# FCC PART 15C TEST REPORT FOR CERTIFICATION

On Behalf of

Planet Computers Limited

COSMO

COSMO COMMUNICATOR

FCC ID: 2AO7Q-COSMO

Prepared for : Planet Computers Limited
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Date of Report : Nov.13, 2019

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Appendix A. Photograph of Test
Appendix B. Photo of the EUT

# TEST REPORT CERTIFICATION

| | | |
|---|---|---|
| Applicant | : | Planet Computers Limited |
| Manufacturer | : | Planet Computers Limited |
| Product | : | COSMO |
| FCC ID | : | 2AO7Q-COSMO |
| | | (A) Model No. : COSMO COMMUNICATOR |
| | | (B) Test Voltage : AC 120V/60Hz |

Tested for comply with:

FCC CFR47 Part 15 Subpart C
Test procedure used: ANSI C63.10: 2013;
KDB 558074 D01v05r02

The device described above is tested by AUDIX TECHNOLOGY (SHENZHEN) CO., LTD. to confirm comply with all the FCC Part 15 Subpart C requirements. The test results are contained in this test report and AUDIX TECHNOLOGY (SHENZHEN) CO., LTD. is assumed full responsibility for the accuracy and completeness of these tests. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements. This report contains data that are not covered by the NVLAP accreditation.

This Report is made under FCC Part 2.1074. No modifications were required during testing to bring this product into compliance.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of AUDIX TECHNOLOGY (SHENZHEN) CO., LTD.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Date of Test : Jul.19~Sep.11, 2019 Report of date: Nov.13, 2019

Prepared by : Monica Liu / Assistant Reviewed by : Sunny Lu/ Deputy Manager

AUDIX® 信華科技（深圳）有限公司
Audix Technology (Shenzhen) Co., Ltd.
EMC 部門報告專用章
Stamp only for EMC Dept. Report
Signature: David Jin

Approved & Authorized Signer : David Jin / Manager

# 1. SUMMARY OF STANDARDS AND RESULTS

## 1.1. Description of Standards and Results

The EUT has been tested according to the applicable standards as referenced below.

| EMISSION | | |
|---|---|---|
| **Description of Test Item** | **Standard** | **Results** |
| Power Line Conducted Emission | FCC Part 15: 15.207 | PASS |
| Radiated Emission | FCC Part 15: 15.209<br>FCC Part 15: 15.205 | PASS |
| Band Edge Compliance | FCC Part 15: 15.247(d) | PASS |
| Conducted spurious emissions | FCC Part 15: 15.247(d) | PASS |
| 6dB Bandwidth Test | FCC Part 15: 15.247(a)(2) | PASS |
| Peak Output Power | FCC Part 15: 15.247(b)(3) | PASS |
| Power Spectral Density | FCC Part 15: 15.247(e) | PASS |
| Antenna requirement | FCC Part 15: 15.203 | PASS |

# 2. GENERAL INFORMATION

## 2.1. Description of Equipment Under Test

| | |
|---|---|
| Applicant | Planet Computers Limited<br>Suite #9, 56 Sloane Square, London, SW1W 8AX, United Kingdom |
| Manufacturer | Planet Computers Limited<br>Suite #9, 56 Sloane Square, London, SW1W 8AX, United Kingdom |
| Factory | Shenzhen Eastaeon Technology Limited Company<br>4F, B block, Kingdee Software Park, 2 Keji South 12 Road, Nanshan District, Shenzhen |
| Product | COSMO |
| Model No. | COSMO COMMUNICATOR |
| FCC ID | 2AO7Q-COSMO |
| Power Adapter | Manufacturer: SHENZHEN TIANYIN ELECTRONICS CO., LTD.<br>Model: TPA-10120125UU-MTK<br>Input: 100-240V~, 50/60Hz, 0.6A<br>Output: 5V, 2A / 7V, 1.67A / 9V, 1.67A / 12V, 1.25A |
| Rechargeable Li-ion Battery | Manufacturer: Shenzhen 3sun Electronics Co., Ltd.;<br>M/N: Gemini Standard Battery;<br>Rating Voltage: 3.85V;<br>Capacity: 4220mAh;<br>Charge Voltage: 4.4V. |
| USB Cable | Shielded, Detachable, 0.8m |
| Sample Type | Prototype production |
| Date of Receipt | Jul.12, 2019 |
| Date of Test | Jul.19~Sep.11, 2019 |

## 2.2.Feature of Equipment Under Test

| Product Feature & Specification | | |
|---|---|---|
| Product | COSMO | |
| Model No. | COSMO COMMUNICATOR | |
| Radio | IEEE802.11 a/b/g/n/ac; Bluetooth V3.0+EDR; Bluetooth V4.0; NFC | |
| Power Source | ☒ Commercial Power | AC 100 ~ 240V, 0.6A |
| | ☒ External Power Source | DC 5/7/9/12V, 2/1.67/1.67/1.25A |
| | ☒ Lithium battery | DC 3.85V, 4220mAh |
| | ☐ UM battery | DC V |
| **NFC** | | |
| Frequency Range | 13.56MHz | |
| Type of Modulation | ASK | |
| **Bluetooth** | | |
| Bluetooth Version | V4.0 dual mode | |
| Frequency Range | 2402-2480MHz | |
| Type of Modulation | GFSK, π/4DQPSK, 8DPSK | |
| Data Rate | 1Mbps, 2Mbps, 3Mbps | |
| Quantity of Channels | 79/40 | |
| Channel Separation | 1MHz/2MHz | |
| **2.4GHz Wi-Fi** | | |
| Support Modes | 802.11b/g/n20/n40 | |
| Frequency Range | 2412-2462MHz | |
| Type of Modulation | 802.11b(DSSS): CCK, QPSK, BPSK;<br>802.11g/n(OFDM): 64QAM,16QAM, QPSK, BPSK | |
| Data Rate | 802.11b: 11/5.5/2/1 Mbps;<br>802.11g: 54/48/36/24/18/12/9/6 Mbps;<br>802.11n: up to 150Mbps | |
| Channel Separation | 5MHz | |
| **5GHz Wi-Fi** | | |
| Support Modes | 802.11a/n20/n40/ac20/ac40/ac80 | |
| Frequency Range | 5180-5240MHz, 5260-5320MHz, 5500-5700MHz, 5745-5825MHz | |
| Type of Modulation | 802.11a/ac/n (OFDM): QPSK, BPSK, 16QAM, 64QAM,256QAM | |
| Data Rate | 802.11a: 54/48/36/24/18/12/9/6 Mbps;<br>802.11n up to 150 Mbps;<br>802.11ac: up to 400Mbps | |
| Channel Separation | 5MHz | |
| Type of Product | Slave device without Radar detection | |
| Transmit Power Control | No Support | |

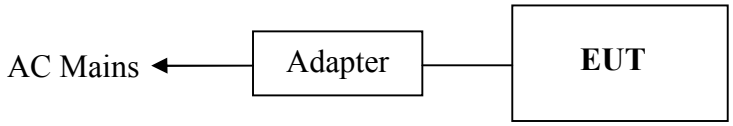
**Antenna System**

| **NFC** | |
|---|---|
| Type of Antenna | FPC Antenna |
| Antenna number | 1 |
| Antenna Peak Gain | 0dBi |
| **Bluetooth** | |
| Type of Antenna | MONOPOLE Antenna |
| Antenna number | 1 |
| Antenna Peak Gain | -0.1dBi |
| **Wi-Fi** | |
| Type of Antenna | MONOPOLE Antenna |
| Antenna number | 1 |
| Antenna Peak Gain | DTS Band (2400-2483.5MHz) Peak Gain: -0.1dBi<br>U-NII-1 Band(5150-5250MHz) Peak Gain: 0.6dBi<br>U-NII-2A Band(5250-5350MHz) Peak Gain: 0.6dBi<br>U-NII-2C Band(5470-5725MHz) Peak Gain: 0.4dBi<br>U-NII-3 Band (5725-5850MHz) Peak Gain: 0.3dBi |

## 2.3. Tested Supporting System Details

[None]

## 2.4. Block Diagram of connection between EUT and simulators




**(EUT: COSMO)**

## 2.5. Test information

A special software(The developer mode that comes with the device) was used to control EUT work in Continuous TX mode (GFSK modulation), and select test channel.

| Tested mode, channel, and data rate information | | | |
|---|---|---|---|
| Mode | data rate (Mbps) | Channel | Frequency (MHz) |
| Tx Mode GFSK modulation | 1 | Low :CH 0 | 2402 |
| | 1 | Middle: CH19 | 2440 |
| | 1 | High: CH39 | 2480 |

## 2.6. Test Facility

Site Description

| | | |
|---|---|---|
| Name of Firm | : | Audix Technology (Shenzhen) Co., Ltd.<br>No. 6, Kefeng Road, Science & Technology Park, Nanshan District , Shenzhen, Guangdong, China |
| EMC Lab. | : | Certificated by Industry Canada<br>Registration Number: IC 5183A-1<br>Valid Date: May.07, 2020 |
| | : | Certificated by DAkkS, Germany<br>Registration No: D-PL-12151-01-00<br>Valid Date: Dec.07, 2021 |
| | : | Accredited by NVLAP, USA<br>NVLAP Code: 200372-0<br>Valid Date: Mar.31, 2020 |
| | : | Certificated by FCC USA.<br>Designation No.: CN5022<br>Valid Date: Mar.31, 2020 |

2.7. Measurement Uncertainty (95% confidence levels, k=2)

| Test Item | Uncertainty |
|---|---|
| Uncertainty for Conduction emission test in No. 1 Conduction | 2.6dB(150KHz to 30MHz) |
| Uncertainty for Radiation Emission test in 3m chamber | 3.6dB(30~200MHz, Polarization: H) |
| | 4.0dB(30~200MHz, Polarization: V) |
| | 3.6dB(200M~1GHz, Polarization: H) |
| | 3.8dB(200M~1GHz, Polarization: V) |
| Uncertainty for Radiation Emission test in 3m chamber(1GHz-25GHz) | 4.6dB(1~6GHz, Distance: 3m) |
| | 4.6dB(6~25GHz, Distance: 3m) |
| Uncertainty for Radiated Spurious Emission test in RF chamber | 3.7dB(30MHz~1000MHz) |
| | 3.3dB(1~26.5GHz) |
| Uncertainty for Conduction Spurious emission test | 2.0dB |
| Uncertainty for Output power test | 0.8dB |
| Uncertainty for Bandwidth test | 83kHz |
| Uncertainty for DC power test | 0.1% |
| Uncertainty for test site temperature and humidity | 0.6℃ |
| | 3% |

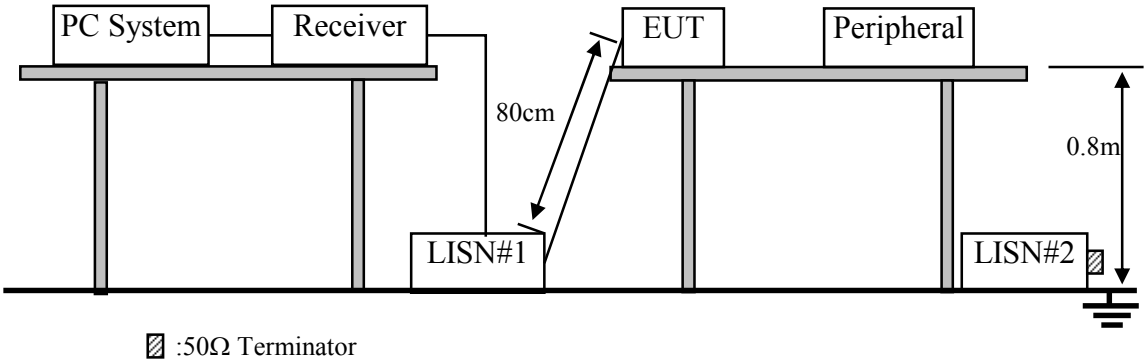
Note: EMI uncertainty is evaluated by CISPR16-4-2.
The value of measurement uncertainty of EMI is less than $U_{CISPR}$.
The value is not calculated in the test results.

# 3. POWER LINE CONDUCTED EMISSION TEST

## 3.1.Test Equipments

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | 1# Shielding Room | AUDIX | N/A | N/A | May.17,18 | 3 Year |
| 2. | EMI Test Receiver | Rohde & Schwarz | ESCI | 100842 | Apr.14,19 | 1 Year |
| 3. | L.I.S.N.#1 | Rohde & Schwarz | ENV216 | 102160 | Dec.01,18 | 1 Year |
| 4. | L.I.S.N.#2 | Kyoritsu | K NW-403D | 8-1750-2 | Apr.18,19 | 1 Year |
| 5. | Terminator | Hubersuhner | 50Ω | No.1 | Apr.14,19 | 1 Year |
| 6. | Terminator | Hubersuhner | 50Ω | No.2 | Apr.14,19 | 1 Year |
| 7. | RF Cable | Fujikura | RG55/U | No.1 | Apr.13,19 | 1 Year |
| 8. | Test Software | AUDIX | e3 | 6.100913a | N/A | N/A |
| Note: N/A means Not applicable. | | | | | | |

## 3.2.Block Diagram of Test Setup




## 3.3.Power Line Conducted Emission Test Limits

| Frequency | Maximum RF Line Voltage | |
|---|---|---|
| | Quasi-Peak Level dB(μV) | Average Level dB(μV) |
| 150kHz ~ 500kHz | 66 ~ 56* | 56 ~ 46* |
| 500kHz ~ 5MHz | 56 | 46 |
| 5MHz ~ 30MHz | 60 | 50 |

Notes: 1. * Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

## 3.4. Configuration of EUT on Test

The following equipment are installed on Power Line Conducted Emission Test to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

3.4.1. COSMO (EUT)

Model Number : COSMO COMMUNICATOR
Serial Number : N/A

3.4.2. Support Equipment: As Tested Supporting System Details, in Section 2.2.

## 3.5. Operating Condition of EUT

3.5.1. Setup the EUT and simulator as shown as Section 3.2.

3.5.2. Turn on the power of all equipments.

3.5.3. PC run test software to control EUT work in BT 4.0 Tx mode.

## 3.6. Test Procedure

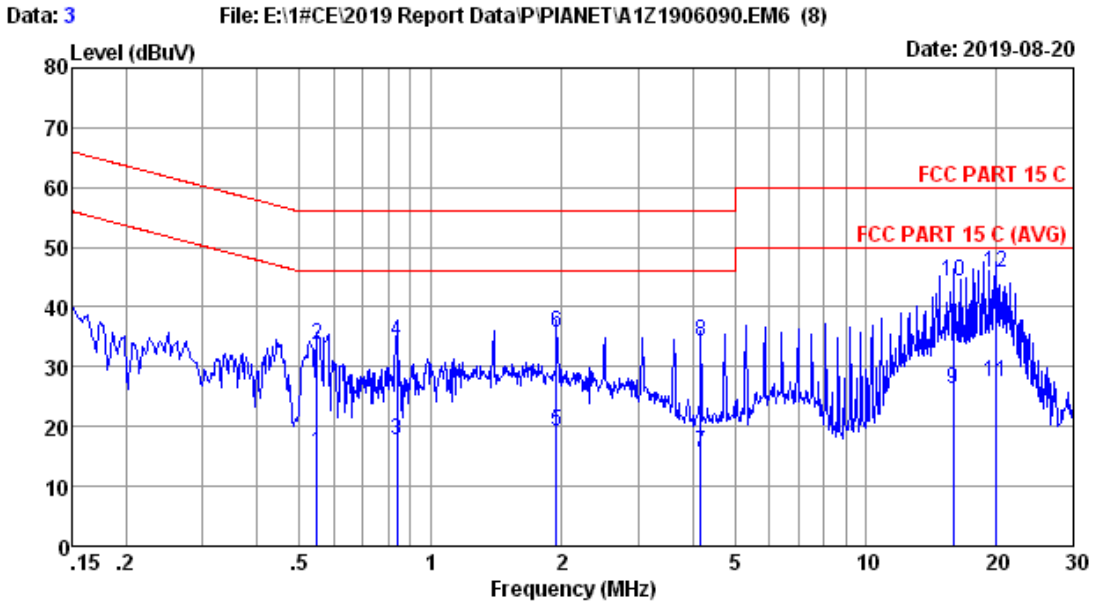
The EUT was placed on a non-metallic table, 80cm above the ground plane. The EUT Power Via AC unit connected to the power mains through a line impedance stabilization network (L.I.S.N. 1#). This provides a 50 ohm coupling impedance for the EUT (Please refer the block diagram of the test setup and photographs). The AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10: 2013 on Conducted Emission Test.

The bandwidth of test receiver (R & S ESCI) is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

## 3.7. Power Line Conducted Emission Test Results

**PASS.** (All emissions not reported below are too low against the prescribed limits.)

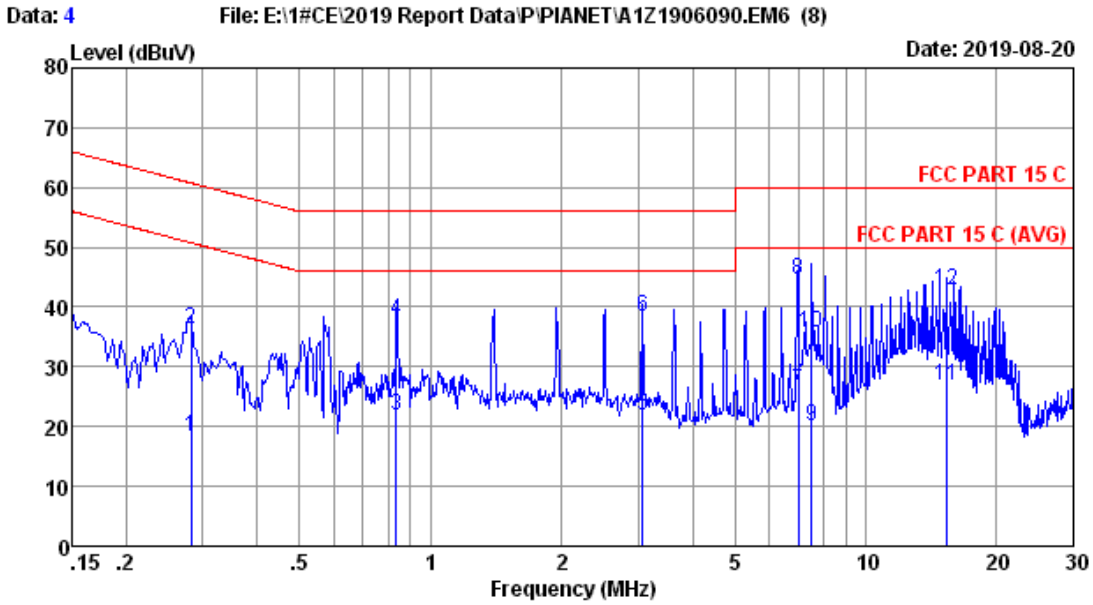



Site no :1# Conduction
Dis./Lisn :2018 ENV216-L
Limit :FCC PART 15 C
Env./Ins. :Temp:23.8*C Humi:55%
EUT :COSMO M/N:COSMO COMMUNICATOR
Power Rating :AC 120V/60Hz
Test Mode :BT 4.0

Data No :3
LISN phase:
Engineer :Evan

| No | Freq (MHz) | LISN Factor (dB) | Cable loss (dB) | Reading (dBuV) | Emission Level (dBuV) | Limits (dBuV) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.549 | 9.40 | 0.02 | 6.23 | 15.65 | 46.00 | 30.35 | Average |
| 2 | 0.549 | 9.40 | 0.02 | 24.37 | 33.79 | 56.00 | 22.21 | QP |
| 3 | 0.839 | 9.40 | 0.03 | 8.26 | 17.69 | 46.00 | 28.31 | Average |
| 4 | 0.839 | 9.40 | 0.03 | 24.70 | 34.13 | 56.00 | 21.87 | QP |
| 5 | 1.949 | 9.49 | 0.04 | 9.56 | 19.09 | 46.00 | 26.91 | Average |
| 6 | 1.949 | 9.49 | 0.04 | 26.15 | 35.68 | 56.00 | 20.32 | QP |
| 7 | 4.180 | 9.50 | 0.06 | 6.17 | 15.73 | 46.00 | 30.27 | Average |
| 8 | 4.180 | 9.50 | 0.06 | 24.54 | 34.10 | 56.00 | 21.90 | QP |
| 9 | 15.885 | 9.60 | 0.13 | 16.42 | 26.15 | 50.00 | 23.85 | Average |
| 10 | 15.885 | 9.60 | 0.13 | 34.62 | 44.35 | 60.00 | 15.65 | QP |
| 11 | 19.845 | 9.60 | 0.15 | 17.59 | 27.34 | 50.00 | 22.66 | Average |
| 12 | 19.845 | 9.60 | 0.15 | 35.91 | 45.66 | 60.00 | 14.34 | QP |

Remarks: 1.Emission Level=LISN Factor+Cable Loss+Reading.
2.If the average limit is met when using a quasi-peak detector. the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.




Site no :1# Conduction
Dis./Lisn :2018 ENV216-N
Limit :FCC PART 15 C
Env./Ins. :Temp:23.8*C Humi:55%
EUT :COSMO M/N:COSMO COMMUNICATOR
Power Rating :AC 120V/60Hz
Test Mode :BT 4.0

Data No :4
LISN phase:
Engineer :Evan

| No | Freq (MHz) | LISN Factor (dB) | Cable loss (dB) | Reading (dBuV) | Emission Level (dBuV) | Limits (dBuV) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.282 | 9.40 | 0.03 | 8.92 | 18.35 | 50.76 | 32.41 | Average |
| 2 | 0.282 | 9.40 | 0.03 | 26.98 | 36.41 | 60.76 | 24.35 | QP |
| 3 | 0.835 | 9.40 | 0.03 | 12.53 | 21.96 | 46.00 | 24.04 | Average |
| 4 | 0.835 | 9.40 | 0.03 | 28.34 | 37.77 | 56.00 | 18.23 | QP |
| 5 | 3.074 | 9.45 | 0.05 | 12.32 | 21.82 | 46.00 | 24.18 | Average |
| 6 | 3.074 | 9.45 | 0.05 | 28.83 | 38.33 | 56.00 | 17.67 | QP |
| 7 | 6.988 | 9.50 | 0.08 | 16.48 | 26.06 | 50.00 | 23.94 | Average |
| 8 | 6.988 | 9.50 | 0.08 | 34.99 | 44.57 | 60.00 | 15.43 | QP |
| 9 | 7.526 | 9.50 | 0.09 | 10.50 | 20.09 | 50.00 | 29.91 | Average |
| 10 | 7.526 | 9.50 | 0.09 | 26.20 | 35.79 | 60.00 | 24.21 | QP |
| 11 | 15.307 | 9.61 | 0.13 | 17.25 | 26.99 | 50.00 | 23.01 | Average |
| 12 | 15.307 | 9.61 | 0.13 | 32.99 | 42.73 | 60.00 | 17.27 | QP |

Remarks: 1.Emission Level=LISN Factor+Cable Loss+Reading.
2.If the average limit is met when using a quasi-peak detector. the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

# 4. RADIATED EMISSION MEASUREMENT

4.1. Test Equipment

Frequency range: 30~1000MHz

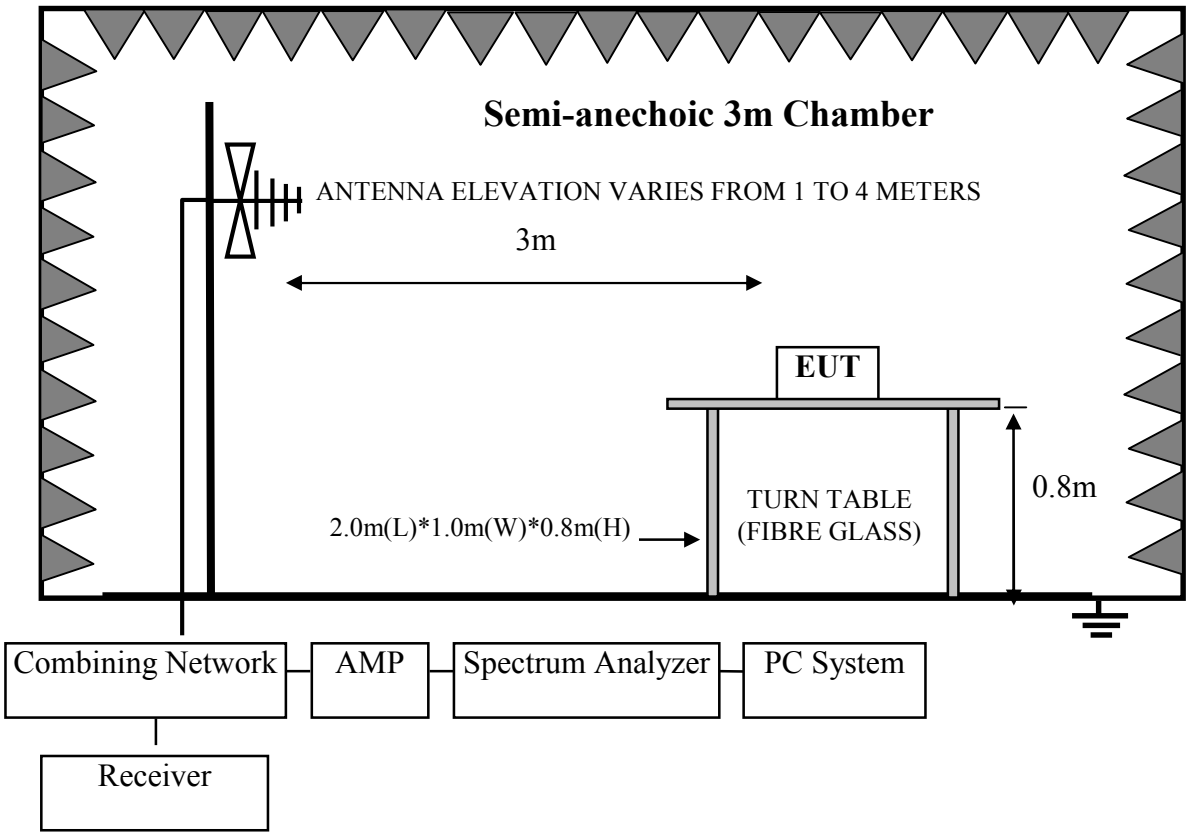
| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | 3#Chamber(NSA) | AUDIX | N/A | N/A | May.10,19 | 1 Year |
| 2. | 3#Chamber(SE) | AUDIX | N/A | N/A | May.17,18 | 3 Year |
| 3. | Signal Analyzer | Rohde & Schwarz | FSV30 | 104050 | Apr.14,19 | 1 Year |
| 4. | EMI Test Receiver | Rohde & Schwarz | ESR7 | 101547 | Apr.14,19 | 1 Year |
| 5. | Amplifier | HP | 8447D | 2648A04738 | Apr.14,19 | 1 Year |
| 6. | Bi log Antenna | TESEQ | CBL6112D | 35375 | Nov.21,18 | 1 Year |
| 7. | Loop Antenna | Chase | HLA6120 | 1062 | Apr.18,19 | 1 Year |
| 8. | NSA Cable | HUBER+SUHNER | CFD400NL-LW | No.3 | Dec.01,18 | 1 Year |
| 9. | Coaxial Switch | Anritsu | MP59B | 6201397222 | Apr.14,19 | 1 Year |
| 10. | Test Software | AUDIX | e3 | 6.2009-5-21a(n) | N/A | N/A |
| Note: N/A means Not applicable. | | | | | | |

Frequency range: above 1000MHz

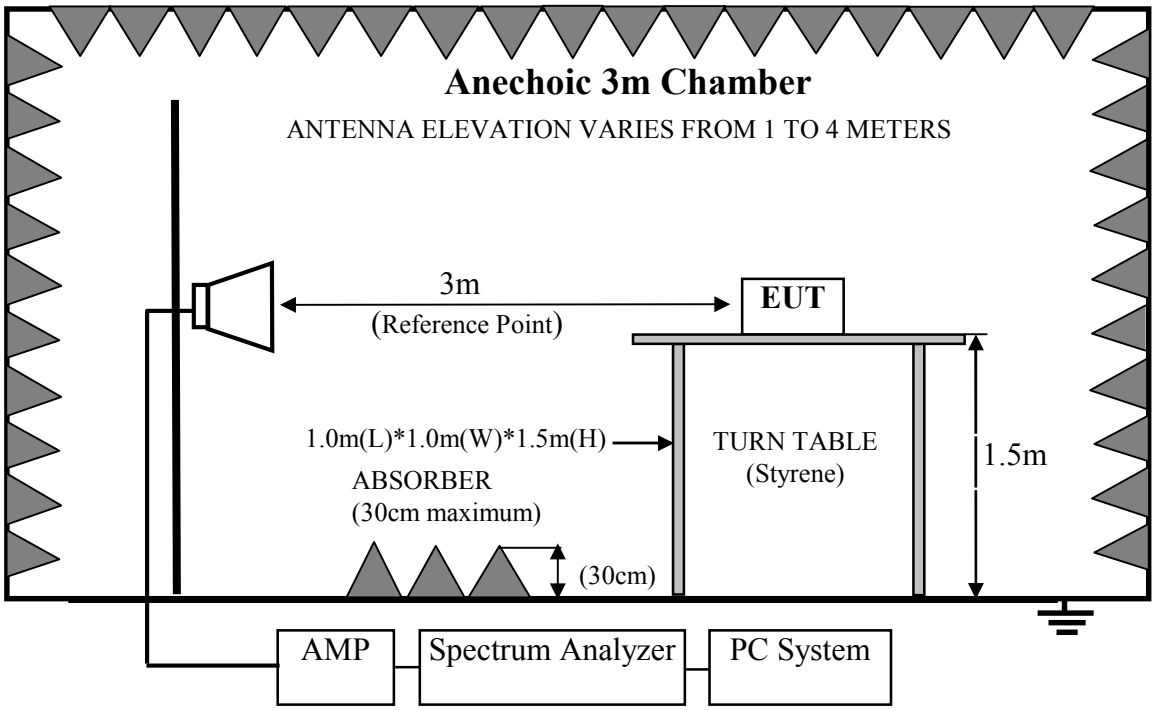
| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | 3#Chamber(Svswr) | AUDIX | N/A | N/A | Apr.18,19 | 1 Year |
| 2. | 3#Chamber(SE) | AUDIX | N/A | N/A | May.17,18 | 3 Year |
| 3. | PXA Signal Analyzer | Agilent | N9030A | MY51380221 | Jun.30,19 | 1 Year |
| 4. | Horn Antenna | ETS | 3115 | 9510-4580 | Dec.13,18 | 1 Year |
| 5. | Horn Antenna | ETS | 3116 | 00060089 | Dec.13,18 | 1 Year |
| 6. | Amplifier | HP | 8449B | 3008A00863 | Apr.23,19 | 1 Year |
| 7. | Amplifier | EMCI | EMC184040SE | 980507 | Jun.30,19 | 1 Year |
| 8. | RF Cable | EMCI | EMC102-KM-KM-3500 | 170702 | May.13,19 | 1 Year |
| 9. | RF Cable | N/A | N/A | No.7 | Oct.14,18 | 1 Year |
| 10. | Test Software | AUDIX | e3 | 6.2009-5-21a(n) | N/A | N/A |
| Note: N/A means Not applicable. | | | | | | |

4.2. Block Diagram of Test Setup

For frequency range 30MHz-1000MHz




For frequency range 1GHz-25GHz



4.3. Radiated Emission Limit Standard:

| FREQUENCY MHz | DISTANCE Meters | FIELD STRENGTHS LIMIT | |
|---|---|---|---|
| | | μV/m | dB(μV)/m |
| 30 ~ 88 | 3 | 100 | 40.0 |
| 88 ~ 216 | 3 | 150 | 43.5 |
| 216 ~ 960 | 3 | 200 | 46.0 |
| 960 ~ 1000 | 3 | 500 | 54.0 |
| Above 1000MHz | 3 | 74.0 dB(μV)/m (Peak)<br>54.0 dB(μV)/m (Average) | |

Remark： (1) Emission level dBμV = 20 log Emission level μV/m

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

(4) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

4.4. EUT Configuration on Test

The following equipment are installed on Radiated Emission Test to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

4.4.1. COSMO (EUT)

Model Number : COSMO COMMUNICATOR
Serial Number : N/A

4.5. Operating Condition of EUT

4.5.1. Setup the EUT and simulator as shown as Section 4.2.

4.5.2. Turn on the power of all equipments.

4.5.3. Let EUT work in BT 4.2 Tx mode.

4.6. Test Procedure

**Frequency below 30MHz:**

The EUT setup on the turn table which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

EUT and its simulators are placed on a turn table, which is 0.8 meter high above ground for frequency 30MHz~1000MHz, 1.5 meter high above ground for frequency above 1GHz and put the absorbing with 2.4m(L)*2.4m(W)*0.3m(H) on the ground . The turn table can rotate 360 degrees to determine the position of the maximum emission level. Power on the EUT and let it working in test mode, then test it.EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna for frequency 30MHz~1000MHz, and the Horm antenna is used as receiving antenna for frequency above 1GHz. Both horizontal and vertical polarization of the antenna is set on Test. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.10-2013 on radiated emission Test.

This test was performed with EUT in X, Y, Z position, and the worse case was found when EUT in X position as the test photo indicated.

The bandwidth of the EMI test receiver (R&S ESR7) is set at 120kHz for frequency range from 30MHz to 1000 MHz.

The bandwidth of the Spectrum's RBW is set at 1MHz and VBW is set at 3MHz for peak emissions measurement above 1GHz.

This device is pulse Modulated, a duty cycle factor was used to calculated average level based measured peak level.

The frequency range from 30MHz to 10th harmonic (25GHz) are checked. and no any emissions were found from 18GHz to 25 GHz, So the radiated emissions from 18GHz to 25GHz were not record.

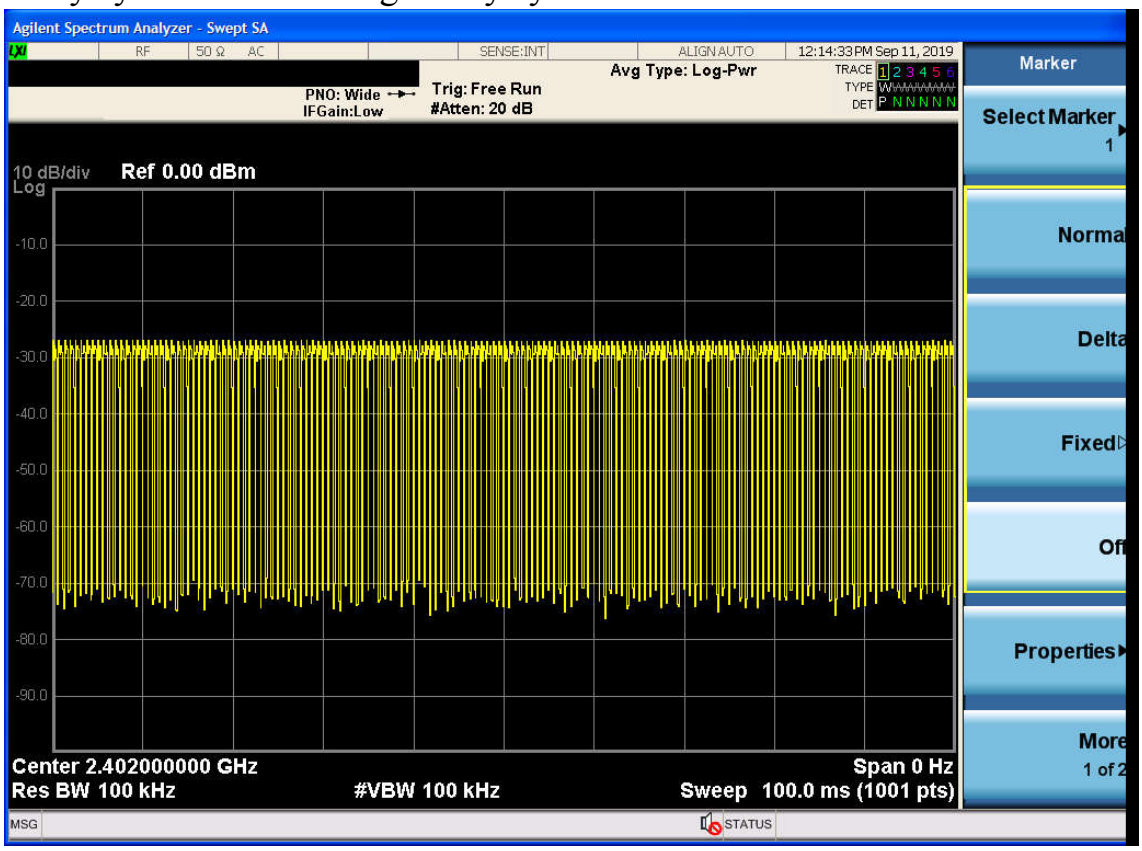
4.7. Radiated Emission Test Results

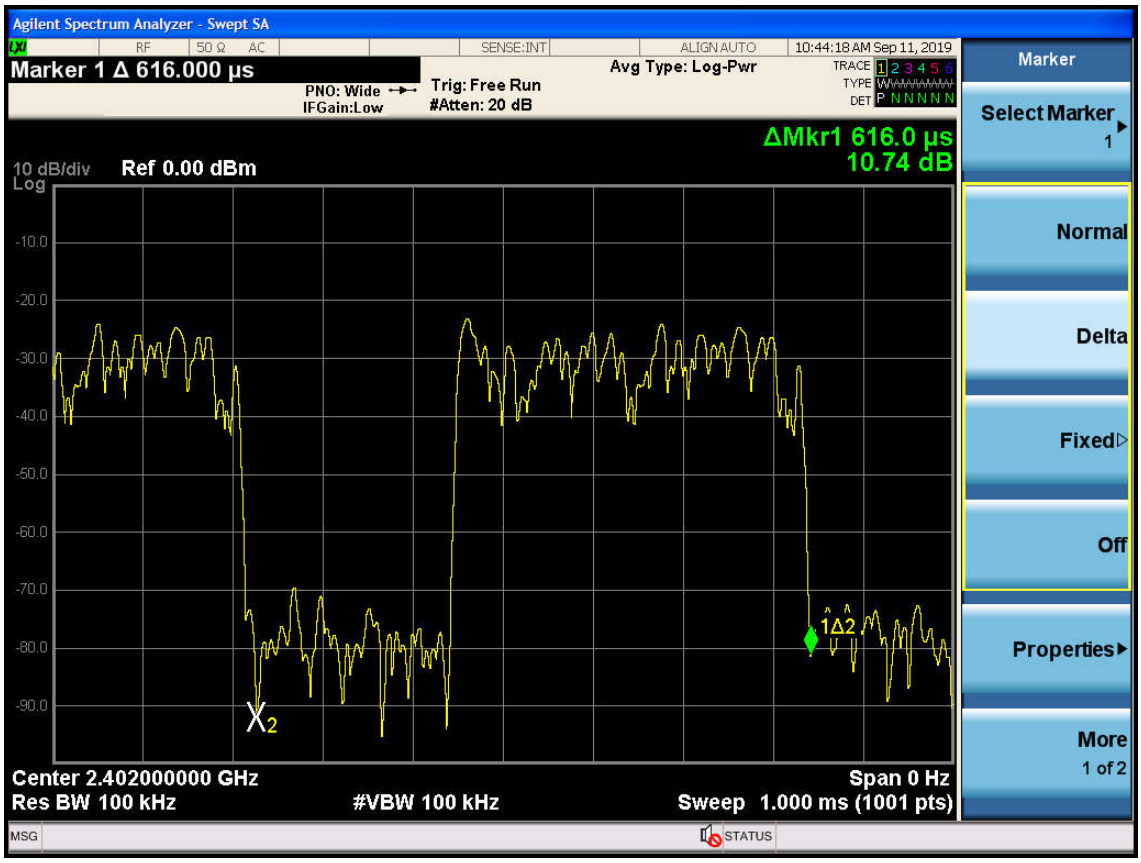
**PASS.**

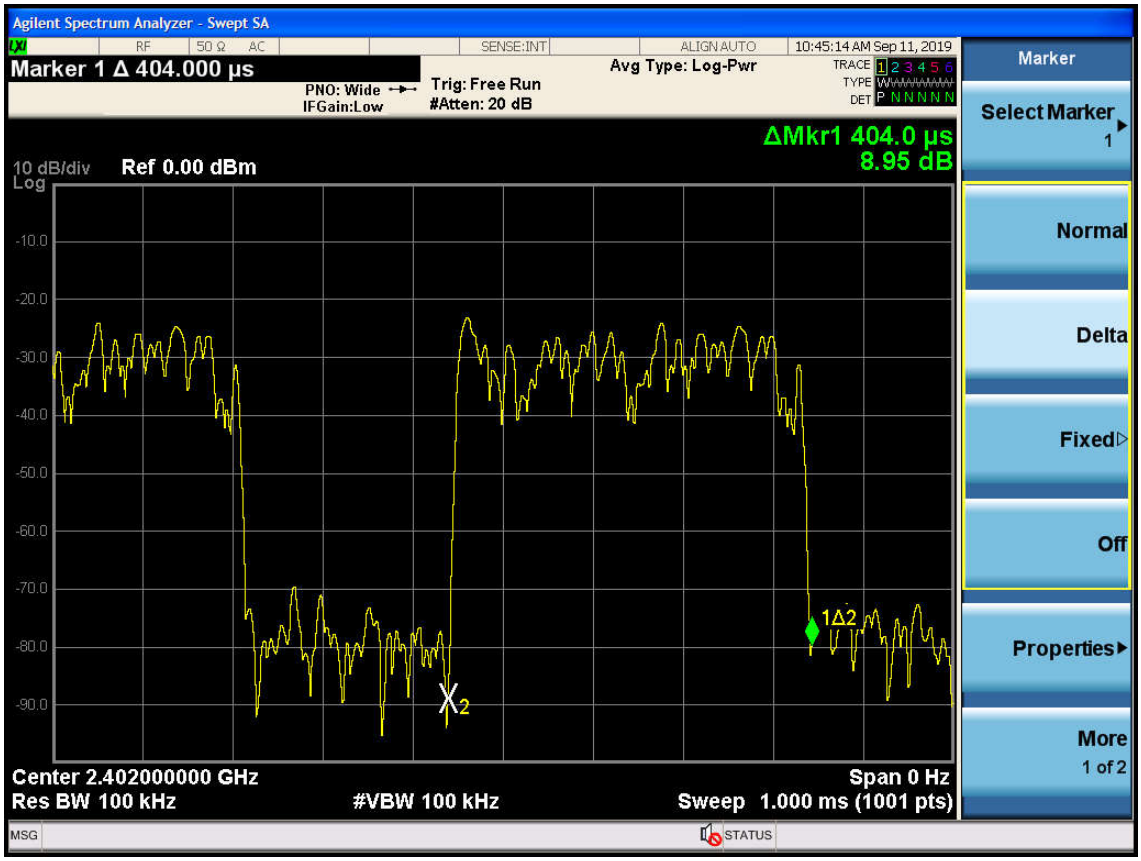
All the emissions from 30MHz to 25GHz were comply with the 15.209 Limit.

Note: The duty cycle factor for calculate average level is -3.664dB, and average limit is 20dB below peak limit, so if peak measured level comply with average limit, the average level was deemed to comply with average limit.

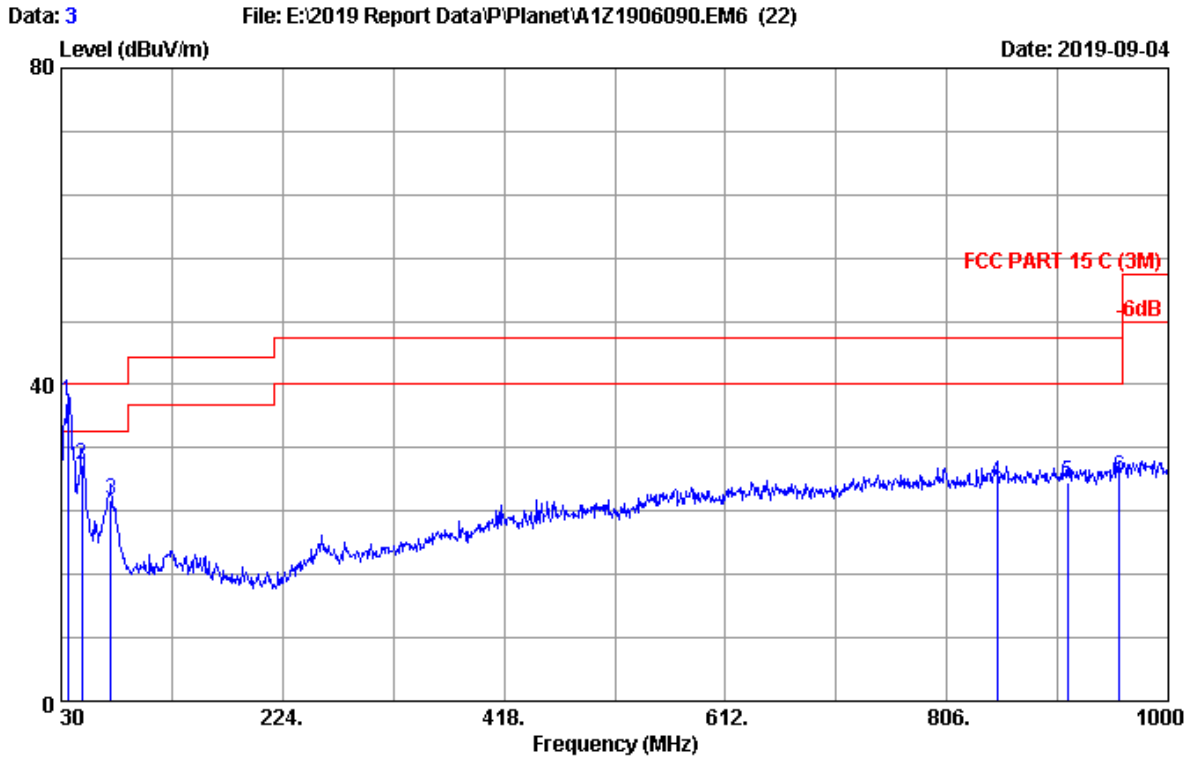
Duty cycle factor = 20log（duty cycle）=-3.664dB




Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 616.000 µs
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
10:44:18 AM Sep 11, 2019
ΔMkr1 616.0 µs
10.74 dB
10 dB/div
Log
Ref 0.00 dBm
Center 2.402000000 GHz
Res BW 100 kHz
#VBW 100 kHz
Span 0 Hz
Sweep 1.000 ms (1001 pts)
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2


Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 404.000 µs
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
10:45:14 AM Sep 11, 2019
ΔMkr1 404.0 µs
8.95 dB
10 dB/div
Log
Ref 0.00 dBm
Center 2.402000000 GHz
Res BW 100 kHz
#VBW 100 kHz
Span 0 Hz
Sweep 1.000 ms (1001 pts)
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2

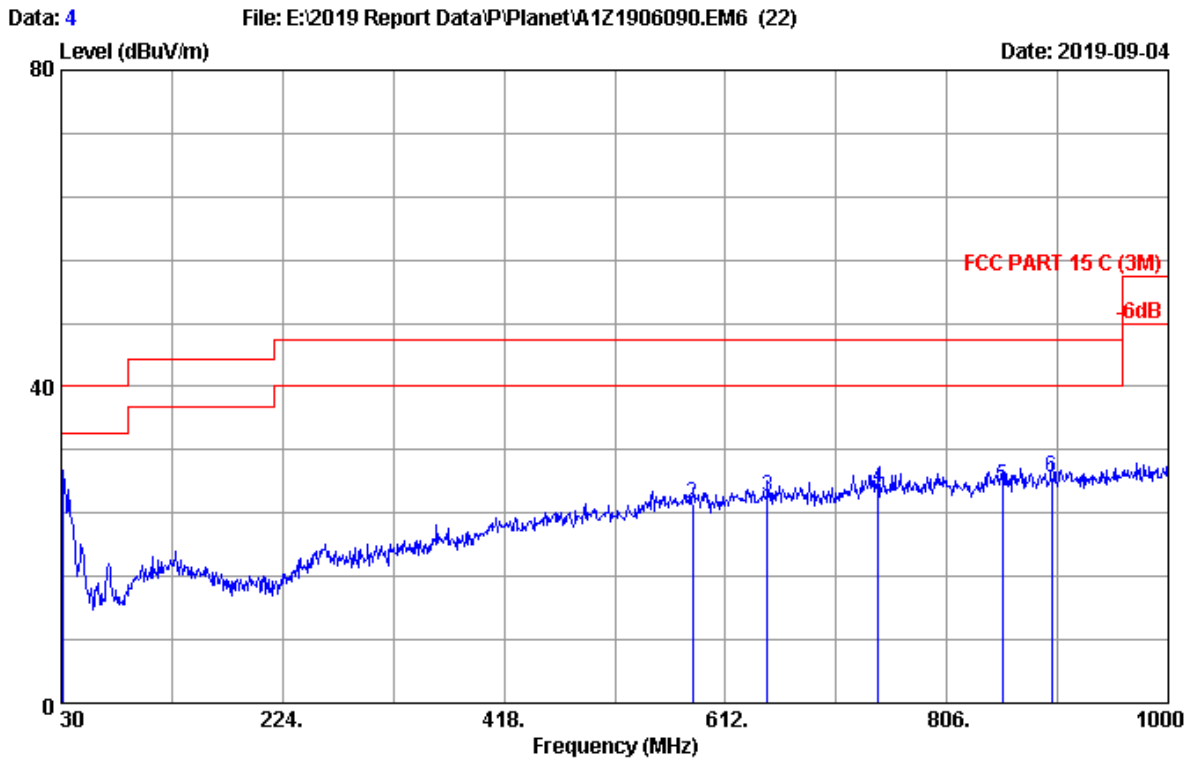
**Frequency: 30MHz~1GHz**




Site no. : 3m Chamber Data no. : 3
Dis. / Ant. : 3m 2018 CBL6112D-35375 Ant. pol. : VERTICAL
Limit : FCC PART 15 C (3M)
Env. / Ins. : 23.4*C/54% Engineer : Hogen
EUT : COSMO M/N:COSMO COMMUNICATOR
Power rating : AC 120V/60Hz
Test Mode : BT4.0

| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 35.820 | 21.30 | 0.57 | 15.96 | 37.83 | 40.00 | 2.17 | QP |
| 2 | 48.430 | 15.80 | 0.66 | 13.48 | 29.94 | 40.00 | 10.06 | QP |
| 3 | 73.650 | 13.10 | 0.83 | 11.49 | 25.42 | 40.00 | 14.58 | QP |
| 4 | 849.650 | 26.70 | 3.22 | -2.32 | 27.60 | 46.00 | 18.40 | QP |
| 5 | 911.730 | 26.84 | 3.36 | -2.50 | 27.70 | 46.00 | 18.30 | QP |
| 6 | 957.320 | 27.28 | 3.50 | -2.55 | 28.23 | 46.00 | 17.77 | QP |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

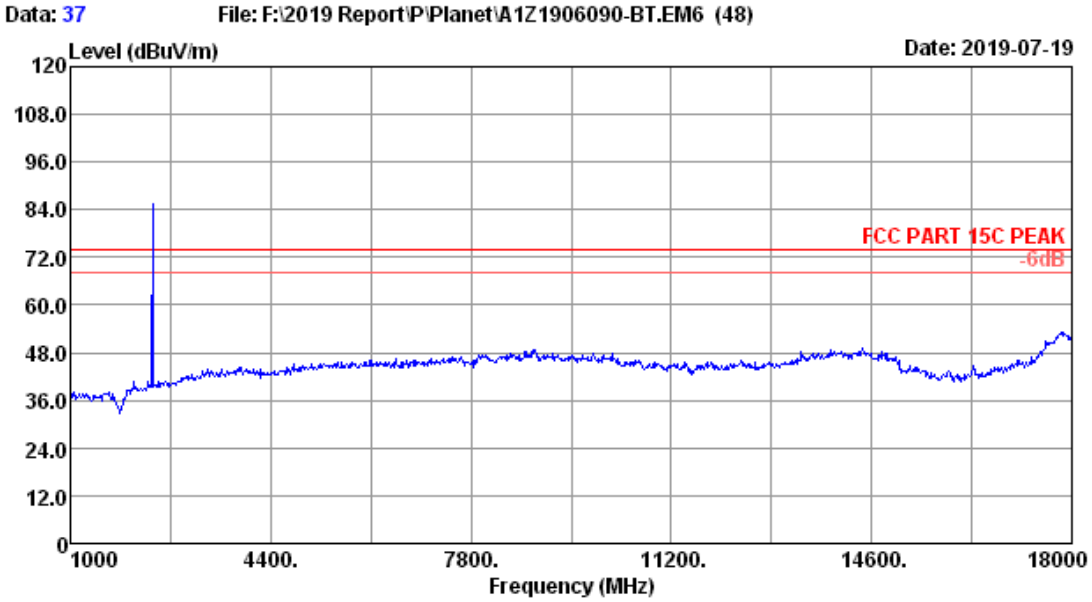



Site no. : 3m Chamber
Data no. : 4
Dis. / Ant. : 3m 2018 CBL6112D-35375
Ant. pol. : HORIZONTAL
Limit : FCC PART 15 C (3M)
Env. / Ins. : 23.4*C/54%
Engineer : Hogen
EUT : COSMO M/N:COSMO COMMUNICATOR
Power rating : AC 120V/60Hz
Test Mode : BT4.0

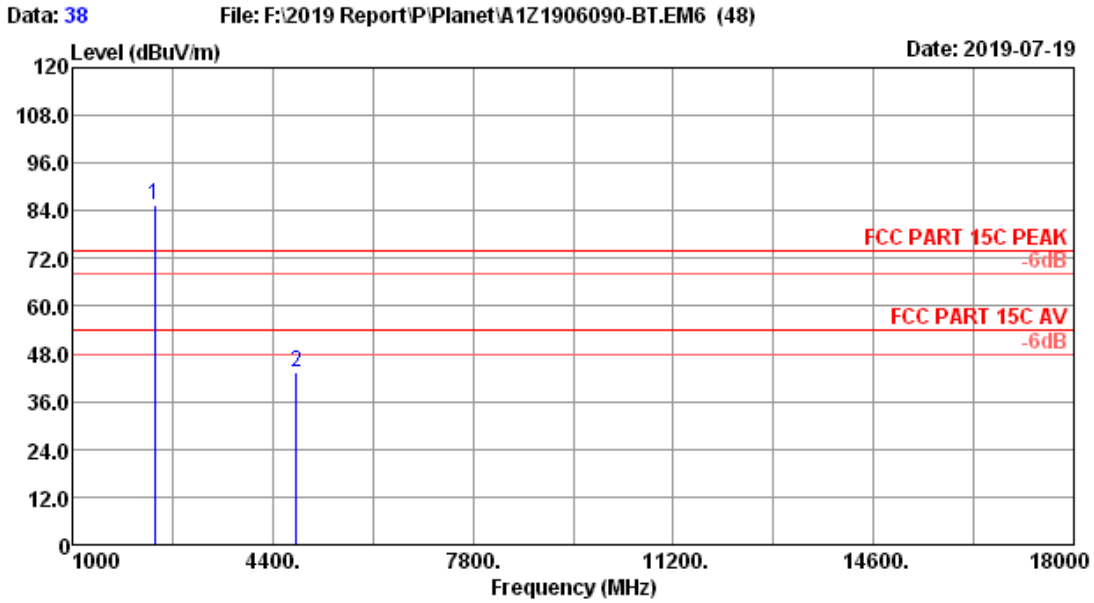
| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 31.940 | 23.50 | 0.54 | 2.63 | 26.67 | 40.00 | 13.33 | QP |
| 2 | 582.900 | 25.06 | 2.56 | -2.42 | 25.20 | 46.00 | 20.80 | QP |
| 3 | 648.860 | 25.28 | 2.73 | -1.88 | 26.13 | 46.00 | 19.87 | QP |
| 4 | 745.860 | 26.06 | 2.98 | -1.77 | 27.27 | 46.00 | 18.73 | QP |
| 5 | 854.500 | 26.62 | 3.23 | -2.53 | 27.32 | 46.00 | 18.68 | QP |
| 6 | 898.150 | 26.70 | 3.32 | -1.53 | 28.49 | 46.00 | 17.51 | QP |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

**Frequency: 1GHz~18GHz**




| | | | |
|---|---|---|---|
| Site no. | : 3m Chamber | Data no. | : 37 |
| Dis. / Ant. | : 3m 2018 3115-4580 | Ant. pol. | : VERTICAL |
| Limit | : FCC PART 15C PEAK | Pre | : |
| Env. / Ins. | : 23.4*C/52.9% | Engineer | : Garry |
| EUT | : COSMO | | |
| Power rating | : AC120V/60Hz | | |
| Test Mode | : BT4.0 BLE 2402MHz Tx Mode | | |
| M/N | : COSMO COMMUNICATOR | | |

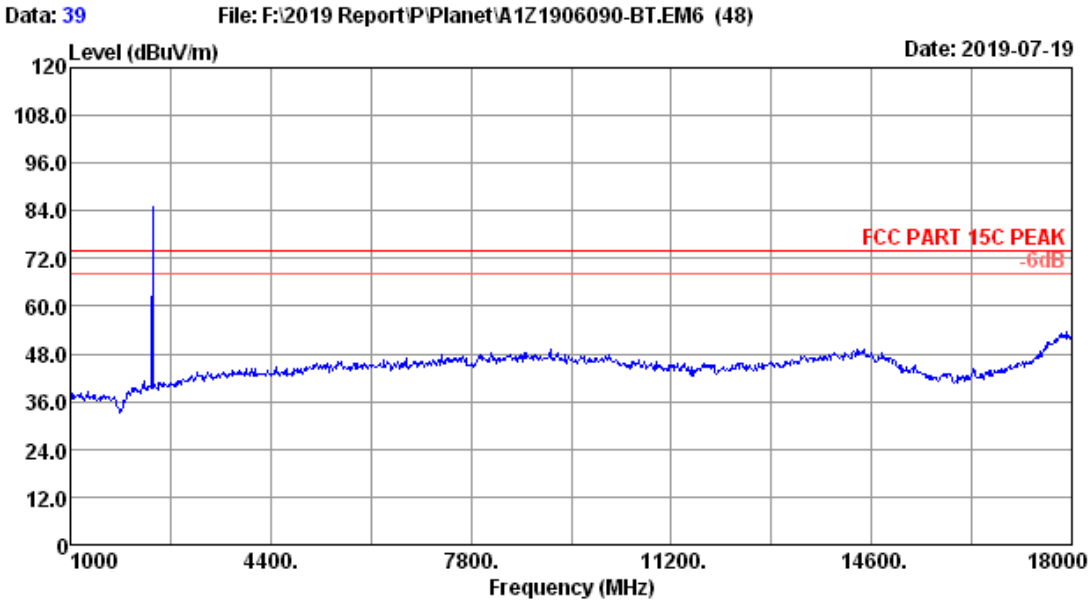



Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
EUT : COSMO
Power rating : AC120V/60Hz
Test Mode : BT4.0 BLE 2402MHz Tx Mode
M/N : COSMO COMMUNICATOR

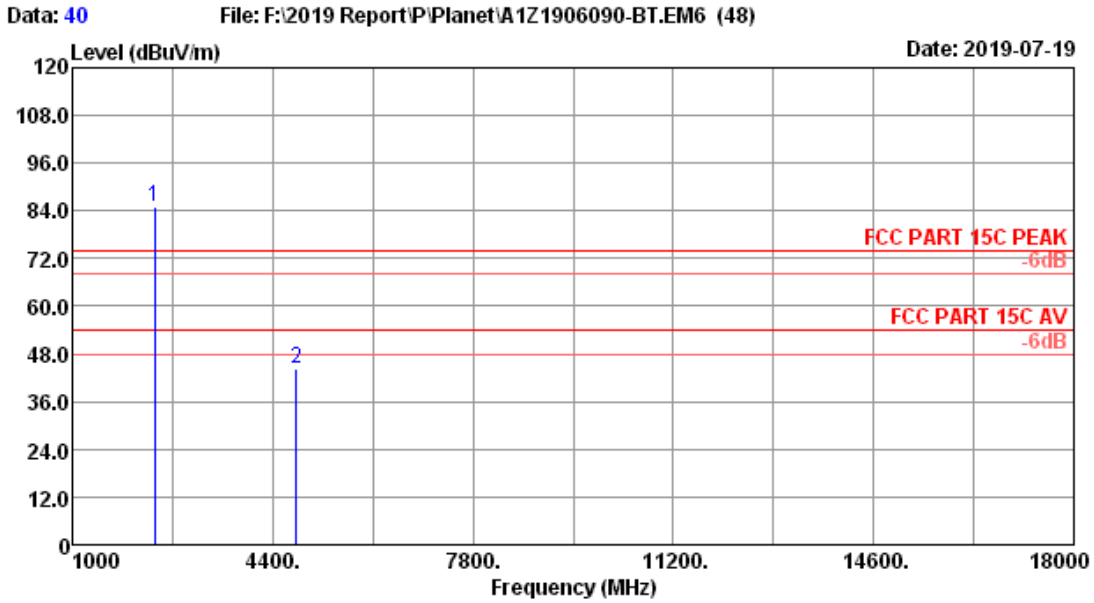
Data no. : 38
Ant. pol. : VERTICAL
Pre :
Engineer : Garry

| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | AMP factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2402.00 | 27.71 | 0.87 | 35.04 | 92.05 | 85.59 | 74.00 | -11.59 | Peak |
| 2 | 4804.00 | 32.10 | 1.24 | 34.36 | 44.46 | 43.44 | 74.00 | 30.56 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.




| | | | |
|---|---|---|---|
| Site no. | : 3m Chamber | Data no. | : 39 |
| Dis. / Ant. | : 3m 2018 3115-4580 | Ant. pol. | : HORIZONTAL |
| Limit | : FCC PART 15C PEAK | Pre | : |
| Env. / Ins. | : 23.4*C/52.9% | Engineer | : Garry |
| EUT | : COSMO | | |
| Power rating | : AC120V/60Hz | | |
| Test Mode | : BT4.0 BLE 2402MHz Tx Mode | | |
| M/N | : COSMO COMMUNICATOR | | |

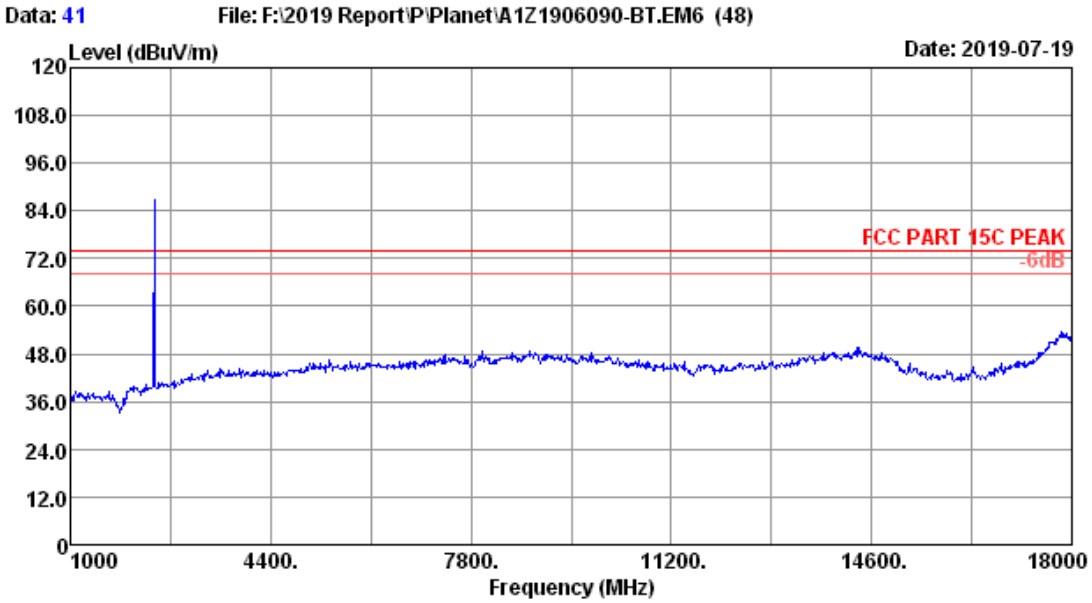



Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
EUT : COSMO
Power rating : AC120V/60Hz
Test Mode : BT4.0 BLE 2402MHz Tx Mode
M/N : COSMO COMMUNICATOR

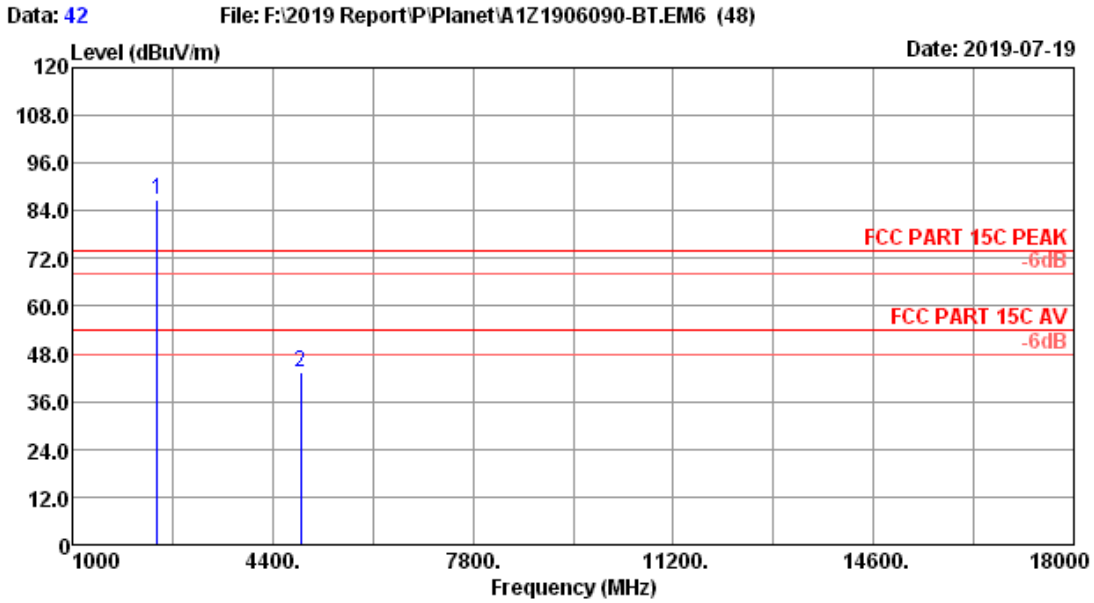
Data no. : 40
Ant. pol. : HORIZONTAL
Pre :
Engineer : Garry

| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | AMP factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2402.00 | 27.71 | 0.87 | 35.04 | 91.59 | 85.13 | 74.00 | -11.13 | Peak |
| 2 | 4804.00 | 32.10 | 1.24 | 34.36 | 45.49 | 44.47 | 74.00 | 29.53 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.




| | | | |
|---|---|---|---|
| Site no. | : 3m Chamber | Data no. | : 41 |
| Dis. / Ant. | : 3m 2018 3115-4580 | Ant. pol. | : VERTICAL |
| Limit | : FCC PART 15C PEAK | Pre | : |
| Env. / Ins. | : 23.4*C/52.9% | Engineer | : Garry |
| EUT | : COSMO | | |
| Power rating | : AC120V/60Hz | | |
| Test Mode | : BT4.0 BLE 2440MHz Tx Mode | | |
| M/N | : COSMO COMMUNICATOR | | |

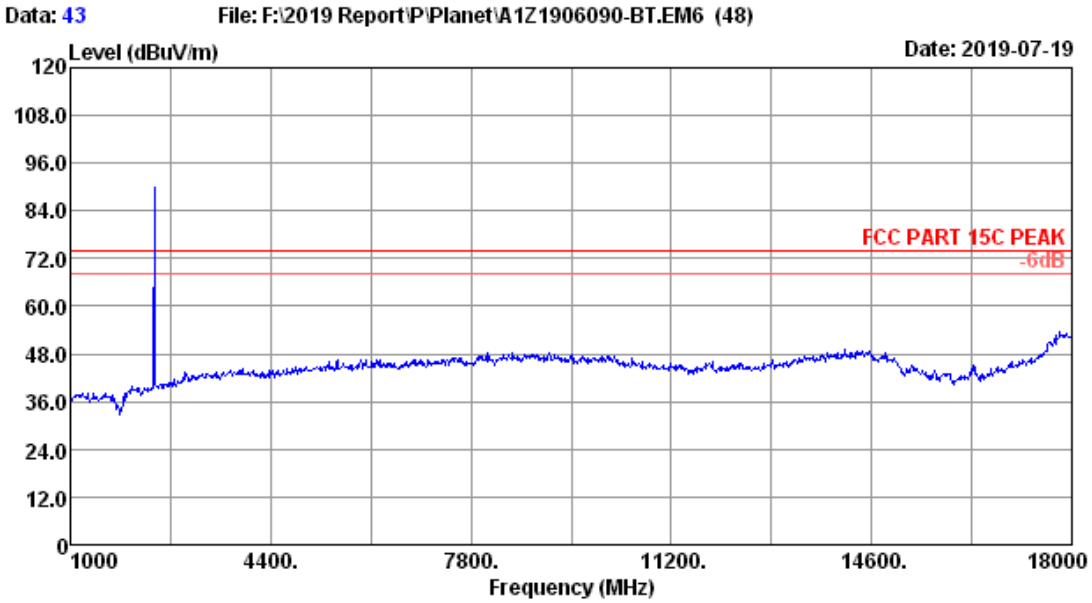



Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
EUT : COSMO
Power rating : AC120V/60Hz
Test Mode : BT4.0 BLE 2440MHz Tx Mode
M/N : COSMO COMMUNICATOR

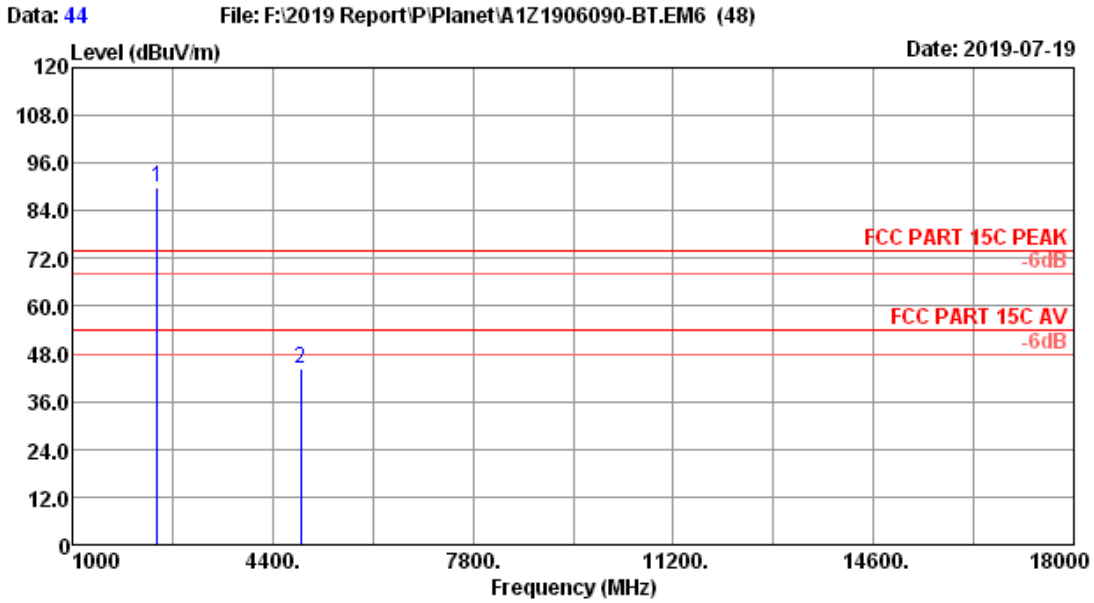
Data no. : 42
Ant. pol. : VERTICAL
Pre :
Engineer : Garry

| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | AMP factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2440.00 | 27.87 | 0.88 | 35.02 | 92.99 | 86.72 | 74.00 | -12.72 | Peak |
| 2 | 4880.00 | 32.25 | 1.25 | 34.38 | 44.06 | 43.18 | 74.00 | 30.82 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.




| | | | |
|---|---|---|---|
| Site no. | : 3m Chamber | Data no. | : 43 |
| Dis. / Ant. | : 3m 2018 3115-4580 | Ant. pol. | : HORIZONTAL |
| Limit | : FCC PART 15C PEAK | Pre | : |
| Env. / Ins. | : 23.4*C/52.9% | Engineer | : Garry |
| EUT | : COSMO | | |
| Power rating | : AC120V/60Hz | | |
| Test Mode | : BT4.0 BLE 2440MHz Tx Mode | | |
| M/N | : COSMO COMMUNICATOR | | |

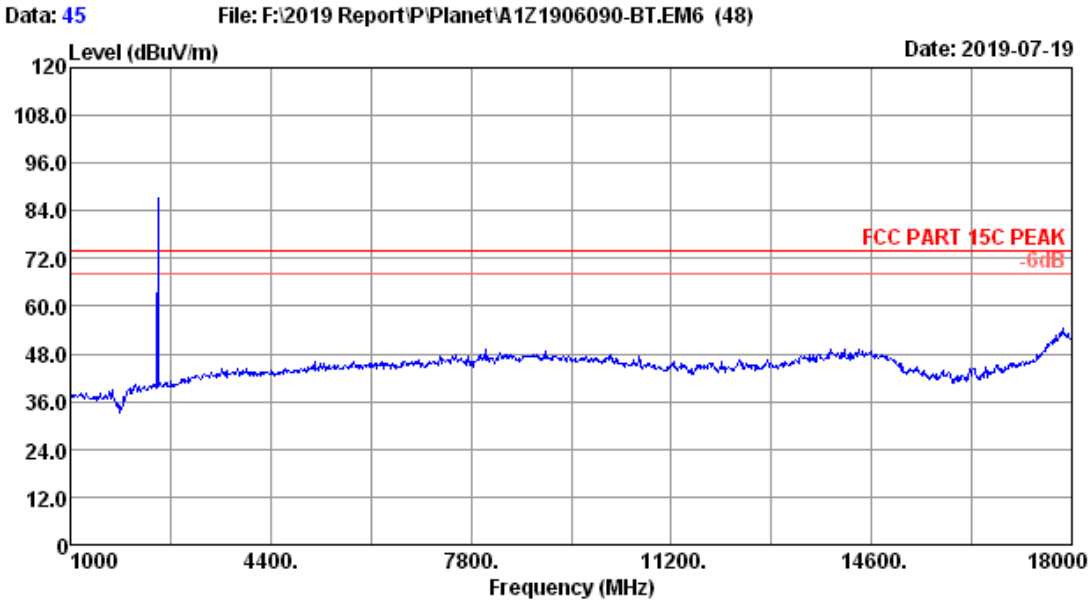



Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
EUT : COSMO
Power rating : AC120V/60Hz
Test Mode : BT4.0 BLE 2440MHz Tx Mode
M/N : COSMO COMMUNICATOR

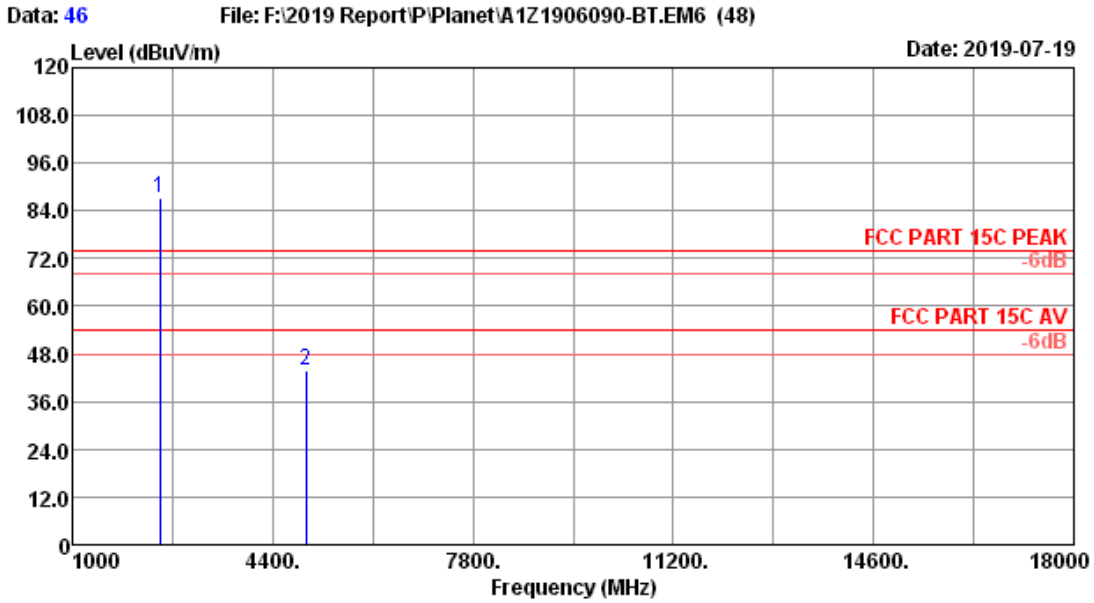
Data no. : 44
Ant. pol. : HORIZONTAL
Pre :
Engineer : Garry

| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | AMP factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2440.00 | 27.87 | 0.88 | 35.02 | 96.03 | 89.76 | 74.00 | -15.76 | Peak |
| 2 | 4880.00 | 32.25 | 1.25 | 34.38 | 45.37 | 44.49 | 74.00 | 29.51 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.




| | | | |
|---|---|---|---|
| Site no. | : 3m Chamber | Data no. | : 45 |
| Dis. / Ant. | : 3m 2018 3115-4580 | Ant. pol. | : HORIZONTAL |
| Limit | : FCC PART 15C PEAK | Pre | : |
| Env. / Ins. | : 23.4*C/52.9% | Engineer | : Garry |
| EUT | : COSMO | | |
| Power rating | : AC120V/60Hz | | |
| Test Mode | : BT4.0 BLE 2480MHz Tx Mode | | |
| M/N | : COSMO COMMUNICATOR | | |

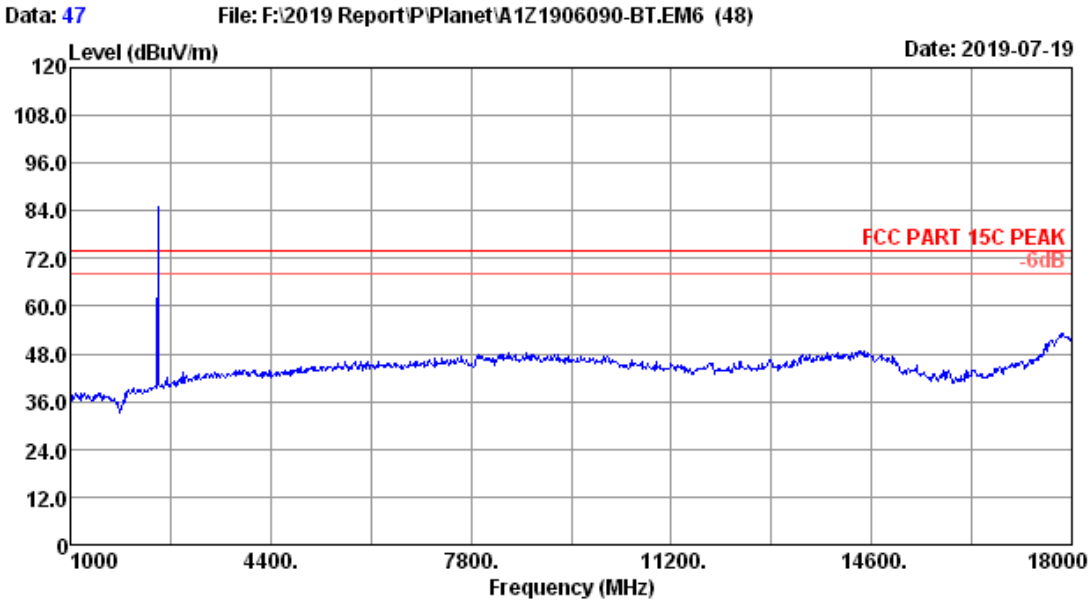



Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
EUT : COSMO
Power rating : AC120V/60Hz
Test Mode : BT4.0 BLE 2480MHz Tx Mode
M/N : COSMO COMMUNICATOR

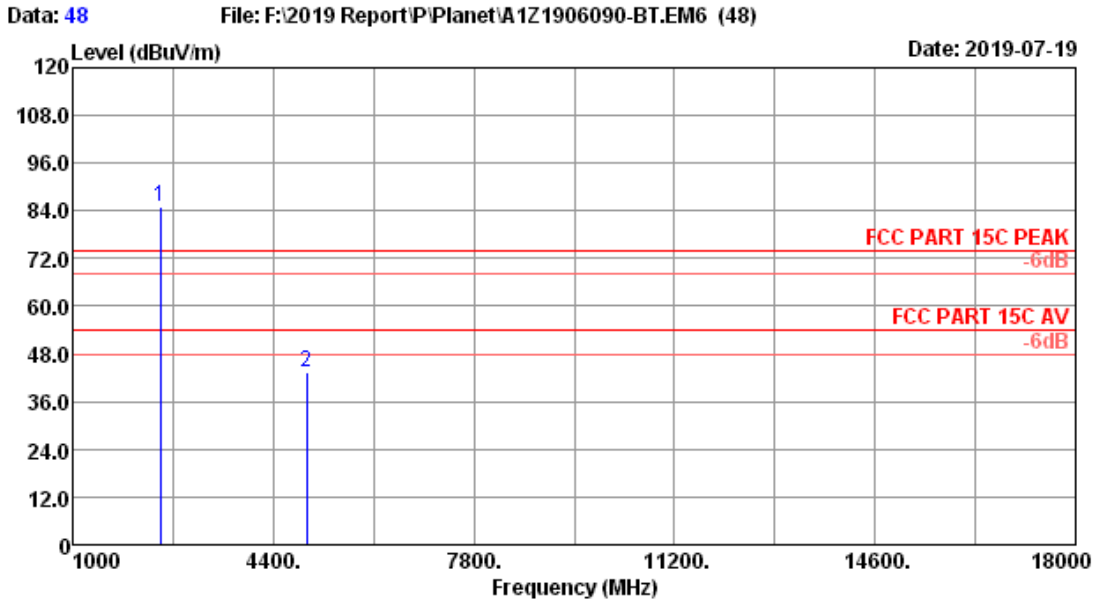
Data no. : 46
Ant. pol. : HORIZONTAL
Pre :
Engineer : Garry

| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | AMP factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2480.00 | 27.98 | 0.89 | 35.01 | 93.57 | 87.43 | 74.00 | -13.43 | Peak |
| 2 | 4960.00 | 32.43 | 1.27 | 34.39 | 44.51 | 43.82 | 74.00 | 30.18 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.




| | | | |
|---|---|---|---|
| Site no. | : 3m Chamber | Data no. | : 47 |
| Dis. / Ant. | : 3m 2018 3115-4580 | Ant. pol. | : VERTICAL |
| Limit | : FCC PART 15C PEAK | Pre | : |
| Env. / Ins. | : 23.4*C/52.9% | Engineer | : Garry |
| EUT | : COSMO | | |
| Power rating | : AC120V/60Hz | | |
| Test Mode | : BT4.0 BLE 2480MHz Tx Mode | | |
| M/N | : COSMO COMMUNICATOR | | |




Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
EUT : COSMO
Power rating : AC120V/60Hz
Test Mode : BT4.0 BLE 2480MHz Tx Mode
M/N : COSMO COMMUNICATOR

Data no. : 48
Ant. pol. : VERTICAL
Pre :
Engineer : Garry

| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | AMP factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2480.00 | 27.98 | 0.89 | 35.01 | 91.27 | 85.13 | 74.00 | -11.13 | Peak |
| 2 | 4960.00 | 32.43 | 1.27 | 34.39 | 44.22 | 43.53 | 74.00 | 30.47 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.

# 5. CONDUCTED SPURIOUS EMISSIONS

## 5.1. Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | PXA Signal Analyzer | Agilent | N9030A | MY51380221 | Jun.30,19 | 1 Year |
| 2. | Attenuator | Agilent | 8491B | MY39262165 | Oct.14,18 | 1 Year |
| 3. | RF Cable | EMCI | EMC102-KM-KM 3500 | 170702 | May.13,19 | 1 Year |

## 5.2. Block Diagram of Test Setup

Please reference to section 2.4.

## 5.3. Limit

In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

## 5.4. Test Procedure

Use the test method descried in ANSI C63.10:
The transmitter output was connected to a spectrum analyzer, The resolution bandwidth is set to 100 kHz, The video bandwidth is set to 300 kHz and measure all the emissions With peak detector.

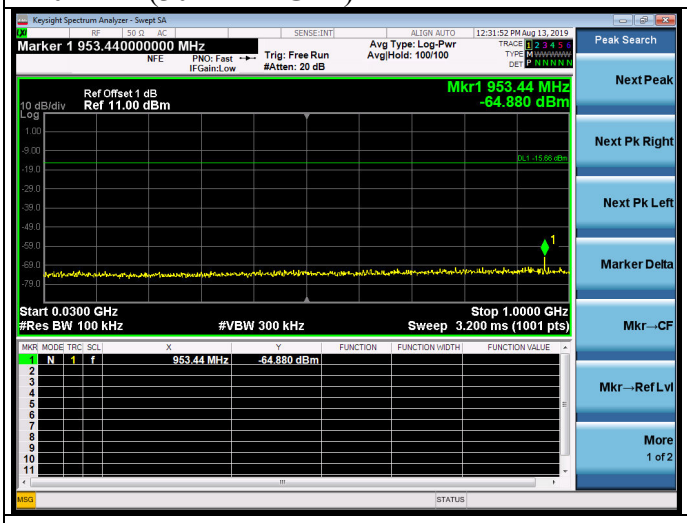
## 5.5. Test result

**PASS** (The testing data was attached in the next pages.)

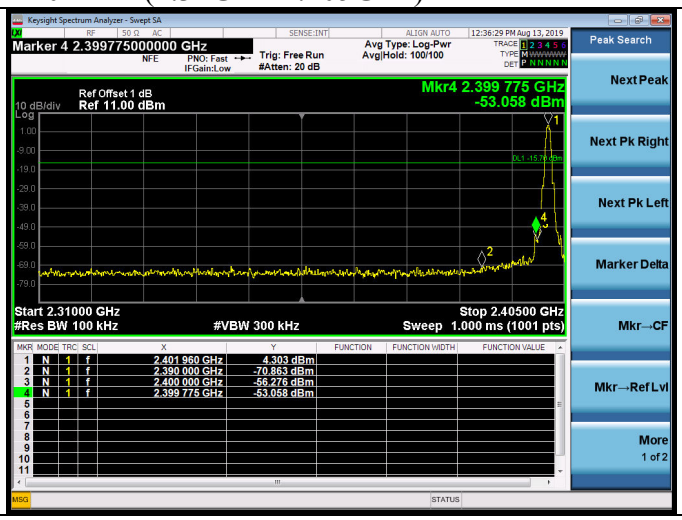
| | | |
|---|---|---|
| EUT: COSMO | | |
| M/N: COSMO COMMUNICATOR | | |
| Test date: 2019-08-13 | Pressure: 102.1±1.0 kpa | Humidity: 51.1±3.0% |
| Tested by: Garry | Test site: RF site | Temperature:22.8±0.6 ℃ |

GFSK

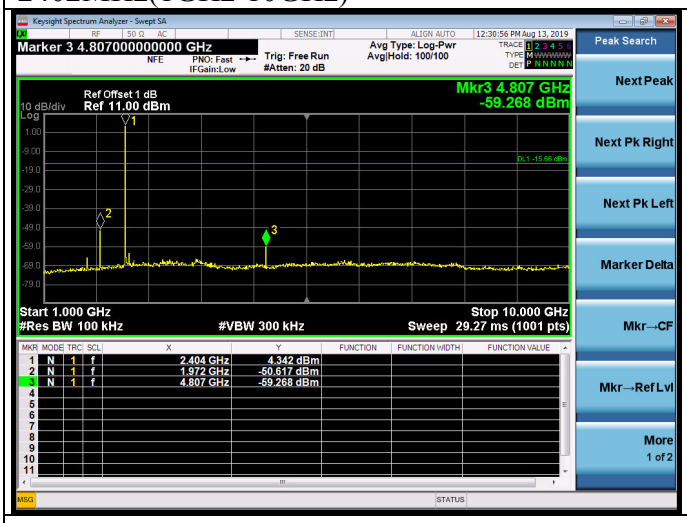
2402MHz(30MHz-1GHz)



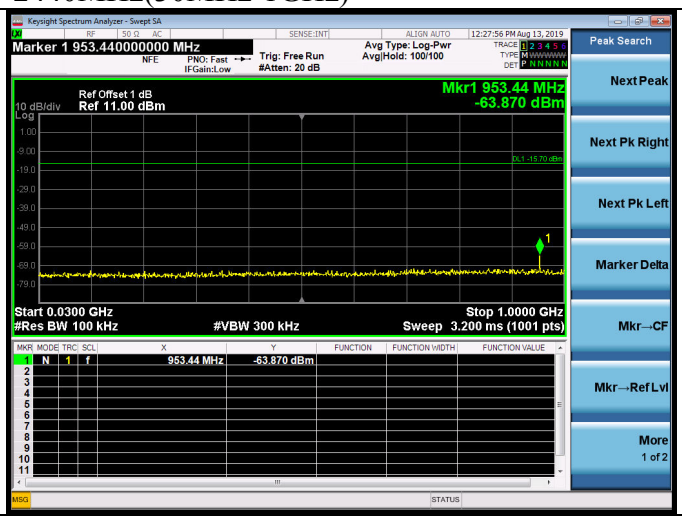

2402MHz(2.31GHz-2.405GHz)



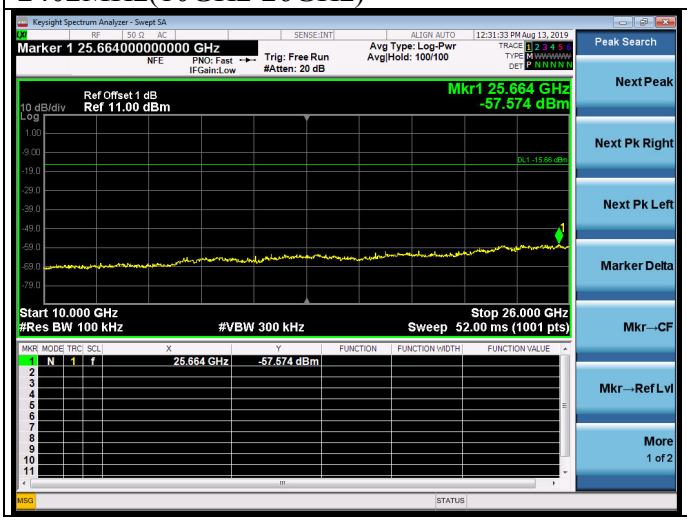

2402MHz(1GHz-10GHz)



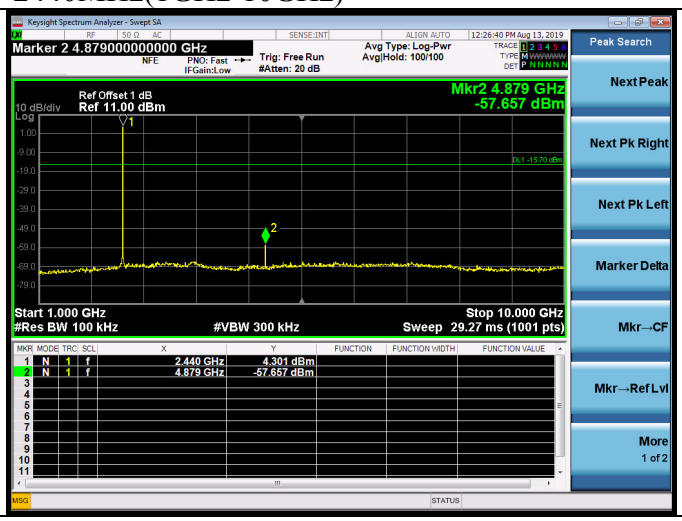

2440MHz(30MHz-1GHz)



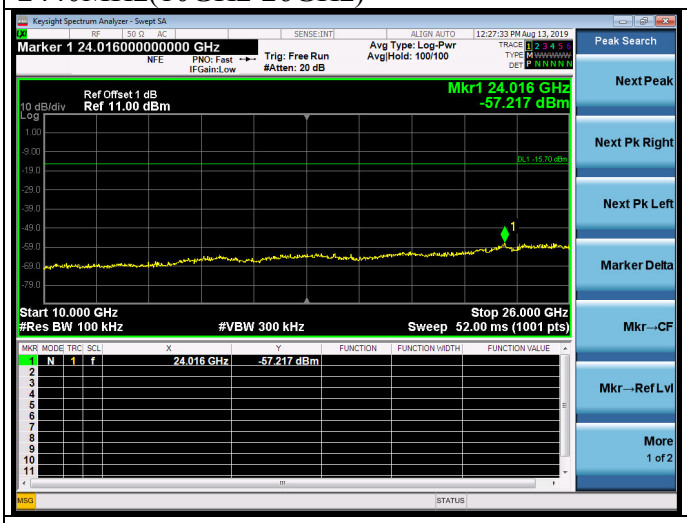

2402MHz(10GHz-26GHz)



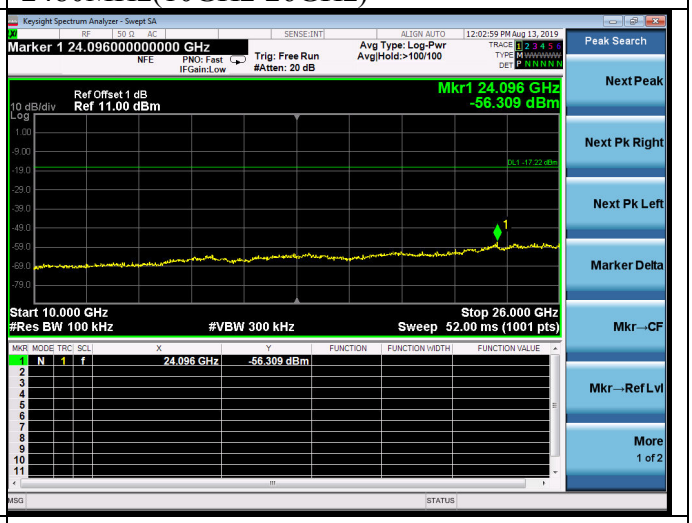

2440MHz(1GHz-10GHz)



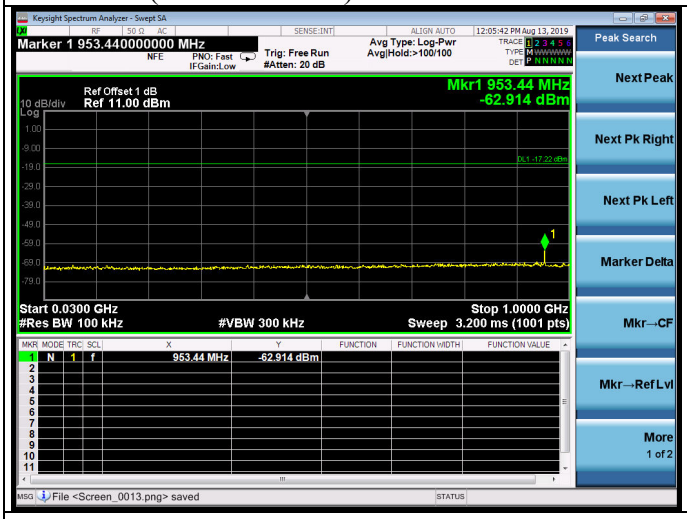
2440MHz(10GHz-26GHz)



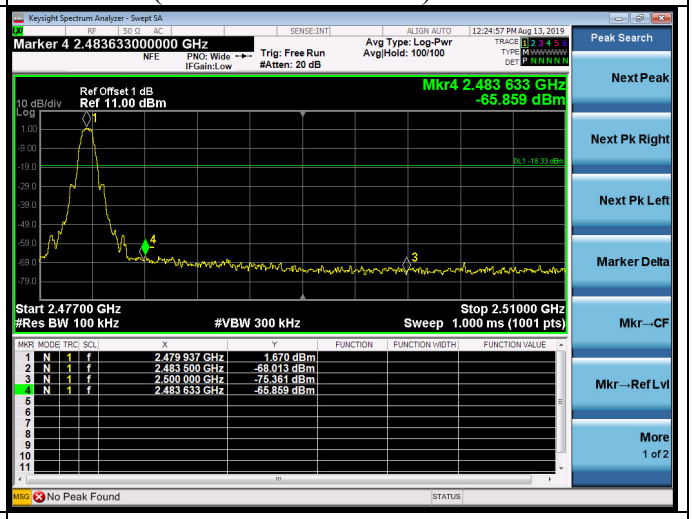

2480MHz(10GHz-26GHz)



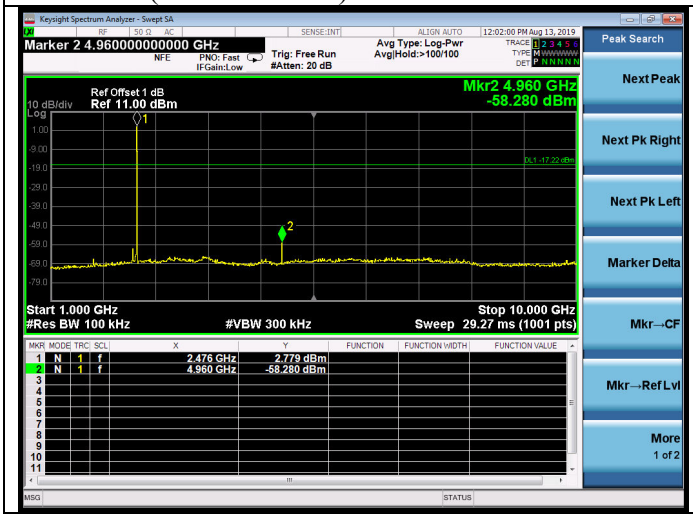

2480MHz(30MHz-1GHz)




2480MHz(2.477GHz-2.51GHz)




2480MHz(1GHz-10GHz)



# 6. 6DB BANDWIDTH TEST

## 6.1. Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | PXA Signal Analyzer | Agilent | N9030A | MY51380221 | Jun.30,19 | 1 Year |
| 2. | Attenuator | Agilent | 8491B | MY39262165 | Oct.14,18 | 1 Year |
| 3. | RF Cable | EMCI | EMC102-KM-KM 3500 | 170702 | May.13,19 | 1 Year |

## 6.2. Block Diagram of Test Setup

Please reference to section 2.4.

## 6.3. Limit

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz.

## 6.4. Test Procedure

Use the test method descried in ANSI C63.10 clause 11.8.2:
The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described in 11.8.1 (i.e., RBW = 100 kHz, VBW ≥ 3 × RBW, and peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥6 dB.

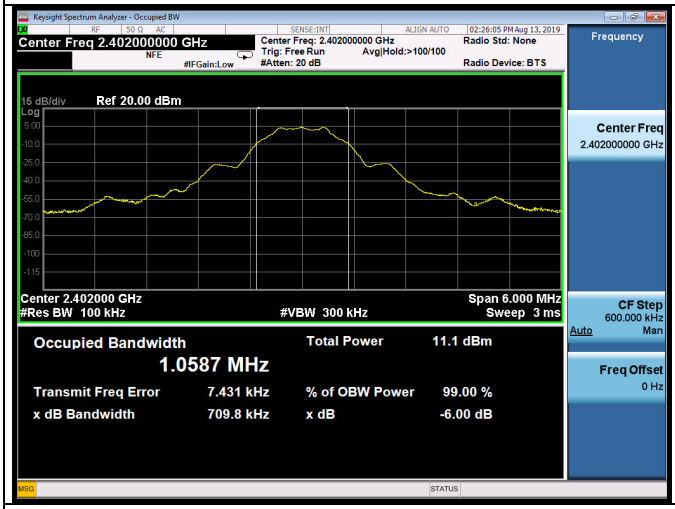
## 6.5. Test Results

| | | |
|---|---|---|
| EUT: COSMO | | |
| M/N: COSMO COMMUNICATOR | | |
| Test date: 2019-08-13 | Pressure: 102.3±1.0 kpa | Humidity: 53.6±3.0% |
| Tested by: Garry | Test site: RF site | Temperature: 25.5±0.6℃ |

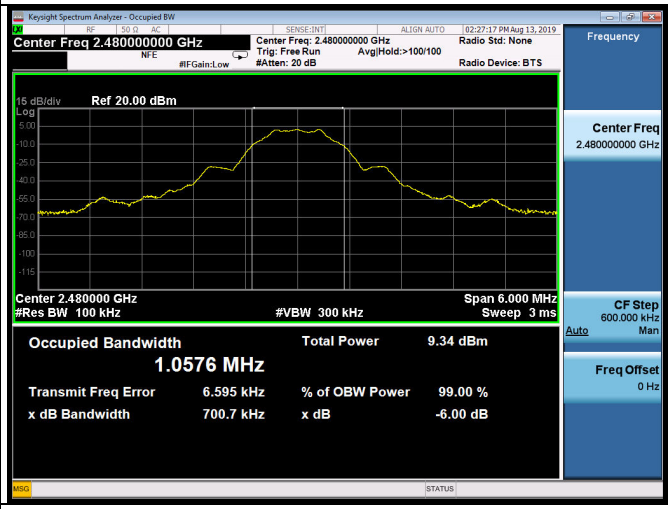
| Test Mode | Frequency (MHz) | 6 dB bandwidth (kHz) | Limit (KHz) |
|---|---|---|---|
| GFSK | 2402 | 709.8 | ≧500 |
| | 2440 | 703.7 | ≧500 |
| | 2480 | 700.7 | ≧500 |
| Conclusion：PASS | | | |

**GFSK**

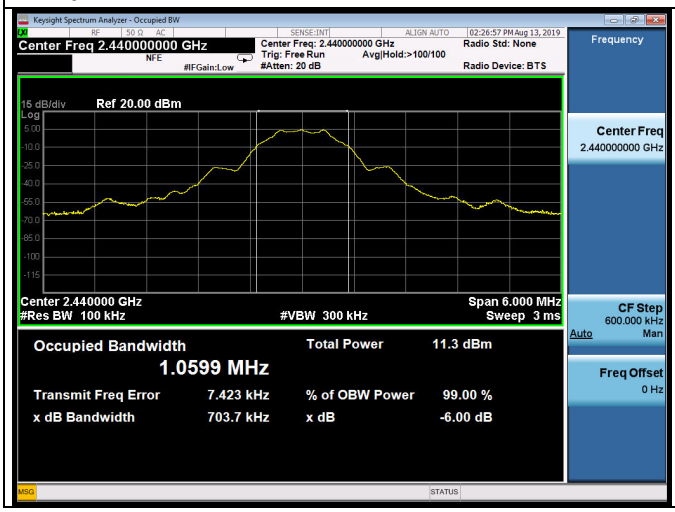
2402MHz




2480MHz




2440MHz



# 7. MAXIMUM PEAK OUTPUT POWER TEST

7.1. Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | PXA Signal Analyzer | Agilent | N9030A | MY51380221 | Jun.30,19 | 1 Year |
| 2. | Power meter | Anritsu | ML2487A | 6K00002472 | Oct.14,18 | 1 Year |
| 3. | Power sensor | Anritsu | MA2491A | 033005 | Oct.13,18 | 1 Year |
| 4. | Attenuator | Agilent | 8491B | MY39262165 | Oct.14,18 | 1 Year |
| 5. | RF Cable | EMCI | EMC102-KM-KM 3500 | 170702 | May.13,19 | 1 Year |

7.2. Limit

For systems using digital modulation in the 2400—2483.5MHz, The Peak out put Power shall not exceed 1W(30dBm).

7.3. Test Procedure

Use the test method descried in ANSI C63.10 clause 11.9.1.3:
Connected the EUT's antenna port to Power Sensor, and use power meter to test peak output power.

7.4. Test Results

| | | |
|---|---|---|
| EUT: COSMO | | |
| M/N: COSMO COMMUNICATOR | | |
| Test date: 2019-08-21 | Pressure: 102.3±1.0 kpa | Humidity: 53.6±3.0% |
| Tested by: Garry | Test site: RF site | Temperature: 25.5±0.6℃ |

| Test Mode | Frequency (MHz) | Peak output Power（dBm） | Limit (dBm) |
|---|---|---|---|
| GFSK | 2402 | 5.198 | 30 |
| | 2440 | 5.360 | 30 |
| | 2480 | 3.355 | 30 |
| Conclusion: PASS | | | |

# 8. BAND EDGE COMPLIANCE TEST

8.1. Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | PXA Signal Analyzer | Agilent | N9030A | MY51380221 | Jun.30,19 | 1 Year |
| 2. | Amplifier | HP | 8449B | 3008A02495 | Apr.23,19 | 1 Year |
| 3. | Horn Antenna | ETS | 3115 | 9607-4580 | Dec.13,18 | 1 Year |
| 4. | RF Cable | EMCI | EMC102-KM-KM 3500 | 170702 | May.13,19 | 1 Year |

8.2. Limit

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

8.3. Test Produce

Use the test method descried in ANSI C63.10 clause 6.10:

For upper band emissions that are up to two bandwidths(2MHz) away (2483.5MHz to 2485.5MHz）from the band-edge use below produce:

1. Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to 100KHz and with a video bandwidth 300KHz. Record the peak levels of the fundamental emission and the relevant band-edge emission, Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not a field strength measurement, it is only a relative measurement to determine the amount by which the emission drops at the band edge relative to the highest fundamental emission level.
2. Subtract the delta measured in step (1) from the maximum field strengths measured in clause 4 .The resultant field strengths are then used to determine band-edge compliance as required by Section 15.205

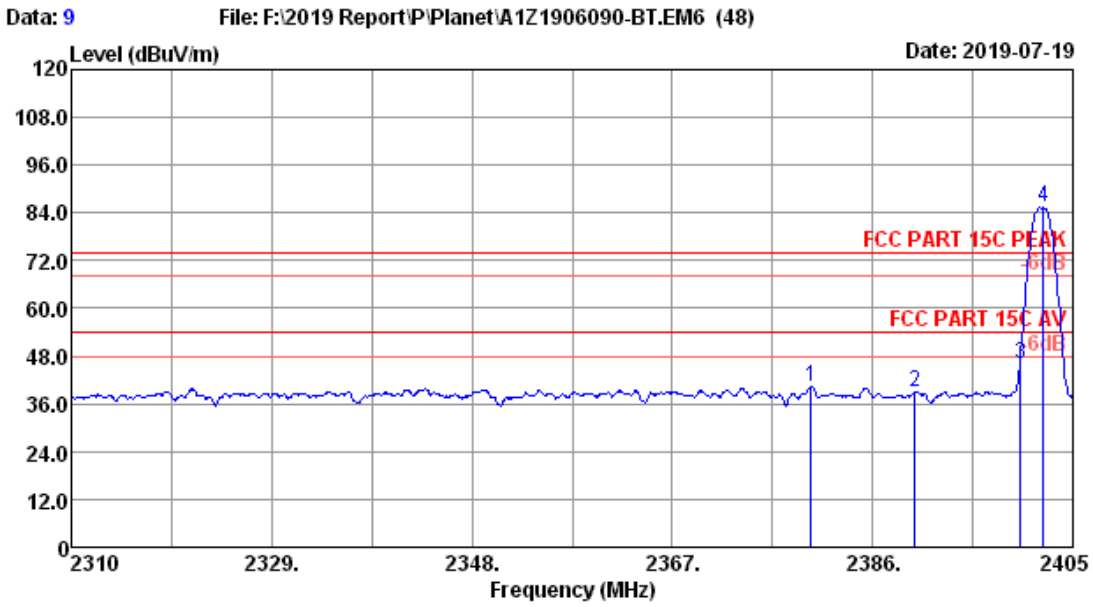
For emissions above two bandwidths away from the band-edge use below produce:

1. The EUT is placed on a turntable, which is 0.8m above the ground plane and worked at highest radiated power.
2. The turntable was rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upperband-edges of the emission:
   (a) PEAK: RBW=1MHz ;VBW=3MHz, PK detector, Sweep=AUTO
   (b) This is pulse Modulation device a duty cycle factor was used to calculate average level based measured peak level.

8.4. Test Results

Pass (The testing data was attached in the next pages.)

Note: If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

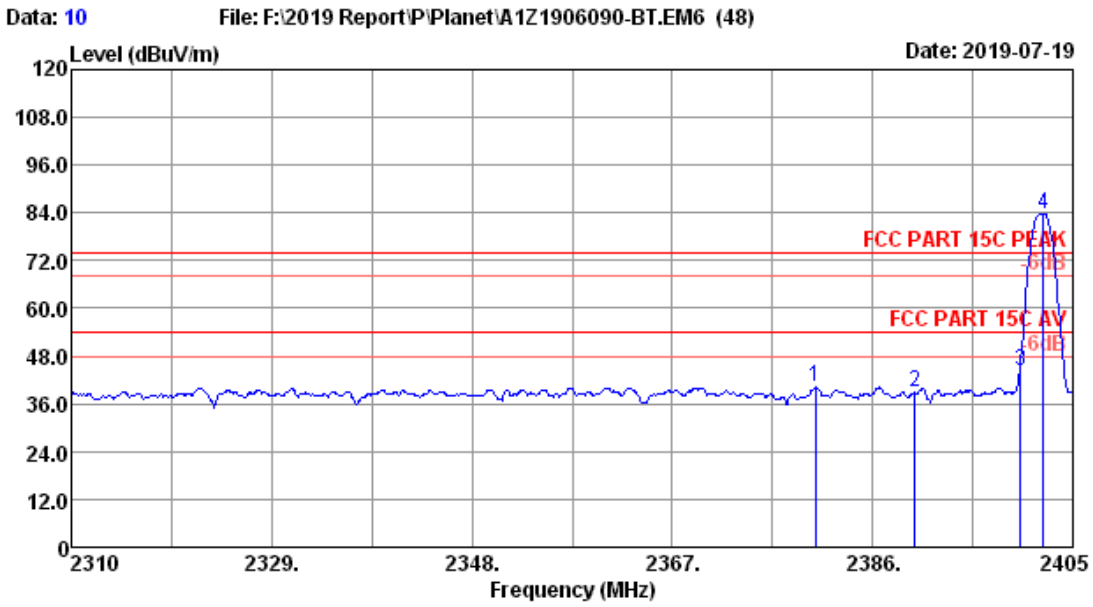



Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
EUT : COSMO
Power rating : AC120V/60Hz
Test Mode : BT4.0 BLE 2402MHz Tx Mode
M/N : COSMO COMMUNICATOR

Data no. : 9
Ant. pol. : HORIZONTAL
Pre :
Engineer : Garry

| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | AMP factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2380.21 | 27.62 | 0.87 | 35.05 | 46.76 | 40.20 | 74.00 | 33.80 | Peak |
| 2 | 2390.00 | 27.71 | 0.87 | 35.04 | 45.45 | 38.99 | 74.00 | 35.01 | Peak |
| 3 | 2400.00 | 27.71 | 0.87 | 35.04 | 52.32 | 45.86 | 74.00 | 28.14 | Peak |
| 4 | 2402.25 | 27.71 | 0.87 | 35.04 | 91.73 | 85.27 | 74.00 | -11.27 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.

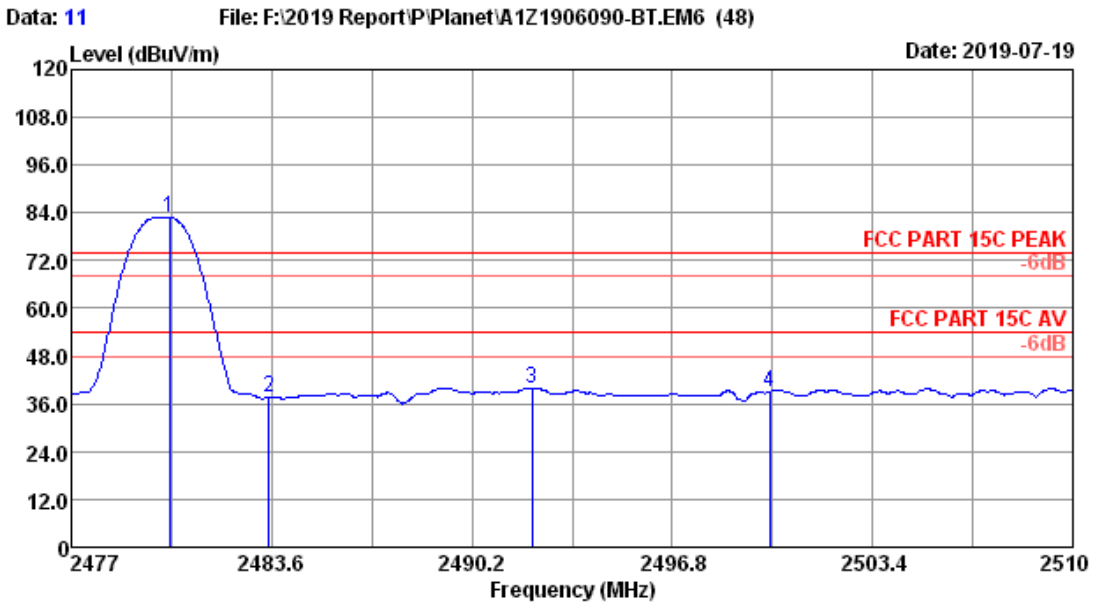



Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
EUT : COSMO
Power rating : AC120V/60Hz
Test Mode : BT4.0 BLE 2402MHz Tx Mode
M/N : COSMO COMMUNICATOR

Data no. : 10
Ant. pol. : VERTICAL
Pre :
Engineer : Garry

| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | AMP factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2380.59 | 27.62 | 0.87 | 35.05 | 46.69 | 40.13 | 74.00 | 33.87 | Peak |
| 2 | 2390.00 | 27.71 | 0.87 | 35.04 | 45.30 | 38.84 | 74.00 | 35.16 | Peak |
| 3 | 2400.00 | 27.71 | 0.87 | 35.04 | 50.65 | 44.19 | 74.00 | 29.81 | Peak |
| 4 | 2402.25 | 27.71 | 0.87 | 35.04 | 90.17 | 83.71 | 74.00 | -9.71 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.

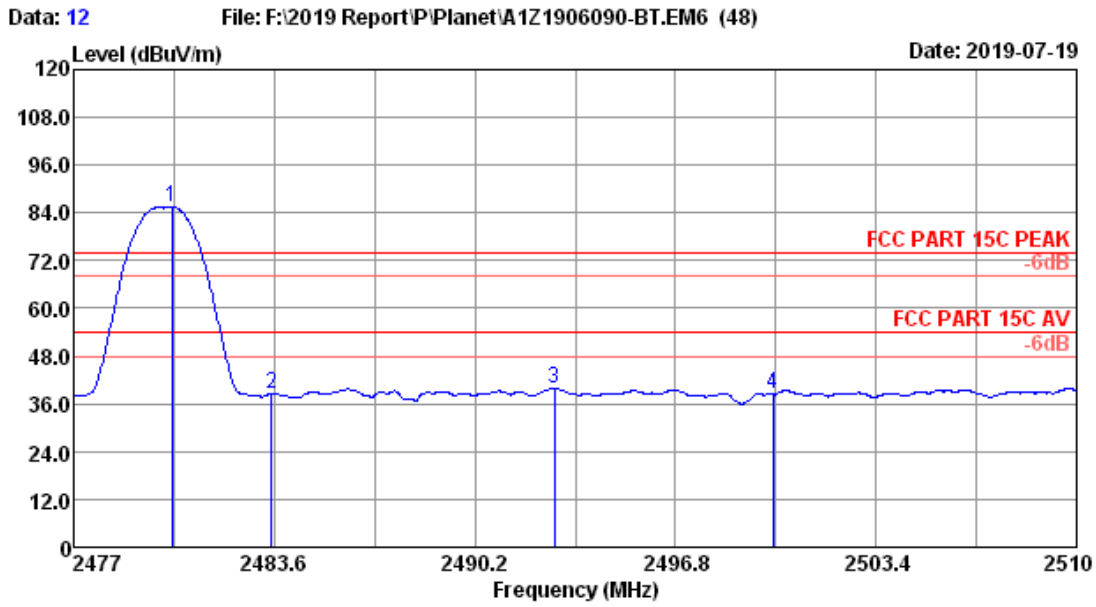



Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
EUT : COSMO
Power rating : AC120V/60Hz
Test Mode : BT4.0 BLE 2480MHz Tx Mode
M/N : COSMO COMMUNICATOR

Data no. : 11
Ant. pol. : VERTICAL
Pre :
Engineer : Garry

| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | AMP factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2480.23 | 27.98 | 0.89 | 35.01 | 89.02 | 82.88 | 74.00 | -8.88 | Peak |
| 2 | 2483.50 | 27.98 | 0.89 | 35.01 | 43.77 | 37.63 | 74.00 | 36.37 | Peak |
| 3 | 2492.18 | 28.03 | 0.89 | 35.00 | 46.13 | 40.05 | 74.00 | 33.95 | Peak |
| 4 | 2500.00 | 28.03 | 0.89 | 35.00 | 45.17 | 39.09 | 74.00 | 34.91 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.




Site no. : 3m Chamber
Dis. / Ant. : 3m 2018 3115-4580
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.4*C/52.9%
EUT : COSMO
Power rating : AC120V/60Hz
Test Mode : BT4.0 BLE 2480MHz Tx Mode
M/N : COSMO COMMUNICATOR

Data no. : 12
Ant. pol. : HORIZONTAL
Pre :
Engineer : Garry

| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | AMP factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2480.23 | 27.98 | 0.89 | 35.01 | 91.62 | 85.48 | 74.00 | -11.48 | Peak |
| 2 | 2483.50 | 27.98 | 0.89 | 35.01 | 44.50 | 38.36 | 74.00 | 35.64 | Peak |
| 3 | 2492.81 | 28.03 | 0.89 | 35.00 | 45.88 | 39.80 | 74.00 | 34.20 | Peak |
| 4 | 2500.00 | 28.03 | 0.89 | 35.00 | 44.46 | 38.38 | 74.00 | 35.62 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.

# 9. POWER SPECTRAL DENSITY TEST

9.1. Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | PXA Signal Analyzer | Agilent | N9030A | MY51380221 | Jun.30,19 | 1 Year |
| 2. | Attenuator | Agilent | 8491B | MY39262165 | Oct.14,18 | 1 Year |
| 3. | RF Cable | Mini-Circuits | CBL-1M-SMSM+ | No.4 | Oct.14,18 | 1 Year |

9.2. Block Diagram of Test Setup

Please reference to section 2.4.

9.3. Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

9.4. Test Procedure

Use the test method descried in ANSI C63.10 clause 11.10.2:

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ [3 × RBW].
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

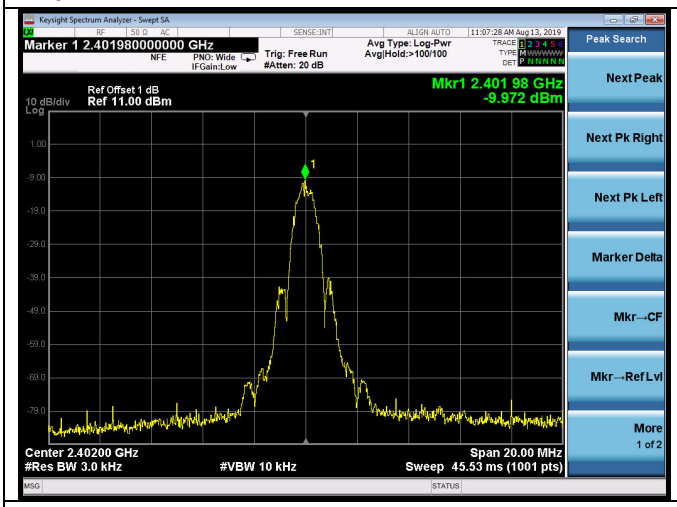
9.5. Test Results

| | | |
|---|---|---|
| EUT: COSMO | | |
| M/N: COSMO COMMUNICATOR | | |
| Test date: 2019-08-13 | Pressure: 102.3±1.0 kpa | Humidity: 53.6±3.0% |
| Tested by: Garry | Test site: RF site | Temperature: 25.5±0.6℃ |

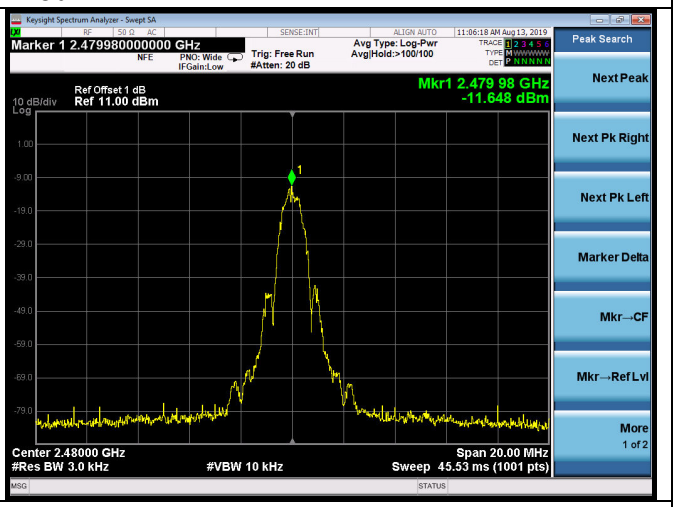
| Test Mode | Frequency (MHz) | Power density (dBm/3KHz) | Limit (dBm/3KHz) |
|---|---|---|---|
| GFSK | 2402 | -9.972 | 8 |
| | 2440 | -9.709 | 8 |
| | 2480 | -11.648 | 8 |
| Conclusion：PASS | | | |

**GFSK**

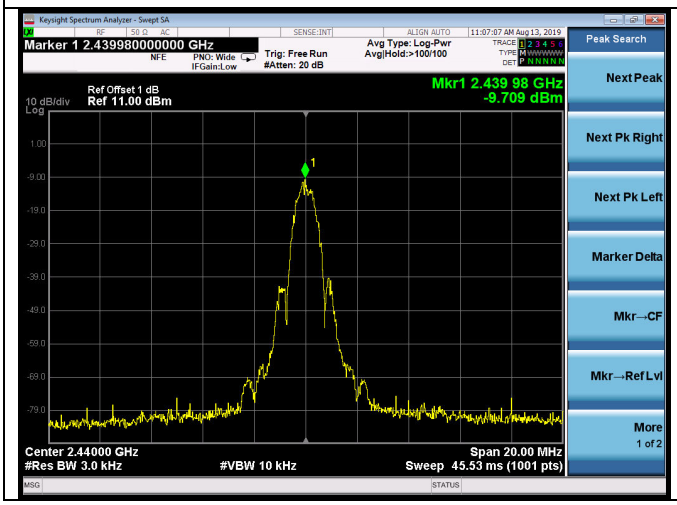
2402MHz




2480MHz




2440MHz



# 10. ANTENNA REQUIREMENT

## 10.1. STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

## 10.2. ANTENNA CONNECTED CONSTRUCTION

The antennas used for this product are MONOPOLE antenna that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is -0.1dBi.

# 11. DEVIATION TO TEST SPECIFICATIONS

[NONE]

End of Report