

Product Name: Computer	Report No: FCC022023-0289RF2
Product Model: IPASONS6-X7004457152	Security Classification: Open
Version: V1.0	Total Page:106

TIRT Testing Report



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FCC Radio Test Report

FCC ID: 2ATY8-IPASONS6

This report concerns: Original Grant

Equipment : Computer
Brand Name : **IPASON**
Test Model : IPASONS6-X7004457152
Series Model : IPASONS6***** (* can be 0-9,a-z,A-Z or "-")
Applicant : Wuhan Ipson Technology Co., Ltd
Address : 5th Floor, Multifunctional Building, No. 1, Ipson Avenue, Shekou Street, Huangpi District, Wuhan City, Hubei Province, China
Manufacturer : Wuhan Ipson Technology Co., Ltd
Address : 5th Floor, Multifunctional Building, No. 1, Ipson Avenue, Shekou Street, Huangpi District, Wuhan City, Hubei Province, China
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Date of Test : Feb. 06, 2023~ Mar. 20, 2023
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Report Version : V1.0
Test Sample : Engineering Sample No.: 20221103019324
Standard(s) : FCC CFR Title 47, Part 15, Subpart E
FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01
FCC KDB 662911 D01 Multiple Transmitter Output v02r01
ANSI C63.10-2013

- The test result referred exclusively to the presented test model /sample.
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Table of Contents	Page
REPORT ISSUED HISTORY	5
1 . SUMMARY OF TEST RESULTS	6
1.1 TEST LOCATION	7
1.2 MEASUREMENT UNCERTAINTY	7
1.3 TEST ENVIRONMENT CONDITIONS	7
2 . GENERAL INFORMATION	8
2.1 GENERAL DESCRIPTION OF EUT	8
2.2 TEST MODES	11
2.3 PARAMETERS OF TEST SOFTWARE	13
2.4 DUTY CYCLE	14
2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	16
2.6 SUPPORT UNITS	16
3 . AC POWER LINE CONDUCTED EMISSIONS	17
3.1 LIMIT	17
3.2 TEST PROCEDURE	17
3.3 DEVIATION FROM TEST STANDARD	17
3.4 TEST SETUP	18
3.5 EUT OPERATION CONDITIONS	18
3.6 TEST RESULTS	18
4 . RADIATED EMISSIONS	19
4.1 LIMIT	19
4.2 TEST PROCEDURE	20
4.3 DEVIATION FROM TEST STANDARD	21
4.4 TEST SETUP	21
4.5 EUT OPERATION CONDITIONS	22
4.6 TEST RESULTS - 9 KHZ TO 30 MHZ	22
4.7 TEST RESULTS - 30 MHZ TO 1000 MHZ	22
4.8 TEST RESULTS - ABOVE 1000 MHZ	22
5 . BANDWIDTH	23
5.1 LIMIT	23
5.2 TEST PROCEDURE	23
5.3 DEVIATION FROM STANDARD	23
5.4 TEST SETUP	24

Table of Contents	Page
5.5 EUT OPERATION CONDITIONS	24
5.6 TEST RESULTS	24
6 . MAXIMUM OUTPUT POWER	25
6.1 LIMIT	25
6.2 TEST PROCEDURE	26
6.3 DEVIATION FROM STANDARD	26
6.4 TEST SETUP	26
6.5 EUT OPERATION CONDITIONS	26
6.6 TEST RESULTS	26
7 . POWER SPECTRAL DENSITY	27
7.1 LIMIT	27
7.2 TEST PROCEDURE	27
7.3 DEVIATION FROM STANDARD	27
7.4 TEST SETUP	28
7.5 EUT OPERATION CONDITIONS	28
7.6 TEST RESULTS	28
9 . MEASUREMENT INSTRUMENTS LIST	30
10 . EUT TEST PHOTOS	31
APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS	34
APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ	36
APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ	37
APPENDIX D - RADIATED EMISSION - ABOVE 1000 MHZ	39
APPENDIX F - MAXIMUM OUTPUT POWER	95
APPENDIX G - POWER SPECTRAL DENSITY	97
APPENDIX H - FREQUENCY STABILITY	105

REPORT ISSUED HISTORY

Report No.	Version	Description	Issued Date	Note
FCC022023-0289RF2	V1.0	Original Report.	2023.03.21	Valid

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC CFR Title 47, Part 15, Subpart E				
Standard(s) Section	Test Item	Test Result	Judgment	Remark
15.207 15.407(b)	AC Power Line Conducted Emissions	APPENDIX A	PASS	-----
15.407(b) 15.205(a) 15.209(a)	Radiated Emissions	APPENDIX B APPENDIX C APPENDIX D	PASS	-----
15.407(a) 15.407(e)	Bandwidth	APPENDIX E	PASS	-----
15.407(a)	Maximum Output Power	APPENDIX F	PASS	-----
15.407(a)	Power Spectral Density	APPENDIX G	PASS	-----
15.407(g)	Frequency Stability	APPENDIX H	PASS	-----
15.203	Antenna Requirements	-----	PASS	NOTE (2)
15.407(c)	Automatically Discontinue Transmission	-----	PASS	NOTE (3)

Note:

- (1) "N/A" denotes test is not applicable in this test report.
- (2) The device what use a detachable antenna were considered sufficient to comply with the provisions of 15.203.
- (3) During no any information transmission, the EUT can automatically discontinue transmission and become standby mode for power saving. the EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.
- (4) For UNII-1 this device was functioned as a
 - ☐ Outdoor access point device
 - ☒ Indoor access point device
 - ☐ Fixed point-to-point access points device
 - ☐ AP device

1.1 TEST LOCATION

Company:	Beijing TIRT Technology Service Co.,Ltd Shenzhen
Address:	101, 3 # Factory Building, Gongjin Electronics, Shatin Community, Kengzi Street, Pingshan District, Shenzhen City, China
CNAS Registration Number:	CNAS L14158
A2LA Registration Number	6049.01
Telephone:	+86-0755-27087573

1.2 MEASUREMENT UNCERTAINTY

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

The TIRT measurement uncertainty as below table:

Uncertainty	
Parameter	Uncertainty
Occupied Channel Bandwidth	±142.12 KHz
RF power conducted	±0.74 dB
RF power radiated	±3.25dB
Spurious emissions, conducted	±1.78dB
Spurious emissions, radiated (30MHz~1GHz)	±4.6dB
Spurious emissions, radiated (1GHz ~ 18GHz)	±4.9dB
Conduction Emissions(150kHz~30MHz)	±3.1 dB
Humidity	±4.6%
Temperature	±0.7°C
Time	±1 25%

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By
AC Power Line Conducted Emissions	24.4°C	56%	AC 120V/60Hz	Stone Tang
Radiated Emissions-9kHz to 30MHz	24.6°C	55%	AC 120V/60Hz	Stone Tang
Radiated Emissions-30MHz to 1000MHz	24.6°C	55%	AC 120V/60Hz	Stone Tang
Radiated Emissions-Above 1000 MHz	24.6°C	55%	AC 120V/60Hz	Stone Tang
Bandwidth	24.2°C	54%	AC 120V/60Hz	Stone Tang
Maximum Output Power	24.2°C	54%	AC 120V/60Hz	Stone Tang
Power Spectral Density	24.2°C	54%	AC 120V/60Hz	Stone Tang
Frequency Stability	Normal & Extreme	54%	Normal & Extreme	Stone Tang

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Computer
Brand Name	IPASON
Test Model	IPASONS6-X7004457152
Series Model	IPASONS6***** (* can be 0-9,a-z,A-Z or "-")
Model Difference(s)	Models differ only from sales customers, markets, etc. RF and electromagnetic compatibility are not affected.
Software Version	V1.0
Hardware Version	V1.0
Power Source	Voltage supplied from AC
Power Rating	AC 100-240V~50/60Hz 10-6A
Operation Frequency Band(s)	UNII-1: 5150 MHz ~ 5250 MHz UNII-3: 5725 MHz ~ 5850 MHz
Modulation Type	IEEE 802.11a/n/ac: OFDM
Bit Rate of Transmitter	IEEE 802.11a: 54/48/36/24/18/12/9/6 Mbps IEEE 802.11n: up to 300 Mbps IEEE 802.11ac: up to 866.7 Mbps
Maximum Output Power_UNII-1	IEEE 802.11ac80: 12.39 dBm (0.017 W)
Maximum Output Power_UNII-3	IEEE 802.11ac80: 12.42 dBm (0.017 W)

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2. Channel List:

IEEE 802.11a IEEE 802.11n(HT20) IEEE 802.11ac(VHT20)		IEEE 802.11n(HT40) IEEE 802.11ac(VHT40)		IEEE 802.11ac(VHT80)	
UNII-1		UNII-1		UNII-1	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

IEEE 802.11a IEEE 802.11n(HT20) IEEE 802.11ac(VHT20)		IEEE 802.11n(HT40) IEEE 802.11ac(VHT40)		IEEE 802.11ac(VHT80)	
UNII-3		UNII-3		UNII-3	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	151	5755	155	5775
153	5765	159	5795		
157	5785				
161	5805				
165	5825				

3. Antenna Specification:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Dipole Ant	N/A	4.73
2	N/A	N/A	Dipole Ant	N/A	4.73

Note:

- This EUT not supports CDD, and all antennas have the same gain,
Directional gain = $G_{ANT} + \text{Array Gain}$.
For power measurements, Array Gain=0dB ($N_{ANT} \leq 4$), so the Directional gain=4.73.
For power spectral density measurements, $N_{ANT}=2$, $N_{SS} = 1$.
So the Directional gain= $G_{ANT} + \text{Array Gain} = G_{ANT} + 10\log(N_{ANT}/N_{SS})\text{dBi} = 4.73 + 10\log(2/1)\text{dBi} = 7.74$.
So limit of power spectral density in MIMO mode is $11 - (7.74 - 6) = 9.26$.(UNII-1)
So limit of power spectral density in MIMO mode is $30 - (7.74 - 6) = 28.26$.(UNII-3)
- The antenna gain are provided by the manufacturer.

4. Table for Antenna Configuration:

Operating Mode	TX Mode	TX
IEEE 802.11a		V (Ant. 1)1T1R
IEEE 802.11n(HT20)		V (Ant. 1 + Ant. 2) 2T2R
IEEE 802.11n(HT40)		V (Ant. 1 + Ant. 2) 2T2R
IEEE 802.11ac(VHT20)		V (Ant. 1 + Ant. 2) 2T2R
IEEE 802.11ac(VHT40)		V (Ant. 1 + Ant. 2) 2T2R
IEEE 802.11ac(VHT80)		V (Ant. 1 + Ant. 2) 2T2R

2.2 TEST MODES

The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

Pretest Mode	Description
Mode 1	TX A Mode Channel 36/40/48 (UNII-1)
Mode 2	TX AC(VHT20) Mode Channel 36/40/48 (UNII-1)
Mode 3	TX AC(VHT40) Mode Channel 38/46 (UNII-1)
Mode 4	TX AC(VHT80) Mode Channel 42 (UNII-1)
Mode 5	TX A Mode Channel 149/157/165 (UNII-3)
Mode 6	TX AC(VHT20) Mode Channel 149/157/165 (UNII-3)
Mode 7	TX AC(VHT40) Mode Channel 151/159 (UNII-3)
Mode 8	TX AC(VHT80) Mode Channel 155 (UNII-3)

Following mode(s) was (were) found to be the worst case(s) and selected for the final test.

AC power line conducted emissions test	
Final Test Mode	Description
Mode 5	TX A Mode Channel 149 (UNII-3)

Radiated Emissions Test - Below 1GHz	
Final Test Mode	Description
Mode 5	TX A Mode Channel 149 (UNII-3)

Radiated Emissions Test - Above 1GHz	
Final Test Mode	Description
Mode 1	TX A Mode Channel 36/40/48 (UNII-1)
Mode 2	TX AC(VHT20) Mode Channel 36/40/48 (UNII-1)
Mode 3	TX AC(VHT40) Mode Channel 38/46 (UNII-1)
Mode 4	TX AC(VHT80) Mode Channel 42 (UNII-1)
Mode 5	TX A Mode Channel 149/157/165 (UNII-3)
Mode 6	TX AC(VHT20) Mode Channel 149/157/165 (UNII-3)
Mode 7	TX AC(VHT40) Mode Channel 151/159 (UNII-3)
Mode 8	TX AC(VHT80) Mode Channel 155 (UNII-3)

Conducted Test	
Final Test Mode	Description
Mode 1	TX A Mode Channel 36/40/48 (UNII-1)
Mode 2	TX AC(VHT20) Mode Channel 36/40/48 (UNII-1)
Mode 3	TX AC(VHT40) Mode Channel 38/46 (UNII-1)
Mode 4	TX AC(VHT80) Mode Channel 42 (UNII-1)
Mode 5	TX A Mode Channel 149/157/165 (UNII-3)
Mode 6	TX AC(VHT20) Mode Channel 149/157/165 (UNII-3)
Mode 7	TX AC(VHT40) Mode Channel 151/159 (UNII-3)
Mode 8	TX AC(VHT80) Mode Channel 155 (UNII-3)

Note:

- (1) For AC power line conducted emissions and radiated emission below 1 GHz test, the TX A Mode Channel 149 is found to be the worst case and recorded.
- (2) For radiated emission above 1 GHz test, the spurious points of 1GHz~18GHz and 18GHz~40GHz have been pre-tested and in this report only recorded the worst case. The remaining spurious points are all below the limit value of 20dB.
- (3) All the bit rate of transmitter have been tested and found the lowest rate is found to be the worst case and recorded.
- (4) VHT20/VHT40 covers HT20/HT40, due to same modulation. The power setting for 802.11n HT20 and HT40 are the same or lower than 802.11ac VHT20 and VHT40.
- (5) For radiated emission above 1 GHz test, the polarization of Vertical and Horizontal are evaluated, the worst case is Vertical and recorded.
- (6) For radiated emission, pre-scan in the X, Y and Z axes of orientation, the worst case of orientation was recorded

2.3 PARAMETERS OF TEST SOFTWARE

UNII-1			
Test Software Version	DRTU_3.0		
Frequency (MHz)	5180	5200	5240
IEEE 802.11a	69	83	83
IEEE 802.11ac(VHT20)	68	83	83
Frequency (MHz)	5190	5230	
IEEE 802.11ac(VHT40)	63	82	
Frequency (MHz)	5210		
IEEE 802.11ac(VHT80)	64		

UNII-3			
Test Software Version	DRTU_3.0		
Frequency (MHz)	5745	5785	5825
IEEE 802.11a	83	83	83
IEEE 802.11ac(VHT20)	83	83	83
Frequency (MHz)	5755	5795	
IEEE 802.11ac(VHT40)	77	78	
Frequency (MHz)	5775		
IEEE 802.11ac(VHT80)	79		

2.4 DUTY CYCLE

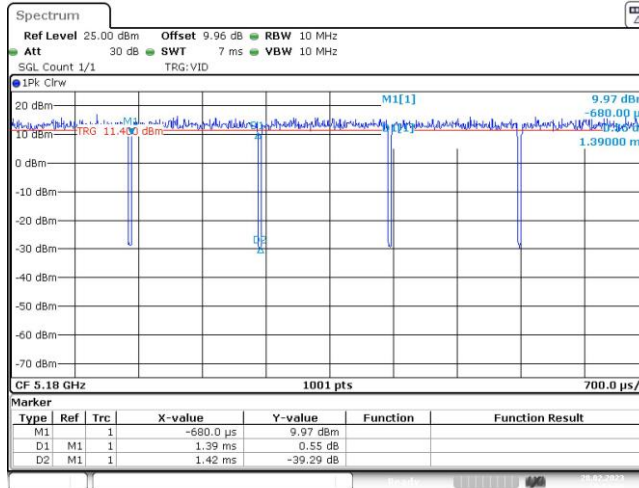
If duty cycle is $\geq 98\%$, duty factor is not required.

If duty cycle is $< 98\%$, duty factor shall be considered.

The output power = measured power + duty factor.

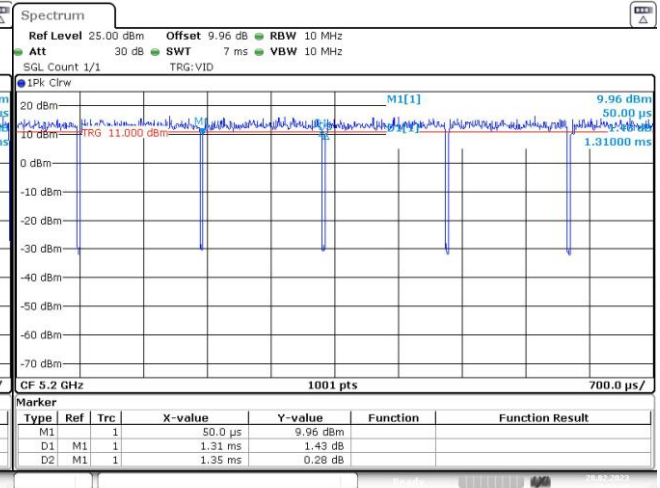
The power spectral density = measured power spectral density + duty factor.

IEEE 802.11a



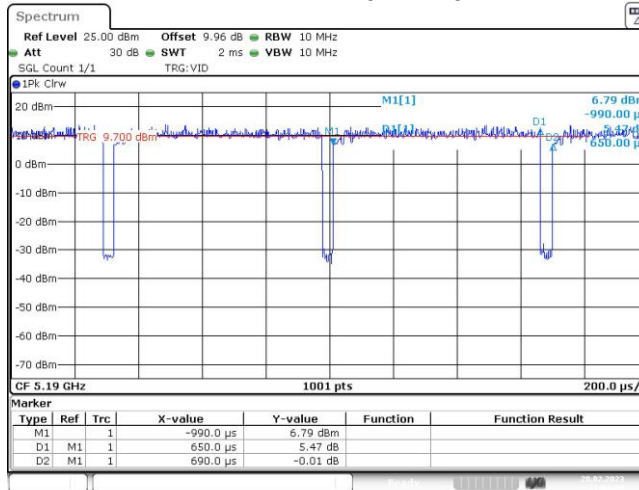
Duty cycle = 1.39 ms / 1.42 ms = 97.89%
Duty Factor = $10 \log(1 / \text{Duty cycle}) = 0.09$

IEEE 802.11ac(VHT20)



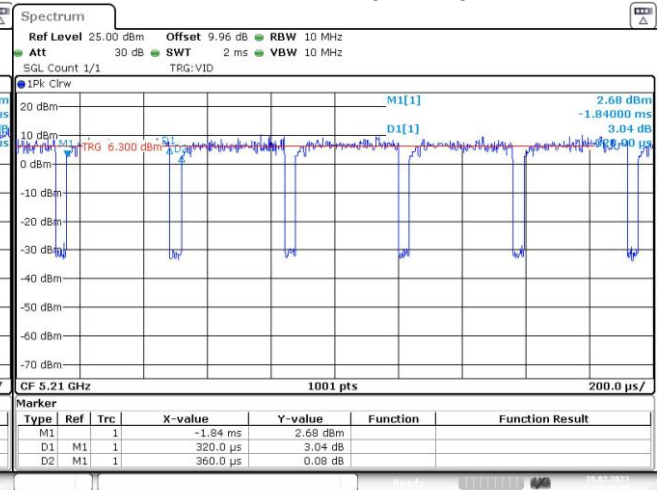
Duty cycle = 1.31 ms / 1.35 ms = 97.04%
Duty Factor = $10 \log(1 / \text{Duty cycle}) = 0.13$

IEEE 802.11ac(VHT40)



Duty cycle = 0.65 ms / 0.69 ms = 94.20%
Duty Factor = $10 \log(1 / \text{Duty cycle}) = 0.26$

IEEE 802.11ac(VHT80)



Duty cycle = 0.32 ms / 0.36 ms = 88.89%
Duty Factor = $10 \log(1 / \text{Duty cycle}) = 0.51$

NOTE:

For IEEE 802.11a:

For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 483Hz (Duty cycle < 98%).

For IEEE 802.11ac(VHT20):

For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10Hz (Duty cycle $\geq$ 98%).

For IEEE 802.11ac(VHT40):

For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1047Hz (Duty cycle < 98%).

For IEEE 802.11ac(VHT80):

For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 2174Hz (Duty cycle < 98%).

2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED**2.6 SUPPORT UNITS**

Support Equipment				
No.	Equipment	Brand Name	Model Name	Remarks
1	N/A	N/A	N/A	N/A

3. AC POWER LINE CONDUCTED EMISSIONS

3.1 LIMIT

Frequency (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 6*	56 to 46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

NOTE:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

3.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item -EUT Test Photos.

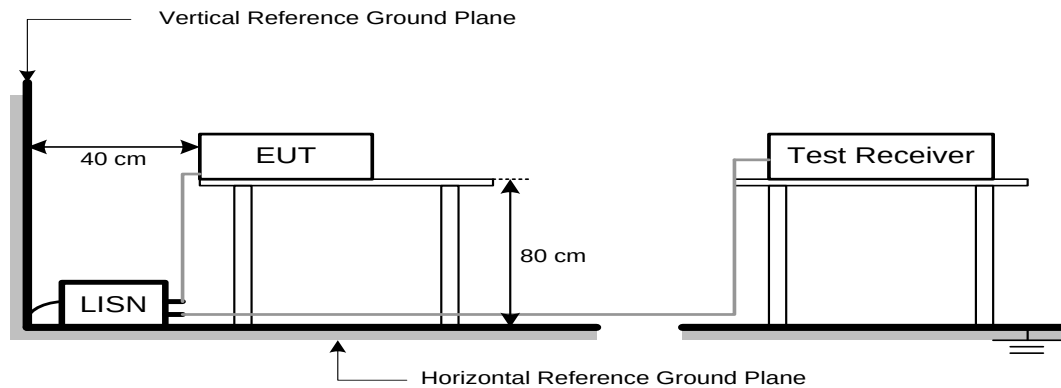
The following table is the setting of the receiver:

Receiver Parameter	Setting
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.3 DEVIATION FROM TEST STANDARD

No deviation

3.4 TEST SETUP



3.5 EUT OPERATION CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

The EUT was programmed to be in continuously transmitting/TX mode.

3.6 TEST RESULTS

Please refer to the APPENDIX A.

4. RADIATED EMISSIONS

4.1 LIMIT

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

LIMITS OF RADIATED EMISSIONS MEASUREMENT (9 kHz to 1000 MHz)

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

LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS (Above 1000 MHz)

Frequency (MHz)	EIRP Limit (dBm/MHz)	Equivalent Field Strength at 3m (dBμV/m)
5150-5250	-27	68.2
5250-5350	-27	68.2
5470-5725	-27	68.2
5725-5850 NOTE (2)	-27	68.2
	10	105.2
	15.6	110.8
	27	122.2

NOTE:

(1) The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m, where P is the eirp (Watts)}$$

(2) According to 15.407(b)(4)(i), all emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

4.2 TEST PROCEDURE

- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
(below 1 GHz)
- All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1 GHz)
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

The following table is the setting of the receiver:

Spectrum Parameters	Setting
Start ~ Stop Frequency	9 kHz~150 kHz for RBW 200 Hz
Start ~ Stop Frequency	0.15 MHz~30 MHz for RBW 9 kHz
Start ~ Stop Frequency	30 MHz~1000 MHz for RBW 100 kHz

Spectrum Parameters	Setting
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic or 40 GHz, whichever is lower
RBW / VBW (Emission in restricted band)	1 MHz / 3 MHz for PK value 1 MHz / 1/T Hz for AVG value

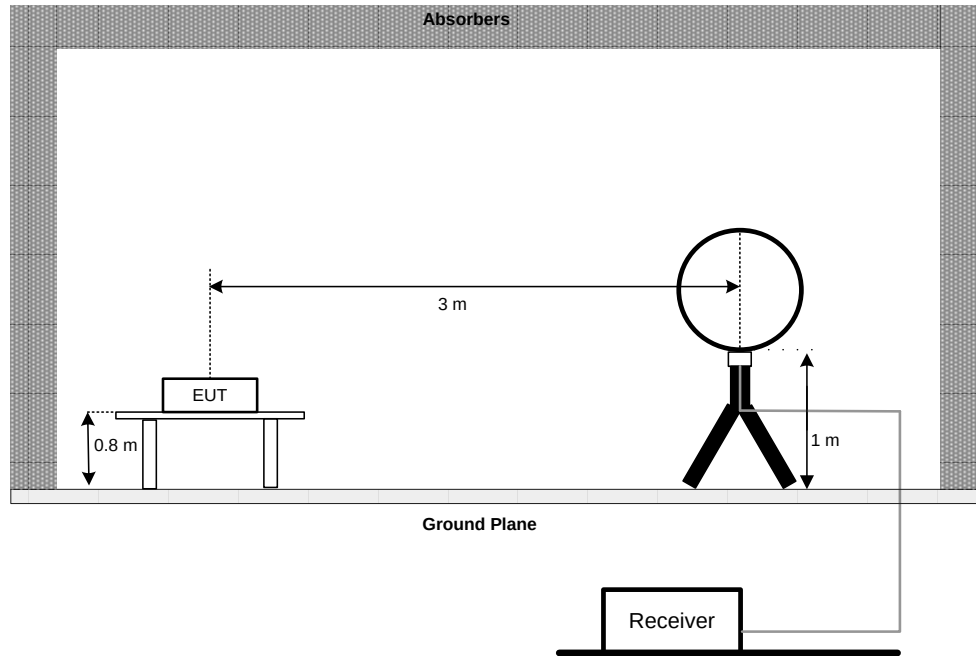
Receiver Parameters	Setting
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000 MHz for QP detector
Start ~ Stop Frequency	1 GHz~40 GHz for PK/AVG detector

4.3 DEVIATION FROM TEST STANDARD

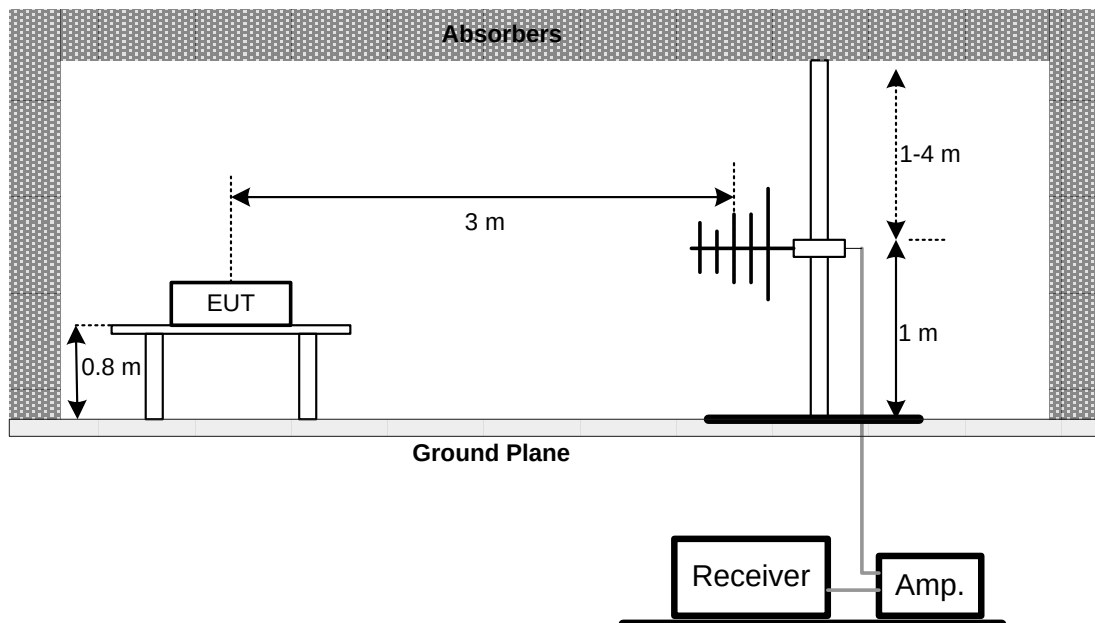
No deviation.

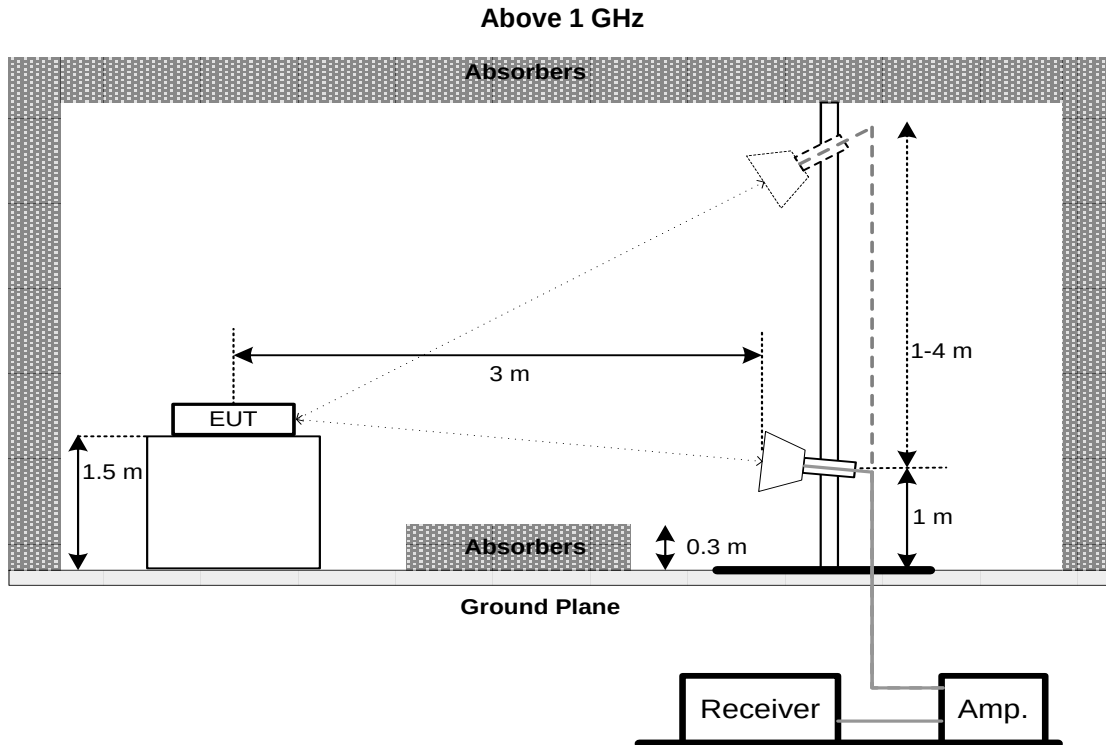
4.4 TEST SETUP

9 kHz to 30 MHz



30 MHz to 1 GHz





4.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

4.6 TEST RESULTS - 9 KHZ TO 30 MHZ

Please refer to the APPENDIX B.

Remark:

- (1) Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB).
- (2) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.7 TEST RESULTS - 30 MHZ TO 1000 MHZ

Please refer to the APPENDIX C.

4.8 TEST RESULTS - ABOVE 1000 MHZ

Please refer to the APPENDIX D.

Remark:

- (1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5. BANDWIDTH

5.1 LIMIT

Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.407(a) FCC 15.407(e)	26 dB Bandwidth	-	5150-5250
	26 dB Bandwidth	-	5250-5350
	26 dB Bandwidth	-	5470-5725
	6 dB Bandwidth	Minimum 500 kHz	5725-5850

5.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below
- b. Spectrum Setting:
For UNII-1, UNII-2A, UNII-2C:

Spectrum Parameter	Setting
Span Frequency	> 26 dB Bandwidth
RBW	Appromiximately 1% of the emission bandwidth
VBW	> RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

For UNII-3:

Spectrum Parameter	Setting
Span Frequency	> 6 dB Bandwidth
RBW	100 kHz
VBW	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

For 99% Occupied Bandwidth:

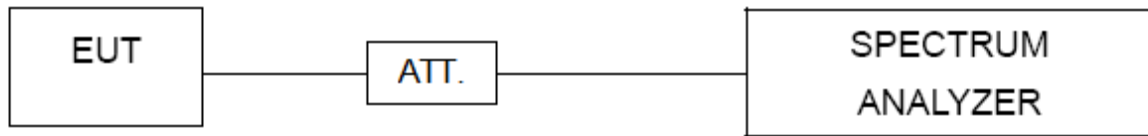
Spectrum Parameter	Setting
Span Frequency	1.5 times to 5 times the OBW
RBW	1% to 5% of the OBW
VBW	$\geq 3 \times \text{RBW}$
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

- c. Measured the spectrum width with power higher than 26 dB / 6 dB below carrier.

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP



5.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

5.6 TEST RESULTS

Please refer to the APPENDIX E.

6. MAXIMUM OUTPUT POWER

6.1 LIMIT

Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.407(a)	Maximum Output Power	AP device: 1 Watt (30 dBm) Client device: 250 mW (23.98 dBm)	5150-5250
		250 mW (23.98 dBm)	5250-5350
		250 mW (23.98 dBm)	5470-5725
		1 Watt (30dBm)	5725-5850

Note:

- a. For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
- b. For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
- c. For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B, where B is the 26dB Bandwidth in megahertz.

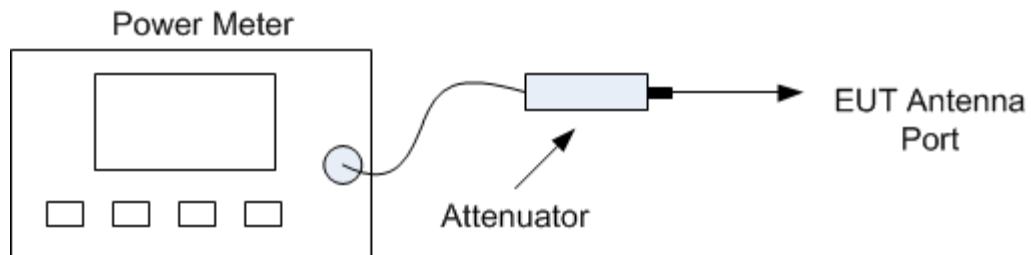
6.2 TEST PROCEDURE

- a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below.
- b. The maximum conducted output power was performed in accordance with method 11.9.2.3.1 (for AVG power) of ANSI C63.10-2013 and FCC KDB 662911 D01 v02r01 Multiple Transmitter Output.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

6.6 TEST RESULTS

Please refer to the APPENDIX F.

7. POWER SPECTRAL DENSITY

7.1 LIMIT

Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.407(a)	Power Spectral Density	AP device: 17 dBm/MHz Client device: 11 dBm/MHz	5150-5250
		11 dBm/MHz	5250-5350
		11 dBm/MHz	5470-5725
		30 dBm/500 kHz	5725-5850

7.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting:

For UNII-1, UNII-2A, UNII-2C:

Spectrum Parameter	Setting
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	1 MHz.
VBW	3 MHz.
Detector	RMS
Trace average	100 trace
Sweep Time	Auto

For UNII-3:

Spectrum Parameter	Setting
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	100 kHz.
VBW	300 kHz.
Detector	RMS
Trace average	100 trace
Sweep Time	Auto

Note:

- For UNII-3, according to KDB publication 789033 D02 General UNII Test Procedures New Rules v02r01, section II.F.5., it is acceptable to set RBW at 100kHz and VBW at 300kHz if the spectrum analyzer does not have 500 kHz RBW. Then, add $10 \log (500 \text{ kHz}/100 \text{ kHz})$ to the measured result, i.e. 7 dB.
- During the test of U-NII 3 PSD, the measurement result with RBW=100kHz has been added 7 dB by compensating offset. For example, the cable loss is 13 dB, and the final offset is $13 + 7 = 20 \text{ dB}$ when RBW=100kHz is used.

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

7.6 TEST RESULTS

Please refer to the APPENDIX G.

8. FREQUENCY STABILITY

8.1 LIMIT

Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.407(g)	Frequency Stability	An emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.	5150-5250
			5250-5350
			5470-5725
			5725-5850

8.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting:

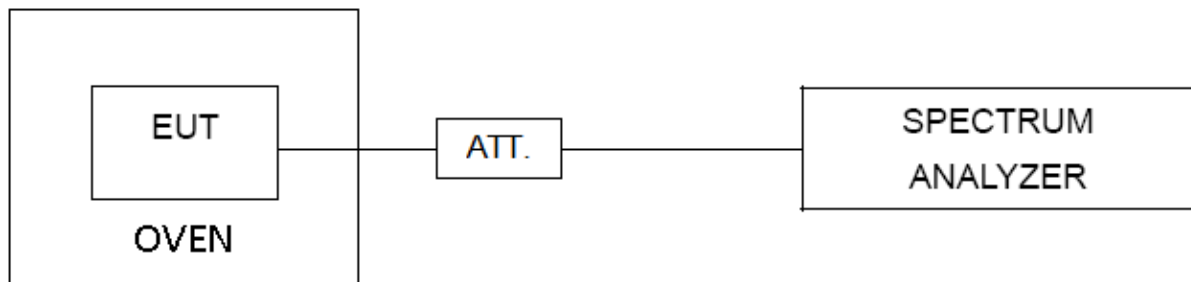
Spectrum Parameter	Setting
Span Frequency	Entire absence of modulation emissions bandwidth
RBW	10 kHz
VBW	10 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

- The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.
- User manual temperature is 0°C~45°C.

8.3 DEVIATION FROM STANDARD

No deviation.

8.4 TEST SETUP



8.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

8.6 TEST RESULTS

Please refer to the APPENDIX H.

9. MEASUREMENT INSTRUMENTS LIST

No.	Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EMI Receiver	Rohde&Schwarz	ESCI	1166.5950.03	2023/10/14
2	AMN	Rohde&Schwarz	ENV216	3560.6550.05	2023/10/14
3	AMN	Schwarzbeck	NSLK8127	#829	2023/10/14
4	ECSI RF IN RF Cable	Rohde&Schwarz	RP-X1	\	2023/10/14
5	ECSI RF IN RF Cable	Rohde&Schwarz	Sapre sm	\	2023/10/14
6	EMI Receiver	Rohde&Schwarz	ESR7	102013	2023/10/14
7	Spectrum analyzer	Rohde&Schwarz	FSV30	103741	2023/10/17
8	EMI receiver	Rohde&Schwarz	ESU	100184	2023/07/20
9	Spectrum analyzer	KEYSIGHT	N9010A-44	MY51440158	2023/10/17
10	Loop Antenna*	Schwarzbeck	FMZB1519B	00029	2025/07/03
11	Integral Antenna	Schwarzbeck	VULB 9163	VULB 9163-361	2023/10/20
12	Integral Antenna	Schwarzbeck	BBHA 9120D	BBHA 9120D 1201	2023/10/15
13	Integral Antenna	Schwarzbeck	BBHA 9170	9170#685	2023/10/15
14	Preamplifier	CD Systems Inc	PAP-03036-30	85060000	2023/10/15
15	Preamplifier	Schwarzbeck	BBV9721	9721-019	2023/10/15
16	Preamplifier	emci	EMC012645 SE	980417	2023/10/16
17	ECSI RF IN RF Cable	Rohde&Schwarz	AP-X1	\	2023/10/16
18	Spectrum Analyzer	Agilent	N9010A	MY52221119	2023/10/17
19	Power Collection Unit	Tonscend	JS0806-2	188060134	2023/10/16
20	Tonscend Test System	Tonscend	2.6.77.0518	NA	NA
21	10dB Attenuator	Tonscend	10dB	NA	NA
22	Temp&Humidity Recorder	Anymetre	JR900	NA	2023/10/16
23	Temp&Humidity Chamber	ETOMA	NTH1100-30 A	16080628	2023/10/16
24	Filter	STI	STI15-9845	N/A	N/A
25	Filter	STI	5.1G	N/A	N/A
26	Filter	STI	STI15-9845	N/A	N/A
27	Testing Software	EZ-EMC	TW-03A2	N/A	N/A

Remark: "N/A" denotes no model name, serial no. or calibration specified.

"*" calibration period of equipment list is three year.

Except * item, all calibration period of equipment list is one year.

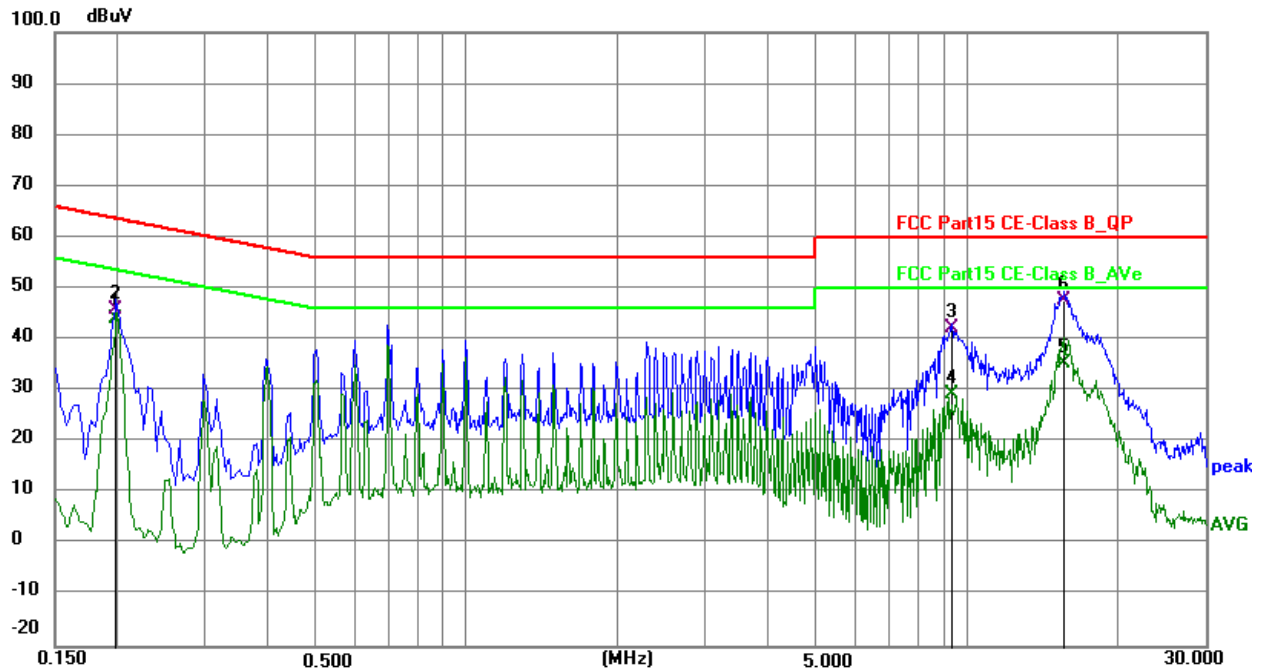
10. EUT TEST PHOTOS**AC Power Line Conducted Emissions Test Photos**

Radiated Emissions Test Photos**30 MHz to 1 GHz****Above 1 GHz**

Conducted Test Photos

APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS

Test Mode	TX AX(VHT20) Mode Channel 149	Phase	Line
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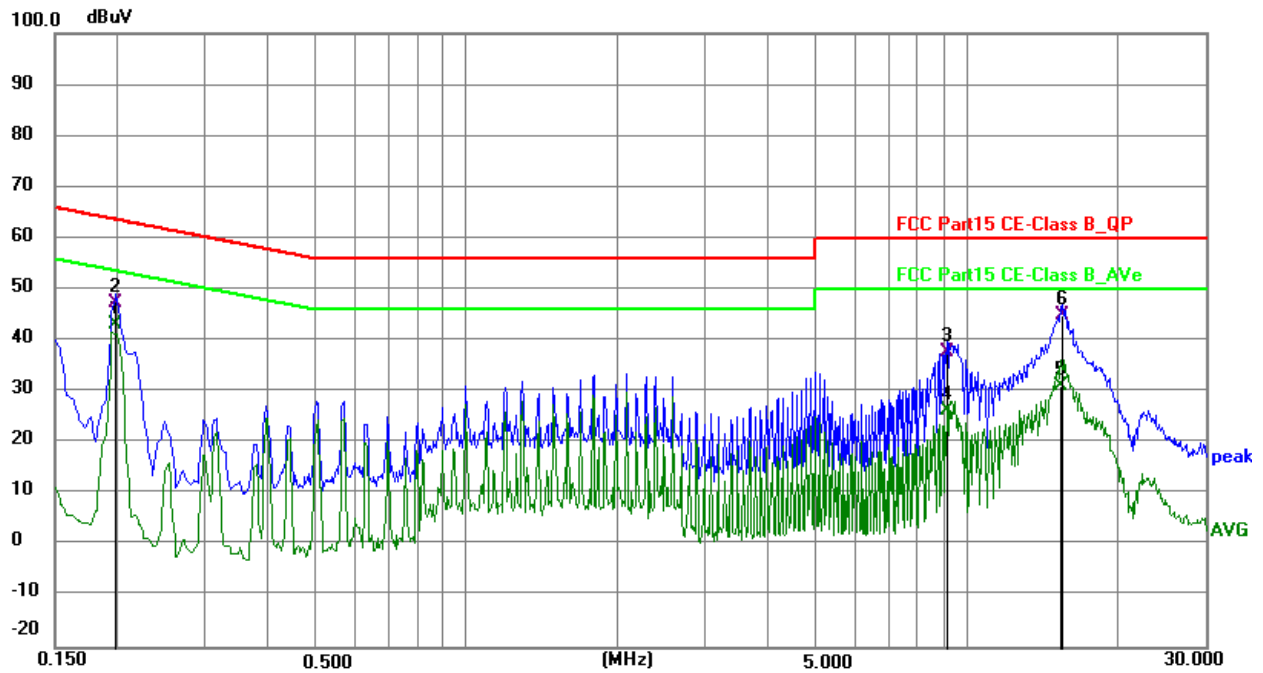


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1 *	0.1992	34.53	9.63	44.16	53.64	-9.48	AVG	P
2	0.1995	36.24	9.63	45.87	63.63	-17.76	QP	P
3	9.3435	32.41	9.72	42.13	60.00	-17.87	QP	P
4	9.3438	19.59	9.72	29.31	50.00	-20.69	AVG	P
5	15.6940	25.67	9.75	35.42	50.00	-14.58	AVG	P
6	15.7065	37.83	9.75	47.58	60.00	-12.42	QP	P

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.
- (3) The test result has included the cable loss.

Test Mode	TX AX(VHT20) Mode Channel 149	Phase	Neutral
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No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1 *	0.1989	33.54	9.63	43.17	53.66	-10.49	AVG	P
2	0.1995	37.62	9.63	47.25	63.63	-16.38	QP	P
3	9.1410	28.15	9.72	37.87	60.00	-22.13	QP	P
4	9.1461	16.69	9.72	26.41	50.00	-23.59	AVG	P
5	15.5021	21.54	9.76	31.30	50.00	-18.70	AVG	P
6	15.5040	35.09	9.76	44.85	60.00	-15.15	QP	P

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.
- (3) The test result has included the cable loss.

APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ

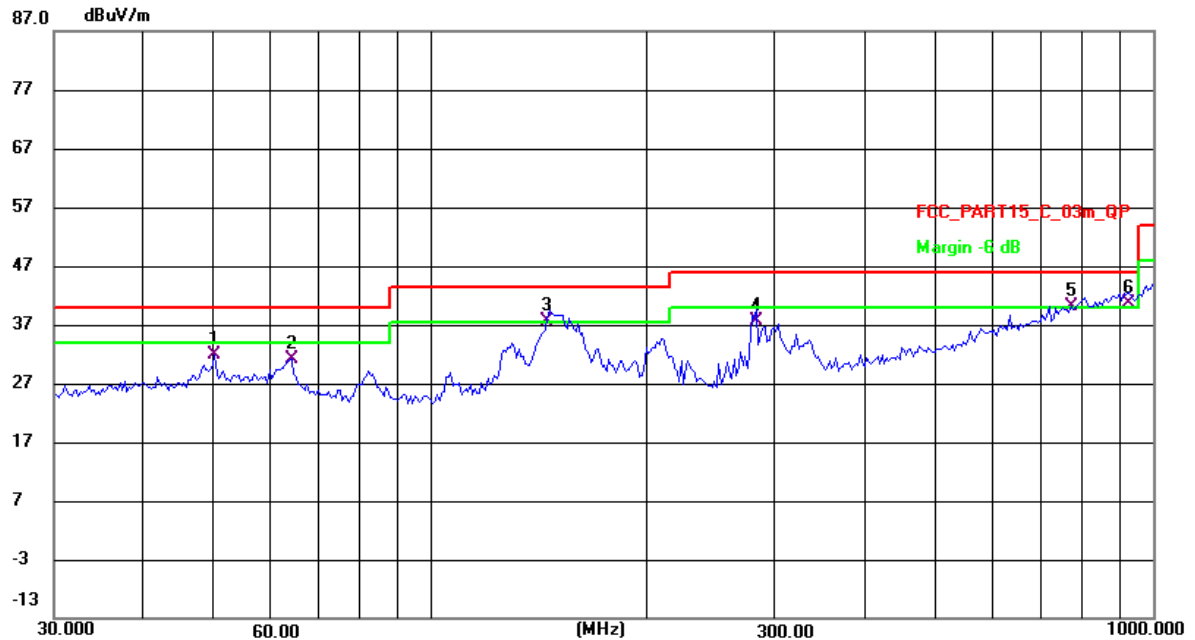
Radiated emission: 9KHz-30MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

Test Mode	TX A Mode Channel 149	Polarization	Vertical
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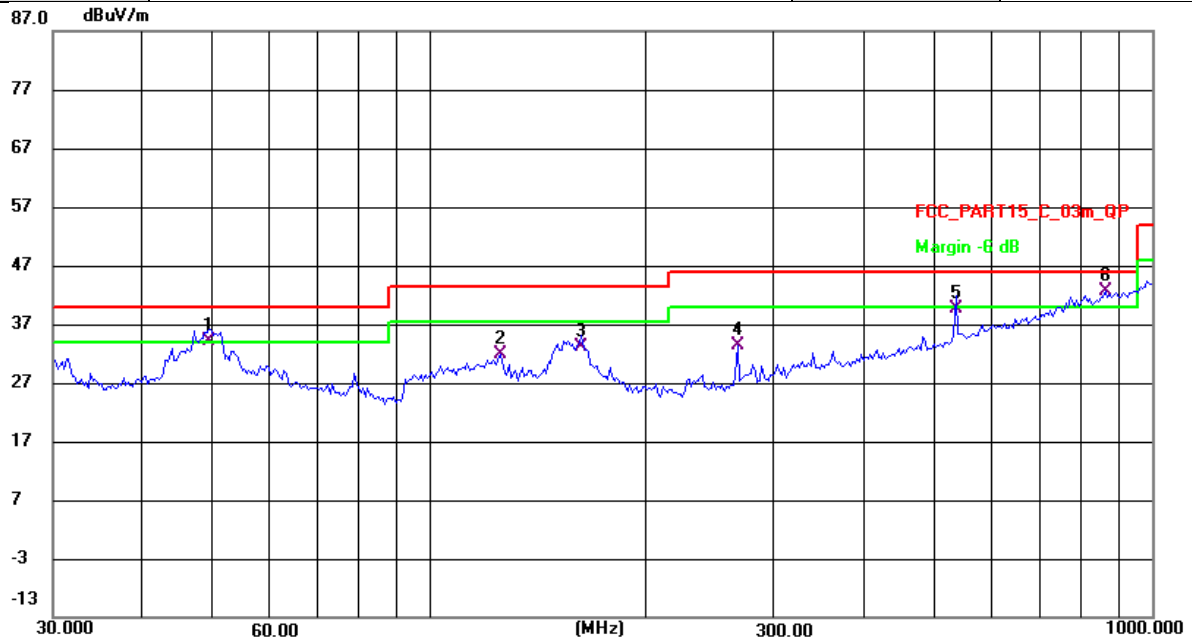


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F
1	50.1080	18.49	13.32	31.81	40.00	-8.19	QP	100	240	P
2	64.0800	19.26	11.96	31.22	40.00	-8.78	QP	100	69	P
3 !	145.8109	24.57	13.06	37.63	43.50	-5.87	QP	100	269	P
4	282.2702	24.80	12.76	37.56	46.00	-8.44	QP	100	38	P
5 !	771.0475	16.71	23.41	40.12	46.00	-5.88	QP	100	260	P
6 *	925.6132	16.04	24.70	40.74	46.00	-5.26	QP	100	241	P

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX A Mode Channel 149	Polarization	Horizontal
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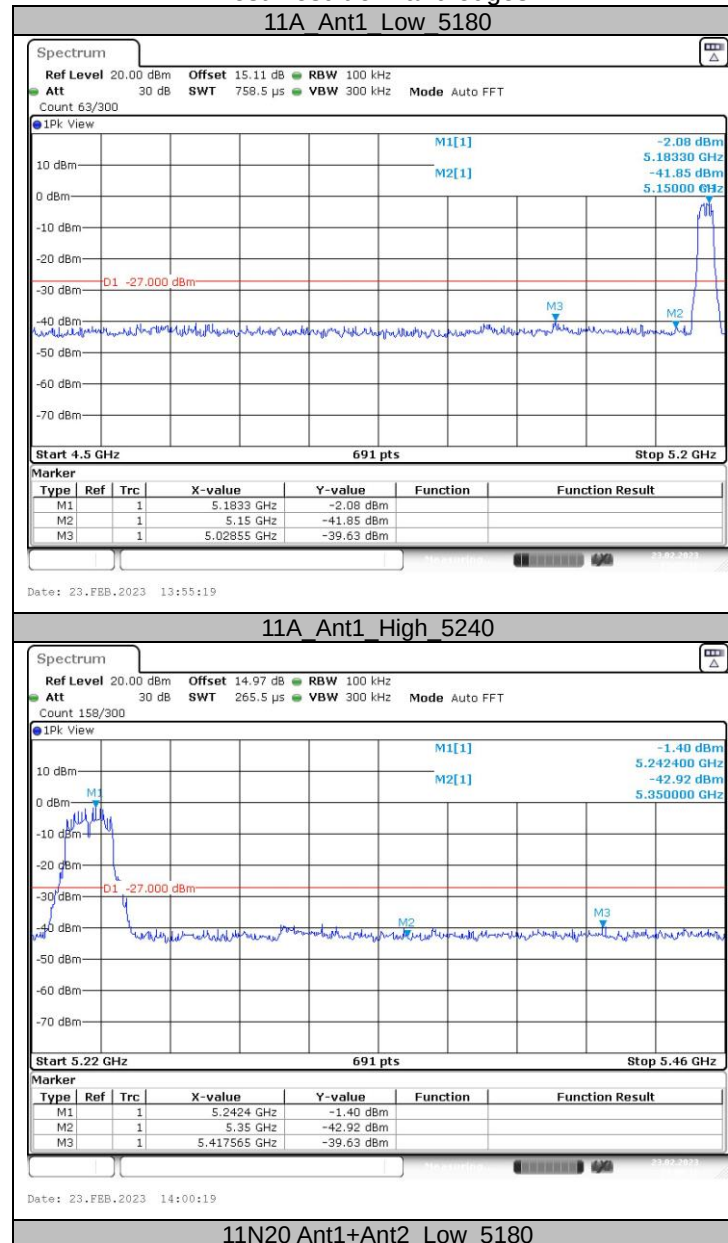
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F
1 !	49.4087	20.90	13.31	34.21	40.00	-5.79	QP	100	187	P
2	124.9250	20.14	11.86	32.00	43.50	-11.50	QP	100	160	P
3	162.0197	19.93	13.32	33.25	43.50	-10.25	QP	100	141	P
4	266.8394	21.12	12.21	33.33	46.00	-12.67	QP	100	101	P
5	535.0377	20.98	18.77	39.75	46.00	-6.25	QP	100	72	P
6 *	862.8015	18.40	24.34	42.74	46.00	-3.26	QP	100	150	P

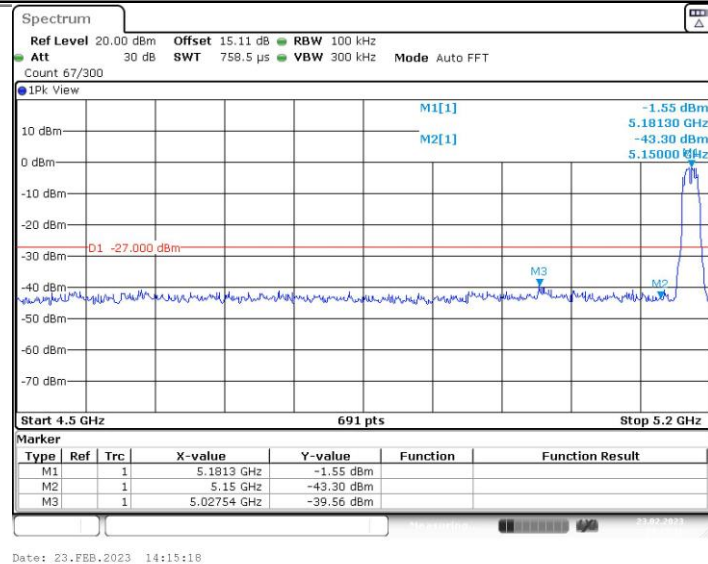
REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

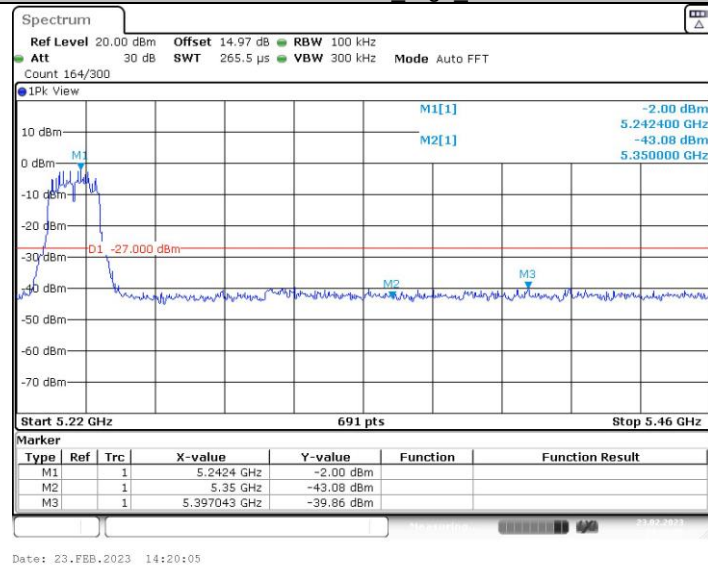
APPENDIX D - RADIATED EMISSION - ABOVE 1000 MHZ

Test Result of Band edges.

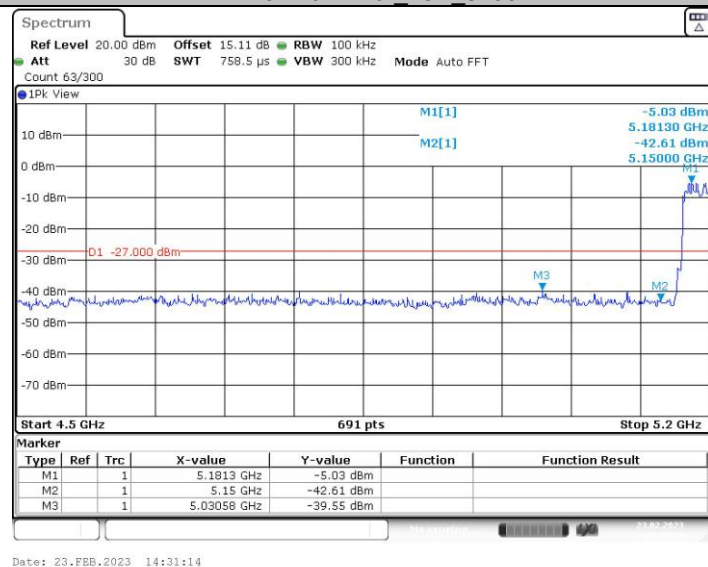




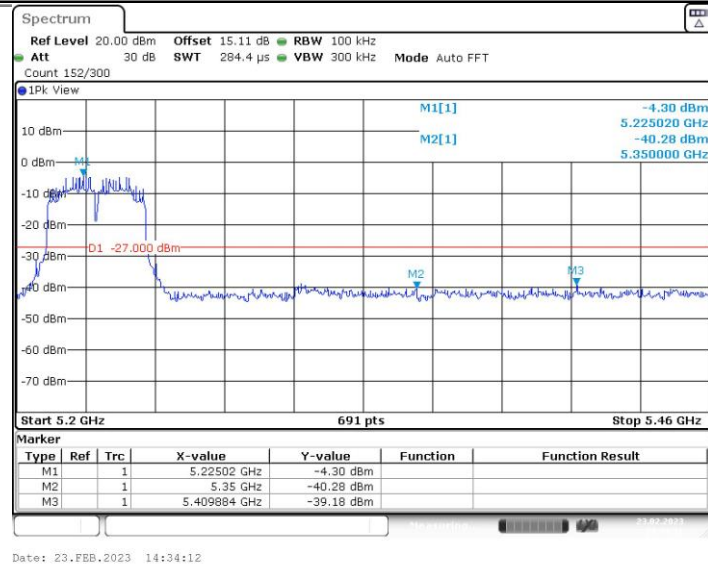
11N20 Ant1+Ant2_High_5240



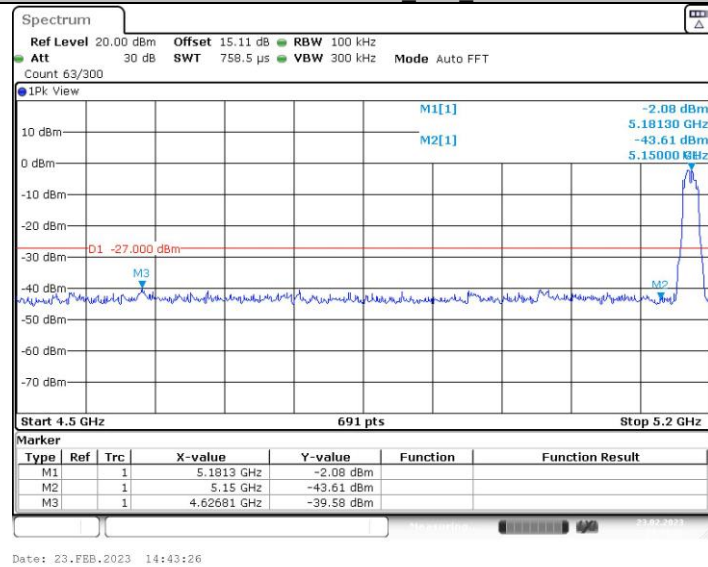
11N40 Ant1+Ant2_Low_5190



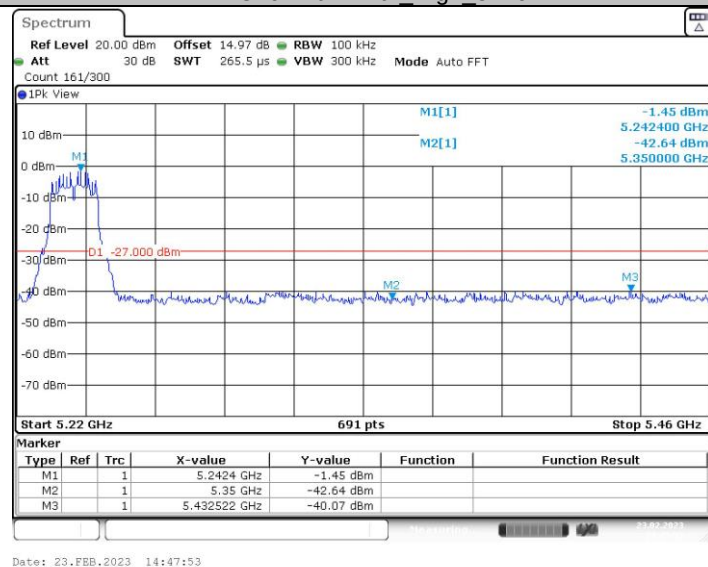
11N40 Ant1+Ant2_High_5230



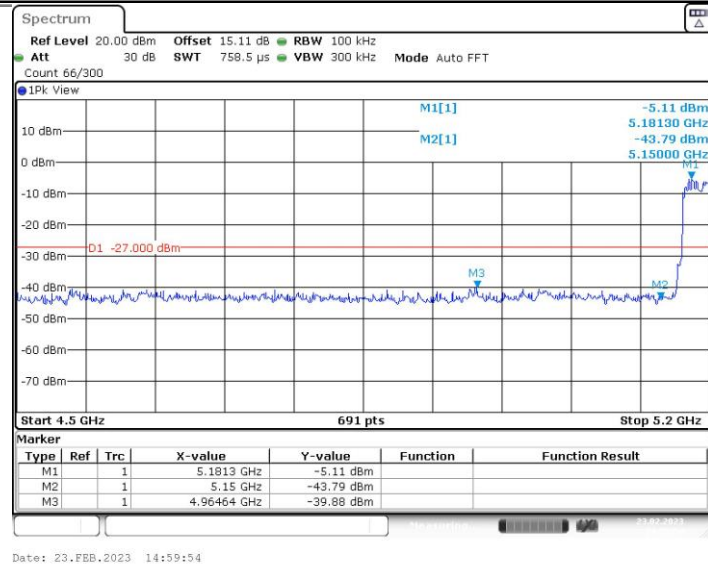
11AC20 Ant1+Ant2_Low_5180



11AC20 Ant1+Ant2_High_5240



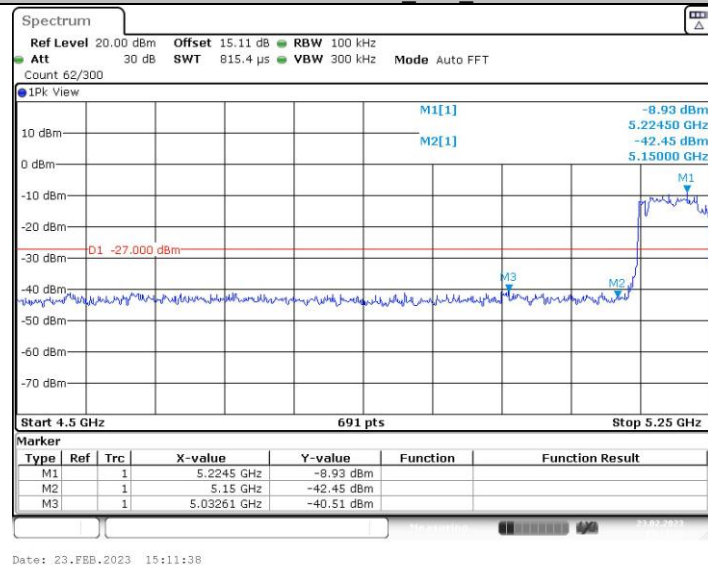
11AC40 Ant1+Ant2_Low_5190



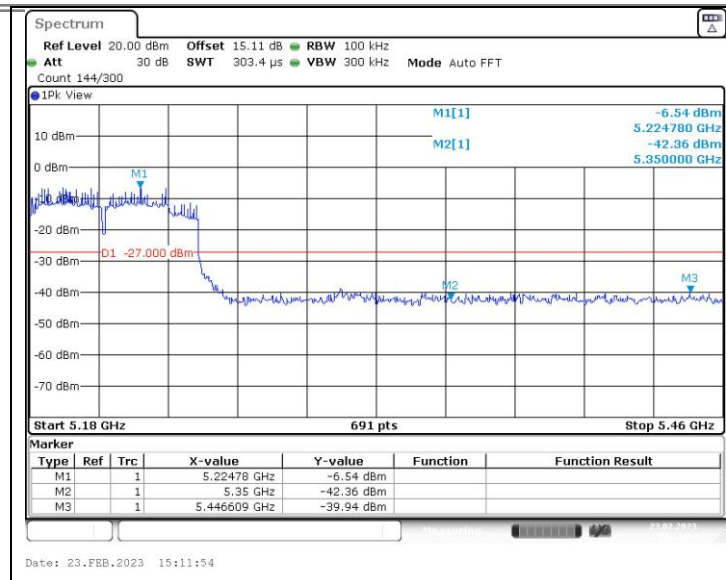
11AC40 Ant1+Ant2_High_5230



11AC80 Ant1+Ant2_Low_5210

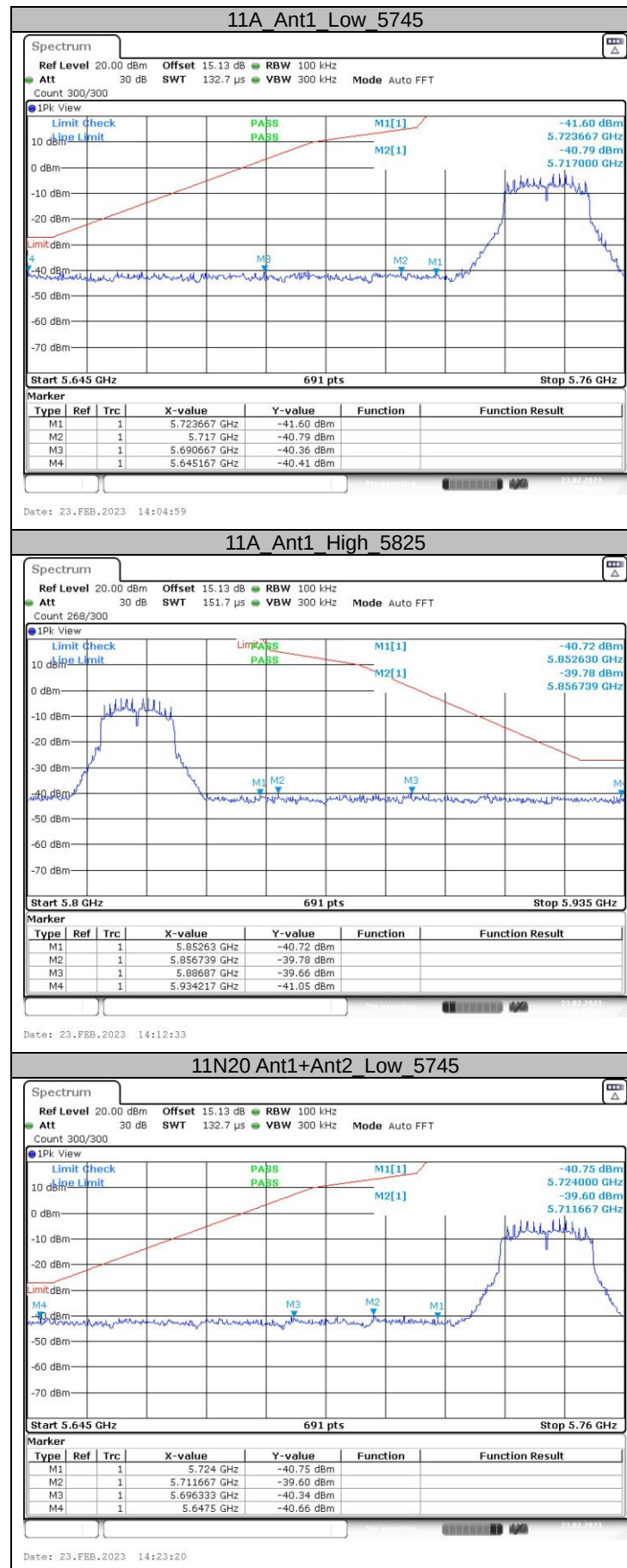


11AC80 Ant1+Ant2_High_5210

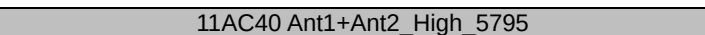
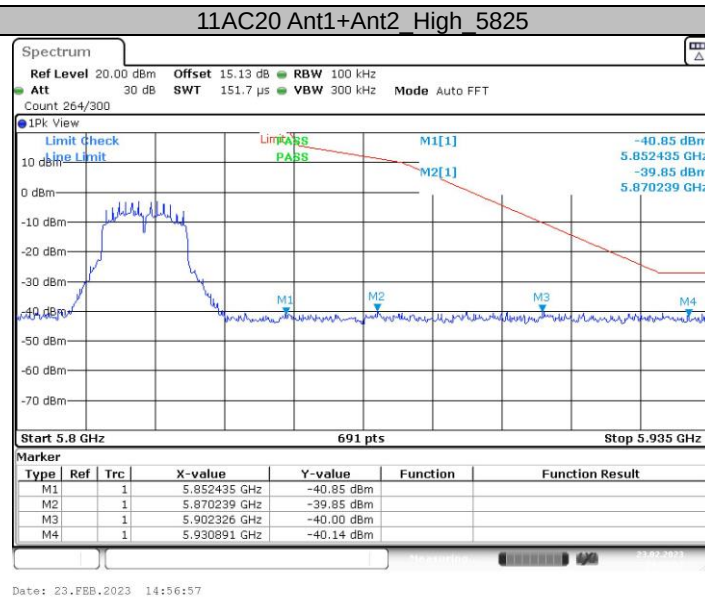


Note: All the modes have been tested and recorded worst mode in the report.

Test Graphs B4









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

ABOVE 1000 MHz

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

11A(ANT1) Channel 36 / 5180 MHz

Frequency	Ant.Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor	Emission Level		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
10360	H	40.42	---	8.02	49.86	---	74	54	-5.56
15540	H	40.75	---	9.87	50.28	---	75	55	-3.38
---	H	---	---	---	---	---	---	---	---
10360	V	39.28	---	8.02	48.48	---	74	54	-6.70
15540	V	40.66	---	9.87	50.89	---	74	54	-3.47
---	V	---	---	---	---	---	---	---	---

11A(ANT1) Channel 40 / 5200 MHz

Frequency	Ant.Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor	Emission Level		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
10400	H	41.44	---	7.97	49.41	---	74	54	-4.59
15600	H	40.09	---	9.83	49.92	---	75	55	-4.08
---	H	---	---	---	---	---	---	---	---
10400	V	42.31	---	7.97	50.28	---	74	54	-3.72
15600	V	39.97	---	9.83	49.80	---	74	54	-4.20
---	V	---	---	---	---	---	---	---	---

11A(ANT1) Channel 48 / 5240 MHz

Frequency	Ant.Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor	Emission Level		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
10480	H	40.54	---	7.97	48.51	---	74	54	-5.49
15720	H	40.80	---	9.83	50.63	---	75	55	-3.37
---	H	---	---	---	---	---	---	---	---
10480	V	41.27	---	7.97	49.27	---	74	54	-4.76
15720	V	38.95	---	9.83	48.78	---	74	54	-5.22
---	V	---	---	---	---	---	---	---	---

11N(HT20)(ANT1+ANT2) Channel 36 / 5180 MHz

Frequency	Ant.Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor	Emission Level		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
10360	H	41.64	---	8.02	49.66	---	74	54	-4.34
15540	H	40.78	---	9.87	50.65	---	75	55	-3.35
---	H	---	---	---	---	---	---	---	---
10360	V	41.43	---	8.02	49.45	---	74	54	-4.55
15540	V	39.35	---	9.87	49.22	---	74	54	-4.78
---	V	---	---	---	---	---	---	---	---

11N(HT20)(ANT1+ANT2) Channel 40 / 5200 MHz

Frequency	Ant.Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor	Emission Level		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
10400	H	40.52	---	7.97	48.49	---	74	54	-5.51
15600	H	40.82	---	9.83	50.65	---	75	55	-3.35
---	H	---	---	---	---	---	---	---	---
10400	V	42.74	---	7.97	50.71	---	74	54	-3.29
15600	V	40.28	---	9.83	50.11	---	74	54	-3.89
---	V	---	---	---	---	---	---	---	---

11N(HT20)(ANT1+ANT2) Channel 48 / 5240 MHz

Frequency	Ant.Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor	Emission Level		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
10480	H	40.21	---	7.97	48.18	---	74	54	-5.82
15720	H	39.15	---	9.83	48.98	---	75	55	-5.02
---	H	---	---	---	---	---	---	---	---
10480	V	40.85	---	7.97	48.82	---	74	54	-5.18
15720	V	40.43	---	9.83	50.26	---	74	54	-3.74
---	V	---	---	---	---	---	---	---	---

11AC(VHT80) (ANT1+ANT2) Channel 151 / 5755 MHz									
Frequency	Ant.Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor	Emission Level		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
11510	H	41.08	---	8.09	49.17	---	74	54	-4.83
17265	H	39.55	---	9.67	49.22	---	75	55	-4.78
---	H	---	---	---	---	---	---	---	---
11510	V	42.32	---	8.09	50.41	---	74	54	-3.59
17265	V	39.17	---	9.67	48.84	---	74	54	-5.16
---	V	---	---	---	---	---	---	---	---

Notes:

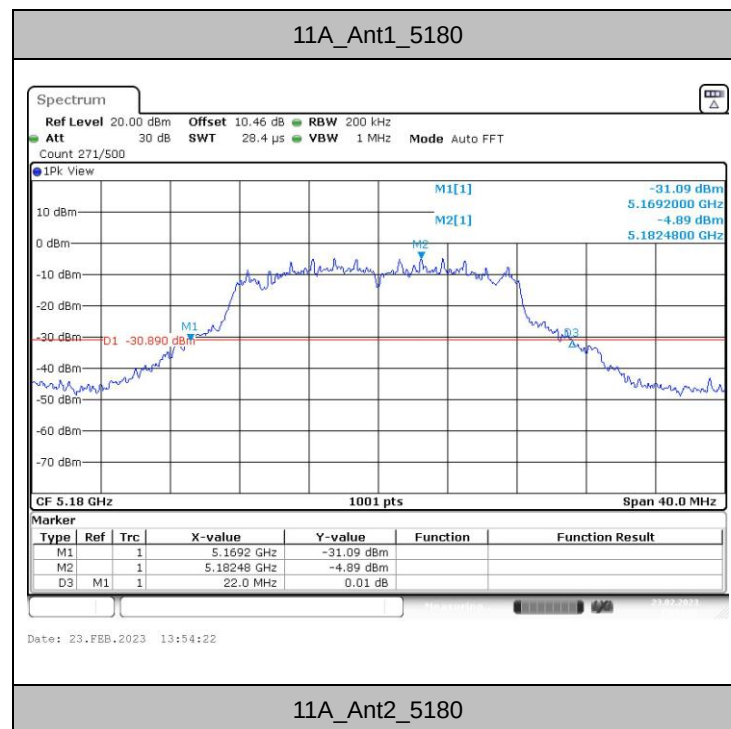
- 1). Radiated emissions measured in frequency range from 9 KHz~10th harmonic or 40GHz (which is less) were made with an instrument using Peak detector mode.
- 2). Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 3). Worst case data at 1Mbps at IEEE 802.11a AN1(SISO). 802.11(HT20) and 11AC(VHT80)Mode ANT1+ANT2(MIMO)
- 4). Measured Level = Reading Level + Factor, Margin = Measured Level – Limit

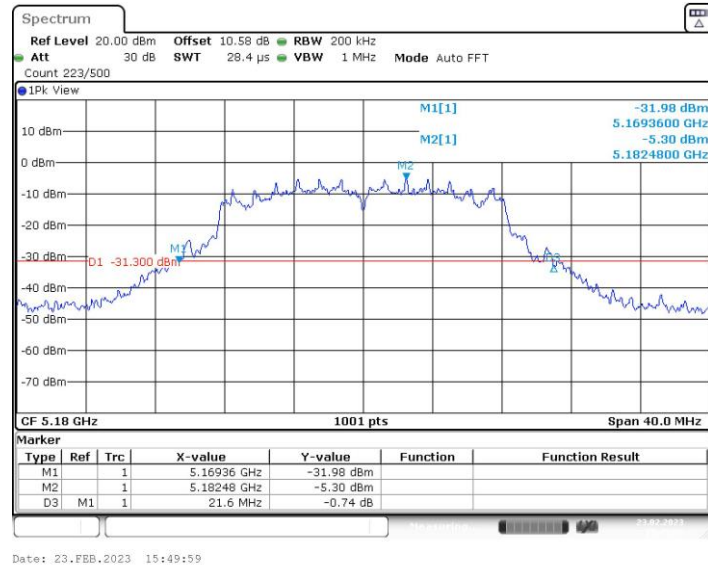
APPENDIX E - BANDWIDTH

Appendix E1:Emission Bandwidth

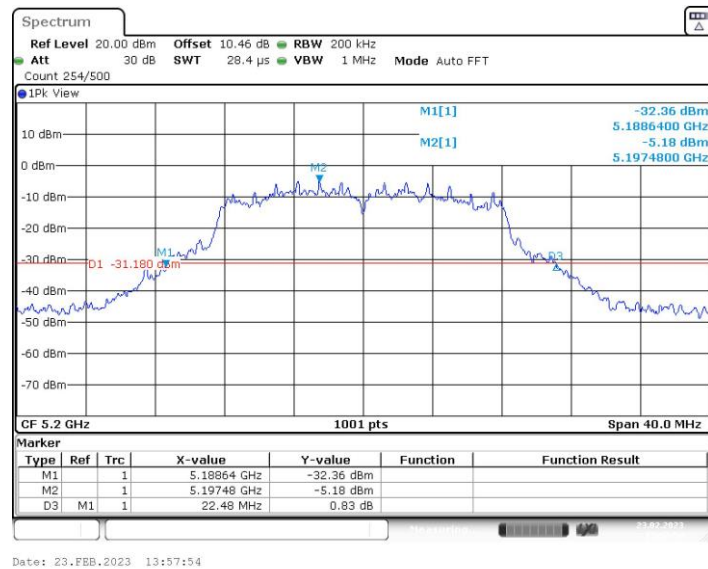
TestMode	Antenna	Freq(MHz)	26db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	22.00	5169.20	5191.20	---	---
	Ant2	5180	21.60	5169.36	5190.96	---	---
	Ant1	5200	22.48	5188.64	5211.12	---	---
	Ant2	5200	22.64	5188.00	5210.64	---	---
	Ant1	5240	21.96	5229.00	5250.96	---	---
	Ant2	5240	22.88	5228.20	5251.08	---	---
11N20SISO	Ant1	5180	21.80	5169.28	5191.08	---	---
	Ant2	5180	23.36	5168.64	5192.00	---	---
	Ant1	5200	22.56	5188.76	5211.32	---	---
	Ant2	5200	22.48	5188.56	5211.04	---	---
	Ant1	5240	23.44	5227.72	5251.16	---	---
	Ant2	5240	23.08	5228.36	5251.44	---	---
11N40SISO	Ant1	5190	42.08	5169.44	5211.52	---	---
	Ant2	5190	43.68	5166.72	5210.40	---	---
	Ant1	5230	43.12	5208.48	5251.60	---	---
	Ant2	5230	42.40	5209.44	5251.84	---	---
11AC20SISO	Ant1	5180	22.20	5168.92	5191.12	---	---
	Ant2	5180	22.56	5168.88	5191.44	---	---
	Ant1	5200	22.88	5188.16	5211.04	---	---
	Ant2	5200	22.80	5188.80	5211.60	---	---
	Ant1	5240	21.76	5228.92	5250.68	---	---
	Ant2	5240	23.36	5228.00	5251.36	---	---
11AC40SISO	Ant1	5190	41.20	5169.36	5210.56	---	---
	Ant2	5190	42.48	5169.68	5212.16	---	---
	Ant1	5230	42.00	5209.44	5251.44	---	---
	Ant2	5230	41.92	5208.80	5250.72	---	---
11AC80SISO	Ant1	5210	81.12	5170.32	5251.44	---	---
	Ant2	5210	80.64	5170.16	5250.80	---	---

Test Graphs

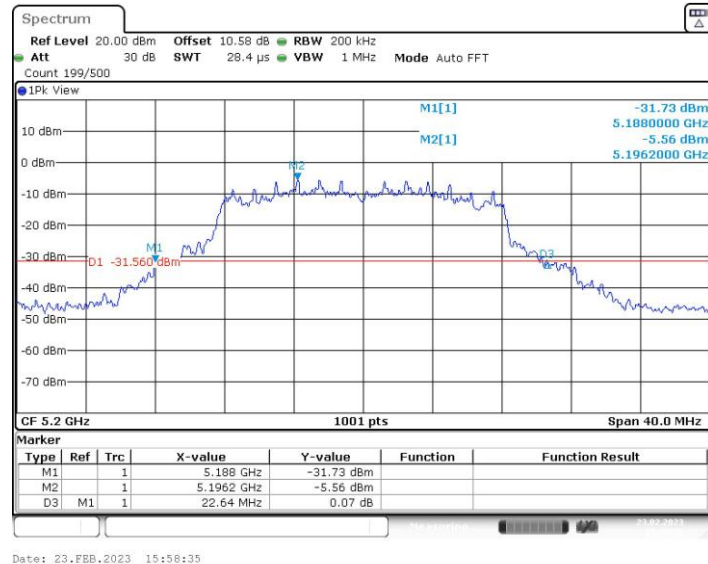




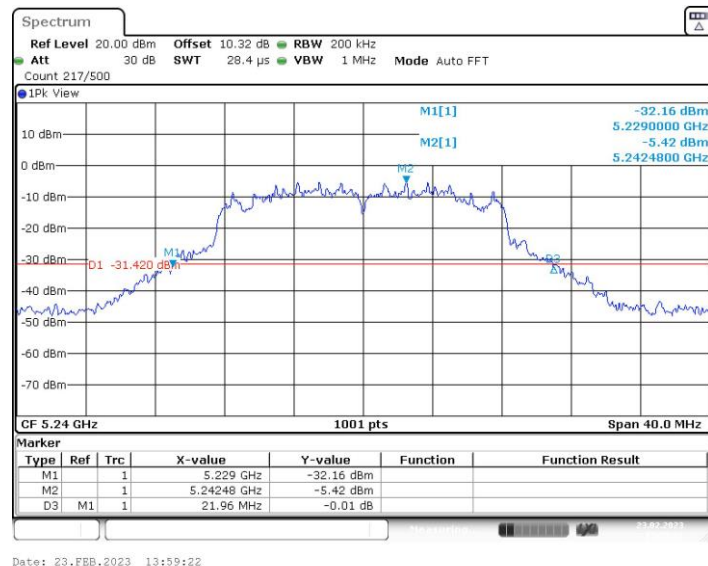
11A_Ant1_5200



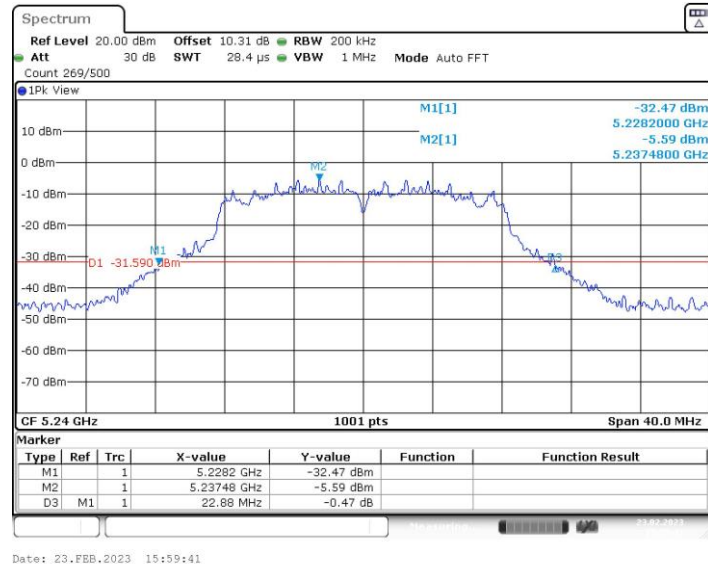
11A_Ant2_5200



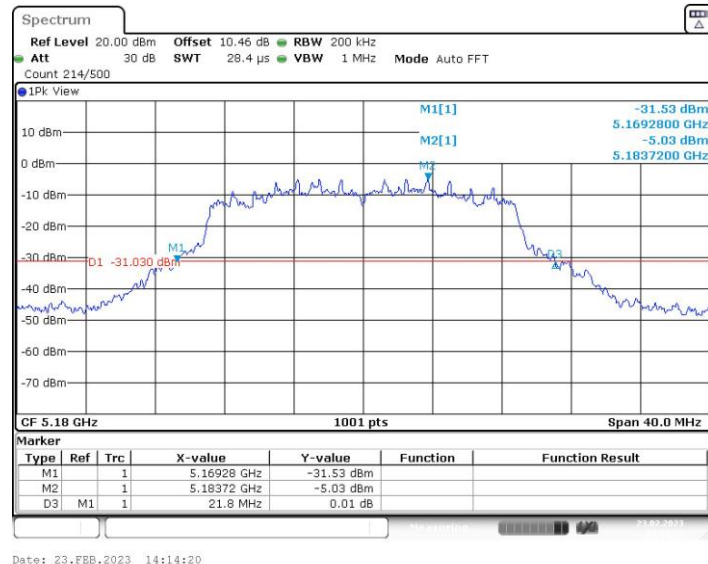
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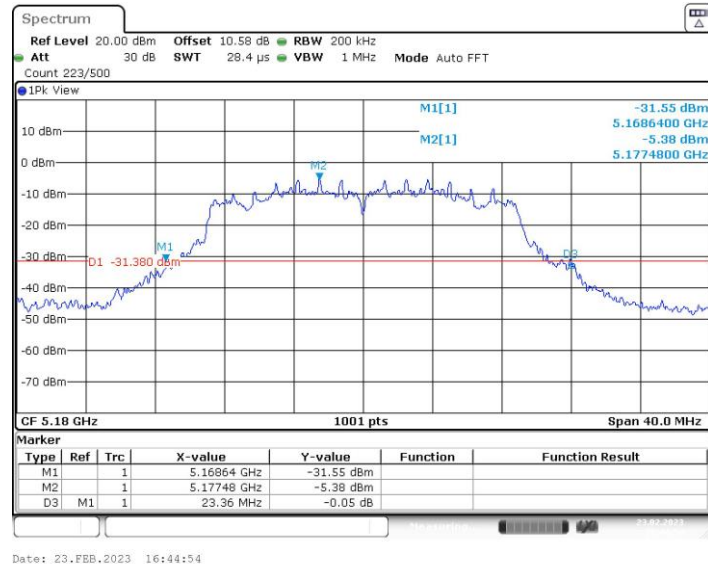
11A_Ant2_5240



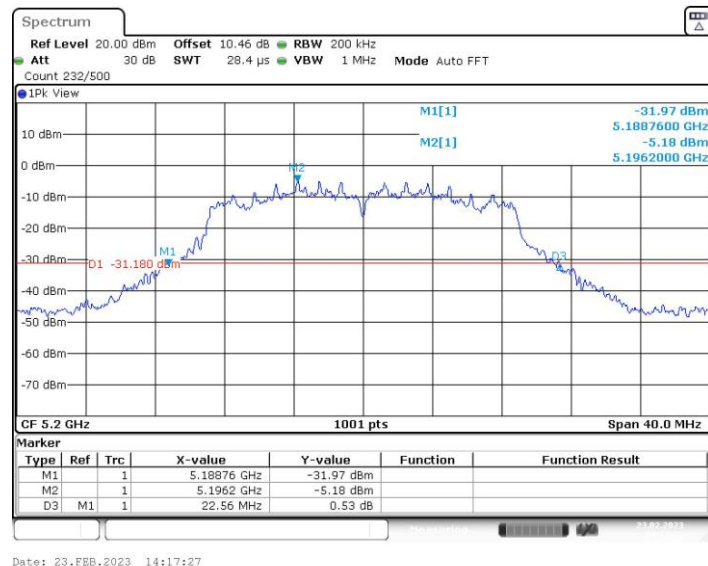
11N20SISO_Ant1_5180



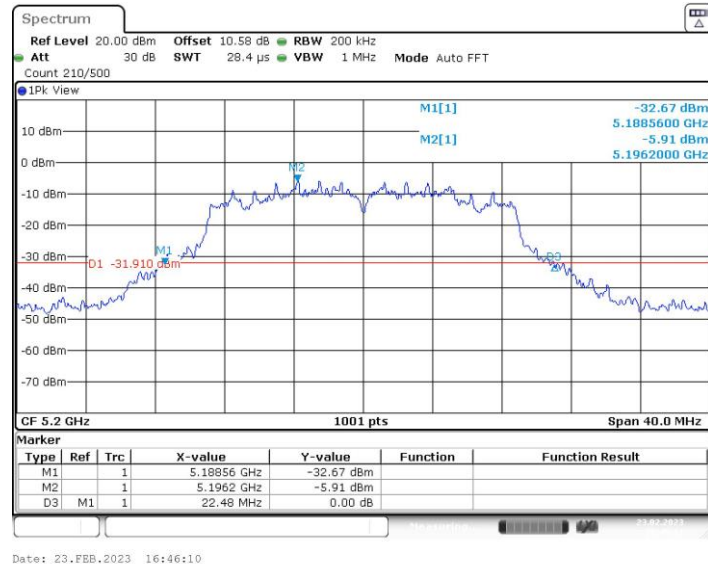
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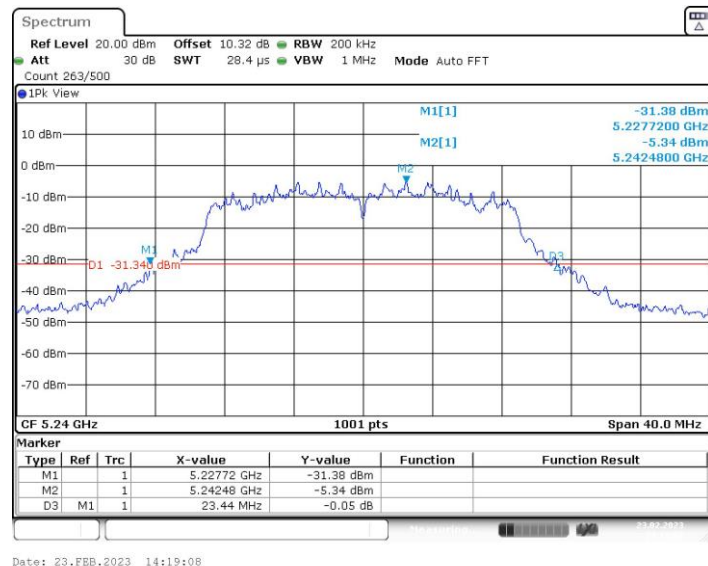
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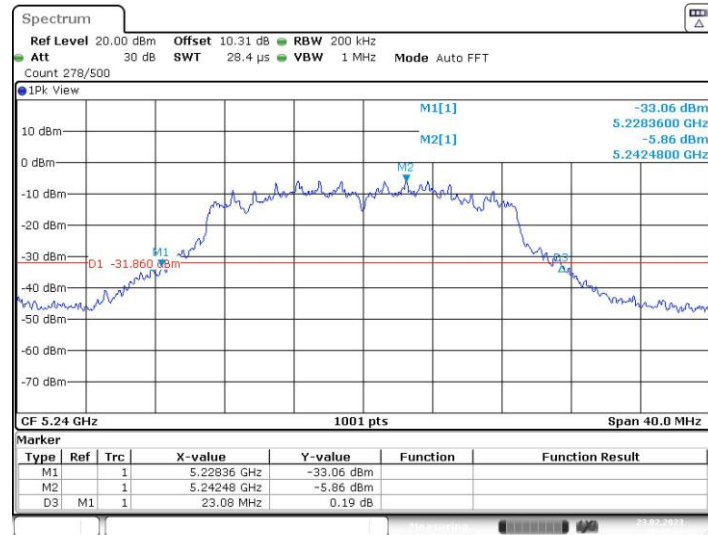
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11N20SISO_Ant1_5240

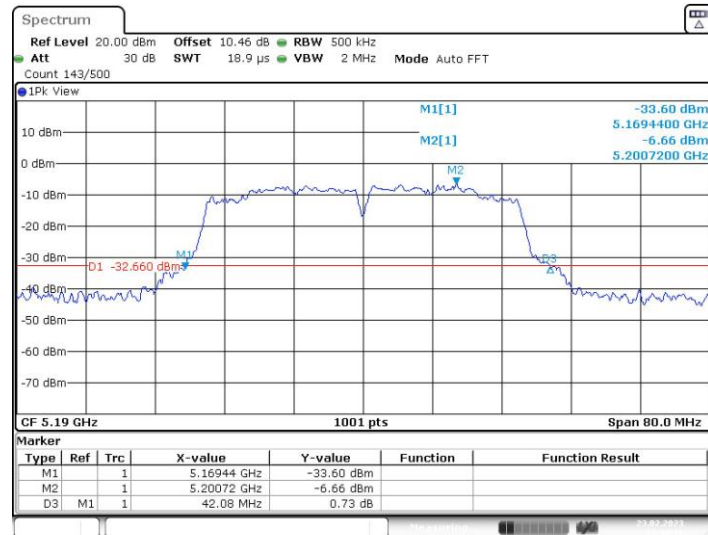


11N20SISO_Ant2_5240



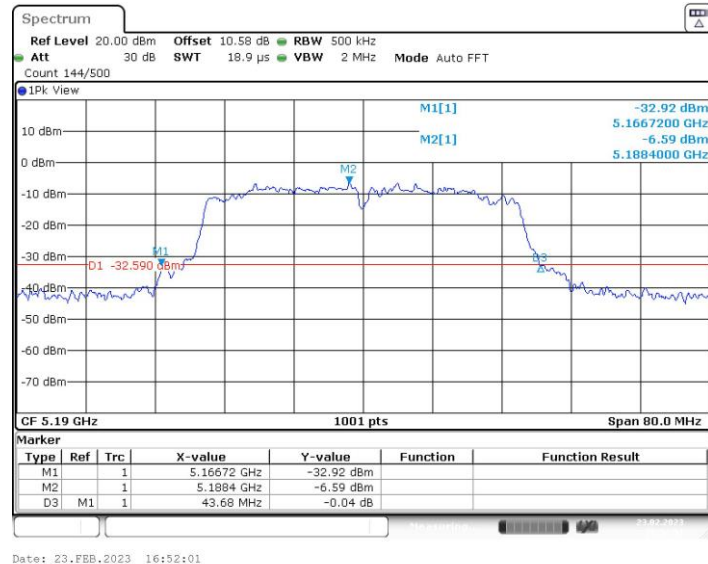
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11N40SISO_Ant1_5190

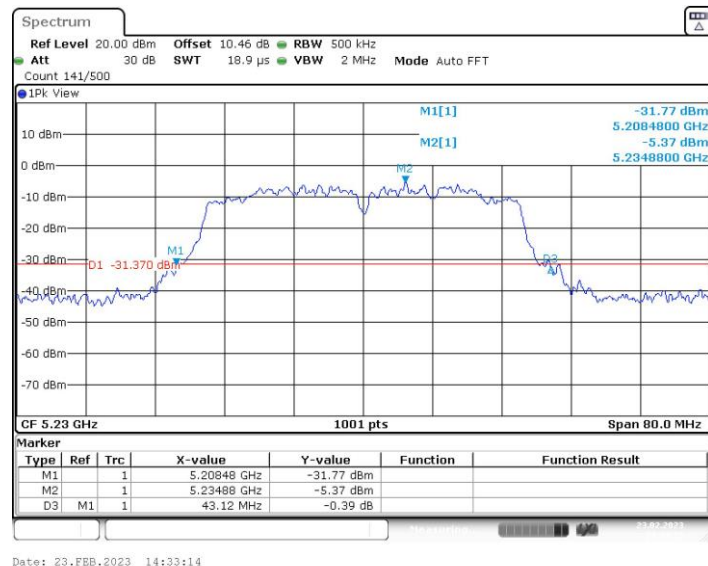


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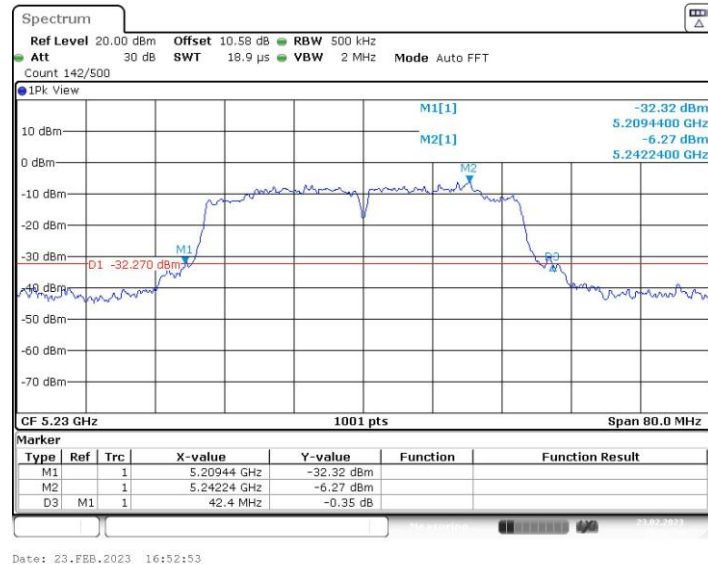
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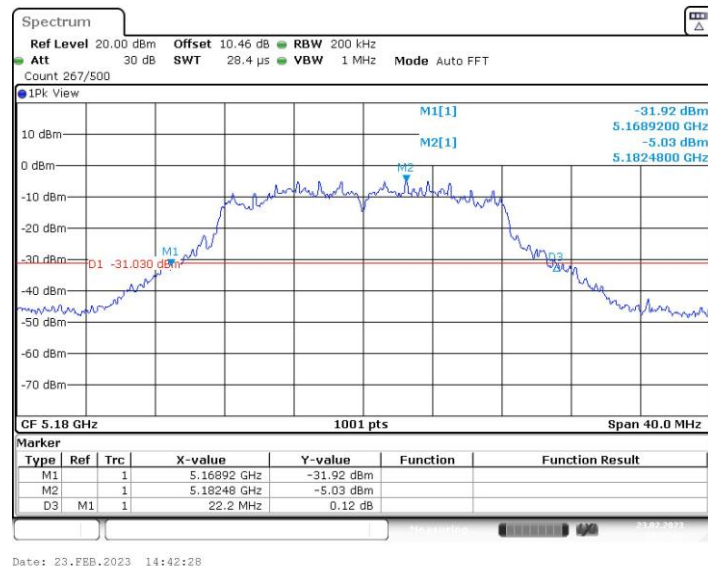
11N40SISO_Ant1_5230



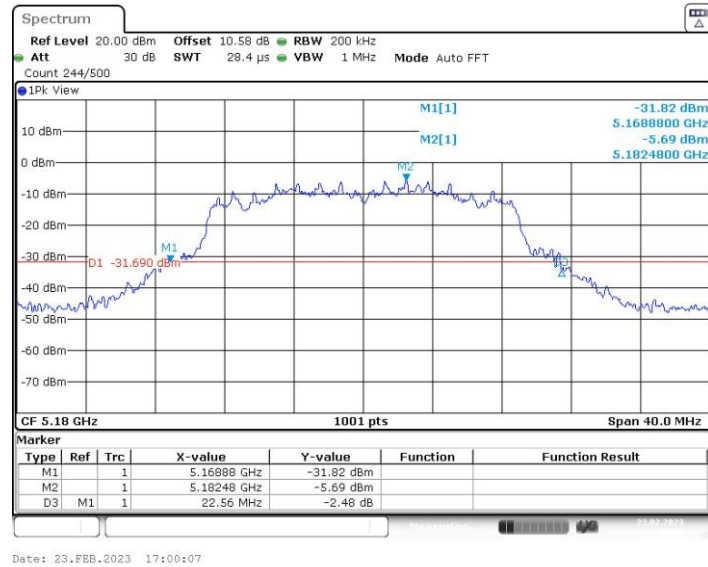
11N40SISO_Ant2_5230



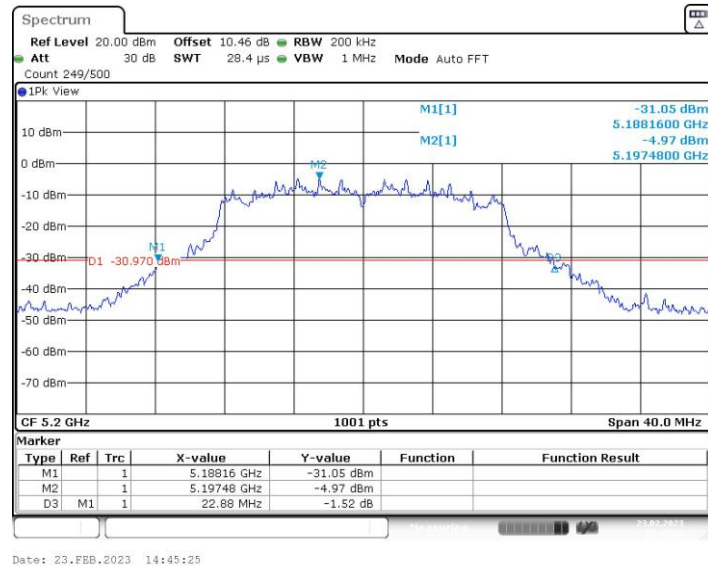
11AC20SISO_Ant1_5180



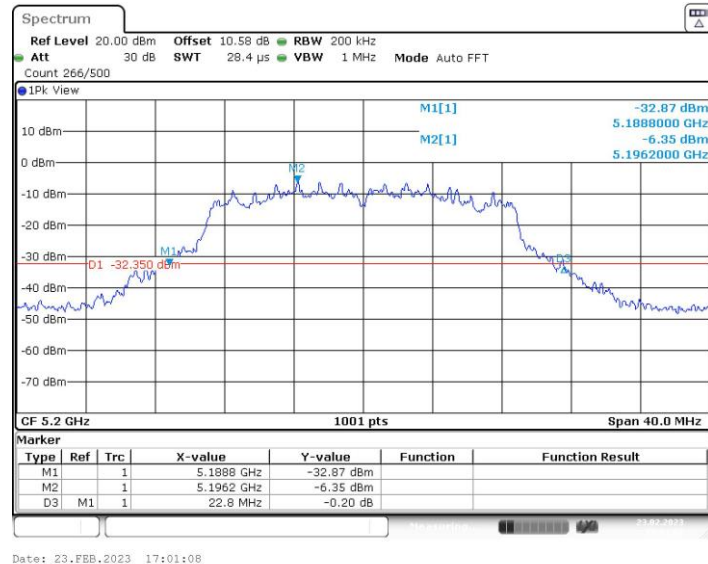
11AC20SISO_Ant2_5180



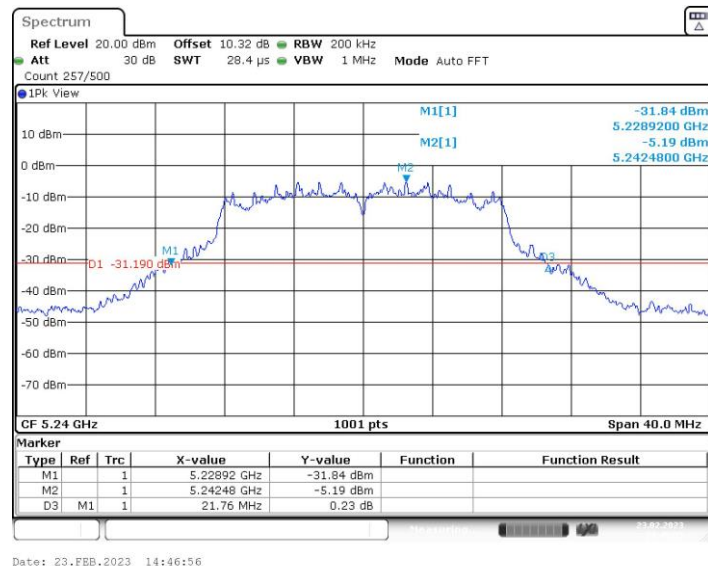
11AC20SISO_Ant1_5200



11AC20SISO_Ant2_5200



11AC20SISO_Ant1_5240



11AC20SISO_Ant2_5240