TECHNICAL REPORT

Report No.:	TW2104174E
File reference No.:	2021-06-05
Applicant:	Shenzhen Star Sources Electronic Technology Co., Ltd.
Product:	Dongle
Model No.:	ST-131D, HPX-KX700, KX700
Brand Name:	N/A
Test Standards:	FCC Part 15.249
Test result:	It is herewith confirmed and found to comply with the requirements set up by ANSI C63.10 &FCC Part 15 Subpart C, Paragraph 15.249 regulations for the evaluation of electromagnetic compatibility

Approved By

Jack Chung

Manager

Dated: June 05, 2021

Results appearing herein relate only to the sample tested
The technical reports is issued errors and omissions exempt and is subject to withdrawal at

SHENZHEN TIMEWAY TESTING LABORATORIES

Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China

Tel (755) 83448688, Fax (755) 83442996, E-Mail:info@timeway-lab.com

Special Statement:

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.

The testing quality system of our laboratory meet with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

CNAS-LAB Code: L2292

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of testing Laboratories.

FCC-Registration No.: 744189

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 744189.

Industry Canada (IC) —Registration No.:5205A

The EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 5205A.

A2LA (Certification Number:5013.01)

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA). Certification Number:5013.01

Test Report Conclusion

Content

1.0 General Details

1.1 Test Lab Details

Name : SHENZHEN TIMEWAY TESTING LABORATORIES.

Address: Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China

Telephone: (755) 83448688

Fax: (755) 83442996

Site on File with the Federal Communications Commission – United Sates

Registration Number: 744189

For 3m Anechoic Chamber

1.2 Applicant Details

Applicant: Shenzhen Star Sources Electronic Technology Co., Ltd.

Address: Room 1102, Block 1 st, Yi Luan Building, Xixiang Road 230, BaoAn District, Shenzhen, China

Telephone: +86-755-86397260

Fax: +86-755-26609516

1.3 Description of EUT

Product: Dongle

Manufacturer: Shenzhen Star Sources Electronic Technology Co., Ltd.

Address: Room 1102, Block 1 st, Yi Luan Building, Xixiang Road 230, BaoAn District, Shenzhen, China

Brand Name: N/A

Model Number: ST-131D

Additional Model Name HPX-KX700, KX700

Hardware Version: V1.1

Software Version: V1.1

Serial No.: ST131D2021050800003

Rating: DC5.0V, from USB port

Modulation Type: GFSK

Operation Frequency: 2405-2475MHz

Channel Number: 8

Channel List:

Channel	1	2	3	4
Frequency (MHz)	2405	2411	2417	2451
Channel	5	6	7	8
Frequency (MHz)	2457	2463	2469	2475

Antenna Designation	PCB antenna with gain -1.66dBi Max (Get from the antenna specification provided by the applicant)

1.4 Submitted Sample: 1 Sample

1.5 Test Duration

2021-04-13 to 2021-06-04

1.6 Test Uncertainty

Conducted Emissions Uncertainty =3.6dB

Radiated Emissions below 1GHz Uncertainty =4.7dB

Radiated Emissions above 1GHz Uncertainty =6.0dB

Conducted Power Uncertainty =6.0dB

Occupied Channel Bandwidth Uncertainty =5%

Conducted Emissions Uncertainty =3.6dB

Note: The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

1.7 Test Engineer

The sample tested by

Print Name: Terry Tang

2.0 Test Equipment					
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	R&S	ESPI 3	100379	2020-06-23	2021-06-22
LISN	R&S	EZH3-Z5	100294	2020-06-23	2021-06-22
LISN	R&S	EZH3-Z5	100253	2020-06-23	2021-06-22
Impuls-Begrenzer	R&S	ESH3-Z2	100281	2020-06-23	2021-06-22
Loop Antenna	EMCO	6507	00078608	2018-06-25	2021-06-24
Spectrum	R&S	FSIQ26	100292	2020-06-23	2021-06-22
Horn Antenna	A-INFO	LB-180400-KF	J211060660	2020-06-23	2021-06-22
Horn Antenna	R&S	BBHA 9120D	9120D-631	2018-07-09	2021-07-08
Power meter	Anritsu	ML2487A	6K00003613	2020-06-23	2021-06-22
Power sensor	Anritsu	MA2491A	32263	2020-06-23	2021-06-22
Bilog Antenna	Schwarebeck	VULB9163	9163/340	2018-07-04	2021-07-03
9*6*6 Anechoic	--	--	N/A	2020-07-06	2021-07-05
EMI Test Receiver	RS	ESVB	826156/011	2020-06-23	2021-06-22
EMI Test Receiver	RS	ESH3	860904/006	2020-06-23	2021-06-22
Spectrum	HP/Agilent	ESA-L1500A	US37451154	2020-06-23	2021-06-22
Spectrum	HP/Agilent	E4407B	MY50441392	2020-06-23	2021-06-22
Spectrum	RS	FSP	1164.4391.38	2021-01-16	2022-01-15
RF Cable	Zhengdi	ZT26-NJ-NJ-8M /FA	--	2020-06-23	2021-06-22
RF Cable	Zhengdi	7m	--	2020-06-23	2021-06-22
RF Switch	EM	EMSW18	060391	2020-06-23	2021-06-22
Pre-Amplifier	Schwarebeck	BBV9743	#218	2020-06-23	2021-06-22
Pre-Amplifier	HP/Agilent	8449B	3008A00160	2020-06-23	2021-06-22
LISN	SCHAFFNER	NNB42	00012	2021-01-07	2022-01-06

2.2 Automation Test Software

For Conducted Emission Test

Name	Version
EZ-EMC	Ver.EMC-CON 3A1.1

For Radiated Emissions

Name	Version
EMI Test Software BL410-EV18.91	V18.905
EMI Test Software BL410-EV18.806 High Frequency	V18.06

3.0 Technical Details

3.1 Summary of test results

The EUT has been tested according to the following specifications:

Standard	Test Type	Result	Notes
FCC Part 15, Paragraph 15.207	Conducted Emission Test	PASS	Complies
FCC Part 15 Subpart C Paragraph 15.249(a) & 15.249(b) Limit	Field Strength of Fundamental	PASS	Complies
FCC Part 15, Paragraph 15.209	Radiated Emission Test	PASS	Complies
FCC Part 15 Subpart C Paragraph 15.249(d) Limit	Band Edge Test	PASS	Complies

3.2 Test Standards

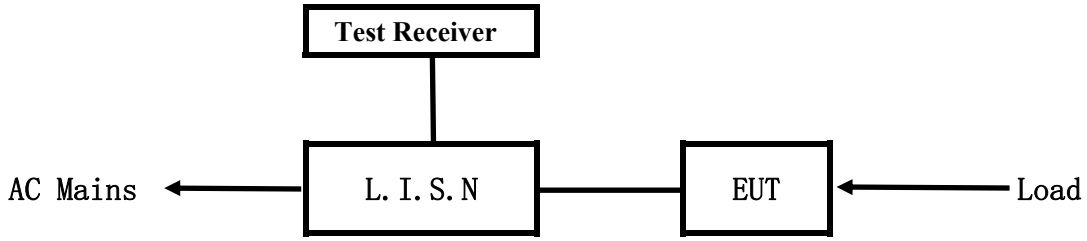
FCC Part 15 Subpart C, Paragraph 15.249 , ANSI C63.4 :2014 and ANSI C63.10 :2013

4.0 EUT Modification

No modification by SHENZHEN TIMEWAY TESTING LABORATORIES

5. Power Line Conducted Emission Test

5.1 Schematics of the test

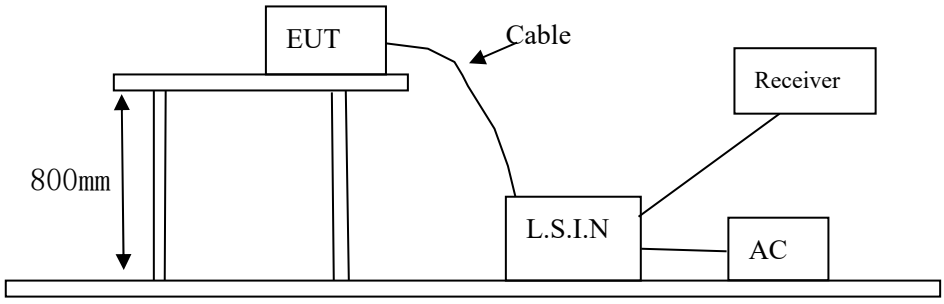


EUT: Equipment Under Test

5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2013.The Frequency spectrum From 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.10 –2013.

Block diagram of Test setup



5.3 Configuration of The EUT

The EUT was configured according to ANSI C63.10-2013. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

One channels are provided to the EUT

A. EUT

Device	Manufacturer	Model	FCC ID
Dongle	Shenzhen Star Sources Electronic Technology Co., Ltd.	ST-131D, HPX-KX700, KX700	ZJE-ST131D

B. Internal Device

Device	Manufacturer	Model	FCC ID/DOC
N/A			

C. Peripherals

Device	Manufacturer	Model	Rating
N/A			

5.4 EUT Operating Condition

Operating condition is according to ANSI C63.10-2013

A Setup the EUT and simulators as shown on follow

B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit according to Paragraph 15.207

Frequency (MHz)	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ～ 0.50	66.0～56.0*	56.0～46.0*
0.50 ～ 5.00	56.0	46.0
5.00 ～ 30.00	60.0	50.0

Notes: 1. *Decreasing linearly with logarithm of frequency.

2. The tighter limit shall apply at the transition frequencies

5.6 Test Results:

Pass

A: Conducted Emission on Live Terminal (150kHz to 30MHz)

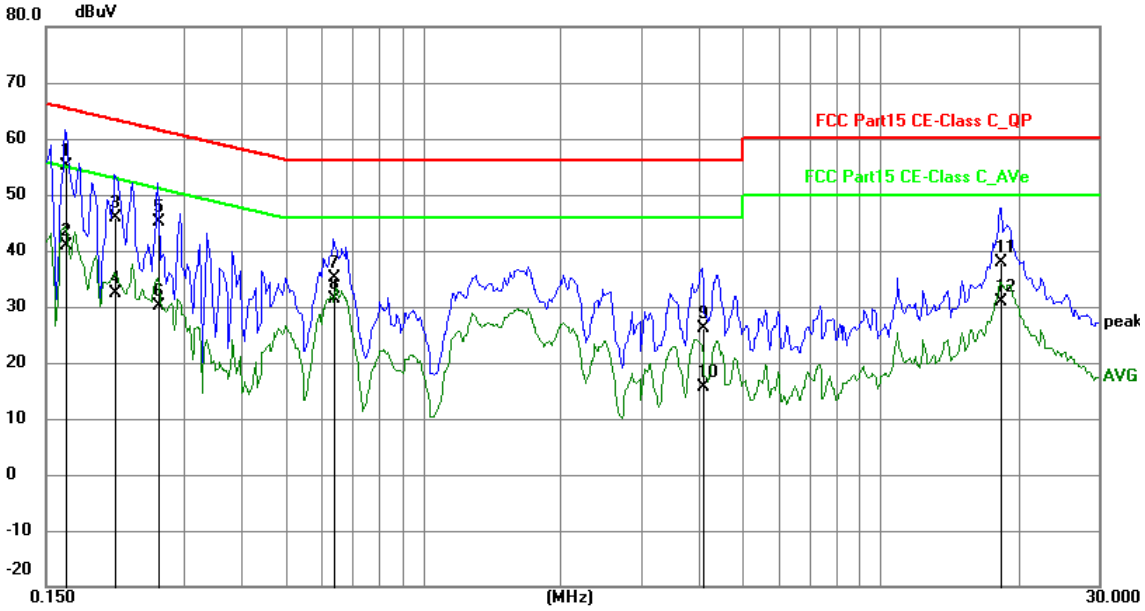
EUT Operating Environment

Temperature: 25℃ Humidity: 65%RH Atmospheric Pressure: 101 kPa

EUT set Condition: Keep Transmitting

Results: Pass

Please refer to following diagram for individual



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1655	45.26	9.77	55.03	65.18	-10.15	QP	P
2	0.1655	31.23	9.77	41.00	55.18	-14.18	AVG	P
3	0.2124	36.24	9.75	45.99	63.11	-17.12	QP	P
4	0.2124	22.65	9.75	32.40	53.11	-20.71	AVG	P
5	0.2631	35.26	9.75	45.01	61.33	-16.32	QP	P
6	0.2631	20.35	9.75	30.10	51.33	-21.23	AVG	P
7	0.6375	25.44	9.78	35.22	56.00	-20.78	QP	P
8	0.6375	21.64	9.78	31.42	46.00	-14.58	AVG	P
9	4.0764	16.32	9.89	26.21	56.00	-29.79	QP	P
10	4.0764	5.64	9.89	15.53	46.00	-30.47	AVG	P
11	18.3270	27.35	10.58	37.93	60.00	-22.07	QP	P
12	18.3270	20.33	10.58	30.91	50.00	-19.09	AVG	P

B: Conducted Emission on Neutral Terminal (150kHz to 30MHz)

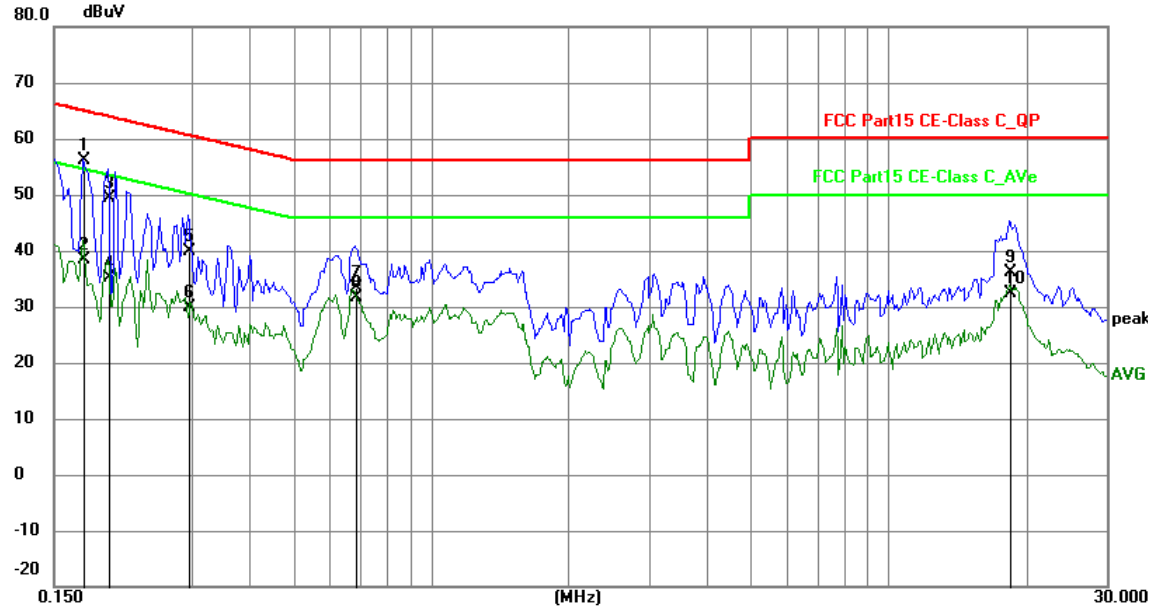
EUT Operating Environment

Temperature: 25℃ Humidity: 65%RH Atmospheric Pressure: 101 kPa

EUT set Condition: Keep Transmitting

Results: Pass

Please refer to following diagram for individual



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1734	46.31	9.77	56.08	64.80	-8.72	QP	P
2	0.1734	28.58	9.77	38.35	54.80	-16.45	AVG	P
3	0.1968	39.61	9.75	49.36	63.74	-14.38	QP	P
4	0.1968	25.36	9.75	35.11	53.74	-18.63	AVG	P
5	0.2943	30.01	9.76	39.77	60.40	-20.63	QP	P
6	0.2943	20.22	9.76	29.98	50.40	-20.42	AVG	P
7	0.6843	23.65	9.78	33.43	56.00	-22.57	QP	P
8	0.6843	21.85	9.78	31.63	46.00	-14.37	AVG	P
9	18.4050	25.61	10.58	36.19	60.00	-23.81	QP	P
10	18.4050	21.88	10.58	32.46	50.00	-17.54	AVG	P

6 Radiated Emission Test

6.1 Test Method and test Procedure:

(1) The EUT was tested according to ANSI C63.10-2013. The radiated test was performed at Timeway EMC Laboratory. This site is on file with the FCC laboratory division, Registration No. 744189

(2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2013.

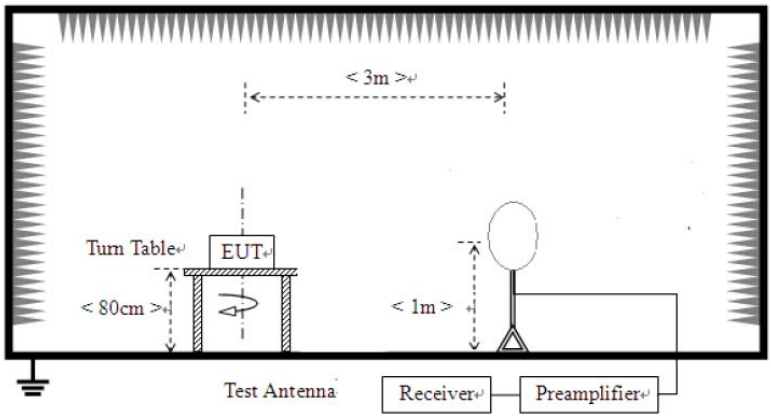
(3) The frequency spectrum from 30 MHz to 25 GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz. All readings are above 1 GHz, peak values with a resolution bandwidth of 1 MHz (Note: for Fundamental frequency radiated emission measurement, RBW=10MHz, VBW=10MHz). Measurements were made at 3 meters.

(4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.

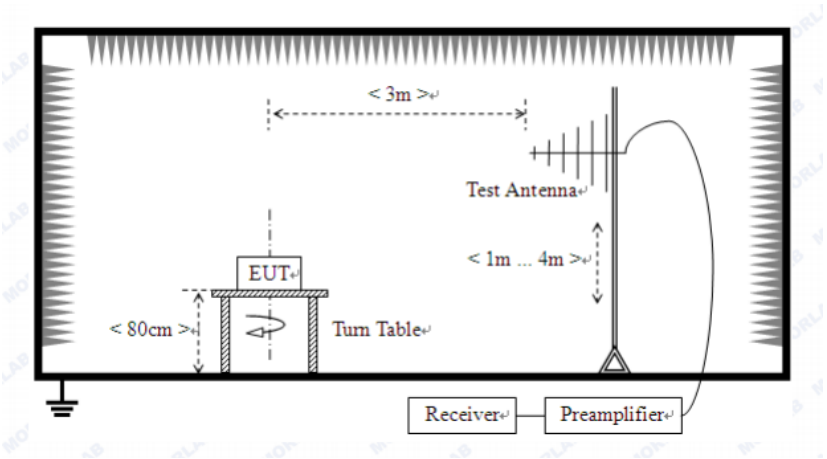
(5) The antenna polarization: Vertical polarization and Horizontal polarization.

Block diagram of Test setup

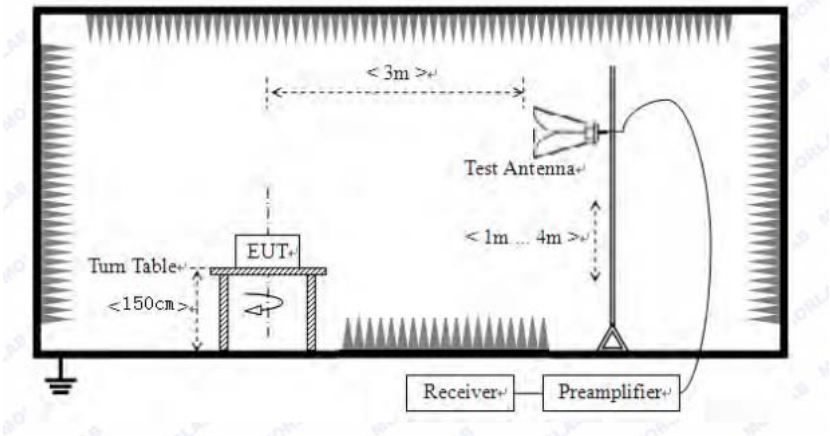
For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30MHz to1GHz



For radiated emissions above 1GHz



6.2 Configuration of The EUT

Same as section 5.3 of this report

6.3 EUT Operating Condition

Same as section 5.4 of this report.

6.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

A FCC Part 15 Subpart C Paragraph 15.249(a) Limit

Fundamental Frequency (MHz)	Field Strength of Fundamental (3m)			Field Strength of Harmonics (3m)		
	mV/m	**dBuV/m**		**uV/m**	**dBuV/m**	
2400-2483.5	50	94 (Average)	114 (Peak)	500	54 (Average)	74 (Peak)

Note: 1. RF Field Strength (dBuV) = 20 log RF Voltage (uV)

2.Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

B. Frequencies in restricted band are complied to limit on Paragraph 15.209.

Frequency Range (MHz)	Distance (m)	Field strength (dB μ V/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note: 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)

2. In the Above Table, the tighter limit applies at the band edges.

3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT

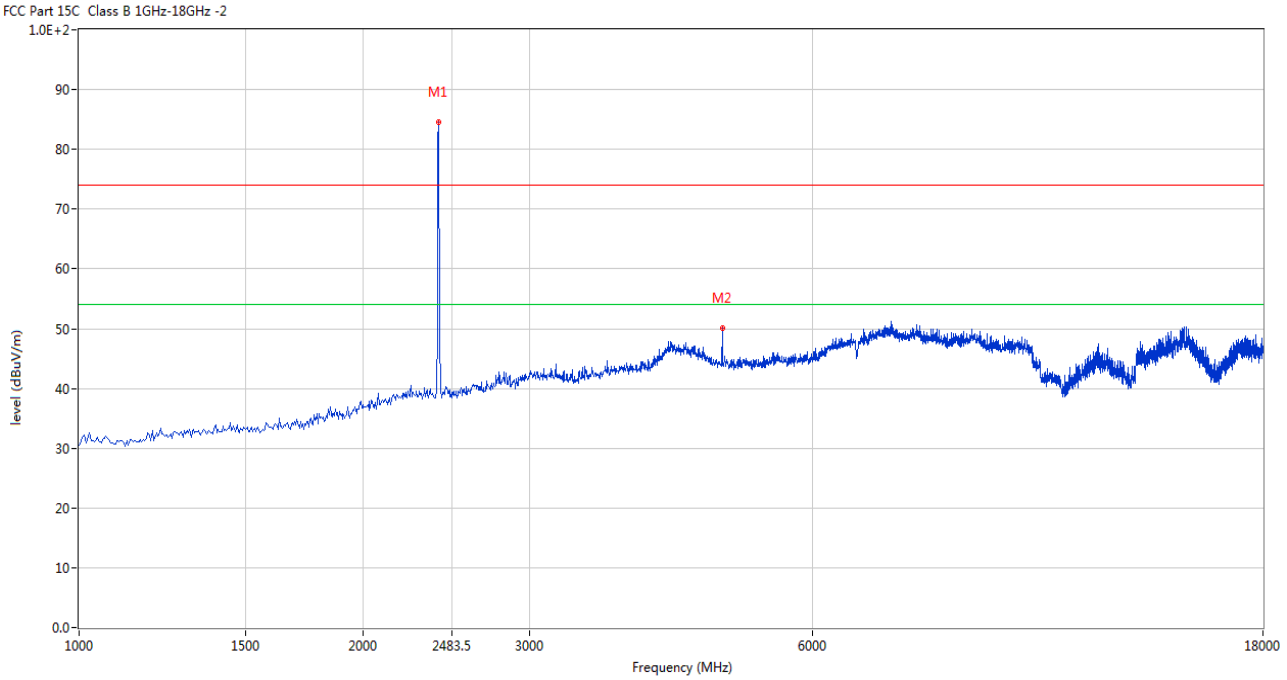
4. All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30-1000MHz.As to 1G-25G, the final emission level got using PK. For fundamental measurement, PK detector used.

6.5 Test result

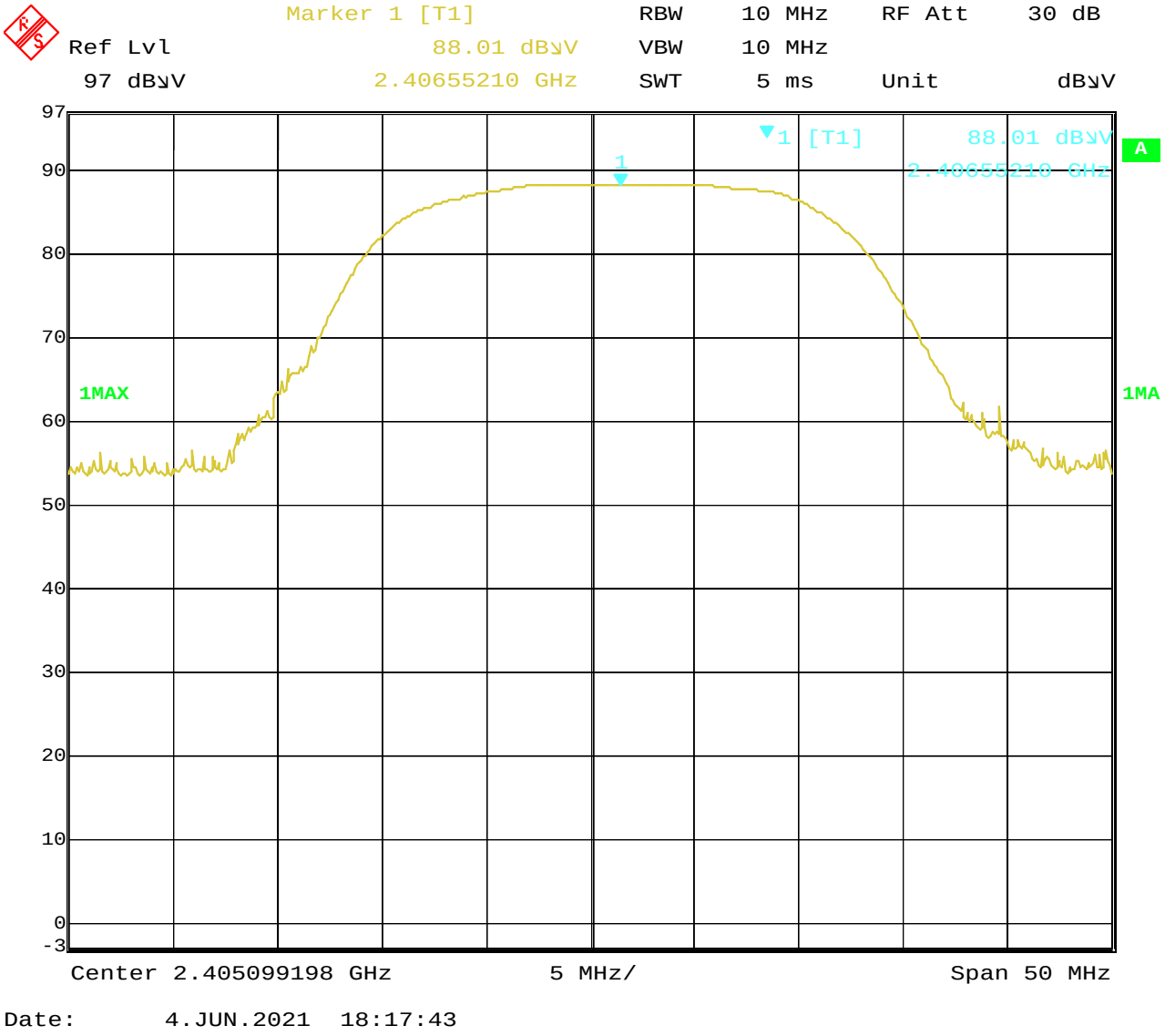
A Fundamental & Harmonics Radiated Emission Data

Please refer to the following test plots for details: Low Channel-2405MHz

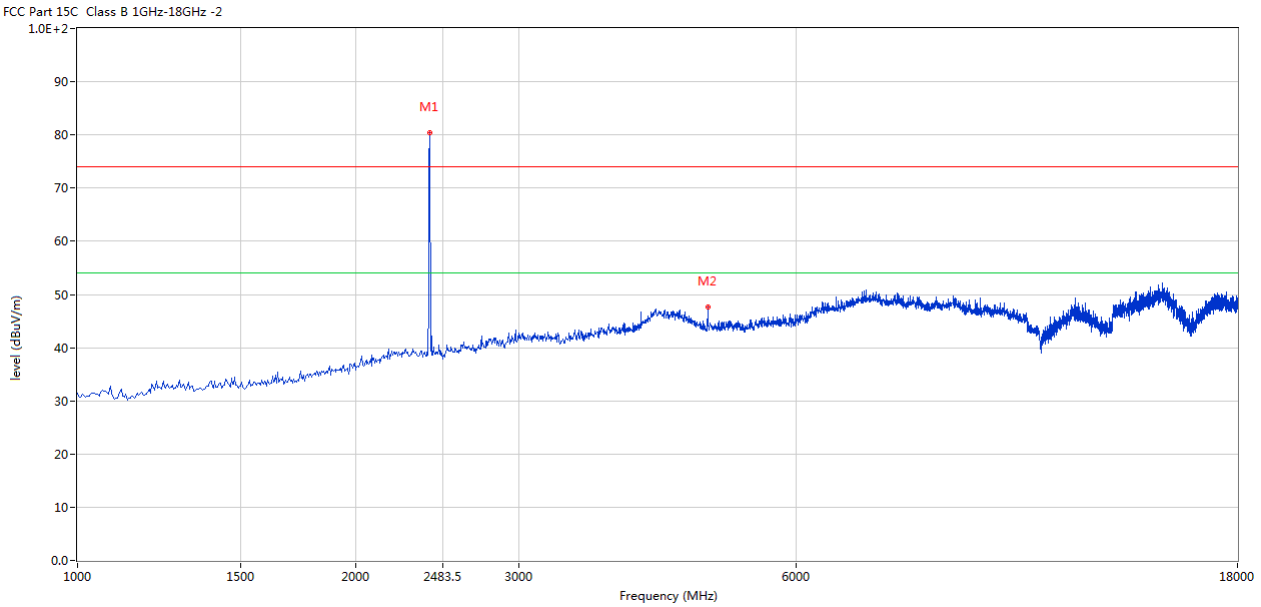
Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2406.398	84.44	-3.57	114.0	-29.56	Peak	217.00	100	Horizontal	Pass
2	4807.048	50.12	3.13	74.0	-23.88	Peak	195.00	100	Horizontal	Pass



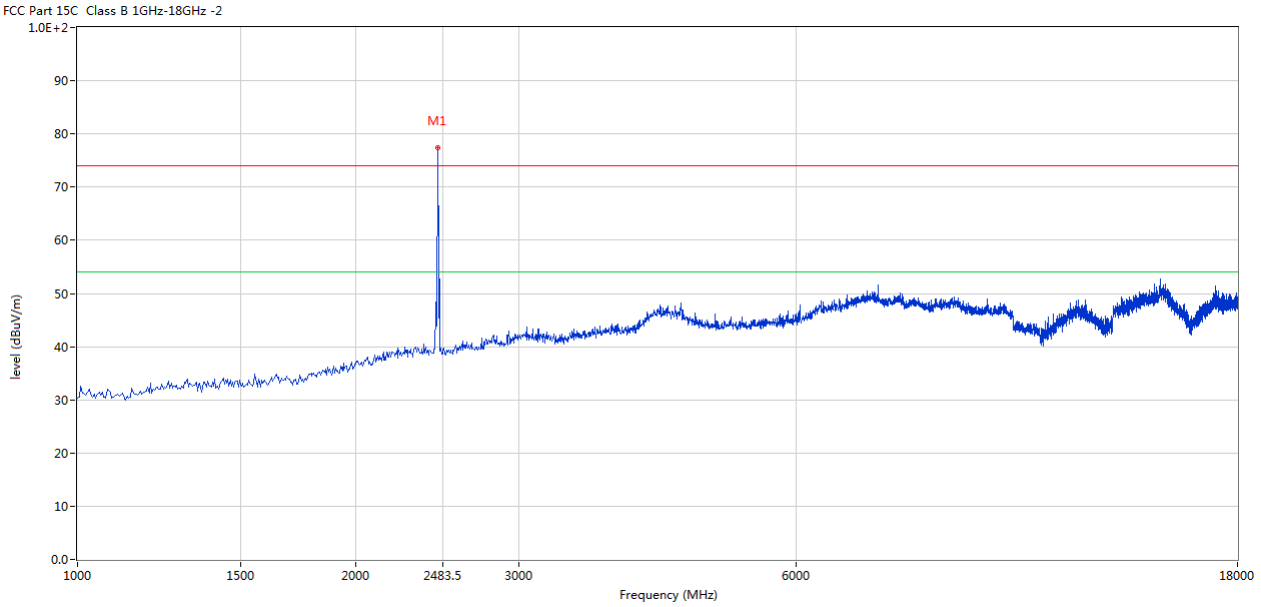
Vertical



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2406.398	80.35	-3.57	114.0	-33.65	Peak	118.00	100	Vertical	Pass
2	4807.048	47.63	3.13	74.0	-26.37	Peak	60.00	100	Vertical	Pass

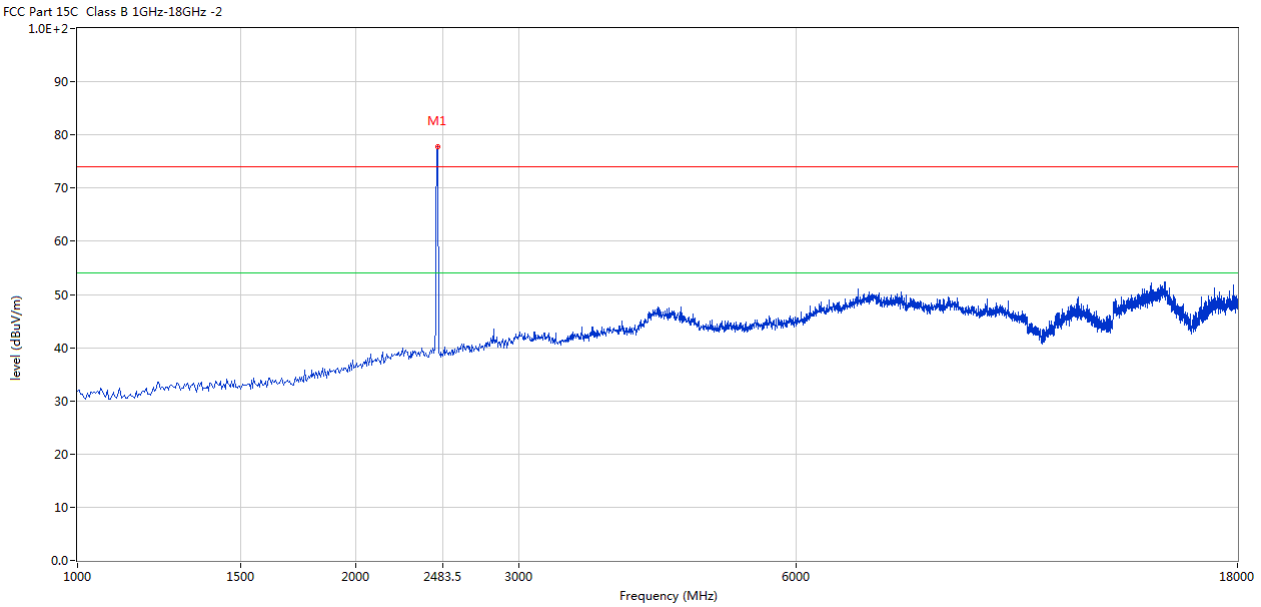
Please refer to the following test plots for details: Middle Channel-2451MHz

Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2453.137	77.48	-3.57	74.0	-36.52	Peak	287.00	100	Horizontal	Pass

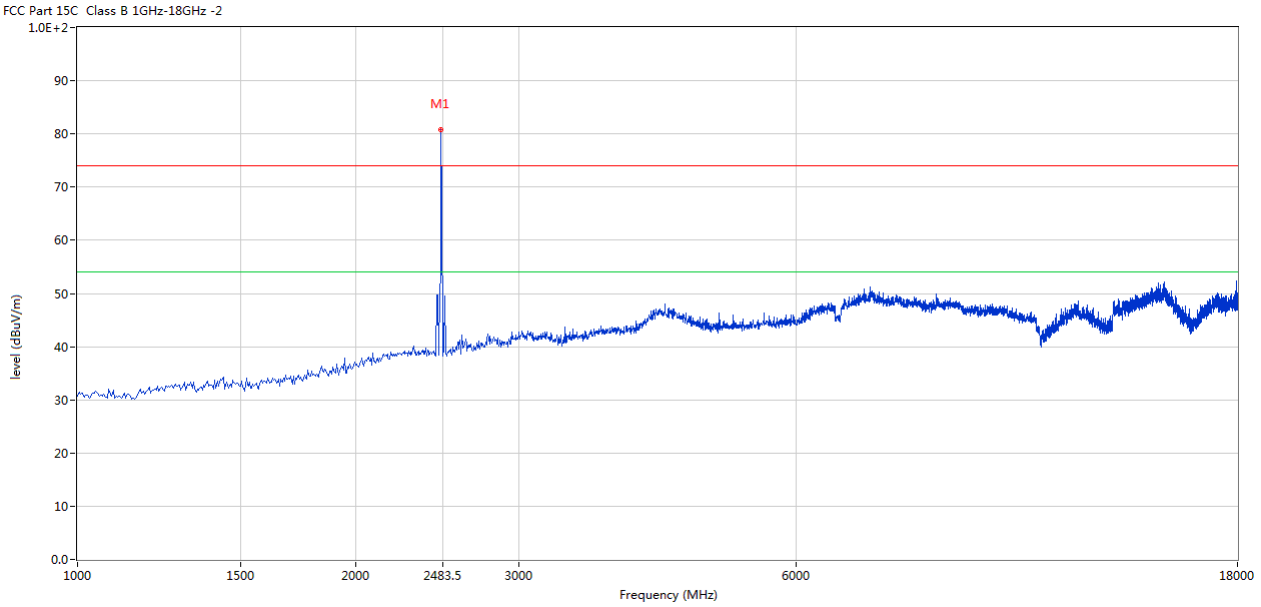
Vertical



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2453.137	77.69	-3.57	114.0	-36.31	Peak	147.00	100	Vertical	Pass

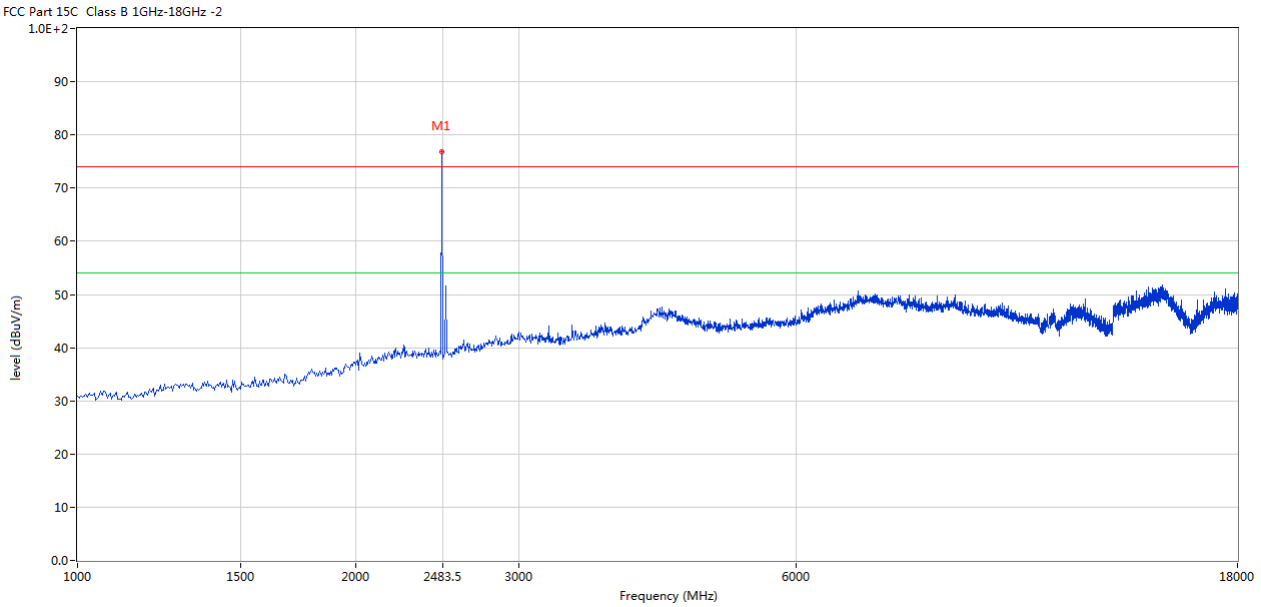
Please refer to the following test plots for details: High Channel-2475MHz

Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2474.381	80.75	-3.57	114.0	-33.25	Peak	208.00	100	Horizontal	Pass

Vertical



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	2478.630	76.91	-3.57	114.0	-37.09	Peak	218.00	100	Vertical	Pass

Note: (2) Emission Level = Reading Level + Antenna Factor + Cable Loss-Amplifier

(3) Margin=Emission-Limits

(4) According to section 15.35(b), the peak limit is 20dB higher than the average limit

(5) For test purpose, keep EUT continuous transmitting

(5) For emission above 18GHz and Below 30MHz, It is only the floor noise. No necessary to take down.

(6) the measured PK value less than the AV limit.

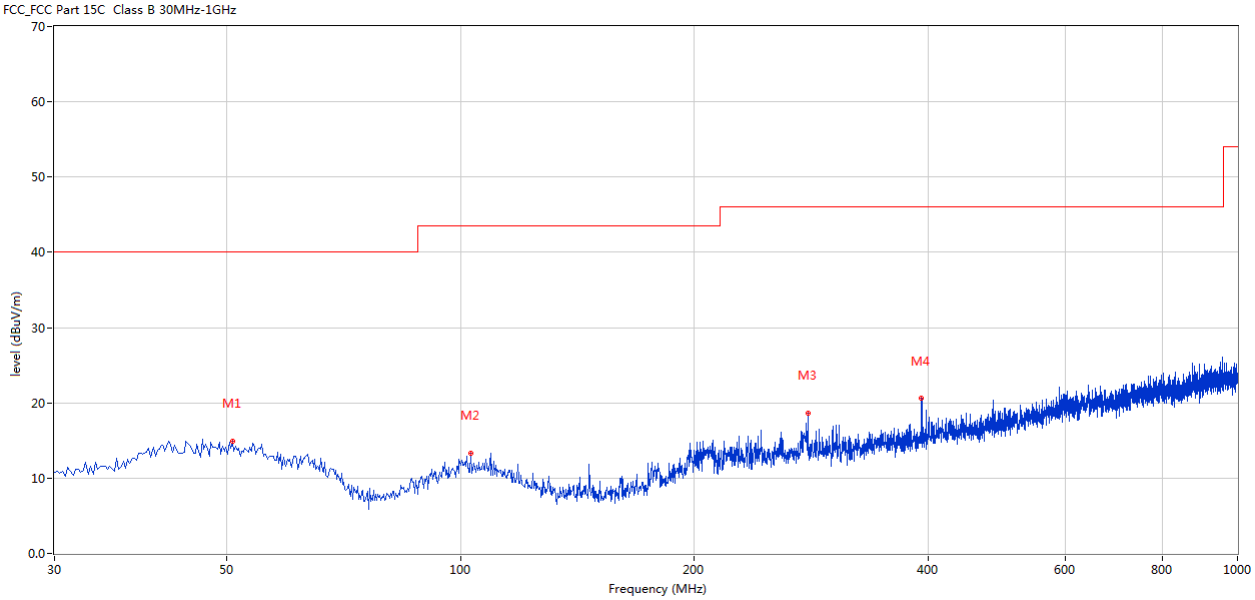
B. **General Radiated Emission Data**

Radiated Emission In Horizontal (30MHz----1000MHz)

EUT set Condition: Keep Tx transmitting

Results: Pass

Please refer to following diagram for individual



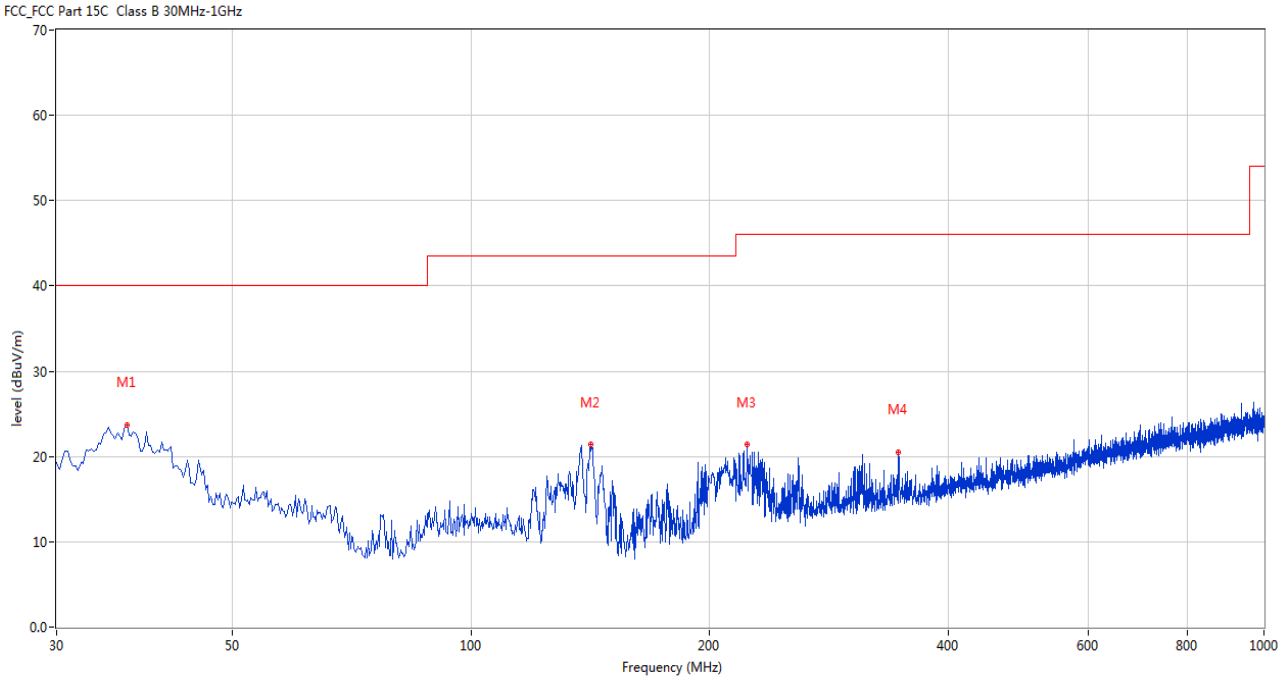
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	50.850	14.93	-11.40	40.0	-25.07	Peak	318.00	100	Horizontal	Pass
2	102.974	13.37	-13.38	43.5	-30.13	Peak	303.00	100	Horizontal	Pass
3	279.955	18.64	-11.50	46.0	-27.36	Peak	295.00	100	Horizontal	Pass
4	392.204	20.61	-8.91	46.0	-25.39	Peak	341.00	100	Horizontal	Pass

Radiated Emission In Vertical (30MHz----1000MHz)

EUT set Condition: Keep Tx transmitting

Results: Pass

Please refer to following diagram for individual



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	36.788	23.71	-13.31	40.0	-16.29	Peak	19.00	100	Vertical	Pass
2	141.765	21.37	-17.29	43.5	-22.13	Peak	143.00	100	Vertical	Pass
3	222.982	21.41	-13.18	46.0	-24.59	Peak	81.00	100	Vertical	Pass
4	345.414	20.56	-9.50	46.0	-25.44	Peak	104.00	100	Vertical	Pass

7. Band Edge

7.1 Test Method and test Procedure:

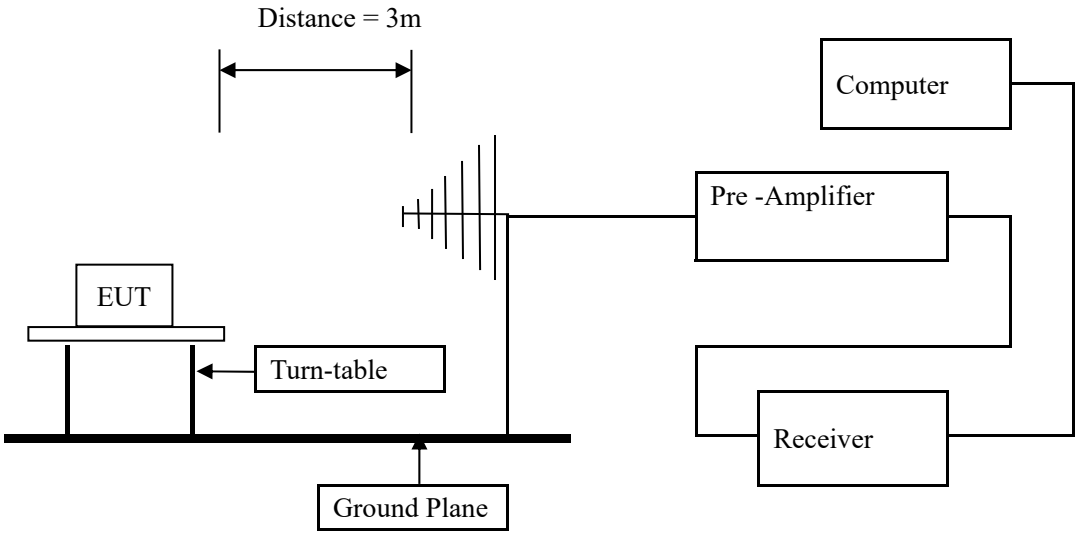
(1) The EUT was tested according to ANSI C63.10–2013. The radiated test was performed at Timeway EMC Laboratory. This site is on file with the FCC laboratory division, Registration No. 744189

(2) Set Spectrum as RBW=1MHz, VBW=3MHz and Peak detector used for PK value. RBW=1MHz, VBW=10Hz and Peak detector used for AV value.

(3) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.

(4) The antenna polarization: Vertical polarization and Horizontal polarization.

7. 2 Radiated Test Setup



For the actual test configuration , please refer to the related items – Photos of Testing

7.3 Configuration of The EUT

Same as section 5.3 of this report

7.4 EUT Operating Condition

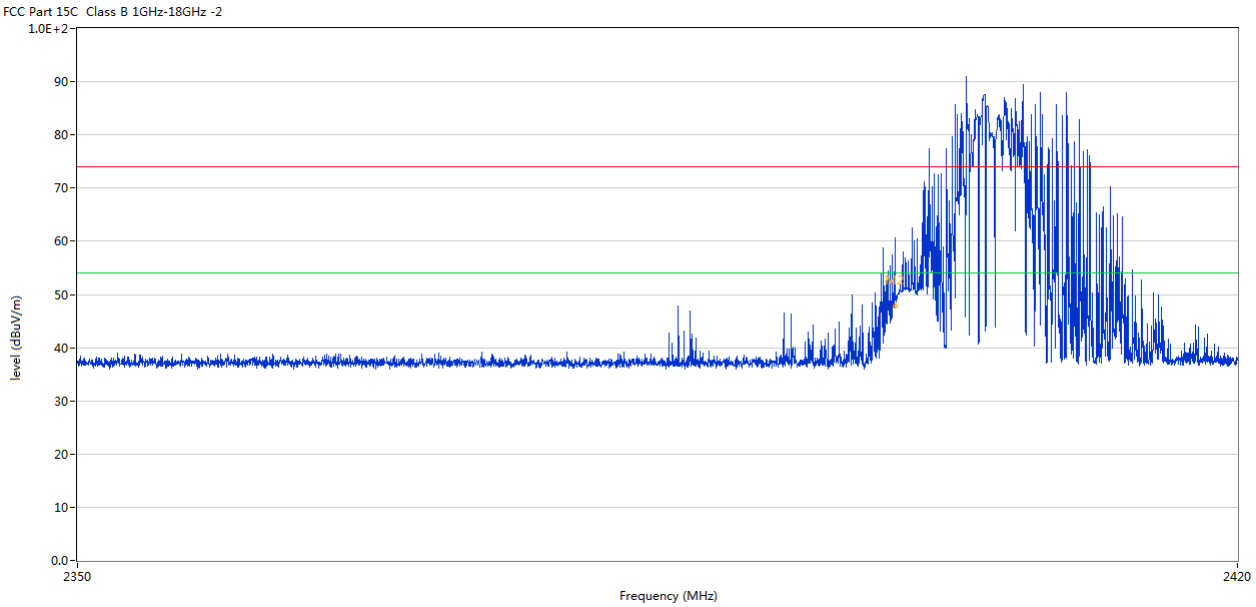
Same as section 5.4 of this report.

7.5 Band Edge Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

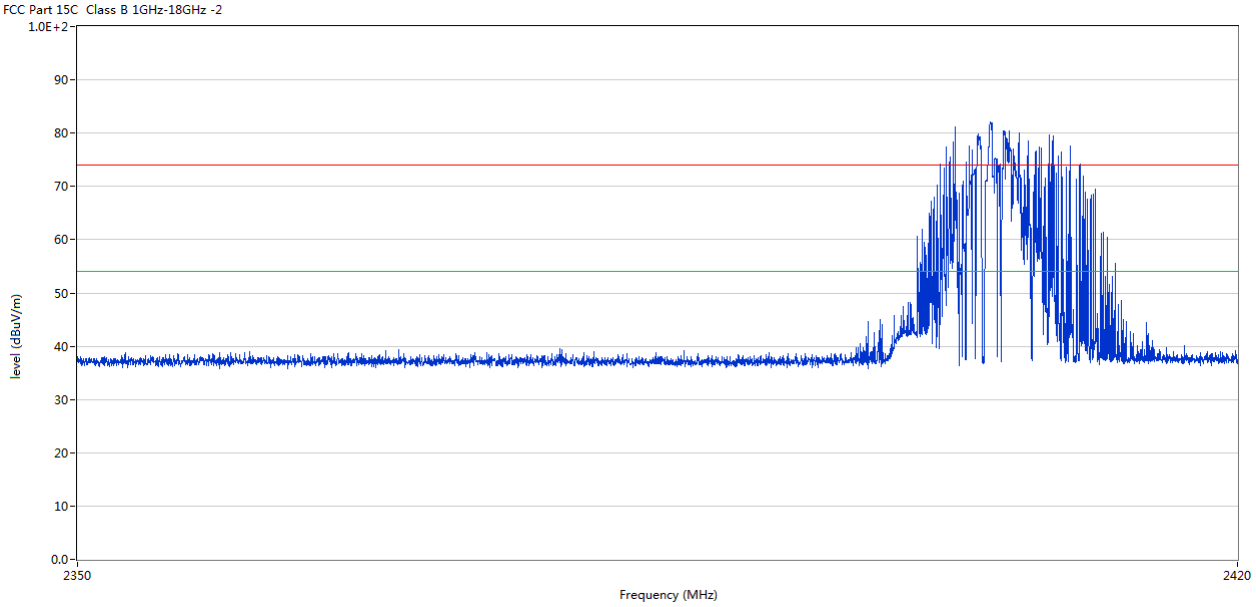
7.6 Test Result

Product:	Dongle	Polarity	Horizontal
Mode	Keeping Transmitting	Test Voltage	DC5.0V
Temperature	24 deg. C,	Humidity	56% RH
Test Result:	Pass	--	--



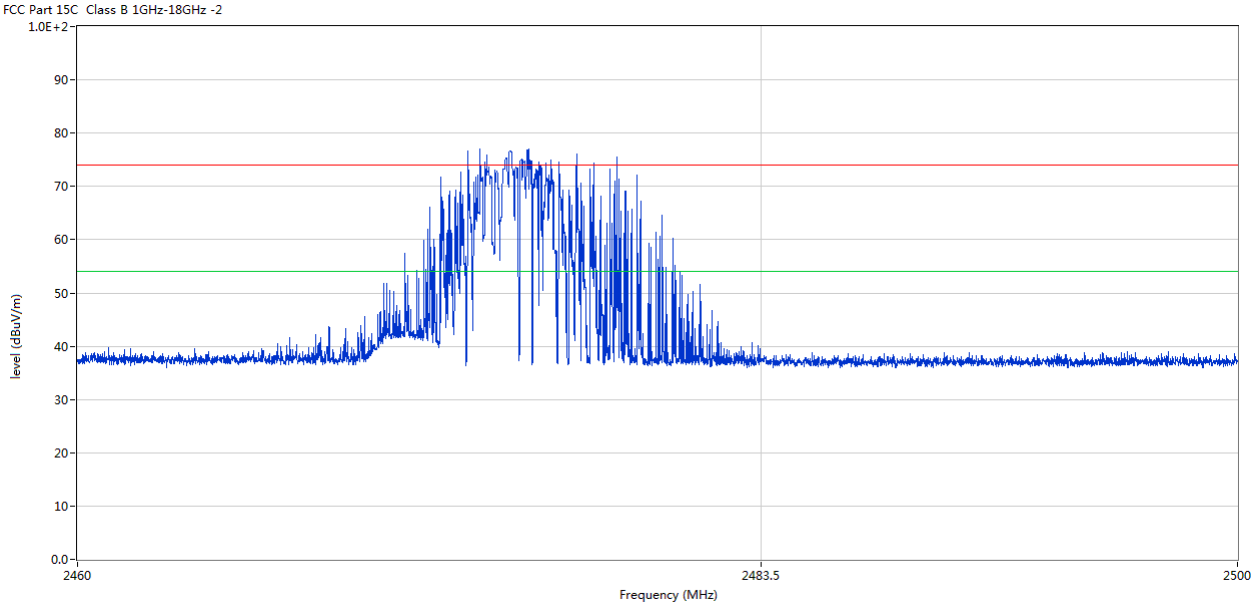
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
2	2399.110	60.61	-3.56	74.0	-13.39	Peak	317.00	100	Horizontal	Pass
2**	2399.110	47.81	-3.56	54.0	-6.19	AV	317.00	100	Horizontal	Pass
3	2389.960	38.59	-3.53	74.0	-35.41	Peak	170.00	100	Horizontal	Pass

Product:	Dongle	Detector	Vertical
Mode	Keeping Transmitting	Test Voltage	DC5.0V
Temperature	24 deg. C,	Humidity	56% RH
Test Result:	Pass	--	--



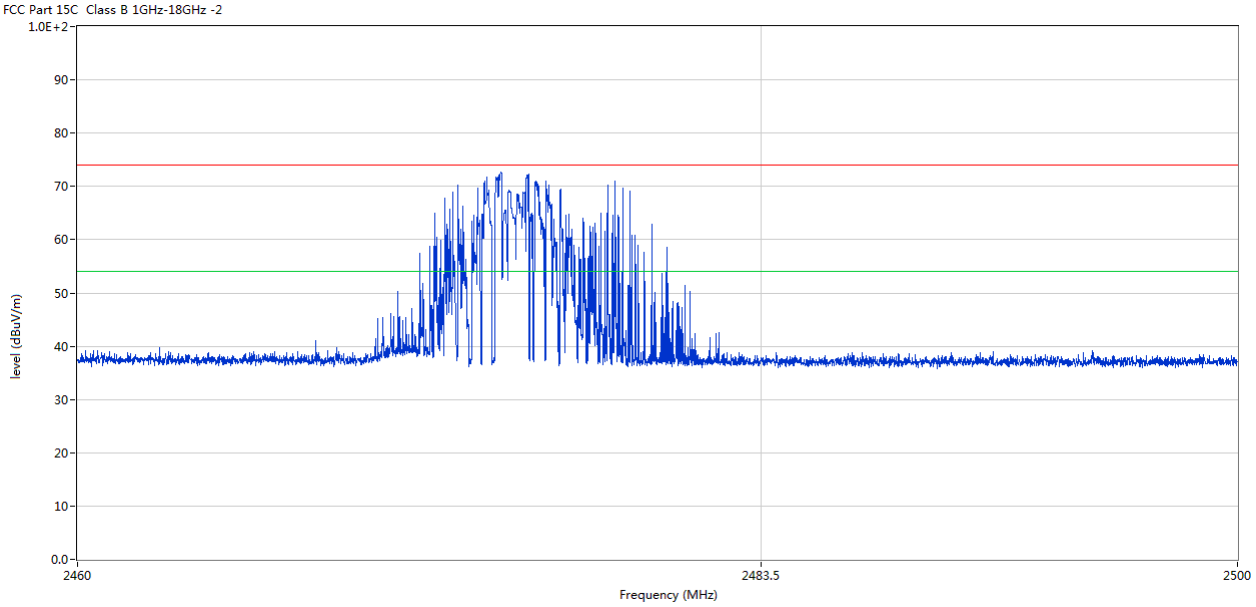
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
2	2399.635	47.49	-3.57	74.0	-26.51	Peak	329.00	100	Vertical	Pass
3	2391.465	38.87	-3.54	74.0	-35.13	Peak	10.00	100	Vertical	Pass

Product:	Dongle	Polarity	Horizontal
Mode	Keeping Transmitting	Test Voltage	DC5.0V
Temperature	24 deg. C,	Humidity	56% RH
Test Result:	Pass	--	--



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
2	2483.404	40.20	-3.57	74.0	-33.80	Peak	259.00	100	Horizontal	Pass

Product:	Dongle	Detector	Vertical
Mode	Keeping Transmitting	Test Voltage	DC5.0V
Temperature	24 deg. C,	Humidity	56% RH
Test Result:	Pass	--	--



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
2	2483.424	38.74	-3.57	74.0	-35.26	Peak	289.00	100	Vertical	Pass

Note: 1. The PK emission level less than the AV limit. No necessary to record the AV emission level.

8.0 Antenna Requirement

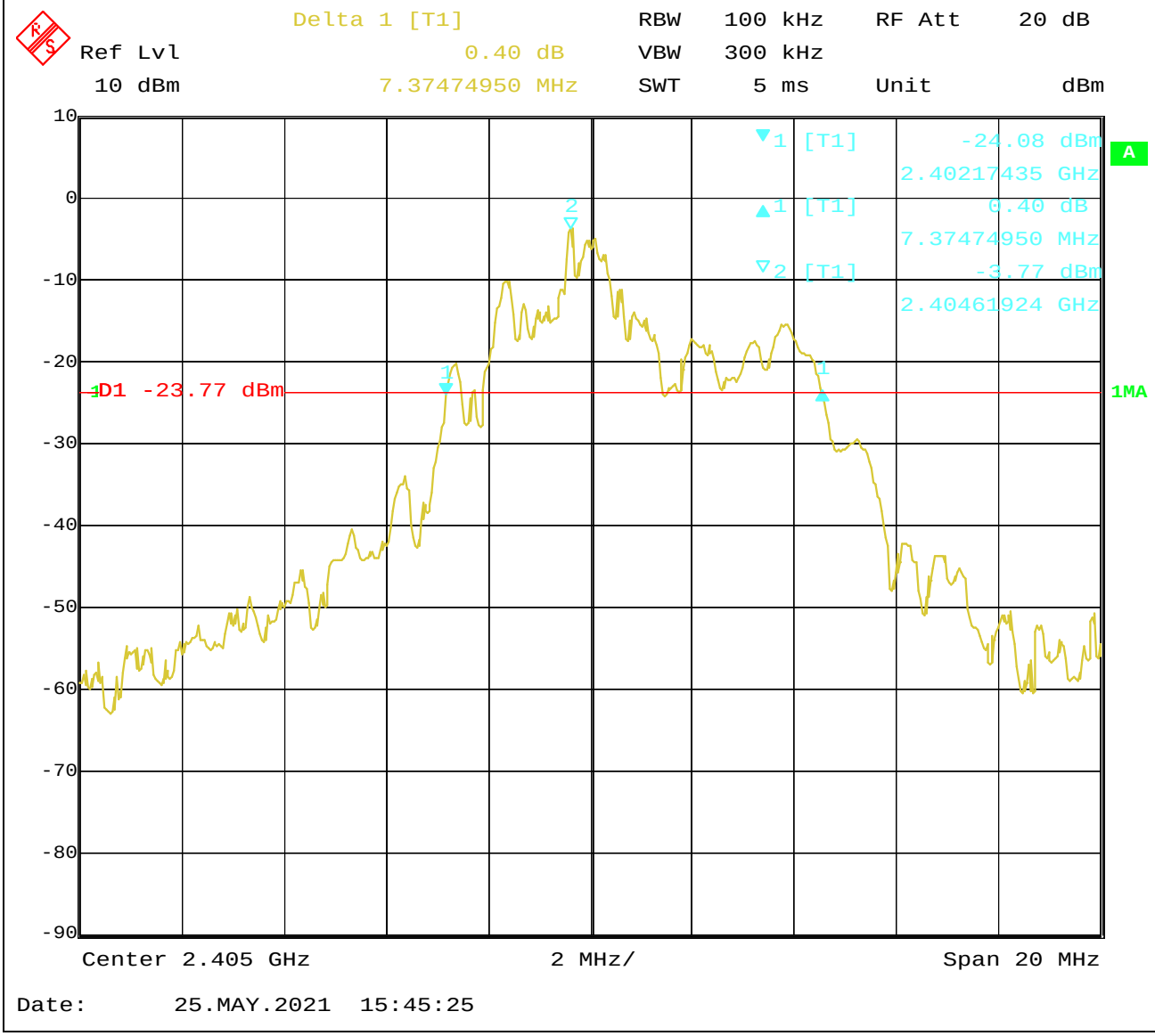
Applicable Standard

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. 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.

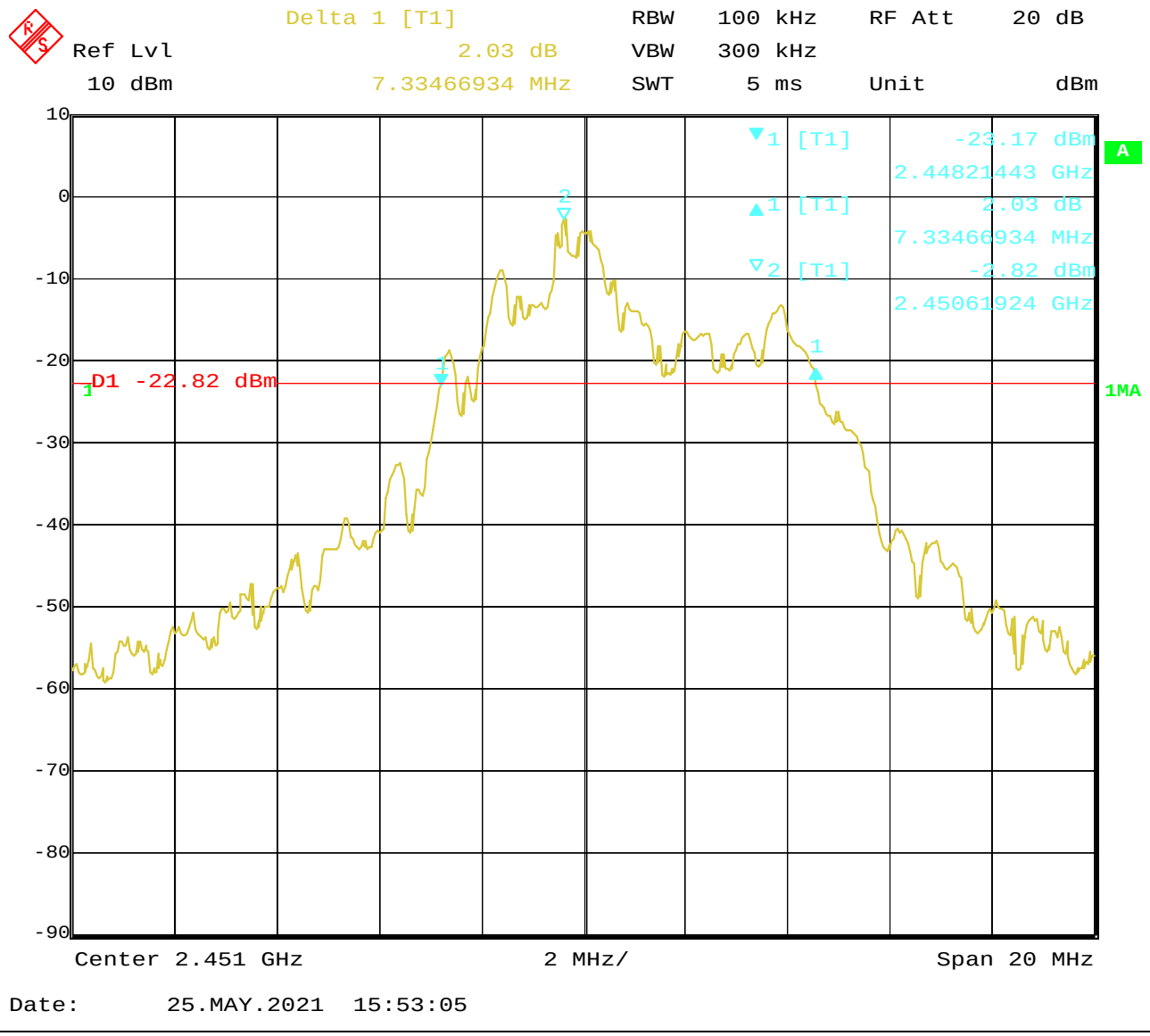
This product has a PCB antenna. The antenna gain is -1.66dBi Max. It fulfills the requirement of this section.

Test Result: Pass

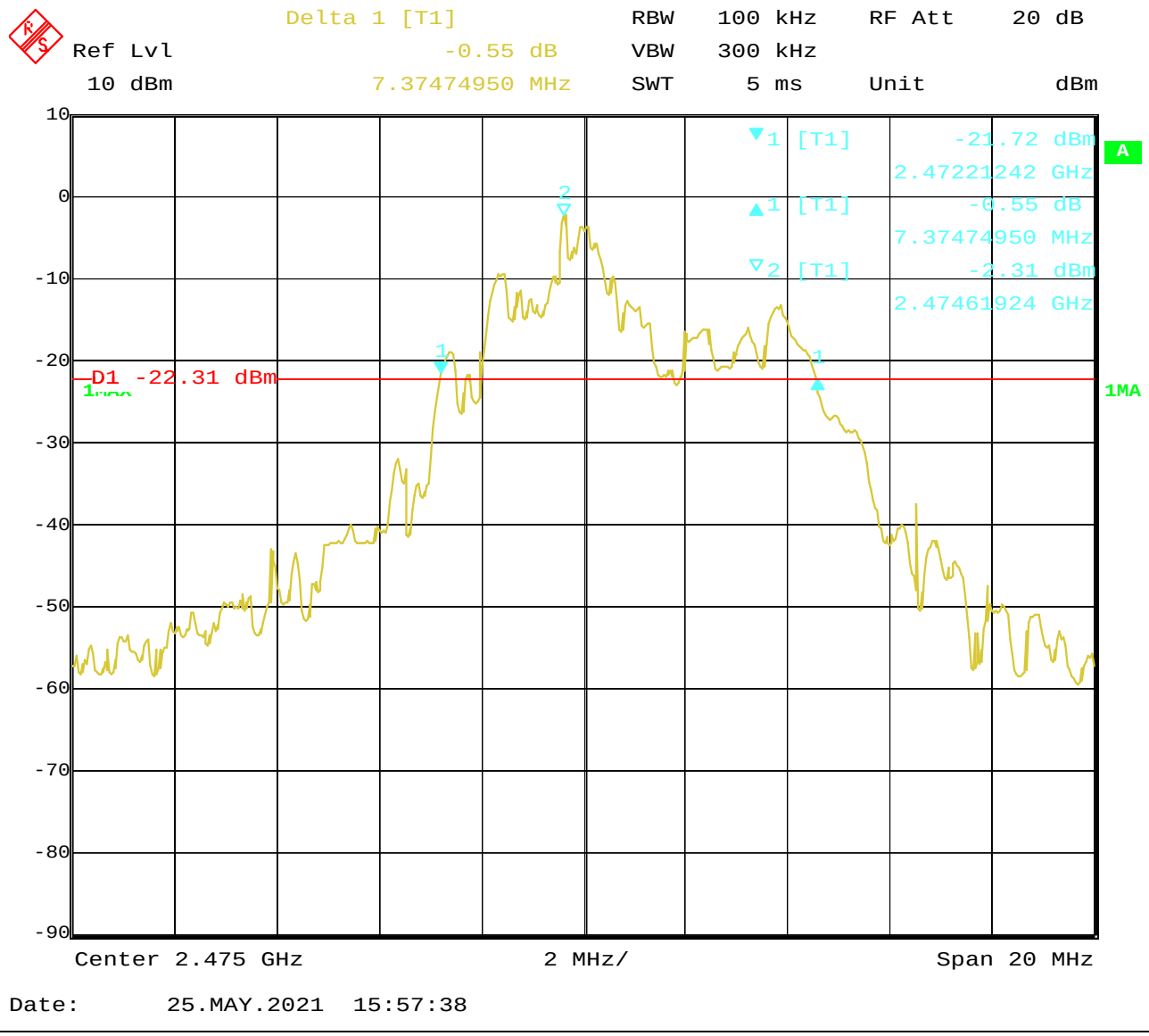
9.0 20dB Bandwidth Measurement			
GFSK Modulation			
Product:	Dongle	Test Mode:	Keep transmitting
Mode	Keeping Transmitting	Test Voltage	DC5.0V
Temperature	24 deg. C,	Humidity	56% RH
Test Result:	Pass	Detector	PK
20dB Bandwidth	7.375MHz	--	--



GFSK Modulation			
Product:	Dongle	Test Mode:	Keep transmitting
Mode	Keeping Transmitting	Test Voltage	DC5.0V
Temperature	24 deg. C,	Humidity	56% RH
Test Result:	Pass	Detector	PK
20dB Bandwidth	7.335MHz	--	--



GFSK Modulation			
Product:	Dongle	Test Mode:	Keep transmitting
Mode	Keeping Transmitting	Test Voltage	DC5.0V
Temperature	24 deg. C,	Humidity	56% RH
Test Result:	Pass	Detector	PK
20dB Bandwidth	7.375MHz	--	--

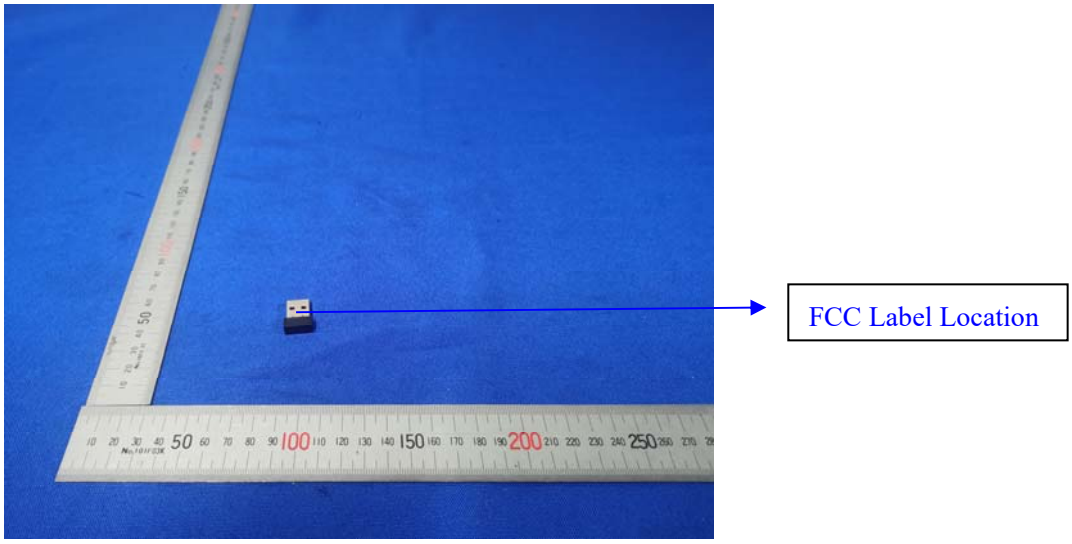


10.0 FCC ID Label

FCC ID: ZJE-ST131D

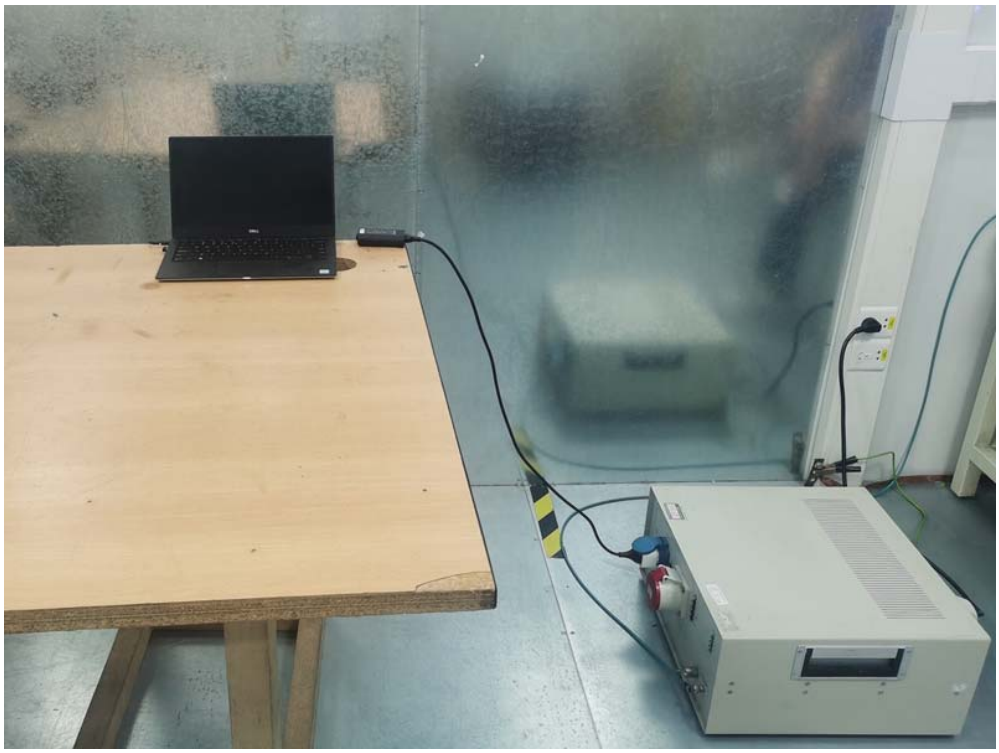
The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Mark Location:

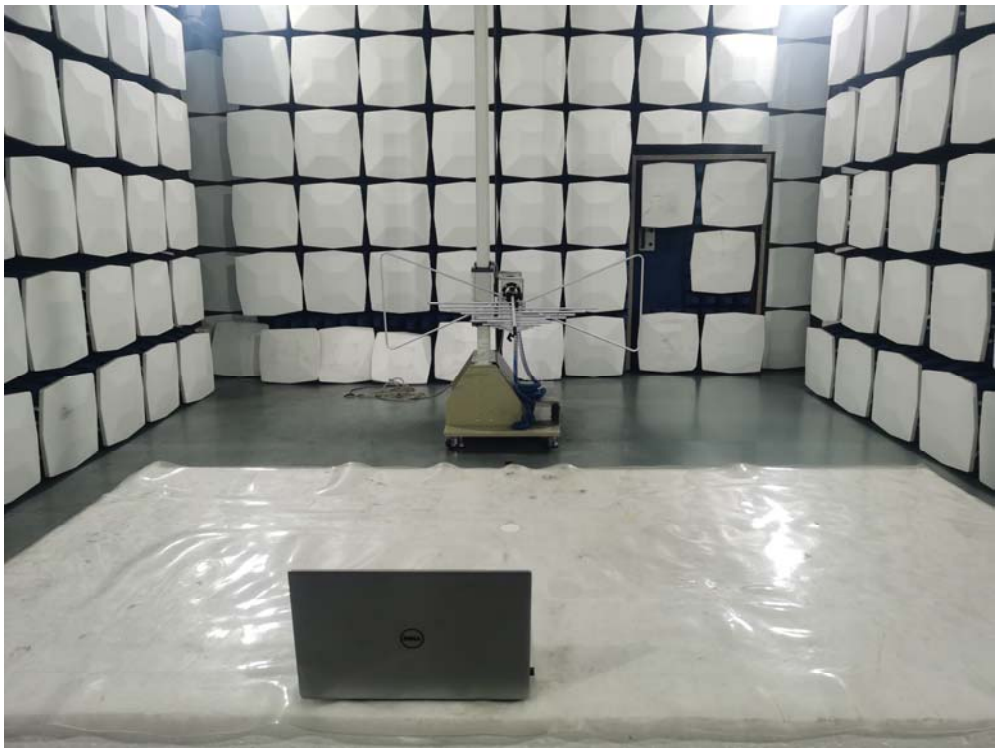


11.0 Photo of testing

11.1 Conducted test View

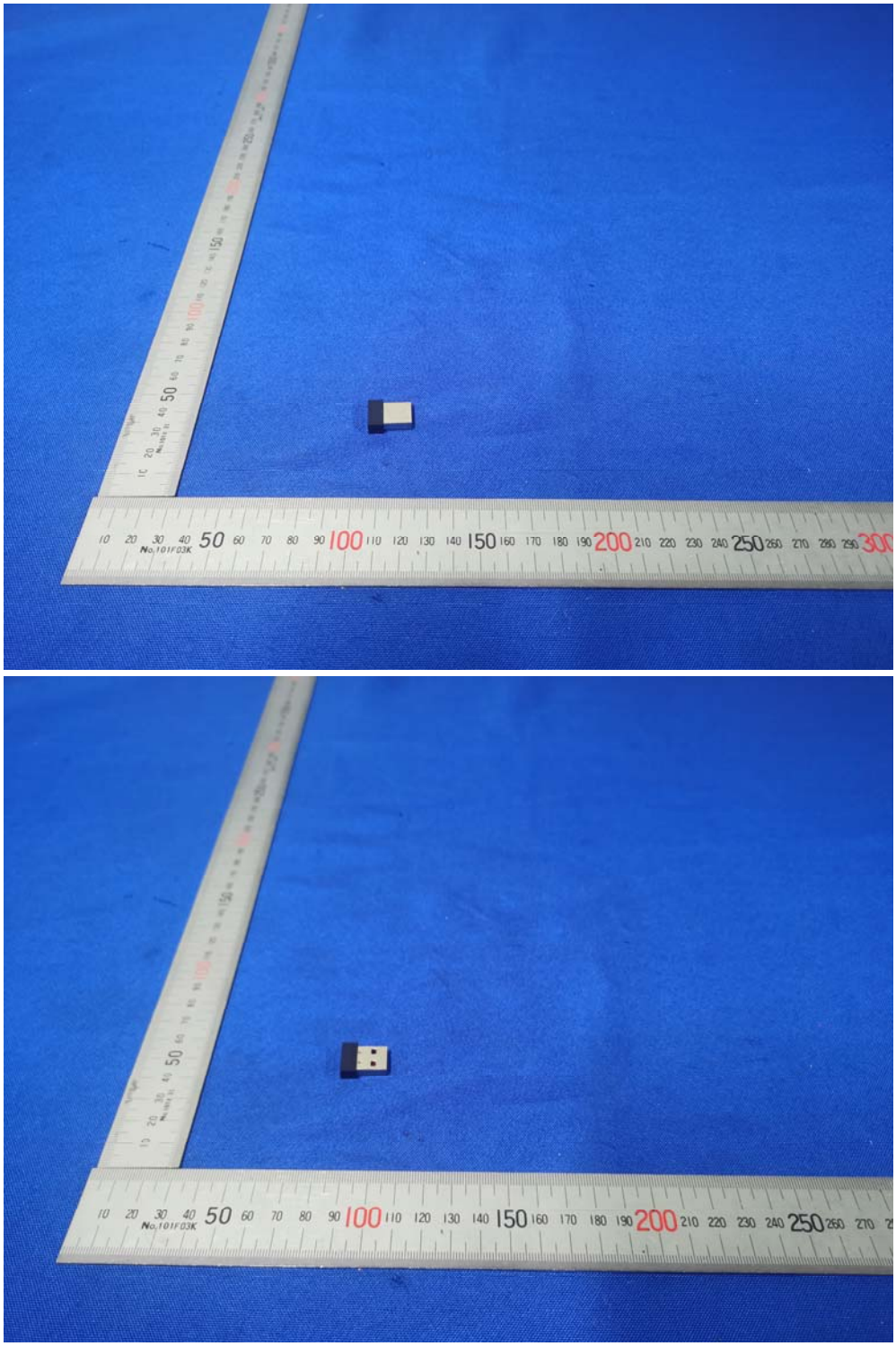


Radiated emission test view



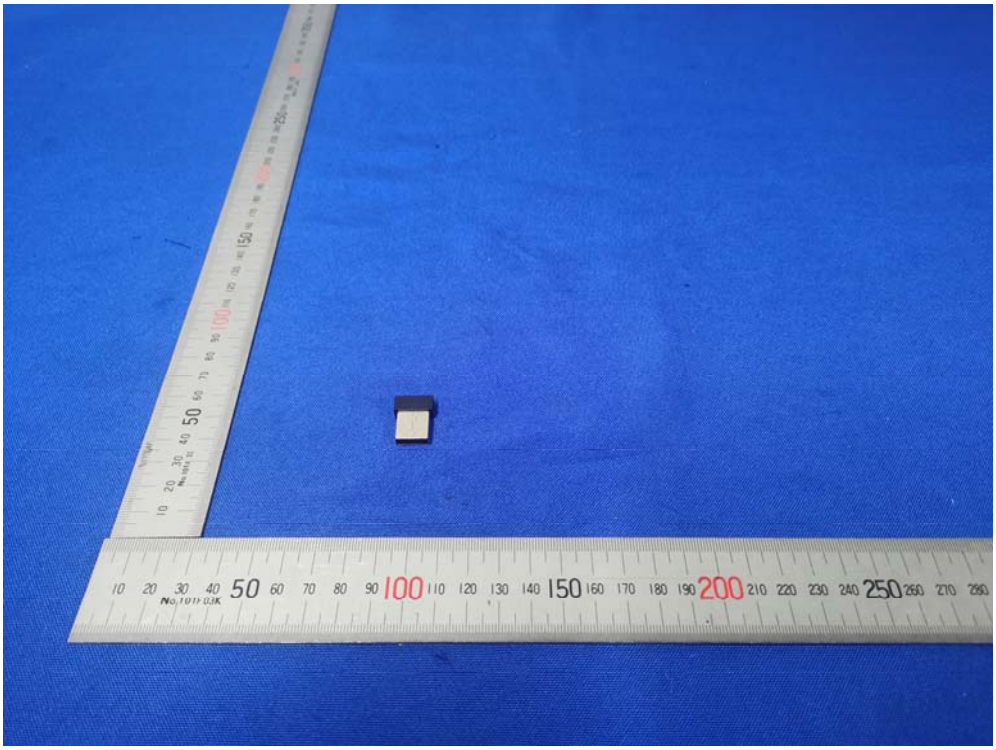
11.2 Photographs – EUT

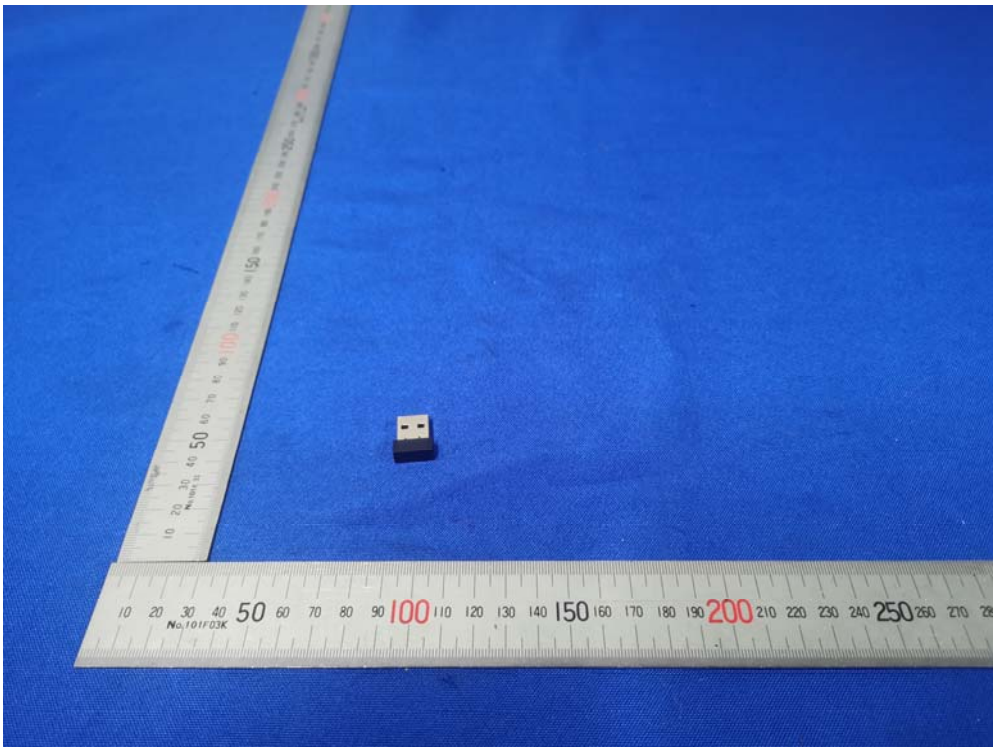
Outside View



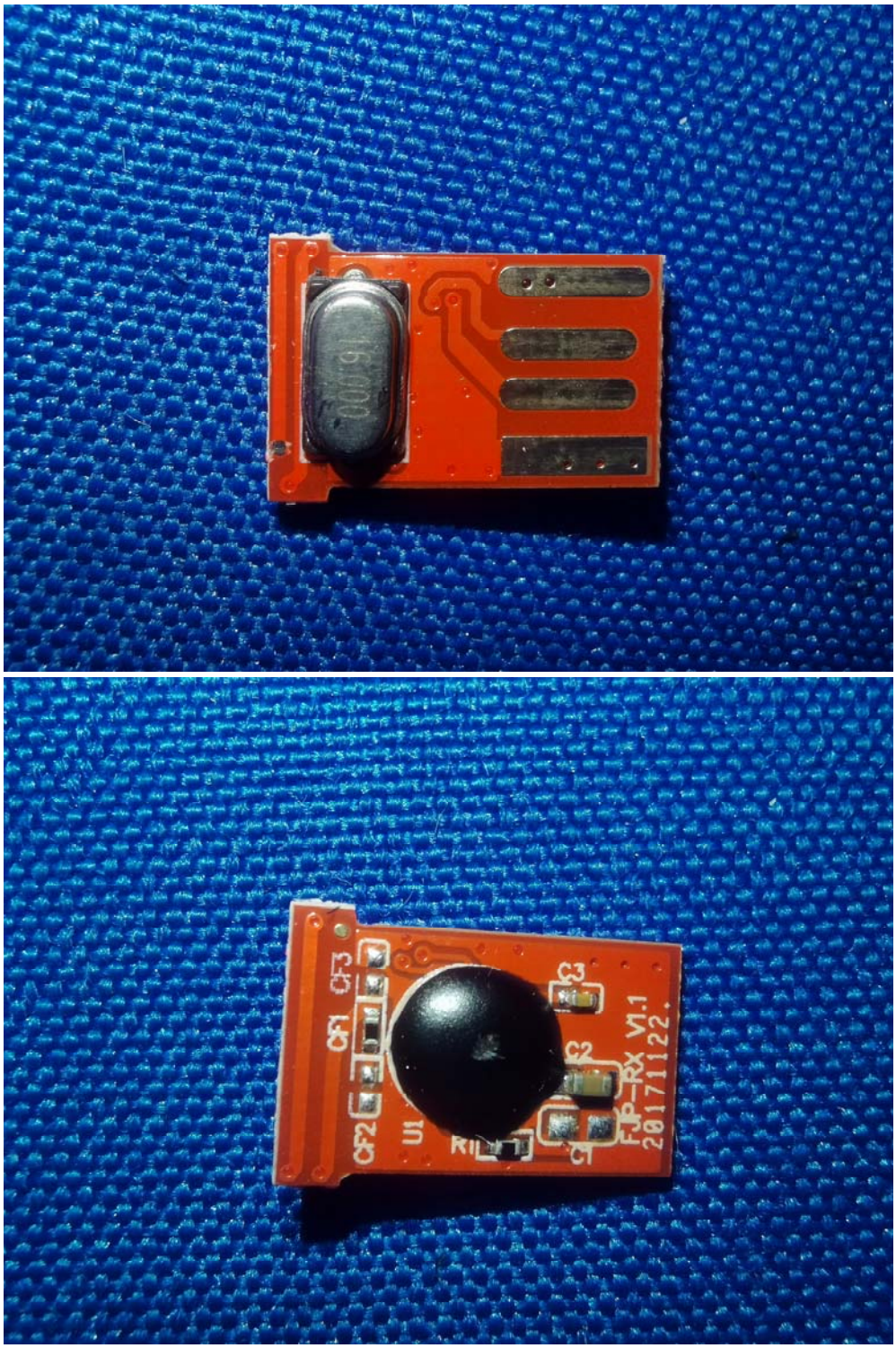
Photographs – EUT

Outside View





Inside view



--End of the report--