Certificate # 2861.01

TEST REPORT

Verified Code: 403651

Report No.:	E202012093237-3	**Application No.:**	E202012093237
Client:	JIANGMEN PEL LIGHTING CO.LTD.		
Address:	2nd Floor, Building#2, No.30, Gaoxin East Road, Jianghai District, Jiangmen City, Guangdong, China		
Sample Description:	12V RGB LED STRIP		
Model:	DR-12V-5050-RGB-300-10m-BL-U		
Test Specification:	CFR47 FCC Part 15 Subpart C 15.247 RADIO FREQUENCY DEVICES Subpart C—Intentional Radiators		
Receipt Date:	2020-12-15		
Test Date:	2021-02-02 to 2021-03-16		
Issue Date:	2021-04-15		
Test Result:	Pass		

Prepared By:	**Reviewed By:**	**Approved By:**
Test Engineer	Technical Manager	Manager
Xie Fang	Jiang Tao	Yong Pai

GUANGZHOU GRG METROLOGY & TEST CO.,LTD. GRGTEST APPROVED(03)

Other Aspects:

Note: 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 station 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 47 CFR Part 15 Subpart C 15.247 KDB 558074 D01 15.247 measurement guidance v05r02		
Limit / Severity	**Item**	**Result**
§15.207	Conducted emission AC power port	Pass
§15.247(b)(1)	Conducted output power for FHSS	N/A
§15.247(b)(3)	Conducted output power for DTS	Pass
§15.247(e)	Power spectral density	Pass
§15.247(a)(2)	6dB bandwidth	Pass
§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
§15.247(d)	Band edge	Pass
§15.247(d) & §15.209 & §15.205	Spurious radiated emissions for transmitter	Pass
§15.203	Antenna requirement	Pass

The EUT has one antenna. The antenna is PCB antenna.
The max gain of antenna is 3.5dBi.which accordance 15.203.is considered sufficient to comply with the provisions of this section.

2. GENERAL DESCRIPTION OF EUT

2.1. APPLICANT

Name:	JIANGMEN PEL LIGHTING CO.LTD.
Address:	2nd Floor, Building#2, No.30, Gaoxin East Road, Jianghai District, Jiangmen City, Guangdong, China

2.2. MANUFACTURER

Name:	JIANGMEN PEL LIGHTING CO.LTD.
Address:	2nd Floor, Building#2, No.30, Gaoxin East Road, Jianghai District, Jiangmen City, Guangdong, China

2.3. FACTORY

Name :	JIANGMEN PEL LIGHTING CO.LTD.
Address :	2nd Floor, Building#2, No.30, Gaoxin East Road, Jianghai District, Jiangmen City, Guangdong, China

2.4. BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment:	12V RGB LED STRIP
Model No.:	DR-12V-5050-RGB-300-10m-BL-U
Adding Model:	/
Trade Name:	PEL
FCC ID:	2AYYP-IR40BT
Power Supply:	DC12V power supplied by adapter
Adapter Specification:	MODEL:GQ36-120300-AU INPUT:100-240V~50/60Hz 1.0A Max OUTPUT:12V⎓ 3.0A
Frequency Range:	2402 MHz ~ 2480 MHz
Transmit Power:	1.041dBm
Modulation type:	GFSK for 1Mbps
Channel space:	2MHz
Antenna Specification:	PCB Antenna with 3.5dBi (Max)
Temperature Range:	-25℃~85℃
Hardware Version:	V2.0
Software Version:	1.4.0

Sample No: E202012093237-0001, E202012093237-A021

Note: /

2.5. TEST OPERATION MODE

Mode No.	Description of the modes
1	Bluetooth LE fixed frequency

2.6. LOCAL SUPPORTIVE

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

Test software:

Software version	Test level
/	/

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

Our laboratories are accredited and approved by the following approval agencies according to GB/T 27025(ISO/IEC 17025:2017)

USA	A2LA(Certificate #:2861.01)

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada
USA	FCC

Copies of granted accreditation certificates are available for downloading from our web site, http://www.grgtest.com

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	4.30dB
		1GHz～18GHz	5.60dB
		18GHz～26GHz	3.65dB
	Vertical	30MHz～1000MHz	4.30dB
		1GHz～18GHz	5.60dB
		18GHz～26GHz	3.65dB
Conduction Emission		9 kHz ~ 150 kHz	2.80dB
		150 kHz ~ 10 MHz	2.80dB
		10 MHz ~ 30 MHz	2.20dB

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	R&S	ESCI	100783	2021-10-08
LISN(EUT)	R&S	ENV216	101543	2021-03-24
EZ-EMC	EZ	CCS-3A1-CE	/	/
Radiated Spurious Emission& Restricted bands of operation				
Spectrum Analyzer	KEYSIGHT	N9020B	MY5712019	2021-07-15
Spectrum Analyzer	Agilent	N9010A	MY52221469	2021-05-16
Bilog Antenna	Schwarzbeck	VULB 9163	01279	2021-03-14
Horn Antenna	Schwarzbeck	BBHA 9120D(1201)	02143	2021-12-27
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170-497	2021-11-05
Amplifier	Tonscend	TAP01018048	AP20E8060075	2021-06-28
Amplifier	Tonscend	TAP037030	AP20E8060081	2021-06-28
Amplifier	Tonscend	TAP184050	AP20E806071	2021-06-15
Test S/W	Tonscend	JS32-RSE/2.5.1.5		
6 dB Bandwidth				
Spectrum Analyzer	Agilent	N9010A	MY52221469	2021-05-16
Maximum Peak Output Power				
Spectrum Analyzer	Agilent	N9010A	MY52221469	2021-05-16
Conducted band edges and Spurious Emission				
Spectrum Analyzer	Agilent	N9010A	MY52221469	2021-05-16
Peak Output Spectral Density Measurement				
Spectrum 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 C63.10:2013.

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.

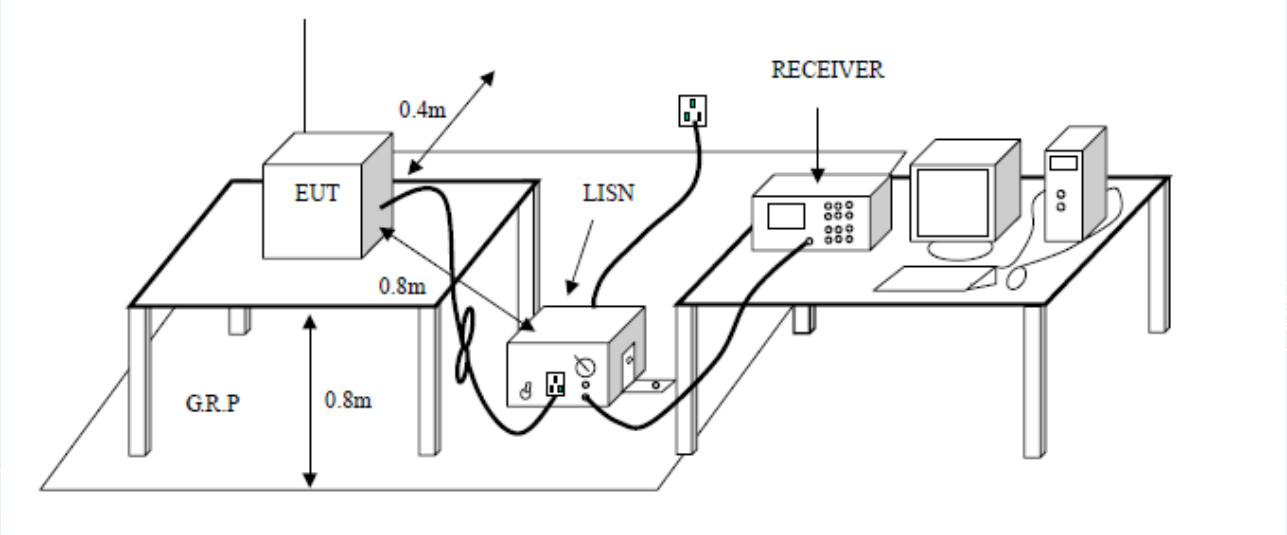
– I/O cables that are connected to a peripheral shall be bundled in the centre. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 1 m.

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



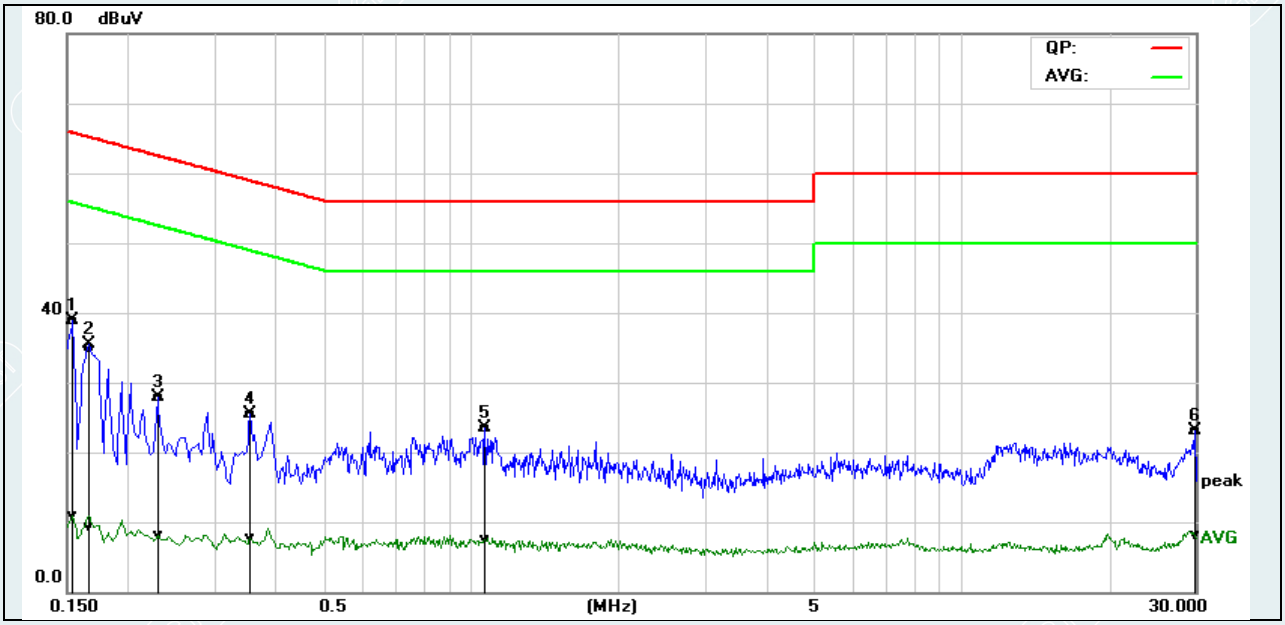
5.4. DATA SAMPLE

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)

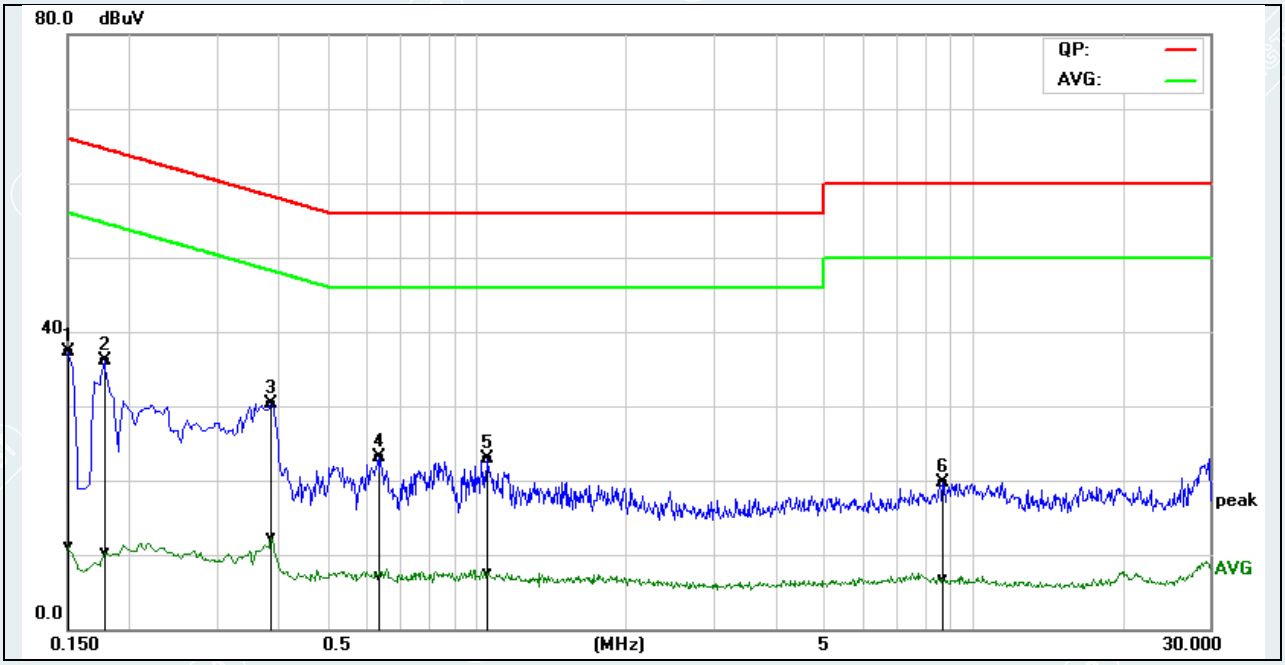
5.5. TEST RESULTS

Model No.	DR-12V-5050-RGB-300-10m-BL-U	**RBW,VBW**	9 kHz
Environmental Conditions	25.4℃/64%RH	**Test Mode**	Mode 1
Tested By	Chen Xiaocong	**Line**	L
Tested Date	2021-03-12	**Test Voltage**	AC120V/60Hz



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1*	0.1540	29.36	1.28	9.60	38.96	10.88	65.78	55.78	-26.82	-44.90	Pass
2	0.1660	25.29	-0.37	9.60	34.89	9.23	65.16	55.16	-30.27	-45.93	Pass
3	0.2300	18.29	-1.55	9.60	27.89	8.05	62.45	52.45	-34.56	-44.40	Pass
4	0.3540	15.90	-1.91	9.61	25.51	7.70	58.87	48.87	-33.36	-41.17	Pass
5	1.0660	13.97	-2.05	9.61	23.58	7.56	56.00	46.00	-32.42	-38.44	Pass
6	29.9660	13.24	-1.75	9.94	23.18	8.19	60.00	50.00	-36.82	-41.81	Pass

Model No.	DR-12V-5050-RGB-300-10m-BL-U	**RBW,VBW**	9 kHz
Environmental Conditions	25.4℃/64%RH	**Test Mode**	Mode 1
Tested By	Chen Xiaocong	**Line**	N
Tested Date	2021-03-12	**Test Voltage**	AC120V/60Hz



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1500	27.74	1.47	9.60	37.34	11.07	66.00	56.00	-28.66	-44.93	Pass
2	0.1780	26.43	0.70	9.60	36.03	10.30	64.58	54.58	-28.55	-44.28	Pass
3*	0.3860	20.77	2.74	9.61	30.38	12.35	58.15	48.15	-27.77	-35.80	Pass
4	0.6340	13.41	-2.51	9.61	23.02	7.10	56.00	46.00	-32.98	-38.90	Pass
5	1.0540	13.27	-2.08	9.61	22.88	7.53	56.00	46.00	-33.12	-38.47	Pass
6	8.7260	9.99	-3.00	9.72	19.71	6.72	60.00	50.00	-40.29	-43.28	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(μV/m)	Measurement distance(m)	Quasi-peak(dBμV/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.
NOTE: (2) Above 18G Limit=74+20log(3/1)=83.54 (dBμV/m).

6.2. TEST PROCEDURES (please refer to measurement standard)

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.

Pre measurement:

--- 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 pre measurement 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 QP or AVG 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 pre measurement 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.

Pre measurement:

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

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 4 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 (±45 °) 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.

Pre measurement:

--- 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 4 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 (±45°) 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 pre measurement 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.

Pre measurement:

--- 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/duty cycle)).

6.3. TEST SETUP

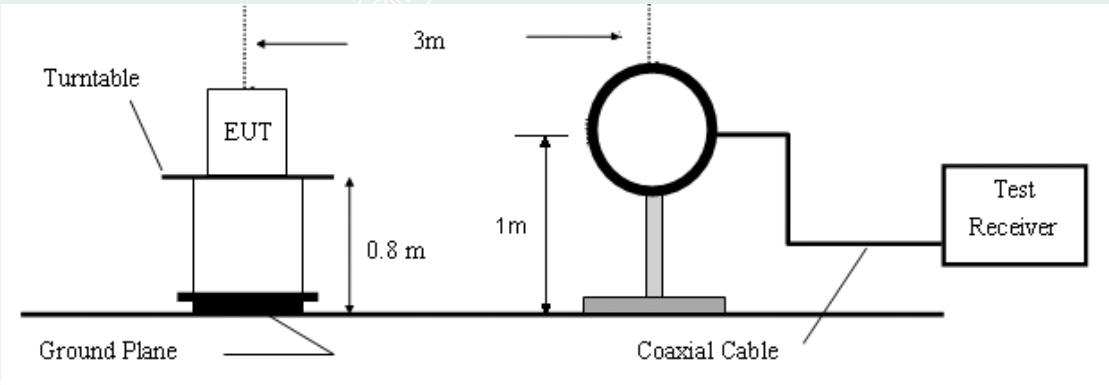


Figure 1. 9 KHz to 30MHz radiated emissions test configuration

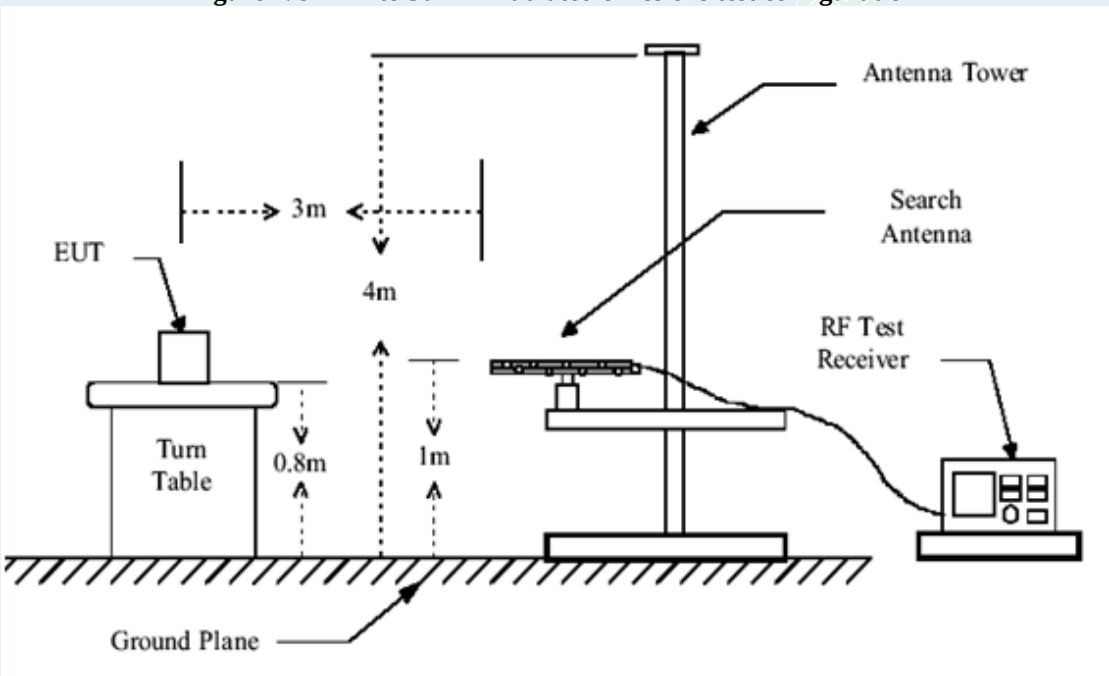


Figure 2. 30MHz to 1GHz radiated emissions test configuration

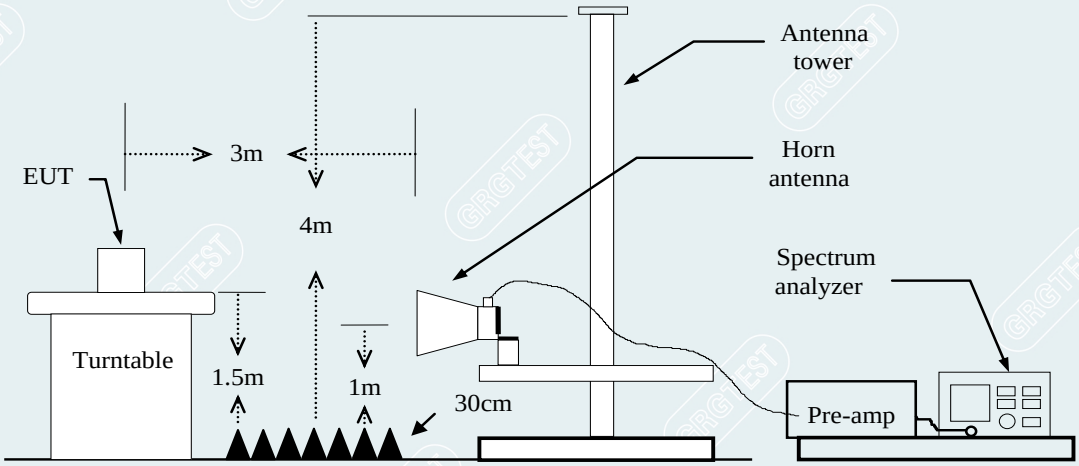


Figure 3. Above 1GHz radiated emissions test configuration

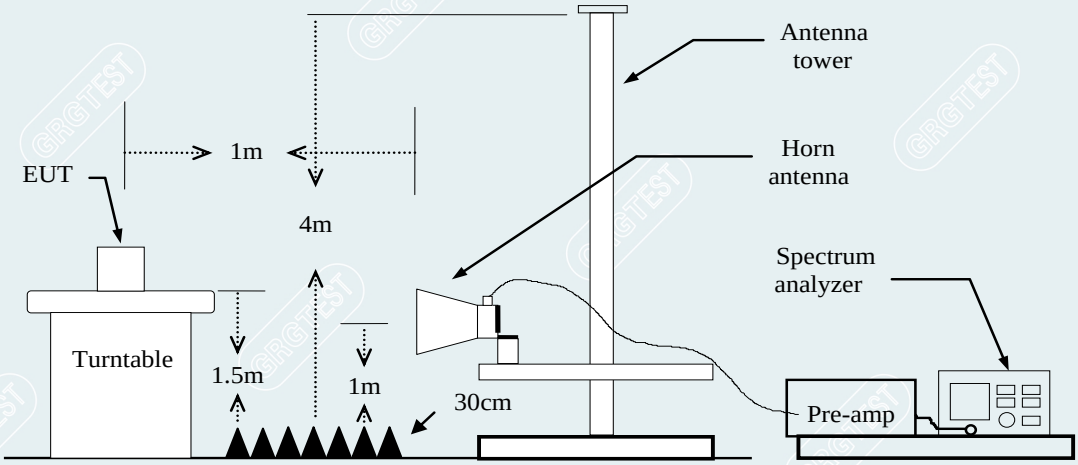


Figure 4. Above 18GHz radiated emissions test configuration

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

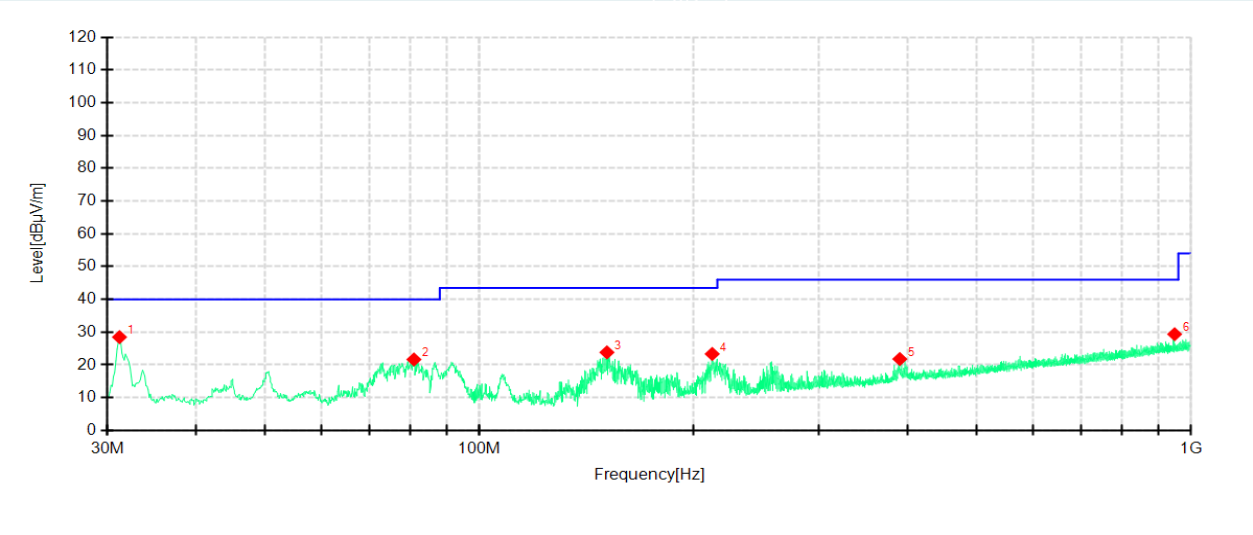
QP = Quasi-peak Reading

AVG = Average Reading

6.5. TEST RESULTS

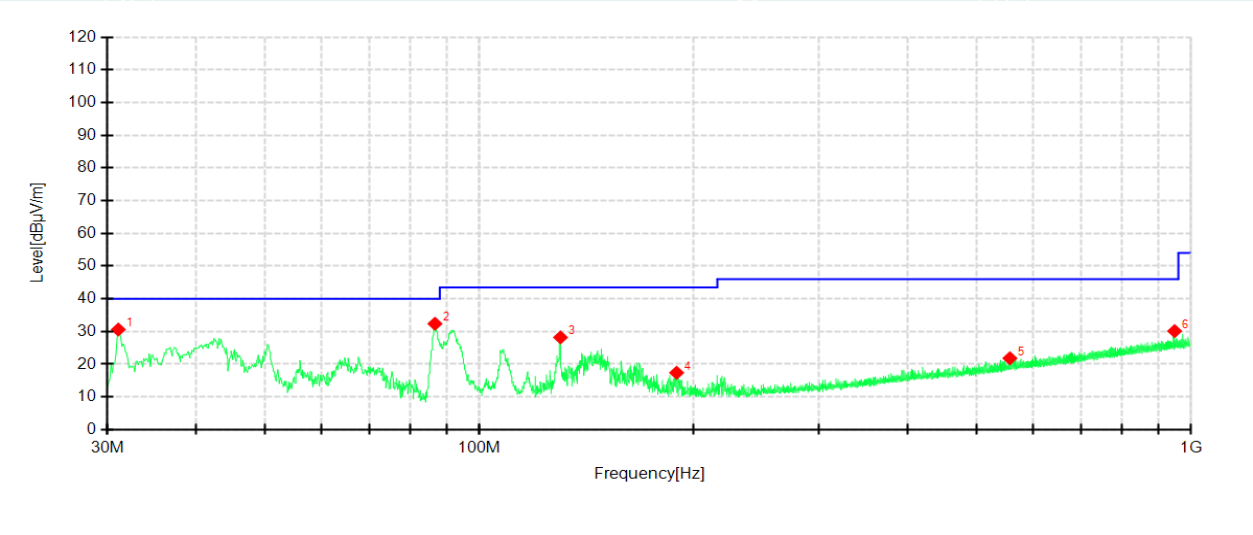
30MHz to 1GHz

Mode: TX
Lowest channel (2402MHz) Date: 2021-02-02
Polarity Horizontal



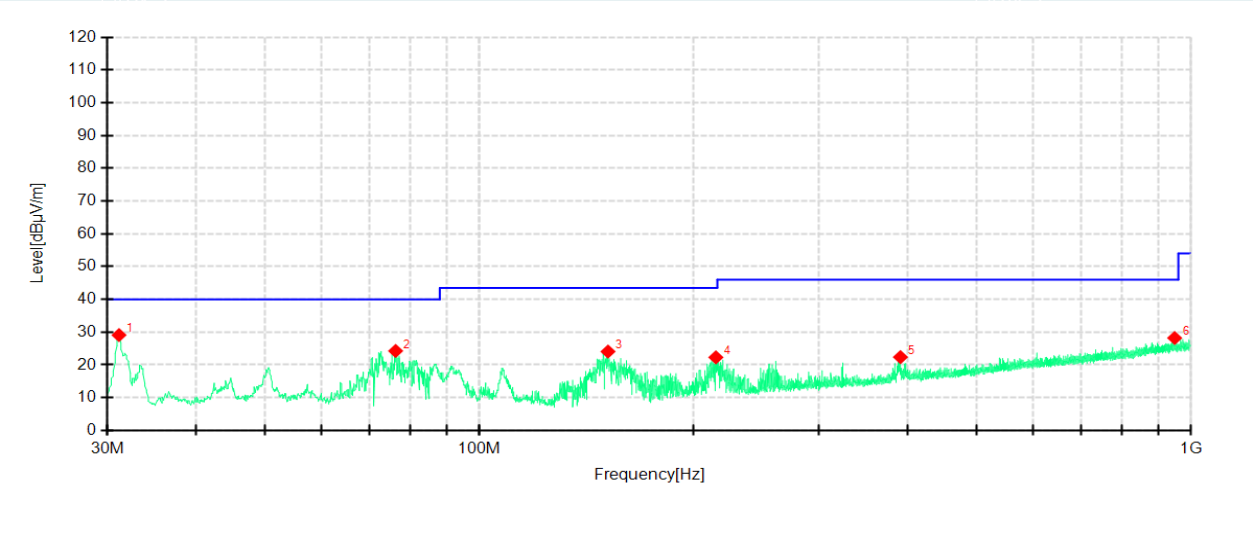
Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	31.2125	58.96	28.48	-30.48	40.00	11.52	200	132	Horizontal
2	80.9250	53.48	21.65	-31.83	40.00	18.35	200	180	Horizontal
3	151.1288	55.36	23.82	-31.54	43.50	19.68	200	339	Horizontal
4	212.4813	51.08	23.34	-27.74	43.50	20.16	200	212	Horizontal
5	389.8700	45.00	21.79	-23.21	46.00	24.21	100	214	Horizontal
6	948.5900	42.98	29.37	-13.61	46.00	16.63	100	281	Horizontal

Mode: TX
Lowest channel (2402MHz) Date: 2021-02-02
Polarity Vertical



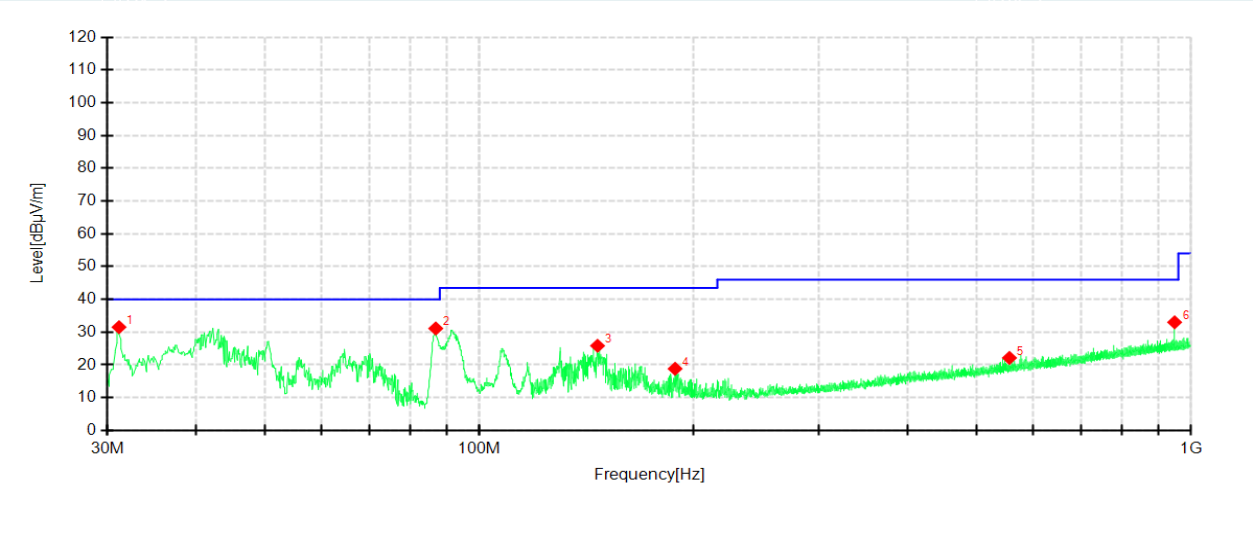
Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	31.0913	59.76	30.60	-29.16	40.00	9.40	100	147	Vertical
2	86.6238	63.77	32.37	-31.40	40.00	7.63	100	30	Vertical
3	130.0313	56.22	28.20	-28.02	43.50	15.30	100	47	Vertical
4	189.3225	45.89	17.39	-28.50	43.50	26.11	100	147	Vertical
5	556.5888	41.41	21.82	-19.59	46.00	24.18	100	183	Vertical
6	948.4688	43.04	30.13	-12.91	46.00	15.87	100	74	Vertical

Mode: TX
Lowest channel (2426MHz) Date: 2021-02-02
Polarity Horizontal



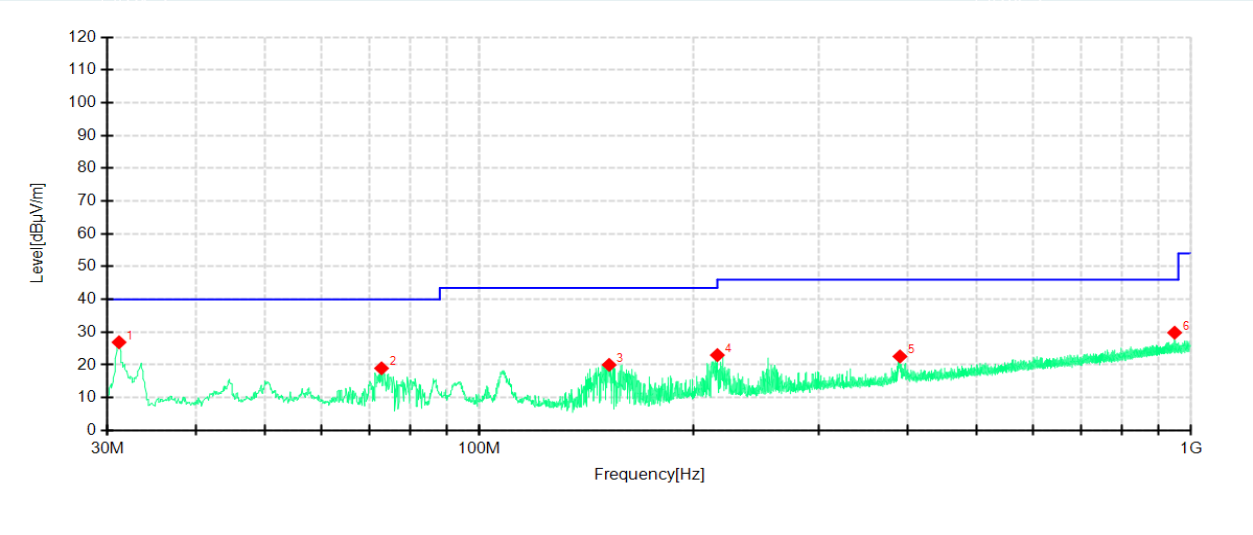
Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	31.1640	59.59	29.10	-30.49	40.00	10.90	200	31	Horizontal
2	76.2690	56.04	24.26	-31.78	40.00	15.74	200	9	Horizontal
3	151.6380	55.58	24.07	-31.51	43.50	19.43	200	4	Horizontal
4	214.9790	49.99	22.30	-27.69	43.50	21.20	100	179	Horizontal
5	390.6460	45.56	22.37	-23.19	46.00	23.63	100	209	Horizontal
6	948.6870	41.81	28.21	-13.60	46.00	17.79	200	106	Horizontal

Mode: TX
Lowest channel (2426MHz) Date: 2021-02-02
Polarity Vertical



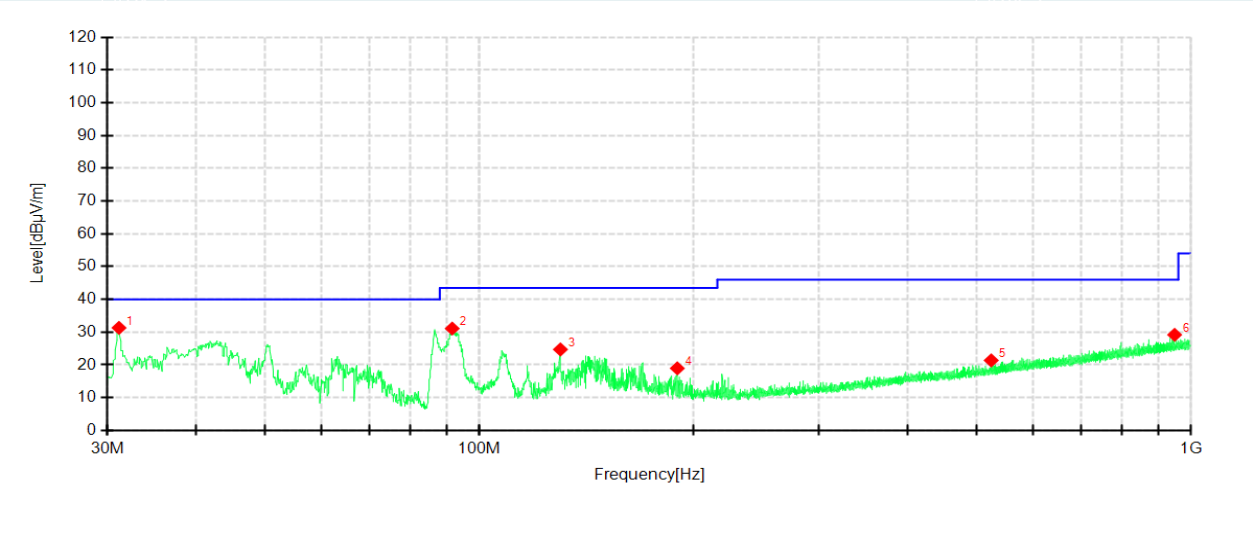
Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	31.1640	60.67	31.51	-29.16	40.00	8.49	100	1	Vertical
2	86.8420	62.51	31.12	-31.39	40.00	8.88	100	45	Vertical
3	146.5940	51.75	25.83	-25.92	43.50	17.67	100	63	Vertical
4	188.4010	47.21	18.82	-28.39	43.50	24.68	100	172	Vertical
5	555.8370	41.75	22.14	-19.61	46.00	23.86	100	34	Vertical
6	948.5900	45.92	33.01	-12.91	46.00	12.99	100	299	Vertical

Mode: TX
Highest channel (2480MHz) Date: 2021-02-02
Polarity Horizontal



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	31.1640	57.39	26.90	-30.49	40.00	13.10	100	84	Horizontal
2	72.8740	50.58	18.96	-31.62	40.00	21.04	100	356	Horizontal
3	152.2200	51.49	20.01	-31.48	43.50	23.49	100	31	Horizontal
4	216.0460	50.65	22.99	-27.66	46.00	23.01	100	210	Horizontal
5	390.0640	45.79	22.58	-23.21	46.00	23.42	100	210	Horizontal
6	948.5900	43.45	29.84	-13.61	46.00	16.16	100	359	Horizontal

Mode: TX
Highest channel (2480MHz) Date: 2021-02-02
Polarity Vertical



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	31.1640	60.46	31.30	-29.16	40.00	8.70	100	115	Vertical
2	91.5950	62.31	31.09	-31.22	43.50	12.41	100	83	Vertical
3	130.0070	52.75	24.72	-28.03	43.50	18.78	100	137	Vertical
4	189.7590	47.51	18.96	-28.55	43.50	24.54	100	152	Vertical
5	524.0210	41.64	21.37	-20.27	46.00	24.63	100	174	Vertical
6	948.5900	42.09	29.18	-12.91	46.00	16.82	100	1	Vertical

Remark:

1 No emission found between lowest internal used/generated frequency to 30MHz.

2 Data of measurement within this frequency range in the table above the reading of PK detector are more 6dB than QP limit, therefore it's unnecessary to performed QP scan.

3 The IF bandwidth of Receiver between 30MHz to 1GHz was 120 kHz.

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) Date: 2021-02-02

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1508.5636	58.35	35.27	-23.08	74.00	38.73	100	255	Horizontal
2	2384.6731	79.49	58.79	-20.70	74.00	15.21	200	204	Horizontal
3	3920.8845	54.67	39.40	-15.27	74.00	34.60	200	105	Horizontal
4	4804.2669	52.92	42.20	-10.72	74.00	31.80	100	105	Horizontal
5	6552.6974	51.38	43.53	-7.85	74.00	30.47	200	123	Horizontal
6	11107.9504	43.43	47.13	3.70	74.00	26.87	100	123	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1476.3095	58.78	35.57	-23.21	74.00	38.43	200	197	Vertical
2	2385.1731	73.37	52.67	-20.70	74.00	21.33	100	255	Vertical
3	4182.5657	53.55	39.34	-14.21	74.00	34.66	200	300	Vertical
4	4804.2669	52.48	41.76	-10.72	74.00	32.24	100	104	Vertical
5	6342.6857	52.42	44.11	-8.31	74.00	29.89	200	104	Vertical
6	11018.7788	45.23	48.36	3.13	74.00	25.64	200	193	Vertical

Mode: TX
Middle channel (2426MHz) Date: 2021-02-02

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1463.3079	58.80	35.53	-23.27	74.00	38.47	100	183	Horizontal
2	2384.4231	80.92	60.21	-20.71	74.00	13.79	100	212	Horizontal
3	4054.2252	55.14	39.72	-15.42	74.00	34.28	200	177	Horizontal
4	4851.7695	58.08	47.52	-10.56	74.00	26.48	100	274	Horizontal
5	7277.7377	60.90	55.46	-5.44	74.00	18.54	100	239	Horizontal
6	17859.1588	40.01	50.09	10.08	74.00	23.91	200	104	Horizontal

AV Final Data List									
NO.	Freq. [MHz]	Factor [dB]	AV Reading [dBµV/m]	AV Value [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	7277.8105	-5.45	56.82	51.37	54.00	2.63	100	358	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1461.0576	59.26	35.98	-23.28	74.00	38.02	100	255	Vertical
2	2384.1730	76.28	55.57	-20.71	74.00	18.43	100	255	Vertical
3	4225.9014	52.91	38.56	-14.35	74.00	35.44	100	159	Vertical
4	4854.2697	56.21	45.63	-10.58	74.00	28.37	100	248	Vertical
5	7277.7377	54.95	49.51	-5.44	74.00	24.49	200	104	Vertical
6	14103.1168	41.82	49.76	7.94	74.00	24.24	200	336	Vertical

Mode: TX
Highest channel (2480MHz) Date: 2021-02-02

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1525.5657	58.27	35.21	-23.06	74.00	38.79	200	255	Horizontal
2	2524.6906	80.24	60.26	-19.98	74.00	13.74	200	211	Horizontal
3	4166.7315	53.36	39.03	-14.33	74.00	34.97	100	178	Horizontal
4	6746.8748	50.48	43.22	-7.26	74.00	30.78	100	339	Horizontal
5	9660.3700	46.97	47.80	0.83	74.00	26.20	100	169	Horizontal
6	13334.7408	43.27	49.66	6.39	74.00	24.34	200	222	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1581.0726	58.80	35.74	-23.06	74.00	38.26	100	159	Vertical
2	2525.4407	74.27	54.31	-19.96	74.00	19.69	200	131	Vertical
3	4135.8964	53.34	38.77	-14.57	74.00	35.23	200	105	Vertical
4	6848.5471	50.29	43.75	-6.54	74.00	30.25	100	274	Vertical
5	10478.7488	46.05	47.74	1.69	74.00	26.26	100	149	Vertical
6	14090.6161	41.83	49.63	7.80	74.00	24.37	100	105	Vertical

Above 18GHz:

Mode: TX
Highest channel (2402MHz) Date: 2021-02-02

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	19389.3250	56.90	45.92	-10.98	83.50	37.58	100	259	Horizontal
2	20240.1750	55.36	44.69	-10.67	83.50	38.81	100	169	Horizontal
3	21581.9000	55.64	45.70	-9.94	83.50	37.80	100	30	Horizontal
4	22863.7000	55.76	46.73	-9.03	83.50	36.77	100	333	Horizontal
5	23933.4250	54.70	46.37	-8.33	83.50	37.13	100	194	Horizontal
6	25651.7000	54.60	46.65	-7.95	83.50	36.85	100	30	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18850.0000	57.74	46.50	-11.24	83.50	37.00	100	256	Vertical
2	19939.7000	56.76	45.90	-10.86	83.50	37.60	100	27	Vertical
3	22110.6000	55.73	45.90	-9.83	83.50	37.60	100	154	Vertical
4	23209.2250	55.74	46.90	-8.84	83.50	36.60	100	256	Vertical
5	24505.4750	54.73	46.59	-8.14	83.50	36.91	100	353	Vertical
6	25225.4250	54.74	47.09	-7.65	83.50	36.41	100	191	Vertical

Mode: TX
Highest channel (2426MHz) Date: 2021-02-02

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18637.9250	57.65	46.26	-11.39	83.50	37.24	100	228	Horizontal
2	20331.1250	56.59	45.99	-10.60	83.50	37.51	100	52	Horizontal
3	21038.3250	56.17	45.87	-10.30	83.50	37.63	100	240	Horizontal
4	23342.6750	55.40	46.62	-8.78	83.50	36.88	100	292	Horizontal
5	24265.3500	55.07	46.88	-8.19	83.50	36.62	100	117	Horizontal
6	25160.8250	55.03	47.35	-7.68	83.50	36.15	100	5	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	19127.1000	56.79	45.70	-11.09	83.50	37.80	100	156	Vertical
2	20914.2250	56.05	45.74	-10.31	83.50	37.76	100	271	Vertical
3	22306.9500	54.93	45.34	-9.59	83.50	38.16	100	320	Vertical
4	23726.8750	55.11	46.57	-8.54	83.50	36.93	100	69	Vertical
5	25196.5250	55.05	47.42	-7.63	83.50	36.08	100	347	Vertical
6	25566.7000	54.60	46.73	-7.87	83.50	36.77	100	347	Vertical

Mode: TX
Highest channel (2480MHz) Date: 2021-02-02

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18819.4000	57.33	46.06	-11.27	83.50	37.44	100	18	Horizontal
2	20035.7500	56.45	45.62	-10.83	83.50	37.88	100	107	Horizontal
3	21526.2250	55.89	45.90	-9.99	83.50	37.60	100	271	Horizontal
4	22799.9500	55.00	45.93	-9.07	83.50	37.57	100	258	Horizontal
5	23721.3500	55.54	46.99	-8.55	83.50	36.51	100	181	Horizontal
6	24938.5500	54.67	46.72	-7.95	83.50	36.78	100	258	Horizontal

Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	19552.5250	57.09	46.20	-10.89	83.50	37.30	100	192	Vertical
2	21174.3250	55.59	45.31	-10.28	83.50	38.19	100	90	Vertical
3	21738.3000	55.36	45.42	-9.94	83.50	38.08	100	1	Vertical
4	23175.2250	55.90	47.05	-8.85	83.50	36.45	100	254	Vertical
5	23733.2500	55.24	46.71	-8.53	83.50	36.79	100	217	Vertical
6	25465.9750	55.21	47.41	-7.80	83.50	36.09	100	16	Vertical

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

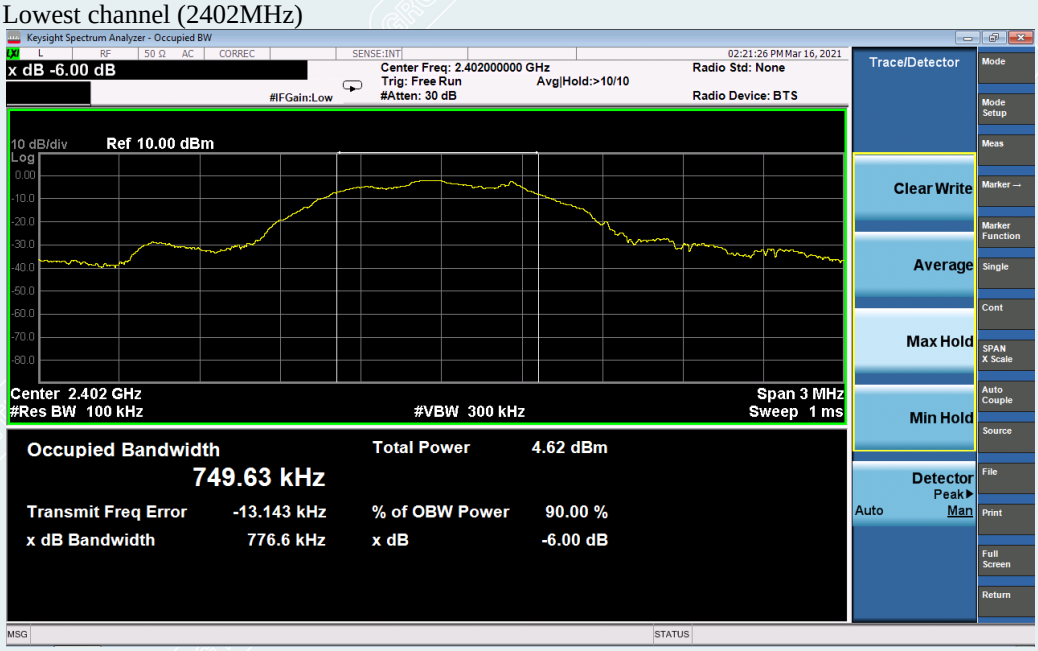
1) Remove the antenna from the EUT, and then connect a low loss RF cable from antenna port to the spectrum analyzer.
2) Set resolution bandwidth (RBW) = 100kHz.Set the video bandwidth (VBW) ≥ 3 x RBW. Detector = Peak. Trace mode = max hold. Sweep = auto couple. Allow the trace to stabilize, record 6dB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

7.3. TEST SETUP

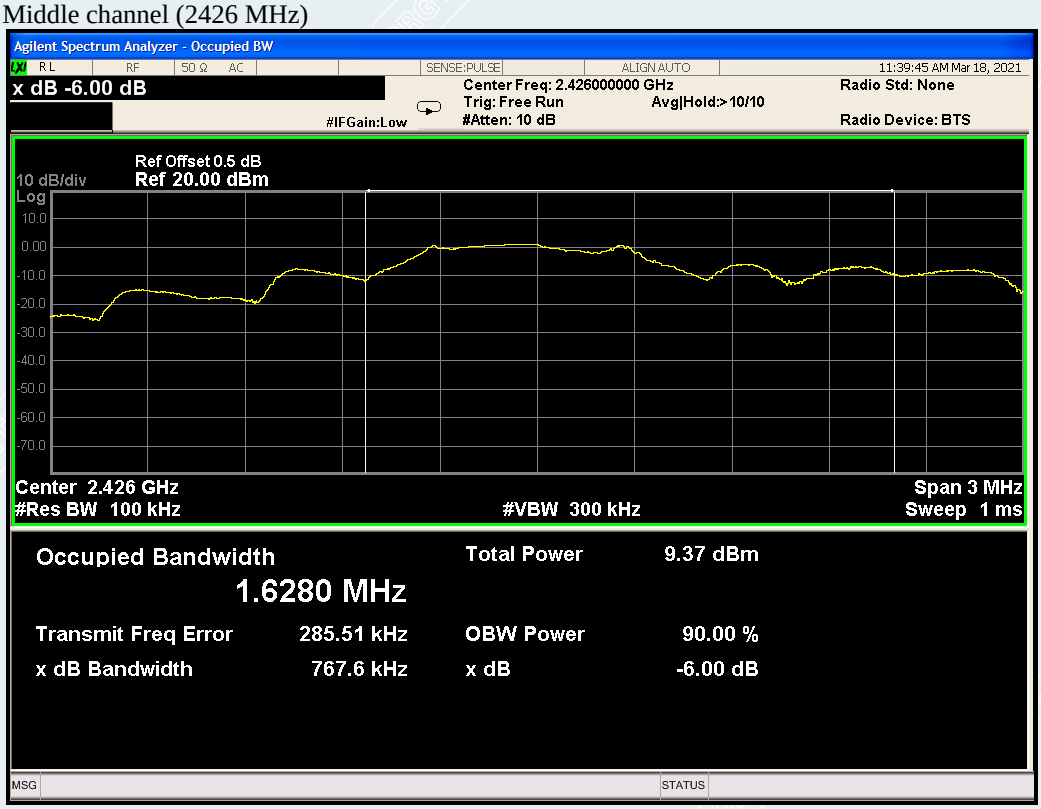
7.4. TEST RESULTS

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	2402	776.6	>500	PASS
Middle	2426	767.6		PASS
Highest	2480	804.0		PASS

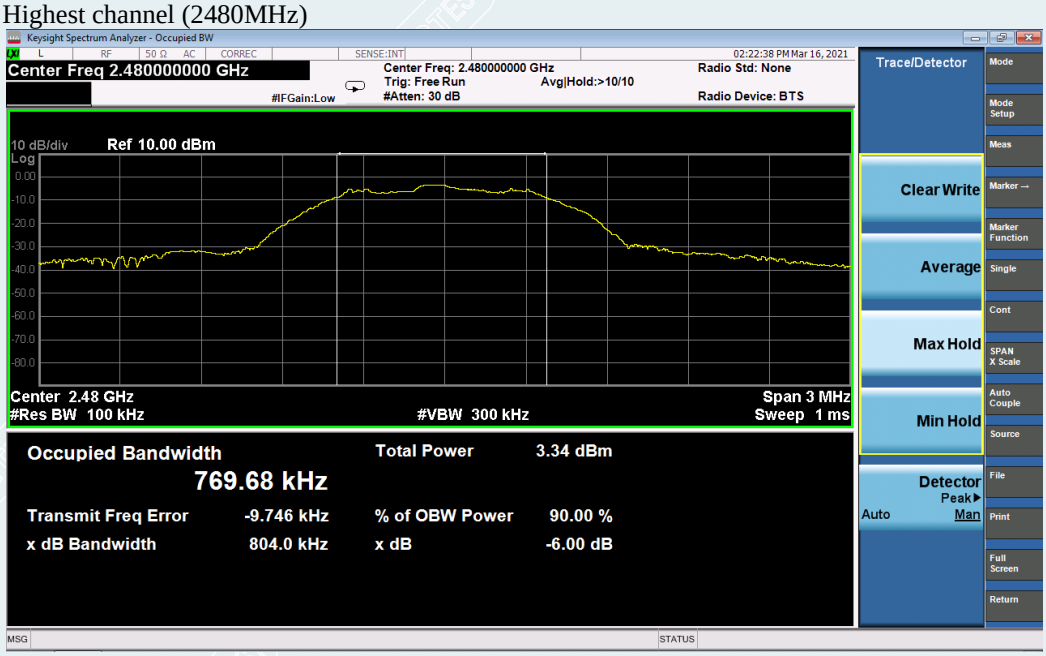
Lowest channel (2402MHz)



Middle channel (2426 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 the power meter.

8.3.TEST SETUP

8.4.TEST RESULTS

Channel	Frequency (MHz)	Measured Channel Power (dBm)	Limit	Peak/ Average	Result
Lowest	2402	-2.306	1W (30dBm)	Peak	Pass
Middle	2426	1.041			Pass
Highest	2480	-3.410			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

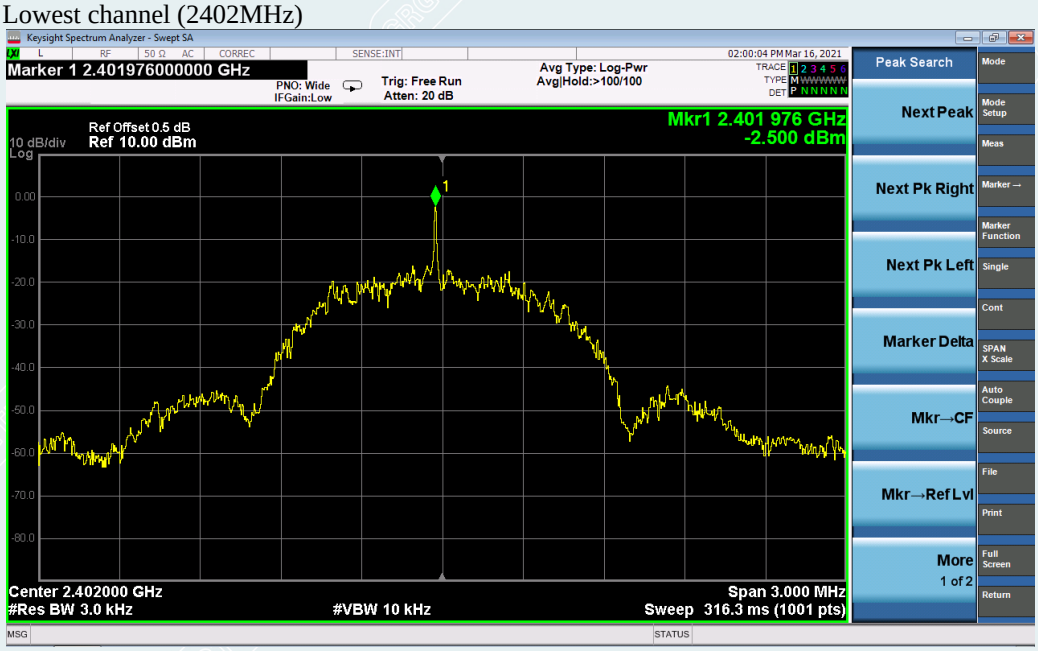
1) Remove the antenna from the EUT, and then connect a low loss RF cable from antenna port to the spectrum analyzer.
2) Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to 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 ≥3 RBW. Detector = peak. Ensure that the number of measurement points in the sweep ≥ 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

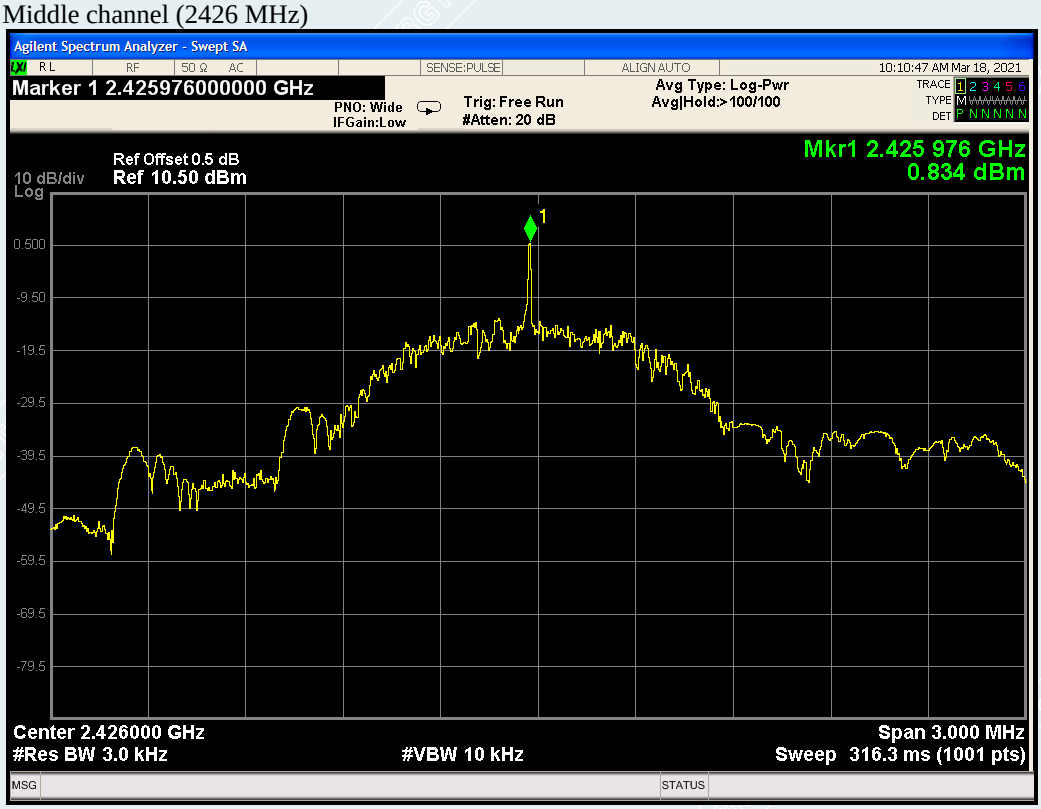
9.4. TEST RESULTS

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm/3kHz)	Test Result
Lowest	2402	-2.500	8	PASS
Middle	2426	0.834		PASS
Highest	2480	-3.651		PASS

Lowest channel (2402MHz)



Middle channel (2426 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 v05r02.

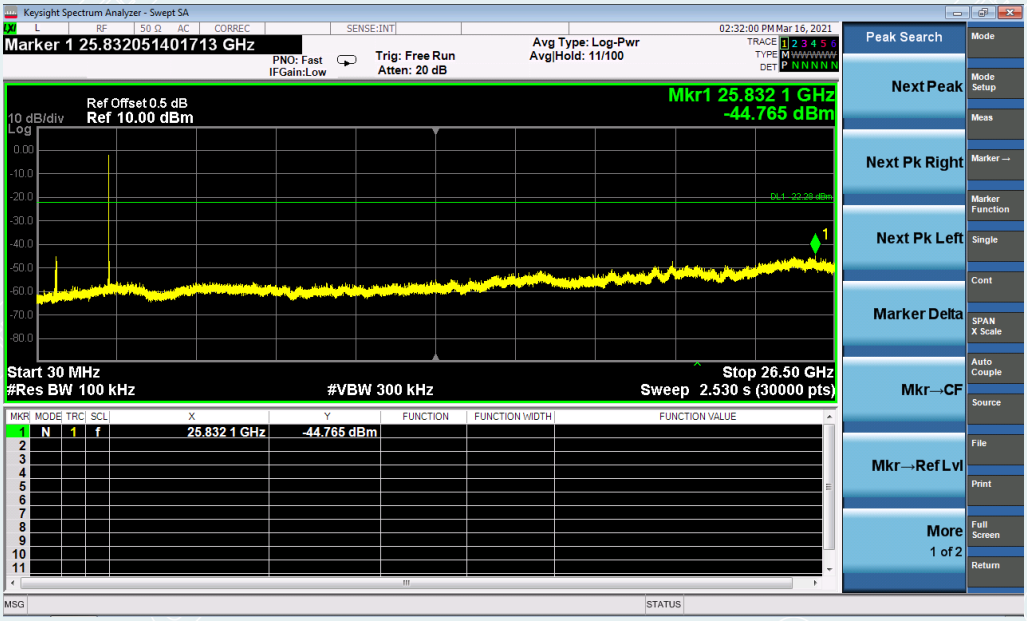
Remove the antenna from the EUT and then connect a low attenuation cable from the antenna port to the spectrum.

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 26.5GHz; 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.
5) Measurements are made over the 9 kHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels. No emission found between lowest internal used/generated frequency to 10MHz，it is only recorded 10MHz to 26GHz.

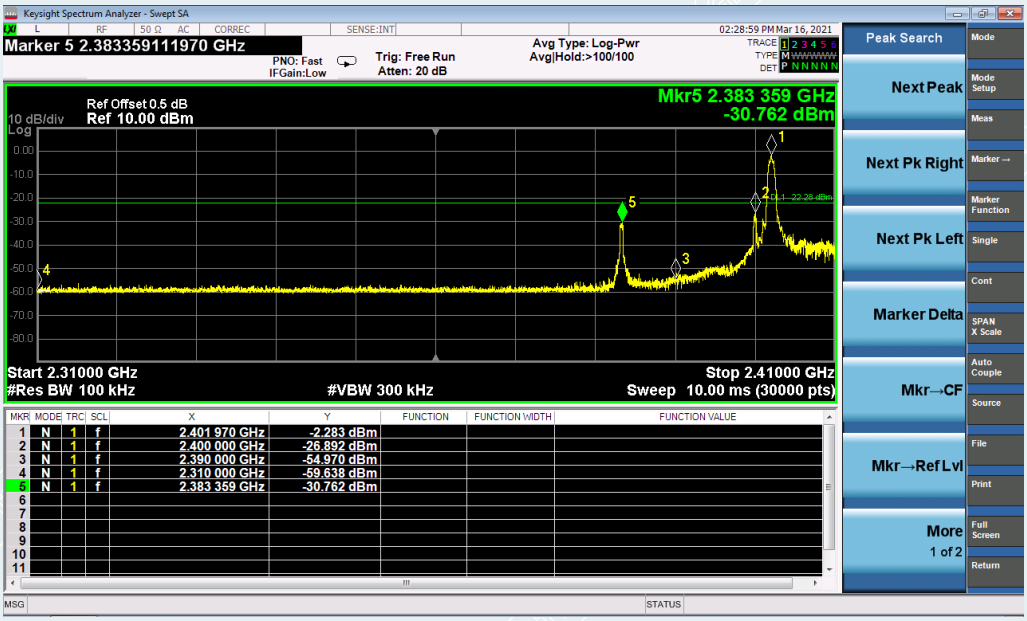
10.3. TEST SETUP

10.4. TEST RESULTS

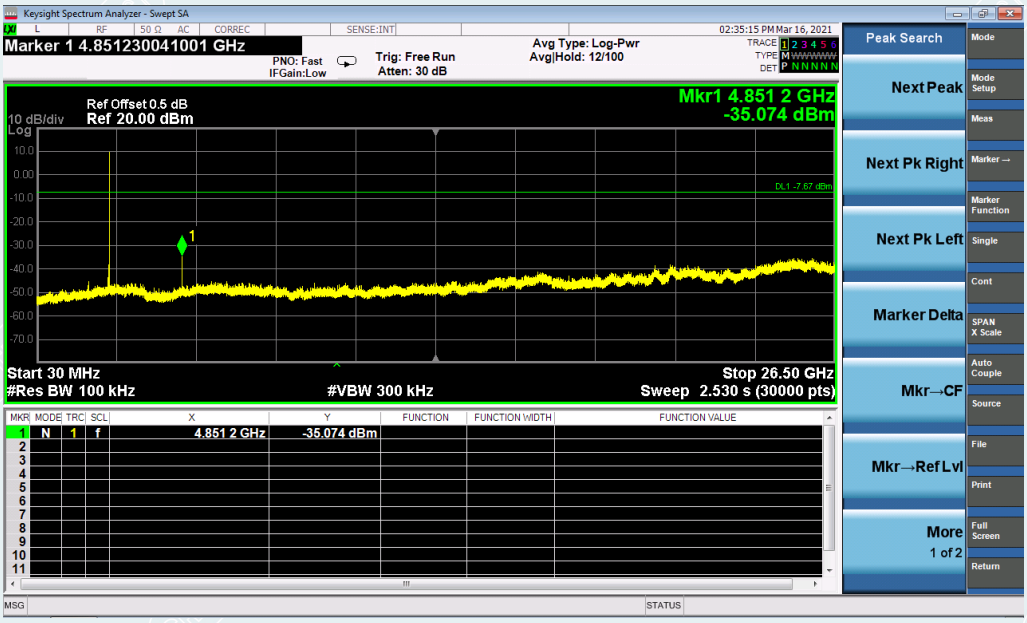
Lowest channel (2402MHz)
0.03GHz-26.5GHz



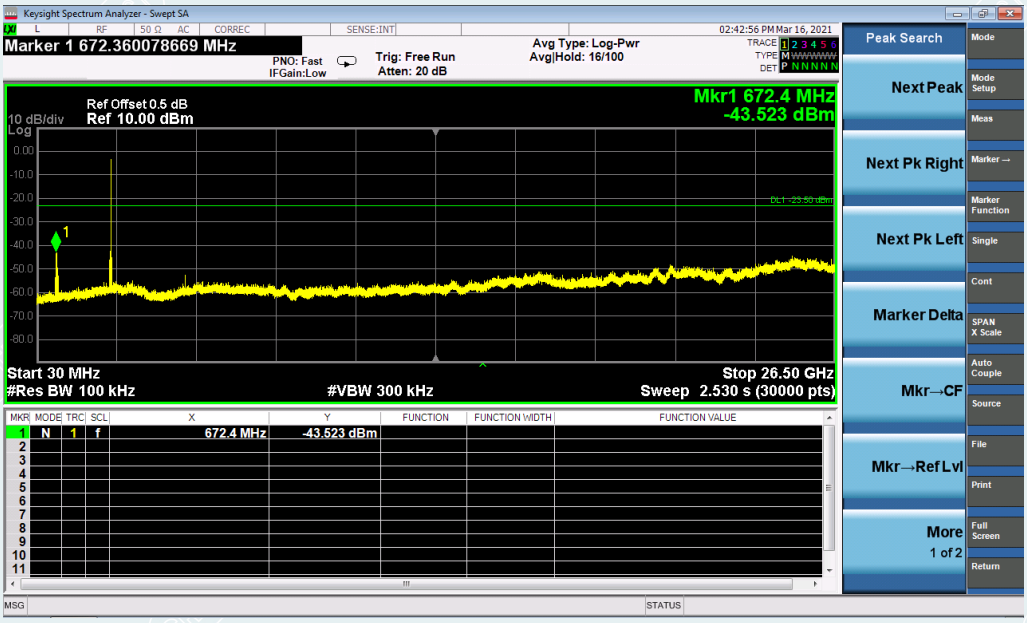
2.31GHz-2.41GHz



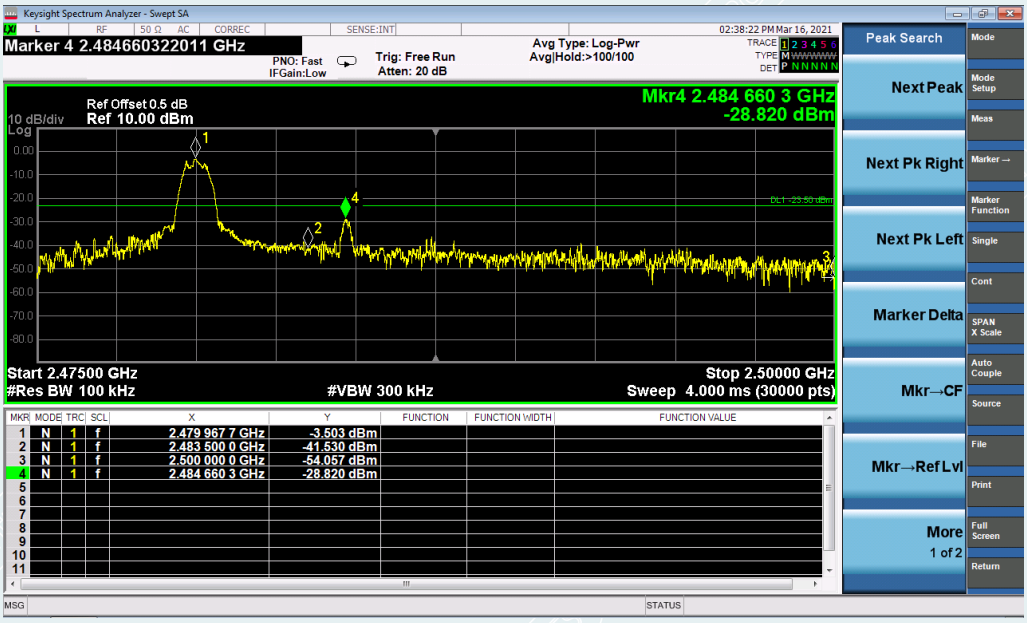
Middle channel (2426 MHz)
0.03GHz-26.5GHz



Highest channel (2480MHz)
0.03GHz-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)).

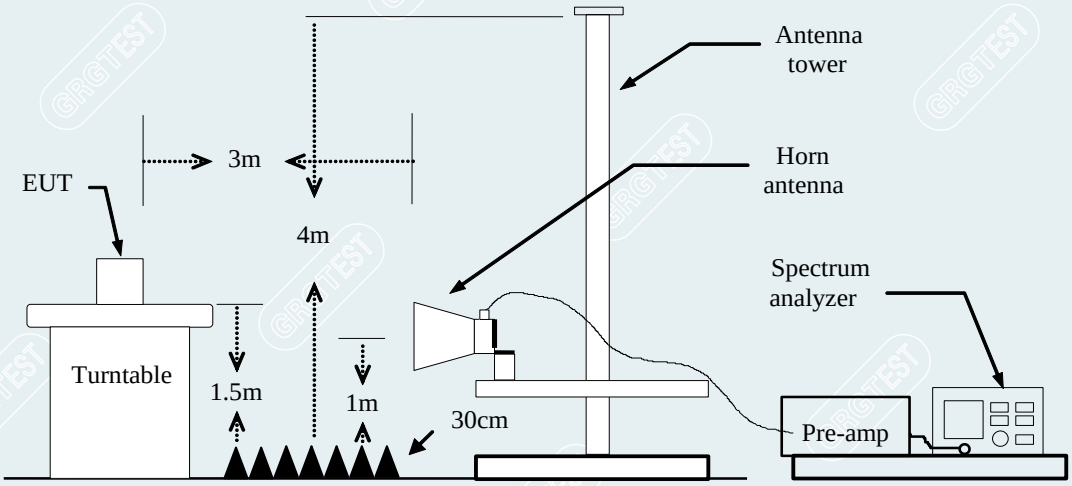
MHz	MHz	MHz	GHz
0.090 - 0.110 [1]0.495 - 0.505 2.1735 - 2.1905 4.125 - 4.128 4.17725 - 4.17775 4.20725 - 4.20775 6.215 - 6.218 6.26775 - 6.26825 6.31175 - 6.31225 8.291 - 8.294 8.362 - 8.366 8.37625 - 8.38675 8.41425 - 8.41475 12.29 - 12.293 12.51975 - 12.52025 12.57675 - 12.57725 13.36 - 13.41	16.42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

11.2. TEST PROCEDURES

Test procedures follow KDB 558074 D01 DTS Meas Guidance v03r01.

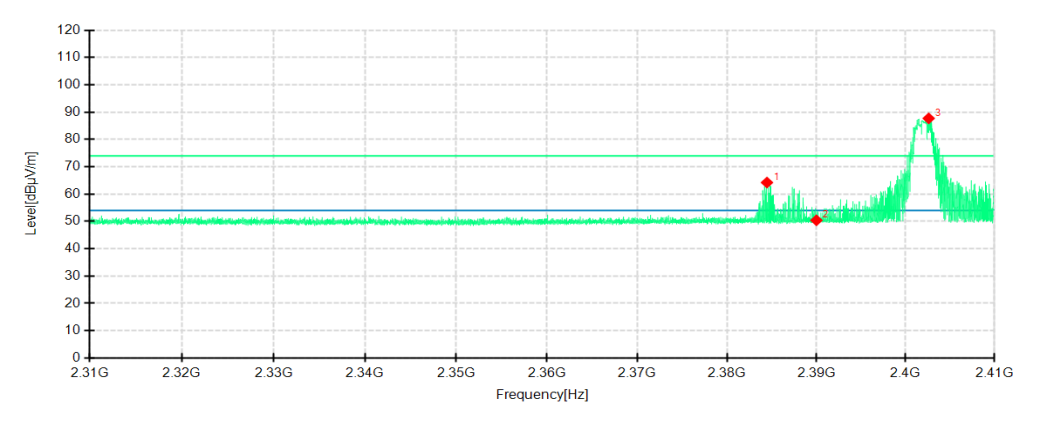
1) The EUT is placed on a turntable, which is 1.5m above the ground plane.
2) The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3) EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4) Set the 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

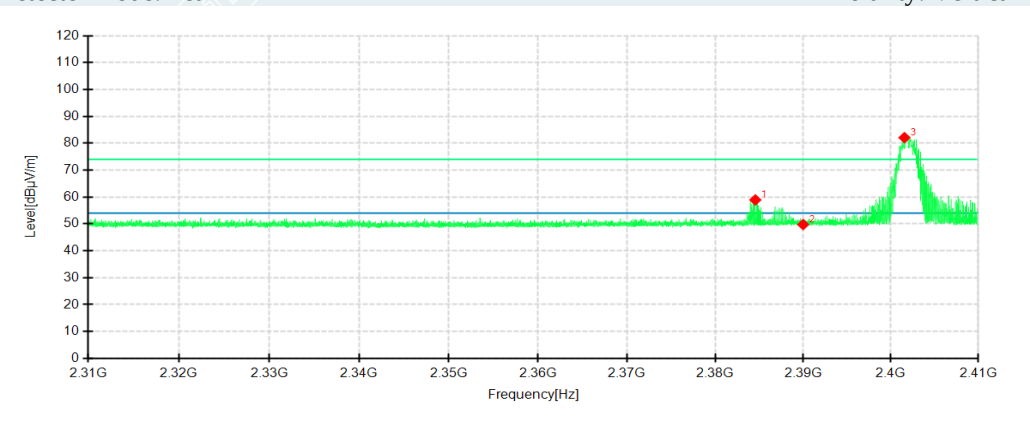


11.4. TEST RESULTS

Lowest Channel
Channel 2402MHz
Detector mode: Peak Polarity: Horizontal

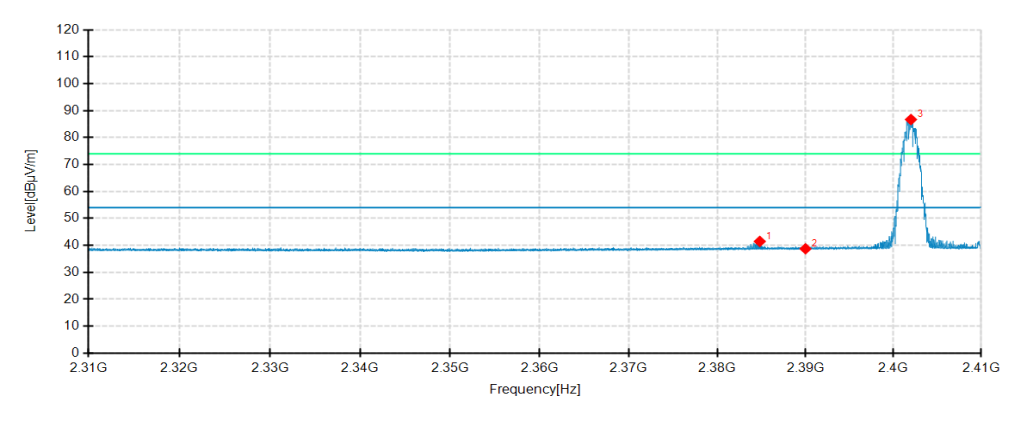


Detector mode: Peak Polarity: Vertical

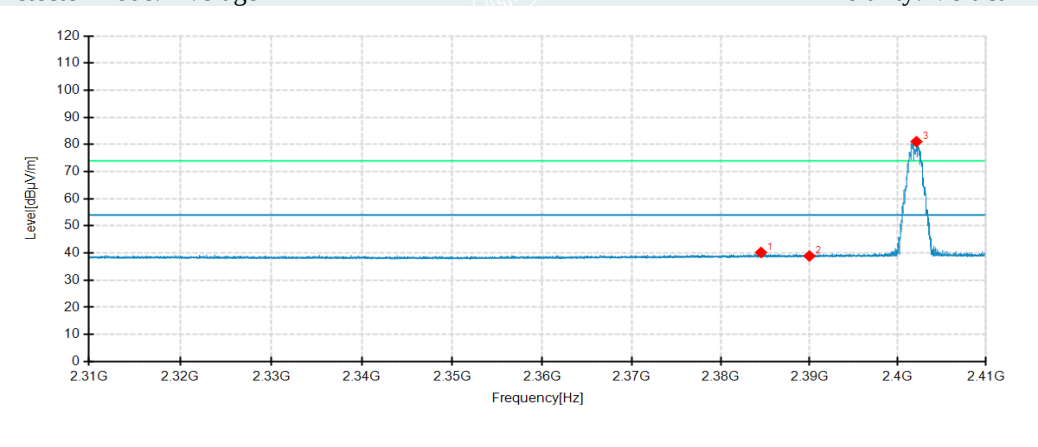


No.	Frequency MHz	Reading dBµV/m	Level dBµV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Comment
1	2384.4700	61.12	64.22	3.10	74.00	9.78	150	211	Horizontal	/
2	2390.0000	47.22	50.41	3.19	74.00	23.59	150	31	Horizontal	/
3	2402.6000	84.35	87.70	3.35	74.00	-13.70	150	211	Horizontal	No limit
1	2384.5600	55.84	58.94	3.10	74.00	15.06	150	306	Vertical	/
2	2390.0000	46.58	49.77	3.19	74.00	24.23	150	342	Vertical	/
3	2401.5500	78.73	82.08	3.35	74.00	-8.08	150	312	Vertical	No limit

Lowest Channel
Channel 2402MHz
Detector mode: Average Polarity: Horizontal

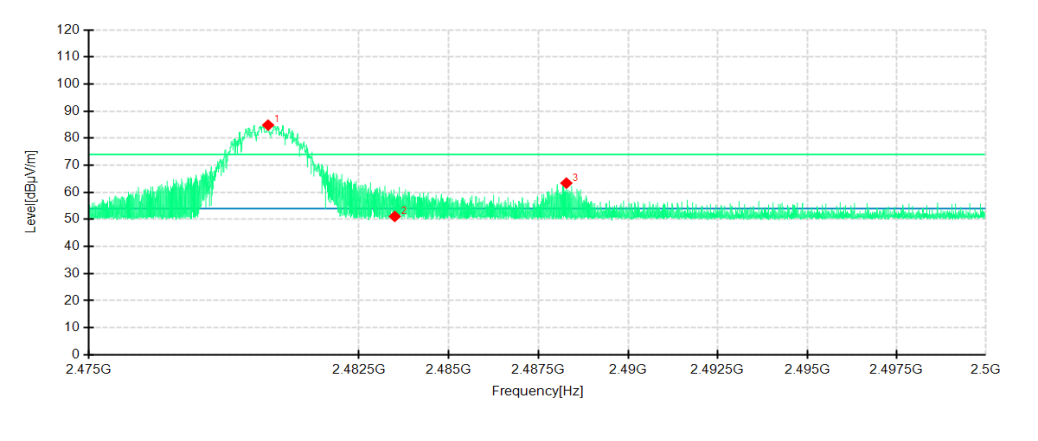


Detector mode: Average Polarity: Vertical

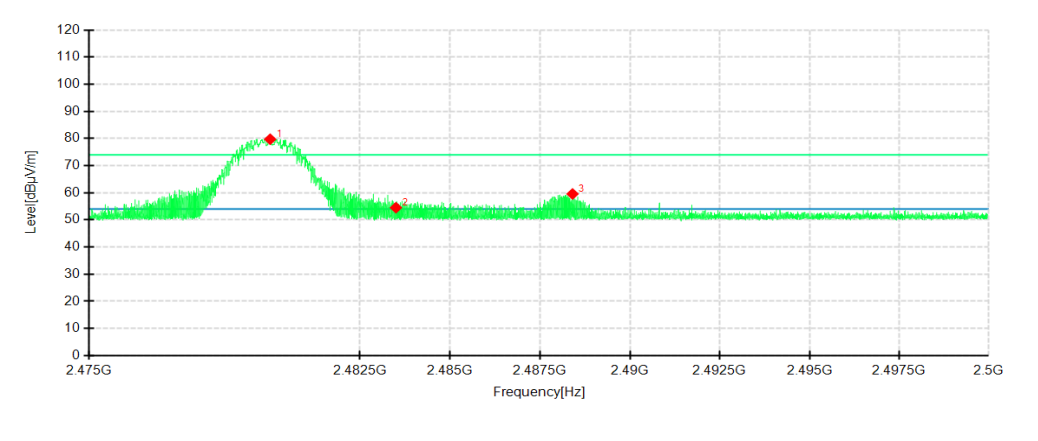


No.	Frequency MHz	Reading dBµV/m	Level dBµV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Comment
1	2384.8200	38.35	41.46	3.11	54.00	12.54	150	0	Horizontal	/
2	2390.0000	35.54	38.73	3.19	54.00	15.27	150	223	Horizontal	/
3	2401.9900	83.33	86.68	3.35	54.00	-32.68	150	248	Horizontal	No limit
1	2384.5400	37.11	40.21	3.10	54.00	13.79	150	139	Vertical	/
2	2390.0000	35.71	38.90	3.19	54.00	15.10	150	309	Vertical	/
3	2402.1200	77.70	81.05	3.35	54.00	-27.05	150	297	Vertical	No limit

Highest Channel
Channel 2480MHz
Detector mode: Peak Polarity: Horizontal

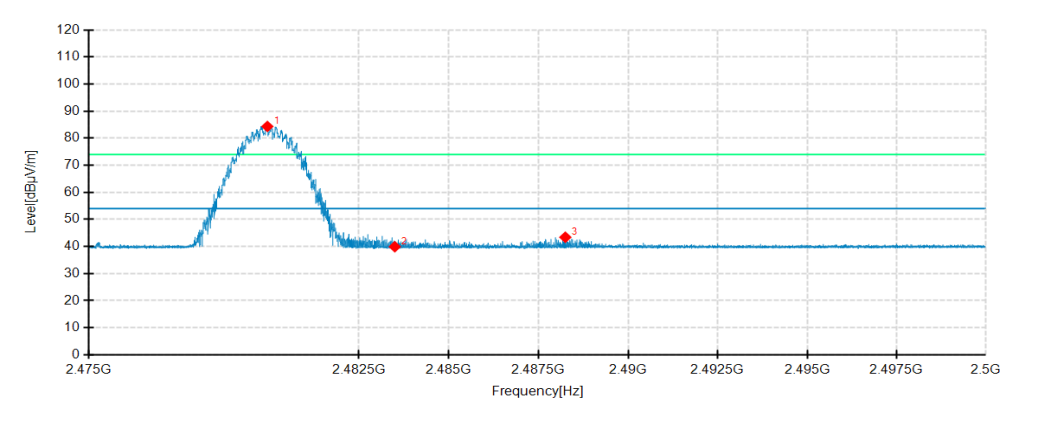


Detector mode: Peak Polarity: Vertical

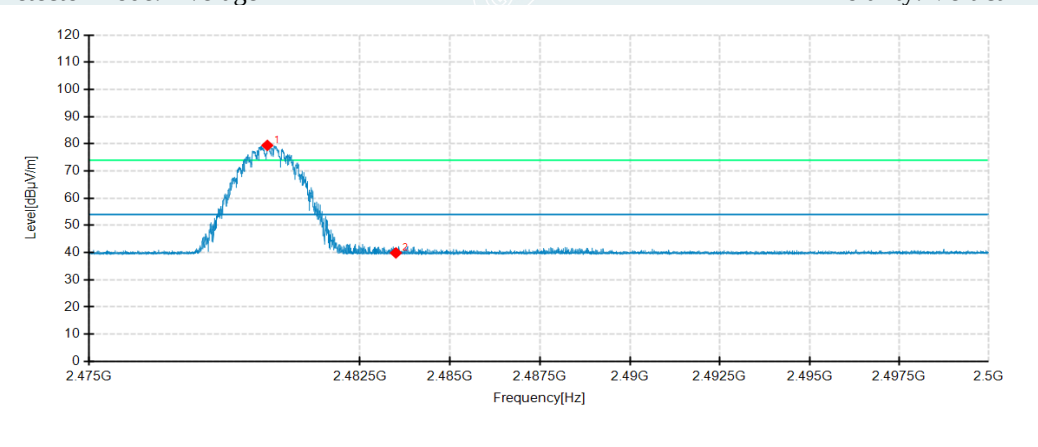


No.	Frequency MHz	Reading dBµV/m	Level dBµV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Comment
1	2479.9775	81.27	84.82	3.55	74.00	-10.82	150	218	Horizontal	No limit
2	2483.5000	47.54	51.10	3.56	74.00	22.90	150	349	Horizontal	/
3	2488.2800	59.84	63.40	3.56	74.00	10.60	150	223	Horizontal	/
1	2480.0125	76.18	79.73	3.55	74.00	-5.73	150	60	Vertical	No limit
2	2483.5000	50.94	54.50	3.56	74.00	19.50	150	341	Vertical	/
3	2488.4050	56.01	59.57	3.56	74.00	14.43	150	95	Vertical	/

Highest Channel
Channel 2480MHz
Detector mode: Average Polarity: Horizontal



Detector mode: Average Polarity: Vertical



No.	Frequency MHz	Reading dBµV/m	Level dBµV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Comment
1	2479.9575	80.78	84.33	3.55	54.00	-30.33	150	223	Horizontal	No limit
2	2483.5000	36.35	39.91	3.56	54.00	14.09	150	164	Horizontal	/
3	2488.2500	39.85	43.41	3.56	54.00	10.59	150	218	Horizontal	/
1	2479.9350	75.86	79.41	3.55	54.00	-25.41	150	58	Vertical	No limit
2	2483.5000	36.33	39.89	3.56	54.00	14.11	150	220	Vertical	/

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

----------This is the last page of the report. ----------