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Project 19286-15

**Pinnacle Peak Holding Corporation  
dba Setcom Corporation**

**LiberatorMAX**

**Wireless Certification Report  
FCC 15.247 & RSS-247**

Prepared for:

Setcom Corporation  
3019 Alvin Devane Blvd.  
Suite 560  
Austin, Texas 78741

By

Professional Testing (EMI), Inc.  
1601 North A.W. Grimes Blvd., Suite B  
Round Rock, Texas 78665

13 Nov 2018

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Reviewed by

A handwritten signature in black ink, appearing to read 'Larry Finn'.

Larry Finn  
Chief Technical Officer

Written by

A handwritten signature in black ink, appearing to read 'Eric Lifsey'.

Eric Lifsey  
EMC Engineer

**Revision History**

<b>Revision Number</b>	<b>Description</b>	<b>Date</b>
Final01	With final model designation LiberatorMAX.	19 Oct 2018
Final02	Added 99% bandwidth measurements.	13 Nov 2018
Final03	Added details on non-restricted band spurious limit calculation.	13 Nov 2018

**Errata:**

All references to Multitalk or MULTITALK apply to the model designated LiberatorMAX.

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# Compliance Certificate

Applicant	Device & Test Identification
Pinnacle Peak Holding Corporation dba Setcom Corporation 3019 Alvin Devane Blvd. Suite 560 Austin, Texas 78741 Certificate Date: 18 Oct 2018	FCC ID: TLV-MULTITALK Industry Canada ID: 6143A-MULTITALK Model(s): LiberatorMAX Laboratory Project ID: 19286-15

The device named above was tested utilizing the following documents and found to be in compliance with the required criteria:

Requirement	Reference	Detail
FCC 47 CFR Part 15 C	15.247	Operation within the bands <u>902-928 MHz</u> , 2400-2483.5 MHz, and 5725-5850 MHz.
FCC 47 CFR Part 15 C	15.209	Radiated emission limits; general requirements.
FCC 47 CFR Part 15 C	15.205	Restricted Bands of Operation
KDB 558074 D01	DR01	DTS Measurement Guidance v03r02
KDB 412172	D01	Guidelines for Determining the ERP and EIRP of an RF Transmitting System
OET Bulletin 65*	Edition 97-01, and Supplement C, Ed. 01-01	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields
RSS-247	Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS-Gen	Issue 4	General Requirements and Information for the Certification of Radio Apparatus
RSS-102	Issue 4	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

\*MPE is reported separately from this document. \*\*Corresponding RSS references are listed in the body of the report.

I, Eric Lifsey, for Professional Testing (EMI), Inc., being familiar with the above requirements and test procedures have reviewed the test setup, measured data, and this report. I believe them to be true and accurate.

Eric Lifsey  
EMC Engineer

This report has been reviewed and accepted by the Applicant. The undersigned is responsible for ensuring that this device will continue to comply with the requirements listed above.

\_\_\_\_\_  
Representative of Applicant

## 1.0 Introduction

### 1.1 Scope

This report describes the extent to which the equipment under test (EUT) conformed to the intentional radiator requirements of the United States and Canada.

Professional Testing (EMI), Inc., (PTI) follows the guidelines of National Institute of Standards and Technology (NIST) for all uncertainty calculations, estimates, and expressions thereof for electromagnetic compatibility testing.

### 1.2 EUT Description

Table 1.2.1: Equipment Under Test		
Manufacturer / Model	Serial #	Description
Setcom Model: LiberatorMAX	none	902 to 928 MHz DTS transceiver; using OFDM with proprietary protocols.

Table 1.2.2: Support Equipment		
Manufacturer / Model	Serial #	Description
None		

The EUT is a battery powered headset/mic that provides real time voice communication for a team of individuals. Nominal battery voltage is 3.7 VDC.

The EUT electronics are on a single circuit board. It fits inside a headphone enclosure. The EUT connects by a wire over the headset frame to the other headphone where a monopole antenna is connected on a RP-SMA connector.

### 1.3 EUT Operation

The EUT was exercised in a manner consistent with normal operations.

### 1.4 Modifications to Equipment

No modifications were made to the EUT during the performance of the test program.

### 1.5 Test Site

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC 459644, IC 3036B-1) in Austin, Texas. The site is registered with the FCC under Section 2.948 and Industry Canada per RSS-GEN, and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnet Road, Austin, Texas 78758, while the main office is located at 1601 North A.W. Grimes Boulevard, Suite B, Round Rock, Texas, 78665.

### 1.6 Radiated Measurements

Radiated levels are determined as follows:

**Raw Measured Level + Antenna Factor + Cable Losses – Amplifier Gain = Corrected Level**

Conducted RF levels, if applicable, are determined as follows:

**Raw Measured Level + Attenuator Factor + Cable Losses = Corrected Level**

Conducted mains levels are determined as follows:

**Raw Measured Level + LISN Factor + Cable/Filter/Limiter Losses = Corrected Level**

Additionally, measurement distance extrapolation factors are applied and documented where used.

## 1.7 Applicable Documents and Clauses

Table 1.7.1: Applicable Documents	
Document	Title
47 CFR	Part 15 – Radio Frequency Devices Subpart C -Intentional Radiators
RSS-247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS-Gen Issue 4	General Requirements and Information for the Certification of Radio Apparatus
ANSI C63.10:2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

Table 1.7.2: Applicable Clauses		
Parameter	FCC Part 15 Rule Paragraphs	IC RSS References
Transmitter Characteristics	15.247	RSS-247 5.2 (DTS) & 5.4, RSS-Gen
Bandwidth	15.247(a)(1), 2.1049, KDB 558074 D01	RSS-Gen 4.6
Spurious Emission	15.247, 15.209, 15.205	RSS-247 5.5, RSS-GEN 4.9, 4.10
Band Edge	15.247, 15.205	RSS-247 5.5, RSS-Gen 4.9
Antenna Requirement	15.203	RSS-Gen 8.3

## 2.0 Fundamental Power

### 2.1 Test Procedure

Peak power is measured using radiated means and without modulation. The transmitter hopping sequence is disabled to operate on a single channel for the measurement.

### 2.2 Test Criteria

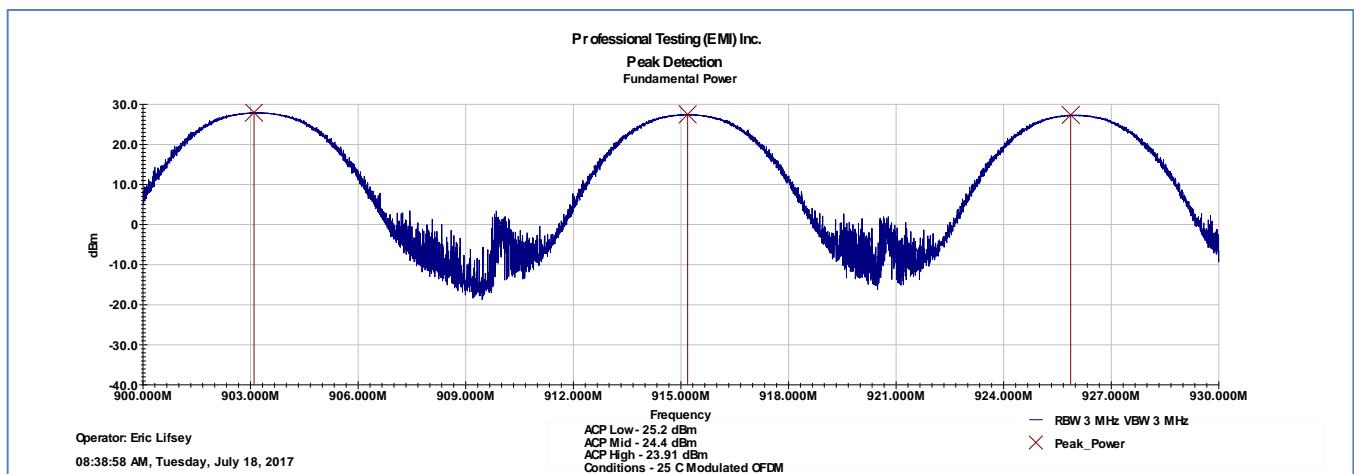
47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date
15.247(a)(3) // RSS-247 5.2	Fundamental Power Conducted Limits 1 W Limit Restated as Field: 125.23 dB $\mu$ V/m @ 3 m	18 Jul 2017

### 2.3 Test Results, Peak Power

Table 2.3.1 Power, Peak, Conducted					
Frequency MHz	Measured Peak Power At Antenna Port dBm*	Actual Channel Power At Antenna Port dBm**	Antenna Gain dBi	Power Restated as EIRP dBm	Maximum Measured Peak Power Restated as EIRP mW
903.2	27.94	25.2	2.0	27.2	525
915.2	27.24	24.4	2.0	26.4	437
926.0	27.34	23.9	2.0	25.9	389

\*Measured in 3 MHz RBW, 3 MHz VBW. \*\*Measured in 1.2 MHz ACP band.

The EUT satisfied the requirements.



### 2.4 Test Results, Duty Cycle

Measurement is based on intervals not to exceed 100 msec. Maximum transmitter on time is divided by the lesser of 100 msec or the actual measured minimum transmitter interval time. The result is



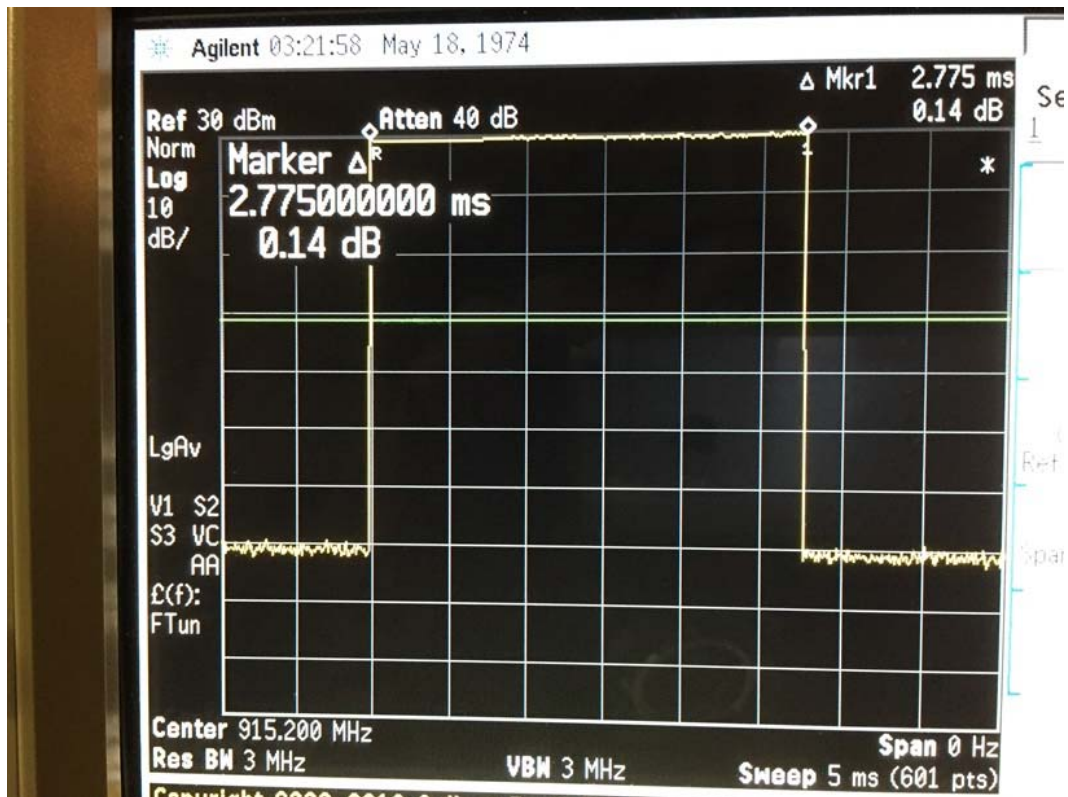
converted to dB and applied as needed to peak measurements of transmitter artifacts to determine average power. This is not a pass/fail measurement.

**Table 2.4.1 Duty Cycle Results and Average Duty Cycle Factor Result**

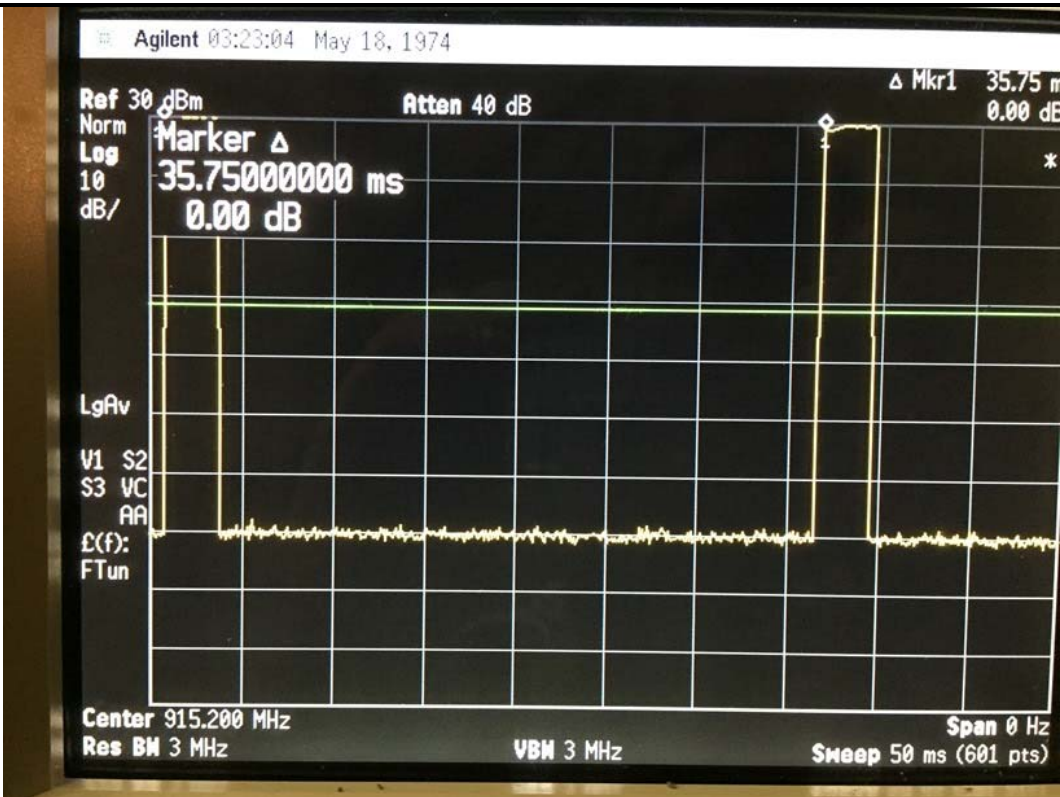
Total Measured On Time (msec)	Measured Time Interval (msec)	Duty Cycle Factor Calculation	Result (dB)	Duty Cycle Factor Allowed (dB)
2.775	35.75	$= 20 * \text{Log}_{10} (2.775 \text{ msec} / 35.75 \text{ msec})$	-22.4	-20

For exposure consideration, the factor is  $-22.4 / 2 = -11.2$  dB

The allowed duty cycle factor is applied to peak measured harmonic signals to find average levels.



**Transmit Time**



Transmit Interval

### 3.0 Power Spectral Density

#### 3.1 Test Procedure

A spectrum analyzer is either connected directly to the EUT or used by radiated means to measure the fundamental emission. It is adjusted to measure the power spectral density in the specified resolution bandwidth.

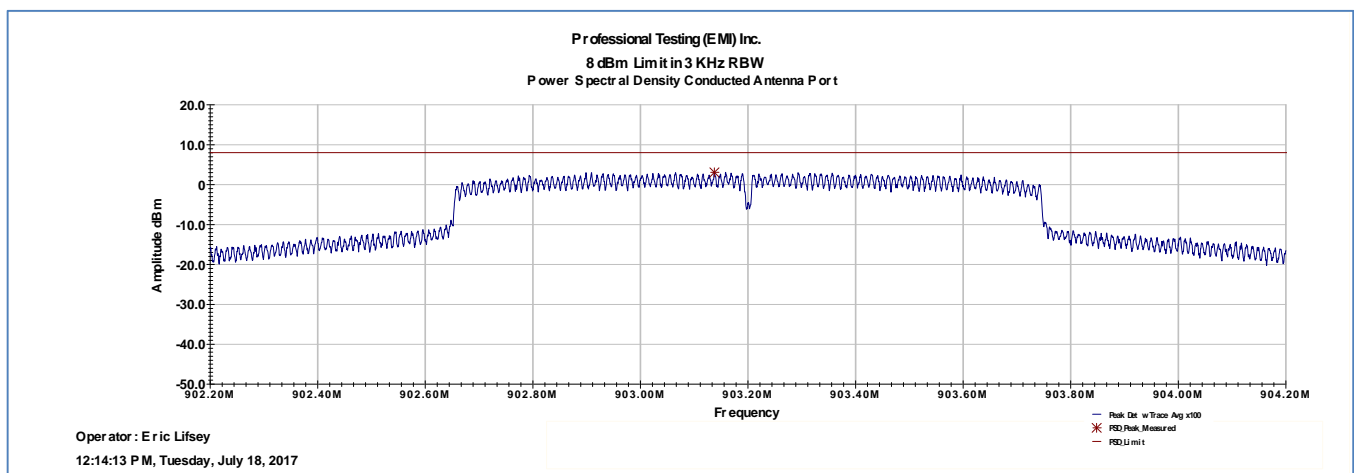
#### 3.2 Test Criteria

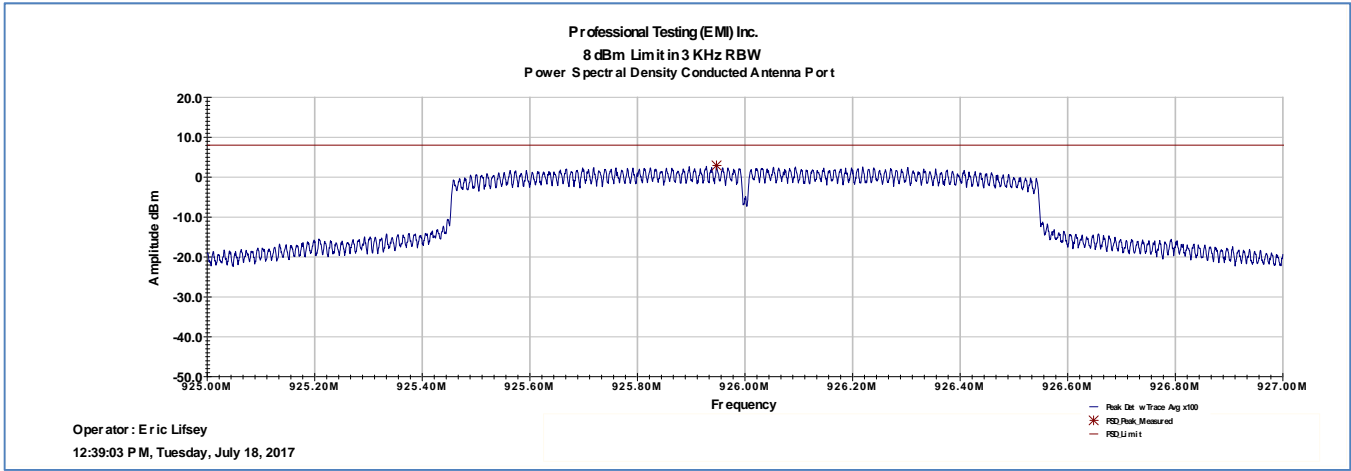
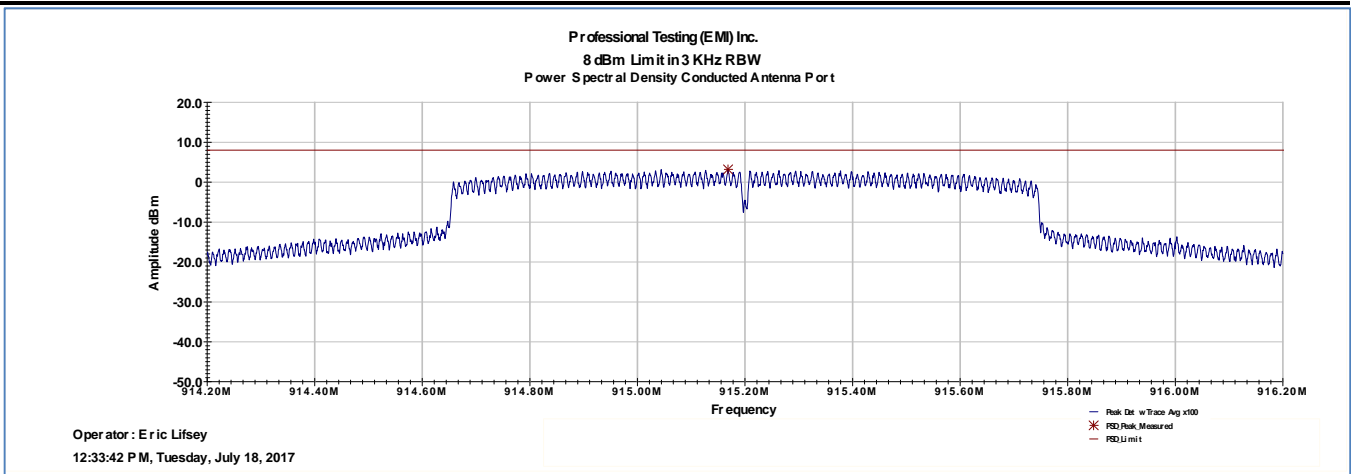
47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date
15.247(e) // RSS-247, 5.2	Power Spectral Density, Conducted Limit: 8 dBm / 3 kHz Restated as field strength limit: 103.23 dB $\mu$ V/m at 3 m	18 Jul 2017

#### 3.3 Test Results

Table 3.3.1 Power Spectral Density, Conducted	
Frequency MHz	Maximum Measured PSD dBm
903.2	3.05
915.2	3.18
926.0	2.92

The EUT satisfied the requirements.





## 4.0 Occupied Bandwidth

### 4.1 Test Procedure

Bandwidth is measured by radiated means. A recording of the results is included.

### 4.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
14.247(a)(2), 2.1049, KDB 558074 D01 // RSS-Gen 4.6	Bandwidth, 6 dB, 20 dB	18 Jul 2017 13 Nov 2018

### 4.3 Test Results

The bandwidth measurement is used to verify DTS characteristics and/or for general reporting for agency application.

The EUT satisfied the requirements.

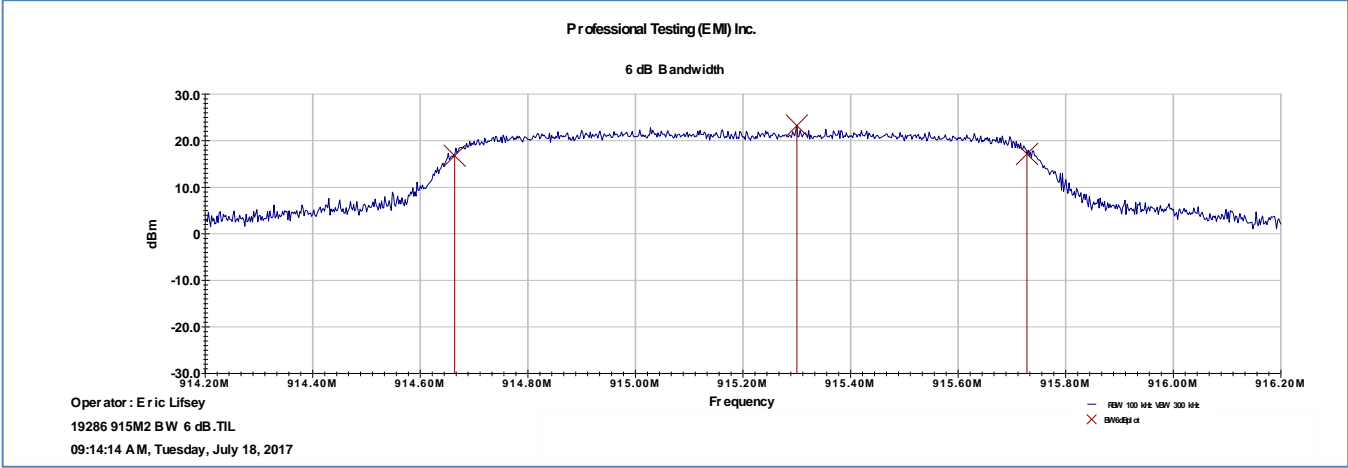
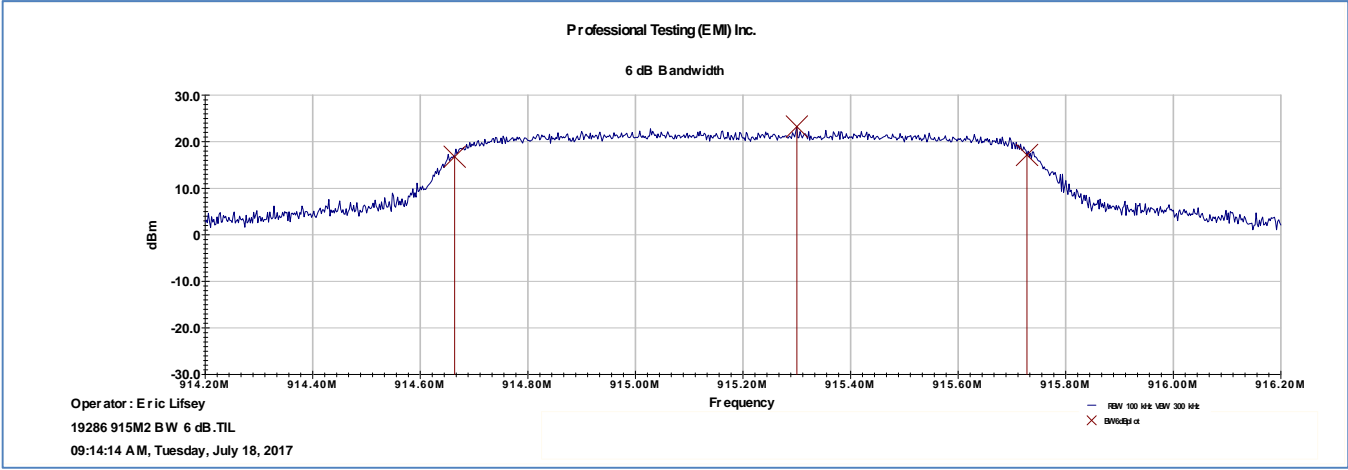
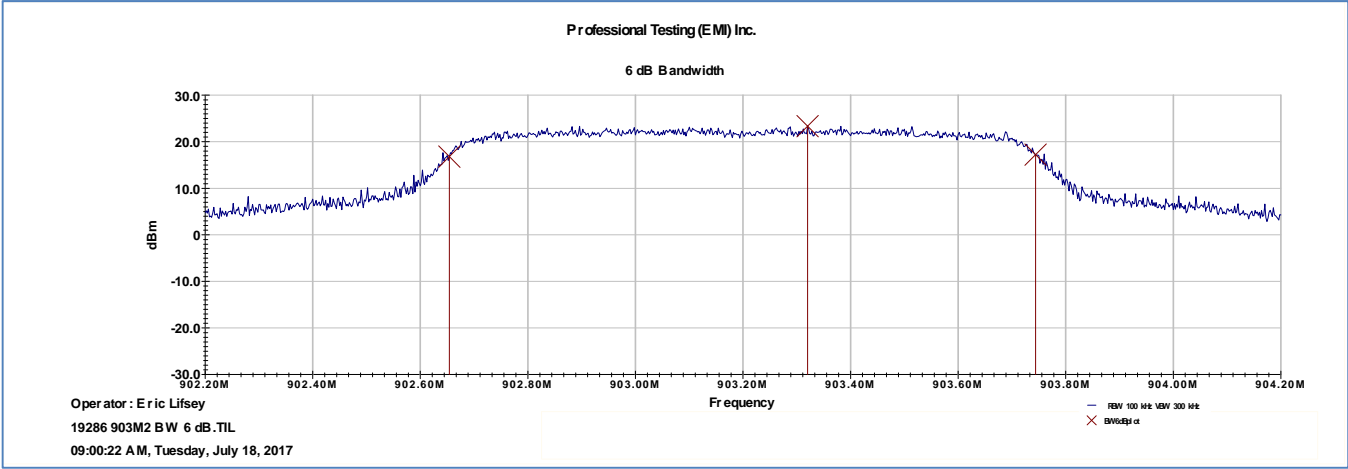
Table 4.3.1 Bandwidth 6 dB, Minimum 500 kHz in 100 kHz RBW			
Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Reported Minimum BW (kHz)
1090	1064	1080	1064

Table 4.3.2 Bandwidth 20 dB, Measure and Report			
Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Reported Maximum BW (kHz)
1700	1488	1376	1700

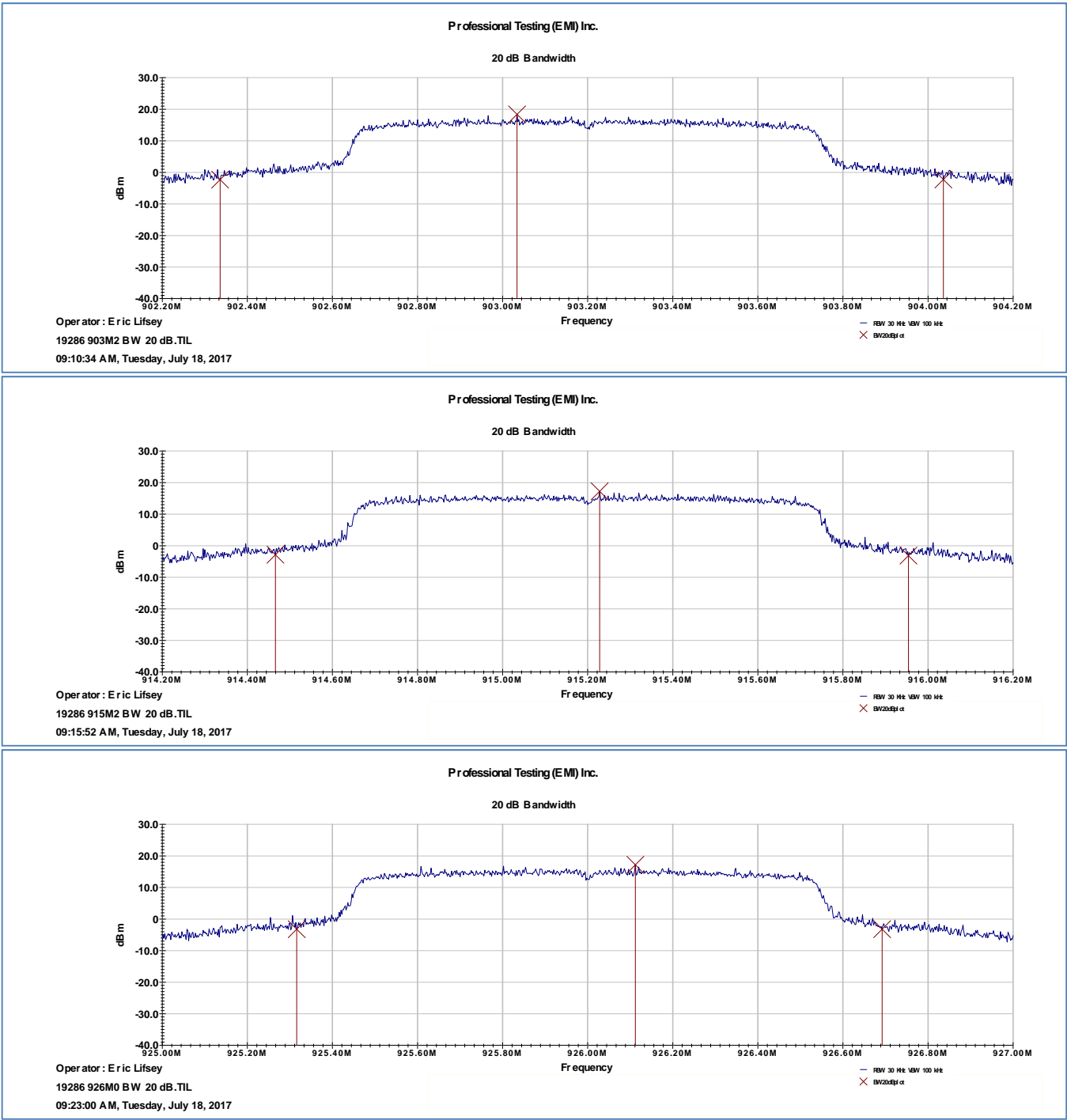
Table 4.3.3 Bandwidth 99%, Measure and Report			
Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Reported Maximum BW (kHz)
1604	1524	1357	1604

Plotted measurements appear on the following pages.

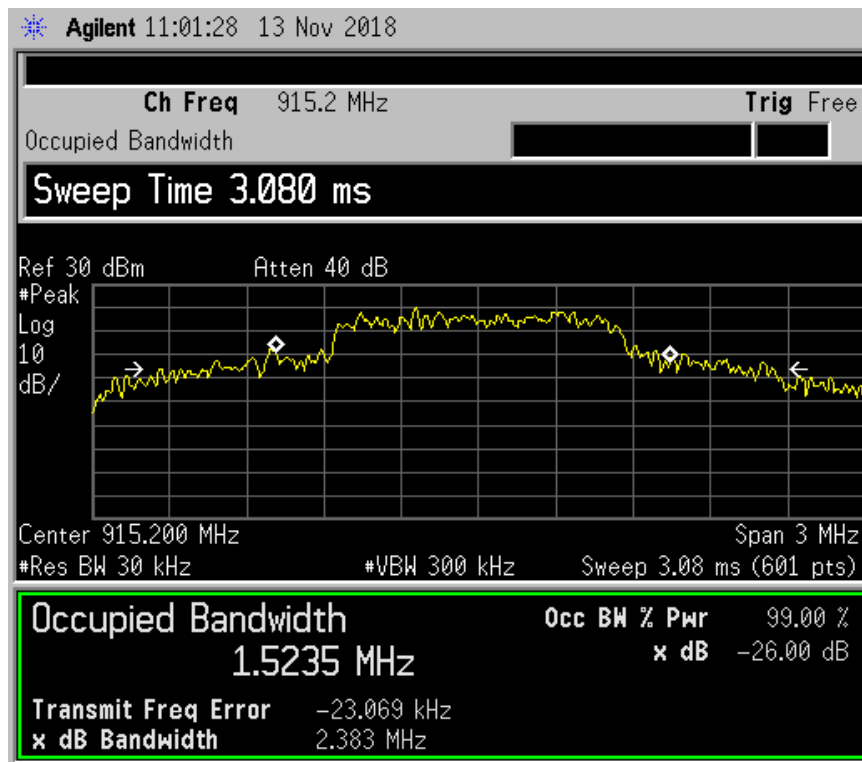
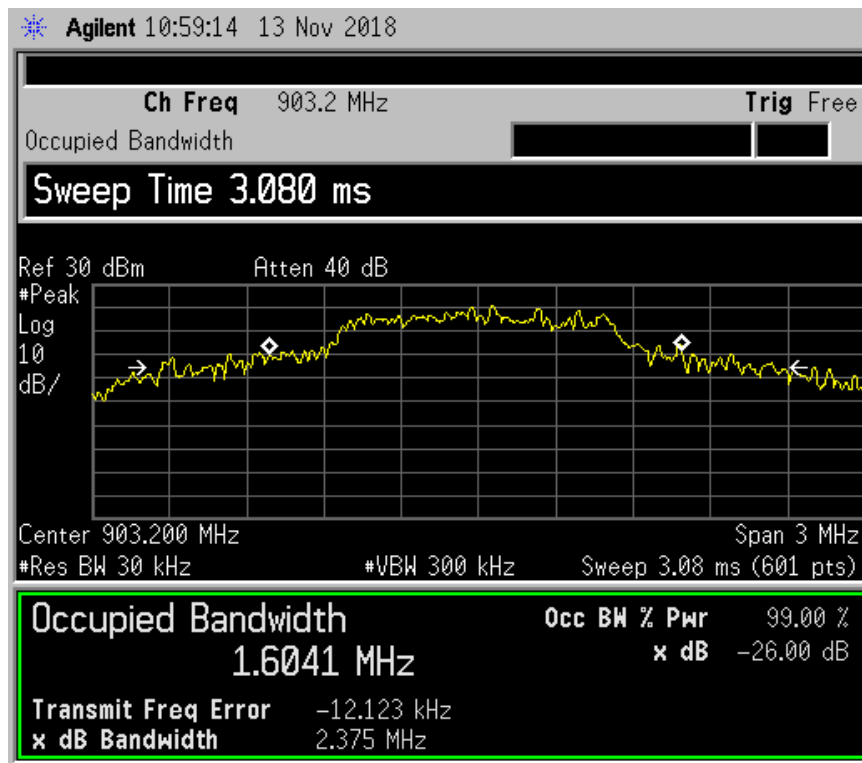
4.3.1 Bandwidth Plots, 6 dB



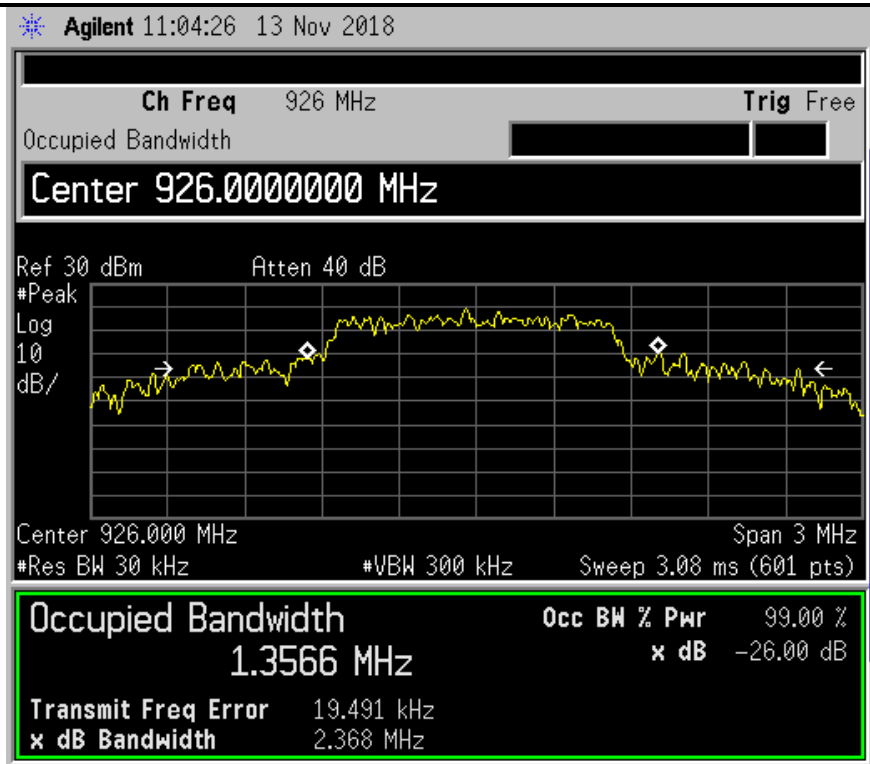
### 4.3.2 Bandwidth Plots, 20 dB



### 4.3.3 Bandwidth Plots, 99%





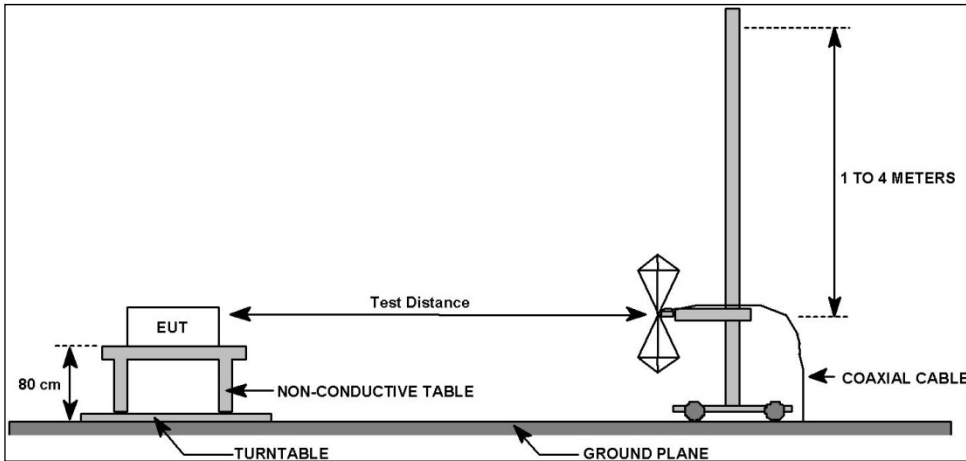


## 5.0 Radiated Spurious Emissions, Receive Mode

### 5.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The EUT was centered on a rotating turntable. Measurements below 1 GHz were taken at a test distance of 10 meters from the measurement antenna. Above 1 GHz the measurement distance was 3 meters.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Above 1 GHz peak measurements were taken and average measured where appropriate and 1 MHz resolution bandwidth. A diagram showing the test setup appears below.



### 5.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 // RSS-247 5.5, RSS-Gen 4.9 & 4.10	Field Strength of Radiated Spurious/Harmonic Emissions Receive Mode	29 Jan 2018

### 5.3 Test Results

The EUT was tuned to the middle channel and placed in receive mode.

The EUT satisfied the criteria.

## 5.3.1 Up to 1 GHz

## Professional Testing, EMI, Inc.

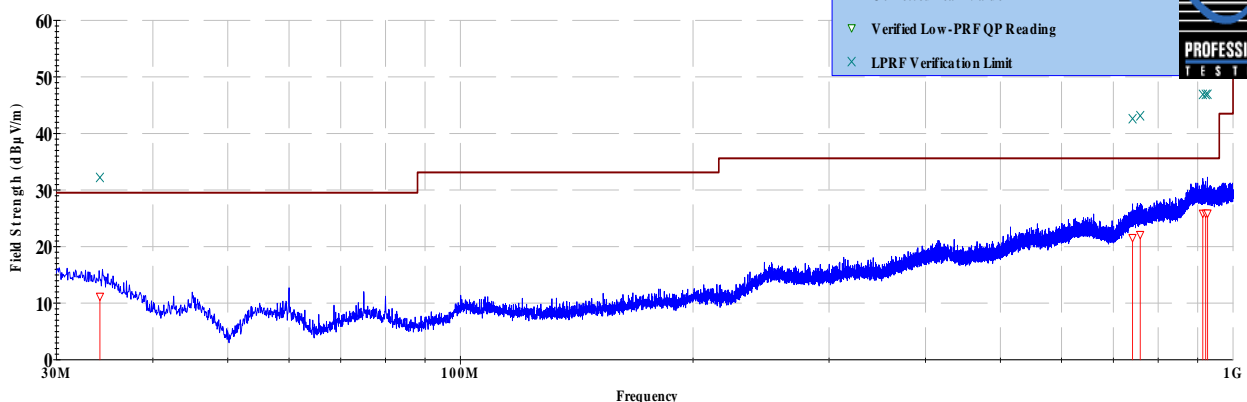
<b>Test Method:</b>	ANSI C63.4: 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
<b>In accordance with:</b>	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits		
<b>Section:</b>	15.109		
<b>Test Date(s):</b>	7/19/2019	<b>EUT Serial #:</b>	5
<b>Customer:</b>	Setcom	<b>EUT Part #:</b>	0
<b>Project Number:</b>	19286	<b>Test Technician:</b>	Eric Lifsey
<b>Purchase Order #:</b>	0	<b>Supervisor:</b>	Lisa Arndt
<b>Equip. Under Test:</b>	Multitalk	<b>Witness' Name:</b>	0

## Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:		3.7 VDC			EUT Power Frequency:		0 N/A		
Antenna Orientation:		Vertical			Frequency Range:		30MHz to 1GHz		
EUT Mode of Operation:					Receive mode, middle channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
34.1609	10	145	2.49	Quasi-peak	23.1	11.213	29.5	-18.3	Pass
741.313	10	156	1.48	Quasi-peak	21.6	21.597	35.6	-14.0	Pass
758.678	10	40	2.31	Quasi-peak	21.5	22.133	35.6	-13.5	Pass
914.337	10	37	3.54	Quasi-peak	21.1	25.901	35.6	-9.7	Pass
921.989	10	241	2.35	Quasi-peak	21.1	25.894	35.6	-9.7	Pass
927.168	10	144	3.78	Quasi-peak	21.1	25.913	35.6	-9.7	Pass

Professional Testing, EMI, Inc  
Radiated Emissions, 10m Distance  
30MHz - 1GHz Vertical Polarity Measured Emissions



Operator: Eric Lifsey

19286'RE071917'Run04'MidCh'RxMode.tif

04:49:07 PM, Wednesday, July 19, 2017

Mode: Receive mid chan  
Power: 3.7 V battery  
Sample: 5

EUT: Multitalk

Project Number: 19286

Client: Setcom

≤ 1GHz Vertical Antenna Polarity Measured Emissions

## Professional Testing, EMI, Inc.

<b>Test Method:</b>	ANSI C63.4: 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
<b>In accordance with:</b>	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits		
<b>Section:</b>	15.109		
<b>Test Date(s):</b>	7/19/2019	<b>EUT Serial #:</b>	5
<b>Customer:</b>	Setcom	<b>EUT Part #:</b>	0
<b>Project Number:</b>	19286	<b>Test Technician:</b>	Eric Lifsey
<b>Purchase Order #:</b>	0	<b>Supervisor:</b>	Lisa Arndt
<b>Equip. Under Test:</b>	Multitalk	<b>Witness' Name:</b>	0

### Radiated Emissions Test Results Data Sheet

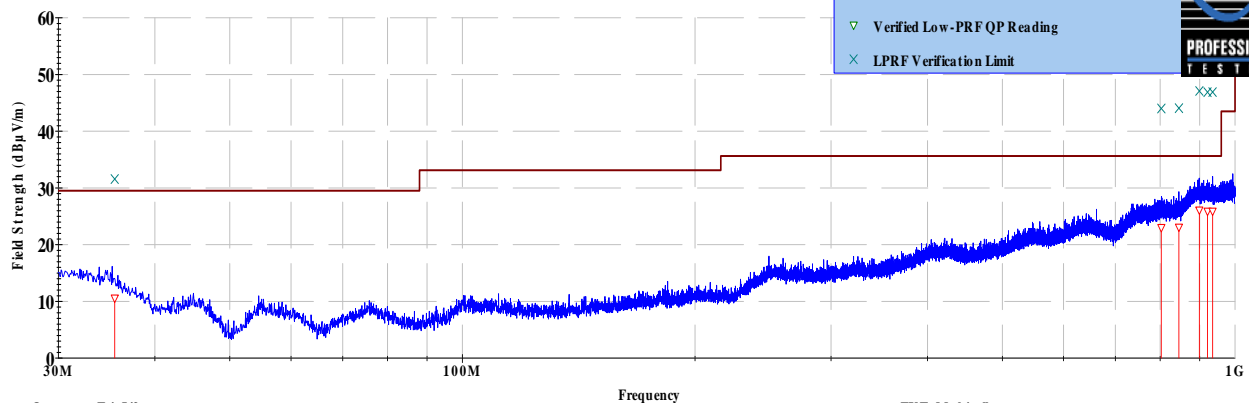
Page: 1 of 1

EUT Line Voltage:		3.7 VDC			EUT Power Frequency:		0 N/A		
Antenna Orientation:		Horizontal			Frequency Range:		30MHz to 1GHz		
EUT Mode of Operation:					Receive mode, middle channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
35.4829	10	84	3.6	Quasi-peak	22.9	10.548	29.5	-19.0	Pass
803.111	10	286	3.35	Quasi-peak	21.3	22.996	35.6	-12.6	Pass
846.165	10	163	1.35	Quasi-peak	21.3	23.055	35.6	-12.5	Pass
899.118	10	33	3.9	Quasi-peak	21.3	26.093	35.6	-9.5	Pass
921.547	10	270	3.62	Quasi-peak	21.1	25.874	35.6	-9.7	Pass
935.538	10	237	3.63	Quasi-peak	21	25.894	35.6	-9.7	Pass

#### Professional Testing, EMI, Inc

Radiated Emissions, 10m Distance

30MHz - 1GHz Horizontal Polarity Measured Emissions



Operator: Eric Lifsey

19286'RE071917'Run04'MidCh'RxMode.tif

04:49:07 PM, Wednesday, July 19, 2017

Mode: Receive mid chan  
Power: 3.7 V battery  
Sample: 5

EUT: Multitalk

Project Number: 19286

Client: Setcom

≤ 1GHz Horizontal Antenna Polarity Measured Emissions

## 5.3.2 Up to 5 GHz

Professional Testing, EMI, Inc.									
<b>Test Method:</b>		ANSI C63.4: 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz							
<b>In accordance with:</b>		FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits							
<b>Section:</b>		15.109							
<b>Test Date(s):</b>		7/19/2019			<b>EUT Serial #:</b>		5		
<b>Customer:</b>		Setcom			<b>EUT Part #:</b>		0		
<b>Project Number:</b>		19286			<b>Test Technician:</b>		Eric Lifsey		
<b>Purchase Order #:</b>		0			<b>Supervisor:</b>		Lisa Arndt		
<b>Equip. Under Test:</b>		Multitalk			<b>Witness' Name:</b>		0		
Radiated Emissions Test Results Data Sheet							Page: 1 of 1		
<b>EUT Line Voltage:</b>		3.7 VDC			<b>EUT Power Frequency:</b>		0 N/A		
<b>Antenna Orientation:</b>		Vertical			<b>Frequency Range:</b>		Above 1GHz		
<b>EUT Mode of Operation:</b>					Receive mode, middle channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
1229.69	3	308	1.88	Average	36.3	24.265	54.0	-29.7	Pass
2018.21	3	190	3.01	Average	35.4	26.081	54.0	-27.9	Pass
2599.48	3	61	2.57	Average	35	26.453	54.0	-27.5	Pass
3813.41	3	11	1.63	Average	34.4	27.825	54.0	-26.1	Pass
4182.68	3	85	3.31	Average	33.9	28.473	54.0	-25.5	Pass
4494.37	3	74	2.47	Average	32.9	28.311	54.0	-25.6	Pass

**Professional Testing, EMI, Inc**  
Radiated Emissions, 3m Distance  
1-18GHz VerticalPolarity Measured Emissions

Operator: Eric Lifsey  
19286'RE071917'Run04'MidCh'RxMode.tif  
05:40:16 PM, Wednesday, July 19, 2017

Mode: Receive mid chan  
Power: 3.7 V battery  
Sample: 5

EUT: Multitalk  
Project Number: 19286  
Client: Setcom

— Average Limit Level  
▽ Corrected Average Reading  
— Peak Limit Level  
— Corrected Peak Reading

**PROFESSIONAL TESTING**

**> 1GHz Vertical Antenna Polarity Measured Emissions**

## Professional Testing, EMI, Inc.

<b>Test Method:</b>	ANSI C63.4: 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
<b>In accordance with:</b>	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits		
<b>Section:</b>	15.109		
<b>Test Date(s):</b>	7/19/2019	<b>EUT Serial #:</b>	5
<b>Customer:</b>	Setcom	<b>EUT Part #:</b>	0
<b>Project Number:</b>	19286	<b>Test Technician:</b>	Eric Lifsey
<b>Purchase Order #:</b>	0	<b>Supervisor:</b>	Lisa Arndt
<b>Equip. Under Test:</b>	Multitalk	<b>Witness' Name:</b>	0

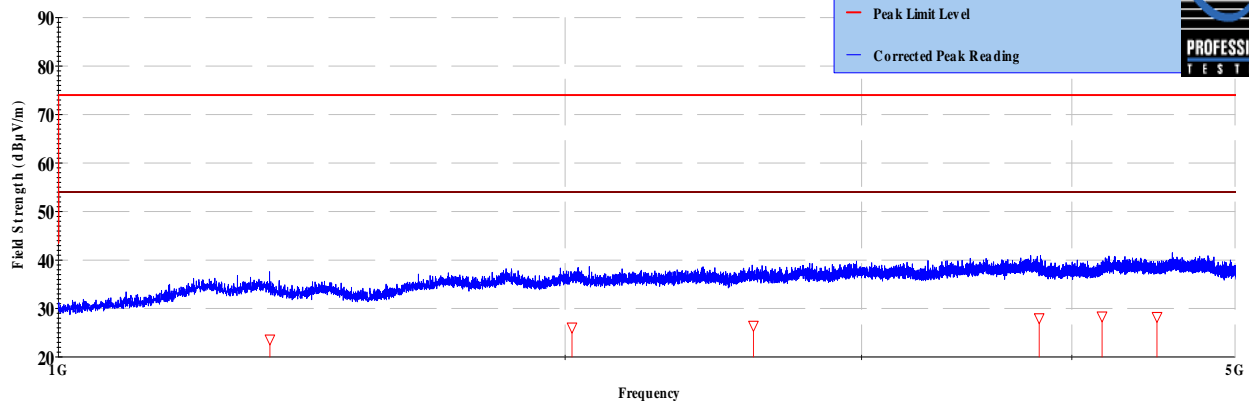
### Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:		3.7 VDC			EUT Power Frequency:		0 N/A		
Antenna Orientation:		Horizontal			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Receive mode, middle channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
1335.57	3	204	1.87	Average	35.6	23.655	54.0	-30.3	Pass
2018.94	3	329	2.94	Average	35.4	26.119	54.0	-27.8	Pass
2587.98	3	217	3.39	Average	35.1	26.478	54.0	-27.5	Pass
3825.57	3	189	2.45	Average	34.6	28.037	54.0	-25.9	Pass
4168.51	3	156	3.37	Average	33.9	28.402	54.0	-25.6	Pass
4494.76	3	228	1.09	Average	32.9	28.289	54.0	-25.7	Pass

#### Professional Testing, EMI, Inc

Radiated Emissions, 3m Distance  
1-18GHz Horizontal Polarity Measured Emissions



Operator: Eric Lifsey

19286'RE071917'Run04'MidCh'RxMode.ttl

05:40:16 PM, Wednesday, July 19, 2017

Mode: Receive mid chan  
Power: 3.7 V battery  
Sample: 5

EUT: Multitalk

Project Number: 19286

Client: Setcom

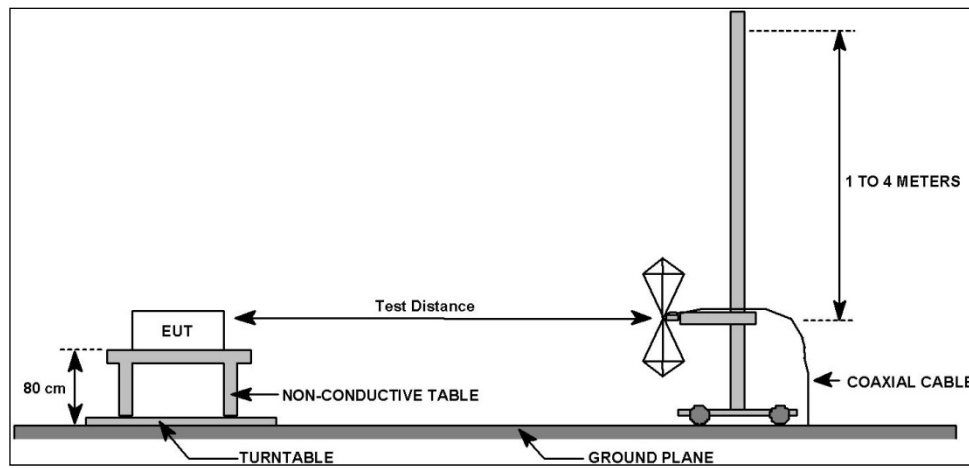
### > 1GHz Horizontal Antenna Polarity Measured Emissions

## 6.0 Radiated Spurious Emissions, Transmit Mode

### 6.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The EUT was centered on a rotating turntable. Measurements below 1 GHz were taken at a test distance of 10 meters from the measurement antenna. Above 1 GHz the measurement distance was 3 meters.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Above 1 GHz peak measurements were taken and average measured where appropriate using 1 MHz resolution bandwidth. A diagram showing the test setup appears below.



### 6.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 // RSS-247 5.5, RSS-Gen 4.9 & 4.10	Field Strength of Radiated Spurious/Harmonic Emissions Transmit Mode	19 Jul 2017

### 6.3 Test Results

Modulation was enabled for this test and the transmitter was placed into continuous transmit mode.

Lowest fundamental power measured 25.9 dBm; subtracting 20 dBc yields limit for unrestricted bands of 5.9 dBm. For field strength at 3 meters (> 1 GHz) the limit calculates to 101.1 dB $\mu$ V/m. Note that the limit as originally shown in the data tables is 99 dB $\mu$ V/m. This is slightly more conservative as the 2 dBi antenna gain was not included at the time.

Spurious emissions outside of restricted bands have a -20 dBc radiated limit of 99 dB $\mu$ V/m at 3 meters.

The duty cycle averaging factor applies -20.0 dB to the peaks recorded for the harmonics.

### 6.3.1 Up to 1 GHz, Bottom Channel

#### Professional Testing, EMI, Inc.

<b>Test Method:</b>	ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
<b>In accordance with:</b>	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
<b>Section:</b>	15.209		
<b>Test Date(s):</b>	7/19/2017	<b>EUT Serial #:</b>	2
<b>Customer:</b>	Setcom	<b>EUT Part #:</b>	0
<b>Project Number:</b>	19268	<b>Test Technician:</b>	Eric Lifsey
<b>Purchase Order #:</b>	NA	<b>Supervisor:</b>	Lisa Arndt
<b>Equip. Under Test:</b>	Multitalk	<b>Witness' Name:</b>	Jason Gossiaux

#### Radiated Emissions Test Results Data Sheet

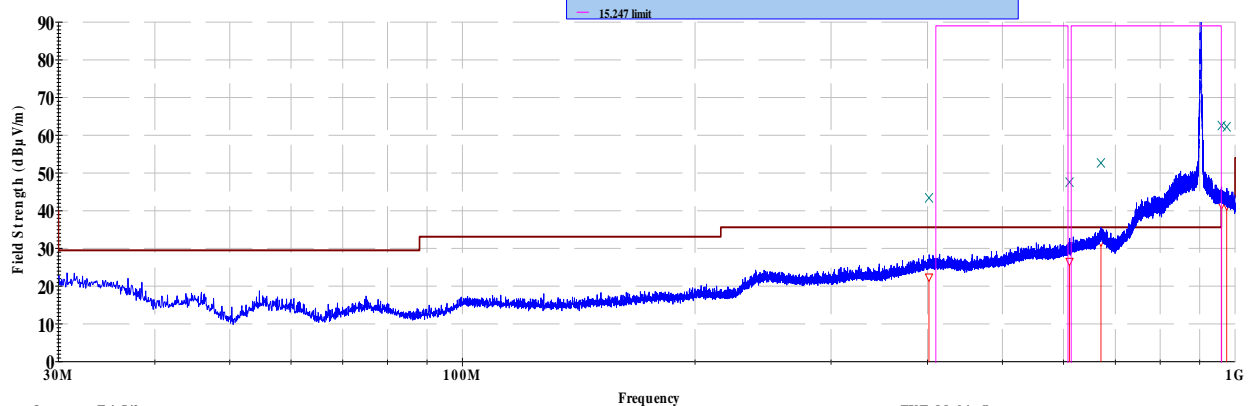
Page: 1 of 1

EUT Line Voltage:		3.7 VDC			EUT Power Frequency:		0 N/A		
Antenna Orientation:		Vertical			Frequency Range:		30MHz to 1GHz		
EUT Mode of Operation:					Transmit, modulated, bottom channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
401.86	10	207	1.59	Quasi-peak	29.4	22.402	35.6	-13.2	Pass
610.847	10	198	1.45	Quasi-peak	29.4	26.56	35.6	-9.0	Pass
670.555	10	68	2.39	Quasi-peak	34	31.675	35.6	-3.9	Pass
961.086	10	24	1.7	Quasi-peak	36.5	41.566	43.5	-1.9	Pass
976.024	10	251	1.7	Quasi-peak	36.1	41.239	43.5	-2.3	Pass

#### Professional Testing, EMI, Inc

##### Radiated Emissions, 10m Distance

30MHz - 1GHz Vertical Polarity Measured Emissions



Operator: Eric Lifsey

19286'RE071917'Run01'LowCh'TxMode.tif

01:47:29 PM, Wednesday, July 19, 2017

Mode: Transmit low chan

Power: 3.7 V battery

Sample: 2

EUT: Multitalk

Project Number: 19286

Client: Setcom

#### ≤ 1GHz Vertical Antenna Polarity Measured Emissions



## Professional Testing, EMI, Inc.

<b>Test Method:</b>	ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
<b>In accordance with:</b>	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
<b>Section:</b>	15.209		
<b>Test Date(s):</b>	7/19/2017	<b>EUT Serial #:</b>	2
<b>Customer:</b>	Setcom	<b>EUT Part #:</b>	0
<b>Project Number:</b>	19268	<b>Test Technician:</b>	Eric Lifsey
<b>Purchase Order #:</b>	NA	<b>Supervisor:</b>	Lisa Arndt
<b>Equip. Under Test:</b>	Multitalk	<b>Witness' Name:</b>	Jason Gossiaux

### Radiated Emissions Test Results Data Sheet

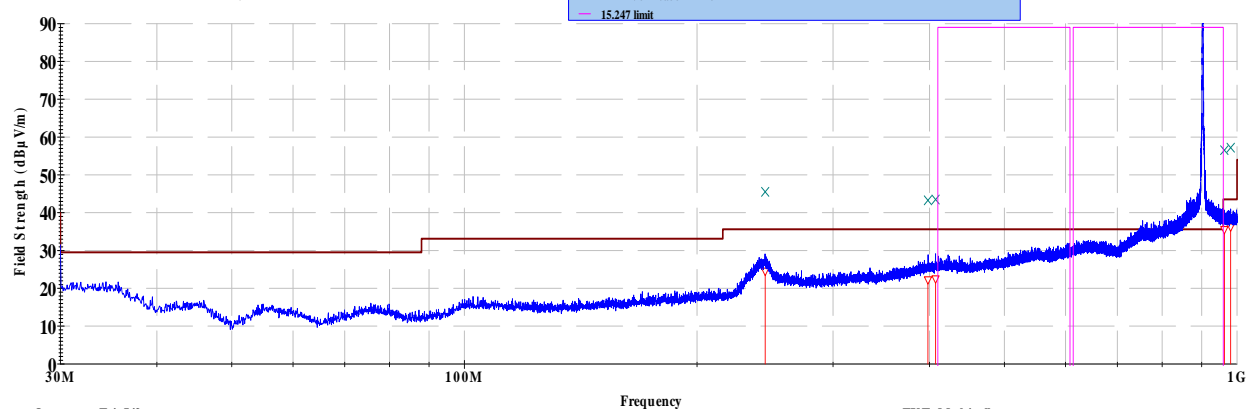
Page: 1 of 1

EUT Line Voltage:		3.7 VDC			EUT Power Frequency:		0 N/A		
Antenna Orientation:		Horizontal			Frequency Range:		30MHz to 1GHz		
EUT Mode of Operation:					Transmit, modulated, bottom channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
245.076	10	147	2.49	Quasi-peak	35.4	24.496	35.6	-11.1	Pass
398.116	10	330	1.97	Quasi-peak	29.4	22.249	35.6	-13.4	Pass
407.24	10	101	2.44	Quasi-peak	29.3	22.473	35.6	-13.1	Pass
963.022	10	181	1.44	Quasi-peak	30.5	35.508	43.5	-8.0	Pass
981.481	10	183	1.57	Quasi-peak	31	36.184	43.5	-7.3	Pass

#### Professional Testing, EMI, Inc.

##### Radiated Emissions, 10m Distance

30 MHz - 1 GHz Horizontal Polarity Measured Emissions



Operator: Eric Lifsey

19286 RE071917 Run01 Low Ch Tx Mode.ttl

01:47:29 PM, Wednesday, July 19, 2017

Mode: Transmit low chan

Power: 3.7 V battery

Sample: 2

EUT: Multitalk

Project Number: 19286

Client: Setcom

**≤ 1GHz Horizontal Antenna Polarity Measured Emissions**

## 6.3.2 Up to 10 GHz, Bottom Channel

Professional Testing, EMI, Inc.									
<b>Test Method:</b>		ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices							
<b>In accordance with:</b>		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
<b>Section:</b>		15.209							
<b>Test Date(s):</b>		7/19/2017			<b>EUT Serial #:</b>		2		
<b>Customer:</b>		Setcom			<b>EUT Part #:</b>		0		
<b>Project Number:</b>		19268			<b>Test Technician:</b>		Eric Lifsey		
<b>Purchase Order #:</b>		NA			<b>Supervisor:</b>		Lisa Arndt		
<b>Equip. Under Test:</b>		Multitalk			<b>Witness' Name:</b>		Jason Gossiaux		
Radiated Emissions Test Results Data Sheet							Page: 1 of 1		
<b>EUT Line Voltage:</b>		3.7 VDC			<b>EUT Power Frequency:</b>		0 N/A		
<b>Antenna Orientation:</b>		Vertical			<b>Frequency Range:</b>		Above 1GHz		
<b>EUT Mode of Operation:</b>					Transmit, modulated, bottom channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
1132.8	3	43	1.24	Average	41.3	28.706	54.0	-25.3	Pass
1221.97	3	88	1.22	Average	39.8	27.748	54.0	-26.2	Pass
1578.84	3	190	2.82	Average	43.6	32.149	54.0	-21.8	Pass
1806.28	3	336	1.26	Peak	85.9	76.084	99.0	-22.9	Pass
2710.01	3	294	1.16	Peak	61.5	53.394	74.0	-20.6	Pass
8521.41	3	150	1.72	Average	27.9	34.439	54.0	-19.5	Pass
<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p><b>Professional Testing, EMI, Inc</b> Radiated Emissions, 3m Distance 1-18GHz VerticalPolarity Measured Emissions</p> </div> <div style="width: 35%; text-align: right;"> <p>Operator: Eric Lifsey 19286 RE071917 Run01 Low Ch Tx Mode til 01:47:29 PM, Wednesday, July 19, 2017</p> <p>Mode: Transmit low chan Power: 3.7 V battery Sample: 2</p> <p>EUT: Multitalk Project Number: 19286 Client: Setcom</p> </div> </div>									

**> 1GHz Vertical Antenna Polarity Measured Emissions**

## Professional Testing, EMI, Inc.

<b>Test Method:</b>	ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
<b>In accordance with:</b>	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
<b>Section:</b>	15.209		
<b>Test Date(s):</b>	7/19/2017	<b>EUT Serial #:</b>	2
<b>Customer:</b>	Setcom	<b>EUT Part #:</b>	0
<b>Project Number:</b>	19268	<b>Test Technician:</b>	Eric Lifsey
<b>Purchase Order #:</b>	NA	<b>Supervisor:</b>	Lisa Arndt
<b>Equip. Under Test:</b>	Multitalk	<b>Witness' Name:</b>	Jason Gossiaux

### Radiated Emissions Test Results Data Sheet

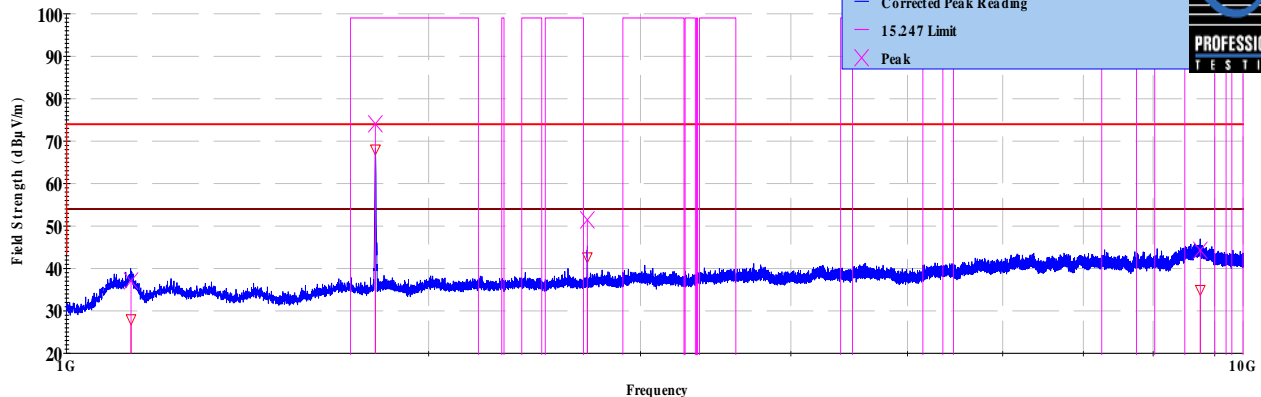
Page: 1 of 1

EUT Line Voltage:		3.7 VDC			EUT Power Frequency:		0 N/A		
Antenna Orientation:		Horizontal			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Transmit, modulated, bottom channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
1131.6	3	261	1.87	Average	40.7	28.066	54.0	-25.9	Pass
1806.27	3	95	1.98	Peak	83.8	74.032	99.0	-25.0	Pass
2709.9	3	336	2.33	Peak	59.5	51.425	74.0	-22.5	Pass
8755.51	3	283	2.45	Average	27.5	34.977	54.0	-19.0	Pass

#### Professional Testing, EMI, Inc

Radiated Emissions, 3m Distance

1-18GHz Horizontal Polarity Measured Emissions



Operator: Eric Lifsey

19286 RE071917 Run01 Low Ch Tx Mode.tif

01:47:29 PM, Wednesday, July 19, 2017

Mode: Transmit low chan

Power: 3.7 V battery

Sample: 2

EUT: Multitalk

Project Number: 19286

Client: Setcom

**> 1GHz Horizontal Antenna Polarity Measured Emissions**

## 6.3.3 Up to 1 GHz, Middle Channel

## Professional Testing, EMI, Inc.

Test Method:	ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	7/19/2017	EUT Serial #:	2
Customer:	Setcom	EUT Part #:	0
Project Number:	19268	Test Technician:	Eric Lifsey
Purchase Order #:	NA	Supervisor:	Lisa Arndt
Equip. Under Test:	Multitalk	Witness' Name:	Jason Gossiaux

## Radiated Emissions Test Results Data Sheet

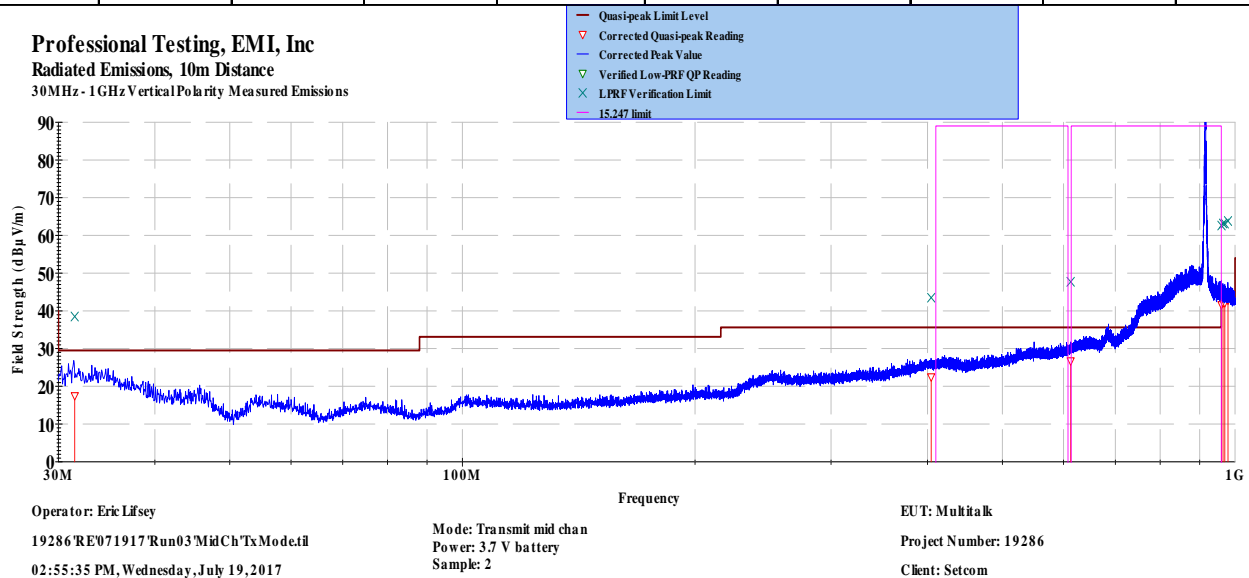
Page: 1 of 1

EUT Line Voltage:		3.7 VDC			EUT Power Frequency:		0 N/A		
Antenna Orientation:		Vertical			Frequency Range:		30MHz to 1GHz		
EUT Mode of Operation:					Transmit, modulated, middle channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
31.4924	10	18	2.05	Quasi-peak	29.5	17.491	29.5	-12.0	Pass
404.38	10	273	2.06	Quasi-peak	29.4	22.475	35.6	-13.1	Pass
612.788	10	102	1.99	Quasi-peak	29.5	26.709	35.6	-8.9	Pass
960.851	10	232	1.71	Quasi-peak	36.6	41.61	43.5	-1.9	Pass
965.13	10	47	1.9	Quasi-peak	37.1	42.153	43.5	-1.3	Pass
970.308	10	221	1.86	Quasi-peak	37	42.13	43.5	-1.4	Pass
979.573	10	38	2.96	Quasi-peak	37.7	42.823	43.5	-0.7	Pass

## Professional Testing, EMI, Inc

## Radiated Emissions, 10m Distance

30MHz - 1GHz Vertical Polarity Measured Emissions



## ≤ 1GHz Vertical Antenna Polarity Measured Emissions

## Professional Testing, EMI, Inc.

<b>Test Method:</b>	ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
<b>In accordance with:</b>	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
<b>Section:</b>	15.209		
<b>Test Date(s):</b>	7/19/2017	<b>EUT Serial #:</b>	2
<b>Customer:</b>	Setcom	<b>EUT Part #:</b>	0
<b>Project Number:</b>	19268	<b>Test Technician:</b>	Eric Lifsey
<b>Purchase Order #:</b>	NA	<b>Supervisor:</b>	Lisa Arndt
<b>Equip. Under Test:</b>	Multitalk	<b>Witness' Name:</b>	Jason Gossiaux

### Radiated Emissions Test Results Data Sheet

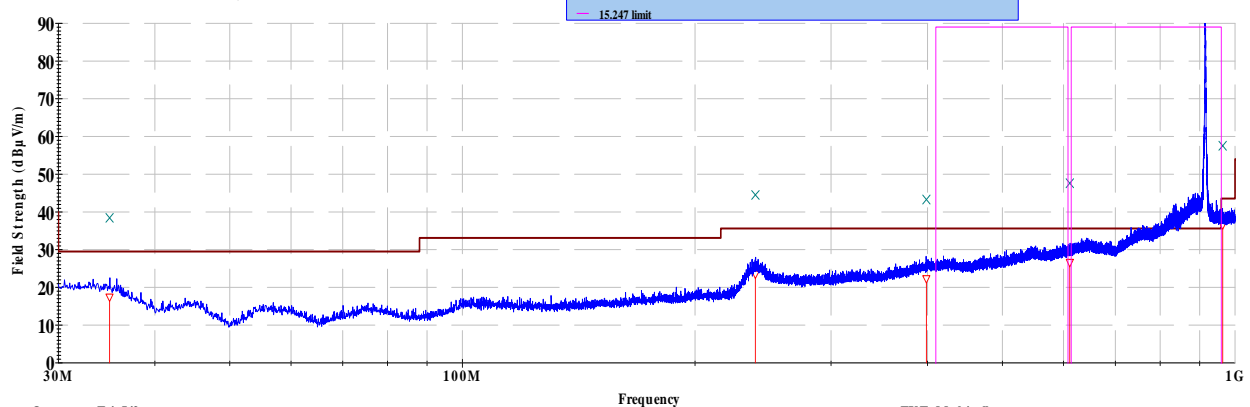
Page: 1 of 1

EUT Line Voltage:		3.7 VDC			EUT Power Frequency:		0 N/A		
Antenna Orientation:		Horizontal			Frequency Range:		30MHz to 1GHz		
EUT Mode of Operation:					Transmit, modulated, middle channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
34.9457	10	315	2.74	Quasi-peak	29.2	17.413	29.5	-12.1	Pass
239.501	10	144	3.66	Quasi-peak	35.3	23.486	35.6	-12.1	Pass
398.608	10	169	3.16	Quasi-peak	29.4	22.274	35.6	-13.3	Pass
611.407	10	281	2.93	Quasi-peak	29.4	26.597	35.6	-9.0	Pass
963.963	10	179	3.63	Quasi-peak	31.5	36.524	43.5	-7.0	Pass

#### Professional Testing, EMI, Inc.

##### Radiated Emissions, 10m Distance

30MHz - 1GHz Horizontal Polarity Measured Emissions



Operator: Eric Lifsey

19286'RE071917'Run03'MidCh'TxModel

02:55:35 PM, Wednesday, July 19, 2017

Mode: Transmit mid chan

Power: 3.7 V battery

Sample: 2

EUT: Multitalk

Project Number: 19286

Client: Setcom

**≤ 1GHz Horizontal Antenna Polarity Measured Emissions**

## 6.3.4 Up to 10 GHz, Middle Channel

## Professional Testing, EMI, Inc.

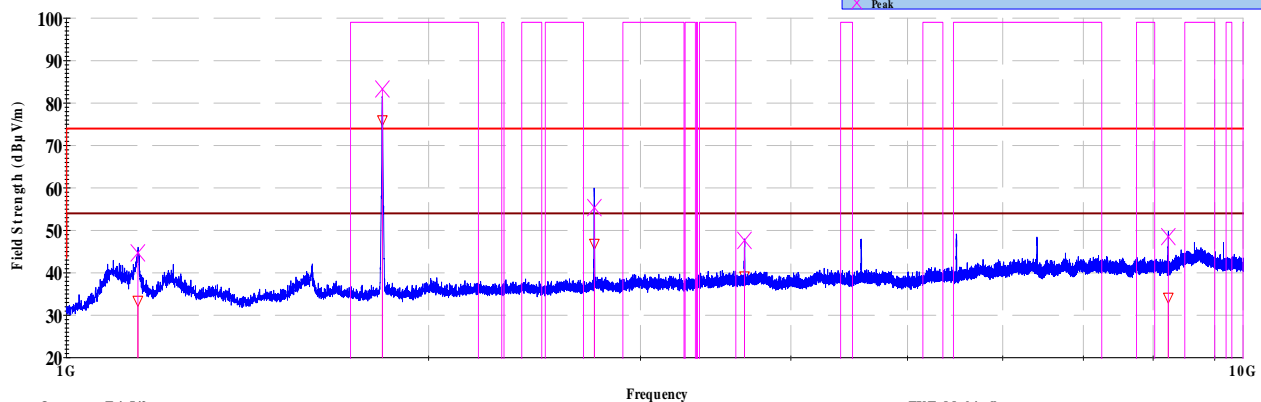
Test Method:	ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices								
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits								
Section:	15.209								
Test Date(s):	7/19/2017	EUT Serial #:	2						
Customer:	Setcom	EUT Part #:	0						
Project Number:	19268	Test Technician:	Eric Lifsey						
Purchase Order #:	NA	Supervisor:	Lisa Arndt						
Equip. Under Test:	Multitalk	Witness' Name:	Jason Gossiaux						

## Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:			3.7VDC		EUT Power Frequency:			0N/A	
Antenna Orientation:			Vertical		Frequency Range:			Above 1GHz	
EUT Mode of Operation:					Transmit, modulated, middle channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
1146.47	3	258	2.94	Average	46	33.476	54.0	-20.5	Pass
1830.6	3	245	2.37	Peak	93	83.284	99.0	-15.7	Pass
2746.24	3	304	2.34	Peak	63.3	55.341	74.0	-18.6	Pass
3660.22	3	199	3.79	Peak	54.5	47.611	74.0	-26.3	Pass
8236.46	3	118	1.81	Peak	43.9	48.505	74.0	-25.5	Pass

Professional Testing, EMI, Inc  
Radiated Emissions, 3m Distance  
1-18GHz Vertical Polarity Measured Emissions



Operator: Eric Lifsey

19286'REW71917'Run03'MidCh'TxMode.tif

03:38:22 PM, Wednesday, July 19, 2017

Mode: Transmit mid chan  
Power: 3.7 V battery  
Sample: 2

EUT: Multitalk

Project Number: 19286

Client: Setcom

## &gt; 1GHz Vertical Antenna Polarity Measured Emissions

## Professional Testing, EMI, Inc.

<b>Test Method:</b>	ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
<b>In accordance with:</b>	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
<b>Section:</b>	15.209		
<b>Test Date(s):</b>	7/19/2017	<b>EUT Serial #:</b>	2
<b>Customer:</b>	Setcom	<b>EUT Part #:</b>	0
<b>Project Number:</b>	19268	<b>Test Technician:</b>	Eric Lifsey
<b>Purchase Order #:</b>	NA	<b>Supervisor:</b>	Lisa Arndt
<b>Equip. Under Test:</b>	Multitalk	<b>Witness' Name:</b>	Jason Gossiaux

### Radiated Emissions Test Results Data Sheet

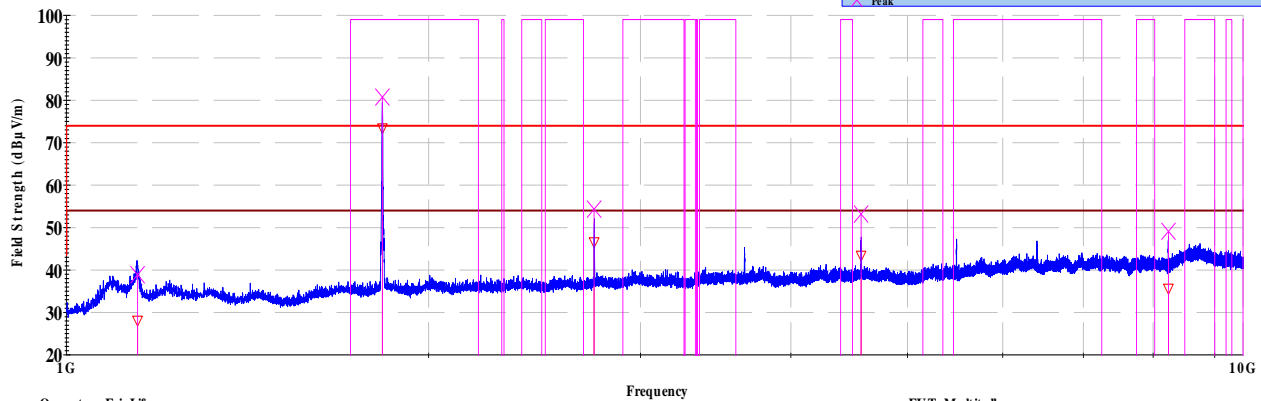
Page: 1 of 1

EUT Line Voltage:			3.7 VDC		EUT Power Frequency:		0 N/A		
Antenna Orientation:			Horizontal		Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Transmit, modulated, middle channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
1145.8	3	140	1.81	Average	40.7	28.121	54.0	-25.8	Pass
1830.56	3	155	1.22	Peak	90.5	80.729	99.0	-18.3	Pass
2745.26	3	197	2.38	Peak	62.3	54.32	74.0	-19.6	Pass
4575.82	3	153	3.78	Peak	57.6	53.169	74.0	-20.8	Pass
8237.98	3	225	1.46	Peak	44.5	49.099	74.0	-24.9	Pass

#### Professional Testing, EMI, Inc

Radiated Emissions, 3m Distance

1-18GHz Horizontal Polarity Measured Emissions



Operator: Eric Lifsey

19286'RE071917'Run03'MidCh'TxModetill

03:38:22 PM, Wednesday, July 19, 2017

Mode: Transmit mid chan

Power: 3.7 V battery

Sample: 2

EUT: Multitalk

Project Number: 19286

Client: Setcom

**> 1GHz Horizontal Antenna Polarity Measured Emissions**

### 6.3.5 Up to 1 GHz, Top Channel

#### Professional Testing, EMI, Inc.

<b>Test Method:</b>	ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
<b>In accordance with:</b>	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
<b>Section:</b>	15.209		
<b>Test Date(s):</b>	7/19/2017	<b>EUT Serial #:</b>	2
<b>Customer:</b>	Setcom	<b>EUT Part #:</b>	0
<b>Project Number:</b>	19268	<b>Test Technician:</b>	Eric Lifsey
<b>Purchase Order #:</b>	NA	<b>Supervisor:</b>	Lisa Arndt
<b>Equip. Under Test:</b>	Multitalk	<b>Witness' Name:</b>	Jason Gossiaux

#### Radiated Emissions Test Results Data Sheet

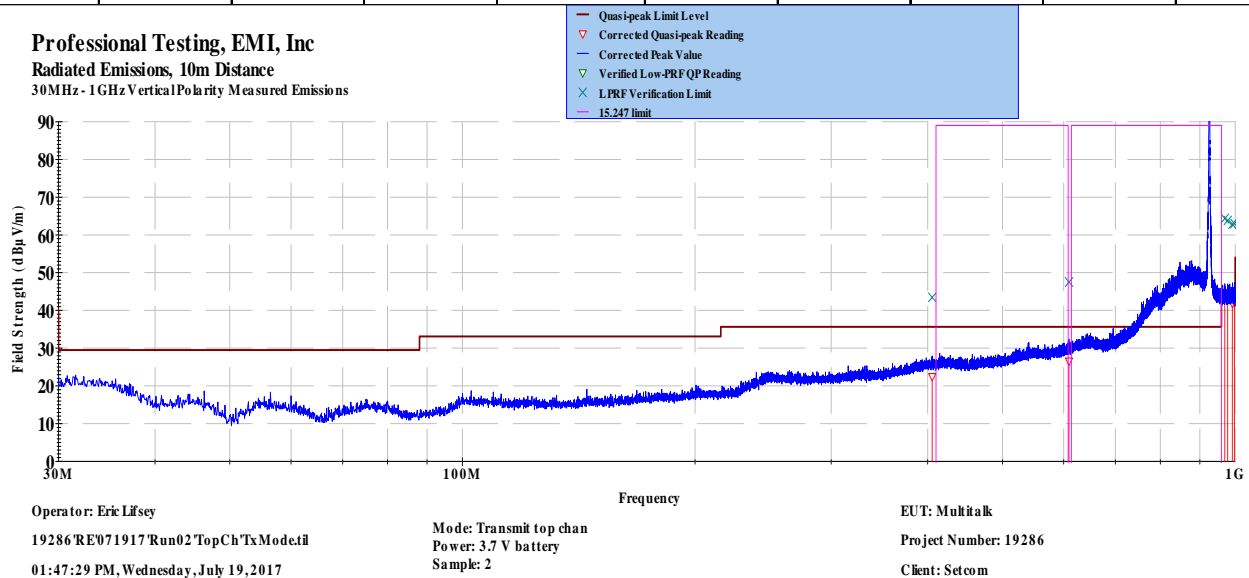
Page: 1 of 1

EUT Line Voltage:		3.7 VDC			EUT Power Frequency:		0 N/A		
Antenna Orientation:		Vertical			Frequency Range:		30MHz to 1GHz		
EUT Mode of Operation:					Transmit, modulated, top channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
405.487	10	144	1.52	Quasi-peak	29.3	22.432	35.6	-13.2	Pass
609.734	10	187	3.95	Quasi-peak	29.4	26.508	35.6	-9.1	Pass
969.982	10	34	1.84	Quasi-peak	38.3	43.339	43.5	-0.2	Pass
978.262	10	125	1.51	Quasi-peak	37.7	42.814	43.5	-0.7	Pass
992.036	10	259	1.51	Quasi-peak	36.6	41.842	43.5	-1.7	Pass
998.161	10	25	3.14	Quasi-peak	36.7	41.989	43.5	-1.5	Pass

#### Professional Testing, EMI, Inc

##### Radiated Emissions, 10m Distance

30MHz - 1GHz Vertical Polarity Measured Emissions



#### ≤ 1GHz Vertical Antenna Polarity Measured Emissions



## Professional Testing, EMI, Inc.

<b>Test Method:</b>	ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
<b>In accordance with:</b>	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
<b>Section:</b>	15.209		
<b>Test Date(s):</b>	7/19/2017	<b>EUT Serial #:</b>	2
<b>Customer:</b>	Setcom	<b>EUT Part #:</b>	0
<b>Project Number:</b>	19268	<b>Test Technician:</b>	Eric Lifsey
<b>Purchase Order #:</b>	NA	<b>Supervisor:</b>	Lisa Arndt
<b>Equip. Under Test:</b>	Multitalk	<b>Witness' Name:</b>	Jason Gossiaux

### Radiated Emissions Test Results Data Sheet

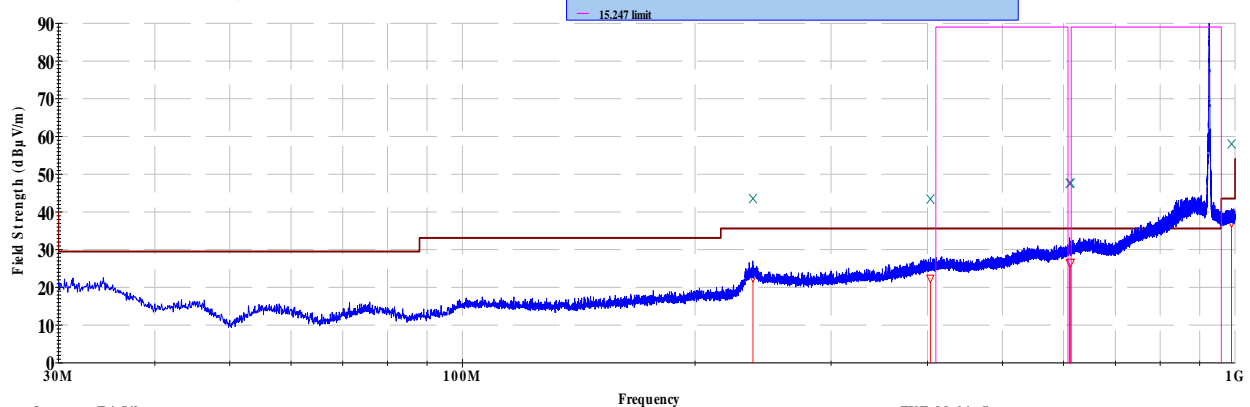
Page: 1 of 1

EUT Line Voltage:		3.7 VDC			EUT Power Frequency:		0 N/A		
Antenna Orientation:		Horizontal			Frequency Range:		30MHz to 1GHz		
EUT Mode of Operation:					Transmit, modulated, top channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
237.759	10	179	3.64	Quasi-peak	34.7	22.538	35.6	-13.1	Pass
403.481	10	308	1.63	Quasi-peak	29.3	22.412	35.6	-13.2	Pass
610.933	10	205	3.55	Quasi-peak	29.4	26.556	35.6	-9.0	Pass
613.107	10	60	2.16	Quasi-peak	29.4	26.662	35.6	-8.9	Pass
990.234	10	287	3.6	Quasi-peak	31.8	37.017	43.5	-6.5	Pass

#### Professional Testing, EMI, Inc.

##### Radiated Emissions, 10m Distance

30MHz - 1GHz Horizontal Polarity Measured Emissions



Operator: Eric Lifsey

19286'RE071917'Run02'TopCh'TxModel

01:47:29 PM, Wednesday, July 19, 2017

Mode: Transmit top chan

Power: 3.7 V battery

Sample: 2

EUT: Multitalk

Project Number: 19286

Client: Setcom

**≤ 1GHz Horizontal Antenna Polarity Measured Emissions**

## 6.3.6 Up to 10 GHz, Top Channel

## Professional Testing, EMI, Inc.

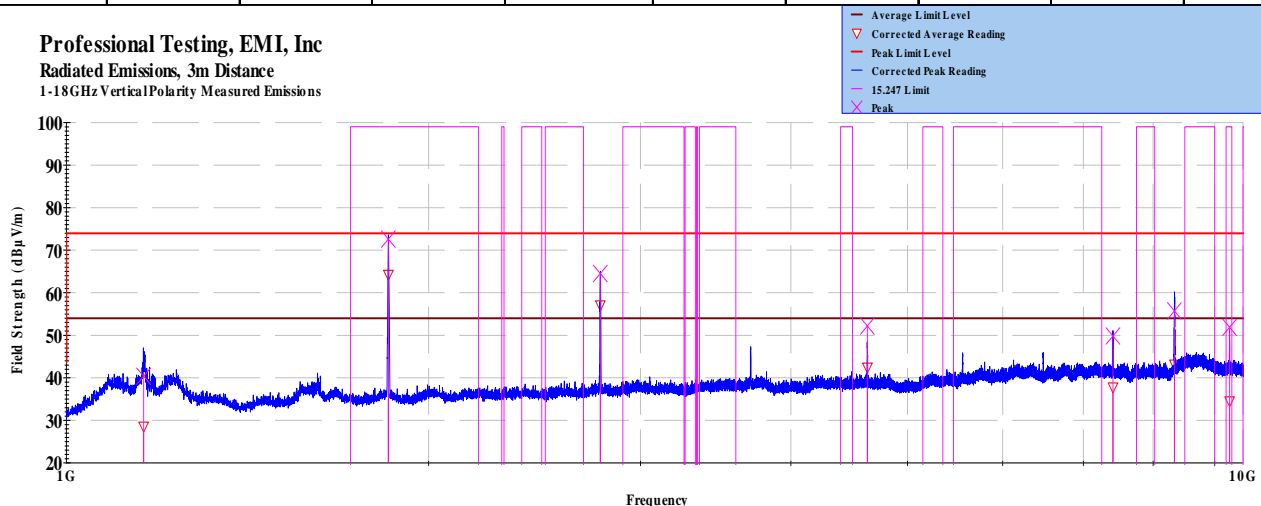
Test Method:	ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	7/19/2017	EUT Serial #:	2
Customer:	Setcom	EUT Part #:	0
Project Number:	19268	Test Technician:	Eric Lifsey
Purchase Order #:	NA	Supervisor:	Lisa Arndt
Equip. Under Test:	Multitalk	Witness' Name:	Jason Gossiaux

## Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:			3.7 VDC		EUT Power Frequency:		0 N/A		
Antenna Orientation:			Vertical		Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Transmit, modulated, top channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
1159.05	3	60	2.71	Average	41	28.583	54.0	-25.4	Pass
1851.57	3	48	2.53	Peak	82.3	72.598	99.0	-26.4	Pass
2777.58	3	181	2.27	Peak	72.3	64.491	74.0	-9.5	Pass
4630.89	3	208	1.66	Peak	56.4	52.164	74.0	-21.8	Pass
7408.26	3	317	1.99	Peak	46.5	49.815	74.0	-24.1	Pass
8332.23	3	222	1.66	Peak	50.5	55.723	74.0	-18.2	Pass
9260.33	3	60	1.37	Peak	43.7	51.863	74.0	-22.1	Pass

Professional Testing, EMI, Inc  
Radiated Emissions, 3m Distance  
1-18GHz Vertical Polarity Measured Emissions



Operator: Eric Lifsey

19286'RE071917'Run02'TopCh'TxModel

01:54:12 PM, Wednesday, July 19, 2017

Mode: Transmit top chan  
Power: 3.7 V battery  
Sample: 2

EUT: Multitalk

Project Number: 19286

Client: Setcom

&gt; 1GHz Vertical Antenna Polarity Measured Emissions

## Professional Testing, EMI, Inc.

<b>Test Method:</b>	ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
<b>In accordance with:</b>	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
<b>Section:</b>	15.209		
<b>Test Date(s):</b>	7/19/2017	<b>EUT Serial #:</b>	2
<b>Customer:</b>	Setcom	<b>EUT Part #:</b>	0
<b>Project Number:</b>	19268	<b>Test Technician:</b>	Eric Lifsey
<b>Purchase Order #:</b>	NA	<b>Supervisor:</b>	Lisa Arndt
<b>Equip. Under Test:</b>	Multitalk	<b>Witness' Name:</b>	Jason Gossiaux

### Radiated Emissions Test Results Data Sheet

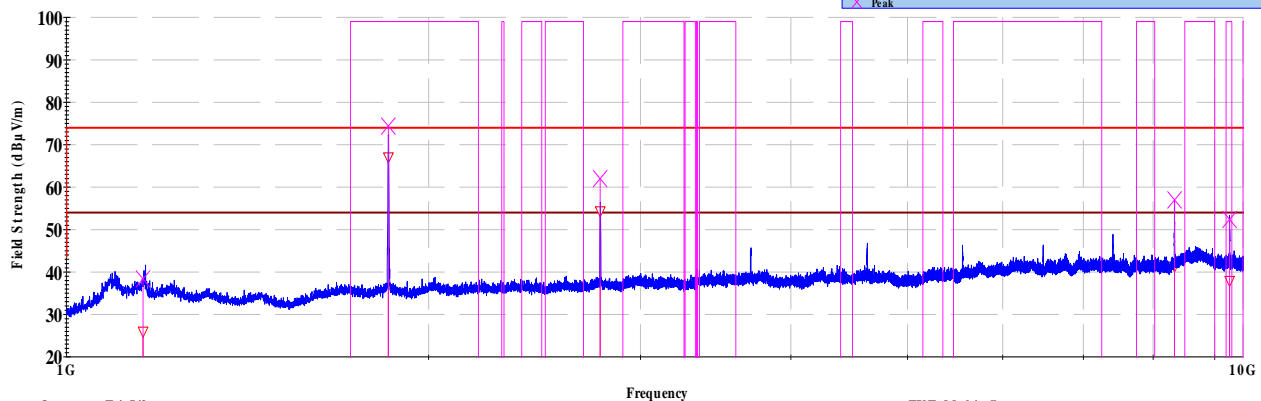
Page: 1 of 1

EUT Line Voltage:			3.7VDC		EUT Power Frequency:			0N/A	
Antenna Orientation:			Horizontal		Frequency Range:			Above 1GHz	
EUT Mode of Operation:					Transmit, modulated, top channel				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
1157.91	3	260	1.85	Average	38.5	25.998	54.0	-28.0	Pass
1851.54	3	149	1.23	Peak	84	74.356	99.0	-24.6	Pass
2777.33	3	180	2.18	Peak	69.9	62.003	74.0	-12.0	Pass
8334.55	3	262	2.11	Peak	51.7	56.966	74.0	-17.0	Pass
9260.48	3	286	2.08	Peak	44.2	52.355	74.0	-21.6	Pass

#### Professional Testing, EMI, Inc

Radiated Emissions, 3m Distance

1-18GHz Horizontal Polarity Measured Emissions



Operator: Eric Lifsey

19286 RE071917 Run02 TopCh Tx Mode till

01:54:12 PM, Wednesday, July 19, 2017

Mode: Transmit top chan

Power: 3.7 V battery

Sample: 2

EUT: Multitalk

Project Number: 19286

Client: Setcom

**> 1GHz Horizontal Antenna Polarity Measured Emissions**

## 7.0 Antenna Construction Requirements

### 7.1 Procedure

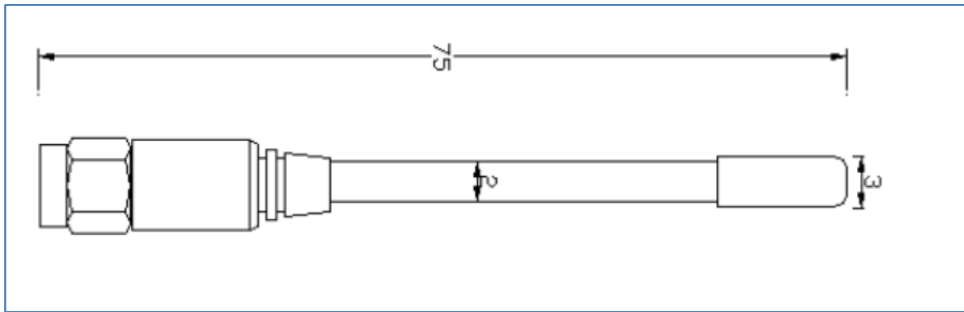
A direct examination of the antenna construction is performed and compared to rule criteria that prevent wireless device antennas from being modified by end users.

### 7.2 Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.203 // RSS-Gen 8.3	Antenna Construction	19 Jul 2017

### 7.3 Results

**Table 7.3.1 Antenna Construction Details**

Manufacturer: LPRS
Model: ANT-RP915SMA-Y

Units: mm

- Antenna is monopole quarter-wave.
- The connector is a reverse-polarized center pin SMA type.
- Peak gain is 2.0 dBi.

The antenna design above satisfies the requirements of the rules.

## 8.0 Equipment

### 8.1 Radiated Emissions, Transmit Mode

Radiated Emissions Test Equipment List					
Tile! Software Version:		4.2.A, May 23, 2010, 08:38:52 AM			
Test Profile:		2016 RE_ClassA - Boresite+Mast_LowPRF_030617.til or 2016 RE_ClassB - Boresite+Mast_LowPRF_030617.til			
Asset #	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration Due Date
1509A	Braden	TDK 10M	TDK 10M Chamber, NSA < 1 GHz	DAC-012915-005	7/10/2019
1890	HP	8447F	Preamp/Amp, 9kHz-1300MHz, 28/25dB	3313A05298	2/1/2018
1937	Agilent	E4440A	Spectrum Analyzer, 3 Hz - 26.5 GHz, Opt. AYZ	MY44808298	11/15/2017
1926	ETS-Lindgren	3142D	Antenna, Biconilog, 26 MHz - 6 GHz	135454	3/7/2019
C027D	PTI	None	Relay	none	N/A
1327	EMCO	1050	Controller, Antenna Mast	none	N/A
0942	EMCO	11968D	Turntable, 4ft.	9510-1835	N/A
1969	HP	11713A	Attenuator/Switch Driver	3748A04113	N/A
1509B	Braden	TDK 10M	TDK 10M Chamber, VSWR > 1 GHz	DAC-012915-005	6/23/2019
2004	Miteq	AFS44-00101800-2S-10P-44	Amplifier, 40dB, .1-18GHz	0	1/11/2018
C030	none	none	Cable Coax, N-N, 30m	none	10/1/2017
1325	EMCO	1050	Controller, Antenna Mast	9003-1461	N/A
1780	ETS-Lindgren	3117	Antenna, Double Ridged Guide Horn, 1 - 18 GHz	110313	3/15/2019

## 8.2 Radiated Emissions, Receive Mode

Radiated Emissions Test Equipment List					
Tile! Software Version:		4.2.A, May 23, 2010, 08:38:52 AM			
Test Profile:		2016 RE_ClassA - Boresite+Mast_LowPRF_030617.til or 2016 RE_ClassB - Boresite+Mast_LowPRF_030617.til			
Asset #	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration Due Date
1509A	Braden	TDK 10M	TDK 10M Chamber, NSA < 1 GHz	DAC-012915-005	7/10/2019
1890	HP	8447F-H64	Preamp/Amp, 9kHz-1300MHz, 28/25dB	3313A05298	1/10/2020
1937	Agilent	E4440A	Spectrum Analyzer, 3 Hz - 26.5 GHz, Opt. AYZ	MY44808298	11/7/2018
1926	ETS-Lindgren	3142D	Antenna, Biconilog, 26 MHz - 6 GHz	135454	3/7/2019
C027D	PTI	None	Relay	none	N/A
1327	EMCO	1050	Controller, Antenna Mast	none	N/A
0942	EMCO	11968D	Turntable, 4ft.	9510-1835	N/A
1969	HP	11713A	Attenuator/Switch Driver	3748A04113	N/A
1509B	Braden	TDK 10M	TDK 10M Chamber, sVSWR > 1 GHz	DAC-012915-005	11/16/2019
2004	Miteq	AFS44-00101800-2S-10P-44	Amplifier, 40dB, .1-18GHz	0	1/10/2020
C030	none	none	Cable Coax, N-N, 30m, 30 MHz - 18GHz	none	9/28/2018
1325	EMCO	1050	Controller, Antenna Mast	9003-1461	N/A
1780	ETS-Lindgren	3117	Antenna, Double Ridged Guide Horn, 1 - 18 GHz	110313	3/15/2019

**8.3 Conducted Antenna Port Measurements of Power, Bandwidth, Spurious**

Asset #	Manufacturer	Model #	Description	Calibration Due
2295	Agilent	E4440A	Spectrum Analyzer	30 Sep 2017

**8.4 Conducted Antenna Port Measurements of PSD and Timings**

Asset #	Manufacturer	Model #	Description	Calibration Due
2262	Agilent	E4440A	Spectrum Analyzer	15 Nov 2017

## 9.0 Measurement Bandwidths

Radiated Emissions Spectrum Analyzer Bandwidth and Measurement Time - Peak Scan				
Frequency Band Start (MHz)	Frequency Band Stop (MHz)	6 dB Bandwidth (kHz)	Number of Ranges Used	Measurement Time per Range
0.009	0.15	0.3	2	Multiple Sweeps
0.15	30	9	6	Multiple Sweeps
30	1000	120	2	Multiple 800 mS Sweeps
1000	6000	1000	2	Multiple Sweeps
6000	18000	1000	2	Multiple Sweeps
18000	26500	1000	2	Multiple Sweeps
*Notes: 1. The settings above are specifically calculated for the E4440A series of spectrum analyzers, which have 8,000 data points per range. 2. The measurement receiver resolution bandwidth setting was 300 Hz for quasi-peak measurements from 9-150 kHz. 3. The measurement receiver resolution bandwidth setting was 9 kHz for quasi-peak measurements from 0.15-30 MHz. 4. The measurement receiver resolution bandwidth setting was 120 kHz for quasi-peak measurements from 30-1000 MHz. 5. The measurement receiver resolution bandwidth setting was 1 MHz for average measurements from 1-18 GHz.				



## Appendix: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty

All uncertainty calculations, estimates and expressions thereof shall be in accordance with NIST policy. Since PTI operates in accordance with NIST (NVLAP) Handbook 150-11: 2007, all instrumentation having an effect on the accuracy or validity of tests shall be periodically calibrated or verified traceable to national standards by a competent calibration laboratory. The certificates of calibration or verification on this instrumentation shall include estimates of uncertainty as required by NIST Handbook 150-11.

### 1. Rationale and Summary of Expanded Uncertainty.

Each piece of instrumentation at PTI that is used in making measurements for determining conformance to a standard (or limit), shall be assessed to evaluate its contribution to the overall uncertainty of the measurement in which it is used. The assessment of each item will be based on either a type A evaluation or a type B evaluation. Most of the evaluations will be type B, since they will be based on the manufacturer's statements or specifications of the calibration tolerances, or uncertainty will be stated along with a brief rationale for the type of evaluation and the resulting stated uncertainties.

The individual uncertainties included in the combined standard uncertainty for a specific test result will depend on the configuration in which the item of instrumentation is used. The combination will always be based on the law of propagation of uncertainty. Any systematic effects will be accommodated by including their uncertainties, in the calculation of the combined standard uncertainty; except that if the direction and amount of the systematic effect cannot be determined and separated from its uncertainty, the whole effect will be treated as uncertainty and combined along with the other elements of the test setup.

Type A evaluations of standard uncertainty will usually be based on calculating the standard deviation of the mean of a series of independent observations, but may be based on a least-squares curve fit or the analysis of variance for unusual situations. Type B evaluations of standard uncertainty will usually be based on manufacturer's specifications, data provided in calibration reports, and experience. The type of probability distribution used (normal, rectangular, a priori, or u-shaped) will be stated for each Type B evaluation.

In the evaluation of the uncertainty of each type of measurement, the uncertainty caused by the operator will be estimated. One notable operator contribution to measurement uncertainty is the manipulation of cables to maximize the measured values of radiated emissions. The operator contribution to measurement uncertainty is evaluated by having several operators independently repeat the same test. This results in a Type A evaluation of operator-contributed measurement uncertainty.

A summary of the expanded uncertainties of PTI measurements is shown as Table 1. These are the worst-case uncertainties considering all operative influence factors.

**Table 1: Summary of Measurement Uncertainties for Site 45**

Type of Measurement	Frequency Range	Meas. Dist.	Expanded Uncertainty U, dB (k=2)
Mains Conducted Emissions	150 kHz to 30 MHz	N/A	2.9
Telecom Conducted Emissions	150 kHz to 30 MHz	N/A	2.8
Radiated Emissions	30 to 1,000 MHz	10 m	4.8
	1 to 18 GHz	3 m	5.7

## **End of Report**

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