

FCC PART 15C TEST REPORT FOR CERTIFICATION

On Behalf of

Planet Computers Limited

COSMO

COSMO COMMUNICATOR VE

FCC ID: 2A07Q-COSMOVE

Prepared for : Planet Computers Limited

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Kingdom

Prepared By : Audix Technology (Shenzhen) Co., Ltd.

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Report Number : ACS-F19156

Date of Test : Jul.19~Sep.11, 2019

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-COSMOVE
(A) Model No. : COSMO COMMUNICATOR VE
(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 Reviewed by : Sunny Lu
Monica Liu / Assistant Sunny Lu / Deputy Manager



Approved & Authorized Signer :

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 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 Suite #9, 56 Sloane Square, London, SW1W 8AX, United Kingdom
Manufacturer	Planet Computers Limited Suite #9, 56 Sloane Square, London, SW1W 8AX, United Kingdom
Factory	Shenzhen Eastaeon Technology Limited Company 4F, B block, Kingdee Software Park, 2 Keji South 12 Road, Nanshan District, Shenzhen
Product	COSMO
Model No.	COSMO COMMUNICATOR VE
FCC ID	2A07Q-COSMOVE
Power Adapter	Manufacturer: SHENZHEN TIANYIN ELECTRONICS CO., LTD. Model: TPA-10120125UU-MTK Input: 100-240V~, 50/60Hz, 0.6A Output: 5V, 2A / 7V, 1.67A / 9V, 1.67A / 12V, 1.25A
Rechargeable Li-ion Battery	Manufacturer: Shenzhen 3sun Electronics Co., Ltd.; M/N: Gemini Standard Battery; Rating Voltage: 3.85V; Capacity: 4220mAh; 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 VE	
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; 802.11g/n(OFDM): 64QAM,16QAM, QPSK, BPSK	
Data Rate	802.11b: 11/5.5/2/1 Mbps; 802.11g: 54/48/36/24/18/12/9/6 Mbps; 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; 802.11n up to 150 Mbps; 802.11ac: up to 400Mbps	
Channel Separation	5MHz	
Type of Product	Slave device without Radar detection	
Transmit Power Control	No Support	

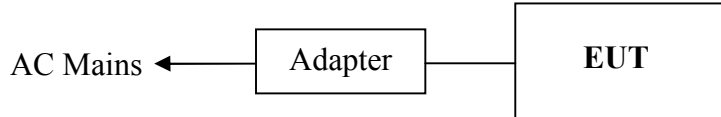
Antenna System

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 U-NII-1 Band(5150-5250MHz) Peak Gain: 0.6dBi U-NII-2A Band(5250-5350MHz) Peak Gain: 0.6dBi U-NII-2C Band(5470-5725MHz) Peak Gain: 0.4dBi 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.
: No. 6, Kefeng Road, Science & Technology Park,
Nanshan District , Shenzhen, Guangdong, China

EMC Lab.

Certificated by Industry Canada
: Registration Number: IC 5183A-1
Valid Date: May.07, 2020

Certificated by DAkkS, Germany
: Registration No: D-PL-12151-01-00
Valid Date: Dec.07, 2021

Accredited by NVLAP, USA
: NVLAP Code: 200372-0
Valid Date: Mar.31, 2020

Certificated by FCC USA.
: Designation No.: CN5022
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.

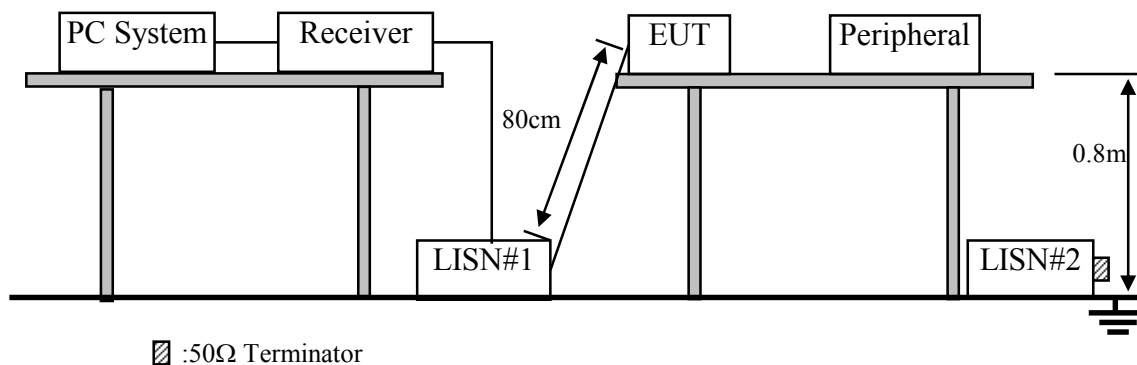
3. POWER LINE CONDUCTED EMISSION TEST

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 VE

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

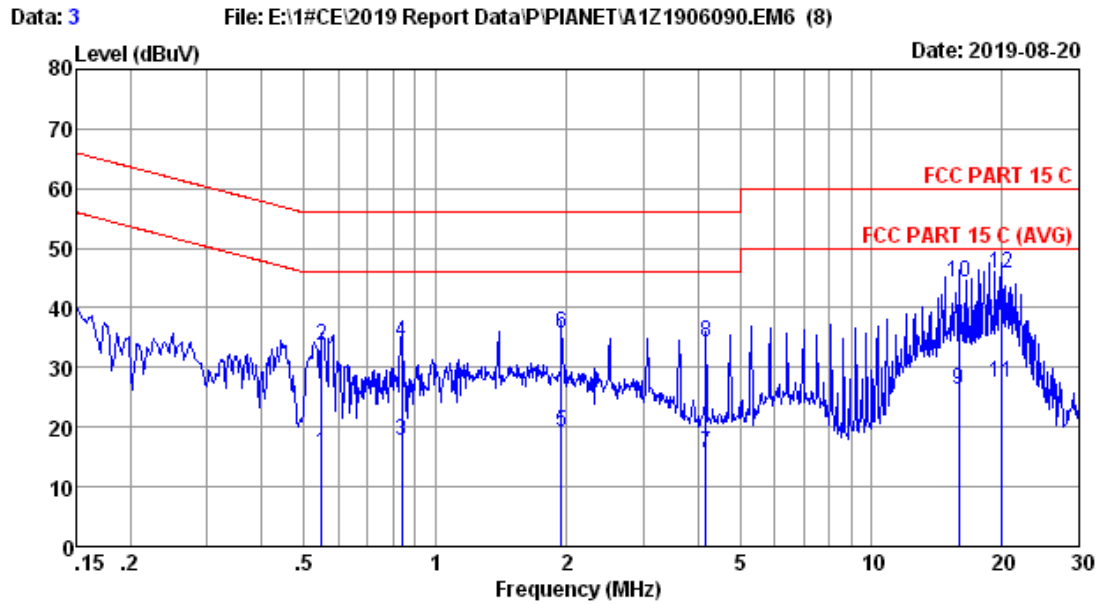
The EUT was placed on a non-metallic table, 80cm above the ground plane. The EUT Power Via AC unit connected to the power mains through a line impedance stabilization network (L.I.S.N. 1#). This provides a 50 ohm coupling impedance for the EUT (Please refer the block diagram of the test setup and photographs). 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

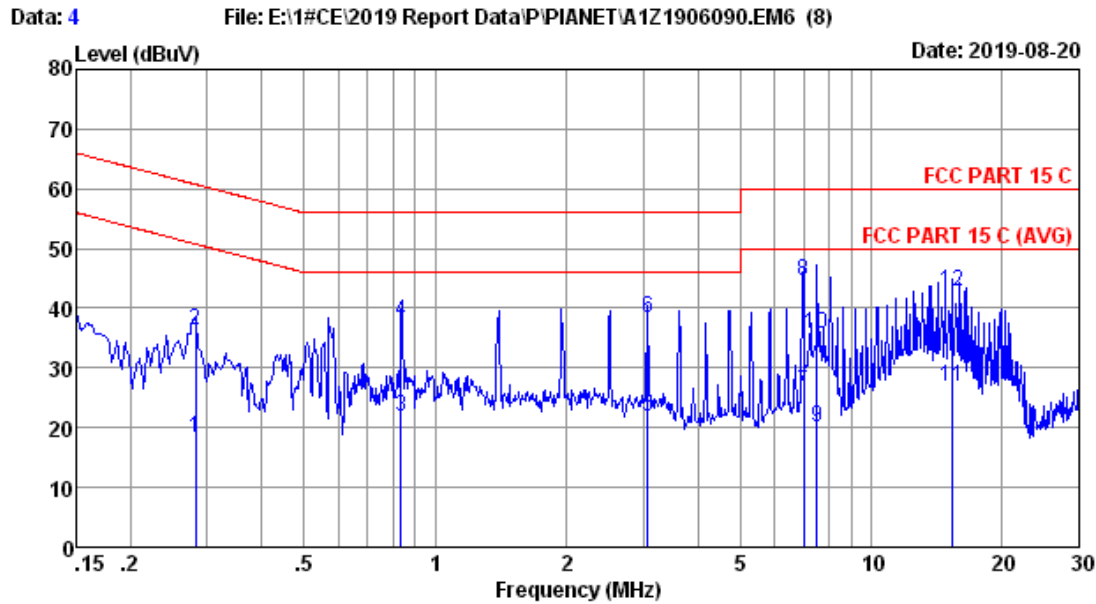
PASS. (All emissions not reported below are too low against the prescribed limits.)



Site no :1# Conduction Data No :3
 Dis./Lisn :2018 ENV216-L LISN phase:
 Limit :FCC PART 15 C
 Env./Ins. :Temp:23.8°C Humi:55% Engineer :Evan
 Power rating : AC 120V/60Hz
 Test Mode : BT4.0

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 Data No :4
 Dis./Lisn :2018 ENV216-N LISN phase:
 Limit :FCC PART 15 C
 Env./Ins. :Temp:23.8°C Humi:55% Engineer :Evan
 EUT :COSMO M/N: COSMO COMMUNICATOR
 Power rating : AC 120V/60Hz
 Test Mode : BT4.0

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

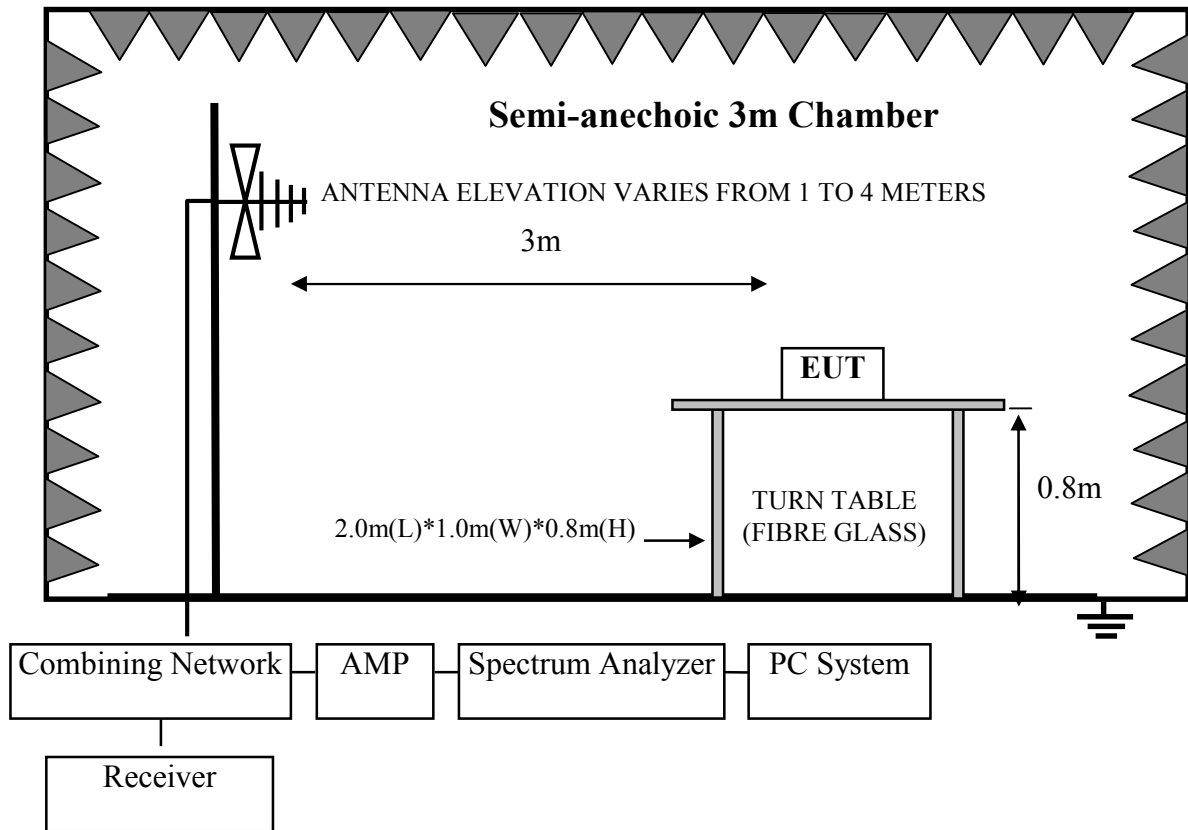
Note: N/A means Not applicable.

Frequency range: above 1000MHz

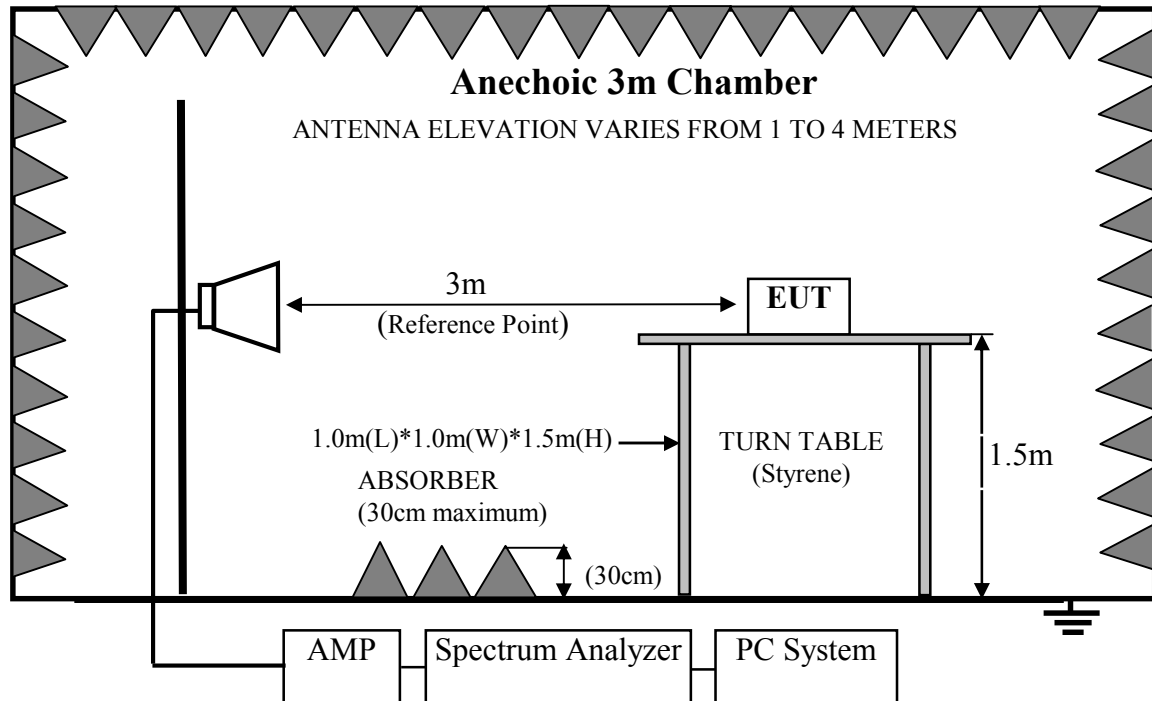
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	3#Chamber(Svswr)	AUDIX	N/A	N/A	Apr.18,19	1 Year
2.	3#Chamber(SE)	AUDIX	N/A	N/A	May.17,18	3 Year
3.	PXA Signal Analyzer	Agilent	N9030A	MY51380221	Jun.30,19	1 Year
4.	Horn Antenna	ETS	3115	9510-4580	Dec.13,18	1 Year
5.	Horn Antenna	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-K M-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	
		$\mu\text{V/m}$	$\text{dB}(\mu\text{V})/\text{m}$
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 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

- Remark :
- (1) Emission level $\text{dB}\mu\text{V} = 20 \log$ Emission level $\mu\text{V/m}$
 - (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 VE
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 Horn 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.

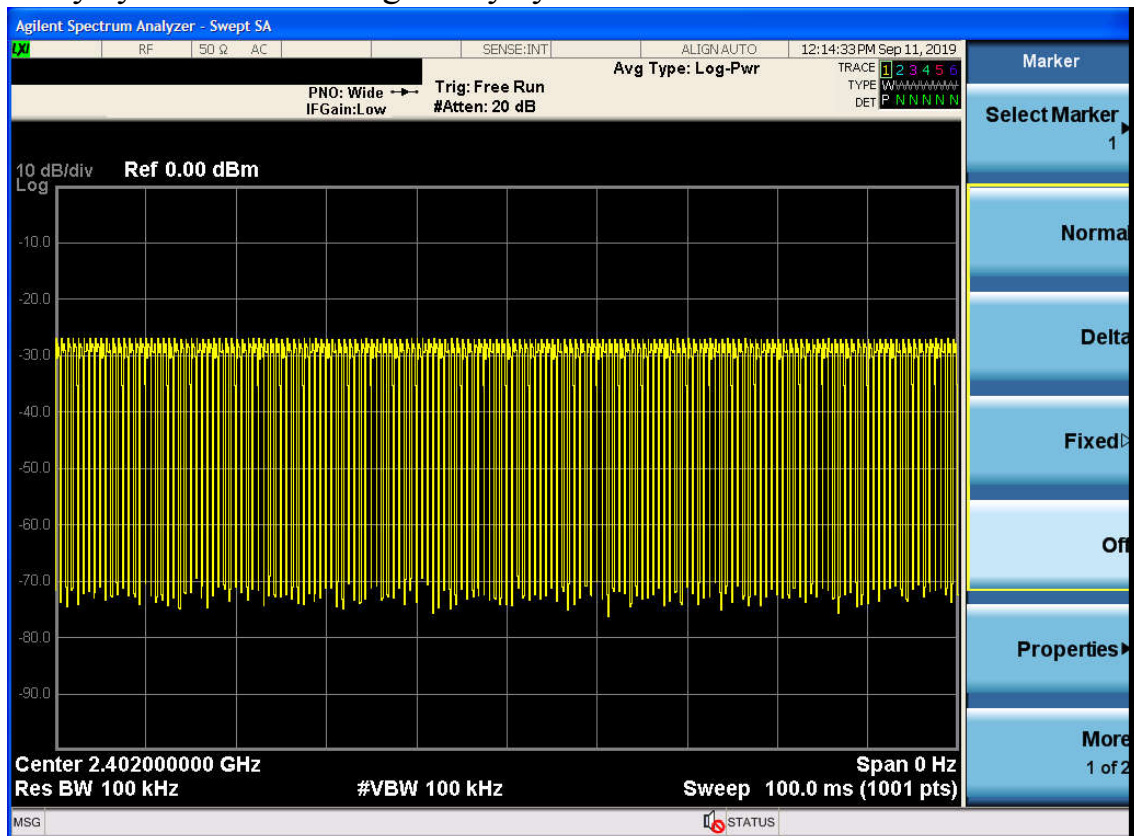
4.7. Radiated Emission Test Results

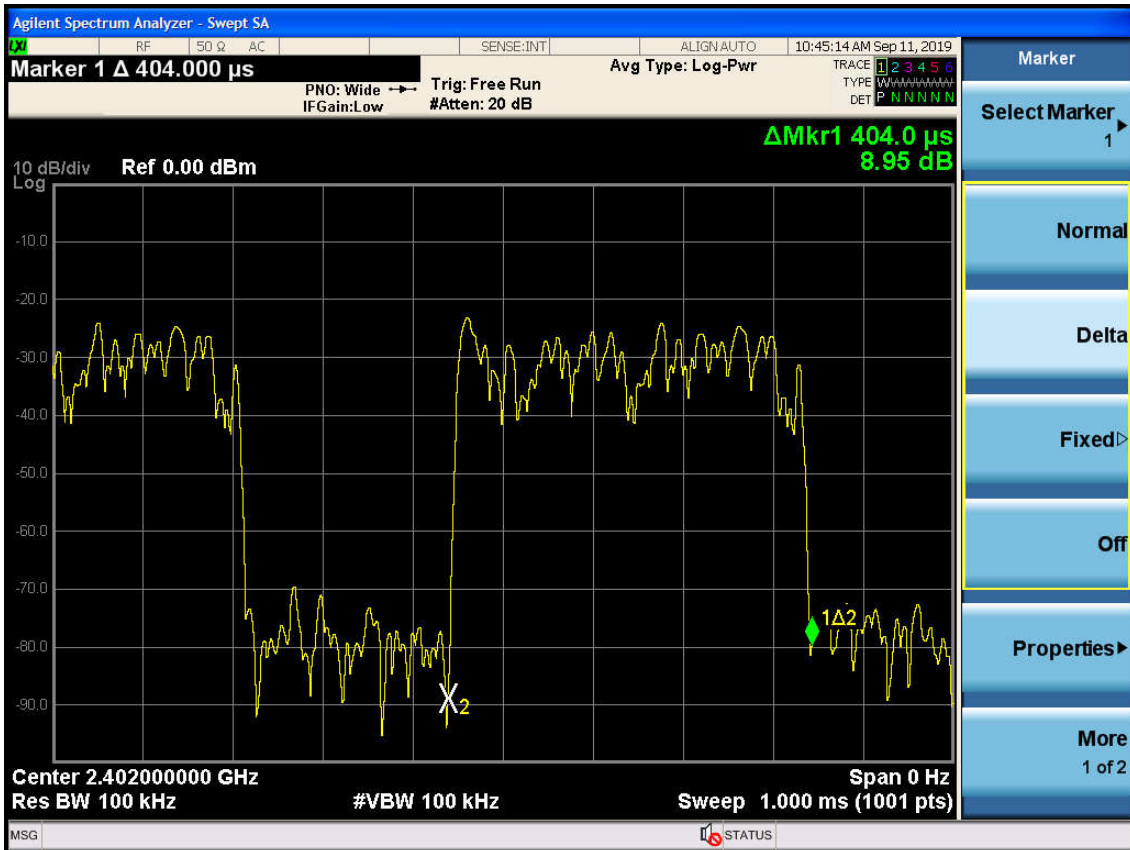
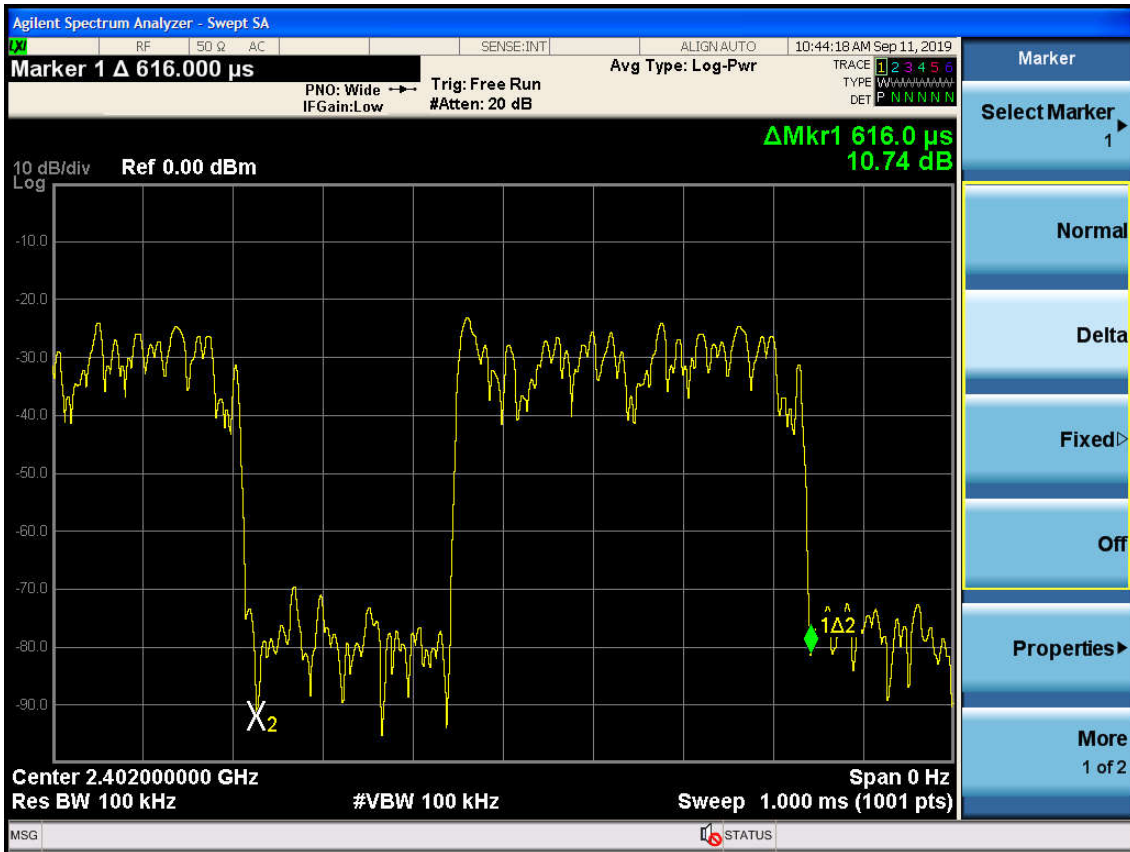
PASS.

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.

$$\text{Duty cycle factor} = 20\log (\text{duty cycle}) = -3.664\text{dB}$$



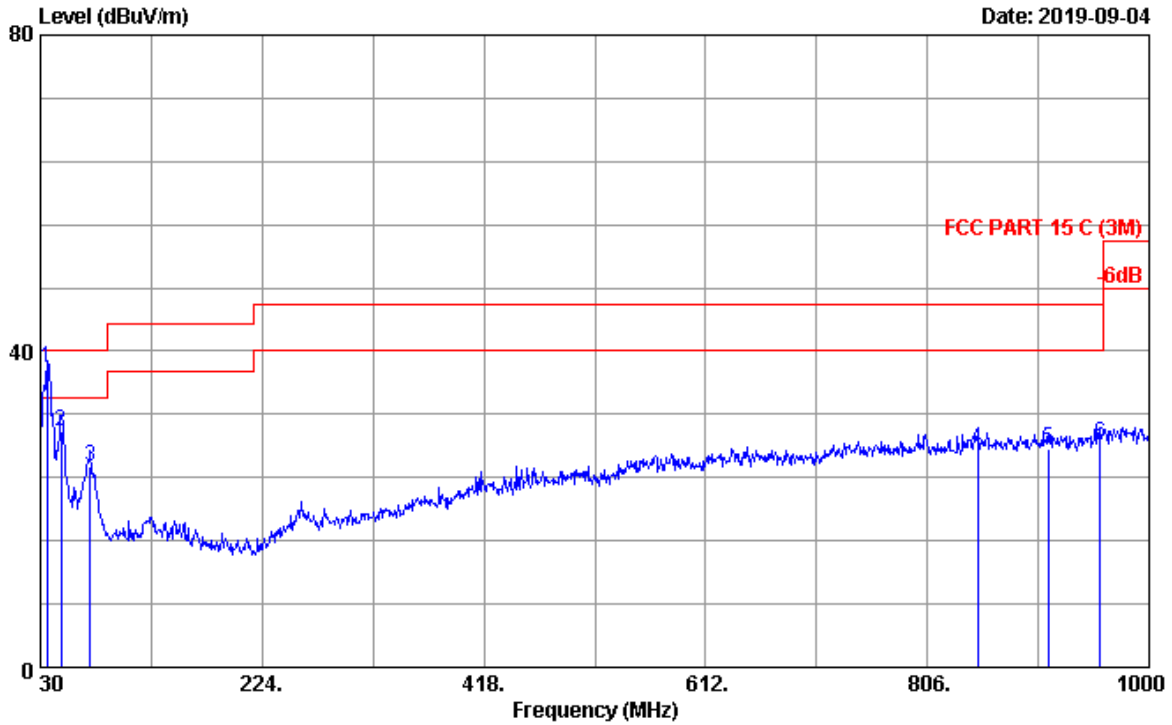


Frequency: 30MHz~1GHz

Data: 3

File: E:\2019 Report Data\PIPlanet\A1Z1906090.EM6 (22)

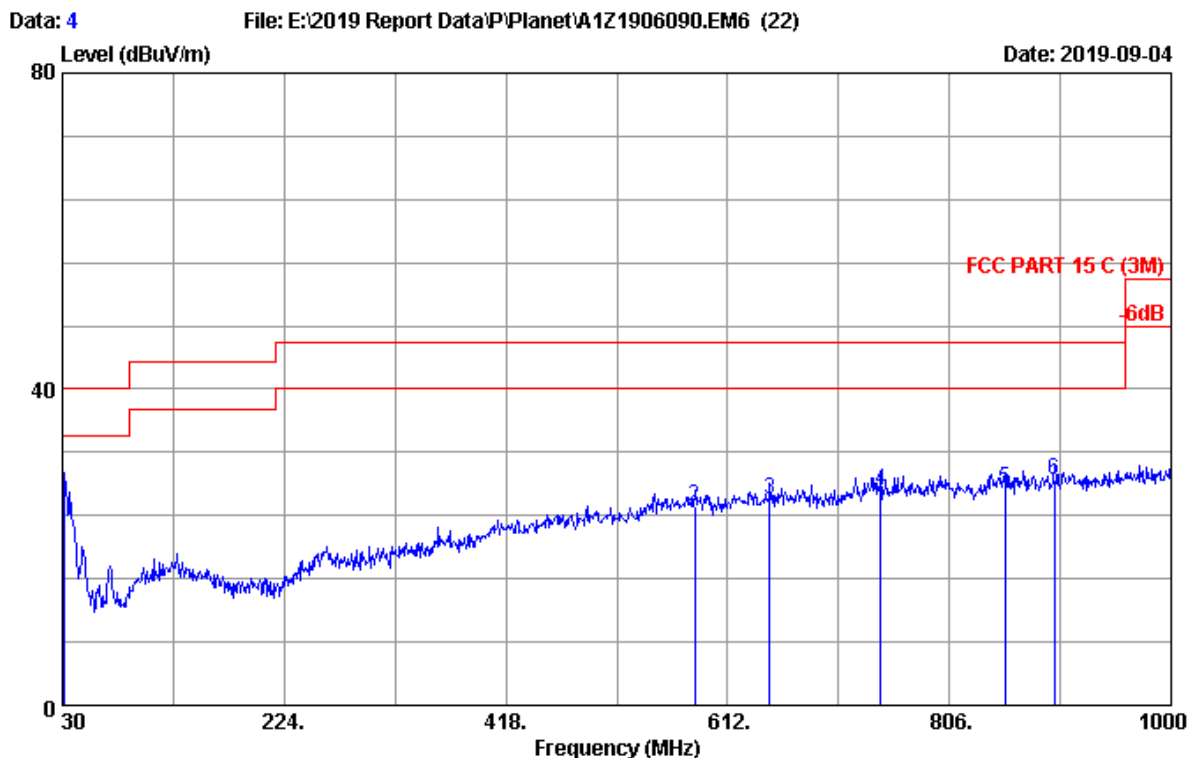
Date: 2019-09-04



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
 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
Power rating	: AC 120V/60Hz		
Test Mode	: BT4.0		

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission		Limits (dBuV/m)	Margin (dB)	Remark
					Level				
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

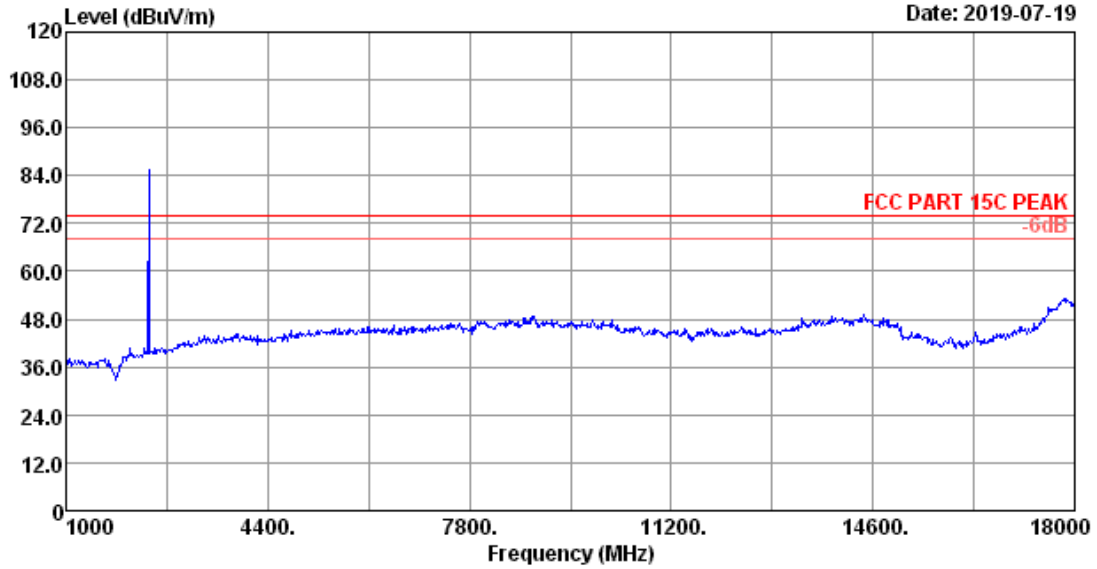
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Frequency: 1GHz~18GHz

Data: 37

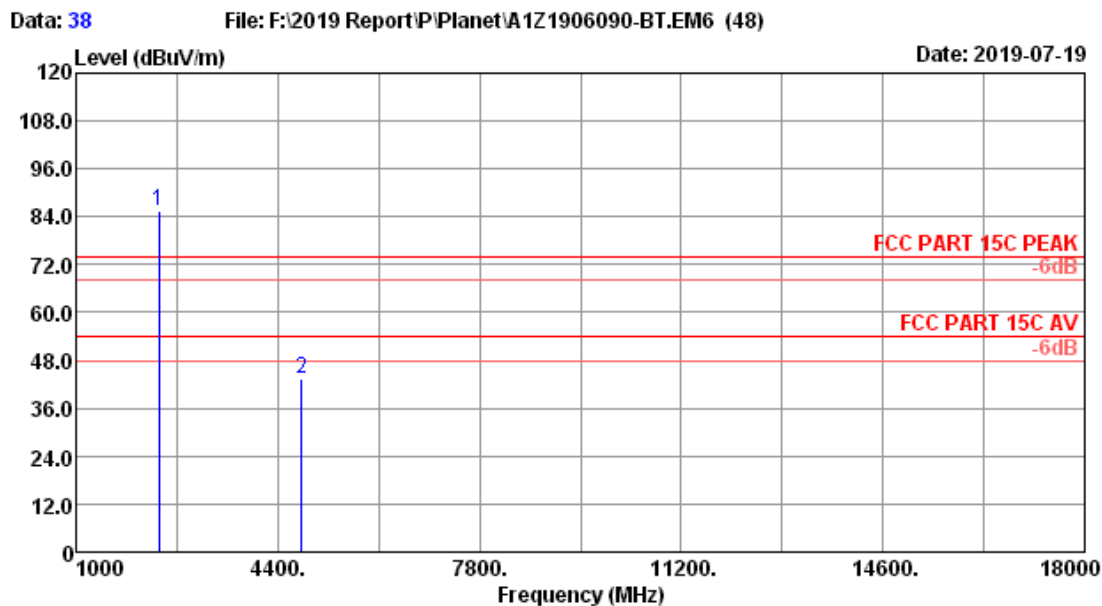
File: F:\2019 Report\Planet\A1Z1906090-BT.EM6 (48)

Date: 2019-07-19



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

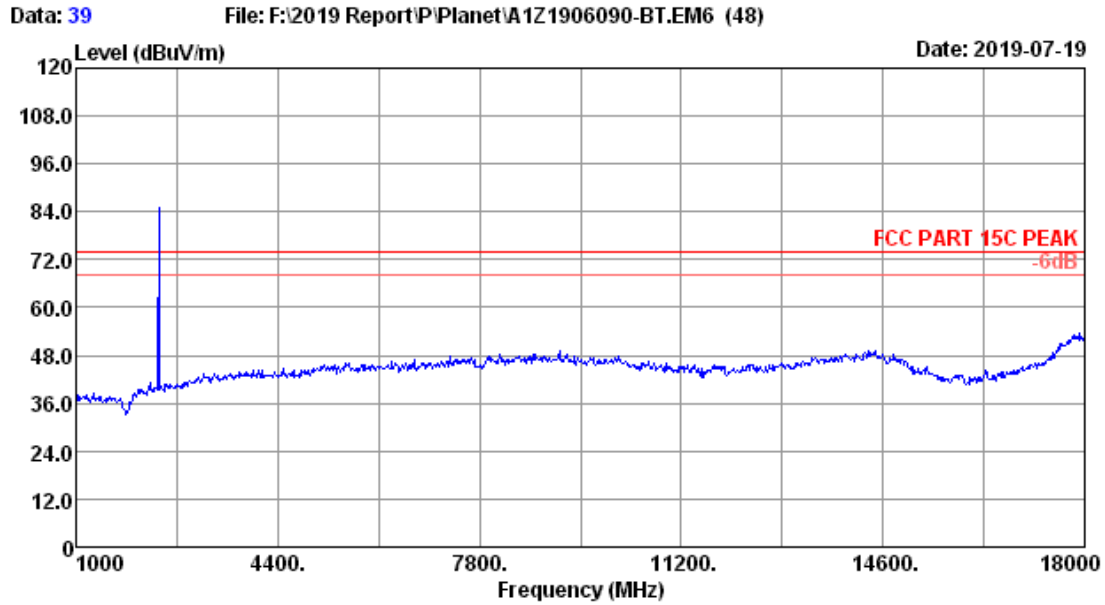
Data no. : 37
 Ant. pol. : VERTICAL
 Pre :
 Engineer : Garry



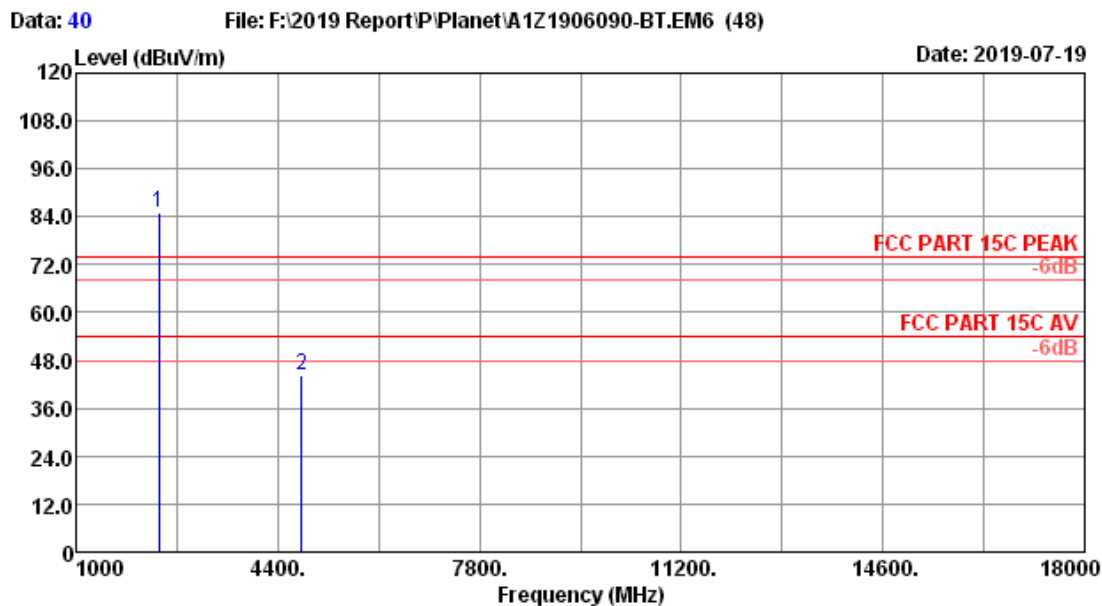
Site no. : 3m Chamber Data no. : 38
 Dis. / Ant. : 3m 2018 3115-4580 Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK Pre :
 Env. / Ins. : 23.4°C/52.9% Engineer : Garry
 Power rating : AC120V/60Hz
 Test Mode : BT4.0 BLE 2402MHz Tx Mode

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.



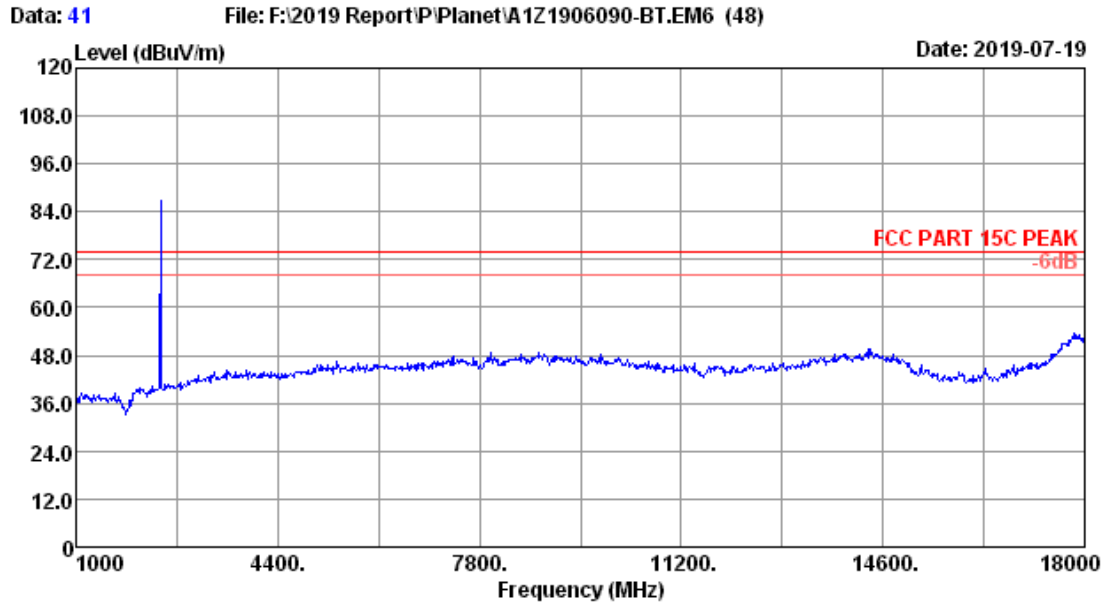
Site no.	: 3m Chamber	Data no.	: 39
Dis. / Ant.	: 3m 2018 3115-4580	Ant. pol.	: HORIZONTAL
Limit	: FCC PART 15C PEAK	Pre	:
Env. / Ins.	: 23.4°C/52.9%	Engineer	: Garry
Power rating	: AC120V/60Hz		
Test Mode	: BT4.0 BLE 2402MHz Tx Mode		



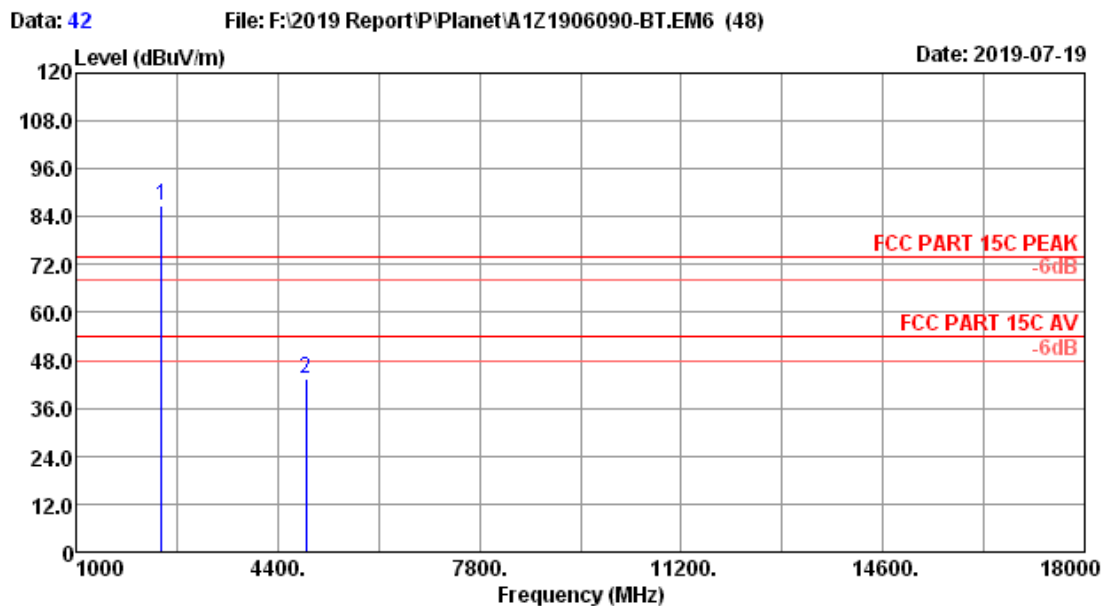
Site no. : 3m Chamber Data no. : 40
 Dis. / Ant. : 3m 2018 3115-4580 Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK Pre :
 Env. / Ins. : 23.4°C/52.9% Engineer : Garry
 Power rating : AC120V/60Hz
 Test Mode : BT4.0 BLE 2402MHz Tx Mode

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.



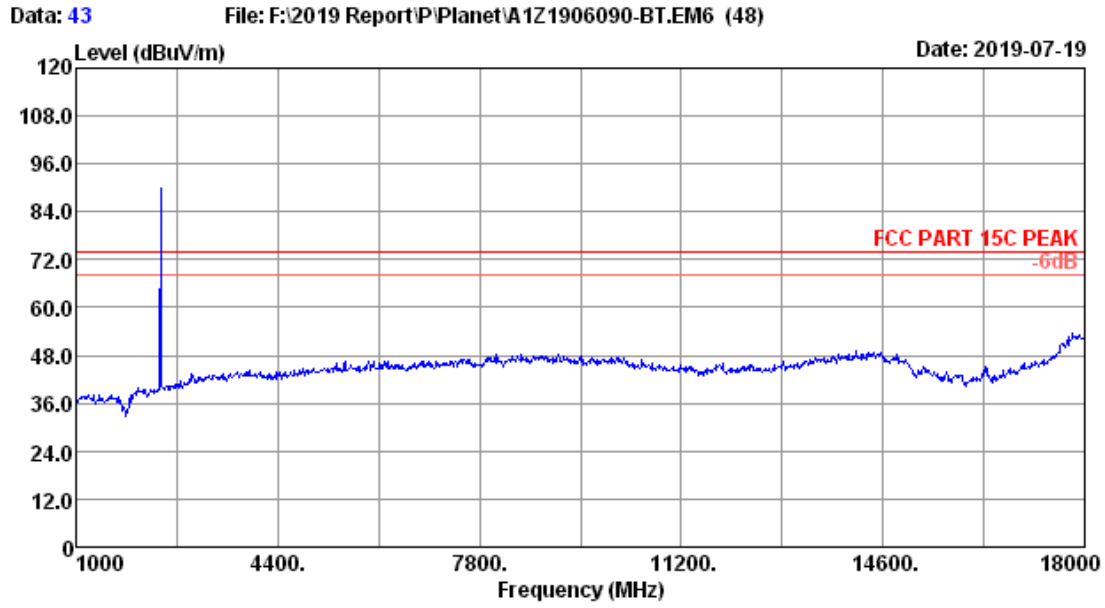
Site no.	: 3m Chamber	Data no.	: 41
Dis. / Ant.	: 3m 2018 3115-4580	Ant. pol.	: VERTICAL
Limit	: FCC PART 15C PEAK	Pre	:
Env. / Ins.	: 23.4°C/52.9%	Engineer	: Garry
Power rating	: AC120V/60Hz		
Test Mode	: BT4.0 BLE 2440MHz Tx Mode		



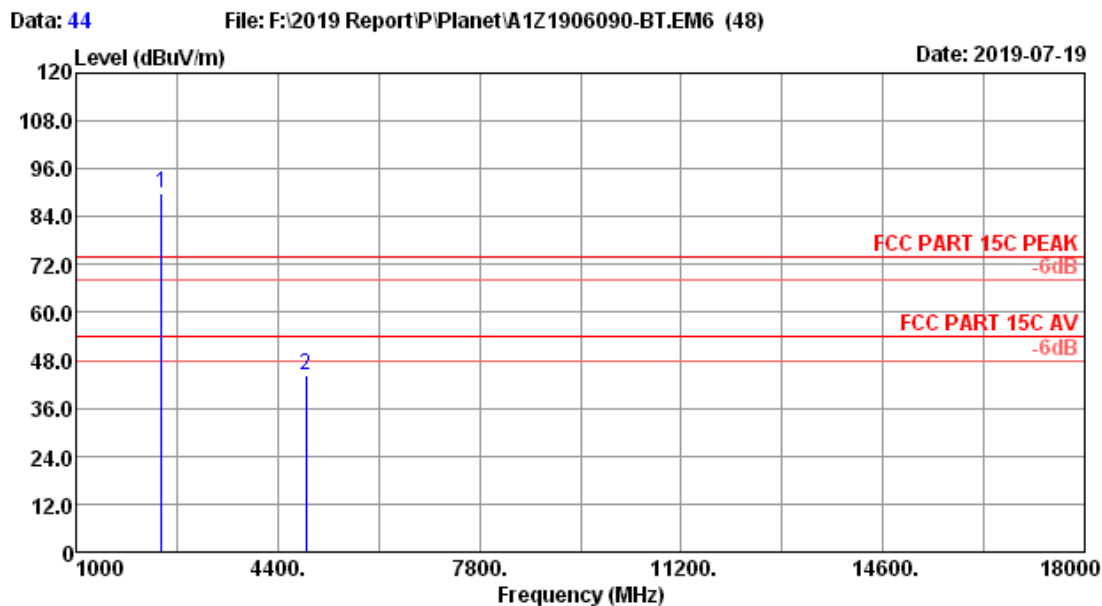
Site no. : 3m Chamber Data no. : 42
 Dis. / Ant. : 3m 2018 3115-4580 Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK Pre :
 Env. / Ins. : 23.4°C/52.9% Engineer : Garry
 Power rating : AC120V/60Hz
 Test Mode : BT4.0 BLE 2440MHz Tx Mode

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.



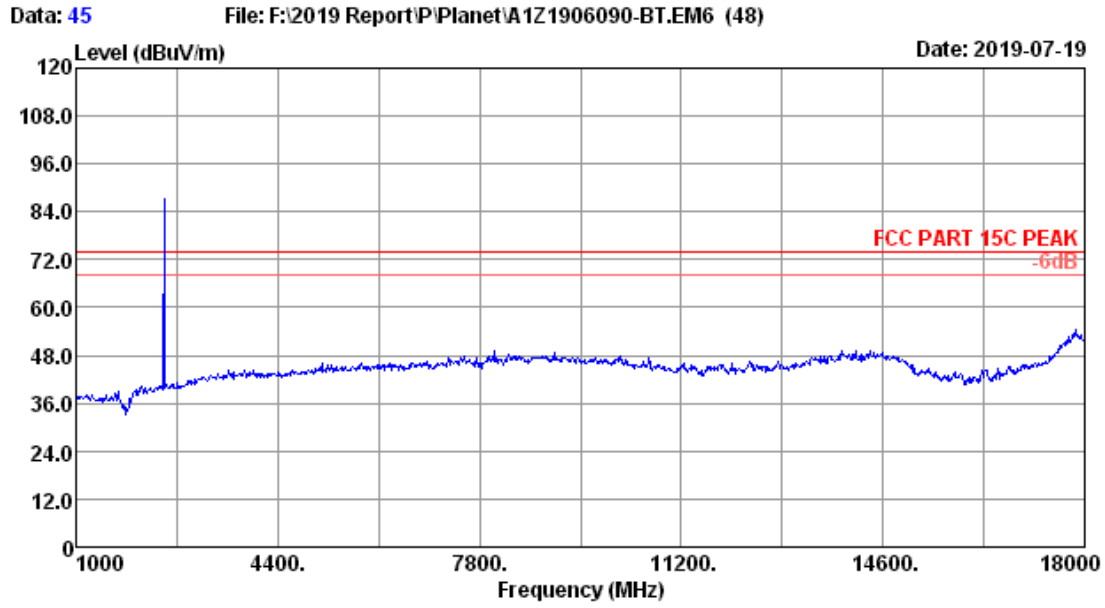
Site no.	: 3m Chamber	Data no.	: 43
Dis. / Ant.	: 3m 2018 3115-4580	Ant. pol.	: HORIZONTAL
Limit	: FCC PART 15C PEAK	Pre	:
Env. / Ins.	: 23.4°C/52.9%	Engineer	: Garry
Power rating	: AC120V/60Hz		
Test Mode	: BT4.0 BLE 2440MHz Tx Mode		



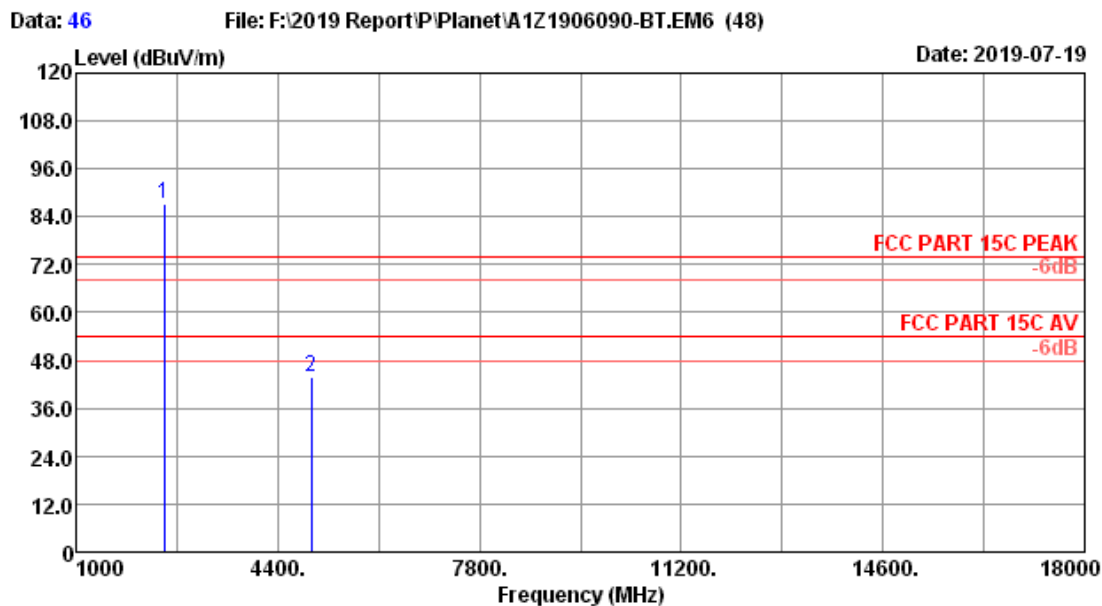
Site no. : 3m Chamber Data no. : 44
 Dis. / Ant. : 3m 2018 3115-4580 Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK Pre :
 Env. / Ins. : 23.4°C/52.9% Engineer : Garry
 Power rating : AC120V/60Hz
 Test Mode : BT4.0 BLE 2440MHz Tx Mode

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.



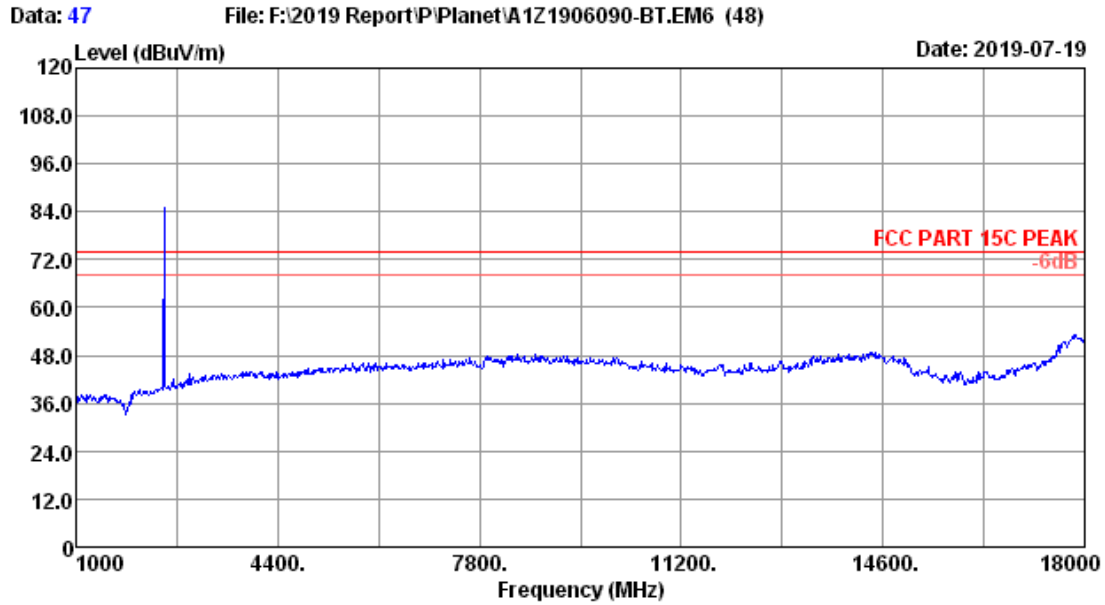
Site no.	: 3m Chamber	Data no.	: 45
Dis. / Ant.	: 3m 2018 3115-4580	Ant. pol.	: HORIZONTAL
Limit	: FCC PART 15C PEAK	Pre	:
Env. / Ins.	: 23.4°C/52.9%	Engineer	: Garry
Power rating	: AC120V/60Hz		
Test Mode	: BT4.0 BLE 2480MHz Tx Mode		



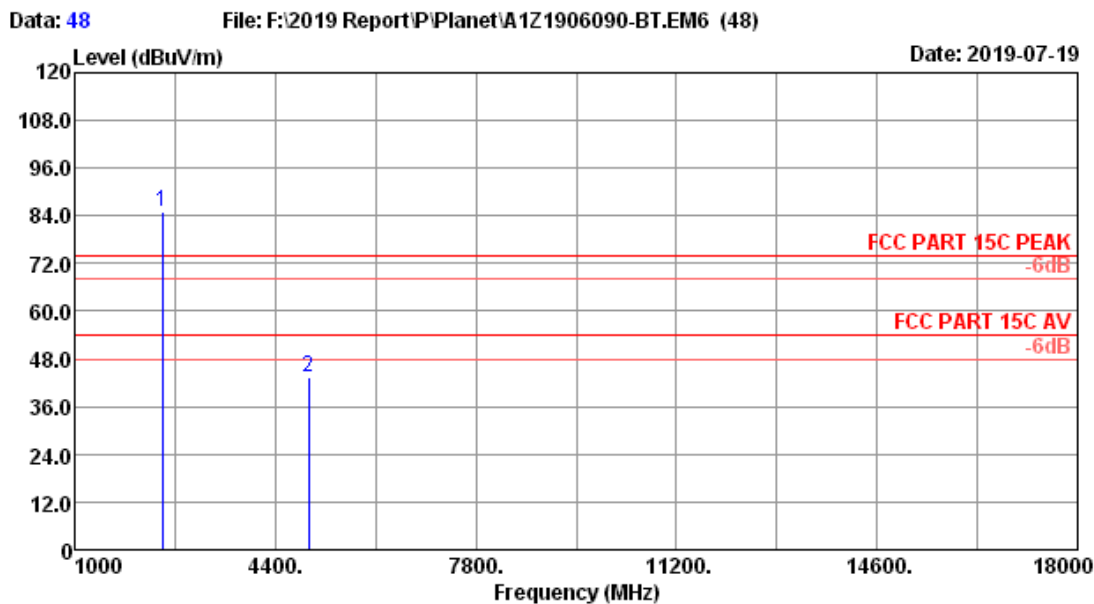
Site no. : 3m Chamber Data no. : 46
 Dis. / Ant. : 3m 2018 3115-4580 Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK Pre :
 Env. / Ins. : 23.4°C/52.9% Engineer : Garry
 Power rating : AC120V/60Hz
 Test Mode : BT4.0 BLE 2480MHz Tx Mode

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
Power rating : AC120V/60Hz	
Test Mode : BT4.0 BLE 2480MHz Tx Mode	



Site no.	: 3m Chamber	Data no.	: 48
Dis. / Ant.	: 3m 2018 3115-4580	Ant. pol.	: VERTICAL
Limit	: FCC PART 15C PEAK	Pre	:
Env. / Ins.	: 23.4°C/52.9%	Engineer	: Garry
Power rating	: AC120V/60Hz		
Test Mode	: BT4.0 BLE 2480MHz Tx Mode		

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 is 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 described 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.

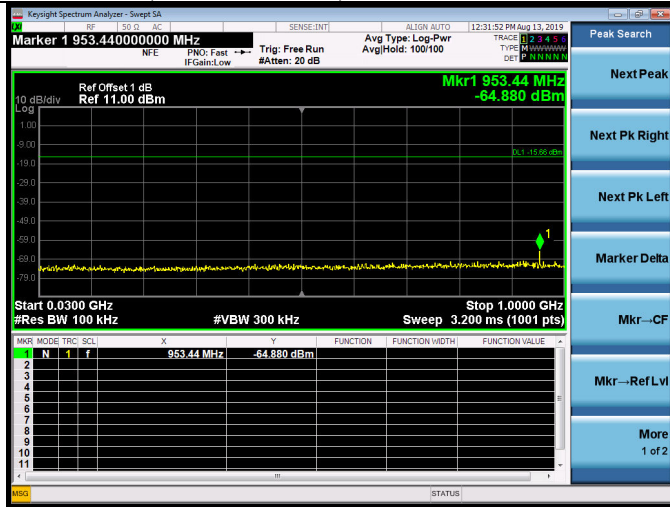
5.5. Test result

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

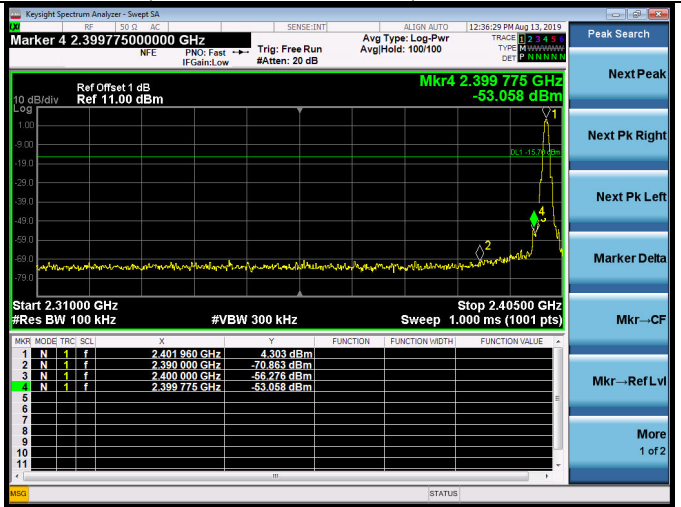
EUT: COSMO		
M/N: COSMO COMMUNICATOR VE		
Test date: 2019-08-13	Pressure: 102.1±1.0 kpa	Humidity: 51.1±3.0%
Tested by: Garry	Test site: RF site	Temperature:22.8±0.6 °C

GFSK

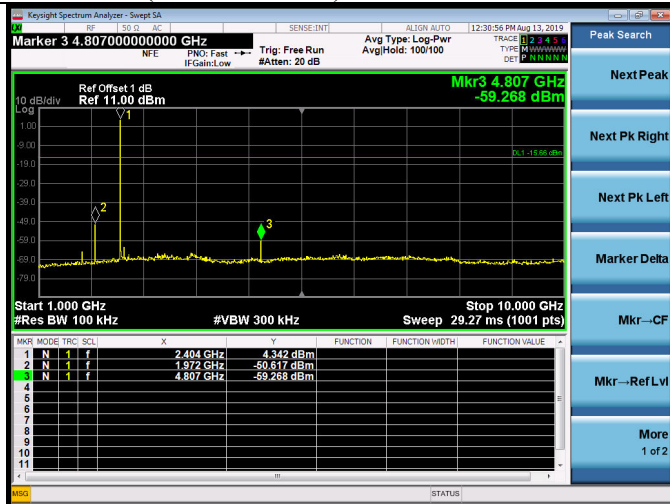
2402MHz(30MHz-1GHz)



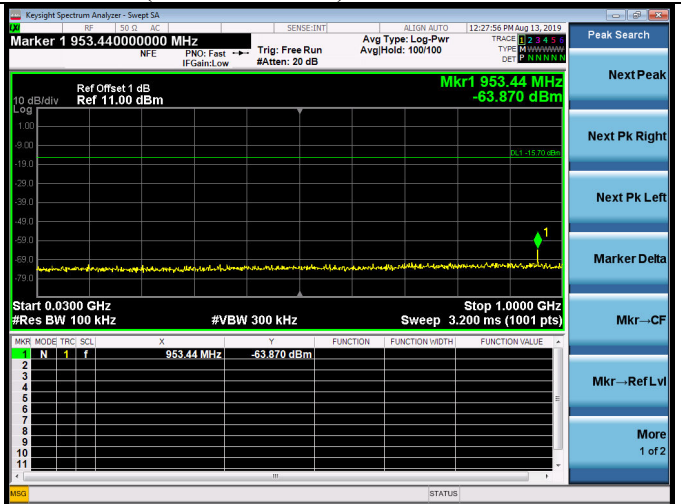
2402MHz(2.31GHz-2.405GHz)



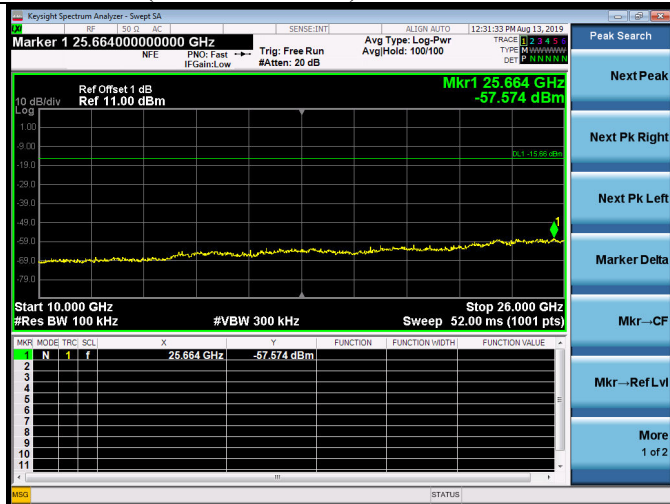
2402MHz(1GHz-10GHz)



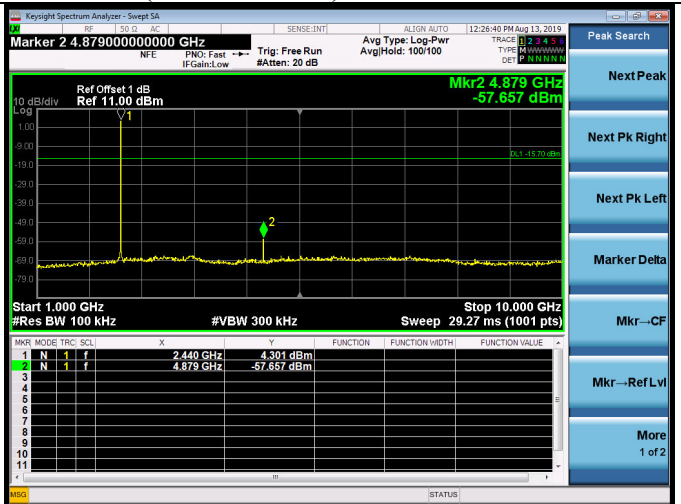
2440MHz(30MHz-1GHz)



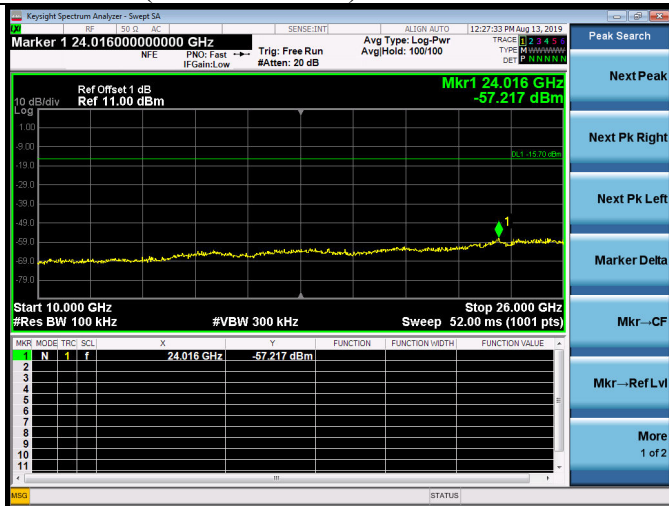
2402MHz(10GHz-26GHz)



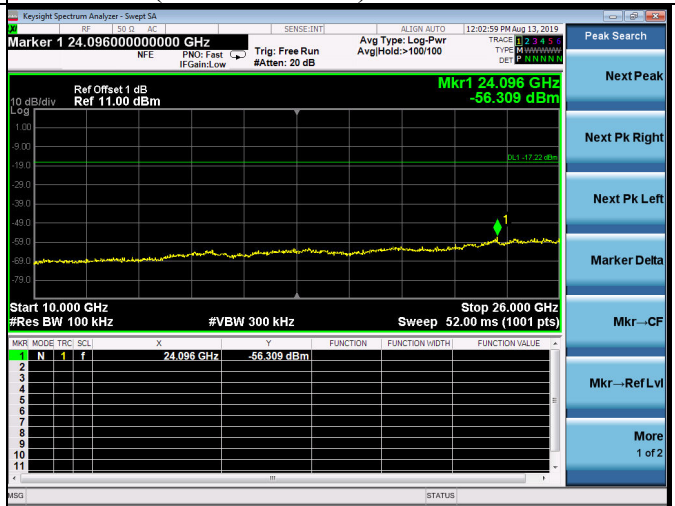
2440MHz(1GHz-10GHz)



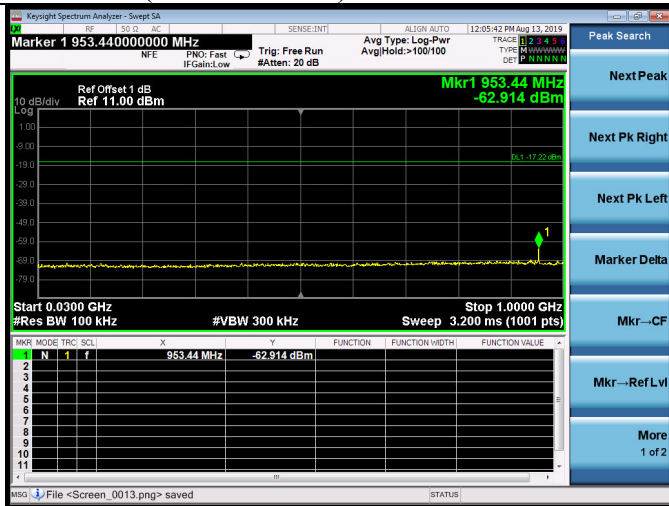
2440MHz(10GHz-26GHz)



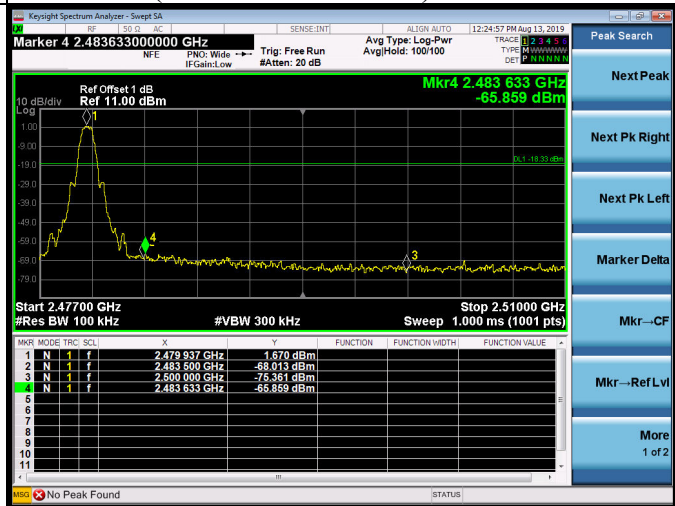
2480MHz(10GHz-26GHz)



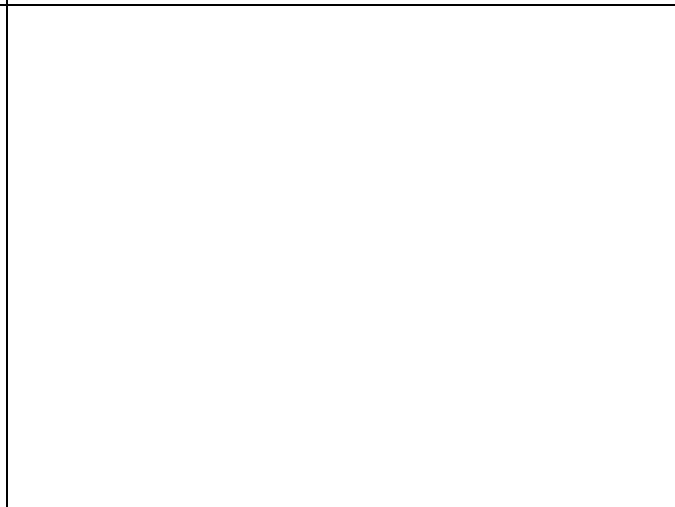
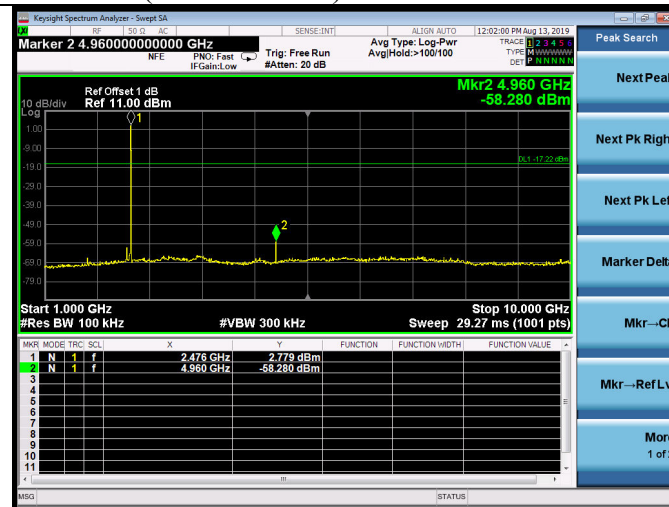
2480MHz(30MHz-1GHz)



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 described 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 $\geq 3 \times$ 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 VE		
Test date: 2019-08-13	Pressure: 102.3 $\pm$ 1.0 kpa	Humidity: 53.6 $\pm$ 3.0%
Tested by: Garry	Test site: RF site	Temperature: 25.5 $\pm$ 0.6 $^{\circ}$ C

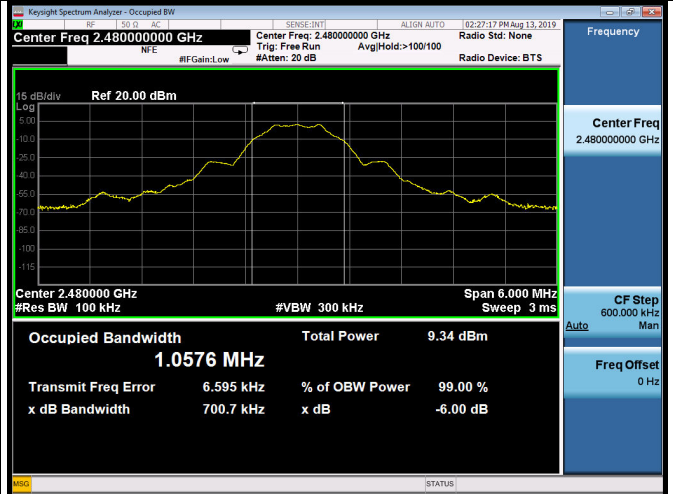
Test Mode	Frequency (MHz)	6 dB bandwidth (kHz)	Limit (KHz)
GFSK	2402	709.8	≥ 500
	2440	703.7	≥ 500
	2480	700.7	≥ 500
Conclusion : PASS			

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 VE		
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 described 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

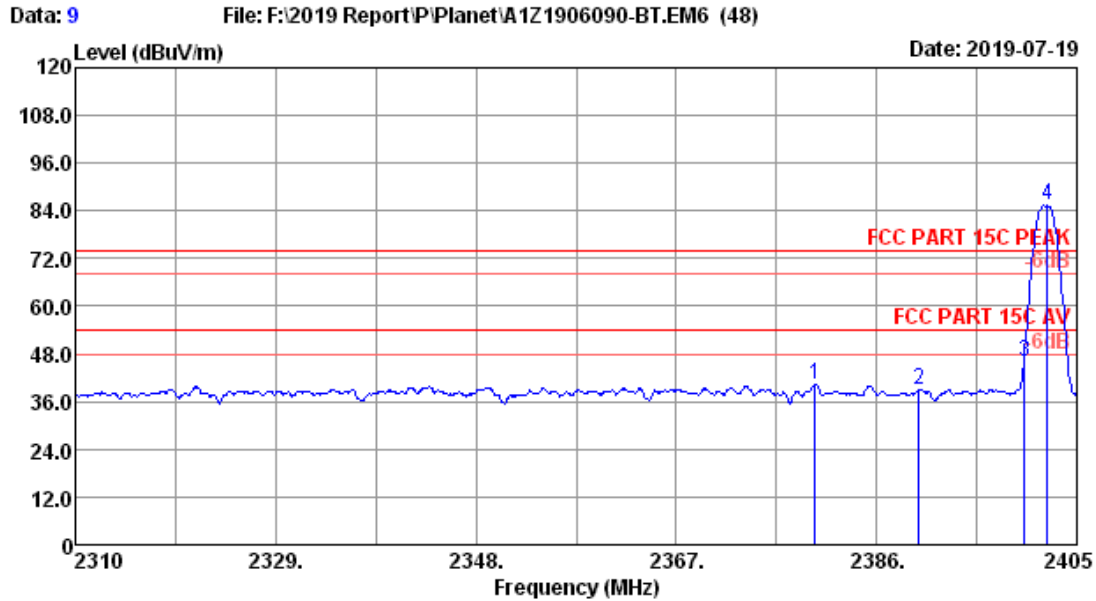
For emissions above two bandwidths away from the band-edge use below produce:

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.)

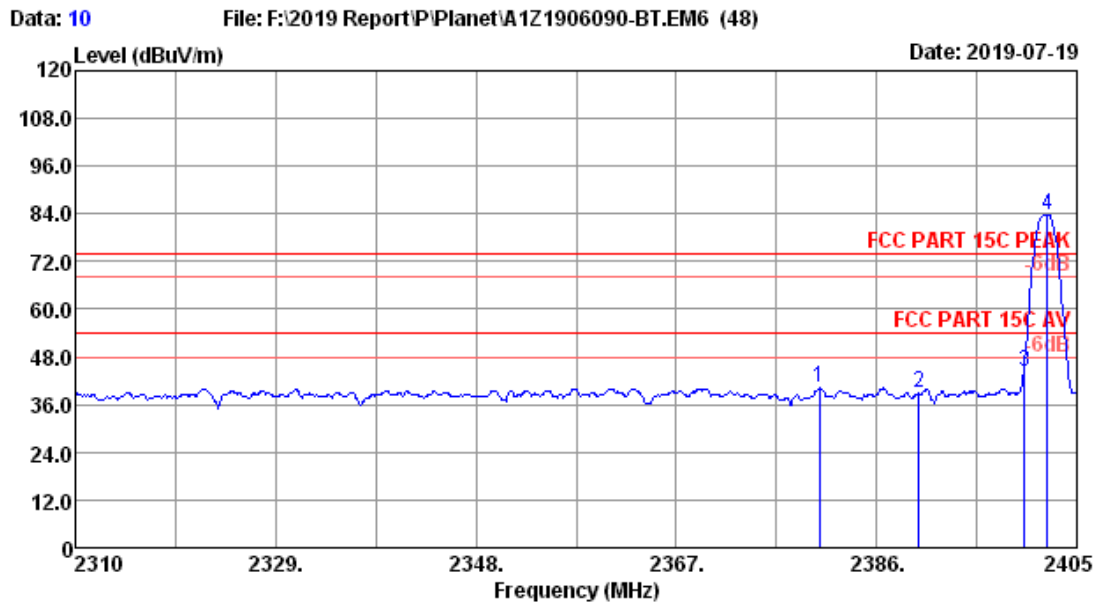
Note: If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.



Site no. : 3m Chamber Data no. : 9
 Dis. / Ant. : 3m 2018 3115-4580 Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK Pre :
 Env. / Ins. : 23.4°C/52.9% Engineer : Garry
 Power rating : AC120V/60Hz
 Test Mode : BT4.0 BLE 2402MHz Tx Mode

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.

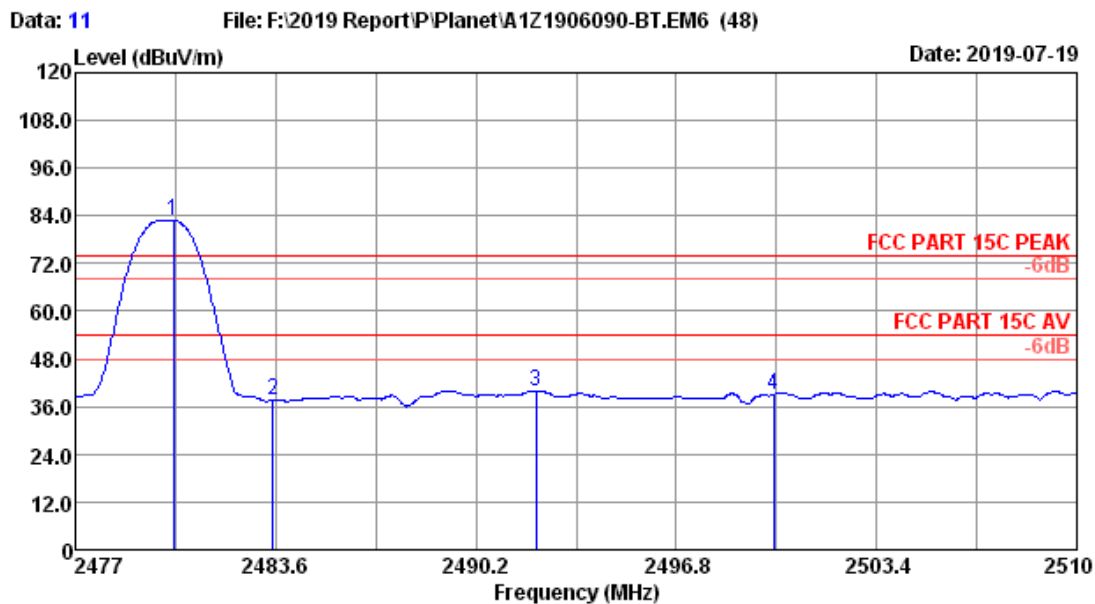


Site no.	: 3m Chamber	Data no.	: 10
Dis. / Ant.	: 3m 2018 3115-4580	Ant. pol.	: VERTICAL
Limit	: FCC PART 15C PEAK	Pre	:
Env. / Ins.	: 23.4°C/52.9%	Engineer	: Garry
Power rating	: AC120V/60Hz		
Test Mode	: BT4.0 BLE 2402MHz Tx Mode		

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

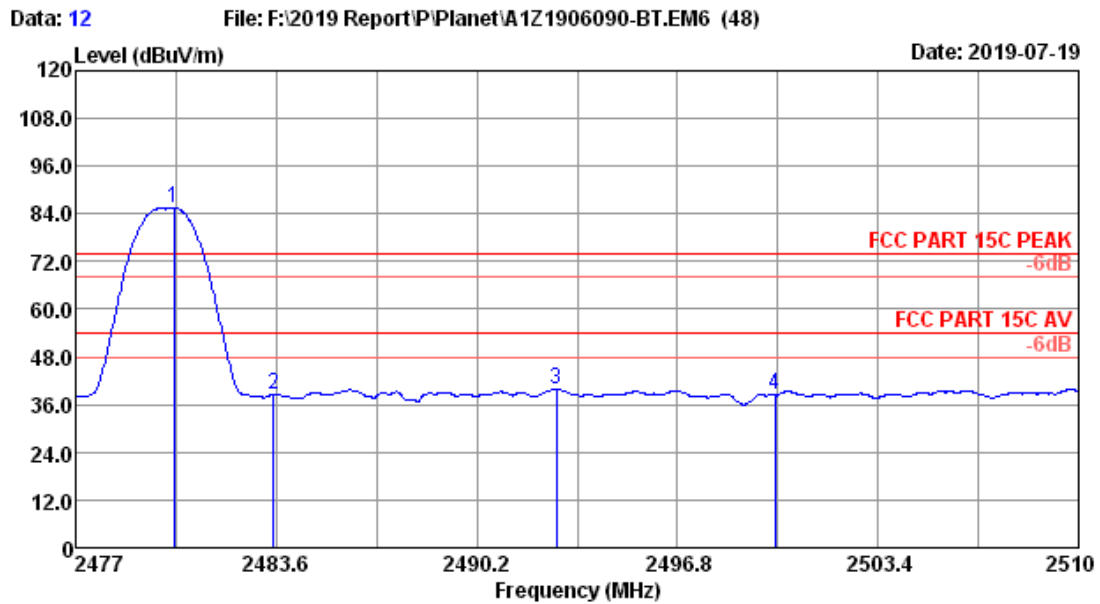
2. The emission levels that are 20dB below the official
limit are not reported.



Site no. : 3m Chamber Data no. : 11
 Dis. / Ant. : 3m 2018 3115-4580 Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK Pre :
 Env. / Ins. : 23.4°C/52.9% Engineer : Garry
 Power rating : AC120V/60Hz
 Test Mode : BT4.0 BLE 2480MHz Tx Mode

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 Data no. : 12
 Dis. / Ant. : 3m 2018 3115-4580 Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK Pre :
 Env. / Ins. : 23.4°C/52.9% Engineer : Garry
 Power rating : AC120V/60Hz
 Test Mode : BT4.0 BLE 2480MHz Tx Mode

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 described in ANSI C63.10 clause 11.10.2:

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$.
- Set the VBW $\geq [3 \times \text{RBW}]$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.
- If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

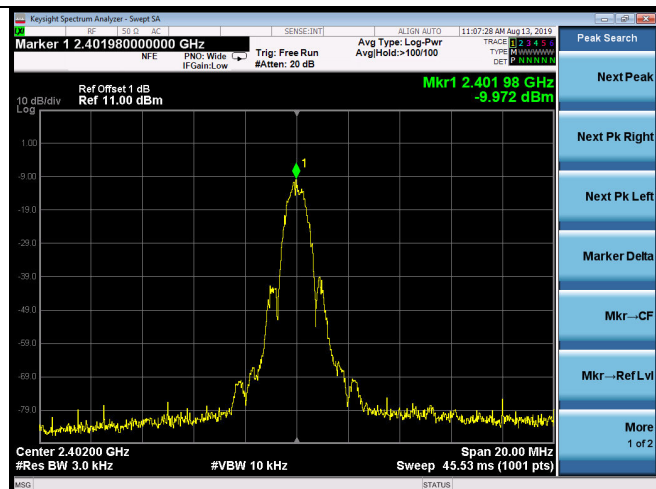
9.5. Test Results

EUT: COSMO		
M/N: COSMO COMMUNICATOR VE		
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℃

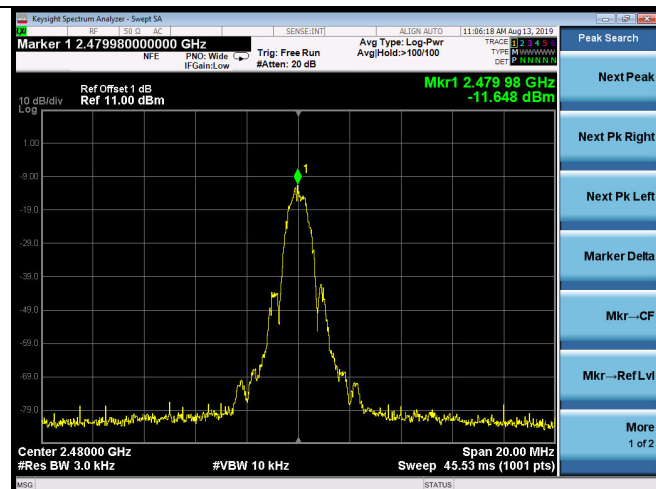
Test Mode	Frequency (MHz)	Power density (dBm/3KHz)	Limit (dBm/3KHz)
GFSK	2402	-9.972	8
	2440	-9.709	8
	2480	-11.648	8
Conclusion : PASS			

GFSK

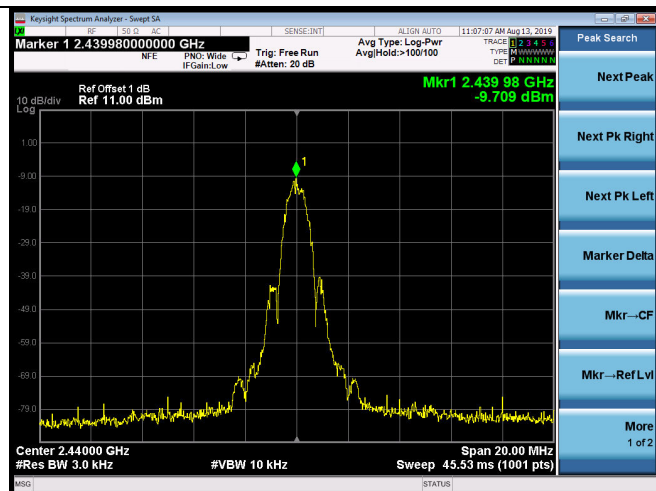
2402MHz



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**