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RF TEST REPORT

Report Type:
FCC Part 15.247 RF report

Model:
51252, SN10012USA

REPORT NUMBER:
221001763SHA-001

ISSUE DATE:
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TEST REPORT

Report no.: 221001763SHA-001

Applicant:	Kangtai Electric Co., Ltd. No.5, Kangtai Rd., Huanghua Industrial District, Yueqing, Zhejiang, P.R.China
Manufacturer:	Kangtai Electric Co., Ltd. No.5, Kangtai Rd., Huanghua Industrial District, Yueqing, Zhejiang, P.R.China
Factory:	Kangtai Electric Co., Ltd. No.5, Kangtai Rd., Huanghua Industrial District, Yueqing, Zhejiang, P.R.China
FCC ID:	RHT252

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:
47CFR Part 15 (2020): Radio Frequency Devices (Subpart C) **ANSI C63.10 (2013):** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

PREPARED BY:	**REVIEWED BY:**
Project Engineer Sky Yang	Reviewer Eric Li

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Revision History

Report No.	Version	Description	Issued Date
221001763SHA-001	Rev. 01	Initial issue of report	November 25, 2022

Measurement result summary

TEST ITEM	FCC REFERENCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	Pass
Maximum conducted output power and e.i.r.p.	15.247(b)(3)	Pass
Power spectrum density	15.247(e)	Pass
Emission outside the frequency band	15.247(d)	Pass
Radiated Emissions in restricted frequency bands	15.247(d), 15.205&15.209	Pass
Power line conducted emission	15.207(a)	Pass
Occupied bandwidth	-	Tested
Antenna requirement	15.203	Pass

Notes: 1: NA =Not Applicable

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Garage door controller
Type/Model:	51252, SN10012USA
Description of EUT:	EUT is a garage door controller and has only one model.
Rating:	Input: 120VAC 60Hz Output: 10VDC 100mA Resistive µ
Category of EUT:	Class B
EUT type:	☒ Table top ☐ Floor standing
Software Version:	/
Hardware Version:	/
Sample Identification No.:	0221019-56-002
Sample received date:	October 20, 2022
Date of test:	October 21, 2022 ~ October 27, 2022

1.2 Technical Specification

Frequency Band:	2400MHz ~ 2483.5MHz
Support Standards:	IEEE 802.11b, IEEE 802.11g, IEEE 802.11n-HT20, IEEE 802.11n-HT40
Type of Modulation:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT20: OFDM (64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT40: OFDM (64-QAM, 16-QAM, QPSK, BPSK)
Channel Number:	11 Channels for 802.11b, 802.11g and 802.11n(HT20) 7 Channels for 802.11n(HT40)
Data Rate:	IEEE 802.11b: Up to 11 Mbps IEEE 802.11g: Up to 54 Mbps IEEE 802.11n-HT20: Up to MCS7 IEEE 802.11n-HT40: Up to MCS7
Channel Separation:	5 MHz
Antenna Information:	-1dBi, PCB Antenna

1.3 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab Registration code No.: 2042B-1
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2020)
ANSI C63.10 (2013)
KDB 558074 (v05or02)

2.2 Mode of operation during the test

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied by following software.

Software name	Manufacturer	Version	Supplied by
Wifi Test Tool	-	V1.5.2	applicant

The lowest, middle and highest channel were tested as representatives.

Frequency Band (MHz)	Mode	Lowest (MHz)	Middle (MHz)	Highest (MHz)
2400-2483.5	802.11b	2412	2437	2462
	802.11g	2412	2437	2462
	802.11n(HT20)	2412	2437	2462
	802.11n(HT40)	2422	2437	2452

Data rate VS Power:
The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases. After this pre-scan, we choose the following table of the data rata as the worst case.

Frequency Band (MHz)	Mode	Worst case data rate
2400-2483.5	802.11b	1Mbps
	802.11g	6Mbps
	802.11n(HT20)	MCS0
	802.11n(HT40)	MCS0

The EUT will use two types antenna, and there have the following test mode:
Radiated test mode:
Mode 1: EUT transmitted signal with internal antenna;

Conducted test mode:
Mode 2: EUT transmitted signal from PCBA RF port connected to SPA directly;

We have verified all test modes, and list all the results in this report.

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	Laptop computer	HP ProBook 6470b	100-240V AC, 50/60Hz FCC DOC
2	Feedback device	2P2CF-1-5M	-

2.5 Test environment condition:

Test items	Temperature	Humidity
Minimum 6dB Bandwidth	23°C	52% RH
Maximum conducted output power and e.i.r.p.		
Power spectrum density		
Emission outside the frequency band		
Occupied bandwidth		
Power line conducted emission	22°C	53% RH
Radiated Emissions in restricted frequency bands	22°C	55% RH

2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESCS 30	EC 2107	2023-07-18
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2023-11-08
☒	Shielded room	Zhongyu	-	EC 2838	2023-01-11
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2023-10-18
☒	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2023-08-23
☒	Horn antenna	ETS	3117	EC 4792-1	2023-08-28
☒	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2023-07-29
☒	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC5262	2023-06-04
☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2023-07-08
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2023-03-14
☒	Power sensor	Agilent	U2021XA	EC 5338-1	2023-03-14
☒	Vector Signal Generator	Agilent	N5182B	EC 5175	2023-03-14
☒	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2023-03-14
☒	Test Receiver	R&S	ESCI 7	EC 4501	2022-12-09
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Thermo-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2023-03-24
☒	Thermo-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3442	2023-01-03
☒	Pressure meter	YM3	Shanghai Mengde	EC 3320	2023-09-13

2.7 Measurement uncertainty

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

Test item	Measurement uncertainty
Maximum peak output power	± 0.74dB
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Emission outside the frequency band	± 2.89dB
Power line conducted emission	± 3.19dB

3 Minimum 6dB bandwidth

Test result: Pass

3.1 Limit

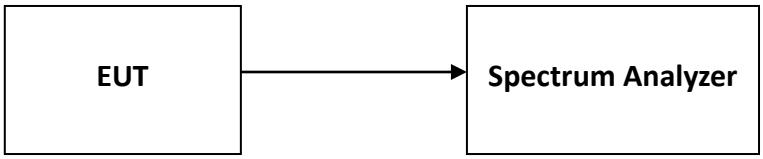
For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

3.2 Measurement Procedure

The minimum 6dB bandwidth is measured using the Spectrum Analyzer according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance" (clause 8.2) for compliance requirements.

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.

3.3 Test Configuration



3.4 Test Results of Minimum 6dB bandwidth

Please refer to Appendix A

4 Maximum conducted output power and e.i.r.p.

Test result: Pass

4.1 Limit

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 W. (The e.i.r.p. shall not exceed 4 W)

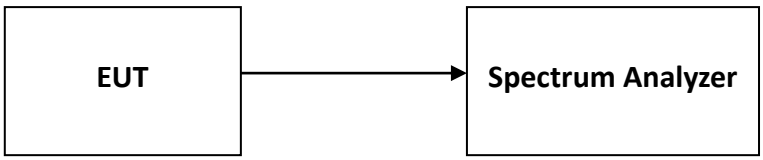
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

4.2 Measurement Procedure

The EUT was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance" (clause 9.2.2.2) for compliance requirements.

a) Set span to at least 1.5OBW.
b) Set RBW = 1 % to 5 % of the OBW, not to exceed 1 MHz.
c) Set VBW ≥ 3RBW.
d) Number of points in sweep ≥ 2span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
e) Sweep time = auto.
f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
g) If transmit duty cycle < 98 %, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 %, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".
h) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

4.3 Test Configuration



4.4 Test Results of Maximum conducted output power

Please refer to Appendix A

5 Power spectrum density

Test result: **Pass**

5.1 Limit

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

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and 8+ (6 –antenna gain-beam forming gain).

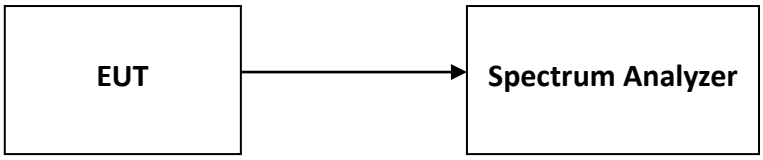
5.2 Measurement Procedure

The power outputwas tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” (clause 10.3) for compliance requirements.

This procedure may be used when the maximum (average) conducted output power was used to demonstrate compliance to the output power limit. This is the baseline method for determining the maximum (average) conducted PSD level. If the instrument has an RMS power averaging detector, it must be used; otherwise, use the sample detector. The EUT must be configured to transmit continuously (duty cycle ≥ 98 %); otherwise sweep triggering/signal gating must be implemented to ensure that measurements are made only when the EUT is transmitting at its maximum power control level (no transmitter off time is to be considered).

a) Set instrument center frequency to DTS channel center frequency.
b) Set span to at least 1.5OBW.
c) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set VBW ≥ 3RBW.
e) Detector = power averaging (RMS) or sample detector (when RMS not available).
f) Ensure that the number of measurement points in the sweep ≥ 2span/RBW.
g) Sweep time = auto couple.
h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
i) Use the peak marker function to determine the maximum amplitude level.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

5.3 Test Configuration



5.4 Test Results of Power spectrum density

Please refer to Appendix A

6 Emission outside the frequency band

Test result: **Pass**

6.1 Limit

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

6.2 Measurement Procedure

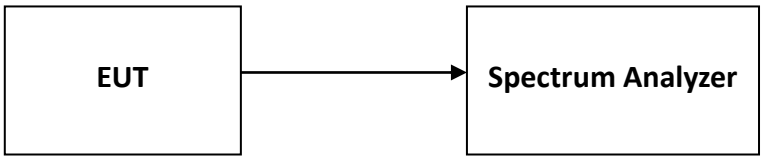
The EUT was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance" (clause 11.0) for compliance requirements.

Reference level measurement
Establish a reference level by using the following procedure:
a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to ≥ 1.5 times the DTS bandwidth.
c) Set the RBW = 100 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.

Emission level measurement
a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW ≥ 3 x RBW.
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

6.3 Test Configuration



6.4 The results of Emission outside the frequency band

Please refer to Appendix A

7 Radiated Emissions in restricted frequency bands

Test result: **Pass**

7.1 Limit

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified showed as below:

Frequencies (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

7.2 Measurement Procedure

For Radiated emission below 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c) Both X and Y axes of the antenna are set to make the measurement.
d) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c) The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

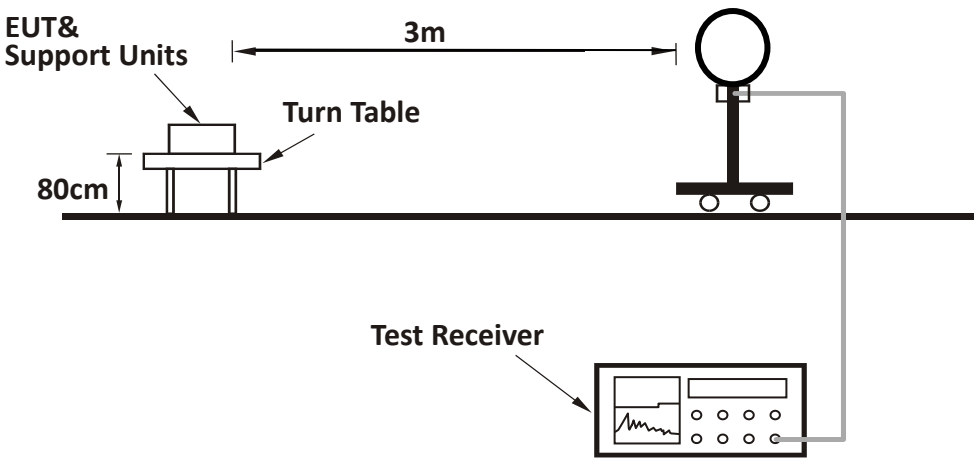
f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

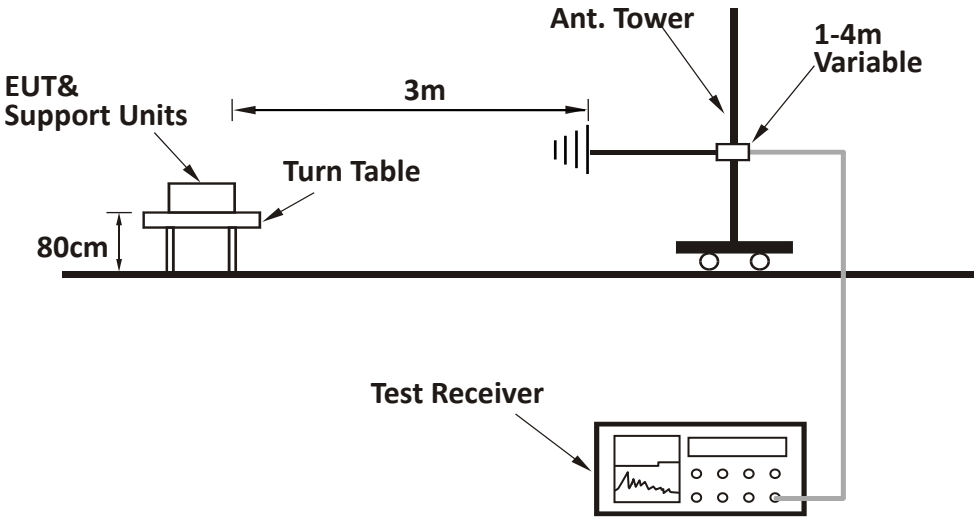
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 3 x RBW (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported

7.3 Test Configuration

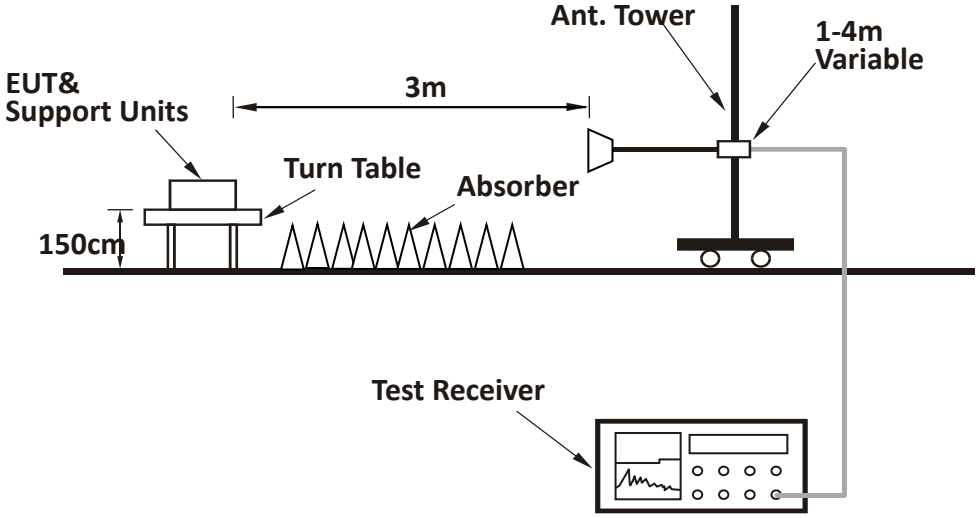
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:

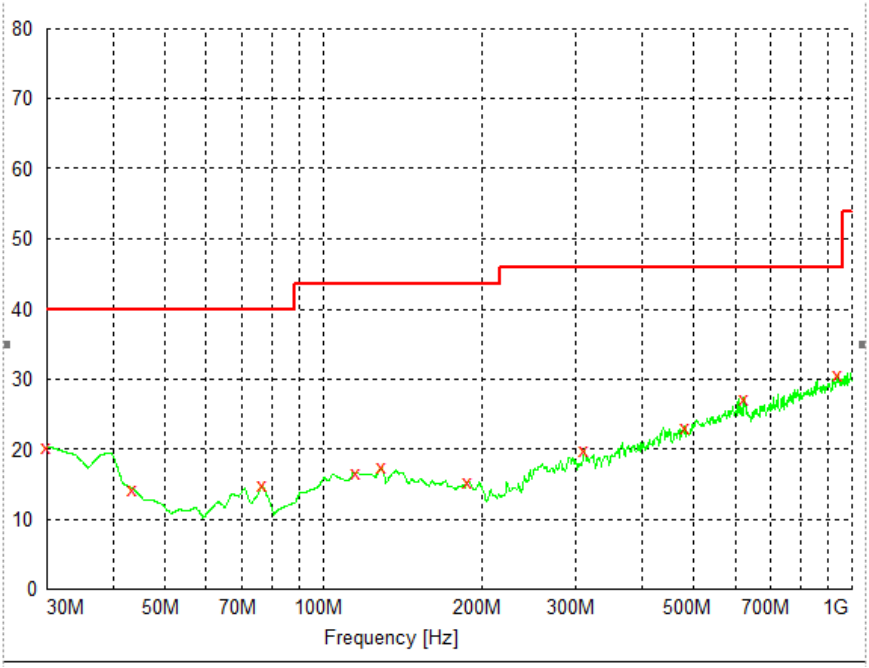


7.4 Test Results of Radiated Emissions

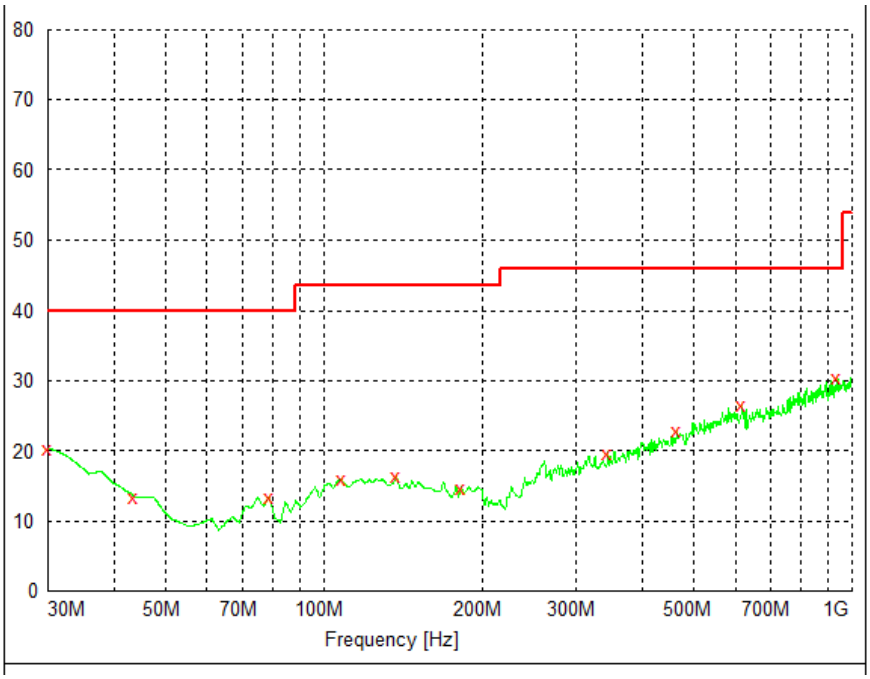
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

The waveform from 30MHz to 1000MHz is listed as below:

Horizontal



Vertical



Test data:

Polarization	Frequency (MHz)	Measured Level (dBμV/m)	Factor (dB/m)	Limits (dBμV/m)	Margin (dB)	Detector
H	30.00	20.4	18.6	40.00	19.6	PK
	624.82	27.3	20.9	46.00	18.7	PK
	939.73	30.7	23.9	46.00	15.3	PK
V	30.00	19.9	18.6	40.00	20.1	PK
	622.94	27.1	20.9	46.00	18.9	PK
	938.71	30.9	23.9	46.00	15.1	PK

Remark: 1. Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Measured Level = Original Receiver Reading + Factor
3. Margin = Limit - Measured Level
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Measured Level = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

The emission was conducted from 1GHz to 25GHz
The result above 1GHz is listed as below.

802.11b:

CH	Antenna	Frequency (MHz)	Measured Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Correct Factor(dB)	Detector
L	H	2390.00	55.38	18.62	74.00	31.20	PK
	H	2390.00	43.27	10.73	54.00	31.20	AV
	V	2390.00	54.41	19.59	74.00	31.20	PK
	V	2390.00	42.16	11.84	54.00	31.20	AV
	H	4824.00	49.51	24.49	74.00	2.70	PK
	V	4824.00	45.73	28.27	74.00	2.70	PK
M	H	4874.00	48.85	25.15	74.00	2.68	PK
	V	4874.00	44.92	29.08	74.00	2.68	PK
H	H	2483.50	52.63	21.37	74.00	31.19	PK
	H	2483.50	44.37	9.63	54.00	31.19	AV
	V	2483.50	53.25	20.75	74.00	31.19	PK
	V	2483.50	45.71	8.29	54.00	31.19	AV
	H	4924.00	47.93	26.07	74.00	2.77	PK
	V	4924.00	43.62	30.38	74.00	2.77	PK

802.11g:

CH	Antenna	Frequency (MHz)	Measured Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Correct Factor(dB)	Detector
L	H	2390.00	54.25	19.75	74.00	31.20	PK
	H	2390.00	44.37	9.63	54.00	31.20	AV
	V	2390.00	55.74	18.26	74.00	31.20	PK
	V	2390.00	46.17	7.83	54.00	31.20	AV
	H	4824.00	47.82	26.18	74.00	2.70	PK
	V	4824.00	44.73	29.27	74.00	2.70	PK
M	H	4874.00	46.93	27.07	74.00	2.68	PK
	V	4874.00	44.61	29.39	74.00	2.68	PK
H	H	2483.50	56.23	17.77	74.00	31.19	PK
	H	2483.50	45.81	8.19	54.00	31.19	AV
	V	2483.50	55.93	18.07	74.00	31.19	PK
	V	2483.50	45.72	8.28	54.00	31.19	AV
	H	4924.00	47.81	26.19	74.00	2.77	PK
	V	4924.00	45.29	28.71	74.00	2.77	PK

802.11n (HT20):

CH	Antenna	Frequency (MHz)	Measured Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Correct Factor(dB)	Detector
L	H	2390.00	56.13	17.87	74.00	31.20	PK
	H	2390.00	45.25	8.75	54.00	31.20	AV
	V	2390.00	56.72	17.28	74.00	31.20	PK
	V	2390.00	44.28	9.72	54.00	31.20	AV
	H	4824.00	46.27	27.73	74.00	2.70	PK
	V	4824.00	42.71	31.29	74.00	2.70	PK
M	H	4874.00	46.92	27.08	74.00	2.67	PK
	V	4874.00	43.08	30.92	74.00	2.67	PK
H	H	2483.50	53.29	20.71	74.00	31.19	PK
	H	2483.50	43.61	10.39	54.00	31.19	AV
	V	2483.50	54.47	19.53	74.00	31.19	PK
	V	2483.50	44.72	9.28	54.00	31.19	AV
	H	4924.00	48.17	25.83	74.00	2.76	PK
	V	4924.00	43.93	30.07	74.00	2.76	PK

802.11n (HT40):

CH	Antenna	Frequency (MHz)	Measured Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Correct Factor(dB)	Detector
L	H	2390.00	55.38	18.62	74.00	31.20	PK
	H	2390.00	46.02	7.98	54.00	31.20	AV
	V	2390.00	54.63	19.37	74.00	31.20	PK
	V	2390.00	45.72	8.28	54.00	31.20	AV
	H	4844.00	47.53	26.47	74.00	2.68	PK
	V	4844.00	42.39	31.61	74.00	2.68	PK
M	H	4874.00	46.82	27.18	74.00	2.67	PK
	V	4874.00	42.38	31.62	74.00	2.67	PK
H	H	2483.50	53.82	20.18	74.00	31.19	PK
	H	2483.50	43.95	10.05	54.00	31.19	AV
	V	2483.50	52.83	21.17	74.00	31.19	PK
	V	2483.50	43.91	10.09	54.00	31.19	AV
	H	4904.00	46.89	27.11	74.00	2.65	PK
	V	4904.00	44.37	29.63	74.00	2.65	PK

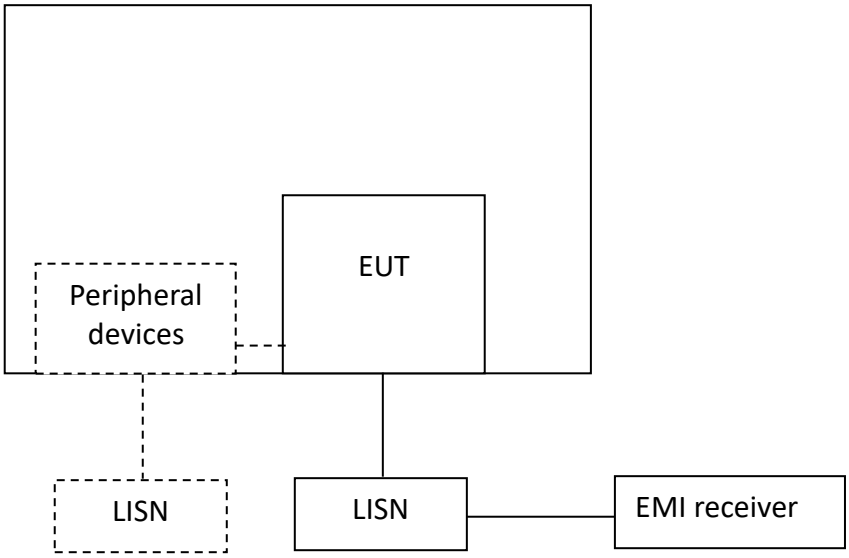
8 Power line conducted emission

Test result: **Pass**

8.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

8.2 Test Configuration



8.3 Measurement Procedure

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

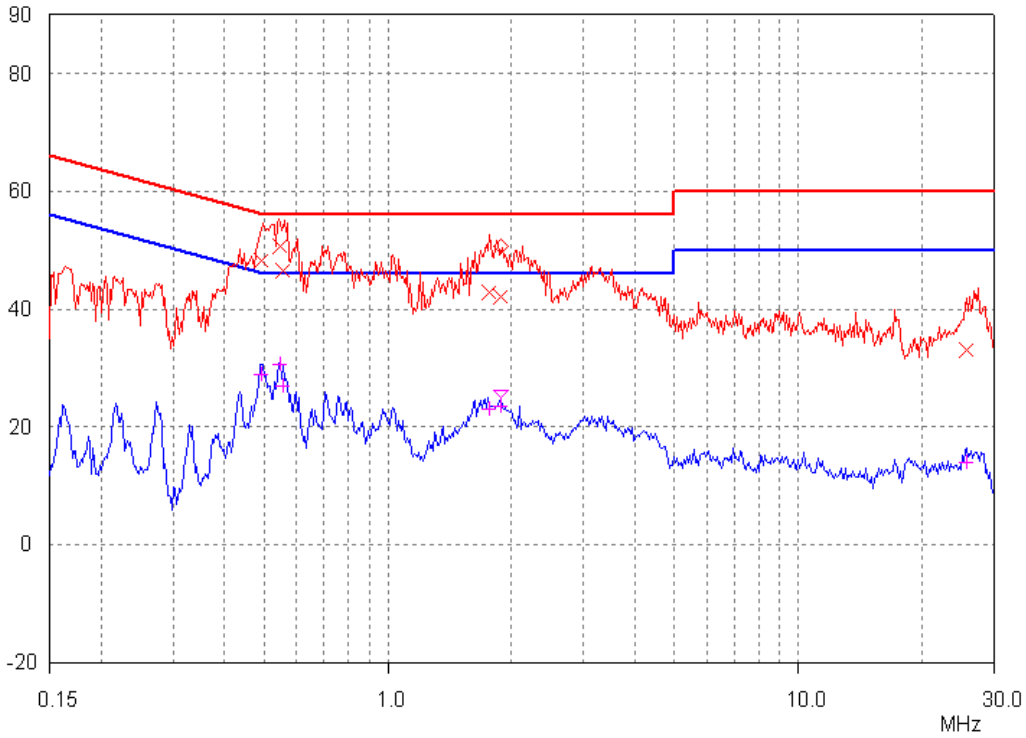
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

8.4 Test Results of Power line conducted emission

L Line

Test Curve:

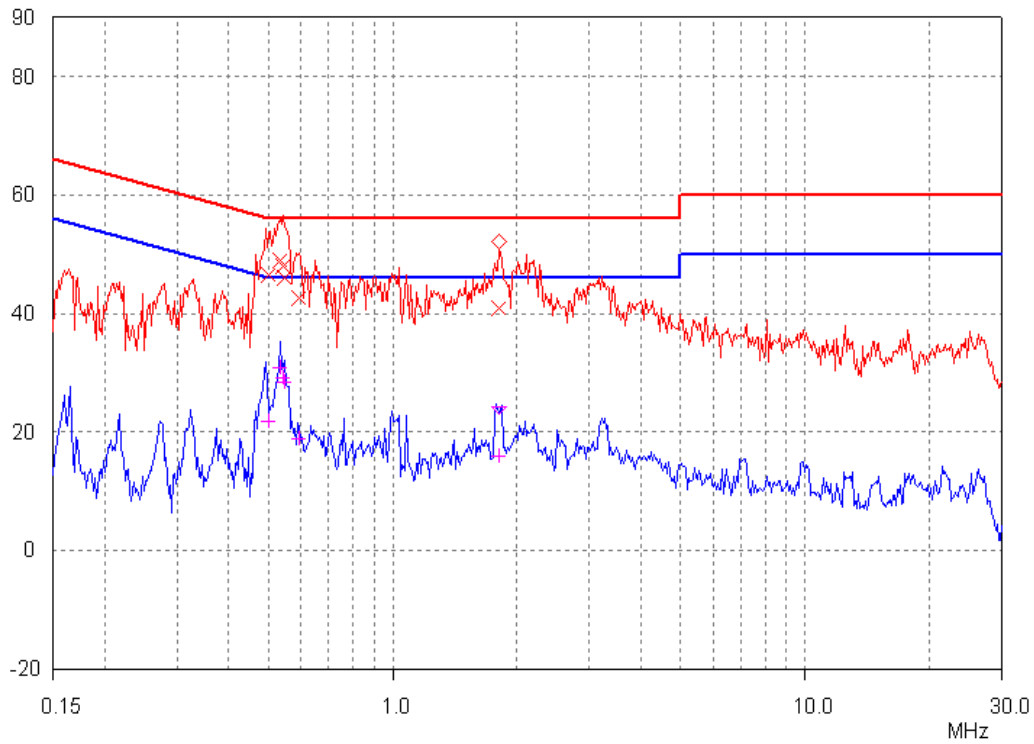


Test Data:

Frequency (MHz)	Quasi-peak			Average		
	Level (dBμV)	Limit (dBμV)	Margin (dB)	Level (dBμV)	Limit (dBμV)	Margin (dB)
0.49287	48.31	56.12	7.81	28.80	46.12	17.32
0.54460	50.61	56.00	5.39	30.63	46.00	15.37
0.55336	46.61	56.00	9.39	26.89	46.00	19.11
1.76817	42.80	56.00	13.20	22.97	46.00	23.03
1.88479	42.04	56.00	13.96	23.42	46.00	22.58
25.65153	32.94	60.00	27.06	14.05	50.00	35.95

N Line

Test Curve:



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	Level (dBμV)	Limit (dBμV)	Margin (dB)	Level (dBμV)	Limit (dBμV)	Margin (dB)
0.49881	46.47	56.02	9.55	21.85	46.02	24.17
0.53384	49.07	56.00	6.93	30.79	46.00	15.21
0.54027	47.93	56.00	8.07	29.11	46.00	16.89
0.54678	46.07	56.00	9.93	28.49	46.00	17.51
0.59222	42.71	56.00	13.29	18.84	46.00	27.16
1.81828	40.96	56.00	15.04	15.98	46.00	30.02

Remark: 1. Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.
2. Level = Original Receiver Reading + Factor
3. Margin = Limit - Level
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Level = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

9 Occupied Bandwidth

Test result: **Pass**

9.1 Limit

None

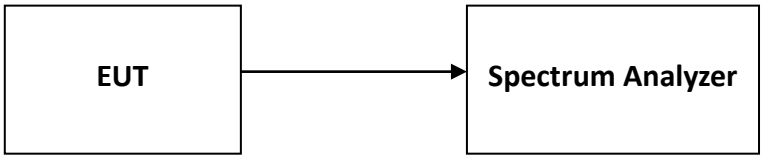
9.2 Measurement Procedure

The occupied bandwidth per RSS-Gen Issue 5 Clause 6.6 was measured using the Spectrum Analyzer.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

9.3 Test Configuration



9.4 The results of Occupied Bandwidth

Please refer to Appendix A

10 Antenna requirement

Requirement:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Result:
EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

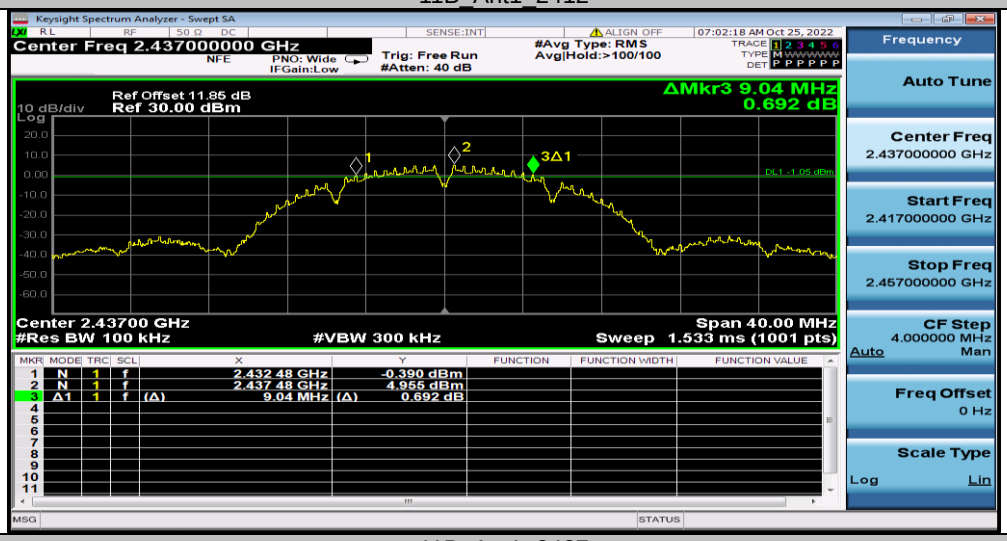
Appendix A: DTS Bandwidth

Test Result

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	9.080	2407.440	2416.520	0.5	PASS
		2437	9.040	2432.480	2441.520	0.5	PASS
		2462	9.080	2457.440	2466.520	0.5	PASS
11G	Ant1	2412	12.560	2405.720	2418.280	0.5	PASS
		2437	12.560	2431.960	2444.520	0.5	PASS
		2462	11.320	2456.960	2468.280	0.5	PASS
11N20SISO	Ant1	2412	12.560	2406.960	2419.520	0.5	PASS
		2437	13.760	2430.720	2444.480	0.5	PASS
		2462	13.760	2455.720	2469.480	0.5	PASS
11N40SISO	Ant1	2422	30.080	2409.440	2439.520	0.5	PASS
		2437	32.560	2420.760	2453.320	0.5	PASS
		2452	31.280	2435.760	2467.040	0.5	PASS

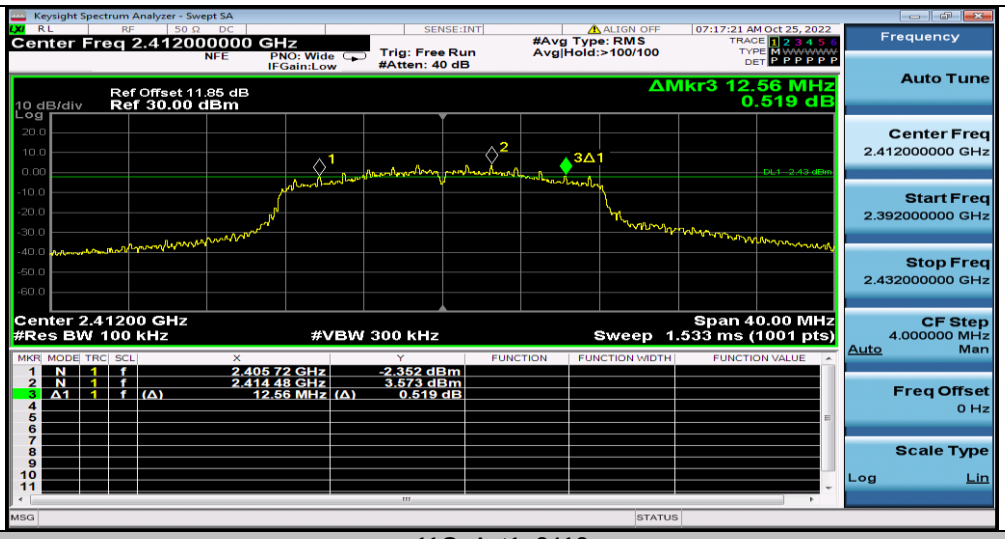
Test Graphs

11B_Ant1_2412

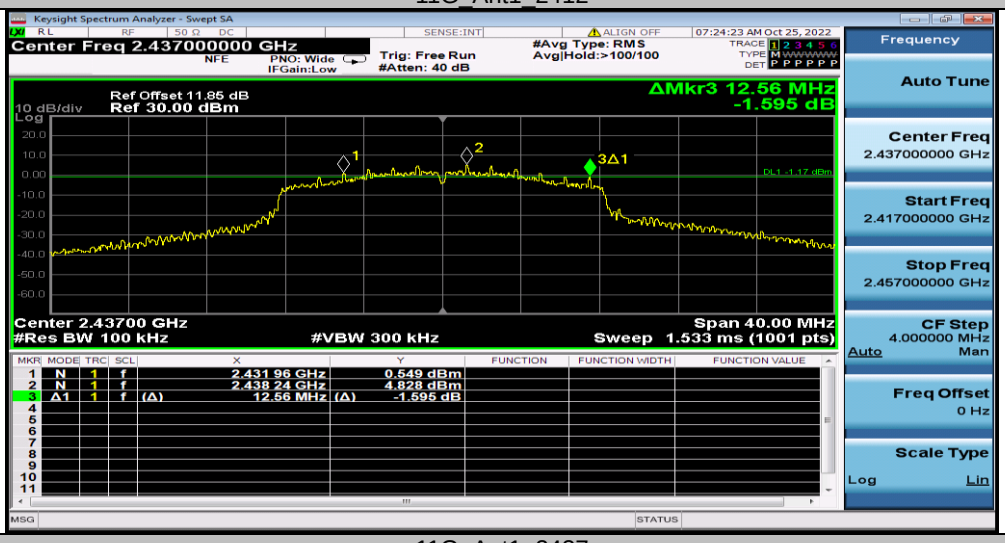


11B_Ant1_2437

11B_Ant1_2462

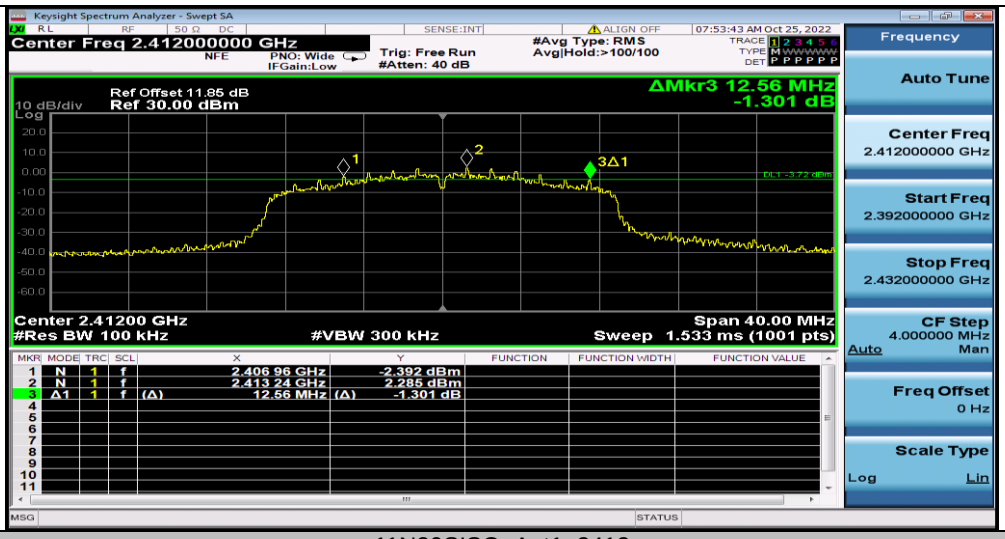


11G_Ant1_2412

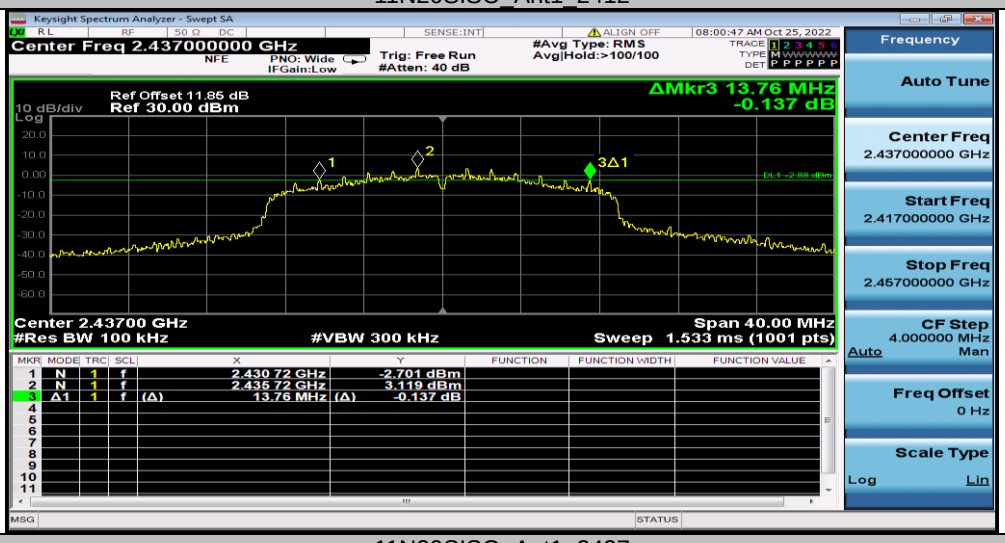


11G_Ant1_2437

11G_Ant1_2462

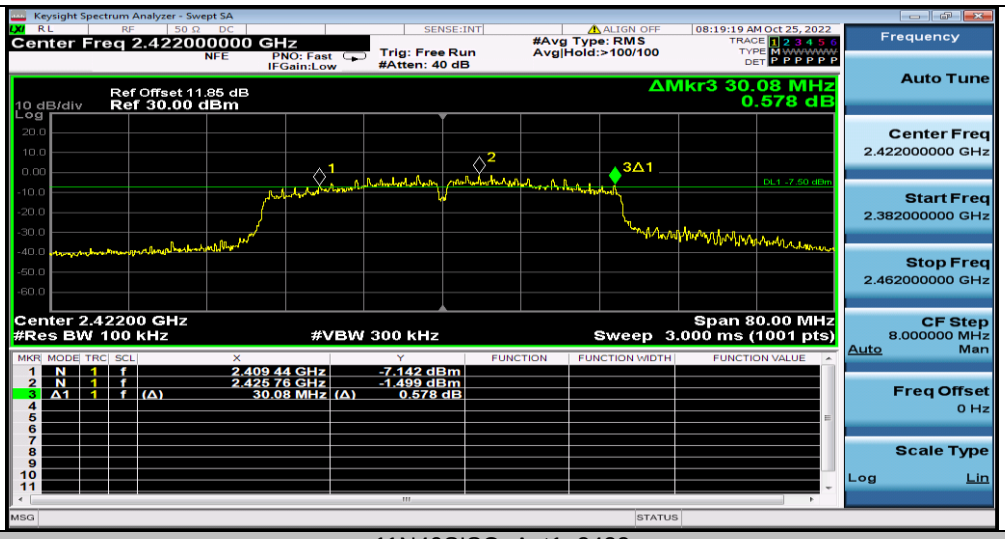


11N20SISO_Ant1_2412

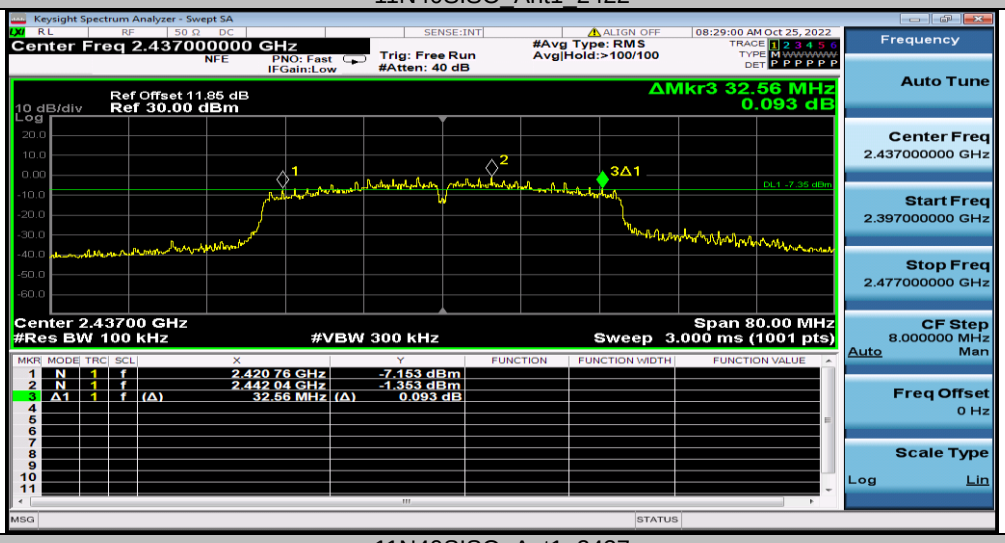


11N20SISO_Ant1_2437

11N20SISO_Ant1_2462



11N40SISO_Ant1_2422



11N40SISO_Ant1_2437

11N40SISO_Ant1_2452

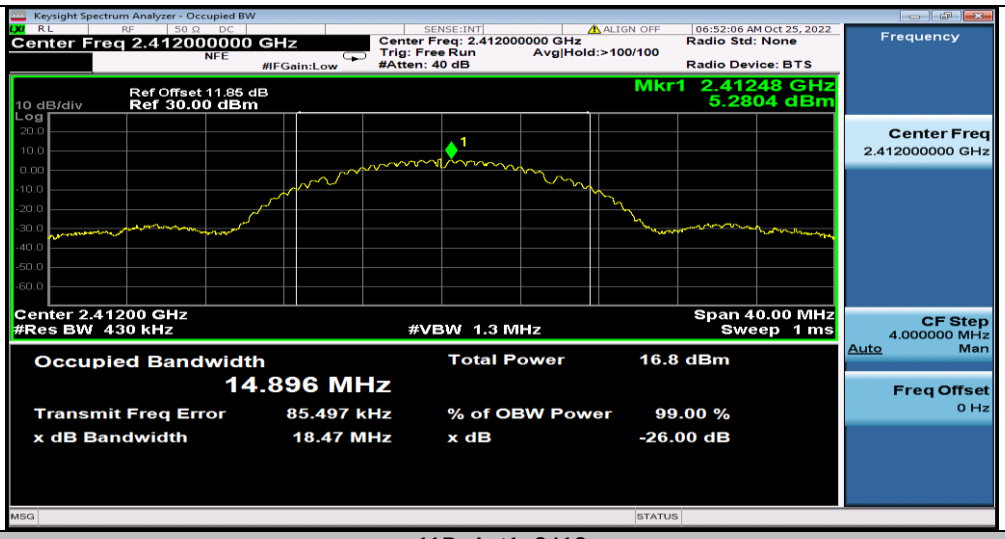
Appendix B: Occupied Channel Bandwidth

Test Result

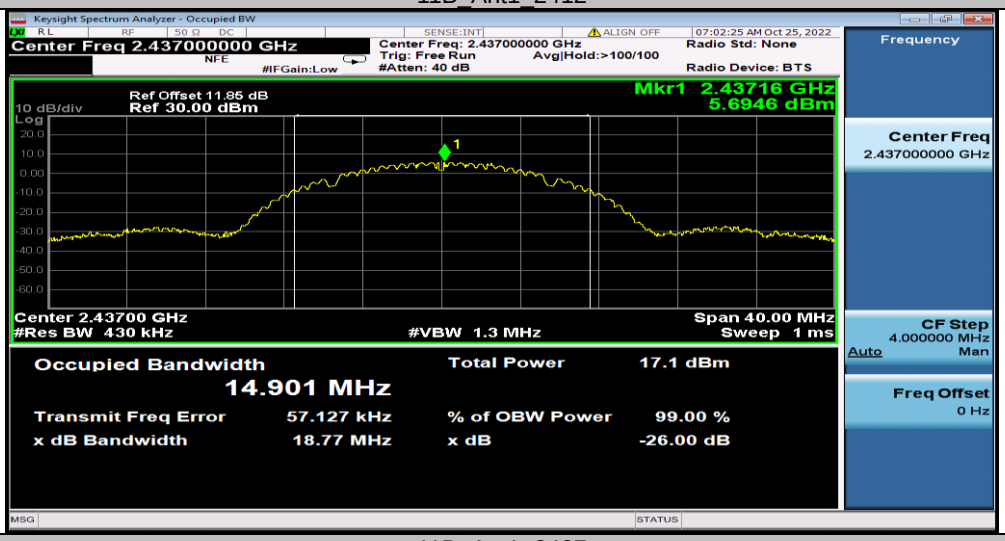
TestMode	Antenna	Channel Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	14.918	2404.622	2419.540	---	---
		2437	14.907	2429.603	2444.510	---	---
		2462	14.889	2454.607	2469.496	---	---
11G	Ant1	2412	16.188	2403.983	2420.171	---	---
		2437	16.298	2428.931	2445.229	---	---
		2462	16.621	2453.792	2470.413	---	---
11N20SISO	Ant1	2412	16.901	2403.630	2420.531	---	---
		2437	16.946	2428.585	2445.531	---	---
		2462	17.187	2453.450	2470.637	---	---
11N40SISO	Ant1	2422	35.852	2404.292	2440.144	---	---
		2437	35.947	2419.127	2455.074	---	---
		2452	36.042	2434.023	2470.065	---	---

TEST REPORT

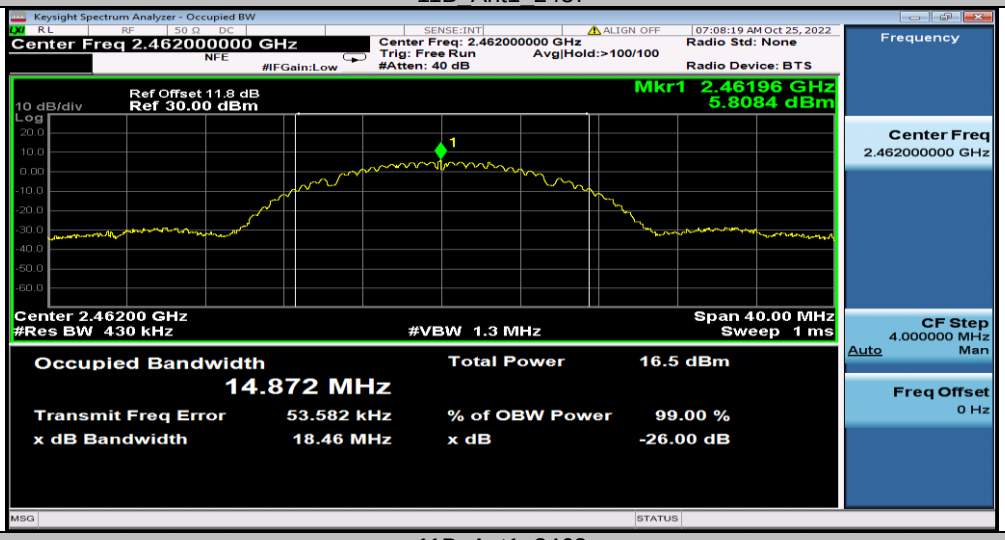
Test Graphs



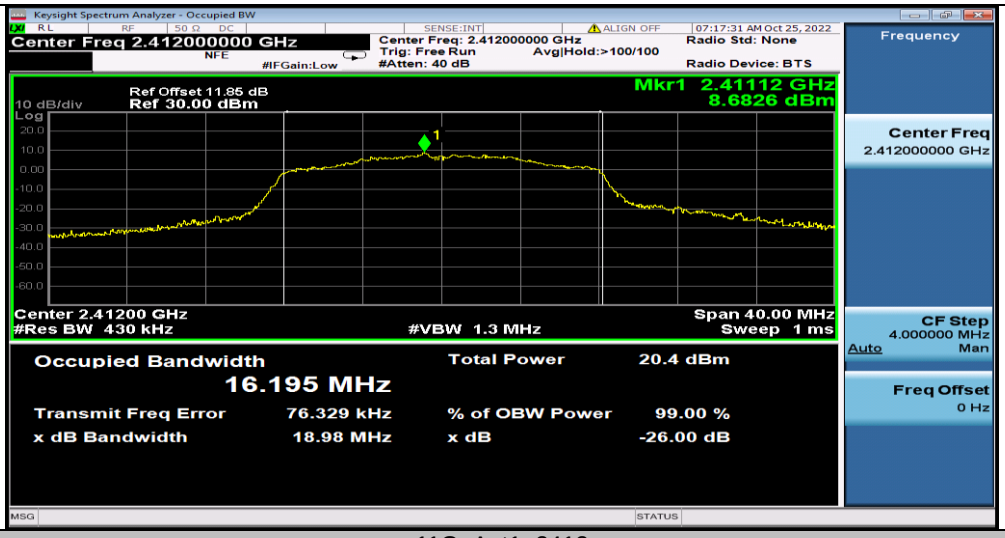
11B_Ant1_2412



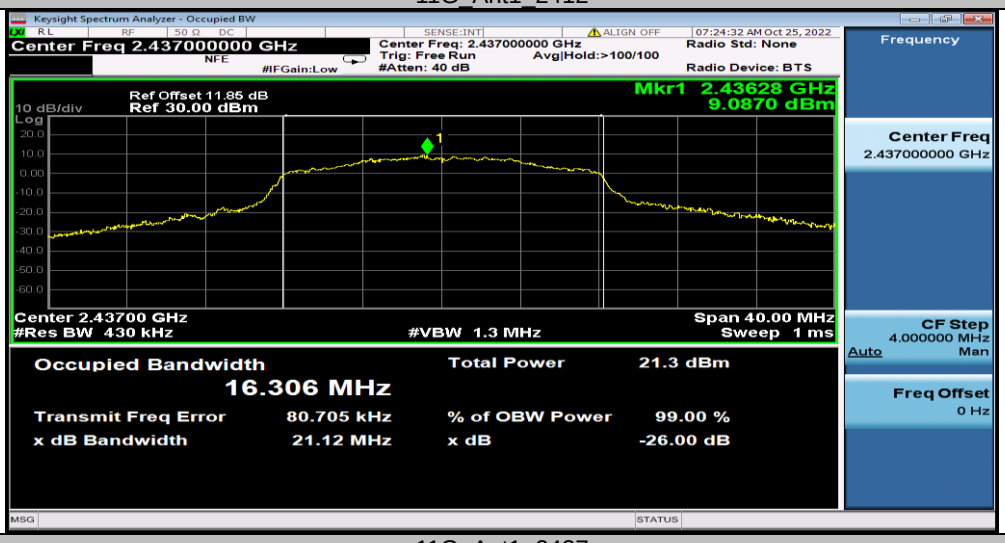
11B_Ant1_2437



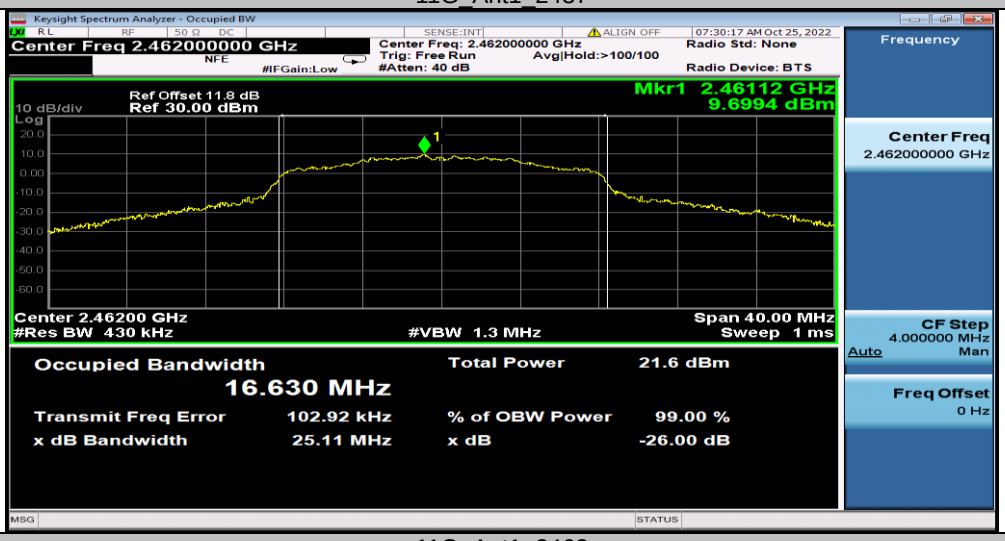
11B_Ant1_2462



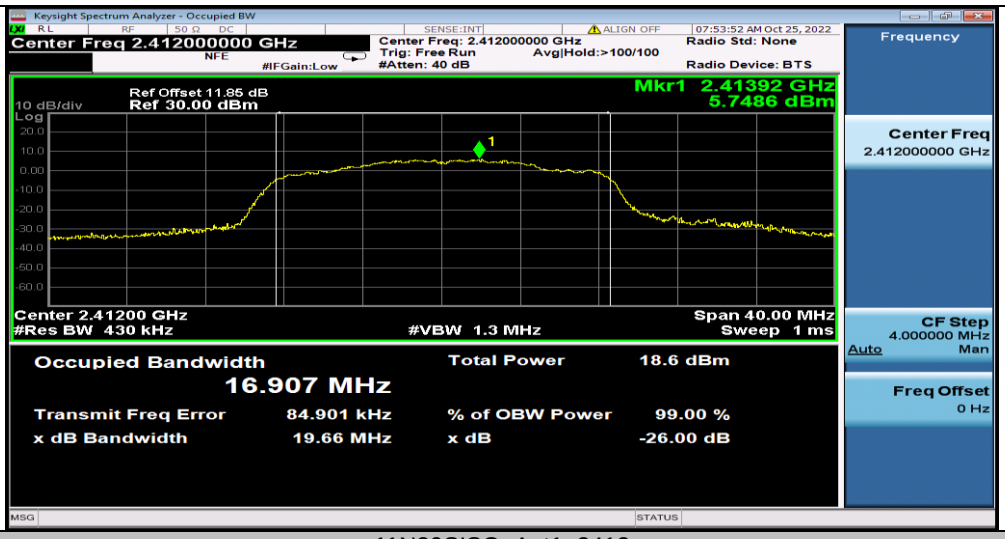
11G_Ant1_2412



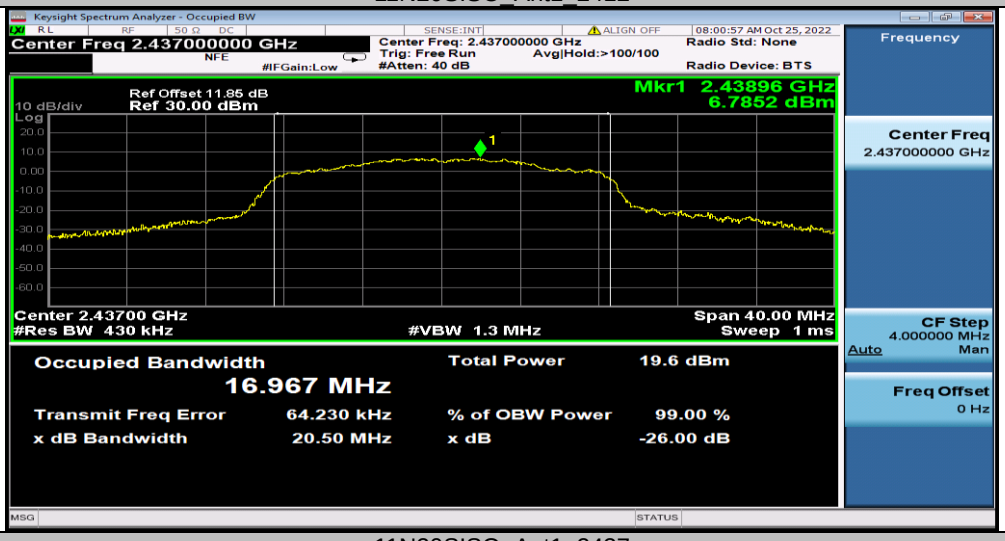
11G_Ant1_2437



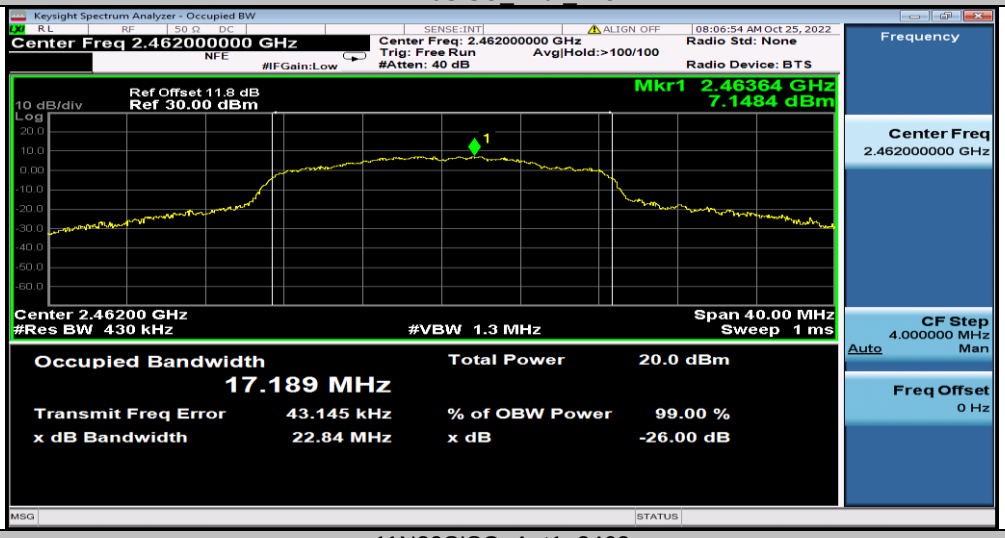
11G_Ant1_2462



11N20SISO_Ant1_2412



11N20SISO_Ant1_2437



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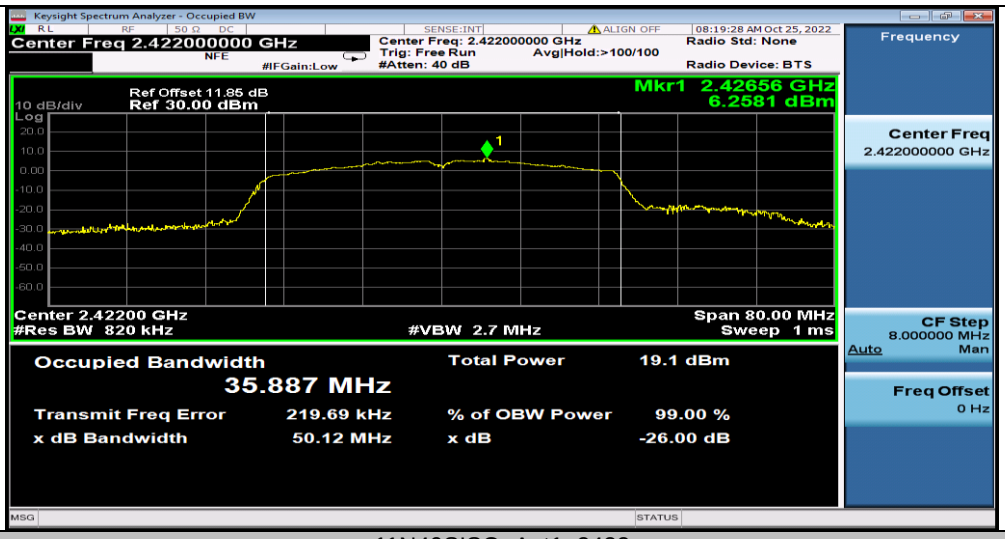
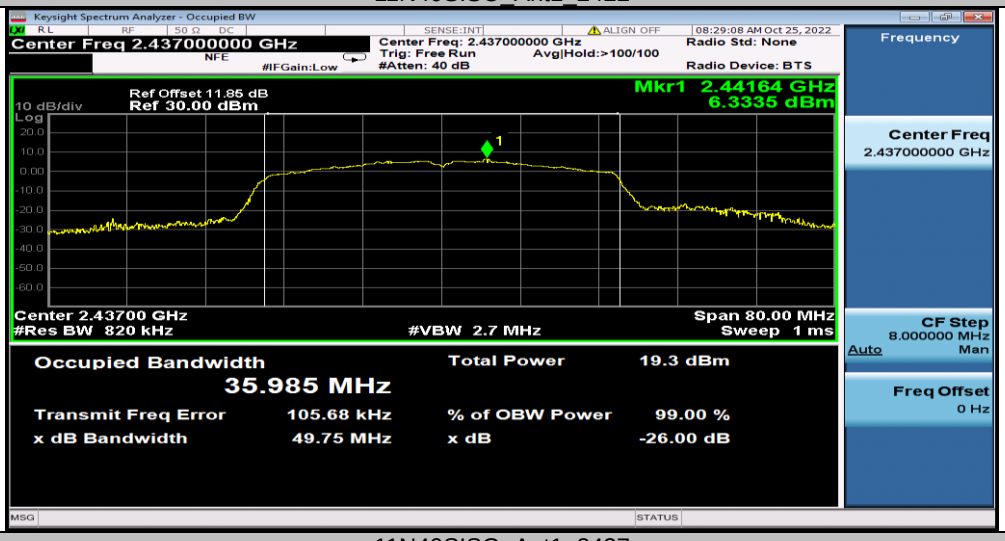
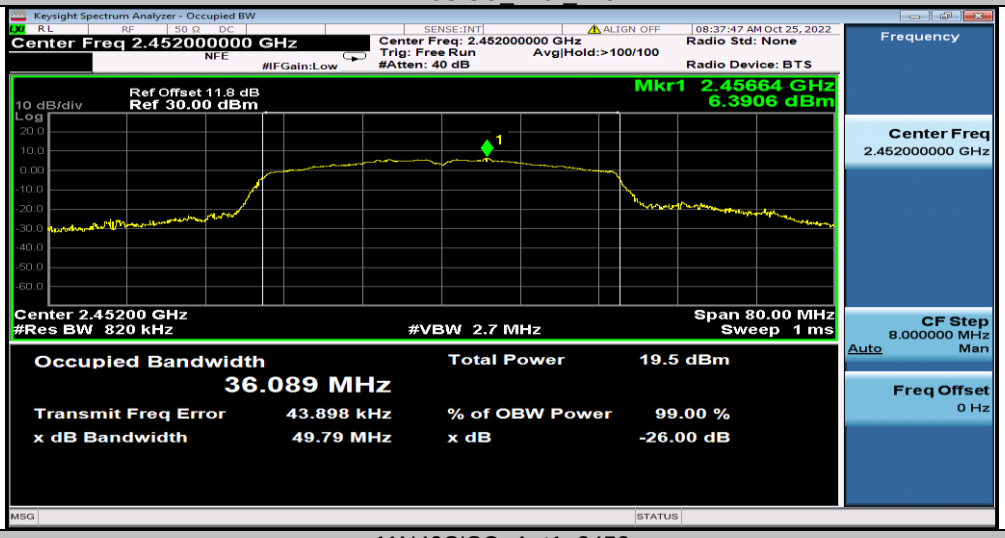


11N40SISO_Ant1_2422



11N40SISO_Ant1_2437



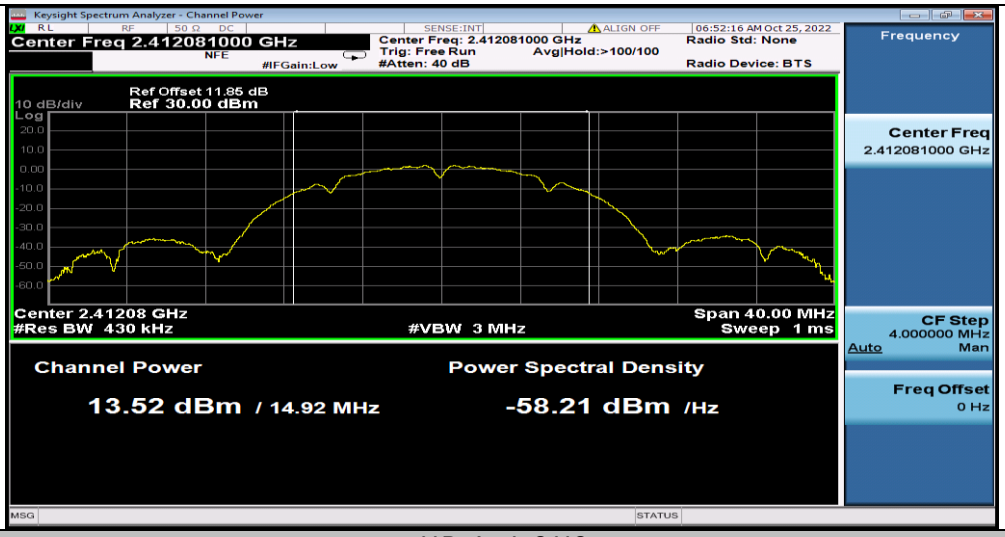
11N40SISO_Ant1_2452

Appendix C: Maximum conducted output power

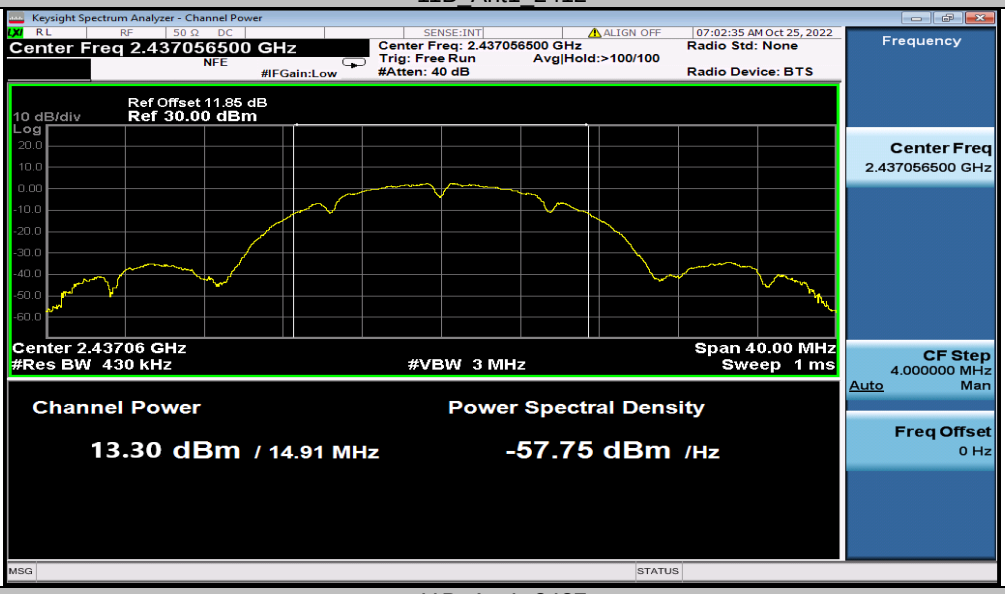
Test Result Peak

TestMode	Antenna	Frequency[MHz]	Peak Powert[dBm]	Conducted Limit[dBm]	EIRP [dBm]	EIRP Limit[dBm]	Verdict
11B	Ant1	2412	13.52	≤30.00	12.52	≤36.00	PASS
		2437	13.30	≤30.00	12.30	≤36.00	PASS
		2462	13.35	≤30.00	12.35	≤36.00	PASS
11G	Ant1	2412	13.38	≤30.00	12.38	≤36.00	PASS
		2437	13.32	≤30.00	12.32	≤36.00	PASS
		2462	13.86	≤30.00	12.86	≤36.00	PASS
11N20SISO	Ant1	2412	11.56	≤30.00	10.56	≤36.00	PASS
		2437	11.55	≤30.00	10.55	≤36.00	PASS
		2462	11.60	≤30.00	10.60	≤36.00	PASS
11N40SISO	Ant1	2422	11.63	≤30.00	10.63	≤36.00	PASS
		2437	11.24	≤30.00	10.24	≤36.00	PASS
		2452	11.30	≤30.00	10.30	≤36.00	PASS

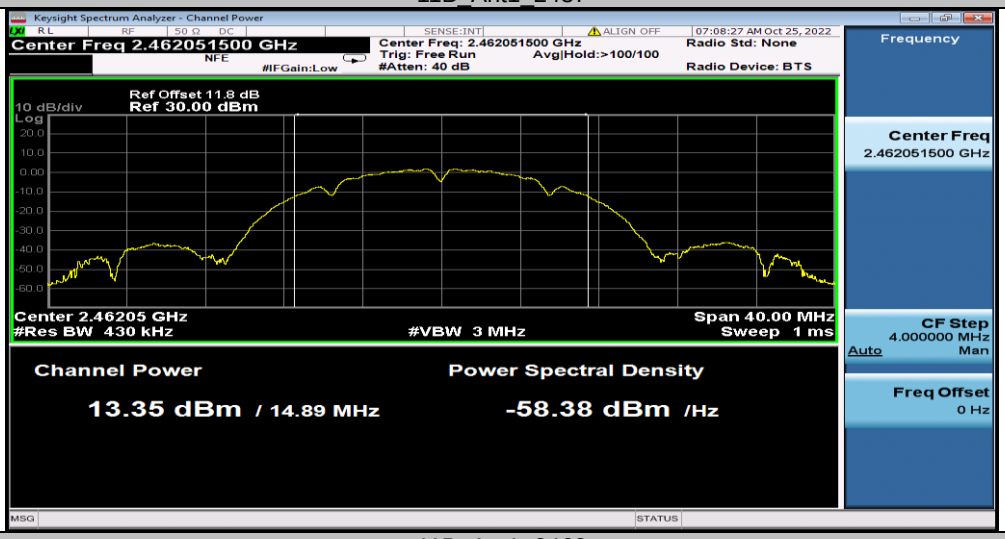
Test Graphs Peak



11B_Ant1_2412



11B_Ant1_2437



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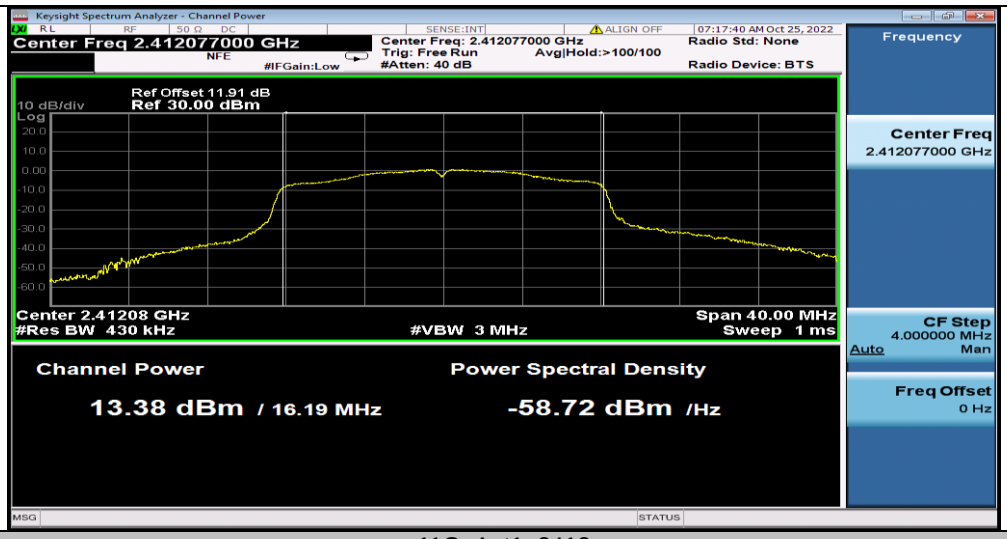

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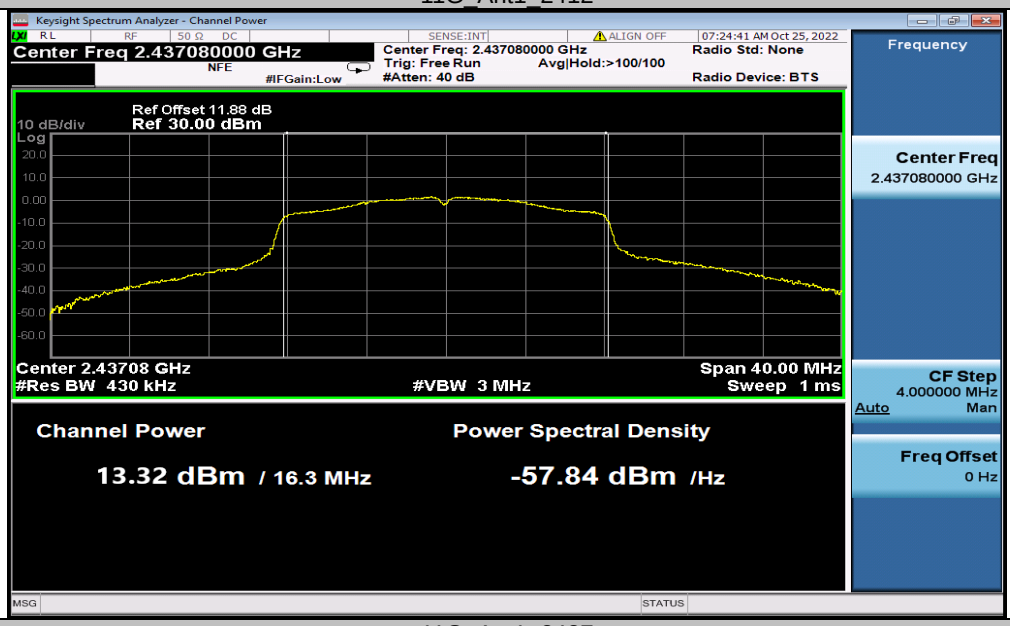

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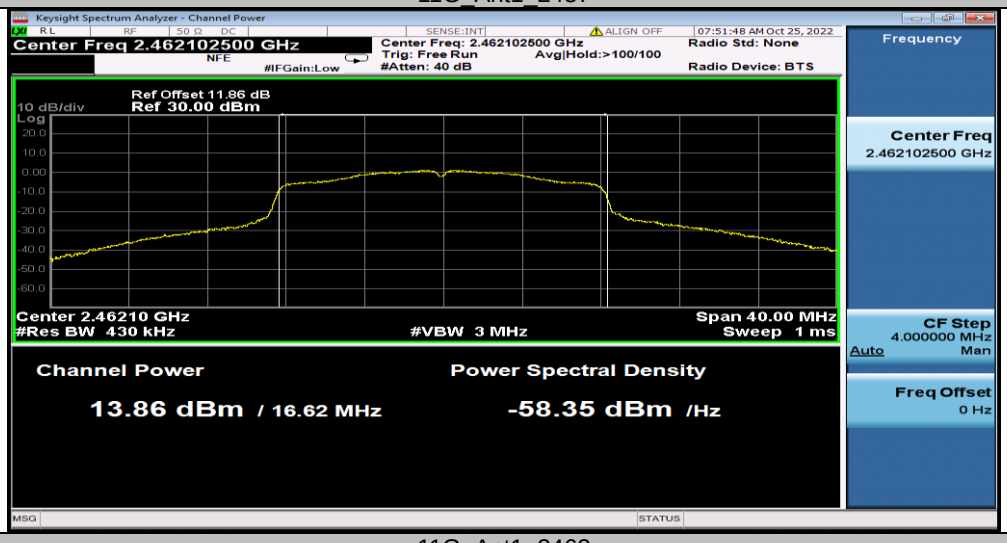

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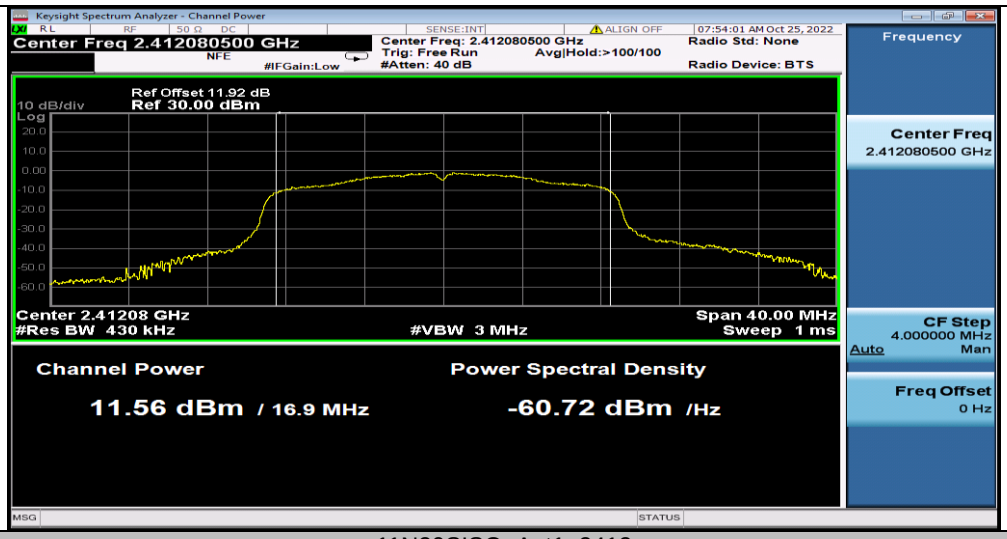
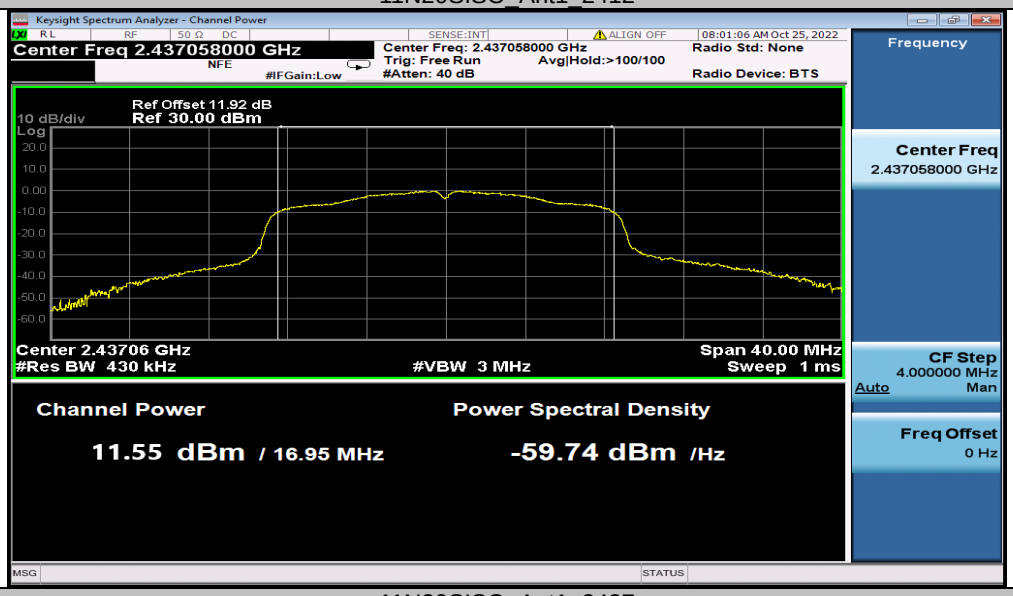


11N20SISO_Ant1_2412



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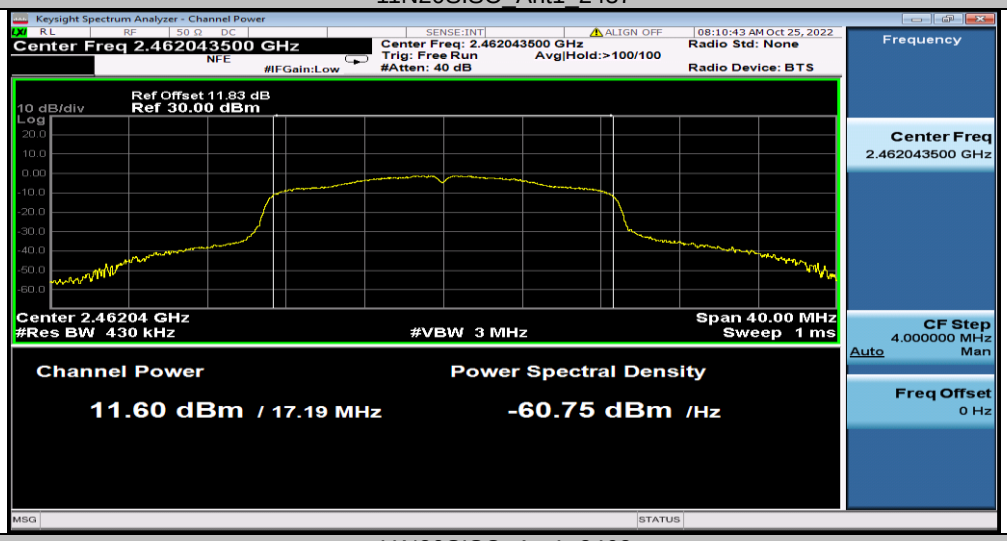

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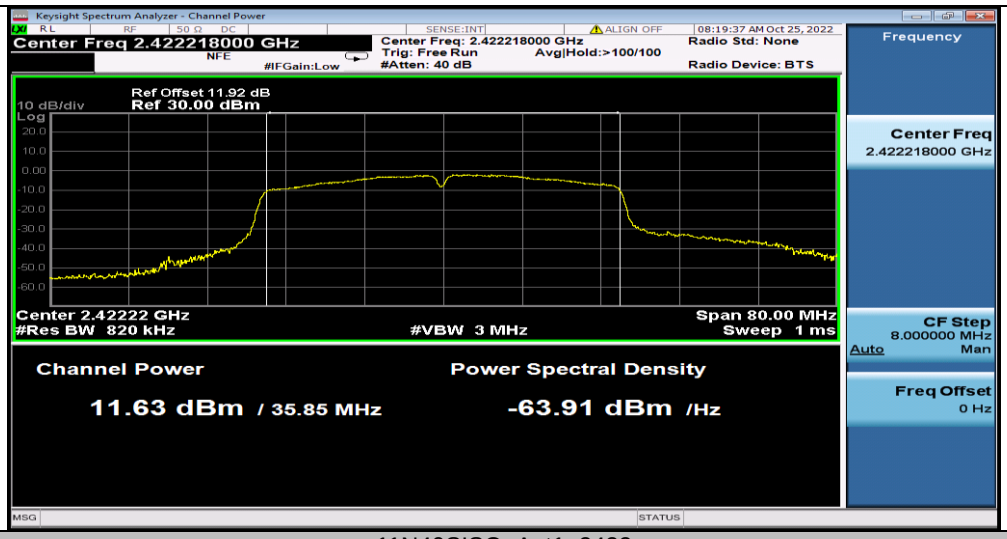
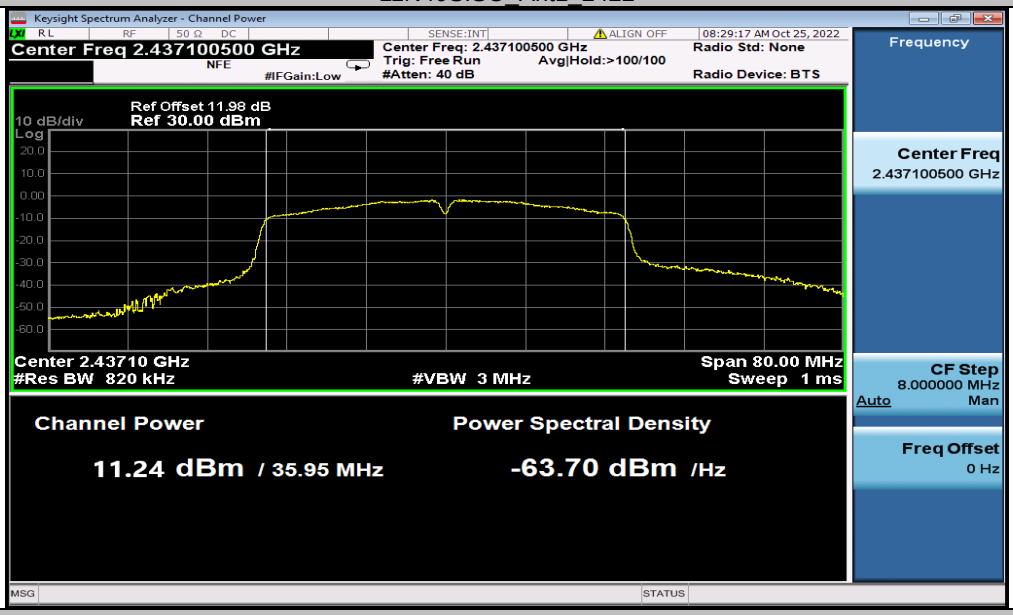
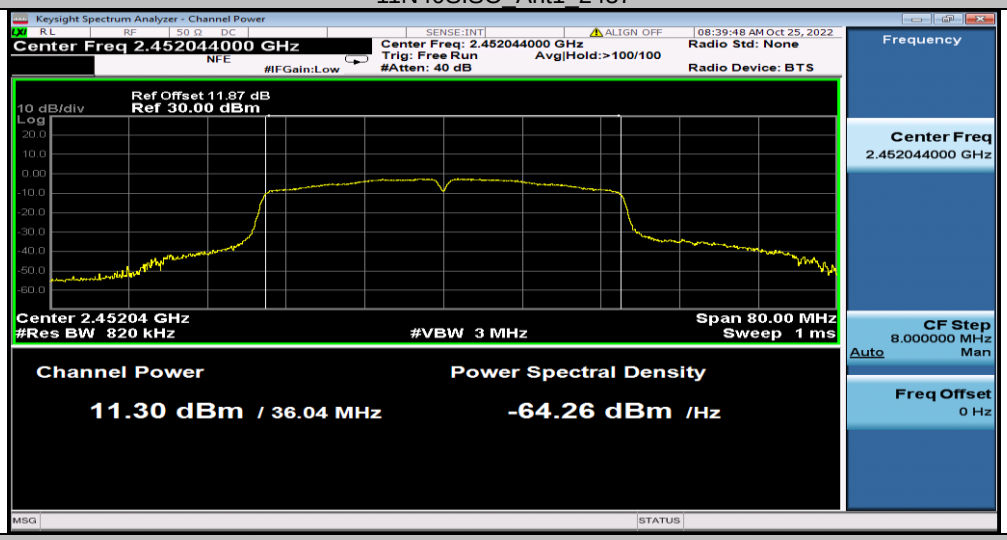


11N40SISO_Ant1_2422



11N40SISO_Ant1_2437



11N40SISO_Ant1_2452

Appendix D: Maximum power spectral density

Test Result

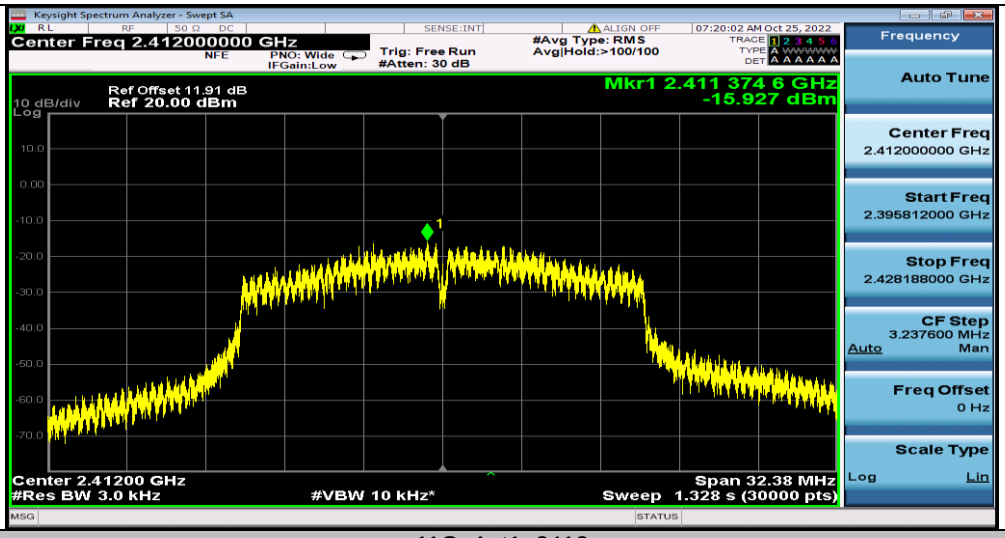
TestMode	Antenna	Frequency[MHz]	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-17.66	≤8.00	PASS
		2437	-16.74	≤8.00	PASS
		2462	-17.52	≤8.00	PASS
11G	Ant1	2412	-15.92	≤8.00	PASS
		2437	-14.38	≤8.00	PASS
		2462	-14.57	≤8.00	PASS
11N20SISO	Ant1	2412	-17.89	≤8.00	PASS
		2437	-16.75	≤8.00	PASS
		2462	-18.56	≤8.00	PASS
11N40SISO	Ant1	2422	-20.96	≤8.00	PASS
		2437	-19.89	≤8.00	PASS
		2452	-20.69	≤8.00	PASS

Test Graphs

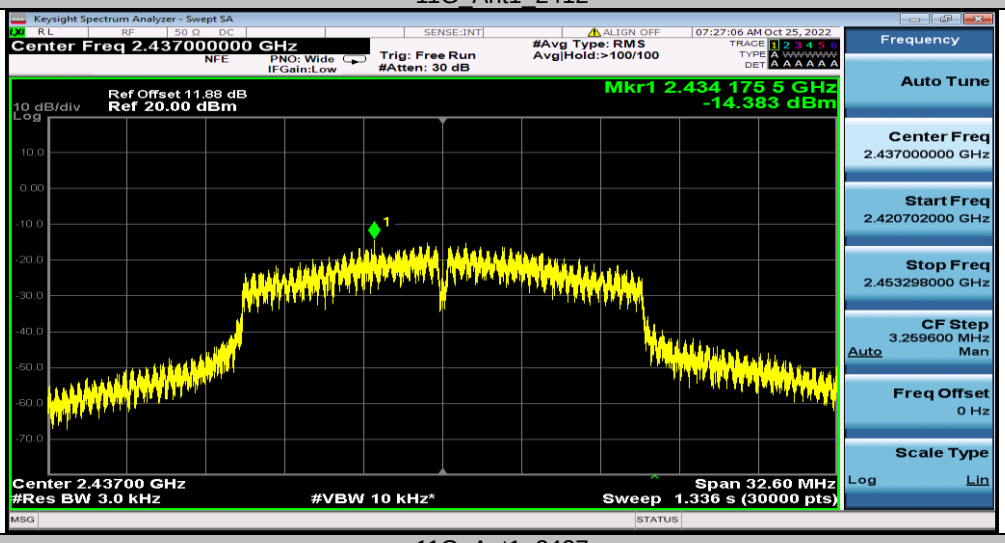
11B_Ant1_2412

11B_Ant1_2437

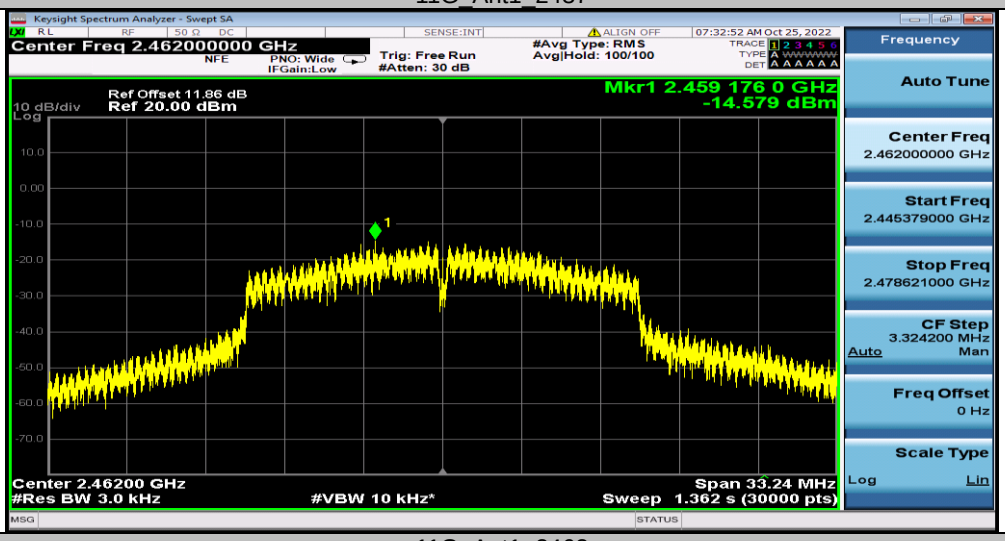
11B_Ant1_2462



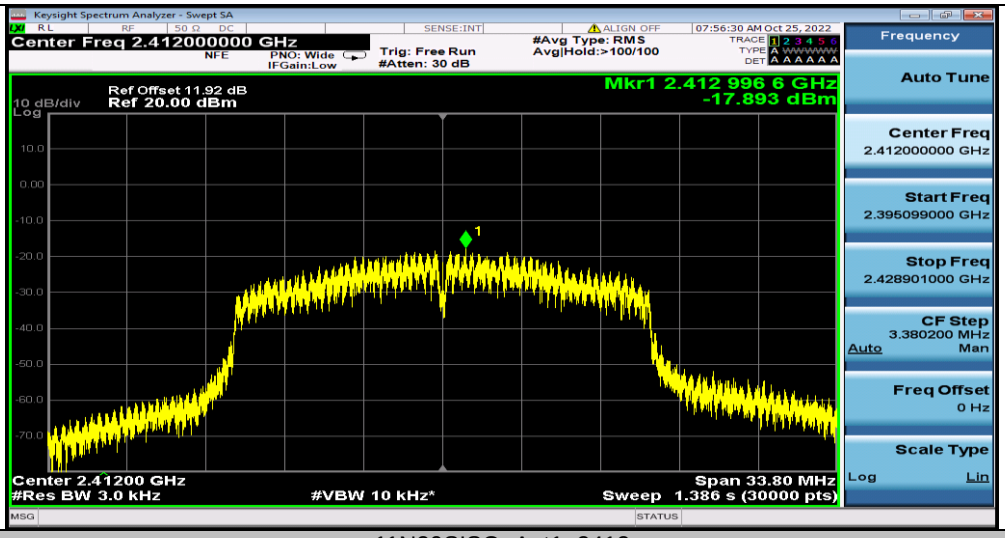
11G_Ant1_2412



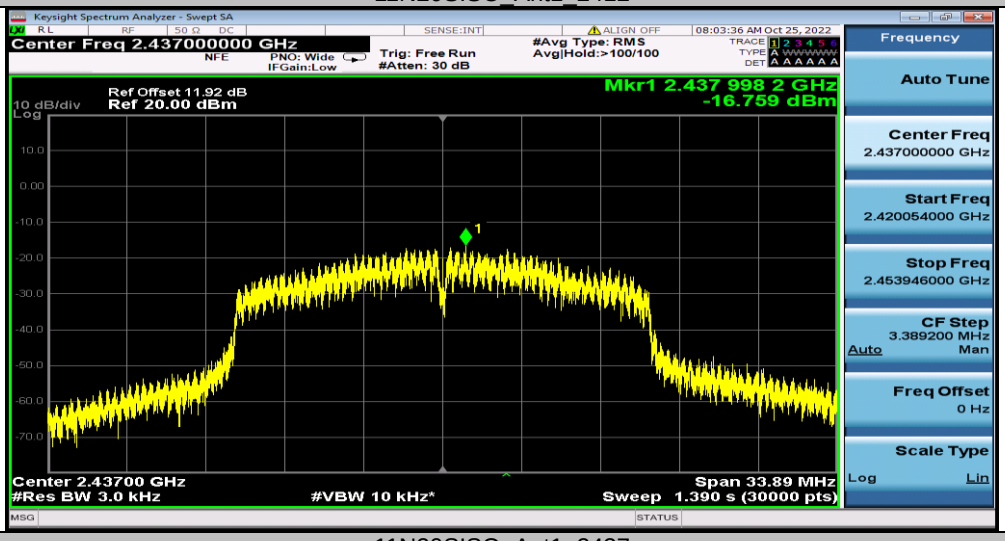
11G_Ant1_2437



11G_Ant1_2462



11N20SISO_Ant1_2412



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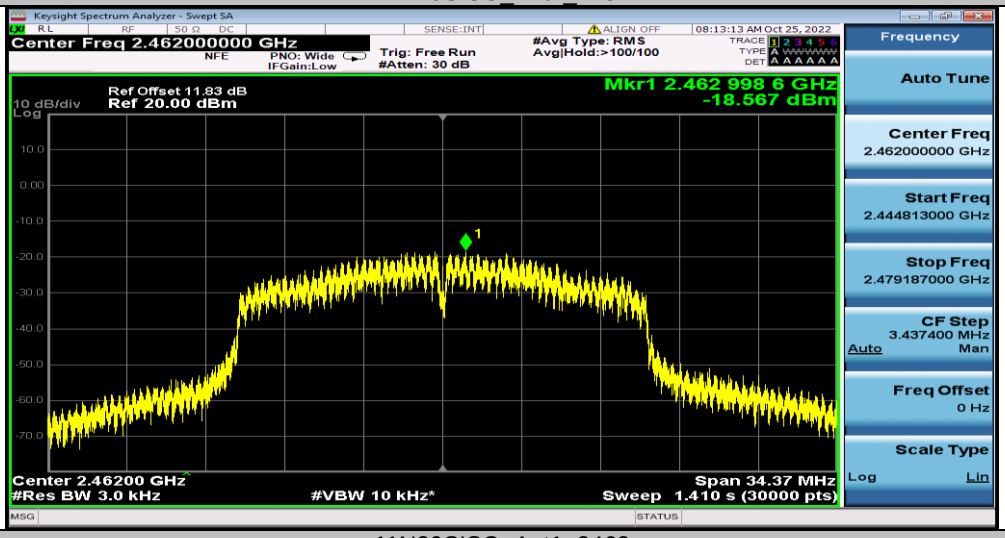
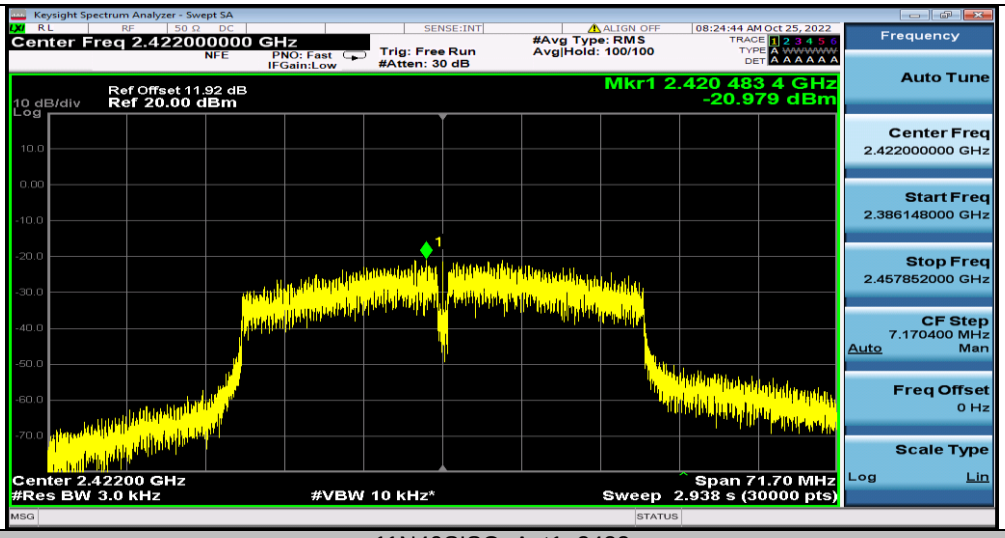
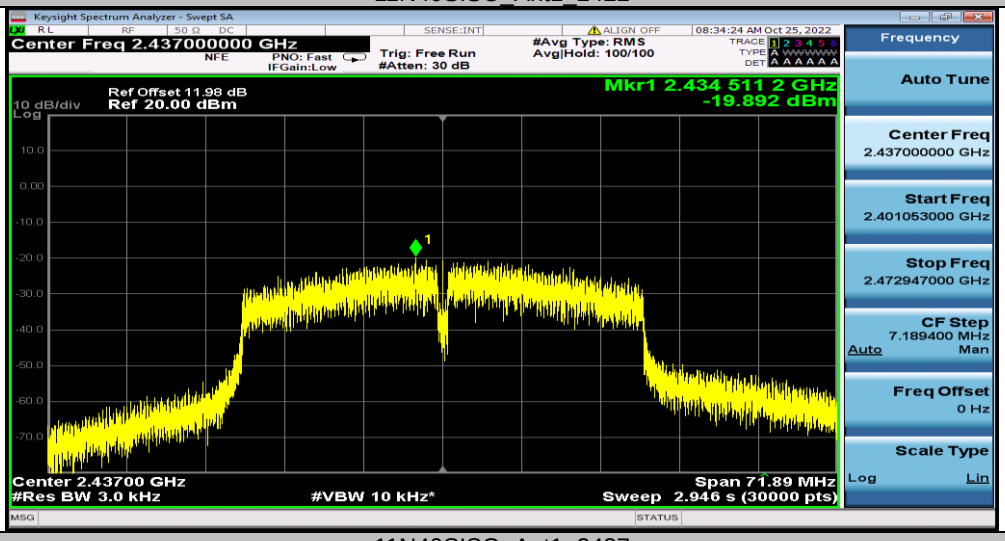


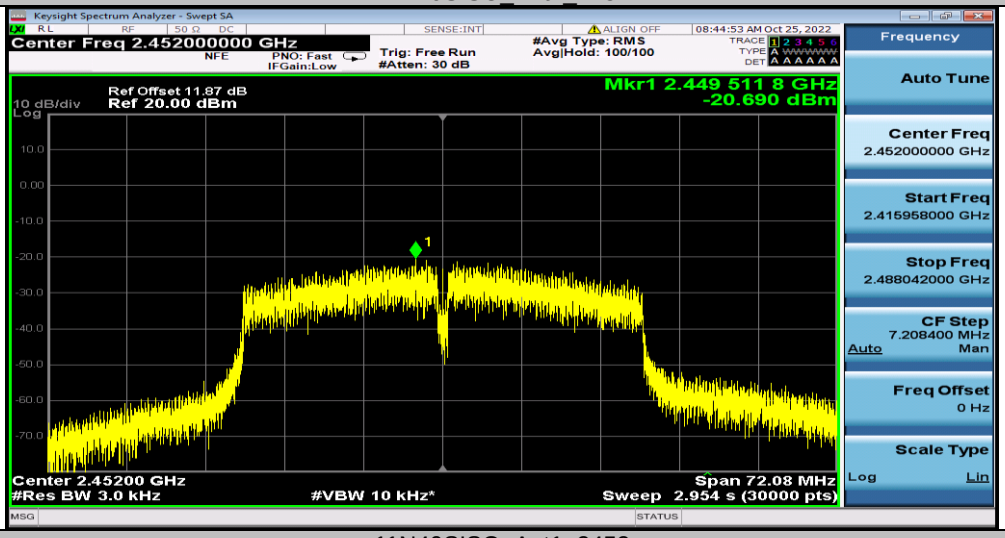
11N20SISO_Ant1_2462



11N40SISO_Ant1_2422



11N40SISO_Ant1_2437



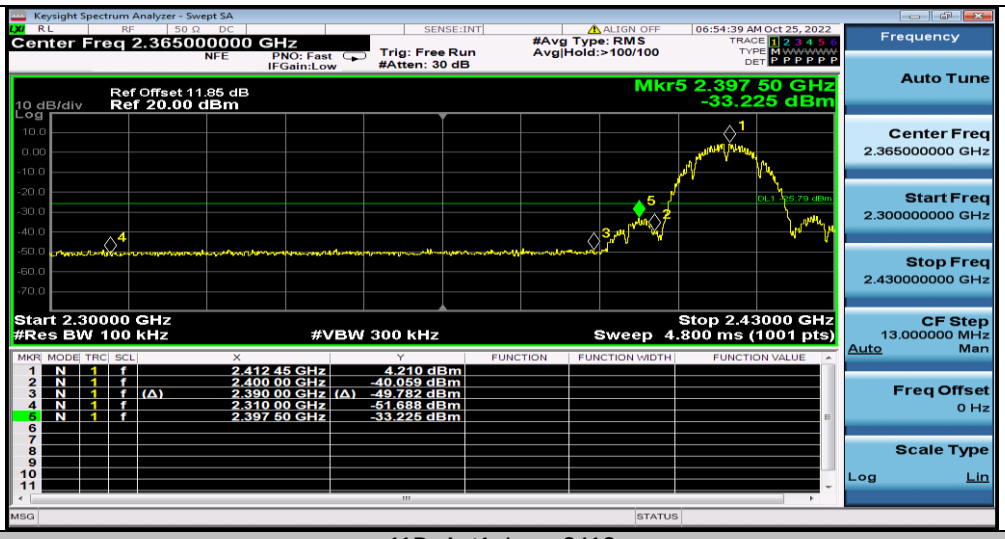
11N40SISO_Ant1_2452

Appendix E: Band edge measurements

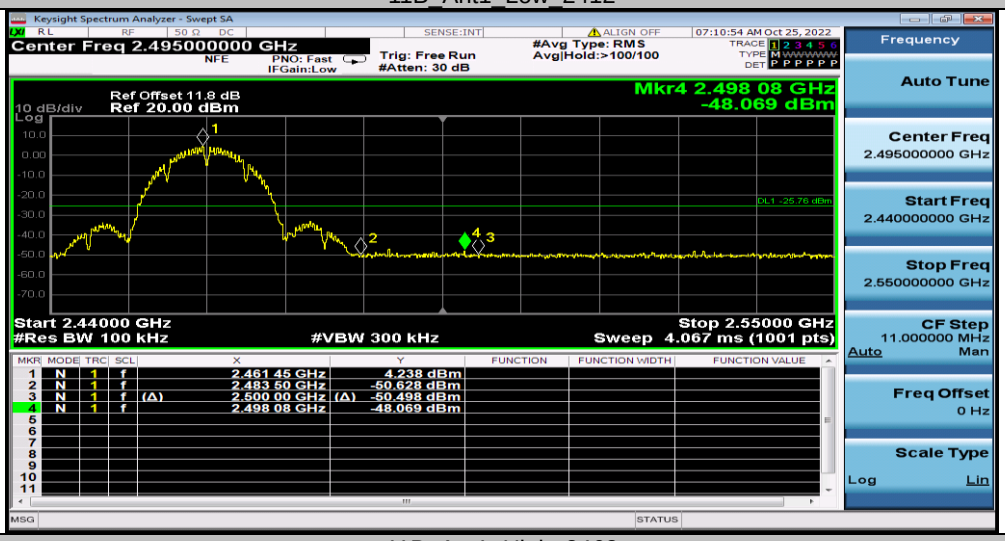
Test Result

TestMode	Antenna	ChName	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	Low	2412	4.21	-33.23	≤-25.79	PASS
		High	2462	4.24	-48.07	≤-25.76	PASS
11G	Ant1	Low	2412	3.56	-34.01	≤-26.44	PASS
		High	2462	4.95	-36.04	≤-25.05	PASS
11N20SISO	Ant1	Low	2412	2.15	-38.75	≤-27.85	PASS
		High	2462	2.18	-45.74	≤-27.83	PASS
11N40SISO	Ant1	Low	2422	-1.40	-36.31	≤-31.4	PASS
		High	2452	-1.80	-33.92	≤-31.8	PASS

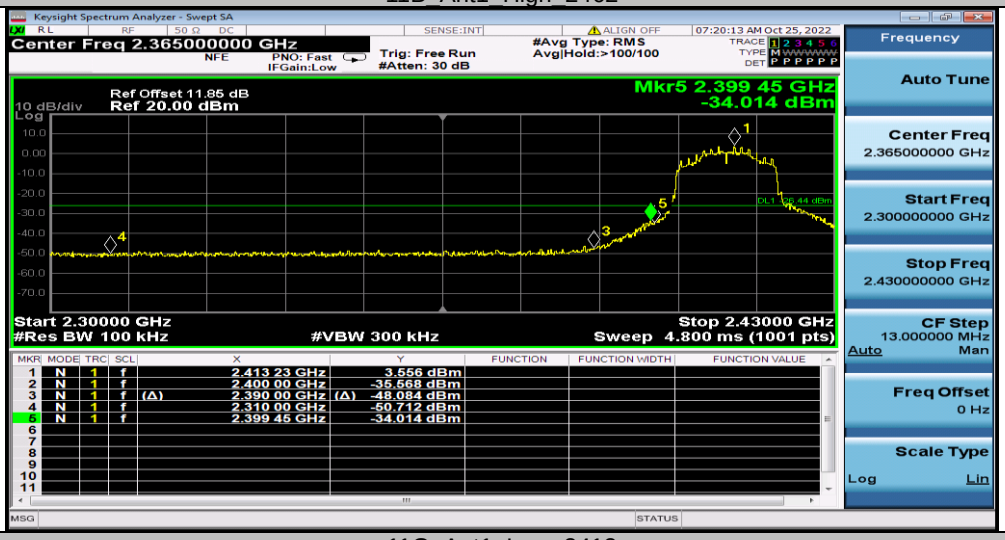
Test Graphs



11B_Ant1_Low_2412



11B_Ant1_High_2462



11G_Ant1_Low_2412