■**Report No.:** DDT-R21091301-1E03

■**Issued Date:** Oct. 20, 2021

FCC AND ISED CERTIFICATION TEST REPORT

FOR

Applicant	**:**	Beijing Orion Star Technology Co., Ltd.
Address	**:**	Room A-2570, 2nd Floor, No. 30, Shixing Street, Shijingshan District, Beijing China
Equipment under Test	**:**	Al Delivery Robot
Model No.	**:**	OS-R-DR01
Trade Mark	**:**	ORIONSTAR
FCC ID	**:**	2A3BD-OSRDR01
IC	**:**	27780-OSRDR01
Manufacturer	**:**	Beijing Orion Star Technology Co., Ltd.
Address	**:**	Room A-2570, 2nd Floor, No. 30, Shixing Street, Shijingshan District, Beijing China

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

Add: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808

Tel: +86-0769-38826678, **E-mail:** ddt@dgddt.com, http://www.dgddt.com

REPORT

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Test Report Declare

Applicant	:	Beijing Orion Star Technology Co., Ltd.
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Equipment under Test	:	Al Delivery Robot
Model No.	:	OS-R-DR01
Trade Mark	:	ORIONSTAR
Manufacturer	:	Beijing Orion Star Technology Co., Ltd.
Address	:	Room A-2570, 2nd Floor, No. 30, Shixing Street, Shijingshan District, Beijing China

Test Standard Used: FCC Rules and Regulations Part 15 Subpart C, RSS-247 Issue 2 February 2017.

Test procedure used: ANSI C63.10:2013, RSS-Gen Issue 5, Apr. 2018, 558074 D01 15.247 Meas Guidance v05r02.

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&ISED standards.

Report No:	DDT-R21091301-1E03		
Date of Receipt:	Sep. 13, 2021	**Date of Test:**	Sep. 13, 2021 ~ Oct. 19, 2021

Prepared By: ***Approved By:***

Ben Jin

Ben Jin/Engineer ***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	Oct. 20, 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**
6Db Bandwidth and 99% Bandwidth	FCC 15.247 (a) (2) RSS-247 Clause 5.2 (a)	PASS
Conducted Output Power	FCC 15.247 (b) (3) RSS-247 Clause 5.4 €	PASS
Power Spectral Density	FCC 15.247 € RSS-247 Clause 5.2 (b)	PASS
Band-edge and Spurious Emissions (Conducted)	FCC 15.247 (d) RSS-247 Clause 5.5	PASS
Radiated Spurious Emissions	FCC 15.247 (d) FCC 15.209 FCC 15.205 RSS-247 Clause 5.5 RSS-GEN Clause 8.9	PASS
Radiated Band Edge Compliance	FCC 15.247 (d) FCC 15.209 FCC 15.205 RSS-247 Clause 5.5 RSS-GEN Clause 8.9	PASS
Power Line Conducted Emission	FCC 15.207 RSS-GEN Clause 8.8	PASS
Antenna requirement	FCC 15.203 RSS-GEN Clause 8.3	PASS

2. General test information

2.1. Description of EUT

EUT* Name	:	AI Delivery Robot
Model Number	:	OS-R-DR01
EUT function description	:	Please reference user manual of this device
Power supply	:	DC 32V 3.93A from external AC/DC Adapter DC 29.4V from Li-ion battery
Radio Technology	:	IEEE 802.11b/g/n
FCC Operation frequency	:	IEEE 802.11b: 2412MHz-2462MHz IEEE 802.11g: 2412MHz-2462MHz IEEE 802.11n HT20: 2412MHz-2462MHz IEEE 802.11n HT40: 2422MHz-2452MHz
Modulation	:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20, HT40: OFDM (64QAM, 16QAM, QPSK, BPSK)
Transmitter rate	:	IEEE 802.11b: 1, 2, 5.5, 11 Mbps IEEE 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps IEEE 802.11n HT20: 6.5, 13, 19.5, 26, 39, 52, 58.5, 65 Mbps IEEE 802.11n HT40: 13.5, 27, 40.5, 54, 81, 108, 121.5, 135 Mbps
Antenna Gain	:	Maximum PK gain: 2 dBi
Sample Type	:	Series production
Serial number	:	N/A

Note: EUT is the ab. of equipment under test.

Channel information					
CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)
1	2412	5	2432	9	2452
2	2417	6	2437	10	2457
3	2422	7	2442	11	2462
4	2427	8	2447	/	/

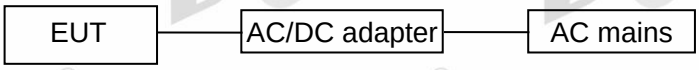
2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number	Serial No.	Other
AC/DC Adapter	GUAN YU DA	GM130-3200 393-1F	N/A	Input: AC 100-240V, 50/60Hz, 2.5A; Output: DC 32V 3.93A

2.3. Assistant equipment used for test

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

2.4. Block diagram of EUT configuration for test



Test software: ESP.exe
The test software was used to control EUT work in Continuous Tx mode, and select test channel, wireless mode as below table.

Tested mode, channel, and data rate information				
Mode	Setting Tx Power	data rate (Mbps) (see Note)	Channel	Frequency (MHz)
IEEE 802.11b	/	11	LCH: CH1	2412
	/	11	MCH: CH6	2437
	/	11	HCH: CH11	2462
IEEE 802.11g	/	6	LCH: CH1	2412
	/	6	MCH: CH6	2437
	/	6	HCH: CH11	2462
IEEE 802.11n HT20	/	MCS 0	LCH: CH1	2412
	/	MCS 0	MCH: CH6	2437
	/	MCS 0	HCH: CH11	2462
IEEE 802.11n HT40	/	MCS 0	LCH: CH3	2422
	/	MCS 0	MCH: CH6	2437
	/	MCS 0	HCH: CH9	2452
Note: According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test.				

2.5. Deviations of test standard

No Deviation

2.6. Test environment conditions

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

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

2.7. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd.

Add.: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808.

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

2.8. 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 < 3.6 GHz);
	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.	

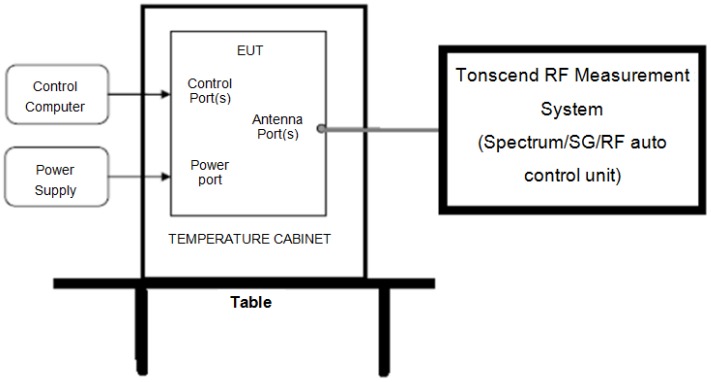
3. Equipment used during test

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. 02, 2021	1 Year
Wideband Radio Communication tester	R&S	CMW500	120259	Sep. 02, 2021	1 Year
Vector Signal Generator	Agilent	E8267D	US49060192	Sep. 18, 2021	1 Year
Vector Signal Generator	Agilent	N5182A	MY48180737	Jun. 01, 2021	1 Year
RF Control Unit	Tonsend	JS0806-2	158060010	Jun. 01, 2021	1 Year
Temp&Humi Programmable	ZHIXIANG	ZXGDJS-150L	ZX170110-A	Jun. 01, 2021	1 Year
Test Software	JS Tonscend	JS1120-3	Ver.2.6.77.0518	N/A	N/A
☒RF Connected Test (Tonscend RF Measurement System 2#)					
Signal analyzer	R&S	FSQ26	101272	Jun. 01, 2021	1 Year
Wideband Radio Communication tester	R&S	CMW500	117491	Jun. 01, 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
Temp&Humi Programmable	ZHIXIANG	ZXGDJS-150L	ZX170110-A	Jun. 01, 2021	1 Year
Test Software	JS Tonscend	JS1120-3	Ver.2.6.77.0518	N/A	N/A
☒Radiation 3#chamber					
EMI Test Receiver	R&S	ESU	100472	Jun. 01, 2021	1 Year
Spectrum analyzer	Agilent	E4447A	MY50180031	Jun. 01, 2021	1 Year
Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	Nov. 18, 2020	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB 9163	01429	Aug. 07, 2021	1 Year
Double Ridged Horn Antenna	Schwarzbeck	BBHA9120	02108	Jul. 17, 2021	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	May 08, 2021	1 Year
Pre-amplifier	COM-POWER	PAM-118A	18040084	Sep. 02, 2021	1 Year
Pre-amplifier	COM-POWER	PAM-840A	461369	Mar. 15, 2021	1 Year
Test software	Audix	E3	V 6.1.1.1	N/A	N/A
☐Power Line Conducted Emissions Test 1#					
Test Receiver	R&S	ESCI	100551	Sep. 02, 2021	1 Year
LISN 1	R&S	ENV216	101109	Sep. 02, 2021	1 Year
LISN 2	R&S	ESH2-Z5	100309	Sep. 02, 2021	1 Year
Pulse Limiter	R&S	ESH3-Z2	101242	Sep. 02, 2021	1 Year
CE Cable 1	HUBSER	N/A	W10.01	Sep. 02, 2021	1 Year
LISN 3	SCHWARZBECK	NSLK 8163	00017	Sep. 02, 2021	1 Year

Test software	Audix	E3	V 6.11111b	N/A	N/A
☒Power Line Conducted Emissions Test 2#					
Test Receiver	R&S	ESCI	101028	Sep. 02, 2021	1 Year
LISN 1	R&S	ENV216	101170	Sep. 02, 2021	1 Year
Pulse Limiter	R&S	KH43101	431011801568-12#	Jun. 01, 2021	1 Year
CE Cable 2	HUBSER	RG214-5	N/A	Jun. 01, 2021	1 Year
Test software	Audix	E3	V 6.11111b	N/A	N/A

4. 6dB Bandwidth and 99% Bandwidth

4.1. Block diagram of test setup



4.2. Limits

For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz

4.3. Test procedure

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

(2) 99% Bandwidth set the spectrum analyzer as follows:

RBW:	300 kHz
VBW:	1 MHz
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

(3) 6dB Bandwidth set the spectrum analyzer as follows:

RBW:	100 kHz
VBW:	300 kHz
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

(4) 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

6dB Bandwidth

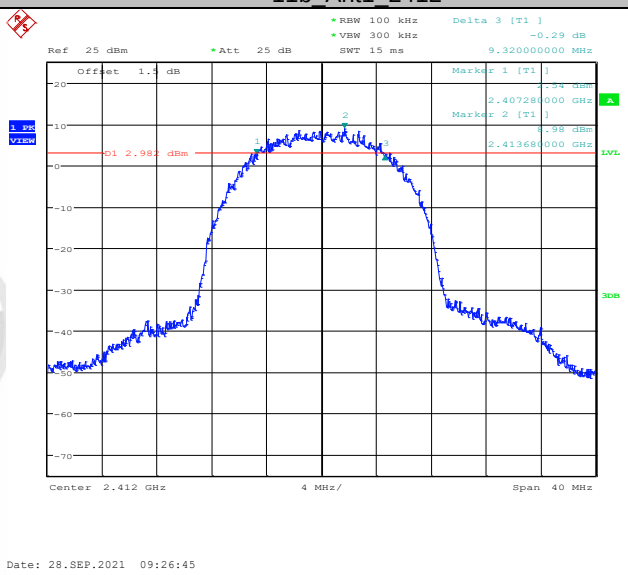
Test Mode	Channel	Ant	6dB Bandwidth (MHz)	Limit (MHz)	Verdict
11B	2412	Ant1	9.320	0.5	Pass
11B	2437	Ant1	9.320	0.5	Pass
11B	2462	Ant1	10.160	0.5	Pass
11G	2412	Ant1	16.480	0.5	Pass
11G	2437	Ant1	16.480	0.5	Pass
11G	2462	Ant1	16.480	0.5	Pass
11N20	2412	Ant1	17.080	0.5	Pass
11N20	2437	Ant1	17.120	0.5	Pass
11N20	2462	Ant1	17.160	0.5	Pass
11N40	2422	Ant1	33.120	0.5	Pass
11N40	2437	Ant1	33.440	0.5	Pass
11N40	2452	Ant1	33.360	0.5	Pass

99% Bandwidth

Test Mode	Channel	Ant	99% OBW (MHz)	Limit (MHz)	Verdict
11B	2412	Ant1	13.12	---	Pass
11B	2437	Ant1	13.12	---	Pass
11B	2462	Ant1	13.08	---	Pass
11G	2412	Ant1	16.56	---	Pass
11G	2437	Ant1	16.56	---	Pass
11G	2462	Ant1	16.56	---	Pass
11N20	2412	Ant1	17.36	---	Pass
11N20	2437	Ant1	17.36	---	Pass
11N20	2462	Ant1	17.32	---	Pass
11N40	2422	Ant1	34.48	---	Pass
11N40	2437	Ant1	34.40	---	Pass
11N40	2452	Ant1	34.48	---	Pass

4.5. Original test data

6dB Bandwidth

11b_Ant1_2412

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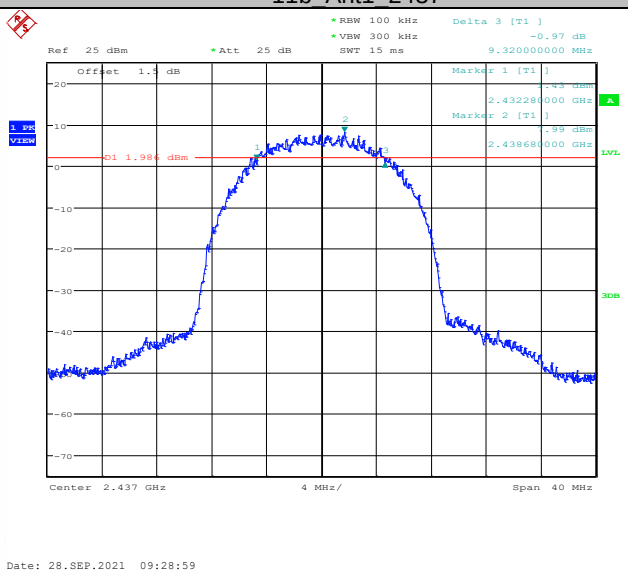
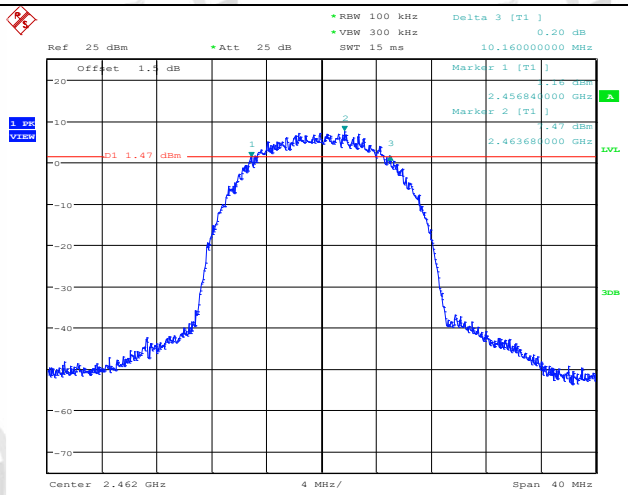

11b_Ant1_2462



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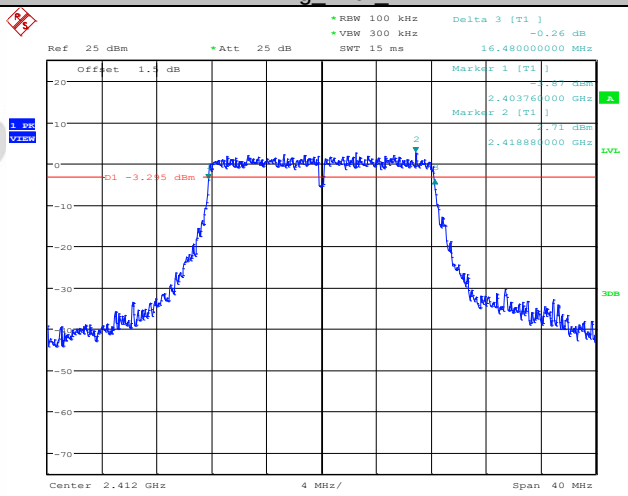

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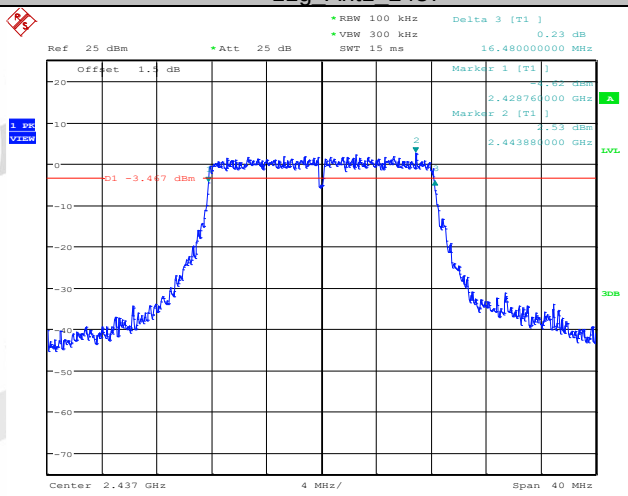

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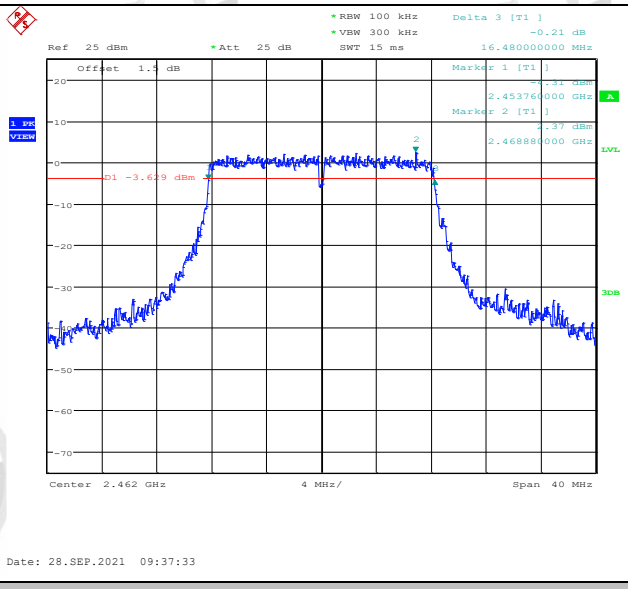

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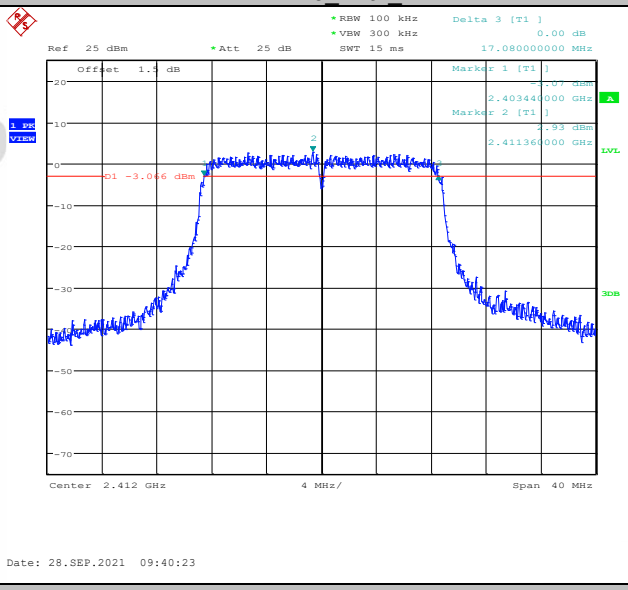

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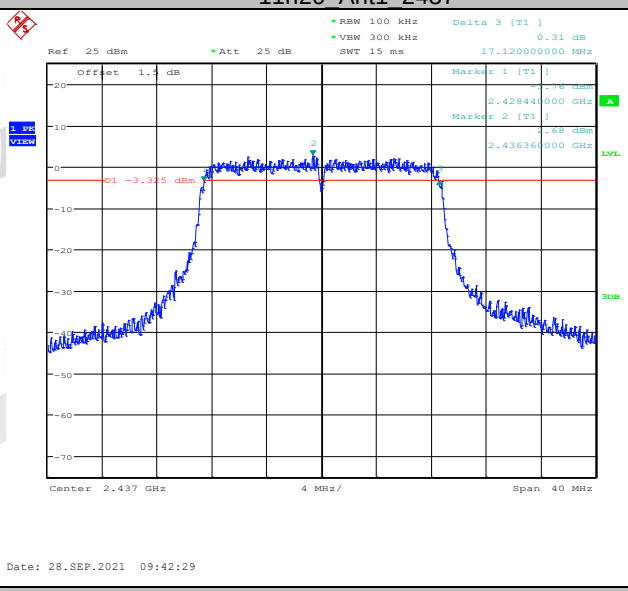

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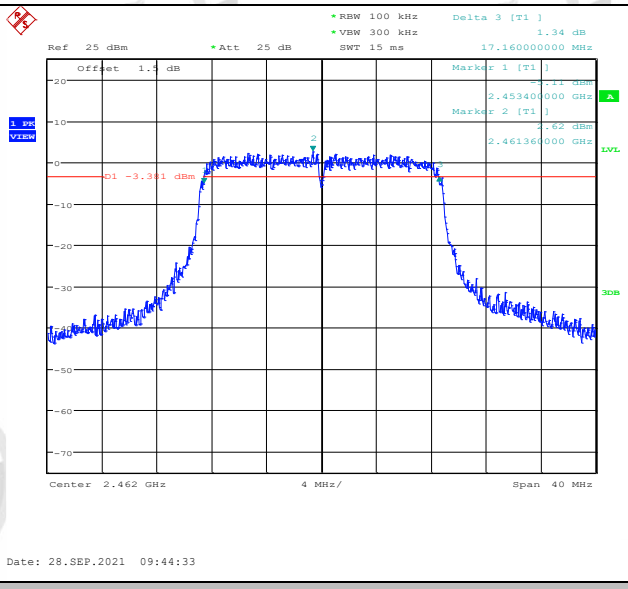

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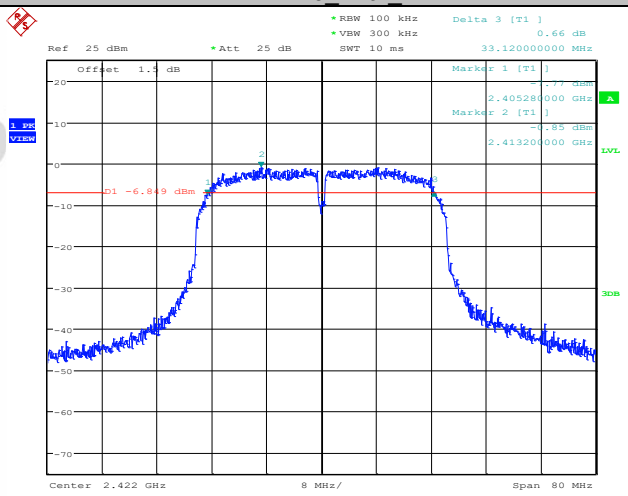

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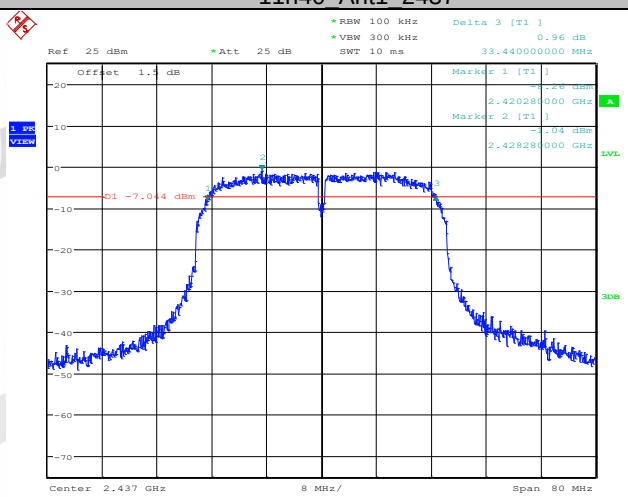

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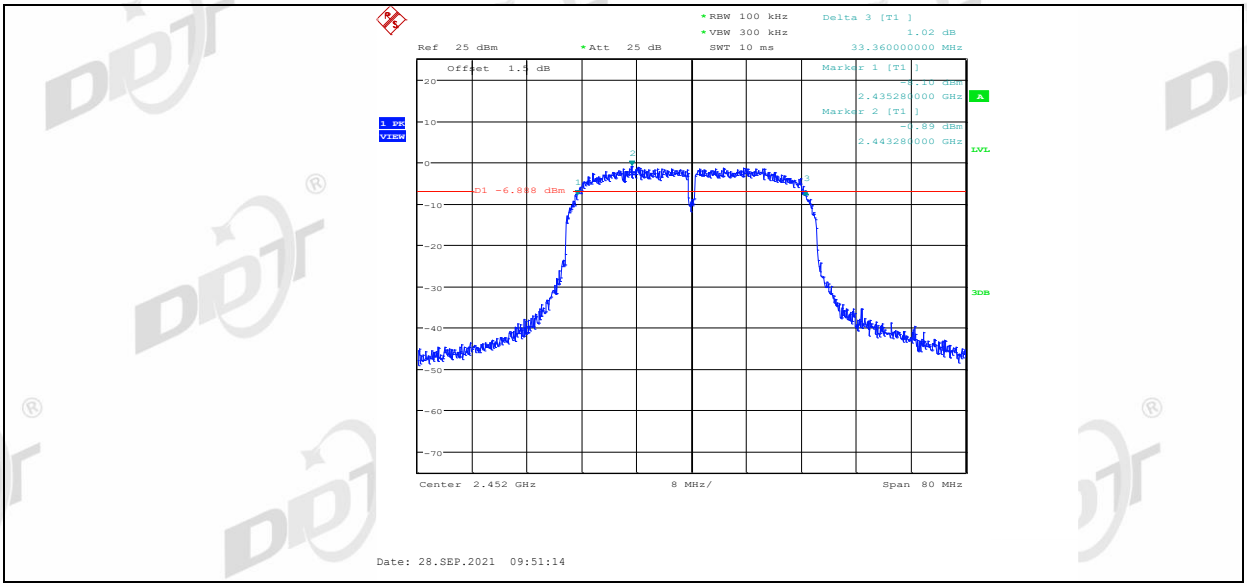
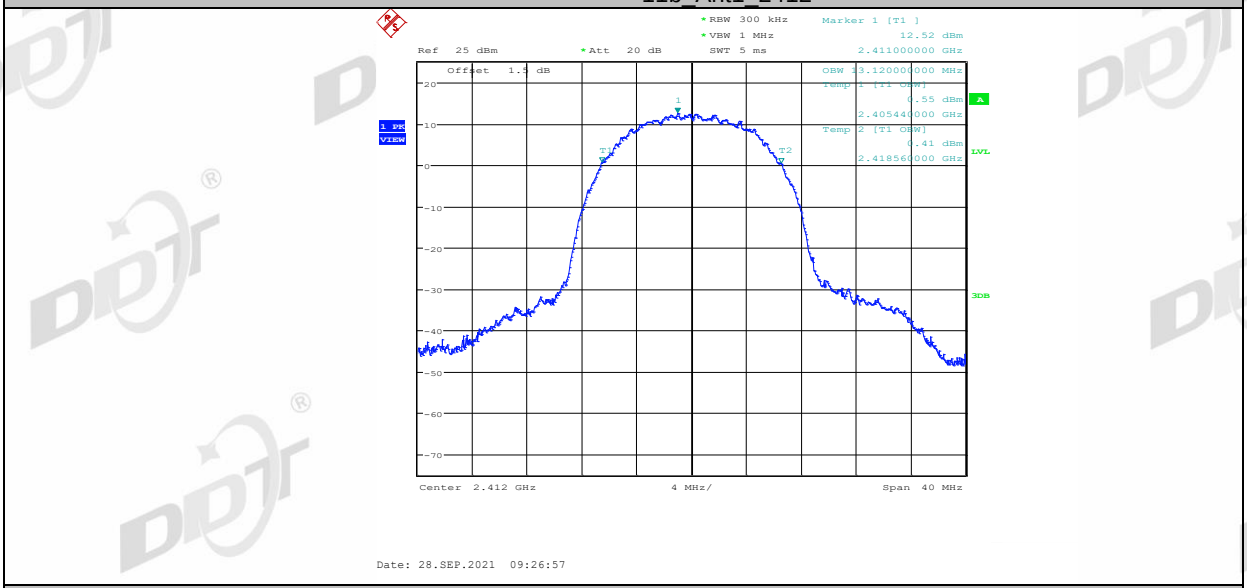
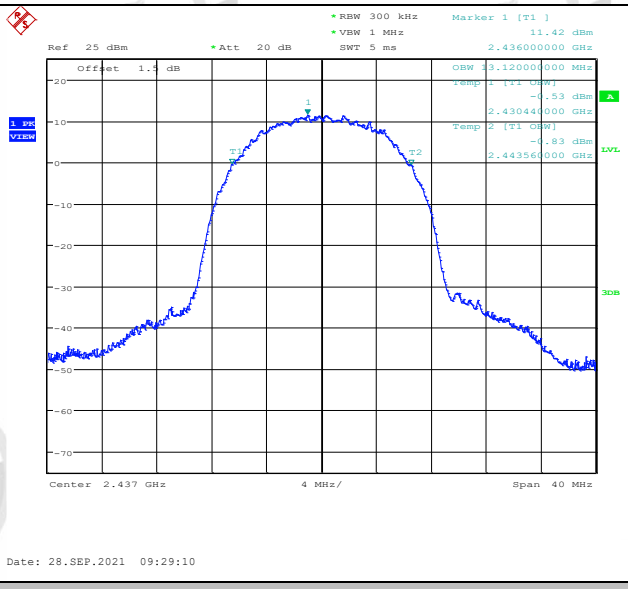


99% Bandwidth

11b_Ant1_2412



11b_Ant1_2437



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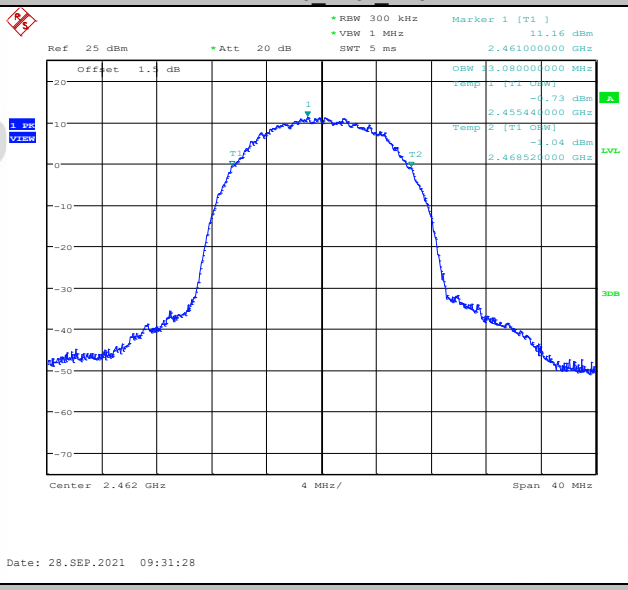
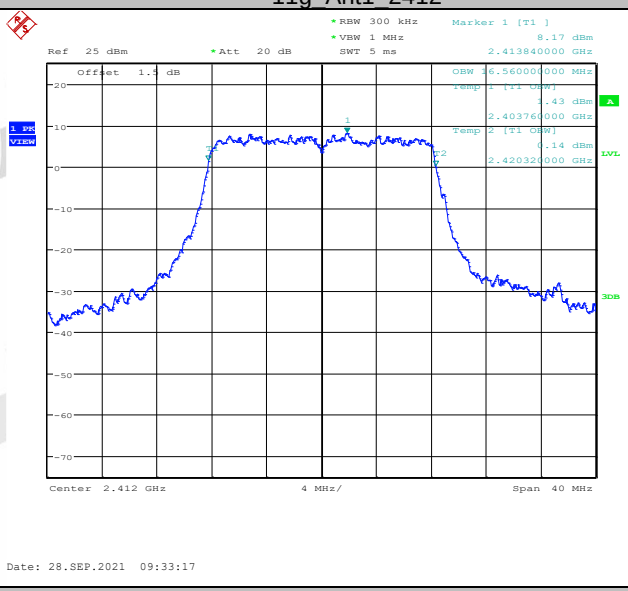


11g_Ant1_2412



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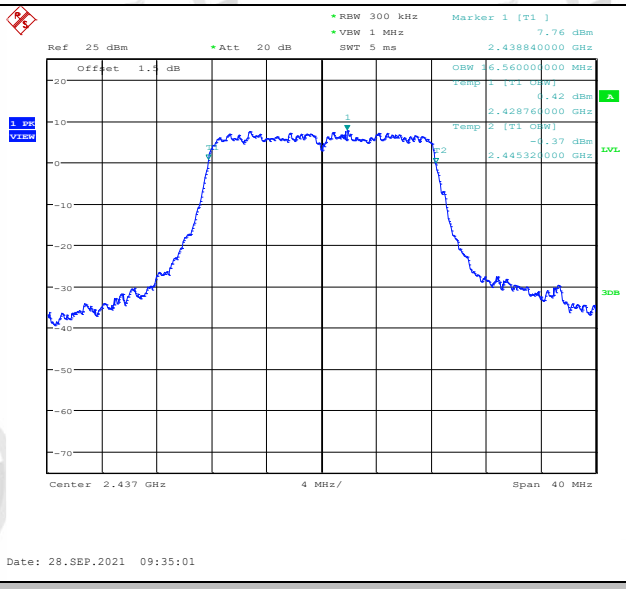

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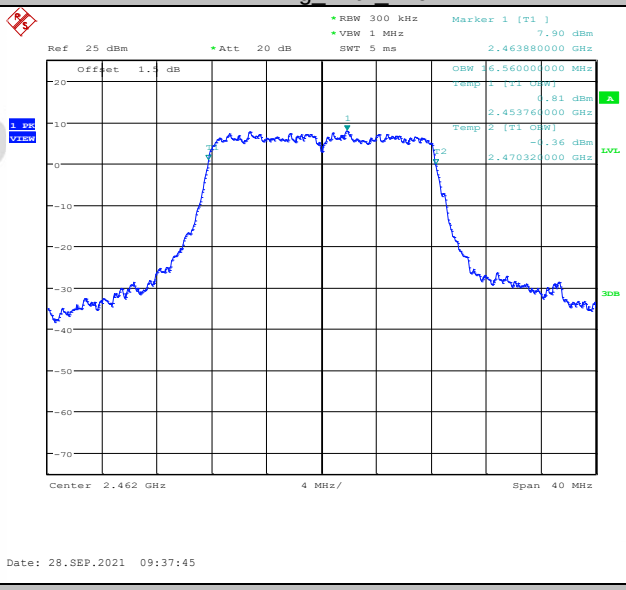

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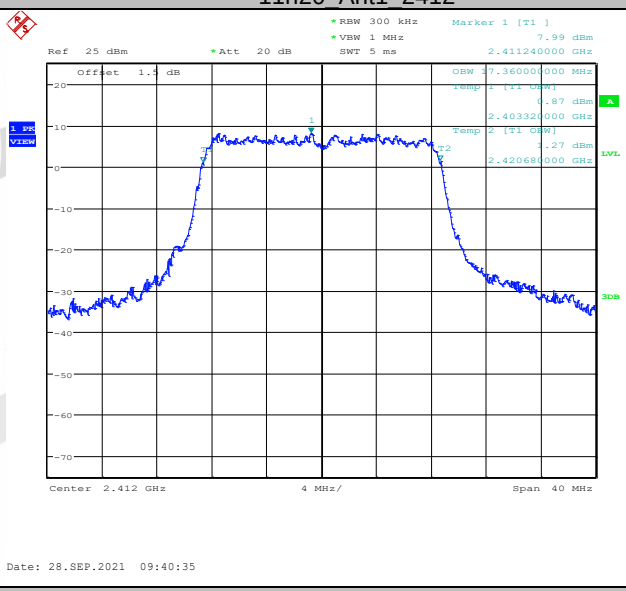
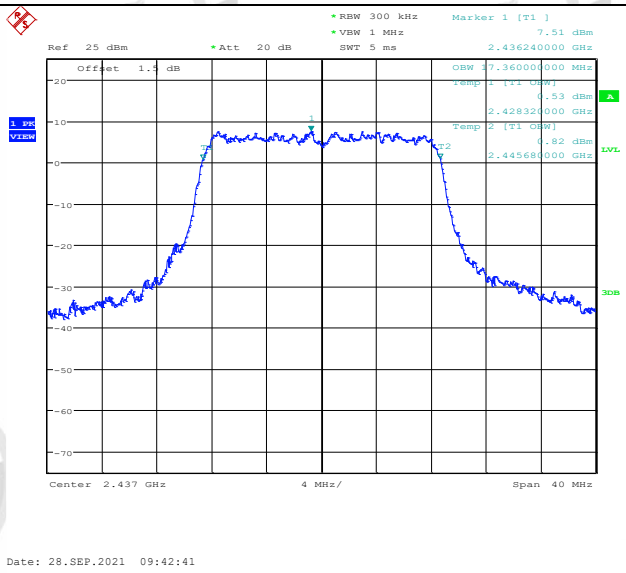


11n20_Ant1_2437



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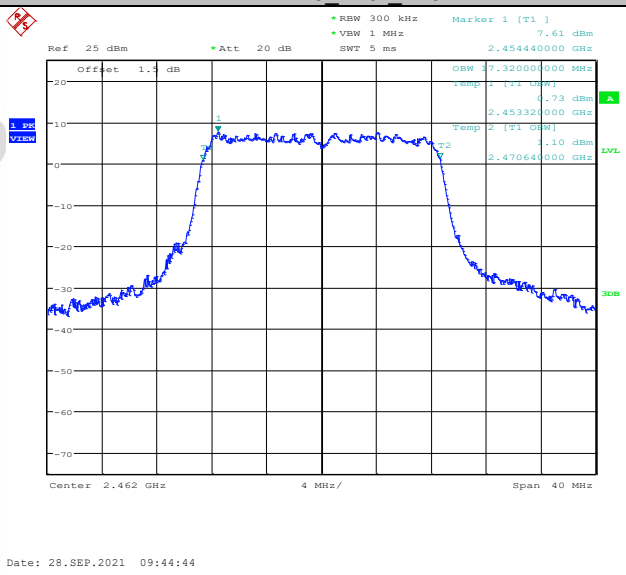

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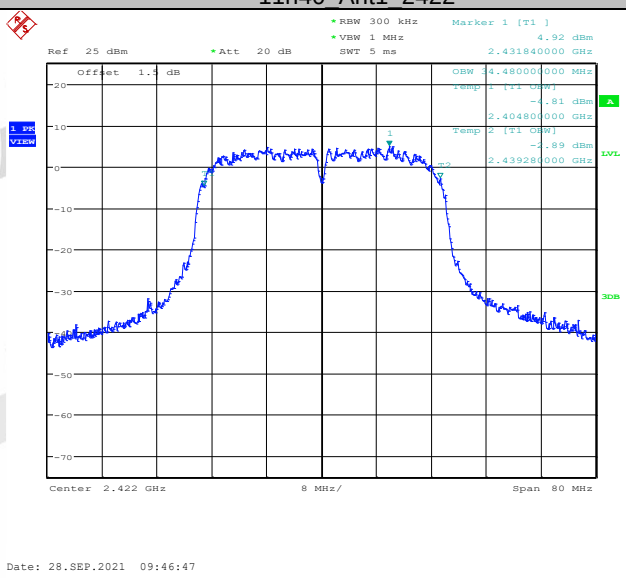

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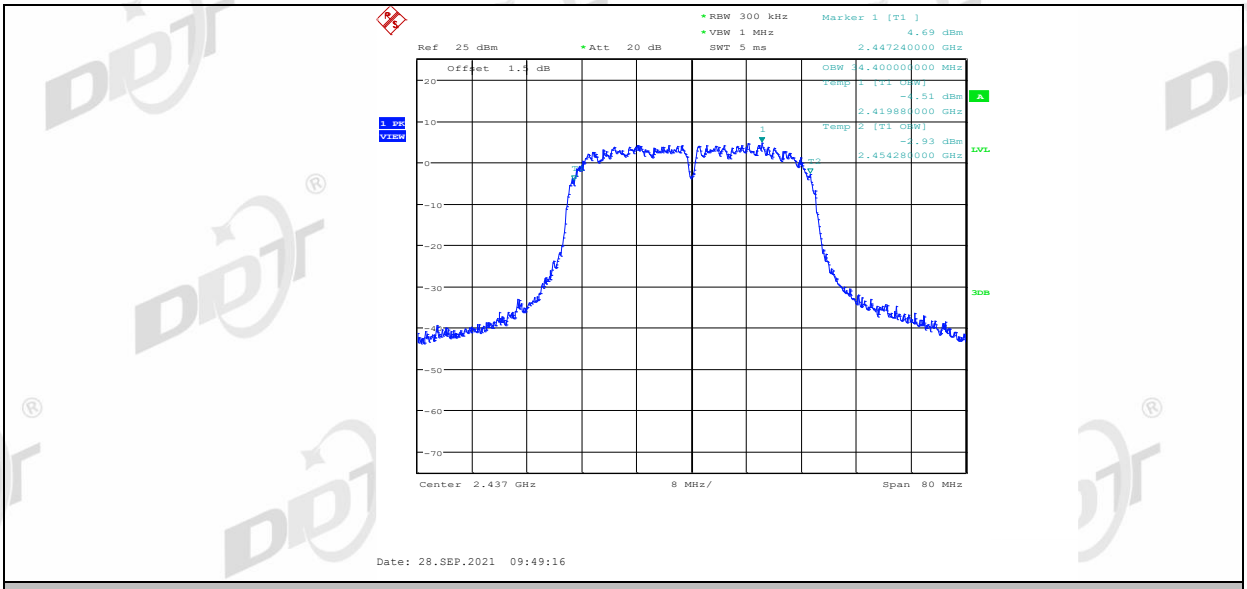
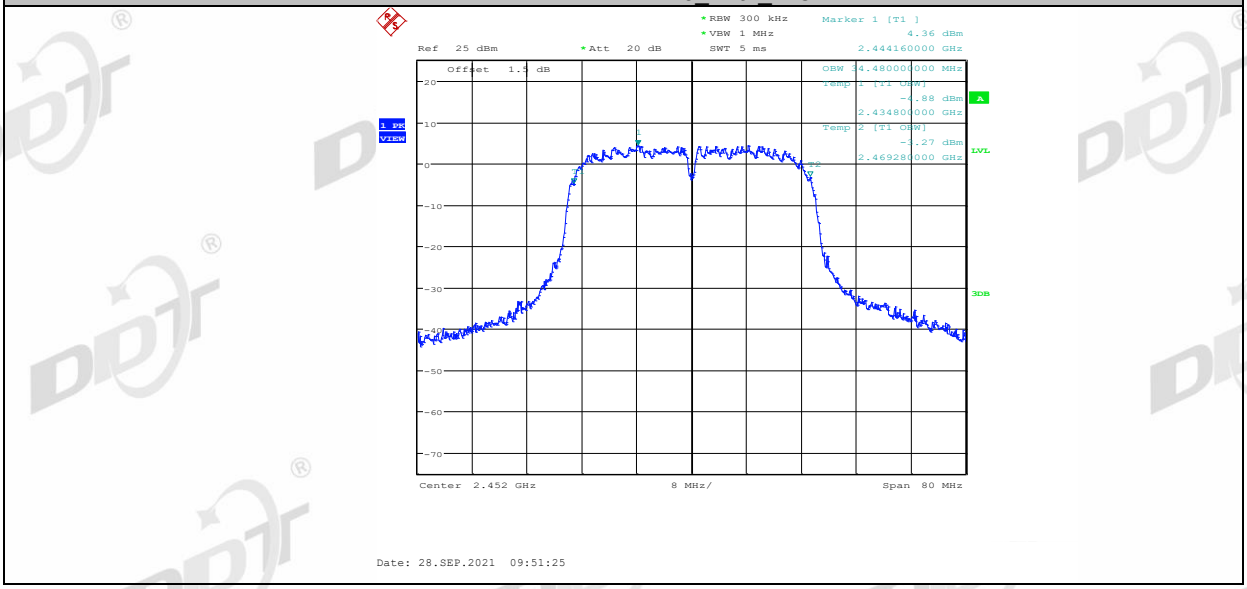


11n40_Ant1_2452



5. Conducted peak Output Power

5.1. Block diagram of test setup

Same as section 4.1

5.2. Limits

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. If transmitting antennas of directional gain greater than 6dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi, the e.i.r.p shall not exceed 4W.

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	Channel	Ant	Conducted Output Power (dBm)	Limit[dBm]
11B	2412	ANT1	16.74	30
11B	2437	ANT1	17.08	30
11B	2462	ANT1	16.28	30
11G	2412	ANT1	15.47	30
11G	2437	ANT1	15.77	30
11G	2462	ANT1	14.92	30
11N20	2412	ANT1	15.39	30
11N20	2437	ANT1	15.64	30
11N20	2462	ANT1	14.78	30
11N40	2422	ANT1	14.97	30
11N40	2437	ANT1	15.16	30
11N40	2452	ANT1	14.74	30

Test Mode	Channel	Ant	EIRP (dBm)	Limit[dBm]
11B	2412	ANT1	18.74	36
11B	2437	ANT1	19.08	36
11B	2462	ANT1	18.28	36
11G	2412	ANT1	17.47	36
11G	2437	ANT1	17.77	36
11G	2462	ANT1	16.92	36
11N20	2412	ANT1	17.39	36
11N20	2437	ANT1	17.64	36
11N20	2462	ANT1	16.78	36
11N40	2422	ANT1	16.97	36
11N40	2437	ANT1	17.16	36
11N40	2452	ANT1	16.74	36
Note: EIRP (dBm)=Conducted Output Power (dBm)+ Antenna Gain (dBi)				

6. Power Spectral Density

6.1. Block diagram of test setup

Same as section 4.1

6.2. Limits

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

6.3. Test Procedure

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

(2) Set the spectrum analyzer as follows:

Center frequency	DTS Channel center frequency
RBW:	3 kHz ≤ RBW ≤ 100 kHz
VBW:	≥ 3RBW
Span	1.5 times the DTS bandwidth
Detector Mode:	RMS
Sweep time:	auto
Trace mode	Max hold

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.

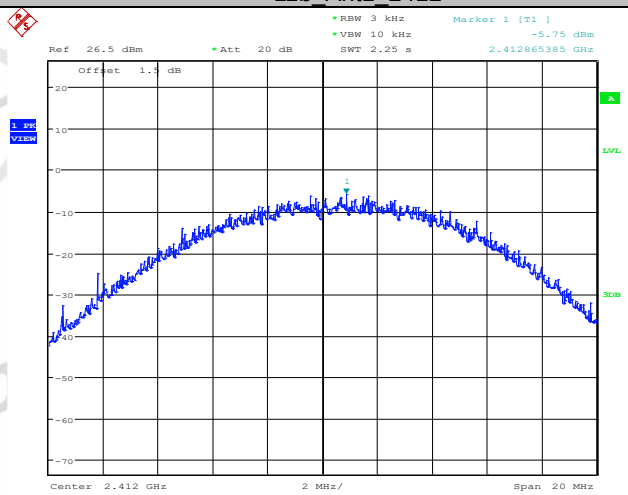
(4) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

6.4. Test Result

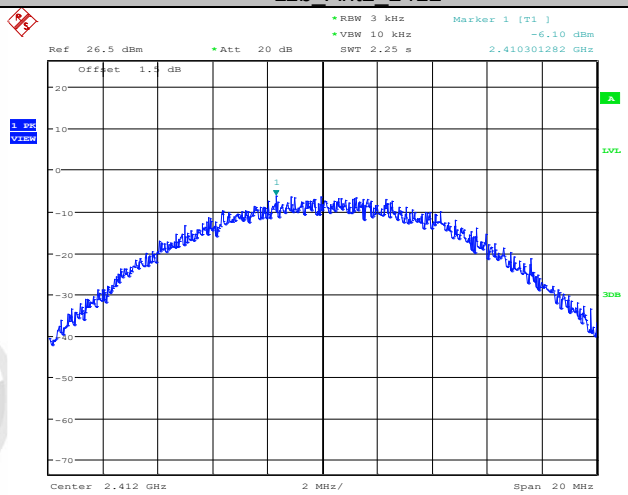
Test Mode	Test Channel	Ant	PSD [dBm]	Limit[dBm/3kHz]	Verdict
11B	2412	ANT1	-5.75	8.00	Pass
11B	2437	ANT1	-4.52	8.00	Pass
11B	2462	ANT1	-4.32	8.00	Pass
11G	2412	ANT1	-8.85	8.00	Pass
11G	2437	ANT1	-10.41	8.00	Pass
11G	2462	ANT1	-10.3	8.00	Pass
11N20	2412	ANT1	-7.31	8.00	Pass
11N20	2437	ANT1	-10.15	8.00	Pass
11N20	2462	ANT1	-8.67	8.00	Pass
11N40	2422	ANT1	-12.91	8.00	Pass
11N40	2437	ANT1	-11.2	8.00	Pass
11N40	2452	ANT1	-13.16	8.00	Pass

6.5. Original Test Data

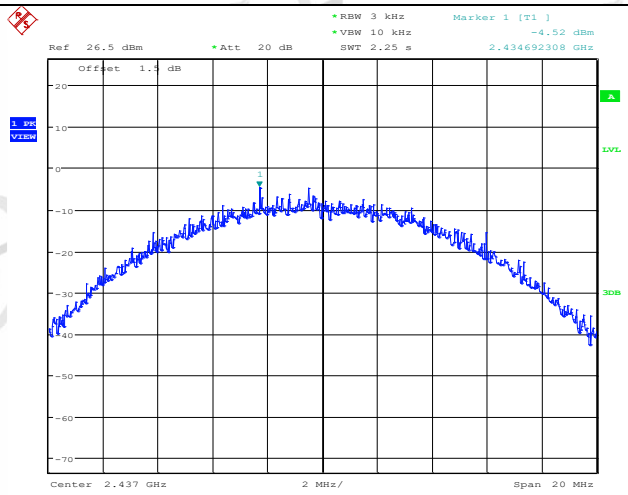
11b_Ant1_2412



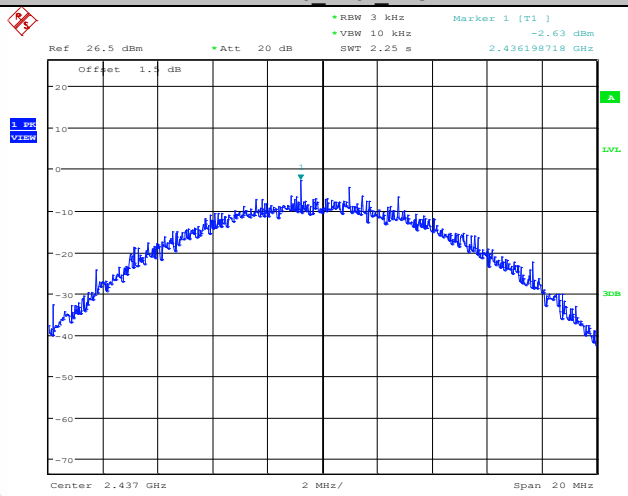
11b_Ant2_2412



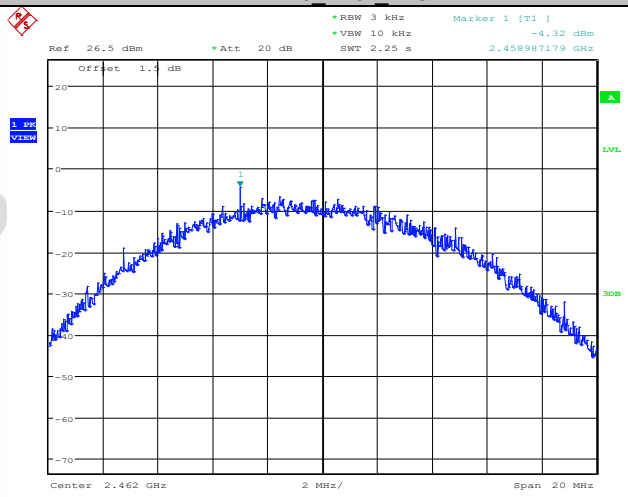
11b_Ant1_2437



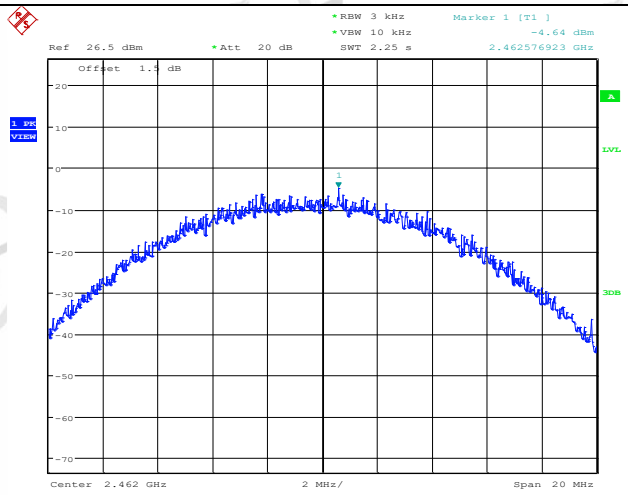
11b_Ant2_2437



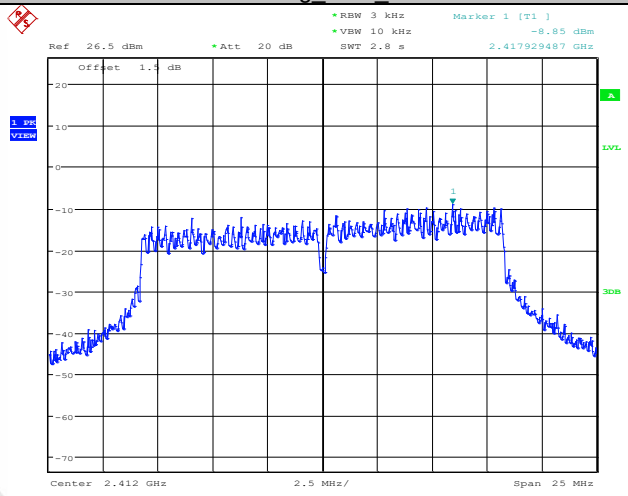
11b_Ant1_2462



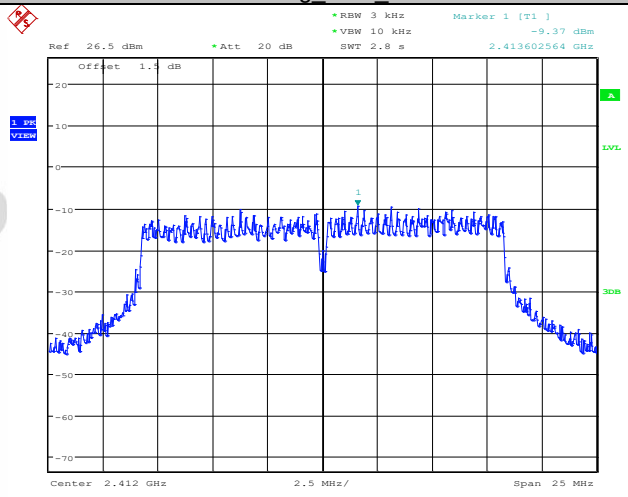
11b_Ant2_2462



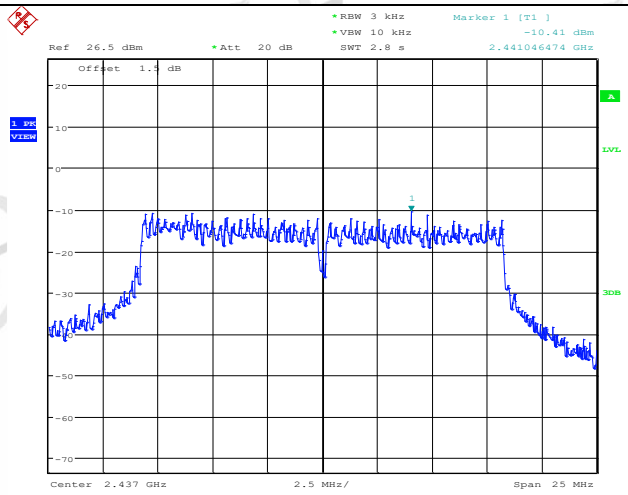
11g_Ant1_2412



11g_Ant2_2412



11g_Ant1_2437



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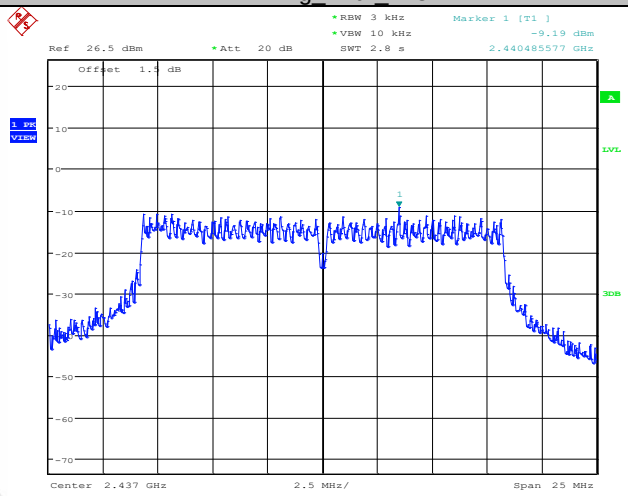
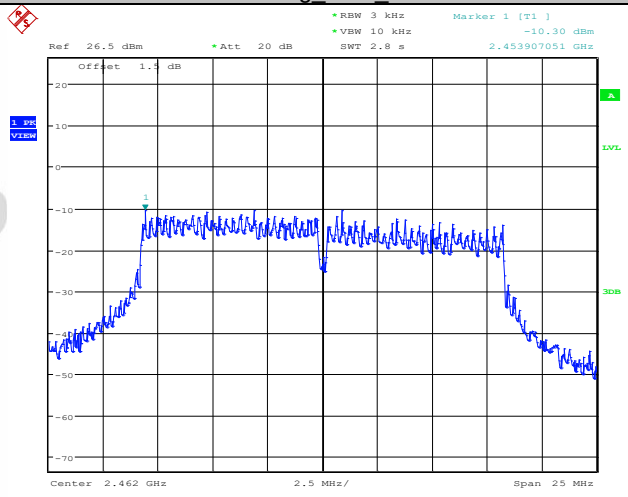
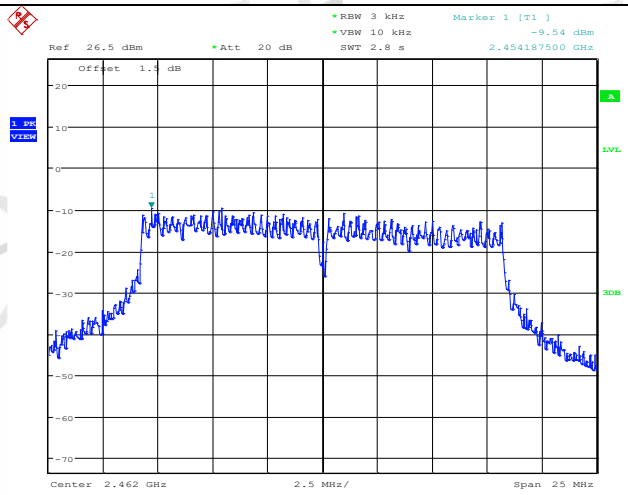


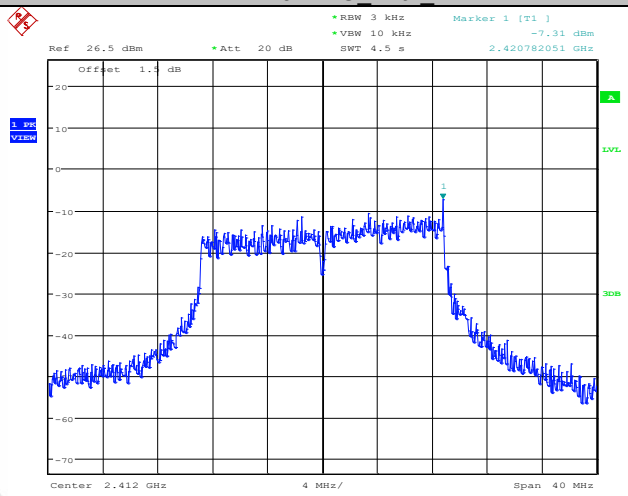
11g_Ant1_2462



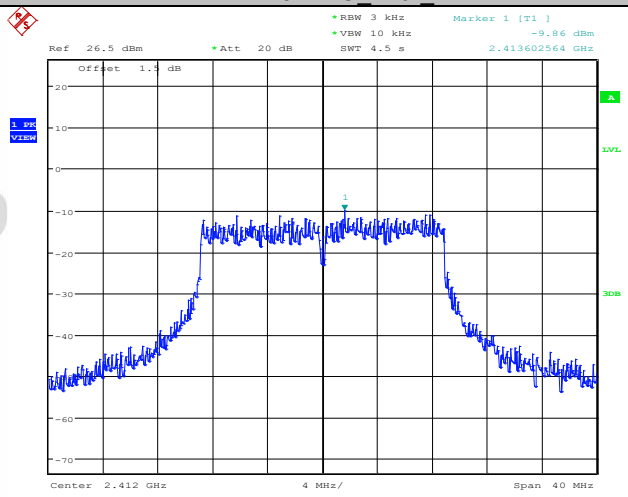
11g_Ant2_2462



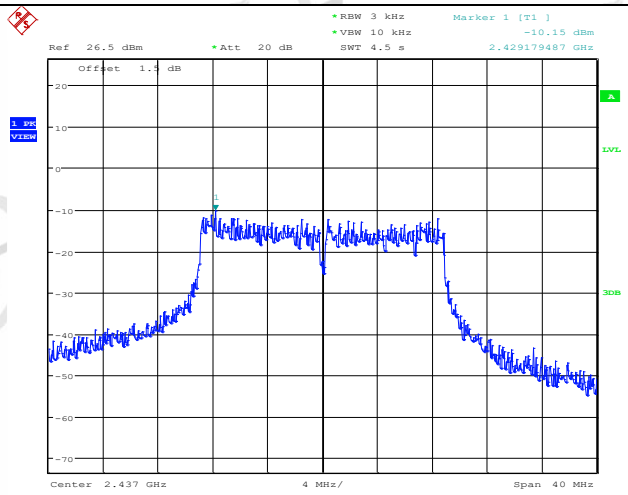
11n20MIMO_Ant1_2412



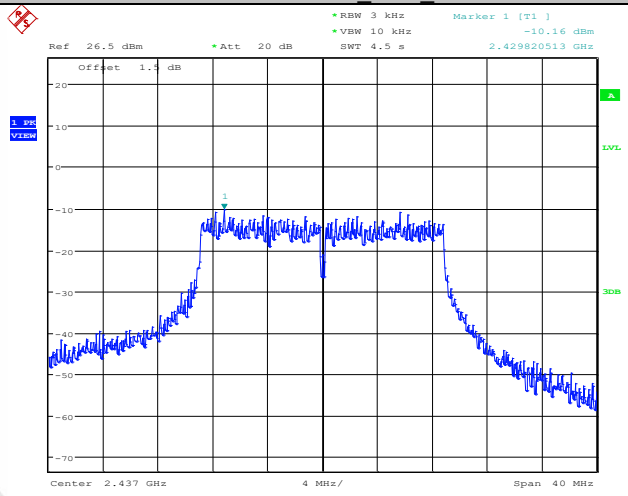
11n20MIMO_Ant2_2412



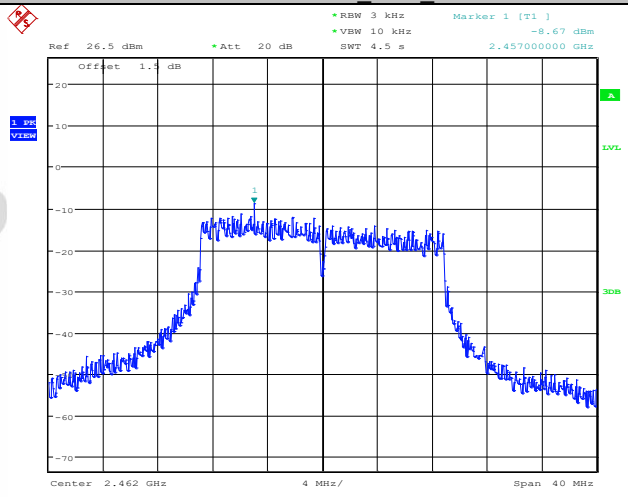
11n20MIMO_Ant1_2437



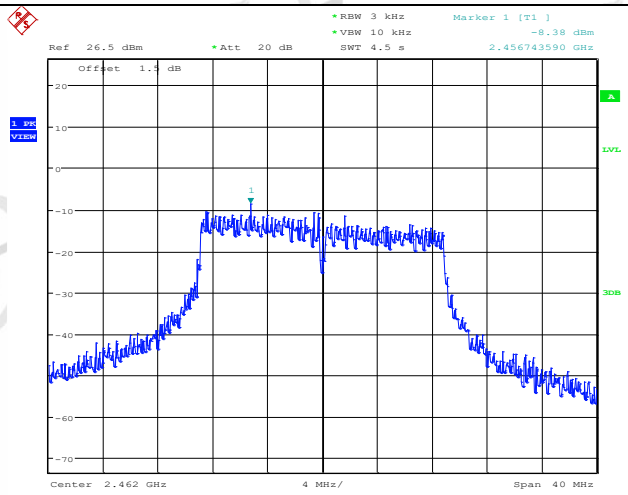
11n20MIMO_Ant2_2437



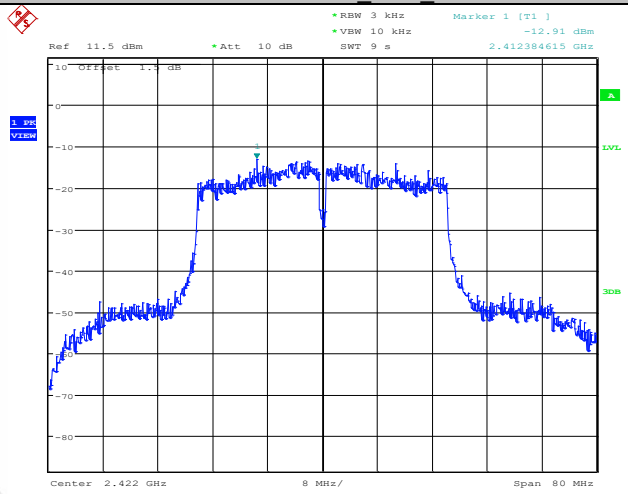
11n20MIMO_Ant1_2462



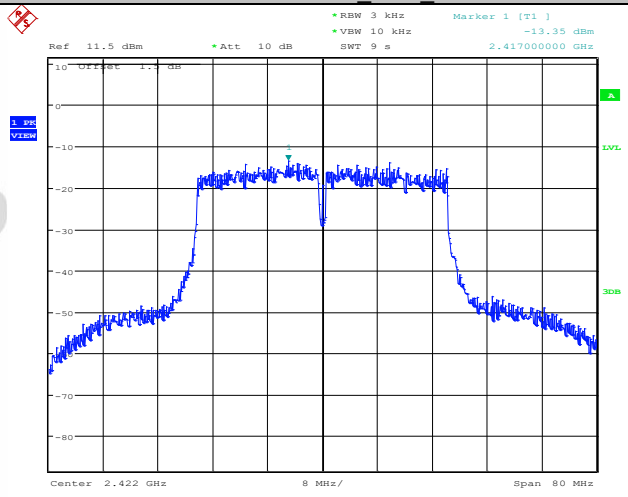
11n20MIMO_Ant2_2462



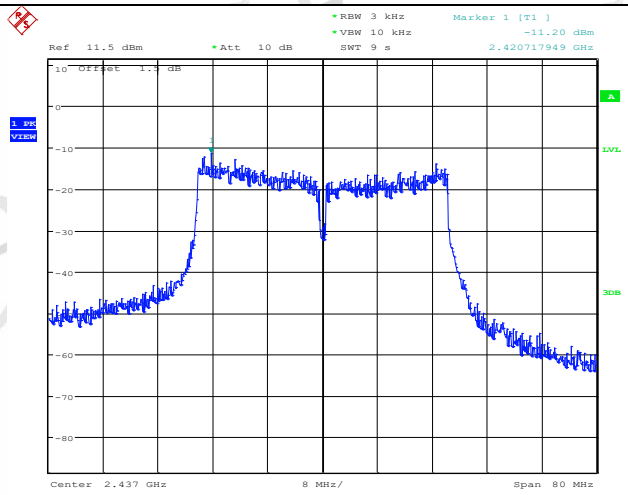
11n40MIMO_Ant1_2422



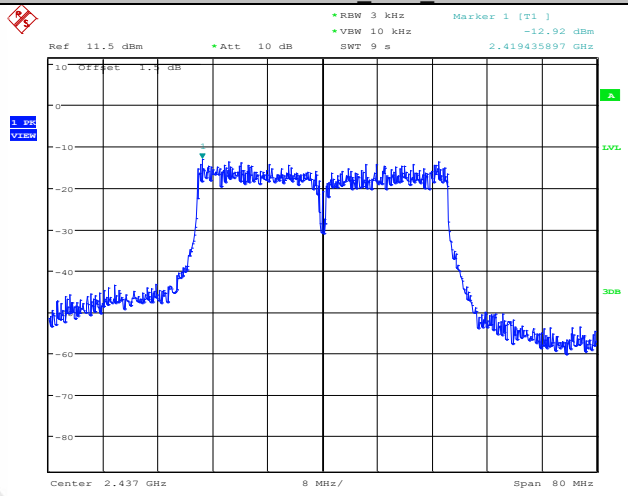
11n40MIMO_Ant2_2422



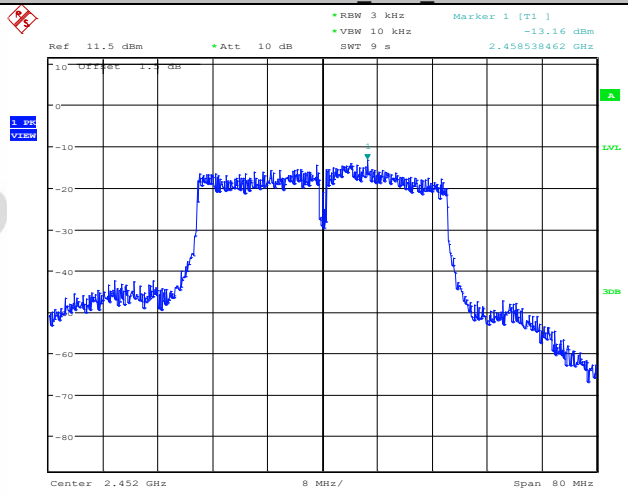
11n40MIMO_Ant1_2437



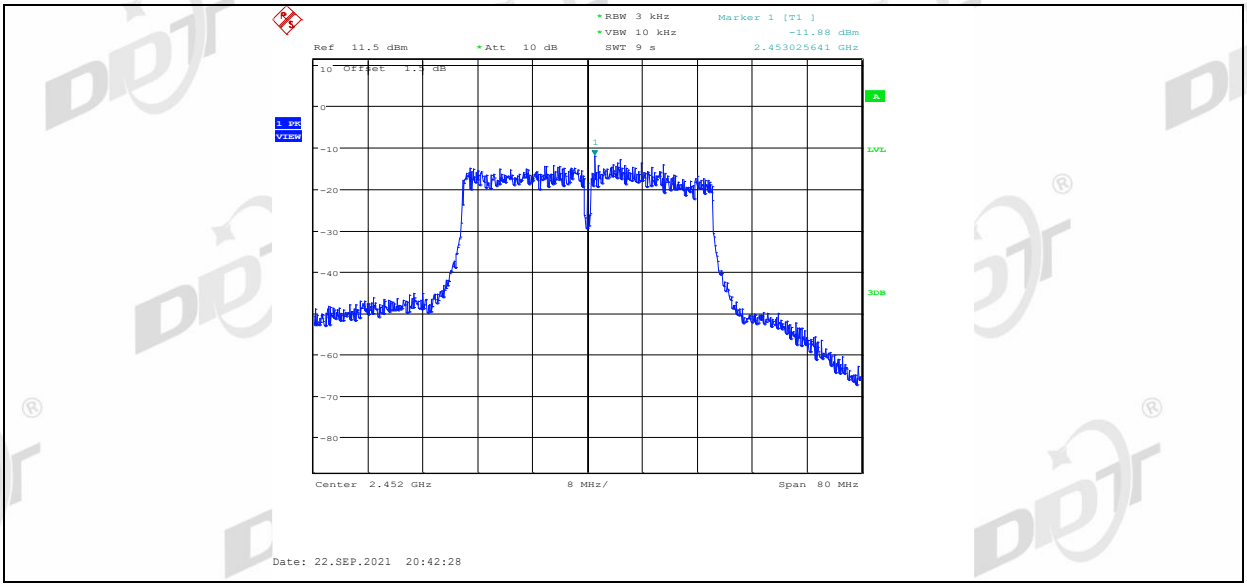
11n40MIMO_Ant2_2437



11n40MIMO_Ant1_2452



11n40MIMO_Ant2_2452


RBW 3 kHz
VBW 10 kHz
SWT 9 s
Marker 1 [T1]
-11.88 dBm
2.453025641 GHz
Ref 11.5 dBm
Att 10 dB
Offset 1.5 dB
1 PK VIEW
A
LVL
3DB
10
0
-10
-20
-30
-40
-60
-70
-80
Center 2.452 GHz
8 MHz/
Span 80 MHz
Date: 22.SEP.2021 20:42:28

7. Band Edge and Spurious Emissions (Conducted)

7.1. Block diagram of test setup

Same as section 4.1

7.2. Limits

In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

7.3. Test Procedure

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

(2) Establish a reference level by using the following procedure:

Center frequency	DTS Channel center frequency
RBW:	100 kHz
VBW:	300 kHz
Span	1.5 times the DTS bandwidth
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.

(4) Set the spectrum analyzer as follows:

RBW:	100 kHz
VBW:	300 kHz
Span	Encompass frequency range to be measured
Number of measurement points	≥span/RBW
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

(5) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude of all unwanted emissions outside of the authorized frequency band

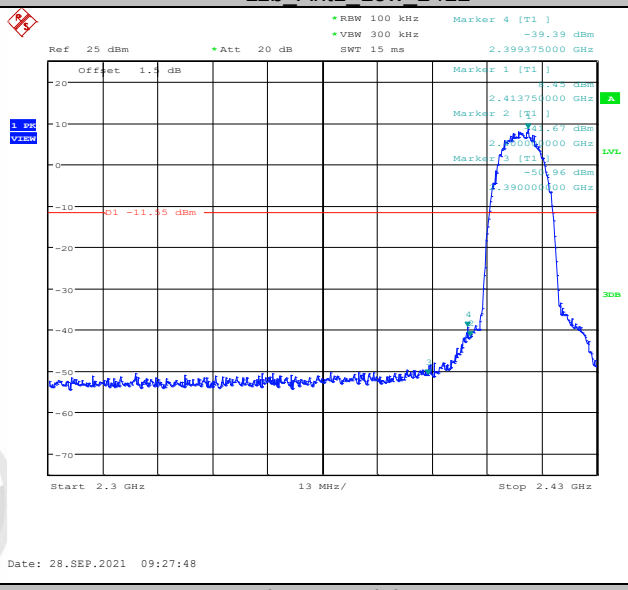
7.4. Test Result

EUT Set Mode	CH or Frequency	Ant1 Result (dBm)	EUT Set Mode	CH or Frequency	Ant1 Result Result (dBm)
11b	CH1	Pass	11n HT 20	CH1	Pass
	CH6	Pass		CH6	Pass
	CH11	Pass		CH11	Pass
11g	CH1	Pass	11n HT 40	CH3	Pass
	CH6	Pass		CH6	Pass
	CH11	Pass		CH9	Pass

7.5. Original test data

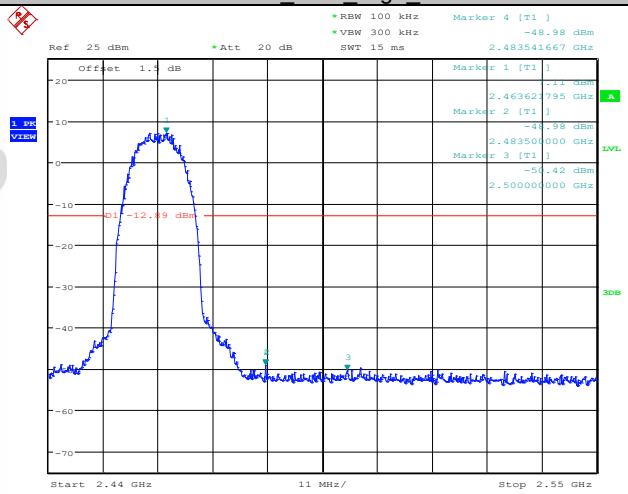
Band Edge

11b_Ant1_Low_2412



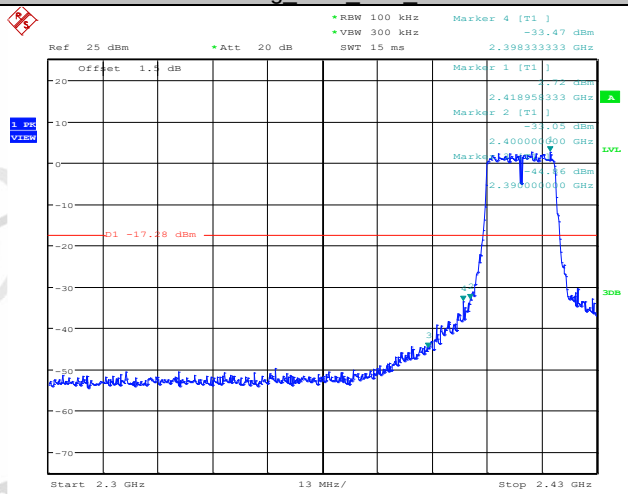
Date: 28.SEP.2021 09:27:48

11b_Ant1_High_2462



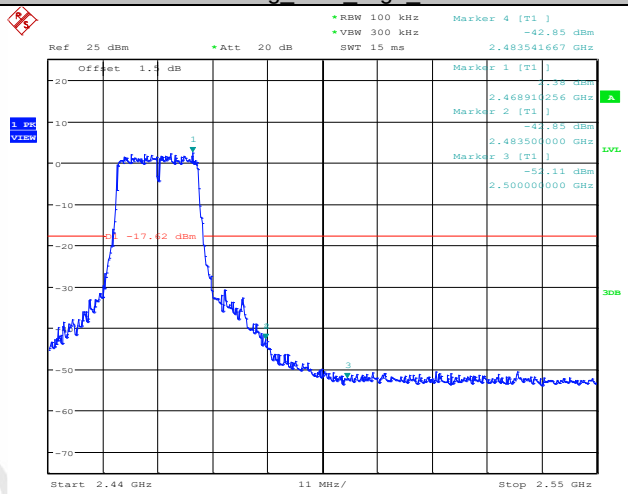
Date: 28.SEP.2021 09:31:58

11g_Ant1_Low_2412



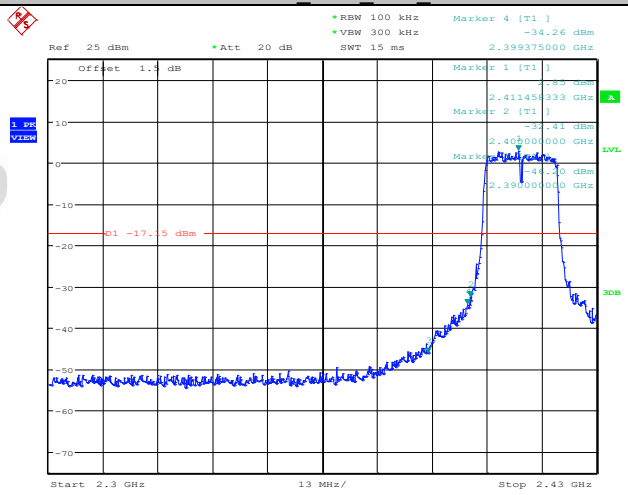
Date: 28.SEP.2021 09:33:45

11g_Ant1_High_2462



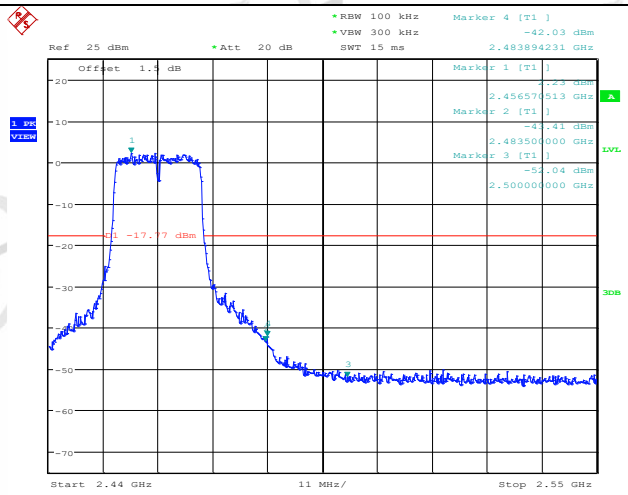
Date: 28.SEP.2021 09:38:34

11n20_Ant1_Low_2412

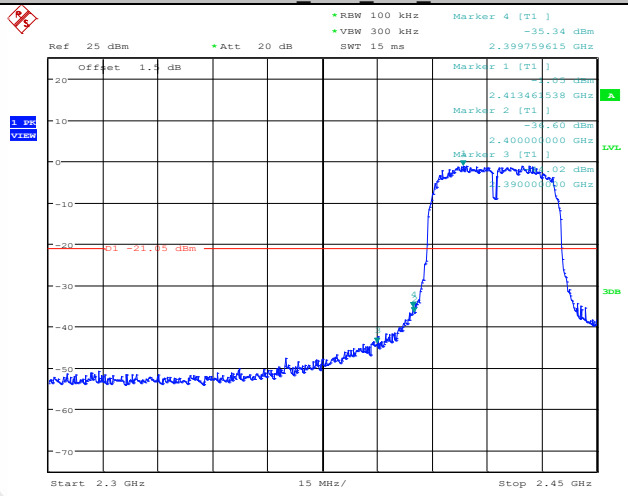


Date: 28.SEP.2021 09:41:16

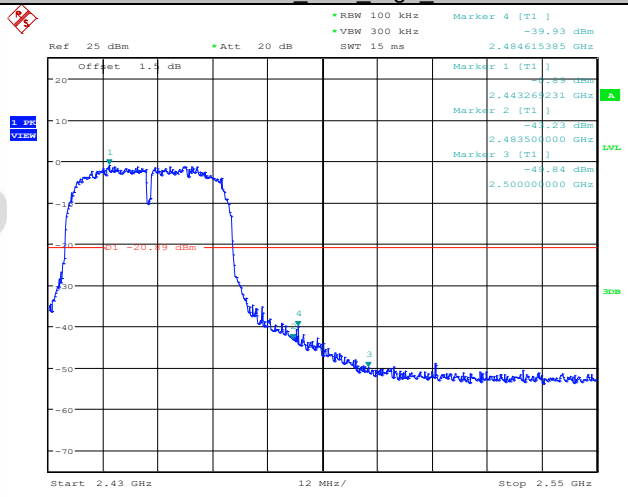
11n20_Ant1_High_2462



11n40_Ant1_Low_2422

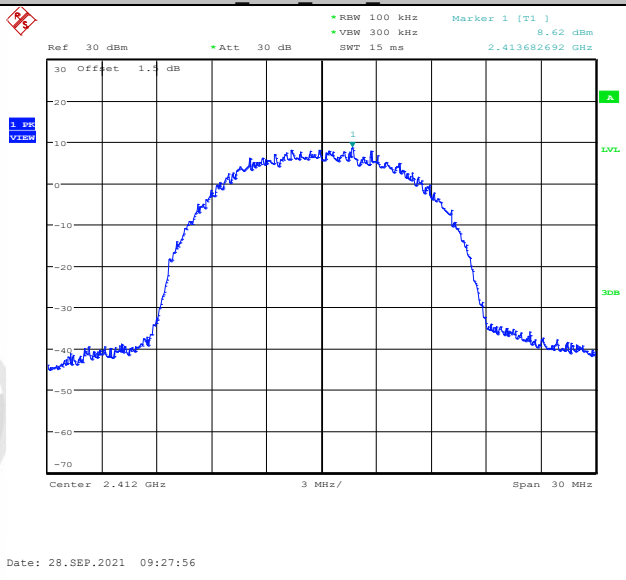


11n40_Ant1_High_2452

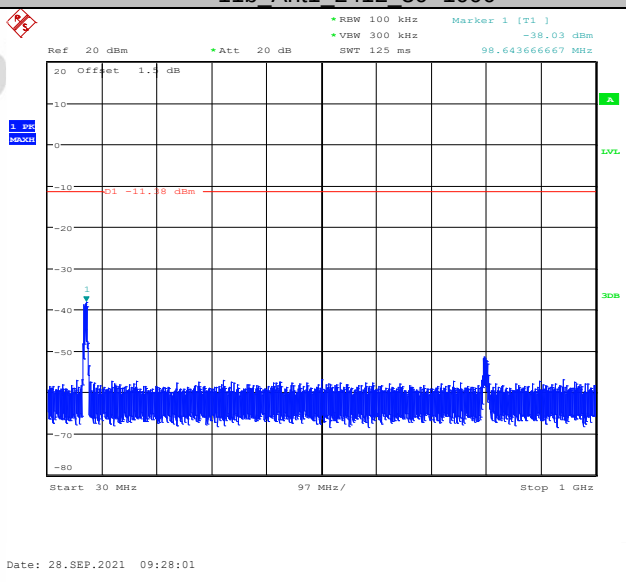


Spurious Emissions

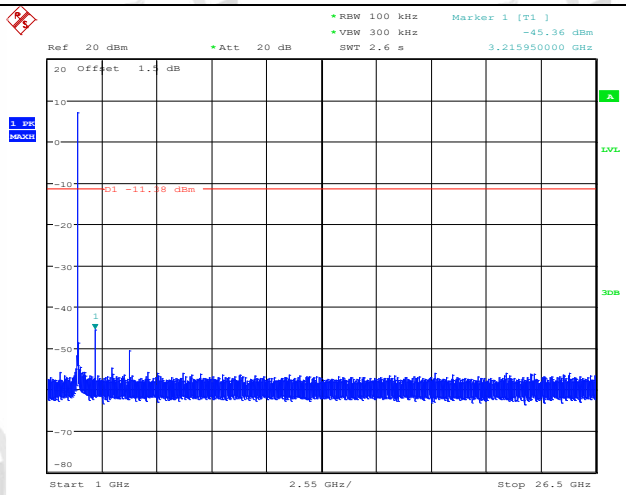
11b_Ant1_2412_0~Reference



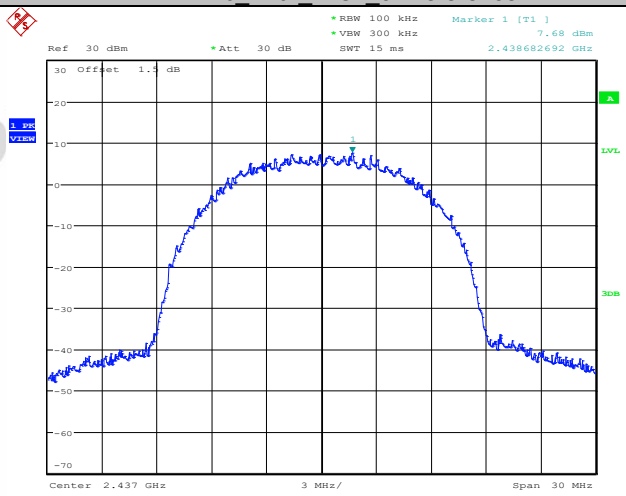
11b_Ant1_2412_30~1000



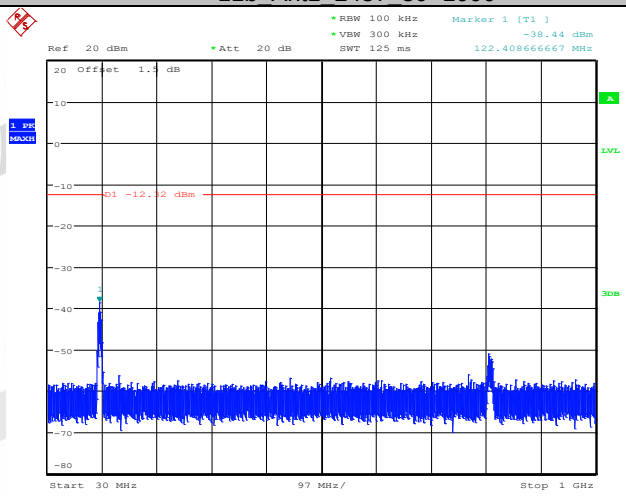
11b_Ant1_2412_1000~26500



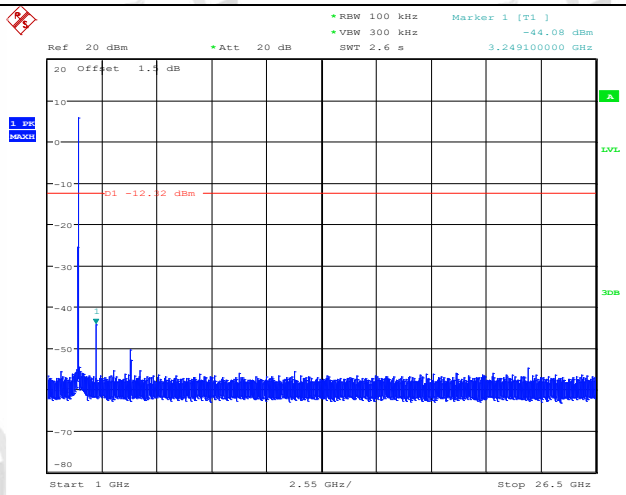
11b_Ant1_2437_0~Reference



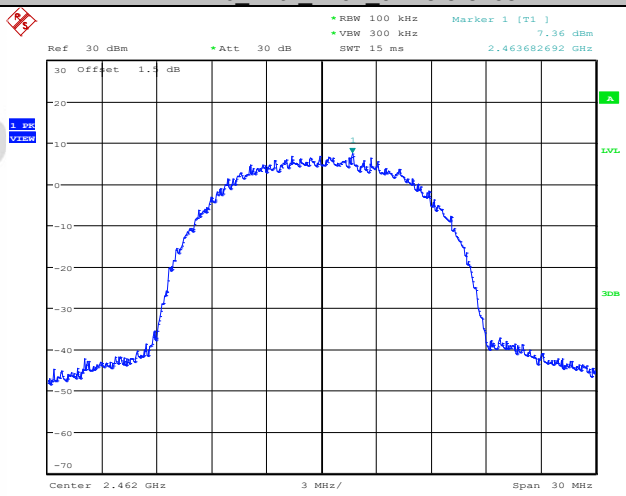
11b_Ant1_2437_30~1000



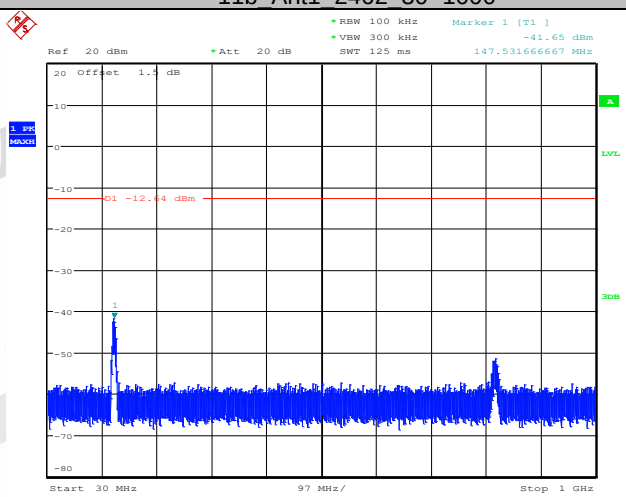
11b_Ant1_2437_1000~26500



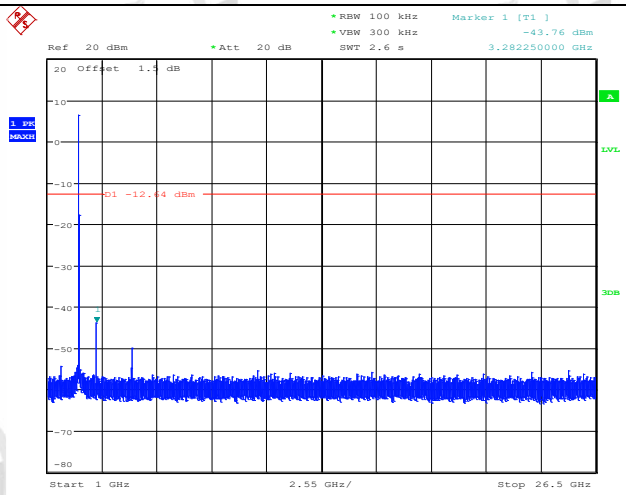
11b_Ant1_2462_0~Reference



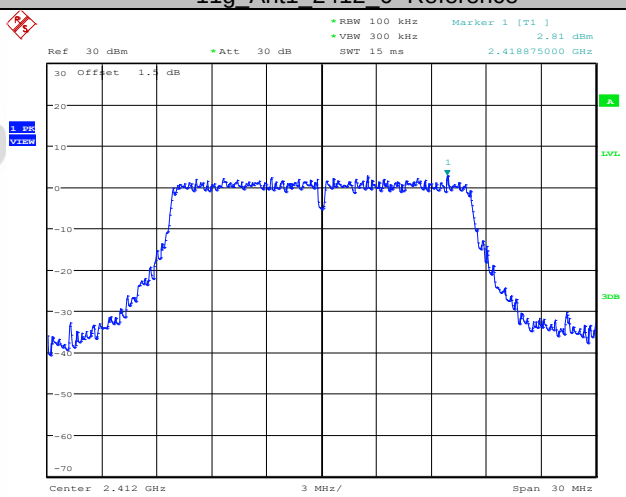
11b_Ant1_2462_30~1000



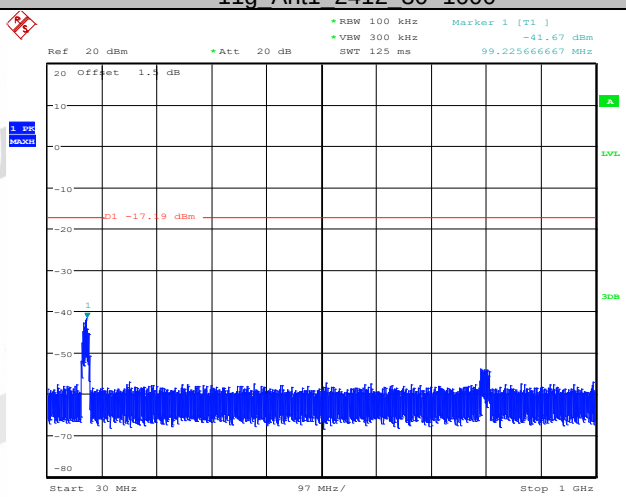
11b_Ant1_2462_1000~26500



11g_Ant1_2412_0~Reference



11g_Ant1_2412_30~1000



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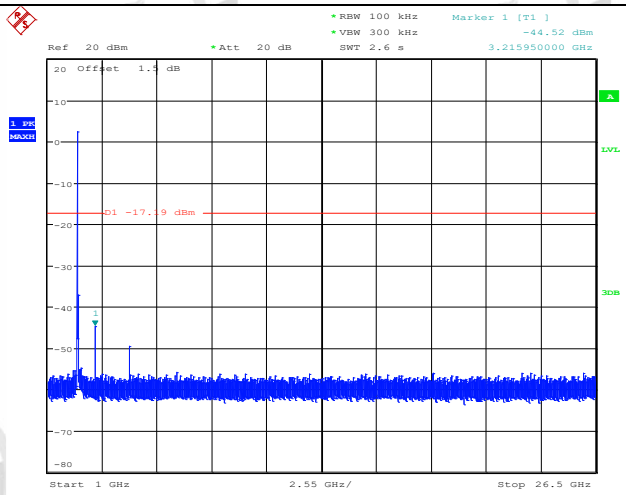

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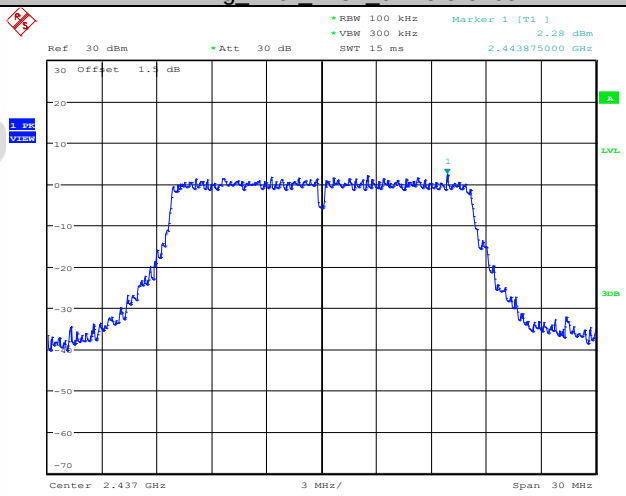

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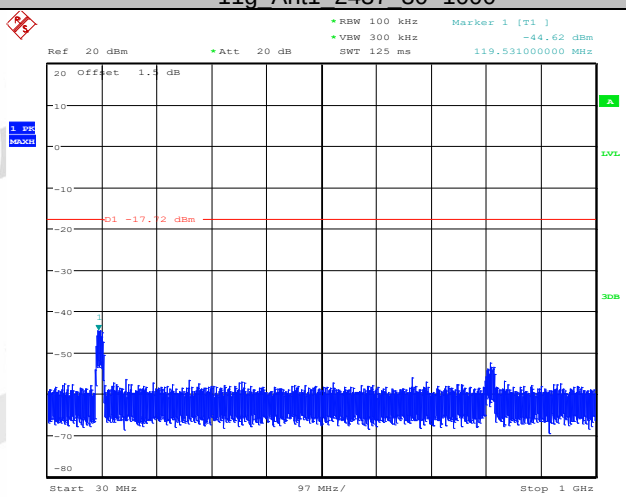

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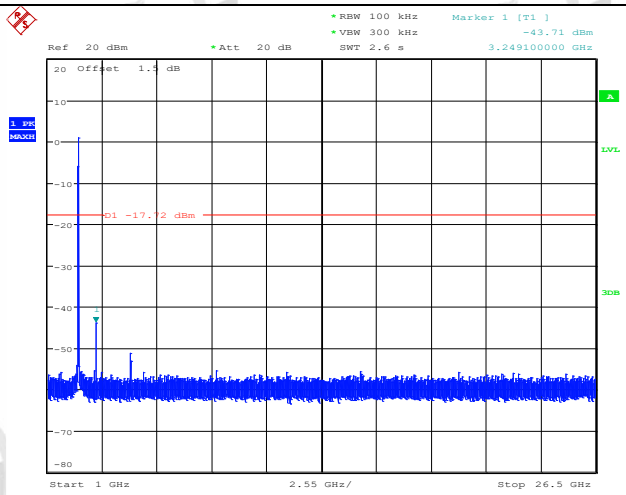

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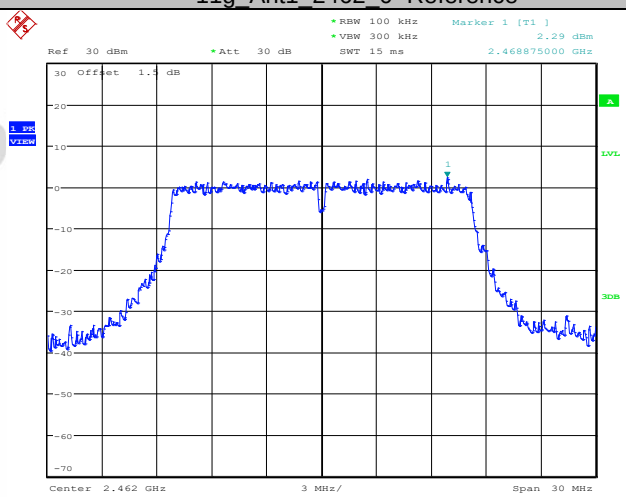

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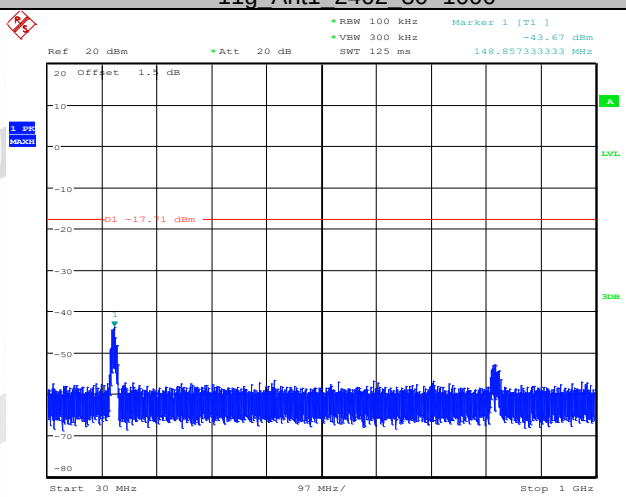

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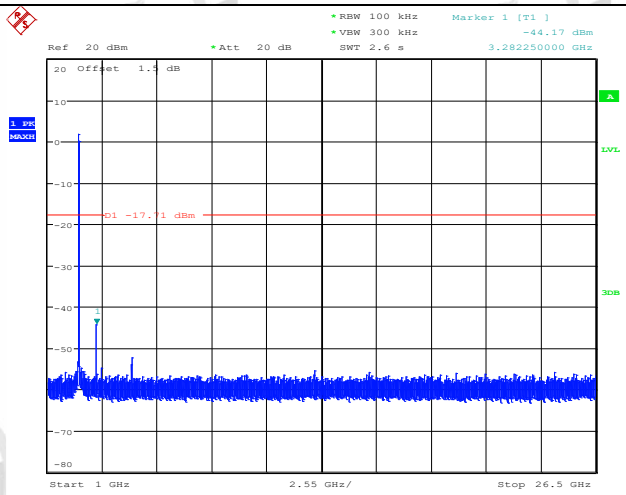

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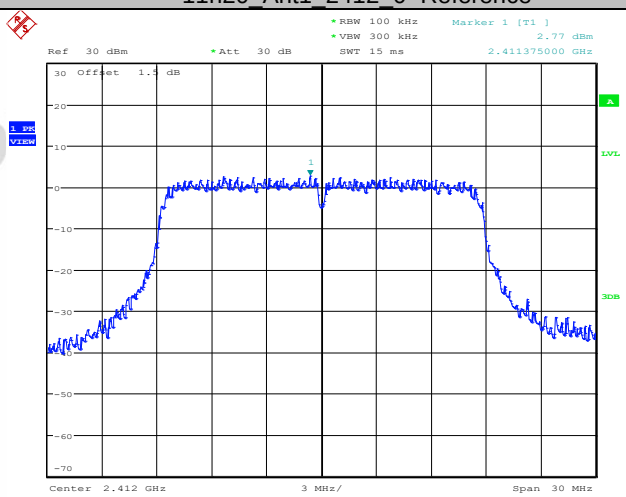

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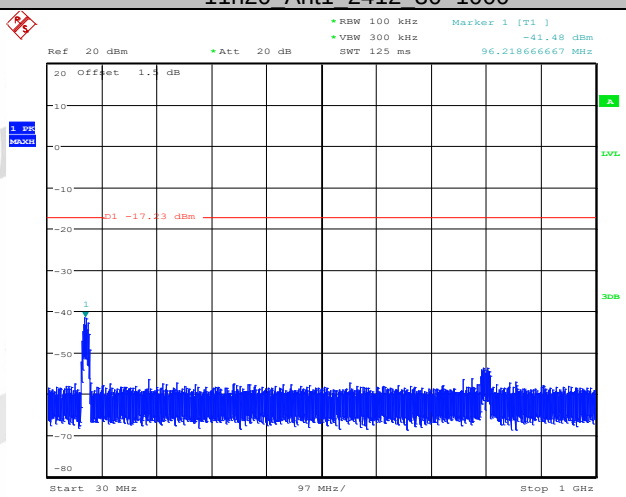

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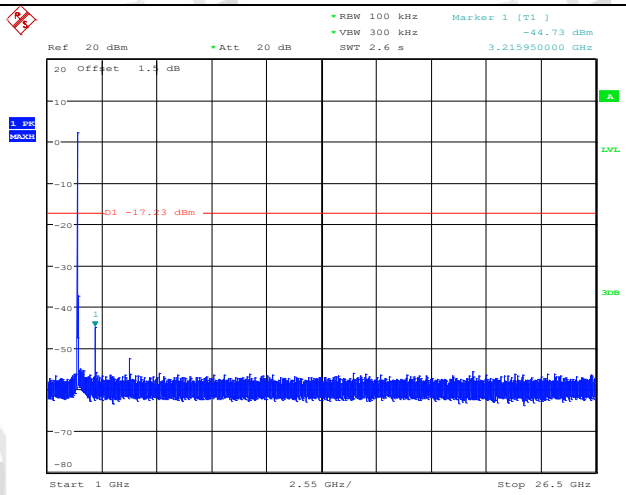

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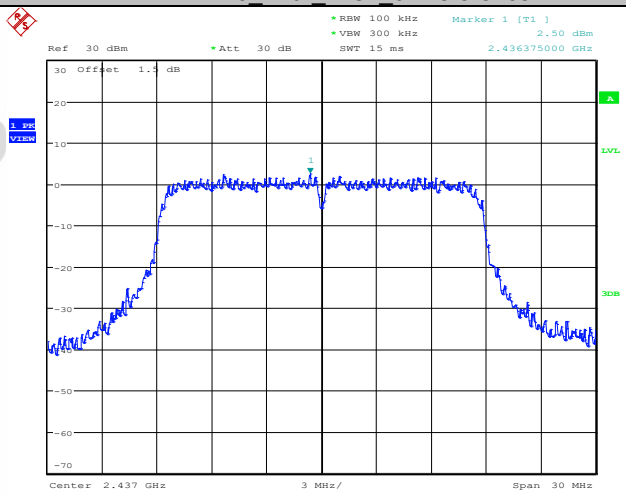

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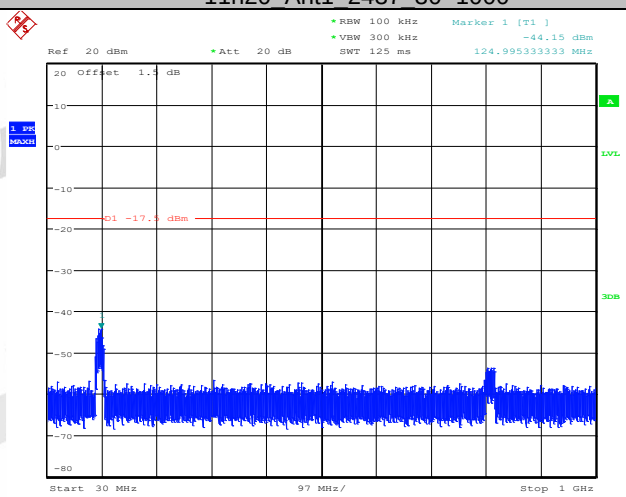

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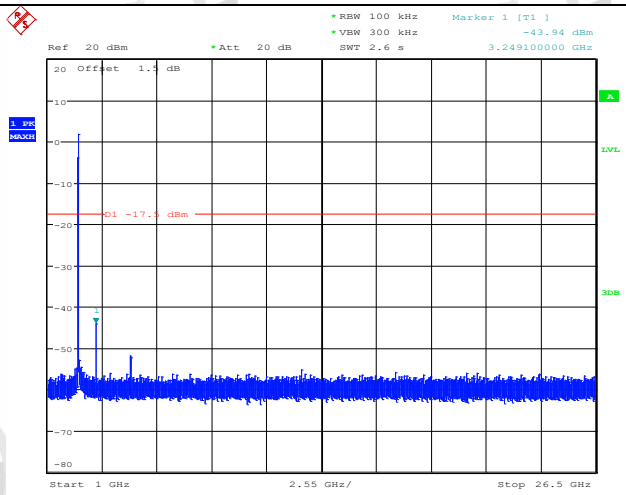

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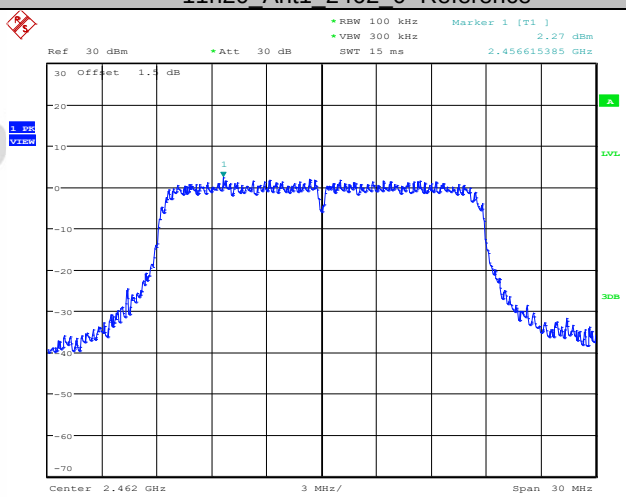

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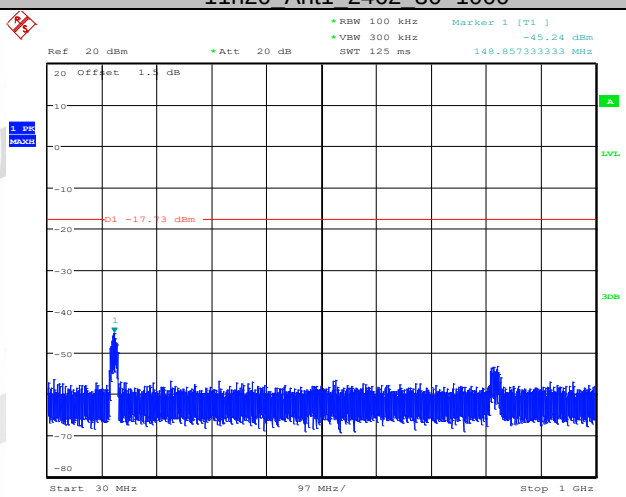

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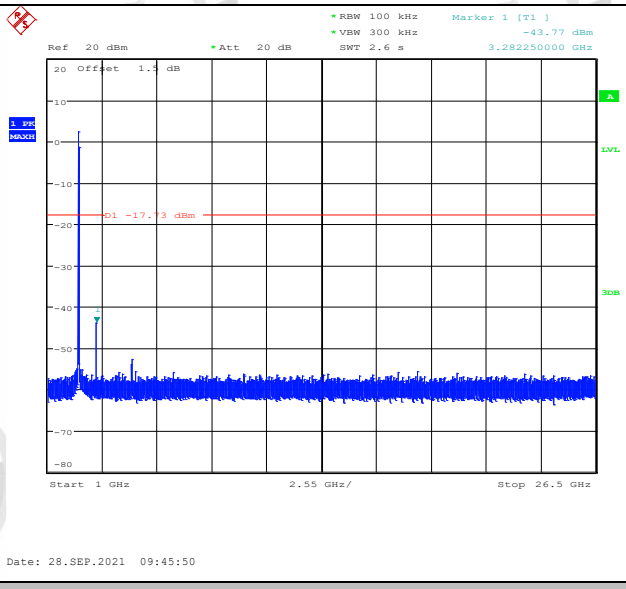
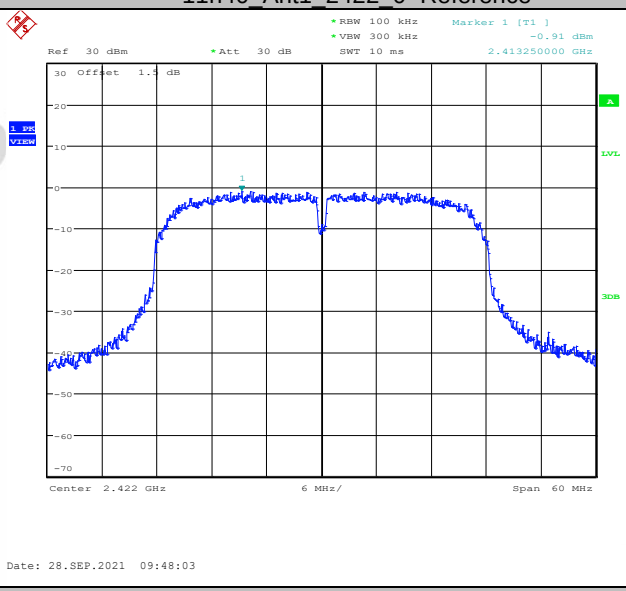
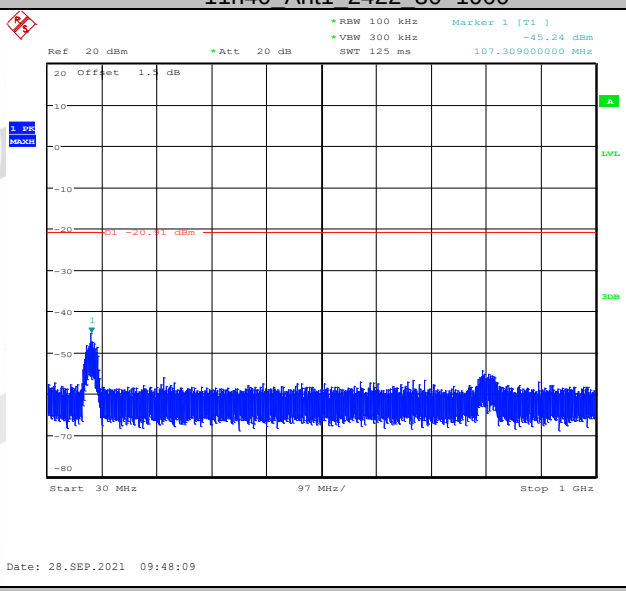


11n40_Ant1_2422_0~Reference



11n40_Ant1_2422_30~1000



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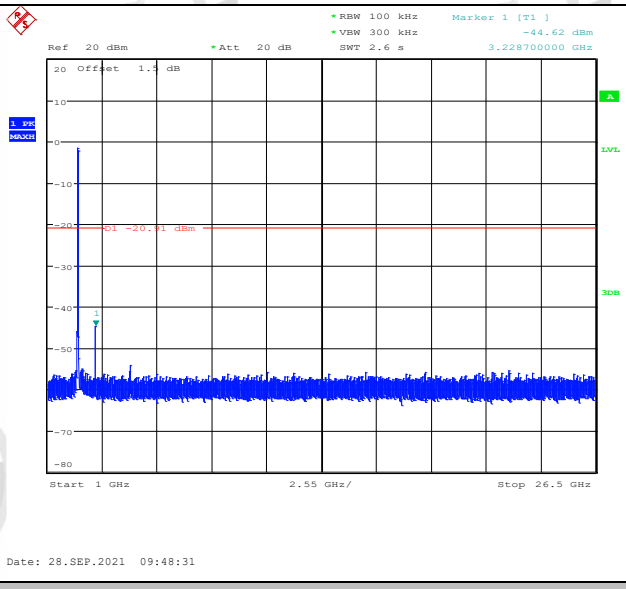

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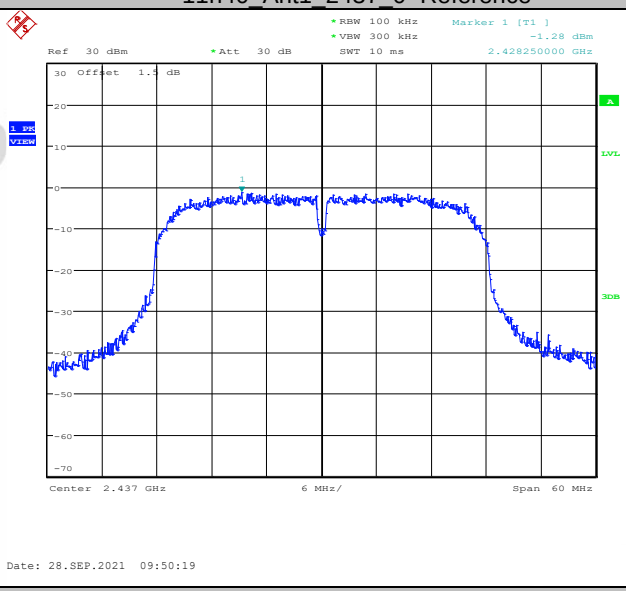
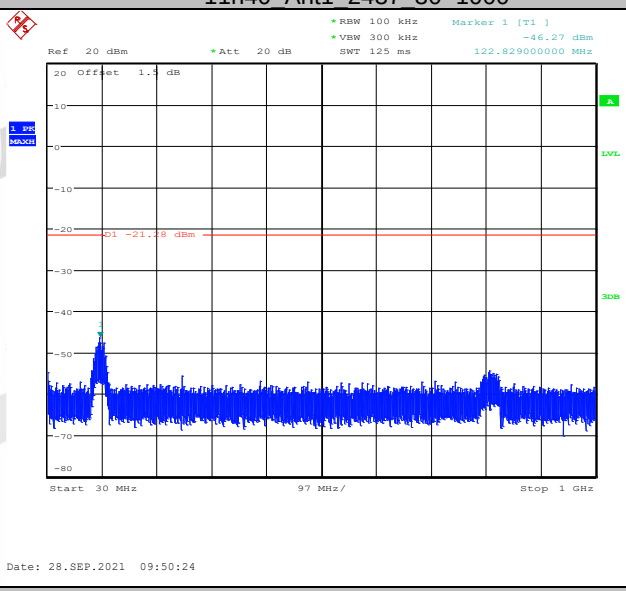


11n40_Ant1_2437_30~1000



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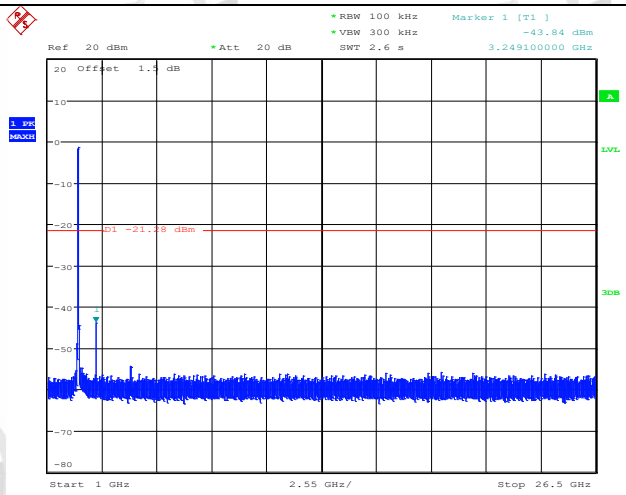

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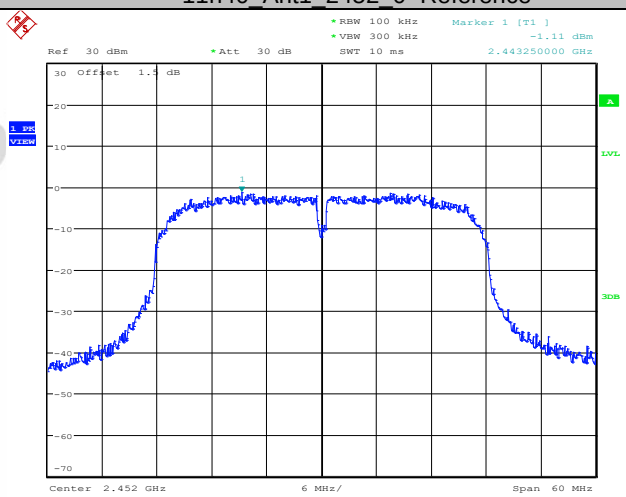

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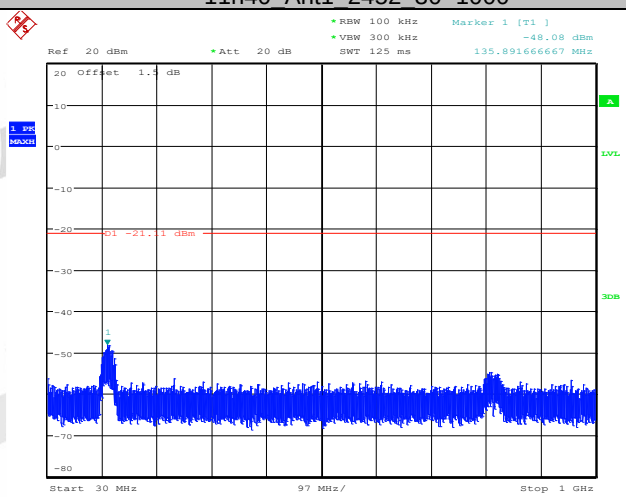

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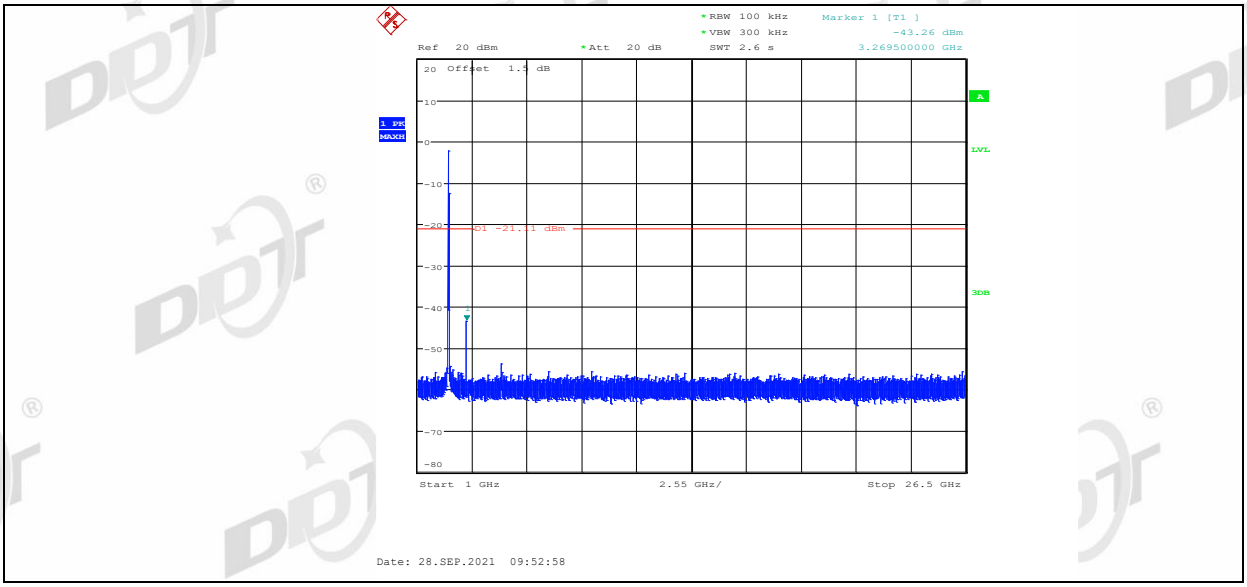
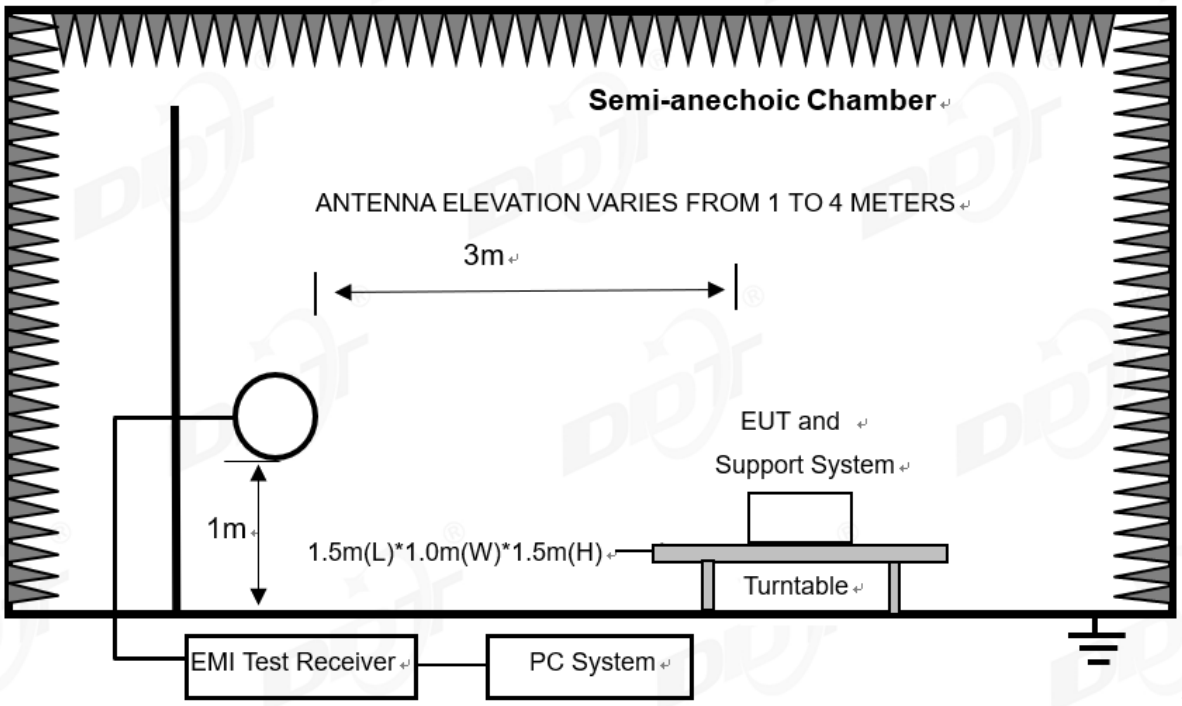

RBW 100 kHz
VBW 300 kHz
SWT 2.6 s
Marker 1 [T1]
-43.26 dBm
3.269500000 GHz
Ref 20 dBm
Att 20 dB
Offset 1.5 dB
D1 -21.1 dBm
1 PK MAXH
A
LVL
3DB
Start 1 GHz
2.55 GHz/
Stop 26.5 GHz
Date: 28.SEP.2021 09:52:58

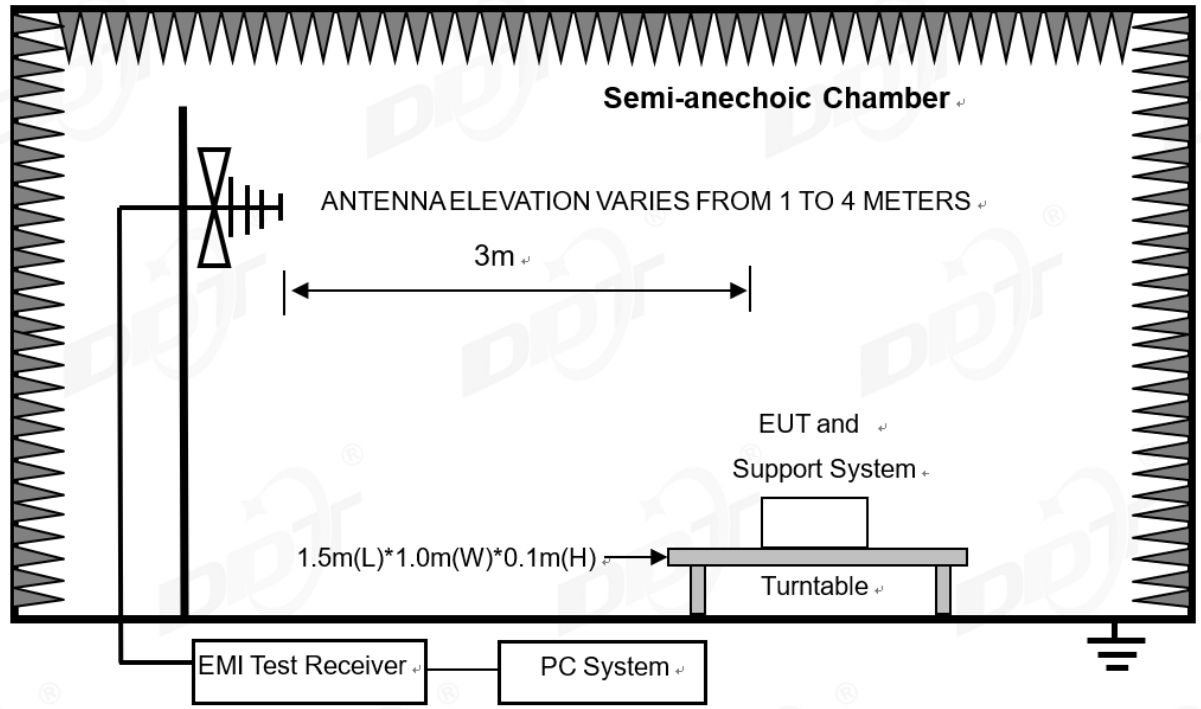
8. Radiated Spurious Emissions

8.1. Block diagram of test setup

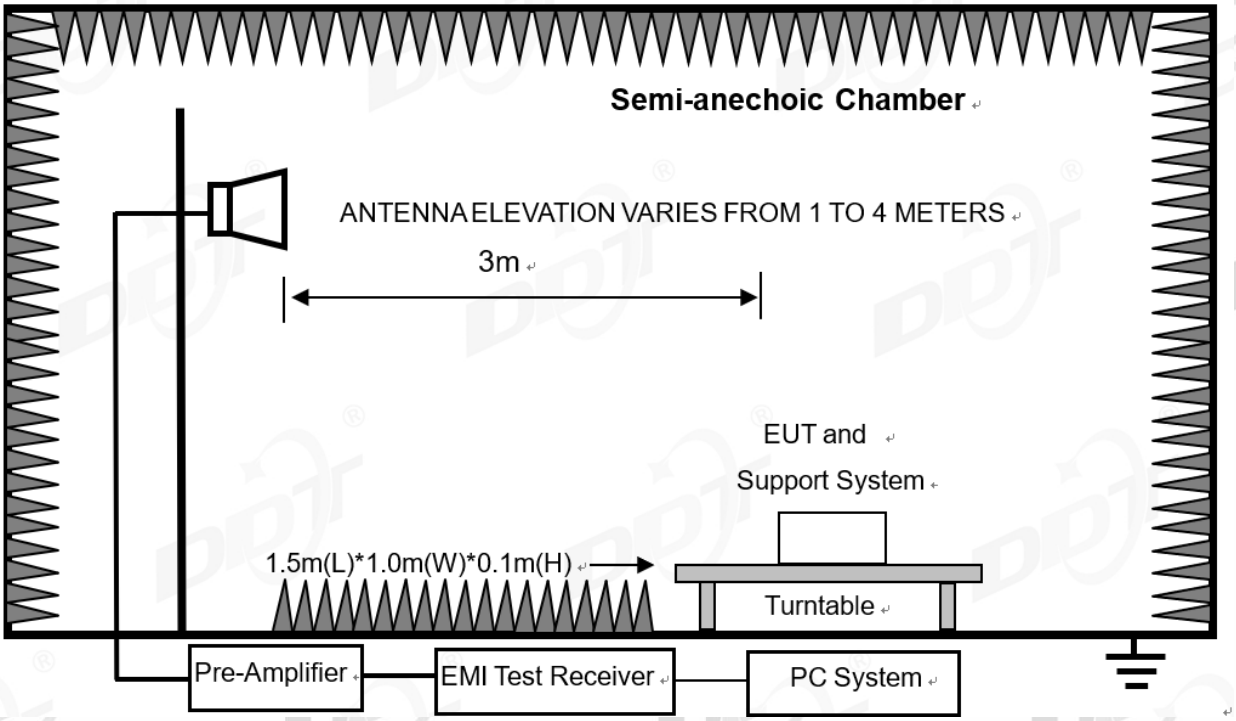
In 3m Anechoic Chamber Test Setup Diagram for 9 kHz-30 MHz



In 3m Anechoic Chamber Test Setup Diagram for 30MHz-1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



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

8.2. Limit

(1) FCC 15.205 Restricted frequency band

(2)

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

RSS-Gen section 8.10 Restricted frequency bands*

MHz	MHz	MHz	GHz
0.090-0.110	12.51975-12.52025	240-285	3500-4400
0.495-0.505	12.57675-12.57725	322-335.4	4.5-5.15
2.1735-2.1905	13.36-13.41	399.9-410	5.35-5.46
3.020-3.026	16.42-16.423	608-614	7.25-7.75
4.125-4.128	16.69475-16.69525	960-1427	8.025-8.5
4.1772&4.17775	16.80425-16.80475	1435-1626.5	9.0-9.2
4.2072&4.20775	25.5-25.67	1645.5-1646.5	9.3-9.5
5.677-5.683	37.5-38.25	1660-1710	10.6-12.7
6.215-6.218	73-74.6	1718.8-1722.2	13.25-13.4
6.26775-6.26825	74.8-75.2	2200-2300	14.47-14.5
6.31175-6.31225	108-138	2310-2390	15.35-16.2
8.291-8.294	149.9-150.05	2483.5-2500	17.7-21.4
8.362-8.366	156.52475-156.52525	2655-2900	22.01-23.12
8.37625-8.38675	156.7-156.9	3260-3267	23.6-24.0
8.41425-8.41475	162.0125-167.17	3332-3339	31.2-31.8
12.29-12.293	167.72-173.2	3345.8-3358	36.43-36.5
			Above 38.6

* Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

(2) FCC 15.209 Limit & RSS-Gen section 8.9 Limit

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/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 30MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$Limit_{3m}(dBuV/m) = Limit_{30m}(dBuV/m) + 40Log(30m/3m)$$

(3) Limit for this EUT

The emissions appearing within 15.205 restricted frequency bands shall not exceed the limits

shown in 15.209, and the emissions appearing within RSS-Gen section 8.10 Restricted frequency bands shall not exceed the limits shown in RSS-Gen section 8.9, all the other emissions shall be at least 20 dB below the fundamental emissions or comply with 15.209 limits and RSS-Gen section 8.9 limits.

8.3. Test Procedure

(1) EUT height should be 0 m for below 1 GHz at a semi-anechoic chamber while EUT height should be 0 m for above 1 GHz at full chamber or semi-anechoic chamber ground with absorbers.

(2) The antenna used as below table.

Test frequency range	Test antenna used	Measuring 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(1GHz-18GHz)	3 m
18 GHz-40 GHz	Horn Antenna(18GHz-40GHz)	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 be 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 3 m 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.

(3) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9 kHz to 25 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 1m 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 25 GHz (tenth harmonic of fundamental frequency) was

investigated, and no any obvious emission were detected from 18GHz to 25GHz, so below final test was performed with frequency range from 9kHz to 18GHz.

(4) 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.

(5) 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.

(6) 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

(7) For emissions above 1GHz, 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; RMS detector RBW 1 MHz VBW 10 Hz for Average measure (according ANSI C63.10:2013 clause 4.2.3.2.3 procedure for average measure).

8.4. Test result

PASS. (See below detailed test result)

All the emissions except fundamental emission from 9 kHz to 25 GHz were comply with 15.209 limits and RSS-Gen section 8.9 limits.

.

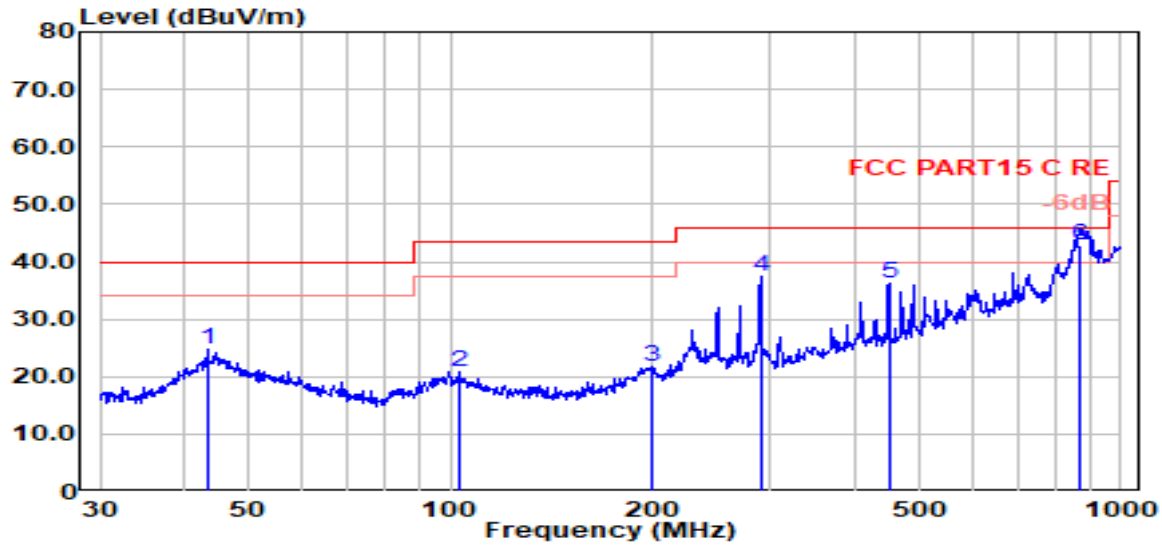
Note1: According exploratory test no any obvious emission was detected from 9 kHz to 30 MHz and 18 GHz to 25 GHz, so the final test was performed with frequency range from 30 MHz to 18 GHz and recorded in below.

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 emissions below 1 GHz, the final test was only performed with EUT working in 11B, Tx CH6 mode.

Radiated Emission test (below 1GHz)

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\ZCB\FCC BELOW 1G\FCC BELOW 1G_00003.EMI	
Test Date	: 2021-09-24	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: Tx mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: VLUB 9163 3#/3m/HORIZONTAL
Memo	: 2.4GWIFI		

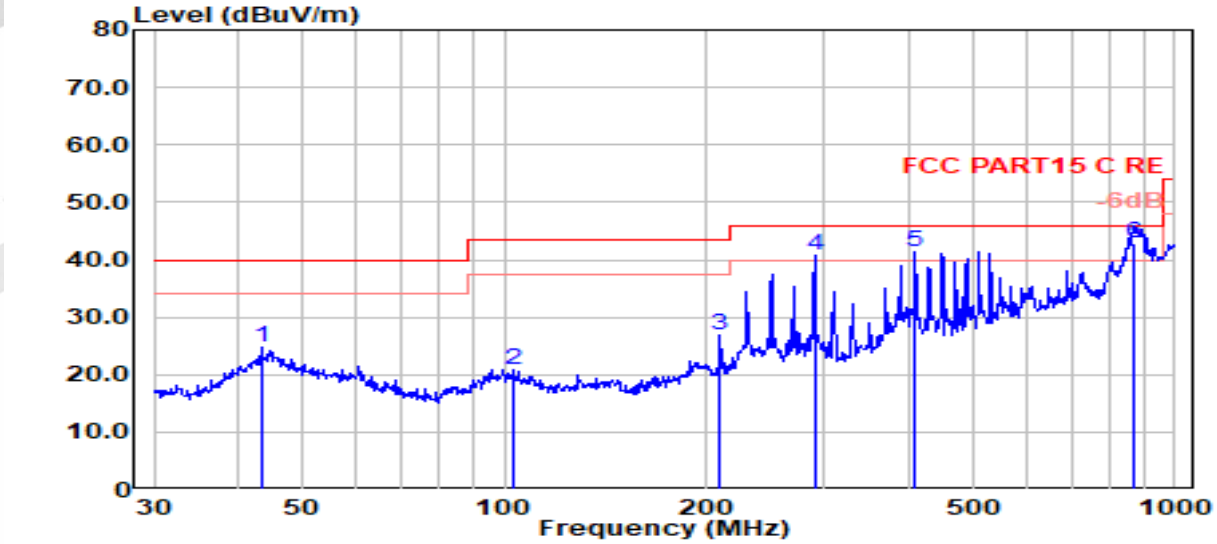


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	43.35	6.50	14.61	3.65	24.77	40.00	-15.23	QP	HORIZONTAL
2	102.72	5.54	11.53	3.90	20.97	43.50	-22.53	QP	HORIZONTAL
3	199.29	5.42	11.97	4.35	21.73	43.50	-21.77	QP	HORIZONTAL
4	290.02	19.72	13.00	4.67	37.39	46.00	-8.61	QP	HORIZONTAL
5	451.14	15.13	15.80	5.21	36.14	46.00	-9.86	QP	HORIZONTAL
6	869.13	15.04	21.48	6.31	42.83	46.00	-3.17	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 3#	D:\2021 report data\ZCB\FCC BELOW 1G\FCC BELOW 1G_00004.EMI	
Test Date	: 2021-09-24	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: Tx mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: VLUB 9163 3#/3m/VERTICAL
Memo	: 2.4GWIFI		



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	43.35	6.50	14.61	3.65	24.77	40.00	-15.23	QP	VERTICAL
2	102.72	5.54	11.53	3.90	20.97	43.50	-22.53	QP	VERTICAL
3	210.05	11.63	10.90	4.38	26.92	43.50	-16.58	QP	VERTICAL
4	290.02	23.20	13.00	4.67	40.87	46.00	-5.13	QP	VERTICAL
5	410.38	20.45	15.81	5.08	41.34	46.00	-4.66	QP	VERTICAL
6	869.13	15.04	21.48	6.31	42.83	46.00	-3.17	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

Radiated Emission test (above 1GHz)

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
11b CH1									
4824.00	52.22	31.38	2.77	40.36	46.00	54.00	-8.00	Average	HORIZONTAL
4824.00	60.30	31.38	2.77	40.36	54.08	74.00	-19.92	Peak	HORIZONTAL
8106.00	47.67	37.14	3.53	39.81	48.53	74.00	-25.47	Peak	HORIZONTAL
11591.00	46.33	39.79	4.16	40.14	50.15	74.00	-23.85	Peak	HORIZONTAL
14498.00	45.08	41.80	4.61	39.65	51.84	74.00	-22.16	Peak	HORIZONTAL
16402.00	46.00	38.66	4.88	39.98	49.56	74.00	-24.44	Peak	HORIZONTAL
17983.00	34.85	48.97	5.08	40.69	48.21	54.00	-5.79	Average	HORIZONTAL
17983.00	40.85	48.97	5.08	40.69	54.21	74.00	-19.79	Peak	HORIZONTAL
4824.00	50.39	31.38	2.77	40.36	44.17	54.00	-9.83	Average	VERTICAL
4824.00	59.32	31.38	2.77	40.36	53.10	74.00	-20.90	Peak	VERTICAL
7273.00	48.17	36.26	3.48	39.73	48.18	74.00	-25.82	Peak	VERTICAL
10622.00	46.50	39.92	4.03	40.35	50.10	74.00	-23.90	Peak	VERTICAL
13478.00	46.96	39.95	4.39	40.07	51.23	74.00	-22.77	Peak	VERTICAL
16742.00	44.16	39.67	4.93	40.05	48.71	74.00	-25.29	Peak	VERTICAL
17983.00	35.51	48.97	5.08	40.69	48.88	54.00	-5.12	Average	VERTICAL
17983.00	40.51	48.97	5.08	40.69	53.88	74.00	-20.12	Peak	VERTICAL
11b CH6									
4876.00	51.84	31.50	2.78	40.38	45.75	54.00	-8.25	Average	HORIZONTAL
4876.00	60.85	31.50	2.78	40.38	54.76	74.00	-19.24	Peak	HORIZONTAL
7562.00	47.80	36.94	3.48	39.76	48.46	74.00	-25.54	Peak	HORIZONTAL
10469.00	45.46	39.83	4.02	40.41	48.90	74.00	-25.10	Peak	HORIZONTAL
13257.00	45.93	39.47	4.40	40.22	49.58	74.00	-24.42	Peak	HORIZONTAL
16759.00	44.03	39.73	4.93	40.05	48.64	74.00	-25.36	Peak	HORIZONTAL
17881.00	38.39	47.58	5.05	40.63	50.39	54.00	-3.61	Average	HORIZONTAL
17881.00	41.57	47.58	5.05	40.63	53.58	74.00	-20.42	Peak	HORIZONTAL
4876.00	56.49	31.50	2.78	40.38	50.40	54.00	-3.60	Average	VERTICAL
4876.00	59.38	31.50	2.78	40.38	53.28	74.00	-20.72	Peak	VERTICAL
7545.00	47.82	36.93	3.48	39.75	48.47	74.00	-25.53	Peak	VERTICAL
9755.00	46.84	38.75	3.75	40.43	48.91	74.00	-25.09	Peak	VERTICAL
11897.00	46.81	39.42	4.27	40.11	50.40	74.00	-23.60	Peak	VERTICAL
14634.00	44.79	41.48	4.64	39.64	51.27	74.00	-22.73	Peak	VERTICAL
17762.00	39.73	45.96	5.01	40.56	50.15	54.00	-3.85	Average	VERTICAL
17762.00	42.40	45.96	5.01	40.56	52.82	74.00	-21.18	Peak	VERTICAL
11b CH11									
4924.00	53.81	31.62	2.79	40.38	47.83	54.00	-6.17	Average	HORIZONTAL
4927.00	64.23	31.62	2.79	40.39	58.26	74.00	-15.74	Peak	HORIZONTAL
7902.00	47.27	37.14	3.51	39.79	48.13	74.00	-25.87	Peak	HORIZONTAL
10605.00	46.22	39.92	4.03	40.36	49.82	74.00	-24.18	Peak	HORIZONTAL
13631.00	46.88	40.24	4.43	39.96	51.59	74.00	-22.41	Peak	HORIZONTAL
17014.00	44.08	40.55	4.96	40.11	49.48	74.00	-24.52	Peak	HORIZONTAL
17796.00	39.93	46.43	5.02	40.58	50.80	54.00	-3.20	Average	HORIZONTAL
17796.00	42.47	46.43	5.02	40.58	53.34	74.00	-20.66	Peak	HORIZONTAL
4924.00	53.81	31.62	2.79	40.38	47.83	54.00	-6.17	Average	VERTICAL

7885.00	46.54	37.72	42.38	8.68	50.56	74.00	-23.44	Peak	VERTICAL
10469.00	45.84	39.55	42.54	10.36	53.21	74.00	-20.79	Peak	VERTICAL
14141.00	43.63	41.44	42.38	12.22	54.91	74.00	-19.09	Peak	VERTICAL
14141.00	35.17	41.44	42.38	12.22	46.45	54.00	-7.55	Average	VERTICAL
16181.00	42.49	39.76	42.28	12.84	52.81	74.00	-21.19	Peak	VERTICAL
17881.00	41.89	47.50	42.47	14.35	61.27	74.00	-12.73	Peak	VERTICAL
17881.00	30.67	47.50	42.47	14.35	50.05	54.00	-3.95	Average	VERTICAL

Note: 1.30MHz~25GHz: (For only the module 3, we scan with 11b mode, 11g mode, 11n HT20 mode and 11n HT40 mode, the worst case is 11b mode)

2. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. For emissions above 1GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

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
11b CH1 & 11n HT20 MIMO CH1									
4804.00	53.16	31.33	2.76	40.36	46.89	54.00	-7.11	Average	HORIZONTAL
4804.00	60.18	31.33	2.76	40.36	53.91	74.00	-20.09	Peak	HORIZONTAL
7443.00	48.03	36.74	3.48	39.74	48.51	74.00	-25.49	Peak	HORIZONTAL
9976.00	47.63	38.80	3.79	40.58	49.64	74.00	-24.36	Peak	HORIZONTAL
11812.00	46.79	39.53	4.24	40.12	50.44	74.00	-23.56	Peak	HORIZONTAL
14617.00	46.21	41.52	4.64	39.64	52.73	74.00	-21.27	Peak	HORIZONTAL
18000.00	36.13	49.20	5.09	40.70	49.72	54.00	-4.28	Average	HORIZONTAL
18000.00	43.18	49.20	5.09	40.70	56.77	74.00	-17.23	Peak	HORIZONTAL
4804.00	52.15	31.33	2.76	40.36	45.88	54.00	-8.12	Average	VERTICAL
4804.00	60.43	31.33	2.76	40.36	54.16	74.00	-19.84	Peak	VERTICAL
7273.00	48.17	36.26	3.48	39.73	48.18	74.00	-25.82	Peak	VERTICAL
9738.00	47.20	38.75	3.74	40.42	49.28	74.00	-24.72	Peak	VERTICAL
12016.00	47.43	39.28	4.31	40.10	50.92	74.00	-23.08	Peak	VERTICAL
14651.00	46.03	41.44	4.65	39.63	52.48	74.00	-21.52	Peak	VERTICAL
18000.00	35.74	49.20	5.09	40.70	49.33	54.00	-4.67	Average	VERTICAL

Note: 1.30MHz~25GHz: (For simultaneous transmission of multiple channels and mode in the 2.4G WIFI of module 3 and 2.4G WIFI of module 2, no noticeable emission. For module 3, we scan with 11b mode, 11g mode, 11n HT20 mode and 11n HT40 mode; for module 2, we scan with 11b mode ANT 1 and ANT 2, 11g mode ANT 1 and ANT 2, 11n HT20 mode ANT 1 and ANT 2, 11n HT40 mode ANT 1 and ANT 2; the the worst case is 11b mode of module 3 and 11 n HT20 MIMO of module 2)

2. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. For emissions above 1GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

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
11b CH1& 11n20 MIMO(WLAN) CH36									
9211.00	46.94	38.18	3.67	40.05	48.74	74.00	-25.26	Peak	HORIZONTAL
11370.00	46.17	39.93	4.10	40.16	50.04	74.00	-23.96	Peak	HORIZONTAL
12747.00	46.39	38.80	4.34	40.32	49.20	74.00	-24.80	Peak	HORIZONTAL
14464.00	45.75	41.74	4.61	39.65	52.44	74.00	-21.56	Peak	HORIZONTAL
16181.00	45.60	38.13	4.82	39.94	48.62	74.00	-25.38	Peak	HORIZONTAL
18000.00	36.06	49.20	5.09	40.70	49.65	54.00	-4.35	Average	HORIZONTAL
18000.00	43.32	49.20	5.09	40.70	56.91	74.00	-17.09	Peak	HORIZONTAL
4824.00	50.39	31.38	2.77	40.36	44.17	54.00	-9.83	Average	VERTICAL
4824.00	59.32	31.38	2.77	40.36	53.10	74.00	-20.90	Peak	VERTICAL
7273.00	48.17	36.26	3.48	39.73	48.18	74.00	-25.82	Peak	VERTICAL
10622.00	46.50	39.92	4.03	40.35	50.10	74.00	-23.90	Peak	VERTICAL
13478.00	46.96	39.95	4.39	40.07	51.23	74.00	-22.77	Peak	VERTICAL
16742.00	44.16	39.67	4.93	40.05	48.71	74.00	-25.29	Peak	VERTICAL
17983.00	35.51	48.97	5.08	40.69	48.88	54.00	-5.12	Average	VERTICAL
11b CH1& 11n20 MIMO(WLAN) CH52									
9160.00	47.73	38.09	3.67	40.01	49.47	74.00	-24.53	Peak	HORIZONTAL
10792.00	46.53	39.96	4.02	40.28	50.23	74.00	-23.77	Peak	HORIZONTAL
12390.00	46.99	38.83	4.27	40.22	49.88	74.00	-24.12	Peak	HORIZONTAL
14430.00	45.32	41.67	4.60	39.66	51.94	74.00	-22.06	Peak	HORIZONTAL
16436.00	45.63	38.75	4.88	39.99	49.28	74.00	-24.72	Peak	HORIZONTAL
18000.00	36.11	49.20	5.09	40.70	49.70	54.00	-4.30	Average	HORIZONTAL
18000.00	44.04	49.20	5.09	40.70	57.63	74.00	-16.37	Peak	HORIZONTAL
8735.00	45.80	37.32	3.62	39.87	46.86	74.00	-27.14	Peak	VERTICAL
10588.00	47.63	39.92	4.03	40.36	51.21	74.00	-22.79	Peak	VERTICAL
12016.00	46.70	39.28	4.31	40.10	50.18	74.00	-23.82	Peak	VERTICAL
13801.00	46.36	40.54	4.49	39.84	51.55	74.00	-22.45	Peak	VERTICAL
16164.00	44.64	38.09	4.82	39.93	47.62	74.00	-26.38	Peak	VERTICAL
18000.00	36.03	49.20	5.09	40.70	49.62	54.00	-4.38	Average	VERTICAL
18000.00	43.86	49.20	5.09	40.70	57.45	74.00	-16.55	Peak	VERTICAL
11b CH1& 11n20 MIMO(WLAN) CH100									
8973.00	46.19	37.75	3.66	39.90	47.70	74.00	-26.30	Peak	HORIZONTAL
10639.00	46.95	39.93	4.03	40.34	50.56	74.00	-23.44	Peak	HORIZONTAL
12475.00	47.01	38.73	4.26	40.24	49.76	74.00	-24.24	Peak	HORIZONTAL
14277.00	45.39	41.40	4.58	39.67	51.70	74.00	-22.30	Peak	HORIZONTAL
16181.00	45.53	38.13	4.82	39.94	48.55	74.00	-25.45	Peak	HORIZONTAL
18000.00	36.32	49.20	5.09	40.70	49.91	54.00	-4.09	Average	HORIZONTAL
18000.00	44.21	49.20	5.09	40.70	57.80	74.00	-16.20	Peak	HORIZONTAL
9177.00	46.64	38.12	3.67	40.02	48.40	74.00	-25.60	Peak	VERTICAL
10843.00	46.36	39.97	4.02	40.26	50.09	74.00	-23.91	Peak	VERTICAL
12645.00	46.75	38.76	4.31	40.29	49.52	74.00	-24.48	Peak	VERTICAL
14583.00	45.59	41.60	4.63	39.64	52.17	74.00	-21.83	Peak	VERTICAL
16453.00	44.80	38.79	4.89	39.99	48.49	74.00	-25.51	Peak	VERTICAL
18000.00	36.45	49.20	5.09	40.70	50.04	54.00	-3.96	Average	VERTICAL

18000.00	44.37	49.20	5.09	40.70	57.96	74.00	-16.04	Peak	VERTICAL
11b CH1& 11n20 MIMO(WLAN) CH149									
9228.00	46.36	38.21	3.67	40.06	48.19	74.00	-25.81	Peak	HORIZONTAL
10724.00	46.50	39.94	4.03	40.31	50.16	74.00	-23.84	Peak	HORIZONTAL
12628.00	47.10	38.75	4.30	40.29	49.86	74.00	-24.14	Peak	HORIZONTAL
14481.00	44.44	41.77	4.61	39.65	51.16	74.00	-22.84	Peak	HORIZONTAL
16538.00	45.10	39.02	4.90	40.01	49.02	74.00	-24.98	Peak	HORIZONTAL
18000.00	36.16	49.20	5.09	40.70	49.75	54.00	-4.25	Average	HORIZONTAL
18000.00	42.81	49.20	5.09	40.70	56.40	74.00	-17.60	Peak	HORIZONTAL
8769.00	46.93	37.38	3.62	39.88	48.06	74.00	-25.94	Peak	VERTICAL
10316.00	47.40	39.50	3.95	40.47	50.36	74.00	-23.64	Peak	VERTICAL
11710.00	46.89	39.65	4.21	40.13	50.61	74.00	-23.39	Peak	VERTICAL
13818.00	45.49	40.57	4.49	39.83	50.72	74.00	-23.28	Peak	VERTICAL
15467.00	45.03	38.64	4.47	39.74	48.40	74.00	-25.60	Peak	VERTICAL
18000.00	35.52	49.20	5.09	40.70	49.11	54.00	-4.89	Average	VERTICAL
18000.00	43.04	49.20	5.09	40.70	56.63	74.00	-17.37	Peak	VERTICAL

Note: 1.30MHz~25GHz: (For simultaneous transmission of multiple channels and mode in the 2.4G WIFI of module 3 and 5G WIFI of module 2, no noticeable emission. For module 3, we scan with 11b mode, 11g mode, 11n HT20 mode and 11n HT40 mode; for module 2, we scan with 11a mode ANT 1 and ANT 2, 11n20 MIMO mode ANT 1 and ANT 2, 11n40 MIMO mode ANT 1 and ANT 2, 11ac20 MIMO mode ANT 1 and ANT 2; 11ac40 MIMO mode ANT 1 and ANT 2. 11ac80 MIMO mode ANT 1 and ANT 2, the worst case is 11b mode of module 3 and 11n20 MIMO of module 2)

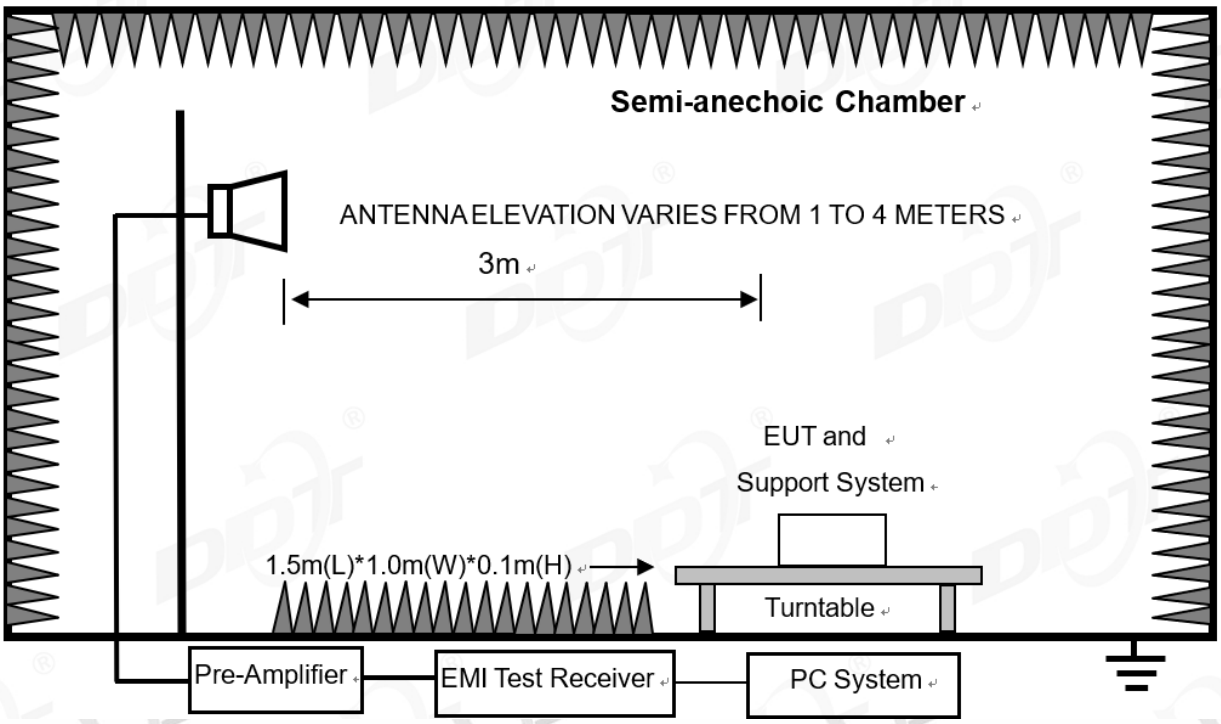
2. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. For emissions above 1GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

9. Radiated Band Edge Compliance

9.1. Block diagram of test setup



9.2. Limit

All restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400 MHz to 2483.5 MHz shall be at least 20dB below the fundamental emissions or comply with RSS-Gen Issue 3 clause 7.2.5 (Same as FCC 15.209) limits.

9.3. Test Procedure

Same with clause 8.3 except change investigated frequency range from 2310 MHz to 2430 MHz and 2440 MHz to 2500 MHz.

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

Note:1. For simultaneous transmission of multiple channels and mode in the 2.4G WIFI of module 3, 5G WIFI of module 2, and 2.4G WIFI of module 2, no noticeable emission. So, we choose only the worst case in the report.

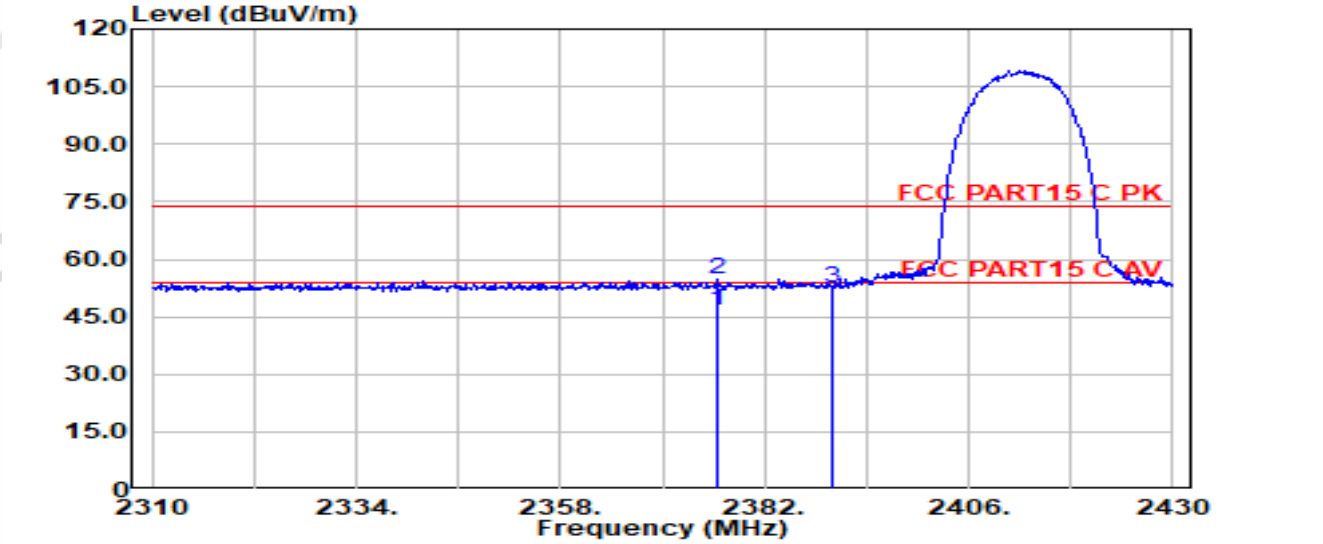
Note:2. For simultaneous transmission of multiple channels in the WLAN ,2.4G WIFI, WCDMA, and LTE, no noticeable emission was found.

9.4. Test result

PASS. (See below detailed test result)

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00003.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/HORIZONTAL
Memo	: 11B 2412		

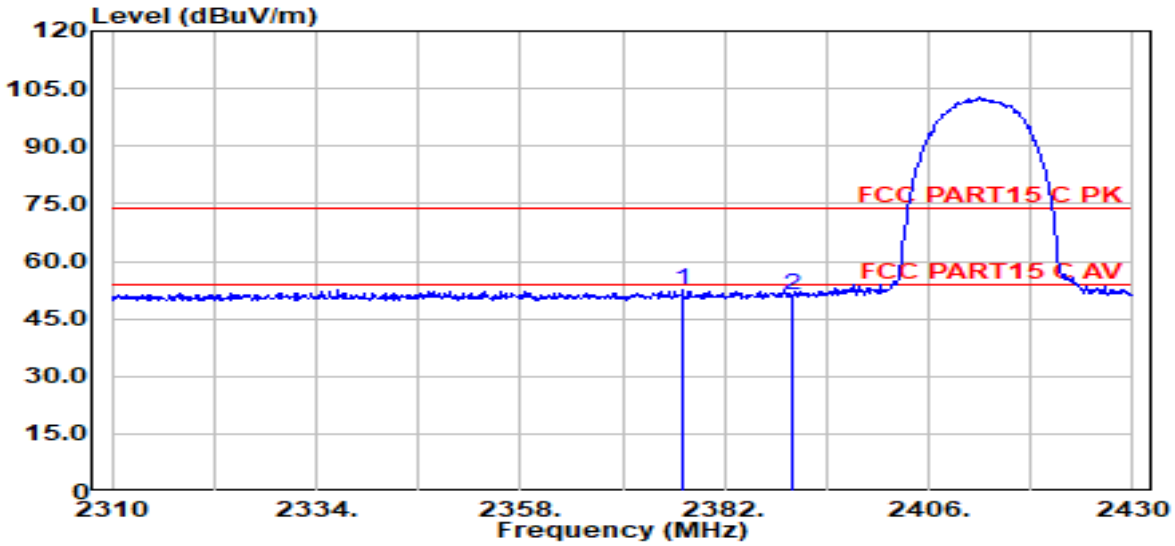


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2376.48	17.36	27.53	1.73	0.00	46.62	54.00	-7.38	Average	HORIZONTAL
2	2376.48	25.69	27.53	1.73	0.00	54.95	74.00	-19.05	Peak	HORIZONTAL
3	2390.00	23.03	27.57	1.73	0.00	52.33	74.00	-21.67	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00004.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/VERTICAL
Memo	: 11B 2412		

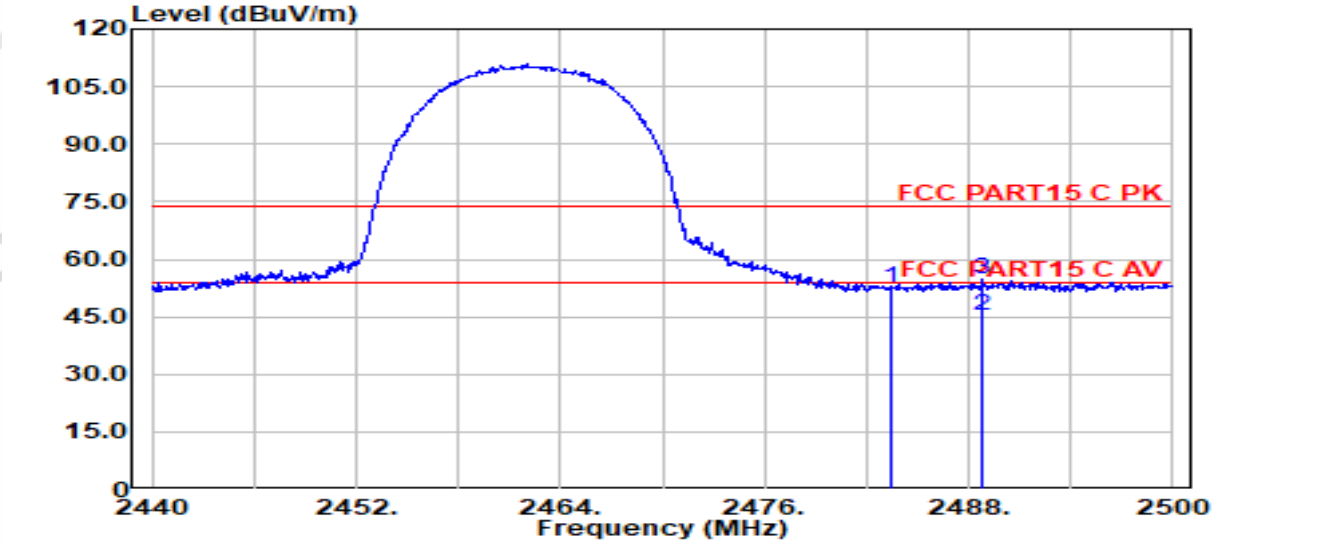


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2377.08	23.24	27.53	1.73	0.00	52.50	74.00	-21.50	Peak	VERTICAL
2	2390.00	21.97	27.57	1.73	0.00	51.27	74.00	-22.73	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00006.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/HORIZONTAL
Memo	: 11B 2462		

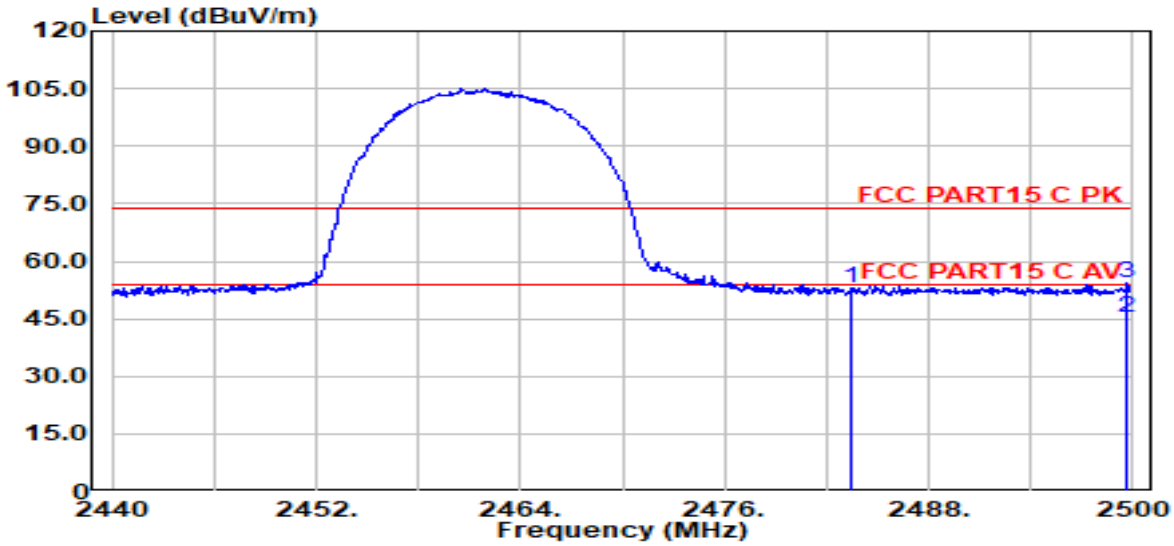


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	22.72	27.85	1.74	0.00	52.31	74.00	-21.69	Peak	HORIZONTAL
2	2488.84	15.82	27.87	1.74	0.00	45.43	54.00	-8.57	Average	HORIZONTAL
3	2488.84	25.05	27.87	1.74	0.00	54.65	74.00	-19.35	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00005.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/VERTICAL
Memo	: 11B 2462		

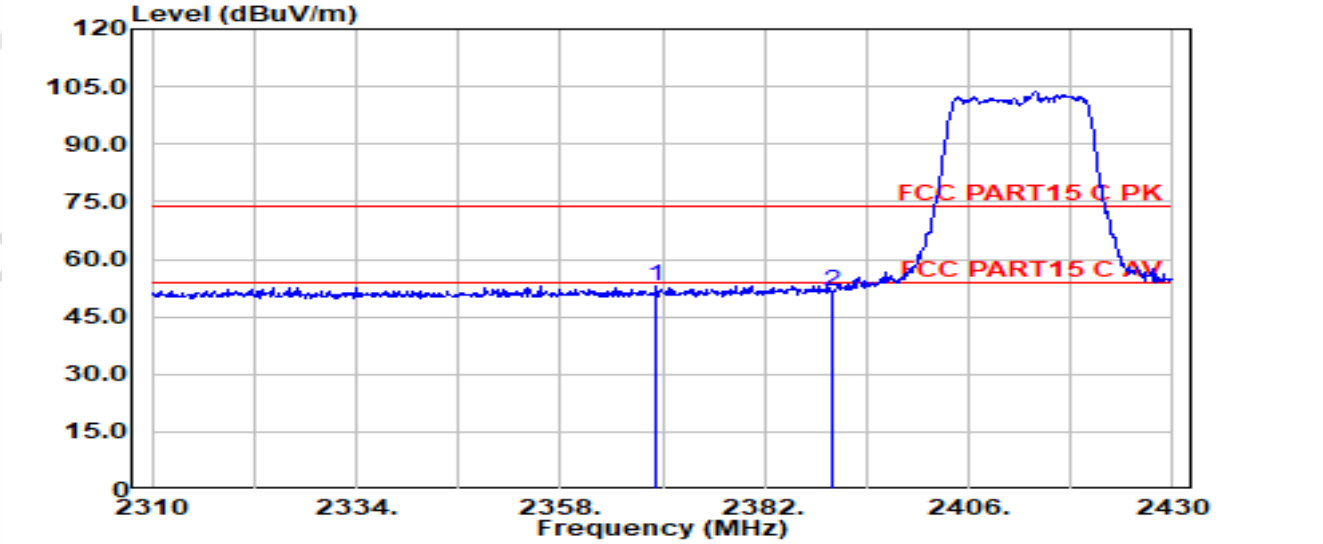


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	23.29	27.85	1.74	0.00	52.88	74.00	-21.12	Peak	VERTICAL
2	2499.70	15.62	27.90	1.74	0.00	45.26	54.00	-8.74	Average	VERTICAL
3	2499.70	24.56	27.90	1.74	0.00	54.20	74.00	-19.80	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00007.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/HORIZONTAL
Memo	: 11G 2412		

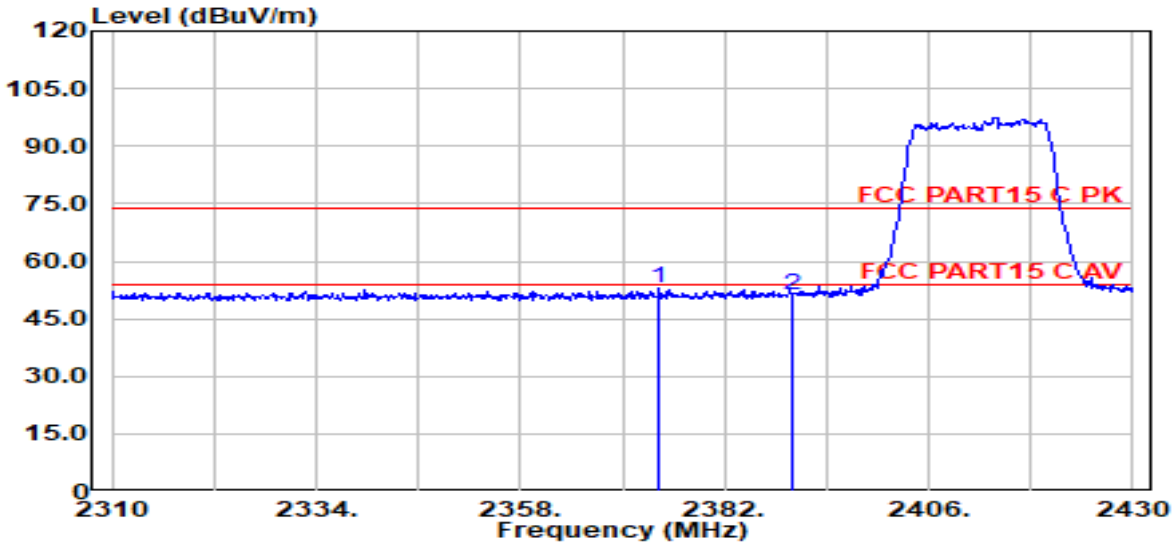


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2369.28	23.88	27.51	1.73	0.00	53.12	74.00	-20.88	Peak	HORIZONTAL
2	2390.00	22.51	27.57	1.73	0.00	51.81	74.00	-22.19	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00008.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/VERTICAL
Memo	: 11G 2412		

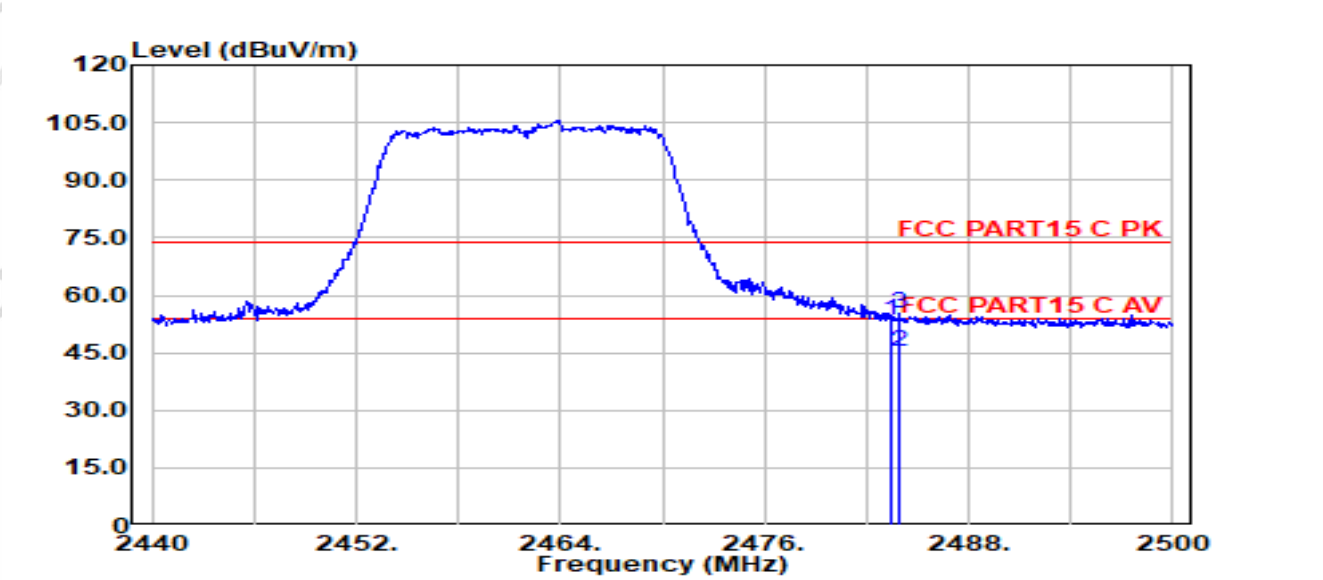


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2374.32	23.63	27.52	1.73	0.00	52.89	74.00	-21.11	Peak	VERTICAL
2	2390.00	21.87	27.57	1.73	0.00	51.17	74.00	-22.83	Peak	VERTICAL

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 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00010.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/HORIZONTAL
Memo	: 11G 2462		

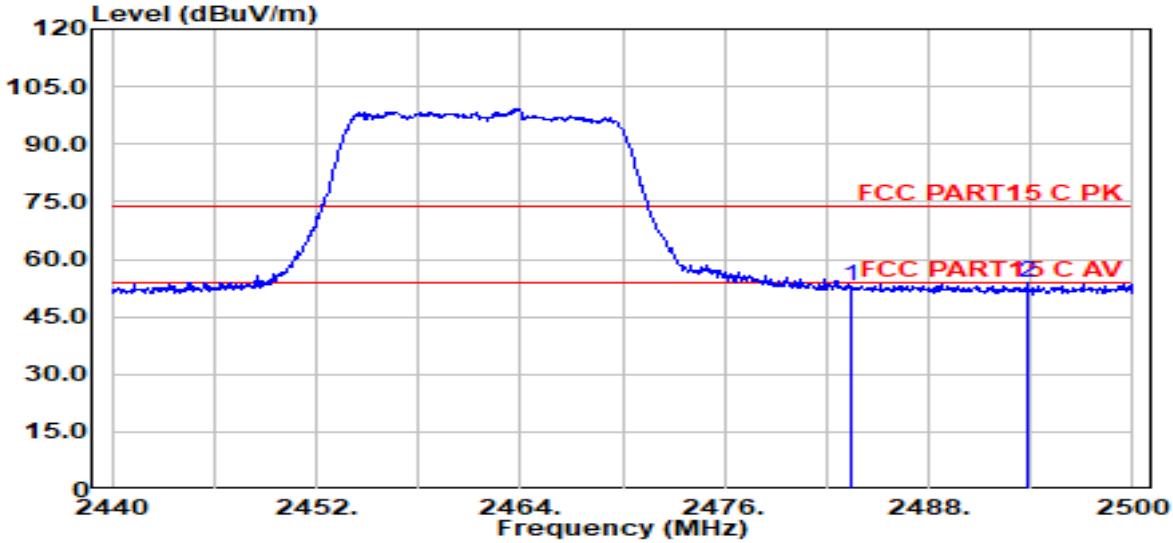


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	23.76	27.85	1.74	0.00	53.35	74.00	-20.65	Peak	HORIZONTAL
2	2483.98	15.72	27.85	1.74	0.00	45.31	54.00	-8.69	Average	HORIZONTAL
3	2483.98	25.78	27.85	1.74	0.00	55.37	74.00	-18.63	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00009.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/VERTICAL
Memo	: 11G 2462		

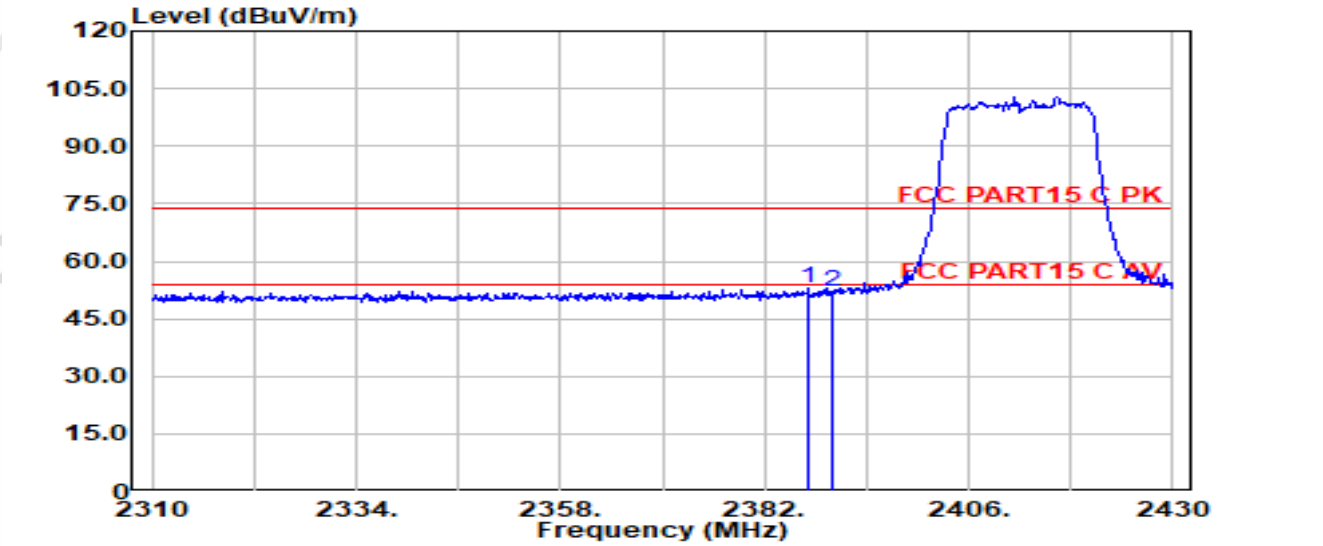


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	23.40	27.85	1.74	0.00	52.99	74.00	-21.01	Peak	VERTICAL
2	2493.82	24.04	27.88	1.74	0.00	53.66	74.00	-20.34	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00011.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/HORIZONTAL
Memo	: 11N20 2412		

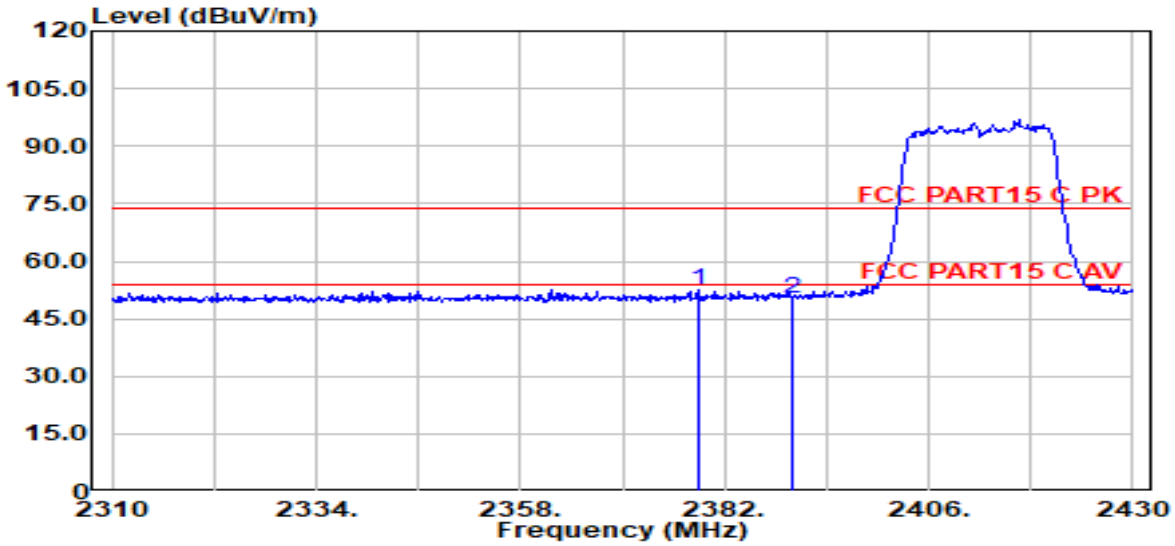


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2387.16	23.69	27.56	1.73	0.00	52.98	74.00	-21.02	Peak	HORIZONTAL
2	2390.00	22.98	27.57	1.73	0.00	52.28	74.00	-21.72	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00012.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/VERTICAL
Memo	: 11N20 2412		

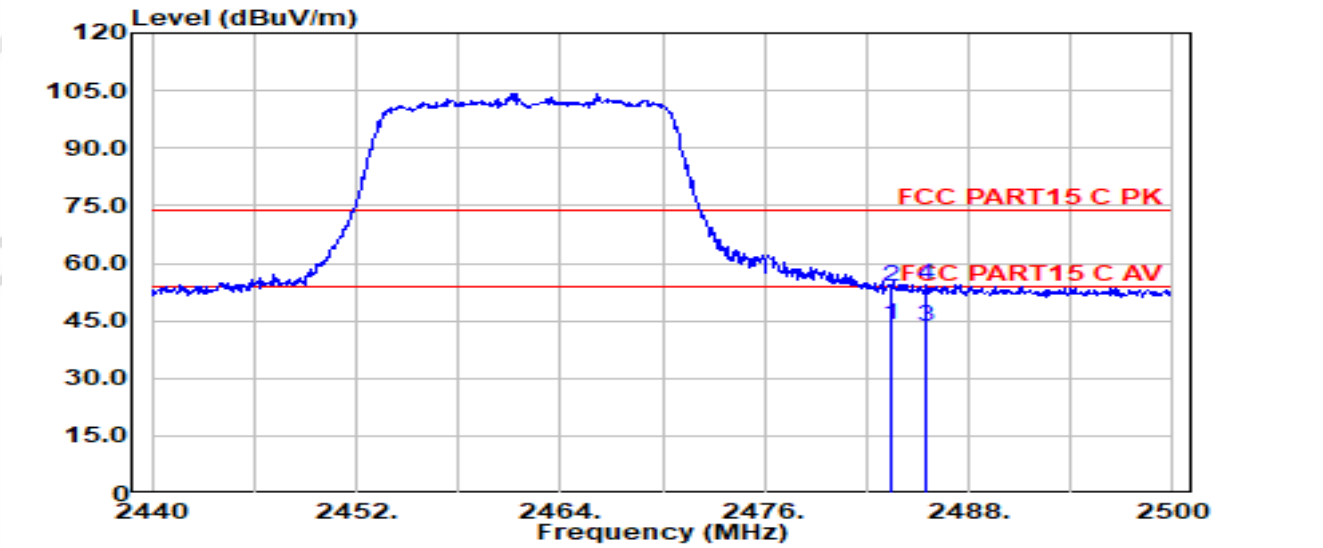


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2378.88	23.20	27.54	1.73	0.00	52.47	74.00	-21.53	Peak	VERTICAL
2	2390.00	20.93	27.57	1.73	0.00	50.24	74.00	-23.76	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00014.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/HORIZONTAL
Memo	: 11N20 2462		

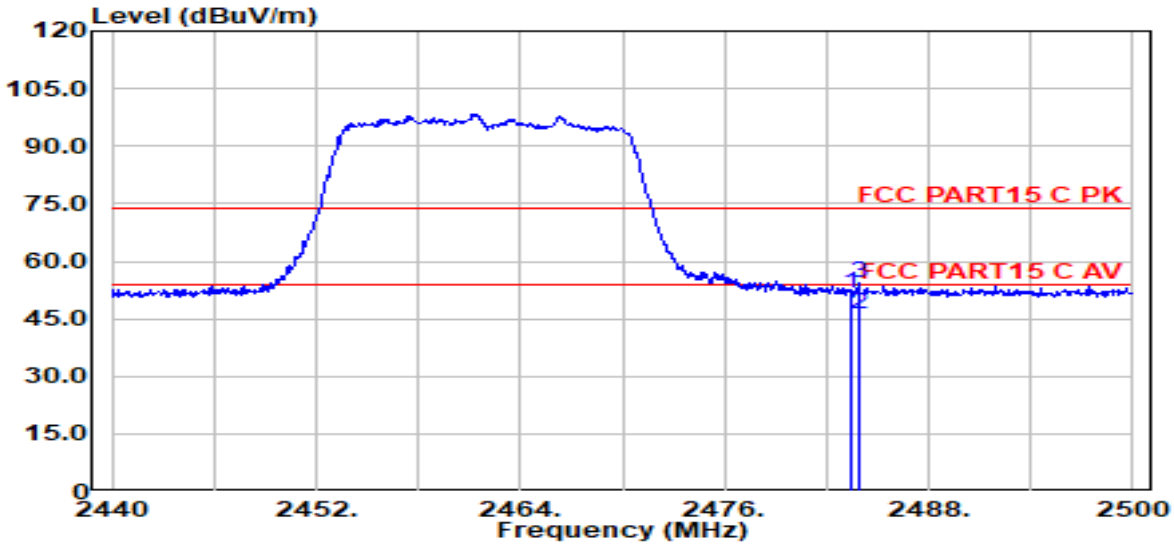


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	14.56	27.85	1.74	0.00	44.15	54.00	-9.85	Average	HORIZONTAL
2	2483.50	24.32	27.85	1.74	0.00	53.91	74.00	-20.09	Peak	HORIZONTAL
3	2485.54	14.06	27.86	1.74	0.00	43.66	54.00	-10.34	Average	HORIZONTAL
4	2485.54	24.78	27.86	1.74	0.00	54.38	74.00	-19.62	Peak	HORIZONTAL

N Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00013.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/VERTICAL
Memo	: 11N20 2462		

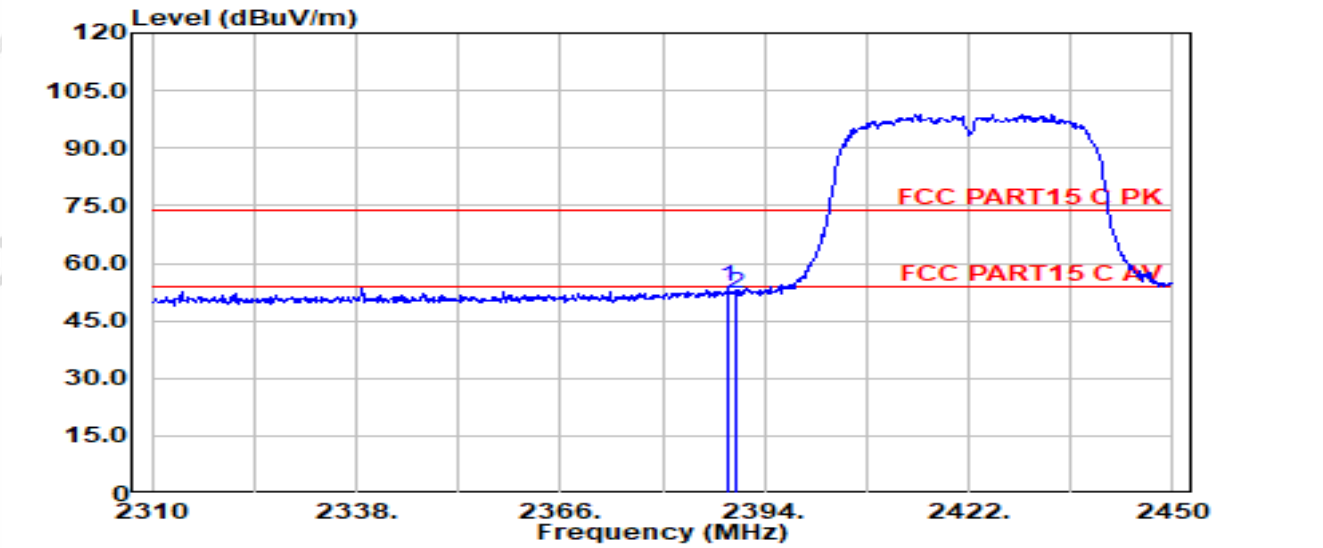


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	21.91	27.85	1.74	0.00	51.50	74.00	-22.50	Peak	VERTICAL
2	2483.92	16.82	27.85	1.74	0.00	46.41	54.00	-7.59	Average	VERTICAL
3	2483.92	24.69	27.85	1.74	0.00	54.28	74.00	-19.72	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00015.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/HORIZONTAL
Memo	: 11N40 2422		

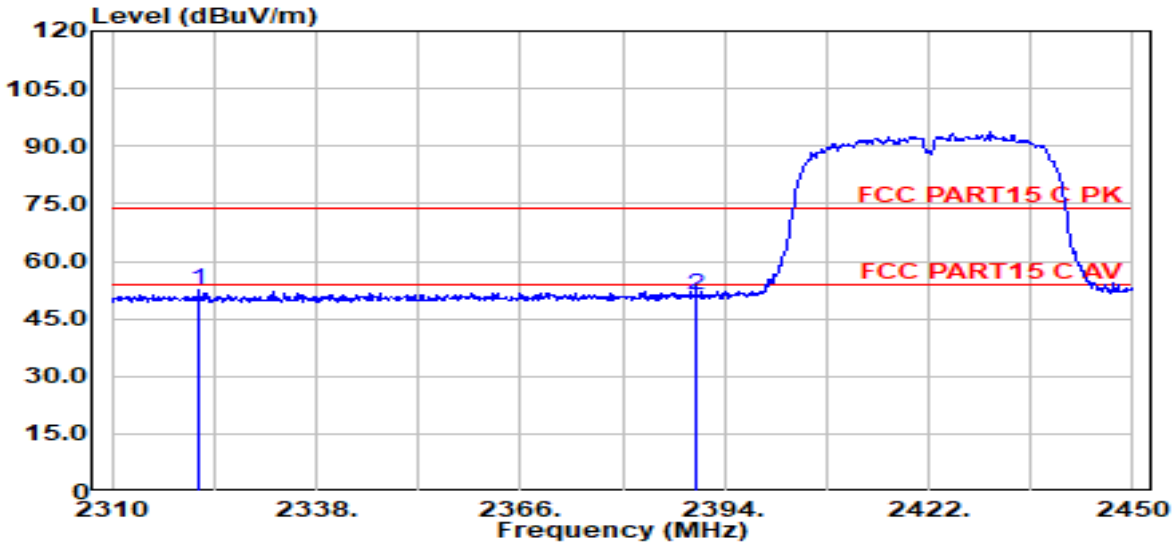


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2389.10	24.44	27.57	1.73	0.00	53.74	74.00	-20.26	Peak	HORIZONTAL
2	2389.94	22.92	27.57	1.73	0.00	52.22	74.00	-21.78	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00016.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/VERTICAL
Memo	: 11N40 2422		

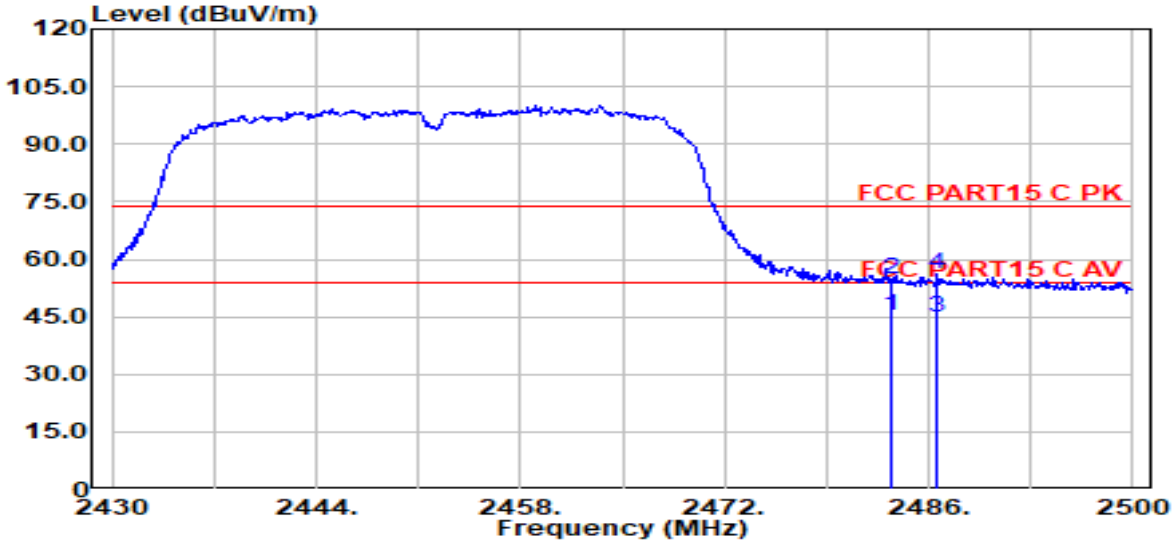


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2321.90	23.26	27.37	1.73	0.00	52.36	74.00	-21.64	Peak	VERTICAL
2	2390.00	21.95	27.57	1.73	0.00	51.26	74.00	-22.74	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00018.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/HORIZONTAL
Memo	: 11N40 2452		

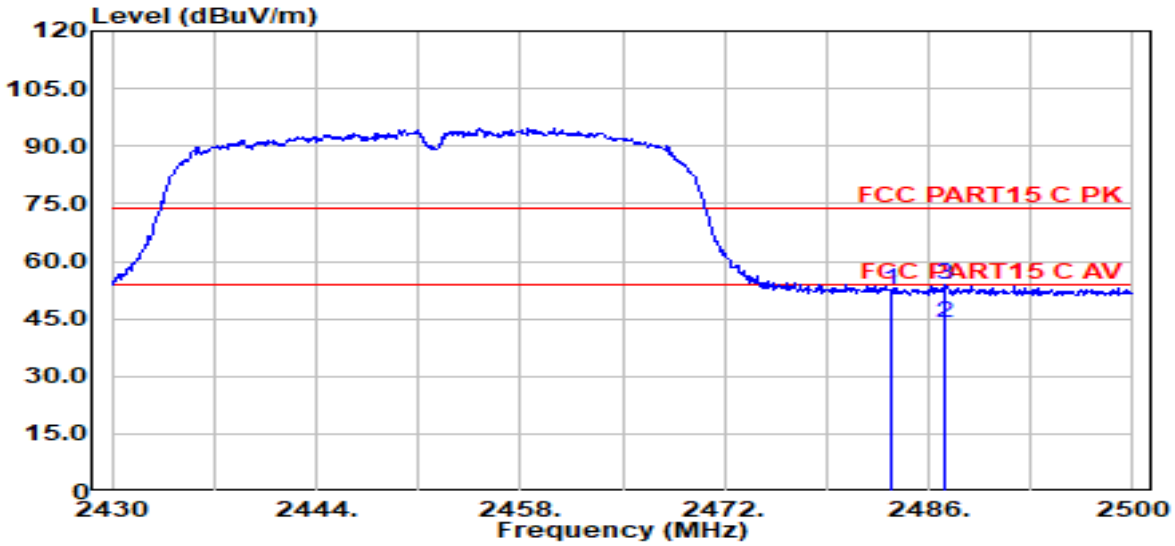


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	15.47	27.85	1.74	0.00	45.06	54.00	-8.94	Average	HORIZONTAL
2	2483.50	25.21	27.85	1.74	0.00	54.80	74.00	-19.20	Peak	HORIZONTAL
3	2486.63	15.32	27.86	1.74	0.00	44.92	54.00	-9.08	Average	HORIZONTAL
4	2486.63	26.43	27.86	1.74	0.00	56.03	74.00	-17.97	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Site	: DDT 3m Chamber 3#	D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G_00017.EMI	
Test Date	: 2021-10-08	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: TX mode
Condition	: Temp:24.5°,Humi:55%,Press:100.1kPa	**Antenna/Distance**	: 2020 BBHA 9120D/3m/VERTICAL
Memo	: 11N40 2452		

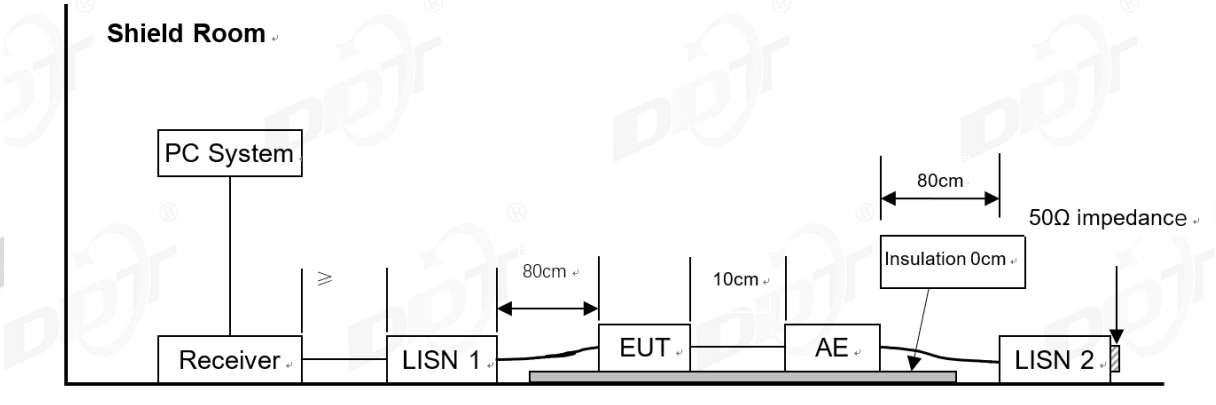


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss dB	PRM Factor (dB)	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	2483.50	22.98	27.85	1.74	0.00	52.57	74.00	-21.43	Peak	VERTICAL
2	2487.05	14.45	27.86	1.74	0.00	44.05	54.00	-9.95	Average	VERTICAL
3	2487.05	24.45	27.86	1.74	0.00	54.05	74.00	-19.95	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

10. Power Line Conducted Emission

10.1. Block diagram of test setup



10.2. Power Line Conducted Emission Limits (Class B)

Frequency	Quasi-Peak Level dB(μV)	Average Level dB(μV)
150 kHz ~ 500 kHz	66 ~ 56*	56 ~ 46*
500 kHz ~ 5 MHz	56	46
5 MHz ~ 30 MHz	60	50

Note 1: * Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

10.3. Test Procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 kHz.

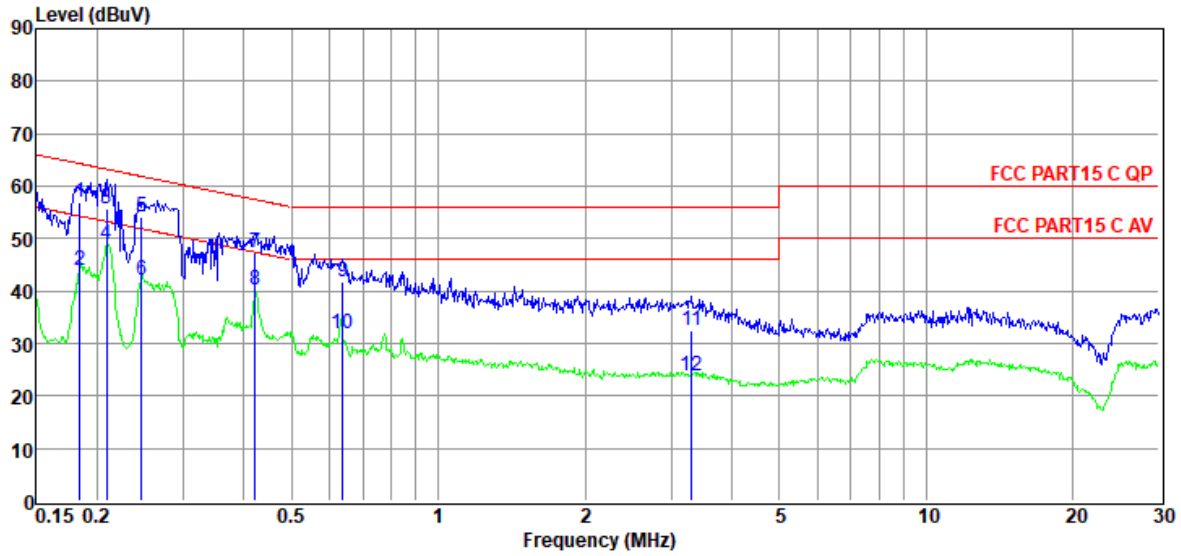
10.4. Test Result

PASS. (See below detailed test result)

Note1: All emissions not reported below are too low against the prescribed limits.
Note2: "-----" means peak detection; "-----" means average detection
Note3: Pre-test AC conducted emission at both voltage AC 120V/60Hz and AC 240V/60Hz, recorded worse case (AC 120V/60Hz).

TR-4-E-010 Conducted Emission Test Result

Test Site	: DDT 5# Shield Room	D:\2021 report data\Q21091301-1E\CE.EM6	
Test Date	: 2021-09-15	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: Tx mode
Condition	: Temp:24.5°C,Humi:55.5%,Press:101.4kPa	**LISN**	: 2020 ENV 216 2#/LINE
Memo	: 2.4GWIFI		

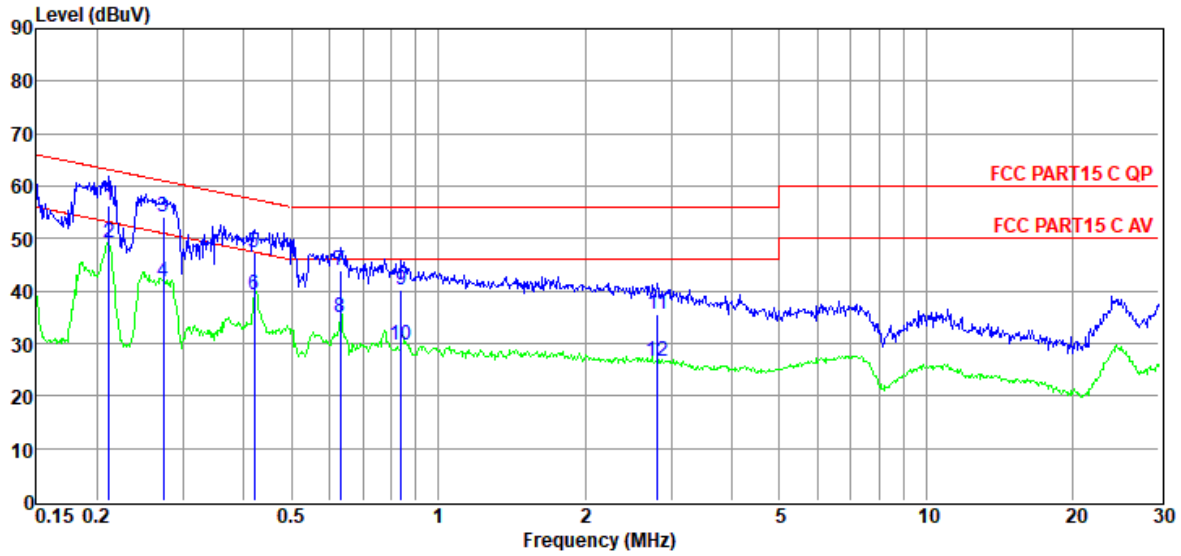


Item (Mark)	Freq. (MHz)	Read Level (dBµV)	LISN Factor (dB)	Cable Loss (dB)	Pulse Limiter Factor (dB)	Result Level (dBµV)	Limit Line (dBµV)	Over Limit (dB)	Detector	Phase
1	0.18	37.44	9.42	0.04	10.01	56.91	64.28	-7.37	QP	LINE
2	0.18	24.36	9.42	0.04	10.01	43.83	54.28	-10.45	Average	LINE
3	0.21	36.35	9.42	0.04	10.01	55.82	63.23	-7.41	QP	LINE
4	0.21	29.39	9.42	0.04	10.01	48.86	53.23	-4.37	Average	LINE
5	0.25	34.68	9.43	0.04	10.01	54.16	61.86	-7.70	QP	LINE
6	0.25	22.48	9.43	0.04	10.01	41.96	51.86	-9.90	Average	LINE
7	0.42	27.96	9.45	0.05	10.01	47.47	57.42	-9.95	QP	LINE
8	0.42	20.85	9.45	0.05	10.01	40.36	47.42	-7.06	Average	LINE
9	0.64	22.33	9.45	0.06	10.01	41.85	56.00	-14.15	QP	LINE
10	0.64	12.48	9.45	0.06	10.01	32.00	46.00	-14.00	Average	LINE
11	3.31	13.04	9.46	0.09	10.01	32.60	56.00	-23.40	QP	LINE
12	3.31	4.40	9.46	0.09	10.01	23.96	46.00	-22.04	Average	LINE

Note: 1. Result Level = Read Level +LISN Factor + Pulse Limiter Factor + Cable loss.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

TR-4-E-010 Conducted Emission Test Result

Test Site	: DDT 5# Shield Room	D:\2021 report data\Q21091301-1E\CE.EM6	
Test Date	: 2021-09-15	**Tested By**	: Kennys
EUT	: AI Delivery Robot	**Model Number**	: OS-R-DR01
Power Supply	: AC 120V/60Hz	**Test Mode**	: Tx mode
Condition	: Temp:24.5°C,Humi:55.5%,Press:101.4kPa	**LISN**	: 2020 ENV 216 2#/NEUTRAL
Memo	: 2.4GWIFI		



Item (Mark)	Freq. (MHz)	Read Level (dBµV)	LISN Factor (dB)	Cable Loss (dB)	Pulse Limiter Factor (dB)	Result Level (dBµV)	Limit Line (dBµV)	Over Limit (dB)	Detector	Phase
1	0.21	36.94	9.39	0.04	10.01	56.38	63.14	-6.76	QP	NEUTRAL
2	0.21	29.78	9.39	0.04	10.01	49.22	53.14	-3.92	Average	NEUTRAL
3	0.27	34.78	9.39	0.04	10.01	54.22	61.03	-6.81	QP	NEUTRAL
4	0.27	22.22	9.39	0.04	10.01	41.66	51.03	-9.37	Average	NEUTRAL
5	0.42	27.99	9.40	0.05	10.01	47.45	57.46	-10.01	QP	NEUTRAL
6	0.42	19.76	9.40	0.05	10.01	39.22	47.46	-8.24	Average	NEUTRAL
7	0.63	24.34	9.40	0.06	10.01	43.81	56.00	-12.19	QP	NEUTRAL
8	0.63	15.41	9.40	0.06	10.01	34.88	46.00	-11.12	Average	NEUTRAL
9	0.84	20.79	9.41	0.07	10.01	40.28	56.00	-15.72	QP	NEUTRAL
10	0.84	10.26	9.41	0.07	10.01	29.75	46.00	-16.25	Average	NEUTRAL
11	2.81	16.17	9.43	0.09	10.01	35.70	56.00	-20.30	QP	NEUTRAL
12	2.81	7.18	9.43	0.09	10.01	26.71	46.00	-19.29	Average	NEUTRAL

Note: 1. Result Level = Read Level +LISN Factor + Pulse Limiter Factor + Cable loss.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

11. Antenna Requirements

11.1. 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 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

For intentional device, according to RSS-Gen issue 5 section 6.8.
The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

11.2. Result

The antennas used for this product are integrated antenna and other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is 2 dBi.