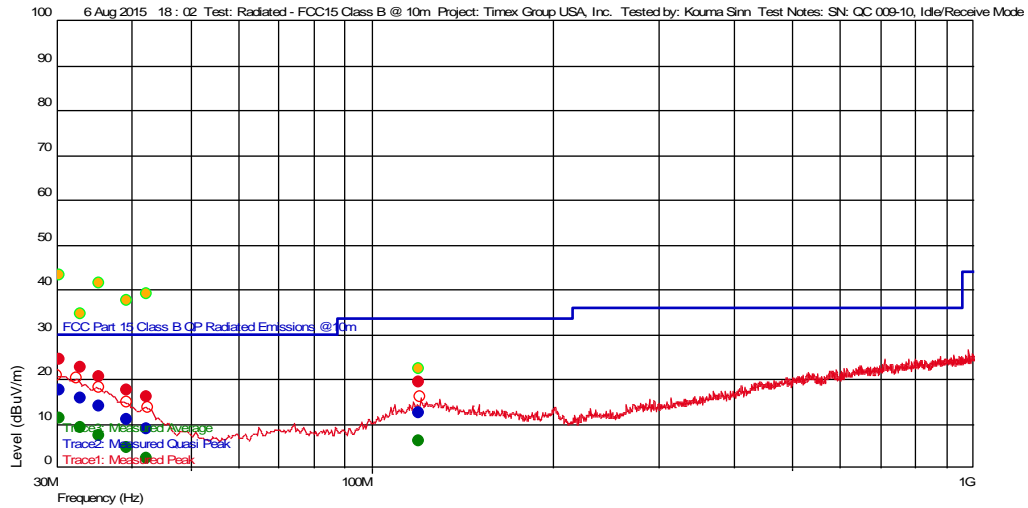
11.5 Plots/Data:

Idle/Receive Mode: 30-1000 MHz

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15 Class B @ 10m	
Project:	Timex Group USA, Inc.	
Test Notes:	SN: QC 009-10, Idle/Receive Mode	
Temperature:	24C	
Humidity:	38%, DAV004mbar	
Tested by:	Kouma Sinn	
Test Started:	6 Aug 2015 18 : 02	

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
120.280160758 M	19.31	13.900	-24.692	--	--		167	2.70	120 k	
42.410822102 M	16.05	11.954	-26.051	--	--		324	3.91	120 k	
39.219038142 M	17.40	14.303	-26.045	--	--	--	308	2.29	120 k	
35.421041701 M	20.57	17.021	-26.038	--	--		1	3.51	120 k	
32.982164609 M	22.66	18.911	-26.033	--	--		95	1.15	120 k	
30.355911824 M	24.20	20.786	-26.028	--	--	--	216	2.38	120 k	

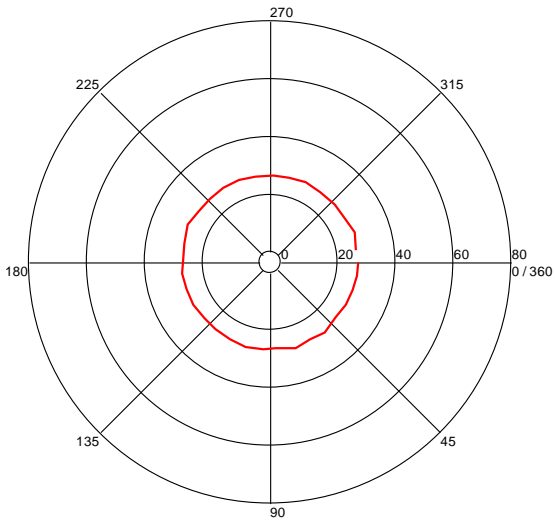
Trace2: Measured Quasi Peak

Frequency(Hz)	Level (dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin(dBuV/m)	Hor (--), Ver ()	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
42.410822102 M	8.82	11.954	-26.051	30.000	-21.18		324	3.91	120 k	
120.280160758 M	12.53	13.900	-24.692	33.520	-20.99		167	2.70	120 k	
39.219038142 M	10.86	14.303	-26.045	30.000	-19.14	--	308	2.29	120 k	
35.421041701 M	13.90	17.021	-26.038	30.000	-16.10		1	3.51	120 k	
32.982164609 M	15.69	18.911	-26.033	30.000	-14.31		95	1.15	120 k	
30.355911824 M	17.36	20.786	-26.028	30.000	-12.64	--	216	2.38	120 k	

Azimuth Plots

Turntable Plot (30.355911824 MHz)

Level (dBuV/m)

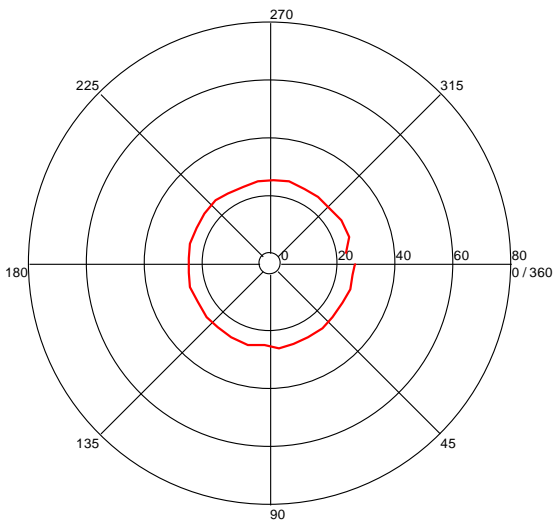


All Polarities

Azimuth (Degrees)

Turntable Plot (32.982164609 MHz)

Level (dBuV/m)

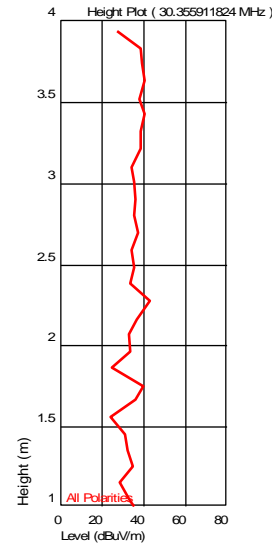


All Polarities

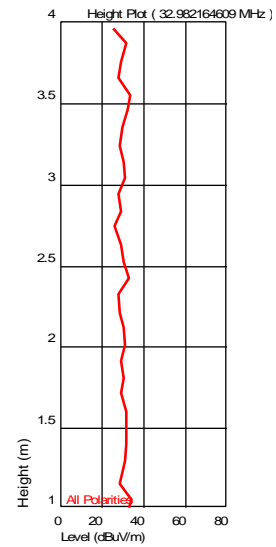
Azimuth (Degrees)

Turntable Plots

Height Plot (30.355911824 MHz)

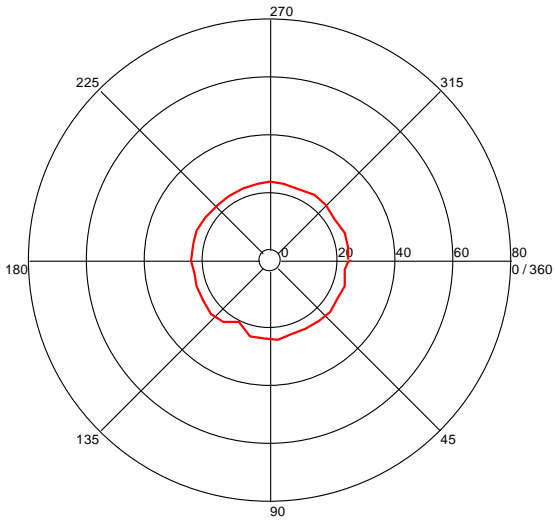


Height Plot (32.982164609 MHz)



Turntable Plot (35.421041701 MHz)

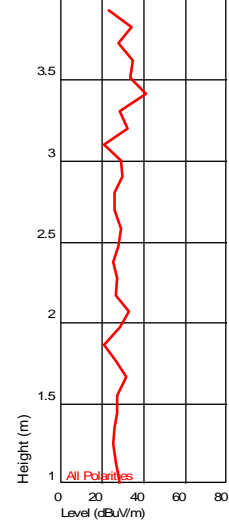
Level (dBuV/m)



All Polarities

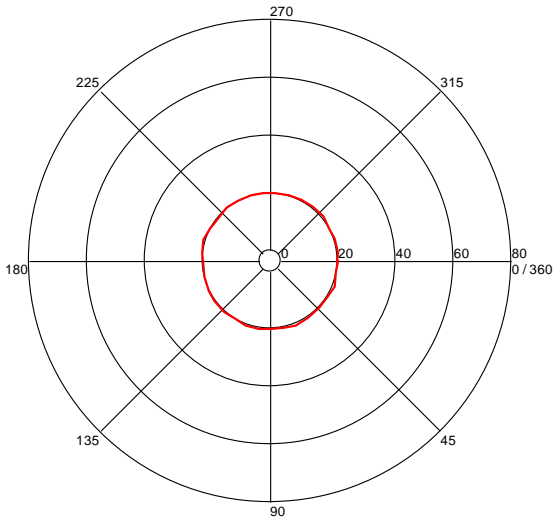
Azimuth (Degrees)

Height Plot (35.421041701 MHz)



Turntable Plot (39.219038142 MHz)

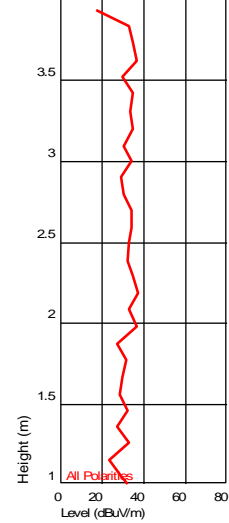
Level (dBuV/m)



All Polarities

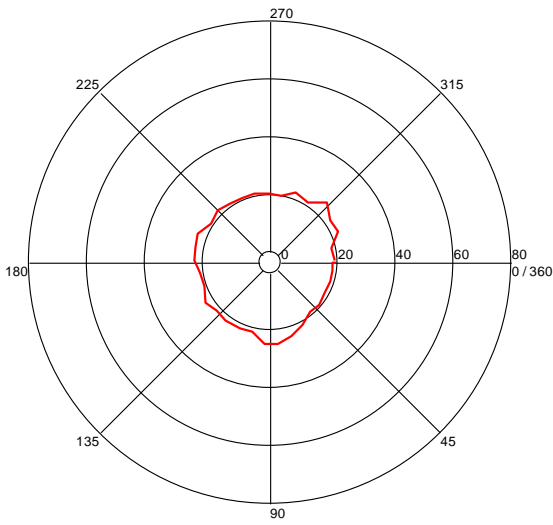
Azimuth (Degrees)

Height Plot (39.219038142 MHz)



Turntable Plot (42.410822102 MHz)

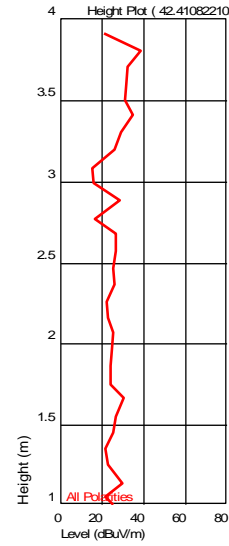
Level (dBuV/m)



All Polarities

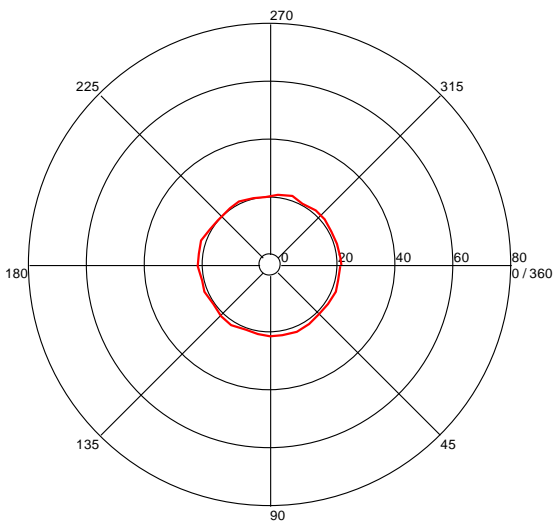
Azimuth (Degrees)

Height Plot (42.410822102 MHz)



Turntable Plot (120.280160758 MHz)

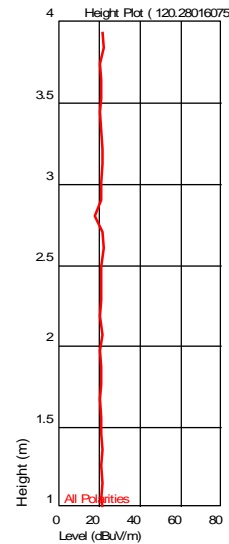
Level (dBuV/m)



All Polarities

Azimuth (Degrees)

Height Plot (120.280160758 MHz)



Test Personnel: Kouma Sinn *KPS*
 Supervising/Reviewing Engineer: _____
 (Where Applicable) N/A
 Product Standard: FCC Part 15.247
 Input Voltage: Battery Powered
 Pretest Verification w/ Ambient Signals or BB Source: BB Source

Test Date: 08/06/2015
 Limit Applied: See Report Section 11.3
 Ambient Temperature: 24 °C
 Relative Humidity: 38 %
 Atmospheric Pressure: 1003 mbars

Deviations, Additions, or Exclusions: None

12 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	08/25/2015	102218261BOX-001	KPS <i>KPS</i>	MFM <i>MFM</i>	Original Issue
1	09/16/2015	102218261BOX-001b	KPS <i>KPS</i>	MFM <i>MFM</i>	Output power correction page 5, 15, and RF Exposure on 17