

CFR 47 FCC PART 15 SUBPART C
CERTIFICATION TEST REPORT

For

Module

MODEL NUMBER: VT-MOB-AH-L

FCC ID: 2BEA6MOB-AH-L

REPORT NUMBER: 4791234678-2-RF-1

ISSUE DATE: May 13, 2024

Prepared for

Vantron Technology, Inc
48434 Milmont Drive Fremont California 94538-7324 United States
Prepared by

UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch

Building 10, Innovation Technology Park, No. 1, Li Bin Road, Song Shan Lake Hi-Tech Development Zone Dongguan, 523808, People's Republic of China

Tel: +86 769 22038881

Fax: +86 769 33244054

Website: www.ul.com



Revision History

Rev.	Issue Date	Revisions	Revised By
V0	May 13, 2024	Initial Issue	



Summary of Test Results			
Clause	Test Items	FCC/ISED Rules	Test Results
1	6dB Bandwidth and 99% Occupied Bandwidth	FCC Part 15.247 (a) (2)	Pass
2	Peak Conducted Output Power	FCC Part 15.247 (b) (3)	Pass
3	Power Spectral Density	FCC Part 15.247 (e)	Pass
4	Conducted Bandedge and Spurious Emission	FCC Part 15.247 (d)	Pass
5	Radiated Bandedge and Spurious Emission	FCC Part 15.247 (d) FCC Part 15.209 FCC Part 15.205	Pass
6	AC Power Line Conducted Emission	FCC Part 15.207	Pass
7	Antenna Requirement	FCC Part 15.203	Pass
Note: 1.This test report is only published to and used by the applicant, and it is not for evidence purpose in China. 2. The measurement result for the sample received is <Pass> according to < CFR 47 FCC PART 15 SUBPART C >when <Accuracy Method> decision rule is applied.			



TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	6
2. TEST METHODOLOGY	7
3. FACILITIES AND ACCREDITATION	7
4. CALIBRATION AND UNCERTAINTY	8
4.1. MEASURING INSTRUMENT CALIBRATION	8
4.2. MEASUREMENT UNCERTAINTY.....	8
5. EQUIPMENT UNDER TEST	9
5.1. DESCRIPTION OF EUT	9
5.2. CHANNEL LIST.....	10
5.3. MAXIMUM OUTPUT POWER	11
5.4. TEST CHANNEL CONFIGURATION.....	11
5.5. THE WORSE CASE POWER SETTING PARAMETER.....	11
5.6. WORST-CASE CONFIGURATIONS	12
5.7. DESCRIPTION OF AVAILABLE ANTENNAS.....	13
5.8. DESCRIPTION OF TEST SETUP	14
6. MEASURING INSTRUMENT AND SOFTWARE USED	15
7. ANTENNA PORT TEST RESULTS.....	18
7.1. ON TIME AND DUTY CYCLE.....	18
7.2. 6 dB DTS BANDWIDTH AND 99 % OCCUPIED BANDWIDTH	19
7.3. CONDUCTED OUTPUT POWER.....	21
7.4. POWER SPECTRAL DENSITY.....	23
7.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS	25
8. RADIATED TEST RESULTS.....	27
8.1. SPURIOUS EMISSIONS (1 GHz ~ 10 GHz).....	33
8.1.1. 802.11ah 1M Mode	33
8.1.2. 802.11ah 2M Mode	39
8.1.3. 802.11ah 4M Mode	45
8.1.4. 802.11ah 8M Mode	51
8.2. SPURIOUS EMISSIONS (30 MHz ~ 1 GHz).....	55
8.2.1. 802.11ah 1M Mode	55
8.3. SPURIOUS EMISSIONS BELOW 30 MHz	57
8.3.1. 80.211ah 1M Mode	57
9. AC POWER LINE CONDUCTED EMISSION	60
10. ANTENNA REQUIREMENTS	64



11. Appendix.....	65
11.1. Appendix A: DTS Bandwidth.....	65
11.1.1. Test Result.....	65
11.1.2. Test Graphs	66
11.2. Appendix B: Occupied Channel Bandwidth.....	70
11.2.1. Test Result.....	70
11.2.2. Test Graphs	71
11.3. Appendix C: Maximum conducted output power	75
11.3.1. Test Result.....	75
11.4. Appendix D: Maximum power spectral density.....	76
11.4.1. Test Result.....	76
11.4.2. Test Graphs	77
11.5. Appendix E: Band edge measurements.....	81
11.5.1. Test Result.....	81
11.5.2. Test Graphs	82
11.6. Appendix F: Conducted Spurious Emission	85
11.6.1. Test Result.....	85
11.6.2. Test Graphs	86
11.7. Appendix G: Duty Cycle.....	97
11.7.1. Test Result.....	97
11.7.2. Test Graphs	98



1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: Vantron Technology, Inc
Address: 48434 Milmont Drive Fremont California 94538-7324 United States

Manufacturer Information

Company Name: Vantron Technology, Inc
Address: 48434 Milmont Drive Fremont California 94538-7324 United States

EUT Information

EUT Name: Module
Model: VT-MOB-AH-L
Sample Received Date: March 15, 2024
Sample Status: Normal
Sample ID: 7019037
Date of Tested: March 15, 2024 to May 13, 2024

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 FCC PART 15 SUBPART C	PASS

Prepared By:

Fanny Huang

Engineer Project Associate

Checked By:

Denny Huang

Senior Project Engineer

Approved By:

Stephen Guo

Operations Manager



2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with KDB 558074 D01 15.247 Meas Guidance v05r02, 414788 D01 Radiated Test Site v01r01, CFR 47 FCC Part 2, CFR 47 FCC Part 15, ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	A2LA (Certificate No.: 4102.01) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA. FCC (FCC Designation No.: CN1187) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules ISED (Company No.: 21320) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320 and the test lab Conformity Assessment Body Identifier (CABID) is CN0046. VCCI (Registration No.: G-20192, C-20153, T-20155 and R-20202) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20192 and R-20202 Shielding Room B, the VCCI registration No. is C-20153 and T-20155
---------------------------	--

Note 1: All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China

Note 2: The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

Note 3: For below 30 MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30 MHz had been correlated to measurements performed on an OFS.



4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognize national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Conduction emission	3.62 dB
Radiated Emission (Included Fundamental Emission) (9 kHz ~ 30 MHz)	2.2 dB
Radiated Emission (Included Fundamental Emission) (30 MHz ~ 1 GHz)	4.00 dB
Radiated Emission (Included Fundamental Emission) (1 GHz to 26 GHz)	5.78 dB (1 GHz ~ 18 GHz)
	5.23 dB (18 GHz ~ 26 GHz)
Duty Cycle	±0.028%
DTS and 99% Occupied Bandwidth	±0.0196%
Maximum Conducted Output Power	±0.686 dB
Maximum Power Spectral Density Level	±0.743 dB
Conducted Band-edge Compliance	±1.328 dB
Conducted Unwanted Emissions In Non-restricted Frequency Bands	±0.746 dB (9 kHz ~ 1 GHz)
	±1.328dB (1 GHz ~ 26 GHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	



5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name	Module
Model	VT-MOB-AH-L
Transmit Frequency Range	902 MHz ~ 928 MHz
Modulation	BPSK & QPSK, 16-QAM & 64-QAM
Radio Technology	802.11ah (1M channel bandwidth) 802.11ah (2M channel bandwidth) 802.11ah (4M channel bandwidth) 802.11ah (8M channel bandwidth)
Data Rates:	802.11ah (1M channel bandwidth): MCS0~MCS7, MCS10 802.11ah (2M channel bandwidth): MCS0~MCS7 802.11ah (4M channel bandwidth): MCS0~MCS7 802.11ah (8M channel bandwidth): MCS0~MCS7
Normal Test Voltage	DC 3.3 V



5.2. CHANNEL LIST

802.11ah (1M channel bandwidth)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	903.5	15	909.5	27	915.5	39	921.5
5	904.5	17	910.5	29	916.5	41	922.5
7	905.5	19	911.5	31	917.5	43	923.5
9	906.5	21	912.5	33	918.5	45	924.5
11	907.5	23	913.5	35	919.5	47	925.5
13	908.5	25	914.5	37	920.5	49	926.5

802.11ah (2M channel bandwidth)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
6	905	18	911	30	917	42	923
10	907	22	913	34	919	46	925
14	909	26	915	38	921	/	/

802.11ah (4M channel bandwidth)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
8	906	24	914	40	922	/	/
16	910	32	918	/	/	/	/

802.11ah (8M channel bandwidth)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
12	908	28	916	/	/	/	/

5.3. MAXIMUM OUTPUT POWER

Test Mode	Frequency (MHz)	Channel Number	Maximum AVG Output Power (dBm)	Maximum Peak Output Power (dBm)
802.11ah 1M	902 - 928	24	20.73	27.68
802.11ah 2M	902 - 928	11	20.61	27.67
802.11ah 4M	902 - 928	5	20.97	27.76
802.11ah 8M	902 - 928	2	20.49	27.63

5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
802.11ah 1M	CH 3(Low Channel), CH 25(Mid Channel), CH 49(High Channel)	903.5 MHz, 914.5 MHz, 926.5 MHz
802.11ah 2M	CH 6(Low Channel), CH 26(Mid Channel), CH 46(High Channel)	905 MHz, 915 MHz, 925 MHz
802.11ah 4M	CH 8(Low Channel), CH 24(Mid Channel), CH 40(High Channel)	906 MHz, 914 MHz, 922 MHz
802.11ah 8M	CH 12(Low Channel), CH 28(High Channel)	908 MHz, 916 MHz,

5.5. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter				
Test Software Version		Putty		
Test Mode	Transmit Antenna Number	Test Software Setting Value		
		LCH	MCH	HCH
802.11ah 1M	1	default	default	default
802.11ah 2M	1	default	default	default
802.11ah 4M	1	default	default	default
802.11ah 8M	1	default	/	default



5.6. WORST-CASE CONFIGURATIONS

The EUT was tested in the following configuration(s):

Controlled in test mode using a software application on the EUT supplied by customer. The application was used to enable a continuous transmission and to select the mode, test channels, bandwidth, data rates as required.

Test channels referring to section 5.4.

Maximum power setting referring to section 5.5.

Worst-case data rates as provided by the client were:

802.11ah (1M channel bandwidth): MCS0
802.11ah (2M channel bandwidth): MCS0
802.11ah (4M channel bandwidth): MCS0
802.11ah (8M channel bandwidth): MCS0

The measured additional path loss was included in any path loss calculations for all RF cable used during tested.



5.7. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna	Frequency (MHz)	Antenna Type	MAX Antenna Gain (dBi)
1	902 - 928	glue stick antenna	2.0

Test Mode	Transmit and Receive Mode	Description
802.11ah 1M	☒ 1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.
802.11ah 2M	☒ 1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.
802.11ah 4M	☒ 1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.
802.11ah 8M	☒ 1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.

Note: 1. The value of the antenna gain was declared by customer.

5.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Remark
1	PC	Lenovo	E42-80	/
2	AC Adapter	/	SAW12-120-1000UD	Input: AC 100-240V, 50/60Hz, 0.3A Output: DC 12V,1000mA

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	/	/	1.0	/

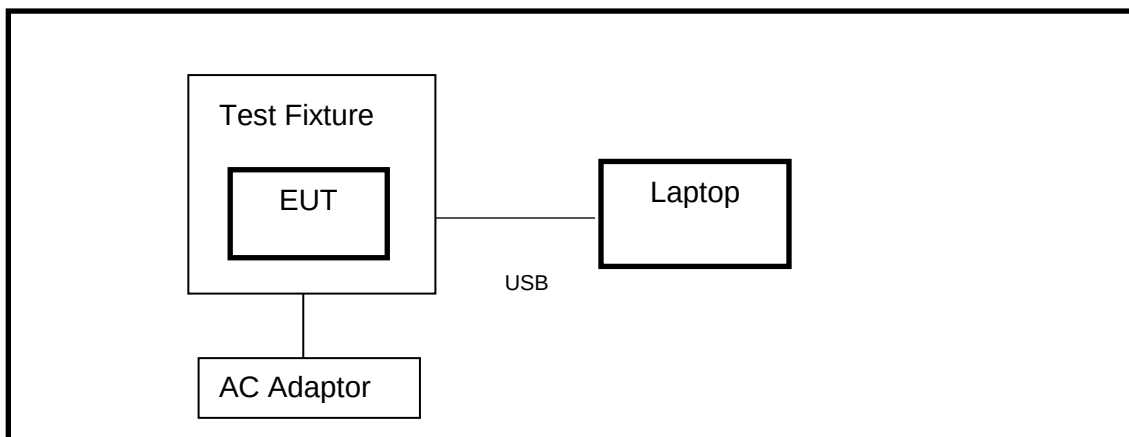
ACCESSORIES

Item	Accessory	Brand Name	Model Name	Description
/	/	/	/	/

TEST SETUP

The EUT can work in engineering mode with a software through a Laptop.

SETUP DIAGRAM FOR TESTS



**6. MEASURING INSTRUMENT AND SOFTWARE USED**

R&S TS 8997 Test System						
Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Due. Date
Power sensor, Power Meter	R&S	OSP120	100921	Mar.31,2023	Mar.25,2024	Mar.24,2025
Vector Signal Generator	R&S	SMBV100A	261637	/	Oct.12, 2023	Oct.11, 2024
Signal Generator	R&S	SMB100A	178553	/	Oct.12, 2023	Oct.11, 2024
Signal Analyzer	R&S	FSV40	101118	/	Oct.12, 2023	Oct.11, 2024
Software						
Description	Manufacturer		Name	Version		
For R&S TS 8997 Test System	Rohde & Schwarz		EMC 32	10.60.10		
Tonsend RF Test System						
Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Due. Date
Wideband Radio Communication Tester	R&S	CMW500	155523	/	Oct.12, 2023	Oct.11, 2024
Wireless Connectivity Tester	R&S	CMW270	1201.0002N75-102	/	Sep.25, 2023	Sep.24, 2024
PXA Signal Analyzer	Keysight	N9030A	MY55410512	/	Oct.12, 2023	Oct.11, 2024
MXG Vector Signal Generator	Keysight	N5182B	MY56200284	/	Oct.12, 2023	Oct.11, 2024
MXG Vector Signal Generator	Keysight	N5172B	MY56200301	/	Oct.12, 2023	Oct.11, 2024
DC power supply	Keysight	E3642A	MY55159130	/	Oct.12, 2023	Oct.11, 2024
Temperature & Humidity Chamber	SANMOOD	SG-80-CC-2	2088	/	Oct.12, 2023	Oct.11, 2024
Attenuator	Aglient	8495B	2814a12853	/	Oct.12, 2023	Oct.11, 2024
RF Control Unit	Tonscend	JS0806-2	23B80620666	April 18, 2023	March 25, 2024	March 24, 2025
Software						
Description	Manufacturer	Name			Version	
Tonsend SRD Test System	Tonsend	JS1120-3 RF Test System			V3.2.22	



Conducted Emissions					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
EMI Test Receiver	R&S	ESR3	101961	Oct.13, 2023	Oct.12, 2024
Two-Line V-Network	R&S	ENV216	101983	Oct.13, 2023	Oct.12, 2024
Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Oct.13, 2023	Oct.12, 2024
Software					
Description			Manufacturer	Name	Version
Test Software for Conducted Emissions			Farad	EZ-EMC	Ver. UL-3A1

Radiated Emissions					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Oct.12, 2023	Oct.11, 2024
Hybrid Log Periodic Antenna	TDK	HLP-3003C	130959	Aug.02, 2021	Aug.01, 2024
Preamplifier	HP	8447D	2944A09099	Oct.12, 2023	Oct.11, 2024
EMI Measurement Receiver	R&S	ESR26	101377	Oct.12, 2023	Oct.11, 2024
Horn Antenna	TDK	HRN-0118	130940	July 20, 2021	July 19, 2024
Preamplifier	TDK	PA-02-0118	TRS-305-00067	Oct.12, 2023	Oct.11, 2024
Horn Antenna	Schwarzbeck	BBHA9170	697	July 20, 2021	July 19, 2024
Preamplifier	TDK	PA-02-2	TRS-307-00003	Oct.12, 2023	Oct.11, 2024
Preamplifier	TDK	PA-02-3	TRS-308-00002	Oct.12, 2023	Oct.11, 2024
Loop antenna	Schwarzbeck	1519B	00008	Dec.14, 2021	Dec.13, 2024
Preamplifier	TDK	PA-02-001-3000	TRS-302-00050	Oct.12, 2023	Oct.11, 2024
Notch Filter	Wainwright	WHJ10-882-980-7000-40SS	1	Oct.12, 2023	Oct.11, 2024
Highpass Filter	Xingbo	XBLBQ-GTA68	211115-2-1	Oct.12, 2023	Oct.11, 2024
Software					
Description			Manufacturer	Name	Version
Test Software for Radiated Emissions			Farad	EZ-EMC	Ver. UL-3A1



Other Instrument					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
Temperature humidity probe	OMEGA	ITHX-SD-5	18470007	Oct.21, 2023	Oct.20, 2024
Barometer	Yiyi	Baro	N/A	Oct.19, 2023	Oct.18, 2024
Attenuator	Agilent	8495B	2814a12853	Oct.12, 2023	Oct.11, 2024



7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

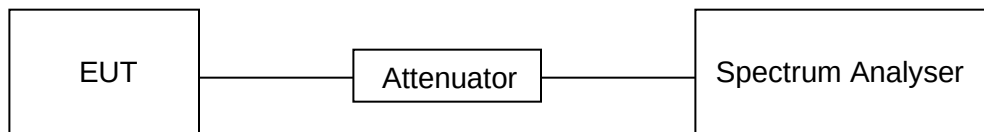
LIMITS

None; for reporting purposes only.

PROCEDURE

Refer to ANSI C63.10-2013 clause 11.6 Zero – Span Spectrum Analyzer method.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8 °C	Relative Humidity	56 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.3 V

TEST DATE / ENGINEER

Test Date	April 8, 2024	Test By	Walker Yuan
-----------	---------------	---------	-------------

RESULTS

Please refer to appendix G.



7.2. 6 dB DTS BANDWIDTH AND 99 % OCCUPIED BANDWIDTH

LIMITS

CFR 47FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247(a)(2)	6 dB Bandwidth	≥ 500 kHz	902-928
ISED RSS-Gen Clause 6.7	99 % Occupied Bandwidth	None; for reporting purposes only.	902-928

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 11.8 for DTS bandwidth and clause 6.9 for Occupied Bandwidth.

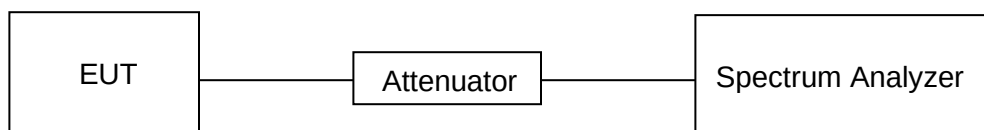
Connect the EUT to the spectrum analyser and use the following settings:

Center Frequency	The center frequency of the channel under test
Frequency Span	For 6 dB Bandwidth: Enough to capture all products of the modulation carrier emission For 99 % Occupied Bandwidth: Between 1.5 times and 5.0 times the OBW
Detector	Peak
RBW	For 6 dB Bandwidth: 100 kHz For 99 % Occupied Bandwidth: 1 % to 5 % of the occupied bandwidth
VBW	For 6 dB Bandwidth: $\geq 3 \times$ RBW For 99 % Occupied Bandwidth: $\geq 3 \times$ RBW
Trace	Max hold
Sweep	Auto couple

a) Use the 99 % power bandwidth function of the instrument, allow the trace to stabilize and report the measured bandwidth.

b) Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

TEST SETUP



**TEST ENVIRONMENT**

Temperature	24.8 °C	Relative Humidity	56 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.3 V

TEST DATE / ENGINEER

Test Date	April 8, 2024	Test By	Walker Yuan
-----------	---------------	---------	-------------

RESULTS

Please refer to appendix A & B.



7.3. CONDUCTED OUTPUT POWER

LIMITS

CFR 47 FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247(b)(3)	AVG Output Power	1 watt or 30 dBm	902-928

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 11.9.2.3.1 and 11.9.1.3.

AVG power:

Connect the EUT to a low loss RF cable from the antenna port to the power sensor (video bandwidth is greater than the occupied bandwidth).

Measure peak emission level, the indicated level is the average output power, after any corrections for external attenuators and cables.

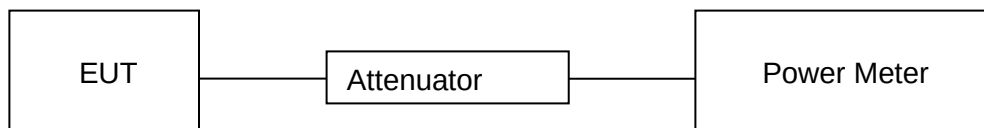
The test result in dBm by adding $[10 \log (1 / D)]$, where D is the duty cycle.

Peak power (For Reference):

Connect the EUT to a low loss RF cable from the antenna port to the power sensor (video bandwidth is greater than the occupied bandwidth).

Measure peak emission level, the indicated level is the peak output power, after any corrections for external attenuators and cables.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8 °C	Relative Humidity	56 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.3 V

TEST DATE / ENGINEER

Test Date	April 8, 2024	Test By	Walker Yuan
-----------	---------------	---------	-------------



RESULTS

Please refer to appendix C.



7.4. POWER SPECTRAL DENSITY

LIMITS

CFR 47 FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC §15.247 (e)	Power Spectral Density	Shall not be greater than 8 dBm in any 3 kHz band	902-928

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 11.10.5.

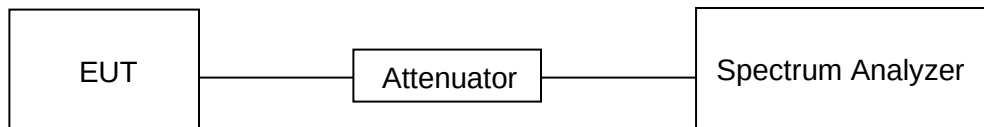
Connect the EUT to the spectrum analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	power averaging (rms)
RBW	$3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
VBW	$\geq 3 \times \text{RBW}$
Span	$\geq 1.5 \times \text{OBW bandwidth}$
Trace	Employ trace averaging(rms)mode over a minimum of 100 traces
Sweep time	Auto couple

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST SETUP





TEST ENVIRONMENT

Temperature	24.8 °C	Relative Humidity	56 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.3 V

TEST DATE / ENGINEER

Test Date	April 8, 2024	Test By	Walker Yuan
-----------	---------------	---------	-------------

RESULTS

Please refer to appendix D.



7.5. CONDUCTED BANDEGE AND SPURIOUS EMISSIONS

LIMITS

CFR 47 FCC Part15 (15.247) Subpart C		
Section	Test Item	Limit
CFR 47 FCC §15.247 (d)	Conducted Bandedge and Spurious Emissions	at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 11.11 and 11.13.

Connect the EUT to the spectrum analyser and use the following settings for reference level measurement:

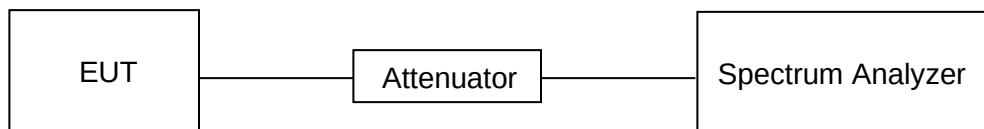
Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	100 kHz
VBW	$\geq 3 \times \text{RBW}$
Span	$1.5 \times \text{DTS bandwidth}$
Trace	Max hold
Sweep time	Auto couple.

Allow trace to fully stabilize and use the peak marker function to determine the maximum PSD level.

Change the settings for emission level measurement:

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100 kHz
VBW	$\geq 3 \times \text{RBW}$
measurement points	$\geq \text{span}/\text{RBW}$
Trace	Max hold
Sweep time	Auto couple.

Allow trace to fully stabilize and use the peak marker function to determine the maximum PSD level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11.

**TEST SETUP****TEST ENVIRONMENT**

Temperature	24.8 °C	Relative Humidity	56 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.3 V

TEST DATE / ENGINEER

Test Date	April 8, 2024	Test By	Walker Yuan
-----------	---------------	---------	-------------

RESULTS

Please refer to appendix E&F.



8. RADIATED TEST RESULTS

LIMITS

Please refer to CFR 47 FCC §15.205 and §15.209.

Radiation Disturbance Test Limit for FCC (Class B) (9 kHz-1 GHz)

Emissions radiated outside of the specified frequency bands above 30 MHz			
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m	
		Quasi-Peak	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	
Above 1000	500	Peak	Average
		74	54

FCC Emissions radiated outside of the specified frequency bands below 30 MHz		
Frequency (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



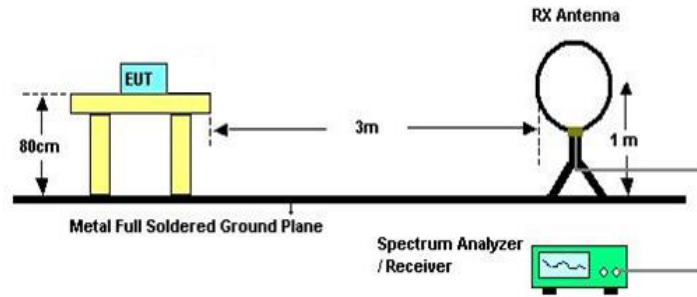
FCC Restricted bands of operation refer to FCC §15.205 (a):

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			

Note: ¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
²Above 38.6c

TEST SETUP AND PROCEDURE

Below 30 MHz

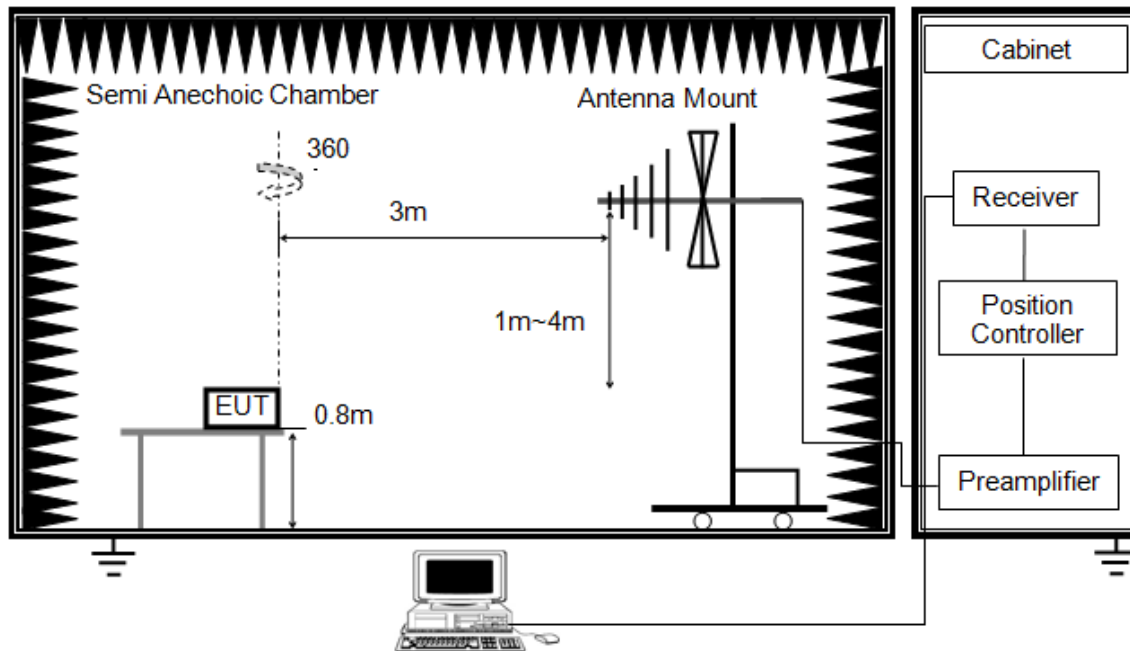


The setting of the spectrum analyser

RBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
VBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
Sweep	Auto
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.4.
2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80 cm above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1 m height antenna tower.
5. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
6. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak and average detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak and average detector and reported.
7. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KDB 414788.
8. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω . For example, the measurement frequency X KHz resulted in a level of Y dBuV/m, which is equivalent to $Y-51.5 = Z$ dBuA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

Below 1 GHz and above 30 MHz

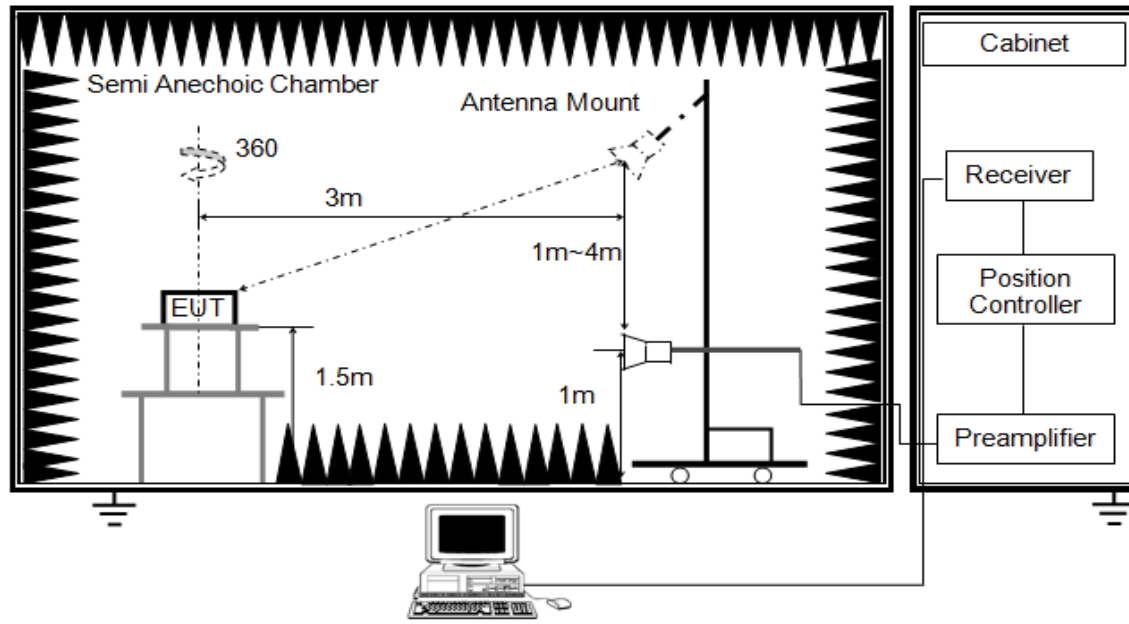


The setting of the spectrum analyser

RBW	120 kHz
VBW	300 kHz
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.5.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80 cm above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

Above 1GHz

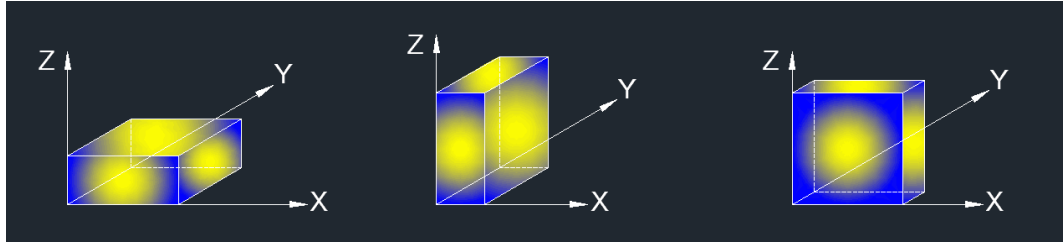


The setting of the spectrum analyser

RBW	1 MHz
VBW	PEAK: 3 MHz AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.6.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 1.5 m above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement above 1 GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.
6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 7.1.ON TIME AND DUTY CYCLE.

X axis, Y axis, Z axis positions:



Note 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

Note 2: For the radiated restricted bandedge, a pre-scan was performed, and the result was 20 dB lower than the limit line, the test data was not shown in the report.

TEST ENVIRONMENT

Temperature	24.6 °C	Relative Humidity	62 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.3 V

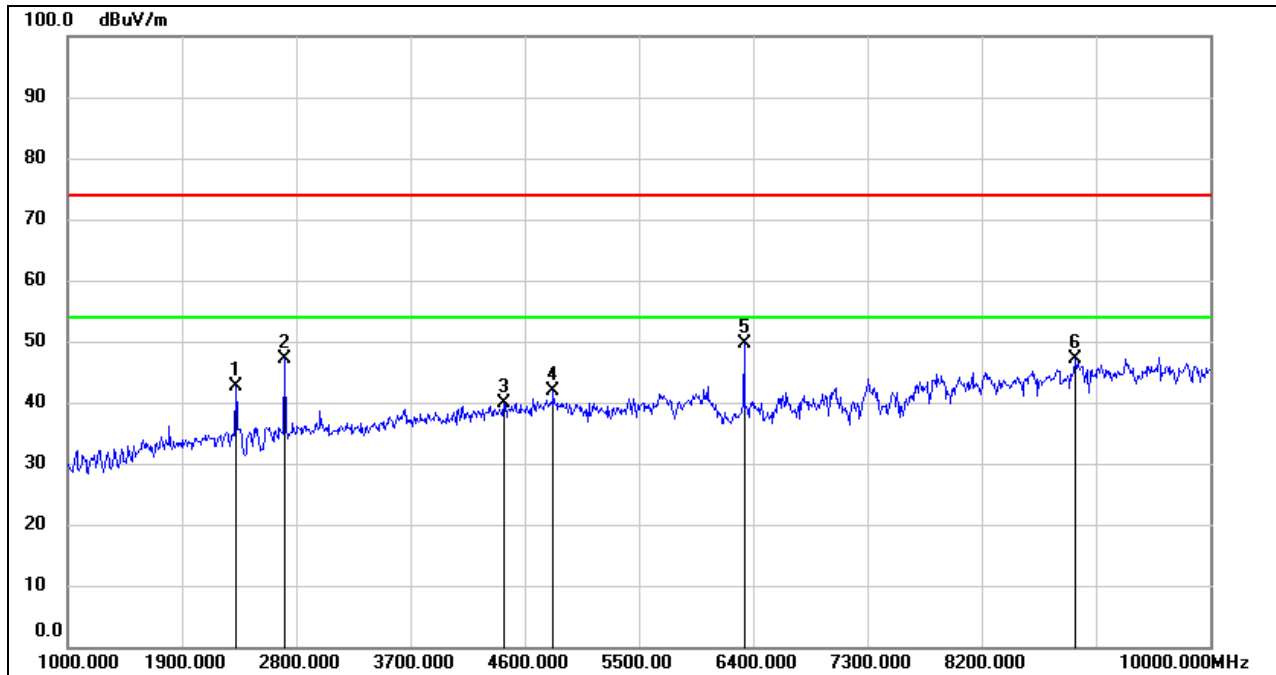
RESULTS



8.1. SPURIOUS EMISSIONS (1 GHz ~ 10 GHz)

8.1.1. 802.11ah 1M Mode

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



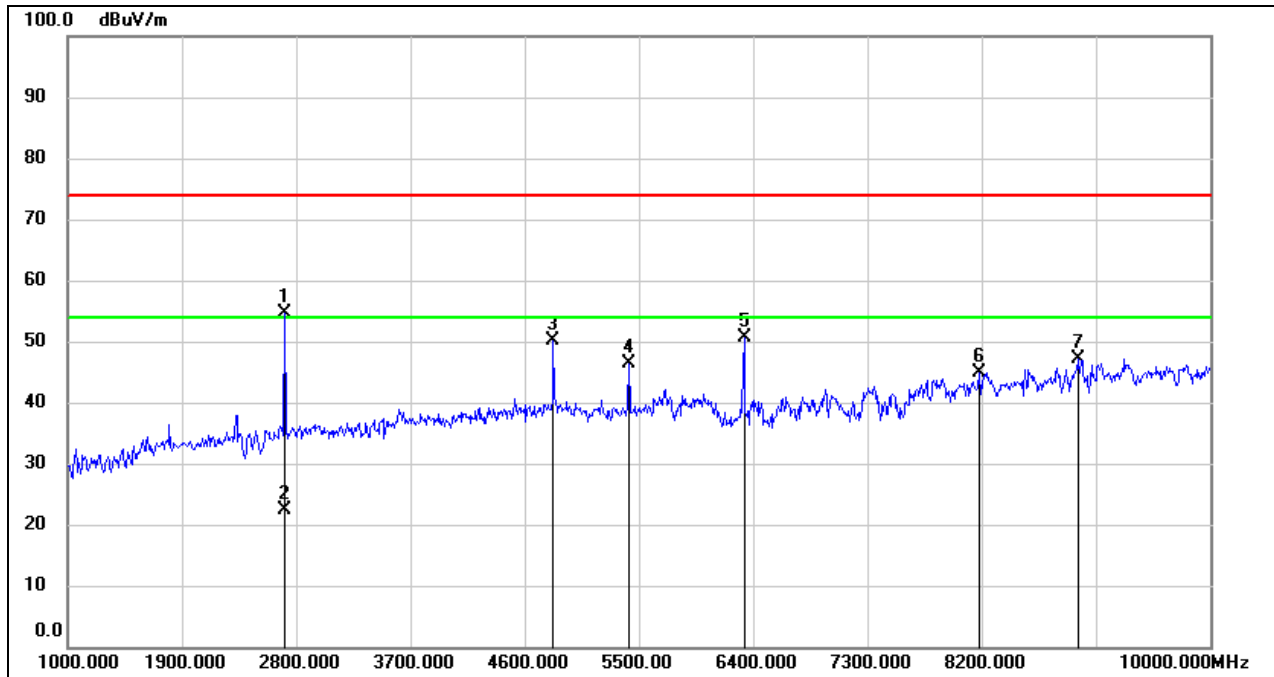
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2323.000	50.96	-8.36	42.60	74.00	-31.40	peak
2	2710.000	54.51	-7.37	47.14	74.00	-26.86	peak
3	4438.000	41.68	-1.75	39.93	74.00	-34.07	peak
4	4825.000	42.07	-0.10	41.97	74.00	-32.03	peak
5	6328.000	46.52	3.05	49.57	74.00	-24.43	peak
6	8938.000	37.55	9.64	47.19	74.00	-26.81	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

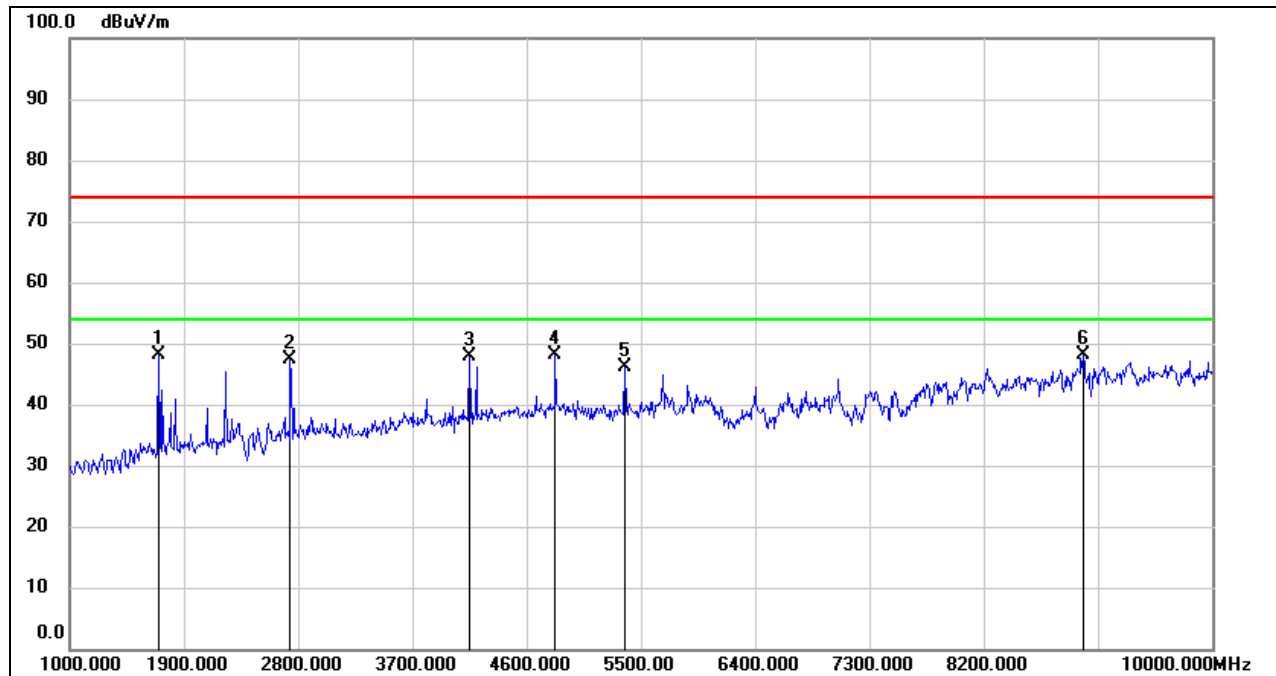
3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2710.000	62.01	-7.37	54.64	74.00	-19.36	peak
2	2710.000	29.87	-7.37	22.50	54.00	-31.50	AVG
3	4825.000	50.30	-0.10	50.20	74.00	-23.80	peak
4	5419.000	45.02	1.27	46.29	74.00	-27.71	peak
5	6328.000	47.54	3.05	50.59	74.00	-23.41	peak
6	8182.000	36.66	8.17	44.83	74.00	-29.17	peak
7	8956.000	37.19	9.85	47.04	74.00	-26.96	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton where: ton is transmit duration.
5. For transmit duration, please refer to clause 7.1.
6. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)**

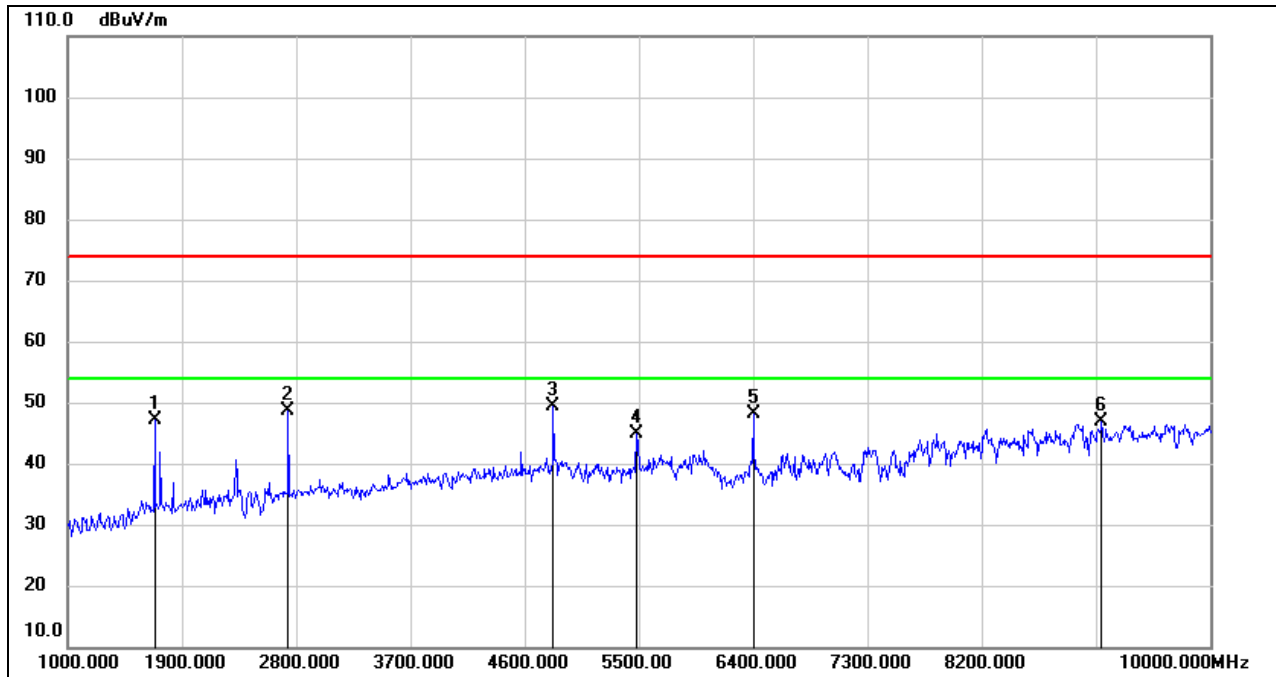
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1702.000	59.06	-10.99	48.07	74.00	-25.93	peak
2	2737.000	54.62	-7.23	47.39	74.00	-26.61	peak
3	4150.000	50.23	-2.47	47.76	74.00	-26.24	peak
4	4825.000	48.15	-0.10	48.05	74.00	-25.95	peak
5	5374.000	44.98	1.14	46.12	74.00	-27.88	peak
6	8983.000	37.95	10.17	48.12	74.00	-25.88	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

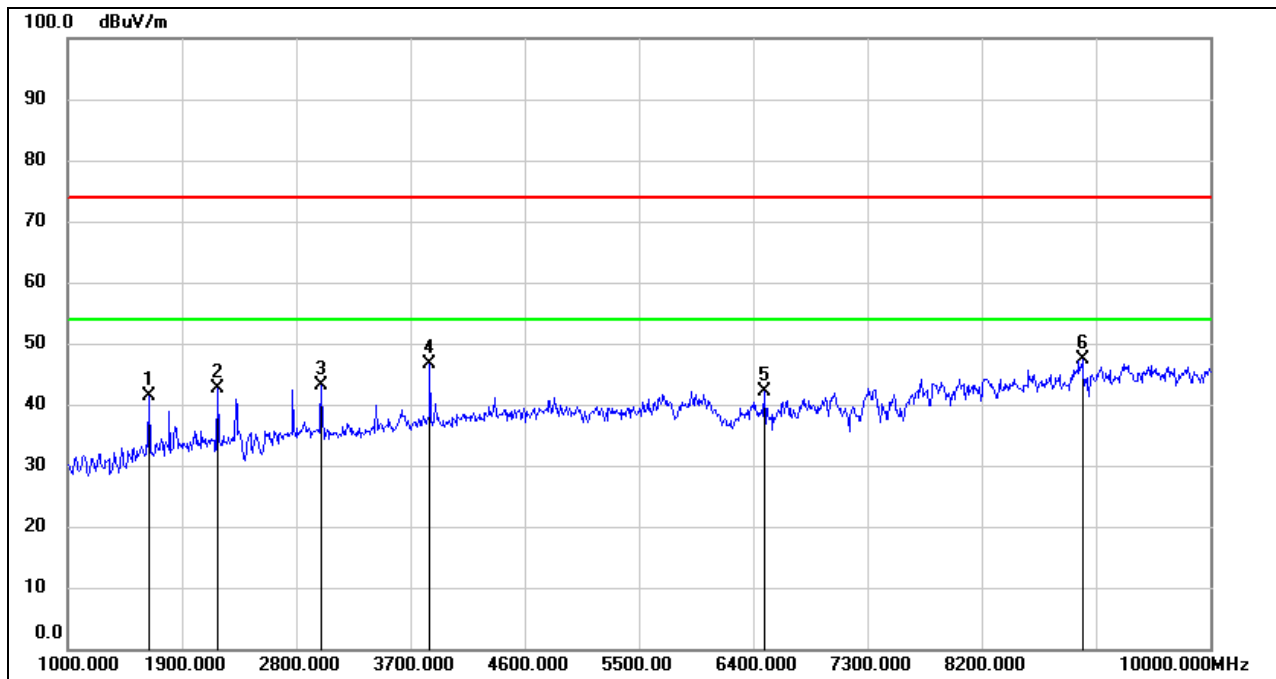
3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)**

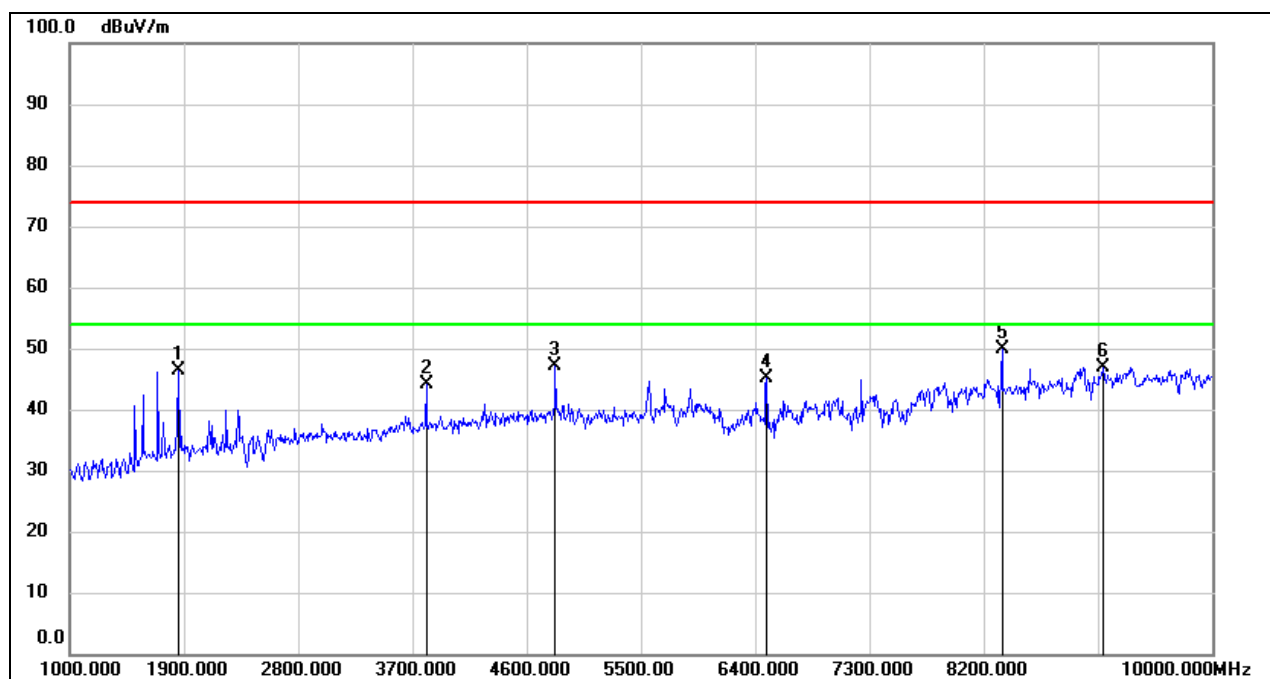
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1684.000	58.19	-11.08	47.11	74.00	-26.89	peak
2	2737.000	55.78	-7.23	48.55	74.00	-25.45	peak
3	4825.000	49.56	-0.10	49.46	74.00	-24.54	peak
4	5482.000	43.35	1.62	44.97	74.00	-29.03	peak
5	6400.000	44.62	3.49	48.11	74.00	-25.89	peak
6	9145.000	37.19	9.72	46.91	74.00	-27.09	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1639.000	52.77	-11.31	41.46	74.00	-32.54	peak
2	2179.000	51.97	-9.23	42.74	74.00	-31.26	peak
3	2998.000	48.88	-5.76	43.12	74.00	-30.88	peak
4	3853.000	50.26	-3.52	46.74	74.00	-27.26	peak
5	6490.000	38.34	3.88	42.22	74.00	-31.78	peak
6	8992.000	37.10	10.28	47.38	74.00	-26.62	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)**

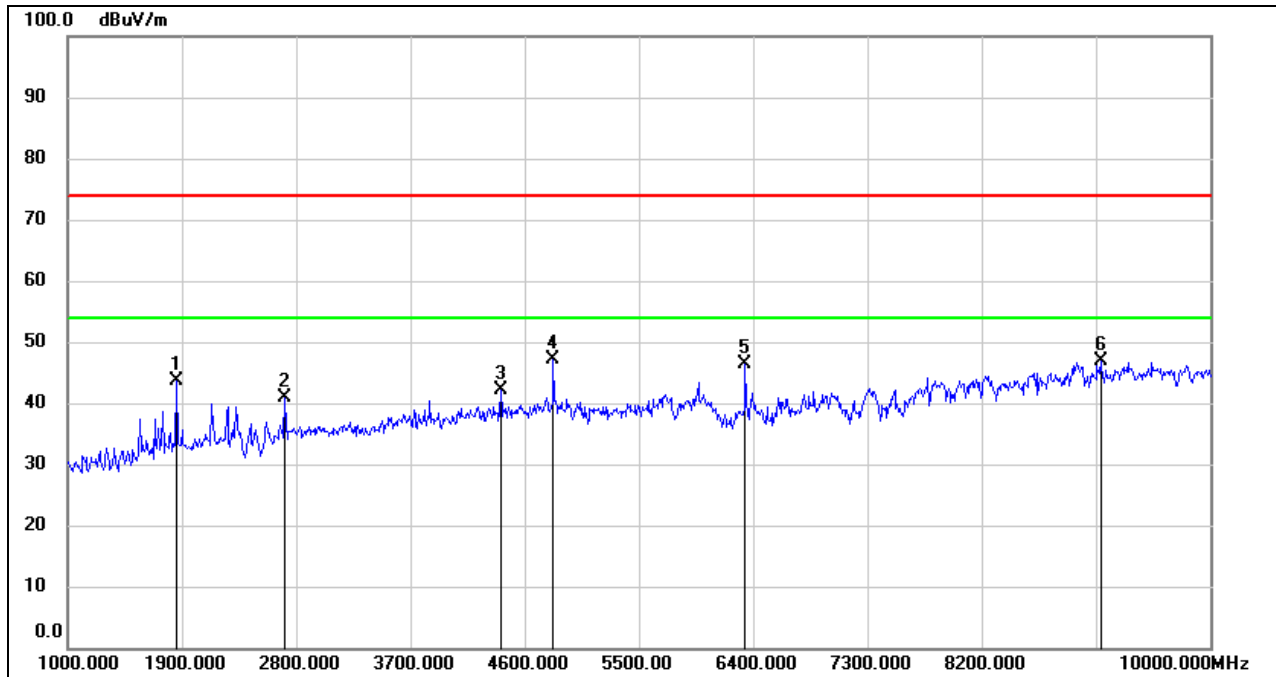
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1855.000	56.75	-10.46	46.29	74.00	-27.71	peak
2	3808.000	47.75	-3.54	44.21	74.00	-29.79	peak
3	4825.000	47.11	-0.10	47.01	74.00	-26.99	peak
4	6490.000	41.31	3.88	45.19	74.00	-28.81	peak
5	8344.000	42.19	7.71	49.90	74.00	-24.10	peak
6	9145.000	37.24	9.72	46.96	74.00	-27.04	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

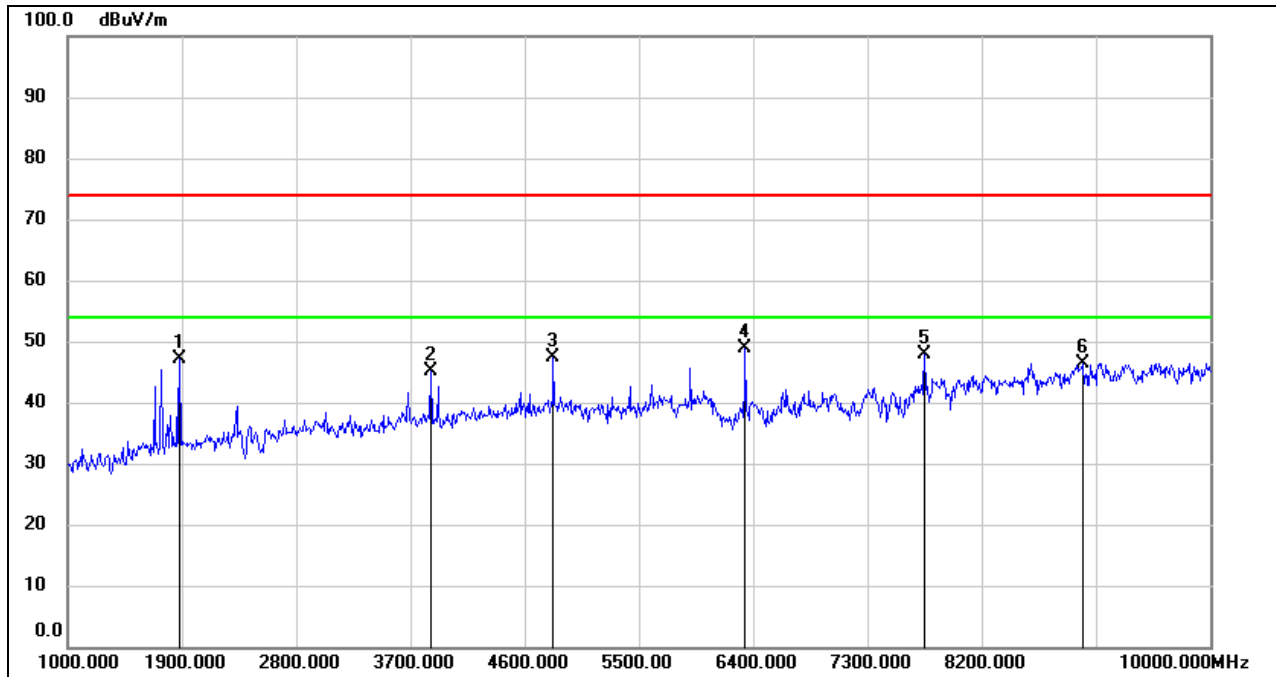
3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**8.1.2. 802.11ah 2M Mode****HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1855.000	54.08	-10.46	43.62	74.00	-30.38	peak
2	2710.000	48.14	-7.37	40.77	74.00	-33.23	peak
3	4411.000	44.01	-1.84	42.17	74.00	-31.83	peak
4	4825.000	47.18	-0.10	47.08	74.00	-26.92	peak
5	6337.000	43.24	3.11	46.35	74.00	-27.65	peak
6	9136.000	37.00	9.77	46.77	74.00	-27.23	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)**

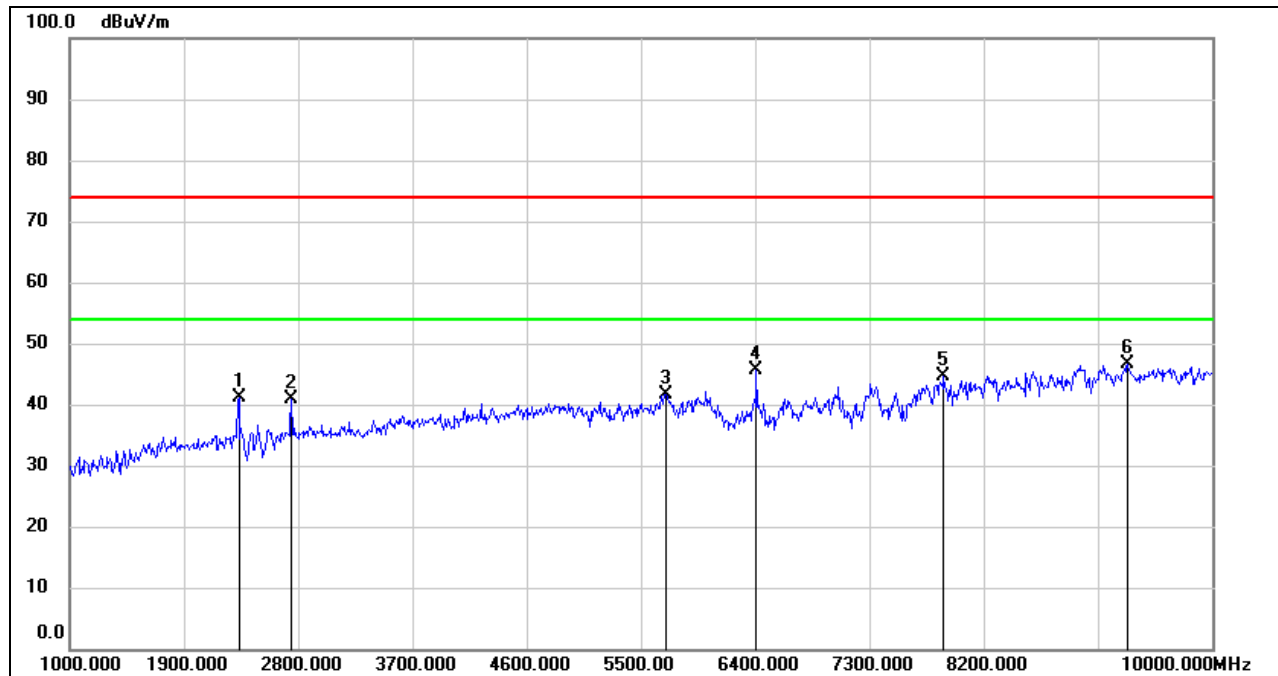
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1882.000	57.51	-10.44	47.07	74.00	-26.93	peak
2	3862.000	48.57	-3.52	45.05	74.00	-28.95	peak
3	4825.000	47.43	-0.10	47.33	74.00	-26.67	peak
4	6337.000	45.65	3.11	48.76	74.00	-25.24	peak
5	7750.000	41.13	6.80	47.93	74.00	-26.07	peak
6	8992.000	36.21	10.28	46.49	74.00	-27.51	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

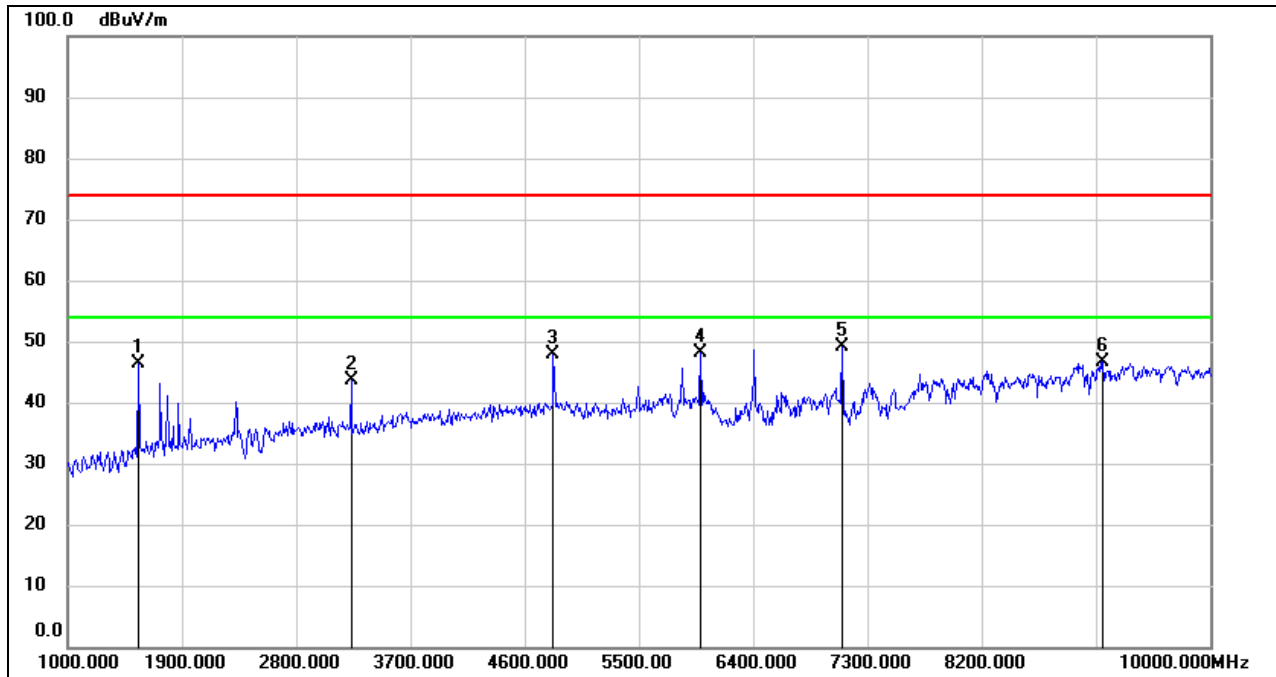
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2332.000	49.47	-8.31	41.16	74.00	-32.84	peak
2	2746.000	48.06	-7.20	40.86	74.00	-33.14	peak
3	5698.000	39.59	2.06	41.65	74.00	-32.35	peak
4	6409.000	42.06	3.54	45.60	74.00	-28.40	peak
5	7885.000	37.94	6.72	44.66	74.00	-29.34	peak
6	9334.000	36.72	9.81	46.53	74.00	-27.47	peak

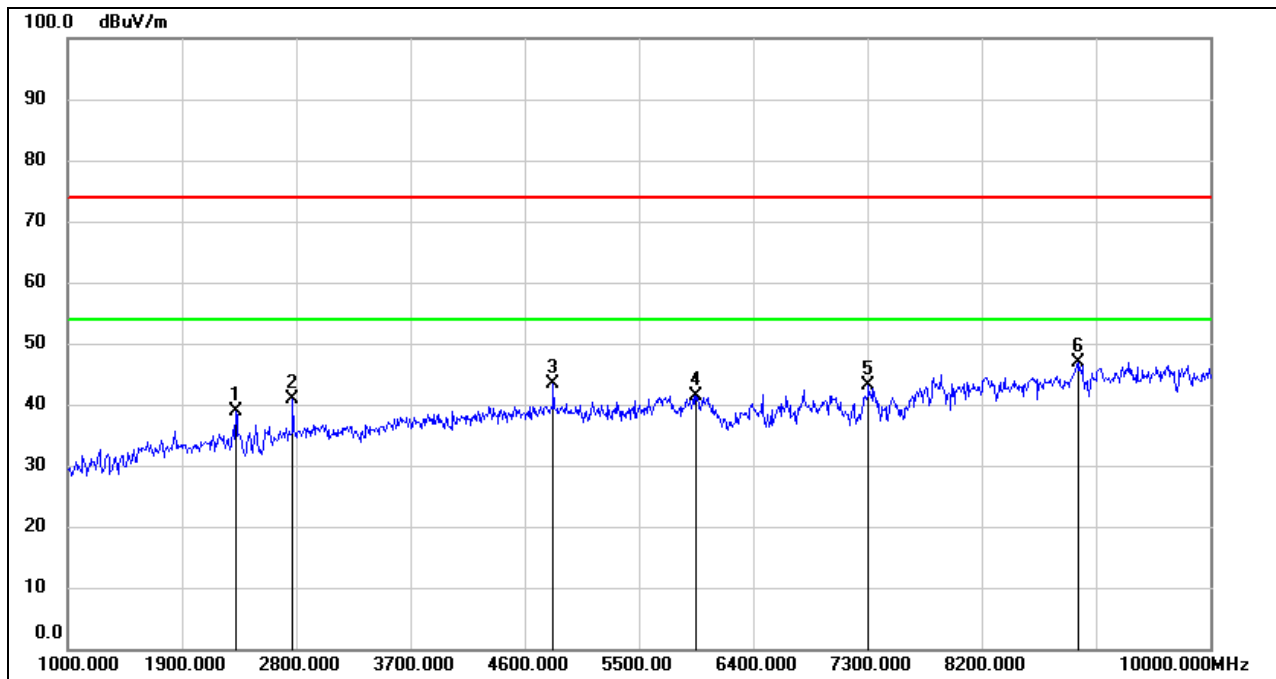
Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1558.000	58.14	-11.70	46.44	74.00	-27.56	peak
2	3232.000	49.40	-5.77	43.63	74.00	-30.37	peak
3	4825.000	47.95	-0.10	47.85	74.00	-26.15	peak
4	5986.000	45.46	2.77	48.23	74.00	-25.77	peak
5	7102.000	42.90	6.30	49.20	74.00	-24.80	peak
6	9154.000	37.01	9.70	46.71	74.00	-27.29	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)**

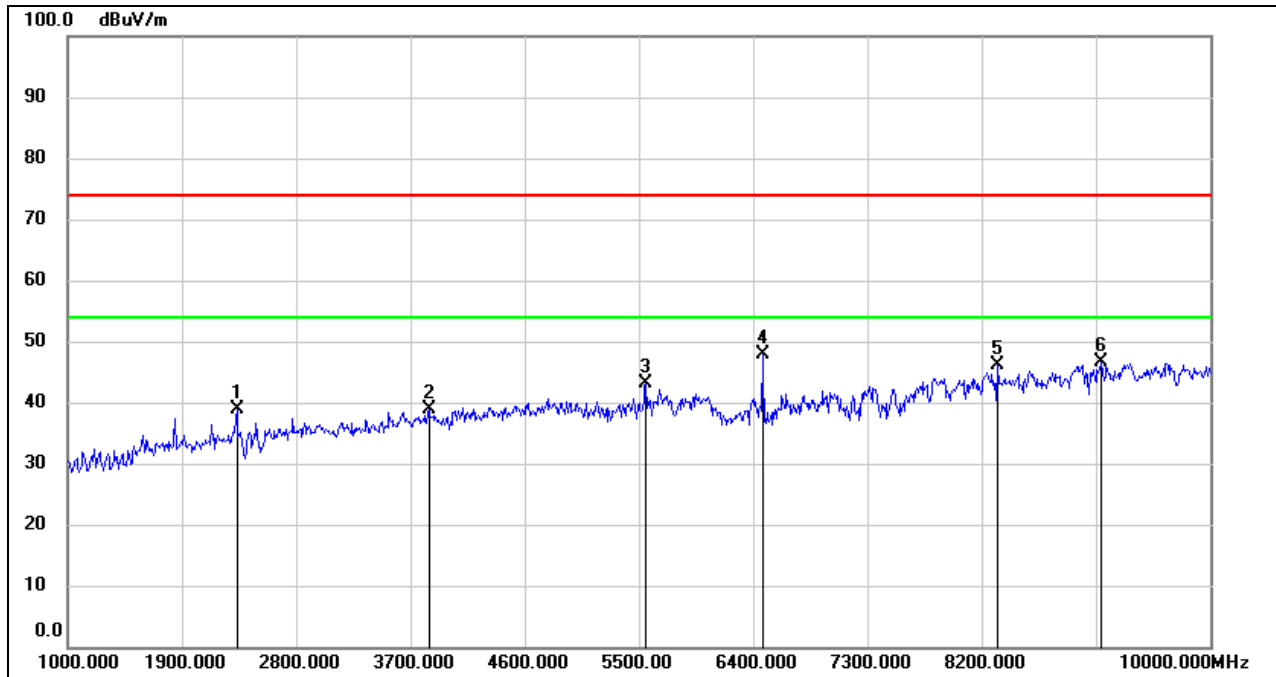
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2323.000	47.25	-8.36	38.89	74.00	-35.11	peak
2	2773.000	47.92	-7.06	40.86	74.00	-33.14	peak
3	4825.000	43.41	-0.10	43.31	74.00	-30.69	peak
4	5950.000	38.88	2.61	41.49	74.00	-32.51	peak
5	7309.000	36.51	6.51	43.02	74.00	-30.98	peak
6	8965.000	36.91	9.96	46.87	74.00	-27.13	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)**

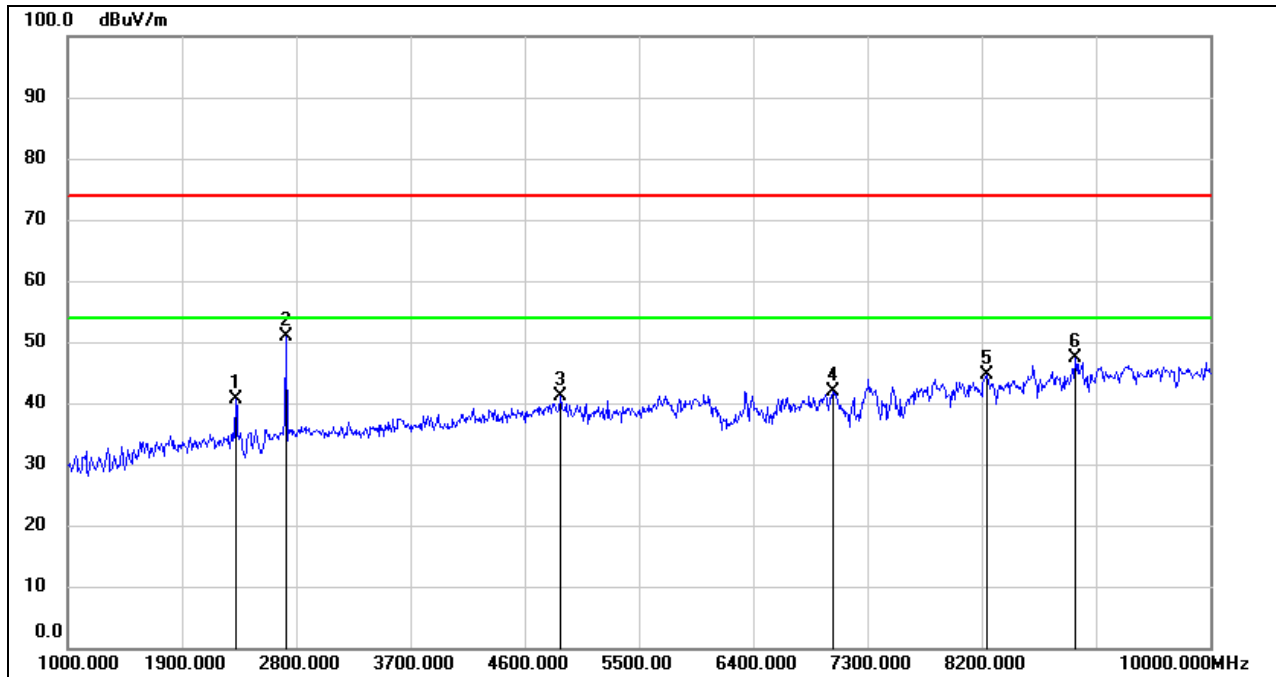
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2332.000	47.31	-8.31	39.00	74.00	-35.00	peak
2	3844.000	42.32	-3.52	38.80	74.00	-35.20	peak
3	5554.000	41.21	1.97	43.18	74.00	-30.82	peak
4	6472.000	44.02	3.81	47.83	74.00	-26.17	peak
5	8326.000	38.25	7.80	46.05	74.00	-27.95	peak
6	9136.000	36.82	9.77	46.59	74.00	-27.41	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**8.1.3. 802.11ah 4M Mode****HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2323.000	48.89	-8.36	40.53	74.00	-33.47	peak
2	2719.000	58.28	-7.34	50.94	74.00	-23.06	peak
3	4879.000	41.10	0.06	41.16	74.00	-32.84	peak
4	7030.000	35.30	6.67	41.97	74.00	-32.03	peak
5	8236.000	36.37	8.19	44.56	74.00	-29.44	peak
6	8938.000	37.84	9.64	47.48	74.00	-26.52	peak

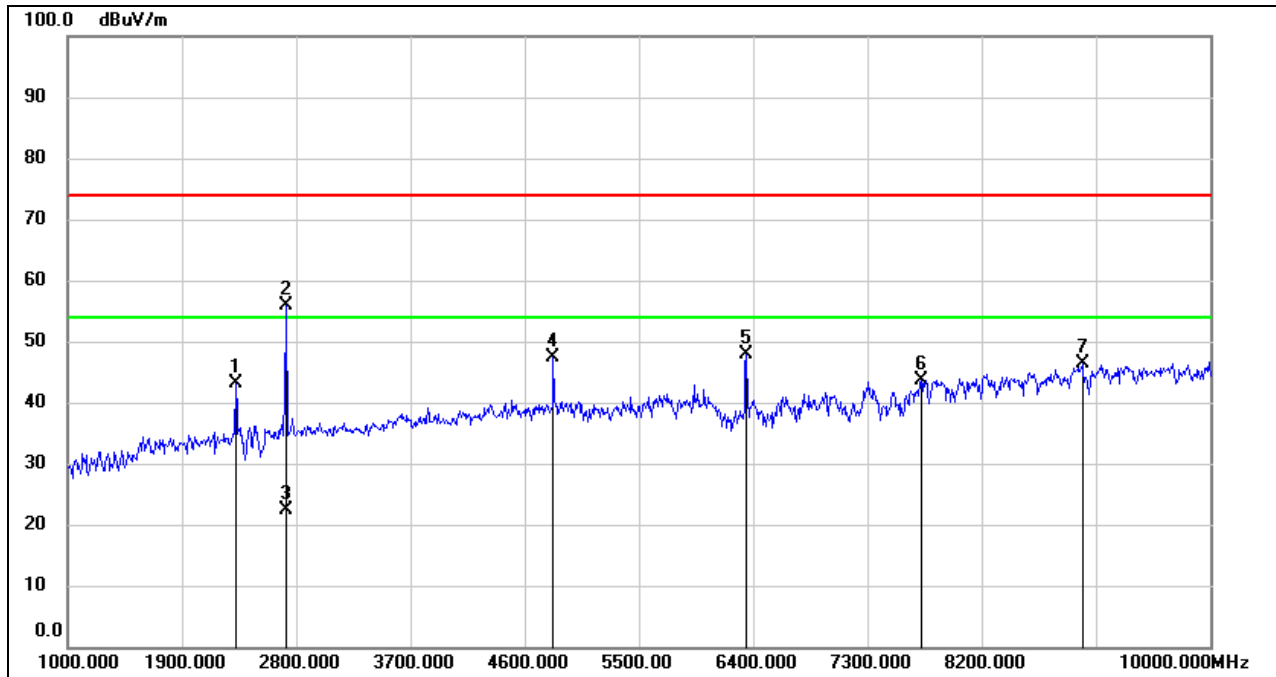
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

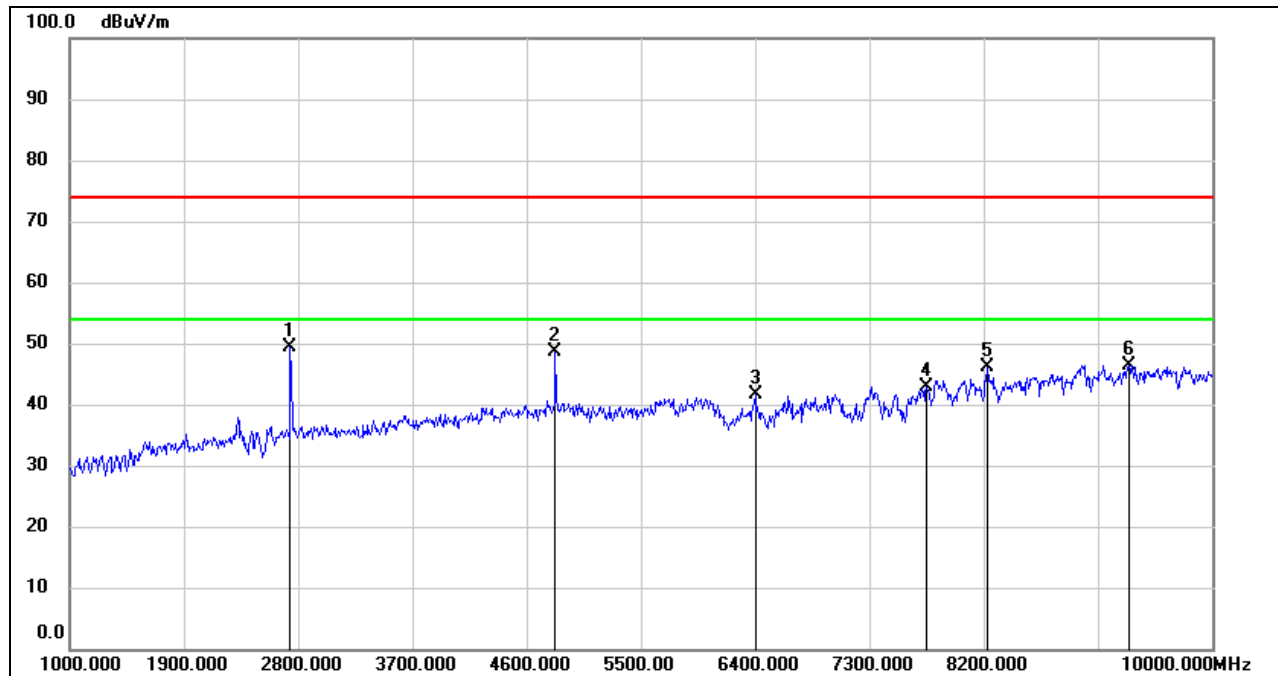
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2323.000	51.53	-8.36	43.17	74.00	-30.83	peak
2	2719.000	63.33	-7.34	55.99	74.00	-18.01	peak
3	2719.000	29.74	-7.34	22.40	54.00	-31.60	AVG
4	4825.000	47.37	-0.10	47.27	74.00	-26.73	peak
5	6346.000	44.69	3.16	47.85	74.00	-26.15	peak
6	7723.000	36.93	6.72	43.65	74.00	-30.35	peak
7	8992.000	36.03	10.28	46.31	74.00	-27.69	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton where: ton is transmit duration.
5. For transmit duration, please refer to clause 7.1.
6. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)**

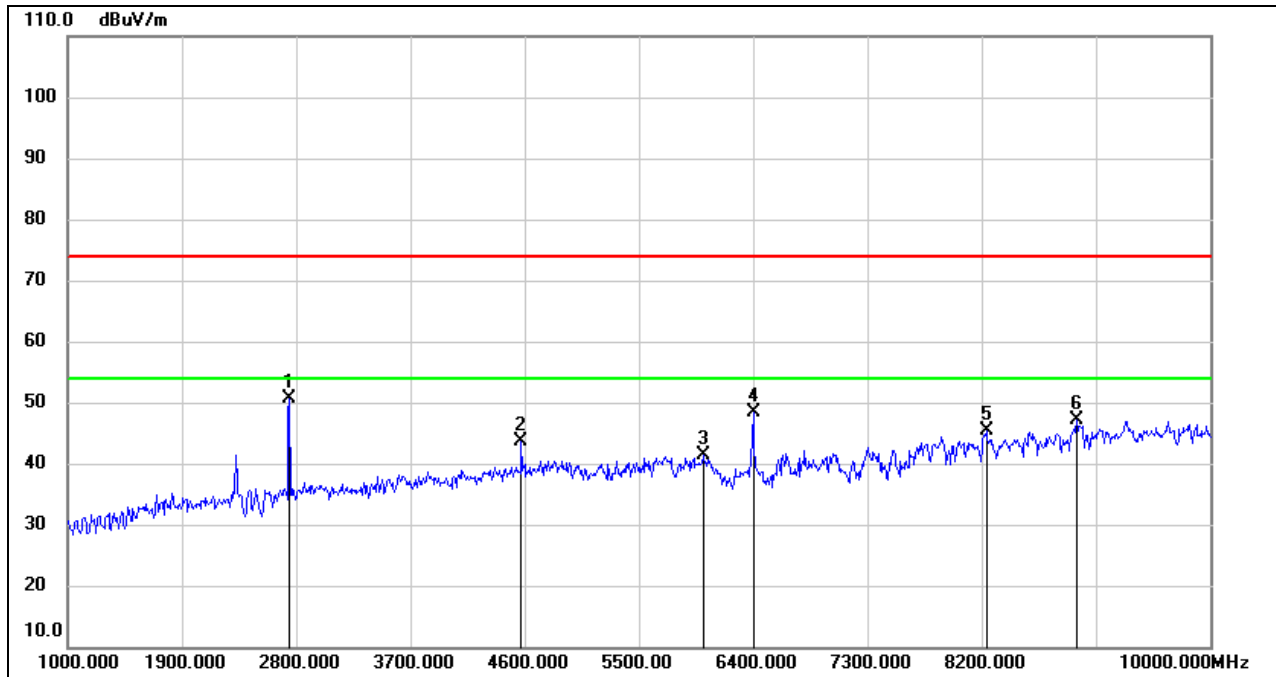
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2737.000	56.58	-7.23	49.35	74.00	-24.65	peak
2	4825.000	48.63	-0.10	48.53	74.00	-25.47	peak
3	6400.000	38.04	3.49	41.53	74.00	-32.47	peak
4	7750.000	36.17	6.80	42.97	74.00	-31.03	peak
5	8227.000	37.79	8.23	46.02	74.00	-27.98	peak
6	9343.000	36.63	9.83	46.46	74.00	-27.54	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

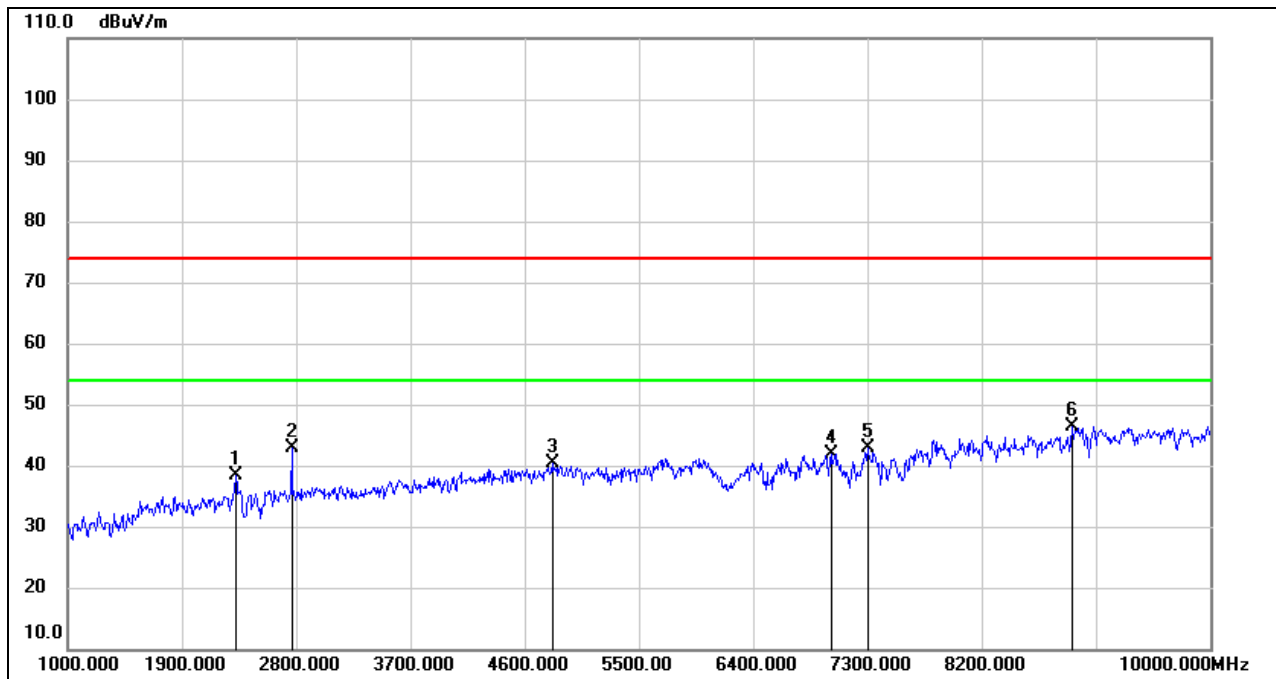
3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2746.000	57.78	-7.20	50.58	74.00	-23.42	peak
2	4573.000	45.02	-1.40	43.62	74.00	-30.38	peak
3	6004.000	38.67	2.82	41.49	74.00	-32.51	peak
4	6400.000	44.84	3.49	48.33	74.00	-25.67	peak
5	8236.000	37.10	8.19	45.29	74.00	-28.71	peak
6	8947.000	37.28	9.75	47.03	74.00	-26.97	peak

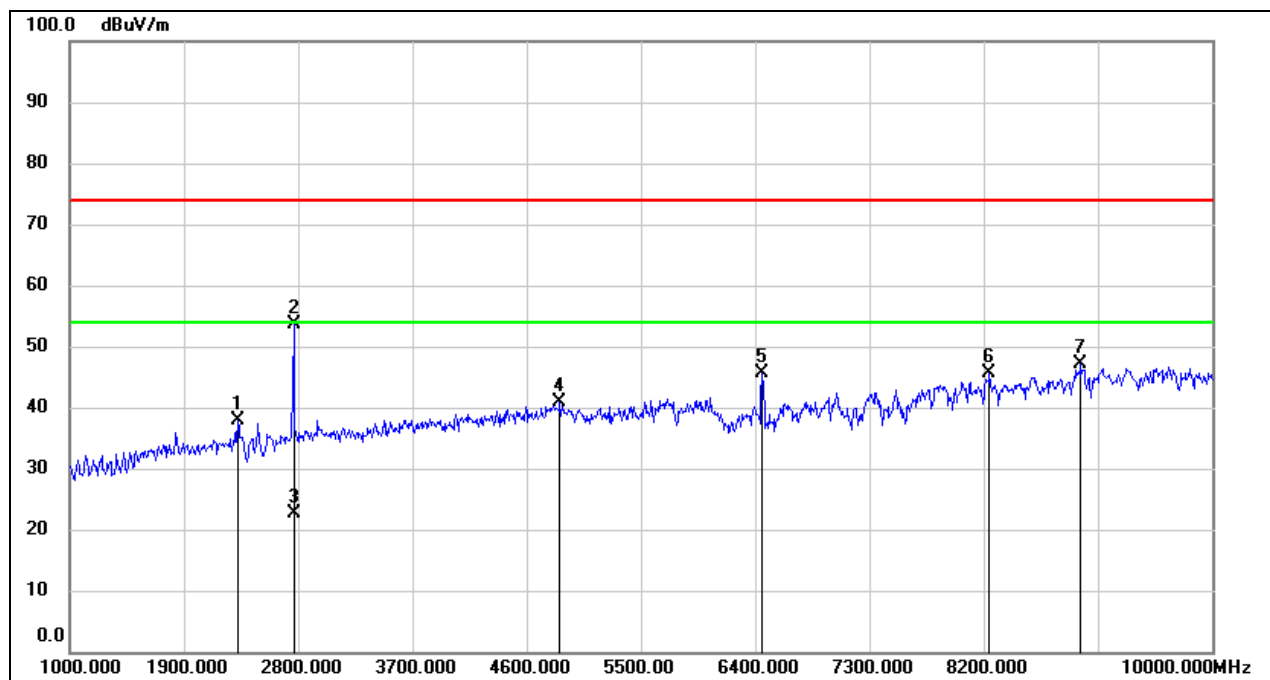
Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2323.000	46.73	-8.36	38.37	74.00	-35.63	peak
2	2764.000	49.95	-7.10	42.85	74.00	-31.15	peak
3	4816.000	40.62	-0.13	40.49	74.00	-33.51	peak
4	7012.000	35.20	6.75	41.95	74.00	-32.05	peak
5	7300.000	36.38	6.45	42.83	74.00	-31.17	peak
6	8911.000	37.08	9.30	46.38	74.00	-27.62	peak

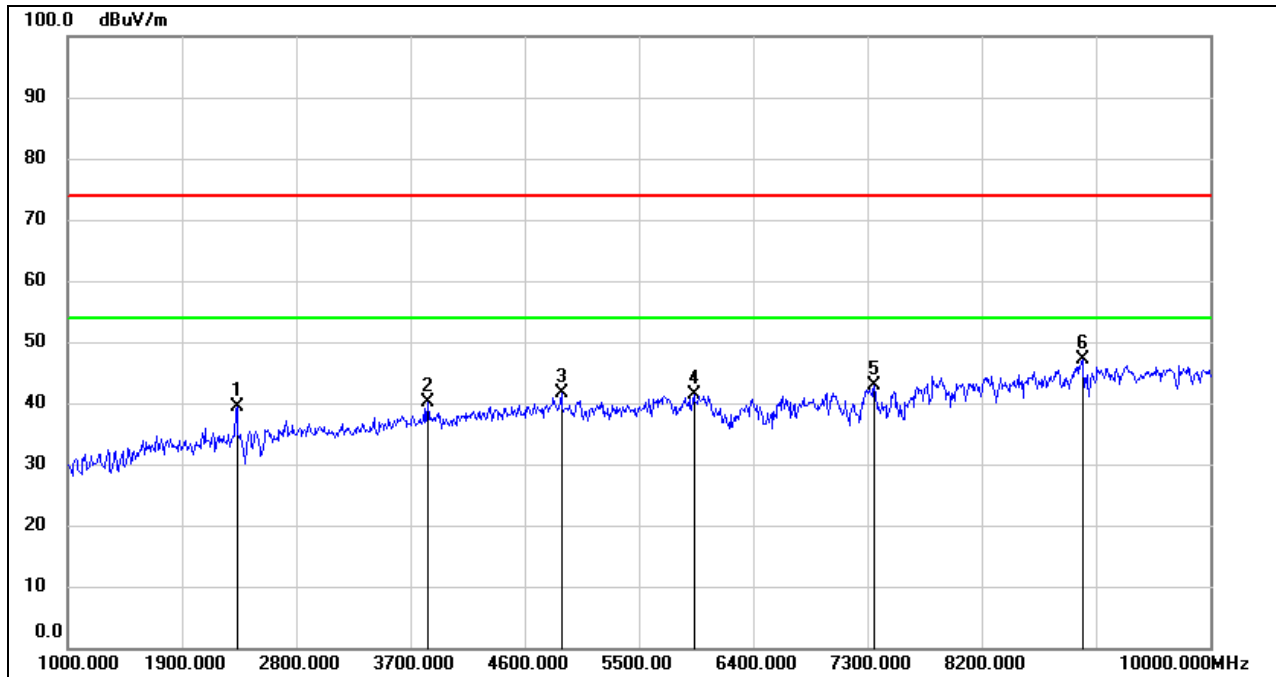
Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)



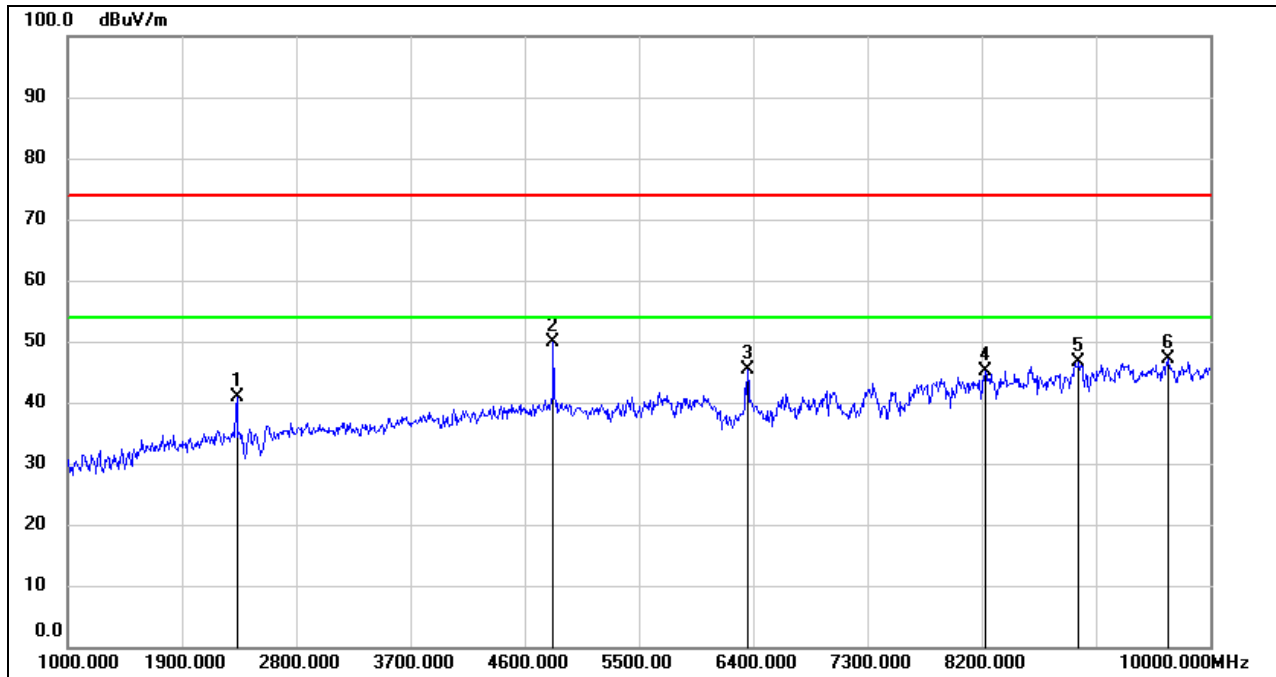
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2323.000	46.34	-8.36	37.98	74.00	-36.02	peak
2	2764.000	60.74	-7.10	53.64	74.00	-20.36	peak
3	2764.000	29.70	-7.10	22.60	54.00	-31.40	AVG
4	4861.000	40.91	0.01	40.92	74.00	-33.08	peak
5	6454.000	41.91	3.73	45.64	74.00	-28.36	peak
6	8245.000	37.57	8.15	45.72	74.00	-28.28	peak
7	8965.000	37.23	9.96	47.19	74.00	-26.81	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton where: ton is transmit duration.
5. For transmit duration, please refer to clause 7.1.
6. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**8.1.4. 802.11ah 8M Mode****HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)**

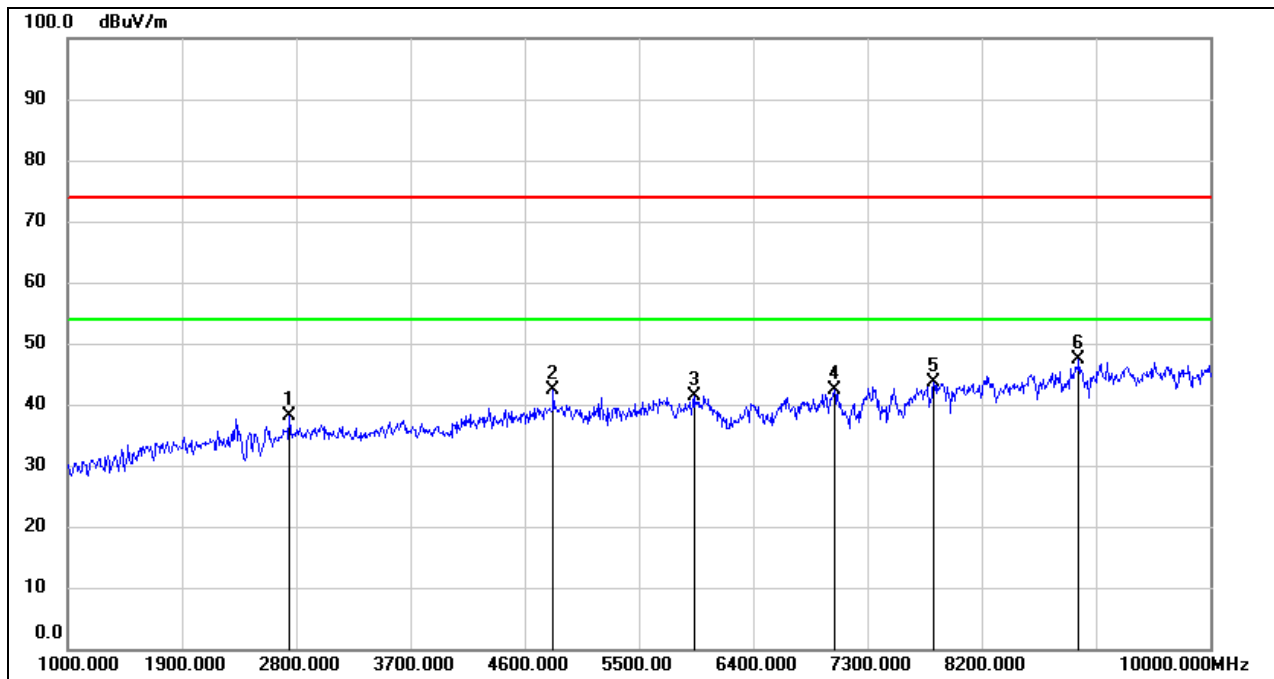
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2332.000	47.71	-8.31	39.40	74.00	-34.60	peak
2	3835.000	43.60	-3.53	40.07	74.00	-33.93	peak
3	4888.000	41.46	0.09	41.55	74.00	-32.45	peak
4	5932.000	38.97	2.52	41.49	74.00	-32.51	peak
5	7354.000	36.01	6.79	42.80	74.00	-31.20	peak
6	8992.000	36.95	10.28	47.23	74.00	-26.77	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2332.000	49.12	-8.31	40.81	74.00	-33.19	peak
2	4825.000	49.93	-0.10	49.83	74.00	-24.17	peak
3	6355.000	42.05	3.21	45.26	74.00	-28.74	peak
4	8227.000	37.00	8.23	45.23	74.00	-28.77	peak
5	8965.000	36.60	9.96	46.56	74.00	-27.44	peak
6	9667.000	36.34	10.76	47.10	74.00	-26.90	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)**

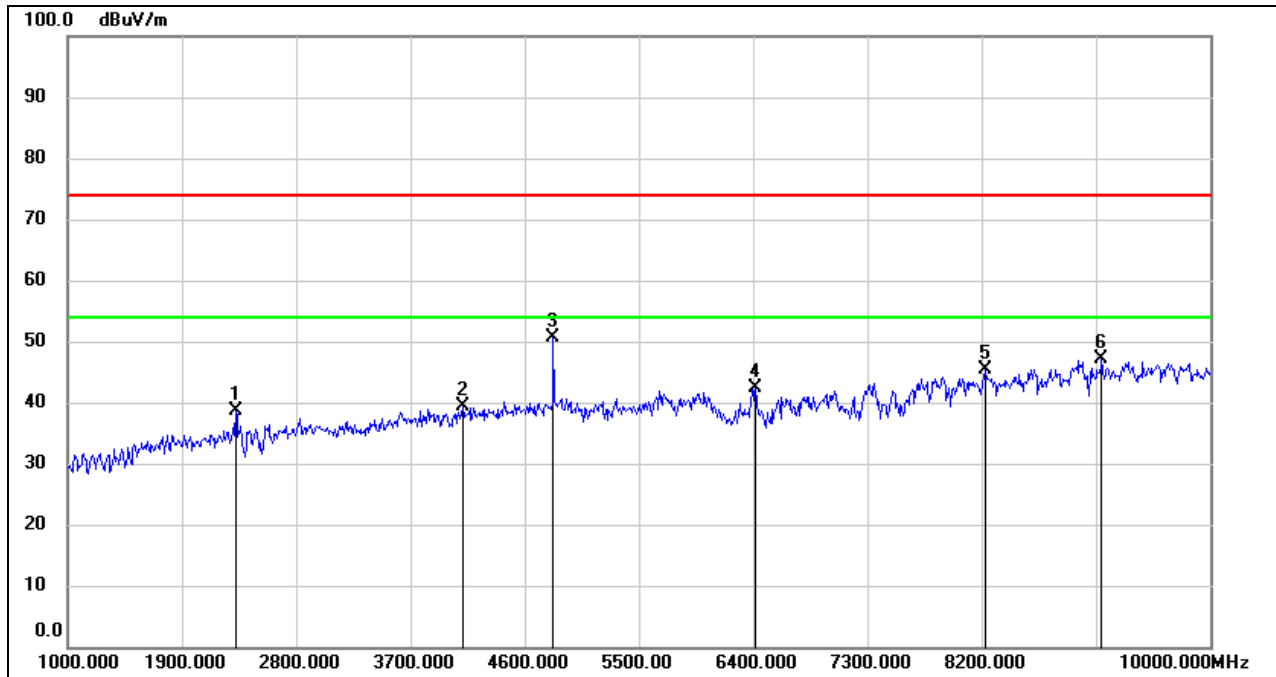
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2746.000	45.34	-7.20	38.14	74.00	-35.86	peak
2	4825.000	42.49	-0.10	42.39	74.00	-31.61	peak
3	5932.000	38.92	2.52	41.44	74.00	-32.56	peak
4	7039.000	35.70	6.62	42.32	74.00	-31.68	peak
5	7822.000	36.84	6.88	43.72	74.00	-30.28	peak
6	8965.000	37.33	9.96	47.29	74.00	-26.71	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

**HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2323.000	46.89	-8.36	38.53	74.00	-35.47	peak
2	4114.000	41.96	-2.70	39.26	74.00	-34.74	peak
3	4825.000	50.69	-0.10	50.59	74.00	-23.41	peak
4	6418.000	38.82	3.57	42.39	74.00	-31.61	peak
5	8227.000	37.14	8.23	45.37	74.00	-28.63	peak
6	9145.000	37.39	9.72	47.11	74.00	-26.89	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

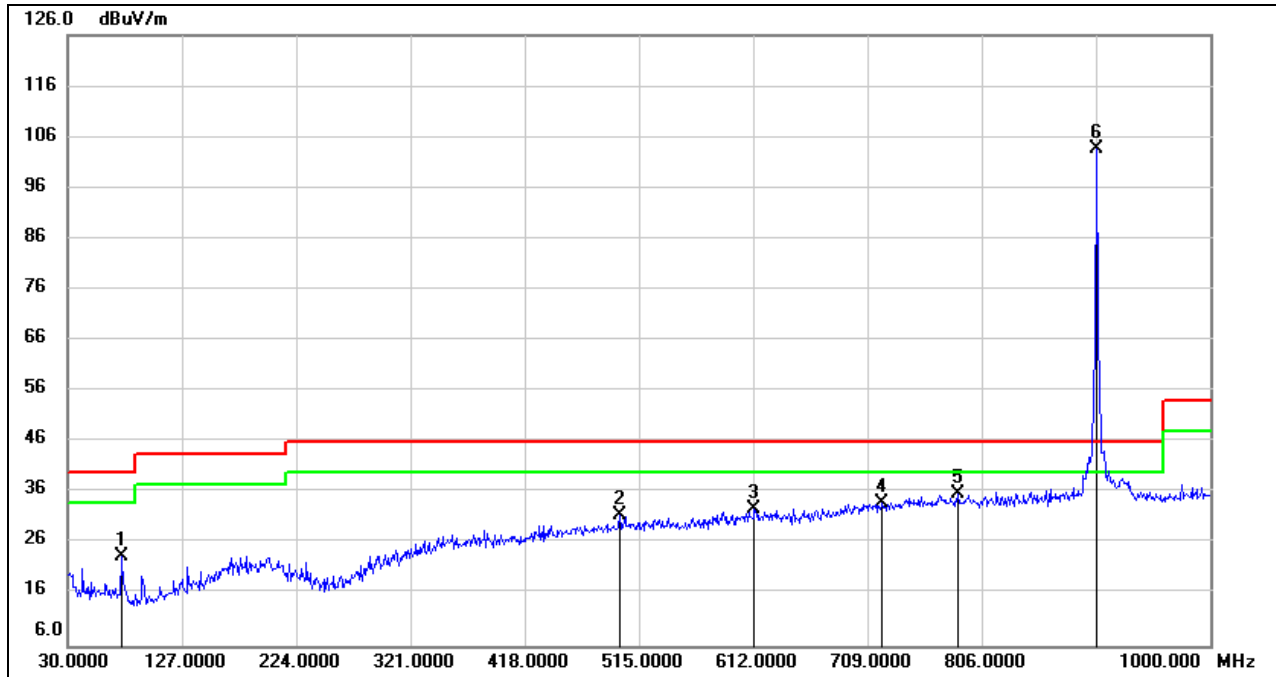
3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

8.2. SPURIOUS EMISSIONS (30 MHz ~ 1 GHz)

8.2.1. 802.11ah 1M Mode

SPURIOUS EMISSIONS (LOW CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	75.5899	29.50	-5.96	23.54	40.00	-16.46	QP
2	498.5100	29.26	2.38	31.64	46.00	-14.36	QP
3	612.9699	29.10	3.68	32.78	46.00	-13.22	QP
4	721.6100	28.30	5.88	34.18	46.00	-11.82	QP
5	785.6300	28.96	6.92	35.88	46.00	-10.12	QP
6	903.500	95.01	8.64	103.65	/	/	fundamental

Note: 1. Result Level = Read Level + Correct Factor.

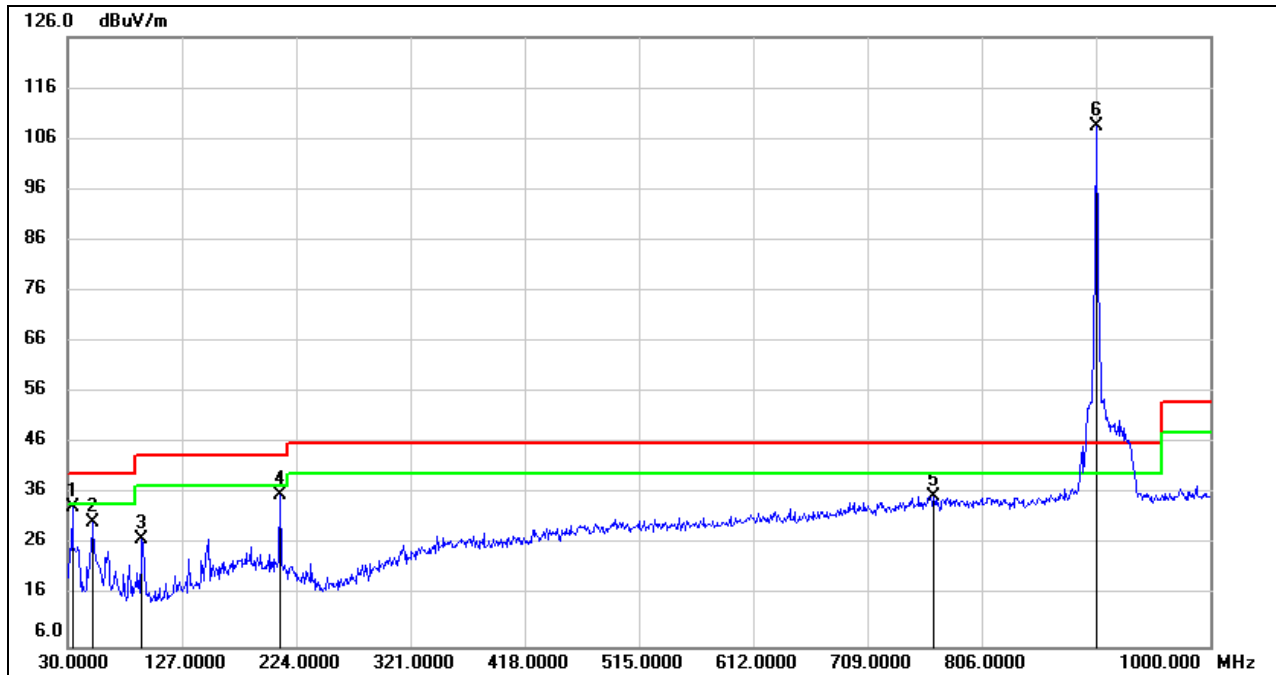
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

4. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for Band reject filter losses.

5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

SPURIOUS EMISSIONS (LOW CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)



Note: 1. Result Level = Read Level + Correct Factor.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto
4. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for Band reject filter losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

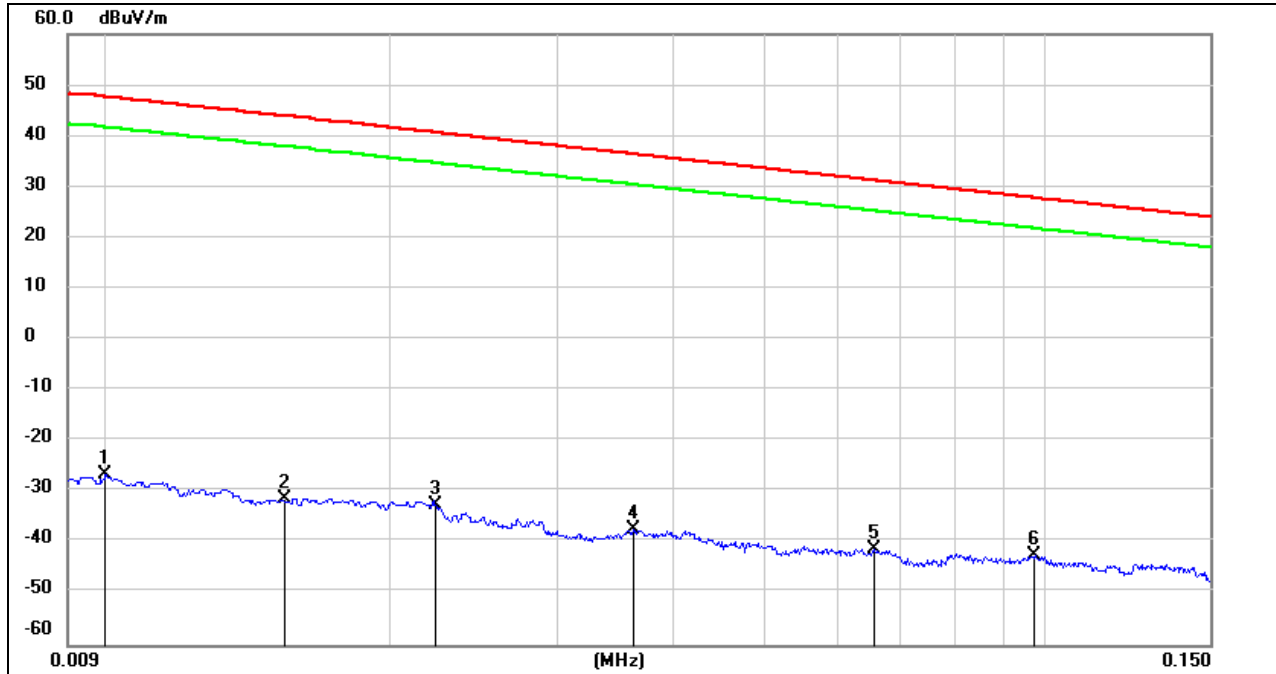
Note: All the modes and channels have been tested, only the worst data was recorded in the report.

8.3. SPURIOUS EMISSIONS BELOW 30 MHz

8.3.1. 80.211ah 1M Mode

SPURIOUS EMISSIONS (HIGH CHANNEL, LOOP ANTENNA FACE ON TO THE EUT, WORST-CASE CONFIGURATION)

9 kHz~ 150 kHz

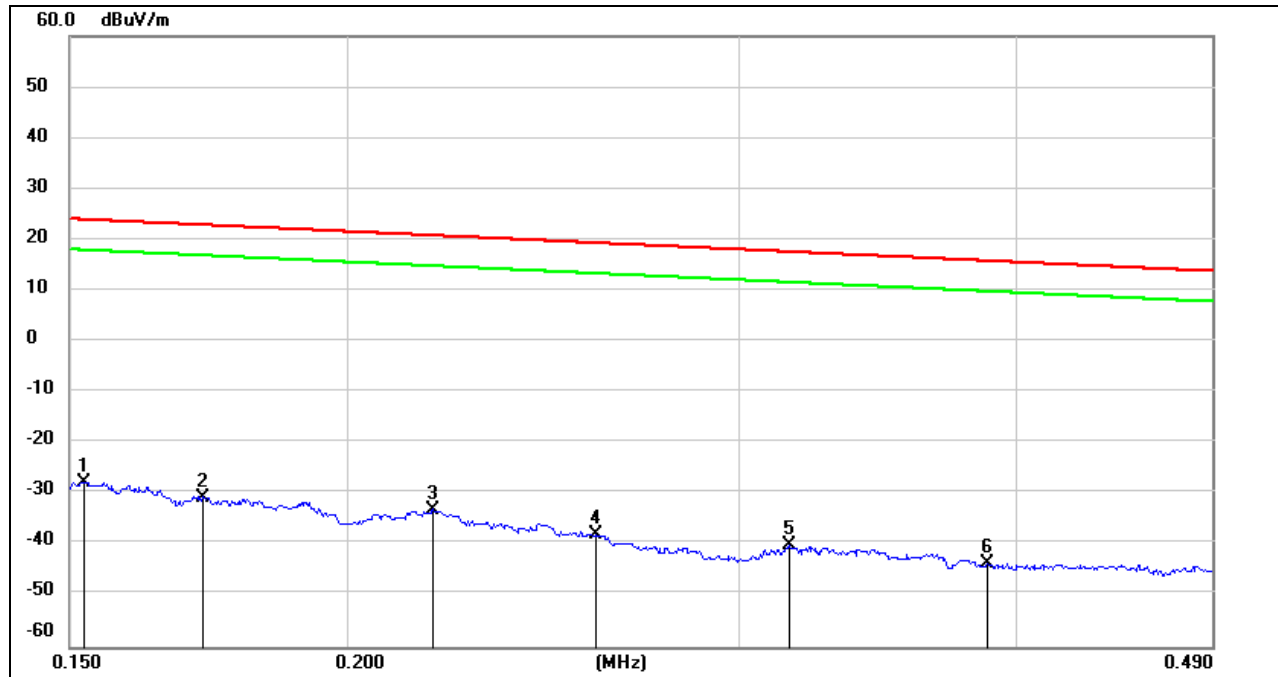


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0100	74.72	-101.40	-26.68	47.60	-74.28	peak
2	0.0154	69.94	-101.37	-31.43	43.85	-75.28	peak
3	0.0223	68.86	-101.35	-32.49	40.63	-73.12	peak
4	0.0362	64.01	-101.42	-37.41	36.43	-73.84	peak
5	0.0656	60.36	-101.55	-41.19	31.26	-72.45	peak
6	0.0974	59.27	-101.78	-42.51	27.83	-70.34	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

150 kHz ~ 490 kHz

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.1524	73.80	-101.63	-27.83	23.94	-51.77	peak
2	0.1723	71.00	-101.67	-30.67	22.88	-53.55	peak
3	0.2187	68.75	-101.75	-33.00	20.80	-53.80	peak
4	0.2590	63.79	-101.81	-38.02	19.34	-57.36	peak
5	0.3163	61.70	-101.87	-40.17	17.60	-57.77	peak
6	0.3881	58.40	-101.95	-43.55	15.82	-59.37	peak

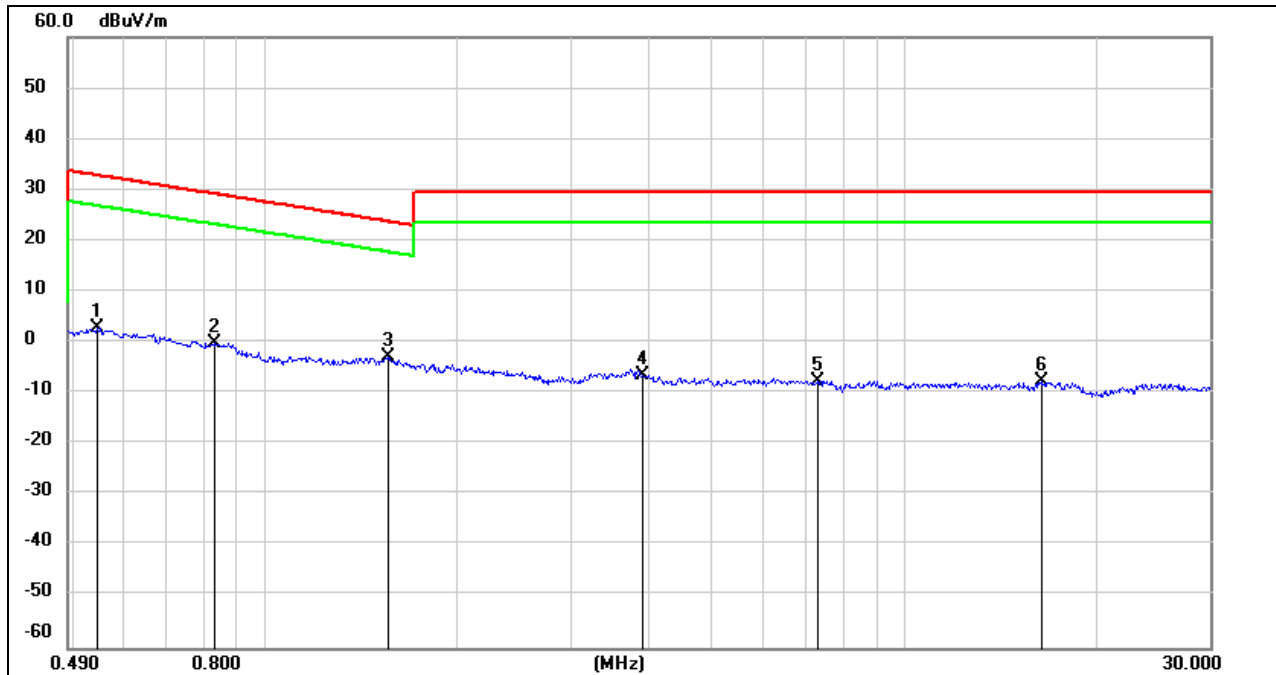
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.



490 kHz ~ 30 MHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.5453	64.87	-62.08	2.79	32.87	-30.08	peak
2	0.8296	61.94	-62.17	-0.23	29.23	-29.46	peak
3	1.5564	59.18	-62.02	-2.84	23.76	-26.60	peak
4	3.8837	54.99	-61.36	-6.37	29.54	-35.91	peak
5	7.3361	53.58	-61.17	-7.59	29.54	-37.13	peak
6	16.3959	53.17	-60.96	-7.79	29.54	-37.33	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

Note: All the modes and channels have been tested, only the worst data was recorded in the report.

9. AC POWER LINE CONDUCTED EMISSION

LIMITS

Please refer to CFR 47 FCC §15.207 (a).

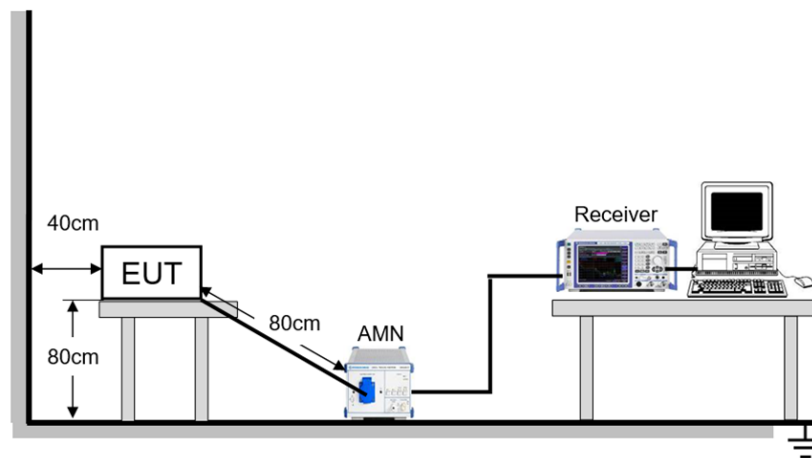
FREQUENCY (MHz)	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

TEST PROCEDURE

The EUT is put on a table of non-conducting material that is 80 cm high. The vertical conducting wall of shielding is located 40 cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9 kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

TEST SETUP



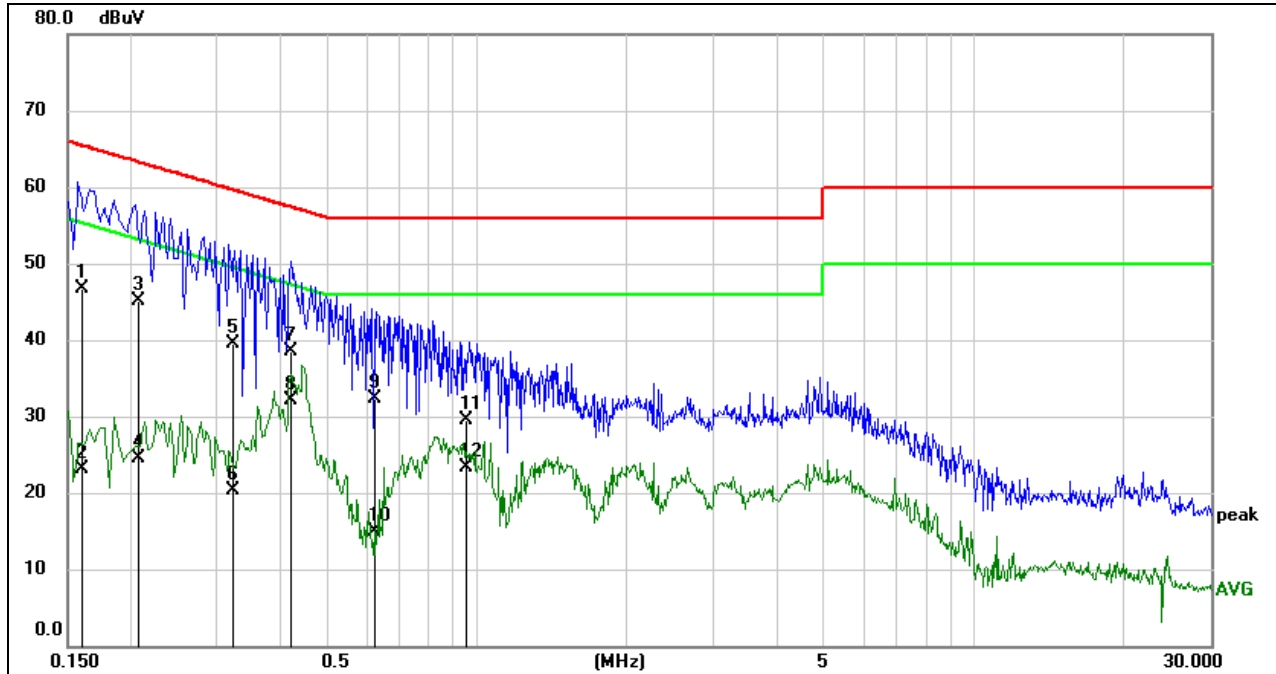


TEST ENVIRONMENT

Temperature	24.5°C	Relative Humidity	61%
Atmosphere Pressure	101kPa	Test Voltage	AC 120 V, 60 Hz

**TEST RESULTS**

Test Mode:	802.11ah 1M	Channel:	903.5 MHz
Line:	Line	Test Voltage:	AC 120 V, 60 Hz



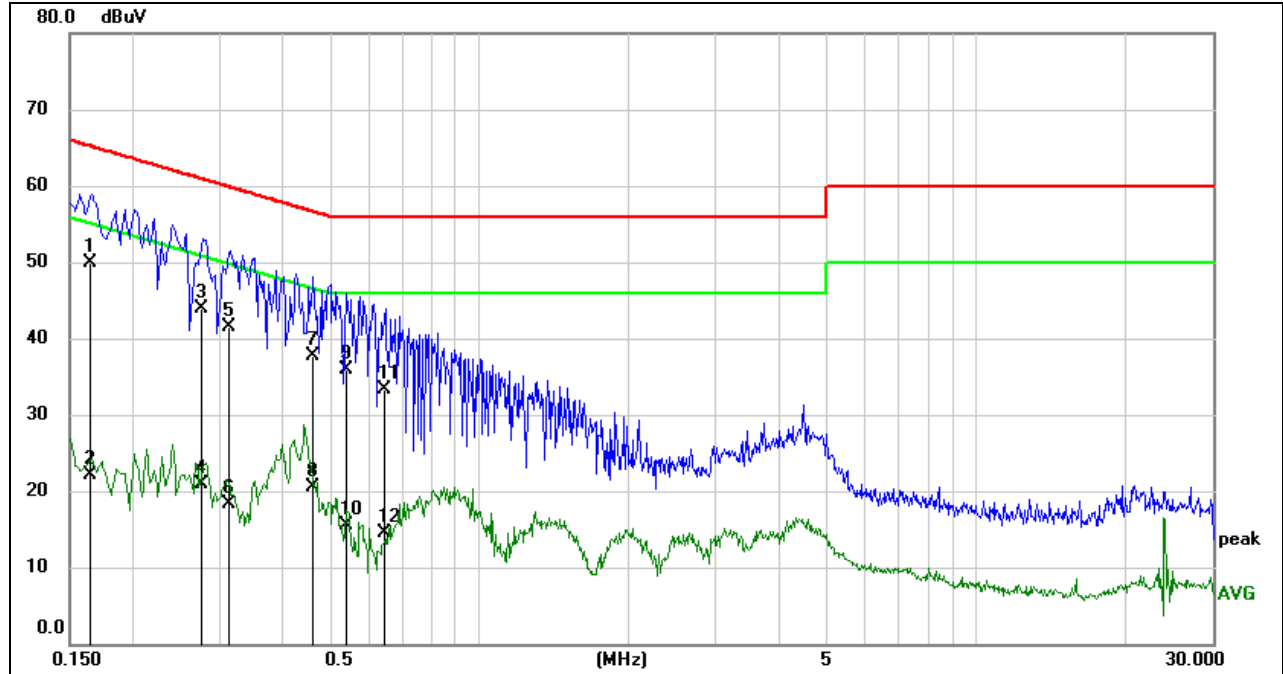
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1604	36.29	10.32	46.61	65.44	-18.83	QP
2	0.1604	12.71	10.32	23.03	55.44	-32.41	AVG
3	0.2089	34.79	10.24	45.03	63.25	-18.22	QP
4	0.2089	14.24	10.24	24.48	53.25	-28.77	AVG
5	0.3231	29.35	10.24	39.59	59.63	-20.04	QP
6	0.3231	10.03	10.24	20.27	49.63	-29.36	AVG
7	0.4227	28.32	10.24	38.56	57.39	-18.83	QP
8	0.4227	21.92	10.24	32.16	47.39	-15.23	AVG
9	0.6196	22.14	10.24	32.38	56.00	-23.62	QP
10	0.6196	4.66	10.24	14.90	46.00	-31.10	AVG
11	0.9600	19.49	10.06	29.55	56.00	-26.45	QP
12	0.9600	13.22	10.06	23.28	46.00	-22.72	AVG

Note:

1. Result = Reading + Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).
4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

Note: All the modes have been tested, only the worst data was recorded in the report.

Test Mode:	802.11ah 1M	Channel:	903.5 MHz
Line:	Neutral	Test Voltage:	AC 120 V, 60 Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1645	39.58	10.31	49.89	65.23	-15.34	QP
2	0.1645	11.80	10.31	22.11	55.23	-33.12	AVG
3	0.2746	33.59	10.24	43.83	60.98	-17.15	QP
4	0.2746	10.74	10.24	20.98	50.98	-30.00	AVG
5	0.3132	31.36	10.24	41.60	59.89	-18.29	QP
6	0.3132	8.16	10.24	18.40	49.89	-31.49	AVG
7	0.4659	27.47	10.24	37.71	56.59	-18.88	QP
8	0.4659	10.35	10.24	20.59	46.59	-26.00	AVG
9	0.5390	25.67	10.24	35.91	56.00	-20.09	QP
10	0.5390	5.27	10.24	15.51	46.00	-30.49	AVG
11	0.6460	23.08	10.23	33.31	56.00	-22.69	QP
12	0.6460	4.24	10.23	14.47	46.00	-31.53	AVG

Note:

1. Result = Reading + Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).
4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

Note: All the modes have been tested, only the worst data was recorded in the report.



10. ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer to FCC §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Please refer to FCC §15.247(b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RESULTS

Complies



11. Appendix

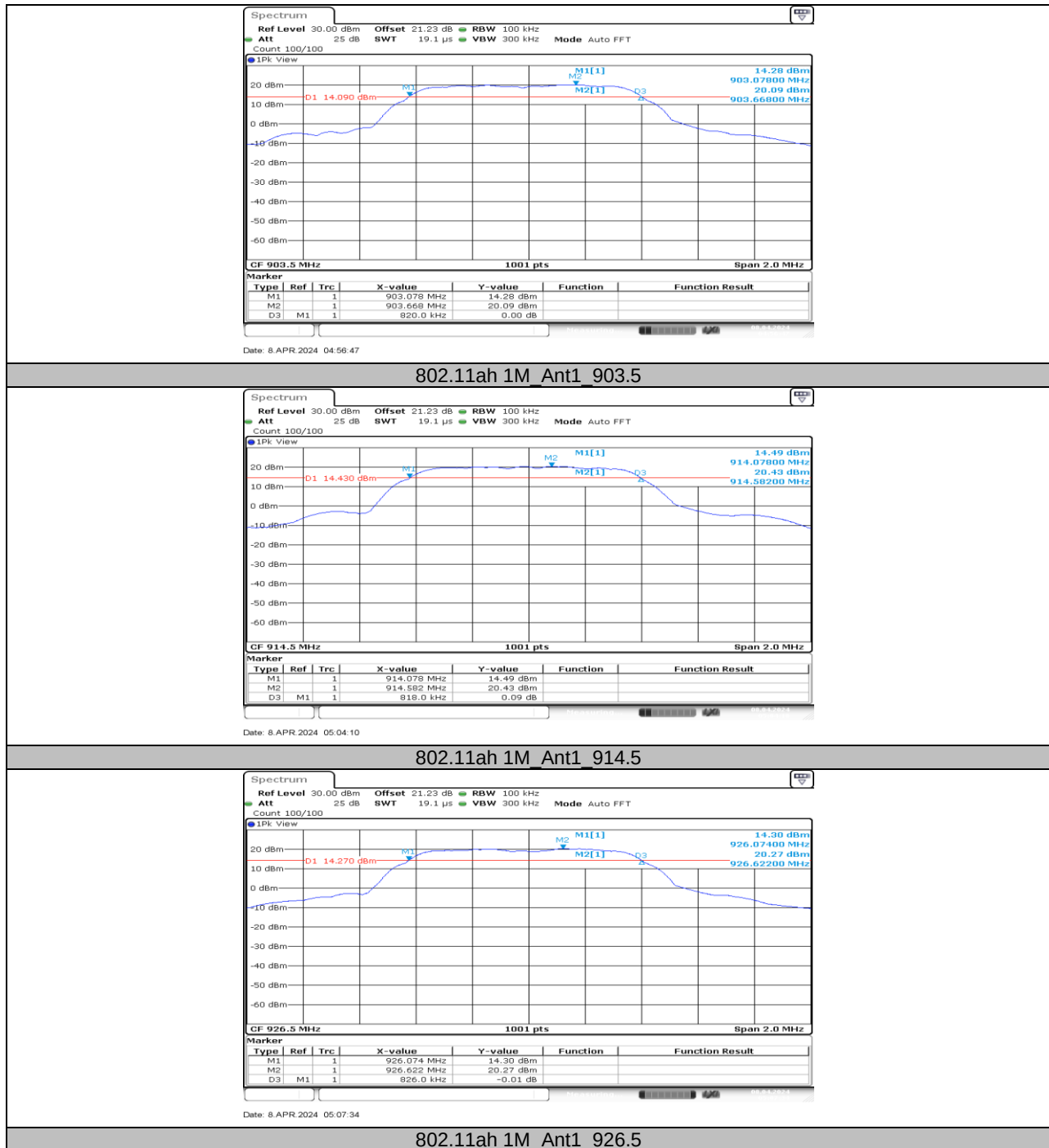
11.1. Appendix A: DTS Bandwidth

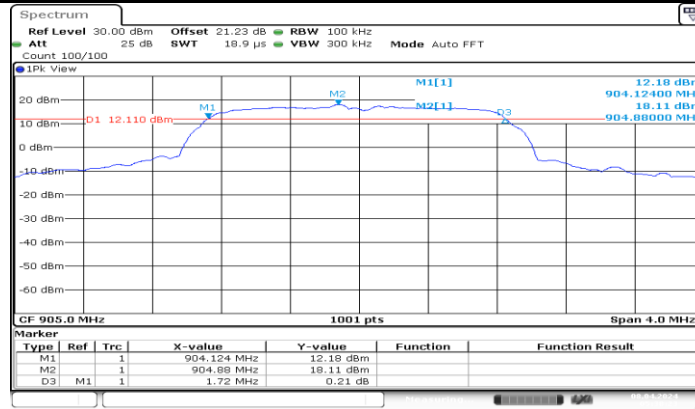
11.1.1. Test Result

TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
802.11ah 1M	Ant1	903.5	0.82	903.08	903.90	≥ 0.5	PASS
		914.5	0.82	914.08	914.90	≥ 0.5	PASS
		926.5	0.83	926.07	926.90	≥ 0.5	PASS
802.11ah 2M	Ant1	905	1.72	904.12	905.84	≥ 0.5	PASS
		915	1.71	914.14	915.84	≥ 0.5	PASS
		925	1.71	924.13	925.84	≥ 0.5	PASS
802.11ah 4M	Ant1	906	3.64	904.13	907.77	≥ 0.5	PASS
		914	3.61	912.13	915.74	≥ 0.5	PASS
		922	3.62	920.14	923.75	≥ 0.5	PASS
802.11ah 8M	Ant1	908	7.01	904.16	911.17	≥ 0.5	PASS
		916	7.28	912.16	919.44	≥ 0.5	PASS



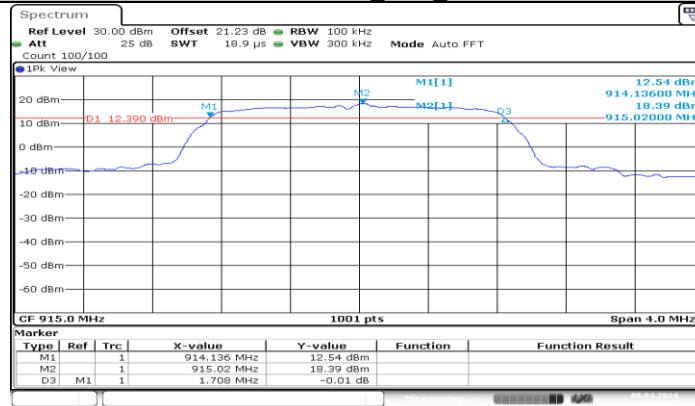
11.1.2. Test Graphs





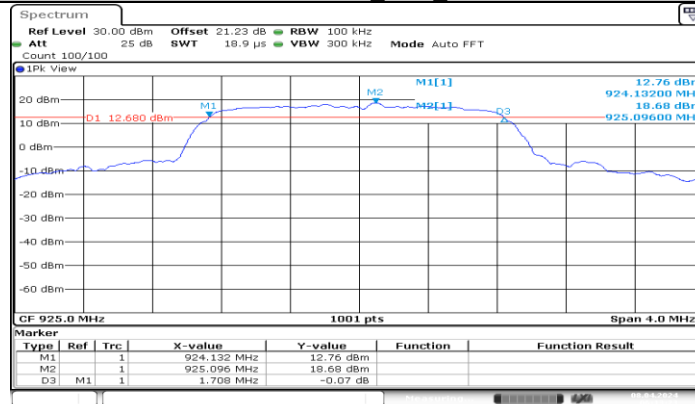
Date: 8 APR 2024 05:38:24

802.11ah 2M Ant1_905



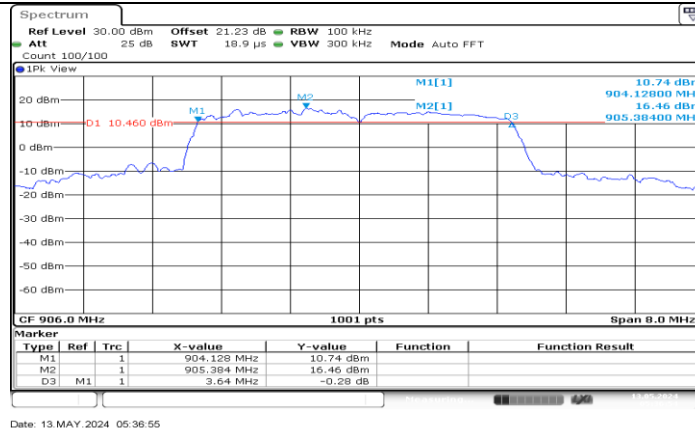
Date: 8 APR 2024 06:10:37

802.11ah 2M Ant1_915

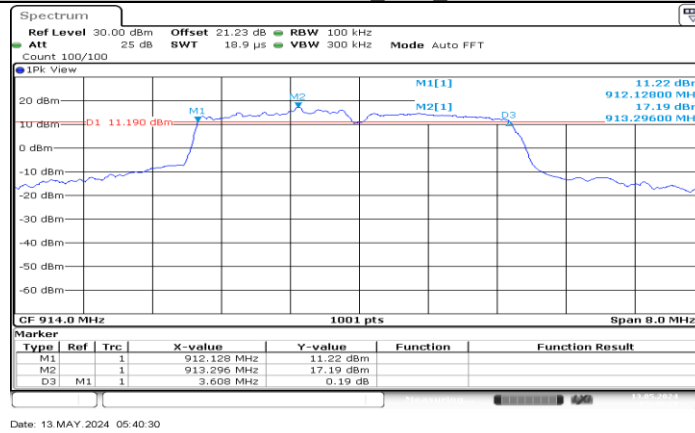


Date: 8 APR 2024 06:13:24

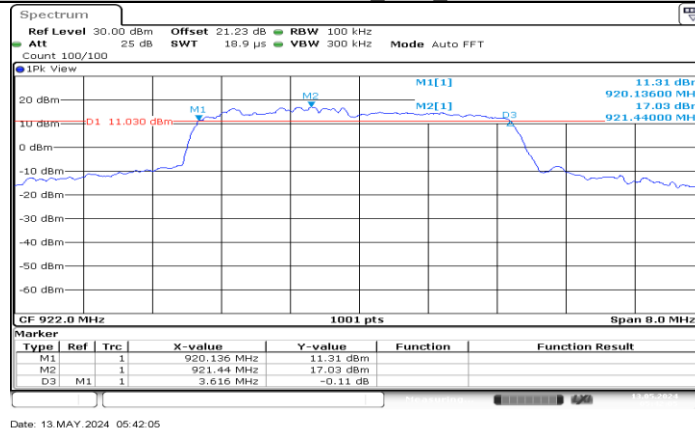
802.11ah 2M Ant1_925



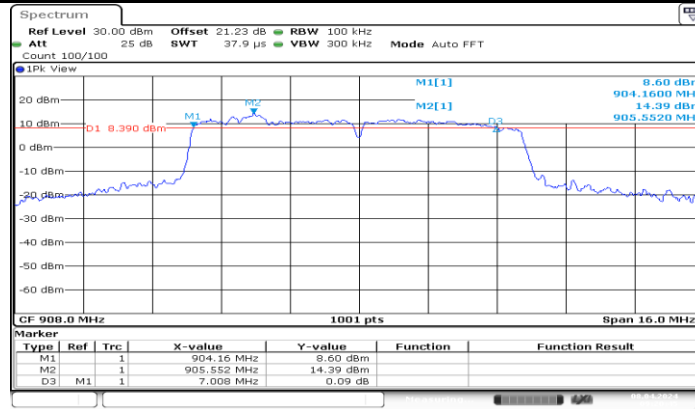
802.11ah 4M Ant1 906



802.11ah 4M Ant1 914

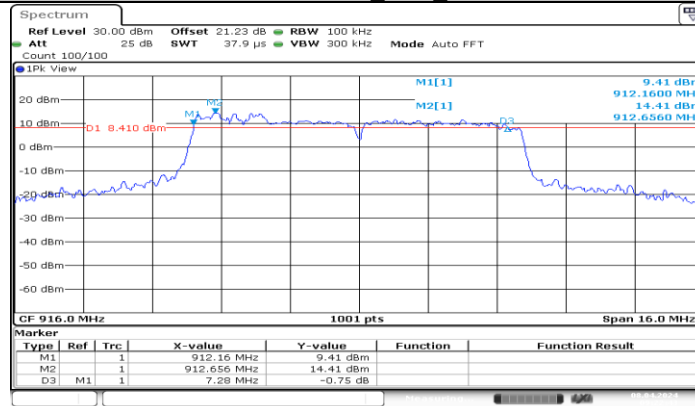


802.11ah 4M Ant1 922



Date: 8 APR 2024 09:20:45

802.11ah 8M_Ant1_908



Date: 8 APR 2024 09:22:43

802.11ah 8M_Ant1_916



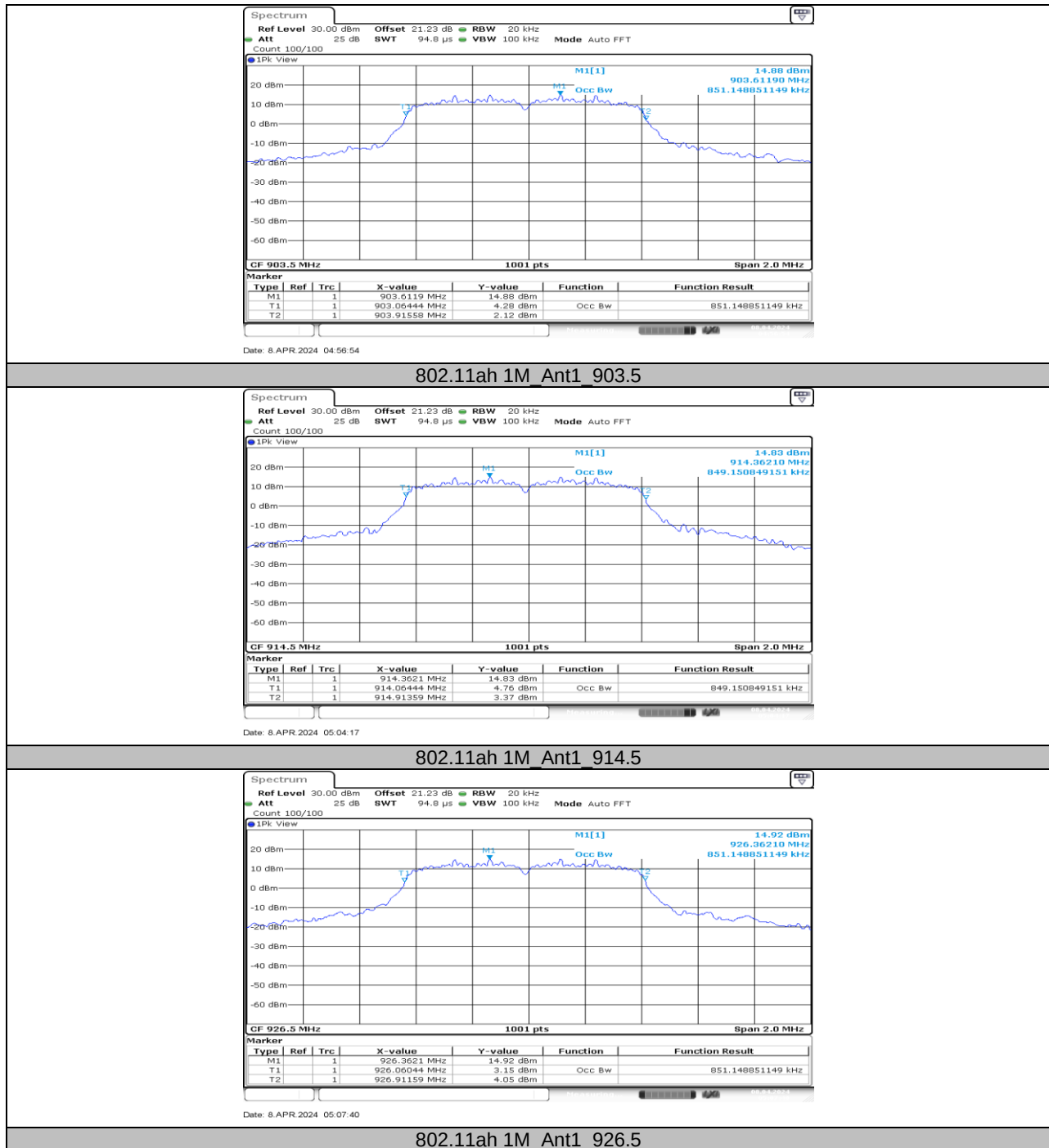
11.2. Appendix B: Occupied Channel Bandwidth

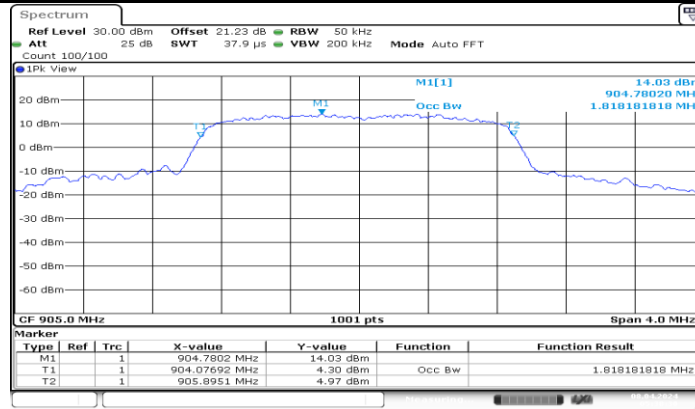
11.2.1. Test Result

TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
802.11ah 1M	Ant1	903.5	0.851	903.0644	903.9156	PASS
		914.5	0.849	914.0644	914.9136	PASS
		926.5	0.851	926.0604	926.9116	PASS
802.11ah 2M	Ant1	905	1.818	904.0769	905.8951	PASS
		915	1.814	914.0769	915.8911	PASS
		925	1.81	924.0769	925.8871	PASS
802.11ah 4M	Ant1	906	3.708	904.1059	907.8142	PASS
		914	3.716	912.1059	915.8222	PASS
		922	3.700	920.1139	923.8142	PASS
802.11ah 8M	Ant1	908	7.624	904.0839	911.7083	PASS
		916	7.672	912.0839	919.7562	PASS



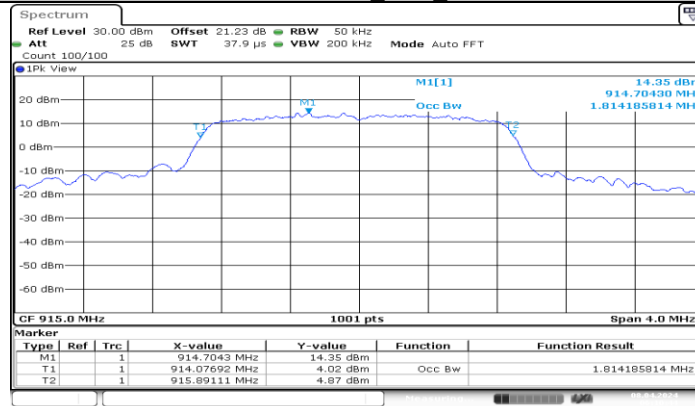
11.2.2. Test Graphs





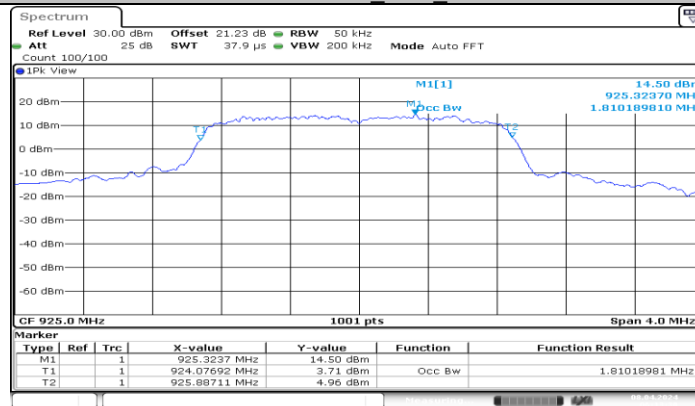
Date: 8 APR 2024 05:38:30

802.11ah 2M Ant1_905



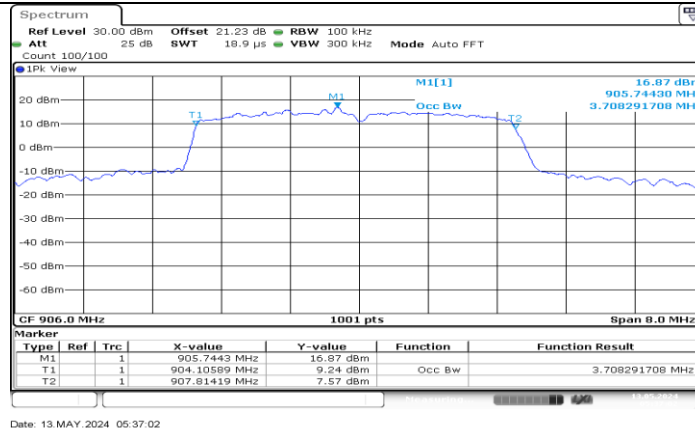
Date: 8 APR 2024 06:10:44

802.11ah 2M Ant1_915

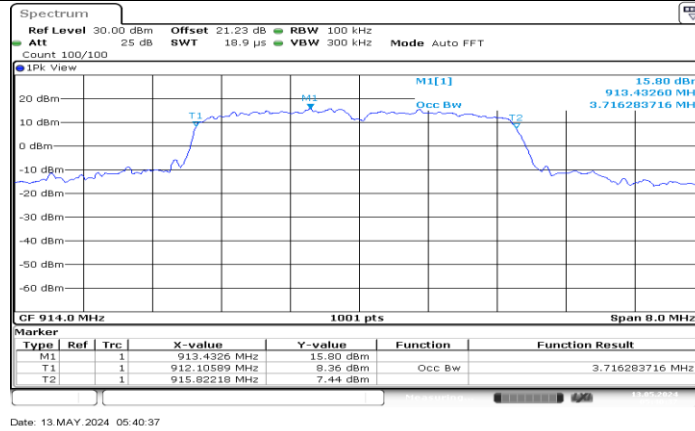


Date: 8 APR 2024 06:13:30

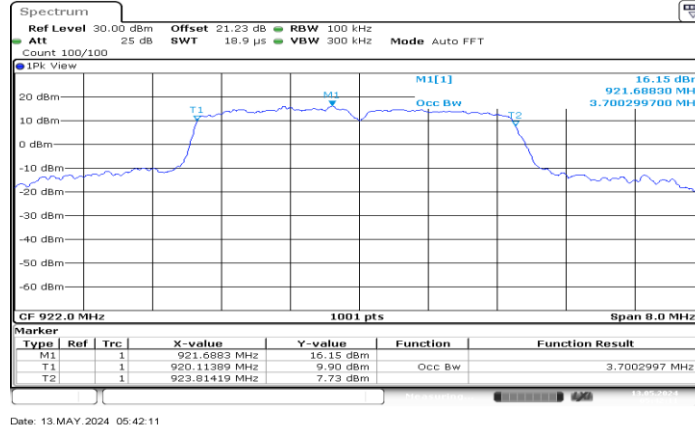
802.11ah 2M Ant1_925



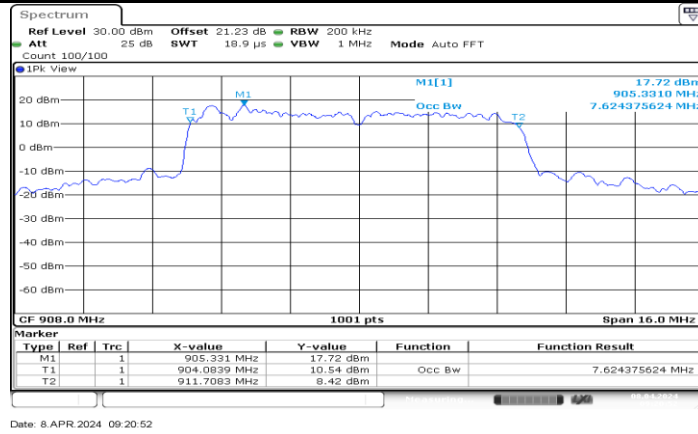
802.11ah 4M Ant1 906



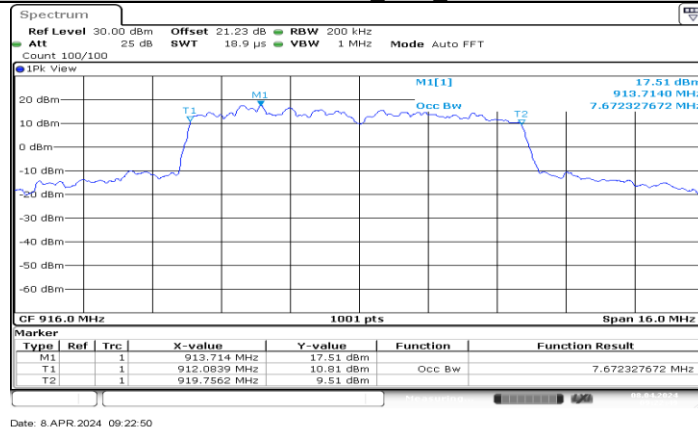
802.11ah 4M Ant1 914



802.11ah 4M Ant1 922



802.11ah 8M Ant1_908



802.11ah 8M Ant1_916



11.3. Appendix C: Maximum conducted output power

11.3.1. Test Result

Test Mode	Antenna	Frequency[MHz]	Peak Result[dBm]	Average Result[dBm]	Limit[dBm]	Verdict
802.11ah 1M	Ant1	903.5	27.44	19.91	≤30	PASS
		914.5	27.49	20.17	≤30	PASS
		926.5	27.68	20.73	≤30	PASS
802.11ah 2M	Ant1	905	27.49	20.08	≤30	PASS
		915	27.67	19.36	≤30	PASS
		925	27.55	20.61	≤30	PASS
802.11ah 4M	Ant1	906	27.76	19.98	≤30	PASS
		914	27.59	20.10	≤30	PASS
		922	27.62	20.97	≤30	PASS
802.11ah 8M	Ant1	908	27.50	20.49	≤30	PASS
		916	27.63	19.85	≤30	PASS



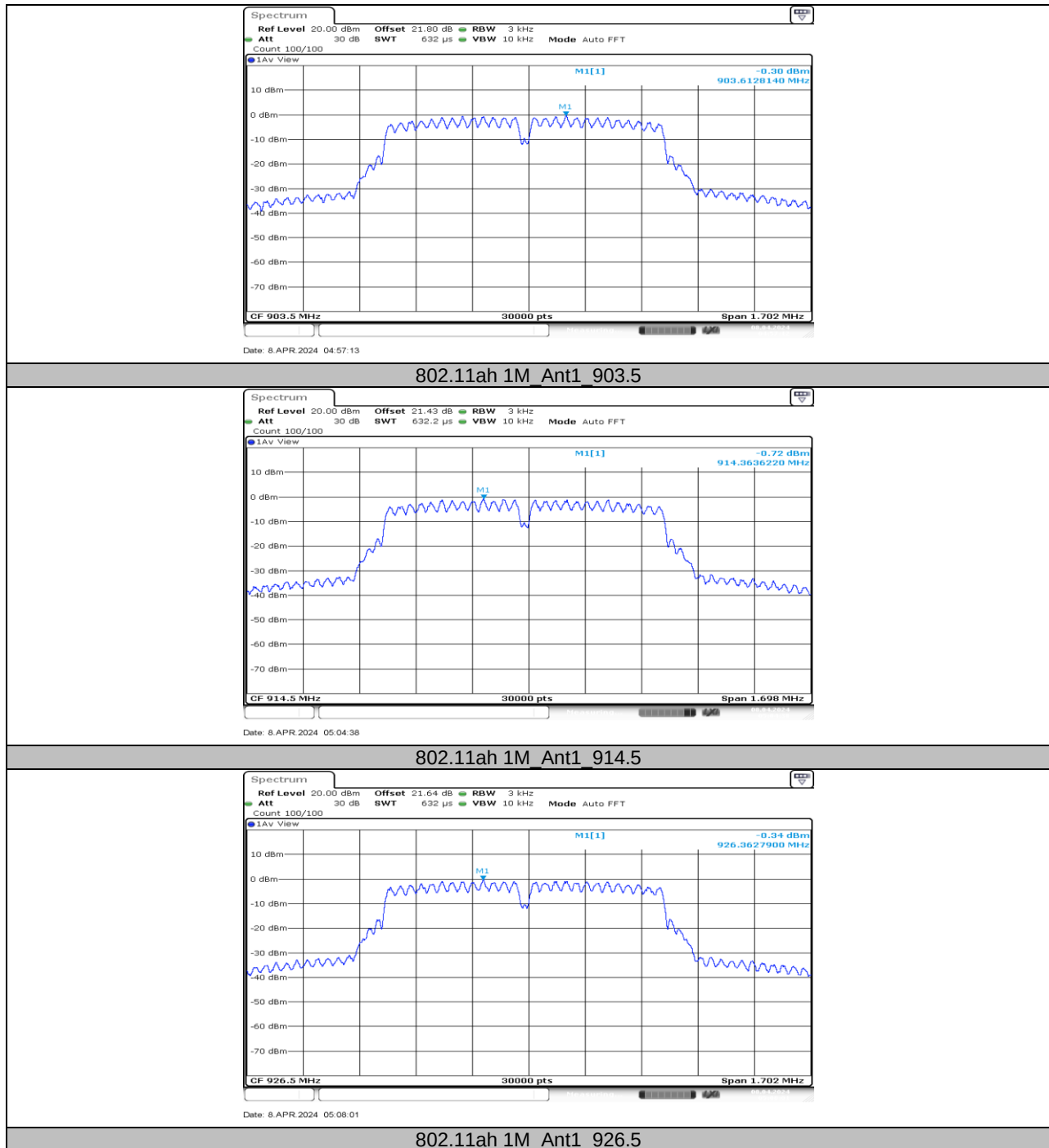
11.4. Appendix D: Maximum power spectral density

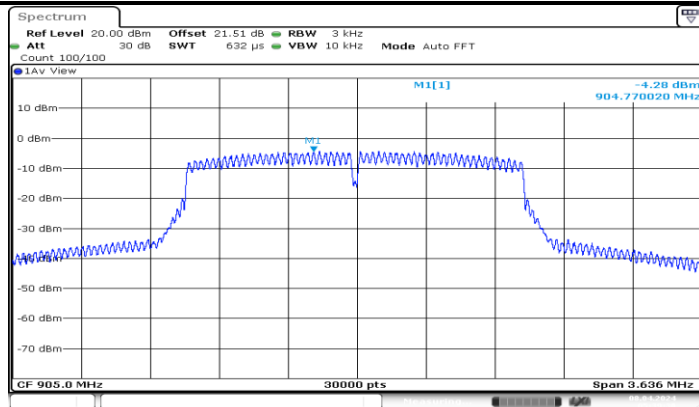
11.4.1. Test Result

TestMode	Antenna	Freq(MHz)	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
802.11ah 1M	Ant1	903.5	-0.30	≤8.00	PASS
		914.5	-0.72	≤8.00	PASS
		926.5	-0.34	≤8.00	PASS
802.11ah 2M	Ant1	905	-4.28	≤8.00	PASS
		915	-3.84	≤8.00	PASS
		925	-4.03	≤8.00	PASS
802.11ah 4M	Ant1	906	-6.22	≤8.00	PASS
		914	-6.32	≤8.00	PASS
		922	-6.30	≤8.00	PASS
802.11ah 8M	Ant1	908	-8.00	≤8.00	PASS
		916	-8.60	≤8.00	PASS



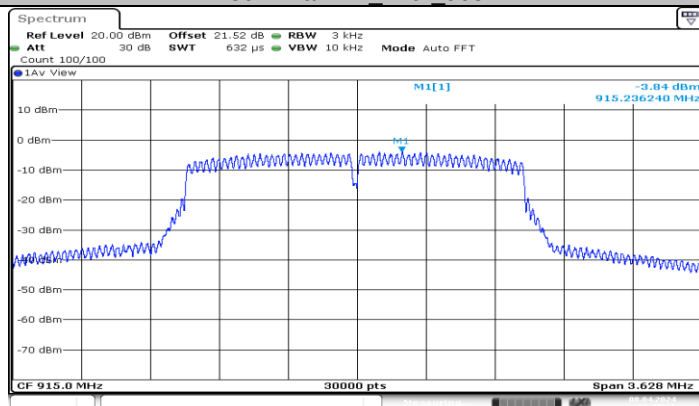
11.4.2. Test Graphs





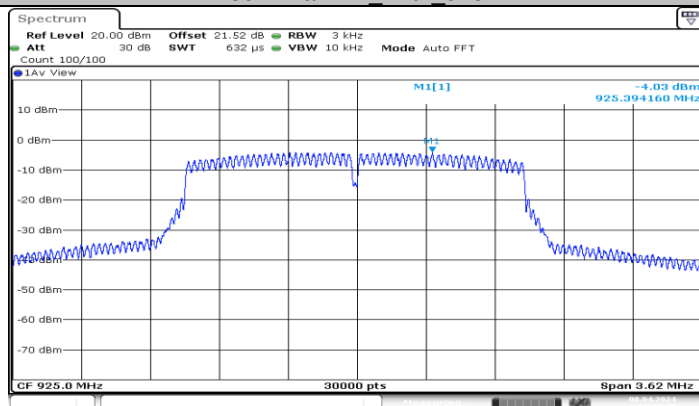
Date: 8 APR 2024 05:39:31

802.11ah 2M_Ant1_905



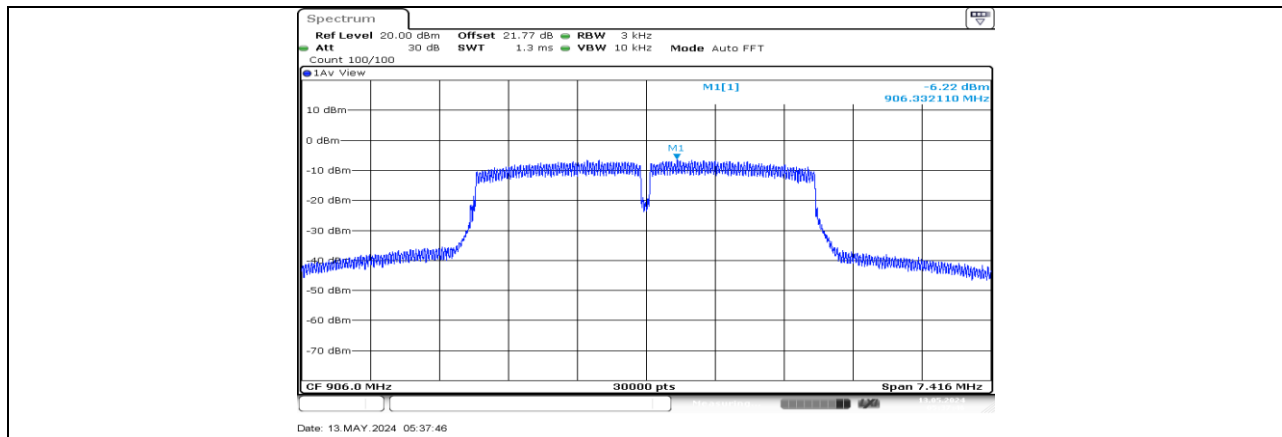
Date: 8 APR 2024 06:12:28

802.11ah 2M_Ant1_915

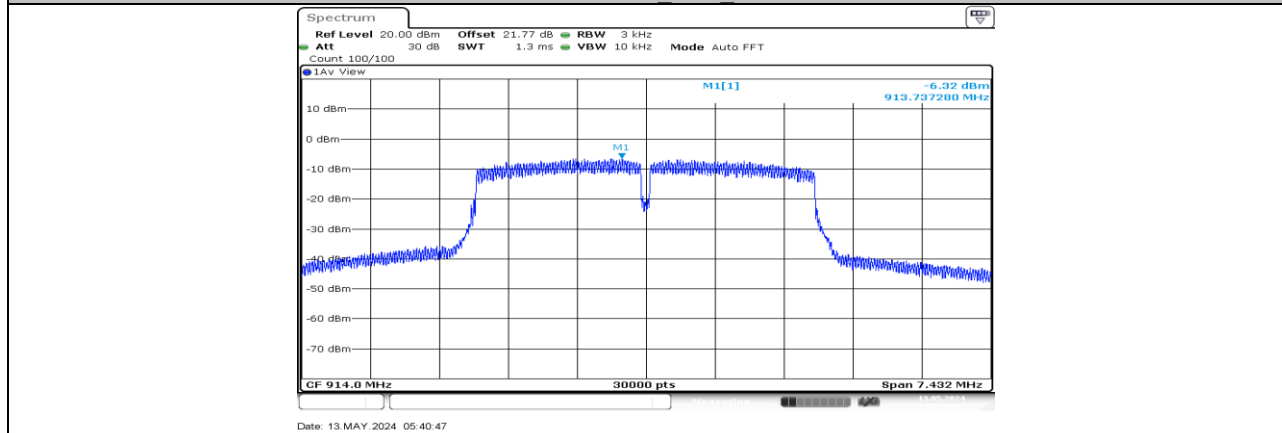


Date: 8 APR 2024 06:13:45

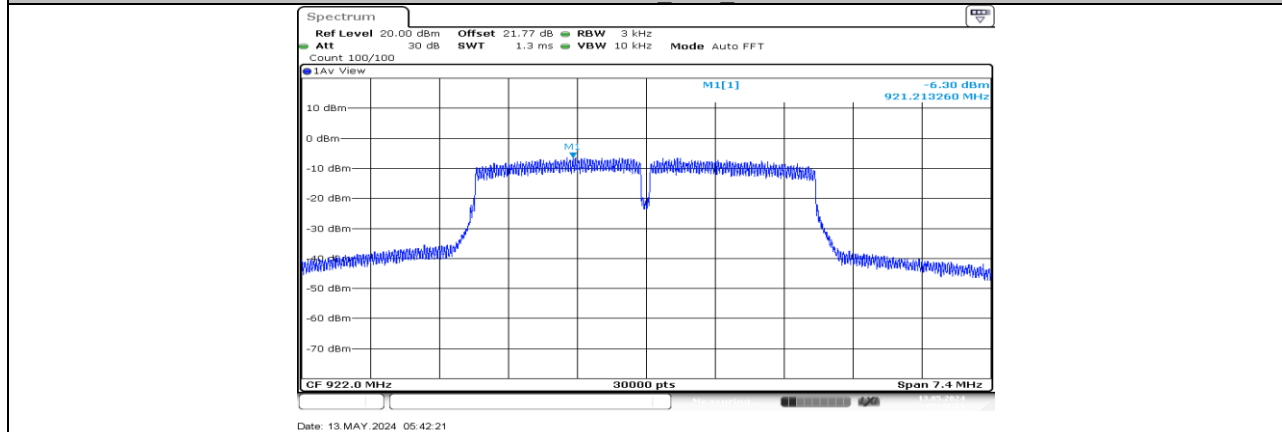
802.11ah 2M_Ant1_925



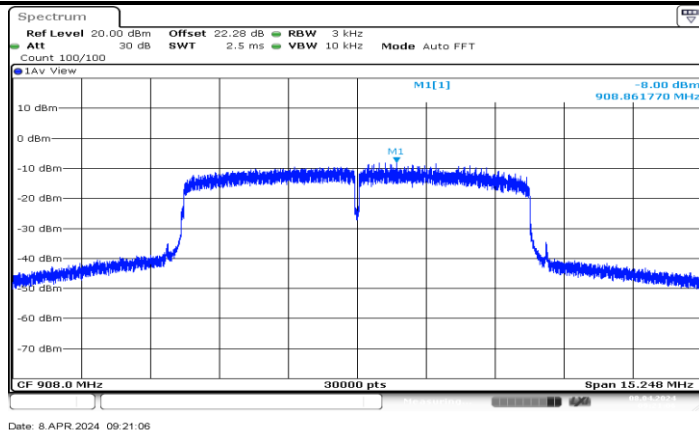
802.11ah 4M Ant1 906



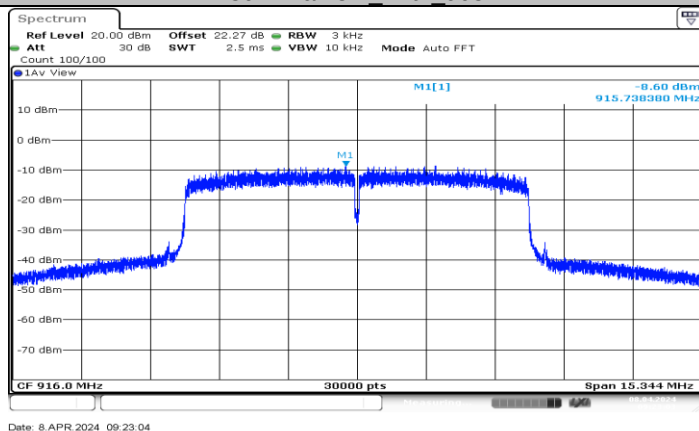
802.11ah 4M Ant1 914



802.11ah 4M Ant1 922



802.11ah 8M_Ant1_908



802.11ah 8M_Ant1_916



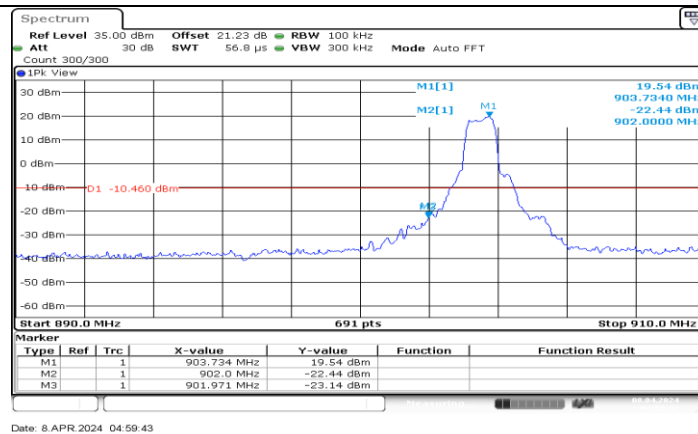
11.5. Appendix E: Band edge measurements

11.5.1. Test Result

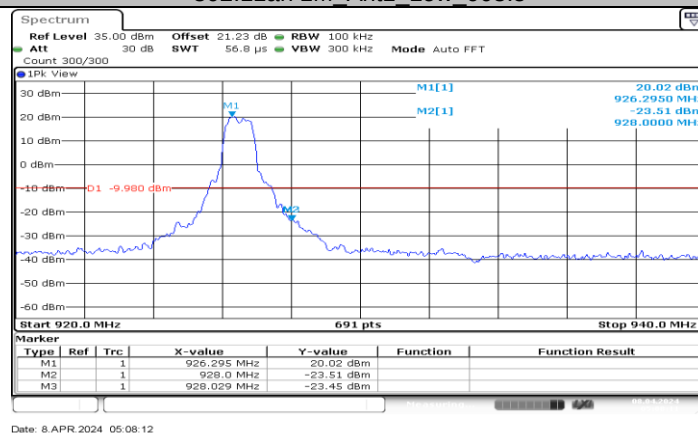
TestMode	Antenna	ChName	Freq (MHz)	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
802.11ah 1M	Ant1	Low	903.5	19.54	-23.14	≤-10.46	PASS
		High	926.5	20.02	-23.45	≤-9.98	PASS
802.11ah 2M	Ant1	Low	905	16.99	-26.47	≤-13.01	PASS
		High	925	17.92	-25.52	≤-12.08	PASS
802.11ah 4M	Ant1	Low	906	16.36	-15.69	≤-13.64	PASS
		High	922	16.52	-30.47	≤-13.48	PASS
802.11ah 8M	Ant1	Low	908	15.70	-17.04	≤-14.3	PASS
		High	916	16.34	-30.97	≤-13.66	PASS



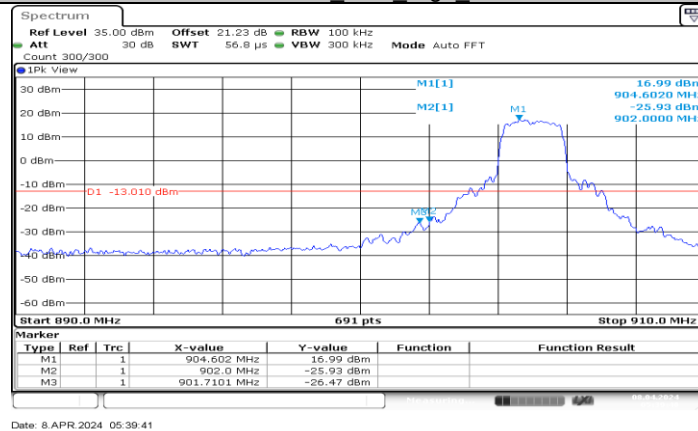
11.5.2. Test Graphs



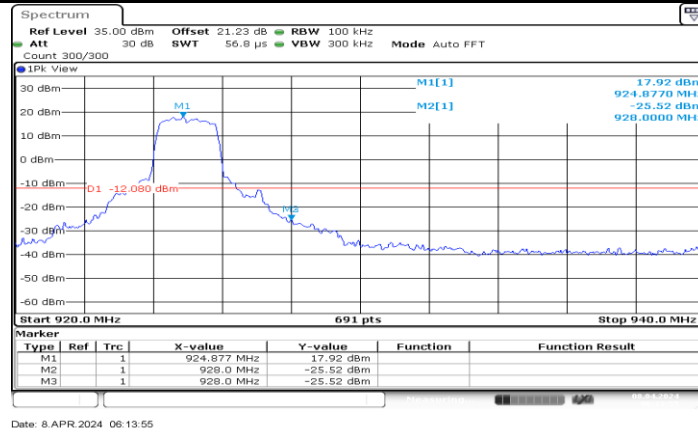
802.11ah 1M_Ant1_Low_903.5



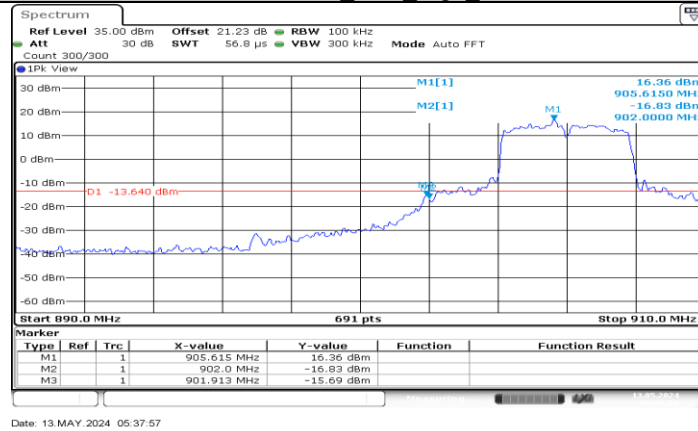
802.11ah 1M_Ant1_High_926.5



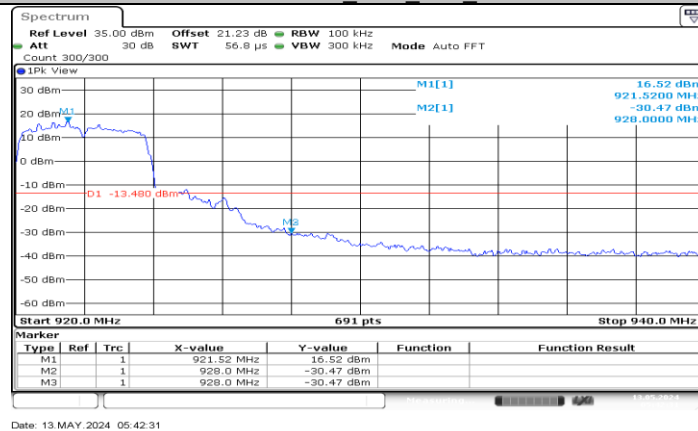
802.11ah 2M_Ant1_Low_905



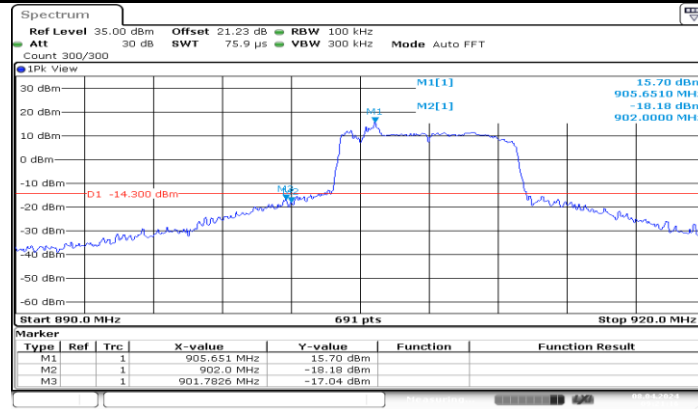
802.11ah 2M Ant1 High 925



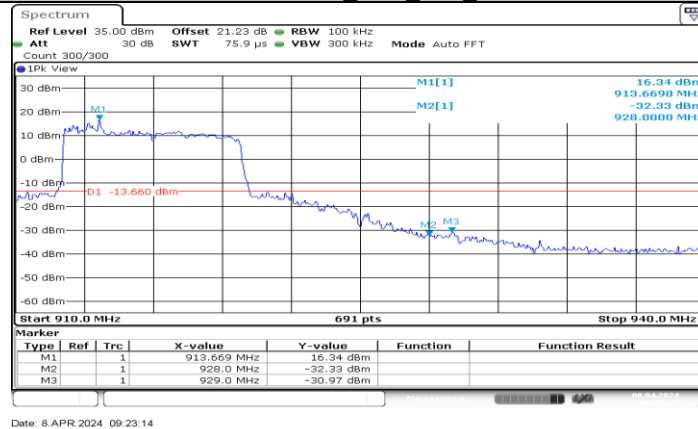
802.11ah 4M Ant1 Low 906



802.11ah 4M Ant1 High 922



802.11ah 8M_Ant1_Low_908



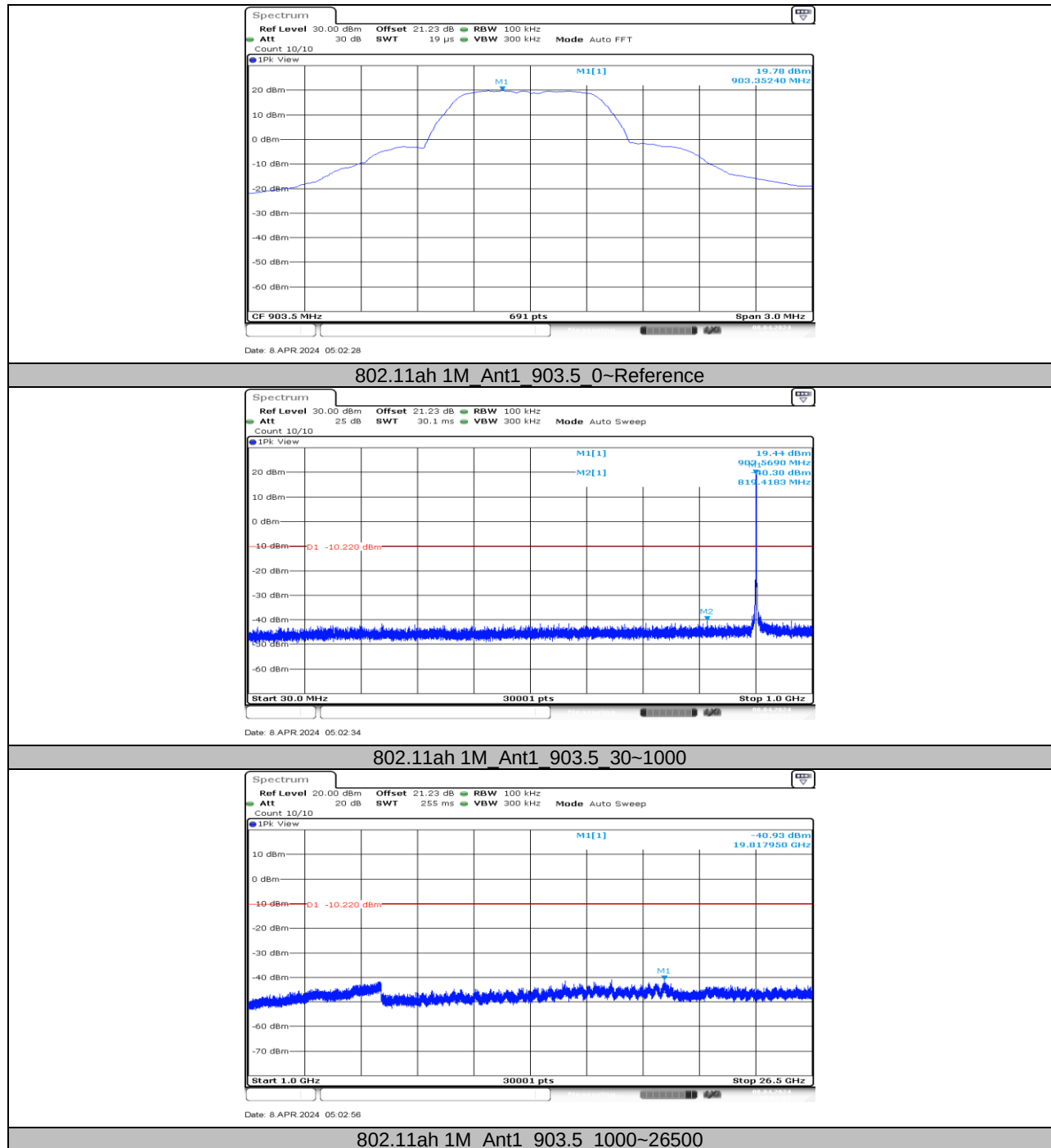
802.11ah 8M_Ant1_High_916

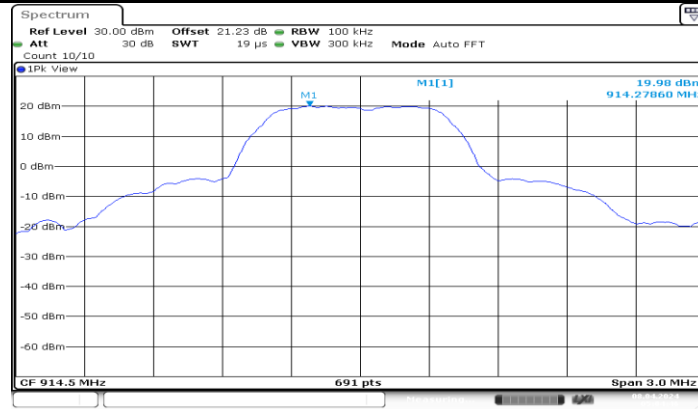
**11.6. Appendix F: Conducted Spurious Emission****11.6.1. Test Result**

TestMode	Antenna	Freq(MHz)	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
802.11ah 1M	Ant1	903.5	Reference	19.78	19.78	---	PASS
			30~1000	19.78	-40.3	≤ -10.22	PASS
			1000~26500	19.78	-40.93	≤ -10.22	PASS
		914.5	Reference	19.98	19.98	---	PASS
			30~1000	19.98	-41.17	≤ -10.02	PASS
			1000~26500	19.98	-41.21	≤ -10.02	PASS
		926.5	Reference	20.66	20.66	---	PASS
			30~1000	20.66	-41.09	≤ -9.34	PASS
			1000~26500	20.66	-40.83	≤ -9.34	PASS
802.11ah 2M	Ant1	905	Reference	17.66	17.66	---	PASS
			30~1000	17.66	-41.02	≤ -12.34	PASS
			1000~26500	17.66	-41.17	≤ -12.34	PASS
		915	Reference	17.26	17.26	---	PASS
			30~1000	17.26	-40.68	≤ -12.74	PASS
			1000~26500	17.26	-40.28	≤ -12.74	PASS
		925	Reference	18.20	18.20	---	PASS
			30~1000	18.20	-40.82	≤ -11.8	PASS
			1000~26500	18.20	-40.19	≤ -11.8	PASS
802.11ah 4M	Ant1	906	Reference	15.03	15.03	---	PASS
			30~1000	15.03	-41.14	≤ -14.97	PASS
			1000~26500	15.03	-41.31	≤ -14.97	PASS
		914	Reference	16.58	16.58	---	PASS
			30~1000	16.58	-40.94	≤ -13.42	PASS
			1000~26500	16.58	-40.82	≤ -13.42	PASS
		922	Reference	16.11	16.11	---	PASS
			30~1000	16.11	-41.01	≤ -13.89	PASS
			1000~26500	16.11	-40.8	≤ -13.89	PASS
802.11ah 8M	Ant1	908	Reference	15.57	15.57	---	PASS
			30~1000	15.57	-40.97	≤ -14.43	PASS
			1000~26500	15.57	-40.97	≤ -14.43	PASS
		916	Reference	16.32	16.32	---	PASS
			30~1000	16.32	-41.09	≤ -13.68	PASS
			1000~26500	16.32	-40.84	≤ -13.68	PASS



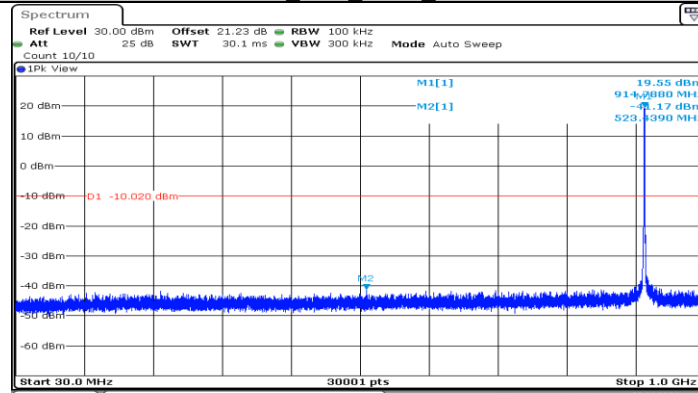
11.6.2. Test Graphs





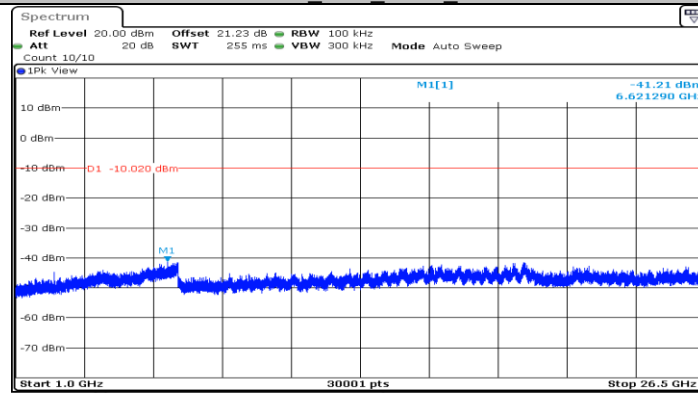
Date: 8 APR 2024 05:04:47

802.11ah 1M Ant1 914.5 0-Reference



Date: 8 APR 2024 05:04:54

802.11ah 1M Ant1 914.5 30-1000

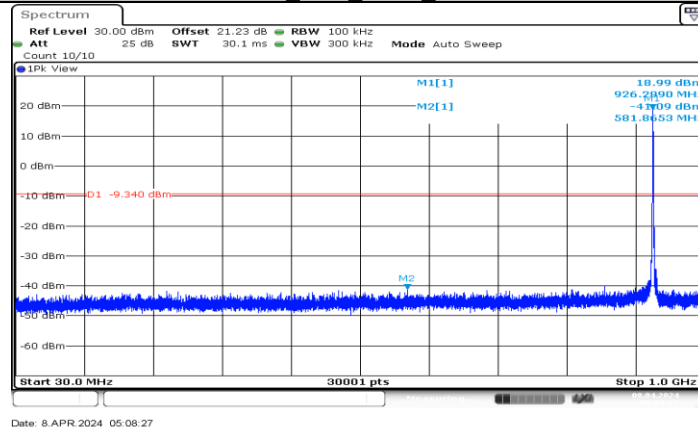


Date: 8 APR 2024 05:05:15

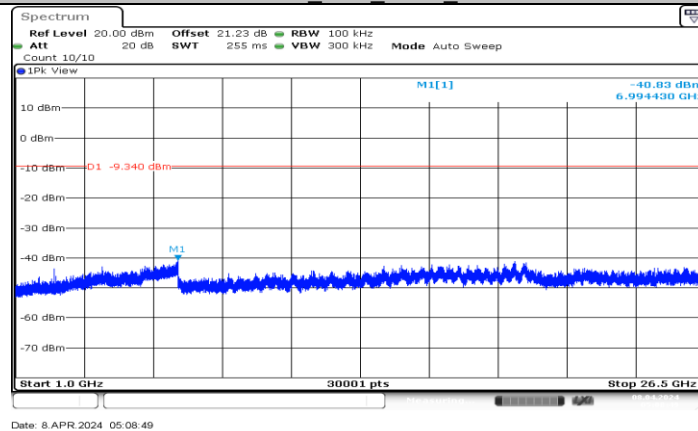
802.11ah 1M Ant1 914.5 1000-26500



802.11ah 1M Ant1 926.5 0-Reference



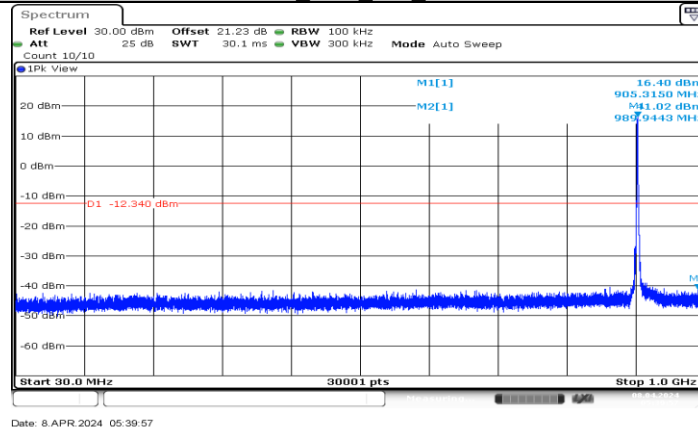
802.11ah 1M Ant1 926.5 30-1000



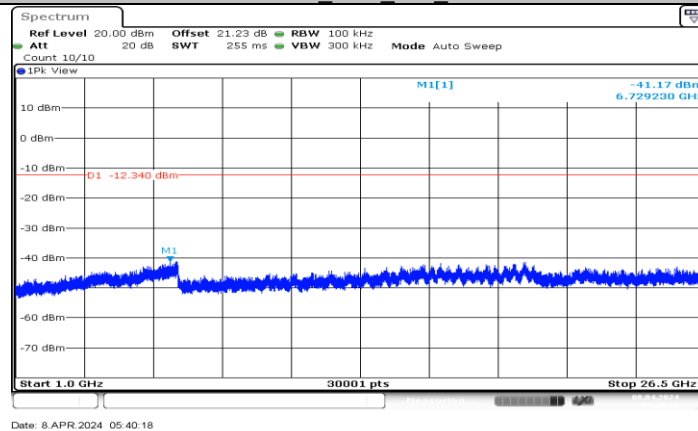
802.11ah 1M Ant1 926.5 1000-26500



802.11ah 2M_Ant1_905_0~Reference



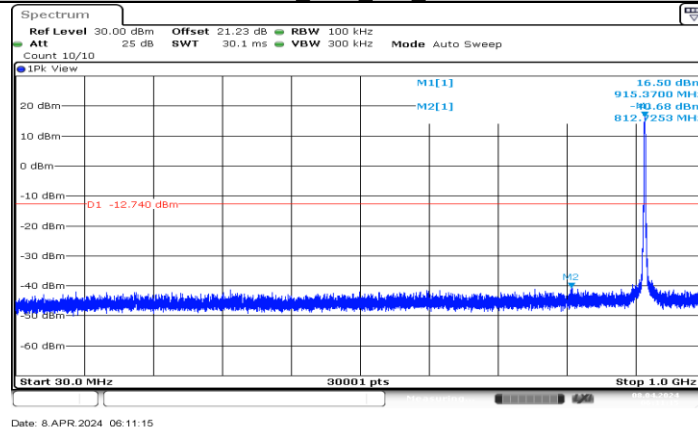
802.11ah 2M_Ant1_905_30~1000



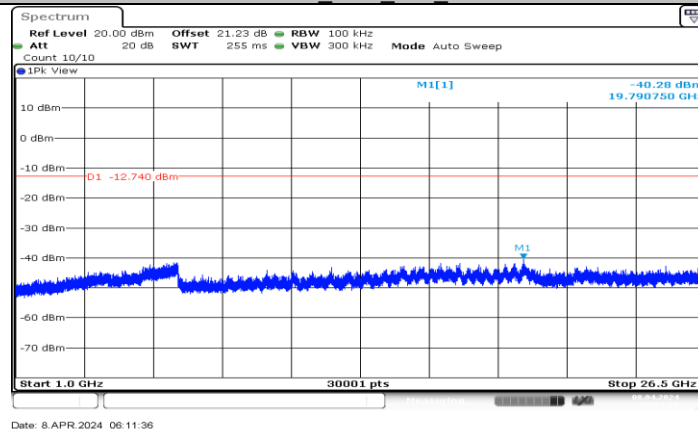
802.11ah 2M_Ant1_905_1000~26500



802.11ah 2M Ant1 915 0~Reference



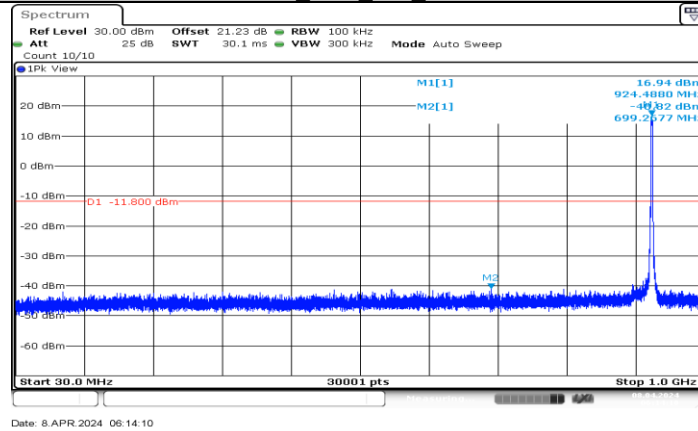
802.11ah 2M Ant1 915 30~1000



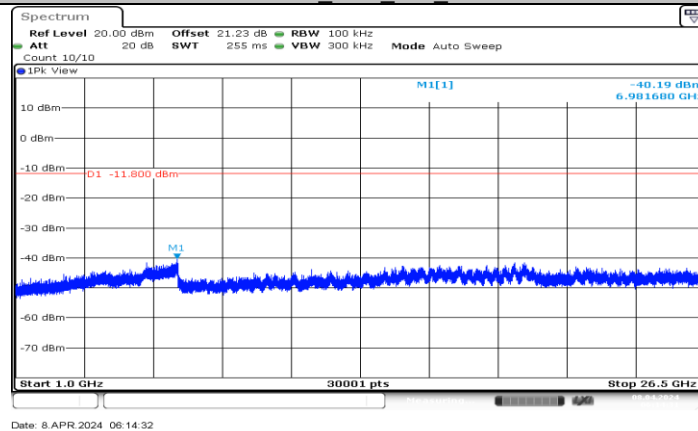
802.11ah 2M Ant1 915 1000~26500



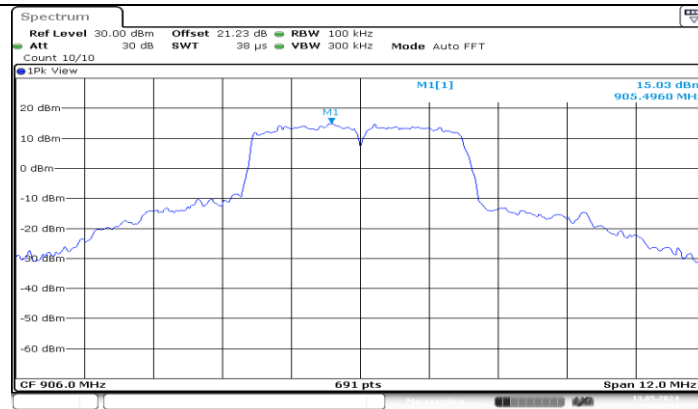
802.11ah 2M Ant1 925 0~Reference



802.11ah 2M Ant1 925 30~1000

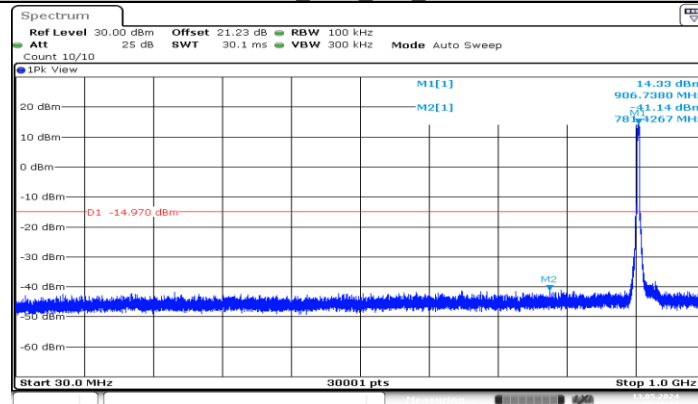


802.11ah 2M Ant1 925 1000~26500



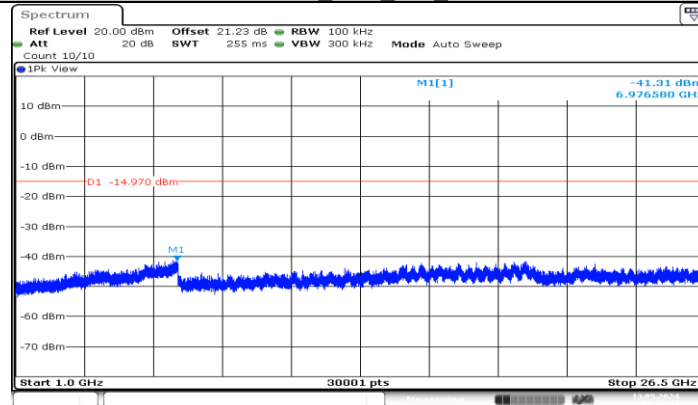
Date: 13.MAY.2024 05:38:06

802.11ah 4M Ant1 906 0~Reference



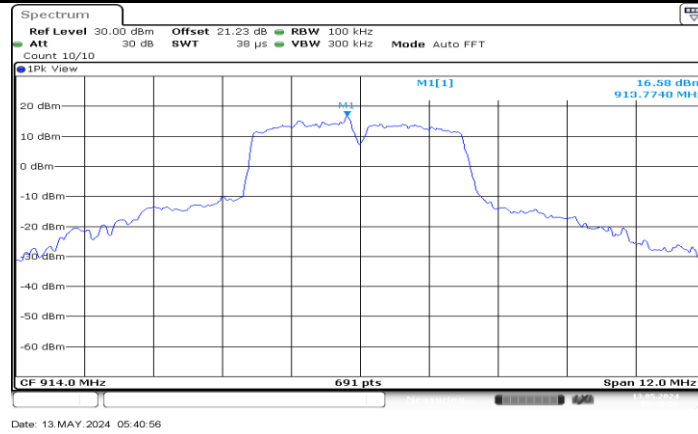
Date: 13.MAY.2024 05:38:12

802.11ah 4M Ant1 906 30~1000

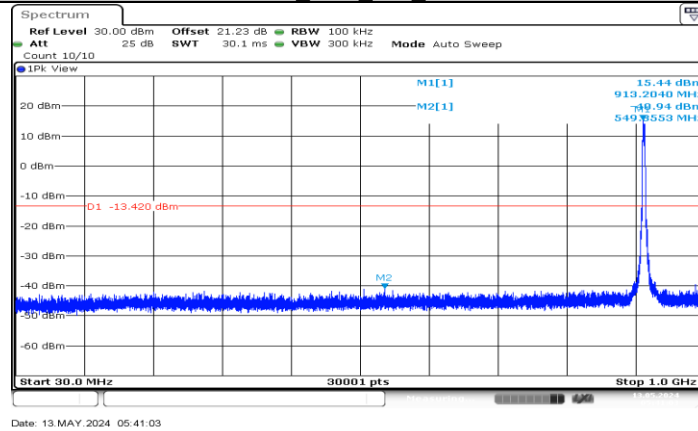


Date: 13.MAY.2024 05:38:34

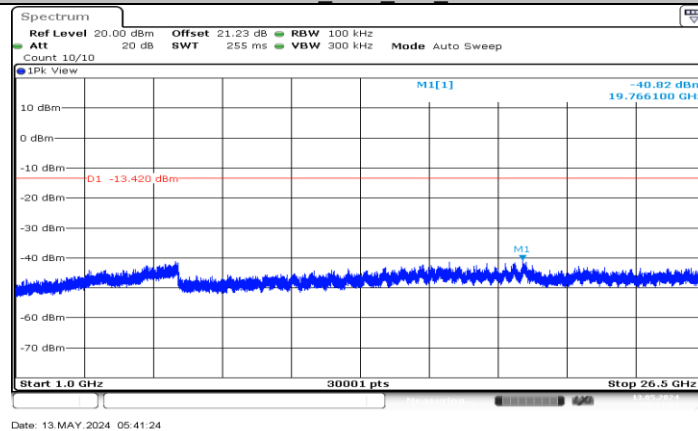
802.11ah 4M Ant1 906 1000~26500



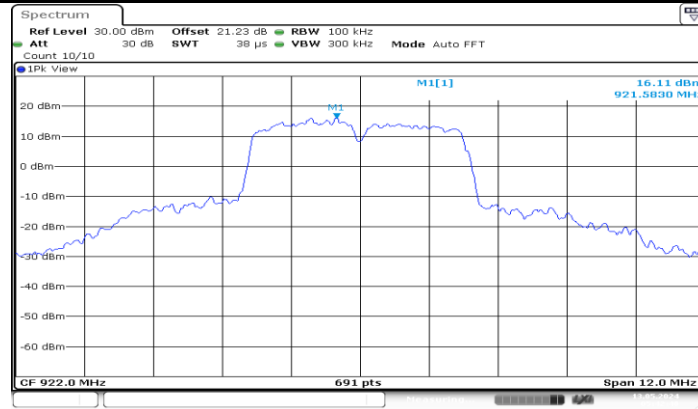
802.11ah 4M Ant1 914 0~Reference



802.11ah 4M Ant1 914 30~1000

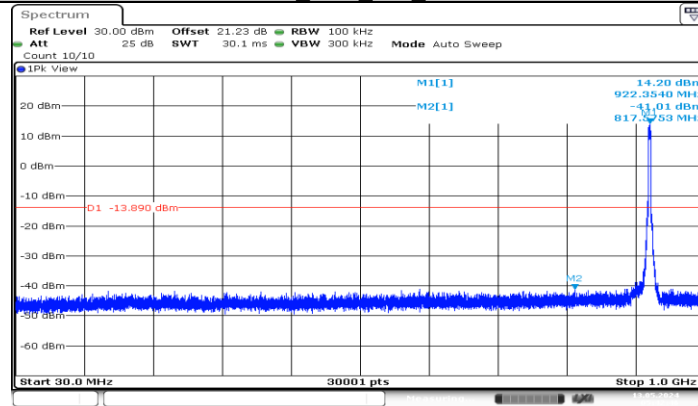


802.11ah 4M Ant1 914 1000~26500



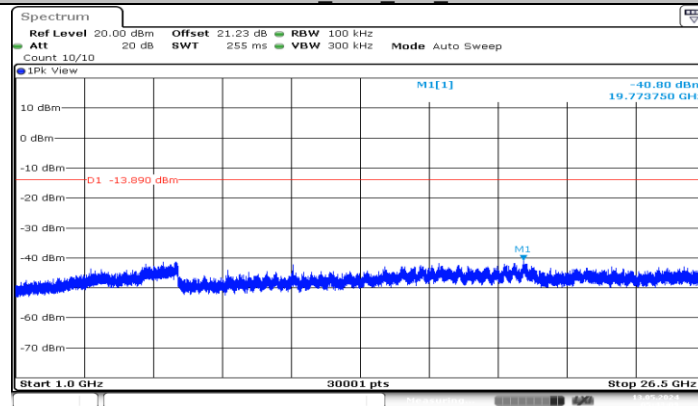
Date: 13.MAY.2024 05:42:40

802.11ah 4M_Ant1_922_0~Reference



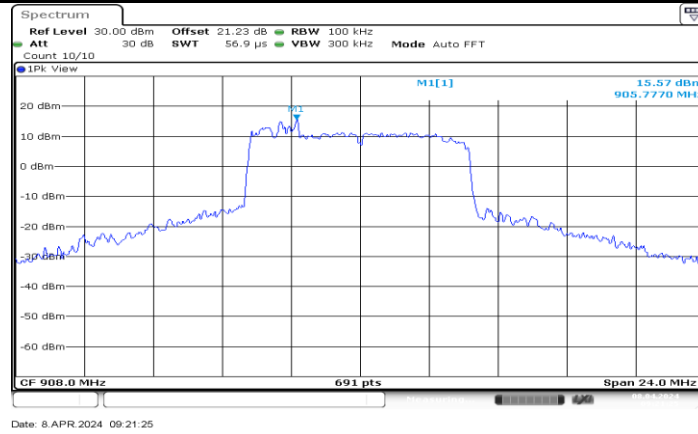
Date: 13.MAY.2024 05:42:47

802.11ah 4M_Ant1_922_30~1000

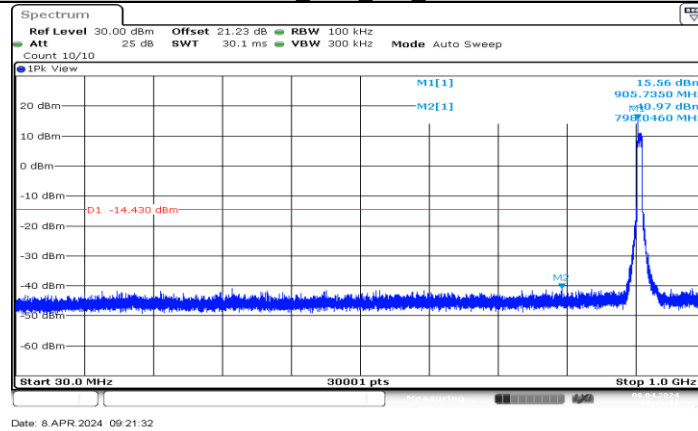


Date: 13.MAY.2024 05:43:08

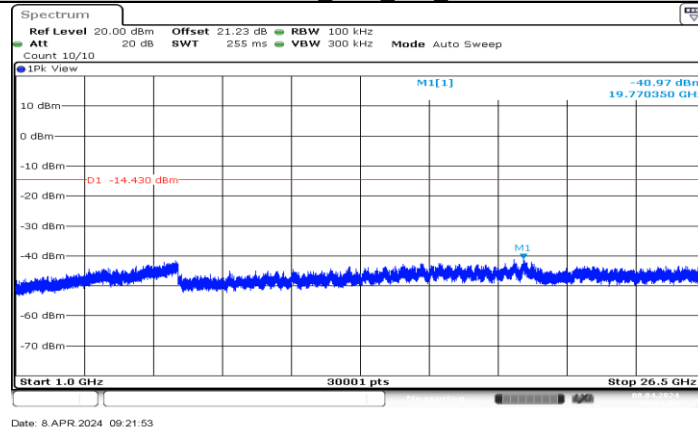
802.11ah 4M_Ant1_922_1000~26500



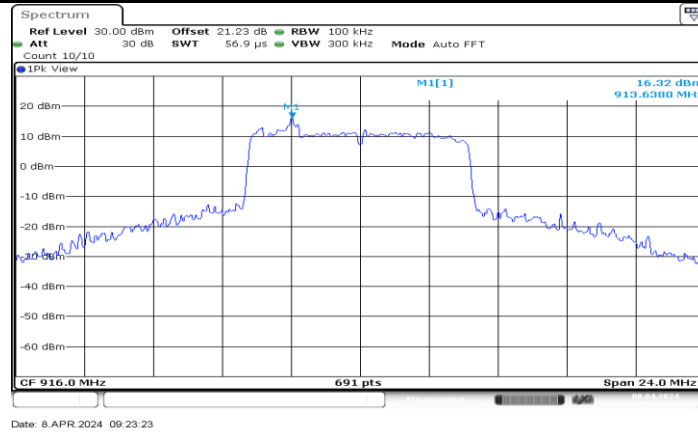
802.11ah 8M Ant1 908 0~Reference



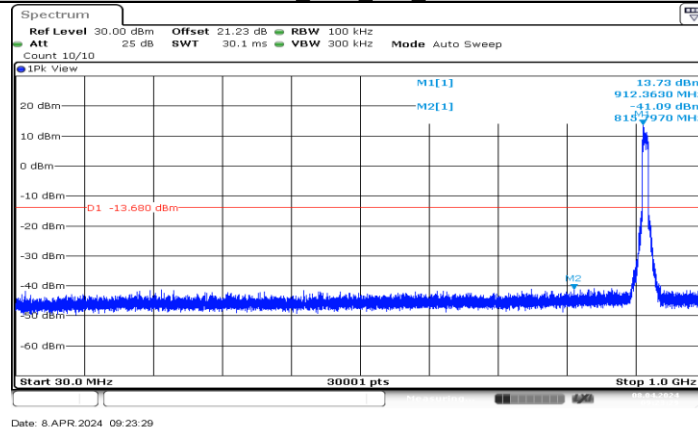
802.11ah 8M Ant1 908 30~1000



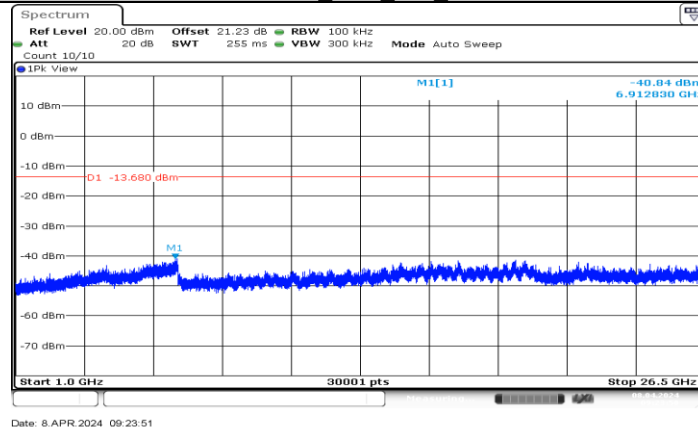
802.11ah 8M Ant1 908 1000~26500



802.11ah 8M_Ant1_916_0~Reference



802.11ah 8M_Ant1_916_30~1000



802.11ah 8M_Ant1_916_1000~26500



11.7. Appendix G: Duty Cycle

11.7.1. Test Result

Test Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)	Final setting For VBW (kHz)
802.11ah 1M	29.13	29.93	0.9733	97.33	0.12	0.03	1
802.11ah 2M	12.69	13.51	0.9393	93.93	0.27	0.08	1
802.11ah 4M	6.23	7.06	0.8824	88.24	0.54	0.16	1
802.11ah 8M	3.04	3.86	0.7876	78.76	1.04	0.33	1

Note:

Duty Cycle Correction Factor=10log (1/x).

Where: x is Duty Cycle (Linear)

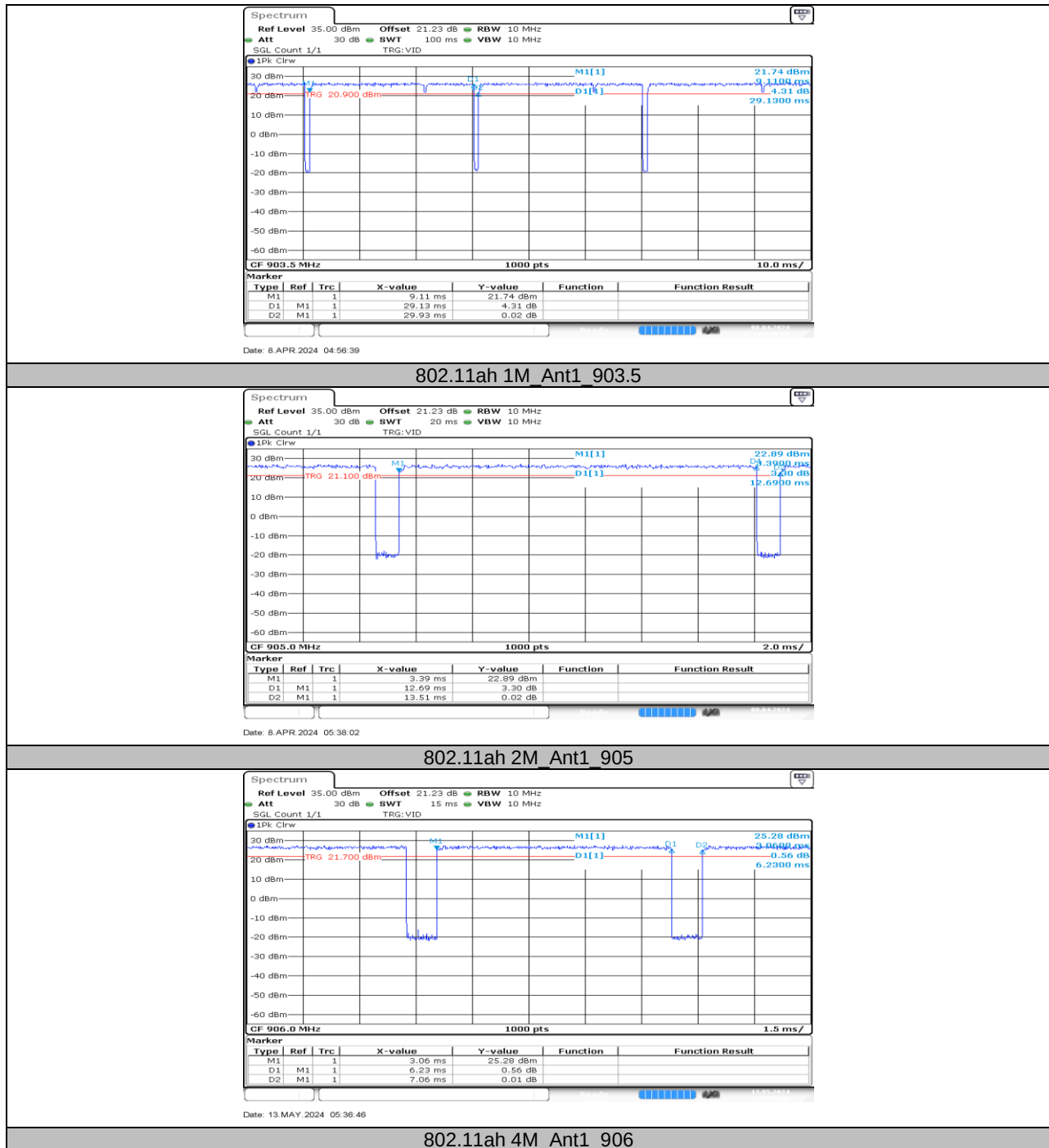
Where: T is On Time

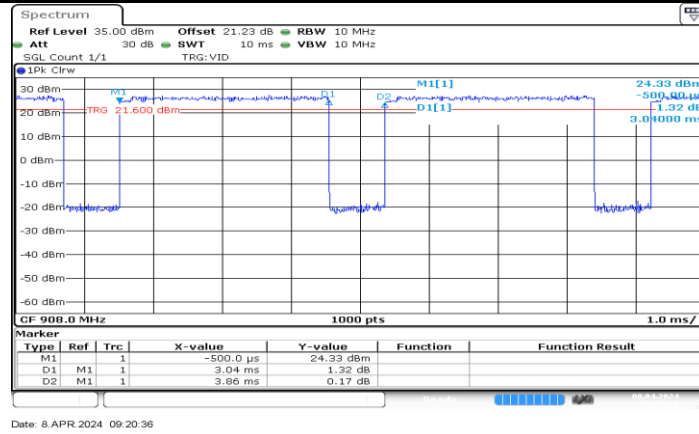
If that calculated VBW is not available on the analyzer, then the next higher value should be used.

We have verified that duty cycle is constant (variation are less than +/- 2%).



11.7.2. Test Graphs





802.11ah 8M Ant1_908

END OF REPORT