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TEST REPORT

FCC Test for RF2216d-D1A
Class II Permissive Change

APPLICANT
SAMSUNG Electronics Co., Ltd.

REPORT NO.
HCT-RF-2208-FC003-R3

DATE OF ISSUE
August 30, 2022

Tested by
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TEST REPORT
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Additional Model
-

Applicant	**SAMSUNG Electronics Co., Ltd.** 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
EUT Type	RRU(RF2216d)
Model Name	RF2216d-D1A
FCC ID	A3LRF2216D-D1A
Date of Test	July 28, 2022 ~ August 12, 2022
FCC Rule Parts:	CFR 47 Part 2, Part 27

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test results were applied only to the test methods required by the standard.

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	August 12, 2022	Initial Release
1	August 22, 2022	Modified test diagrams on page 12~13.
2	August 26, 2022	Added explanations on NB-IoT test configurations.
3	August 30, 2022	- Revised the title. (LTE B13 + NB-IoT 10 MHz → LTE B13 10 MHz + NB-IoT) - Added the test data on LTE B13 5 MHz + NB-IoT.

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance.

If this report is required to confirmation of authenticity, please contact to www.hct.co.kr

CONTENTS

1. GENERAL INFORMATION

1.1. APPLICANT INFORMATION

Company Name	Samsung Electronics Co., Ltd.
Company Address	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

1.2. PRODUCT INFORMATION

EUT Type	RRU(RF2216d)
EUT Serial Number	SC77B00021
Power Supply	DC: -48 V / PoE: 57 V

Output Power

Band	Carrier	Bandwidth	Power
5G NR n13	1	5 MHz	0.125 W/path, Total: 0.250 W
5G NR n13	1	10 MHz	0.125 W/path, Total: 0.250 W
LTE B13 + NB-IoT	1	5 MHz	0.125 W/path, Total: 0.250 W
LTE B13 + NB-IoT	1	10 MHz	0.125 W/path, Total: 0.250 W
LTE B66	1	5 MHz	0.125 W/path, Total: 0.250 W
LTE B66	1	20 MHz	0.125 W/path, Total: 0.250 W
5G NR n66	1	5 MHz	0.125 W/path, Total: 0.250 W
5G NR n66	1	20 MHz	0.125 W/path, Total: 0.250 W
5G NR n66 + LTE B66	2	5 MHz + 5 MHz	0.125 W/path, Total: 0.250 W
LTE B66 + LTE B66	2	5 MHz + 5 MHz	0.125 W/path, Total: 0.250 W
5G NR n66 + 5G NR n66	2	20 MHz + 10 MHz	0.125 W/path, Total: 0.250 W
5G NR n66 + LTE B66	2	20 MHz + 10 MHz	0.125 W/path, Total: 0.250 W

Frequency Range	Band 13 : 746 MHz ~ 756 MHz Band 66 : 2 110 MHz ~ 2 180 MHz

	Mode	Bandwidth	Emission Designator			
			QPSK (G7D)	Conducted (W)	16/64/256 QAM (W7D)	Conducted (W)
Emission Designator	5G NR n13	5 MHz	-	-	4M50W7D	0.24
	5G NR n13	10 MHz	-	-	9M00W7D	0.24
	LTE B13 + NB-IoT	5 MHz	4M50G7D	0.24	4M51W7D	0.24
	LTE B13 + NB-IoT	10 MHz	9M75G7D	0.25	9M77W7D	0.25
	LTE B66	5 MHz	-	-	4M51W7D	0.24
	LTE B66	20 MHz	18M0G7D	0.25	-	-
	5G NR n66	5 MHz	-	-	4M51W7D	0.24
	5G NR n66	20 MHz	-	-	19M0W7D	0.24
	5G NR n66 + LTE B66 (Contiguous)	5 MHz + 5 MHz	-	-	9M51W7D	0.24
	LTE B66 + LTE B66 (Contiguous)	5 MHz + 5 MHz	-	-	9M47W7D	0.24
	5G NR n66 + 5G NR n66 (Contiguous)	20 MHz + 10 MHz	29M0G7D	0.23	-	-
	5G NR n66 + LTE B66 (Contiguous)	20 MHz + 10 MHz	-	-	29M0W7D	0.24
	5G NR n66 + LTE B66 (Non-Contiguous)	5 MHz + 5 MHz	-	-	9M01W7D	0.26
	LTE B66 + LTE B66 (Non-Contiguous)	5 MHz + 5 MHz	-	-	9M02W7D	0.26
	5G NR n66 + 5G NR n66 (Non-Contiguous)	20 MHz + 10 MHz	28M3G7D	0.23	-	-
	5G NR n66 + LTE B66 (Non-Contiguous)	20 MHz + 10 MHz	-	-	28M0W7D	0.24
Modulation Type	QPSK, 16QAM, 64QAM, 256QAM					
Antenna Specification	Directional Peak Gain: B13: 7.5 dBi B66: 8.0 dBi Antenna type: Integrated Beam pattern type: Omni					

1.3. TEST INFORMATION

FCC Rule Parts	CFR 47 Part 2, Part 27
Measurement standards	ANSI C63.26-2015, KDB 662911 D01 v02r01, KDB 971168 D01 v03r01
Place of Test	HCT CO., LTD. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

2. FACILITIES AND ACCREDITATIONS

2.1. FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.
The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.
Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032).

2.2. EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.
Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.
All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

3. TEST SPECIFICATIONS

3.1. STANDARDS

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 2, Part 27

Description	Reference	Results
RF Output Power and PSD	§ 2.1046, § 27.50(b), § 27.50(d)(2)	Compliant
PAPR	§ 27.50(d)(5)	Compliant
Occupied Bandwidth	§ 2.1049	Compliant
Out-of-band Unwanted Emissions	§ 2.1051, § 27.53(c), (f), § 27.53(h)	Compliant
Spurious Unwanted Emissions		Compliant
Radiated Emissions	§ 2.1053, § 27.53(c), § 27.53(h)	Compliant
Frequency Stability	§ 2.1055, § 27.54	Compliant

3.2. ADDITIONAL DESCRIPTIONS ABOUT TEST

- The EUT was operated in a manner representative of the typical usage of the equipment.
- During all testing, system components were manipulated within the confines of typical usage to maximize each emission.
- All LTE and 5G NR modulation types (QPSK, 16QAM, 64QAM, 256QAM) supported by the EUT have been tested.
- All mode of operation, supporting bandwidth and frequencies were investigated. The test plots shown in the following sections represent the worst case emissions.
- The measurement has performed for each LTE and NR carrier in the mode of full resource block size as worst case to transmit maximum output power condition.
- To prove the compliance for adding PoE operation mode, worst case spot checking in all modes has performed.
- We did spot checking on LTE B13 5 MHz with NB IoT as in-band operation, this does not generate any changes because in-band NB-IoT cannot distinguish with original LTE signal.
- For adding NB-IoT operation, pre-liminary testing has performed in the all mode of LTE B13 10 MHz 1 Carrier + NB IoT including all location of NB IoT described in technical documents. But we only included final test result for NB IoT located in both sides of the edges as worst case in this test report.
- NB-IoT does not support SA(Stand-Alone) mode without LTE B13.
- The device was operating at 100% duty cycle.

- The tests results in plots are already including the actual value of loss for the attenuator and cable combination. Please check correction factors below table.

Correction factor table			
Frequency (MHz)	Factor (dB)	Frequency (MHz)	Factor (dB)
500	20.440	4 000	22.454
600	20.511	5 000	23.016
700	20.611	6 000	23.354
800	20.749	7 000	23.619
900	20.815	8 000	24.015
1 000	20.880	9 000	24.355
1 100	20.999	10 000	25.281
1 200	21.101	11 000	25.145
1 300	21.140	12 000	25.606
1 400	21.232	13 000	25.646
1 500	21.295	14 000	26.244
1 600	21.355	15 000	26.849
1 700	21.420	16 000	26.748
1 800	21.504	17 000	26.634
1 900	21.570	18 000	26.920
2 000	21.623	19 000	27.108
2 100	21.685	20 000	27.329
2 200	21.727	21 000	27.337
2 300	21.780	22 000	27.748
2 400	21.857	23 000	27.871
2 500	21.902	24 000	28.560
2 600	21.961	25 000	28.708
2 700	22.015	26 000	29.002
2 800	22.085	27 000	30.090
2 900	22.162	-	-
3 000	22.172	-	-

3.3. MAXIMUM MEASUREMENTUNCERTAINTY

Description	Condition	Uncertainty
Radiated Disturbance	9 kHz ~ 30 MHz	4.40 dB
	30 MHz ~ 1 GHz	5.74 dB
	1 GHz ~ 18 GHz	5.51 dB
	18 GHz ~ 40 GHz	5.92 dB

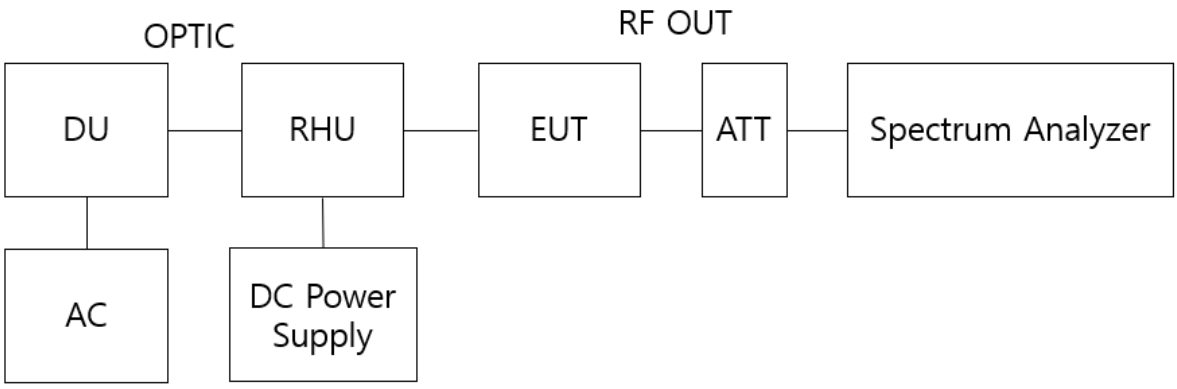
Coverage factor $k = 2$, Confidence levels of 95 %

3.4. STANDARDS ENVIRONMENTAL TEST CONDITIONS

Temperature :	+15 °C to +35 °C
Relative humidity:	30 % to 60 %
Air pressure	860 mbar to 1 060 mbar

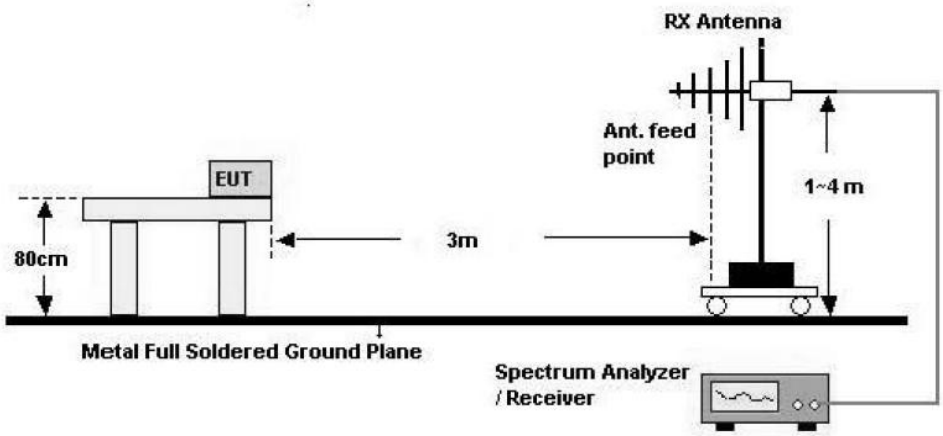
3.5. TEST DIAGRAMS

Conducted Test

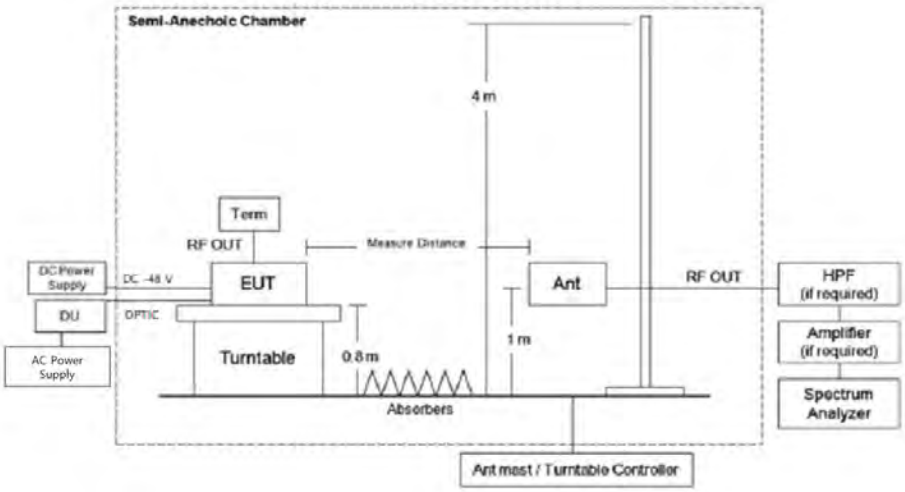


Radiated Test

30 MHz ~ 1 GHz

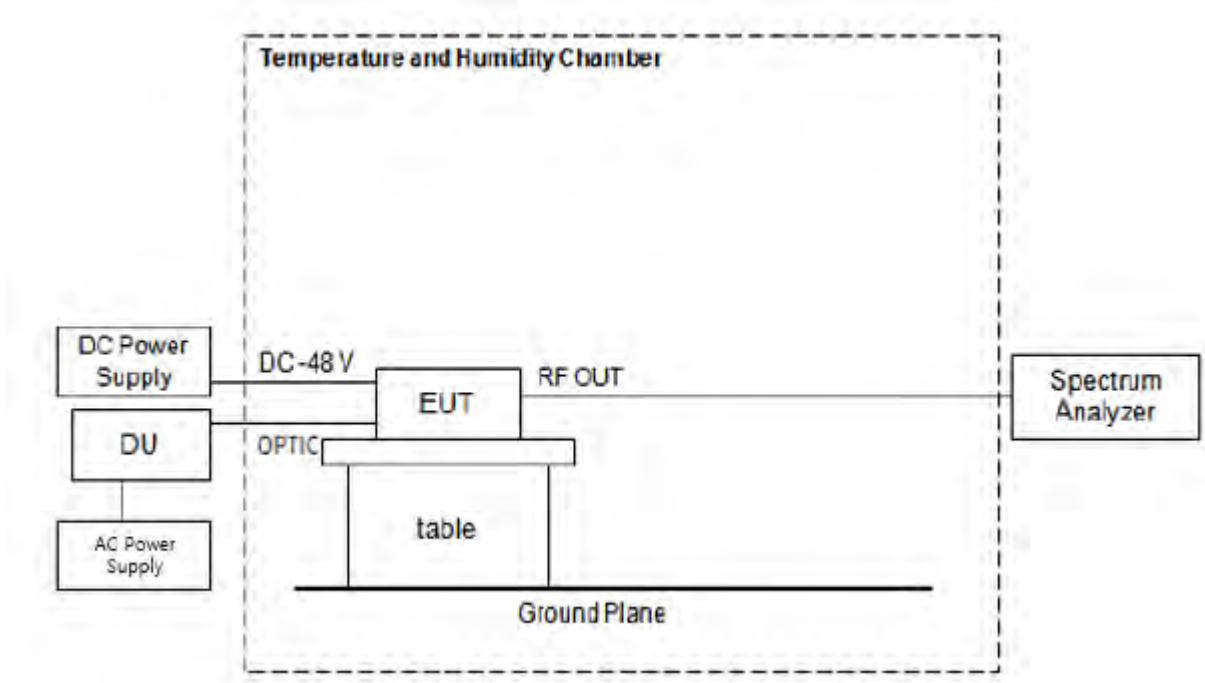


Above 1 GHz



※ EUT position is adopted by placement of floor-standing refer to section 5.5.2.3.2 of ANSI C63.26-2015

Frequency Stability



Note: All modulations(QPSK, 16QAM, 64QAM, 256QAM) were investigated and the worst case configuration channel results are reported.

4. TEST EQUIPMENTS

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
PXA Signal Analyzer	N9030A	Keysight	MY49431434	2023-01-05	Annual
PXA Signal Analyzer	N9020A	Keysight	MY46471250	2023-07-22	Annual
MXG Signal Generator	N5182A	Agilent	MY50140312	2022-08-26	Annual
*50Ω Termination	50Ω SMA Termination	N/A	N/A	N/A	N/A
Coaxial Attenuator	FAS-23-20	MCLI	103756	2023-01-03	Annual
DC Power Supply	PWR800L	KIKUSUI	RE001154	2023-03-03	Annual
Temperature and Humidity Chamber	NY-THR18750	NANGYEUL CO., LTD.	NY-200912201A	2023-02-10	Annual
Amp & Filter Bank Switch Controller	FBSM-01B	TNM system	TM20090002	N/A	N/A
Controller(Antenna mast & Turn Table)	CO3000	Innco systems	CO3000/1251/48920320/P	N/A	N/A
Antenna Position Tower	MA4640/800-XP-ET	Innco systems	N/A	N/A	N/A
Turn Table	DS2000-S	Innco systems	N/A	N/A	N/A
Turn Table	Turn Table	Ets	N/A	N/A	N/A
Loop Antenna	FMZB 1513	Schwarzbeck	1513-333	2024-03-17	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	2022-09-04	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	02296	2023-05-19	Biennial
Spectrum Analyzer	FSP40	Rohde & Schwarz	100843	2022-11-08	Annual
HPF(3 ~ 18 GHz) + LNA(0.1 ~ 18 GHz)	FBSR-04C	TNM system	N/A	2022-09-16	Annual
High Pass Filter	WHKX12-2805-3000-18000-40SS	Wainwright Instruments	45	2022-09-16	Annual
High Pass Filter	WHKX10-900-1000-15000-40SS	Wainwright Instruments	16	2023-08-02	Annual
Low Noise Amplifier	LLAU1183540Q	LTC Microwave	100	2022-09-16	Annual
Power Amplifier	CBL18265035	CERNEX	22966	2022-12-02	Annual

* This equipment has been used to each port, but we only listed one equipment for simplicity.

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date, or will be tested after the calibration is completed.

5. TEST RESULT

5.1. RF OUTPUT POWER and PSD

Test Requirements:

§ 2.1046 Measurements required: RF power output.

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

(b) For single sideband, independent sideband, and single channel, controlled carrier radiotelephone transmitters the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as specified and applicable in § 2.1046 (b) (1-5). In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.

(c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

§ 27.50 Power limits and duty cycle.

(b) The following power and antenna height limits apply to transmitters operating in the 746-758 MHz, 775-788 MHz and 805-806 MHz bands:

(1) Fixed and base stations transmitting a signal in the 757-758 and 775-776 MHz bands must not exceed an effective radiated power (ERP) of 1000 watts and an antenna height of 305 m height above average terrain (HAAT), except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section.

(2) Fixed and base stations transmitting a signal in the 746-757 MHz and 776-787 MHz bands with an emission bandwidth of 1 MHz or less must not exceed an ERP of 1000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section.

(3) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 746-757 MHz and 776-787 MHz bands with an emission bandwidth of 1 MHz or less must not exceed an ERP of 2000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts ERP in accordance with Table 2 of this section.

(4) Fixed and base stations transmitting a signal in the 746-757 MHz and 776-787 MHz bands with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that

antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section.

(5) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 746-757 MHz and 776-787 MHz bands with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section.

(d) The following power and antenna height requirements apply to stations transmitting in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz and 2180-2200 MHz bands:

(2) The power of each fixed or base station transmitting in the 1995-2000 MHz, the 2110-2155 MHz 2155-2180 MHz band, or 2180-2200 MHz band and situated in any geographic location other than that described in paragraph (d)(1) of this section is limited to:

(ii) An EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

Test Procedures:

The measurement is performed in accordance with Section 5.2.4.4.1 of ANSI C63.26.

The EUT is considered to transmit continuously if it can be configured to transmit at a burst duty cycle of greater than or equal to 98 % throughout the duration of the measurement. If this condition can be achieved, then the following procedure can be used to measure the average output power of the EUT.

a) Set span to 2 × to 3 × the OBW.

b) Set RBW = 1 % to 5 % of the OBW.

c) Set VBW ≥ 3 × RBW.

d) Set number of measurement points in sweep ≥ 2 × span / RBW.

e) Sweep time:

   1) Set = auto-couple, or

   2) Set ≥ [10 × (number of points in sweep) × (transmission period)] for single sweep (automation-compatible) measurement. Transmission period is the on and off time of the transmitter.

f) Detector = power averaging (rms).

g) If the EUT can be configured to transmit continuously, then set the trigger to free run.

h) If the EUT cannot be configured to transmit continuously, then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Verify that the sweep time is less than or equal to the transmission burst duration. Time gating can also be used under similar constraints (i.e., configured such that measurement data is collected only during active full-power transmissions).

i) Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over multiple symbols, it can be necessary to increase the number of traces to be averaged above 100 or, if using a manually configured sweep time, increase the sweep time.

j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

The measurement is performed in accordance with Section 5.2.4.5 of ANSI C63.26.
Some regulatory requirements specify the RF output power limits in terms of maximum or average PSD, (i.e., the output power or unwanted emissions power limits are defined within a specified reference bandwidth).
When average PSD limits are specified, the same fundamental measurement condition applies as previously discussed (i.e., averaging is to be performed only over durations of active transmissions at maximum output power level). Thus, when performing this measurement, the EUT must either be configured to transmit continuously at full power while the compliance measurement is performed, or else the measurement instrumentation must be configured to acquire data only over durations when the EUT is actively transmitting at full power. In circumstances where neither of these conditions can be realized, then alternative procedures are provided for both constant duty cycle and non-constant duty cycle transmissions.
The PSD is measured following the same procedures described in 5.2.4.4 for measuring the total average power, but with the RBW set to the reference bandwidth specified by the applicable regulatory requirement, and by using the marker function to identify the maximum PSD instead of summing the power across the OBW. If the fundamental measurement condition cannot be realized, then one of the alternative procedures in 5.2.4.4.2 or 5.2.4.4.3 should be selected, based on whether the transmitter duty cycle is constant (variations $\leq \pm 2$ %) or non-constant (variations $> \pm 2$ %), respectively.

Note:

(1) The results of the Conducted output power and PSD test shown above the frequency measured values are very small and similar trend for each port, so we are attached only the worst case plot.

(2) All power supplies of operation were investigated and the worst case configuration results are reported.
- Mode: DC: -48 V / PoE: 57 V
- Worst case: PoE: 57 V

Test Results:
Tabular Data of RF output power

5G NR n13 5 MHz 1 Carrier

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm)	Calculated (W)
0	256QAM	Middle	751.00	20.72	0.12
1	256QAM	Middle	751.00	20.74	0.12

Sum Data of Port 0 and Port 1

Frequency (MHz)	Output Power(Conducted)			
	QPSK	16QAM	64QAM	256QAM
	W			
751.00	-	-	-	0.24

5G NR n13 10 MHz 1 Carrier

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm)	Calculated (W)
0	16QAM	Middle	751.00	20.84	0.12
1	16QAM	Middle	751.00	20.83	0.12

Sum Data of Port 0 and Port 1

Frequency (MHz)	Output Power(Conducted)			
	QPSK	16QAM	64QAM	256QAM
	W			
751.00	0.24	-	-	-

LTE B13 5 MHz + NB-IoT 1 Carrier

Ant. No.	Modulation	Channel	Frequency (MHz)	[Original] LTE B13 5 MHz Measured Value (dBm)	[Permissive Change] LTE B13 5 MHz + NB-IoT Measured Value (dBm)	Deviation
1	QPSK	Middle	751.00	20.80	20.77	-0.03
	64QAM	Low	748.50	20.82	20.78	-0.04

*** We did spot checking on LTE B13 5 MHz with NB IoT as in-band operation, this does not generate any changes because in-band NB-IoT cannot distinguish with original LTE signal.**

LTE B13 10 MHz + NB-IoT 1 Carrier

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm)	Calculated (W)
0	QPSK	Middle	751.00	20.90	0.12
	16QAM	Middle	751.00	20.94	0.12
	64QAM	Middle	751.00	20.96	0.12
	256QAM	Middle	751.00	20.98	0.13
1	QPSK	Middle	751.00	20.96	0.12
	16QAM	Middle	751.00	20.88	0.12
	64QAM	Middle	751.00	21.01	0.13
	256QAM	Middle	751.00	20.99	0.13

Sum Data of Port 0 and Port 1

Frequency (MHz)	Output Power(Conducted)			
	QPSK	16QAM	64QAM	256QAM
	W			
751.00	0.25	0.25	0.25	0.25

LTE B66 5 MHz 1 Carrier

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm)	Calculated (W)
0	256QAM	High	2 177.50	20.72	0.12
1	256QAM	High	2 177.50	20.62	0.12

Sum Data of Port 0 and Port 1

Frequency (MHz)	Output Power(Conducted)			
	QPSK	16QAM	64QAM	256QAM
	W			
2 177.50	-	-	-	0.24

LTE B66 20 MHz 1 Carrier

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm)	Calculated (W)
0	QPSK	High	2 170.00	20.87	0.12
1	QPSK	High	2 170.00	20.82	0.12

Sum Data of Port 0 and Port 1

Frequency (MHz)	Output Power(Conducted)			
	QPSK	16QAM	64QAM	256QAM
	W			
2 170.00	0.25	-	-	-

5G NR n66 5 MHz 1 Carrier

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm)	Calculated (W)
0	16QAM	High	2 177.50	20.75	0.12
1	16QAM	High	2 177.50	20.84	0.12

Sum Data of Port 0 and Port 1

Frequency (MHz)	Output Power(Conducted)			
	QPSK	16QAM	64QAM	256QAM
	W			
2 177.50	-	0.24	-	-

5G NR n66 20 MHz 1 Carrier

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm)	Calculated (W)
0	64QAM	High	2 170.00	20.75	0.12
1	64QAM	High	2 170.00	20.69	0.12

Sum Data of Port 0 and Port 1

Frequency (MHz)	Output Power(Conducted)			
	QPSK	16QAM	64QAM	256QAM
	W			
2 170.00	-	-	0.24	-

Tabular Data of RF Contiguous output power

5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm)	Calculated (W)
0	256QAM	High	2 175.00	20.72	0.12
1	256QAM	High	2 175.00	20.81	0.12

Sum Data of Port 0 and Port 1

Frequency (MHz)	Output Power(Conducted)			
	QPSK	16QAM	64QAM	256QAM
	W			
2 175.00	-	-	-	0.24

LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm)	Calculated (W)
0	64QAM	High	2 175.00	20.78	0.12
1	64QAM	High	2 175.00	20.76	0.12

Sum Data of Port 0 and Port 1

Frequency (MHz)	Output Power(Conducted)			
	QPSK	16QAM	64QAM	256QAM
	W			
2 175.00	-	-	0.24	-

5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier]

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm)	Calculated (W)
0	QPSK	High	2 165.00	20.68	0.12
1	QPSK	High	2 165.00	20.65	0.12

Sum Data of Port 0 and Port 1

Frequency (MHz)	Output Power(Conducted)			
	QPSK	16QAM	64QAM	256QAM
	W			
2 165.00	0.23	-	-	-

5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier]

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm)	Calculated (W)
0	256QAM	High	2 165.00	20.84	0.12
1	256QAM	High	2 165.00	20.80	0.12

Sum Data of Port 0 and Port 1

Frequency (MHz)	Output Power(Conducted)			
	QPSK	16QAM	64QAM	256QAM
	W			
2 165.00	-	-	-	0.24

Tabular Data of RF Non-Contiguous output power

5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Mod	5G NR n66 5 MHz		LTE B66 5 MHz		Summation Value (dBm)	Calculated (W)
		Frequency (MHz)	Measured Value (dBm)	Frequency (MHz)	Measured Value (dBm)		
0	256QAM	2 112.50	17.92	2 177.50	18.15	21.05	0.13
1	256QAM	2 112.50	17.81	2 177.50	18.18	21.01	0.13

Sum Data of Port 0 and Port 1

Frequency (MHz)	Output Power(Conducted)			
	QPSK	16QAM	64QAM	256QAM
	W			
2 112.50 + 2 177.50	-	-	-	0.26

LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Mod	LTE B66 5 MHz		LTE B66 5 MHz		Summation Value (dBm)	Calculated (W)
		Frequency (MHz)	Measured Value (dBm)	Frequency (MHz)	Measured Value (dBm)		
0	64QAM	2 112.50	18.06	2 177.50	18.18	21.13	0.13
1	64QAM	2 112.50	18.13	2 177.50	18.26	21.21	0.13

Sum Data of Port 0 and Port 1

Frequency (MHz)	Output Power(Conducted)			
	QPSK	16QAM	64QAM	256QAM
	W			
2 112.50 + 2 177.50	-	-	0.26	-

5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier]

Ant.	Mod	5G NR n66 20 MHz		5G NR n66 10 MHz		Summation Value (dBm)	Calculated (W)
		Frequency (MHz)	Measured Value (dBm)	Frequency (MHz)	Measured Value (dBm)		
0	QPSK	2 120.00	18.88	2 175.00	15.92	20.65	0.12
1	QPSK	2 120.00	18.82	2 175.00	15.90	20.61	0.12

Sum Data of Port 0 and Port 1

Frequency (MHz)	Output Power(Conducted)			
	QPSK	16QAM	64QAM	256QAM
	W			
2 120.00 + 2 175.00	0.23	-	-	-

5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier]

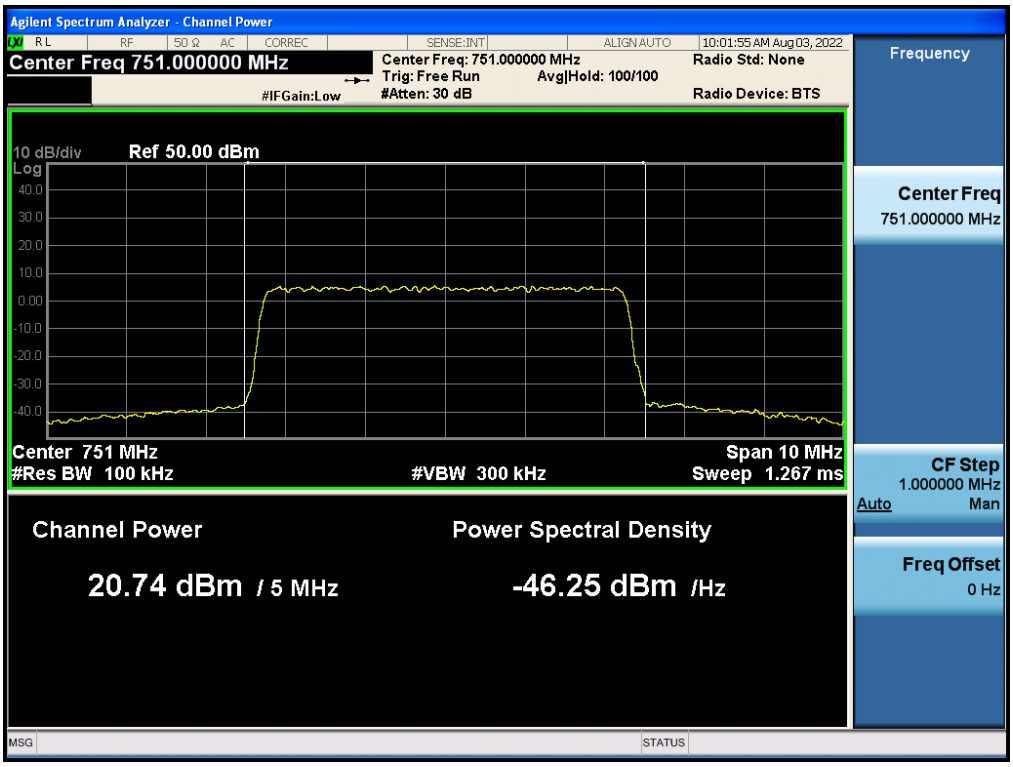
Ant.	Mod	5G NR n66 20 MHz		LTE B66 10 MHz		Summation Value (dBm)	Calculated (W)
		Frequency (MHz)	Measured Value (dBm)	Frequency (MHz)	Measured Value (dBm)		
0	256QAM	2 120.00	18.85	2 175.00	16.18	20.73	0.12
1	256QAM	2 120.00	18.85	2 175.00	16.19	20.73	0.12

Sum Data of Port 0 and Port 1

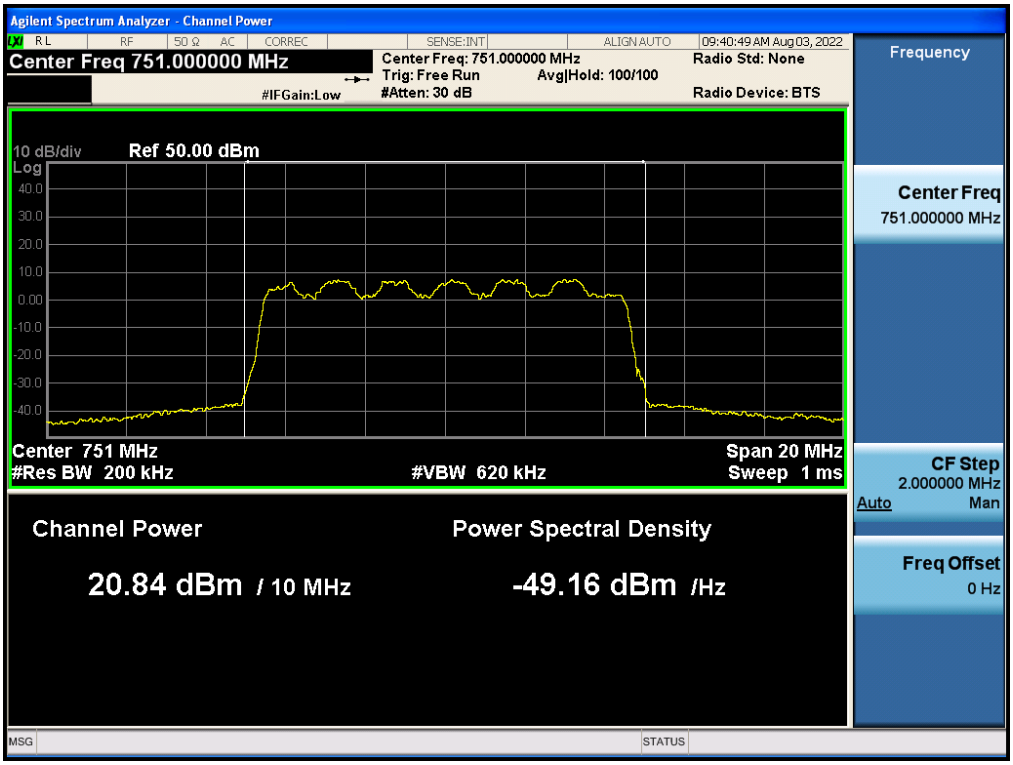
Frequency (MHz)	Output Power(Conducted)			
	QPSK	16QAM	64QAM	256QAM
	W			
2 120.00 + 2 175.00	-	-	-	0.24

Plot Data of RF Output Power

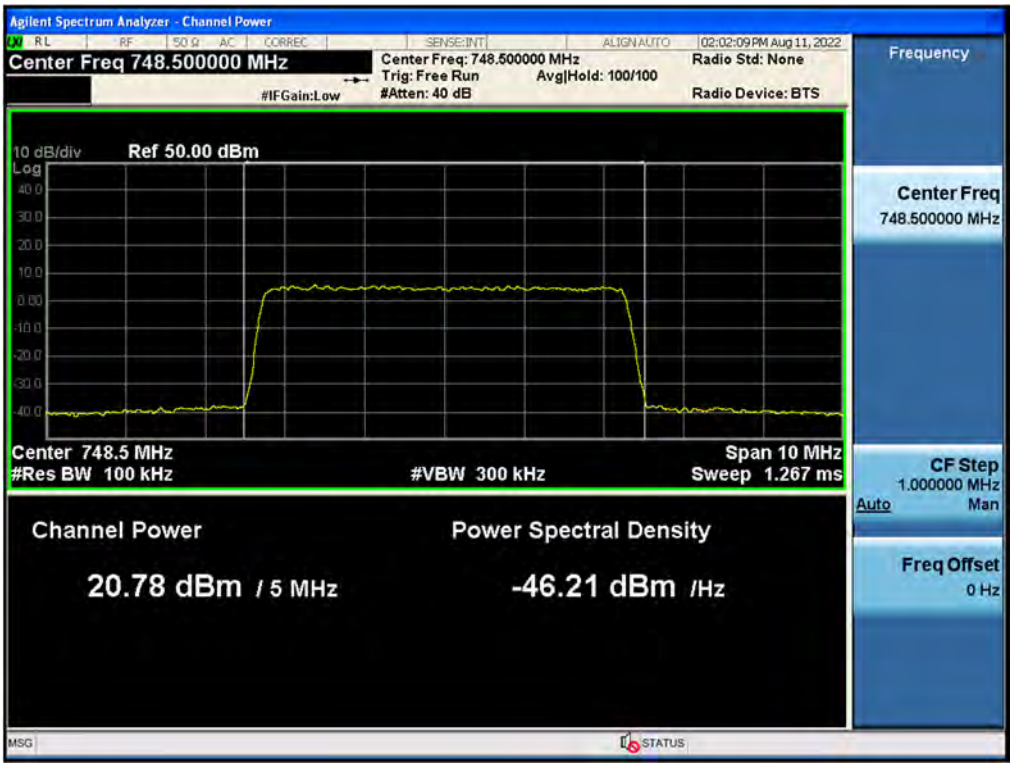
Antenna 1 / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle



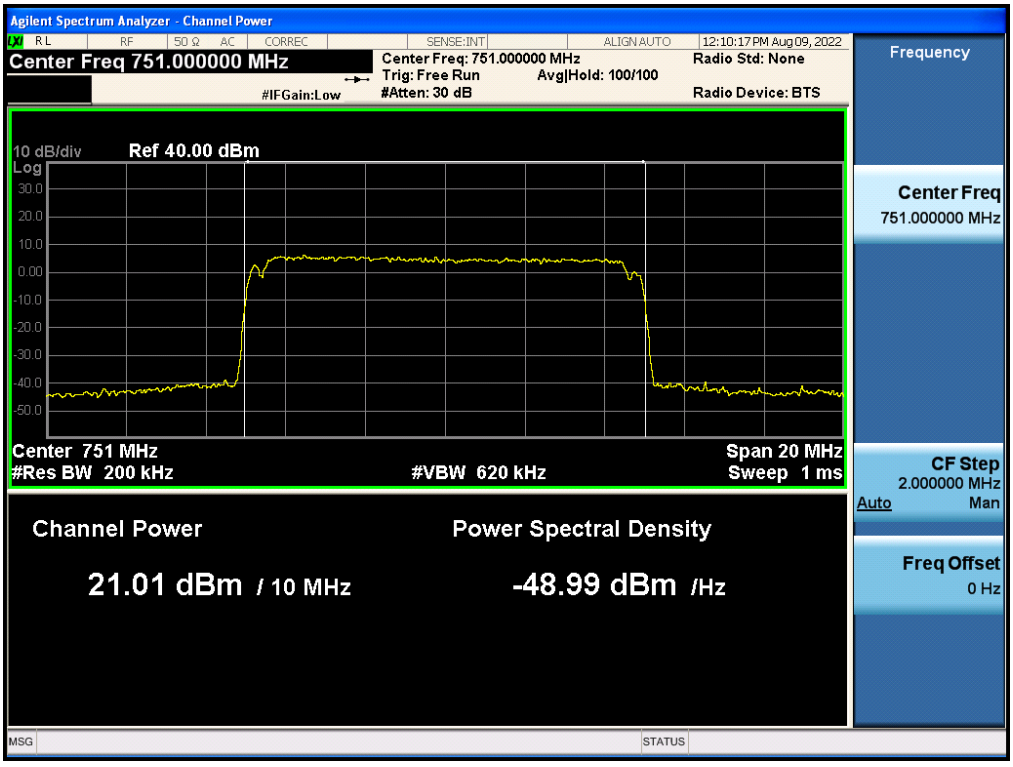
Antenna 0 / 5G NR n13 10 MHz 1 Carrier / 16QAM / Middle



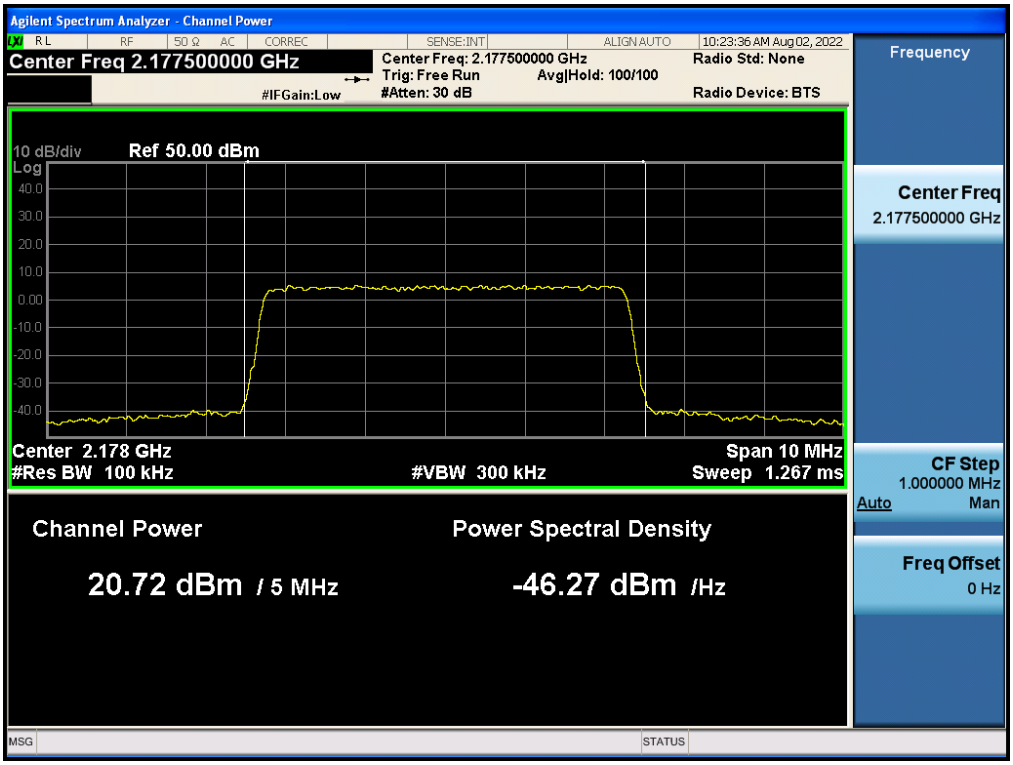
Antenna 1 / LTE B13 5 MHz + NB-IoT 1 Carrier / 64QAM / Low



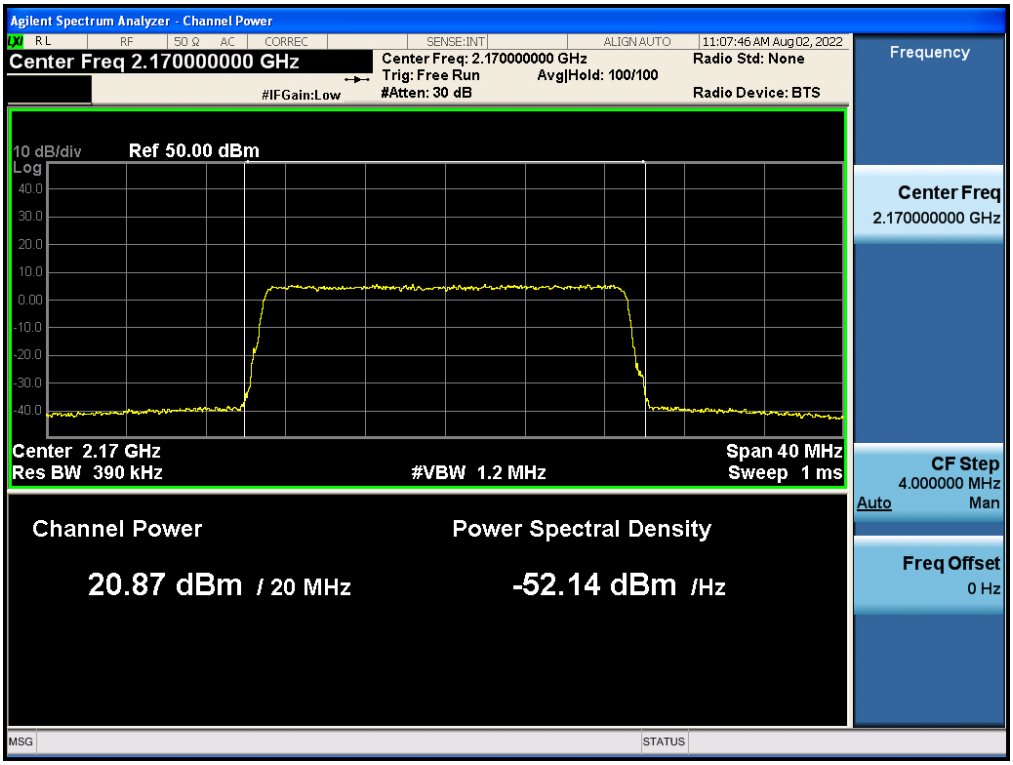
Antenna 1 / LTE B13 10 MHz + NB-IoT 1 Carrier / 64QAM / Middle



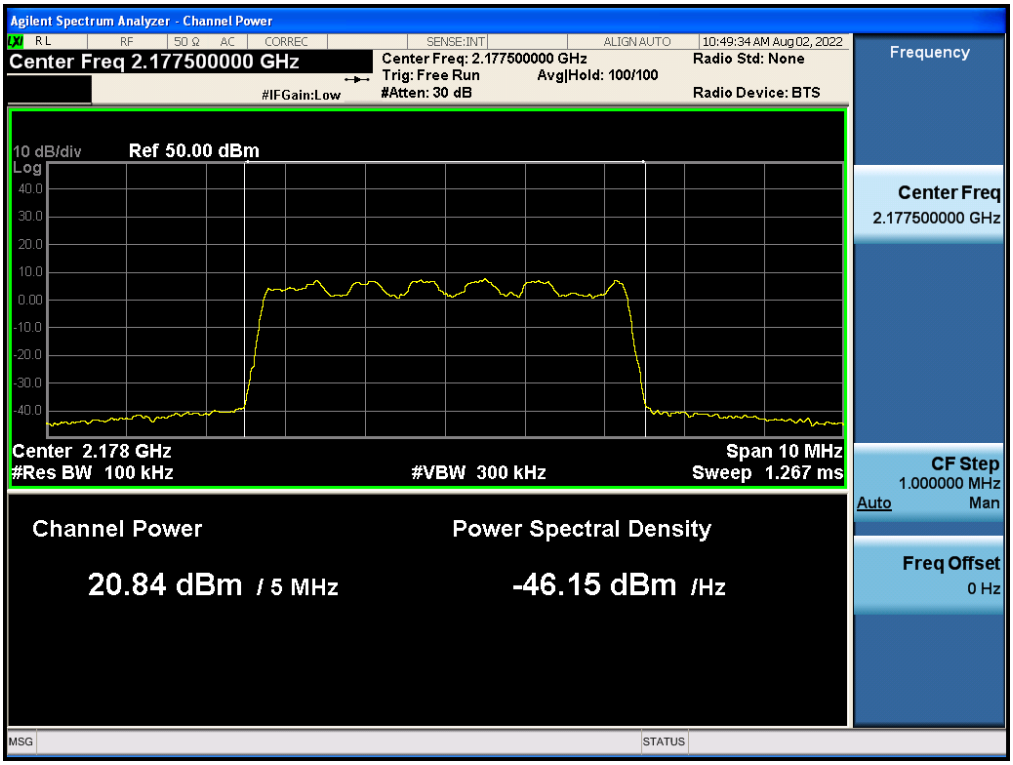
Antenna 0 / LTE B66 5 MHz 1 Carrier / 256QAM / High



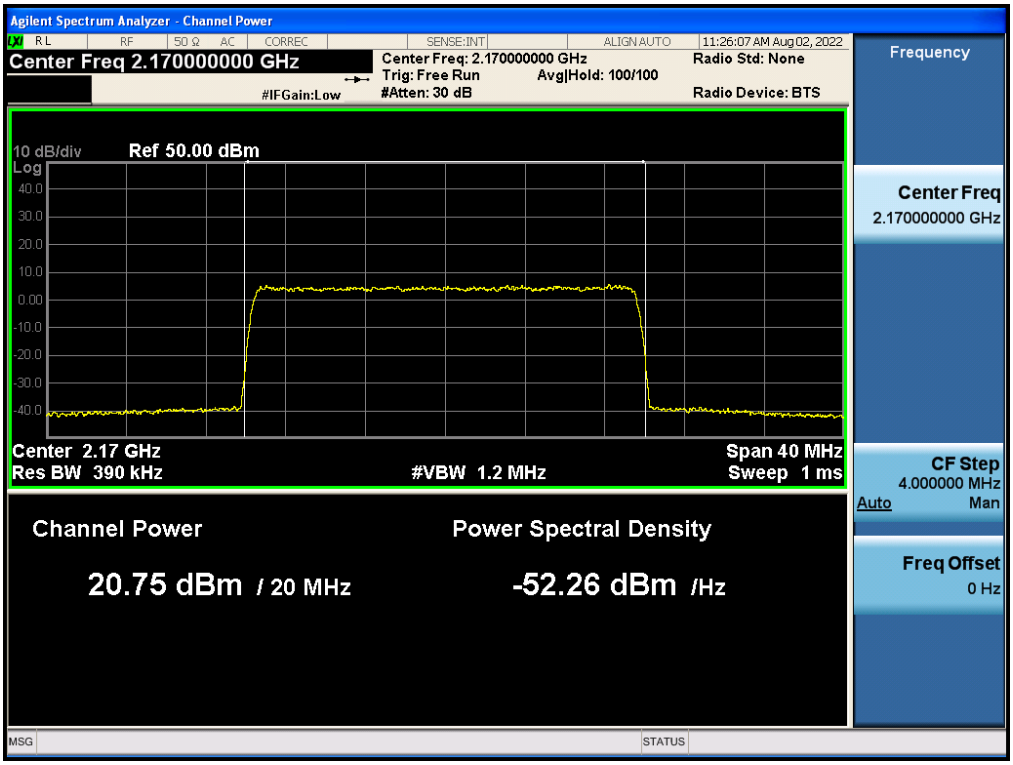
Antenna 0 / LTE B66 20 MHz 1 Carrier / QPSK / High



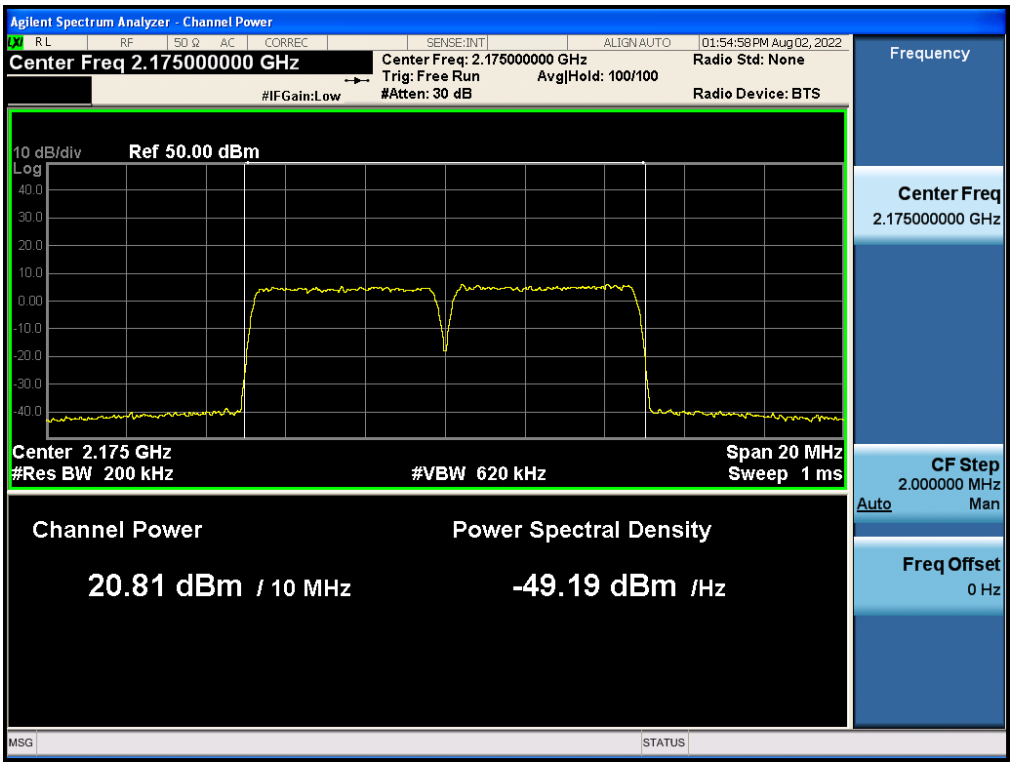
Antenna 1 / 5G NR n66 5 MHz 1 Carrier / 16QAM / High



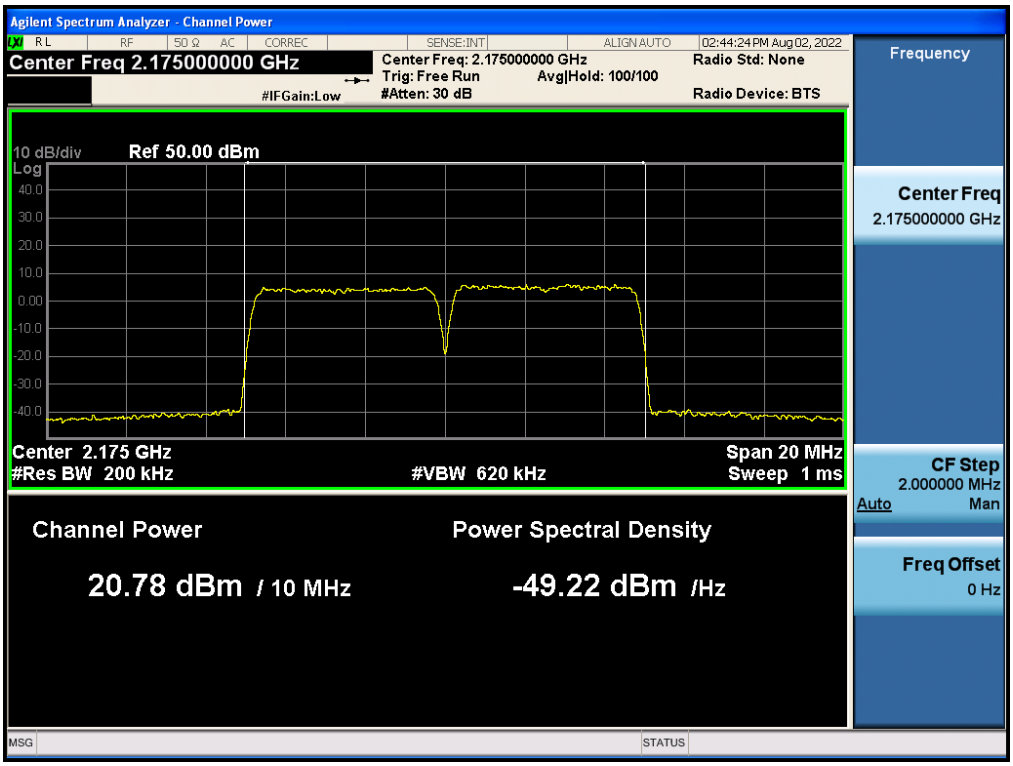
Antenna 0 / 5G NR n66 20 MHz 1 Carrier / 64QAM / High



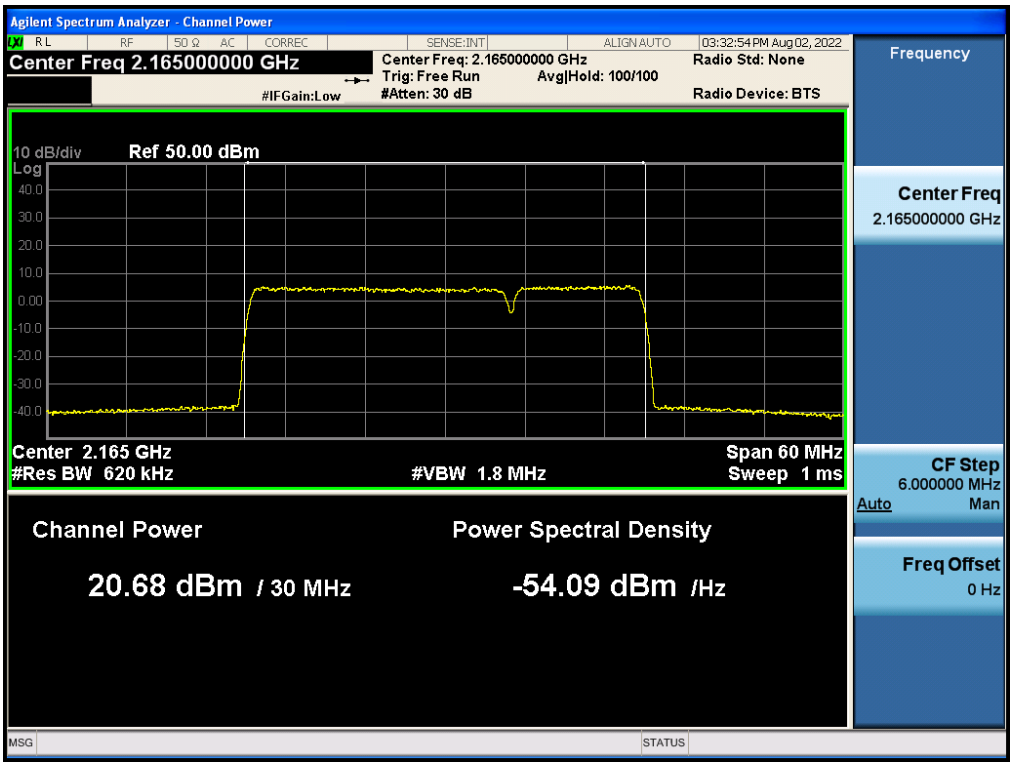
Antenna 1 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Contiguous / 256QAM / High



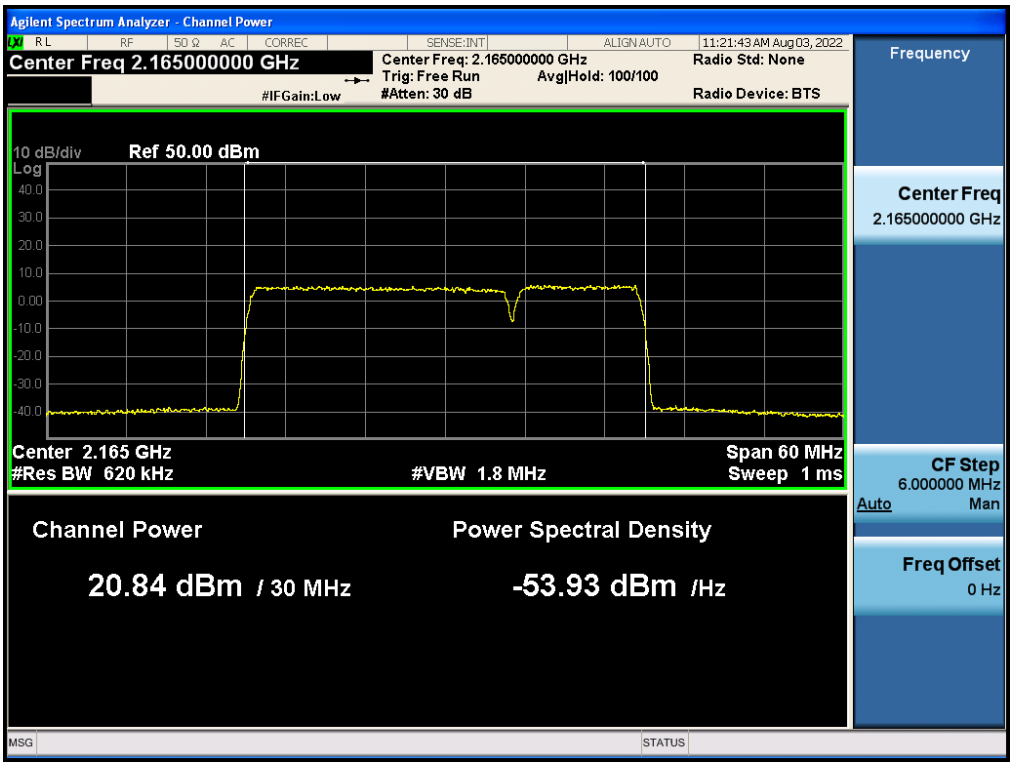
Antenna 0 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Contiguous / 64QAM / High



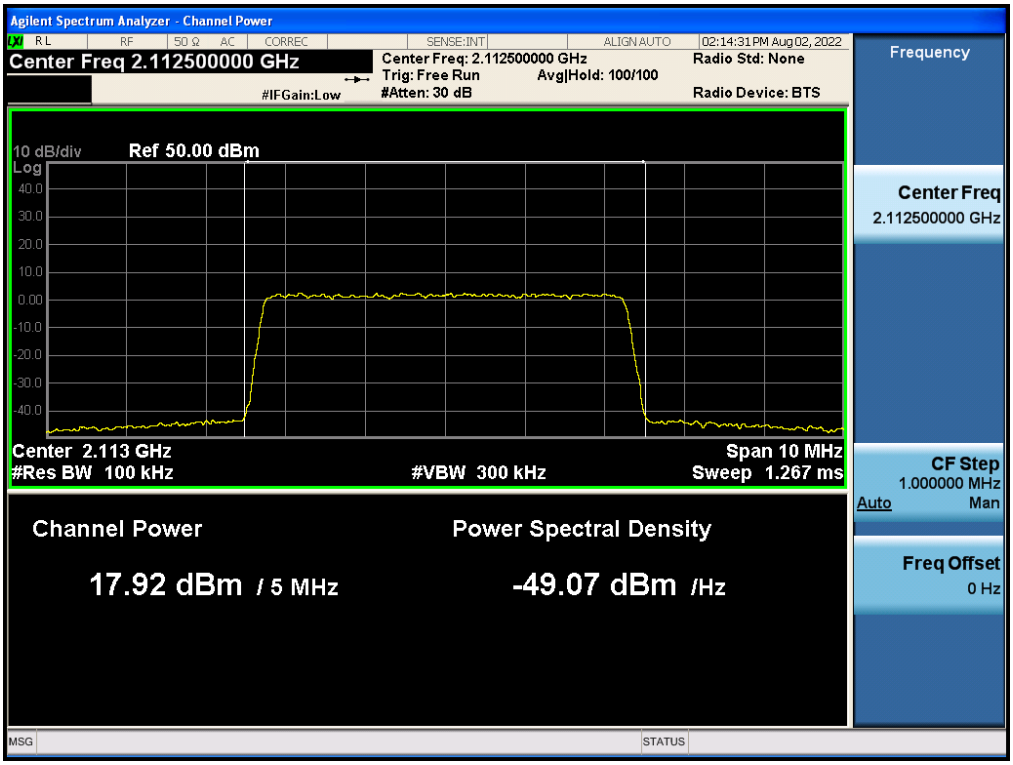
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Contiguous / QPSK / High



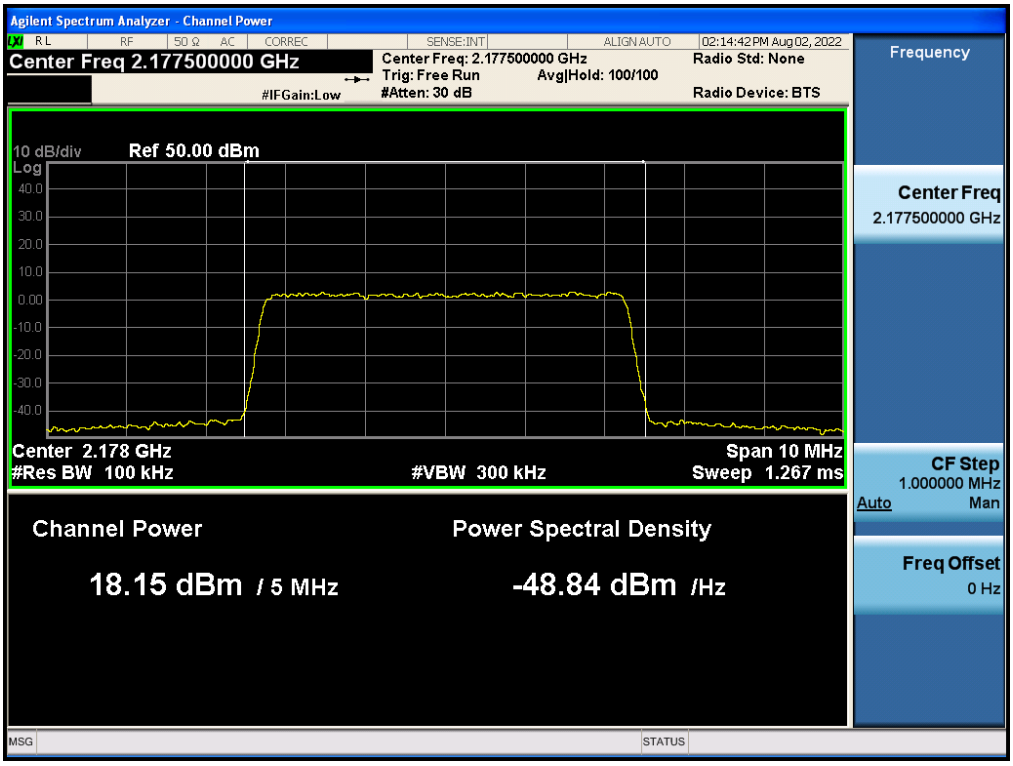
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Contiguous / 256QAM / High



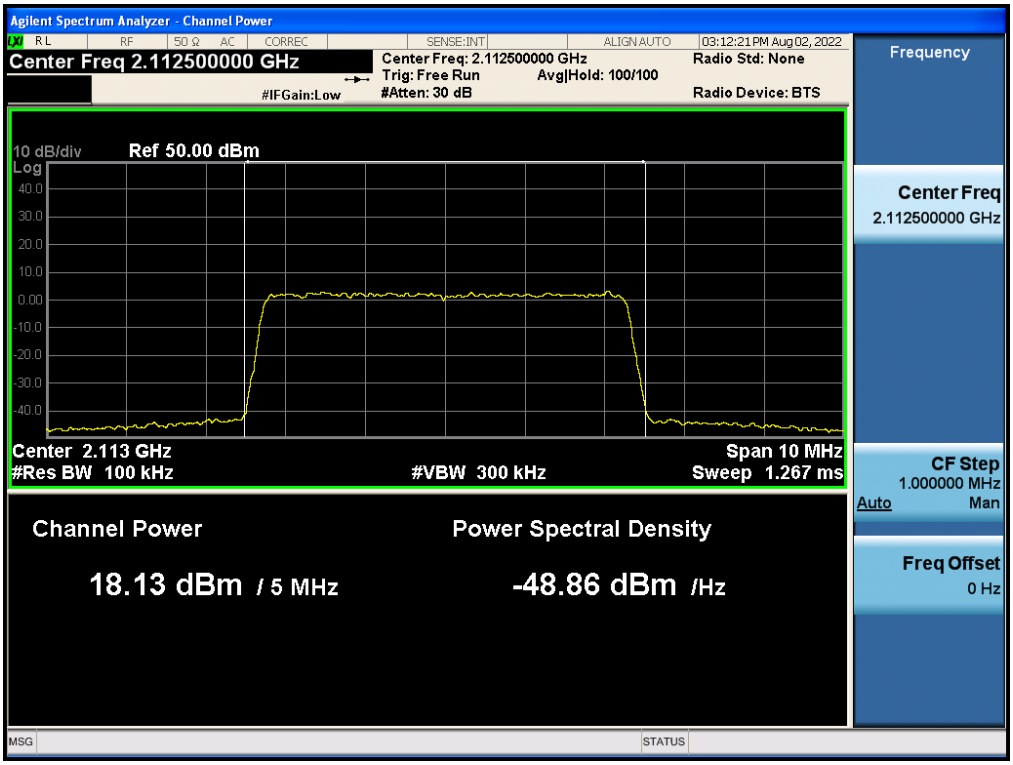
Antenna 0 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 5 MHz 1 Carrier / 256QAM / Low



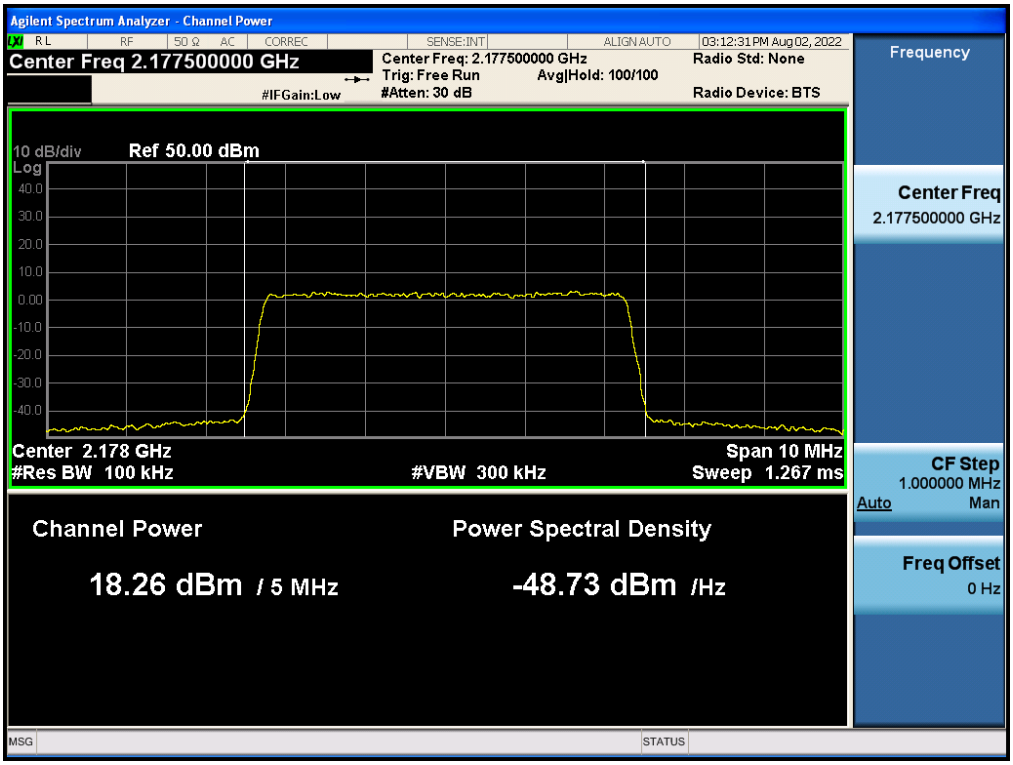
Antenna 0 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 5 MHz 1 Carrier / 256QAM / High



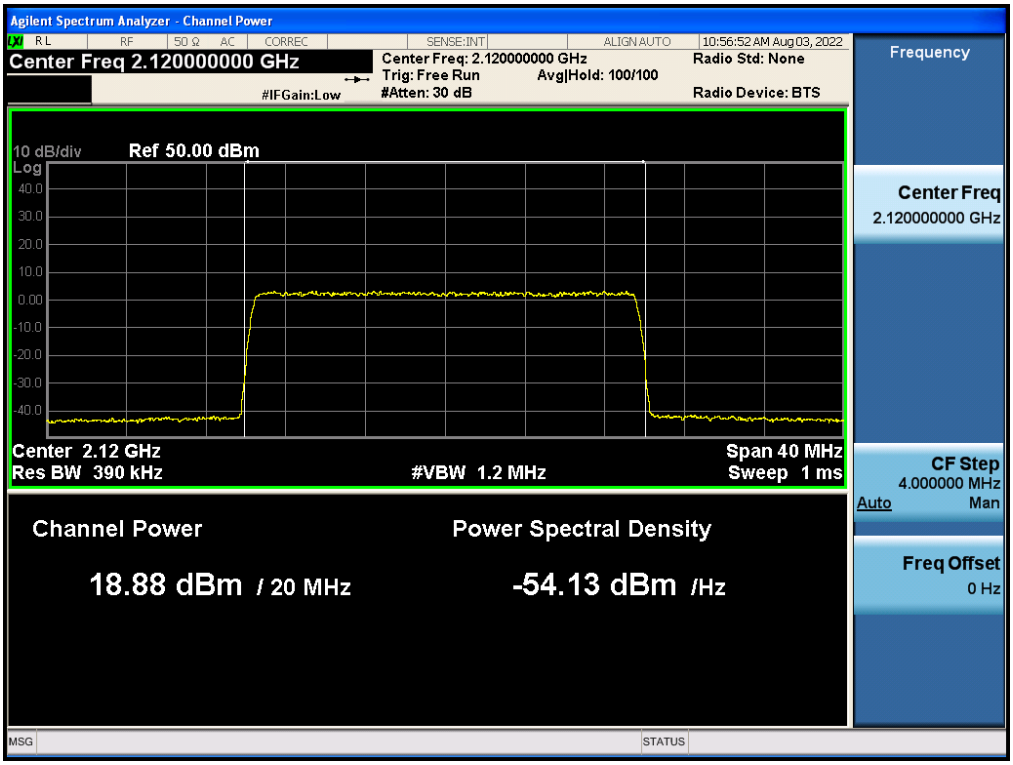
Antenna 1 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 5 MHz 1 Carrier / 64QAM / Low



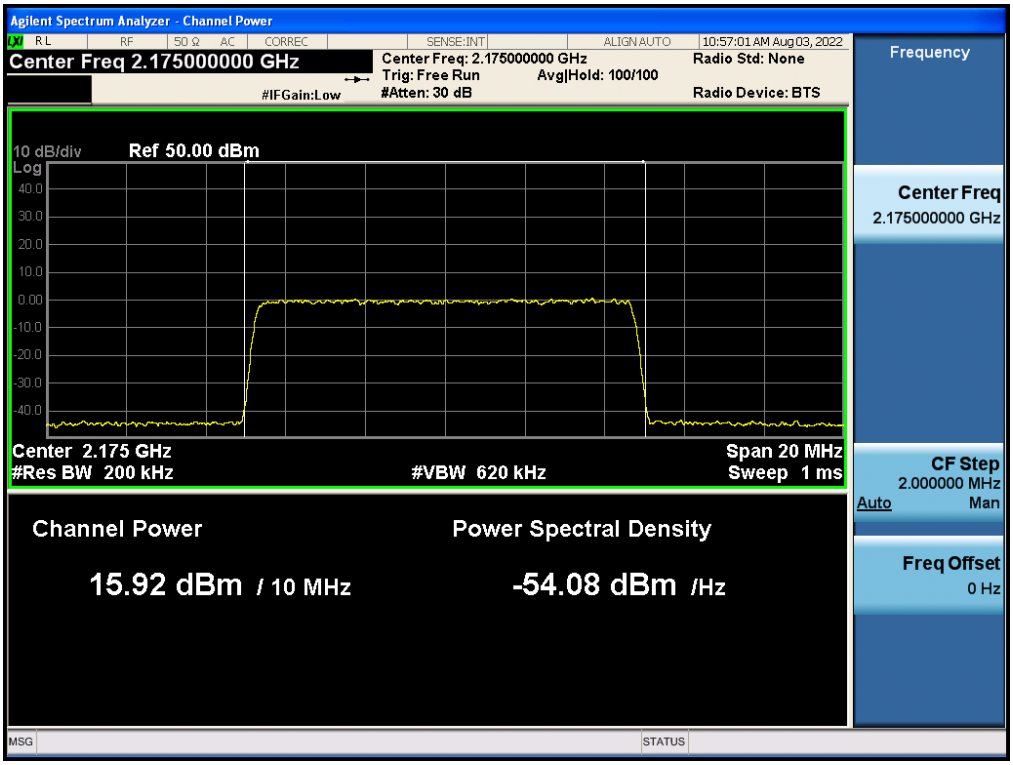
Antenna 1 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 5 MHz 1 Carrier / 64QAM / High



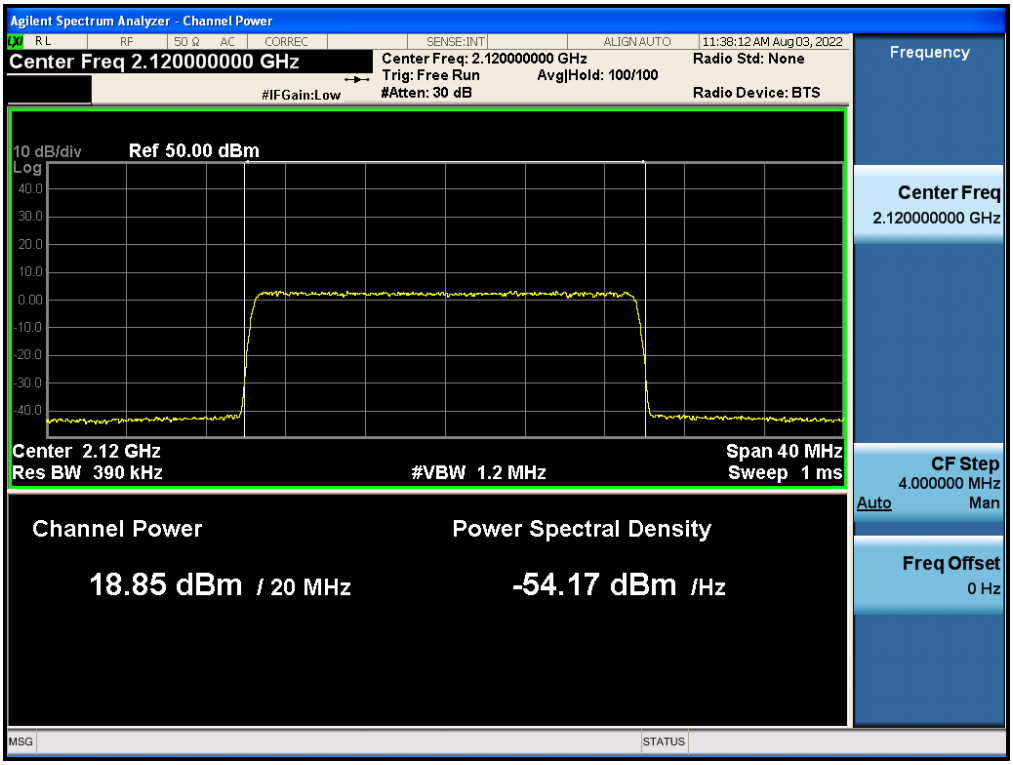
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 20 MHz 1 Carrier / QPSK / Low



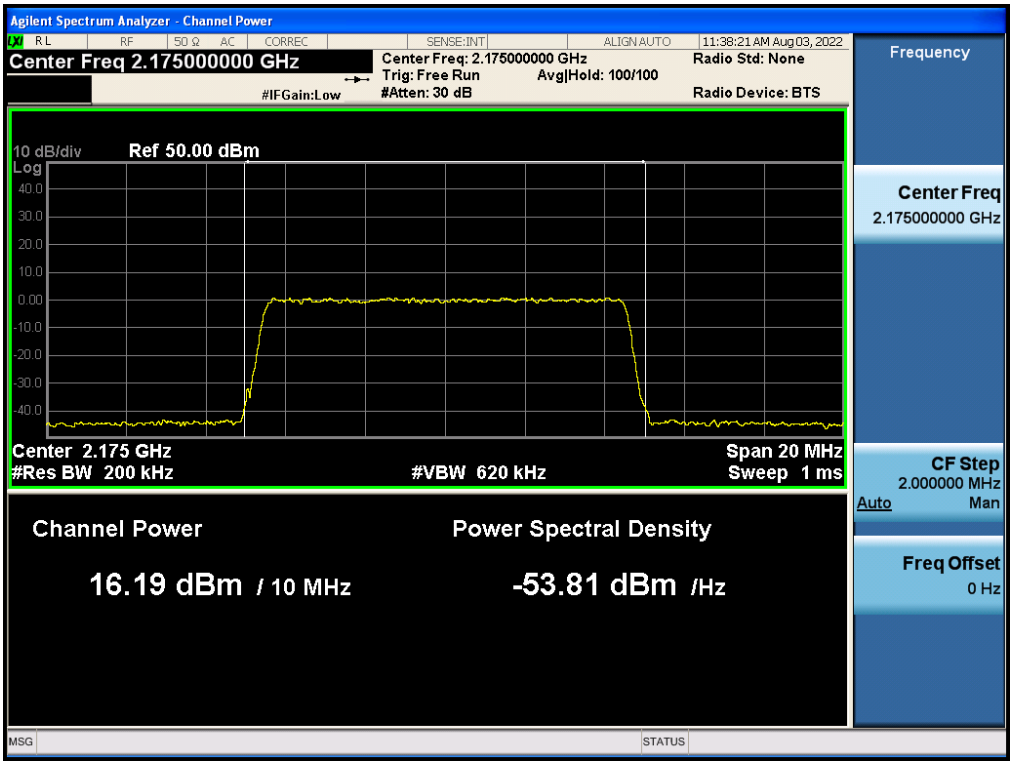
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 10 MHz 1 Carrier / QPSK / High



Antenna 1 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 20 MHz 1 Carrier / 256QAM / Low



Antenna 1 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 10 MHz 1 Carrier / 256QAM / High



Tabular Data of PSD

5G NR n13 5 MHz 1 Carrier

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm/MHz)	Ant.Gain (dBi)	E.R.P. (dBm/MHz)	Calculated (W/MHz)	Limit (W/MHz)
0	256QAM	Middle	751.00	15.33	7.50	20.68	0.12	1000
1	256QAM	Middle	751.00	15.26	7.50	20.61	0.12	

Sum Data of Port 0 and Port 1

Frequency (MHz)	PSD				Limit
	QPSK	16QAM	64QAM	256QAM	
	W/MHz				
751.00	-	-	-	0.24	1000

5G NR n13 10 MHz 1 Carrier

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm/MHz)	Ant.Gain (dBi)	E.R.P. (dBm/MHz)	Calculated (W/MHz)	Limit (W/MHz)
0	16QAM	Middle	751.00	13.17	7.50	18.52	0.07	1000
1	16QAM	Middle	751.00	12.82	7.50	18.17	0.07	

Sum Data of Port 0 and Port 1

Frequency (MHz)	PSD				Limit
	QPSK	16QAM	64QAM	256QAM	
	W/MHz				
751.00	-	0.15	-	-	1000

LTE B13 5 MHz + NB-IoT 1 Carrier

Ant. No.	Mod	Ch	[Original] LTE B13 5 MHz Measured Value (dBm/MHz)	[Permissive Change] LTE B13 5 MHz + NB-IoT Measured Value (dBm/MHz)	Deviation
1	16QAM	High	15.65	15.41	-0.24

*** We did spot checking on LTE B13 5 MHz with NB IoT as in-band operation, this does not generate any changes because in-band NB-IoT cannot distinguish with original LTE signal.**

LTE B13 10 MHz + NB-IoT 1 Carrier

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm/MHz)	Ant.Gain (dBi)	E.R.P. (dBm/MHz)	Calculated (W/MHz)	Limit (W/MHz)
0	QPSK	Middle	751.00	12.77	7.50	18.12	0.06	1000
	16QAM	Middle	751.00	12.60	7.50	17.95	0.06	
	64QAM	Middle	751.00	12.86	7.50	18.21	0.07	
	256QAM	Middle	751.00	12.77	7.50	18.12	0.06	
1	QPSK	Middle	751.00	12.66	7.50	18.01	0.06	
	16QAM	Middle	751.00	12.39	7.50	17.74	0.06	
	64QAM	Middle	751.00	12.61	7.50	17.96	0.06	
	256QAM	Middle	751.00	12.73	7.50	18.08	0.06	

Sum Data of Port 0 and Port 1

Frequency (MHz)	PSD				Limit
	QPSK	16QAM	64QAM	256QAM	
	W/MHz				
751.00	0.14	0.13	0.14	0.14	1000

LTE B66 5 MHz 1 Carrier

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm/MHz)	Ant.Gain (dBi)	E.I.R.P. (dBm/MHz)	Calculated (W/MHz)	Limit (W/MHz)
0	256QAM	High	2 177.50	15.07	8.00	23.07	0.20	1640
1	256QAM	High	2 177.50	15.21	8.00	23.21	0.21	

Sum Data of Port 0 and Port 1

Frequency (MHz)	PSD				Limit
	QPSK	16QAM	64QAM	256QAM	
	W/MHz				
2 177.50	-	-	-	0.42	1640

LTE B66 20 MHz 1 Carrier

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm/MHz)	Ant.Gain (dBi)	E.I.R.P. (dBm/MHz)	Calculated (W/MHz)	Limit (W/MHz)
0	QPSK	High	2 170.00	9.65	8.00	17.65	0.06	1640
1	QPSK	High	2 170.00	9.43	8.00	17.43	0.06	

Sum Data of Port 0 and Port 1

Frequency (MHz)	PSD				Limit
	QPSK	16QAM	64QAM	256QAM	
	W/MHz				
2 170.00	0.13	-	-	-	1640

5G NR n66 5 MHz 1 Carrier

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm/MHz)	Ant.Gain (dBi)	E.I.R.P. (dBm/MHz)	Calculated (W/MHz)	Limit (W/MHz)
0	16QAM	High	2 177.50	15.48	8.00	23.48	0.22	1640
1	16QAM	High	2 177.50	15.62	8.00	23.62	0.23	

Sum Data of Port 0 and Port 1

Frequency (MHz)	PSD				Limit
	QPSK	16QAM	64QAM	256QAM	
	W/MHz				
2 177.50	-	0.47	-	-	1640

5G NR n66 20 MHz 1 Carrier

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm/MHz)	Ant.Gain (dBi)	E.I.R.P. (dBm/MHz)	Calculated (W/MHz)	Limit (W/MHz)
0	64QAM	High	2 170.00	9.02	8.00	17.02	0.05	1640
1	64QAM	High	2 170.00	9.16	8.00	17.16	0.05	

Sum Data of Port 0 and Port 1

Frequency (MHz)	PSD				Limit
	QPSK	16QAM	64QAM	256QAM	
	W/MHz				
2 170.00	-	-	0.11	-	1640

Tabular Data of Contiguous PSD

5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm/MHz)	Ant.Gain (dBi)	E.I.R.P. (dBm/MHz)	Calculated (W/MHz)	Limit (W/MHz)
0	256QAM	High	2 175.00	12.49	8.00	20.49	0.11	1640
1	256QAM	High	2 175.00	12.53	8.00	20.53	0.11	

Sum Data of Port 0 and Port 1

Frequency (MHz)	PSD				Limit
	QPSK	16QAM	64QAM	256QAM	
	W/MHz				
2 175.00	-	-	-	0.23	1640

LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm/MHz)	Ant.Gain (dBi)	E.I.R.P. (dBm/MHz)	Calculated (W/MHz)	Limit (W/MHz)
0	64QAM	High	2 175.00	12.90	8.00	20.90	0.12	1640
1	64QAM	High	2 175.00	12.64	8.00	20.64	0.12	

Sum Data of Port 0 and Port 1

Frequency (MHz)	PSD				Limit
	QPSK	16QAM	64QAM	256QAM	
	W/MHz				
2 175.00	-	-	0.24	-	1640

5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier]

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm/MHz)	Ant.Gain (dBi)	E.I.R.P. (dBm/MHz)	Calculated (W/MHz)	Limit (W/MHz)
0	QPSK	High	2 165.00	7.36	8.00	15.36	0.03	1640
1	QPSK	High	2 165.00	7.52	8.00	15.52	0.04	

Sum Data of Port 0 and Port 1

Frequency (MHz)	PSD				Limit
	QPSK	16QAM	64QAM	256QAM	
	W/MHz				
2 165.00	0.07	-	-	-	1640

5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier]

Ant.	Mod	Ch	Frequency (MHz)	Measured Value (dBm/MHz)	Ant.Gain (dBi)	E.I.R.P. (dBm/MHz)	Calculated (W/MHz)	Limit (W/MHz)
0	256QAM	High	2 165.00	7.68	8.00	15.68	0.04	1640
1	256QAM	High	2 165.00	7.63	8.00	15.63	0.04	

Sum Data of Port 0 and Port 1

Frequency (MHz)	PSD				Limit
	QPSK	16QAM	64QAM	256QAM	
	W/MHz				
2 165.00	-	-	-	0.07	1640

Tabular Data of Non-Contiguous PSD

5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Mod	Frequency (MHz)	Measured Value (dBm/MHz)	Ant.Gain (dBi)	E.I.R.P. (dBm/MHz)	Calculated (W/MHz)	Limit (W/MHz)
0	256QAM	2 112.50 + 2 175.00	12.74	8.00	20.74	0.12	1640
1	256QAM	2 112.50 + 2 175.00	12.86	8.00	20.86	0.12	

Sum Data of Port 0 and Port 1

Frequency (MHz)	PSD				Limit
	QPSK	16QAM	64QAM	256QAM	
	W/MHz				
2 112.50 + 2 175.00	-	-	-	0.24	1640

LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Mod	Frequency (MHz)	Measured Value (dBm/MHz)	Ant.Gain (dBi)	E.I.R.P. (dBm/MHz)	Calculated (W/MHz)	Limit (W/MHz)
0	64QAM	2 112.50 + 2 175.00	12.92	8.00	20.92	0.12	1640
1	64QAM	2 112.50 + 2 175.00	12.70	8.00	20.70	0.12	

Sum Data of Port 0 and Port 1

Frequency (MHz)	PSD				Limit
	QPSK	16QAM	64QAM	256QAM	
	W/MHz				
2 112.50 + 2 175.00	-	-	0.24	-	1640

5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier]

Ant.	Mod	Frequency (MHz)	Measured Value (dBm/MHz)	Ant.Gain (dBi)	E.I.R.P. (dBm/MHz)	Calculated (W/MHz)	Limit (W/MHz)
0	QPSK	2 112.50 + 2 175.00	7.36	8.00	15.36	0.03	1640
1	QPSK	2 112.50 + 2 175.00	7.19	8.00	15.19	0.03	

Sum Data of Port 0 and Port 1

Frequency (MHz)	PSD				Limit
	QPSK	16QAM	64QAM	256QAM	
	W/MHz				
2 112.50 + 2 175.00	0.07	-	-	-	1640

5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier]

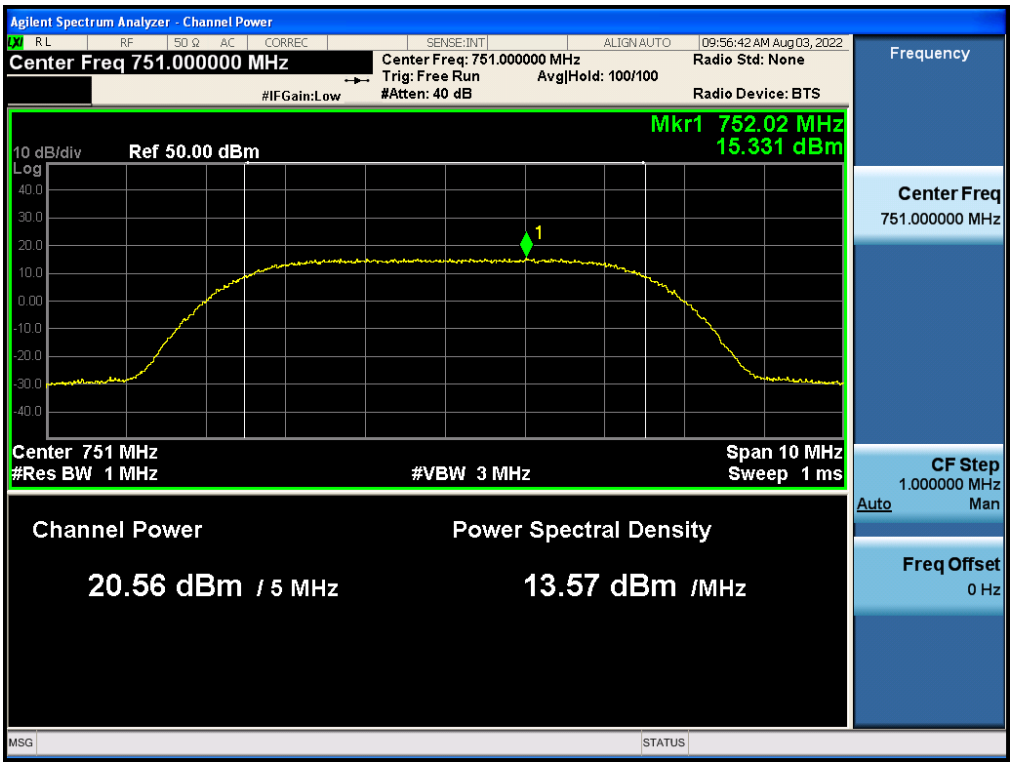
Ant.	Mod	Frequency (MHz)	Measured Value (dBm/MHz)	Ant.Gain (dBi)	E.I.R.P. (dBm/MHz)	Calculated (W/MHz)	Limit (W/MHz)
0	256QAM	2 112.50 + 2 175.00	7.69	8.00	15.69	0.04	1640
1	256QAM	2 112.50 + 2 175.00	7.71	8.00	15.71	0.04	

Sum Data of Port 0 and Port 1

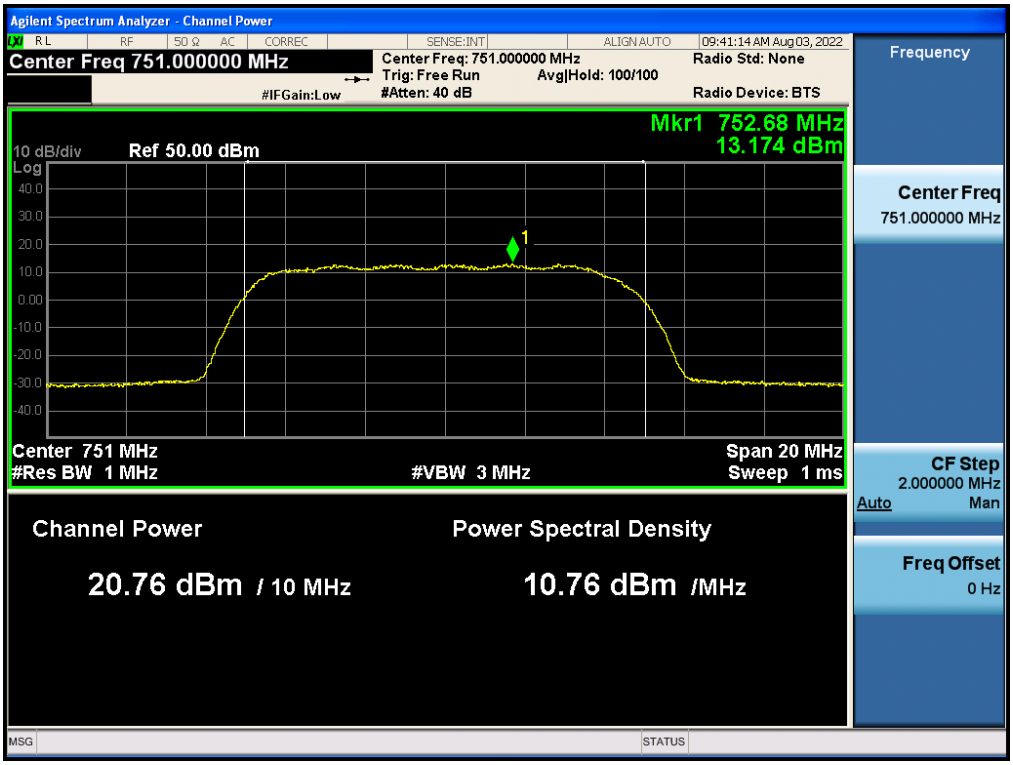
Frequency (MHz)	PSD				Limit
	QPSK	16QAM	64QAM	256QAM	
	W/MHz				
2 112.50 + 2 175.00	-	-	-	0.07	1640

Plot Data of PSD

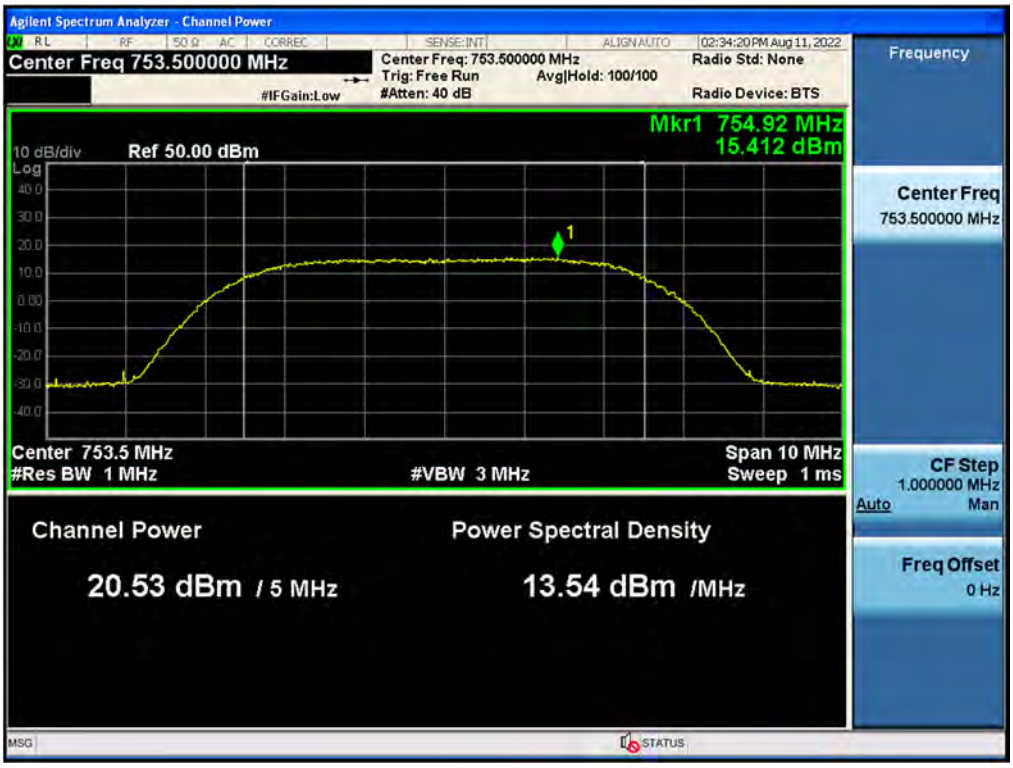
Antenna 0 / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle



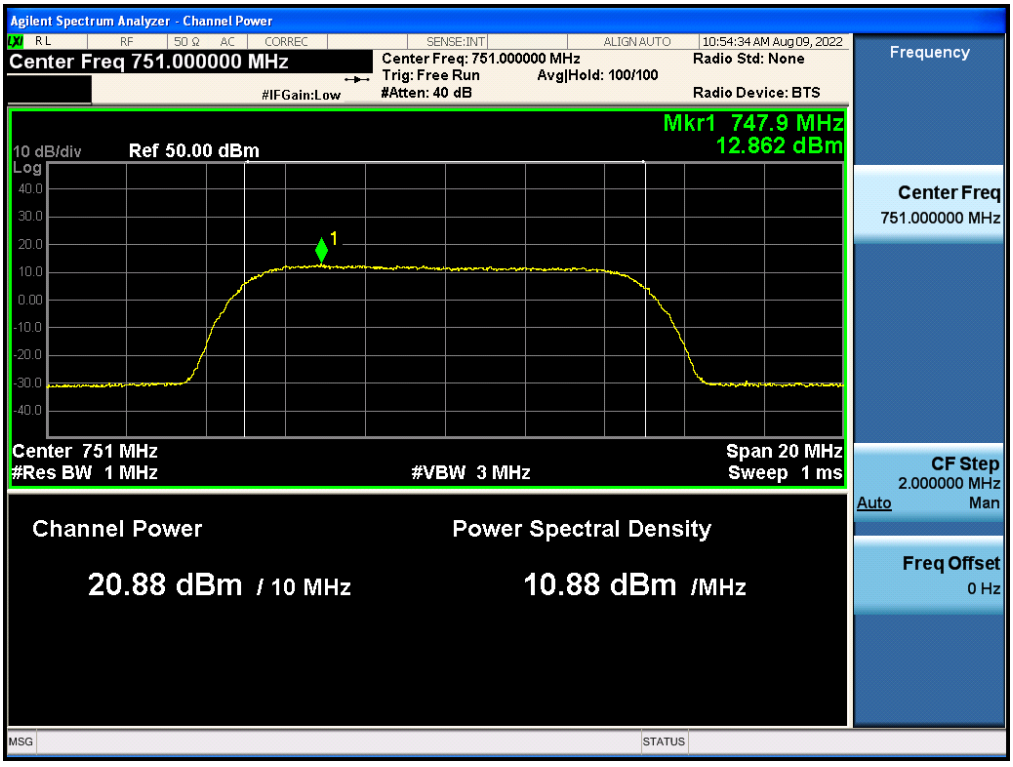
Antenna 0 / 5G NR n13 10 MHz 1 Carrier / QPSK / Middle



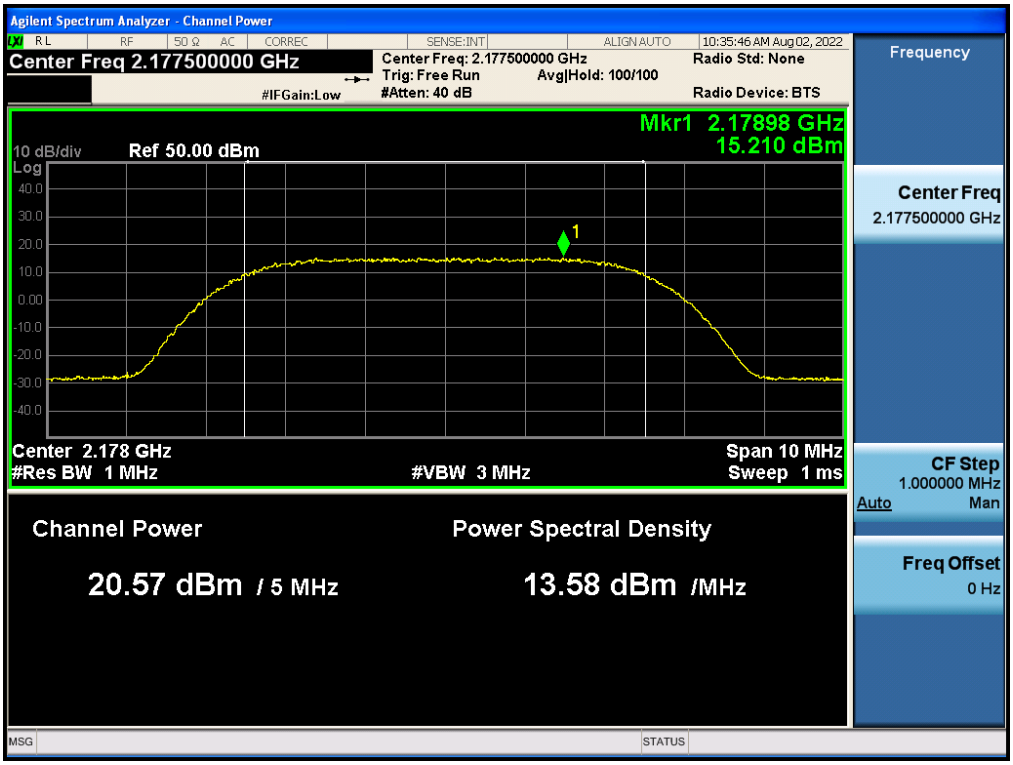
Antenna 1 / LTE B13 5 MHz + NB-IoT 1 Carrier / 16QAM / High



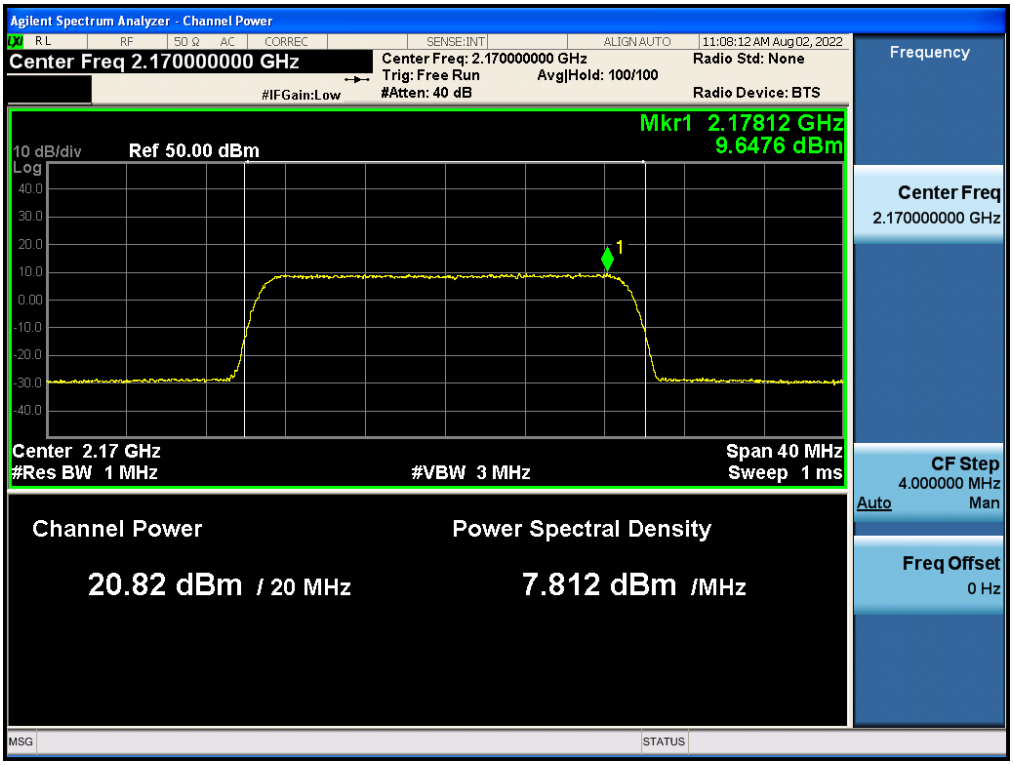
Antenna 0 / LTE B13 10 MHz + NB-IoT 1 Carrier / 64QAM / Middle



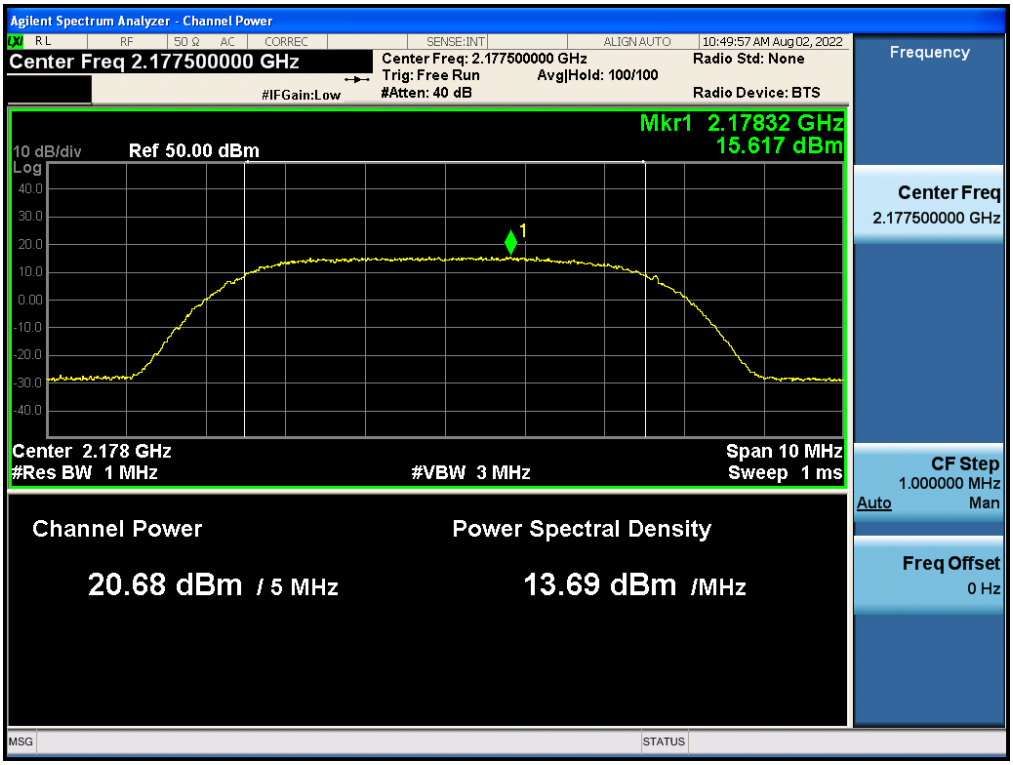
Antenna 1 / LTE B66 5 MHz 1 Carrier / 256QAM / High



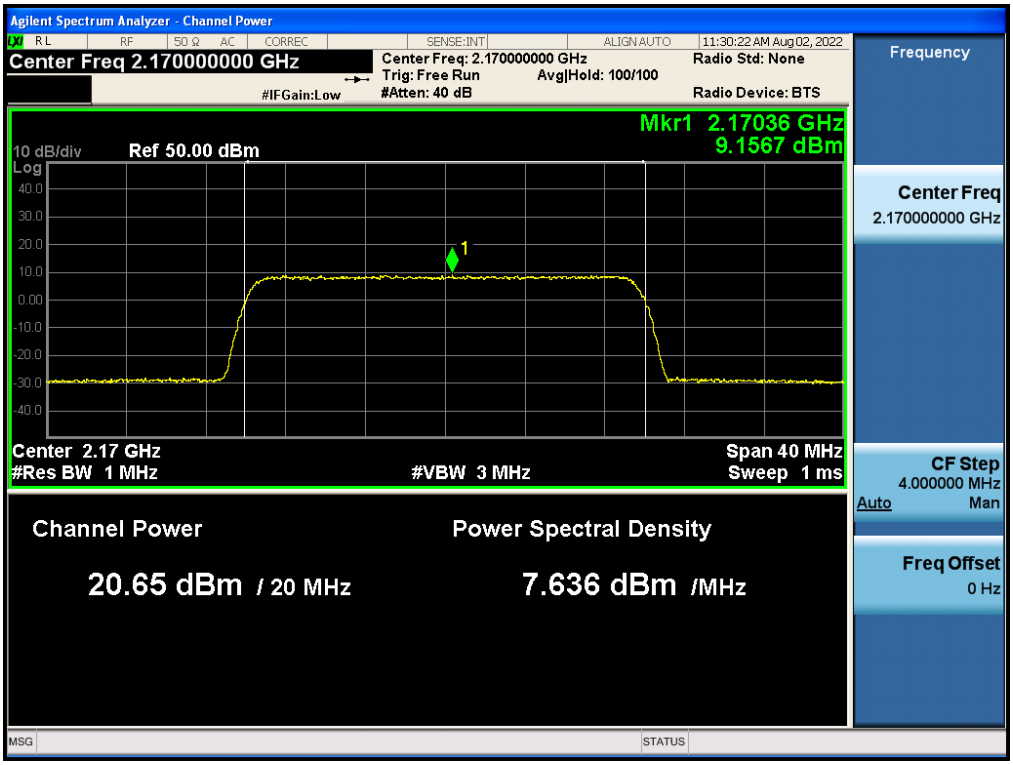
Antenna 0 / LTE B66 20 MHz 1 Carrier / QPSK / High



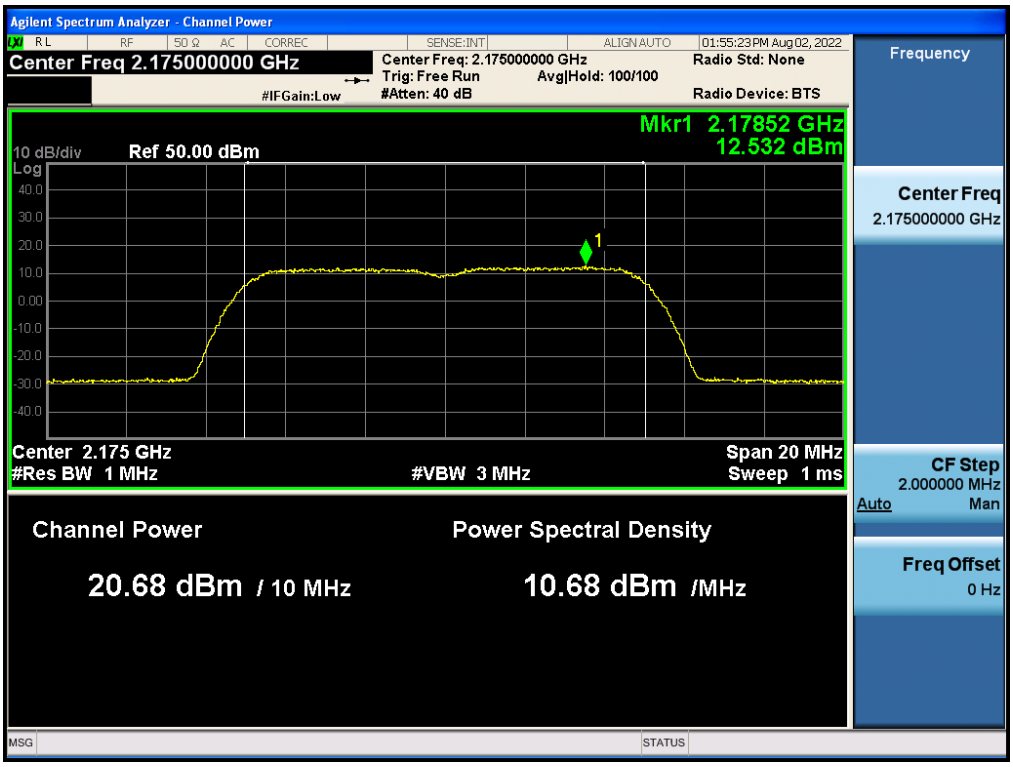
Antenna 1 / 5G NR n66 5 MHz 1 Carrier / 16QAM / High



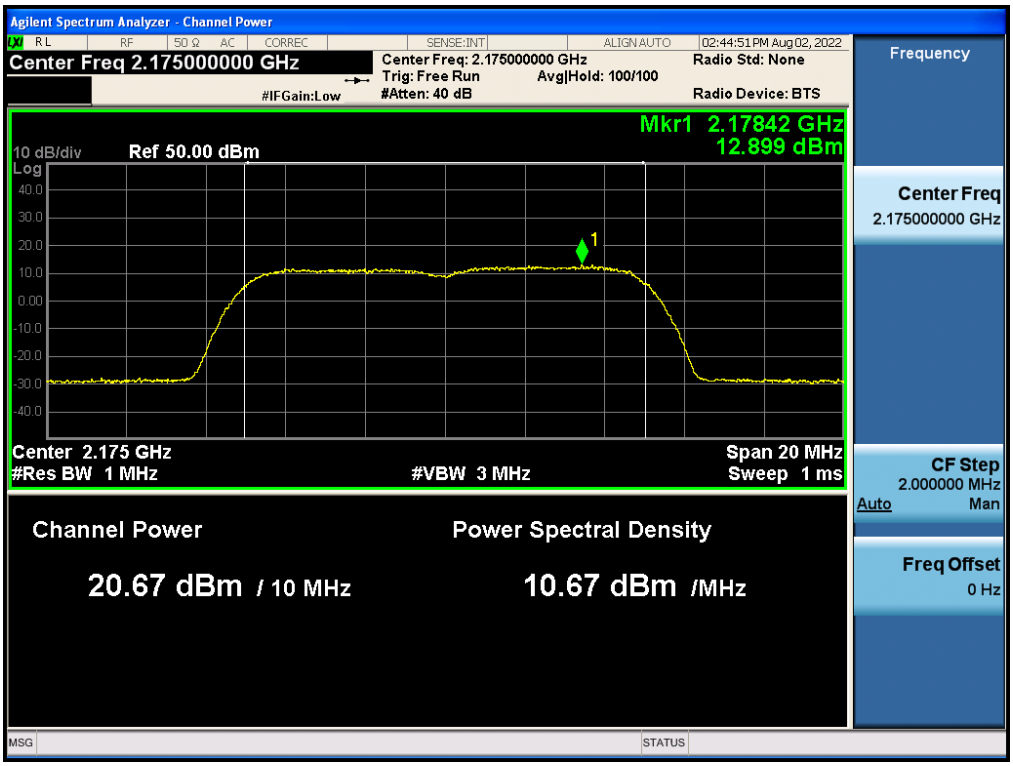
Antenna 1 / 5G NR n66 20 MHz 1 Carrier / 64QAM / High



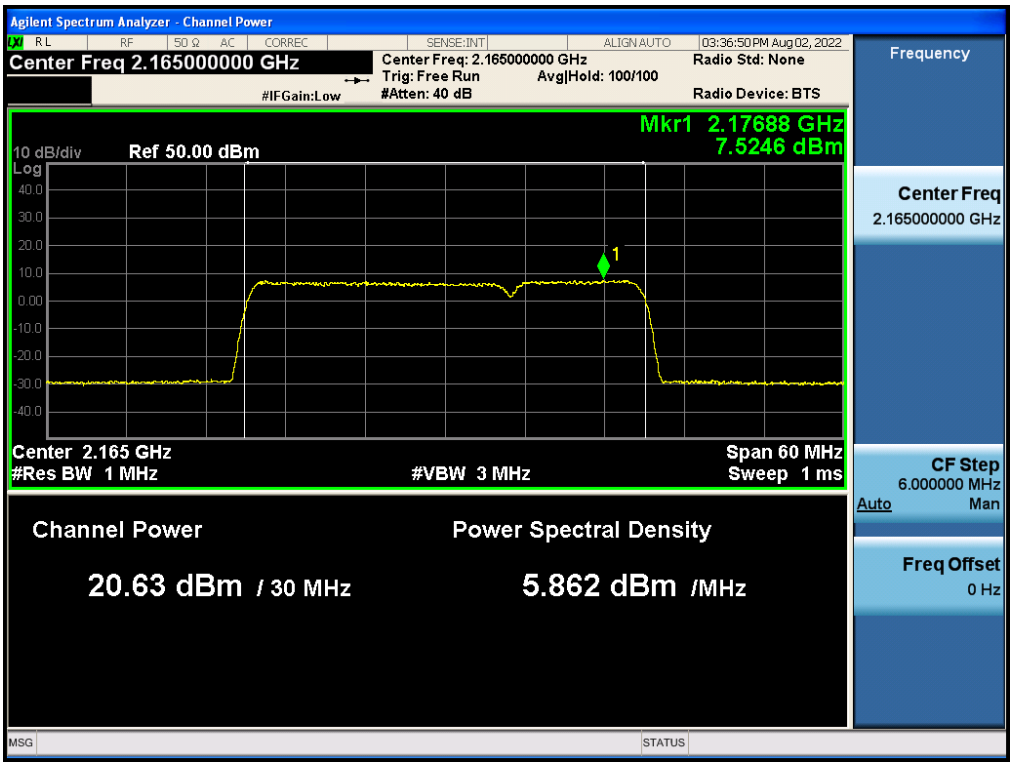
Antenna 1 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Contiguous / 256QAM / High



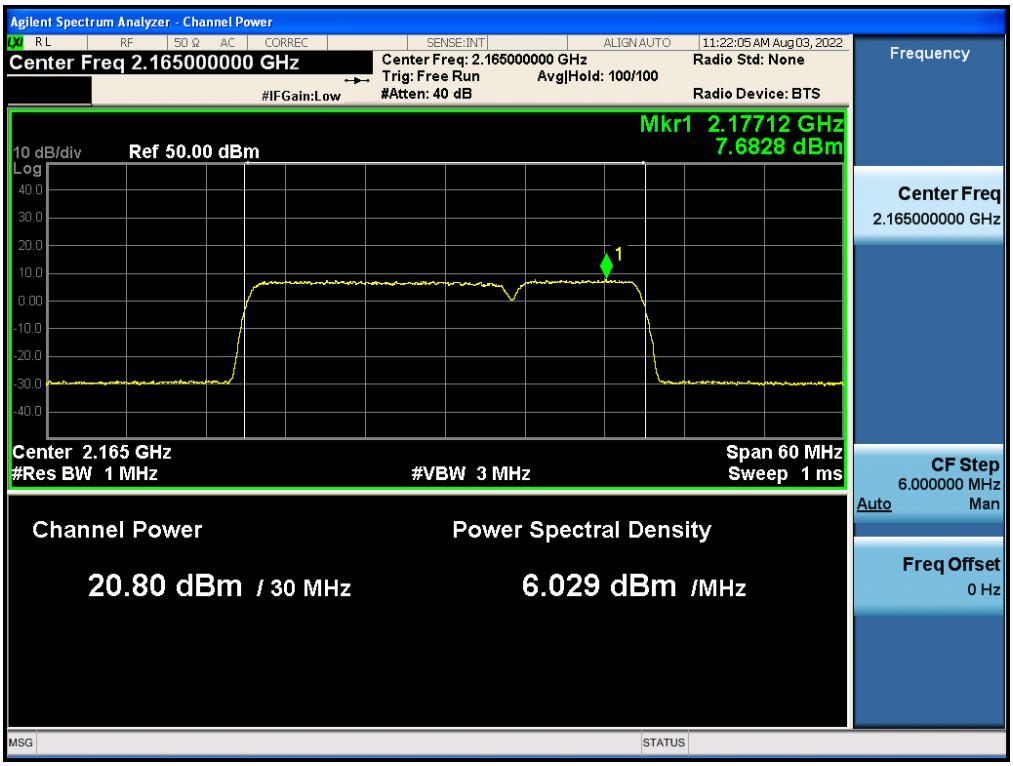
Antenna 0 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Contiguous / 64QAM / High



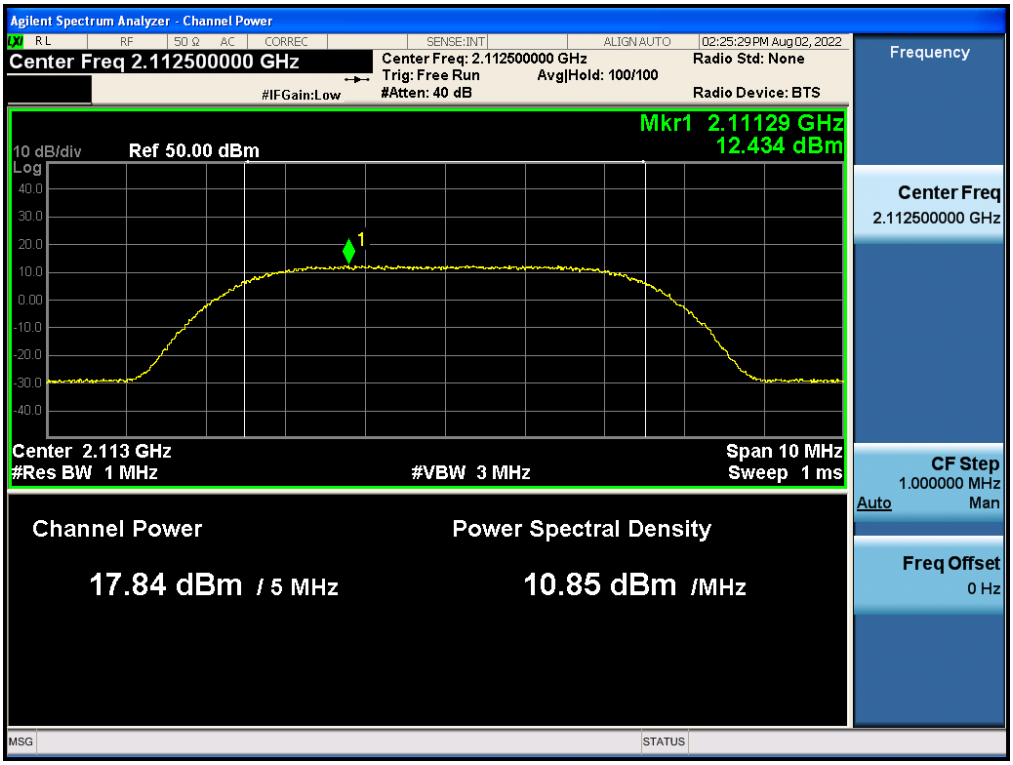
Antenna 1 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Contiguous / QPSK / High



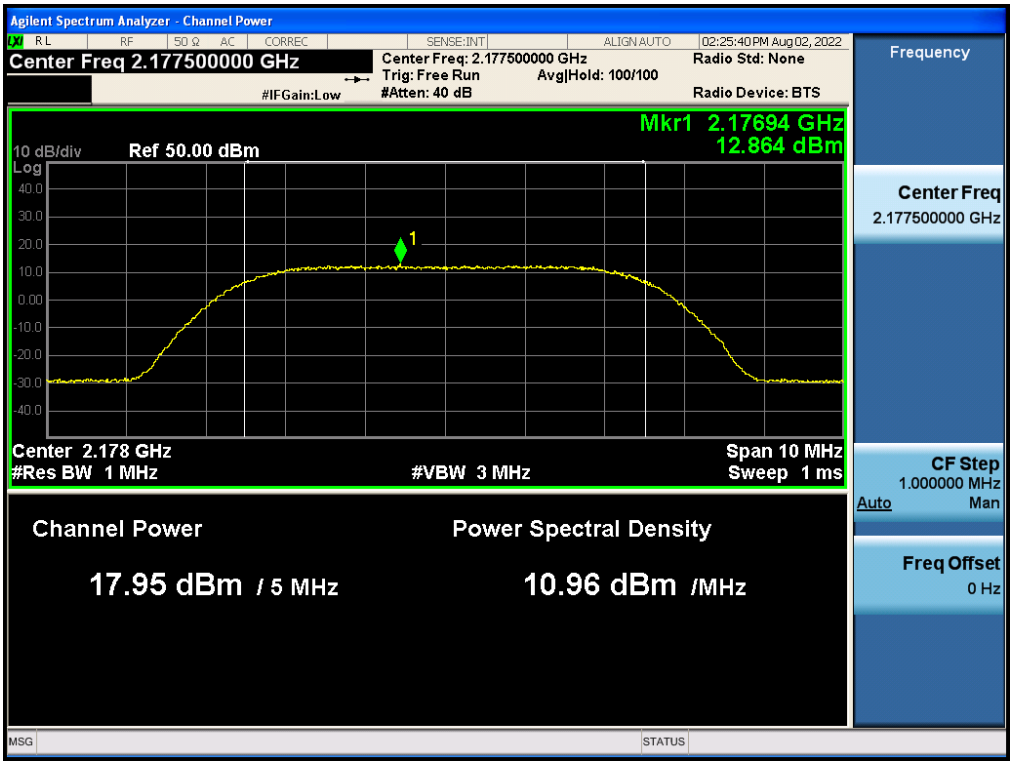
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Contiguous / 256QAM / High



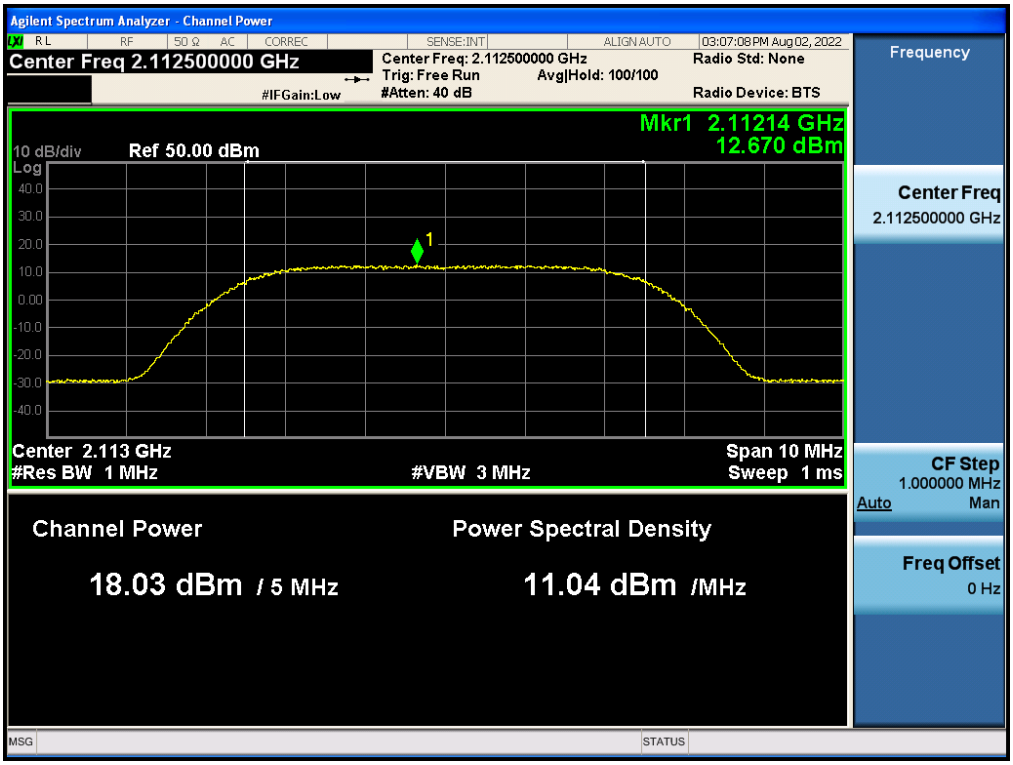
Antenna 1 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 5 MHz 1 Carrier / 256QAM / Low



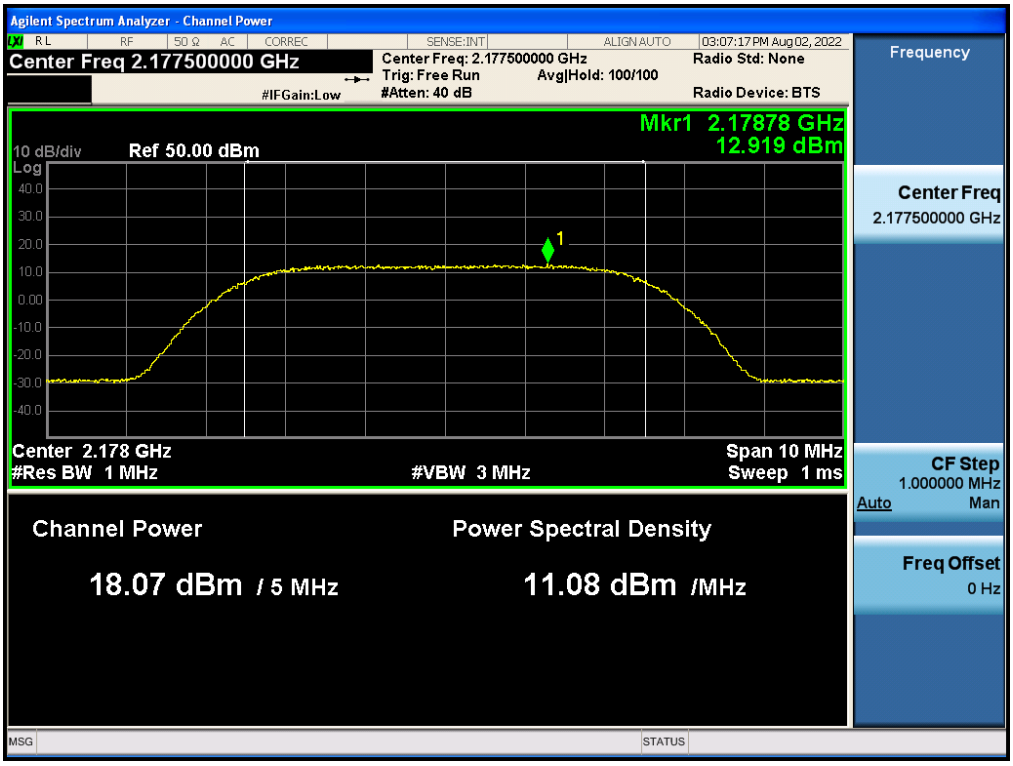
Antenna 1 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 5 MHz 1 Carrier / 256QAM / High



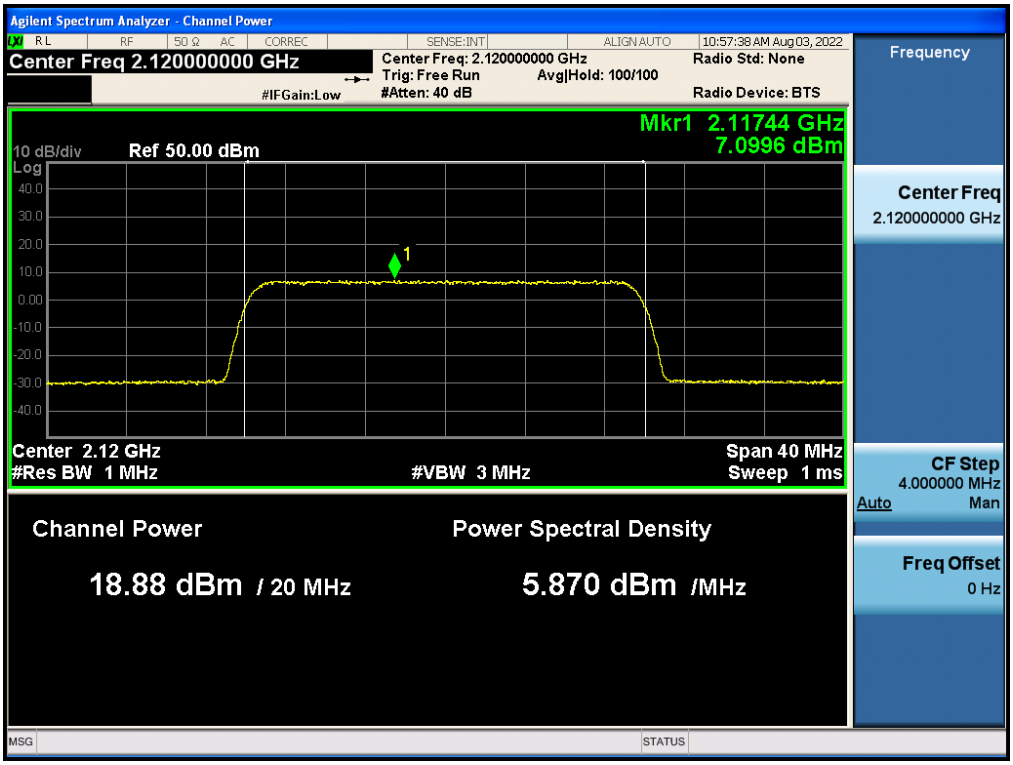
Antenna 0 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 5 MHz 1 Carrier / 64QAM / Low



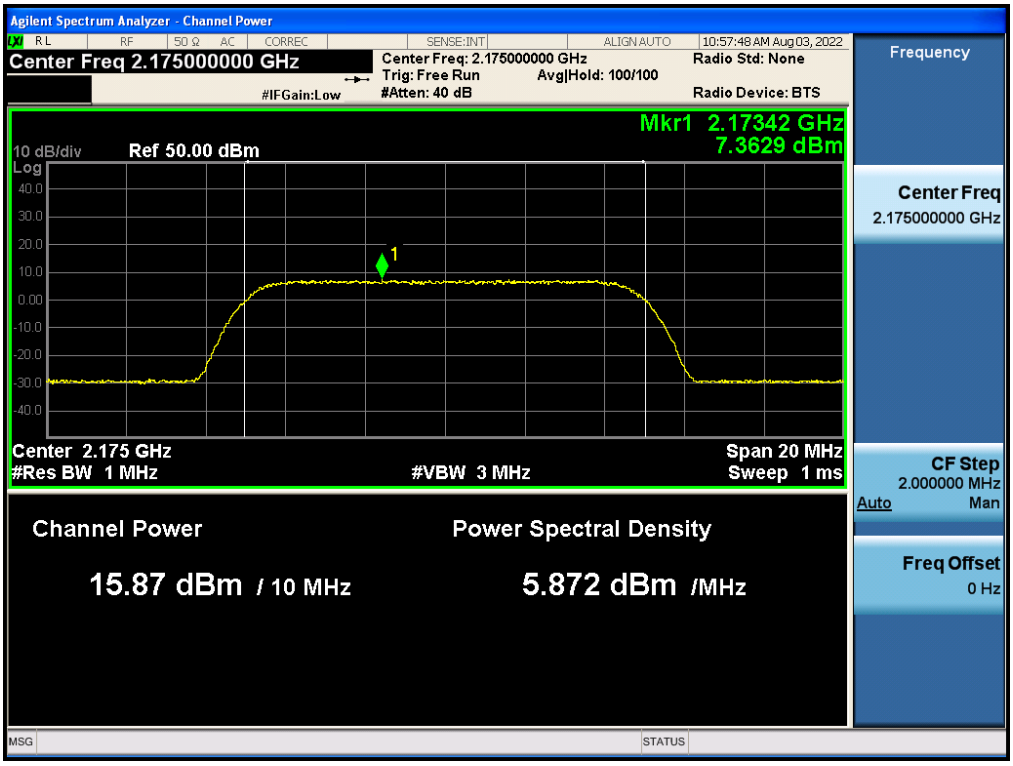
Antenna 0 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 5 MHz 1 Carrier / 64QAM / High



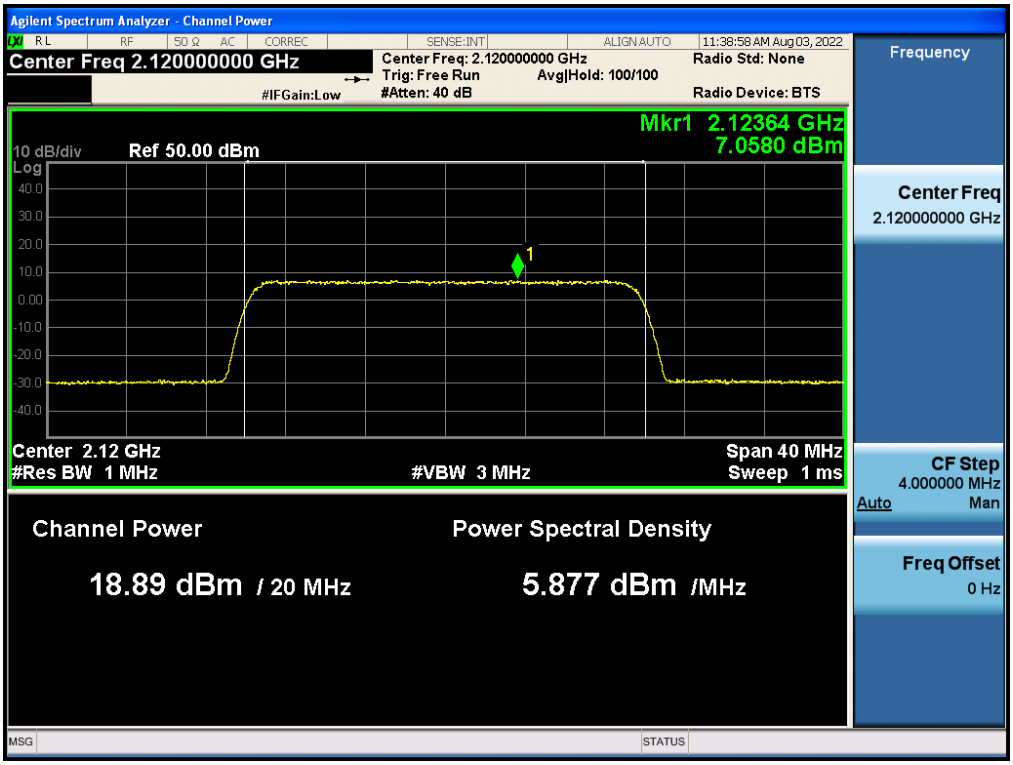
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 20 MHz 1 Carrier / QPSK / Low



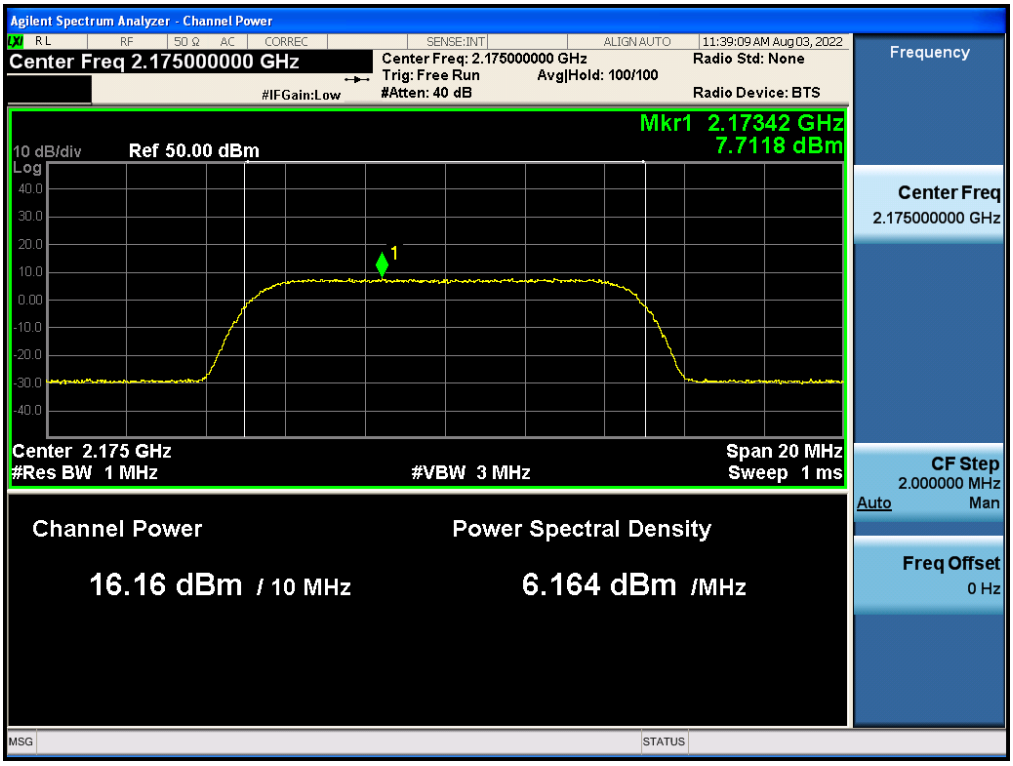
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 10 MHz 1 Carrier / QPSK / High



Antenna 1 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 20 MHz 1 Carrier / 256QAM / Low



Antenna 1 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 10 MHz 1 Carrier / 256QAM / High



5.2. PAPR

Test Requirements:

§ 27.50 Power limits and duty cycle.

(d) The following power and antenna height requirements apply to stations transmitting in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz and 2180-2200 MHz bands:

(5) Equipment employed must be authorized in accordance with the provisions of § 24.51. Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (d)(6) of this section. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

Test Procedures:

The measurement is performed in accordance with Section 5.2.3.4 of ANSI C63.26.

The following guidelines are offered for performing a CCDF measurement..

a) Set resolution/measurement bandwidth ≥ OBW or specified reference bandwidth.

b) Set the number of counts to a value that stabilizes the measured CCDF curve.

c) Set the measurement interval as follows:

1) For continuous transmissions, set to the greater of [10 × (number of points in sweep) × (transmission symbol period)] or 1 ms.

2) For burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize. Set the measurement interval to a time that is less than or equal to the burst duration.

3) If there are several carriers in a single antenna port, the peak power shall be determined for each individual carrier (by disabling the other carriers while measuring the required carrier) and the total peak power calculated from the sum of the individual carrier peak powers.

d) Record the maximum PAPR level associated with a probability of 0.1 %.

e) The peak power level is calculated form the sum of the PAPR value from step d) to the measured average power.

Note:

(1) The results of PAPR test shown above the frequency measured values are very small and similar trend for each port, so we are attached only the worst case plot.

(2) All power supplies of operation were investigated and the worst case configuration results are reported.

- Mode: DC: -48 V / PoE: 57 V
- Worst case: PoE: 57 V

Tabular data of PAPR

5G NR n13 5 MHz 1 Carrier

Ant.	Modulation	Channel	Frequency (MHz)	0.1 % PAPR (dB)
0	256QAM	Middle	751.00	8.63
1	256QAM	Middle	751.00	8.59

5G NR n13 10 MHz 1 Carrier

Ant.	Modulation	Channel	Frequency (MHz)	0.1 % PAPR (dB)
0	16QAM	Middle	751.00	8.60
1	16QAM	Middle	751.00	8.60

LTE B13 5 MHz + NB-IoT 1 Carrier

Ant. No.	Modulation	Channel	Frequency (MHz)	[Original] LTE B13 5 MHz 0.1 % PAPR (dB)	[Permissive Change] LTE B13 5 MHz + NB-IoT 0.1 % PAPR (dB)	Deviation
1	64QAM	Low	748.50	8.38	8.35	-0.03

*** We did spot checking on LTE B13 5 MHz with NB IoT as in-band operation, this does not generate any changes because in-band NB-IoT cannot distinguish with original LTE signal.**

LTE B13 10 MHz + NB-IoT 1 Carrier

Ant.	Modulation	Channel	Frequency (MHz)	0.1 % PAPR (dB)
0	QPSK	Middle	751.00	8.50
	16QAM	Middle	751.00	8.38
	64QAM	Middle	751.00	8.43
	256QAM	Middle	751.00	8.46
1	QPSK	Middle	751.00	8.44
	16QAM	Middle	751.00	8.40
	64QAM	Middle	751.00	8.46
	256QAM	Middle	751.00	8.48

LTE B66 5 MHz 1 Carrier

Ant.	Modulation	Channel	Frequency (MHz)	0.1 % PAPR (dB)
0	256QAM	High	2 177.50	8.31
1	256QAM	High	2 177.50	8.25

LTE B66 20 MHz 1 Carrier

Ant.	Modulation	Channel	Frequency (MHz)	0.1 % PAPR (dB)
0	QPSK	High	2 170.00	8.30
1	QPSK	High	2 170.00	8.32

5G NR n66 5 MHz 1 Carrier

Ant.	Modulation	Channel	Frequency (MHz)	0.1 % PAPR (dB)
0	16QAM	High	2 177.50	8.42
1	16QAM	High	2 177.50	8.45

5G NR n66 20 MHz 1 Carrier

Ant.	Modulation	Channel	Frequency (MHz)	0.1 % PAPR (dB)
0	64QAM	High	2 170.00	8.42
1	64QAM	High	2 170.00	8.38

Tabular data of Contiguous PAPR

5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Modulation	Channel	Frequency (MHz)	0.1 % PAPR (dB)
0	256QAM	High	2 175.00	8.25
1	256QAM	High	2 175.00	8.22

LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Modulation	Channel	Frequency (MHz)	0.1 % PAPR (dB)
0	64QAM	High	2 175.00	8.29
1	64QAM	High	2 175.00	8.34

5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier]

Ant.	Modulation	Channel	Frequency (MHz)	0.1 % PAPR (dB)
0	QPSK	High	2 165.00	8.41
1	QPSK	High	2 165.00	8.38

5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier]

Ant.	Modulation	Channel	Frequency (MHz)	0.1 % PAPR (dB)
0	256QAM	High	2 165.00	8.37
1	256QAM	High	2 165.00	8.42

Tabular data of Non-Contiguous PAPR

5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Modulation	5G NR n66 5 MHz		LTE B66 5 MHz	
		Frequency (MHz)	Measured Value (dB)	Frequency (MHz)	Measured Value (dB)
0	256QAM	2 112.50	8.41	2 177.50	8.08
1	256QAM	2 112.50	8.49	2 177.50	8.08

LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Modulation	LTE B66 5 MHz		LTE B66 5 MHz	
		Frequency (MHz)	Measured Value (dB)	Frequency (MHz)	Measured Value (dB)
0	64QAM	2 112.50	8.36	2 177.50	8.47
1	64QAM	2 112.50	8.28	2 177.50	8.41

5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier]

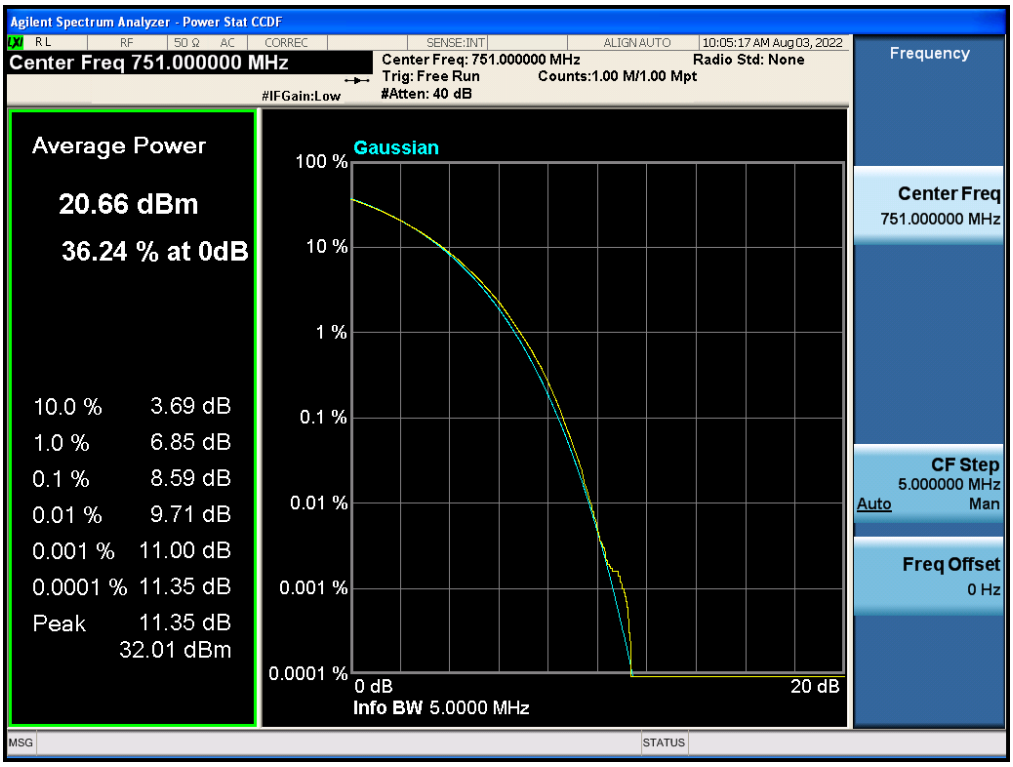
Ant.	Modulation	5G NR n66 20 MHz		5G NR n66 10 MHz	
		Frequency (MHz)	Measured Value (dB)	Frequency (MHz)	Measured Value (dB)
0	QPSK	2 120.00	8.42	2 175.00	8.41
1	QPSK	2 120.00	8.43	2 175.00	8.41

5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier]

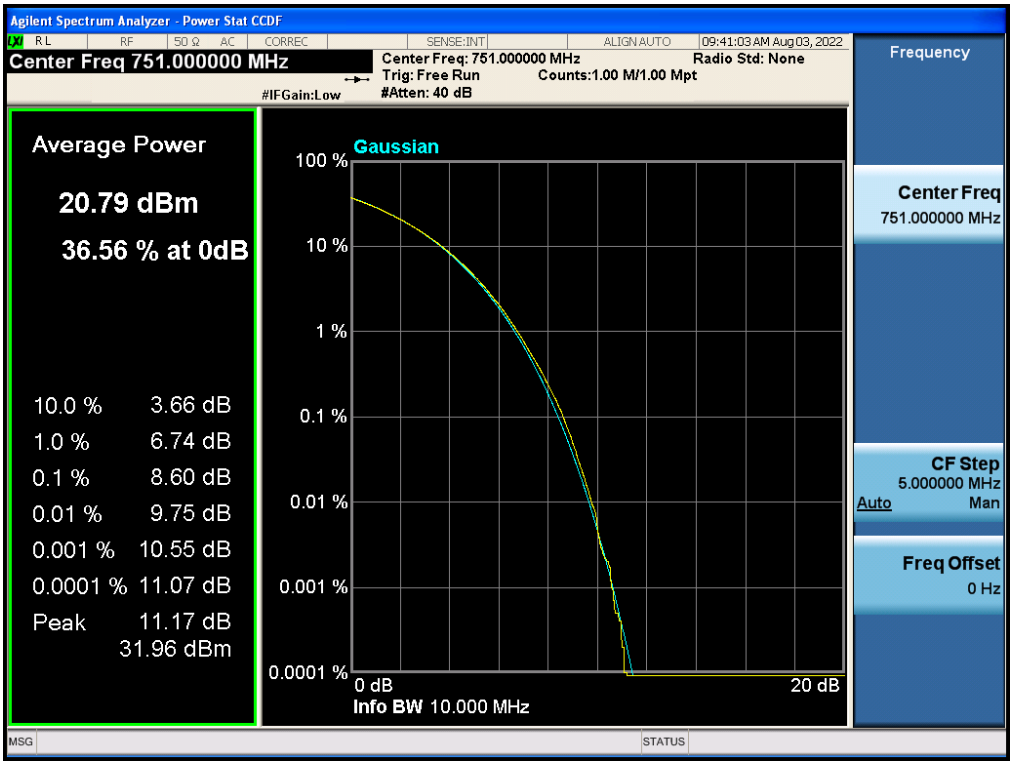
Ant.	Modulation	5G NR n66 20 MHz		LTE B66 10 MHz	
		Frequency (MHz)	Measured Value (dB)	Frequency (MHz)	Measured Value (dB)
0	256QAM	2 120.00	8.44	2 175.00	8.42
1	256QAM	2 120.00	8.51	2 175.00	8.40

Plot Data of PAPR

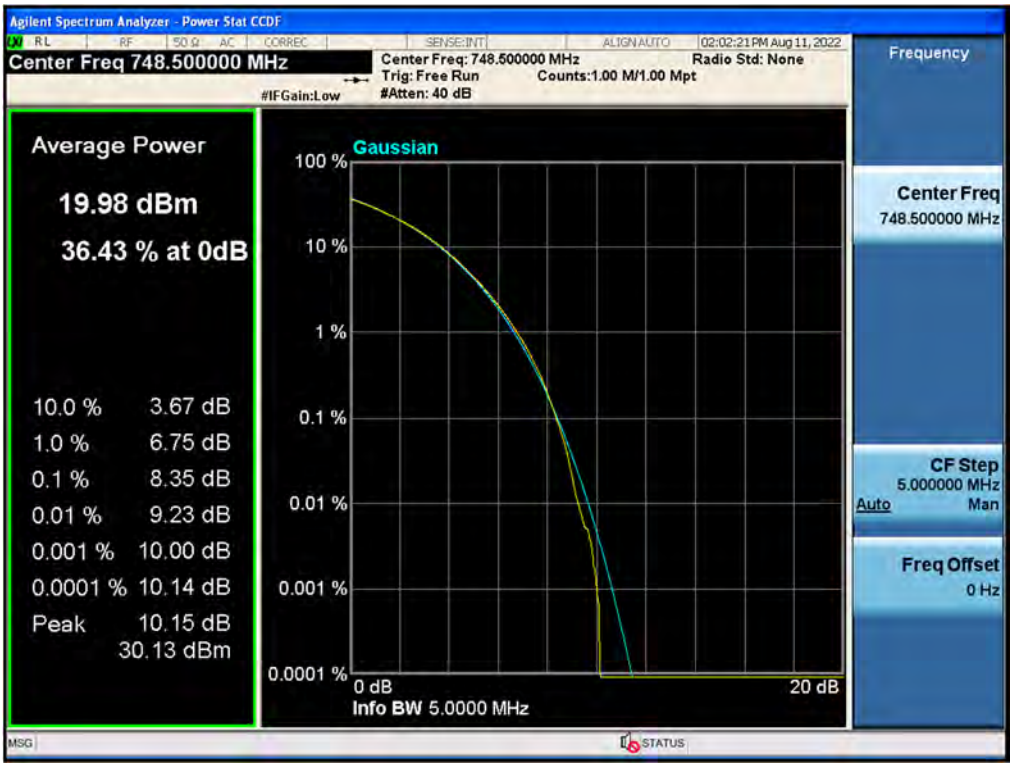
Antenna 1 / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle



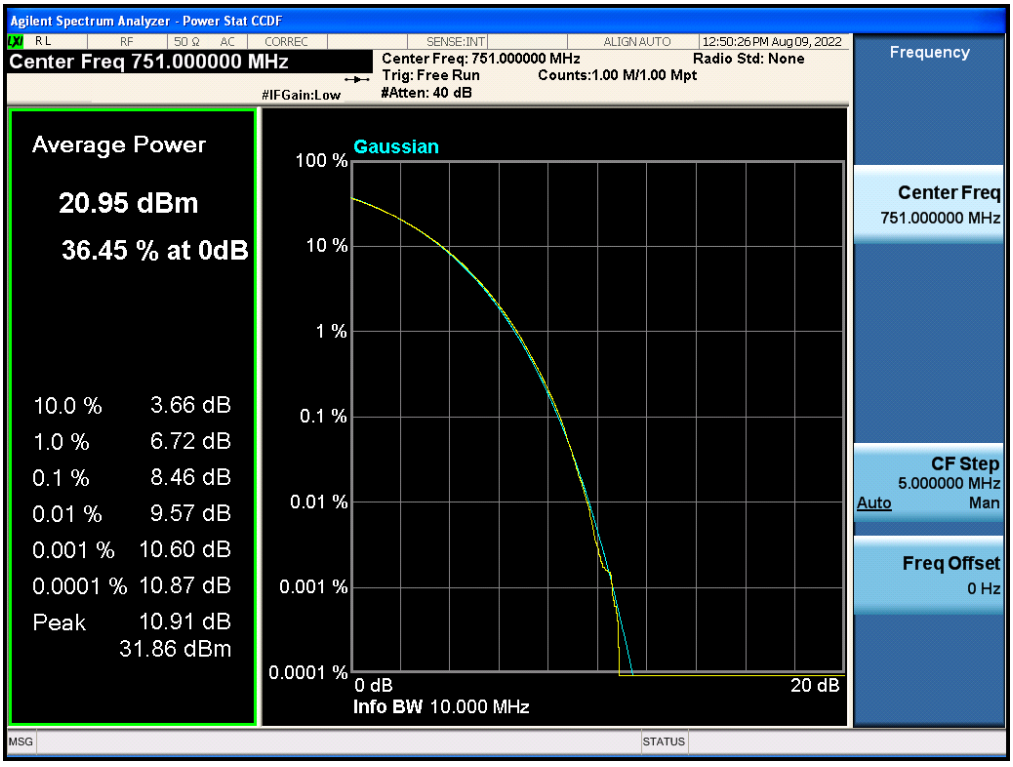
Antenna 0 / 5G NR n13 10 MHz 1 Carrier / QPSK / Middle



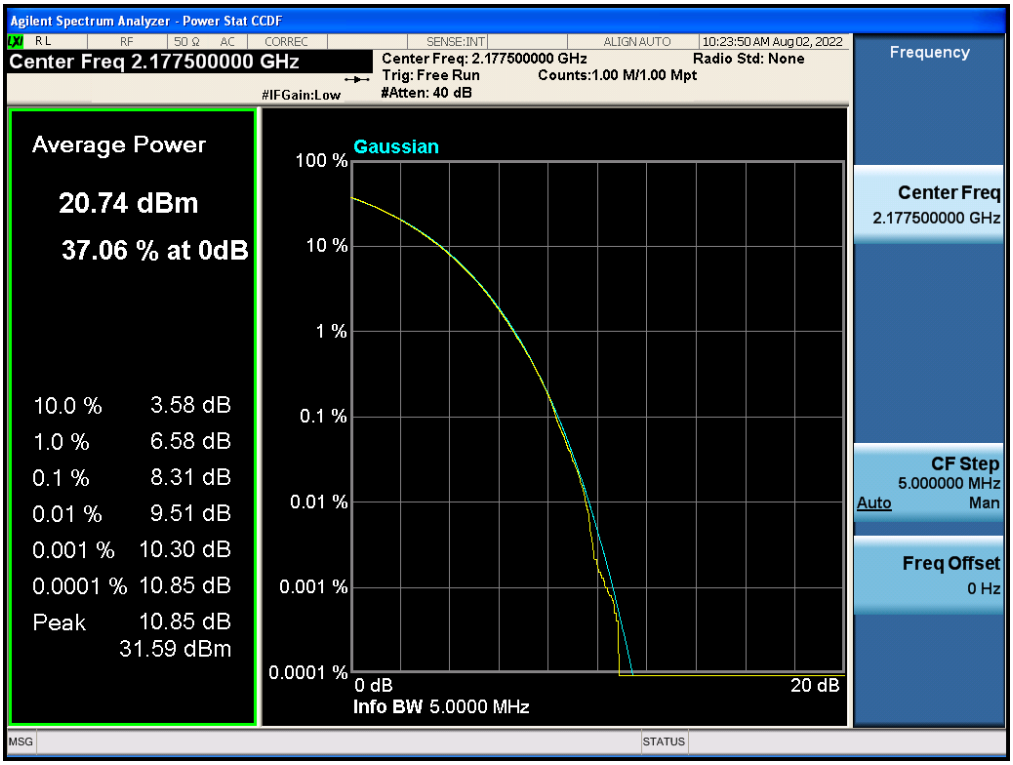
Antenna 1 / LTE B13 10 MHz + NB-IoT 1 Carrier / 64QAM / Low



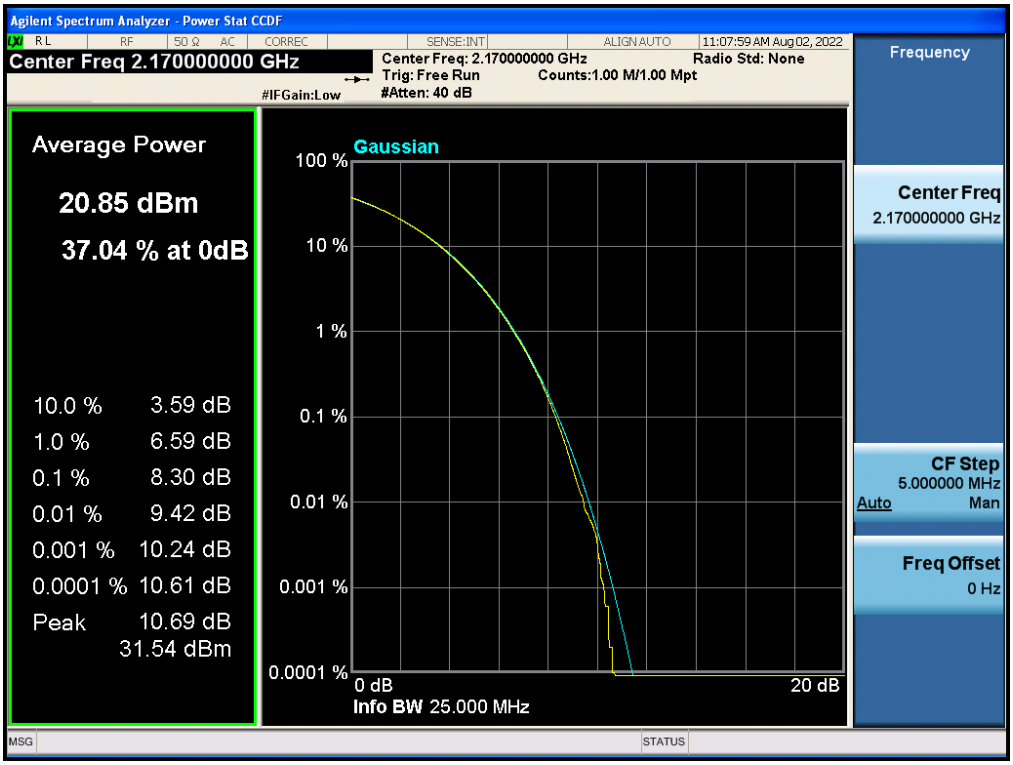
Antenna 1 / LTE B13 10 MHz + NB-IoT 1 Carrier / 64QAM / Middle



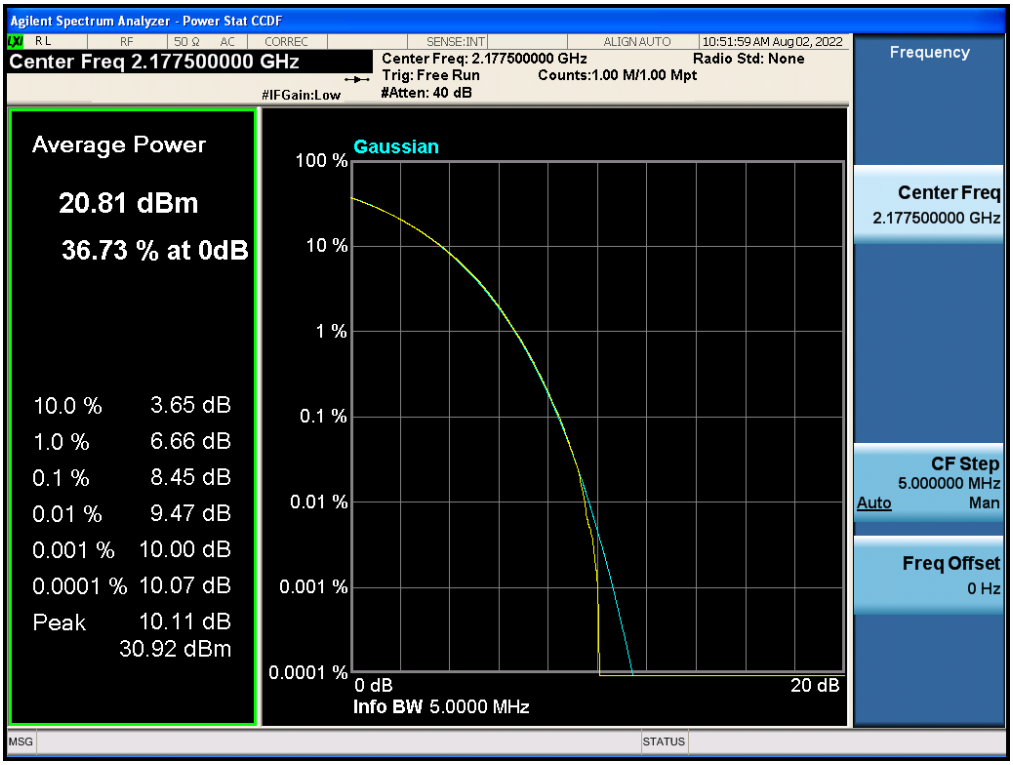
Antenna 0 / LTE B66 5 MHz 1 Carrier / 256QAM / High



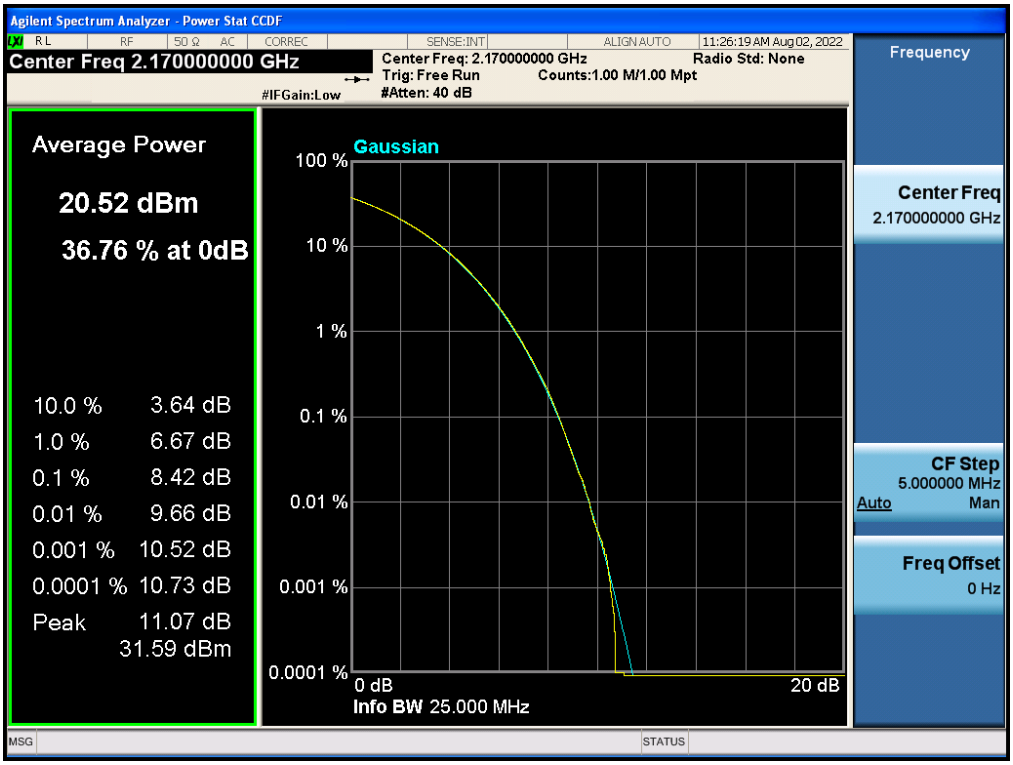
Antenna 0 / LTE B66 20 MHz 1 Carrier / QPSK / High



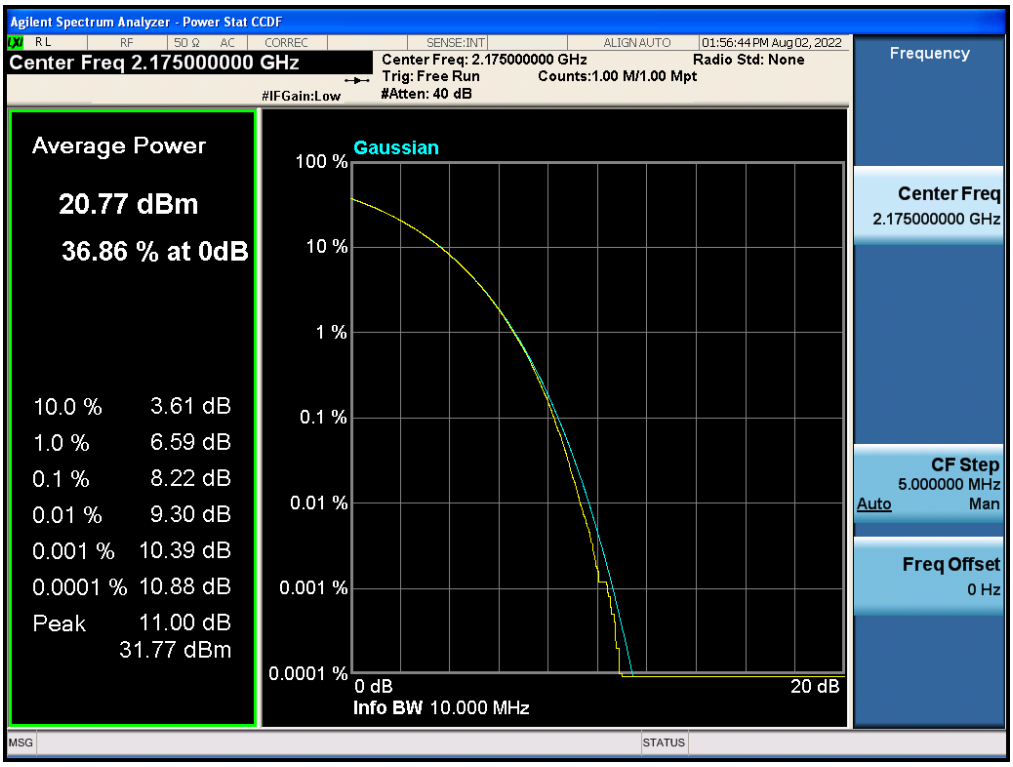
Antenna 1 / 5G NR n66 5 MHz 1 Carrier / 16QAM / High



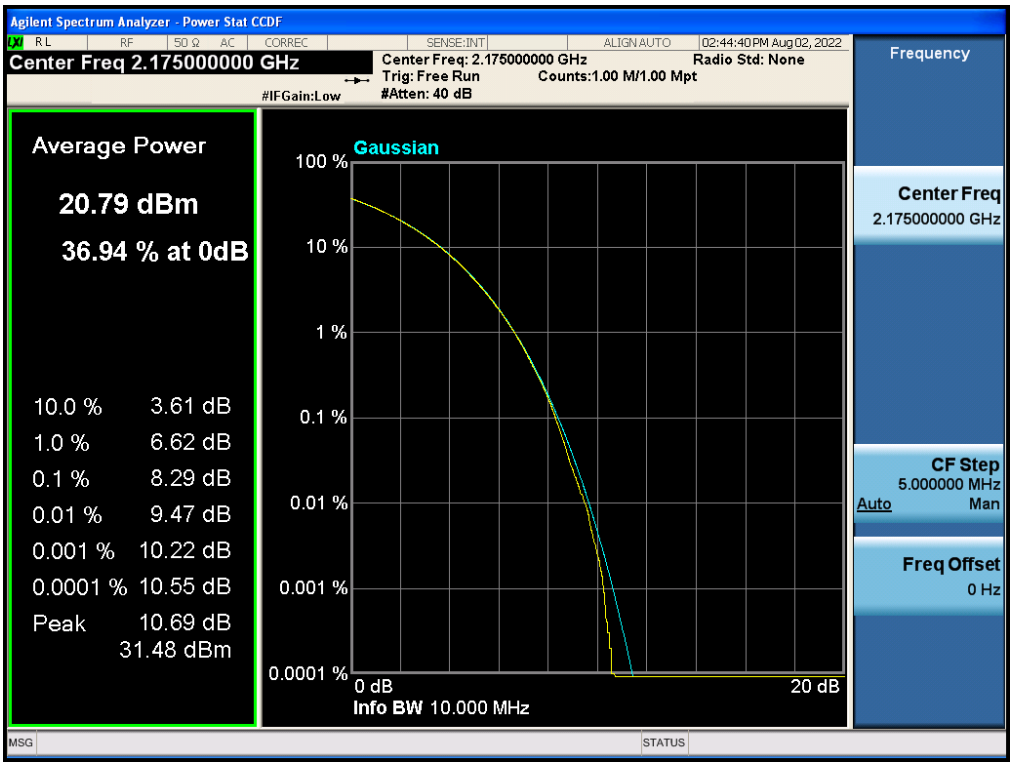
Antenna 0 / 5G NR n66 20 MHz 1 Carrier / 64QAM / High



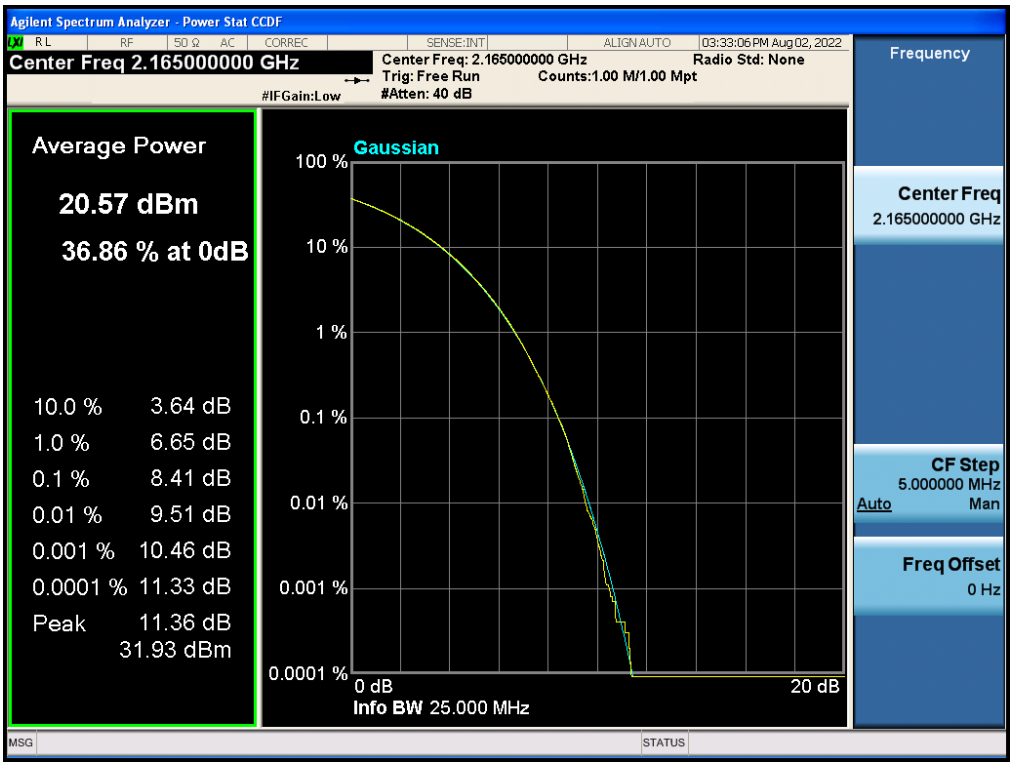
Antenna 1 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Contiguous / 256QAM / High



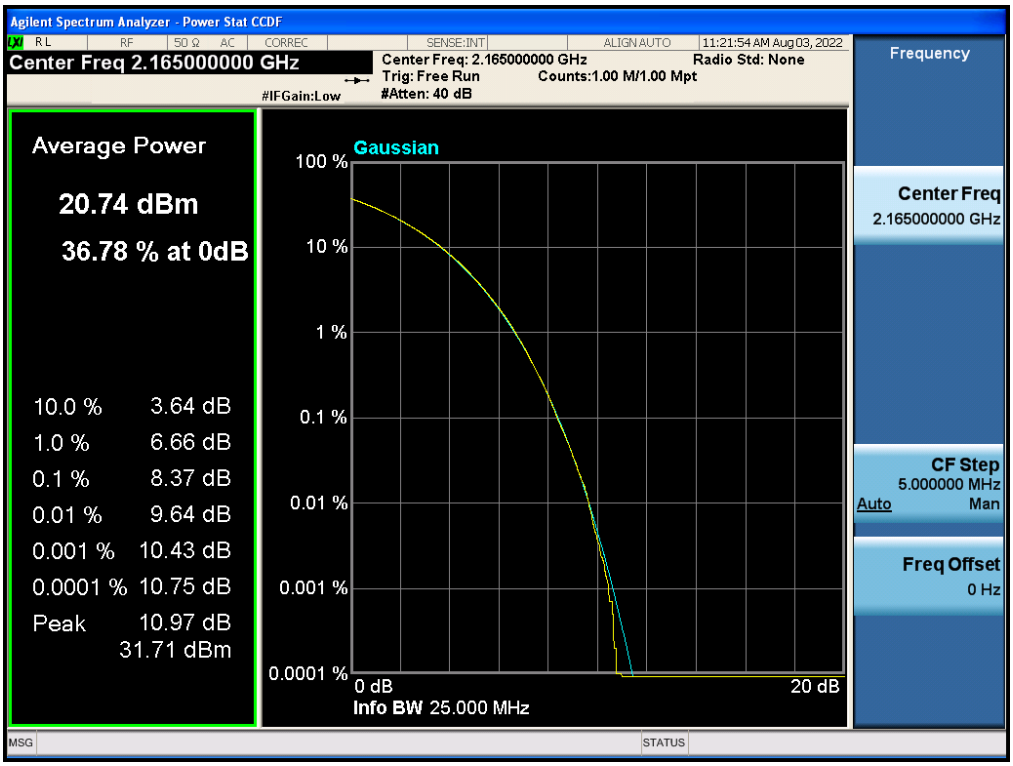
Antenna 0 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Contiguous / 64QAM / High



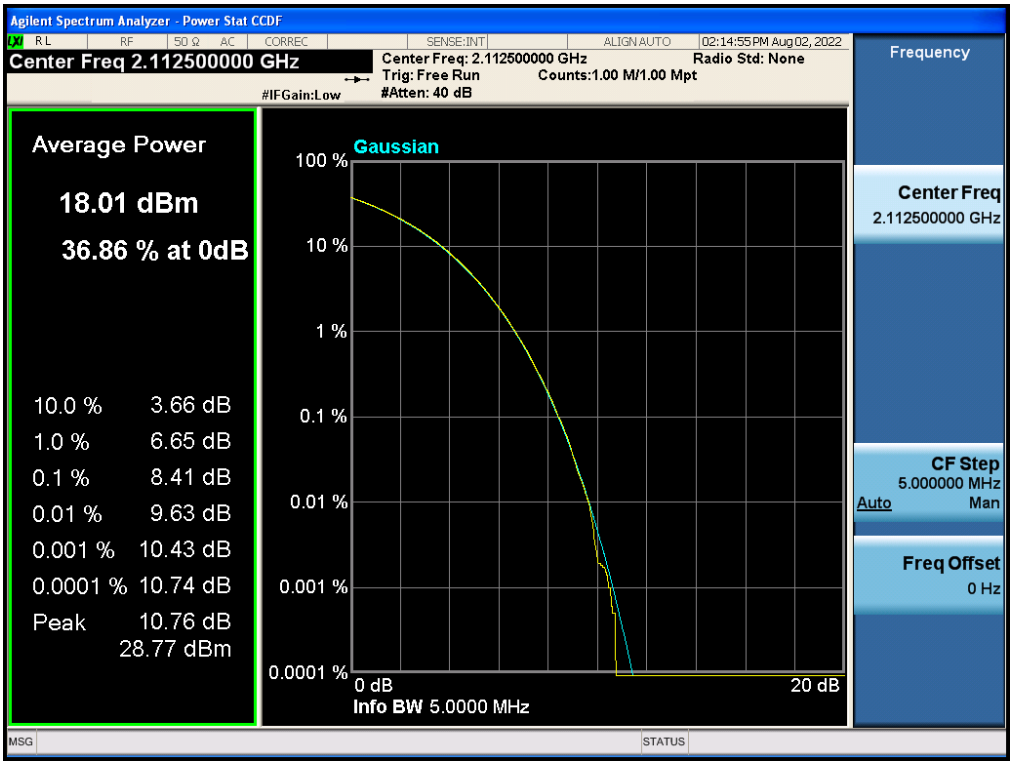
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Contiguous / QPSK / High



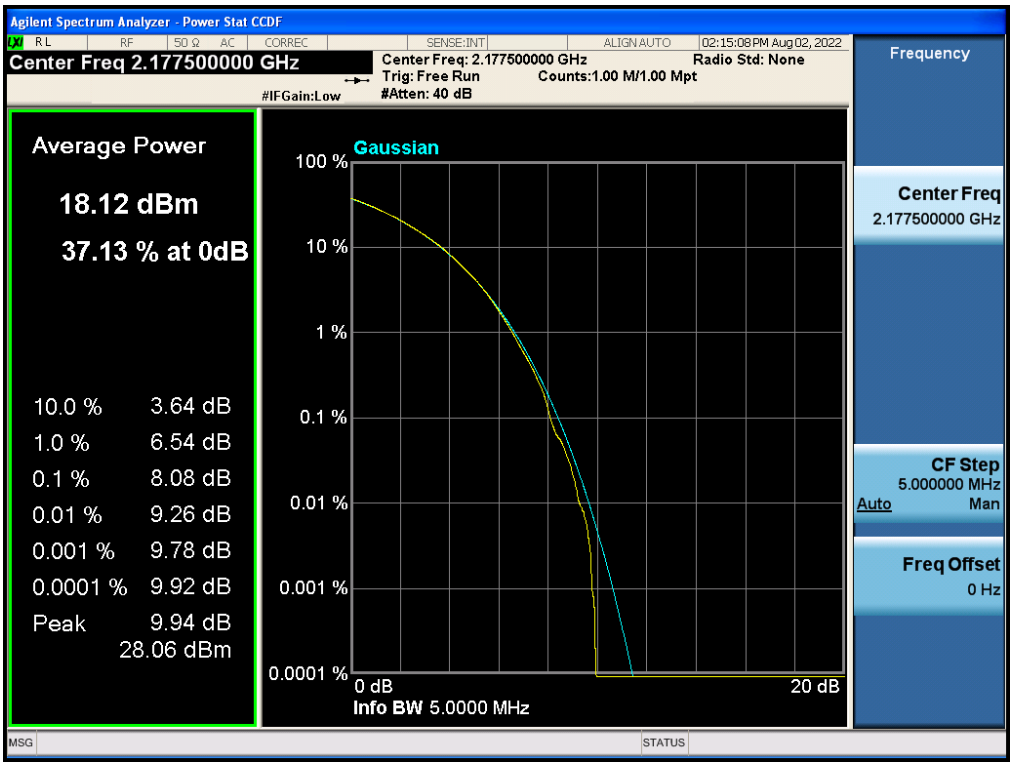
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Contiguous / 256QAM / High



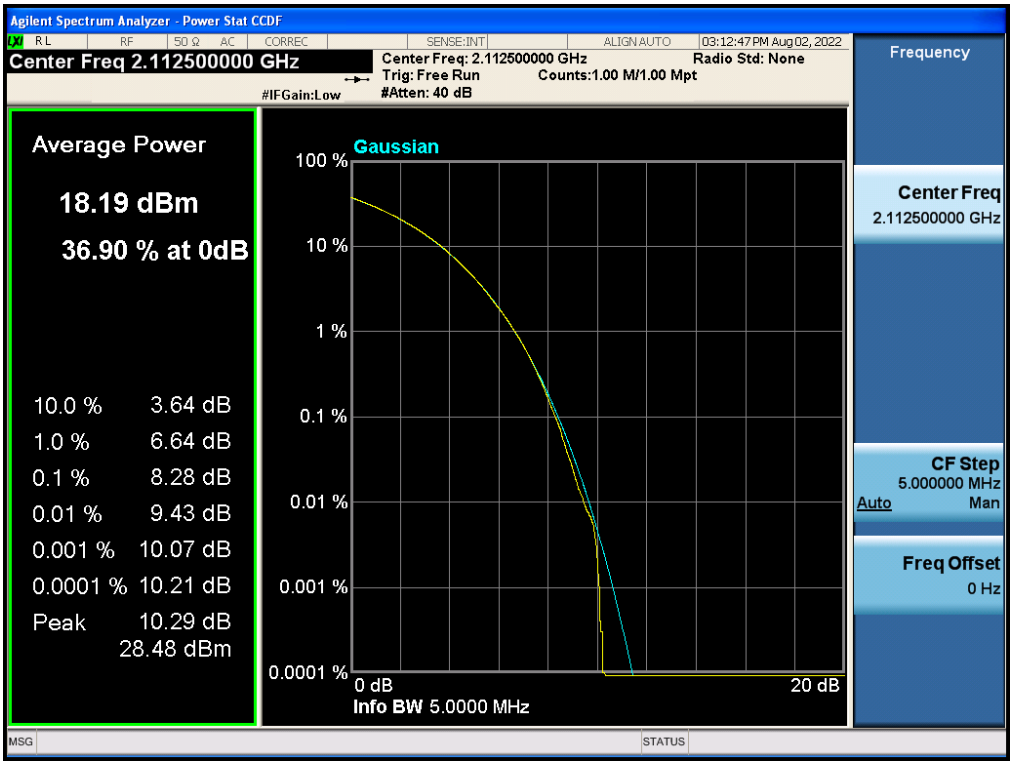
Antenna 0 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 5 MHz 1 Carrier / 256QAM / Low



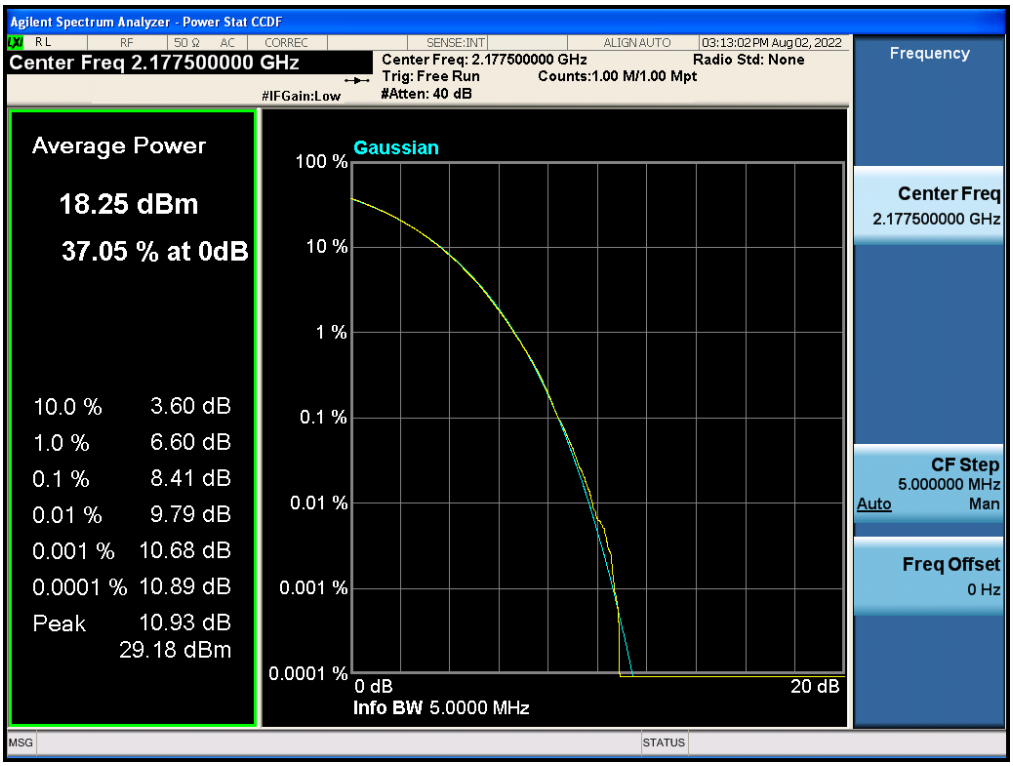
Antenna 0 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 5 MHz 1 Carrier / 256QAM / High



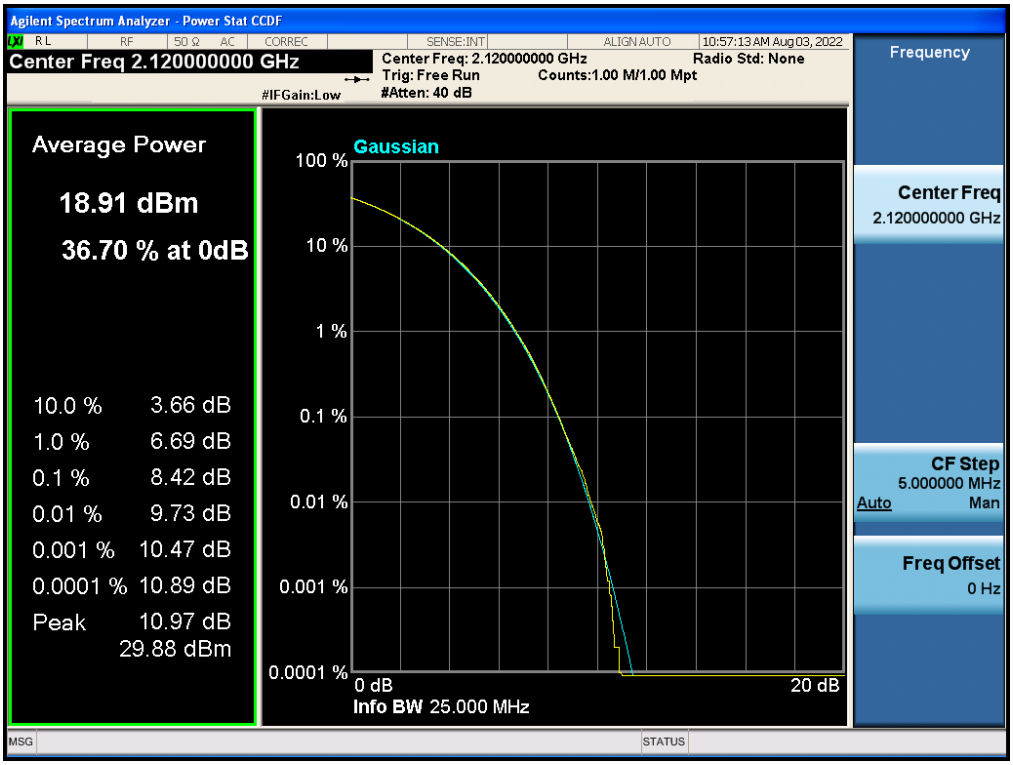
Antenna 1 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 5 MHz 1 Carrier / 64QAM / Low



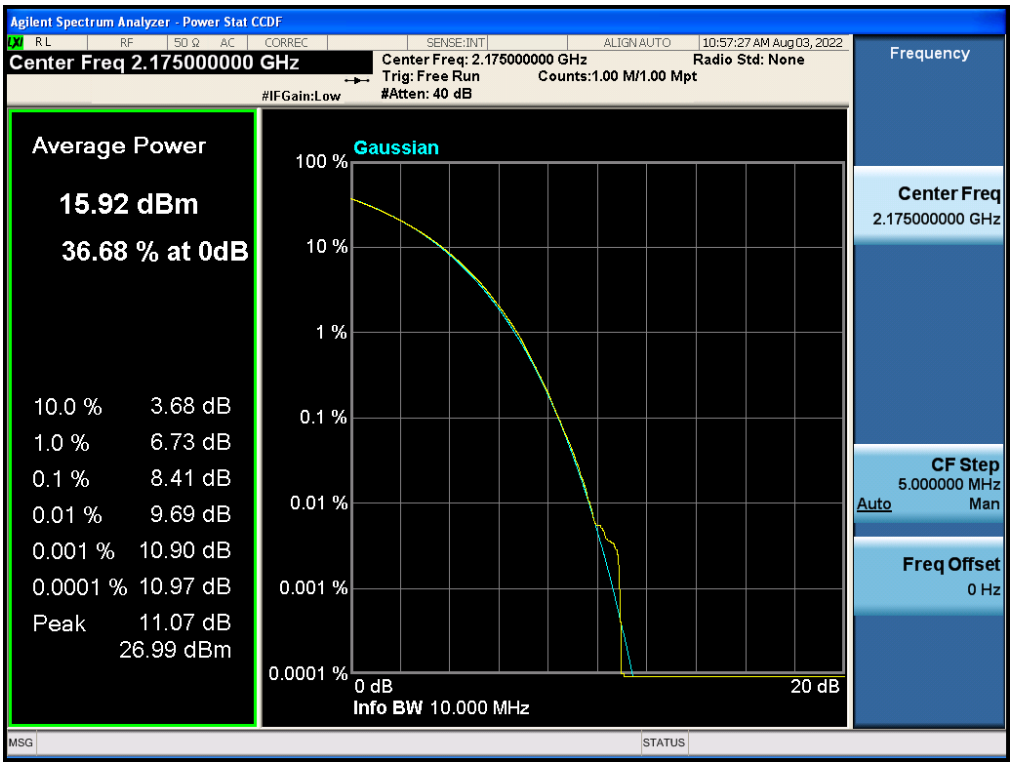
Antenna 1 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 5 MHz 1 Carrier / 64QAM / High



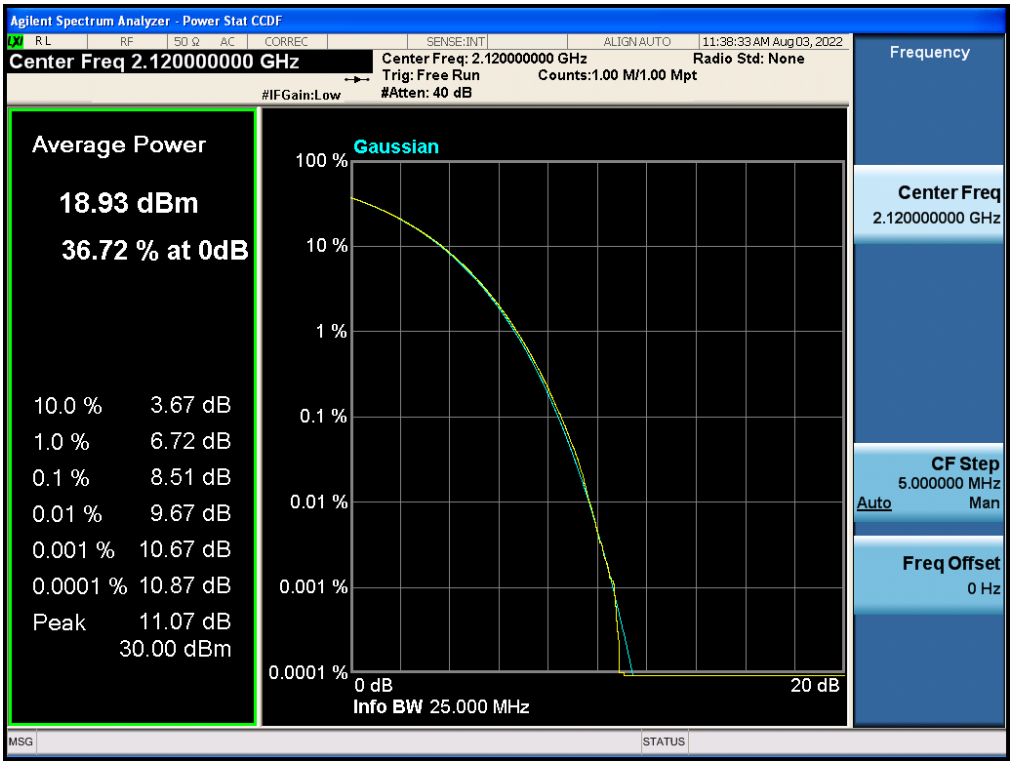
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 20 MHz 1 Carrier / QPSK / Low



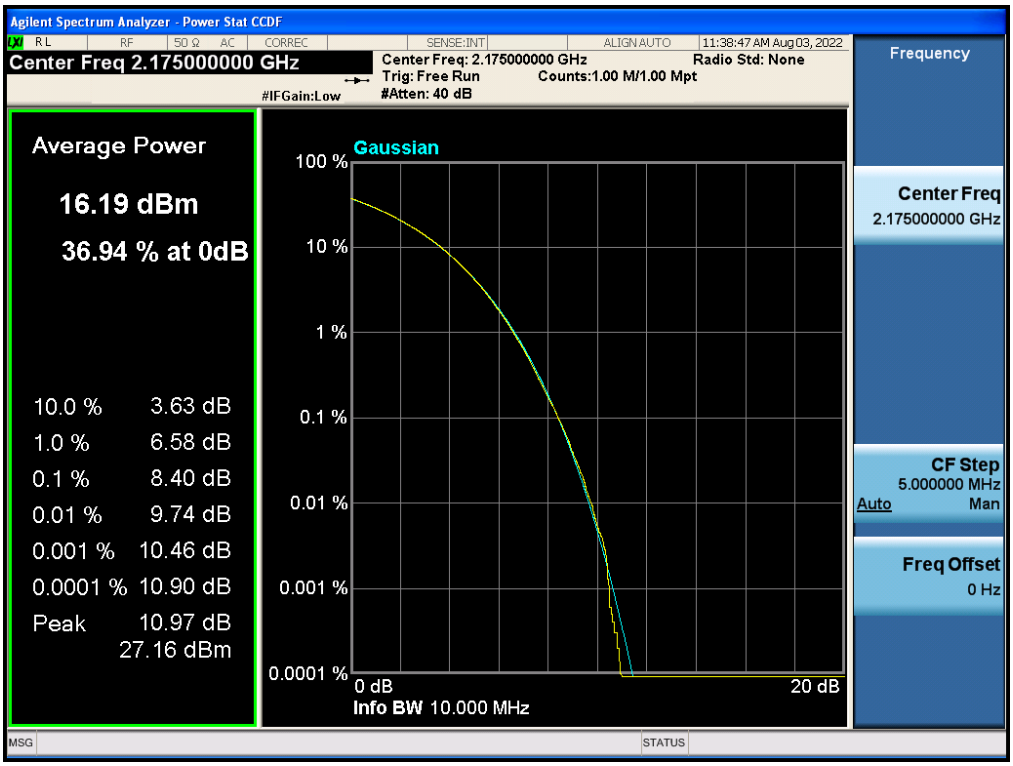
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 10 MHz 1 Carrier / QPSK / High



Antenna 1 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 20 MHz 1 Carrier / 256QAM / Low



Antenna 1 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 10 MHz 1 Carrier / 256QAM / High



5.3. OCCUPIED BANDWIDTH

Test Requirements:

§ 2.1049 Measurements required: Occupied bandwidth.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the specified conditions of § 2.1049 (a) through (i) as applicable.

Test Procedures:

The measurement is performed in accordance with Section 5.4.3 and 5.4.4 of ANSI C63.26.

5.4.3 Occupied bandwidth—Relative measurement procedure

The OBW is measured as the width of the spectral envelope of the modulated signal, at an amplitude level reduced from a reference value by a specified ratio (or in decibels, a specified number of dB down from the reference value). The typical ratio for transmitters is −26 dB, corresponding to the 26 dB BW; however, other ratios can be specified. In this subclause, the ratio is designated by "−X dB."

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.

b) The nominal RBW shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.

c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
NOTE—Step a), step b), and step c) may require iteration to adjust within the specified tolerances.

d) The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target "−X dB" requirement, i.e., if the requirement calls for measuring the −26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.

e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.

f) Determine the reference value by either of the following:
   1) Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the Highest level of the displayed trace (this is the reference value).
   2) Set the EUT to transmit an unmodulated carrier. Set the spectrum analyzer marker to the level of the carrier.

g) Determine the "−X dB amplitude" as equal to (Reference Value − X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.

h) If the reference value was determined using an unmodulated carrier, turn the EUT modulation on, then either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise the trace from step f) shall be used for step i).

i) Place two markers, one at the lowest and the other at the Highest frequency of the envelope of the spectral display such that each marker is at or slightly below the "−X dB amplitude" determined in step f). If a marker is below this "−X dB amplitude" value it should be as close as possible to this value. The OBW is the positive frequency difference between the two markers. The spectral envelope can cross the "−X dB amplitude" at multiple points. The lowest or Highest frequency

shall be selected as the frequencies that are the farthest away from the center frequency at which the spectral envelope crosses the "−X dB amplitude."

j) The OBW shall be reported by providing plot(s) of the measuring instrument display, to include markers depicting the relevant frequency and amplitude information (e.g., marker table). The frequency and amplitude axis and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

5.4.4 Occupied bandwidth—Power bandwidth (99 %) measurement procedure

The OBW is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 % of the total mean power of the given emission.

The following procedure shall be used for measuring (99 %) power bandwidth:

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of 1.5 × OBW is sufficient).

b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.

c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
NOTE—Step a), step b), and step c) may require iteration to adjust within the specified tolerances.

d) Set the detection mode to peak, and the trace mode to max-hold.

e) If the instrument does not have a 99 % OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5 % of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5 % of the total is reached and record that frequency as the upper OBW frequency. The 99 % power OBW can be determined by computing the difference these two frequencies.

f) The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).

Note:

(1) The results of PAPR test shown above the frequency measured values are very small and similar trend for each port, so we are attached only the worst case plot.

(2) All power supplies of operation were investigated and the worst case configuration results are reported.
- Mode: DC: -48 V / PoE: 57 V
- Worst case: PoE: 57 V

Test Results:
Tabular Data of Occupied Bandwidth

5G NR n13 5 MHz 1 Carrier

Ant	Mod	Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
0	256QAM	Middle	751.00	4.4854
1	256QAM	Middle	751.00	4.4948

5G NR n13 10 MHz 1 Carrier

Ant	Mod	Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
0	16QAM	Middle	751.00	8.9557
1	16QAM	Middle	751.00	8.9093

LTE B13 5 MHz + NB-IoT 1 Carrier

Ant. No.	Modulation	Channel	Frequency (MHz)	[Original] LTE B13 5 MHz Occupied BW (MHz)	[Permissive Change] LTE B13 5 MHz + NB-IoT Occupied BW (MHz)	Deviation
1	QPSK	Low	748.50	4.5045	4.4987	-0.0058
	64QAM	Low	748.50	4.5091	4.5065	-0.0026

*** We did spot checking on LTE B13 5 MHz with NB IoT as in-band operation, this does not generate any changes because in-band NB-IoT cannot distinguish with original LTE signal.**

LTE B13 10 MHz + NB-IoT 1 Carrier

Ant	Mod	Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
0	QPSK	Middle	751.00	9.7466
	16QAM	Middle	751.00	9.7096
	64QAM	Middle	751.00	9.7676
	256QAM	Middle	751.00	9.7209
1	QPSK	Middle	751.00	9.7461
	16QAM	Middle	751.00	9.6749
	64QAM	Middle	751.00	9.7369
	256QAM	Middle	751.00	9.7177

LTE B66 5 MHz 1 Carrier

Ant	Mod	Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
0	256QAM	High	2 177.50	4.5112
1	256QAM	High	2 177.50	4.5104

LTE B66 20 MHz 1 Carrier

Ant	Mod	Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
0	QPSK	High	2 170.00	17.979
1	QPSK	High	2 170.00	17.997

5G NR n66 5 MHz 1 Carrier

Ant	Mod	Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
0	16QAM	High	2 177.50	4.4996
1	16QAM	High	2 177.50	4.5103

5G NR n66 20 MHz 1 Carrier

Ant	Mod	Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
0	64QAM	High	2 170.00	18.973
1	64QAM	High	2 170.00	18.956

Tabular Data of Contiguous Occupied Bandwidth

5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant	Mod	Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
0	256QAM	High	2 175.00	9.4755
1	256QAM	High	2 175.00	9.5061

LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant	Mod	Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
0	64QAM	High	2 175.00	9.4667
1	64QAM	High	2 175.00	9.4461

5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier]

Ant	Mod	Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
0	QPSK	High	2 165.00	29.107
1	QPSK	High	2 165.00	29.098

5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier]

Ant	Mod	Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
0	256QAM	High	2 165.00	28.966
1	256QAM	High	2 165.00	28.973

Tabular Data of Non-Contiguous Occupied Bandwidth

5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant	Mod	5G NR n66 5 MHz		LTE B66 5 MHz		Total OBW (MHz)
		Frequency (MHz)	Measured Value (MHz)	Frequency (MHz)	Measured Value (MHz)	
0	256QAM	2 112.50	4.4917	2 177.50	4.5161	9.0078
1	256QAM	2 112.50	4.4908	2 177.50	4.5069	8.9977

LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant	Mod	LTE B66 5 MHz		LTE B66 5 MHz		Total OBW (MHz)
		Frequency (MHz)	Measured Value (MHz)	Frequency (MHz)	Measured Value (MHz)	
0	64QAM	2 112.50	4.5203	2 177.50	4.5008	9.0211
1	64QAM	2 112.50	4.5041	2 177.50	4.5080	9.0122

5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier]

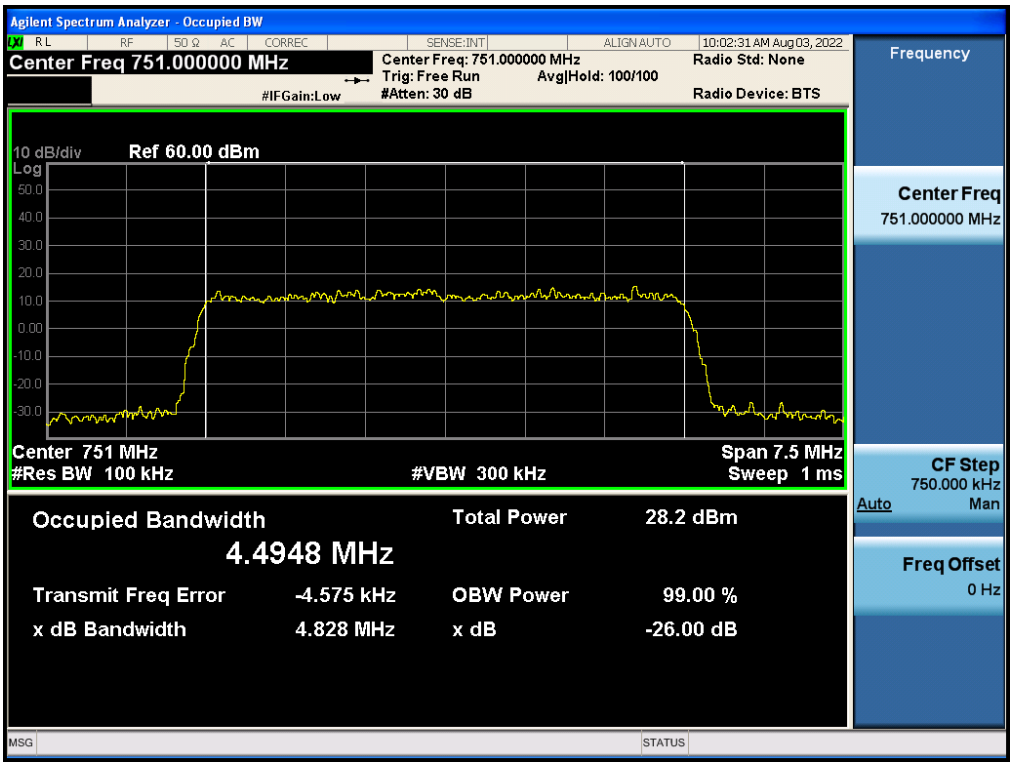
Ant	Mod	5G NR n66 20 MHz		5G NR n66 10 MHz		Total OBW (MHz)
		Frequency (MHz)	Measured Value (MHz)	Frequency (MHz)	Measured Value (MHz)	
0	QPSK	2 120.00	18.971	2 175.00	9.3107	28.282
1	QPSK	2 120.00	18.956	2 175.00	9.3106	28.267

5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier]

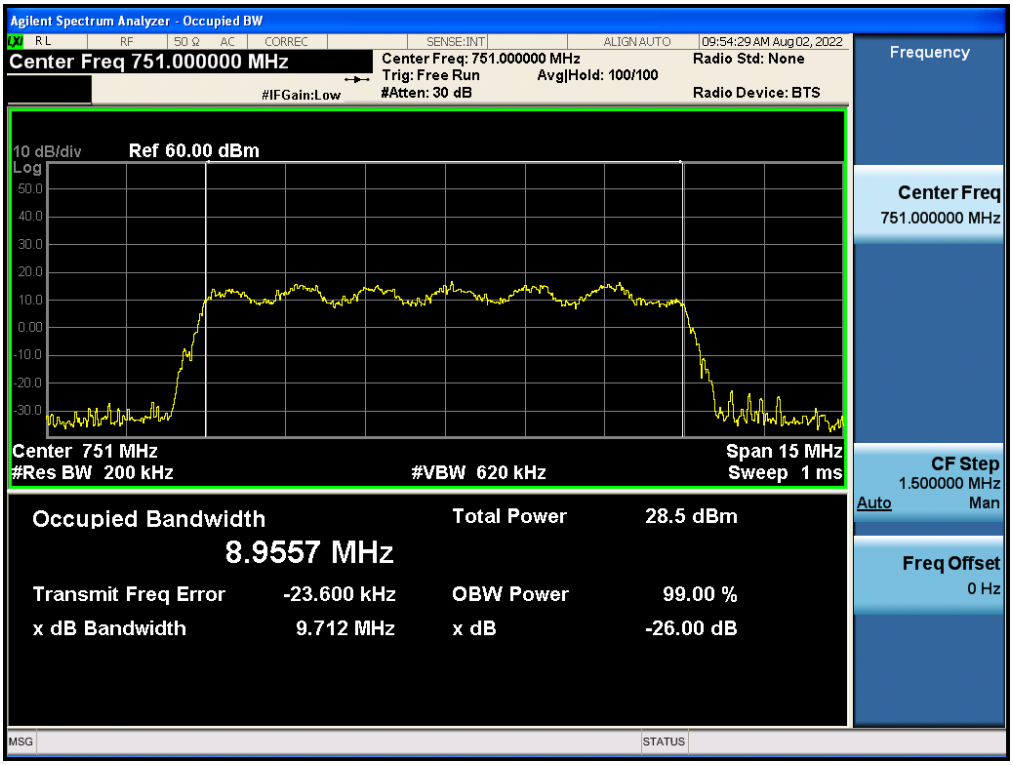
Ant	Mod	5G NR n66 20 MHz		LTE B66 10 MHz		Total OBW (MHz)
		Frequency (MHz)	Measured Value (MHz)	Frequency (MHz)	Measured Value (MHz)	
0	256QAM	2 120.00	18.977	2 175.00	8.9972	27.974
1	256QAM	2 120.00	19.025	2 175.00	8.9683	27.993

Plot Data of Occupied bandwidth

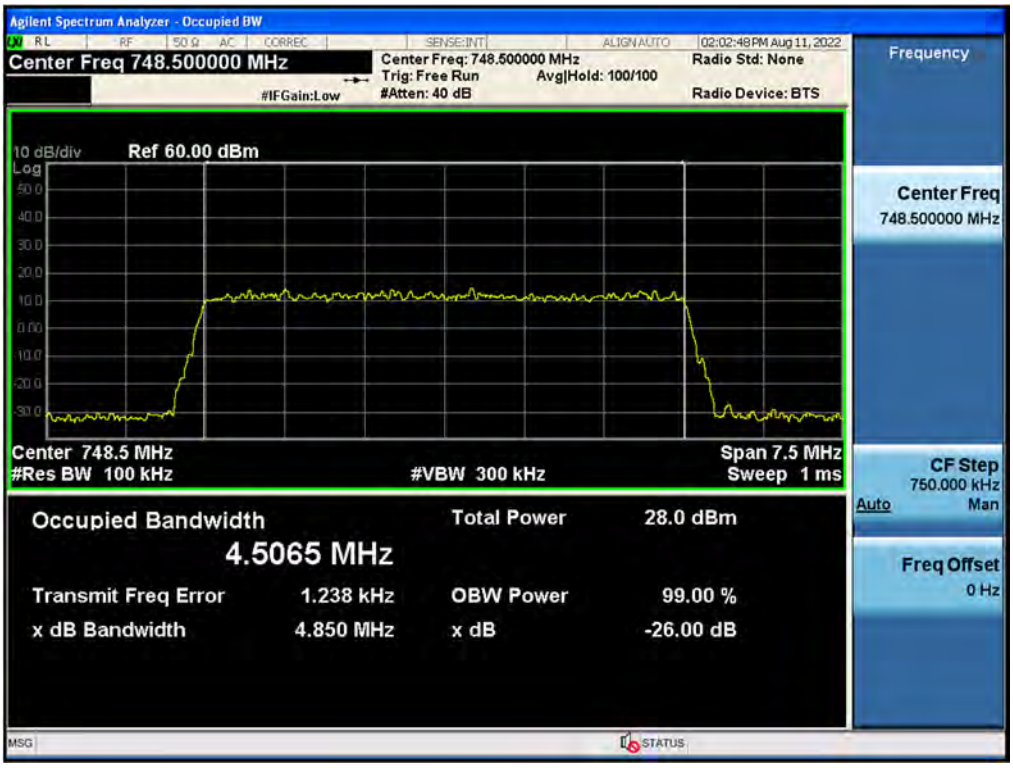
Antenna 1 / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle



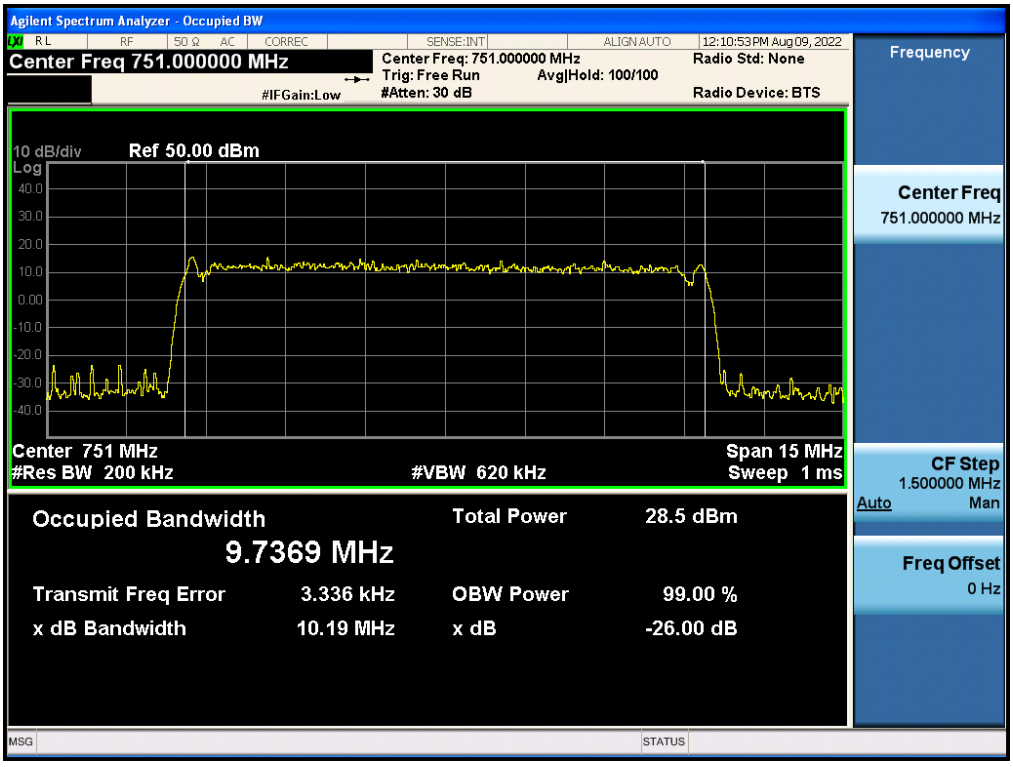
Antenna 0 / 5G NR n13 10 MHz 1 Carrier / QPSK / Middle



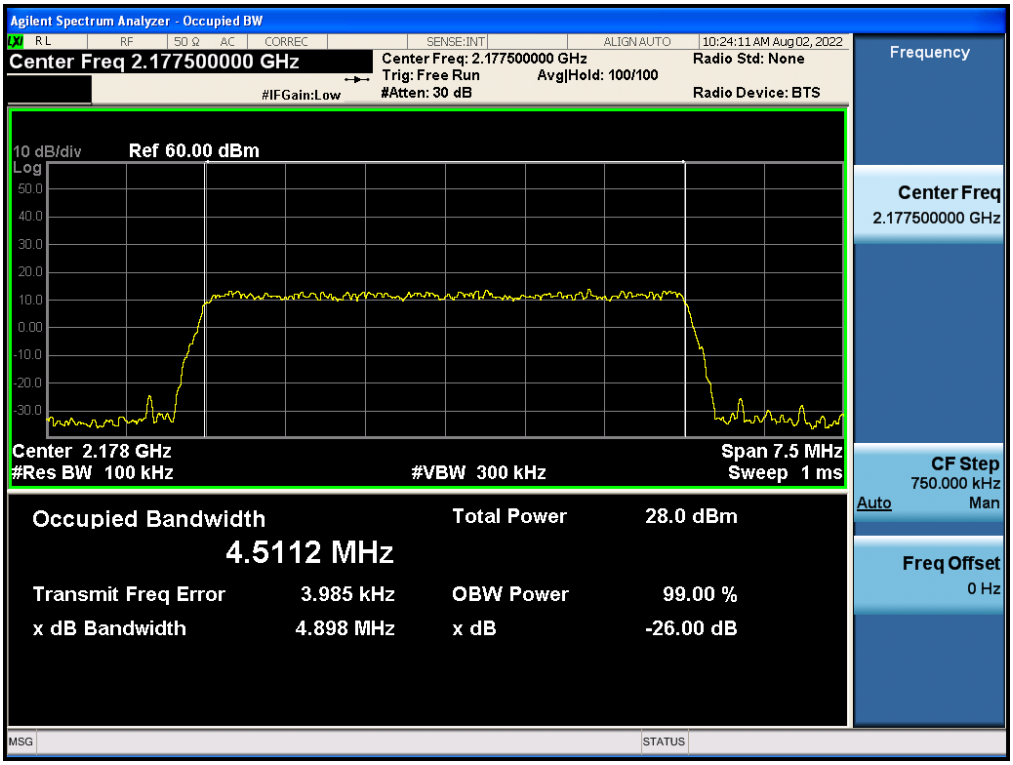
Antenna 1 / LTE B13 5 MHz + NB-IoT 1 Carrier / 64QAM / Low



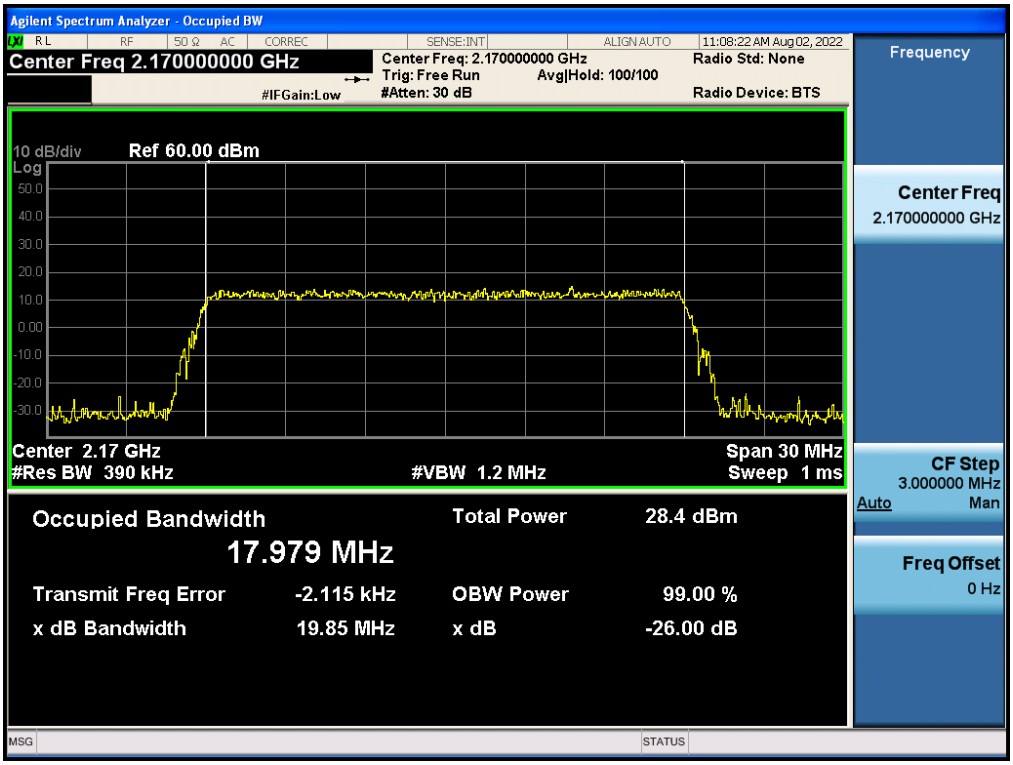
Antenna 1 / LTE B13 10 MHz + NB-IoT 1 Carrier / 64QAM / Middle



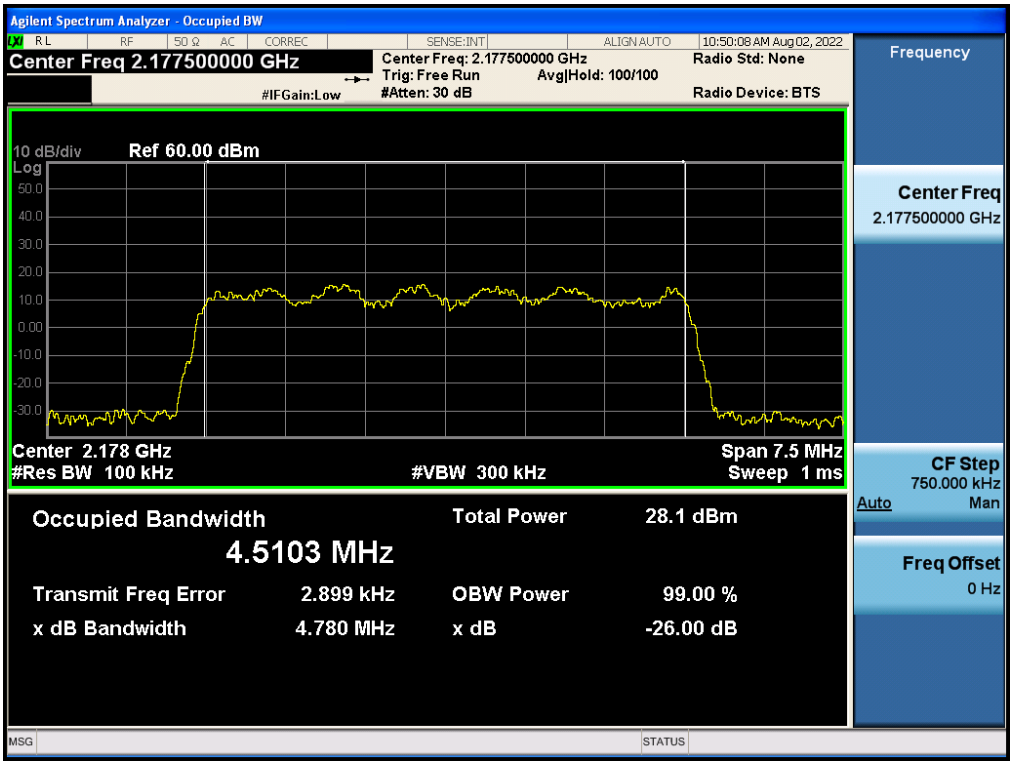
Antenna 0 / LTE B66 5 MHz 1 Carrier / 256QAM / High



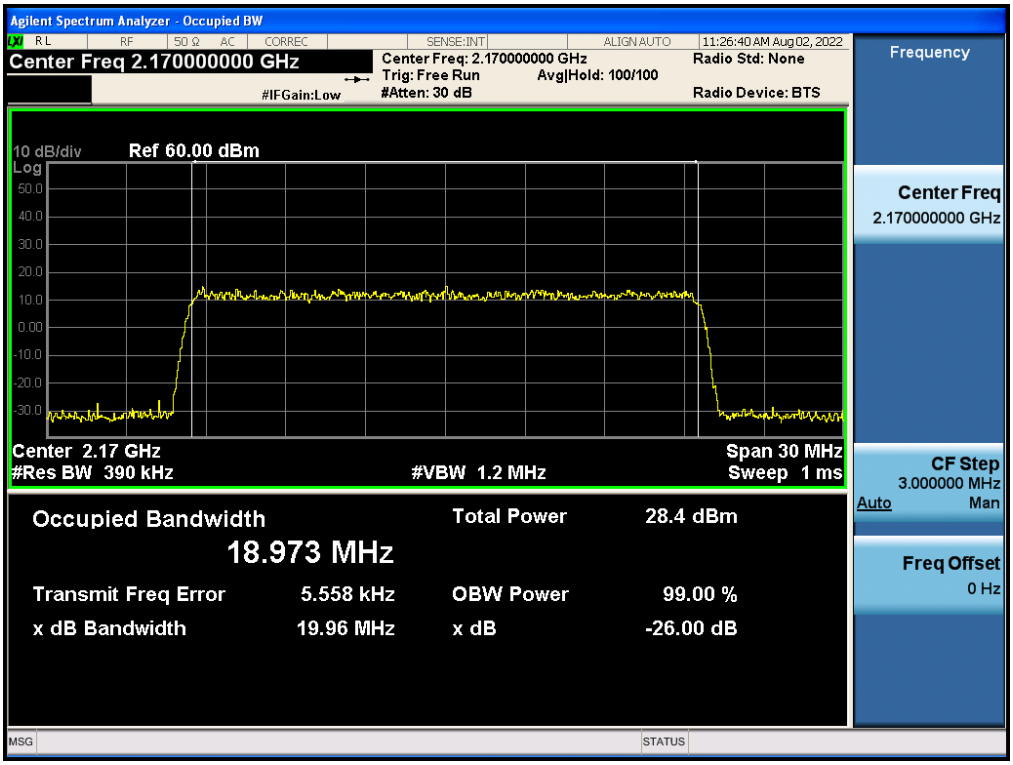
Antenna 0 / LTE B66 20 MHz 1 Carrier / QPSK / High



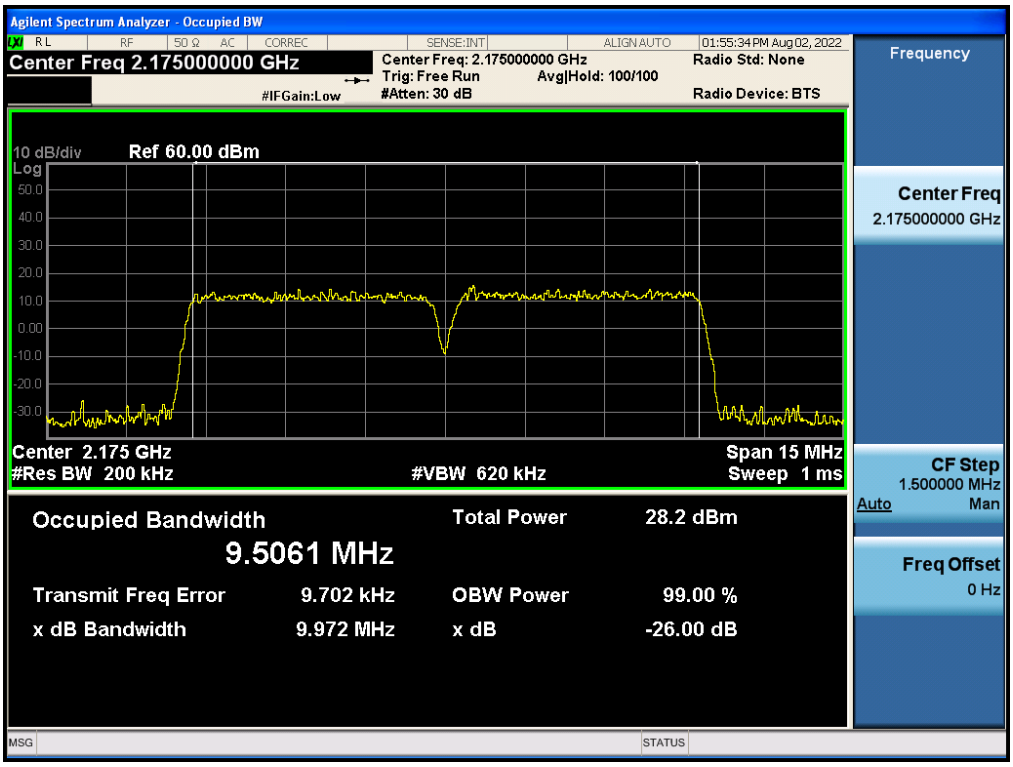
Antenna 1 / 5G NR n66 5 MHz 1 Carrier / 16QAM / High



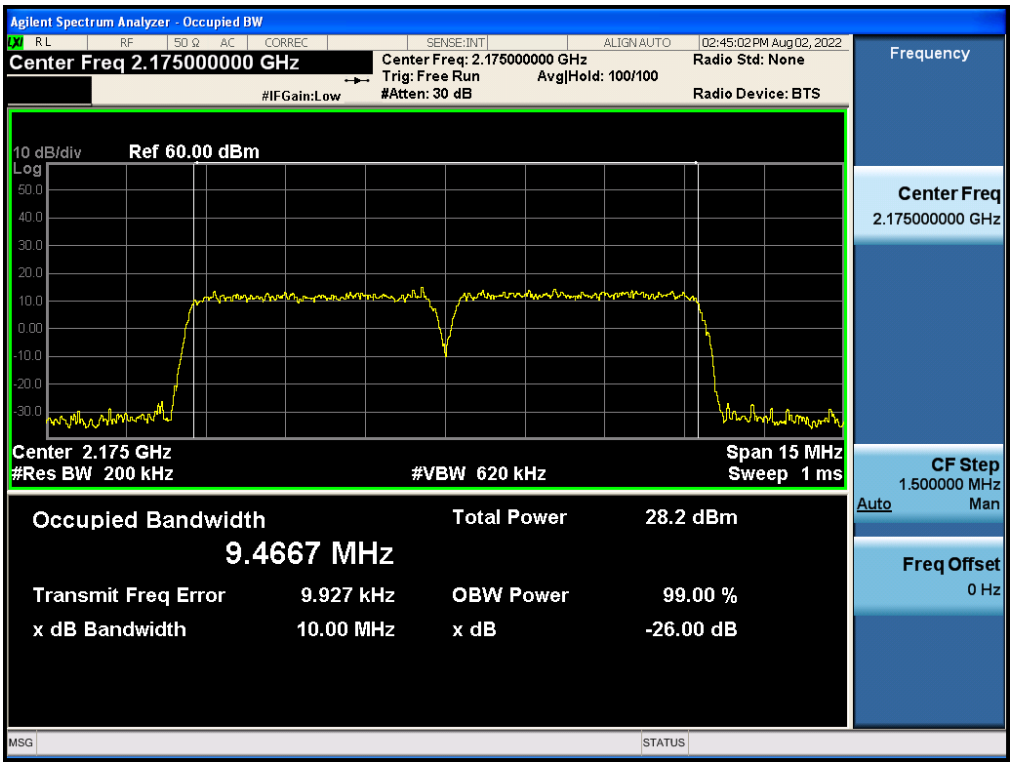
Antenna 0 / 5G NR n66 20 MHz 1 Carrier / 64QAM / High



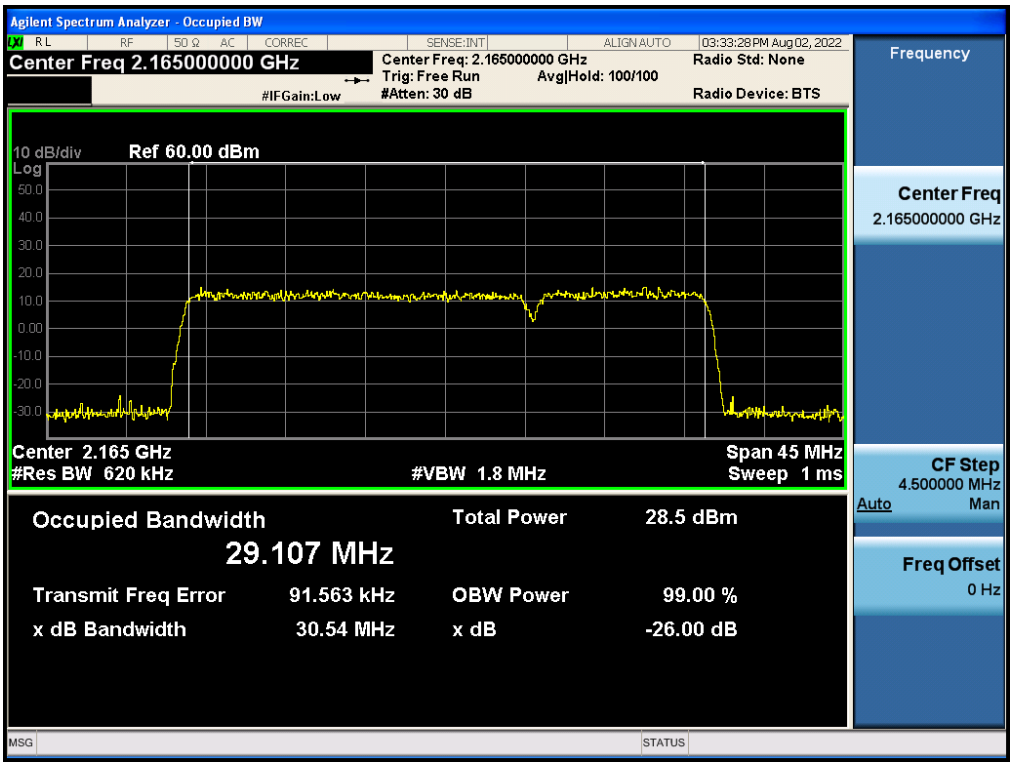
Antenna 1 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Contiguous / 256QAM / High



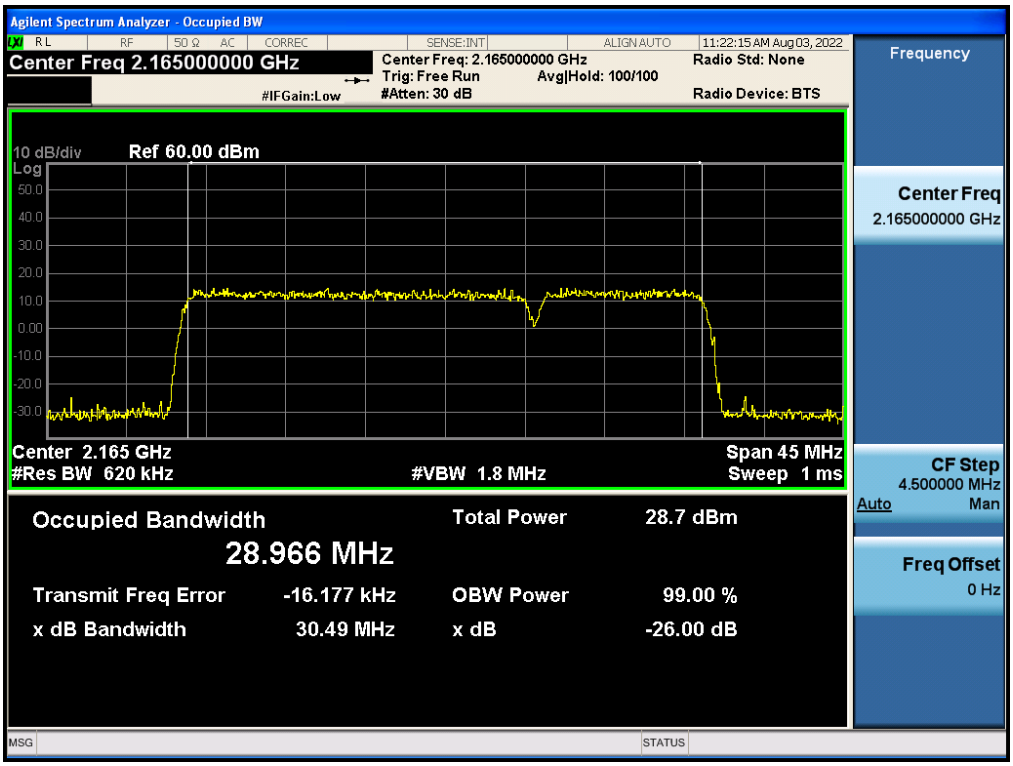
Antenna 0 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Contiguous / 64QAM / High



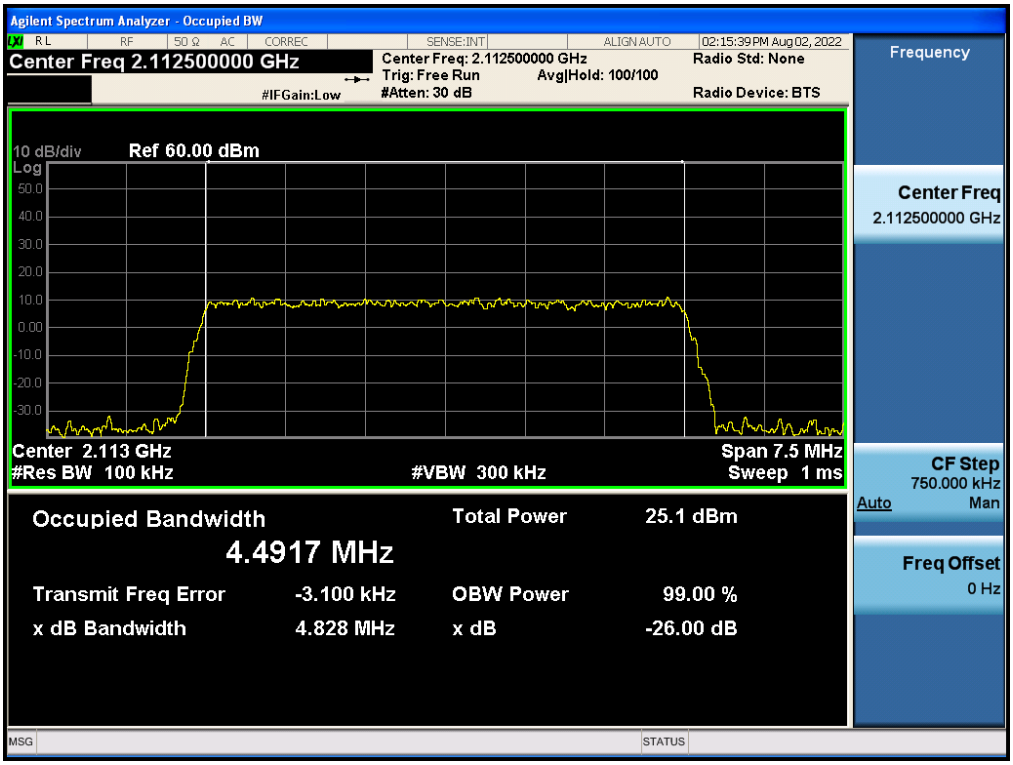
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Contiguous / QPSK / High



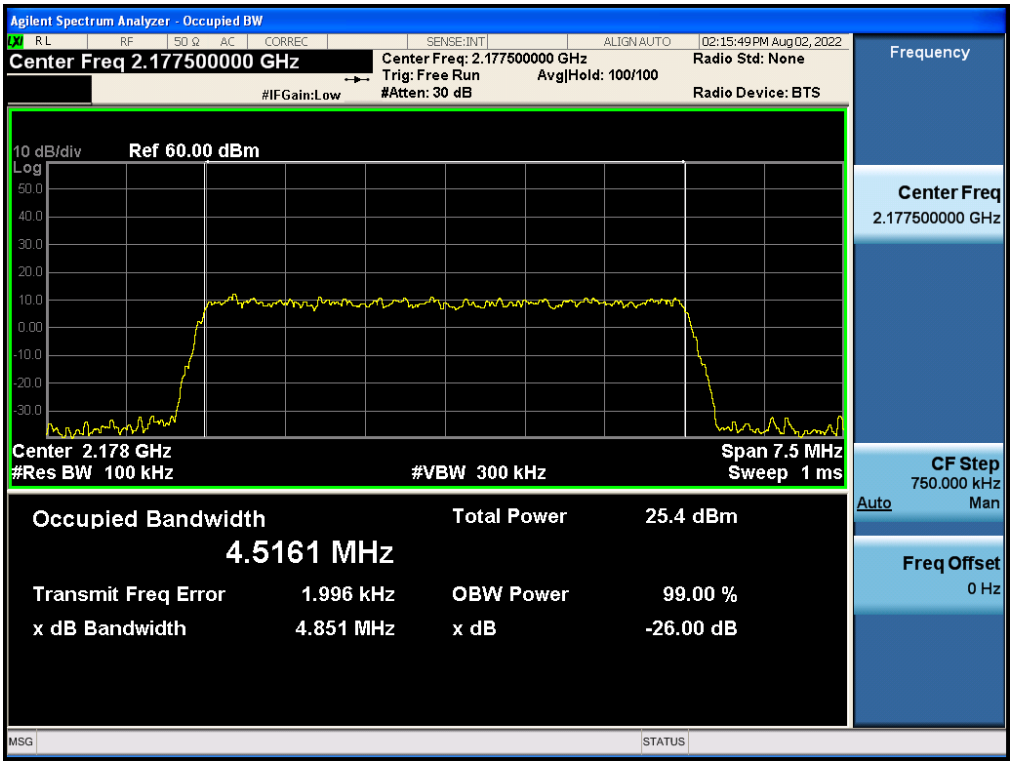
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Contiguous / 256QAM / High



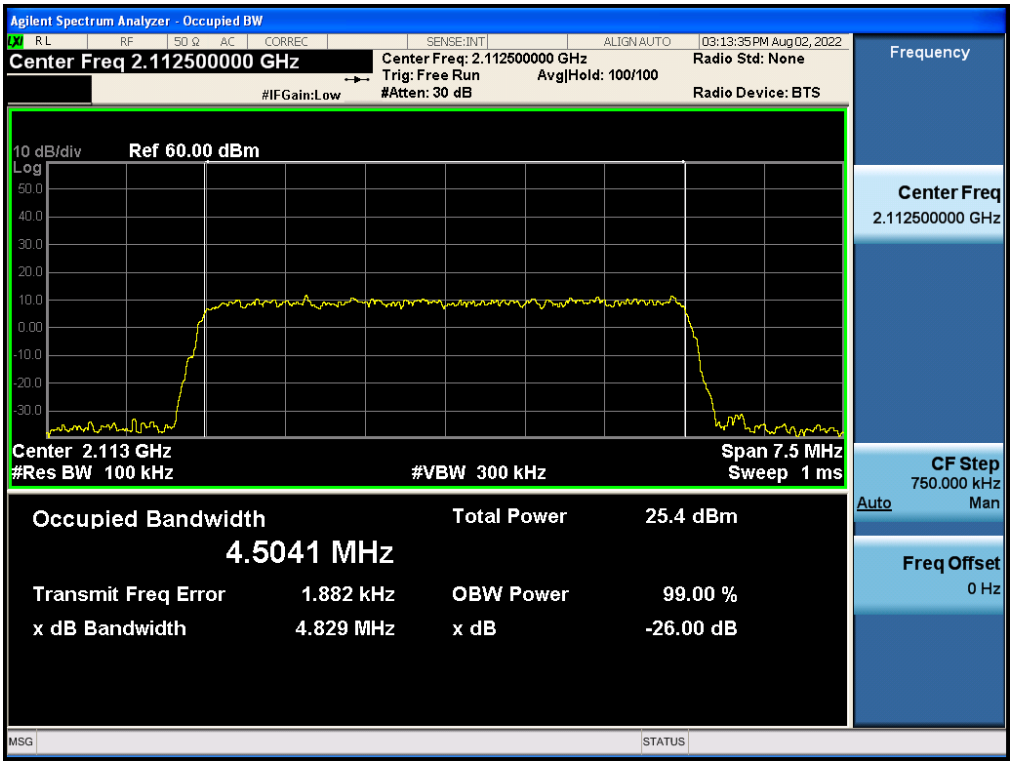
Antenna 0 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 5 MHz 1 Carrier / 256QAM / Low



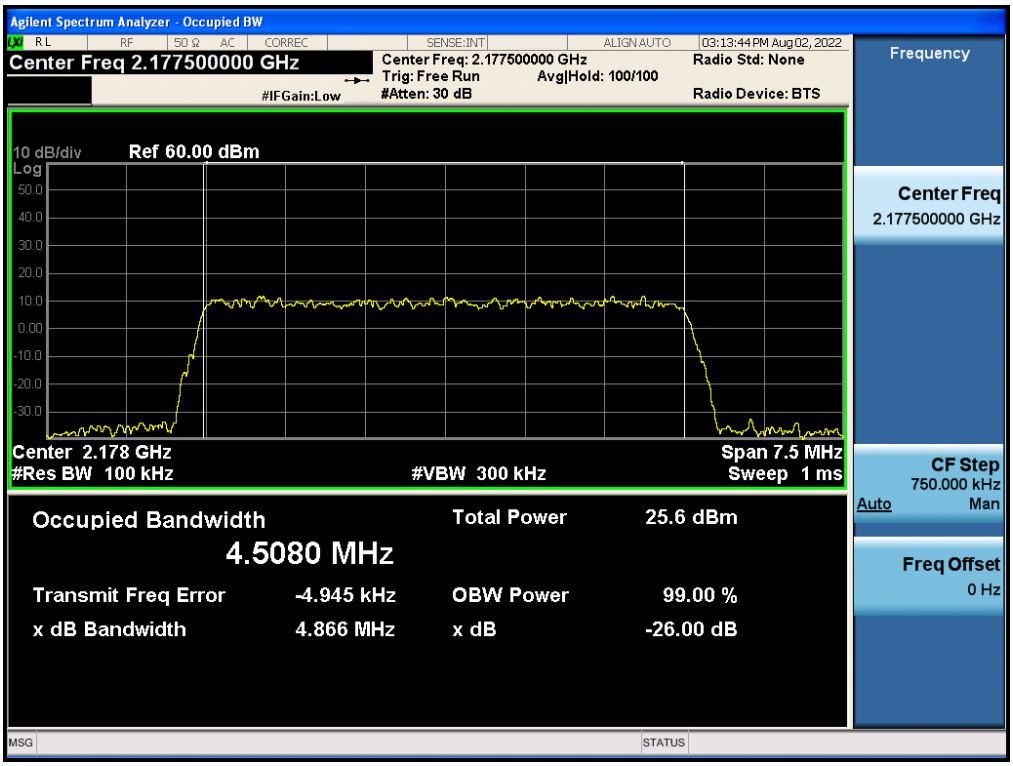
Antenna 0 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 5 MHz 1 Carrier / 256QAM / High



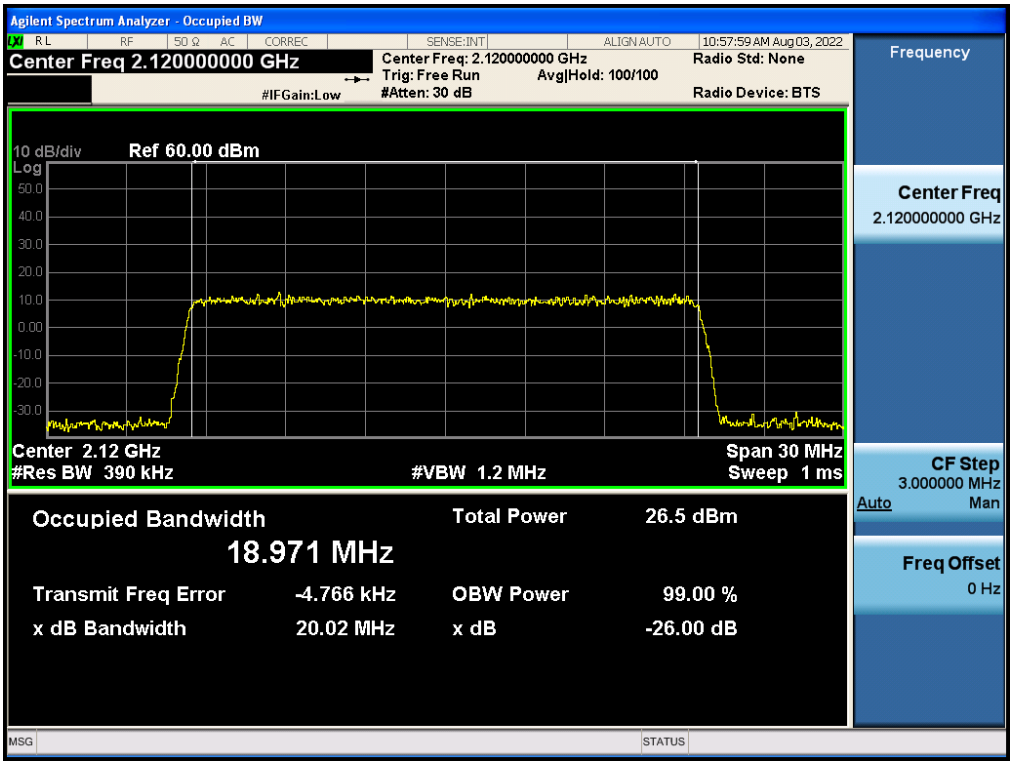
Antenna 1 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 5 MHz 1 Carrier / 64QAM / Low



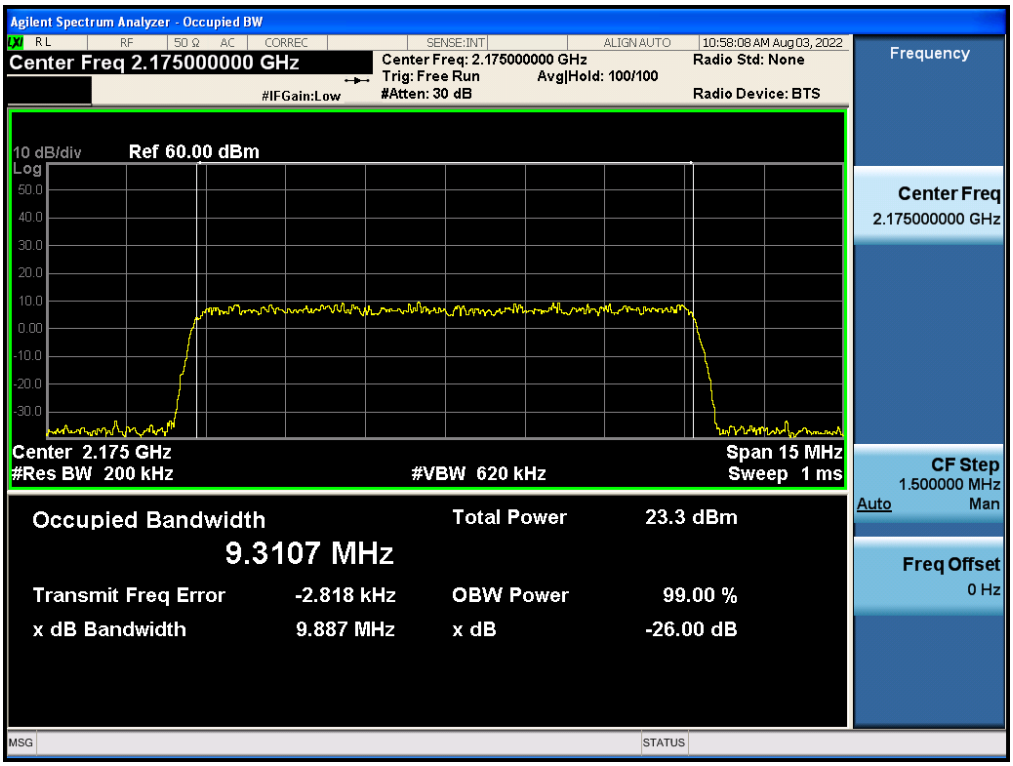
Antenna 1 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 5 MHz 1 Carrier / 64QAM / High



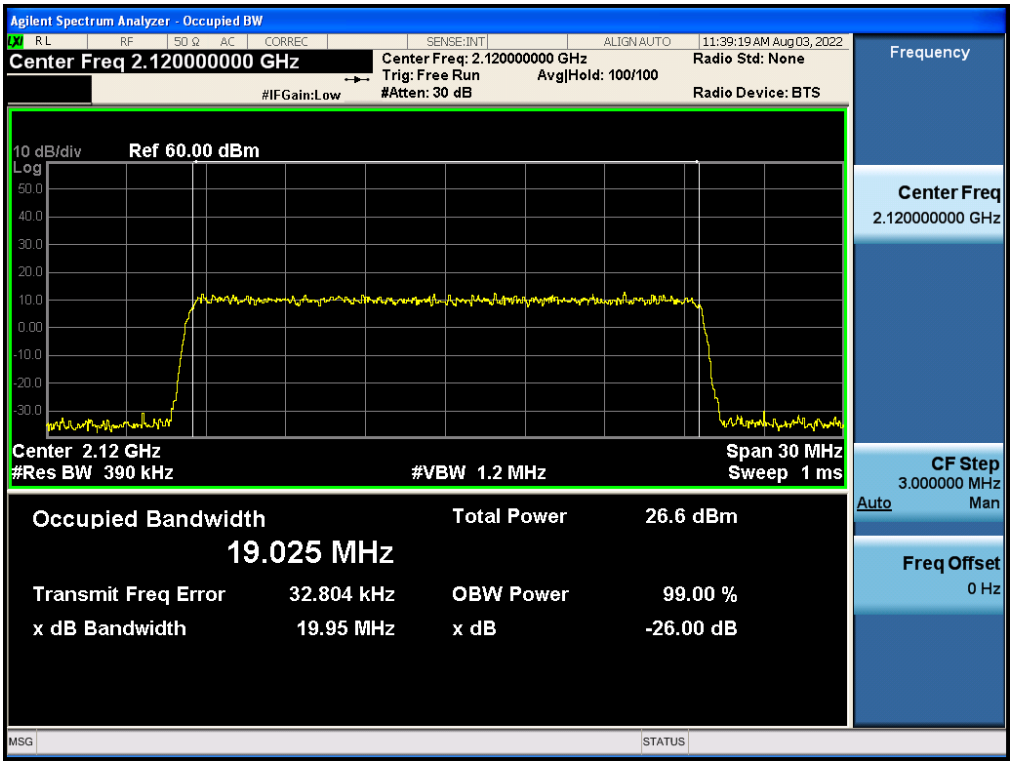
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 20 MHz 1 Carrier / QPSK / Low



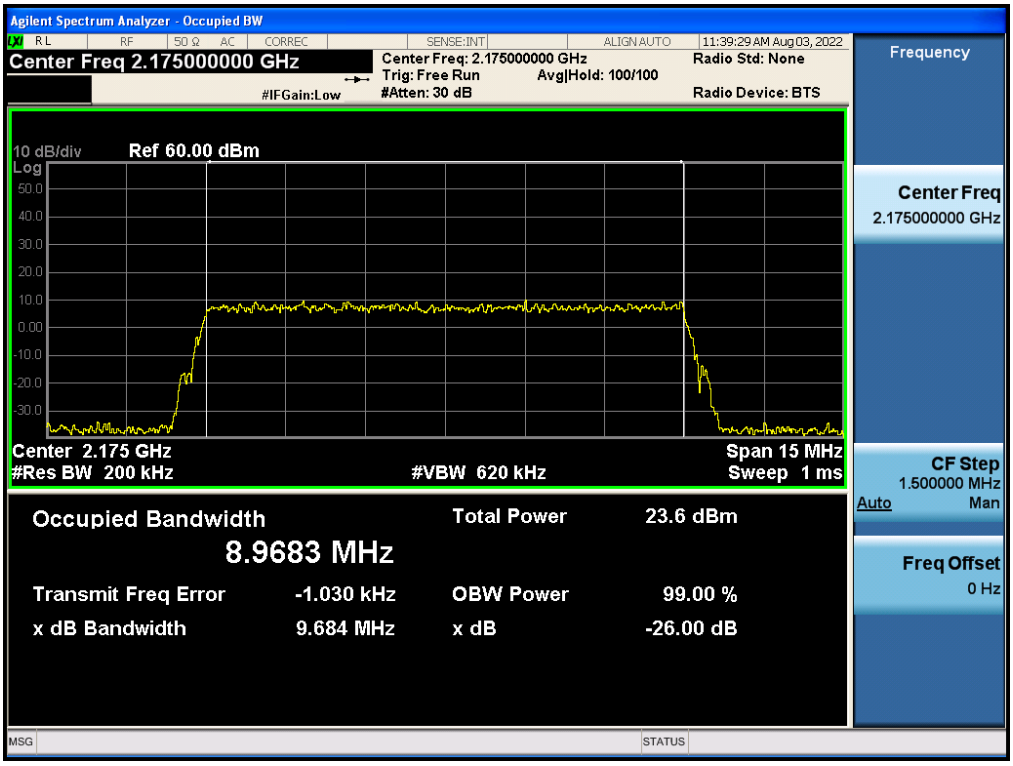
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 10 MHz 1 Carrier / QPSK / High



Antenna 1 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 5G NR n66 20 MHz 1 Carrier / 256QAM / Low



Antenna 1 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / LTE B66 10 MHz 1 Carrier / 256QAM / High



5.4. OUT-OF-BAND UNWANTED EMISSIONS

Test Requirements:

§ 2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 27.53 Emission limits.

(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) Omitted

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

(h) AWS emission limits

(1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

(3) Measurement procedure.

(i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the

licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(ii) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.

(iii) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

Test Procedures:

The measurement is performed in accordance with Section 5.7.3 of ANSI C63.26.

5.7.3 Out-of-band unwanted emissions measurements

a) Set the spectrum analyzer center frequency to the block, band, or channel edge frequency.

b) Set the span wide enough to capture the fundamental emission closest to the authorized block or band edge, and to include all modulation products that spill into the immediately adjacent frequency band. In some cases, it may be possible to set the center frequency and span so as to encompass the fundamental emission and the unwanted out-of-band (band-edge) emissions on either side of the authorized block, band, or channel. This can be accomplished with a single (slow) sweep, if adequate overload protection and sufficient dynamic range can be maintained.

c) Set the number of points in sweep ≥ 2 × span / RBW.

d) Sweep time should be auto for peak detection. For rms detection the sweep time should be set as follows:

   1) If the device can be configured to transmit continuously (duty cycle ≥ 98 %), set the (sweep time) > (number of points in sweep) × (symbol period) (e.g., by a factor of 10 × symbol period × number of points). Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols

   2) If the device cannot be configured to transmit continuously (duty cycle < 98 %) and a freerunning sweep must be used, set the sweep time so that the averaging is performed over multiple on/off cycles by setting the sweep time > (number of points in sweep) × (transmitter period) (i.e., the transmit on-time + the off-time). The spectrum analyzer readings shall subsequently be corrected by [10 log (1/duty cycle)]. This assumes that the transmission period and duty cycle is relatively constant (duty cycle variation ≤ ±2 %).

   3) If the device cannot be configured to transmit continuously (duty cycle < 98 %) and a freerunning sweep must be used, set the sweep time so that the averaging is performed over multiple on/off cycles by setting the sweep time > (number of points in sweep) × (transmitter period) (i.e., the transmit on-time + the off-time). The spectrum analyzer readings shall subsequently be corrected by [10 log (1/duty cycle)]. This assumes that the transmission period and duty cycle is relatively constant (duty cycle variation ≤ ±2 %).

   4) If the device cannot be configured to transmit continuously and a free-running sweep must be used, and if the transmissions exhibit a non-constant duty cycle (duty cycle variations > ±2 %), set the sweep time so that the averaging is performed over the on-period by setting the sweep time > (symbol period) × (number of points), while also maintaining the sweep time < (transmitter on-time). The trace mode shall be set to max hold, since not every display point will be averaged only over just the on-time. Thus, multiple sweeps (e.g., 100) in maximum hold are necessary to ensure that the maximum power is measured.

e) The test report shall include the plots of the measuring instrument display and the measured data.

f) See Annex I for example emission mask plots.

Note:

(1) Due to MIMO operations, a correction has been added to the limit according to KDB 662911 D01 v02r01.

- 2Tx MIMO correction: 10 log(N_{ANT}) = 10 log(2) = 3.01 dB // -13 dBm – 10*log (2) = -16.01 dBm

(2) The results of the Out-of-band Unwanted Emissions test shown above the frequency measured values are very small and similar trend for each port, so we are attached only the worst case plot.

(3) All power supplies of operation were investigated and the worst case configuration results are reported.

- Mode: DC: -48 V / PoE: 57 V
- Worst case: PoE: 57 V

Test Results:

Tabular Data of Out-of-band Unwanted Emissions

5G NR n13 5 MHz 1 Carrier

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	745.92	-42.89
		High	756.03	-43.09
1	QPSK	Low	745.91	-42.90
		High	756.04	-42.53

5G NR n13 10 MHz 1 Carrier

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	16QAM	Low	745.94	-44.22
		High	756.07	-44.66
1	16QAM	Low	745.95	-44.74
		High	756.07	-44.29

LTE B13 5 MHz + NB-IoT 1 Carrier

Ant. No.	Modulation	Channel	[Original] LTE B13 5 MHz Measured Value (dBm)	[Permissive Change] LTE B13 5 MHz + NB-IoT Measured Value (dBm)	Deviation
1	256QAM	Low	-33.44	-42.83	-9.39
0	16QAM	High	-33.70	-42.53	-8.83

*** We did spot checking on LTE B13 5 MHz with NB IoT as in-band operation, this does not generate any changes because in-band NB-IoT cannot distinguish with original LTE signal.**

LTE B13 10 MHz + NB-IoT 1 Carrier

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	745.96	-43.68
		High	756.06	-43.84
	16QAM	Low	745.94	-44.74
		High	756.05	-44.65
	64QAM	Low	745.97	-44.38
		High	756.03	-44.56
	256QAM	Low	745.94	-44.12
		High	756.06	-44.03
1	QPSK	Low	745.96	-44.10
		High	756.02	-44.58
	16QAM	Low	745.92	-44.52
		High	756.02	-44.11
	64QAM	Low	745.92	-44.04
		High	756.04	-43.95
	256QAM	Low	745.95	-44.32
		High	756.03	-44.31

LTE B66 5 MHz 1 Carrier

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	256QAM	Low	2 109.38	-46.02
		High	2 180.09	-42.18
1	256QAM	Low	2 109.34	-46.15
		High	2 180.13	-41.89

LTE B66 20 MHz 1 Carrier

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	2 109.88	-42.39
		High	2 180.18	-41.14
1	QPSK	Low	2 109.55	-43.20
		High	2 180.54	-40.69

5G NR n66 5 MHz 1 Carrier

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	16QAM	Low	2 109.72	-46.10
		High	2 180.05	-42.46
1	16QAM	Low	2 109.98	-46.03
		High	2 180.15	-42.30

5G NR n66 20 MHz 1 Carrier

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	64QAM	Low	2 109.55	-43.48
		High	2 180.41	-41.21
1	64QAM	Low	2 109.82	-42.87
		High	2 180.10	-41.37

Tabular Data of Contiguous Out-of-band Unwanted Emissions

5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	256QAM	Low	2 109.98	-47.62
		High	2 180.53	-44.68
1	256QAM	Low	2 109.84	-47.70
		High	2 180.15	-44.98

LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	64QAM	Low	2 109.98	-47.19
		High	2 180.41	-44.72
1	64QAM	Low	2 109.71	-47.64
		High	2 180.94	-45.16

5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier]

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	2 109.42	-43.49
		High	2 180.48	-45.47
1	QPSK	Low	2 109.80	-43.73
		High	2 180.98	-45.18

5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier]

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	256QAM	Low	2 109.36	-43.67
		High	2 180.05	-45.99
1	256QAM	Low	2 109.13	-43.78
		High	2 180.24	-45.67

Tabular Data of Non-Contiguous Out-of-band Unwanted Emissions

5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	256QAM	Low	2 109.91	-45.49
		High	2 180.12	-45.64
1	256QAM	Low	2 109.95	-45.72
		High	2 180.16	-45.98

LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	64QAM	Low	2 109.88	-45.06
		High	2 180.56	-45.80
1	64QAM	Low	2 109.94	-45.46
		High	2 180.35	-46.06

5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier]

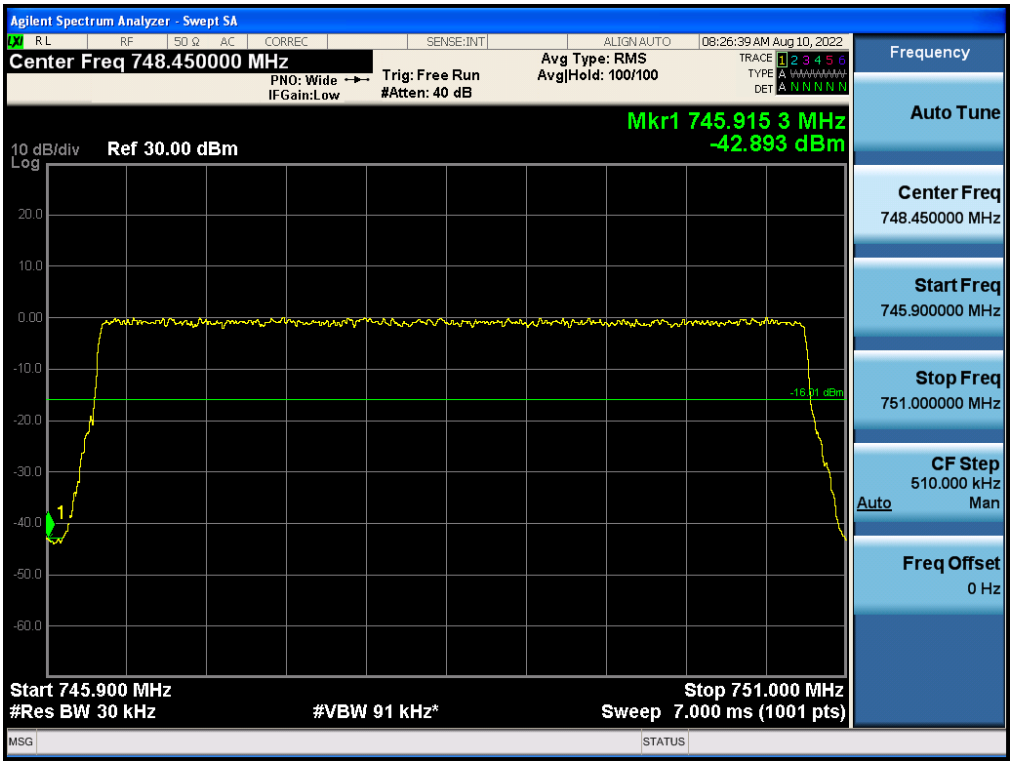
Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	QPSK	Low	2 109.42	-44.47
		High	2 180.46	-46.10
1	QPSK	Low	2 109.46	-44.27
		High	2 180.92	-46.27

5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier]

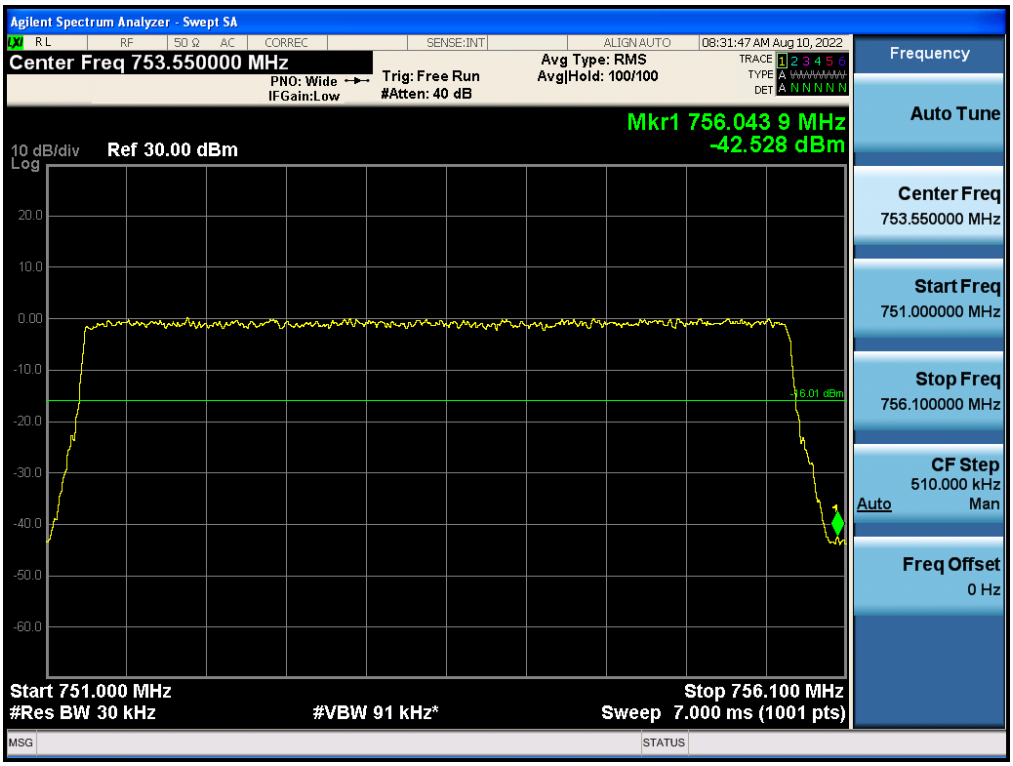
Ant.	Mod.	Channel	Frequency (MHz)	Measured Value (dBm)
0	256QAM	Low	2 109.78	-44.66
		High	2 180.10	-46.14
1	256QAM	Low	2 109.86	-44.43
		High	2 180.05	-46.11

Plot Data of Out-of-band Unwanted Emissions

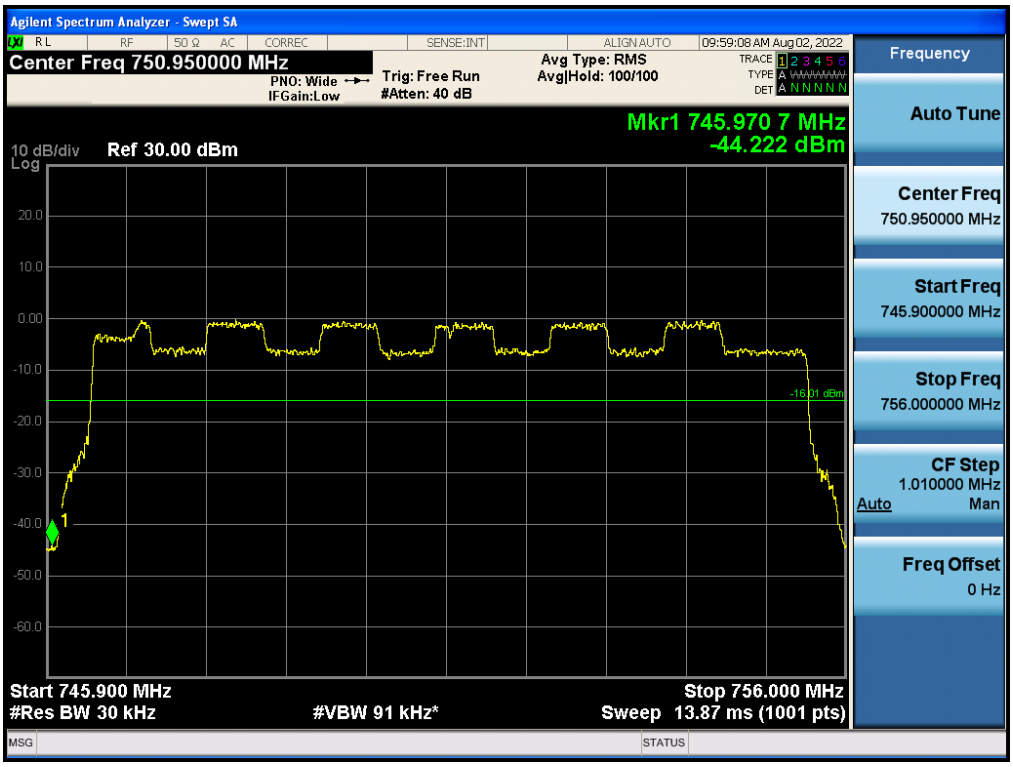
Antenna 0 / 5G NR n13 5 MHz 1 Carrier / QPSK / Low



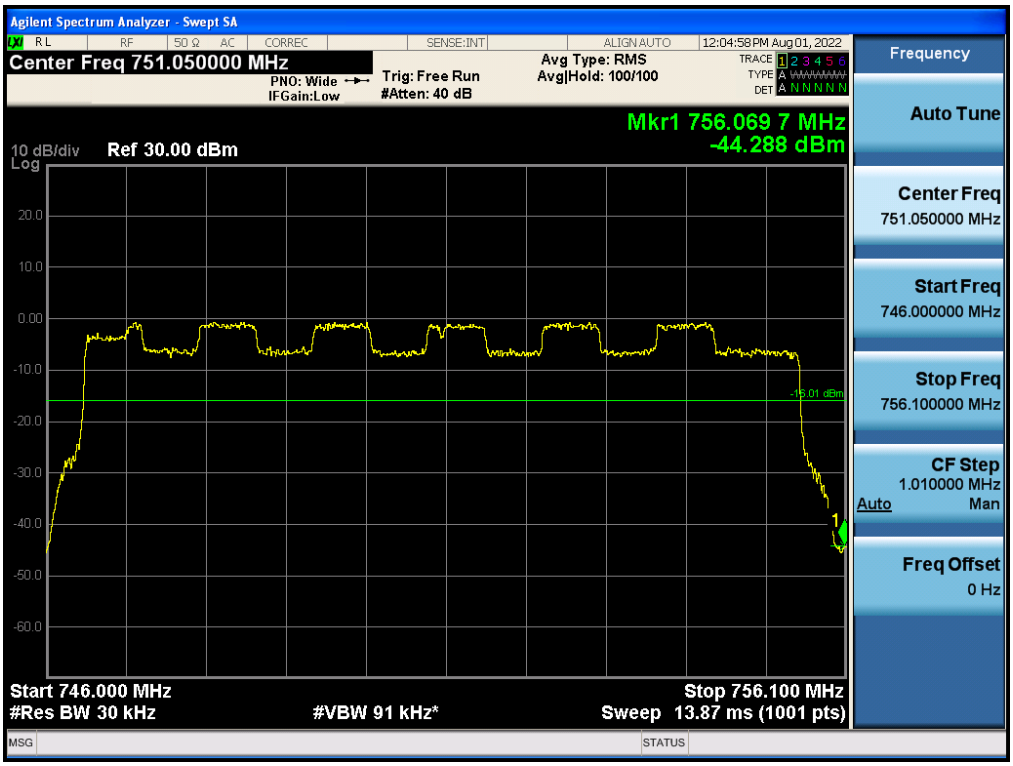
Antenna 1 / 5G NR n13 5 MHz 1 Carrier / QPSK / High



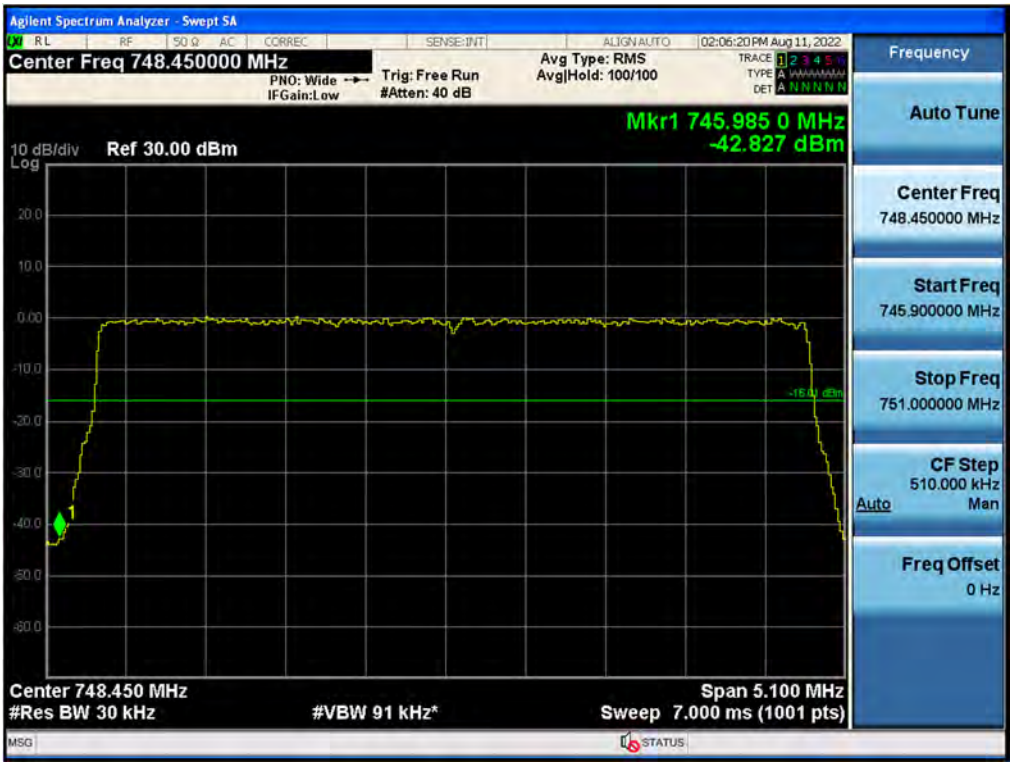
Antenna 0 / 5G NR n13 10 MHz 1 Carrier / 16QAM / Low



Antenna 1 / 5G NR n13 10 MHz 1 Carrier / 16QAM / High

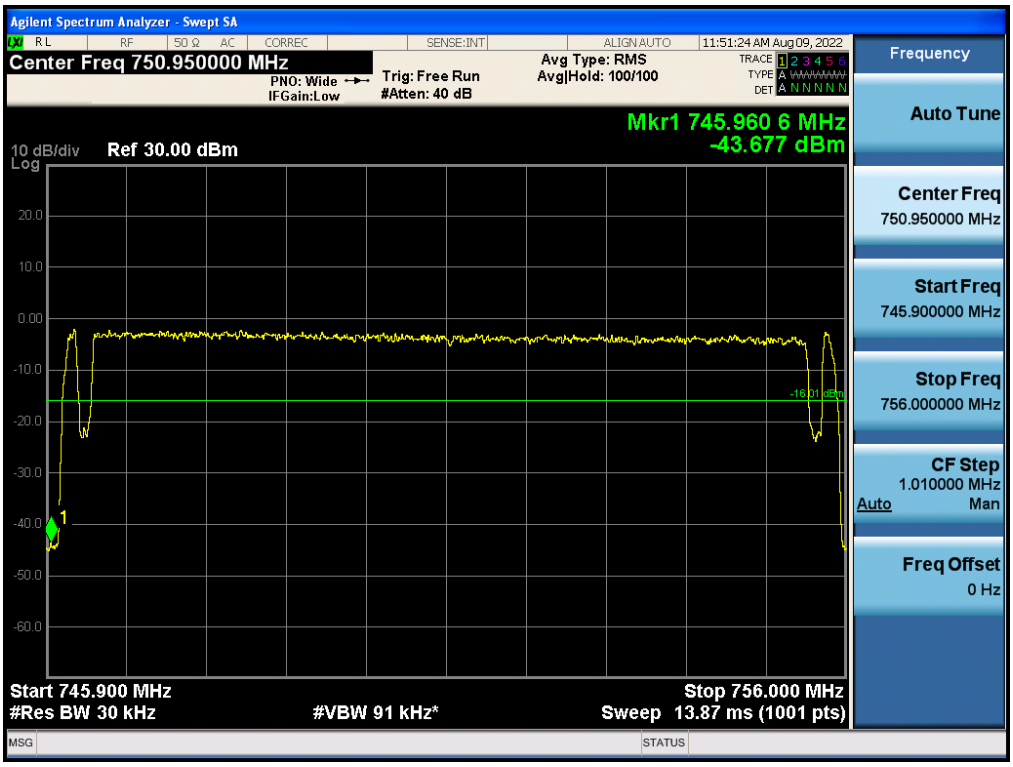


Antenna 1 / LTE B13 5 MHz + NB-IoT 1 Carrier / 256QAM / Low

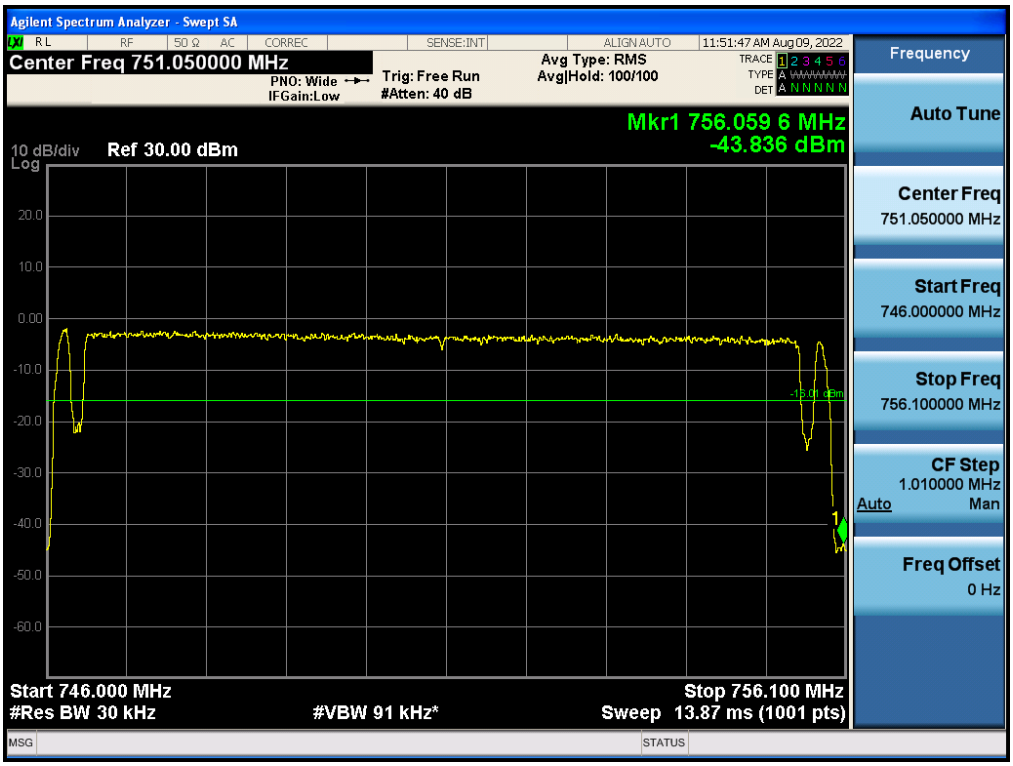


Antenna 0 / LTE B13 5 MHz + NB-IoT 1 Carrier / 16QAM / High

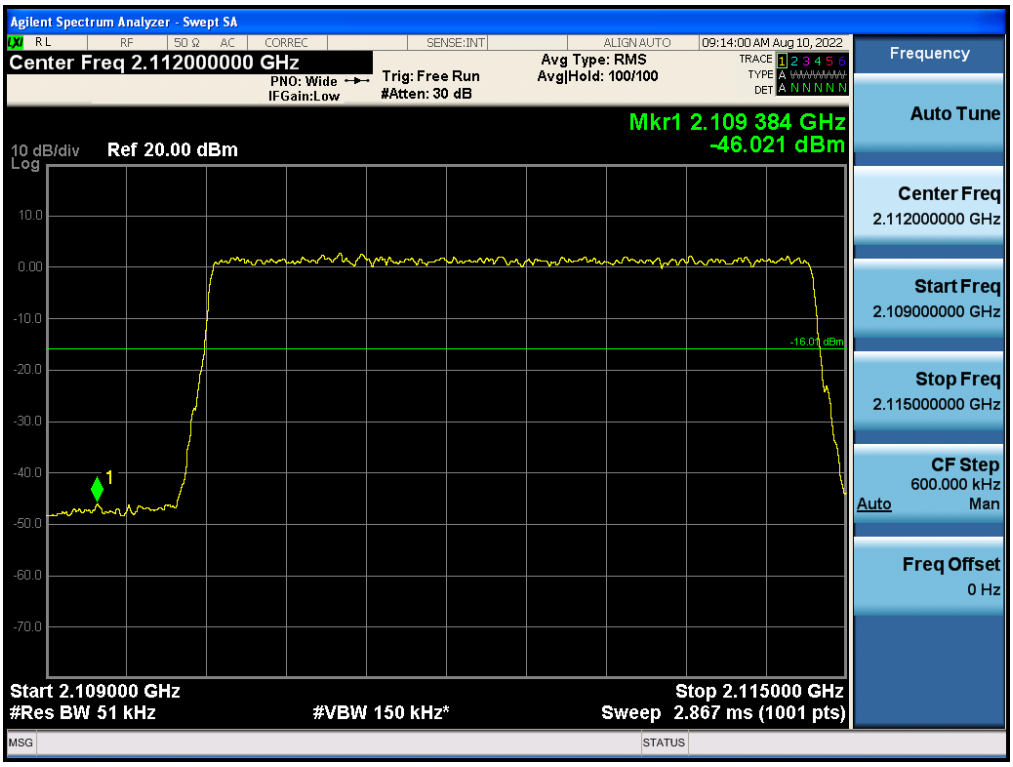
Antenna 0 / LTE B13 10 MHz + NB-IoT 1 Carrier / QPSK / Low



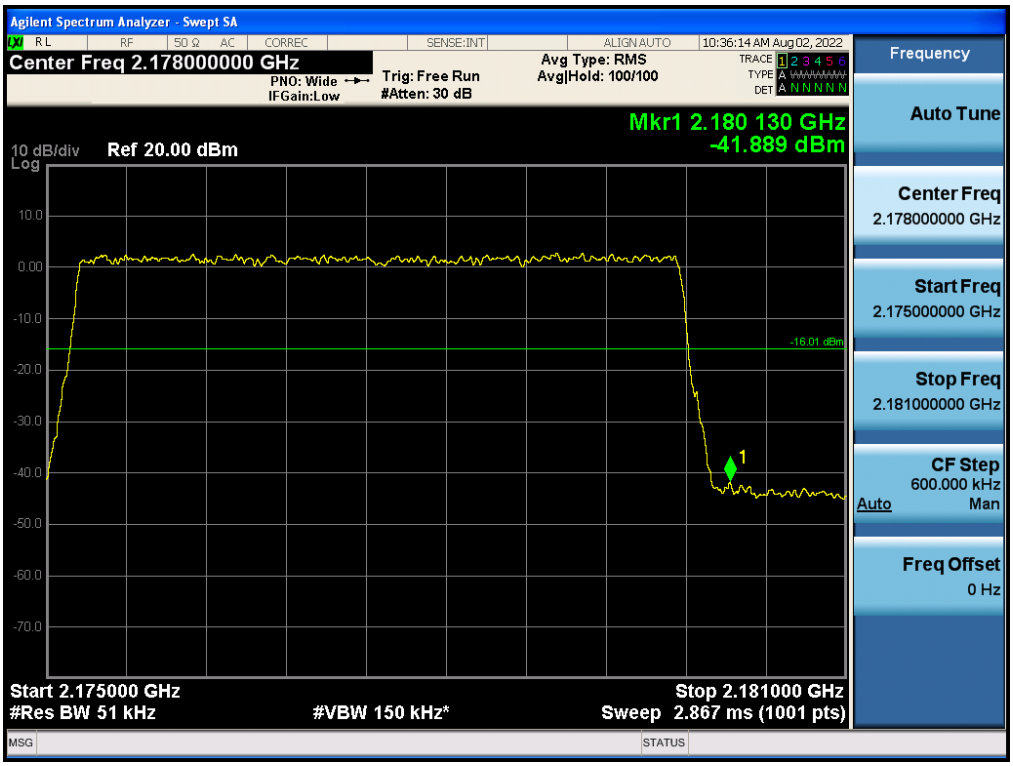
Antenna 0 / LTE B13 10 MHz + NB-IoT 1 Carrier / QPSK / High



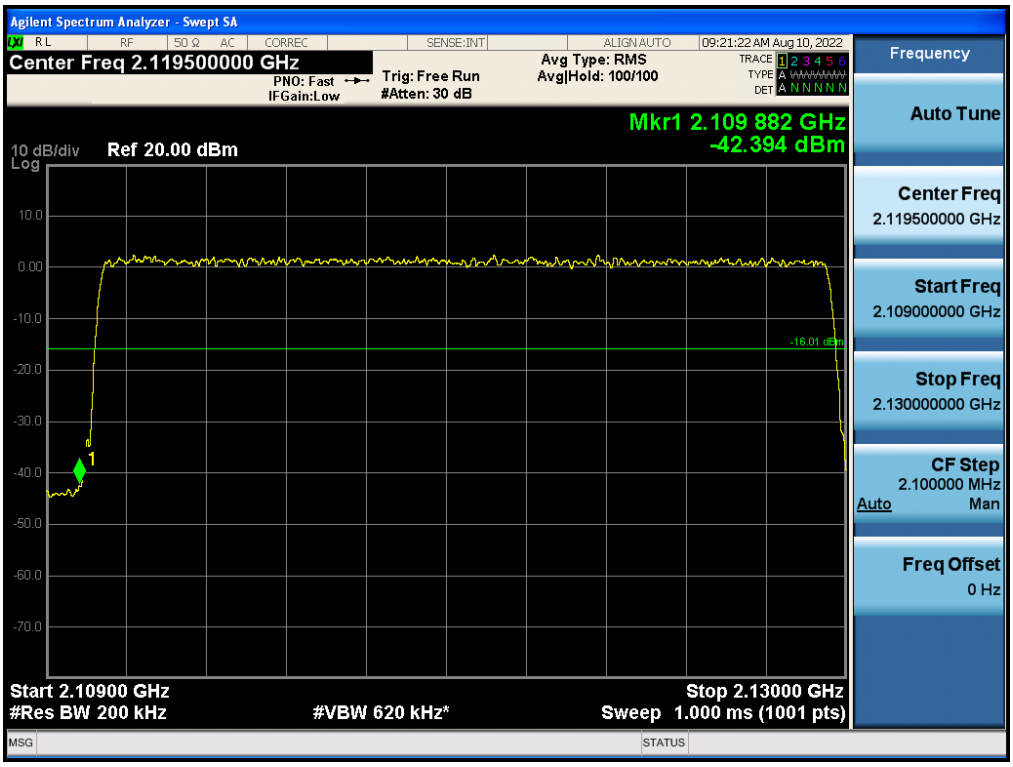
Antenna 0 / LTE B66 5 MHz 1 Carrier / 256QAM / Low



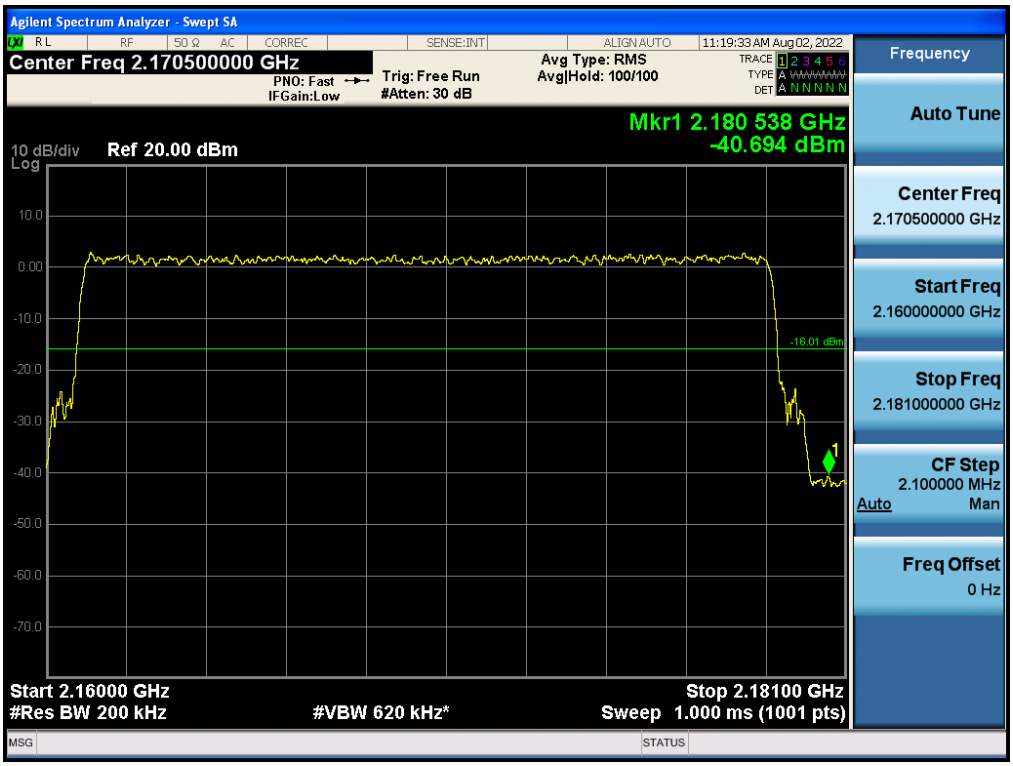
Antenna 1 / LTE B66 5 MHz 1 Carrier / 256QAM / High



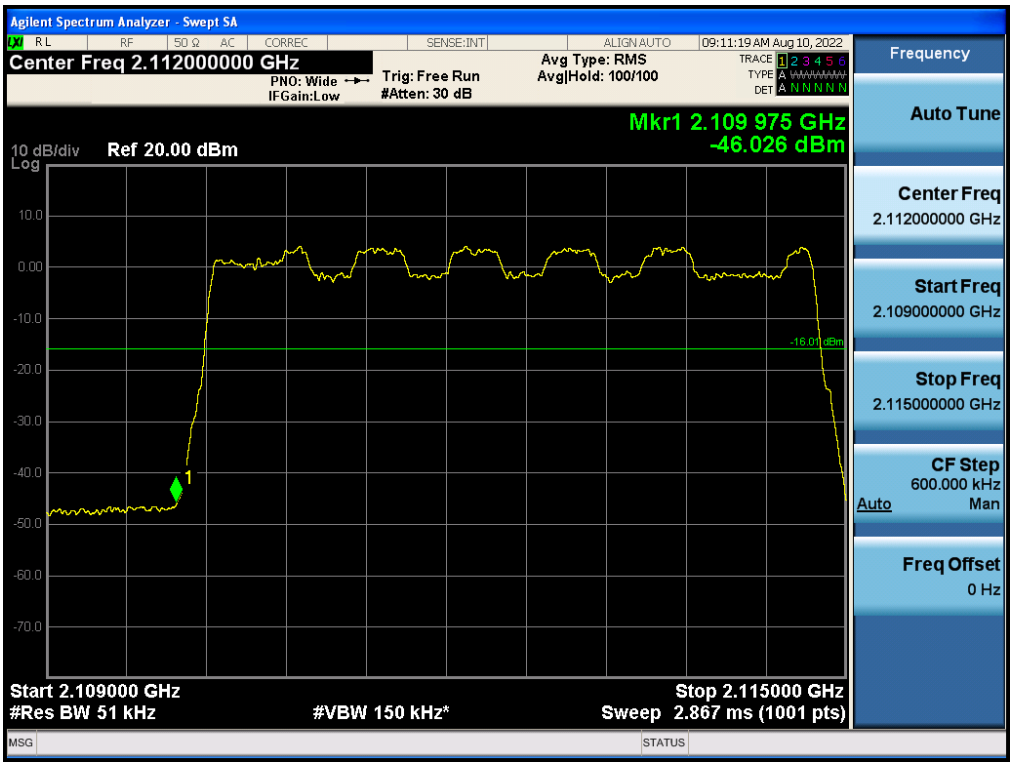
Antenna 0 / LTE B66 20 MHz 1 Carrier / QPSK / Low



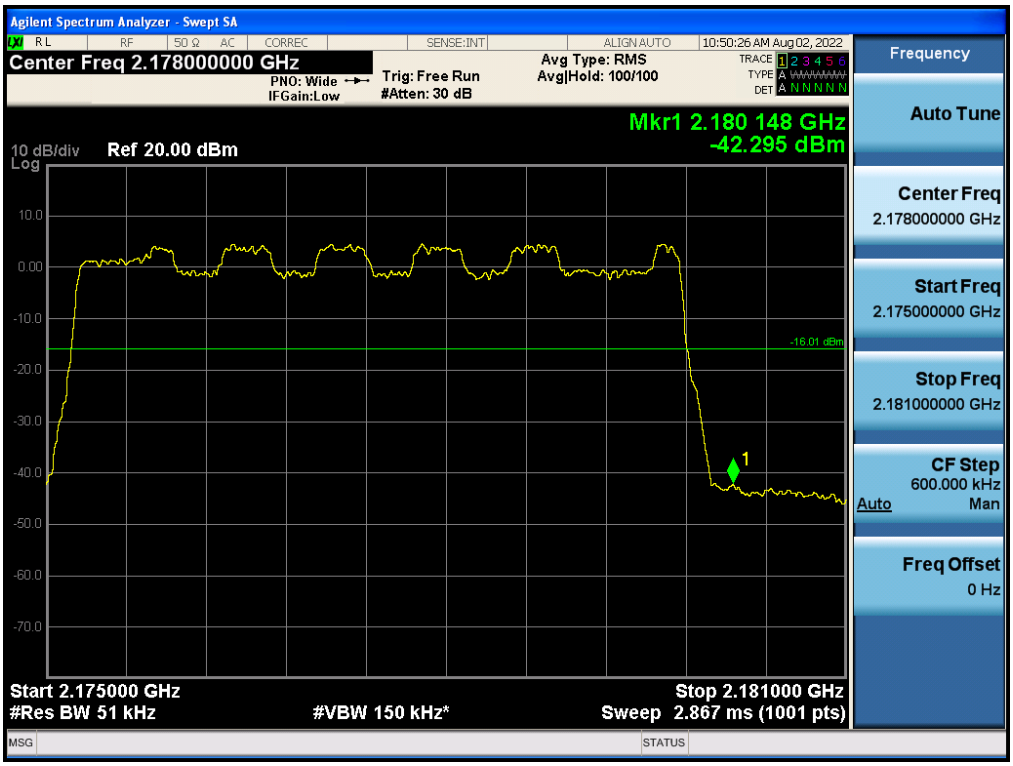
Antenna 1 / LTE B66 20 MHz 1 Carrier / QPSK / High



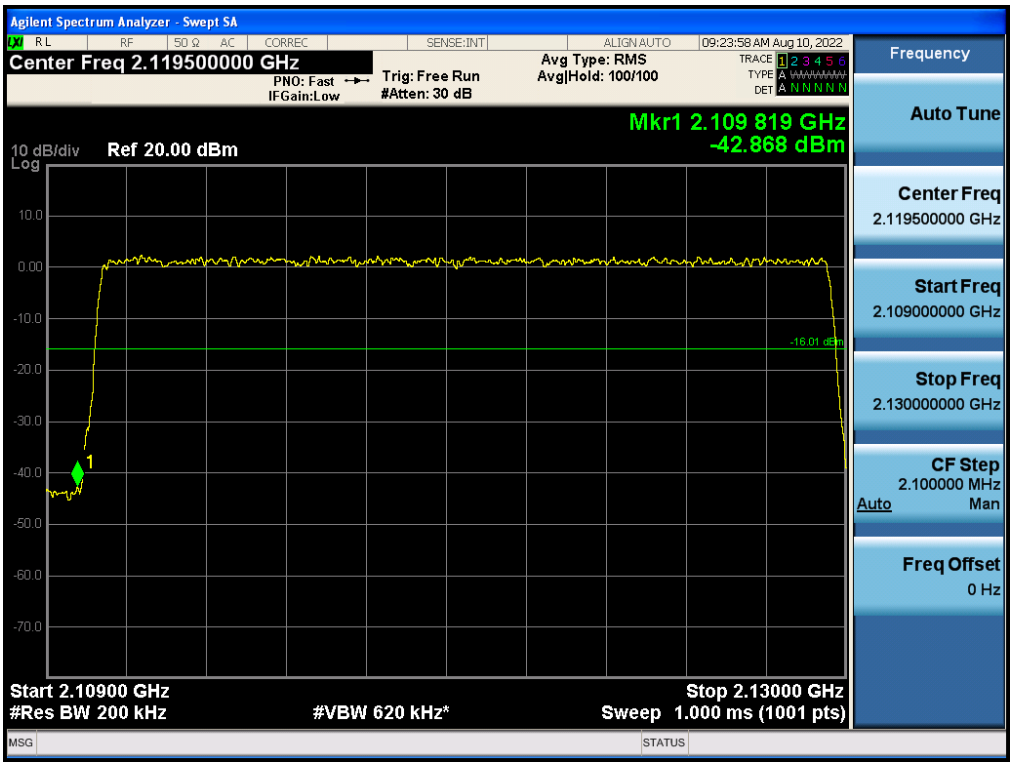
Antenna 1 / 5G NR n66 5 MHz 1 Carrier / 16QAM / Low



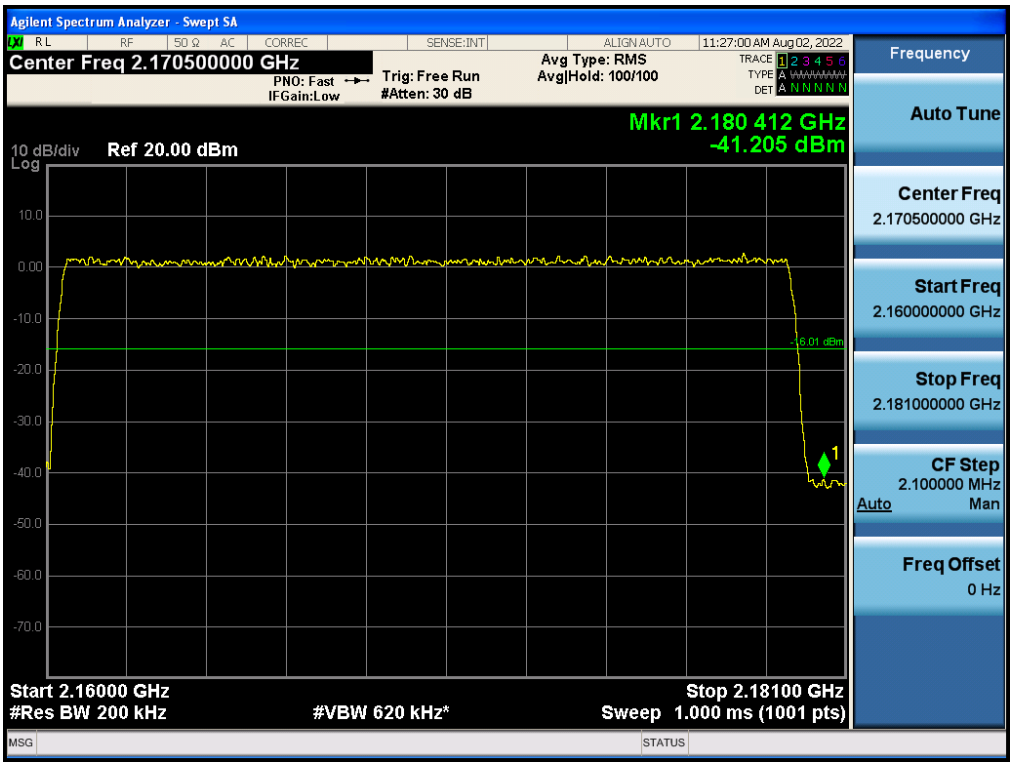
Antenna 1 / 5G NR n66 5 MHz 1 Carrier / 16QAM / High



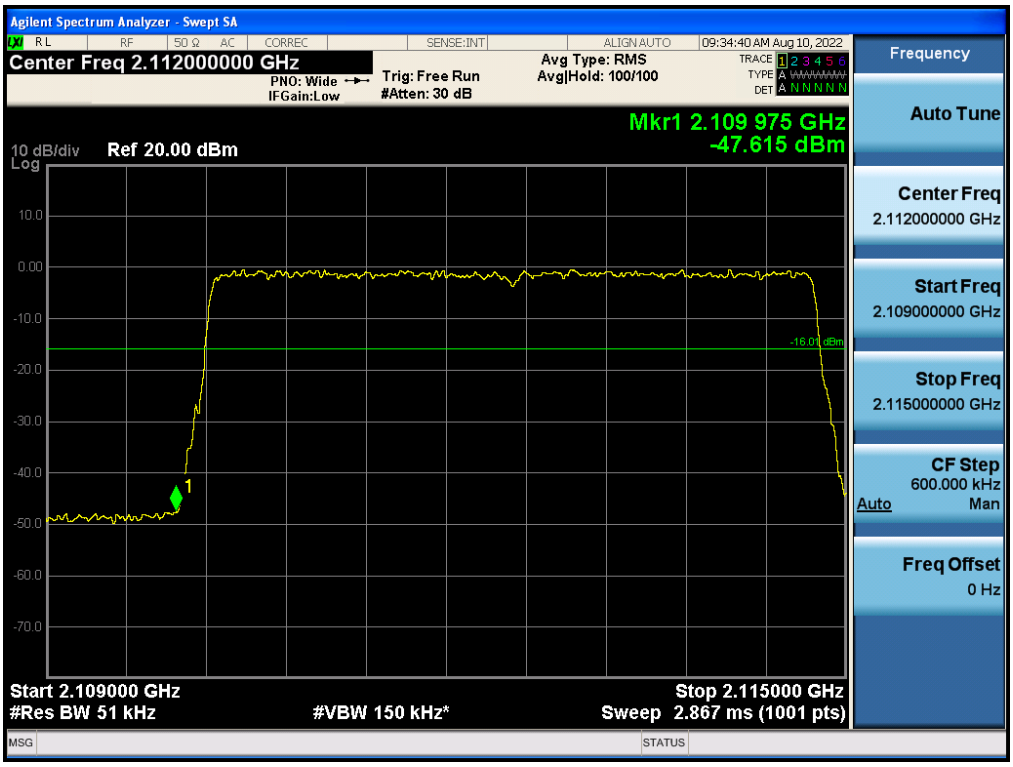
Antenna 1 / 5G NR n66 20 MHz 1 Carrier / 64QAM / Low



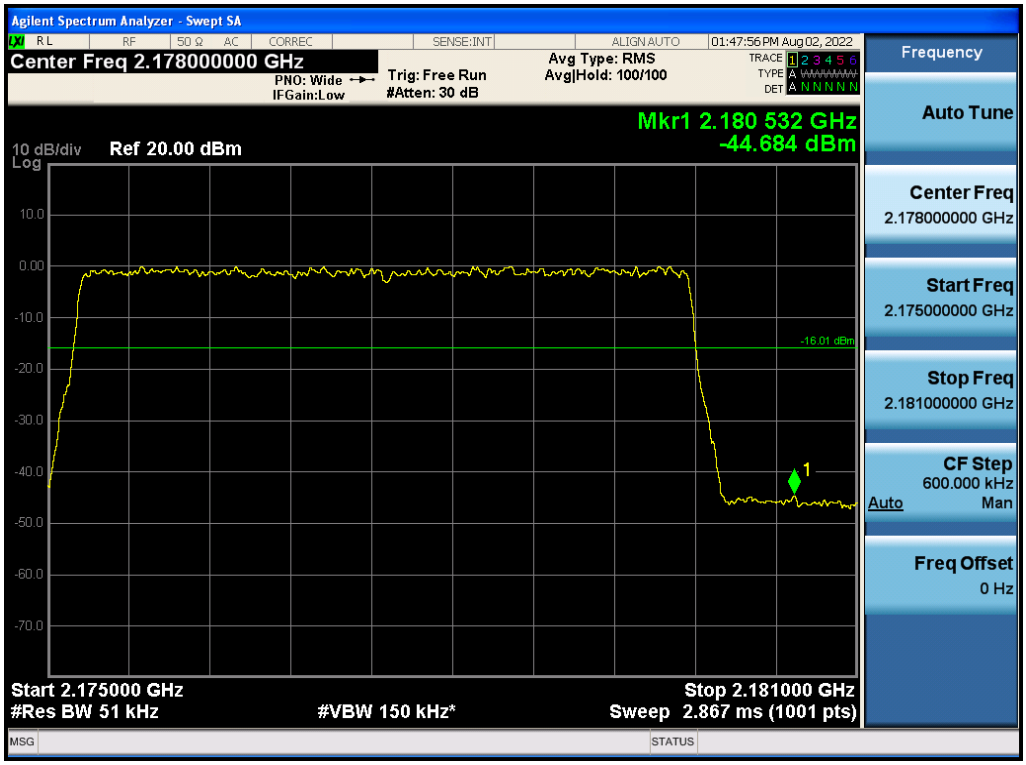
Antenna 0 / 5G NR n66 20 MHz 1 Carrier / 64QAM / High



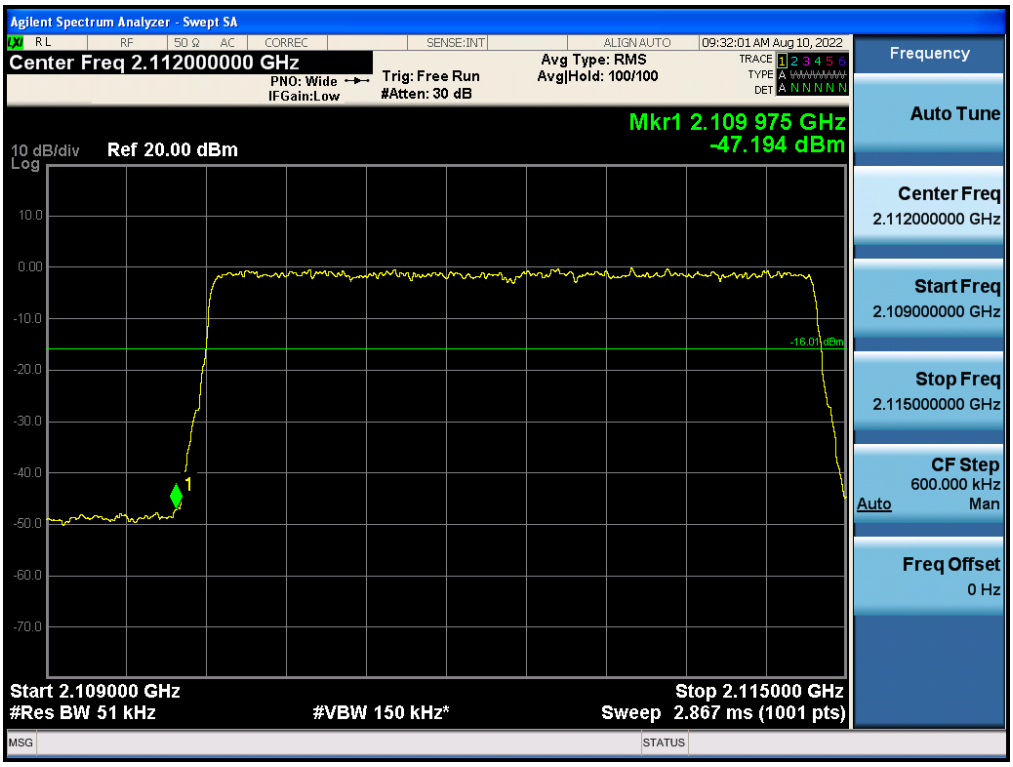
Antenna 0 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Contiguous / 256QAM / Low



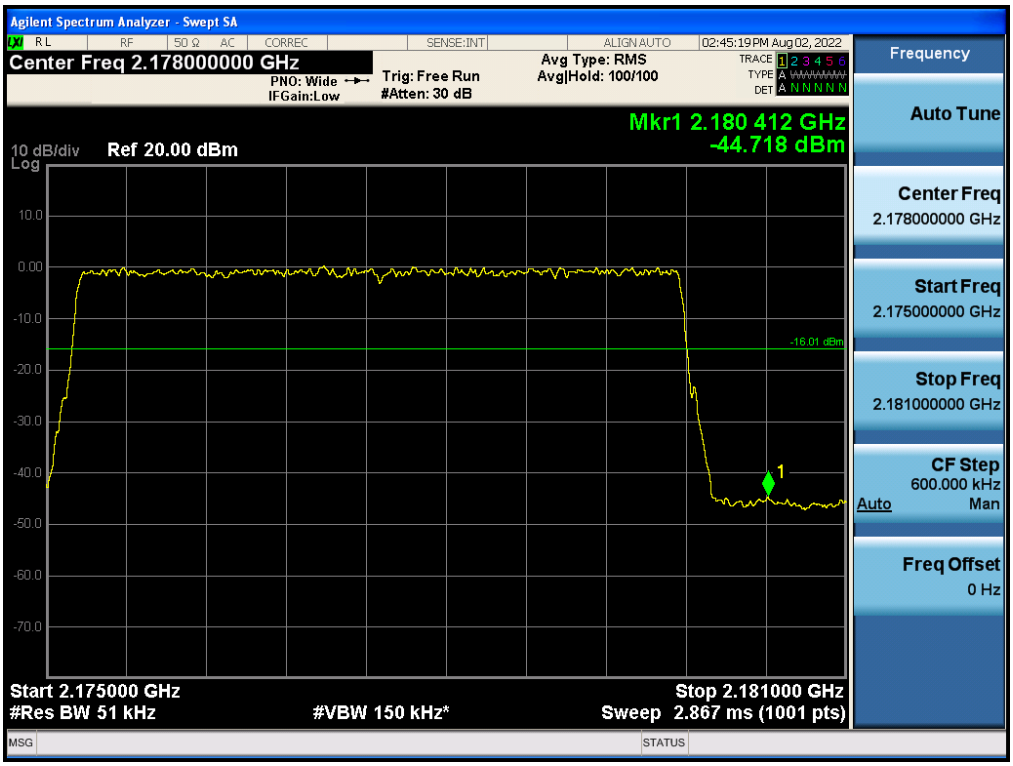
Antenna 0 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Contiguous / 256QAM / High



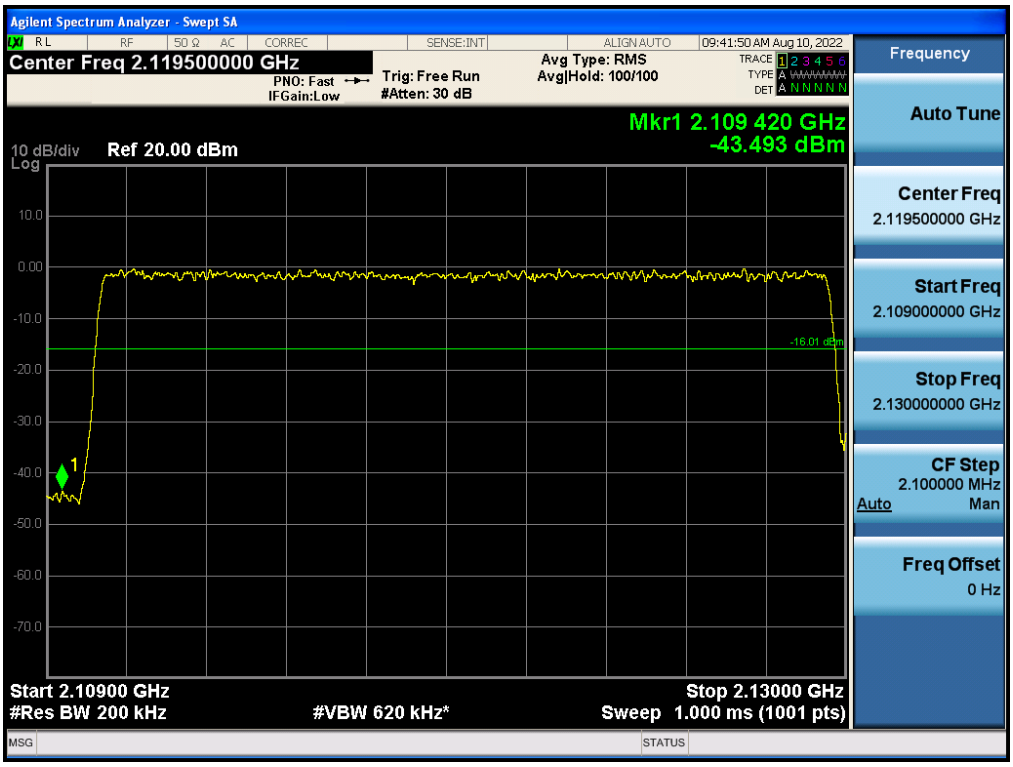
Antenna 0 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Contiguous / 64QAM / Low



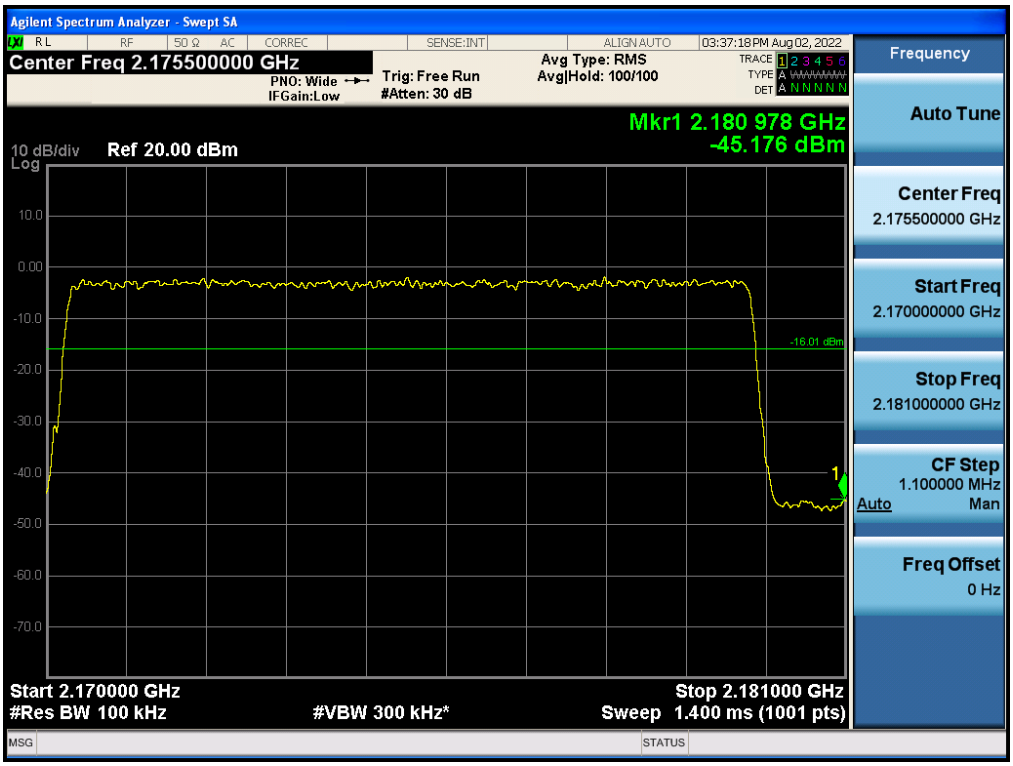
Antenna 0 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Contiguous / 64QAM / High



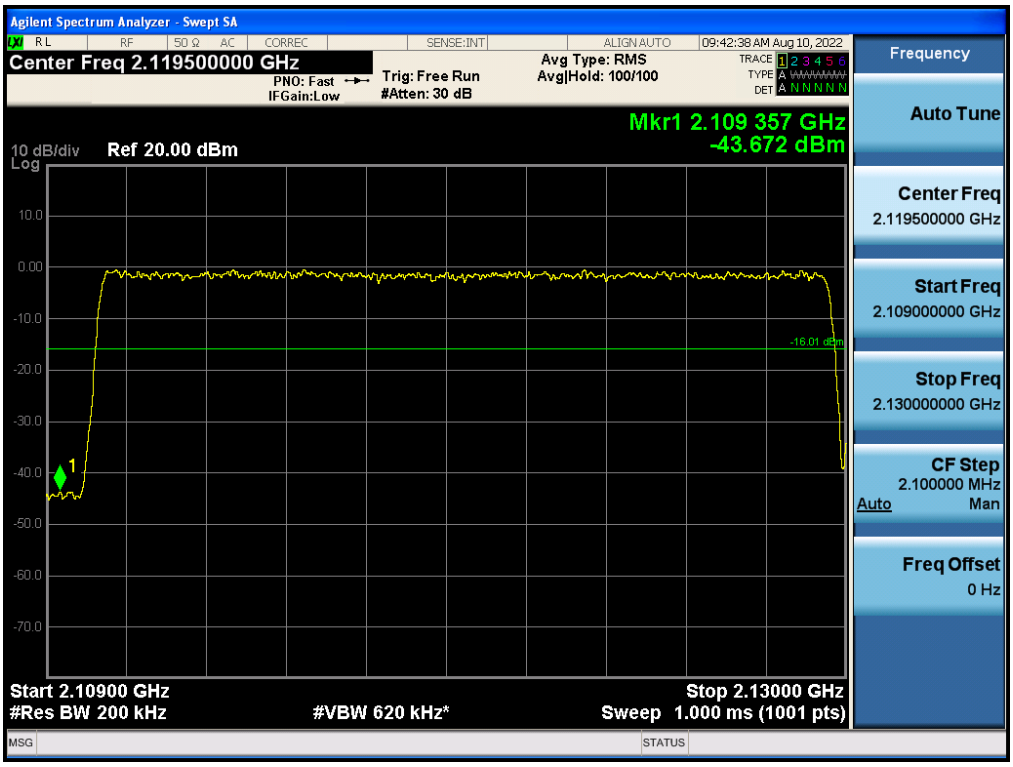
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Contiguous / QPSK / Low



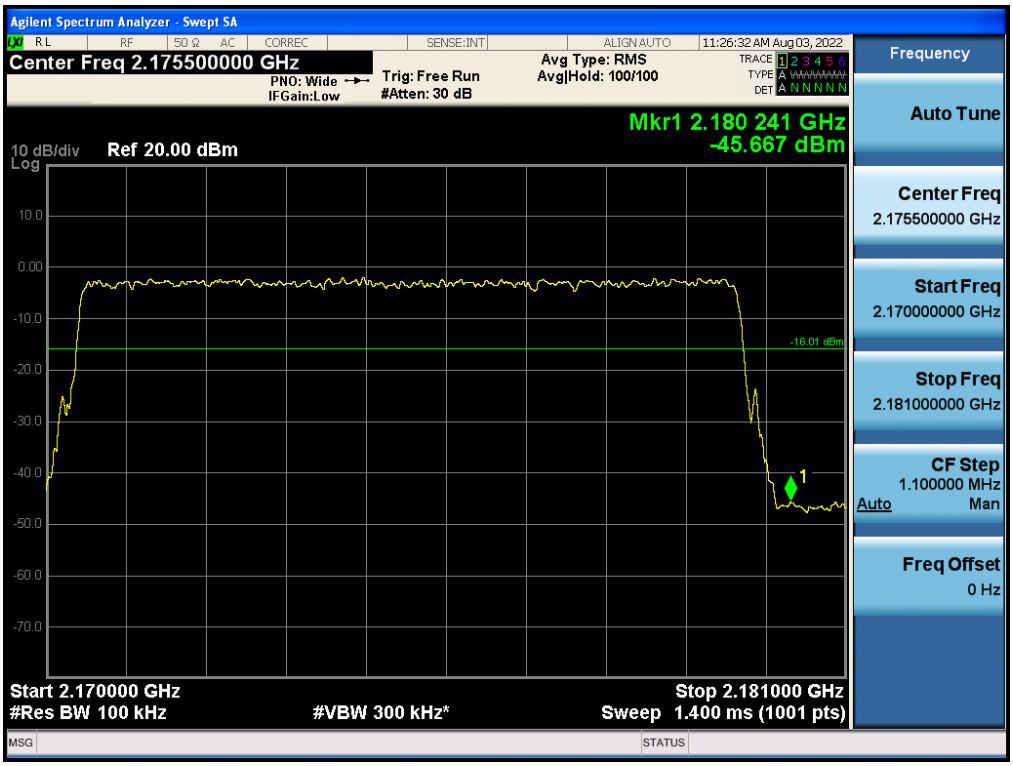
Antenna 1 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Contiguous / QPSK / High



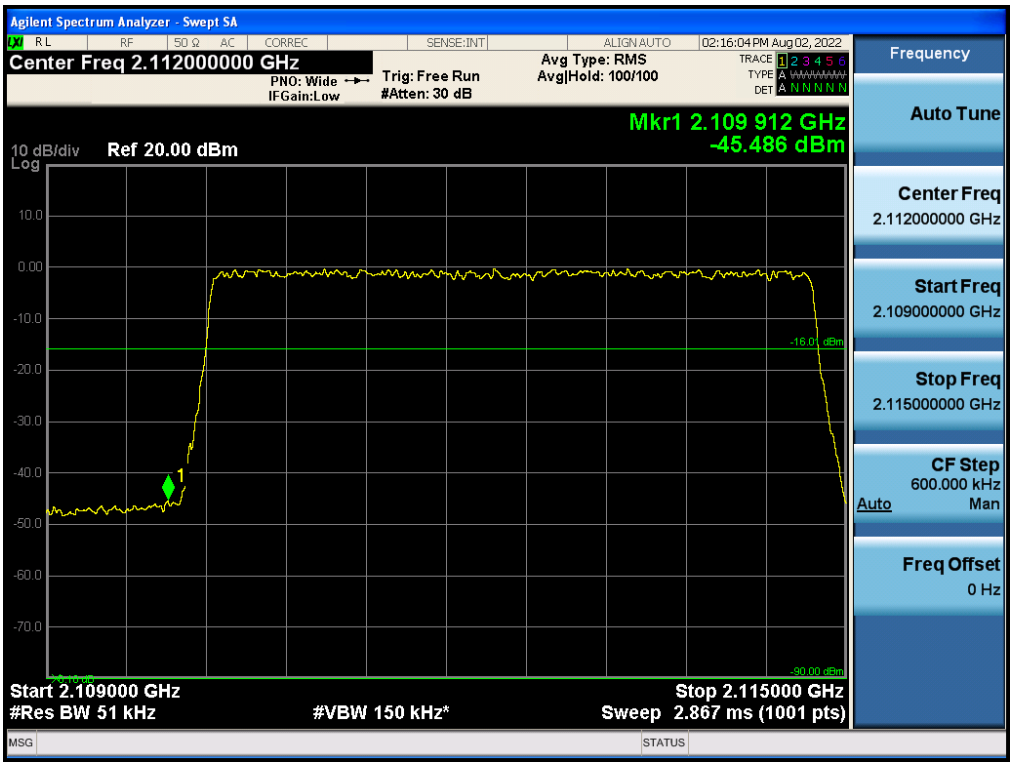
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Contiguous / 256QAM / Low



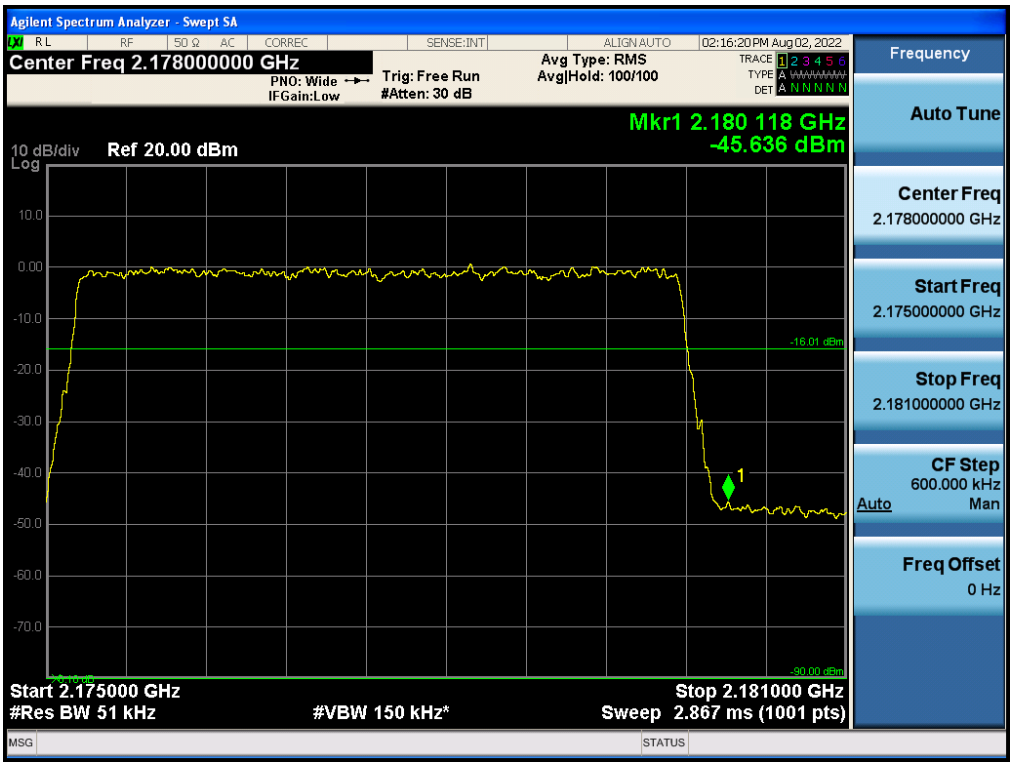
Antenna 1 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Contiguous / 256QAM / High



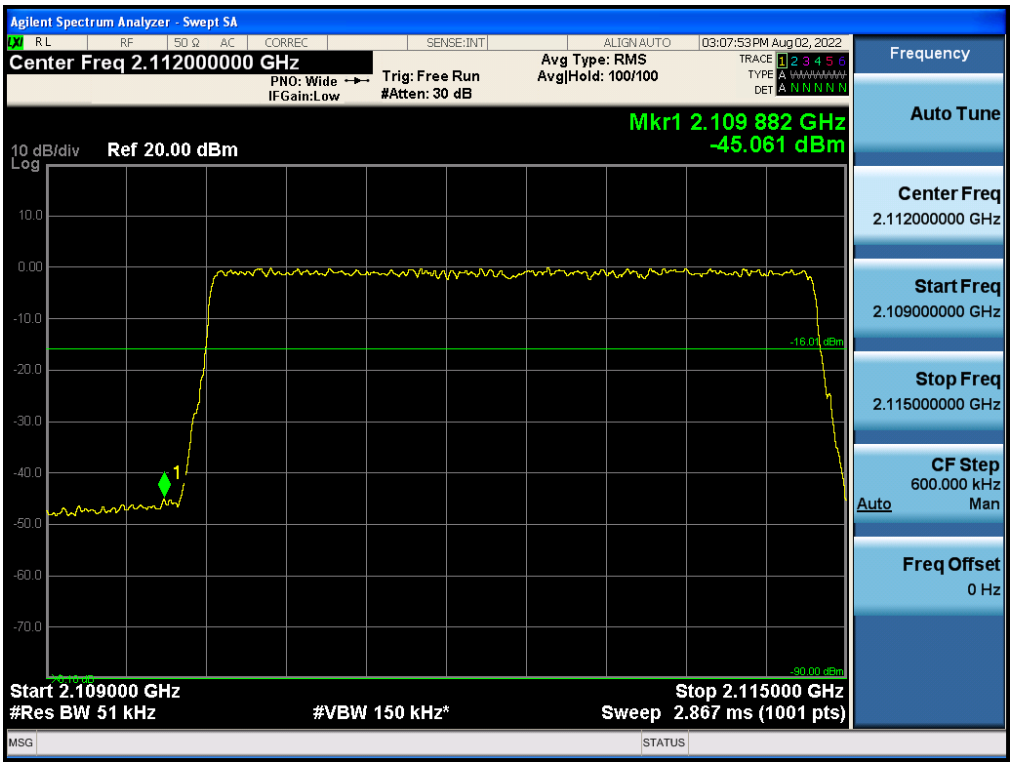
Antenna 0 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 256QAM / Low



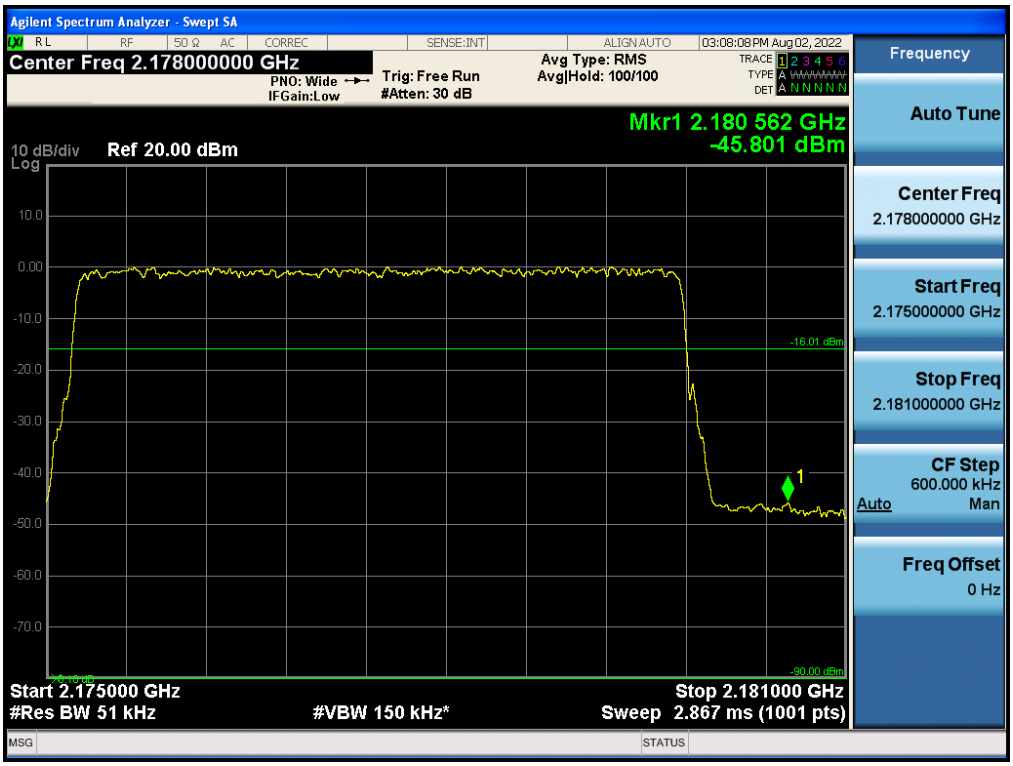
Antenna 0 / 5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 256QAM / High



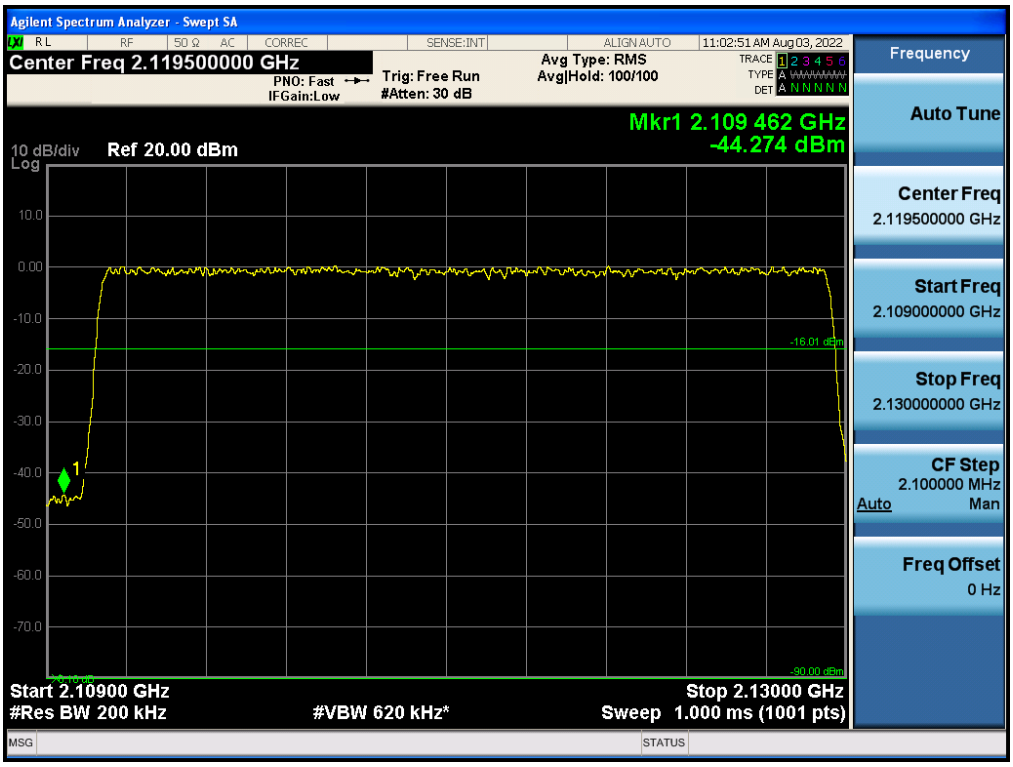
Antenna 0 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 64QAM / Low



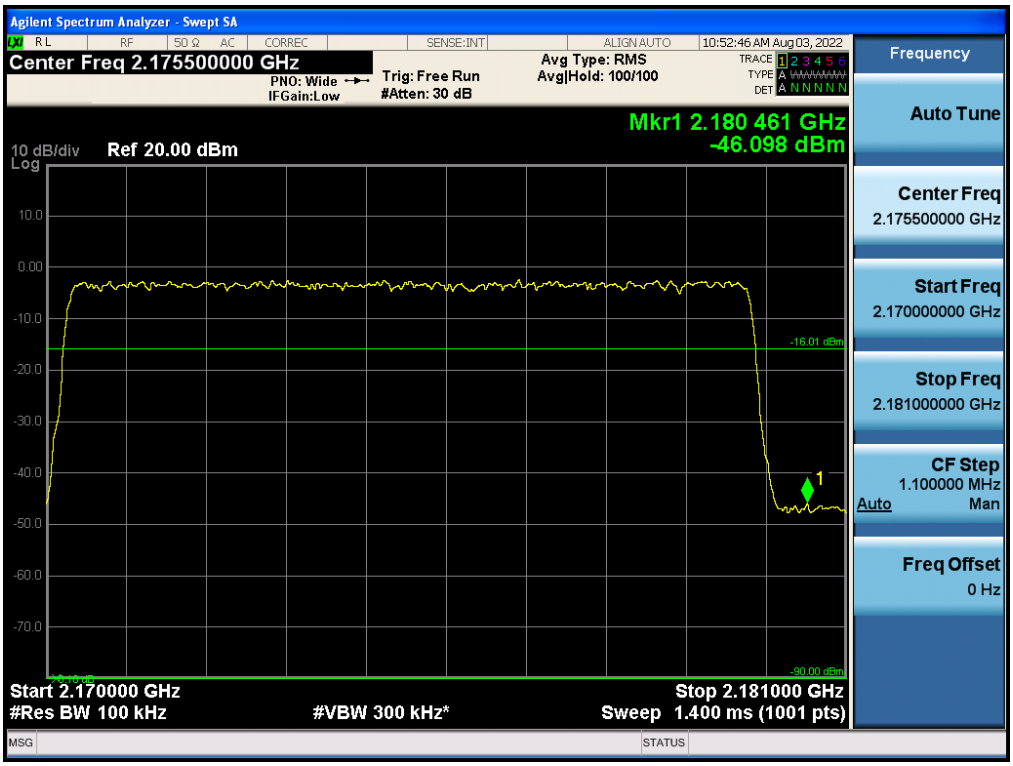
Antenna 0 / LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 64QAM / High



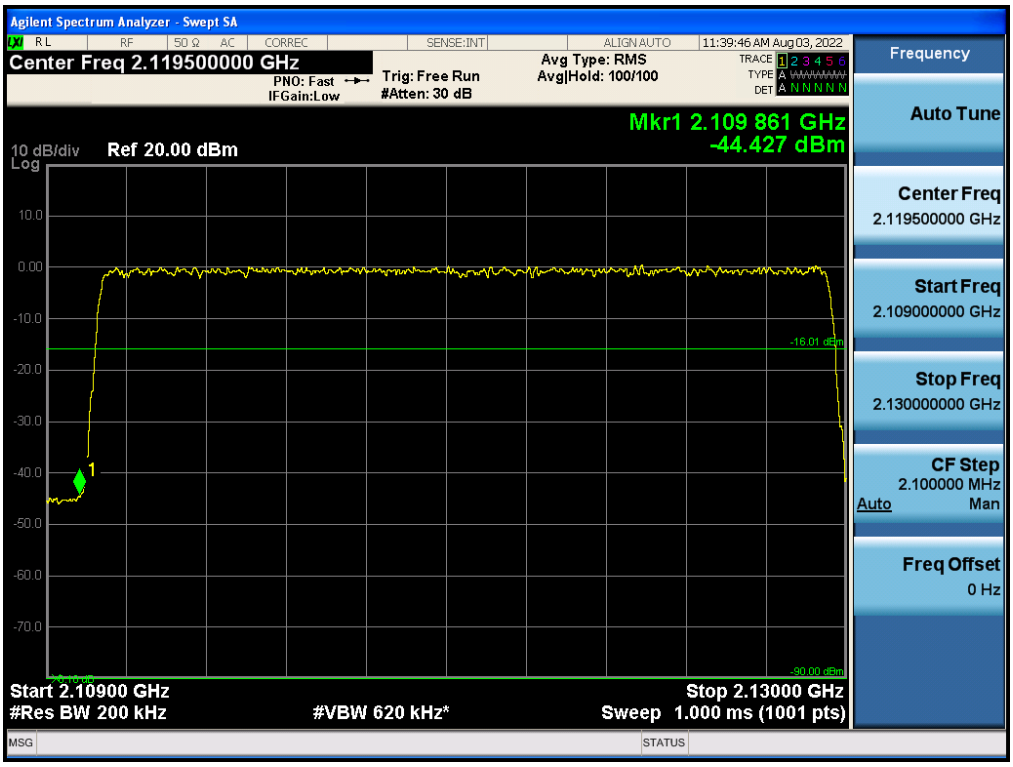
Antenna 1 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / QPSK / Low



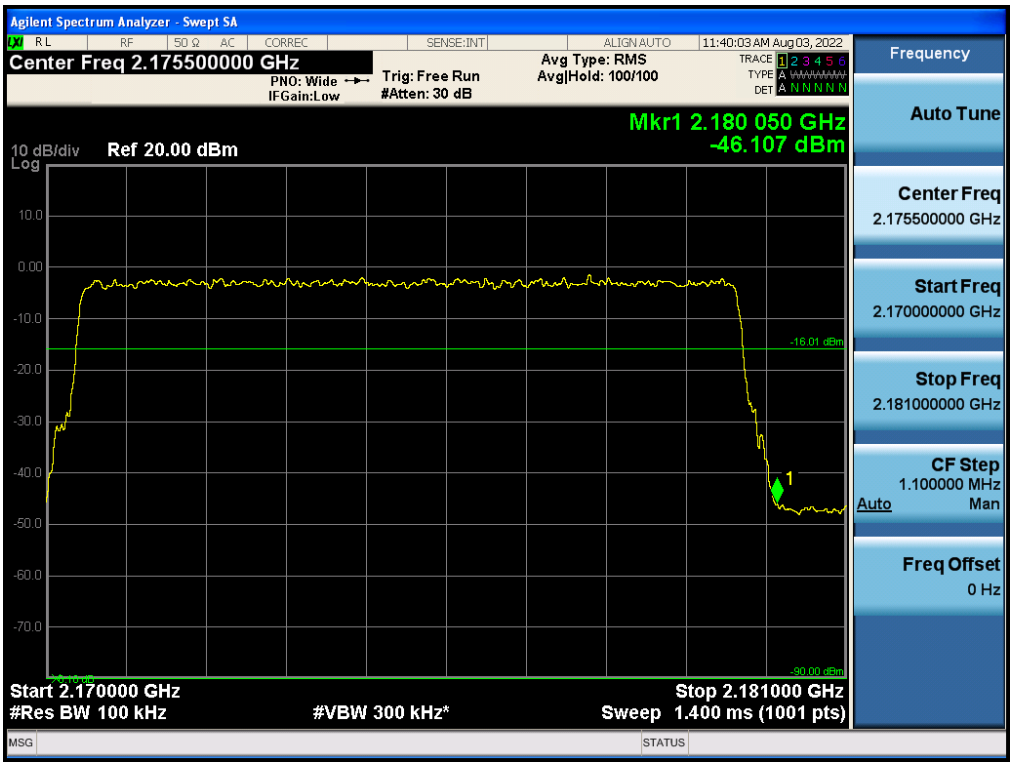
Antenna 0 / 5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / QPSK / High



Antenna 1 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 256QAM / Low



Antenna 1 / 5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier] / Non-Contiguous / 256QAM / High



5.5. SPURIOUS UNWANTED EMISSIONS

Test Requirements:

§ 2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 27.53 Emission limits.

(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) Omitted

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

(h) AWS emission limits

(1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

(3) Measurement procedure.

(i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the

licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(ii) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.

(iii) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

Test Procedures:

The measurement is performed in accordance with Section 5.7.4 of ANSI C63.26.

5.7.4 Spurious unwanted emission measurements

a) Set the spectrum analyzer start frequency to the lowest frequency generated by the EUT, without going below 9 kHz, and the stop frequency to the lower frequency covered by the measurements previously performed in 5.7.3. As an alternative, the stop frequency can be set to the value specified in 5.1.1, depending on the EUT operating range, if the resulting plot can clearly demonstrate compliance for all frequencies not addressed by the out-of-band emissions measurements performed as per 5.7.3.

b) When using an average power (rms) detector, ensure that the number of points in the sweep $\geq 2 \times$ (span / RBW). This may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the spectrum analyzer capabilities. This requirement does not apply to peak-detected power measurements. When average power is specified by the applicable regulation, a peak-detector can be utilized for preliminary measurements to accommodate wider frequency spans. Any emissions found in the preliminary measurement to exceed the applicable limit(s) shall be further examined using a power averaging (rms) detector with the minimum number of measurement points as defined above.

c) The sweep time should be set to auto-couple for performing peak-detector measurements. For measurements that use a power averaging (rms) detector, the sweep time shall be set as described for out-of-band emissions measurements in item d) of 5.7.3.

d) Identify and measure the Highest spurious emission levels in each frequency range. It is not necessary to re-measure the out-of-band emissions as a part of this test. Record the frequencies and amplitudes corresponding to the measured emissions and capture the data plots.

e) Repeat step b) through step d) for the upper spurious emission frequency range if not already captured by a wide span measurement performed as per the alternative provided in step a). The upper frequency for this measurement is defined in 5.1.1 as a function of the EUT operating range.

f) Compare the results with the corresponding limit in the applicable regulation.

g) The test report shall include the data plots of the measuring instrument display and the measured data.

Note:

(1) In 9 kHz to 30 MHz band, RBW narrower than reference bandwidth is used. So following correction factor is applied.

- 10 log [(reference bandwidth)/(resolution bandwidth)]

: 9 kHz to 150 kHz applied 1 kHz RBW, 10 log (100 kHz / 1 kHz) = 20 dB for Band 13

10 log (1 MHz / 1 kHz) = 30 dB for Band 66

: 150 kHz to 30 MHz applied 10 kHz RBW, 10 log (100 kHz / 10 kHz) = 10 dB for Band 13

10 log (1 MHz / 10 kHz) = 20 dB for Band 66

: Edge freq. to edge ±100 MHz applied 100 kHz RBW, 10 log (1 MHz / 100 kHz) = 10 dB for Band 66

(2) Due to MIMO operations, a correction has been added to the limit according to KDB 662911 D01 v02r01.

- 2Tx MIMO correction: 10 log(N_{ANT}) = 10 log(2) = 3.01 dB
- For Unwanted Spurious Domain, -13 dBm – 10*log (2) = -16.01 dBm
- For 763-775 MHz and 793-805 MHz, -46 dBm – 10*log (2) = -49.01 dBm
- For 1559-1610 MHz (E.I.R.P. Limit), -40 dBm/MHz – 10*log (2) = -43.01 dBm/MHz

(3) Sample Calculations:

For 1559-1610 MHz,

-56.193 dBm/MHz (Measured value) + 7.5 dBi (Directional Gain) = -48.693 dBm/MHz (Final E.I.R.P.)

(4) The results of the Spurious Unwanted Emissions shown above the frequency measured values are very small and similar trend for each port, so we are attached only the worst case plot.

(5) All power supplies of operation were investigated and the worst case configuration results are reported.

- Mode: DC: -48 V / PoE: 57 V
- Worst case: PoE: 57 V

Test Results:
Tabular Data of Spurious Unwanted Emissions

5G NR n13 5 MHz 1 Carrier
Test Result for Output Port 0

Mod.	Channel	Measured Level (dBm)								
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ 1 GHz	1 GHz ~ 2 GHz	2 GHz ~ 4 GHz	4 GHz ~ 6 GHz	6 GHz ~ 8 GHz
256QAM	Middle	-28.220	-28.158	-47.150	-44.004	-44.097	-41.296	-40.954	-41.249	-42.027

Mod.	Channel	Measured Level (dBm)		
		Additional 763-775 MHz	Additional 793-805 MHz	Additional 1559-1610 MHz (E.I.R.P.)
256QAM	Middle	-77.047	-78.425	-49.172

Test Result for Output Port 1

Mod.	Channel	Measured Level (dBm)								
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ 1 GHz	1 GHz ~ 2 GHz	2 GHz ~ 4 GHz	4 GHz ~ 6 GHz	6 GHz ~ 8 GHz
256QAM	Middle	-30.698	-28.284	-46.626	-44.061	-44.533	-41.620	-40.358	-41.117	-42.403

Mod.	Channel	Measured Level (dBm)		
		Additional 763-775 MHz	Additional 793-805 MHz	Additional 1559-1610 MHz (E.I.R.P.)
256QAM	Middle	-76.892	-78.629	-49.233

5G NR n13 10 MHz 1 Carrier
Test Result for Output Port 0

Mod.	Channel	Measured Level (dBm)								
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ 1 GHz	1 GHz ~ 2 GHz	2 GHz ~ 4 GHz	4 GHz ~ 6 GHz	6 GHz ~ 8 GHz
16QAM	Middle	-29.876	-27.822	-46.520	-40.787	-42.525	-41.719	-41.107	-41.589	-41.865

Mod.	Channel	Measured Level (dBm)		
		Additional 763-775 MHz	Additional 793-805 MHz	Additional 1559-1610 MHz (E.I.R.P.)
16QAM	Middle	-65.252	-78.125	-49.190

Test Result for Output Port 1

Mod.	Channel	Measured Level (dBm)								
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ 1 GHz	1 GHz ~ 2 GHz	2 GHz ~ 4 GHz	4 GHz ~ 6 GHz	6 GHz ~ 8 GHz
16QAM	Middle	-29.821	-28.743	-46.941	-42.353	-42.581	-41.856	-41.202	-42.040	-41.908

Mod.	Channel	Measured Level (dBm)		
		Additional 763-775 MHz	Additional 793-805 MHz	Additional 1559-1610 MHz (E.I.R.P.)
16QAM	Middle	-64.792	-77.437	-49.021

Test Result for Output Port 1

Mod.	Channel	Measured Level (dBm)								
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ 1 GHz	1 GHz ~ 2 GHz	2 GHz ~ 4 GHz	4 GHz ~ 6 GHz	6 GHz ~ 8 GHz
QPSK	Low	-31.374	-27.164	-46.963	-40.339	-50.282	-51.797	-44.716	-69.762	-69.757
	Middle	-30.101	-28.062	-46.346	-44.629	-44.207	-51.584	-43.729	-69.661	-69.367
	High	-30.767	-30.110	-46.645	-49.123	-40.741	-51.418	-44.833	-69.790	-69.963
16QAM	Low	-29.347	-28.587	-46.916	-40.727	-50.102	-51.608	-45.092	-69.593	-68.981
	Middle	-27.523	-29.052	-46.934	-44.915	-44.207	-51.649	-44.493	-69.695	-69.289
	High	-30.910	-29.990	-46.990	-49.206	-40.678	-51.385	-45.000	-69.510	-69.886
64QAM	Low	-31.272	-27.531	-46.953	-40.183	-50.136	-51.499	-44.909	-69.930	-69.550
	Middle	-28.282	-28.826	-47.165	-44.771	-44.691	-51.910	-44.957	-69.949	-69.276
	High	-30.115	-28.412	-46.978	-49.148	-40.195	-51.628	-44.493	-69.564	-70.034
256QAM	Low	-30.048	-27.883	-47.113	-40.454	-50.153	-51.309	-44.991	-70.107	-69.630
	Middle	-30.457	-28.360	-47.123	-45.155	-45.289	-51.152	-44.440	-69.365	-69.375
	High	-29.418	-26.977	-47.294	-49.473	-40.669	-51.372	-44.510	-69.655	-69.793

Mod.	Channel	Measured Level (dBm)		
		Additional 763-775 MHz	Additional 793-805 MHz	Additional 1559-1610 MHz (E.I.R.P.)
QPSK	Low	-77.615	-78.723	-49.339
	Middle	-75.625	-78.657	-48.838
	High	-71.278	-78.213	-48.244
16QAM	Low	-77.621	-78.428	-49.366
	Middle	-76.753	-78.152	-49.379
	High	-69.872	-78.623	-49.285
64QAM	Low	-77.736	-78.491	-48.208
	Middle	-75.883	-78.640	-49.403
	High	-71.654	-78.585	-49.067
256QAM	Low	-78.046	-78.028	-49.084
	Middle	-75.701	-78.453	-49.305
	High	-72.313	-78.353	-48.630

LTE B13 5 MHz + NB-IoT 1 Carrier
Test Result for Output Port 1

-	Mod.	Channel	Measured Level (dBm)								
			9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 2 GHz	2 GHz ~ 4 GHz	4 GHz ~ 6 GHz	6 GHz ~ 8 GHz
Original	64QAM	Low	-29.225	-34.223	-47.122	-40.580	-40.000	-45.549	-59.569	-57.720	-58.310
Permissive Change	64QAM	Low	-31.521	-40.363	-47.103	-40.327	-49.113	-50.879	-66.641	-69.742	-69.950
Deviation			-2.296	-6.140	0.019	0.253	-9.113	-5.330	-7.072	-12.022	-11.640

-	Mod.	Channel	Measured Level (dBm)		
			Additional 763-775 MHz	Additional 793-805 MHz	Additional 1559-1610 MHz (E.I.R.P.)
Original	64QAM	Low	-69.808	-69.774	-54.907
Permissive Change	64QAM	Low	-79.524	-79.761	-57.671
Deviation			-9.716	-9.987	-2.764

*** We did spot checking on LTE B13 5 MHz with NB IoT as in-band operation, this does not generate any changes because in-band NB-IoT cannot distinguish with original LTE signal.**

LTE B13 10 MHz + NB-IoT 1 Carrier
Test Result for Output Port 0

Mod.	Channel	Measured Level (dBm)								
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ 1 GHz	1 GHz ~ 2 GHz	2 GHz ~ 4 GHz	4 GHz ~ 6 GHz	6 GHz ~ 8 GHz
QPSK	Middle	-30.761	-27.182	-47.026	-42.605	-43.175	-51.453	-45.094	-69.754	-69.414
16QAM	Middle	-30.029	-28.415	-46.824	-42.353	-43.476	-51.518	-44.380	-69.380	-69.918
64QAM	Middle	-29.582	-27.246	-46.917	-42.507	-42.866	-51.514	-44.780	-69.797	-69.501
256QAM	Middle	-28.564	-27.303	-47.034	-42.638	-43.403	-50.492	-45.147	-69.596	-69.793

Mod.	Channel	Measured Level (dBm)		
		Additional 763-775 MHz	Additional 793-805 MHz	Additional 1559-1610 MHz (E.I.R.P.)
QPSK	Middle	-63.482	-78.790	-49.306
16QAM	Middle	-62.803	-77.850	-49.282
64QAM	Middle	-63.640	-78.279	-48.693
256QAM	Middle	-62.957	-78.805	-48.764

Test Result for Output Port 1

Mod.	Channel	Measured Level (dBm)								
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ 1 GHz	1 GHz ~ 2 GHz	2 GHz ~ 4 GHz	4 GHz ~ 6 GHz	6 GHz ~ 8 GHz
QPSK	Middle	-29.131	-28.754	-46.870	-42.802	-43.180	-51.198	-44.351	-69.951	-69.767
16QAM	Middle	-29.988	-29.279	-47.151	-42.367	-43.306	-51.897	-44.834	-69.487	-69.482
64QAM	Middle	-29.866	-25.859	-47.034	-42.603	-43.027	-50.975	-45.122	-69.560	-70.066
256QAM	Middle	-28.914	-28.309	-47.306	-41.805	-43.276	-51.506	-44.493	-69.617	-69.487

Mod.	Channel	Measured Level (dBm)		
		Additional 763-775 MHz	Additional 793-805 MHz	Additional 1559-1610 MHz (E.I.R.P.)
QPSK	Middle	-63.533	-78.526	-49.399
16QAM	Middle	-63.584	-79.066	-49.327
64QAM	Middle	-63.432	-78.269	-49.178
256QAM	Middle	-63.847	-78.128	-49.196

B66 LTE 5 MHz 1 Carrier
Test Result for Output Port 0

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
256QAM	High	-33.874	-43.998	-44.216	-38.502	-31.715	-40.747	-45.506

Test Result for Output Port 1

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
256QAM	High	-31.633	-44.119	-44.335	-38.389	-31.342	-41.034	-45.048

LTE B66 20 MHz 1 Carrier
Test Result for Output Port 0

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
QPSK	High	-33.593	-43.408	-44.451	-38.426	-34.677	-40.945	-45.585

Test Result for Output Port 1

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
QPSK	High	-34.269	-45.802	-44.304	-38.461	-34.719	-41.303	-45.606

5G NR n66 5 MHz 1 Carrier
Test Result for Output Port 0

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
16QAM	High	-33.952	-43.379	-44.679	-38.468	-32.351	-41.268	-45.784

Test Result for Output Port 1

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
16QAM	High	-34.968	-44.276	-43.729	-38.535	-31.718	-41.173	-45.838

5G NR n66 20 MHz 1 Carrier
Test Result for Output Port 0

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
64QAM	High	-33.546	-44.260	-42.996	-38.467	-34.751	-41.216	-45.546

Test Result for Output Port 1

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
64QAM	High	-33.263	-44.355	-44.498	-38.575	-34.683	-40.851	-45.726

Tabular Data of RF Contiguous

5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Test Result for Output Port 0

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
256QAM	High	-35.085	-46.229	-43.651	-38.672	-32.953	-41.051	-45.475

Test Result for Output Port 1

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
256QAM	High	-35.254	-45.460	-44.236	-38.535	-33.104	-40.795	-45.911

LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Test Result for Output Port 0

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
64QAM	High	-33.947	-44.664	-44.204	-38.701	-32.961	-40.755	-45.786

Test Result for Output Port 1

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
64QAM	High	-34.380	-44.137	-44.629	-38.346	-33.237	-40.697	-45.345

5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier]

Test Result for Output Port 0

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
QPSK	High	-34.353	-44.558	-44.681	-38.509	-35.502	-40.847	-45.710

Test Result for Output Port 1

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
QPSK	High	-34.831	-43.872	-44.643	-38.409	-35.734	-40.782	-45.720

5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier]

Test Result for Output Port 0

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
256QAM	High	-34.271	-44.216	-44.080	-38.611	-35.908	-40.968	-45.583

Test Result for Output Port 1

Mod.	Channel	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
256QAM	High	-33.842	-43.981	-44.058	-38.589	-36.190	-40.769	-45.165

Tabular Data of RF Non-Contiguous

5G NR n66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Port	Mod	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
0	256QAM	-33.493	-44.944	-44.116	-34.803	-34.930	-40.986	-45.930
1	256QAM	-34.609	-45.299	-44.257	-34.751	-34.927	-41.074	-45.698

LTE B66 5 MHz 1 Carrier + LTE B66 5 MHz 1 Carrier [2 Carrier]

Port	Mod	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
0	64QAM	-33.097	-45.300	-44.285	-34.937	-35.065	-41.040	-45.954
1	64QAM	-33.175	-43.616	-44.161	-34.557	-34.461	-41.084	-45.764

5G NR n66 20 MHz 1 Carrier + 5G NR n66 10 MHz 1 Carrier [2 Carrier]

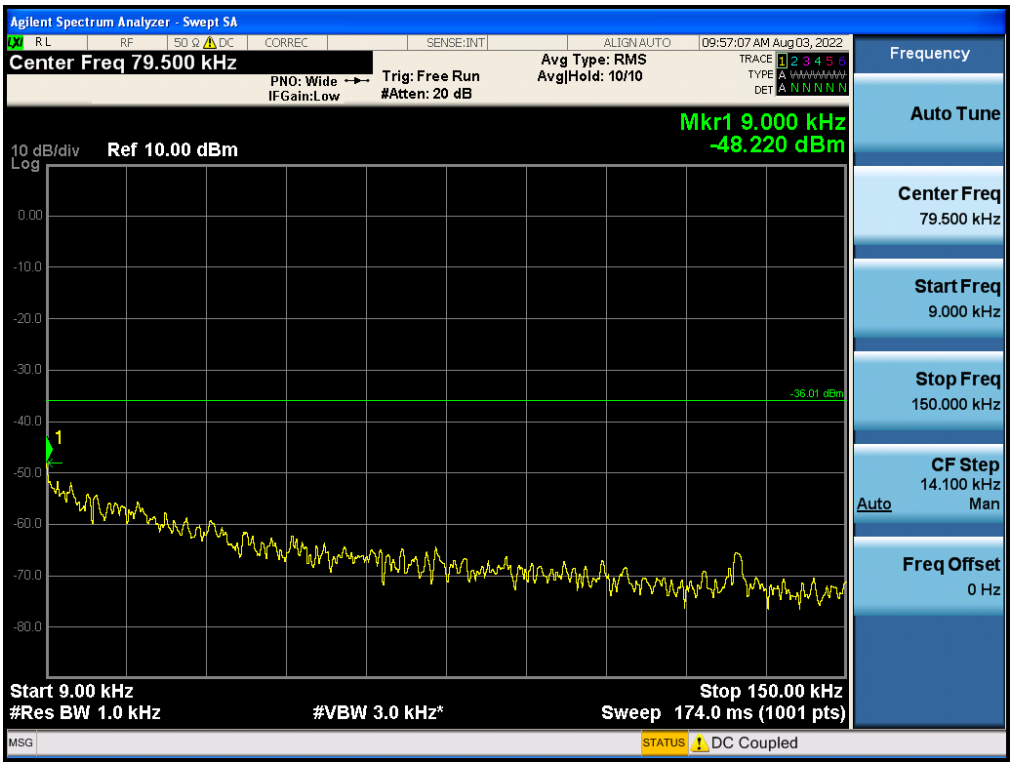
Port	Mod	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
0	QPSK	-34.987	-44.055	-44.597	-38.489	-37.940	-41.521	-45.667
1	QPSK	-34.409	-45.560	-44.521	-38.625	-38.087	-40.850	-45.442

5G NR n66 20 MHz 1 Carrier + LTE B66 10 MHz 1 Carrier [2 Carrier]

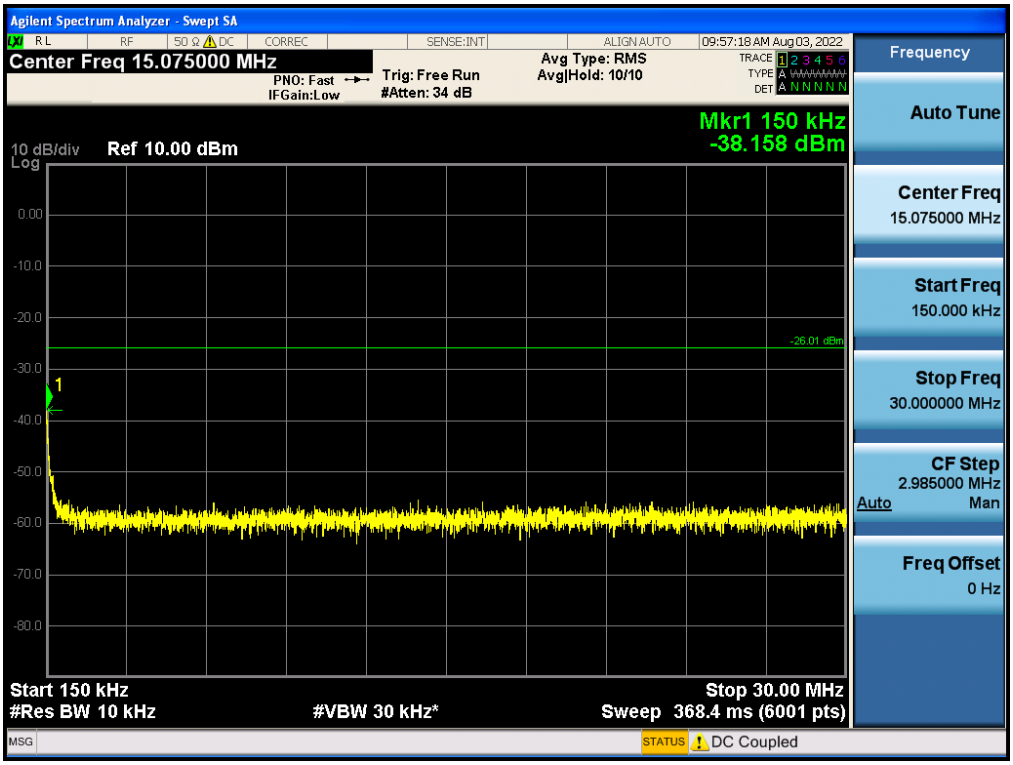
Port	Mod	Measured Level (dBm)						
		9 kHz ~ 150 kHz	150 kHz ~ 30 MHz	30 MHz ~ Low Edge – 100 MHz	Low Edge – 100 MHz ~ Low Edge	High Edge ~ High Edge + 100 MHz	High Edge + 100 MHz ~ 10 GHz	10 GHz ~ 26.5 GHz
0	256QAM	-34.421	-37.989	-43.601	-38.487	-38.040	-41.160	-45.767
1	256QAM	-33.520	-42.227	-44.910	-38.491	-38.019	-40.988	-45.923

Plot Data of Spurious Unwanted Emissions

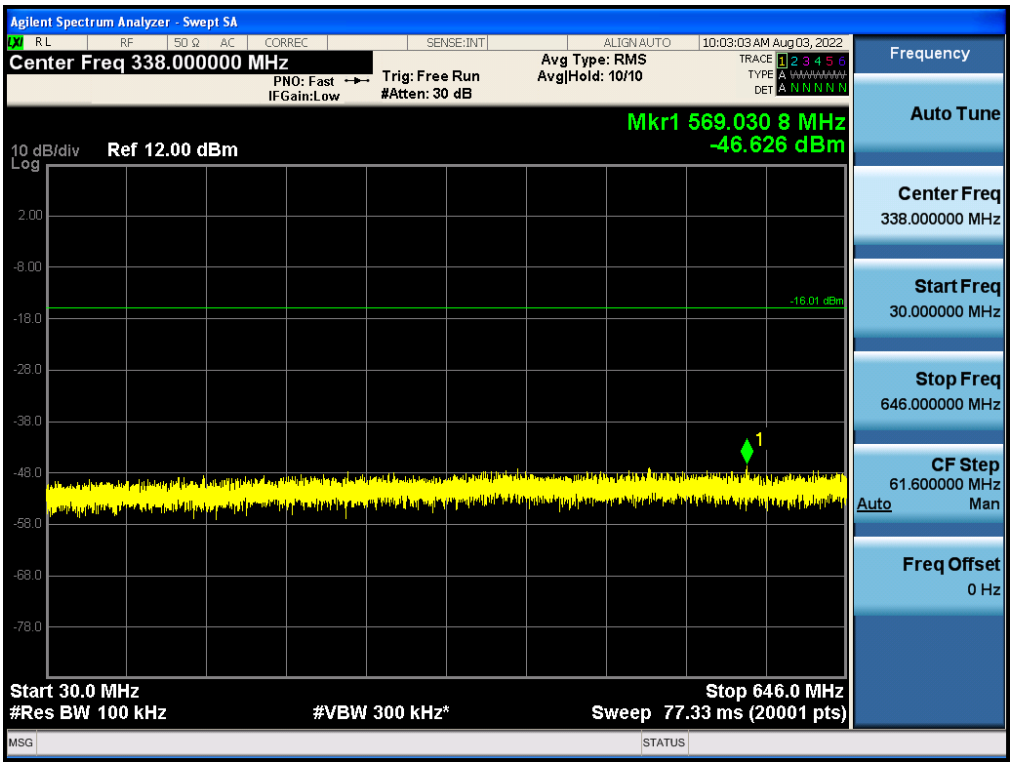
Antenna 0 / 9 kHz ~ 150 kHz / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle



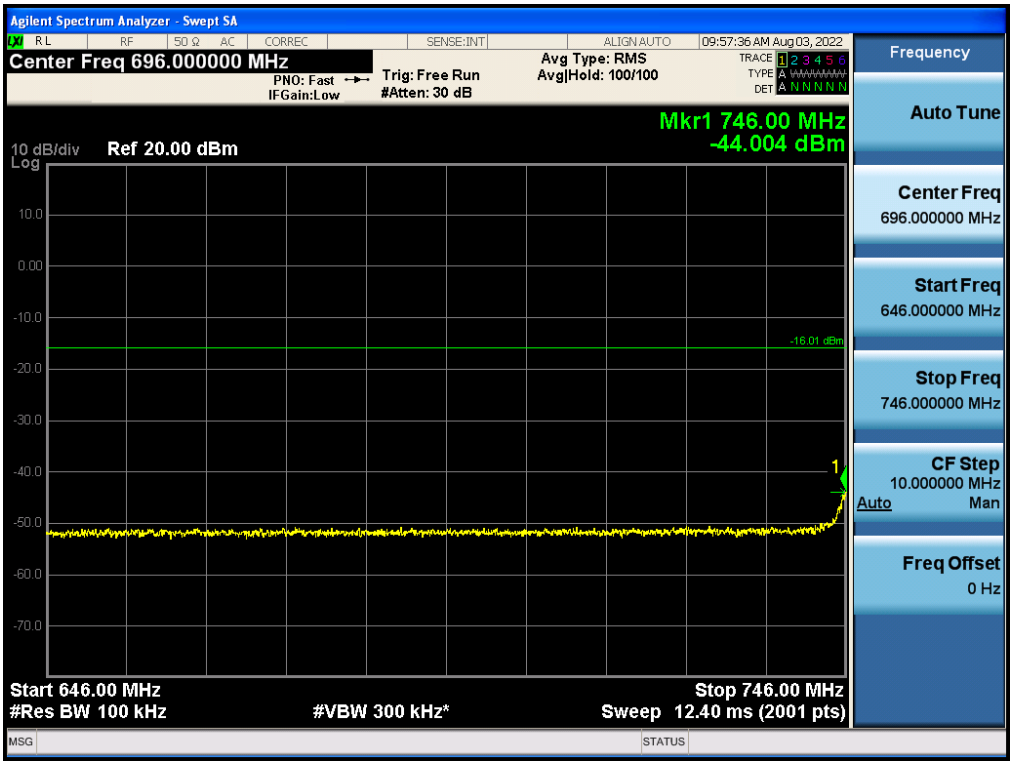
Antenna 0 / 150 kHz ~ 30 MHz / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle



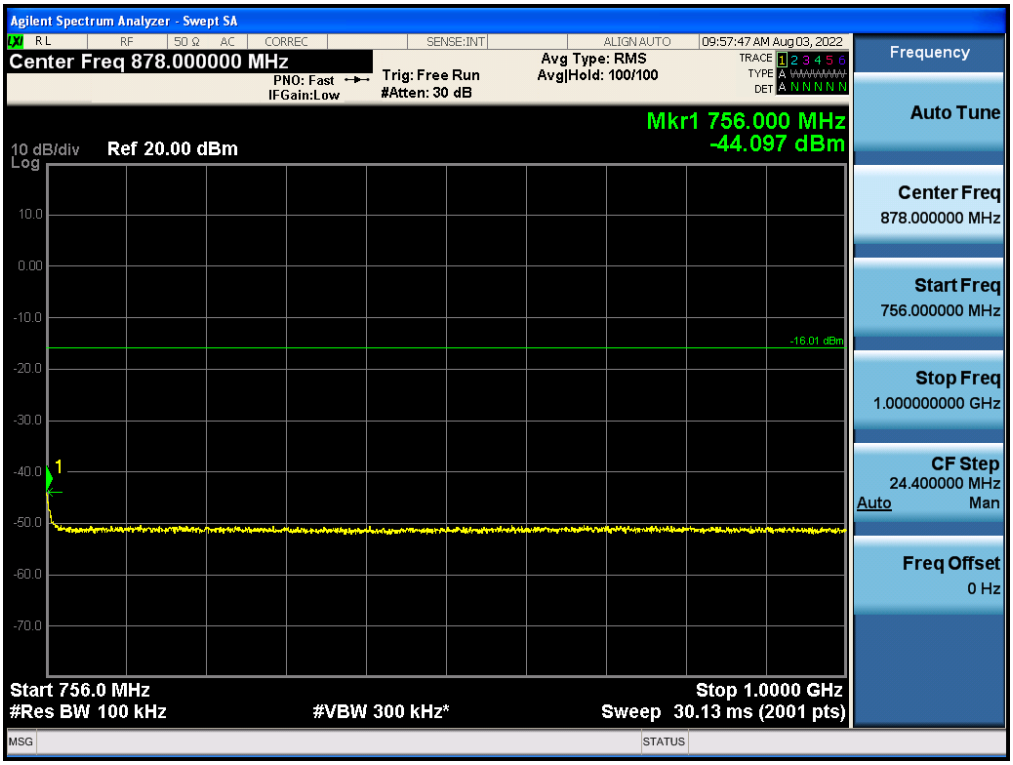
Antenna 1 / 30 MHz ~ Low Edge - 100 MHz / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle



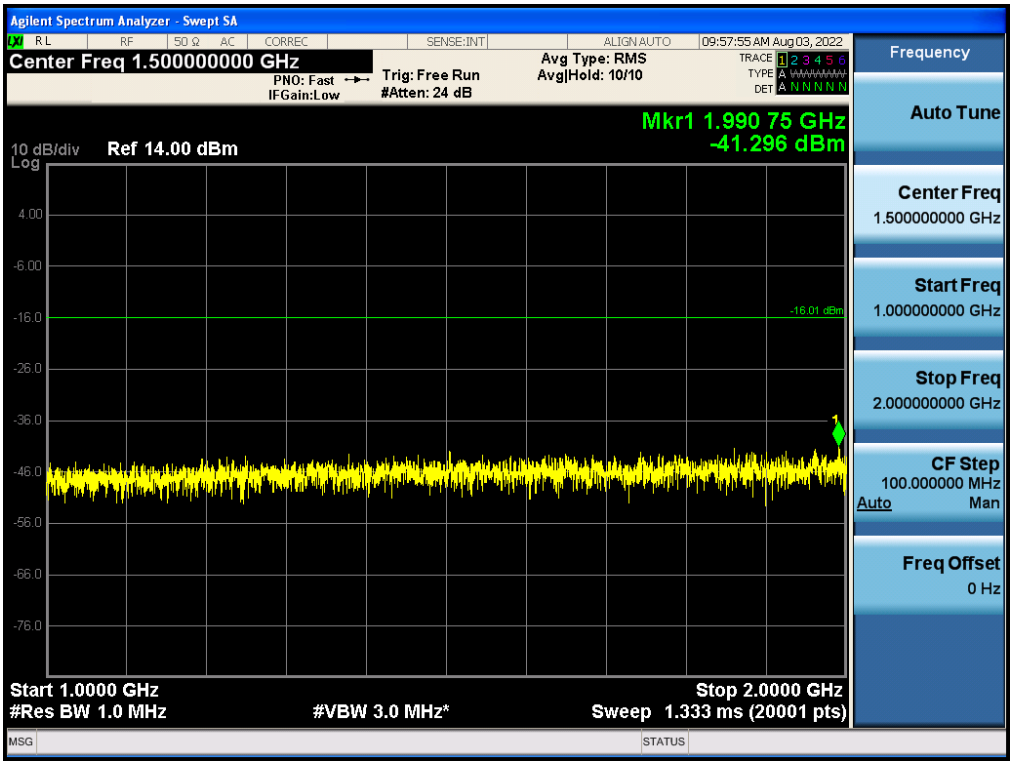
Antenna 0 / Low Edge - 100 MHz ~ Low Edge / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle



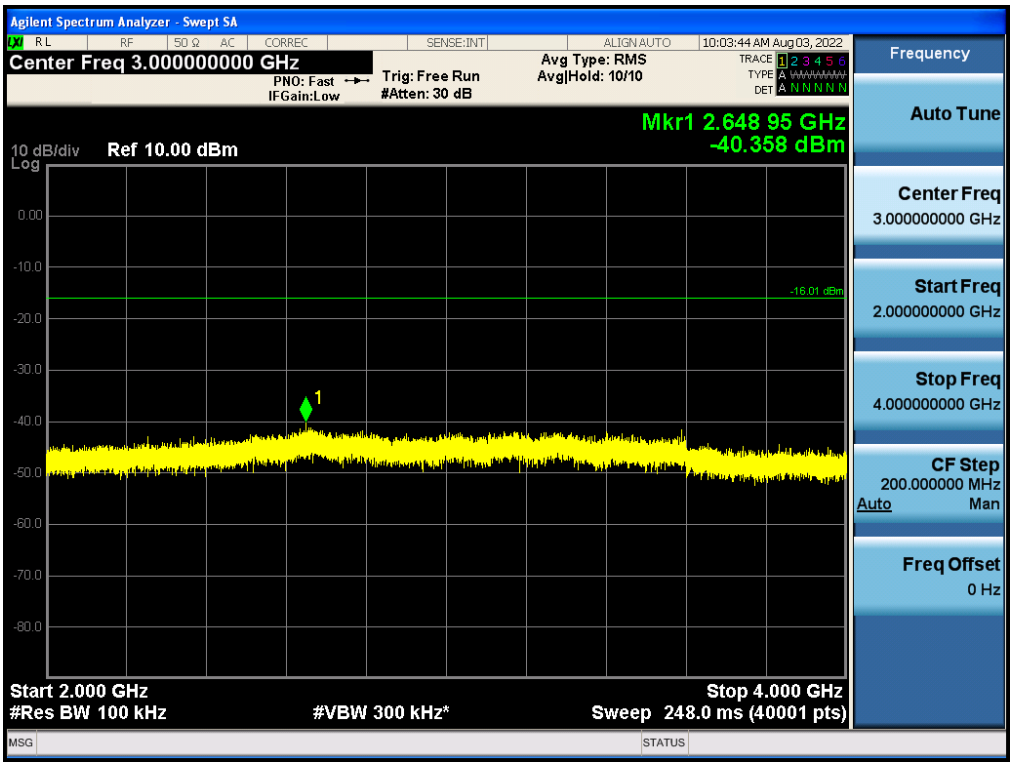
Antenna 0 / High Edge ~ 1 GHz / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle



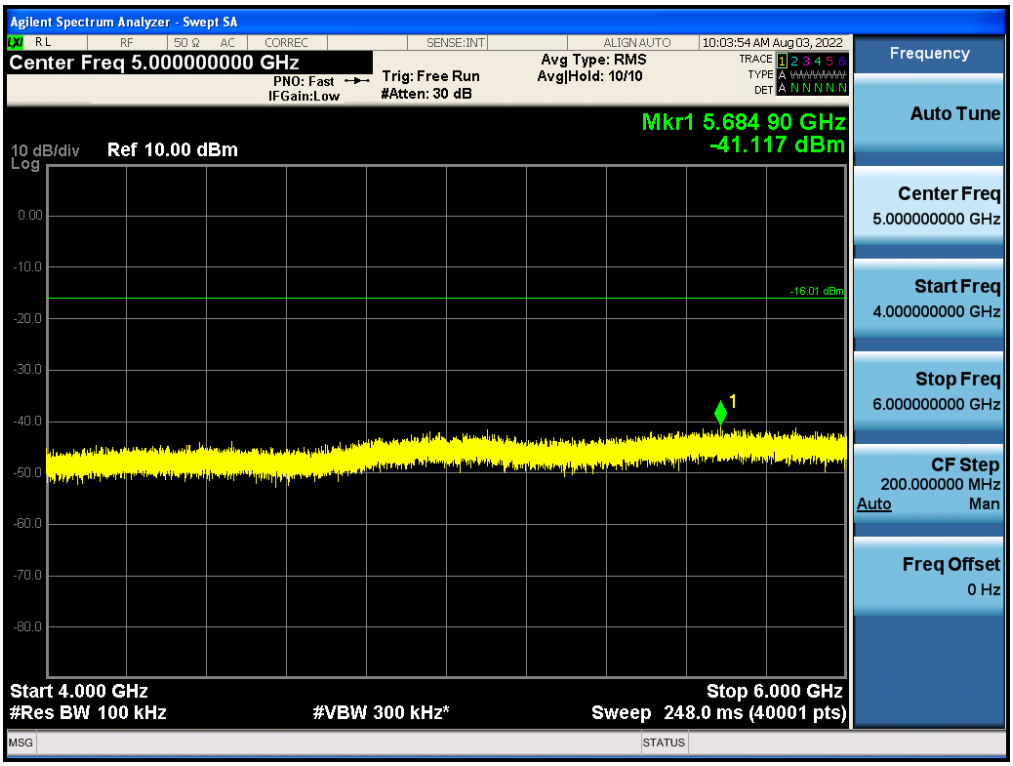
Antenna 0 / 1 GHz ~ 2 GHz / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle



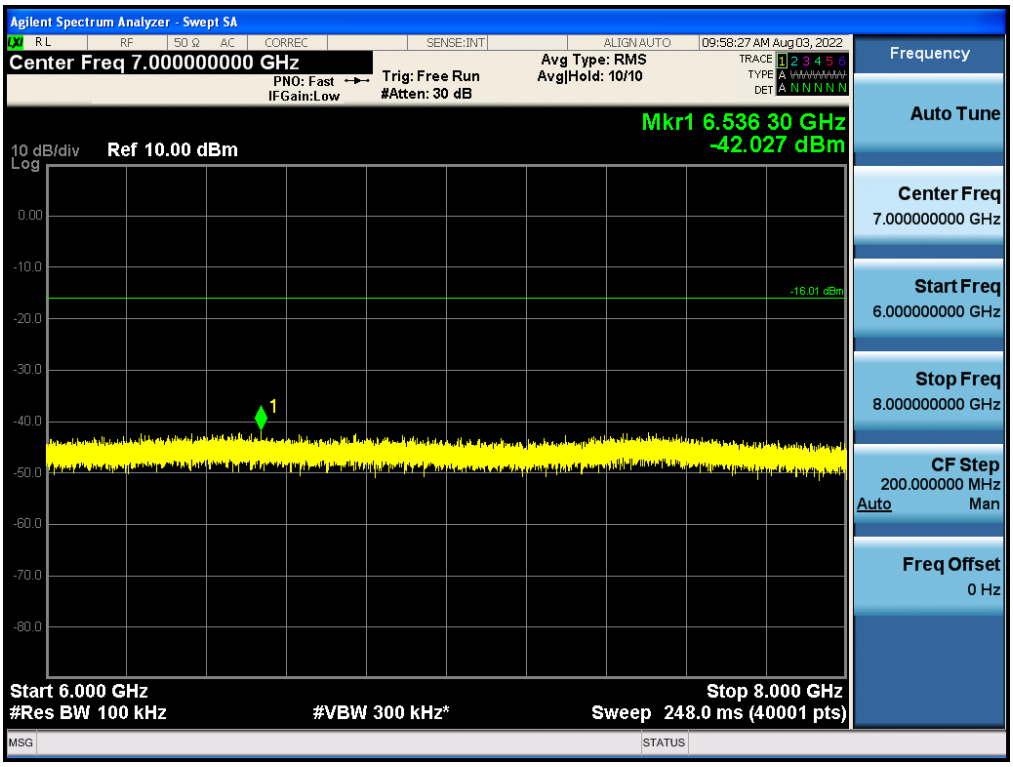
Antenna 1 / 2 GHz ~ 4 GHz / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle



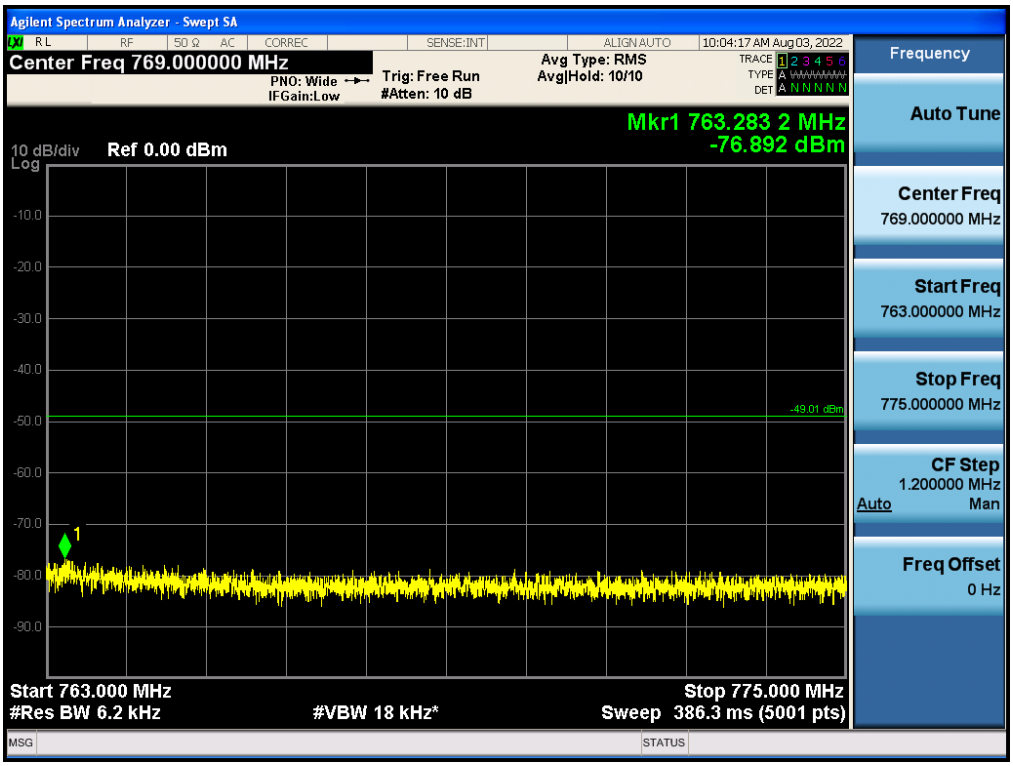
Antenna 1 / 4 GHz ~ 6 GHz / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle



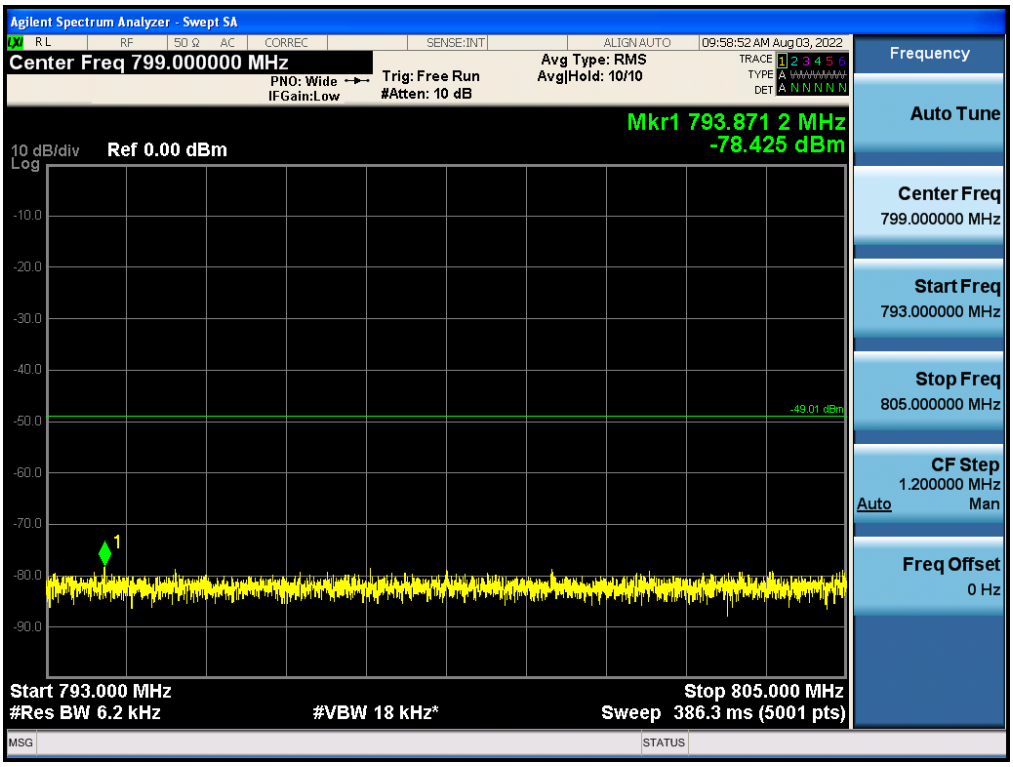
Antenna 0 / 6 GHz ~ 8 GHz / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle



Antenna 1 / Additional 763-775 MHz / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle



Antenna 0 / Additional 793-805 MHz / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle



Antenna 0 / Additional 1559-1610 MHz / 5G NR n13 5 MHz 1 Carrier / 256QAM / Middle