RF Test Report

For

Applicant Name:	**Shenzhen Lingzhe Communication Technology Co., Ltd.**
Address:	6th Floor, Building 6, Kaijieda Industrial Zone, No. 97 Huaxing Road, Dalang Street, Longhua District, Shenzhen of China
EUT Name:	Cell Phone Signal Booster
Brand Name:	N/A
Model Number:	15A
Series Model Number:	Refer to section 2

Issued By

Company Name:	**BTF Testing Lab (Shenzhen) Co., Ltd.**
Address:	F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
Report Number:	BTF240608R00101
Test Standards:	47 CFR Part 20.21
Test Conclusion:	Pass
FCC ID:	2BGYG15A
Test Date:	2024-06-12 to 2024-07-09
Date of Issue:	2024-07-09
Prepared By:	AceXie / Project Engineer
Date:	2024-07-09
Approved By:	Ryan.CJ / EMC Manager
Date:	2024-07-09

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Revision History		
Version	Issue Date	Revisions Content
R_V0	2024-07-09	Original
Note: Once the revision has been made, then previous versions reports are invalid.		

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BTF Testing Lab (Shenzhen) Co., Ltd.
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1 Introduction

1.1 Identification of Testing Laboratory

Company Name:	BTF Testing Lab (Shenzhen) Co., Ltd.
Address:	F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
Phone Number:	+86-0755-23146130
Fax Number:	+86-0755-23146130

1.2 Identification of the Responsible Testing Location

Company Name:	BTF Testing Lab (Shenzhen) Co., Ltd.
Address:	F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
Phone Number:	+86-0755-23146130
Fax Number:	+86-0755-23146130
FCC Registration Number:	518915
Designation Number:	CN1330

1.3 Announcement

(1) The test report reference to the report template version v0.
(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.
(3) The test report is invalid if there is any evidence and/or falsification.
(4) This document may not be altered or revised in any way unless done so by BTF and all revisions are duly noted in the revisions section.
(5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
(6) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

2 Product Information

2.1 Application Information

Company Name:	Shenzhen Lingzhe Communication Technology Co., Ltd.
Address:	6th Floor, Building 6, Kaijieda Industrial Zone, No. 97 Huaxing Road, Dalang Street, Longhua District, Shenzhen of China

2.2 Manufacturer Information

Company Name:	Shenzhen Lingzhe Communication Technology Co., Ltd.
Address:	6th Floor, Building 6, Kaijieda Industrial Zone, No. 97 Huaxing Road, Dalang Street, Longhua District, Shenzhen of China

2.3 Factory Information

Company Name:	Shenzhen Lingzhe Communication Technology Co., Ltd.
Address:	6th Floor, Building 6, Kaijieda Industrial Zone, No. 97 Huaxing Road, Dalang Street, Longhua District, Shenzhen of China

2.4 General Description of Equipment under Test (EUT)

EUT Name:	Cell Phone Signal Booster
Test Model Number:	15A
Series Model Number:	N/A

2.5 Technical Information

Power Supply:	DC 5V from AC/DC ADAPTER		
AC/DC ADAPTER:	MODEL: AS011Z-0502000UC INPUT: 100-240V~ 50/60Hz, 0.45A OUTPUT: 5.0V⎓2.0A		
Operation Frequency:	Frequency	Uplink (MHz)	Downlink (MHz)
	Cellular	824-849	869-894
	Lower A-E Blocks	699-716	729-746
	700 MHz Upper C Block	777-787	746-756

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Mode	Frequency (MHz)	Antenna Gain(dBi)	Cable loss(dB)
Uplink	824-849	10	3
	699-716	10	3
	777-787	10	3
Downlink	869-894	9	3
	729-746	9	3
	746-756	9	3

Note:
#: The antenna gain provided by the applicant, and the laboratory will not be responsible for the accumulated calculation results which covers the information provided by the applicant.

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3 Summary of Test Results

3.1 Test Standards

The tests were performed according to following standards: **47 CFR Part 20.21:** Signal boosters **935210 D03:** Wideband Consumer Signal Booster Measurement Guidance

3.2 Uncertainty of Test

Item	Measurement Uncertainty
RF output power, conducted	0.63 dB
Conducted spurious emissions	0.94 dB
Radiated emissions (< 1 GHz)	4.12 dB
Radiated emissions (> 1 GHz)	4.16 dB
Occupied Channel Bandwidth	69 KHz
Frequency Stability	0.4 KHz
Temperature	0.82 °C
Humidity	4.1 %
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3.3 Summary of Test Result

Item	Standard	Result
Authorized Frequency Band Verification	Part 20.21(e)(3)	Pass
Maximum Power	Part 20.21(e)(8)(i)(D), Part 20.21(e)(8)(i)(B), Part 20.21(e)(4)	Pass
Maximum Booster Gian Computation	Part 20.21(e)(8)(i)(C)(2), Part 20.21(e)(8)(i)(B), Part 20.21(e)(4)	Pass
Intermodulation Product	Part 20.21(e)(8)(i)(F)	Pass
Out Of Band Emissions	Part 20.21(e)(8)(i)(E)	Pass
Spurious Emissions At Antenna Terminals	Part 2.1051	Pass
Noise Limits	Part 20.21(e)(8)(i)(A), Part 20.21(e)(8)(i)(H), Part 20.21(e)(4)	Pass
Uplink Inactivity	Part 20.21(e)(8)(i)(I), Part 20.21(e)(4)	Pass
Variable Booster Gain	Part 20.21(e)(8)(i)(C)(1), Part 20.21(e)(8)(i)(H)	Pass
Occupied Bandwidth	Part 2.1049	Pass
Oscillation Detection	Part 20.21(e)(8)(ii)(A), Part 20.21(e)(5)	Pass
Radiated Spurious Emissions	Part 2.1053	Pass
Spectrum block filtering test procedure	Part 20.21(e)(8)(i)(B), Part 20.21(e)(3)	N/A

Note:*1. PASS: Test item meets the requirement.*
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

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4 Test Configuration

4.1 Test Equipment List

Conducted Method Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2023.11.24	2024.11.23	☒
WIDEBAND RADIO COMMNUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2023.11.24	2024.11.23	☒
ESG VECTOR SIGNAL GENERATOR	Agilent	E4438C	MY45094854	2023.11.24	2024.11.23	☒
MXG Vector Signal Generator	Agilent	N5182A	MY46240163	2023.11.24	2024.11.23	☒
Adjustable Direct Current Regulated Power Supply	Dongguan Tongmen Electronic Technology Co., LTD	etm-6050c	20211026123	2023.11.25	2024.11.24	☒
Programmable constant temperature and humidity box	ZZCKONG	ZZ-K02A	20210928007	2023.11.24	2024.11.23	☒
RF Control Unit	TST	TST-Full	S01	/	/	☒
RF Test software	TST	V2.0	/	/	/	☒

Radiated Method Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
SIGNAL ANALYZER	ROHDE&SCHWARZ	FSQ40	100010	2023.11.24	2024.11.23	☒
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI7	101032	2023.11.24	2024.11.23	☒
Log periodic antenna	SCHWARZBECK	VULB 9168	01328	2023.11.28	2024.11.27	☒
Horn Antenna	SCHWARZBECK	BBHA9170	01157	2023.11.28	2024.11.27	☒
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/	☒
RE Cable	REBES Talent	UF2-NMNM-10m	21101570	2023.11.24	2024.11.23	☒
RE Cable	REBES Talent	UF2-NMNM-2.5m	21101573	2023.11.24	2024.11.23	☒
RE Cable	REBES Talent	UF2-NMNM-1m	21101576	2023.11.24	2024.11.23	☒
Coaxial cable Multiflex 141	Schwarzbeck	N/SMA 0.5m	517386	2024.03.24	2025.03.23	☒
RE Cable	Talent Microwave	A40-2.92M2.92 M-14M	22080539	2023.11.24	2024.11.23	☒
RE Cable	Talent Microwave	A81-SMAMNM-14M	22080538	2023.11.24	2024.11.23	☒
Preamplifier	SCHWARZBECK	BBV9744	00246	2023.11.24	2024.11.23	☒
Horn Antenna	Schwarzbeck	BBHA9120D	2597	2024.05.22	2025.05.21	☒
Broadband Preamplilifier	Schwarzbeck	BBV9718D	00008	2024.03.24	2025.03.23	☒

4.2 Test Auxiliary Equipment

The EUT was tested as an independent device.

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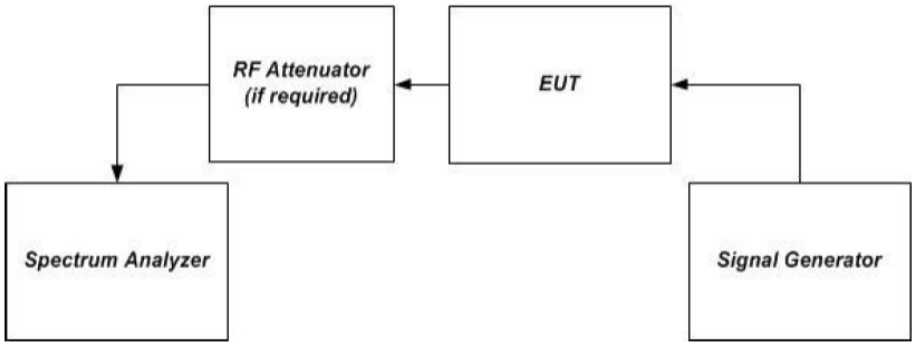
5 Radio Spectrum Matter Test Results (RF)

5.1 Authorized Frequency Band Verification

Test Requirement:	This test is intended to confirm that the signal booster only operates on the CMRS frequency bands authorized for use by the NPS. In other words, the signal booster shall reject amplification of other signals outside of its passband. In addition, this test will identify the frequency at which the maximum gain is realized within each CMRS operational band, which then serves as a basis for subsequent tests.
Test Setup:	
Procedure:	a) Connect the EUT to the test equipment as shown in Figure 1. Begin with the uplink output (donor) port connected to the spectrum analyzer. b) Set the spectrum analyzer resolution bandwidth (RBW) for 100 kHz with the video bandwidth (VBW) ⩾ 3 the RBW, using a PEAK detector with the MAX HOLD function. c) Set the center frequency of the spectrum analyzer to the center of the operational band under test with a span of 1MHz. d) Set the signal generator for CW mode and tune to the center frequency of the operational band under test. e) Set the initial signal generator power to a level that is at least 6 dB below the AGC level specified by the manufacturer. f) Slowly increase the signal generator power level until the output signal reaches the AGC operational level. g) Reduce the signal generator power to a level that is 3 dB below the level noted above, then manually reset the EUT (e.g., cycle ac/dc power). h) Reset the spectrum analyzer span to 2 the width of the CMRS band under test. Adjust the tuned frequency of the signal generator to sweep 2 the width of the CMRS band using the sweep function. The AGC must be deactivated throughout the entire sweep. i) Using three markers, identify the CMRS band edges and the frequency with the highest power. Affirm that the values of all markers are visible on the display of the spectrum analyzer (e.g., marker table set to on). j) Capture the spectrum analyzer trace for inclusion in the test report. k) Repeat 7.1c) to 7.1j) for all operational uplink and downlink bands.

5.1.1 E.U.T. Operation:

Operating Environment:	
Temperature:	25.8 °C
Humidity:	49.9 %
Atmospheric Pressure:	1010 mbar

5.1.2 Test Data:

Frequency(MHz)	F_L(MHz)	F_H(MHz)	$Mark1_{MHz}$/Level(dBm)	$Mark1_{MHz}$/Level(dBm)	Result
UL824-849	824	849	824/14.911	849/16.566	PASS
UL699-716	699	716	699/7.238	716/9.437	PASS
UL777-787	777	787	777/13.384	787/20.328	PASS
DL869-894	869	894	869/13.493	894/15.563	PASS
DL729-746	729	746	729/10.423	746/11.101	PASS
DL746-756	746	756	746/9.264	756/-0.635	PASS

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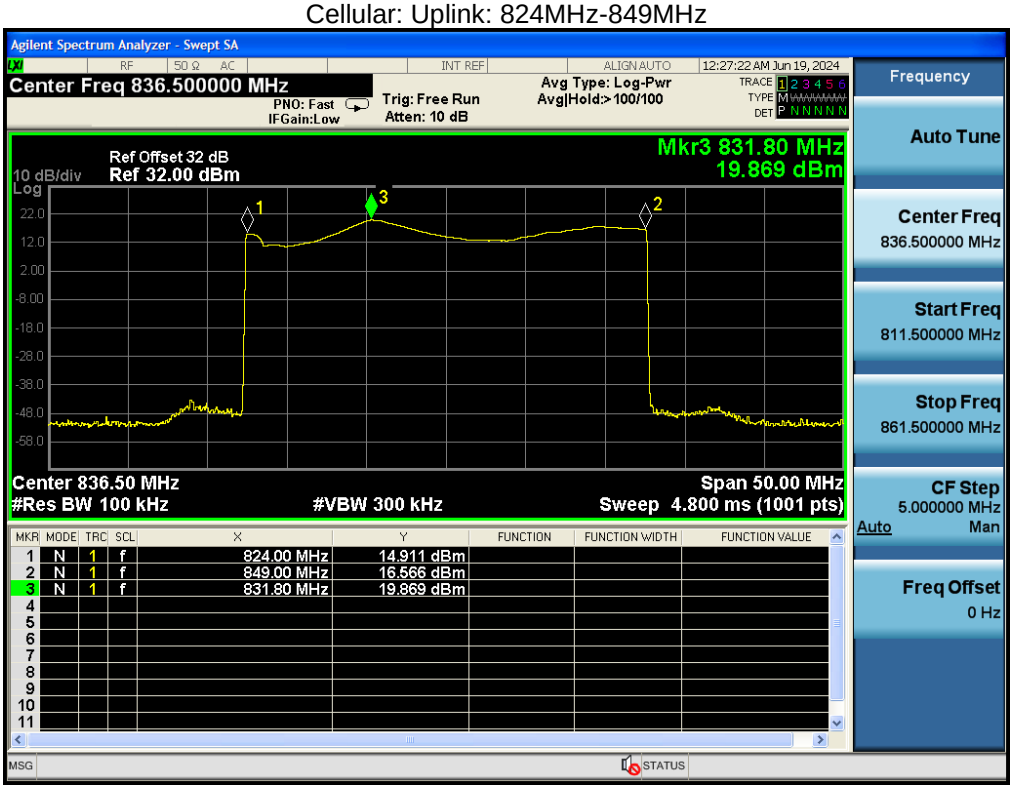
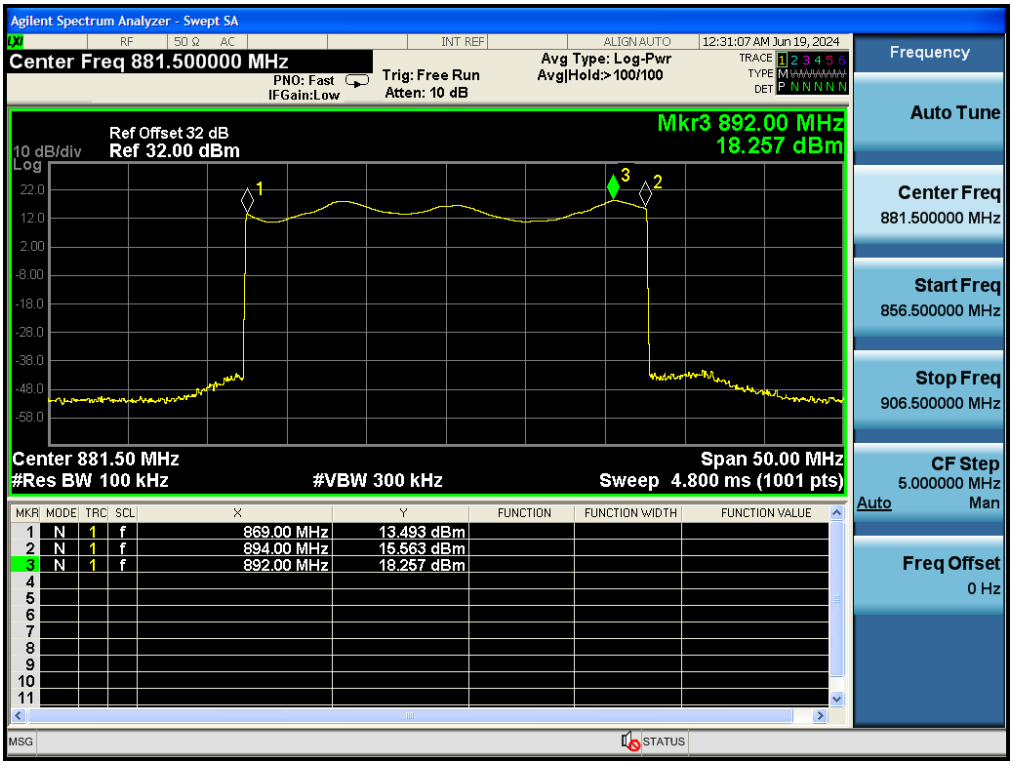
Cellular: Uplink: 824MHz-849MHz



Cellular: Downlink: 869MHz-894MHz



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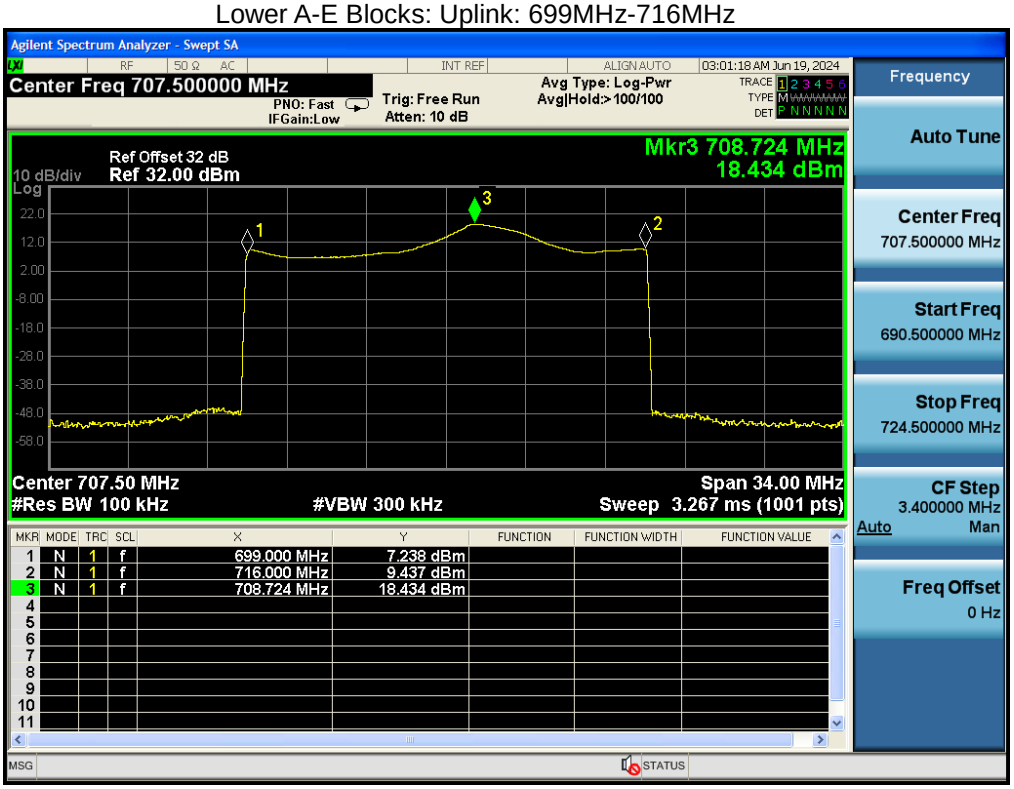
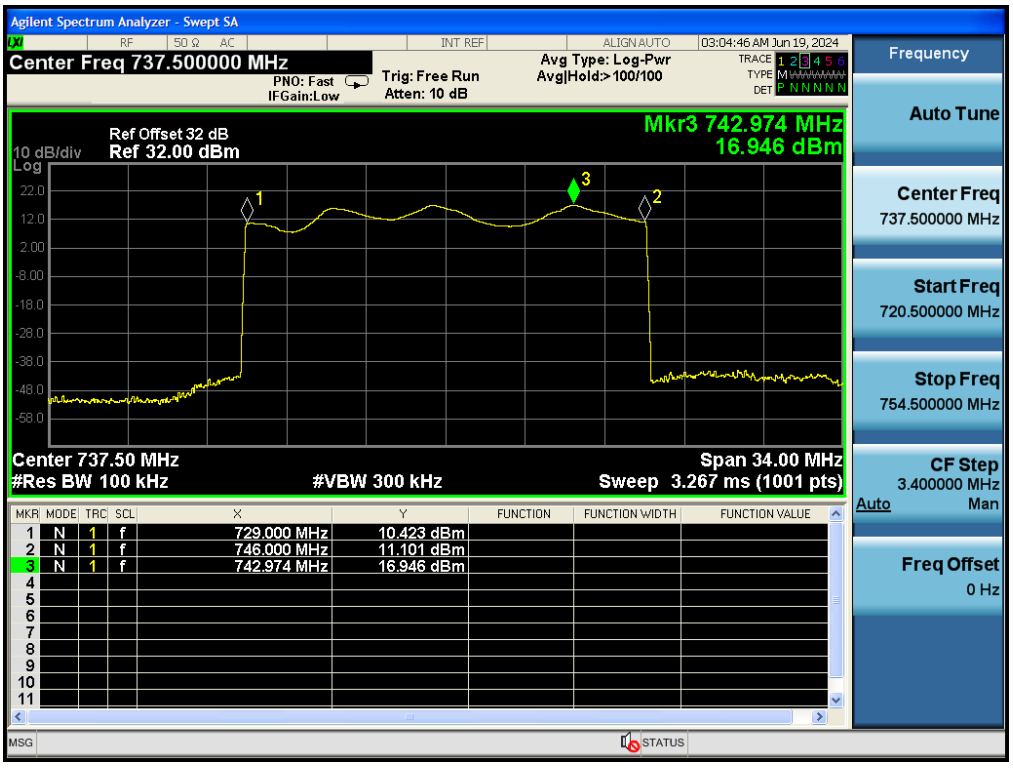
Lower A-E Blocks: Uplink: 699MHz-716MHz



Lower A-E Blocks: Downlink: 729MH-746MHz



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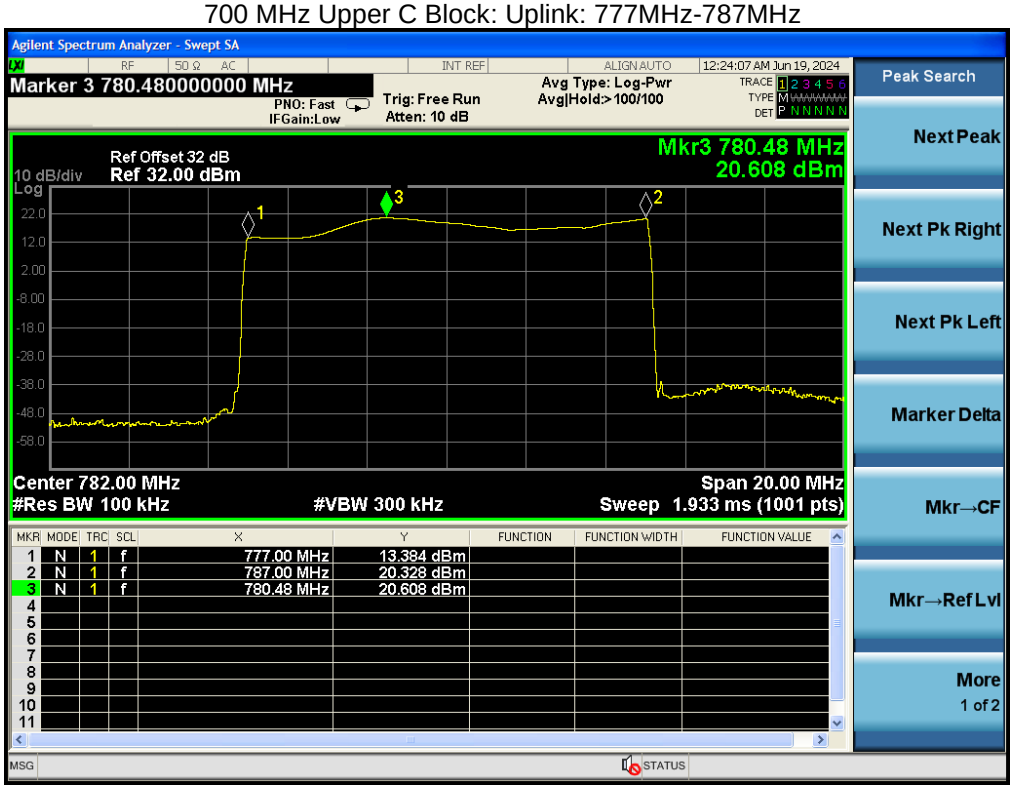
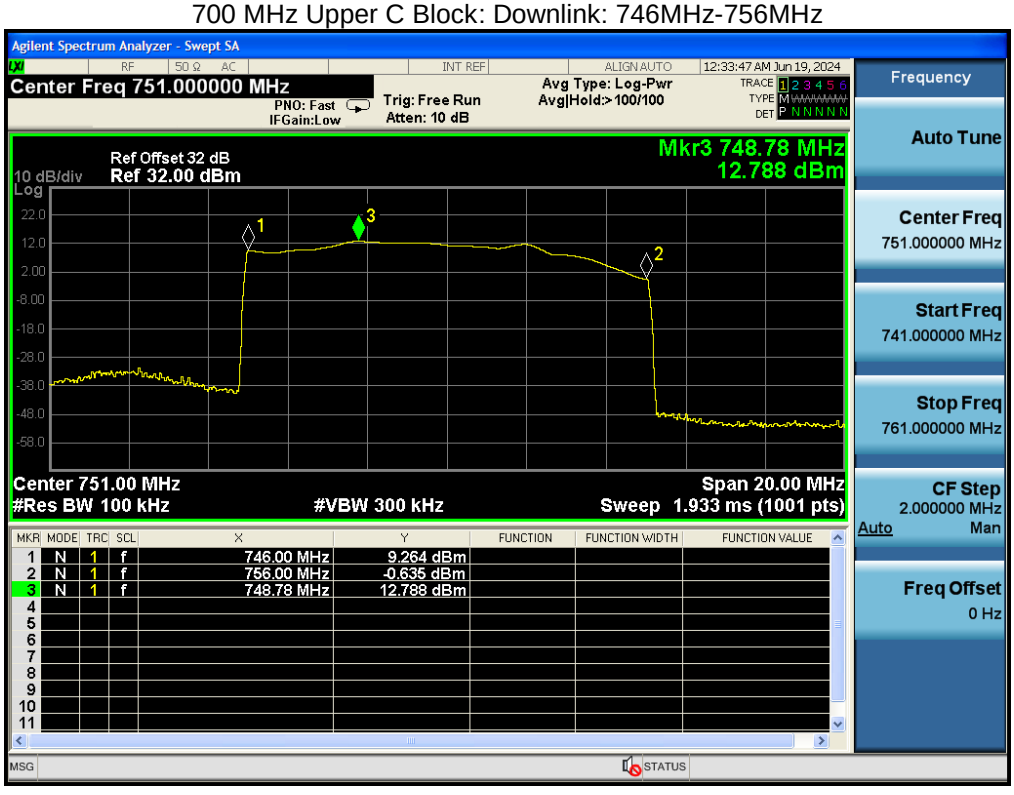
700 MHz Upper C Block: Uplink: 777MHz-787MHz



700 MHz Upper C Block: Downlink: 746MHz-756MHz



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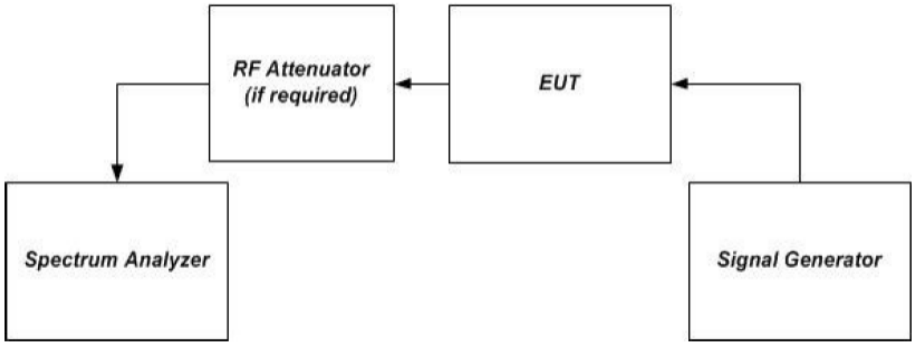
5.2 Maximum Power

Test Requirement:	The following procedures shall be used to demonstrate compliance to the signal booster power limits and requirements as specified in §20.21(e)(8)(i)(D) and §20.21(e)(8)(i)(B) for Wideband Consumer Signal Boosters (i.e., a maximum uplink composite power level of 1 watt (30 dBm) conducted power and EIRP, a maximum downlink power level of 0.05 watt (17 dBm) conducted power and EIRP, and a conducted uplink power output that is at least 0.05 watt (17 dBm) for each band of operation). 1) Compliance to authorized EIRP limits must be shown using the highest gains from the list of antennas, cabling and coupling devices authorized by the manufacturer for use with the consumer booster. 2) In addition, the maximum power levels measured in this procedure will be utilized in calculating the maximum gain as described in the next section. 3) The frequency with the highest power level in each operational band as determined in section 7.1 is to be measured discretely by applying the following procedure utilizing the stated emission and power detector types independently. 4) Use a signal generator to create a pulsed CW signal with a pulse width of 570 µsec and a duty cycle of 12.5% and measure utilizing the burst power function of the measuring instrument. 5) Use a signal generator to create an AWGN signal with a 99% Occupied Bandwidth of 4.1 MHz and measure utilizing the channel or band power function of the measurring instrumentation. 6) All modes of operation must be verified to maintain operation at the maximum uplink and downlink test levels per device type as defined in section 5.4.
Limit:	Gain: Fixed Booster maximum gain shall not exceed 6.5 dB + 20Log10(Frequency) *Where, Frequency is the uplink mid-band frequency of the supported spectrum bands in MHz.* Conducted Output Power: 17dBm<P_{uplink} $P_{donwlink}$<17dBm. EIRP: Uplink<30dBm, Donwlink<17dBm.
Test Setup:	
Procedure:	a) Connect the EUT to the test equipment as shown in Figure 1. Begin with the uplink output (donor) port connected to the spectrum analyzer. b) Configure the signal generator and spectrum analyzer for operation on the frequency determined in 7.1 with the highest power level, but with the center frequency of the signal no closer than 2.5 MHz from the band edge. The spectrum analyzer span shall be set to at least 10 MHz. c) Set the initial signal generator power to a level well below that which causes AGC activation. d) Slowly increase the signal generator power level until the output signal reaches the AGC operational limit (from observation of signal behavior on the spectrum analyzer; i.e., no further increase in output power as input power is increased). e) Reduce power sufficiently on the signal generator to ensure that the AGC is not controlling the power output.

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	f) Slowly increase the signal generator power to a level just below (and within 0.5 dB of) the AGC limit without triggering the AGC. Note the signal generator power level as Pin. g) Measure the output power, Pout, with the spectrum analyzer as follows. 1) Set RBW=100kHz for AWGN signal type, or 300kHz for CW or GSM signal type. 2) Set VBW ⩾ 3*RBW. 3) Select either the BURST POWER or CHANNEL POWER measurement mode, as required for each signal type. For AWGN, the channel power integration bandwidth shall be the 99% OBW of the 4.1 MHz signal. 4) Select the power averaging (rms) detector. 5) Affirm that the number of measurement points per sweep ⩾ (2*span)/RBW. NOTE–This requirement does not apply for BURST power measurement mode. 6) Set sweep time = auto couple, or as necessary (but no less than auto couple value). 7) Trace average at least 100 traces in power averaging (i.e., rms) mode. 8) Record the measured power level Pout, with one set of results for the GSM or CW input stimulus, and another set of results for the AWGN input stimulus. h) Repeat step g) while increasing the signal generator amplitude in 2 dB steps until the maximum input level indicated in 5.5 is reached. If the booster has shut down at any point during the input power steps, it should be noted and step g) shall be repeated at an input level 1 dB less than that found to cause the shutdown. The test report shall include either a statement describing that the device complies at 10 dB above AGC or at the 5.5 power levels, or a table showing compliance at the additional input power(s) required. i) Repeat the entire procedure for each operational uplink and downlink frequency band supported by the booster. j) Provide tabulated results in the test report.

5.2.1 E.U.T. Operation:

Operating Environment:	
Temperature:	25.8 °C
Humidity:	49.9 %
Atmospheric Pressure:	1010 mbar

5.2.2 Test Data:

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Max. Gain

Frequency(MHz)	Signal Type	Pre AGC Input Level (dBm)	Conducted Output Level (dBm)	Gain(dB)	Gain Limit (dB)
Cellular UL	CW	-38	22.04	60.04	64.00
	AWGN	-38	20.75	58.75	
Lower A-E Blocks UL	CW	-38	25.04	63.04	63.49
	AWGN	-38	24.80	62.80	
700 MHz Upper C Block UL	CW	-38	26.13	64.13	64.36
	AWGN	-38	25.82	63.82	
Cellular DL	CW	-47	15.58	62.58	65.40
	AWGN	-47	13.01	60.01	
Lower A-E Blocks DL	CW	-45	15.08	60.08	63.86
	AWGN	-45	13.51	58.51	
700 MHz Upper C Block DL	CW	-52	9.77	61.77	64.01
	AWGN	-52	9.05	61.05	

Remark: *Fixed Booster maximum gain shall not exceed 6.5 dB + 20 Log10 (Frequency), where Frequency is the uplink mid-band frequency of the supported spectrum bands in MHz.*

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Max. Input level

Frequency(MHz)	Signal Type	Max. Input Level (dBm)	Conducted Output Level (dBm)	Conducted Output Power Limit (dBm)	Conducted& EIRP Power Limit (dBm)
Cellular UL	CW	0	17.15	>17dBm	<30dBm
	AWGN	0	22.71		
Lower A-E Blocks UL	CW	0	17.12		
	AWGN	0	19.74		
700 MHz Upper C Block UL	CW	0	23.24		
	AWGN	0	27.84		
Cellular DL	CW	-22	16.73	N/A	<17dBm
	AWGN	-25	16.81		
Lower A-E Blocks DL	CW	-22	15.68		
	AWGN	-27	16.74		
700 MHz Upper C Block DL	CW	-26	14.73		
	AWGN	-28	10.18		

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Max. Output level

Frequency(MHz)	Signal Type	Conducted Output Level (dBm)	Max Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Conducted Output Power Limit (dBm)	Conducted& EIRP Power Limit (dBm)
Cellular UL	CW	20.37	10	3	27.37	>17dBm	<30dBm
	AWGN	18.53	10	3	25.53		
Lower A-E Blocks UL	CW	21.20	10	3	28.20		
	AWGN	17.99	10	3	24.99		
700 MHz Upper C Block UL	CW	20.26	10	3	27.26		
	AWGN	18.93	10	3	25.93		
Cellular DL	CW	10.53	9	3	16.53	N/A	<17dBm
	AWGN	9.49	9	3	15.49		
Lower A-E Blocks DL	CW	10.27	9	3	16.27		
	AWGN	8.82	9	3	14.82		
700 MHz Upper C Block DL	CW	10.35	9	3	16.35		
	AWGN	8.31	9	3	14.31		

Remark: *EIRP= Conducted Output Level+ Max Antenna Gain- Cable Loss*

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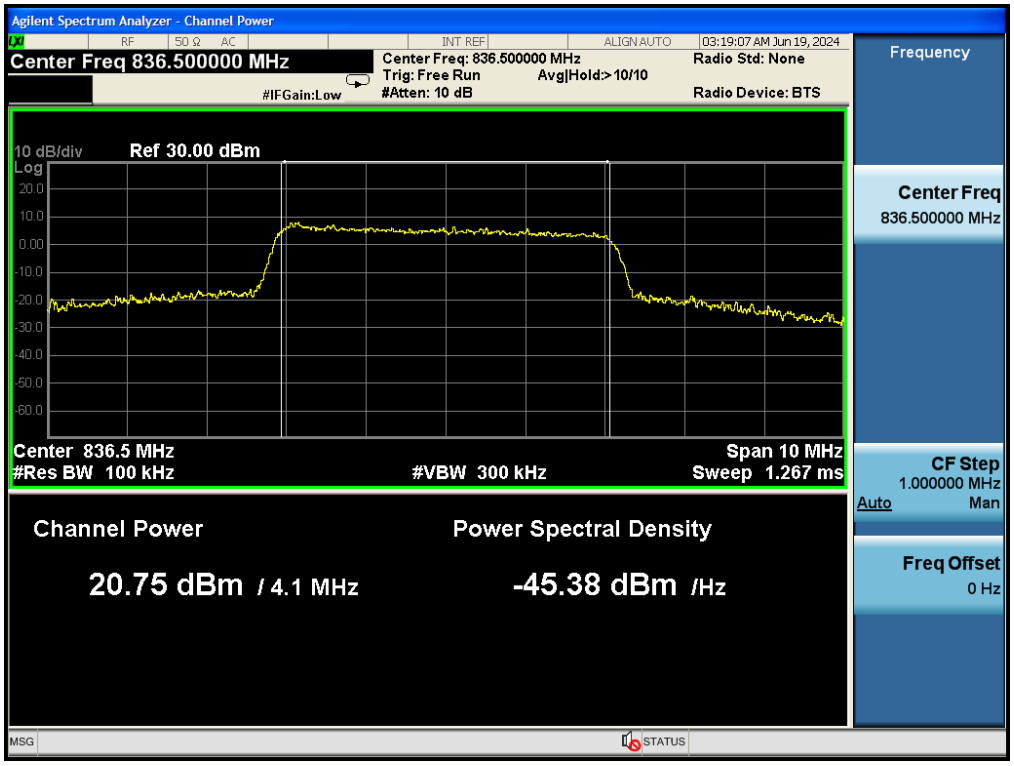
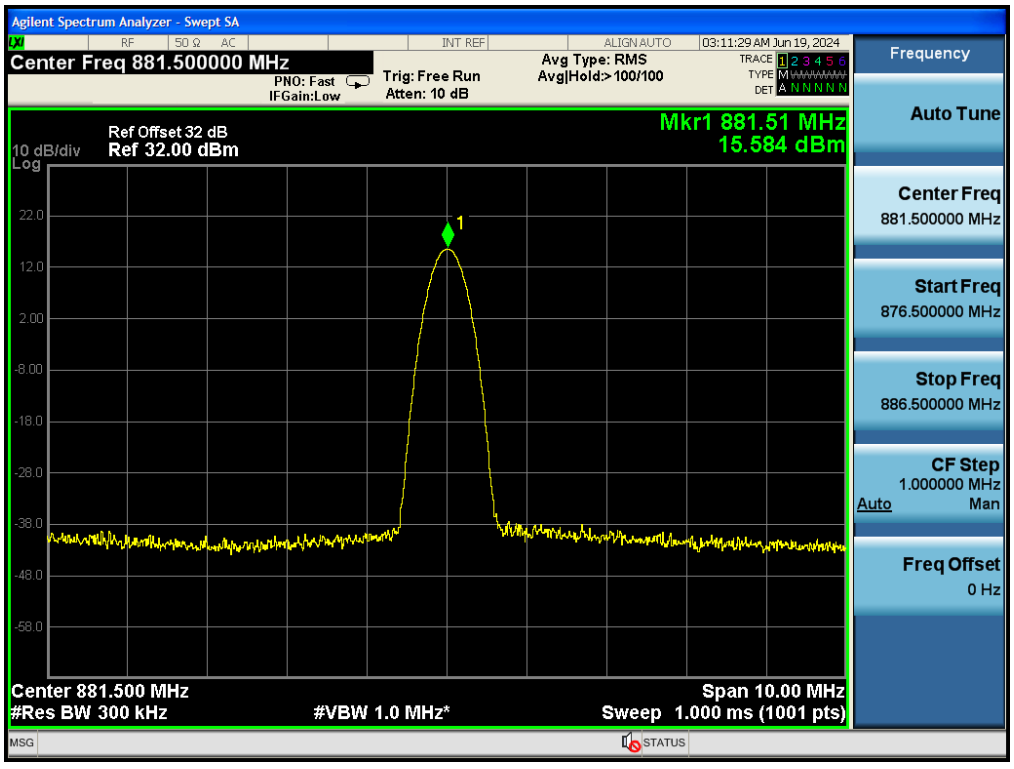
Max. Gain
Cellular AWGN, UL



Cellular CW, DL



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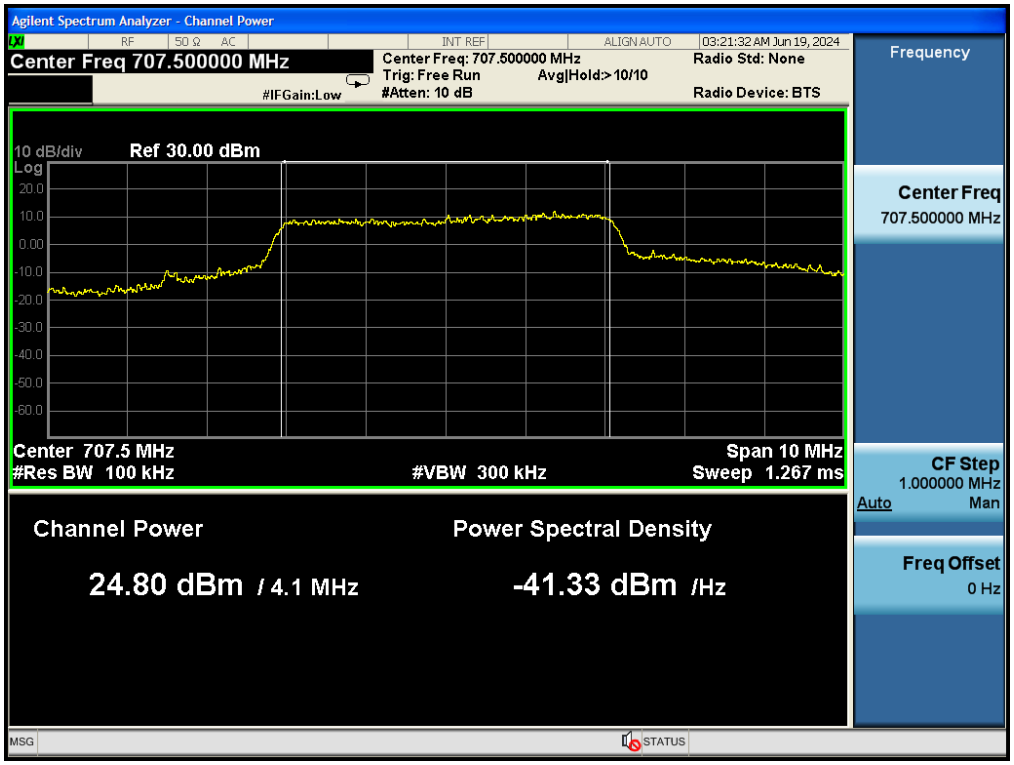
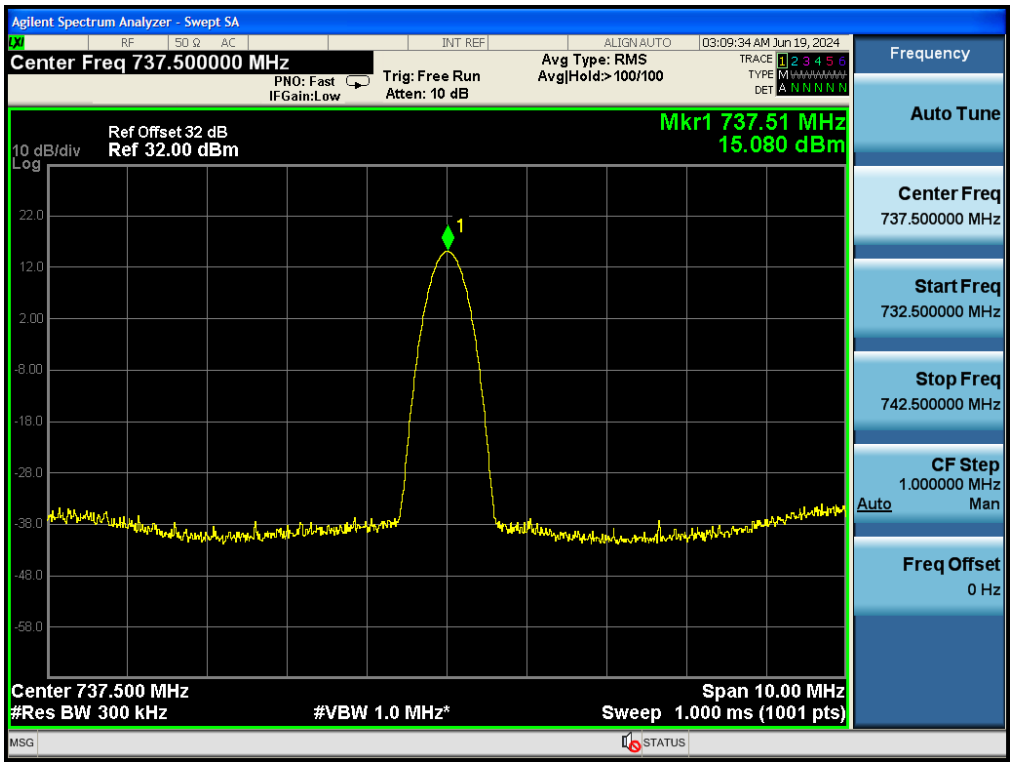
Lower A-E Blocks AWGN, UL



Lower A-E Blocks CW, DL



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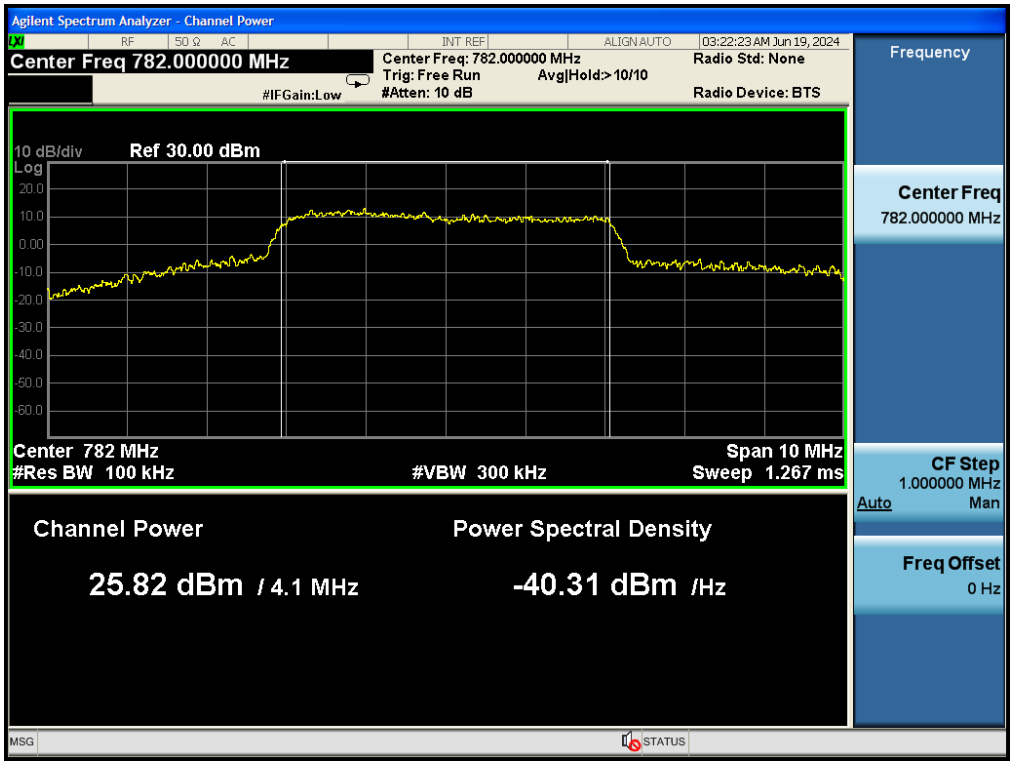
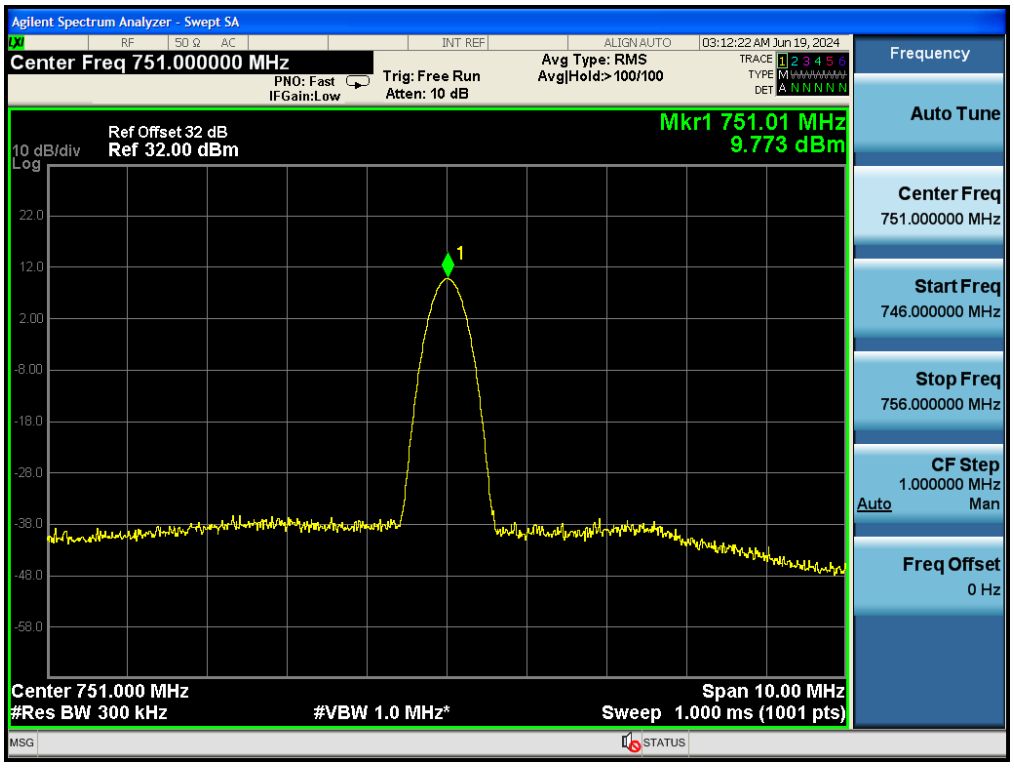
700 MHz Upper C Block AWGN, UL



700 MHz Upper C Block CW, DL



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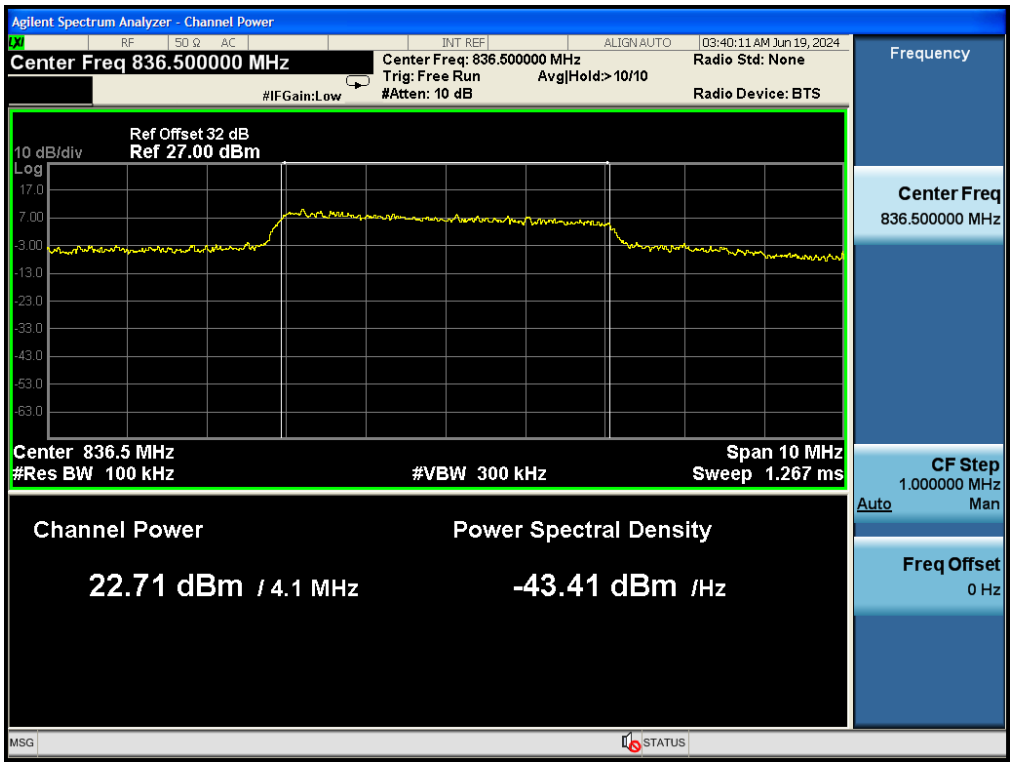
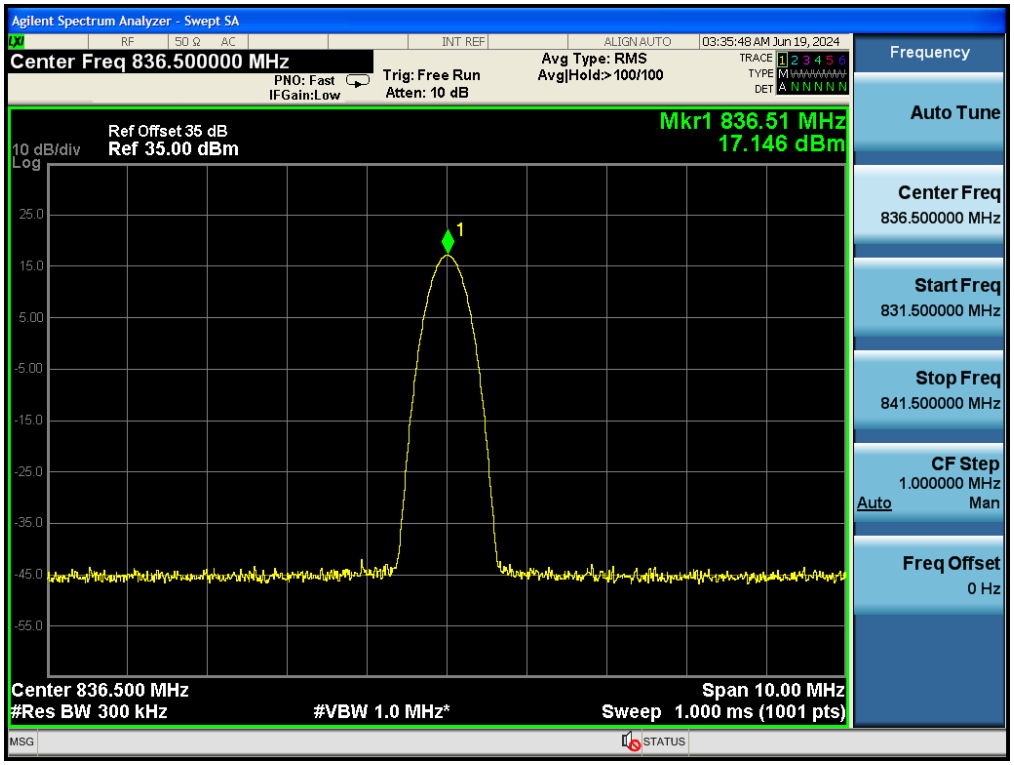
Max. Input level

Cellular AWGN, UL



Cellular CW, UL



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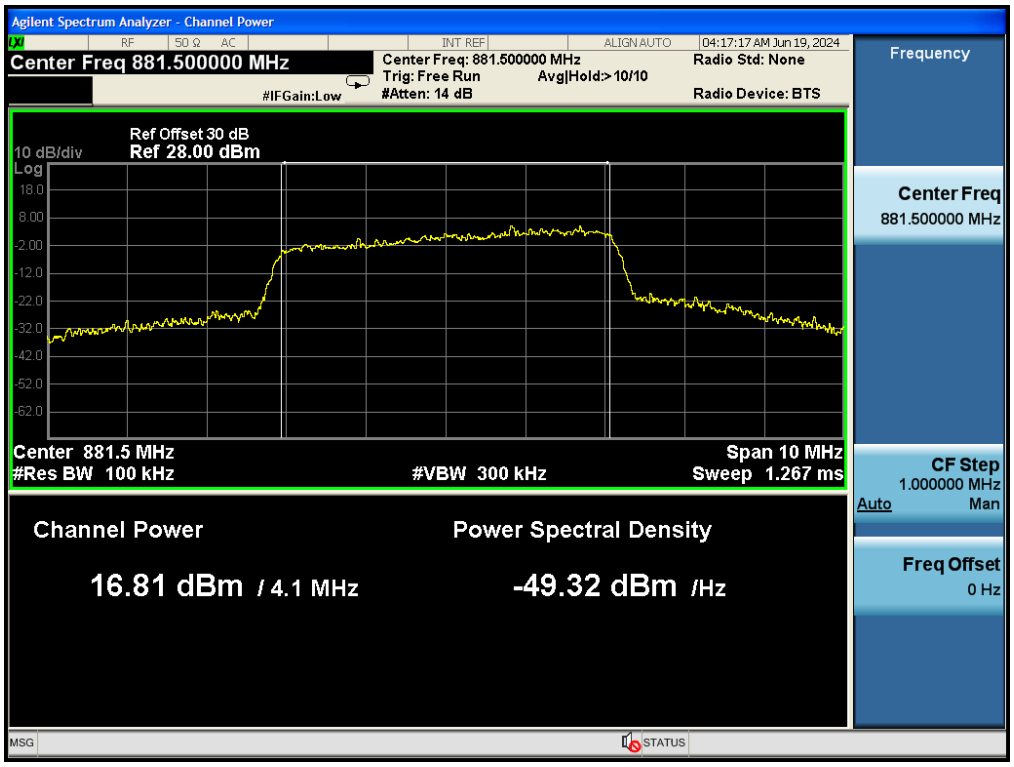
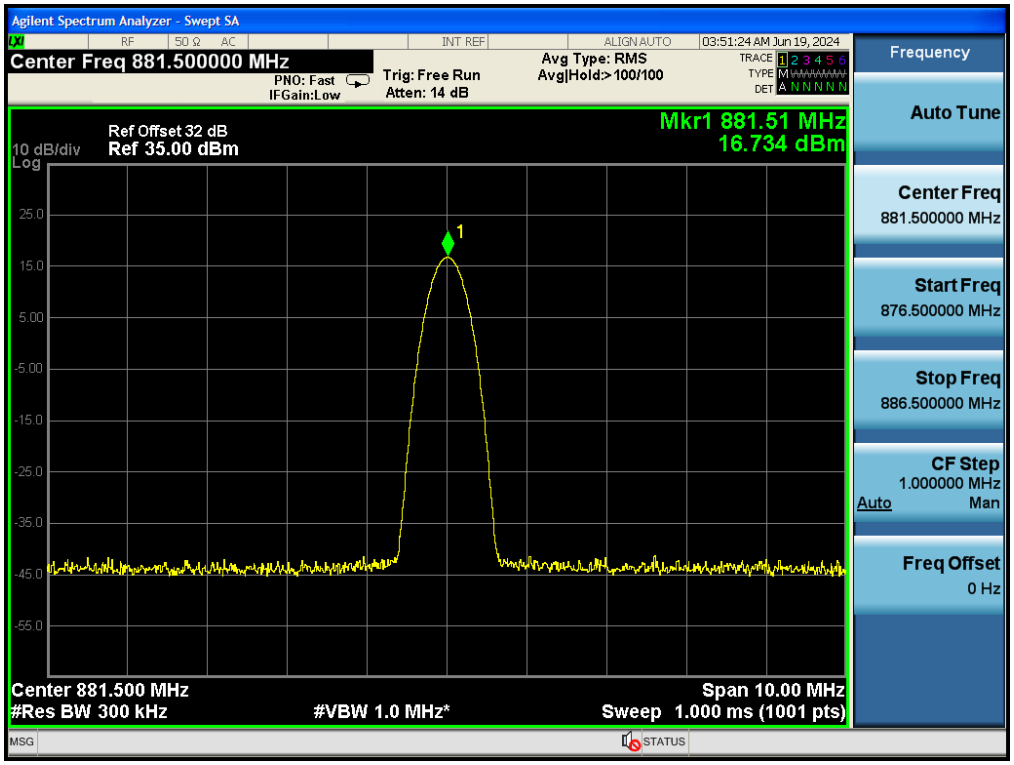
Cellular AWGN, DL



Cellular CW, DL



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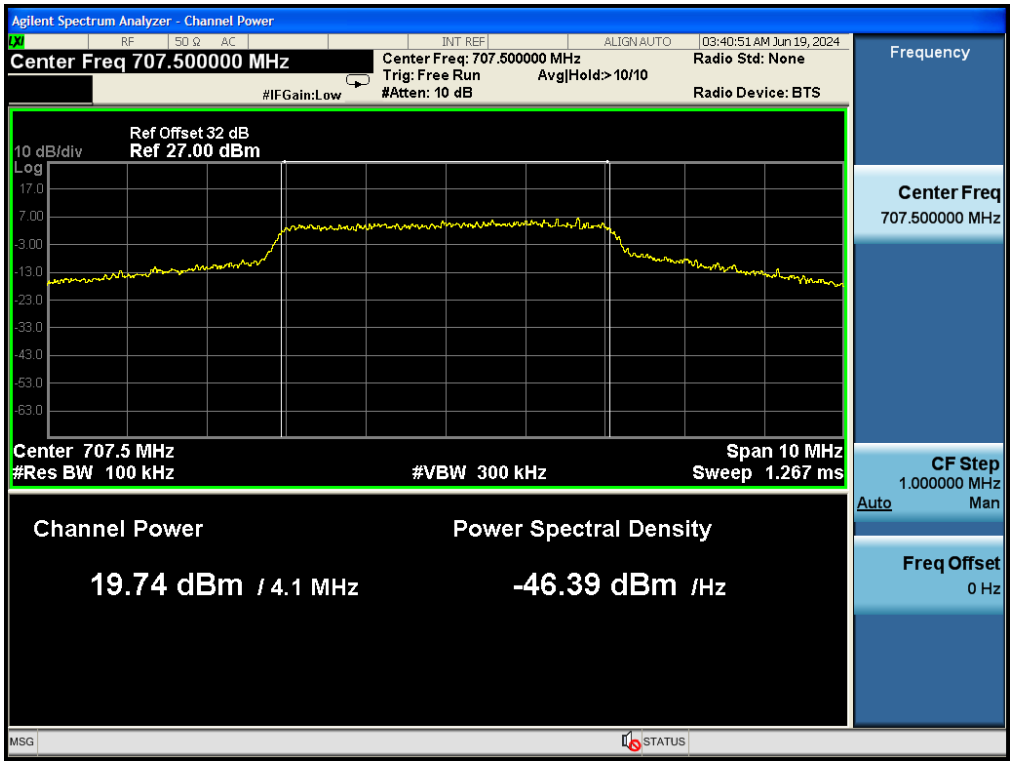
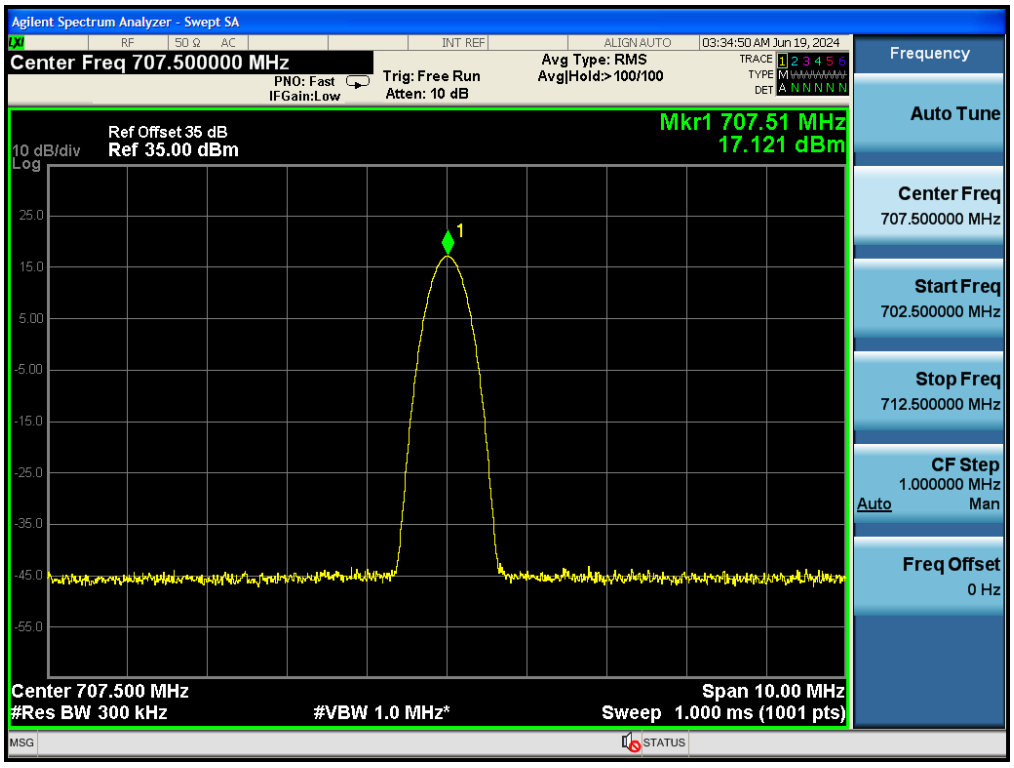
Lower A-E Blocks AWGN, UL



Lower A-E Blocks CW, UL



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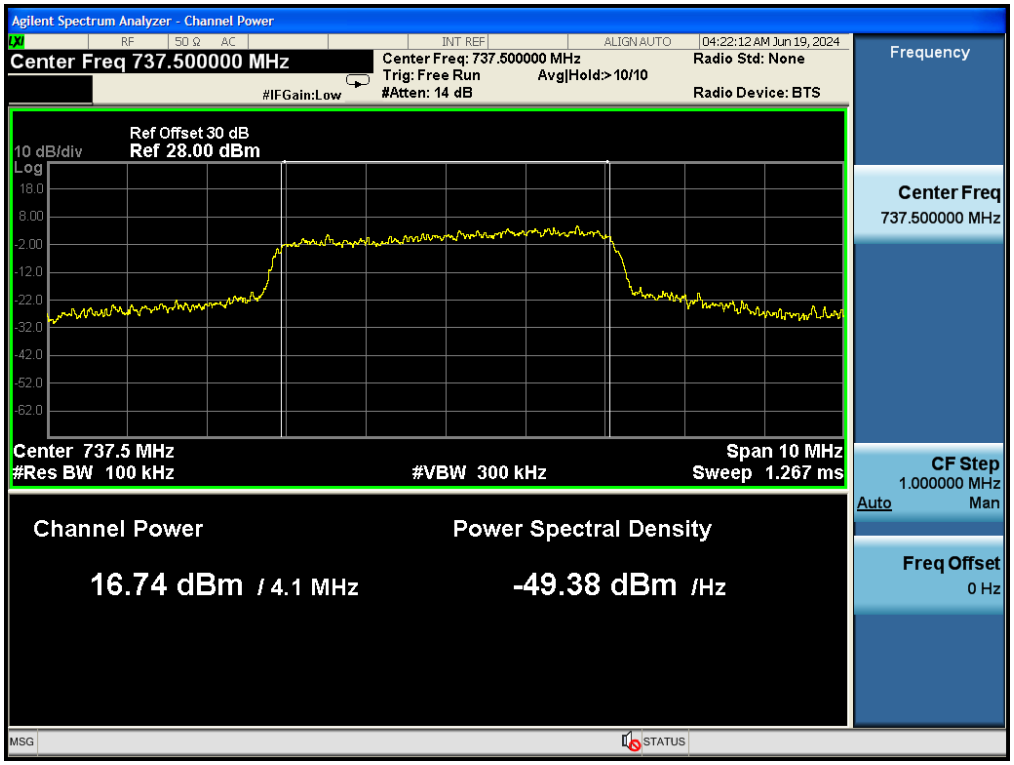
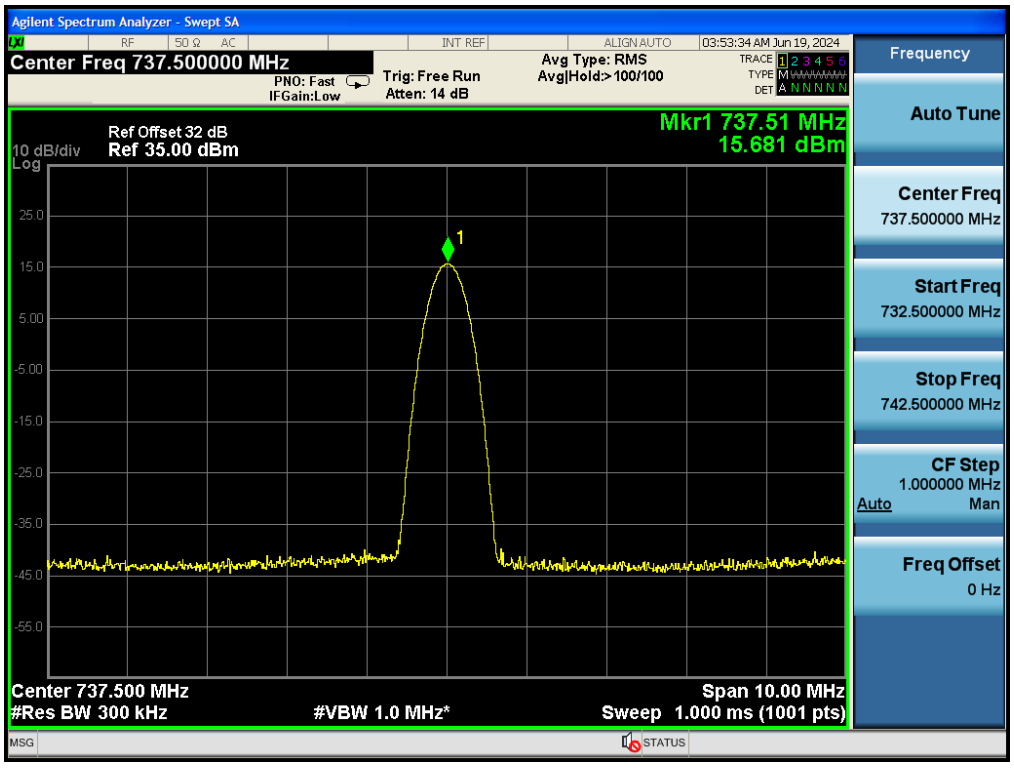
Lower A-E Blocks AWGN, DL



Lower A-E Blocks CW, DL



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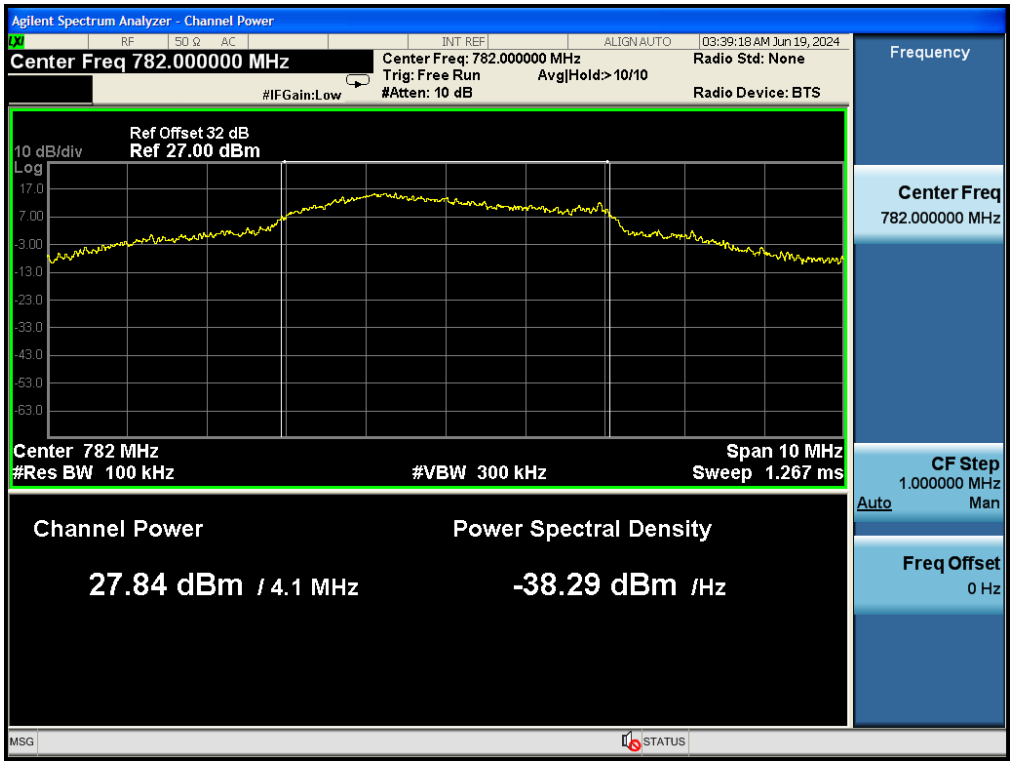
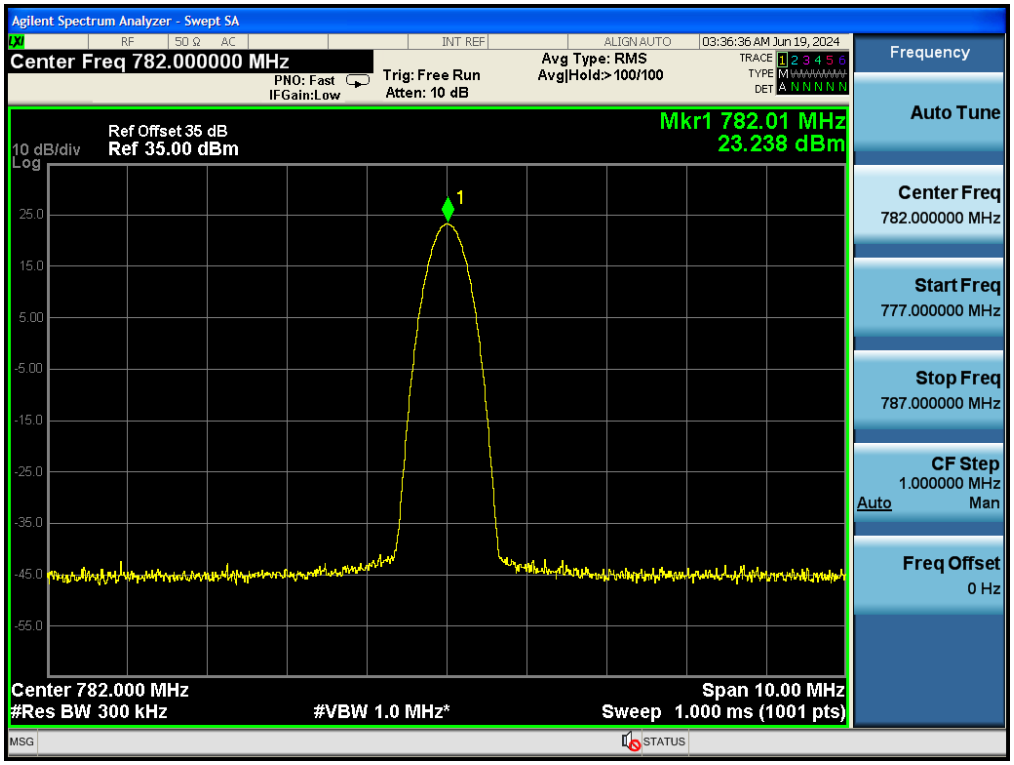
700 MHz Upper C Block AWGN, UL



700 MHz Upper C Block CW, UL



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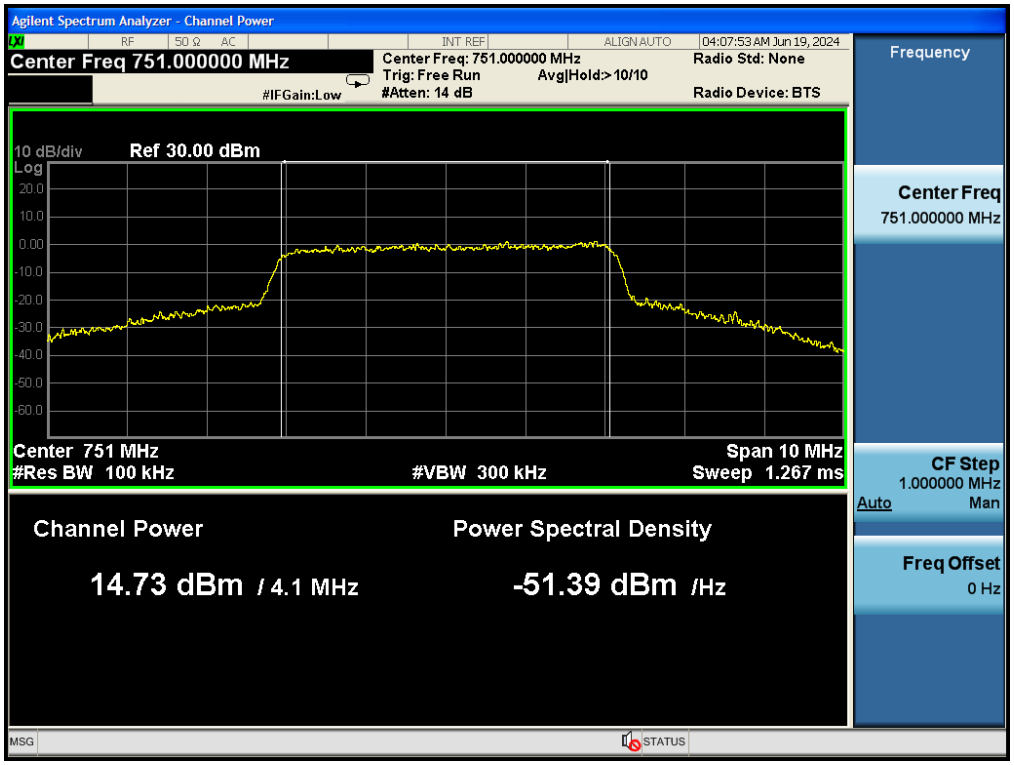
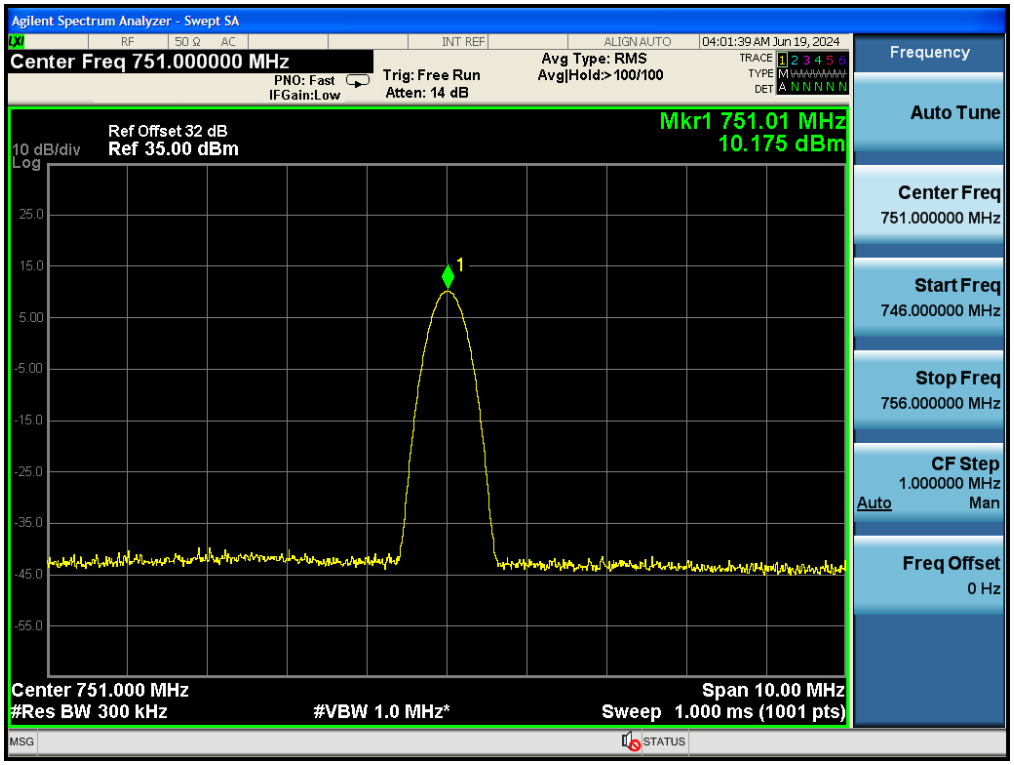
700 MHz Upper C Block AWGN, DL



700 MHz Upper C Block CW, DL



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5.3 Maximum Booster Gian Computation

Test Requirement:	This section provides guidance on the computation of the maximum gain based on the results obtained from previous measurements. The NPS limits on maximum gain for fixed and mobile Wideband Consumer Signal Boosters are provided in §20.21(e)(8)(i)(C)(2). Additionally, §20.21(e)(8)(i)(B) requires that Wideband Consumer Signal Boosters be able to provide equivalent uplink and downlink gain (within 9 dB).
Procedure:	a) Compute the maximum gain of the booster as follows to demonstrate compliance to the applicable gain limits as specified. b) For both the uplink and downlink in each supported frequency band, use each of the POUT and PIN value pairs determined in 7.2 in the following equation to determine the maximum gain (G) of the booster: G (dB) = P_{OUT}(dBm) - P_{IN}(dBm). c) Record the maximum gain of the uplink and downlink paths for each supported frequency band and verify that the each gain value complies with the applicable limit.

5.3.1 E.U.T. Operation:

Operating Environment:	
Temperature:	25.8 °C
Humidity:	49.9 %
Atmospheric Pressure:	1010 mbar

5.3.2 Test Data:

Uplink Gain VS Downlink Gain

Band	Signal Type	Uplink Gain (dB)	Downlink Gain(dB)	D-value	Limit (dBm)
Cellular	CW	60.04	62.58	-2.54	9
	AWGN	58.75	60.01	-1.26	
Lower A-E Blocks	CW	63.04	60.08	2.96	
	AWGN	62.80	58.51	4.29	
700 MHz Upper C Block	CW	64.13	61.77	2.36	
	AWGN	63.82	61.05	2.77	

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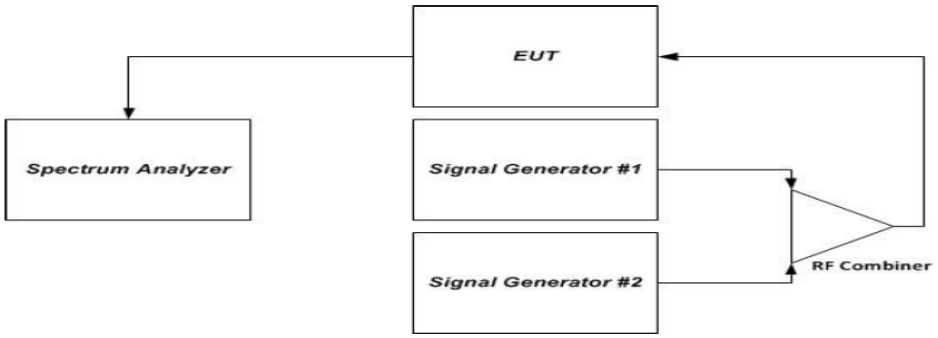
5.4 Intermodulation Product

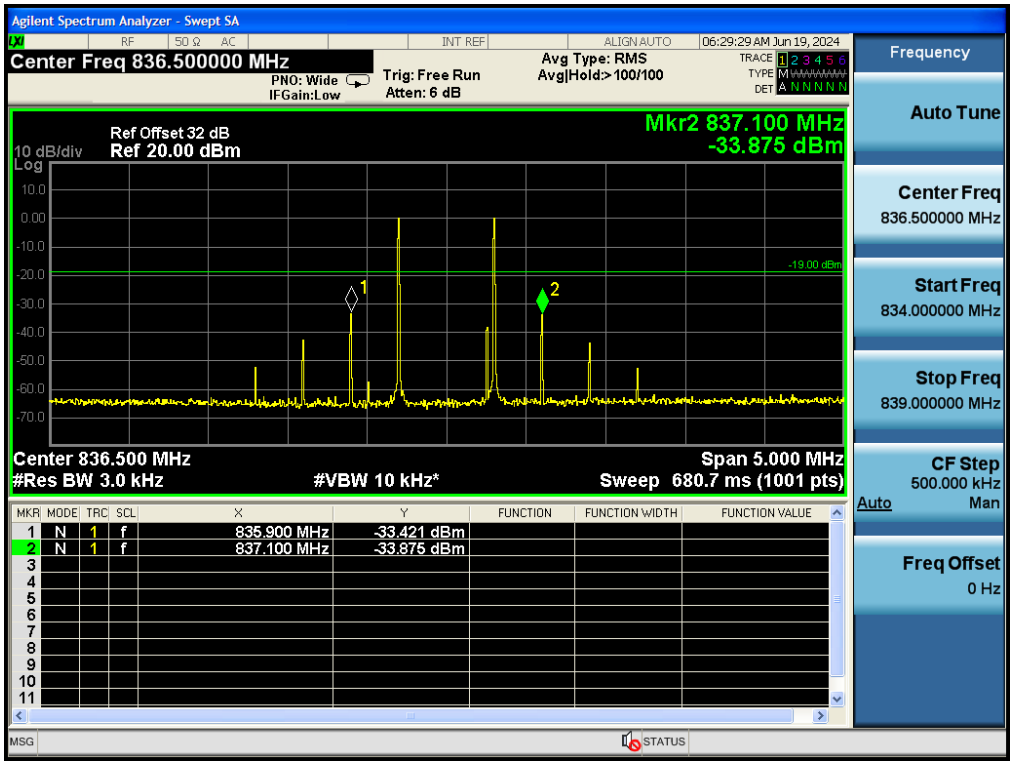
Test Requirement:	The following procedures shall be used to demonstrate compliance to the intermodulation limit specified in §20.21(e)(8)(i)(F) for Wideband Consumer Signal Boosters (i.e., -19 dBm).
Limit:	-19dBm
Test Setup:	 Figure 2 – Intermodulation product instrumentation test setup
Procedure:	a) Connect the signal booster to the test equipment as shown in Figure 2. Begin with the uplink output connected to the spectrum analyzer. b) Set the spectrum analyzer RBW = 3 kHz. c) Set the VBW ⩾ 3 X the RBW. d) Select the RMS detector. e) Set the spectrum analyzer center frequency to the center of the supported operational band under test. f) Set the span to 5 MHz. g) Configure the two signal generators for CW operation with generator 1 tuned 300 kHz below the operational band center frequency and generator 2 tuned 300 kHz above the operational band center frequency. h) Set the signal generator amplitudes so that the power from each into the RF combiner is equivalent and turn on the RF output. i) Increase the signal generators' amplitudes equally until just before the EUT begins AGC and ensure that all intermodulation products (if any exist), are below the specified limit of -19 dBm. j) Utilize the MAX HOLD function of the spectrum analyzer and wait for the trace to stabilize. Place a marker at the highest amplitude intermodulation product. k) Record the maximum intermodulation product amplitude level that is observed. l) Capture the spectrum analyzer trace for inclusion in the test report. m) Repeat steps 7.4.5 to 7.4.12 for all uplink and downlink operational bands. Note: If using a single signal generator with dual outputs, ensure that intermodulation products are not the result of the generator.

5.4.1 E.U.T. Operation:

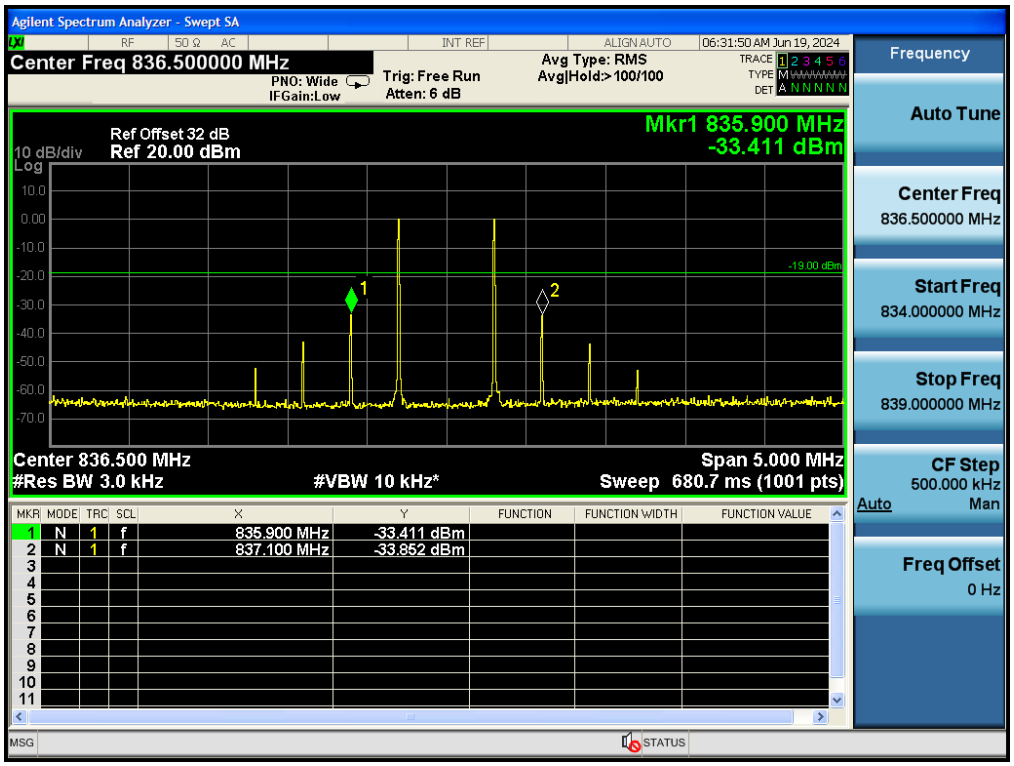
Operating Environment:	
Temperature:	25.8 °C
Humidity:	49.9 %
Atmospheric Pressure:	1010 mbar

5.4.2 Test Data:

Cellular Pre AGC, UL



Cellular Pre AGC+10dB, UL



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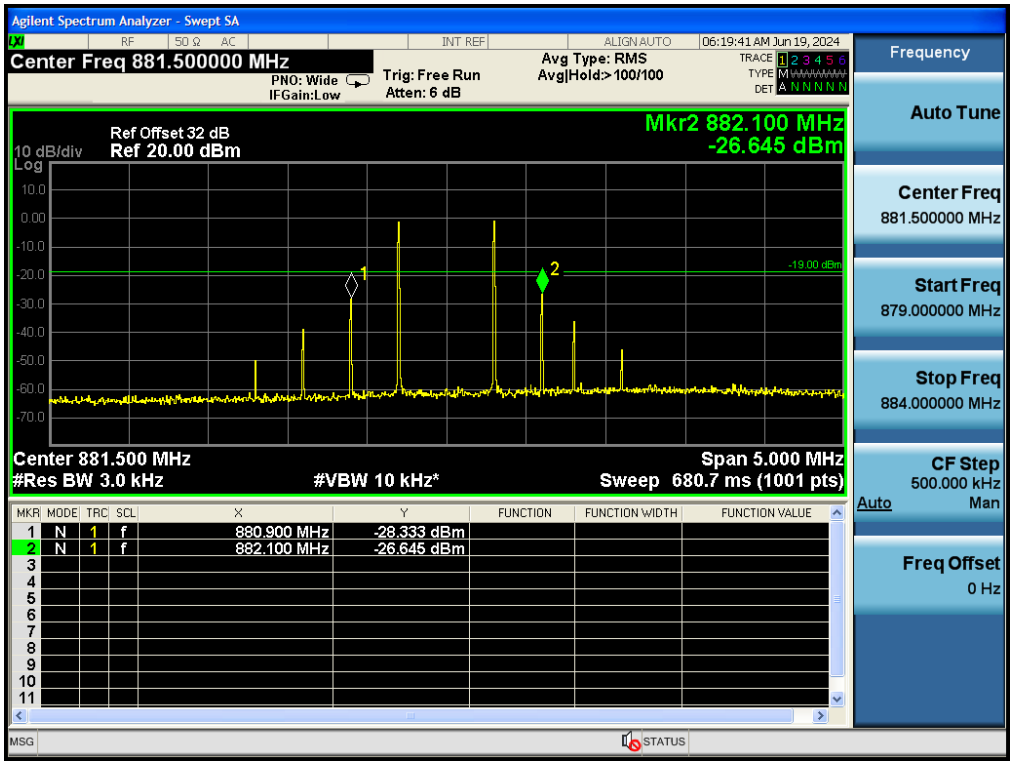
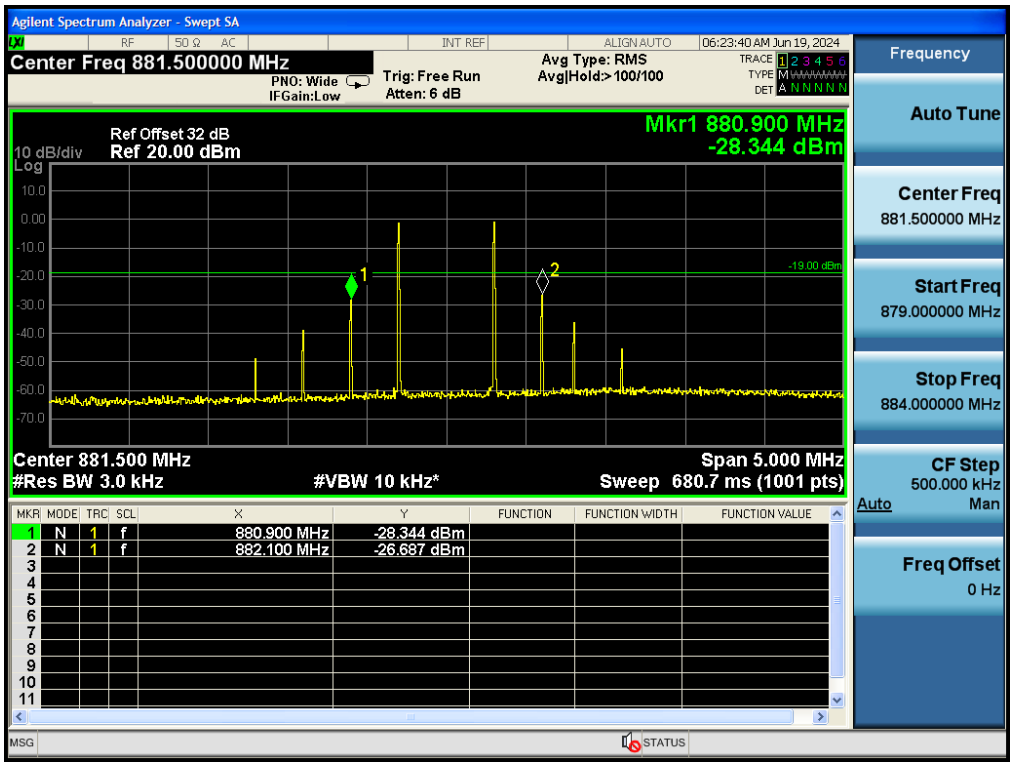
Cellular Pre AGC, DL



Cellular Pre AGC+10dB, DL



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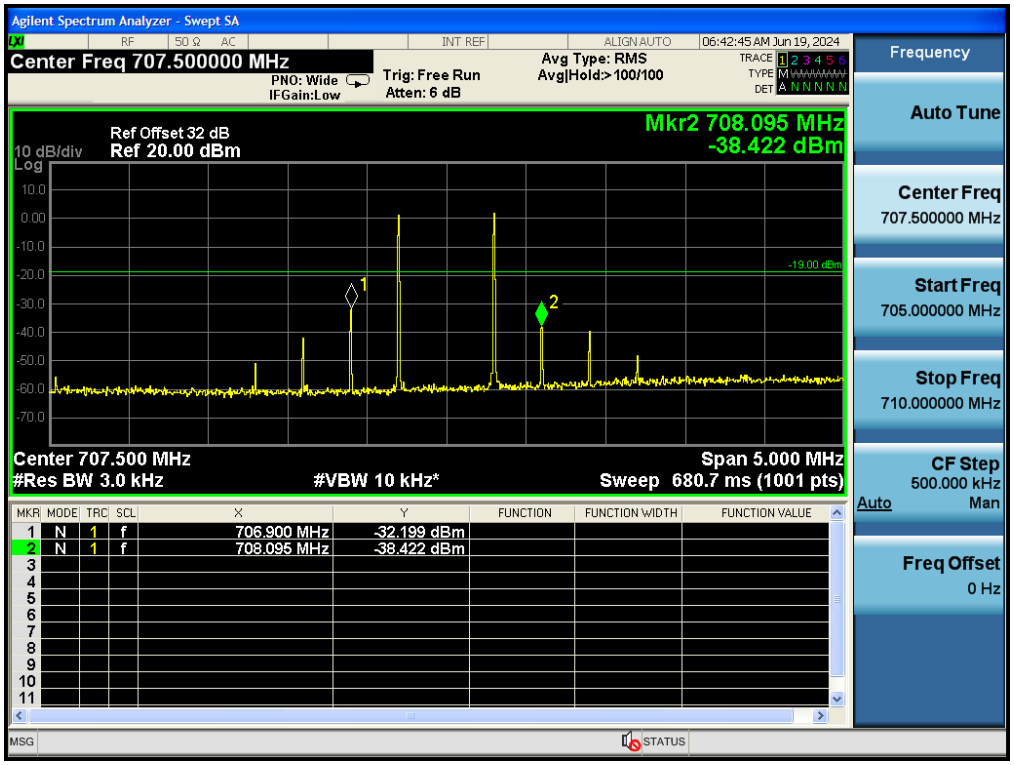
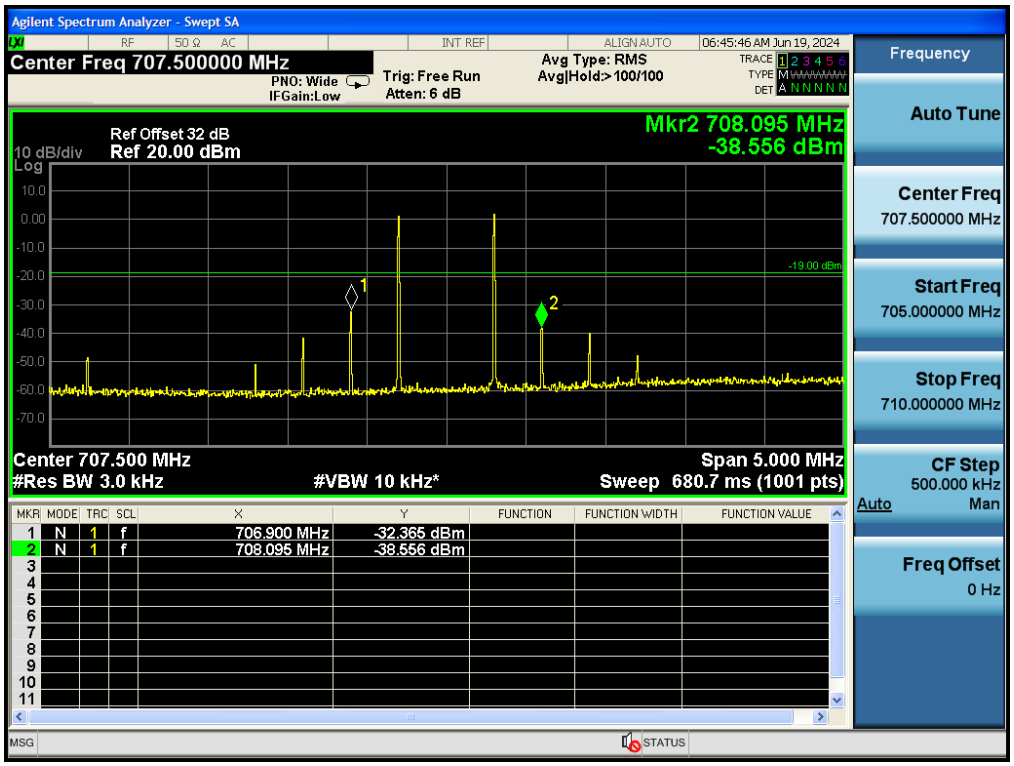
Lower A-E Blocks Pre AGC, UL



Lower A-E Blocks Pre AGC+10dB, UL



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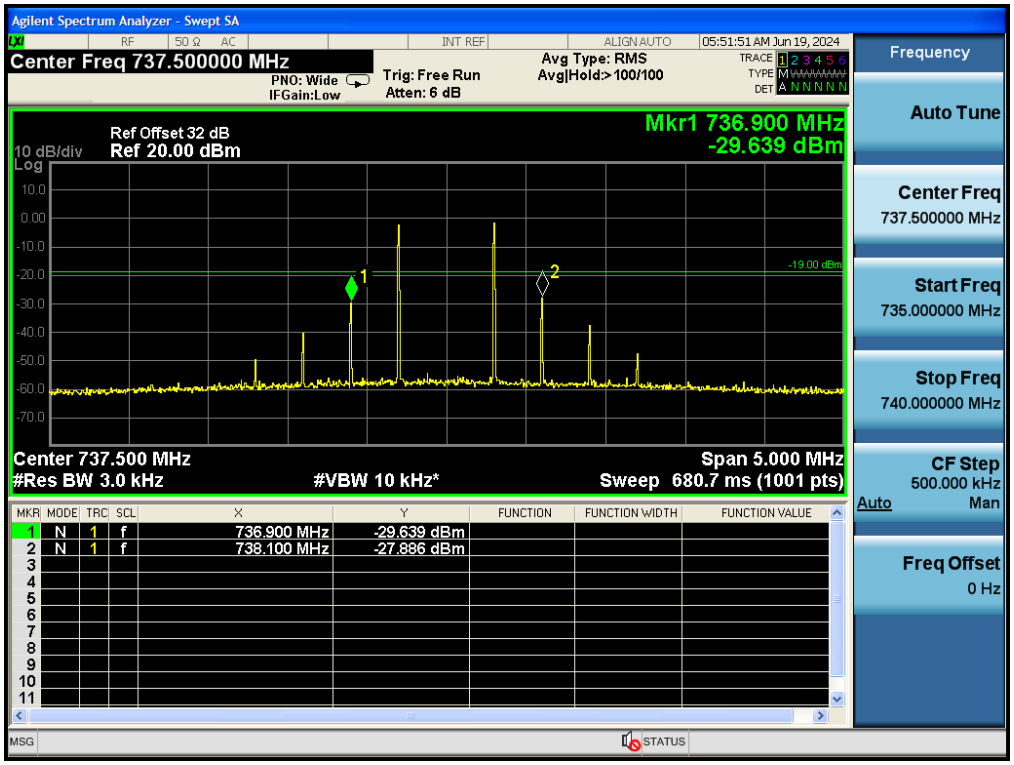
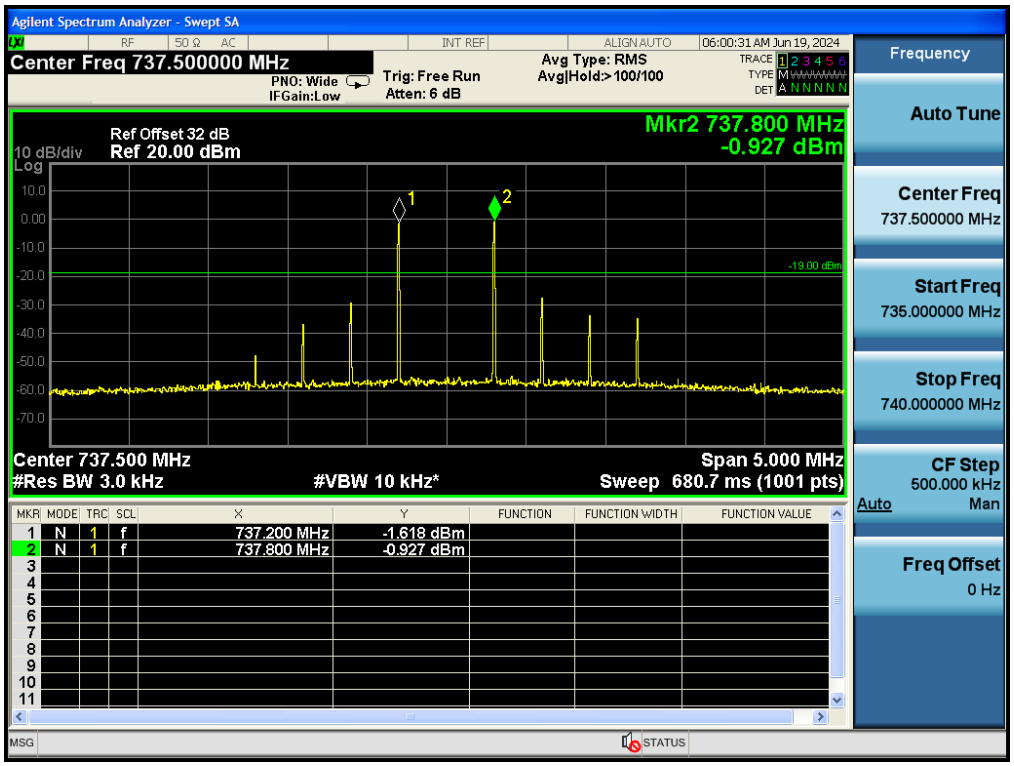
Lower A-E Blocks Pre AGC, DL



Lower A-E Blocks Pre AGC+10dB, DL



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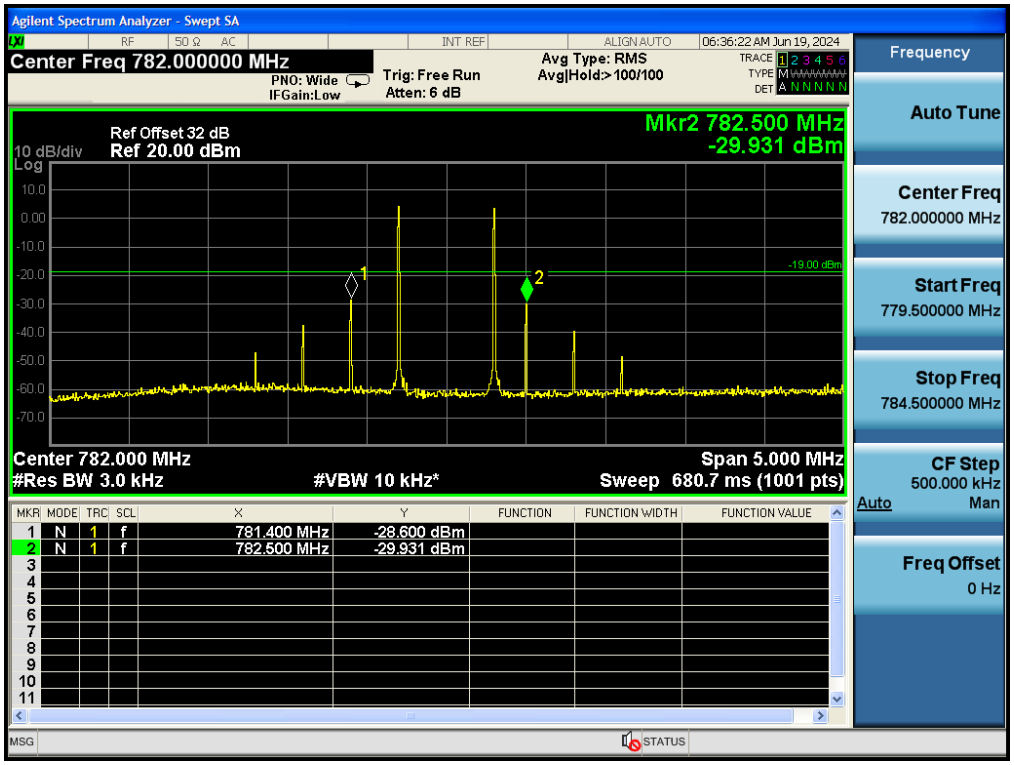
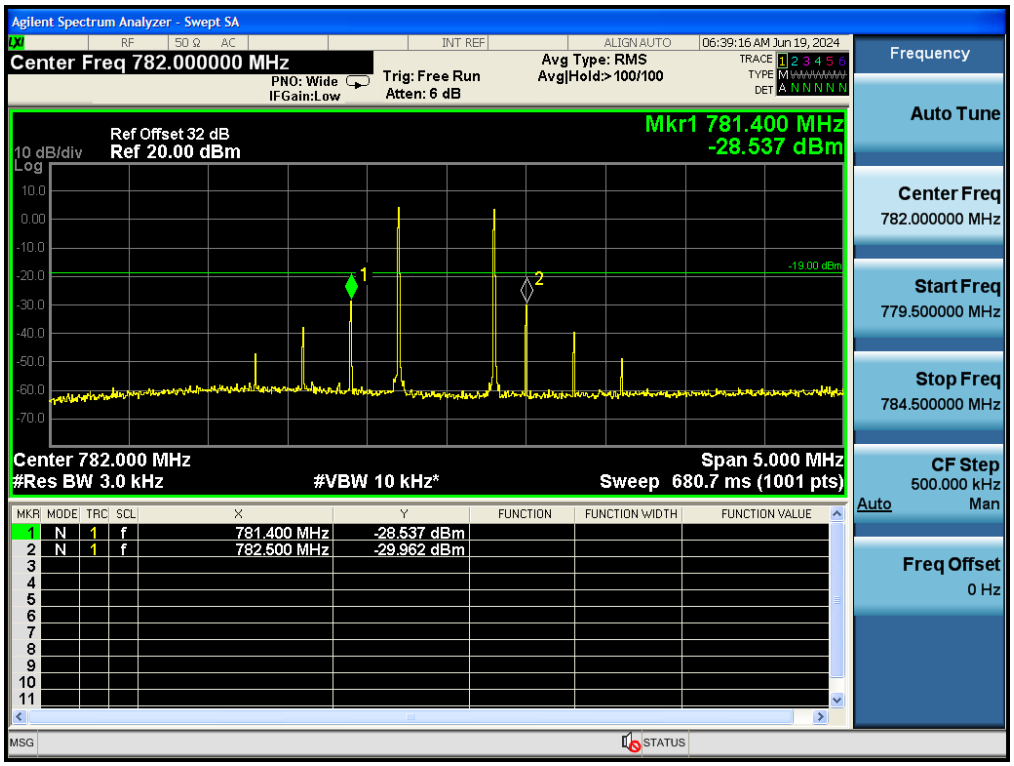
700 MHz Upper C Block Pre AGC, UL



700 MHz Upper C Block Pre AGC+10dB, UL



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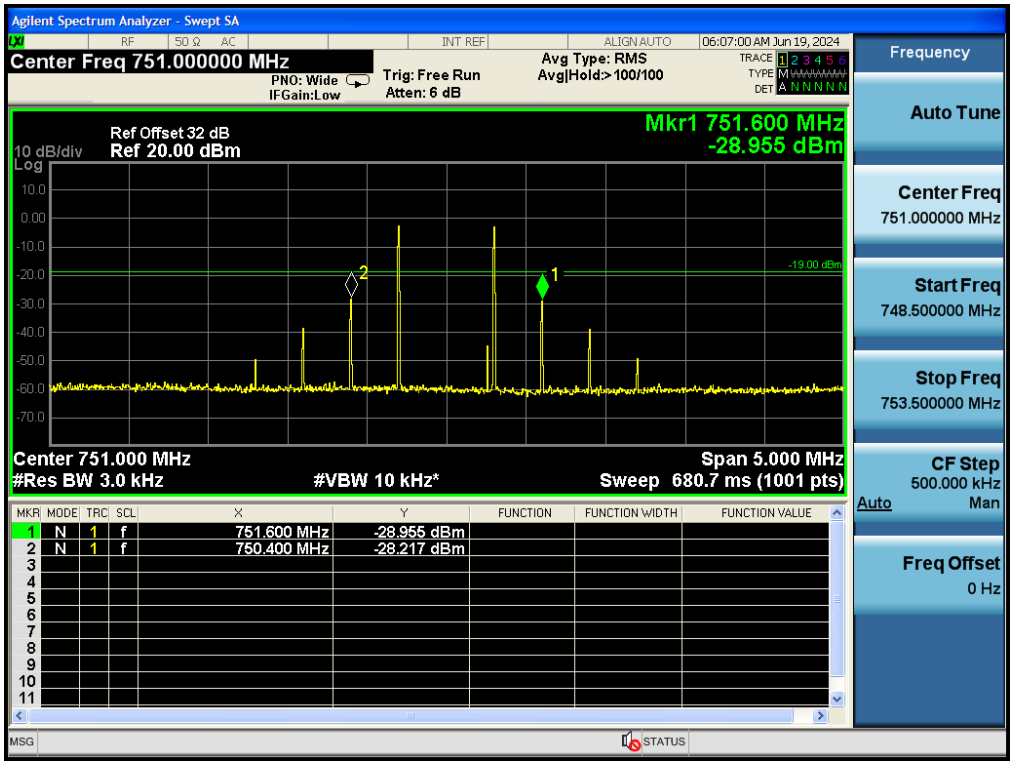
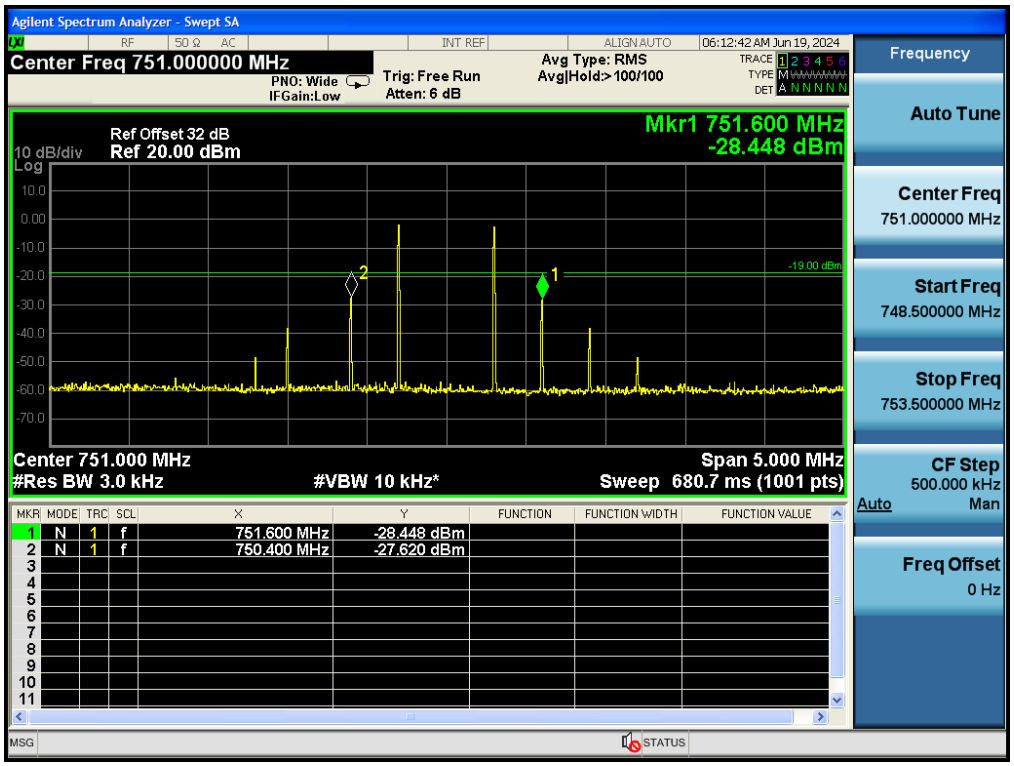
700 MHz Upper C Block Pre AGC, DL



700 MHz Upper C Block Pre AGC+10dB, DL



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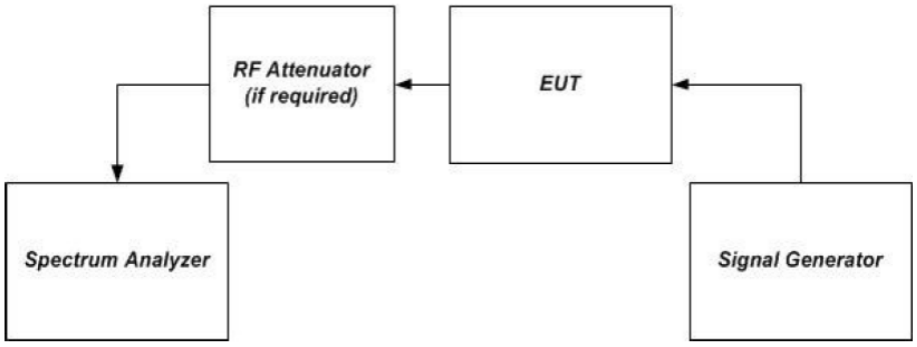
5.5 Out Of Band Emissions

Test Requirement:	This measurement is intended to demonstrate compliance to the limit specified in §20.21(e)(8)(i)(E), which specifies that out-of-band emissions generated by a Wideband Signal Booster shall be at least 6 dB below the mobile emission limit applicable to the supported band of operation. The mobile emission limit applicable to the supported band of operation can be determined from the applicable rule part which is referenced in Annex A for each authorized operating band.
Limit:	-19dBm
Test Setup:	
Procedure:	a) Connect the EUT to the test equipment as shown in figure 1. Begin with the uplink output connected to the spectrum analyzer. b) Configure the signal generator for the appropriate operation for all uplink and downlink bands: 1) GSM: 0.2 MHz from upper and lower band edges. 2) LTE (5 MHz): 2.5 MHz from upper and lower band edges. 3) Cellular: 1.25 MHz from upper and lower band edges, except for cellular band as follows (only the upper and lower frequencies need to be tested): 824.88 MHz, 845.73 MHz, 836.52 MHz, 848.10 MHz, 869.88 MHz, 890.73 MHz, 881.52 MHz, 893.10 MHz. c) Set the signal generator amplitude to the maximum power level prior to AGC similar to the procedures in 7.2.4 to 7.2.6 of power measurement procedure for appropriate modulations. d) Set RBW = measurement bandwidth specified in the applicable rule section for the supported frequency band (see Annex A for cross-reference to applicable rule section). e) Set VBW = 3 X RBW. f) Select the RMS (power averaging) detector. g) Sweep time = auto-couple. h) Set the analyzer start frequency to the upper band/block edge frequency and the stop frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, per applicable rule part. i) Trace average at least 100 traces in power averaging (i.e., RMS) mode. j) Use peak marker function to find the maximum power level. k) Capture the Spectrum Analyzer trace of the power level for inclusion in the test report. l) Increase the signal generator amplitude to the saturation level indicated in 5.4. Ensure that the EUT maintains compliance with the OOBE limits. m) Reset the analyzer start frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as per applicable rule part, and the stop frequency to the lower band/block edge frequency and repeat steps 7.5.10-7.5.12. n) Repeat steps 7.5.2 through 7.5.14 for each uplink and downlink operational band.

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5.5.1 E.U.T. Operation:

Operating Environment:	
Temperature:	22.1 °C
Humidity:	46.3 %
Atmospheric Pressure:	1010 mbar

5.5.2 Test Data:

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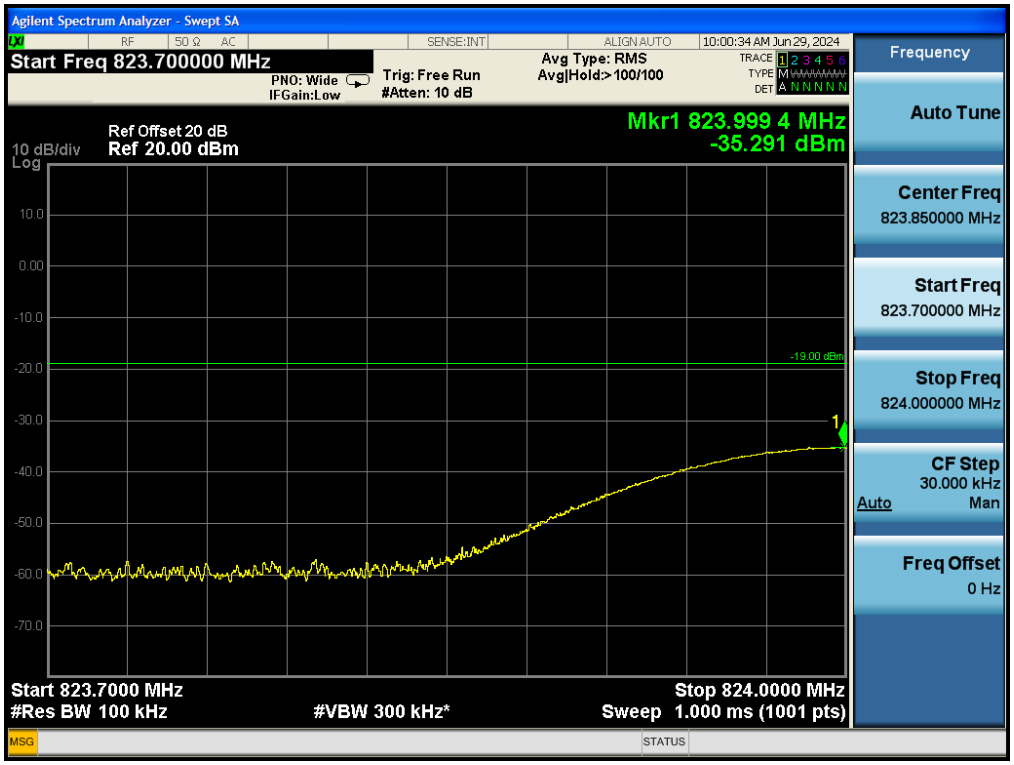
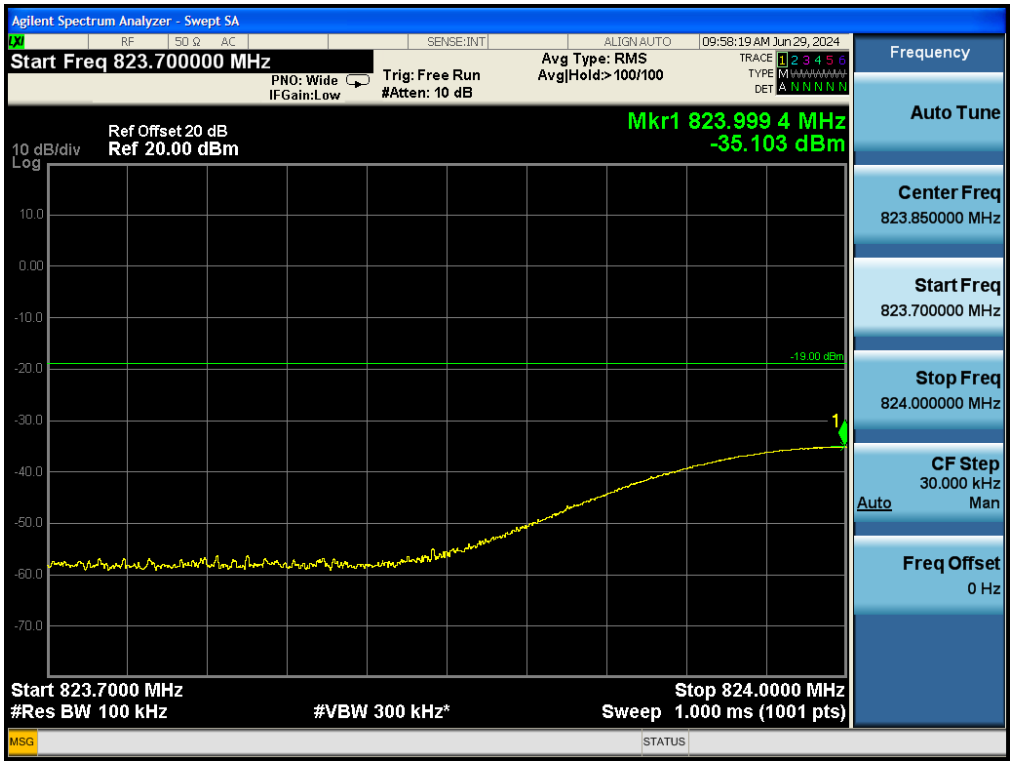
Cellular UL Left Side Pre AGC



Cellular UL Left Side Max Input



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Cellular UL Right Side Pre AGC

Cellular UL Right Side Max Input

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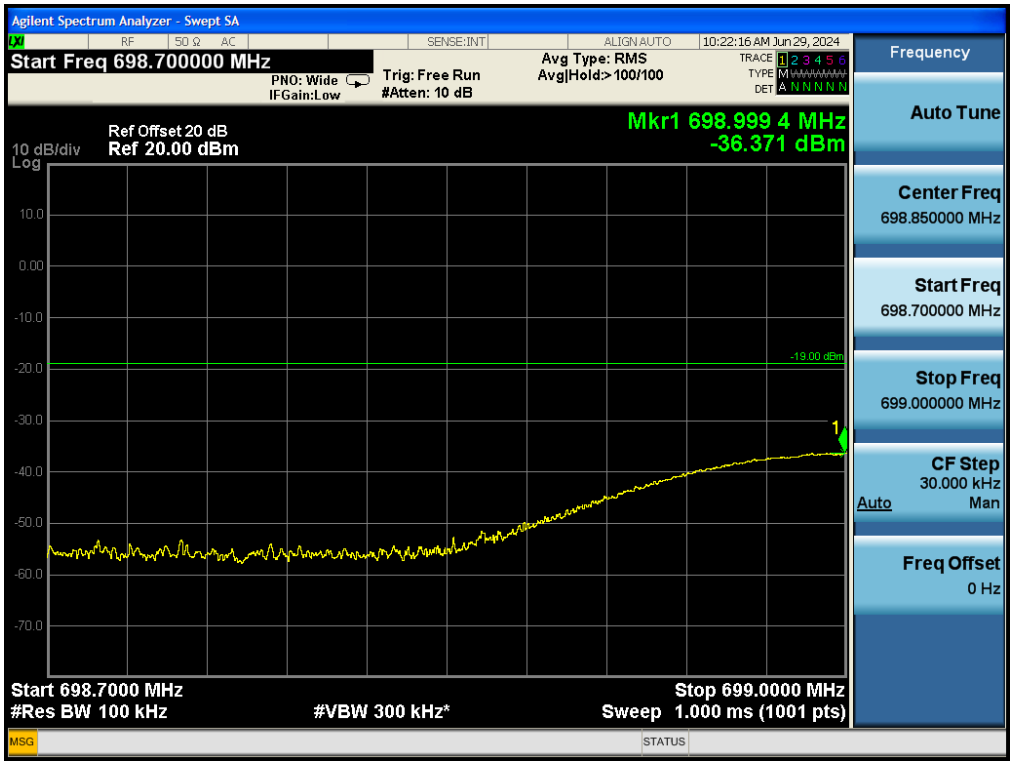
Lower A-E Blocks UL Left Side Pre AGC



Lower A-E Blocks UL Left Side Max Input

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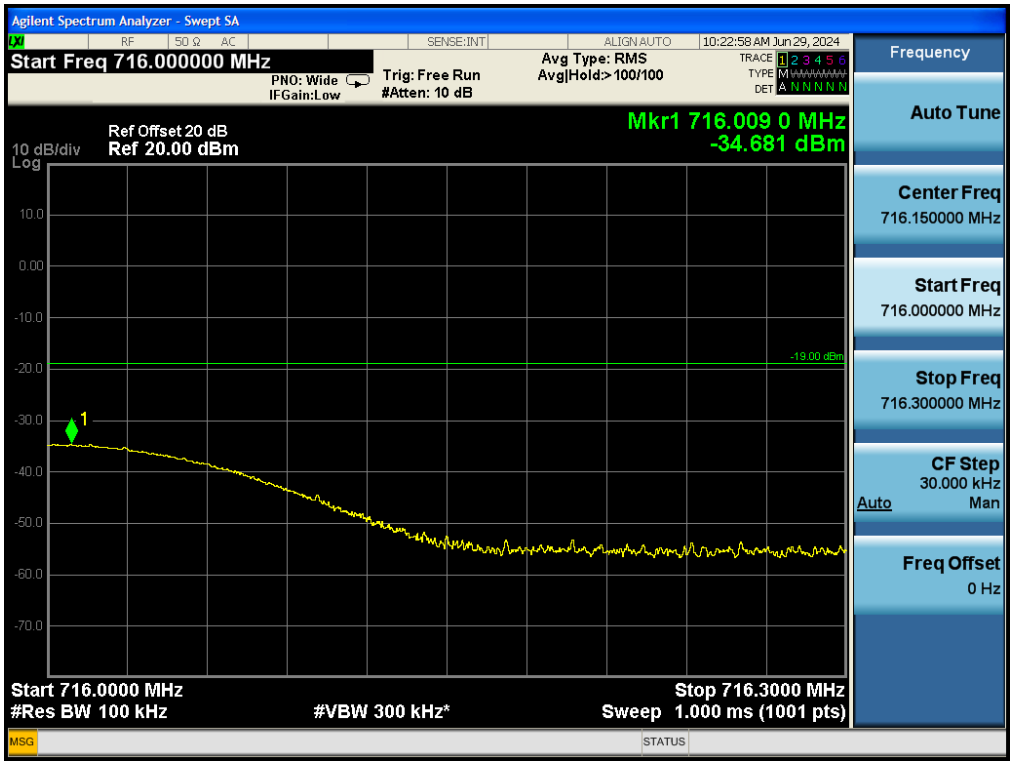
F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China

Lower A-E Blocks UL Right Side Pre AGC



Lower A-E Blocks UL Right Side Max Input

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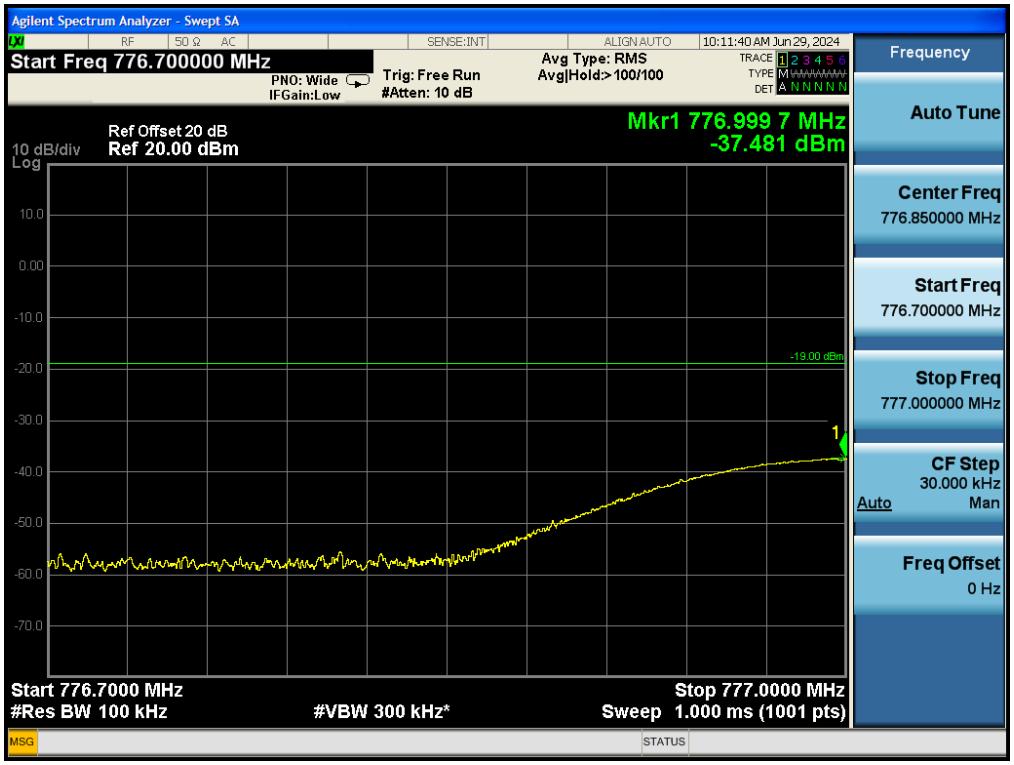
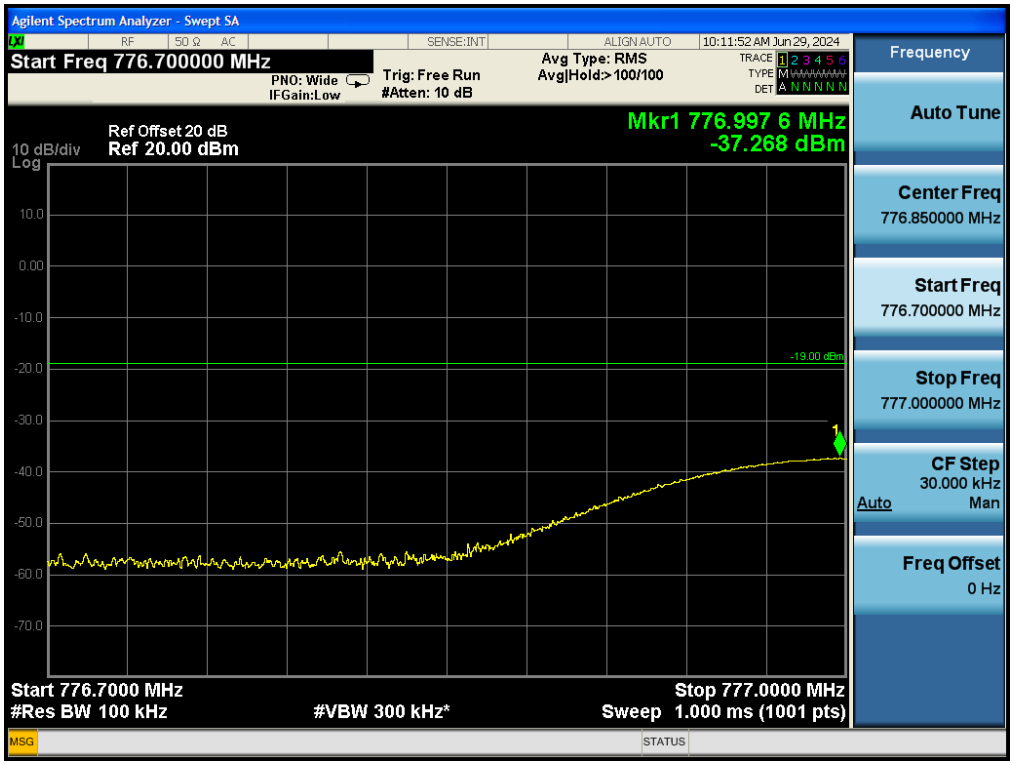
F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China

700 MHz Upper C Block s UL Left Side Pre AGC



700 MHz Upper C Block UL Left Side Max Input



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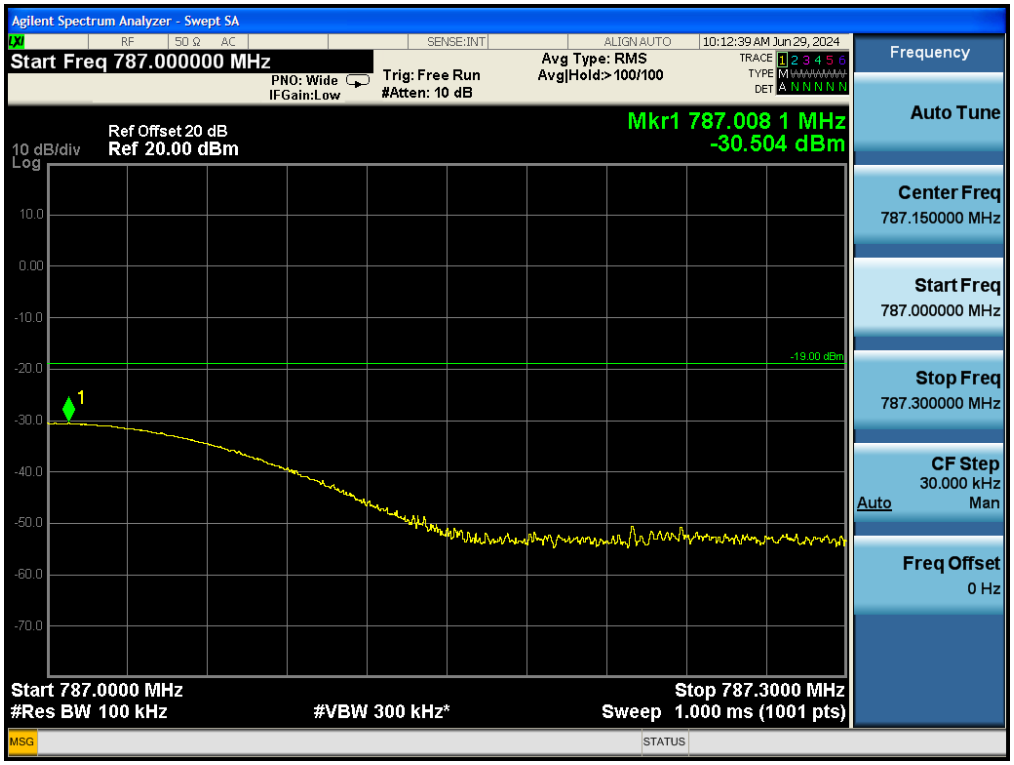
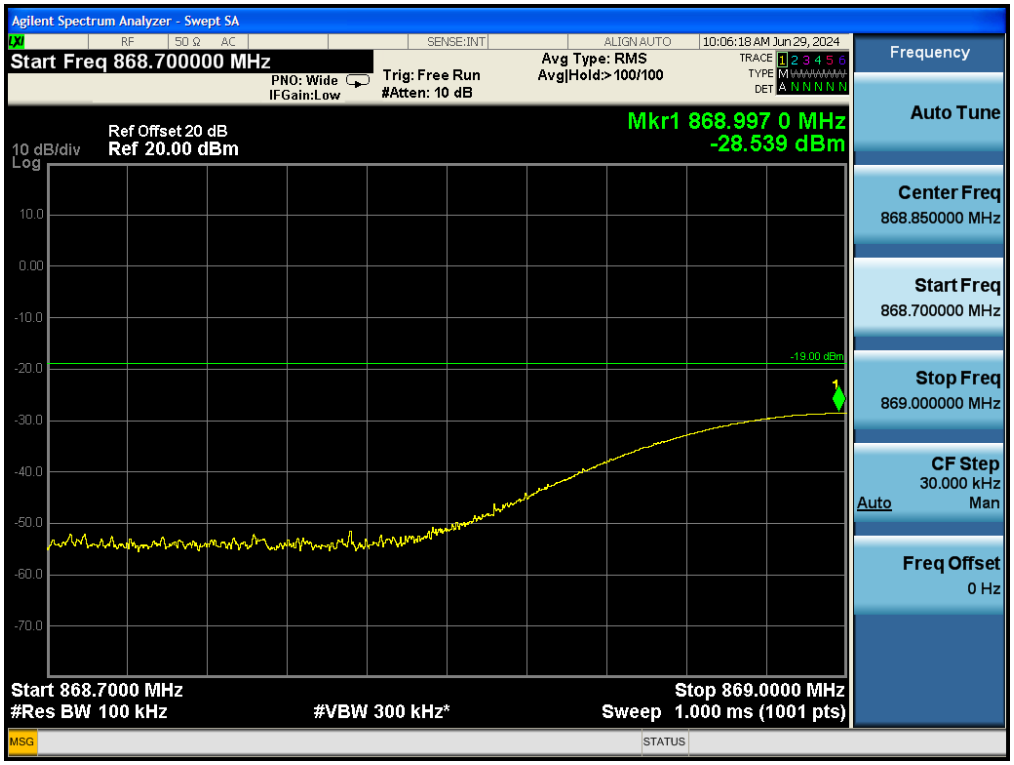
700 MHz Upper C Block UL Right Side Pre AGC

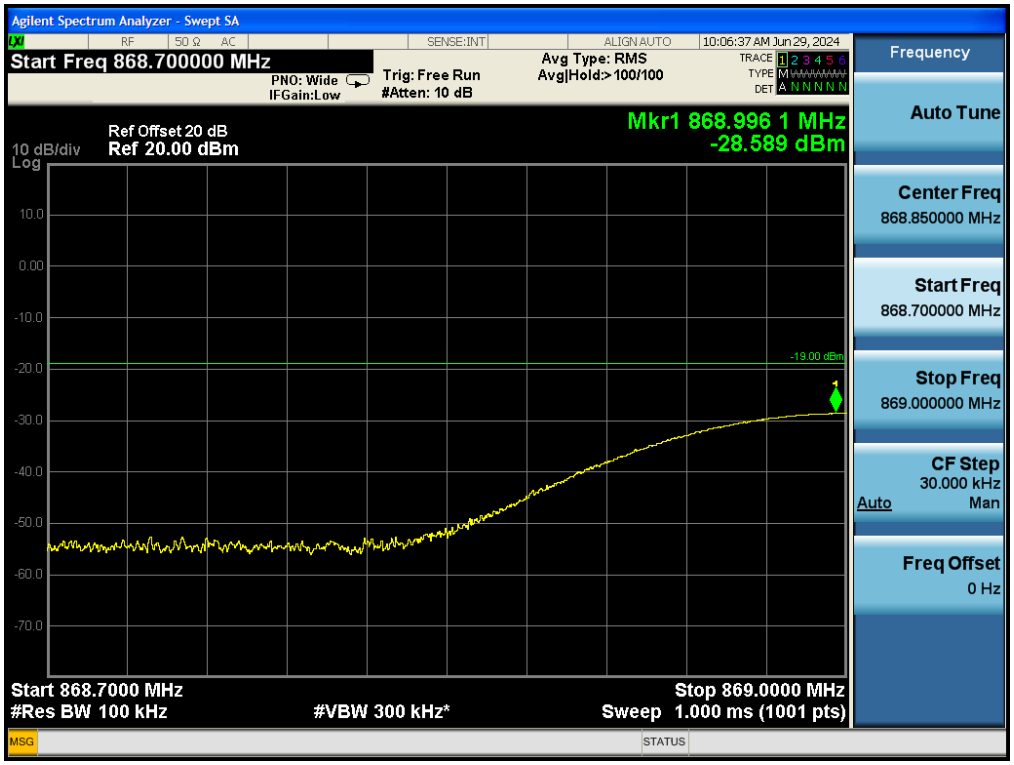


700 MHz Upper C Block UL Right Side Max Input

Cellular DL Left Side Pre AGC



Cellular DL Left Side Max Input



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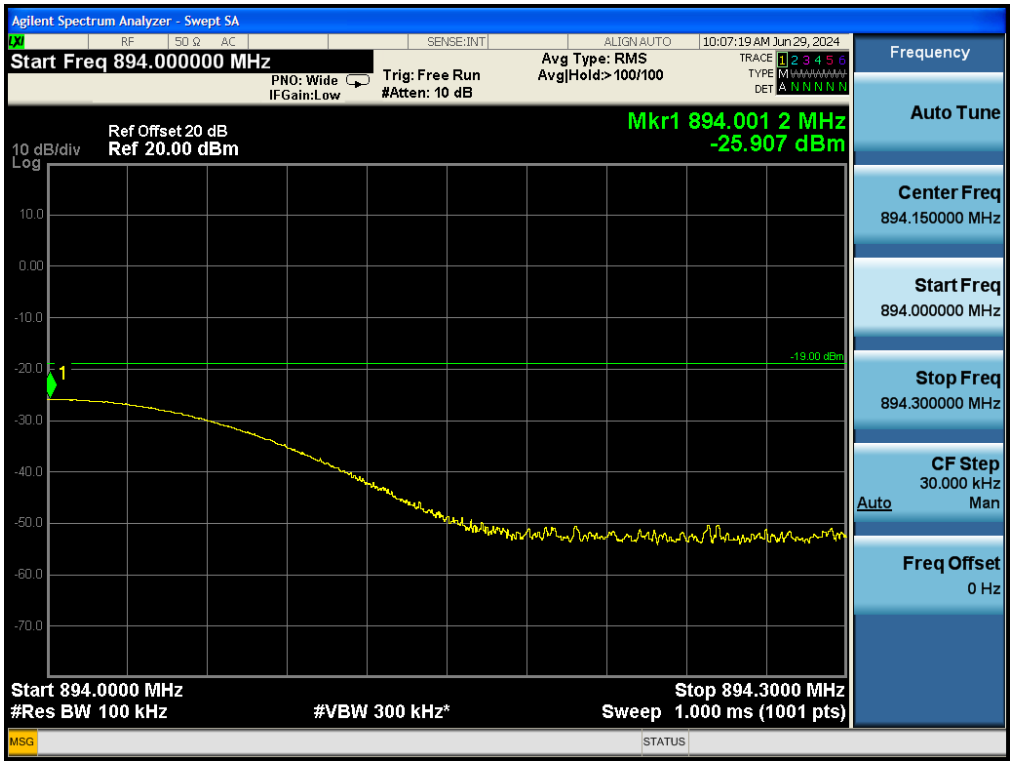
Cellular DL Right Side Pre AGC



Cellular DL Right Side Max Input

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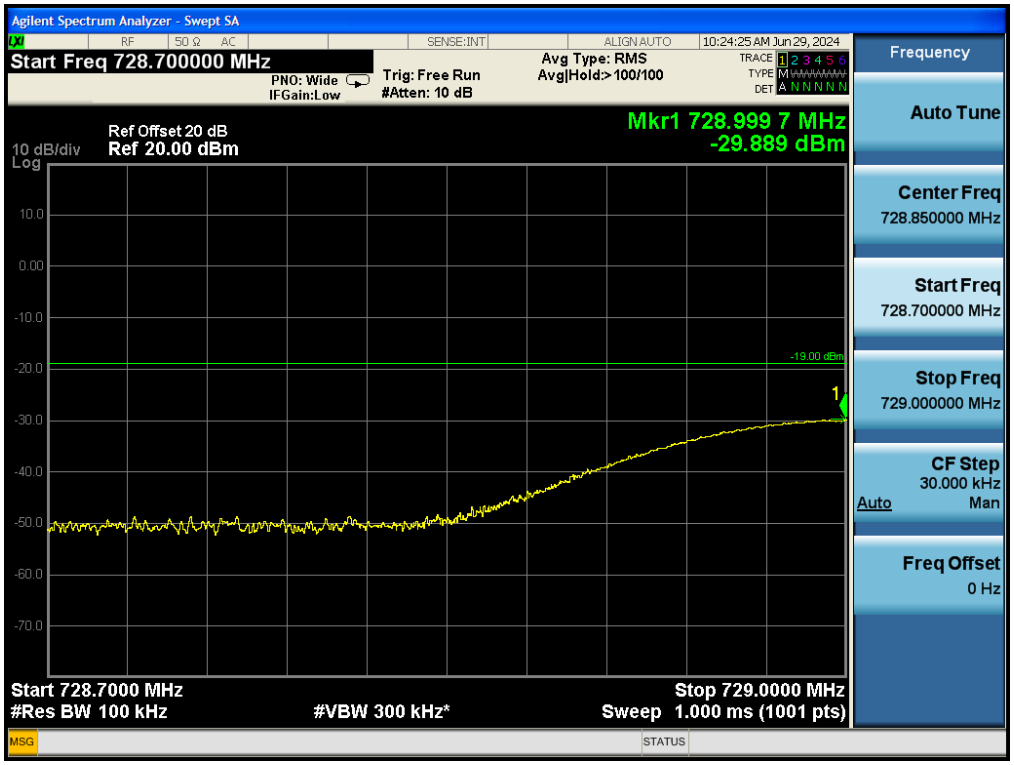
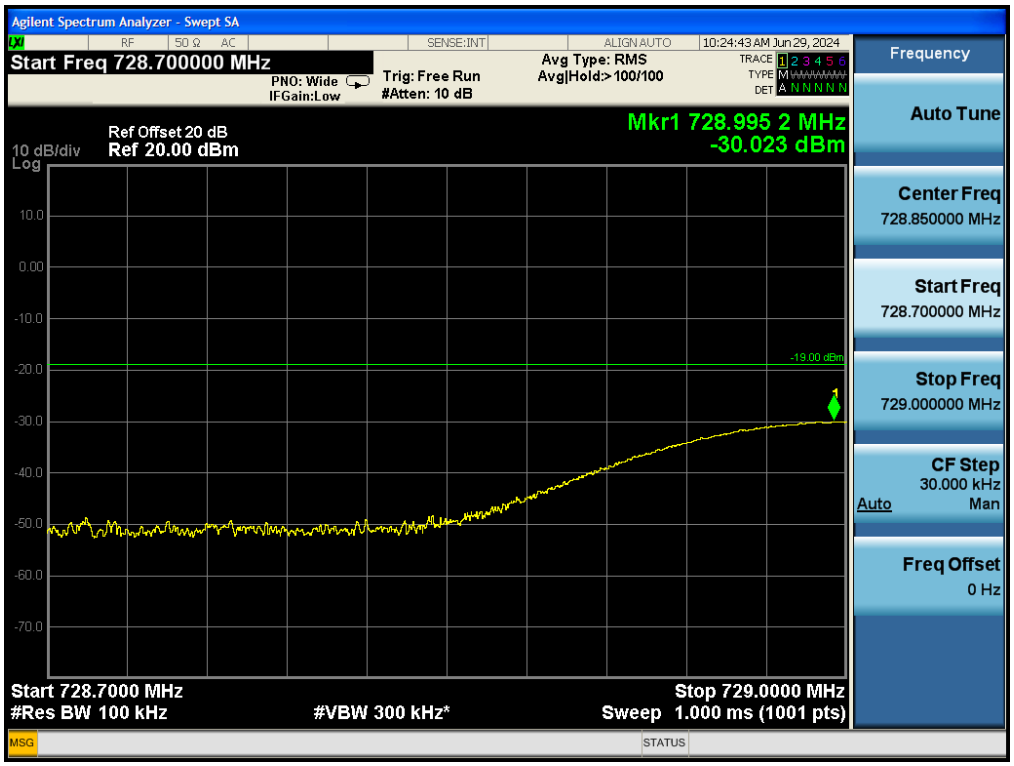
Lower A-E Blocks DL Left Side Pre AGC



Lower A-E Blocks DL Left Side Max Input



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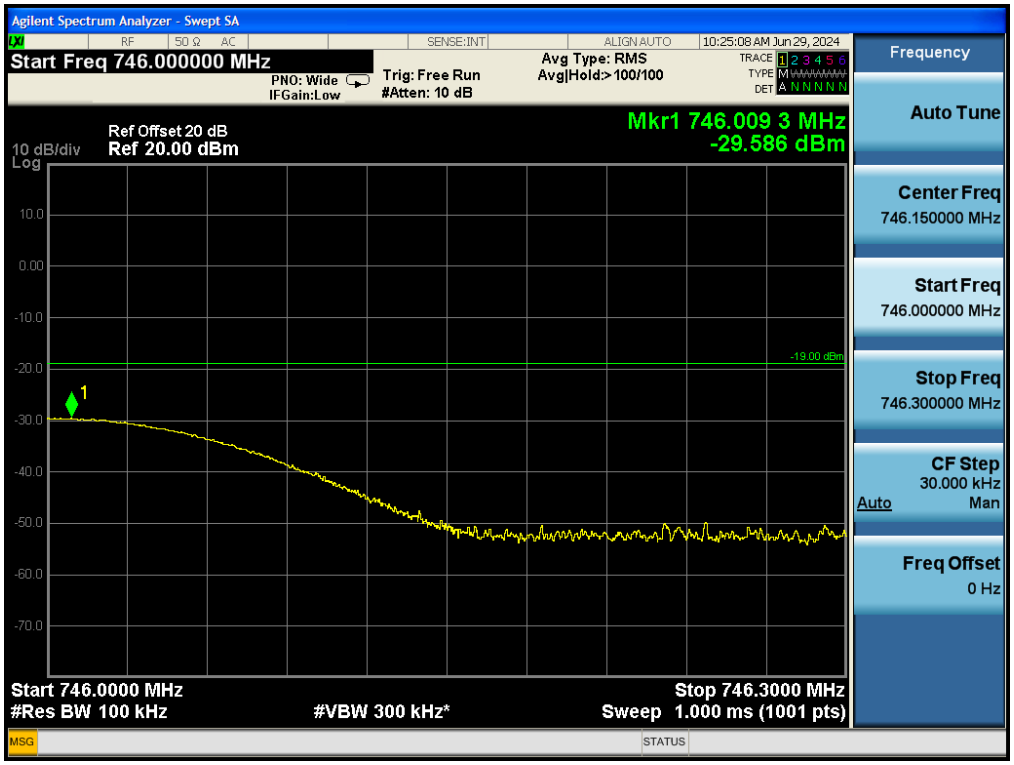
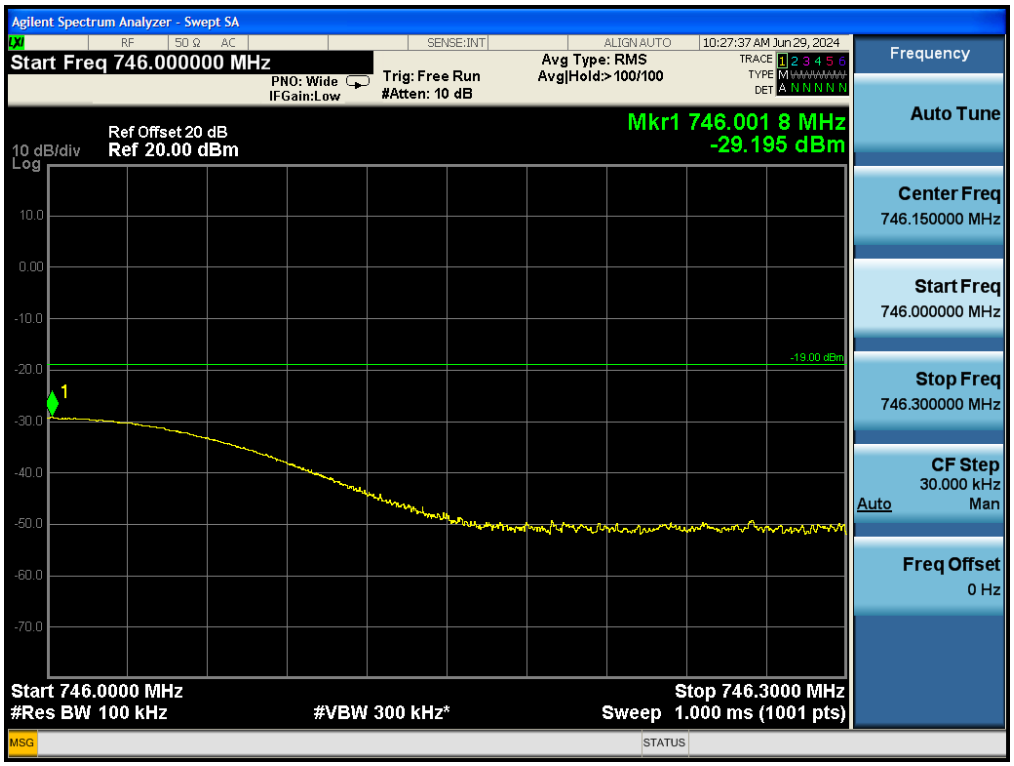
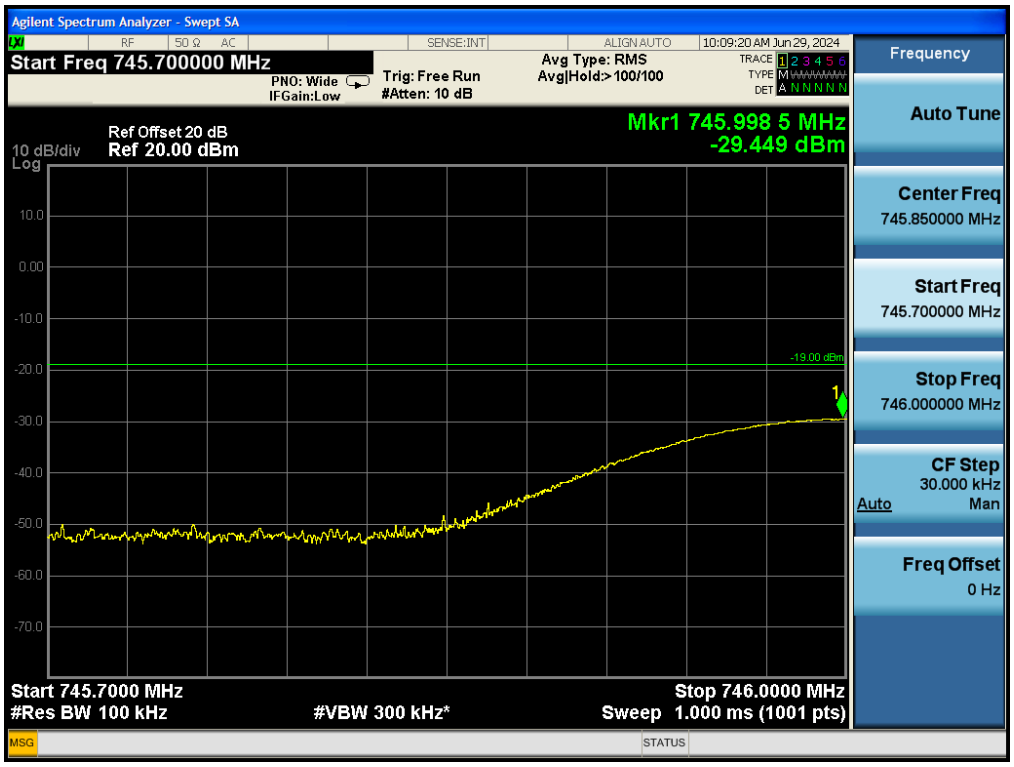
Lower A-E Blocks DL Right Side Pre AGC



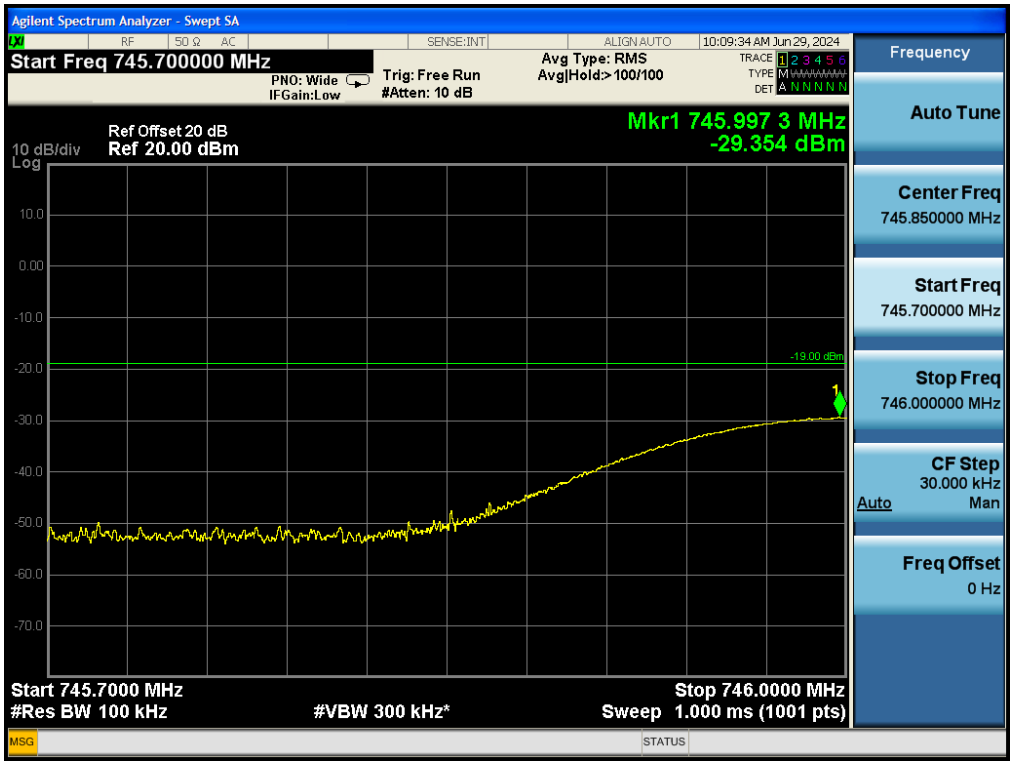
Lower A-E Blocks DL Right Side Max Input



700 MHz Upper C Block DL Left Side Pre AGC



700 MHz Upper C Block DL Left Side Max Input



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700 MHz Upper C Block DL Right Side Pre AGC

700 MHz Upper C Block DL Right Side Max Input

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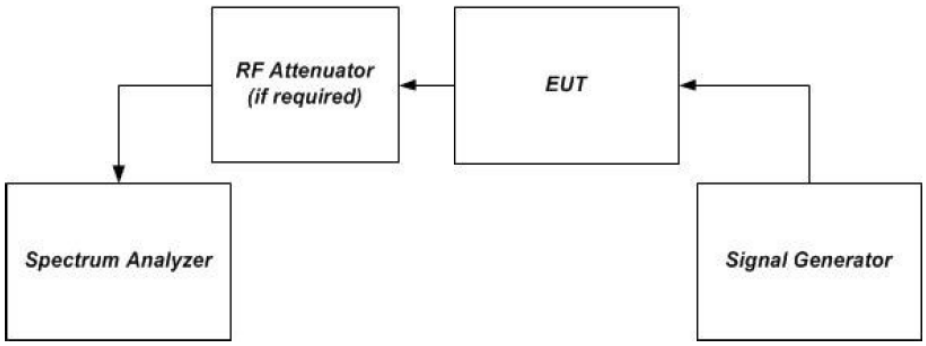
5.6 Spurious Emissions At Antenna Terminals

Test Requirement:	The following procedures shall be used to demonstrate compliance to the applicable conducted spurious emissions limits as per §2.1051. Note: For frequencies below 1 GHz, an RBW of 1 MHz may be used in a preliminary measurement. If non-compliant emissions are detected, a final measurement shall be made with a 100 kHz RBW. Additionally, a peak detector may also be used for the preliminary measurement. If non-compliant emissions are detected then a final measurement of these emissions shall be made with the power averaging (RMS) detector.
Limit:	-13 dBm; For equipment operating in the frequency bands 746-756 MHz and 777-787 MHz, The power of any unwanted emissions in any 6.25 kHz bandwidth for all Frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least: (i) 76 + 10 log10 p (watts), dB, for base and fixed equipment, and (ii) 65 + 10 log10 p (watts), dB, for mobile and portable equipment.
Test Setup:	
Procedure:	a) Connect the EUT to the test equipment as shown in Figure 1. Begin with the uplink output connected to the spectrum analyzer. b) Configure the signal generator for AWGN with an emissions bandwidth of 4.1 MHz operation with a center frequency corresponding to the center of the operational band under test and with a bandwidth representative of the bandwidth of the uplink or downlink signal. c) Set the signal generator amplitude to the level determined in the power measurement procedure in 7.2. d) Turn on the signal generator RF output and measure the spurious emission power levels with an appropriate measurement instrument as follows. e) Set RBW = measurement bandwidth specified in the applicable rule section for the operational frequency band under consideration (see Annex A for relevant cross-references). Note that many of the individual rule sections permit the use of a narrower RBW (typically ⩾ 1% of the emission bandwidth) in order to enhance measurement accuracy, but the result must then be integrated over the specified measurement bandwidth. f) Set VBW = 3 X RBW. g) Select the power averaging (RMS) detector. (See above note regarding the use of a peak detector for preliminary measurements.) h) Sweep time = auto-couple. i) Set the analyzer start frequency to the lowest radio frequency signal generated in the equipment, without going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as specified in the applicable rule part. Note that the number of measurement points in each sweep

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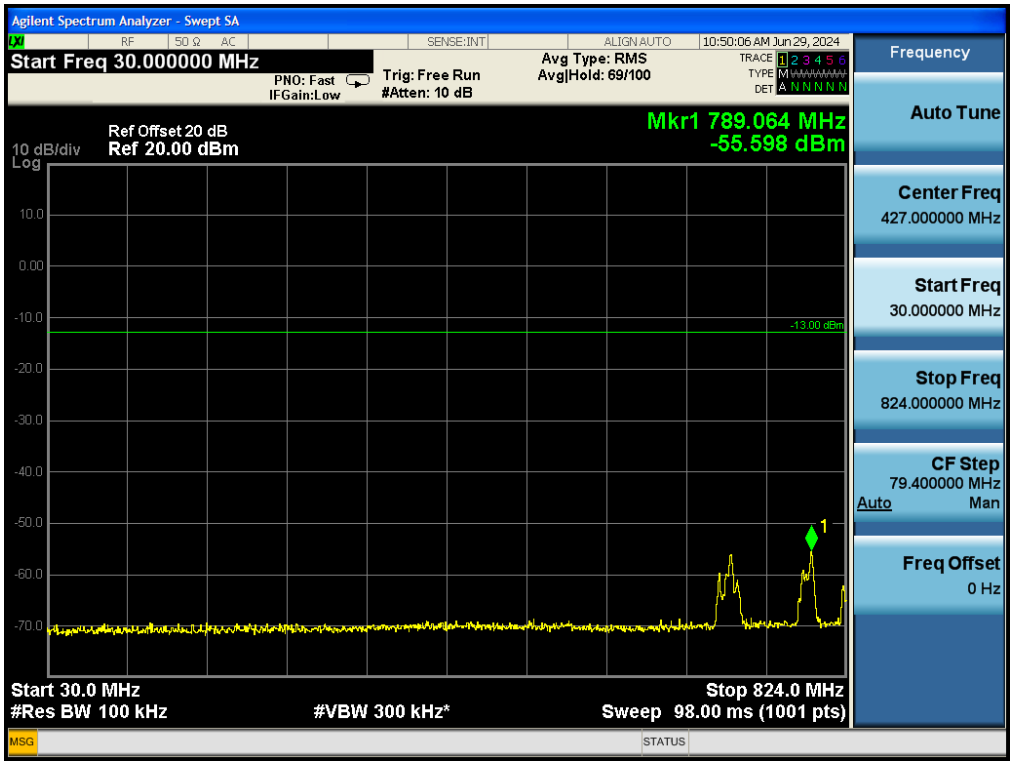
	must be ⩾ (2 x span/RBW) which may require that the measurement range defined by the start and stop frequencies above be subdivided, depending on the available number of measurement points provided by the spectrum analyzer trace average at least 10 traces in power averaging (i.e., RMS) mode. j) Use the 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. k) Reset the analyzer start frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, as specified in the applicable rule part, and the analyzer stop frequency to 10 times the highest frequency of the fundamental emission. Note that the number of measurement points in each sweep must be ⩾ (2 x span/RBW) which may require that the measurement range defined by the start and stop frequencies above be subdivided, depending on the available number of measurement points provided by the spectrum analyzer. l) 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. m) Repeat steps 7.6.2 through 7.6.12 for each supported frequency band of operation.

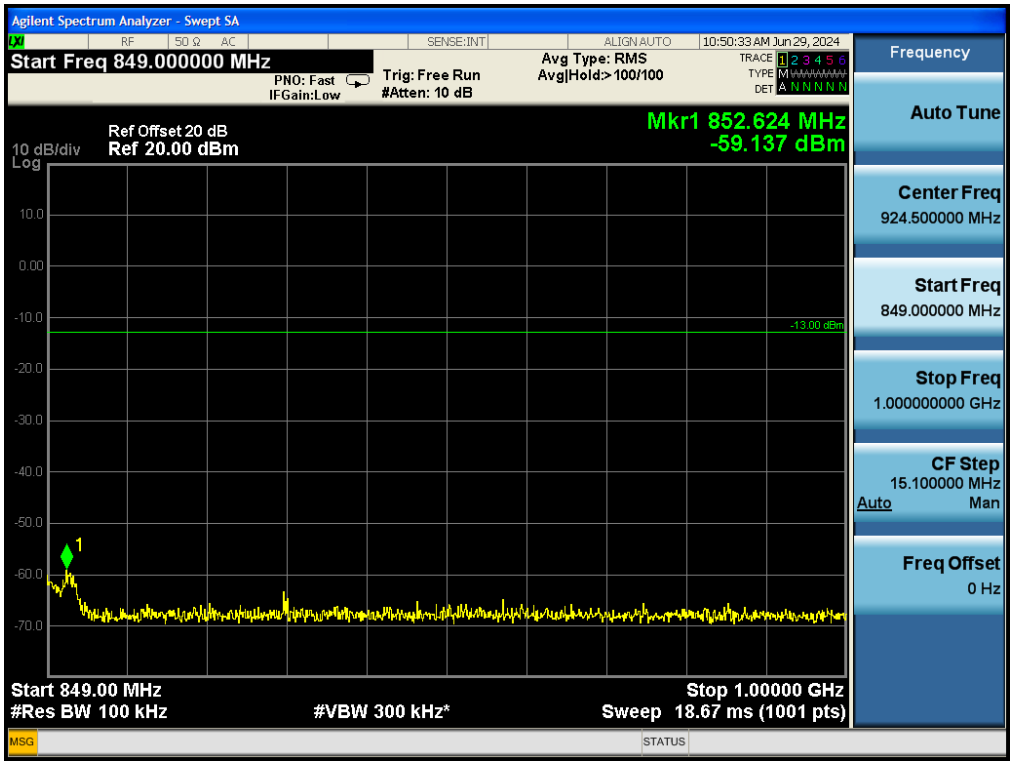
5.6.1 E.U.T. Operation:

Operating Environment:	
Temperature:	22.1 °C
Humidity:	46.3 %
Atmospheric Pressure:	1010 mbar

5.6.2 Test Data:

Cellular Uplink





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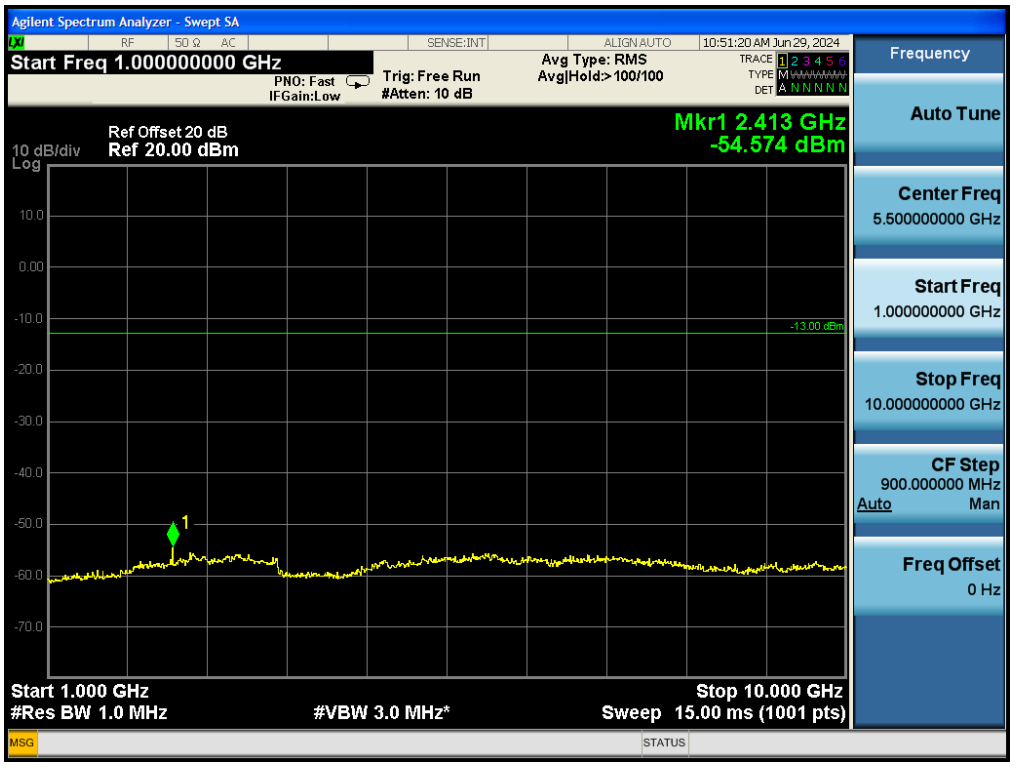
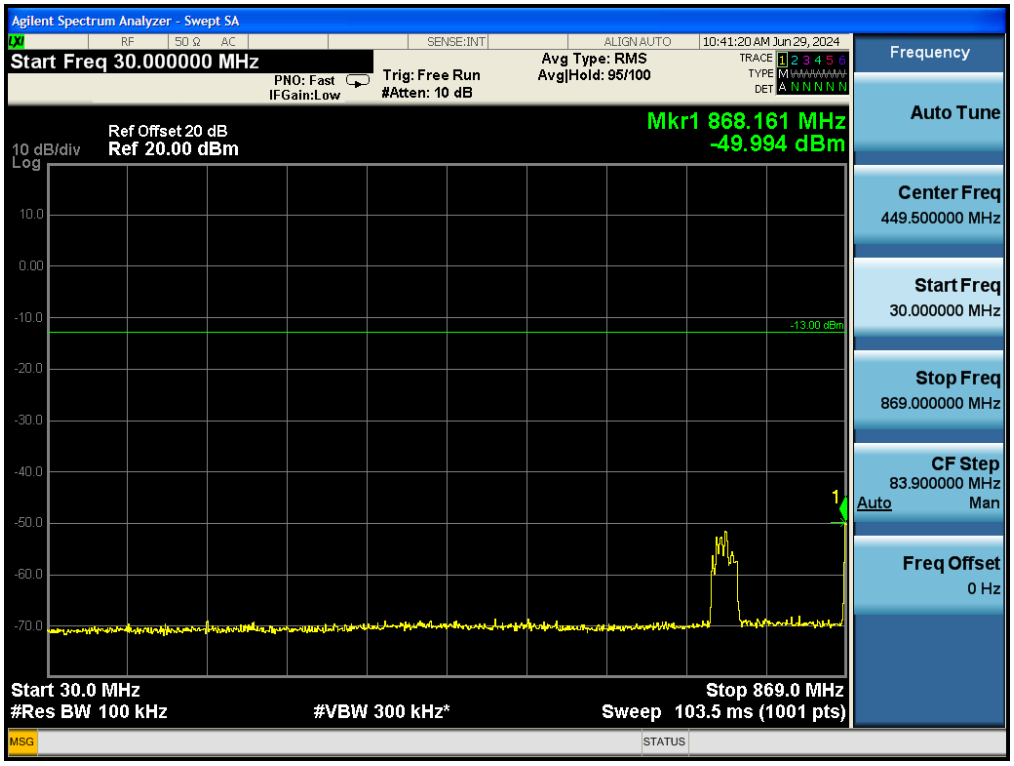


Cellular Downlink



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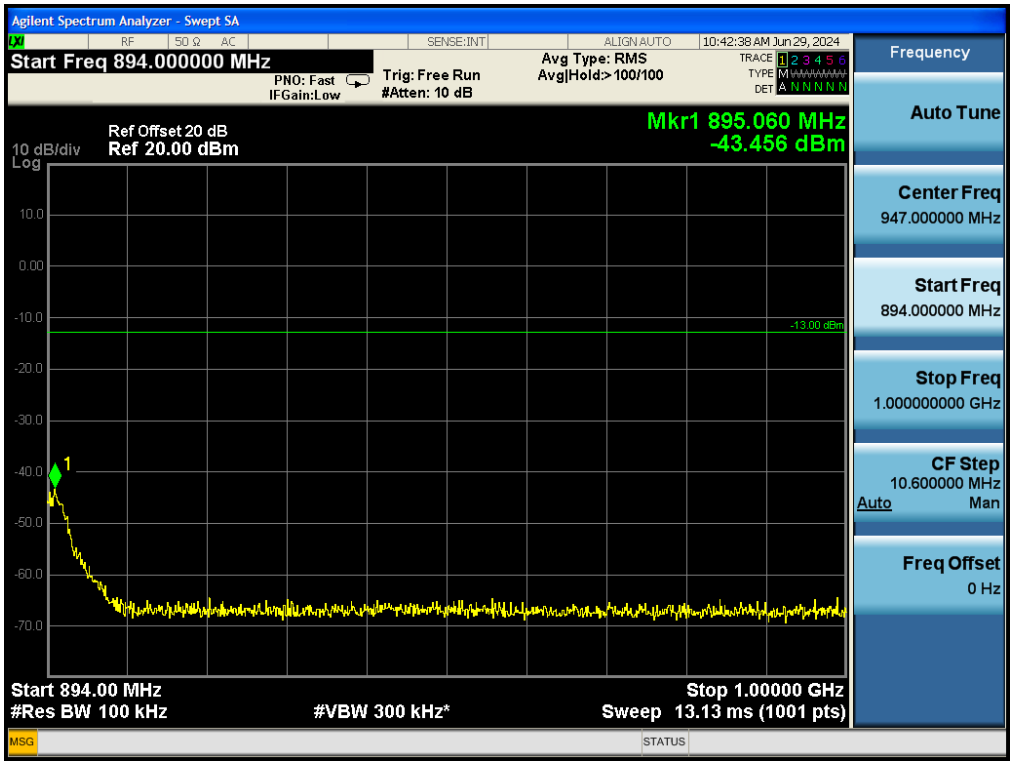

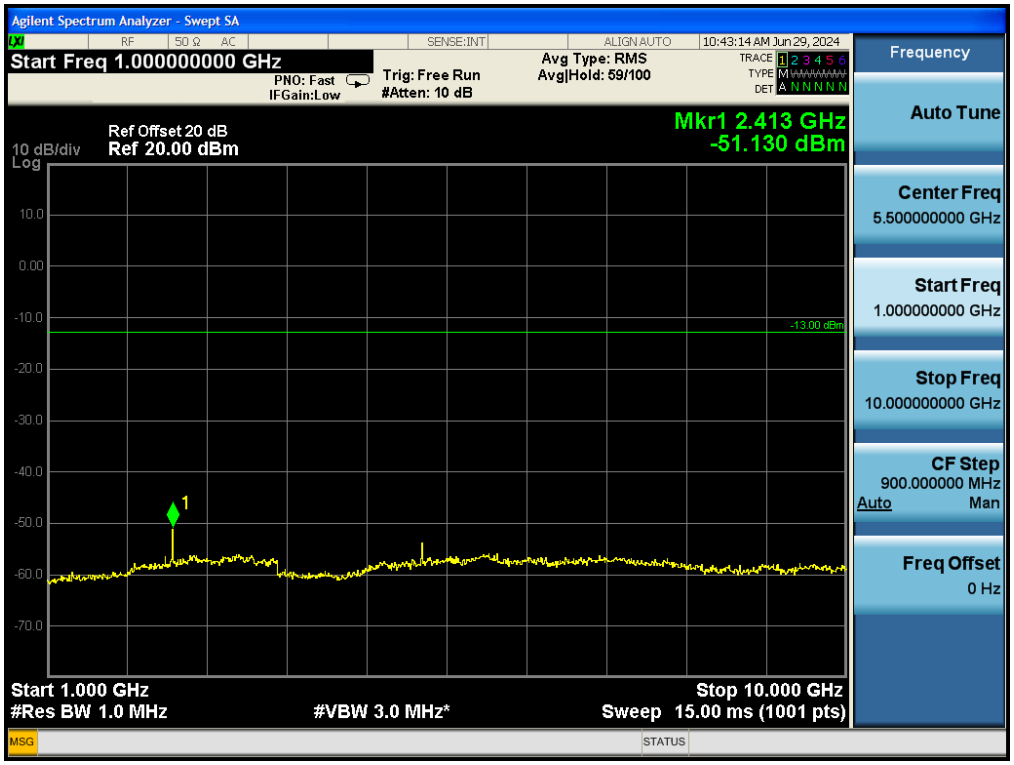

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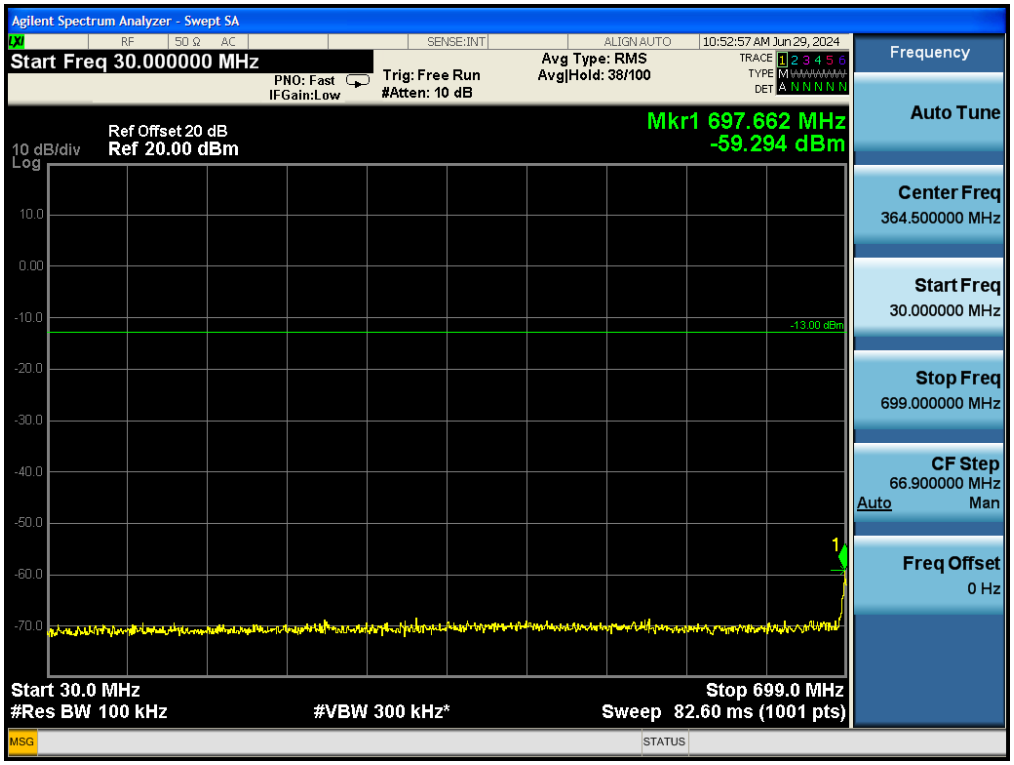
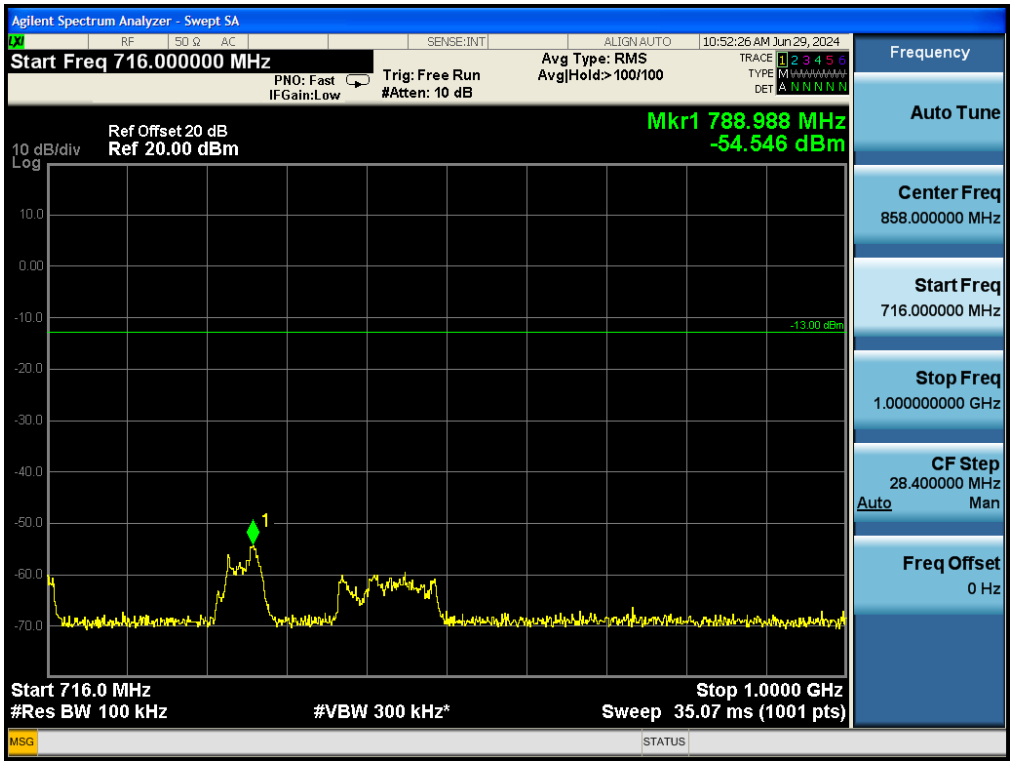
Lower A-E Blocks Uplink





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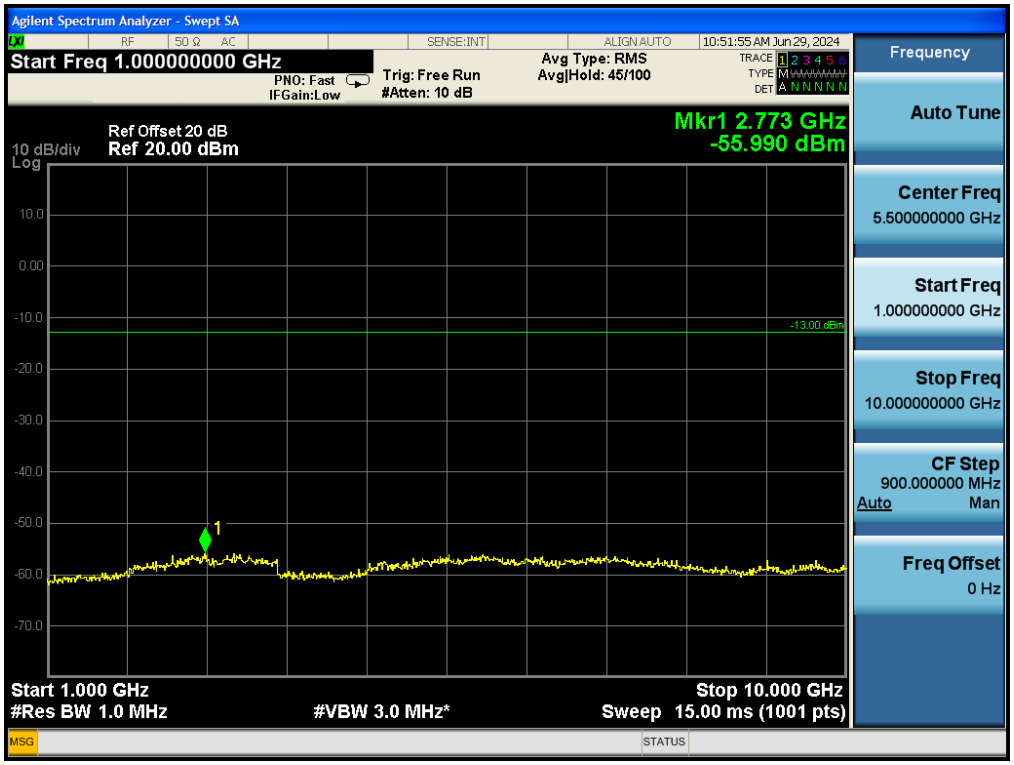
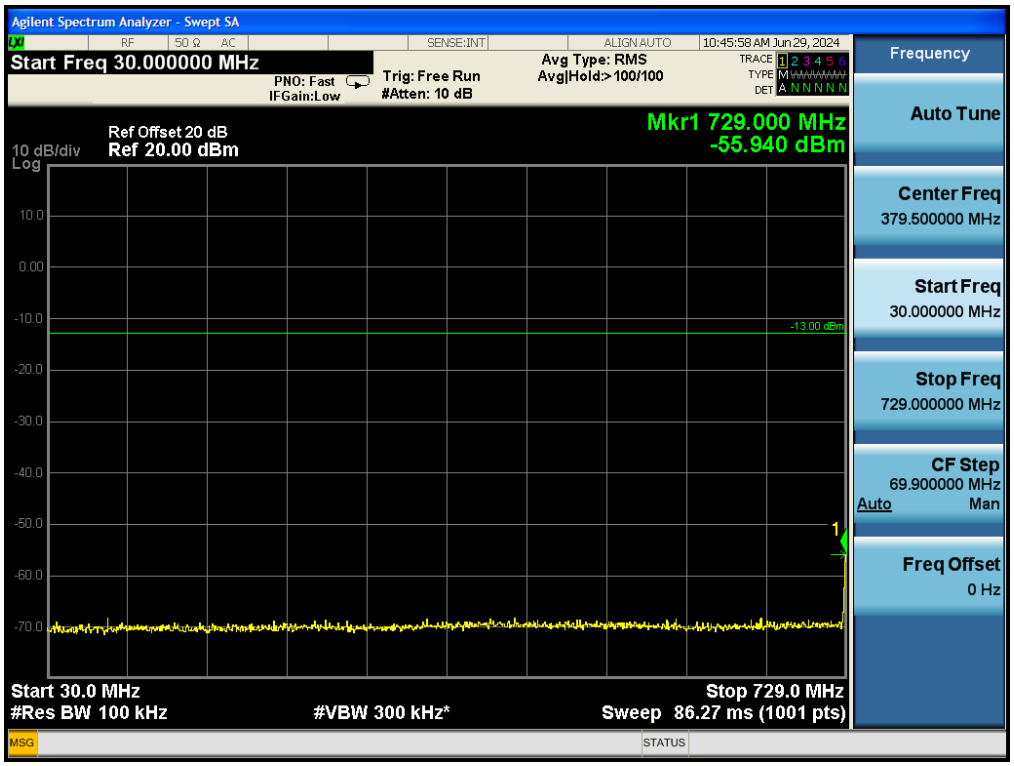


Lower A-E Blocks Downlink



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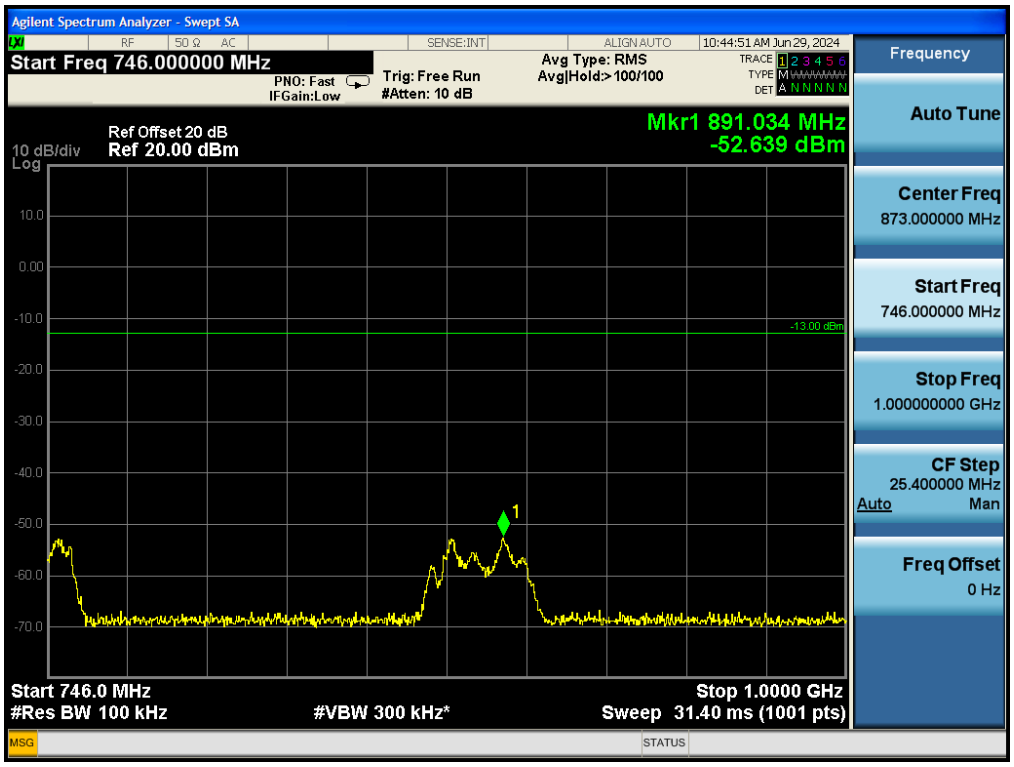

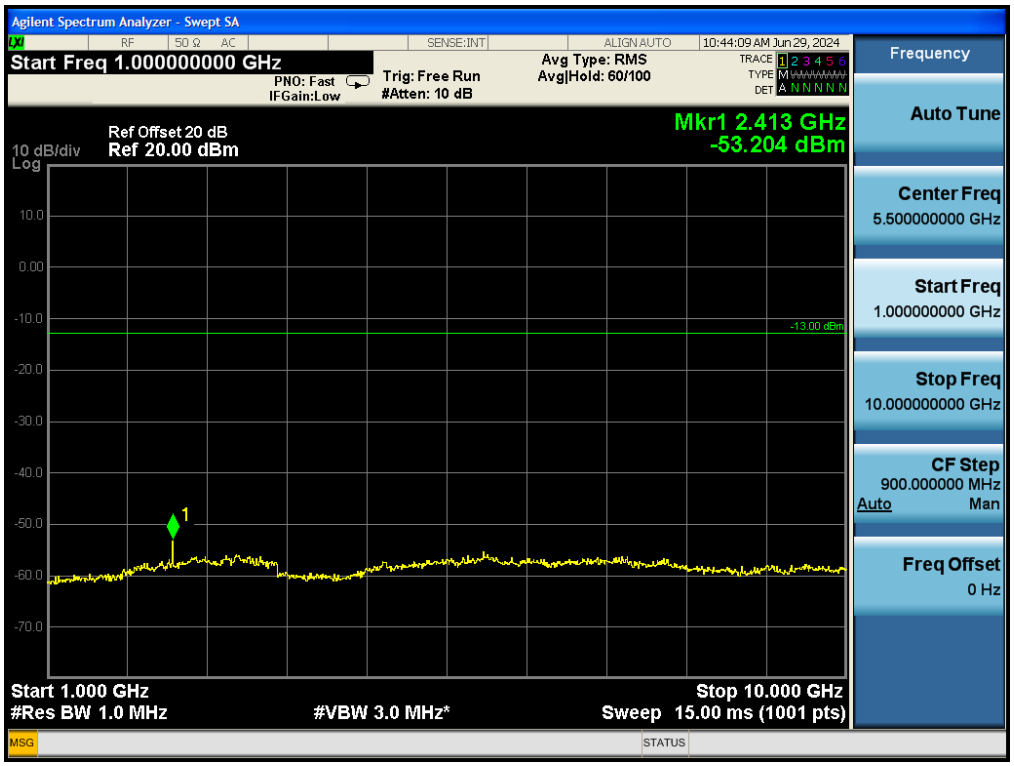

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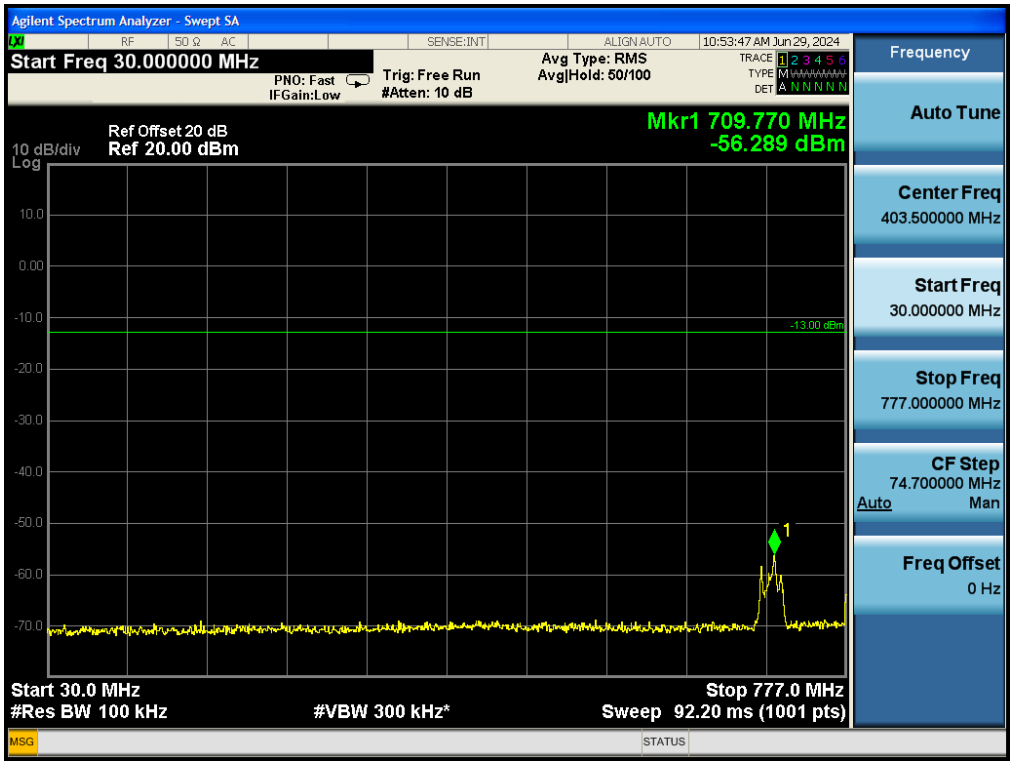
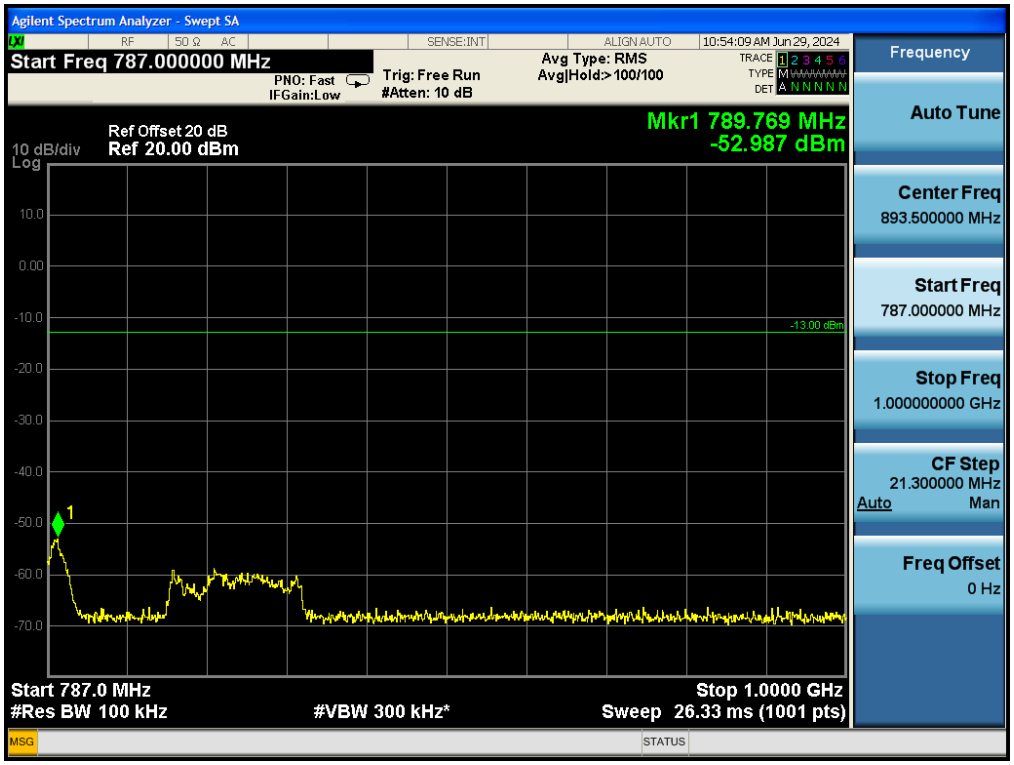
700 MHz Upper C Block Uplink





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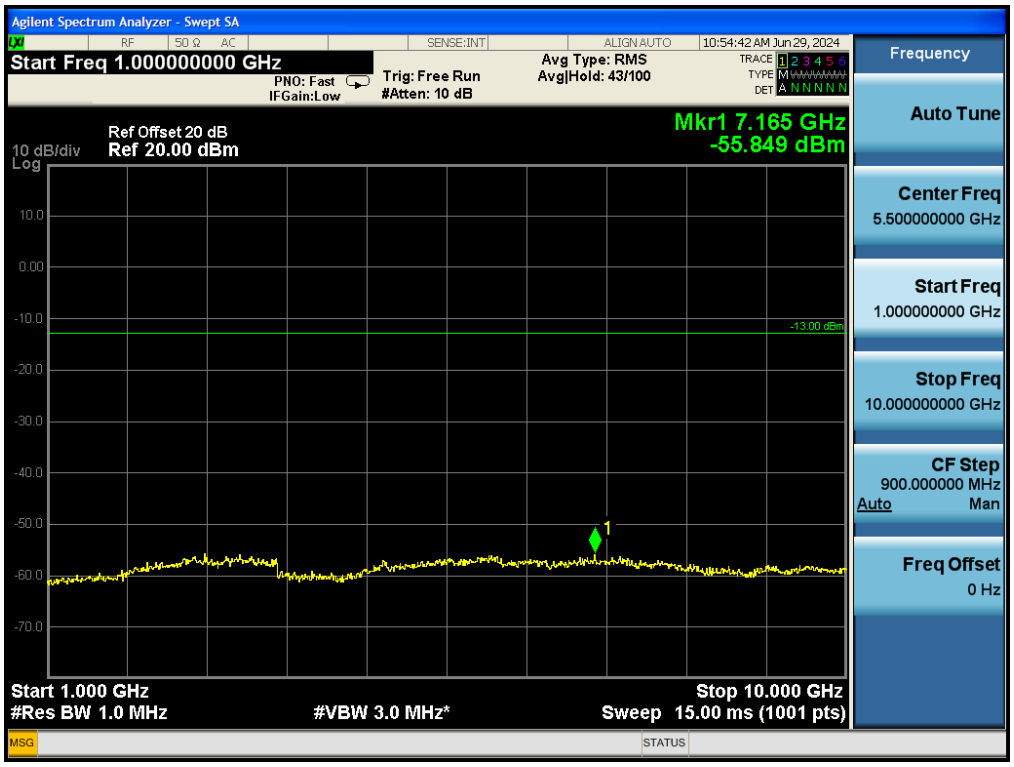
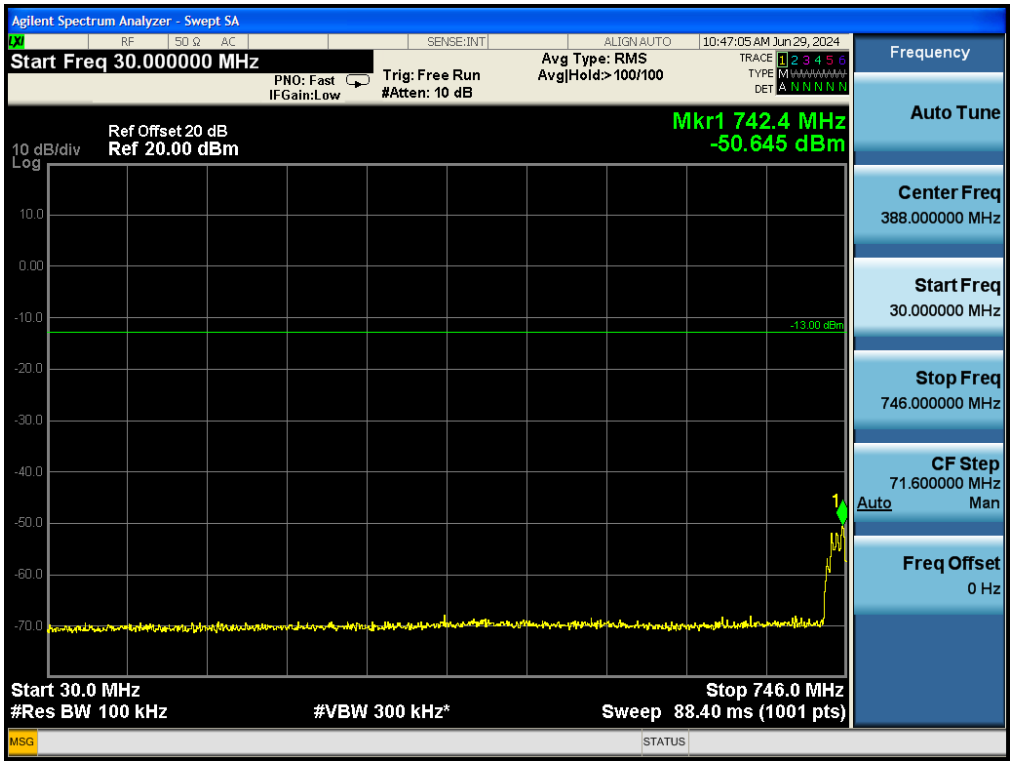


700 MHz Upper C Block Downlink



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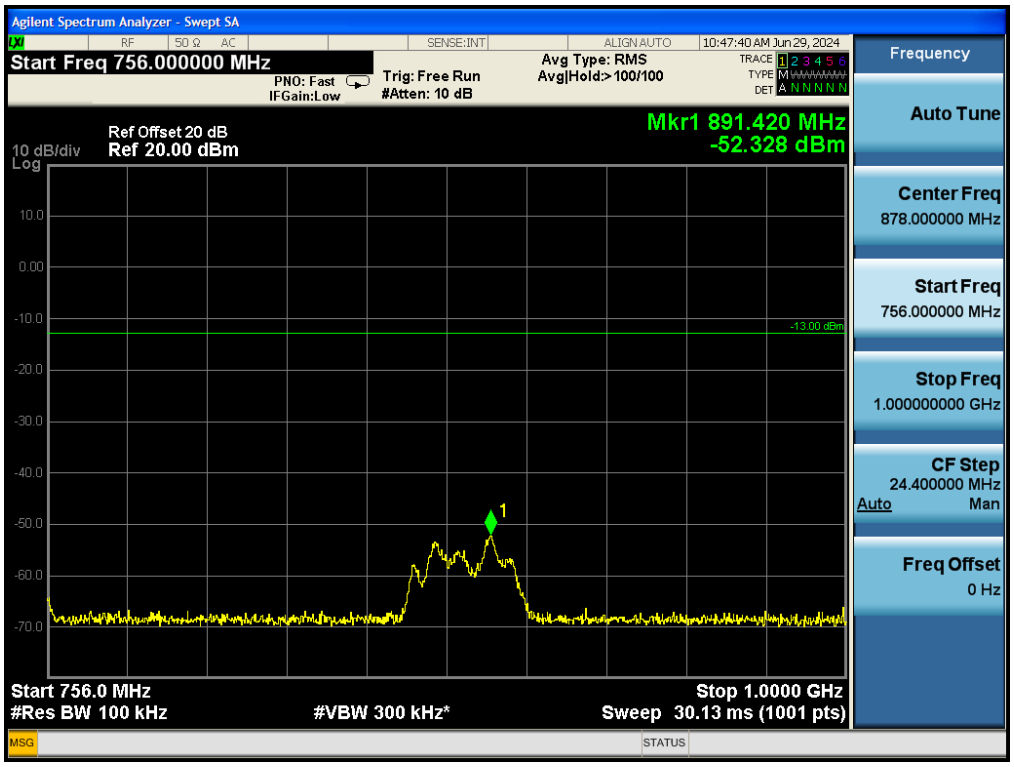

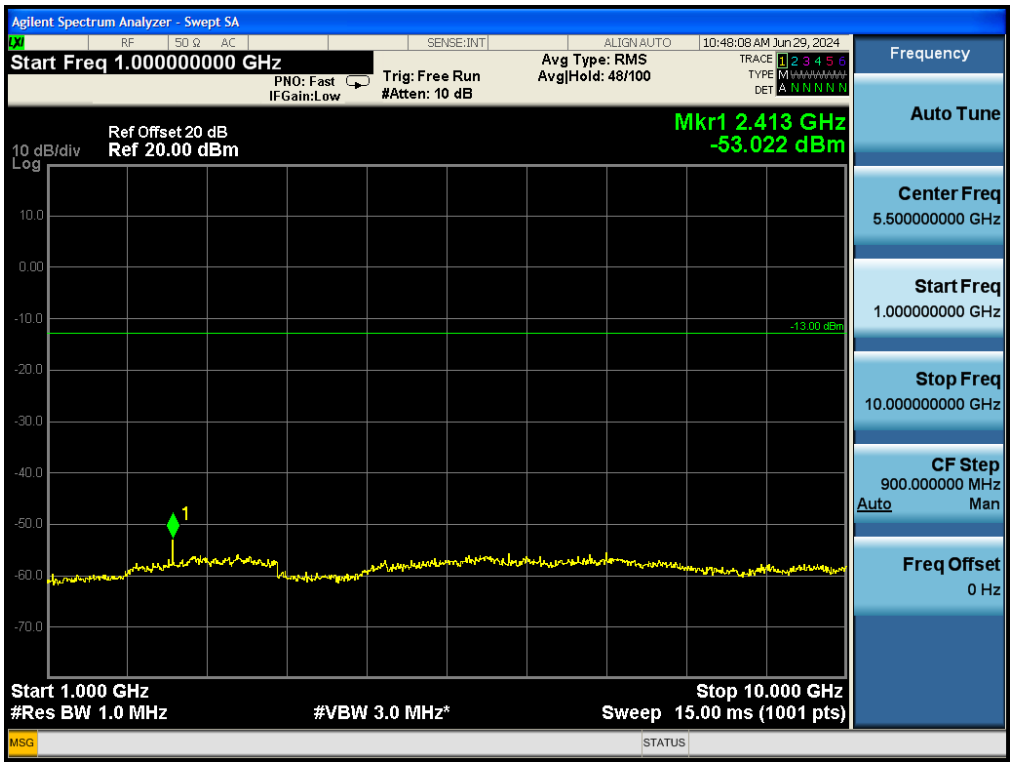

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