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

Reviewed by

Written by

Larry Finn Chief Technical Officer

Eric Lifsey EMC Engineer

Revision History

Revision Number	Description	Date
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	FCC ID:	TLV-MULTITALK	
dba Setcom Corporation	Industry Canada ID:	6143A-MULTITALK	
3019 Alvin Devane Blvd.	Model(s):	LIberatorMAX	
Suite 560	Laboratory Project ID:	19286-15	
Austin, Texas 78741			
Certificate Date: 18 Oct 2018			

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.



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			
47 CFR	Subpart C -Intentional Radiators			
RSS-247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-			
N33-247 ISSUE 2	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			
ANSI C05.10.2015	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

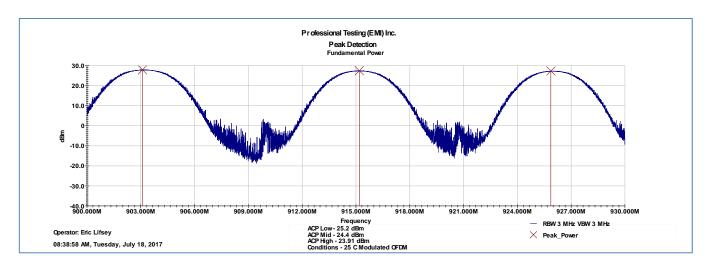
47 CFR (USA) // IC (Canada)						
Section Reference	Date					
	Fundamental Power					
15.247(a)(3) //	Conducted Limits	18 Jul 2017				
RSS-247 5.2	1 W	10 Jul 2017				
	Limit Restated as Field: 125.23 dBμV/m @ 3 m					

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

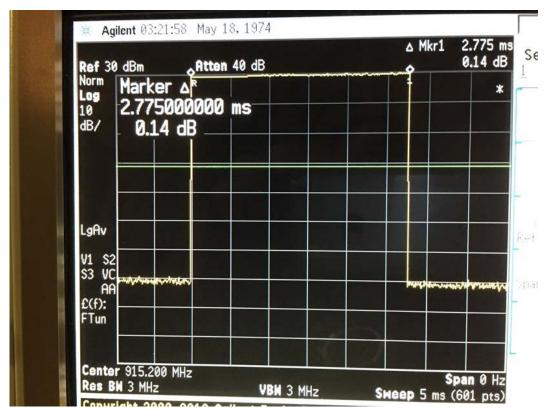
Measurement is based on intervals not to exceed 100 msec. Maximum transmitter on time is divided by the lesser of 100 msec or the actual measured minimum transmitter interval time. The result is

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

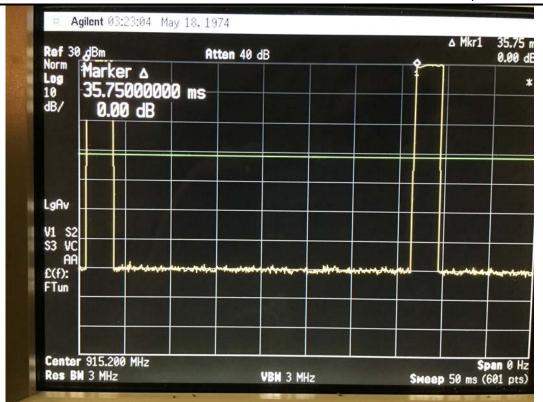
Table 2.4.1 Duty Cycle Results and Average Duty Cycle Factor Result						
Total Measured On Time (msec)	Measured Time Interval (msec)	Duty Cycle Factor Calculation	Result (dB)	Duty Cycle Factor Allowed (dB)		
2.775	35.75	= 20 * Log ₁₀ (2.775 msec / 35.75 msec)	-22.4	-20		

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.

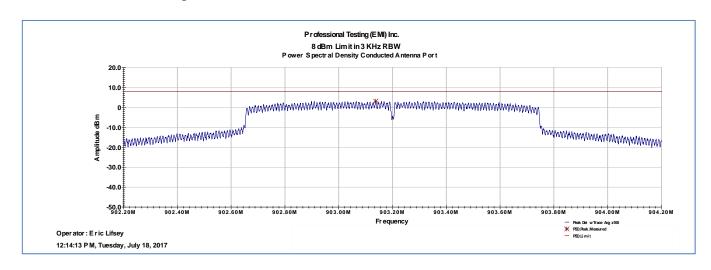
3.2 Test Criteria

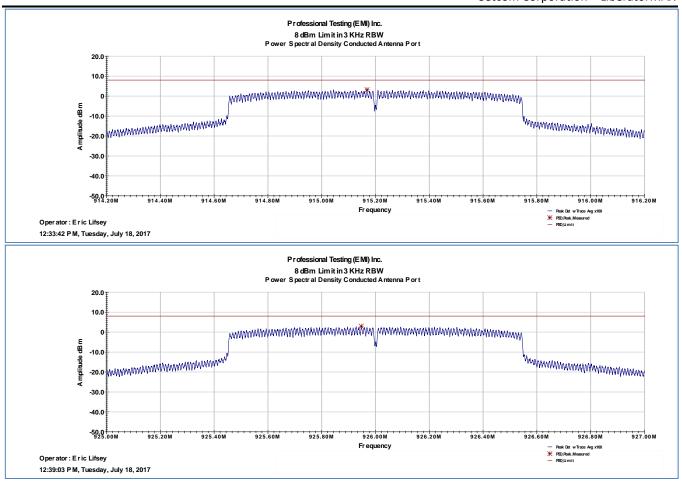
47 CFR (USA) // IC (Canada)								
Section Reference	Parameter	Date						
15.247(e) // RSS-247, 5.2	Power Spectral Density, Conducted Limit: 8 dBm / 3 kHz Restated as field strength limit: 103.23 dBμV/m at 3 m	18 Jul 2017						

3.3 Test Results

Table 3.3.1 Power Spectral Density, Conducted						
Frequency Maximum Measured PSD						
MHz	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 //	Bandwidth, 6 dB, 20 dB	18 Jul 2017						
RSS-Gen 4.6	balluwlutti, 6 dB, 20 dB	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.

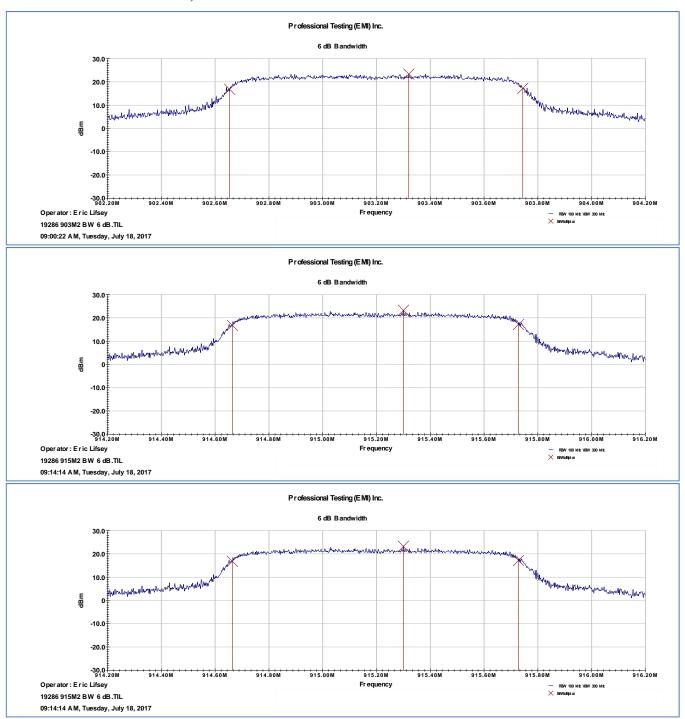
	Table 4.3.1 Bandwidth 6 dB, Minimum 500 kHz in 100 kHz RBW								
Low Channel Mid Channel High Channel Reported									
	Measured BW	Measured BW	Measured BW	Minimum BW					
	(kHz)	(kHz)	(kHz)	(kHz)					
	1090	1064	1080	1064					

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

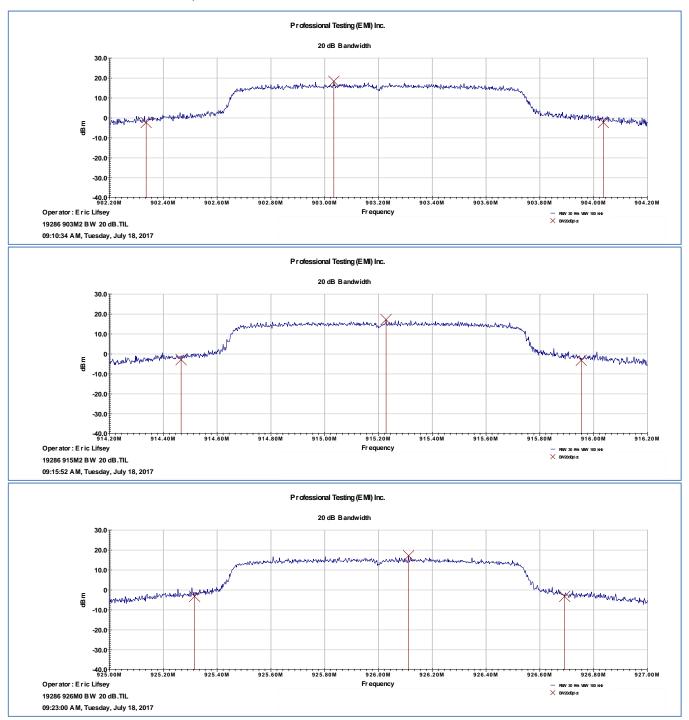
Table 4.3.3 Bandwidth 99%, Measure and Report								
Low Channel	Mid Channel	High Channel	Reported					
Measured BW	Measured BW	Measured BW	Maximum BW					
(kHz)	(kHz)	(kHz)	(kHz)					
1604	1524	1357	1604					

Plotted measurements appear on the following pages.

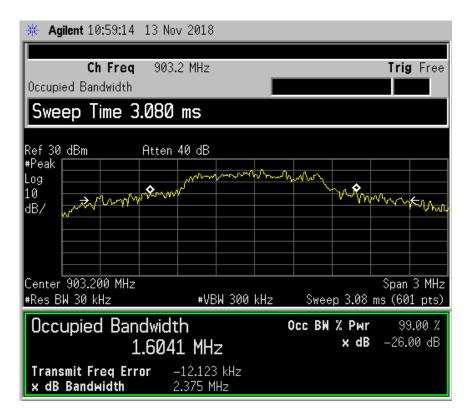
4.3.1 Bandwidth Plots, 6 dB

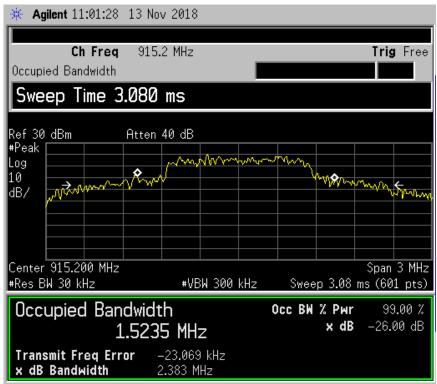


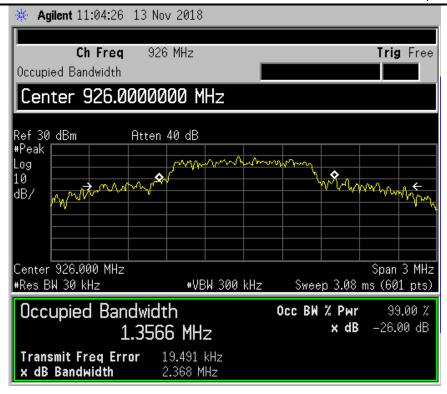
4.3.2 Bandwidth Plots, 20 dB



4.3.3 Bandwidth Plots, 99%





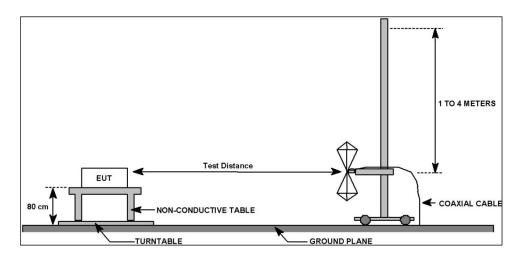


5.0 Radiated Spurious Emissions, Receive Mode

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

		Profes	sional Te	sting, EN	VII, Inc.			
Test Method:		•	an National Star Electronic Equi				dio-Noise Em	issions from
In accordance with: FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits								
Section: 15.109								
Test Date(s):	7/19/2019			EUT Serial		5		
Customer:	Setcom			EUT Part #:		0		
Project Number:	19286			Test Techni		Eric Lifsey		
Purchase Order #:	70			Supervisor:		Lisa Arndt		
Equip. Under Test:	Multitalk			Witness' N	ame:	0		
	Radiated Em	nissions Test	Results Data	Sheet		Pa	ge: 1	of 1
EUT Line Voltage	: 3	.7 VDC		EUT Pow	ver Frequen	cy: (N/A	
Antenna Orientati	on:	Vertic	al	Frequ	ency Range:	1	30MHz to	1GHz
EUT I	Mode of Ope	eration:			Receive m	node, middl	e channel	
Frequency Test Measured Distance (MHz) (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 Radiated Emissions, 10m I 30MHz-1GHz Vertical Polarity 60 50 WAREP 10 WAREP 10 0 30M Operator: Eric Lifsey	Distance	100M	Freq	uency	∨ Corre ∨ Verifi × LPRF	-peak Limit Level cted Quasi-peak Read cted Peak Value cd Low-PRF QP Readi Verification Limit		PROFESSIONAL ESTING

								Setcom Co	orporation –	LiberatorMA
			Profes	sional Te	sting, EN	ΜI,	Inc.			
Test Metho	d:		•	an National Star Electronic Equi						missions from
In accordance with: FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits										
Section:		15.109								
Test Date(s):	7/19/2019			EUT Serial	#:		5		
Customer:		Setcom			EUT Part #:			0		
Project Nur	nber:	19286			Test Techn	ician:		Eric Lifsey	<u> </u>	
Purchase O	rder #:	0			Supervisor			Lisa Arnd	t	
Equip. Und	er Test:	Multitalk			Witness' N	ame:		0		
	F	Radiated Er	nissions Test	Results Data	a Sheet			P	age: 1	of 1
EUT Li	ne Voltage	: 3	3.7 VDC		EUT Pow	ver Fr	equen	су:	0 N/A	1
Antenna	Orientatio	n:	Horizor	ntal	Frequ	ency	Range:		30MHz to	1GHz
	EUT N	/lode of Op	eration:			Red	ceive m	node, mid	dle channel	
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Le	ected evel iV/m)	Limit Leve		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
Radiated 1	ional Testing, Emissions, 10m Di GHz Horizontal Polar	istance	ns				∇ CorreCorre∇ Verific	-peak Limit Level cted Quasi-peak R cted Peak Value ed Low-PRF QP Re		PROFESSIONAL
20 (d Bu Vim) (a Bu Vim) (a Bu Vim) (a Bu Vim) (b Vim) (a Bu Vim)	× Manual	And the state of t				adiyətiyə yəlisə	LPRF	Verification Limit		X X X X X X X X X X X X X X X X X X X
0 ± 30 M			100M							1G
	Eric Lifsey 171917 'Run04 'Mid C M, Wednesday, July			Freq ceive mid chan 'V battery	juency		P	UT: Multitalk roject Number: 19 lient: Setcom	286	

≤ 1GHz Horizontal Antenna Polarity Measured Emissions

5.3.2 Up to 5 GHz

rest Method: n accordance with: Section: Test Date(s): Customer: Project Number: Purchase Order #:	Low-Voltage	Electrical and	n National Star Electronic Equi Federal Regula	pment in the I	Range of 9 kH		dio-Noise Em	issions from
Section: Fest Date(s): Customer: Project Number:	Emissions Lin 15.109		ederal Regula	tions Part 47, S				
Test Date(s): Customer: Project Number:					Subpart B - Un	intentional Ra	adiators, Rad	iated
Customer: Project Number:	7/19/2019							
Project Number:	Cataana			EUT Serial #		5 0		
•	Setcom 19286			EUT Part #: Test Techni		Eric Lifsey		
archase oraci ii.	0			Supervisor:		Lisa Arndt		
quip. Under Test:	Multitalk			Witness' Na		0		
	Radiated Em	issions Test	Results Dat	a Sheet		Pa	ge: 1	of 1
EUT Line Voltage:		.7 VDC			er Frequen			-
Antenna Orientatio	on:	Vertic	al	Freque	ency Range:		Above 1	GHz
EUT N	/lode of Ope	eration:			Receive n	node, middl	e channel	
Frequency Test Measured Distance (MHz) (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Result
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 4182.68 3	11 85	1.63	Average	34.4	27.825	54.0	-26.1 -25.5	Pass
4182.68 3 4494.37 3	74	3.31 2.47	Average Average	33.9 32.9	28.473 28.311	54.0 54.0	-25.5 -25.6	Pass Pass
Professional Testing, Radiated Emissions, 3m Dis 1-18GHz Vertical Polarity Meast 90 80 60 60 40 40 20 G Operator: Eric Lifsey 19286 RE071917 Runo4 MidC	tance ured Emissions	Mode: Red	Freeive mid chan	quency	∇ Corre Peak I Corre Corre E	ge Limit Level cted Average Reading Limit Level cted Peak Reading		PROFESSIONAL TESTING

							Setcom Cor	poration – L	_iberatorMA
			Profess	sional Te	sting, El	VII, Inc.			
Test Metho	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								
In accordance with: FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits									
Section:		15.109							
Test Date(s):	7/19/2019			EUT Serial	# :	5		
Customer:		Setcom			EUT Part #:		0		
Project Nur		19286			Test Techn		Eric Lifsey		
Purchase O		0			Supervisor		Lisa Arndt		
Equip. Und	er Test:	Multitalk			Witness' N	ame:	0		
	F	Radiated Em	nissions Test	Results Dat	a Sheet		Pa	ge: 1	of 1
EUT Li	ne Voltage	: 3	.7 VDC		EUT Pow	er Frequen	cy: (N/A	
Antenna	Orientatio	n:	Horizon	ıtal	Frequ	ency Range:		Above 1	GHz
	EUT N	Node of Ope	eration:			Receive n	node, middl	e 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
Radiated	cional Testing, Emissions, 3m Dis forizontal Polarity Mo	tance				▽ Corre	ige Limit Level cted Average Reading Limit Level cted Peak Reading		PROFESSIONAL TESTING
Field Strength (dBµV/m) 30 30 30 30	and the second second second	Alexandra A	the desired and the second			3 T T T T T T T T T T T T T T T T T T T	n la des lichenberg en de la	, , ,	5 G
1 G Operator: 1	Eric Lifsey			Fre	quency	E	UT: Multitalk		5G
19286 RE)71917'Run04'MidC 'M, Wednesday, July		Mode: Rec Power: 3.7 Sample: 5	eive mid chan V battery		P	roject Number: 19286	i	

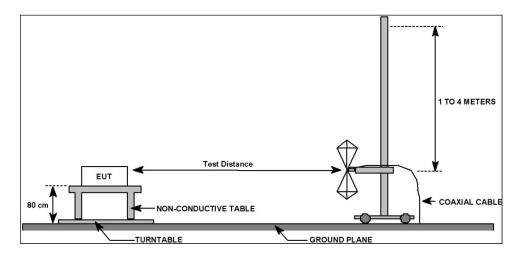
> 1GHz Horizontal Antenna Polarity Measured Emissions

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 μ V/m. Note that the limit as originally shown in the data tables is 99 dB μ 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 dBµV/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

rest Metho n accordan Section:	d: 	Devices	2013: Ameri	can National Sta	andard of Proc				1
Section: Test Date(s)	ce with:	FCC Part 15.2				edures for Co	mpliance Tes	sting of Unlice	ised Wireless
Test Date(s)		Limits	209 - Code of	Federal Regulat	ions Part 47, S	Subpart C - Int	entional Rad	liators, Radiate	ed Emissions
-		15.209			1		•		
	:	7/19/2017			EUT Serial		2		
Customer:		Setcom			EUT Part #:		0		
Project Nun		19268			Test Techni		Eric Lifsey		
Purchase O		NA			Supervisor:		Lisa Arndt		
quip. Unde	er Test:	Multitalk			Witness' N	ame:	Jason Gos	siaux	
	R	adiated Em	issions Test	Results Data	Sheet		Pa	age: 1	of 1
EUT Li	ne Voltage:	3	.7 VDC		EUT Pow	er Frequen	cy:	0 N/A	
Antenna	Orientatio	n:	Vertic	al	Frequ	ency Range:		30MHz to	1GHz
	EUT N	lode of Ope	eration:		Tr	ansmit, mo	dulated, b	ottom chanr	nel
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
Radiated I	onal Testing, Emissions, 10m Di Hz Vertical Polarity	stance		∇ Correcte— Correcte∇ Verified I	ak Limit Level d Quasi-peak Reading d Peak Value Cow-PRF QP Reading rification Limit				
Field Strength (dBµV/m) 20 20 30 30								× ×	*
20 £	and the control of			or to make the second s	la service de la la companya de la c	Benggabil Bloka distil	Y	<u> </u>	-
10		A STATE OF THE PERSON NAMED AND ADDRESS OF THE PERSON NAMED ADDRESS OF THE PERSON NAMED AND ADDRESS OF THE PERSON NAMED ADDRESS OF THE PERSON NAMED AND ADDRES	Production of the second		Personal Assistance of the Control o		_	_	
0 30M									
Operator: E 19286 RE'0	ric Lifsey 7 1917 'Run 01 'Lo w C 1, Wednesday , July 1			Freq ansmit low chan V battery	quency	P	UT: Multitalk roject Number: 1923 lient: Setcom	86	1 G

									iberatorMAX
			Profes	sional Te	sting, EN	VII, Inc.			
est Metho	d:	ANSI C63.10 Devices	: 2013: Ameri	can National Sta	andard of Proc	edures for Co	mpliance Tes	ting of Unlice	nsed Wireless
n accordan	ce with:	FCC Part 15. Limits	209 - Code of	Federal Regulat	ions Part 47, S	Subpart C - Int	tentional Radi	ators, Radiate	d Emissions
ection:		15.209							
est Date(s):	7/19/2017			EUT Serial	#:	2		
ustomer:		Setcom			EUT Part #:		0		
roject Nur		19268			Test Techn		Eric Lifsey		
urchase O		NA			Supervisor:		Lisa Arndt		
quip. Und	er Test:	Multitalk			Witness' N	ame:	Jason Goss	siaux	
	F	Radiated En	nissions Test	t Results Data	Sheet		Ра	ge: 1	of 1
EUT Li	ne Voltage:	: 3	.7 VDC		EUT Pow	ver Frequen	cy:	0 N/A	
Antenna	Orientatio	n:	Horizor	ntal	Frequ	ency Range:		30MHz to	1GHz
	EUT N	/lode of Op	eration:		Tr	ansmit, mo	dulated, bo	ttom chanr	ıel
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
Radiated	cional Testing, Emissions, 10m Di GHzHorizontalPolari	stance	18		ak Limit Level d Quasi-peak Reading d Peak Value Low-PRF QP Reading rification Limit				
Field Strength (dBµV/m) 90 09 00 00 00 00 00 00 00 00 00 00 00					×		××		×
10	Mary Marine Company of the Company o	And the second second second	A STATE OF THE PERSON ASSESSMENT	Provide transfer to the state of the state o					-
0 30 M			100M						1G
Operator: 19286 RE	Eric Lifsey 071917 Run01 Low C M, Wednesday, July		Mode: Tra	ansmit low chan 7 V battery	quency	P	CUT: Multitalk Project Number: 1928 Client: Setcom	6	
		≤ 10	Hz Horizont	tal Antenna P	olarity Mea	sured Emis	sions		

6.3.2 Up to 10 GHz, Bottom Channel

			Profess	sional Te	sting, El	VII, Inc.			
Test Metho	od:	ANSI C63.10: Devices	2013: Americ	an National St	andard of Prod	edures for C	ompliance Tes	ting of Unlice	nsed Wireless
n accordar	nce with:	Limits	209 - Code of F	ederal Regulat	tions Part 47,	Subpart C - I	ntentional Radi	ators, Radiate	ed Emissions
ection:		15.209			1		P		
est Date(s	s):	7/19/2017			EUT Serial		2		
Customer:	mh a ri	Setcom 19268			EUT Part # Test Techn		© Eric Lifeou		
Project Nui Purchase C		NA			Supervisor		Eric Lifsey Lisa Arndt		
Equip. Und		Multitalk			Witness' N		Jason Goss	iaux	
-чир. опи			issions Test	Results Data		unic.		ge: 1	of 1
EUT L	ine Voltage:		.7 VDC	nesures Date	Ī	ver Freque		0 N/A	0, 1
	a Orientatio		Vertic	al		ency Rang		Above 1	GHz
	EUT N	Node of Ope	eration:		,		odulated, bo	ttom chann	nel
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
Radiated	sional Testing, Emissions, 3m Dis Vertical Polarity Measu	tance				∇ Co— Pea	rage Limit Level rected A verage Reading k Limit Level rected Peak Reading	3	
100			_			— 15. — Pea	247 Limit k		PROFESSIONAL TESTING
100		- Aller and		Free	quency				

							Setcor	n Corpo	ration – L	iberatorN	ΛA
			Profess	sional Te	sting, EN	VII, Inc	•				
Test Metho	od:	ANSI C63.1 Devices	0: 2013: Americ	an National Sta	andard of Proc	edures for	Compliand	ce Testing	g of Unlice	nsed Wirel	less
In accorda	nce with:	FCC Part 1!	5.209 - Code of F	ederal Regulat	ions Part 47, S	Subpart C -	Intentiona	al Radiato	rs, Radiate	ed Emissio	ns
Section:		15.209									
Test Date(s):	7/19/201	.7		EUT Serial	#:	2				
Customer:		Setcom			EUT Part #:		0				
Project Nu		19268			Test Techn		Eric Li				
Purchase C		NA			Supervisor		Lisa A				
Equip. Und	ler Test:	Multitalk			Witness' N	ame:	Jason	Gossia	XI		
	F	Radiated E	missions Test	Results Data	a Sheet			Page	1	of	1
EUT L	ine Voltage	:	3.7 VDC		EUT Pow	ver Frequ	ency:	0	N/A		
Antenn	a Orientatio	n:	Horizon	tal	Frequ	ency Rang	ge:		Above 1	GHz	
	EUT N	/lode of O	peration:		Tr	ansmit, n	nodulate	d, botto	m chanr	nel	
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees		Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m	Limit I		Margin (dB)	Test Resi	ults
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	
Radiated	sional Testing, I Emissions, 3m Dis Horizontal Polarity Mo	tance	\times \tag{\tau}			▽ C — Po — C — 19	verage Limit Lev orrected A verage ask Limit Level orrected Peak Ro	e Reading		PROFESSION	ALL
30 20 G Operator:	Eric Lifsey 1071917 'Run01 'Low C		Mode: Tra Power: 3.7 Sample: 2	nsmit low chan	luency		EUT: Multita Project Numb	per: 19286		10G	

> 1GHz Horizontal Antenna Polarity Measured Emissions

6.3.3 Up to 1 GHz, Middle Channel

			Profes	sional Te	sting, El	MI, Inc.				
Test Meth	nod:	ANSI C63.10: Devices	2013: Ameri	can National Sta	andard of Proc	edures for Co	mpliance Test	ting of Unlice	nsed Wir	eless
	ance with:	FCC Part 15.2 Limits	09 - Code of	Federal Regulat	ions Part 47,	Subpart C - Int	entional Radi	ators, Radiate	ed Emissi	ons
Section:		15.209			1		•			
Test Date	(s):	7/19/2017			EUT Serial	#:	2			
Customer	:	Setcom			EUT Part #:		0			
Project N	umber:	19268			Test Techn	ician:	Eric Lifsey			
Purchase	Order #:	NA			Supervisor		Lisa Arndt			
Equip. Un	der Test:	Multitalk			Witness' N	ame:	Jason Goss	iaux		
		Radiated Em	issions Test	Results Data	a Sheet		Pa	ge: 1	of	1
EUT	Line Voltage	e: 3	7 VDC		EUT Pov	ver Frequen	cy: (N/A		
Anten	na Orientati	on:	Vertic	al	Frequ	ency Range:		30MHz to	1GHz	
	EUT	Mode of Ope	eration:		Т	ransmit, mo	dulated, m	iddle chann	nel	
Frequency Measured (MHz)		EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Re	sults
31.4924	10	18	2.05	Quasi-peak	29.5	17.491	29.5	-12.0	Pas	s
404.38	10	273	2.06	Quasi-peak	29.4	22.475	35.6	-13.1	Pas	
612.788	10	102	1.99	Quasi-peak	29.5	26.709	35.6	-8.9	Pas	
960.851	10	232	1.71	Quasi-peak	36.6	41.61	43.5	-1.9	Pas	
965.13	10	47	1.9	Quasi-peak	37.1	42.153	43.5	-1.3	Pas	
970.308	10	221	1.86	Quasi-peak	37	42.13	43.5	-1.4	Pas	
979.573	10	38	2.96	Quasi-peak	37.7	42.823	43.5	-0.7	Pas	
Radiati 30MHz 90	essional Testing ed Emissions, 10m l 1 GHz Vertical Polarit	Distance y Measured Emissions		V Correcte Correcte V Verified X LPRF VV — 15.247 lin Free in smit mid chan	ak Limit Level d Quasi-peak Reading d Peak Value Low-PRF QP Reading rifteation Limit ait		UT: Muhitalk roject Number: 1928(1G	
	5 PM, Wednesday, Jul		Power: 3.7 Sample: 2	V battery			lient: Setcom			

							Setcom Cor	poration – L	iberatorMAX
			Profes	sional Te	sting, El	VII, Inc.			
est Metho	d:	ANSI C63.10 Devices	: 2013: Ameri	can National Sta	andard of Proc	edures for Co	mpliance Test	ting of Unlice	nsed Wireless
n accordar	ice with:	FCC Part 15. Limits	209 - Code of	Federal Regulat	ions Part 47,	Subpart C - Int	tentional Radi	ators, Radiate	ed Emissions
ection:		15.209			1				
est Date(s):	7/19/2017			EUT Serial	#:	2		
Customer:		Setcom			EUT Part #:		0		
Project Nui	nber:	19268			Test Techn	ician:	Eric Lifsey		
urchase O	rder #:	NA			Supervisor		Lisa Arndt		
quip. Und	er Test:	Multitalk			Witness' N	ame:	Jason Goss	iaux	
	F	Radiated En	nissions Test	Results Data	Sheet		Ра	ge: 1	of 1
EUT Li	ne Voltage	: 3	3.7 VDC		EUT Pov	ver Frequen	cy:	0 N/A	
Antenna	Orientatio	on:	Horizor	ntal	Frequ	ency Range:		30MHz to	1GHz
	EUT N	/lode of Op	eration:		T	ransmit, mo	dulated, m	iddle chann	el
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
Radiated	sional Testing, Emissions, 10m Di GHz Horizontal Polar	istance	ns		ak Limit Level d Quasi-peak Reading d Peak Value Low-PRF QP Reading rification Limit			hi hi	
30 (a By V/m) (b d By V/m) (b d By V/m) (b d By V/m) (b d By V/m) (c d	x + -						X		- X
20 20 20 20 20 20 20 20 20 20 20 20 20 2	white and a securior as	navisas.				in the state of th	V V		- ++
10									
0± 30M	 -		100M	P	menev		 		1G
	Eric Lifsey)71917'Run03'MidC 'M, Wednesday, July			Free nsmit mid chan 'V battery	quency	P	CUT: Multitalk Project Number: 1928 Client: Setcom	6	
		≤ 10	iHz Horizont	al Antenna F	Polarity Mea	sured Emis	sions		

6.3.4 Up to 10 GHz, Middle Channel

			Profess	sional Te	sting, El	VII, Inc.						
Test Meth	od:	ANSI C63.10 Devices	: 2013: Americ	an National St	andard of Prod	cedures for Co	ompliance Tes	ting of Unlice	nsed Wireless			
In accorda	nce with:	Limits	209 - Code of F	ederal Regula	tions Part 47,	Subpart C - In	tentional Radi	ators, Radiate	ed Emissions			
Section:	,	15.209			I a		<u> </u>					
Test Date(•	7/19/2017			EUT Serial		2					
Customer:		Setcom			EUT Part #		0 Eric Lifeov					
Project Nu Purchase (19268 NA			Test Techn Supervisor		Eric Lifsey Lisa Arndt					
		Multitalk			•			riany				
Equip. Under Test: Multitalk Witness' Name: Jason Gossiaux Radiated Emissions Test Results Data Sheet Page: 1 of 1												
EUT L	ine Voltage		3.7 VDC			ver Frequen		0 N/A				
Antenn	a Orientatio	on:	Vertic	al	Frequ	ency Range	:	Above 1	GHz			
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			
Radiated	ssional Testing, Emissions, 3m Dis Vertical Polarity Measu	stance				- Peak Lim	ed Average Reading nit Level ed Peak Reading					
90			_ 									
Field Strength (d B µ Vm												
50 50		A STATE OF THE STA	in the second second second	V		All the state of t	The state of the s					
20 1 _G									10G			
	Eric Lifsey		Mada: Tro	Fre	quency	F	EUT: Multitalk	6	100			

						Setcom	Corporation – L	iberatorMAን			
		Profess	sional Te	sting, EN	∕II, Inc.						
Test Method:	ANSI C63.10: Devices	2013: Americ	can National Sta	andard of Proc	edures for Co	mpliance	Testing of Unlice	nsed Wireless			
In accordance with:	FCC Part 15.2 Limits	209 - Code of F	ederal Regulat	ions Part 47, S	Subpart C - Int	entional F	Radiators, Radiate	ed Emissions			
Section:	15.209										
Test Date(s):	7/19/2017			EUT Serial #	‡ :	2					
Customer:	Setcom			EUT Part #:		0					
Project Number:	19268			Test Techni		Eric Lifs					
Purchase Order #:	NA			Supervisor:		Lisa Arn					
Equip. Under Test:	Multitalk			Witness' Na	ame:	Jason G	ossiaux				
Radiated Emissions Test Results Data Sheet Page: 1 of 1											
EUT Line Voltage	: 3	.7 VDC		EUT Pow	er Frequen	cy:	0 N/A				
Antenna Orientation	on:	Horizon	ital	Freque	ency Range:		Above 1	GHz			
EUT I	Mode of Ope	eration:		Tı	ransmit, mo	dulated	, middle chann	el			
Frequency Test Measured Distance (MHz) (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBµV/m)	Limit Le ⁻ (dBμV/i	- 0	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 Radiated Emissions, 3m Di 1-18GHz Horizontal Polarity M	stance				- Peak Limi	d Average Reading it Level d Peak Reading					
90 80 Rength (M) 416 90 90 90 90 90 90 90 90 90 90 90 90 90								106			

> 1GHz Horizontal Antenna Polarity Measured Emissions

6.3.5 Up to 1 GHz, Top Channel

			Profes	sional Te	sting, El	MI, Inc.			
Test Metho	d:	ANSI C63.10: Devices	2013: Ameri	can National Sta	andard of Proc	edures for Co	mpliance Tes	ting of Unlice	nsed Wireless
n accordan	nce with:	FCC Part 15.2 Limits	09 - Code of	Federal Regulat	ions Part 47,	Subpart C - Int	entional Rad	iators, Radiate	ed Emissions
Section:		15.209							
Test Date(s	5):	7/19/2017			EUT Serial		2		
Customer:		Setcom			EUT Part #:		0		
Project Nur Purchase O		19268 NA			Test Techn		Eric Lifsey Lisa Arndt		
		Multitalk			Supervisor: Witness' N		Jason Goss	iauv	
Equip. Und						aille.			
				t Results Data				ige: 1	of 1
	ne Voltage:					ver Frequen		0 N/A	
Antenna	Orientatio		Vertic	al	-	ency Range:		30MHz to	
	EUT N	lode of Ope				Transmit, n	nodulated,	top channe	l
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
Radiated	sional Testing, Emissions, 10m Di GHz V ertical Polarity	stance			ak Limit Level d Quasi-peak Reading d Peak Value Low-PRF QP Reading rification Limit				
Field Strength (d B w V/m) 90 90 90 90 90 90 90 90 90 9								- - - - - - - - - -	*
20 A/hJ/M	and a property of the same of	plentrichten der		olander de la descriptor de la constitución de la c					
Operator: 1 19286 REC	Eric Lifsey 071917 Run02 TopC PM, Wednesday, July			Freq ansmit top chan VV battery	uency	P	UT: Multitalk roject Number: 1928 lient: Setcom	6	16

est Method:	ANSI C63.10		sional Te	sting, El	VII Inc			
				G,	vii, iiic.			
n accordance with:	501.003): 2013: Ameri	can National Sta	andard of Proc	cedures for Co	mpliance Tes	ting of Unlicer	nsed Wireless
in accordance with.	FCC Part 15. Limits	209 - Code of	Federal Regulat	tions Part 47,	Subpart C - Int	entional Radi	ators, Radiate	d Emissions
Section:	15.209			•				
est Date(s):	7/19/2017			EUT Serial	#:	2		
Customer:	Setcom			EUT Part #:		0		
Project Number:	19268			Test Techn	ician:	Eric Lifsey		
urchase Order #:	NA			Supervisor		Lisa Arndt		
quip. Under Test:	Multitalk			Witness' N	ame:	Jason Goss	iaux	
	Radiated Er	nissions Tes	t Results Data	a Sheet		Pa	ge: 1	of 1
EUT Line Voltag	e: 3	3.7 VDC		EUT Pov	ver Frequen	cy:	0 N/A	
Antenna Orientat	ion:	Horizoi	ntal	Frequ	ency Range	1	30MHz to	1GHz
EUT	Mode of Op	eration:			Transmit, n	nodulated,	top channel	
Frequency Test Measured Distance (MHz) (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 Testin Radiated Emissions, 10m 30MHz-1GHzHorizontalPo	Distance	ns	✓ Correcte— Correcte✓ Verified	ak Limit Level ed Quasi-peak Reading ed Peak Value Low-PKF QP Reading er ification Limit				
80 70 70 80 80 80 80 80 80 80 80 80 80 80 80 80						X	- - - - - - - - - -	×
20 10 10 10 30M	and the second s	Mindelier and American State of the American	Andreas and the Million of State of		the state of the s		V	
30M Operator: Eric Lifsey 19286 RE'071917 Run02 To 01:47:29 PM, Wednesday, Ju			ansmit top chan 7 V battery	quency	P	UT: Multitalk roject Number: 1928 lient: Setcom	6	1G

6.3.6 Up to 10 GHz, Top Channel

			Profess	sional Te	sting, EN	VII, Inc.			
Test Metho	d:	ANSI C63.10: Devices	2013: Americ	can National Sta	andard of Proc	edures for Co	mpliance Test	ing of Unlicer	nsed Wireless
In accordar	ice with:	FCC Part 15.2 Limits	209 - Code of F	ederal Regulat	ions Part 47, S	Subpart C - Int	entional Radia	ators, Radiate	ed Emissions
Section:		15.209			I	-	<u>.</u>		
Test Date(s):	7/19/2017			EUT Serial		2		
Customer:		Setcom			EUT Part #:		0		
Project Nur Purchase O		19268 NA			Test Techni		Eric Lifsey Lisa Arndt		
		Multitalk			Supervisor: Witness' N		Jason Goss	iauv	
Equip. Und						airie.			
				Results Data	I		Pa		of 1
	ne Voltage: Orientatio		.7 VDC			er Frequen	•	N/A Above 10	CII-
Antenna		node of Ope	Vertice	d1		ency Range: Transmit, n	nodulated, t		
		·					loudiuteu, t	op charme	
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
Radiated 1-18GHz V	sional Testing, Emissions, 3m Dis erticalPolarity Measu	tance				- Peak Lim	d Average Reading it Level d Peak Reading		
100 Field Strength (dBµV)m) 80 40 40 40 40 40 40 40 40 40 40 40 40 40				¥ V					10G
Operator: 1 19286 RE	Eric Lifsey 071917 'Run02 'TopC		Mode: Tra Power: 3.7 Sample: 2	nsmit top chan	quency	P	UT: Multitalk roject Number: 19286 lient: Setcom		10 G

> 1GHz Vertical Antenna Polarity Measured Emissions

							Setcom (Corporation – L	.iberatorMAX
			Profess	ional Te	sting, EN	VII, Inc.			
Test Metho	d:	ANSI C63.10 Devices	: 2013: Americ	an National Sta	andard of Proc	edures for Co	mpliance 1	Testing of Unlice	nsed Wireless
In accordan	ice with:	FCC Part 15.2	209 - Code of F	ederal Regulat	ions Part 47,	Subpart C - Int	entional R	adiators, Radiato	ed Emissions
Section:		15.209							
Test Date(s):	7/19/2017			EUT Serial	# :	2		
Customer:		Setcom			EUT Part #:		0		
Project Nur	nber:	19268			Test Techn	ician:	Eric Lifse	•	
Purchase O		NA			Supervisor		Lisa Arn	dt	
Equip. Und	er Test:	Multitalk			Witness' N	ame:	Jason G	ossiaux	
	F	Radiated En	nissions Test	Results Data	Sheet			Page: 1	of 1
EUT Li	ne Voltage:	3	.7 VDC		EUT Pow	er Frequen	cy:	0 N/A	
Antenna	Orientatio	n:	Horizon	tal	Frequ	ency Range:		Above 1	GHz
	EUT N	lode of Op	eration:			Transmit, m	nodulate	d, top channe	l
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Lev (dBµV/r	- 0	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
Radiated	sional Testing, Emissions, 3m Dis torizontal Polarity Mo	tance				- Peak Limi	d Average Reading it Level d Peak Reading		
Field Strength (dB µ V/m) 20 30 30									- X
20 1 G Operator: 1	Eric Lifsey 071917 'Run02 'Top C	h'TvMade+il		nsmit top chan	uency		UT: Multitalk	19286	10G
	M, Wednesday, July		Power: 3.7 Sample: 2	v dattery			lient: Setcom	.,=,,	

> 1GHz Horizontal Antenna Polarity Measured Emissions

7.0 Antenna Construction Requirements

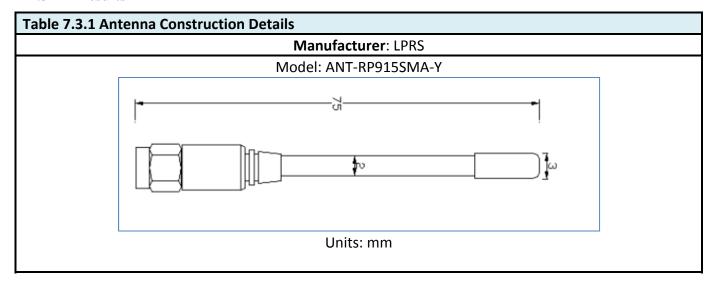
7.1 Procedure

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



- 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:			RE_ClassA - Boresite+Mast_LowPRF_ RE_ClassB - Boresite+Mast_LowPRF_	•		
					6 : 10 1	Calibration

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	НР	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	НР	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	Λf	Re	nor	f
Lillu	UI.	IZC	NUL I	L

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