



REGULATORY COMPLIANCE TEST REPORT

FCC CFR 47 Part 15.225 & ISSED RSS-210

Report No.: LYFT06-U7 Rev A

Company: Lyft, Inc

Model Name: BIT040B

REGULATORY COMPLIANCE TEST REPORT

Company Name: Lyft, Inc

Model Name: BIT040B

To: FCC CFR 47 Part 15.225 & ISED RSS-210

Test Report Serial No.: LYFT06-U7 Rev A

This report supersedes: NONE

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

Issue Date: 19th April 2021

This Test Report is Issued Under the Authority of:

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MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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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

MICOM LABS

Pleasanton, CA

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 | | | |
| Europe | European Commission | NB | EU MRA 2 | A-0012 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

MRA 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>



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

2. DOCUMENT HISTORY

| Document History | | |
|------------------|-----------------------------|-------------------------------------|
| Revision | Date | Comments |
| Draft | 16 th April 2021 | Draft report for client for review. |
| Rev A | 19 th April 2021 | Initial release. |
| | | |
| | | |
| . | | |
| . | | |
| . | | |

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

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: BIT040B | Telephone: +1 925 462 0304 |
| Type Of Equipment: E-Bike Location and Control Unit | Fax: +1 925 462 0306 |
| S/N's: Conducted: 65-0000015-7 Radiated: LY2112CVCU2FC0001 | |
| Test Date(s): 30 th March 2021 | Website: www.micomlabs.com |

| STANDARD(S) | TEST RESULTS |
|--|--------------------|
| FCC CFR 47 Part 15.225 & ISSED RSS-210 | 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.

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 | KDB 662911 D01 & D02 | Oct 31 2013 | Guidance for measurement of output emission of devices that employ single transmitter with multiple outputs or systems with multiple transmitters operating simultaneously in the same frequency band |
| II | A2LA | 5th October 2020 | R105 - Requirement's When Making Reference to A2LA Accreditation Status |
| III | ANSI C63.10 | 2013 | American National Standard for Testing Unlicensed Wireless Devices |
| IV | ANSI C63.4 | 2014 | American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |
| V | CISPR 32 | 2015 | Electromagnetic compatibility of multimedia equipment - Emission requirements |
| VI | 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 |
| VII | FCC 47 CFR Part 15.225 | 2020 | Operation within the band 13.110-14.010MHz |
| VIII | ICES-003 | Issue 7 ; October 15, 2020 | Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement. |
| IX | M 3003 | Edition 3 Nov.2012 | Expression of Uncertainty and Confidence in Measurements |
| X | RSS-210 | Issue 10 December 2019 | RSS-210 — Licence-Exempt Radio Apparatus: Category I Equipment |
| XI | RSS-Gen Issue 5 | March 2019 Amendment 1 | General Requirements for Compliance of Radio Apparatus |
| XII | FCC 47 CFR Part 2.1033 | 2020 | FCC requirements and rules regarding photographs and test setup diagrams. |

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.

5. PRODUCT DETAILS AND TEST CONFIGURATIONS

5.1. Technical Details

| Details | Description |
|----------------------------------|--|
| Purpose: | Test of the Lyft, Inc BIT040B to FCC CFR 47 Part 15.225 & ISED RSS-210 |
| Applicant: | Lyft, Inc 185 Berry St #5000 San Francisco California 94107 USA |
| Manufacturer: | Lyft, Inc |
| Laboratory performing the tests: | MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA |
| Test report reference number: | LYFT06-U7 Rev A |
| Date EUT received: | 30 th March to 1 st April 2021 |
| Standard(s) applied: | FCC CFR 47 Part 15.225 & ISED RSS-210 |
| Dates of test (from - to): | 30th March 2021 |
| No of Units Tested: | 1 |
| Type Of Equipment: | E-Bike Location and Control Unit |
| Model(s): | BIT040B |
| Location for use: | Indoor / Outdoor |
| Declared Frequency Range(s): | 13.56 MHz; |
| Type of Modulation: | ASK |
| EUT Modes of Operation: | NFC |
| Transmit/Receive Operation: | Transceiver |
| Rated Input Voltage and Current: | 48VDC / 1A Battery |
| Operating Temperature Range: | -20°C to +50°C |
| ITU Emission Designator: | 2K00N0N |
| Equipment Dimensions: | 15.75cm x 8.8cm x 5.5cm |
| Weight: | 360 grams |
| Hardware Rev: | 5 |
| Software Rev: | 9686a2fa0817 |

5.2. Scope Of Test Program

Lyft, Inc BIT040B

The scope of the test program was to test the Lyft, Inc BIT040B NFC operating in the frequency range 13.110 – 14.010 MHz; for compliance against the following specifications:

FCC CFR 47 Part 15.225

Radio Frequency Devices; Operating in the band 13.110 – 14.010 MHz

ISSED RSS-210

License-Exempt Radio Apparatus

Section 7. Technical Specifications; B.6 Band 13.110-14.010 MHz

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 | BIT040B | Conducted: 65-0000015-7 Radiated: LY2112CVCU2FC0001 |
| Support | Laptop | Lenovo | N/A | N/A |

5.4. Antenna Details

| Type | Manufacturer | Model | Gain (dBi) | Frequency Band (MHz) |
|----------|--------------|------------------|------------|----------------------|
| Integral | Lyft | PCB Loop Antenna | 0.0 | 13.110-14.010 |

5.5. 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 |

5.6. Test Configurations

Results for the following configurations are provided in this report:

| Operational Mode | Data Rate with Highest Power MBit/s | Channel Frequency (MHz) | | |
|---------------------|-------------------------------------|-------------------------|-------|------|
| | | Low | Mid | High |
| 13.110 – 14.010 MHz | | | | |
| NFC | - | -- | 13.56 | -- |

5.7. Equipment Modifications

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

1. NONE

5.8. Deviations from the Test Standard

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

1. NONE

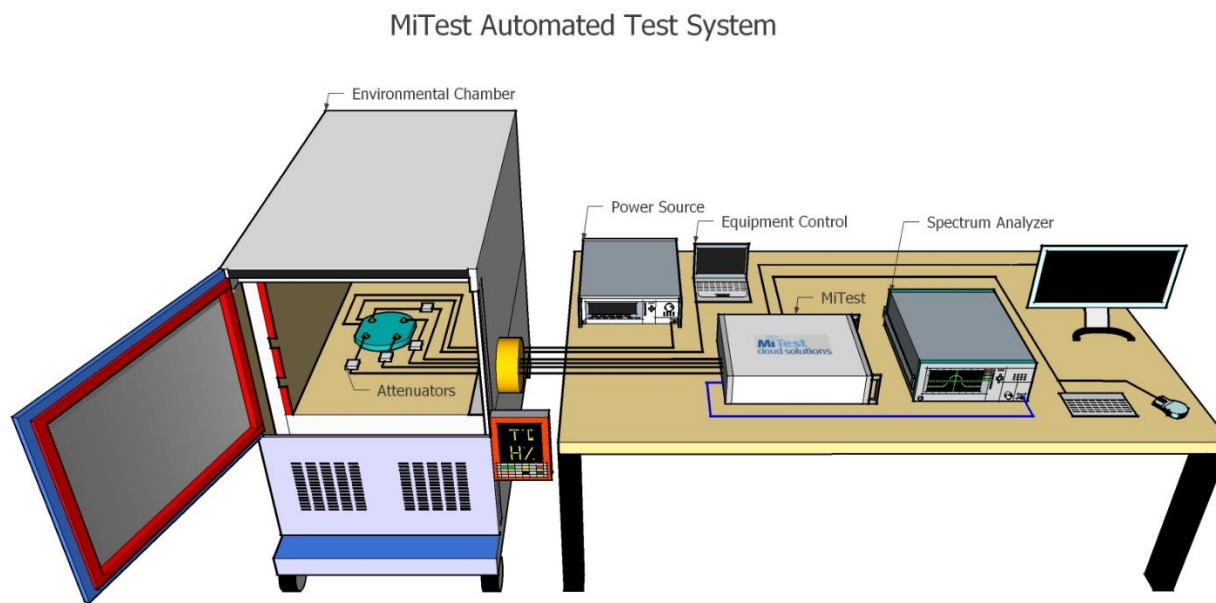
6. TEST SUMMARY

List of Measurements

| Test Header | Result | Data Link |
|---|----------|---------------------------|
| Frequency Tolerance | Complies | View Data |
| Emissions | Complies | - |
| Radiated Emissions | Complies | - |
| (i) TX Spurious & Restricted Band Emissions | Complies | View Data |
| (ii) Field Strength | Complies | View Data |

7. TEST EQUIPMENT CONFIGURATION(S)

7.1. Conducted Test Setup



A full system calibration was performed on the test station and any resulting system losses (or gains) were considered in the production of all final measurement data.

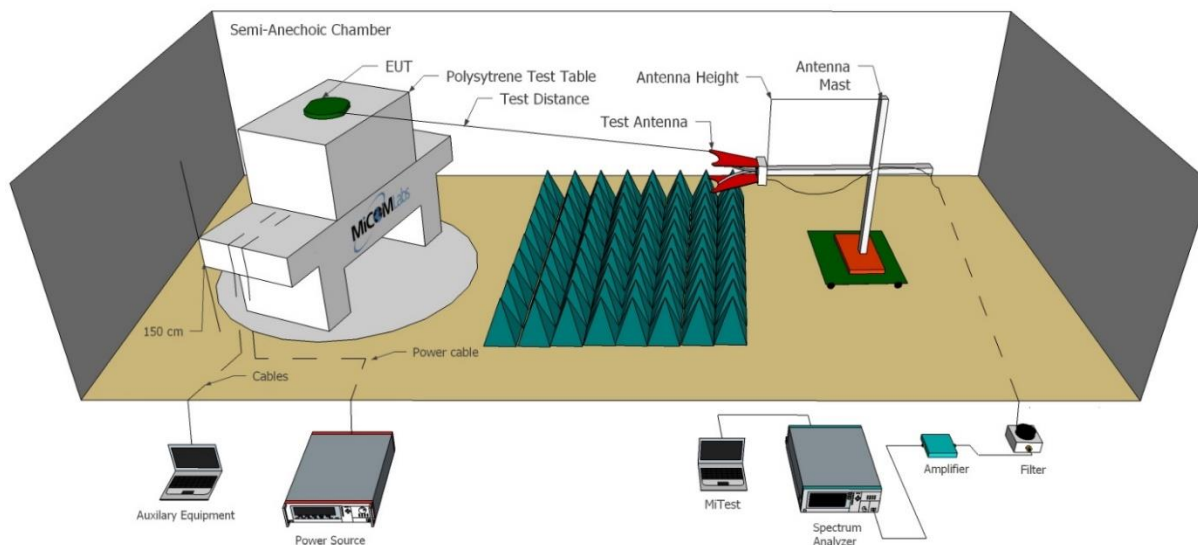
| Asset# | Description | Manufacturer | Model# | Serial# | Calibration Due Date |
|--------|--|--------------------|-----------------|-----------------|----------------------|
| #3 SA | MiTest Box to SA | Fairview Microwave | SCA1814-0101-72 | #3 SA | 4 Jun 2021 |
| #3P1 | EUT to MiTest box port 1 | Fairview Microwave | SCA1814-0101-72 | #3P1 | 4 Jun 2021 |
| #3P2 | EUT to MiTest box port 2 | Fairview Microwave | SCA1814-0101-72 | #3P2 | 4 Jun 2021 |
| #3P3 | EUT to MiTest box port 3 | Fairview Microwave | SCA1814-0101-72 | #3P3 | 4 Jun 2021 |
| #3P4 | EUT to MiTest box port 4 | Fairview Microwave | SCA1812-0101-72 | #3P4 | 4 Jun 2021 |
| 249 | Thermocouple; Resistance Thermometer | Thermotronics | GR2105-02 | 9340 #2 | 30 Oct 2021 |
| 287 | Rohde & Schwarz 40 GHz Receiver | Rhode & Schwarz | ESIB40 | 100201 | 8 Oct 2021 |
| 378 | Rohde & Schwarz 40 GHz Receiver with Generator | Rhode & Schwarz | ESIB40 | 100107/040 | 12 Jun 2021 |
| 398 | MiTest RF Conducted Test Software | MiCOM | MiTest ATS | Version 4.2.3.0 | Not Required |
| 405 | DC Power Supply 0-60V | Agilent | 6654A | MY4001826 | Cal when used |
| 408 | USB to GPIB interface | National | GPIB-USB HS | 14C0DE9 | Not Required |

| | | Instruments | | | |
|-----|---------------------------------------|-----------------|------------------|------------------------------------|--------------|
| 440 | USB Wideband Power Sensor | Boonton | 55006 | 9178 | 22 Jun 2021 |
| 441 | USB Wideband Power Sensor | Boonton | 55006 | 9179 | 20 Jun 2021 |
| 442 | USB Wideband Power Sensor | Boonton | 55006 | 9181 | 19 Jun 2021 |
| 445 | PoE Injector | D-Link | DPE-101GL | QTAH1E 2000625 | Not Required |
| 461 | Spectrum Analyzer | Agilent | E4440A | MY46185 537 | 20 Jun 2021 |
| 510 | Barometer/Thermometer | Control Company | 68000-49 | 1708713 75 | 20 Dec 2021 |
| 515 | MiTest Cloud Solutions RF Test Box | MiCOM | 2nd Gen with DFS | 515 | 4 Jun 2021 |
| 534 | Power Sensor 50 GHz - 70dBm to +20dBm | R&S | NRP50SN | 1419.009 3K02- 100888- SB | 26 Feb 2022 |
| 75 | Environmental Chamber | Theratron | SE-300-2-2 | 27946 | 20 Feb 2022 |

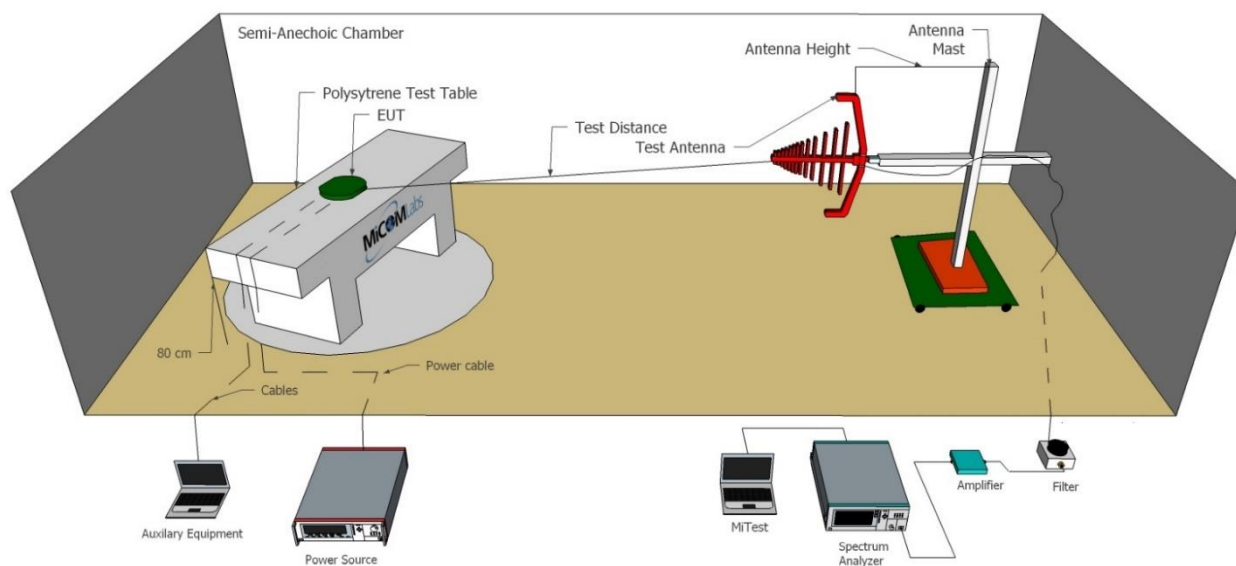
7.2. Radiated Emissions - 3m Chamber

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



A full system calibration was performed on the test station and any resulting system losses (or gains) were considered in the production of all final measurement data.

| 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 |
| 330 | Variac 0-280 Vac | Staco Energy Co | 3PN1020B | 0546 | Cal when used |
| 336 | Active loop Ant 10kHz to 30 MHz | EMCO | EMCO 6502 | 00060498 | 29 Nov 2021 |
| 338 | Sunol 30 to 3000 MHz Antenna | Sunol | JB3 | A052907 | 4 Oct 2021 |
| 342 | 2.4 GHz Notch Filter | EWT | EWT-14-0203 | H1 | 4 May 2021 |
| 373 | 26III RMS Multimeter | Fluke | Fluke 26 series III | 76080720 | 21 Jun 2021 |
| 378 | Rohde & Schwarz 40 GHz Receiver with Generator | Rhode & Schwarz | ESIB40 | 100107/040 | 12 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 |
| 416 | Gigabit ethernet filter | ETS-Lingren | Gigafoil 260366 | 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 |

| | | | | | |
|-----|------------------------------|-----------------|--------------|-------------|---------------|
| 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 |
| 87 | Uninterruptible Power Supply | Falcon Electric | ED2000-1/2LC | F3471 02/01 | Cal when used |

8. 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)

9. TEST RESULTS

9.1. Frequency Tolerance

| Conducted Test Conditions for Frequency Stability | | | |
|--|---------------------------------------|---------------------|-------------|
| Standard: | FCC CFR 47:15.225 ISED RSS-210/Gen | Ambient Temp. (°C): | 24.0 - 27.5 |
| Test Heading: | Frequency Stability | Rel. Humidity (%): | 32 - 45 |
| Standard Section(s): | 15.225(e) RSS-Gen 6.11 | Pressure (mBars): | 999 - 1001 |
| Reference Document(s): | See Normative References | | |
| Test Procedure for Frequency Stability Measurement | | | |
| The Frequency Error was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency. | | | |
| Testing was performed under ambient conditions at extreme voltages and over extreme temperatures at nominal voltages. Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured and reported. | | | |
| Test configuration and setup used for the measurement was per the Conducted Test Set-up specified in this document. | | | |
| Limit: 100 ppm | | | |

Equipment Configuration for Nominal Centre frequencies

| | | | |
|--------------------------------|----------------|-----------------------------------|----------------|
| Variant: | NFC | Duty Cycle (%): | Not Applicable |
| Data Rate: | Not Applicable | Antenna Gain (dBi): | Not Applicable |
| Modulation: | Not Applicable | Beam Forming Gain (Y)(dB): | Not Applicable |
| TPC: | Not Applicable | Tested By: | SB |
| Engineering Test Notes: | | | |

Test Measurement Results

| Test frequency | 13.56 MHz | Measured Frequency | Frequency Error | | Limit | Margin |
|----------------|-----------|--------------------|-----------------|-------------|-------|-------------|
| Temperature | Voltage | Hz | kHz | ppm | ppm | ppm |
| 20 °C | 48.0 Vdc | 13560558.00 | 0.558 | 41.15044248 | ±100 | -58.8495575 |
| 20 °C | 40.8 Vdc | 13560558.00 | 0.558 | 41.15044248 | ±100 | -58.8495575 |
| 20 °C | 55.2 Vdc | 13560558.00 | 0.558 | 41.15044248 | ±100 | -58.8495575 |
| 40 °C | 48.0 Vdc | 13560558.00 | 0.558 | 41.15044248 | ±100 | -58.8495575 |
| 30 °C | 48.0 Vdc | 13560558.00 | 0.558 | 41.15044248 | ±100 | -58.8495575 |
| 10 °C | 48.0 Vdc | 13560558.00 | 0.558 | 41.15044248 | ±100 | -58.8495575 |
| 0 °C | 48.0 Vdc | 13560566.00 | 0.566 | 41.74041298 | ±100 | -58.259587 |
| -10 °C | 48.0 Vdc | 13560566.00 | 0.566 | 41.74041298 | ±100 | -58.259587 |
| -20 °C | 48.0 Vdc | 13560574.00 | 0.574 | 42.33038348 | ±100 | -57.6696165 |

Traceability to Industry Recognized Test Methodologies

| | |
|--------------------------|---------------------------|
| Work Instruction: | WI-02 MEASURING FREQUENCY |
| Measurement Uncertainty: | ±0.86 ppm |

9.2. Radiated Emissions

9.2.1.1. TX Spurious & Restricted Band Emissions

| Radiated Test Conditions for Radiated Spurious and Band-Edge Emissions (Restricted Bands) | | | |
|---|--|----------------------------|-------------|
| Standard: | FCC CFR 47 Part 15.225 ISED RSS-210/GEN | Ambient Temp. (°C): | 20.0 - 24.5 |
| Test Heading: | Radiated Spurious and Band-Edge Emissions | Rel. Humidity (%): | 32 - 45 |
| Standard Section(s): | 15.205, 15.209 RSS-GEN 6.13 | Pressure (mBars): | 999 - 1001 |
| Reference Document(s): | See Normative References | | |

Test Procedure for Radiated Spurious and Band-Edge Emissions (Restricted Bands)

Radiated emissions for restricted bands above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned. Measurements on any restricted band frequency or frequencies above 1 GHz are based on the use of measurement instrumentation employing peak and average detectors. All measurements were performed using a resolution bandwidth of 1 MHz.

Test configuration and setup for Radiated Spurious and Band-Edge Measurement were per the Radiated Test Set-up specified in this document.

Limits for Restricted Bands

Peak emission: 74 dBuV/m

Average emission: 54 dBuV/m

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

$$FS = R + AF + CORR - FO$$

where:

FS = Field Strength

R = Measured Spectrum analyzer Input Amplitude

AF = Antenna Factor

CORR = Correction Factor = CL – AG + NFL

CL = Cable Loss

AG = Amplifier Gain

FO = Distance Falloff Factor

NFL = Notch Filter Loss or Waveguide Loss

Example:

Given receiver input reading of 51.5 dBmV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength (FS) of the measured emission is:

$$FS = 51.5 + 8.5 + 1.3 - 26.0 + 1 = 36.3 \text{ dBmV/m}$$

Conversion between dBmV/m (or dBmV) and mV/m (or mV) are as follows:

$$\text{Level (dBmV/m)} = 20 * \text{Log (level (mV/m))}$$

$$40 \text{ dBmV/m} = 100 \text{ mV/m}$$

$$48 \text{ dBmV/m} = 250 \text{ mV/m}$$

Restricted Bands of Operation (15.205)

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| Frequency Band | | | |
|-------------------|---------------------|---------------|-------------|
| MHz | MHz | MHz | GHz |
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| 0.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | Above 38.6 |
| 13.36-13.41 | | | |

(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

(c) Except as provided in paragraphs (d) and (e) of this section, regardless of the field strength limits specified elsewhere in this subpart, the provisions of this section apply to emissions from any intentional radiator.

(d) The following devices are exempt from the requirements of this section:

- (1) Swept frequency field disturbance sensors operating between 1.705 and 37 MHz provided their emissions only sweep through the bands listed in paragraph (a) of this section, the sweep is never stopped with the fundamental emission within the bands listed in paragraph (a) of this section, and the fundamental emission is outside of the bands listed in paragraph (a) of this section more than 99% of the time the device is actively transmitting, without compensation for duty cycle.
- (2) Transmitters used to detect buried electronic markers at 101.4 kHz which are employed by telephone companies.
- (3) Cable locating equipment operated pursuant to §15.213.
- (4) Any equipment operated under the provisions of §15.253, 15.255, and 15.256 in the frequency band 75-85 GHz, or §15.257 of this part.
- (5) Biomedical telemetry devices operating under the provisions of §15.242 of this part are not subject to the restricted band 608-614 MHz but are subject to compliance within the other restricted bands.
- (6) Transmitters operating under the provisions of subparts D or F of this part.
- (7) Devices operated pursuant to §15.225 are exempt from complying with this section for the 13.36-13.41 MHz band only.
- (8) Devices operated in the 24.075-24.175 GHz band under §15.245 are exempt from complying with the requirements of this

section for the 48.15-48.35 GHz and 72.225-72.525 GHz bands only, and shall not exceed the limits specified in §15.245(b).

(9) Devices operated in the 24.0-24.25 GHz band under §15.249 are exempt from complying with the requirements of this section for the 48.0-48.5 GHz and 72.0-72.75 GHz bands only, and shall not exceed the limits specified in §15.249(a).

(e) Harmonic emissions appearing in the restricted bands above 17.7 GHz from field disturbance sensors operating under the provisions of §15.245 shall not exceed the limits specified in §15.245(b).

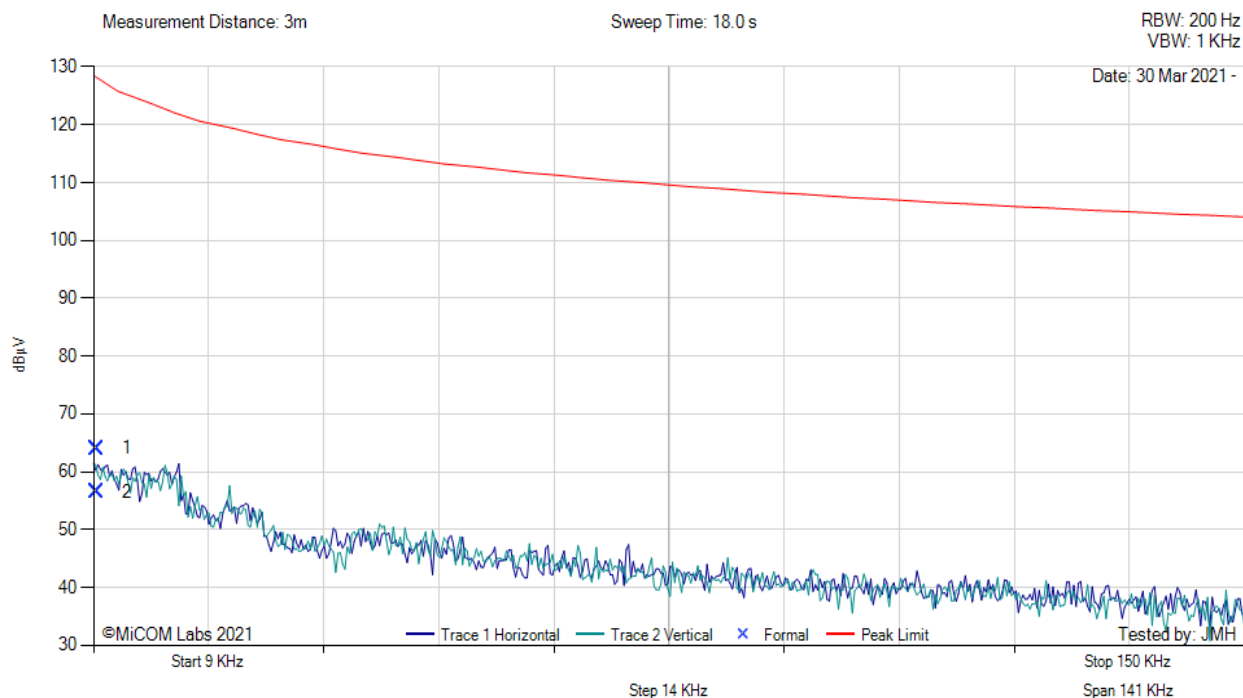
Equipment Configuration for Below 30MHz Emissions (9kHz - 150kHz)

| | | | |
|---------------------------------|----------------|------------------------|----------------|
| Antenna: | Integral | Variant: | NFC |
| Antenna Gain (dBi): | Not Applicable | Modulation: | Not Applicable |
| Beam Forming Gain (Y): | Not Applicable | Duty Cycle (%): | 99 |
| Channel Frequency (MHz): | 13.56 | Data Rate: | Not Applicable |
| Power Setting: | Max | Tested By: | JMH |

Test Measurement Results



Test Freq: 13.56 MHz, Power Setting: Max



9.0 – 150.0 kHz

| 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 | 0.01 | 45.78 | 0.09 | 18.20 | 64.07 | Peak (NRB) | -- | 0 | 0 | -- | -- | Pass |
| 2 | 0.01 | 38.24 | 0.09 | 18.20 | 56.53 | MaxQP | Vertical | 0 | 290 | 128.2 | -71.7 | Pass |

Test Notes: COSMO VCU powered by 48 V DC.

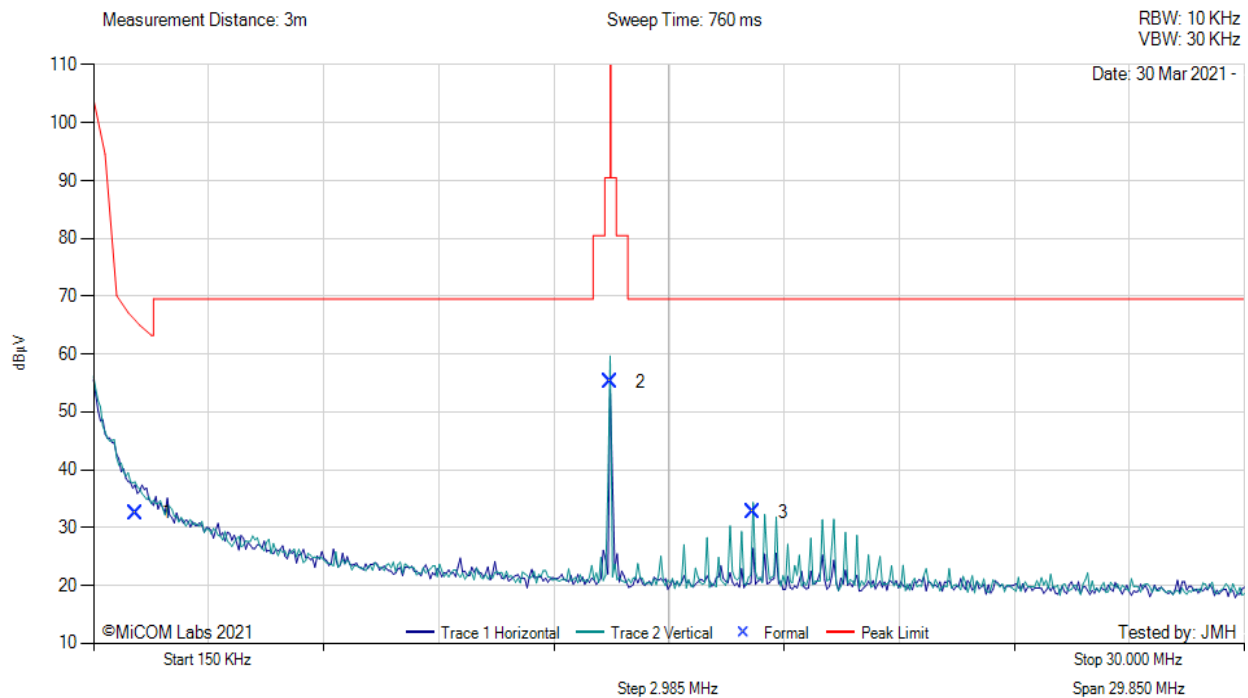
Equipment Configuration for Below 30MHz Emissions (150kHz - 30MHz)

| | | | |
|---------------------------------|----------------|------------------------|----------------|
| Antenna: | Integral | Variant: | NFC |
| Antenna Gain (dBi): | Not Applicable | Modulation: | Not Applicable |
| Beam Forming Gain (Y): | Not Applicable | Duty Cycle (%): | 99 |
| Channel Frequency (MHz): | 13.56 | Data Rate: | Not Applicable |
| Power Setting: | Max | Tested By: | JMH |

Test Measurement Results



Test Freq: 13.56 MHz, Power Setting: Max



0.150 - 30.00 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 | 1.25 | 21.22 | 0.20 | 11.10 | 32.52 | MaxQP | Vertical | 0 | 357 | 65.6 | -33.1 | Pass |
| 2 | 13.56 | 44.76 | 0.41 | 9.96 | 55.13 | Fundamental | Vertical | 0 | 63 | 80.5 | -25.4 | Pass |
| 3 | 17.25 | 22.48 | 0.47 | 9.72 | 32.67 | MaxQP | Vertical | 0 | 143 | 69.5 | -36.9 | Pass |

Test Notes: COSMO VCU powered by 48 V DC.

Equipment Configuration for Radiated Digital Emissions (Class B)

| | | | |
|---------------------------------|----------------|------------------------|----------------|
| Antenna: | Integral | Variant: | NFC |
| Antenna Gain (dBi): | Not Applicable | Modulation: | Not Applicable |
| Beam Forming Gain (Y): | Not Applicable | Duty Cycle (%): | 99 |
| Channel Frequency (MHz): | 13.56 | Data Rate: | Not Applicable |
| Power Setting: | Max | Tested By: | JMH |

Test Measurement Results



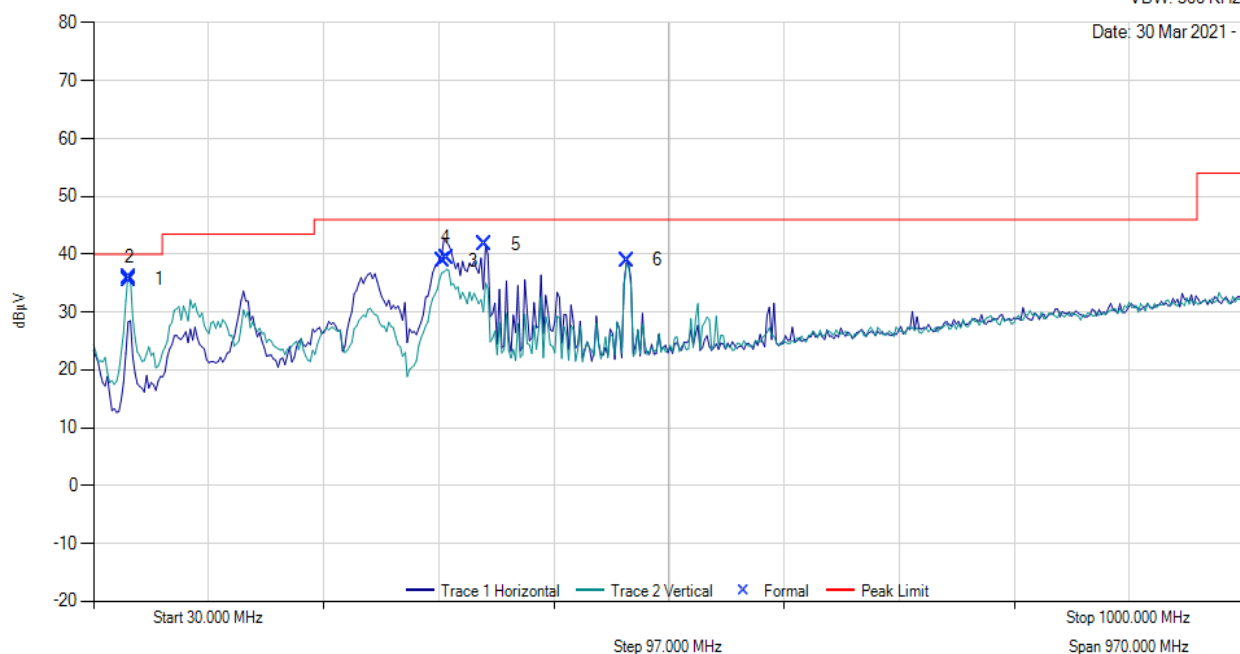
Test Freq: 13.56 MHz

Measurement Distance: 3m

Sweep Time: 170 ms

RBW: 120 KHz
VBW: 300 KHz

Date: 30 Mar 2021 -



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 | 59.85 | 52.80 | 3.80 | -20.97 | 35.63 | MaxQP | Vertical | 108 | 356 | 40.0 | -4.4 | Pass |
| 2 | 60.46 | 53.21 | 3.80 | -21.08 | 35.93 | MaxQP | Vertical | 101 | 340 | 40.0 | -4.1 | Pass |
| 3 | 324.42 | 47.55 | 5.00 | -13.65 | 38.90 | MaxQP | Horizontal | 102 | 99 | 46.0 | -7.1 | Pass |
| 4 | 327.34 | 47.95 | 5.01 | -13.62 | 39.34 | MaxQP | Horizontal | 101 | 114 | 46.0 | -6.7 | Pass |
| 5 | 360.01 | 49.25 | 5.12 | -12.70 | 41.67 | MaxQP | Horizontal | 101 | 263 | 46.0 | -4.3 | Pass |
| 6 | 480.02 | 43.37 | 5.53 | -9.97 | 38.93 | MaxQP | Horizontal | 182 | 234 | 46.0 | -7.1 | Pass |

Test Notes: COSMO VCU powered by 48 V DC Battery. NFC, BLE, WiFi and LTE Band 5 transmitting

9.2.1.2. Field Strength

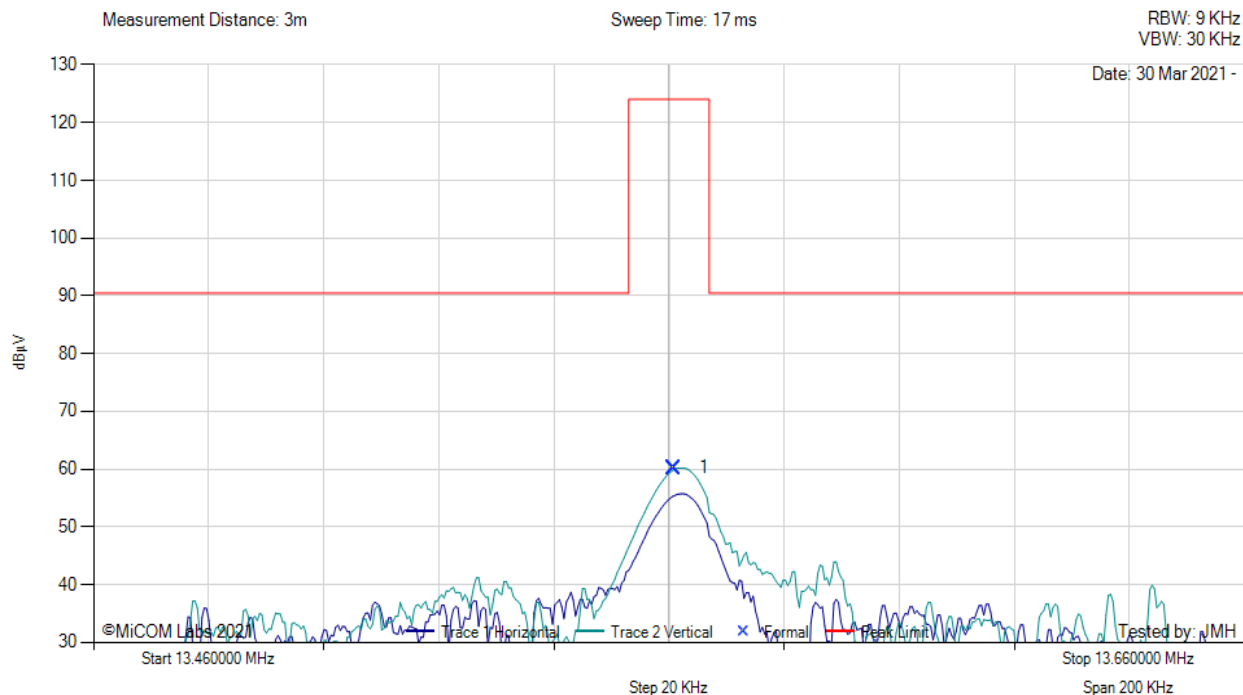
Equipment Configuration for 13.56 MHz Field Strength

| | | | |
|---------------------------------|----------------|------------------------|----------------|
| Antenna: | Integral | Variant: | NFC |
| Antenna Gain (dBi): | Not Applicable | Modulation: | Not Applicable |
| Beam Forming Gain (Y): | Not Applicable | Duty Cycle (%): | 99 |
| Channel Frequency (MHz): | 13.56 | Data Rate: | Not Applicable |
| Power Setting: | Max | Tested By: | JMH |

Test Measurement Results



Test Freq: 13.56 MHz, Power Setting: Max



13.46.00 - 13.66.00 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 | 13.56 | 49.88 | 0.41 | 9.96 | 60.25 | MaxQP | Vertical | 0 | 60 | 124.0 | -63.7 | Pass |

Test Notes: COSMO VCU powered by 48 V DC.



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