On your side

고 객 비 밀
CUSTOMER SECRET

TEST REPORT

FCC Test for eROUa_682335_X_R
Certification

APPLICANT
SOLiD, Inc.

REPORT NO.
HCT-RF-2201-FC115

DATE OF ISSUE
January 28, 2022

Tested by
Kyung Soo Kang

Technical Manager
Jong Seok Lee

HCT CO., LTD.
BongJai Huh / CEO

HCT CO., LTD.
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si,
Gyeonggi-do, 17383 KOREA
Tel. +82 31 634 6300 Fax. +82 31 645 6401

The report shall not be reproduced except in full(only partly) without approval of the laboratory.

HCT Co., Ltd.
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
Tel. +82 31 634 6300 Fax. +82 31 645 6401

고 객 비 밀
CUSTOMER SECRET

TEST REPORT

FCC Test for
eROUa_682335_X_R

REPORT NO.
HCT-RF-2201-FC115

DATE OF ISSUE
January 28, 2022

Additional Model
eROUa_682335_N_R

Applicant	**SOLiD, Inc.** 10, 9th Floor, SOLiD Space, Pangyoyeok-ro 220, Bundang-gu, Seongnam-si, Gyeonggi-do, 463-400, South Korea
Eut Type Model Name	DAS eROUa_682335_X_R
FCC ID	W6UERA682335R
Output Power	600 MHz Service, ESMR, Cellular : 19 dBm, WCS: 23 dBm
Date of Test	September 13, 2021 ~ January 7, 2022
FCC Rule Parts:	Part 2, Part 22, Part 27, Part 90

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	January 28, 2022	Initial Release

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	SOLiD, Inc.
Company Address	10, 9th Floor, SOLiD Space, Pangyoyeok-ro 220, Bundang-gu, Seongnam-si, Gyeonggi-do, 463-400, South Korea

1.2. PRODUCT INFORMATION

EUT Type	DAS
EUT Serial Number	EX20400001
Power Supply	DC 39~57 Vdc
Frequency Range	Band Name / Uplink (MHz) / Downlink (MHz) 600 MHz Service / 663 ~ 698 / 617 ~ 652 ESMR / 817 ~ 824 / 862 ~ 869 Cellular / 824 ~ 849 / 869 ~ 894 WCS / 2 305 ~ 2 315 / 2 350 ~ 2 360
Tx Output Power	600 MHz Service, ESMR, Cellular: 19 dBm, WCS: 23 dBm
Antenna Peak Gain	17 dBi

1.3. TEST INFORMATION

FCC Rule Parts	Part 2, Part 22, Part 27, Part 90
Measurement Standards	KDB 935210 D05 v01r04, KDB 971168 D01 v03r01, ANSI C63.26-2015
Test Location	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 22, Part 27, Part 90.

Description	Reference	Results
AGC threshold	KDB 935210 D05 v01r04 3.2	Compliant
Out-of-band rejection	KDB 935210 D05 v01r04 3.3	Compliant
Input-versus-output signal comparison	§ 2.1049	Compliant
Input/output power and amplifier/booster gain	§ 2.1046, § 22.913(a), (d), § 27.50(a), (c), § 90.635	Compliant
Out-of-band/out-of-block emissions and spurious emissions	§ 2.1051, § 22.917, § 27.53(a), (g), § 90.691	Compliant
Spurious emissions radiated	§ 2.1053	Compliant

3.2. ADDITIONAL DESCRIPTIONS ABOUT TEST

- Except for the following cases, EUT was tested under normal operating conditions.
  : Out-of-band rejection test requires maximum gain condition without AGC.

- The test was generally based on the method of KDB 935210 D05 v01r04 and only followed ANSI C63.26-2015 if there was no test method in KDB standard.

- EUT was tested with following modulated signals provide by applicant.

Band Name	Tested signals
600 MHz Service	LTE 5 MHz
	LTE 10 MHz
	LTE 20 MHz
ESMR	CDMA
	WCDMA
	LTE 5 MHz
Cellular	CDMA
	WCDMA
	LTE 5 MHz
	LTE 10 MHz
WCS	LTE 5 MHz
	LTE 10 MHz

*Note: We have done CDMA and 1xEVDO modulation test in technology. Test results are only attached worst cases.

- Simultaneous band condition

Ant 1	
ESMR, Cellular	WCS

- The frequency stability measurement has been omitted in accordance with section 3.7 of KDB 935210 D05 v01r04.
  : It can be confirmed through input-versus-output signal comparison test that EUT does not alter the input signal.

The tests results included actual loss value for attenuator and cable combination as shown in the table below.

: Input Path

Correction factor table			
Frequency (MHz)	Factor (dB)	Frequency (MHz)	Factor (dB)
600	0.711	2 400	1.426
700	0.757	2 500	1.302
800	0.732	2 600	1.469
900	0.708	2 700	1.301
1 000	0.639	2 800	1.294
1 100	0.741	2 900	1.444
1 200	0.950	3 000	1.693
1 300	0.915	3 100	1.540
1 400	0.945	3 200	1.469
1 500	0.986	3 300	1.421
1 600	1.079	3 400	1.455
1 700	1.148	3 500	1.645
1 800	0.909	3 600	2.097
1 900	0.832	3 700	2.119
2 000	1.184	3 800	2.276
2 100	1.223	3 900	2.096
2 200	1.231	4 000	2.234
2 300	1.212		

: Output Path

Correction factor table			
Frequency (MHz)	Factor (dB)	Frequency (MHz)	Factor (dB)
10	29.563	3 000	33.437
30	29.540	4 000	34.259
50	29.587	5 000	34.441
100	29.734	6 000	34.988
200	29.992	7 000	35.917
300	30.423	8 000	35.966
400	30.673	9 000	36.684
500	30.866	10 000	38.385
600	31.018	11 000	37.696
700	31.158	12 000	37.748
800	31.216	13 000	37.991
900	31.263	14 000	39.116
1 000	31.331	15 000	38.948
1 100	31.436	16 000	39.681
1 200	31.716	17 000	39.408
1 300	31.787	18 000	40.211
1 400	31.906	19 000	40.495
1 500	31.987	20 000	41.467
1 600	32.172	21 000	42.769
1 700	32.084	22 000	44.252
1 800	32.100	23 000	42.239
1 900	32.179	24 000	44.267
2 000	32.342	25 000	45.718
2 100	32.497	26 000	43.780
2 200	32.529	26 500	50.111
2 300	32.602	-	-
2 400	32.766	-	-
2 500	32.836	-	-
2 600	33.004	-	-
2 700	32.788	-	-

3.3. MEASUREMENTUNCERTAINTY

Description	Condition	Uncertainty
Radiated Disturbance	9 kHz ~ 30 MHz	± 3.40 dB
	30 MHz ~ 1 GHz	± 4.80 dB
	1 GHz ~ 18 GHz	± 5.70 dB
	18 GHz ~ 40 GHz	± 5.05 dB

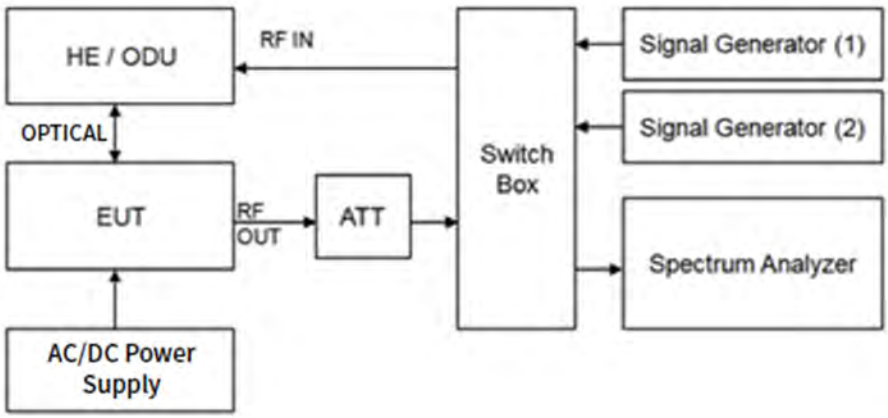
** Coverage factor k = 2, Confidence levels of 95 %*

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

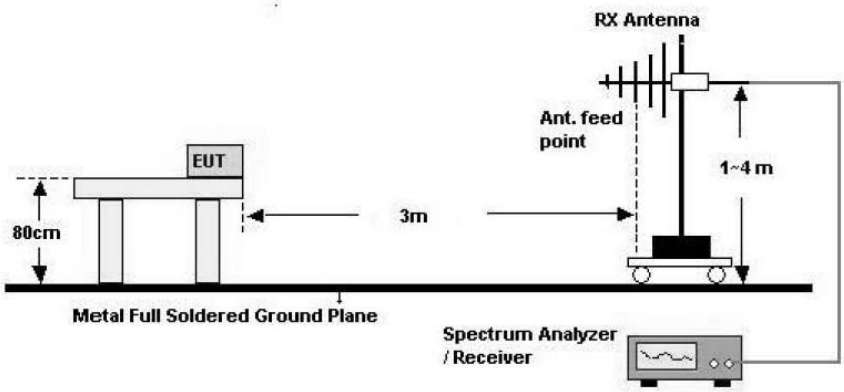
3.5. TEST DIAGRAMS

Conducted Test

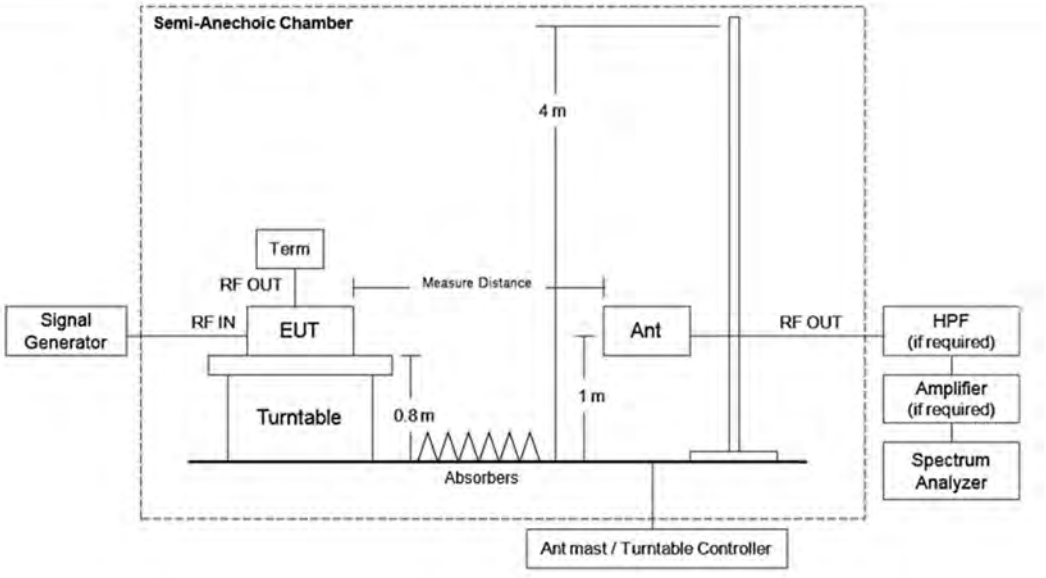


Radiated Test

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

4. TEST EQUIPMENTS

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
MXA Signal Analyzer	N9020A	Agilent	MY46471250	08/11/2022	Annual
PXA Signal Analyzer	N9030A	Agilent	US51350313	03/30/2022	Annual
PXA Signal Analyzer	N9030B	Agilent	MY55480167	06/02/2022	Annual
MXG Vector Signal Generator	N5182A	Agilent	MY46240807	11/23/2022	Annual
MXG Vector Signal Generator	N5182A	Agilent	MY47070406	01/08/2022	Annual
30 dB Attenuator	WA93-30-33	Weinschel Associates	0202	04/13/2022	Annual
30 dB Attenuator	67-30-33	Weinschel Associates	CL4337	05/12/2022	Annual
DC Power Supply	PWR800L	KIKUSUI	LJ003448	06/21/2022	Annual
Switch	S46	KEITHLEY	1088024	N/A	N/A
Controller(Antenna mast)	CO3000	Innco system	CO3000-4p	N/A	N/A
Antenna Position Tower	MA4640/800-XP-EP	Innco system	N/A	N/A	N/A
Controller	EM1000	Audix	060520	N/A	N/A
Turn Table	Turn Table	Audix	N/A	N/A	N/A
Amp & Filter Bank Switch Controller	FBSM-01B	TNM system	N/A	N/A	N/A
Loop Antenna	Loop Antenna	Rohde & Schwarz	1513-175	05/18/2022	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	01039	07/14/2023	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	1300	06/23/2022	Biennial
Horn Antenna(15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170342	10/13/2022	Biennial
HPF(3~18GHz) + LNA1(1~18GHz)	FBSR-04C	TNM system	N/A	09/16/2022	Annual
LNA1(1~18GHz)	FBSR-04C	TNM system	N/A	09/16/2022	Annual
High Pass Filter	WHKX10-900-1000-15000-40SS	Wainwright Instruments	16	08/05/2022	Annual
Power Amplifier	CBL18265035	CERNEX	22966	12/02/2022	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/23/2022	Annual

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.

5. TEST RESULT

5.1. AGC THRESHOLD

Test Requirement:

KDB 935210 D05 v01r04

Testing at and above the AGC threshold is required.

Test Procedures:

Measurements were in accordance with the test methods section 3.2 of KDB 935210 D05 v01r04.

In the case of fiber-optic distribution systems, the RF input port of the equipment under test (EUT) refers to the RF input of the supporting equipment RF to optical convertor; see also descriptions and diagrams for typical DAS booster systems in KDB Publication 935210 D02.

Devices intended to be directly connected to an RF source (donor port) only need to be evaluated for any over-the-air transmit paths.

a) Connect a signal generator to the input of the EUT.
b) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary.
c) The signal generator should initially be configured to produce either of the required test signals (i.e., broadband or narrowband).
d) Set the signal generator frequency to the center frequency of the EUT operating band.
e) While monitoring the output power of the EUT, measured using the methods of 3.5.3 or 3.5.4, increase the input level until a 1 dB increase in the input signal power no longer causes a 1 dB increase in the output signal power.
f) Record this level as the AGC threshold level.
g) Repeat the procedure with the remaining test signal.

Output power measurement in subclause 5.2.4.4.1 of ANSI C63.26

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: auto-couple
f) Detector = power averaging (rms).
g) If the EUT can be configured to transmit continuously, then set the trigger to free run.
h) Omit
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.

Test Results:

Test Band	Link	Signal	Center Frequency (MHz)	AGC Threshold Level (dBm)	Output Level (dBm)
600 MHz Service	Downlink	LTE 5 MHz	634.50	-20	18.80
		LTE 10 MHz	634.50	-20	18.84
		LTE 20 MHz	634.50	-20	19.12
ESMR		CDMA	865.50	-20	18.92
		WCDMA	865.50	-20	18.88
		LTE 5 MHz	865.50	-20	18.88
Cellular		CDMA	881.50	-20	19.03
		WCDMA	881.50	-20	18.81
		LTE 5 MHz	881.50	-20	19.08
		LTE 10 MHz	881.50	-20	19.20
WCS		LTE 5 MHz	2 355.00	-20	22.51
		LTE 10 MHz	2 355.00	-20	22.58

5.2. OUT-OF-BAND REJECTION

Test Requirement:

KDB 935210 D05 v01r04

Out-of-band rejection required.

Test Procedures:

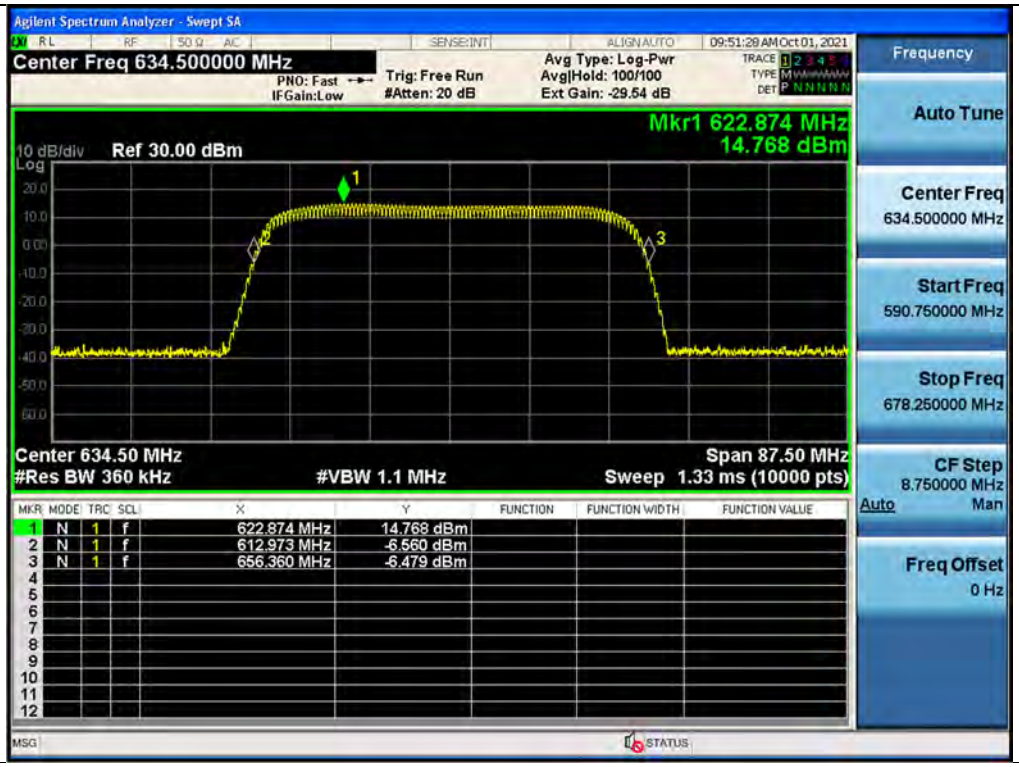
Measurements were in accordance with the test methods section 3.3 of KDB 935210 D05 v01r04.

Adjust the internal gain control of the EUT to the maximum gain for which equipment certification is sought.

a) Connect a signal generator to the input of the EUT.
b) Configure a swept CW signal with the following parameters:
   1) Frequency range = ±250 % of the passband, for each applicable CMRS band.
   2) Level = a sufficient level to affirm that the out-of-band rejection is > 20 dB above the noise floor and will not engage the AGC during the entire sweep.
   3) Dwell time = approximately 10 ms.
   4) Number of points = SPAN/(RBW/2).
c) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
d) Set the span of the spectrum analyzer to the same as the frequency range of the signal generator.
e) Set the resolution bandwidth (RBW) of the spectrum analyzer to be 1 % to 5 % of the EUT passband, and the video bandwidth (VBW) shall be set to ≥ 3 × RBW.
f) Set the detector to Peak Max-Hold and wait for the spectrum analyzer's spectral display to fill.
g) Place a marker to the peak of the frequency response and record this frequency as f_0.
h) 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 −20 dB down amplitude, to determine the 20 dB bandwidth.
i) Capture the frequency response of the EUT.
j) Repeat for all frequency bands applicable for use by the EUT.

Test Results:

600 MHz Service (617 MHz ~ 652 MHz) / Downlink



ESMR + Cellular (862 MHz ~ 869 MHz / 869 MHz ~ 894 MHz) / Downlink

WCS (2 350 MHz ~ 2 360 MHz) / Downlink

5.3. INPUT-VERSUS-OUTPUT SIGNAL COMPARISON

Test Requirement:

§ 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:

Measurements were in accordance with the test methods section 3.4 of KDB 935210 D05 v01r04.

A 26 dB bandwidth measurement shall be performed on the input signal and the output signal; alternatively, the 99% OBW can be measured and used. See KDB Publication 971168 [R8] for more information on measuring OBW.

a) Connect a signal generator to the input of the EUT.
b) Configure the signal generator to transmit the AWGN signal.
c) Configure the signal amplitude to be just below the AGC threshold level (see 3.2), but not more than 0.5 dB below.
d) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
e) Set the spectrum analyzer center frequency to the center frequency of the operational band under test. The span range of the spectrum analyzer shall be between 2 times to 5 times the emission bandwidth (EBW) or alternatively, the OBW.
f) The nominal RBW shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be ≥ 3 × RBW.
g) Set the reference level of the instrument as required to preclude the signal from exceeding the maximum spectrum analyzer input mixer level for linear operation. In general, the peak of the spectral envelope must be more than [10 log (OBW / RBW)] below the reference level. Steps f) and g) may require iteration to enable adjustments within the specified tolerances.
h) The noise floor of the spectrum analyzer at the selected RBW shall be at least 36 dB below the reference level.
i) Set spectrum analyzer detection function to positive peak.
j) Set the trace mode to max hold.
k) Determine the reference value: Allow the trace to stabilize. Set the spectrum analyzer marker to the highest amplitude level of the displayed trace (this is the reference value) and record the associated frequency as f0.
l) 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 −26 dB down amplitude. The 26 dB EBW (alternatively OBW) is the positive frequency difference between the two markers. If the spectral envelope crosses the −26 dB down amplitude at multiple points, the lowest or highest frequency shall be selected as the frequencies that are the furthest removed from the center frequency at which the spectral envelope crosses the −26 dB down amplitude point.
m) Repeat steps e) to l) with the input signal connected directly to the spectrum analyzer (i.e., input signal

measurement).

n) Compare the spectral plot of the input signal (determined from step m) to the output signal (determined from step l) to affirm that they are similar (in passband and rolloff characteristic features and relative spectral locations), and include plot(s) and descriptions in test report.

o) Repeat the procedure [steps e) to n)] with the input signal amplitude set to 3 dB above the AGC threshold.

p) Repeat steps e) to o) with the signal generator set to the narrowband signal.

q) Repeat steps e) to p) for all frequency bands authorized for use by the EUT.

Test Results:

Tabular data of Output Occupied Bandwidth

Test Band	Link	Signal	Center Frequency (MHz)	99 % OBW (MHz)
600 MHz Service	Downlink	LTE 5 MHz	634.50	4.5231
		LTE 10 MHz	634.50	9.0434
		LTE 20 MHz	634.50	17.953
ESMR		CDMA	865.50	1.2647
		WCDMA	865.50	4.2233
		LTE 5 MHz	865.50	4.5178
Cellular		CDMA	881.50	1.2622
		WCDMA	881.50	4.1968
		LTE 5 MHz	881.50	4.5308
		LTE 10 MHz	881.50	9.0134
WCS		LTE 5 MHz	2 355.00	4.5106
		LTE 10 MHz	2 355.00	8.9445

Tabular data of Input Occupied Bandwidth

Test Band	Link	Signal	Center Frequency (MHz)	99 % OBW (MHz)
600 MHz Service	Downlink	LTE 5 MHz	634.50	4.5008
		LTE 10 MHz	634.50	8.9903
		LTE 20 MHz	634.50	17.956
ESMR		CDMA	865.50	1.2586
		WCDMA	865.50	4.1715
		LTE 5 MHz	865.50	4.5181
Cellular		CDMA	881.50	1.2541
		WCDMA	881.50	4.1919
		LTE 5 MHz	881.50	4.5209
		LTE 10 MHz	881.50	8.9975
WCS		LTE 5 MHz	2 355.00	4.5098
		LTE 10 MHz	2 355.00	8.9928

Tabular data of 3 dB above the AGC threshold Output Occupied Bandwidth

Test Band	Link	Signal	Center Frequency (MHz)	99 % OBW (MHz)
600 MHz Service	Downlink	LTE 5 MHz	634.50	4.5274
		LTE 10 MHz	634.50	9.0030
		LTE 20 MHz	634.50	17.962
ESMR		CDMA	865.50	1.2599
		WCDMA	865.50	4.1927
		LTE 5 MHz	865.50	4.5203
Cellular		CDMA	881.50	1.2605
		WCDMA	881.50	4.1985
		LTE 5 MHz	881.50	4.5053
		LTE 10 MHz	881.50	9.0112
WCS		LTE 5 MHz	2 355.00	4.4996
		LTE 10 MHz	2 355.00	8.9297

Tabular data of 3 dB above the AGC threshold Input Occupied Bandwidth

Test Band	Link	Signal	Center Frequency (MHz)	99 % OBW (MHz)
600 MHz Service	Downlink	LTE 5 MHz	634.50	4.5128
		LTE 10 MHz	634.50	8.9950
		LTE 20 MHz	634.50	18.025
ESMR		CDMA	865.50	1.2584
		WCDMA	865.50	4.2040
		LTE 5 MHz	865.50	4.5024
Cellular		CDMA	881.50	1.2694
		WCDMA	881.50	4.1957
		LTE 5 MHz	881.50	4.5210
		LTE 10 MHz	881.50	8.9981
WCS		LTE 5 MHz	2 355.00	4.5140
		LTE 10 MHz	2 355.00	8.9684

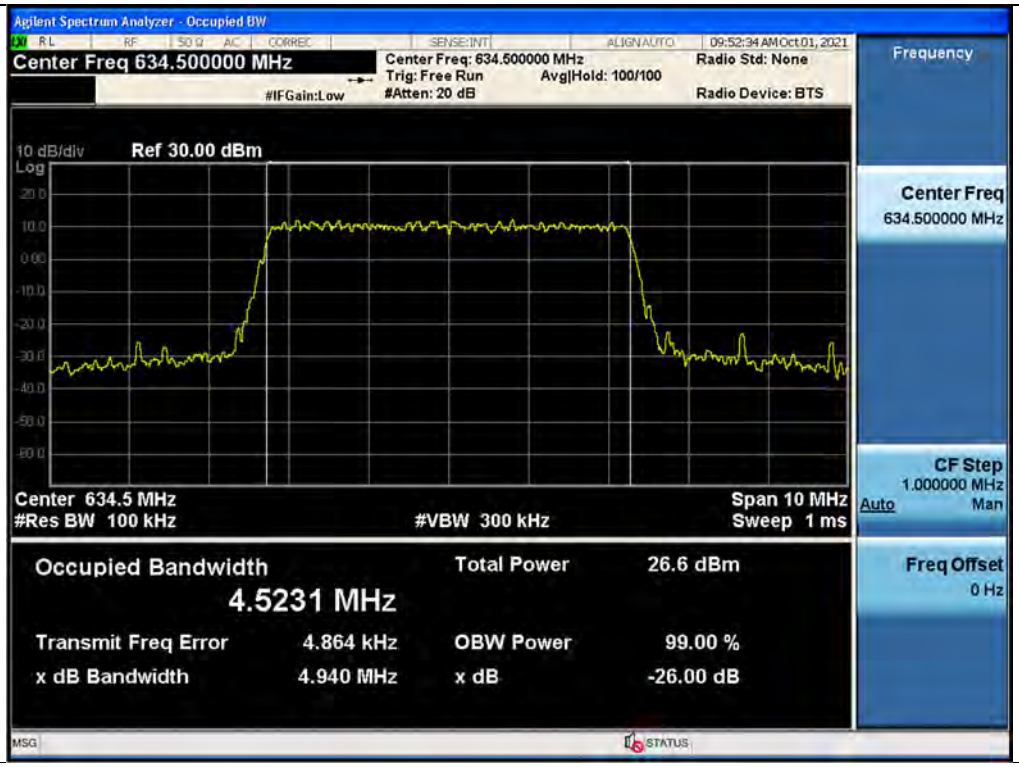
Measured Occupied Bandwidth Comparison

Test Band	Link	Signal	Variant of Input and output Occupied Bandwidth (%)	Variant of Input and 3 dB above the AGC threshold output Occupied Bandwidth (%)
600 MHz Service	Downlink	LTE 5 MHz	-1.279	1.401
		LTE 10 MHz	1.515	1.406
		LTE 20 MHz	1.857	-1.500
ESMR		CDMA	-0.429	-0.072
		WCDMA	0.875	0.702
		LTE 5 MHz	-1.144	0.822
Cellular		CDMA	0.504	0.215
		WCDMA	1.064	0.489
		LTE 5 MHz	0.479	0.080
		LTE 10 MHz	0.393	0.121
WCS		LTE 5 MHz	0.199	-0.298
		LTE 10 MHz	-2.099	-1.005

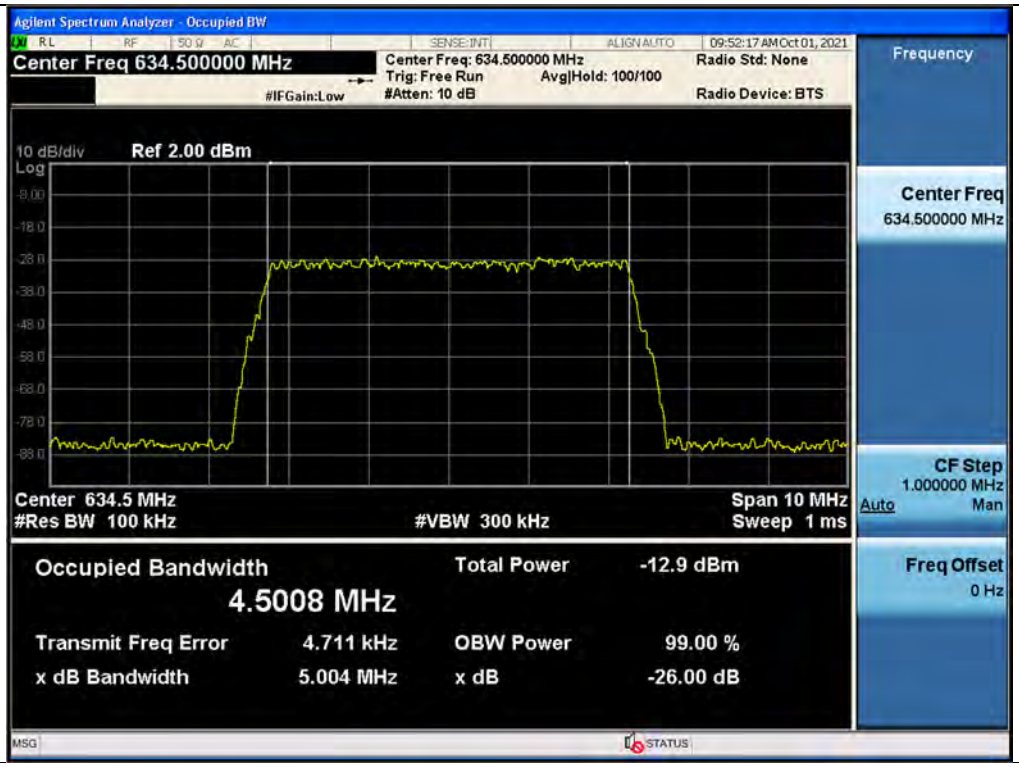
** Change in input-output OBW is less than ±5 %.*

Plot data of Occupied Bandwidth

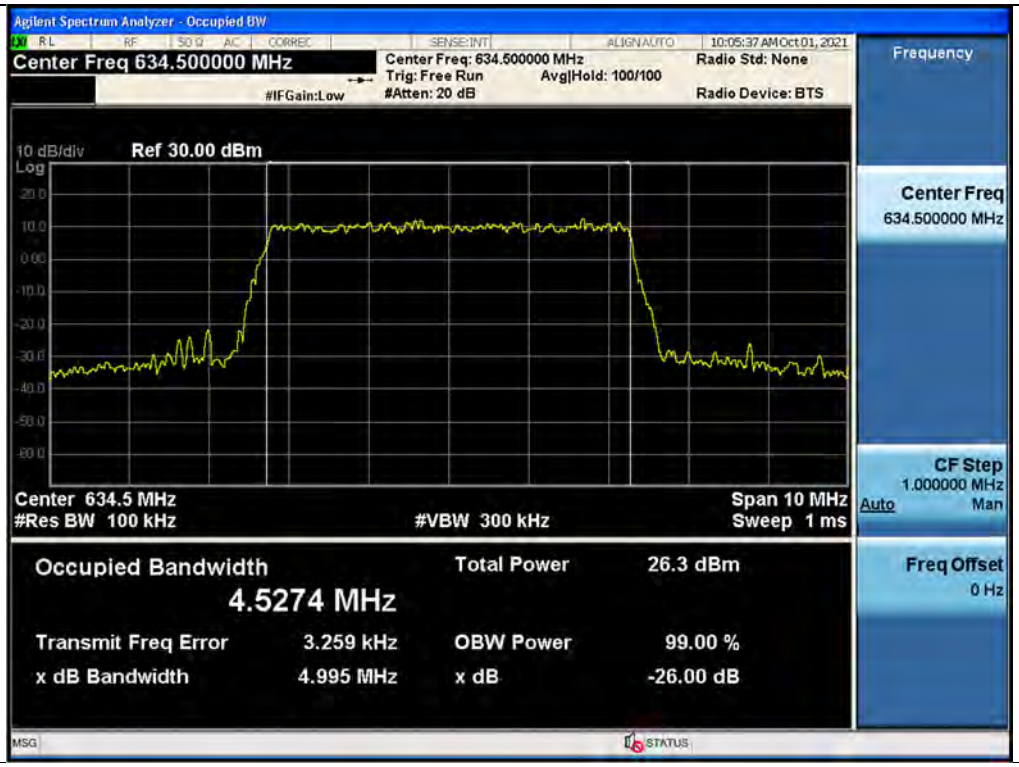
Output / 600 MHz Service / Downlink / LTE 5 MHz



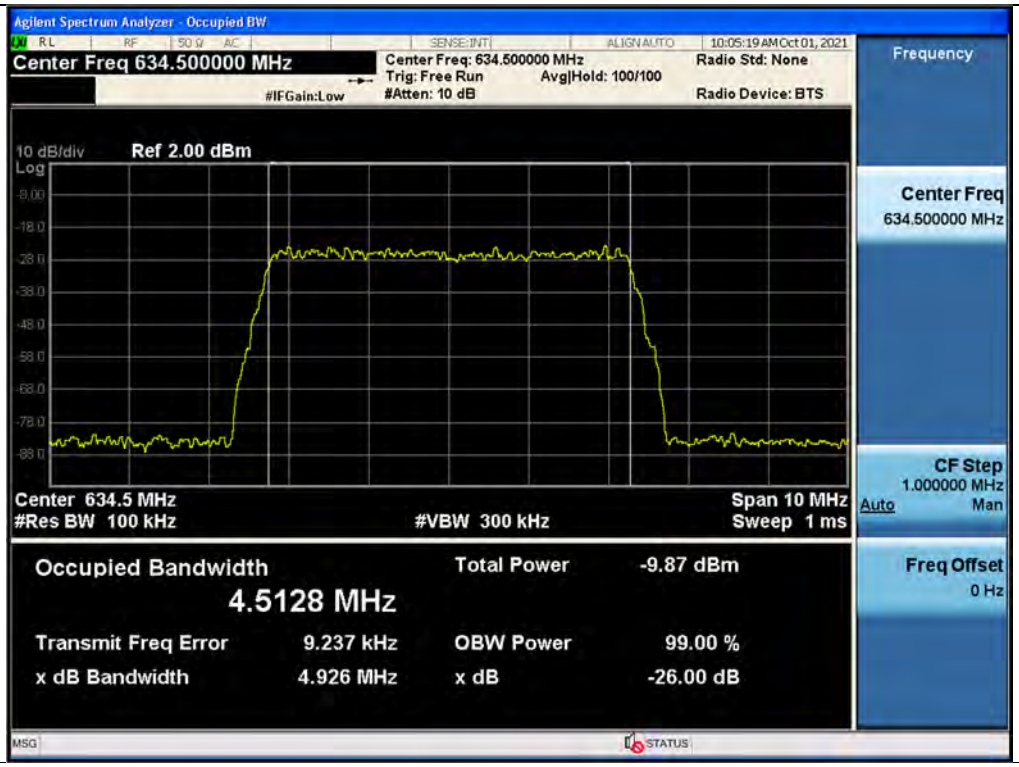
Input / 600 MHz Service / Downlink / LTE 5 MHz



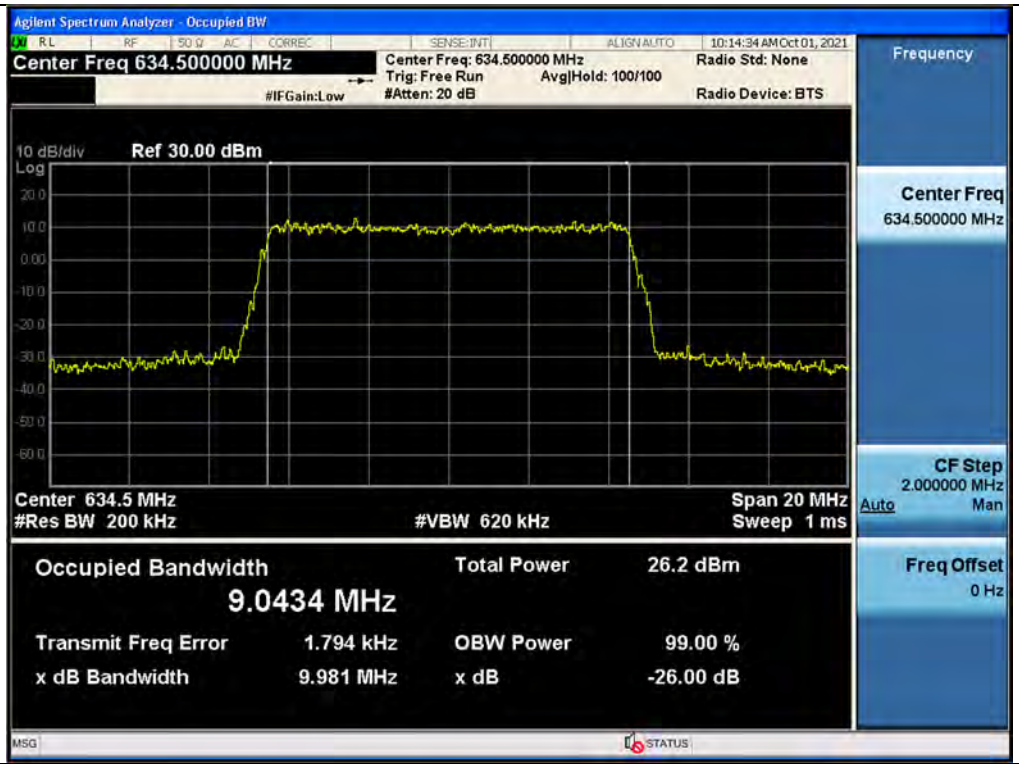
3 dB above the AGC threshold output / 600 MHz Service / Downlink / LTE 5 MHz



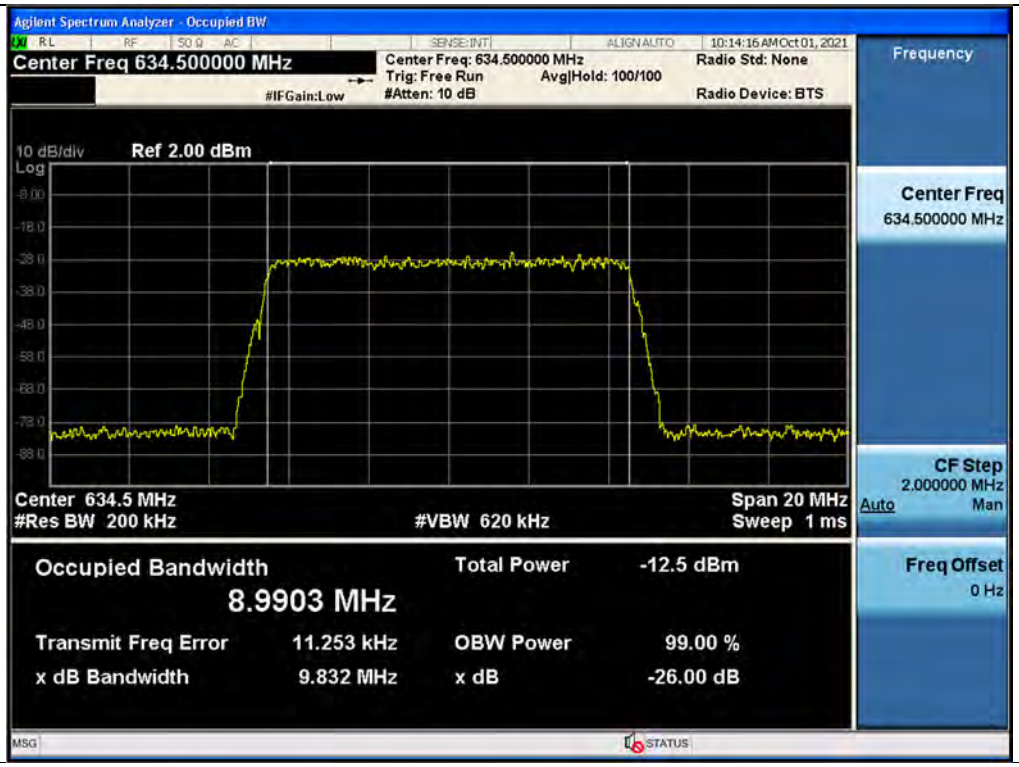
3 dB above the AGC threshold Input / 600 MHz Service / Downlink / LTE 5 MHz



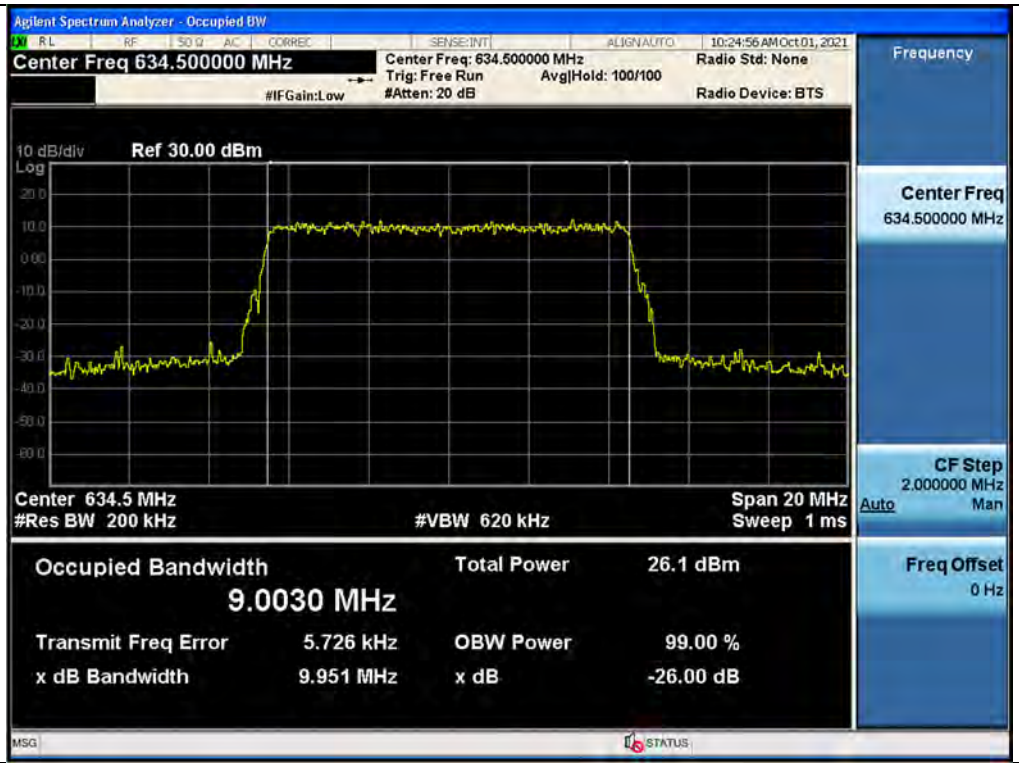
Output / 600 MHz Service / Downlink / LTE 10 MHz



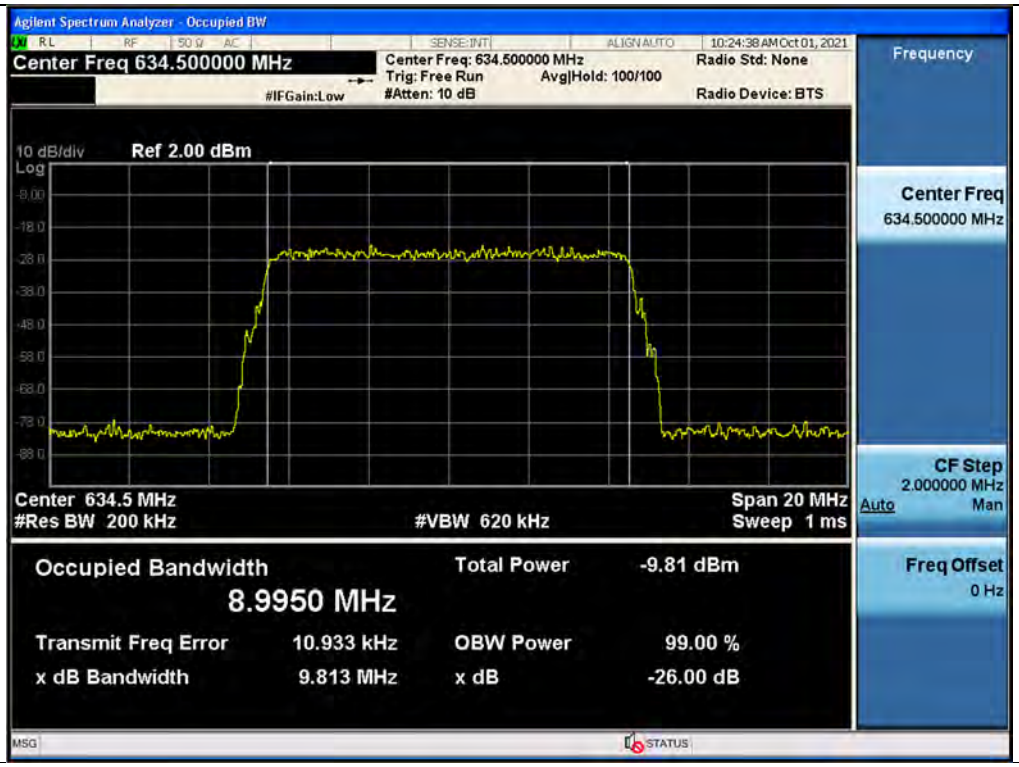
Input / 600 MHz Service / Downlink / LTE 10 MHz



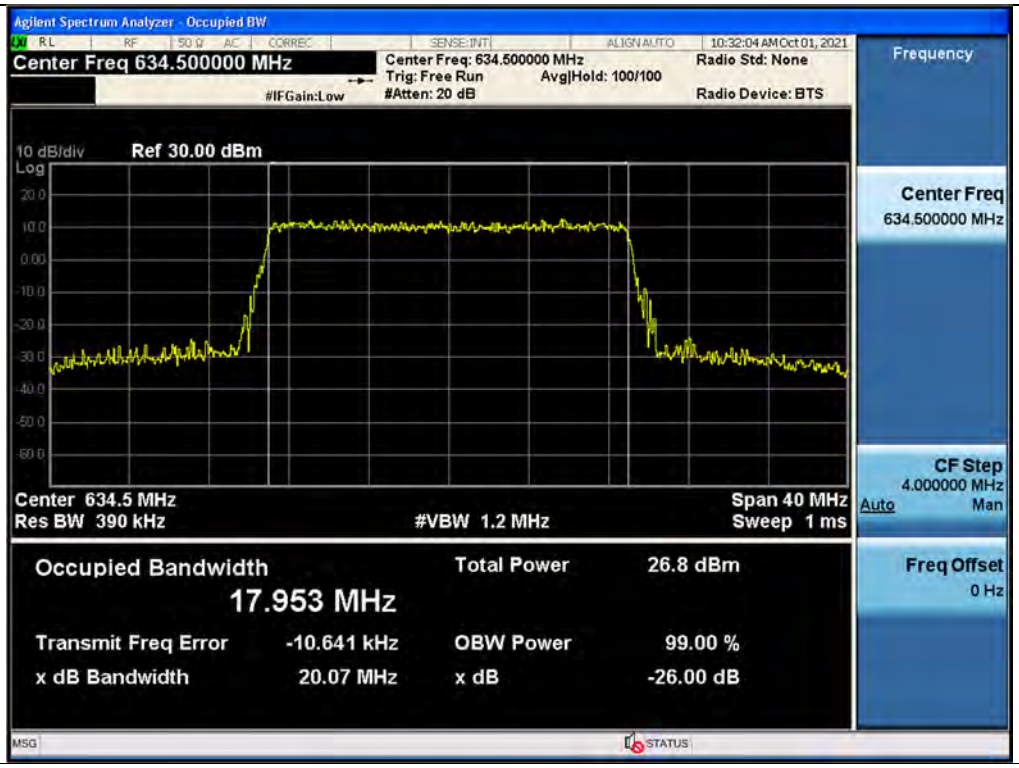
3 dB above the AGC threshold output / 600 MHz Service / Downlink / LTE 10 MHz



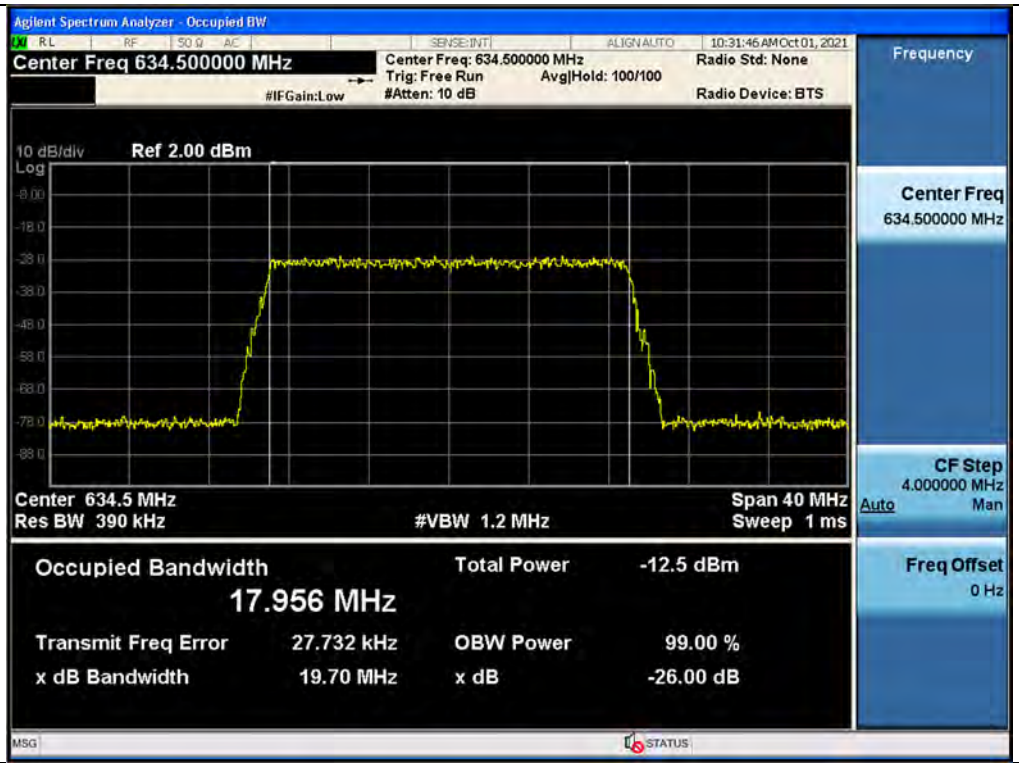
3 dB above the AGC threshold Input / 600 MHz Service / Downlink / LTE 10 MHz



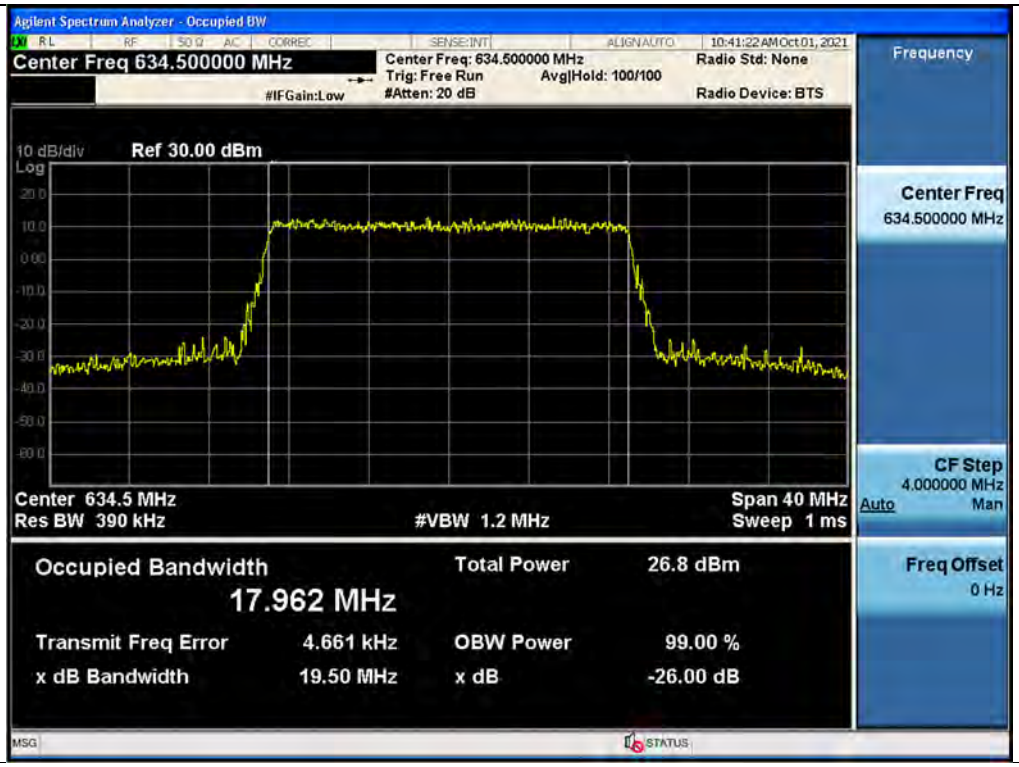
Output / 600 MHz Service / Downlink / LTE 20 MHz



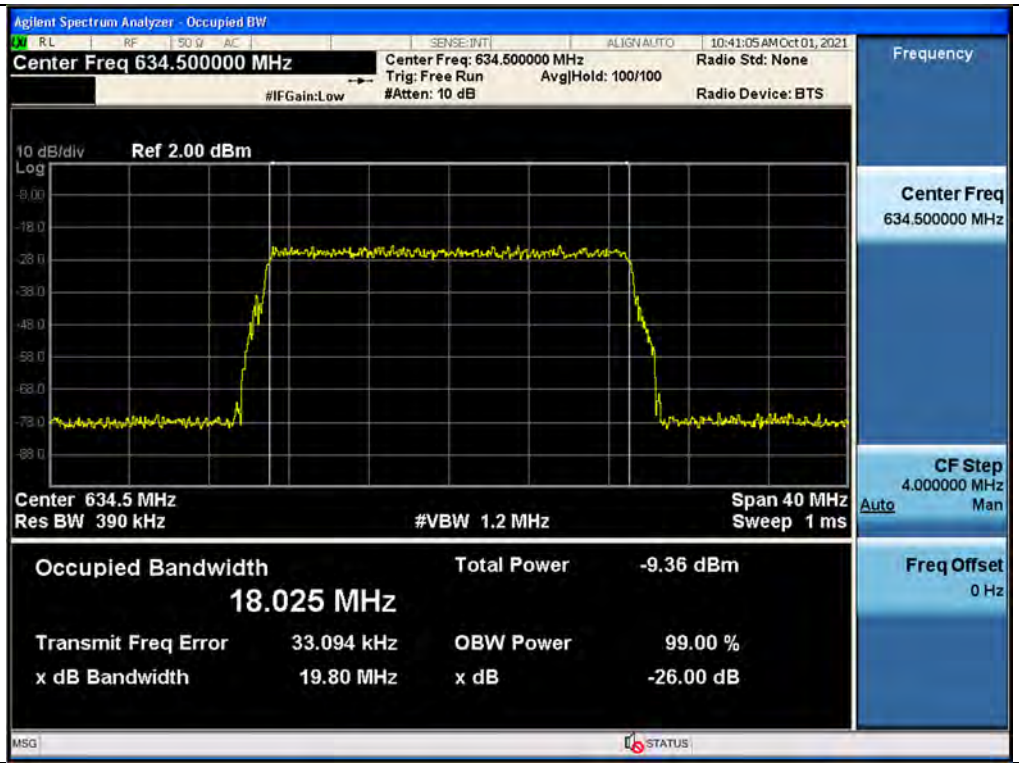
Input / 600 MHz Service / Downlink / LTE 20 MHz



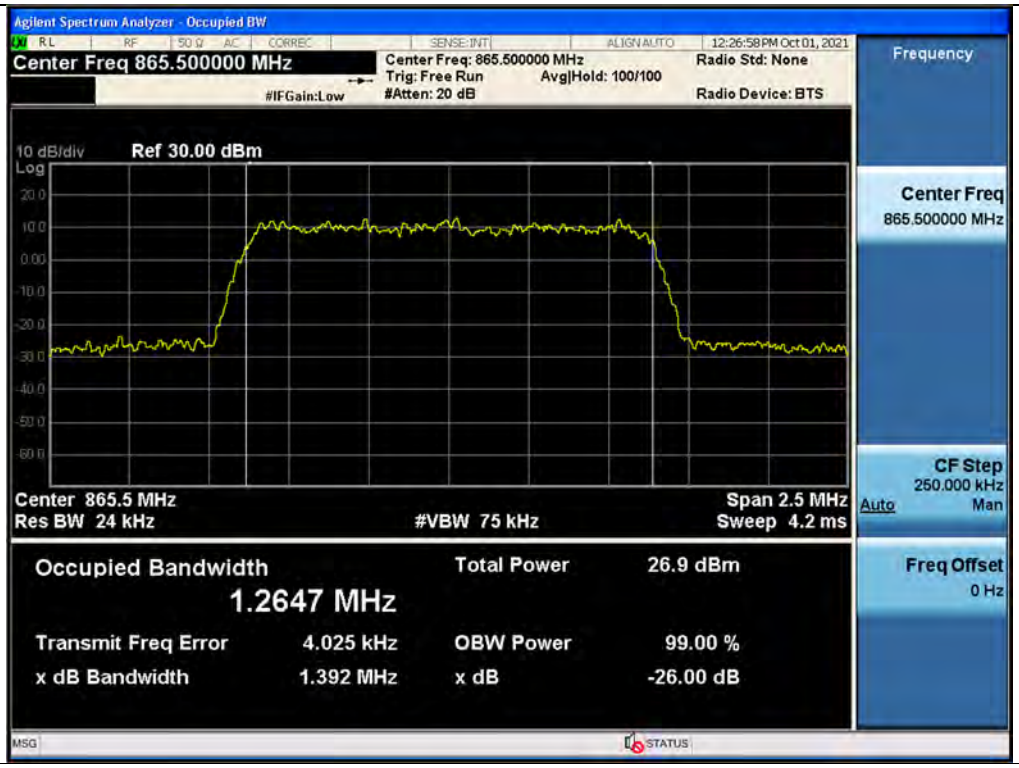
3 dB above the AGC threshold output / 600 MHz Service / Downlink / LTE 20 MHz



3 dB above the AGC threshold Input / 600 MHz Service / Downlink / LTE 20 MHz

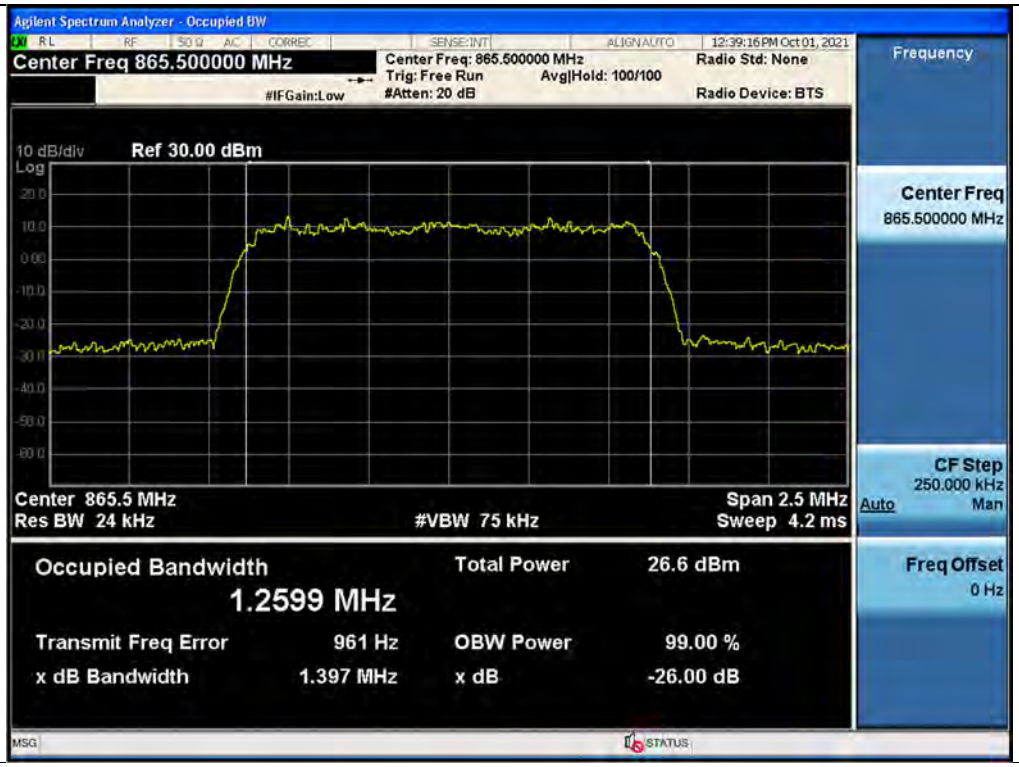


Output / ESMR / Downlink / CDMA

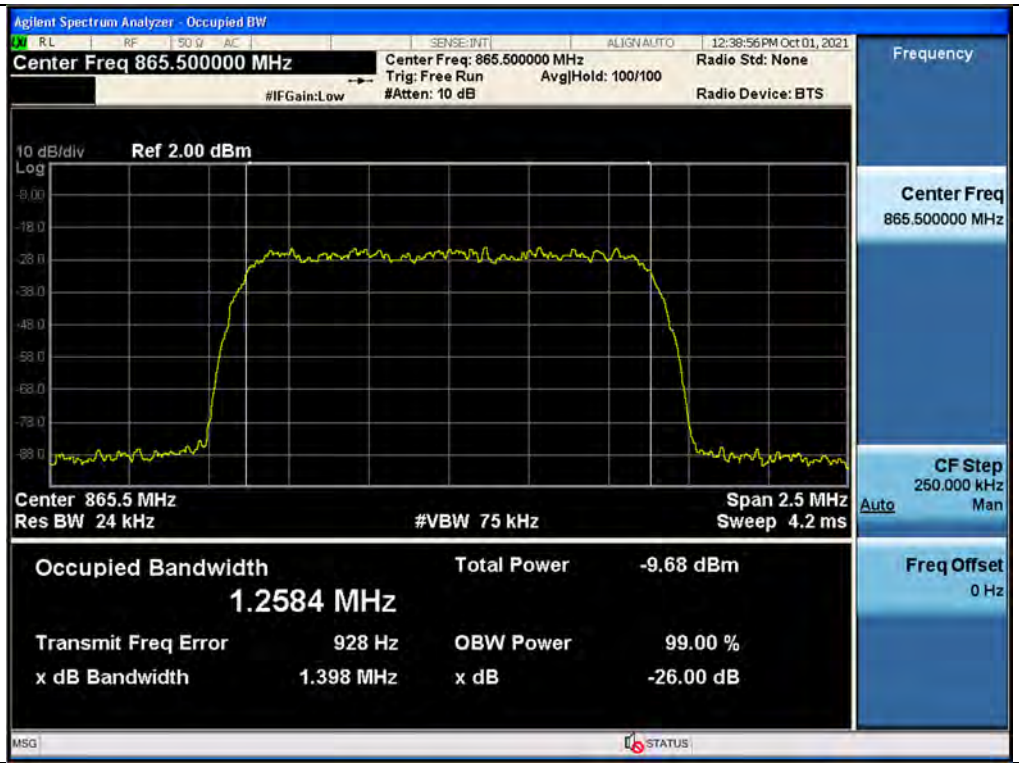


Input / ESMR / Downlink / CDMA

3 dB above the AGC threshold output / ESMR / Downlink / CDMA

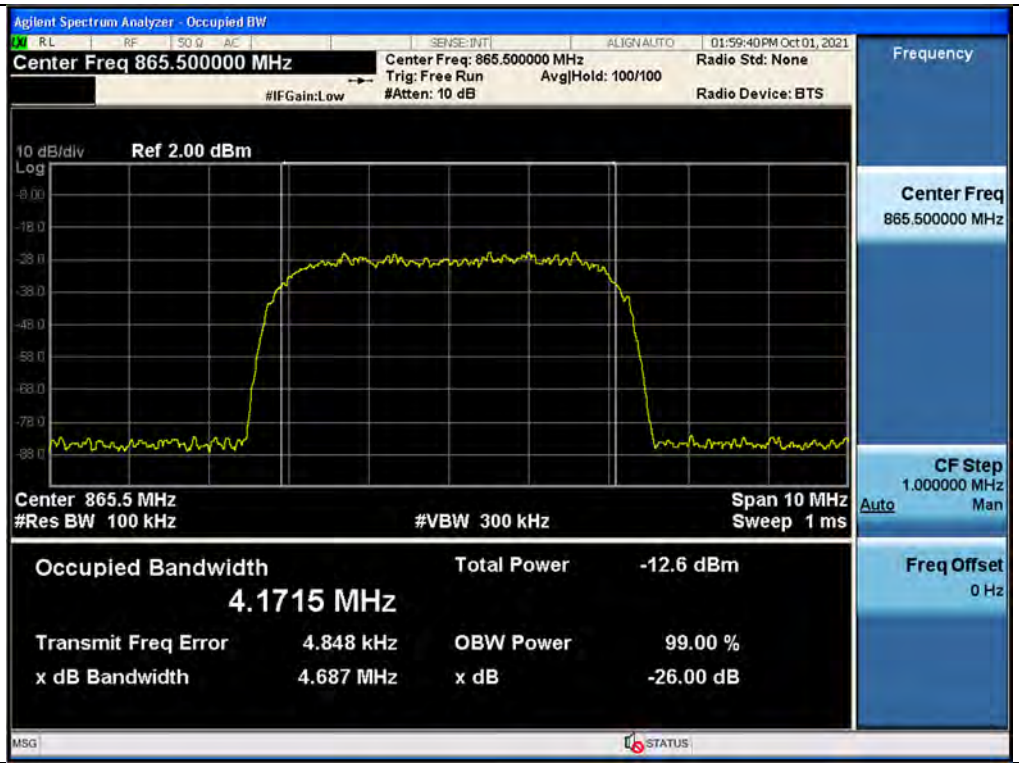


3 dB above the AGC threshold Input / ESMR / Downlink / CDMA

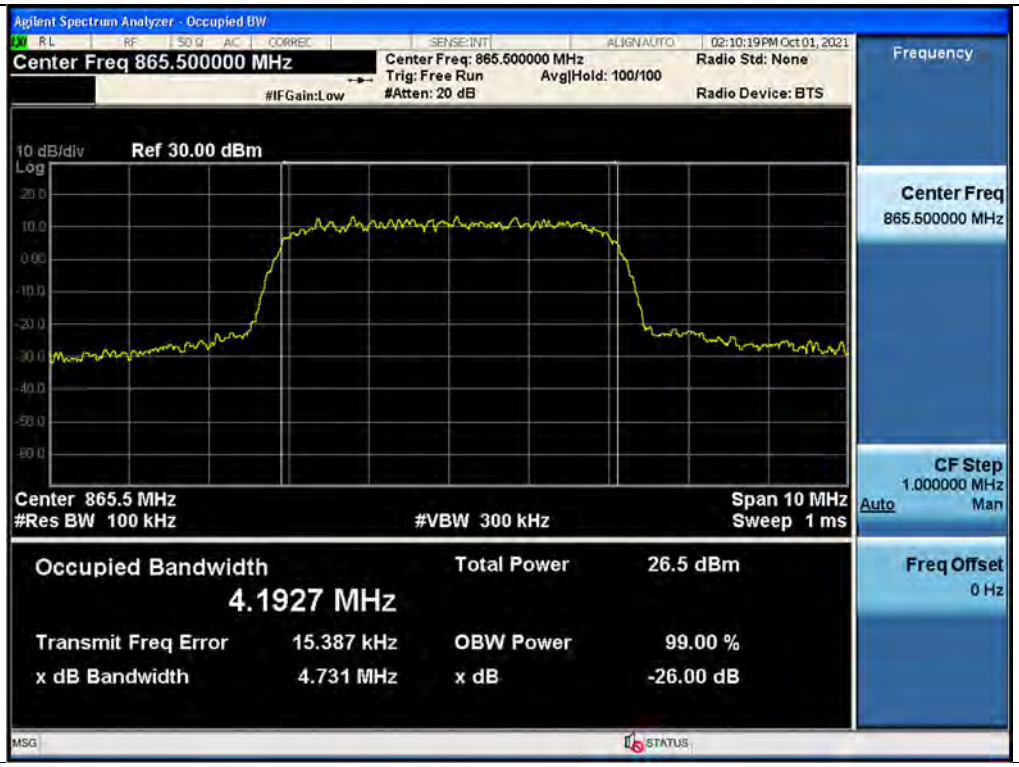


Output / ESMR / Downlink / WCDMA

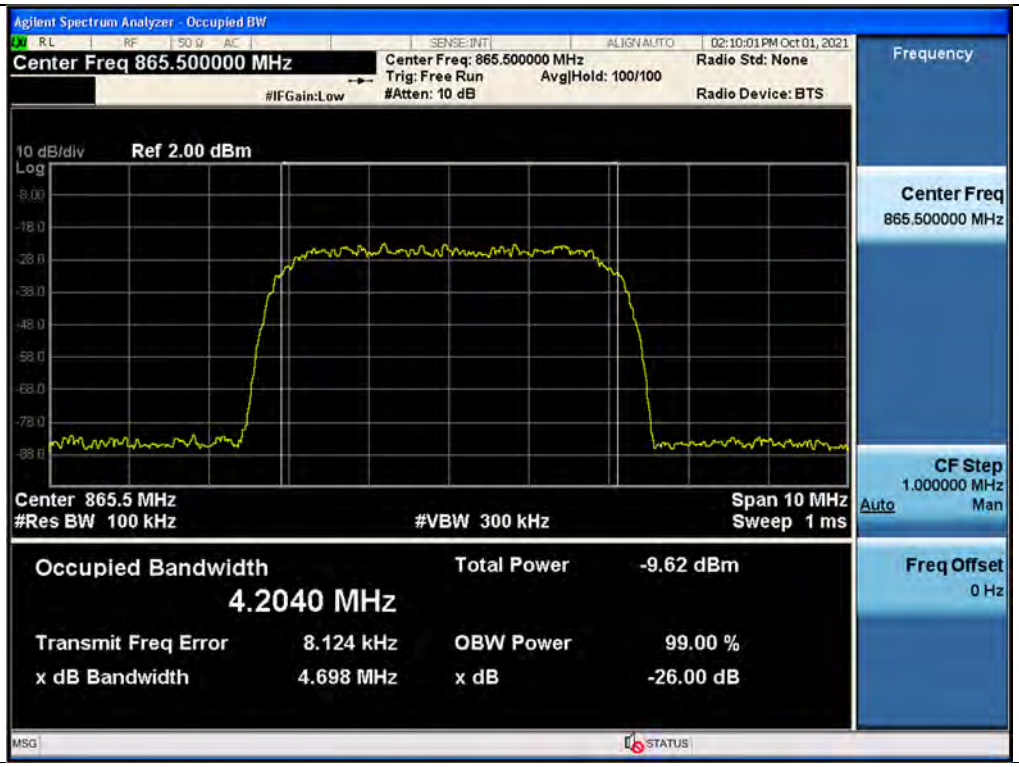
Input / ESMR / Downlink / WCDMA



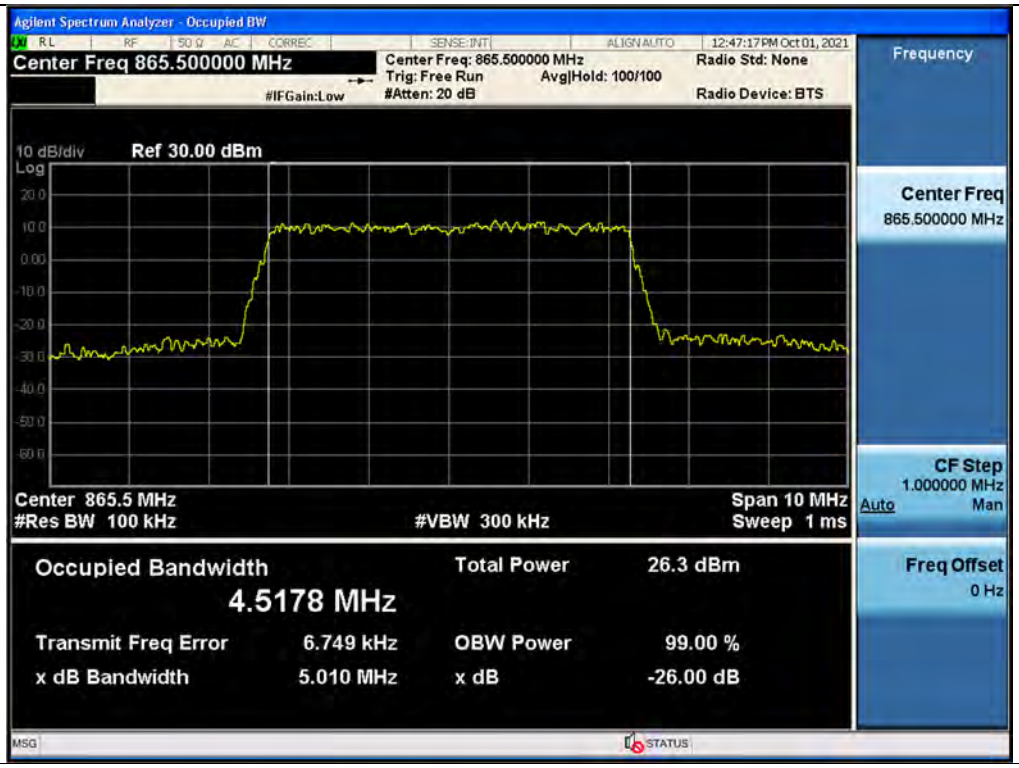
3 dB above the AGC threshold output / ESMR / Downlink / WCDMA



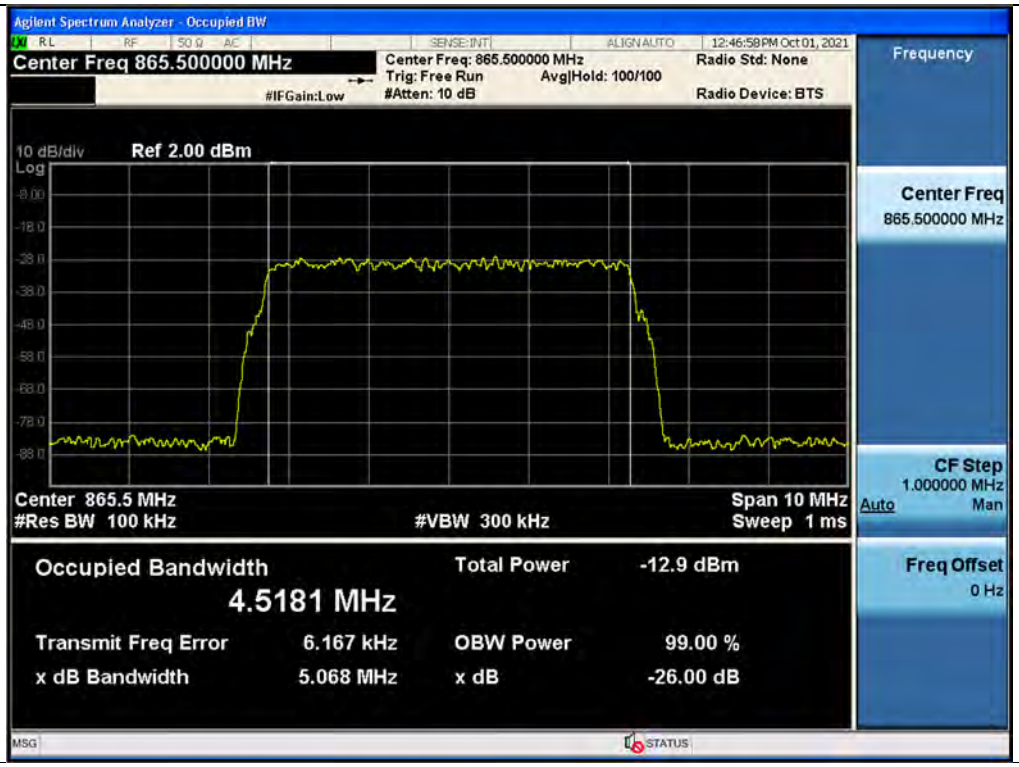
3 dB above the AGC threshold Input / ESMR / Downlink / WCDMA



Output / ESMR / Downlink / LTE 5 MHz

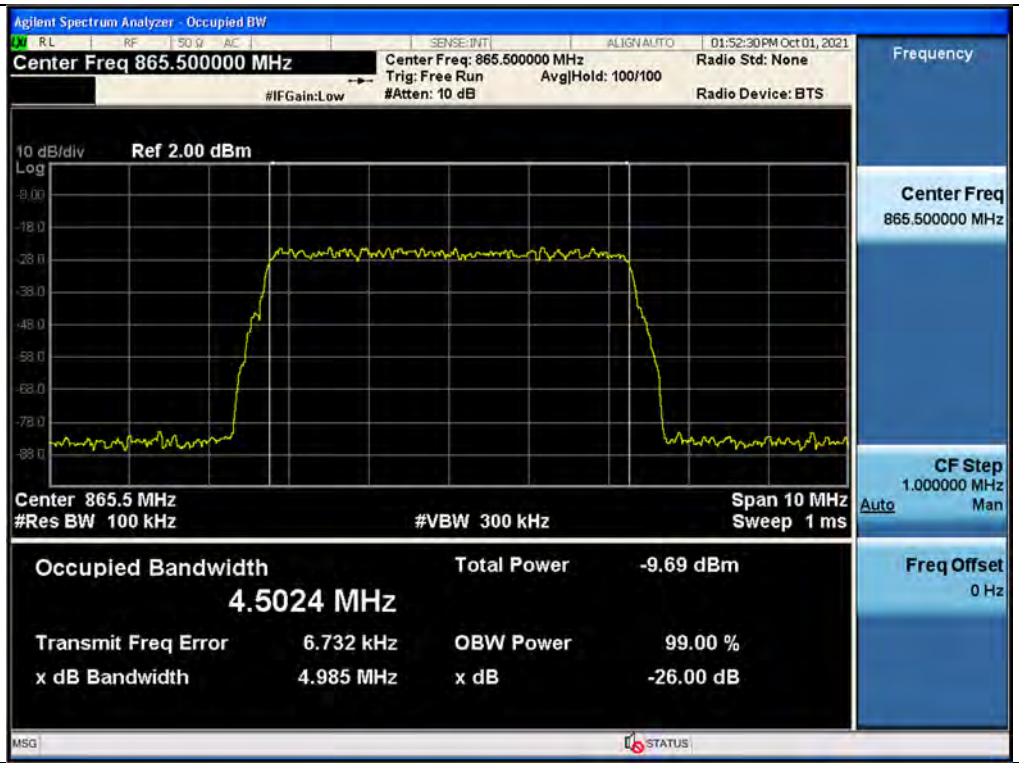


Input / ESMR / Downlink / LTE 5 MHz

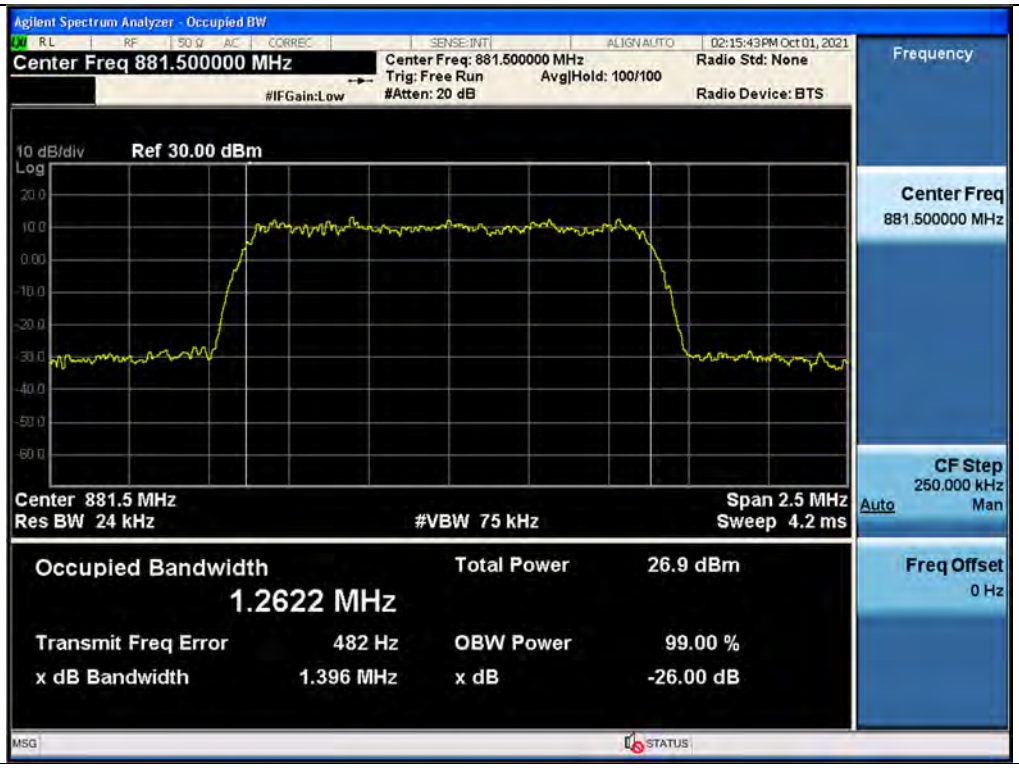


3 dB above the AGC threshold output / ESMR / Downlink / LTE 5 MHz

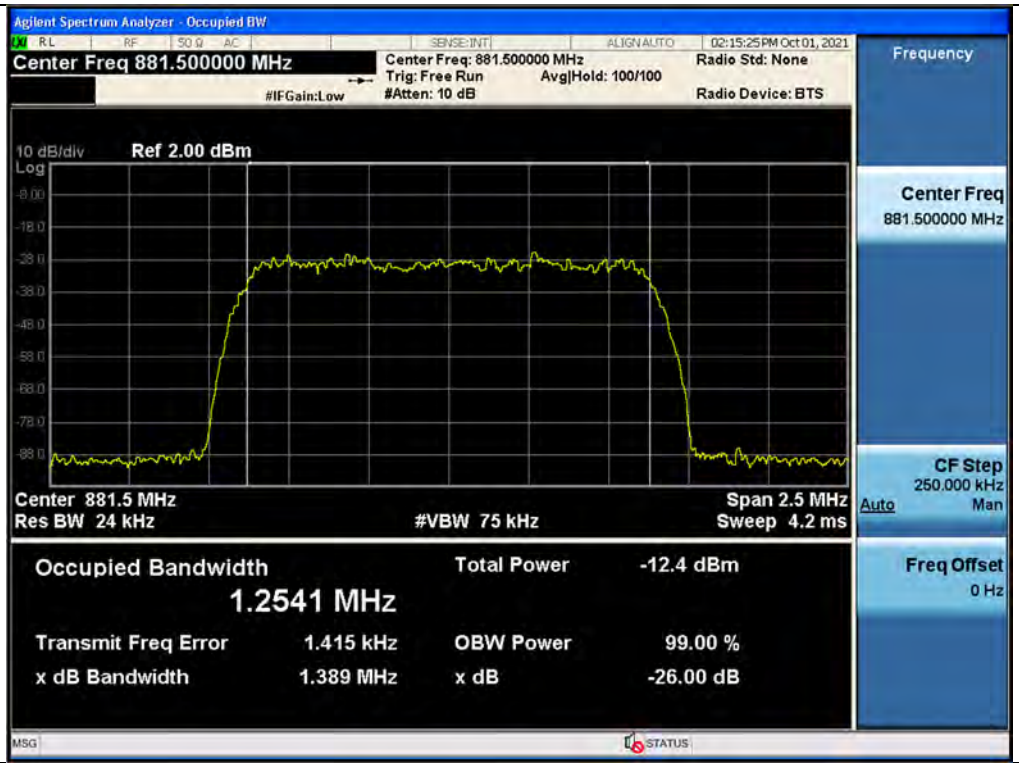
3 dB above the AGC threshold Input / ESMR / Downlink / LTE 5 MHz



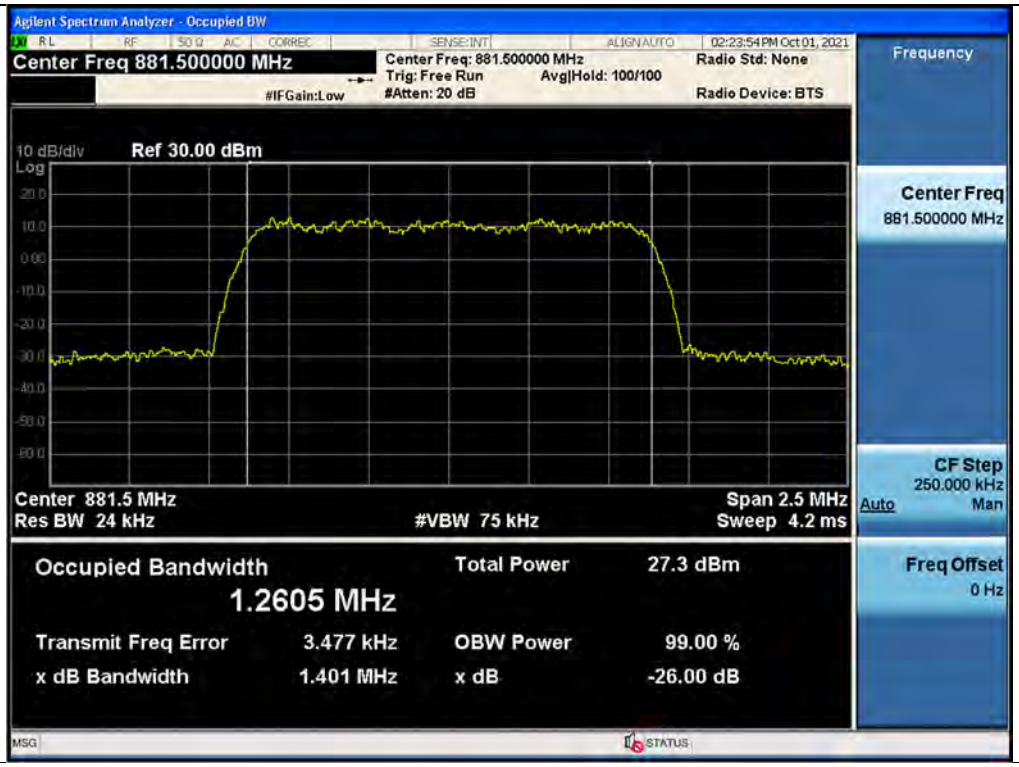
Output / Cellular / Downlink / CDMA



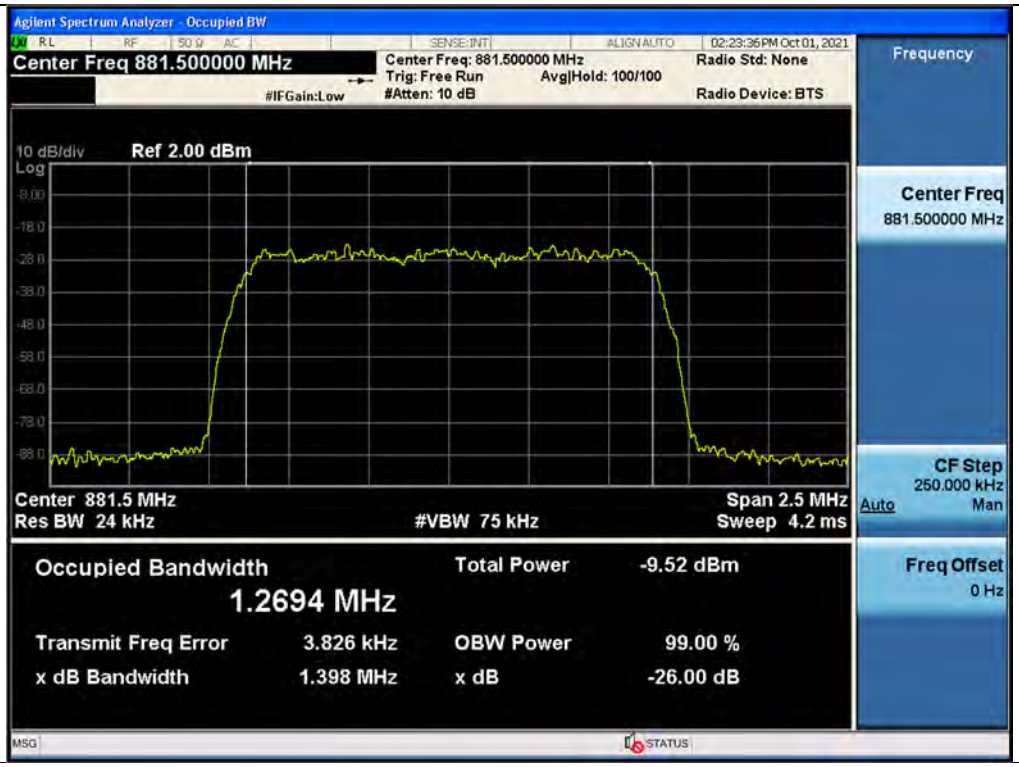
Input / Cellular / Downlink / CDMA



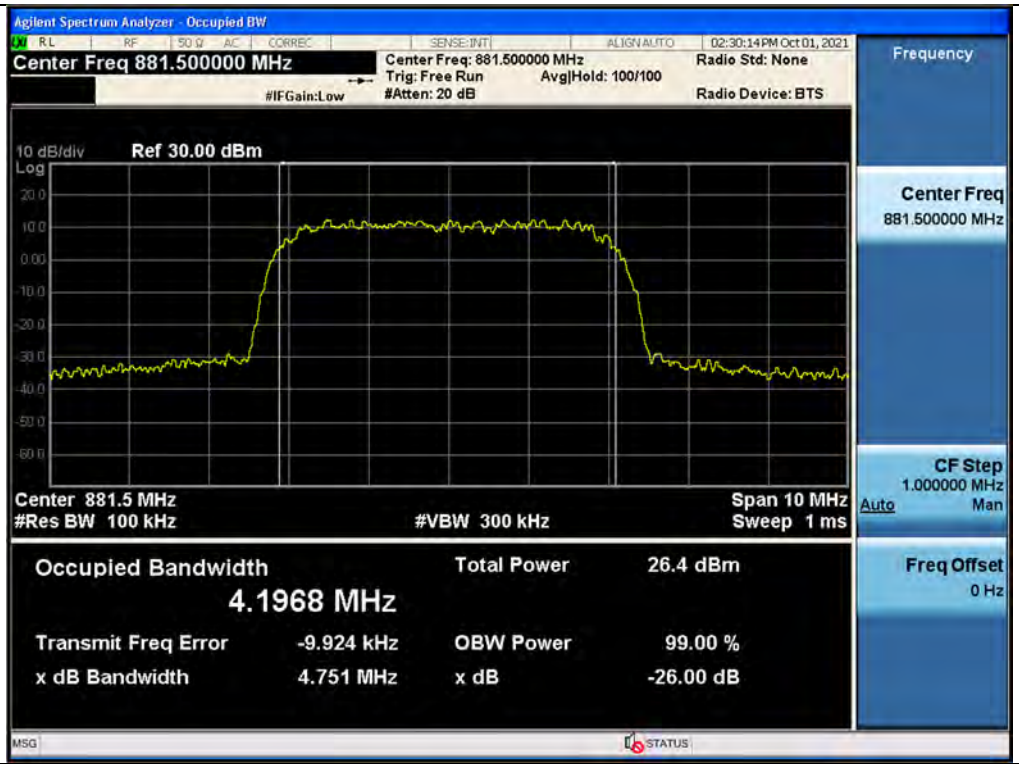
3 dB above the AGC threshold output / Cellular / Downlink / CDMA



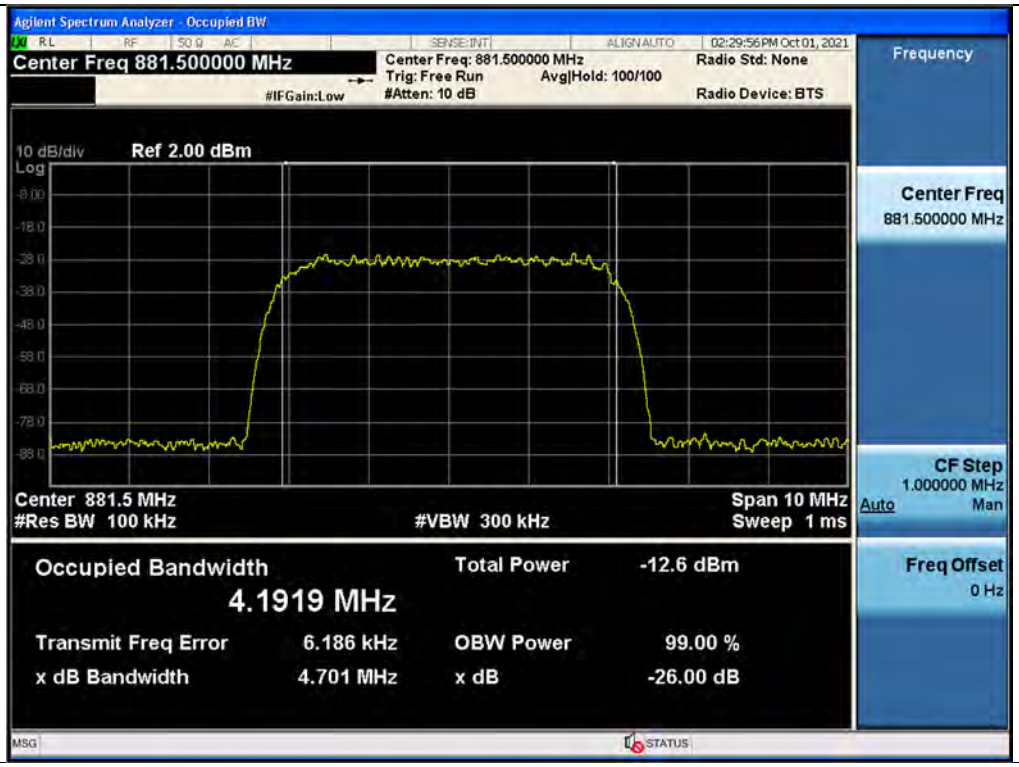
3 dB above the AGC threshold Input / Cellular / Downlink / CDMA



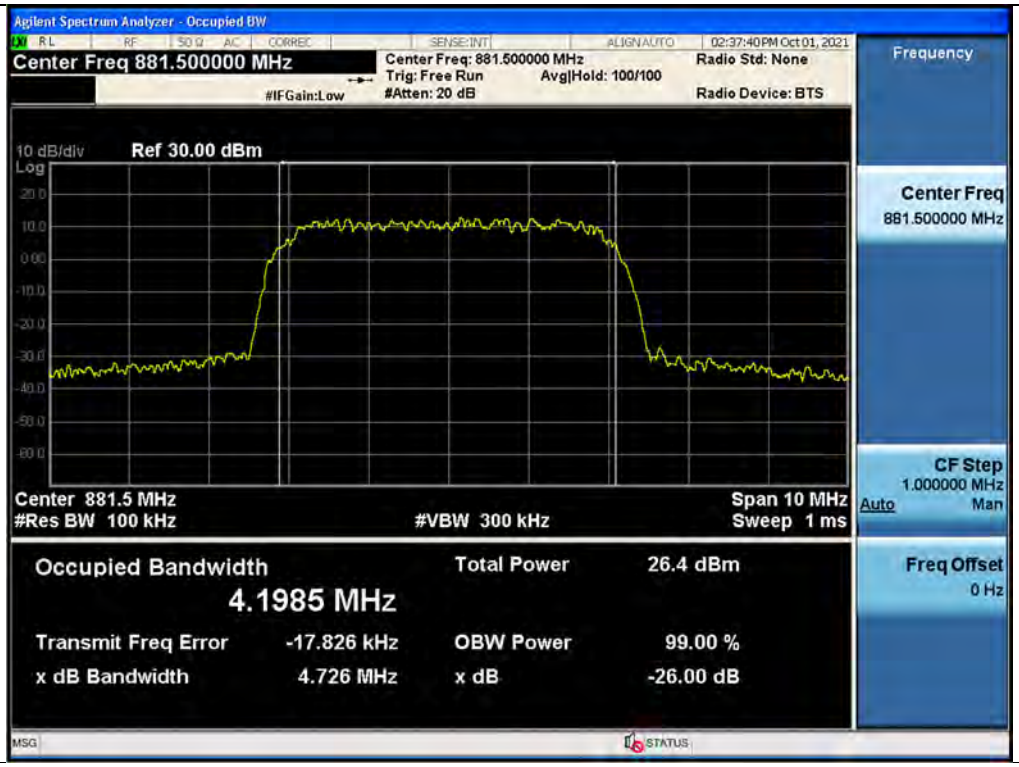
Output / Cellular / Downlink / WCDMA



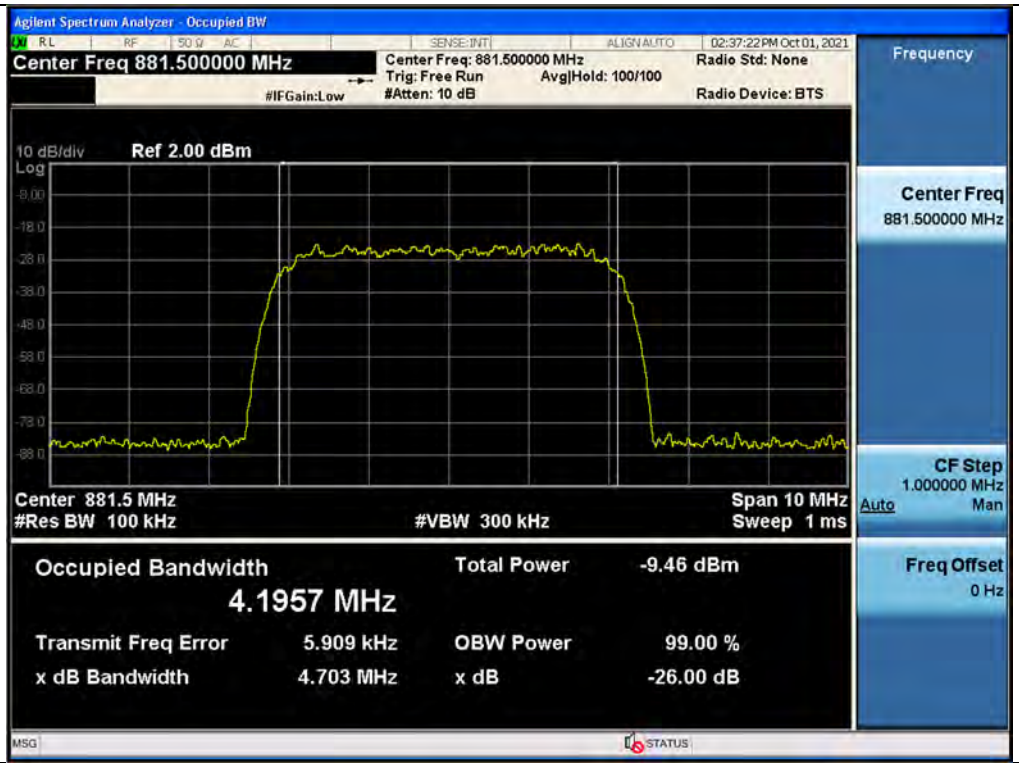
Input / Cellular / Downlink / WCDMA



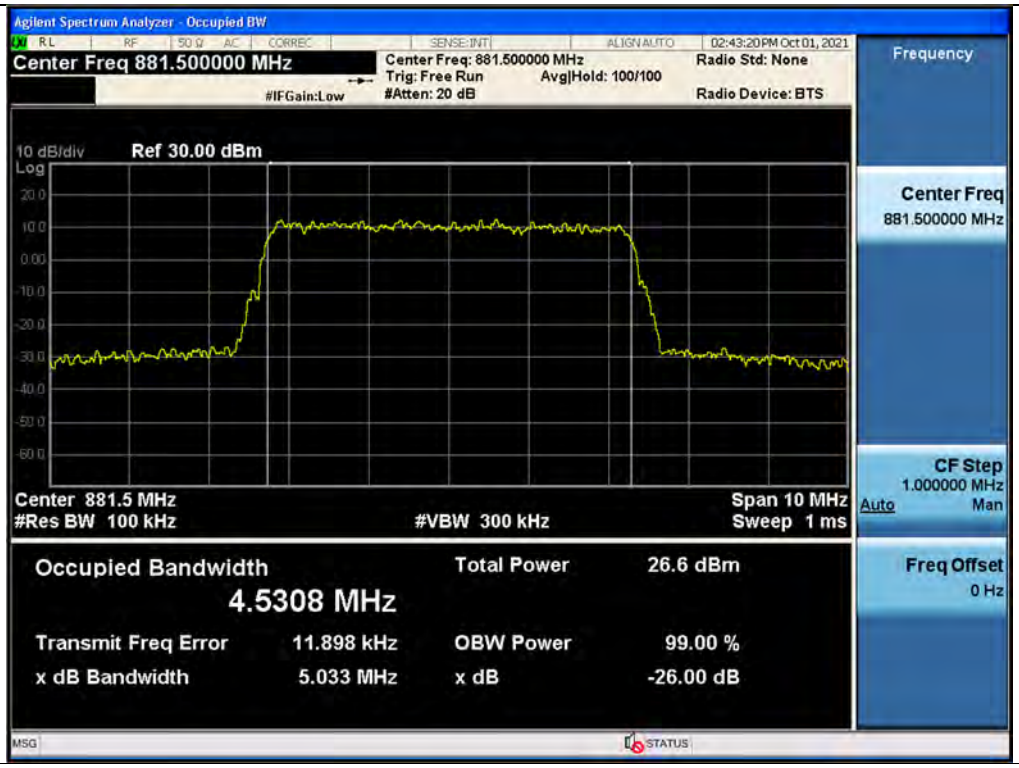
3 dB above the AGC threshold output / Cellular / Downlink / WCDMA



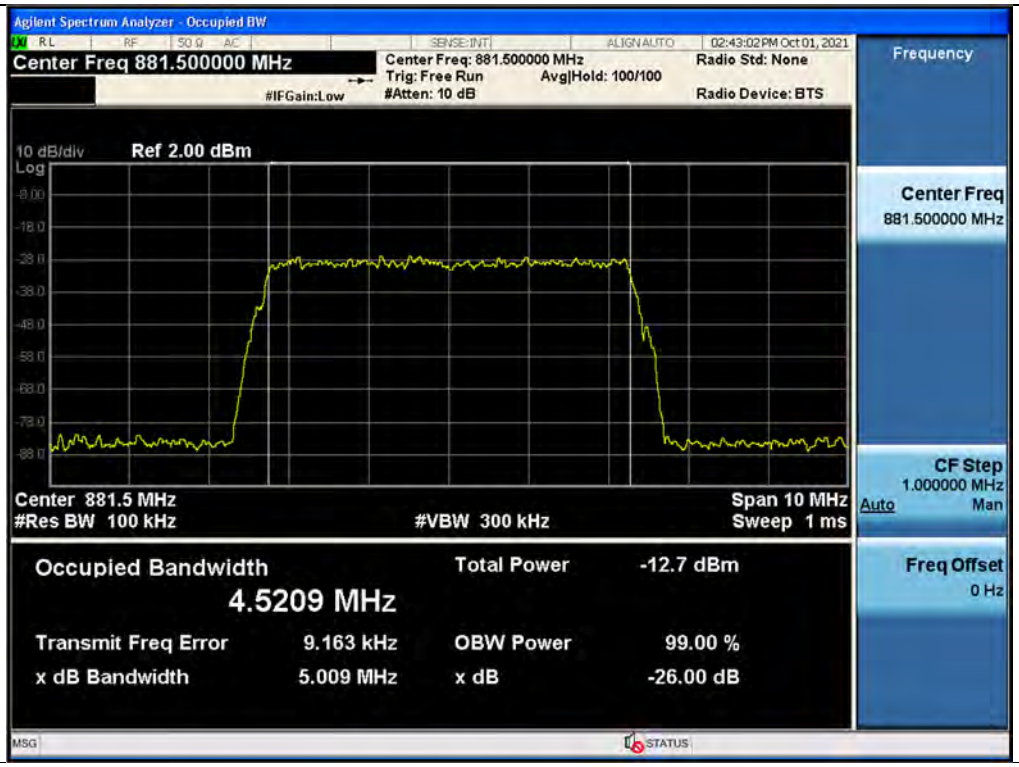
3 dB above the AGC threshold Input / Cellular / Downlink / WCDMA



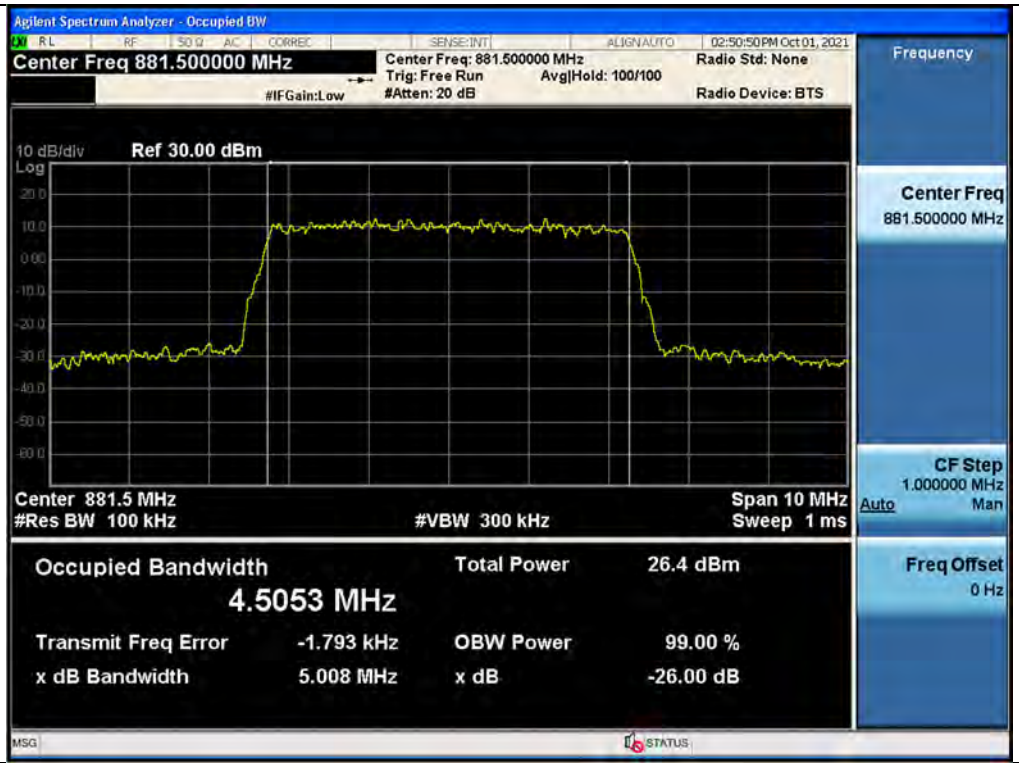
Output / Cellular / Downlink / LTE 5 MHz



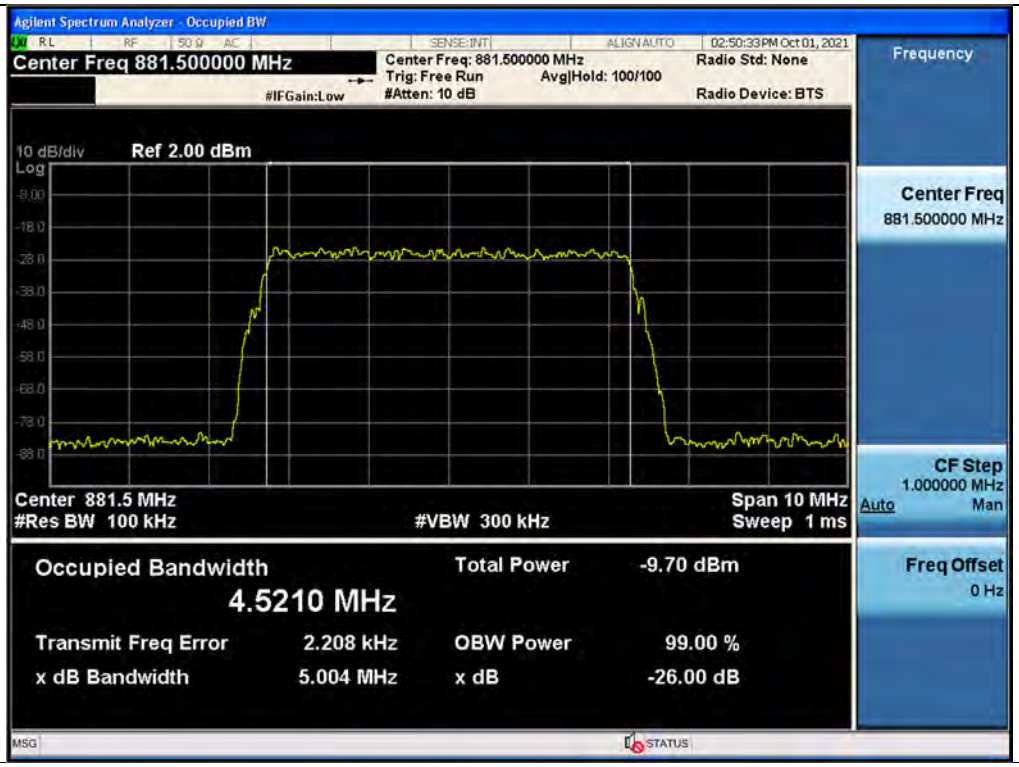
Input / Cellular / Downlink / LTE 5 MHz



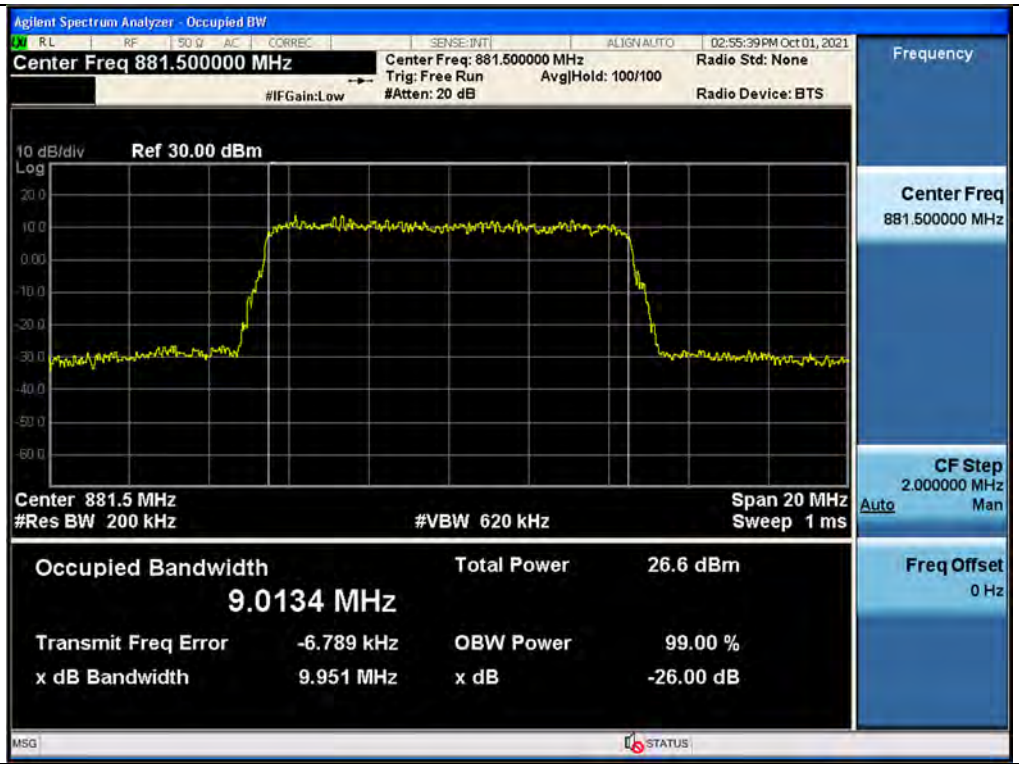
3 dB above the AGC threshold output / Cellular / Downlink / LTE 5 MHz



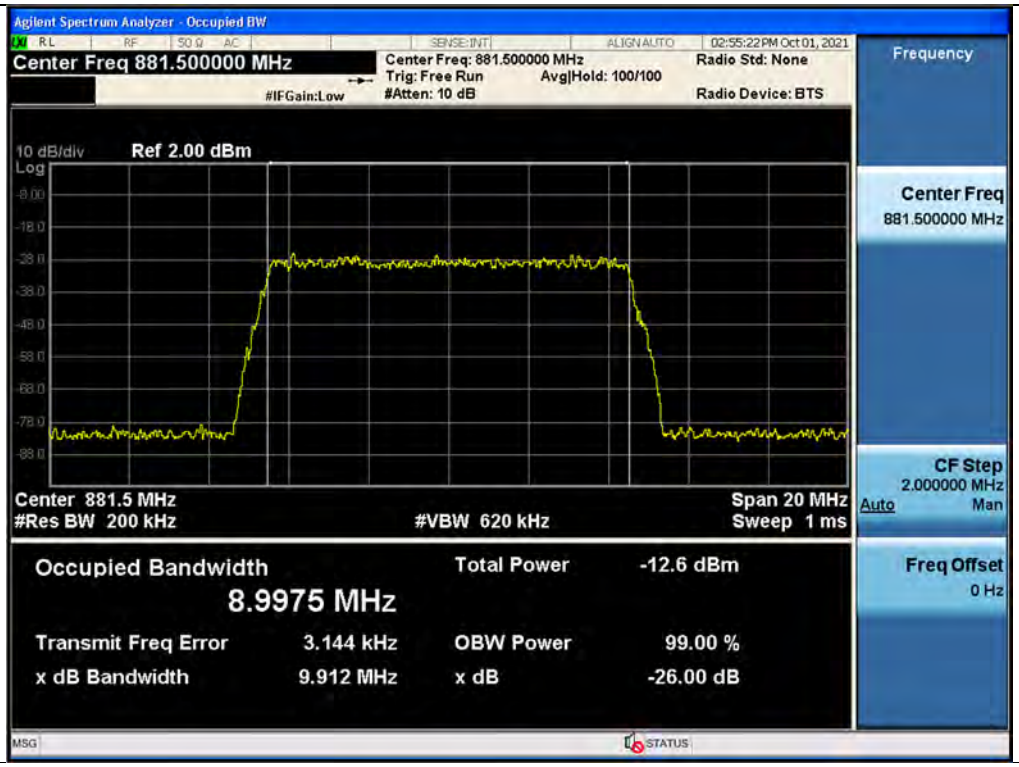
3 dB above the AGC threshold Input / Cellular / Downlink / LTE 5 MHz



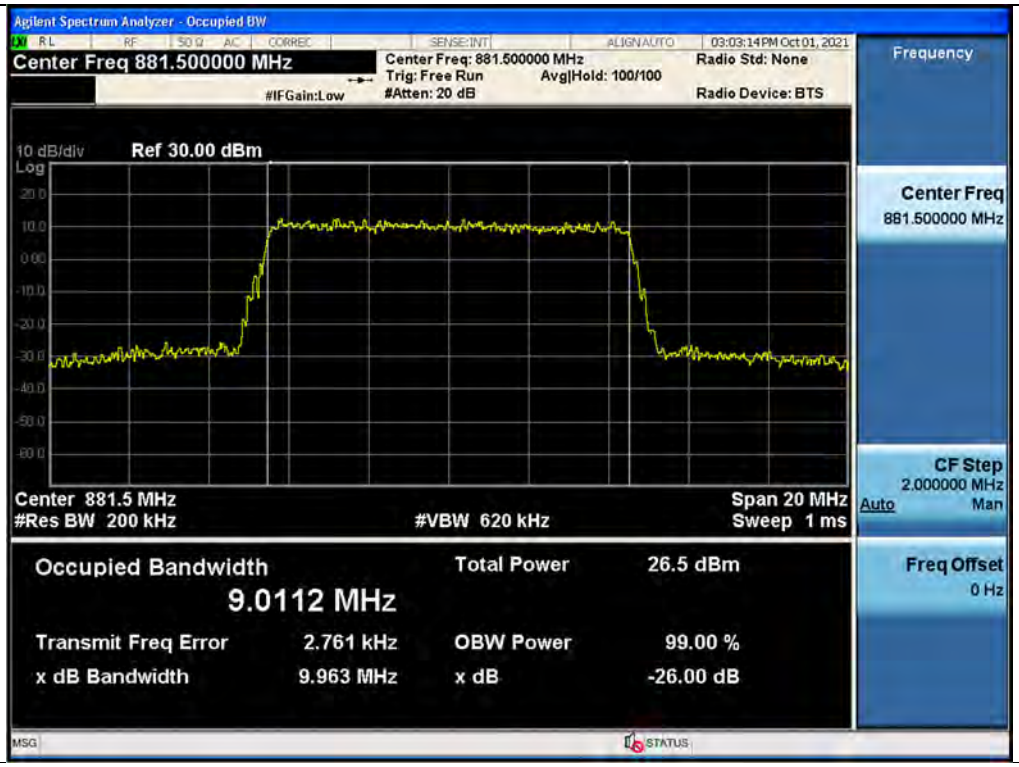
Output / Cellular / Downlink / LTE 10 MHz



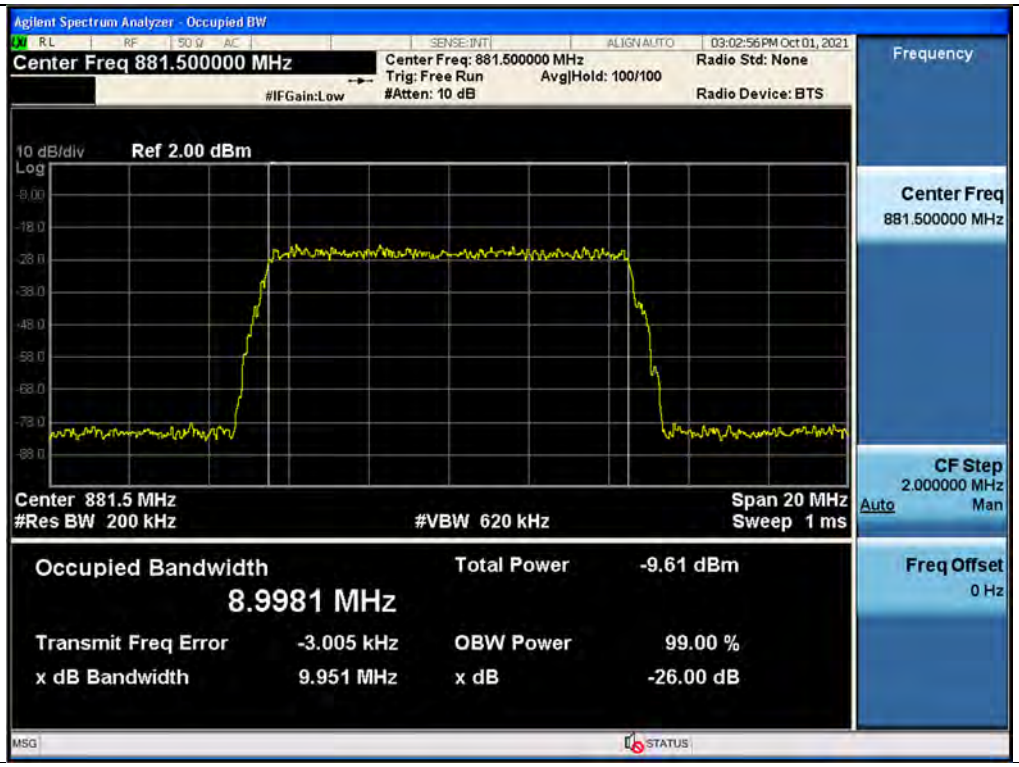
Input / Cellular / Downlink / LTE 10 MHz



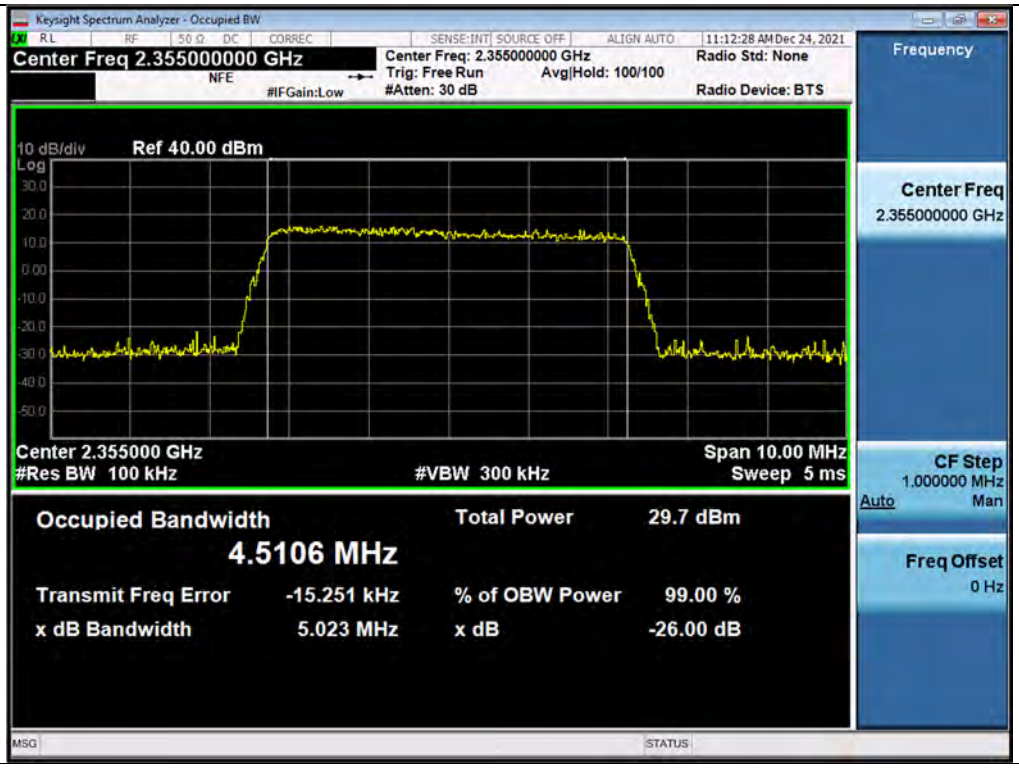
3 dB above the AGC threshold output / Cellular / Downlink / LTE 10 MHz



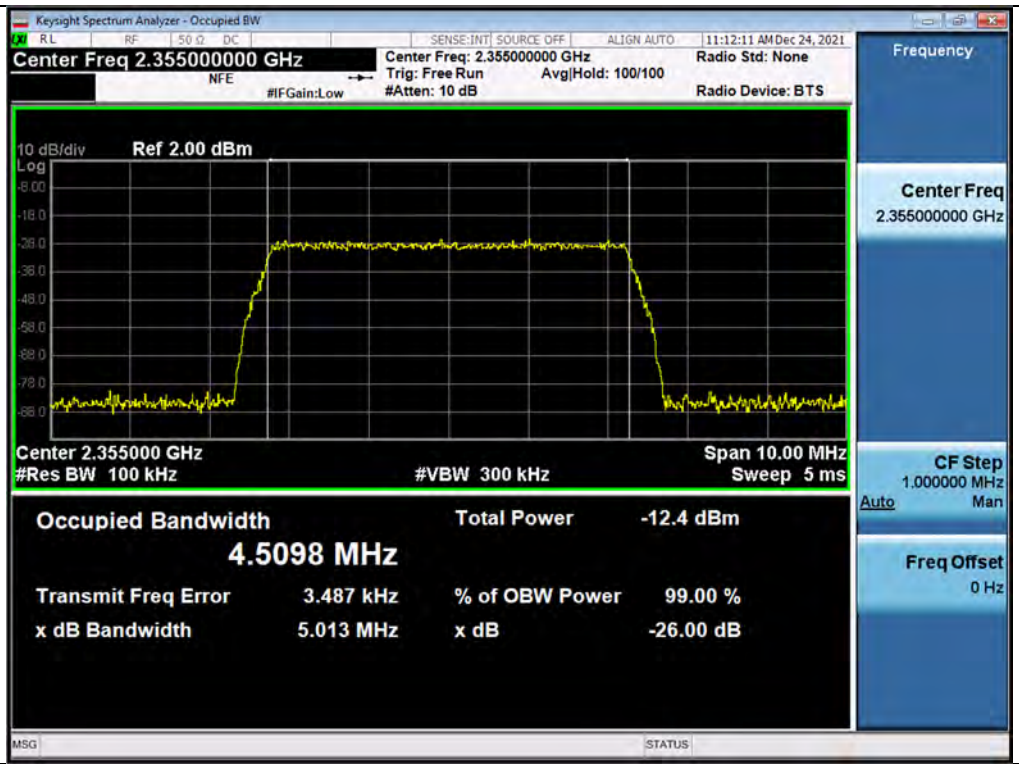
3 dB above the AGC threshold Input / Cellular / Downlink / LTE 10 MHz



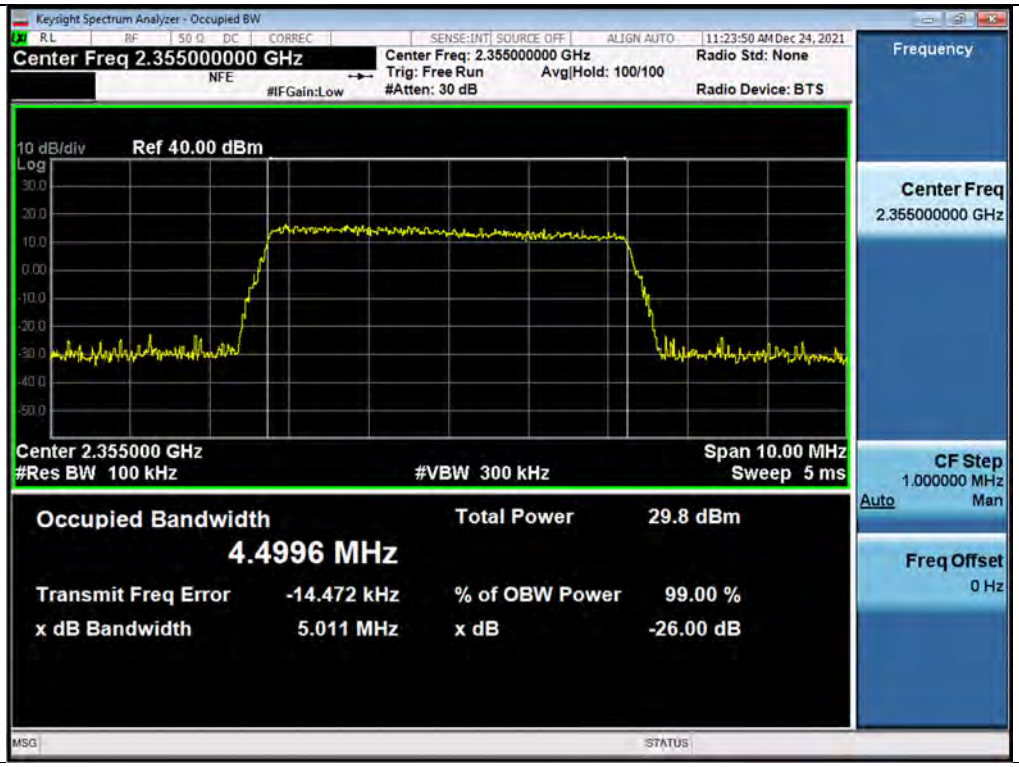
Output / WCS / Downlink / LTE 5 MHz



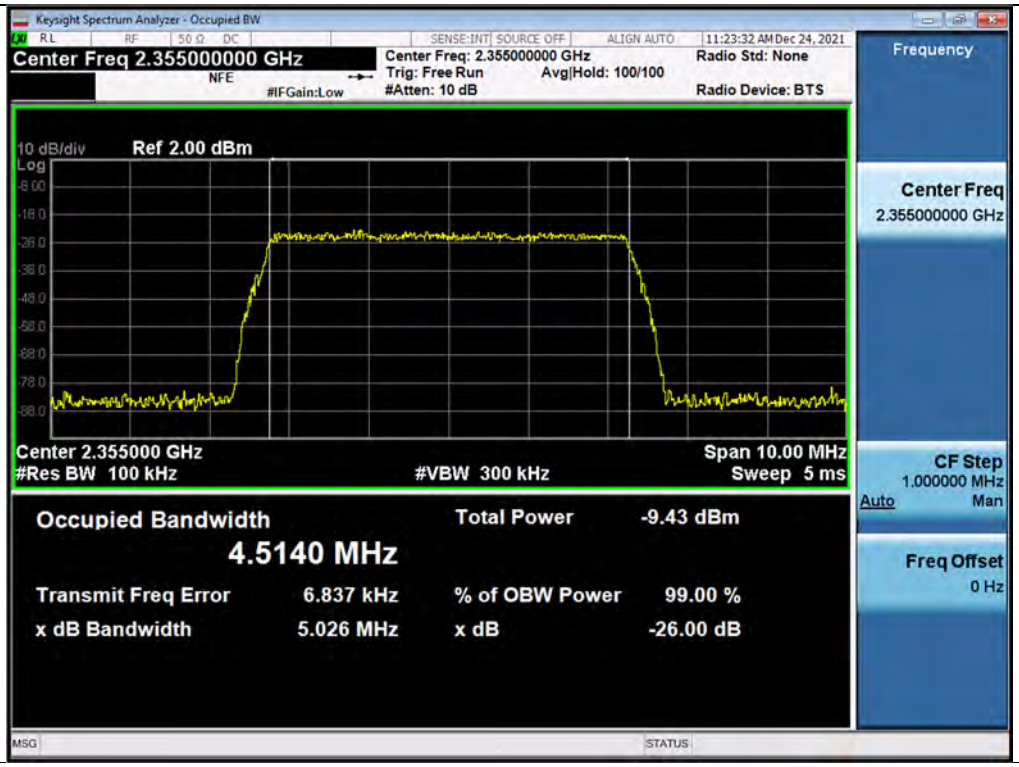
Input / WCS / Downlink / LTE 5 MHz



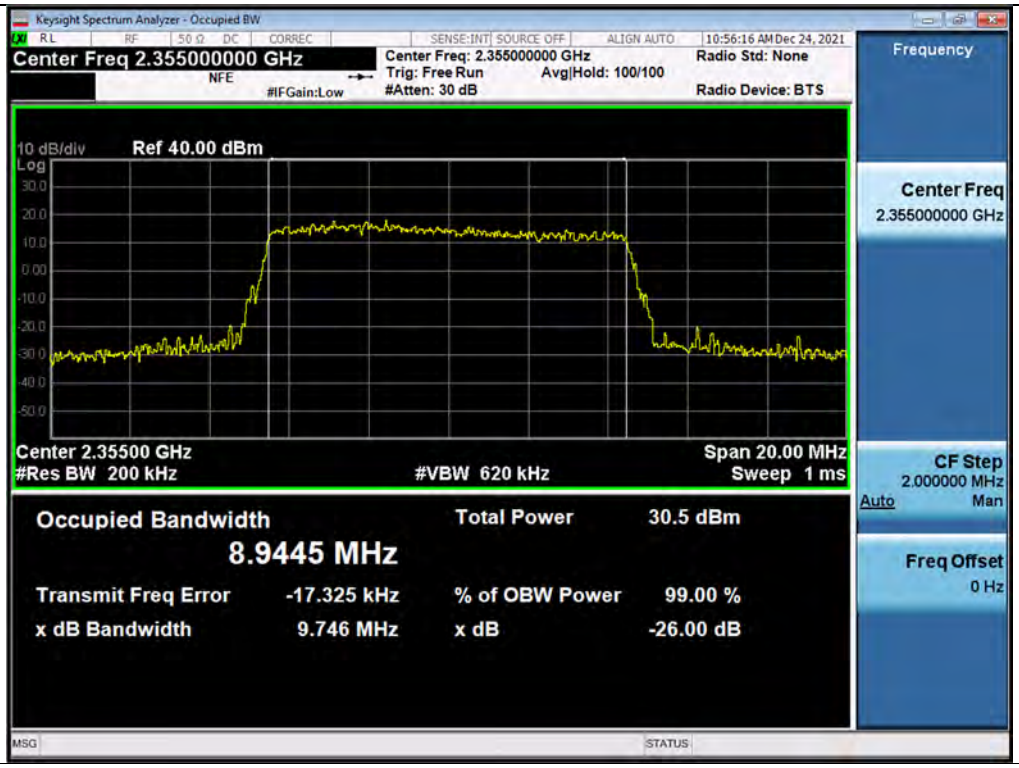
3 dB above the AGC threshold output / WCS / Downlink / LTE 5 MHz



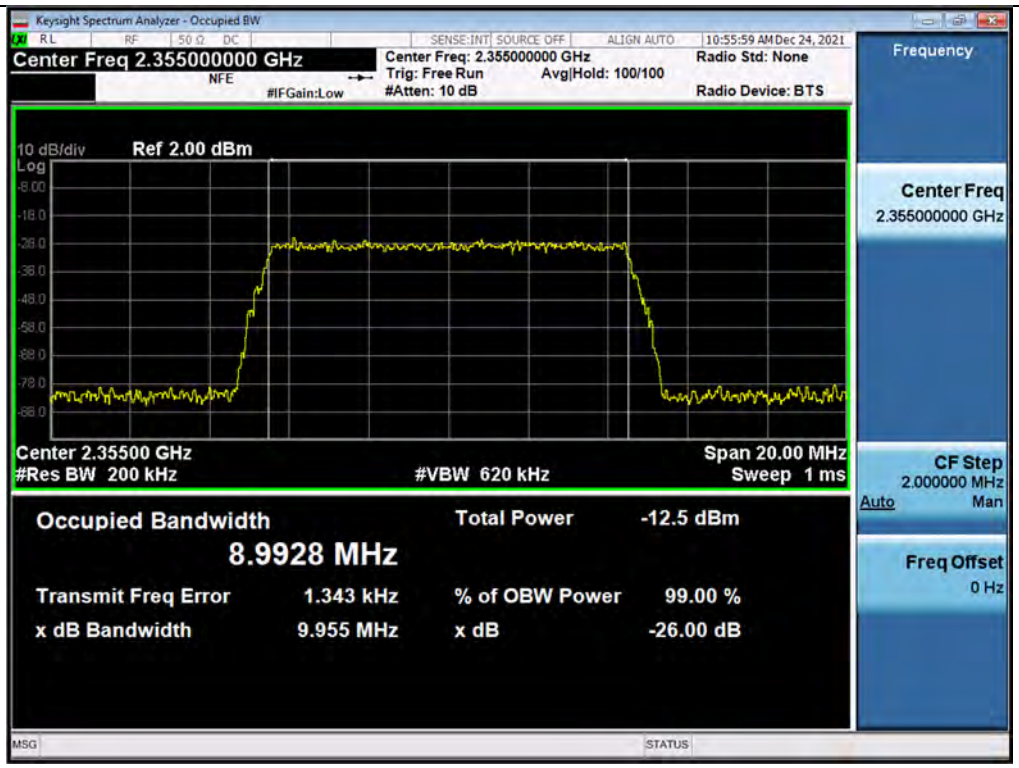
3 dB above the AGC threshold Input / WCS / Downlink / LTE 5 MHz



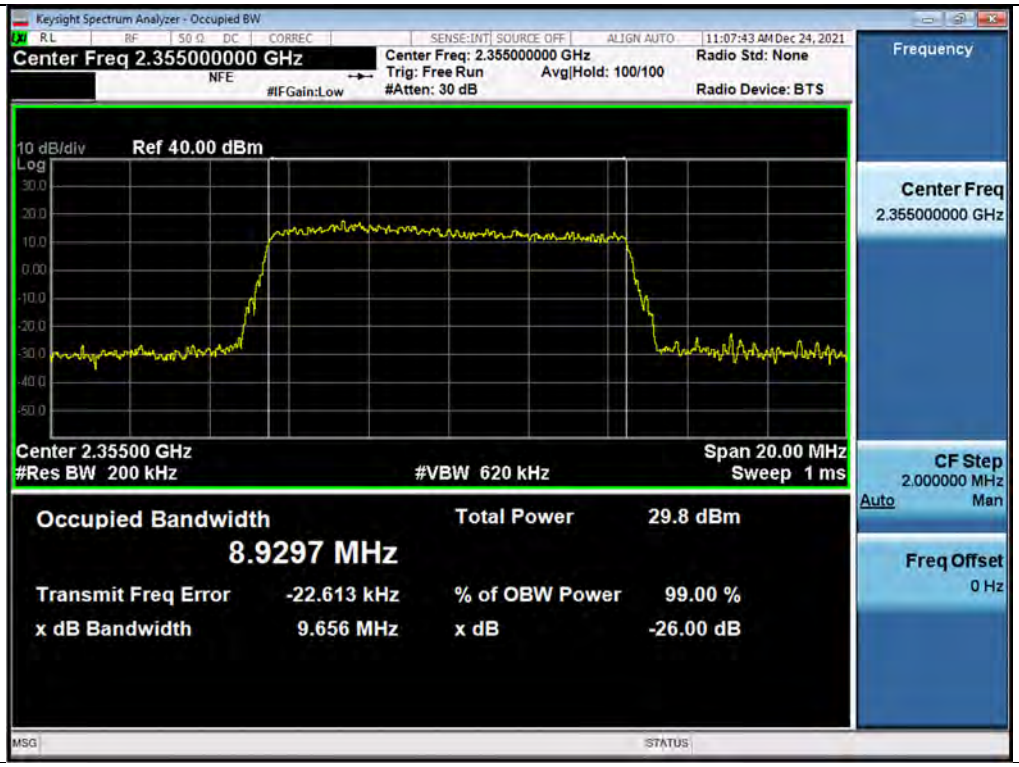
Output / WCS / Downlink / LTE 10 MHz



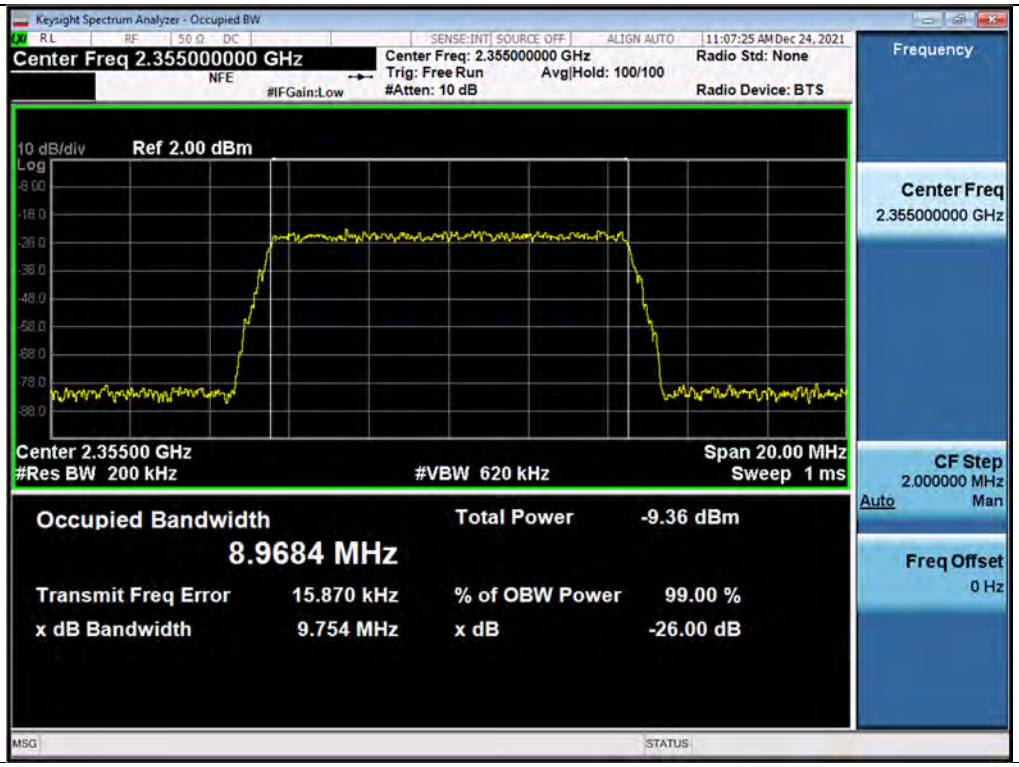
Input / WCS / Downlink / LTE 10 MHz



3 dB above the AGC threshold output / WCS / Downlink / LTE 10 MHz



3 dB above the AGC threshold Input / WCS / Downlink / LTE 10 MHz



5.4. INPUT/OUTPUT POWER AND AMPLIFIER/BOOSTER GAIN

Test Requirement:

§ 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.

§ 22.913 Effective radiated power limits.

Licensees in the Cellular Radiotelephone Service are subject to the effective radiated power (ERP) limits and other requirements in this Section. See also § 22.169.

(a) Maximum ERP. The ERP of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

(1) Except as described in paragraphs (a)(2), (3), and (4) of this section, the ERP of base stations and repeaters must not exceed—

(i) 500 watts per emission; or

(ii) 400 watts/MHz (PSD) per sector.

(d) Power measurement. Measurement of the ERP of Cellular base transmitters and repeaters must be made using an average power measurement technique. The peak-to-average ratio (PAR) of the transmission must not exceed 13 dB. Power measurements for base transmitters and repeaters must be made in accordance with either of the following:

§ 27.50 Power limits and duty cycle.

(a) The following power limits and related requirements apply to stations transmitting in the 2305-2320 MHz band or the 2345-2360 MHz band.

(1) Base and fixed stations.

(i) For base and fixed stations transmitting in the 2305-2315 MHz band or the 2350-2360 MHz band:

(A) The average equivalent isotropically radiated power (EIRP) must not exceed 2,000 watts within any 5 megahertz of authorized bandwidth and must not exceed 400 watts within any 1 megahertz of authorized bandwidth.

(B) The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.

(ii) For base and fixed stations transmitting in the 2315-2320 MHz band or the 2345-2350 MHz band, the peak EIRP must not exceed 2,000 watts.

(c) The following power and antenna height requirements apply to stations transmitting in the 600 MHz band and the 698-746 MHz band:

(3) Fixed and base stations transmitting a signal 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;

(4) 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 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;

(5) Licensees, except for licensees operating in the 600 MHz downlink band, seeking to operate a fixed or base station 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 at an ERP greater than 1000 watts must:

(i) Coordinate in advance with all licensees authorized to operate in the 698-758 MHz, 775-788, and 805-806 MHz bands within 120 kilometers (75 miles) of the base or fixed station;

(ii) coordinate in advance with all regional planning committees, as identified in § 90.527 of this chapter, with jurisdiction within 120 kilometers (75 miles) of the base or fixed station.

§ 90.635 Limitations on power and antenna height

(a) The effective radiated power and antenna height for base stations may not exceed 1 kilowatt (30 dBw) and 304 m. (1,000 ft.) above average terrain (AAT), respectively, or the equivalent thereof as determined from the Table. These are maximum values, and applicants will be required to justify power levels and antenna heights requested.

(b) The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).

Table—Equivalent Power and Antenna Heights for Base Stations in the 851-869 MHz and 935-940 MHz Bands Which Have a Requirement for a 32 km (20 mi) Service Area Radius

Antenna height (ATT) meters (feet)	Effective radiated power (watts)
Above 1,372 (4,500)	65
Above 1,220 (4,000) to 1,372 (4,500)	70
Above 1,067 (3,500) to 1,220 (4,000)	75
Above 915 (3,000) to 1,067 (3,500)	100
Above 763 (2,500) to 915 (3,000)	140
Above 610 (2,000) to 763 (2,500)	200
Above 458 (1,500) to 610 (2,000)	350
Above 305 (1,000) to 458 (1,500)	600
Up to 305 (1,000)	1,000

Test Procedures:

Measurements were in accordance with the test methods section 3.5 of KDB 935210 D05 v01r04.

Adjust the internal gain control of the EUT to the maximum gain for which the equipment certification is being sought. Any EUT attenuation settings shall be set to their minimum value.

Input power levels (uplink and downlink) should be set to maximum input ratings while confirming that the device is not capable of operating in saturation (non-linear mode) at the rated input levels, including during the performance of the input/output power measurements.

3.5.2 Measuring the EUT mean input and output power

a) Connect a signal generator to the input of the EUT.
b) Configure to generate the AWGN (broadband) test signal.
c) The frequency of the signal generator shall be set to the frequency f0 as determined from 3.3.
d) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary.
e) Set the signal generator output power to a level that produces an EUT output level that is just below the AGC threshold, but not more than 0.5 dB below.
f) Measure and record the output power of the EUT; use 3.5.3 or 3.5.4 for power measurement.
g) Remove the EUT from the measurement setup. Using the same signal generator settings, repeat the power measurement at the signal generator port, which was used as the input signal to the EUT, and record as the input power. EUT gain may be calculated as described in 3.5.5.
h) Repeat steps f) and g) with input signal amplitude set to 3 dB above the AGC threshold level.
i) Repeat steps e) to h) with the narrowband test signal.
j) Repeat steps e) to i) for all frequency bands authorized for use by the EUT.

3.5.5 Calculating amplifier, repeater, or industrial booster gain

After the input and output power levels have been measured as described in the preceding subclauses, the gain of the EUT can be determined from:

Gain (dB) = output power (dBm) − input power (dBm).

Report the gain for each authorized operating frequency band, and each test signal stimulus.

Note. If f_0 that determined from out-of-band test is smaller or greater than difference of test signal's center frequency and operation band block, test is performed at the lowest or the highest frequency that test signals can be passed.

Test Results:

Tabular data of Input / Output Power and Gain

Test Band	Link	Signal	f_0 Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Gain (dB)	E.R.P.		
							(dBm)	(W/MHz)	(W)
600 MHz Service	Downlink	LTE 5 MHz	622.87	-20.24	19.77	40.01	34.62	0.58	2.90
		LTE 10 MHz	622.87	-20.16	19.38	39.54	34.23	0.26	2.65
		LTE 20 MHz	627.00	-20.06	19.33	39.39	34.18	0.13	2.62
ESMR		CDMA	868.38	-20.32	19.33	39.65	34.18	2.09	2.62
		WCDMA	866.50	-20.15	19.00	39.15	33.85	0.49	2.43
		LTE 5 MHz	866.50	-20.23	19.01	39.24	33.86	0.49	2.43
Cellular		CDMA	877.42	-20.09	19.39	39.48	34.24	2.12	2.65
		WCDMA	877.42	-20.11	19.00	39.11	33.85	0.49	2.43
		LTE 5 MHz	877.42	-20.07	19.44	39.51	34.29	0.54	2.69
		LTE 10 MHz	877.42	-20.05	19.42	39.47	34.27	0.27	2.67
Test Band	Link	Signal	f_0 Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Gain (dB)	E.I.R.P.		
							(dBm)	(W/MHz)	(W)
WCS	Downlink	LTE 5 MHz	2 352.81	-19.88	23.18	43.06	40.18	2.08	10.42
		LTE 10 MHz	2 355.00	-19.83	22.60	42.43	39.60	0.91	9.12

*E.I.R.P.(dBm) = Output Power(dBm) + Ant. Gain

(*E.R.P(dBm) = E.I.R.P. - 2.15 dB)

Tabular data of Input / 3 dB above AGC threshold Output Power and Gain

Test Band	Link	Signal	f_0 Frequency (MHz)	Input Power (dBm)	+3 dB Output Power (dBm)	Gain (dB)	E.R.P.		
							(dBm)	(W/MHz)	(W)
600 MHz Service	Downlink	LTE 5 MHz	622.87	-17.16	19.62	36.78	34.47	0.56	2.80
		LTE 10 MHz	622.87	-17.08	19.11	36.19	33.96	0.25	2.49
		LTE 20 MHz	627.00	-16.97	19.25	36.22	34.10	0.13	2.57
ESMR		CDMA	868.38	-17.33	19.36	36.69	34.21	2.11	2.64
		WCDMA	866.50	-17.25	18.98	36.23	33.83	0.48	2.42
		LTE 5 MHz	866.50	-17.31	18.92	36.23	33.77	0.48	2.38
Cellular		CDMA	877.42	-17.17	19.37	36.54	34.22	2.11	2.64
		WCDMA	877.42	-17.11	19.03	36.14	33.88	0.49	2.44
		LTE 5 MHz	877.42	-17.12	19.42	36.54	34.27	0.53	2.67
		LTE 10 MHz	877.42	-17.04	19.33	36.37	34.18	0.26	2.62
Test Band	Link	Signal	f_0 Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Gain (dB)	E.I.R.P.		
							(dBm)	(W/MHz)	(W)
WCS	Downlink	LTE 5 MHz	2 352.81	-16.74	23.11	39.85	40.11	2.05	10.26
		LTE 10 MHz	2 355.00	-16.78	22.51	39.29	39.51	0.89	8.93

*E.I.R.P.(dBm) = Output Power(dBm) + Ant. Gain

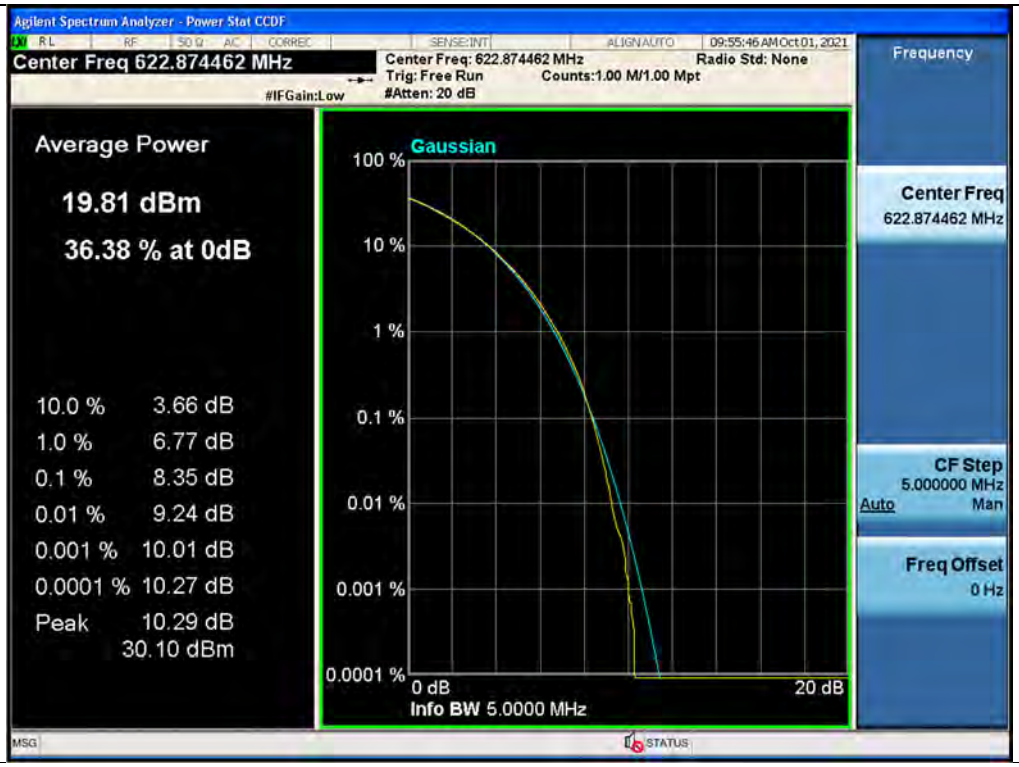
(*E.R.P(dBm) = E.I.R.P. - 2.15 dB)

Tabular data of PAPR

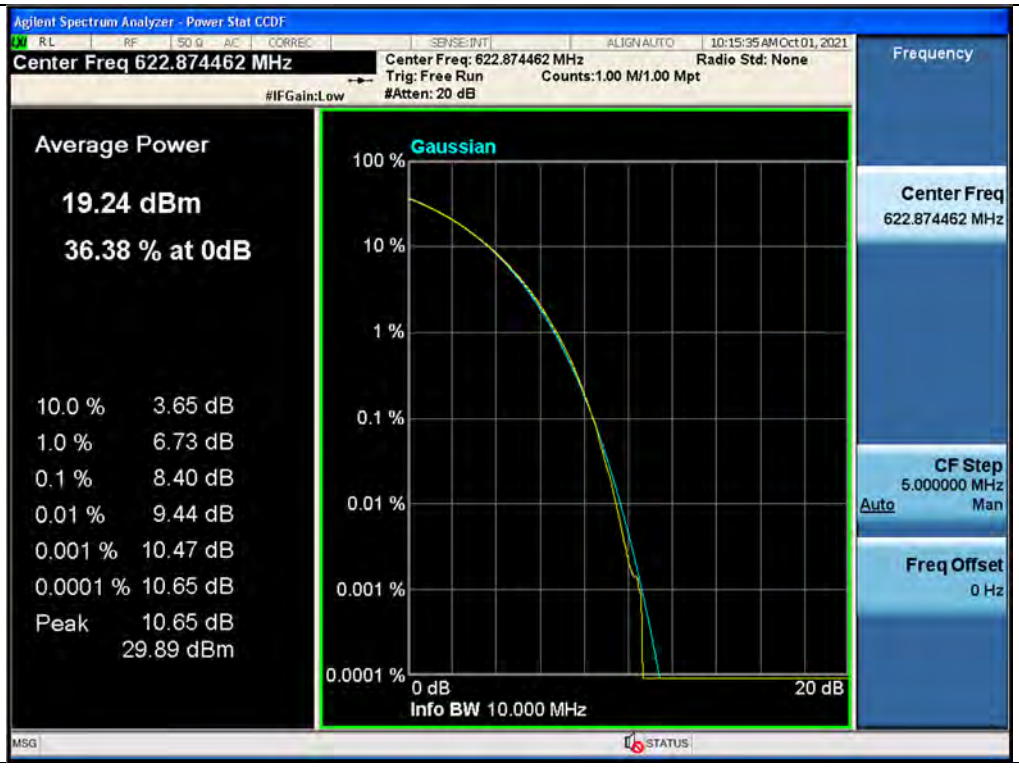
Test Band	Link	Signal	f_0 Frequency (MHz)	0.1 % PAPR (dB)
600 MHz Service	Downlink	LTE 5 MHz	622.87	8.35
		LTE 10 MHz	622.87	8.40
		LTE 20 MHz	627.00	8.48
ESMR		CDMA	868.38	7.68
		WCDMA	866.50	4.20
		LTE 5 MHz	866.50	8.24
Cellular		CDMA	877.42	7.68
		WCDMA	877.42	4.22
		LTE 5 MHz	877.42	8.32
		LTE 10 MHz	877.42	8.27
WCS		LTE 5 MHz	2 352.81	8.20
		LTE 10 MHz	2 355.00	8.38

Plot data of PAPR

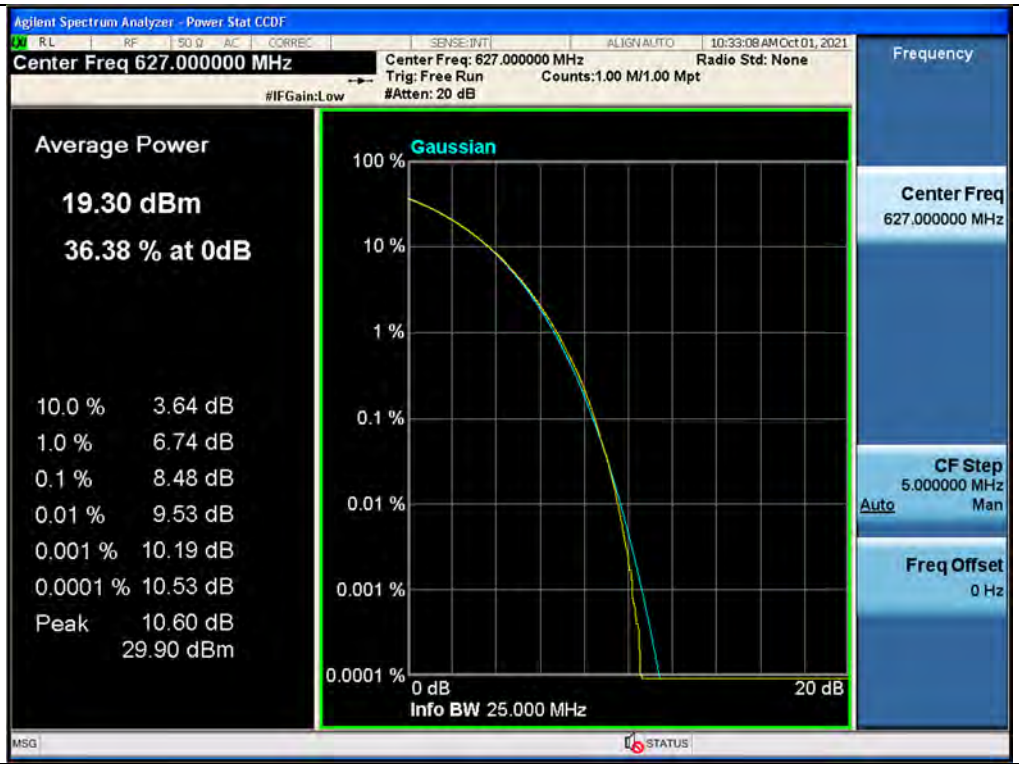
PAPR / 600 MHz Service / Downlink / LTE 5 MHz



PAPR / 600 MHz Service / Downlink / LTE 10 MHz



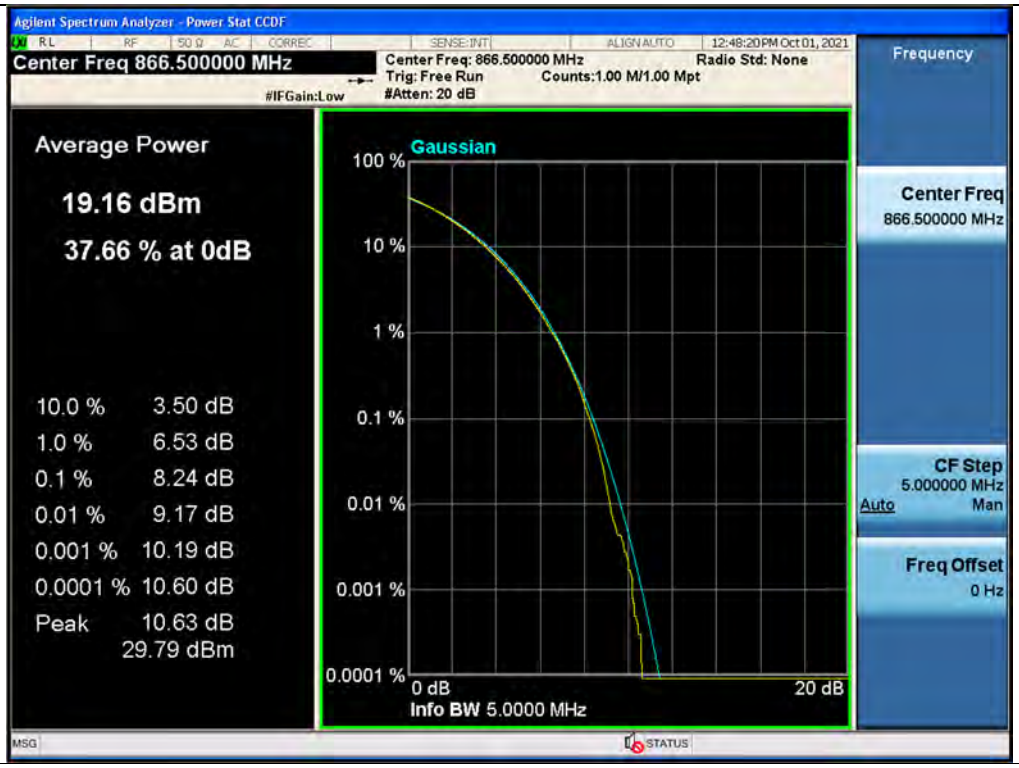
PAPR / 600 MHz Service / Downlink / LTE 20 MHz



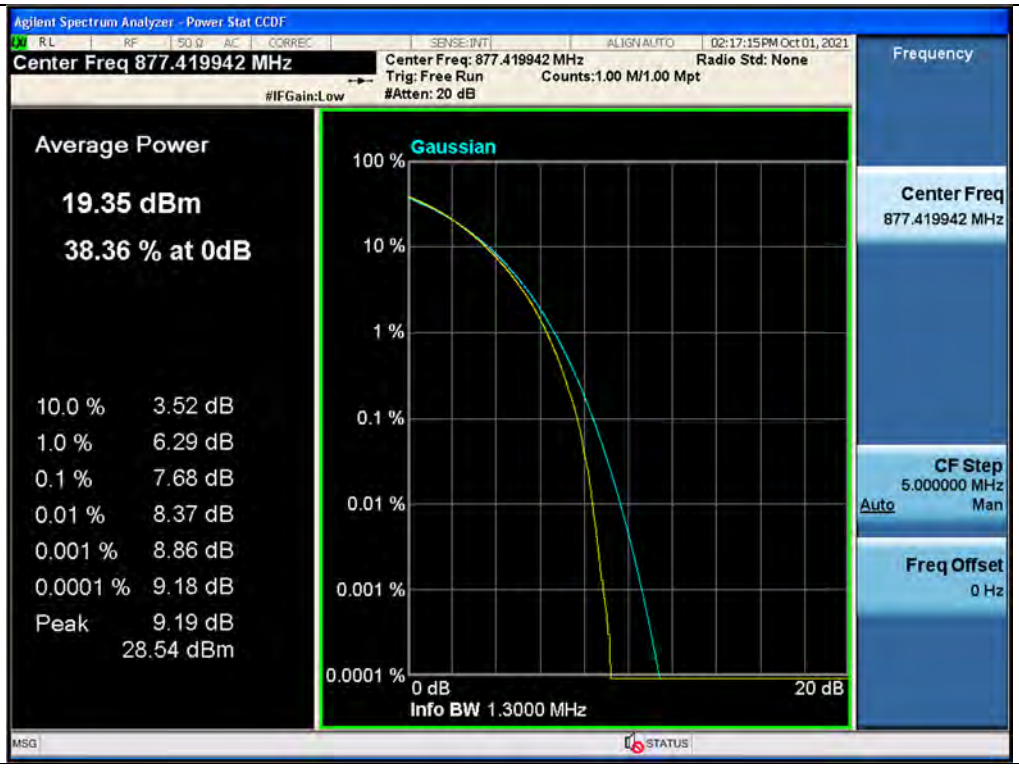
PAPR / ESMR / Downlink / CDMA

PAPR / ESMR / Downlink / WCDMA

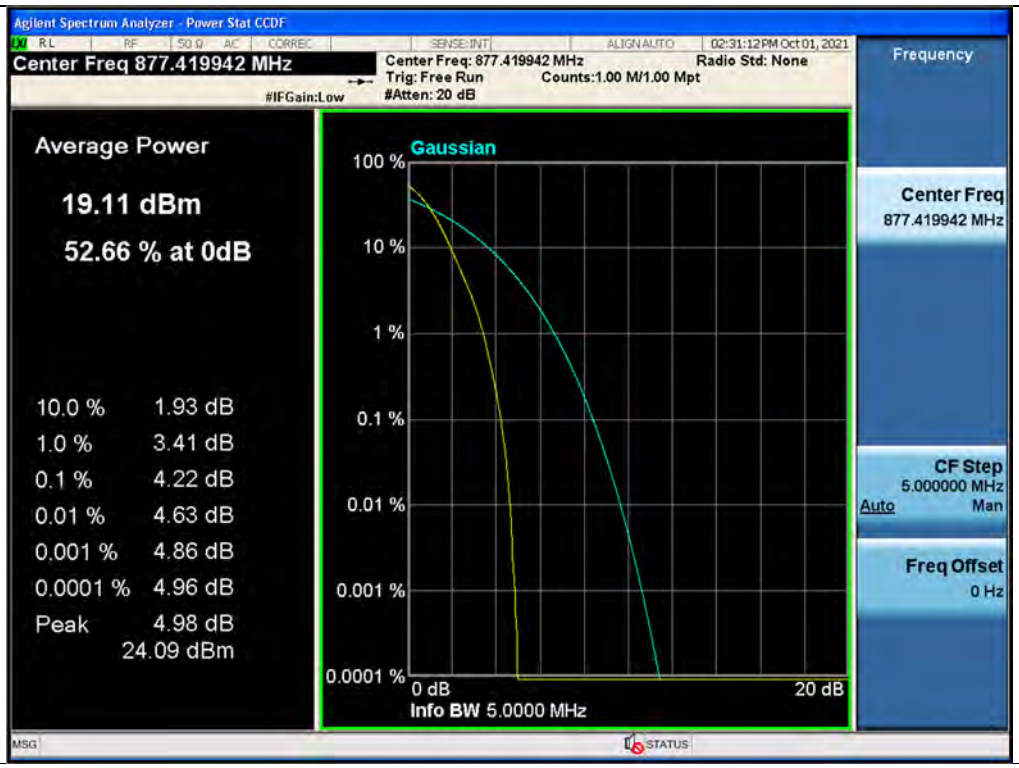
PAPR / ESMR / Downlink / LTE 5 MHz



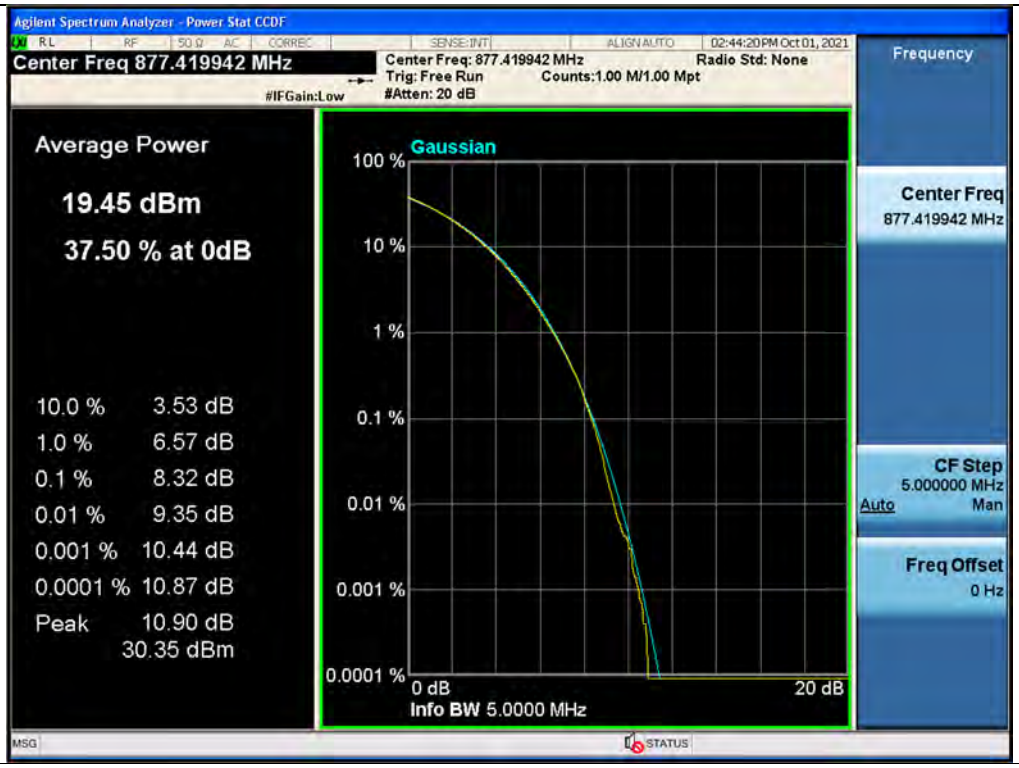
PAPR / Cellular / Downlink / CDMA



PAPR / Cellular / Downlink / WCDMA

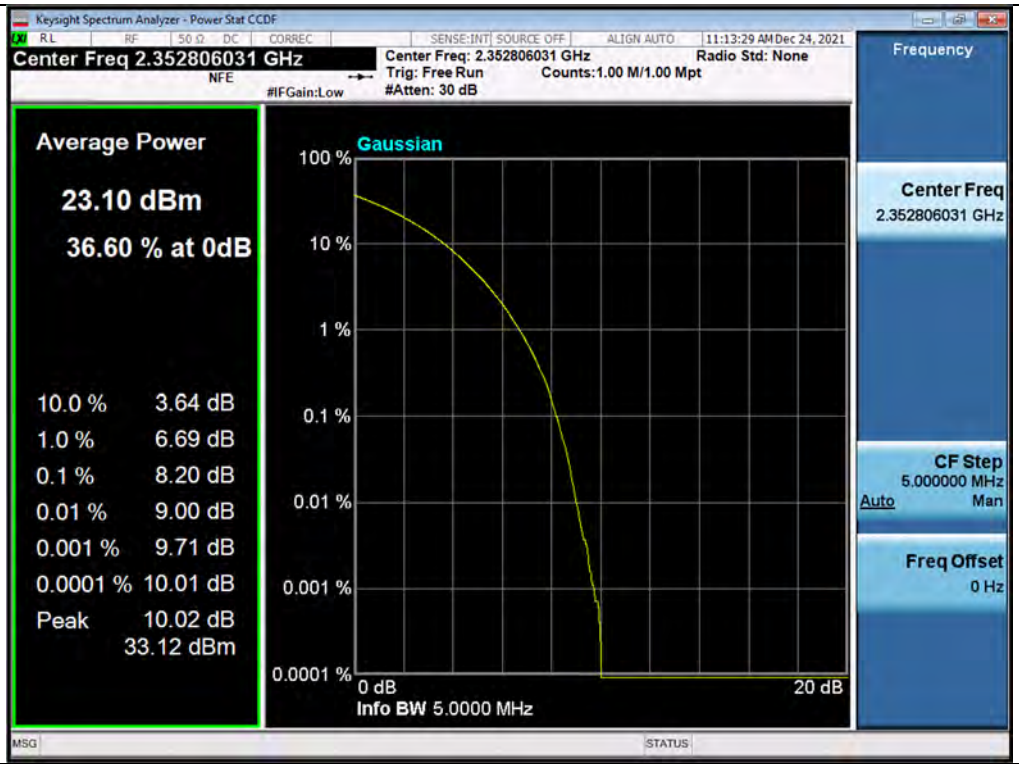


PAPR / Cellular / Downlink / LTE 5 MHz

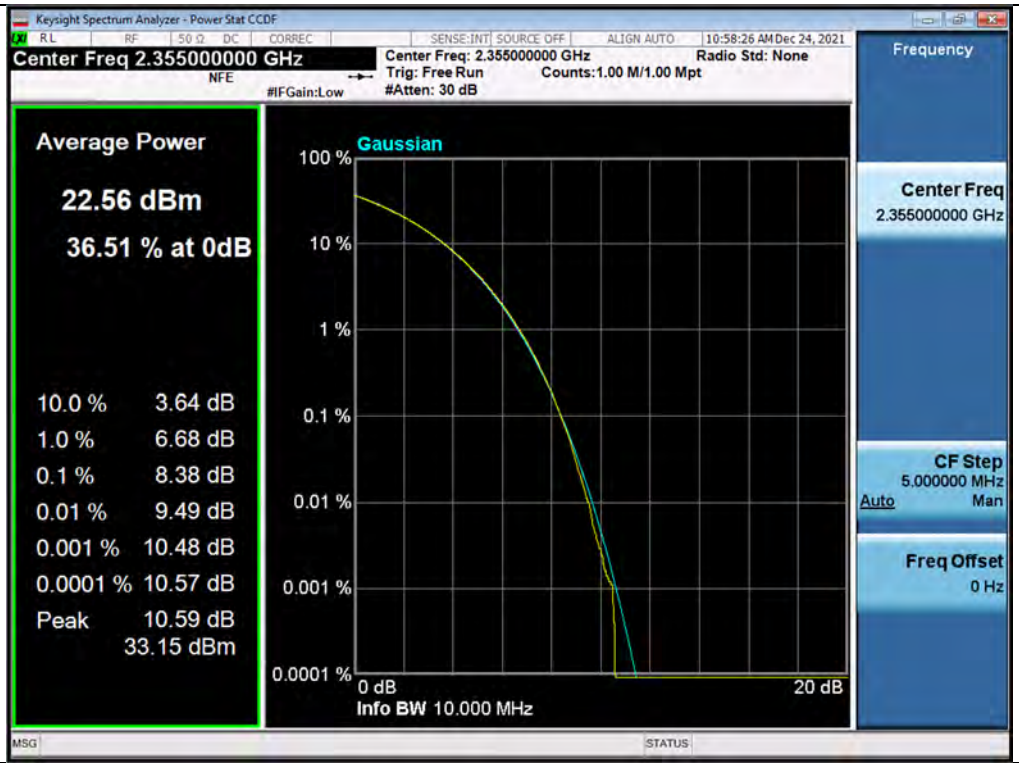


PAPR / Cellular / Downlink / LTE 10 MHz

PAPR / WCS / Downlink / LTE 5 MHz



PAPR / WCS / Downlink / LTE 10 MHz



5.5. OUT-OF-BAND/OUT-OF-BLOCK EMISSIONS AND SPURIOUS 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.

§ 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a reference bandwidth as follows:

(1) In the spectrum below 1 GHz, instrumentation should employ a reference bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy, provided that the measured power is integrated over the full required reference bandwidth (i.e., 100 kHz or 1 percent of emission bandwidth, as specified). 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.

(2) In the spectrum above 1 GHz, instrumentation should employ a reference bandwidth of 1 MHz.

(c) Alternative out of band emission limit. Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

(d) Interference caused by out of band emissions. If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

§ 27.53 Emission limits.

(a) For operations in the 2305-2320 MHz band and the 2345-2360 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power P (with averaging performed only during periods of transmission) within the licensed band(s) of operation, in watts, by the following amounts:

(1) For base and fixed stations' operations in the 2305-2320 MHz band and the 2345-2360 MHz band:

(i) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, and not less than 75 + 10 log (P) dB on all frequencies between 2320 and 2345 MHz;

(ii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 70 + 10 log (P) dB on all frequencies between 2287.5 and 2300 MHz, 72 + 10 log (P) dB on all frequencies between 2285 and 2287.5 MHz, and 75 + 10 log (P) dB below 2285 MHz;

(iii) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2362.5 MHz, 55 + 10 log (P) dB on all frequencies between 2362.5 and 2365 MHz, 70 + 10 log (P) dB on all frequencies between 2365 and 2367.5 MHz, 72 + 10 log (P) dB on all frequencies between 2367.5 and 2370 MHz, and 75 + 10 log (P) dB above 2370 MHz.

(5) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the channel blocks at 2305, 2310, 2315, 2320, 2345, 2350, 2355, and 2360 MHz, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 1 MHz). 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.

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a 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, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

§ 90.691 Emission mask requirements for EA-based systems.

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 $Log_{10}(f/6.1)$ decibels or 50 + 10 $Log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + $10Log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

Test Procedures:

Measurements were in accordance with the test methods section 3.6 of KDB 935210 D05 v01r04.

Spurious emissions shall be measured using a single test signal sequentially tuned to the low, middle, and high channels or frequencies within each authorized frequency band of operation.

Out-of-band/out-of-block emissions (including intermodulation products) shall be measured under each of the following two stimulus conditions:

a) two adjacent test signals sequentially tuned to the lower and upper frequency band/block edges;

b) a single test signal, sequentially tuned to the lowest and highest frequencies or channels within the frequency band/block under examination.

NOTE—Single-channel boosters that cannot accommodate two simultaneous signals within the passband may be excluded from the test stipulated in step a).

3.6.2 Out-of-band/out-of-block emissions conducted measurements

a) Connect a signal generator to the input of the EUT.
If the signal generator is not capable of generating two modulated carriers simultaneously, then two discrete signal generators can be connected with an appropriate combining network to support this two-signal test.

b) Set the signal generator to produce two AWGN signals as previously described.

c) Set the center frequencies such that the AWGN signals occupy adjacent channels, as defined by industry standards such as 3GPP or 3GPP2, at the upper edge of the frequency band or block under test.

d) Set the composite power levels such that the input signal is just below the AGC threshold, but not more than 0.5 dB below. The composite power can be measured using the procedures provided in KDB Publication 971168, but it will be necessary to expand the power integration bandwidth so as to include both of the transmit channels.

e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.
f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band.
g) Set the VBW = 3 × RBW.
h) Set the detector to power averaging (rms) detector.
i) Set the Sweep time = auto-couple.
j) Set the spectrum analyzer start frequency to the upper block edge frequency, and the stop frequency to the upper block edge frequency plus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively.
k) Trace average at least 100 traces in power averaging (rms) mode.
l) Use the marker function to find the maximum power level.
m) Capture the spectrum analyzer trace of the power level for inclusion in the test report.
n) Repeat steps k) to m) with the composite input power level set to 3 dB above the AGC threshold.
o) Reset the frequencies of the input signals to the lower edge of the frequency block or band under test.
p) Reset the spectrum analyzer start frequency to the lower block edge frequency minus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively, and the stop frequency to the lower band or block edge frequency.
q) Repeat steps k) to n).
r) Repeat steps a) to q) with the signal generator configured for a single test signal tuned as close as possible to the block edges.
s) Repeat steps a) to r) with the narrowband test signal.
t) Repeat steps a) to s) for all authorized frequency bands or blocks used by the EUT.

3.6.3 Spurious emissions conducted measurements

a) Connect a signal generator to the input of the EUT.
b) Set the signal generator to produce the broadband test signal as previously described.
c) Set the center frequency of the test signal to the lowest available channel within the frequency band or block.
d) Set the EUT input power to a level that is just below the AGC threshold, but not more than 0.5 dB below.
e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.
f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band of operation.
g) Set the VBW ≥ 3 × RBW.
h) Set the Sweep time = auto-couple.
i) Set the spectrum analyzer start frequency to the lowest RF signal generated in the equipment, without going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 1 MHz.
The number of measurement points in each sweep must be ≥ (2 × span/RBW), which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.
j) Select the power averaging (rms) detector function.
k) Trace average at least 10 traces in power averaging (rms) mode.
l) Use the peak marker function to identify the highest amplitude level over each measured frequency range.

Record the frequency and amplitude and capture a plot for inclusion in the test report.

m) Reset the spectrum analyzer start frequency to the upper band/block edge frequency plus 1 MHz, and the spectrum analyzer stop frequency to 10 times the highest frequency of the fundamental emission. The number of measurement points in each sweep must be ≥ (2 × span/RBW), which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.

n) Trace average at least 10 traces in power averaging (rms) mode.

o) Use the peak marker function to identify the highest amplitude level over each of the measured frequency ranges. Record the frequency and amplitude and capture a plot for inclusion in the test report; also provide tabular data, if required.

p) Repeat steps i) to o) with the input test signals firstly tuned to a middle band/block frequency/channel, and then tuned to a high band/block frequency/channel.

q) Repeat steps b) to p) with the narrowband test signal.

r) Repeat steps b) to q) for all authorized frequency bands/blocks used by the EUT.

Note:

1. In some bands, RBW was reduced to 0.1 %, 1 % and 10% of the reference bandwidth for measuring unwanted emission level (typically, 1 MHz if the authorized frequency band is above 1 GHz) and power was integrated according to section 5.7.2 of ANSI C63.26-2015.

Reduced RBW	0.1 %	1 %	10 %
Below 1 GHz (Ref.RBW: 100 kHz)	-	20 dB	10 dB
Above 1 GHz (Ref.RBW: 1 MHz)	30 dB	20 dB	10 dB

2. Intermodulation test is not performed for 5G NR 100 MHz signal, because the band cannot accommodate two signals. (Refer to Section 3.6.1 of KDB 935210 D05)
3. Among the data of simultaneous and single band emission conditions, the single emission condition is the worst.

Test Results: Plot data of Out-of-band/out-of-block emissions

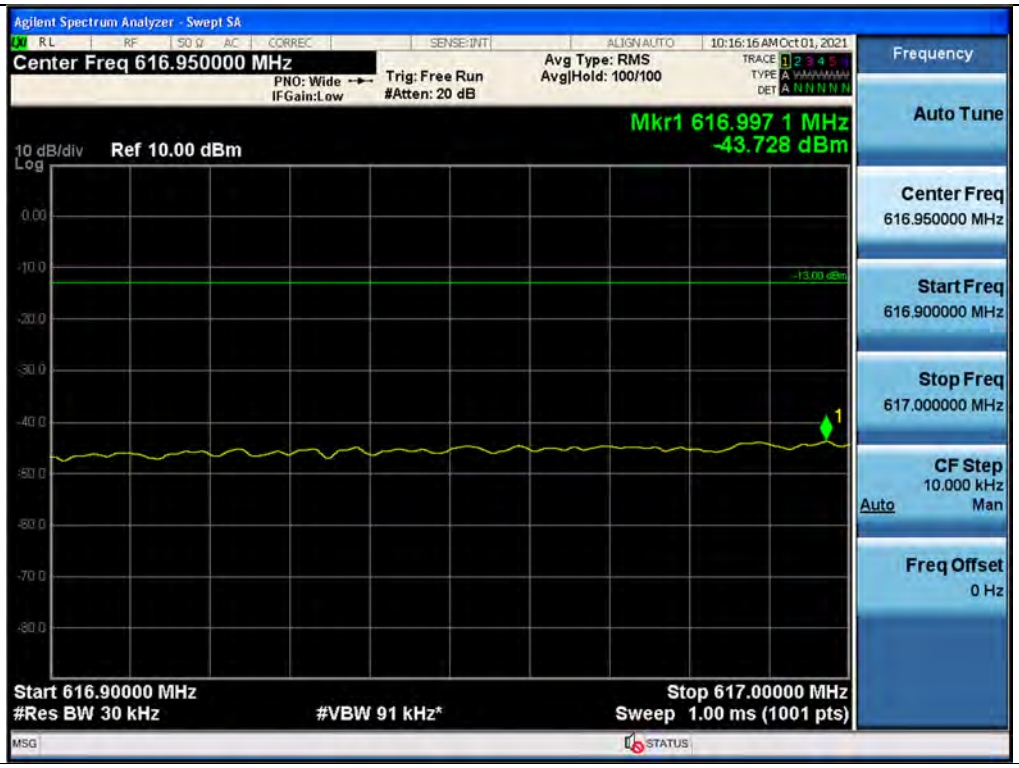
Out-of-band (two adjacent test signals) / 600 MHz Service / Downlink / LTE 5 MHz / Lower

Out-of-band (two adjacent test signals) / 600 MHz Service / Downlink / LTE 5 MHz / Upper

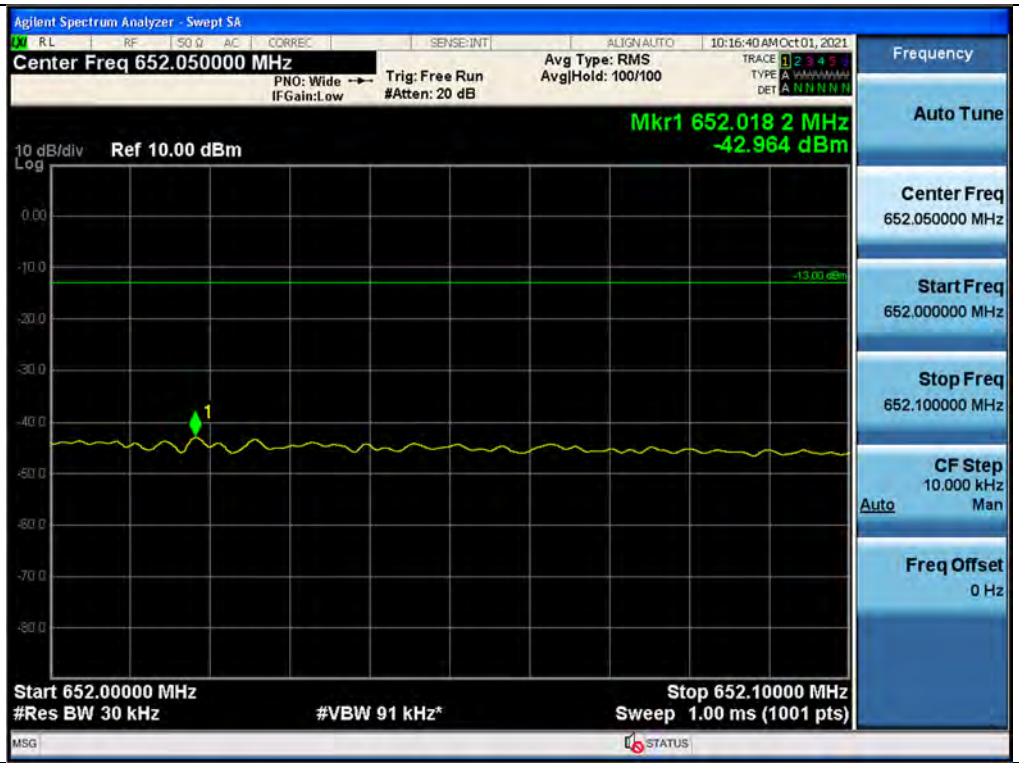
+3 dB above Out-of-band (two adjacent test signals) / 600 MHz Service / Downlink / LTE 5 MHz / Lower

+3 dB above Out-of-band (two adjacent test signals) / 600 MHz Service / Downlink / LTE 5 MHz / Upper

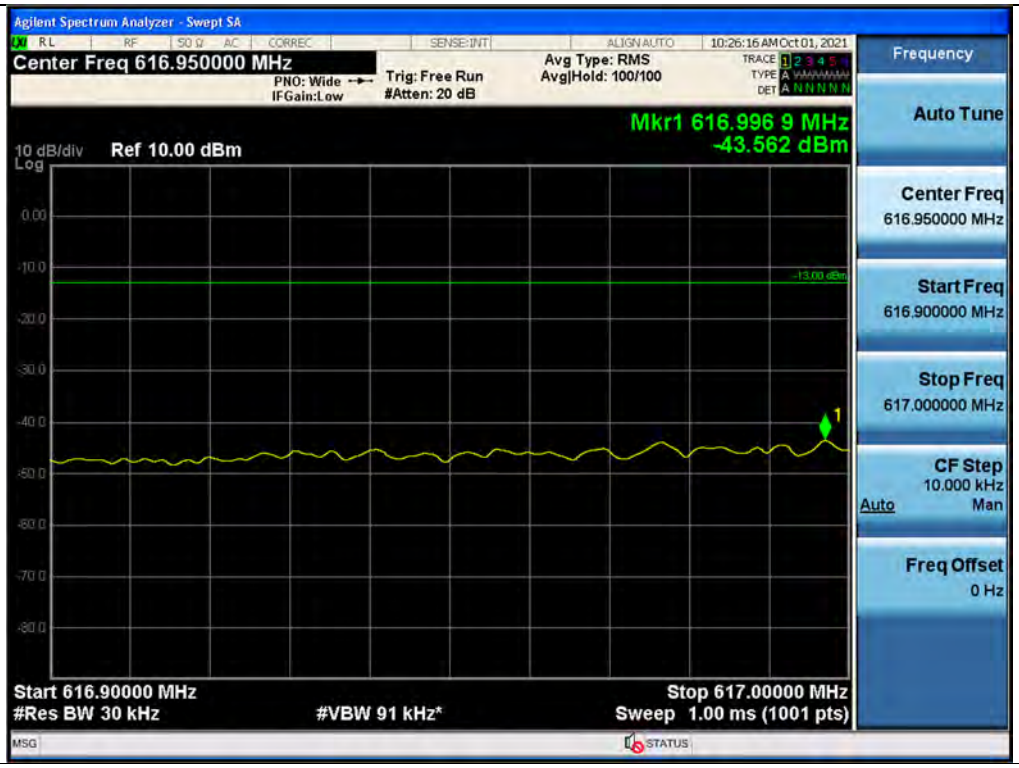
Out-of-band (two adjacent test signals) / 600 MHz Service / Downlink / LTE 10 MHz / Lower



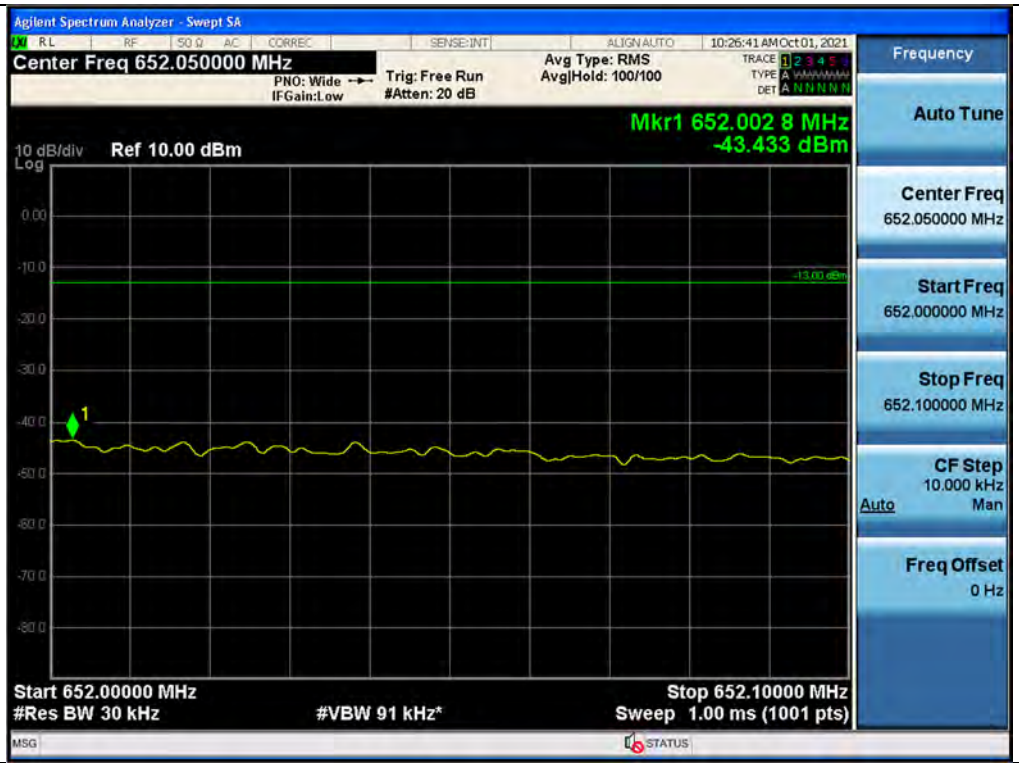
Out-of-band (two adjacent test signals) / 600 MHz Service / Downlink / LTE 10 MHz / Upper



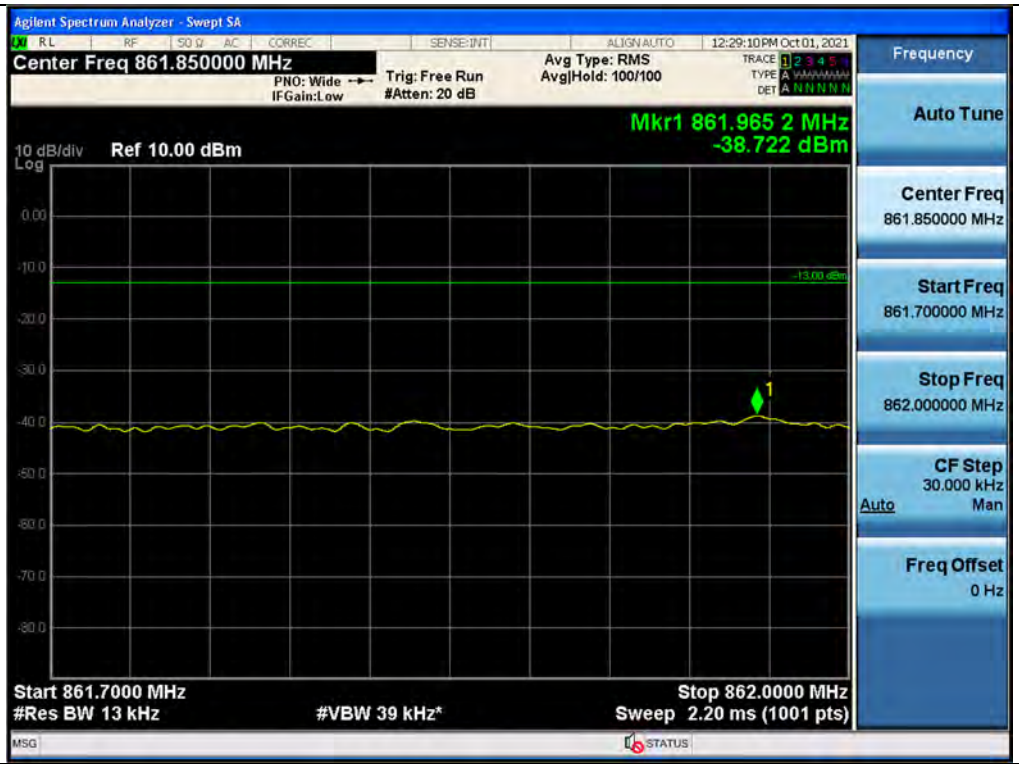
+3 dB above Out-of-band (two adjacent test signals) / 600 MHz Service / Downlink / LTE 10 MHz / Lower



+3 dB above Out-of-band (two adjacent test signals) / 600 MHz Service / Downlink / LTE 10 MHz / Upper

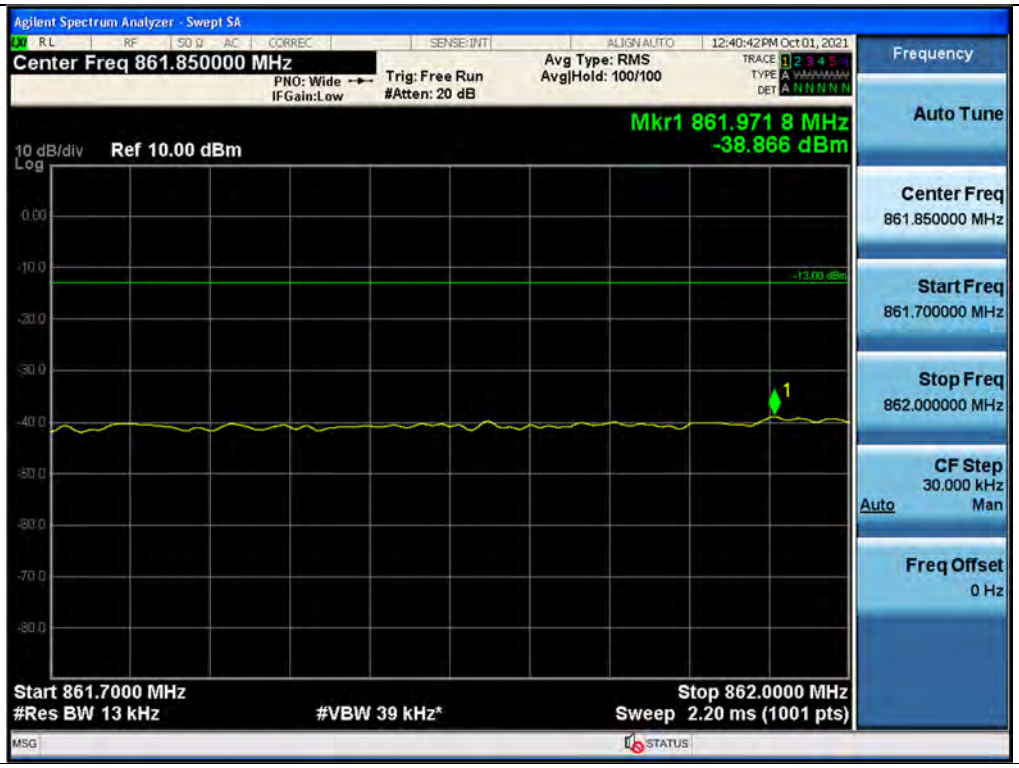


Out-of-band (two adjacent test signals) / ESMR / Downlink / CDMA / Lower

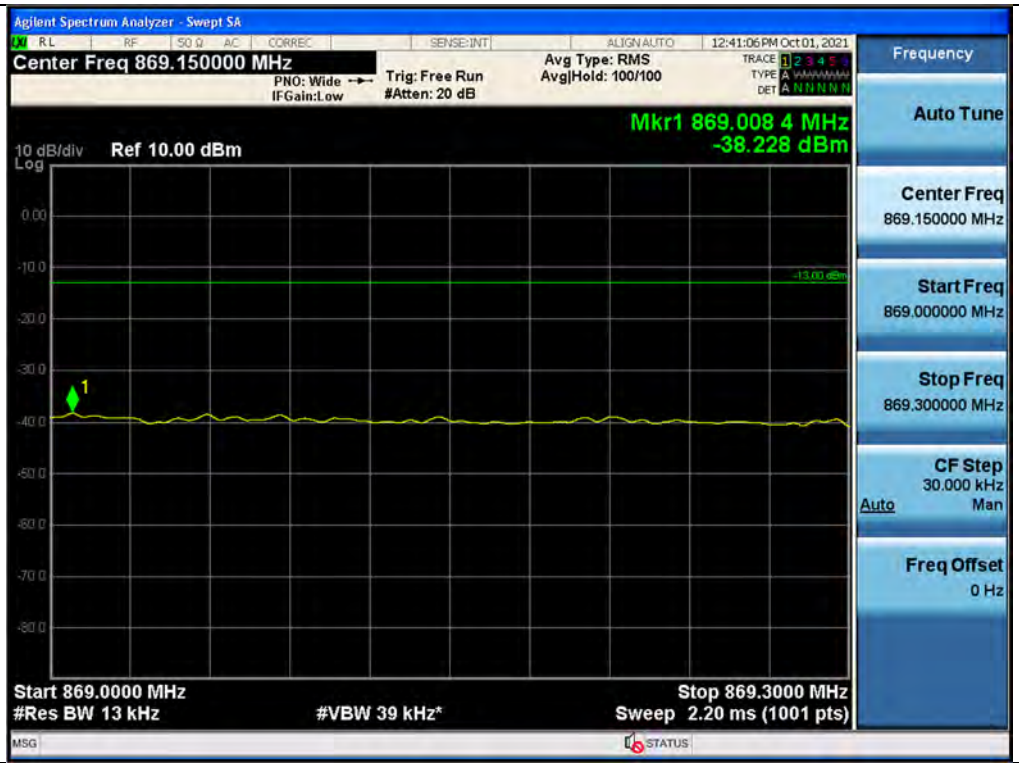


Out-of-band (two adjacent test signals) / ESMR / Downlink / CDMA / Upper

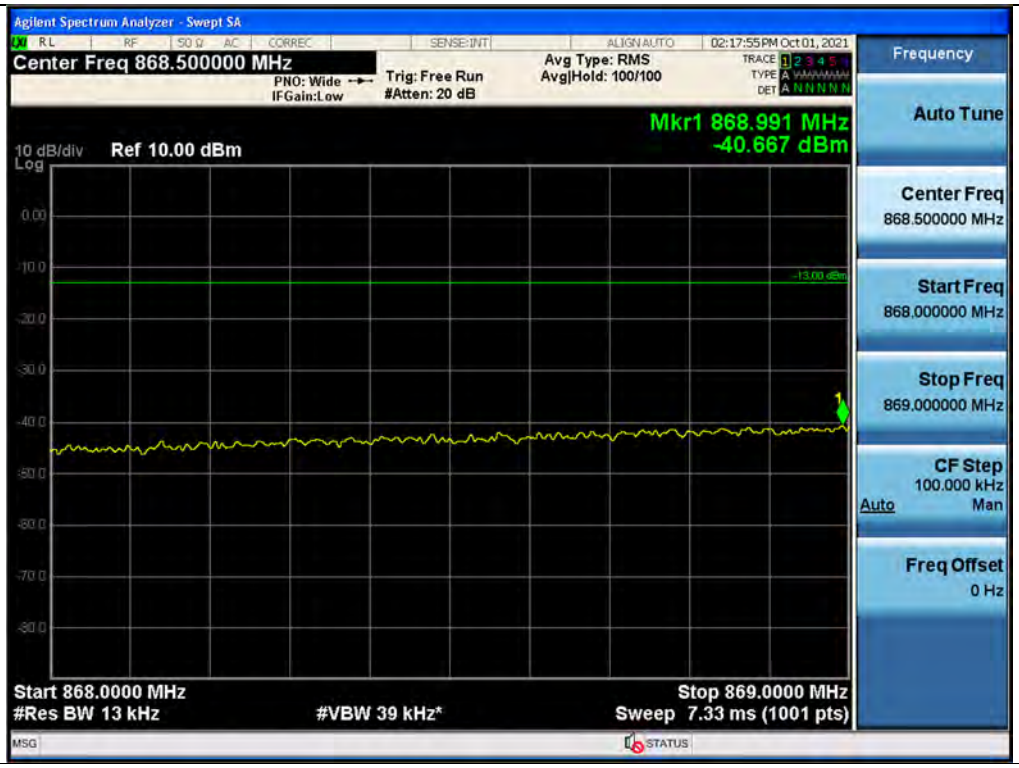
+3 dB above Out-of-band (two adjacent test signals) / ESMR / Downlink / CDMA / Lower



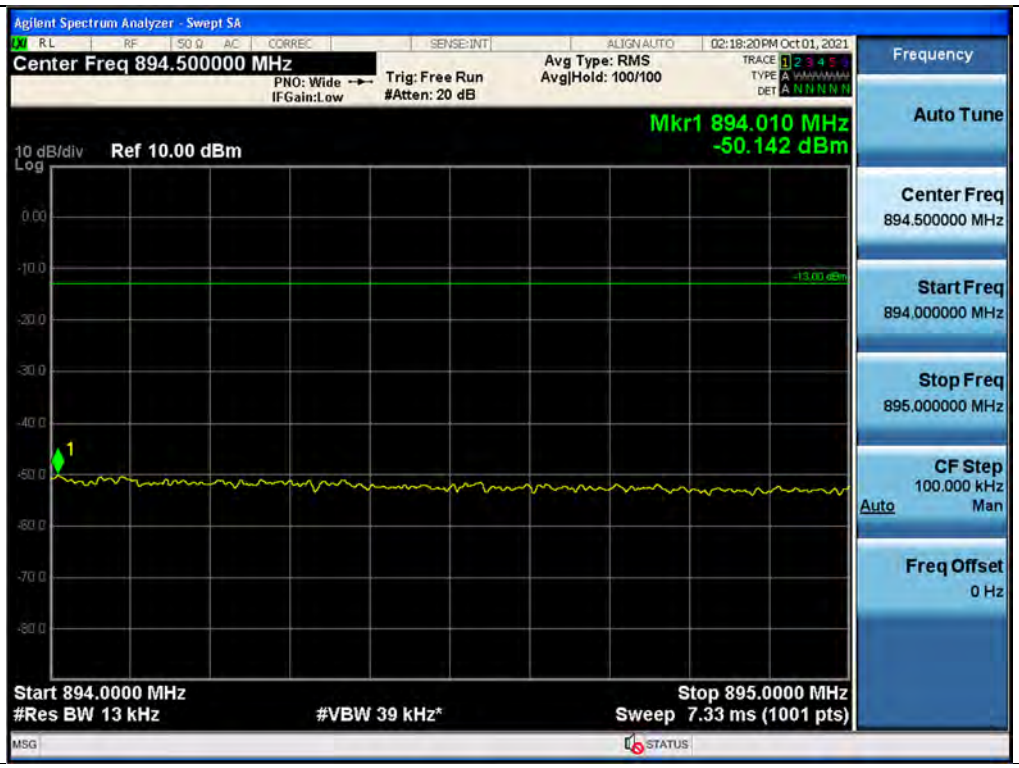
+3 dB above Out-of-band (two adjacent test signals) / ESMR / Downlink / CDMA / Upper



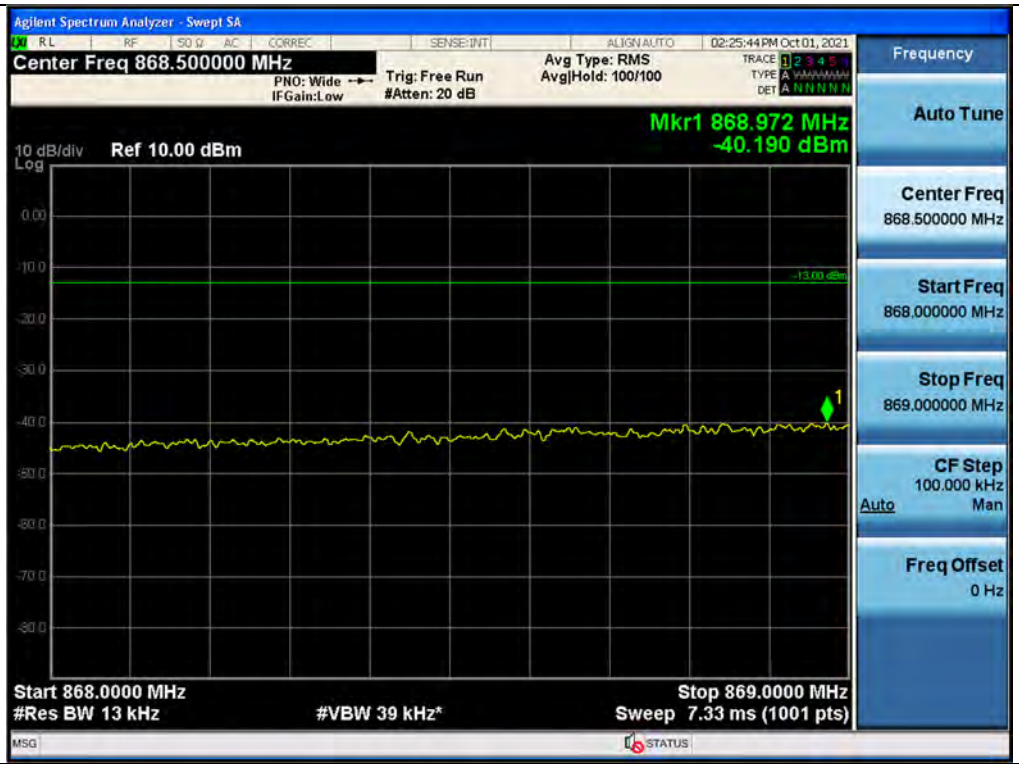
Out-of-band (two adjacent test signals) / Cellular / Downlink / CDMA / Lower



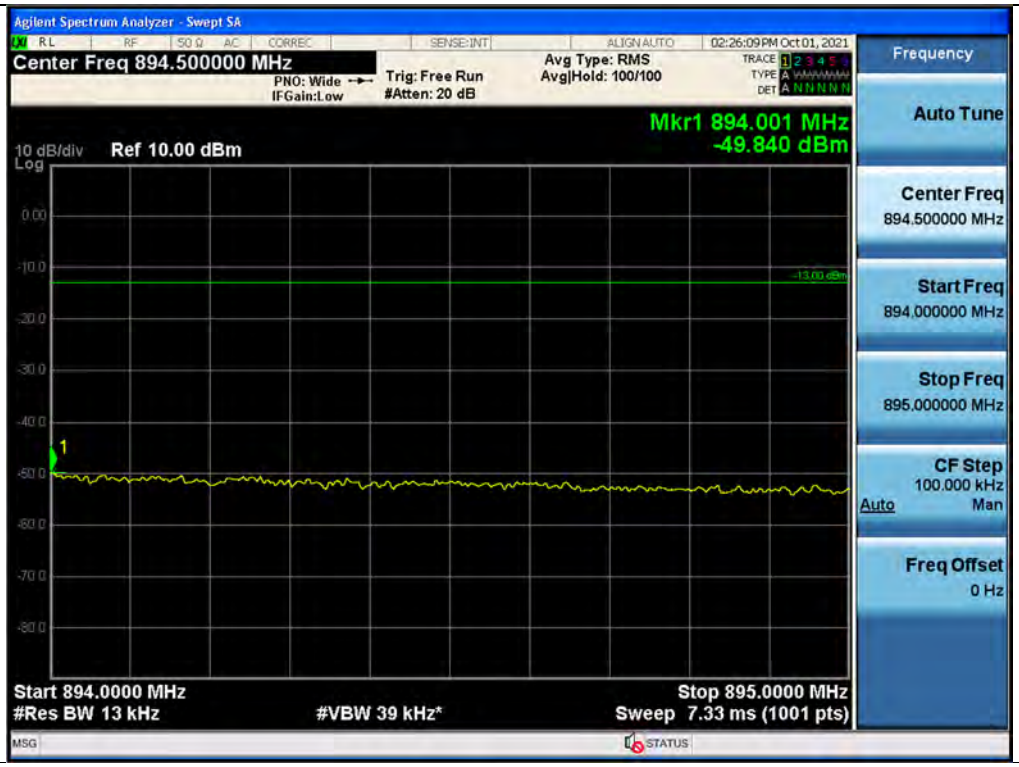
Out-of-band (two adjacent test signals) / Cellular / Downlink / CDMA / Upper



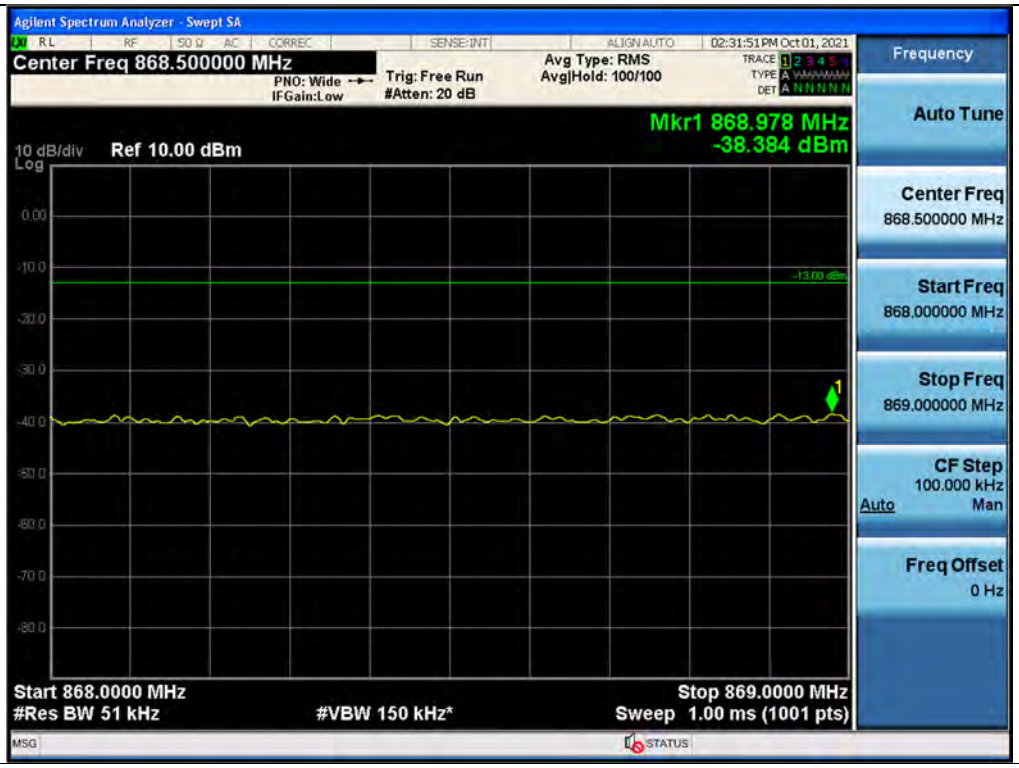
+3 dB above Out-of-band (two adjacent test signals) / Cellular / Downlink / CDMA / Lower



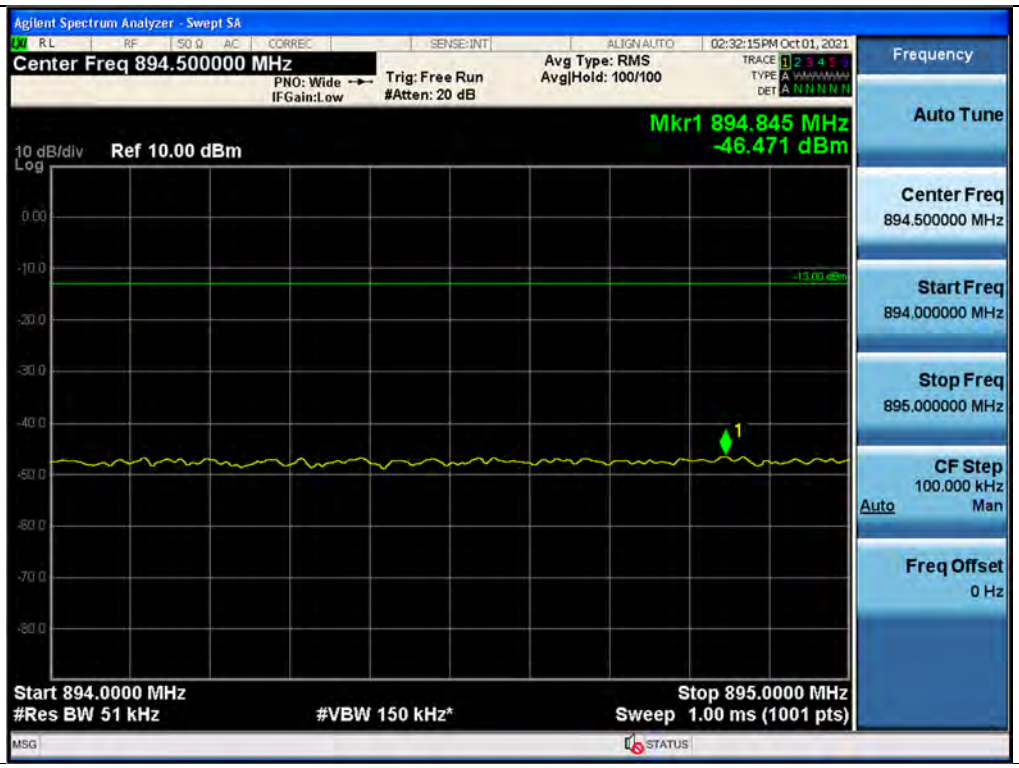
+3 dB above Out-of-band (two adjacent test signals) / Cellular / Downlink / CDMA / Upper



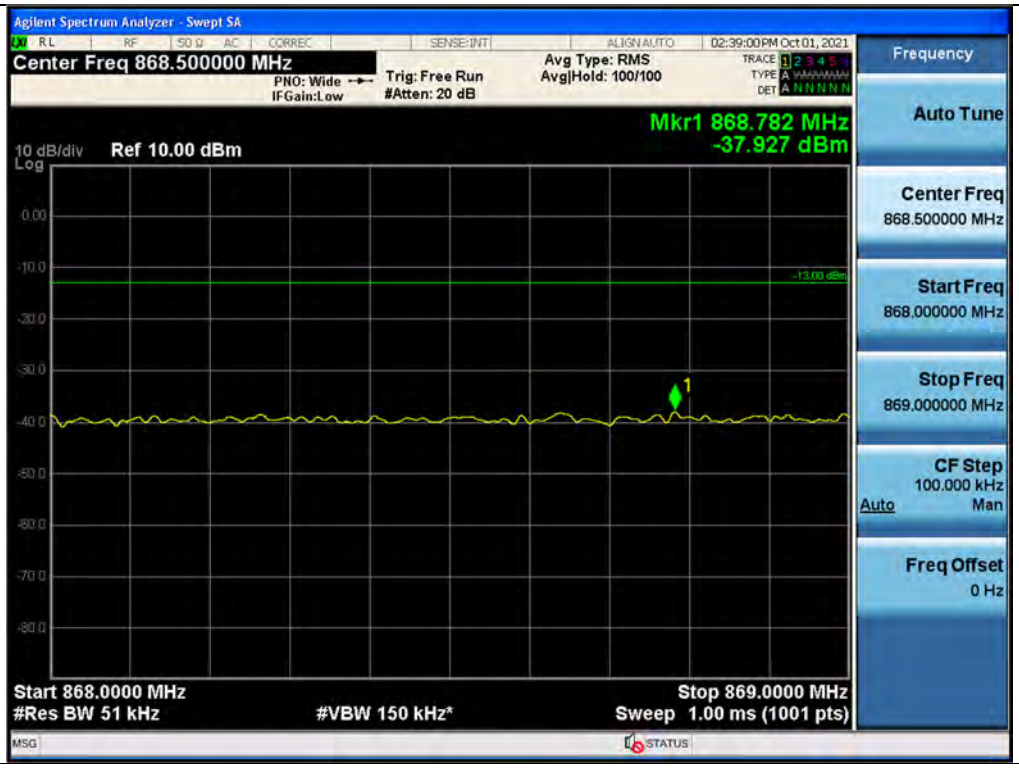
Out-of-band (two adjacent test signals) / Cellular / Downlink / WCDMA / Lower



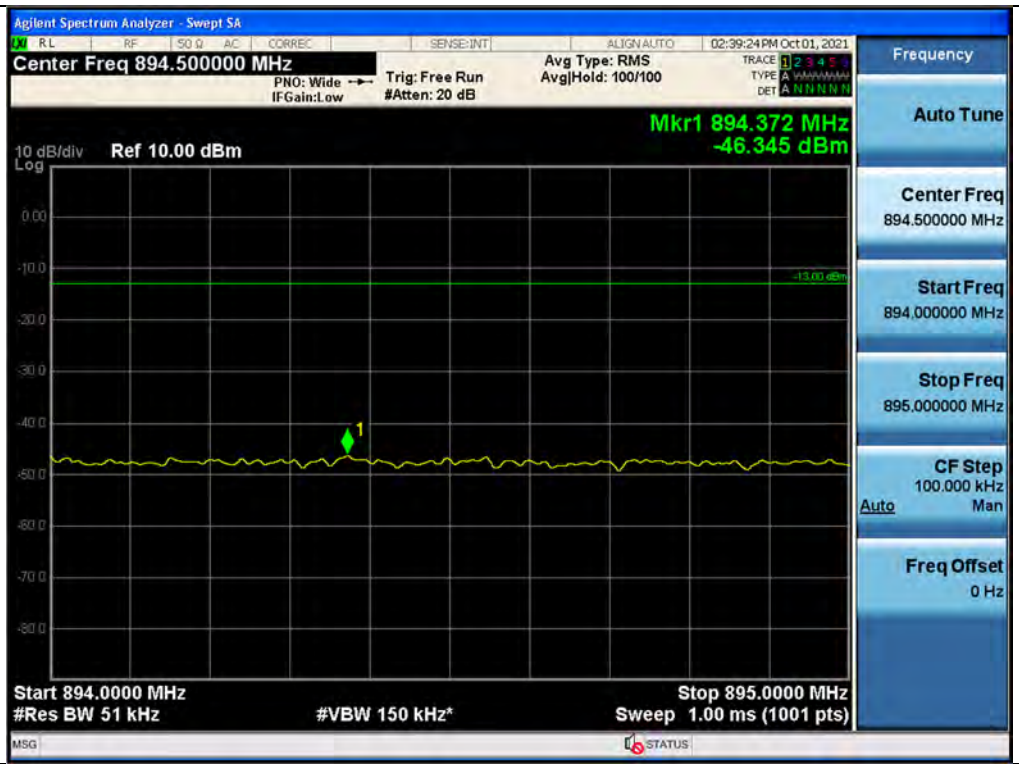
Out-of-band (two adjacent test signals) / Cellular / Downlink / WCDMA / Upper



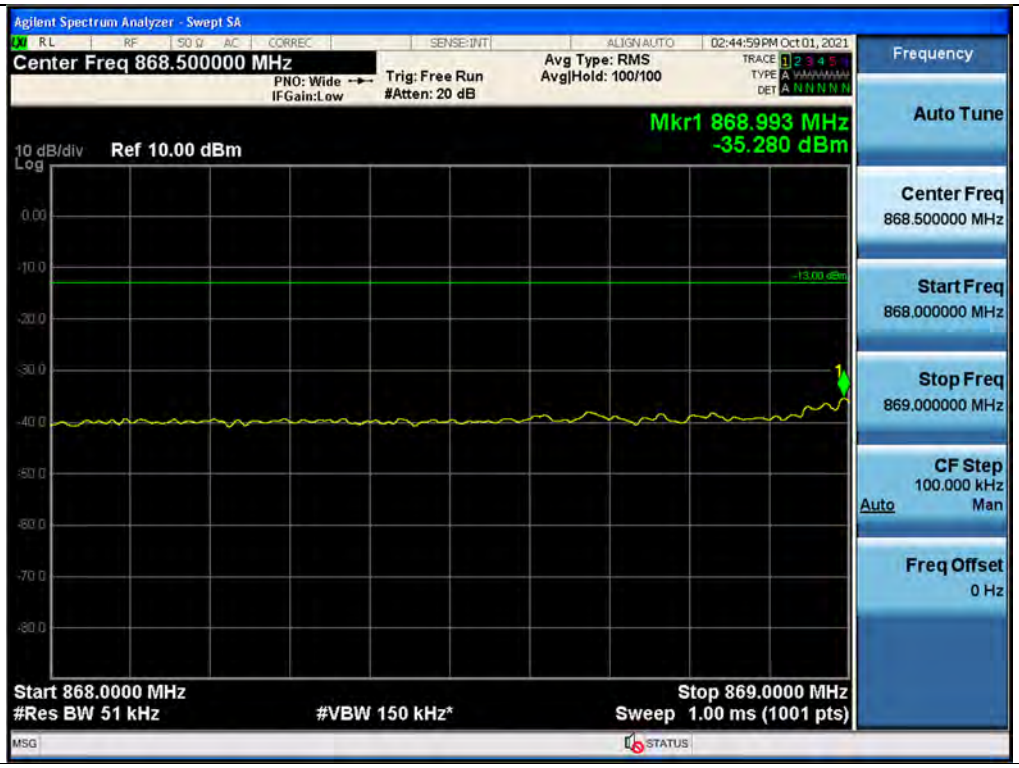
+3 dB above Out-of-band (two adjacent test signals) / Cellular / Downlink / WCDMA / Lower



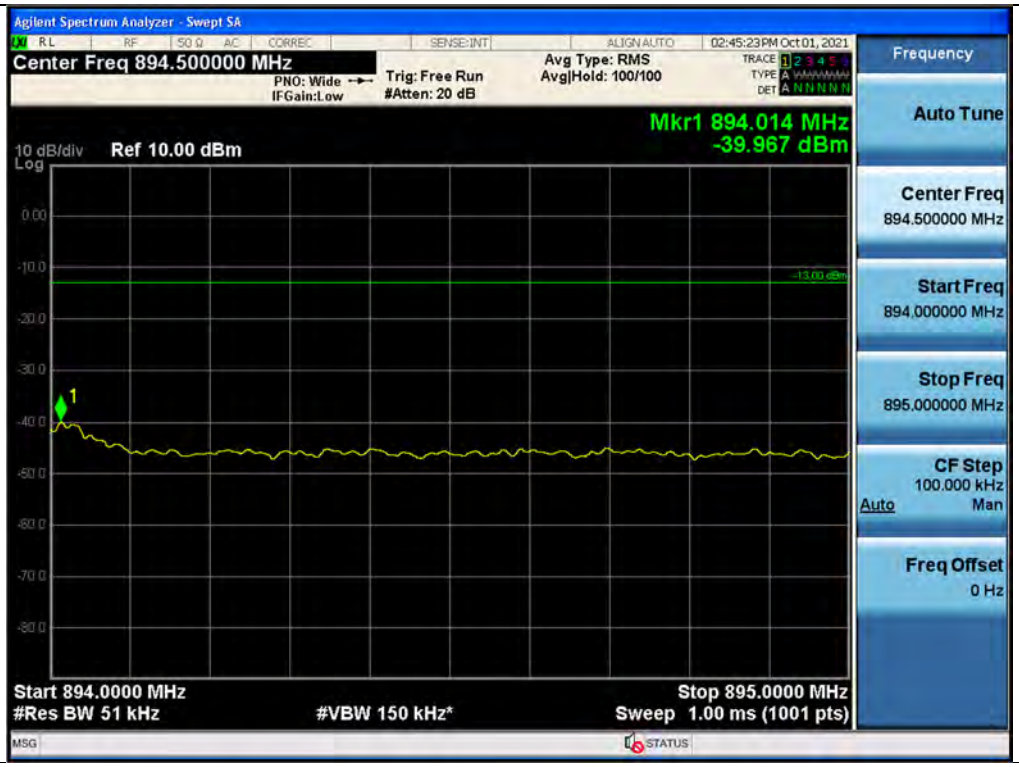
+3 dB above Out-of-band (two adjacent test signals) / Cellular / Downlink / WCDMA / Upper



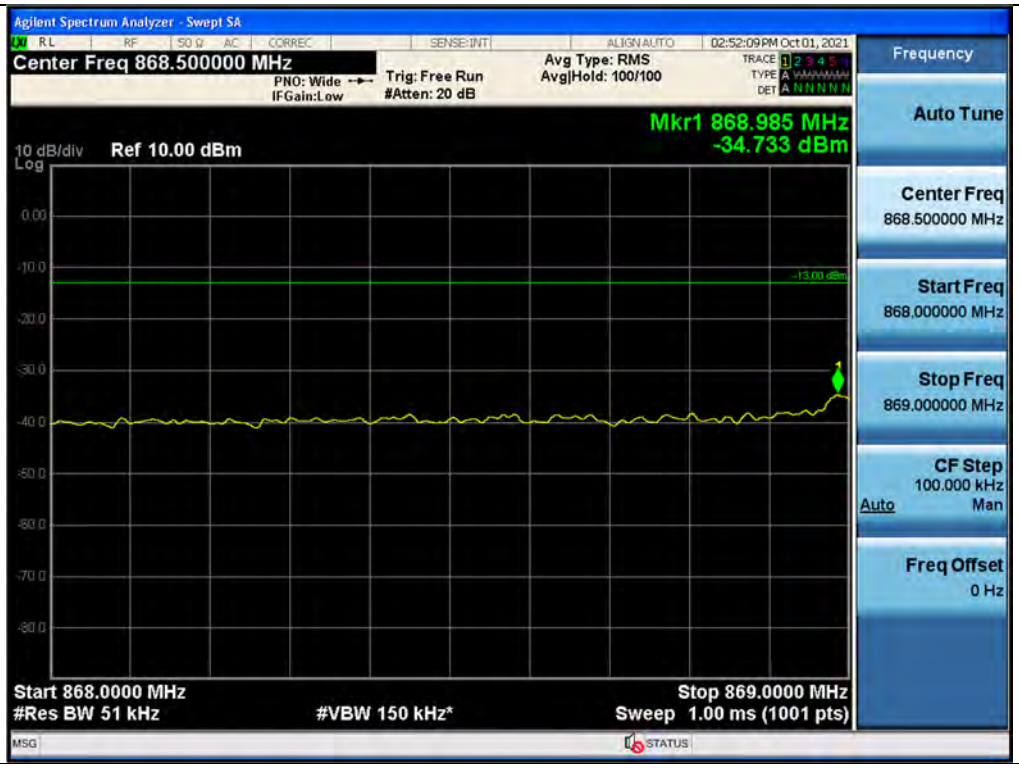
Out-of-band (two adjacent test signals) / Cellular / Downlink / LTE 5 MHz / Lower



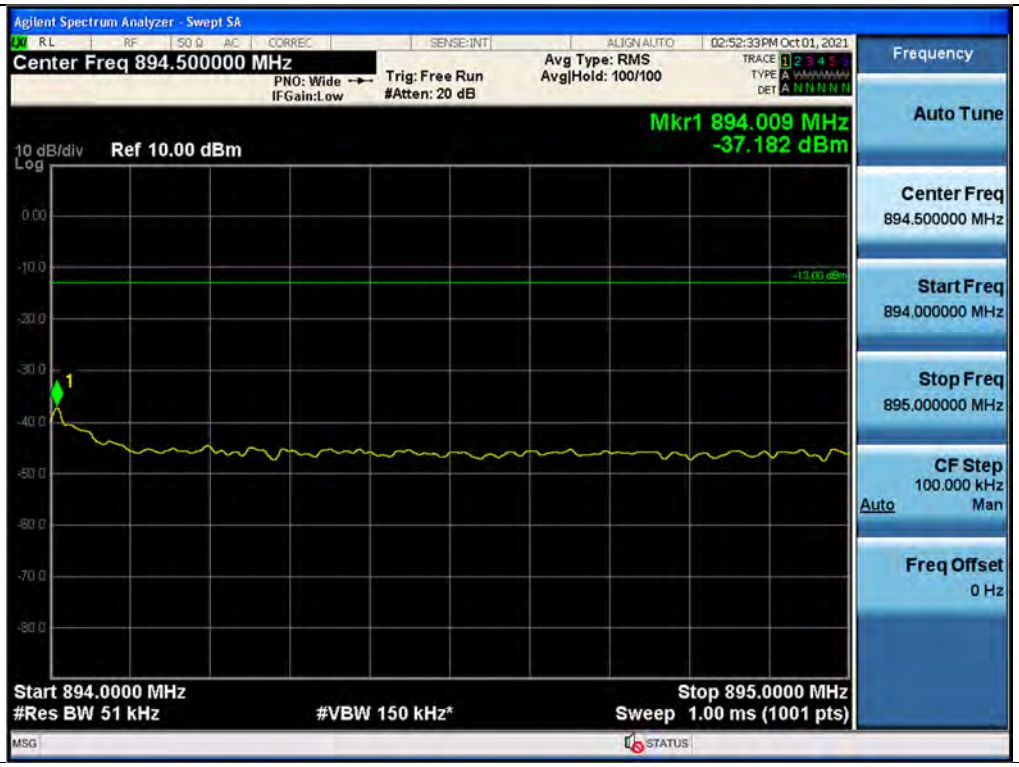
Out-of-band (two adjacent test signals) / Cellular / Downlink / LTE 5 MHz / Upper



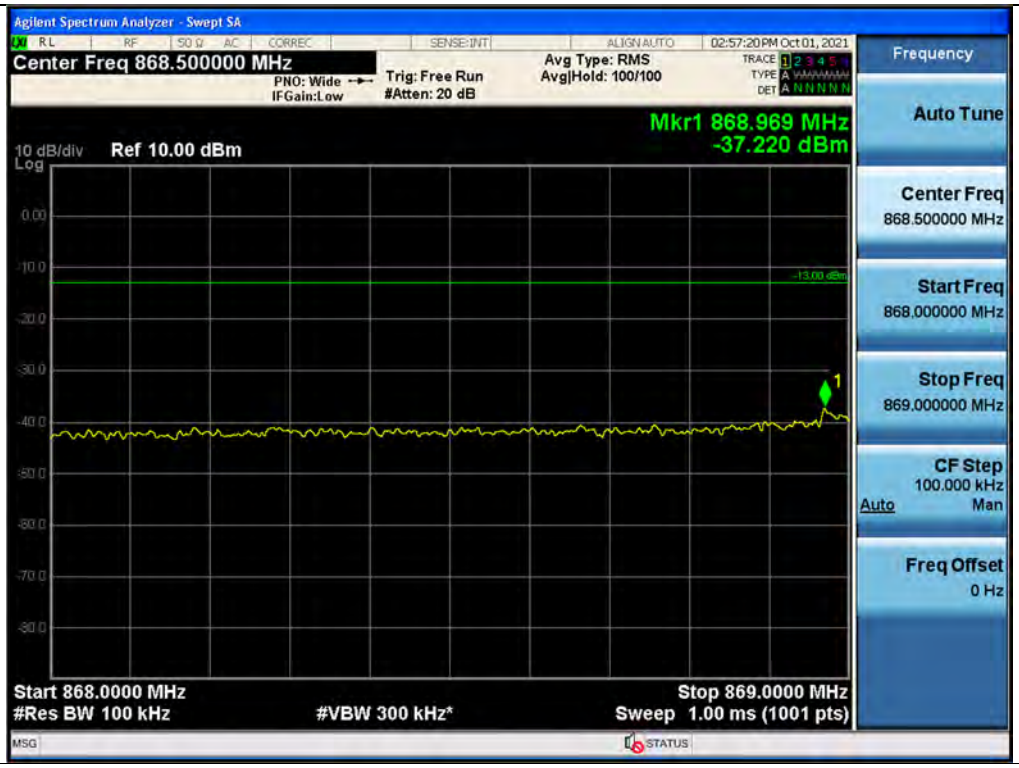
+3 dB above Out-of-band (two adjacent test signals) / Cellular / Downlink / LTE 5 MHz / Lower



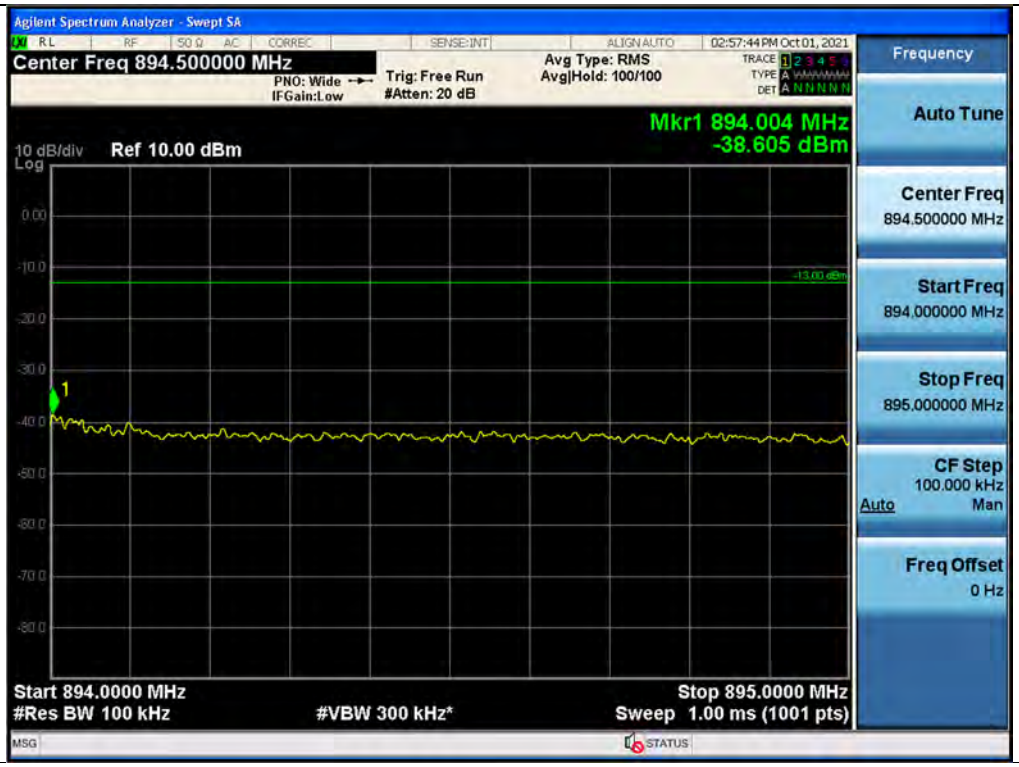
+3 dB above Out-of-band (two adjacent test signals) / Cellular / Downlink / LTE 5 MHz / Upper



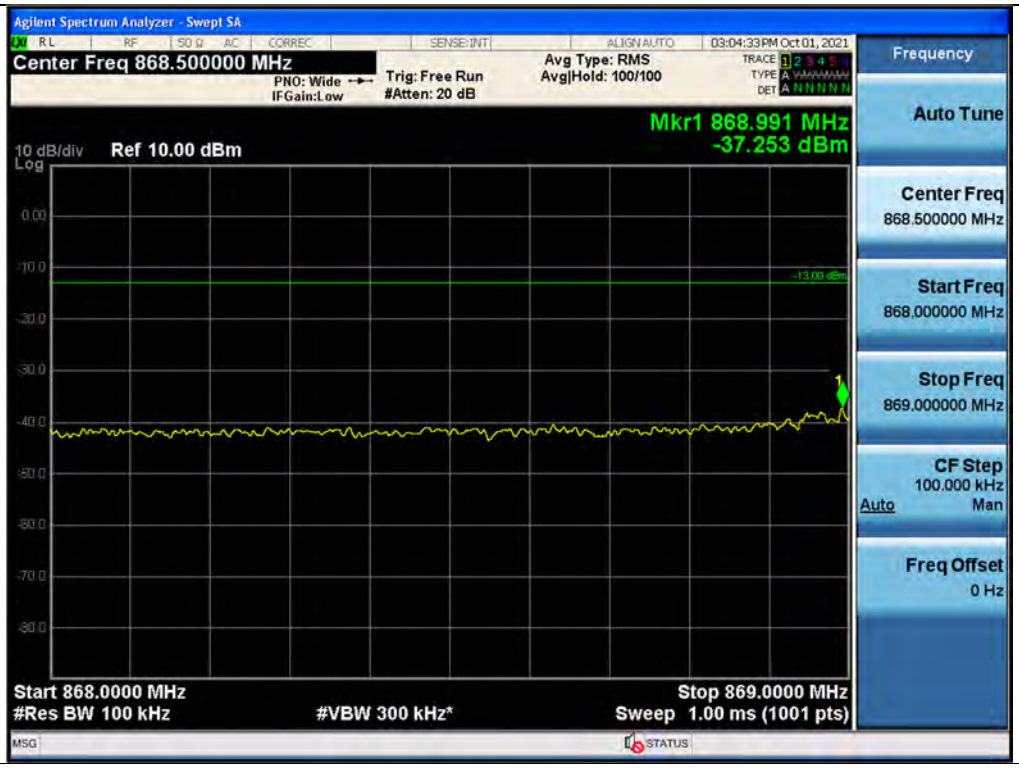
Out-of-band (two adjacent test signals) / Cellular / Downlink / LTE 10 MHz / Lower



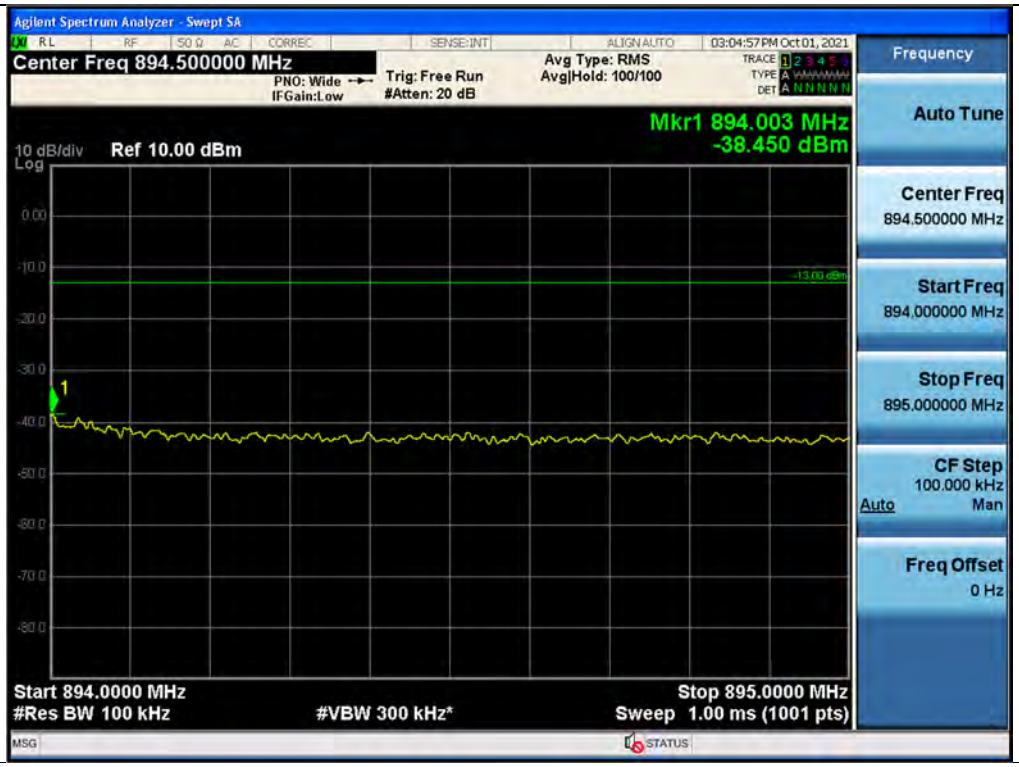
Out-of-band (two adjacent test signals) / Cellular / Downlink / LTE 10 MHz / Upper



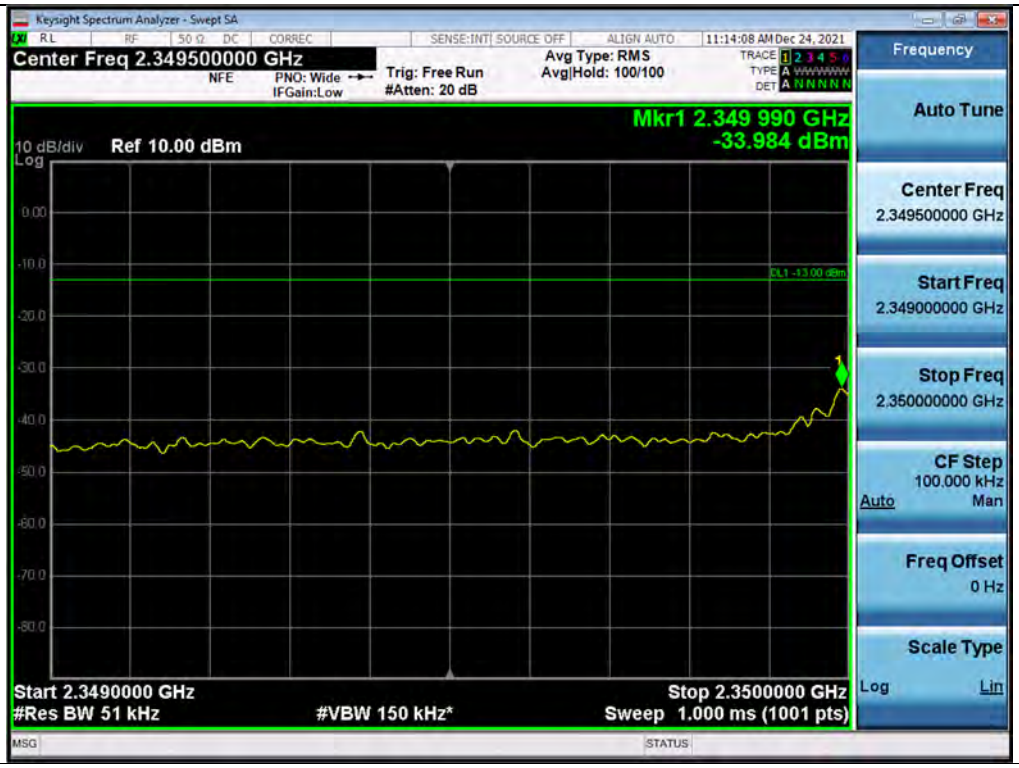
+3 dB above Out-of-band (two adjacent test signals) / Cellular / Downlink / LTE 10 MHz / Lower



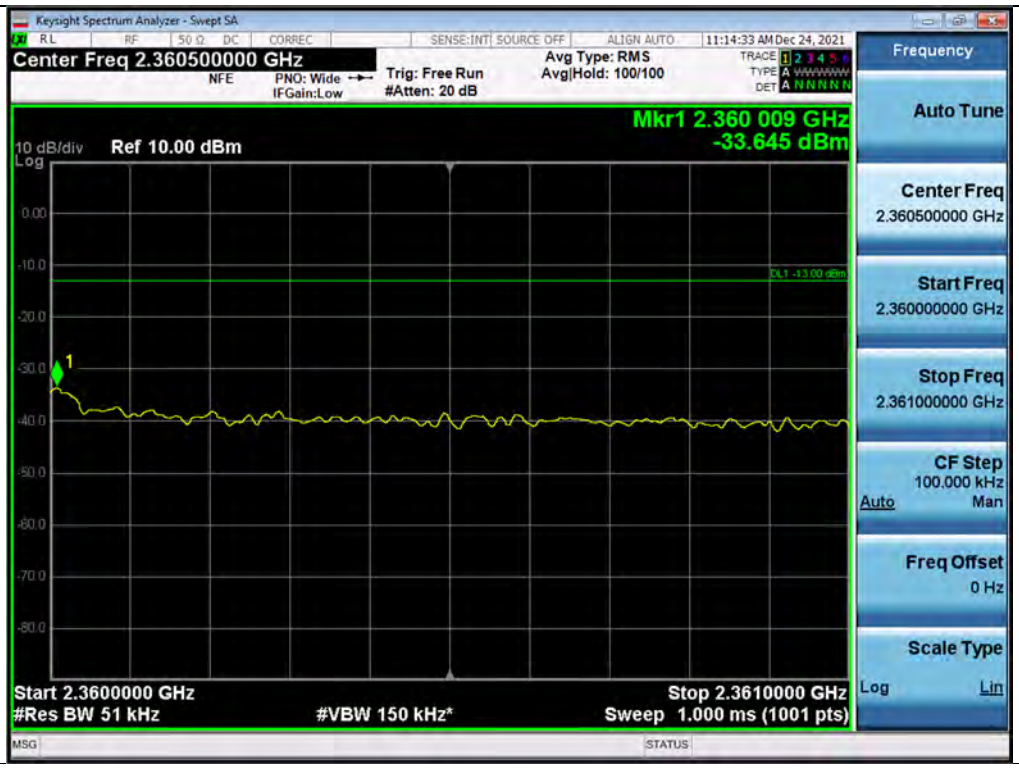
+3 dB above Out-of-band (two adjacent test signals) / Cellular / Downlink / LTE 10 MHz / Upper



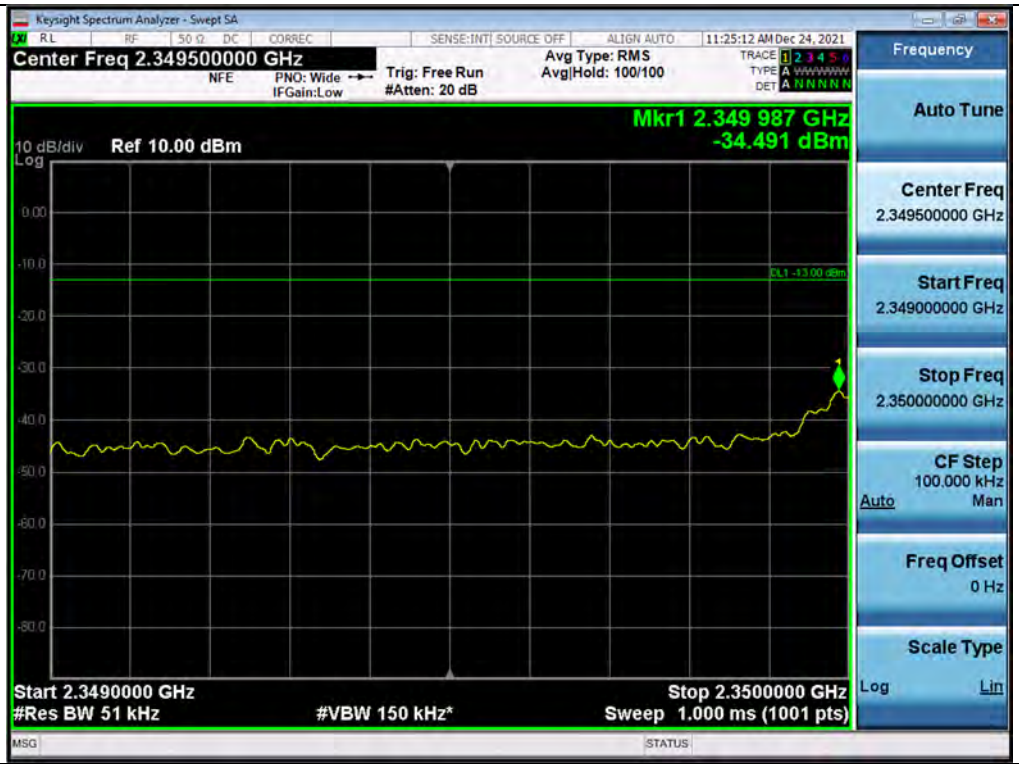
Out-of-band (two adjacent test signals) / WCS / Downlink / LTE 5 MHz / Lower



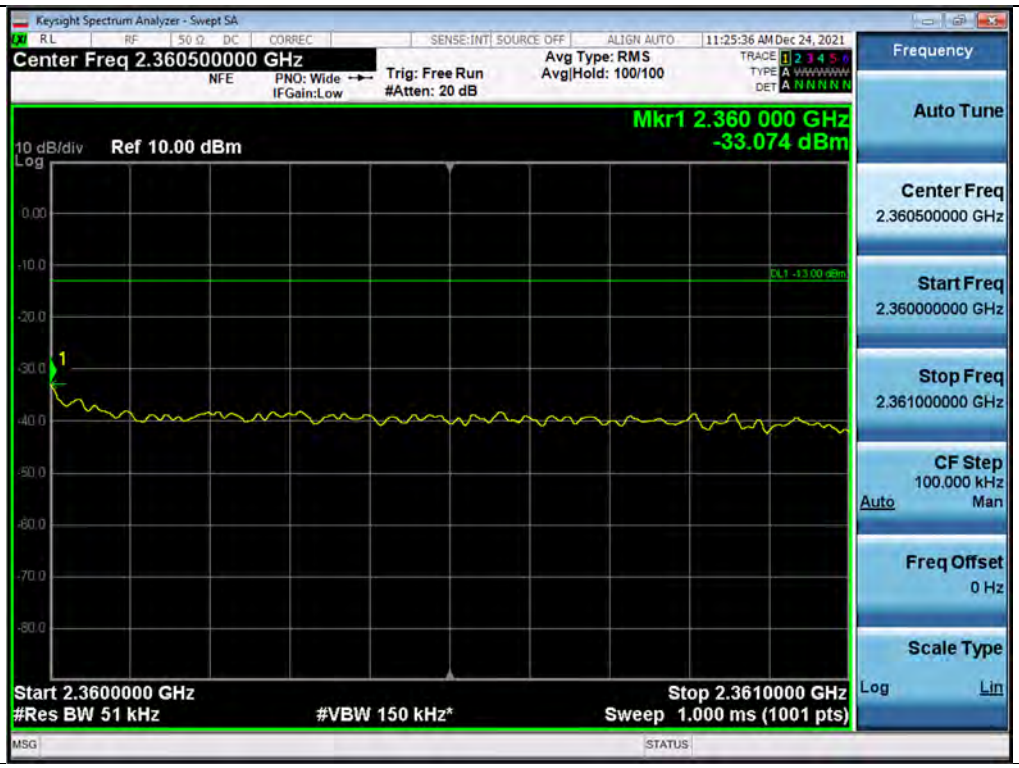
Out-of-band (two adjacent test signals) / WCS / Downlink / LTE 5 MHz / Upper



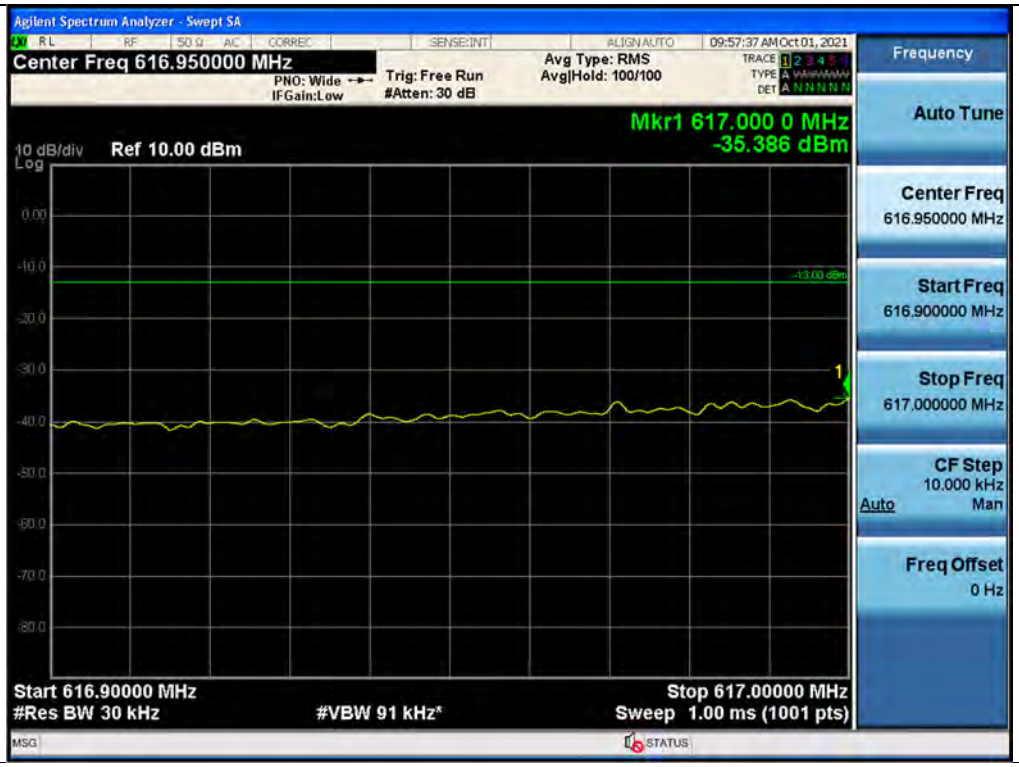
+3 dB above Out-of-band (two adjacent test signals) / WCS / Downlink / LTE 5 MHz / Lower



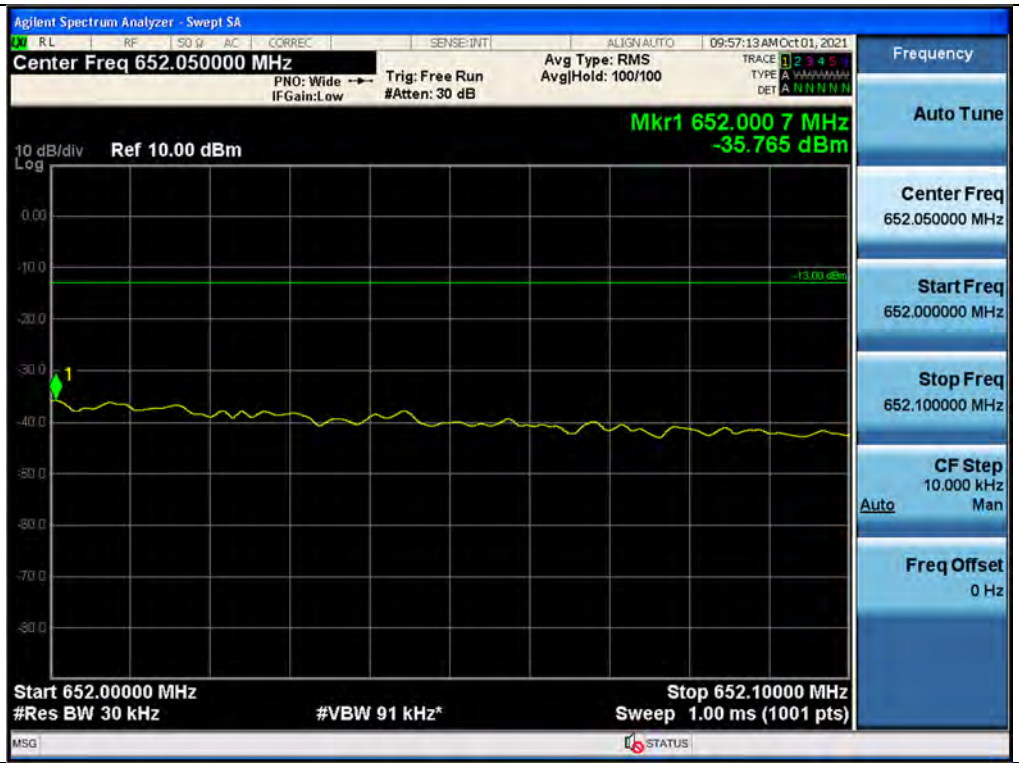
+3 dB above Out-of-band (two adjacent test signals) / WCS / Downlink / LTE 5 MHz / Upper



Out-of-band (single test signals) / 600 MHz Service / Downlink / LTE 5 MHz / Lower



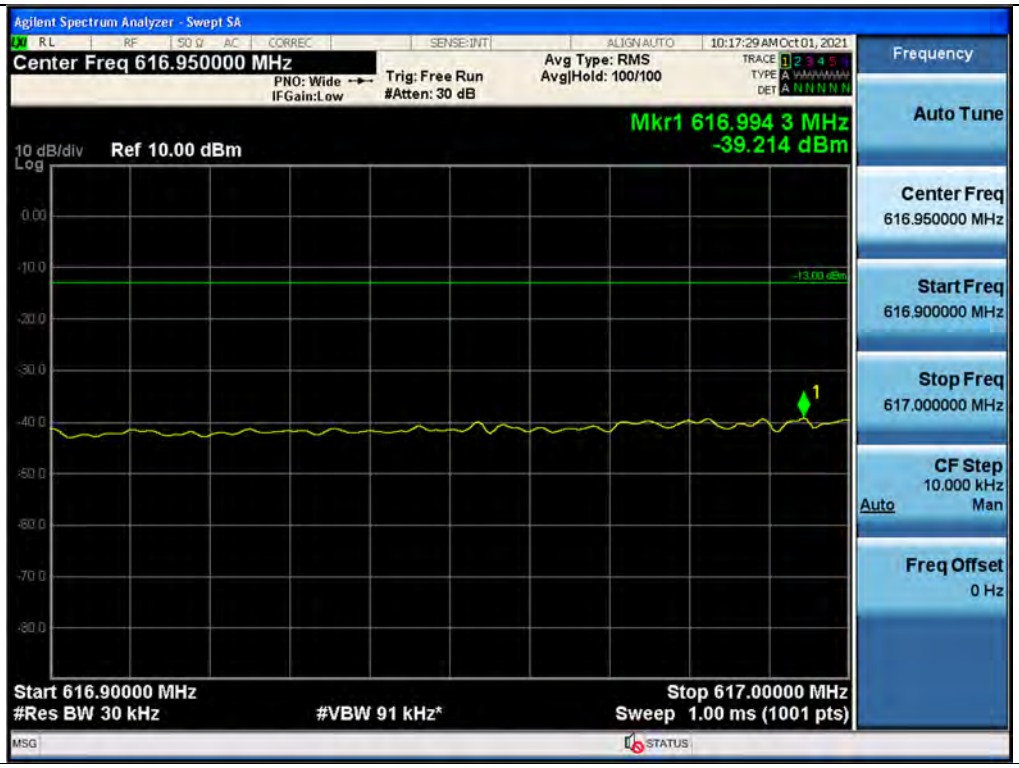
Out-of-band (single test signals) / 600 MHz Service / Downlink / LTE 5 MHz / Upper



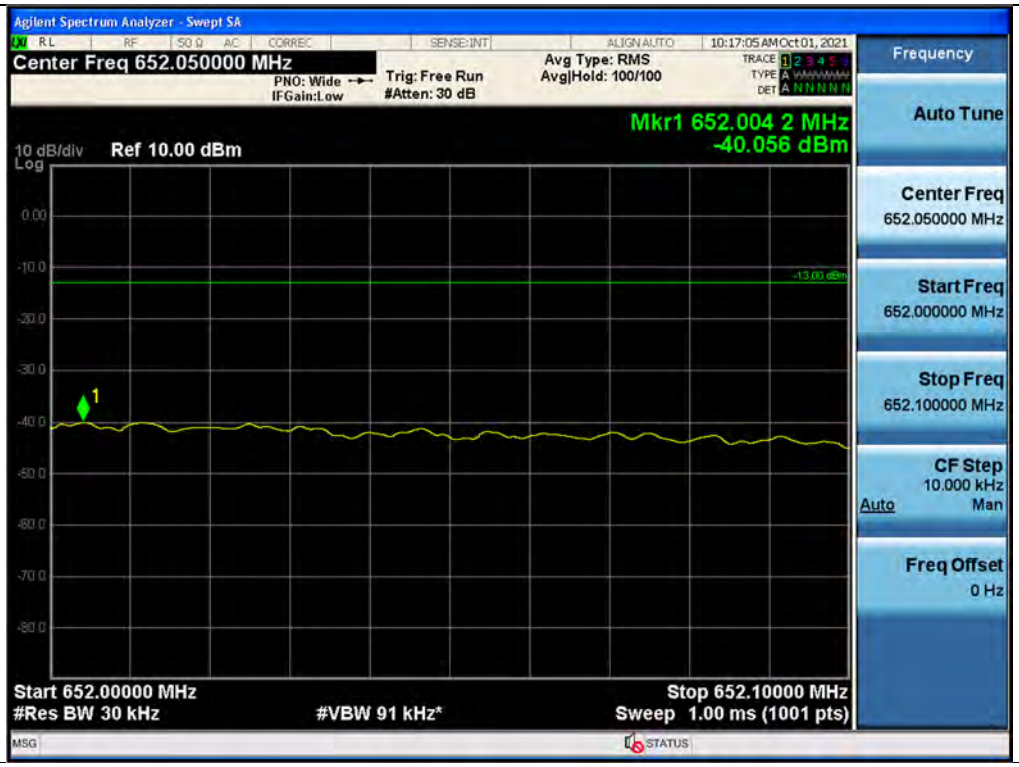
+3 dB above Out-of-band (single test signals) / 600 MHz Service / Downlink / LTE 5 MHz / Lower

+3 dB above Out-of-band (single test signals) / 600 MHz Service / Downlink / LTE 5 MHz / Upper

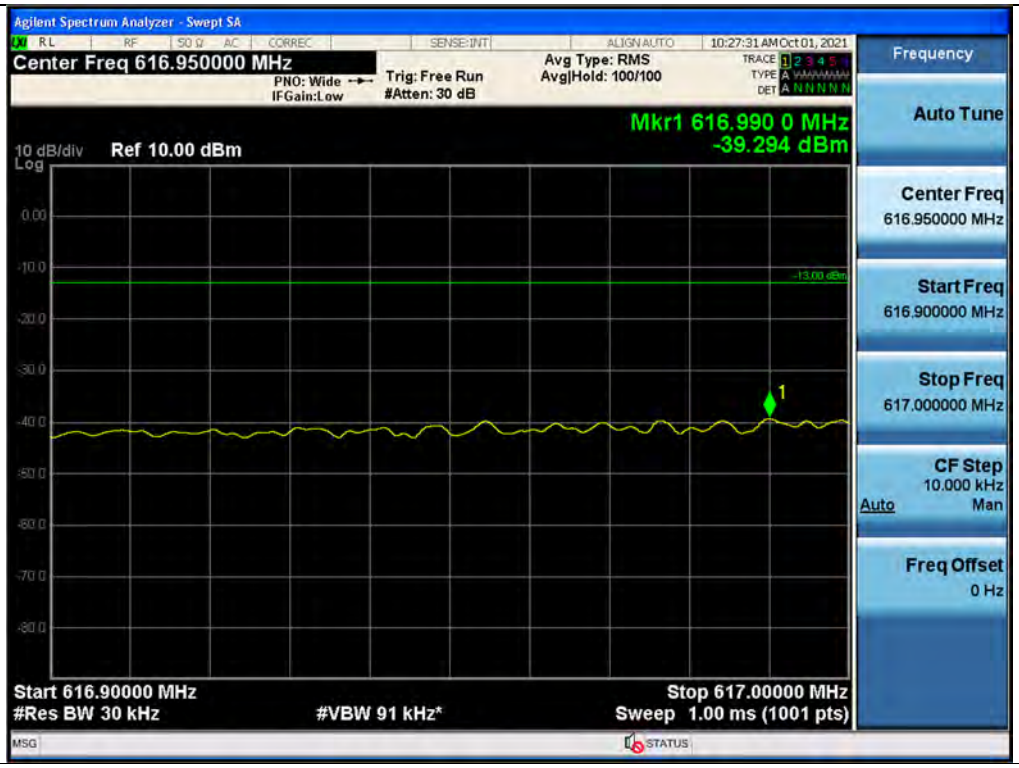
Out-of-band (single test signals) / 600 MHz Service / Downlink / LTE 10 MHz / Lower



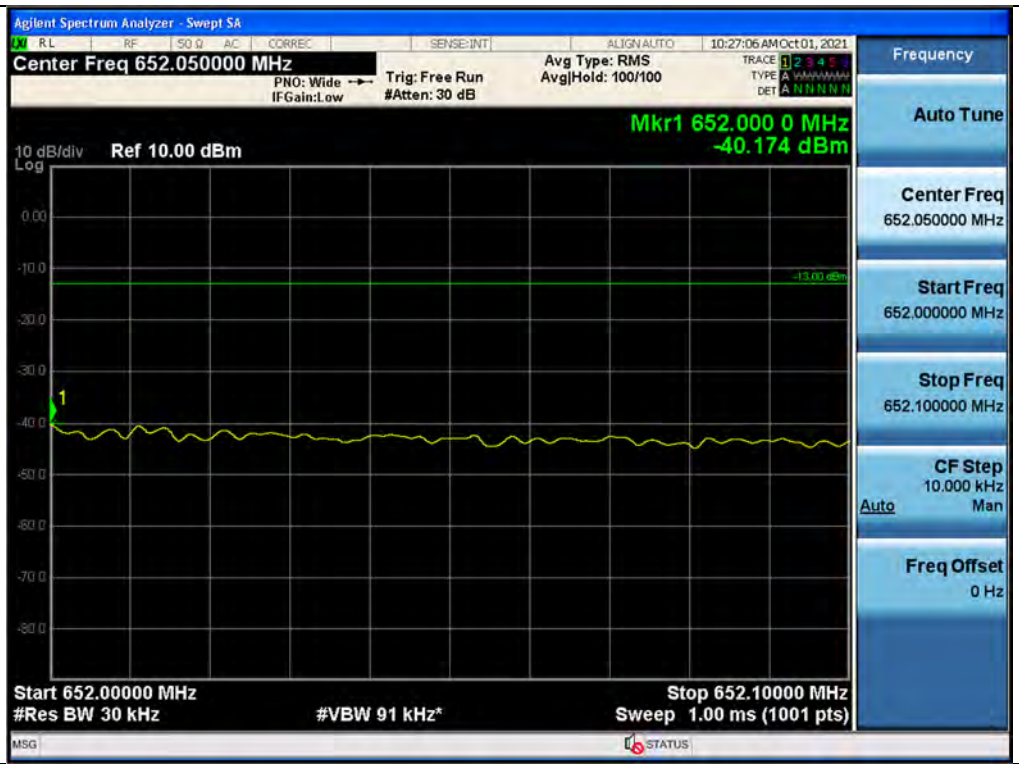
Out-of-band (single test signals) / 600 MHz Service / Downlink / LTE 10 MHz / Upper



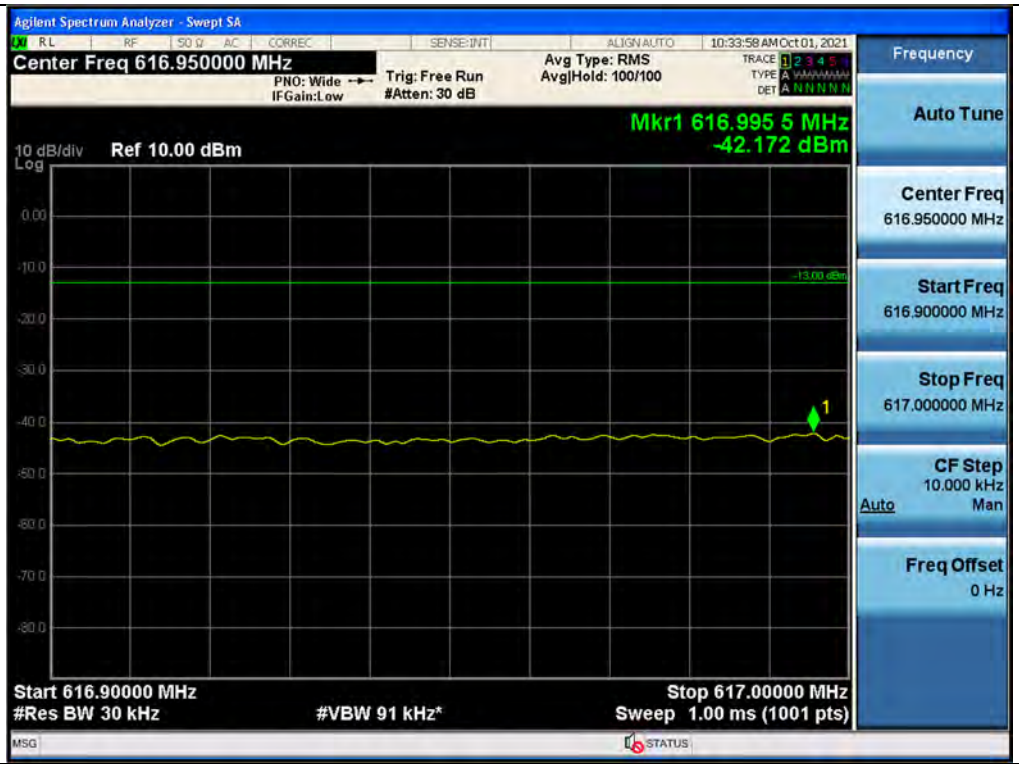
+3 dB above Out-of-band (single test signals) / 600 MHz Service / Downlink / LTE 10 MHz / Lower



+3 dB above Out-of-band (single test signals) / 600 MHz Service / Downlink / LTE 10 MHz / Upper

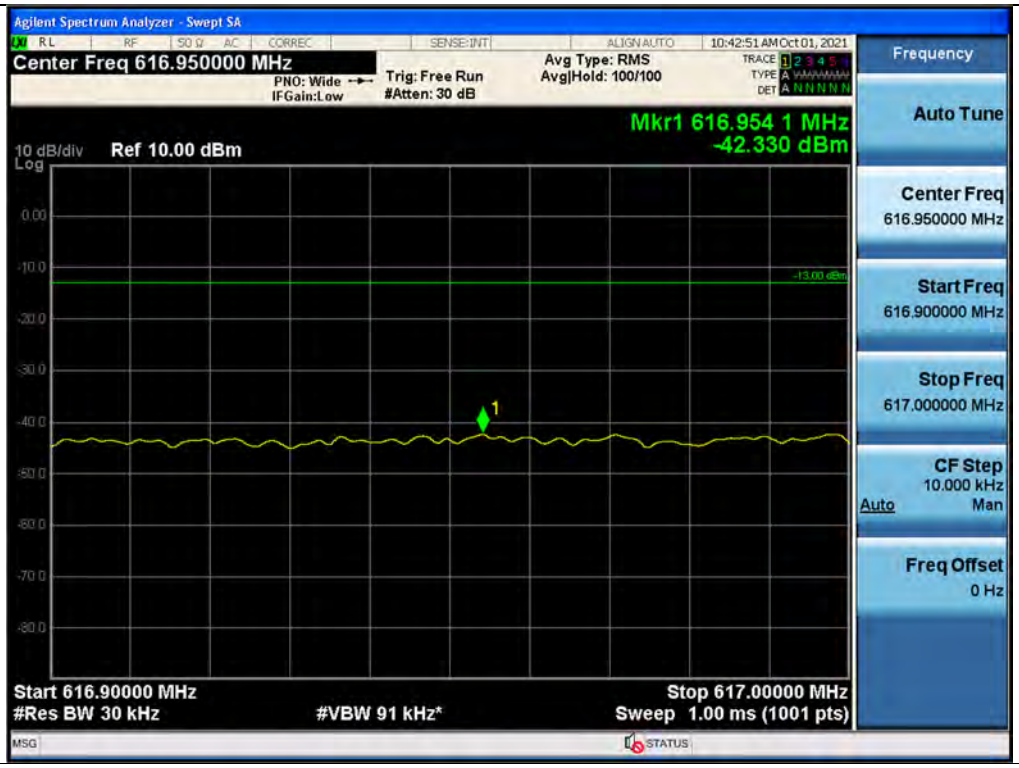


Out-of-band (single test signals) / 600 MHz Service / Downlink / LTE 20 MHz / Lower

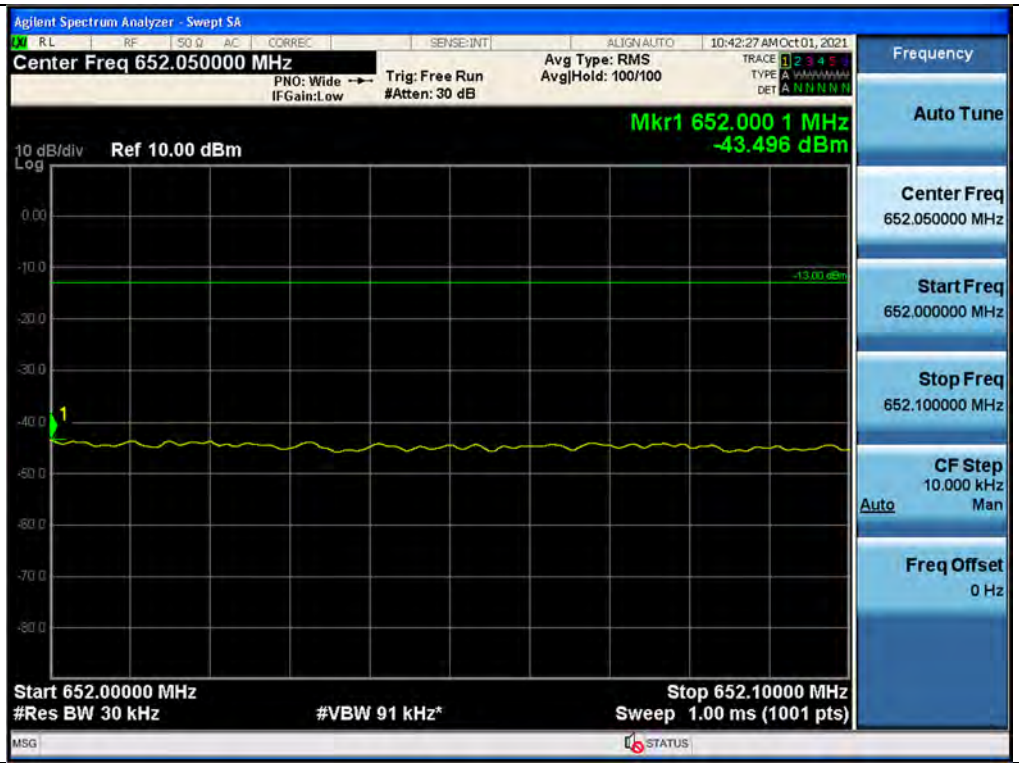


Out-of-band (single test signals) / 600 MHz Service / Downlink / LTE 20 MHz / Upper

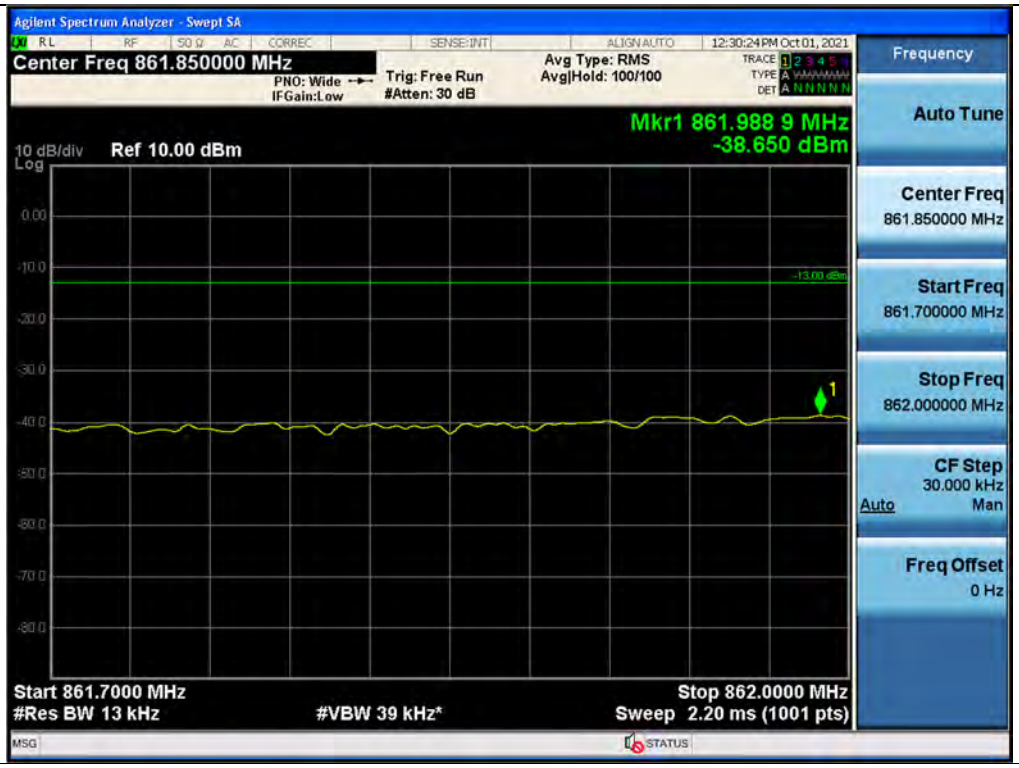
+3 dB above Out-of-band (single test signals) / 600 MHz Service / Downlink / LTE 20 MHz / Lower



+3 dB above Out-of-band (single test signals) / 600 MHz Service / Downlink / LTE 20 MHz / Upper

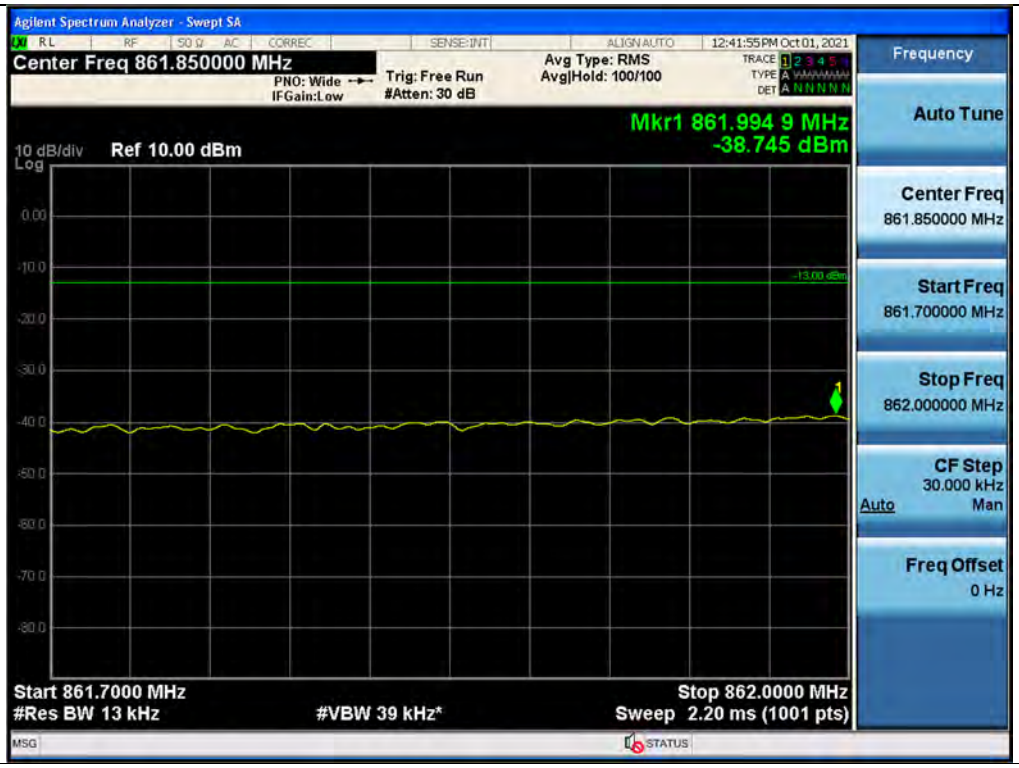


Out-of-band (single test signals) / ESMR / Downlink / CDMA / Lower



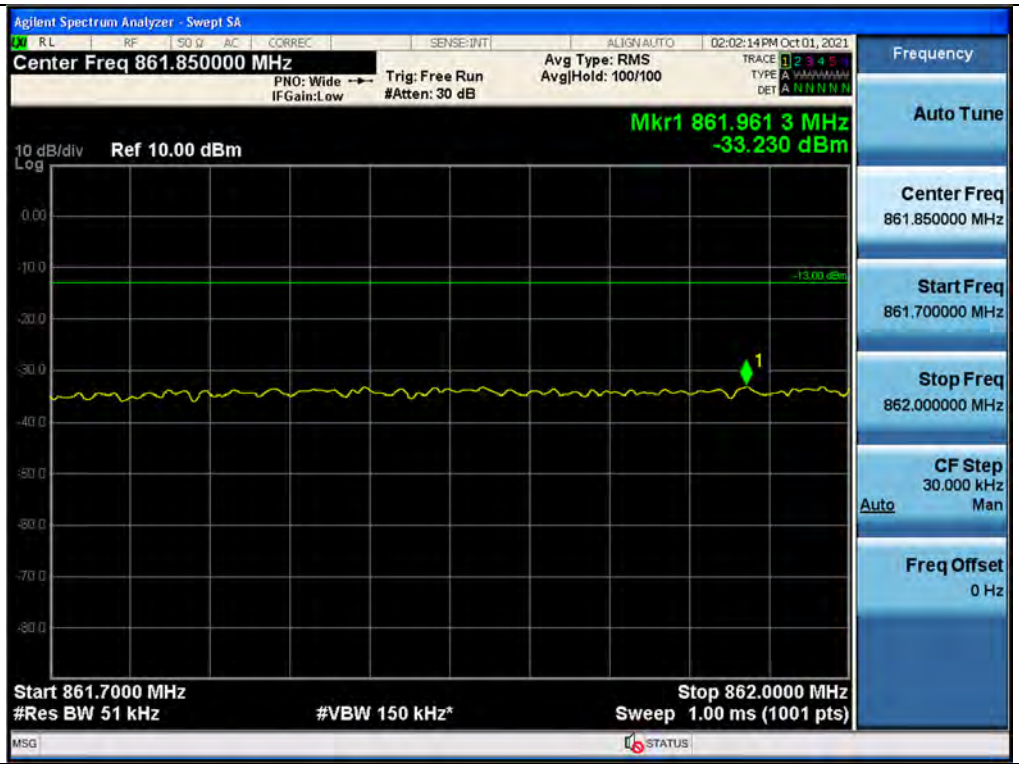
Out-of-band (single test signals) / ESMR / Downlink / CDMA / Upper

+3 dB above Out-of-band (single test signals) / ESMR / Downlink / CDMA / Lower



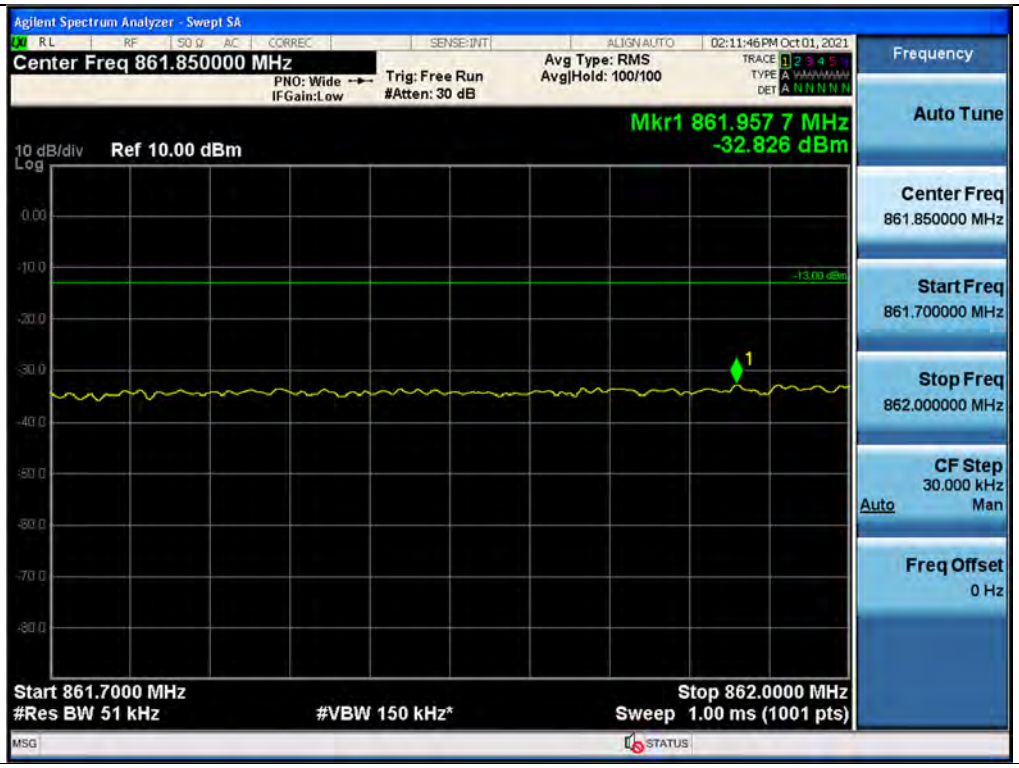
+3 dB above Out-of-band (single test signals) / ESMR / Downlink / CDMA / Upper

Out-of-band (single test signals) / ESMR / Downlink / WCDMA / Lower

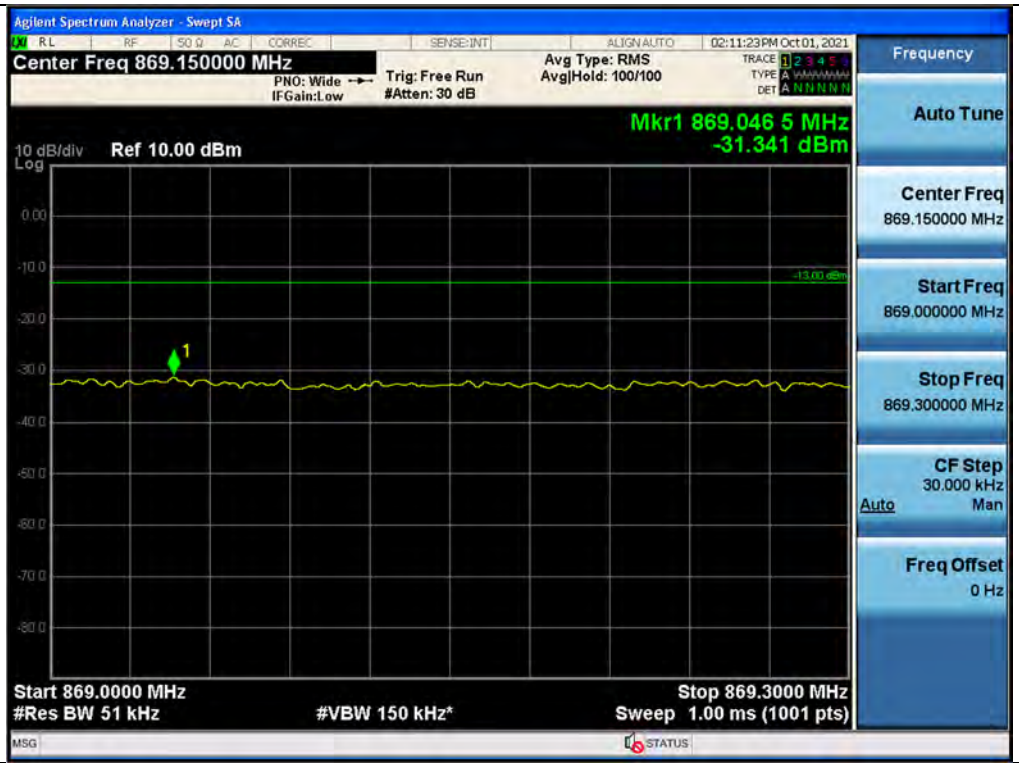


Out-of-band (single test signals) / ESMR / Downlink / WCDMA / Upper

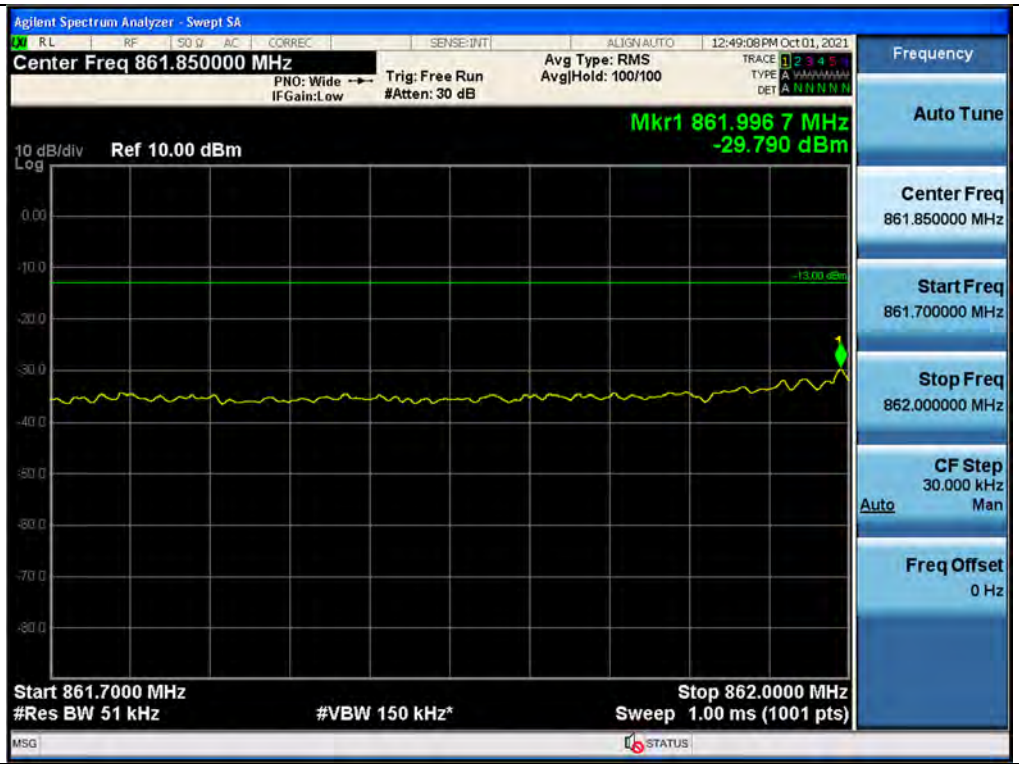
+3 dB above Out-of-band (single test signals) / ESMR / Downlink / WCDMA / Lower



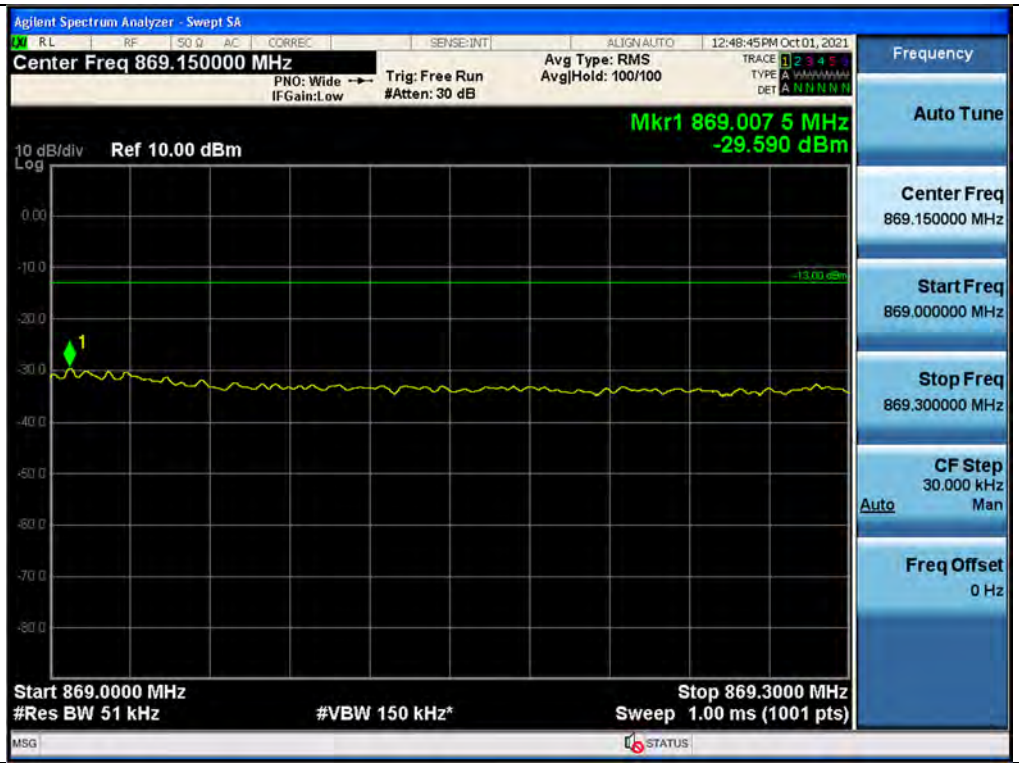
+3 dB above Out-of-band (single test signals) / ESMR / Downlink / WCDMA / Upper



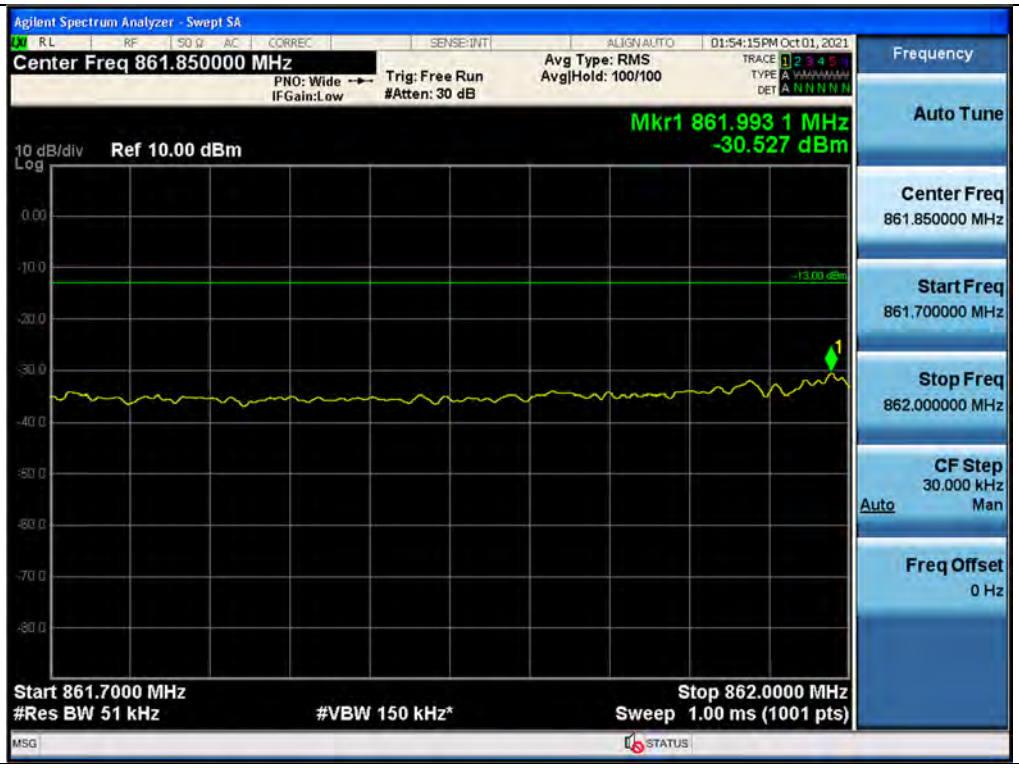
Out-of-band (single test signals) / ESMR / Downlink / LTE 5 MHz / Lower



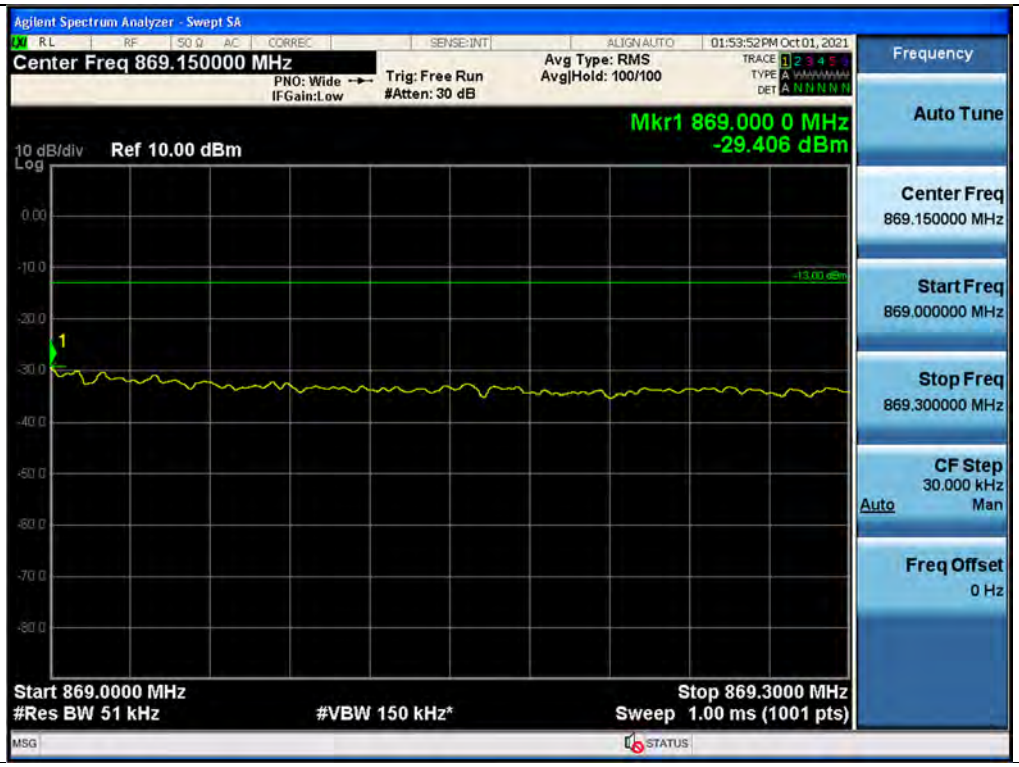
Out-of-band (single test signals) / ESMR / Downlink / LTE 5 MHz / Upper



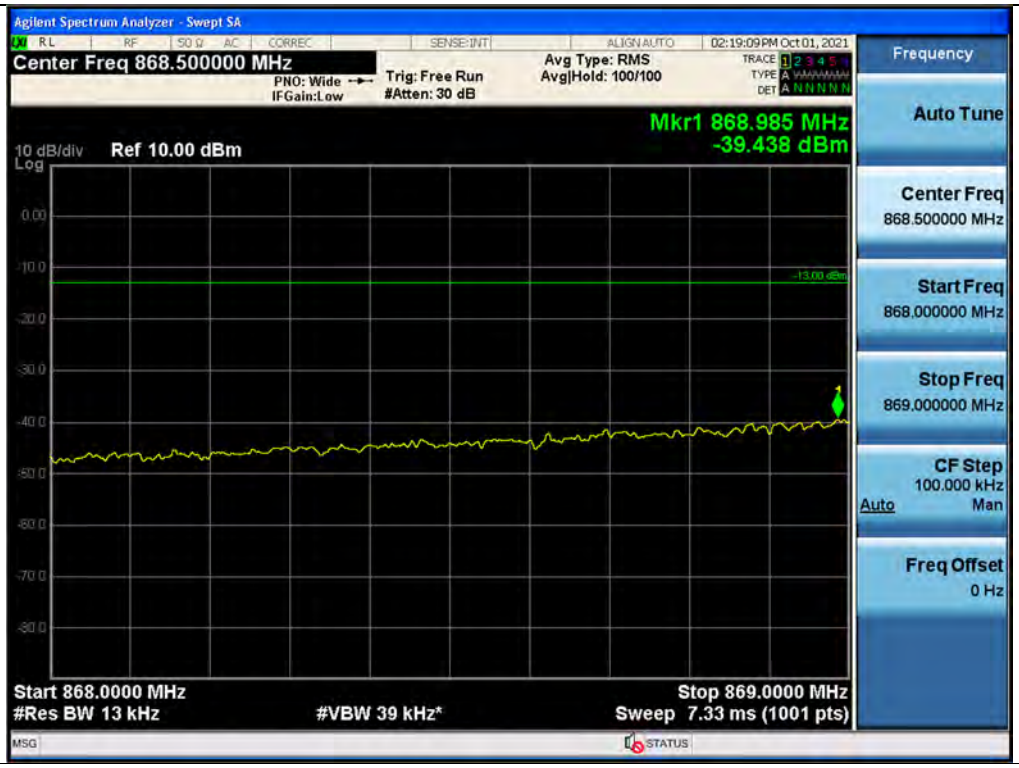
+3 dB above Out-of-band (single test signals) / ESMR / Downlink / LTE 5 MHz / Lower



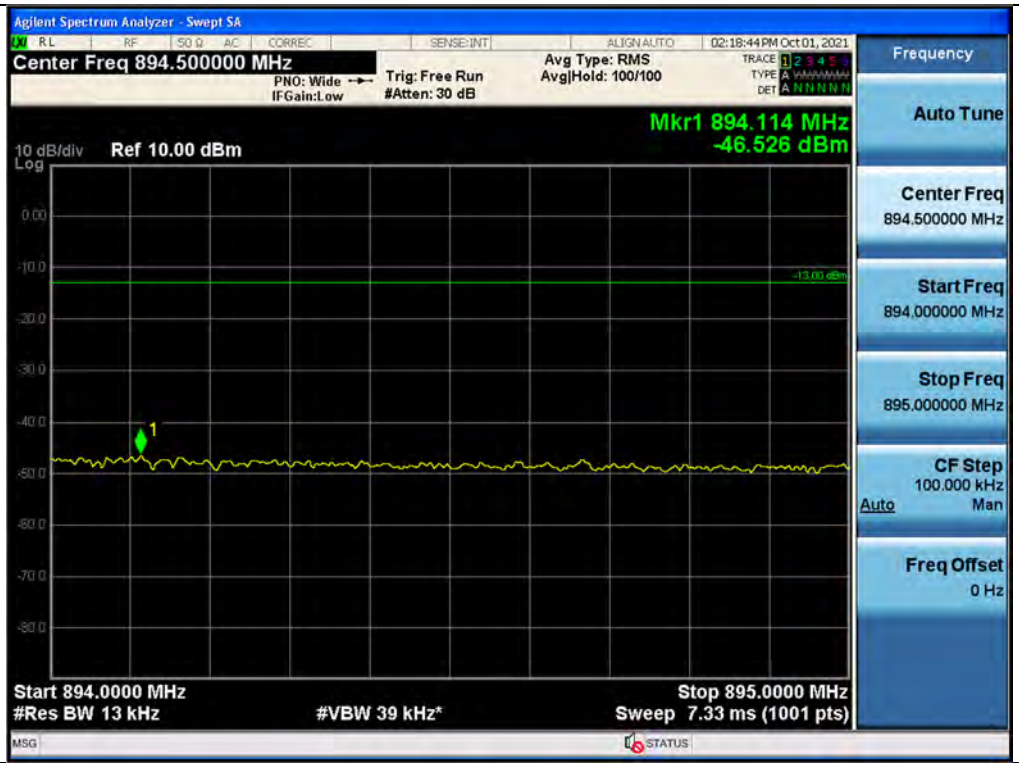
+3 dB above Out-of-band (single test signals) / ESMR / Downlink / LTE 5 MHz / Upper



Out-of-band (single test signals) / Cellular / Downlink / CDMA / Lower

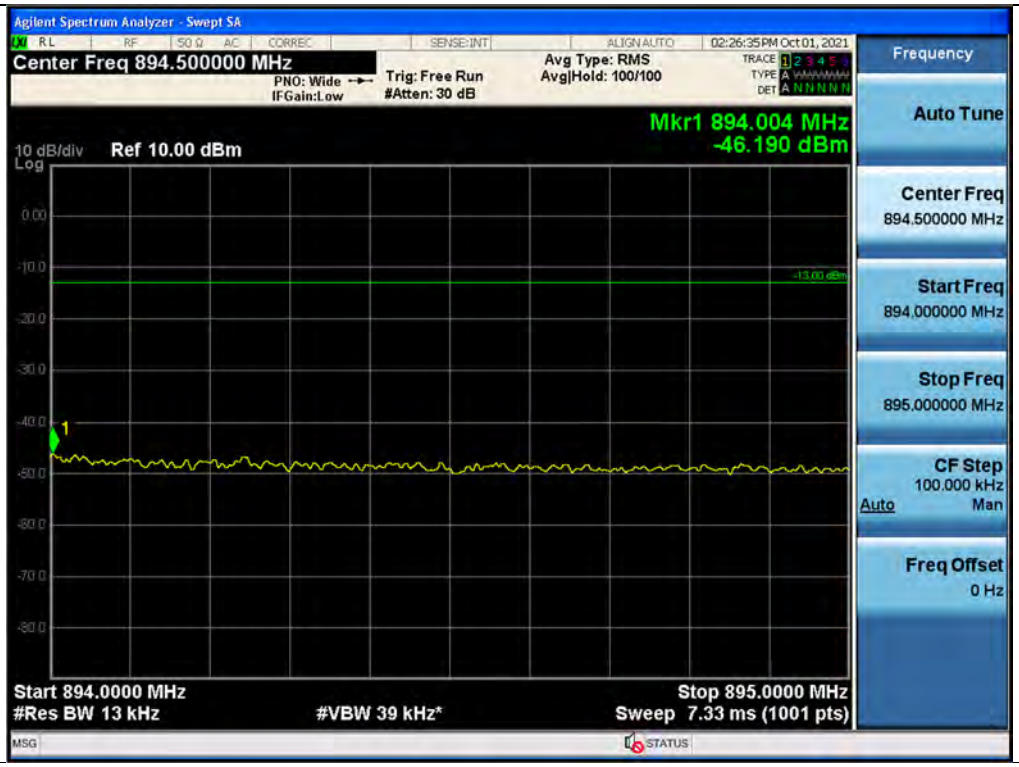


Out-of-band (single test signals) / Cellular / Downlink / CDMA / Upper

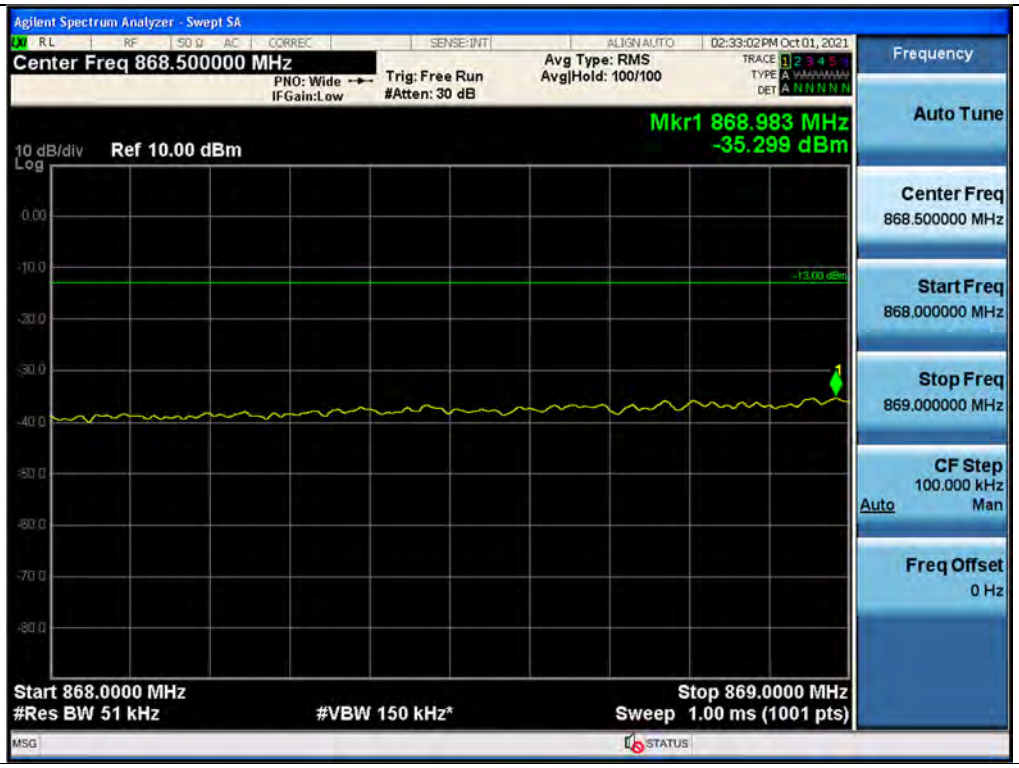


+3 dB above Out-of-band (single test signals) / Cellular / Downlink / CDMA / Lower

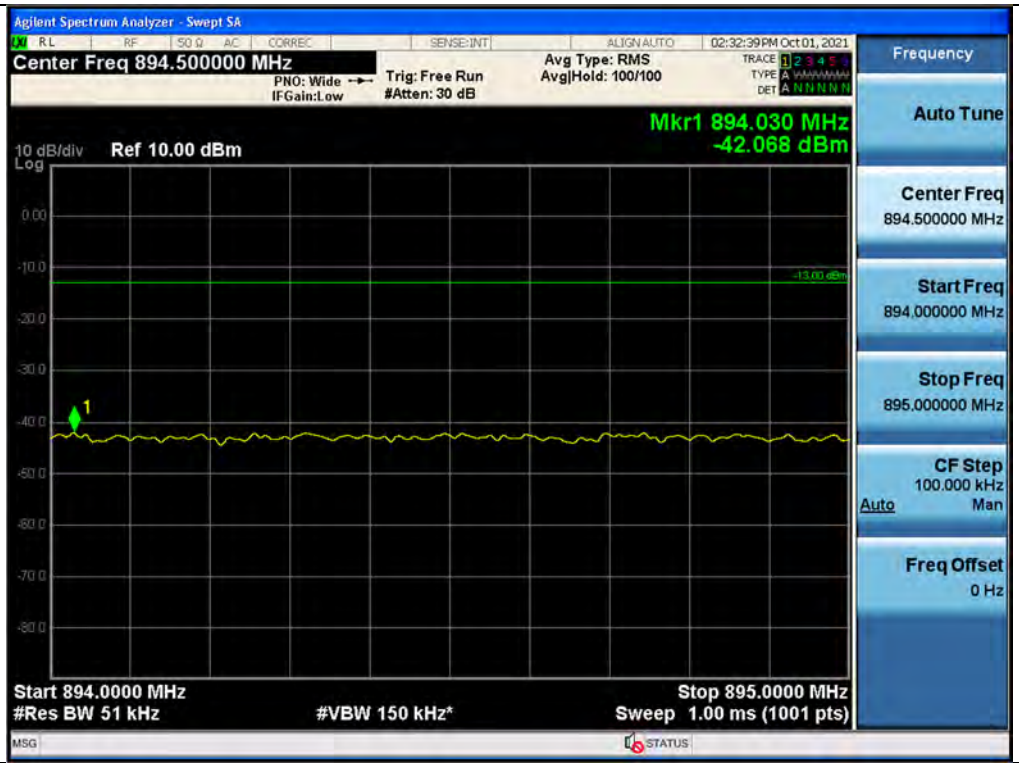
+3 dB above Out-of-band (single test signals) / Cellular / Downlink / CDMA / Upper



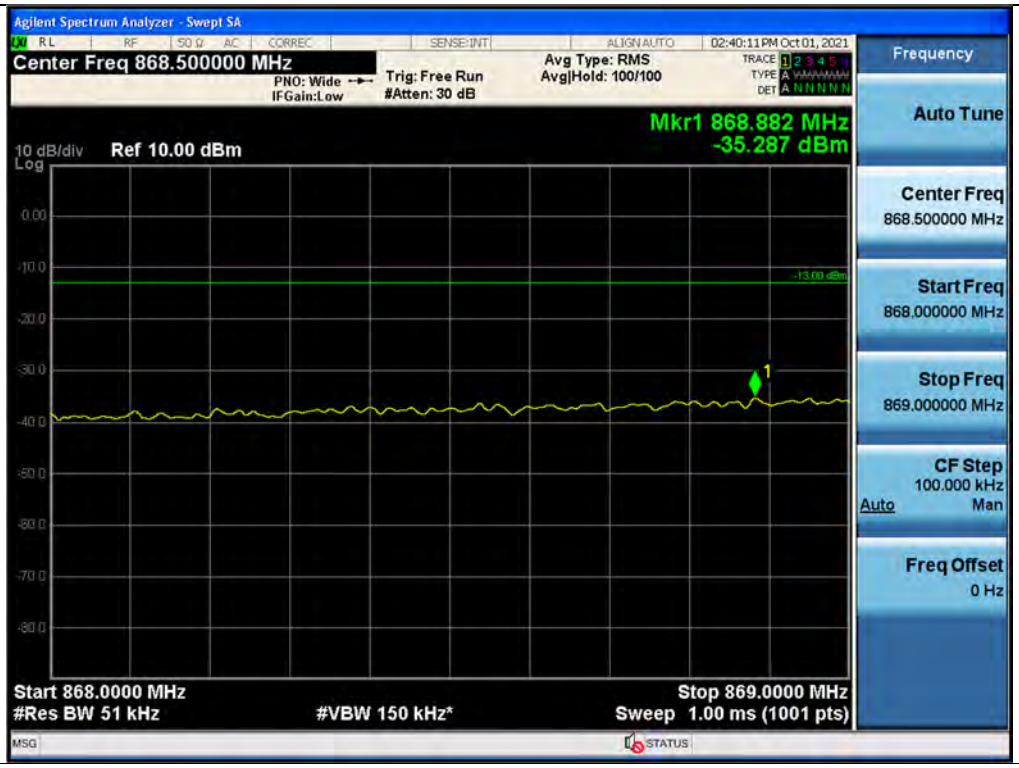
Out-of-band (single test signals) / Cellular / Downlink / WCDMA / Lower



Out-of-band (single test signals) / Cellular / Downlink / WCDMA / Upper



+3 dB above Out-of-band (single test signals) / Cellular / Downlink / WCDMA / Lower



+3 dB above Out-of-band (single test signals) / Cellular / Downlink / WCDMA / Upper