

TEST REPORT

Product Name : 6221B-UUC
Brand Mark : HUNAN FN-LINK
Model No. : 6221B-UUC
FCC ID : 2AATL-6221B-UUC
Report Number : BLA-EMC-202012-A2901
Date of Sample Receipt : 2020/12/8
Date of Test : 2020/12/10 to 2021/1/11
Date of Issue : 2021/1/11
Test Standard : 47 CFR Part 15, Subpart C 15.247
Test Result : Pass

Prepared for:

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No. 8, Litong Road, Liuyang Economic Development Zone,
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2021/1/11



REPORT REVISE RECORD

Version No.	Date	Description
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BlueAsia

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1 TEST SUMMARY

Test item	Test Requirement	Test Method	Class/Severity	Result
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Dwell Time	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
Hopping Channel Number	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Carrier Frequencies Separation	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass
20dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass

2 GENERAL INFORMATION

Applicant	HUNAN FN-LINK TECHNOLOGY LIMITED
Address	No. 8, Litong Road, Liuyang Economic Development Zone, Liuyang China
Manufacturer	HUNAN FN-LINK TECHNOLOGY LIMITED
Address	No. 8, Litong Road, Liuyang Economic Development Zone, Liuyang China
Factory	N/A
Address	N/A
Product Name	6221B-UUC
Test Model No.	6221B-UUC

3 GENERAL DESCRIPTION OF E.U.T.

Hardware Version	1.4
Software Version	1.4
Operation Frequency:	2402MHz-2480MHz
Modulation Type:	GFSK, p/4DQPSK, 8DPSK
Channel Spacing:	1MHz
Number of Channels:	79
Antenna Type:	Internal antenna
Antenna Gain:	2dBi(Provided by customer)

4 TEST ENVIRONMENT

Environment	Temperature	Voltage
Normal	25℃	DC3.3V

5 TEST MODE

TEST MODE	TEST MODE DESCRIPTION
Transmitting mode	Keep the EUT in continuously transmitting mode with modulation. (hopping and non hopping mode all have been tested, non hopping mode is worse case for RE)
Remark: Full battery is used during all test except ac conducted emission, DH1,DH3, DH5 all have been tested, during the test, GFSK, Pi/4QPSK, 8-DPSK modulation were all pre-scanned Only the GFSK, Pi/4QPSK 8DPSK of the worst mode would be recorded in this report.	

6 MEASUREMENT UNCERTAINTY

Parameter	Expanded Uncertainty (Confidence of 95%)
Radiated Emission(9kHz-30MHz)	±4.34dB
Radiated Emission(30Mz-1000MHz)	±4.24dB
Radiated Emission(1GHz-18GHz)	±4.68dB
AC Power Line Conducted Emission(150kHz-30MHz)	±3.45dB

7 DESCRIPTION OF SUPPORT UNIT

Device Type	Manufacturer	Model Name	Serial No.	Remark
PC	HASEE	K610D	N/A	N/A

8 LABORATORY LOCATION

All tests were performed at:
BlueAsia of Technical Services(Shenzhen) Co., Ltd.
Building C, No. 107, Shihuan Road, Shiyan Sub-District, Baoan District, Shenzhen, Guangdong Province, China
Telephone: TEL: +86-755-28682673 FAX: +86-755-28682673
No tests were sub-contracted.

9 TEST INSTRUMENTS LIST

Test Equipment Of Radiated Spurious Emissions					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Chamber	SKET	966	N/A	2020/11/10	2023/11/9
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Receiver	R&S	ESR7	101199	2020/10/12	2021/10/11
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	2020/9/26	2022/9/25
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	2020/9/26	2022/9/25
Amplifier	SKET	PA-000318G-45	N/A	2020/10/16	2021/10/15
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	2020/9/26	2022/9/25
Controller	SKET	N/A	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-02	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-03	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-01	N/A	N/A	N/A

Test Equipment Of Conducted Band Edges Measurement					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Dwell Time					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due

Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Conducted Spurious Emissions

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Hopping Channel Number

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Carrier Frequencies Separation

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11

Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11
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Test Equipment Of 20dB Bandwidth

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Conducted Peak Output Power

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Conducted Emissions at AC Power Line (150kHz-30MHz)

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Shield room	SKET	833	N/A	2020/11/25	2023/11/24
Receiver	R&S	ESPI3	101082	2020/10/12	2021/10/11
LISN	R&S	ENV216	3560.6550.15	2020/10/12	2021/10/11
LISN	安泰信	AT166-2	AKK1806000003	2020/10/12	2021/10/11
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A

Test Equipment Of Radiated Emissions which fall in the restricted bands

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Chamber	SKET	966	N/A	2020/11/10	2023/11/9
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Receiver	R&S	ESR7	101199	2020/10/12	2021/10/11
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	2020/9/26	2022/9/25
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	2020/9/26	2022/9/25
Amplifier	SKET	PA-000318G-45	N/A	2020/10/16	2021/10/15
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	2020/9/26	2022/9/25
Controller	SKET	N/A	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-02	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-03	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-01	N/A	N/A	N/A

1 RADIATED SPURIOUS EMISSIONS

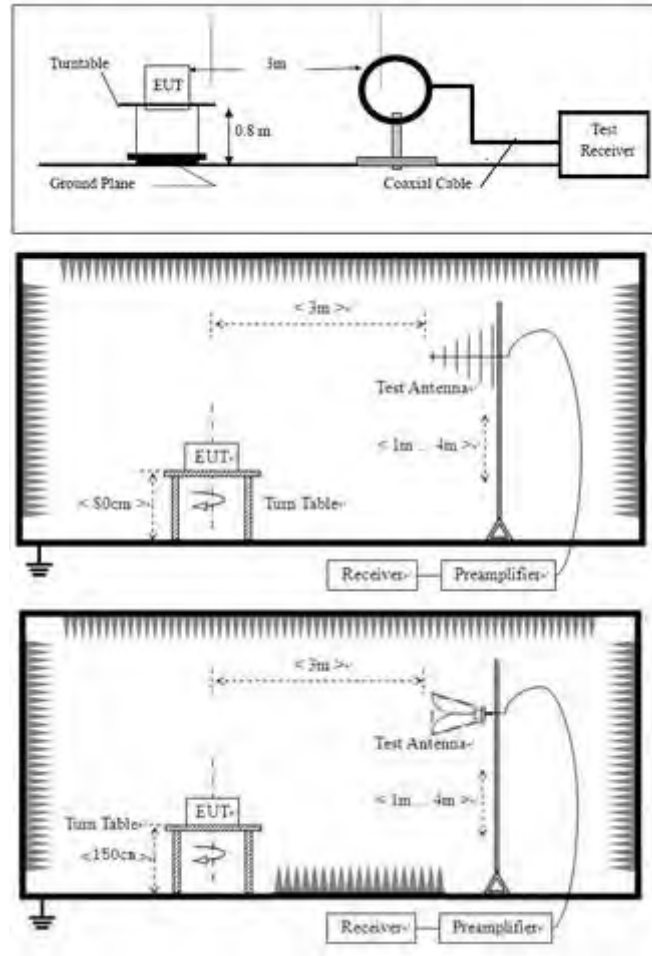
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.4,6.5,6.6
Test Mode (Pre-Scan)	TX mode (SE) below 1G; TX mode (SE) Above1G
Test Mode (Final Test)	TX mode (SE) below 1G; TX mode (SE) Above1G
Tester	Eason
Temperature	22℃
Humidity	50%

1.1 LIMITS

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

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

1.2 BLOCK DIAGRAM OF TEST SETUP



1.3 PROCEDURE

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height 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.
- 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark:

- 1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor + Preamplifier Factor
- 3) Scan from 9kHz to 25GHz, the disturbance above 12.75GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported. Fundamental frequency is blocked by filter, and only spurious emission is shown.
- 4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

1.4 TEST DATA

TestMode: TX mode (SE) below 1G;[Polarity: Horizontal];

Radiated Emission Measurement



Site

Limit: FCC Part15 Class B

EUT: 6221B-UUC

M/N: 6221B-UUC

Mode: BT mode

Note:

Polarization: **Horizontal**

Temperature:

Power:

Humidity: %

Distance: 3m

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	
			dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	48.3318	3.43	24.11	27.54	40.00	-12.46	QP		
2		118.1862	4.16	22.55	26.71	43.50	-16.79	QP		
3		146.3735	5.79	23.47	29.26	43.50	-14.24	QP		
4		237.4760	9.56	22.92	32.48	46.00	-13.52	QP		
5		279.0436	7.39	23.77	31.16	46.00	-14.84	QP		
6		432.5457	4.03	28.15	32.18	46.00	-13.82	QP		

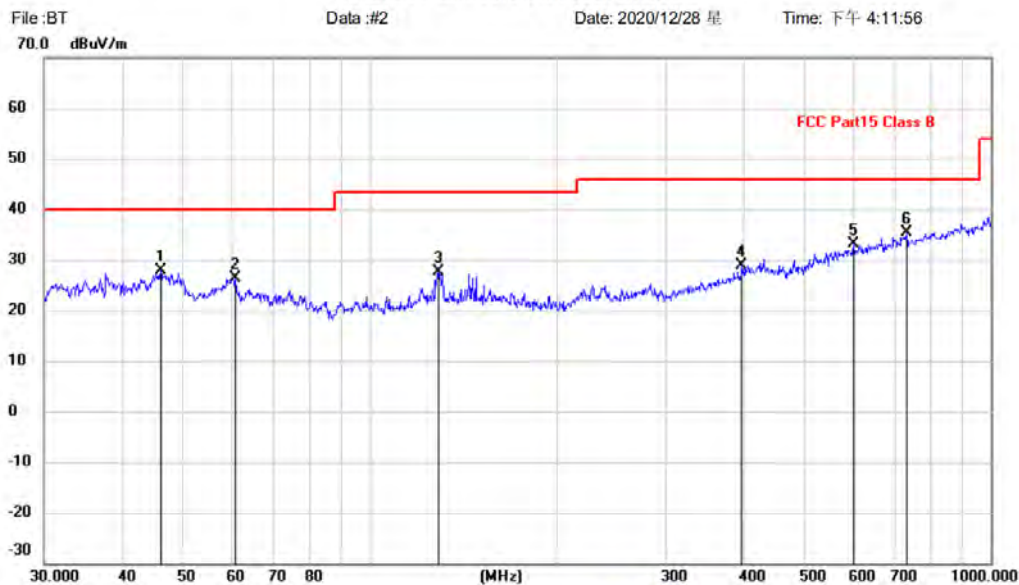
*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

TestMode: TX mode (SE) below 1G];[Polarity: Vertical]

Radiated Emission Measurement



Site

Limit: FCC Part15 Class B

EUT: 6221B-UUC

M/N: 6221B-UUC

Mode: BT mode

Note:

Polarization: **Vertical**

Temperature:

Power:

Humidity: %

Distance: 3m

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		46.1779	3.81	24.16	27.97	40.00	-12.03	QP		
2		60.9176	2.80	23.53	26.33	40.00	-13.67	QP		
3		129.4677	4.56	23.09	27.65	43.50	-15.85	QP		
4		397.6334	1.15	27.75	28.90	46.00	-17.10	QP		
5		601.4265	1.39	31.81	33.20	46.00	-12.80	QP		
6	*	731.9203	2.18	33.32	35.50	46.00	-10.50	QP		

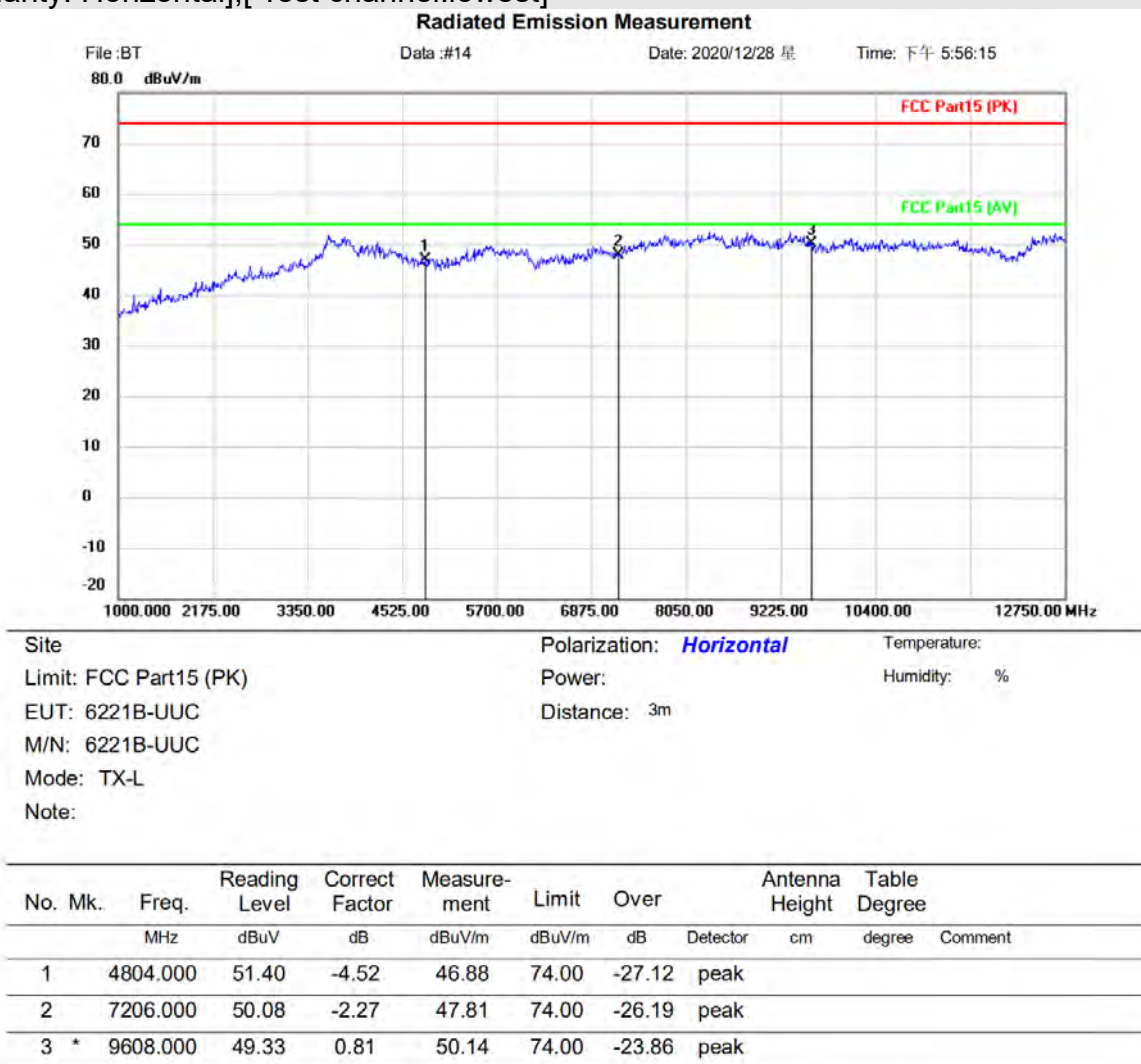
*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

Remark: During the test, pre-scan the GFSK, Pi/4QPSK, 8-DPSK modulation, and found the GFSK modulation which it is worse case.

[Polarity: Horizontal];[Test channel:lowest]



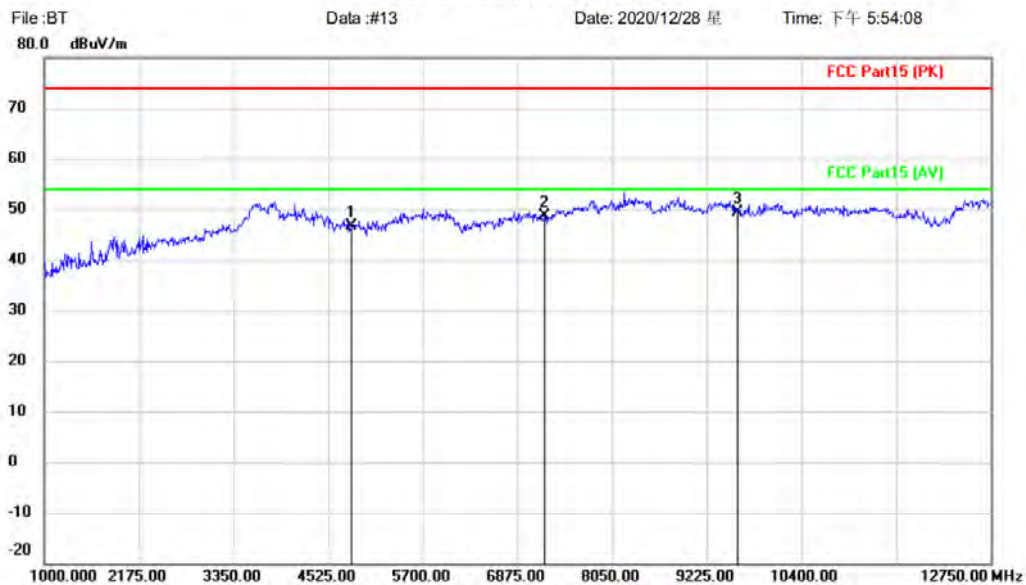
*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

[Polarity: Vertical] ;[Test channel:lowest]

Radiated Emission Measurement



Site Limit: FCC Part15 (PK) Polarization: **Vertical** Temperature:
EUT: 6221B-UUC Power: Humidity: %
M/N: 6221B-UUC Distance: 3m
Mode: TX-L
Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Comment
1		4804.000	51.18	-4.52	46.66	74.00	-27.34	peak		
2		7206.000	50.64	-2.02	48.62	74.00	-25.38	peak		
3	*	9608.000	48.79	0.62	49.41	74.00	-24.59	peak		

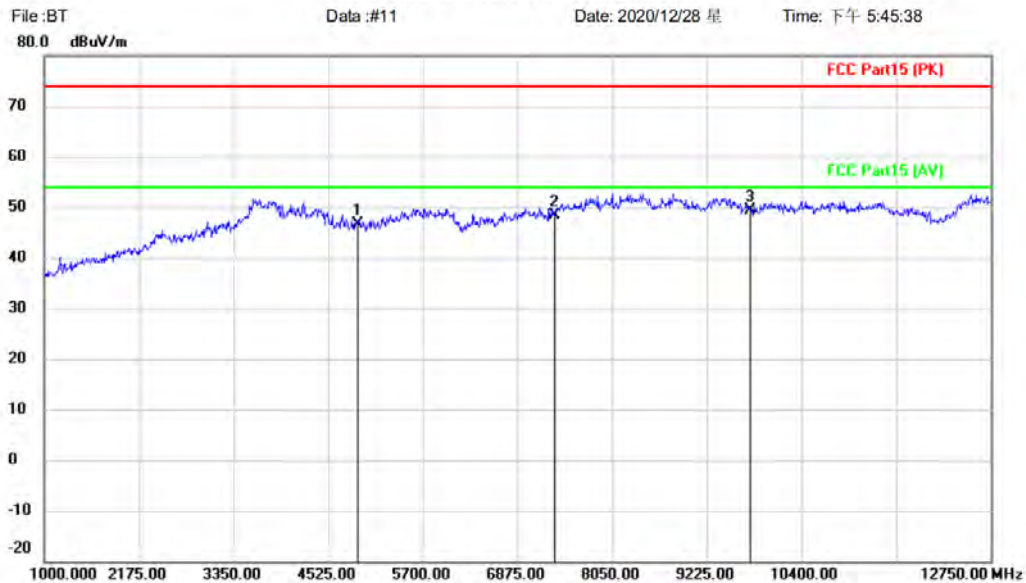
*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

[Polarity: Horizontal]; [Test channel: Middle]

Radiated Emission Measurement



Site Limit: FCC Part15 (PK) Polarization: **Horizontal** Temperature:
EUT: 6221B-UUC Power: Humidity: %
M/N: 6221B-UUC Distance: 3m
Mode: TX-M
Note:

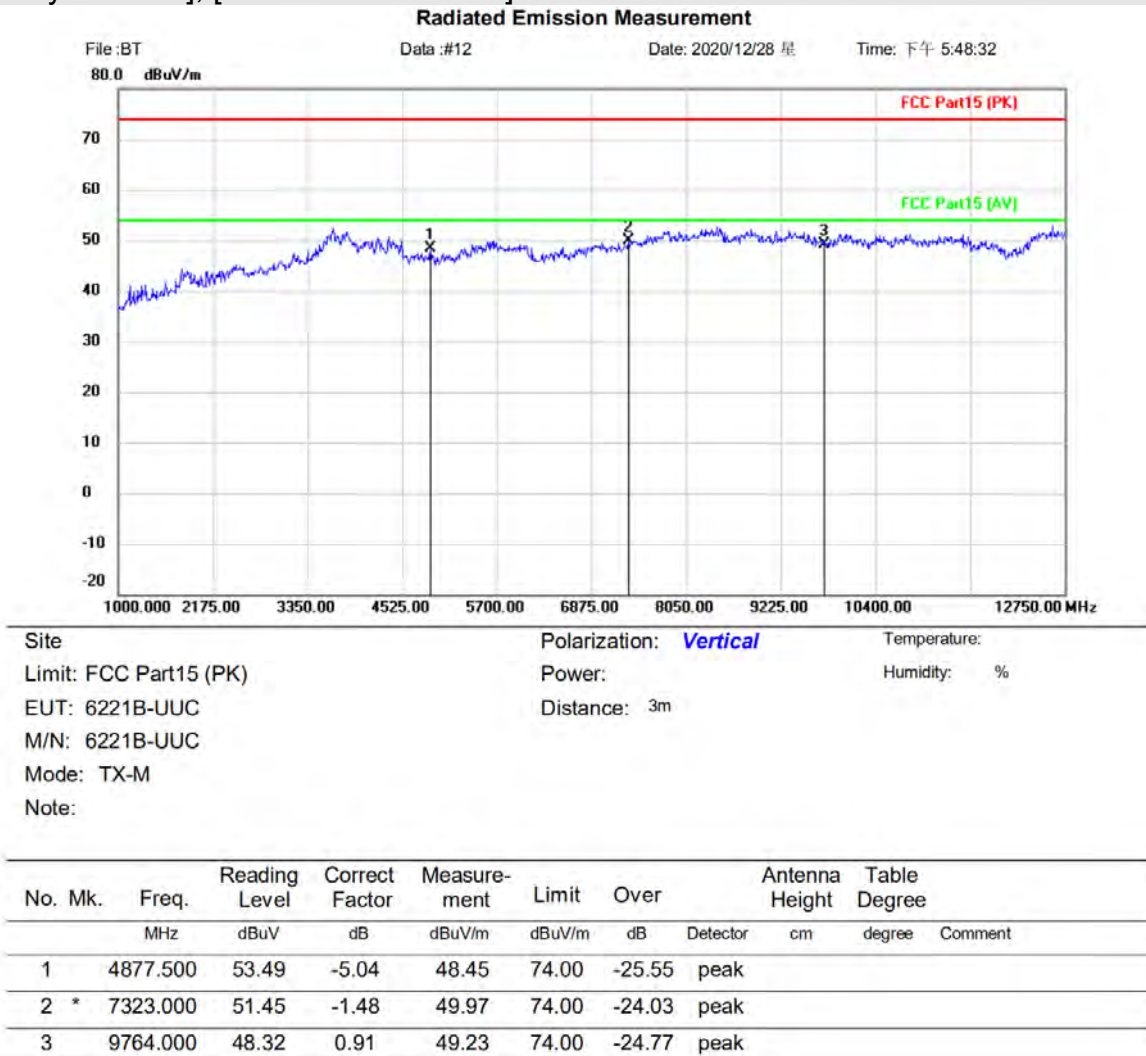
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1		4882.000	51.61	-5.07	46.54	74.00	-27.46	peak			
2		7323.000	49.72	-1.34	48.38	74.00	-25.62	peak			
3	*	9764.000	48.49	0.94	49.43	74.00	-24.57	peak			

*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

[Polarity: Vertical]; [Test channel: Middle]

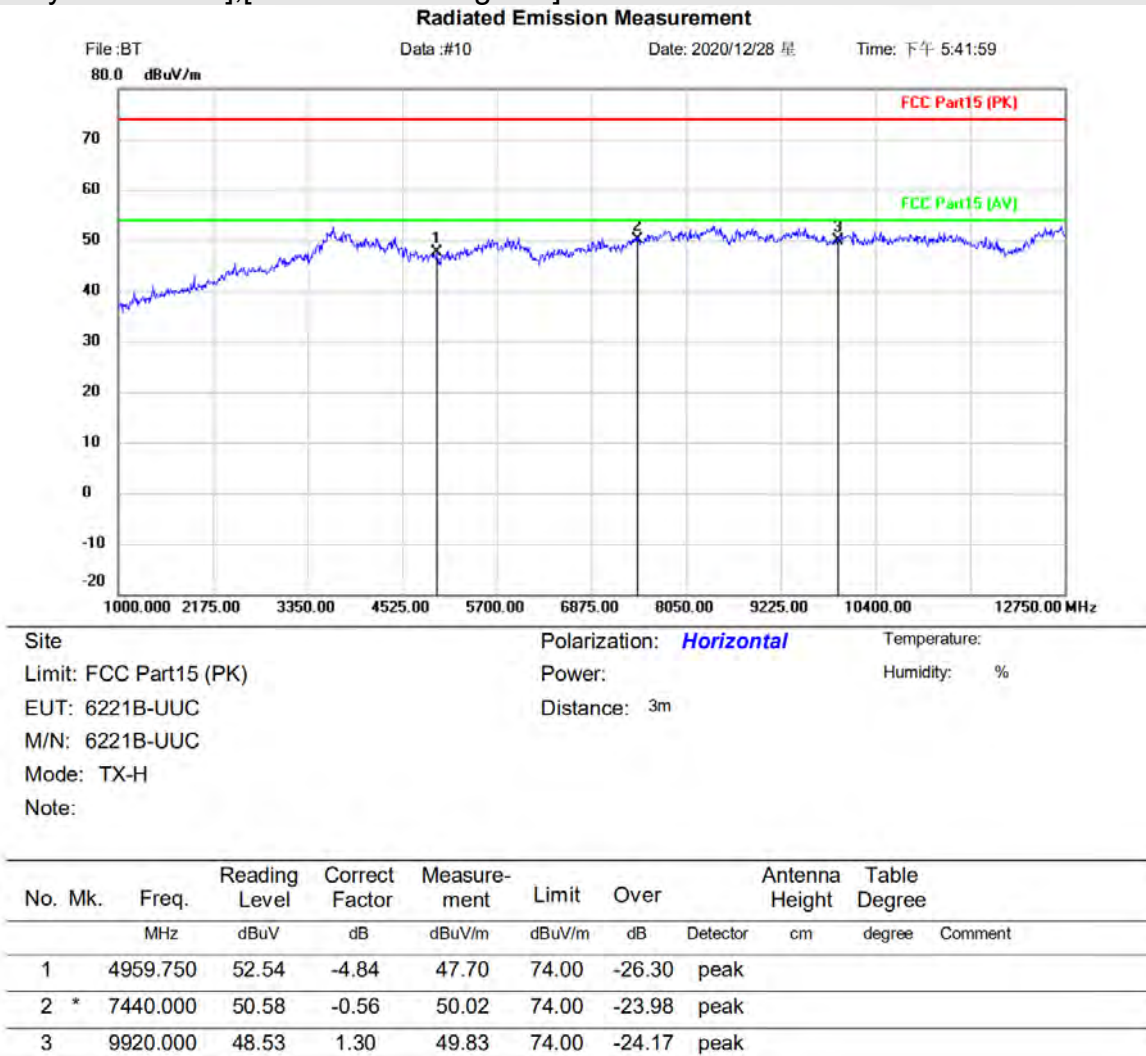


*:Maximum data x:Over limit !:over margin

〈Reference Only

Test Result: Pass

[Polarity: Horizontal];[Test channel:highest]

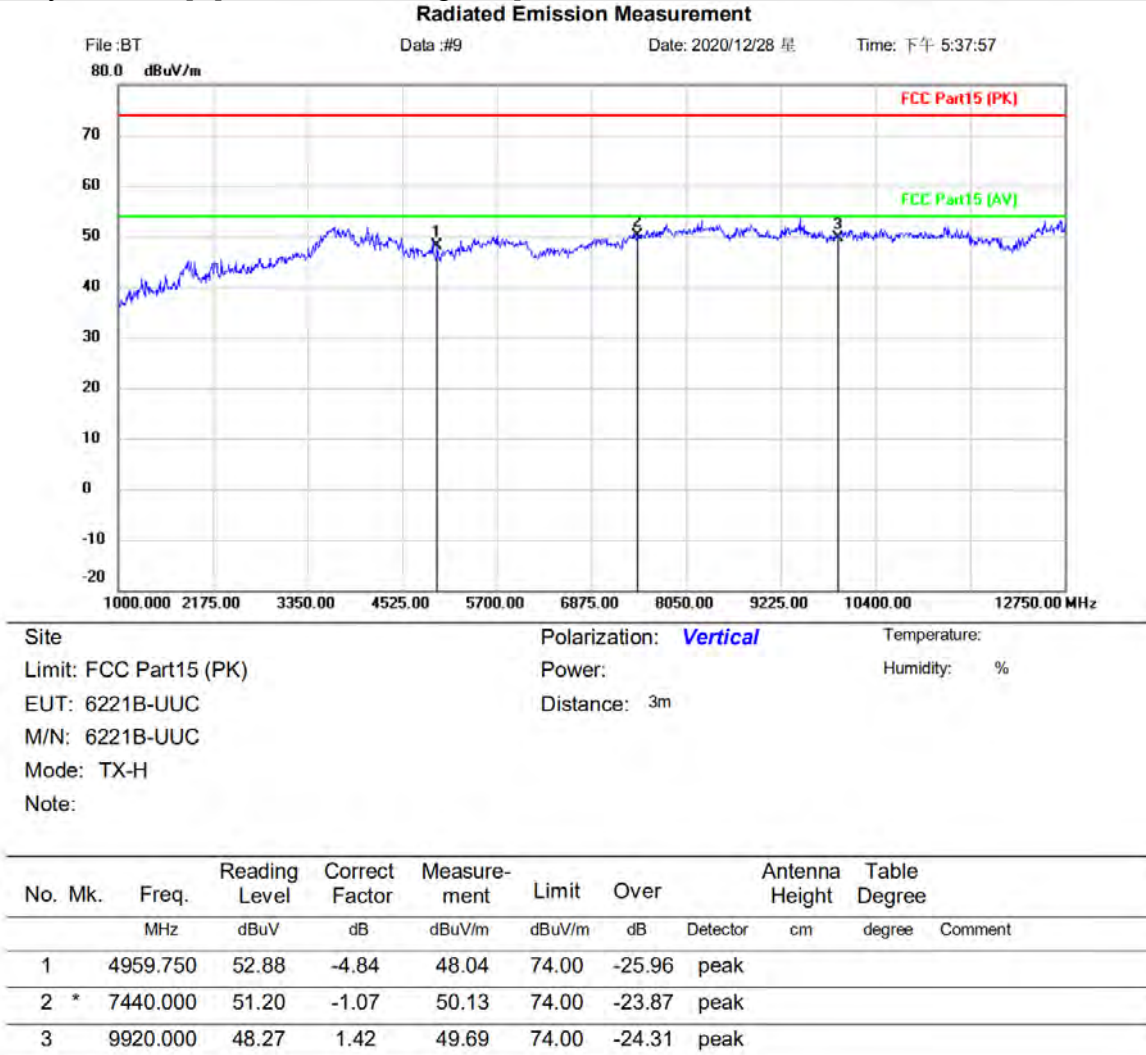


*:Maximum data x:Over limit !:over margin

⟨Reference Only

Test Result: Pass

[Polarity: Vertical]; [Test channel: highest]



*:Maximum data x:Over limit !:over margin

⟨Reference Only

Test Result: Pass

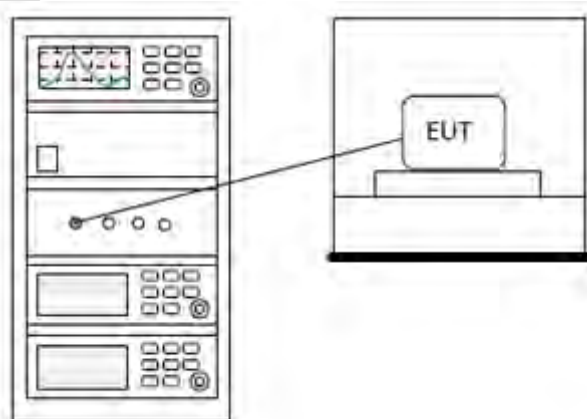
2 CONDUCTED BAND EDGES MEASUREMENT

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2
Test Mode (Pre-Scan)	Transmitting mode
Test Mode (Final Test)	Transmitting mode
Tester	Eason
Temperature	22°C
Humidity	50%

2.1 LIMITS

Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
---------------	--

2.2 BLOCK DIAGRAM OF TEST SETUP



2.3 TEST DATA

Pass: Please Refer To Appendix: For Details

BlueAsia

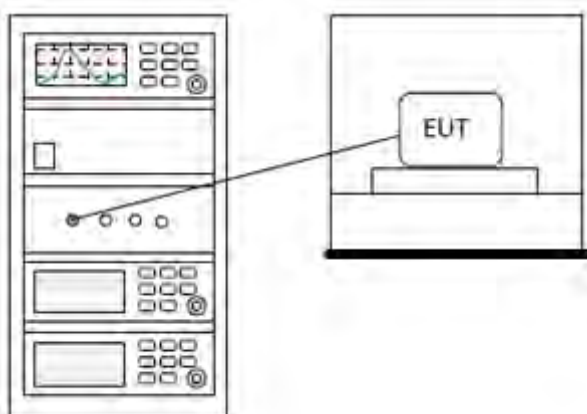
3 DWELL TIME

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.4
Test Mode (Pre-Scan)	Transmitting mode
Test Mode (Final Test)	Transmitting mode
Tester	Eason
Temperature	22℃
Humidity	50%

3.1 LIMITS

Frequency(MHz)	Limit
902-928	0.4S within a 20S period(20dB bandwidth<250kHz)
	0.4S within a 10S period(20dB bandwidth≥250kHz)
2400-2483.5	0.4S within a period of 0.4S multiplied by the number of hopping channels
5725-5850	0.4S within a 30S period

3.2 BLOCK DIAGRAM OF TEST SETUP



3.3 TEST DATA

Pass: Please Refer To Appendix: For Details

BlueAsia

4 ANTENNA REQUIREMENT

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	N/A

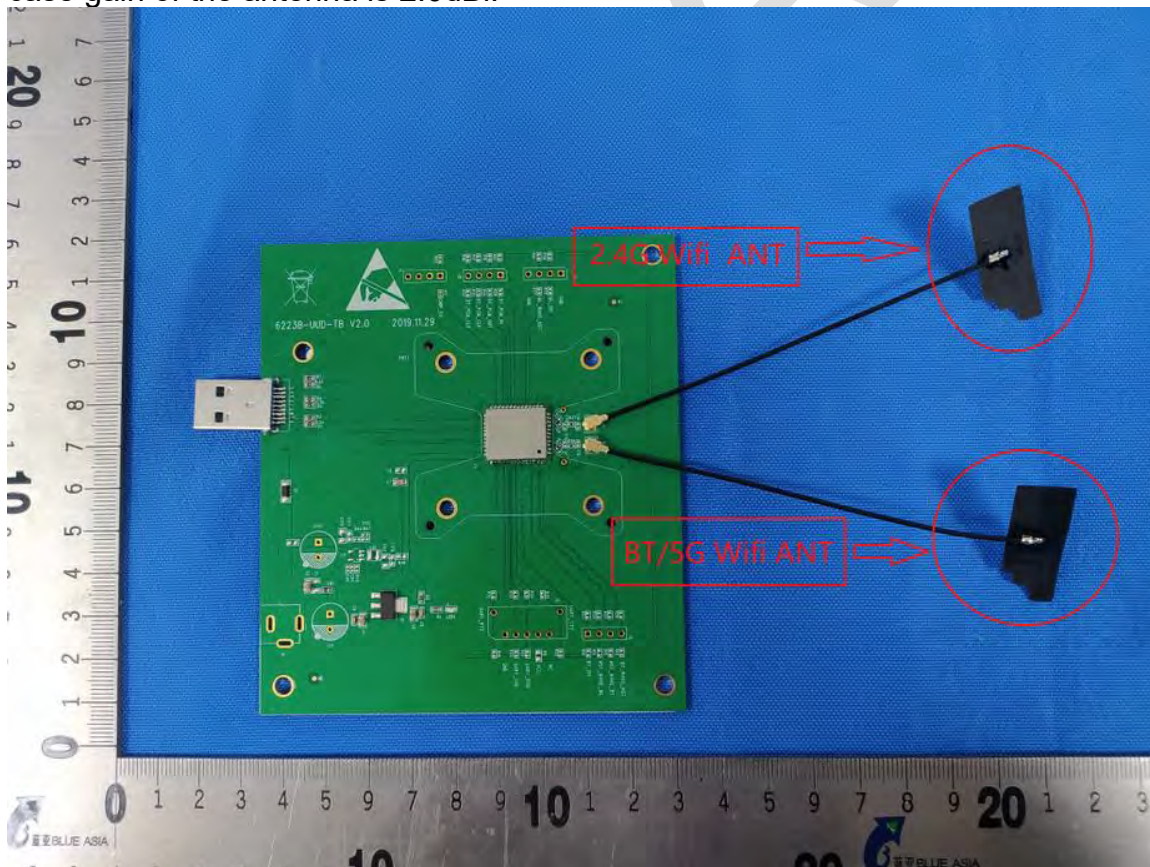
4.1 CONCLUSIONB

Standard 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 antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.0dBi.



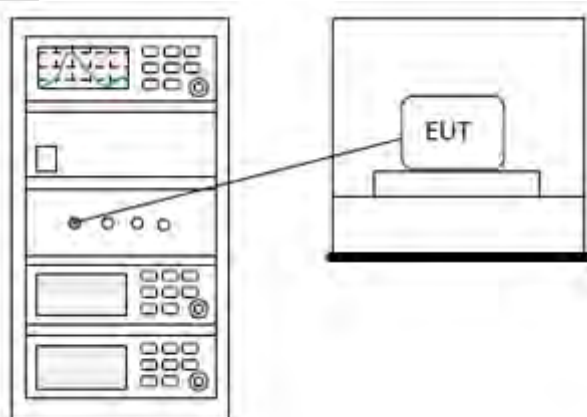
5 CONDUCTED SPURIOUS EMISSIONS

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11
Test Mode (Pre-Scan)	Transmitting mode
Test Mode (Final Test)	Transmitting mode
Tester	Eason
Temperature	22°C
Humidity	50%

5.1 LIMITS

Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
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5.2 BLOCK DIAGRAM OF TEST SETUP



5.3 TEST DATA

Pass: Please Refer To Appendix: For Details

BlueAsia

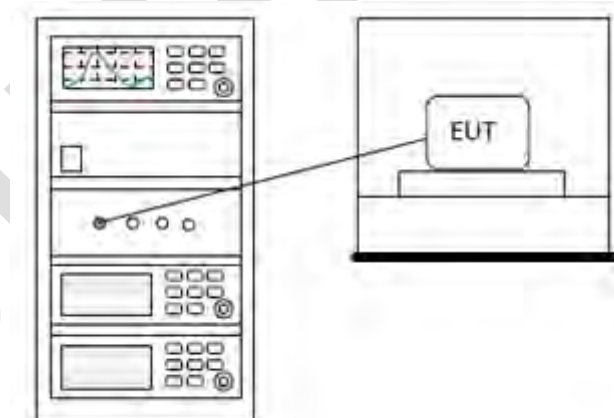
6 HOPPING CHANNEL NUMBER

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.3
Test Mode (Pre-Scan)	Transmitting mode
Test Mode (Final Test)	Transmitting mode
Tester	Eason
Temperature	22℃
Humidity	50%

6.1 LIMITS

Frequency range(MHz)	Number of hopping channels (minimum)
902-928	50 for 20dB bandwidth <250kHz
	25 for 20dB bandwidth ≥250kHz
2400-2483.5	15
5725-5850	75

6.2 BLOCK DIAGRAM OF TEST SETUP



6.3 TEST DATA

Pass: Please Refer To Appendix: For Details

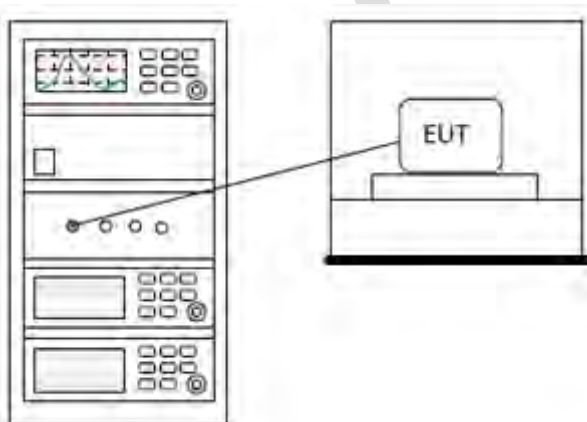
7 CARRIER FREQUENCIES SEPARATION

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.2
Test Mode (Pre-Scan)	Transmitting mode
Test Mode (Final Test)	Transmitting mode
Tester	Eason
Temperature	22°C
Humidity	50%

7.1 LIMITS

Limit:	2/3 of the 20dB bandwidth base on the transmission power is less than 0.125W
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7.2 BLOCK DIAGRAM OF TEST SETUP



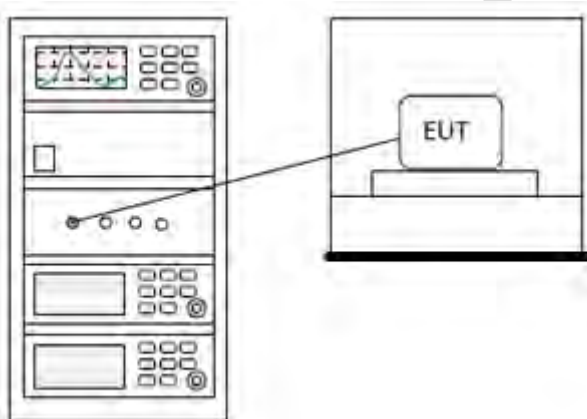
7.3 TEST DATA

Pass: Please Refer To Appendix: For Details

8 20DB BANDWIDTH

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.7
Test Mode (Pre-Scan)	Transmitting mode
Test Mode (Final Test)	Transmitting mode
Tester	Eason
Temperature	22℃
Humidity	50%

8.1 BLOCK DIAGRAM OF TEST SETUP



8.2 TEST DATA

Pass: Please Refer To Appendix: For Details

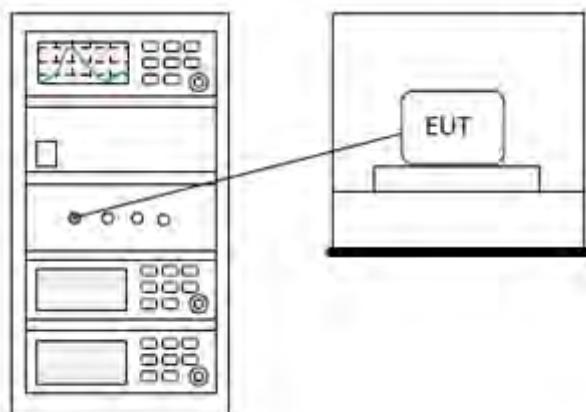
9 CONDUCTED PEAK OUTPUT POWER

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.5
Test Mode (Pre-Scan)	Transmitting mode
Test Mode (Final Test)	Transmitting mode
Tester	Eason
Temperature	22℃
Humidity	50%

9.1 LIMITS

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥ 50 hopping channels
	0.25 for $25 \leq \text{hopping channels} < 50$
	1 for digital modulation
2400-2483.5	1 for ≥ 75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

9.2 BLOCK DIAGRAM OF TEST SETUP



9.3 TEST DATA

Pass: Please Refer To Appendix: For Details

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10 CONDUCTED EMISSIONS AT AC POWER LINE (150KHZ-30MHZ)

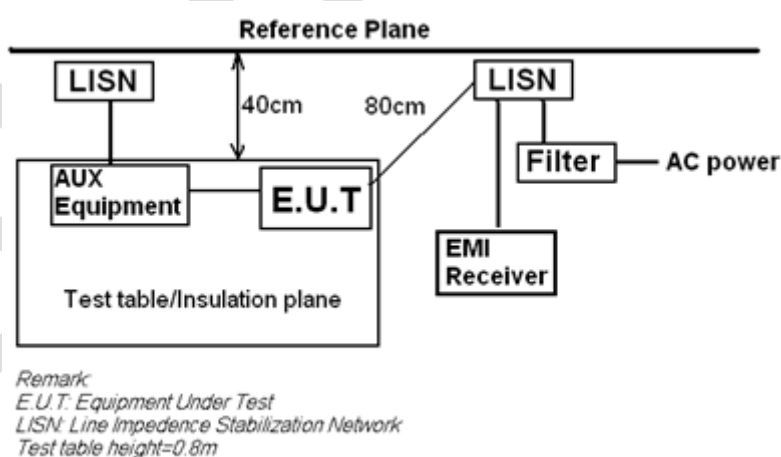
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.2
Test Mode (Pre-Scan)	Transmitting mode
Test Mode (Final Test)	Transmitting mode
Tester	Eason
Temperature	22℃
Humidity	50%

10.1 LIMITS

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
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.

10.2 BLOCK DIAGRAM OF TEST SETUP



10.3 PROCEDURE

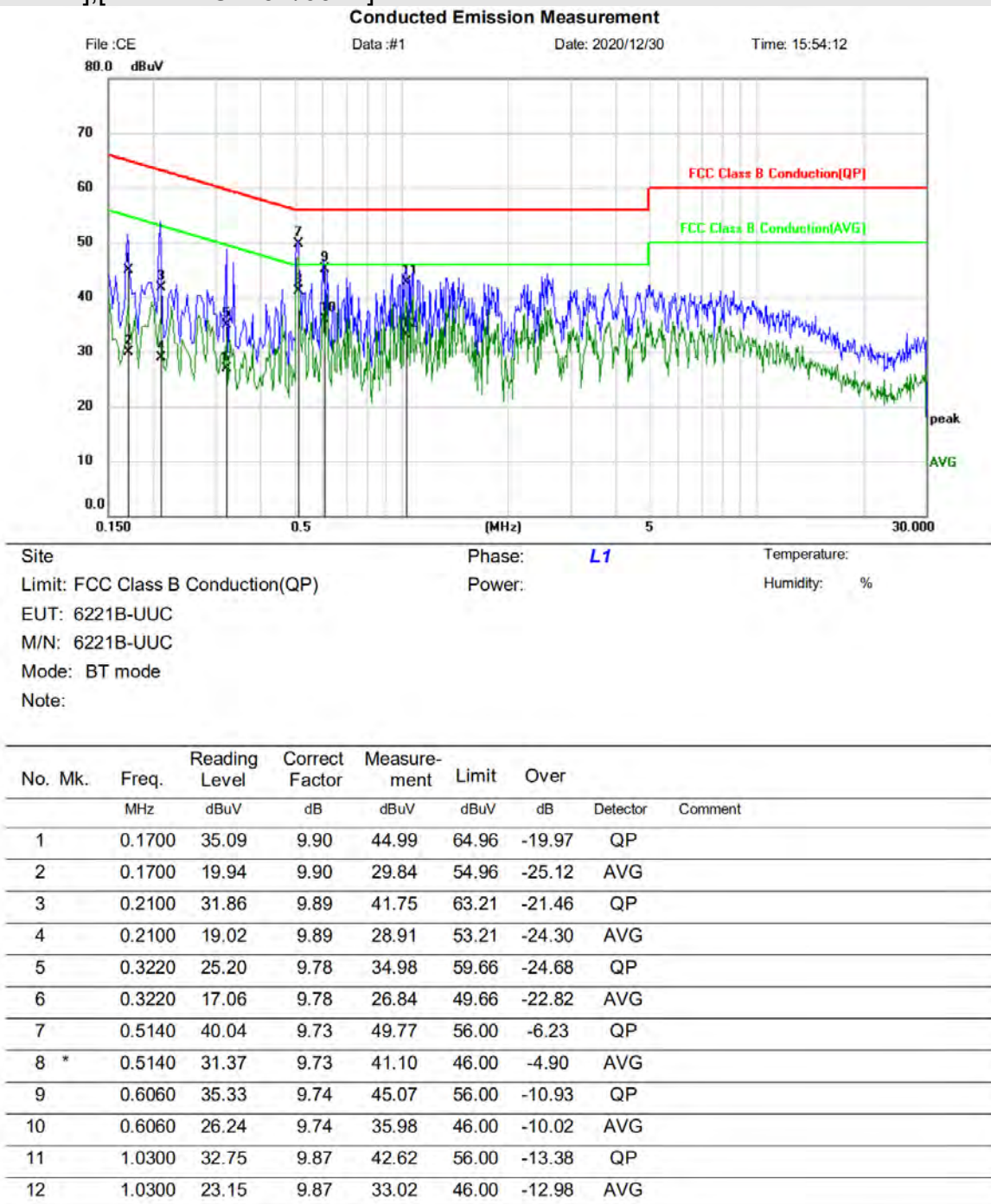
- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: $LISN = Read\ Level + Cable\ Loss + LISN\ Factor$

10.4 TEST DATA

[Line: Line];[Power:AC120V/60Hz]



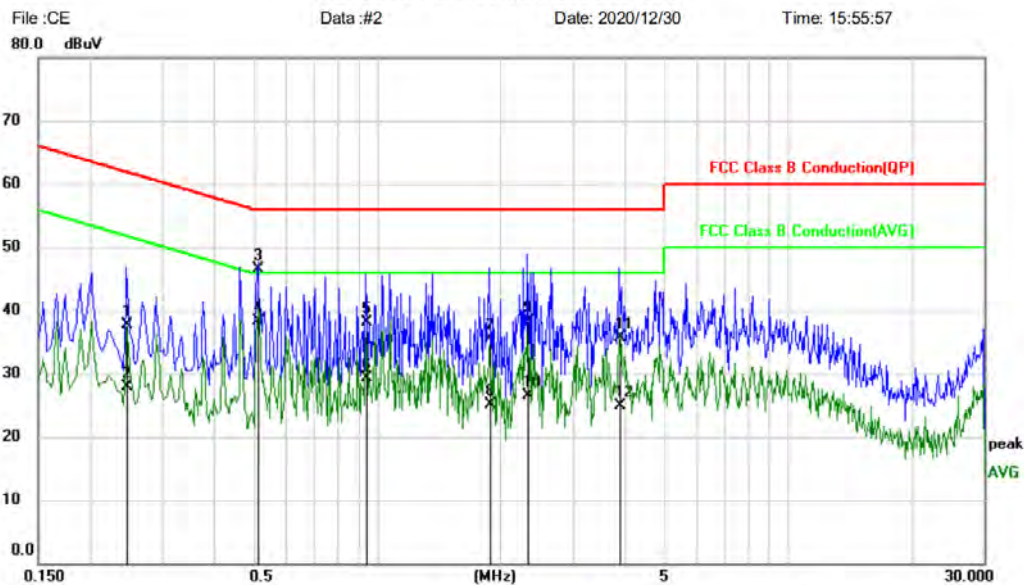
*:Maximum data x:Over limit !:over margin

(Reference Only)

Test Result: Pass

[Line: Neutral]; [Power: AC120V/60Hz]

Conducted Emission Measurement



Site: Limit: FCC Class B Conduction(QP) Phase: **N** Temperature:
EUT: 6221B-UUC Power: Humidity: %
M/N: 6221B-UUC
Mode: BT mode
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2460	27.89	9.84	37.73	61.89	-24.16	QP	
2		0.2460	17.97	9.84	27.81	51.89	-24.08	AVG	
3		0.5140	36.69	9.72	46.41	56.00	-9.59	QP	
4	*	0.5140	28.50	9.72	38.22	46.00	-7.78	AVG	
5		0.9420	28.44	9.76	38.20	56.00	-17.80	QP	
6		0.9420	19.49	9.76	29.25	46.00	-16.75	AVG	
7		1.8860	25.60	9.85	35.45	56.00	-20.55	QP	
8		1.8860	15.28	9.85	25.13	46.00	-20.87	AVG	
9		2.3300	28.44	9.86	38.30	56.00	-17.70	QP	
10		2.3300	16.56	9.86	26.42	46.00	-19.58	AVG	
11		3.8980	25.79	9.83	35.62	56.00	-20.38	QP	
12		3.8980	15.15	9.83	24.98	46.00	-21.02	AVG	

*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

11 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS

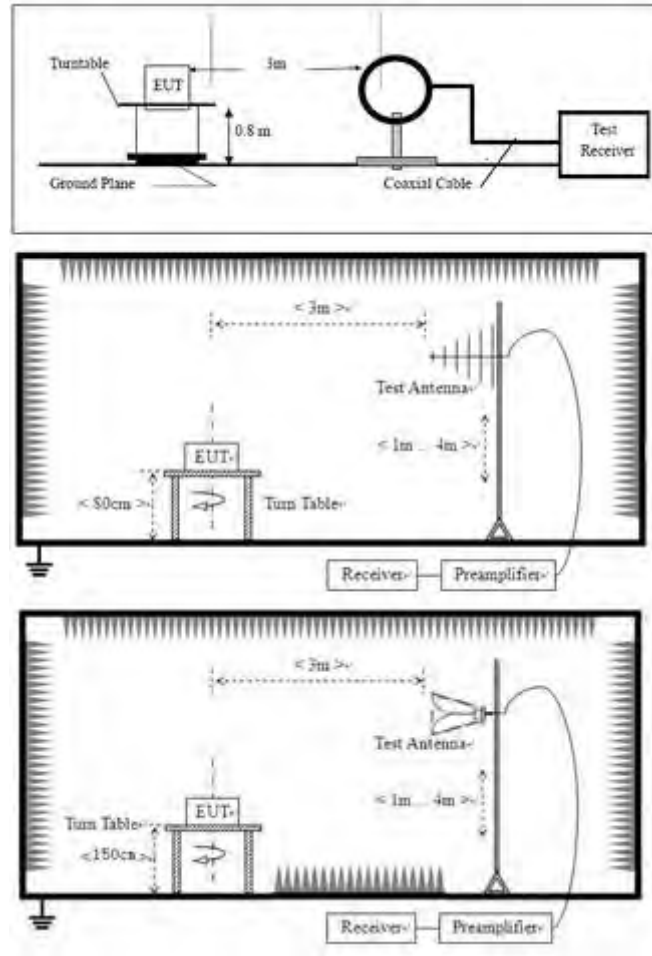
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.10.5
Test Mode (Pre-Scan)	TX Low channel;TX high channel
Test Mode (Final Test)	TX Low channel;TX high channel
Tester	Ben
Temperature	22℃
Humidity	50%

11.1 LIMITS

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

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

11.2 BLOCK DIAGRAM OF TEST SETUP



11.3 PROCEDURE

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height 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.
- 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

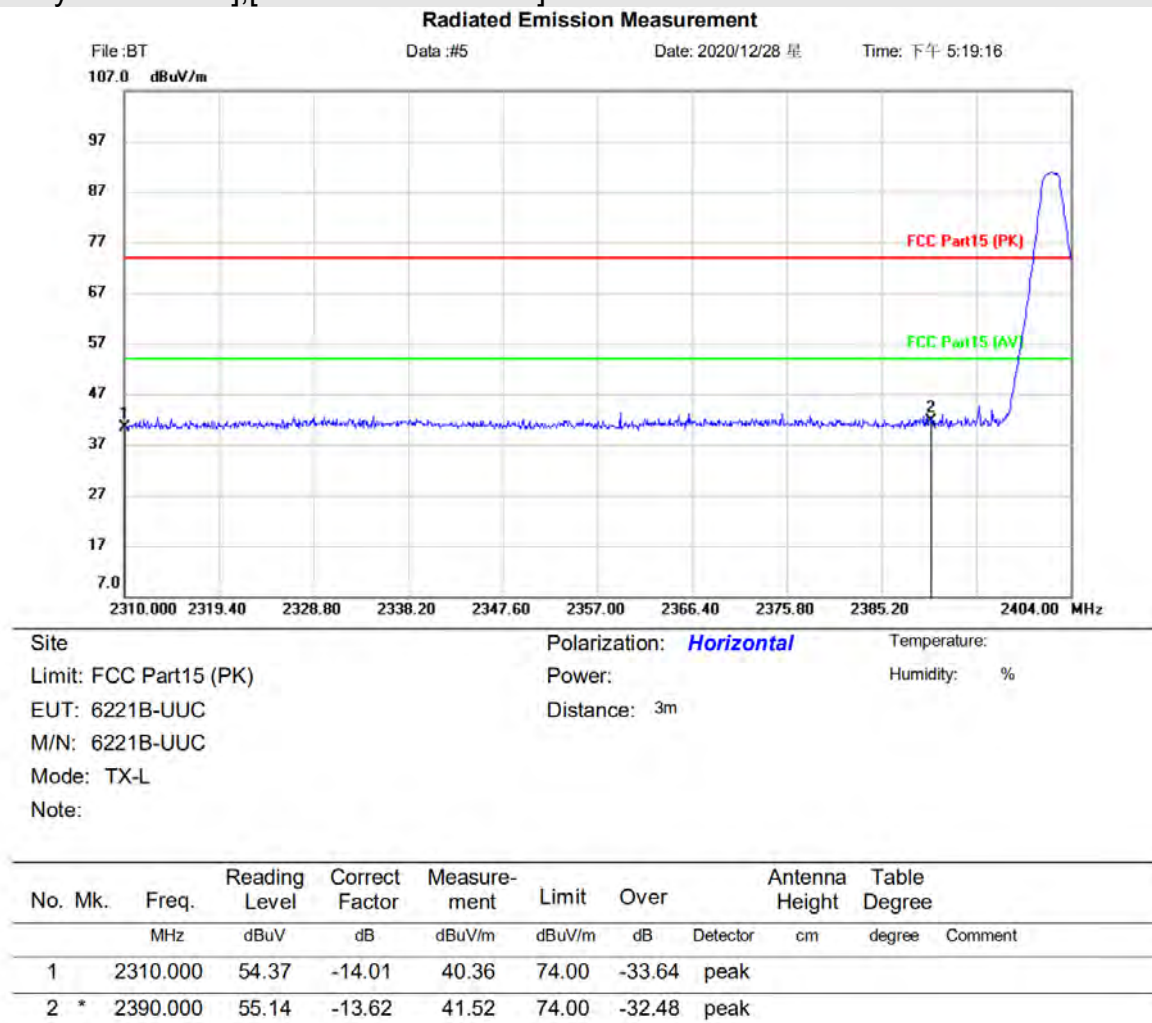
Remark 1: $\text{Level} = \text{Read Level} + \text{Cable Loss} + \text{Antenna Factor} - \text{Preamp Factor}$

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

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11.4 TEST DATA

[Polarity: Horizontal];[Test channel:lowest]

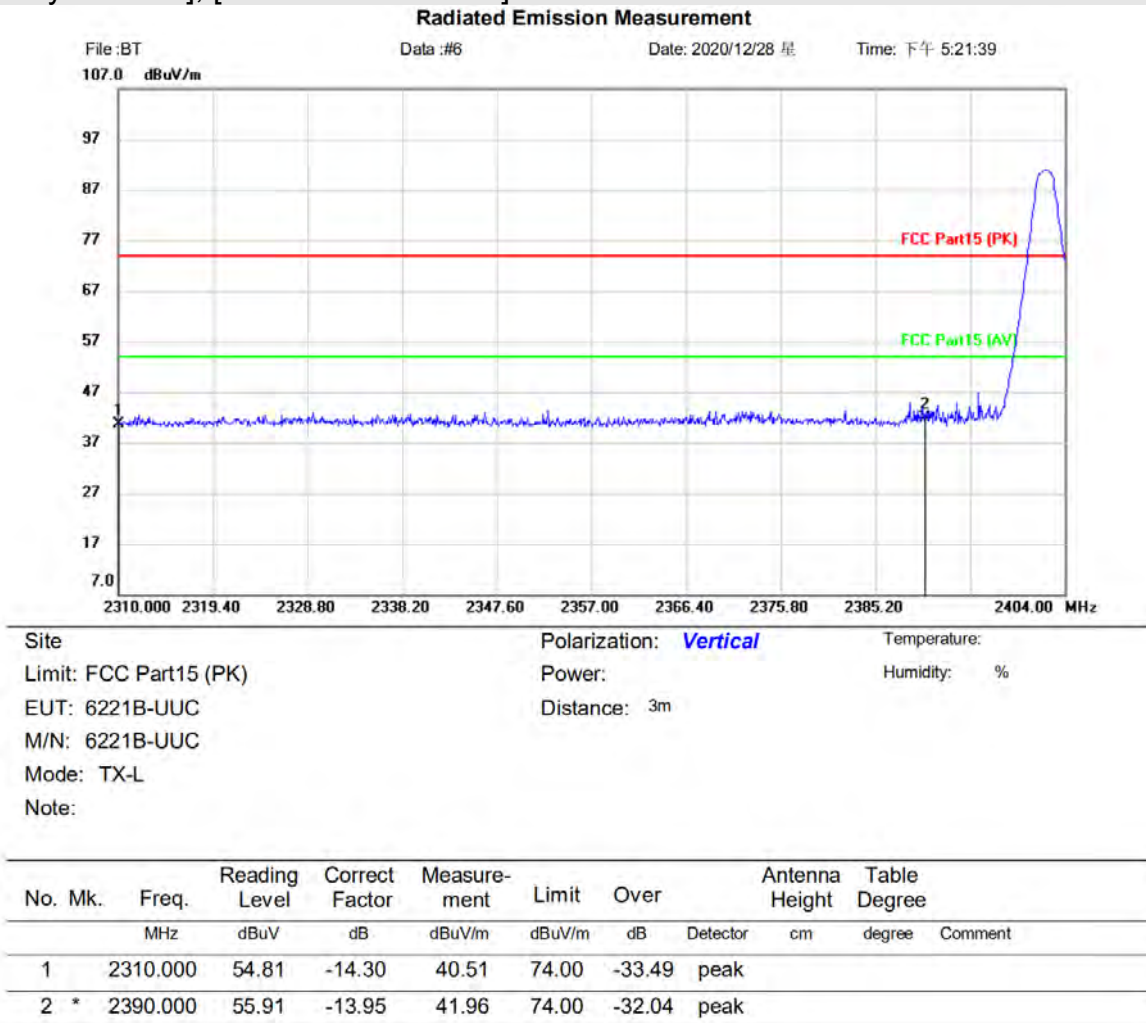


*:Maximum data x:Over limit !:over margin

⟨Reference Only

Test Result: Pass

[Polarity: Vertical]; [Test channel:lowest]

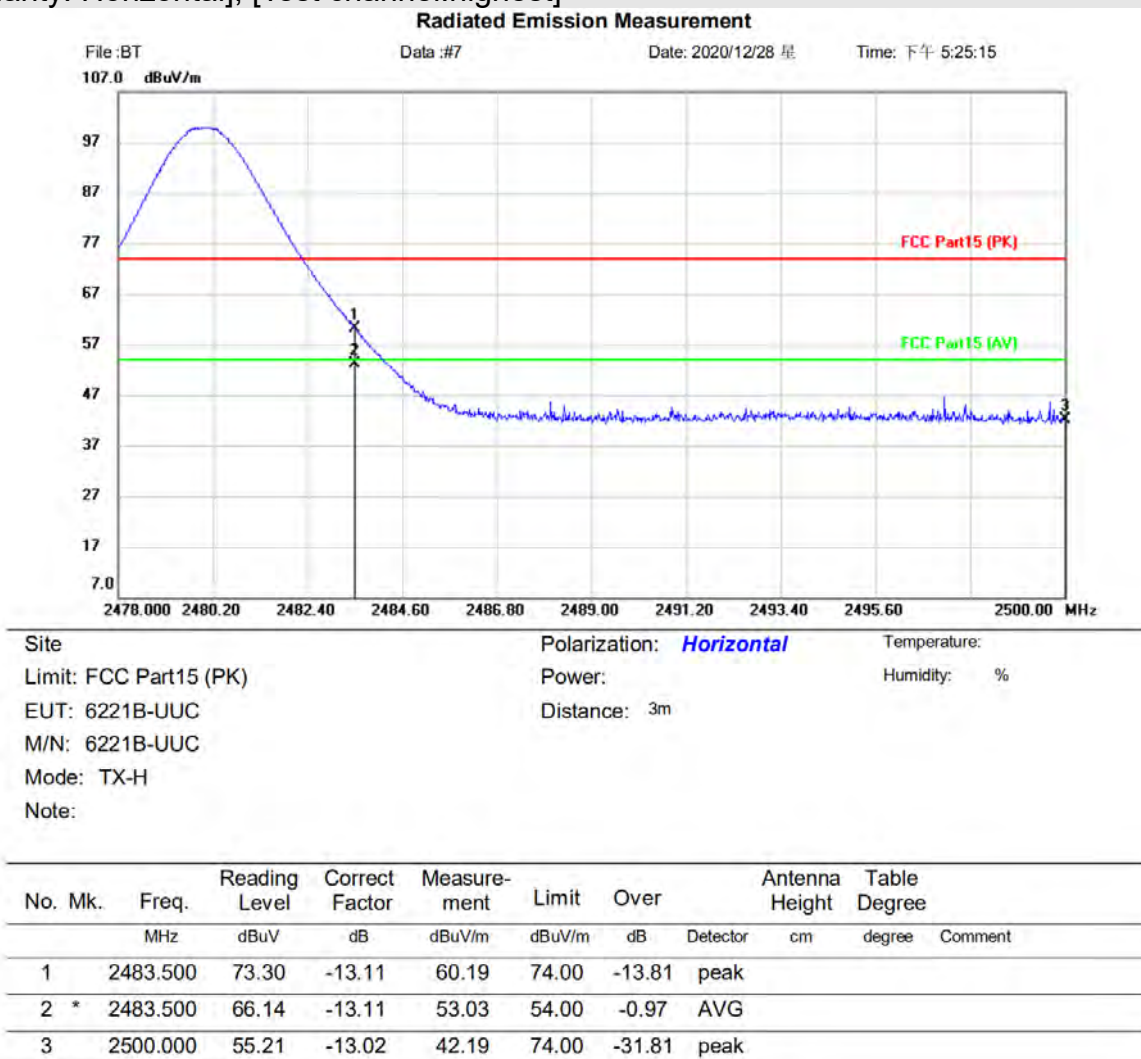


*:Maximum data x:Over limit !:over margin

⟨Reference Only

Test Result: Pass

[Polarity: Horizontal]; [Test channel: highest]



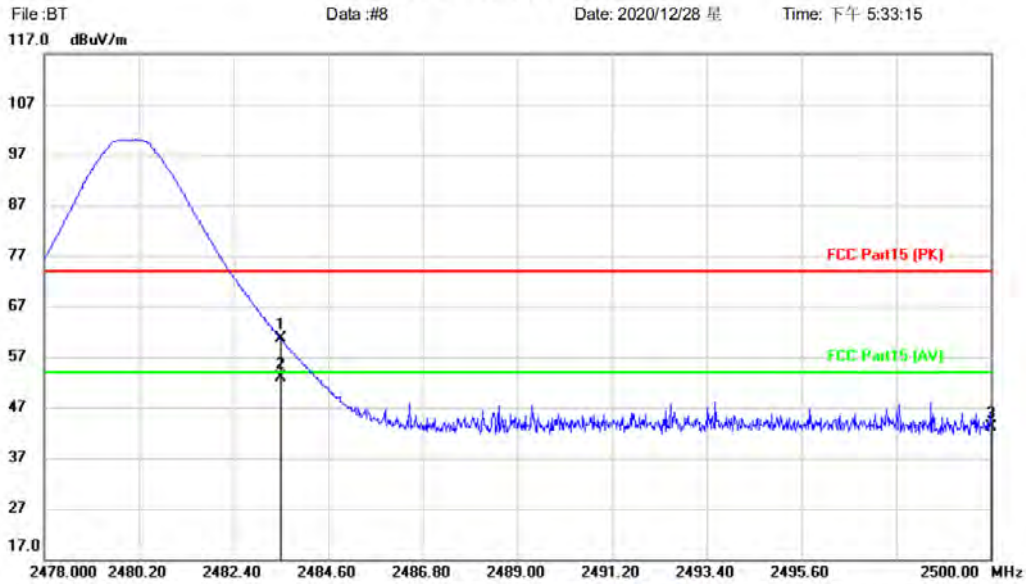
*:Maximum data x:Over limit !:over margin

⟨Reference Only

Test Result: Pass

[Polarity: Vertical]; [Test channel: highest]

Radiated Emission Measurement



Site Limit: FCC Part15 (PK) Polarization: **Vertical** Temperature:
EUT: 6221B-UUC Power: Humidity: %
M/N: 6221B-UUC Distance: 3m
Mode: TX-H
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		2483.500	74.08	-13.50	60.58	74.00	-13.42	peak		
2	*	2483.500	66.42	-13.50	52.92	54.00	-1.08	AVG		
3		2500.000	56.58	-13.42	43.16	74.00	-30.84	peak		

*:Maximum data x:Over limit !:over margin

<Reference Only

Test Result: Pass

10 APPENDIX

10.1 APPENDIX A: 20DB EMISSION BANDWIDTH

Test Result

TestMode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH1	Ant1	2402	1.089	2401.448	2402.537	---	PASS
		2441	1.089	2440.448	2441.537	---	PASS
		2480	1.095	2479.445	2480.540	---	PASS
2DH1	Ant1	2402	1.311	2401.331	2402.642	---	PASS
		2441	1.314	2440.328	2441.642	---	PASS
		2480	1.323	2479.325	2480.648	---	PASS
3DH1	Ant1	2402	1.302	2401.343	2402.645	---	PASS
		2441	1.299	2440.346	2441.645	---	PASS
		2480	1.305	2479.343	2480.648	---	PASS

Test Graphs

DH1 Ant1 2402



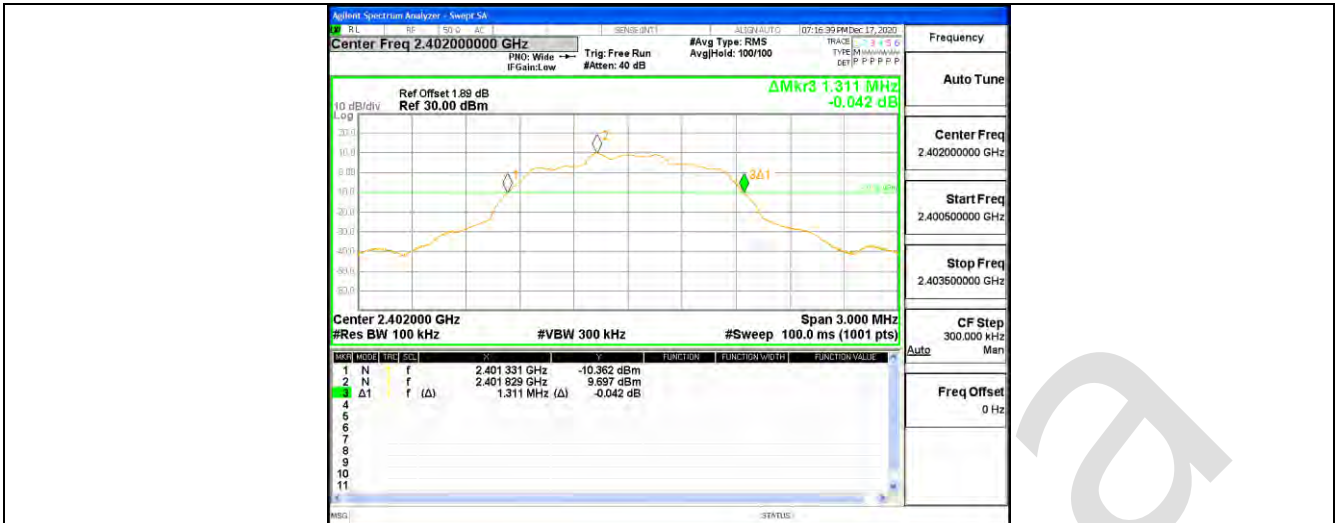
DH1 Ant1 2441



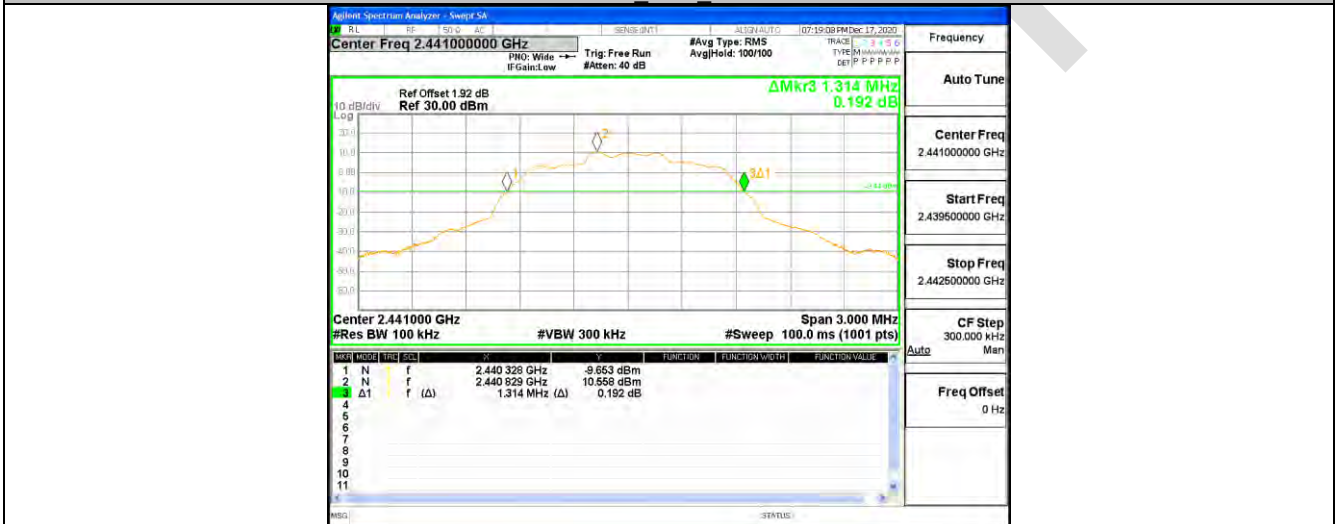
DH1 Ant1 2480



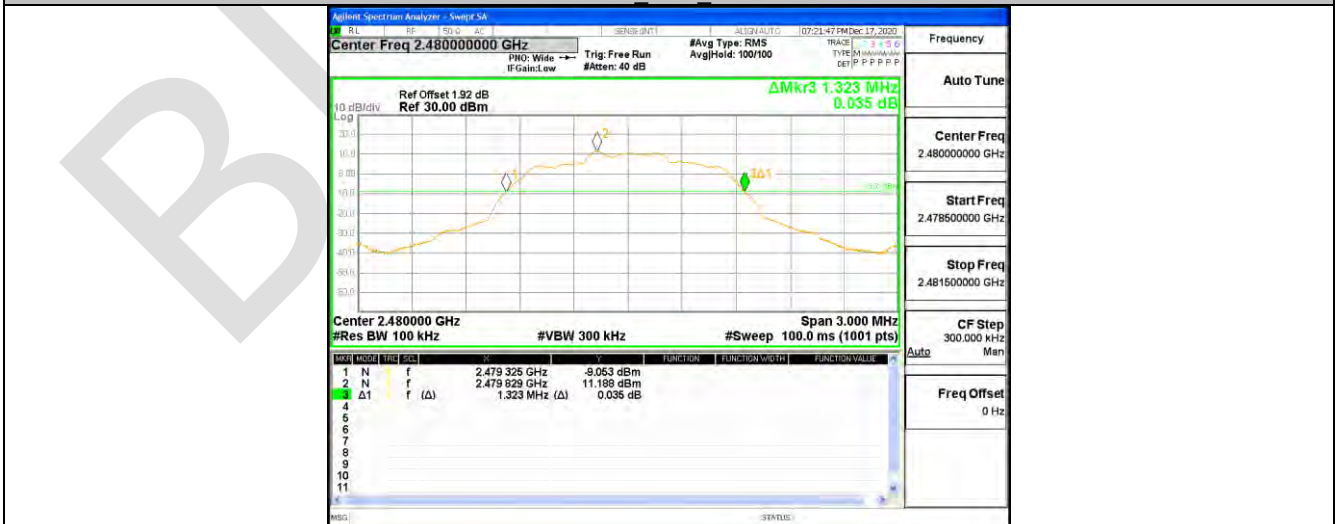
2DH1 Ant1 2402



2DH1 Ant1 2441



2DH1 Ant1 2480



3DH1 Ant1 2402



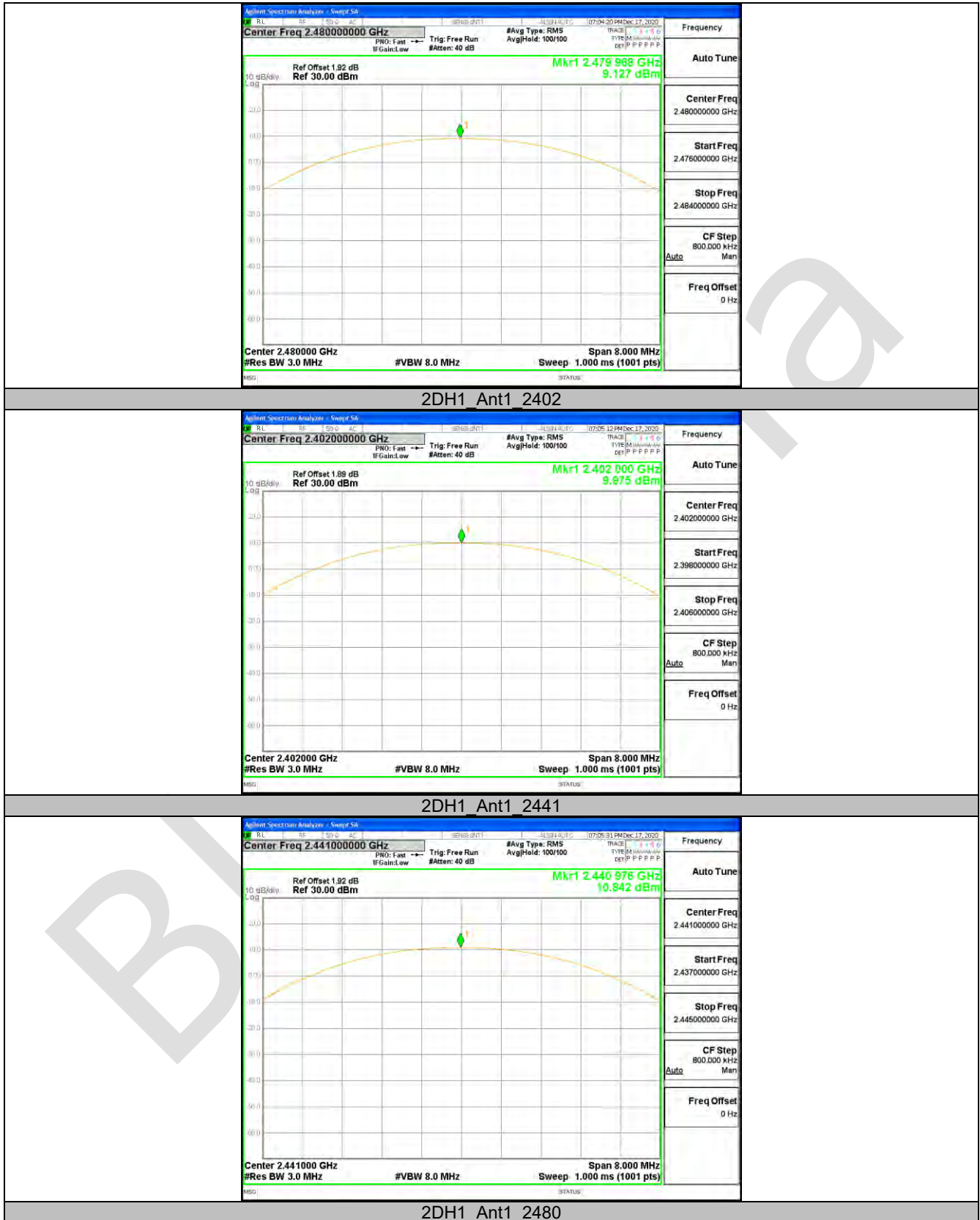
10.2 APPENDIX C: MAXIMUM CONDUCTED OUTPUT POWER

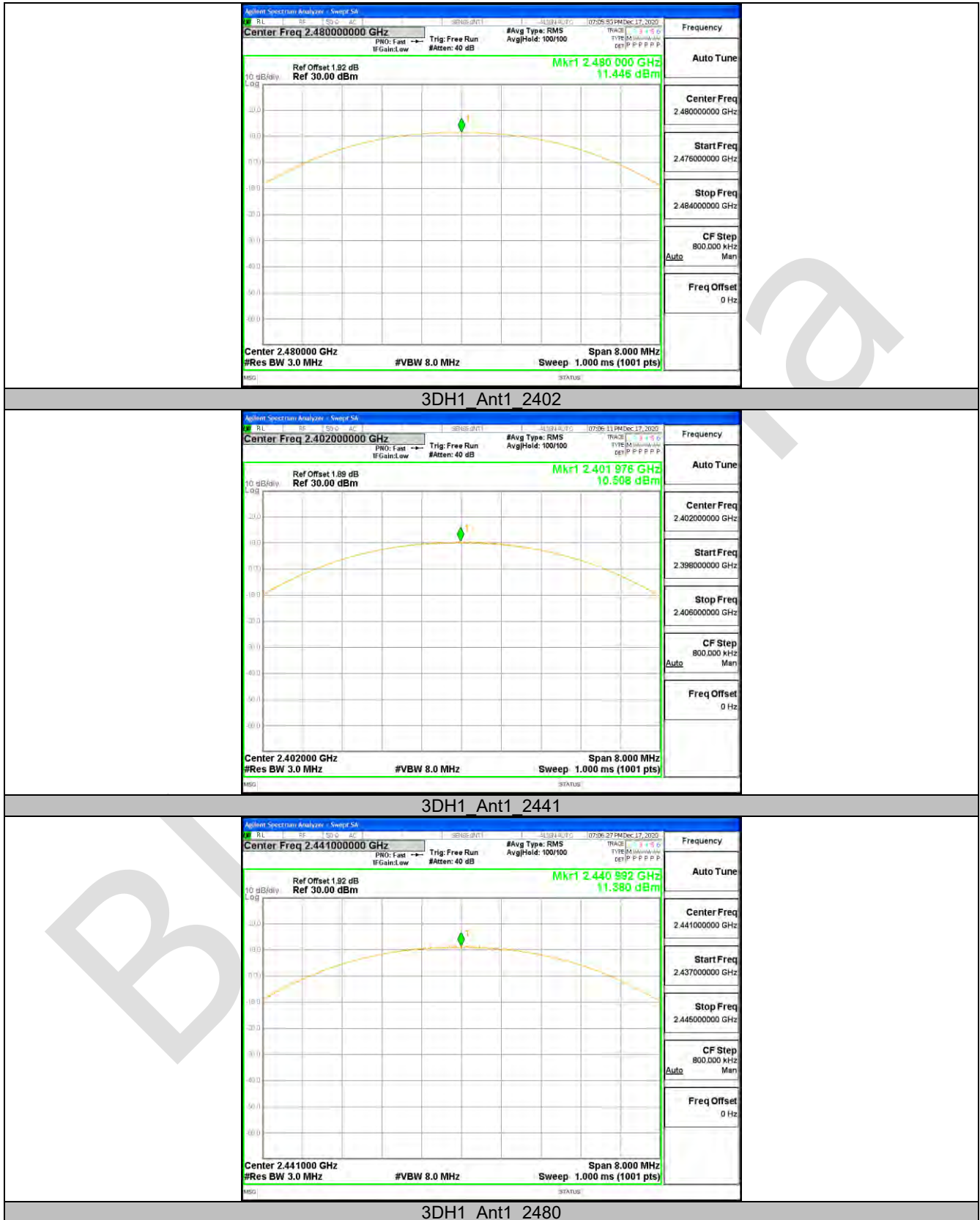
Test Result

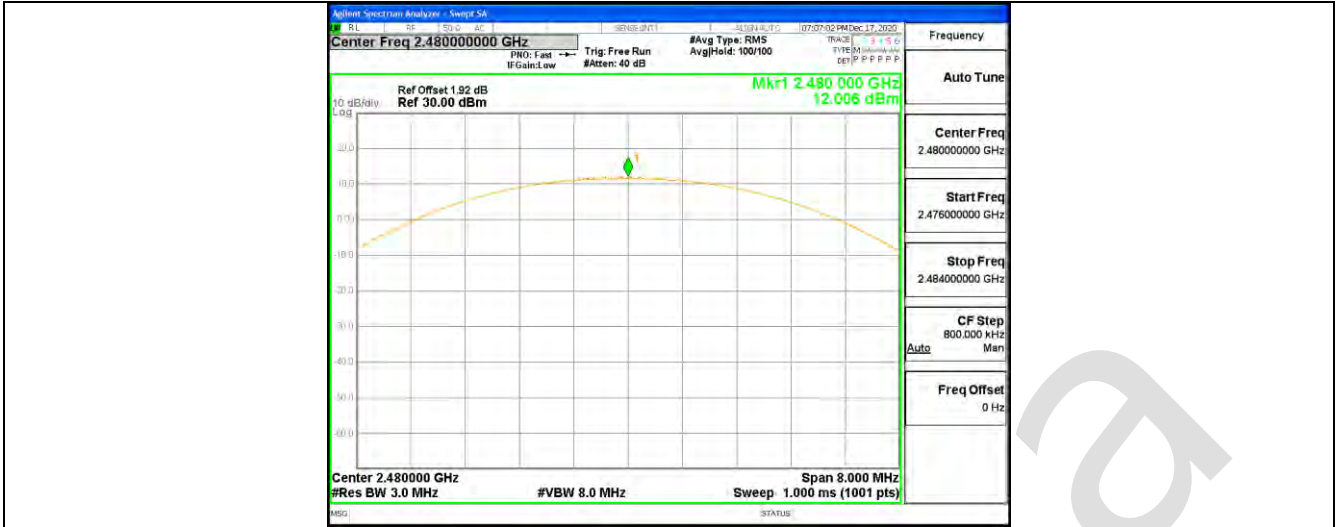
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH1	Ant1	2402	8.35	<=30	PASS
		2441	8.77	<=30	PASS
		2480	9.13	<=30	PASS
2DH1	Ant1	2402	9.98	<=30	PASS
		2441	10.84	<=30	PASS
		2480	11.45	<=30	PASS
3DH1	Ant1	2402	10.51	<=30	PASS
		2441	11.38	<=30	PASS
		2480	12.01	<=30	PASS

Test Graphs







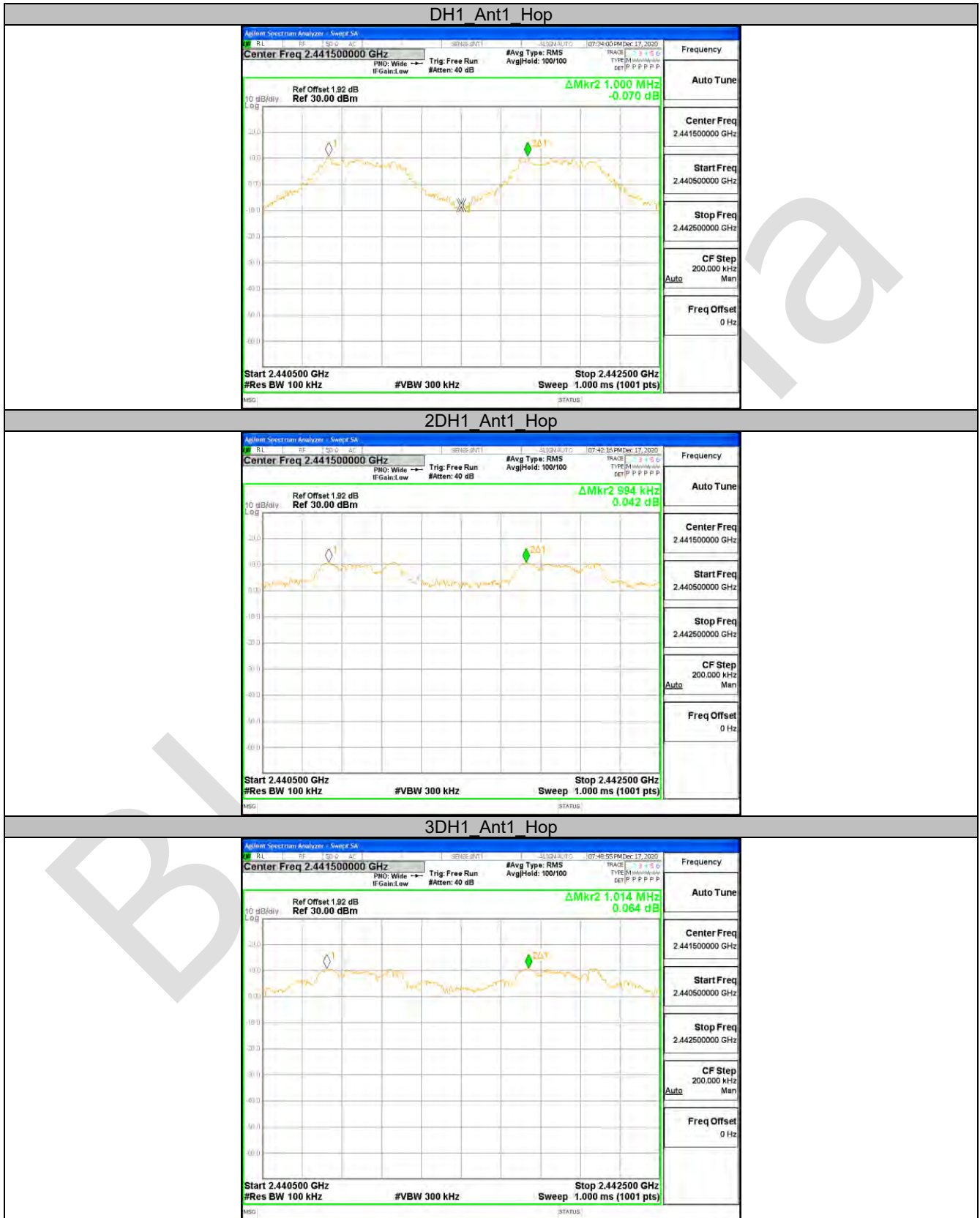


10.3 APPENDIX D: CARRIER FREQUENCY SEPARATION

Test Result

TestMode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH1	Ant1	Hop	1	≥ 0.730	PASS
2DH1	Ant1	Hop	0.994	≥ 0.882	PASS
3DH1	Ant1	Hop	1.014	≥ 0.870	PASS

Test Graphs

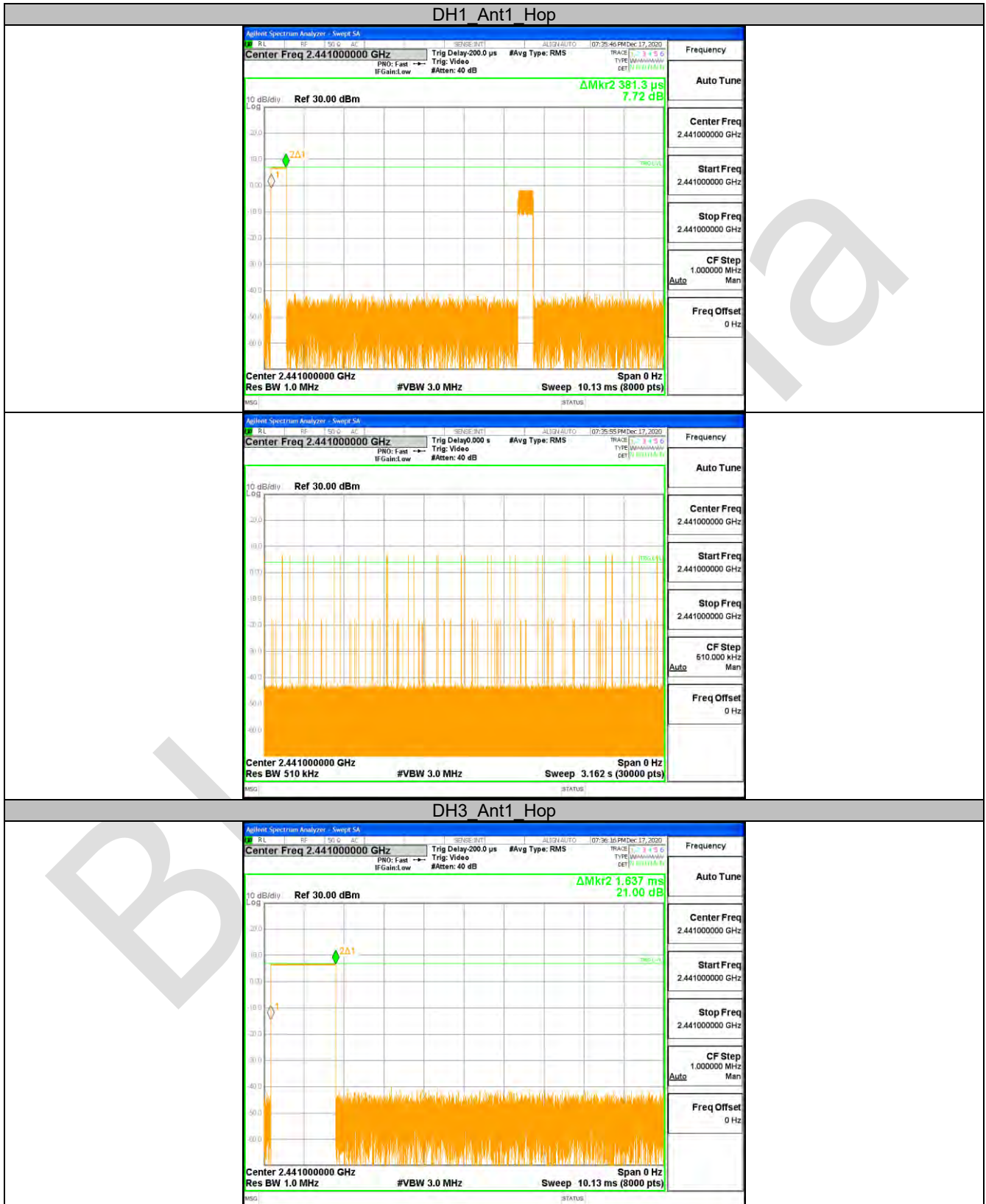


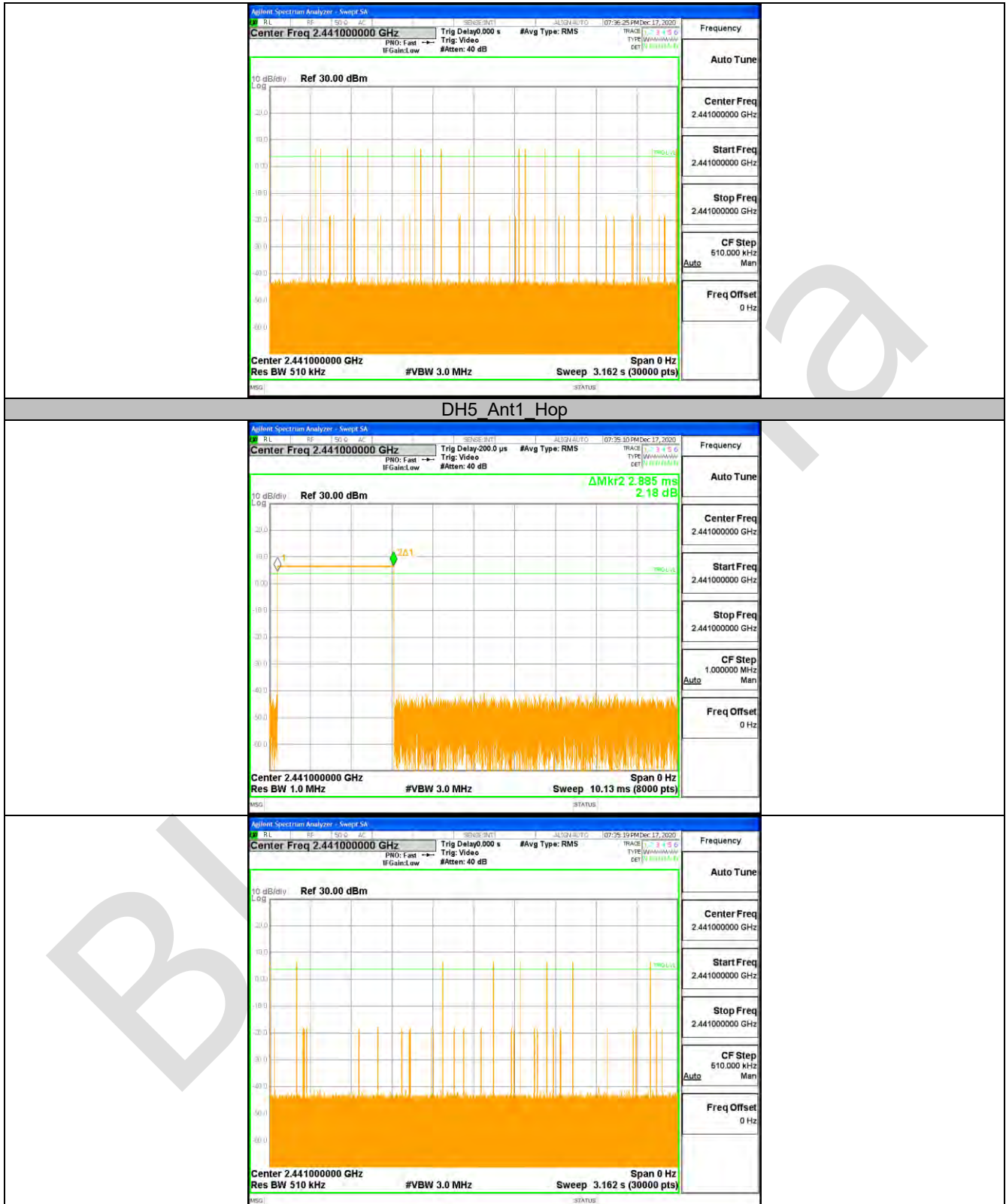
10.4 APPENDIX E: TIME OF OCCUPANCY

Test Result

TestMode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.38	330	0.126	≤ 0.4	PASS
DH3	Ant1	Hop	1.64	160	0.262	≤ 0.4	PASS
DH5	Ant1	Hop	2.89	80	0.231	≤ 0.4	PASS

Test Graphs





10.5 APPENDIX F: NUMBER OF HOPPING CHANNELS**Test Result**

TestMode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH1	Ant1	Hop	79	≥ 15	PASS
2DH1	Ant1	Hop	79	≥ 15	PASS
3DH1	Ant1	Hop	79	≥ 15	PASS

Test Graphs



10.6 APPENDIX G: BAND EDGE MEASUREMENTS

Test Result

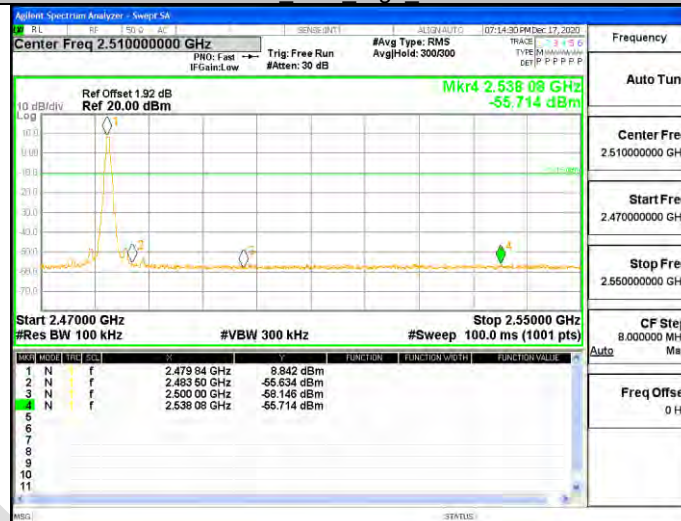
TestMode	Antenna	ChName	Channel	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH1	Ant1	Low	2402	8.01	-56.17	<=-12	PASS
		High	2480	8.84	-55.71	<=-11.16	PASS
		Low	Hop_2402	7.11	-55.75	-12.89	PASS
		High	Hop_2480	9.08	-54.48	-10.92	PASS
2DH1	Ant1	Low	2402	9.60	-55.47	<=-10.4	PASS
		High	2480	11.13	-55.42	<=-8.87	PASS
		Low	Hop_2402	9.79	-56.08	-10.21	PASS
		High	Hop_2480	10.72	-55.32	-9.28	PASS
3DH1	Ant1	Low	2402	9.57	-55.72	<=-10.43	PASS
		High	2480	11.09	-55.65	<=-8.91	PASS
		Low	Hop_2402	9.78	-55.83	-10.22	PASS
		High	Hop_2480	11.40	-54.85	-8.6	PASS

Test Graphs

DH1 Ant1 Low 2402



DH1 Ant1 High 2480



DH1 Ant1 Low Hop 2402



DH1 Ant1 High Hop 2480







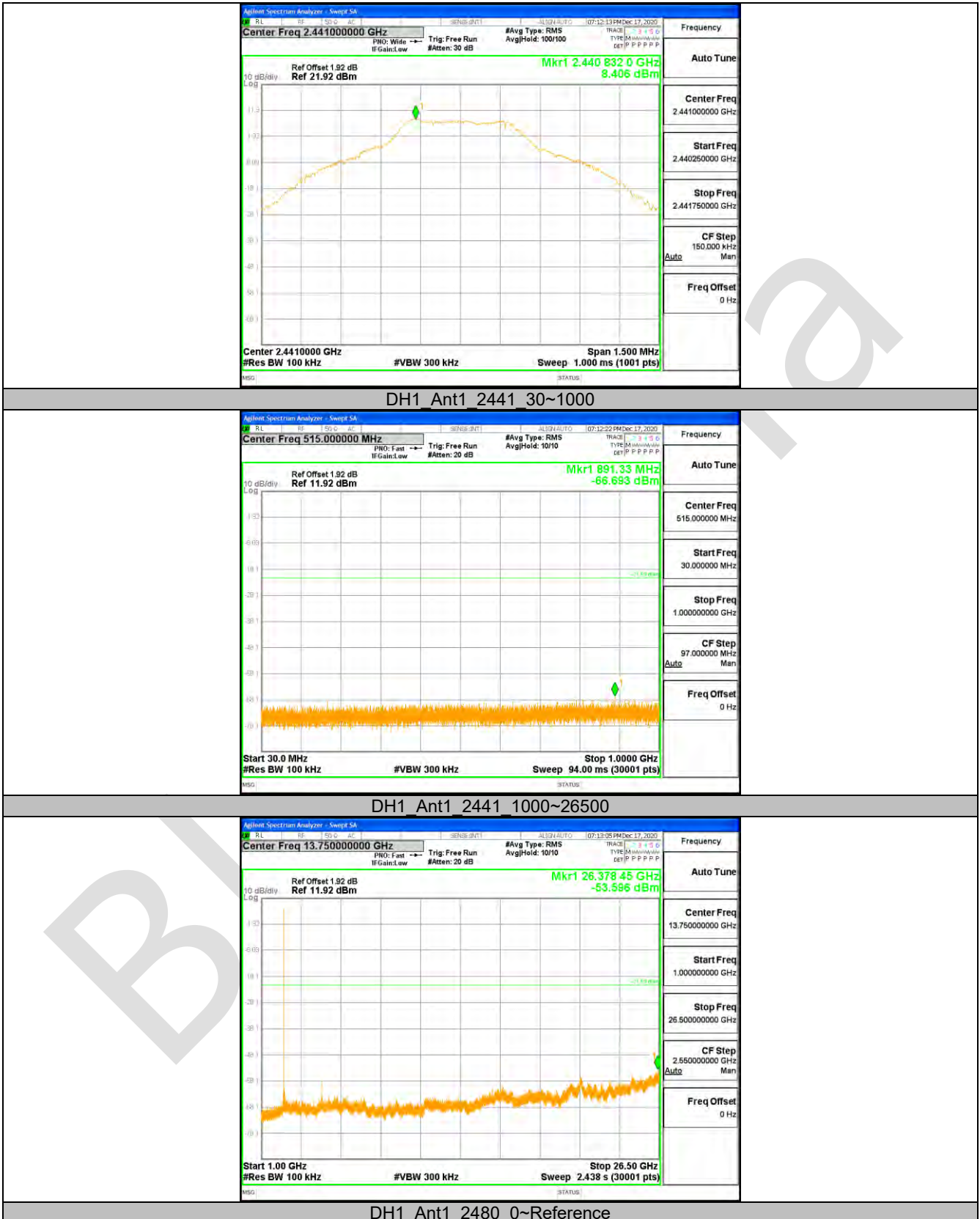
10.7 APPENDIX H: CONDUCTED SPURIOUS EMISSION

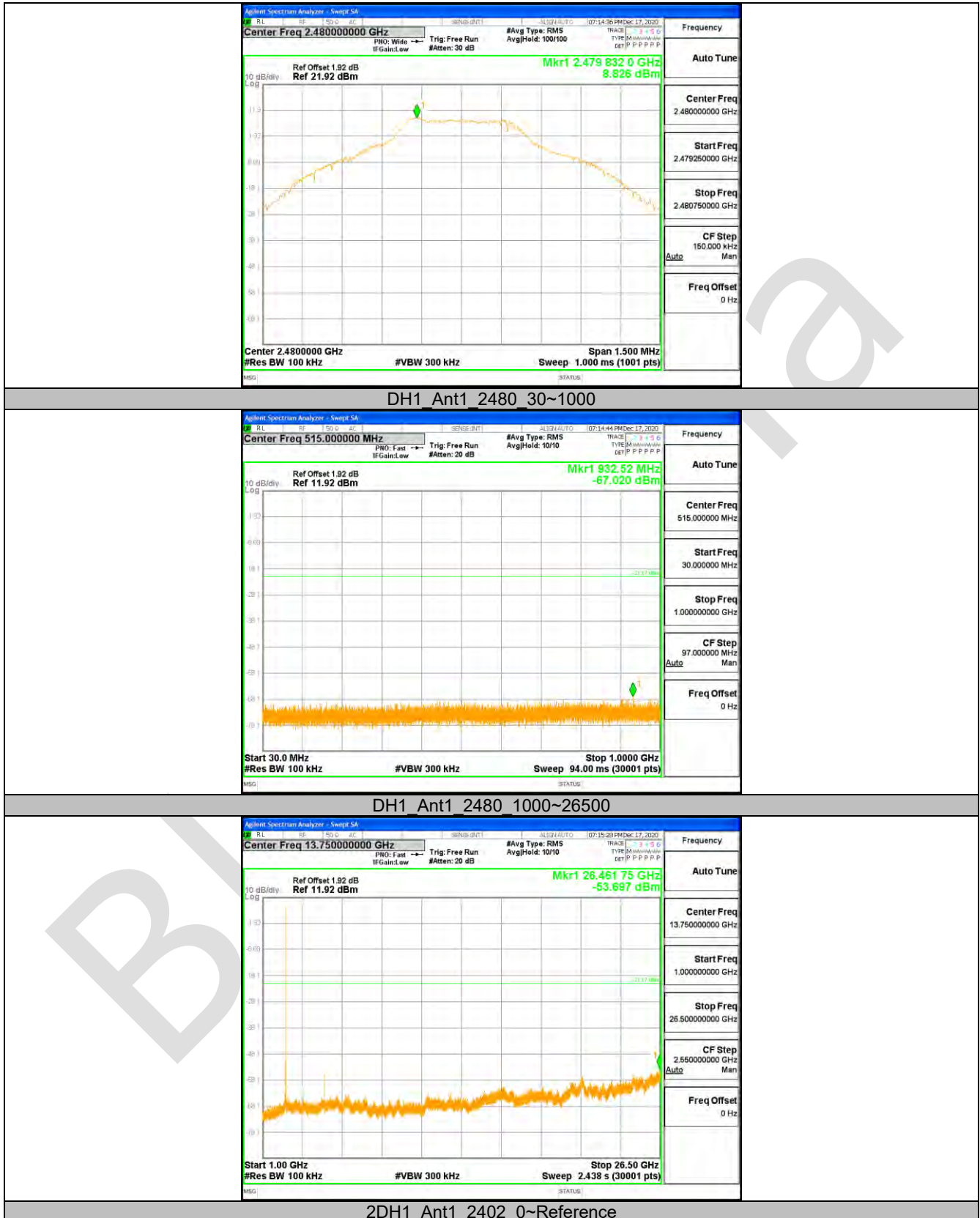
Test Result

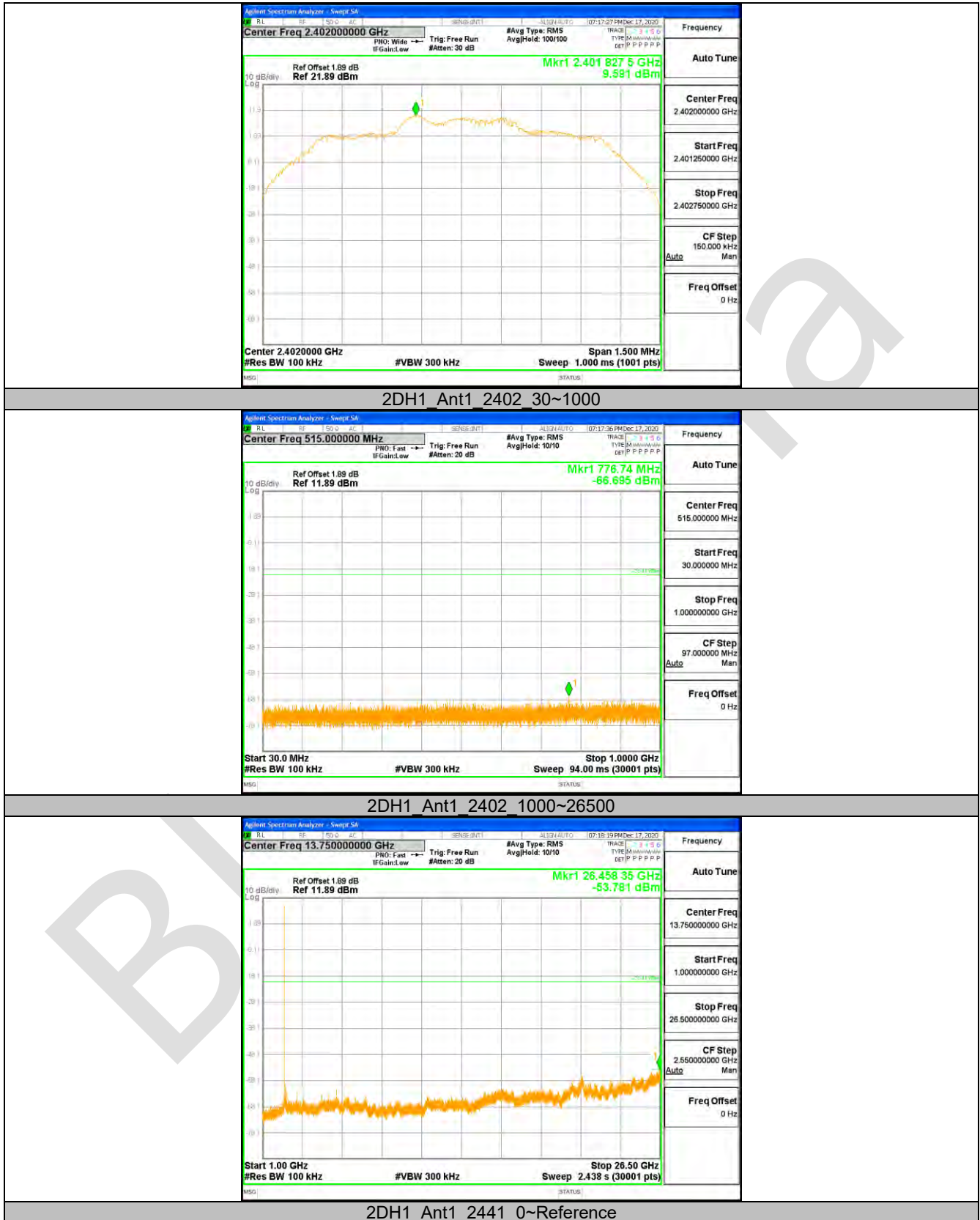
TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH1	Ant1	2402	Reference	8.00	8.00	---	PASS
			30~1000	30~1000	-67.151	<=-22.001	PASS
			1000~26500	1000~26500	-54.785	<=-22.001	PASS
		2441	Reference	8.41	8.41	---	PASS
			30~1000	30~1000	-66.693	<=-21.594	PASS
			1000~26500	1000~26500	-53.596	<=-21.594	PASS
		2480	Reference	8.83	8.83	---	PASS
			30~1000	30~1000	-67.02	<=-21.174	PASS
			1000~26500	1000~26500	-53.697	<=-21.174	PASS
2DH1	Ant1	2402	Reference	9.59	9.59	---	PASS
			30~1000	30~1000	-66.695	<=-20.409	PASS
			1000~26500	1000~26500	-53.781	<=-20.409	PASS
		2441	Reference	10.42	10.42	---	PASS
			30~1000	30~1000	-67.723	<=-19.579	PASS
			1000~26500	1000~26500	-53.615	<=-19.579	PASS
		2480	Reference	11.10	11.10	---	PASS
			30~1000	30~1000	-68.006	<=-18.9	PASS
			1000~26500	1000~26500	-53.902	<=-18.9	PASS
3DH1	Ant1	2402	Reference	9.58	9.58	---	PASS
			30~1000	30~1000	-67.183	<=-20.421	PASS
			1000~26500	1000~26500	-54.523	<=-20.421	PASS
		2441	Reference	10.41	10.41	---	PASS
			30~1000	30~1000	-67.368	<=-19.594	PASS
			1000~26500	1000~26500	-53.659	<=-19.594	PASS
		2480	Reference	11.09	11.09	---	PASS
			30~1000	30~1000	-66.889	<=-18.908	PASS
			1000~26500	1000~26500	-54.156	<=-18.908	PASS

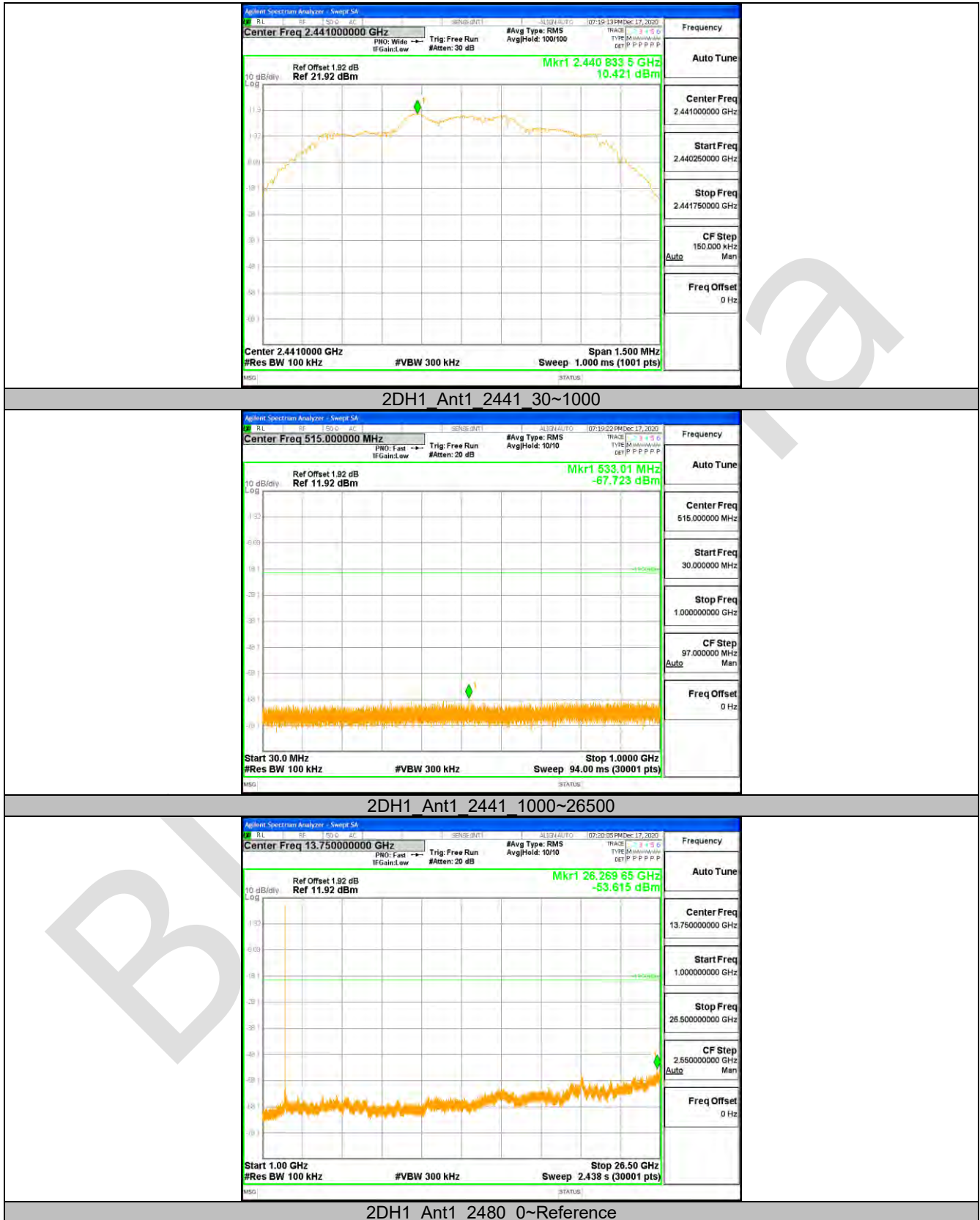
Test Graphs

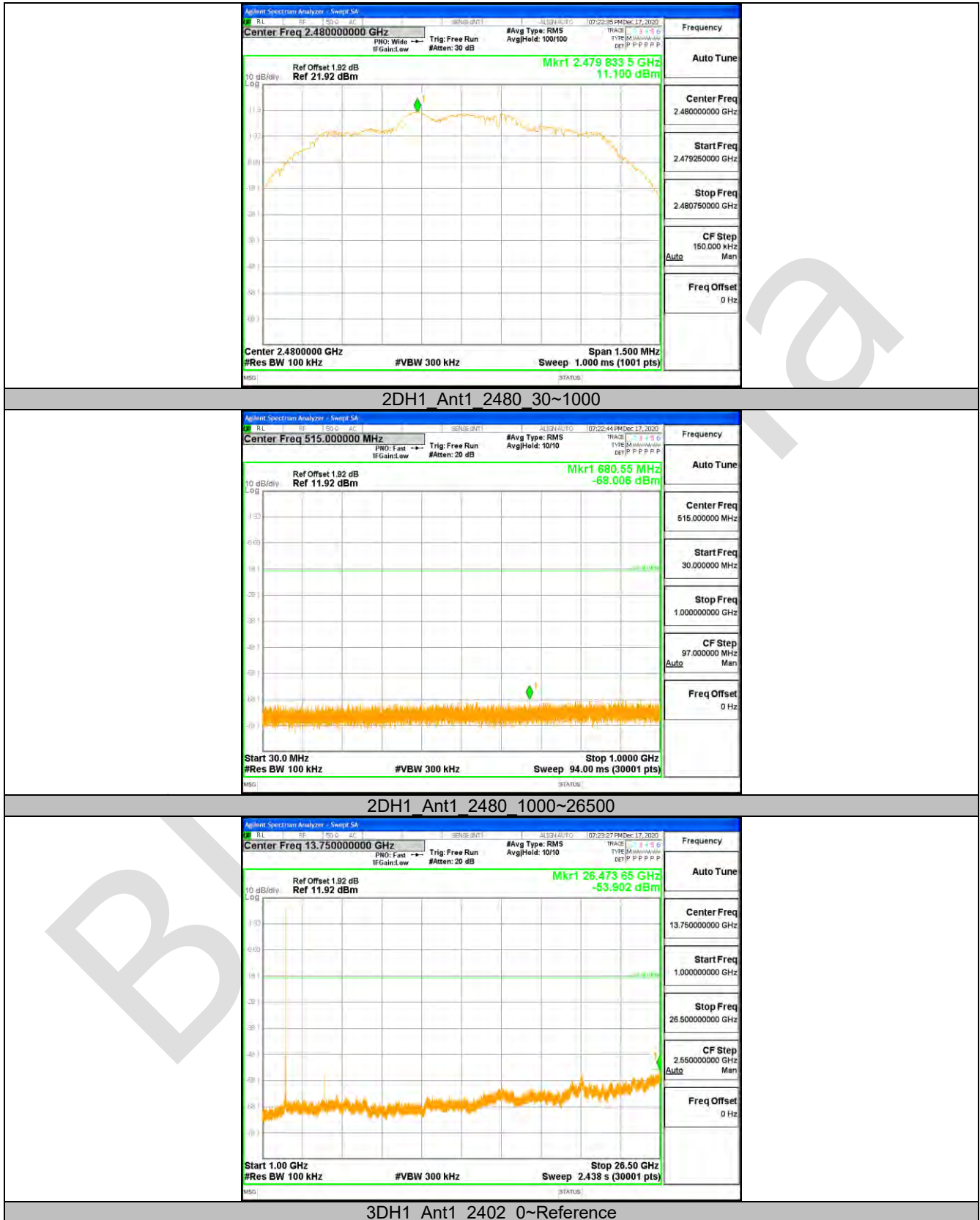


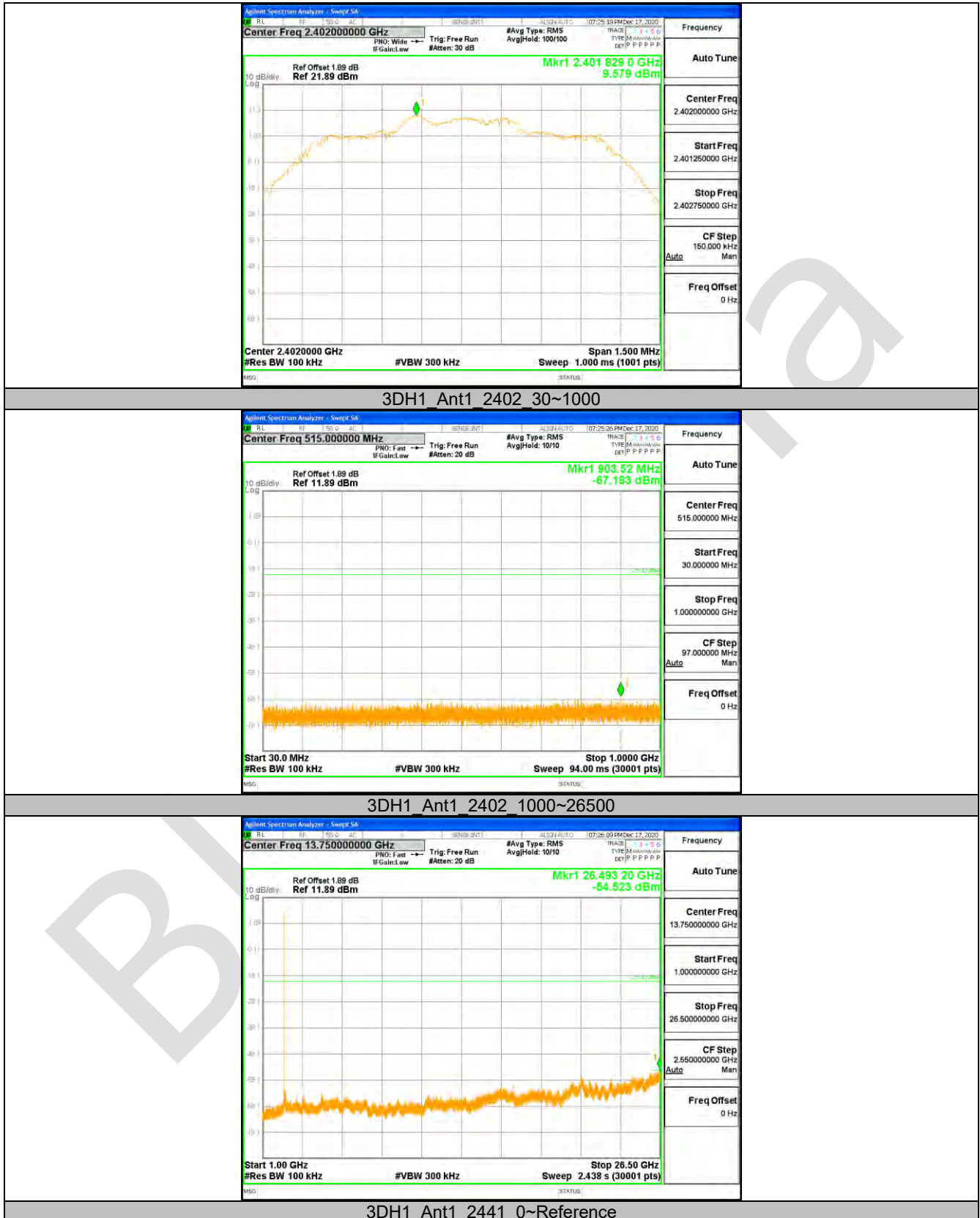


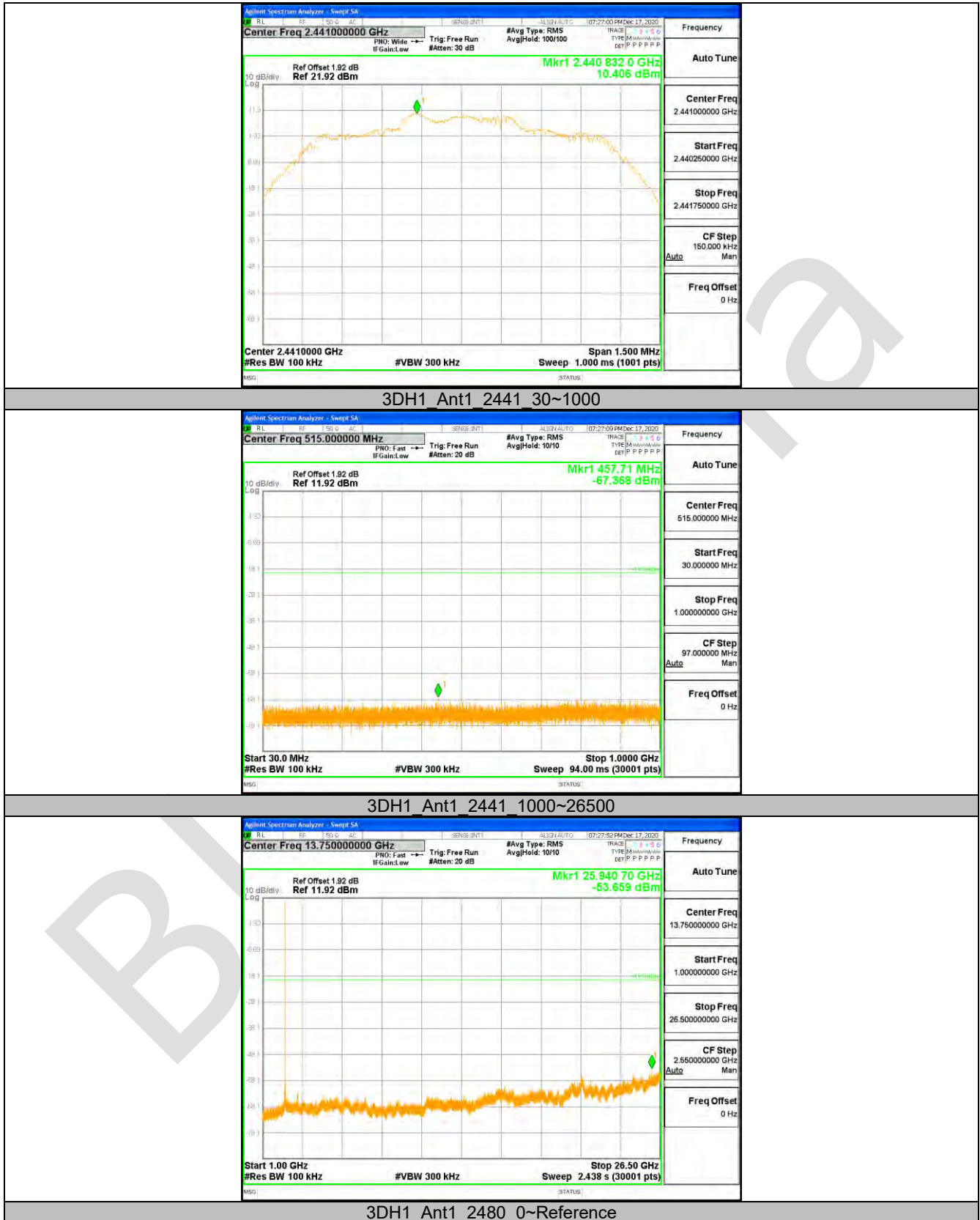


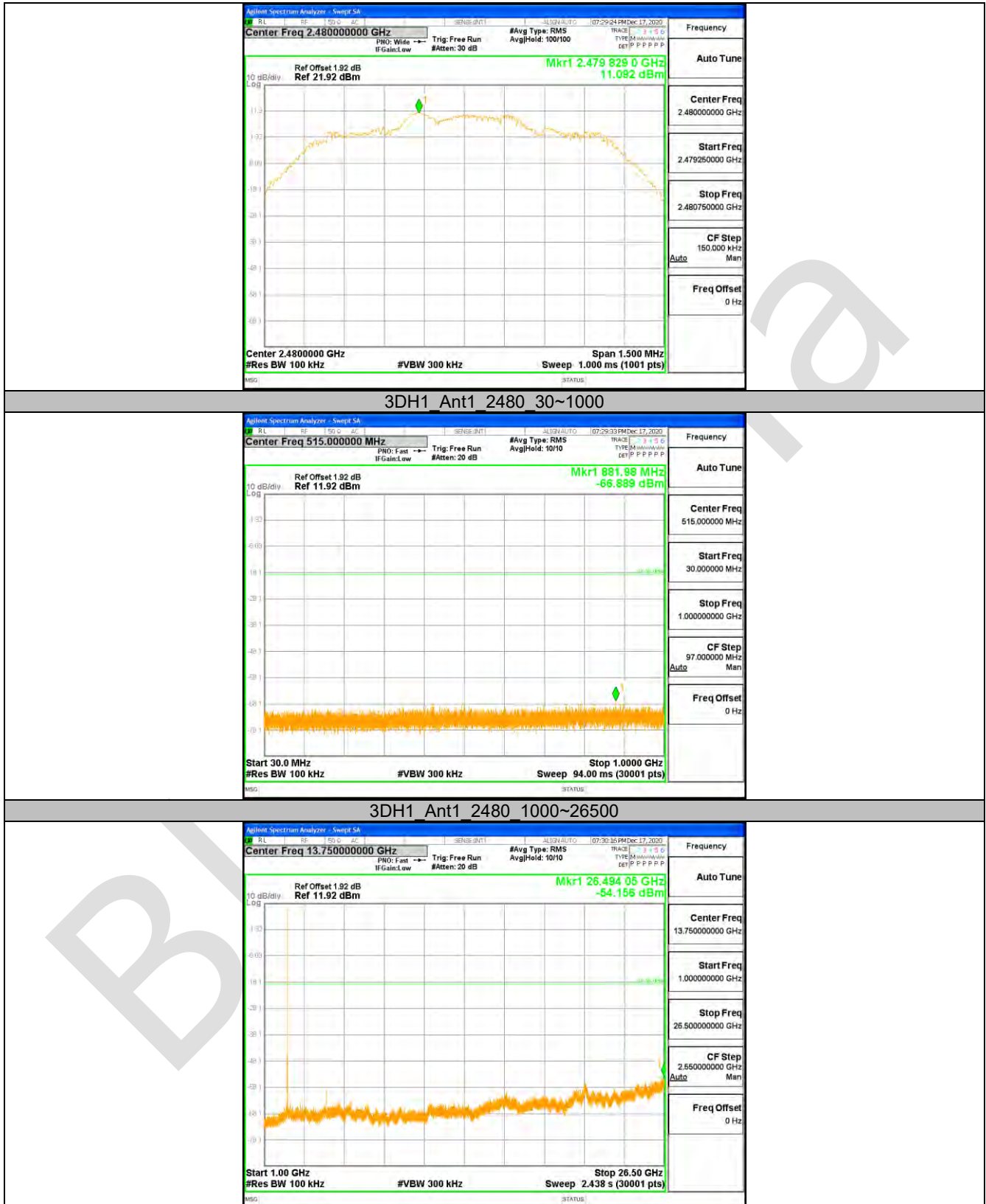












APPENDIX A: PHOTOGRAPHS OF TEST SETUP

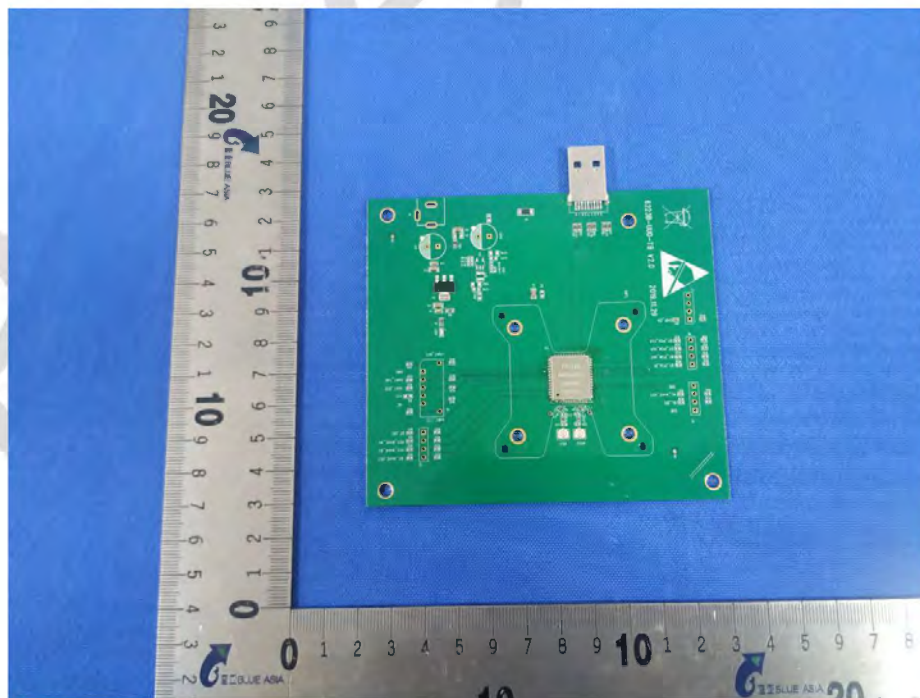
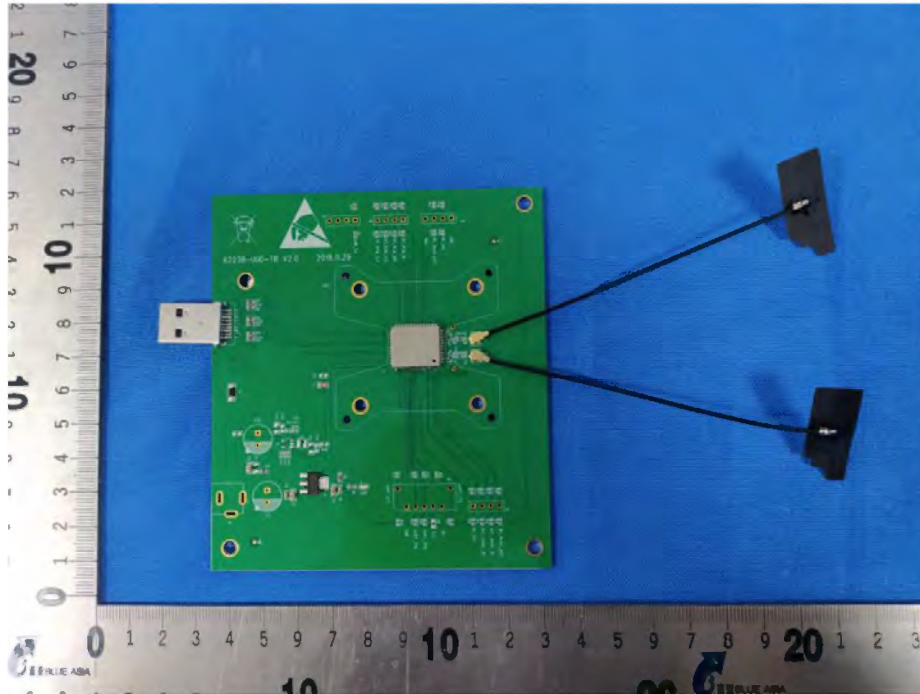
Radiated Spurious Emissions

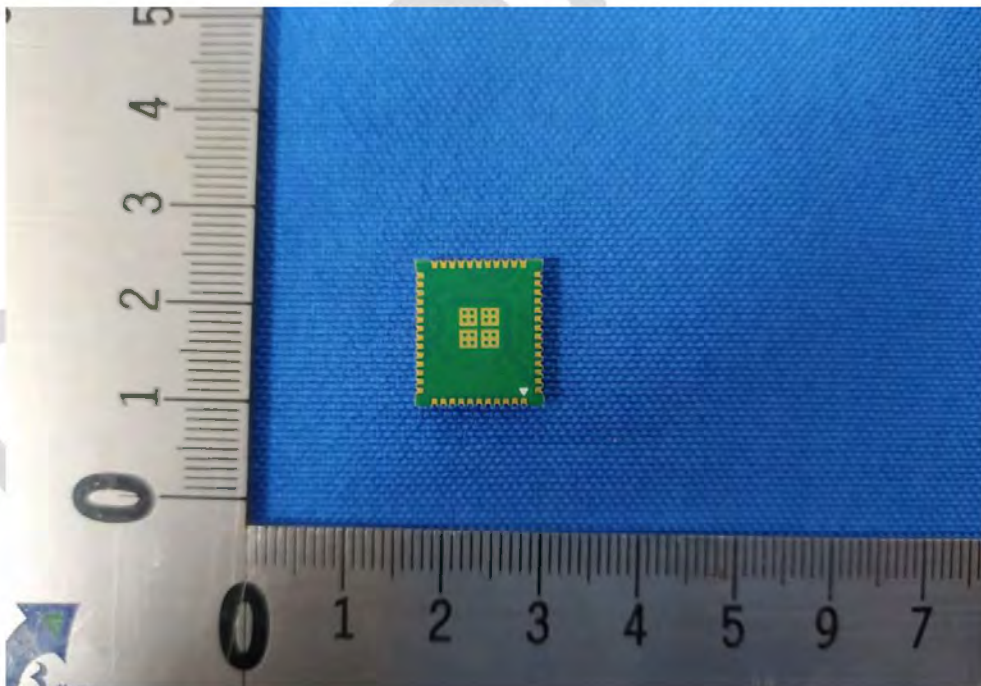
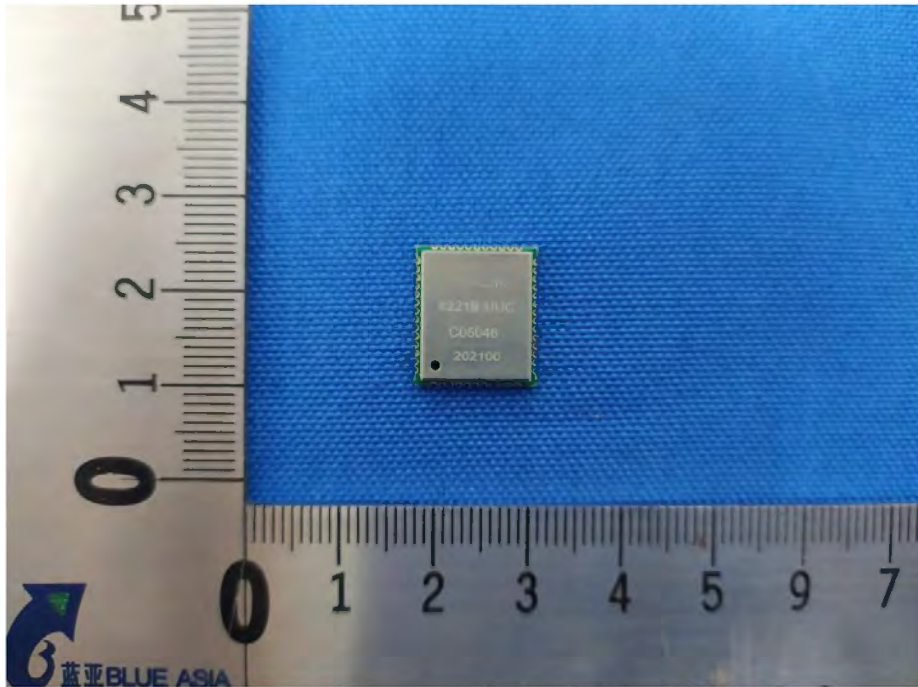


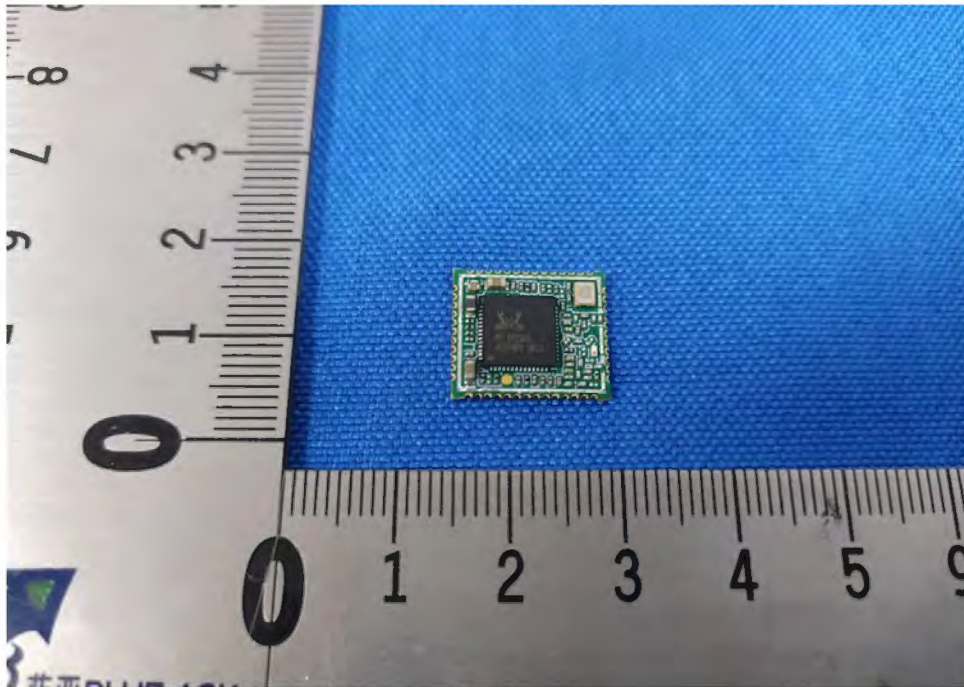
Conducted Emissions at AC Power Line (150kHz-30MHz)



APPENDIX B: PHOTOGRAPHS OF EUT







----END OF REPORT----

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