



FCC TEST REPORT

For

Doodle Labs (SG) Pte Ltd

Mesh Rider Radio

Test Model: RM-1700-21N3

Prepared for : Doodle Labs (SG) Pte Ltd
Address : 601 MacPherson Road, Grantral Complex, Suite 07-15, Singapore
368242, Singapore

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
Address : 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei,
Shajing Street, Baoan District, Shenzhen, 518000, China
Tel : (+86)755-82591330
Fax : (+86)755-82591332
Web : www.LCS-cert.com
Mail : webmaster@LCS-cert.com

Date of receipt of test sample : September 04, 2023
Number of tested samples : 2
Sample No. : A09043048-1, A09043048-2
Serial number : Prototype
Date of Test : September 04, 2023 ~ March 9, 2024
Date of Report : March 9, 2024



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Add: 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China

Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

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FCC TEST REPORT FCC CFR 47 PART 15 C(15.247)	
Report Reference No.	: LCSA09043048EA
Date of Issue	: March 9, 2024
Testing Laboratory Name.....	: Shenzhen LCS Compliance Testing Laboratory Ltd.
Address	: 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
Testing Location/ Procedure	: Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name	: Doodle Labs (SG) Pte Ltd
Address	: 601 MacPherson Road, Grantral Complex, Suite 07-15, Singapore 368242, Singapore
Test Specification	
Standard	: FCC CFR 47 PART 15 C(15.247)
Test Report Form No.	: LCSEMC-1.0
TRF Originator.....	: Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF	: Dated 2011-03
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EUT Description.	: Mesh Rider Radio
Trade Mark	: N/A
Test Model.....	: RM-1700-21N3
Ratings	: Input: DC 5V, 3A
Result	: Positive

Compiled by:

Kay Hu/ Administrator

Supervised by:

Cary Luo/ Technique principal

Approved by:

Gavin Liang/ Manager



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**FCC -- TEST REPORT**

Test Report No. :	LCSA09043048EA	<u>March 9, 2024</u> Date of issue
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EUT.....	: Mesh Rider Radio
Test Model.....	: RM-1700-21N3
Applicant.....	: Doodle Labs (SG) Pte Ltd
Address.....	: 601 MacPherson Road, Grantral Complex, Suite 07-15, Singapore 368242,Singapore
Telephone.....	: /
Fax.....	: /
Manufacturer.....	: Doodle Labs (SG) Pte Ltd
Address.....	: 601 MacPherson Road, Grantral Complex, Suite 07-15, Singapore 368242,Singapore
Telephone.....	: /
Fax.....	: /
Factory.....	: Doodle Labs (SG) Pte Ltd
Address.....	: 601 MacPherson Road, Grantral Complex, Suite 07-15, Singapore 368242,Singapore
Telephone.....	: /
Fax.....	: /

Test Result	Positive
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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.



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Revision History

Report Version	Issue Date	Revision Content	Revised By
000	March 9, 2024	Initial Issue	---





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1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT : Mesh Rider Radio
Test Model : RM-1700-21N3
Additional Model No. : RM-1700-21N
RM-1700-21N3-IN
RM-1700-21N4
RM-1700-21N4-IN
Power Supply : Input: DC 5V, 3A
Hardware Version : /
Software Version : /

915MHz

Frequency Range : 902MHz~928MHz
Channel Spacing : 1MHz
Channel Number : 17 Channels for 10MHz bandwidth (907~923MHz)
21 Channels for 5MHz bandwidth (905~925MHz)
Modulation Type : g mode: OFDM (64QAM, 16QAM, QPSK, BPSK)
n mode: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description : External Antenna, 2.0dBi (Max.)

2.4G Band

Frequency Range : 2412MHz ~ 2467MHz
Channel Spacing : 5MHz
Channel Number : 11 Channels for 20MHz bandwidth (2412~2462MHz)
12 Channels for 10MHz bandwidth (2412~2467MHz)
Modulation Type : IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK)
IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description : External Antenna, 2.2dBi (Max.)





1.2. Support Equipment List

Manufacturer	Description	Model	Serial Number	Certificate
Lenovo	PC	TP00094A	--	FCC

Note: The PC is supplied by lab and only use tested.

1.3. External I/O Cable

I/O Port Description	Quantity	Cable
JSTCable	4	11.5cm
ANTENNA INTERFACE	1	

1.4. Description of Test Facility

NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

Test Firm Registration Number: 254912.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.5. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.



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1.6. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	±3.10dB	(1)
		30MHz~200MHz	±2.96dB	(1)
		200MHz~1000MHz	±3.10dB	(1)
		1GHz~26.5GHz	±3.80dB	(1)
		26.5GHz~40GHz	±3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	±1.63dB	(1)
Power disturbance	:	30MHz~300MHz	±1.60dB	(1)
Output power	:	1GHz-40GHz	±0.57dB	(1)
Power Spectral Density	:	1GHz-40GHz	±1.2dB	(1)
Occupied Channel Bandwidth	:	1GHz-40GHz	±5%	(1)
Conducted RF Spurious Emission	:	9kHz-40GHz	±1.80dB	(1)
Emissions in Restricted Bands	:	1GHz-40GHz	±2.47dB	(1)

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

1.7. Description of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in Y position.

AC conducted emission pre-test at both at AC120V/60Hz and AC240V/50Hz modes, recorded-worst Case at AC 120V/60Hz.

Worst-case mode and channel used for 150 KHz-30 MHz power line conducted emissions was determined to be n10M mode (Low Channel).

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was determined to be n10M mode (Low Channel).

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:

g Mode: OFDM 6Mbps.
n Mode: OFDM 6.5Mbps (MCS0)

Antenna & Bandwidth

Antenna	ANT0	
	5MHz	10MHz
g	☒	☒
n	☒	☒



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Channel List & Frequency

g/n 5M

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
902~928MHz	1(Low)	905	12	916
	2	906	13	917
	3	907	14	918
	4	908	15	919
	5	909	16	920
	6	910	17	921
	7	911	18	922
	8	912	19	923
	9	913	20	924
	10	914	21 (High)	925
	11(Mid)	915	---	---

g/n 10M

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
902~928MHz	1(Low)	907	10	916
	2	908	11	917
	3	909	12	918
	4	910	13	919
	5	911	14	920
	6	912	15	921
	7	913	16	922
	8	914	17 (High)	923
	9 (Mid)	915	---	---



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2. TEST METHODOLOGY

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

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd.

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to FCC's request, Test Procedure KDB558074 D01 15.247 Meas Guidance v05r02 is required to be used for this kind of FCC 15.247 digital modulation device.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz and 1.5 m above ground plane above 1GHz. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013.

2.4. Test Sample

The application provides 2 samples to meet requirement;

Sample Number	Description
Sample 1(A09043048-1)	Engineer sample – continuous transmit
Sample 2(A09043048-2)	Normal sample – Intermittent transmit



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3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmits condition.

3.2. EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software provided by applicant.

3.3. Special Accessories

N/A.

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.



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4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart C				
FCC Rules	Description of Test	Test Sample	Result	Remark
§15.247(a)(2)	6dB Bandwidth	Sample 1	Compliant	Appendix B.1
§15.209(a)	Radiated Spurious Emissions	Sample 1 Sample 2	Compliant	Note 1
§15.247(b)	Maximum Peak Conducted Output Power	Sample 1	Compliant	Appendix B.3
§15.247(e)	Power Spectral Density	Sample 1	Compliant	Appendix B.4
§15.247(d)	Band Edge Measurements and Conducted Spurious Emissions	Sample 1	Compliant	Appendix B.5 Appendix B.6
/	On Time and Duty Cycle	Sample 1	/	Only reported; Appendix B.7
§15.205	Emissions in Restricted Band	Sample 1	Compliant	Note 1
§15.207(a)	Conducted Emissions	Sample 1	Compliant	Note 1
§15.203	Antenna Requirements	Sample 1	Compliant	Note 1
§15.247(i)§2.1091	RF Exposure	N/A	Compliant	Note 2

Remark:

1. Note 1 – Test results inside test report;
2. Note 2 – Test results in other test report (RF Exposure Evaluation);





5. TEST RESULT

5.1. 6 dB Spectrum Bandwidth Measurement

5.1.1. Standard Applicable

According to §15.247(a) (2): For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

5.1.2. Measuring Instruments and Setting

Please refer to equipment's list in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto Sweep

5.1.3. Test Procedures

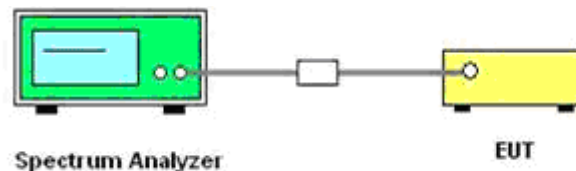
5.1.3.1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.

5.1.3.2. Set RBW/VBW = 100 KHz/300KHz (for 6dB bandwidth measurement)

Set RBW = 1%~5% OBW; VBW $\geq$ 3*RBW (for occupied bandwidth measurement).

5.1.3.3. Measured the 6dB bandwidth and 99% occupied bandwidth by related function of the spectrum analyzer.

5.1.4. Test Setup Layout



5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.1.6. Test Result of 6dB Spectrum Bandwidth

PASS

Please refer to Appendix B.1

Remark:

- 1). Measured 6dB bandwidth at difference data rate for each mode and recorded worst case for each mode.
- 2). Test results including cable loss;





5.2. Radiated Emissions Measurement

5.2.1. Standard Applicable

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

\2\ Above 38.6

According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

5.2.2. Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10 th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average



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Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

5.2.3. 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 1.0 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.



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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.



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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 polarizations of the antenna.

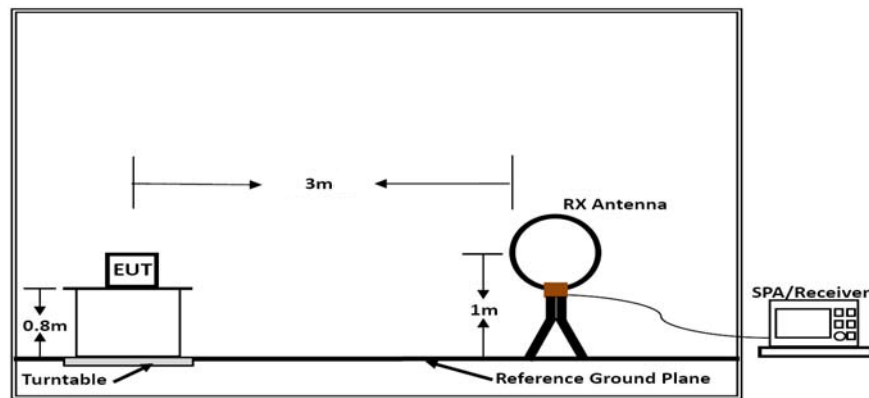
Final measurement:

- 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.

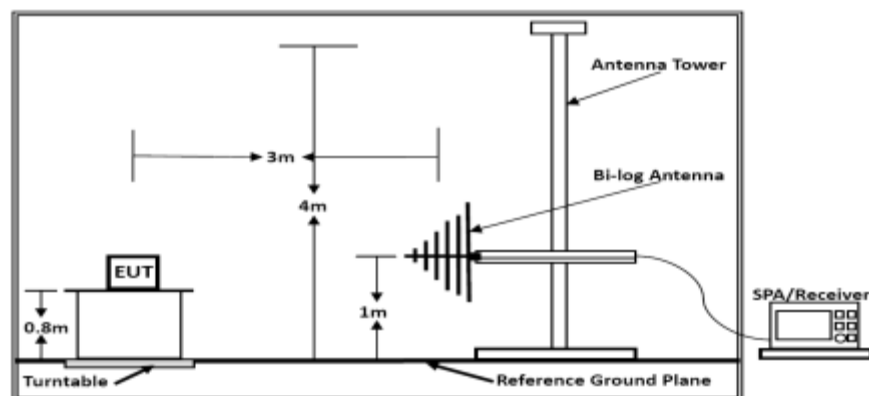




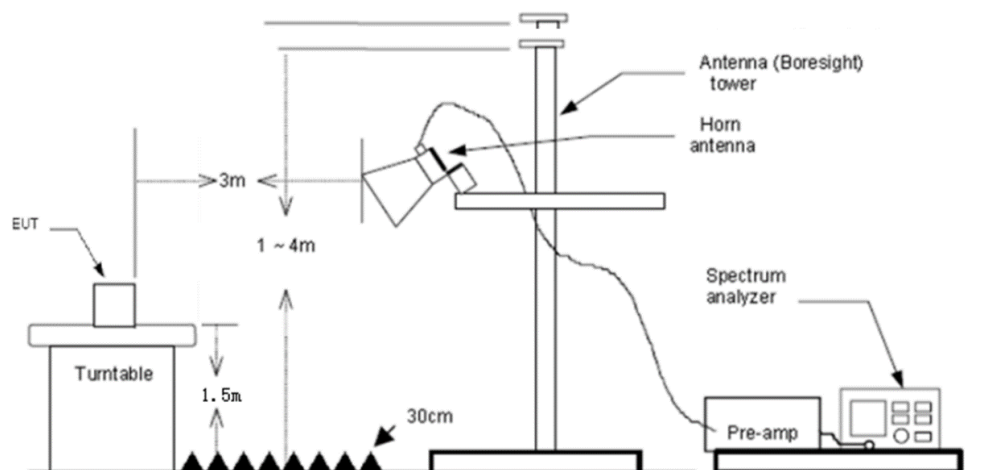
5.2.4. Test Setup Layout



Below 30MHz



Below 1GHz



Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

5.2.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.





5.2.6. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS \text{ (dBuV/m)} = RA \text{ (dBuV)} + AF \text{ (dB/m)} + CL \text{ (dB)} - AG \text{ (dB)}$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

5.2.7. Results of Radiated Emissions (9 KHz~30MHz)

Temperature	23.8℃	Humidity	52.1%
Test Engineer	Taylor Hu	Configurations	IEEE 802.11g/n

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dB)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

5.2.8. Results of Radiated Emissions (30MHz~1GHz)

Temperature	23.8℃	Humidity	52.1%
Test Engineer	Taylor Hu	Configurations	IEEE 802.11g/n

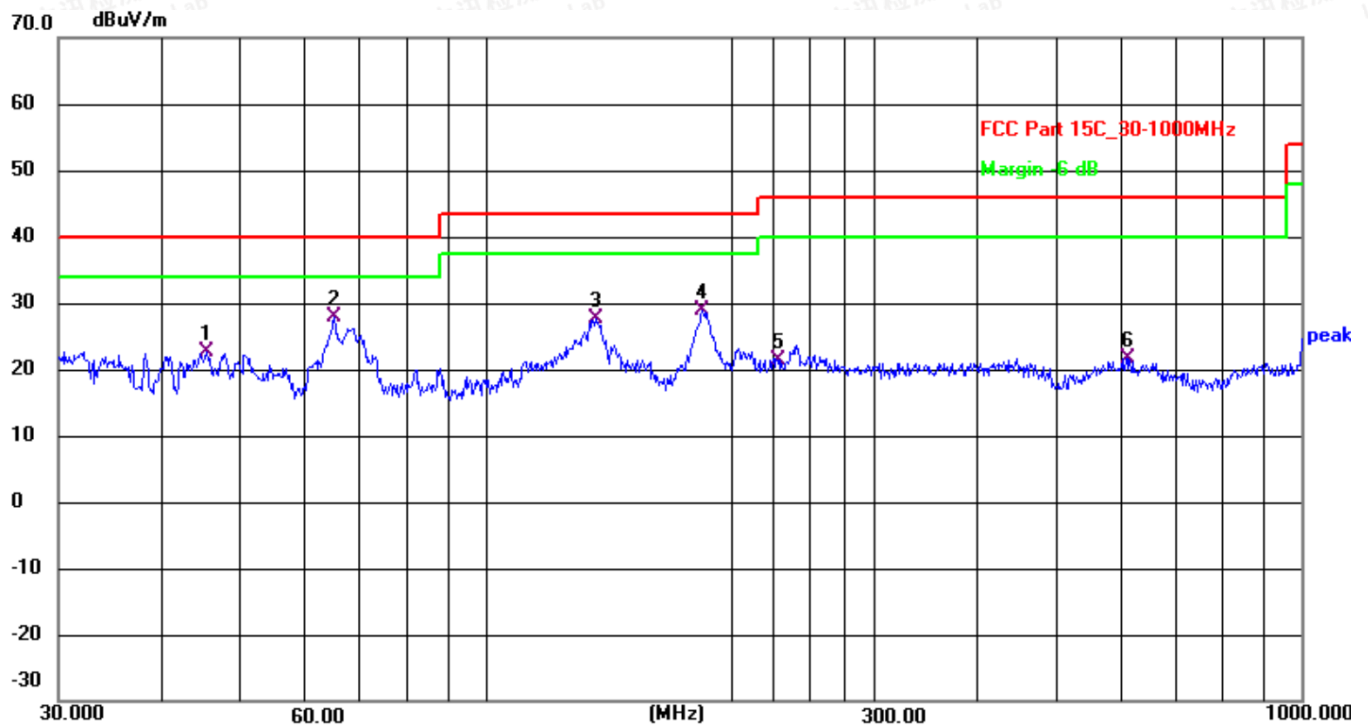
PASS.

The test data please refer to following page.





Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	45.5347	39.42	-16.91	22.51	40.00	-17.49	QP
2	65.3431	47.01	-19.18	27.83	40.00	-12.17	QP
3	136.4598	48.28	-20.77	27.51	43.50	-15.99	QP
4	184.4898	47.31	-18.54	28.77	43.50	-14.73	QP
5	228.4901	37.88	-16.59	21.29	46.00	-24.71	QP
6	614.2142	32.48	-10.80	21.68	46.00	-24.32	QP

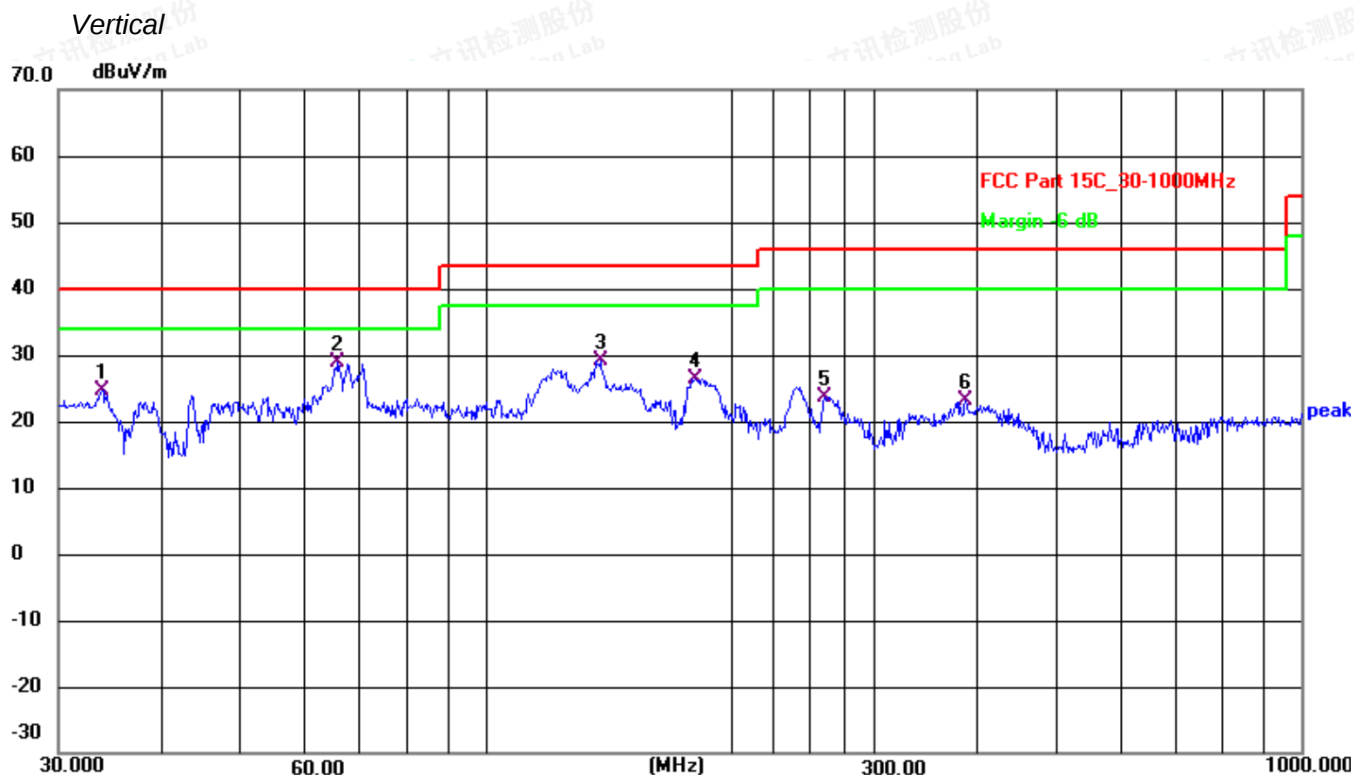


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No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	33.9172	42.56	-17.94	24.62	40.00	-15.38	QP
2	66.0340	48.00	-19.22	28.78	40.00	-11.22	QP
3	138.3873	49.99	-20.84	29.15	43.50	-14.35	QP
4	181.2834	45.14	-18.64	26.50	43.50	-17.00	QP
5	260.1444	39.14	-15.51	23.63	46.00	-22.37	QP
6	387.9917	37.71	-14.57	23.14	46.00	-22.86	QP

Note:

Pre-scan all modes and recorded the worst case results in this report n10M mode (Low Channel).

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Level = Reading + Factor, Margin = Level – Limit, Factor = Antenna Factor + Cable Loss - Preamp Factor



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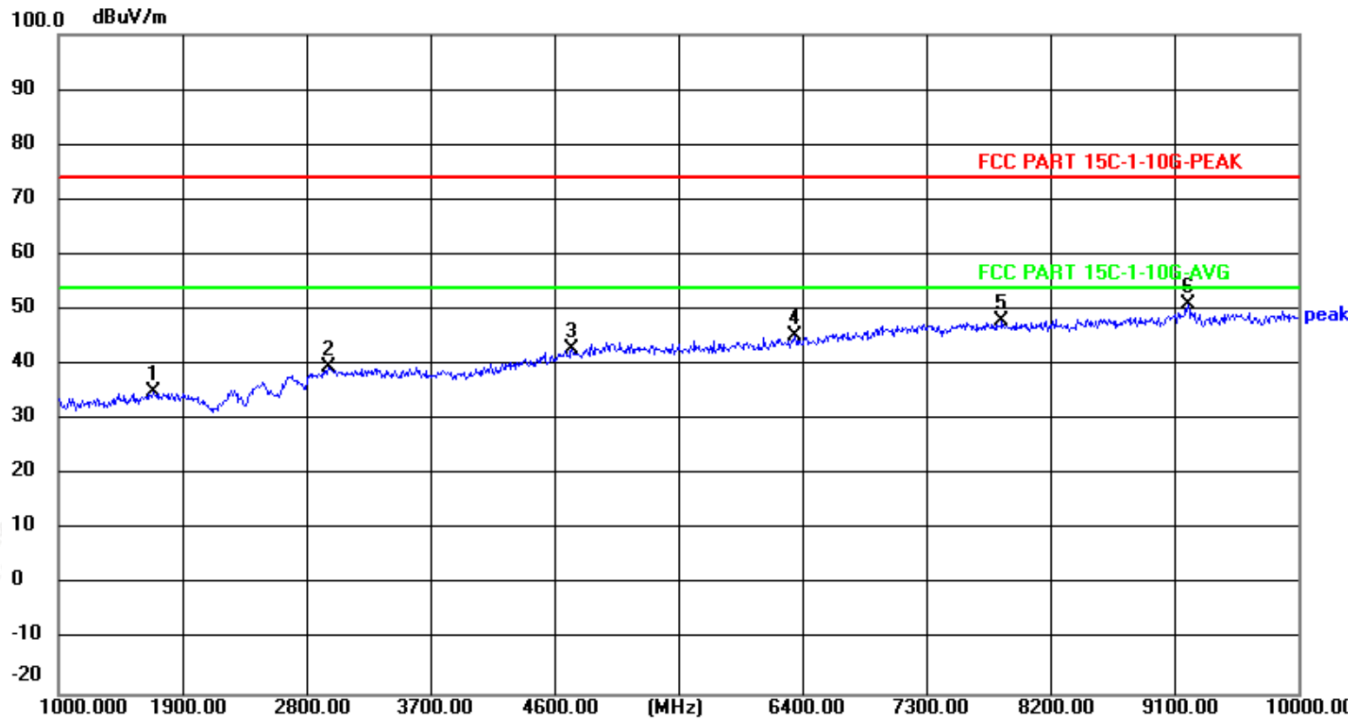
5.2.9. Results for Radiated Emissions (1 GHz~10GHz)

Temperature	23.8℃	Humidity	52.1%
Test Engineer	Taylor Hu	Configurations	g/n

Note: All the modes have been tested and recorded worst mode in the report.

g-5M 905MHz

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1684.000	49.46	-14.41	35.05	74.00	-38.95	peak
2	2962.000	49.22	-9.73	39.49	74.00	-34.51	peak
3	4726.000	48.40	-5.47	42.93	74.00	-31.07	peak
4	6346.000	47.29	-2.14	45.15	74.00	-28.85	peak
5	7849.000	47.27	0.67	47.94	74.00	-26.06	peak
6	9199.000	48.60	2.22	50.82	74.00	-23.18	peak



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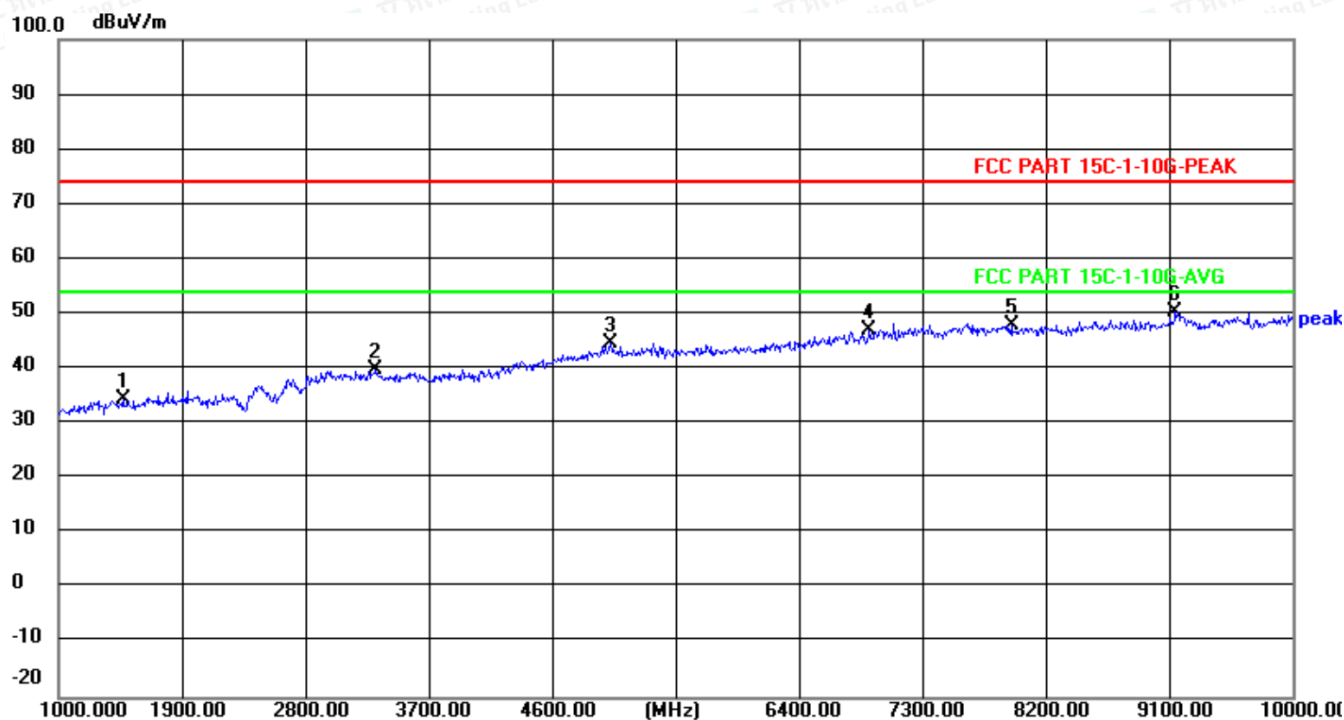
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Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1468.000	49.55	-15.04	34.51	74.00	-39.49	peak
2	3313.000	49.27	-9.48	39.79	74.00	-34.21	peak
3	5023.000	48.85	-4.09	44.76	74.00	-29.24	peak
4	6913.000	47.38	-0.42	46.96	74.00	-27.04	peak
5	7948.000	47.12	0.86	47.98	74.00	-26.02	peak
6	9145.000	48.32	2.13	50.45	74.00	-23.55	peak



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g-5M 915MHz

Vertical

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1153.000	49.55	-15.27	34.28	74.00	-39.72	peak
2	2998.000	49.64	-9.59	40.05	74.00	-33.95	peak
3	4240.000	48.06	-7.60	40.46	74.00	-33.54	peak
4	6031.000	47.97	-3.55	44.42	74.00	-29.58	peak
5	7255.000	47.67	0.23	47.90	74.00	-26.10	peak
6	9190.000	48.19	2.21	50.40	74.00	-23.60	peak



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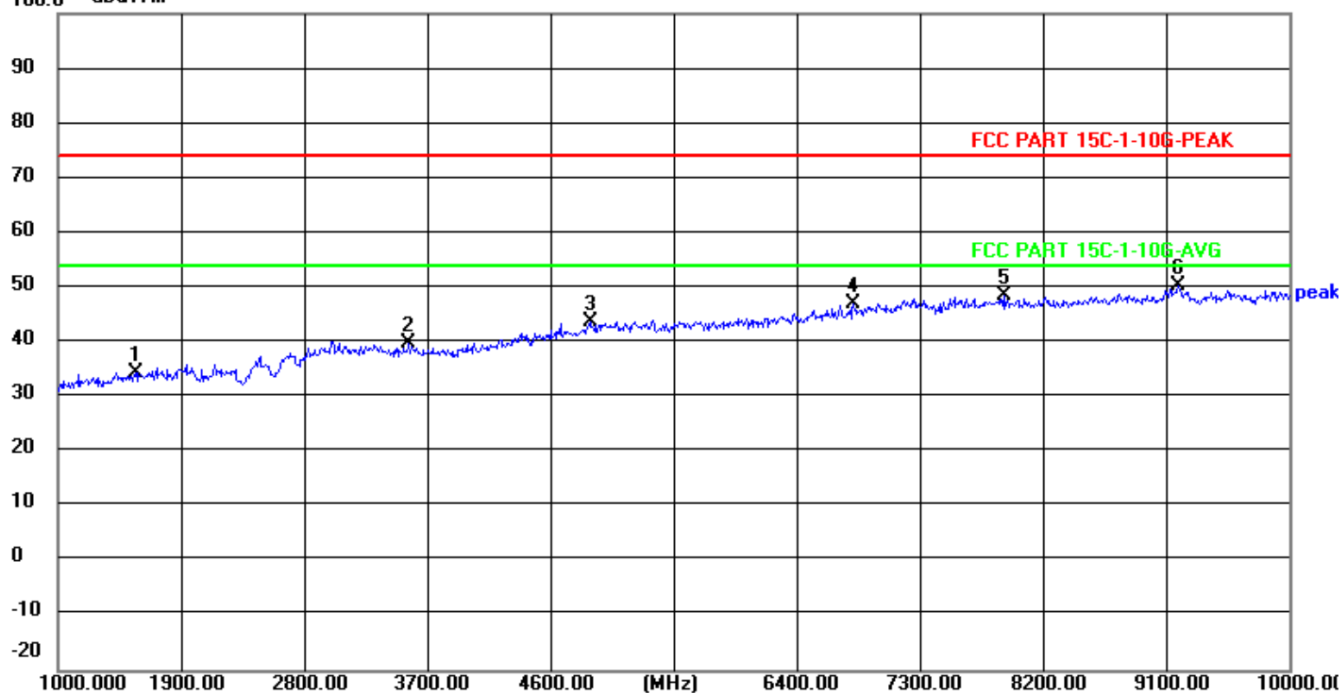
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Horizontal

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1567.000	49.25	-14.72	34.53	74.00	-39.47	peak
2	3565.000	49.16	-9.30	39.86	74.00	-34.14	peak
3	4888.000	48.49	-4.67	43.82	74.00	-30.18	peak
4	6814.000	47.65	-0.67	46.98	74.00	-27.02	peak
5	7912.000	47.76	0.84	48.60	74.00	-25.40	peak
6	9190.000	48.19	2.21	50.40	74.00	-23.60	peak



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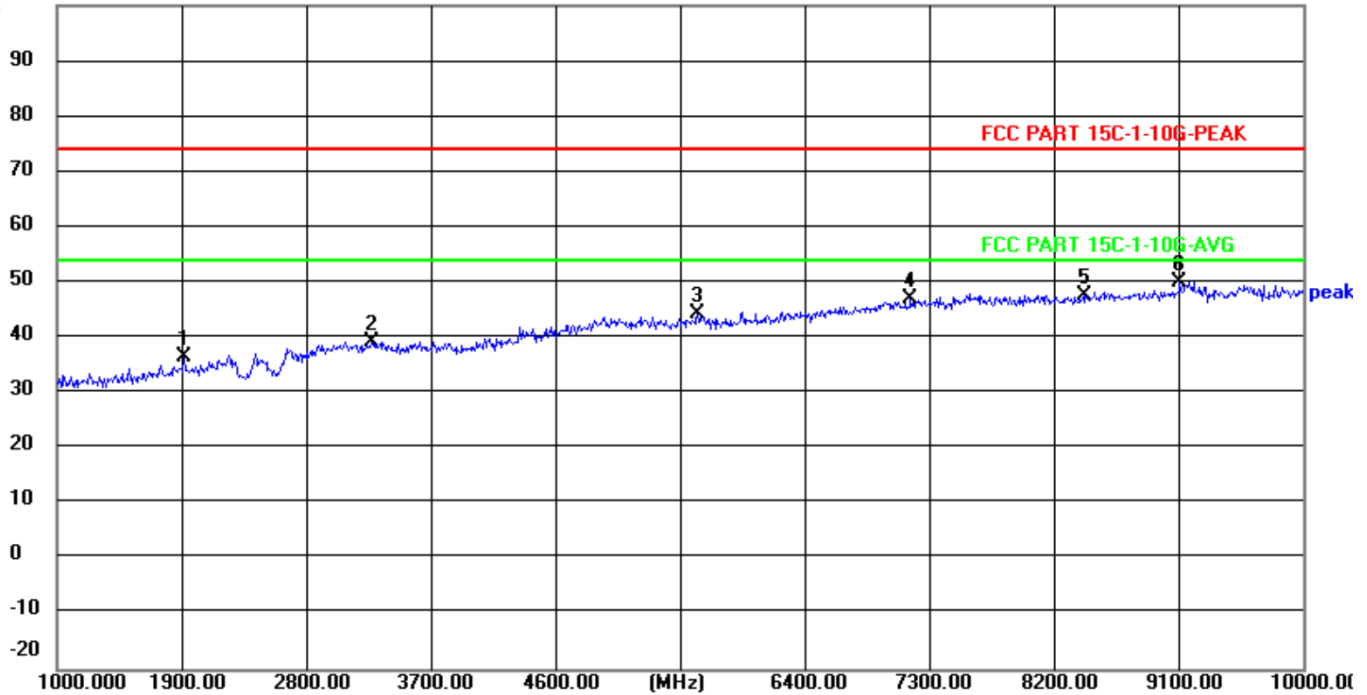
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g-5M 925MHz

Vertical

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1918.000	50.13	-13.53	36.60	74.00	-37.40	peak
2	3268.000	48.84	-9.50	39.34	74.00	-34.66	peak
3	5626.000	47.76	-3.32	44.44	74.00	-29.56	peak
4	7165.000	46.88	0.08	46.96	74.00	-27.04	peak
5	8416.000	46.38	1.19	47.57	74.00	-26.43	peak
6	9109.000	48.02	2.07	50.09	74.00	-23.91	peak



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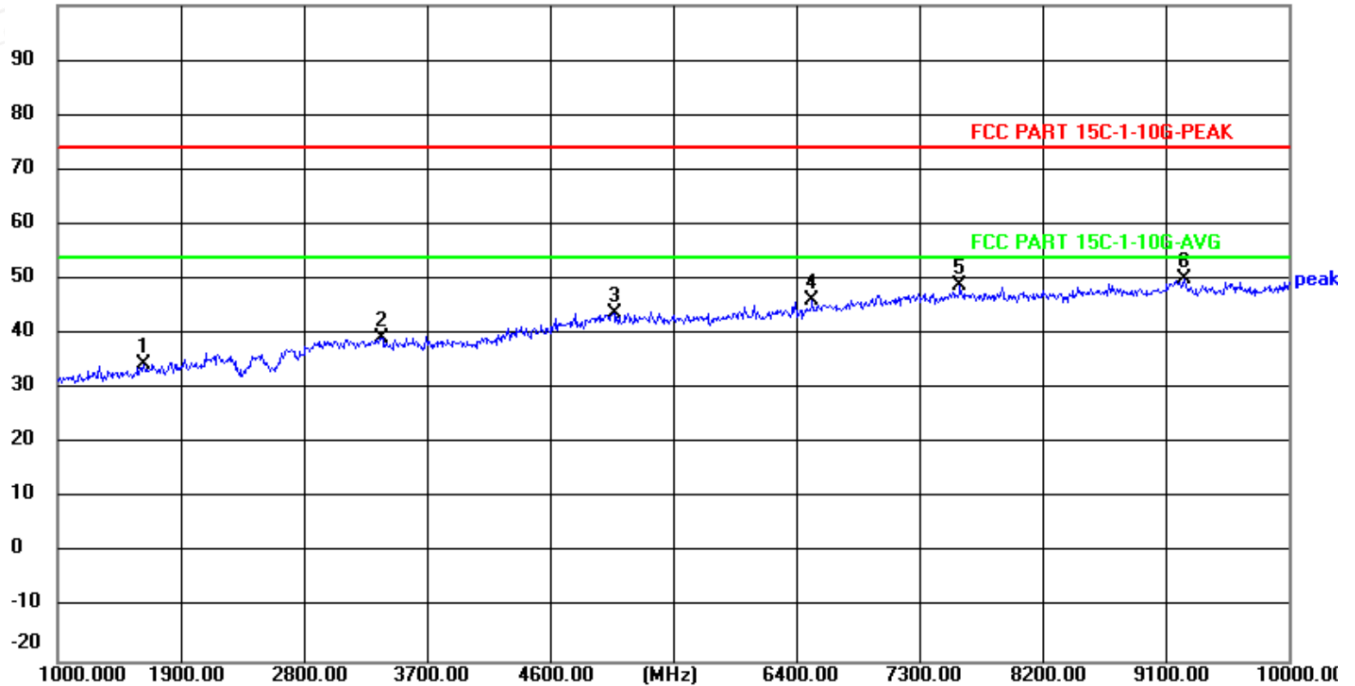
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Horizontal

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1630.000	48.84	-14.53	34.31	74.00	-39.69	peak
2	3367.000	48.77	-9.46	39.31	74.00	-34.69	peak
3	5068.000	47.75	-3.99	43.76	74.00	-30.24	peak
4	6517.000	47.62	-1.40	46.22	74.00	-27.78	peak
5	7597.000	48.02	0.69	48.71	74.00	-25.29	peak
6	9235.000	47.68	2.28	49.96	74.00	-24.04	peak



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n-5M 905MHz

Vertical

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1630.000	49.21	-14.53	34.68	74.00	-39.32	peak
2	3808.000	48.97	-8.88	40.09	74.00	-33.91	peak
3	4969.000	47.97	-4.27	43.70	74.00	-30.30	peak
4	6436.000	47.61	-1.73	45.88	74.00	-28.12	peak
5	7534.000	48.15	0.65	48.80	74.00	-25.20	peak
6	9550.000	47.32	2.80	50.12	74.00	-23.88	peak



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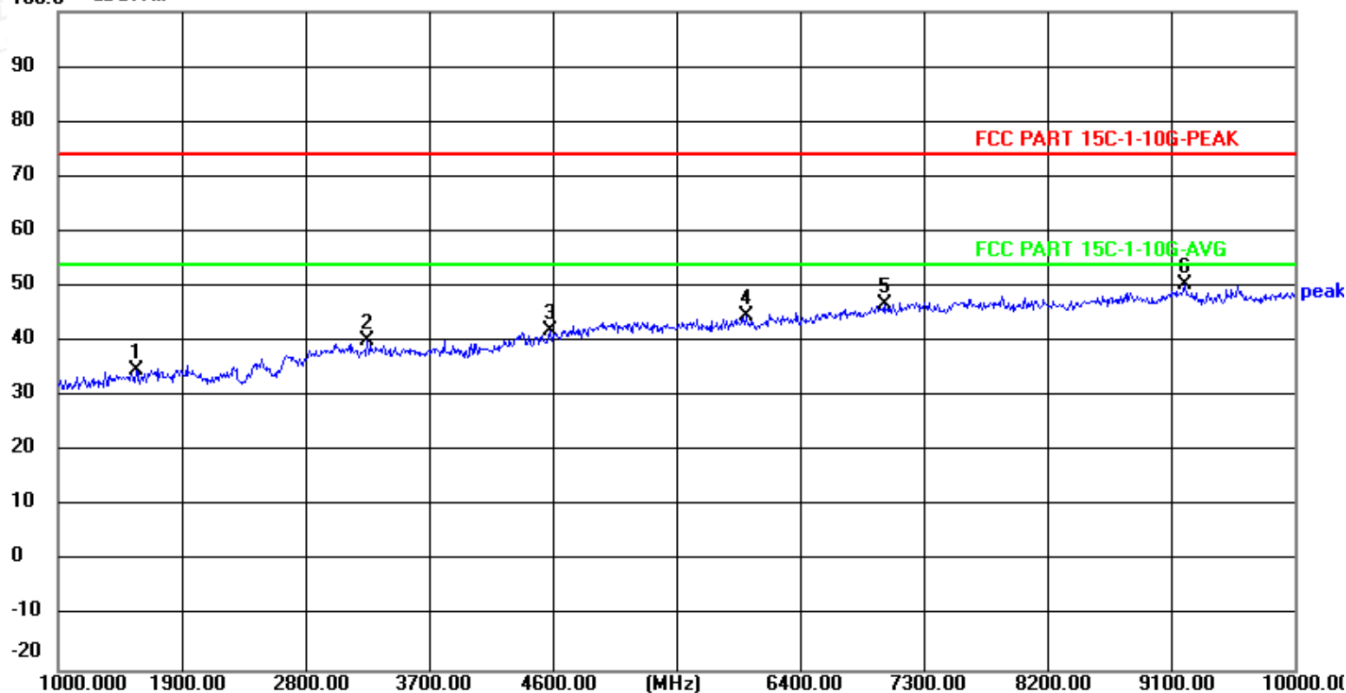
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Horizontal

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1567.000	49.35	-14.72	34.63	74.00	-39.37	peak
2	3250.000	49.55	-9.50	40.05	74.00	-33.95	peak
3	4582.000	48.07	-6.17	41.90	74.00	-32.10	peak
4	6004.000	48.36	-3.67	44.69	74.00	-29.31	peak
5	7012.000	46.84	-0.19	46.65	74.00	-27.35	peak
6	9199.000	48.16	2.22	50.38	74.00	-23.62	peak



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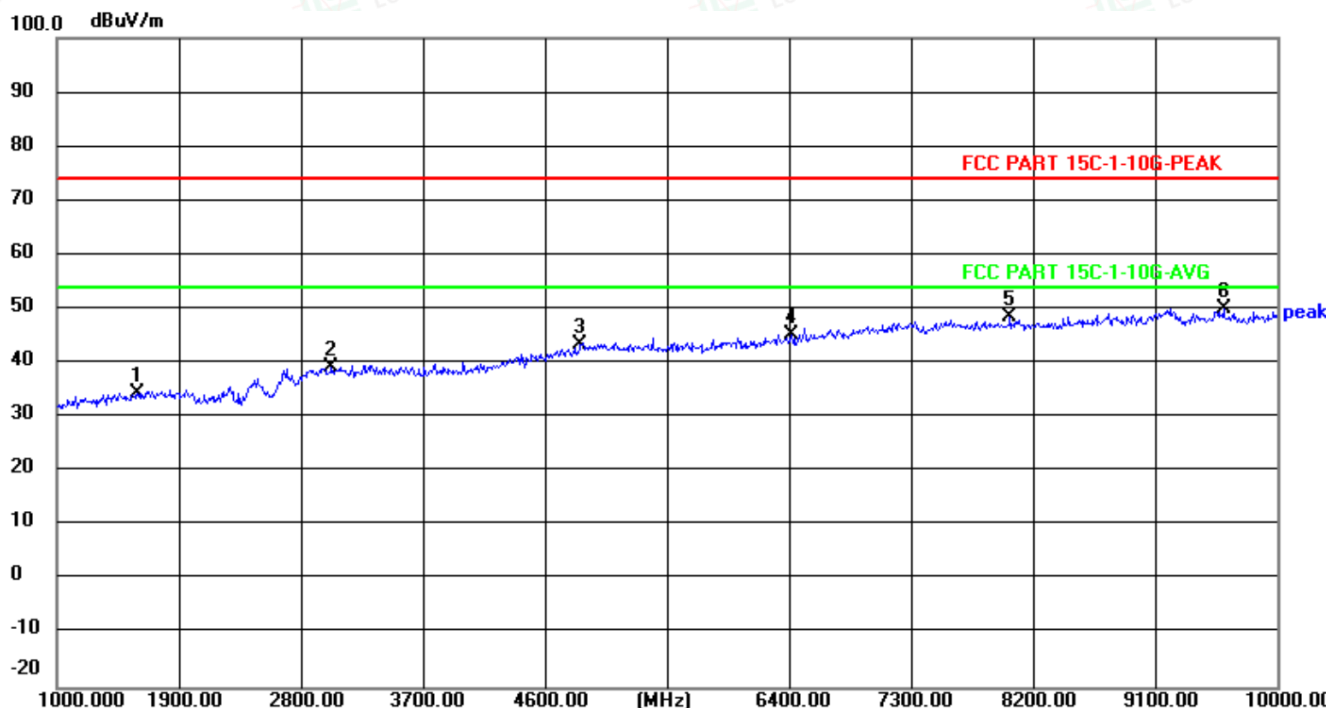
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n-5M 915MHz

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1594.000	49.14	-14.62	34.52	74.00	-39.48	peak
2	3025.000	48.77	-9.59	39.18	74.00	-34.82	peak
3	4861.000	48.37	-4.80	43.57	74.00	-30.43	peak
4	6418.000	47.19	-1.81	45.38	74.00	-28.62	peak
5	8029.000	47.80	0.72	48.52	74.00	-25.48	peak
6	9604.000	47.21	2.89	50.10	74.00	-23.90	peak



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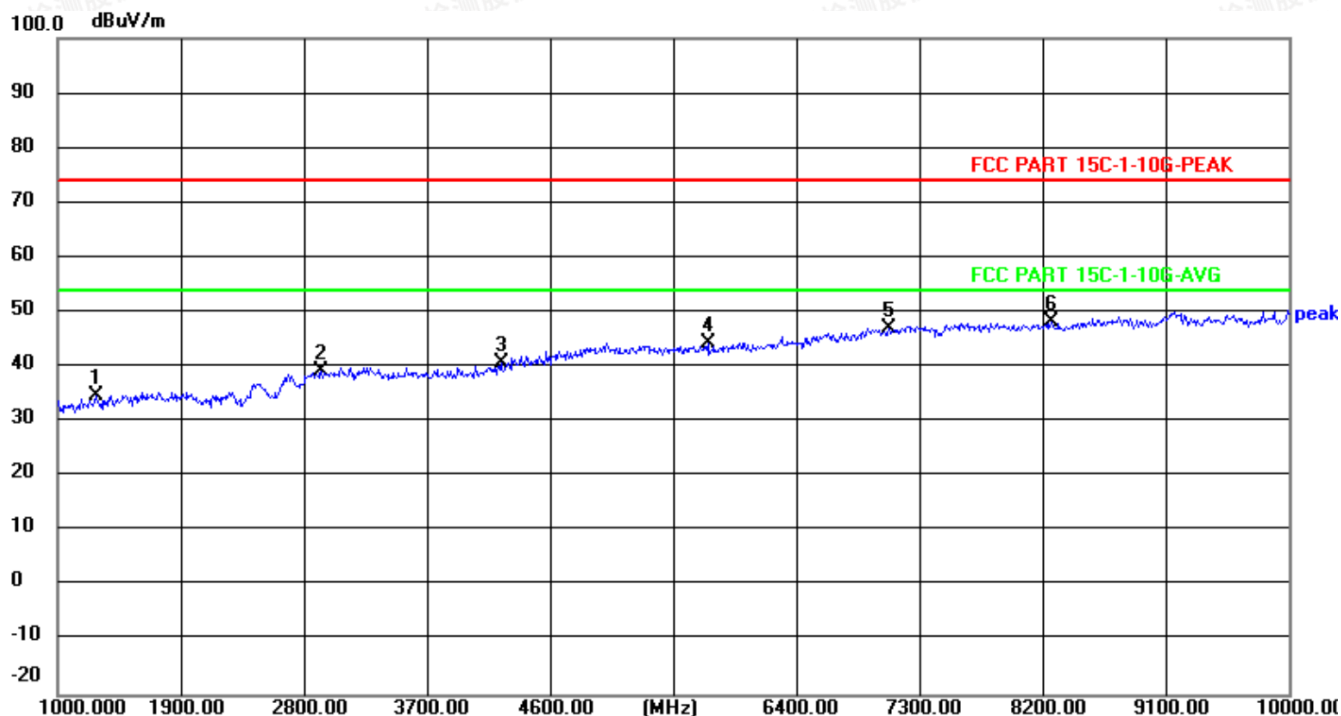
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Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1279.000	49.96	-15.22	34.74	74.00	-39.26	peak
2	2926.000	49.21	-9.85	39.36	74.00	-34.64	peak
3	4240.000	48.32	-7.60	40.72	74.00	-33.28	peak
4	5752.000	47.87	-3.45	44.42	74.00	-29.58	peak
5	7075.000	47.12	-0.07	47.05	74.00	-26.95	peak
6	8263.000	47.13	1.00	48.13	74.00	-25.87	peak



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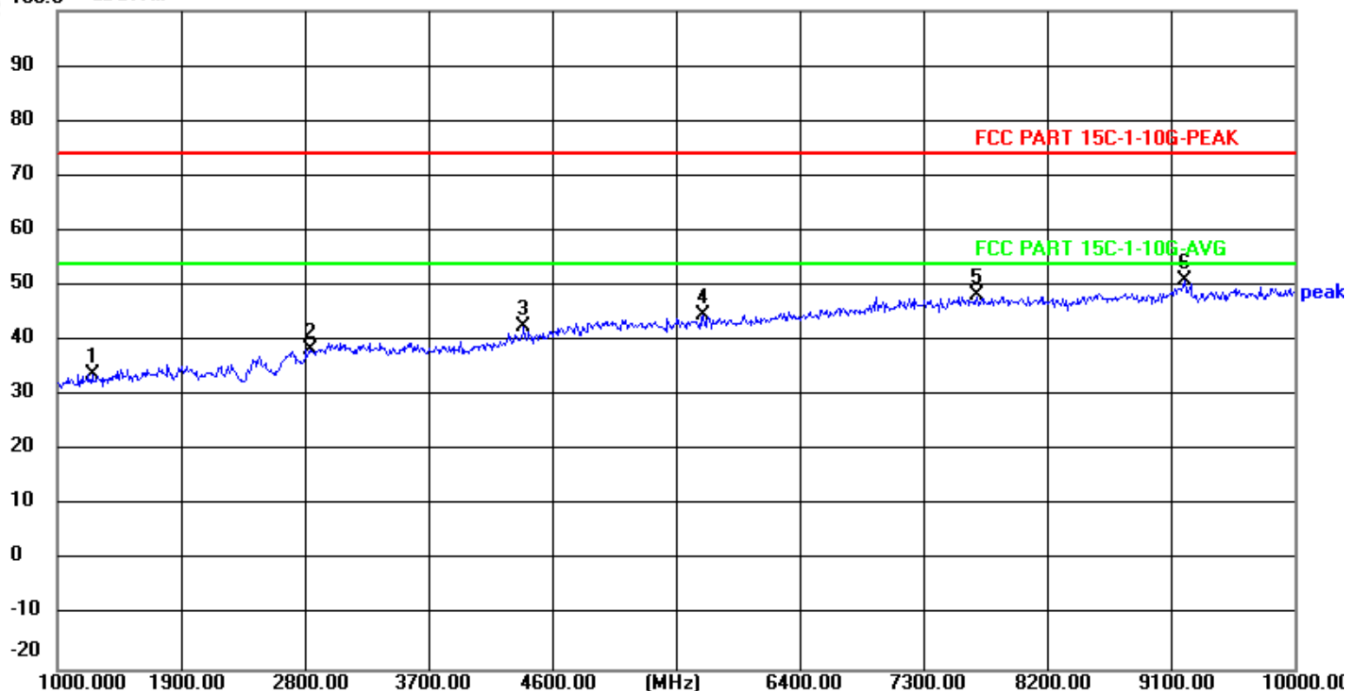
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n-5M 925MHz

Vertical

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1252.000	49.15	-15.23	33.92	74.00	-40.08	peak
2	2845.000	48.61	-10.13	38.48	74.00	-35.52	peak
3	4393.000	49.47	-7.00	42.47	74.00	-31.53	peak
4	5698.000	48.12	-3.40	44.72	74.00	-29.28	peak
5	7687.000	47.44	0.66	48.10	74.00	-25.90	peak
6	9199.000	48.74	2.22	50.96	74.00	-23.04	peak



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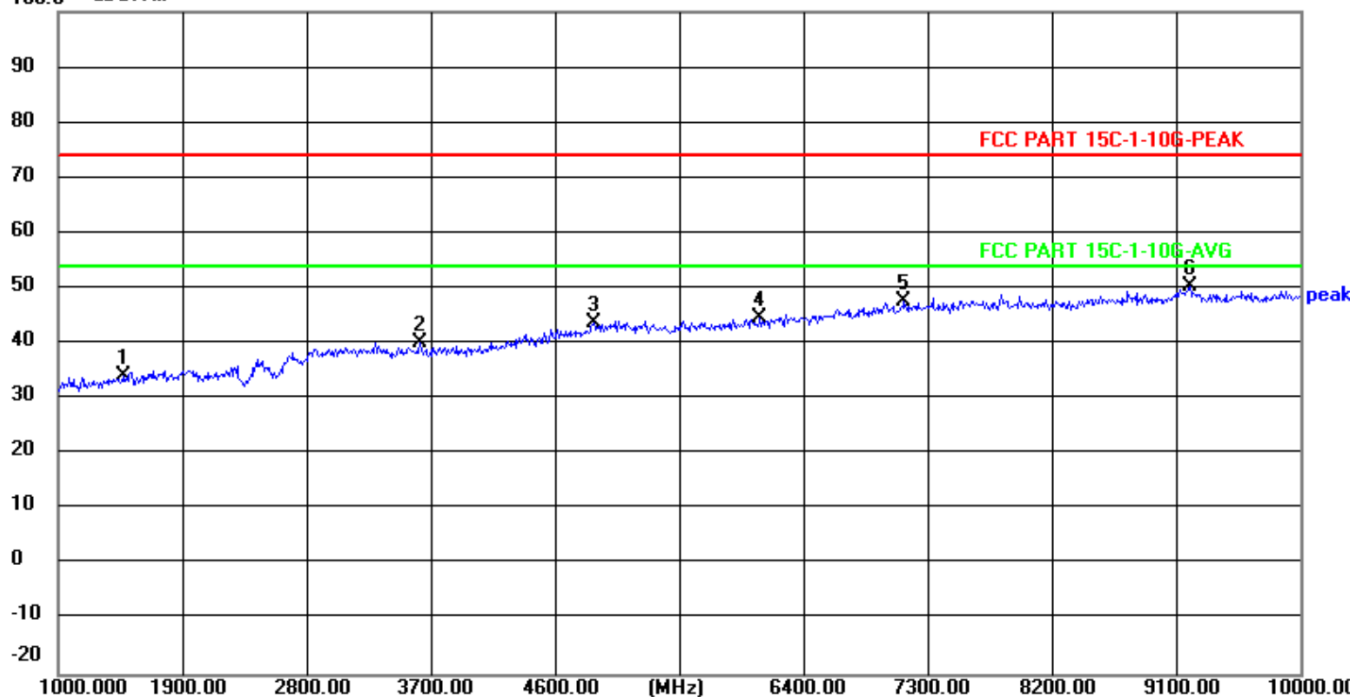
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Horizontal

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1468.000	49.30	-15.04	34.26	74.00	-39.74	peak
2	3619.000	49.44	-9.21	40.23	74.00	-33.77	peak
3	4879.000	48.36	-4.71	43.65	74.00	-30.35	peak
4	6085.000	48.04	-3.31	44.73	74.00	-29.27	peak
5	7129.000	47.52	0.02	47.54	74.00	-26.46	peak
6	9199.000	47.98	2.22	50.20	74.00	-23.80	peak



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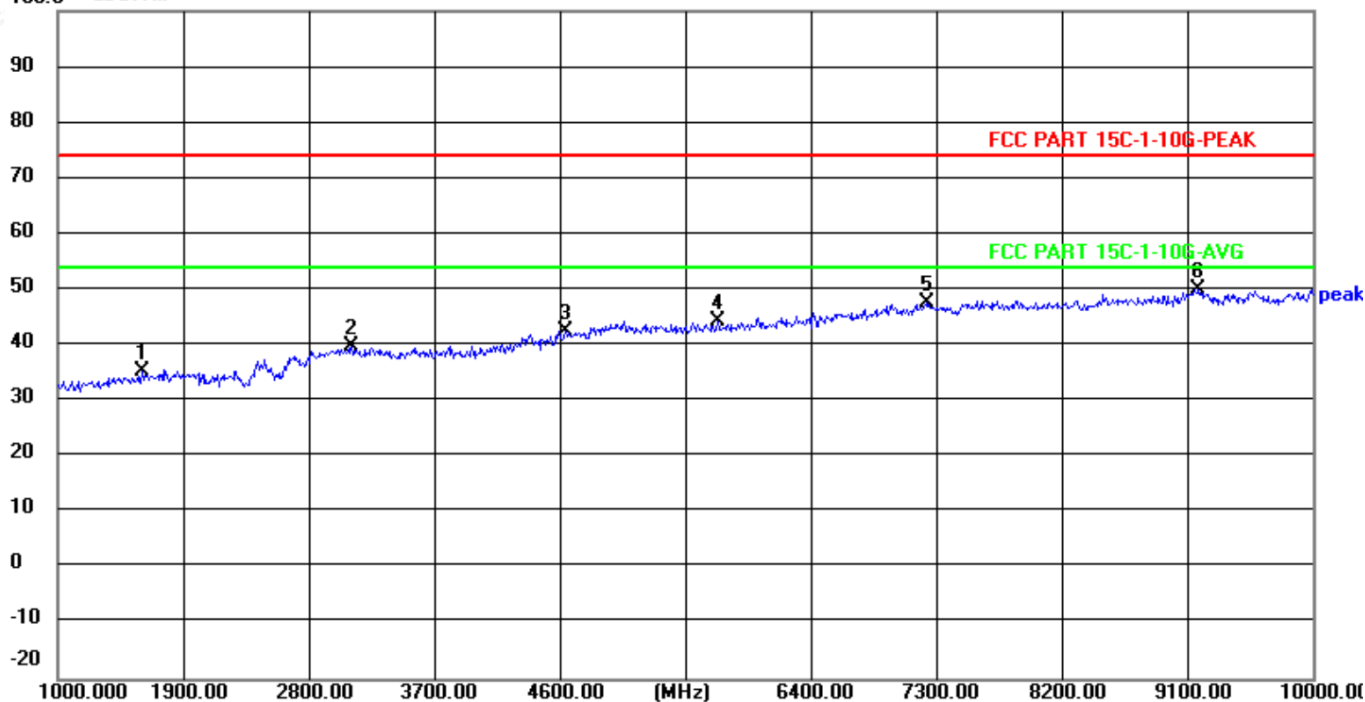
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g-10M 907MHz

Vertical

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1603.000	49.83	-14.60	35.23	74.00	-38.77	peak
2	3106.000	49.52	-9.55	39.97	74.00	-34.03	peak
3	4645.000	48.52	-5.87	42.65	74.00	-31.35	peak
4	5734.000	47.89	-3.42	44.47	74.00	-29.53	peak
5	7228.000	47.48	0.18	47.66	74.00	-26.34	peak
6	9181.000	47.94	2.19	50.13	74.00	-23.87	peak



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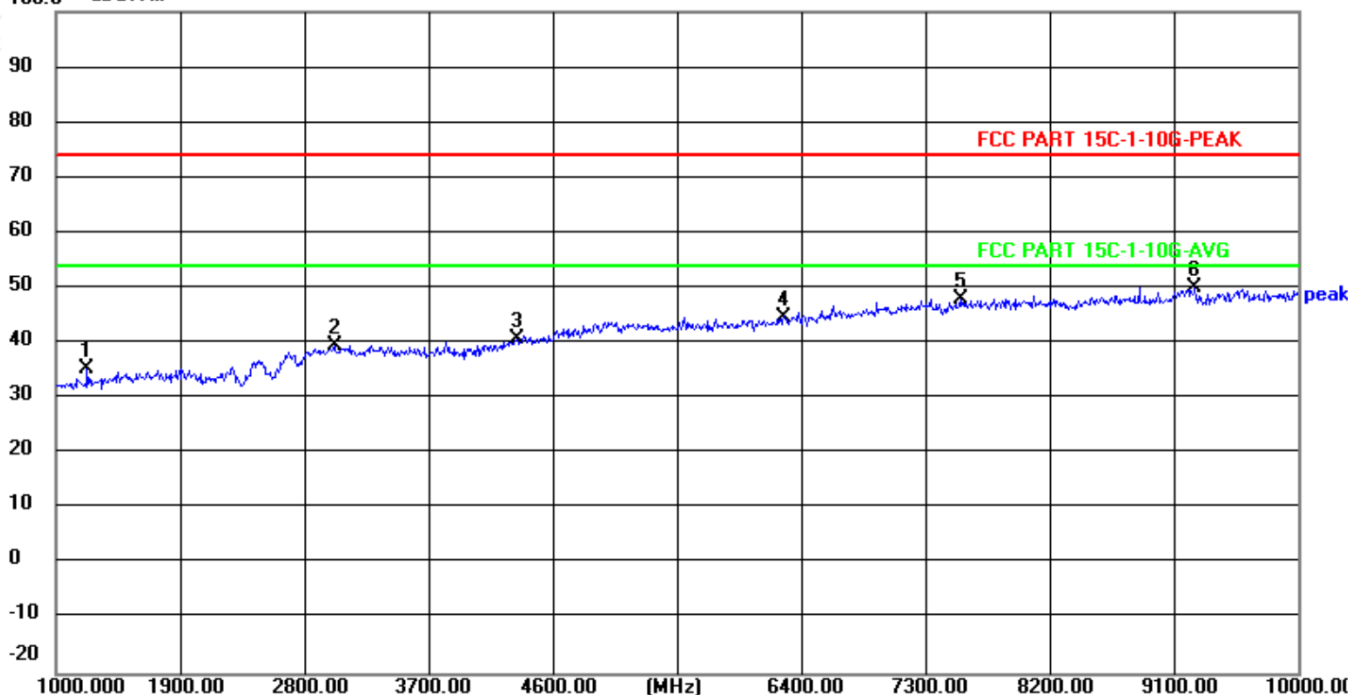
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Horizontal

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1225.000	50.41	-15.21	35.20	74.00	-38.80	peak
2	3016.000	49.28	-9.59	39.69	74.00	-34.31	peak
3	4339.000	48.10	-7.22	40.88	74.00	-33.12	peak
4	6274.000	47.25	-2.45	44.80	74.00	-29.20	peak
5	7552.000	47.33	0.66	47.99	74.00	-26.01	peak
6	9253.000	47.69	2.30	49.99	74.00	-24.01	peak



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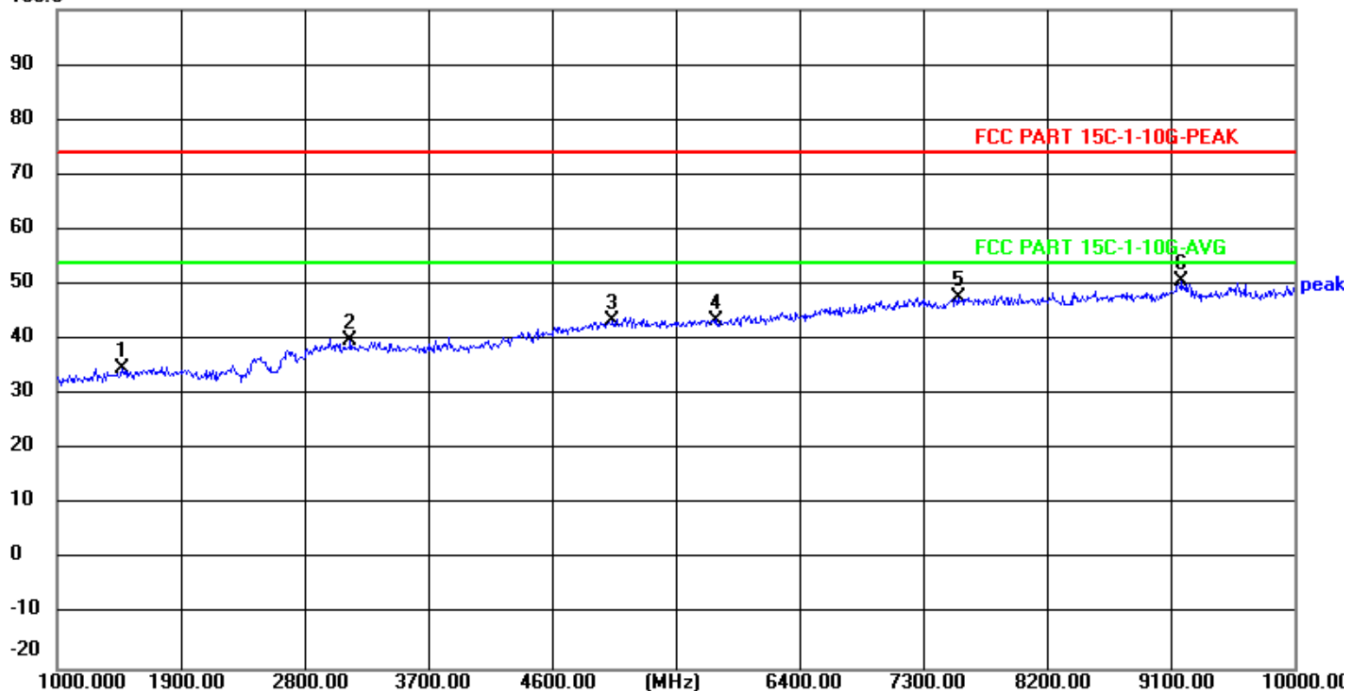
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g-10M 915MHz

Vertical

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1468.000	49.83	-15.04	34.79	74.00	-39.21	peak
2	3133.000	49.34	-9.54	39.80	74.00	-34.20	peak
3	5041.000	47.50	-4.05	43.45	74.00	-30.55	peak
4	5797.000	47.10	-3.50	43.60	74.00	-30.40	peak
5	7552.000	47.06	0.64	47.70	74.00	-26.30	peak
6	9181.000	48.52	2.19	50.71	74.00	-23.29	peak



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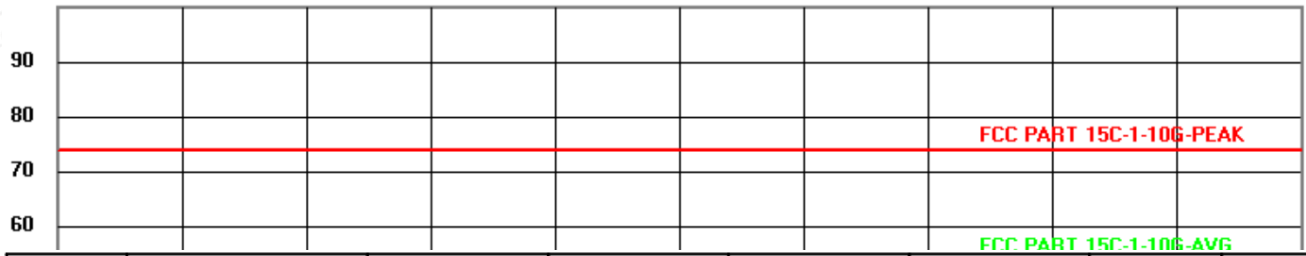
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Horizontal

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1423.000	49.62	-15.18	34.44	74.00	-39.56	peak
2	2683.000	49.21	-10.71	38.50	74.00	-35.50	peak
3	3826.000	48.78	-8.84	39.94	74.00	-34.06	peak
4	5932.000	48.82	-3.63	45.19	74.00	-28.81	peak
5	7426.000	47.45	0.52	47.97	74.00	-26.03	peak
6	9190.000	48.26	2.21	50.47	74.00	-23.53	peak



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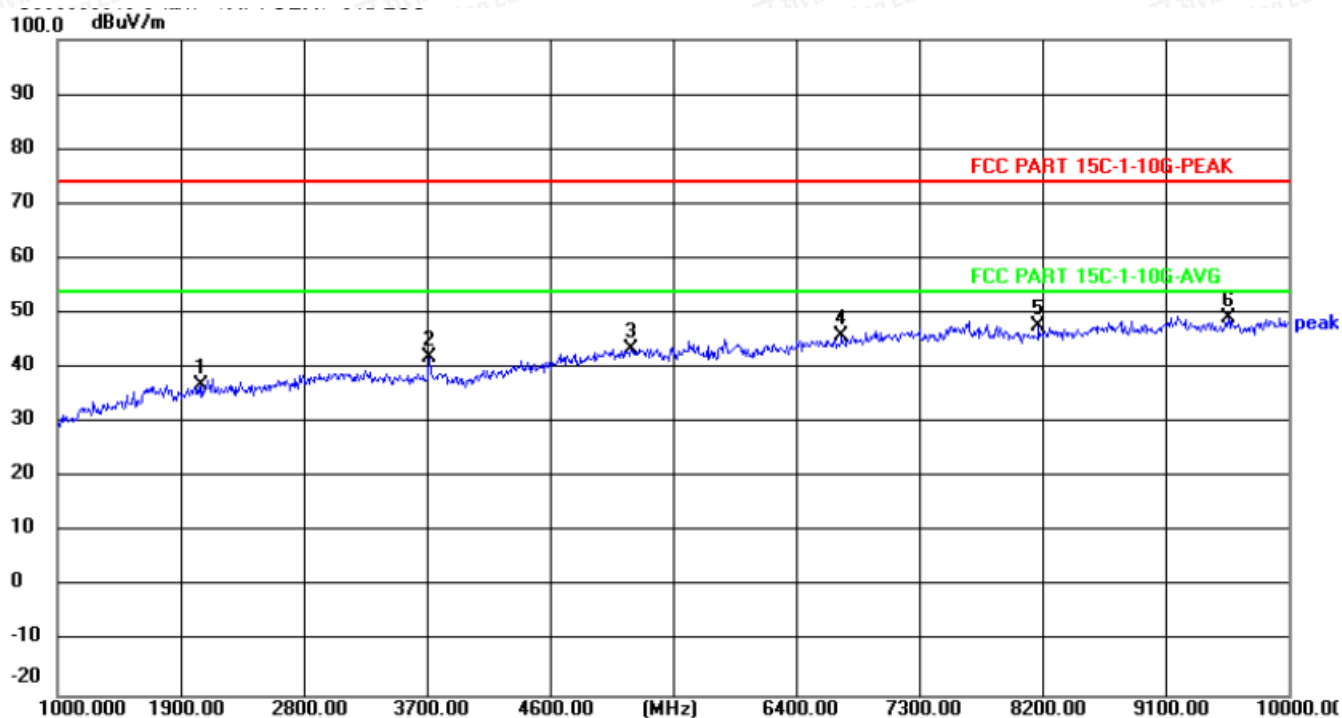
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g-10M 923MHz

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	2053.000	49.88	-12.91	36.97	74.00	-37.03	peak	P
2	3718.000	51.08	-9.03	42.05	74.00	-31.95	peak	P
3	5194.000	47.29	-3.76	43.53	74.00	-30.47	peak	P
4	6733.000	46.67	-0.87	45.80	74.00	-28.20	peak	P
5	8173.000	46.54	1.05	47.59	74.00	-26.41	peak	P
6	9559.000	46.38	2.82	49.20	74.00	-24.80	peak	P



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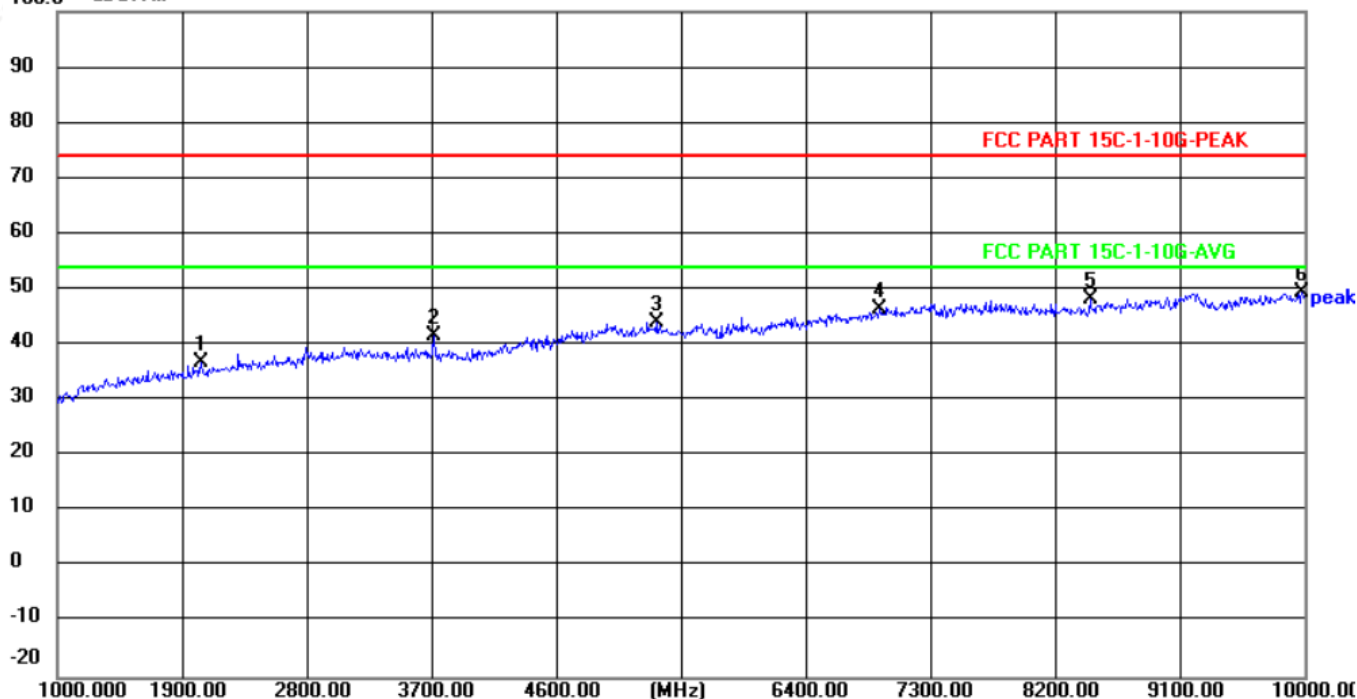
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Horizontal

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	2035.000	49.84	-12.98	36.86	74.00	-37.14	peak	P
2	3718.000	50.73	-9.03	41.70	74.00	-32.30	peak	P
3	5320.000	47.51	-3.53	43.98	74.00	-30.02	peak	P
4	6931.000	46.68	-0.37	46.31	74.00	-27.69	peak	P
5	8452.000	46.97	1.22	48.19	74.00	-25.81	peak	P
6	9982.000	45.94	3.52	49.46	74.00	-24.54	peak	P



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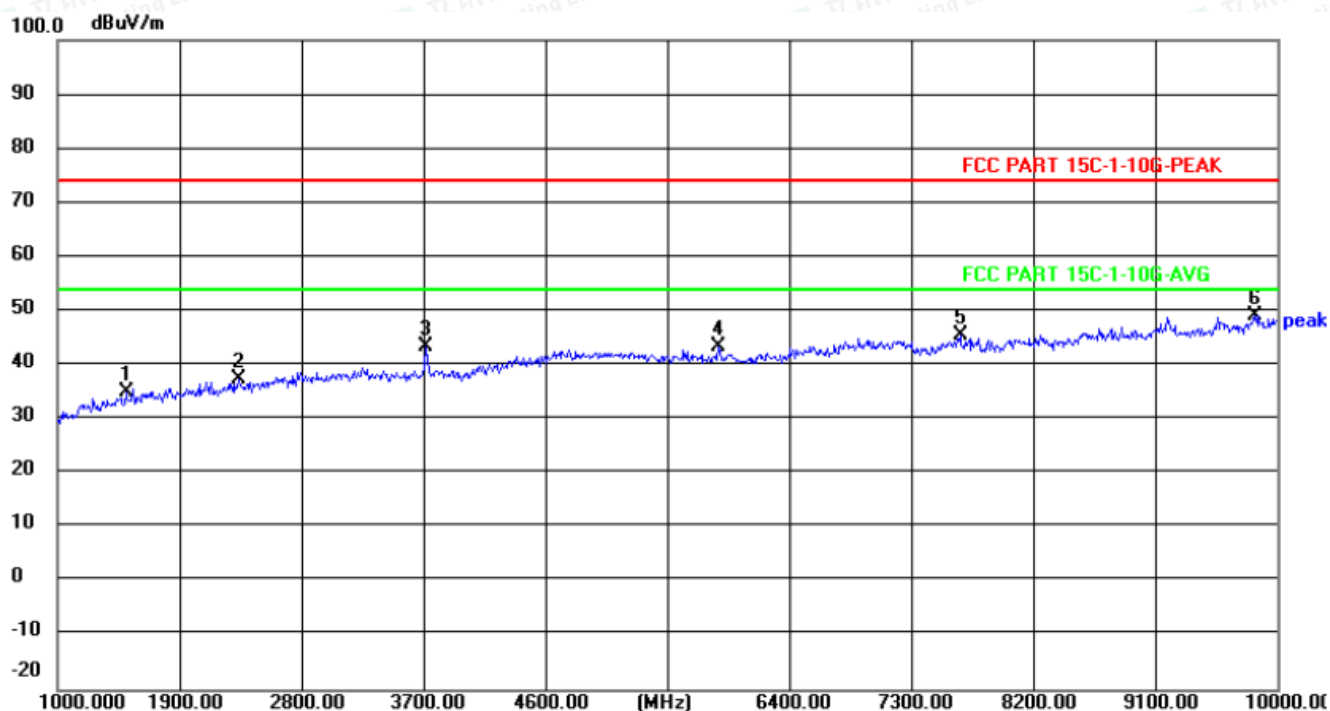
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n-10M 907MHz

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	1504.000	49.89	-14.92	34.97	74.00	-39.03	peak	P
2	2332.000	49.33	-11.93	37.40	74.00	-36.60	peak	P
3	3718.000	52.58	-9.03	43.55	74.00	-30.45	peak	P
4	5878.000	46.92	-3.57	43.35	74.00	-30.65	peak	P
5	7660.000	44.72	0.71	45.43	74.00	-28.57	peak	P
6	9838.000	45.97	3.29	49.26	74.00	-24.74	peak	P



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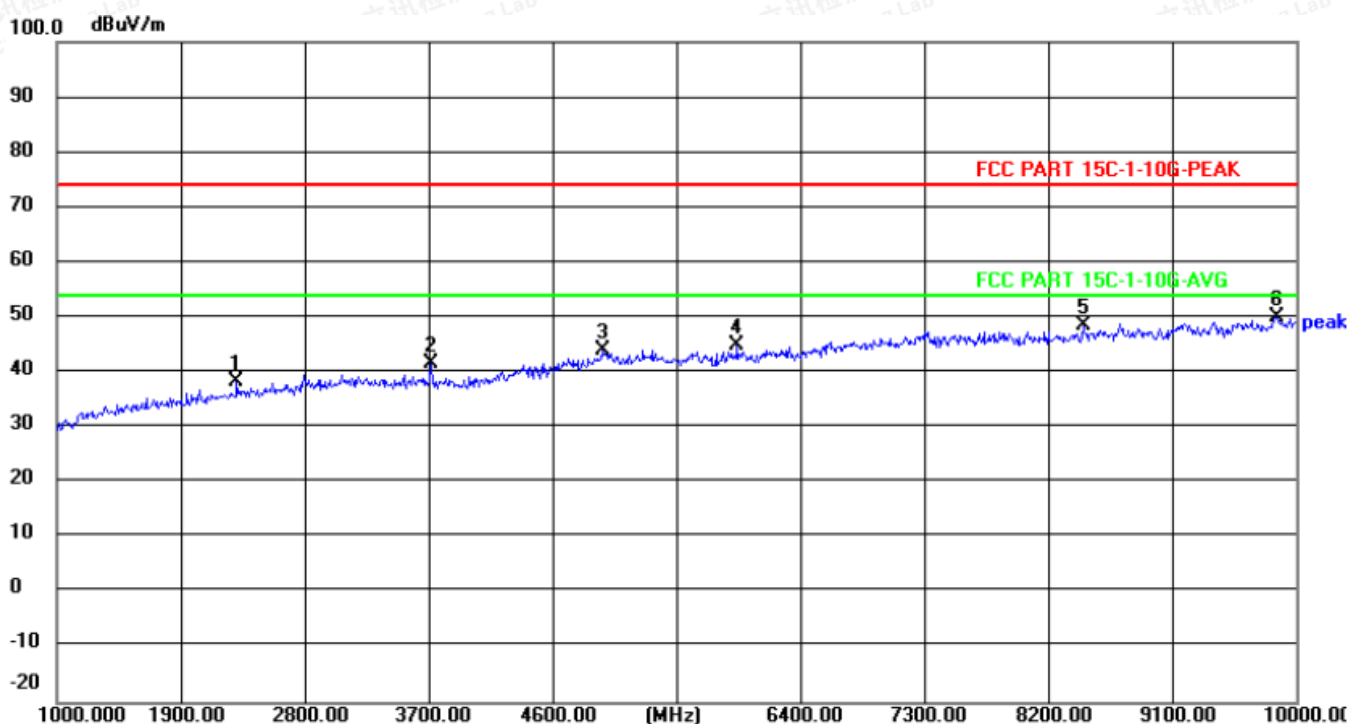
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Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	2305.000	50.43	-12.03	38.40	74.00	-35.60	peak	P
2	3718.000	50.73	-9.03	41.70	74.00	-32.30	peak	P
3	4960.000	48.42	-4.32	44.10	74.00	-29.90	peak	P
4	5941.000	48.52	-3.64	44.88	74.00	-29.12	peak	P
5	8452.000	47.47	1.22	48.69	74.00	-25.31	peak	P
6	9856.000	46.86	3.31	50.17	74.00	-23.83	peak	P



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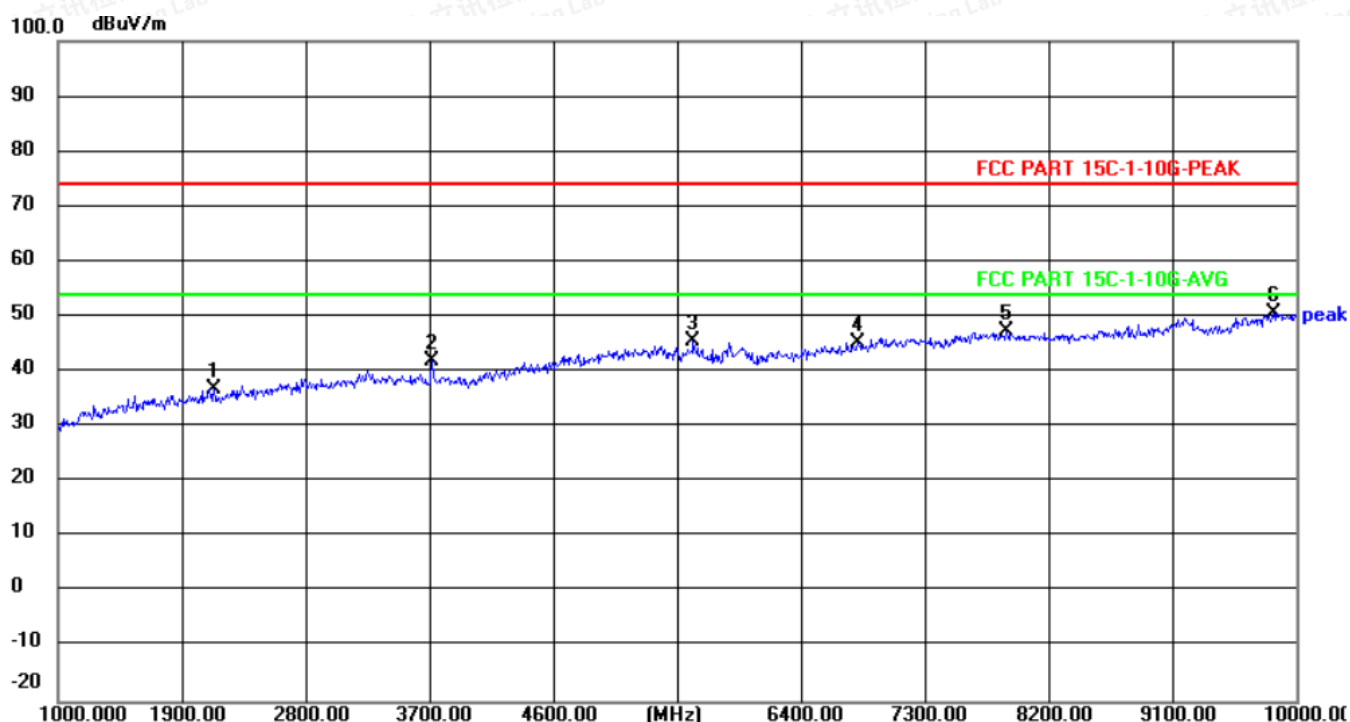
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n-10M 915MHz

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	2134.000	49.53	-12.63	36.90	74.00	-37.10	peak	P
2	3718.000	51.08	-9.03	42.05	74.00	-31.95	peak	P
3	5617.000	48.81	-3.32	45.49	74.00	-28.51	peak	P
4	6814.000	46.06	-0.67	45.39	74.00	-28.61	peak	P
5	7894.000	46.41	0.83	47.24	74.00	-26.76	peak	P
6	9838.000	47.47	3.29	50.76	74.00	-23.24	peak	P



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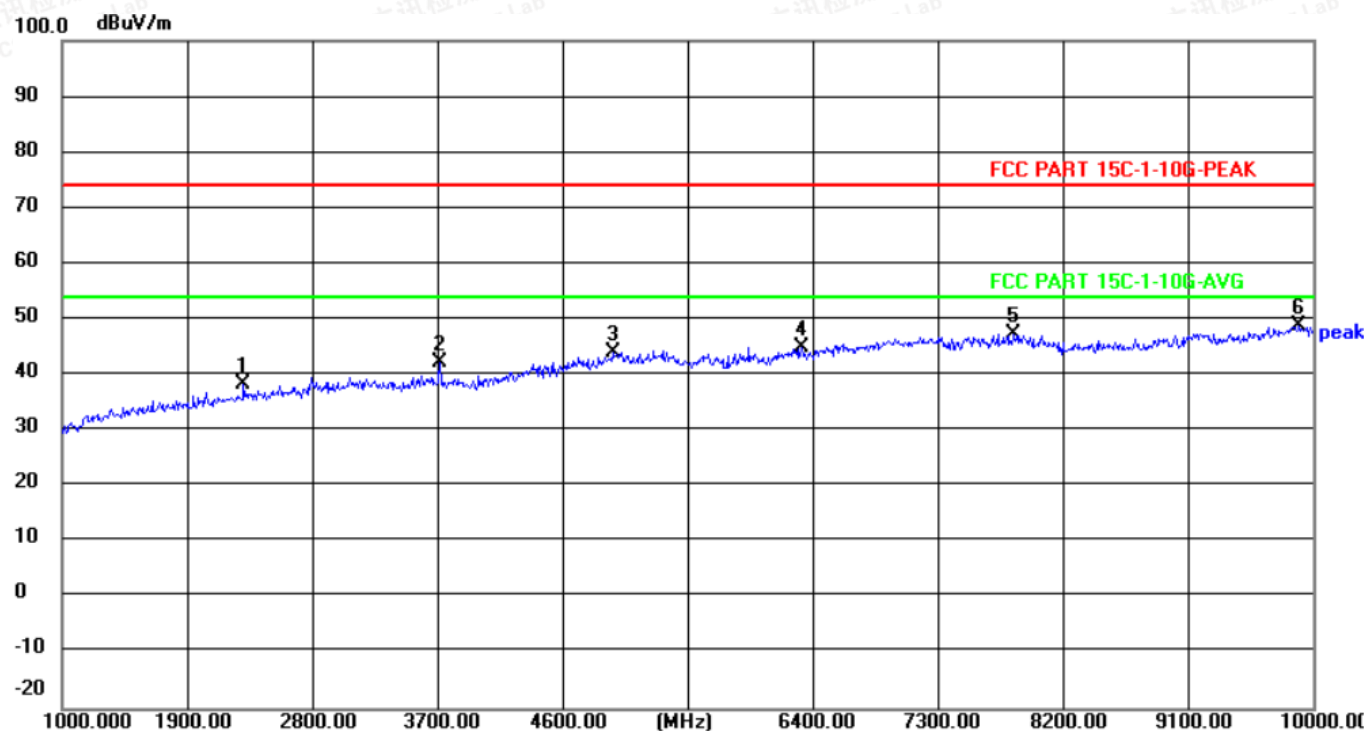
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Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	2305.000	50.43	-12.03	38.40	74.00	-35.60	peak	P
2	3718.000	51.23	-9.03	42.20	74.00	-31.80	peak	P
3	4960.000	48.42	-4.32	44.10	74.00	-29.90	peak	P
4	6319.000	47.26	-2.26	45.00	74.00	-29.00	peak	P
5	7849.000	46.53	0.67	47.20	74.00	-26.80	peak	P
6	9901.000	45.36	3.38	48.74	74.00	-25.26	peak	P



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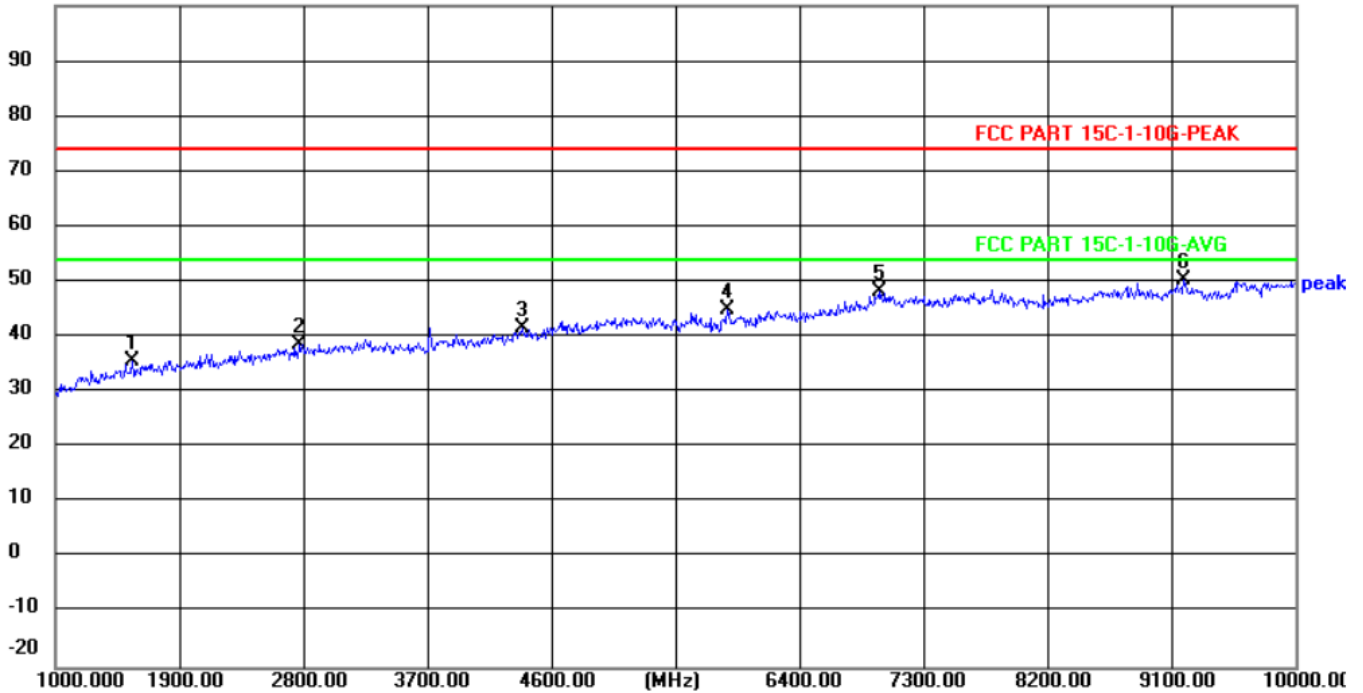
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n-10M 923MHz

Vertical

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	1558.000	50.46	-14.75	35.71	74.00	-38.29	peak	P
2	2773.000	49.08	-10.39	38.69	74.00	-35.31	peak	P
3	4393.000	48.72	-7.00	41.72	74.00	-32.28	peak	P
4	5878.000	48.42	-3.57	44.85	74.00	-29.15	peak	P
5	6976.000	48.37	-0.26	48.11	74.00	-25.89	peak	P
6	9190.000	48.18	2.21	50.39	74.00	-23.61	peak	P



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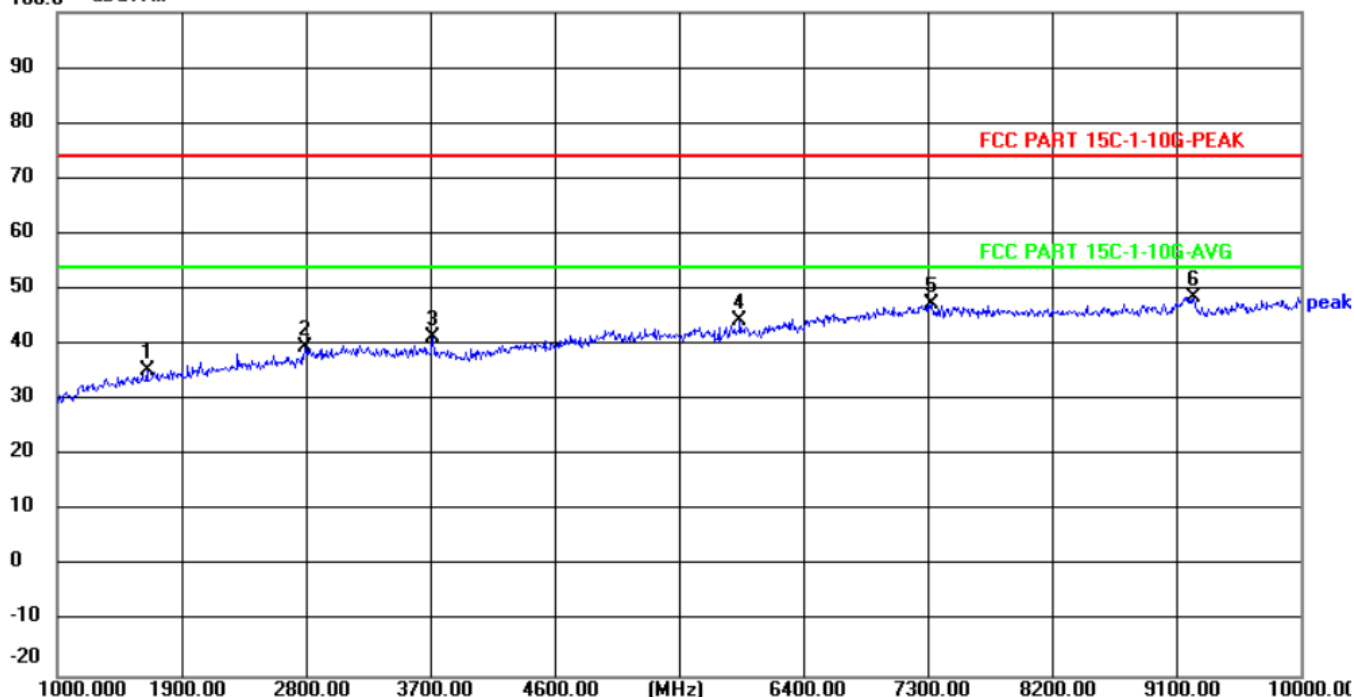
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Horizontal

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	1648.000	49.88	-14.49	35.39	74.00	-38.61	peak	P
2	2791.000	49.94	-10.32	39.62	74.00	-34.38	peak	P
3	3718.000	50.23	-9.03	41.20	74.00	-32.80	peak	P
4	5941.000	48.02	-3.64	44.38	74.00	-29.62	peak	P
5	7327.000	47.00	0.35	47.35	74.00	-26.65	peak	P
6	9226.000	46.27	2.27	48.54	74.00	-25.46	peak	P

Notes:

1. Worst case data at 6Mbps at g mode; 6.5Mbps at n mode HT10,
2. Measured Level = Reading Level + Factor, Margin = Level – Limit,
Factor = Antenna Factor + Cable Loss - Preamp Factor



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5.3. Maximum Peak Conducted Output Power Measurement

5.3.1. Standard Applicable

According to §15.247(b): For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz band, the limit for maximum peak conducted output power is 30dBm. The limit has to be reduced by the amount in dB that the gain of the antenna exceeds 6dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi without any corresponding reduction in transmitter peak output power.

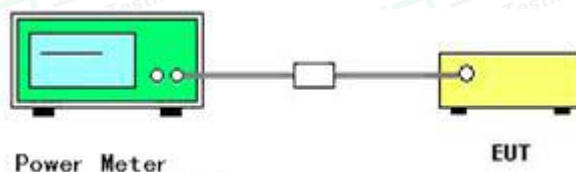
5.3.2. Measuring Instruments and Setting

Please refer to equipment's list in this report. The following table is the setting of the power meter.

5.3.3. Test Procedures

According to KDB558074 D01 15.247 Meas Guidance v05r02 Section 9.1 Maximum peak conducted output power, 9.1.3 the maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

5.3.4. Test Setup Layout



5.3.5. EUT Operation during Test

- 1) The EUT is configured to transmit continuously.
- 2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
- 3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.



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5.3.6. Test Result of Maximum Peak Conducted Output Power

Limits

Mode	Antenna 0 Gain (dBi)	FCC Power Limit (dBm)
g	2.0	30
n	2.0	30

PASS

Please refer to Appendix B.3

Remark:

1). Measured output power at difference data rate for each mode and recorded worst case for each mode.

2). Test results including cable loss;

3). For power measurements on devices;

Array Gain = 0 dB (i.e., no array gain) for $NANT \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any NANT;

Array Gain = $5 \log (NANT/NSS)$ dB or 3 dB, whichever is less, for 20-MHz channel widths with $NANT \geq 5$.





5.4. Power Spectral Density Measurement

5.4.1. Standard Applicable

According to §15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

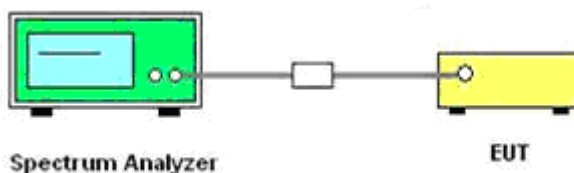
5.4.2. Measuring Instruments and Setting

Please refer to equipment's list in this report. The following table is the setting of Spectrum Analyzer.

5.4.3. Test Procedures

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.
3. Set the RBW = 3 kHz.
4. Set the VBW $\geq 3 \times$ RBW
5. Set the span to 1.5 times the DTS channel bandwidth.
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum power level.
11. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
12. The resulting peak PSD level shall not be greater than 8dBm in any 3 kHz.

5.4.4. Test Setup Layout



5.4.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.





5.4.6. Test Result of Power Spectral Density

PASS

Please refer to Appendix B.4

Remark:

1). Measured power spectrum density at difference data rate for each mode and recorded worst case for each mode.

2). Test results including cable loss;

3). The PSD limits of g mode and n mode for MIMO with CDD technology should be reduce ($10 \cdot \log(2) = 3.01\text{dBi}$) according to KDB662911D01;

4). For MIMO with CCD technology device, The Directional Gain= Gain of individual transmit antennas (dBi) + Array gain;

Array gain = $10 \log(N_{\text{ant}})$, where N_{ant} is the number of transmit antennas



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