MEASUREMENT REPORT

FCC PART 15.247 Bluetooth-LE

FCC ID:	2AUBBFL60P-E
APPLICANT:	China Starwin Science & Technology Co.,Ltd
Application Type:	Certification
Product:	Flat Panel Integrated Satellite Communication Terminal
Model No.:	FL60P-E
Serial Model No.:	FL60P-M, FL60F-M
Brand Name:	StarWin
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15 Subpart C (Section 15.247)
Test Procedure(s):	ANSI C63.10-2013, KDB 558074 D01v05r02
Test Date:	July 16 ~ 20, 2019

Reviewed By: (Jame Yuan)

Approved By: (Robin Wu)

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
1907RSU030-U2	Rev. 01	Initial Report	09-10-2019	Valid

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§2.1033 General Information

Applicant:	China Starwin Science & Technology Co.,Ltd
Applicant Address:	Floor 3th, Building B, No. 2 Keyuannan 2nd Road, High-tech Zone, Chengdu, China
Manufacturer:	China Starwin Science & Technology Co.,Ltd
Manufacturer Address:	Floor 3th, Building B, No. 2 Keyuannan 2nd Road, High-tech Zone, Chengdu, China
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- **MRT facility is a FCC registered (MRT Reg. No. 893164) test facility with the site description report on file and has met all the requirements specified in ANSI C63.4-2014.**
- **MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.**
- **MRT facility is a VCCI registered (R-20025, G-20034, C-20020, T-20020) test laboratory with the site description on file at VCCI Council.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications, Radio and SAR testing.**

Accredited Laboratory

A2LA has accredited

MRT TECHNOLOGY (SUZHOU) CO., LTD.

Suzhou, Jiangsu, People's Republic of China

for technical competence in the field of

Electrical Testing

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

Presented this 24th day of July 2018.

President and CEO
For the Accreditation Council
Certificate Number 3628.01
Valid to August 31, 2020

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

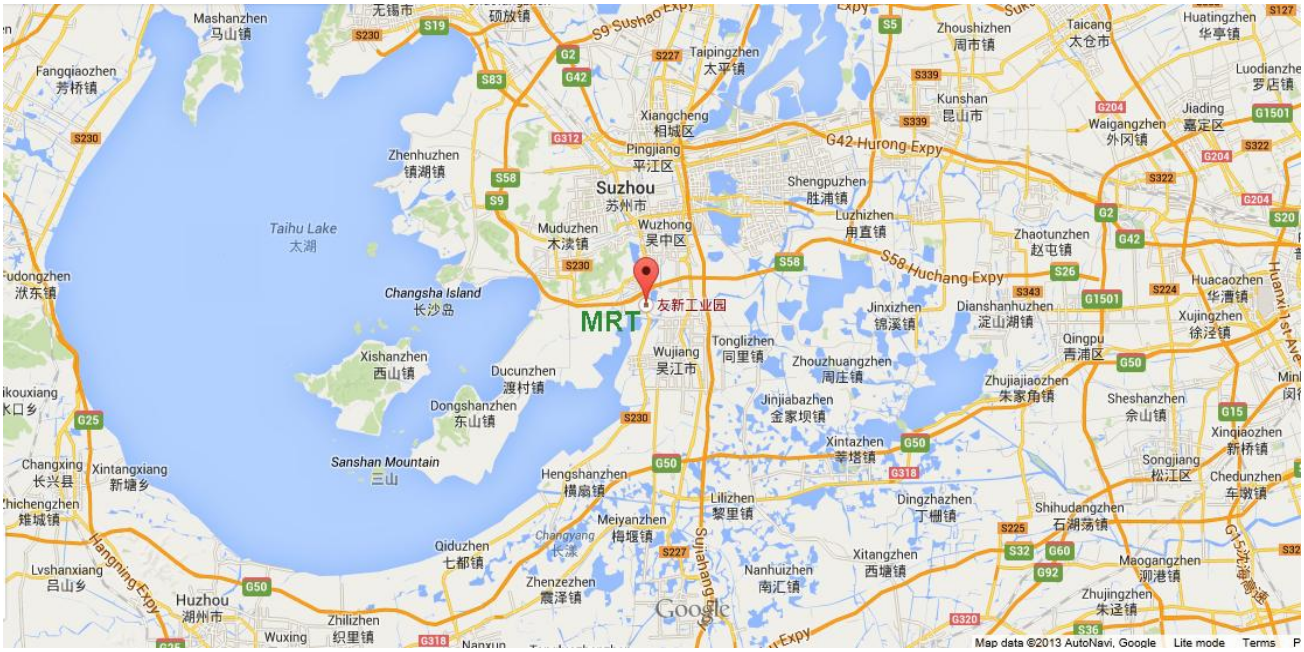
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The measurement facility compliant with the test site requirements specified in ANSI C63.4-2014.

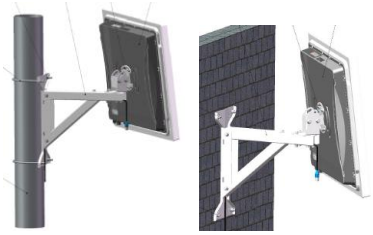


2. PRODUCT INFORMATION

2.1. Feature of Equipment under Test

Product Name	Flat Panel Integrated Satellite Communication Terminal
Model No.	FL60P-E
Serial Model No.	FL60P-M, FL60F-M
Brand Name	StarWin
Wi-Fi Specification	802.11b/g/n
Bluetooth Version	V5.0 (single mode only for BLE)
Satellite Specification	Transmit: 13.75~14.50GHz Receive: 10.95~12.75GHz
GNSS Specification	GPS, GLONASS, BDS
Accessories	
Adapter	Model No.: GST160A24 Input Power: 100 - 240V ~ 50/60Hz, Max. 2.0A Output Power: 24VDC 6.67A, 160W MAX

2.2. Difference of models:

Model	Align Satellite Method	Installation	Mobility	Appearance
FL60P-E	FL60P-E applies a self-aligning satellite mechanism. The main controller controls the antenna to align the target satellite.	Base support	Yes	
FL60P-M	FL60P-M applies a manually aligned satellite mechanism. The users manually adjust the antenna to align the target satellite.	Base support	Yes	
FL60F-M	FL60P-M applies a manually aligned satellite mechanism. The users manually adjust the antenna to align the target satellite.	Wall or Pole	No	

2.3. Product Specification Subjective to this Report

Frequency Range	2402 ~ 2480MHz
Channel Number	40
Type of modulation	GFSK
Data Rate	Up to 2Mbps
Antenna Type	PCB Antenna
Antenna Gain	1.5dBi

Note: For other features of this EUT, test report will be issued separately.

2.4. Working Frequencies for this Report

Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	01	2404 MHz	02	2406 MHz
03	2408 MHz	04	2410 MHz	05	2412 MHz
06	2414 MHz	07	2416 MHz	08	2418 MHz
09	2420 MHz	10	2422 MHz	11	2424 MHz
12	2426 MHz	13	2428 MHz	14	2430 MHz
15	2432 MHz	16	2434 MHz	17	2436 MHz
18	2438 MHz	19	2440 MHz	20	2442 MHz
21	2444 MHz	22	2446 MHz	23	2448 MHz
24	2450 MHz	25	2452 MHz	26	2454 MHz
27	2456 MHz	28	2458 MHz	29	2460 MHz
30	2462 MHz	31	2464 MHz	32	2466 MHz
33	2468 MHz	34	2470 MHz	35	2472 MHz
36	2474 MHz	37	2476 MHz	38	2478 MHz
39	2480 MHz	--	--	--	--

2.5. Test Mode

Test Mode	Mode 1: Transmit by Bluetooth-LE (1Mbps)
	Mode 2: Transmit by Bluetooth-LE (2Mbps)

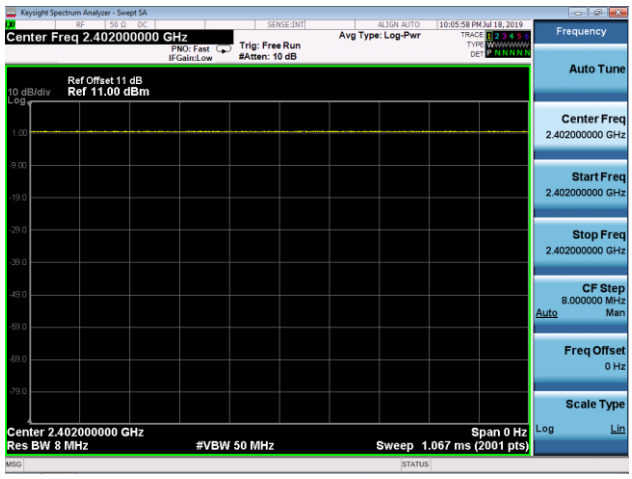
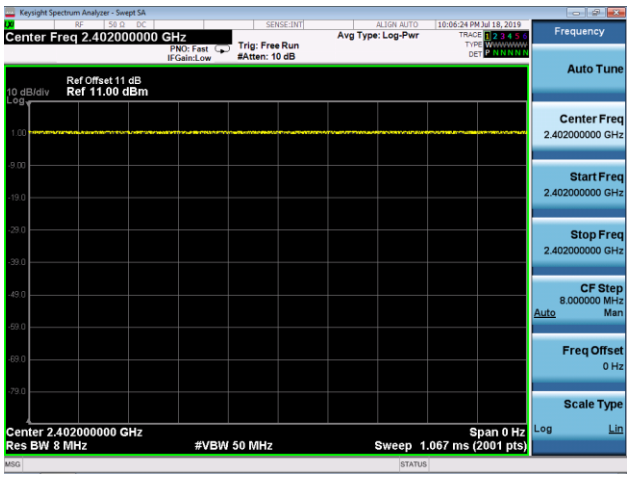
2.6. Device Capabilities

This device contains the following capabilities:

2.4GHz WLAN (DTS), Bluetooth v5.0 only BLE (DTS), Satellite (TNB) and GPS, GLONASS, BDS.

Note: The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Test Mode	Duty Cycle
Bluetooth-LE - 1Mbps	100%
Bluetooth-LE - 2Mbps	100%

Duty Cycle	
Bluetooth-LE - 1Mbps	Bluetooth-LE - 2Mbps
	

2.7. Test Configuration

The device was tested per the guidance of ANSI C63.10-2013. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.8. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.9. Description of Test Software

The test utility software used during testing was “SmartRF Studio”, and the version was 2.6.0.

2.10. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013), and the guidance provided in ANSI C63.10-2013 were used in the measurement.

Deviation from measurement procedure…….....None

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions were used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the Antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable. For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive Antenna height using a broadband Antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn Antennas were used. For frequencies below 30MHz, a calibrated loop Antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband Antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-40GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive Antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn Antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive Antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive Antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn Antenna, the horn Antenna should be always directed to the EUT when rising height.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- The antenna of the device is **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions - SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2020/04/15
Two-Line V-Network	R&S	ENV 216	MRTSUE06002	1 year	2020/06/13
Two-Line V-Network	R&S	ENV 216	MRTSUE06003	1 year	2020/06/13
Thermohygrometer	Testo	608-H1	MRTSUE06404	1 year	2020/08/08
Shielding Room	MIX-BEP	Chamber-SR2	MRTSUE06215	N/A	N/A

Radiated Emissions - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2020/08/01
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2019/09/25
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2019/11/09
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2020/03/31
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2019/10/19
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06024	1 year	2019/12/17
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2019/11/16
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2020/06/11
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2020/08/08
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2020/04/30

Radiated Emission - AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2020/08/01
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2019/11/09
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2019/10/19
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2019/11/09
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06024	1 year	2019/12/17
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2019/11/16
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2020/06/11
Temperature/Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2019/12/13
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2020/04/30

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2020/04/15
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06452	1 year	2020/07/11
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2020/04/15
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2019/11/16
USB wideband power sensor	Keysight	U2021XA	MRTSUE06446	1 year	2020/06/30
USB wideband power sensor	Keysight	U2021XA	MRTSUE06447	1 year	2020/06/30
Bluetooth Test Set	Anritsu	MT8852B-042	MRTSUE06389	1 year	2020/06/13
Audio Analyzer	Agilent	U8903B	MRTSUE06143	1 year	2020/06/13
Modulation Analyzer	HP	8901A	MRTSUE06098	1 year	2019/10/18
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2019/11/16
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2019/11/16
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2020/08/08

Software	Version	Function
EMI Software	V3	EMI Test Software

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

AC Conducted Emission Measurement - SR2
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz~150kHz: 3.84dB 150kHz~30MHz: 3.46dB
Radiated Emission Measurement - AC1
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): Horizontal: 30MHz~300MHz: 4.07dB 300MHz~1GHz: 3.63dB 1GHz~18GHz: 4.16dB Vertical: 30MHz~300MHz: 4.18dB 300MHz~1GHz: 3.60dB 1GHz~18GHz: 4.76dB
Radiated Emission Measurement - AC2
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): Horizontal: 30MHz~300MHz: 3.75dB 300MHz~1GHz: 3.53dB 1GHz~18GHz: 4.28dB Vertical: 30MHz~300MHz: 3.86dB 300MHz~1GHz: 3.53dB 1GHz~18GHz: 4.33dB

7. TEST RESULT

7.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	6dB Bandwidth	≥ 500kHz	Conducted	Pass	Section 7.2
15.247(b)(3)	Output Power	≤ 1Watt		Pass	Section 7.3
15.247(e)	Power Spectral Density	≤ 8dBm / 3kHz		Pass	Section 7.4
15.247(d)	Band Edge / Out-of-Band Emissions	≥ 20dBc (Peak)		Pass	Section 7.5
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	Radiated	Pass	Section 7.6 Section 7.7
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.8

Notes:

1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.

7.2. Occupied Bandwidth Measurement

7.2.1.Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

7.2.2.Test Procedure used

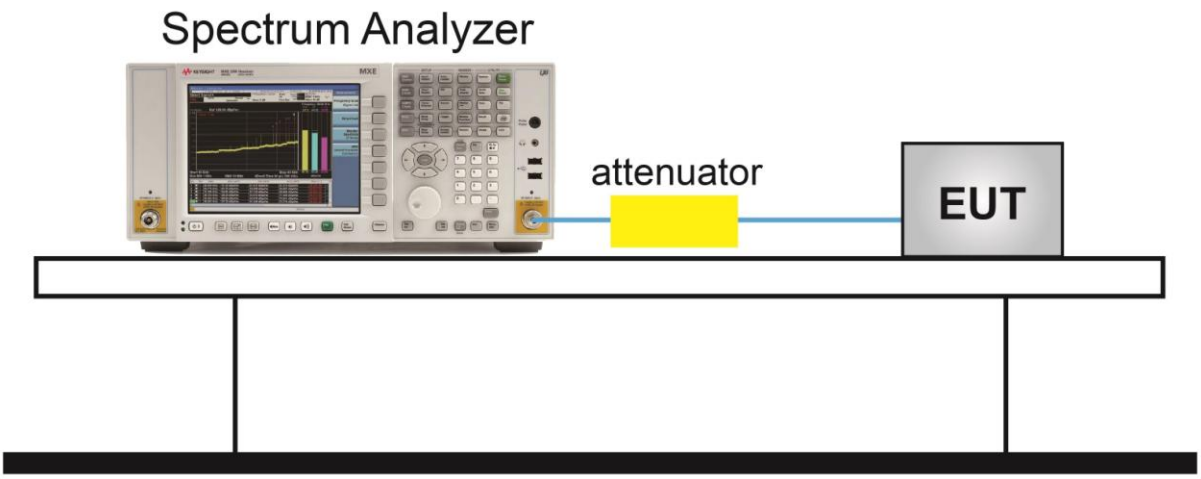
ANSI C63.10-2013 - Section 11.8

7.2.3.Test Setting

For 6dB bandwidth

1. The Spectrum's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set RBW = 100 kHz
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = Max hold
6. Sweep = Auto couple
7. Allow the trace was allowed to stabilize

7.2.4.Test Setup

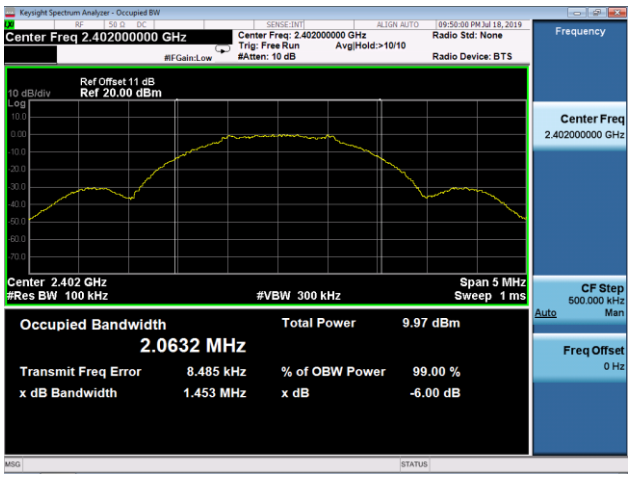


7.2.5.Test Result

Product	Flat Panel Integrated Satellite Communication Terminal	Temperature	25℃
Test Engineer	Yuri Li	Relative Humidity	52%
Test Site	TR3	Test Date	2019/07/18

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
Bluetooth-LE	1	00	2402	0.712	≥ 0.5	Pass
Bluetooth-LE	1	19	2440	0.718	≥ 0.5	Pass
Bluetooth-LE	1	39	2480	0.728	≥ 0.5	Pass
Bluetooth-LE	2	00	2402	1.453	≥ 0.5	Pass
Bluetooth-LE	2	19	2440	1.491	≥ 0.5	Pass
Bluetooth-LE	2	39	2480	1.503	≥ 0.5	Pass

Bluetooth-LE (1Mbps) 6dB Bandwidth	
Channel 00 (2402MHz)	Channel 19 (2440MHz)
Channel 39 (2480MHz)	

Bluetooth-LE (2Mbps) 6dB Bandwidth	
Channel 00 (2402MHz)	Channel 19 (2440MHz)
	
Channel 39 (2480MHz)	

7.3. Output Power Measurement

7.3.1.Test Limit

The maximum out power shall be less 1 Watt (30dBm).

7.3.2.Test Procedure Used

ANSI C63.10 - Section 11.9.1.3

ANSI C63.10 - Section 11.9.2.3.2

7.3.3.Test Setting

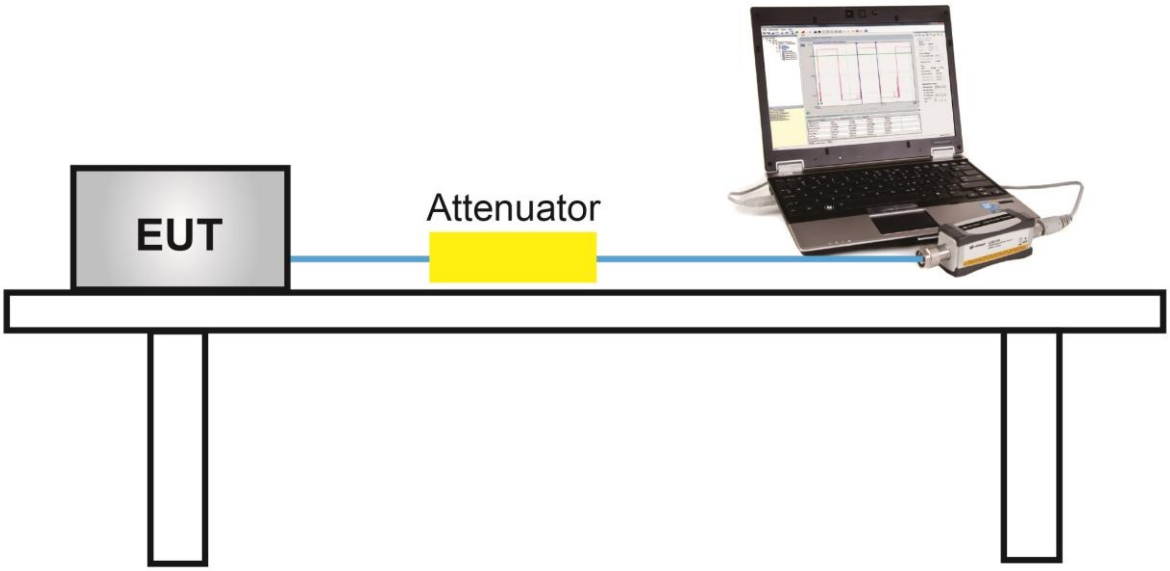
Method PKPM1 (Peak Power Measurement)

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

Method AVGPM-G (Measurement using a gated RF average-reading power meter)

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

7.3.4.Test Setup



7.3.5.Test Result of Output Power

Product	Flat Panel Integrated Satellite Communication Terminal	Temperature	25℃
Test Engineer	Amy Zhang	Relative Humidity	52%
Test Site	TR3	Test Date	2019/07/18

Test Result of Peak Output Power

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result
Bluetooth-LE	1	00	2402	0.35	≤ 30.00	Pass
Bluetooth-LE	1	19	2440	-0.46	≤ 30.00	Pass
Bluetooth-LE	1	39	2480	-0.80	≤ 30.00	Pass
Bluetooth-LE	2	00	2402	0.33	≤ 30.00	Pass
Bluetooth-LE	2	19	2440	-0.28	≤ 30.00	Pass
Bluetooth-LE	2	39	2480	-0.88	≤ 30.00	Pass

Test Result of Average Output Power (Reporting Only)

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Result
Bluetooth-LE	1	00	2402	0.25	≤ 30.00	Pass
Bluetooth-LE	1	19	2440	-0.58	≤ 30.00	Pass
Bluetooth-LE	1	39	2480	-1.01	≤ 30.00	Pass
Bluetooth-LE	2	00	2402	0.18	≤ 30.00	Pass
Bluetooth-LE	2	19	2440	-0.57	≤ 30.00	Pass
Bluetooth-LE	2	39	2480	-1.20	≤ 30.00	Pass

7.4. Power Spectral Density Measurement

7.4.1.Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band.

The same method of determining the conducted output power shall be used to determine the power spectral density.

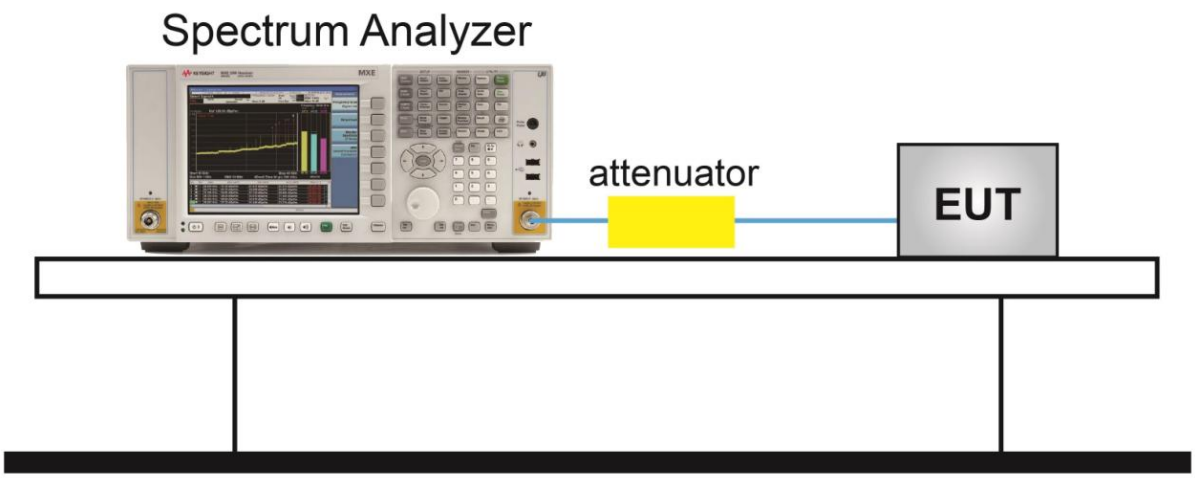
7.4.2.Test Procedure Used

ANSI C63.10 - Section 11.10.2

7.4.3.Test Setting

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 3kHz
4. VBW = 10kHz
5. Detector = Peak
6. Sweep time = Auto couple
7. Trace mode = Max hold
8. Trace was allowed to stabilize

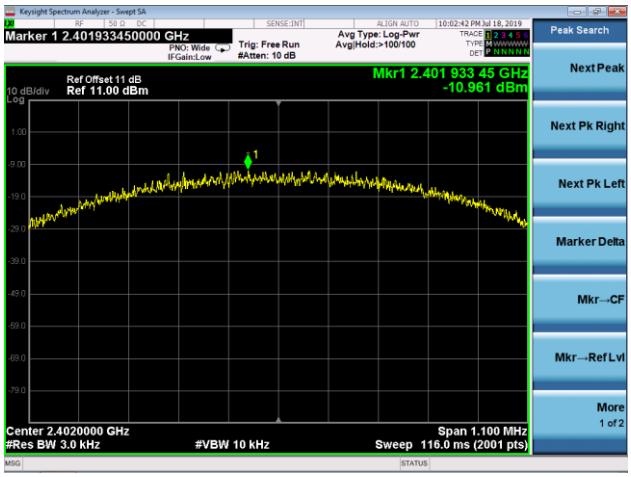
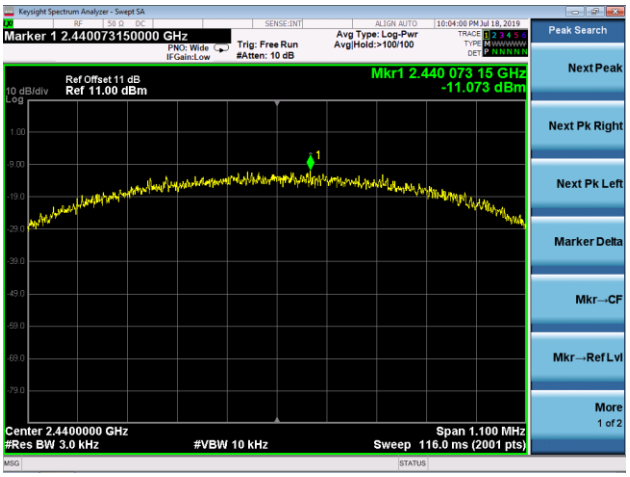
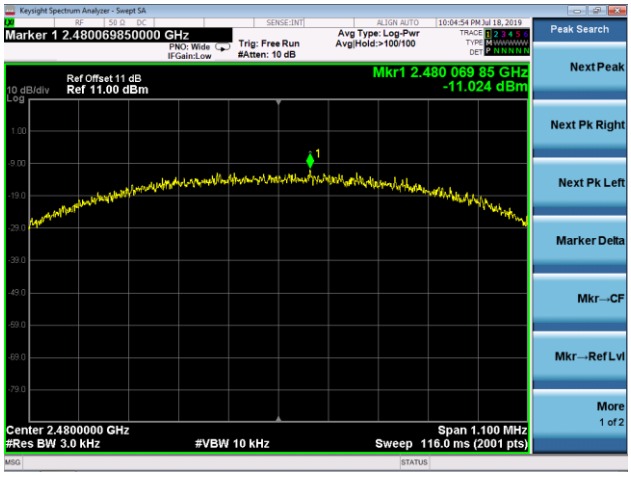
7.4.4.Test Setup

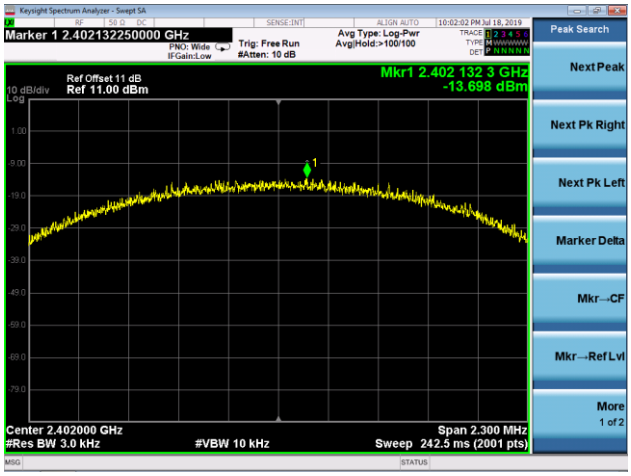
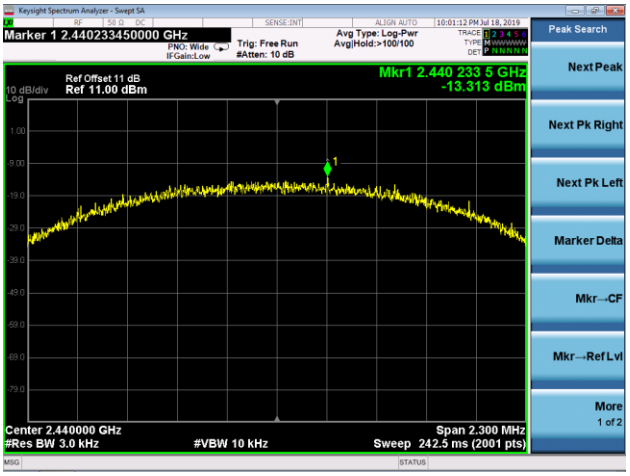
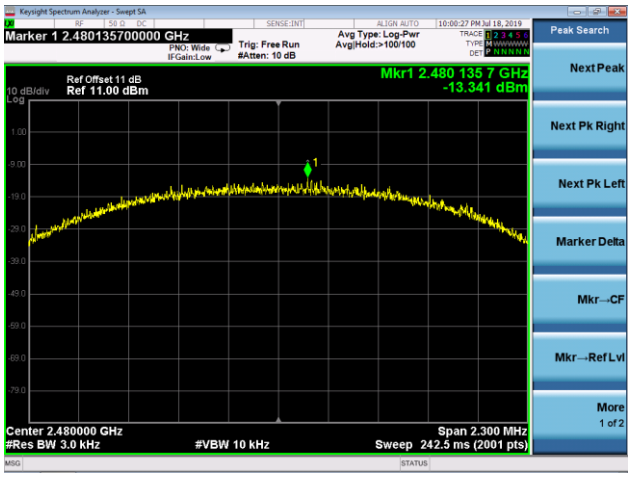


7.4.5.Test Result

Product	Flat Panel Integrated Satellite Communication Terminal	Temperature	25℃
Test Engineer	Yuri Li	Relative Humidity	52%
Test Site	TR3	Test Date	2019/07/18

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	PSD Result (dBm/3kHz)	Limit (dBm/3kHz)	Result
Bluetooth-LE	1	00	2402	-10.96	≤ 8.00	Pass
Bluetooth-LE	1	19	2440	-11.07	≤ 8.00	Pass
Bluetooth-LE	1	39	2480	-11.02	≤ 8.00	Pass
Bluetooth-LE	2	00	2402	-13.70	≤ 8.00	Pass
Bluetooth-LE	2	19	2440	-13.31	≤ 8.00	Pass
Bluetooth-LE	2	39	2480	-13.34	≤ 8.00	Pass

Bluetooth-LE (1Mbps) PSD	
Channel 00 (2402MHz)	Channel 19 (2440MHz)
	
Channel 39 (2480MHz)	
	

Bluetooth-LE (2Mbps) PSD	
Channel 00 (2402MHz)	Channel 19 (2440MHz)
	
Channel 39 (2480MHz)	
	

7.5. Conducted Band Edge and Out-of-Band Emissions

7.5.1.Test Limit

The limit for out-of-band spurious emissions at the band edge is 20 dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100 kHz bandwidth per the PSD procedure.

7.5.2.Test Procedure Used

ANSI C63.10 - Section 11.11

7.5.3.Test Setting

Reference level measurement

1. Set instrument center frequency to DTS channel center frequency
2. Set the span to ≥ 1.5 times the DTS bandwidth
3. Set the RBW = 100 kHz
4. Set the VBW ≥ 3 x RBW
5. Detector = Peak
6. Sweep time = Auto couple
7. Trace mode = Max hold
8. Allow trace to fully stabilize

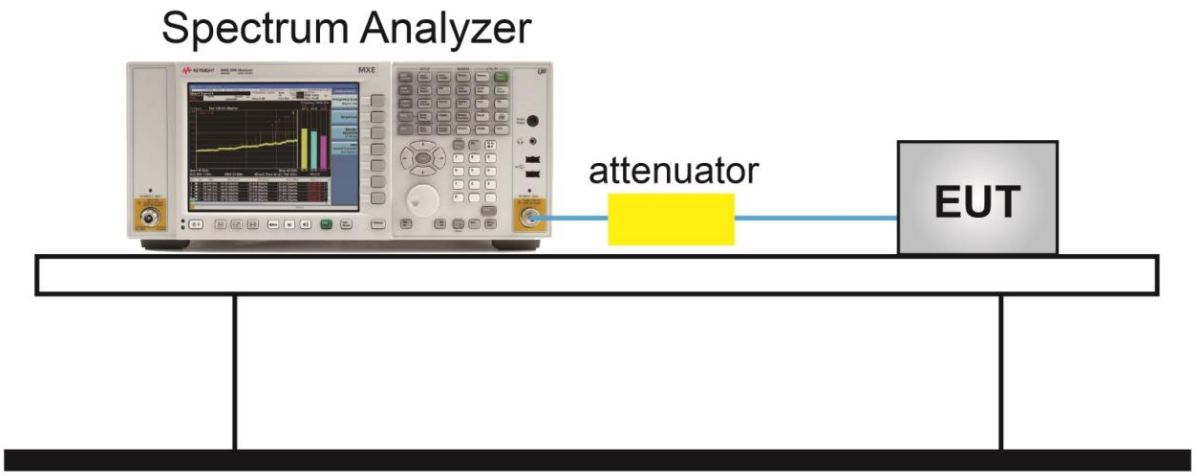
Emission level measurement

1. Set the center frequency and span to encompass frequency range to be measured
2. RBW = 100kHz
3. VBW = 300kHz
4. Detector = Peak
5. Trace mode = Max hold
6. Sweep time = Auto couple
7. The trace was allowed to stabilize

Test Notes

1. RBW was set to 1.3MHz rather than 100 kHz in order to increase the measurement speed.
2. The display line shown in the following plots denotes the limit at 20dB below the fundamental emission level measured in a 100 kHz bandwidth. However, since the traces in the following plots are measured with a 1.3MHz RBW, the display line may not necessarily appear to be 20dB below the level of the fundamental in a 1.3MHz bandwidth.
3. For plots showing conducted spurious emissions near the limit, the frequencies were investigated with a reduced RBW to ensure that no emissions were present.

7.5.4.Test Setup



7.5.5.Test Result

Product	Flat Panel Integrated Satellite Communication Terminal	Temperature	25℃
Test Engineer	Yuri Li	Relative Humidity	52%
Test Site	TR3	Test Date	2019/07/18

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Limit	Result
Bluetooth-LE	1	00	2402	20dBc	Pass
Bluetooth-LE	1	19	2440	20dBc	Pass
Bluetooth-LE	1	39	2480	20dBc	Pass
Bluetooth-LE	2	00	2402	20dBc	Pass
Bluetooth-LE	2	19	2440	20dBc	Pass
Bluetooth-LE	2	39	2480	20dBc	Pass

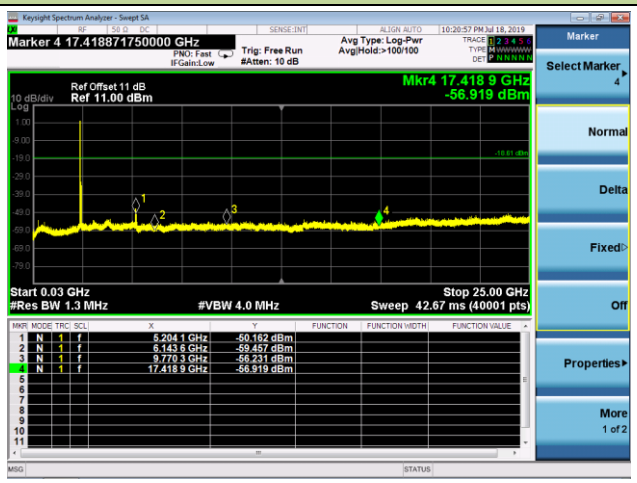
Bluetooth-LE (1Mbps) Out-of-Band Emissions

Channel 00 (2402MHz)

100kHz PSD reference Level

Low Band Edge

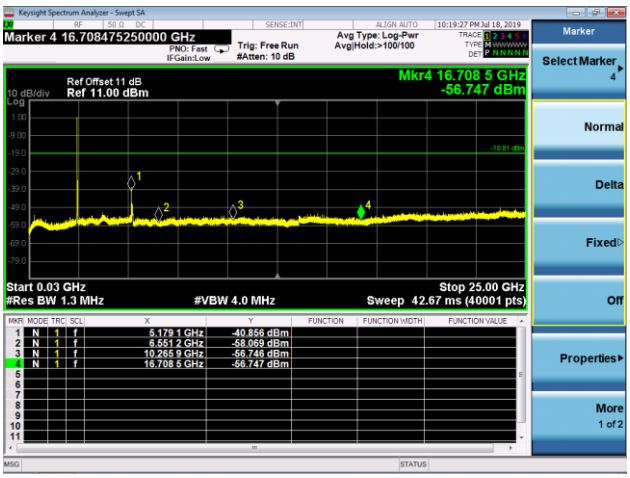
Spurious Emission 30MHz ~ 25GHz

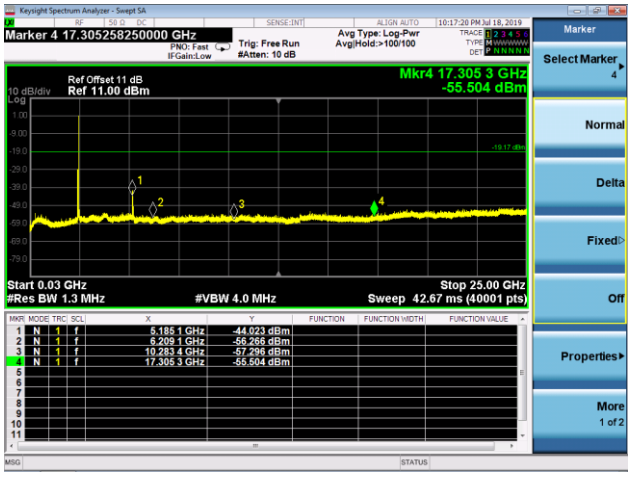


Channel 19 (2440MHz)

100kHz PSD reference Level

Spurious Emission 30MHz ~ 25GHz



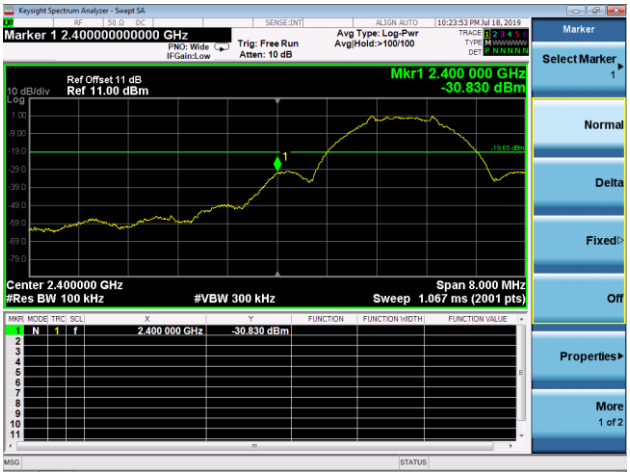
Channel 39 (2480MHz)	
100kHz PSD reference Level	High Band Edge
Spurious Emission 30MHz ~ 25GHz	
	

Bluetooth-LE (2Mbps) Out-of-Band Emissions

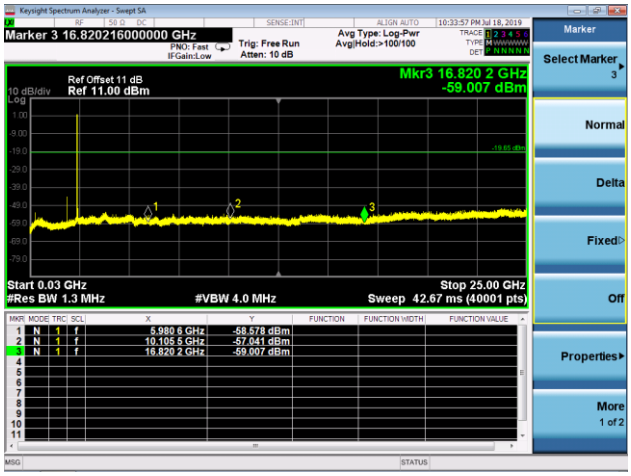
Channel 00 (2402MHz)

100kHz PSD reference Level

Low Band Edge



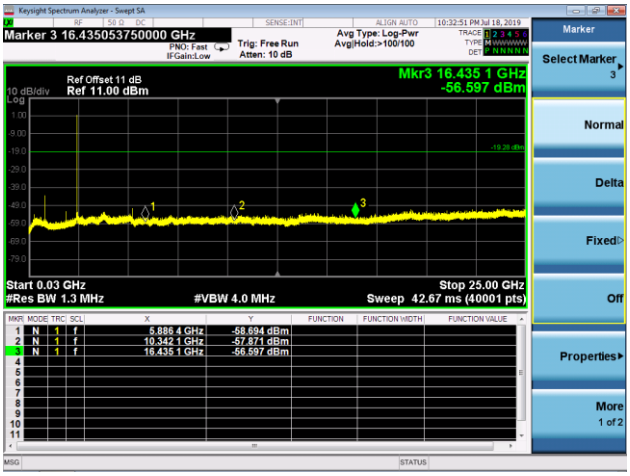
Spurious Emission 30MHz ~ 25GHz

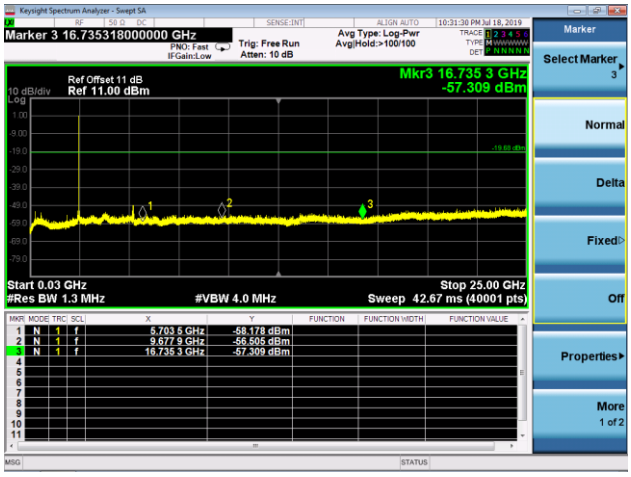


Channel 19 (2440MHz)

100kHz PSD reference Level

Spurious Emission 30MHz ~ 25GHz



Channel 39 (2480MHz)	
100kHz PSD reference Level	High Band Edge
Spurious Emission 30MHz ~ 25GHz	
	

7.6. Radiated Spurious Emission Measurement

7.6.1.Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Field Strength (μV/m)	Measured Distance (m)
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

7.6.2.Test Procedure Used

ANSI C63.10 - Section 6.3 (General Requirements)

ANSI C63.10 - Section 6.4 (Standard test method below 30MHz)

ANSI C63.10 - Section 6.5 (Standard test method above 30MHz to 1GHz)

ANSI C63.10 - Section 6.6 (Standard test method above 1GHz)

7.6.3.Test Setting

Table 1 - RBW as a function of frequency

Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = as specified in Table 1
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

Peak Measurements above 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

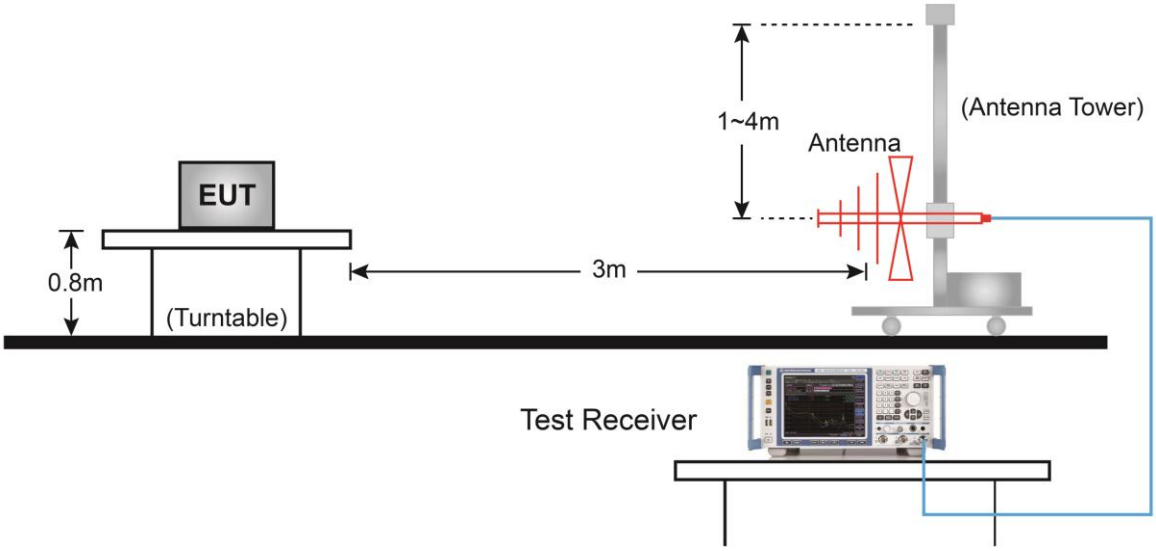
Average Measurements above 1GHz (Method VB)

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle ≥ 98%, set VBW = 10Hz

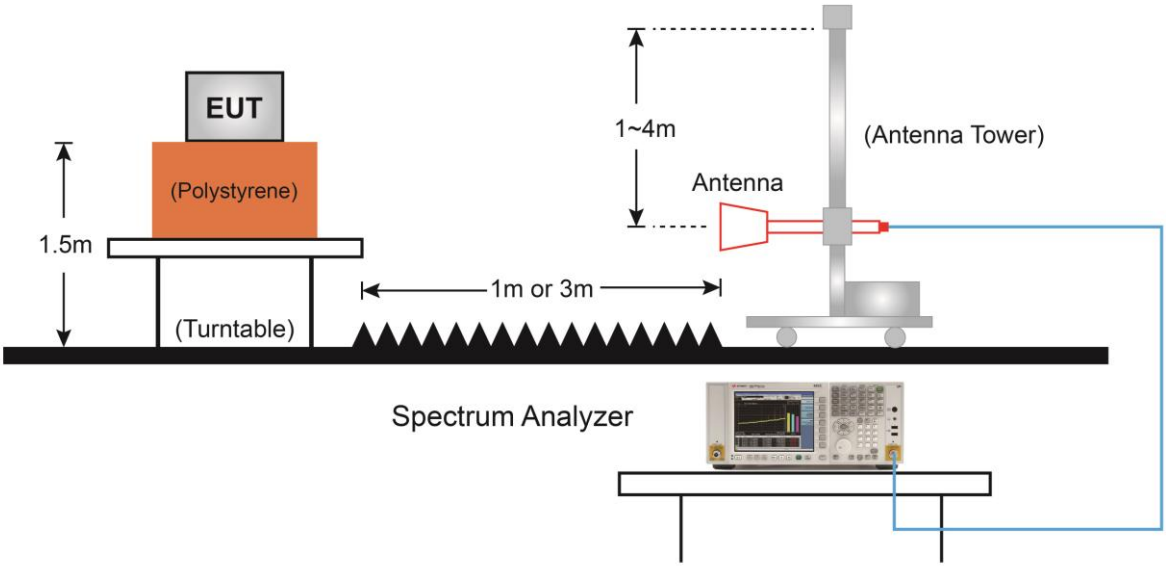
   If the EUT duty cycle is < 98%, set VBW ≥ 1/T. T is the minimum transmission duration
4. Detector = Peak
5. Sweep time = auto
6. Trace mode = max hold
7. Trace was allowed to stabilize

7.6.4.Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



7.6.5.Test Result

Product	Flat Panel Integrated Satellite Communication Terminal	Temperature	25℃
Test Engineer	Dandy Li	Relative Humidity	54%
Test Site	AC1	Test Date	2019/07/17
Test Mode	Bluetooth-LE (1Mbps)	Test Channel	00
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4043.0	37.9	2.7	40.6	74.0	-33.4	Peak	Horizontal
	4935.5	37.0	5.8	42.8	74.0	-31.2	Peak	Horizontal
*	6244.5	36.7	8.1	44.8	74.0	-29.2	Peak	Horizontal
*	7205.0	41.3	11.6	52.9	74.0	-21.1	Peak	Horizontal
	4357.5	37.5	3.8	41.3	74.0	-32.7	Peak	Vertical
	5003.5	36.9	6.1	43.0	74.0	-31.0	Peak	Vertical
*	6270.0	36.5	8.4	44.9	74.0	-29.1	Peak	Vertical
*	7205.0	42.5	11.6	54.1	74.0	-19.9	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (92.3dBμV/m) or 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	Flat Panel Integrated Satellite Communication Terminal	Temperature	25℃
Test Engineer	Dandy Li	Relative Humidity	54%
Test Site	AC1	Test Date	2019/07/17
Test Mode	Bluetooth-LE (1Mbps)	Test Channel	19
Remark	1. Average measurement was not performed if peak level lower than average limit. So the margin was calculated using the average limit for emissions fall within the restricted bands. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4876.0	37.2	5.7	42.9	74.0	-31.1	Peak	Horizontal
	7315.5	38.2	11.7	49.9	74.0	-24.1	Peak	Horizontal
*	7834.0	36.2	12.1	48.3	74.0	-25.7	Peak	Horizontal
*	8896.5	36.6	13.3	49.9	74.0	-24.1	Peak	Horizontal
	4952.5	35.8	5.9	41.7	74.0	-32.3	Peak	Vertical
	7324.0	40.3	11.7	52.0	74.0	-22.0	Peak	Vertical
*	7851.0	35.2	12.1	47.3	74.0	-26.7	Peak	Vertical
*	8811.5	36.1	13.4	49.5	74.0	-24.5	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (91.9dBμV/m) or 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	Flat Panel Integrated Satellite Communication Terminal	Temperature	25℃
Test Engineer	Dandy Li	Relative Humidity	54%
Test Site	AC1	Test Date	2019/07/17
Test Mode	Bluetooth-LE (1Mbps)	Test Channel	39
Remark	1. Average measurement was not performed if peak level lower than average limit. So the margin was calculated using the average limit for emissions fall within the restricted bands. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4799.5	36.9	5.5	42.4	74.0	-31.6	Peak	Horizontal
	7443.0	38.5	11.9	50.4	74.0	-23.6	Peak	Horizontal
*	7987.0	37.3	12.6	49.9	74.0	-24.1	Peak	Horizontal
*	8701.0	35.5	13.2	48.7	74.0	-25.3	Peak	Horizontal
	4884.5	37.1	5.7	42.8	74.0	-31.2	Peak	Vertical
	7443.0	38.8	11.9	50.7	74.0	-23.3	Peak	Vertical
*	7851.0	35.4	12.1	47.5	74.0	-26.5	Peak	Vertical
*	8930.5	35.6	13.4	49.0	74.0	-25.0	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (90.4dBμV/m) or 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	Flat Panel Integrated Satellite Communication Terminal	Temperature	25℃
Test Engineer	Dandy Li	Relative Humidity	54%
Test Site	AC1	Test Date	2019/07/17
Test Mode	Bluetooth-LE (2Mbps)	Test Channel	00
Remark	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4077.0	38.3	2.6	40.9	74.0	-33.1	Peak	Horizontal
	4799.5	37.4	5.5	42.9	74.0	-31.1	Peak	Horizontal
*	5751.5	37.1	7.1	44.2	74.0	-29.8	Peak	Horizontal
*	7205.0	42.2	11.6	53.8	74.0	-20.2	Peak	Horizontal
	4034.5	38.5	2.7	41.2	74.0	-32.8	Peak	Vertical
	4816.5	36.9	5.6	42.5	74.0	-31.5	Peak	Vertical
*	6278.5	36.5	8.4	44.9	74.0	-29.1	Peak	Vertical
*	7205.0	41.8	11.6	53.4	74.0	-20.6	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (92.2dBμV/m) or 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	Flat Panel Integrated Satellite Communication Terminal	Temperature	25℃
Test Engineer	Dandy Li	Relative Humidity	54%
Test Site	AC1	Test Date	2019/07/17
Test Mode	Bluetooth-LE (2Mbps)	Test Channel	19
Remark	1. Average measurement was not performed if peak level lower than average limit. So the margin was calculated using the average limit for emissions fall within the restricted bands. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	5063.0	37.2	6.4	43.6	74.0	-30.4	Peak	Horizontal
	7315.5	39.7	11.7	51.4	74.0	-22.6	Peak	Horizontal
*	7893.5	35.8	12.3	48.1	74.0	-25.9	Peak	Horizontal
*	8879.5	35.9	13.4	49.3	74.0	-24.7	Peak	Horizontal
	4935.5	36.7	5.8	42.5	74.0	-31.5	Peak	Vertical
	7324.0	40.2	11.7	51.9	74.0	-22.1	Peak	Vertical
*	7859.5	36.8	12.2	49.0	74.0	-25.0	Peak	Vertical
*	8633.0	36.1	13.1	49.2	74.0	-24.8	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (91.8dBμV/m) or 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	Flat Panel Integrated Satellite Communication Terminal	Temperature	25℃
Test Engineer	Dandy Li	Relative Humidity	54%
Test Site	AC1	Test Date	2019/07/17
Test Mode	Bluetooth-LE (2Mbps)	Test Channel	39
Remark	1. Average measurement was not performed if peak level lower than average limit. So the margin was calculated using the average limit for emissions fall within the restricted bands. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4799.5	36.5	5.5	42.0	74.0	-32.0	Peak	Horizontal
	7434.5	38.8	11.9	50.7	74.0	-23.3	Peak	Horizontal
*	7817.0	36.5	12.1	48.6	74.0	-25.4	Peak	Horizontal
*	8624.5	35.8	13.0	48.8	74.0	-25.2	Peak	Horizontal
	5054.5	36.7	6.3	43.0	74.0	-31.0	Peak	Vertical
	7443.0	37.5	11.9	49.4	74.0	-24.6	Peak	Vertical
*	7944.5	36.2	12.6	48.8	74.0	-25.2	Peak	Vertical
*	8854.0	35.5	13.4	48.9	74.0	-25.1	Peak	Vertical

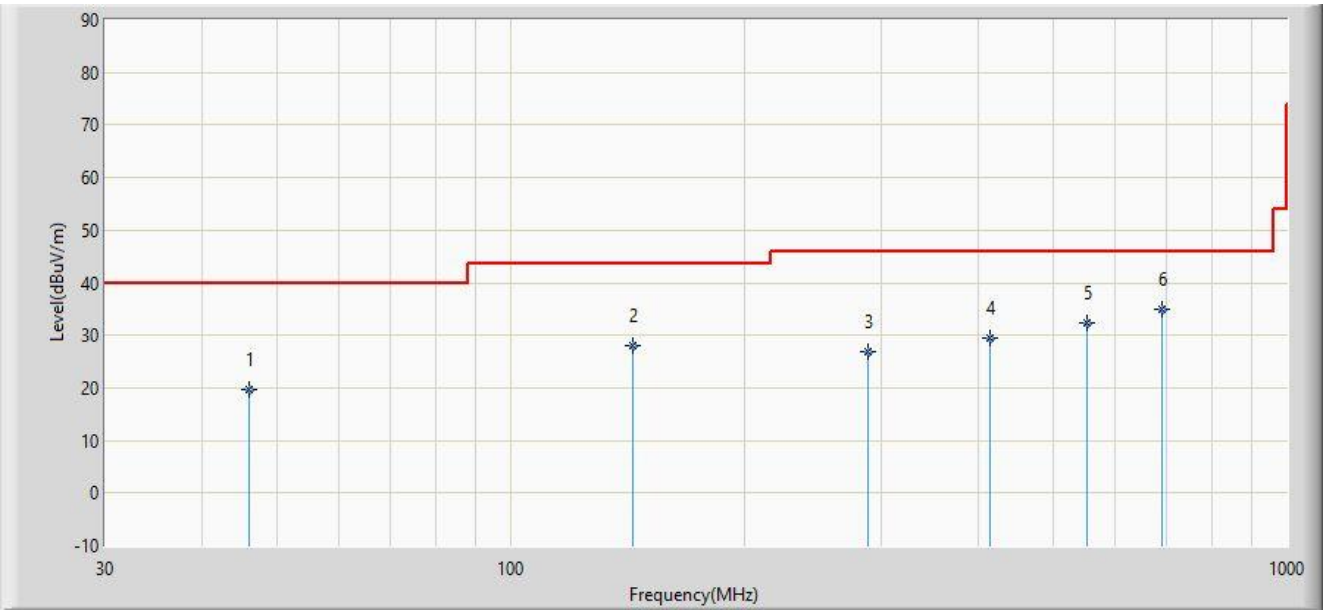
Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (90.3dBμV/m) or 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

The Worst Case of Radiated Emission below 1GHz:

Site: AC1	Time: 2019/07/18 - 09:52
Limit: FCC_Part15.209_RSE(3m)	Engineer: Kyrie Xie
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: AC 120V/60Hz
Test Mode: Transmit by Bluetooth-LE(1Mbps) at Channel 2402MHz	



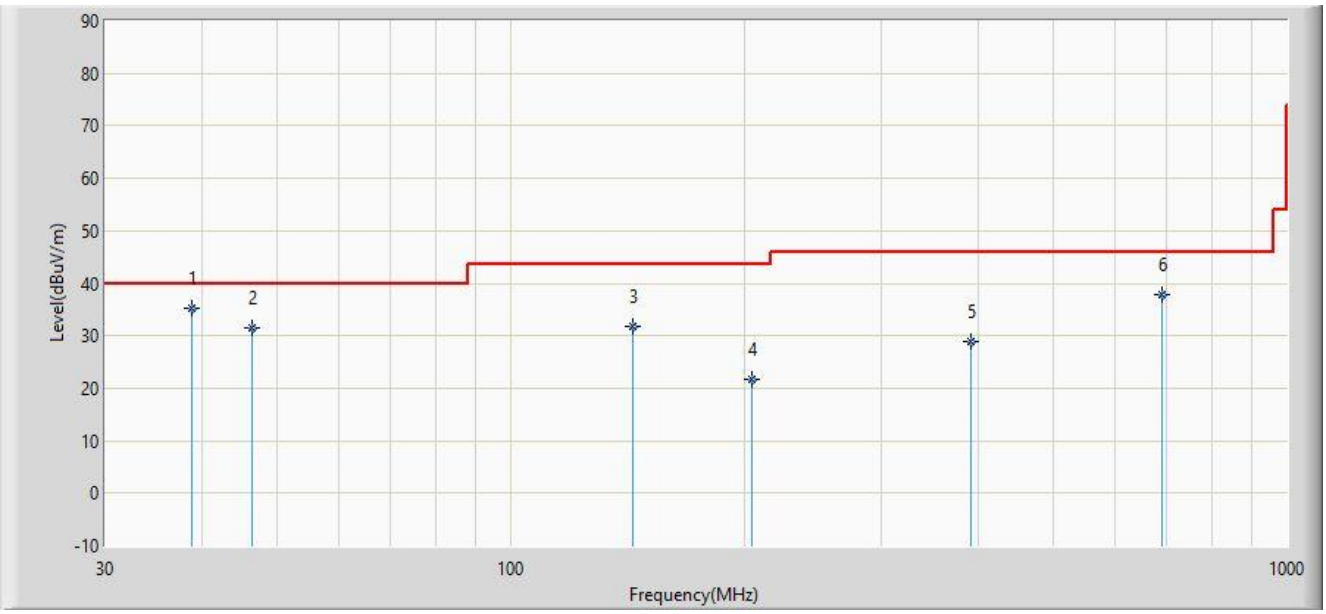
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		46.005	19.664	5.346	-20.336	40.000	14.318	QP
2		143.667	28.045	13.088	-15.455	43.500	14.957	QP
3		288.138	26.760	12.529	-19.240	46.000	14.232	QP
4		414.580	29.541	12.404	-16.459	46.000	17.137	QP
5		552.436	32.322	12.395	-13.678	46.000	19.927	QP
6	*	691.132	35.011	12.696	-10.989	46.000	22.315	QP

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

Site: AC1	Time: 2019/07/18 - 09:56
Limit: FCC_Part15.209_RSE(3m)	Engineer: Kyrie Xie
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: AC 120V/60Hz
Test Mode: Transmit by Bluetooth-LE(1Mbps) at Channel 2402MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	38.730	35.237	20.702	-4.763	40.000	14.535	QP
2		46.490	31.476	17.166	-8.524	40.000	14.310	QP
3		143.772	31.753	16.789	-11.747	43.500	14.964	QP
4		204.245	21.829	10.423	-21.671	43.500	11.407	QP
5		391.743	28.775	12.209	-17.225	46.000	16.565	QP
6		690.308	37.777	15.477	-8.223	46.000	22.300	QP

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

7.7. Radiated Restricted Band Edge Measurement

7.7.1.Test Limit

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1] 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 – 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41	--	--	--

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Field Strength (μV/m)	Measured Distance (m)
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

7.7.2.Test Procedure Used

ANSI C63.10 - Section 6.3 (General Requirements)

ANSI C63.10 - Section 6.6 (Standard test method above 1GHz)

7.7.3.Test Setting

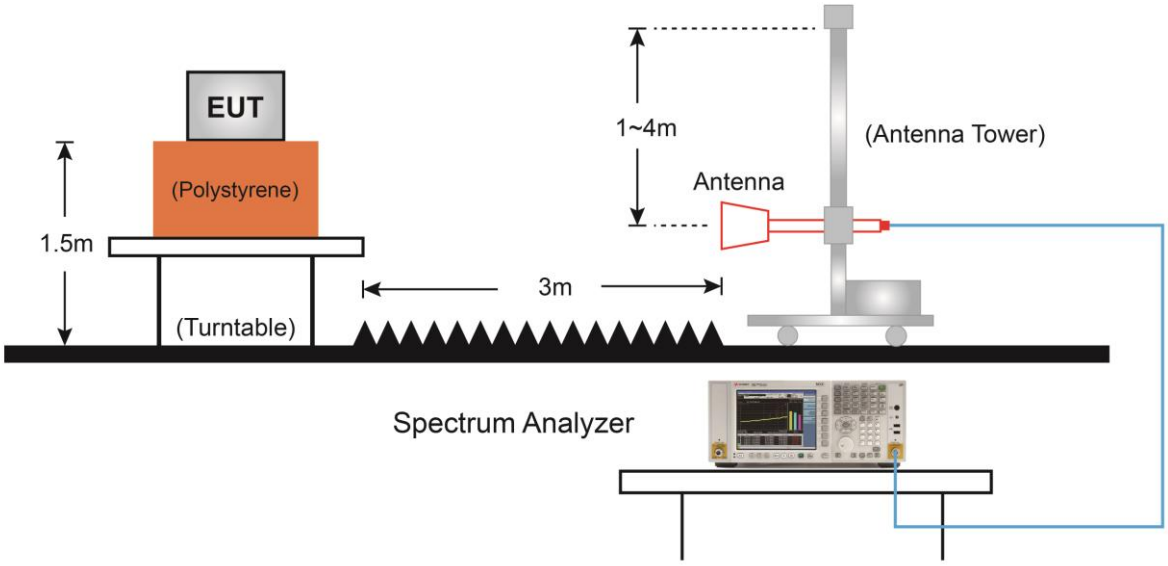
Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Peak
5. Sweep time = Auto couple
6. Trace mode = Max hold
7. Trace was allowed to stabilize

Average Field Strength Measurements

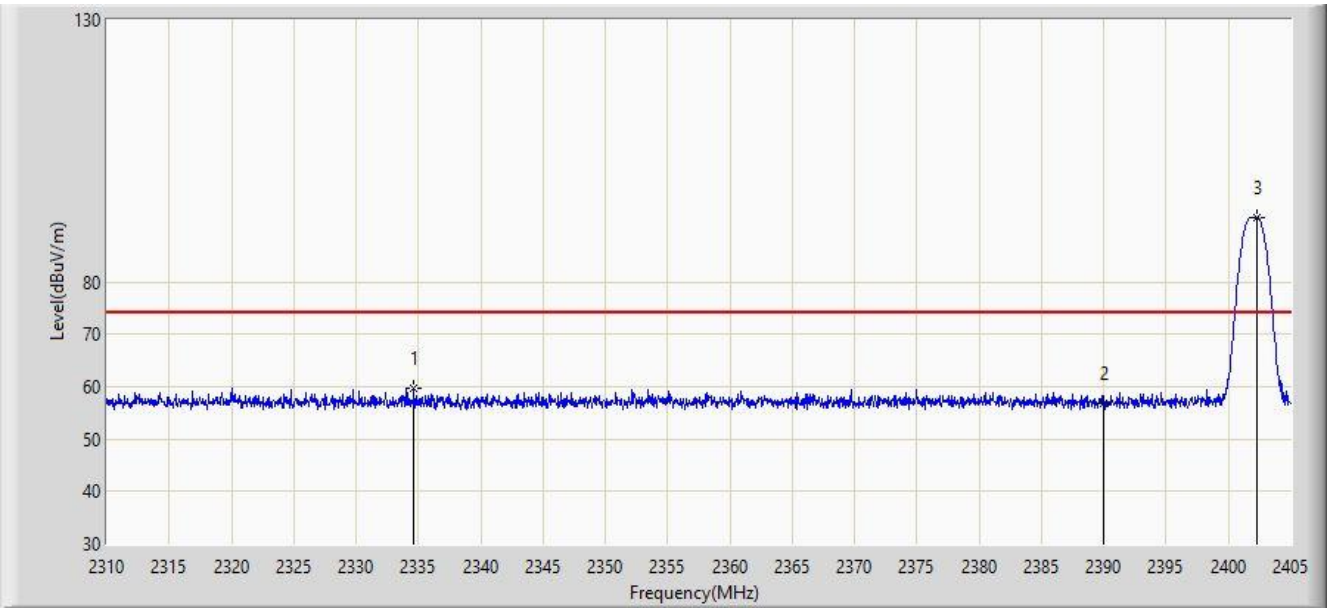
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle ≥ 98%, set VBW = 10Hz
4. If the EUT duty cycle is < 98%, set VBW ≥ 1/T. T is the minimum transmission duration
5. Detector = Peak
6. Sweep time = Auto
7. Trace mode = Max hold
8. Trace was allowed to stabilize

7.7.4.Test Setup



7.7.5.Test Result

Site: AC1	Time: 2019/07/17 - 22:41
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(1Mbps) at Channel 2402MHz	

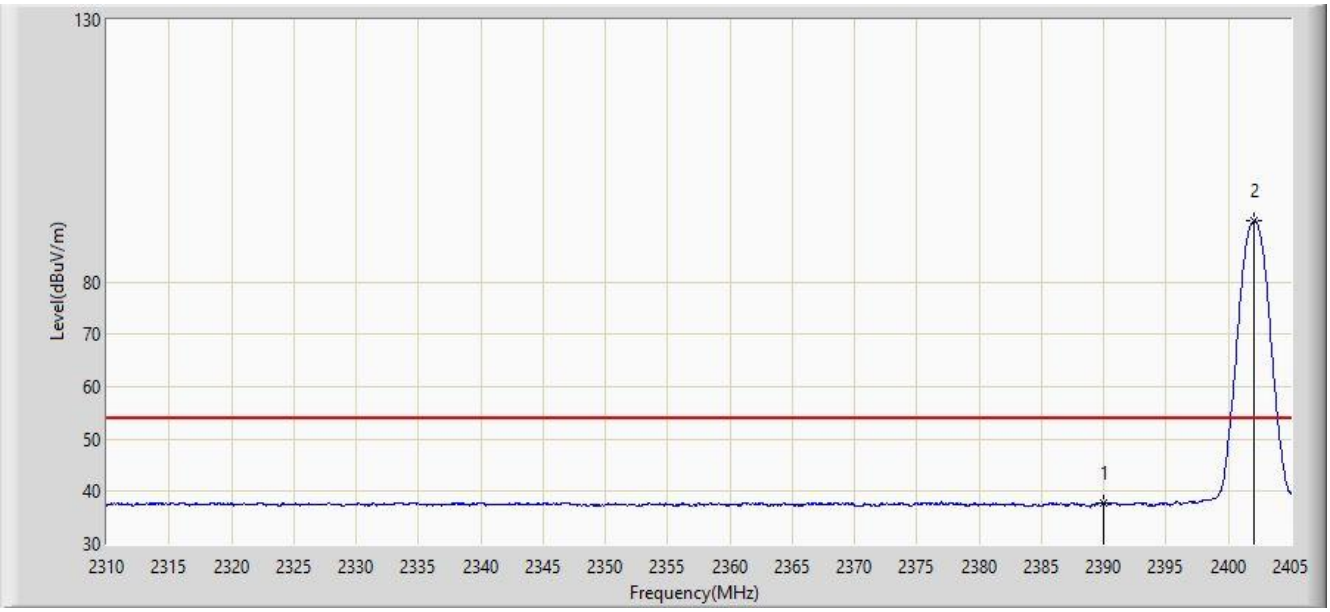


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2334.653	59.811	27.239	-14.189	74.000	32.572	PK
2		2390.000	56.771	24.358	-17.229	74.000	32.413	PK
3	*	2402.293	92.329	59.933	N/A	N/A	32.396	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/07/17 - 22:44
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(1Mbps) at Channel 2402MHz	

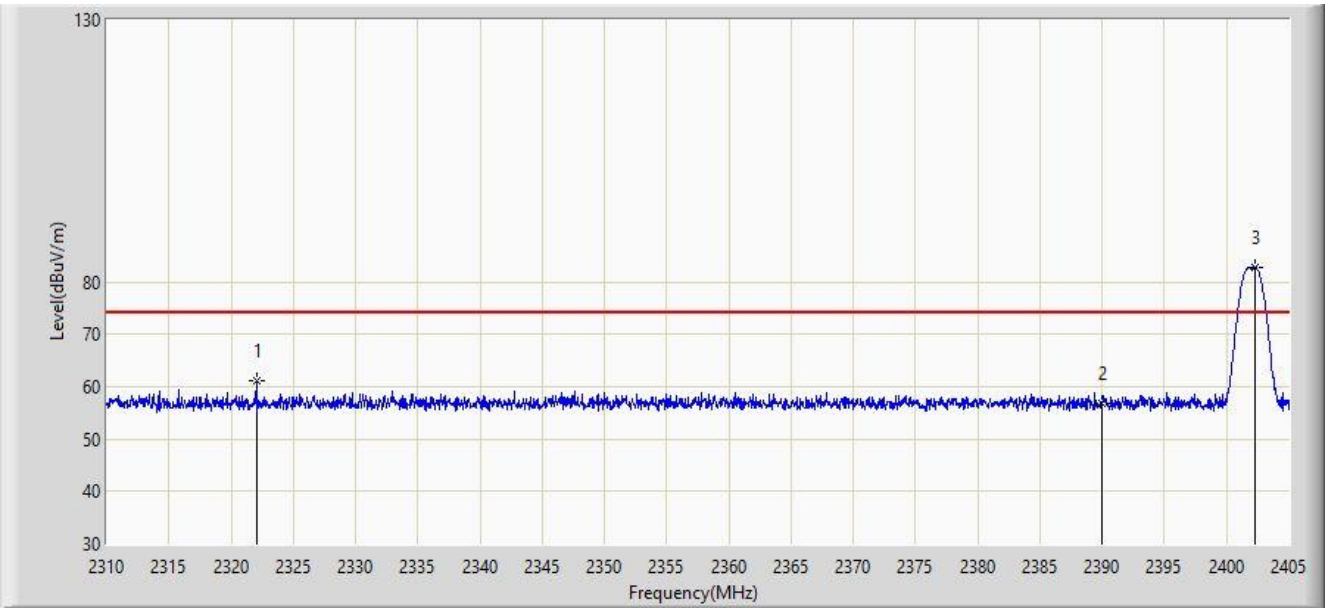


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	37.751	5.338	-16.249	54.000	32.413	AV
2	*	2402.055	91.583	59.187	N/A	N/A	32.395	AV

Note: Measure Level (dBµV/m) = Reading Level (dBµV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/07/17 - 22:44
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(1Mbps) at Channel 2402MHz	

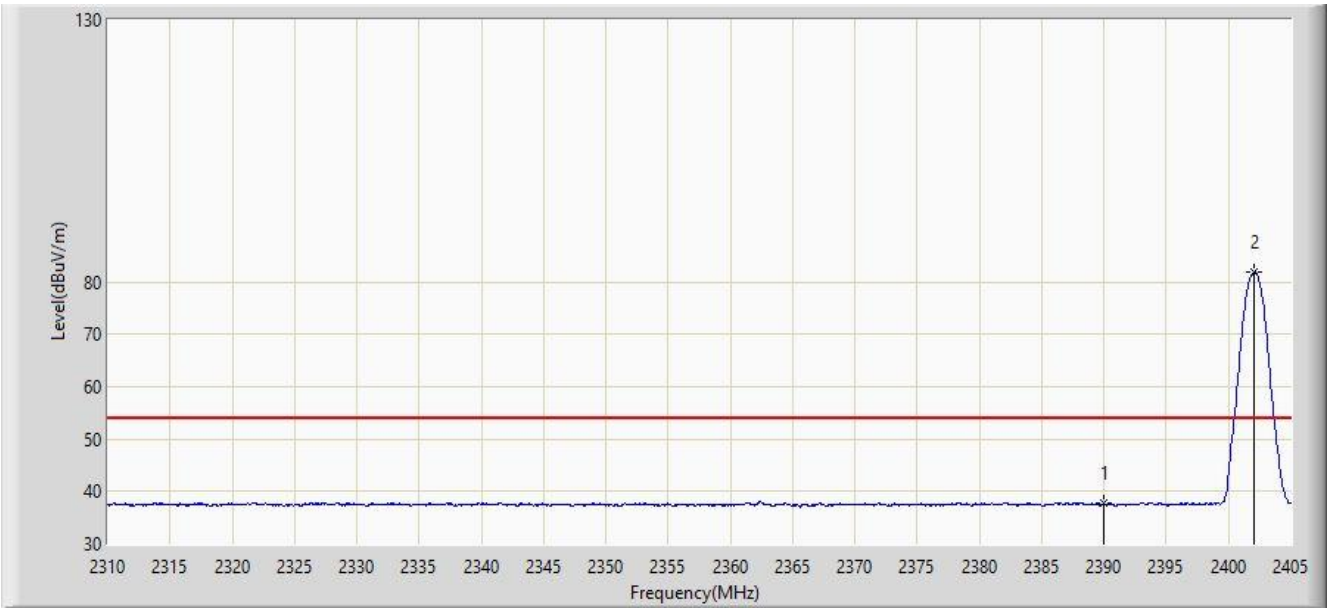


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2322.018	61.018	28.395	-12.982	74.000	32.623	PK
2		2390.000	56.673	24.260	-17.327	74.000	32.413	PK
3	*	2402.245	82.752	50.356	N/A	N/A	32.396	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/07/17 - 22:46
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(1Mbps) at Channel 2402MHz	

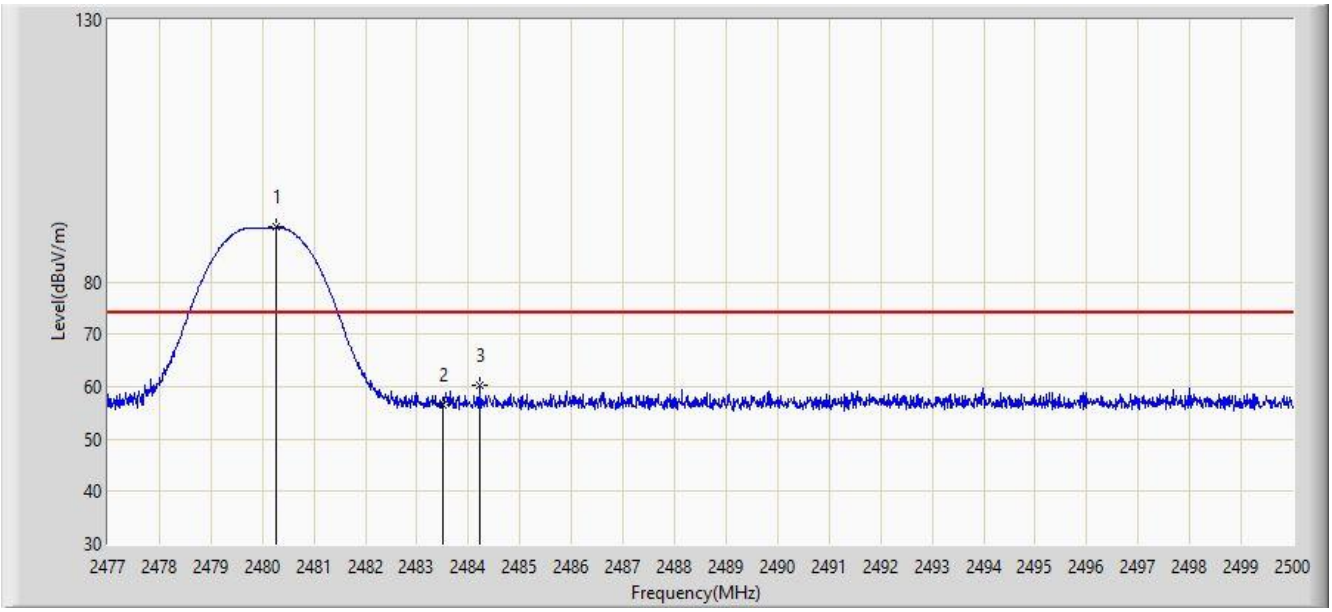


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	37.716	5.303	-16.284	54.000	32.413	AV
2	*	2402.055	81.797	49.401	N/A	N/A	32.395	AV

Note: Measure Level (dBµV/m) = Reading Level (dBµV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/07/17 - 22:46
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(1Mbps) at Channel 2480MHz	

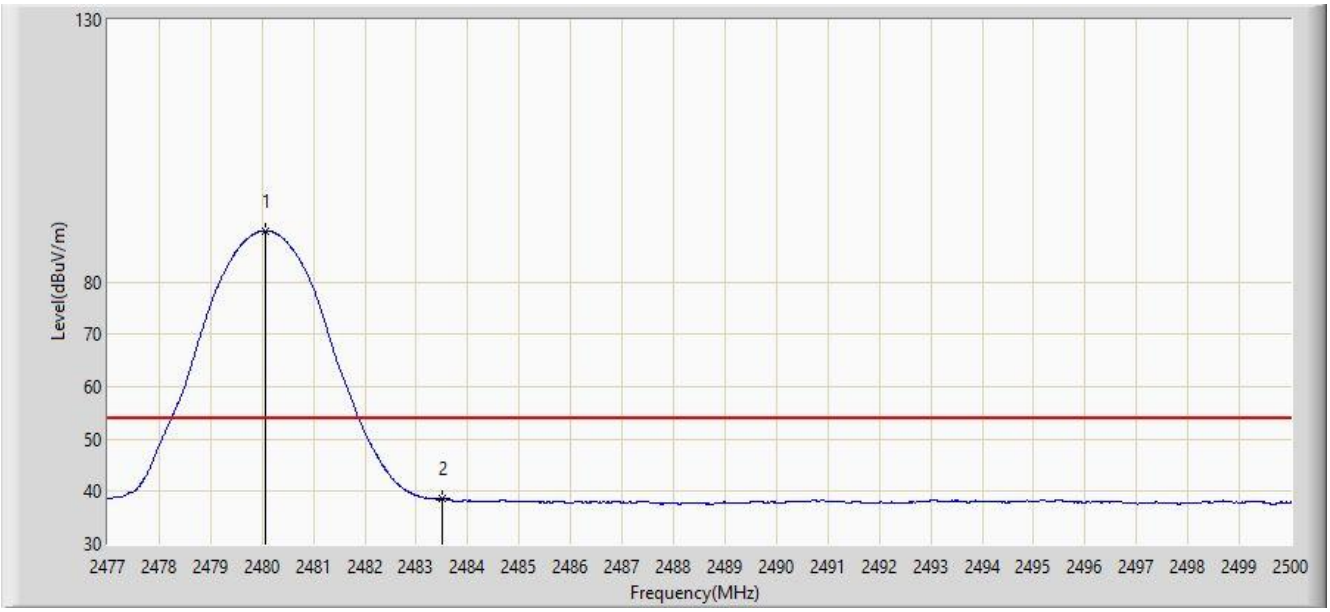


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.266	90.394	57.985	N/A	N/A	32.409	PK
2		2483.500	56.650	24.235	-17.350	74.000	32.416	PK
3		2484.210	60.186	27.769	-13.814	74.000	32.417	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/07/17 - 22:48
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(1Mbps) at Channel 2480MHz	

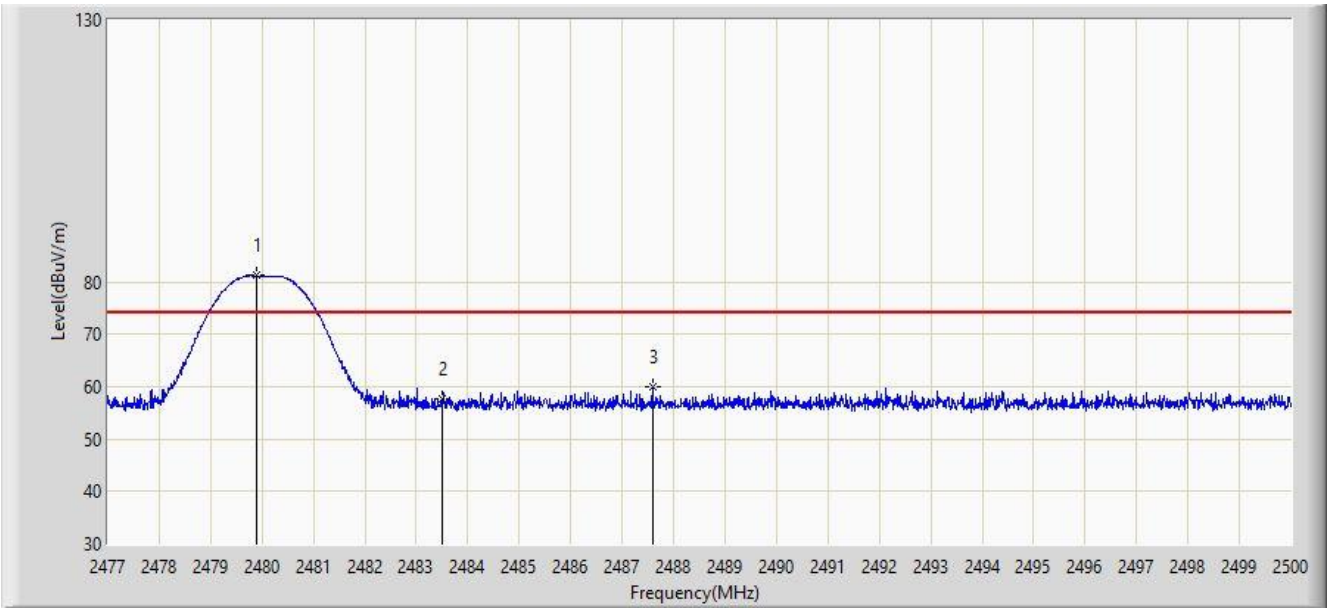


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.059	89.698	57.289	N/A	N/A	32.408	AV
2		2483.500	38.582	6.167	-15.418	54.000	32.416	AV

Note: Measure Level (dBµV/m) = Reading Level (dBµV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/07/17 - 22:48
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(1Mbps) at Channel 2480MHz	

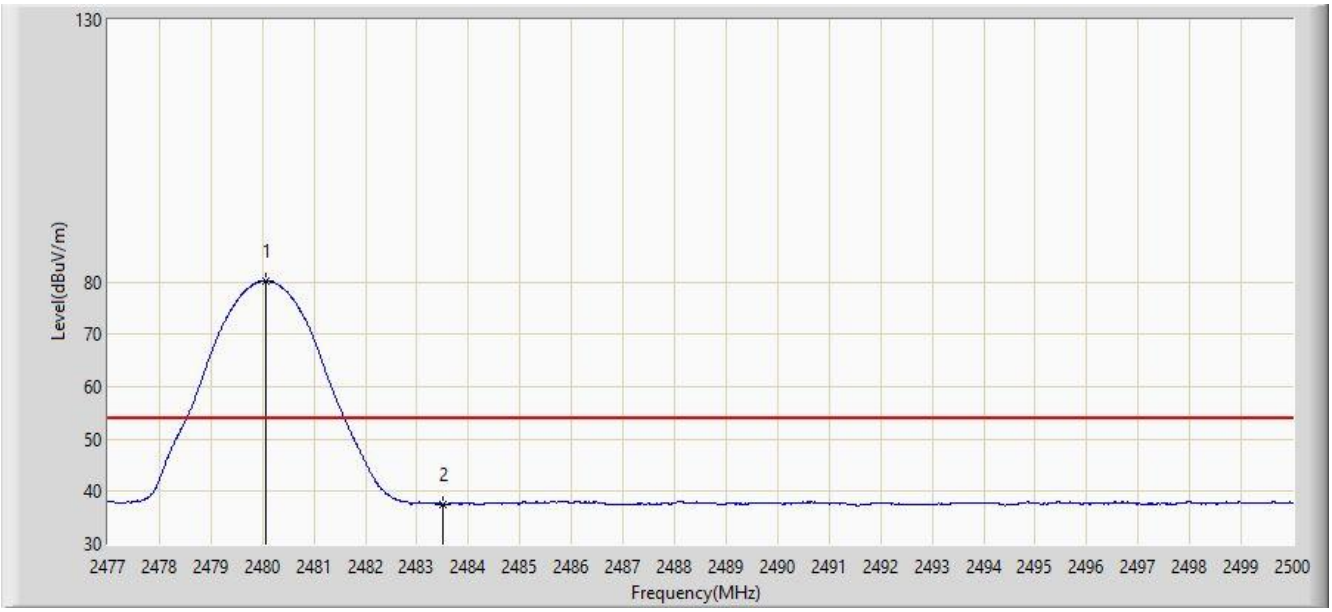


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2479.886	81.206	48.798	N/A	N/A	32.408	PK
2		2483.500	57.581	25.166	-16.419	74.000	32.416	PK
3		2487.592	59.877	27.453	-14.123	74.000	32.424	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/07/17 - 22:49
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(1Mbps) at Channel 2480MHz	

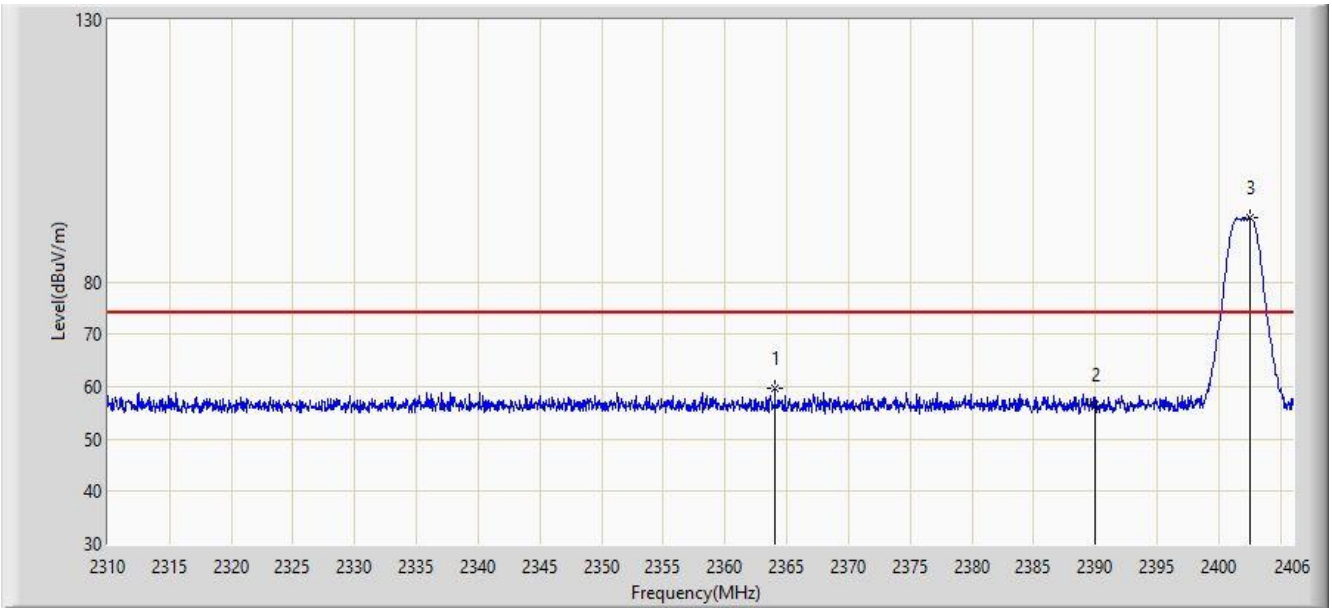


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.059	80.120	47.711	N/A	N/A	32.408	AV
2		2483.500	37.544	5.129	-16.456	54.000	32.416	AV

Note: Measure Level (dBµV/m) = Reading Level (dBµV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/07/17 - 22:50
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(2Mbps) at Channel 2402MHz	

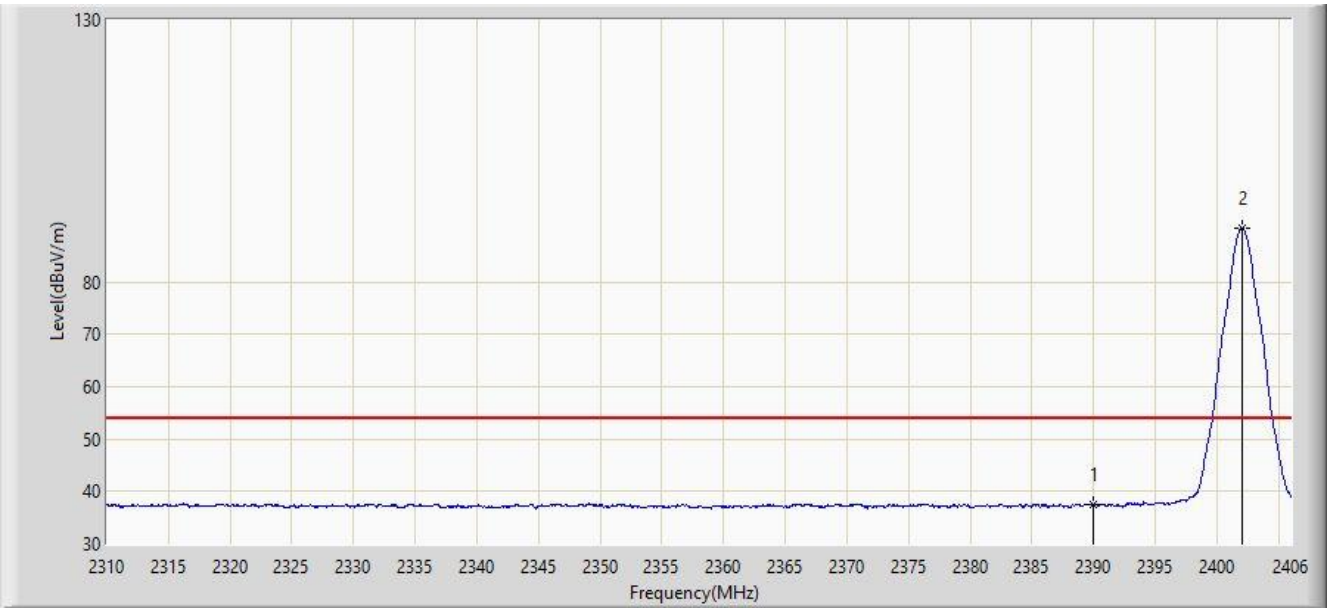


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2364.048	59.737	27.271	-14.263	74.000	32.465	PK
2		2390.000	56.472	24.059	-17.528	74.000	32.413	PK
3	*	2402.496	92.233	59.838	N/A	N/A	32.395	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/07/17 - 22:51
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(2Mbps) at Channel 2402MHz	

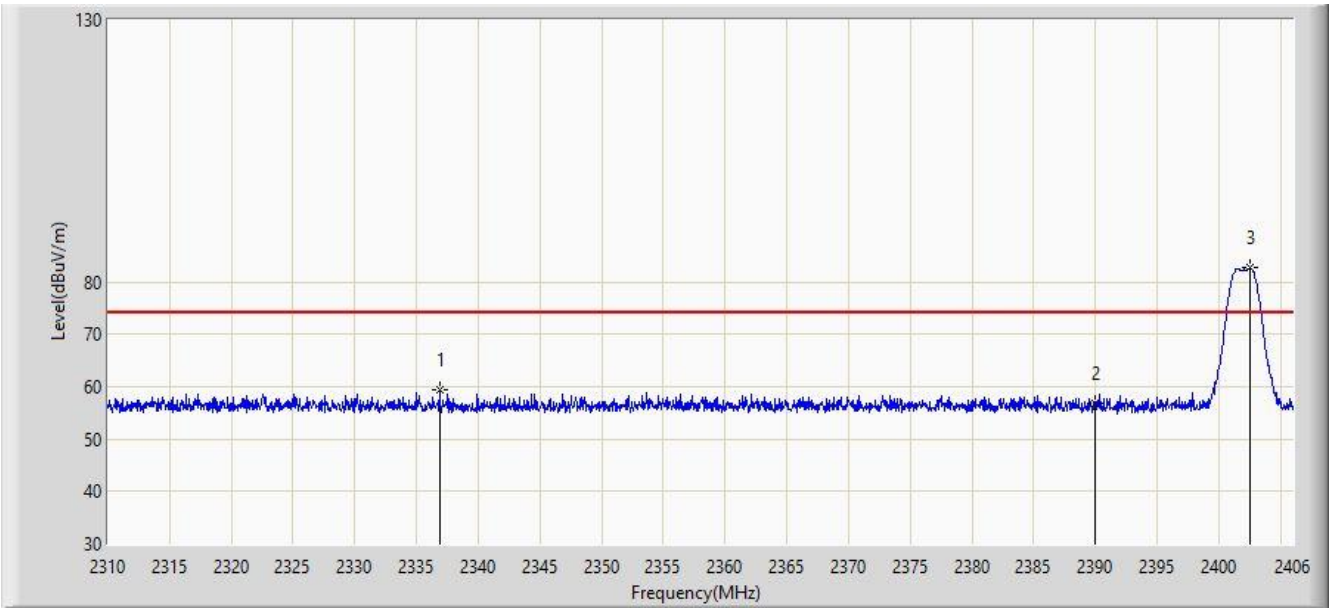


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	37.376	4.963	-16.624	54.000	32.413	AV
2	*	2402.064	90.159	57.763	N/A	N/A	32.395	AV

Note: Measure Level (dBµV/m) = Reading Level (dBµV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/07/17 - 22:51
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(2Mbps) at Channel 2402MHz	

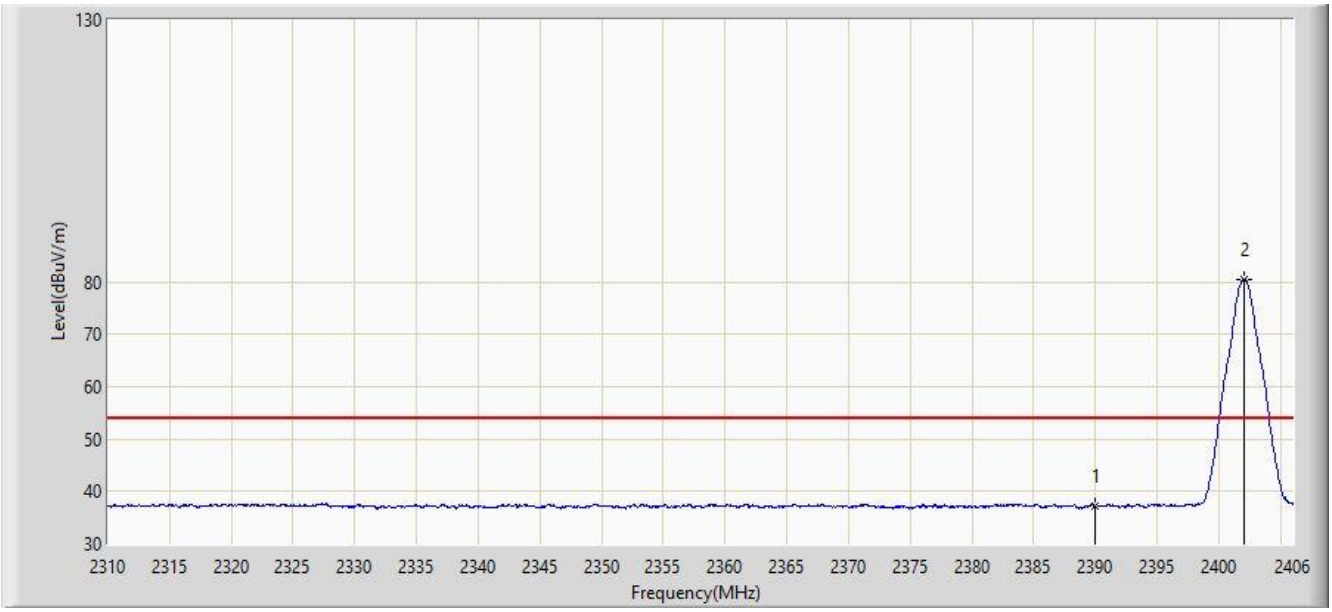


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2336.880	59.265	26.702	-14.735	74.000	32.563	PK
2		2390.000	56.701	24.288	-17.299	74.000	32.413	PK
3	*	2402.592	82.672	50.277	N/A	N/A	32.395	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/07/17 - 22:52
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(2Mbps) at Channel 2402MHz	

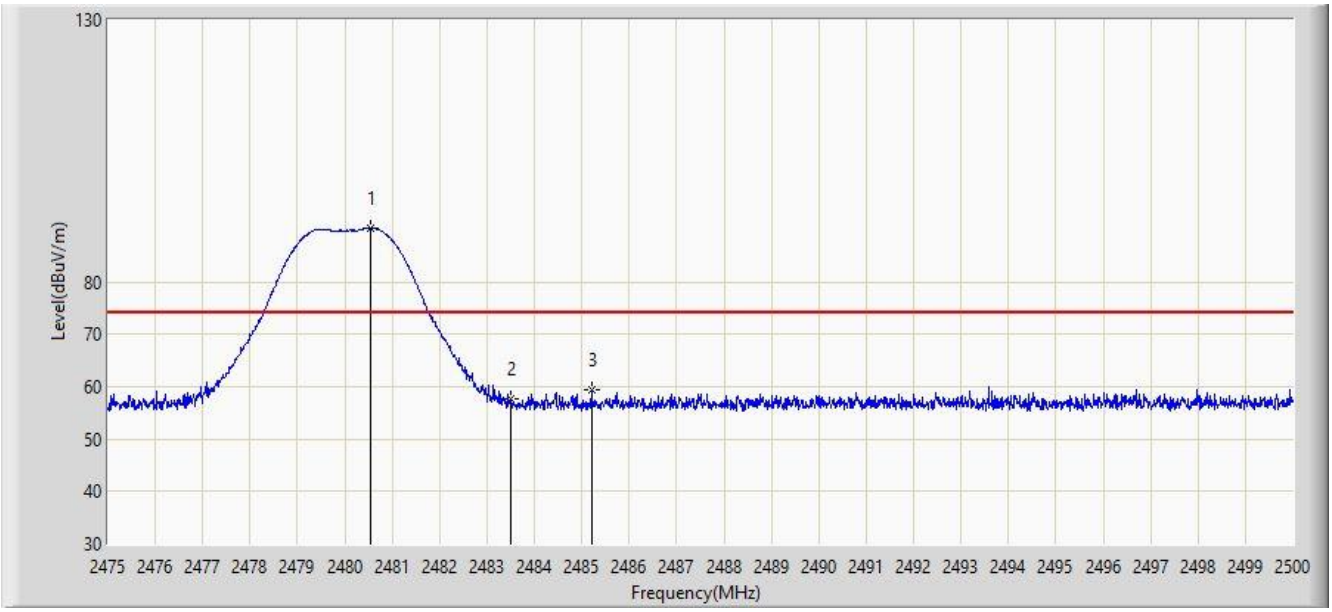


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	37.130	4.717	-16.870	54.000	32.413	AV
2	*	2402.064	80.444	48.048	N/A	N/A	32.395	AV

Note: Measure Level (dBµV/m) = Reading Level (dBµV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/07/17 - 22:53
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(2Mbps) at Channel 2480MHz	

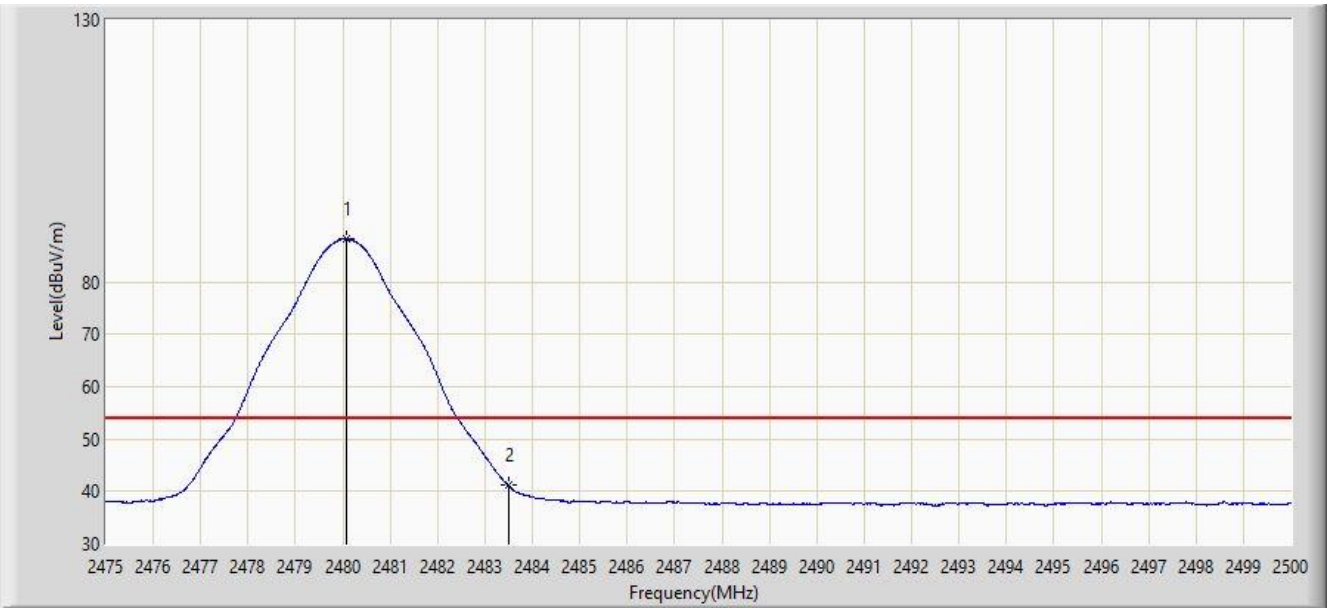


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.537	90.275	57.865	N/A	N/A	32.409	PK
2		2483.500	57.554	25.139	-16.446	74.000	32.416	PK
3		2485.200	59.330	26.911	-14.670	74.000	32.419	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/07/17 - 22:54
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(2Mbps) at Channel 2480MHz	

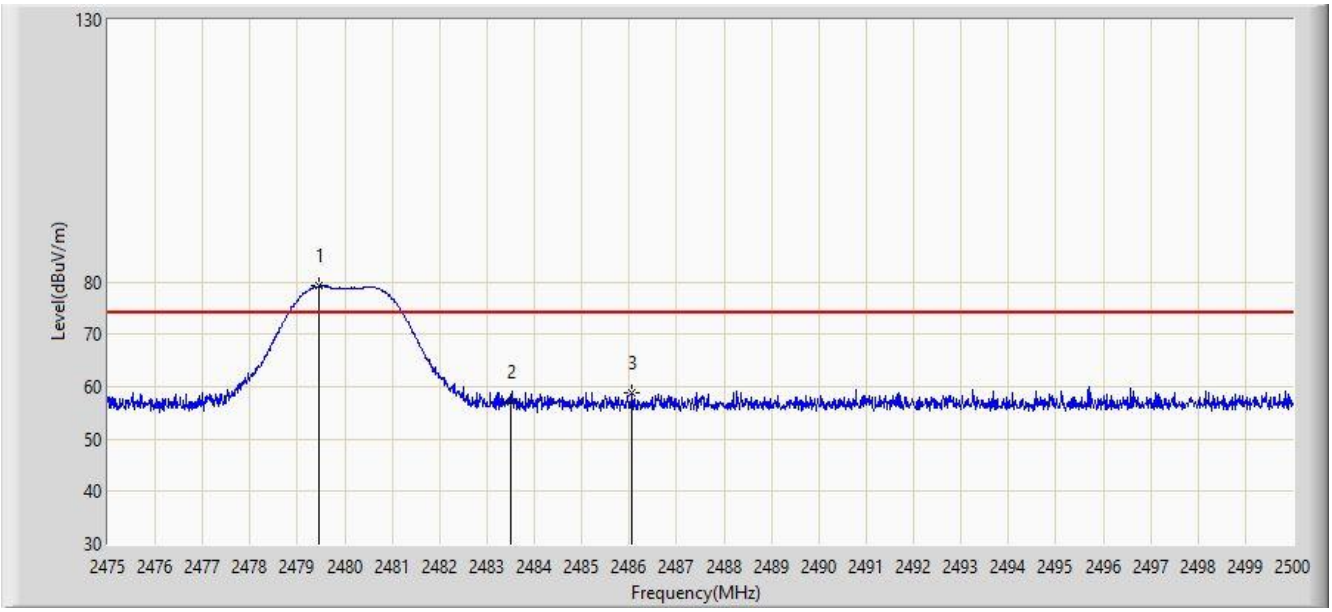


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.062	88.159	55.750	N/A	N/A	32.408	AV
2		2483.500	41.129	8.714	-12.871	54.000	32.416	AV

Note: Measure Level (dBµV/m) = Reading Level (dBµV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/07/17 - 22:55
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(2Mbps) at Channel 2480MHz	

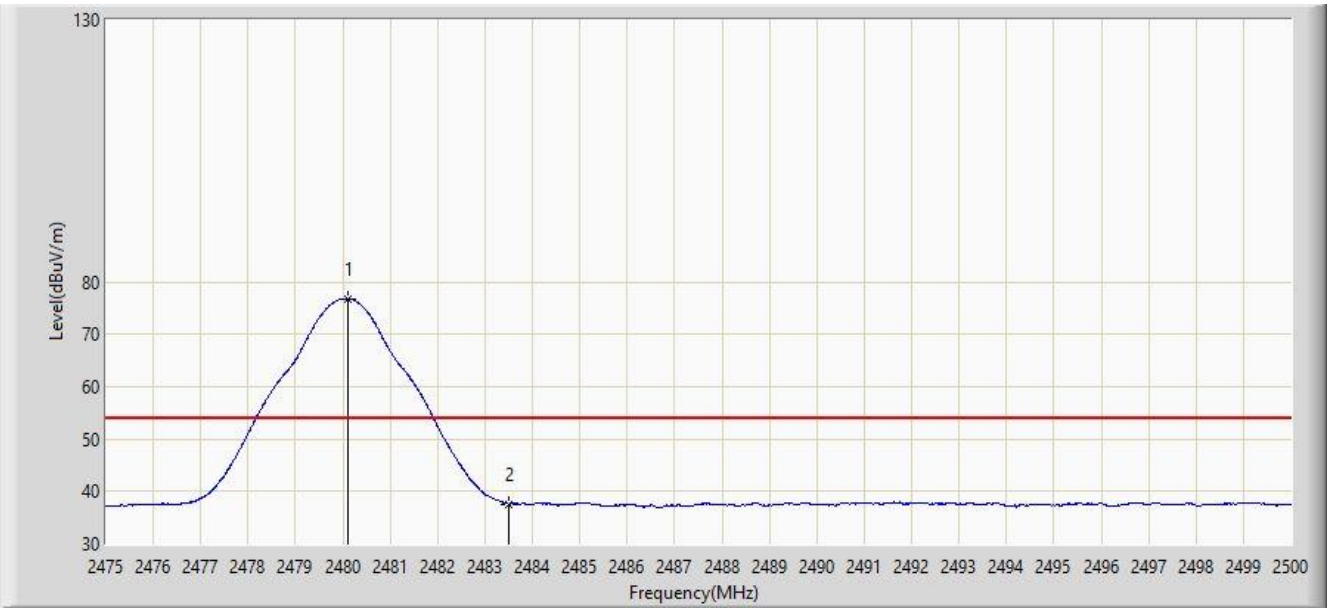


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2479.463	79.275	46.868	N/A	N/A	32.407	PK
2		2483.500	57.225	24.810	-16.775	74.000	32.416	PK
3		2486.050	58.676	26.256	-15.324	74.000	32.420	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2019/07/17 - 22:55
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: By USB
Test Mode: Transmit by Bluetooth-LE(2Mbps) at Channel 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.100	76.817	44.408	N/A	N/A	32.408	AV
2		2483.500	37.610	5.195	-16.390	54.000	32.416	AV

Note: Measure Level (dBµV/m) = Reading Level (dBµV) + Factor (dB)

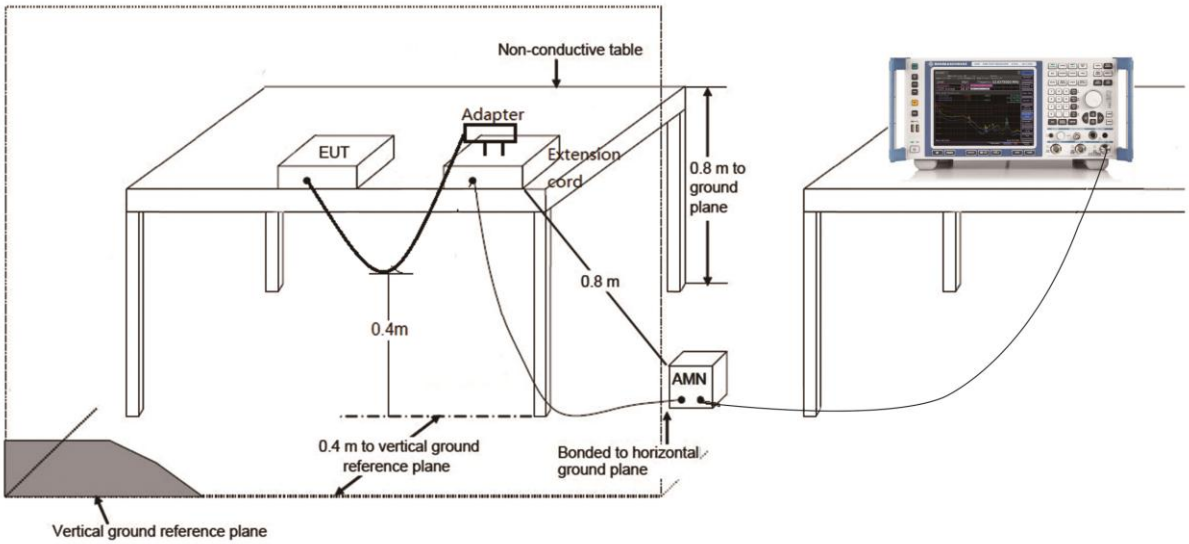
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

7.8. AC Conducted Emissions Measurement

7.8.1.Test Limit

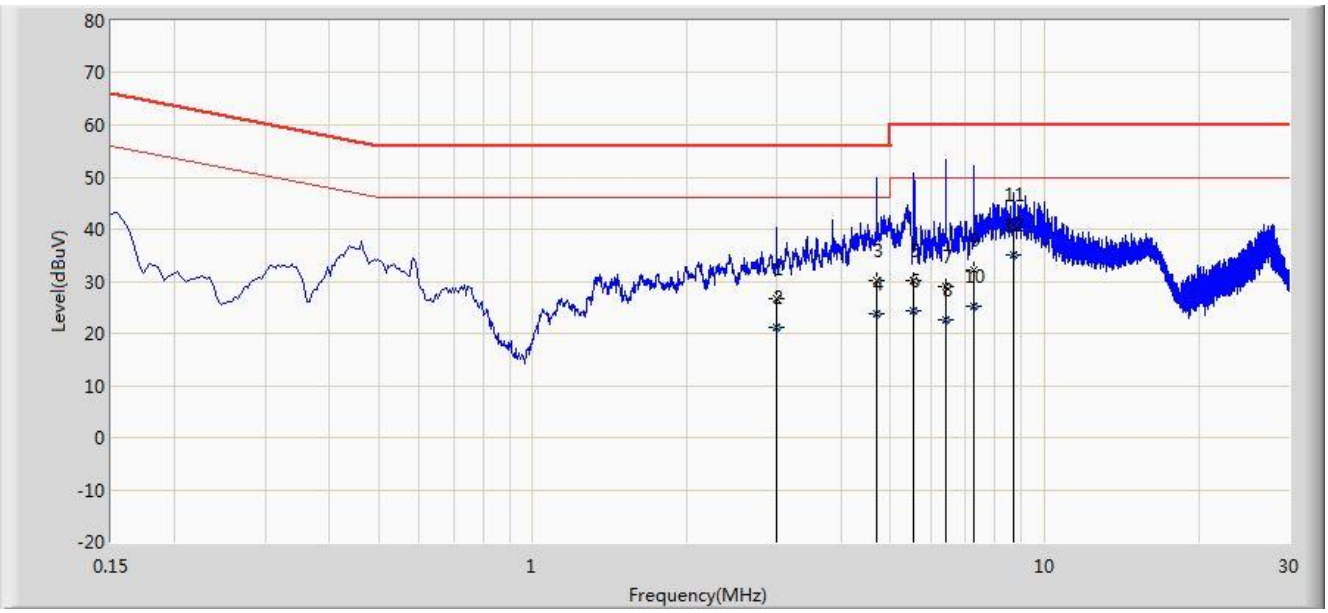
FCC Part 15.207 - Limits		
Frequency (MHz)	QP (dBμV)	Average (dBμV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50
Note 1: The lower limit shall apply at the transition frequencies. Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.		

7.8.2.Test Setup



7.8.3.Test Result

Site: SR2	Time: 2019/07/19 - 10:20
Limit: FCC_Part15.207_CE_AC Power	Engineer: Liz Yuan
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: AC 120V/60Hz
Test Mode: Transmit by Bluetooth-LE(1Mbps) at Channel 2402MHz	

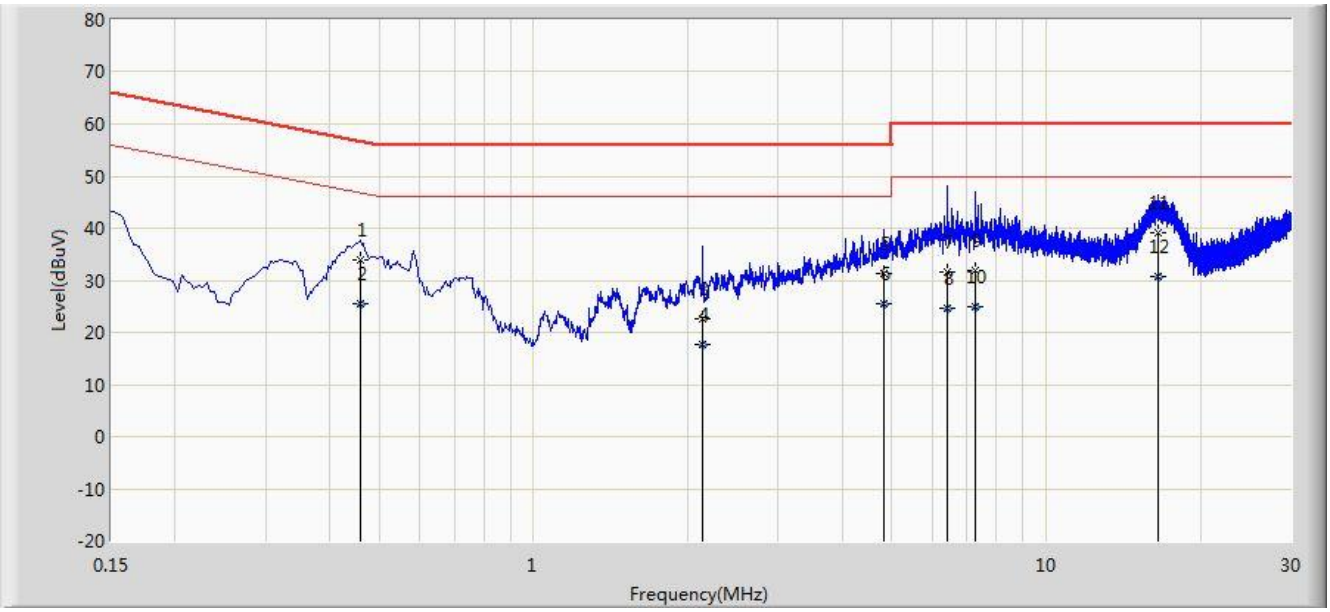


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor (dB)	Type
1			2.990	26.766	16.904	-29.234	56.000	9.862	QP
2			2.990	21.096	11.235	-24.904	46.000	9.862	AV
3			4.702	30.158	20.149	-25.842	56.000	10.009	QP
4			4.702	23.863	13.854	-22.137	46.000	10.009	AV
5			5.558	30.249	20.177	-29.751	60.000	10.072	QP
6			5.558	24.292	14.220	-25.708	50.000	10.072	AV
7			6.414	29.052	18.931	-30.948	60.000	10.121	QP
8			6.414	22.590	12.469	-27.410	50.000	10.121	AV
9			7.270	32.224	22.060	-27.776	60.000	10.164	QP
10			7.270	25.320	15.156	-24.680	50.000	10.164	AV
11			8.718	40.768	30.594	-19.232	60.000	10.174	QP
12		*	8.718	34.928	24.754	-15.072	50.000	10.174	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

Site: SR2	Time: 2019/07/19 - 10:36
Limit: FCC_Part15.207_CE_AC Power	Engineer: Liz Yuan
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: Flat Panel Integrated Satellite Communication Terminal	Power: AC 120V/60Hz
Test Mode: Transmit by Bluetooth-LE(1Mbps) at Channel 2402MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.458	33.963	23.808	-22.765	56.729	10.156	QP
2			0.458	25.437	15.281	-21.292	46.729	10.156	AV
3			2.138	22.557	12.687	-33.443	56.000	9.870	QP
4			2.138	17.748	7.878	-28.252	46.000	9.870	AV
5			4.826	31.297	21.262	-24.703	56.000	10.036	QP
6			4.826	25.398	15.363	-20.602	46.000	10.036	AV
7			6.414	31.734	21.601	-28.266	60.000	10.133	QP
8			6.414	24.721	14.587	-25.279	50.000	10.133	AV
9			7.270	31.971	21.793	-28.029	60.000	10.178	QP
10			7.270	24.885	14.707	-25.115	50.000	10.178	AV
11			16.534	39.059	28.938	-20.941	60.000	10.121	QP
12		*	16.534	30.657	20.536	-19.343	50.000	10.121	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

8. CONCLUSION

The data collected relate only the item(s) tested and show that the device is in compliance with Part 15C of the FCC rules.

The End

Appendix A - Test Setup Photograph

Refer to “1907RSU030-UT” file.

Appendix B - EUT Photograph

Refer to “1907RSU030-UE” file.