

TEST REPORT

Applicant:	FUJIAN TEAMDA PHOTOELECTRICITY CO.,LTD
Address:	Triangulation Point, Shengqiao Town, Zhaoan County,Zhangzhou City, Fujian Province P.R .China

Manufacturer or Supplier	FUJIAN TEAMDA PHOTOELECTRICITY CO.,LTD
Address	Triangulation Point, Shengqiao Town, Zhaoan County,Zhangzhou City, Fujian Province P.R .China
Product:	Toy RC Side Drifter Monster Truck
Brand Name:	SHARPER IMAGE
Model:	TD2020D
Additional Model & Model Difference	1012179,1012283
Date of tests:	Mar. 05 to Apr. 30, 2020

the tests have been carried out according to the requirements of the following standard:

FCC Part 15, Subpart C, Section 15.249

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Evans He Project Engineer / EMC Department	Approved by David Huang Supervisor / EMC Department
<i>Evans He</i>	<i>David Huang</i>
Date: May 09, 2020	

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Test Report No.: RF200304N047- 2

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF200304N047-2	Original release	May 09, 2020



1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.249)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
§15.203	Antenna Requirement	PASS	No antenna connector is used
§15.207 (a)	Conducted Emission	N/A	Powered from battery
§15.205	Restricted Band of Operation	PASS	Compliant
§15.209 §15.249(a)	Radiated Emission	PASS	Compliant
§15.215(c)	20dB Bandwidth Test	PASS	Compliant

NOTE: Test Lab Information:

Lab: Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

Test Lab Address: Zone A, Floor 1, Building 2 Wan Ye Long Technology Park
South Side of Zhoushi Road, Bao'an District Shenzhen, Guangdong, 518108,
People's Republic of China

2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Radiated emissions	9kHz~30MHz	2.16dB
	30MHz ~ 1GMHz	3.74dB
	1GHz ~ 18GHz	4.66dB
	18GHz ~ 40GHz	4.67dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.



3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Toy RC Side Drifter Monster Truck
MODEL NO.	TD2020D
ADDITIONAL MODELS	1012179,1012283
FCC ID	P45TD2020D24GR
NOMINAL VOLTAGE	DC 6V(1.5V*AA*4) from Battery
MODULATION TECHNOLOGY	GFSK
OPERATING FREQUENCY	2405-2450MHz
ANTENNA TYPE	Whip antenna, with 1.5dBi gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	N/A

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions, but only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.: 200304N047-2) for detailed product photos.
4. Additional models (see about table) are identical with the test model TD2020D except the color of the appearance、trade name and model name for trading purpose.



3.2 DESCRIPTION OF TEST MODES

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and packet type. The worst case was found when the EUT was positioned on Y axis for radiated emission. The EUT was tested under the following mode.

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE<1G	RE≥1G	PLC	BW	
A	√	√	-	√	DC 6V from Battery

Where **RE<1G**: Radiated Emission below 1GHz **RE≥1G**: Radiated Emission above 1GHz
PLC: Power Line Conducted Emission **BW**: 20db bandwidth

NOTE: No need to concern of Conducted Emission due to the EUT is powered by battery.

Following channel(s) was (were) selected for the test as listed below.

TESTED CHANNEL	TESTED FREQUENCY
Low	2405 MHz
Middle	2428 MHz
High	2450 MHz

Channel List

CHANNEL	FREQUENCY (MHZ)
1	2405
2	2428
3	2450

Note: The more detailed channel, please refer to the product specifications

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE	25deg. C, 57%RH	DC 6V from Battery	Aaron
BW	25deg. C, 57%RH	DC 6V from Battery	Aaron
PLC	-	-	-

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C, Section 15.249

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together without any other necessary accessories or support units

4. TEST TYPES AND RESULTS

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

According to §15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental (milli-volts/meter)	Field strength of harmonics (micro-volts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESL6	1300.5001K06-100262-eQ	Mar. 24, 20	Mar. 24, 21
Bilog Antenna	Sunol Sciences	JB6	A110712	Apr. 08, 20	Apr. 07, 21
Active Antenna	CMO-POWER	AL-130	121031	Mar. 27, 20	Mar. 26, 21
Signal Amplifier	HP	8447E	443008	Mar. 24, 20	Mar. 24, 21
3m Semi-anechoic Chamber	SAEMC	9m*6m*6m	N/A	Oct. 18, 18	Oct. 17, 21
Test Software	EZ-EMC	ICP-03A1	N/A	N/A	N/A
Spectrum	Agilent	E4446A	MY46180622	May 08, 19	May 07, 20
MXA signal analyzer	Agilent	N9020A	MY49100060	Mar. 24, 20	Mar. 24, 21
Horn Antenna	COM-POWER	HAH-118	71259	Mar. 22, 20	Mar. 21, 21
Horn Antenna	COM-POWER	HAH-118	71283	Mar. 20, 20	Mar. 19, 21
SHF-EHF Horn	Schwarzbeck	BBHA9170	BBHA9170147	Jun. 30, 19	Jun. 29, 20
SHF-EHF Horn	Schwarzbeck	BBHA9170	BBHA9170242	Jun. 30, 19	Jun. 29, 20
AMPLIFIER	EM Electornic Corporation	EM01G26G	60613	Mar. 24, 20	Mar. 24, 21
AMPLIFIER	Emc Instruments Corporation	Emc012645	980077	Jan. 04, 20	Jan. 03, 21

NOTE:

1. The test was performed in 966 Chamber.
2. The calibration interval of the above test instruments are 12 months (except 3m Semi-anechoic Chamber) and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 749762.

4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 1.5 meters (above 1GHz) and 0.8 meters (below 1GHz) above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its 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.
- d. 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.
- g. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The testing of the EUT was performed on all 3 orthogonal axes; the worst-case test configuration was reported on the file test setup photo.

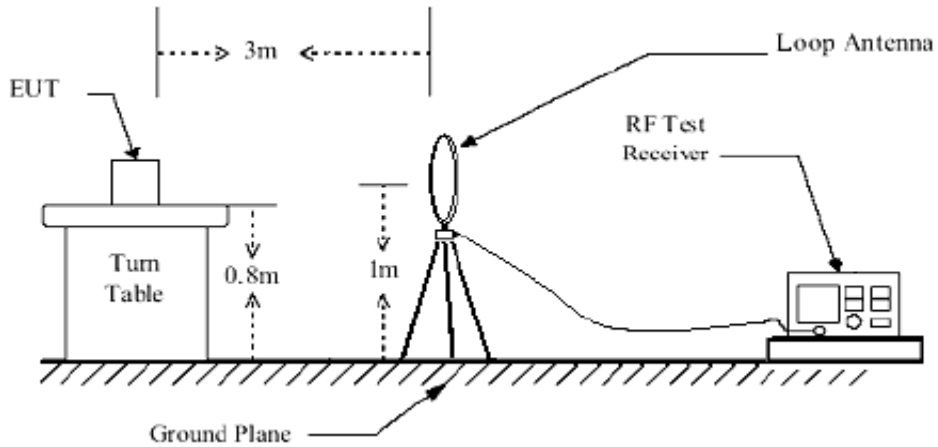
4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

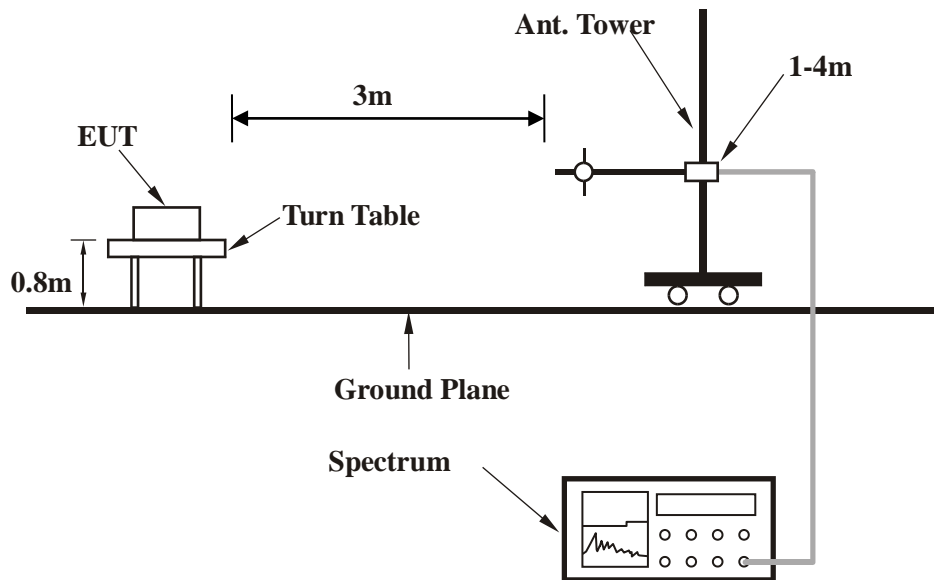


4.1.5 TEST SETUP

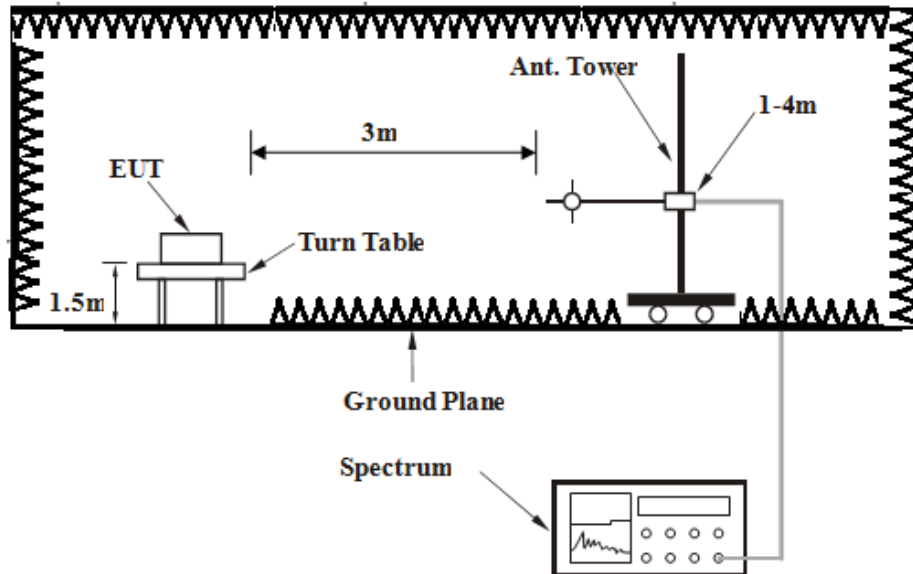
Below 30MHz test setup



Below 1GHz test setup



Above 1GHz test setup



Note: For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT OPERATING CONDITIONS

- a) Turned on the power of all equipment.
- b) EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.



4.1.7 TEST RESULTS

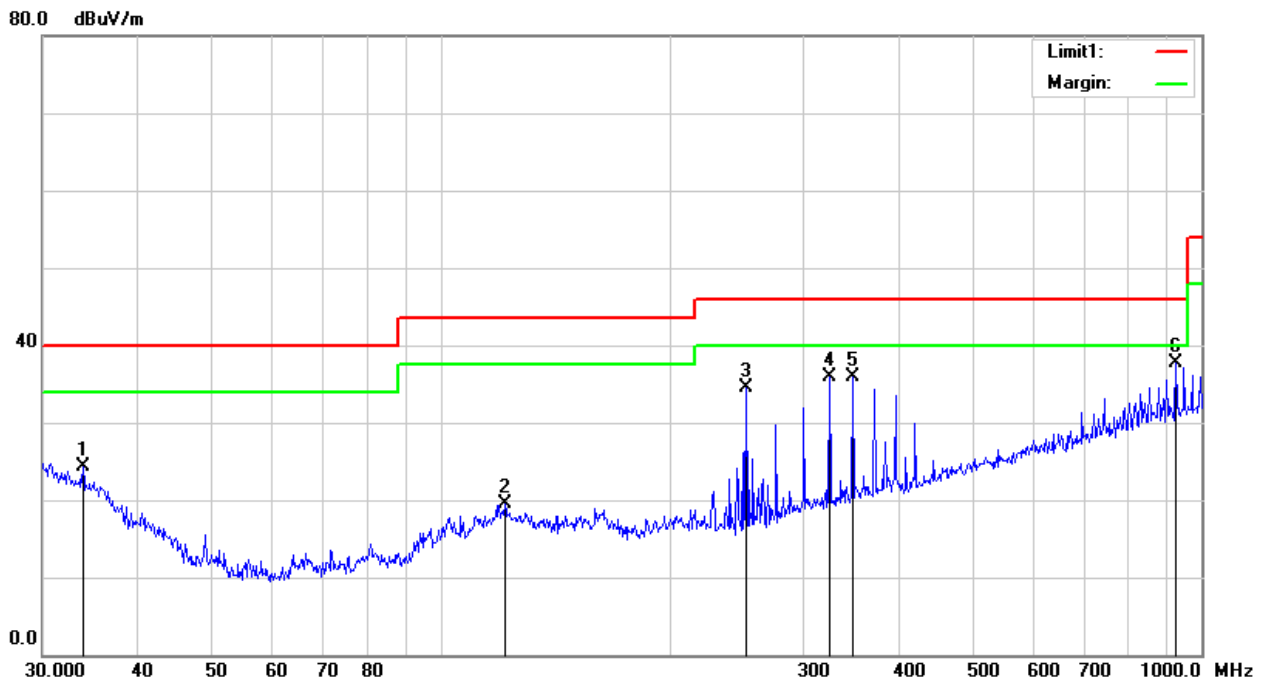
BELOW 1GHz WORST-CASE DATA

CHANNEL	TX Middle Channel	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9KHz ~ 1GHz		

ANTENNA POLARITY & test distance: HORIZONTAL at 3 m										
No.	Frequency (MHz)	Reading (dBuV/m)	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	33.9174	27.97	18.38	22.26	0.15	24.24	40.00	-15.76	100	232
2	121.5486	27.02	13.80	22.36	0.97	19.43	43.50	-24.07	100	194
3	252.0627	43.60	11.49	22.29	1.61	34.41	46.00	-11.59	100	256
4	324.4561	42.15	14.11	22.22	1.78	35.82	46.00	-10.18	100	116
5	348.0274	41.58	14.61	22.16	1.84	35.87	46.00	-10.13	100	124
6	925.7563	33.21	22.63	20.83	2.68	37.69	46.00	-8.31	100	337

REMARKS:

1. Result (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Ant_F (dB/m) + Cab_L (dB) - PA_G (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Result level – Limit value



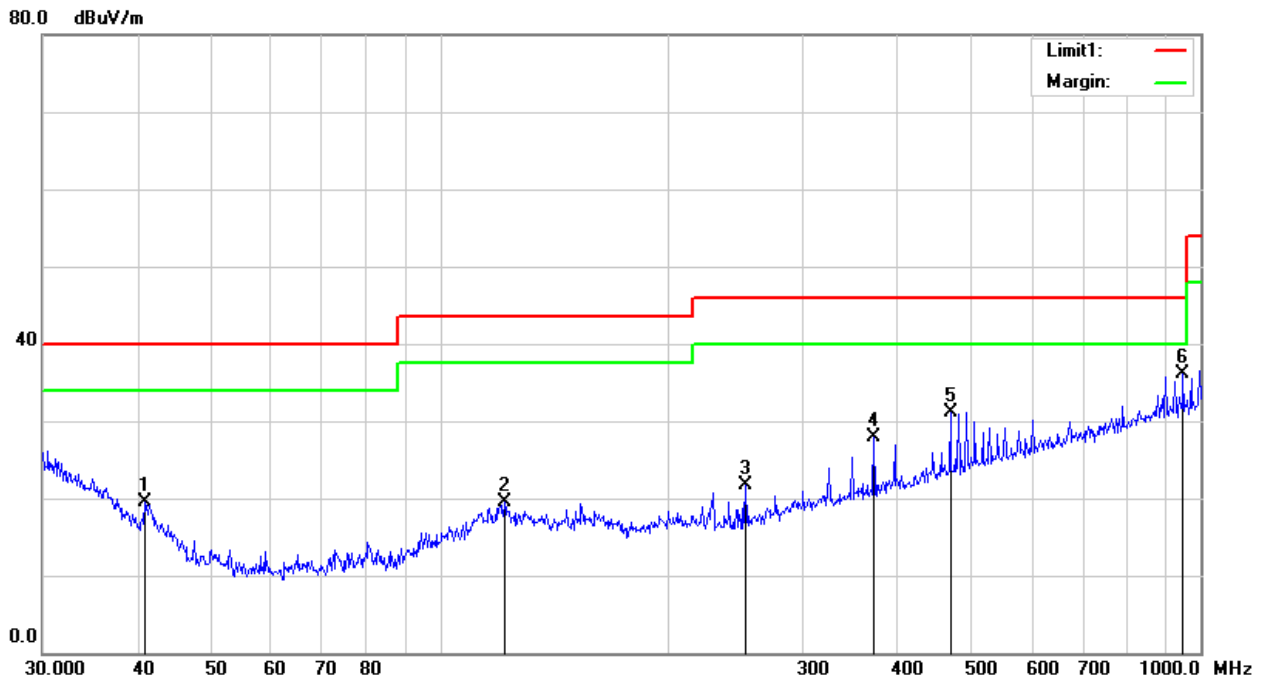


CHANNEL	TX Middle Channel	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9KHz ~ 1GHz		

ANTENNA POLARITY & test distance: Vertical at 3 m										
No.	Frequency (MHz)	Reading (dBuV/m)	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	40.8446	28.26	13.34	22.28	0.19	19.51	40.00	-20.49	100	346
2	121.5486	27.15	13.80	22.36	0.97	19.56	43.50	-23.94	100	84
3	252.0627	30.82	11.49	22.29	1.61	21.63	46.00	-24.37	100	14
4	372.0045	33.08	15.11	22.09	1.89	27.99	46.00	-18.01	100	131
5	468.8762	33.77	17.08	21.87	2.06	31.04	46.00	-14.96	100	38
6	948.7610	31.48	22.74	20.79	2.70	36.13	46.00	-9.87	100	30

REMARKS:

1. Result (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Ant_F (dB/m) + Cab_L (dB) - PA_G (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Result level – Limit value





ABOVE 1GHZ WORST-CASE DATA:

CHANNEL	TX Low Channel	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

2405-Horizonta

FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	DETECTOR (PK/AV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (mm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
2376	50.37	PK	74	-23.63	100	51	64.02	-13.65
2376	33.60	AV	54	-20.40	100	51	47.25	-13.65
*2405	74.79	PK	114	-39.21	200	42	88.76	-13.97
*2405	58.02	AV	94	-35.98	200	42	71.99	-13.97
4810	61.38	PK	74	-12.62	100	92	65.13	-3.75
4810	44.61	AV	54	-9.39	100	92	48.36	-3.75
7215	63.48	PK	74	-10.52	200	35	64.06	-0.58
7215	46.71	AV	54	-7.29	200	35	47.29	-0.58

2405-Vertical

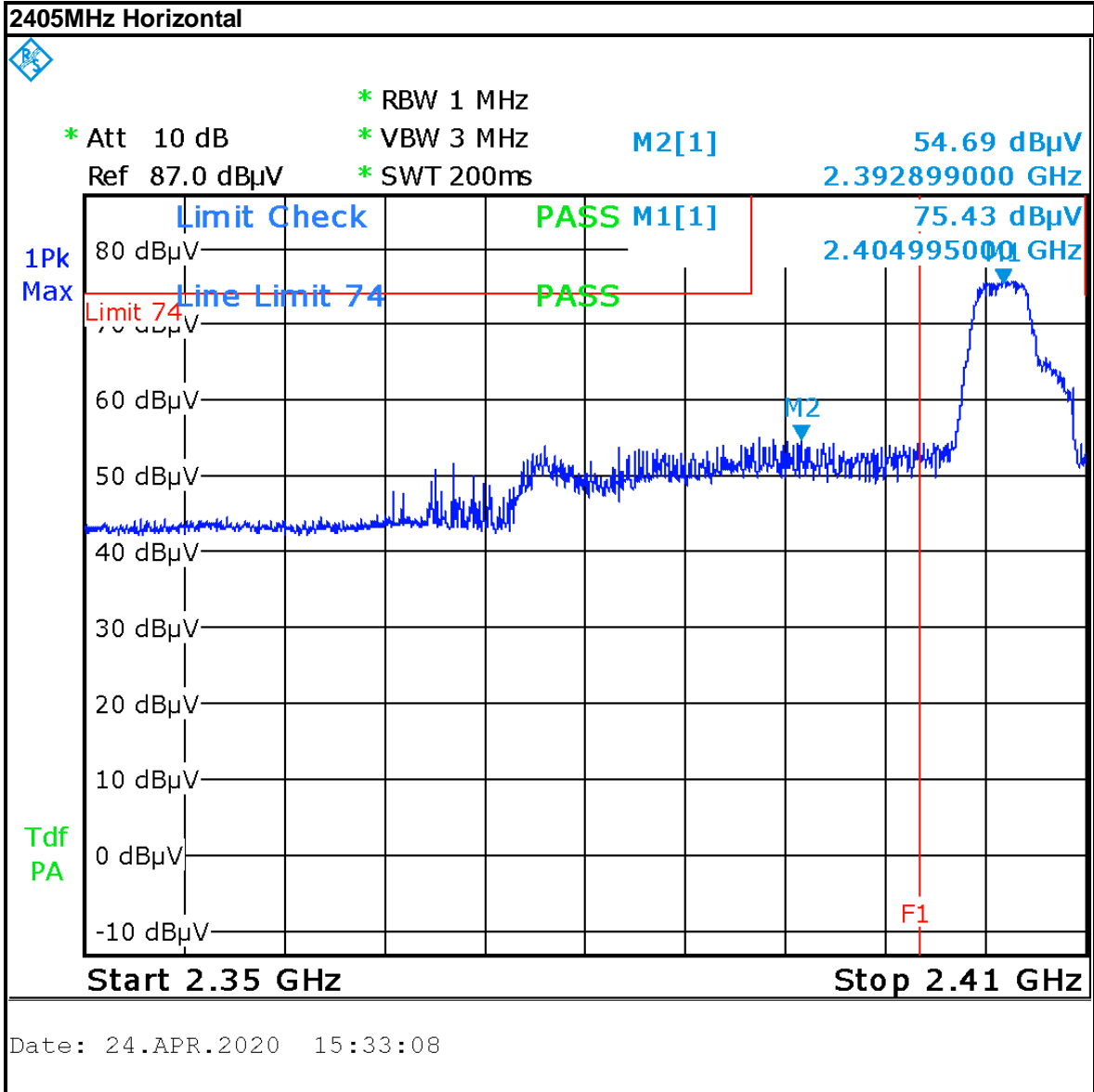
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	DETECTOR (PK/AV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (mm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
2384	52.87	PK	74	-21.13	100	250	66.52	-13.65
2384	36.10	AV	54	-17.90	100	250	49.75	-13.65
*2405	72.51	PK	114	-41.49	100	253	86.48	-13.97
*2405	55.74	AV	94	-38.26	100	253	69.71	-13.97
4810	64.65	PK	74	-9.35	100	354	68.40	-3.75
4810	47.88	AV	54	-6.12	100	354	51.63	-3.75
7215	63.71	PK	74	-10.29	100	312	64.29	-0.58
7215	46.94	AV	54	-7.06	100	312	47.52	-0.58

REMARKS:

1. Field strength value(AV) (dBuV/m) = Field strength value(PK) (dBuV/m) + Average Factor (dB).
2. Margin value = Field strength value – Limit value.
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. " * ": Fundamental frequency.



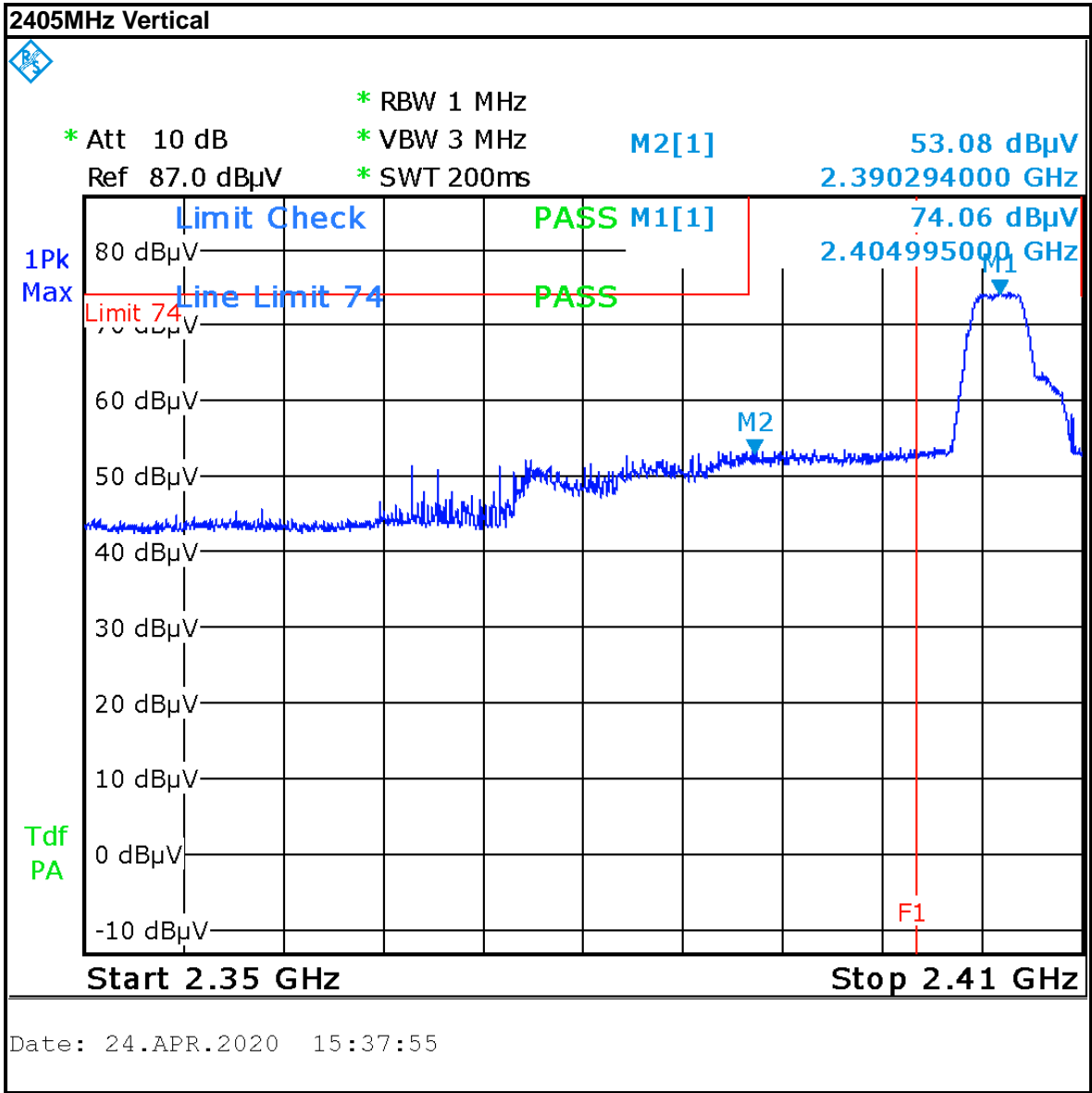
Band edge Plot





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CHANNEL	TX Middle Channel	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

2428-Horizonta

FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	DETECTOR (PK/AV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (mm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
*2428	74.16	PK	114	-39.84	100	281	87.18	-13.02
*2428	57.39	AV	94	-36.61	100	281	70.41	-13.02
4856	65.71	PK	74	-8.29	100	53	69.67	-3.96
4856	48.94	AV	54	-5.06	100	53	52.90	-3.96
7284	63.48	PK	74	-10.52	100	354	64.24	-0.76
7284	46.71	AV	54	-7.29	100	354	47.47	-0.76

2428-Vertical

FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	DETECTOR (PK/AV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (mm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
*2428	70.88	PK	114	-43.12	200	297	83.90	-13.02
*2428	54.11	AV	94	-39.89	200	297	67.13	-13.02
4856	64.19	PK	74	-9.81	200	93	68.15	-3.96
4856	47.42	AV	54	-6.58	200	93	51.38	-3.96
7284	62.19	PK	74	-11.81	100	154	62.95	-0.76
7284	45.42	AV	54	-8.58	100	154	46.18	-0.76

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

CHANNEL	TX High Channel	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

2450-Horizonta

FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	DETECTOR (PK/AV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (mm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
*2483.5	46.13	PK	74	-27.87	100	209	59.78	-13.65
*2483.5	29.36	AV	54	-24.64	100	209	43.01	-13.65
2450	74.25	PK	114	-39.75	100	298	88.22	-13.97
2450	57.48	AV	94	-36.52	100	298	71.45	-13.97
4900	66.79	PK	74	-7.21	200	41	70.54	-3.75
4900	50.02	AV	54	-3.98	200	41	53.77	-3.75
7350	63.79	PK	74	-10.21	100	70	64.37	-0.58
7350	47.02	AV	54	-6.98	100	70	47.60	-0.58

2450-Vertical

FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	DETECTOR (PK/AV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (mm)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
*2483.5	44.29	PK	74	-29.71	200	221	57.94	-13.65
*2483.5	27.52	AV	54	-26.48	200	221	41.17	-13.65
2450	72.18	PK	114	-41.82	100	46	86.15	-13.97
2450	55.41	AV	94	-38.59	100	46	69.38	-13.97
4900	64.57	PK	74	-9.43	200	95	68.32	-3.75
4900	47.80	AV	54	-6.20	200	95	51.55	-3.75
7350	64.97	PK	74	-9.03	200	81	65.55	-0.58
7350	48.20	AV	54	-5.80	200	81	48.78	-0.58

REMARKS:

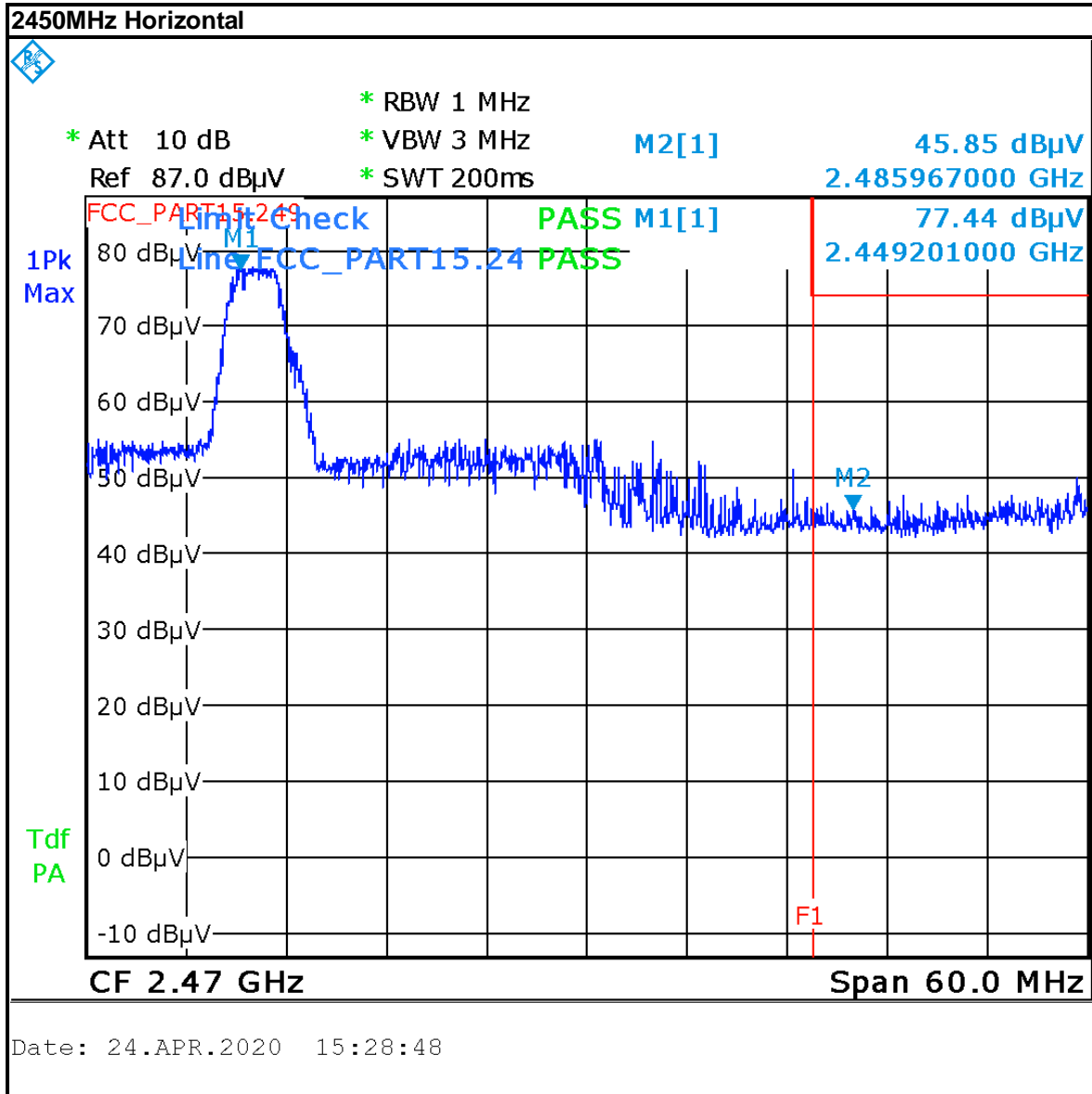
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.



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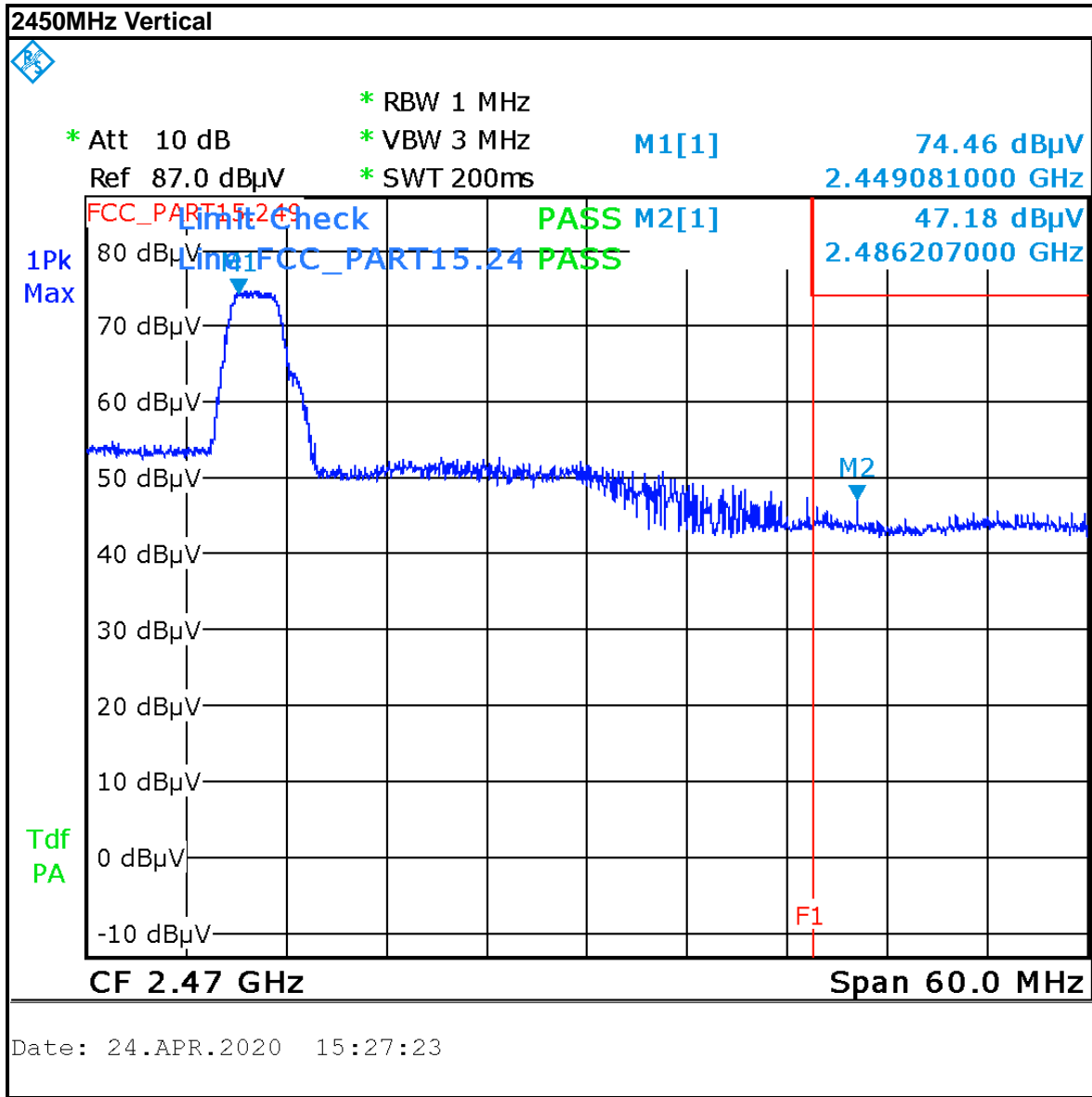
Band edge Plot





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4.2 20dB BANDWIDTH MEASUREMENT

4.2.1 LIMITS OF 20dB BANDWIDTH MEASUREMENT

According to FCC 15.215(c), must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Wireless Connectivity Tester	R&S	CMW270	1201.0002K75	Dec. 18, 19	Dec. 17, 20
MXA VEXTOR SIGNAL	Agilent	n5182a	MY50140530	Mar. 24, 20	Mar. 24, 21
MXA signal analyzer	Agilent	n9020a	MY49100060	Mar. 24, 20	Mar. 24, 21
RF Control Unit	Tonscend	JS0806-2	188060112	Mar. 24, 20	Mar. 24, 21
Signal Generation	Agilent	E4421B	US40051152	Dec. 18, 19	Dec. 17, 20
DC Power Supply	Agilent	E3640A	MY40004013	Mar. 28, 20	Mar. 27, 21
Programmable Temperature & Humidity Chamber	Hongjin	HYC-TH-225D H	DG-180746	Mar. 24, 20	Mar. 24, 21
Test System	Tonscend	JS 1120-3	N/A	N/A	N/A
Power Splitter	Weinschel	1580-1	TL177	Mar. 20, 20	Mar. 19, 21

NOTE:

1. The test was performed in RF Oven room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

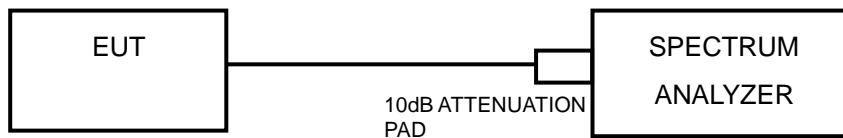
4.2.3 TEST PROCEDURE

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- d. Repeat above procedures until all frequencies measured were complete.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



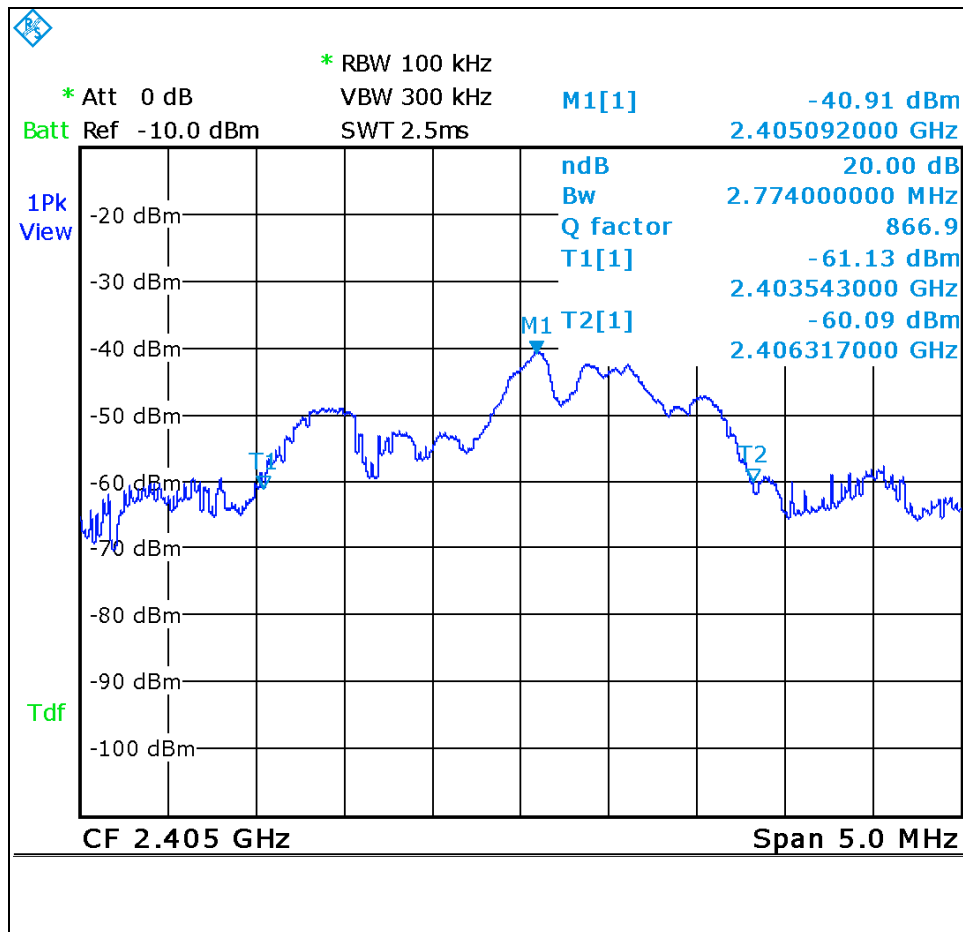
4.2.6 EUT OPERATING CONDITIONS

- a) Turned on the power of all equipment.
- b) EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.

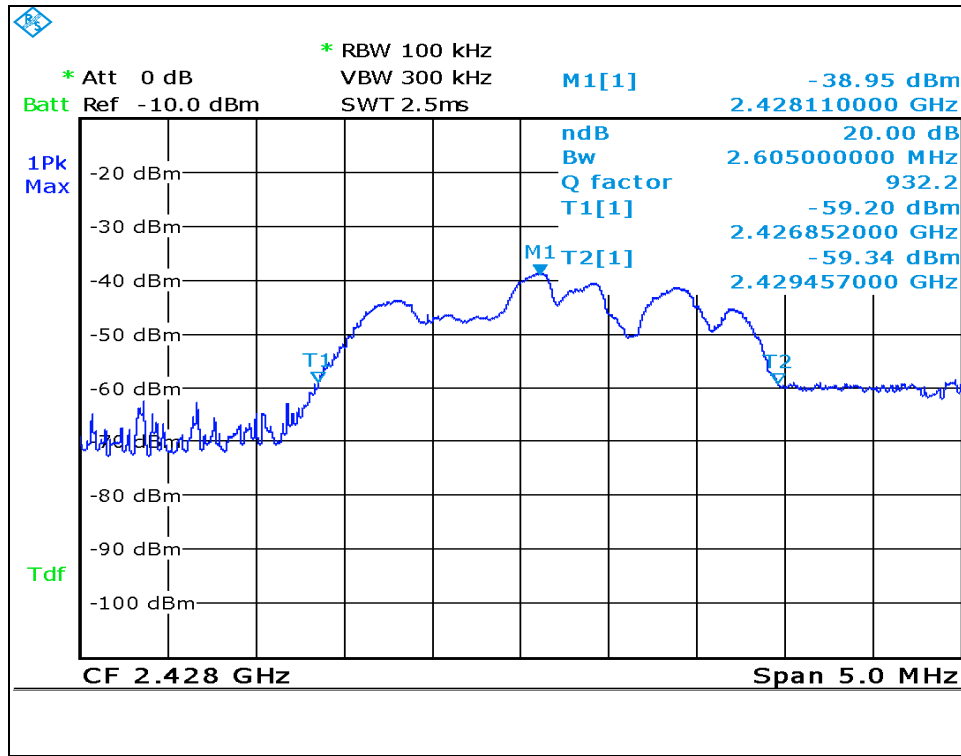
4.2.7 TEST RESULTS

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
Low	2405	2.7740
Middle	2438	2.6050
High	2450	2.7150

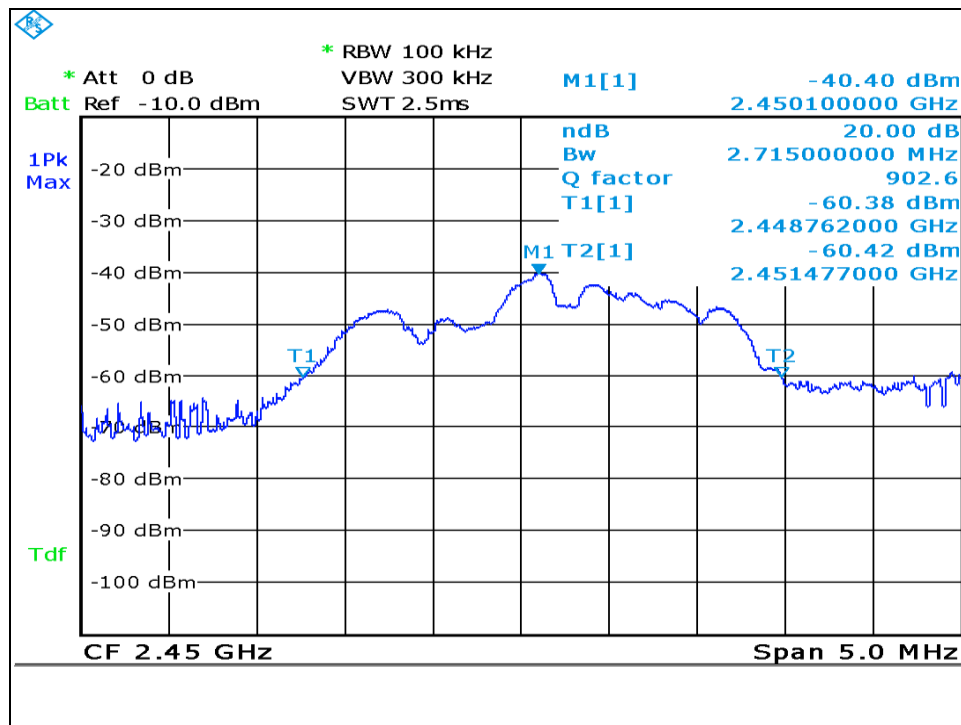
Test Data: Low channel



Test Data: Middle channel



Test Data: High channel





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5. PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).



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6. APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---