

FCC PART 15.231 TEST REPORT

For

Chengdu Ebyte Electronic Technology Co., Ltd

Building B2, Mould Industrial Park, 199# Xi-Qu Ave, West High-tech Zone, Chengdu, 611731, Sichuan, China

Tested Model: E77-400M22S
FCC ID: 2A8C3-E77400M22S

Report Type: Original Report		Product Name: wireless module	
Report Number:	RSC241216002-0		
Date of Report Issue:	2025-02-20		
Reviewed By:	Sula Huang 		
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Chengdu Ebyte Electronic Technology Co., Ltd
Address	Building B2, Mould Industrial Park, 199# Xi-Qu Ave, West High-tech Zone, Chengdu, 611731, Sichuan, China
Email	157768495@qq.com
Product	wireless module
Tested Model	E77-400M22S
FCC ID	2A8C3-E77400M22S
Frequency*	410.3 MHz to 493.3 MHz
Modulation Type*	GFSK
Antenna Gain*	2.62dBi
Voltage*	DC 1.8V – 3.6V (Typical: 3.3V)
Measure approximately	20mm (L)×14mm (W)×2.7mm (H)
Sample serial number	241216002/01 (RF Radiated Test & RF Conducted Test) (assigned by the BACL, Chengdu)
Sample/EUT Status	The test sample was in good condition and received: 2024-12-16

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

Objective

This report is prepared on behalf of **Chengdu Ebyte Electronic Technology Co., Ltd** in accordance according to the measurement procedure described in ANSI C63.10-2020.

The tests were performed in order to determine the compliance of the EUT with FCC Part 15, Subpart C, section, section 15.203, 15.205, 15.207, 15.209, 15.35(c) and 15.231 rules.

Measurement Uncertainty

Item			Measurement Uncertainty	U_{cispr}
AC power line conducted emission			2.79 dB	3.4 dB
Radiated Emission	9kHz-30MHz		4.48dB	-
	30MHz-200MHz	H	4.34dB	6.3dB
	30MHz-200MHz	V	4.59dB	6.3dB
	200MHz-1GHz	H	4.69dB	6.3dB
	200MHz-1GHz	V	5.79dB	6.3dB
	1GHz-6GHz		4.58dB	5.2dB

Item	Measurement Uncertainty
RF output power, conducted	$\pm 0.61\text{dB}$
Occupied Bandwidth	$\pm 1.69\%$
Power Spectrum Density, conducted	$\pm 2.52\text{dB}$
Humidity	$\pm 5\%$
Temperature	$\pm 1^{\circ}\text{C}$
Voltage(DC)	$\pm 0.4\%$
Voltage(AC,<10kHz)	$\pm 1\%$
Time	1%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the corresponding inclusion factor K when the inclusion probability is about 95%.

Test Methodology

All measurements contained in this report were conducted with:

ANSI C63.10-2020 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Chengdu) to collect test data is located No.5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China.

Bay Area Compliance Laboratories Corp. (Chengdu) lab is accredited to ISO/IEC 17025 by NVLAP (Lab code: 600346-0) and the FCC designation No.: CN5056. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Description of Test Configuration*

The system was configured in testing mode, which was provided by manufacturer.

For GFSK (250kbps mode), 167 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	410.3	43	431.3	85	452.3	127	473.3
2	410.8	44	431.8	86	452.8	128	473.8
3	411.3	45	432.3	87	453.3	129	474.3
4	411.8	46	432.8	88	453.8	130	474.8
5	412.3	47	433.3	89	454.3	131	475.3
6	412.8	48	433.8	90	454.8	132	475.8
7	413.3	49	434.3	91	455.3	133	476.3
8	413.8	50	434.8	92	455.8	134	476.8
9	414.3	51	435.3	93	456.3	135	477.3
10	414.8	52	435.8	94	456.8	136	477.8
11	415.3	53	436.3	95	457.3	137	478.3
12	415.8	54	436.8	96	457.8	138	478.8
13	416.3	55	437.3	97	458.3	139	479.3
14	416.8	56	437.8	98	458.8	140	479.8
15	417.3	57	438.3	99	459.3	141	480.3
16	417.8	58	438.8	100	459.8	142	480.8
17	418.3	59	439.3	101	460.3	143	481.3
18	418.8	60	439.8	102	460.8	144	481.8
19	419.3	61	440.3	103	461.3	145	482.3
20	419.8	62	440.8	104	461.8	146	482.8
21	420.3	63	441.3	105	462.3	147	483.3
22	420.8	64	441.8	106	462.8	148	483.8
23	421.3	65	442.3	107	463.3	149	484.3
24	421.8	66	442.8	108	463.8	150	484.8
25	422.3	67	443.3	109	464.3	151	485.3
26	422.8	68	443.8	110	464.8	152	485.8
27	423.3	69	444.3	111	465.3	153	486.3
28	423.8	70	444.8	112	465.8	154	486.8
29	424.3	71	445.3	113	466.3	155	487.3
30	424.8	72	445.8	114	466.8	156	487.8
31	425.3	73	446.3	115	467.3	157	488.3
32	425.8	74	446.8	116	467.8	158	488.8
33	426.3	75	447.3	117	468.3	159	489.3
34	426.8	76	447.8	118	468.8	160	489.8
35	427.3	77	448.3	119	469.3	161	490.3
36	427.8	78	448.8	120	469.8	162	490.8
37	428.3	79	449.3	121	470.3	163	491.3
38	428.8	80	449.8	122	470.8	164	491.8
39	429.3	81	450.3	123	471.3	165	492.3
40	429.8	82	450.8	124	471.8	166	492.8
41	430.3	83	451.3	125	472.3	167	493.3
42	430.8	84	451.8	126	472.8	168	-

The EUT was tested with channel 1, 84 and 167.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software*

The setting by the software as following table:

Test Mode	Test Software	XCOM V2.6		
250kbps	Test Frequency (MHz)	410.3	451.8	493.3
	Data Rate	250kbps	250kbps	250kbps
	Power Level	-9	-9	-9

Support Test Devices Description

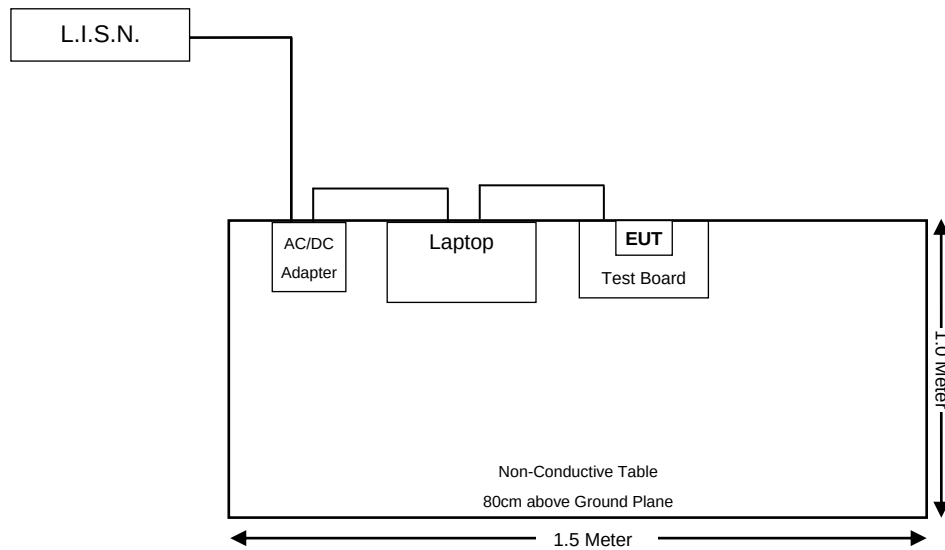
Manufacturer	Device Name	Model	Serial Number
Local			
Lenovo	Laptop	L540	No
Lenovo	AC/DC Adapter	ADLX45NDC2A	SA10E75790
Ebyte	Test Board	v1.0	10571

Support Test Cable Description

Cable Description	Length (m)	From / Port	To
Unshielded AC Power Cable	1.5	L.I.S.N.	AC/DC Adapter
Unshielded DC Power Cable	1.5	Adapter	Laptop
Unshielded USB Power Cable	0.5	Laptop	Test Board

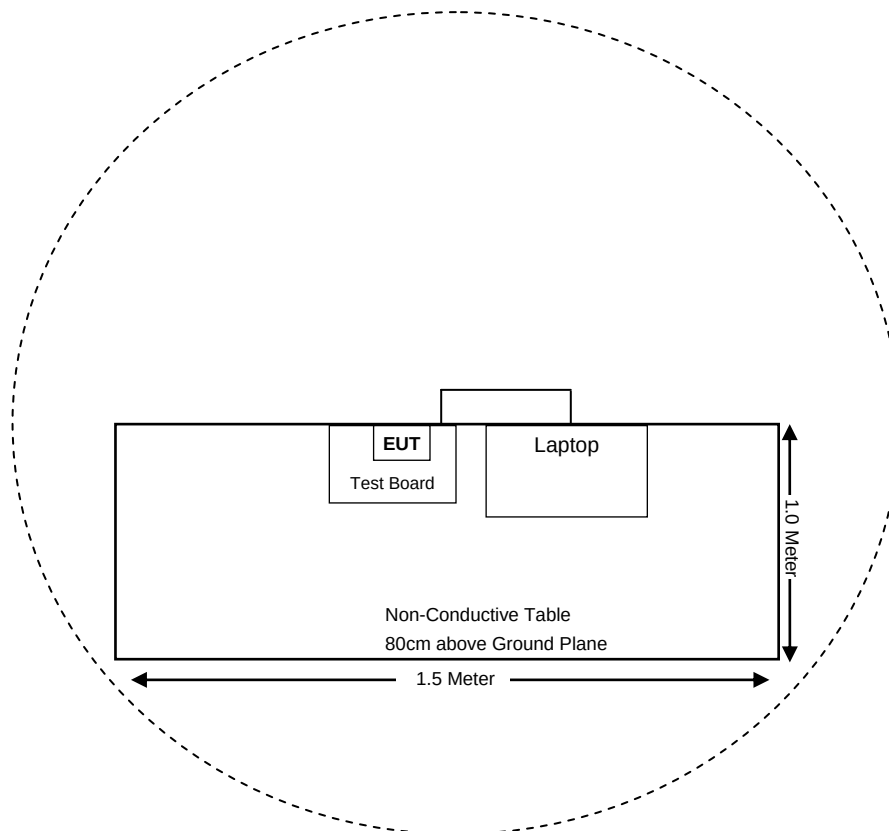
Block Diagram of Test Setup

Conducted Emissions:

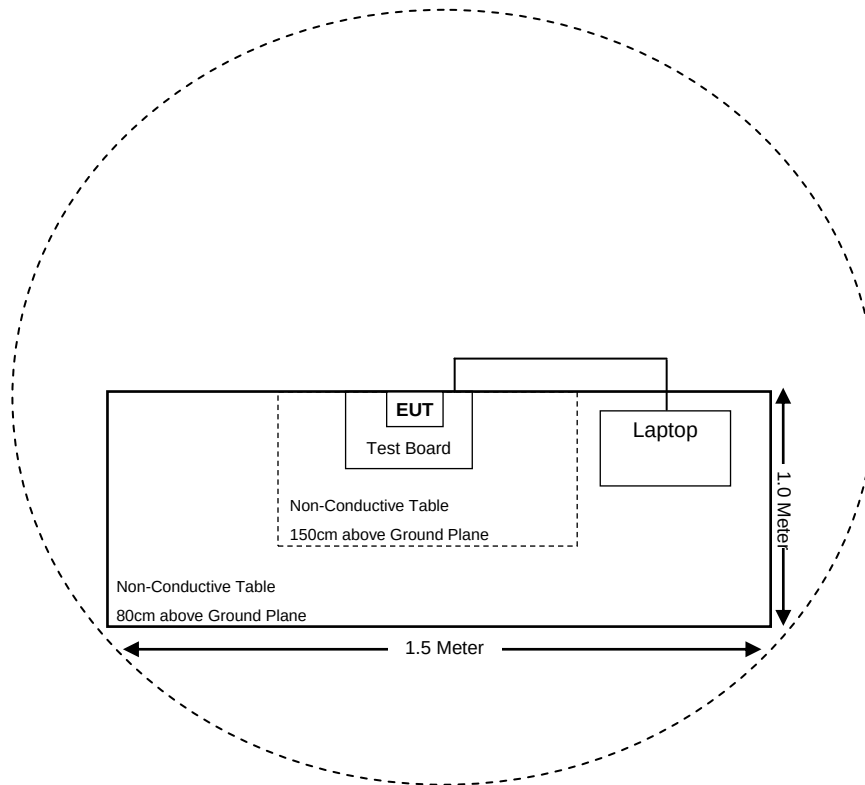


Radiated Emissions

Below 1GHz:



Above 1GHz:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207	AC Power Line Conducted Emissions	Compliant
§15.231(b), §15.205, §15.209	Field Strength of Fundamental and Spurious Emissions	Compliant
§15.231(a)(1)	Deactivation Testing	Compliant
§15. 231(c)	20dB Emission Bandwidth	Compliant
§1.1307	RF Exposure Evaluation	Compliant

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

TEST EQUIPMENTS LIST

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions					
Rohde & Schwarz	EMI Test Receiver	ESCI 3	100028	2024-04-10	2025-04-09
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.16	2024-04-10	2025-04-09
HP	RF Limiter	11947A	3107A01270	2024-08-03	2025-08-02
UTIFLEX	Conducted Cable	L-E-003	000003	2024-08-03	2025-08-02
Rohde & Schwarz	EMC32	EMC32	V 8.52.0	NCR	NCR
Radiated Emissions (9kHz-30MHz)					
EMCT	Semi-Anechoic Chamber	966	001	2023-04-15	2028-04-14
Rohde & Schwarz	EMI Test Receiver	ESR3	102456	2024-04-11	2025-04-10
BACL CORP	Active Loop Antenna	1313-1A	4031411	2024-05-20	2025-05-19
Xin Hang Xun Wei Bo	RF Cable (Below 1GHz)	XH500A-N/J- N/J-2Mbps-A	T-E271	2024-11-18	2025-11-17
Xin Hang Xun Wei Bo	RF Cable (Below 1GHz)	XH500A-N/J- N/J-7M-A	T-E268	2024-11-18	2025-11-17
Rohde & Schwarz	EMC32	EMC32	V9.10.00	NCR	NCR
Radiated Emissions (30MHz-1GHz)					
EMCT	Semi-Anechoic Chamber	966	001	2023-04-15	2028-04-14
SONOMA INSTRUMENT	Pre-Amplifier	310 N	186684	2024-08-07	2025-08-06
SUNOL SCIENCES	Broadband Antenna	JB3	A121808	2024-01-24	2025-01-23
				2025-01-16	2026-01-15
INMET	Attenuator	18N-6dB	64671	2024-01-24	2025-01-23
				2025-01-16	2026-01-15
Rohde & Schwarz	EMI Test Receiver	ESR3	102456	2024-04-11	2025-04-10
HUBER+SUHENER	RF Cable (Below 1GHz)	L-E-015	MY4345/EA	2024-11-18	2025-11-17
Xin Hang Xun Wei Bo	RF Cable (Below 1GHz)	XH500A-N/J- N/J-2Mbps-A	T-E271	2024-11-18	2025-11-17
Xin Hang Xun Wei Bo	RF Cable (Below 1GHz)	XH500A-N/J- N/J-7M-A	T-E268	2024-11-18	2025-11-17
Rohde & Schwarz	EMC32	EMC32	V9.10.00	NCR	NCR

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Radiated Emissions (1GHz-6GHz)					
EMCT	Semi-Anechoic Chamber	966	001	2023-04-15	2028-04-14
Rohde & Schwarz	Signal Analyzer	FSV40	101943	2024-04-10	2025-04-09
ETS	Horn Antenna	3115	003-6076	2024-08-16	2025-08-15
A.H. Systems, inc.	Pre-Amplifier	PAM-0118P	509	2024-08-07	2025-08-06
Xin Hang Xun Wei Bo	RF Cable (Above 1GHz)	XH500A-SMA/J -N/J-2Mbps-A	L-E-016	2024-12-12	2025-12-11
Xin Hang Xun Wei Bo	RF Cable (Above 1GHz)	XH500A-SMA/J -N/J-5M-A	L-E-017	2024-12-12	2025-12-11
Rohde & Schwarz	EMC32	EMC32	V9.10.00	NCR	NCR
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSU26	100113	2024-04-10	2025-04-09
MIDWEST	6dB Attenuator	219	AA4305	2024-03-01	2025-03-01
Astrolab	RF Coaxial Cable	MINIREND-5	1206	2024-10-18	2025-10-17

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

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. The unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Information*

The EUT has one external monopole antenna with RP-SMA connector and the maximum antenna gain is 2.62dBi, which fulfill the requirement of this section. Please refer to the EUT photos.

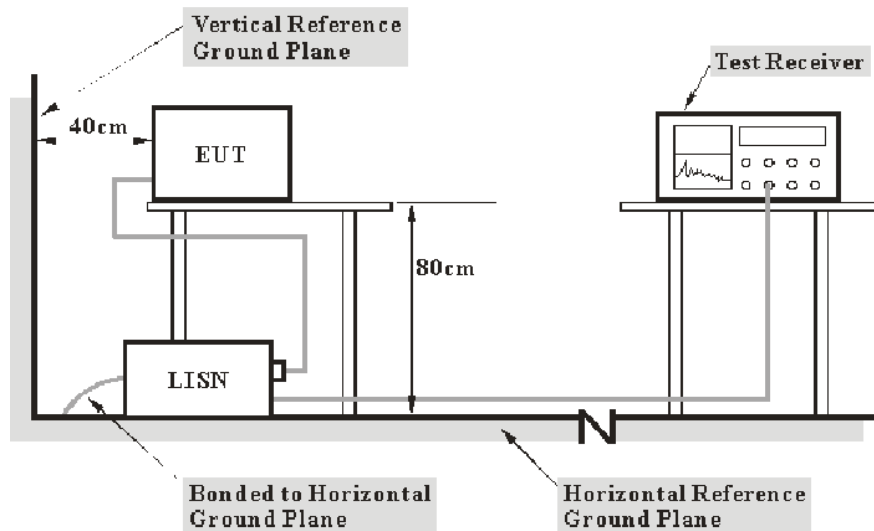
Result: Compliance

FCC §15.207 – AC POWER LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2020 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter of laptop was connected to the first L.I.S.N.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

$$C_f = A_C + VDF$$

Herein,

V_C (cord. Reading): corrected voltage amplitude

V_R : reading voltage amplitude

A_C : attenuation caused by cable loss

VDF: voltage division factor of AMN

C_f : Correction Factor

The “**Margin**” column of the following data tables indicates the degree of compliance within 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:

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

Test Data

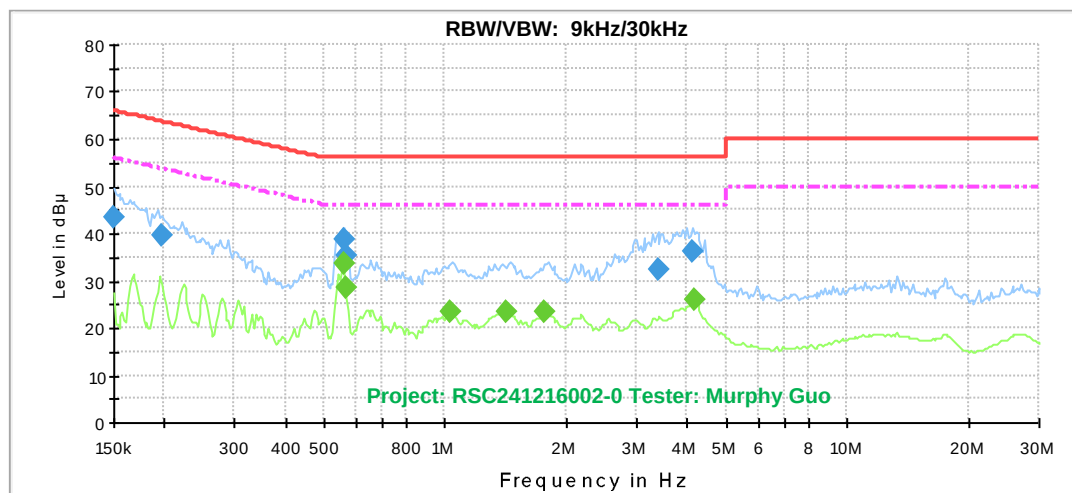
Test Environment Conditions

Temperature:	17 °C
Relative Humidity:	63 %
ATM Pressure:	96.1 kPa

The testing was performed by Murphy Guo on 2024-12-23.

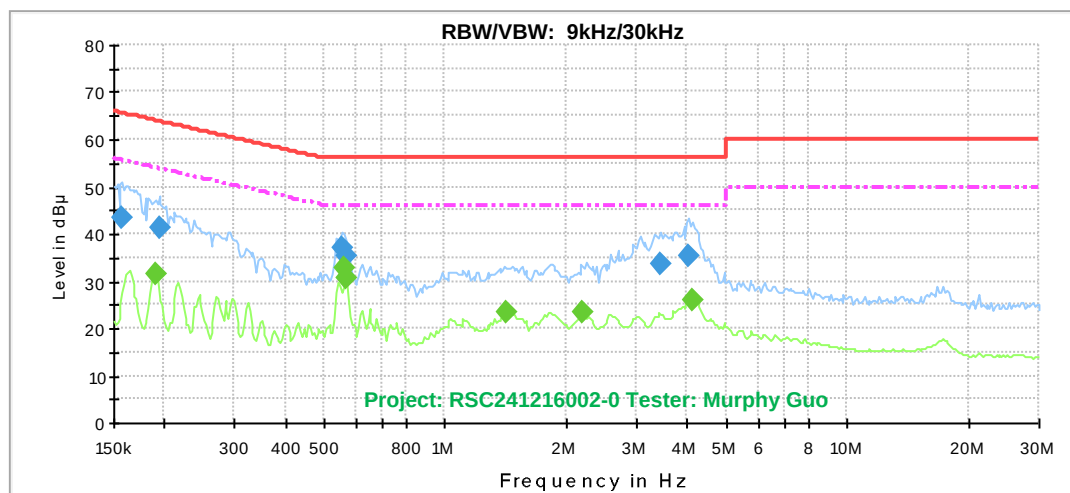
Test Mode: Transmitting with maximum power(Low channel)

AC120V/60Hz, Line:



Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150000	43.6	5000.0	9.000	L1	19.8	22.4	66.0
0.198194	39.4	5000.0	9.000	L1	19.6	24.3	63.7
0.557844	38.7	5000.0	9.000	L1	19.6	17.3	56.0
0.569057	35.3	5000.0	9.000	L1	19.6	20.7	56.0
3.378170	32.2	5000.0	9.000	L1	19.7	23.8	56.0
4.122010	36.3	5000.0	9.000	L1	19.7	19.7	56.0

Frequency (MHz)	CAverage (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.557844	33.5	5000.0	9.000	L1	19.6	12.5	46.0
0.569057	28.5	5000.0	9.000	L1	19.6	17.5	46.0
1.033804	23.5	5000.0	9.000	L1	19.7	22.5	46.0
1.421419	23.6	5000.0	9.000	L1	19.6	22.4	46.0
1.769262	23.2	5000.0	9.000	L1	19.5	22.8	46.0
4.163230	26.0	5000.0	9.000	L1	19.7	20.0	46.0

AC120V/60Hz, Neutral:

Frequency (MHz)	QuasiPeak (dBμ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμ V)
0.157652	43.5	5000.0	9.000	N	19.4	22.1	65.6
0.196231	41.4	5000.0	9.000	N	19.4	22.4	63.8
0.552321	36.9	5000.0	9.000	N	19.5	19.1	56.0
0.569057	35.4	5000.0	9.000	N	19.5	20.6	56.0
3.446072	33.4	5000.0	9.000	N	19.6	22.6	56.0
4.040790	35.4	5000.0	9.000	N	19.6	20.6	56.0

Frequency (MHz)	CAverage (dBμ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμ V)
0.190460	31.5	5000.0	9.000	N	19.4	22.6	54.0
0.563423	32.7	5000.0	9.000	N	19.5	13.3	46.0
0.569057	30.8	5000.0	9.000	N	19.5	15.2	46.0
1.421419	23.2	5000.0	9.000	N	19.5	22.8	46.0
2.202229	23.5	5000.0	9.000	N	19.5	22.5	46.0
4.122010	26.1	5000.0	9.000	N	19.7	19.9	46.0

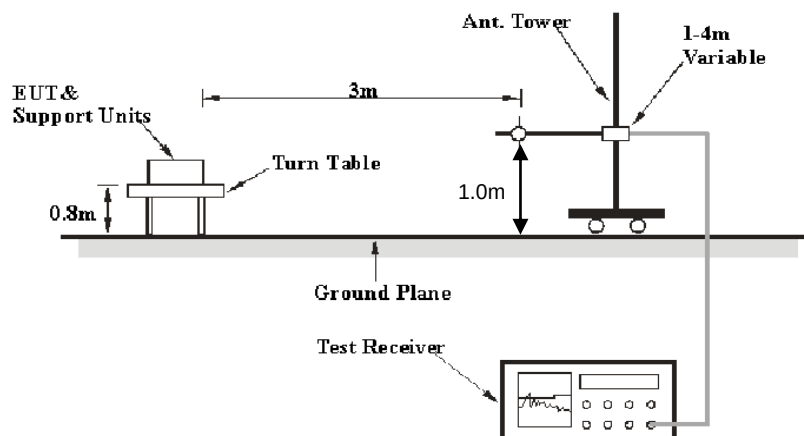
FCC §15.231(b), §15.205, §15.209 - FIELD STRENGTH OF FUNDAMENTAL AND SPURIOUS EMISSIONS

Applicable Standard

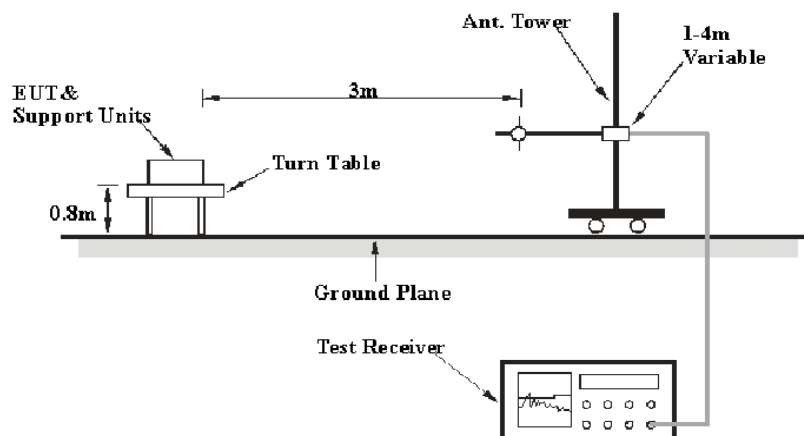
FCC §§15.231(b), §15.205, §15.209

EUT Setup

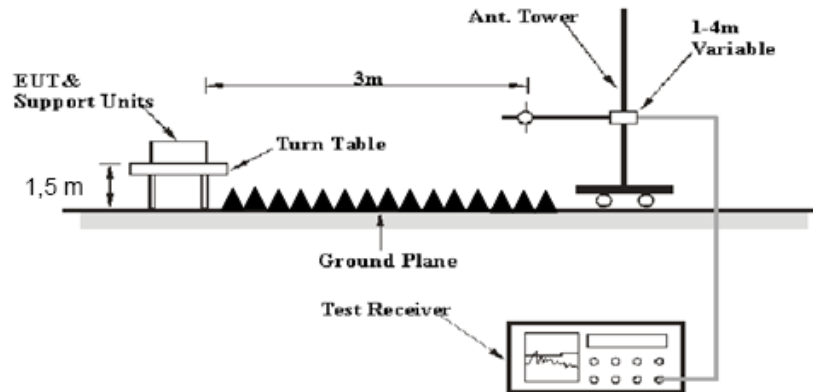
9kHz - 30MHz:



30MHz - 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2020. The specification used was the FCC 15.209, and FCC 15.231(b) limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

EMI Test Receiver & Signal Analyzer Setup

The system was investigated from 9 kHz to 6 GHz.

During the radiated emission test, the EMI test receiver or Signal Analyzer was set with the following configurations:

Frequency Range	RBW	Video B/W	Measurement
9 kHz – 150 kHz	200 Hz	1 kHz	PK
150 kHz – 30 MHz	9 kHz	30 kHz	PK
30 MHz – 1000 MHz	120 kHz	300 kHz	QP
Above 1 GHz	1 MHz	3 MHz	PK
	1 MHz	3 MHz	CISPR AV

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

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.

If the peak detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

Test Procedure

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

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

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

Corrected Amplitude (MaxPeak or QuasiPeak)= Meter Reading + Antenna Loss + Cable Loss- 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:

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

Test Data

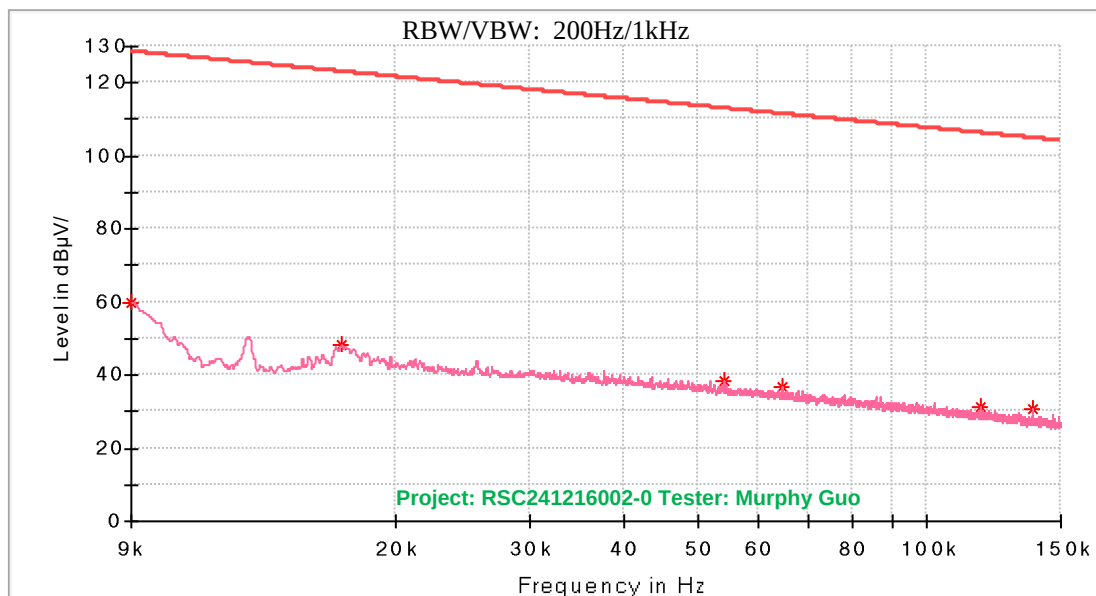
Test Environment Conditions

Test Measurement:	Radiated	Radiated(band edge)	Conducted
Test Date:	2024-12-23	2025-02-19	2024-12-26
Temperature:	21 °C	186°C	15 °C
Relative Humidity:	56 %	62 %	59 %
ATM Pressure:	96.2 kPa	95.7 kPa	96.1 kPa

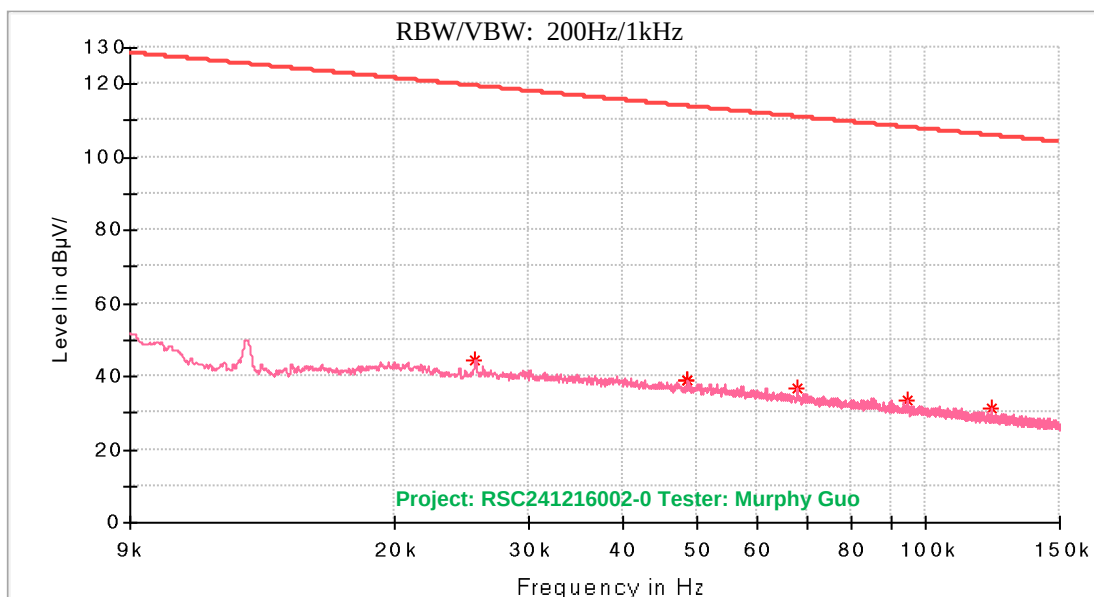
The testing was performed by Murphy Guo.

Test Mode: Transmitting

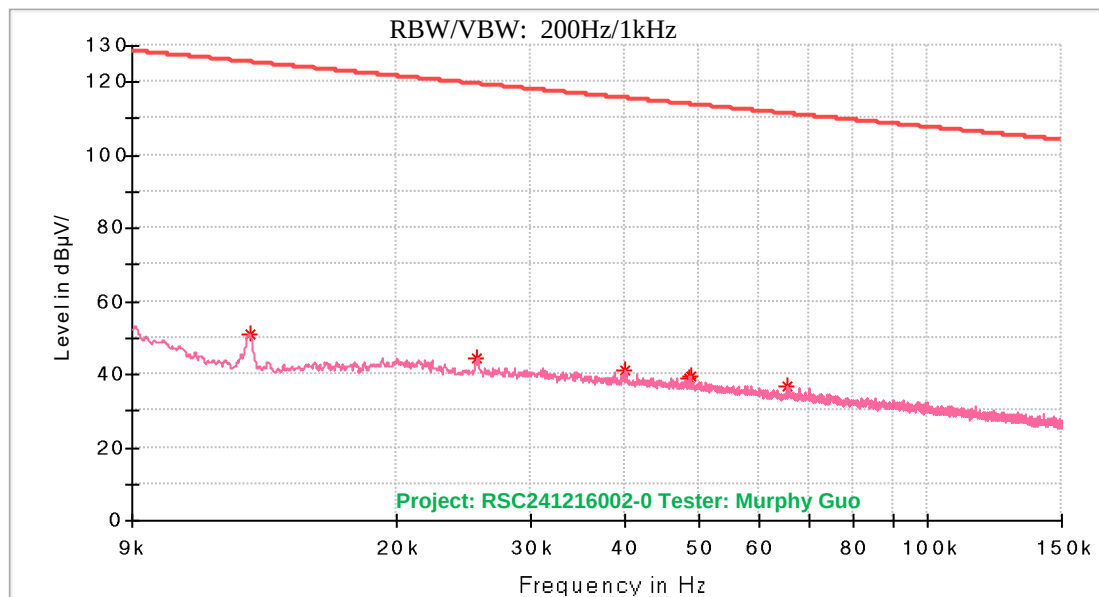
Note: 1. Pre-scan and configuration EUT with X, Y and Z-axis, the Y-axis is the worst case.
2. The field strength of spurious emissions meets 15.209 requirement.
3. If the peak detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

Radiated Spurious Emissions:**1) 9 kHz to 150 kHz_low channel_transmitting with maximum power****Parallel**

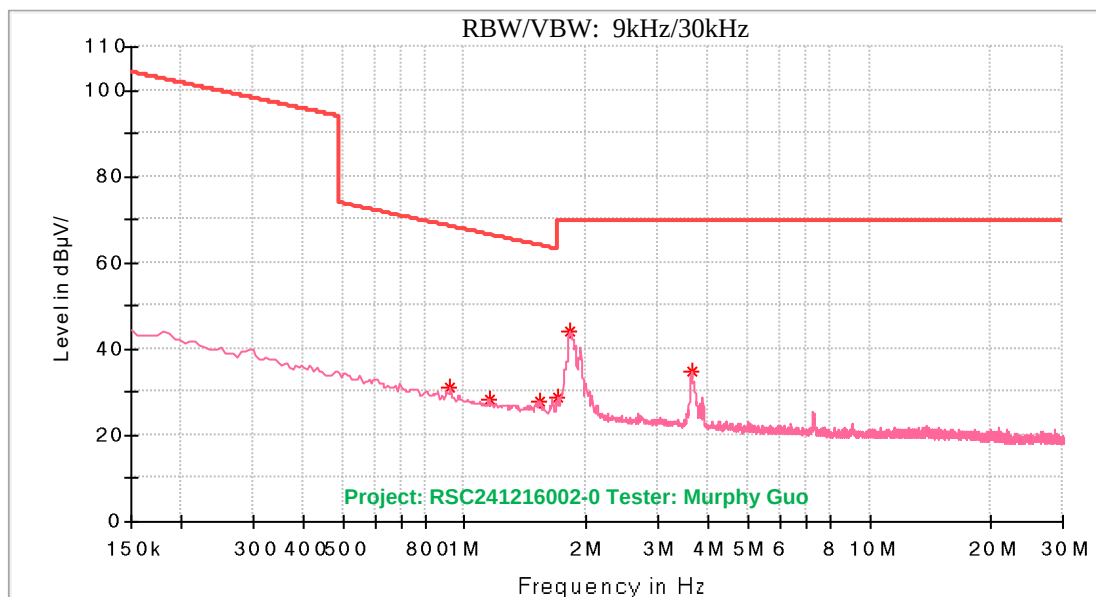
Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Corr. (dB)
0.009000	60.03	128.50	68.47	100.0	43.0	28.5
0.017019	48.32	122.97	74.65	100.0	0.0	22.8
0.054085	38.32	112.93	74.61	100.0	346.0	18.7
0.064642	36.83	111.38	74.56	100.0	141.0	17.4
0.117588	31.43	106.19	74.76	100.0	205.0	12.6
0.137451	30.50	104.83	74.34	100.0	169.0	11.3

Perpendicular

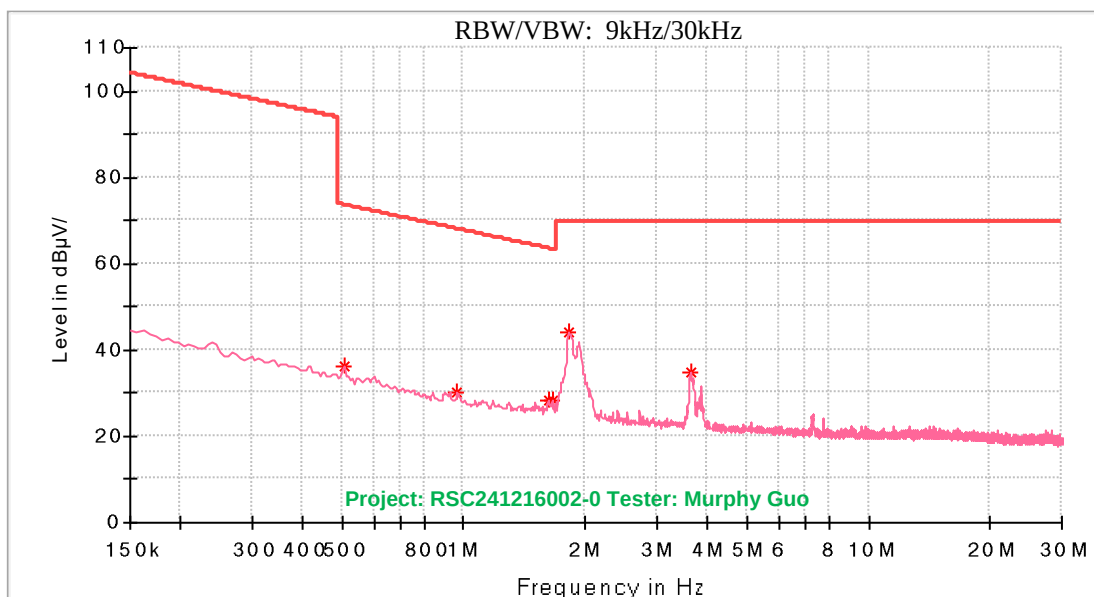
Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Corr. (dB)
0.025603	44.69	119.42	74.74	100.0	269.0	22.6
0.048674	38.90	113.85	74.95	100.0	143.0	19.5
0.048692	38.93	113.84	74.92	100.0	143.0	19.5
0.067850	36.83	110.96	74.13	100.0	233.0	17.0
0.094728	33.46	108.07	74.61	100.0	79.0	14.4
0.122152	31.03	105.86	74.83	100.0	213.0	12.3

Ground Parallel

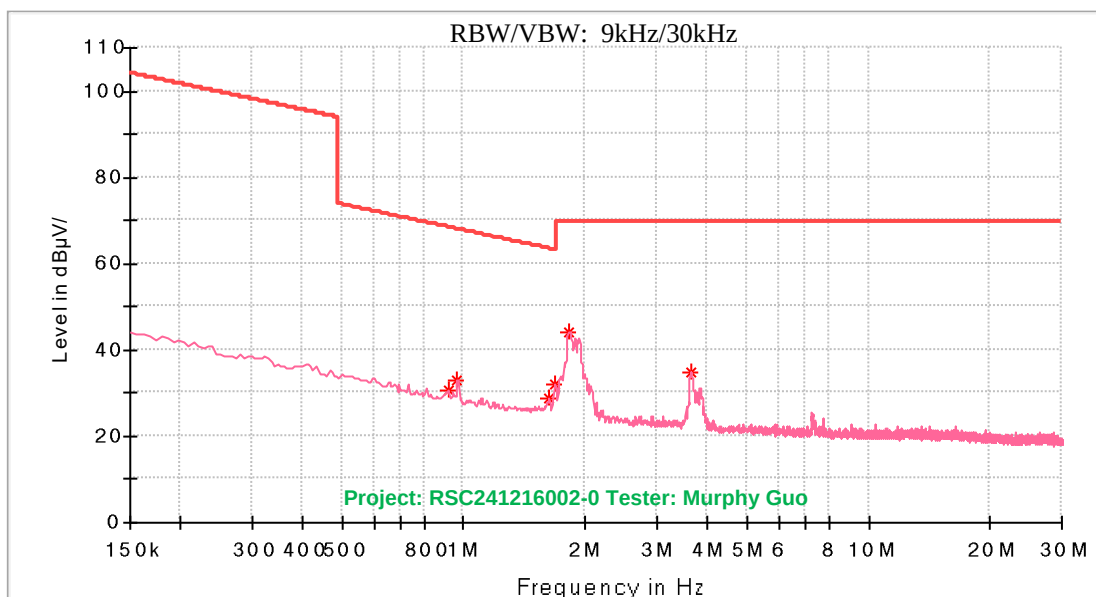
Frequency (MHz)	MaxPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Corr. (dB)
0.012842	50.97	125.41	74.44	100.0	213.0	22.8
0.025603	44.47	119.42	74.95	100.0	63.0	22.6
0.040090	41.01	115.53	74.52	100.0	327.0	20.7
0.048674	38.82	113.85	75.03	100.0	166.0	19.5
0.048727	39.41	113.84	74.43	100.0	166.0	19.5
0.065224	36.85	111.31	74.45	100.0	0.0	17.3

2) 150 kHz to 30 MHz_low channel_ transmitting with maximum power**Parallel**

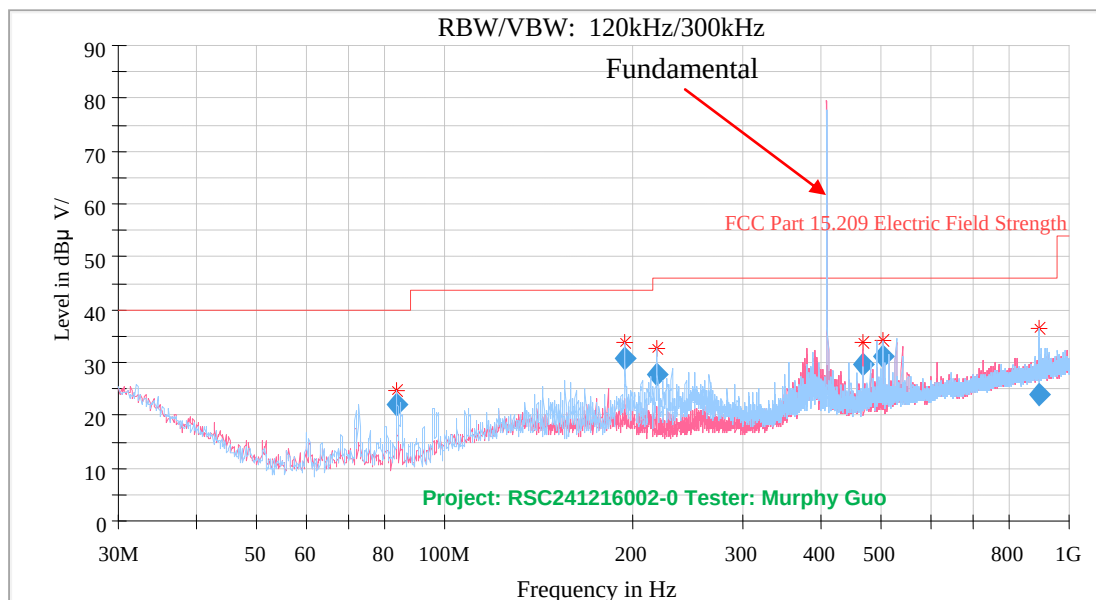
Frequency (MHz)	MaxPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Corr. (dB)
0.920130	30.88	68.34	37.46	100.0	179.0	-3.9
1.146990	28.32	66.43	38.12	100.0	78.0	-5.0
1.529070	27.85	63.94	36.10	100.0	32.0	-6.3
1.696230	28.57	63.04	34.48	100.0	346.0	-6.8
1.809660	44.25	69.50	25.25	100.0	28.0	-7.1
3.630510	34.99	69.50	34.51	100.0	20.0	-8.6

Perpendicular

Frequency (MHz)	MaxPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Corr. (dB)
0.508200	35.99	73.48	37.49	100.0	100.0	0.4
0.961920	30.14	67.96	37.82	100.0	179.0	-4.1
1.618620	28.44	63.45	35.01	100.0	1.0	-6.6
1.654440	28.27	63.26	34.99	100.0	1.0	-6.7
1.815630	44.28	69.50	25.22	100.0	26.0	-7.1
3.624540	34.96	69.50	34.54	100.0	30.0	-8.6

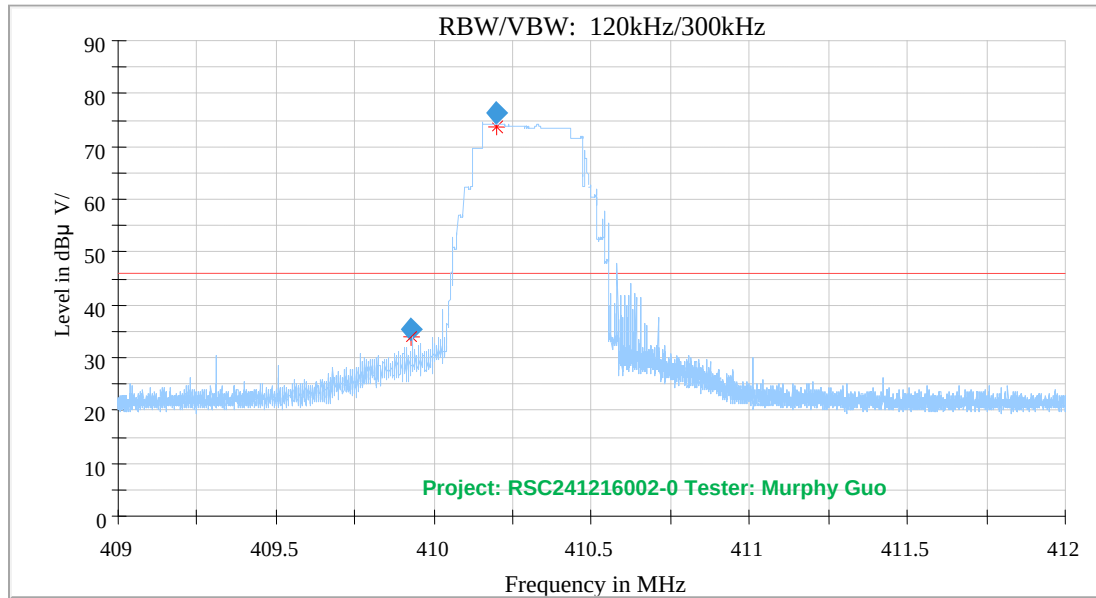
Ground Parallel

Frequency (MHz)	MaxPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Corr. (dB)
0.914160	30.52	68.40	37.88	100.0	32.0	-3.8
0.961920	33.11	67.96	34.85	100.0	32.0	-4.1
1.624590	28.78	63.42	34.64	100.0	15.0	-6.6
1.684290	31.89	63.11	31.21	100.0	32.0	-6.8
1.815630	44.14	69.50	25.36	100.0	23.0	-7.1
3.636480	34.87	69.50	34.63	100.0	28.0	-8.6

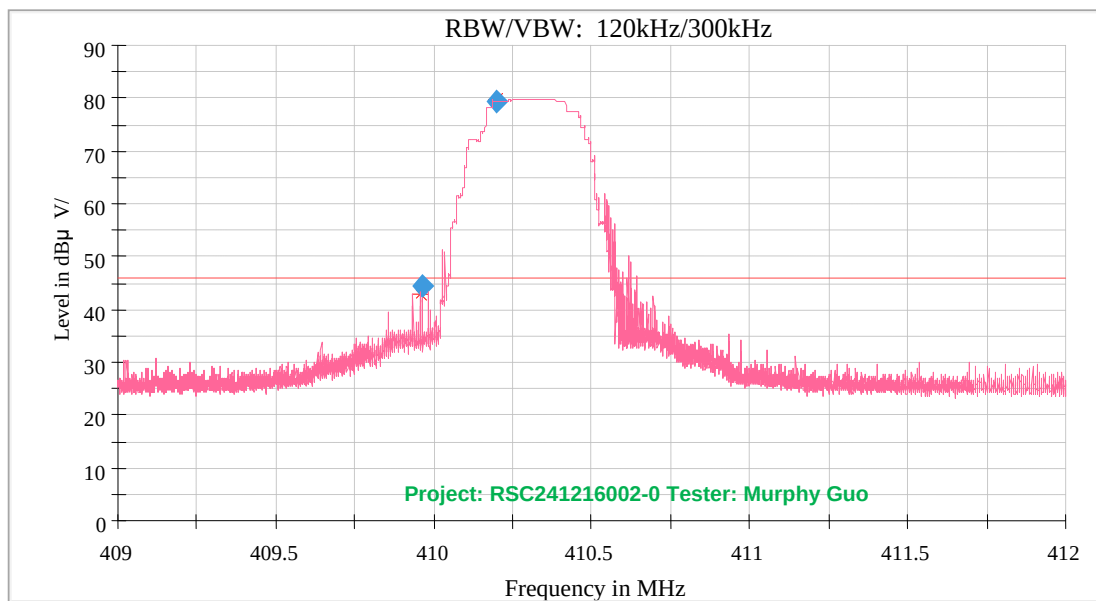
3) 30 MHz to 1 GHz**Low Channel**

Frequency (MHz)	QuasiPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
84.012600	21.87	40.00	18.13	1000.0	120.000	174.0	H	184.0	-15.9
194.581400	30.66	43.50	12.84	1000.0	120.000	160.0	H	212.0	-10.9
218.929300	27.74	46.00	18.26	1000.0	120.000	134.0	H	136.0	-12.1
468.042850	29.79	46.00	16.21	1000.0	120.000	124.0	V	275.0	-5.1
503.985850	30.98	46.00	15.02	1000.0	120.000	103.0	H	42.0	-4.4
894.779150	23.82	46.00	22.18	1000.0	120.000	124.0	H	68.0	1.5

Frequency (MHz)	MaxPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
410.196800	79.75	80.01	0.26	1000.0	120.000	151.0	V	347.0	-6.4

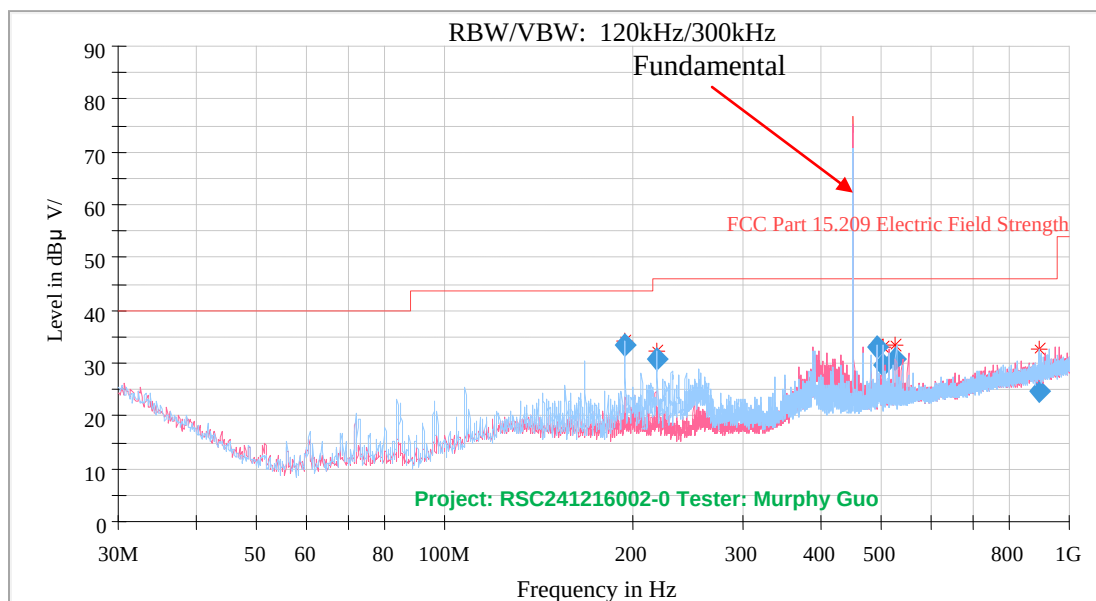
Band Edge**Horizontal**

Frequency (MHz)	QuasiPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
409.935410	33.65	46.00	12.35	120.000	128.0	H	217.0	-6.4
410.196750	76.36	80.01	3.65	120.000	128.0	H	219.0	-6.4

Vertical

Frequency (MHz)	QuasiPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
409.968610	42.95	46.00	3.05	120.000	150.0	V	96.0	-6.4
410.201750	79.31	80.01	0.70	120.000	145.0	V	87.0	-6.4

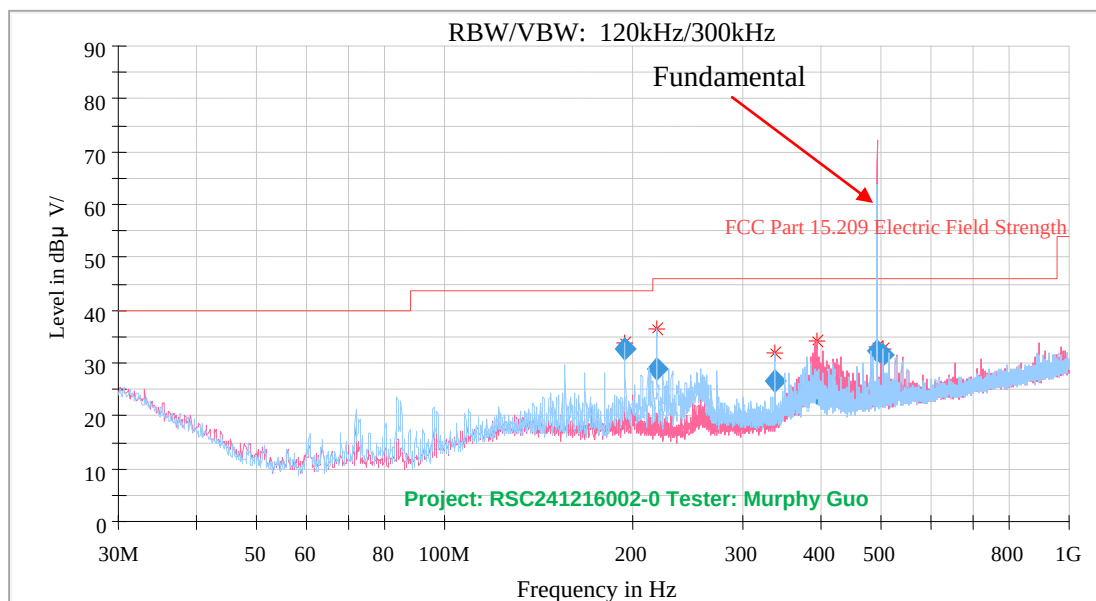
Middle Channel



Frequency (MHz)	QuasiPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
194.645050	33.52	43.50	9.98	1000.0	120.000	168.0	H	183.0	-10.9
218.956850	30.83	46.00	15.17	1000.0	120.000	141.0	H	169.0	-12.1
491.995300	33.18	46.00	12.82	1000.0	120.000	104.0	H	173.0	-4.5
504.001850	29.52	46.00	16.48	1000.0	120.000	111.0	V	238.0	-4.4
528.021900	30.82	46.00	15.18	1000.0	120.000	103.0	H	51.0	-4.1
897.338000	24.85	46.00	21.15	1000.0	120.000	114.0	H	81.0	1.5

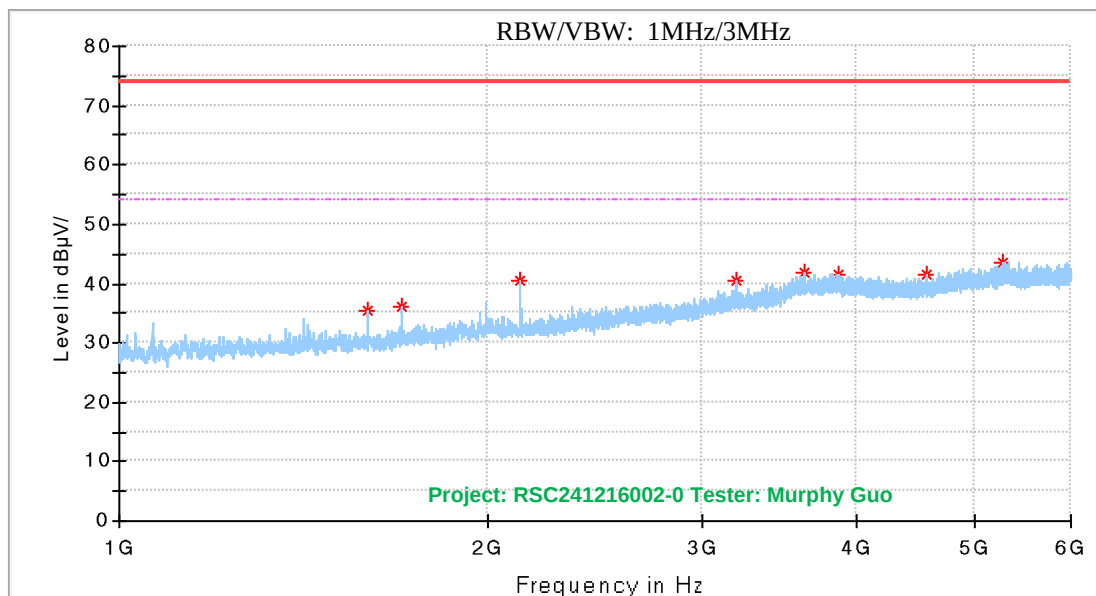
Frequency (MHz)	MaxPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
451.688100	76.73	81.39	4.66	1000.0	120.000	133.0	V	0.0	-5.6

High Channel



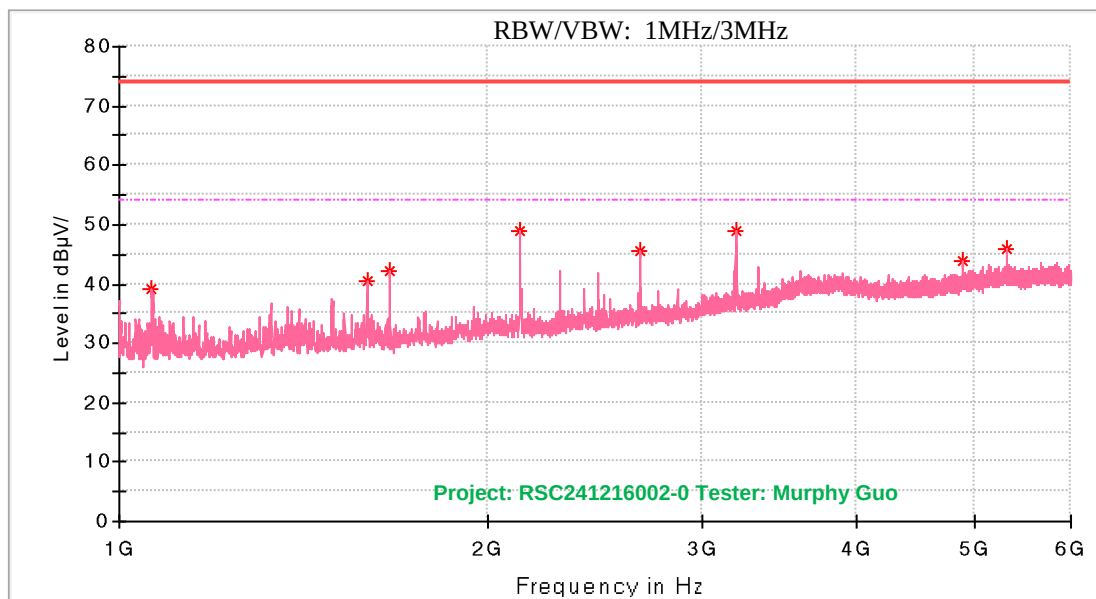
Frequency (MHz)	QuasiPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
194.650150	32.57	43.50	10.93	1000.0	120.000	128.0	H	177.0	-10.9
218.780350	28.83	46.00	17.17	1000.0	120.000	128.0	H	163.0	-12.1
337.513600	26.68	46.00	19.32	1000.0	120.000	135.0	H	337.0	-8.4
395.194500	24.30	46.00	21.70	1000.0	120.000	139.0	V	183.0	-6.8
492.013950	32.13	46.00	13.87	1000.0	120.000	103.0	H	167.0	-4.5
504.031000	31.48	46.00	14.52	1000.0	120.000	103.0	H	42.0	-4.4

Frequency (MHz)	MaxPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
493.423550	72.04	81.94	9.9	1000.0	120.000	124.0	V	348.0	-4.5

4) 1GHz-6GHz**Low Channel_Horizontal**

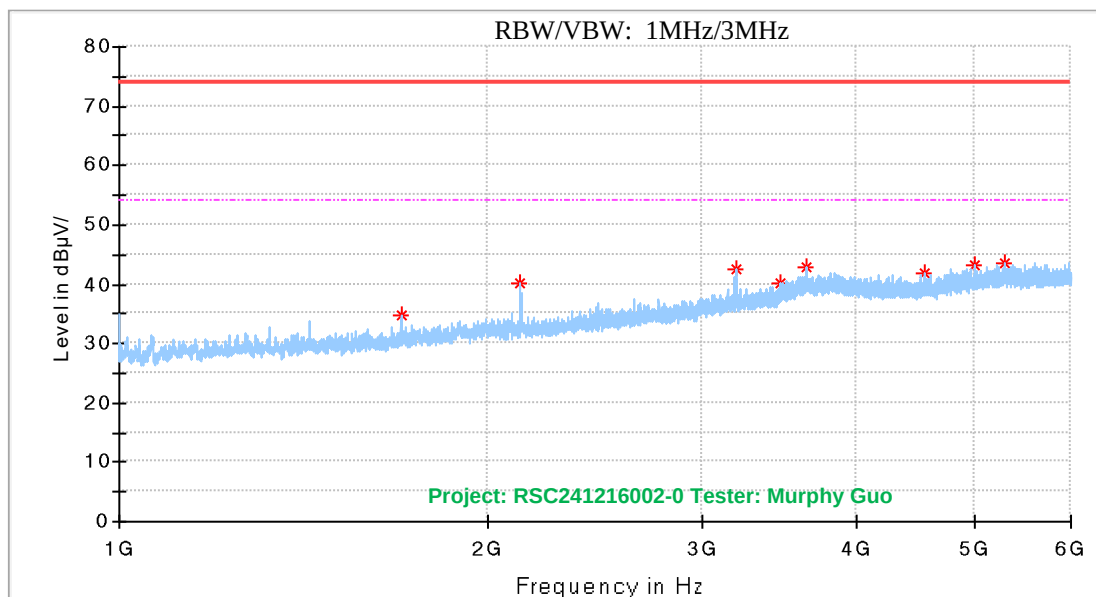
Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1596.000000	35.56	74.00	38.44	150.0	H	254.0	-16.3
1700.500000	36.01	74.00	37.99	150.0	H	128.0	-15.7
2129.500000	40.51	74.00	33.49	150.0	H	303.0	-13.7
3194.000000	40.51	74.00	33.49	150.0	H	359.0	-9.0
3634.000000	41.90	74.00	32.10	150.0	H	321.0	-6.1
3870.500000	41.49	74.00	32.51	150.0	H	233.0	-5.8
4577.500000	41.54	74.00	32.46	150.0	H	134.0	-6.4
5283.000000	43.64	74.00	30.36	150.0	H	272.0	-4.3

Low Channel_Vertical

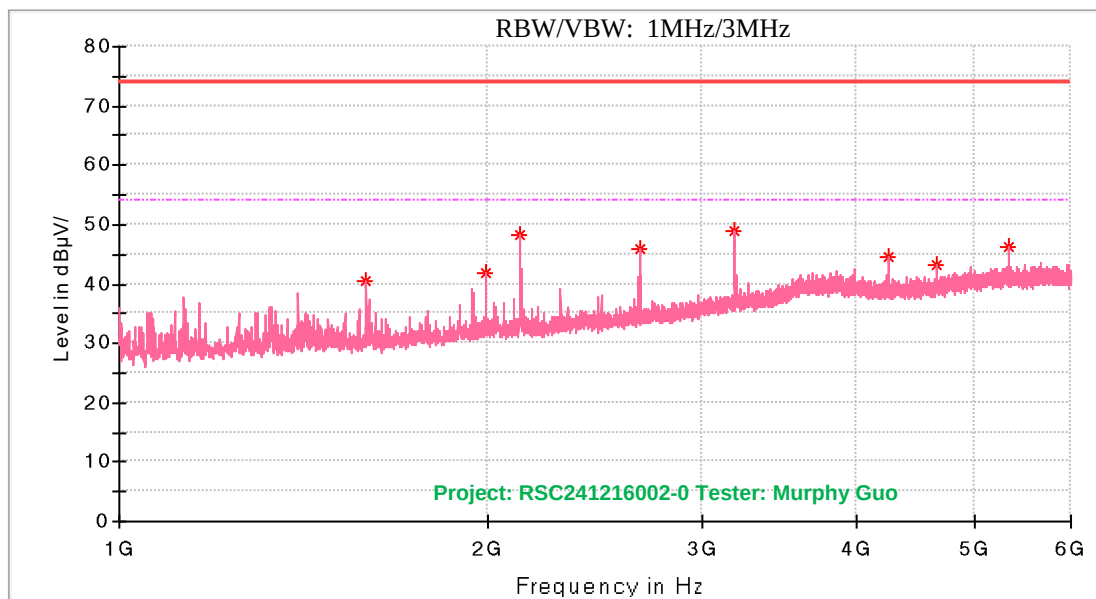


Frequency (MHz)	MaxPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1064.000000	39.21	74.00	34.79	150.0	V	79.0	-18.6
1593.500000	40.38	74.00	33.62	150.0	V	52.0	-16.3
1662.000000	42.23	74.00	31.77	150.0	V	296.0	-16.2
2125.500000	49.02	74.00	24.98	150.0	V	104.0	-13.8
2664.500000	45.53	74.00	28.47	150.0	V	270.0	-11.6
3199.000000	48.82	74.00	25.18	150.0	V	329.0	-9.0
4888.500000	43.80	74.00	30.20	150.0	V	71.0	-5.1
5322.500000	45.78	74.00	28.22	150.0	V	229.0	-4.1

Middle Channel_Horizontal

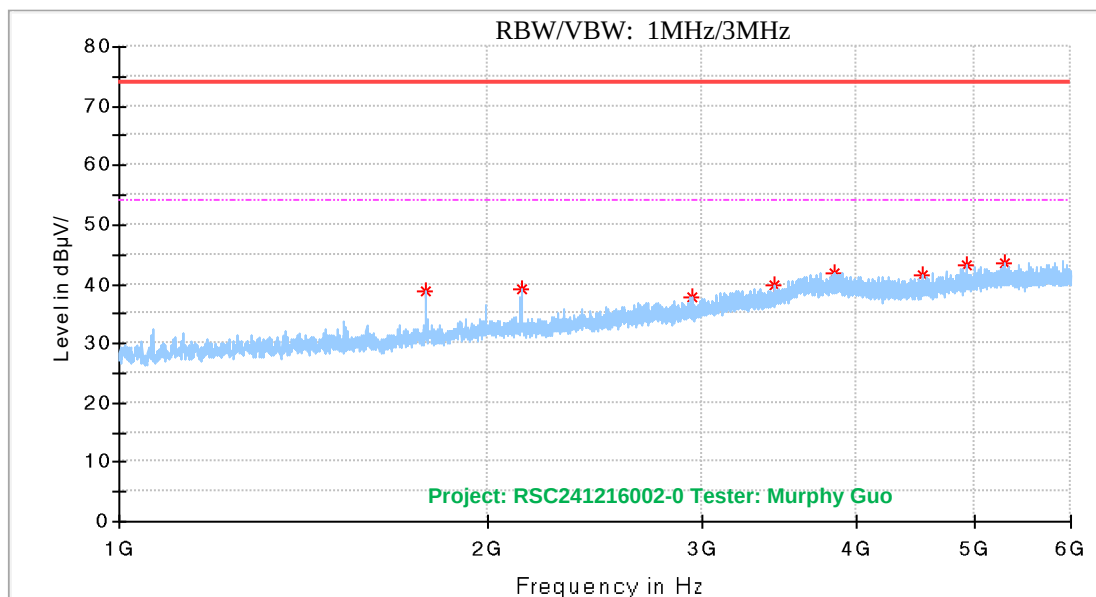


Frequency (MHz)	MaxPeak (dBμ V/m)	Limit (dBμ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1699.000000	34.70	74.00	39.30	150.0	H	101.0	-15.7
2125.000000	40.10	74.00	33.90	150.0	H	289.0	-13.8
3194.500000	42.52	74.00	31.48	150.0	H	119.0	-9.0
3476.500000	40.14	74.00	33.86	150.0	H	0.0	-7.5
3652.500000	42.80	74.00	31.20	150.0	H	0.0	-6.1
4561.500000	41.88	74.00	32.12	150.0	H	329.0	-6.4
5009.000000	43.14	74.00	30.86	150.0	H	0.0	-4.8
5303.500000	43.50	74.00	30.50	150.0	H	205.0	-4.0

Middle Channel_Vertical

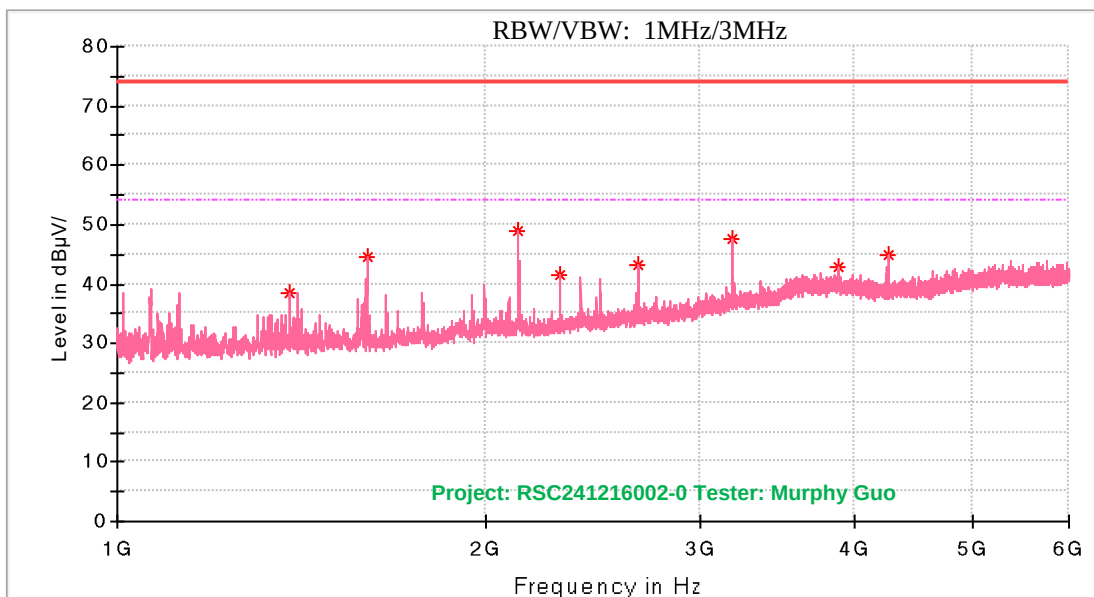
Frequency (MHz)	MaxPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1593.000000	40.59	74.00	33.41	150.0	V	102.0	-16.3
1994.500000	41.77	74.00	32.23	150.0	V	291.0	-13.7
2125.000000	48.18	74.00	25.82	150.0	V	333.0	-13.8
2663.000000	45.91	74.00	28.09	150.0	V	260.0	-11.6
3188.000000	48.84	74.00	25.16	150.0	V	303.0	-9.0
4257.500000	44.45	74.00	29.55	150.0	V	315.0	-6.7
4654.500000	43.20	74.00	30.80	150.0	V	278.0	-6.2
5332.500000	46.36	74.00	27.64	150.0	V	242.0	-4.1

High Channel_Horizontal



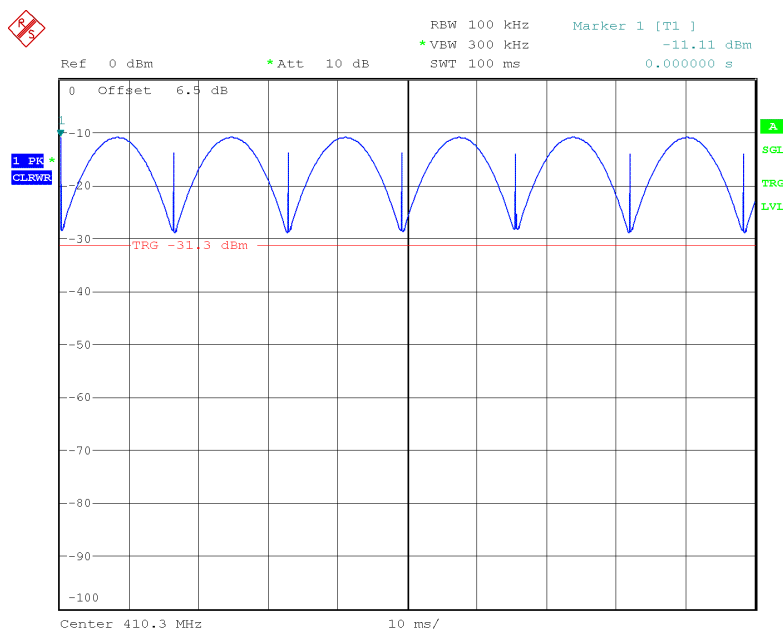
Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1782.000000	38.75	74.00	35.25	150.0	H	152.0	-15.2
2133.500000	39.07	74.00	34.93	150.0	H	272.0	-13.7
2939.000000	37.86	74.00	36.14	150.0	H	357.0	-10.7
3439.500000	39.68	74.00	34.32	150.0	H	232.0	-8.0
3840.500000	42.00	74.00	32.00	150.0	H	226.0	-5.8
4543.500000	41.66	74.00	32.34	150.0	H	352.0	-6.4
4932.500000	43.17	74.00	30.83	150.0	H	308.0	-4.8
5299.000000	43.51	74.00	30.49	150.0	H	152.0	-4.0

High Channel_Vertical



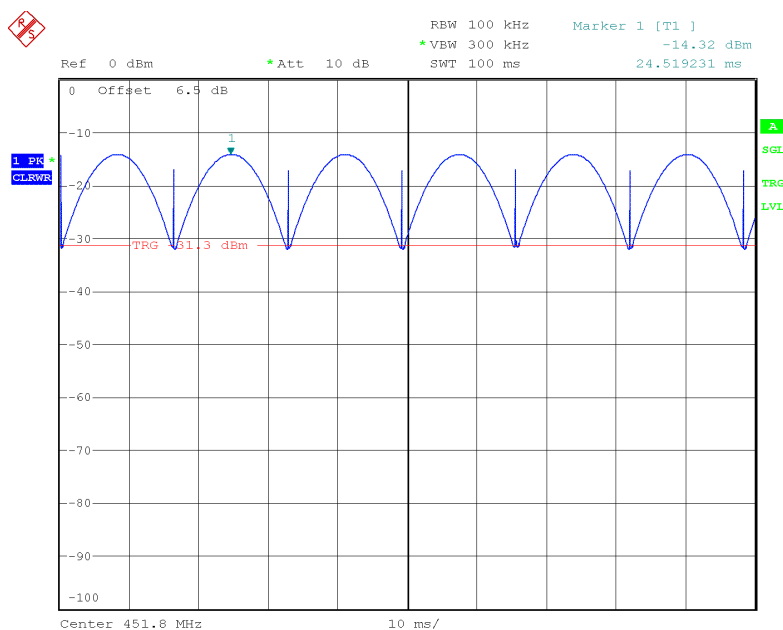
Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1381.500000	38.52	74.00	35.48	150.0	V	287.0	-17.1
1600.000000	44.57	74.00	29.43	150.0	V	81.0	-16.3
2125.000000	48.93	74.00	25.07	150.0	V	329.0	-13.8
2299.000000	41.68	74.00	32.32	150.0	V	242.0	-13.0
2663.000000	43.11	74.00	30.89	150.0	V	236.0	-11.6
3188.000000	47.54	74.00	26.46	150.0	V	294.0	-9.0
3883.000000	42.89	74.00	31.11	150.0	V	205.0	-5.8
4265.500000	44.80	74.00	29.20	150.0	V	161.0	-6.7

Duty Cycle(410.3 MHz)



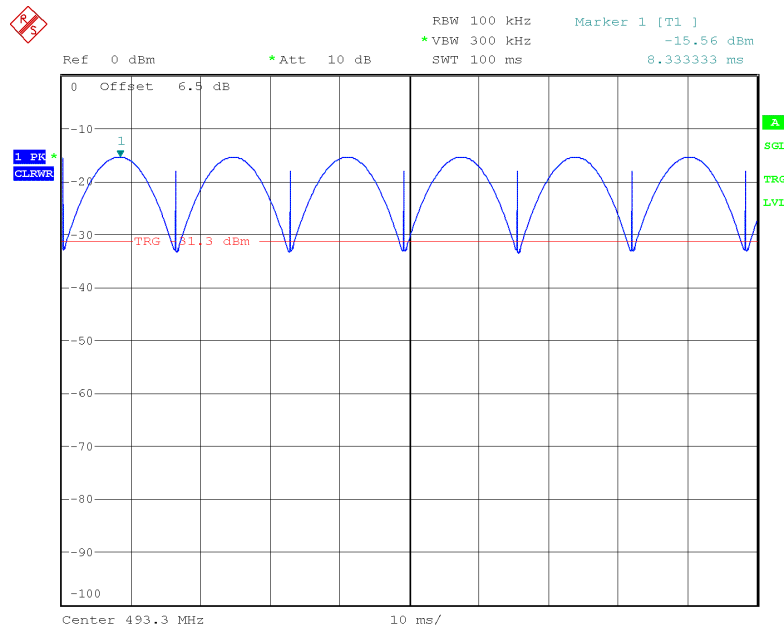
Comment: Project:RSC241216002-0 Tester:Murphy Guo
 Date: 26.DEC.2024 15:03:48

Duty Cycle (451.8 MHz)



Comment: Project:RSC241216002-0 Tester:Murphy Guo
 Date: 26.DEC.2024 15:02:53

Duty Cycle (493.3 MHz)



Comment: Project:RSC241216002-0 Tester:Murphy Guo
 Date: 26.DEC.2024 15:04:49

FCC §15.231(a) (1) - DEACTIVATION TESTING

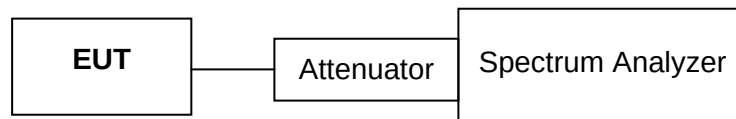
Applicable Standard

Per FCC §15.231(a) (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Test Procedure

1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set center frequency of spectrum analyzer=operating frequency.
3. Set the spectrum analyzer as RBW=100k VBW=100k Span=0Hz.
4. Repeat above procedures until all frequency measured was complete.

Test Setup Block



Note: Offset (6.5dB) = 6dB Attenuator(6dB) + RF cable loss(0.5dB)

Test Data

Environmental Conditions

Temperature:	15 °C
Relative Humidity:	59 %
ATM Pressure:	96.1 kPa

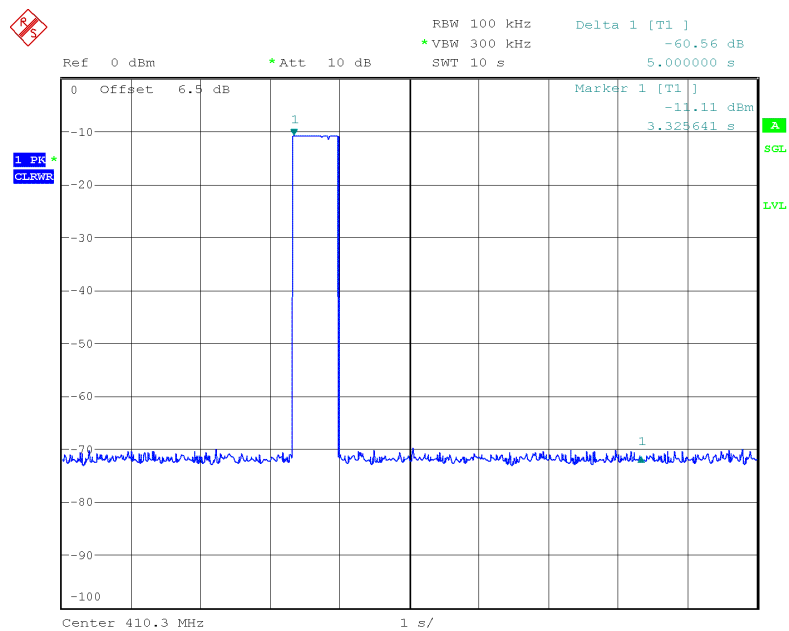
The testing was performed by Murphy Guo on 2024-12-26.

Test mode: Transmitting

Test Result: Compliance. Please refer to the following table and plots.

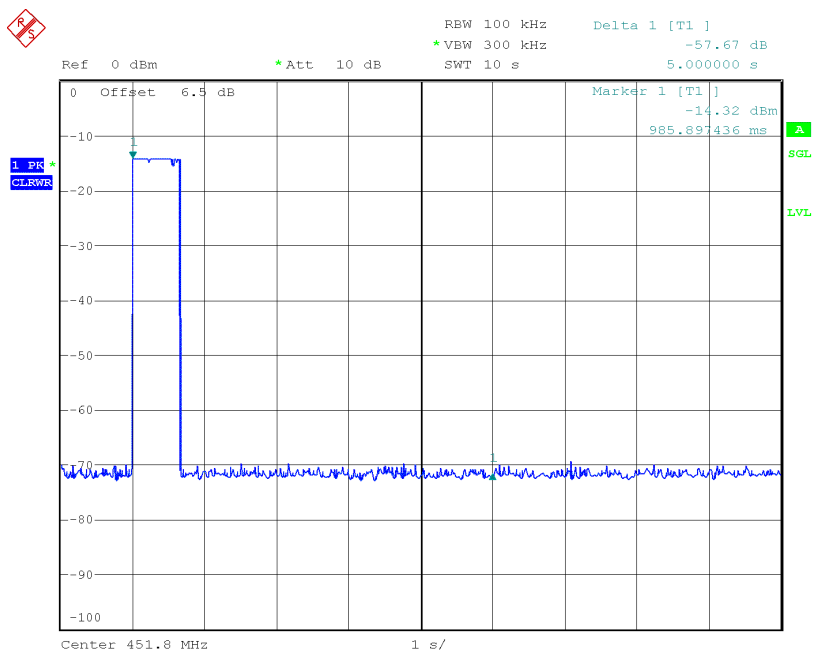
Channel	Frequency (MHz)	Limit (S)	Result
Low	410.3	<5	Pass
Middle	451.8	<5	Pass
High	493.3	<5	Pass

Low Channel



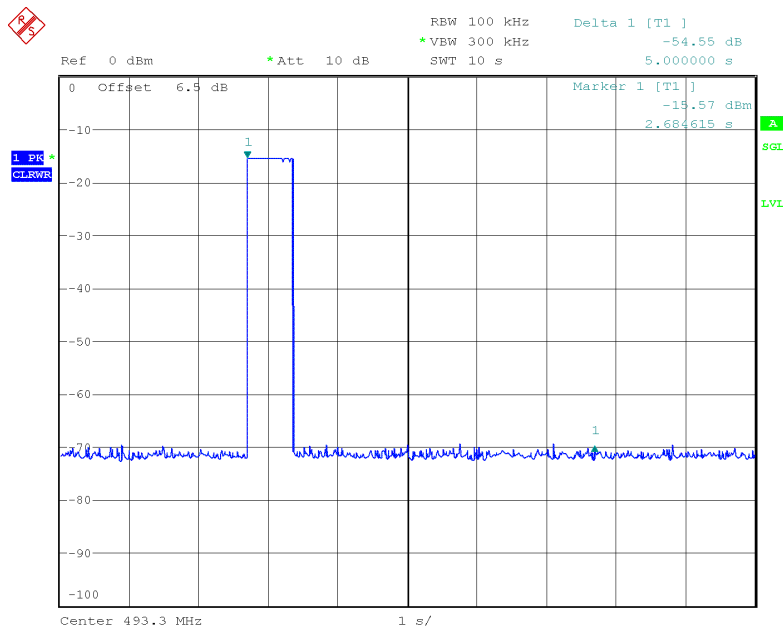
Comment: Project:RSC241216002-0 Tester:Murphy Guo
Date: 26.DEC.2024 15:12:37

Middle Channel



Comment: Project:RSC241216002-0 Tester:Murphy Guo
Date: 26.DEC.2024 15:10:40

High Channel



Comment: Project:RSC241216002-0 Tester:Murphy Guo
Date: 26.DEC.2024 15:08:43

FCC §15.231(c) – 20dB EMISSION BANDWIDTH

Applicable Standard

Per 15.231(c), the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

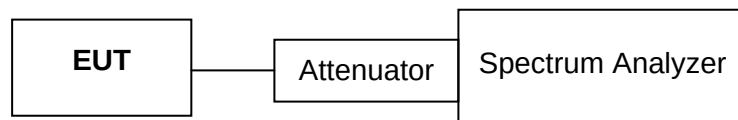
The 99% bandwidth of momentarily operated devices shall be less or equal to 0.25% of the centre frequency of devices operating between 70 MHz and 900 MHz. For devices operating above 900 MHz, the 99% bandwidth shall be less or equal to 0.5% of the centre frequency.

Test Procedure

ANSI C63.10-2020 Clause 6.9.2

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be at least three times RBW, unless otherwise specified by the applicable requirement.
- c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than $[10 \log (OBW/RBW)]$ below the reference level.
- d) Steps a) through c) might require iteration to adjust within the specified tolerances.
- e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target “-xx dB down” requirement; that is, if the requirement calls for measuring the -20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.
- f) Set detection mode to peak and trace mode to max-hold.
- g) Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
- h) Determine the “-xx dB down amplitude” using $[(\text{reference value}) - xx]$. Alternatively, this calculation may be made by using the marker-delta function of the instrument.

Test Setup Block



Note: Offset (6.5dB) = 6dB Attenuator(6dB) + RF cable loss(0.5dB)

Test Data**Environmental Conditions**

Temperature:	15 °C
Relative Humidity:	59 %
ATM Pressure:	96.1 kPa

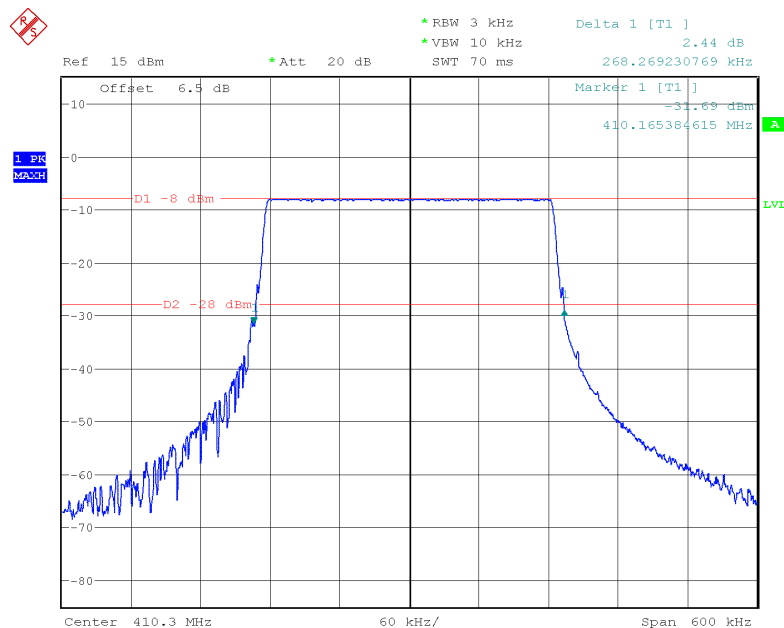
The testing was performed by Murphy Guo on 2024-12-26.

Test Mode: Transmitting

Test Result: Compliance. Please refer to the following table and plots.

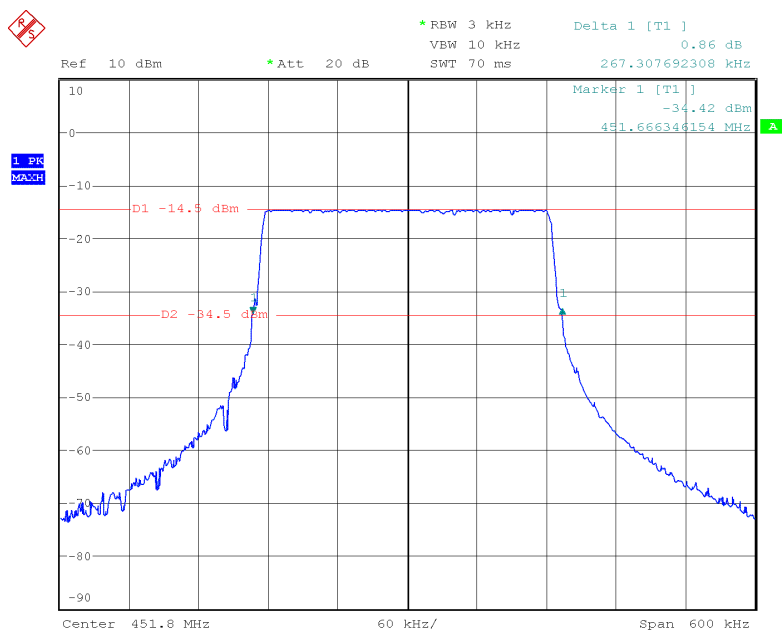
Channel	Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)
Low	410.3	268.27	1025.75
Middle	451.8	267.31	1129.50
High	493.3	267.31	1233.25

Note: Limit = 0.25% x Center Frequency

20dB Bandwidth, Low Channel

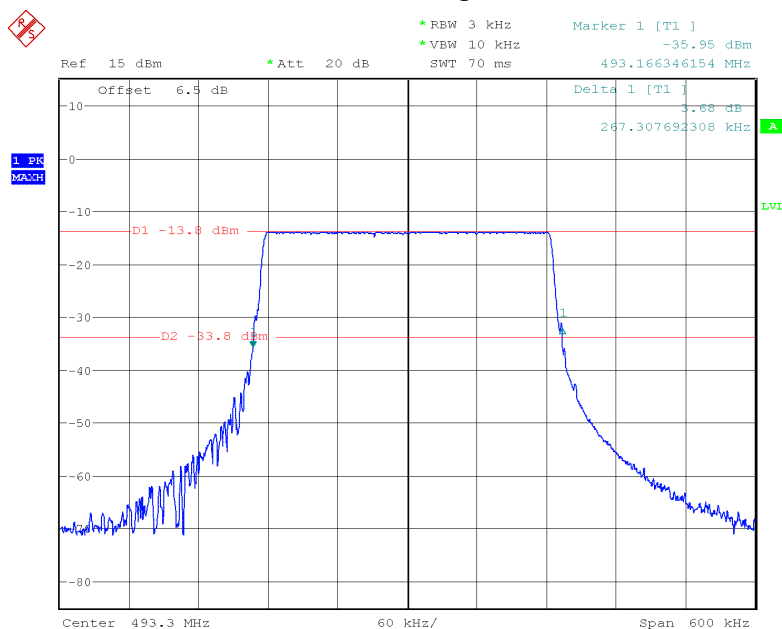
Comment: Project:RSC241216002-0 Tester:Murphy Guo
Date: 26.DEC.2024 16:36:30

20dB Bandwidth, Middle Channel



Comment: Project:RSC241216002-0 Tester:Murphy Guo
Date: 26.DEC.2024 10:10:56

20dB Bandwidth, High Channel



Comment: Project:RSC241216002-0 Tester:Murphy Guo
Date: 26.DEC.2024 16:44:44

FCC §1.1307 – RF EXPOSURE EVALUATION

Applicable Standard

According to §1.1307(b)(3)(i), 447498 D04 Interim General RF Exposure Guidance v01

1-mW Test Exemption

Per § 1.1307(b)(3)(i)(A), a single RF source is exempt RF device (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

RF EXPOSURE EVALUATION

Frequency (MHz)	Maximum EIRP (dBm)	Maximum ERP		1-mW Test Exemption
		dBm	mW	
410.30	-15.45	-17.60	0.017	Compliant

Note:

1. The maximum power was chose to evaluate.
2. The device maximum fundamental E-field level is 79.75 dB μ V/m @3m, so the EIRP is -15.45dBm.
3. $E[\text{dB}\mu\text{V/m}] = \text{EIRP}[\text{dBm}] + 95.2$, for $d = 3 \text{ m}$.
4. $\text{EIRP} = \text{ERP} + 2.15$

END OF REPORT