

TEST REPORT

Verified code: 257799

Report No.:	E202003308171-4	Application No.:	E202003308171
Client:	Shenzhen Malide Technology Co.,Ltd		
Address:	Room 201, No.26A, Xin'E Industrial Zone, E'GongLing, Pinghu Street, Longgang District, Shenzhen, Guangdong Province		
Sample Description:	Voice Broadcaster		
Model:	MLD-R06		
Test Location:	Guangzhou GRG Metrology & Test Co., Ltd.		
Test Specification:	CFR 47 FCC Part 15 Subpart C 10-1-2019 Edition KDB 558074 DO1: DTS measurement guidance v0502 ANSI C63.10:2013		
Issue Date:	2020/06/23		
Test Result:	PASS		
Prepared By: Test Engineer <i>Wu Haoting</i>	Reviewed By: Technical Manager <i>Wu Chengrong</i>	Approved By: Manager 	
Other Aspects:			
Note: /			
Abbreviations: ok / P = passed; fail / F = failed; n.a. / N = not applicable;			
The test result in this test report refers exclusively to the presented test sample. This report shall not be reproduced except in full, without the written approval of GRGT.			



DIRECTIONS OF TEST

1. This company carries out test task according to the national regulation of verifications which can be traced to National Primary Standards and BIPM.
2. The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test result without the written permission of the test laboratory.
3. If there is any objection concerning the test, the client should inform the laboratory within 15 days from the date of receiving the test report.

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1. TEST RESULT SUMMARY

Technical Requirements			
FCC Part 15 Subpart C			
Test Condition		Verdict	Page
§15.207	Conducted emission AC power port	Pass	Page 9
§15.247(b)(1)	Conducted output power for FHSS	N/A	--
§15.247(b)(3)	Conducted output power for DTS	Pass	Page 31
§15.247(e)	Power spectral density	Pass	Page 32
§15.247(a)(2)	6dB bandwidth	Pass	Page 28
§15.247(a)(1)	20dB Occupied bandwidth	N/A	--
--	99% Occupied Bandwidth	N/A	--
§15.247(a)(1)	Carrier frequency separation	N/A	--
§15.247(a)(1)(iii)	Number of hopping frequencies	N/A	--
§15.247(a)(1)(iii)	Dwell Time	N/A	--
§15.247(d)	Spurious RF conducted emissions	Pass	Page 35
§15.247(d)	Band edge	Pass	Page 39
§15.247(d) & §15.209 & §15.205	Spurious radiated emissions for transmitter	Pass	Page 13
§15.203	Antenna requirement	Pass	--

The EUT has one antenna. The antenna is integrated antenna.

The max gain of antenna is -4.86dBi .which accordance 15.203.is considered sufficient to comply with the provisions of this section

2. GENERAL DESCRIPTION OF EUT

2.1. APPLICANT

Name: Shenzhen Malide Technology Co.,Ltd
Address: Room 201, No.26A, Xin'E Industrial Zone, E'GongLing, Pinghu Street,
Longgang District, Shenzhen,Guangdong Province

2.2. MANUFACTURER

Name: Shenzhen Malide Technology Co.,Ltd
Address: Room 201, No.26A, Xin'E Industrial Zone, E'GongLing, Pinghu Street,
Longgang District, Shenzhen,Guangdong Province

2.3. FACTORY

Name : Shenzhen Malide Technology Co.,Ltd
Address : Room 201, No.26A, Xin'E Industrial Zone, E'GongLing, Pinghu Street,
Longgang District, Shenzhen,Guangdong Province

2.4. BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment: Voice Broadcaster
Model No.: MLD-R06
Adding Model: /
Model /
Discrepancy:
Trade Name: Malide
FCC ID: 2AV7VMLD-R06
Power Supply: DC 5V powered by USB port.
Frequency Range: 2402 ~ 2480 MHz
Transmit Power: -17.41dBm
Modulation type: GFSK for 1Mbps
Antenna Specification: Integrated Antenna, -4.86dBi
Temperature Range: -40°C ~ +85°C
Hardware Version: V2.0
Software Version: V3.0
Note: N/A

2.5. TEST OPERATION MODE

Test Item	Mode No.	Description of the modes
Radiated Emission	1	Continuously Transmitting
Conducted Emission	1	Continuously Transmitting

2.6. LOCAL SUPPORTIVE

Name of Equipment	Manufacturer	Model	Serial Number	Note
/	/	/	/	/

3. LABORATORY AND ACCREDITATIONS

3.1. LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of Guangzhou GRG Metrology & Test Co., Ltd.

Add : Address: No.1301 Guanguang Road Xinlan Community, Guanlan Street,
Longhua District Shenzhen, 518110, People's Republic of China

P.C. : 518000

Tel : 0755-61180008

Fax : 0755-61180008

3.2. ACCREDITATIONS

A2LA	Certificate Number 2861.01
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3.3. 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 Emission	Horizontal	30MHz~1000MHz	4.3dB
		1GHz~18GHz	5.6dB
	Vertical	30MHz~1000MHz	4.3dB
		1GHz~18GHz	5.6dB
Conduction Emission		9 kHz ~ 150 kHz	2.8 dB
		150 kHz ~ 10 MHz	2.8 dB
		10 MHz ~ 30 MHz	2.2 dB

This uncertainty represents an expanded uncertainty factor of $k=2$.

4. LIST OF USED TEST EQUIPMENT AT GRGT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Conducted Emissions				
EMI TEST RECEIVER	ROHDE&SCHWARE	ESCI	100783	2020-11-27
LISN(EUT)	ROHDE&SCHWARE	ENV216	101543	2021-03-24
Test S/W	FARAD	EZ-EMC/ CCS-3A1-CE		
Radiated Spurious Emission& Restricted bands of operation				
EMI TEST Receiver	ROHDE&SCHWARZ	ESU26	EMC26-G260	2020-07-16
EXA signal analyzer	Agilent	N9010A	MY52221469	2021-05-16
Bilog Antenna	Schwarzbeck	VULB9160	VULB9160-3401	2020-11-27
Horn Antenna	Schwarzbeck	BBHA9120	D286	2020-11-27
Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170-497	2020-11-30
Amplifier	tonscend	TAP9E6343	AP20E806065	/
Amplifier	tonscend	TAP01018048	AP20E806075	/
High Noise Amplifier	Agilent	8449B	3008A02060	2020-11-18
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2		
6 dB Bandwidth				
EXA signal analyzer	Agilent	N9010A	MY52221469	2021-05-16
Peak Output Power				
Pulse Power Sentor	Agilent	MA2411B	1126150	2021-04-13
Power Meter	Anritsu	ML2495A	1204003	2021-04-13
Conducted band edges and Spurious Emission				
EXA signal analyzer	Agilent	N9010A	MY52221469	2021-05-16
Peak Output Spectral Density Measurement				
EXA signal analyzer	Agilent	N9010A	MY52221469	2021-05-16

5. CONDUCTED EMISSION MEASUREMENT

5.1. LIMITS

Frequency range	Limits (dBμV)	
	Quasi-peak	Average
150kHz ~ 0.5MHz	66~56	56~46
0.5 MHz ~ 5 MHz	56	46
5 MHz ~ 30 MHz	60	50

NOTE: (1) The lower limit shall apply at the transition frequencies.

(2) The limit decreases in line with the logarithm of the frequency in the range of 150 kHz to 0.5MHz.

5.2. TEST PROCEDURES

Procedure of Preliminary Test

Test procedures follow ANSI C63.4:2014.

For measurement of the disturbance voltage the equipment under test (EUT) is connected to the power supply mains and any other extended network via one or more artificial network(s). An EUT, whether intended to be grounded or not, and which is to be used on a table is configured as follows:

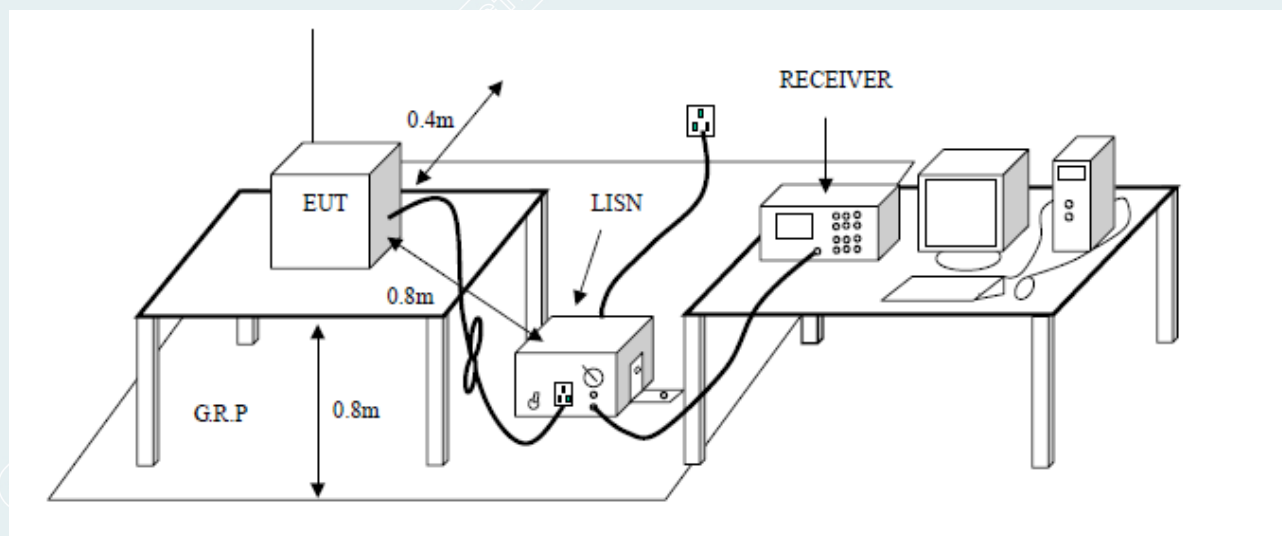
- Either the bottom or the rear of the EUT shall be at a controlled distance of 40 cm from a reference ground plane. This ground plane is normally the wall or floor of a shielded room. It may also be a grounded metal plane of at least 2 m by 2 m. This is physically accomplished as follows:
 - 1) place the EUT on a table of non-conducting material which is at least 80 cm high. Place the EUT so that it is 40 cm from the wall of the shielded room, or
 - 2) place the EUT on a table of non-conducting material which is 40 cm high so that the bottom of the EUT is 40 cm above the ground plane;
- All other conductive surfaces of the EUT shall be at least 80 cm from the reference ground plane;
- The EUT are placed on the floor that one side of the housings is 40 cm from the vertical reference ground plane and other metallic parts;
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth forming a bundle 30 cm to 40 cm long, hanging approximately in the middle between the ground plane and the table.
- I/O cables that are connected to a peripheral shall be bundled in the centre. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 1 m.

The test mode(s) described in Item 2.4 were scanned during the preliminary test. After the preliminary scan, we found the test mode described in Item 2.4 producing the highest emission level. The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

Procedure of Final Test

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test. A scan was taken on both power lines, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. The test data of the worst-case condition(s) was recorded.

5.3. TEST SETUP



5.4. DATA SAMPLE

Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XXXX	32.69	25.65	11.52	44.21	37.17	65.78	55.79	-21.57	-18.62	Pass

Factor = Insertion loss of LISN + Cable Loss

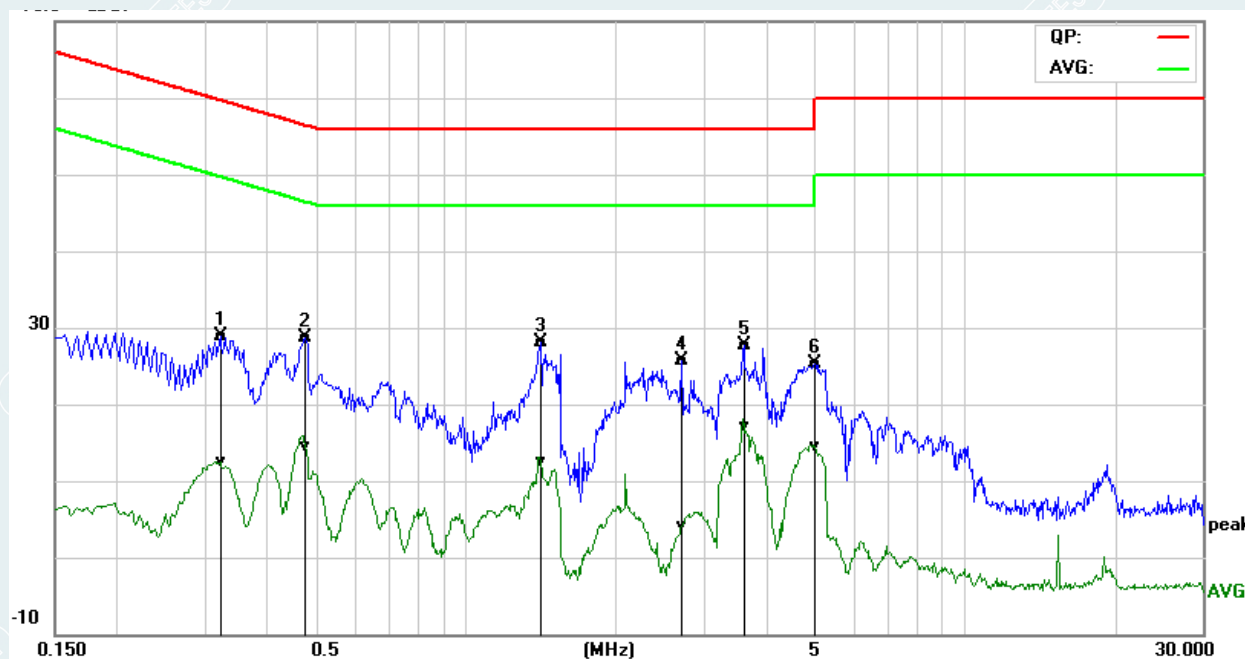
Result = Quasi-peak Reading/ Average Reading + Factor

Limit = Limit stated in standard

Margin = Result (dBuV) – Limit (dBuV)

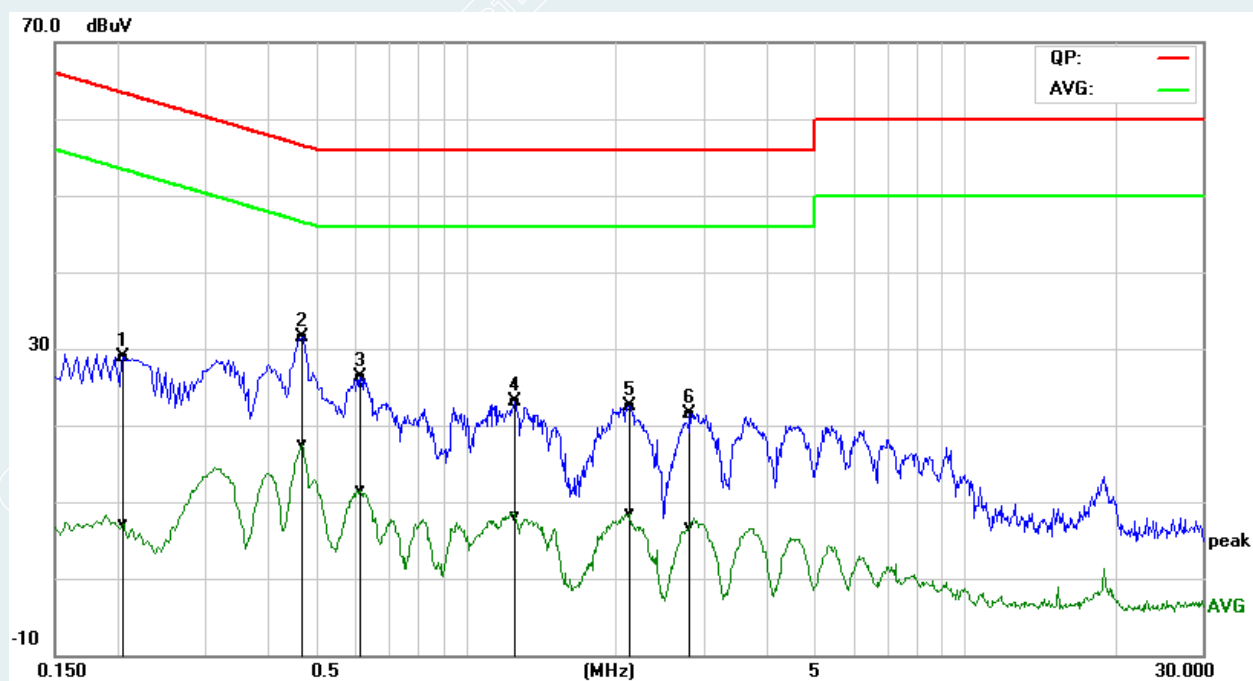
5.5. TEST RESULTS

L



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.3220	19.16	2.77	9.68	28.84	12.45	59.65	49.66	-30.81	-37.21	Pass
2*	0.4780	19.01	4.81	9.67	28.68	14.48	56.37	46.37	-27.69	-31.89	Pass
3	1.4140	18.29	2.70	9.72	28.01	12.42	56.00	46.00	-27.99	-33.58	Pass
4	2.7100	15.90	-5.62	9.75	25.65	4.13	56.00	46.00	-30.35	-41.87	Pass
5	3.6060	17.85	7.26	9.77	27.62	17.03	56.00	46.00	-28.38	-28.97	Pass
6	5.0260	15.43	4.73	9.80	25.23	14.53	60.00	50.00	-34.77	-35.47	Pass

N



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1	0.2060	19.25	-2.57	9.67	28.92	7.10	63.36	53.37	-34.44	-46.27	Pass
2*	0.4700	21.91	7.75	9.67	31.58	17.42	56.51	46.51	-24.93	-29.09	Pass
3	0.6140	16.58	1.86	9.68	26.26	11.54	56.00	46.00	-29.74	-34.46	Pass
4	1.2579	13.38	-1.51	9.71	23.09	8.20	56.00	46.00	-32.91	-37.80	Pass
5	2.1260	12.85	-1.17	9.73	22.58	8.56	56.00	46.00	-33.42	-37.44	Pass
6	2.8179	11.83	-3.07	9.75	21.58	6.68	56.00	46.00	-34.42	-39.32	Pass

6. RADIATED SPURIOUS EMISSIONS

6.1. LIMITS

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Frequency (MHz)	Quasi-peak($\mu\text{V/m}$)	Measurement distance(m)	Quasi-peak($\text{dB}\mu\text{V/m}$)@distance 3m
0.009-0.490	2400/F(kHz)	300	53.8~88.5
0.490-1.705	24000/F(kHz)	30	43~53.8
1.705-30.0	30	30	49.5
30 ~ 88	100	3	40
88~216	150	3	43.5
216 ~ 960	200	3	46
Above 960	500	3	54

NOTE: (1) The lower limit shall apply at the transition frequencies.

6.2. TEST PROCEDURES

1) Sequence of testing 9 kHz to 30 MHz

Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 0.8 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^\circ$) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP detector with an EMI receiver.
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz**Setup:**

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 2.5 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^\circ$) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 1 meter.
- The EUT was set into operation.

Premeasurement:

- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

NOTE: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).

6.3. TEST SETUP

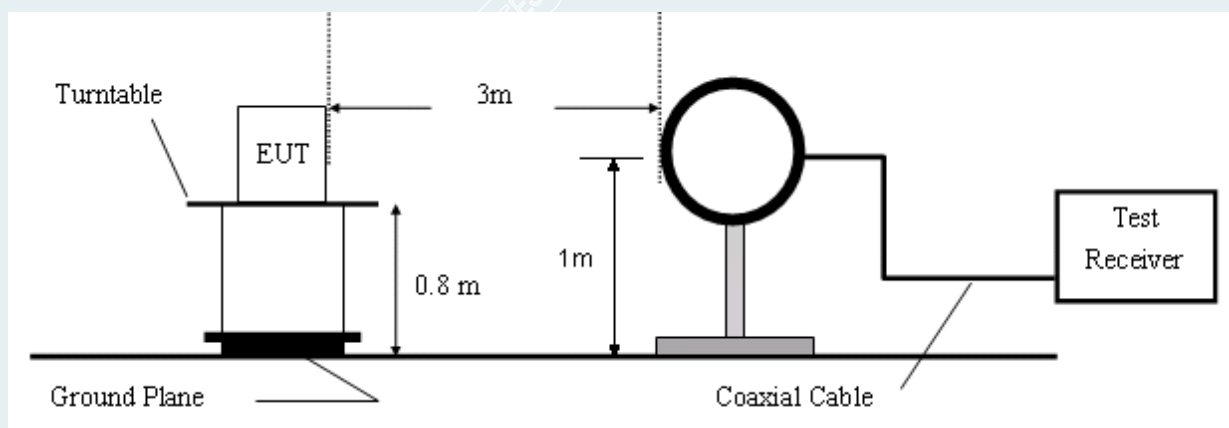


Figure 1.9KHz to 30MHz radiated emissions test configuration

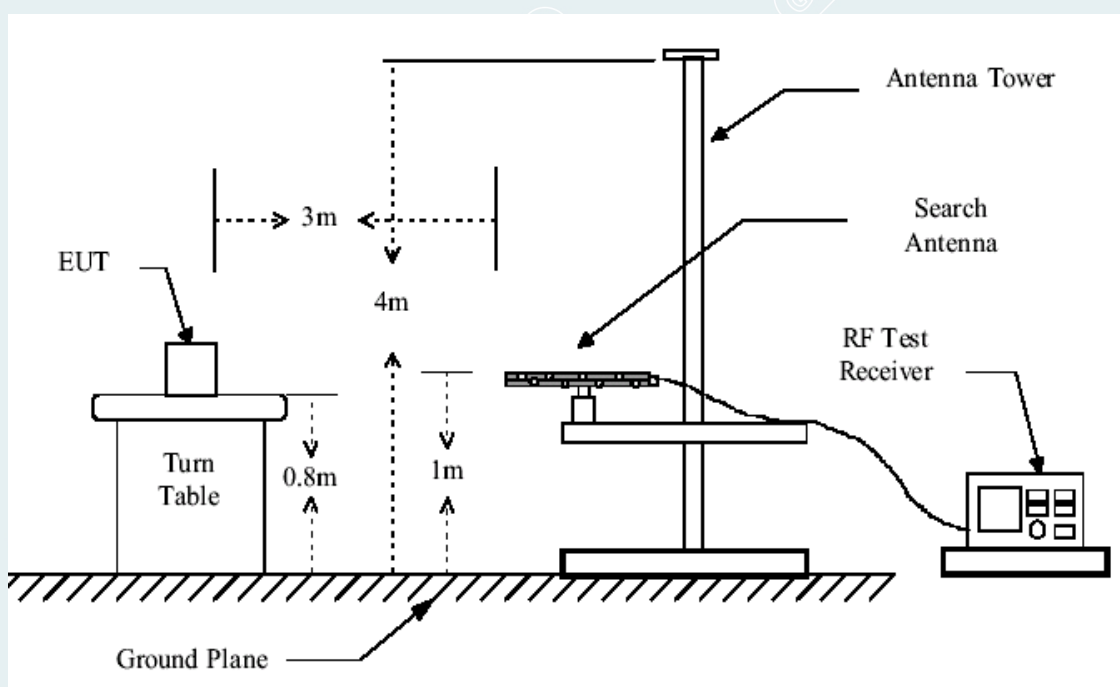


Figure 2. 30MHz to 1GHz radiated emissions test configuration

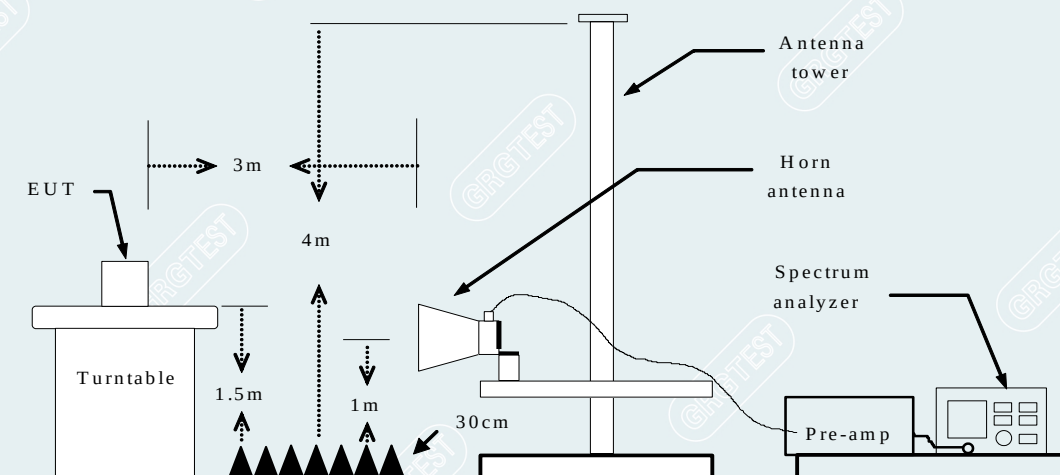


Figure 3. Above 1GHz radiated emissions test configuration

6.4. DATA SAMPLE

30MHz to 1GHz

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Pole
xxx	xxx	37.06	-15.48	21.58	40.00	-18.42	QP	Vertical

Above 1 GHz

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Pole
xxx	xxx	65.45	-11.12	54.33	74.00	-19.67	peak	Vertical
xxx	xxx	63.00	-11.12	51.88	54.00	-2.12	AVG	Vertical

Frequency (MHz)

= Emission frequency in MHz

Ant.Pol. (H/V)

= Antenna polarization

Reading (dBuV)

= Uncorrected Analyzer / Receiver reading

Correction Factor (dB/m)

= Antenna factor + Cable loss – Amplifier gain

Result (dBuV/m)

= Reading (dBuV) + Correction Factor (dB/m)

Limit (dBuV/m)

= Limit stated in standard

Margin (dB)

= Remark Result (dBuV/m) – Limit (dBuV/m)

Peak

= Peak Reading

QP

= Quasi-peak Reading

AVG

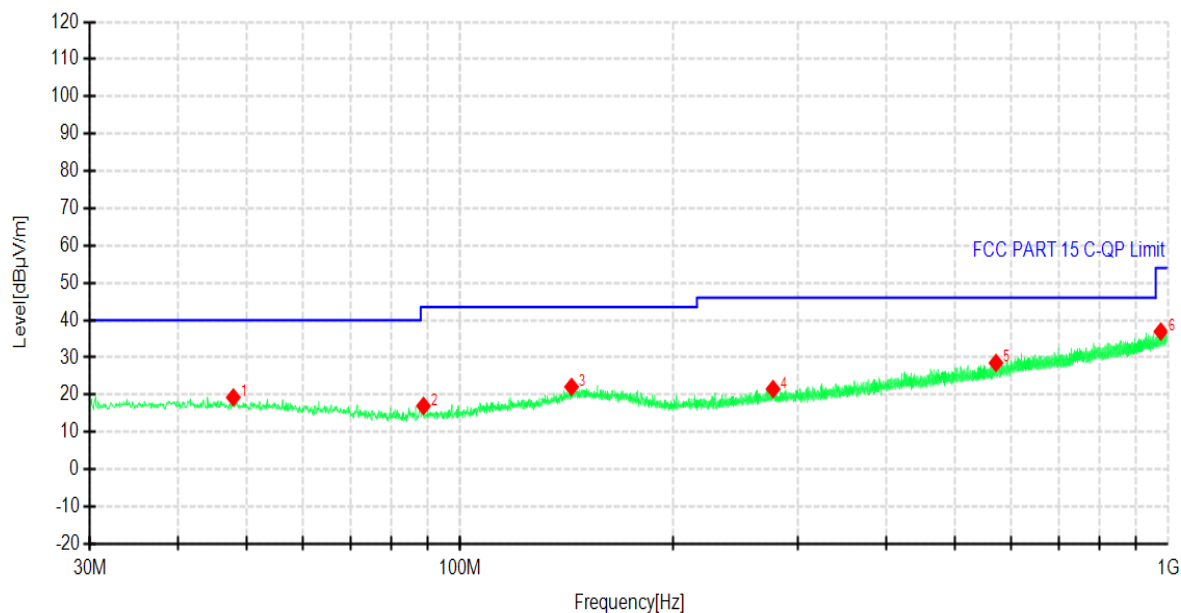
= Average Reading

6.5. TEST RESULTS

30MHz to 1GHz:

Mode: TX

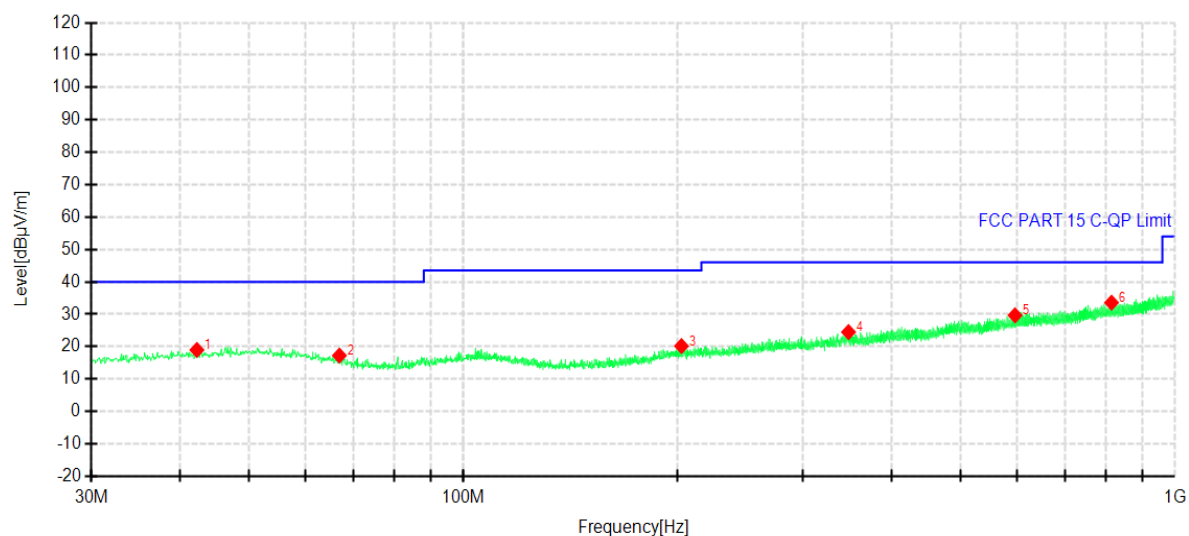
Lowest channel (2402MHz)



NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	47.8480	49.21	19.30	-29.91	40.00	20.70	150	301	Vertical
2	88.7820	49.21	17.01	-32.20	43.50	26.49	150	236	Vertical
3	143.6840	48.96	22.13	-26.83	43.50	21.37	150	84	Vertical
4	276.6710	48.67	21.56	-27.11	46.00	24.44	150	354	Vertical
5	571.1630	48.41	28.54	-19.87	46.00	17.46	150	354	Vertical
6	976.1380	48.75	36.98	-11.77	54.00	17.02	150	3	Vertical

Mode: TX

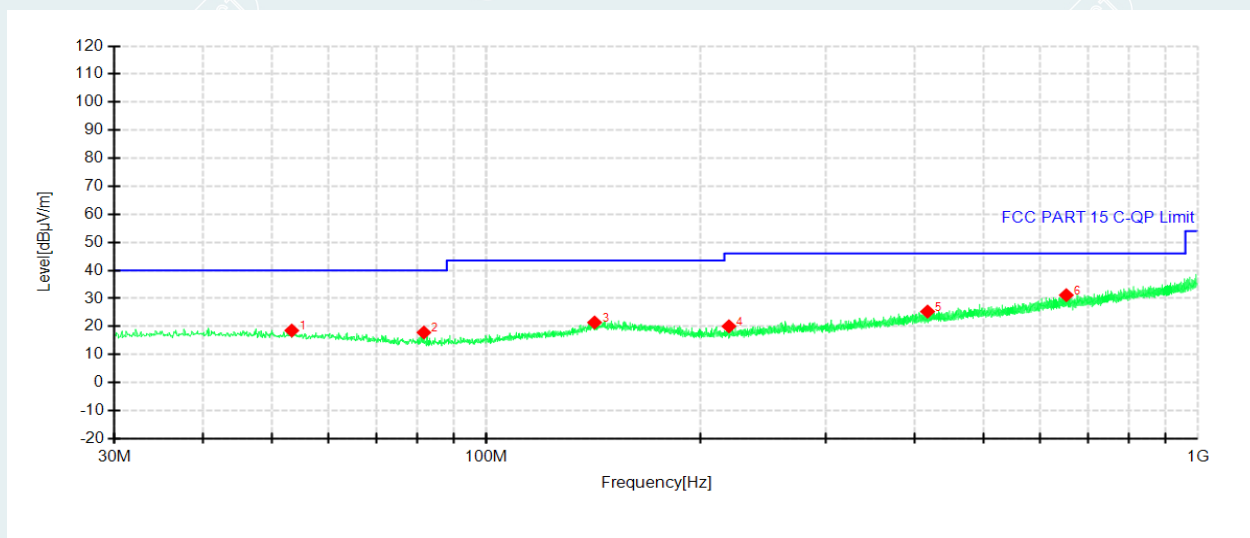
Lowest channel (2402MHz)



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	42.2220	48.44	18.98	-29.46	40.00	21.02	150	200	Horizontal
2	66.9570	48.71	17.26	-31.45	40.00	22.74	150	74	Horizontal
3	202.5630	48.75	20.18	-28.57	43.50	23.32	150	272	Horizontal
4	347.7720	49.11	24.50	-24.61	46.00	21.50	150	124	Horizontal
5	596.0920	48.59	29.68	-18.91	46.00	16.32	150	314	Horizontal
6	814.5360	49.32	33.58	-15.74	46.00	12.42	150	284	Horizontal

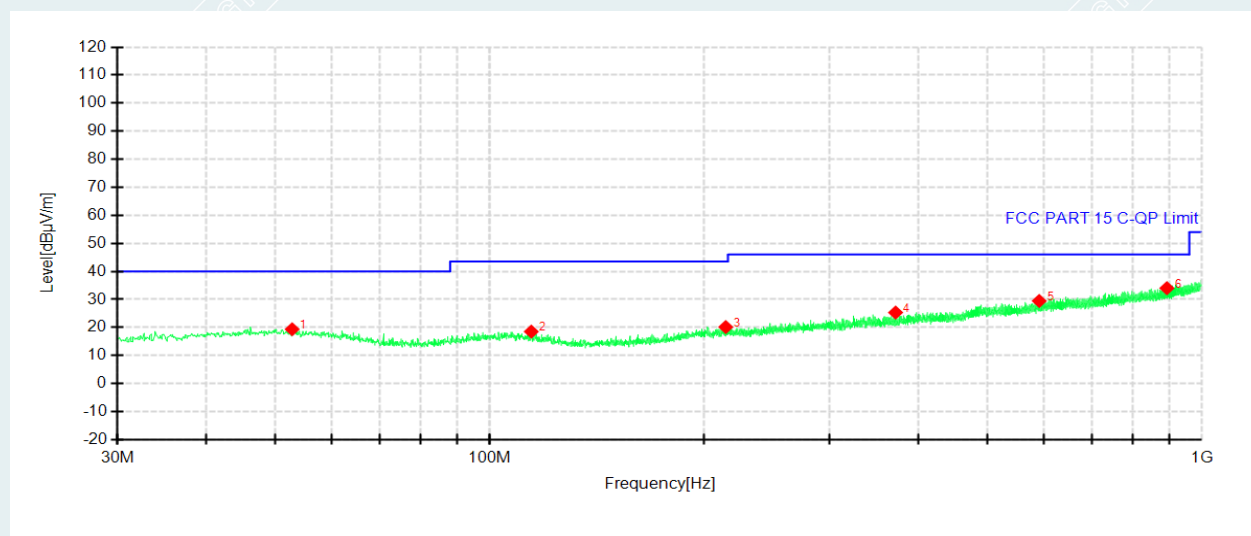
Mode: TX
Middle channel (2440MHz)



NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	53.2800	48.75	18.56	-30.19	40.00	21.44	150	158	Vertical
2	81.7010	50.32	17.85	-32.47	40.00	22.15	150	261	Vertical
3	141.9380	48.41	21.43	-26.98	43.50	22.07	150	231	Vertical
4	219.2470	48.95	20.07	-28.88	46.00	25.93	150	88	Vertical
5	416.9330	48.33	25.32	-23.01	46.00	20.68	150	158	Vertical
6	653.2250	48.89	31.17	-17.72	46.00	14.83	150	162	Vertical

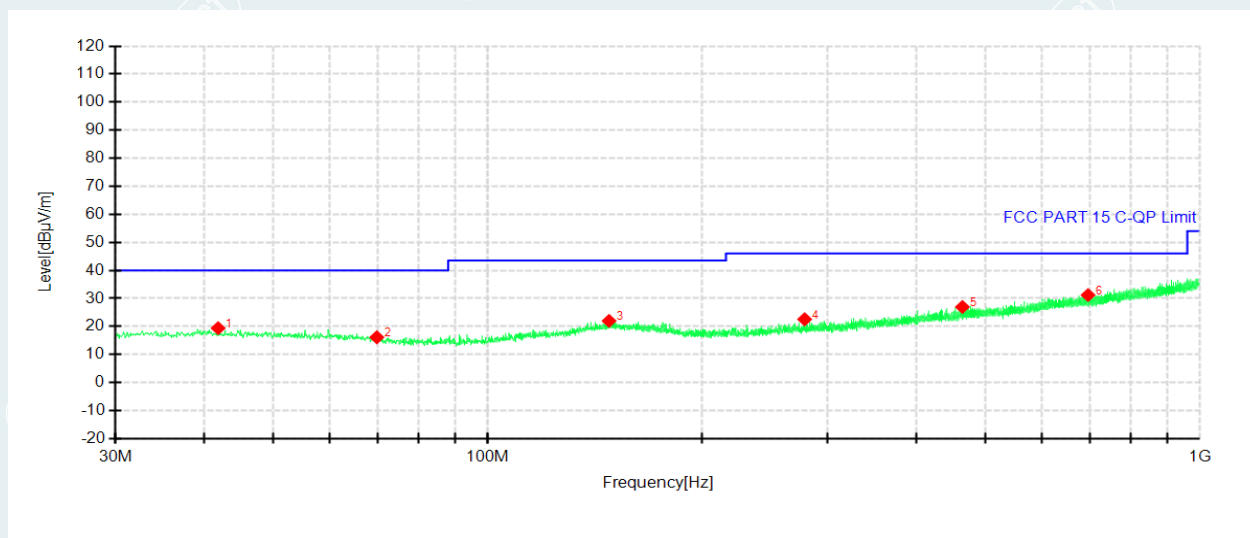
Mode: TX

Middle channel (2440MHz)



NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	52.7950	48.25	19.36	-28.89	40.00	20.64	150	220	Horizontal
2	114.3900	48.95	18.53	-30.42	43.50	24.97	150	339	Horizontal
3	214.4940	48.48	20.16	-28.32	43.50	23.34	150	11	Horizontal
4	371.4400	49.49	25.33	-24.16	46.00	20.67	150	281	Horizontal
5	591.0480	48.60	29.47	-19.13	46.00	16.53	150	350	Horizontal
6	892.9120	48.41	34.03	-14.38	46.00	11.97	150	182	Horizontal

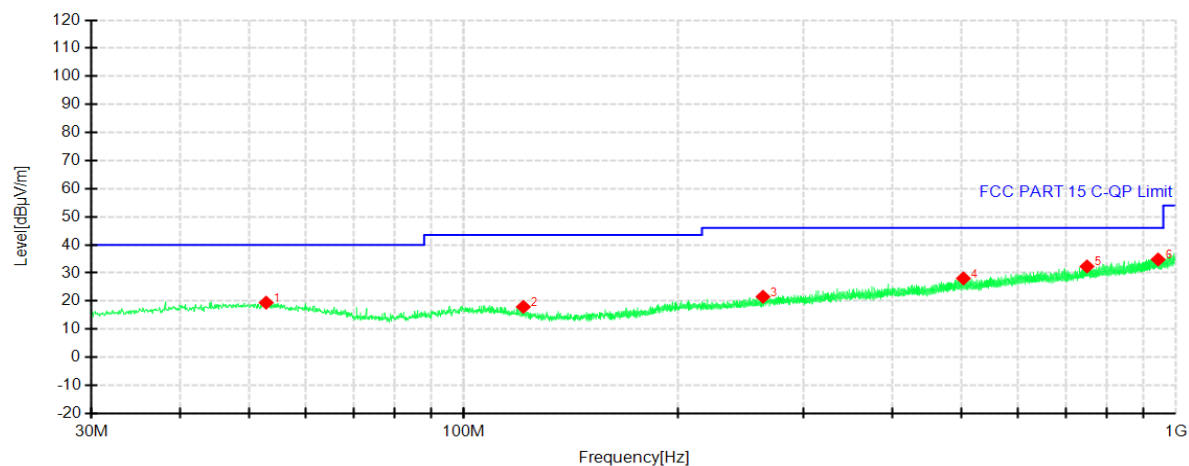
TX
Highest channel (2480MHz)



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	41.8340	49.08	19.40	-29.68	40.00	20.60	150	163	Vertical
2	69.8670	47.66	16.15	-31.51	40.00	23.85	150	140	Vertical
3	148.0490	48.44	21.98	-26.46	43.50	21.52	150	202	Vertical
4	278.6110	49.66	22.58	-27.08	46.00	23.42	150	320	Vertical
5	464.0750	48.93	26.96	-21.97	46.00	19.04	150	110	Vertical
6	696.5840	48.37	31.20	-17.17	46.00	14.80	150	259	Vertical

TX

Highest channel (2480MHz)



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	52.7950	48.33	19.44	-28.89	40.00	20.56	150	2	Horizontal
2	121.2770	49.28	17.94	-31.34	43.50	25.56	150	78	Horizontal
3	263.1880	48.36	21.55	-26.81	46.00	24.45	150	296	Horizontal
4	503.0690	49.03	28.07	-20.96	46.00	17.93	150	10	Horizontal
5	750.2250	48.75	32.34	-16.41	46.00	13.66	150	63	Horizontal
6	944.2250	48.14	34.81	-13.33	46.00	11.19	150	223	Horizontal

Above 1GHz:

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Mode: TX

Lowest channel (2402MHz)

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	1748.0000	39.59	-21.70	74.00	34.41	PK	Horizontal
2	2439.9000	63.60	-19.06	74.00	10.40	PK	Horizontal
3	2439.9000	51.58	-19.06	54.00	2.42	AV	Horizontal
4	4879.4000	57.86	-10.37	74.00	16.14	PK	Horizontal
5	4879.4000	48.07	-10.37	54.00	5.93	AV	Horizontal
6	7318.9000	54.49	-3.58	74.00	19.51	PK	Horizontal
7	7318.9000	46.30	-3.58	54.00	7.70	AV	Horizontal
8	9642.8000	45.85	2.63	74.00	28.15	PK	Horizontal
9	12750.4000	47.87	6.90	74.00	26.13	PK	Horizontal

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	1931.6000	33.17	-21.25	74.00	40.83	PK	Vertical
2	2439.9000	61.88	-19.06	74.00	12.12	PK	Vertical
3	2439.9000	50.81	-19.06	54.00	3.19	AV	Vertical
4	4879.4000	55.65	-10.37	74.00	18.35	PK	Vertical
5	4879.4000	47.15	-10.37	54.00	6.85	AV	Vertical
6	7318.9000	48.58	-3.58	74.00	25.42	PK	Vertical
7	11568.9000	48.03	6.94	74.00	25.97	PK	Vertical
8	14605.1000	50.50	11.65	74.00	23.50	PK	Vertical

Mode: TX

Middle channel (2440MHz)

NO.	Freq. [MHz]	Level [dB μ V/m]	Factor [dB]	Limit [dB μ V/m]	Margin [dB]	Detector	Polarity
1	1748.0000	39.59	-21.70	74.00	34.41	PK	Horizontal
2	2439.9000	63.60	-19.06	74.00	10.40	PK	Horizontal
3	2439.9000	50.19	-19.06	54.00	3.81	AV	Horizontal
4	4879.4000	57.86	-10.37	74.00	16.14	PK	Horizontal
5	4879.4000	49.56	-10.37	54.00	4.44	AV	Horizontal
6	7318.9000	54.49	-3.58	74.00	19.51	PK	Horizontal
7	7318.9000	47.18	-3.58	54.00	6.82	AV	Horizontal
8	9642.8000	45.85	2.63	74.00	28.15	PK	Horizontal
9	12750.4000	47.87	6.90	74.00	26.13	PK	Horizontal

NO.	Freq. [MHz]	Level [dB μ V/m]	Factor [dB]	Limit [dB μ V/m]	Margin [dB]	Detector	Polarity
1	1931.6000	33.17	-21.25	74.00	40.83	PK	Vertical
2	2439.9000	61.88	-19.06	74.00	12.12	PK	Vertical
3	2439.9000	48.90	-19.06	54.00	5.10	AV	Vertical
4	4879.4000	55.65	-10.37	74.00	18.35	PK	Vertical
5	4879.4000	46.19	-10.37	54.00	7.81	AV	Vertical
6	7318.9000	48.58	-3.58	74.00	25.42	PK	Vertical
7	11568.9000	48.03	6.94	74.00	25.97	PK	Vertical
8	14605.1000	50.50	11.65	74.00	23.50	PK	Vertical

Remark:

- 1 Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2 Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- 3 Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 4 Data of measurement within this frequency range shown “ --- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “ N/A ” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

Mode: TX

Highest channel (2480MHz)

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	1756.5000	35.98	-21.64	74.00	38.02	PK	Horizontal
2	2479.0000	59.13	-18.76	74.00	14.87	PK	Horizontal
3	2479.0000	49.58	-18.76	54.00	4.42	AV	Horizontal
4	4959.3000	56.62	-9.87	74.00	17.38	PK	Horizontal
5	4959.3000	47.28	-9.87	54.00	6.72	AV	Horizontal
6	7439.6000	53.49	-2.99	74.00	20.51	PK	Horizontal
7	11300.3000	47.92	6.83	74.00	26.08	PK	Horizontal
8	14596.6000	50.29	11.74	74.00	23.71	PK	Horizontal

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	1751.4000	40.94	-21.67	74.00	33.06	PK	Vertical
2	2479.0000	58.39	-18.76	74.00	15.61	PK	Vertical
3	2479.0000	49.86	-18.76	54.00	4.14	AV	Vertical
3	4959.3000	53.87	-9.87	74.00	20.13	PK	Vertical
4	7439.6000	47.94	-2.99	74.00	26.06	PK	Vertical
5	9481.3000	47.12	1.82	74.00	26.88	PK	Vertical
6	14652.7000	51.05	10.76	74.00	22.95	PK	Vertical

Remark:

- 1 Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2 Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- 3 Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 4 Data of measurement within this frequency range shown “ --- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “ N/A ” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

7. 6DB BANDWIDTH

7.1. LIMITS

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

7.2. TEST PROCEDURES

- 1) Remove the antenna from the EUT, and then connect a low loss RF cable from antenna port to the spectrum analyzer.
- 2) Set resolution bandwidth (RBW) = 100kHz. Set the video bandwidth (VBW) $\geq 3 \times$ RBW. Detector = Peak. Trace mode = max hold. Sweep = auto couple. Allow the trace to stabilize, record 6dB bandwidth value.
- 3) Repeat above procedures until all frequencies measured were complete.

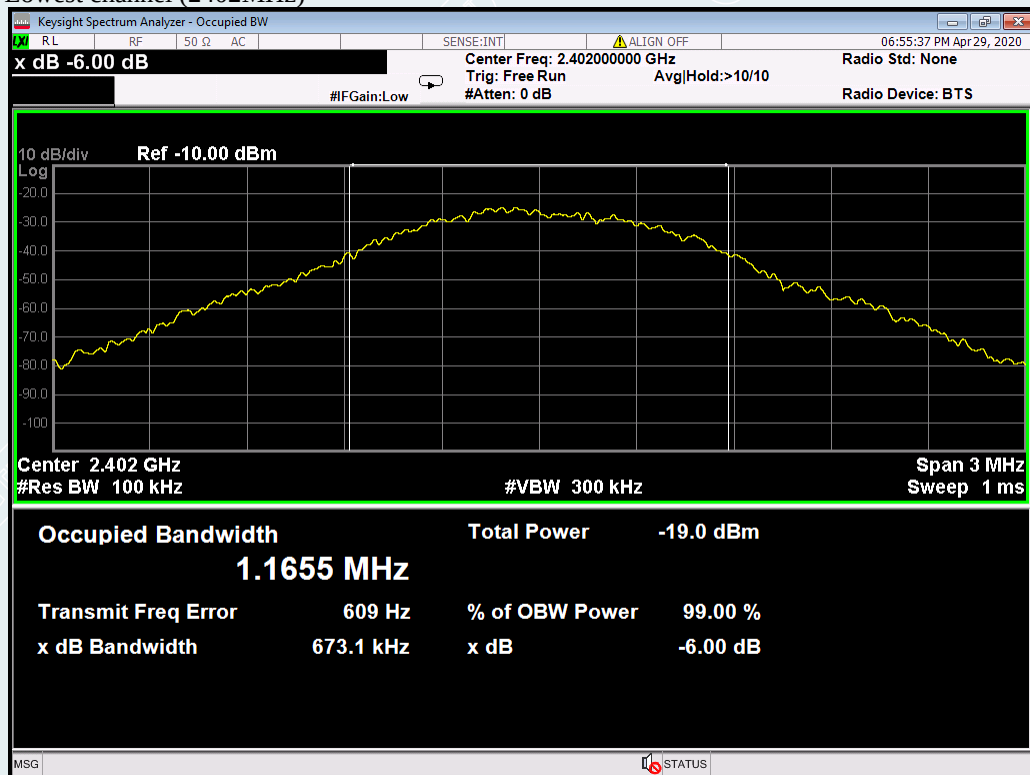
7.3. TEST SETUP



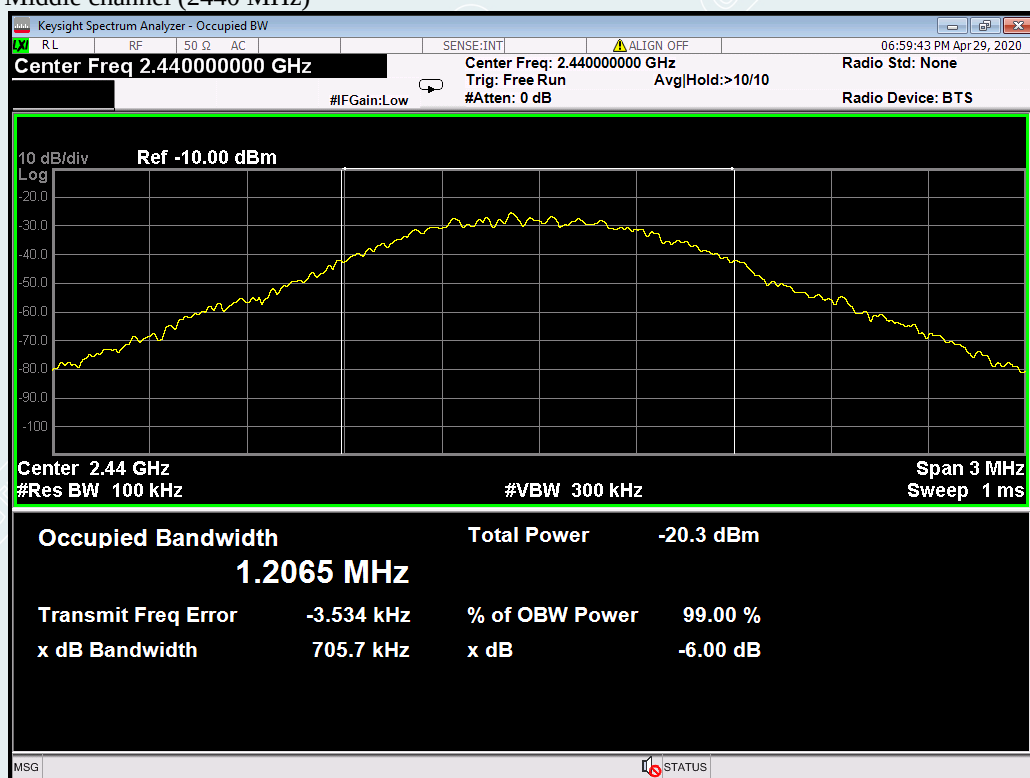
7.4. TEST RESULTS

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	2402	673.1	>500	PASS
Middle	2440	705.7		PASS
Highest	2480	748.2		PASS

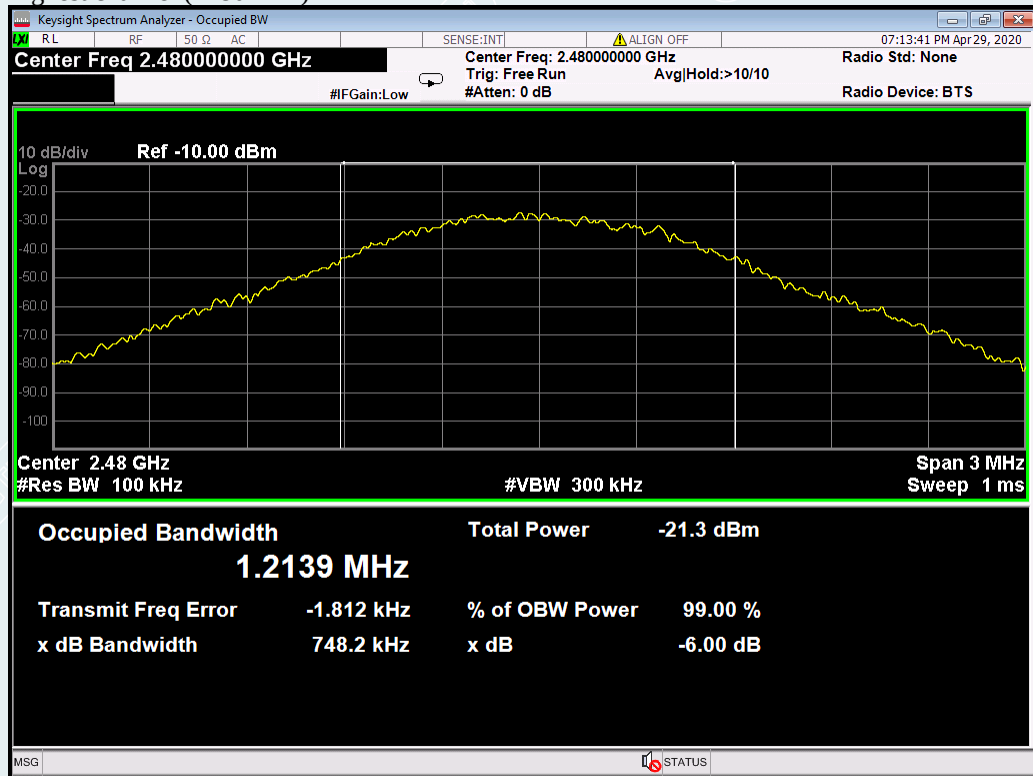
Lowest channel (2402MHz)



Middle channel (2440 MHz)



Highest channel (2480MHz)



8. MAXIMUM PEAK OUTPUT POWER

8.1.LIMITS

The maximum Peak output power measurement is 1W

8.2.TEST PROCEDURES

- 1) Place the EUT on a bench and set it in transmitting mode.
- 2) Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to an EMI Test Receiver.
- 3) The spectrum analyzer resolution bandwidth that is $\leq$ EBW. So we test the Maximum Conducted Output Power —Integrated band power method.
- 4) Set the analyzer span $\geq 1.5 \times$ DTS bandwidth. Set the RBW = 1 MHz. Set the VBW ≥ 3 MHz. Sweep time = auto couple. Detector = peak. Allow trace to fully stabilize.

8.3.TEST SETUP



8.4.TEST RESULTS

Channel	Frequency (MHz)	Measured Channel Power (dBm)	Limit	Peak/ Average	Result
Lowest	2402	-17.41	1W (30dBm)	Peak	Pass
Middle	2440	-18.56			Pass
Highest	2480	-19.54			Pass

9. POWER SPECTRAL DENSITY

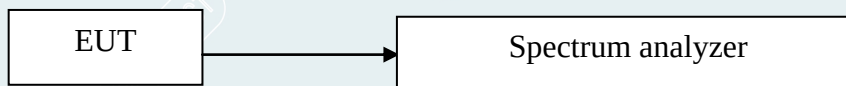
9.1. LIMITS

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

9.2. TEST PROCEDURES

- 1) Remove the antenna from the EUT, and then connect a low loss RF cable from antenna port to the spectrum analyzer.
- 2) Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- 3) Set the analyzer span to 1.5 times the DTS bandwidth. Set the RBW = 3 kHz. Set the VBW $\geq$ 3 RBW. Detector = peak. Ensure that the number of measurement points in the sweep $\geq$ 2 x span/RBW (use of a greater number of measurement points than this minimum requirement is recommended).
- 4) Repeat above procedures until all frequencies measured were complete.

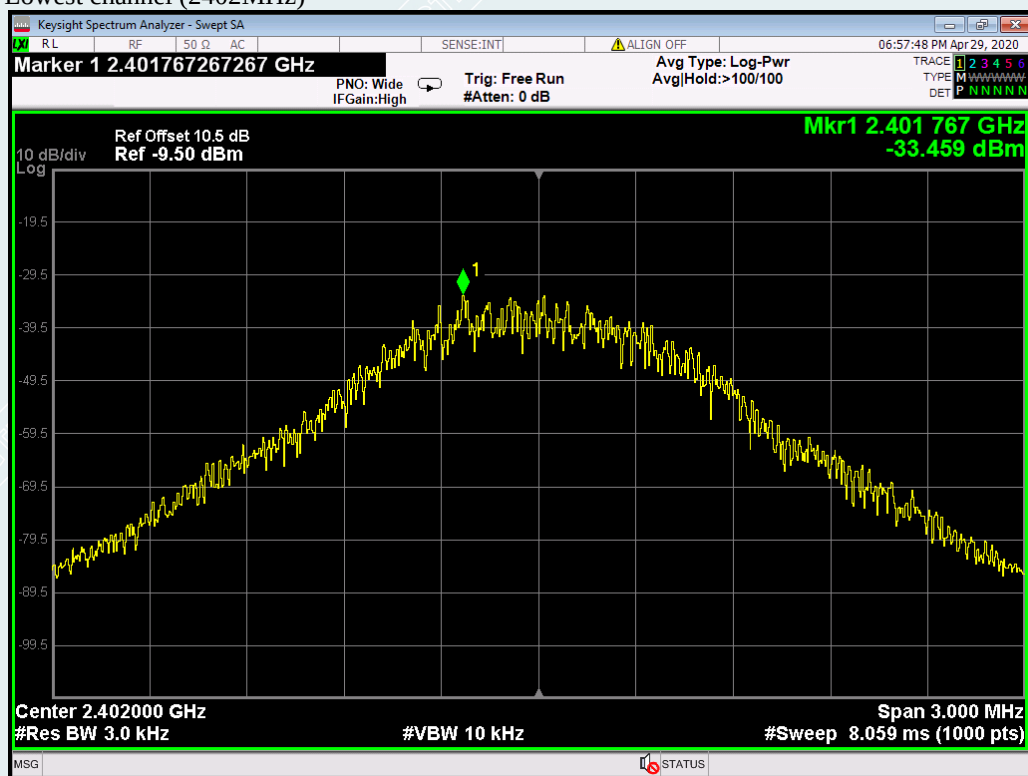
9.3. TEST SETUP



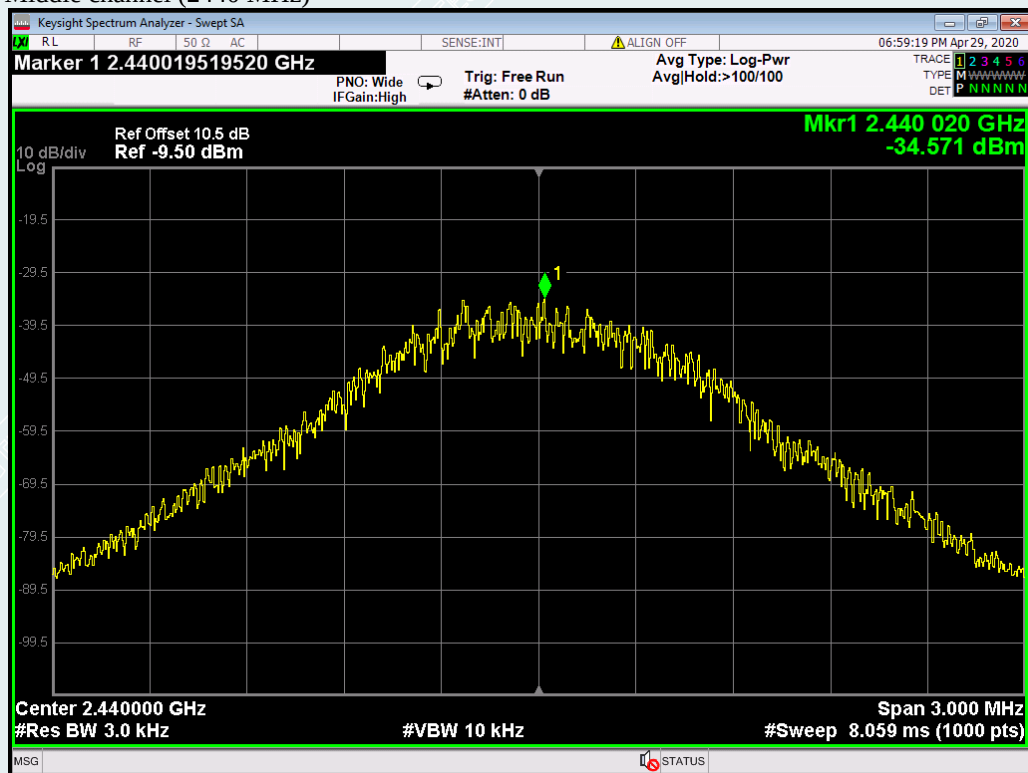
9.4. TEST RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm/3kHz)	Test Result
Lowest	2402	-33.459	8	PASS
Middle	2440	-34.571		PASS
Highest	2480	-35.888		PASS

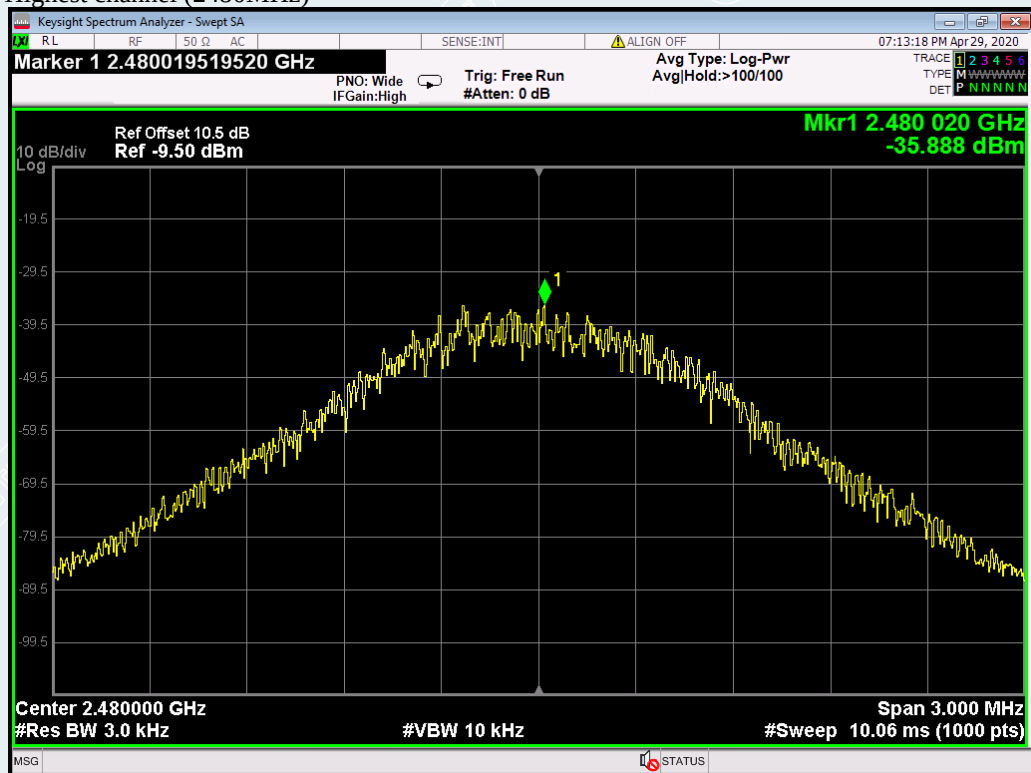
Lowest channel (2402MHz)



Middle channel (2440 MHz)



Highest channel (2480MHz)



10. CONDUCTED BAND EDGES AND SPURIOUS EMISSIONS

10.1. LIMITS

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

10.2. TEST PROCEDURES

Test procedures follow KDB 558074 D01 DTS Measurement Guidance v03r01.

Remove the antenna from the EUT and then connect a low attenuation cable from the antenna port to the spectrum.

- 1) Remove the antenna from the EUT and then connect a low attenuation cable from the antenna port to the spectrum.
- 2) Set the spectrum analyzer: RBW = 100KHz; VBW = 300KHz, Span = 10MHz to 26GHz; Sweep = auto; Detector Function = Peak. Trace = Max, hold.
- 3) Measure and record the results in the test report.
- 4) The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

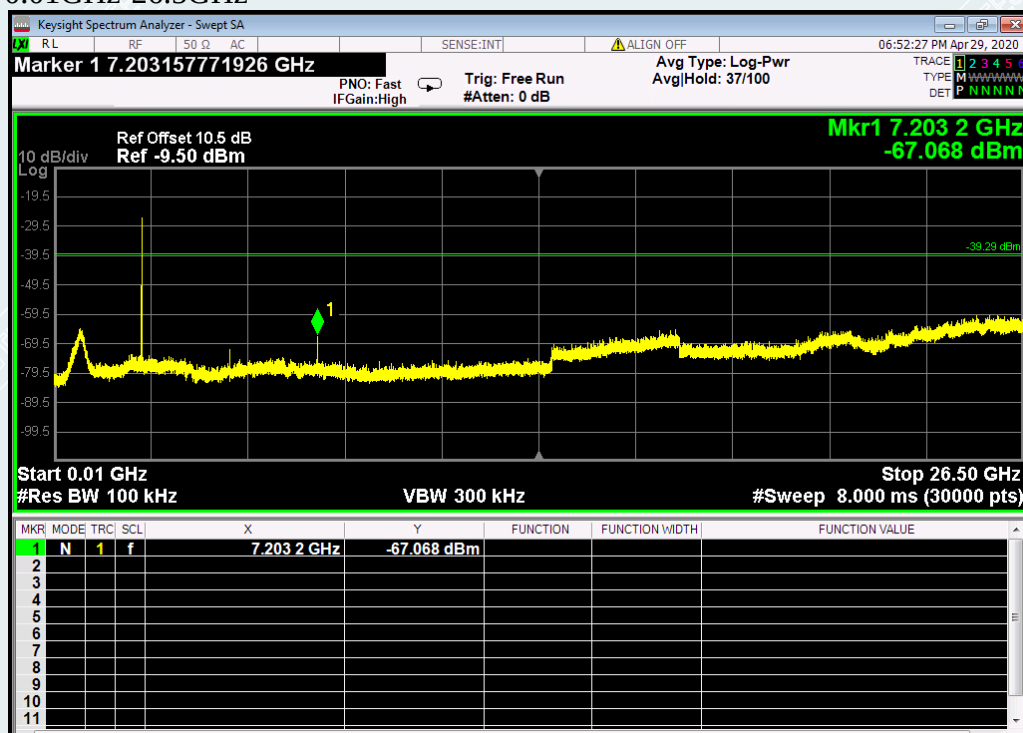
10.3. TEST SETUP



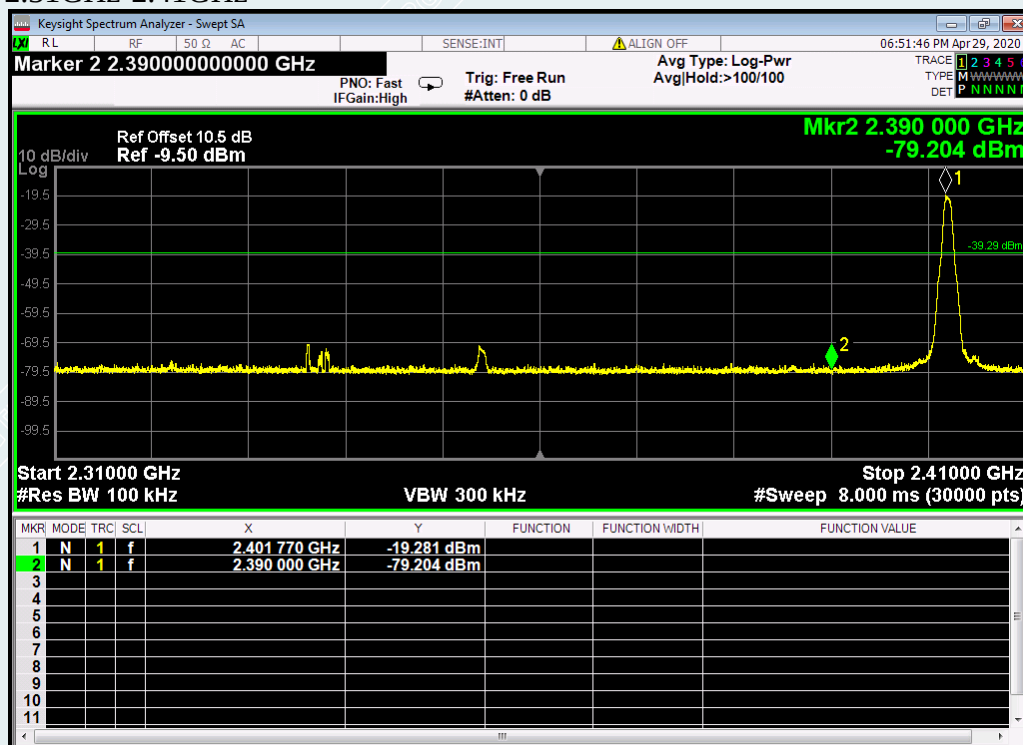
10.4. TEST RESULTS

Lowest channel (2402MHz)

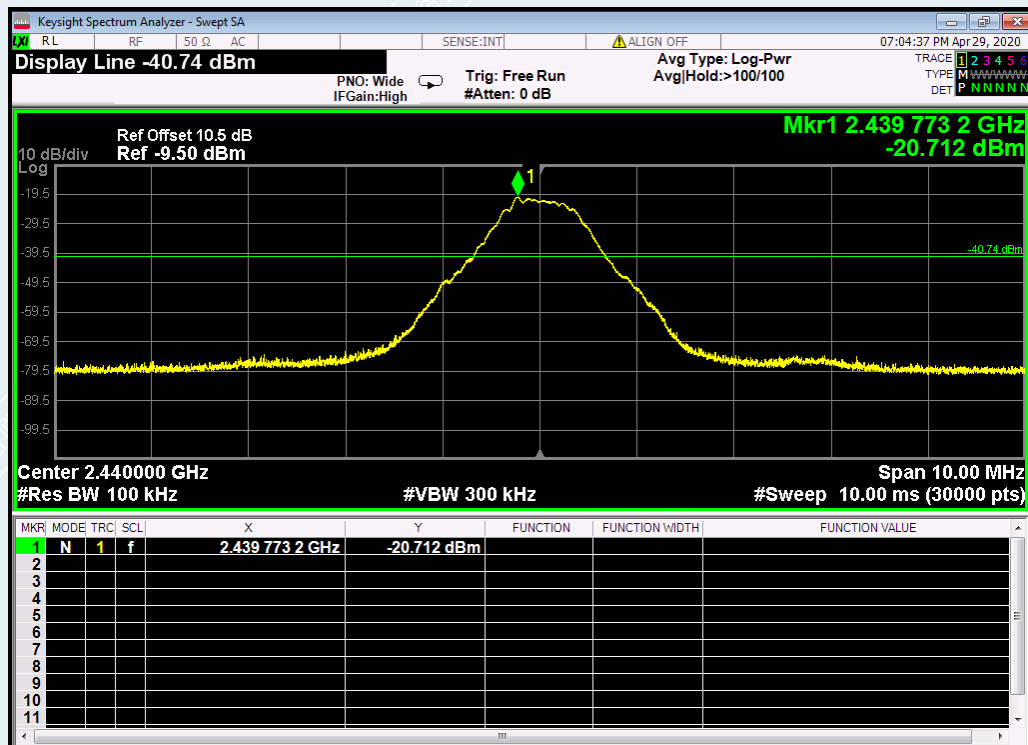
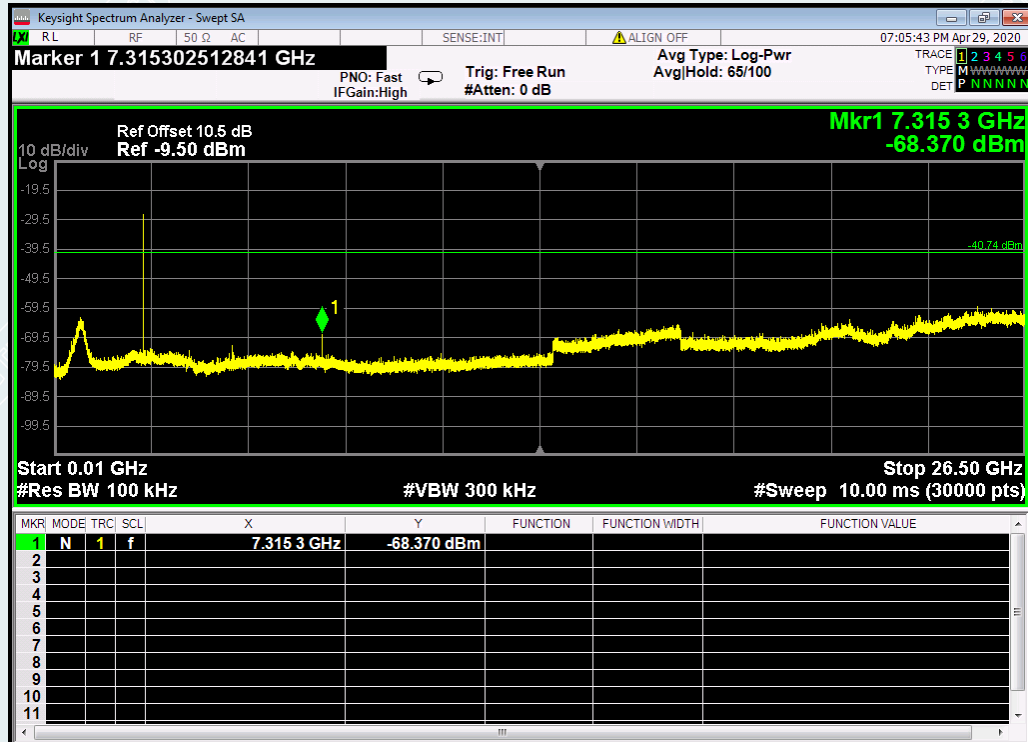
0.01GHz-26.5GHz

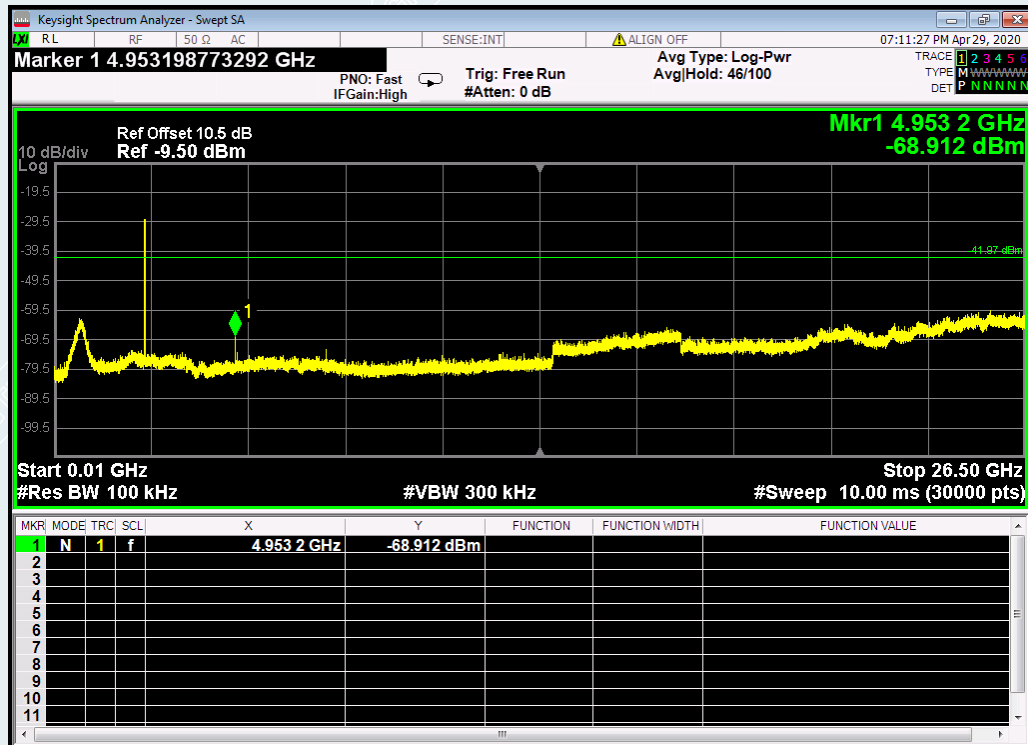


2.31GHz-2.41GHz

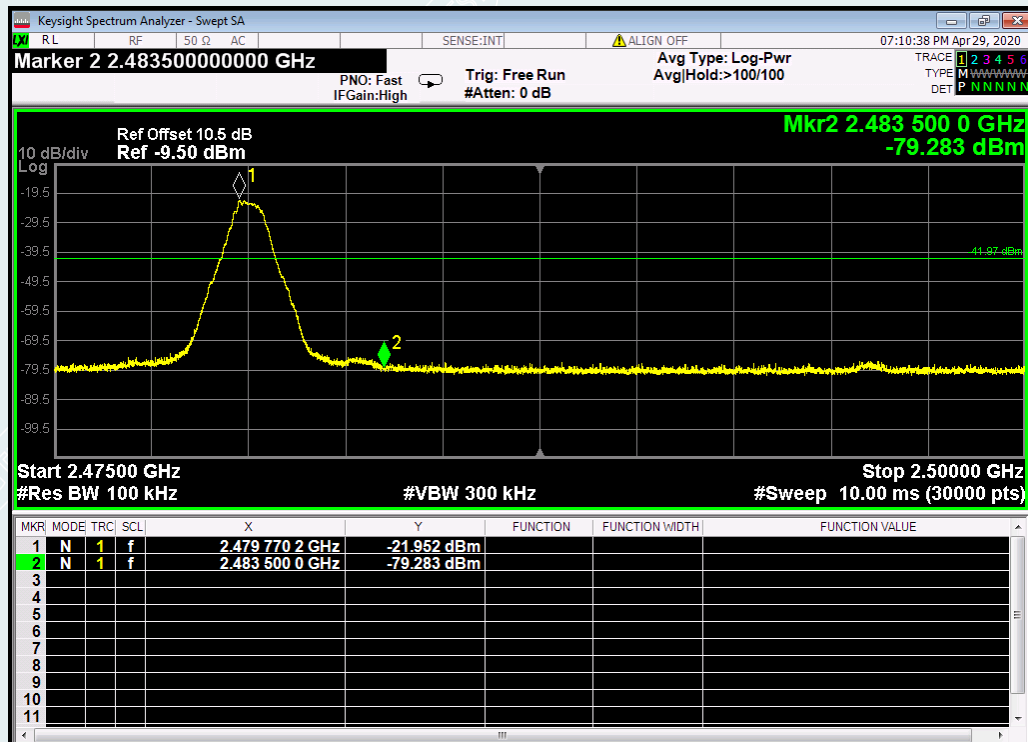


Middle channel (2440 MHz)
0.01GHz-26.5GHz



Highest channel (2480MHz)
0.01GHz-26.5GHz

2.475GHz-2.5GHz



11. RESTRICTED BANDS OF OPERATION

11.1. LIMITS

Section 15.247(d) In addition, Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

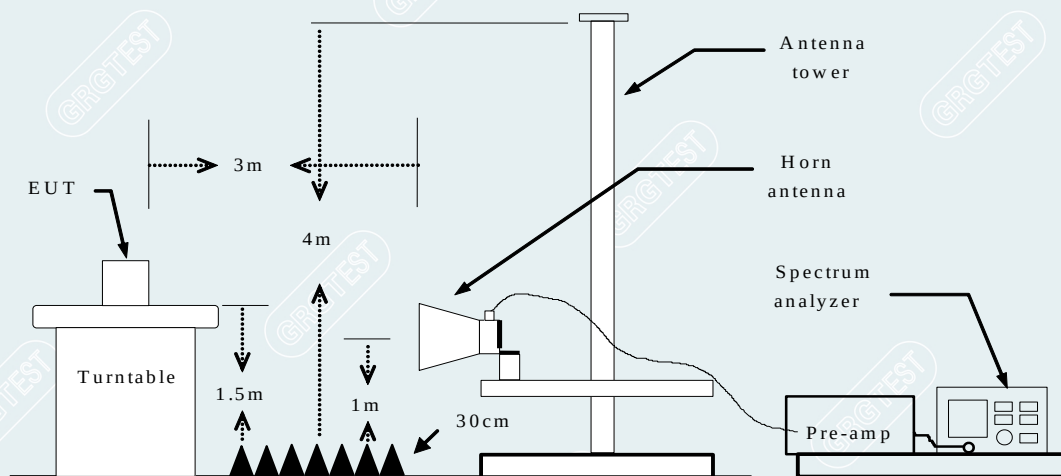
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 -	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.69525	960 - 1240	7.25 - 7.75
4.125 - 4.128	16.80425 -	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	16.80475	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	25.5 - 25.67	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	37.5 - 38.25	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	73 - 74.6	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	74.8 - 75.2	2200 - 2300	14.47 - 14.5
8.291 - 8.294	108 - 121.94	2310 - 2390	15.35 - 16.2
8.362 - 8.366	123 - 138	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	149.9 - 150.05	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.52475 -	3260 - 3267	23.6 - 24.0
12.29 - 12.293	156.52525	3332 - 3339	31.2 - 31.8
12.51975 -	156.7 - 156.9	3345.8 - 3358	36.43 - 36.5
12.52025	162.0125 - 167.17	3600 - 4400	
12.57675 -	167.72 - 173.2		
12.57725	240 - 285		
13.36 - 13.41	322 - 335.4		

11.2. TEST PROCEDURES

Test procedures follow KDB 558074 D01 DTS Meas Guidance v03r01.

- 1) The EUT is placed on a turntable, which is 1.5m above the ground plane.
- 2) The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 3) EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
- 4) Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
 - a) PEAK: RBW=1MHz / VBW=1MHz / Sweep=AUTO
 - b) AVERAGE: RBW=1MHz / VBW=1/T / Sweep=AUTO
- 5) Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

11.3.TEST SETUP

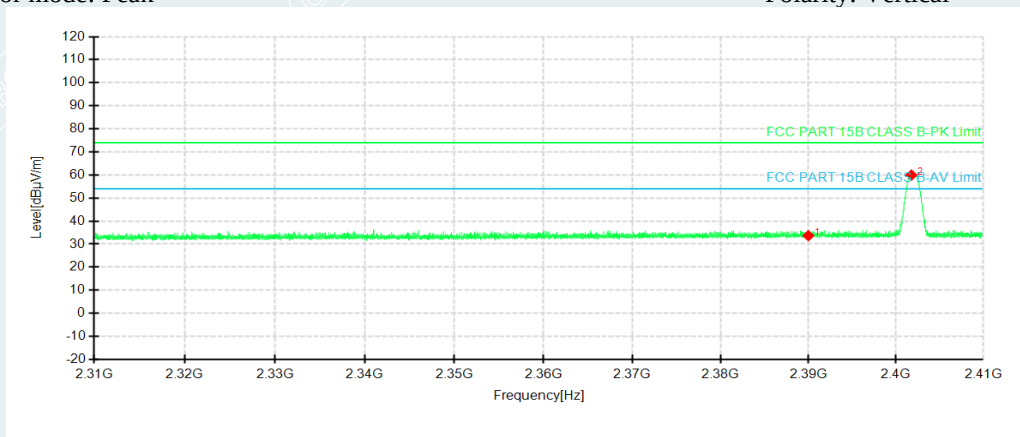


11.4.TEST RESULTS

Lowest Channel

Detector mode: Peak

Polarity: Vertical

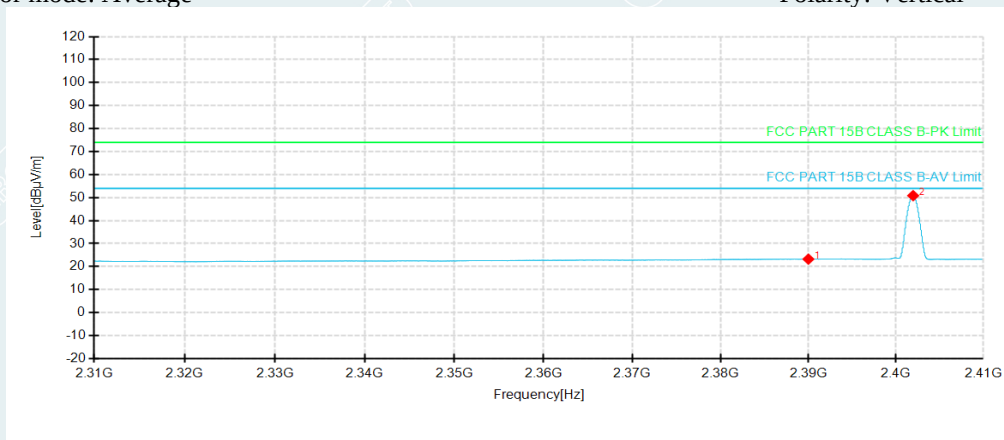


Suspected Data List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2390.0000	33.67	-19.42	74.00	40.33	150	234	Vertical
2	2401.7600	59.94	-19.37	74.00	14.06	150	215	Vertical

Detector mode: Average

Polarity: Vertical



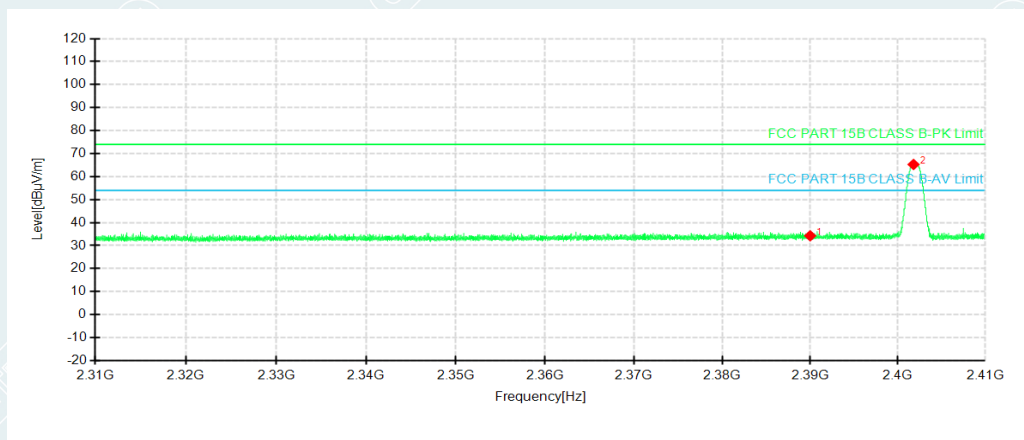
Suspected Data List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2390.0000	23.25	-19.42	54.00	30.75	150	229	Vertical
2	2401.9600	50.85	-19.36	54.00	3.15	150	209	Vertical

Lowest Channel

Detector mode: Peak

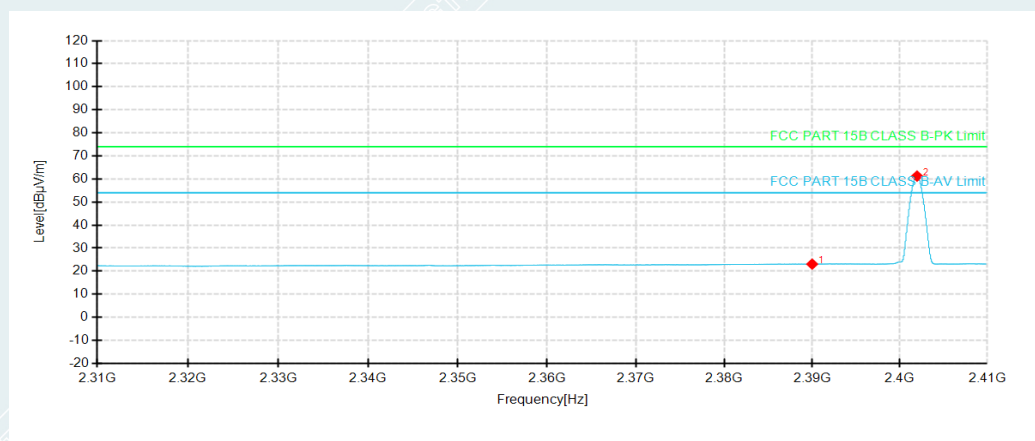
Polarity: Horizontal

**Suspected Data List**

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2390.0000	34.25	-19.42	74.00	39.75	150	190	Horizontal
2	2401.7900	65.27	-19.37	74.00	8.73	150	348	Horizontal

Detector mode: Average

Polarity: Horizontal

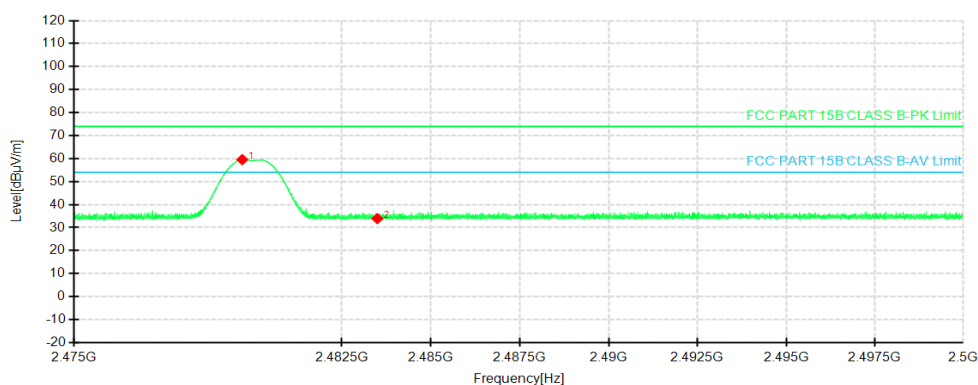
**Suspected Data List**

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2390.0000	23.07	-19.42	54.00	30.93	150	131	Horizontal
2	2401.9600	61.24	-19.36	54.00	-7.24	150	316	Horizontal

Highest channel

Detector mode: Peak

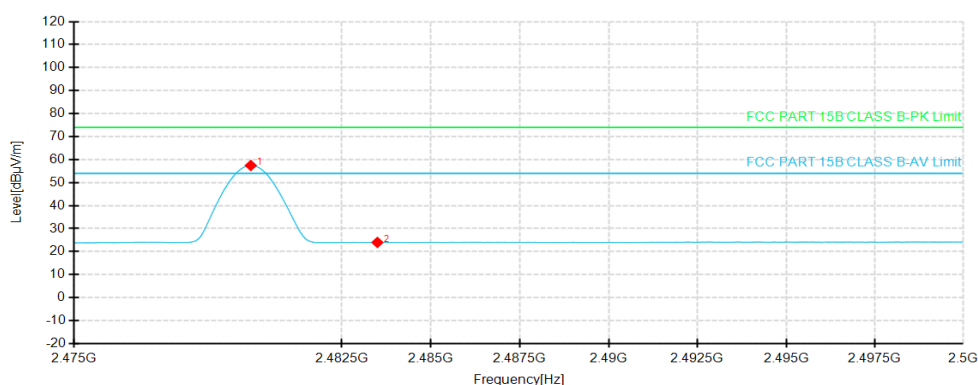
Polarity: Vertical

**Suspected Data List**

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2479.7100	59.55	-18.75	74.00	14.45	150	107	Vertical
2	2483.5000	33.91	-18.72	74.00	40.09	150	66	Vertical

Detector mode: Average

Polarity: Vertical

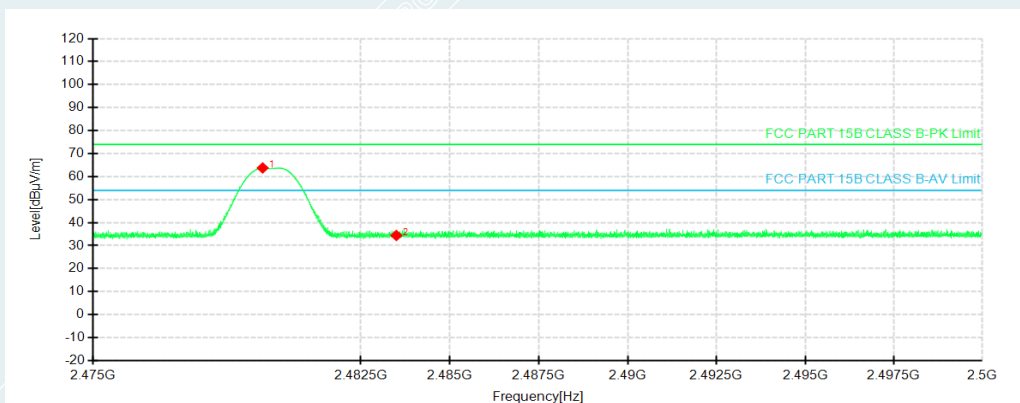
**Suspected Data List**

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2479.9500	57.44	-18.75	54.00	-3.44	150	98	Vertical
2	2483.5000	23.98	-18.72	54.00	30.02	150	61	Vertical

Highest channel

Detector mode: Peak

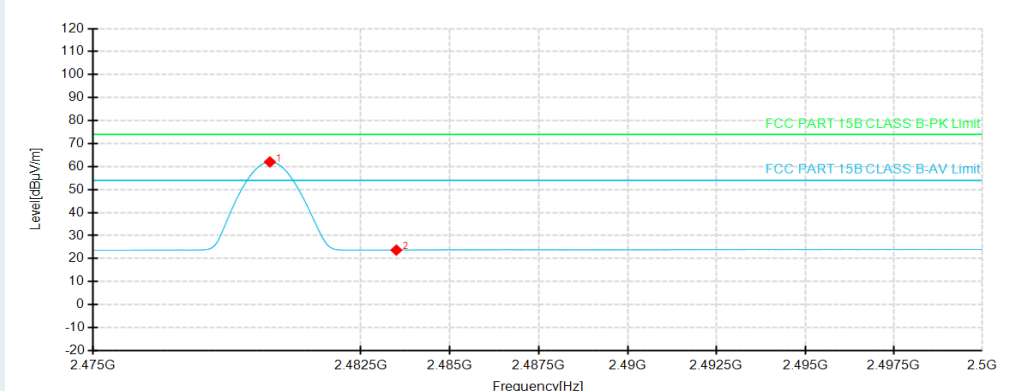
Polarity: Horizontal

**Suspected Data List**

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2479.7500	63.76	-18.75	74.00	10.24	150	126	Horizontal
2	2483.5000	34.40	-18.72	74.00	39.60	150	285	Horizontal

Detector mode: Average

Polarity: Horizontal

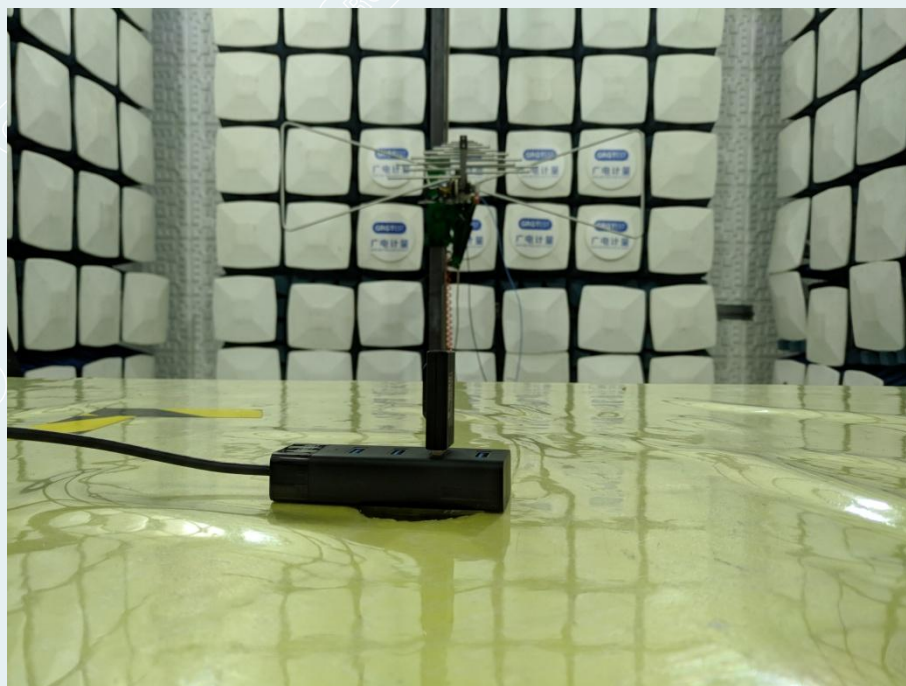
**Suspected Data List**

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2479.9525	62.01	-18.75	54.00	-8.01	150	129	Horizontal
2	2483.5000	23.69	-18.72	54.00	30.31	150	166	Horizontal

Remark: Max field strength in 3m distance. No any other emission which falls in restricted bands can be detected and be reported.

APPENDIX A: PHOTOGRAPH OF THE TEST ARRANGEMENT

RSE (Below 1GHz)



RSE (Above 1GHz)



Conducted Emissions



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