



FCC PART 15.249
TEST REPORT

For

NEWEST ONE TECH Co., Ltd.

A-607, 908, 910 DAEWOO TECHNO PARK, 261 DOYAK-RO, WONMI-GU, BUCHEON, 14523 South Korea

FCC ID:2AT7URM-04

Report Type: Original Report	Product Type: Radar Object Detection Sensor
Report Number:	RGZ200302002-00
Report Date:	2020-05-12
Reviewed By:	Ivan Cao Assistant Manager 
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Radar Object Detection Sensor
Test Model:	RM-04, RM-04-F
Multiple Models:	RC-01, RM-04XX, RODS-L, RODL-XXX, RC-XXXX, RC-01-F, RODS-L-F
Operation Frequency:	24125MHz
Modulation Type:	FMCW
Rated Input Voltage:	9 ~ 24Vdc
Serial Number:	RGZ200302002-RF-S1(RM-04) RGZ200302002-RF-S3(RM-04-F)
EUT Received Date:	2020.03.02
EUT Received Status:	Good

Note: each model have two different firmware, both firmware were provided sample to test respectively.

Model RM-04, RM-04-F was selected for fully testing, the detailed information about the difference among RC-01, RM-04XX, RODS-L, RODL-XXX, RC-XXXX, RC-01-F, RODS-L-F and model RM-04, RM-04-F can be referred to the declaration letter which was stated and guaranteed by the manufacturer.

Objective

This type approval report is prepared on behalf of **NEWEST ONE TECH Co., Ltd.** in accordance with Part 2-Subpart J, and Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Rules Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.249 rules.

Related Submittal(s)/Grant(s)

N/A.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
Unwanted Emissions, radiated	30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical 1G~6GHz: 4.45 dB, 6G~26.5GHz: 5.23 dB
Temperature	±1 °C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “Δ”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk “★”.

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured in swept mode for testing which was provided by the manufacturer.

EUT Exercise Software

No software was used in test.

Equipment Modifications

No modifications were made to the EUT.

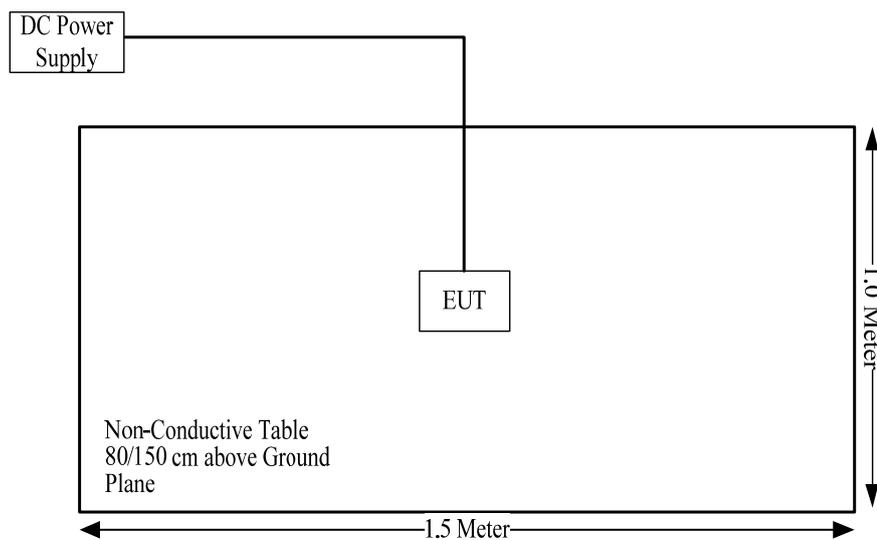
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Pro instrument	DC Power Supply	pps3300	3300012

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
DC Power Cable	No	No	3	DC Power Supply	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	Conduction Emissions	Not Applicable
15.205, §15.209, §15.249	Radiated Emissions	Compliance
§15.215 (c)	20 dB Bandwidth	Compliance

Not Applicable: the device powered by DC of vehicle.

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.
- c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Connector Construction

The EUT has one internal antenna arrangement, and the antenna gain is 8 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant.

FCC§15.205, §15.209&§15.249- RADIATED EMISSIONS

Applicable Standard

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

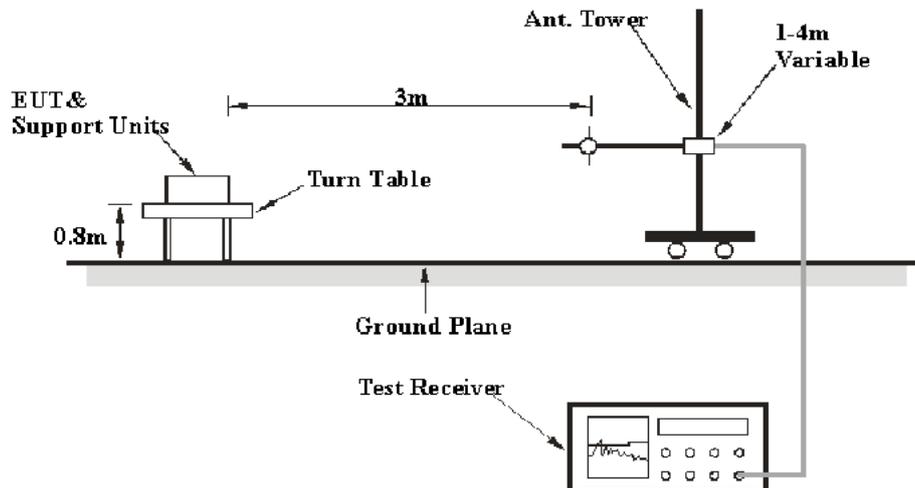
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

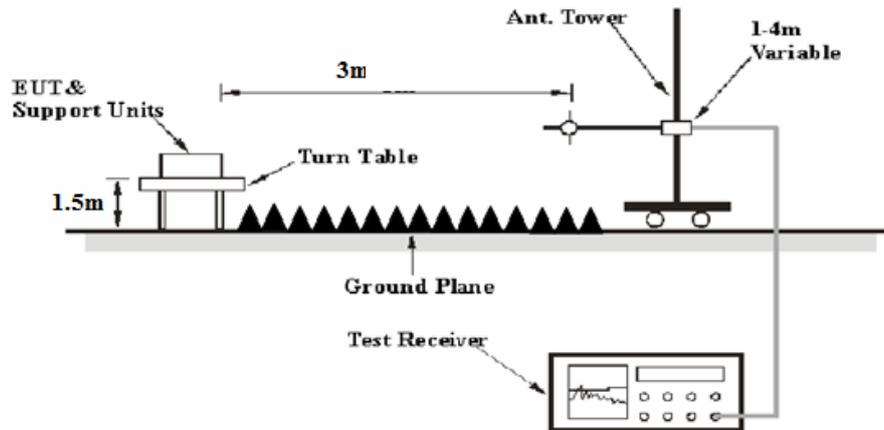
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

EUT Setup

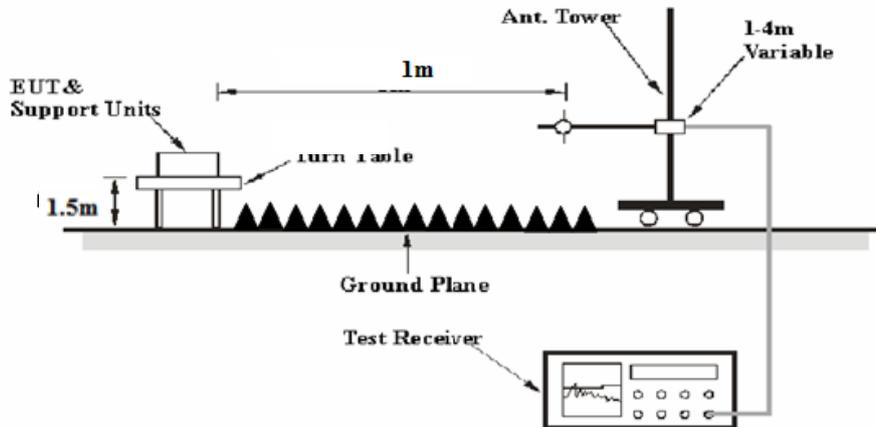
Below 1 GHz:



1-26.5 GHz:



26.5-40 GHz:



The radiated emission tests were performed in the 3 meters Chamber A, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209/15.205 and FCC 15.249 limits.

According to C63.10, the 26.5- 100GHz test result shall be extrapolated to the specified distance using an extrapolation factor of 20dB/decade from 3m to 1m

Distance extrapolation factor = $20 \log (\text{specific distance [3m]}/\text{test distance [1m]})$ dB

Extrapolation result = Corrected Amplitude (dB μ V/m) - distance extrapolation factor (9.54dB)

For above 40GHz, external harmonic mixers are utilized. The antenna is scanned around the entire perimeter surface of the EUT, in both horizontal and vertical polarizations, at the distance of 1m from the EUT for 40-60GHz, and 0.5m for 60-140GHz. The Mixers and it's RF cables is compose a system for calibration, the conversion factor was added into the test Spectrum Analyzer in testing.

Test Equipment Setup

The system was investigated from 30 MHz to 100 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	AV

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detection mode from 30 MHz to 1GHz, peak and average detection mode above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Or

$$\text{Margin} = \text{Limit} - \text{Extrapolation result}$$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2019-09-12	2020-09-12
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Sunol Sciences	Antenna	JB3	A060611-3	2017-07-21	2020-07-21
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-02	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0530-01	2019-09-24	2020-09-24
Sonoma	Amplifier	310N	185914	2019-10-13	2020-10-13
R&S	Spectrum Analyzer	FSP 38	100478	2019-05-09	2020-05-09
R&S	Spectrum Analyzer	8564E	3943A01781	2019-03-02	2020-03-02
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2019-09-05	2020-09-05
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2017-12-06	2020-12-05
Ducommun Technologies	Horn Antenna	ARH-2823-02	1007726-01 1302	2017-12-06	2020-12-05
OML	Harmonic Mixer	WR19/M19HWD	U60313-1	2019-10-14	2022-10-14
OML	Horn Antenna	M19RH	11648-01	2019-10-14	2022-10-14
OML	Harmonic Mixer	WR12/M12HWD	E60120-1	2019-10-19	2022-10-19
OML	Horn Antenna	M12RH	E60120-2	2019-10-19	2022-10-19
OML	Harmonic Mixer	WR08/M08HWD	F60313-1	2019-10-24	2022-10-24
OML	Horn Antenna	M08RH	F60313-2	2019-10-24	2022-10-24
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2019-06-27	2020-06-27

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data**Environmental Conditions**

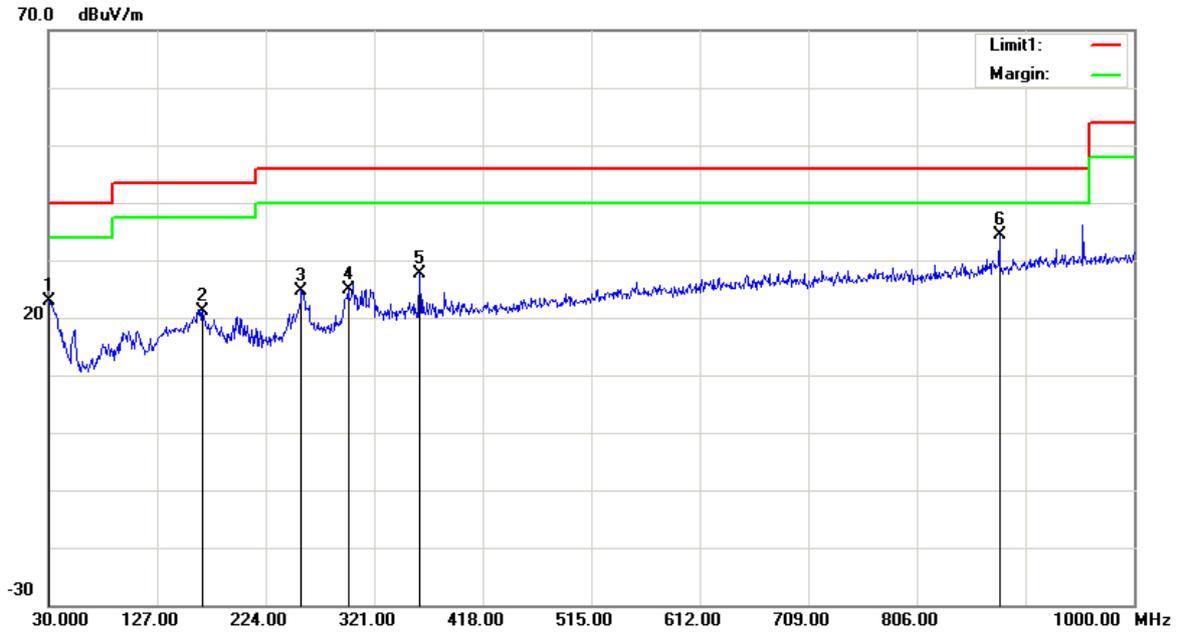
Test Items	Radiation Below 1GHz	Radiation Above 1GHz
Temperature:	25.3 °C	24.5°C
Relative Humidity:	53%	52 %
ATM Pressure:	101.1 kPa	101.1 kPa
Tester:	Jalon Liu	Bond Qin
Test Date:	2020-04-23	2020-04-23

Test Mode: Transmitting

RM-04:

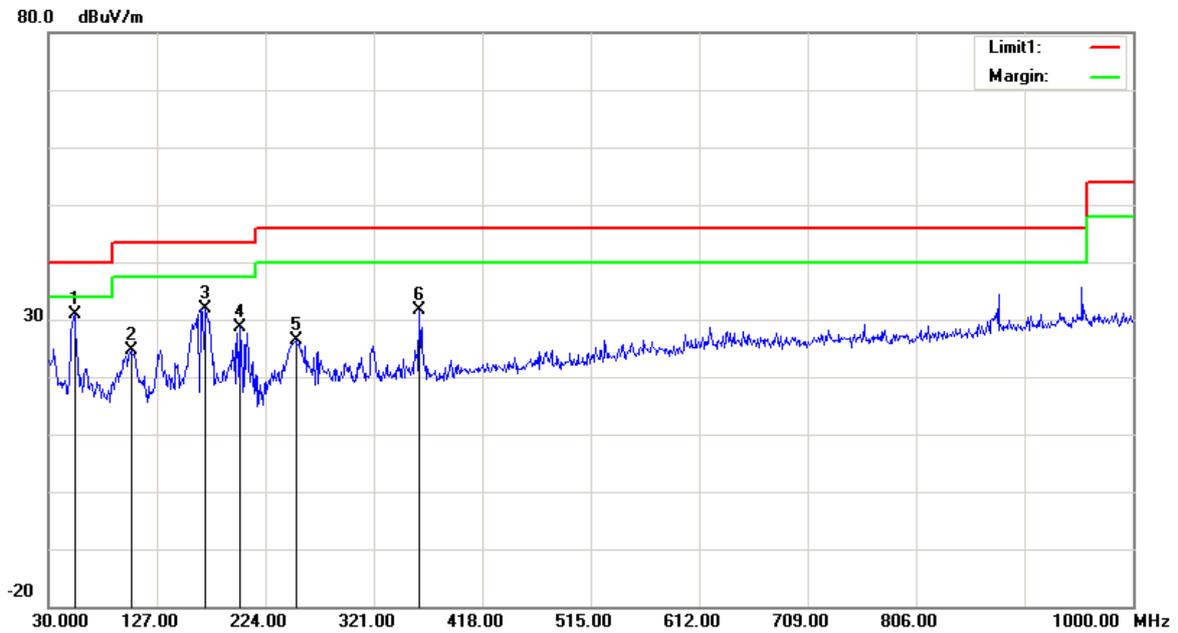
1) 30MHz-1GHz:

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.0000	27.21	peak	-4.33	22.88	40.00	17.12
167.7400	30.65	peak	-9.53	21.12	43.50	22.38
256.0100	34.32	peak	-9.63	24.69	46.00	21.31
297.7200	32.49	peak	-7.56	24.93	46.00	21.07
361.7400	33.56	peak	-6.05	27.51	46.00	18.49
879.7200	31.30	peak	2.99	34.29	46.00	11.71

Vertical:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
53.2800	47.41	peak	-16.52	30.89	40.00	9.11
103.7200	38.59	peak	-13.85	24.74	43.50	18.76
170.6500	41.52	peak	-9.63	31.89	43.50	11.61
200.7200	38.02	peak	-9.45	28.57	43.50	14.93
251.1600	36.31	peak	-9.81	26.50	46.00	19.50
361.7400	37.62	peak	-6.05	31.57	46.00	14.43

2) 1GHz-40GHz:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
	Reading (dB μ V)	Detector	Polar (H/V)	Factor (dB/m)					
24125.00	87.92	PK	H	35.50	10.95	37.17	97.20	127.96	30.76
24125.00	67.87	AV	H	35.50	10.95	37.17	77.15	107.96	30.81
24125.00	96.82	PK	V	35.50	10.95	37.17	106.10	127.96	21.86
24125.00	76.83	AV	V	35.50	10.95	37.17	86.11	107.96	21.85
24000.00	53.17	PK	H	35.50	10.87	37.40	62.14	74.00	11.86
24000.00	40.67	AV	H	35.50	10.87	37.40	49.64	54.00	4.36
24250.00	52.45	PK	H	35.50	11.02	36.94	62.03	74.00	11.97
24250.00	41.06	AV	H	35.50	11.02	36.94	50.64	54.00	3.36
1747.00	40.79	PK	H	26.24	1.65	25.81	42.87	74.00	31.13
1747.00	36.28	AV	H	26.24	1.65	25.81	38.36	54.00	15.64

3) 40GHz-100GHz:

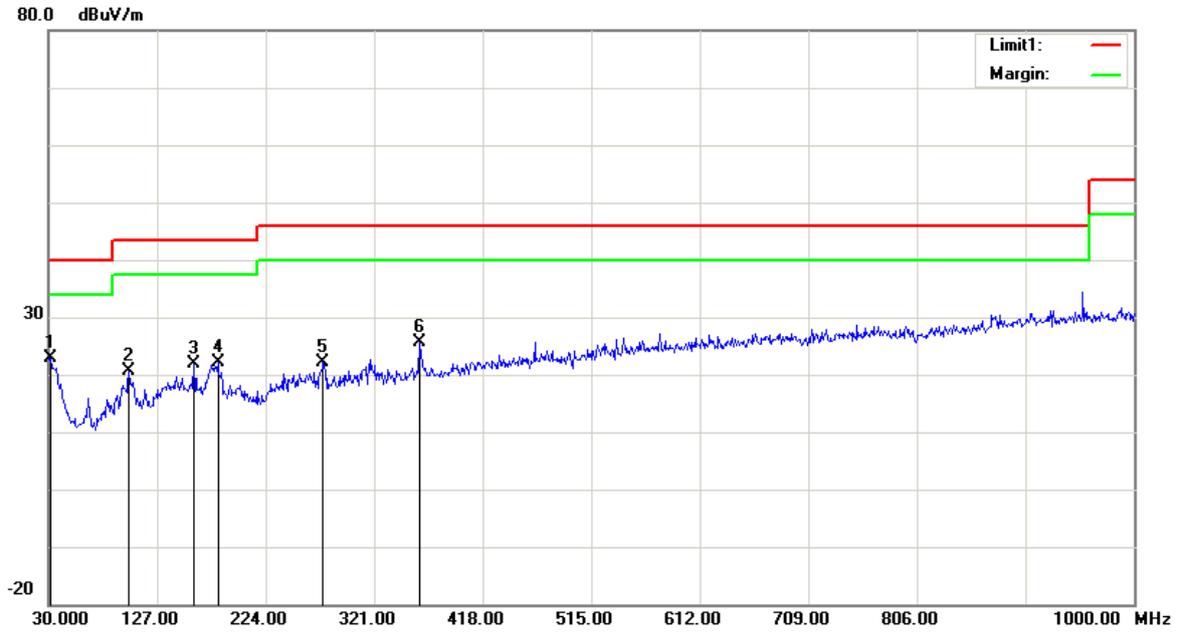
Frequency (GHz)	Receiver		Rx Antenna		Corrected Amplitude (dB μ V/m)	Extrapolation result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
	Reading (dB μ V)	Detector	Polar (H/V)	Factor (dB/m)				
55.57	31.78	PK	H	41.22	73	63.46	74	10.54
55.57	19.24	AV	H	41.22	60.46	50.92	54	3.08
89.20	29.01	PK	H	45.01	74.02	64.48	74	9.52
89.20	16.25	AV	H	45.01	61.26	51.72	54	2.28

Note: 1. for the range 40-60GHz, the test performed at the distance 1m. for the range 60-100GHz, the test performed at the distance 0.5m.

RM-04-F:

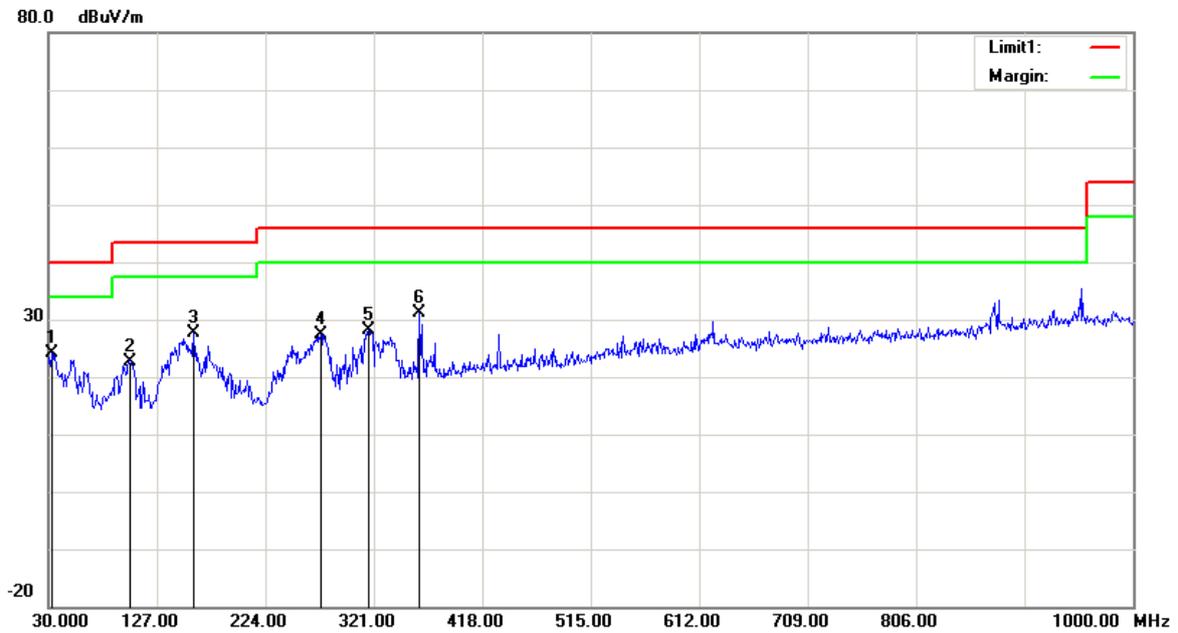
1) 30MHz-1GHz:

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
31.9400	28.39	peak	-5.47	22.92	40.00	17.08
101.7800	34.57	peak	-13.98	20.59	43.50	22.91
159.9800	31.36	peak	-9.53	21.83	43.50	21.67
181.3200	32.09	peak	-9.98	22.11	43.50	21.39
275.4100	30.72	peak	-8.67	22.05	46.00	23.95
361.7400	31.77	peak	-6.05	25.72	46.00	20.28

Vertical:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
32.9100	30.04	peak	-5.92	24.12	40.00	15.88
102.7500	36.67	peak	-13.92	22.75	43.50	20.75
159.9800	37.06	peak	-9.53	27.53	43.50	15.97
273.4700	36.04	peak	-8.64	27.40	46.00	18.60
316.1500	35.26	peak	-7.11	28.15	46.00	17.85
361.7400	37.12	peak	-6.05	31.07	46.00	14.93

2) 1GHz-40GHz:

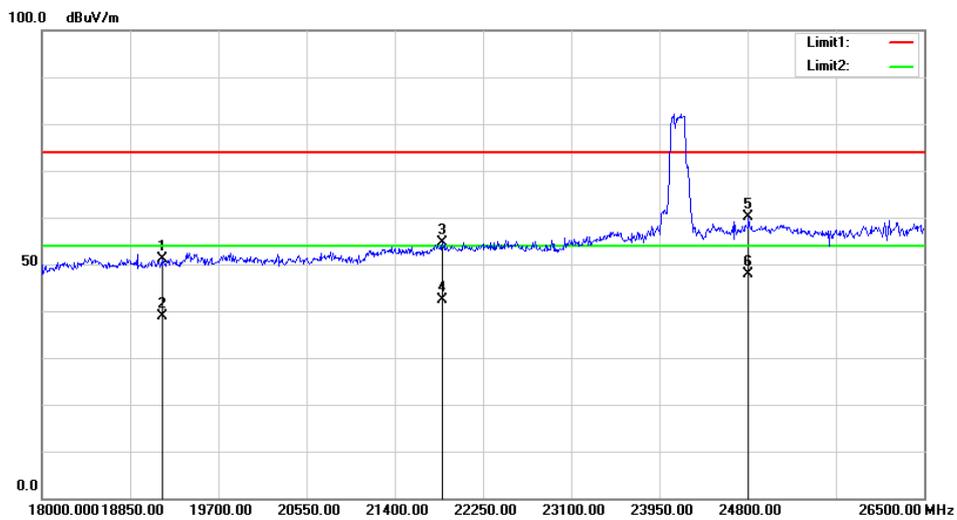
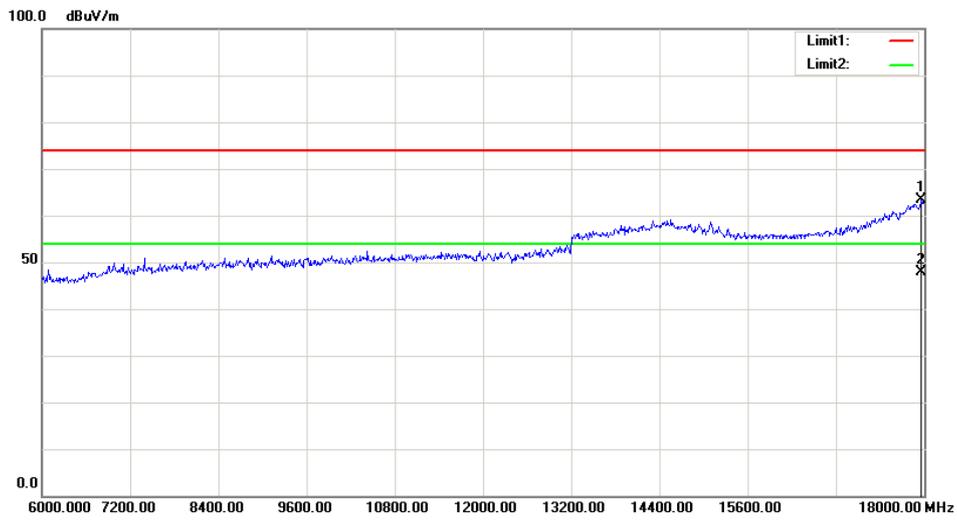
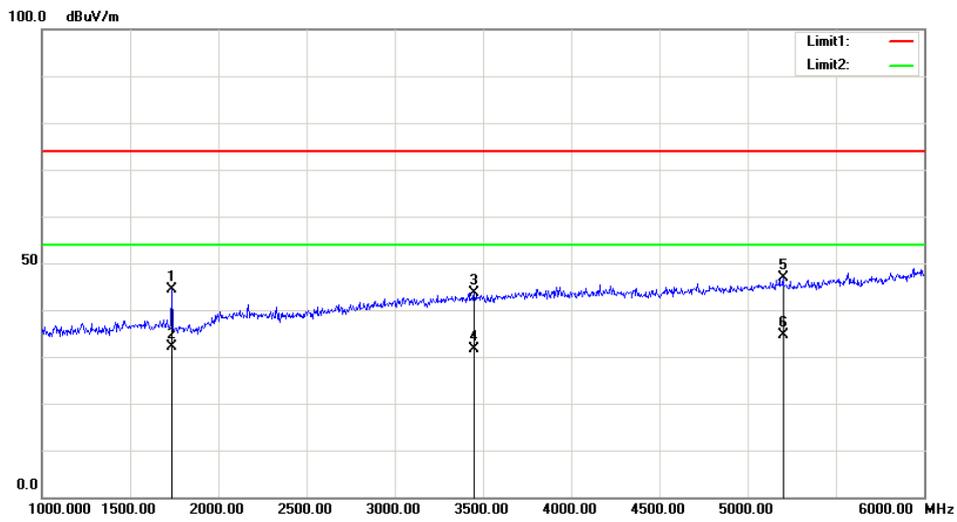
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
	Reading (dB μ V)	Detector	Polar (H/V)	Factor (dB/m)					
24125.00	85.08	PK	H	35.50	10.95	37.17	94.36	127.96	33.60
24125.00	65.59	AV	H	35.50	10.95	37.17	74.87	107.96	33.09
24125.00	96.54	PK	V	35.50	10.95	37.17	105.82	127.96	22.14
24125.00	71.48	AV	V	35.50	10.95	37.17	80.76	107.96	27.20
24000.00	51.02	PK	H	35.50	10.87	37.40	59.99	74.00	14.01
24000.00	40.08	AV	H	35.50	10.87	37.40	49.05	54.00	4.95
24250.00	52.02	PK	H	35.50	11.02	36.94	61.60	74.00	12.40
24250.00	40.86	AV	H	35.50	11.02	36.94	50.44	54.00	3.56
1918.00	47.76	PK	H	26.96	1.67	26.05	50.34	74.00	23.66
1918.00	41.58	AV	H	26.96	1.67	26.05	44.16	54.00	9.84

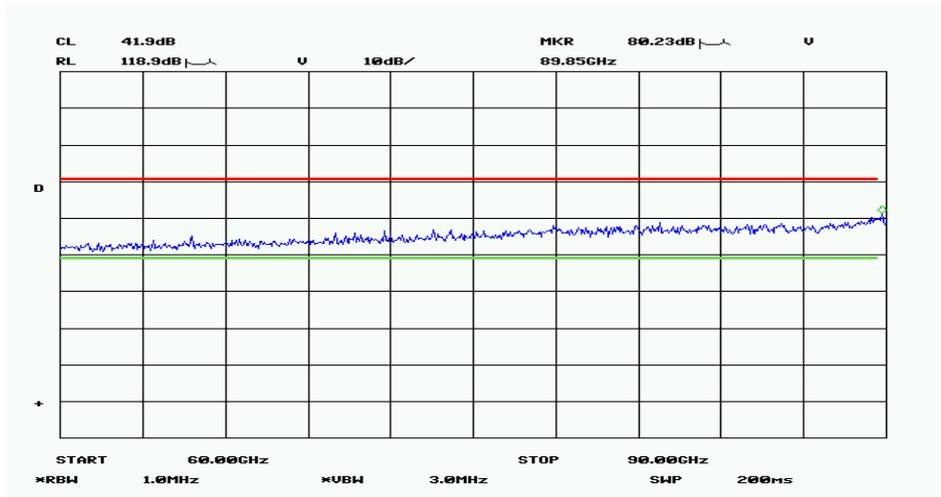
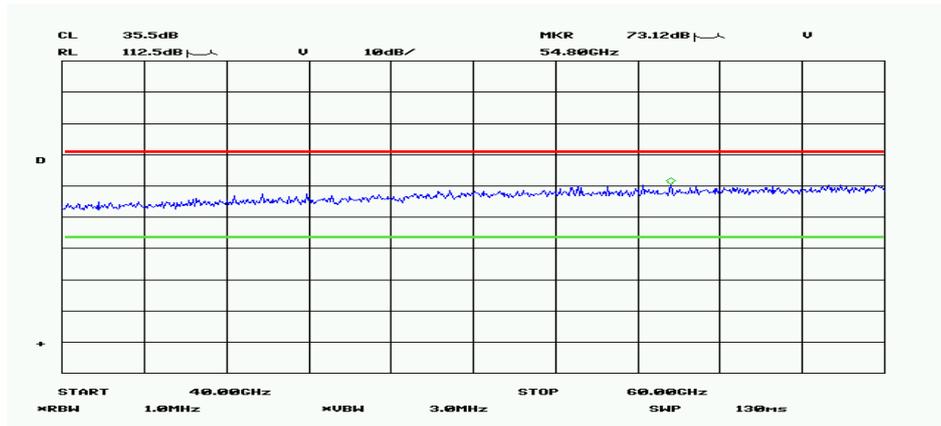
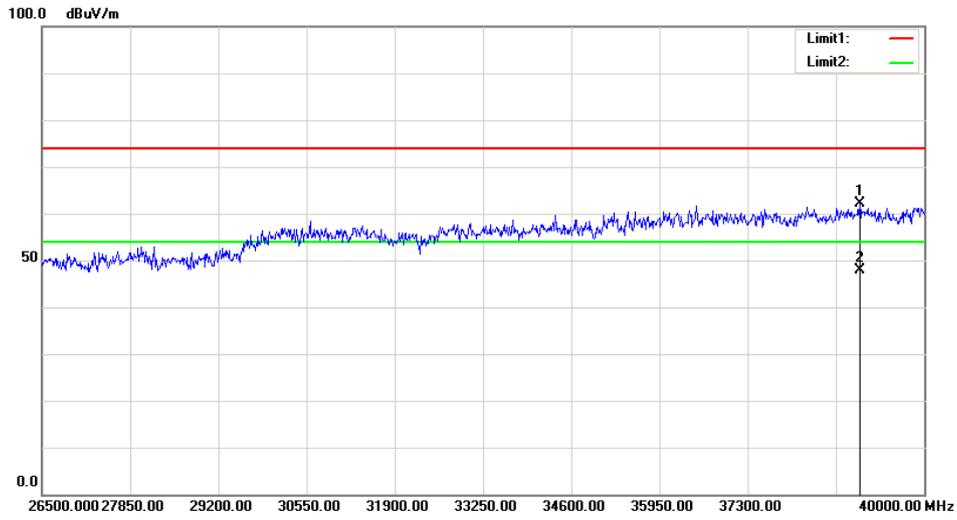
3) 40GHz-100GHz:

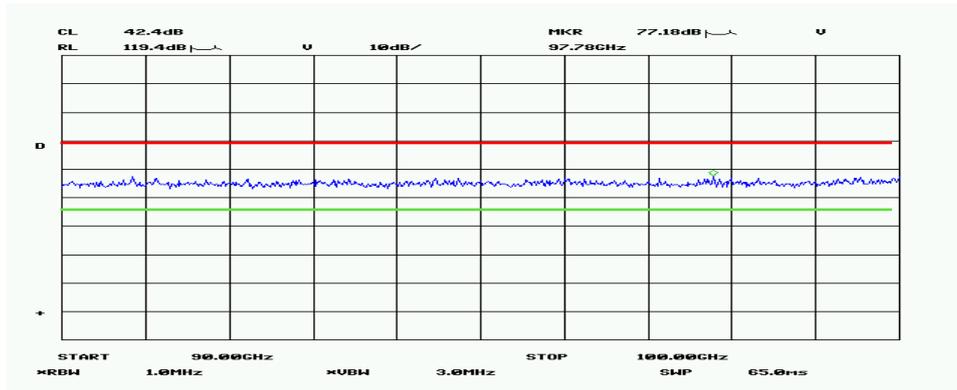
Frequency (GHz)	Receiver		Rx Antenna		Corrected Amplitude (dB μ V/m)	Extrapolation result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
	Reading (dB μ V)	Detector	Polar (H/V)	Factor (dB/m)				
56.59	32.42	PK	H	41.38	73.8	64.26	74	9.74
56.59	20.12	AV	H	41.38	61.5	51.96	54	2.04
90.00	29.10	PK	H	45.11	74.21	58.65	74	15.35
90.00	12.01	AV	H	45.11	57.12	41.56	54	12.44

Note: 1. for the range 40-60GHz, the test performed at the distance 1m. for the range 60-100GHz, the test performed at the distance 0.5m.

Test Plots for above 1GHz(RM-04-F was the worst)

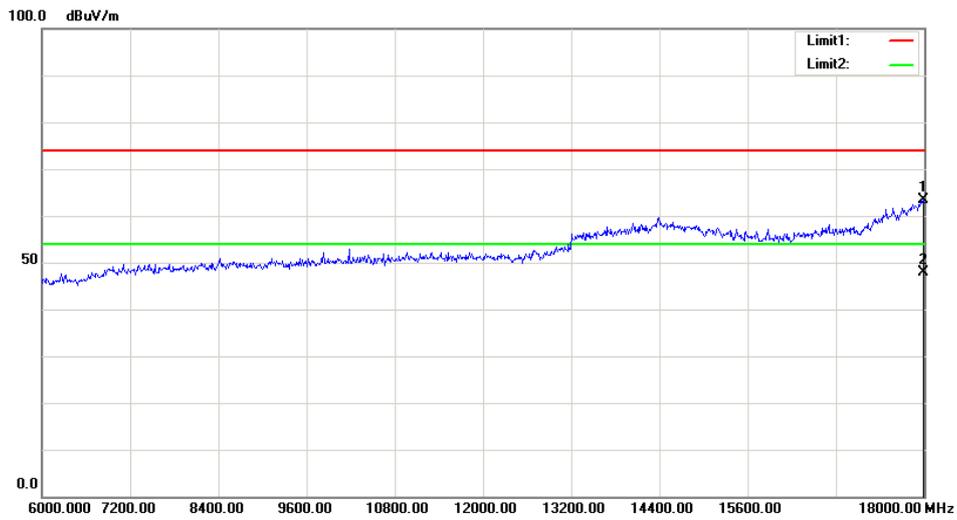
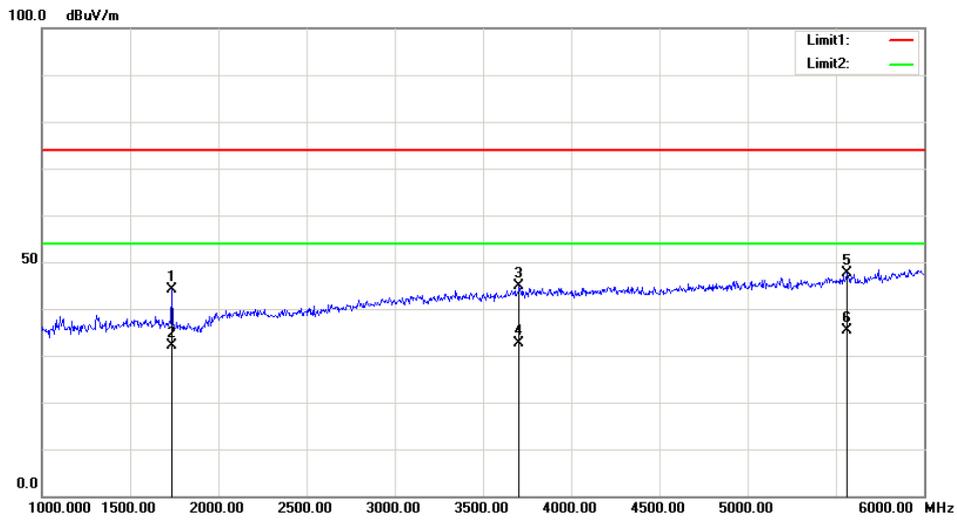


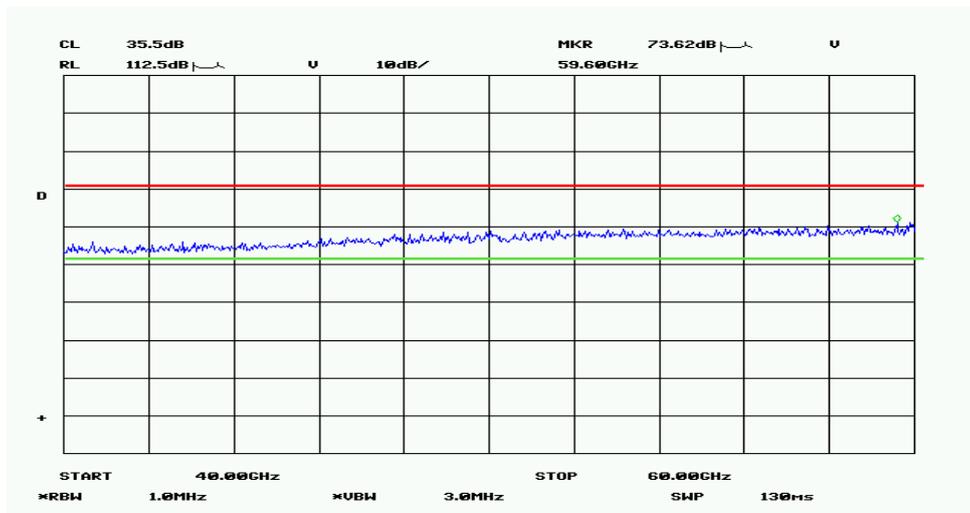
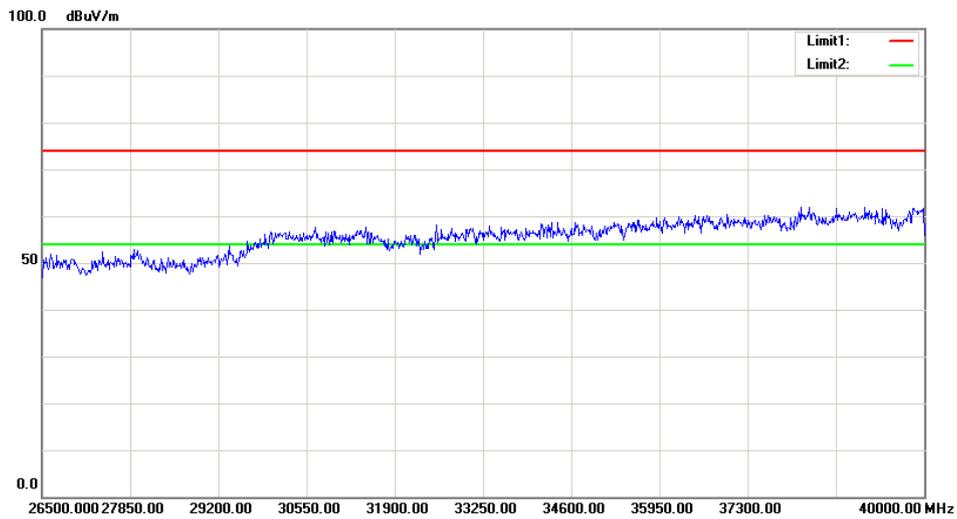
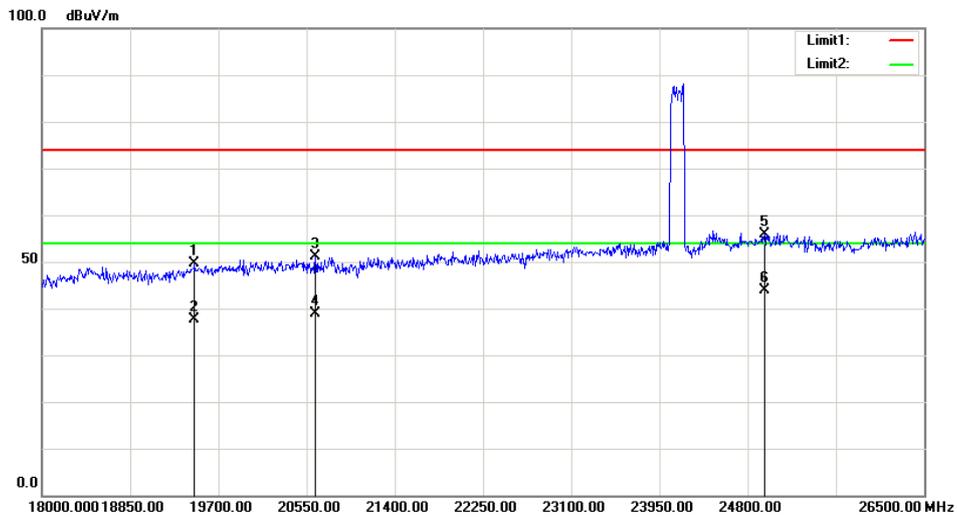


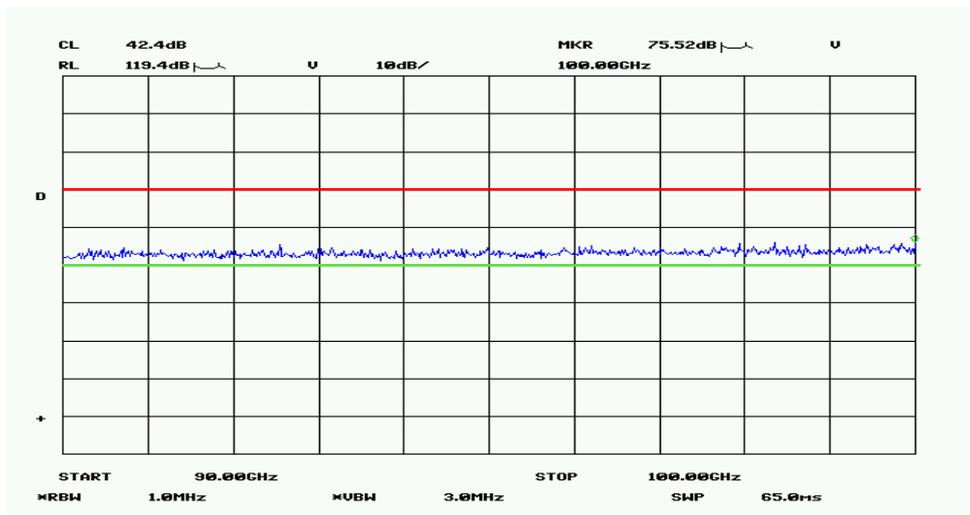
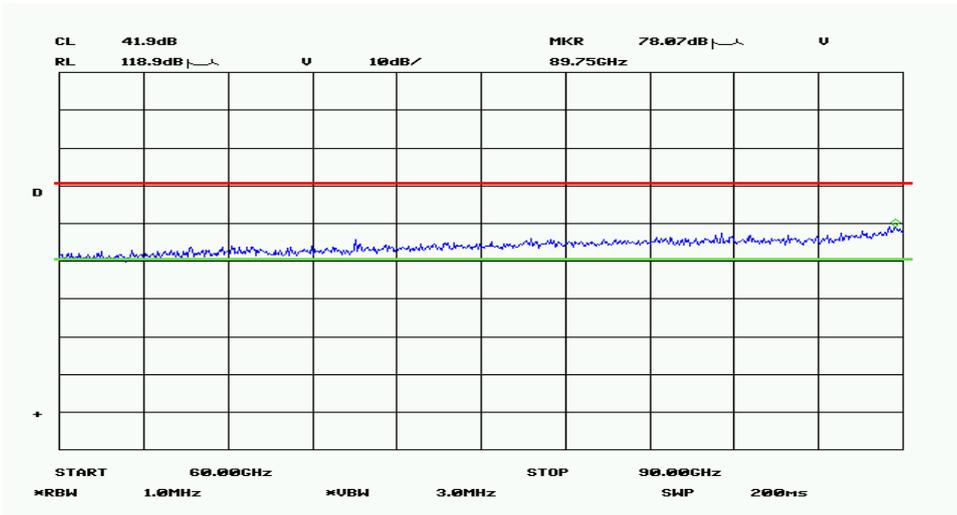


Note: the plots above 40GHz have not add the Extrapolation factor

Vertical







Note: the plots above 40GHz have not add the Extrapolation factor

FCC §15.215(c) – 20 dB BANDWIDTH TESTING

Applicable Standard

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, 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.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
3. Repeat above procedures until all frequencies measured were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40	101474	2020-01-09	2021-01-09
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2017-12-06	2020-12-05
MICRO-COAX	Coaxial Cable	UFA147-1-2362-100100	64639 231029-001	2020-02-24	2021-02-24

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	22 °C
Relative Humidity:	43 %
ATM Pressure:	101.6kPa
Tester:	Bond Qin
Test Date:	2020-04-16

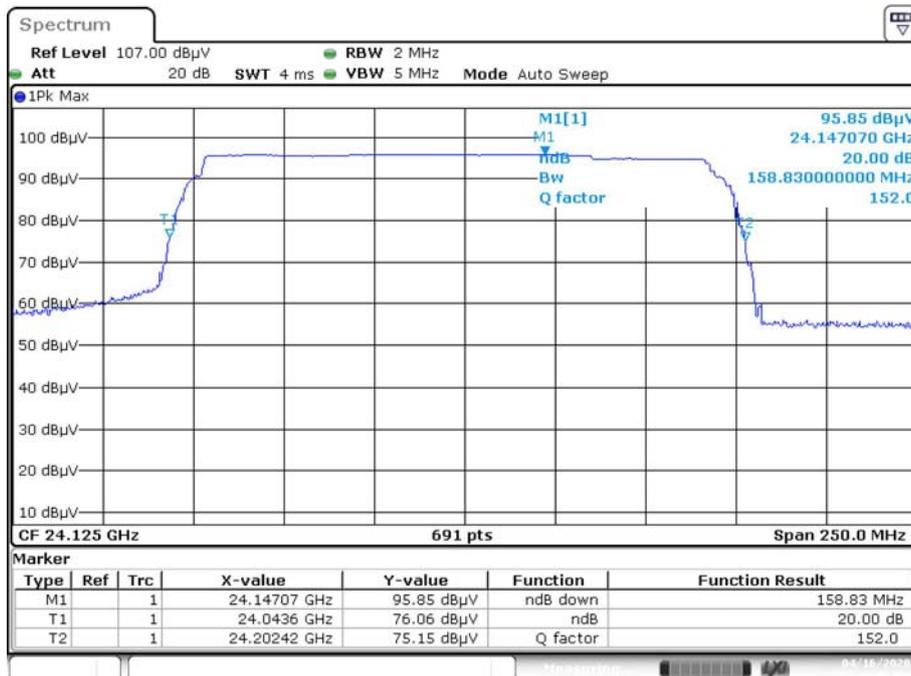
Test Result: Compliant.

Please refer to following tables and plots

Test Mode: Transmitting

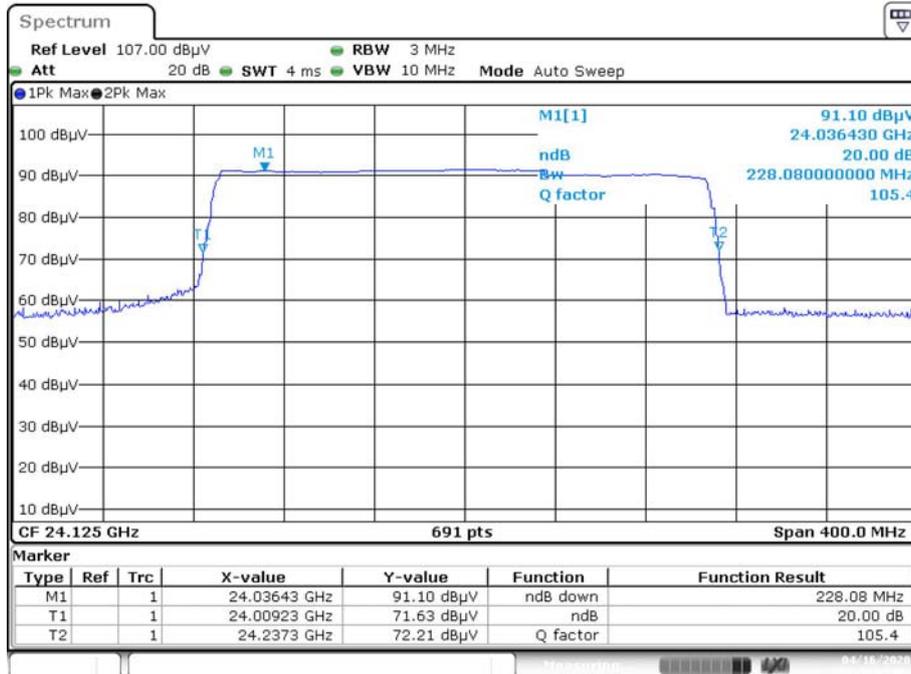
Model	Frequency (MHz)	20 dB Bandwidth (MHz)
RM-04	24125	158.83
RM-04-F	24125	228.08

RM-04



Date: 16.APR.2020 15:36:40

RM-04-F



Date: 16.APR.2020 19:55:08

***** END OF REPORT *****