FCC Radio Test Report

FCC ID: RWO-RZ090421

This report concerns: Class II Permissive Change

Project No.	:	2111C140
Equipment	:	Notebook PC
Brand Name	:	RAZER
Test Model	:	RZ09-0421
Series Model	:	N/A
Applicant	:	Razer Inc.
Address	:	9 Pasteur, Suite 100, Irvine, CA92618, USA
Manufacturer	:	Razer Inc.
Address	:	9 Pasteur, Suite 100, Irvine, CA92618, USA
Date of Receipt	:	Nov. 22, 2021
Date of Test	:	Dec. 02, 2021 ~ Dec. 23, 2021
Issued Date	:	Feb. 10, 2022
Report Version	:	R00
Test Sample	:	Sample No.: DG20211202160 for conducted, DG20211201114 for radiated.
Standard(s)	:	FCC CFR Title 47, Part 15, Subpart E ANSI C63.10-2013 FCC KDB 987594 D02 U-NII 6GHz EMC Measurement v01 FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01 FCC KDB 662911 D01 Multiple Transmitter Output v02r01

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

Prepared by : Evan Yang

Approved by : Chay Cai

TESTING CERT #5123.02

Add: No. 3 Jinshagang 1st Rd. Shixia, Dalang Town Dongguan City, Guangdong 523792 People's Republic of China.

Tel: +86-769-8318-3000

Web: www.newbtl.com

Declaration

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Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.
Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	Feb. 10, 2022

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC CFR Title 47, Part 15, Subpart E				
Standard(s) Section	**Test Item**	**Test Result**	**Judgment**	**Remark**
15.207 15.407(b)	AC Power Line Conducted Emissions	------	PASS	------
15.407(b) 15.205(a) 15.209(a)	Radiated Emissions	Appendix A Appendix B	PASS	------
15.407(a)	Bandwidth	------	PASS	------
15.407(a)	Maximum e.i.r.p.	------	PASS	------
15.407(a)	Maximum Power Spectral Density (e.i.r.p.)	------	PASS	------
15.407(b)	In-Band Emission (Mask)	------	PASS	------
15.407(d)	Contention Based Protocol	Appendix C	PASS	------
15.407(g)	Frequency Stability	------	PASS	------
15.203 15.407(a)	Antenna Requirements	------	PASS	**NOTE (2)** **NOTE (3)**

Note:
(1) "N/A" denotes test is not applicable in this test report.
(2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.
(3) The device employ a permanently attached integrated antenna.
(4) Device Type:
☐ Indoor access point
☐ Subordinate device (operating under control of a low-power indoor access point)
☒ Indoor client (operating under control of a low-power indoor access point)
☐ Dual client (operating under control of either a low-power indoor access point or standard power access point)
☐ Standard power access point
☐ Standard client (operating under control of a Standard power access point)
☐ Fixed client (operating under control of a Standard power access point)
(5) In this report only the worst cases of radiated spurious emissions were evaluated and recorded. For the test results of all other test items please refer to module test report.

1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No. 3 Jinshagang 1st Rd. Shixia, Dalang Town Dongguan City, Guangdong 523792 People's Republic of China.
BTL's Registration Number for FCC: 357015
BTL's Designation Number for FCC: CN1240

1.2 MEASUREMENT UNCERTAINTY

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

A. Radiated emissions test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
DG-CB03 (3m)	CISPR	30MHz ~ 200MHz	V	4.36
		30MHz ~ 200MHz	H	3.32
		200MHz ~ 1,000MHz	V	4.08
		200MHz ~ 1,000MHz	H	3.96

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-CB03 (3m)	CISPR	1GHz ~ 6GHz	3.80
		6GHz ~ 18GHz	4.82

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-CB03 (1m)	CISPR	18 ~ 26.5 GHz	3.62
		26.5 ~ 40 GHz	4.00

B. Other Measurement test:

Test Item	Uncertainty
Temperature	±0.08 °C
Humidity	±1.5%

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

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By
Radiated Emissions-30MHz to 1000MHz	24°C	45%	AC 120V/60Hz	Hayden Chen
Radiated Emissions-Above 1000 MHz	22°C	42%	AC 120V/60Hz	Hayden Chen
Contention Based Protocol	22°C	53%	AC 120V/60Hz	Mark Wu

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Notebook PC
Brand Name	RAZER
Test Model	RZ09-0421
Series Model	N/A
Model Difference(s)	N/A
Power Source	1# DC Voltage supplied from AC adapter. Model: RC30-024801 2# Supplied from battery. Model: RC30-0248
Power Rating	1# I/P: 100-240V~ 50/60Hz 3.6A O/P: 19.5V⎓ 11.8A 2# 15.4V, 5209mAh, 80Wh
Operation Frequency Band(s)	UNII-5: 5925 MHz ~ 6425 MHz UNII-6: 6425 MHz ~ 6525 MHz UNII-7: 6525 MHz ~ 6875 MHz UNII-8: 6875 MHz ~ 7125 MHz
Modulation Type	IEEE 802.11a/n/ac: OFDM IEEE 802.11ax: OFDMA
Bit Rate of Transmitter	IEEE 802.11a: 54/48/36/24/18/12/9/6 Mbps IEEE 802.11n: Up to 300 Mbps IEEE 802.11ac: Up to 1733.4 Mbps IEEE 802.11ax: Up to 2402 Mbps

Note:

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

2. Channel List:

UNII-5					
IEEE 802.11a, IEEE 802.11n(HT20), IEEE 802.11ac(VHT20), IEEE 802.11ax(HE20)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	5955	33	6115	65	6275
5	5975	37	6135	69	6295
9	5995	41	6155	73	6315
13	6015	45	6175	77	6335
17	6035	49	6195	81	6355
21	6055	53	6215	85	6375
25	6075	57	6235	89	6395
29	6095	61	6255	93	6415

UNII-5					
IEEE 802.11n(HT40), IEEE 802.11ac(VHT40), IEEE 802.11ax(HE40)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	5965	35	6125	67	6285
11	6005	43	6165	75	6325
19	6045	51	6205	83	6365
27	6085	59	6245	91	6405

UNII-5					
IEEE 802.11ac(VHT80), IEEE 802.11ax(HE80)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
7	5985	39	6145	71	6305
23	6065	55	6225	87	6385

UNII-5					
IEEE 802.11ac(VHT160), IEEE 802.11ax(HE160)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
15	6025	47	6185	79	6345

UNII-6					
IEEE 802.11a, IEEE 802.11n(HT20), IEEE 802.11ac(VHT20), IEEE 802.11ax(HE20)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
97	6435	105	6475	113	6515
101	6455	109	6495		

UNII-6					
IEEE 802.11n(HT40), IEEE 802.11ac(VHT40), IEEE 802.11ax(HE40)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
99	6445	107	6485	115	6525

UNII-6					
IEEE 802.11ac(VHT80), IEEE 802.11ax(HE80)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
103	6465				

UNII-6					
IEEE 802.11ac(VHT160), IEEE 802.11ax(HE160)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
111	6505				

UNII-7					
IEEE 802.11a, IEEE 802.11n(HT20), IEEE 802.11ac(VHT20), IEEE 802.11ax(HE20)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
117	6535	141	6655	165	6775
121	6555	145	6675	169	6795
125	6575	149	6695	173	6815
129	6595	153	6715	177	6835
133	6615	157	6735	181	6855
137	6635	161	6755	185	6875

UNII-7					
IEEE 802.11n(HT40), IEEE 802.11ac(VHT40), IEEE 802.11ax(HE40)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
123	6565	147	6685	171	6805
131	6605	155	6725	179	6845
139	6645	163	6765		

UNII-7					
IEEE 802.11ac(VHT80), IEEE 802.11ax(HE80)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
119	6545	151	6705	183	6865
135	6625	167	6785		

UNII-7					
IEEE 802.11ac(VHT160), IEEE 802.11ax(HE160)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
143	6665	175	6825		

UNII-8					
IEEE 802.11a, IEEE 802.11n(HT20), IEEE 802.11ac(VHT20), IEEE 802.11ax(HE20)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
189	6895	205	6975	221	7055
193	6915	209	6995	225	7075
197	6935	213	7015	229	7095
201	6955	217	7035	233	7115

UNII-8					
IEEE 802.11n(HT40), IEEE 802.11ac(VHT40), IEEE 802.11ax(HE40)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
187	6885	203	6965	219	7045
195	6925	211	7005	227	7085

UNII-8					
IEEE 802.11ac(VHT80), IEEE 802.11ax(HE80)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
199	6945	215	7025		

UNII-8					
IEEE 802.11ac(VHT160), IEEE 802.11ax(HE160)					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
207	6985				

3. Table for Filed Antenna:

Ant.	Brand	P/N	Antenna Type	Connector	Gain (dBi)
1	Amphenol Taiwan Corporation	BY5921-15-001-C	PIFA	N/A	3.87
2	Amphenol Taiwan Corporation	BY5921-15-001-C	PIFA	N/A	3.03

Note:

1) This EUT supports MIMO 2X2, any transmit signals are correlated with each other, so Directional gain $=10\log[(10^{G1/10}+10^{G2/10}+...10^{GN/10})^2/N]$dBi, that is Directional gain$=10\log[(10^{3.87/10}+10^{3.03/10})^2/2]$dBi $=6.47$.

2) The antenna gain is provided by the manufacturer.

4. Table for Antenna Configuration:

Operating Mode / TX Mode	2TX
IEEE 802.11a	V (Ant. 1 + Ant. 2)
IEEE 802.11n(HT20)	V (Ant. 1 + Ant. 2)
IEEE 802.11n(HT40)	V (Ant. 1 + Ant. 2)
IEEE 802.11ac(VHT20)	V (Ant. 1 + Ant. 2)
IEEE 802.11ac(VHT40)	V (Ant. 1 + Ant. 2)
IEEE 802.11ac(VHT80)	V (Ant. 1 + Ant. 2)
IEEE 802.11ac(VHT160)	V (Ant. 1 + Ant. 2)
IEEE 802.11ax(HE20)	V (Ant. 1 + Ant. 2)
IEEE 802.11ax(HE40)	V (Ant. 1 + Ant. 2)
IEEE 802.11ax(HE80)	V (Ant. 1 + Ant. 2)
IEEE 802.11ax(HE160)	V (Ant. 1 + Ant. 2)

2.2 TEST MODES

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

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

Final Test Mode	Description
Mode 1	TX AX(HE20) Mode Channel 53 (UNII-5)
Mode 2	TX AX(HE160) Mode Channel 47/79 (UNII-5)
Mode 3	TX AX(HE20) Mode Channel 101 (UNII-6)
Mode 4	TX AX(HE160) Mode Channel 111 (UNII-6)
Mode 5	TX AX(HE20) Mode Channel 149 (UNII-7)
Mode 6	TX AX(HE160) Mode Channel 143 (UNII-7)
Mode 7	TX AX(HE20) Mode Channel 213 (UNII-8)
Mode 8	TX AX(HE160) Mode Channel 207 (UNII-8)
Mode 9	Normal Mode

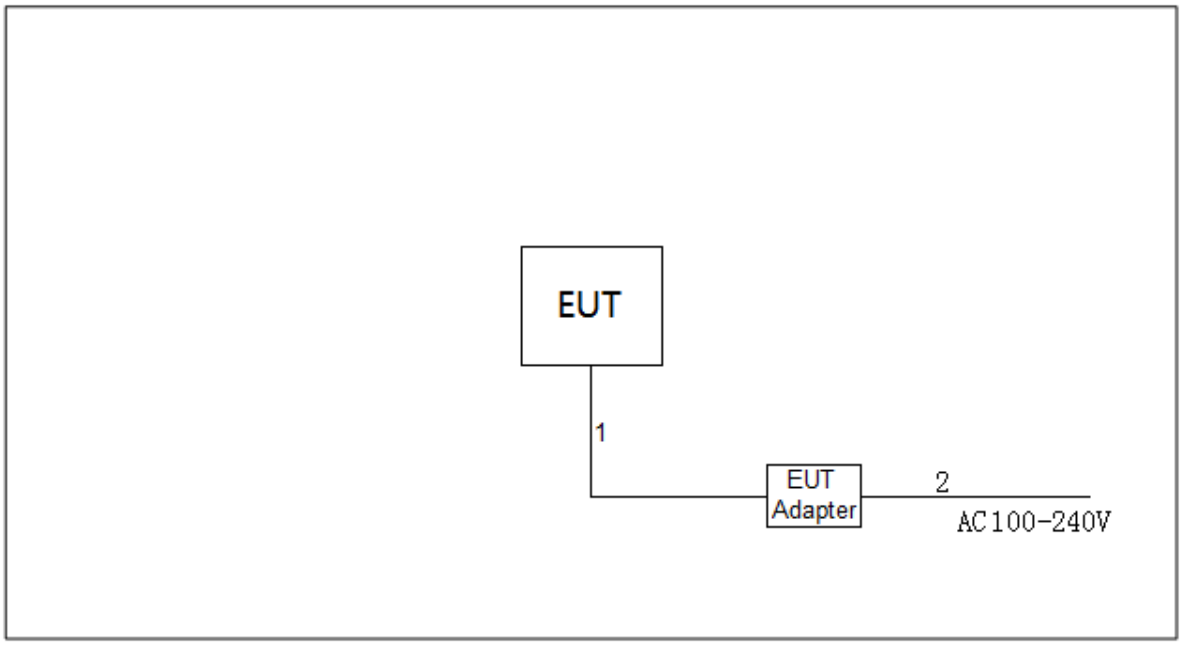
Radiated Emissions Test - Below 1GHz	
Final Test Mode	Description
Mode 9	Normal Mode

Radiated Emissions Test - Above 1GHz	
Final Test Mode	Description
Mode 2	TX AX(HE160) Mode Channel 79 (UNII-5)
Mode 4	TX AX(HE160) Mode Channel 111 (UNII-6)
Mode 6	TX AX(HE160) Mode Channel 143 (UNII-7)
Mode 8	TX AX(HE160) Mode Channel 207 (UNII-8)

Contention Based Protocol	
Final Test Mode	Description
Mode 1	TX AX(HE20) Mode Channel 53 (UNII-5)
Mode 2	TX AX(HE160) Mode Channel 47/79 (UNII-5)
Mode 3	TX AX(HE20) Mode Channel 101 (UNII-6)
Mode 4	TX AX(HE160) Mode Channel 111 (UNII-6)
Mode 5	TX AX(HE20) Mode Channel 149 (UNII-7)
Mode 6	TX AX(HE160) Mode Channel 143 (UNII-7)
Mode 7	TX AX(HE20) Mode Channel 213 (UNII-8)
Mode 8	TX AX(HE160) Mode Channel 207 (UNII-8)

Note:
(1) IEEE 802.11ax mode only supports full RU, so only the full RU is evaluated and measured inside report.

2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



2.4 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.
-	-	-	-	-

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	2m
2	AC Cable	NO	NO	1m

3. RADIATED EMISSIONS

3.1 LIMIT

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

LIMITS OF RADIATED EMISSIONS MEASUREMENT (30 MHz to 1000 MHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

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

Frequency (MHz)	EIRP Limit (dBm/MHz)	Equivalent Field Strength at 3m (dBµV/m)
5925-7125	Average: -27	68.2

NOTE:

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

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

3.2 TEST PROCEDURE

a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
c. The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn‘t perform. (below 1 GHz)
h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn‘t perform. (above 1 GHz)
i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

The following table is the setting of the receiver:

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

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

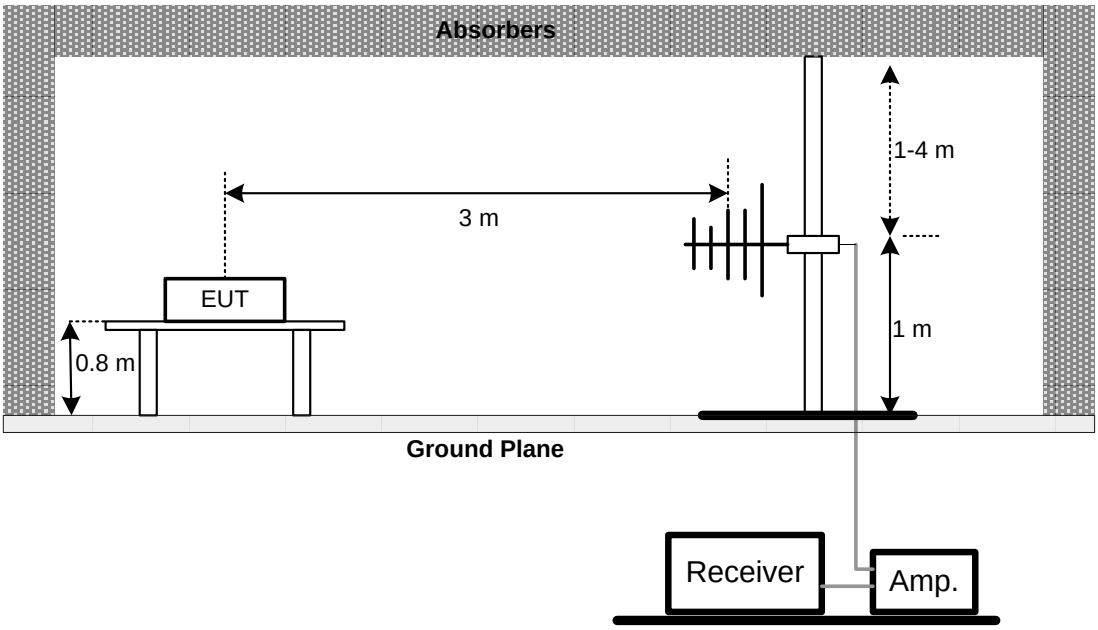
Receiver Parameters	Setting
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000 MHz for QP detector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

3.3 DEVIATION FROM TEST STANDARD

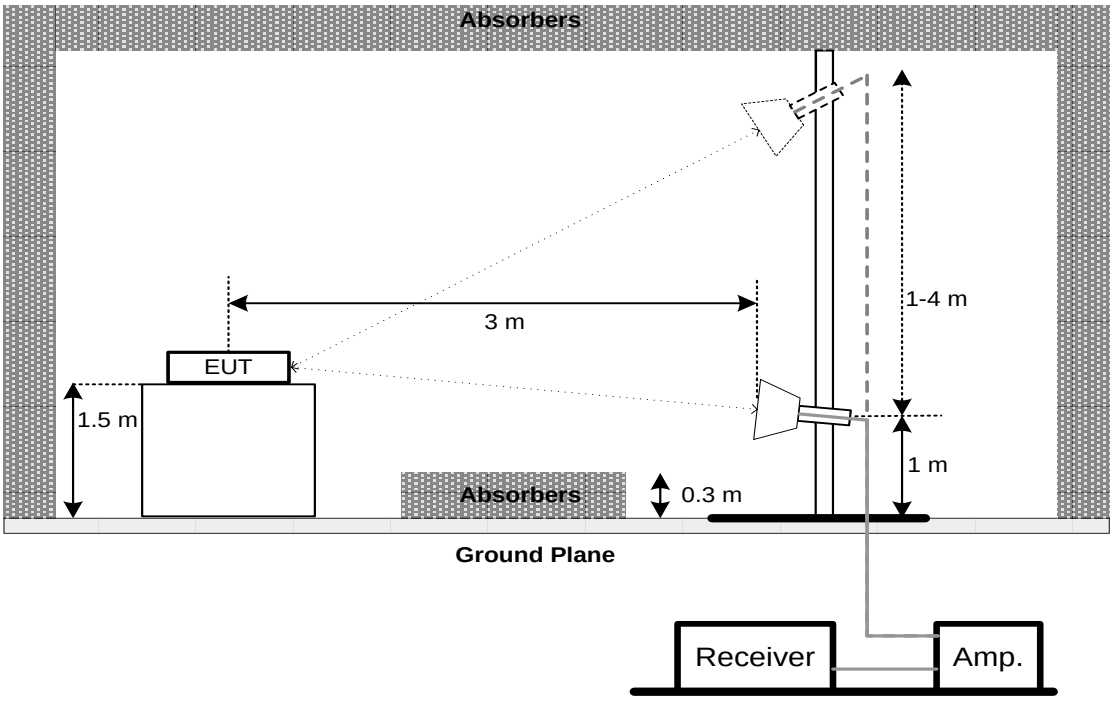
No deviation.

3.4 TEST SETUP

30 MHz to 1 GHz



Above 1 GHz



3.5 EUT OPERATION CONDITIONS

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

3.6 TEST RESULTS - 30 MHZ TO 1000 MHZ

Please refer to the APPENDIX A.

3.7 TEST RESULTS - ABOVE 1000 MHZ

Please refer to the APPENDIX B.

Remark:

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

4. CONTENTION BASED PROTOCOL

4.1 LIMIT

Indoor access points, subordinate devices and client devices operating in the 5.925-7.125 GHz band (herein referred to as unlicensed devices) are required to use technologies that include a contention-based protocol to avoid co-channel interference with incumbent devices sharing the band. To ensure incumbent co-channel operations are detected in a technology-agnostic manner, unlicensed devices are required to detect co-channel radio frequency energy (energy detect) and avoid simultaneous transmission.
Unlicensed low-power indoor devices must detect co-channel radio frequency power that is at least -62 dBm or lower. Upon detection of energy in the band, unlicensed low power indoor devices must vacate the channel and stay off the channel as long as detected radio frequency power is equal to or greater than the threshold (-62 dBm). The -62 dBm (or lower) threshold is referenced to a 0 dBi antenna gain.
To ensure incumbent operations are reliably detected in the band, low power indoor devices must detect RF energy throughout their intended operating channel. For example, an 802.11 device that plans to transmit a 40 MHz- wide signal (on a primary 20 MHz channel and a secondary 20 MHz channel) must detect energy throughout the entire 40 MHz channel. Additionally, low-power indoor devices must detect co-channel energy with 90% or greater certainty.

Note: The EUT with a lowest gain is 3.03dBi. All power injected into EUT should be -62+3.03= -58.97dBm.

4.2 TEST PROCEDURE

a. Number of times detection threshold:

If	Number of Tests	Placement of Incumbent Transmission
$BW_{EUT} \leqslant BW_{Inc}$	Once	Tune incumbent and EUT transmissions ($f_{c1}=f_{c2}$)
$BW_{Inc} < BW_{EUT} \leqslant 2BW_{Inc}$	Once	Incumbent transmission is contained within BW_{EUT}
$2BW_{Inc} < BW_{EUT} \leqslant 4BW_{Inc}$	Twice. Incumbent transmission is contained within BW_{EUT}	Incumbent transmission is located as closely s possible to the lower edge and upper edge, respectively, of the EUT channel
$BW_{EUT} > 4BW_{Inc}$	Three times	Incumbent transmission is located as closely as possible to the lower edge of the EUT channel, in the middle of EUT channel, and as closely as possible to the upper edge of the EUT channel

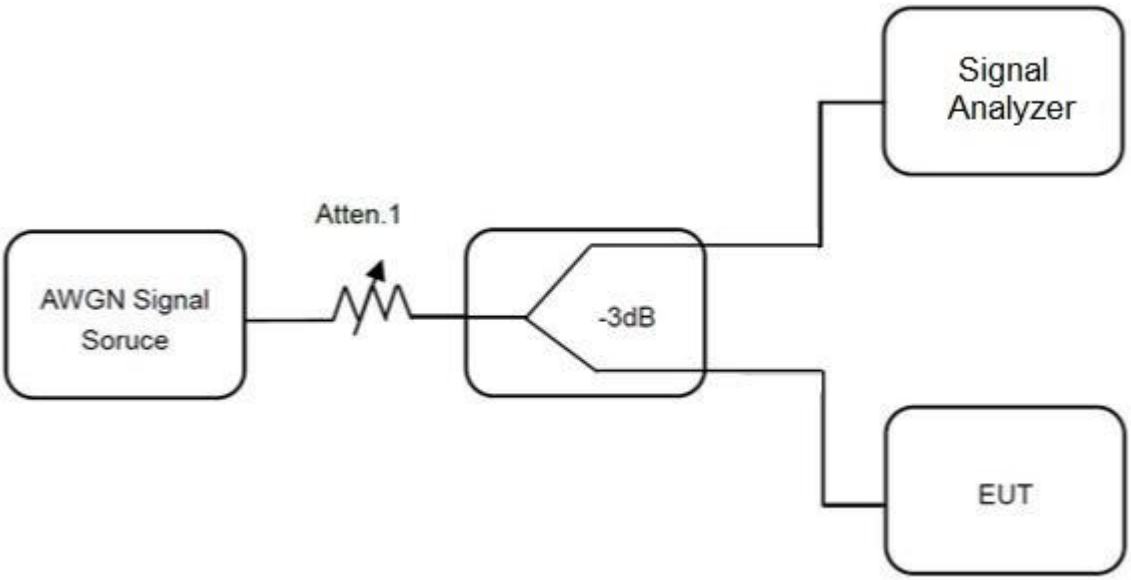
Where:
BW_{EUT}: Transmission bandwidth of EUT signal.
BW_{Inc}: Transmission bandwidth of the simulated incumbent signal (10 MHz wide AWGN signal).
f_{c1}: Center frequency of EUT transmission.
f_{c2}: Center frequency of simulated incumbent signal.

b. Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use step b table to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
c. Set the AWGN signal power to an extremely low level (more than 20 dB below the -62 dBm threshold). Connect the AWGN signal source, via a 3-dB splitter, to the signal analyzer and the EUT as show in the block diagram below.
d. Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer.
e. Monitor the signal analyzer to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, then incrementally increase the AWGN signal power level until the EUT stops transmitting.
f. (Including all losses in the RF paths) Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least 10 times to verify the EUT can detect an AWGN signal with 90% (or better) level of certainty.
g. Refer to step b table to determine number of times the detection threshold testing needs to be repeated. If testing is required more than once, then go back to step c, choose a different center frequency for the AWGN signal and repeat the process.

4.3 DEVIATION FROM STANDARD

No deviation.

4.4 TEST SETUP



4.5 EUT OPERATION CONDITIONS

The EUT was Configured to be in normally transmitting mode with a constant duty cycle.

4.6 TEST RESULTS

Please refer to the APPENDIX C.

5. MEASUREMENT INSTRUMENTS LIST

Radiated Emissions - 30 MHz to 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB9160	9160-3232	Mar. 15, 2022
2	Amplifier	HP	8447D	2944A08742	Feb. 28, 2022
3	Cable	emci	LMR-400	N/A	Nov. 30, 2022
4	Controller	CT	SC100	N/A	N/A
5	Controller	MF	MF-7802	MF780208416	N/A
6	Receiver	Agilent	N9038A	MY52130039	Mar. 19, 2022
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
8	966 Chamber Room	RM	9*6*6	N/A	Jul. 24, 2022

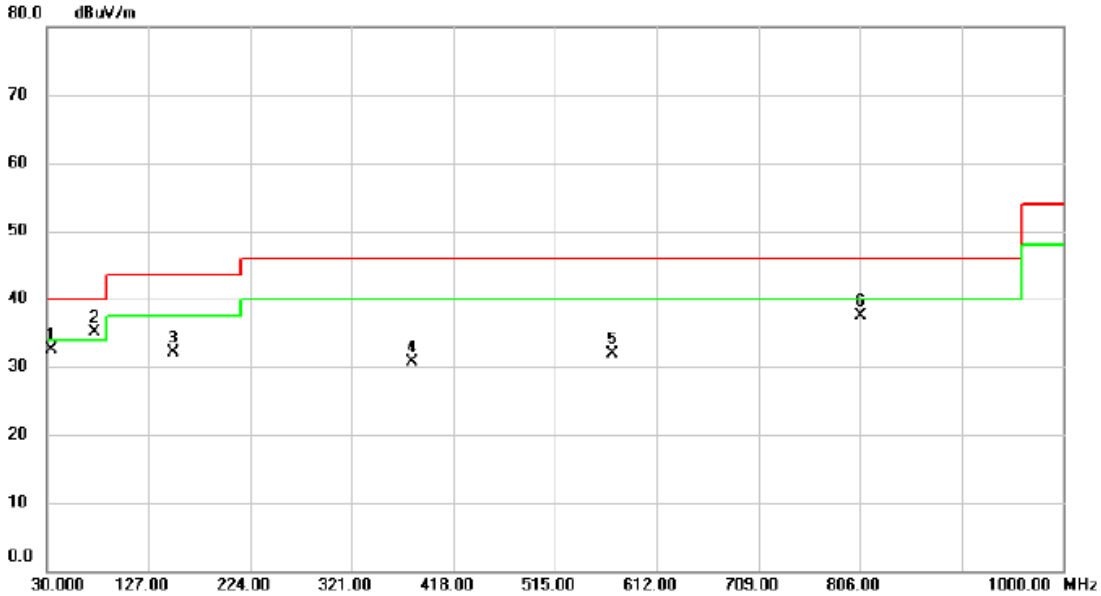
Radiated Emissions - Above 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Guide Antenna	ETS	3115	75789	May 10, 2022
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 30, 2022
3	Amplifier	Agilent	8449B	3008A02584	Jul. 10, 2022
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Feb. 28, 2022
5	Receiver	Agilent	N9038A	MY52130039	Mar. 19, 2022
6	Controller	CT	SC100	N/A	N/A
7	Controller	MF	MF-7802	MF780208416	N/A
8	Cable	N/A	EMC104-SM-SM-6000	N/A	Oct. 16, 2022
9	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
10	Band Reject Filter	Micro-Tronics	BRC50705-01	10	Feb. 27, 2022
11	Band Reject Filter	Micro-Tronics	BRC50704-01	8	Feb. 27, 2022
12	Band Reject Filter	Micro-Tronics	BRC50703-01	7	Feb. 27, 2022
13	966 Chambe Room	RM	9*6*6m	N/A	Jul. 25, 2022

Contention Based Protocol					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EXA Spectrum Analyzer	Agilent	N9010A	MY55150209	Jul. 10, 2022
2	Frequency expansion instrument	Keysight	N5182BX07	MY59360135	N/A
3	MXG Vector Signal Generator	Keysight	N5182B	MY57300568	Jul. 10, 2022
4	Wi-Fi Router	ASUS	GT-AXE11000	N/A	N/A
5	POWER SPLITTER	Mini-Circuits	ZN4PD1-63-S+	SF9335D1045-2	Feb. 07, 2022
6	POWER SPLITTER	Mini-Circuits	ZFRSC-183-S+	SF601301339-1	Feb. 07, 2022
7	Cable	N/A	EMC104-SM-SM-6000	N/A	Oct. 16, 2022

Remark: “N/A” denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

APPENDIX A - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

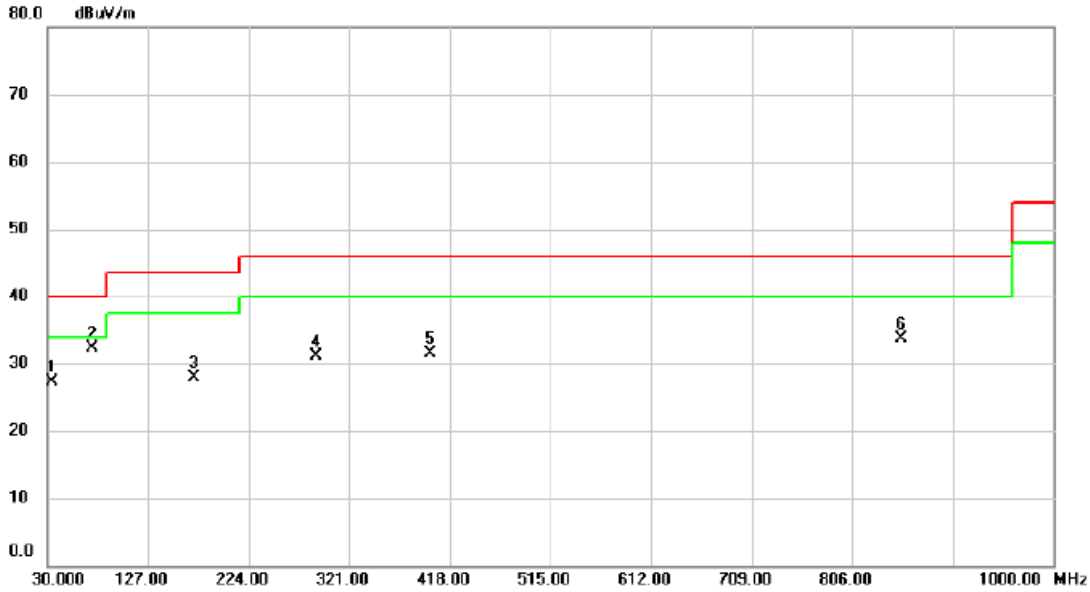
Test Mode	Normal Mode	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		33.8800	47.62	-15.09	32.53	40.00	-7.47	peak	
2	*	75.5900	52.62	-17.45	35.17	40.00	-4.83	peak	
3		151.2500	44.75	-12.59	32.16	43.50	-11.34	peak	
4		378.2300	40.01	-9.30	30.71	46.00	-15.29	peak	
5		570.2900	37.32	-5.35	31.97	46.00	-14.03	peak	
6		806.9700	38.19	-0.67	37.52	46.00	-8.48	peak	

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

Test Mode	Normal Mode	Polarization	Horizontal

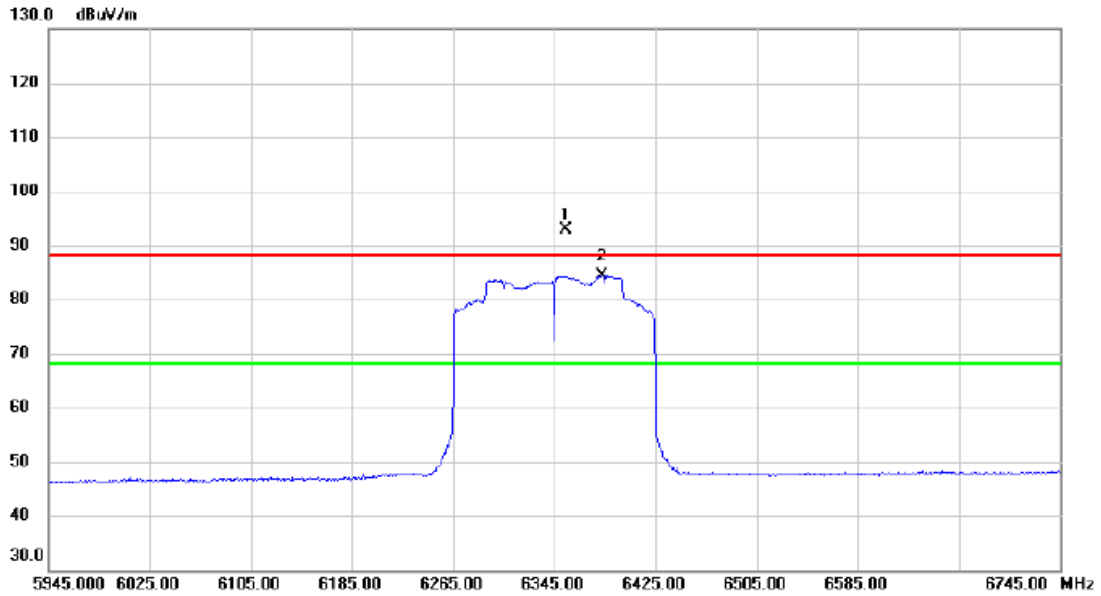


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		33.8800	42.37	-15.09	27.28	40.00	-12.72	peak	
2	*	72.6800	49.19	-16.81	32.38	40.00	-7.62	peak	
3		171.6200	40.63	-12.75	27.88	43.50	-15.62	peak	
4		289.9600	42.27	-11.22	31.05	46.00	-14.95	peak	
5		398.6000	40.26	-8.81	31.45	46.00	-14.55	peak	
6		853.5300	34.24	-0.58	33.66	46.00	-12.34	peak	

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

APPENDIX B - RADIATED EMISSION - ABOVE 1000 MHZ

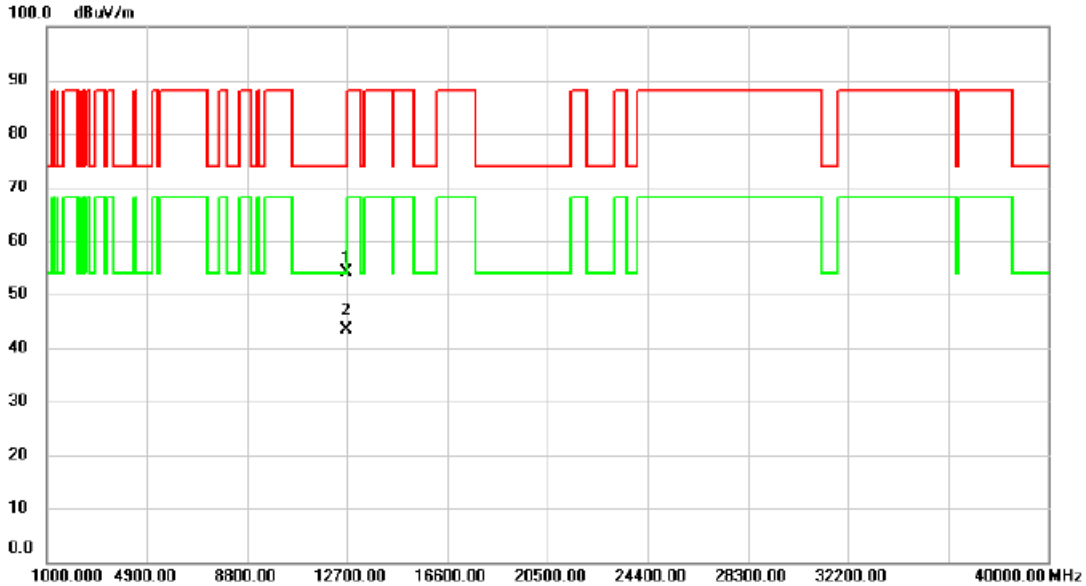
Test Mode	UNII-5_TX AX(HE160) Mode 6345 MHz	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	6353.800	75.36	17.63	92.99	88.20	4.79	peak	No Limit
2	*	6383.400	66.80	17.69	84.49	68.20	16.29	AVG	No Limit

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

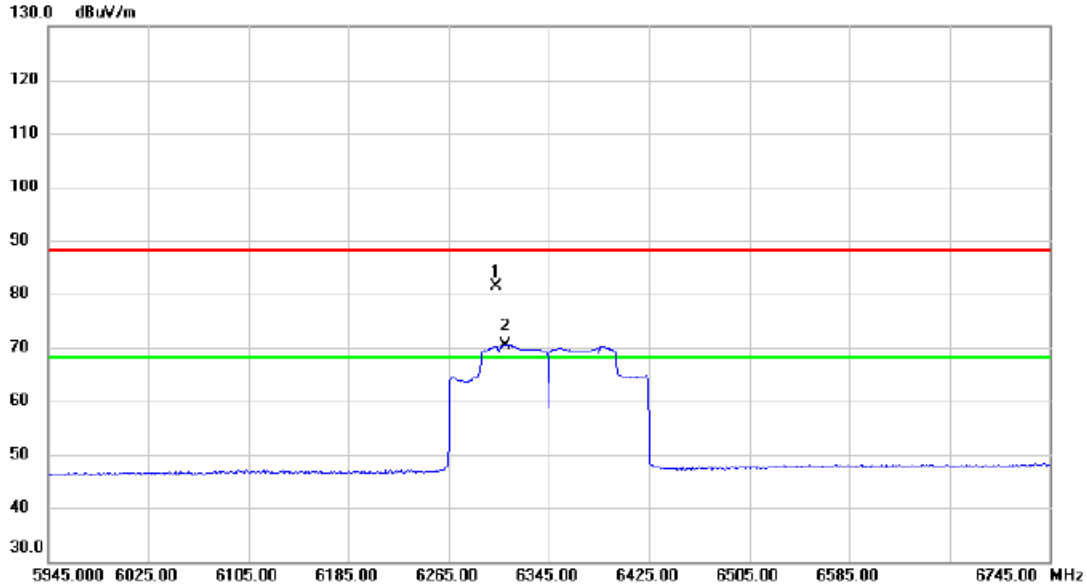
Test Mode	UNII-5_TX AX(HE160) Mode 6345 MHz	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		12688.17	37.85	16.30	54.15	74.00	-19.85	peak	
2	*	12689.87	27.03	16.30	43.33	54.00	-10.67	AVG	

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

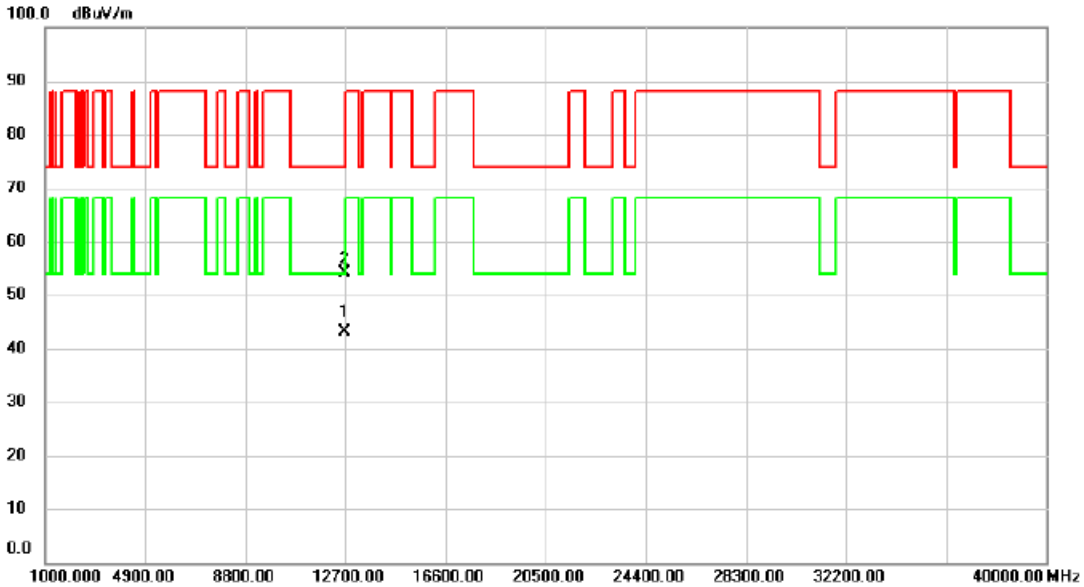
Test Mode	UNII-5_TX AX(HE160) Mode 6345 MHz	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		6302.600	63.84	17.53	81.37	88.20	-6.83	peak	No Limit
2	*	6310.600	52.84	17.54	70.38	68.20	2.18	AVG	No Limit

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

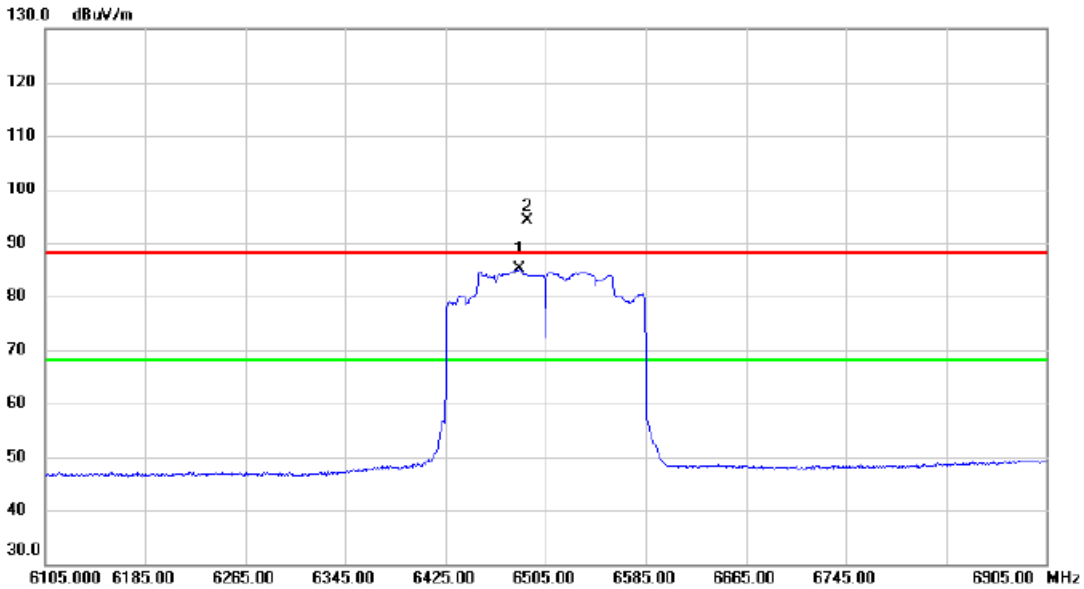
Test Mode	UNII-5_TX AX(HE160) Mode 6345 MHz	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	12691.30	26.84	16.31	43.15	54.00	-10.85	AVG	
2		12691.64	37.72	16.31	54.03	74.00	-19.97	peak	

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

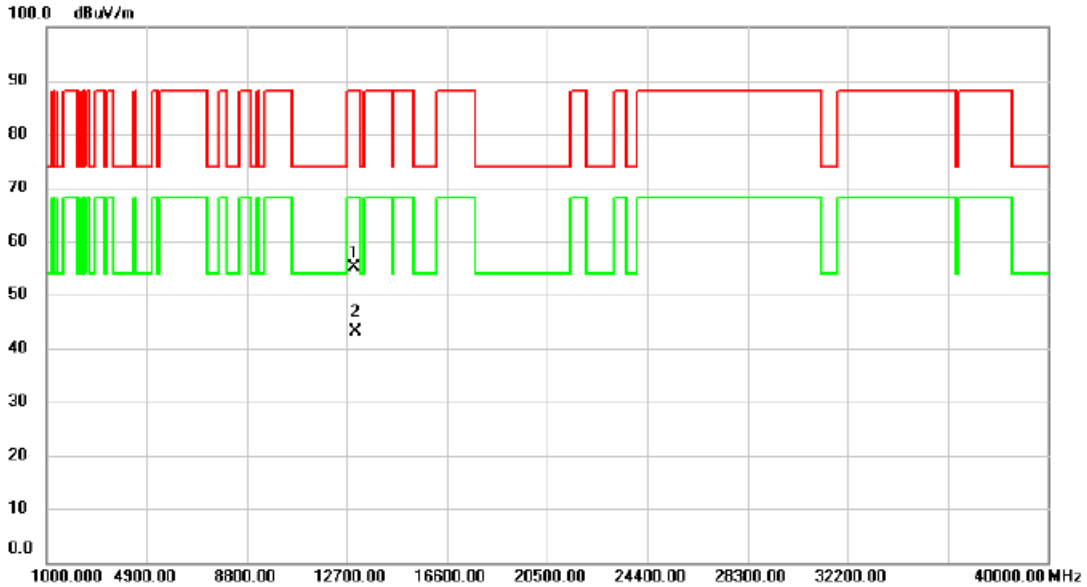
Test Mode	UNII-6_TX AX(HE160) Mode 6505 MHz	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	6484.200	67.19	17.87	85.06	68.20	16.86	AVG	No Limit
2	X	6490.600	76.22	17.88	94.10	88.20	5.90	peak	No Limit

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

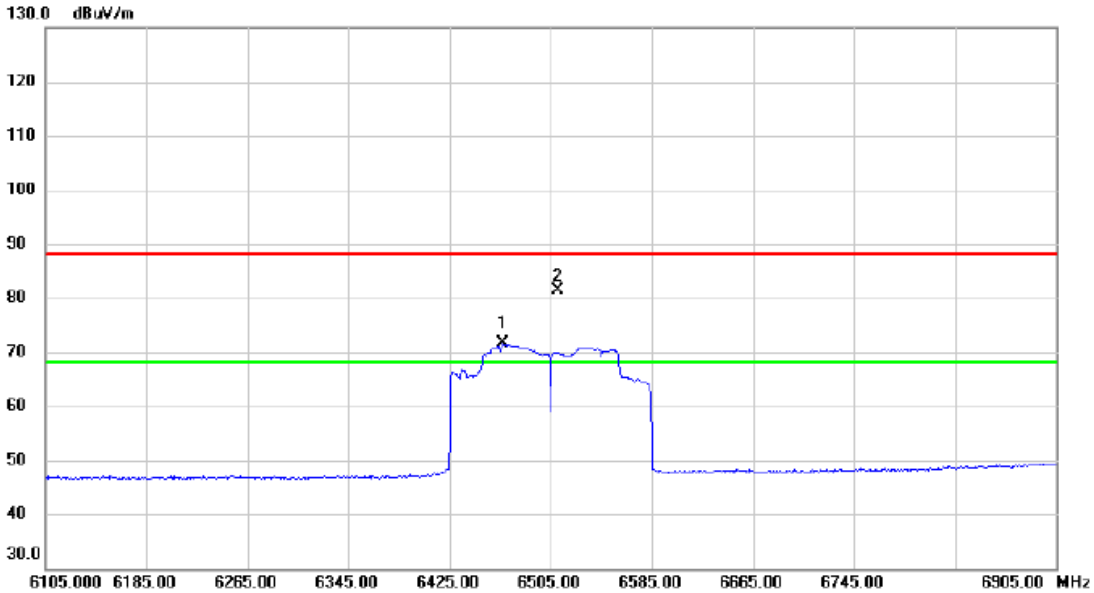
Test Mode	UNII-6_TX AX(HE160) Mode 6505 MHz	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		13011.74	38.37	16.65	55.02	88.20	-33.18	peak	
2	*	13012.22	26.39	16.65	43.04	68.20	-25.16	AVG	

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

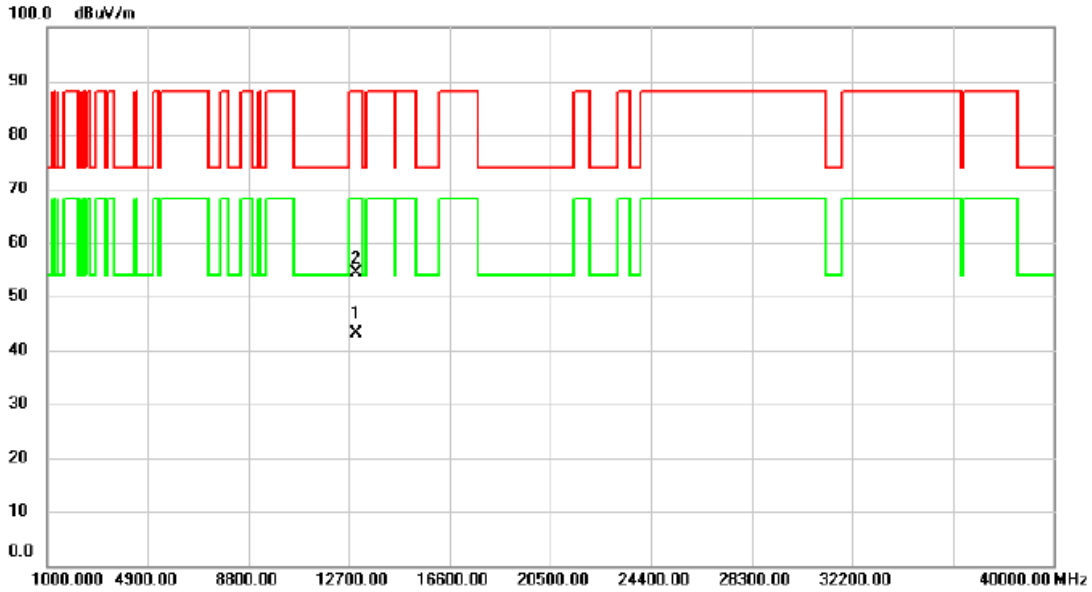
Test Mode	UNII-6_TX AX(HE160) Mode 6505 MHz	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	6467.400	53.71	17.84	71.55	68.20	3.35	AVG	No Limit
2		6511.400	63.46	17.95	81.41	88.20	-6.79	peak	No Limit

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

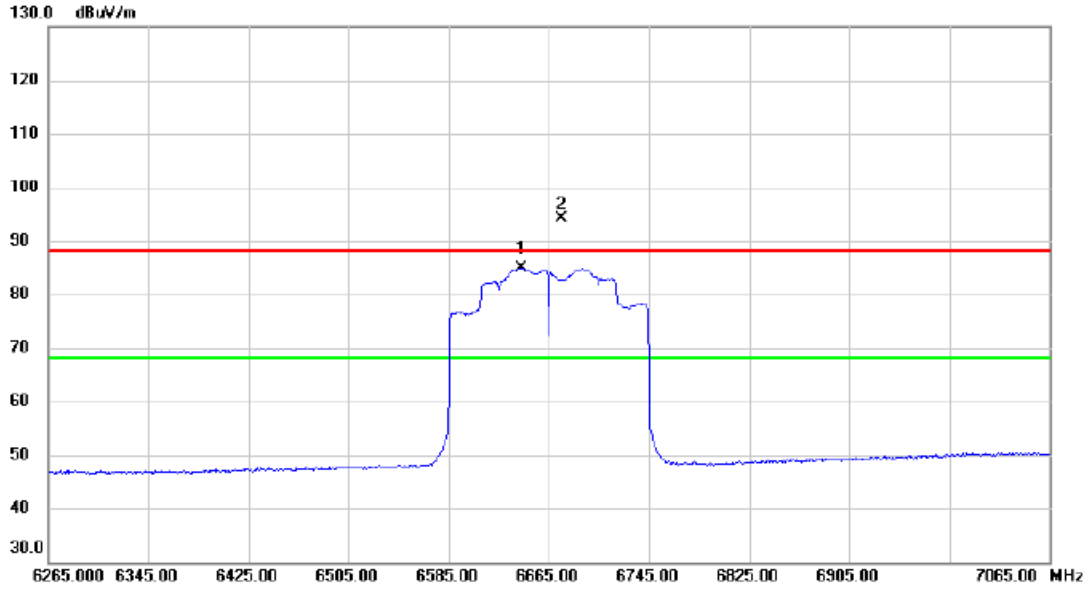
Test Mode	UNII-6_TX AX(HE160) Mode 6505 MHz	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	13009.44	26.47	16.65	43.12	68.20	-25.08	AVG	
2		13011.15	37.66	16.65	54.31	88.20	-33.89	peak	

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

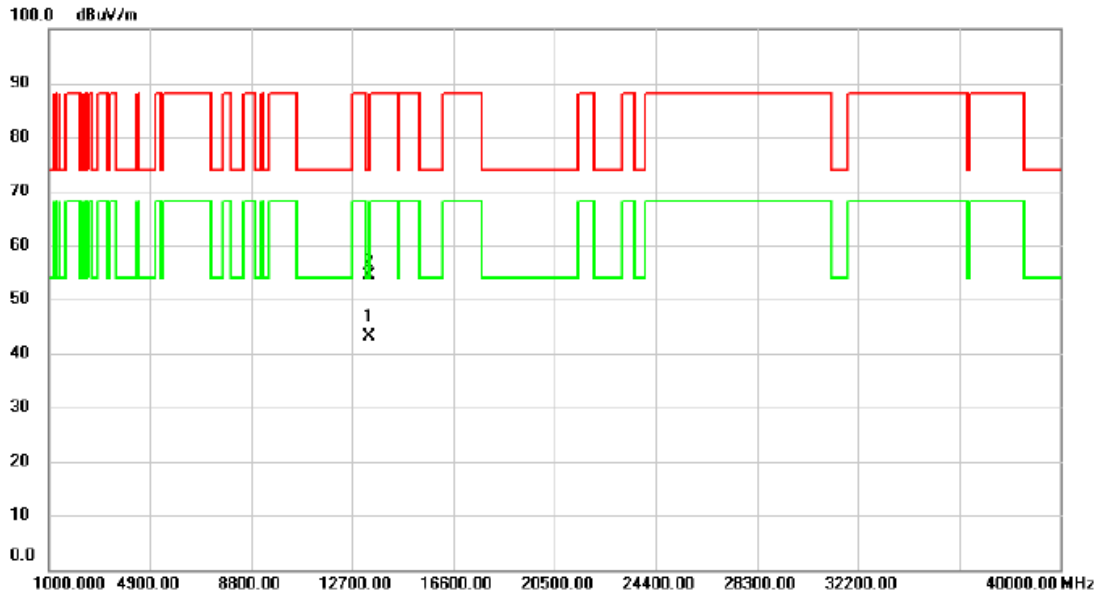
Test Mode	UNII-7_TX AX(HE160) Mode 6665 MHz	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	6643.400	66.40	18.58	84.98	68.20	16.78	AVG	No Limit
2	X	6674.600	75.28	18.74	94.02	88.20	5.82	peak	No Limit

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

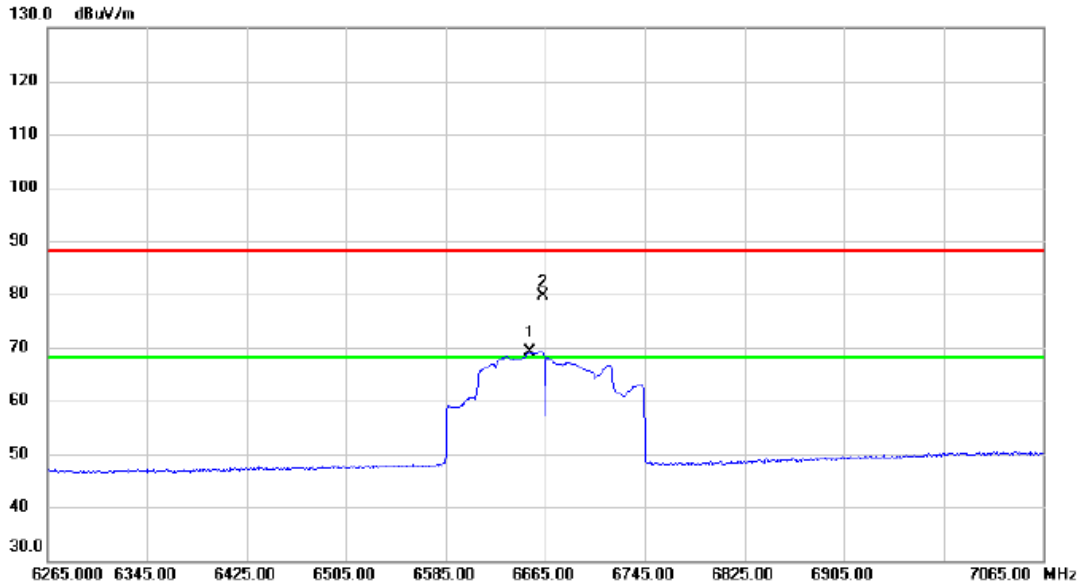
Test Mode	UNII-7_TX AX(HE160) Mode 6665 MHz	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	13330.16	25.88	17.19	43.07	54.00	-10.93	AVG	
2		13330.75	37.14	17.19	54.33	74.00	-19.67	peak	

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

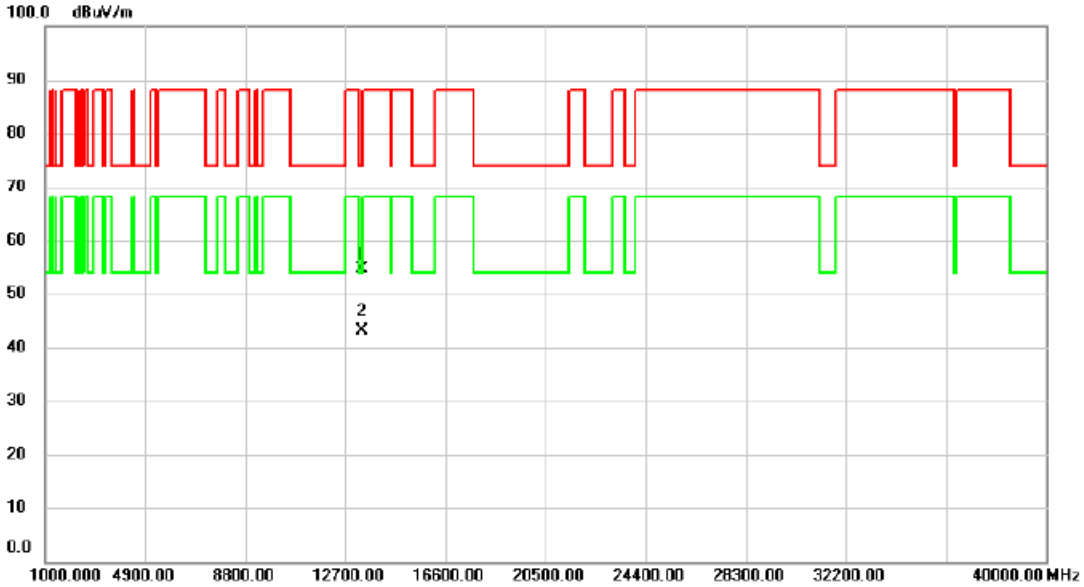
Test Mode	UNII-7_TX AX(HE160) Mode 6665 MHz	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	6653.000	50.45	18.64	69.09	68.20	0.89	AVG	No Limit
2		6663.400	60.84	18.69	79.53	88.20	-8.67	peak	No Limit

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

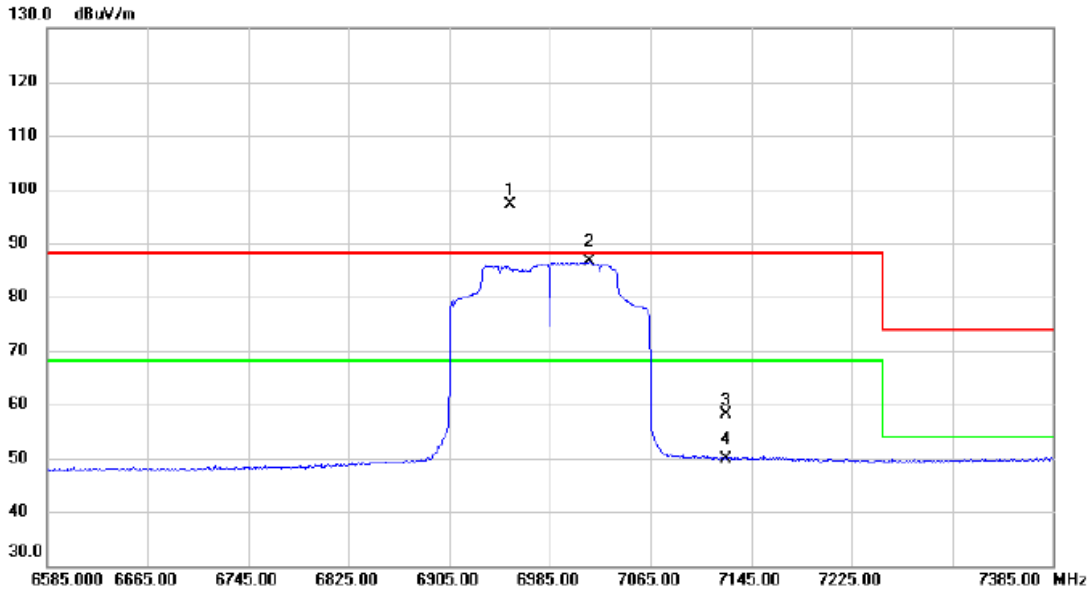
Test Mode	UNII-7_TX AX(HE160) Mode 6665 MHz	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		13329.57	37.41	17.19	54.60	74.00	-19.40	peak	
2	*	13331.32	25.81	17.20	43.01	54.00	-10.99	AVG	

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

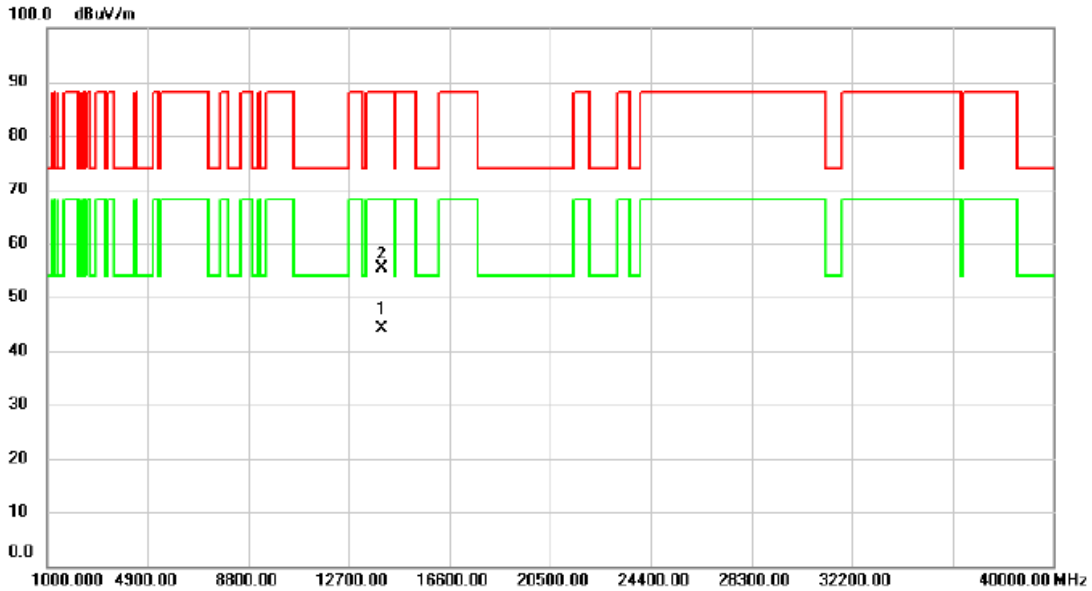
Test Mode	UNII-8_TX AX(HE160) Mode 6985 MHz	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	6953.800	77.18	20.07	97.25	88.20	9.05	peak	No Limit
2	*	7016.200	66.22	20.31	86.53	68.20	18.33	AVG	No Limit
3		7125.000	37.73	20.46	58.19	88.20	-30.01	peak	
4		7125.000	29.52	20.46	49.98	68.20	-18.22	AVG	

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

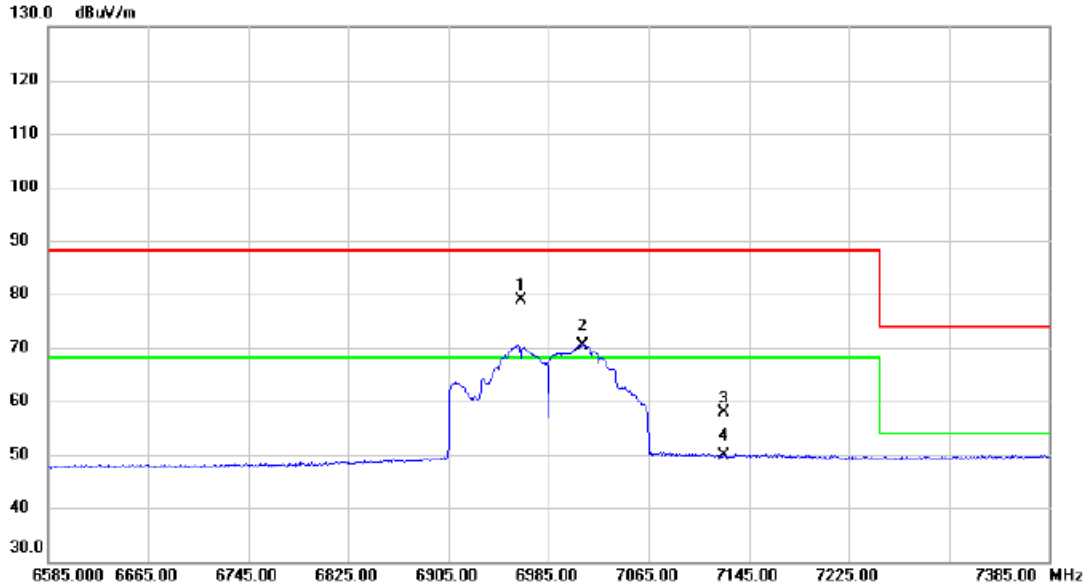
Test Mode	UNII-8_TX AX(HE160) Mode 6985 MHz	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	13970.01	25.61	18.51	44.12	68.20	-24.08	AVG	
2		13971.85	36.83	18.51	55.34	88.20	-32.86	peak	

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

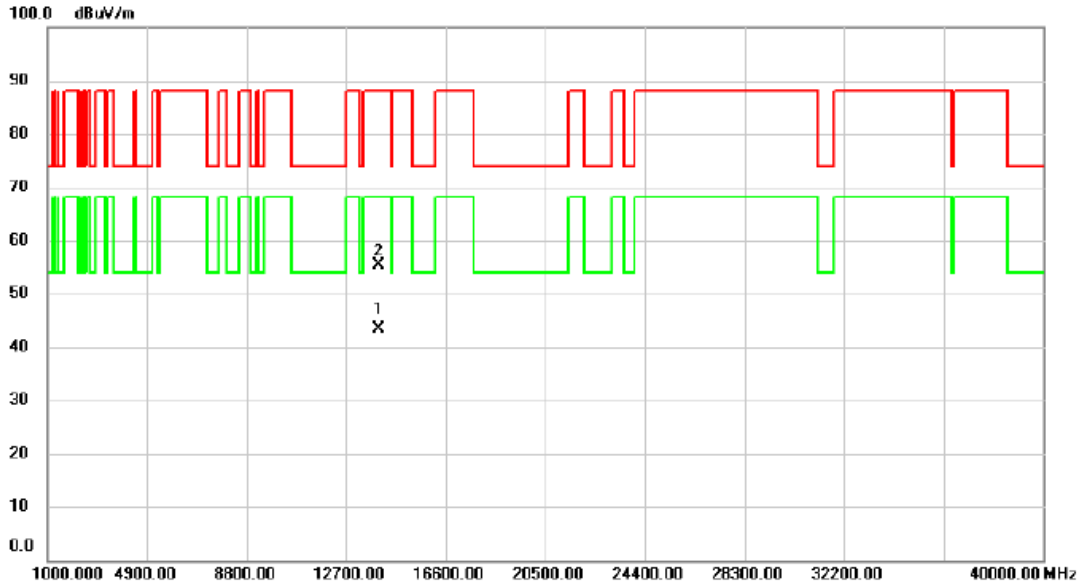
Test Mode	UNII-8_TX AX(HE160) Mode 6985 MHz	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		6963.400	58.72	20.12	78.84	88.20	-9.36	peak	No Limit
2	*	7012.200	50.10	20.30	70.40	68.20	2.20	AVG	No Limit
3		7125.000	37.53	20.46	57.99	88.20	-30.21	peak	
4		7125.000	29.33	20.46	49.79	68.20	-18.41	AVG	

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

Test Mode	UNII-8_TX AX(HE160) Mode 6985 MHz	Polarization	Horizontal



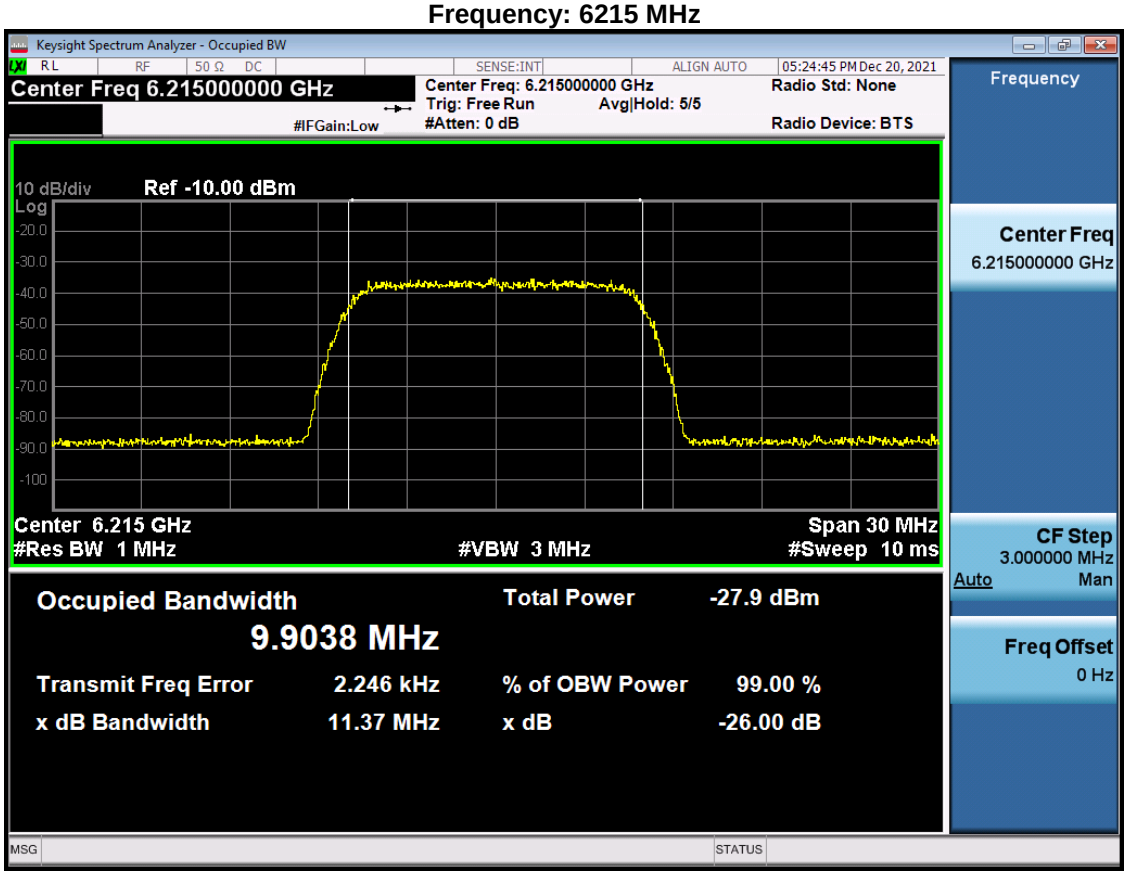
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	13970.90	24.95	18.51	43.46	68.20	-24.74	AVG	
2		13970.99	36.98	18.51	55.49	88.20	-32.71	peak	

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

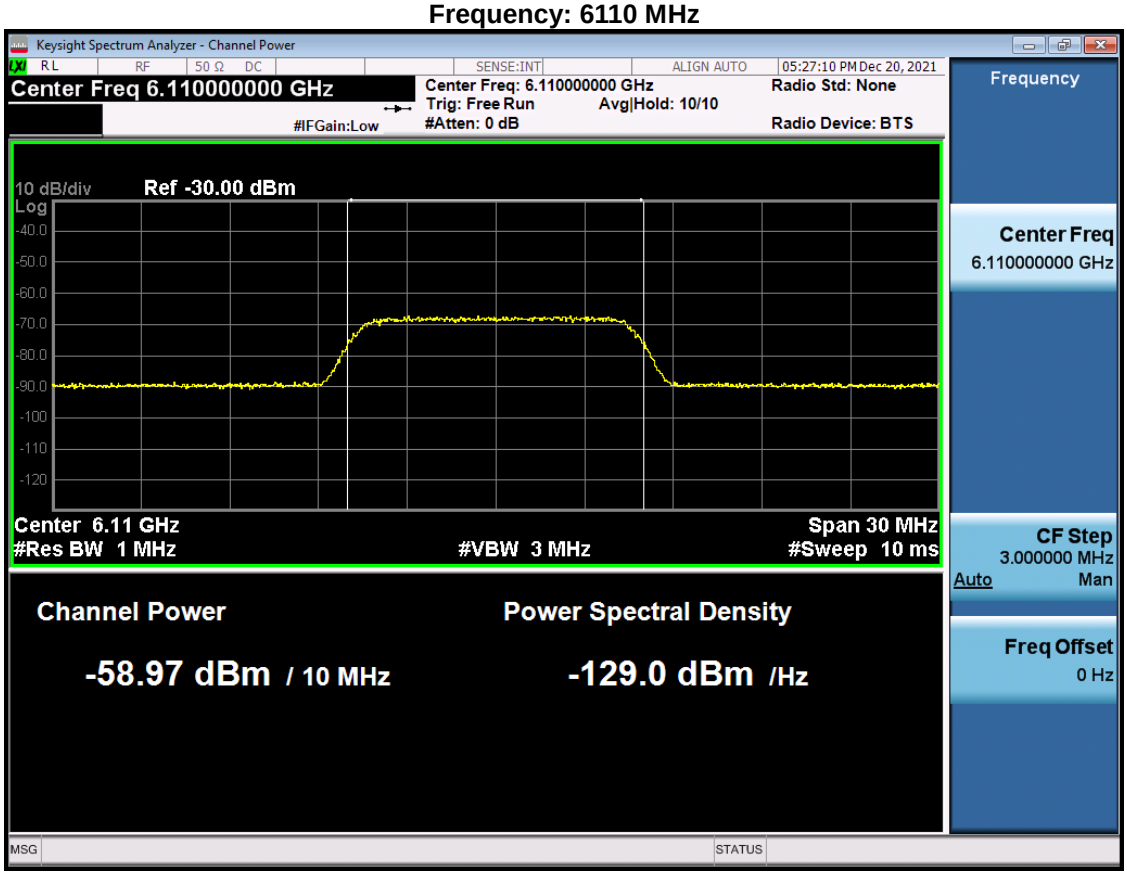
APPENDIX C - CONTENTION BASED PROTOCOL

Test Mode	UNII-5, UNII-6, UNII-7, UNII-8

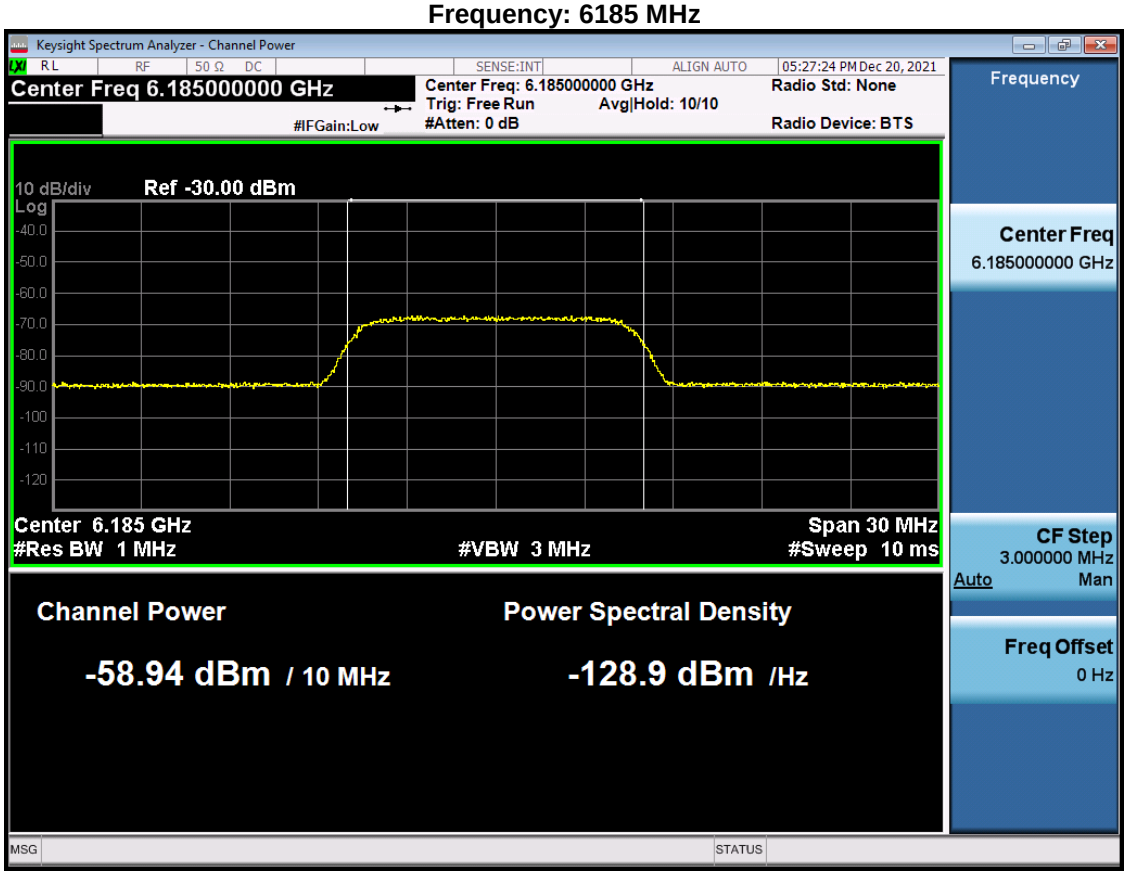
Incumbent Signal (AWGN)
Frequency: 6215 MHz



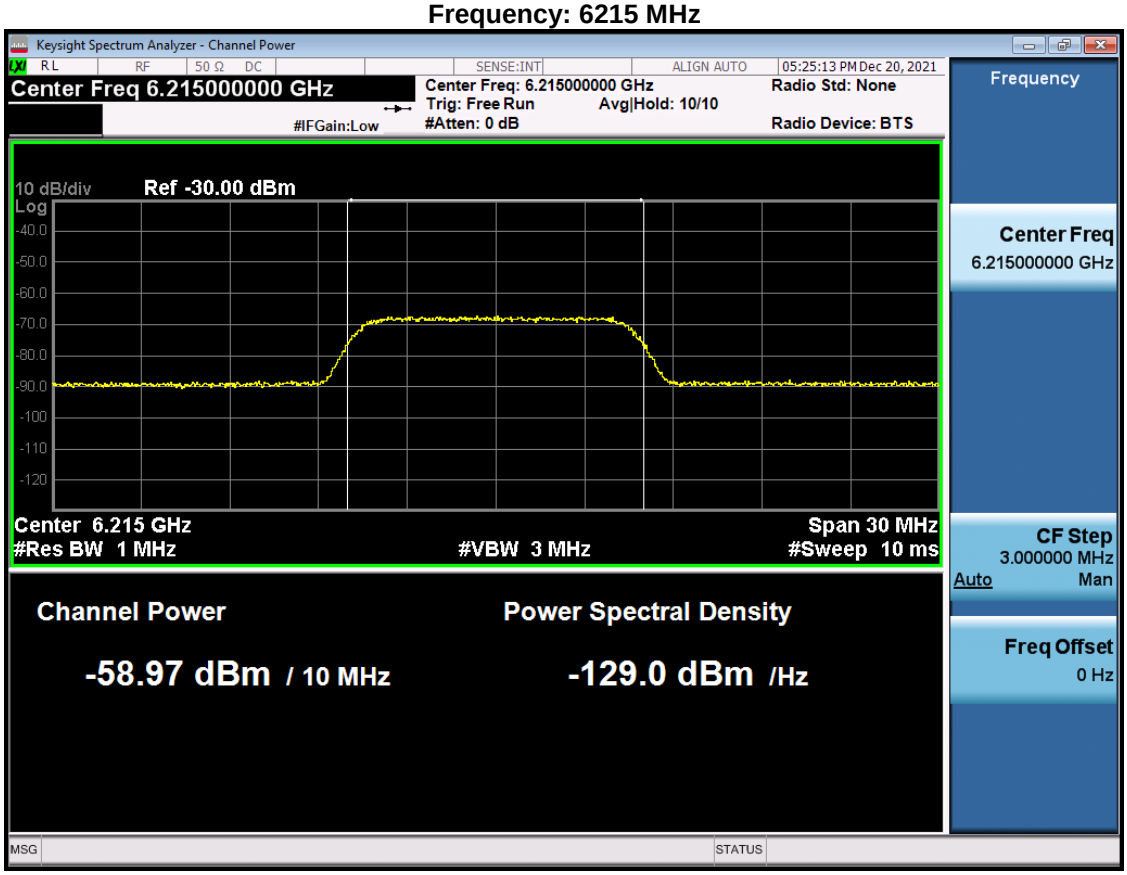
Frequency: 6110 MHz



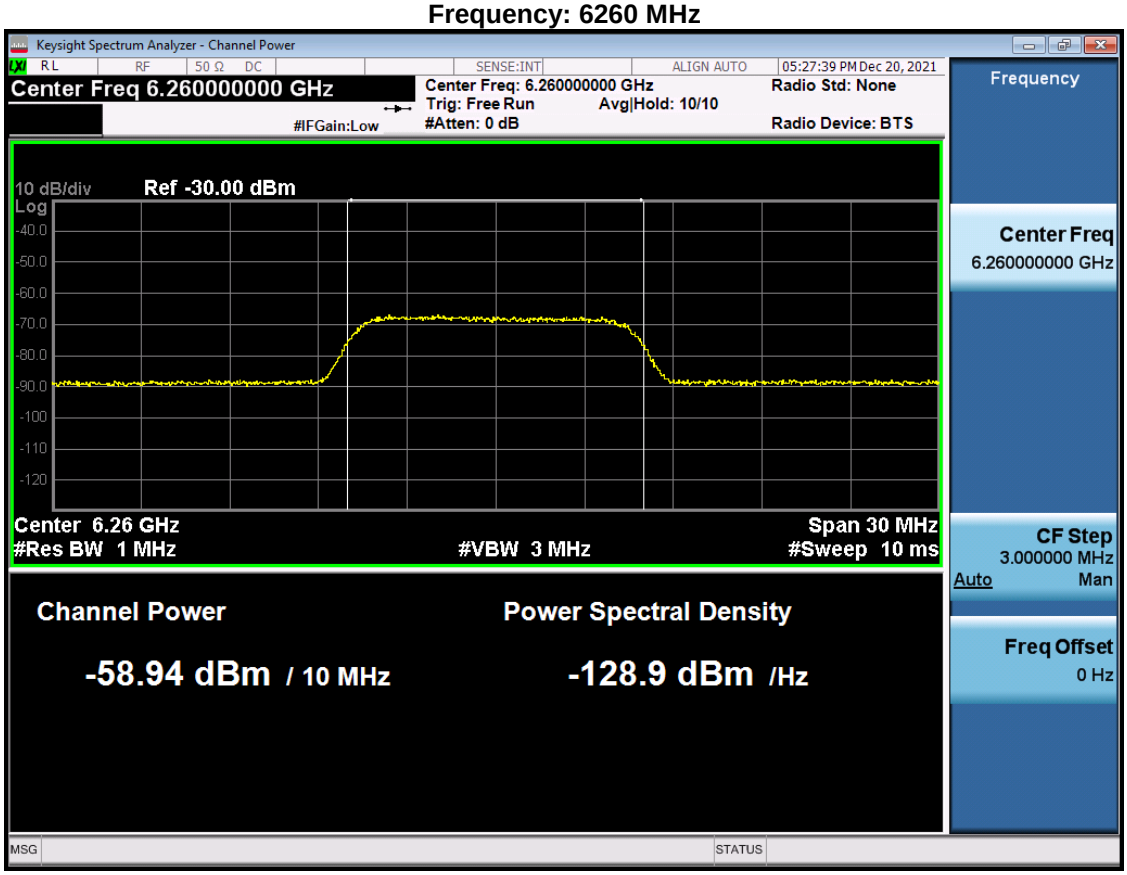
Frequency: 6185 MHz



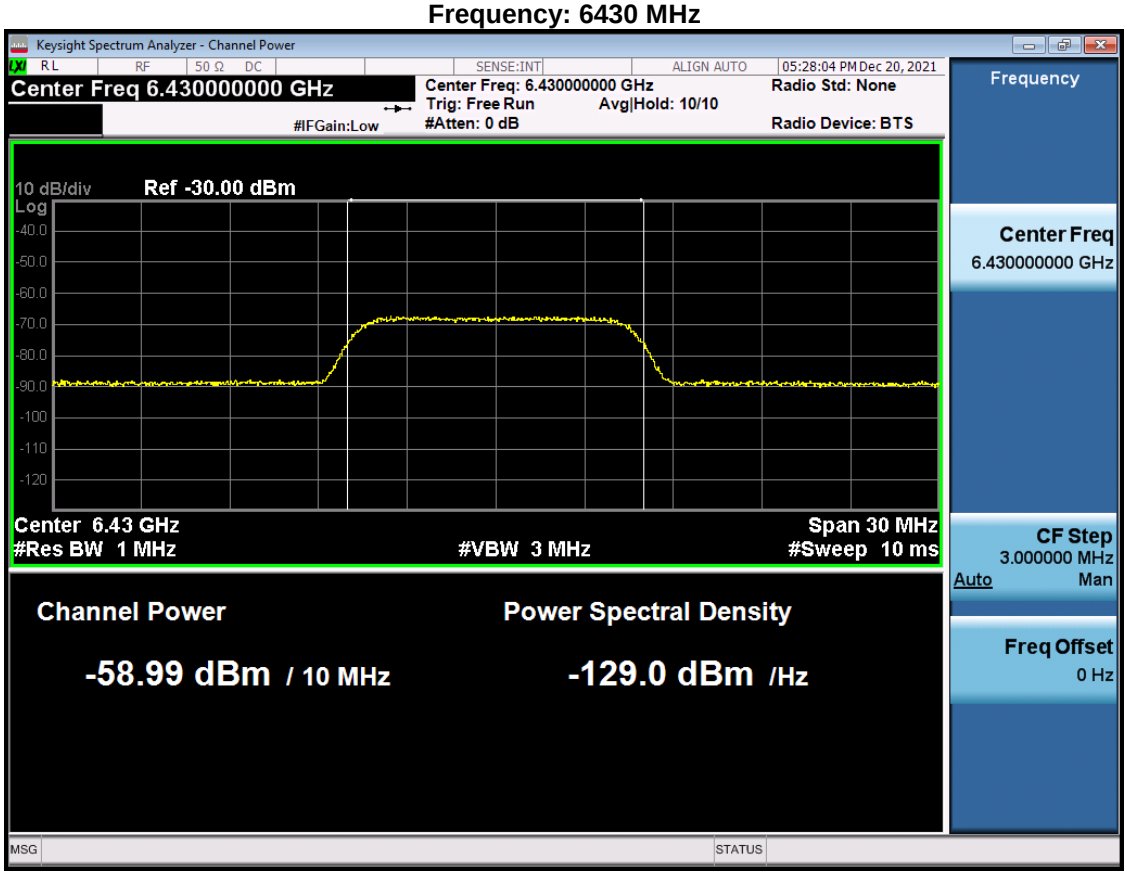
Frequency: 6215 MHz



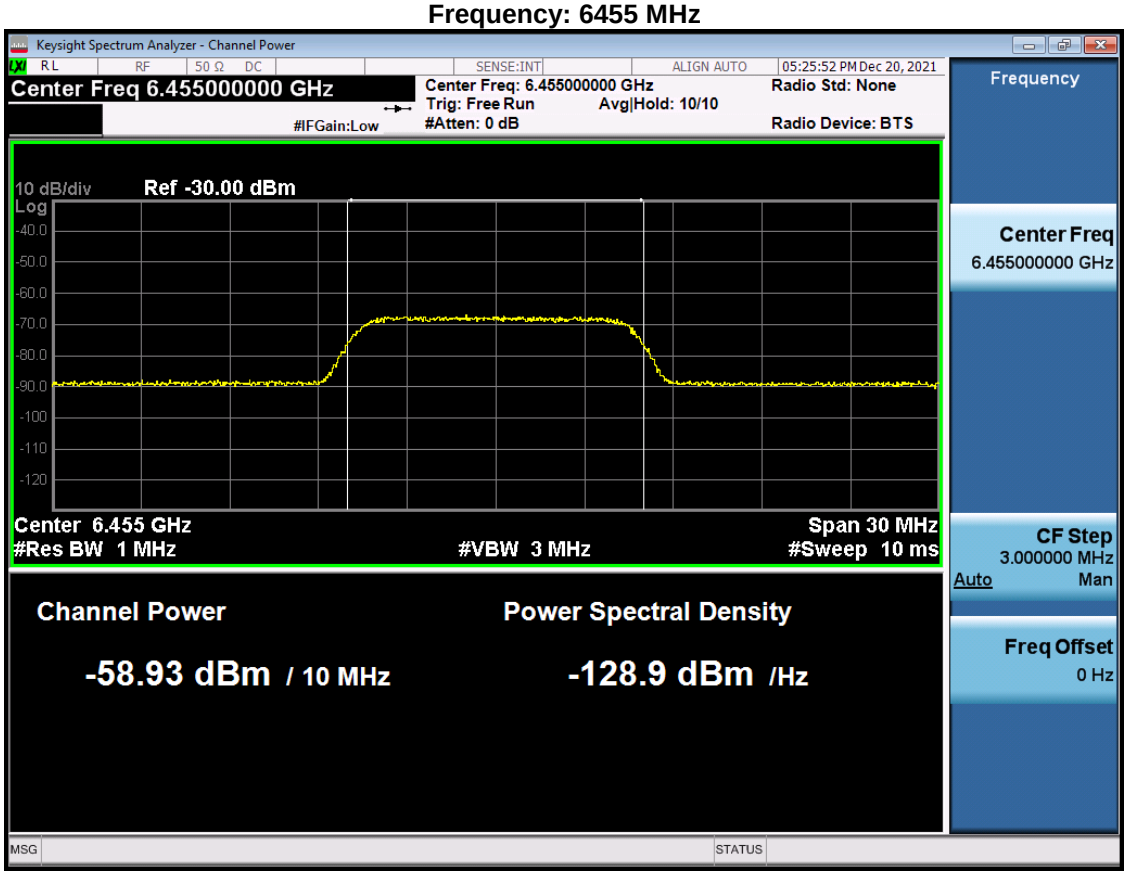
Frequency: 6260 MHz



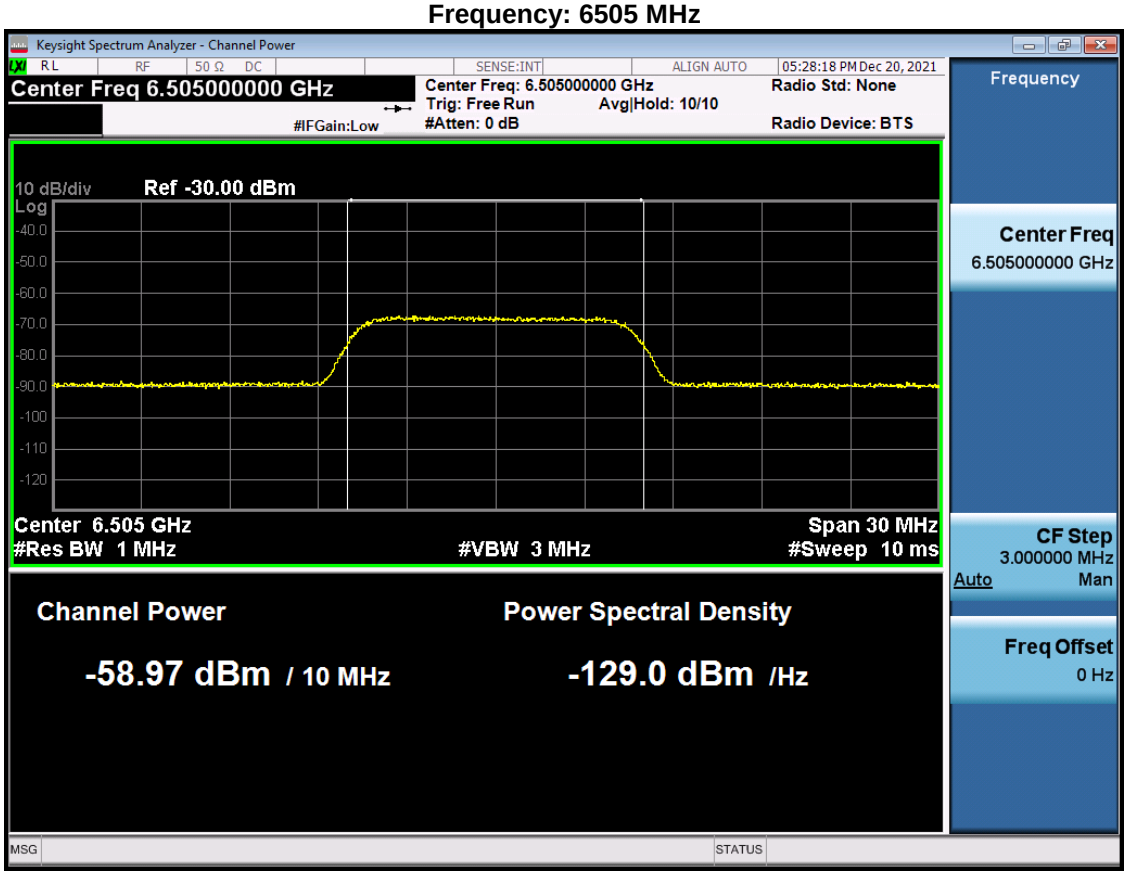
Frequency: 6430 MHz



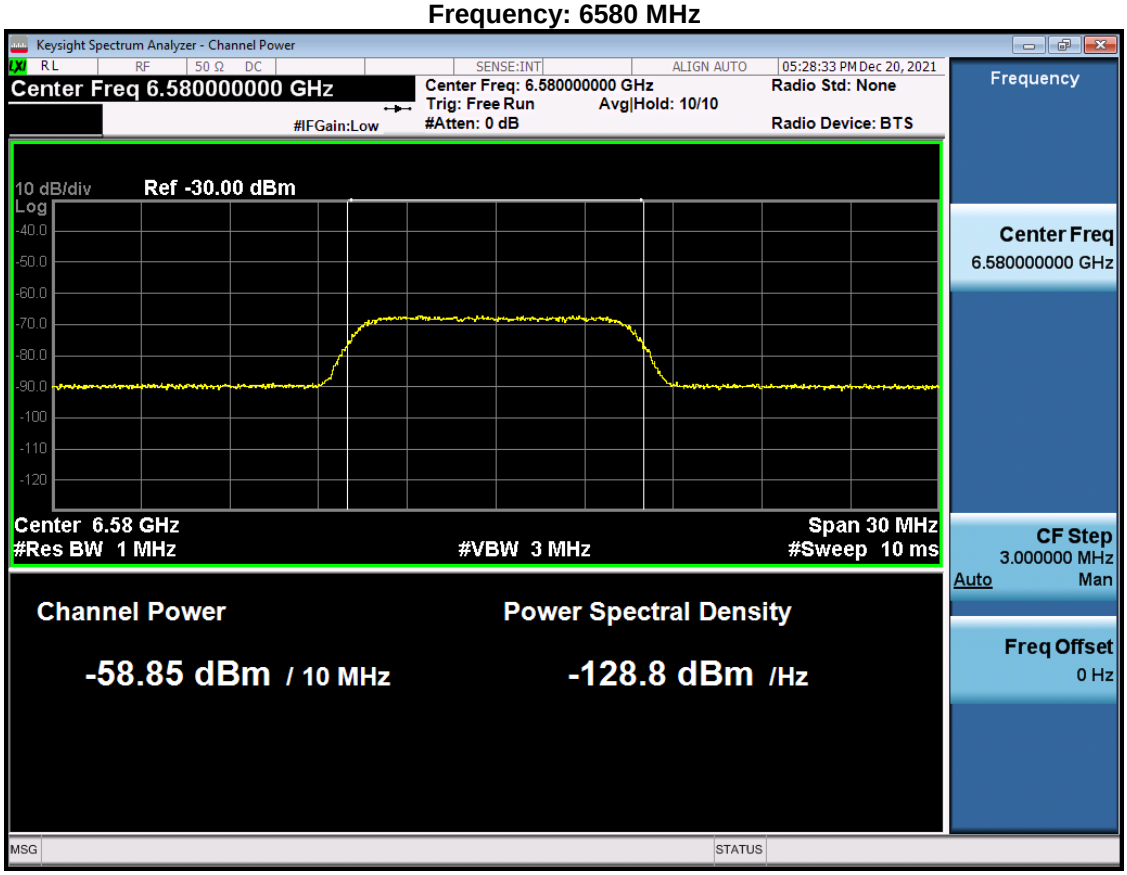
Frequency: 6455 MHz



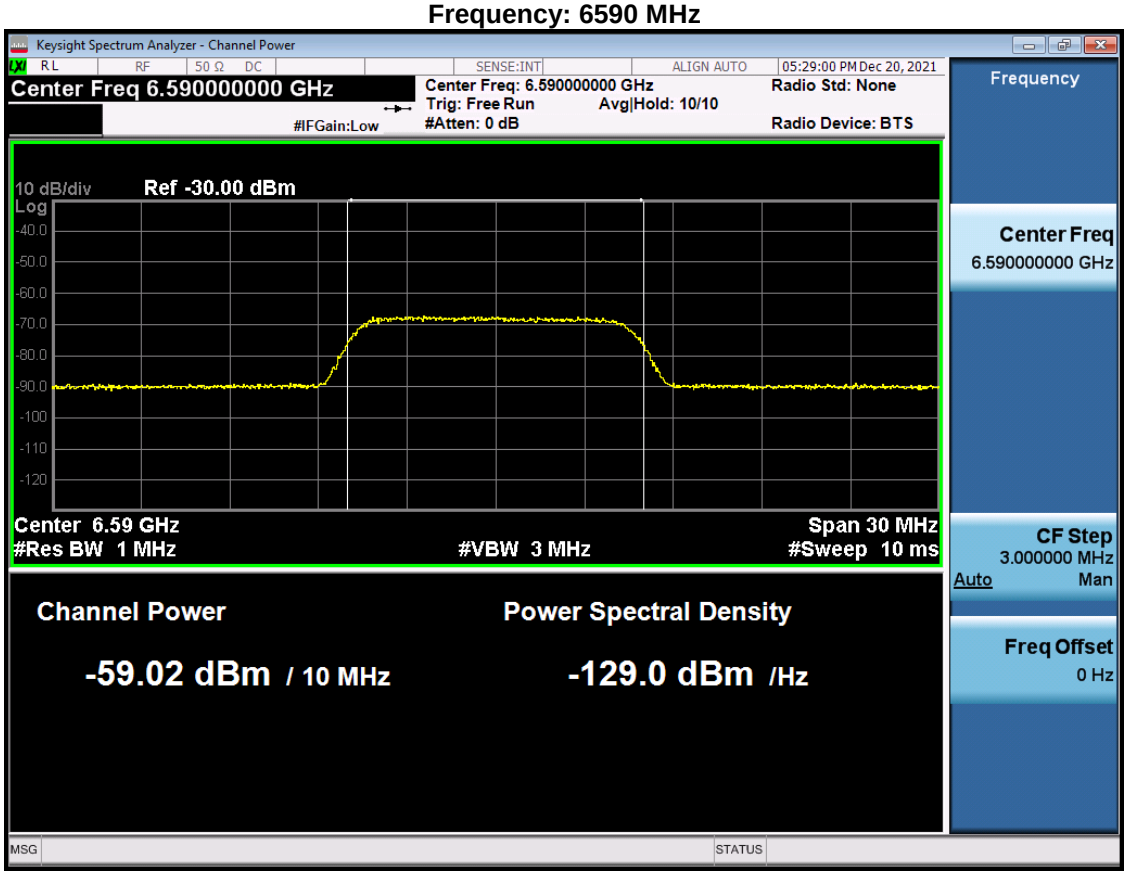
Frequency: 6505 MHz



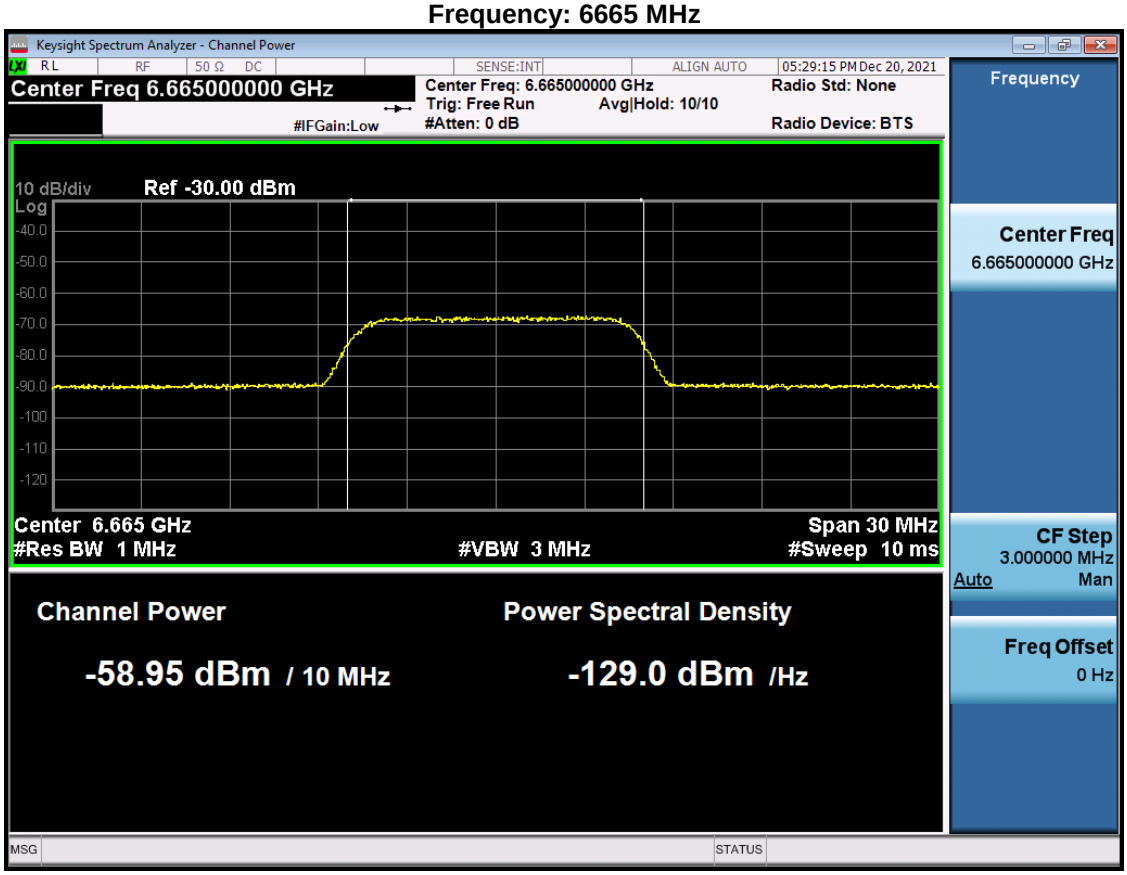
Frequency: 6580 MHz



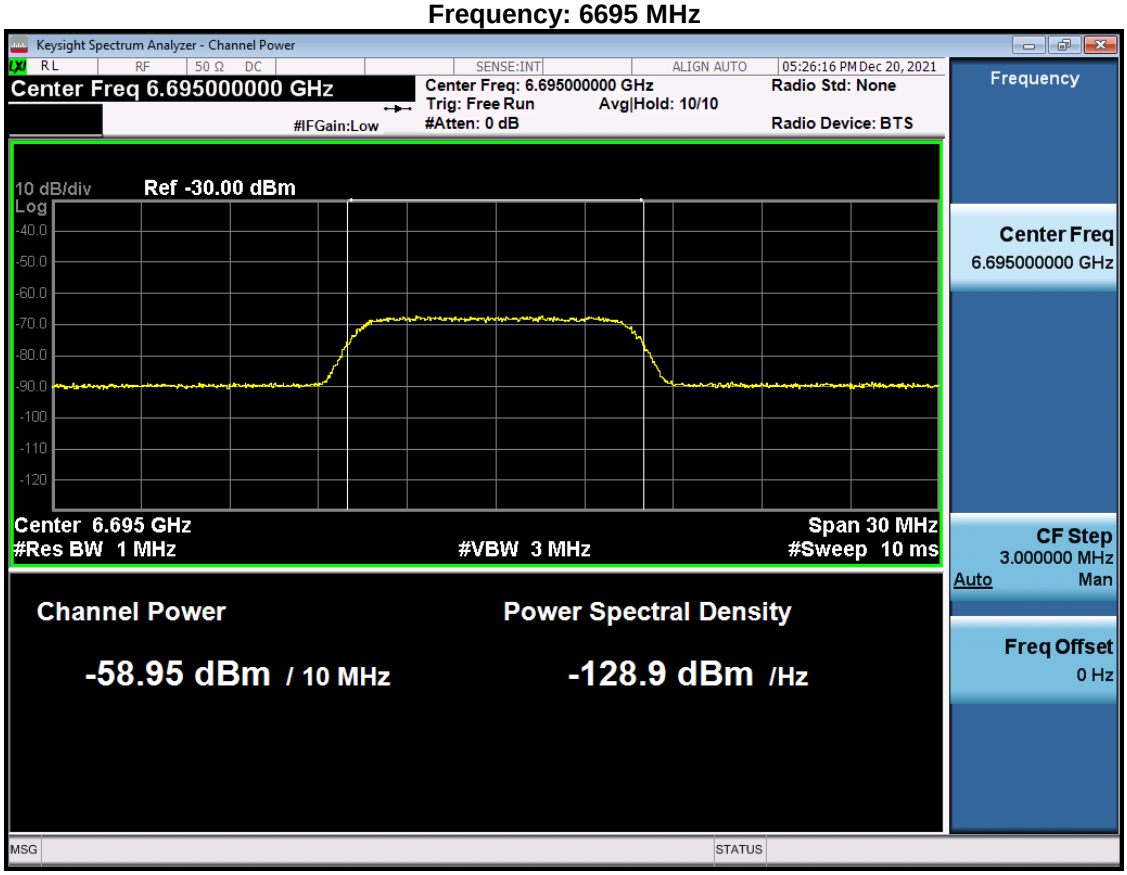
Frequency: 6590 MHz



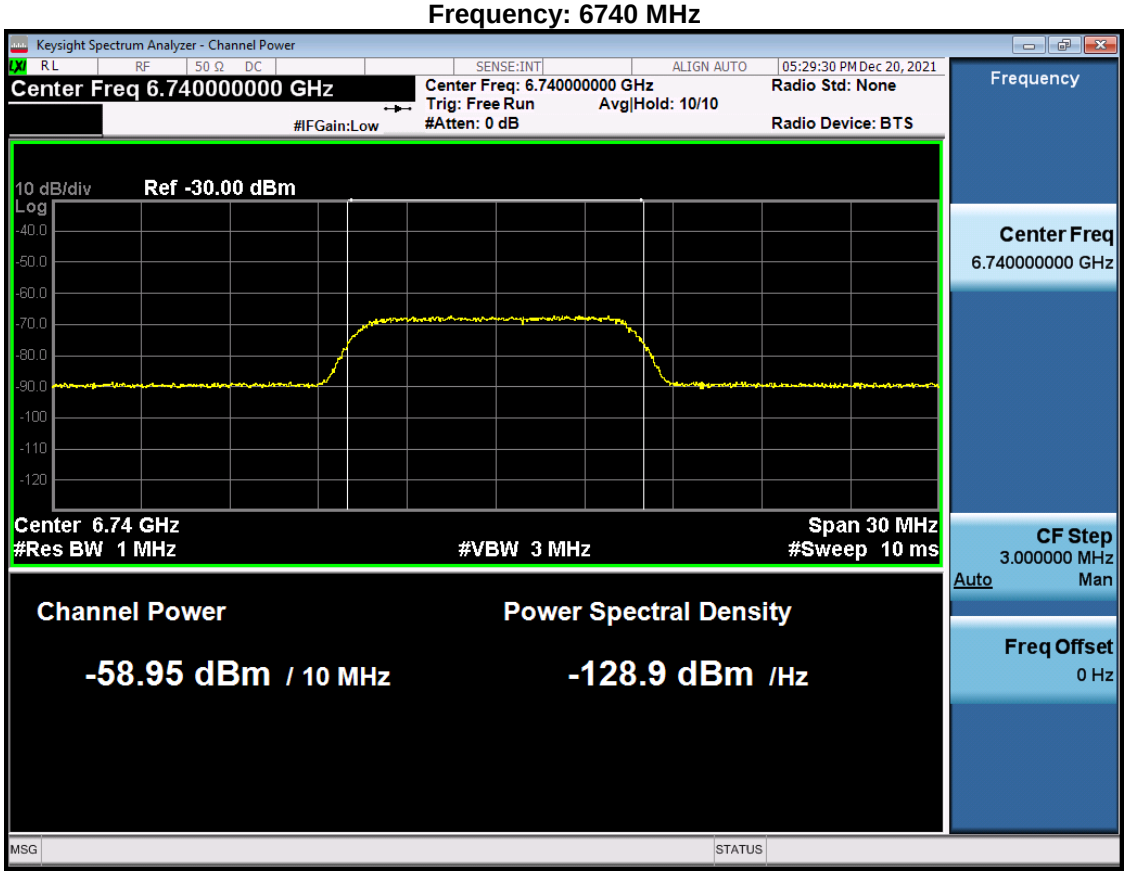
Frequency: 6665 MHz



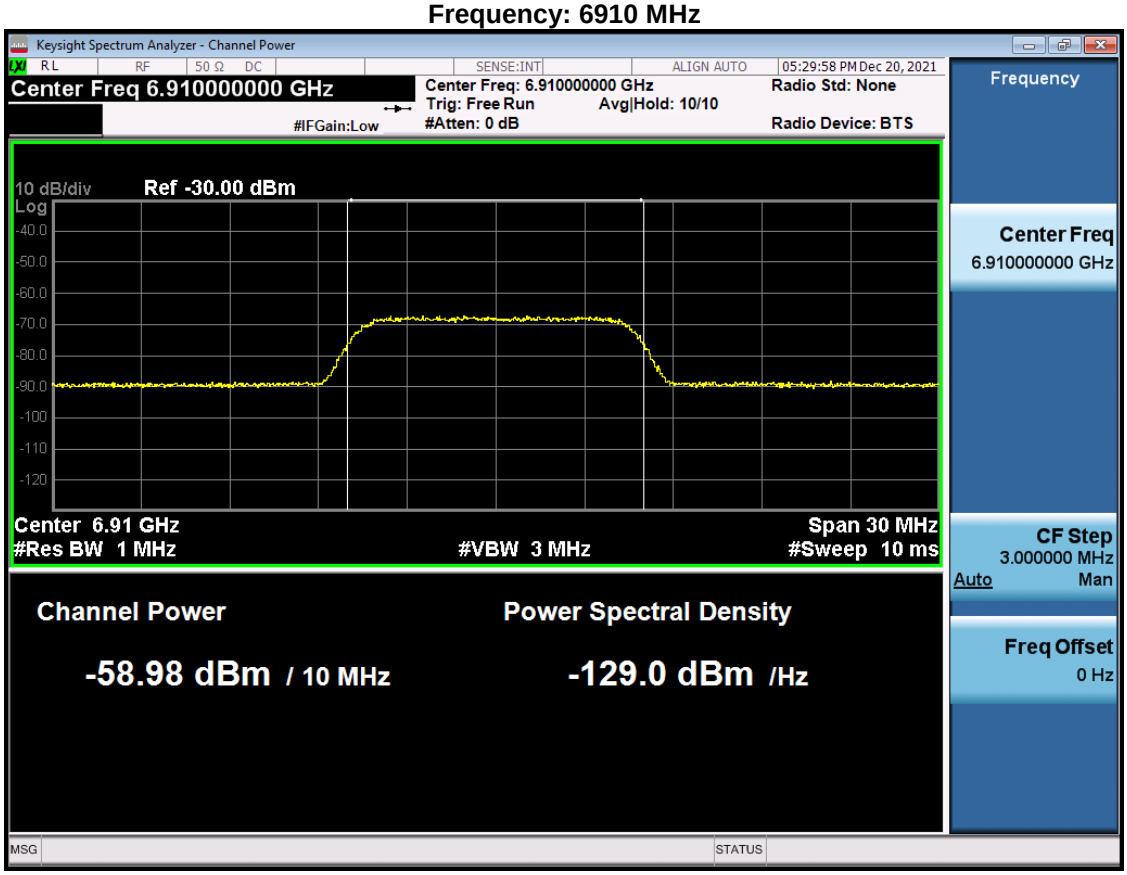
Frequency: 6695 MHz



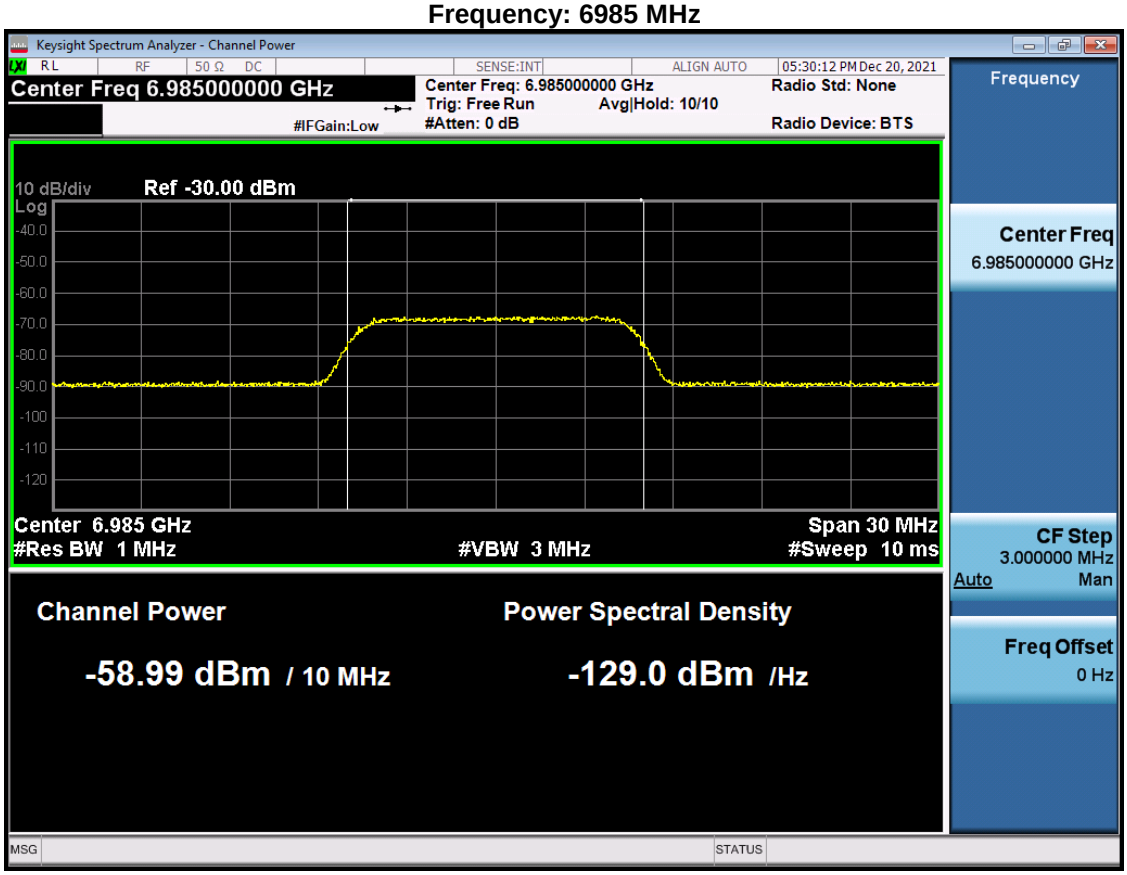
Frequency: 6740 MHz



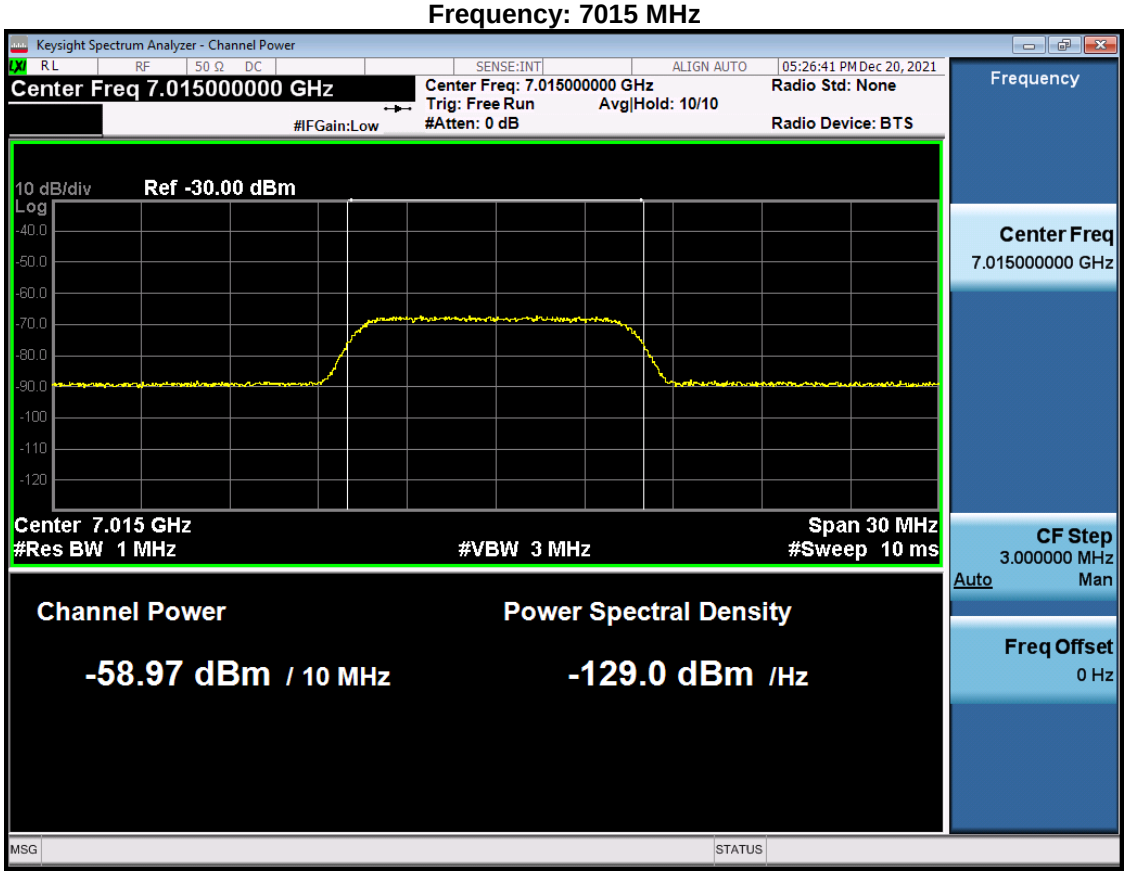
Frequency: 6910 MHz



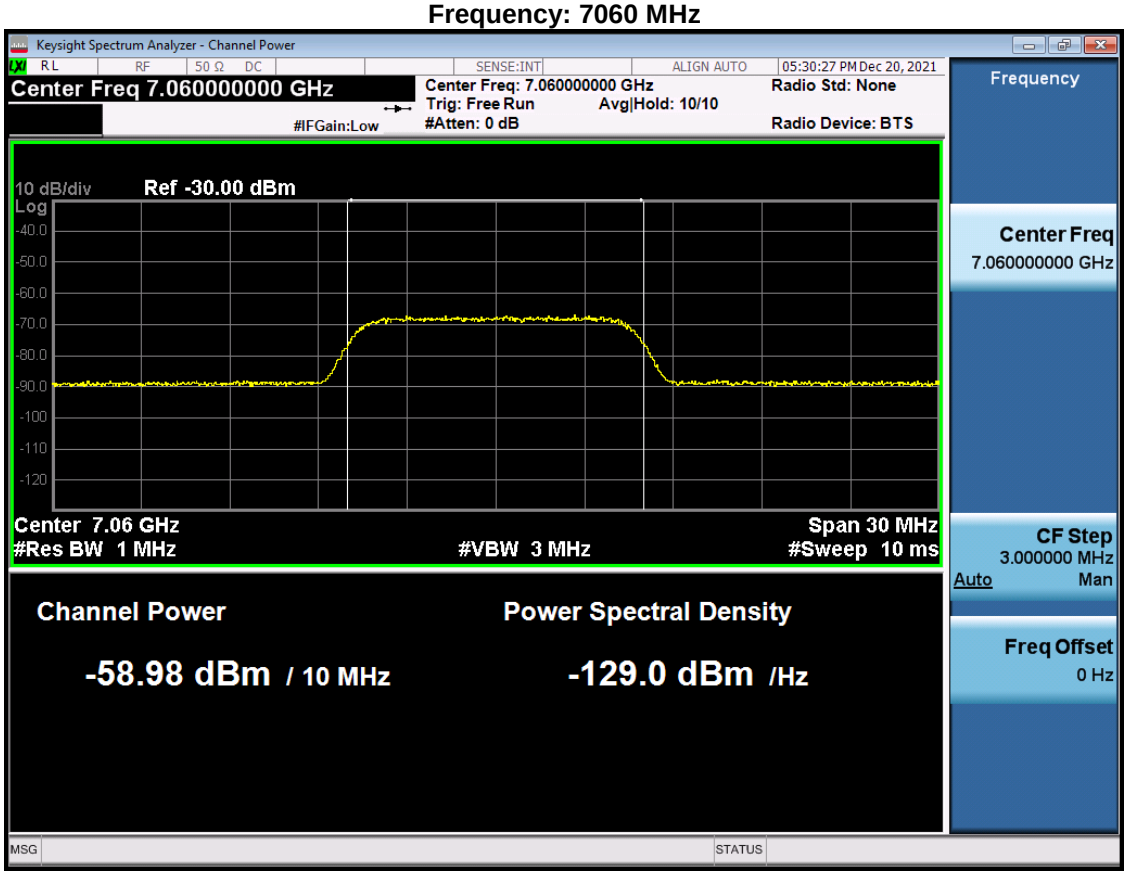
Frequency: 6985 MHz



Frequency: 7015 MHz



Frequency: 7060 MHz

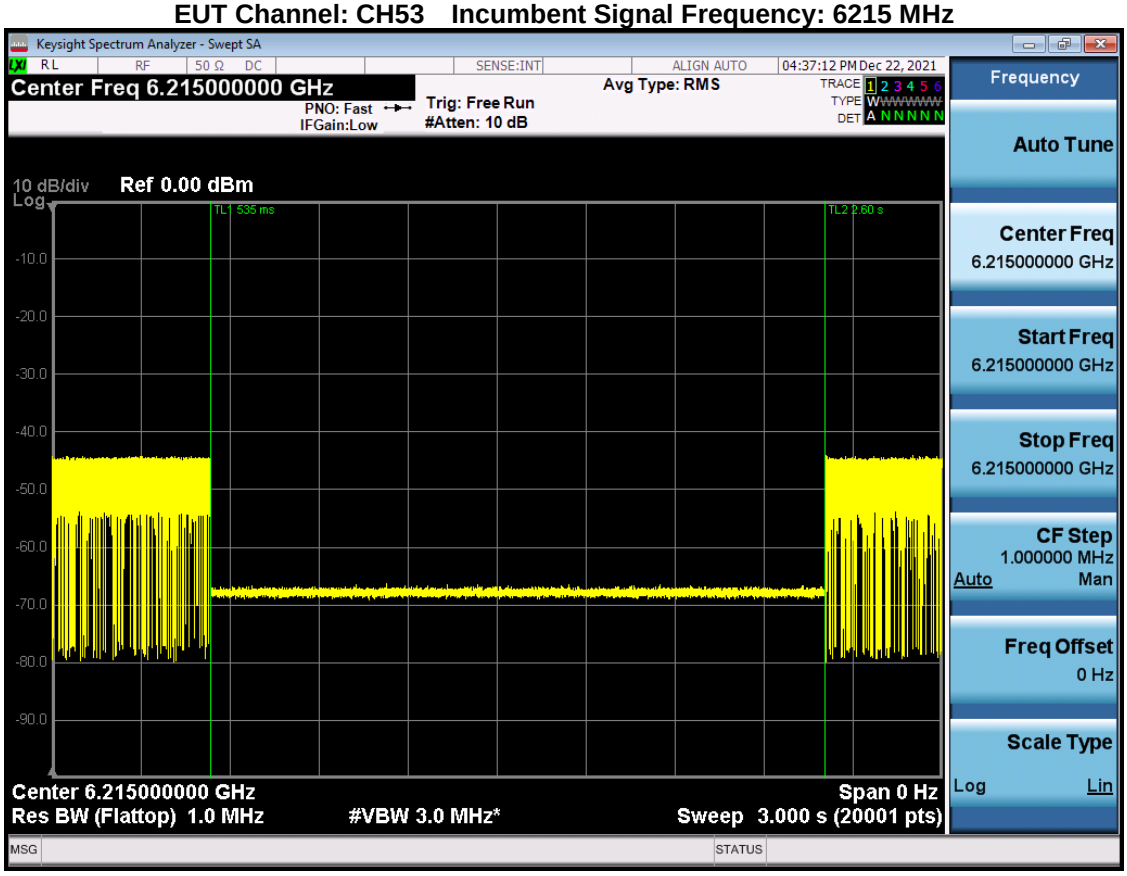


Detection power level and detection probability

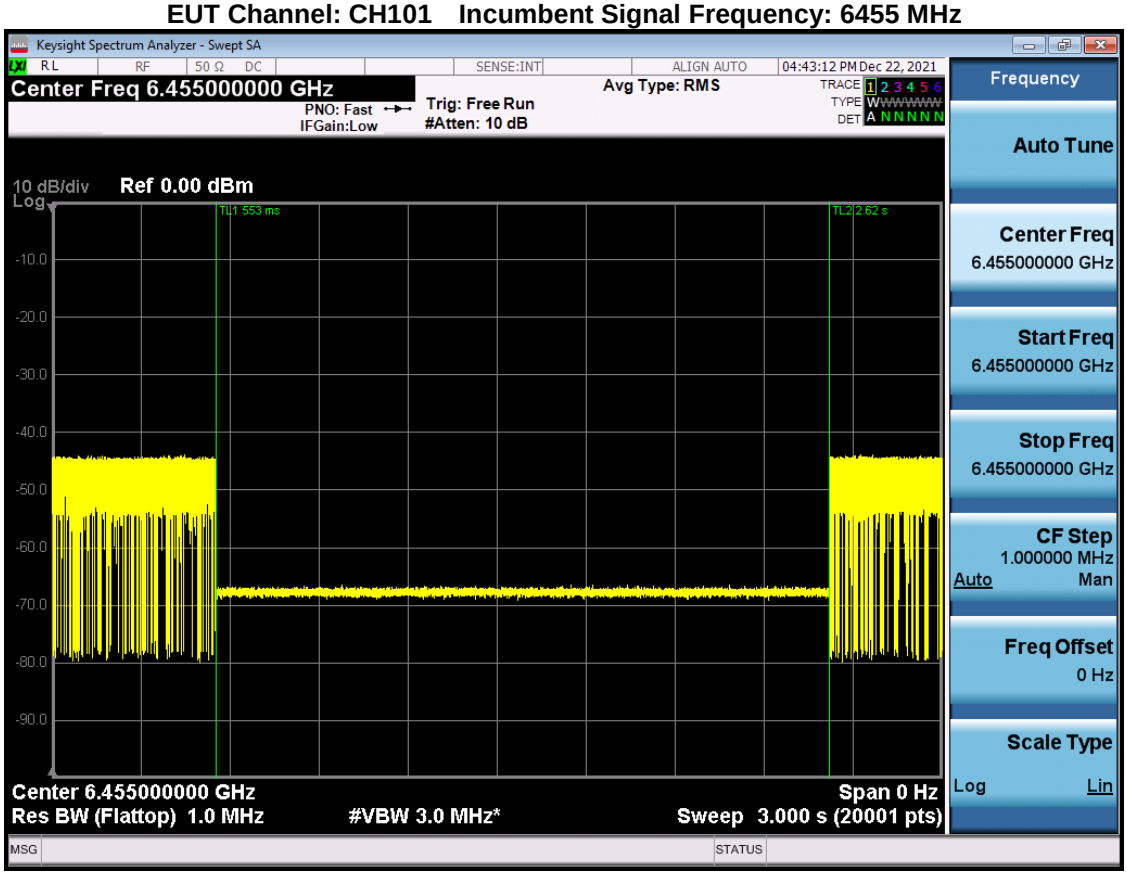
Bands	Test Mode	Bandwidth (MHz)	Channel	Frequency (MHz)	interference Frequency (MHz)	Detection power level (dBm)	Detection Power Limit (dBm)	Number of Times	Number of Detected	Detection Probability	Detection Probability Limit	Test Result
UNII-5	802.11a	20	53	6215	6215	-59.31	-58.97	10	10	100%	90%	Pass
	802.11ax	160	47	6185	6110	-59.35	-58.97	10	9	90%	90%	Pass
					6185	-60.67	-58.97	10	10	100%	90%	Pass
					6260	-60.86	-58.97	10	10	100%	90%	Pass
UNII-6	802.11a	20	101	6455	6455	-59.83	-58.97	10	9	90%	90%	Pass
	802.11ax	160	111	6505	6430	-59.17	-58.97	10	10	100%	90%	Pass
					6505	-59.32	-58.97	10	10	100%	90%	Pass
					6580	-60.83	-58.97	10	9	90%	90%	Pass
UNII-7	802.11a	20	149	6695	6695	-59.12	-58.97	10	10	100%	90%	Pass
	802.11ax	160	143	6665	6590	-59.23	-58.97	10	10	100%	90%	Pass
					6665	-59.99	-58.97	10	9	90%	90%	Pass
					6740	-60.37	-58.97	10	10	100%	90%	Pass
UNII-8	802.11a	20	213	7015	7015	-59.98	-58.97	10	9	90%	90%	Pass
	802.11ax	160	207	6985	6910	-59.63	-58.97	10	10	100%	90%	Pass
					6985	-60.54	-58.97	10	9	90%	90%	Pass
					7060	-60.72	-58.97	10	10	100%	90%	Pass

Contention-Based Protocol

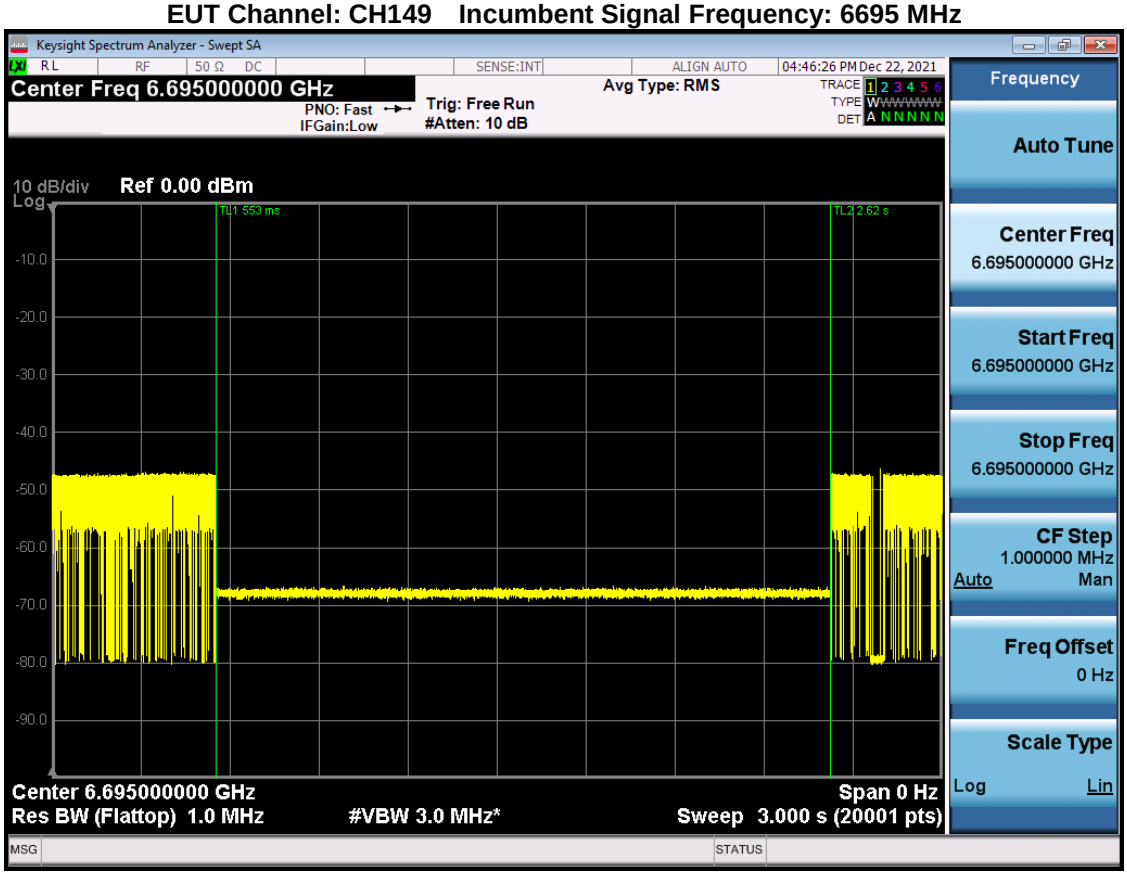
EUT Channel: CH53 Incumbent Signal Frequency: 6215 MHz



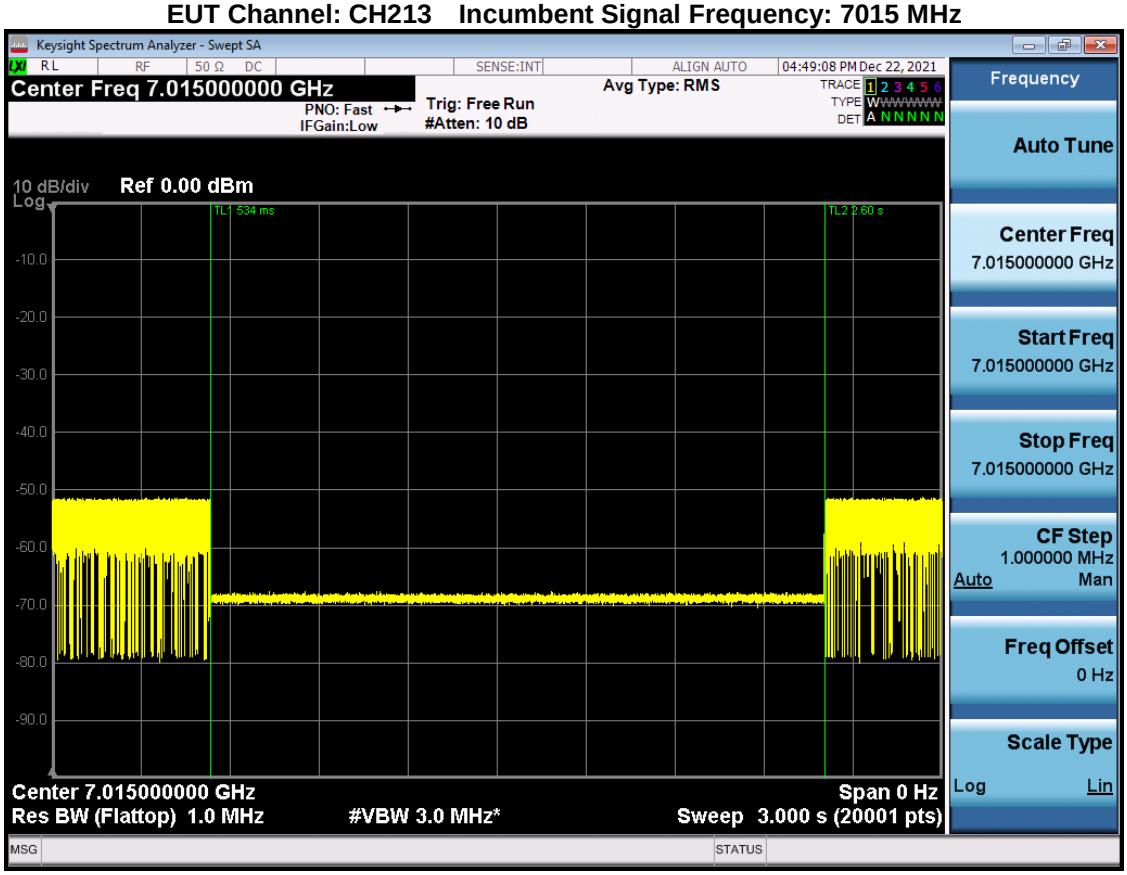
EUT Channel: CH101 Incumbent Signal Frequency: 6455 MHz



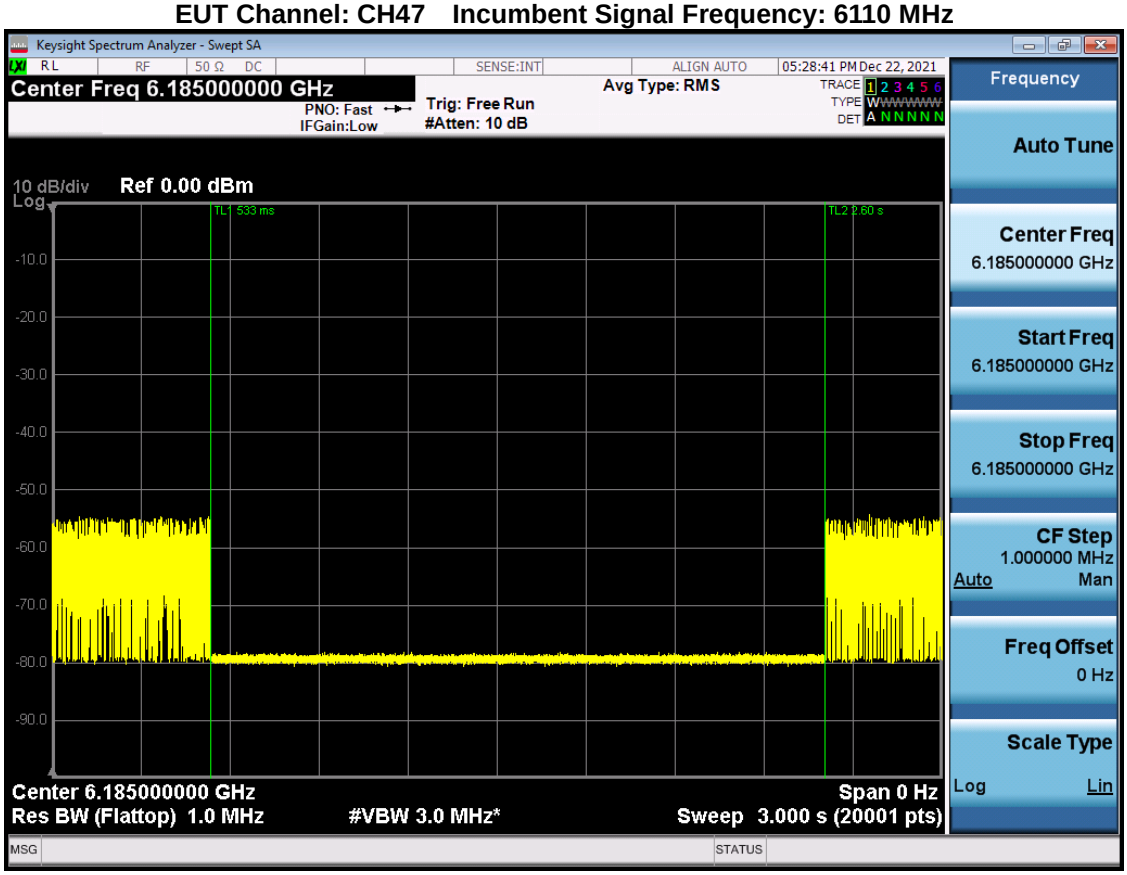
EUT Channel: CH149 Incumbent Signal Frequency: 6695 MHz



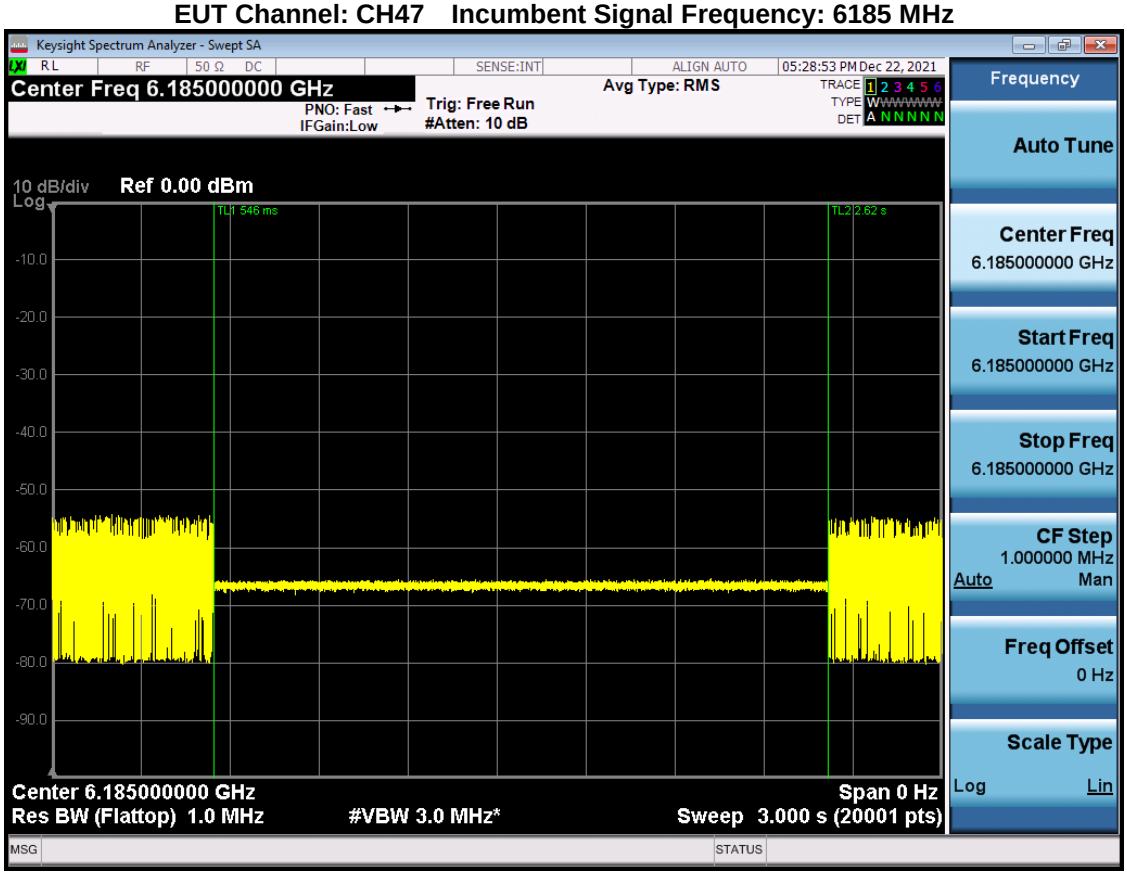
EUT Channel: CH213 Incumbent Signal Frequency: 7015 MHz



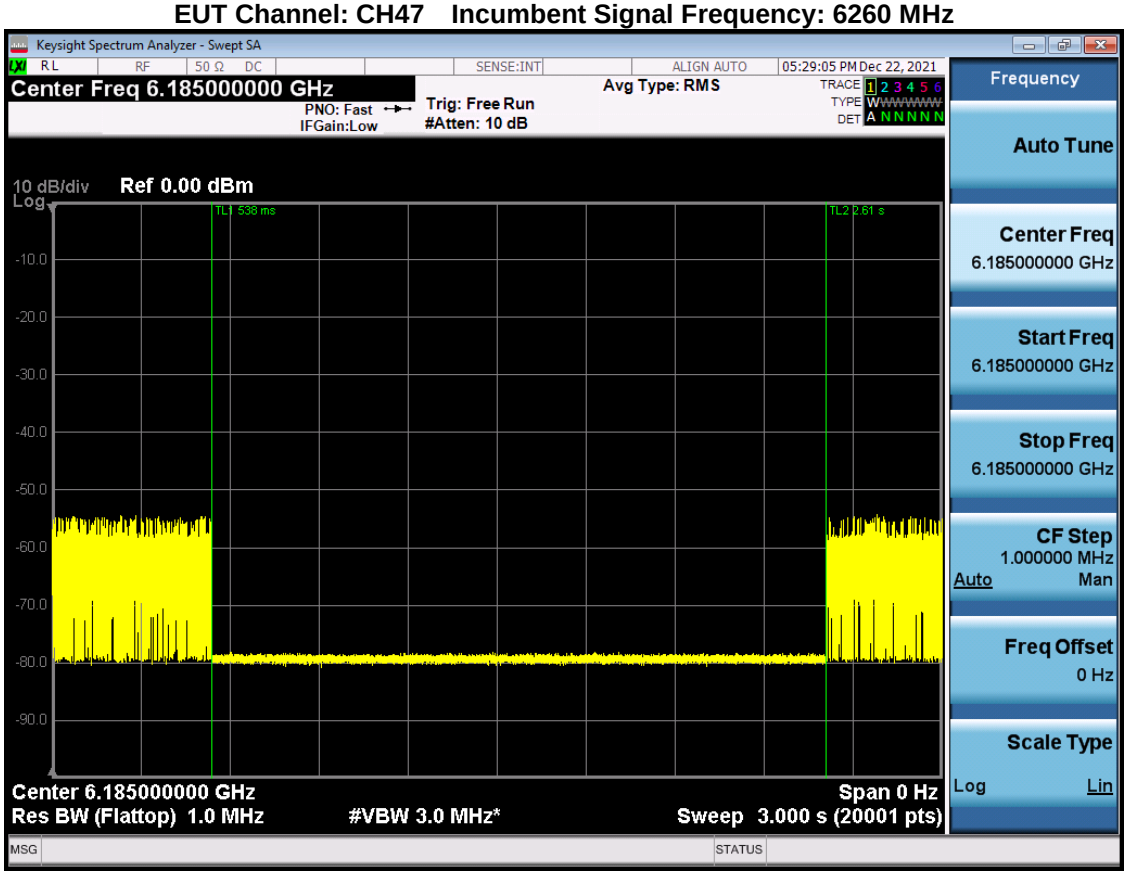
EUT Channel: CH47 Incumbent Signal Frequency: 6110 MHz



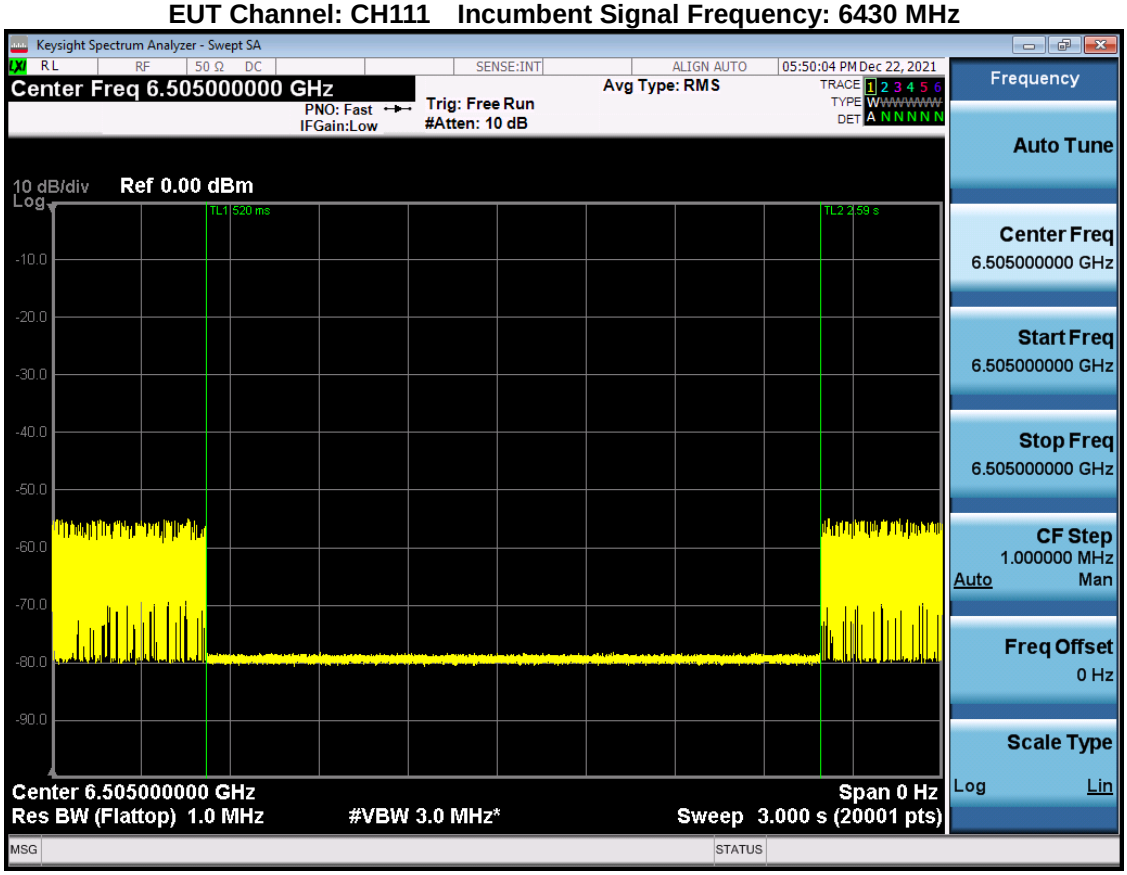
EUT Channel: CH47 Incumbent Signal Frequency: 6185 MHz



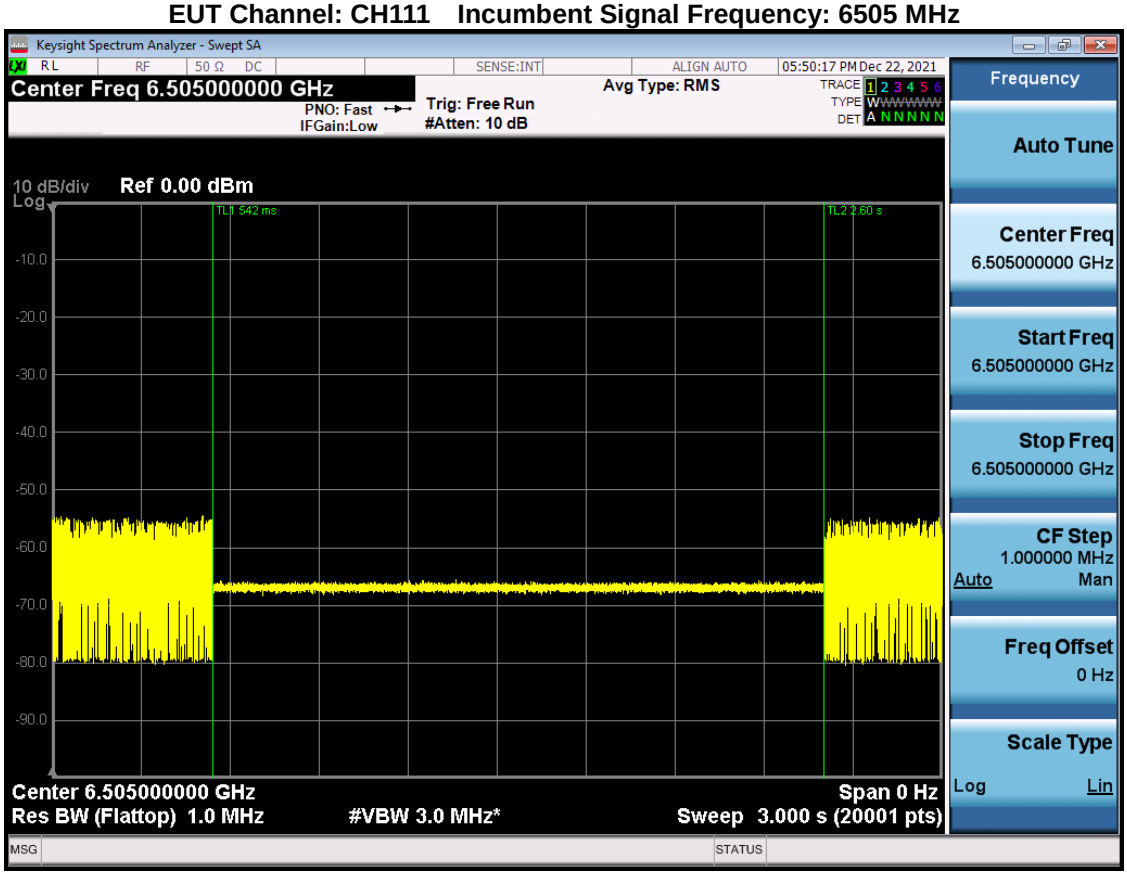
EUT Channel: CH47 Incumbent Signal Frequency: 6260 MHz



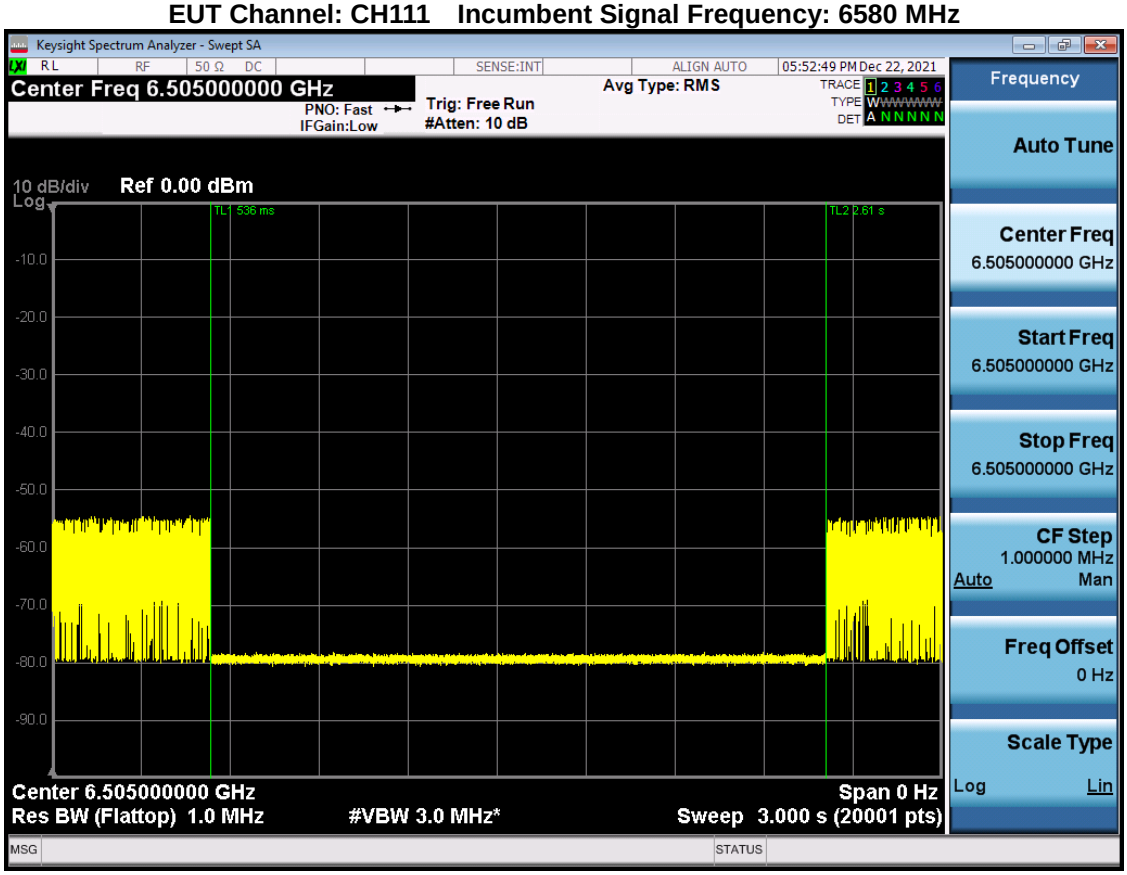
EUT Channel: CH111 Incumbent Signal Frequency: 6430 MHz



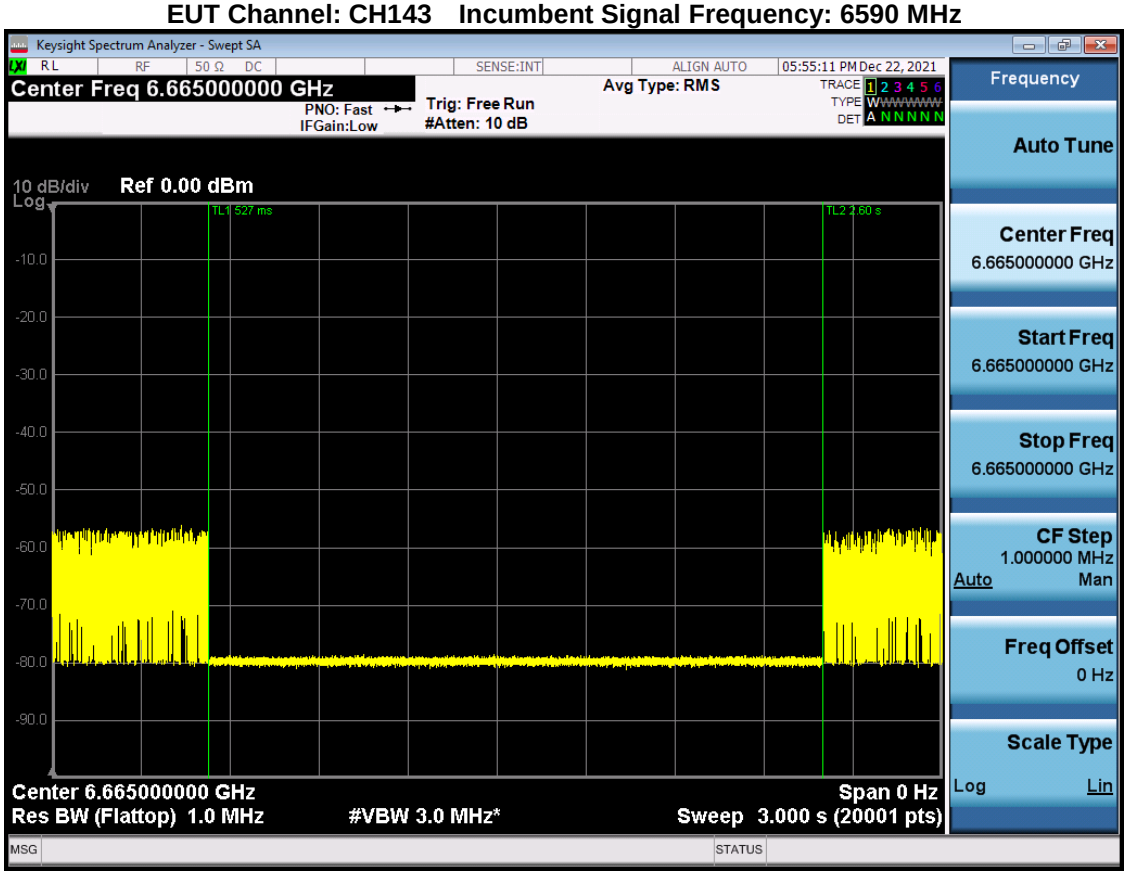
EUT Channel: CH111 Incumbent Signal Frequency: 6505 MHz



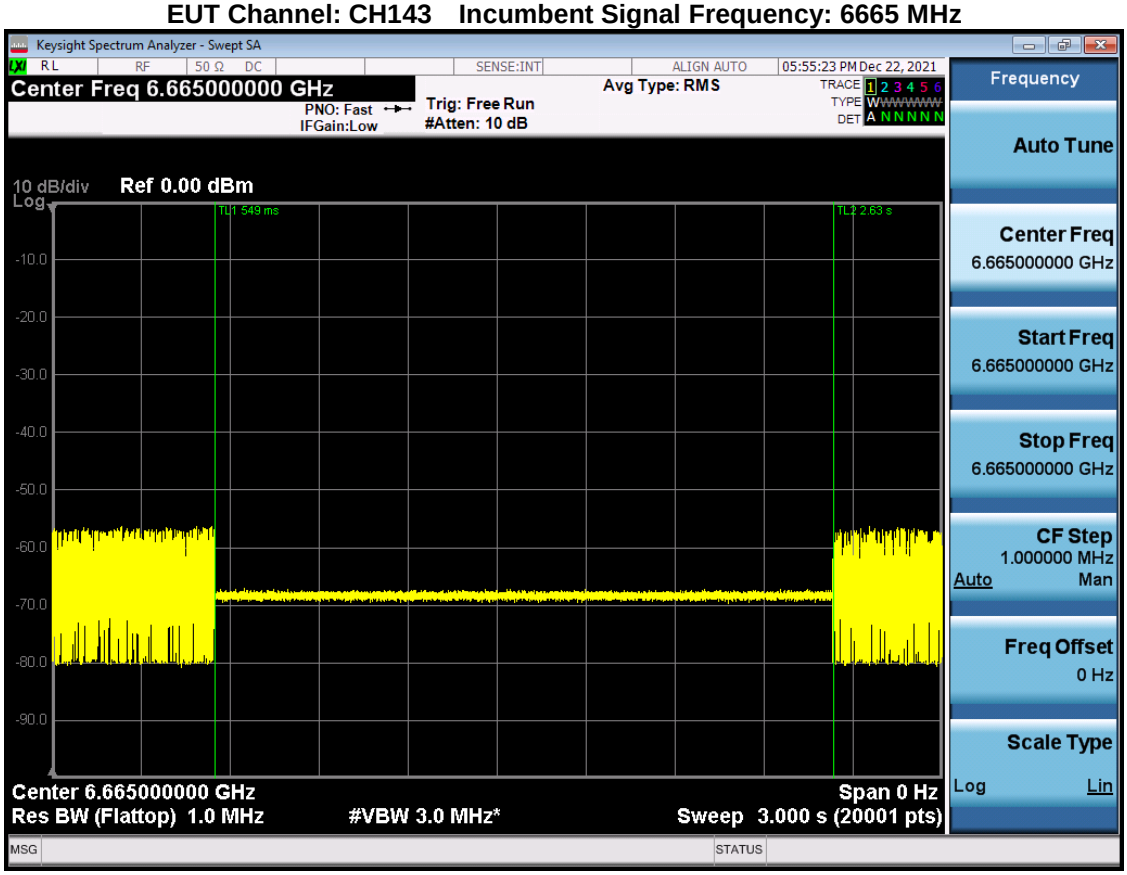
EUT Channel: CH111 Incumbent Signal Frequency: 6580 MHz



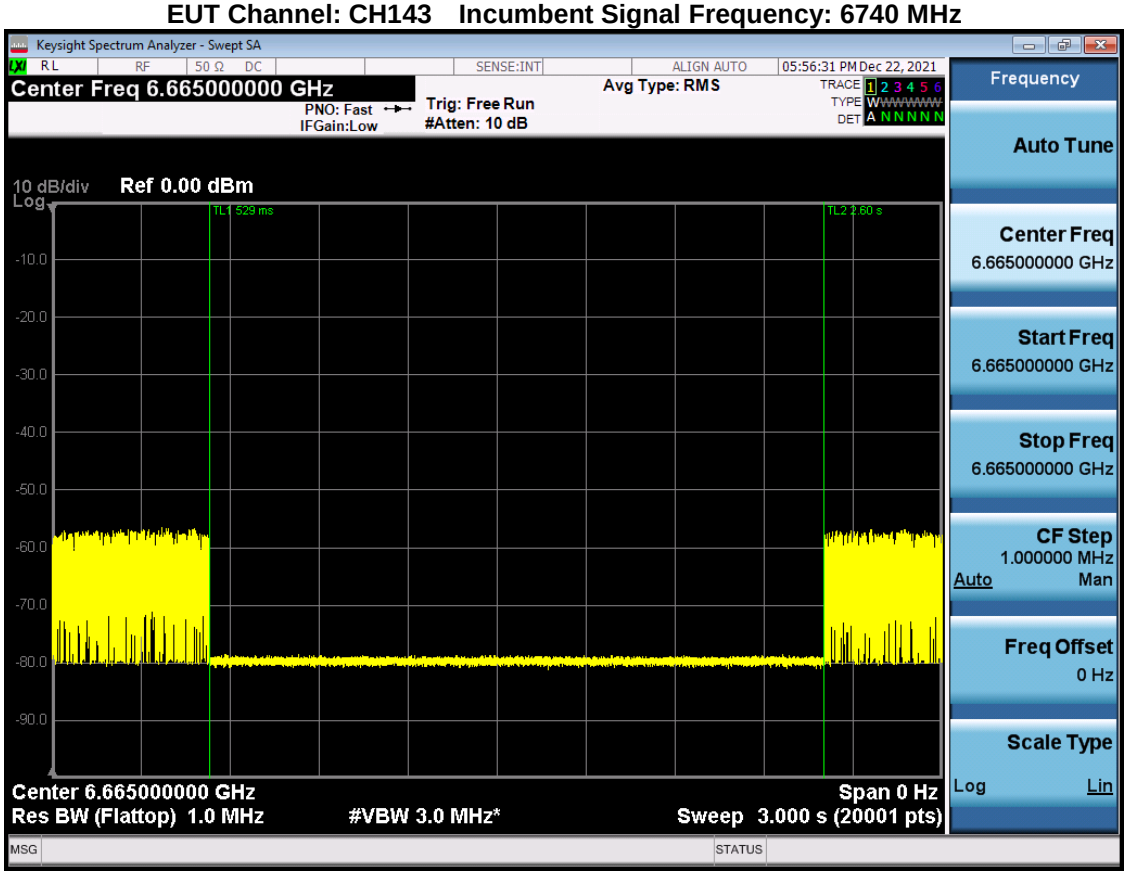
EUT Channel: CH143 Incumbent Signal Frequency: 6590 MHz



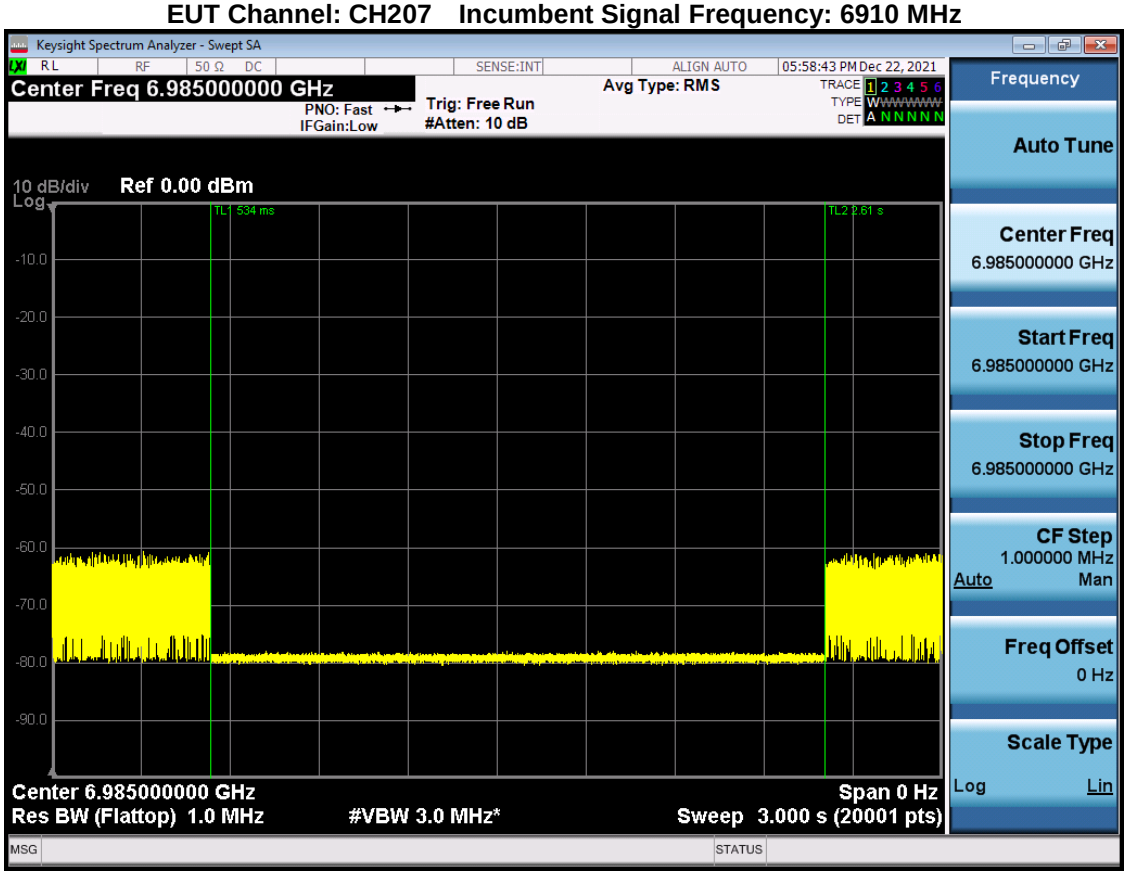
EUT Channel: CH143 Incumbent Signal Frequency: 6665 MHz



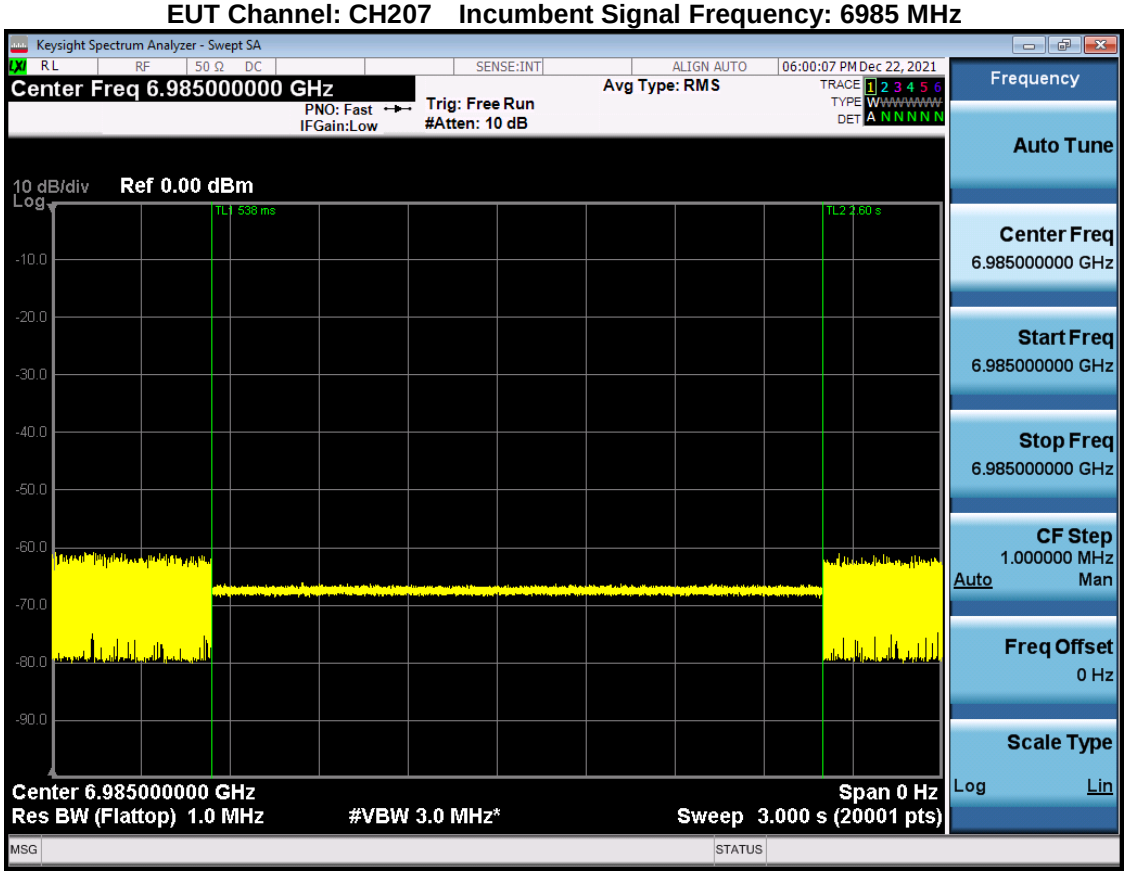
EUT Channel: CH143 Incumbent Signal Frequency: 6740 MHz



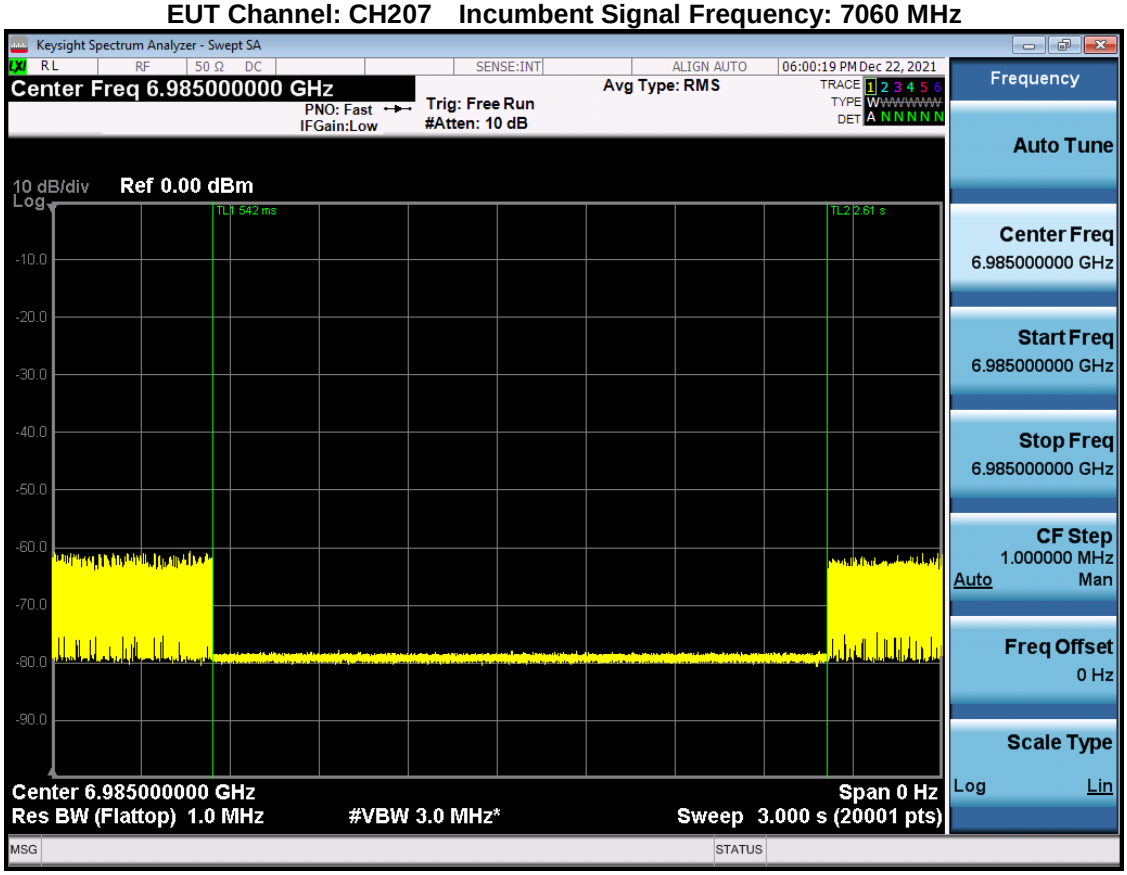
EUT Channel: CH207 Incumbent Signal Frequency: 6910 MHz



EUT Channel: CH207 Incumbent Signal Frequency: 6985 MHz



EUT Channel: CH207 Incumbent Signal Frequency: 7060 MHz



End of Test Report