FCC REPORT

Applicant:	Ningbo Troika Science & Technology Company Limited
Address of Applicant:	No.11 Gaoya Road, Jiangshan Town Yinzhou District, Ningbo, China
Manufacturer/Factory:	Ningbo Troika Science & Technology Company Limited
Address of Manufacturer/Factory:	No.11 Gaoya Road, Jiangshan Town Yinzhou District, Ningbo, China

Equipment Under Test (EUT)

Product Name:	MT Turbo Remote Control
Model No.:	OT024
FCC ID:	2APNP-OT024
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.249
Date of sample receipt:	May 07, 2018
Date of Test:	May 08-14, 2018
Date of report issued:	May 15, 2018
Test Result :	PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Robinson Lo
Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

2 Version

Version No.	Date	Description
00	*May 15, 2018*	*Original*

Prepared By:		***Date:***	*May 15, 2018*
	Project Engineer		
Check By:		***Date:***	*May 15, 2018*
	Reviewer		

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	N/A
Field strength of the fundamental signal	15.249 (a)	Pass
Spurious emissions	15.249 (a) (d)/15.209	Pass
Band edge	15.249 (d)/15.205	Pass
20dB Occupied Bandwidth	15.215 (c)	Pass

Pass: The EUT complies with the essential requirements in the standard.

Remark：Test according to ANSI C63.10:2013.

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Radiated Emission	1GHz ~ 26.5GHz	± 4.68dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	± 3.45dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

5 General Information

5.1 General Description of EUT

Product Name:	MT Turbo Remote Control
Model No.:	OT024
Serial No.:	OT024-02
Test sample(s) ID:	GTS201805000069-1
Sample(s) Status	Engineer sample
Hardware:	XF193-1
Software:	V193.1.02
Operation Frequency:	2405MHz~2479MHz
Channel numbers:	30
Modulation type:	GFSK
Antenna Type:	Integral antenna
Antenna gain:	2.50 dBi(declare by Applicant)
Power supply:	Battery: DC 3V(1.5V*2 SIZE”AAA”)

Operation Frequency each of channel			
Channel	Frequency	Channel	Frequency
01	2405 MHz	16	2451 MHz
02	2406 MHz	17	2456 MHz
03	2422 MHz	18	2457 MHz
04	2424 MHz	19	2458 MHz
05	2425 MHz	20	2459 MHz
06	2426 MHz	21	2467 MHz
07	2427 MHz	22	2468 MHz
08	2428 MHz	23	2469 MHz
09	2436 MHz	24	2470 MHz
10	2437 MHz	25	2471 MHz
11	2444 MHz	26	2472 MHz
12	2445 MHz	27	2473 MHz
13	2446 MHz	28	2476 MHz
14	2447 MHz	29	2477 MHz
15	2449 MHz	30	2479 MHz

Test Channel	Frequency
The lowest channel	2405MHz
The middle channel	2444MHz
The Highest channel	2479MHz

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Remark: During the test, the dutycycle >98%, New battery is used during all test. So the report just shows that condition's data.	

Pre-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

Axis	X	Y	Z
Field Strength(dBuV/m)	93.44	94.26	92.12

5.3 Description of Support Units

None

5.4 Test Facility

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

● **FCC —Registration No.: 381383**

Global United Technology Services Co., Ltd., Shenzhen 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 files. Registration 381383, January 08, 2018.

● **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, August 15, 2016

5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

5.6 Additional instructions

Engineer sample (Used for fixed frequency test)

6 Test Instruments list

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July 03 2015	July 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June 28 2017	June 27 2018
4	Loop Antenna (9kHz-30MHz)	ZHINAN	ZN30900A	GTS534	June 28 2017	June 27 2018
5	BiConiLog Antenna (30MHz-1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June 28 2017	June 27 2018
6	Double -ridged waveguide horn (1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 28 2017	June 27 2018
7	Horn Antenna (18GHz -40GHz)	ETS-LINDGREN	3116C	GTS574	June 28 2017	June 27 2018
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable (9kHz-1GHz)	GTS	N/A	GTS213	June 28 2017	June 27 2018
10	Coaxial Cable (9kHz-1GHz)	GTS	N/A	GTS211	June 28 2017	June 27 2018
11	Coaxial cable (1GHz-26GHz)	GTS	N/A	GTS210	June 28 2017	June 27 2018
12	Coaxial Cable (1GHz-26GHz)	GTS	N/A	GTS212	June 28 2017	June 27 2018
13	Amplifier (100kHz-3GHz)	HP	8347A	GTS204	June 28 2017	June 27 2018
14	Amplifier (2GHz-20GHz)	HP	8349B	GTS206	June 28 2017	June 27 2018
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 28 2017	June 27 2018
16	Band filter	Amindeon	82346	GTS219	June 28 2017	June 27 2018

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Barometer	ChangChun	DYM3	GTS257	June 28 2017	June 27 2018

7 Test results and Measurement Data

7.1 Antenna requirement

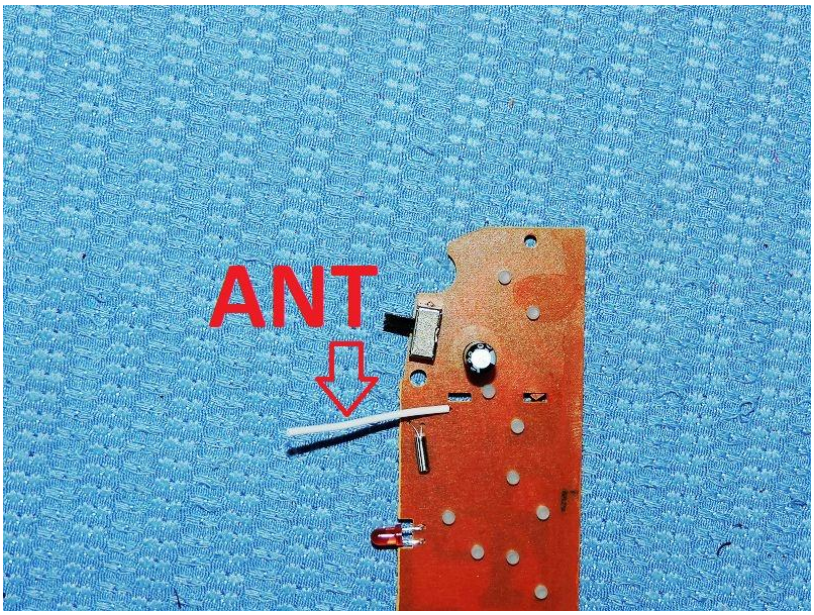
Standard requirement:	FCC Part15 C Section 15.203

15.203 requirement:

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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is Integral antenna, the best case gain of the antenna is 2.5 dBi



7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209
Test Method:	ANSI C63.10:2013
Test Frequency Range:	9kHz to 25GHz
Test site:	Measurement Distance: 3m

Receiver setup:

Frequency	Detector	RBW	VBW	Value
9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Limit:
(Field strength of the fundamental signal)

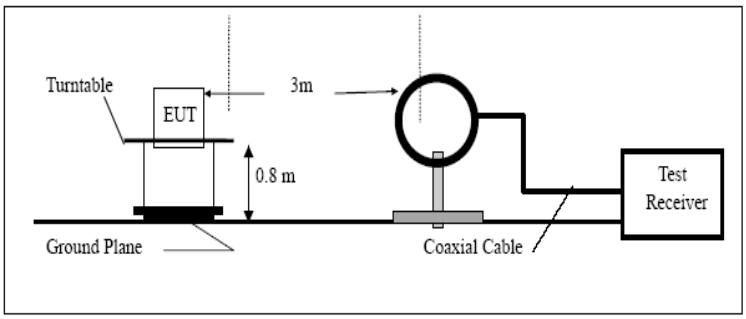
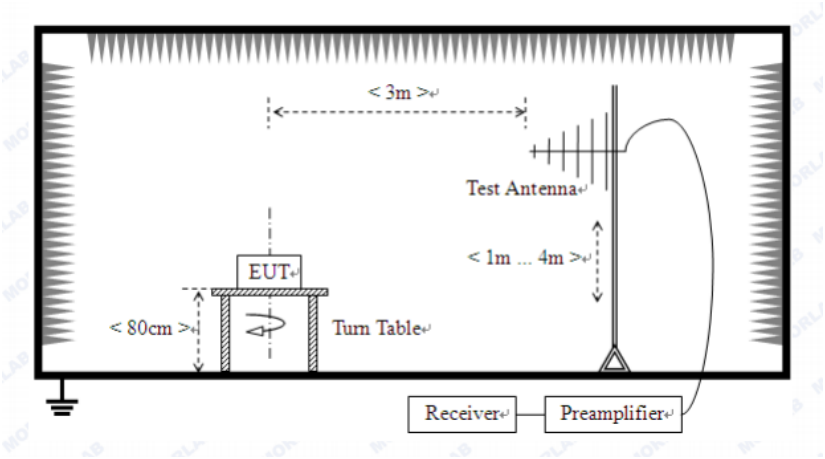
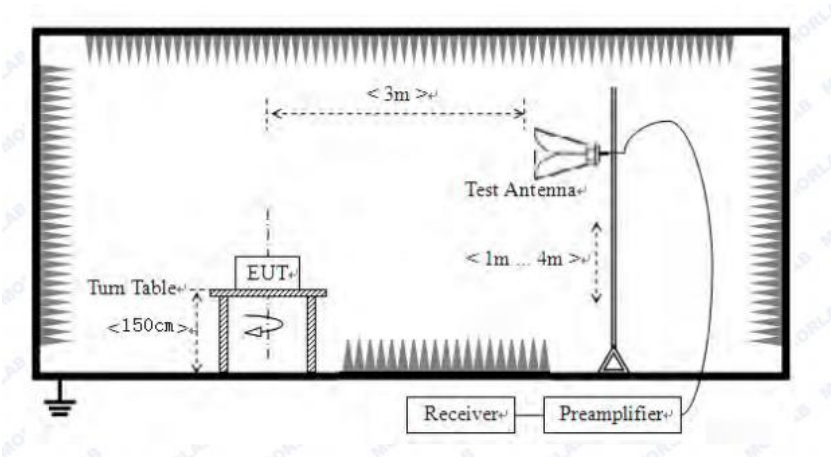
Frequency	Limit (dBuV/m @3m)	Remark
2400MHz-2483.5MHz	94.00	Average Value
	114.00	Peak Value

Limit:
(Spurious Emissions)

Frequency	Limit (uV/m)	Value	Measurement Distance
0.009MHz-0.490MHz	2400/F(KHz)	QP	300m
0.490MHz-1.705MHz	24000/F(KHz)	QP	300m
1.705MHz-30MHz	30	QP	30m
30MHz-88MHz	100	QP	3m
88MHz-216MHz	150	QP	
216MHz-960MHz	200	QP	
960MHz-1GHz	500	QP	
Above 1GHz	500	Average	
	5000	Peak	

Limit:
(band edge)

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.

Test setup:	Below 30MHz  Below 1GHz  Above 1GHz 
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

	3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement data:

7.2.1 Field Strength of The Fundamental Signal

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2405.00	93.10	27.43	5.40	36.87	89.06	114.00	-24.94	Vertical
2405.00	98.30	27.43	5.40	36.87	94.26	114.00	-19.74	Horizontal
2444.00	92.10	27.53	5.43	36.89	88.17	114.00	-25.83	Vertical
2444.00	97.83	27.53	5.43	36.89	93.90	114.00	-20.10	Horizontal
2479.00	94.76	27.64	5.47	36.92	90.95	114.00	-23.05	Vertical
2479.00	97.69	27.64	5.47	36.92	93.88	114.00	-20.12	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2405.00	79.23	27.43	5.40	36.87	75.19	94.00	-18.81	Vertical
2405.00	83.91	27.43	5.40	36.87	79.87	94.00	-14.13	Horizontal
2444.00	76.77	27.53	5.43	36.89	72.84	94.00	-21.16	Vertical
2444.00	82.86	27.53	5.43	36.89	78.93	94.00	-15.07	Horizontal
2479.00	76.41	27.64	5.47	36.92	72.60	94.00	-21.40	Vertical
2479.00	82.36	27.64	5.47	36.92	78.55	94.00	-15.45	Horizontal

Note: RBW 3MHz VBW 3MHz Peak detector is for PK value RMS detector is for AV value

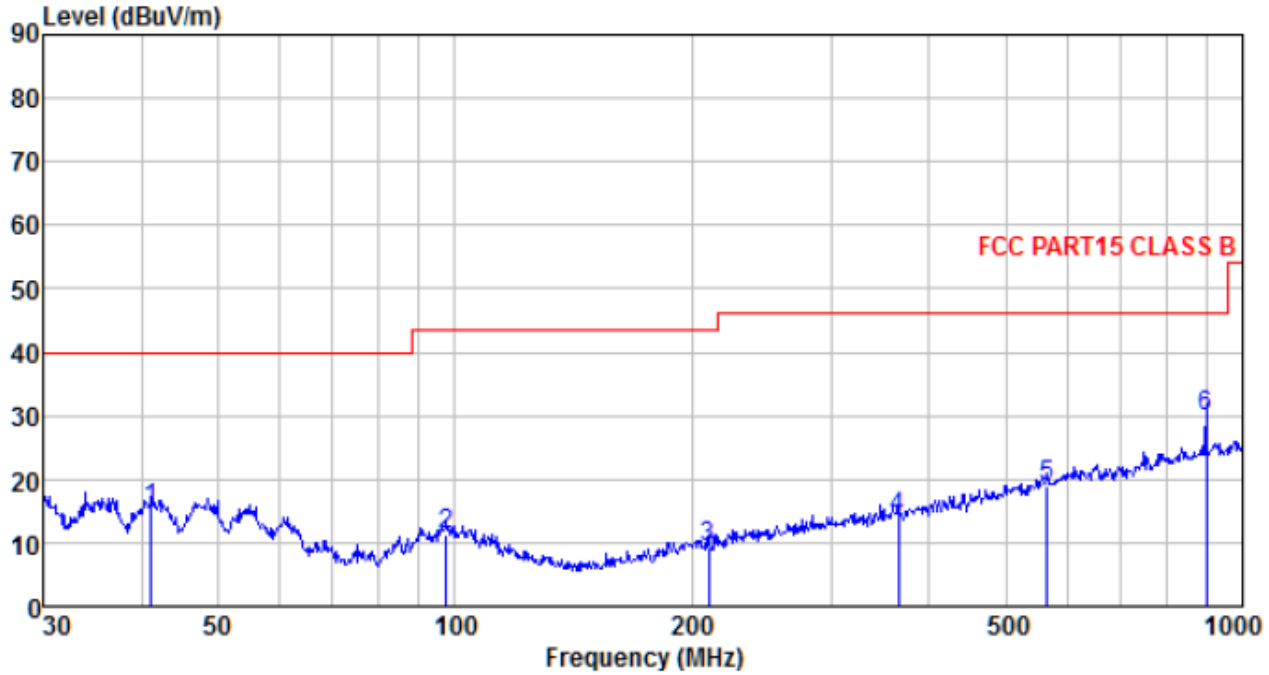
7.2.2 Spurious emissions

■ **9KHz to 30MHz**

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

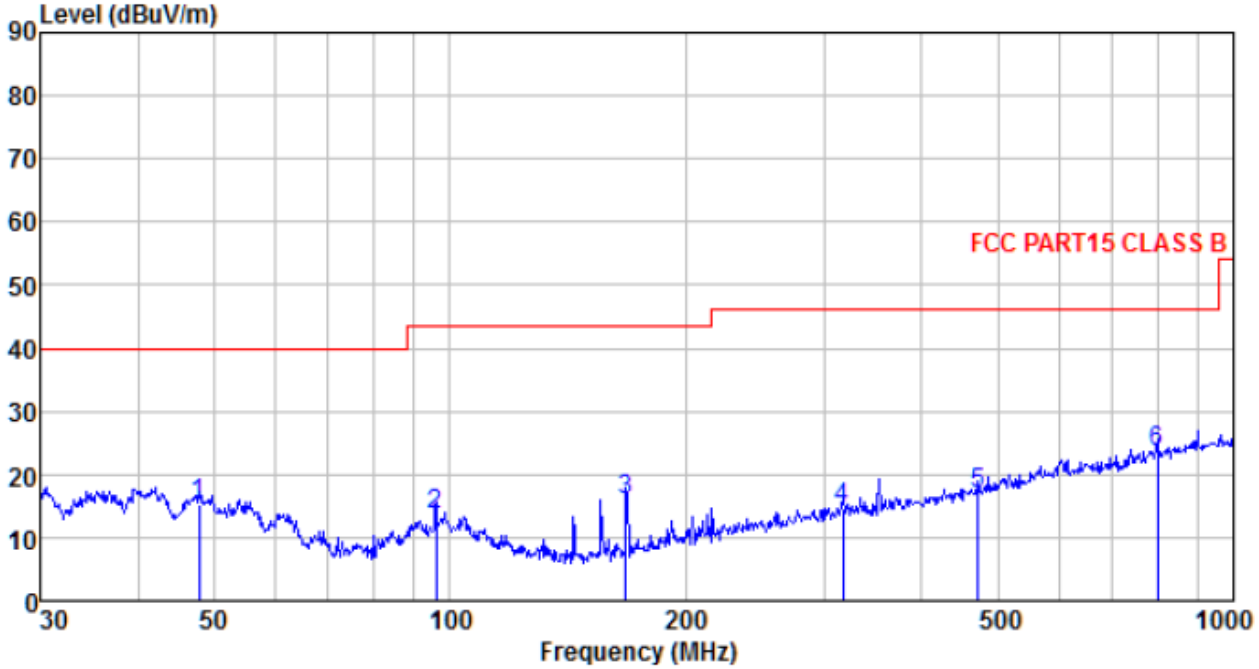
■ **Below 1GHz**

Horizontal :



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
41.132	38.18	12.21	0.67	35.73	15.33	40.00	-24.67	QP
97.456	35.10	11.86	1.17	36.70	11.43	43.50	-32.07	QP
210.048	34.03	10.80	1.90	37.34	9.39	43.50	-34.11	QP
365.539	33.92	14.78	2.69	37.49	13.90	46.00	-32.10	QP
564.639	34.18	18.73	3.58	37.53	18.96	46.00	-27.04	QP
900.147	40.29	22.30	4.85	37.60	29.84	46.00	-16.16	QP

Vertical :

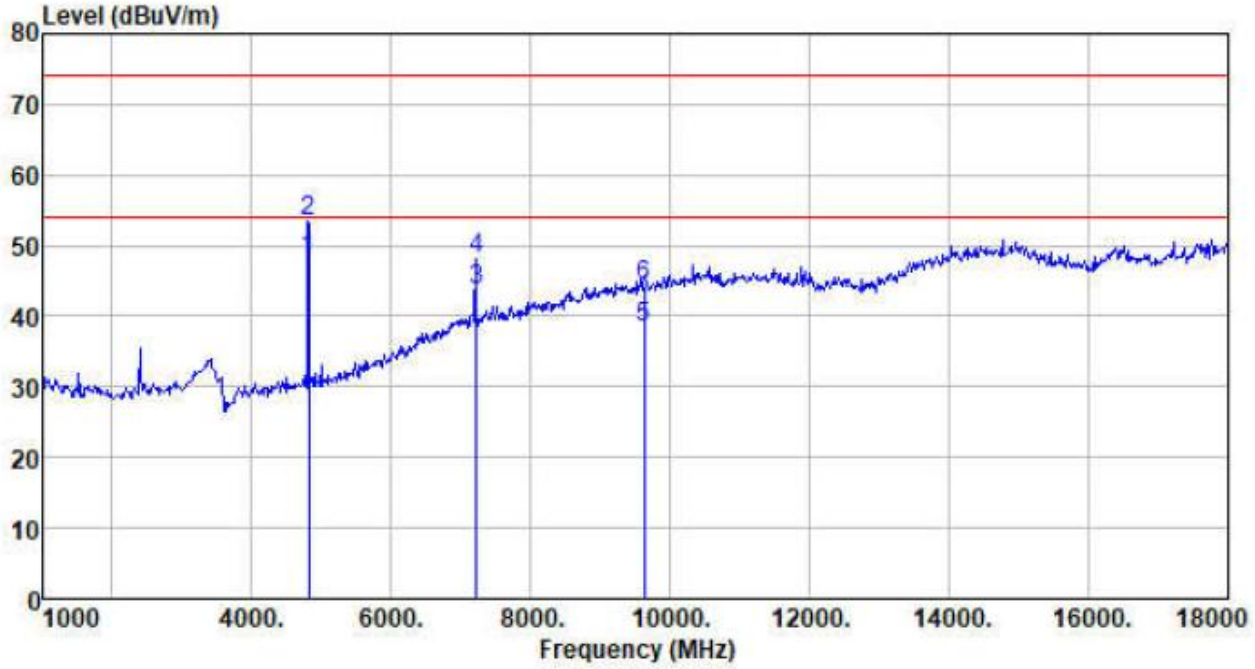


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
47.826	38.21	12.28	0.75	36.08	15.16	40.00	-24.84	QP
96.099	37.52	11.65	1.16	36.69	13.64	43.50	-29.86	QP
167.824	42.90	8.46	1.67	37.18	15.85	43.50	-27.65	QP
317.701	35.51	13.93	2.45	37.44	14.45	46.00	-31.55	QP
472.176	34.46	16.77	3.19	37.51	16.91	46.00	-29.09	QP
798.980	35.19	21.40	4.45	37.62	23.42	46.00	-22.58	QP

■ **Above 1GHz**

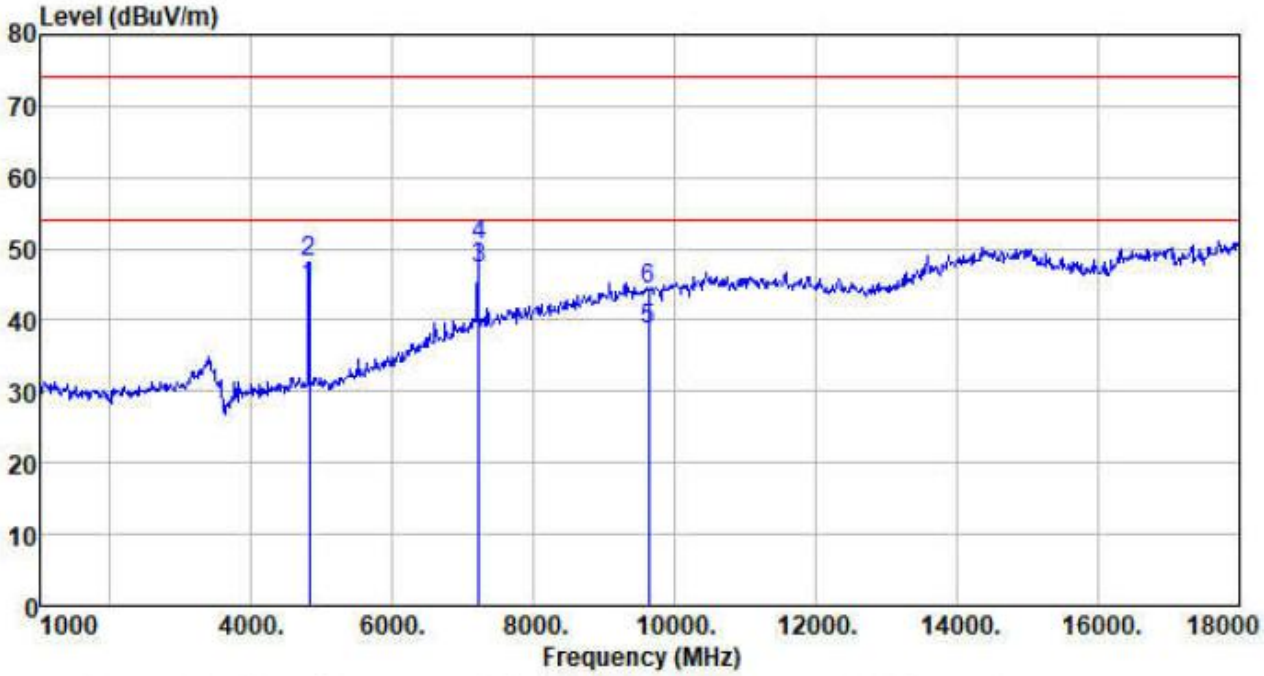
Test channel:	Lowest

Horizontal :



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
4810.000	46.11	31.20	8.60	37.73	48.18	54.00	-5.82	Average
4810.000	51.49	31.20	8.60	37.73	53.56	74.00	-20.44	Peak
7215.000	31.36	36.20	11.66	35.63	43.59	54.00	-10.41	Average
7215.000	35.95	36.20	11.66	35.63	48.18	74.00	-25.82	Peak
9620.000	21.34	37.93	14.14	34.94	38.47	54.00	-15.53	Average
9620.000	27.03	37.93	14.14	34.94	44.16	74.00	-29.84	Peak

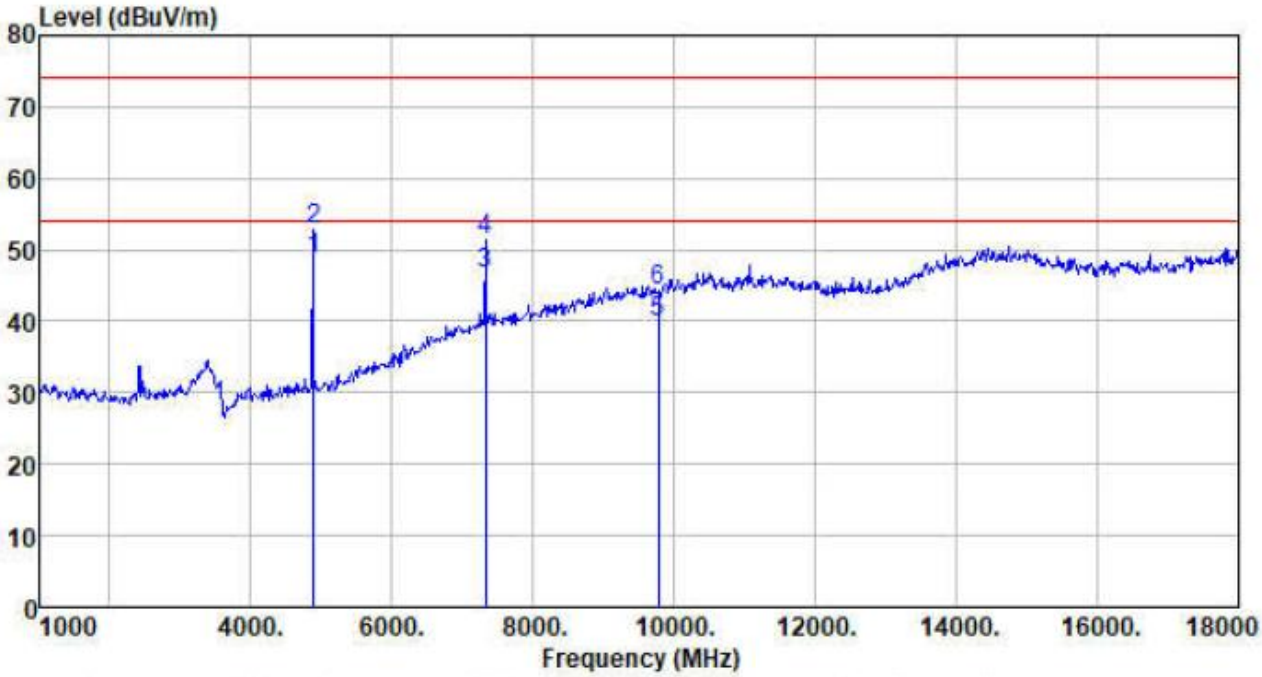
Vertical:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
4810.000	42.47	31.20	8.60	37.73	44.54	54.00	-9.46	Average
4810.000	46.10	31.20	8.60	37.73	48.17	74.00	-25.83	Peak
7215.000	34.99	36.20	11.66	35.63	47.22	54.00	-6.78	Average
7215.000	38.31	36.20	11.66	35.63	50.54	74.00	-23.46	Peak
9620.000	21.59	37.93	14.14	34.94	38.72	54.00	-15.28	Average
9620.000	27.09	37.93	14.14	34.94	44.22	74.00	-29.78	Peak

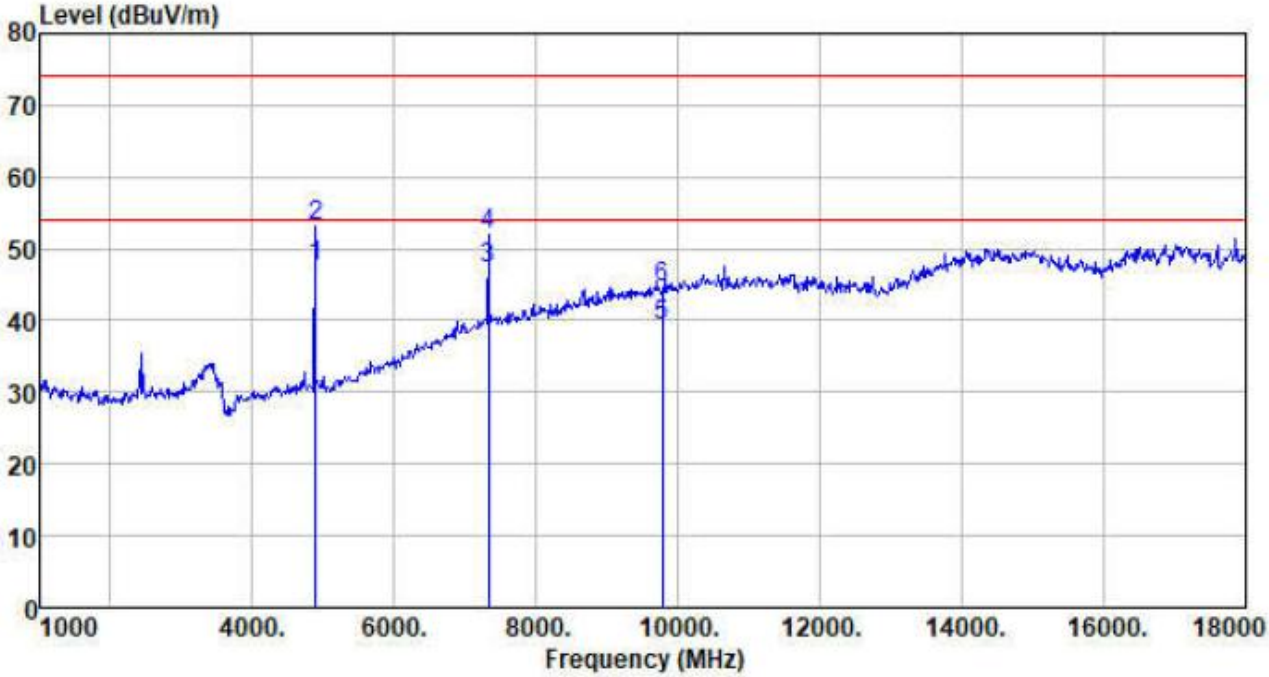
Test channel:	Middle

Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
4888.000	46.58	31.33	8.67	37.76	48.82	54.00	-5.18	Average
4888.000	50.55	31.33	8.67	37.76	52.79	74.00	-21.21	Peak
7332.000	34.02	36.43	11.72	35.60	46.57	54.00	-7.43	Average
7332.000	38.68	36.43	11.72	35.60	51.23	74.00	-22.77	Peak
9776.000	22.38	38.13	14.27	35.05	39.73	54.00	-14.27	Average
9776.000	27.01	38.13	14.27	35.05	44.36	74.00	-29.64	Peak

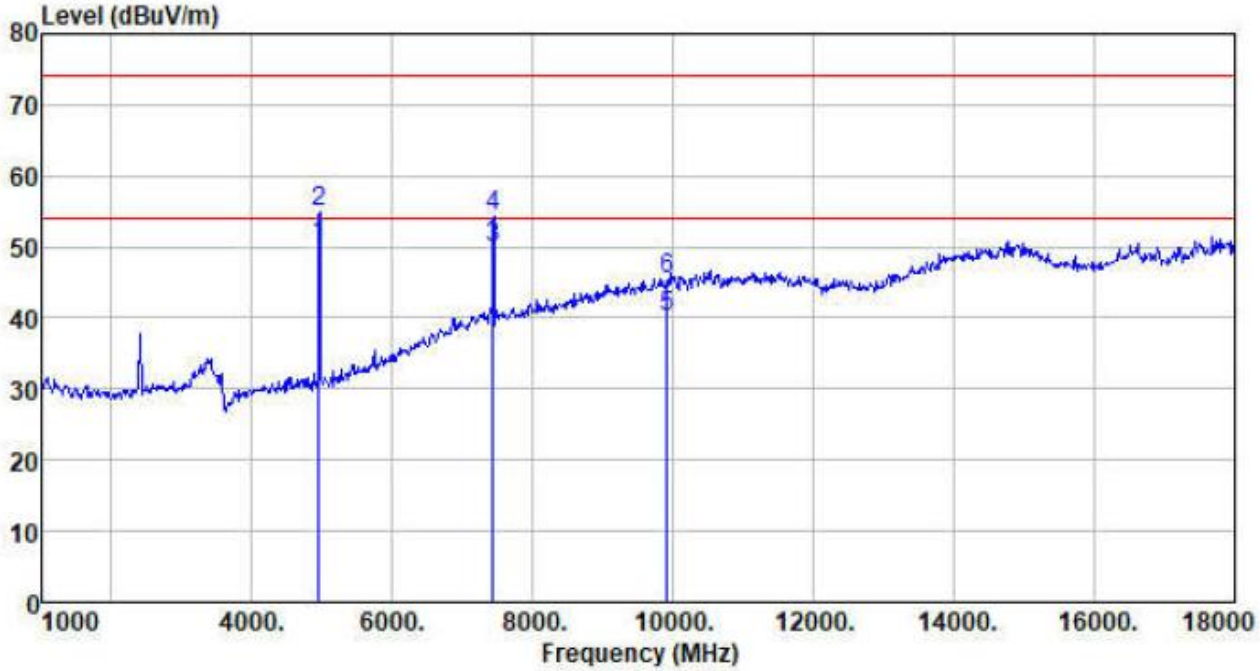
Vertical:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
4888.000	45.42	31.33	8.67	37.76	47.66	54.00	-6.34	Average
4888.000	50.79	31.33	8.67	37.76	53.03	74.00	-20.97	Peak
7332.000	34.76	36.43	11.72	35.60	47.31	54.00	-6.69	Average
7332.000	39.40	36.43	11.72	35.60	51.95	74.00	-22.05	Peak
9776.000	21.81	38.13	14.27	35.05	39.16	54.00	-14.84	Average
9776.000	27.18	38.13	14.27	35.05	44.53	74.00	-29.47	Peak

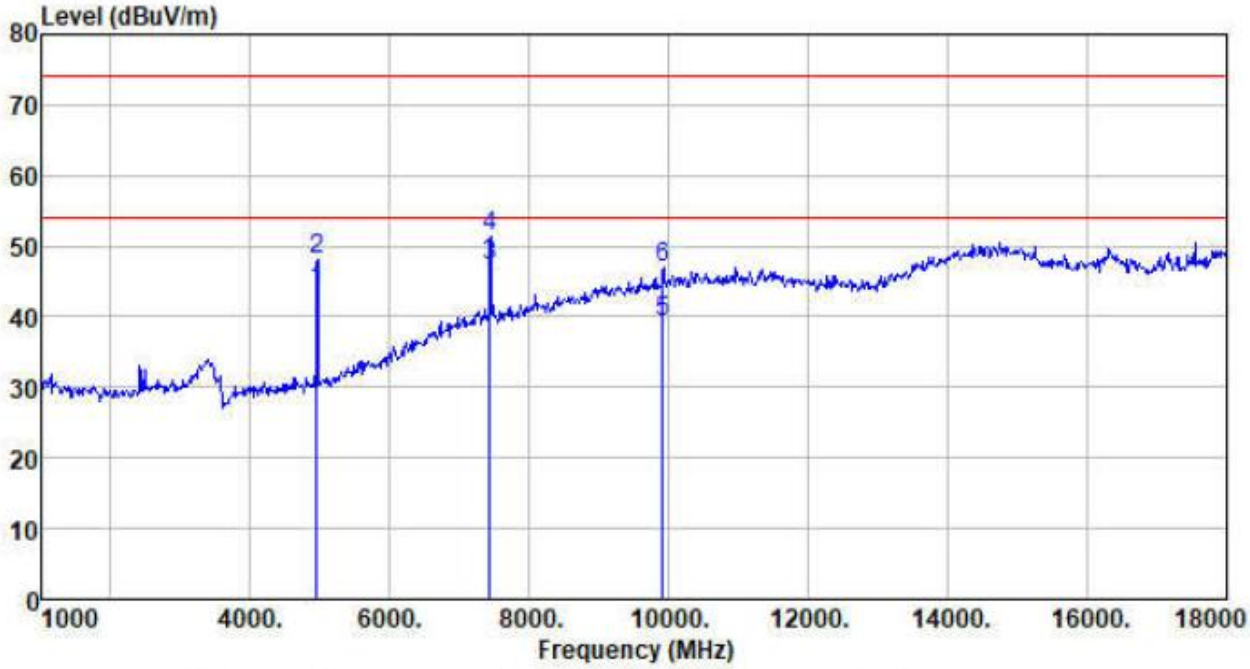
Test channel:	Highest

Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
4958.000	47.79	31.44	8.73	37.78	50.18	54.00	-3.82	Average
4958.000	52.44	31.44	8.73	37.78	54.83	74.00	-19.17	Peak
7437.000	37.10	36.66	11.79	35.56	49.99	54.00	-4.01	Average
7437.000	41.57	36.66	11.79	35.56	54.46	74.00	-19.54	Peak
9916.000	22.75	38.30	14.38	35.14	40.29	54.00	-13.71	Average
9916.000	27.97	38.30	14.38	35.14	45.51	74.00	-28.49	Peak

Vertical:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
4958.000	41.35	31.44	8.73	37.78	43.74	54.00	-10.26	Average
4958.000	45.69	31.44	8.73	37.78	48.08	74.00	-25.92	Peak
7437.000	34.42	36.66	11.79	35.56	47.31	54.00	-6.69	Average
7437.000	38.46	36.66	11.79	35.56	51.35	74.00	-22.65	Peak
9916.000	21.65	38.30	14.38	35.14	39.19	54.00	-14.81	Average
9916.000	29.49	38.30	14.38	35.14	47.03	74.00	-26.97	Peak

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"18-25GHz"The emission levels of other frequencies are very lower than the limit and not show in test report.*

7.2.3 Bandedge emissions

Test channel:	Lowest

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	31.63	27.59	5.38	30.18	34.42	74.00	-39.58	Horizontal
2400.00	46.81	27.58	5.39	30.18	49.60	74.00	-24.40	Horizontal
2390.00	31.10	27.59	5.38	30.18	33.89	74.00	-40.11	Vertical
2400.00	47.64	27.58	5.39	30.18	50.43	74.00	-23.57	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	24.72	27.59	5.38	30.18	27.51	54.00	-26.49	Horizontal
2400.00	35.29	27.58	5.39	30.18	38.08	54.00	-15.92	Horizontal
2390.00	23.86	27.59	5.38	30.18	26.65	54.00	-27.35	Vertical
2400.00	35.87	27.58	5.39	30.18	38.66	54.00	-15.34	Vertical

Test channel:	Highest

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	32.39	27.53	5.47	29.93	35.46	74.00	-38.54	Horizontal
2500.00	33.71	27.55	5.49	29.93	36.82	74.00	-37.18	Horizontal
2483.50	31.36	27.53	5.47	29.93	34.43	74.00	-39.57	Vertical
2500.00	33.63	27.55	5.49	29.93	36.74	74.00	-37.26	Vertical

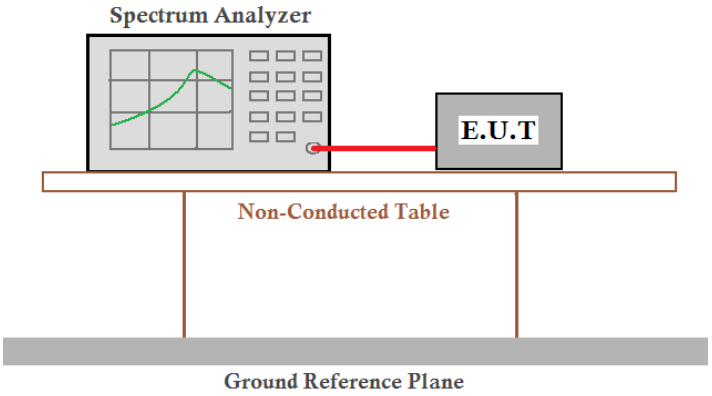
Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	27.41	27.53	5.47	29.93	30.48	54.00	-23.52	Horizontal
2500.00	27.02	27.55	5.49	29.93	30.13	54.00	-23.87	Horizontal
2483.50	27.69	27.53	5.47	29.93	30.76	54.00	-23.24	Vertical
2500.00	26.01	27.55	5.49	29.93	29.12	54.00	-24.88	Vertical

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

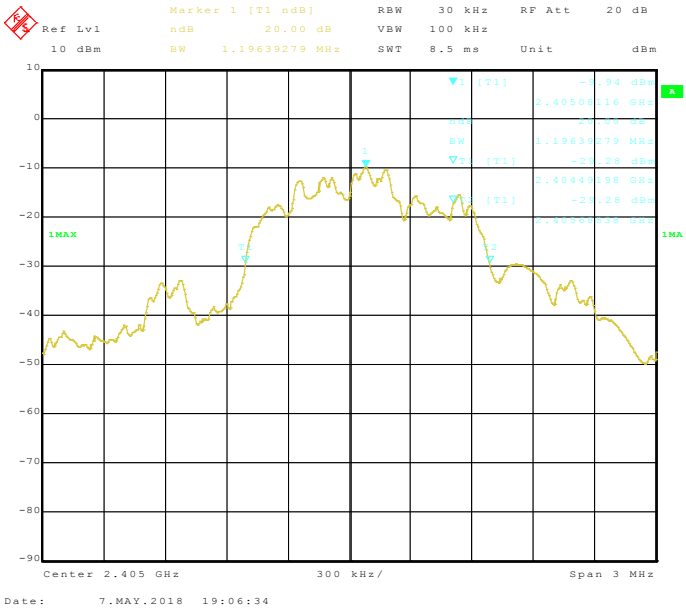
7.3 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.10:2013
Limit:	Operation Frequency range 2400MHz~2483.5MHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

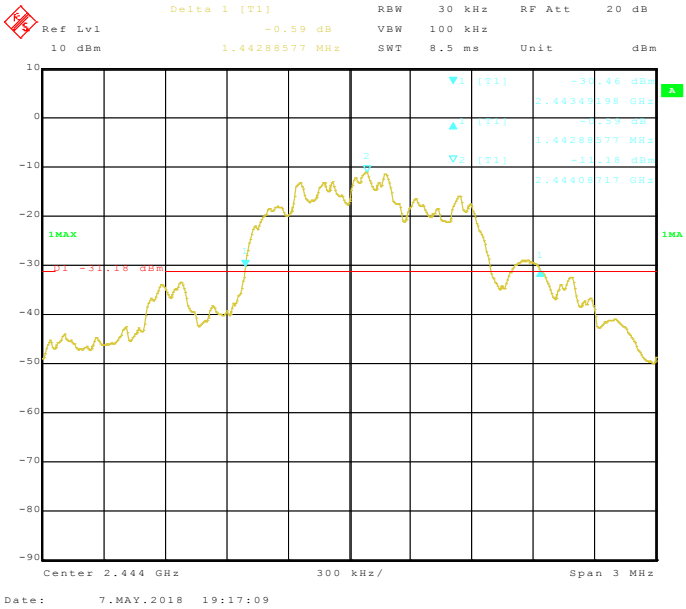
Measurement Data

Test channel	20dB bandwidth(MHz)	Result
2405MHz	1.19639279	Pass
2444MHz	1.44288577	Pass
2479MHz	1.37074148	Pass

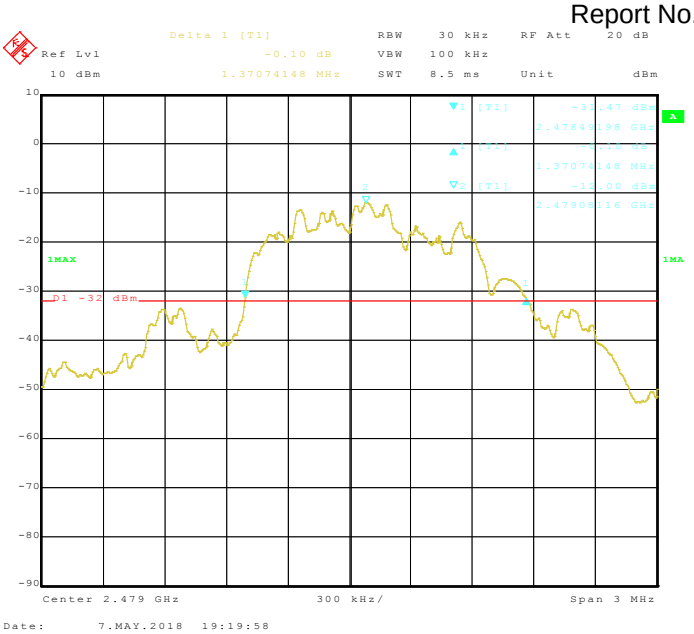
Test plot as follows:



2405MHz



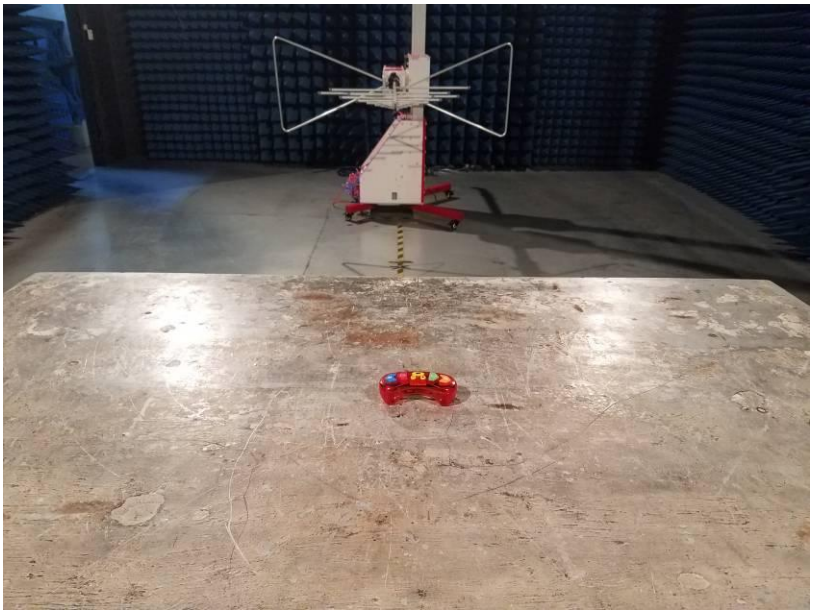
2444MHz

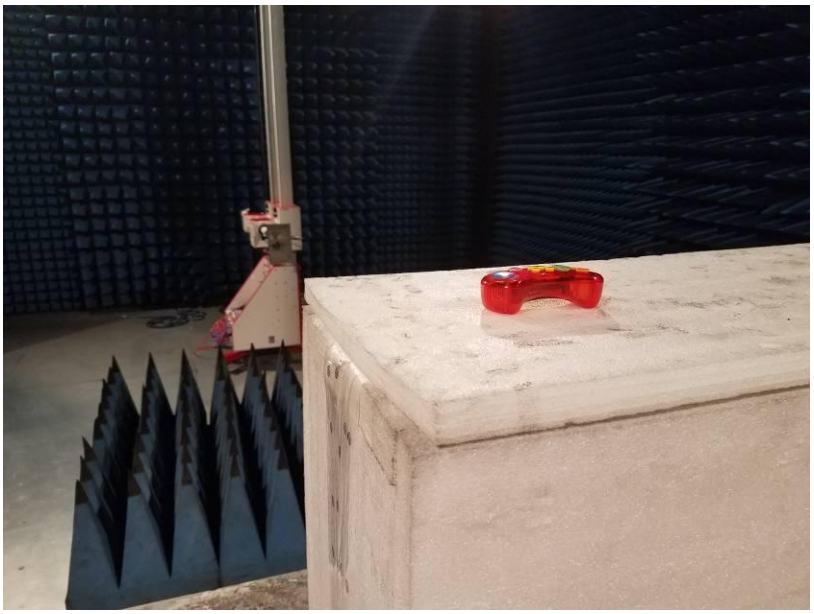

Delta 1 [T1]
-0.10 dB
1.37074148 MHz
RBW 30 kHz
VBW 100 kHz
SWT 8.5 ms
RF Att 20 dB
Unit dBm
Ref Lvl
10 dBm
1MAX
D1 -32 dBm
Center 2.479 GHz
300 kHz/
Span 3 MHz
Date: 7.MAY.2018 19:19:58

2479MHz

8 Test Setup Photo

Radiated Emission



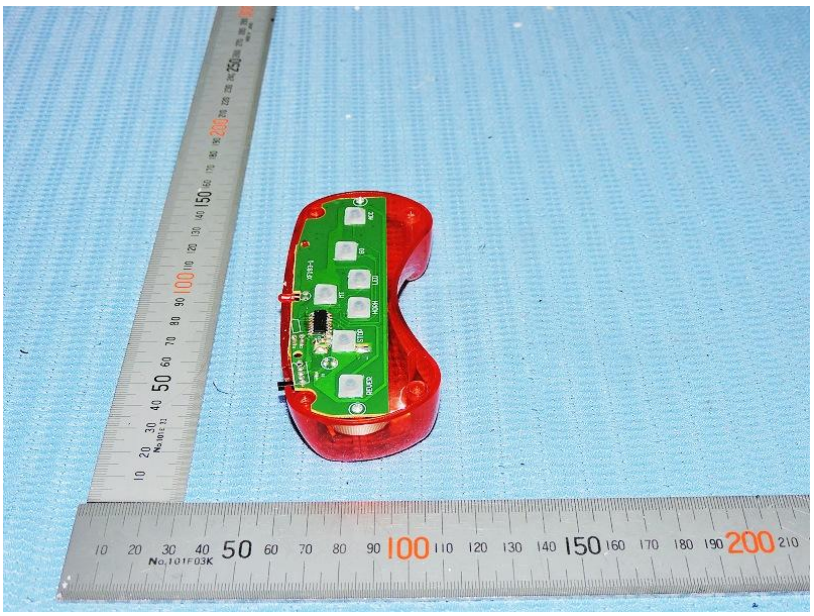


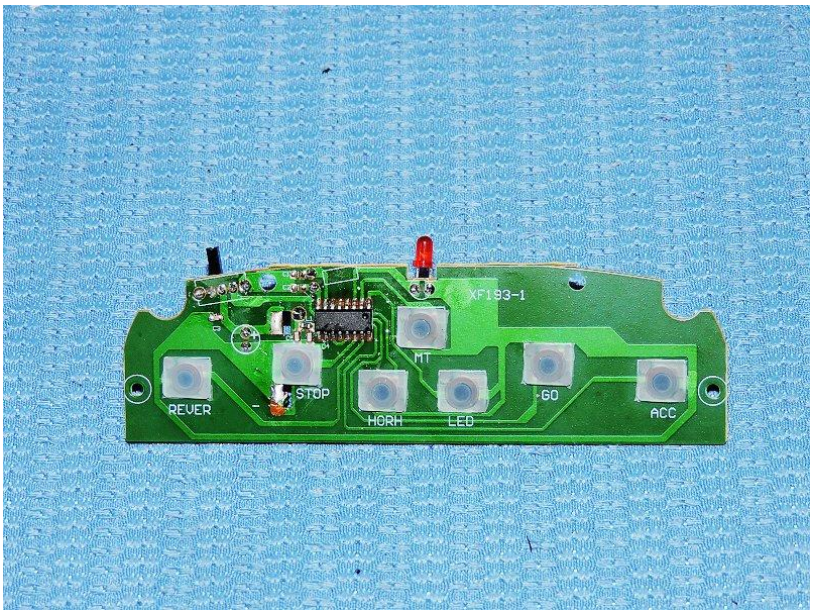
9 EUT Constructional Details

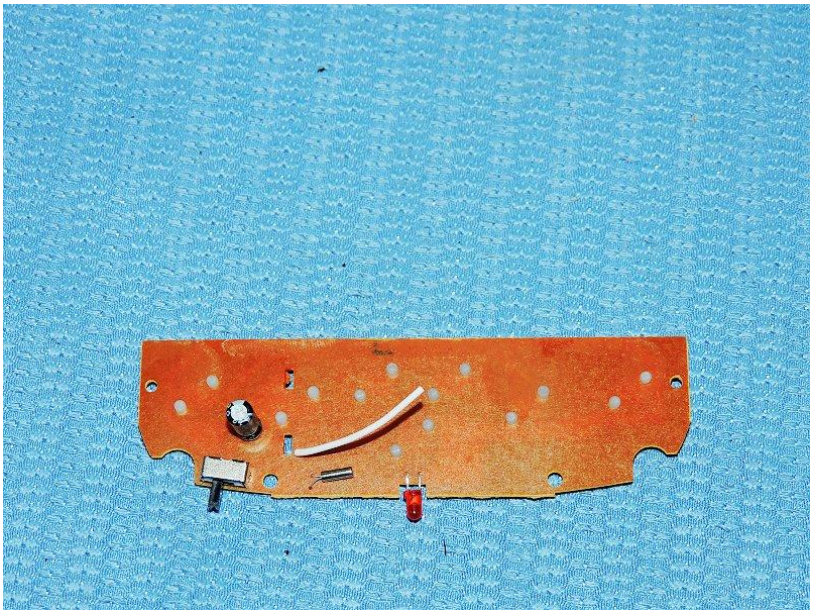
OFF
ON

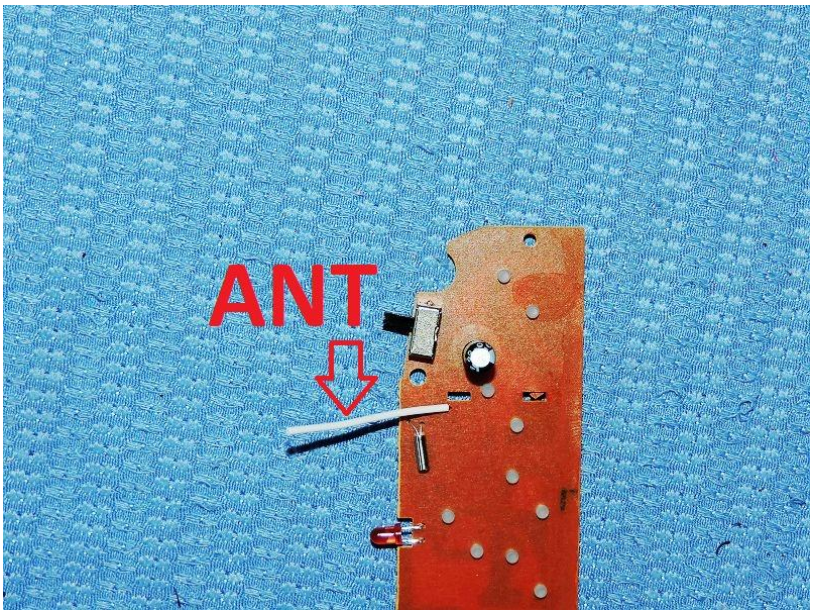
MT
STOP
No.101F03K

ON
OFF
No.101F03K




XF193-1
MT
REVER
STOP
HORH
LED
GO
ACC





------End------