VERIFICATION TEST REPORT

FCC Part 22, 24, 27
IC RSS 130, 132, 133, 139

Report No.: LYFT08-U13 Rev A

Company: Lyft, Inc.

Model: BIT041B

VERIFICATION TEST REPORT

Company: Lyft, Inc.

Model: BIT041B

Standard(s): FCC Part 22, 24, 27 & ISED RSS 130, 132, 133, 139

Test Report Serial No.: LYFT08-U13 Rev A

This report supersedes: NONE

Applicant: Lyft, Inc
185 Berry St #5000
San Francisco, California 94107
USA

Issue Date: 28th July 2021

This Test Report is Issued Under the Authority of:

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ACCREDITED
TESTING CERT #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

Table of Contents

1. ACCREDITATION, LISTINGS & RECOGNITION 4
1.1. TESTING ACCREDITATION 4
1.2. RECOGNITION 5
1.3. PRODUCT CERTIFICATION 6
2. DOCUMENT HISTORY 7
3. TEST RESULT CERTIFICATE 8
4. REFERENCES AND MEASUREMENT UNCERTAINTY 9
4.1. Normative References 9
4.2. Test and Uncertainty Procedure 10
5. PRODUCT DETAILS AND TEST CONFIGURATIONS 11
5.1. Technical Details 11
5.2. Scope Of Test Program 12
5.3. Equipment Model(s) and Serial Number(s) 13
5.4. External A.C/D.C. Power Adaptor 13
5.5. Antenna Details 13
5.6. Cabling and I/O Ports 13
5.7. Test Configurations 14
5.8. Equipment Modifications 14
5.9. Deviations from the Test Standard 14
6. TEST EQUIPMENT CONFIGURATION(S) 15
6.1. Radiated Emissions - 3m Chamber 15
7. MEASUREMENT AND PRESENTATION OF TEST DATA 17
8. TEST SUMMARY 18
9. TEST RESULTS 19
9.1. Radiated Output Power 19
Band 4: Effective Radiated Power 20
Band 12: Effective Radiated Power 21
9.2. Radiated Transmitter Emissions 22
Band 4: Radiated Transmitter Emissions 24
Band 12: Radiated Transmitter Emissions 25
APPENDIX A – GRAGHICAL IMAGES 26
A.1. Radiated EIRP 27
Band 4: Radiated Output Power 27
Band 12: Radiated Output Power 28

1. ACCREDITATION, LISTINGS & RECOGNITION

1.1. TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard ISO/IEC 17025:2017. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-01.pdf

Accredited Laboratory

A2LA has accredited

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for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 24th day of February 2020.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2021

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

1.2. RECOGNITION

MiCOM Labs, Inc is widely recognized for its wireless testing and certification capabilities. In addition to being recognized for Testing and Certification under Phase 2 Mutual Recognition Agreements (MRA) with Canada, Europe, United Kingdom and Japan, our international recognition includes Conformity Assessment Body (CAB) designation status under agreements with Asia Pacific (APEC) MRA Phase 1 countries giving acceptance of MiCOM Labs test reports. MiCOM Labs test reports are accepted globally.

Country	Recognition Body	Status	MRA Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	US0159 Test Firm Designation#: US1084
Canada	Industry Canada (ISED)	FCB	APEC MRA 2	US0159 ISED#: 4143A
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	Japan MRA 2	RCB 210
	Japan Approvals Institute for Telecommunication Equipment (JATE)			
	VCCI	--	--	A-0012
Europe	European Commission	NB	EU MRA 2	NB 2280
United Kingdom	Department for Business, Energy & Industrial Strategy (BEIS)	AB	UK MRA 2	AB 2280
Mexico	Instituto Federal de Telecomunicaciones (IFT)	CAB	Mexico MRA 1	US0159
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)			
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)			
Singapore	Infocomm Development Authority (IDA)			
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)			
Vietnam	Ministry of Communication (MIC)			

TCB – Telecommunications Certification Bodies (TCB)
FCB – Foreign Certification Body
CAB – Conformity Assessment Body
NB – Notified Body
AB – Approved Body

MRA – Mutual Recognition Agreement
MRA Phase I - recognition for product testing
Phase II – recognition for both product testing and certification

1.3. PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard ISO/IEC 17065:2012. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-02.pdf

Accredited Product Certification Body

A2LA has accredited

MiCOM LABS

Pleasanton, CA

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 *Requirements for bodies certifying products, processes and services*. This product certification body also meets the *A2LA R322 – Specific Requirements – Notified Body Accreditation Requirements* and *A2LA R308 - Specific Requirements - ISO-IEC 17065 - Telecommunication Certification Body Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a management system.

Presented this 24th day of February 2020

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2021

For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.

United States of America – Telecommunication Certification Body (TCB)
Industry Canada – Certification Body, CAB Identifier – US0159
Europe – Notified Body (NB), NB Identifier - 2280
Japan – Recognized Certification Body (RCB), RCB Identifier - 210

2. DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft	25th July 2021	Draft report for client review.
Rev A	28th July 2021	Initial Release

In the above table the latest report revision will replace all earlier versions.

MiCOM Labs, 575 Boulder Court, Pleasanton, California 94566 USA, Phone: +1 (925) 462 0304, Fax: +1 (925) 462 0306, www.micomlabs.com

3. TEST RESULT CERTIFICATE

Manufacturer:	Lyft, Inc 185 Berry St #5000 San Francisco California 94107 USA	**Tested By:**	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Model:	BIT041B	**Telephone:** **Fax:**	+1 925 462 0304 +1 925 462 0306
Equipment Type:	E-Bike Location and Control Unit		
S/N's:	FK2114CVCU2NC0155		
Test Date(s):	20th July 2021	**Website:**	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC Part 22, 24, 27 & ISED RSS 130, 132, 133, 139 199	**EQUIPMENT COMPLIES**

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.

2. Details of test methods used have been recorded and kept on file by the laboratory.

3. Test results apply only to the item(s) tested.

ACCREDITED
TESTING CERT #2381.01

Approved & Released for MiCOM Labs, Inc. by:

Graeme Grieve
Quality Manager MiCOM Labs, Inc.

Gordon Hurst
President & CEO MiCOM Labs, Inc.

4. REFERENCES AND MEASUREMENT UNCERTAINTY

4.1. Normative References

REF.	PUBLICATION	YEAR	TITLE
I	A2LA	October 2019	R105 - Requirement's When Making Reference to A2LA Accreditation Status
II	ETSI TR 100 028	2001-12	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
III	M 3003	Edition 3 Nov.2012	Expression of Uncertainty and Confidence in Measurements
IV	KDB 412172 D01	August 7, 2015	EIRP and ERP are similarly defined as the product of the power supplied to the antenna and the antenna gain. The primary difference is that for ERP the antenna gain is expressed relative to an ideal half-wave dipole antenna, whereas with EIRP the antenna gain is expressed relative to an ideal (theoretical) isotropic antenna. EIRP and ERP can be expressed mathematically as described in the following sections.1
V	RSS-130 Issue 2	February 2019	RSS-130 Equipment Operating in the Frequency Bands 617-652 MHz, 663-698 MHz, 698-756 MHz and 777-787 MHz
VI	RSS-132 Issue 3	January 2013	RSS-132 Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz
VII	RSS-133 Issue 6, Amendment 1	January 2018	RSS-133 2GHz Personal Communications Services. This Radio Standards Specification (RSS) sets out the requirements for certification of transmitters and receivers used in radio communications systems to provide Personal Communications Services (PCS) in the bands 1850-1915 MHz and 1930-1995 MHz.
VIII	RSS-139 Issue 3	July 2015	RSS-139 Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710-1780 MHz and 2110-2180 MHz
IX	FCC Part 22H	April 8, 2021	Subpart H – Cellular Radio Telephone Service: The rules in this subpart govern the licensing and operation of cellular radiotelephone systems. (a) Block A: 824-835 MHz and 845-846.5 MHz (b) Block B: 835-845 MHz and 846.5-849 MHz
X	FCC Part 24E	April 8, 2021	Subpart E—Broadband PCS; (c) This subpart sets out the regulations licensing and operations of personal communications services authorized in the 1850-1910 and 1930-1990 MHz bands.
XI	FCC Part 27C, H	April 8, 2021	Miscellaneous Wireless Communications Services This part .. for the provision of wireless communications services in the following bands. (2) 746-758 MHz, 775-788 MHz, and 805-806 MHz. (3) 698-746 MHz, 1710-1755 MHz

4.2. Test and Uncertainty Procedure

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

MiCOM Labs, 575 Boulder Court, Pleasanton, California 94566 USA, Phone: +1 (925) 462 0304, Fax: +1 (925) 462 0306, www.micomlabs.com

5. PRODUCT DETAILS AND TEST CONFIGURATIONS

5.1. Technical Details

Details	Description
Purpose:	Test of the Lyft, Inc. BIT041B to requirements of FCC Part 22, 24E, 27C & ISED RSS-130, 132, 133, 199
Applicant:	Lyft, Inc 185 Berry St #5000 San Francisco, California 94107, USA
Manufacturer:	Same as Applicant
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566, USA
Test report reference number:	LYFT08-U13
Date EUT received:	20th July 2021
Standard(s) applied:	FCC Part 22, 24E, 27C & ISED RSS-130, 132, 133, 199
Dates of test (from - to):	20th July 2021
No of Units Tested:	1
Type Of Equipment:	E-Bike Location and Control Unit
Model(s):	BIT041B
Equipment Secondary Function(s):	None
Type of Technology:	E-Bike Location and Control Unit
Installation type:	Mobile installation
Construction/Location for Use:	Outdoor
Declared Frequency Range(s):	LTE B1/B2/B3/B4/B5/B7/B8/B12/B13/B18/B19/B20 /B25/B26/B28/B38/B39/B40/B41
Type of Modulation:	QPSK, 64QAM, 256QAM
Declared Nominal Output Power (dBm):	23
Transmit/Receive Operation:	Transceiver
Rated Input Voltage and Current:	48VDC / 1A Battery
Operating Temperature Range:	-20ºC to +50ºC
Equipment Dimensions:	15.75cm x 8.8cm x 5.5cm
Weight:	360 grams
Hardware Rev:	A
Software Rev:	16b00bc1d102c

5.2. Scope Of Test Program

Lyft, Inc. BIT041B

The scope of the test program was a verification test of the Lyft, Inc. BIT041B configurations with the pre-certified LTE Module in the specified frequency bands for compliance against the following IMT Cellular Network specifications:

FCC Part 22 Subpart H – Cellular Radio Telephone Service
The rules in this subpart govern the licensing and operation of cellular radiotelephone systems.

(a) Block A: 824-835 MHz and 845-846.5 MHz
(b) Block B: 835-845 MHz and 846.5-849 MHz

FCC Part 24 Subpart E – Broadband PCS
This subpart sets out the regulations governing the licensing and operations of personal communications services authorized in the 1850-1910 and 1930-1990 MHz bands.

FCC Part 27 - Miscellaneous Wireless Communications Services
This part states the conditions under which spectrum is made available and licensed for the provision of wireless communications services in the following bands… 746-758 MHz, 775-788 MHz, and 805-806 MHz, 698-746 MHz. 1710 - 1755 MHz

Industry Canada RSS-130 Issue 2
This Radio Standards Specification (RSS) sets out the requirements for equipment operating in the Frequency Bands 617-652 MHz, 663-698 MHz, 698-756 MHz and 777-787 MHz bands.

Industry Canada RSS-132 Issue 3
RSS-132 Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz

Industry Canada RSS-133 Issue 6
RSS-133 2 GHz Personal Communications Services sets out the requirements for certification of transmitters and receivers used in radio communications systems to provide Personal Communications Services (PCS) in the bands 1850-1915 MHz and 1930-1995 MHz.

Industry Canada RSS-139 Issue 3
RSS-139 Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710-1780 MHz and 2110-2180 MHz

Pre-Certified LTE module tested by SGS-CSTC Standards Technical Services Co., Ltd Shenzhen;
Test Report # HR/2019/10016E-0101, dated 7th May 2019.

5.3. Equipment Model(s) and Serial Number(s)

Type (EUT/ Support)	Equipment Description (Including Brand Name)	Mfr.	Model No.	Serial No.
EUT	E-Bike Location and Control Unit	Lyft Inc	BIT041B	FK2114CVCU2NC0155
Support	Laptop	Lenovo	N/A	N/A

5.4. External A.C/D.C. Power Adaptor

The BIT040B is powered via 48V Battery, no external ac/dc adaptor is used.

5.5. Antenna Details

Type	Manufacturer	Model	Family	Gain (dBi)	BF Gain	Dir BW	X-Pol	Frequency Band (MHz)
integral	Taoglas	PCS.06A	Chip	-0.21	-	360		698-803
integral	Taoglas	PCS.06A	Chip	0.77	-	360		824-894
integral	Taoglas	PCS.06A	Chip	0.61	-	360		880-960
integral	Taoglas	PCS.06A	Chip	3.05	-	360		1710-1880
integral	Taoglas	PCS.06A	Chip	2.92	-	360		1850-1990
integral	Taoglas	PCS.06A	Chip	3.17	-	360		1920-2170
integral	Taoglas	PCS.06A	Chip	3.72	-	360	-	2500-2690

BF Gain - Beamforming Gain
Dir BW - Directional BeamWidth
X-Pol - Cross Polarization

5.6. Cabling and I/O Ports

Port Type	Max Cable Length	Conn Type	Environment
Discrete I/O	<3m	Higo L810 CG	End-User|
Analog	<3m	Higo L309 CM	End-User|
Analog	<3m	Higo L609 CM	End-User|
CAN+DC IN	<3m	Higo L409 CG	End-User|
Power + Digital I/O	<3m	Higo L509 CM	End-User|

5.7. Test Configurations

Test configurations are as noted in the test results.

LTE Band No.	Bandwidth (MHz)	Channels No.'s	Frequencies (MHz)
2	10	18650, 18900, 19150	1855.0, 1880.0, 1905.0
4	10	20000, 20175, 20350	1715.0, 1732.0, 1750.0
5	10	20450, 20525, 20610	829.0, 836.5 845.0
12	10	23060, 23095, 23130	704.5, 707.5, 711
13	10	23230	782.0

Verification Testing only of pre-certified module tested by; SGS-CSTC Standards Technical Services Co., Ltd Shenzhen.

Test Report # HR/2019/10016E-0101 Dated 7th May 2019.

LTE Band	Test Report Appendix
2	B.3
4	B.4
5	B.5
12	B.7
13	B.8

5.8. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

1. NONE

5.9. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

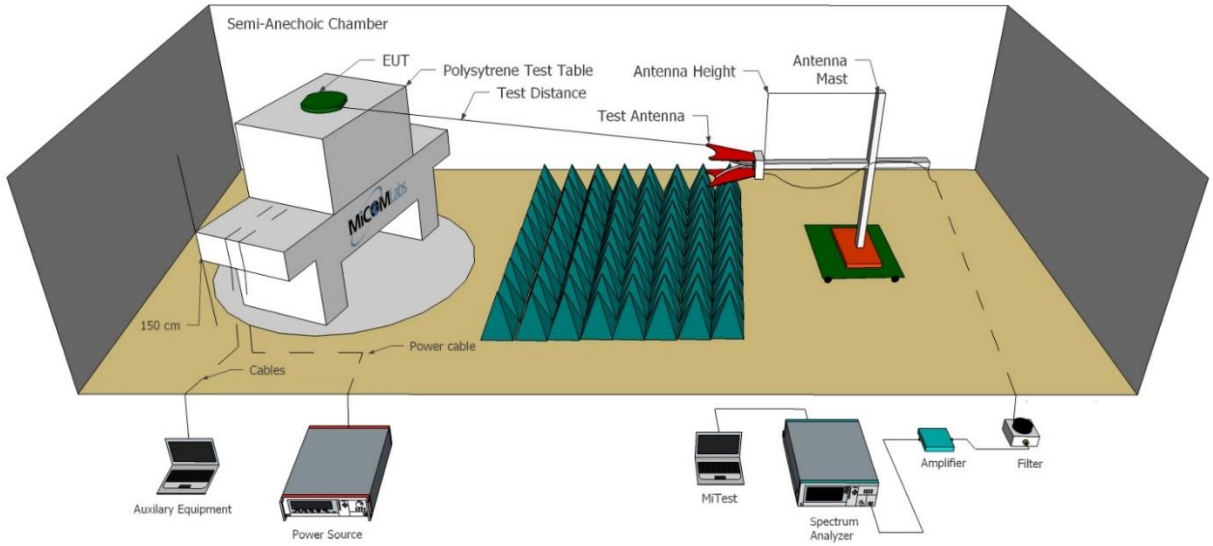
1. NONE

6. TEST EQUIPMENT CONFIGURATION(S)

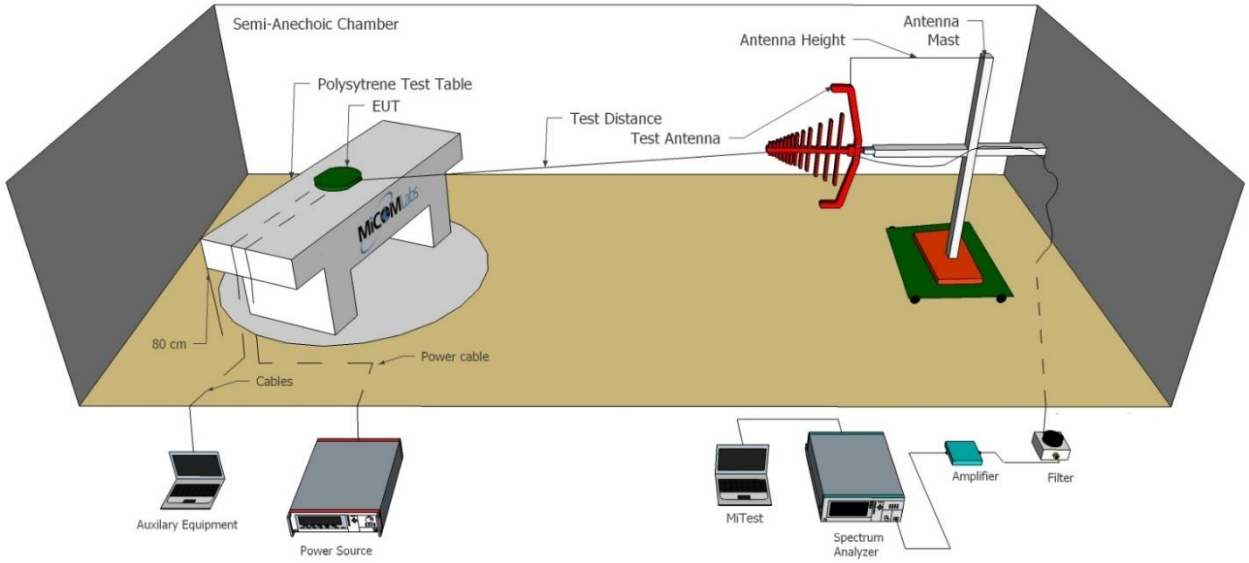
6.1. Radiated Emissions - 3m Chamber

The following tests were performed using the radiated test set-up shown in the diagram below. Radiated emissions above and below 1GHz.

Radiated Emissions Above 1GHz Test Setup



Radiated Emissions Below 1GHz Test Setup



Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CU101	04R08507	Not Required
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	8 Oct 2021
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	4 Oct 2021
373	26III RMS Multimeter	Fluke	Fluke 26 series III	76080720	21 Jun 2021
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	9 May 2021
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	12 May 2021
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	9 May 2021
410	Desktop Computer	Dell	Inspiron 620	WS38	Not Required
411	Mast/Turntable Controller	Sunol Sciences	SC98V	060199-1D	Not Required
412	USB to GPIB Interface	National Instruments	GPIB-USB HS	11B8DC2	Not Required
413	Mast Controller	Sunol Science	TWR95-4	030801-3	Not Required
414	DC Power Supply 0-60V	HP	6274	1029A01285	Cal when used
415	Turntable Controller	Sunol Sciences	Turntable Controller	None	Not Required
447	MiTest Rad Emissions Test Software	MiCOM	Rad Emissions Test Software Version 1.0	447	Not Required
462	Schwarzbeck cable from Antenna to Amplifier.	Schwarzbeck	AK 9513	462	4 May 2021
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	4 May 2021
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	4 May 2021
466	Low Pass Filter DC-1500 MHz	Mini-Circuits	NLP-1750+	VUU10401438	4 May 2021
467	2495 to 2650 MHz notch filter	MicroTronics	BRM50709	011	4 May 2021
480	Cable - Bulkhead to Amp	SRC Haverhill	157-3050360	480	4 May 2021
481	Cable - Bulkhead to Receiver	SRC Haverhill	151-3050787	481	4 May 2021
510	Barometer/Thermometer	Control Company	68000-49	170871375	20 Dec 2021
518	Cable - Amp to Antenna	SRC Haverhill	157-3051574	518	4 May 2021

7. MEASUREMENT AND PRESENTATION OF TEST DATA

The measurement and graphical data presented in this test report was generated automatically using state-of-the-art technology creating an easy to read report structure. Numerical measurement data is separated from supporting graphical data (plots) through hyperlinks. Numerical measurement data can be reviewed without scrolling through numerous graphical pages to arrive at the next data matrix.

Plots have been relegated into the Appendix 'Graphical Data'.

Test and report automation was performed by MiTest. MiTest is an automated test system developed by MiCOM Labs. MiTest is the first cloud based modular test system enabling end-to-end automation of regulatory compliance testing for conducted RF testing.

The MiCOM Labs "MiTest" Automated Test System" (Patent Pending)

8. TEST SUMMARY

Test Header	Result	Data Link
Transmitter Test Parameters		
EIRP Emissions	Complies	View Data
Transmitter Spurious Emissions	Complies	View Data

Note: The EUT is a pre-certified module incorporated in a host with antennas. This report is a verification report of the pre-certified module in the host. For full testing of the module tested by; SGS-CSTC Standards Technical Services Co., Ltd Shenzhen refer to Test Report # HR/2019/10016E-0101 Dated 7th May 2019.

9. TEST RESULTS

9.1. Radiated Output Power

Radiated Test Conditions for Output Power			
Standard:	FCC Part 22, 24E, 27C, H IC RSS-130, 132, 133, 139	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	EIRP	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	FCC 22, FCC 24E: 24.232 (d) FCC 27C: 27.50 (b), (d) RSS-130: 4.6, RSS-132:5.4, RSS-133: 6.4, RSS-139: 6.5	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Output Power
With reference to the test configuration identified in Section 6.1 Radiated Test Setup the EUT was set to transmit on the appropriate centre frequency of the selected frequency band and bandwidth. Output Power was measured on each of the active chain(s) (antenna outputs) using a power sensor connected to each antenna terminal.

Testing was performed under ambient conditions.

Limits Output Power - Band 2:

FCC 24E: §24.232
(c) Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

RSS-133: 6.4 Transmitter Output Power and Equivalent Isotropically Radiated Power:
The equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510.

Limits Output Power - Band 4,12,13:
FCC 27.50
(b) (10) Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.
(d)(4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

RSS-130: 4.6 Transmitter Output Power and Effective Radiated Power:
For base and fixed equipment other than fixed subscriber equipment, refer to SRSP-518 for the e.i.r.p. limits.

RSS-139: 6.6 Transmitter Output Power and Effective Radiated Power:
The equivalent isotropically radiated power (e.i.r.p.) for mobile and portable transmitters shall not exceed one watt.

Limits Output Power - Band 5:
FCC 22.913: (5): The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

RSS-132: 5.4: Transmitter Output Power and Effective Radiated Power:
The transmitter output power shall be measured in terms of average power. The equivalent isotropically radiated power (e.i.r.p.) for mobile equipment shall not exceed 11.5 watts. Refer to SRSP-503 for base station e.i.r.p. limits.

Band 4: Effective Radiated Power

Equipment Configuration for Output Power			
Band:	4	**Duty Cycle (%):**	99.00
Modulation:	QPSK	**Antenna Gain (dBi):**	Not Applicable
Temperature (°C):	+20.0	**Beam Forming Gain (Y)(dB):**	Not Applicable
Voltage (Vdc):	48.0	**Tested By:**	JMH
Engineering Test Notes:	None		

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	EIRP (dBm)	ERP	EIRP Limit (dBm)	Margin (dB)
10	20175	1732.5	0	50	18.73	16.53	30.00	-11.27

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Uncertainty:	1.33 dB

Click in Links above to see plots

Band 12: Effective Radiated Power

Equipment Configuration for Output Power			
Band:	12	**Duty Cycle (%):**	99.00
Modulation:	QPSK	**Antenna Gain (dBi):**	Not Applicable
Temperature (°C):	+20.0	**Beam Forming Gain (Y)(dB):**	Not Applicable
Voltage (Vdc):	48.0	**Tested By:**	JMH
Engineering Test Notes:	None		

Bandwidth (MHz)	Chanel #	Frequency (MHz)	RB (Starting)	RB #	EIRP (dBm)	ERP	EIRP Limit (dBm)	Margin (dB)
10	23095	707.5	0	50	13.90	11.7	34.77	-21.87

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Uncertainty:	1.33 dB

Click in Links above to see plots

9.2. Radiated Transmitter Emissions

Radiated Test Conditions for Transmitter Spurious Emissions			
Standard:	FCC Part 22, 24E, 27C, IC RSS-130, 132, 133, 139	**Ambient Temp. (ºC):**	20.0 - 24.5
Test Heading:	Out of Band Emissions	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	FCC 22:917(a), FCC 24E: 238(a) FCC 27C, H: 27.53 (c), (g) RSS-130: 4.7.1 RSS-132:5.5, RSS-133: 6.5, RSS-139: 6.5	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Out of Band Emissions
With reference to the test configuration identified in Section 6.1 Radiated Test Setup the EUT was set to transmit on the appropriate center frequency of the selected frequency band and bandwidth. Out of Band emissions was tested under QPSK.

Testing was performed under ambient conditions.

Limits Out of Band Emissions

Band 2:
FCC 24E: §24.238 Emission limitations for Broadband PCS equipment.
(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

RSS-133: 6.5 (i) In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p(watts). 2 GHz Personal Communications Services RSS-133 4

(ii) After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p(watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

(b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

Band 4, 12,13:
FCC 27C: §27.53 Emission limits for Miscellaneous Wireless Communications Services.
(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:
(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(h) ***AWS emission limits*****—(**1) *General protection levels.* Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB.

RSS-130: 4.7.1 The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

RSS-139: 6.6 Transmitter Unwanted Emissions
(i) In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block,2 which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log10 p (watts) dB.
(ii) After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log10 p (watts) dB.

Band 5:
FCC 22H: 917(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

RSS-132: 5.5 Transmitter Unwanted Emissions
Mobile and base station equipment shall comply with the limits in (i) and (ii) below.
(i) In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p (watts).
(ii) After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.
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Band 4: Radiated Transmitter Emissions

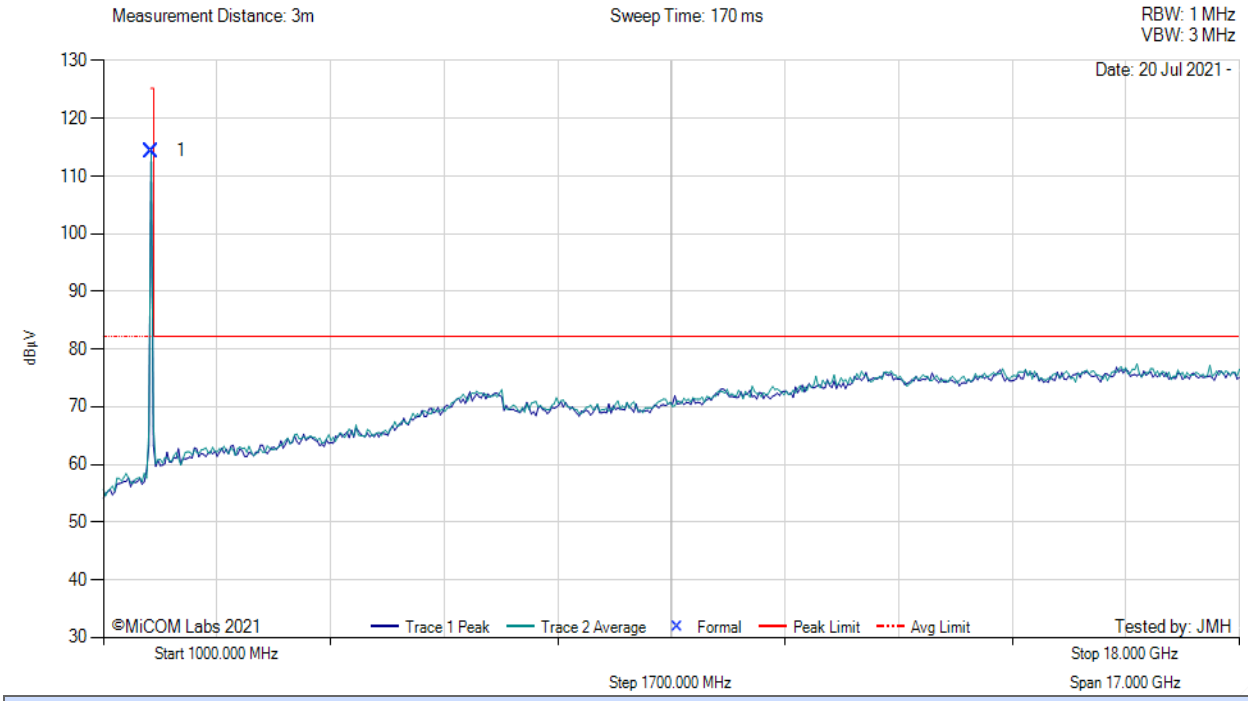
FCC 27.53 h: *AWS emission limits*—(1) *General protection levels.* Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB.. ~ -13 dBm or 82.23 dBuV/m

Equipment Configuration for Restricted Band Spurious Emissions

Antenna:	Integral	**Variant:**	LTE
Antenna Gain (dBi):	Not Applicable	**Modulation:**	QPSK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99
Channel Frequency (MHz):	1715.0	**Data Rate:**	Full RB
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

Variant: LTE, Test Freq: 1732.50 MHz, Power Setting: Max, Duty Cycle (%): 99



1000.00 - 18000.00 MHz

Num	Frequency MHz	Raw dBµV	Cable Loss dB	AF dB/m	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	1715.43	83.46	1.70	29.19	114.35	Max Peak	Vertical	153	376	125.2	-10.9	Pass

Test Notes: COSMO VCU powered by 48 V DC. LTE Call up Band 4 1732.5 MHz, Full RB.

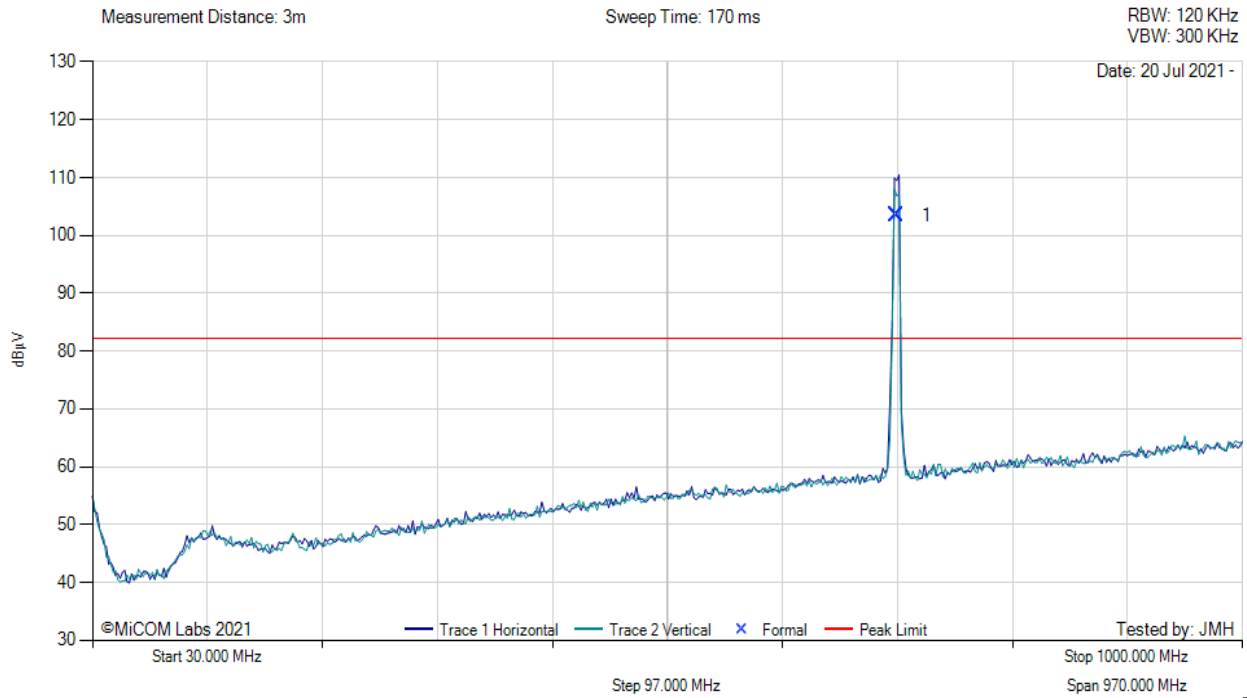
Band 12: Radiated Transmitter Emissions

FCC 27.53g: Emission limits for Miscellaneous Wireless equipment.
(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. ~ -13 dBm or 82.23 dBuV/m

Equipment Configuration for Radiated Digital Emissions			
Antenna:	Integral	**Variant:**	LTE
Antenna Gain (dBi):	Not Applicable	**Modulation:**	QPSK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	99
Channel Frequency (MHz):	704.50	**Data Rate:**	Full RB
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

Variant: LTE, Test Freq: 707.50 MHz, Power Setting: Max



30.00 - 1000.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	707.81	104.37	6.22	-7.16	103.43	Fundamental	Horizontal	150	0	--	--	

Test Notes: Cosmo VCU powered by 48V DC. LTE Band 12 704.5 MHz. Full RB

APPENDIX A – GRAGHICAL IMAGES

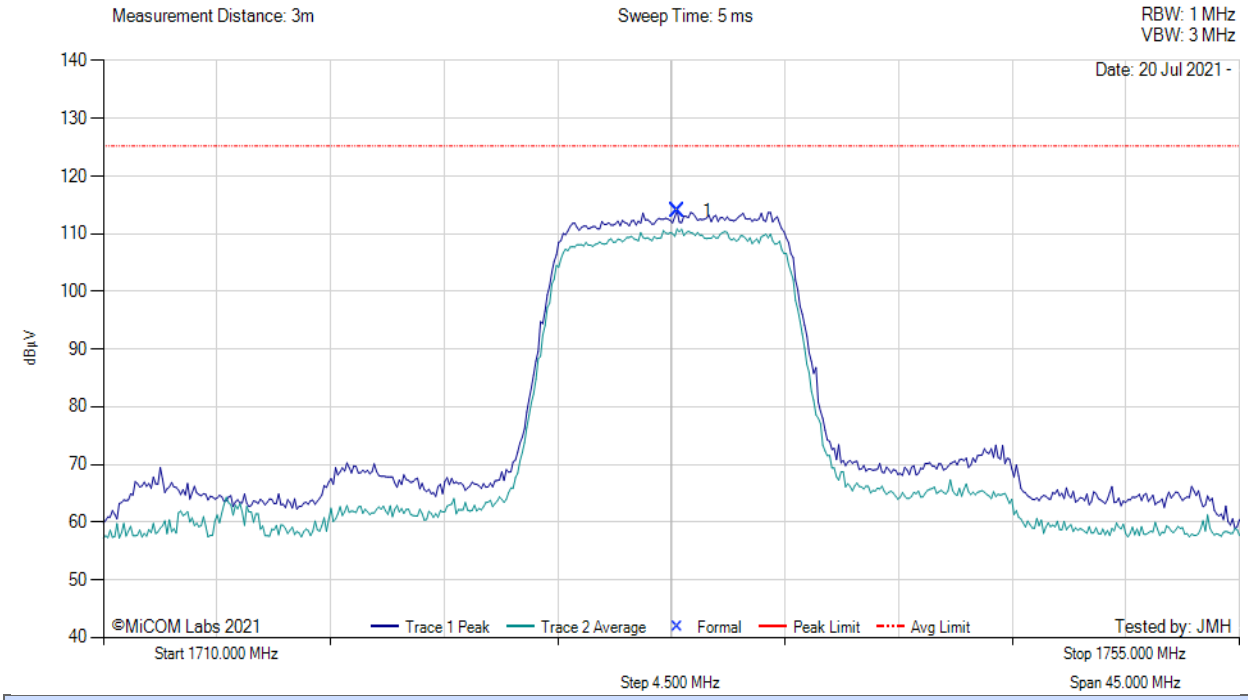
A.1. Radiated EIRP

Band 4: Radiated Output Power

Equipment Configuration for Restricted Band Spurious Emissions			
Antenna:	Integral	**Variant:**	LTE
Antenna Gain (dBi):	Not Applicable	**Modulation:**	QPSK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	
Channel Frequency (MHz):	1732.5	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

Variant: LTE, Test Freq: 1732.50 MHz, Power Setting: Max, Duty Cycle (%): 99



1710.00 - 1755.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	1732.73	82.83	1.68	29.45	113.96	Max Peak	Vertical	172	148	125.2	-11.2	Pass

Test Notes: Cosmo VCU powered by 48V DC. LTE Band 4 1732 MHz EIRP Power

113.96 dBµV/m – 95.23 = 18.73 dbm Limit = 30 dBm

Back to Matrix

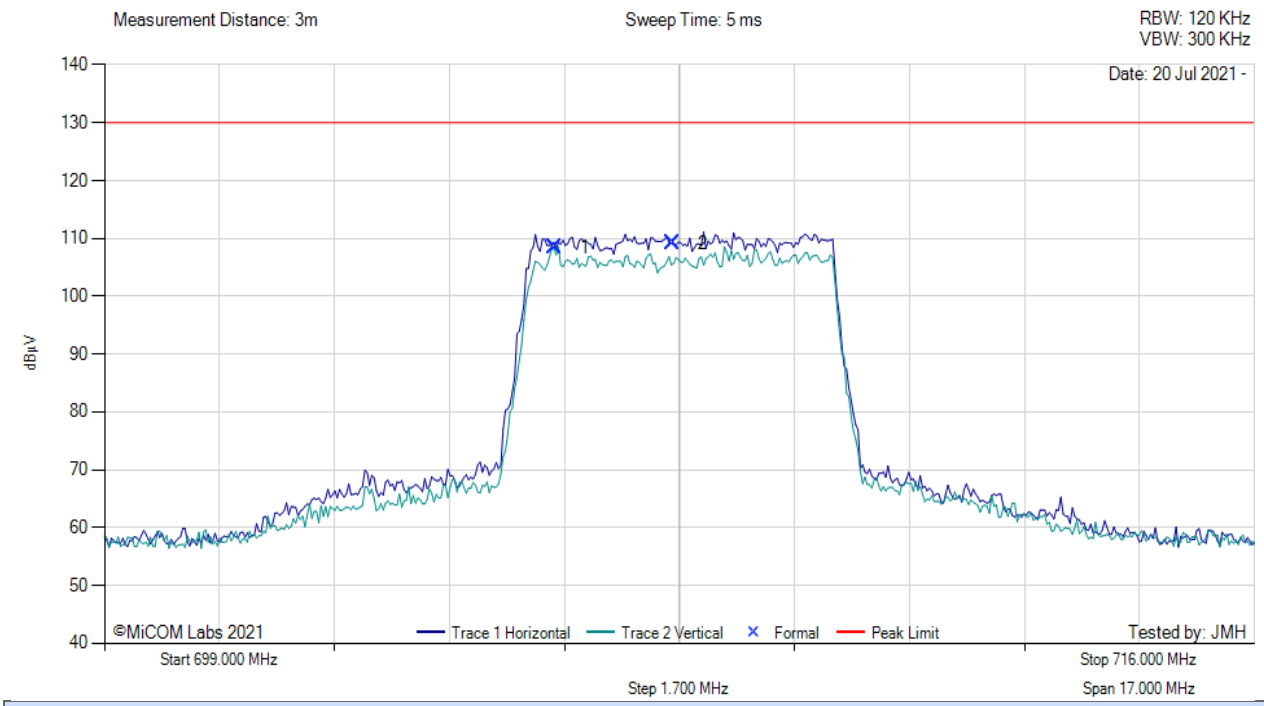
Band 12: Radiated Output Power

Equipment Configuration for Restricted Band Spurious Emissions

Antenna:	Integral	**Variant:**	LTE
Antenna Gain (dBi):	Not Applicable	**Modulation:**	QPSK
Beam Forming Gain (Y):	Not Applicable	**Duty Cycle (%):**	
Channel Frequency (MHz):	707.5	**Data Rate:**	
Power Setting:	Max	**Tested By:**	JMH

Test Measurement Results

Variant: LTE, Test Freq: 707.50 MHz, Power Setting: Max



699.00 - 716.00 MHz												
Num	**Frequency MHz**	**Raw dBµV**	**Cable Loss dB**	**AF dB/m**	**Level dBµV/m**	**Measurement Type**	**Pol**	**Hgt cm**	**Azt Deg**	**Limit dBµV/m**	**Margin dB**	**Pass /Fail**
1	705.65	109.49	6.22	-7.25	108.46	MaxQP	Horizontal	148	141	130.0	-21.5	Pass
2	707.40	110.07	6.22	-7.16	109.13	MaxQP	Horizontal	148	138	130.0	-20.9	Pass

Test Notes: Cosmo VCU powered by 48V DC . LTE Band 12 707.5 MHz

109.13 dBµV/m – 95.23 = 13.90 dbm Limit = 34.77 dBm

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