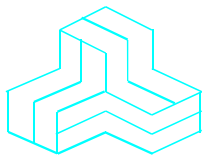


# ENGINEERING TEST REPORT



## DVRS Vehicular Repeater

Model No.: DVR-LX UHF

FCC ID: LO6-DVRSUHF

IC: 2098B-DVRSUHF

Applicant:

### Futurecom Systems Group, ULC

3277 Langstaff Road

Concord, Ontario

Canada, L4K 5P8

### Tested in Accordance With

Federal Communications Commission (FCC)

47 CFR, Parts 2, 22, 74, 80 and 90 (Subpart I), RSS-119, Issue 12

UltraTech's File No.: 20FSG193\_FCC90

This Test report is Issued under the Authority of  
Tri M. Luu  
Vice President of Engineering  
UltraTech Group of Labs

Date: July 16<sup>th</sup>, 2020

Report Prepared by: Sharly Le

Tested by: Nimisha Desai

Issued Date: July 16<sup>th</sup>, 2020

Test Dates: June 15-17<sup>th</sup>, 2020

- The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.
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APEC TEL CA0001



1309



CA 0001/2049



AT-1945



SL2-IN-E-1119R



Korea KCC-RRA  
CA0001

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## EXHIBIT 1. INTRODUCTION

### 1.1. SCOPE

Reference:	FCC Parts 2, 22, 74, 80 and 90 (Subpart I), RSS-119
Title:	Code of Federal Regulations (CFR), Title 47 Telecommunication – Parts 2, 22, 74, 80 and 90 (Subpart I), Land Mobile
Purpose of Test:	To gain FCC C2PC Equipment Authorization for Radio operating in Parts 2, 22, 74, 80 and 90 (Subpart I) & ISED C2PC TAC
Test Procedures:	ANSI/TIA-603-E, ANSI C63.26

### 1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

### 1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19, 80-End	2020	Code of Federal Regulations, Title 47 – Telecommunication
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
ANSI C63.26	2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
ANSI/TIA-603-E	2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
RSS-119, Issue 12	2015	Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.41-960 MHz
RSS-Gen, Issue 5	2018	General Requirements for Compliance of Radio Apparatus
ICES-003 Issue 6	2016 updated 2019	Information Technology Equipment (Including Digital Apparatus) – Limits

## EXHIBIT 2. PERFORMANCE ASSESSMENT

### 2.1. CLIENT INFORMATION

Applicant	
<b>Name:</b>	Futurecom Systems Group, ULC
<b>Address:</b>	3277 Langstaff Road Concord, ON Canada L4K 5P8
<b>Contact Person:</b>	Mr. Tony Bombera Phone #: 905 532 1114 Fax #: 905 660 6858 Email Address: tony.bombera@futurecom.com

Manufacturer	
<b>Name:</b>	Futurecom Systems Group, ULC
<b>Address:</b>	3277 Langstaff Road Concord, ON Canada L4K 5P8
<b>Contact Person:</b>	Mr. Tony Bombera Phone #: 905 532 1114 Fax #: 905 660 6858 Email Address: tony.bombera@futurecom.com

### 2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

<b>Brand Name:</b>	Futurecom Systems Group, ULC
<b>Product Name:</b>	DVRS Vehicular Repeater
<b>Model Name or Number:</b>	DVR-LX UHF
<b>Type of Equipment:</b>	Non-broadcast Radio Communication Equipment
<b>External Power Supply:</b>	None
<b>Primary User functions of EUT:</b>	To provide extended portable radio coverage
<b>Transmitting/Receiving Antenna Type:</b>	Non-Integral

**2.3. EUT'S TECHNICAL SPECIFICATIONS**

<b>TRANSMITTER</b>	
<b>Equipment Type:</b>	Mobile
<b>Intended Operating Environment:</b>	Commercial, industrial or business environment
<b>Power Supply Requirement:</b>	13.8 Vdc
<b>RF Output Power Rating:</b>	<ul style="list-style-type: none"> <li>• 20 watts max.</li> <li>• 1 watt min.</li> </ul>
<b>Operating Frequency Range:</b>	380-470 MHz
<b>RF Output Impedance:</b>	50 Ohms
<b>Channel Spacing</b>	12.5 kHz and 25 kHz
<b>Occupied Bandwidth (99%):</b>	<ul style="list-style-type: none"> <li>• 6.9 kHz Digital and 10.4 kHz Analog (12.5 kHz Channel Spacing)</li> <li>• 15.9 kHz (25 kHz Channel Spacing)</li> </ul>
<b>Emission Designation:</b>	<ul style="list-style-type: none"> <li>• 11K0F3E, 8K10F1E and 8K10F1D (12.5 kHz Channel Spacing)</li> <li>• 16K0F3E (25 kHz Channel Spacing)</li> </ul>
<b>Antenna Connector Type:</b>	TNC Female

\* For an average case of commercial telephony, the Necessary Bandwidth is calculated as follows:

For FM Voice Modulation:

Channel Spacing = 12.5 KHz, D = 2.5 KHz max., K = 1, M = 3 KHz

$$B_n = 2M + 2DK = 2(3) + 2(2.5)(1) = \mathbf{11\ KHz}$$

Emission designation: 11K0F3E

Channel Spacing = 25 KHz, D = 5 KHz max., K = 1, M = 3 KHz

$$B_n = 2M + 2DK = 2(3) + 2(5)(1) = \mathbf{16\ KHz}$$

Emission designation: 16K0F3E

**2.4. LIST OF EUT'S PORTS**

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Transmitter	1	TNC	Terminated with 50 Ohm load
2	Receiver	1	TNC	Terminated with 50 Ohm load
3	DC Input	1	4-pin	Non-shielded
4	RS 232	1	DB9	Shielded
5	Mobile Radio	1	DB25	Shielded
6	Control Head	1	DB25	Shielded

**2.5. ANCILLARY EQUIPMENT**

None.

**EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS**

**3.1. CLIMATE TEST CONDITIONS**

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power input source:	13.8 Vdc

**3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS**

<b>Operating Modes:</b>	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
<b>Special Test Software:</b>	Testing software provided by the manufacturer to configure different test configurations.
<b>Special Hardware Used:</b>	N/A
<b>Transmitter Test Antenna:</b>	The EUT is tested with the transmitter antenna port terminated to a 50 Ohms RF Load.

<b>Transmitter Test Signals</b>	
<b>Frequency Band(s):</b>	380-470 MHz*
<b>Frequency(ies) Tested:</b> (Near lowest and near highest frequencies in the frequency range of operation.)	406.2 MHz; 450.1 MHz & 469.975 MHz.
<b>RF Power Output:</b>	20 Watts High & 1 Watt Low
<b>Normal Test Modulation:</b>	Unmodulated, FM Voice (analog & digital)
<b>Modulating signal source:</b>	External

\* Equipment to be operated in the authorized frequency band / extended frequency band as allowed by FCC and ISED rules

**EXHIBIT 4. SUMMARY OF TEST RESULTS**

**4.1. LOCATION OF TESTS**

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with ANAB File No.: AT-1945.

**4.2. APPLICABILITY & SUMMARY OF EMISSION TEST RESULTS**

FCC Section(s)	Test Requirements	Applicability (Yes/No)
1.1307, 1.1310, 2.1091 & 2.1093 RSS-Gen § 3.4 RSS-102	RF Exposure Limit	N/A
2.1046, 22.565, 74.461, 80.215 & 90.205 RSS-119 § 5.4	RF Power Output	Yes
2.1047(a), 80.213(e) & 90.242(b)(8)	Audio Frequency Response	N/A
2.1047(b), 74.463, 80.213 & 90.210	Modulation Limiting	N/A
2.1049, 74.462, 80.211(f), 90.209 & 90.210 RSS-119 § 5.5	Emission Mask	N/A
2.1051, 2.1057, 80.211(f)(3), & 90.210 RSS-119 § 5.8	Emission Limits - Spurious Emissions at Antenna Terminal	N/A
2.1053, 2.1057, 22.359, 80.211(f)(3), & 90.210	Emission Limits - Field Strength of Spurious Emissions	Yes
2.1055, 22.355, 74.464 80.209 & 90.213 RSS-119 § 5.3	Frequency Stability	N/A
74.462(c) & 90.214 RSS-119 § 5.9	Transient Frequency Behavior	N/A
ICES-003	Radiated Emissions from Digital Devices	Yes
	Conducted Emission from Digital Devices	N/A

**4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES**

None.

**4.4. DEVIATION OF STANDARD TEST PROCEDURES**

None.

**ULTRATECH GROUP OF LABS**

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File #: 20FSG193\_FCC90  
 July 16<sup>th</sup>, 2020

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)



**EXHIBIT 5. TEST DATA**

**5.1. RF POWER OUTPUT [§§ 2.1046, 22.565, 74.461, 80.215 & 90.205] [RSS-119 § 5.4]**

**5.1.1. Limits**

Please refer to FCC 47 CFR 90.205, 74.461, 80.215 & 22.565 for specification details.

RSS-119- The output power shall be within  $\pm 1.0$  dB of the manufacturer’s rated power and RSS 119 Section 5.4 table 2

**5.1.2. Method of Measurements**

Refer to Section 8.1 (Conducted) of this report for measurement details

**5.1.3. Test Arrangement**

**5.1.4. Test Data**

High Power

Frequencies MHz	Wide/ Narrow	Power Rating Watts	Power Rating dBm	Measured dBm	Power dBm	Actual Power Watts
406.200	Narrow	20.0	43.01	3.01	42.99	19.91
450.100	Narrow	20.0	43.01	3.00	42.98	19.86
469.975	Narrow	20.0	43.01	2.76	42.74	18.79

Low Power

Frequencies MHz	Wide/ Narrow	Power Rating Watts	Power Rating dBm	Measured dBm	Power dBm	Actual Power Watts
406.200	Narrow	1.0	30.00	-10.02	29.96	0.99
450.100	Narrow	1.0	30.00	-8.94	31.04	1.27
469.975	Narrow	1.0	30.00	-9.24	30.74	1.19

**5.2. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS [§§ 2.1053, 2.1057, 22.359, 80.211(f)(3) & 90.210] [RSS-119 § 5.5 & § 5.8]**

**5.2.1. Limits**

Emissions shall be attenuated below the mean output power of the transmitter as follows:

FCC Rules	Attenuation Limit (dBc)
§ 22.359	At least 43 + 10 log (P) dB.
§ 80.211(f)(3),	At least 43 + 10log <sub>10</sub> (mean power in watts) dB
§ 90.210(b)	At least 43 + 10 log (P) dB
§ 90.210(d)	At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.
§ 90.210(e)	At least 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation.

RSS-119, Issue 12	Frequency Range	Attenuation Limit (dBc)
Mask D	30 MHz or lowest radio frequency signal generated in the device to the tenth harmonic of the highest fundamental frequency.	At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

**5.2.2. Method of Measurements**

The spurious/harmonic ERP measurements are using substitution method specified in Section 8.2 of this report.

**5.2.3. Test Data**

**Remarks:**

- The RF spurious/harmonic emission characteristics for different channel spacing are indistinguishable. Therefore, the following radiated emissions were performed at digital 12.5 kHz channel spacing operation, and the results were compared with the for the worst-case.
- The radiated emissions were performed with high power setting at 3 m distance to represents the worst-case test configuration.
- The emissions were scanned from 30 MHz to 10<sup>th</sup> harmonics ; all spurious emissions that are in excess of 20dB below the specified limit shall be recorded.

**5.2.3.1. Near Lowest Frequency (406.2 MHz)**

<b>Test Frequency (MHz):</b>		406.2				
<b>Power</b>		High				
<b>Limit (dBm):</b>		-20				
Frequency (MHz)	E-Field (dBµV/m)	EMI Detector (Peak/QP)	Antenna Polarization (H/V)	ERP Measured (dBm)	Limit (dBm)	Margin (dB)
All emissions found are more than 20 dB below the limit.						

**5.2.3.2. Near Middle Frequency (450.1 MHz)**

<b>Test Frequency (MHz):</b>		450.1				
<b>Power</b>		High				
<b>Limit (dBm):</b>		-20				
Frequency (MHz)	E-Field (dBµV/m)	EMI Detector (Peak/QP)	Antenna Polarization (H/V)	ERP Measured (dBm)	Limit (dBm)	Margin (dB)
1350.3	67.95	PEAK	V	-37.49	-20	-11.49
1350.3	65.48	PEAK	H	-34.35	-20	-14.35
1800.400	61.14	PEAK	V	-38.56	-20	-18.56
All other emissions found are more than 20 dB below the limit.						

**5.2.3.3. Near Highest Frequency (469.975 MHz)**

<b>Test Frequency (MHz):</b>		469.975				
<b>Power</b>		High				
<b>Limit (dBm):</b>		-20				
<b>Frequency (MHz)</b>	<b>E-Field (dBμV/m)</b>	<b>EMI Detector (Peak/QP)</b>	<b>Antenna Polarization (H/V)</b>	<b>ERP Measured (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
1409.925	62.59	PEAK	V	-37.50	-20	-17.50
1409.85	63.01	PEAK	H	-36.88	-20	-16.88
3759.800	70.05	PEAK	V	-30.91	-20	-10.91
3759.800	69.90	PEAK	H	-31.85	-20	-11.85
All other emissions found are more than 20 dB below the limit.						

**5.3. RADIATED EMISSIONS FROM UNINTENTIONAL RADIATORS [ICES-003]**

**5.3.1. Limits**

The equipment shall meet the limits of the following table:

Frequency of emission (MHz)	Class B Limits	
	(dB $\mu$ V/m at 3 m)	(dB $\mu$ V/m at 10 m)
30 – 88	40.0	29.5
88 – 216	43.5	33.1
216 – 960	46.0	35.6
Above 960	54.0	43.5

**5.3.2. Method of Measurements**

Refer to Ultratech Test Procedures ULTR-P001-2004 & ANSI C63.4 for method of measurements.

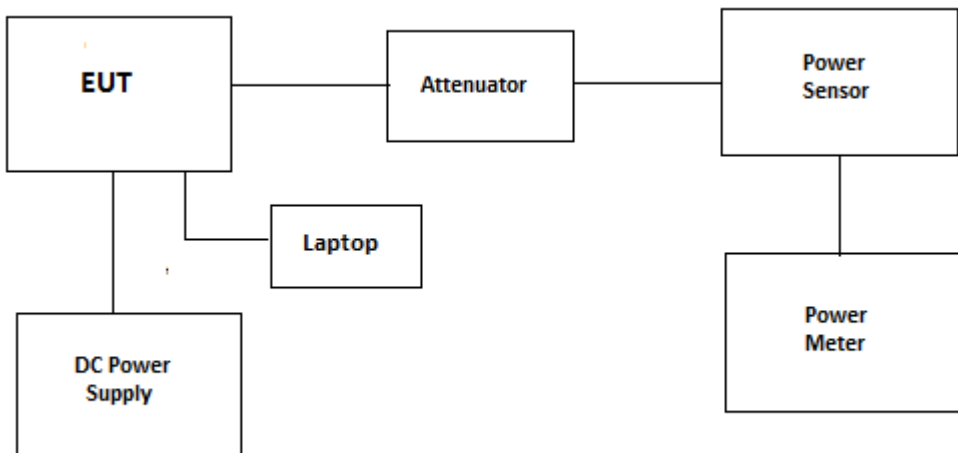
**5.3.3. Test Data**

The emissions were scanned from 30 MHz to 6 GHz at 3m. All emissions found above than 20 dB below the permissible limits were recorded

FREQUENCY (MHz)	RF LEVEL (dBuV/m)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	LIMIT (dBuV/m)	MARGIN (dB)	PASS/ FAIL
72	29.53	PEAK	V	40	-10.47	PASS
72	19.7	PEAK	H	40	-20.3	PASS
87.51	29.05	PEAK	V	40	-10.95	PASS
87.51	25.75	PEAK	H	40	-14.25	PASS
196.33	29.4	PEAK	V	43.5	-14.1	PASS
196.33	18.49	PEAK	H	43.5	-25.01	PASS
900.51	39.26	PEAK	V	46	-6.74	PASS
900.51	38.74	PEAK	H	46	-7.26	PASS
925.38	39.55	PEAK	V	46	-6.45	PASS
925.38	37.68	PEAK	H	46	-8.32	PASS
948.7	39.6	PEAK	V	46	-6.4	PASS
948.7	36	PEAK	H	46	-10	PASS
1184	40.88	PEAK	V	54	-13.12	PASS
1184	41.72	PEAK	H	54	-12.28	PASS
2421	48.9	PEAK	V	54	-5.1	PASS
2421	49.72	PEAK	H	54	-4.28	PASS

**EXHIBIT 6. Block Diagram and Test Equipment**

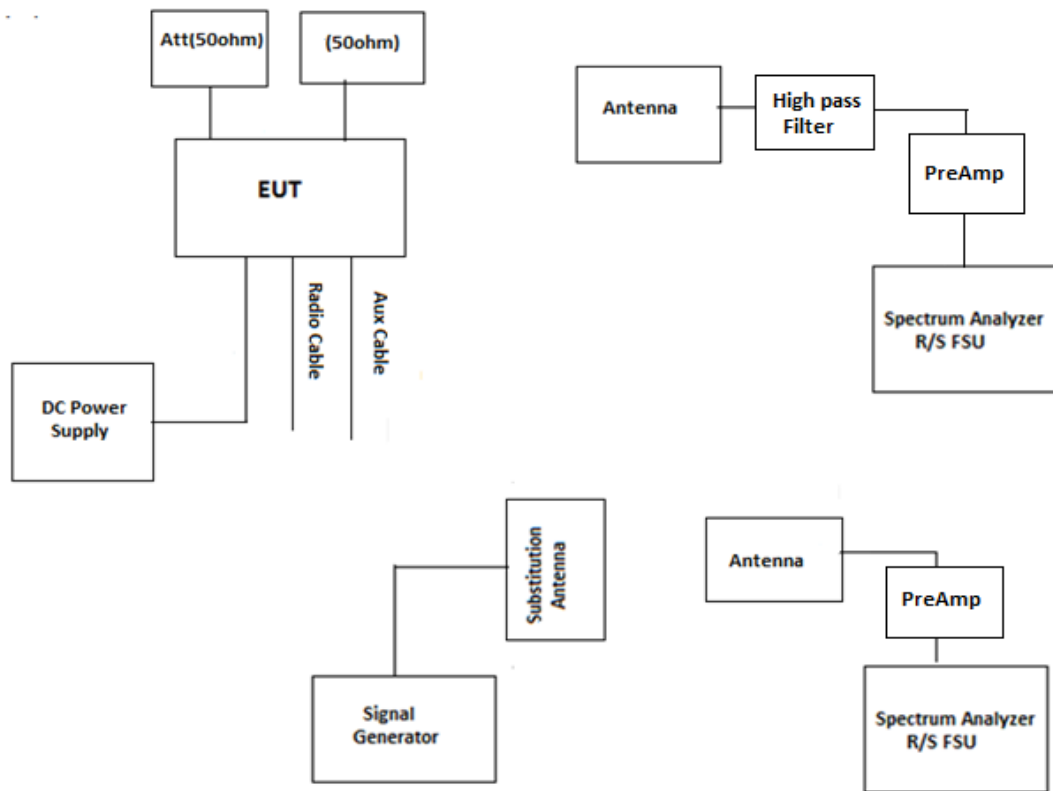
**6.1. Conducted Power**



Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Power Meter	HP	436A	2016A0774 7	100KHz-sensor dependant	14 Apr 2021
Power Sensor	HP	8482A	MY4417518 2	10MHz-4.2GHz	15 Nov 2020
Attenuator(20d B)	Weinschel	WA35-20- 33	A164	DC-8.5GHz	Cal on use
Attenuator(20d B)	Aeroflex\Weinschel	23-20-34	BH7876	DC-18GHz	Cal on use
Power Supply	Pyramid	PS-36KX	--	1-15V, DC 35A	----
Multimeter	Fluke	8842A	5021295	---	19 Dec 2020

Test date: June 15<sup>th</sup>, 2020

6.2. Tx Radiated



Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Spectrum Analyzer	Rohde & Schwarz	FSU	100398	20Hz-26.5GHz	23 Oct 2021
EMI Receiver	Rohde & Schwarz	ESU40	100037	20Hz-40GHz	18 Mar 2021
Log Periodic Antenna	ETS	3148	00023845	200-2000MHz	02 Aug 2020
Biconilog Antenna	EMCO	3142C	00034792	26-2000MHz	16 May 2022
Preamplifier	Com-Power	PAM-118A	551016	500MHz-18GHz	17 Mar 2021
Preamplifier	Com-Power	PA-103	161040	1-1000MHz	23 Mar 2021
Horn Antenna	ETS	3117	00119425	1-18GHz	25 July 2021
Horn Antenna	ETS	3115	6570	1-18GHz	11 Oct 2020
Signal Generator	SMIQ 06ATE	SMIQ 06ATE	100086	300KHz-6.4GHz	27 Sep 2020
Hi-pass filter	Mini-Circuit	SHP-600	--	Cut off 600MHz	Cal on use
Attenuator(20dB)	Weinschel	WA35-20-33	A164	DC-8.5GHz	Cal on use
Attenuator(20dB)	Aeroflex\Weinschel	23-20-34	BH7876	DC-18GHz	Cal on use
Power Supply	Pyramid	PS-36KX	--	1-15V, DC 35A	----
Multimeter	Fluke	8842A	5021295	---	19 Dec 2020

Test date: June 17<sup>th</sup>, 2020

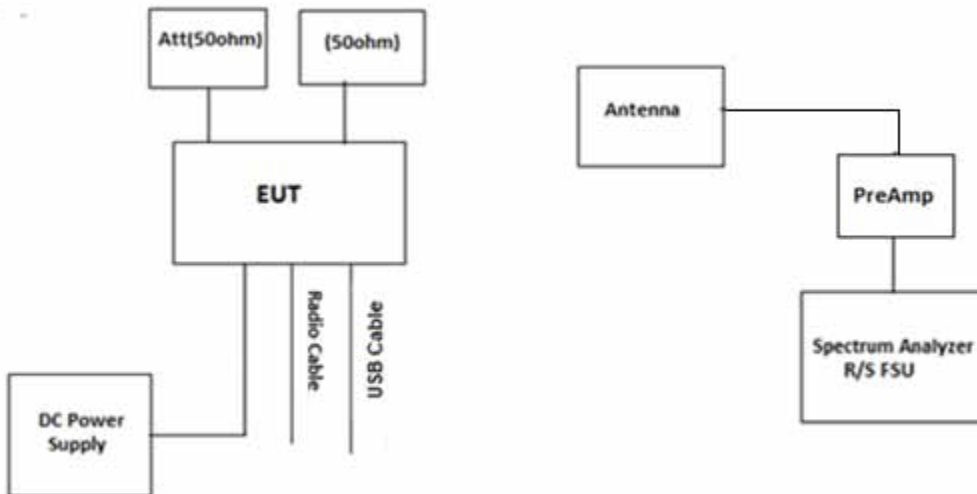
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File #: 20FSG193\_FCC90  
 July 16<sup>th</sup>, 2020

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

6.3. Unintentional Radiated



Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Calibration Due Date
EMI Receiver	Rohde & Schwarz	ESU40	100037	20Hz-40Ghz	Mar 18 <sup>th</sup> , 2021
Biconilog Antenna	EMCO	3142C	00034792	26-2000 Mhz	May 16 <sup>th</sup> , 2022
Pre-Amplifier	Com-Power	Pam-0118A	551052	500Mhz-18Ghz	July 24 <sup>th</sup> , 2020
Horn Antenna	EMCO	3115	6570	1-18Ghz	Oct 11 <sup>th</sup> , 2020



**EXHIBIT 7. MEASUREMENT UNCERTAINTY**

Test description		Uncertainty
Conducted Output Power		+/- 0.62 dB
Radiated Out of Band/Spurious Emissions	<30 MHz	+/-2.69dB
	30-1000 MHz	+/-4.20dB
	>1 GHz	+/-2.70dB

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

## EXHIBIT 8. MEASUREMENT METHODS

### 8.1. CONDUCTED POWER MEASUREMENTS

- The following shall be applied to the combination(s) of the radio device and its intended antenna(e).
- If the RF level is user adjustable, all measurements shall be made with the highest power level available to the user for that combination.
- The following method of measurement shall apply to both conducted and radiated measurements.
- The radiated measurements are performed at the Ultratech Calibrated Open Field Test Site.
- The measurement shall be performed using normal operation of the equipment with modulation.

Test procedure shall be as follows:

#### Step 1: Duty Cycle measurements if the transmitter's transmission is transient

- Using a EMI Receiver with the frequency span set to 0 Hz and the sweep time set at a suitable value to capture the envelope peaks and the duty cycle of the transmitter output signal;
- The duty cycle of the transmitter,  $x = \text{Tx on} / (\text{Tx on} + \text{Tx off})$  with  $0 < x < 1$ , is measure and recorded in the test report. For the purpose of testing, the equipment shall be operated with a duty cycle that is equal or more than 0.1.

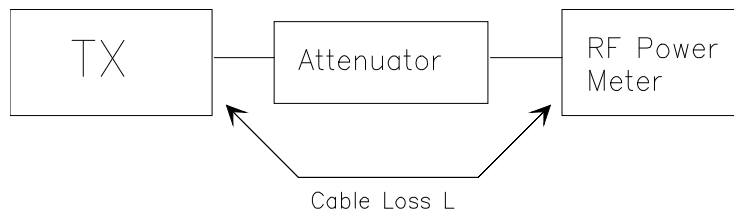
#### Step 2: Calculation of Average EIRP. See Figure 1

- The average output power of the transmitter shall be determined using a wideband, calibrated RF average power meter with the power sensor with an integration period that exceeds the repetition period of the transmitter by a factor 5 or more. The observed value shall be recorded as "A" (in dBm);
- The e.i.r.p. shall be calculated from the above measured power output "A", the observed duty cycle x, and the applicable antenna assembly gain "G" in dBi, according to the formula:

$$\text{EIRP} = \text{A} + \text{G} + 10\log(1/x)$$

{X = 1 for continuous transmission =>  $10\log(1/x) = 0$  dB}

Figure 1.



## 8.2. RADIATED POWER MEASUREMENTS (ERP & EIRP) USING SUBSTITUTION METHOD

### 8.2.1. MAXIMIZING RF EMISSION LEVEL (E-FIELD)

- (a) The measurements were performed with full rf output power and modulation.
- (b) Test was performed at listed 3m open area test site (listed with FCC, IC, ITI, NVLAP, ACA & VCCI).
- (c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
- (d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
- (e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor  
 $E \text{ (dB}\mu\text{V/m)} = \text{Reading (dB}\mu\text{V)} + \text{Total Correction Factor (dB/m)}$

- (f) Set the EMI Receiver and #2 as follows:

Center Frequency: test frequency  
Resolution BW: 100 KHz  
Video BW: same  
Detector Mode: positive  
Average: off  
Span: 3 x the signal bandwidth

- (g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
- (h) The transmitter was rotated through 360° about a vertical axis until a higher maximum signal was received.
- (i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
- (j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
- (k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
- (l) Repeat for all different test signal frequencies.

### 8.2.2. Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:

Center Frequency: equal to the signal source  
Resolution BW: 100 KHz  
Video BW: VBW > RBW  
Detector Mode: positive  
Average: off  
Span: 3 x the signal bandwidth

(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor  
 $E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$

(c) Select the frequency and E-field levels obtained in the Section 8.2.1 for ERP/EIRP measurements.

(d) Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):

- ◆ DIPOLE antenna for frequency from 30-1000 MHz or
- ◆ HORN antenna for frequency above 1 GHz }.

(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.

(f) Use one of the following antenna as a receiving antenna:

- ◆ DIPOLE antenna for frequency from 30-1000 MHz or
- ◆ HORN antenna for frequency above 1 GHz }.

(g) If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.

(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.

(i) Tune the EMI Receivers to the test frequency.

(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.

(k) The transmitter was rotated through 360° about a vertical axis until a higher maximum signal was received.

(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.

(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.

(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:

$$P = P1 - L1 = (P2 + L2) - L1 = P3 + A + L2 - L1$$

$$\text{EIRP} = P + G1 = P3 + L2 - L1 + A + G1$$

$$\text{ERP} = \text{EIRP} - 2.15 \text{ dB}$$

$$\text{Total Correction factor in EMI Receiver \# 2} = L2 - L1 + G1$$

Where: P: Actual RF Power fed into the substitution antenna port after corrected.  
P1: Power output from the signal generator  
P2: Power measured at attenuator A input  
P3: Power reading on the Average Power Meter  
EIRP: EIRP after correction  
ERP: ERP after correction

(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)

(p) Repeat step (d) to (o) for different test frequency

(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.

(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

Figure 2

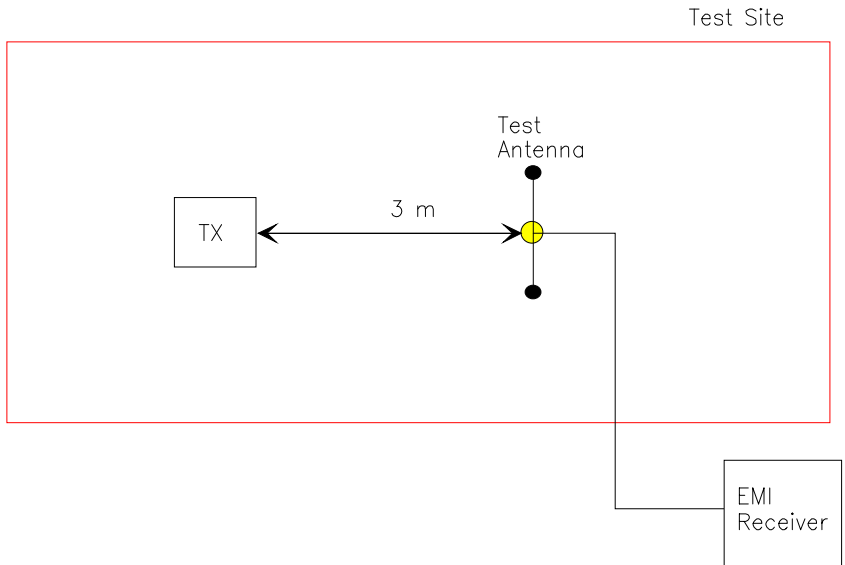


Figure 3

