TEST REPORT

Applicant Name :	Shenzhen Snapmaker Technologies Co., Ltd.
Address :	4F & 5F, Building 13, Pingshan 1st Road, Nanshan District, Shenzhen, Guangdong, China
Report Number :	SZNS220913-41332E-RF-00
FCC ID:	2AVDG-ARTISAN

Test Standard (s)

FCC PART 15.407

Sample Description

Product Type:	3D Printer
Model No.:	Artisan
Multiple Model(s) No.:	N/A
Trade Mark:	SNAPMAKER
Date Received:	2022/09/13
Report Date:	2022/10/25

Test Result:	Pass*

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

Prepared and Checked By:

Audy. Yu

Audy Yu
EMC Engineer

Approved By:

Candy. Li

Candy Li
EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★ ".
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Frequency Range	5G Wi-Fi: 5150-5250MHz; 5725-5850MHz
Mode	802.11a/n20/n40
Maximum Conducted Average Output Power	5150-5250MHz: 17.21dBm 5725-5850MHz: 15.09dBm
Modulation Technique	OFDM
Antenna Specification*	0.69dBi (It is provided by the applicant)
Voltage Range	AC 110-220V , 50-60Hz
Sample serial number	SZNS220913-41332E-RF-S1 for Conducted and Radiated Emissions SZNS220913-41332E-RF-S2 for RF Conducted Test (Assigned by ATC)
Sample/EUT Status	Good condition

Note: Manufacturers can sell any of the three functions (3DP Module, Laser Module, CNC Module), the corresponding model names are as follows:

Product Name	Model	Note
3DP Module	TH-F-DUAL-AS ,TH-F-DUAL-MS	Only the model name is different between the two models.
Laser Module	TH-L-P100-W450	/
CNC Module	TH-C-200W	/

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and E of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart E, section 15.203, 15.205, 15.207, 15.209 and 15.407 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices. And KDB789033 D02 General U-NII Test Procedures New Rules v02r01.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF Frequency		$0.082*10^{-7}$
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
AC Power Lines Conducted Emissions		2.72dB
Emissions, Radiated	9kHz - 30MHz	2.66dB
	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
	18GHz - 26.5GHz	5.06dB
	26.5GHz - 40GHz	4.72dB
Temperature		1℃
Humidity		6%
Supply voltages		0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISEDC), the Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode, which was provided by manufacturer.

For 5150-5250MHz Band, 6 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
38	5190	46	5230
40	5200	48	5240

For 802.11a/n20 mode: channel 36, 40, 48 were tested;
For 802.11n40 mode: channel 38, 46 were tested.

For 5725-5850MHz Band, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	159	5795
151	5755	161	5805
153	5765	165	5825
157	5785	/	/

For 802.11a/n20 mode: channel 149, 157, 165 were tested;
For 802.11n40 mode: channel 151, 159 were tested.

EUT Exercise Software

"QRCT 3"* exercise software was used. The software and power level was provided by the applicant.

The worst case was performed under:

U-NII	Mode	Data rate	Power Level*		
			Low Channel	Middle Channel	High Channel
5150 – 5250MHz	802.11a	6Mbps	16	16	16
	802.11n-HT20	MCS0	16	16	16
	802.11n-HT40	MCS0	16	/	16
5725 – 5850MHz	802.11a	6Mbps	16	16	16
	802.11n-HT20	MCS0	16	16	16
	802.11n-HT40	MCS0	16	/	16

The worse-case data rates are determined to be as follows for each mode based upon investigations by measuring the output power and PSD across all data rated bandwidths, and modulations.

Duty cycle

Test Result: Pass. Please refer to the Appendix.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

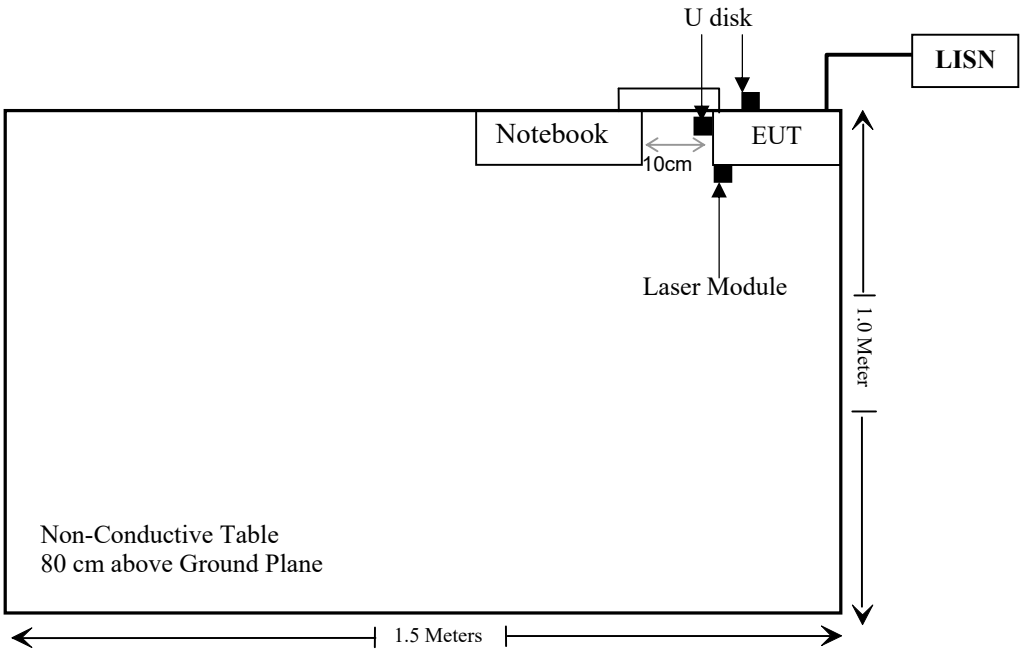
Manufacturer	Description	Model	Serial Number
DELL	NoteBook	Latitude E4710	PC201911252059
Unknown	U disk	Unknown	Unknown
Unknown	U disk	Unknown	Unknown
Snapmaker	Laser Module	TH-L-P100-W450	Unknown

External I/O Cable

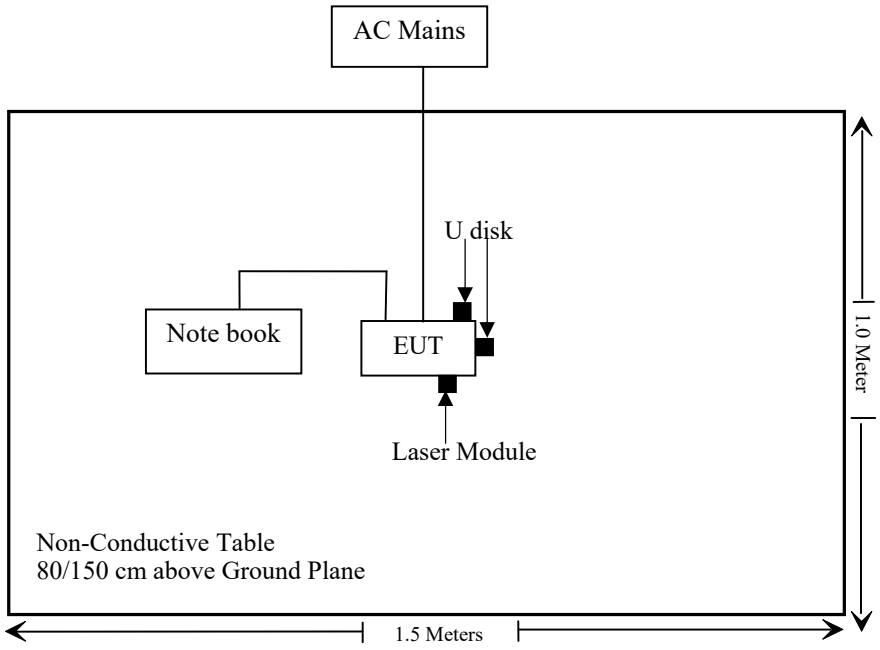
Cable Description	Length (m)	From Port	To
Un-shielded detachable AC cable	1.5	EUT	LISN/AC Mains
Un-shielded detachable USB cable	1.5	EUT	NoteBook

Block Diagram of Test Setup

For conducted emission:



For radiated emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) (3) & §2.1091	Maximum Permissible Exposure (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.407(b)(9)& §15.207(a)	Conducted Emissions	Compliant
§15.205& §15.209 &§15.407(b)	Undesirable Emission& Restricted Bands	Compliant
§15.407(a) (e)	26 dB Emission Bandwidth & 6dB Bandwidth	Compliant
§15.407(a)	Conducted Transmitter Output Power	Compliant
§15.407 (a)	Power Spectral Density	Compliant
§15.407 (h)	Transmit Power Control (TPC)	Not Applicable
§15.407 (h)	Dynamic Frequency Selection (DFS)	Not Applicable

Not Applicable: the EUT not operating within frequency range of 5250-5350MHz&5470-5725MHz.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde& Schwarz	EMI Test Receiver	ESCI	100784	2021/12/13	2022/12/12
Rohde & Schwarz	L.I.S.N.	ENV216	101314	2021/12/13	2022/12/12
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2021/12/13	2022/12/12
Unknown	RF Coaxial Cable	No.17	N0350	2021/12/14	2022/12/13
Conducted Emission Test Software: e3 19821b (V9)					
Radiated Emissions Test					
Rohde& Schwarz	Test Receiver	ESR	102725	2021/12/13	2022/12/12
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2021/12/13	2022/12/12
SONOMA INSTRUMENT	Amplifier	310 N	186131	2021/11/09	2022/11/08
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2021/11/09	2022/11/08
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2021/11/11	2022/11/10
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
Radiated Emission Test Software: e3 19821b (V9)					
Unknown	RF Coaxial Cable	No.10	N050	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.11	N1000	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.12	N040	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.13	N300	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.14	N800	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.15	N600	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.16	N650	2021/12/14	2022/12/13
CD	Band Reject Filter	BRM-5.15/5.35g-45	075	2021/12/14	2022/12/13
CD	Band Reject Filter	BRM-5.725/5.875G-45	065	2021/12/14	2022/12/13
RF Conducted Test					
Rohde&Schwarz	Spectrum Analyzer	FSV-40	101590	2022/01/19	2023/01/18
Tonscend	RF Control Unit	JS0806-2	19G8060182	2021/10/26	2022/10/25
HP	20dB Attenuator	8491A	53857	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.31	RF-01	Each time	

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations hAve.e been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

§1.1307 (b) (3) & §2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to KDB 447498 D04 Interim General RF Exposure Guidance

MPE-Based Exemption:

An alternative to the SAR-based exemption is provided in § 1.1307(b)(3)(i)(C), for a much wider frequency range, from 300 kHz to 100 GHz, applicable for separation distances greater or equal to λ/2π, where λ is the free-space operating wavelength in meters. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power. For this case, a RF source is an RF exempt device if its ERP (watts) is no more than a frequency-dependent value, as detailed tabular form in Appendix B. These limits have been derived based on the basic specifications on Maximum Permissible Exposure (MPE) considered for the FCC rules in § 1.1310(e)(1).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R^2.
1.34-30	3,450 R^2/f^2.
30-300	3.83 R^2.
300-1,500	0.0128 R^2f.
1,500-100,000	19.2R^2.

f = frequency in MHz;
R = minimum separation distance from the body of a nearby person (appropriate units, e.g., m);

For multiple RF sources: Multiple RF sources are exempt if:

in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation:

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Result

For worst case:

Mode	Frequency (MHz)	Tune up conducted power	Antenna Gain		ERP		Evaluation Distance (m)	ERP Limit (mW)
		(dBm)	(dBi)	(dBd)	(dBm)	(mW)		
BT	2402-2480	4.0	0.51	-1.64	2.36	1.722	0.2	768
2.4G Wi-Fi	2412-2462	21.0	0.51	-1.64	19.36	86.298	0.2	768
5G Wi-Fi	5150-5250	17.5	0.69	-1.46	16.04	40.179	0.2	768
5G Wi-Fi	5725-5850	15.5	0.69	-1.46	14.04	25.351	0.2	768

Note 1: The tune-up power and antenna gain was declared by the applicant.
Note 2: 0dBd=2.15dBi.
Note 3: The BT can transmit at the same time with the Wi-Fi, the 2.4G Wi-Fi and 5G Wi-Fi cannot Simultaneous transmitting

Simultaneous transmitting consideration (worst case):

The ratio=ERP_{BT}/limit $_{BT}$ + ERP $_{Wi\text{-}Fi}$/limit $_{Wi\text{-}Fi}$ = 1.722/768+86.298/768=0.115＜1.0

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliant.

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
And according to FCC 47 CFR section 15.407 (a), if the transmitting antennas of directional gain greater than 6dBi are used, the transmit power and power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has one internal antenna arrangement for 5G Wi-Fi which were permanently attached. Please refer to the EUT photos.

Type	Antenna Gain	Impedance	Frequency Range
FPC	0.69dBi	50 Ω	5150-5850MHz

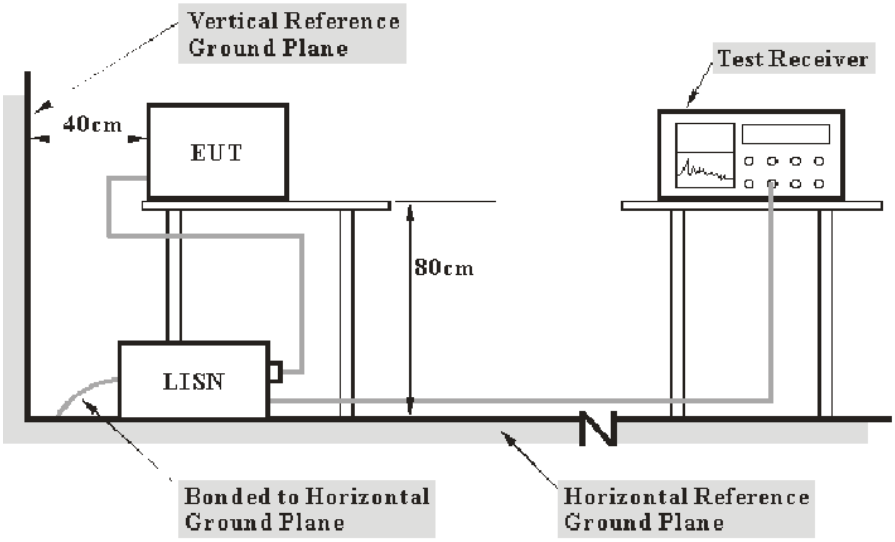
Result: Compliant.

FCC §15.407 (b) (6) §15.207 (a) – CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207, §15.407(b) (6)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and Ave.erage detection mode.

Corrected Factor & Margin Calculation

The Transd factor is calculated by adding LISN VDF (Voltage Division Factor) and Cable Loss. The basic equation is as follows:

Transd Factor = LISN VDF + Cable Loss

The "**Over limit**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over limit of -7 dB means the emission is 7 dB below the limit. The equation for calculation is as follows:

Over Limit = Level – Limit
Level = Read Level + Factor

Test Data

Environmental Conditions

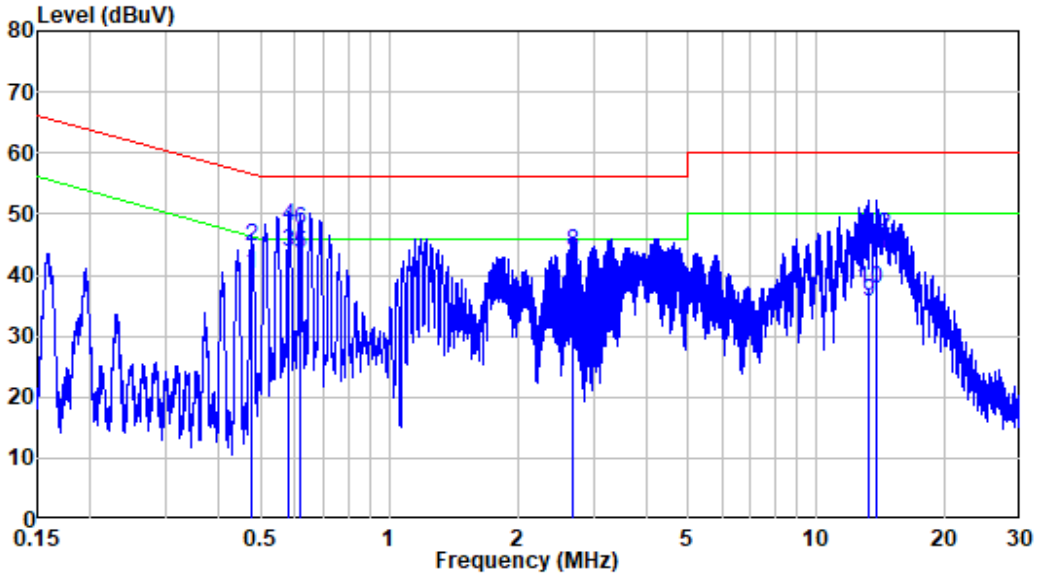
Temperature:	24°C
Relative Humidity:	40 %
ATM Pressure:	101.0 kPa

The testing was performed by Jason Liu on 2022-10-09.

EUT operation mode: Transmitting (worst case is 802.11n40, 5230MHz)

Note：The worst case is Laser printing.

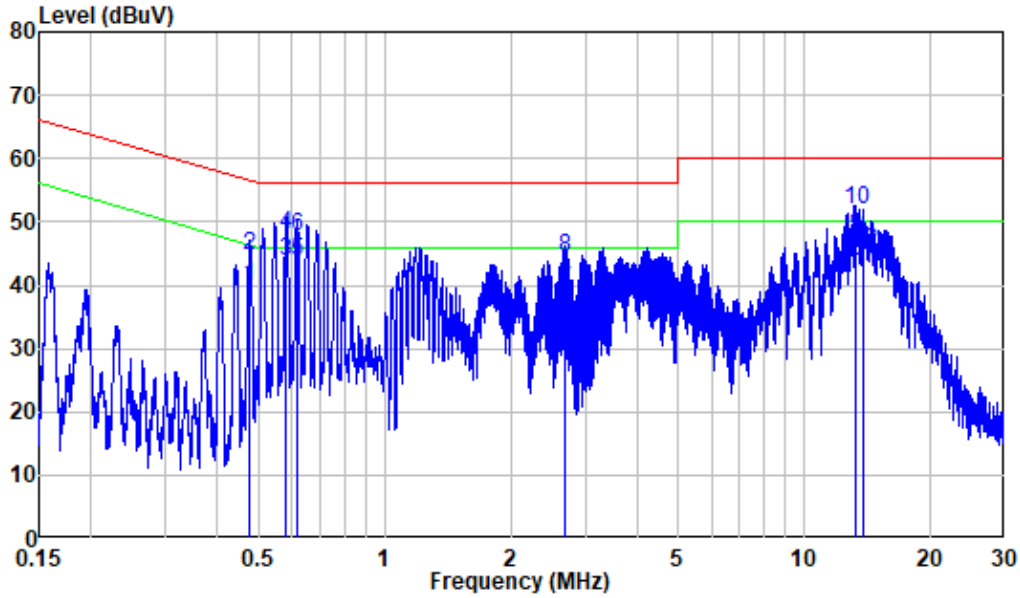
AC 120V/60 Hz, Line



Site : Shielding Room
Condition: Line
Job No. : SZNS220913-41332E-RF
Mode : 5G WIFI
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.476	9.80	30.22	40.02	46.40	-6.38	Average
2	0.476	9.80	34.96	44.76	56.40	-11.64	QP
3	0.583	9.81	33.90	43.71	46.00	-2.29	Average
4	0.583	9.81	38.07	47.88	56.00	-8.12	QP
5	0.619	9.81	33.76	43.57	46.00	-2.43	Average
6	0.619	9.81	37.70	47.51	56.00	-8.49	QP
7	2.685	9.83	29.05	38.88	46.00	-7.12	Average
8	2.685	9.83	33.92	43.75	56.00	-12.25	QP
9	13.267	9.93	25.70	35.63	50.00	-14.37	Average
10	13.267	9.93	27.74	37.67	60.00	-22.33	QP
11	13.795	9.94	33.44	43.38	50.00	-6.62	Average
12	13.795	9.94	36.45	46.39	60.00	-13.61	QP

AC 120V/60 Hz, Neutral



Site : Shielding Room
Condition: Neutral
Job No. : SZNS220913-41332E-RF
Mode : 5G WIFI
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.475	9.80	30.05	39.85	46.42	-6.57	Average
2	0.475	9.80	34.79	44.59	56.42	-11.83	QP
3	0.583	9.81	33.93	43.74	46.00	-2.26	Average
4	0.583	9.81	38.05	47.86	56.00	-8.14	QP
5	0.619	9.81	33.84	43.65	46.00	-2.35	Average
6	0.619	9.81	37.78	47.59	56.00	-8.41	QP
7	2.684	9.83	29.54	39.37	46.00	-6.63	Average
8	2.684	9.83	34.53	44.36	56.00	-11.64	QP
9	13.223	10.03	37.67	47.70	50.00	-2.30	Average
10	13.223	10.03	41.90	51.93	60.00	-8.07	QP
11	13.832	10.04	32.00	42.04	50.00	-7.96	Average
12	13.832	10.04	35.38	45.42	60.00	-14.58	QP

§15.205 & §15.209 & §15.407(B)– UNDESIRABLE EMISSION

Applicable Standard

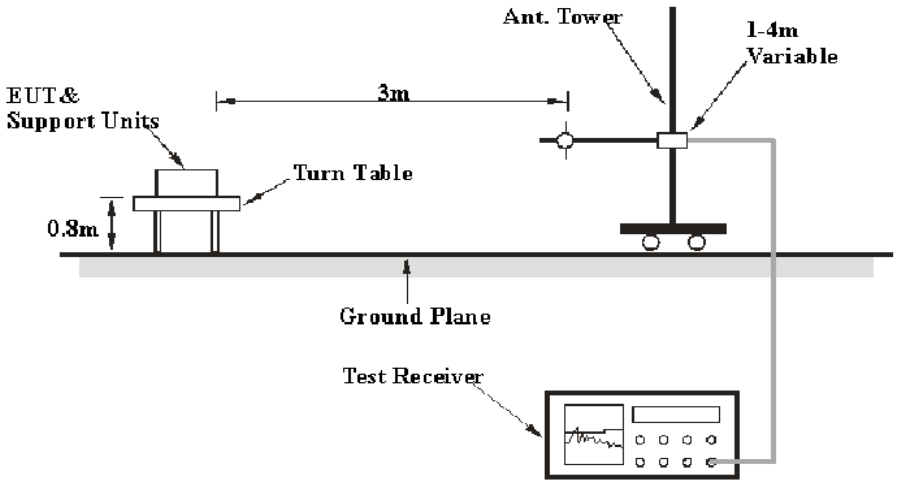
FCC §15.407 (b); §15.209; §15.205;

(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(4) For transmitters operating in the 5.725-5.85 GHz band:
(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.

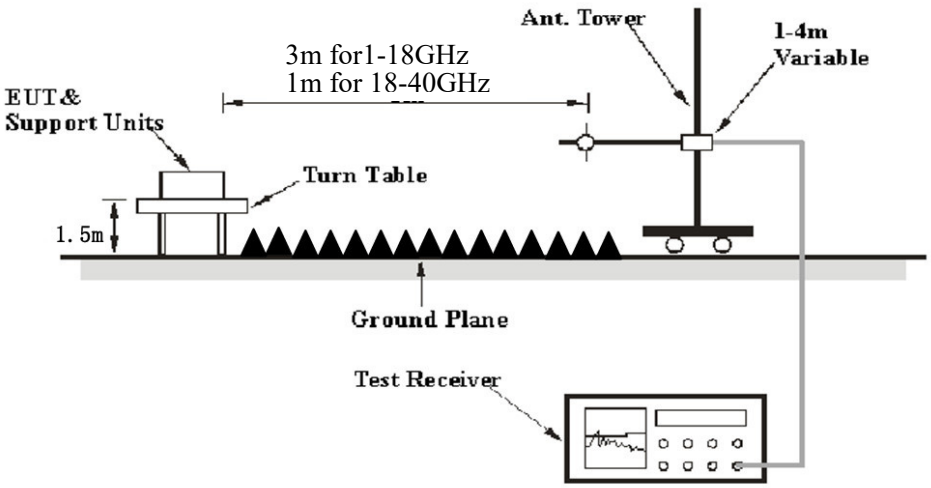
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

EUT Setup

Below 1 GHz:



Above 1 GHz:



The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC 15.209 and FCC 15.407 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 40 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1MHz	10 Hz Note 1	/	Ave.erage
	1MHz	＞1/T Note 2	/	Ave.erage

Note 1: when duty cycle is no less than 98%
Note 2: when duty cycle is less than 98%

Test Procedure

Radiated Spurious Emission

During the radiated emission test, the adapter was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all the installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1GHz, peak and Ave.erage detection modes for frequencies above 1GHz.

According to ANSI C63.10-2013,9.4: For field strength measurements made at other than the distance at which the applicable limit is specified,extrapolate the measured field strength to the field strength at the distance specified by the limit using an inverse distance correction factor (20 dB/decade of distance). In some cases, a different distance correction factor may be required;

$$E_{\mathrm{SpecLimit}} = E_{\mathrm{Meas}} + 20\log\left(\frac{d_{\mathrm{Meas}}}{d_{\mathrm{SpecLimit}}}\right)$$

where

$E_{\mathrm{SpecLimit}}$	is the field strength of the emission at the distance specified by the limit, in dBμV/m
E_{Meas}	is the field strength of the emission at the measurement distance, in dBμV/m
d_{Meas}	is the measurement distance, in m
$d_{\mathrm{SpecLimit}}$	is the distance specified by the limit, in m

So the extrapolation factor of 1m is 20*log(1/3)= -9.5 dB, for 18-40GHz range, the limit of 1m distance was added by 9.5dB from limit of 3m to compared with the result measurement at 1m distance.

Factor & Margin Calculation

The Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain. The basic equation is as follows:

Factor = Antenna Factor + Cable Loss - Amplifier Gain

The "**Over Limit/Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit/margin of -7dB means the emission is 7dB below the limit. The equation for calculation is as follows:

Over Limit/Margin = Level / Corrected Amplitude – Limit
Level / Corrected Amplitude = Read Level + Factor

Test Data

Environmental Conditions

Temperature:	24.5~25℃
Relative Humidity:	50~60%
ATM Pressure:	101.0 kPa

The testing was performed by Level Li on 2022-10-09 for below 1GHz , Jeff Jiang on 2022-09-28 for above 1GHz.

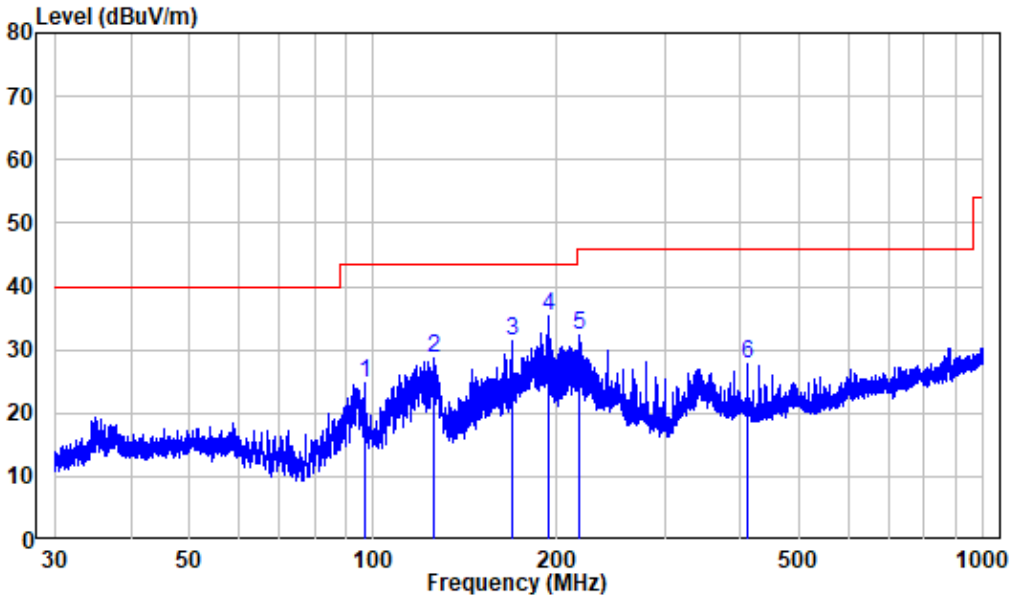
EUT operation mode: Transmitting (Pre-scan in the X,Y and Z axes of orientation, the worst case X-axes of orientation was recorded)

Note：The worst case is Laser printing.

30 MHz – 1 GHz: *(worst case is 802.11n40, 5230MHz)*

Note: When the result of Peak less than the limit of QP by more than 6dB, just the peak value was recorded.

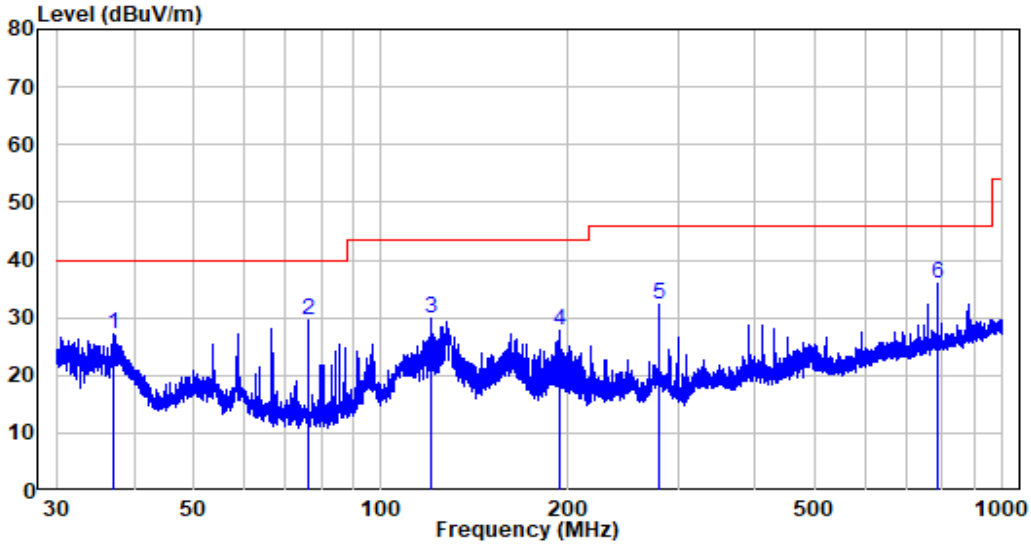
Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : SZNS220913-41332E-RF
Test Mode: 5G WIFI

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	96.605	-12.29	36.99	24.70	43.50	-18.80	Peak
2	125.721	-14.38	42.94	28.56	43.50	-14.94	Peak
3	169.080	-13.67	45.18	31.51	43.50	-11.99	Peak
4	193.179	-11.29	46.67	35.38	43.50	-8.12	Peak
5	217.354	-11.56	43.94	32.38	46.00	-13.62	Peak
6	410.023	-6.33	34.23	27.90	46.00	-18.10	Peak

Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : SZNS220913-41332E-RF
Test Mode: 5G WIFI

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	37.155	-10.99	38.18	27.19	40.00	-12.81	Peak
2	76.144	-16.43	45.93	29.50	40.00	-10.50	Peak
3	120.013	-13.53	43.33	29.80	43.50	-13.70	Peak
4	193.179	-11.29	39.17	27.88	43.50	-15.62	Peak
5	280.024	-9.58	41.92	32.34	46.00	-13.66	Peak
6	784.406	-0.01	36.03	36.02	46.00	-9.98	Peak

Above 1GHz:

5150-5250 MHz:

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave		Height (m)	Polar (H/V)				
802.11a									
5180 MHZ									
4500	64.02	PK	350	1.8	H	-4.72	59.3	74	-14.7
4500	49.74	AV	350	1.8	H	-4.72	45.02	54	-8.98
4500	63.61	PK	29	2.3	V	-4.72	58.89	74	-15.11
4500	49.71	AV	29	2.3	V	-4.72	44.99	54	-9.01
5150	63.98	PK	87	1.5	H	-2.73	61.25	74	-12.75
5150	50.03	AV	87	1.5	H	-2.73	47.3	54	-6.7
5150	63.77	PK	48	2	V	-2.73	61.04	74	-12.96
5150	49.83	AV	48	2	V	-2.73	47.1	54	-6.9
10360	43.1	PK	239	2.1	H	8.12	51.22	68.2	-16.98
10360	42.29	PK	311	2	V	8.12	50.41	68.2	-17.79
5200 MHZ									
10400	41.82	PK	235	1.1	H	8.24	50.06	68.2	-18.14
10400	42.03	PK	206	1.3	V	8.24	50.27	68.2	-17.93
5240 MHZ									
5350	63.54	PK	334	2.2	H	-2.33	61.21	74	-12.79
5350	50.83	AV	334	2.2	H	-2.33	48.5	54	-5.5
5350	63.49	PK	352	1.2	V	-2.33	61.16	74	-12.84
5350	50.64	AV	352	1.2	V	-2.33	48.31	54	-5.69
5460	62.77	PK	238	1.7	H	-2.26	60.51	74	-13.49
5460	51.08	AV	238	1.7	H	-2.26	48.82	54	-5.18
5460	62.64	PK	343	1.2	V	-2.26	60.38	74	-13.62
5460	51.08	AV	343	1.2	V	-2.26	48.82	54	-5.18
10480	41.44	PK	275	2.5	H	8.56	50	68.2	-18.2
10480	41.21	PK	351	1.5	V	8.56	49.77	68.2	-18.43

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave		Height (m)	Polar (H/V)				
802.11N20									
5180 MHZ									
4500	63.7	PK	99	1.1	H	-4.72	58.98	74	-15.02
4500	49.59	AV	99	1.1	H	-4.72	44.87	54	-9.13
4500	63.98	PK	101	1.3	V	-4.72	59.26	74	-14.74
4500	49.57	AV	101	1.3	V	-4.72	44.85	54	-9.15
5150	65.67	PK	294	1.6	H	-2.73	62.94	74	-11.06
5150	50.05	AV	294	1.6	H	-2.73	47.32	54	-6.68
5150	68.79	PK	52	2	V	-2.73	66.06	74	-7.94
5150	50.58	AV	52	2	V	-2.73	47.85	54	-6.15
10360	42.05	PK	299	1.9	H	8.12	50.17	68.2	-18.03
10360	42.3	PK	321	1.5	V	8.12	50.42	68.2	-17.78
5200 MHZ									
10400	42.16	PK	296	1.9	H	8.24	50.4	68.2	-17.8
10400	41.91	PK	105	2.5	V	8.24	50.15	68.2	-18.05
5240 MHZ									
5350	63.83	PK	305	1.9	H	-2.33	61.5	74	-12.5
5350	50.8	AV	305	1.9	H	-2.33	48.47	54	-5.53
5350	63.6	PK	337	2.2	V	-2.33	61.27	74	-12.73
5350	50.68	AV	337	2.2	V	-2.33	48.35	54	-5.65
5460	62.7	PK	137	1.9	H	-2.26	60.44	74	-13.56
5460	51.02	AV	137	1.9	H	-2.26	48.76	54	-5.24
5460	63.12	PK	323	1.7	V	-2.26	60.86	74	-13.14
5460	50.83	AV	323	1.7	V	-2.26	48.57	54	-5.43
10480	41.29	PK	106	1.3	H	8.56	49.85	68.2	-18.35
10480	41.21	PK	281	2.1	V	8.56	49.77	68.2	-18.43

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave		Height (m)	Polar (H/V)				
802.11N40									
5190 MHZ									
4500	63.75	PK	43	1.2	H	-4.72	59.03	74	-14.97
4500	49.66	AV	43	1.2	H	-4.72	44.94	54	-9.06
4500	63.95	PK	14	1.7	V	-4.72	59.23	74	-14.77
4500	49.8	AV	14	1.7	V	-4.72	45.08	54	-8.92
5150	66.96	PK	342	1.9	H	-2.73	64.23	74	-9.77
5150	50.67	AV	342	1.9	H	-2.73	47.94	54	-6.06
5150	70.82	PK	11	1.6	V	-2.73	68.09	74	-5.91
5150	50.93	AV	11	1.6	V	-2.73	48.2	54	-5.8
10380	42.01	PK	118	2	H	8.18	50.19	68.2	-18.01
10380	41.8	PK	331	1	V	8.18	49.98	68.2	-18.22
5230 MHZ									
5350	64.15	PK	2	1.3	H	-2.33	61.82	74	-12.18
5350	51.09	AV	2	1.3	H	-2.33	48.76	54	-5.24
5350	65.41	PK	11	2.2	V	-2.33	63.08	74	-10.92
5350	51.16	AV	11	2.2	V	-2.33	48.83	54	-5.17
5460	62.92	PK	81	1.9	H	-2.26	60.66	74	-13.34
5460	51.02	AV	81	1.9	H	-2.26	48.76	54	-5.24
5460	63.01	PK	116	1.9	V	-2.26	60.75	74	-13.25
5460	50.96	AV	116	1.9	V	-2.26	48.7	54	-5.3
10460	41.55	PK	240	1.3	H	8.47	50.02	68.2	-18.18
10460	41.63	PK	137	1.3	V	8.47	50.1	68.2	-18.1

5725-5850 MHz:

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave		Height (m)	Polar (H/V)				
802.11a									
5745 MHZ									
5650	65.24	PK	121	1.8	H	-1.95	63.29	68.2	-4.91
5700	65.78	PK	117	1	H	-2.02	63.76	105.2	-41.44
5720	70.31	PK	90	1.4	H	-1.97	68.34	110.8	-42.46
5725	81.06	PK	311	1.7	H	-1.96	79.1	122.2	-43.1
5650	65.24	PK	76	1.8	V	-1.95	63.29	68.2	-4.91
5700	65.78	PK	303	1.5	V	-2.02	63.76	105.2	-41.44
5720	70.31	PK	228	1.2	V	-1.97	68.34	110.8	-42.46
5725	81.06	PK	296	1.5	V	-1.96	79.1	122.2	-43.1
11490	42.9	PK	255	1.8	H	6.63	49.53	74	-24.47
11490	43.57	PK	152	1.4	V	6.63	50.2	74	-23.8
5785 MHZ									
11570	43.39	PK	275	1.9	H	6.59	49.98	74	-24.02
11570	43.76	PK	305	1.5	V	6.59	50.35	74	-23.65
5825 MHZ									
5850	67.5	PK	240	1.8	H	-1.81	65.69	122.2	-56.51
5855	66.2	PK	55	2	H	-1.82	64.38	110.8	-46.42
5875	66.16	PK	270	2.1	H	-1.84	64.32	105.2	-40.88
5925	65.62	PK	215	1.9	H	-1.82	63.8	68.2	-4.4
5850	67.55	PK	242	1.5	V	-1.81	65.74	122.2	-56.46
5855	66.64	PK	93	2.4	V	-1.82	64.82	110.8	-45.98
5875	65.23	PK	30	1.3	V	-1.84	63.39	105.2	-41.81
5925	66.17	PK	123	1.2	V	-1.82	64.35	68.2	-3.85
11650	41.64	PK	87	1	H	6.77	48.41	74	-25.59
11650	42.29	PK	95	1.9	V	6.77	49.06	74	-24.94

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave		Height (m)	Polar (H/V)				
802.11N20									
5745 MHz									
5650	65.26	PK	17	2.2	H	-1.95	63.31	68.2	-4.89
5700	65.87	PK	159	1.9	H	-2.02	63.85	105.2	-41.35
5720	68.24	PK	20	1.7	H	-1.97	66.27	110.8	-44.53
5725	79.32	PK	326	1.8	H	-1.96	77.36	122.2	-44.84
5650	65.01	PK	24	2	V	-1.95	63.06	68.2	-5.14
5700	65.59	PK	53	2.3	V	-2.02	63.57	105.2	-41.63
5720	70.24	PK	151	2.4	V	-1.97	68.27	110.8	-42.53
5725	81.28	PK	293	1.2	V	-1.96	79.32	122.2	-42.88
11490	42.89	PK	212	1.5	H	6.63	49.52	74	-24.48
11490	43.52	PK	191	1.9	V	6.63	50.15	74	-23.85
5785 MHz									
11570	43.23	PK	191	1.7	H	6.59	49.82	74	-24.18
11570	43.71	PK	315	1.2	V	6.59	50.3	74	-23.7
5825 MHz									
5850	67.47	PK	142	2.5	H	-1.81	65.66	122.2	-56.54
5855	66.19	PK	208	1.7	H	-1.82	64.37	110.8	-46.43
5875	66.14	PK	227	1.4	H	-1.84	64.3	105.2	-40.9
5925	65.95	PK	245	1.8	H	-1.82	64.13	68.2	-4.07
5850	67.66	PK	128	1.4	V	-1.81	65.85	122.2	-56.35
5855	66.68	PK	309	2.5	V	-1.82	64.86	110.8	-45.94
5875	65.34	PK	351	1.6	V	-1.84	63.5	105.2	-41.7
5925	65.76	PK	76	1.3	V	-1.82	63.94	68.2	-4.26
11650	41.64	PK	190	1.9	H	6.77	48.41	74	-25.59
11650	42.05	PK	108	1.6	V	6.77	48.82	74	-25.18

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave		Height (m)	Polar (H/V)				
802.11N40									
5755 MHz									
5650	65.42	PK	146	2.4	H	-1.95	63.47	68.2	-4.73
5700	67.21	PK	119	1.5	H	-2.02	65.19	105.2	-40.01
5720	77.36	PK	99	2.3	H	-1.97	75.39	110.8	-35.41
5725	78.08	PK	91	2.5	H	-1.96	76.12	122.2	-46.08
5650	65.29	PK	200	1.1	V	-1.95	63.34	68.2	-4.86
5700	67.45	PK	4	1.1	V	-2.02	65.43	105.2	-39.77
5720	78.05	PK	324	1.7	V	-1.97	76.08	110.8	-34.72
5725	79.05	PK	74	2.2	V	-1.96	77.09	122.2	-45.11
11510	43.38	PK	356	2.3	H	6.59	49.97	74	-24.03
11510	44.29	PK	237	1.6	V	6.59	50.88	74	-23.12
5795 MHz									
5850	66.68	PK	351	1.6	H	-1.81	64.87	122.2	-57.33
5855	66.58	PK	82	2.1	H	-1.82	64.76	110.8	-46.04
5875	65.79	PK	20	1.8	H	-1.84	63.95	105.2	-41.25
5925	66.07	PK	270	1.1	H	-1.82	64.25	68.2	-3.95
5850	67.16	PK	287	1.9	V	-1.81	65.35	122.2	-56.85
5855	66.4	PK	171	1.1	V	-1.82	64.58	110.8	-46.22
5875	65.89	PK	48	1.7	V	-1.84	64.05	105.2	-41.15
5925	65.5	PK	296	2.1	V	-1.82	63.68	68.2	-4.52
11590	43.07	PK	95	1.3	H	6.57	49.64	74	-24.36
11590	44.26	PK	202	1.4	V	6.57	50.83	74	-23.17

Simultaneous transmitting consideration：

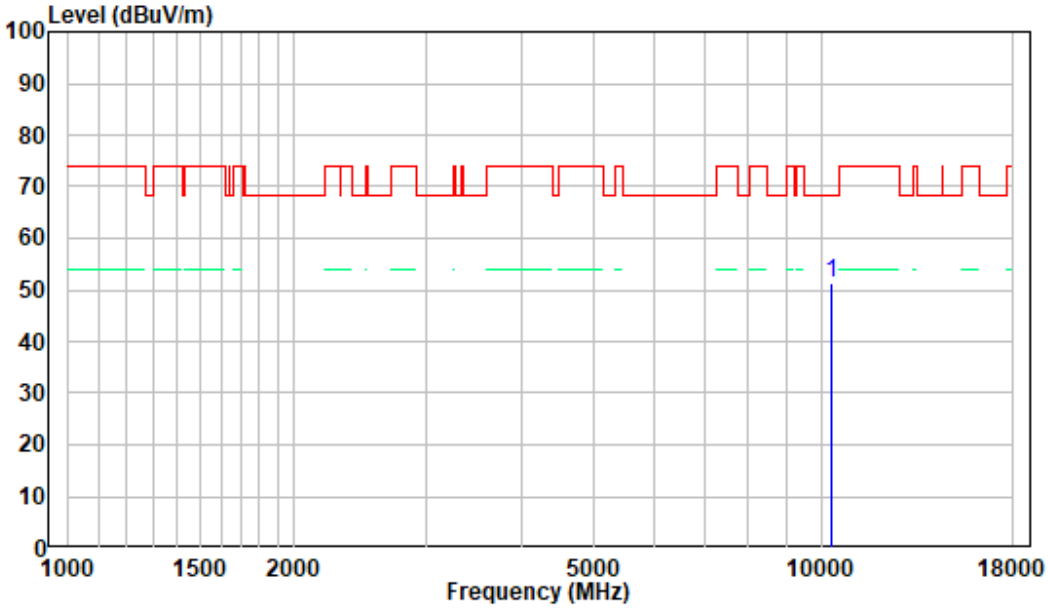
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/AV		Height (m)	Polar (H/V)				
Worst case: Bluetooth 3DH5 2480MHz+ 802.11a 5180MHz									
193.25	44.55	PK	26	1.5	H	-11.29	33.26	43.5	-10.24
193.25	37.42	PK	227	1.5	V	-11.29	26.13	43.5	-17.37
4960	54.19	PK	221	2.1	H	-3.01	51.18	74	-22.82
4960	53.83	PK	46	1.4	V	-3.01	50.82	74	-23.18
10360	42.95	PK	235	2.2	H	8.12	51.07	68.2	-17.13
10360	42.22	PK	307	2.1	V	8.12	50.34	68.2	-17.86

Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Corrected. Amplitude - Limit
The other spurious emission which is 20dB to the limit or in the noise floor level was not recorded.
The test result of peak was less than the limit of average or QP, so just the peak value was recorded.

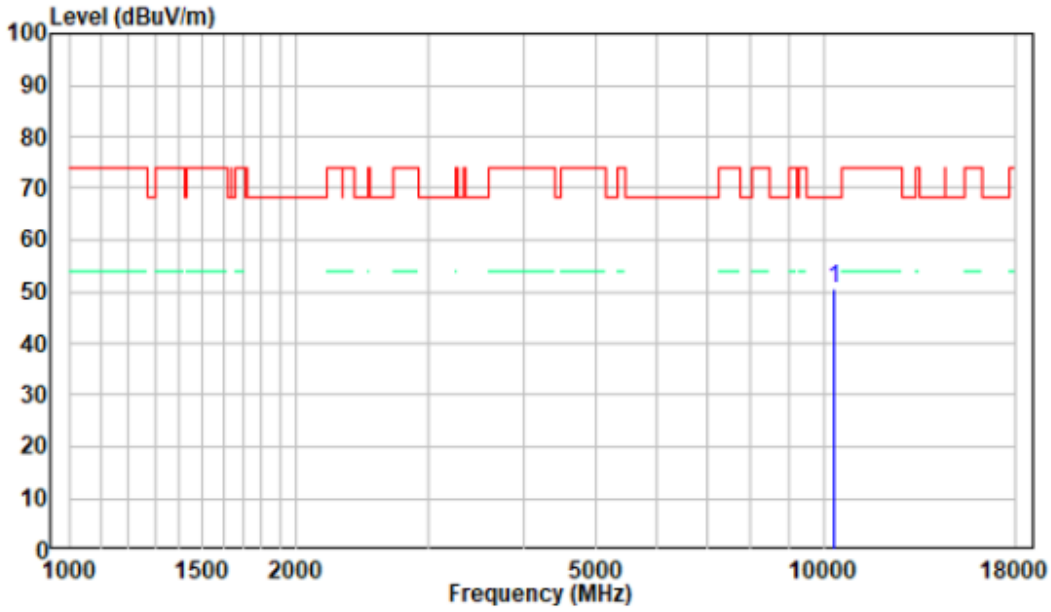
1 GHz - 18 GHz: (Pre-Scan plots)

802.11a, 5180MHz

Horizontal



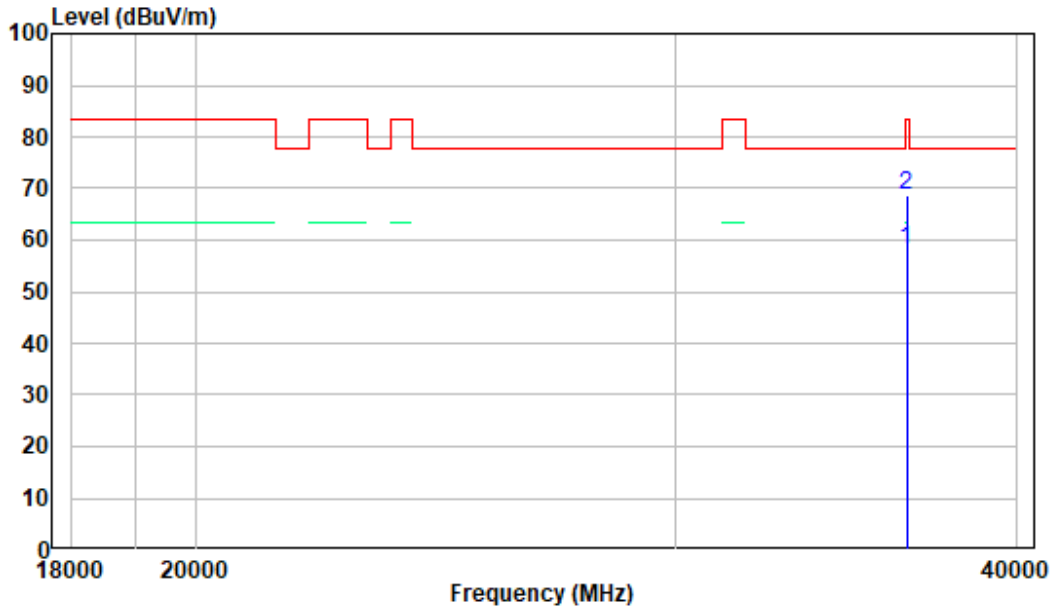
Vertical



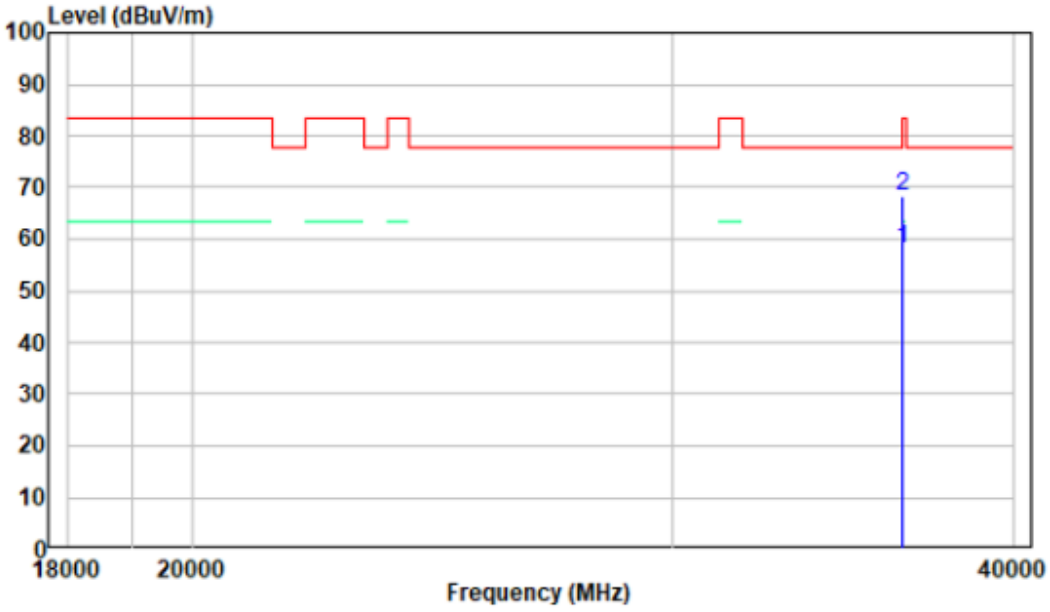
18-40GHz: (Pre-Scan plots)

802.11a, 5180MHz

Horizontal



Vertical



FCC §15.407(a),(e) – 26 dB & 6dB EMISSION BANDWIDTH

Applicable Standard

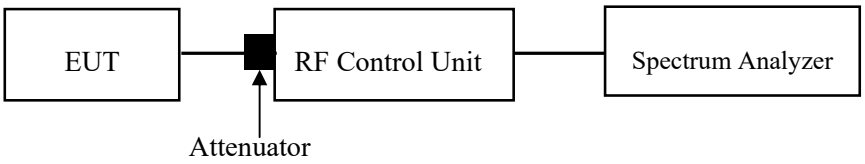
The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Test Procedure

1. Emission Bandwidth (EBW)
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

2. **Minimum Emission Bandwidth for the band 5.725-5.85 GHz**
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.725-5.85 GHz. The following procedure shall be used for measuring this bandwidth:
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



Test Data

Environmental Conditions

Temperature:	25℃
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

The testing was performed by Roger Ling from 2022-10-09 to 2022-10-21.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix.

FCC §15.407(a) – CONDUCTED TRANSMITTER OUTPUT POWER

Applicable Standard

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.

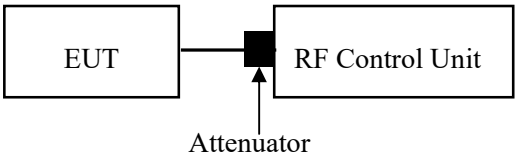
For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting 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.

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 + 10 log B, where B is the 26 dB emission bandwidth in megahertz. 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.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Procedure

c. Place the EUT on a bench and set it in transmitting mode.
d. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
e. Add a correction factor to the display.



Note: the RF control unit has a built-in power sensor.

Test Data

Environmental Conditions

Temperature:	25℃
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

The testing was performed by Roger Ling on 2022-10-09.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix.

FCC §15.407(a) - POWER SPECTRAL DENSITY

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.

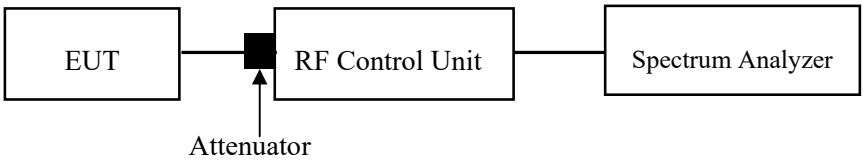
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 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.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Procedure

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not hAve.e 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW ⩾ 1/T, where T is defined in section II.B.l.a).
b) Set VBW ⩾ 3 RBW.
c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log (500 kHz/RBW) to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10 log (1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.



Test Data

Environmental Conditions

Temperature:	25℃
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

The testing was performed by Roger Ling on 2022-10-09.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix.

APPENDIX

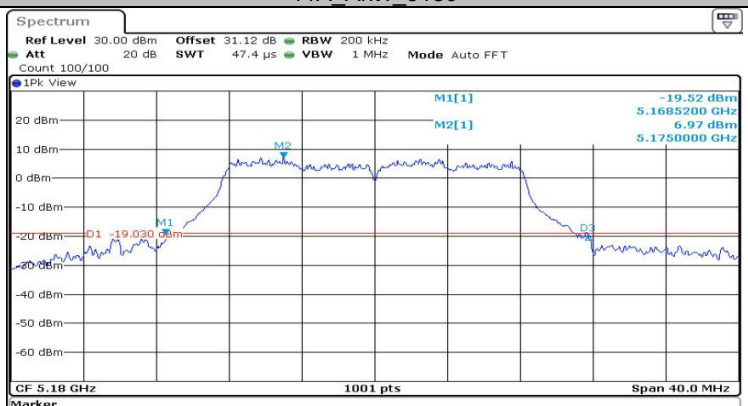
Appendix A1: Emission Bandwidth

Test Result

Test Mode	Antenna	Frequency[MHz]	26db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	23.20	5168.52	5191.72	---	---
		5200	22.88	5188.72	5211.60	---	---
		5240	24.92	5226.76	5251.68	---	---
11N20SISO	Ant1	5180	22.88	5168.84	5191.72	---	---
		5200	22.04	5189.08	5211.12	---	---
		5240	22.16	5229.00	5251.16	---	---
11N40SISO	Ant1	5190	45.28	5167.44	5212.72	---	---
		5230	45.04	5207.68	5252.72	---	---

Test Graphs

11A_Ant1_5180

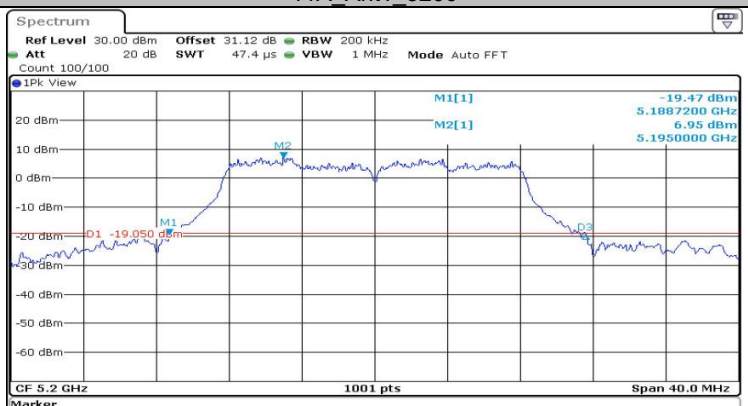


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.16852 GHz	-19.52 dBm		
M2		1	5.175 GHz	6.97 dBm		
D3	M1	1	23.2 MHz	0.12 dB		

Date: 9.OCT.2022 04:11:21

11A_Ant1_5200

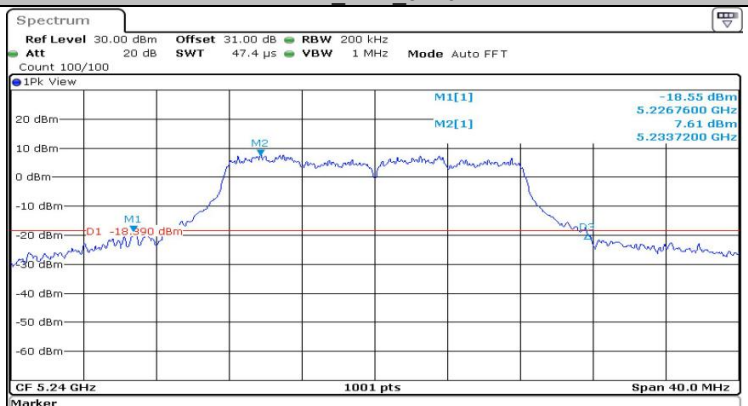


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.18872 GHz	-19.47 dBm		
M2		1	5.195 GHz	6.95 dBm		
D3	M1	1	22.88 MHz	0.28 dB		

Date: 9.OCT.2022 04:12:57

11A_Ant1_5240

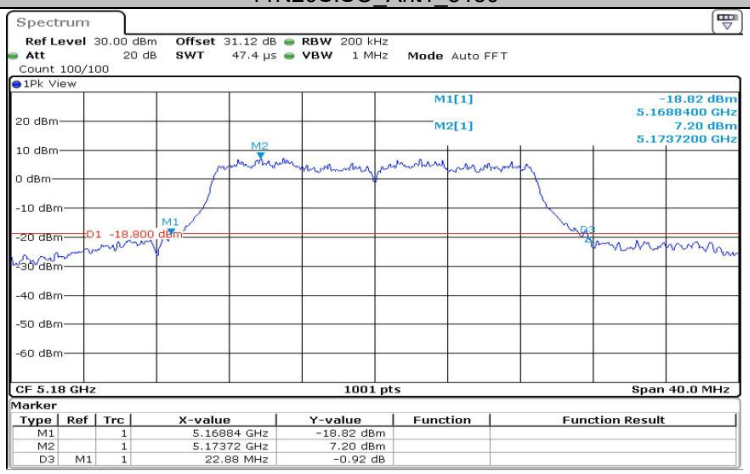


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.22676 GHz	-18.55 dBm		
M2		1	5.2372 GHz	7.61 dBm		
D3	M1	1	24.92 MHz	-0.92 dB		

Date: 9.OCT.2022 04:14:28

11N20SISO_Ant1_5180

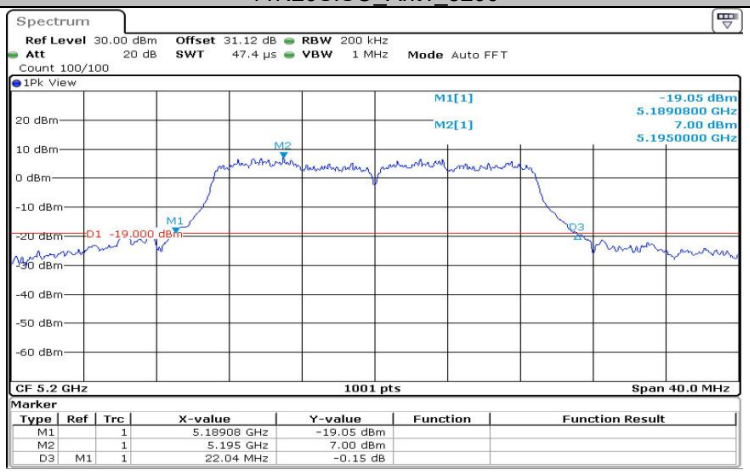


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.16884 GHz	-18.82 dBm		
M2		1	5.17372 GHz	7.20 dBm		
D3	M1	1	22.88 MHz	-0.92 dB		

Date: 9.OCT.2022 04:21:05

11N20SISO_Ant1_5200

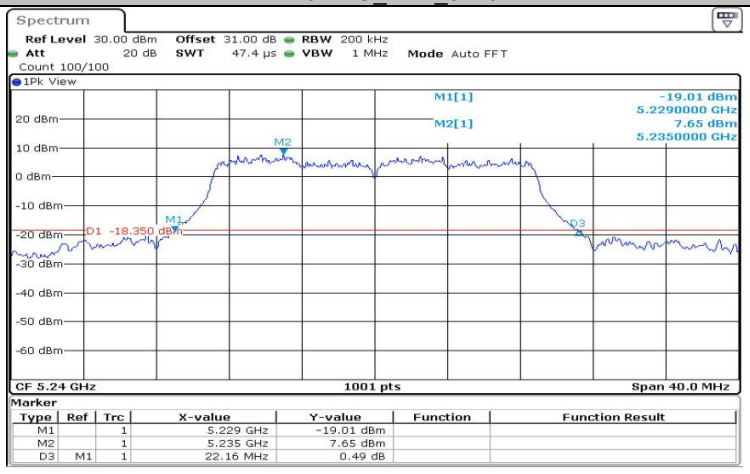


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.18908 GHz	-19.05 dBm		
M2		1	5.195 GHz	7.00 dBm		
D3	M1	1	22.04 MHz	-0.15 dB		

Date: 9.OCT.2022 04:22:38

11N20SISO_Ant1_5240

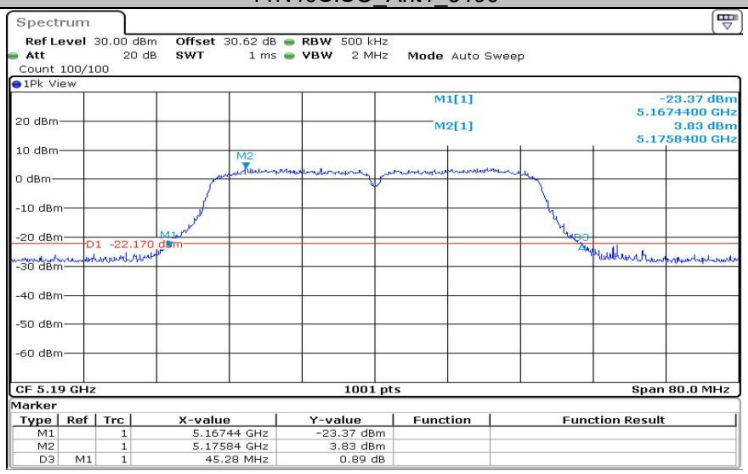


Marker

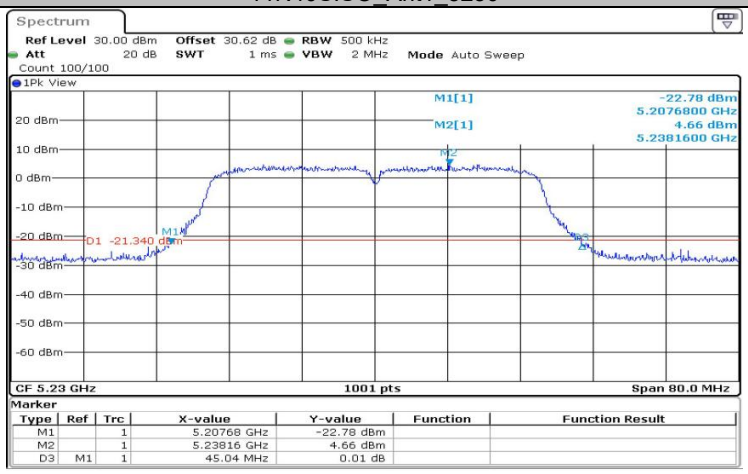
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.229 GHz	-19.01 dBm		
M2		1	5.235 GHz	7.65 dBm		
D3	M1	1	22.16 MHz	0.49 dB		

Date: 9.OCT.2022 04:24:03

11N40SISO_Ant1_5190



11N40SISO_Ant1_5230



Appendix A2: Occupied channel bandwidth

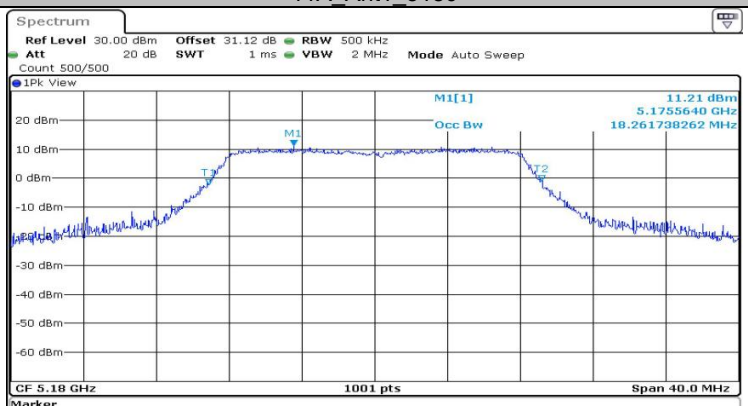
Test Result

Test Mode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	18.262	5170.889	5189.151	---	---
		5200	18.342	5190.849	5209.191	---	---
		5240	18.342	5230.849	5249.191	---	---
		5745	18.501	5735.689	5754.191	---	---
		5785	18.422	5775.689	5794.111	---	---
		5825	18.541	5815.649	5834.191	---	---
11N20SISO	Ant1	5180	19.061	5170.490	5189.550	---	---
		5200	19.061	5190.529	5209.590	---	---
		5240	19.021	5230.490	5249.510	---	---
		5745	19.141	5735.410	5754.550	---	---
		5785	19.101	5775.410	5794.510	---	---
		5825	19.261	5815.330	5834.590	---	---
11N40SISO	Ant1	5190	37.403	5171.379	5208.781	---	---
		5230	37.243	5211.459	5248.701	---	---
		5755	37.483	5736.219	5773.701	---	---
		5795	37.403	5776.299	5813.701	---	---

Note: No transmitted signal in the 99% bandwidth extends into the U-NII-2A band and U-NII-2C band.

Test Graphs

11A_Ant1_5180

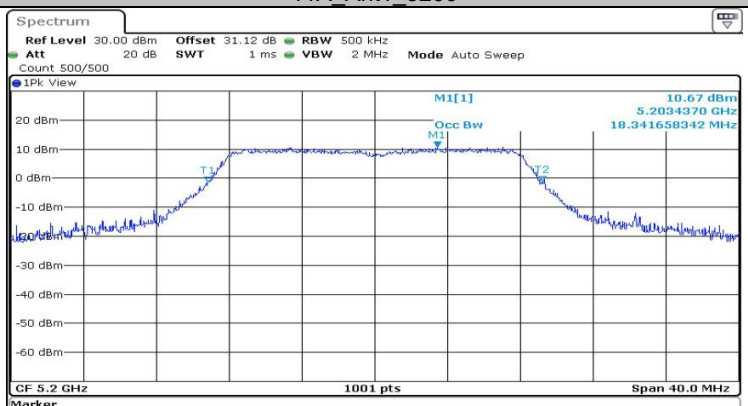


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.175564 GHz	11.21 dBm		
T1		1	5.1708891 GHz	-2.23 dBm	Occ Bw	18.261738262 MHz
T2		1	5.1891508 GHz	-1.04 dBm		

Date: 9.OCT.2022 04:11:33

11A_Ant1_5200

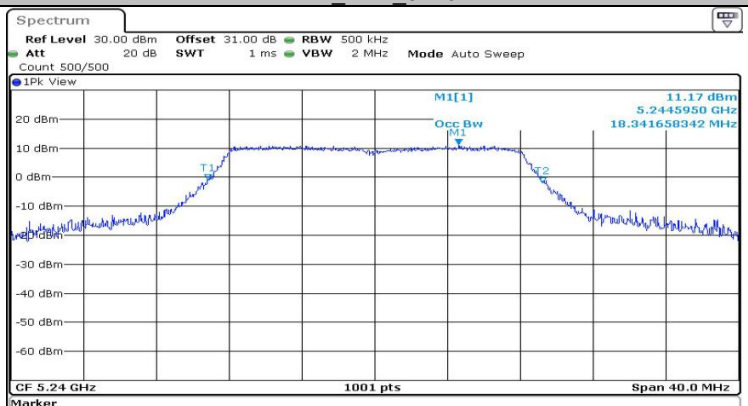


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.203437 GHz	10.67 dBm		
T1		1	5.1908492 GHz	-1.41 dBm	Occ Bw	18.341658342 MHz
T2		1	5.2091908 GHz	-1.23 dBm		

Date: 9.OCT.2022 04:13:08

11A_Ant1_5240

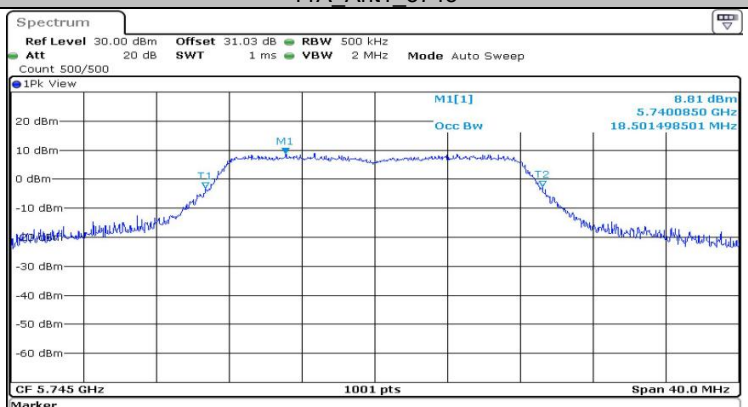


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.244595 GHz	11.17 dBm		
T1		1	5.2308492 GHz	-1.04 dBm	Occ Bw	18.341658342 MHz
T2		1	5.2491908 GHz	-2.08 dBm		

Date: 9.OCT.2022 04:14:39

11A_Ant1_5745

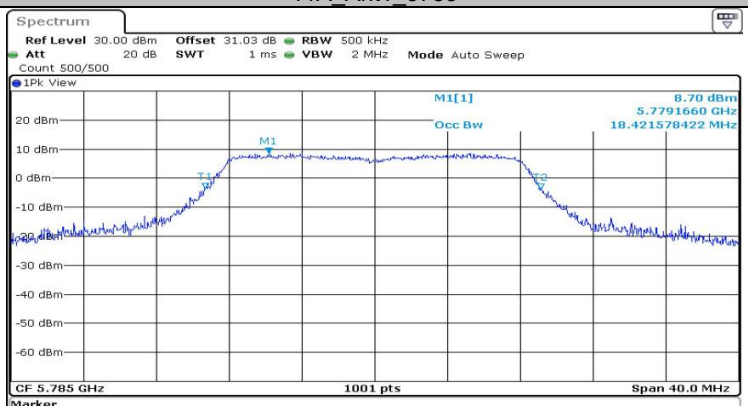


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.740085 GHz	8.81 dBm		
T1		1	5.7356893 GHz	-2.98 dBm	Occ Bw	18.501498501 MHz
T2		1	5.7541908 GHz	-2.57 dBm		

Date: 9.OCT.2022 04:16:19

11A_Ant1_5785

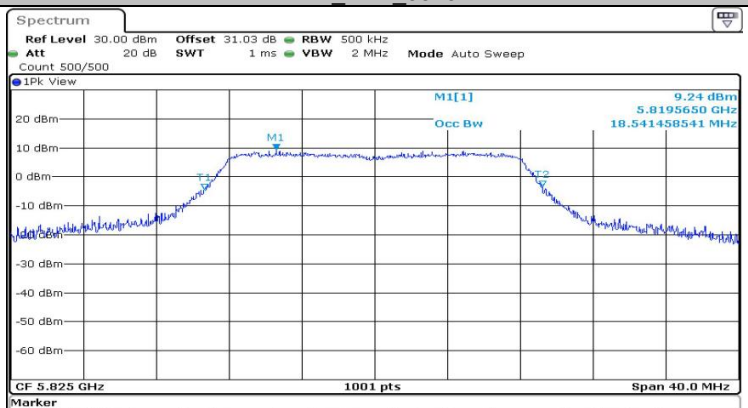


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.779166 GHz	8.70 dBm		
T1		1	5.7756893 GHz	-3.61 dBm	Occ Bw	18.421578422 MHz
T2		1	5.7941109 GHz	-3.87 dBm		

Date: 9.OCT.2022 04:17:53

11A_Ant1_5825

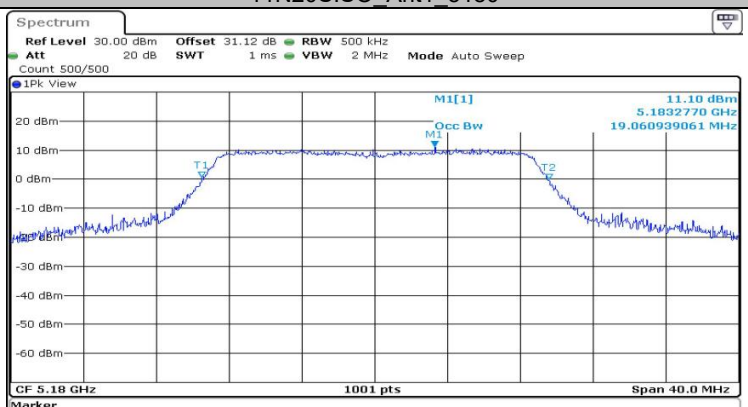


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.819565 GHz	9.24 dBm		
T1		1	5.8156494 GHz	-4.45 dBm	Occ Bw	18.541458541 MHz
T2		1	5.8341908 GHz	-3.43 dBm		

Date: 9.OCT.2022 04:19:32

11N20SISO_Ant1_5180

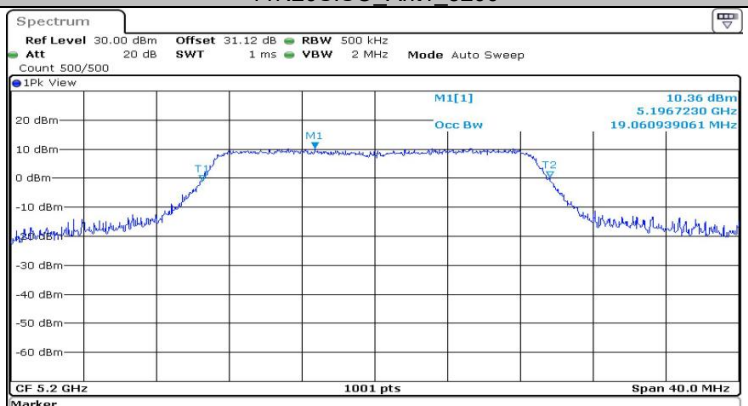


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.183277 GHz	11.10 dBm		
T1		1	5.1704895 GHz	0.62 dBm	Occ Bw	19.060939061 MHz
T2		1	5.1895504 GHz	-0.26 dBm		

Date: 9.OCT.2022 04:21:16

11N20SISO_Ant1_5200

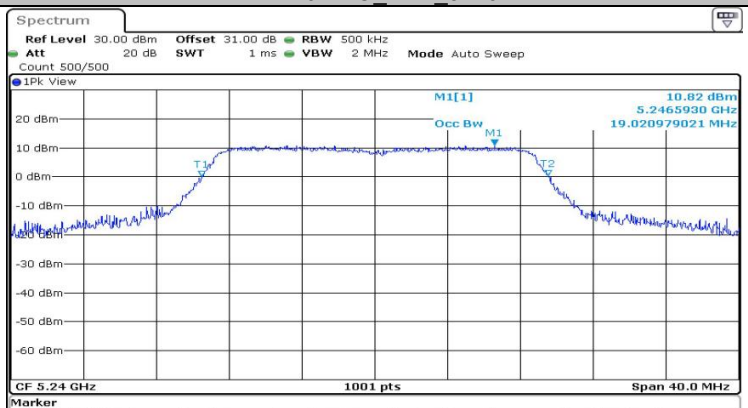


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.196723 GHz	10.36 dBm		
T1		1	5.1905295 GHz	-0.94 dBm	Occ Bw	19.060939061 MHz
T2		1	5.2095904 GHz	0.29 dBm		

Date: 9.OCT.2022 04:22:49

11N20SISO_Ant1_5240

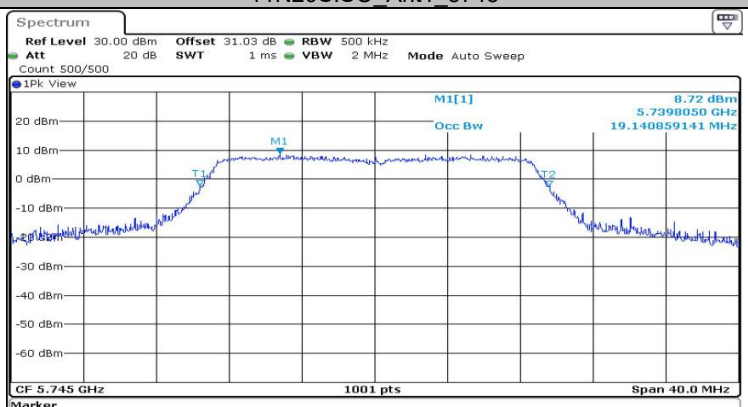


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.246593 GHz	10.82 dBm		
T1		1	5.2304895 GHz	0.08 dBm	Occ Bw	19.020979021 MHz
T2		1	5.2495105 GHz	0.25 dBm		

Date: 9.OCT.2022 04:24:14

11N20SISO_Ant1_5745

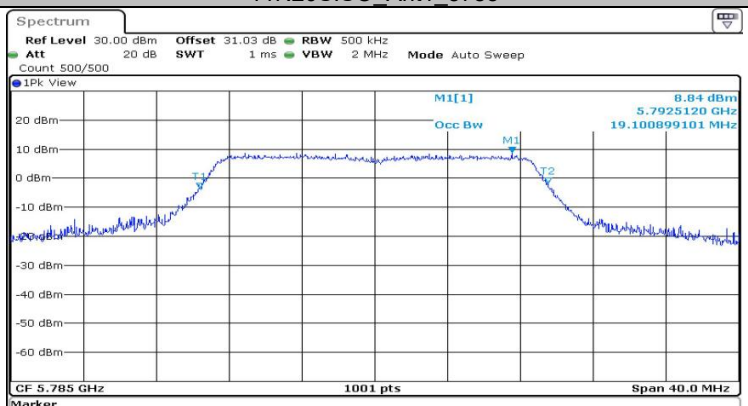


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.739805 GHz	8.72 dBm		
T1		1	5.7354096 GHz	-2.36 dBm	Occ Bw	19.140859141 MHz
T2		1	5.7545504 GHz	-2.52 dBm		

Date: 9.OCT.2022 04:25:58

11N20SISO_Ant1_5785

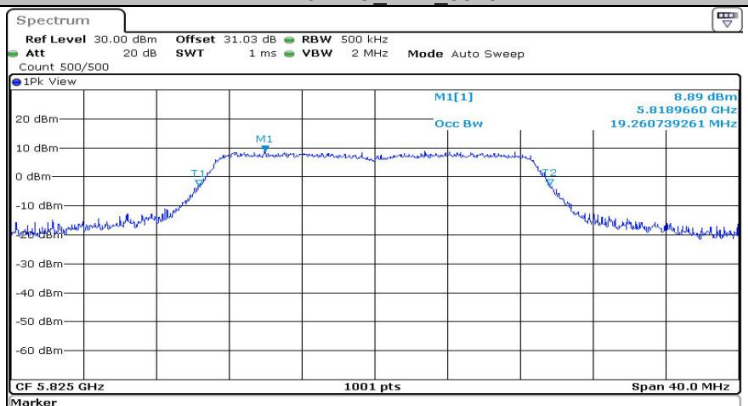


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.792512 GHz	8.84 dBm		
T1		1	5.7754096 GHz	-3.49 dBm	Occ Bw	19.100899101 MHz
T2		1	5.7945105 GHz	-1.66 dBm		

Date: 9.OCT.2022 04:27:35

11N20SISO_Ant1_5825

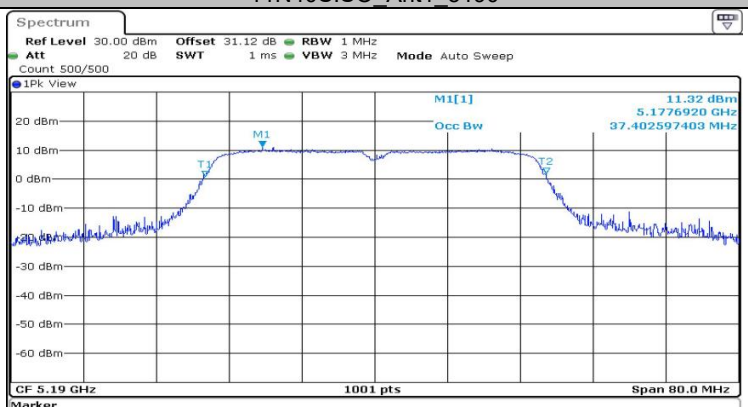


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.818966 GHz	8.89 dBm		
T1		1	5.8153297 GHz	-3.14 dBm	Occ Bw	19.260739261 MHz
T2		1	5.8345904 GHz	-2.83 dBm		

Date: 9.OCT.2022 04:29:12

11N40SISO_Ant1_5190

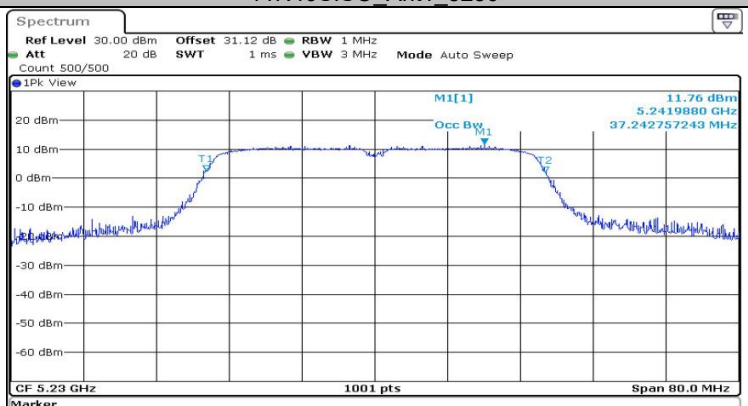


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.177692 GHz	11.32 dBm		
T1		1	5.1713786 GHz	0.97 dBm	Occ Bw	37.402597403 MHz
T2		1	5.2087812 GHz	1.83 dBm		

Date: 9.OCT.2022 04:30:59

11N40SISO_Ant1_5230

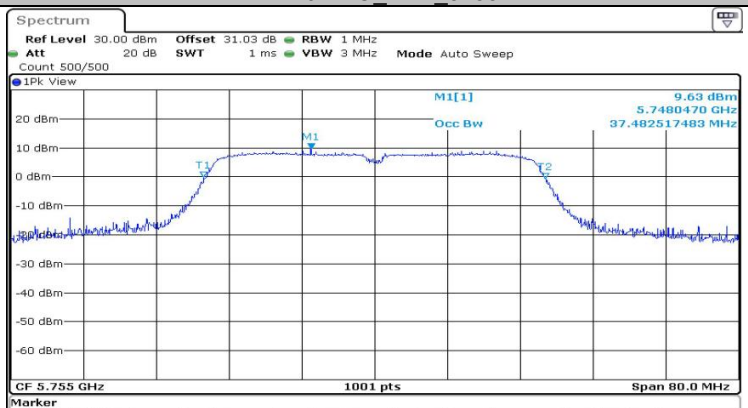


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.241988 GHz	11.76 dBm		
T1		1	5.2114585 GHz	2.41 dBm	Occ Bw	37.242757243 MHz
T2		1	5.2487013 GHz	2.04 dBm		

Date: 9.OCT.2022 04:32:29

11N40SISO_Ant1_5755

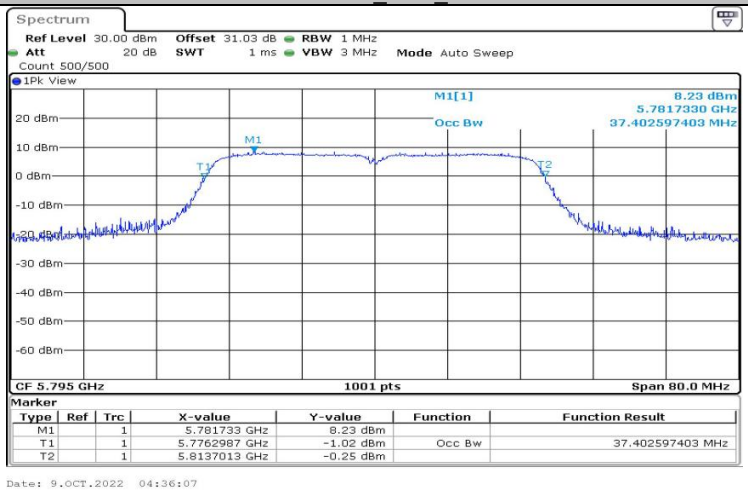


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.748047 GHz	9.63 dBm		
T1		1	5.7362188 GHz	-0.25 dBm	Occ Bw	37.482517483 MHz
T2		1	5.7737013 GHz	-0.73 dBm		

Date: 9.OCT.2022 04:34:22

11N40SISO_Ant1_5795



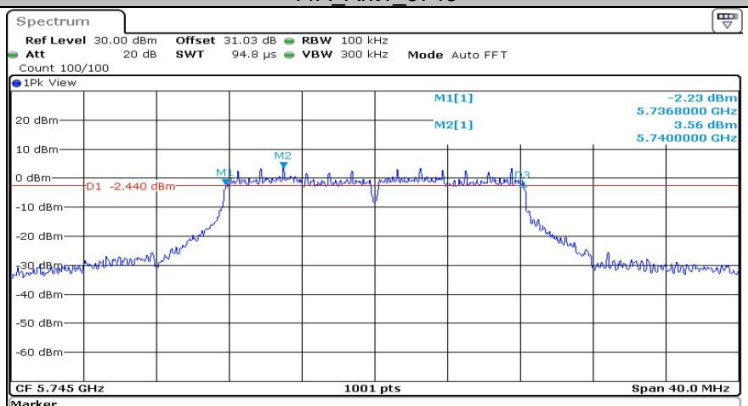
Appendix A3: Min emission bandwidth

Test Result

Test Mode	Antenna	Frequency[MHz]	6db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5745	16.36	5736.80	5753.16	0.5	PASS
		5785	16.32	5776.80	5793.12	0.5	PASS
		5825	16.36	5816.80	5833.16	0.5	PASS
11N20SISO	Ant1	5745	17.32	5736.44	5753.76	0.5	PASS
		5785	17.56	5776.20	5793.76	0.5	PASS
		5825	17.60	5816.20	5833.80	0.5	PASS
11N40SISO	Ant1	5755	35.20	5737.40	5772.60	0.5	PASS
		5795	35.12	5777.48	5812.60	0.5	PASS

Test Graphs B4

11A_Ant1_5745

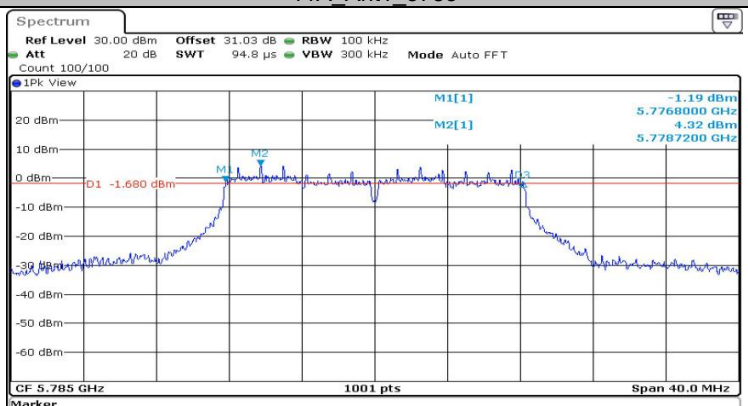


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.7368 GHz	-2.23 dBm		
M2		1	5.74 GHz	3.56 dBm		
D3	M1	1	16.36 MHz	1.00 dB		

Date: 9.OCT.2022 04:16:08

11A_Ant1_5785

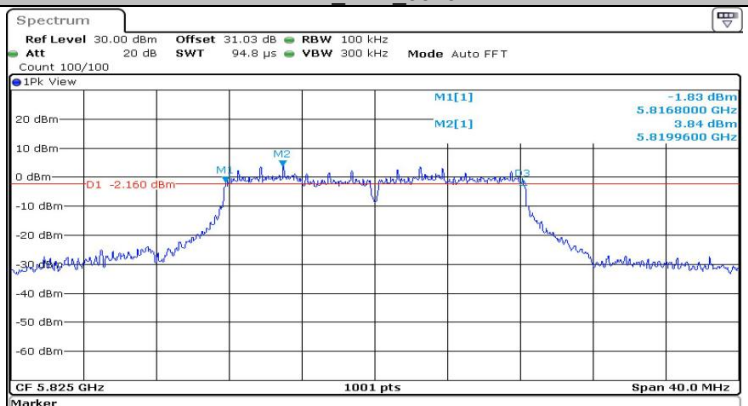


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.7768 GHz	-1.19 dBm		
M2		1	5.77872 GHz	4.32 dBm		
D3	M1	1	16.32 MHz	-0.09 dB		

Date: 9.OCT.2022 04:17:42

11A_Ant1_5825

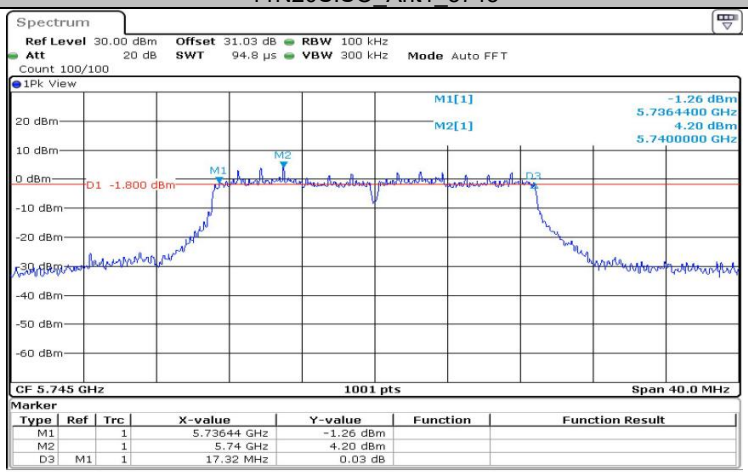


Marker

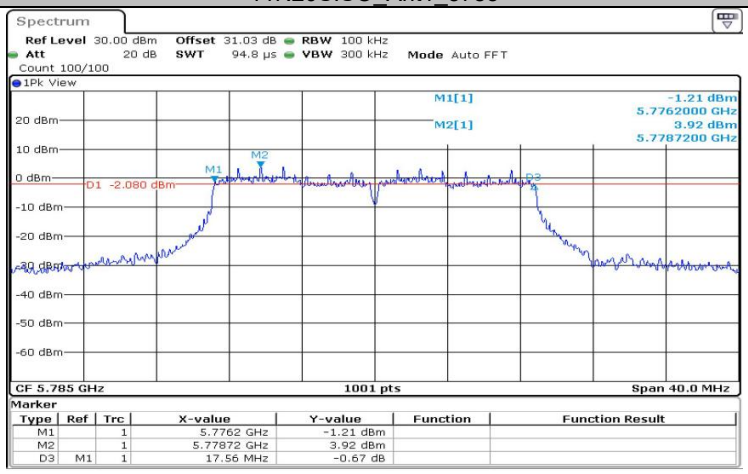
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.8168 GHz	-1.83 dBm		
M2		1	5.81996 GHz	3.84 dBm		
D3	M1	1	16.36 MHz	0.83 dB		

Date: 9.OCT.2022 04:19:20

11N20SISO_Ant1_5745



11N20SISO_Ant1_5785



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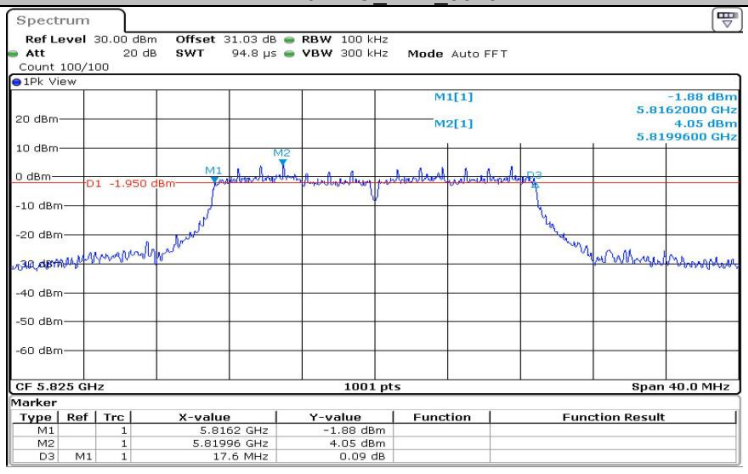
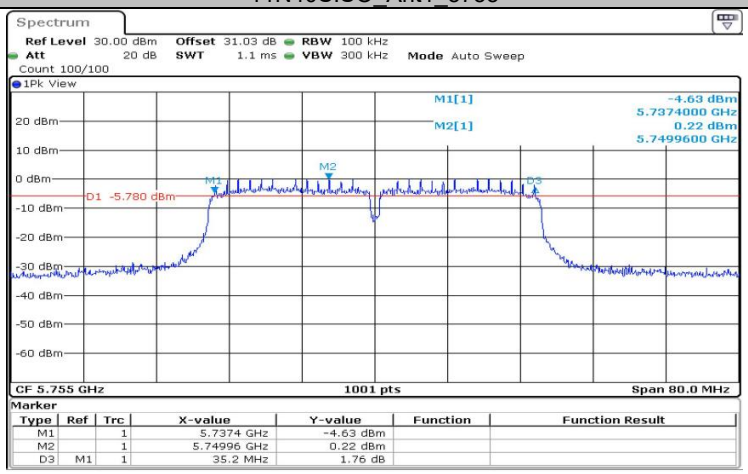
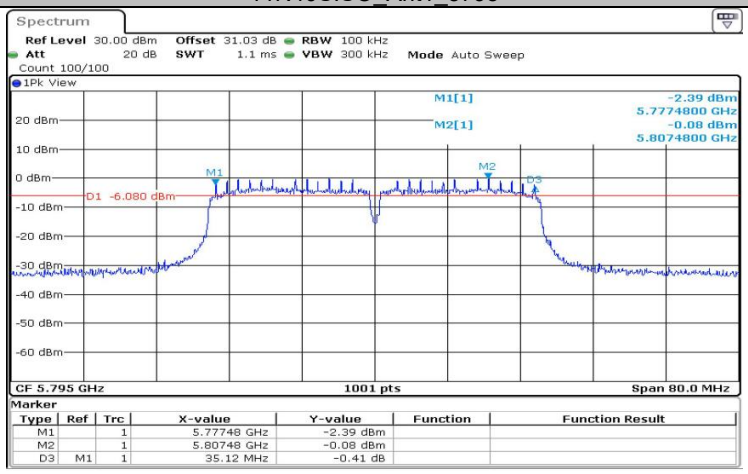


11N40SISO_Ant1_5755



11N40SISO_Ant1_5795



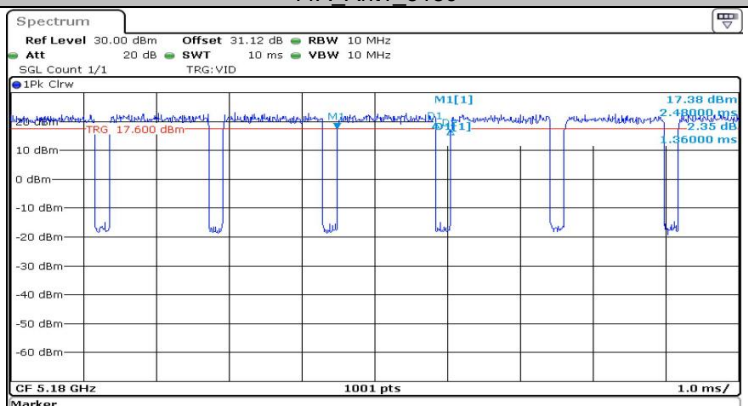
Appendix B: Duty Cycle

Test Result

Test Mode	Antenna	Frequency[MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11A	Ant1	5180	1.36	1.56	87.18
		5745	1.36	1.56	87.18
11N20SISO	Ant1	5180	1.28	1.48	86.49
		5745	1.27	1.47	86.39
11N40SISO	Ant1	5190	0.63	0.83	75.90
		5755	0.63	0.83	75.90

Test Graphs

11A_Ant1_5180

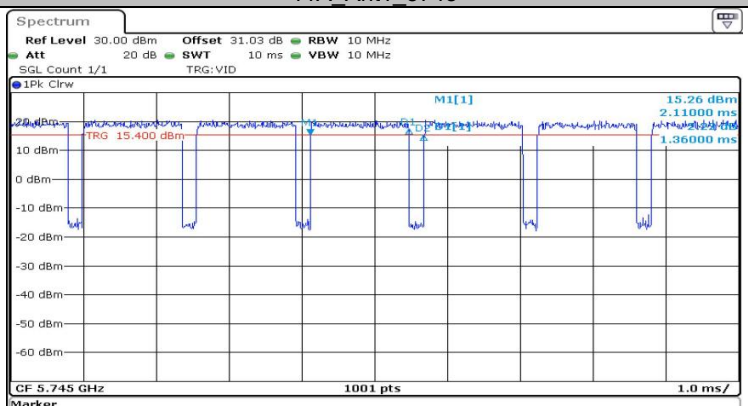


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48 ms	17.38 dBm		
D1	M1	1	1.36 ms	2.35 dB		
D2	M1	1	1.56 ms	-0.26 dB		

Date: 9.OCT.2022 04:11:44

11A_Ant1_5745

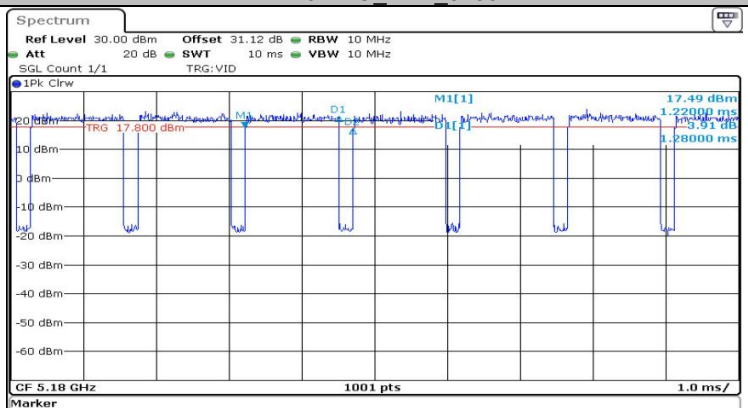


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.11 ms	15.26 dBm		
D1	M1	1	1.36 ms	2.22 dB		
D2	M1	1	1.56 ms	0.06 dB		

Date: 9.OCT.2022 04:16:31

11N20SISO_Ant1_5180

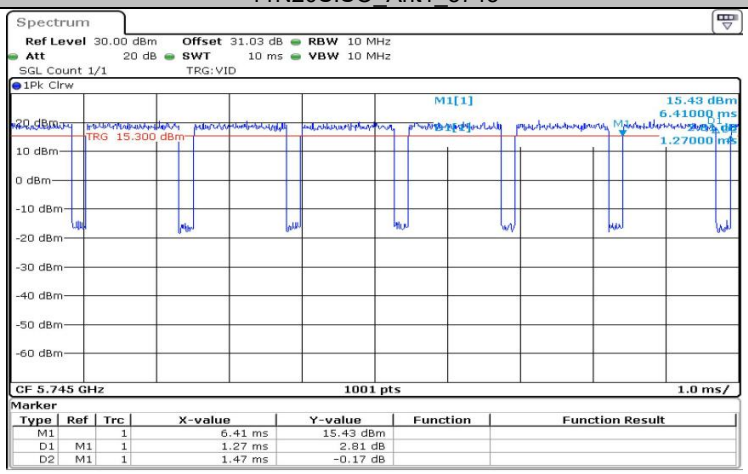


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.22 ms	17.49 dBm		
D1	M1	1	1.28 ms	3.91 dB		
D2	M1	1	1.48 ms	-0.27 dB		

Date: 9.OCT.2022 04:21:28

11N20SISO_Ant1_5745

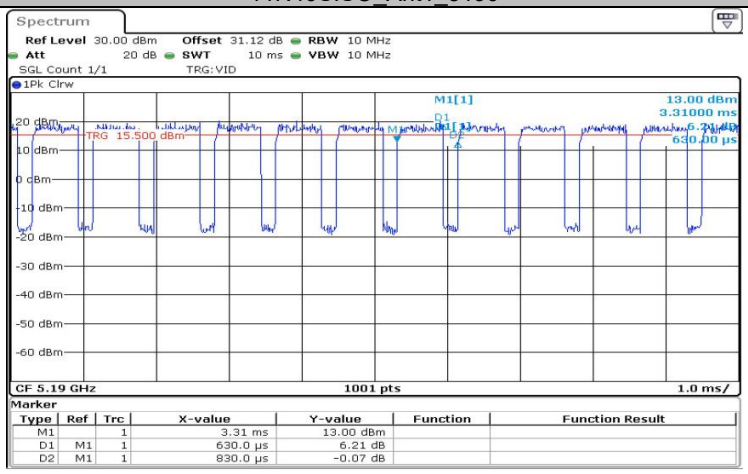


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	6.41 ms	15.43 dBm		
D1	M1	1	1.27 ms	2.81 dB		
D2	M1	1	1.47 ms	-0.17 dB		

Date: 9.OCT.2022 04:26:10

11N40SISO_Ant1_5190

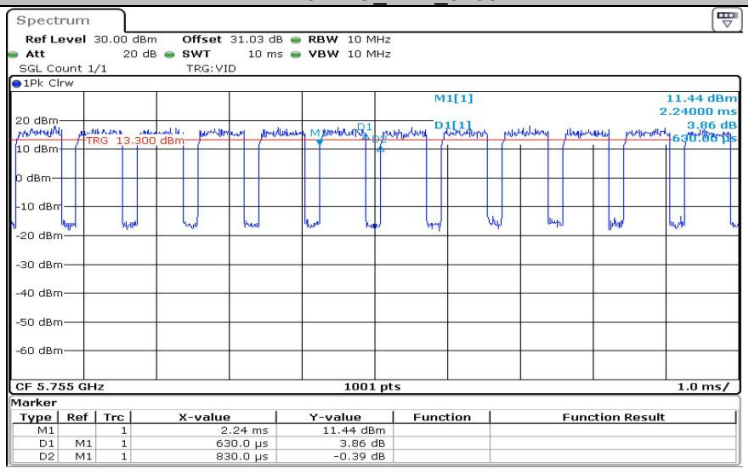


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	3.31 ms	13.00 dBm		
D1	M1	1	630.0 µs	6.21 dB		
D2	M1	1	830.0 µs	-0.07 dB		

Date: 9.OCT.2022 04:31:10

11N40SISO_Ant1_5755



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.24 ms	11.44 dBm		
D1	M1	1	630.0 µs	3.86 dB		
D2	M1	1	830.0 µs	-0.39 dB		

Date: 9.OCT.2022 04:34:33

Appendix C: Maximum conducted output power

Test Result

Test Mode	Antenna	Frequency[MHz]	Result [dBm]	Limit [dBm]	Verdict
11A	Ant1	5180	16.65	≤23.98	PASS
		5200	16.69	≤23.98	PASS
		5240	17.19	≤23.98	PASS
		5745	14.68	≤30.00	PASS
		5785	14.70	≤30.00	PASS
		5825	14.94	≤30.00	PASS
11N20SISO	Ant1	5180	16.77	≤23.98	PASS
		5200	16.73	≤23.98	PASS
		5240	17.21	≤23.98	PASS
		5745	14.72	≤30.00	PASS
		5785	14.74	≤30.00	PASS
		5825	15.09	≤30.00	PASS
11N40SISO	Ant1	5190	16.15	≤23.98	PASS
		5230	16.66	≤23.98	PASS
		5755	14.36	≤30.00	PASS
		5795	13.98	≤30.00	PASS

Note: the duty cycle factor has added into result.

Appendix D: Maximum power spectral density

Test Result

Test Mode	Antenna	Frequency[MHz]	Result [dBm/MHz]	Limit[dBm/MHz]	Verdict
11A	Ant1	5180	5.46	≤11.00	PASS
		5200	5.55	≤11.00	PASS
		5240	5.82	≤11.00	PASS
		5745	0.23	≤30.00	PASS
		5785	0.38	≤30.00	PASS
		5825	0.77	≤30.00	PASS
11N20SISO	Ant1	5180	5.13	≤11.00	PASS
		5200	5.11	≤11.00	PASS
		5240	5.58	≤11.00	PASS
		5745	0.3	≤30.00	PASS
		5785	-0.03	≤30.00	PASS
		5825	0.47	≤30.00	PASS
11N40SISO	Ant1	5190	1.77	≤11.00	PASS
		5230	2.17	≤11.00	PASS
		5755	-2.96	≤30.00	PASS
		5795	-3.37	≤30.00	PASS

Note: 1. The Result and Limit Unit is dBm/500 kHz in the band 5.725–5.85 GHz.
2. The Duty Cycle Factor is compensated in the graph.

Test Graphs

11A_Ant1_5180

Date: 9.OCT.2022 04:12:02

11A_Ant1_5200

Date: 9.OCT.2022 04:13:37

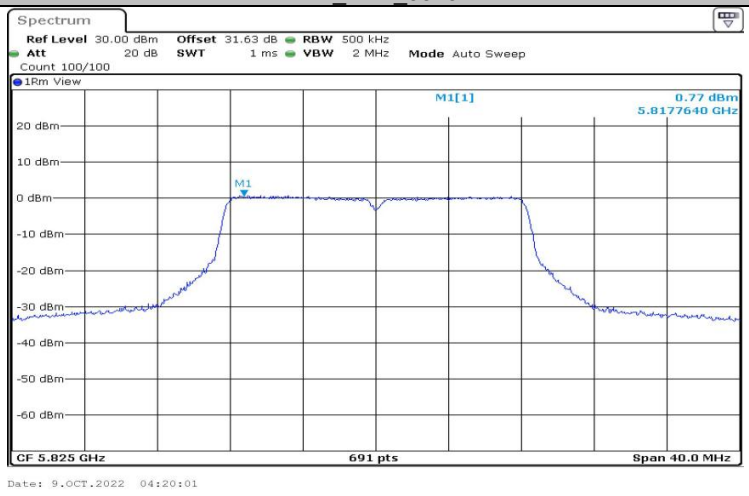
11A_Ant1_5240

Date: 9.OCT.2022 04:15:08

11A_Ant1_5745

11A_Ant1_5785

11A_Ant1_5825

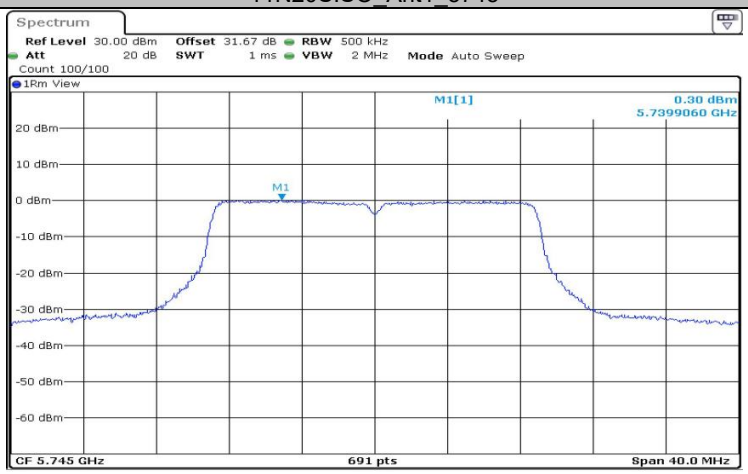


11N20SISO_Ant1_5180

11N20SISO_Ant1_5200

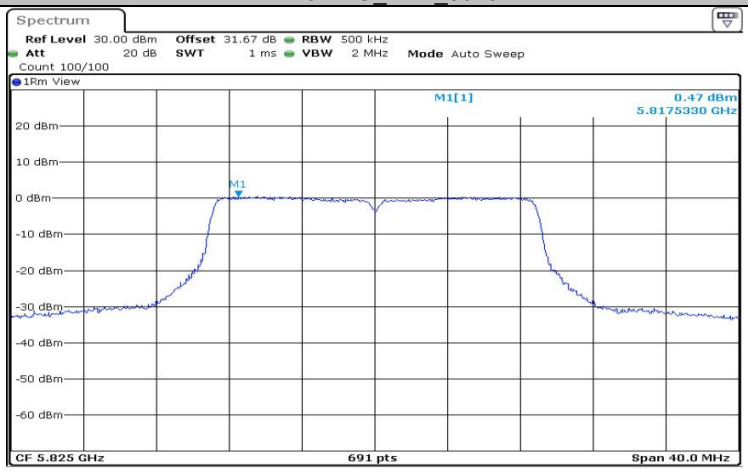
11N20SISO_Ant1_5240

11N20SISO_Ant1_5745



11N20SISO_Ant1_5785

11N20SISO_Ant1_5825



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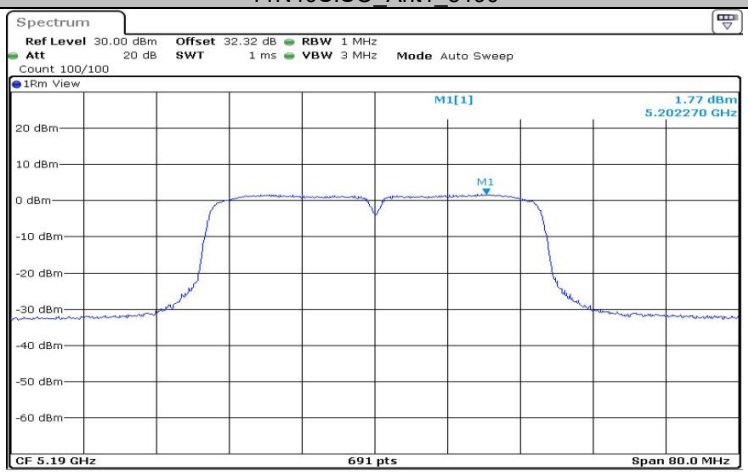

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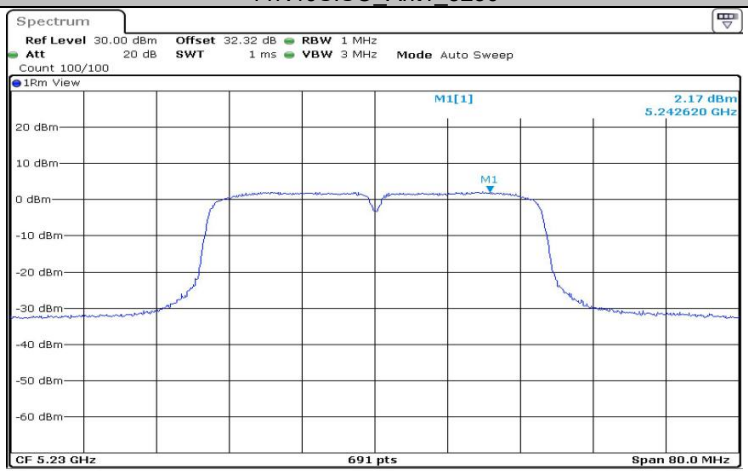
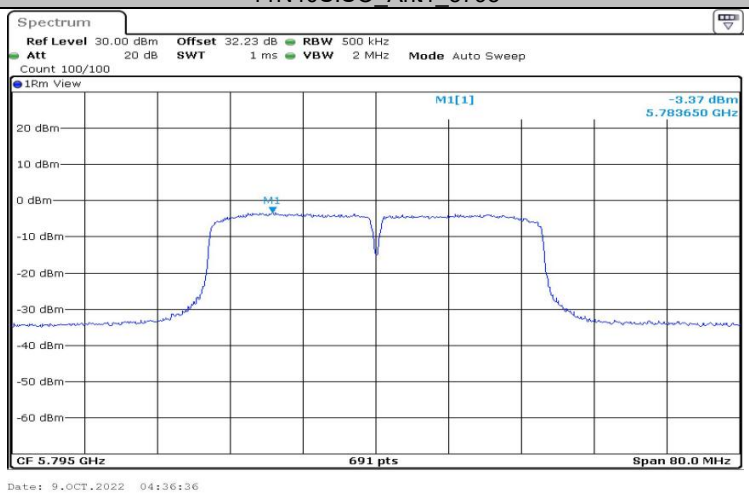


11N40SISO_Ant1_5755

11N40SISO_Ant1_5795



******* END OF REPORT *******