

FCC CERTIFICATION TEST REPORT

FOR

Applicant	:	MOTREX Co., LTD.
Address	:	Seoyoung Bldg. 25, Hwangsaoul-ro 258beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, South Korea
Equipment under Test	:	Equipo de Audio y Video para Vehiculo
Model No.	:	MTXMO500ASU2i, MTXMO500ASP2i
Trade Mark	:	MOTREX
FCC ID	:	BP9-MO500ASP2I
Manufacturer	:	Skypine Electronics (ShenZhen)Co.,Ltd
Address	:	A1, A5 Building, No.6, Xinxing Industrial Park, Xinhe Village, Fuyong Town, Bao'an District, Shenzhen City, Guangdong Province, China

Issued By: Dongguan Dongdian Testing Service Co., Ltd.

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Dongguan City, Guangdong Province, China, 523808

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REPORT

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Test Report Declare

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Manufacturer	:	Skypine Electronics (ShenZhen)Co.,Ltd
Address	:	A1, A5 Building, No.6, Xinxing Industrial Park, Xinhe Village, Fuyong Town, Bao'an District, Shenzhen City, Guangdong Province, China

Test Standard Used: FCC Rules and Regulations Part 15 Subpart E

Test procedure used: ANSI C63.10:2013, 789033 D02 General U-NII Test Procedures New Rules v02r01, 662911 D01 Multiple Transmitter Output v02r01

We Declare:

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.

Report No:	DDT-R21060707-2E03		
Date of Receipt:	Jun. 13, 2021	Date of Test:	Jun. 13, 2021 ~ Jul. 23, 2021

Prepared By:

Jacky Huang

Jacky Huang/Engineer

Approved By:



Damon Hu/EMC Manager

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

Revision History

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	Jul. 23, 2021	

1. Summary of Test Results

The EUT have been tested according to the applicable standards as referenced below.

Description of Test Item	Standard	Results
6 dB Bandwidth	FCC 15.407 (e)	Pass
Maximum Conducted Output Power	FCC 15.407 (a)	Pass
Power Spectral Density	FCC 15.407 (a)	Pass
Frequency Stability Measurement	FCC 15.407 (g)	Pass
Emissions in restricted frequency bands	FCC 15.407 (a) FCC 15.209 FCC 15.205	Pass
Band Edge Compliance	FCC 15.407 (a) FCC 15.209 FCC 15.205	Pass
Power Line Conducted Emission	FCC 15.207	N/A
Antenna Requirement	FCC 15.203	Pass
Dynamic Frequency Selection	FCC 15.407 (h)	Pass

Note: N/A is an abbreviation for Not Applicable.

2. General Test Information

2.1. Description of EUT

EUT* Name	: Equipo de Audio y Video para Vehiculo
Model Number	: MTXMO500ASU2i, MTXMO500ASP2i
Difference of models	: All models are identical except the appearance and control panel, therefore the test performed on the model MTXMO500ASU2i.
EUT function description	: Please reference user manual of this device
Power supply	: DC 12V
Radio Technology	: IEEE 802.11a/ac
FCC Operation frequency	: IEEE 802.11a: 5745MHz-5825MHz IEEE 802.11ac HT20: 5745MHz-5825MHz IEEE 802.11ac HT40: 5755MHz-5795MHz
Modulation	: IEEE 802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)
Transmitter rate	: IEEE 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps IEEE 802.11ac HT20: 14.4, 28.8, 43.4, 57.8, 86.6, 115.6, 130, 144.4, 173.4 Mbps IEEE 802.11ac HT40: 30, 60, 90, 120, 180, 240, 270, 300, 360, 400 Mbps
Antenna Gain	: Antenna 1: maximum PK gain: 3.628 dBi Antenna 2: maximum PK gain: 3.628 dBi
Sample Type	: Series production

Note: EUT is the abbreviation of equipment under test.

Antenna information			
	Ant1 gain	Ant2 gain	MIMO
IEEE 802.11a	3.628	3.628	/
IEEE 802.11ac VHT20	3.628	3.628	6.638
IEEE 802.11ac VHT40	3.628	3.628	6.638

2.2. Device Capabilities

This device contains the following capabilities:
Bluetooth (BR, EDR), 802.11b/g/n WLAN, 802.11a/ac UNII

This device supports simultaneous transmission operations. The table below shows all configurations possible.

Simultaneous Transmission			
NO.	Simultaneous Transmission Configuration	Antenna 2 2.4G WIFI	Antenna 2 5.8G WIFI
1	Antenna 1 BT	Yes	Yes

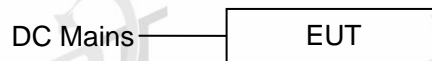
2.3. Accessories of EUT

Description of Accessories	Manufacturer	Model number	Serial No.	Other
N/A	N/A	N/A	N/A	N/A

2.4. Assistant equipment used for test

Assistant equipment	Manufacturer	Model number	EMC Compliance	SN
N/A	N/A	N/A	N/A	N/A

2.5. Block diagram of EUT configuration for test



EUT was connected to control to provide by manufacturer which has a standard LAN PORT connector to connect to Notebook, and the Notebook will run a special test software “QRCT Qualcomm Radio Control Tool” provided by manufacturer to control EUT work in Continuous Tx mode, and select test channel, wireless mode and data rate.

Tested mode, channel, and data rate information				
Mode	Setting Tx Power	data rate (Mbps) (see Note)	Channel	Frequency (MHz)
IEEE 802.11a	16	6	Low: CH149	5745
	16	6	Middle: CH157	5785
	16	6	High: CH165	5825
IEEE 802.11ac HT20	13	MCS 0	Low: CH149	5745
	13	MCS 0	Middle: CH157	5785
	13	MCS 0	High: CH165	5825
IEEE 802.11ac HT40	12	MCS 0	Middle: CH151	5755
	12	MCS 0	High: CH159	5795

2.6. Deviations of test standard

① No deviation.

2.7. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature range:	21-25 °C
Humidity range:	40-75%
Pressure range:	86-106 kPa

2.8. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd.

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Tel.: +86-0769-38826678, <http://www.dgddt.com>, Email: ddt@dgddt.com.

CNAS Accreditation No. L6451; A2LA Accreditation Number: 3870.01

FCC Designation Number: CN1182, Test Firm Registration Number: 540522

Innovation, Science and Economic Development Canada Site Registration Number: 10288A

Conformity Assessment Body identifier: CN0048

VCCI facility registration number: C-20087, T-20088, R-20123, G-20118

2.9. Measurement uncertainty

Test Item	Uncertainty
Bandwidth	1.1%
Peak Output Power (Conducted) (Spectrum analyzer)	0.86 dB (10 MHz ≤ f < 3.6 GHz);
	1.38 dB (3.6 GHz ≤ f < 8 GHz)
Peak Output Power (Conducted) (Power Sensor)	0.74 dB
Power Spectral Density	0.74 dB (10 MHz ≤ f < 3.6 GHz);
	1.38 dB (3.6 GHz ≤ f < 8 GHz)
Frequencies Stability	6.7 × 10 ⁻⁸ (Antenna couple method)
	5.5 × 10 ⁻⁸ (Conducted method)
Conducted spurious emissions	0.86 dB (10 MHz ≤ f < 3.6GHz);
	1.40 dB (3.6 GHz ≤ f < 8 GHz)
	1.66 dB (8 GHz ≤ f < 22 GHz)
Uncertainty for radio frequency (RBW < 20 kHz)	3×10 ⁻⁸
Temperature	0.4℃
Humidity	2%
Uncertainty for Radiation Emission test (30 MHz - 1 GHz)	4.70 dB (Antenna Polarize: V)
	4.84 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission test (1 GHz - 40 GHz)	4.10 dB (1-6 GHz)
	4.40 dB (6 GHz - 18 GHz)
	3.54 dB (18 GHz - 26 GHz)
	4.30 dB (26 GHz - 40 GHz)
Uncertainty for Power line conduction emission test	3.32 dB (150 kHz - 30 MHz)

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

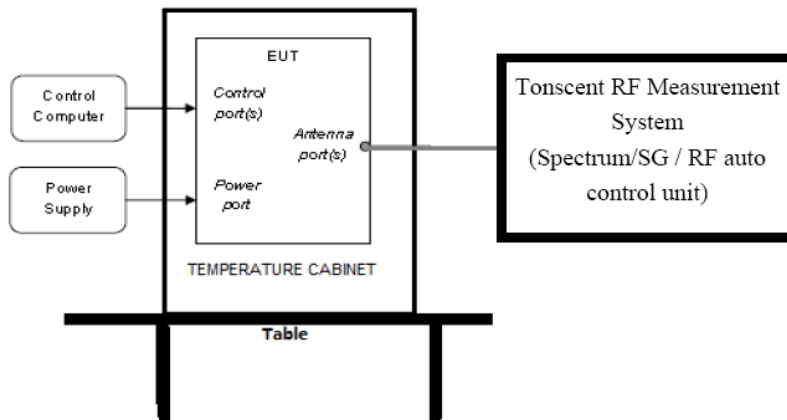
3. Equipment Used During Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
☐RF Connected Test (Tonscend RF Measurement System 1#)					
Spectrum analyzer	R&S	FSU26	200071	Sep. 25, 2020	1 Year
Wideband Radio Communication tester	R&S	CMW500	117491	Jun. 01, 2021	1 Year
Vector Signal Generator	Agilent	E8267D	US49060192	Sep. 24, 2020	1 Year
Vector Signal Generator	Agilent	N5182A	MY48180737	Jun. 01, 2021	1 Year
Power Sensor	Agilent	U2021XA	MY55150010	Jun. 01, 2021	1 Year
Power Sensor	Agilent	U2021XA	MY55150011	Jun. 01, 2021	1 Year
RF Cable	Micable	C10-01-01-1	100309	Sep. 28, 2020	1 Year
Temp&Humi Programmable	ZHIXIANG	ZXGDJS-150L	ZX170110-A	Jun. 01, 2021	1 Year
Test Software	JS Tonscend	JS1120-3	Ver.2.7	N/A	N/A
☑RF Connected Test (Tonscend RF Measurement System 2#)					
Spectrum analyzer	R&S	FSU26	101472	Jun. 01, 2021	1 Year
Wideband Radio Communication tester	R&S	CMW500	120259	Jan. 19, 2021	1 Year
Vector Signal Generator	Agilent	N5182A	MY19060405	Jun. 01, 2021	1 Year
Vector Signal Generator	Agilent	N5182A	MY48180912	Jun. 01, 2021	1 Year
RF Control Unit	Tonsend	JS0806-2	DDT-ZC01449	Jun. 01, 2021	1 Year
RF Cable	Micable	C10-01-01-1	100309	Sep. 28, 2020	1 Year
Temp&Humi Programmable	ZHIXIANG	ZXGDJS-150L	ZX170110-A	Jun. 01, 2021	1 Year
Test Software	JS Tonscend	JS1120-3	Ver.2.7	N/A	N/A
☑Radiation 1#chamber					
EMI Test Receiver	R&S	ESU8	100316	Sep. 24, 2020	1 Year
Spectrum analyzer	Agilent	E4447A	MY50180031	Jun. 01, 2021	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	Nov. 13, 2020	1 Year
Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	Nov. 18, 2020	1 Year
Double Ridged Horn Antenna	R&S	HF907	100276	Nov. 13, 2020	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	May 07, 2021	1 Year
Pre-amplifier	A.H.	PAM-0118	360	Sep. 28, 2020	1 Year
RF Cable	HUBSER	CP-X2+ CP-X1	W11.03+ W12.02	Sep. 24, 2020	1 Year
RF Cable	N/A	5m+6m+1m	06270619	Sep. 30, 2020	1 Year
MI Cable	HUBSER	C10-01-01-1M	1091629	Sep. 30, 2020	1 Year
Test software	Audix	E3	V 6.11111b	N/A	N/A
☑Radiation 2#chamber					

EMI Test Receiver	R&S	ESCI	101364	Sep. 28, 2020	1 Year
Spectrum analyzer	Agilent	E4447A	MY50180031	Jun. 01, 2021	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB 9163	9163-994	Nov. 13, 2020	1 Year
Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	Nov. 18, 2020	1 Year
Double Ridged Horn Antenna	Schwarzbeck	BBHA9120	02108	Jul. 17, 2021	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	May 07, 2021	1 Year
Pre-amplifier	TERA-MW	TRLA-0040 G35	1013 03	Sep. 28, 2020	1 Year
RF Cable	N/A	14+1.5m	06270619	Sep. 28, 2020	1 Year
Test software	Audix	E3	V 6.11111b	N/A	N/A
□ Power Line Conducted Emissions Test 1#					
EMI Test Receiver	R&S	ESU8	100316	Sep. 24, 2020	1 Year
LISN 1	R&S	ENV216	101109	Sep. 28, 2020	1 Year
LISN 2	R&S	ESH2-Z5	100309	Sep. 28, 2020	1 Year
Pulse Limiter	R&S	ESH3-Z2	101242	Sep. 24, 2020	1 Year
CE Cable 1	HUBSER	N/A	W10.01	Sep. 24, 2020	1 Year
Test software	Audix	E3	V 6.11111b	N/A	N/A
□ Power Line Conducted Emissions Test 2#					
Test Receiver	R&S	ESPI	101761	Sep. 24, 2020	1 Year
LISN 1	R&S	ENV216	101170	Sep. 28, 2020	1 Year
LISN 2	R&S	ESH2-Z5	100309	Sep. 28, 2020	1 Year
Pulse Limiter	R&S	KH43101	43101180156 8-12#	Jul. 01, 2020	1 Year
CE Cable 2	HUBSER	N/A	W11.02	Sep. 24, 2020	1 Year
Test software	Audix	E3	V 6.11111b	N/A	N/A

4. 6 dB Bandwidth

4.1. Block diagram of test setup



4.2. Limits

FCC Part15, Subpart E		
Test Item	Limit	Frequency Range (MHz)
Bandwidth	Minimum 500kHz 6dB Bandwidth	5725-5850

4.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	For 6 dB Bandwidth: RBW=100 kHz
VBW	For 6 dB Bandwidth: VBW=300 kHz
Trace	Max hold
Sweep	Auto couple

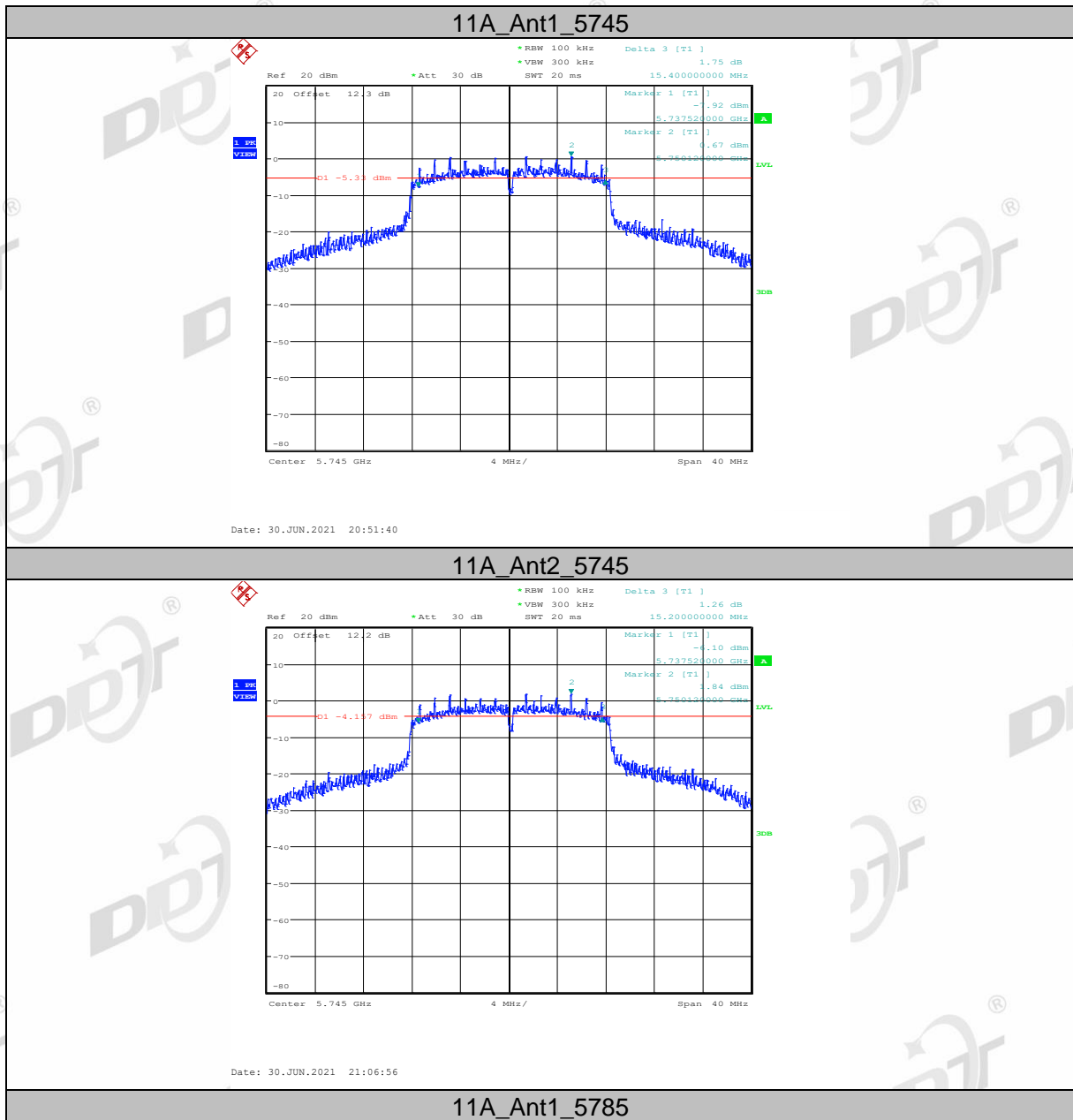
(2) Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

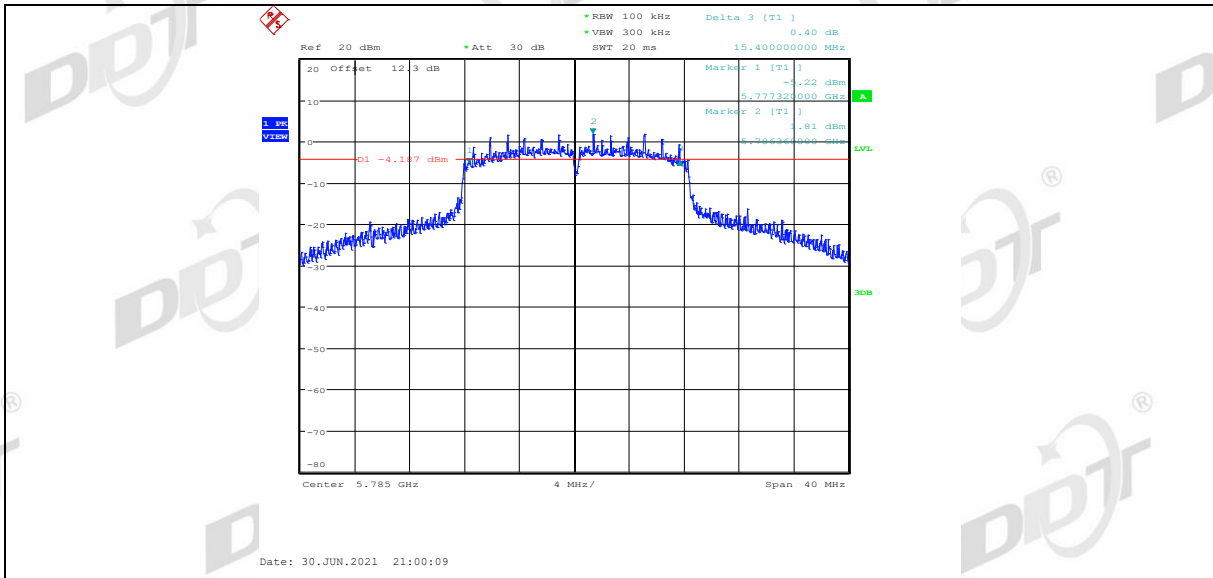
4.4. Test result

Test Mode	Antenna	Channel	6 dB EBW [MHz]	FL [MHz]	FH [MHz]	Limit [MHz]	Verdict
11A	Ant1	5745	15.400	5737.52	5752.92	0.5	Pass
	Ant2	5745	15.200	5737.52	5752.72	0.5	Pass
	Ant1	5785	15.400	5777.32	5792.72	0.5	Pass
	Ant2	5785	15.160	5777.56	5792.72	0.5	Pass
	Ant1	5825	15.160	5817.56	5832.72	0.5	Pass
	Ant2	5825	15.200	5817.52	5832.72	0.5	Pass
11AC20 MIMO	Ant1	5745	15.120	5737.56	5752.68	0.5	Pass
	Ant2	5745	15.200	5737.52	5752.72	0.5	Pass
	Ant1	5785	15.200	5777.52	5792.72	0.5	Pass
	Ant2	5785	15.200	5777.52	5792.72	0.5	Pass
	Ant1	5825	15.200	5817.52	5832.72	0.5	Pass
	Ant2	5825	15.240	5817.48	5832.72	0.5	Pass
11AC40 MIMO	Ant1	5755	36.560	5736.84	5773.40	0.5	Pass
	Ant2	5755	36.480	5736.92	5773.40	0.5	Pass
	Ant1	5795	36.560	5776.84	5813.40	0.5	Pass
	Ant2	5795	36.560	5776.84	5813.40	0.5	Pass

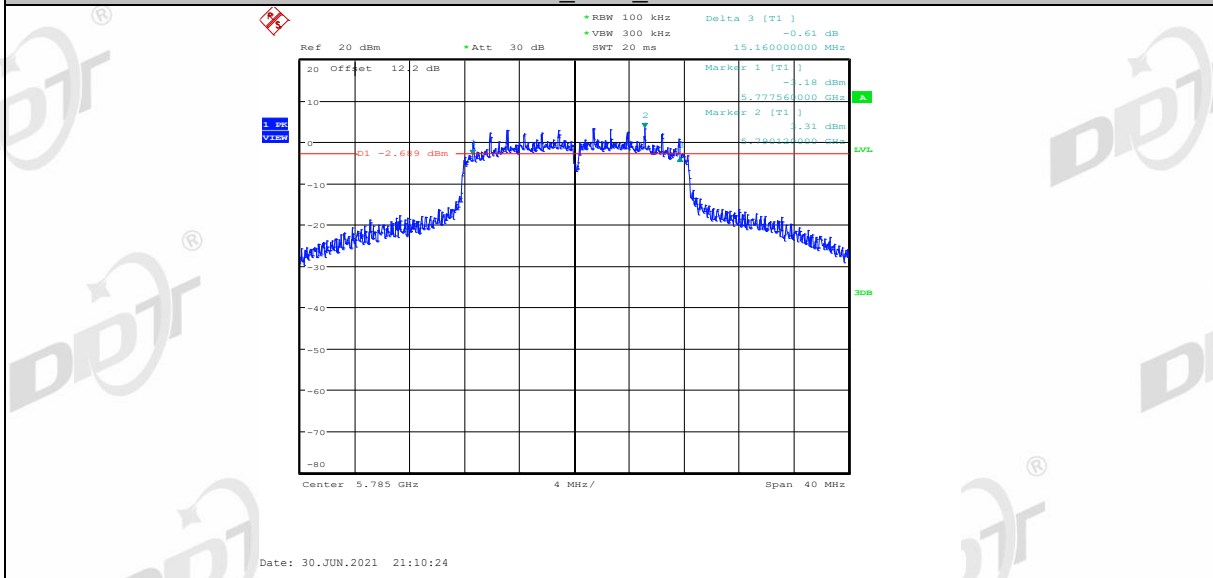
4.5. Original test data

6 dB EBW:

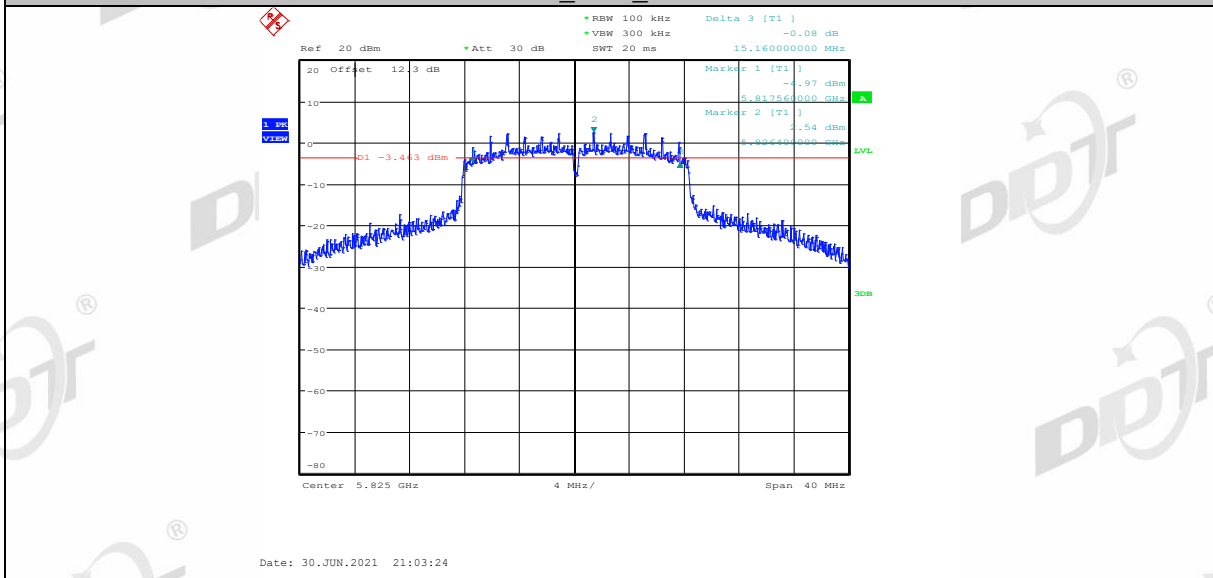




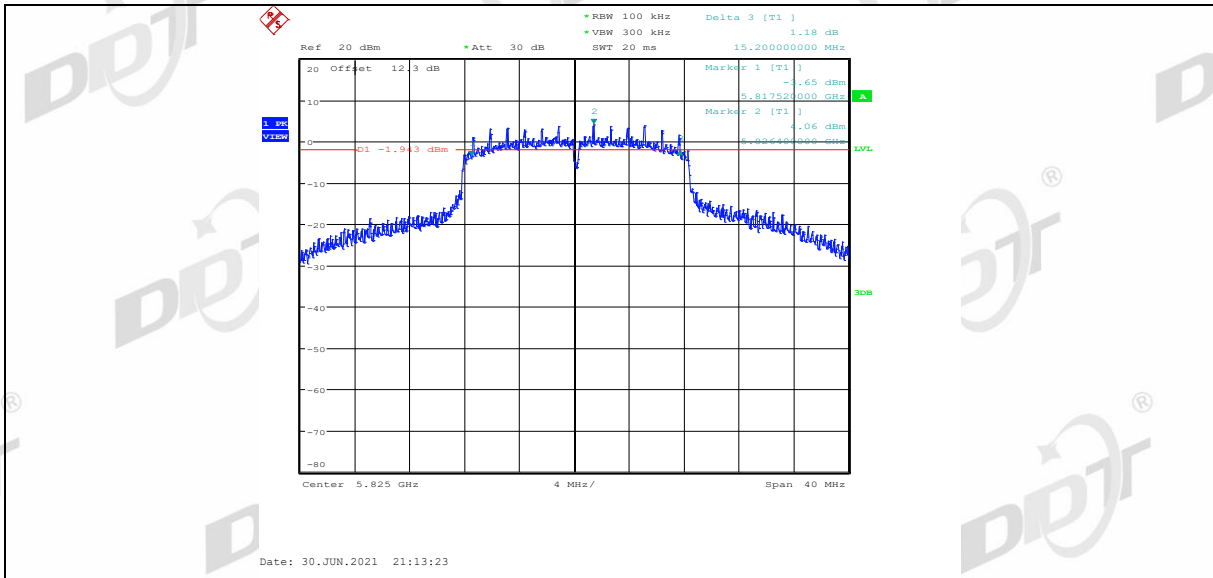
11A_Ant2_5785



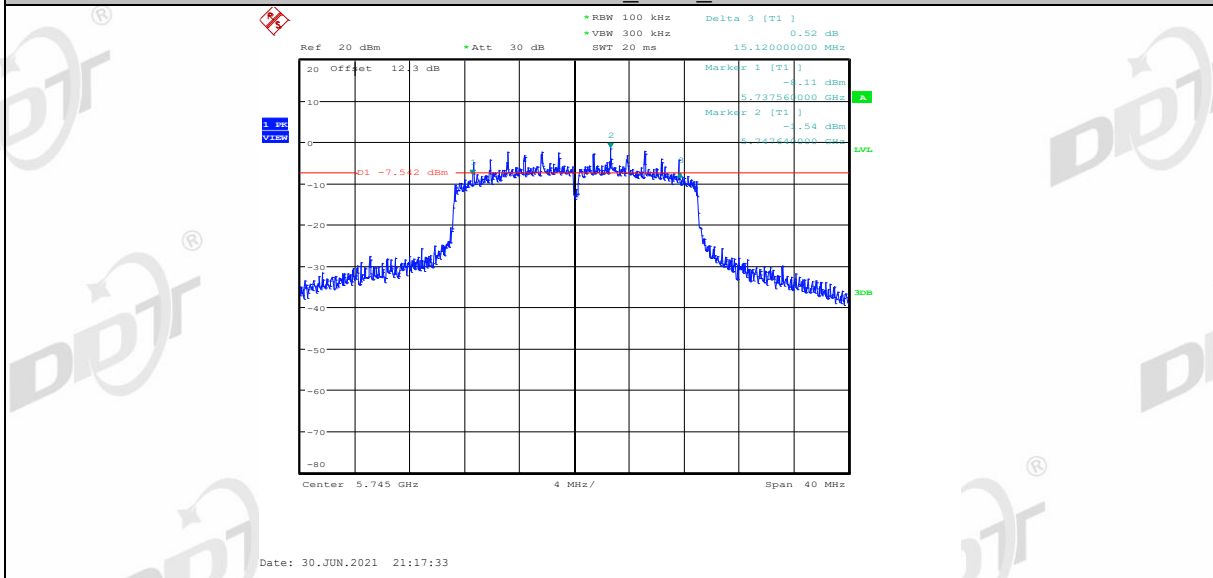
11A_Ant1_5825



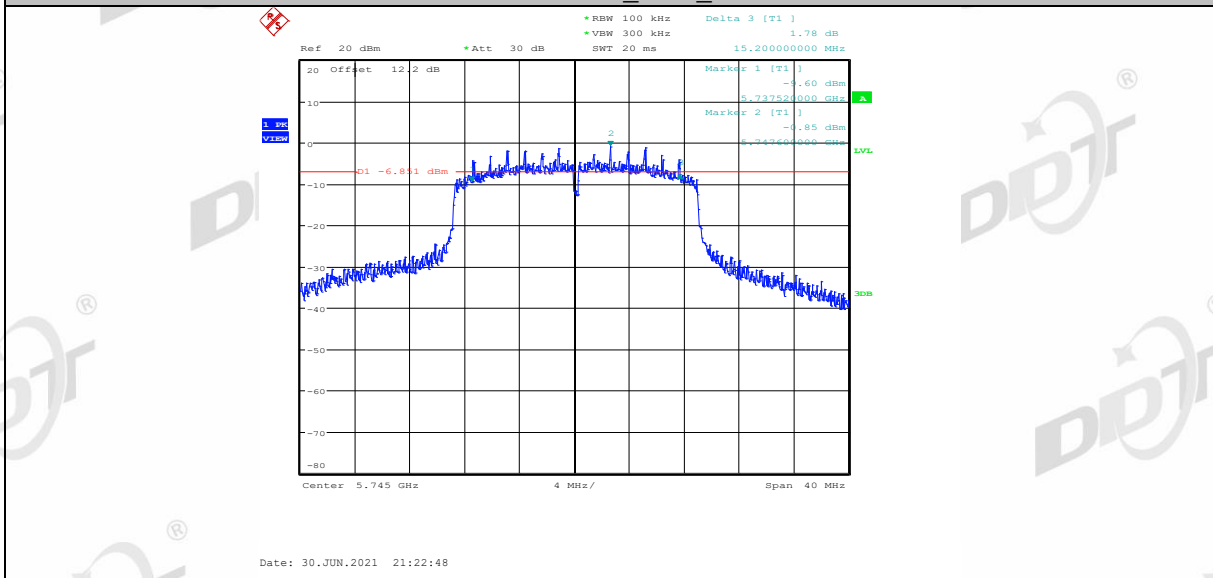
11A_Ant2_5825



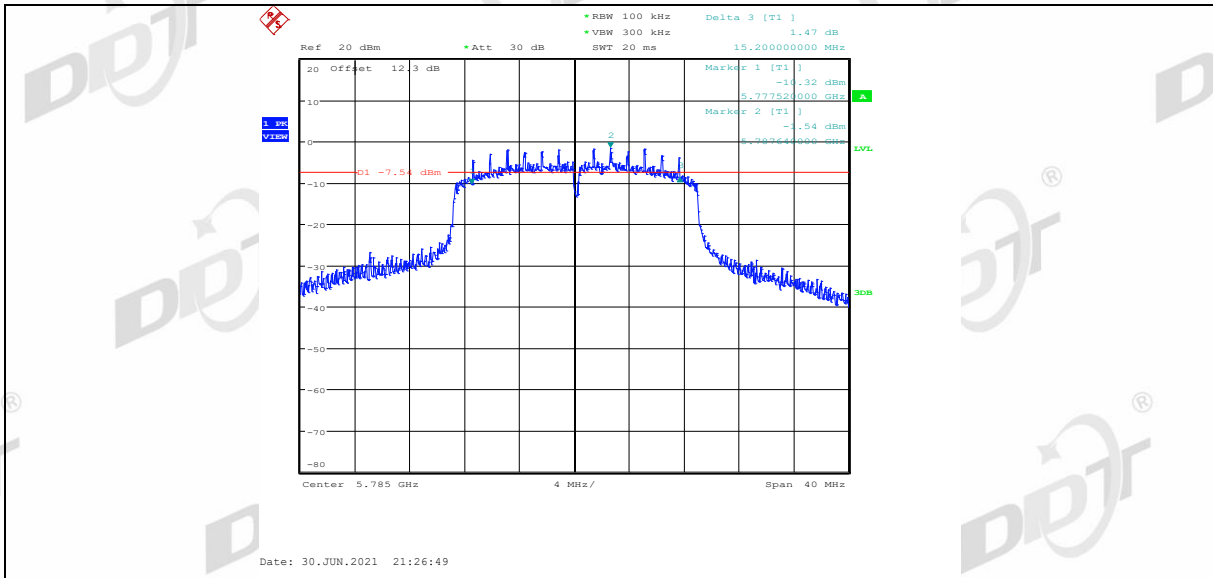
11AC20MIMO_Ant1_5745



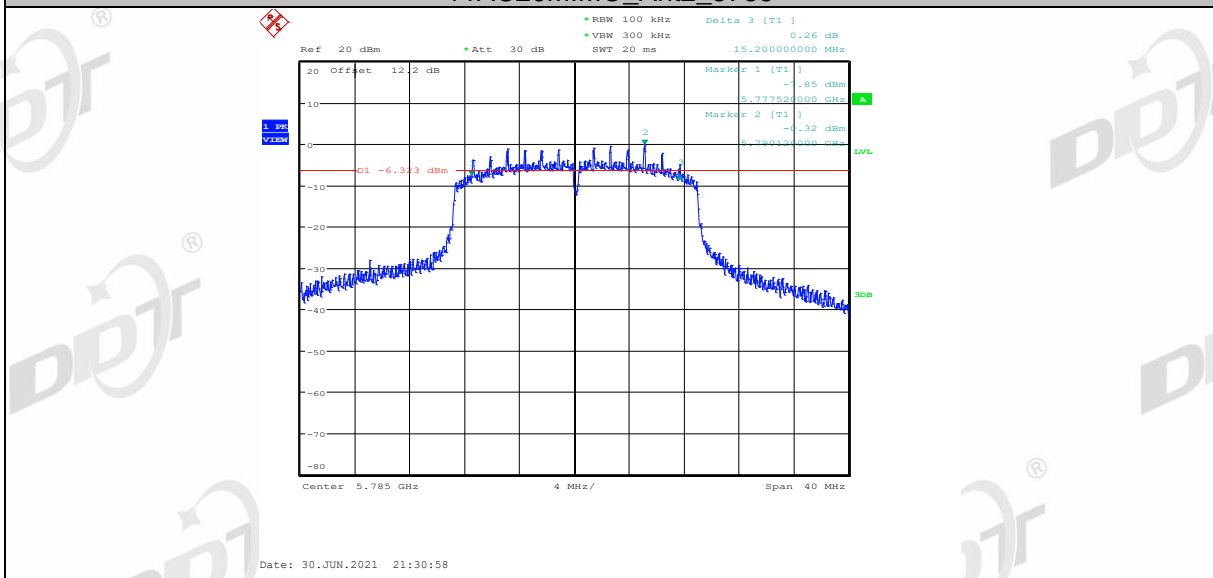
11AC20MIMO_Ant2_5745



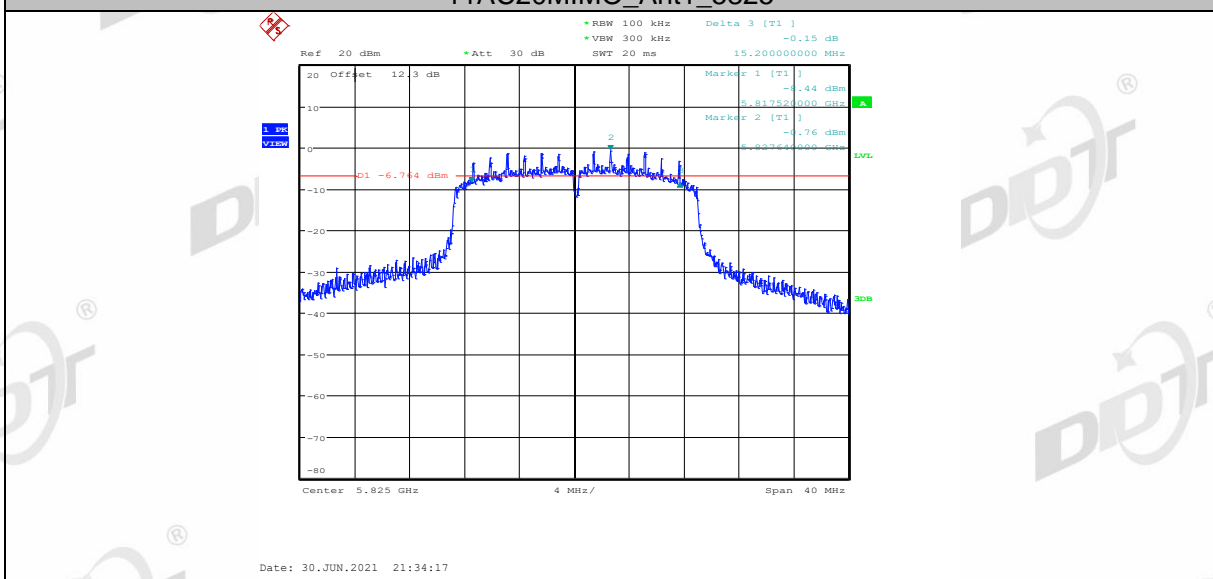
11AC20MIMO_Ant1_5785



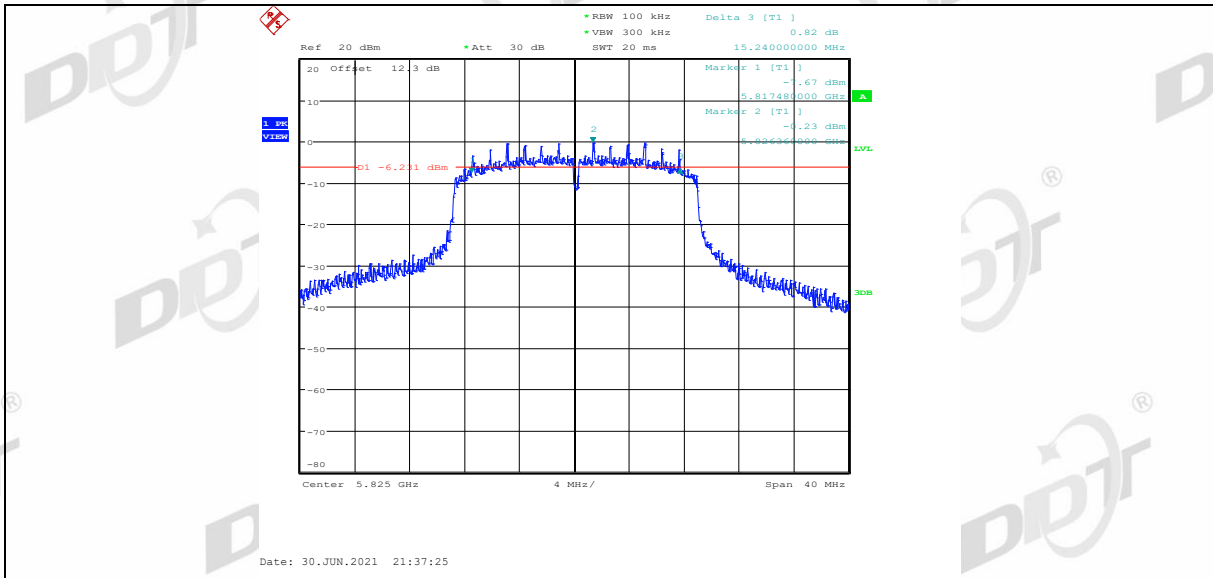
11AC20MIMO_Ant2_5785



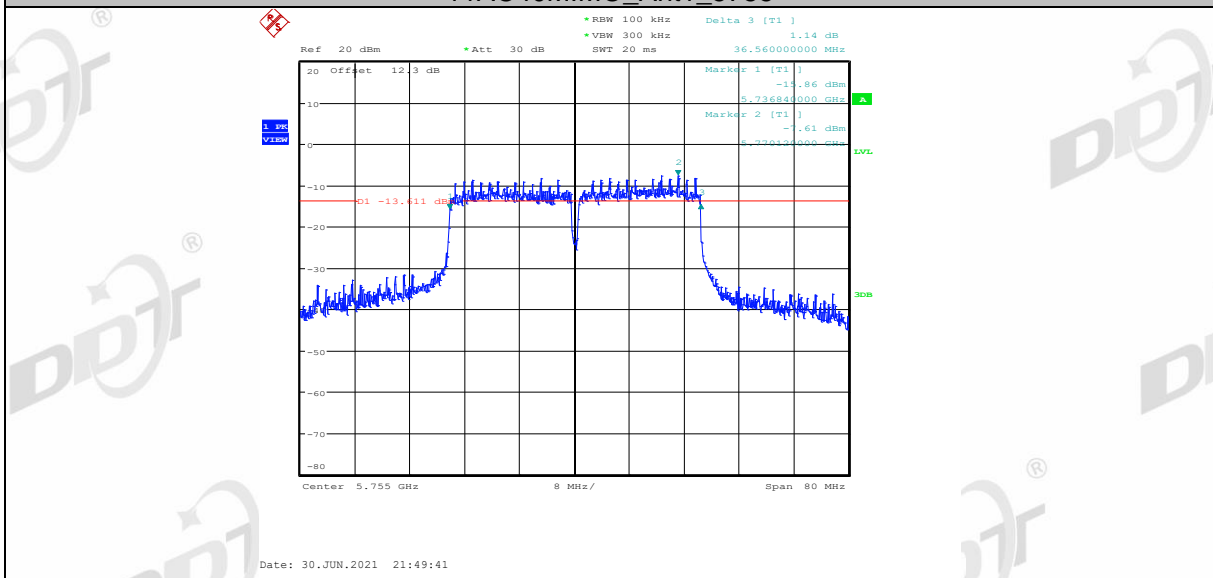
11AC20MIMO_Ant1_5825



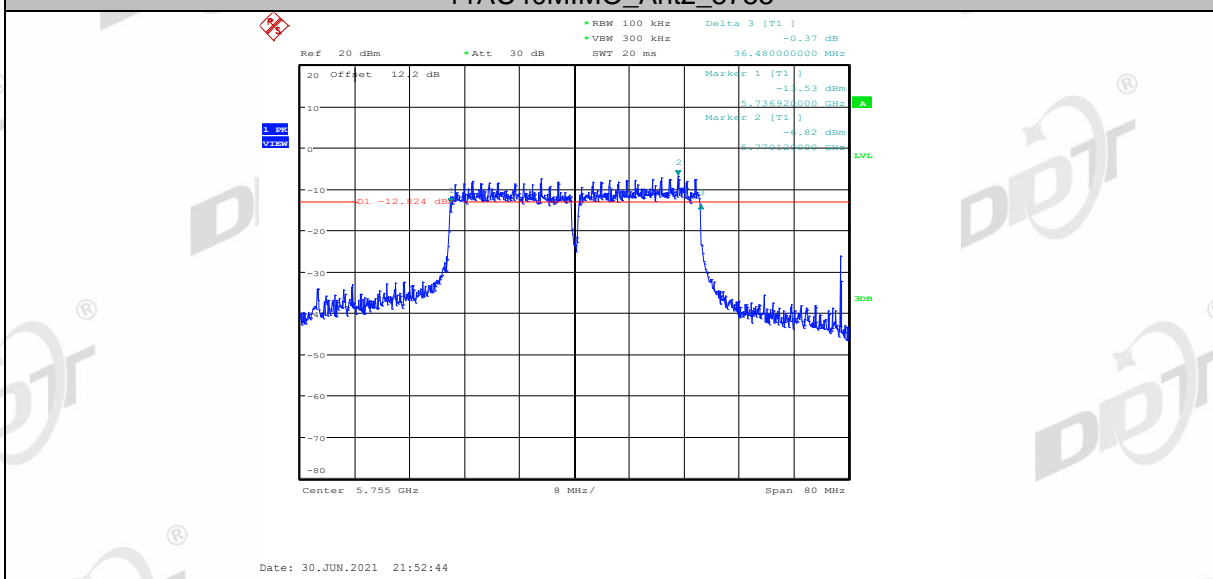
11AC20MIMO_Ant2_5825



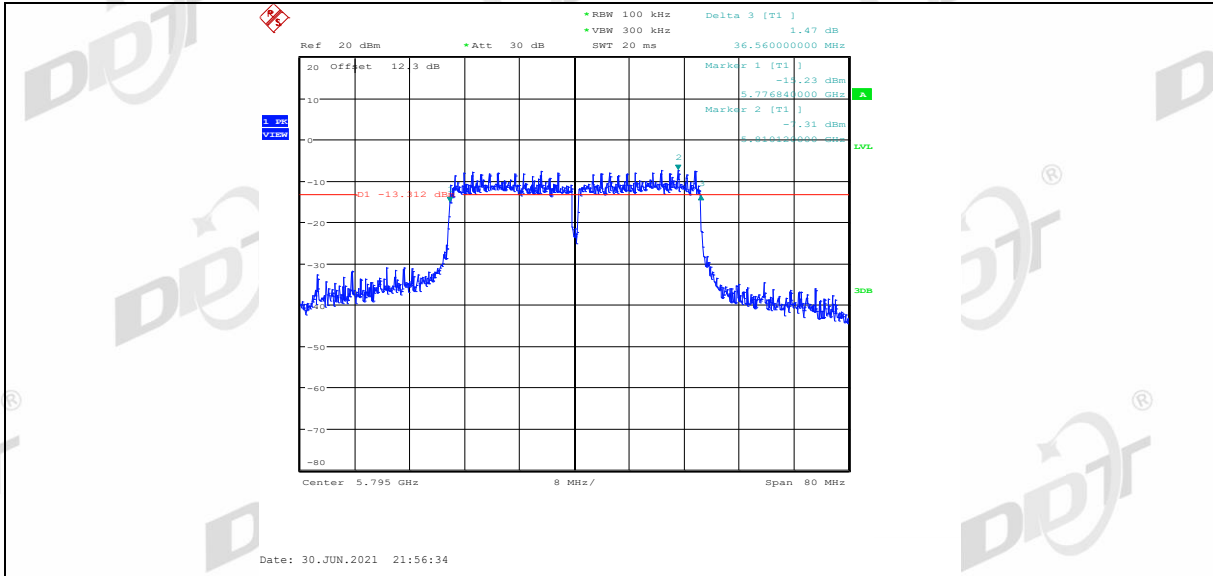
11AC40MIMO_Ant1_5755



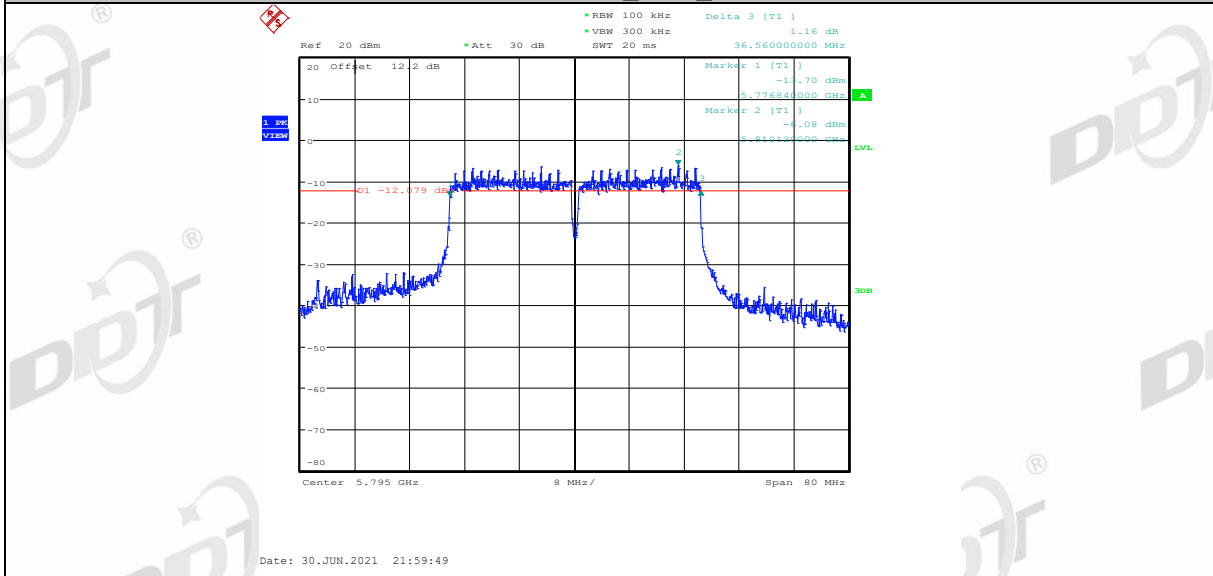
11AC40MIMO_Ant2_5755



11AC40MIMO_Ant1_5795



11AC40MIMO_Ant2_5795



5. Maximum Output Power

5.1. Block diagram of test setup

Same as section 4.1

5.2. Limits

FCC Part15, Subpart E/ RSS-247		
Test Item	Limit	Frequency Range (MHz)
Conducted Output Power	For FCC client devices: 250 mW (24 dBm)	5150-5250
	For RSS: e.i.r.p. power: not exceed 200 mW (23 dBm) or $10 + 10 \log_{10} B$	
	For FCC: 250 mW (24 dBm) or $11 + 10 \log_{10} B$	5250-5350
	For RSS: e.i.r.p. power: not exceed 1.0 W (30 dBm) or $17 + 10 \log_{10} B$	
	For FCC: 250 mW (24 dBm) or $11 + 10 \log_{10} B$	For FCC:5470-5725 For IC:5470-5600 5650-5725
	For RSS: e.i.r.p. power: not exceed 1.0 W (30 dBm) or $17 + 10 \log_{10} B$	
	1 Watt (30 dBm)	5725-5850

Note: 1. For FCC: $B=26$ bandwidth.
 2. For 802.11ac, the EUT incorporates a MIMO function. The Antenna directional gain is 6.638 dBi.
 The Output Power limit is the above limits-(6.638-6)
 (For ISSED e.i.r.p. power only for 5725-5850 Band)

5.3. Test procedure

Connect each EUT's antenna output to power sensor by RF cable and attenuator
 Measure the output power of each antenna port by power sensor.

5.4. Test result

Test Mode	Ant	Test Channel	Output Power [dBm]	FCC LIMIT
11A	ANT1	5745	11.01	30
11A	ANT2	5745	12.53	30
11A	ANT1	5785	12.05	30
11A	ANT2	5785	13.76	30
11A	ANT1	5825	12.64	30
11A	ANT2	5825	14.43	30
11AC20MIMO	ANT1	5745	8.45	29.36
11AC20MIMO	ANT2	5745	9.25	29.36
11AC20MIMO	total	5745	11.88	29.36
11AC20MIMO	ANT1	5785	8.56	29.36
11AC20MIMO	ANT2	5785	9.98	29.36
11AC20MIMO	total	5785	12.34	29.36
11AC20MIMO	ANT1	5825	8.92	29.36
11AC20MIMO	ANT2	5825	10.23	29.36
11AC20MIMO	total	5825	12.63	29.36
11AC40MIMO	ANT1	5755	6.50	29.36
11AC40MIMO	ANT2	5755	7.97	29.36
11AC40MIMO	total	5755	10.31	29.36
11AC40MIMO	ANT1	5795	6.42	29.36
11AC40MIMO	ANT2	5795	8.98	29.36
11AC40MIMO	total	5795	10.90	29.36

6. Power Spectral Density

6.1. Block diagram of test setup

Same with 4.1

6.2. Limits

FCC Part15, Subpart E/ RSS-247		
Test Item	Limit	Frequency Range (MHz)
Power Spectral Density	For FCC: Other than Mobile and portable:17 dBm/MHz Mobile and portable client devices:11 dBm/MHz	5150-5250
	For RSS eirp:10 dBm/MHz	
	11 dBm/MHz	5250-5350
	11 dBm/MHz	For FCC:5470-5725 For IC:5470-5600 5650-5725
	30 dBm/500 kHz	5725-5850
Note: For 802.11ac, the EUT incorporates a MIMO function. The Antenna directional gain is 6.638 dBi. The Power Spectral Density limit is the above limits-(6.638-6)		

6.3. Test procedure

The transmitter output was connected to a spectrum analyzer. Power density was measured by spectrum analyzer with 1MHz RBW and 3MHz VBW.

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

5150 MHz~5250 MHz, 5250 MHz~5350 MHz, 5470 MHz~5725 MHz

Center Frequency	The centre frequency of the channel under test
Detector	RMS
RBW	1MHz
VBW	$\geq 3 \times$ RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

5725 MHz-5850 MHz

Center Frequency	The centre frequency of the channel under test
Detector	RMS
RBW	500 kHz
VBW	$\geq 3 \times \text{RBW}$
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

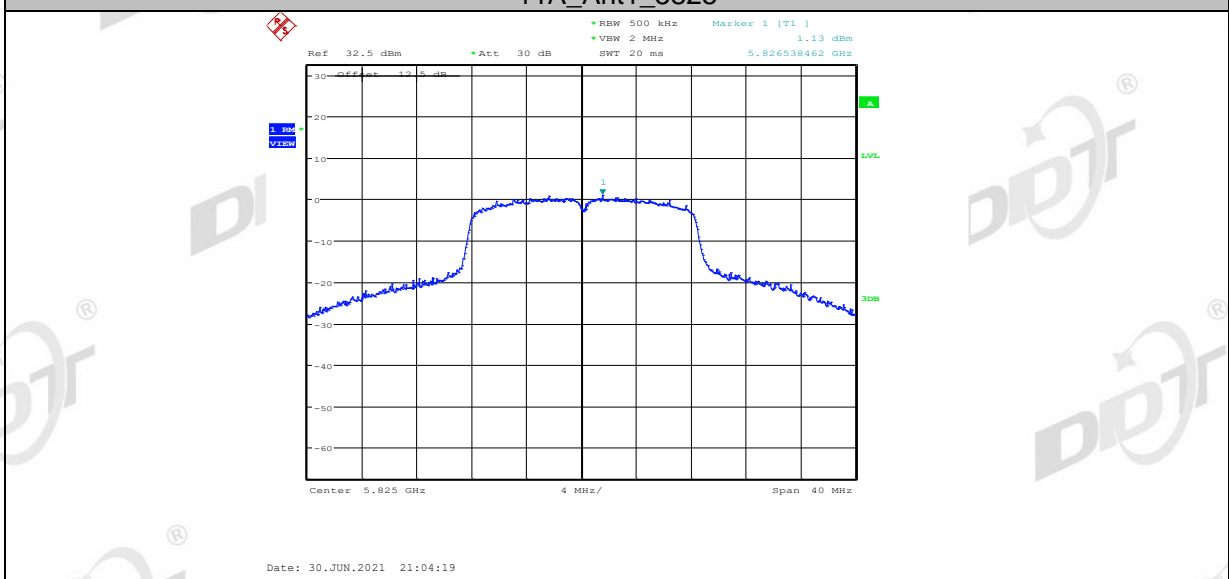
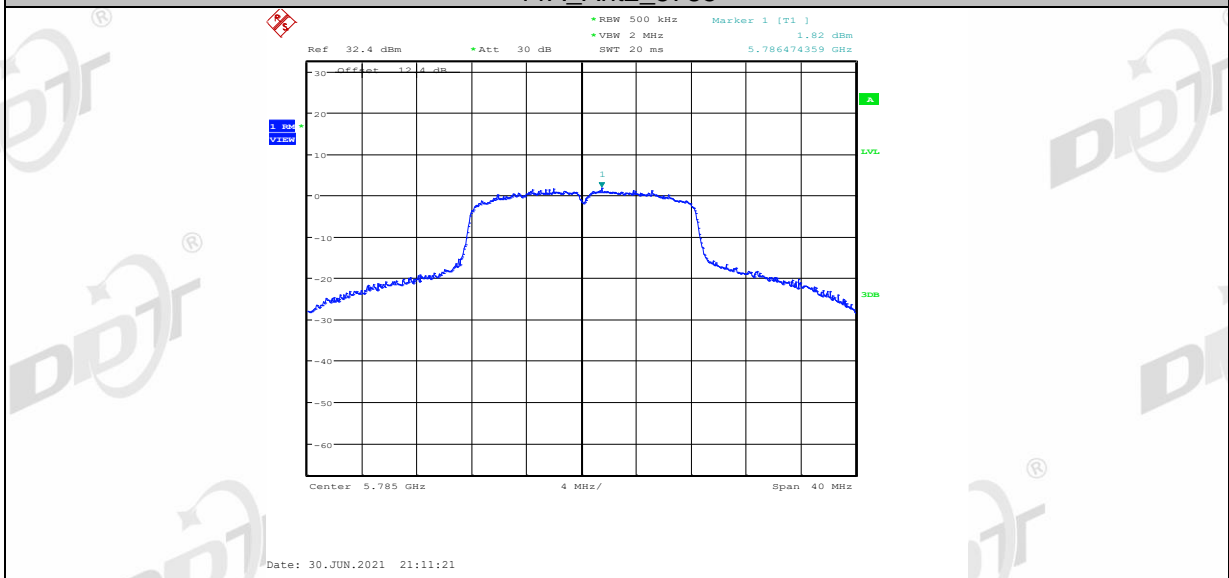
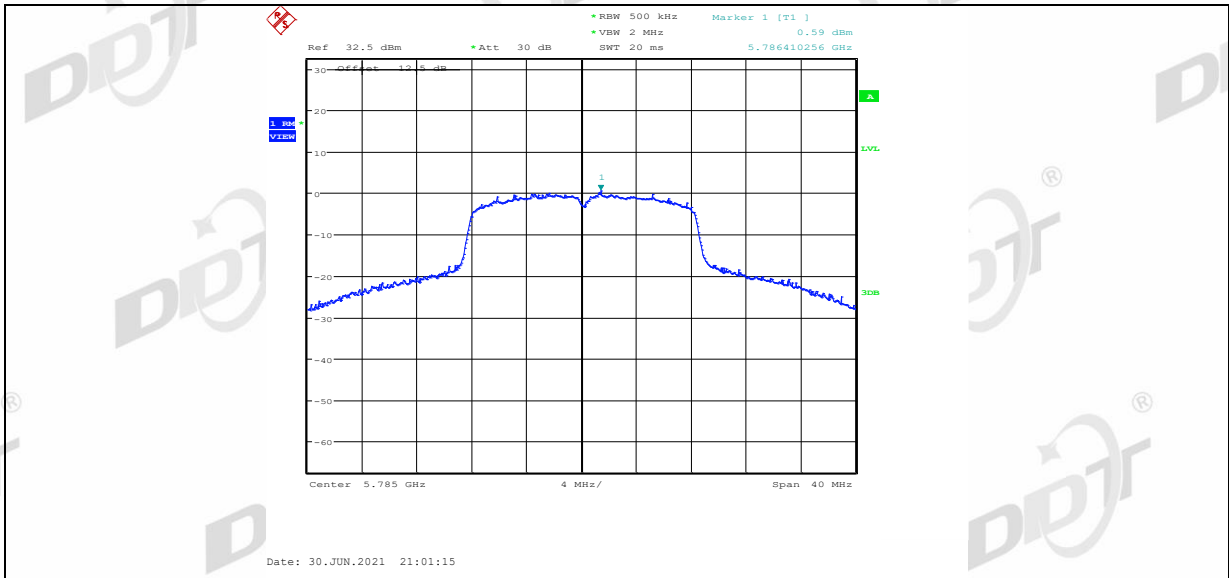
6.4. Test result

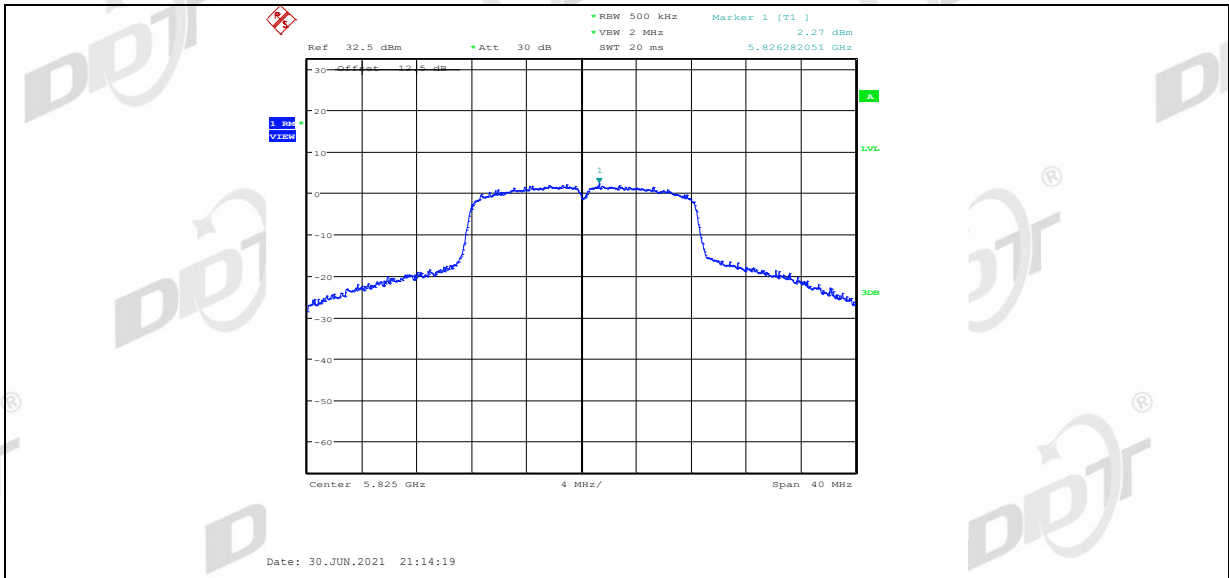
(5725-5850)

Test Mode	Ant	Test Channel	PSD [dBm/500kHz]	Limit [dBm/500kHz]	Verdict
11A	ANT1	5745	-1.08	30	Pass
11A	ANT2	5745	0.59	30	Pass
11A	ANT1	5785	0.59	30	Pass
11A	ANT2	5785	1.82	30	Pass
11A	ANT1	5825	1.13	30	Pass
11A	ANT2	5825	2.27	30	Pass
11AC20MIMO	ANT1	5745	-2.93	29.36	Pass
11AC20MIMO	ANT2	5745	-1.86	29.36	Pass
11AC20MIMO	total	5745	0.65	29.36	Pass
11AC20MIMO	ANT1	5785	-2.91	29.36	Pass
11AC20MIMO	ANT2	5785	-1.90	29.36	Pass
11AC20MIMO	total	5785	0.63	29.36	Pass
11AC20MIMO	ANT1	5825	-2.09	29.36	Pass
11AC20MIMO	ANT2	5825	-1.30	29.36	Pass
11AC20MIMO	total	5825	1.33	29.36	Pass
11AC40MIMO	ANT1	5755	-6.41	29.36	Pass
11AC40MIMO	ANT2	5755	-4.55	29.36	Pass
11AC40MIMO	total	5755	-2.37	29.36	Pass
11AC40MIMO	ANT1	5795	-6.18	29.36	Pass
11AC40MIMO	ANT2	5795	-4.57	29.36	Pass
11AC40MIMO	total	5795	-2.29	29.36	Pass

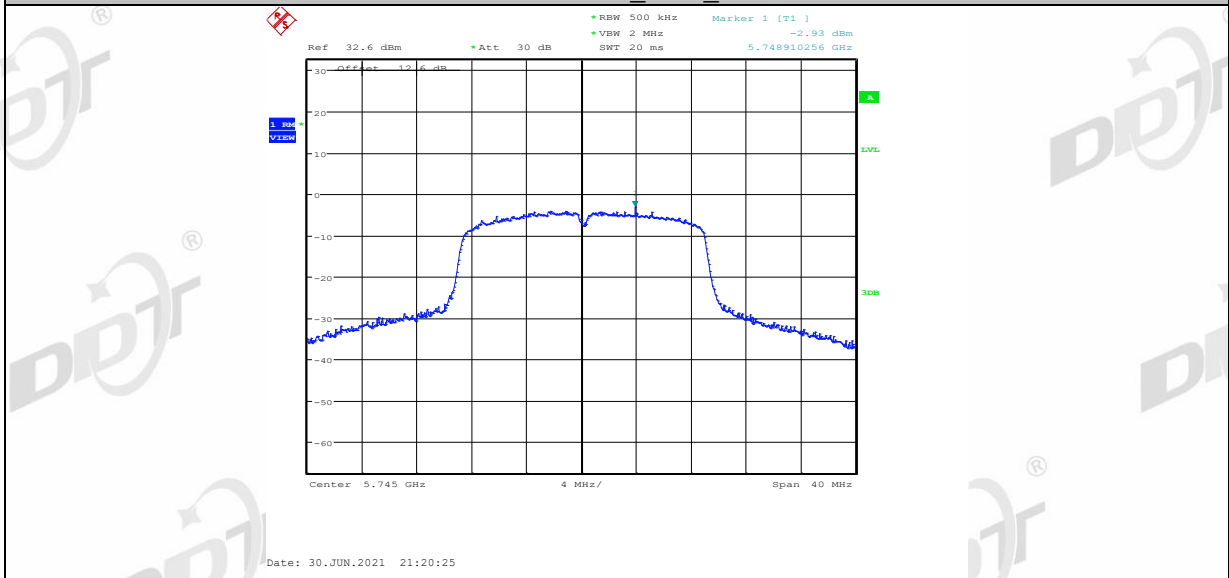
6.5. Original test data



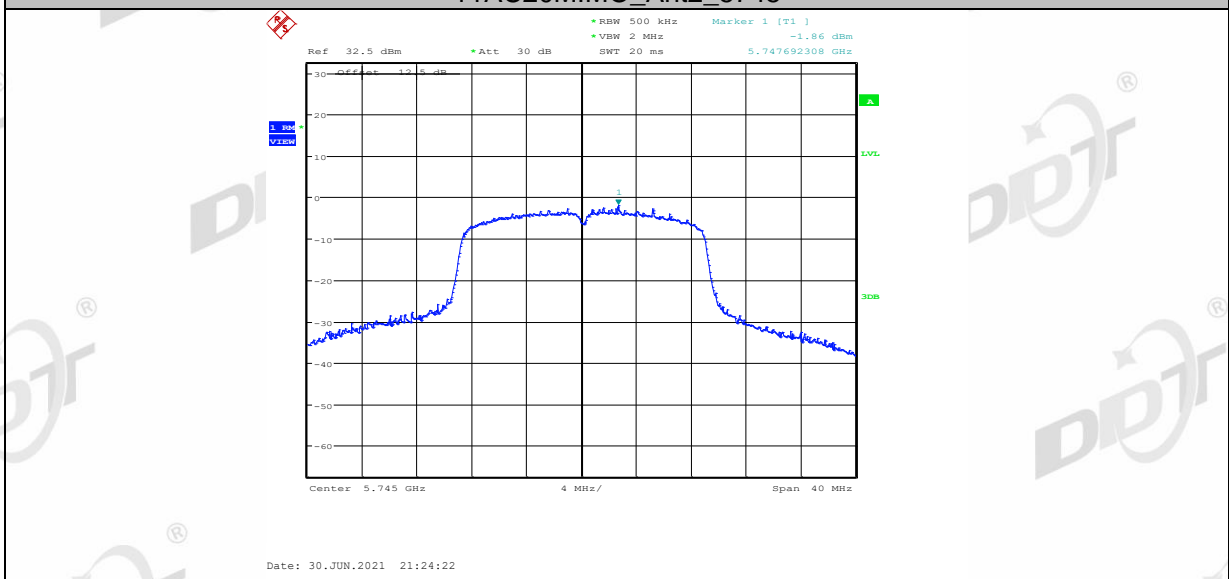




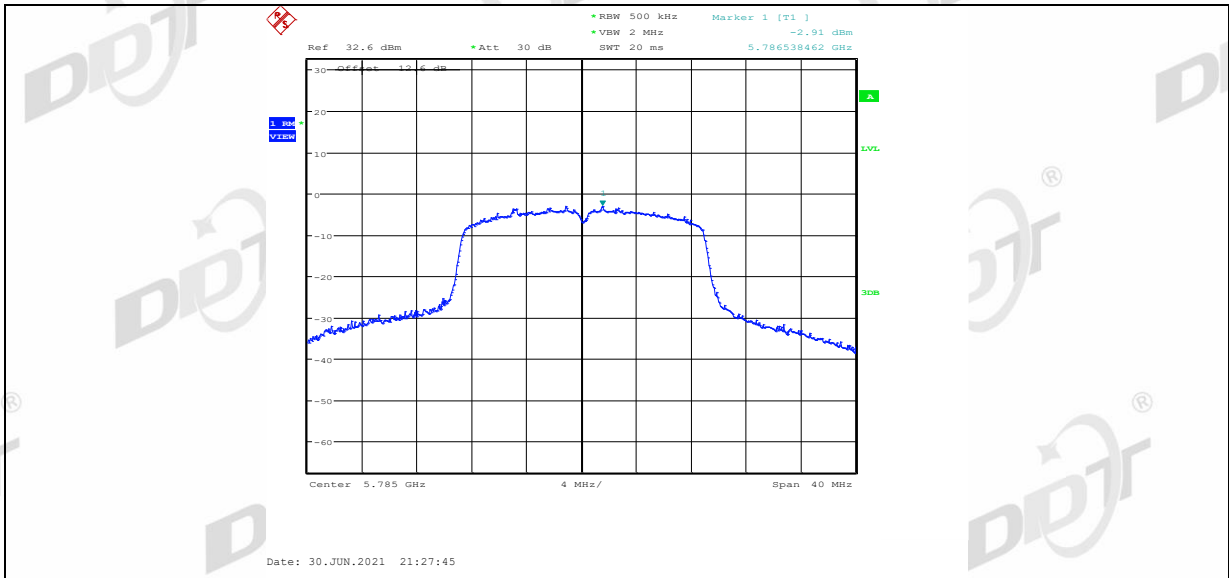
11AC20MIMO_Ant1_5745



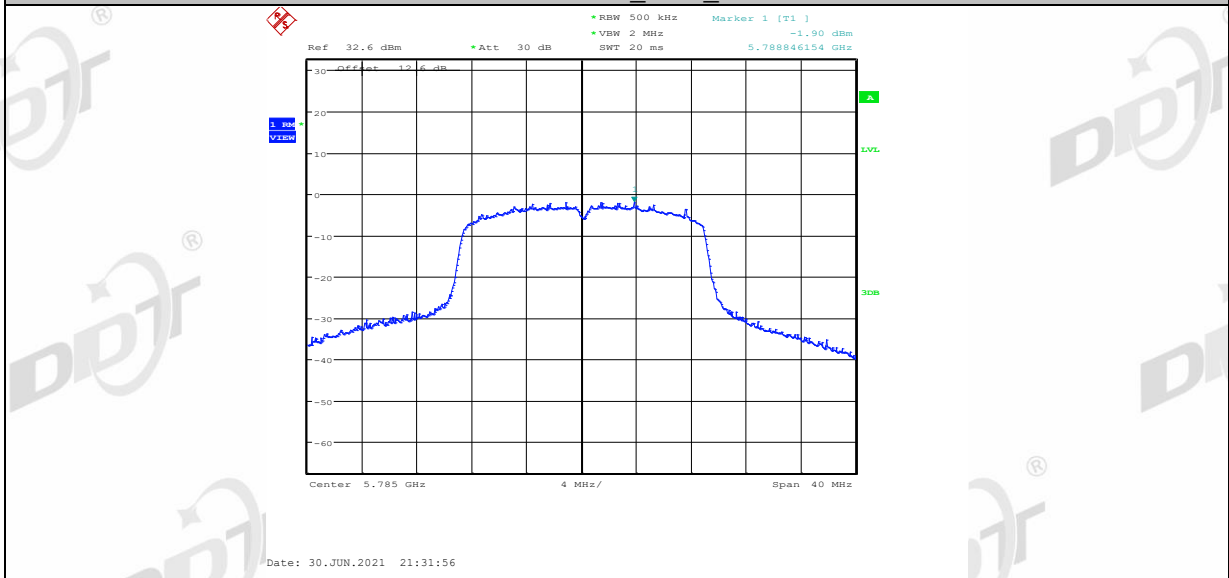
11AC20MIMO_Ant2_5745



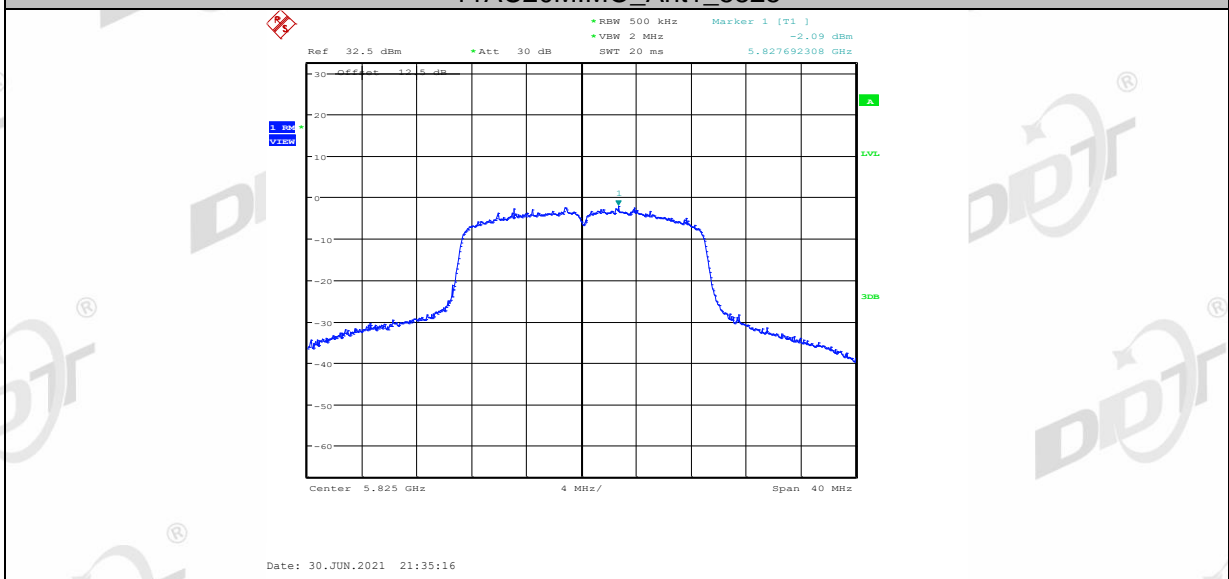
11AC20MIMO_Ant1_5785



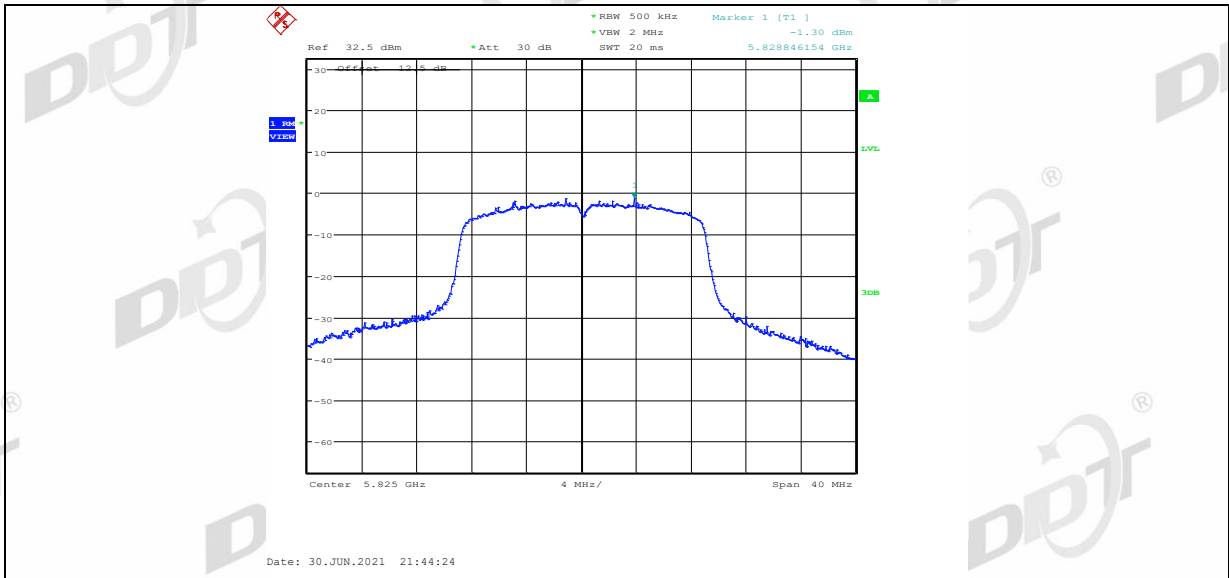
11AC20MIMO_Ant2_5785



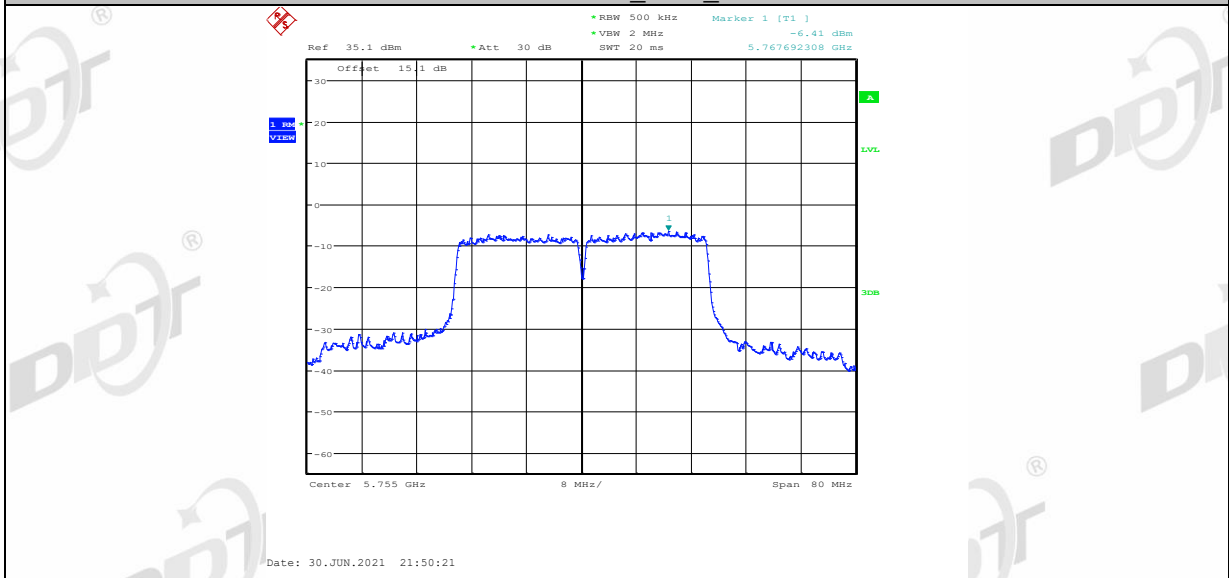
11AC20MIMO_Ant1_5825



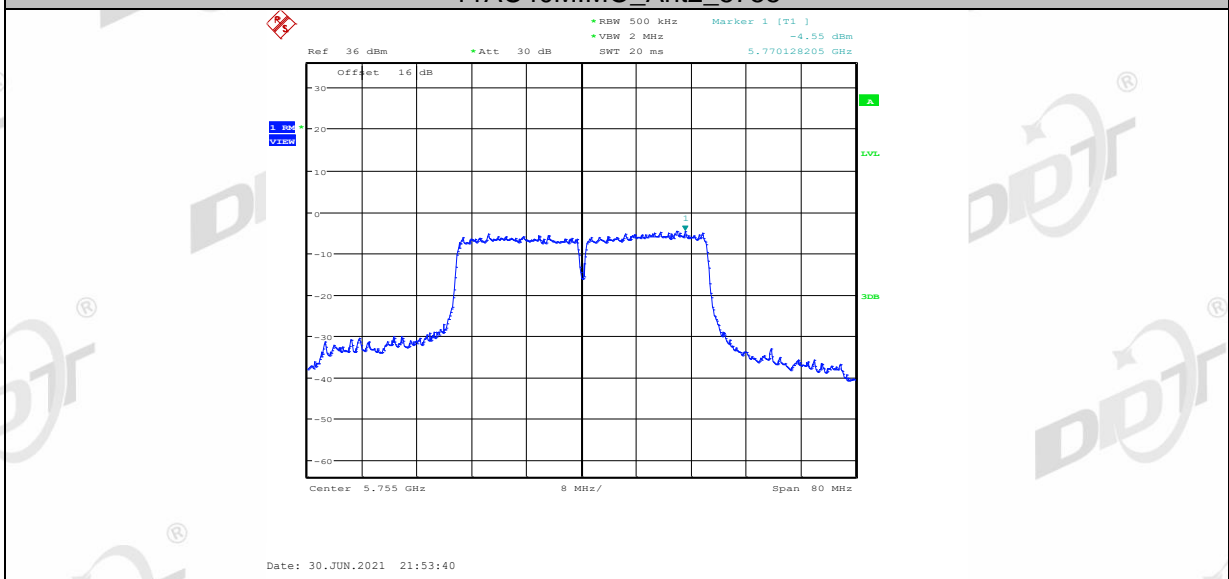
11AC20MIMO_Ant2_5825



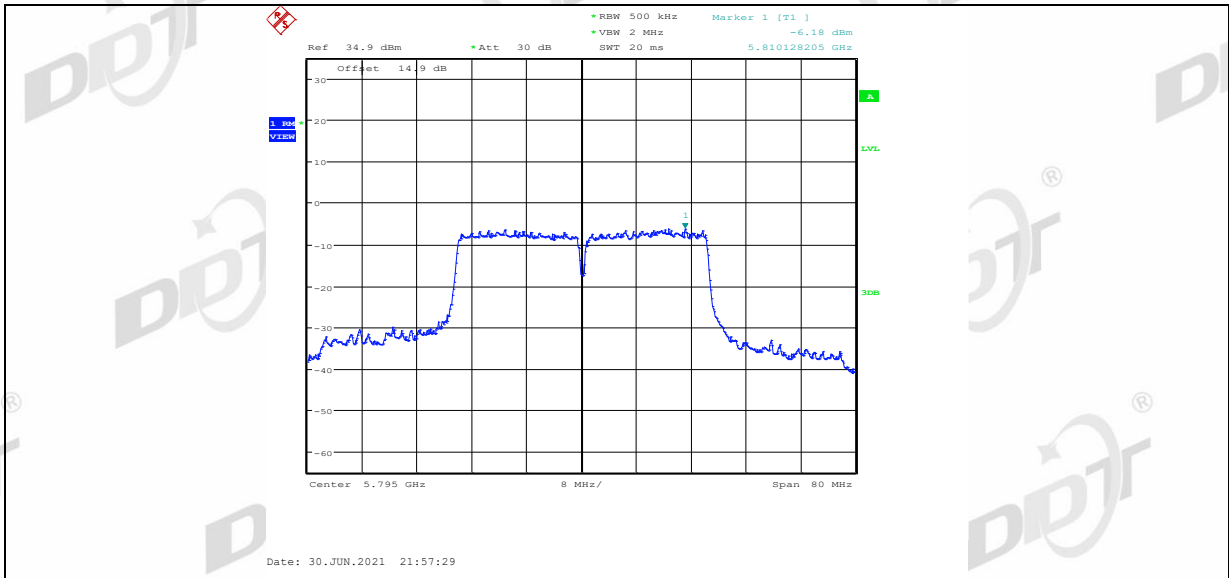
11AC40MIMO_Ant1_5755



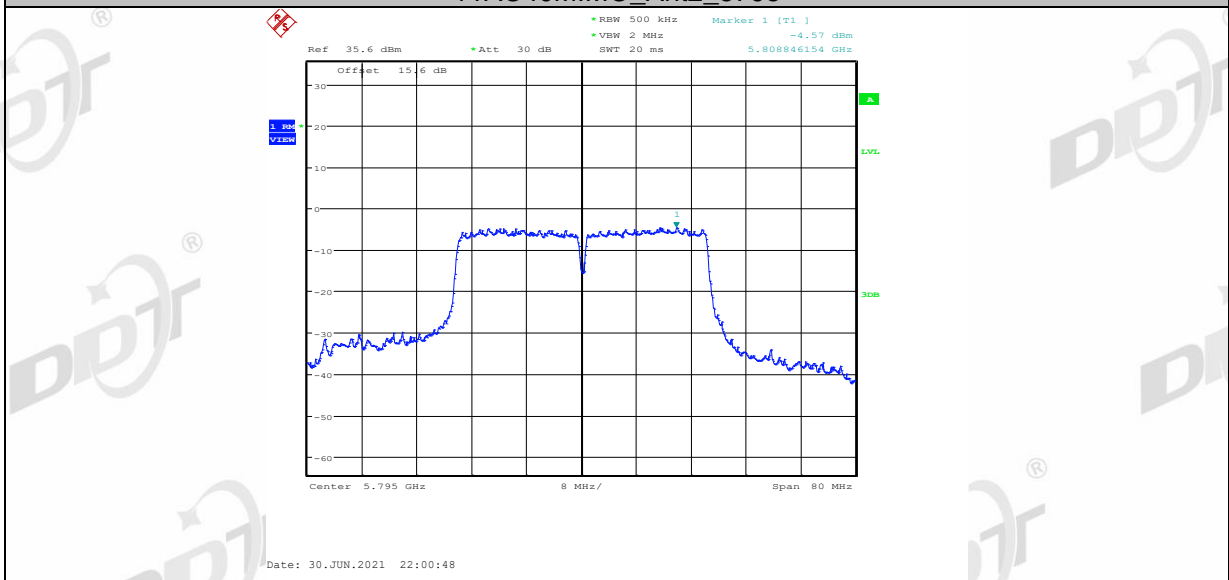
11AC40MIMO_Ant2_5755



11AC40MIMO_Ant1_5795



11AC40MIMO_Ant2_5795



7. Frequency Stability Measurement

7.1. Limit of frequency stability

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.

7.2. Measuring instruments

The measuring equipment is listed in the section 4 of this test report.

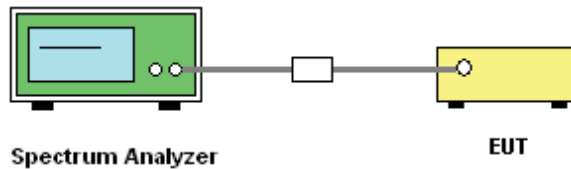
7.3. Test procedures

(1) To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.

(2) The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10 dB lower than the measured peak value.

(3) The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

7.4. Test setup



7.5. Test result

Test Mode	Antenna	Channel	Voltage					Limit (ppm)	Verdict
			Voltage [Vdc]	Temperature (°C)	Deviation (Hz)	Deviation (ppm)			
11A	Ant1	5745	NV	NT	7000	1.218451	20	Pass	
			LV	NT	7000	1.218451	20	Pass	
			HV	NT	7000	1.218451	20	Pass	
	Ant2	5745	NV	NT	5000	0.870322	20	Pass	
			LV	NT	5000	0.870322	20	Pass	
			HV	NT	5000	0.870322	20	Pass	
	Ant1	5785	NV	NT	6000	1.037165	20	Pass	
			LV	NT	7000	1.210026	20	Pass	
			HV	NT	6000	1.037165	20	Pass	
	Ant2	5785	NV	NT	6000	1.037165	20	Pass	
			LV	NT	6000	1.037165	20	Pass	
			HV	NT	5000	0.864304	20	Pass	
	Ant1	5825	NV	NT	6000	1.030043	20	Pass	
			LV	NT	6000	1.030043	20	Pass	
			HV	NT	6000	1.030043	20	Pass	
	Ant2	5825	NV	NT	5000	0.858369	20	Pass	
			LV	NT	5000	0.858369	20	Pass	
			HV	NT	6000	1.030043	20	Pass	
	11AC20 MIMO	Ant1	5745	NV	NT	6000	1.044386	20	Pass
				LV	NT	6000	1.044386	20	Pass
				HV	NT	6000	1.044386	20	Pass
		Ant2	5745	NV	NT	8000	1.392515	20	Pass
				LV	NT	8000	1.392515	20	Pass
				HV	NT	9000	1.56658	20	Pass
Ant1		5785	NV	NT	10000	1.728608	20	Pass	
			LV	NT	10000	1.728608	20	Pass	
			HV	NT	10000	1.728608	20	Pass	
Ant2		5785	NV	NT	11000	1.901469	20	Pass	
			LV	NT	11000	1.901469	20	Pass	
			HV	NT	11000	1.901469	20	Pass	
Ant1		5825	NV	NT	11000	1.888412	20	Pass	
			LV	NT	11000	1.888412	20	Pass	
			HV	NT	11000	1.888412	20	Pass	
Ant2		5825	NV	NT	11000	1.888412	20	Pass	
			LV	NT	11000	1.888412	20	Pass	
			HV	NT	12000	2.060086	20	Pass	
11AC40 MIMO		Ant1	5755	NV	NT	13000	2.258905	20	Pass
				LV	NT	13000	2.258905	20	Pass
				HV	NT	13000	2.258905	20	Pass
		Ant2	5755	NV	NT	13000	2.258905	20	Pass
				LV	NT	13000	2.258905	20	Pass
				HV	NT	14000	2.432667	20	Pass
	Ant1	5795	NV	NT	14000	2.415876	20	Pass	
			LV	NT	14000	2.415876	20	Pass	
			HV	NT	14000	2.415876	20	Pass	

	Ant2	5795	NV	NT	14000	2.415876	20	Pass
			LV	NT	14000	2.415876	20	Pass
			HV	NT	14000	2.415876	20	Pass

Temperature								
Test Mode	Antenna	Channel	Voltage [Vdc]	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
11A	Ant1	5745	NV	-30	7000	1.218451	20	Pass
			NV	-20	7000	1.218451	20	Pass
			NV	-10	7000	1.218451	20	Pass
			NV	0	7000	1.218451	20	Pass
			NV	10	7000	1.218451	20	Pass
			NV	20	7000	1.218451	20	Pass
			NV	30	7000	1.218451	20	Pass
			NV	40	7000	1.218451	20	Pass
	Ant2	5745	NV	-30	6000	1.044386	20	Pass
			NV	-20	5000	0.870322	20	Pass
			NV	-10	5000	0.870322	20	Pass
			NV	0	5000	0.870322	20	Pass
			NV	10	6000	1.044386	20	Pass
			NV	20	6000	1.044386	20	Pass
			NV	30	5000	0.870322	20	Pass
			NV	40	6000	1.044386	20	Pass
	Ant1	5785	NV	-30	7000	1.210026	20	Pass
			NV	-20	6000	1.037165	20	Pass
			NV	-10	6000	1.037165	20	Pass
			NV	0	6000	1.037165	20	Pass
			NV	10	6000	1.037165	20	Pass
			NV	20	6000	1.037165	20	Pass
			NV	30	6000	1.037165	20	Pass
			NV	40	6000	1.037165	20	Pass
	Ant2	5785	NV	-30	6000	1.037165	20	Pass
			NV	-20	6000	1.037165	20	Pass
			NV	-10	6000	1.037165	20	Pass
			NV	0	6000	1.037165	20	Pass
			NV	10	6000	1.037165	20	Pass
			NV	20	6000	1.037165	20	Pass
			NV	30	6000	1.037165	20	Pass
			NV	40	6000	1.037165	20	Pass
	Ant1	5825	NV	-30	6000	1.030043	20	Pass
			NV	-20	6000	1.030043	20	Pass
			NV	-10	6000	1.030043	20	Pass
			NV	0	6000	1.030043	20	Pass
			NV	10	6000	1.030043	20	Pass
			NV	20	6000	1.030043	20	Pass
			NV	30	6000	1.030043	20	Pass
			NV	40	6000	1.030043	20	Pass

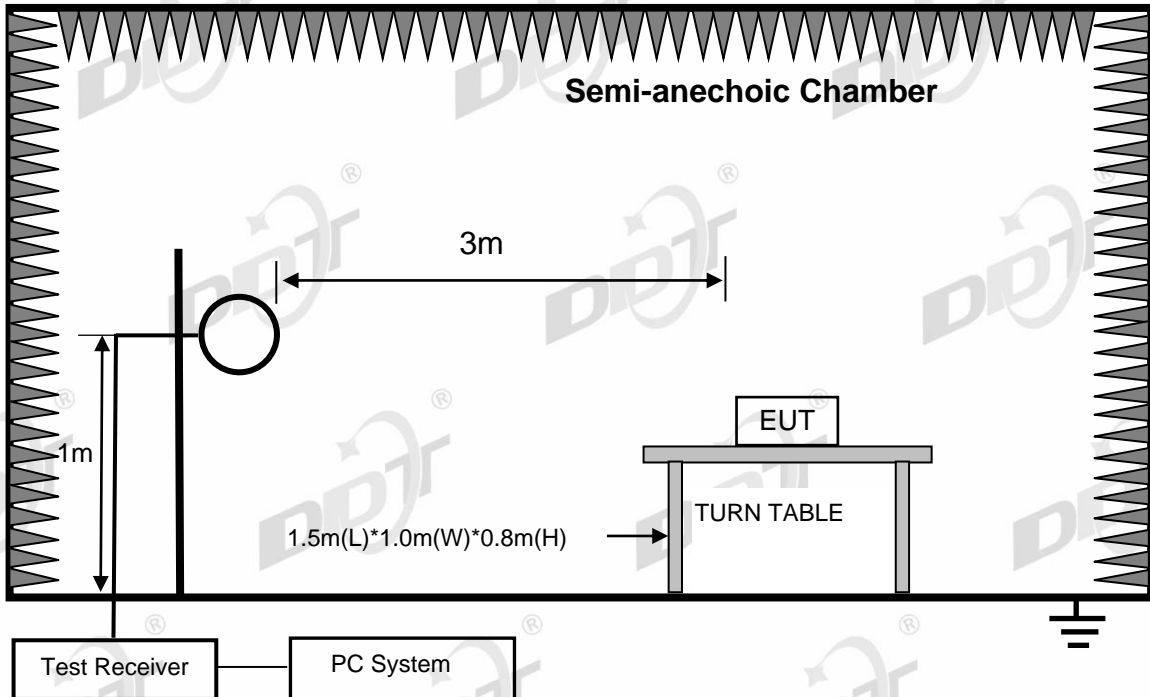
	Ant2	5825	NV	50	6000	1.030043	20	Pass
			NV	-30	5000	0.858369	20	Pass
			NV	-20	6000	1.030043	20	Pass
			NV	-10	5000	0.858369	20	Pass
			NV	0	6000	1.030043	20	Pass
			NV	10	5000	0.858369	20	Pass
			NV	20	6000	1.030043	20	Pass
			NV	30	6000	1.030043	20	Pass
			NV	40	6000	1.030043	20	Pass
			NV	50	6000	1.030043	20	Pass
11AC20 MIMO	Ant1	5745	NV	-30	6000	1.044386	20	Pass
			NV	-20	6000	1.044386	20	Pass
			NV	-10	7000	1.218451	20	Pass
			NV	0	7000	1.218451	20	Pass
			NV	10	7000	1.218451	20	Pass
			NV	20	7000	1.218451	20	Pass
			NV	30	7000	1.218451	20	Pass
			NV	40	7000	1.218451	20	Pass
			NV	50	8000	1.392515	20	Pass
	Ant2	5745	NV	-30	9000	1.56658	20	Pass
			NV	-20	9000	1.56658	20	Pass
			NV	-10	9000	1.56658	20	Pass
			NV	0	9000	1.56658	20	Pass
			NV	10	9000	1.56658	20	Pass
			NV	20	9000	1.56658	20	Pass
			NV	30	9000	1.56658	20	Pass
			NV	40	9000	1.56658	20	Pass
			NV	50	10000	1.740644	20	Pass
Ant1	5785	NV	-30	10000	1.728608	20	Pass	
		NV	-20	10000	1.728608	20	Pass	
		NV	-10	11000	1.901469	20	Pass	
		NV	0	11000	1.901469	20	Pass	
		NV	10	10000	1.728608	20	Pass	
		NV	20	11000	1.901469	20	Pass	
		NV	30	11000	1.901469	20	Pass	
		NV	40	11000	1.901469	20	Pass	
		NV	50	11000	1.901469	20	Pass	
Ant2	5785	NV	-30	11000	1.901469	20	Pass	
		NV	-20	11000	1.901469	20	Pass	
		NV	-10	11000	1.901469	20	Pass	
		NV	0	11000	1.901469	20	Pass	
		NV	10	11000	1.901469	20	Pass	
		NV	20	11000	1.901469	20	Pass	
		NV	30	12000	2.07433	20	Pass	
		NV	40	12000	2.07433	20	Pass	
		NV	50	12000	2.07433	20	Pass	
Ant1	5825	NV	-30	11000	1.888412	20	Pass	
		NV	-20	11000	1.888412	20	Pass	
		NV	-10	11000	1.888412	20	Pass	
		NV	0	11000	1.888412	20	Pass	
		NV	10	11000	1.888412	20	Pass	

11AC40 MIMO			NV	20	11000	1.888412	20	Pass		
			NV	30	11000	1.888412	20	Pass		
			NV	40	11000	1.888412	20	Pass		
			NV	50	11000	1.888412	20	Pass		
	Ant2	5825	NV	-30	12000	2.060086	20	Pass		
			NV	-20	12000	2.060086	20	Pass		
			NV	-10	12000	2.060086	20	Pass		
			NV	0	12000	2.060086	20	Pass		
			NV	10	12000	2.060086	20	Pass		
			NV	20	12000	2.060086	20	Pass		
			NV	30	12000	2.060086	20	Pass		
			NV	40	12000	2.060086	20	Pass		
			NV	50	12000	2.060086	20	Pass		
			Ant1	5755	NV	-30	13000	2.258905	20	Pass
					NV	-20	13000	2.258905	20	Pass
					NV	-10	13000	2.258905	20	Pass
	NV	0			13000	2.258905	20	Pass		
	NV	10			13000	2.258905	20	Pass		
	NV	20			13000	2.258905	20	Pass		
	NV	30			13000	2.258905	20	Pass		
	NV	40			13000	2.258905	20	Pass		
	Ant2	5755	NV	-30	14000	2.432667	20	Pass		
			NV	-20	14000	2.432667	20	Pass		
			NV	-10	14000	2.432667	20	Pass		
			NV	0	14000	2.432667	20	Pass		
			NV	10	14000	2.432667	20	Pass		
			NV	20	14000	2.432667	20	Pass		
			NV	30	14000	2.432667	20	Pass		
NV			40	14000	2.432667	20	Pass			
Ant1	5795	NV	-30	14000	2.415876	20	Pass			
		NV	-20	14000	2.415876	20	Pass			
		NV	-10	14000	2.415876	20	Pass			
		NV	0	14000	2.415876	20	Pass			
		NV	10	14000	2.415876	20	Pass			
		NV	20	14000	2.415876	20	Pass			
		NV	30	14000	2.415876	20	Pass			
		NV	40	14000	2.415876	20	Pass			
Ant2	5795	NV	-30	14000	2.415876	20	Pass			
		NV	-20	14000	2.415876	20	Pass			
		NV	-10	14000	2.415876	20	Pass			
		NV	0	14000	2.415876	20	Pass			
		NV	10	14000	2.415876	20	Pass			
		NV	20	15000	2.588438	20	Pass			
		NV	30	15000	2.588438	20	Pass			
		NV	40	14000	2.415876	20	Pass			
			NV	50	15000	2.588438	20	Pass		

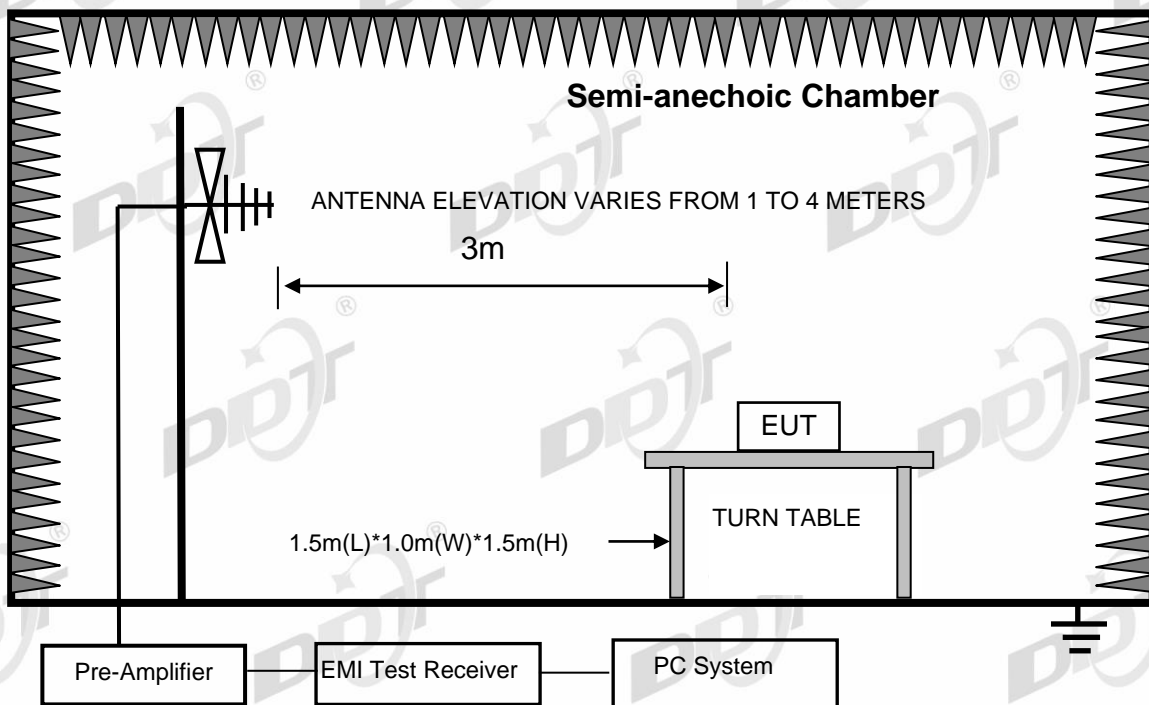
8. Emissions in Restricted Frequency Bands

8.1. Block diagram of test setup

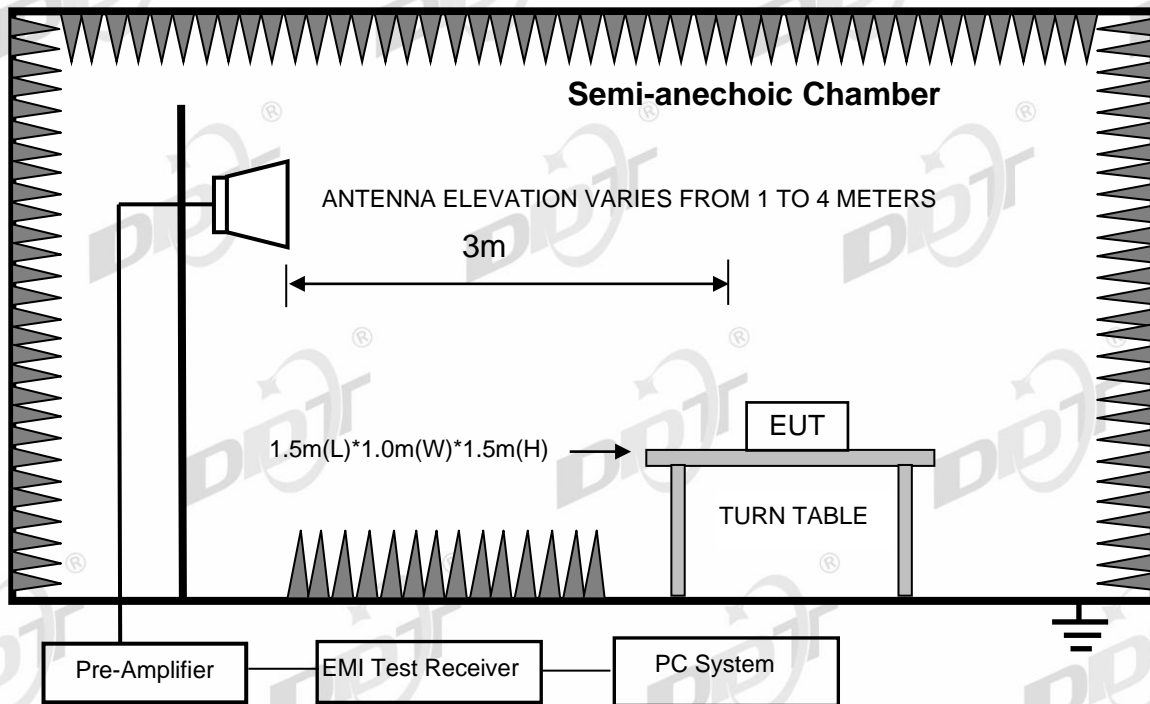
In 3 m Anechoic Chamber, test setup diagram for 9 kHz - 30 MHz:



In 3 m Anechoic Chamber, test setup diagram for 30 MHz - 1 GHz:



In 3 m Anechoic Chamber, test setup diagram for frequency above 1 GHz:



Note: For harmonic emissions test an appropriate high pass filter was inserted in the input port of AMP.

8.2. Limit

8.3.1 FCC 15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	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
4.1772&4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.2072&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			

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

²Above 38.6

8.3.2 FCC 15.209 Limit.

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V}/\text{m}$	$\text{dB}(\mu\text{V})/\text{m}$
0.009 ~ 0.490	300	2400/F(kHz)	67.6-20log(F)
0.490 ~ 1.705	30	24000/F(kHz)	87.6-20log(F)
1.705 ~ 30.0	30	30	29.54
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

Note: (1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30 MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3\text{m}}(\text{dB}\mu\text{V}/\text{m}) = \text{Limit}_{30\text{m}}(\text{dB}\mu\text{V}/\text{m}) + 40\text{Log}(30\text{m}/3\text{m})$$

8.3.3 Limit for this EUT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20 dB below the fundamental emissions or comply with 15.209 limits.

8.3. Test procedure

- (1) EUT height should be 0.8 m for below 1 GHz at a semi - anechoic chamber while EUT height should be 1.5 m for above 1 GHz at full chamber or semi - anechoic chamber ground with absorbers
- (2) Setup EUT and assistant system according clause 2.3 and 8.2
- (3) Test antenna was located 3m from the EUT on an adjustable mast, and the antenna used as below table.

Test frequency range	Test antenna used	Test distance
9 kHz - 30 MHz	Active Loop antenna	3 m
30 MHz - 1 GHz	Trilog Broadband Antenna	3 m
1 GHz - 18 GHz	Double Ridged Horn Antenna (1 GHz - 18 GHz)	3 m
18 GHz - 40 GHz	Horn Antenna (18 GHz - 40 GHz)	1 m

According ANSI C63.10:2013 clause 6.4.4.2 and 6.5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical

axis for maximum response at each azimuth position around the EUT. And the loop antenna also is positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground. for measurement above 30 MHz, the Trilog Broadband Antenna or Horn Antenna was located 3m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

(4) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9 kHz to 40 GHz:

(a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1 m to 4 m (Except loop antenna, it's fixed 1 m above ground.)

(b) Change work frequency or channel of device if practicable.

(c) Change modulation type of device if practicable.

(d) Change power supply range from 85% to 115% of the rated supply voltage

(e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Spectrum frequency from 9 kHz to 40 GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 9 kHz to 30 MHz and 18 GHz to 40 GHz, so below final test was performed with frequency range from 30 MHz to 18 GHz.

(5) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission.

Measurements in both horizontal and vertical polarities were made and the data was recorded.

In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10:2013 on Radiated Emission test.

(6) The emissions from 9 kHz to 1 GHz were measured based on CISPR QP detector except for the frequency bands 9-90 kHz, 110-490 kHz, for emissions from 9 kHz - 90 kHz, 110 kHz - 490 kHz and above 1 GHz were measured based on average detector, for emissions above 1 GHz, peak emissions also be measured and need comply with Peak limit.

(7) The emissions from 9 kHz to 1 GHz, QP or average values were measured with EMI receiver with below RBW

Frequency band	RBW
9 kHz-150 kHz	200 Hz
150 kHz-30 MHz	9 kHz
30 MHz-1 GHz	120 kHz

(8) For emissions above 1 GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1 MHz, VBW is set at 3 MHz for Peak measure, the RBW is set at 1 MHz, VBW is set at 1/T for AV value.

8.4. Test result

Pass. (See below detailed test result)

All the emissions except fundamental emission from 9kHz to 40GHz were comply with 15.209 limit.

Note1: According exploratory test, the emission levels are 20 dB below the limit detected from 9 kHz to 30 MHz and 18 GHz to 25 GHz, so the final test was performed with frequency range from 30 MHz to 18 GHz and recorded in below.

Note2: For emissions below 1. GHz, according exploratory explorer test, when change Tx mode and channel, have no distinct influence on emissions level, so for Non-simultaneous transmission operation, the final test was only performed with EUT working in ANT2, 11a, Tx CH165 mode.

Note3: For simultaneous transmission of multiple channels in the 2.4GHz BT and WLAN bands, or 2.4GHz BT and 5.8G RLAN bands, all possible configurations have been tested, the worst case is shown in the table below and recorded in the report.

Worst Case Simultaneous Transmission Configuration:

Description	Bluetooth	2.4G WLAN/5.8G RLAN
Antenna	Antenna 1	Antenna 2
Channel	39	1/165
Operation Frequency (MHz)	2441	2412/5825
Mode/Modulation	GFSK	802.11g: OFDM/802.11a: OFDM

Note4: For below test data, when the limit tabular marked “/” means this frequency point is the fundamental emission and no need comply with this limit.

Note5: There are two vendors of the WiFi/Bluetooth radio modules: variant 1 and variant 2. The WiFi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

Radiated Emission test (below 1 GHz)

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 1#

D:\2021 RE 1# Report data\Q21060707-2E\FCC
BELOW 1G.EM6

Test Date : 2021-06-30

Tested By : Ziqin

EUT : Equipo de Audio y Video para Vehiculo

Model Number : MTXMO500ASU2i

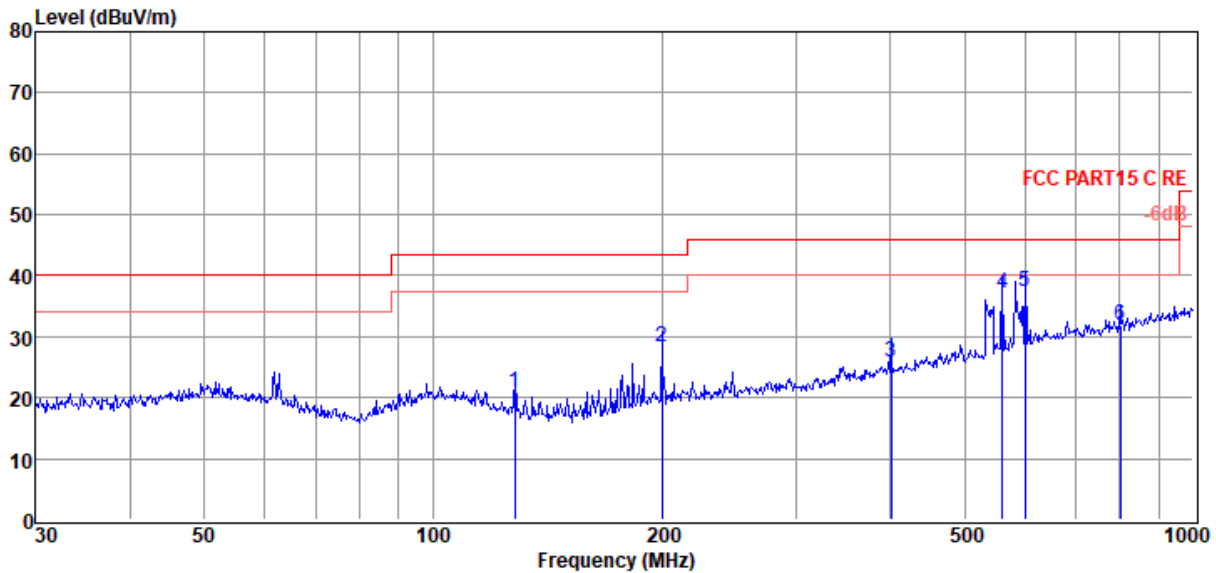
Power
Supply : DC 12V

Test Mode : TX mode

Condition : Temp:24.2°C,Humi:53.4%,Press:101.1kPa

Antenna/Distance : 2020 VULB 9163
1#/3m/VERTICAL

Memo : 11a Antenna2 5825



Item (Mark)	Freq. (MHz)	Read Level (dB μ V)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dB μ V/m)	Limit Line (dB μ V/m)	Over Limit (dB)	Detector	Polarization
1	128.11	6.95	9.90	4.03	20.88	43.50	-22.62	QP	VERTICAL
2	199.99	12.81	11.20	4.33	28.34	43.50	-15.16	QP	VERTICAL
3	400.43	5.03	15.81	5.01	25.85	46.00	-20.15	QP	VERTICAL
4	560.69	13.38	18.24	5.46	37.08	46.00	-8.92	QP	VERTICAL
5	601.43	13.14	18.81	5.56	37.51	46.00	-8.49	QP	VERTICAL
6	801.79	5.12	20.82	6.01	31.95	46.00	-14.05	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

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.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 1#

D:\2021 RE 1# Report data\Q21060707-2E\FCC BELOW 1G.EM6

Test Date : 2021-06-30

Tested By : Ziqin

EUT : Equipo de Audio y Video para Vehiculo

Model Number : MTXMO500ASU2i

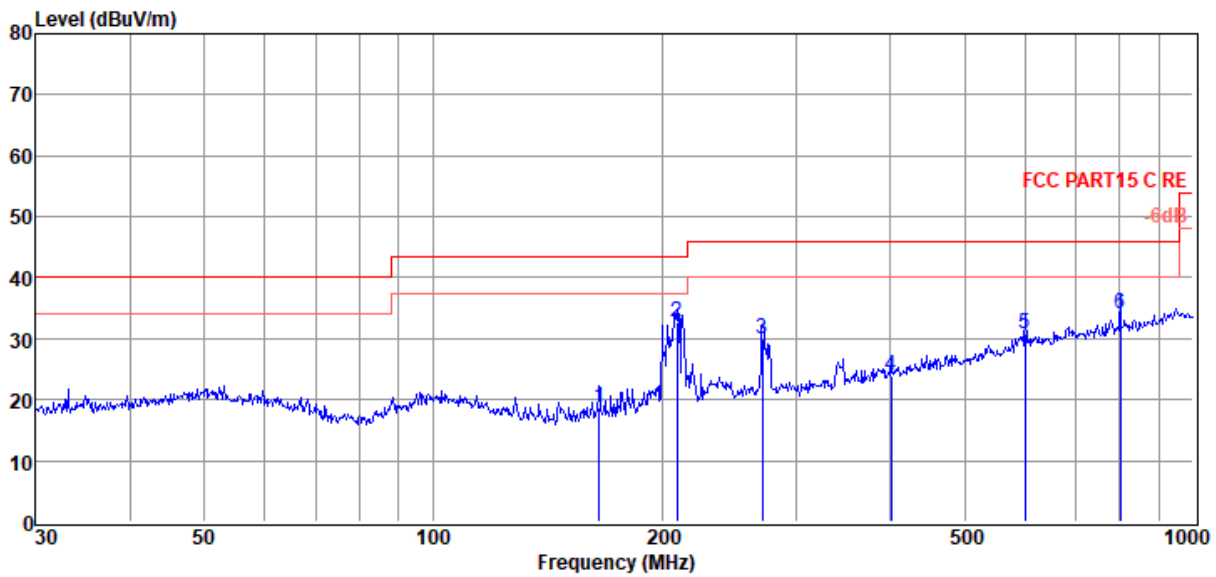
Power Supply : DC 12V

Test Mode : TX mode

Condition : Temp:24.2°C,Humi:53.4%,Press:101.1kPa

Antenna/Distance : 2020 VULB 9163
1#/3m/HORIZONTAL

Memo : 11a Antenna2 5825



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	165.49	5.03	9.52	4.19	18.74	43.50	-24.76	QP	HORIZONTAL
2	209.31	16.89	11.44	4.37	32.70	43.50	-10.80	QP	HORIZONTAL
3	271.33	12.72	12.78	4.60	30.10	46.00	-15.90	QP	HORIZONTAL
4	400.43	3.12	15.81	5.01	23.94	46.00	-22.06	QP	HORIZONTAL
5	601.43	6.37	18.81	5.56	30.74	46.00	-15.26	QP	HORIZONTAL
6	801.79	7.37	20.82	6.01	34.20	46.00	-11.80	QP	HORIZONTAL

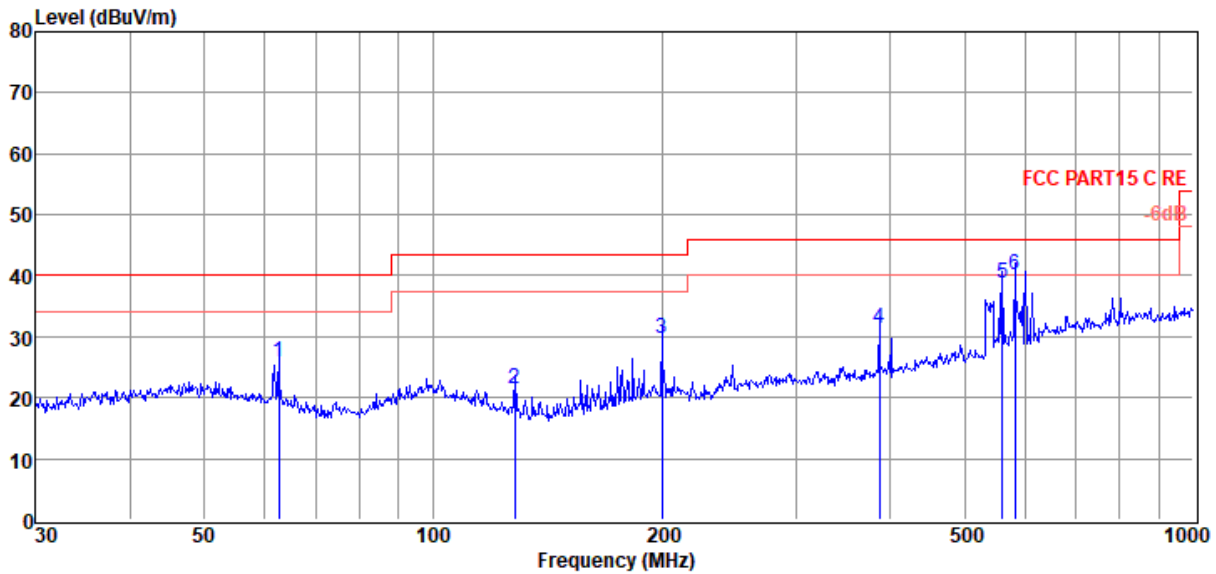
Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

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.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 1#
Test Date : 2021-06-30
EUT : Equipo de Audio y Video para Vehiculo
Power Supply : DC 12V
Condition : Temp:24.2°C,Humi:53.4%,Press:101.1kPa
Memo : simultaneous transmission 5.8G WIFI+BT
D:\2021 RE 1# Report data\Q21060707-2E\FCC BELOW 1G.EM6
Tested By : Ziqin
Model Number : MTXMO500ASU2i
Test Mode : TX mode
Antenna/Distance : 2020 VULB 9163
 1#/3m/VERTICAL



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	62.65	10.47	11.84	3.66	25.97	40.00	-14.03	QP	VERTICAL
2	128.11	7.61	9.90	4.03	21.54	43.50	-21.96	QP	VERTICAL
3	199.99	14.19	11.20	4.33	29.72	43.50	-13.78	QP	VERTICAL
4	386.63	10.92	15.50	4.97	31.39	46.00	-14.61	QP	VERTICAL
5	560.69	15.06	18.24	5.46	38.76	46.00	-7.24	QP	VERTICAL
6	582.74	15.95	18.56	5.52	40.03	46.00	-5.97	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
 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.

TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 1#

D:\2021 RE 1# Report data\Q21060707-2E\FCC BELOW 1G.EM6

Test Date : 2021-06-30

Tested By : Ziqin

EUT : Equipo de Audio y Video para Vehiculo

Model Number : MTXMO500ASU2i

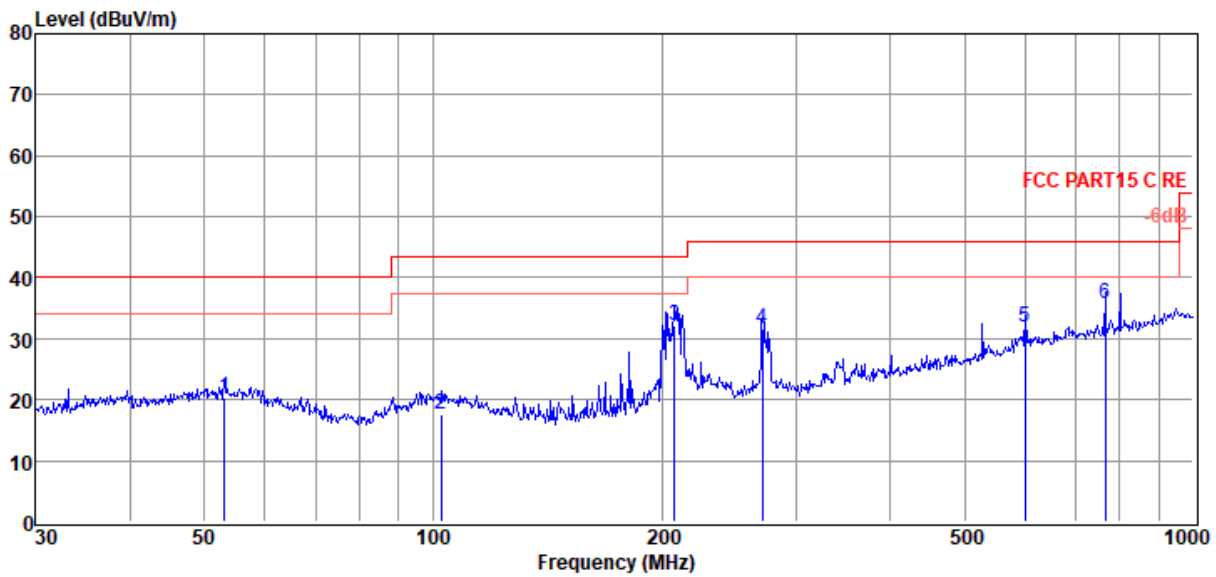
Power Supply : DC 12V

Test Mode : TX mode

Condition : Temp:24.2°C,Humi:53.4%,Press:101.1kPa

Antenna/Distance : 2020 VULB 9163
1#/3m/HORIZONTAL

Memo : simultaneous transmission 5.8G WIFI+BT



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	53.13	3.46	13.27	3.59	20.32	40.00	-19.68	QP	HORIZONTAL
2	102.36	0.71	12.93	3.89	17.53	43.50	-25.97	QP	HORIZONTAL
3	207.85	16.34	11.40	4.36	32.10	43.50	-11.40	QP	HORIZONTAL
4	271.33	14.17	12.78	4.60	31.55	46.00	-14.45	QP	HORIZONTAL
5	601.43	7.51	18.81	5.56	31.88	46.00	-14.12	QP	HORIZONTAL
6	766.06	9.25	20.44	5.94	35.63	46.00	-10.37	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

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.

Radiated Emission test (above 1 GHz)

Freq (MHz)	Read level (dBμV)	Antenna Factor (dB/m)	PRM Factor (dB)	Cable Loss (dB)	Result Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector type	Polarization
11a CH149									
9636.00	45.84	38.80	42.06	9.83	52.41	74.00	-21.59	Peak	HORIZONTAL
11591.00	45.48	39.76	42.00	11.11	54.35	74.00	-19.65	Peak	HORIZONTAL
11591.00	36.82	39.76	42.00	11.11	45.69	54.00	-8.31	Average	HORIZONTAL
13155.00	46.34	40.04	42.92	11.29	54.75	74.00	-19.25	Peak	HORIZONTAL
13155.00	37.47	40.04	42.92	11.29	45.88	54.00	-8.12	Average	HORIZONTAL
14600.00	44.04	41.12	42.01	12.25	55.40	74.00	-18.60	Peak	HORIZONTAL
14600.00	36.44	41.12	42.01	12.25	47.80	54.00	-6.20	Average	HORIZONTAL
17235.00	42.25	43.89	42.27	13.68	57.55	74.00	-16.45	Peak	HORIZONTAL
17235.00	35.40	43.89	42.27	13.68	50.70	54.00	-3.30	Average	HORIZONTAL
17711.00	43.51	46.79	42.42	13.94	61.82	74.00	-12.18	Peak	HORIZONTAL
17711.00	32.17	46.79	42.42	13.94	50.48	54.00	-3.52	Average	HORIZONTAL
8990.00	45.14	38.29	41.80	9.51	51.14	74.00	-22.86	Peak	VERTICAL
11795.00	45.92	39.68	41.70	11.09	54.99	74.00	-19.01	Peak	VERTICAL
11795.00	36.18	39.68	41.70	11.09	45.25	54.00	-8.75	Average	VERTICAL
13784.00	43.08	41.20	42.60	11.98	53.66	74.00	-20.34	Peak	VERTICAL
13784.00	36.43	41.20	42.60	11.98	47.01	54.00	-6.99	Average	VERTICAL
15671.00	42.85	39.39	42.11	12.47	52.60	74.00	-21.40	Peak	VERTICAL
17235.00	41.39	43.89	42.27	13.68	56.69	74.00	-17.31	Peak	VERTICAL
17235.00	34.43	43.89	42.27	13.68	49.73	54.00	-4.27	Average	VERTICAL
17949.00	41.53	47.79	42.49	14.51	61.34	74.00	-12.66	Peak	VERTICAL
17949.00	30.97	47.79	42.49	14.51	50.78	54.00	-3.22	Average	VERTICAL
11a CH157									
9619.00	45.42	38.80	42.05	9.81	51.98	74.00	-22.02	Peak	HORIZONTAL
11761.00	45.60	39.70	41.75	11.09	54.64	74.00	-19.36	Peak	HORIZONTAL
11761.00	35.97	39.70	41.75	11.09	45.01	54.00	-8.99	Average	HORIZONTAL
13750.00	44.51	41.15	42.62	11.93	54.97	74.00	-19.03	Peak	HORIZONTAL
13750.00	36.44	41.15	42.62	11.93	46.90	54.00	-7.10	Average	HORIZONTAL
15280.00	42.56	39.95	41.87	12.69	53.33	74.00	-20.67	Peak	HORIZONTAL
16640.00	43.45	41.38	42.24	13.38	55.97	74.00	-18.03	Peak	HORIZONTAL
16640.00	36.47	41.38	42.24	13.38	48.99	54.00	-5.01	Average	HORIZONTAL
17475.00	40.89	45.71	42.34	13.45	57.71	74.00	-16.29	Peak	HORIZONTAL
17475.00	32.96	45.71	42.34	13.45	49.78	54.00	-4.22	Average	HORIZONTAL
9670.00	48.68	38.80	42.07	9.87	55.28	74.00	-18.72	Peak	VERTICAL
9670.00	43.21	38.80	42.07	9.87	49.81	54.00	-4.19	Average	VERTICAL
11570.00	45.38	39.77	42.03	11.11	54.23	74.00	-19.77	Peak	VERTICAL
11570.00	37.67	39.77	42.03	11.11	46.52	54.00	-7.48	Average	VERTICAL
13359.00	44.93	40.49	42.82	11.46	54.06	74.00	-19.94	Peak	VERTICAL
13359.00	36.77	40.49	42.82	11.46	45.90	54.00	-8.10	Average	VERTICAL
14855.00	43.56	40.66	41.81	12.79	55.20	74.00	-18.80	Peak	VERTICAL
14855.00	34.67	40.66	41.81	12.79	46.31	54.00	-7.69	Average	VERTICAL
16504.00	43.46	41.11	42.25	13.18	55.50	74.00	-18.50	Peak	VERTICAL
16504.00	36.71	41.11	42.25	13.18	48.75	54.00	-5.25	Average	VERTICAL
17475.00	41.02	45.71	42.34	13.45	57.84	74.00	-16.16	Peak	VERTICAL

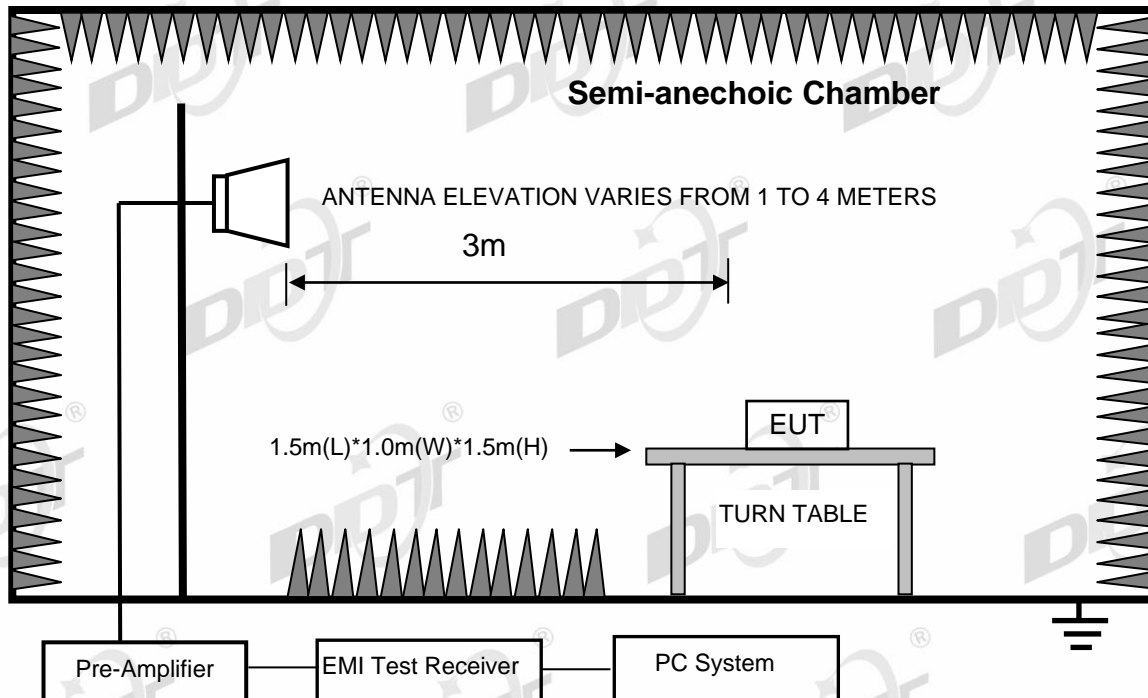
17475.00	34.15	45.71	42.34	13.45	50.97	54.00	-3.03	Average	VERTICAL
11a CH165									
9636.00	45.40	38.80	42.06	9.83	51.97	74.00	-22.03	Peak	HORIZONTAL
11540.00	46.55	39.78	42.07	11.12	55.38	74.00	-18.62	Peak	HORIZONTAL
11540.00	37.07	39.78	42.07	11.12	45.90	54.00	-8.10	Average	HORIZONTAL
13614.00	44.94	40.96	42.69	11.74	54.95	74.00	-19.05	Peak	HORIZONTAL
13614.00	35.87	40.96	42.69	11.74	45.88	54.00	-8.12	Average	HORIZONTAL
16011.00	44.94	39.05	42.30	12.66	54.35	74.00	-19.65	Peak	HORIZONTAL
16011.00	36.11	39.05	42.30	12.66	45.52	54.00	-8.48	Average	HORIZONTAL
17475.00	41.58	45.71	42.34	13.45	58.40	74.00	-15.60	Peak	HORIZONTAL
17475.00	33.41	45.71	42.34	13.45	50.23	54.00	-3.77	Average	HORIZONTAL
17881.00	41.92	47.50	42.47	14.35	61.30	74.00	-12.70	Peak	HORIZONTAL
17881.00	30.67	47.50	42.47	14.35	50.05	54.00	-3.95	Average	HORIZONTAL
9619.00	45.79	38.80	42.05	9.81	52.35	74.00	-21.65	Peak	VERTICAL
11795.00	45.64	39.68	41.70	11.09	54.71	74.00	-19.29	Peak	VERTICAL
11795.00	36.58	39.68	41.70	11.09	45.65	54.00	-8.35	Average	VERTICAL
13665.00	45.26	41.03	42.66	11.81	55.44	74.00	-18.56	Peak	VERTICAL
13665.00	35.82	41.03	42.66	11.81	46.00	54.00	-8.00	Average	VERTICAL
14906.00	44.02	40.57	41.77	12.90	55.72	74.00	-18.28	Peak	VERTICAL
14906.00	36.21	40.57	41.77	12.90	47.91	54.00	-6.09	Average	VERTICAL
16470.00	43.60	40.97	42.25	13.14	55.46	74.00	-18.54	Peak	VERTICAL
16470.00	36.88	40.97	42.25	13.14	48.74	54.00	-5.26	Average	VERTICAL
17475.00	42.50	45.71	42.34	13.45	59.32	74.00	-14.68	Peak	VERTICAL
17475.00	33.95	45.71	42.34	13.45	50.77	54.00	-3.23	Average	VERTICAL
simultaneous transmission Tx mode BT+5.8G RLAN									
7885.00	45.93	37.72	42.38	8.68	49.95	74.00	-24.05	Peak	HORIZONTAL
10129.00	46.02	39.01	42.29	10.30	53.04	74.00	-20.96	Peak	HORIZONTAL
12135.00	45.86	39.41	41.62	11.35	55.00	74.00	-19.00	Peak	HORIZONTAL
12135.00	36.44	39.41	41.62	11.35	45.58	54.00	-8.42	Average	HORIZONTAL
13886.00	44.56	41.34	42.56	12.13	55.47	74.00	-18.53	Peak	HORIZONTAL
13886.00	36.74	41.34	42.56	12.13	47.65	54.00	-6.35	Average	HORIZONTAL
16521.00	43.70	41.14	42.25	13.20	55.79	74.00	-18.21	Peak	HORIZONTAL
16521.00	36.69	41.14	42.25	13.20	48.78	54.00	-5.22	Average	HORIZONTAL
17949.00	41.44	47.79	42.49	14.51	61.25	74.00	-12.75	Peak	HORIZONTAL
17949.00	30.99	47.79	42.49	14.51	50.80	54.00	-3.20	Average	HORIZONTAL
8021.00	46.68	37.90	42.29	8.64	50.93	74.00	-23.07	Peak	VERTICAL
9636.00	46.38	38.80	42.06	9.83	52.95	74.00	-21.05	Peak	VERTICAL
11744.00	46.66	39.70	41.77	11.10	55.69	74.00	-18.31	Peak	VERTICAL
11744.00	36.88	39.70	41.77	11.10	45.91	54.00	-8.09	Average	VERTICAL
14039.00	44.28	41.48	42.47	12.27	55.56	74.00	-18.44	Peak	VERTICAL
14039.00	36.59	41.48	42.47	12.27	47.87	54.00	-6.13	Average	VERTICAL
15705.00	44.36	39.35	42.13	12.49	54.07	74.00	-19.93	Peak	VERTICAL
15705.00	36.89	39.35	42.13	12.49	46.60	54.00	-7.40	Average	VERTICAL
17949.00	41.34	47.79	42.49	14.51	61.15	74.00	-12.85	Peak	VERTICAL
17949.00	31.12	47.79	42.49	14.51	50.93	54.00	-3.07	Average	VERTICAL
Conclusion: Pass									
Note: $-27 \text{ dBm/MHz Limit} = 95.2 + \text{EIRP}[\text{dBm}] = 95.2 - 27 = 68.2 \text{ dB}\mu\text{V/m}$									
For transmitters operating in the 5150MHz-5250MHz, 5250MHz-5350MHz, 5470MHz-5725MHz,									

5725MHz-5850MHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

- Note: 1. 30MHz~40GHz: (For Non-simultaneous transmission, 11a, 11ac20, 11ac40 mode all have been tested, only 11A mode is the worst case and reported. For simultaneous transmission the worst case configuration is Bluetooth GFSK and 802.11a OFDM.)
2. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

9. Band Edge Compliance

9.1. Block diagram of test setup



9.2. Limit

For transmitters operating in the 5.15-5.25 GHz and 5.725-5.85 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

$$-27 \text{ dBm/MHz Limit} = 95.2 + \text{EIRP}[\text{dBm}] = 95.2 - 27 = 68.2 \text{ dB}\mu\text{V/m}$$

9.3. Test procedure

Same with clause 8.3 except change investigated frequency range from 5.15-5.25 GHz, 5250-5350 GHz, 5470-5725 GHz, 5.725-5.85 GHz.

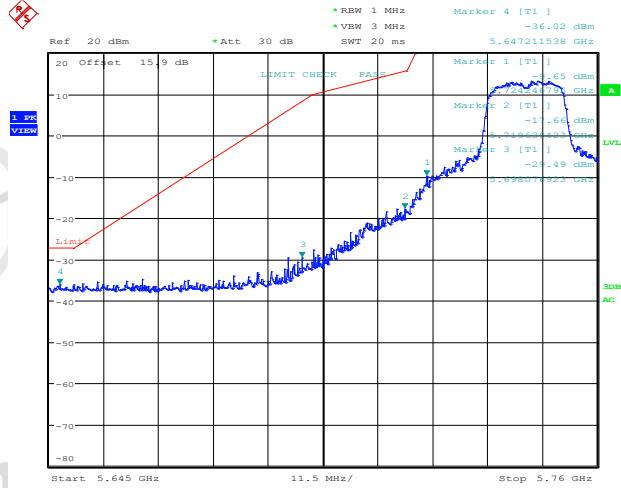
Remark: All restriction band have been tested, and only the worst case is shown in report.

9.4. Test result

Pass. (See below detailed test result)

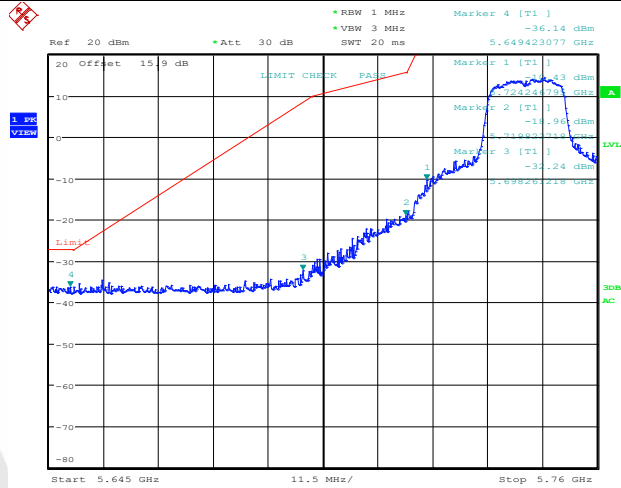
Note: As specified in 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in 15.407(b)(4)). However, an out-of-band emission that complies with both the average and peak limits of 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz peak emission limit

11A_Ant1_Low_5745



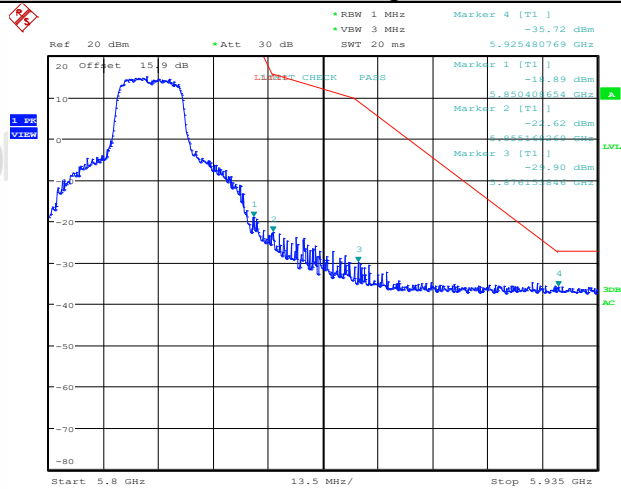
Date: 23.JUL.2021 16:42:39

11A_Ant2_Low_5745

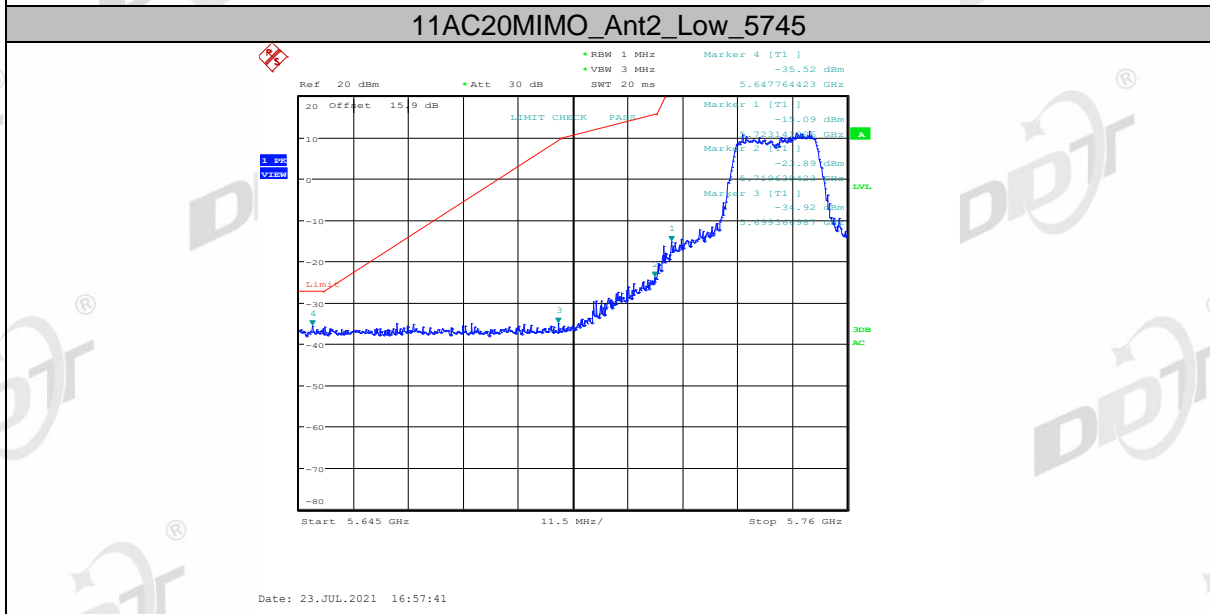
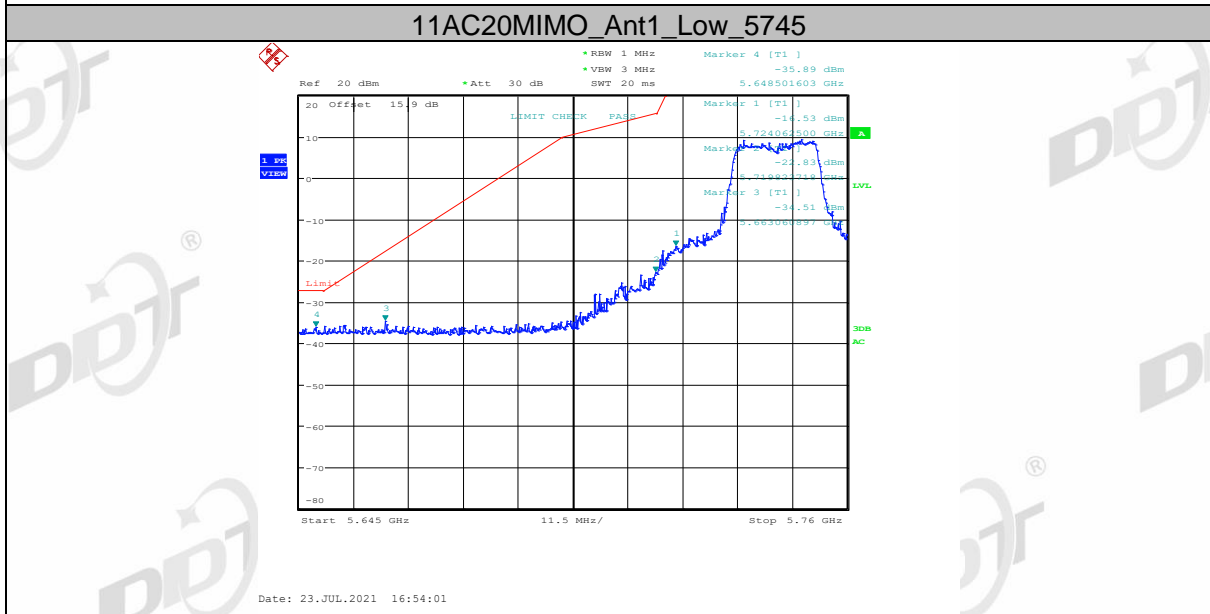
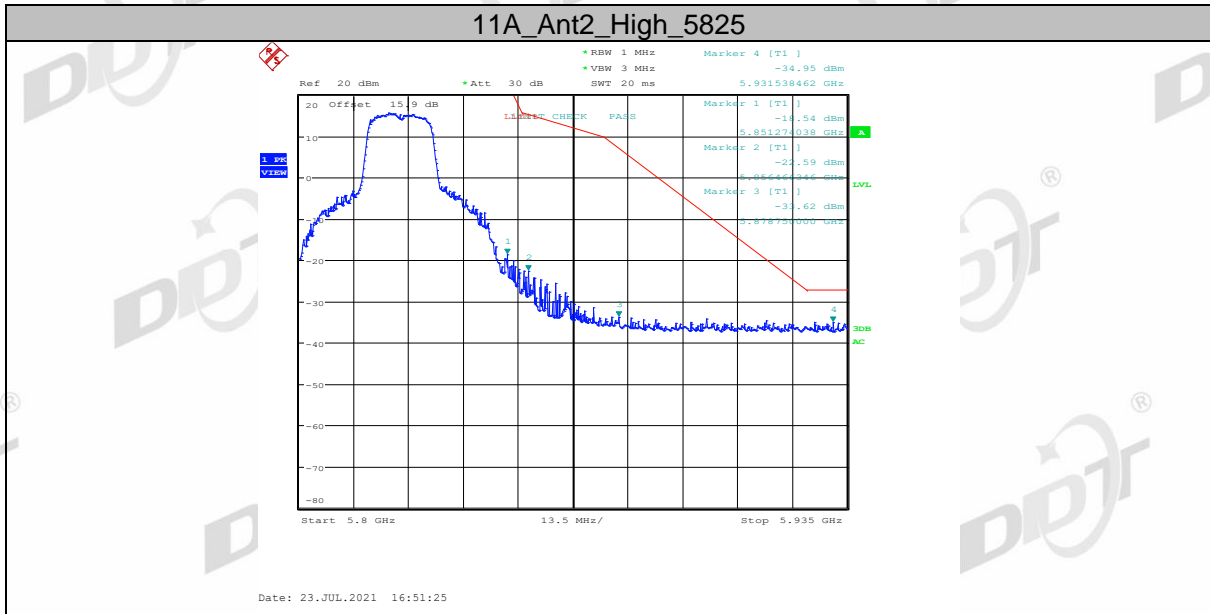


Date: 23.JUL.2021 16:56:56

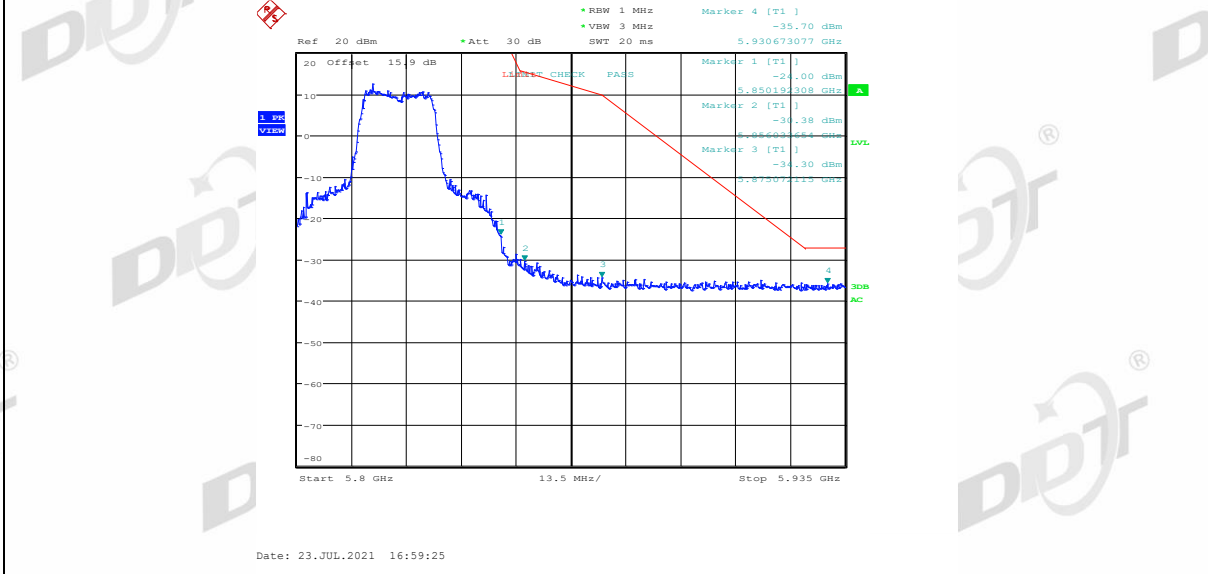
11A_Ant1_High_5825



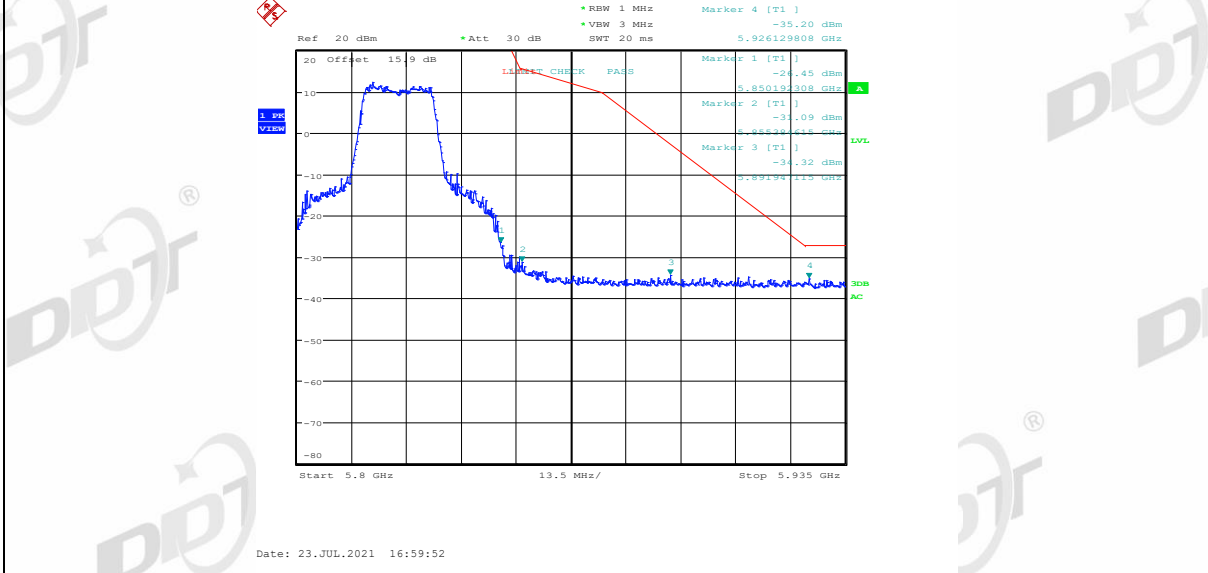
Date: 23.JUL.2021 16:43:32



11AC20MIMO_Ant1_High_5825

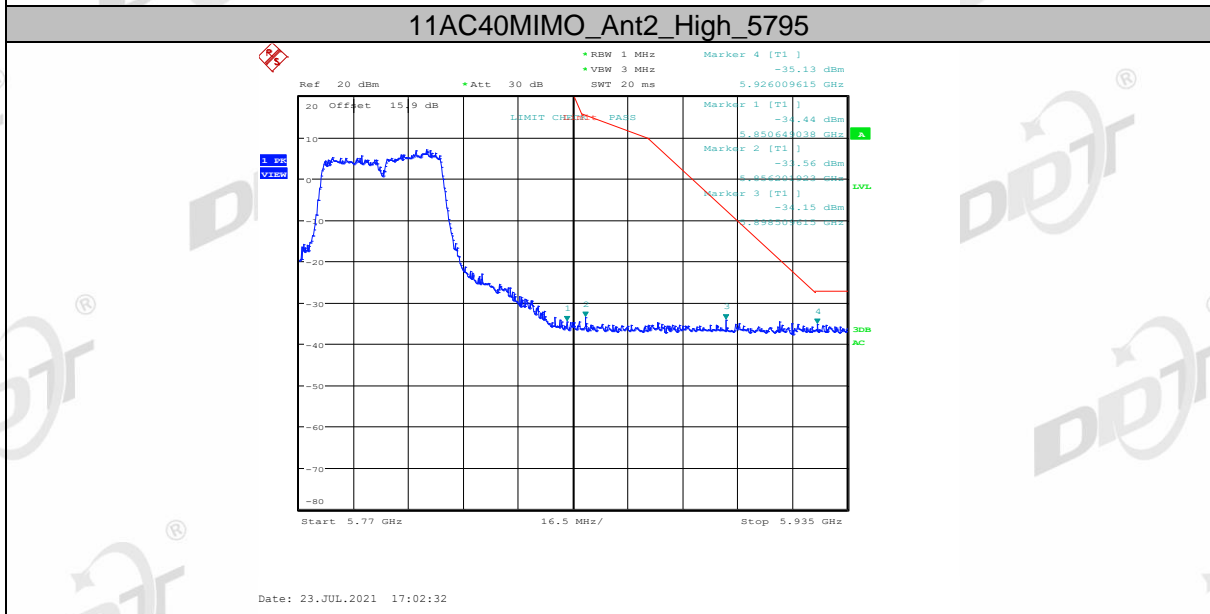
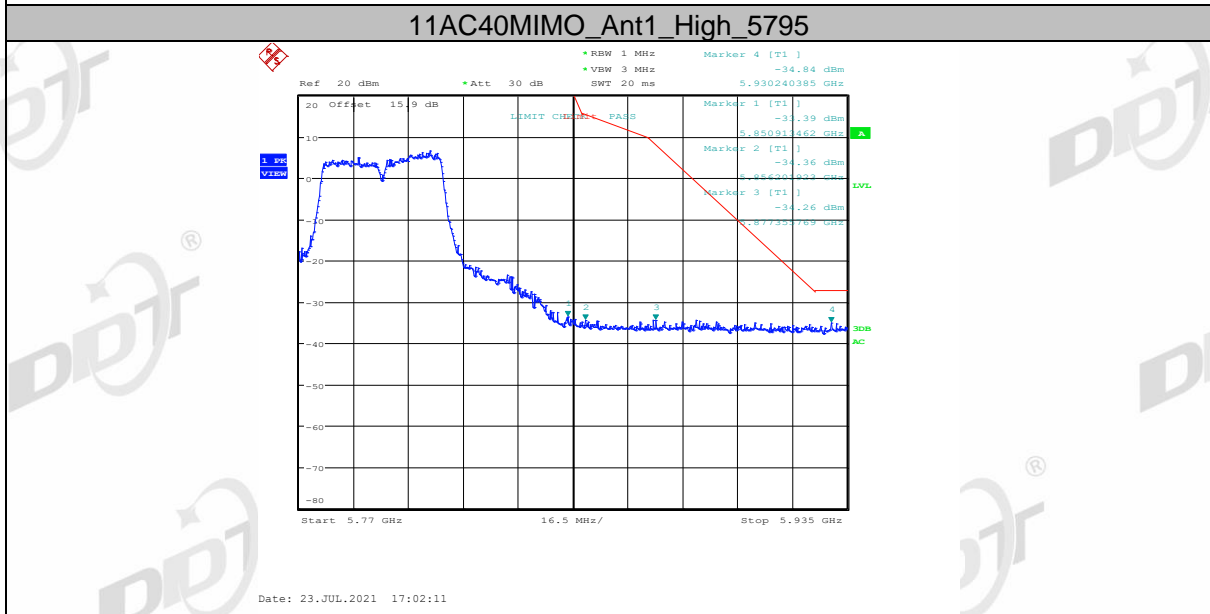
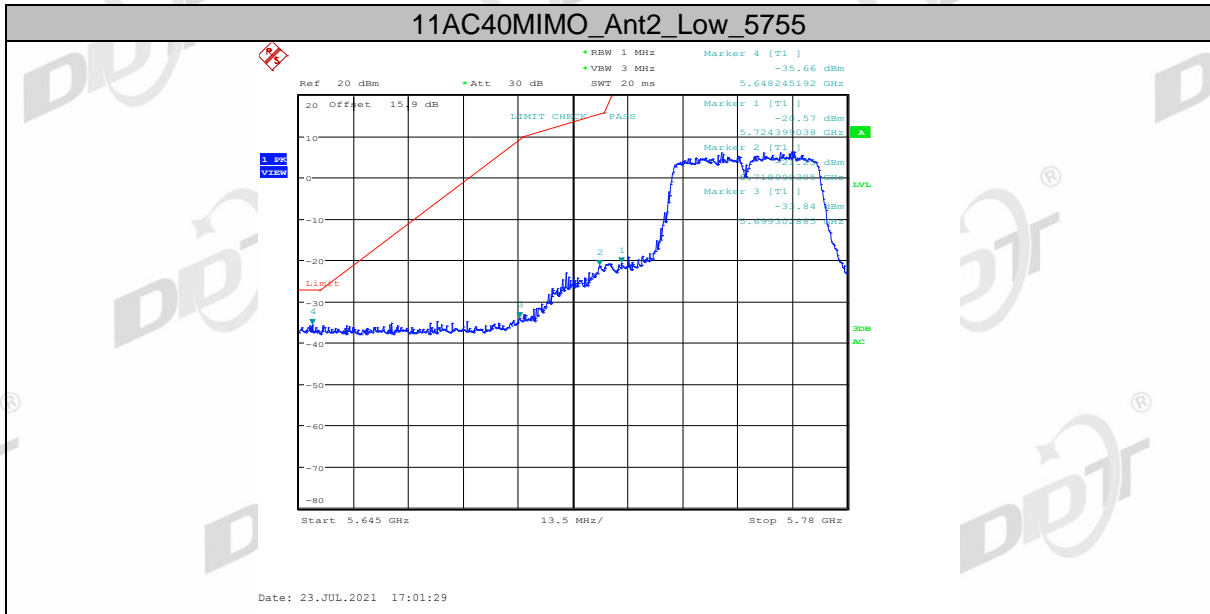


11AC20MIMO_Ant2_High_5825



11AC40MIMO_Ant1_Low_5755





10. Antenna Requirements

10.1. Limit

For intentional device, according to FCC 47 CFR Section 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

10.2. Result

The device support 2T2R MIMO, there is no other than that furnished by the responsible party shall be used with the device, maximum antenna gain is 3.628 dBi for antenna 1, 3.628 dBi for antenna 2