

FCC REPORT


Applicant: Autel Robotics Co., Ltd.

Address of Applicant: 9th Floor, Bldg. B1, Zhiyuan, 1001 Xueyuan Rd., Xili, Nanshan, Shenzhen 518055, China

Equipment Under Test (EUT)

Product Name: Data transmission Module

Model No.: MA58R

Trade mark: 

FCC ID: 2AGNTM58A

Applicable standards: FCC CFR Title 47 Part 15 Subpart E Section 15.407

Date of sample receipt: 13 Oct., 2021

Date of Test: 14 Oct., to 28 Oct., 2021

Date of report issued: 28 Oct., 2021

Test Result: PASS*

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Bruce Zhang
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the JYT product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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2 Version

Version No.	Date	Description
00	28 Oct., 2021	Original

Tested by: Mike.ou
Test Engineer

Date: 28 Oct., 2021

Reviewed by: Winner Zhang
Project Engineer

Date: 28 Oct., 2021

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4 Test Summary

Test Item	Section in CFR 47	Test Data	Test Result
Antenna requirement	15.203 & 15.407 (a)	See Section 6.1	Pass
AC Power Line Conducted Emission	15.207	See Section 6.2	Pass
Conducted Output Power	(a) (3)	See Section 6.3	Pass
26dB Occupied Bandwidth	15.407 (a) (12)	See Section 6.4	Pass
6dB Emission Bandwidth	15.407(e)	See Section 6.4	Pass
Power Spectral Density	(a) (3)	See Section 6.5	Pass
Band Edge	15.407(b)	See Section 6.6	Pass
Spurious Emission	15.407 (b) & 15.205 & 15.209	See Section 6.7	Pass
Frequency Stability	15.407(g)	See Section 6.8	Pass
<p>Remark:</p> <ol style="list-style-type: none"> 1. Pass: The EUT complies with the essential requirements in the standard. 2. The cable insertion loss used by "RF Output Power" and other conduction measurement items is 0.5dB (provided by the customer). 			
Test Method:	ANSI C63.10-2013 KDB 789033 D02 General UNII Test Procedures New Rules v02r01		

5 General Information

5.1 Client Information

Applicant:	Autel Robotics Co., Ltd.
Address:	9th Floor, Bldg. B1, Zhiyuan, 1001 Xueyuan Rd., Xili, Nanshan, Shenzhen 518055, China
Manufacturer/ Factory:	Autel Robotics Co., Ltd.
Address:	9th Floor, Bldg. B1, Zhiyuan, 1001 Xueyuan Rd., Xili, Nanshan, Shenzhen 518055, China

5.2 General Description of E.U.T.

Product Name:	Data transmission Module
Model No.:	MA58R
Operation Frequency:	5729.68-5770.68 MHz
Channel numbers:	42
Channel separation:	1 MHz
Modulation technology:	GFSK
Antenna Type:	External Antenna
Antenna gain:	ANT 1: 0.2 dBi (declare by Applicant) ANT 2: -0.1 dBi (declare by Applicant) ANT 3: -0.1 dBi (declare by Applicant)
Power supply:	DC 5V
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

Operation Frequency each of channel for 19 for 1.4MHz Bandwidth					
Channel	Frequency	Channel	Frequency	Channel	Frequency
1	5729.68MHz
2	5730.68MHz	22	5750.68MHz	41	5769.68MHz
3	5731.68MHz	42	5770.68MHz

Note:
1. Channel 1, 22 & 42 selected as Lowest, Middle and Highest channel.

5.3 Test environment and mode

Operating Environment:	
Temperature:	24.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
Test mode:	
Transmitting mode	Keep the EUT in continuous transmitting with modulation
Radiated Emission: The sample was placed 0.8m (below 1GHz)/1.5m (above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. Duty cycle setting during the transmission is 100% with maximum power setting for all modulations.	

5.4 Description of Support Units

Manufacturer	Description	Model	Serial Number	FCC ID/DoC
The EUT has been tested as an independent unit.				

5.5 Measurement Uncertainty

Parameter	Expanded Uncertainty (Confidence of 95%)
Conducted Emission (9kHz ~ 150kHz) for V-AMN	3.11 dB
Conducted Emission (150kHz ~ 30MHz) for V-AMN	2.62 dB
Conducted Emission (150kHz ~ 30MHz) for AAN	3.54 dB
Radiated Emission (9kHz ~ 30MHz electric field) for 3m SAC	3.13 dB
Radiated Emission (9kHz ~ 30MHz magnetic field) for 3m SAC	3.13 dB
Radiated Emission (30MHz ~ 1GHz) for 3m SAC	4.45 dB
Radiated Emission (1GHz ~ 18GHz) for 3m SAC	5.34 dB
Radiated Emission (18GHz ~ 40GHz) for 3m SAC	5.34 dB

5.6 Additions to, deviations, or exclusions from the method

No

5.7 Related Submittal(s) / Grant (s)

This is an original grant, no related submittals and grants.
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5.8 Laboratory Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> ● FCC - Designation No.: CN1211 JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551. ● ISED – CAB identifier.: CN0021 The 3m Semi-anechoic chamber and 10m Semi-anechoic chamber of JianYan Testing Group Shenzhen Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1. ● A2LA - Registration No.: 4346.01 This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: https://portal.a2la.org/scopepdf/4346-01.pdf
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5.9 Laboratory Location

JianYan Testing Group Shenzhen Co., Ltd.
 Address: No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, People's Republic of China.
 Tel: +86-755-23118282, Fax: +86-755-23116366
 Email: info-JYTee@lets.com, Website: <http://www.ccis-cb.com>

5.10 Test Instruments list

Radiated Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
3m SAC	ETS	RFD-100	Q1984	04-14-2021	04-13-2024
BiConiLog Antenna	SCHWARZBECK	VULB9163	9163-1246	03-07-2021	03-06-2022
Biconical Antenna	SCHWARZBECK	VUBA 9117	9117#359	06-17-2021	06-17-2022
Horn Antenna	SCHWARZBECK	BBHA9120D	912D-916	03-07-2021	03-06-2022
Broad-Band Horn Antenna	SCHWARZBECK	BBHA9170	1067	04-02-2021	04-01-2022
Broad-Band Horn Antenna	SCHWARZBECK	BBHA9170	1068	04-02-2021	04-01-2022
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-03-2021	03-02-2022
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-03-2021	03-02-2022
Spectrum analyzer	Keysight	N9010B	MY60240202	11-27-2020	11-26-2021
Low Pre-amplifier	SCHWARZBECK	BBV9743B	00305	03-07-2021	03-06-2022
High Pre-amplifier	SKET	LNPA_0118G-50	MF280208233	03-07-2021	03-06-2022
Cable	Qualwave	JYT3M-1G-NN-8M	JYT3M-1	03-07-2021	03-06-2022
Cable	Qualwave	JYT3M-18G-NN-8M	JYT3M-2	03-07-2021	03-06-2022
Cable	Qualwave	JYT3M-1G-BB-5M	JYT3M-3	03-07-2021	03-06-2022
Cable	Bost	JYT3M-40G-SS-8M	JYT3M-4	04-02-2021	04-01-2022
EMI Test Software	Tonscend	TS+	Version:3.0.0.1		

Conducted Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
EMI Test Receiver	Rohde & Schwarz	ESCI 3	101189	03-03-2021	03-02-2022
LISN	Rohde & Schwarz	ENV432	101602	04-06-2021	04-05-2022
LISN	Rohde & Schwarz	ESH3-Z5	843862/010	06-18-2020	06-17-2022
RF Switch	TOP PRECISION	RSU0301	N/A	03-03-2021	03-02-2022
Cable	Bost	JYTCE-1G-NN-2M	JYTCE-1	03-03-2021	03-02-2022
Cable	Bost	JYTCE-1G-BN-3M	JYTCE-2	03-03-2021	03-02-2022
EMI Test Software	AUDIX	E3	Version: 6.110919b		

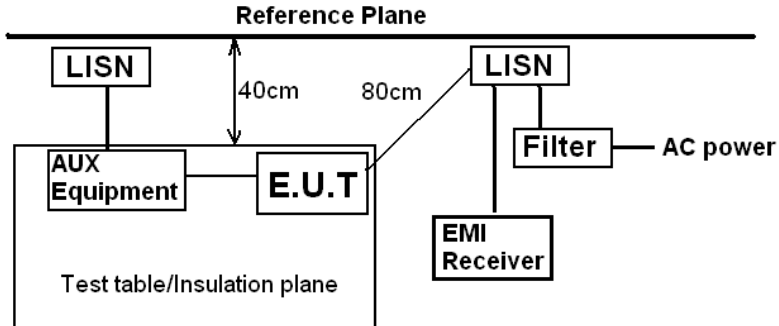
Conducted method:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
Spectrum Analyzer	Keysight	N9010B	MY60240202	11-27-2020	11-26-2021
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-03-2021	03-02-2022
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-03-2021	03-02-2022

6 Test results and Measurement Data

6.1 Antenna requirement

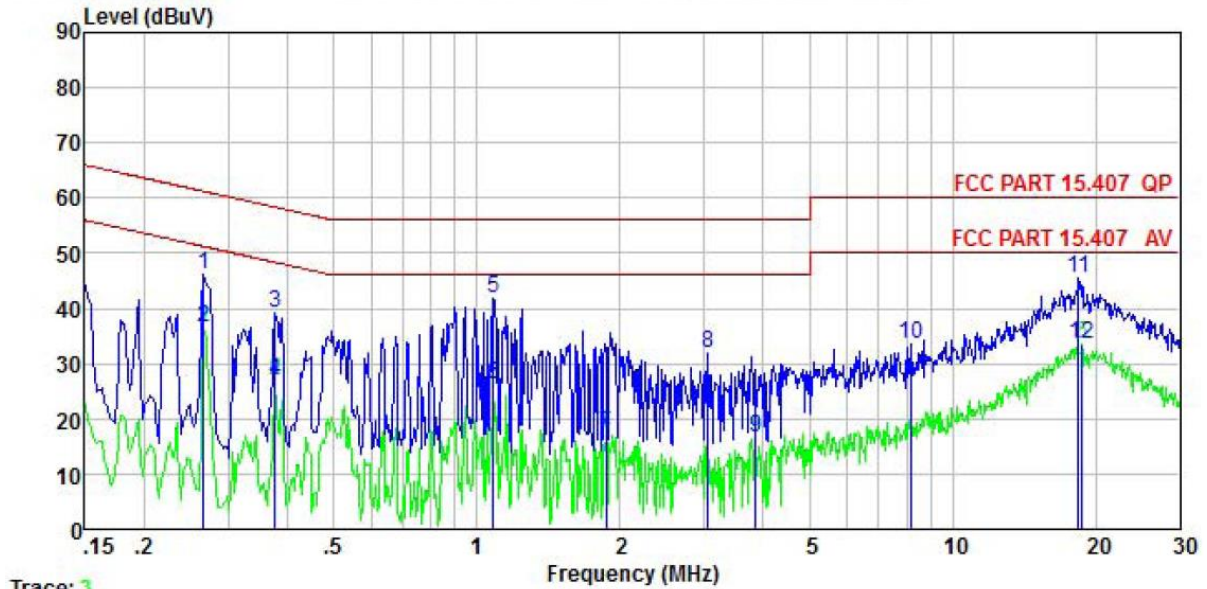
Standard requirement:	FCC Part15 E Section 15.203 /407(a)
<p>15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, 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.</p> <p>This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.</p>	
E.U.T Antenna:	
The antenna cannot replace by end-user, the best case gain of the antenna is 0.6dBi	

6.2 Conducted Emission

Test Requirement:	FCC Part15 C Section 15.207		
Test Frequency Range:	150kHz to 30MHz		
Class / Severity:	Class B		
Receiver setup:	RBW=9kHz, VBW=30kHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	
	0.15-0.5	66 to 56*	0.15-0.5
	0.5-5	56	0.5-5
	5-30	60	5-30
* Decreases with the logarithm of the frequency.			
Test procedure	<ol style="list-style-type: none"> The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). It provides a 50ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10(latest version) on conducted measurement. 		
Test setup:	 <p style="text-align: center;">Reference Plane</p> <p>40cm 80cm</p> <p>LISN LISN Filter AC power</p> <p>AUX Equipment E.U.T</p> <p>Test table/Insulation plane</p> <p>EMI Receiver</p> <p><i>Remark</i> <i>E.U.T: Equipment Under Test</i> <i>LISN: Line Impedance Stabilization Network</i> <i>Test table height=0.8m</i></p>		
Test Instruments:	Refer to section 5.10 for details		
Test mode:	Refer to section 5.3 for details.		
Test results:	Passed		
Remark:	During the test, pre-scan Antenna 1&2&3, found Antenna 3 was worse case mode. The report only reflects the worst mode.		

Measurement Data:

Product name:	Data transmission Module	Product model:	MA58R
Test by:	Mike	Test mode:	5.8GHz Tx mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Line
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.5°C Huni: 55%



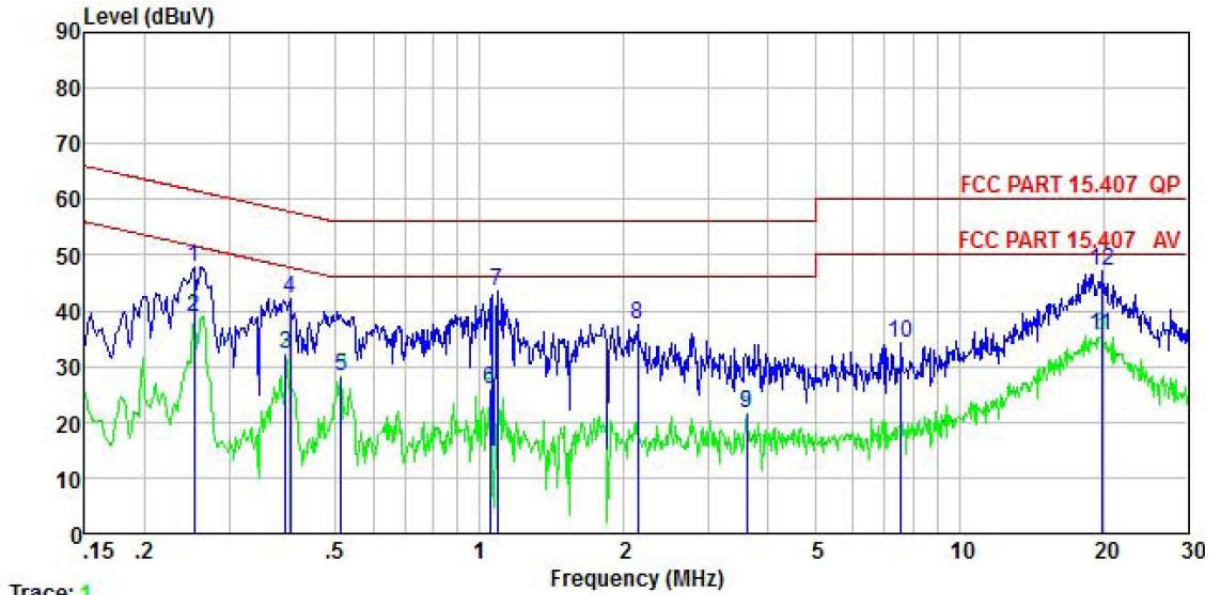
Trace: 3

	Read Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.266	36.21	10.25	-0.23	0.02	46.25	61.25	-15.00	QP
2	0.266	26.45	10.25	-0.23	0.02	36.49	51.25	-14.76	Average
3	0.377	28.53	10.27	0.27	0.03	39.10	58.34	-19.24	QP
4	0.377	16.36	10.27	0.27	0.03	26.93	48.34	-21.41	Average
5	1.082	30.92	10.32	0.38	0.07	41.69	56.00	-14.31	QP
6	1.082	15.31	10.32	0.38	0.07	26.08	46.00	-19.92	Average
7	1.868	7.02	10.33	-0.25	0.19	17.29	46.00	-28.71	Average
8	3.058	21.76	10.35	-0.20	0.07	31.98	56.00	-24.02	QP
9	3.860	6.31	10.38	-0.07	0.08	16.70	46.00	-29.30	Average
10	8.148	21.50	10.53	1.58	0.10	33.71	60.00	-26.29	QP
11	18.426	32.85	10.87	1.67	0.15	45.54	60.00	-14.46	QP
12	18.721	20.89	10.88	1.51	0.15	33.43	50.00	-16.57	Average

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Aux Factor + Cable Loss.

Product name:	Data transmission Module	Product model:	MA58R
Test by:	Mike	Test mode:	5.8GHz Tx mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Neutral
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.5°C Huni: 55%



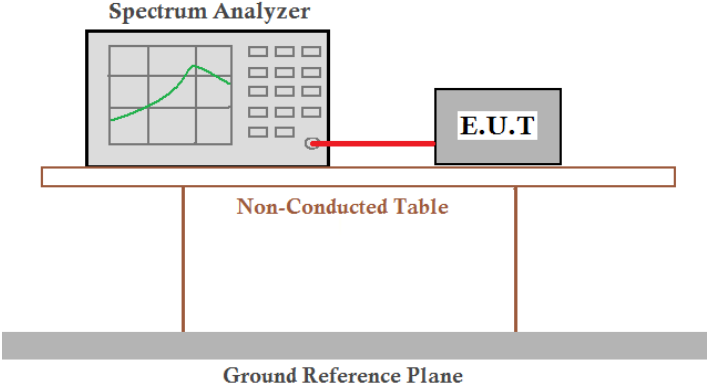
Trace: 1

	Read Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.253	37.67	10.24	0.01	0.01	47.93	61.64	-13.71	QP
2	0.253	28.75	10.24	0.01	0.01	39.01	51.64	-12.63	Average
3	0.393	21.83	10.27	-0.06	0.04	32.08	47.99	-15.91	Average
4	0.402	31.84	10.27	-0.06	0.04	42.09	57.81	-15.72	QP
5	0.513	17.78	10.28	0.03	0.03	28.12	46.00	-17.88	Average
6	1.049	15.53	10.31	0.09	0.06	25.99	46.00	-20.01	Average
7	1.088	33.01	10.31	0.09	0.07	43.48	56.00	-12.52	QP
8	2.133	26.98	10.32	0.19	0.19	37.68	56.00	-18.32	QP
9	3.603	10.59	10.37	0.44	0.08	21.48	46.00	-24.52	Average
10	7.566	22.81	10.50	0.95	0.10	34.36	60.00	-25.64	QP
11	19.845	24.17	10.88	0.31	0.15	35.51	50.00	-14.49	Average
12	19.950	35.93	10.88	0.23	0.19	47.23	60.00	-12.77	QP

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Aux Factor + Cable Loss.

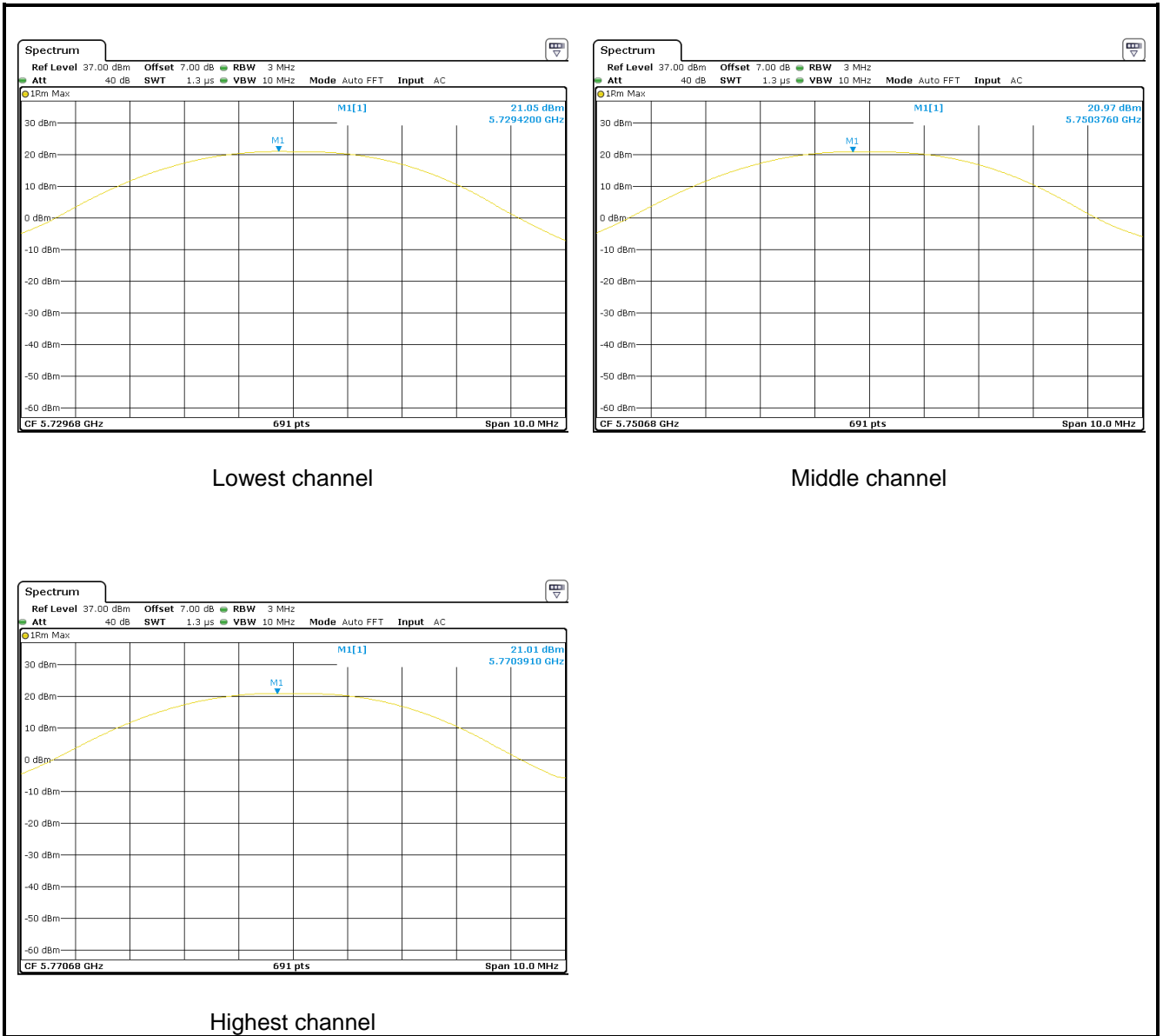
6.3 Conducted Output Power

Test Requirement:	FCC Part15 E Section 15.407 (a) (3)
Limit:	30dBm
Test setup:	
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

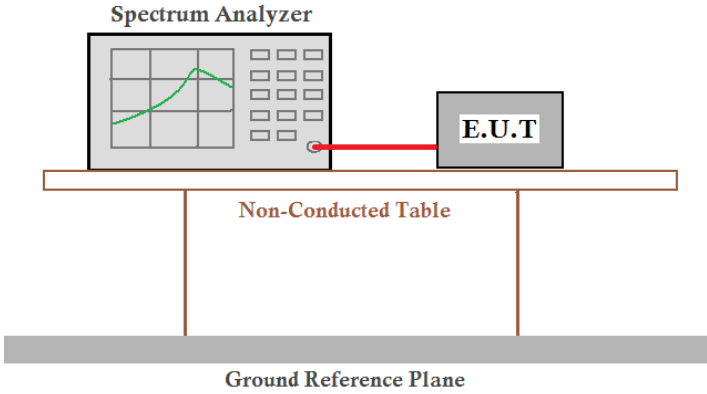
Measurement Data:

Test CH	Maximum Conducted Output Power (dBm)	Limit(dBm)	Result
Lowest	21.05	30.00	Pass
Middle	20.97		
Highest	21.01		

Test plot as follows:



6.4 Occupy Bandwidth

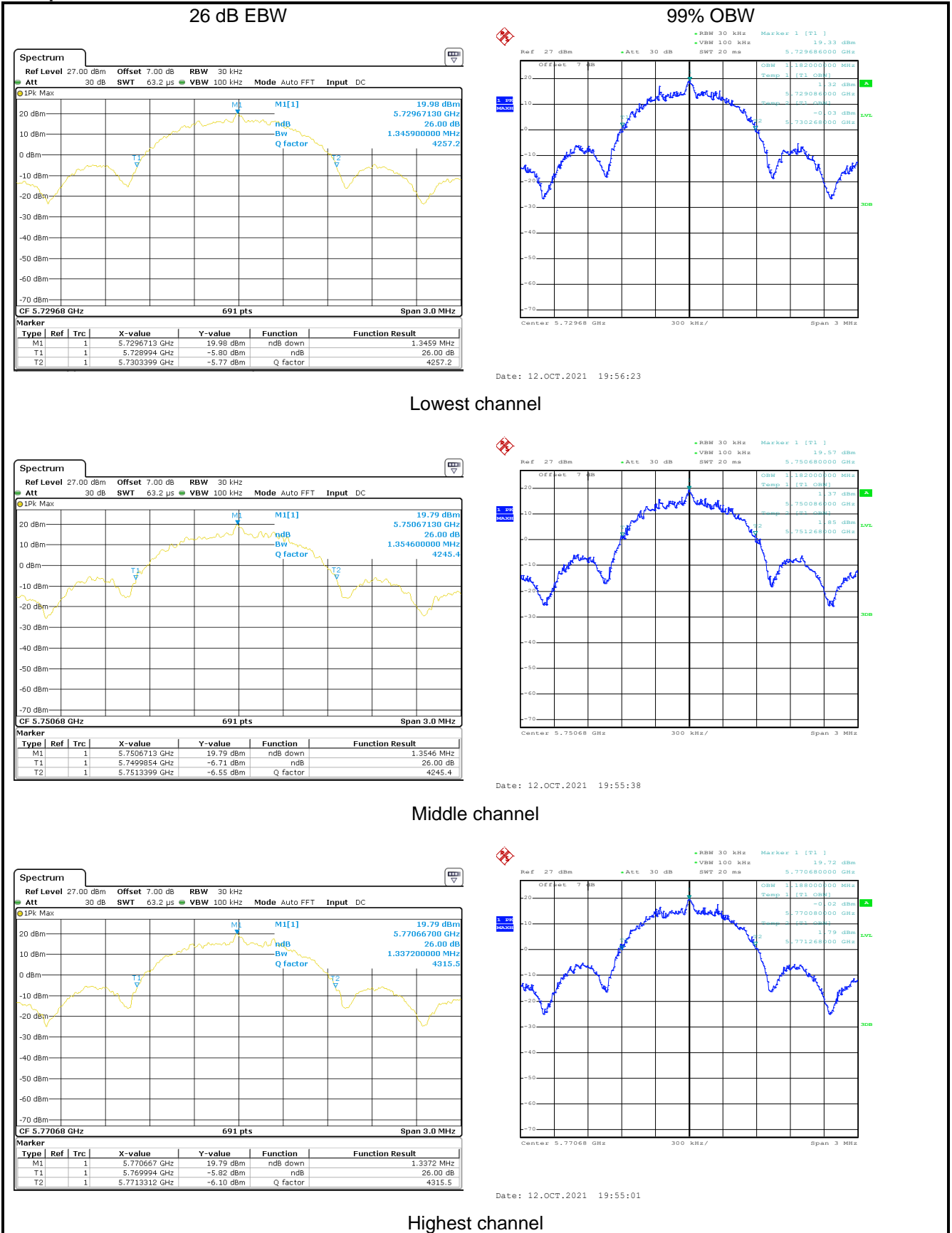
Test Requirement:	FCC Part15 E Section Section 15.407 (e)
Limit:	N/A (26dB Emission Bandwidth and 99% Occupy Bandwidth) 6dB EBW: >500kHz
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

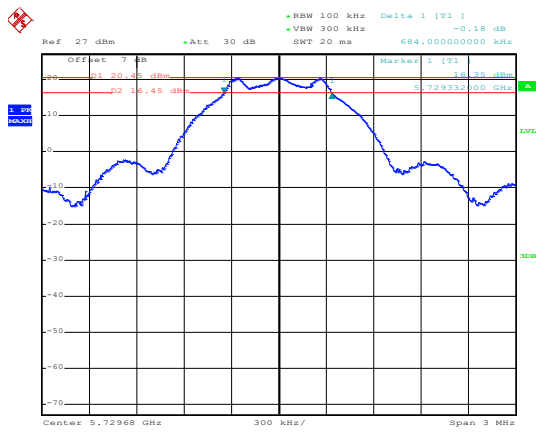
Test CH	26dB EBW(MHz)	99%OBW(MHz)	Limit
Lowest	1.3459	1.182	N/A
Middle	1.3546	1.182	
Highest	1.3372	1.188	

Test CH	6dB EBW(MHz)	Limit	Result
Lowest	0.684	>500kHz	Pass
Middle	0.690		
Highest	0.702		

Test plot as follows:

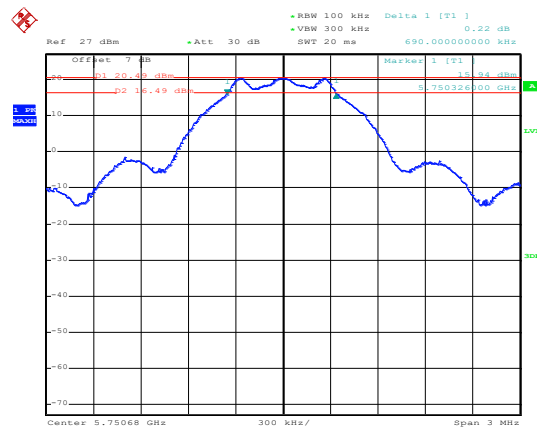


6 dB EBW



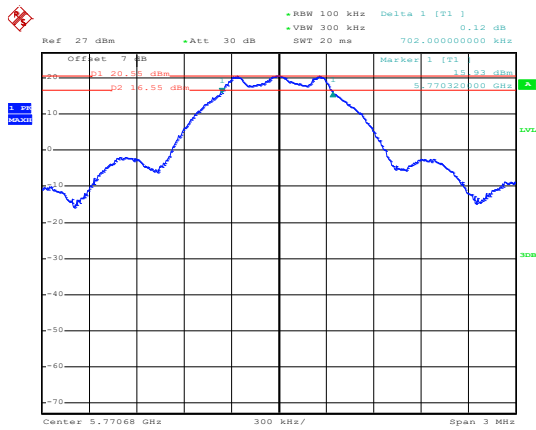
Date: 12.OCT.2021 19:57:36

Lowest channel



Date: 12.OCT.2021 19:58:57

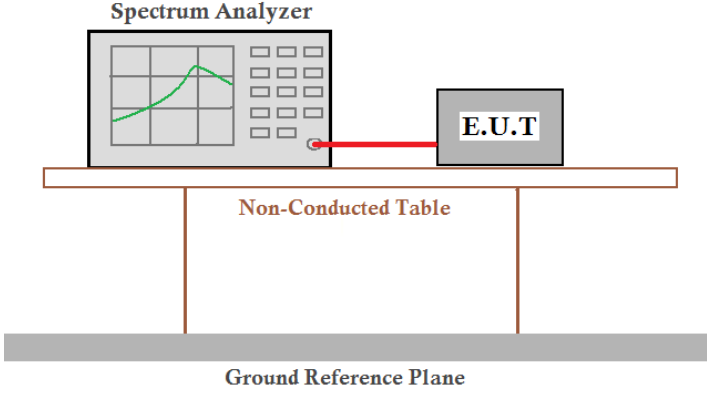
Middle channel



Date: 12.OCT.2021 20:00:16

Highest channel

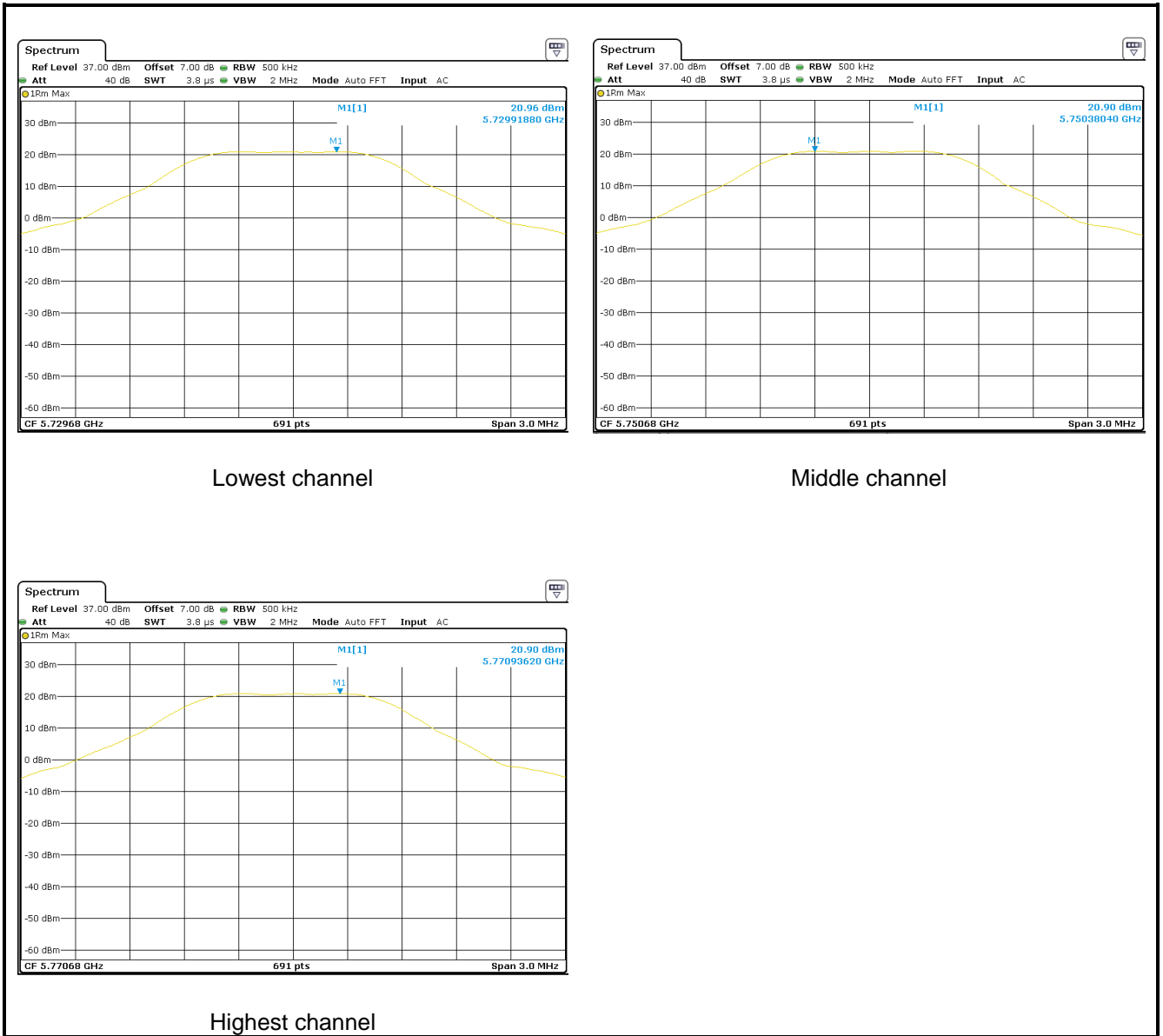
6.5 Power Spectral Density

Test Requirement:	FCC Part15 E Section 15.407 (a)(3)
Limit:	30 dBm/500kHz
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Measurement Data:

Test CH	Power Spectral Density (dBm/500KHz)	Limit(dBm/500KHz)	Result
Lowest	20.96	30.00	Pass
Middle	20.90		
Highest	20.90		

Test plot as follows:



6.6 Band Edge

Test Requirement:	FCC Part 15 E Section 15.407 (b)			
Receiver setup:	Detector	RBW	VBW	Remark
	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	RMS	1MHz	3MHz	Average Value
	limit: $E[dB\mu V/m] = EIRP[dBm] + 95.2 = 68.2 \text{ dBuV/m}$, for $EIPR[dBm] = -27 \text{ dBm}$. $E[dB\mu V/m] = EIRP[dBm] + 95.2 = 105.2 \text{ dBuV/m}$, for $EIPR[dBm] = 10 \text{ dBm}$. $E[dB\mu V/m] = EIRP[dBm] + 95.2 = 110.8 \text{ dBuV/m}$, for $EIPR[dBm] = 15.6 \text{ dBm}$. $E[dB\mu V/m] = EIRP[dBm] + 95.2 = 122.2 \text{ dBuV/m}$, for $EIPR[dBm] = 27 \text{ dBm}$.			
Test Procedure:	<ol style="list-style-type: none"> The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. 			
Test setup:				
Test Instruments:	Refer to section 5.10 for details			
Test mode:	Refer to section 5.3 for details			
Test results:	Passed			

Measurement Data (worst case):

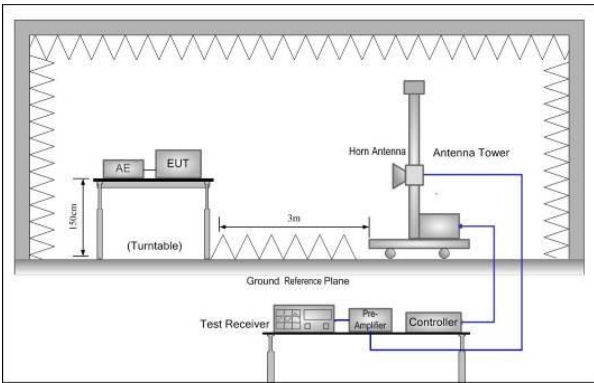
ANT1						
Test channel: Lowest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin [dB]	Polarization
5650.00	40.26	18.87	59.13	68.20	9.07	Horizontal
5700.00	40.85	19.05	59.90	105.20	45.30	Horizontal
5720.00	45.71	19.00	64.71	110.80	46.09	Horizontal
5725.00	53.92	18.99	72.91	122.20	49.29	Horizontal
5650.00	40.36	18.87	59.23	68.20	8.97	Vertical
5700.00	40.22	19.05	59.27	105.20	45.93	Vertical
5720.00	53.85	19.00	72.85	110.80	37.95	Vertical
5725.00	60.71	18.99	79.70	122.20	42.50	Vertical
Test channel: Highest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin [dB]	Polarization
5850.00	39.53	19.10	58.63	122.20	63.57	Horizontal
5855.00	40.26	19.12	59.38	110.80	51.42	Horizontal
5875.00	40.22	19.23	59.45	105.20	45.75	Horizontal
5925.00	40.74	19.39	60.13	68.20	8.07	Horizontal
5850.00	40.55	19.10	59.65	122.20	62.55	Vertical
5855.00	40.92	19.12	60.04	110.80	50.76	Vertical
5875.00	39.59	19.23	58.82	105.20	46.38	Vertical
5925.00	40.33	19.39	59.72	68.20	8.48	Vertical
<i>Remark:</i> 1. <i>Final Level = Receiver Read level + Factor.</i> 2. <i>The emission levels of other frequencies are very lower than the limit and not show in test report.</i>						

ANT2						
Test channel: Lowest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin [dB]	Polarization
5650.00	40.42	18.87	59.29	68.20	8.91	Horizontal
5700.00	40.43	19.05	59.48	105.20	45.72	Horizontal
5720.00	46.10	19.00	65.10	110.80	45.70	Horizontal
5725.00	54.13	18.99	73.12	122.20	49.08	Horizontal
5650.00	40.83	18.87	59.70	68.20	8.50	Vertical
5700.00	39.91	19.05	58.96	105.20	46.24	Vertical
5720.00	54.21	19.00	73.21	110.80	37.59	Vertical
5725.00	61.06	18.99	80.05	122.20	42.15	Vertical
Test channel: Highest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin [dB]	Polarization
5850.00	39.58	19.10	58.68	122.20	63.52	Horizontal
5855.00	40.04	19.12	59.16	110.80	51.64	Horizontal
5875.00	40.25	19.23	59.48	105.20	45.72	Horizontal
5925.00	40.47	19.39	59.86	68.20	8.34	Horizontal
5850.00	40.54	19.10	59.64	122.20	62.56	Vertical
5855.00	41.18	19.12	60.30	110.80	50.50	Vertical
5875.00	39.76	19.23	58.99	105.20	46.21	Vertical
5925.00	40.10	19.39	59.49	68.20	8.71	Vertical
<i>Remark:</i> 1. <i>Final Level = Receiver Read level + Factor.</i> 2. <i>The emission levels of other frequencies are very lower than the limit and not show in test report.</i>						

ANT3						
Test channel: Lowest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin [dB]	Polarization
5650.00	40.03	18.87	58.90	68.20	9.30	Horizontal
5700.00	40.70	19.05	59.75	105.20	45.45	Horizontal
5720.00	45.34	19.00	64.34	110.80	46.46	Horizontal
5725.00	54.32	18.99	73.31	122.20	48.89	Horizontal
5650.00	40.71	18.87	59.58	68.20	8.62	Vertical
5700.00	40.45	19.05	59.50	105.20	45.70	Vertical
5720.00	53.45	19.00	72.45	110.80	38.35	Vertical
5725.00	60.25	18.99	79.24	122.20	42.96	Vertical
Test channel: Highest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin [dB]	Polarization
5850.00	39.90	19.10	59.00	122.20	63.20	Horizontal
5855.00	39.78	19.12	58.90	110.80	51.90	Horizontal
5875.00	40.21	19.23	59.44	105.20	45.76	Horizontal
5925.00	40.94	19.39	60.33	68.20	7.87	Horizontal
5850.00	40.67	19.10	59.77	122.20	62.43	Vertical
5855.00	41.26	19.12	60.38	110.80	50.42	Vertical
5875.00	39.99	19.23	59.22	105.20	45.98	Vertical
5925.00	40.04	19.39	59.43	68.20	8.77	Vertical
<i>Remark:</i> 1. <i>Final Level = Receiver Read level + Factor.</i> 2. <i>The emission levels of other frequencies are very lower than the limit and not show in test report.</i>						

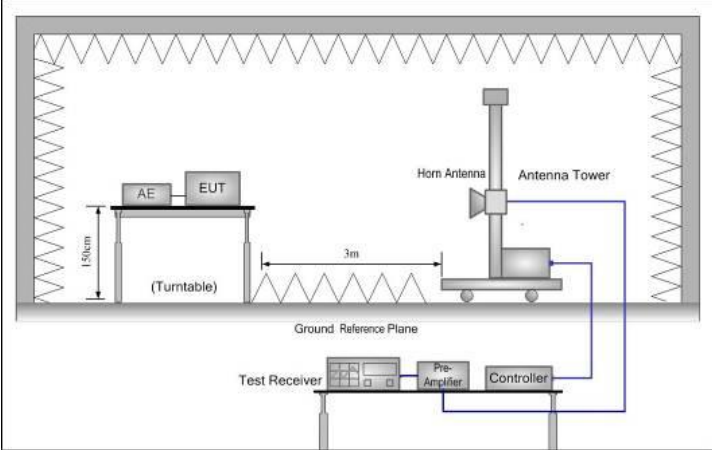
6.7 Spurious Emission

6.7.1 Restricted Band

Test Requirement:	FCC Part15 E Section 15.407(b)				
Test Frequency Range:	5.35GHz to 5.46GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
RMS		1MHz	3MHz	Average Value	
Limit:	Frequency	Limit (dBuV/m @3m)		Remark	
	Above 1GHz	74.00		Peak Value	
54.00		Average Value			
Test Procedure:	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. 				
Test setup:					
Test Instruments:	Refer to section 5.10 for details				
Test mode:	Refer to section 5.3 for details				
Test results:	Passed(Refer to section 6.6)				

6.7.2 Unwanted Emissions out of the Restricted Bands

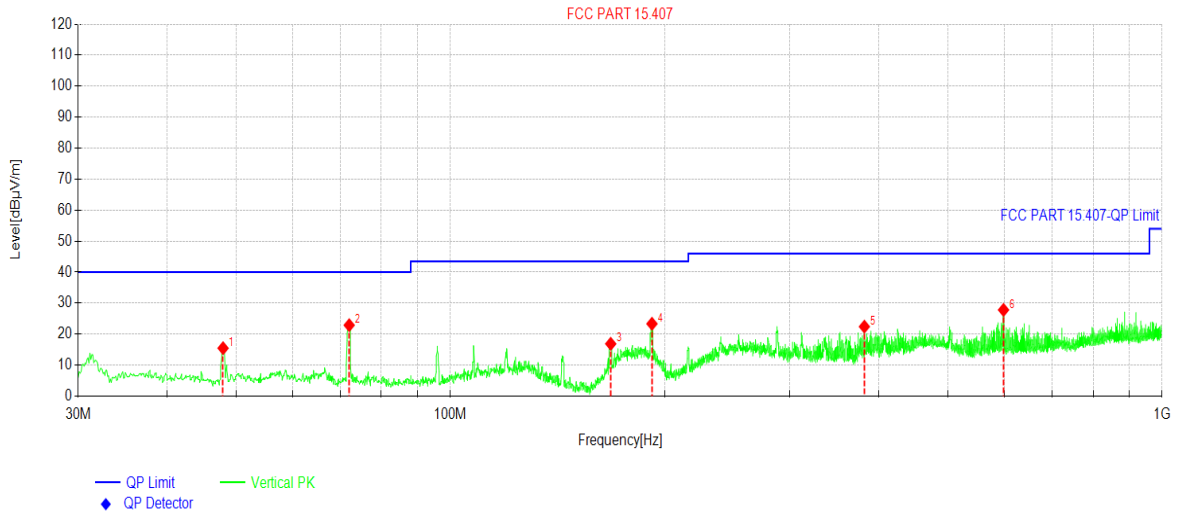
Test Requirement:	FCC Part 15 C Section 15.209 and 15.205				
Test Frequency Range:	9kHz to 40GHz				
Test Distance:	3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
RMS		1MHz	3MHz	Average Value	
Limit:	Frequency	Limit (dBuV/m @3m)		Remark	
	30MHz-88MHz	40.0		Quasi-peak Value	
	88MHz-216MHz	43.5		Quasi-peak Value	
	216MHz-960MHz	46.0		Quasi-peak Value	
	960MHz-1GHz	54.0		Quasi-peak Value	
Above 1GHz	54.0		Average Value		
	74.0		Peak Value		
Test Procedure:	<ol style="list-style-type: none"> The EUT was placed on the top of a rotating table 0.8m(below 1GHz)/1.5m(above 1GHz) above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. 				
Test setup:	<p>Below 1GHz</p> <p>Above 1GHz</p>				

	
<p>Test Instruments:</p>	<p>Refer to section 5.9 for details</p>
<p>Test mode:</p>	<p>Refer to section 5.3 for details</p>
<p>Test results:</p>	<p>Passed</p>
<p>Remark:</p>	<ol style="list-style-type: none"> 1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case. 2. 9 kHz to 30MHz is lower than the limit 20dB, so only shows the data of above 30MHz in this report. 3. Below 1GHz: During the test, pre-scan Antenna 1&2&3, found Antenna 3 was worse case mode. The report only reflects the worst mode.

Measurement Data (worst case):

Below 1GHz

Product Name:	Data transmission Module	Product Model:	MA58R
Test By:	Mike	Test mode:	5.8GHz Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical
Test Voltage:	DC 5.0V	Environment:	Temp: 24°C Humi: 57%

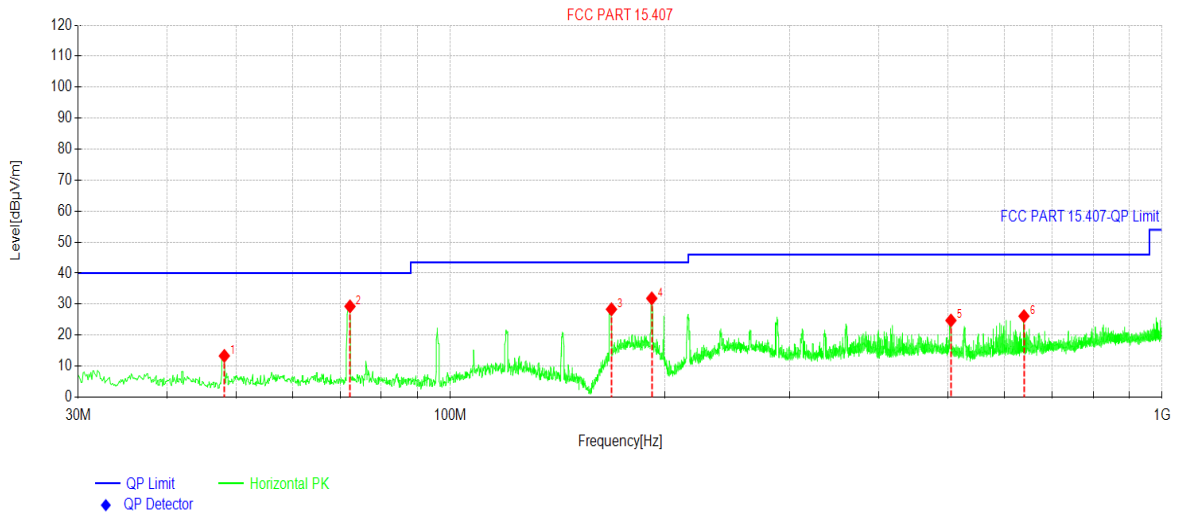


Suspected Data List								
NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Factor [dB]	Limit [dBuV/m]	Margin [dB]	Trace	Polarity
1	47.9468	32.72	15.47	-17.25	40.00	24.53	PK	Vertical
2	72.1022	42.00	22.89	-19.11	40.00	17.11	PK	Vertical
3	168.044	35.78	16.87	-18.91	43.50	26.63	PK	Vertical
4	192.006	40.81	23.33	-17.48	43.50	20.17	PK	Vertical
5	381.757	35.05	22.41	-12.64	46.00	23.59	PK	Vertical
6	598.767	36.20	27.81	-8.39	46.00	18.19	PK	Vertical

Remark:

- Final Level = Receiver Read level + Factor (Antenna Factor + Cable Loss – Preamplifier Factor).
- The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	Data transmission Module	Product Model:	MA58R
Test By:	Mike	Test mode:	5.8GHz Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	DC 5.0V	Environment:	Temp: 24°C Huni: 57%



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Polarity
1	48.1408	30.55	13.31	-17.24	40.00	26.69	PK	Horizontal
2	72.2962	48.39	29.27	-19.12	40.00	10.73	PK	Horizontal
3	168.432	47.25	28.35	-18.90	43.50	15.15	PK	Horizontal
4	191.909	49.33	31.85	-17.48	43.50	11.65	PK	Horizontal
5	505.153	34.23	24.74	-9.49	46.00	21.26	PK	Horizontal
6	639.706	34.21	26.12	-8.09	46.00	19.88	PK	Horizontal

Remark:

- Final Level = Receiver Read level + Factor (Antenna Factor + Cable Loss – Preamplifier Factor).
- The emission levels of other frequencies are very lower than the limit and not show in test report.

Above 1GHz

ANT1						
Test channel: Lowest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11459.36	52.81	6.97	59.78	74.00	14.22	Vertical
11459.36	53.87	6.97	60.84	74.00	13.16	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11476.00	45.35	6.97	52.32	54.00	1.68	Vertical
11476.00	45.79	6.97	52.76	54.00	1.24	Horizontal
Test channel: Middle channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11501.36	53.88	7.01	60.89	74.00	13.11	Vertical
11501.36	52.75	7.01	59.76	74.00	14.24	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11501.36	45.30	7.01	52.31	54.00	1.69	Vertical
11501.36	46.20	7.01	53.21	54.00	0.79	Horizontal
Test channel: Highest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11541.36	53.63	7.03	60.66	74.00	13.34	Vertical
11541.36	53.89	7.03	60.92	74.00	13.08	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11541.36	45.19	7.03	52.22	54.00	1.78	Vertical
11541.36	45.77	7.03	52.80	54.00	1.20	Horizontal
<i>Remark:</i> 1. <i>Final Level =Receiver Read level + Factor.</i> 2. <i>The emission levels of other frequencies are lower than the limit 20dB and not show in test report.</i>						

ANT2						
Test channel: Lowest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11459.36	52.92	6.97	59.89	74.00	14.11	Vertical
11459.36	54.05	6.97	61.02	74.00	12.98	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11476.00	46.01	6.97	52.98	54.00	1.02	Vertical
11476.00	45.30	6.97	52.27	54.00	1.73	Horizontal
Test channel: Middle channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11501.36	53.61	7.01	60.62	74.00	13.38	Vertical
11501.36	53.23	7.01	60.24	74.00	13.76	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11501.36	45.26	7.01	52.27	54.00	1.73	Vertical
11501.36	46.02	7.01	53.03	54.00	0.97	Horizontal
Test channel: Highest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11541.36	54.38	7.03	61.41	74.00	12.59	Vertical
11541.36	53.72	7.03	60.75	74.00	13.25	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11541.36	45.38	7.03	52.41	54.00	1.59	Vertical
11541.36	45.86	7.03	52.89	54.00	1.11	Horizontal
Remark: 1. Final Level =Receiver Read level + Factor. 2. The emission levels of other frequencies are lower than the limit 20dB and not show in test report.						

ANT3						
Test channel: Lowest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11459.36	52.82	6.97	59.79	74.00	14.21	Vertical
11459.36	53.47	6.97	60.44	74.00	13.56	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11476.00	45.50	6.97	52.47	54.00	1.53	Vertical
11476.00	45.94	6.97	52.91	54.00	1.09	Horizontal
Test channel: Middle channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11501.36	53.60	7.01	60.61	74.00	13.39	Vertical
11501.36	53.00	7.01	60.01	74.00	13.99	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11501.36	44.96	7.01	51.97	54.00	2.03	Vertical
11501.36	45.61	7.01	52.62	54.00	1.38	Horizontal
Test channel: Highest channel						
Detector: Peak Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11541.36	53.72	7.03	60.75	74.00	13.25	Vertical
11541.36	53.54	7.03	60.57	74.00	13.43	Horizontal
Detector: Average Value						
Frequency (MHz)	Read Level (dBuV)	Factor(dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
11541.36	44.76	7.03	51.79	54.00	2.21	Vertical
11541.36	45.37	7.03	52.40	54.00	1.60	Horizontal
<i>Remark:</i> 1. <i>Final Level =Receiver Read level + Factor.</i> 2. <i>The emission levels of other frequencies are lower than the limit 20dB and not show in test report.</i>						

6.8 Frequency stability

Test Requirement:	FCC Part15 E Section 15.407 (g)
Limit:	Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.
Test setup:	<p style="text-align: center;">Temperature Chamber</p> <p style="text-align: center;">Spectrum analyzer Att. EUT</p> <p style="text-align: center;">Variable Power Supply</p> <p>Note : Measurement setup for testing on Antenna connector</p>
Test procedure:	<ol style="list-style-type: none"> 1. The EUT is installed in an environment test chamber with external power source. 2. Set the chamber to operate at 50 centigrade and external power source to output at nominal voltage of EUT. 3. A sufficient stabilization period at each temperature is used prior to each frequency measurement. 4. When temperature is stabled, measure the frequency stability. 5. The test shall be performed under -30 to 50 centigrade and 85 to 115 percent of the nominal voltage. Change setting of chamber and external power source to complete all conditions.
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.3 for details
Test results:	PASS

Measurement Data (the worst channel):

Voltage vs. Frequency Stability (Middle channel=5750.68MHz)

Test conditions		Frequency(MHz)	Max. Deviation (ppm)
Temp(°C)	Voltage(dc)		
20	4.5V	5750.673	-1.22
	5.0V	5750.668	-2.09
	5.5V	5750.671	-1.57

Temperature vs. Frequency Stability (Middle channel=5180MHz)

Test conditions		Frequency(MHz)	Max. Deviation (ppm)
Voltage(dc)	Temp(°C)		
5	-20	5750.673	-1.22
	-10	5750.668	-2.09
	0	5750.672	-1.39
	10	5750.668	-2.09
	20	5750.673	-1.22
	30	5750.672	-1.39
	40	5750.674	-1.04
	50	5750.669	-1.91