Huaptec

REVISED TEST REPORT TO 100428-9

Quint Band Cradle Signal Booster
Model: C23G-5S

Tested to The Following Standard:

FCC Part 20.21 / 22H / 24E / 27

Report No.: 100428-9A

Date of issue: August 13, 2018

ACCREDITED

Test Certificate # 803.02

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

Testing the Future

CKC LABORATORIES, INC.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:	REPORT PREPARED BY:
Huaptec 5th FL, E BLDG, Sogood Science Park Bao'an Shenzhen 518102 , China	Terri Rayle CKC Laboratories, Inc. 5046 Sierra Pines Drive Mariposa, CA 95338
Representative: April	Project Number: 100428

DATE OF EQUIPMENT RECEIPT:	March 18, 2018
DATE(S) OF TESTING:	March 18, 2018 – June 12, 2018

Revision History

Original: Testing of the Quint Band Cradle Signal Booster, Model: C23G-5S to FCC Part 20.21 / 22 / 24 / 27.
Revision A: Replaced the Summary of Results tables in Section 7.2-7.3 due to the manufacturer revision of the antenna kitting information. Replaced Section 7.9 data due to the manufacturer revision of the measured MSCL.

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.

Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
110 Olinda Place
Brea, CA 92823

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.11
EMITest Immunity	5.03.10

Site Registration & Accreditation Information

Location	NIST CB #	TAIWAN	CANADA	FCC	JAPAN
Brea A, CA	US0060	SL2-IN-E-1146R	3082D-1	US1025	A-0147

SUMMARY OF RESULTS

Standard / Specification: FCC Part 20.21/22H/24E/27
Wideband Consumer Signal Booster Measurement Guidance: KDB #935210 DO3 v04r01, October 27, 2017

Correlation Matrix & Results					
Guidance Section	**Guidance Description**	**FCC Section**	**FCC Rule Description**	**Mods**	**Results**
7.1 a) - k)	Authorized Frequency Band Verification Test	20.21(e)(3)	Frequency Bands	NA	Pass
7.2.2 a) - k)	Maximum Power Measurement Procedure	2.1046/20.21(e)(8)(i)(D)	Power Limit	NA	Pass
7.3 a) - d)	Maximum Booster Gain Computation	20.21(e)(8)(i)(B)	Bidirectional Capabilities	NA	Pass
7.4 a) - n)	Intermodulation Product	20.21(e)(8)(i)(F)	Intermodulation Limit	Mod. #1	Pass
7.5 a) - n)	Out of Band Emissions	20.21(e)(8)(i)(E)	Out of Band Emission	NA	Pass
7.6 a) - e)	Conducted Spurious Emission	2.1051/22H/24E/27	Spurious emission	NA	Pass
7.7.1 a) - g) 7.7.1 h) - n) 7.7.2 a) - g)	Noise Limit Procedure Variable Noise Variable Noise Timing	20.21(e)(8)(i)(A)(2)(i) 20.21(e)(8)(i)(A)(1) 20.21(e)(8)(i)(H)	Noise Limits Transmit Power Off Mode	NA	Pass

Standard / Specification: FCC Part 20.21/22H/24E/27 - continued

Correlation Matrix & Results - continued					
Guidance Section	**Guidance Description**	**FCC Section**	**FCC Rule Description**	**Mods**	**Results**
7.8 a) - l)	Uplink inactivity	20.21(e)(8)(i)(I)	Uplink Inactivity	NA	Pass
7.9.1 a) - l) 7.9.2 a) - f)	Variable Booster Gain Variable Uplink Gain Timing	20.21(e)(8)(i)(C) (1), (2)(i) 20.21(e)(8)(i)(H)	Booster Gain Transmit Power Off Mode	NA	Pass
7.10.a) - j)	Occupied Band Width	2.1049/22H/24E/27	Occupied Band Width	NA	Pass
7.11.2 a) - r) 7.11.3 a) - h) 7.11.4 a) - h) (alternate to 7.11.3)	Anti-Oscillation	20.21(e)(8)(ii)(A)	Anti-Oscillation	Mod. #2	Pass
7.12a) - f)	Radiated Spurious Emission	2.1053/ 22H/24E/27	Spurious Emission	NA	Pass
7.13 a) - c)	Spectrum Block Filter	NA	NA	NA	NA1

NA = Not applicable
NA1 = Not applicable because the EUT does not have spectrum blocking.

Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
Modification #1: For uplink 824-849 band only, gain distribution changed, total gain remains unchanged.
Modification #2: For uplink 824-849 band only. Anti-oscillation detection timing changed via firmware

Modifications listed above must be incorporated into all production units.

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Quint Band Cradle Signal Booster	Huaptec	C23G-5S	NA

Support Equipment:

Device	Manufacturer	Model #	S/N
DC Power Supply	Topward	6306D	988614
Charger	Generic	NA	NA

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Equipment	Zone Enhancer
Operating Frequency Range:	UL: 824-849MHz DL: 869-894MHz UL: 1850-1915MHz DL: 1930-1995MHz UL: 1710-1755MHz, 698-716MHz, 776-787MHz DL: 2110-2155MHz, 728-746MHz, 746-757MHz
OBW and Emissions Type(s):	GXW (GSM) G7W (EDGE) F9W(CDMA) F9W(WCDMA) W7D (LTE) G7D (LTE) See table below for OBW
Modulation Type(s):	0.3 GMSK (GSM) 3p/8 8-PSK (EDGE) QPSK (CDMA) BPSK/QPSK (WCDMA) OFDM (LTE)
Number of TX Chains:	1
Antenna Type(s) and Gain:	Dedicated, See antenna kitting information
Beamforming Type:	NA
Antenna Connection Type:	UL: 50 Ohm/ SMB type DL: 50 Ohm/ UFL type (DL connection is only for test purpose)
Nominal Input Voltage:	5VDC
Firmware / Software used for Test:	Version 2.0

FCC PART 20.21/22H/24E/27

7.1 Authorized Frequency Band Verification

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place. Brea, CA 92821• 714 993 6112		
Customer:	Huaptec		
Specification:	Section 20.21(e)(3) Frequency Bands		
Work Order #:	**100428**	Date:	3/19/2018
Test Type:	**Conducted Emissions**		
Tested By:	E. Wong		
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

General test condition.
The equipment under test (EUT) is a Mobile Wideband Consumer Booster with direct contact coupling (cradle-type) antenna.
The EUT is placed on the test bench. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port.
The EUT Donor port is a MCX type connector and 50-ohm impedance.
The EUT Server/DL port /is type UFL connector and 50-ohm impedance.

Part 22
UL: 824-849MHz
DL: 869-894MHz
Part 24
UL: 1850-1915MHz
DL: 1930-1995MHz
Part 27
UL: 1710-1755MHz, 698-716MHz, 776-787MHz
DL: 2110-2155MHz, 728-746MHz, 746-757MHz

Test procedure:
The test was performed in accordance with the FCC document: 935210 D03 Signal Booster Measurements v04r01, dated October 27, 2017.
Firmware: 2.0

Test environment conditions:
Temperature: 20 -25°C
Relative Humidity: 37-45 %
Pressure: 100kPa
Device is powered by a provided 5V USB/12V Automotive adaptor

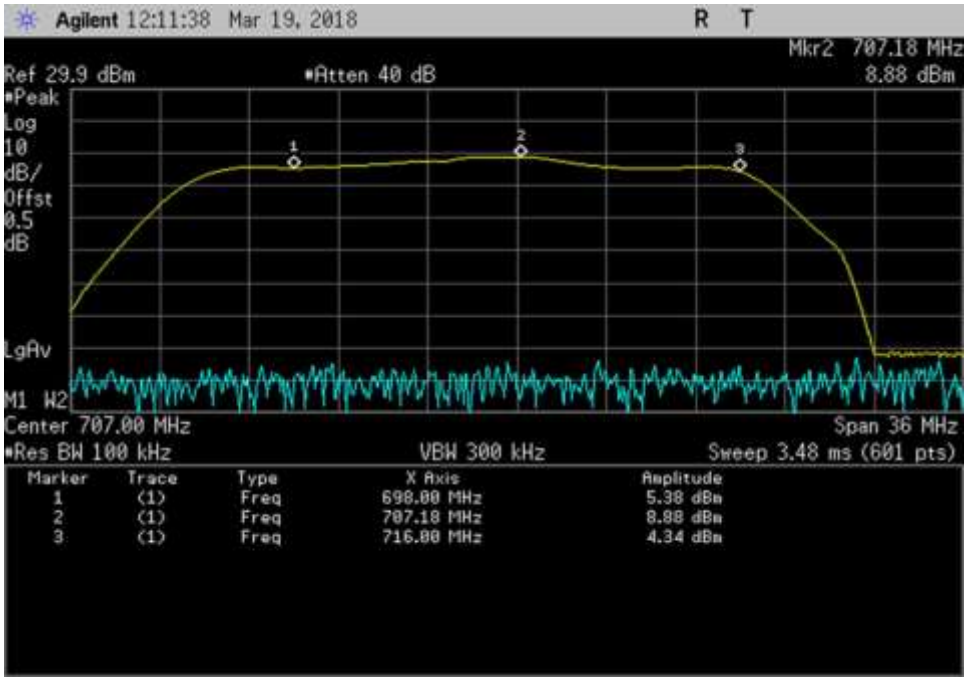
Test Equipment:

Asset #	Description	Manufacturer	Model	Calibration Date	Cal Due Date
03420	Signal Generator	Agilent	E4438C	6/9/2017	6/9/2019
P07037	RF Signal Generator	Agilent	E4432B	10/6/2016	10/6/2018
P06544	Cable	Astro Steel	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
02946	Cable	Astro Steel	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
02672	Spectrum Analyzer	Agilent	E4446A	3/2/2017	3/2/2019

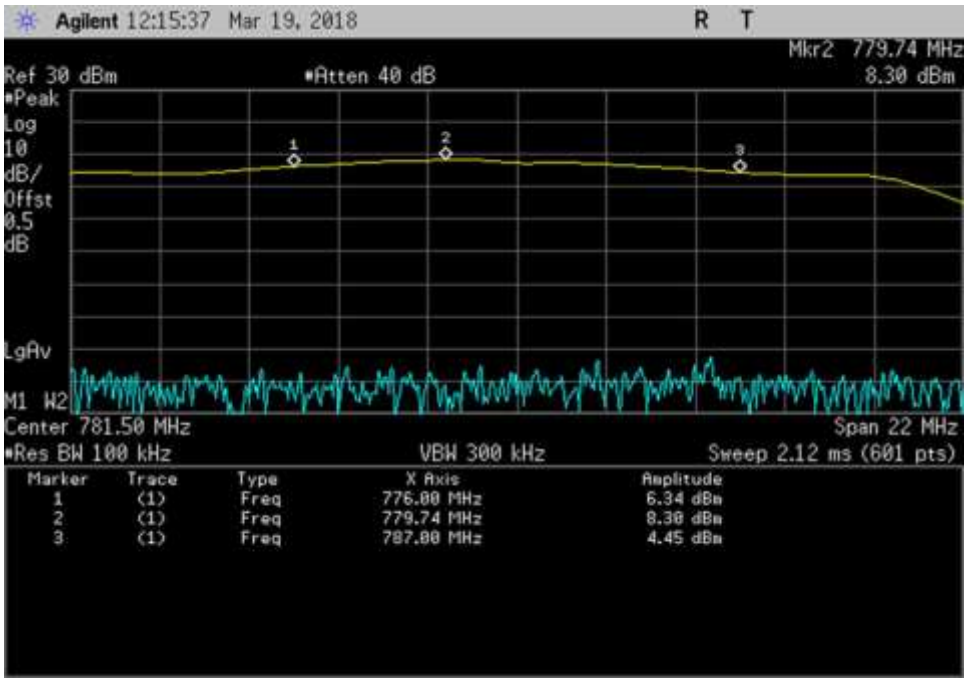
Summary of Results

Pass: The plots below show the device only operates on the CMRS frequency bands authorized for use by the NPS.

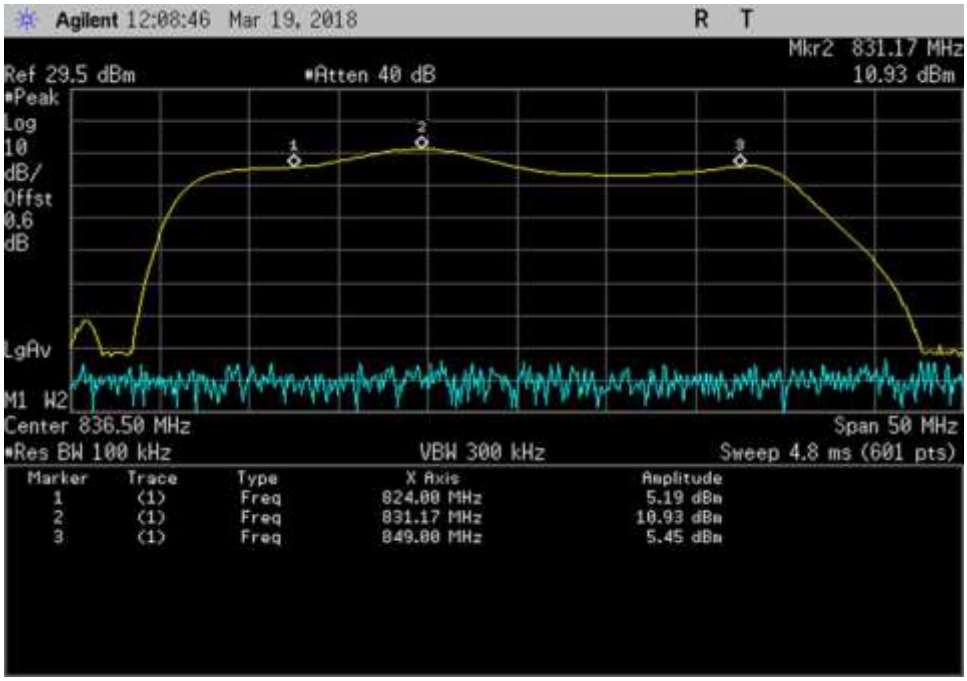
Plots



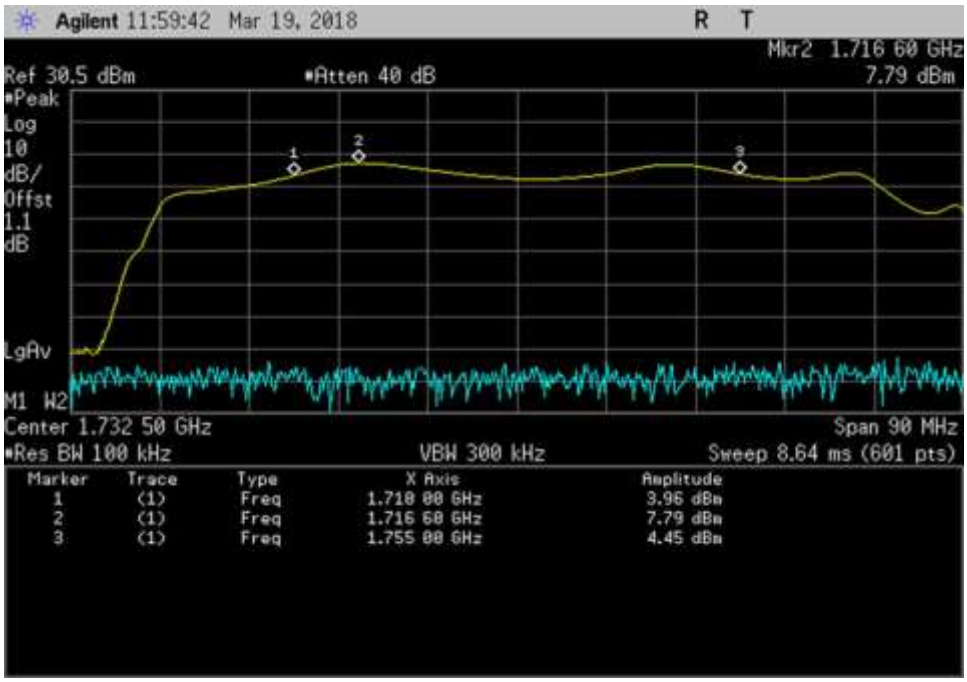
UL_698-716- 707.18MHz



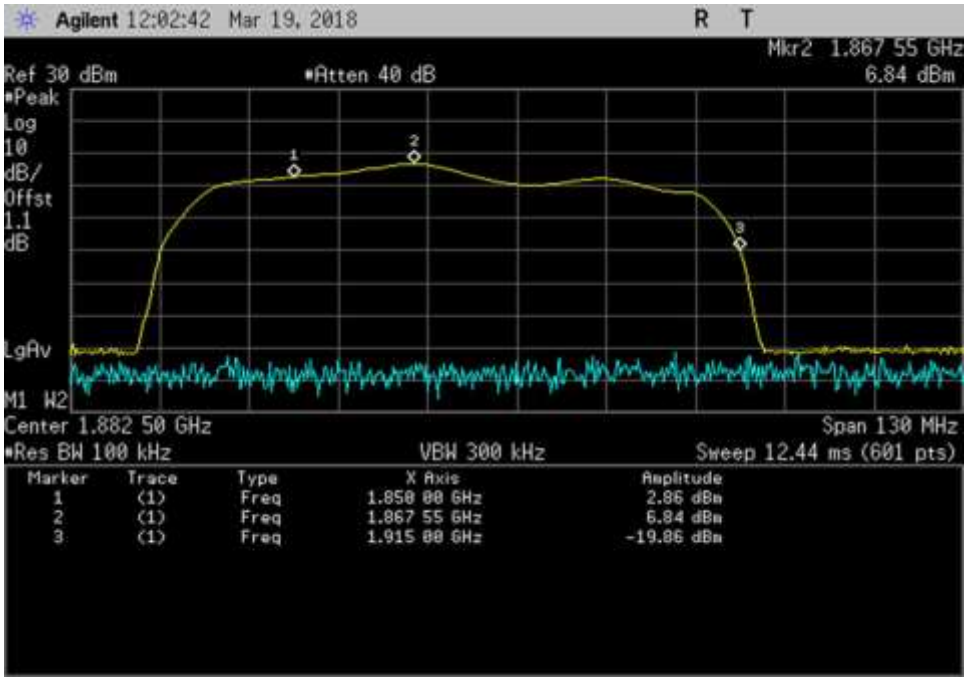
UL_776-787- 779.74MHz



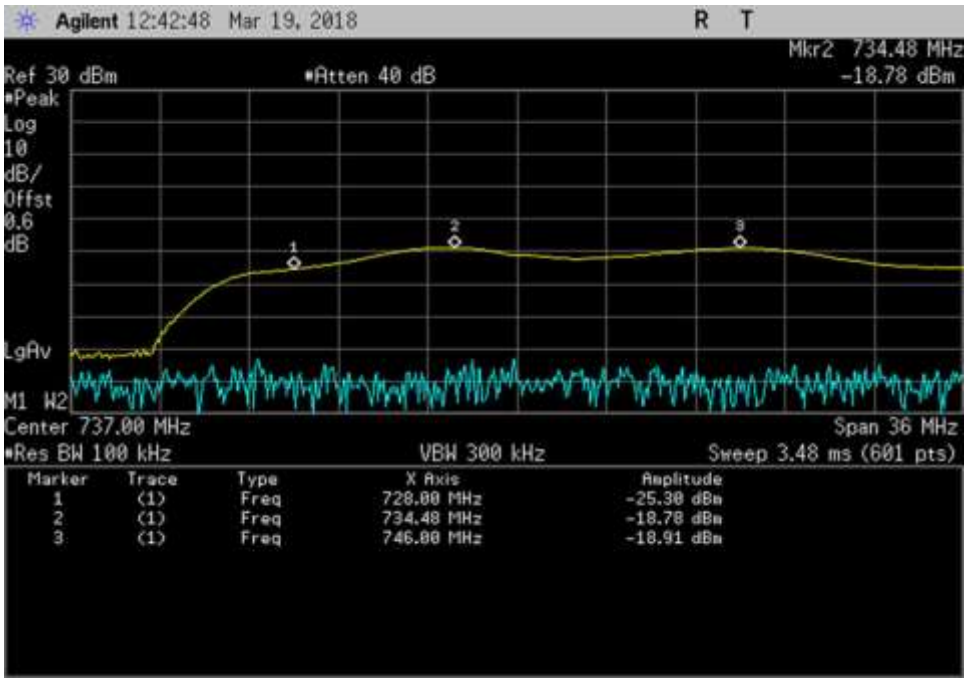
UL_824-849- 831.17MHz



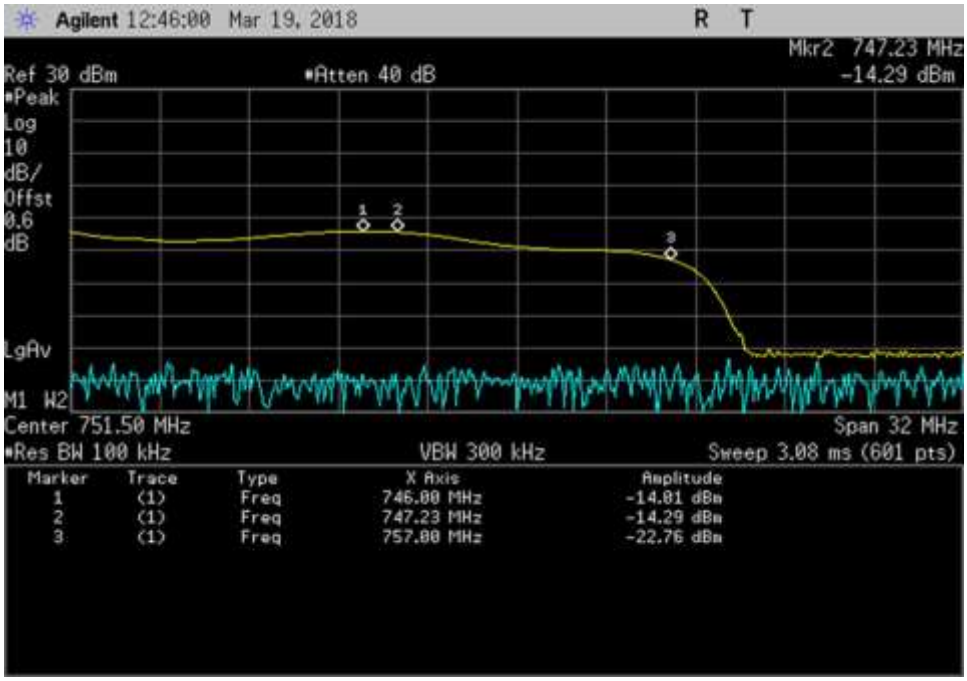
UL_1710-1755-1716.6MHz



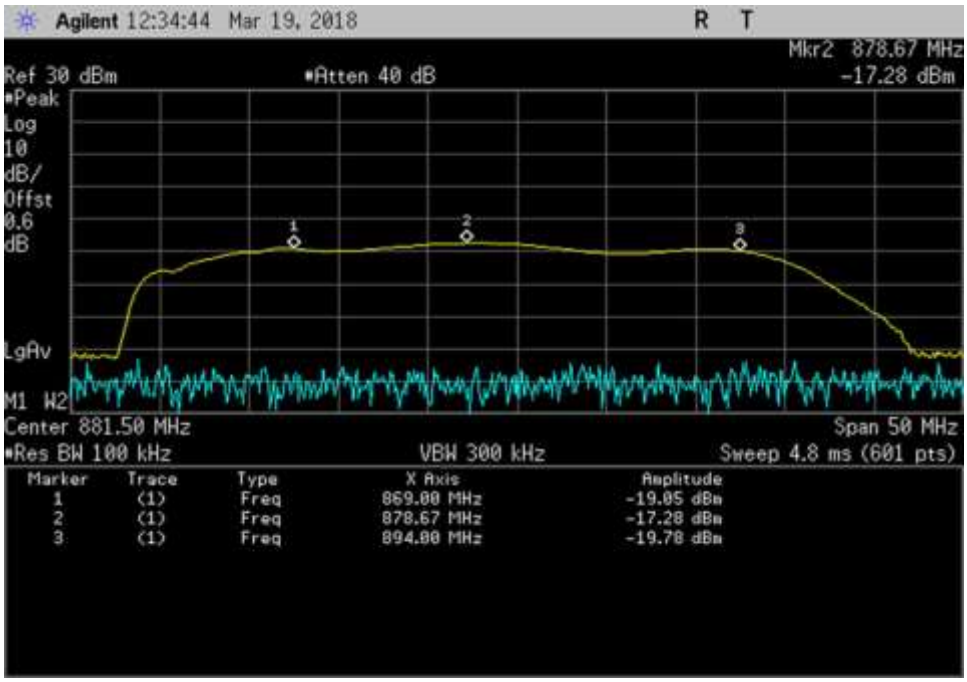
UL_1850-1915-1867.55MHz



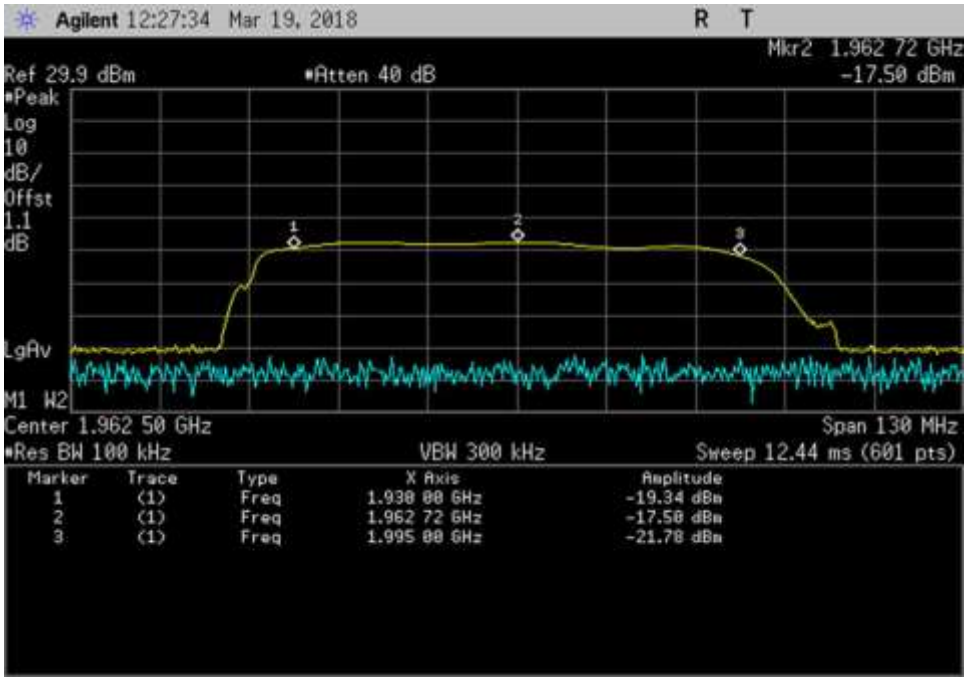
DL_728-746-734.48MHz



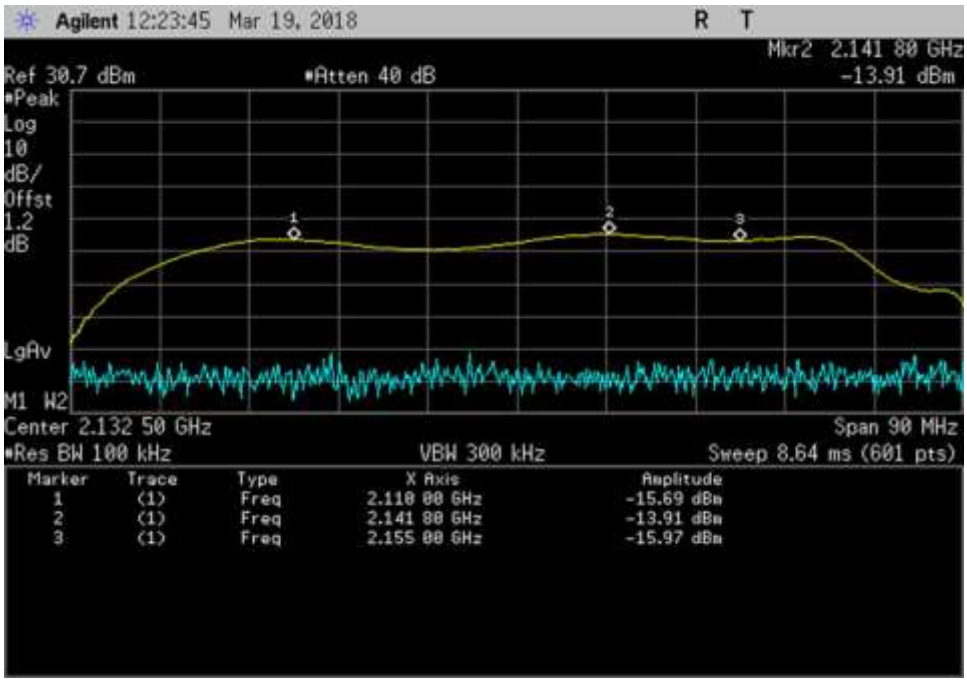
DL_746-757- 747.23MHz



DL_869-894- 878.67MHz



DL_1930-1995- 1962.72MHz



DL_2110-2155_- 2141.8MHz

7.2 Maximum Power and 7.3 Maximum Gain

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place. Brea, CA 92821• 714 993 6112
Customer:	Huaptec
Specification:	Section 20.21(e)(8)(i)(D) Power Limits, Section 20.21(e)(8)(i)(B) Bidirectional Capability, Section 20.21(e)(8)(i)(C)(2) Booster Gain Limits
Work Order #:	**100428** Date: 3/19 and 20, 2018
Test Type:	**Conducted Emissions**
Tested By:	E. Wong / S. Yamamoto
Software:	EMITest 5.03.11

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

General test condition.
The equipment under test (EUT) is a Mobile Wideband Consumer Booster with direct contact coupling (cradle-type) antenna.
The EUT is placed on the test bench. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port.
The EUT Donor port is a MCX type connector and 50-ohm impedance.
The EUT Server/DL port /is type UFL connector and 50-ohm impedance.

Part 22
UL: 824-849MHz
DL: 869-894MHz
Part 24
UL: 1850-1915MHz
DL: 1930-1995MHz
Part 27
UL: 1710-1755MHz, 698-716MHz, 776-787MHz
DL: 2110-2155MHz, 728-746MHz, 746-757MHz

Test procedure:
The test was performed in accordance with the FCC document: 935210 D03 Signal Booster Measurements v04r01, dated October 27, 2017.
Firmware: 2.0

Test environment conditions:
Temperature: 20 -25°C
Relative Humidity: 37-45 %
Pressure: 100kPa

Device is powered by a provided 5V USB/12V Automotive adaptor

Test Equipment:

Asset #	Description	Manufacturer	Model	Calibration Date	Cal Due Date
03420	Signal Generator	Agilent	E4438C	6/9/2017	6/9/2019
P07037	RF Signal Generator	Agilent	E4432B	10/6/2016	10/6/2018
P06544	Cable	Astro Steel	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
02946	Cable	Astro Steel	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
02672	Spectrum Analyzer	Agilent	E4446A	3/2/2017	3/2/2019

Summary of Results

Pass: As summarized in tables below, measured EIRP, Gain and UL/DL gain ratio are within limits.

Pre AGC				Pre AGC		
Pulse GSM				4.1 MHz AWGN		
Frequency (MHz)	Input (dBm)	Output (dBm)	Gain (dB)	Input (dBm)	Output (dBm)	Gain (dB)
UL1710-1755	4.7	17.9	13.2	5.9	17.0	11.1
UL1850-1915	6.3	18.9	12.6	4.6	17.2	12.6
UL824-894	5.6	19.1	13.5	4.2	17.4	13.2
UL 698-716	4.8	19.3	14.5	3.6	17.0	13.4
UL776-787	2.7	17.2	14.5	2.9	17.5	14.6
DL2110-2155	-27.9	-9.9	18.0	-27.9	-10.3	17.6
DL1930-1995	-28.8	-10.3	18.5	-30.4	-11.7	18.7
DL869-894	-30.5	-12.4	18.1	-29.8	-11.9	17.9
DL:728-746	-29.5	-9.9	19.6	-30.4	-10.8	19.6
DL 746-757	-28.5	-9.2	19.3	-28.5	-10.1	18.4

Max Mobile Gain limit:
Mobile: 23dB, direct contact coupling

Pulse GSM					Conducted	Conducted and EIRP
Frequency (MHz)	Output Power (dBm)	*Ant Gain (dBi)	Cable loss	EIRP (dBm)	Limit Min (dBm)	Limit Max (dBm)
UL1710-1755	17.9	11.0	1.8	27.1	17	30
UL1850-1915	18.9	11.0	1.8	28.1	17	30
UL824-894	19.1	10.0	1.2	27.9	17	30
UL 698-716	19.3	10.0	1.2	28.1	17	30
UL776-787	17.2	10.0	1.2	26.0	17	30
DL2110-2155	-9.9	-2.0	0.0	-11.9	NA	17
DL1930-1995	-10.3	-2.0	0.0	-12.3	NA	17
DL869-894	-12.4	-3.0	0.0	-15.4	NA	17
DL:728-746	-9.9	-3.0	0.0	-12.9	NA	17
DL 746-757	-9.2	-3.0	0.0	-12.2	NA	17

4.1MHz AWGN					Conducted	Conducted and EIRP
Frequency (MHz)	Output Power (dBm)	*Ant Gain (dBi)	Cable loss (dB)	EIRP (dBm)	Limit Min (dBm)	Limit Max (dBm)
UL1710-1755	17.0	11.0	1.8	26.2	17	30
UL1850-1915	17.2	11.0	1.8	26.4	17	30
UL824-894	17.4	10.0	1.2	26.2	17	30
UL 698-716	17.0	10.0	1.2	25.8	17	30
UL776-787	17.5	10.0	1.2	26.3	17	30
DL2110-2155	-10.3	-2.0	0.0	-12.3	NA	17
DL1930-1995	-11.7	-2.0	0.0	-13.7	NA	17
DL869-894	-11.9	-3.0	0.0	-14.9	NA	17
DL:728-746	-10.8	-3.0	0.0	-13.8	NA	17
DL 746-757	-10.1	-3.0	0.0	-13.1	NA	17

* Antenna gain and cable losses indicated from the antenna kitting are calculated from worse case combination.

UL Ant kit number	11-30400
DL Ant Kit number	NA (Intergral antenna)

4. Wide Band Directional Antenna 11dbi Antenna with 30' 400 Kit numbers: 11-30400

Antenna Gain (dBi)	10	10	10	11	11
Coax Cable Loss (dB)	1.2	1.2	1.2	1.8	1.8
Final Gain Less Loss (dB)	8.8	8.8	8.8	9.2	9.2
Final Output Power (dBm EIRP)	**28.1**	**26.3**	**27.9**	**27.1**	**28.1**

Indoor Antenna is integrated into the signal booster

Antenna Gain (dBi)	-3	-3	-3	-2	-2
Splitter/Coax Loss (dB)	0	0	0	0	0
Final Gain Less Splitter/Coax Loss (dB)	-3	-3	-3	-2	-2
Antenna Gain with Coax Loss Margin (dB)	-29.91	-29.21	-31.91	-28.91	-29.30
Final Output Power (dBm EIRP)	-12.90	-12.20	-14.90	-11.90	-12.30

Section 5.5 power						
Pulse GSM				4.1 MHz AWGN		
Frequency (MHz)	Input (dBm)	Output (dBm)	Gain (dB)	Input (dBm)	Output (dBm)	Gain (dB)
UL1710-1755	15.6	17.7	2.1	16.4	16.8	0.4
UL1850-1915	18.0	18.3	0.3	17.0	17.1	0.1
UL824-894	17.7	18.3	0.6	16.2	17.5	1.3
UL 698-716	17.5	18.7	1.2	15.8	17.5	1.7
UL776-787	16.0	16.2	0.2	15.0	17.4	2.4
DL2110-2155	-15.7	-10.6	5.1	-15.2	-9.9	5.3
DL1930-1995	-13.7	-10.7	3.0	-17.9	-11.4	6.5
DL869-894	-18.5	-13.4	5.1	-18.5	-11.6	6.9
DL:728-746	-17.4	-10.4	7.0	-18.0	-10.6	7.4
DL 746-757	-16.5	-9.4	7.1	-15.7	-10.6	5.1

Note: The booster went into Transmitter off mode at Max input power in accordance with section 5.5. Results presented on the above table are at 1 dB below the Transmit off RF input level.

UL gain vs DL gain	Pulse GSM (dB)	4.1MHz AWGN (dB)	Limit (dB)
UL gain vs DL gain 1710/2110	-4.8	-6.5	9.0
UL gain vs DL gain 1850/1930	-5.9	-6.1	9.0
UL gain vs DL gain 824/869	-4.6	-4.7	9.0
UL gain vs DL gain 698/716	-5.1	-6.2	9.0
UL gain vs DL gain 776/746	-4.8	-3.8	9.0

7.4 Intermodulation Product

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place. Brea, CA 92821• 714 993 6112
Customer:	Huaptec
Specification:	Section 20.21(e)(8)(i)(F) Intermodulation Limits
Work Order #:	**100428** Date: 3/21/18 and 5/15/2018
Test Type:	**Conducted Emissions**
Tested By:	E. Wong / S. Yamamoto
Software:	EMITest 5.03.11

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

General test condition.
The equipment under test (EUT) is a Mobile Wideband Consumer Booster with direct contact coupling (cradle-type) antenna.
The EUT is placed on the test bench. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port.
The EUT Donor port is a MCX type connector and 50-ohm impedance.
The EUT Server/DL port /is type UFL connector and 50-ohm impedance.

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UL: 824-849MHz
DL: 869-894MHz
Part 24
UL: 1850-1915MHz
DL: 1930-1995MHz
Part 27
UL: 1710-1755MHz, 698-716MHz, 776-787MHz
DL: 2110-2155MHz, 728-746MHz, 746-757MHz

Test procedure:
The test was performed in accordance with the FCC document: 935210 D03 Signal Booster Measurements v04r01, dated October 27, 2017.
Firmware: 2.0

Test environment conditions:
Temperature: 20 -25°C
Relative Humidity: 37-45 %
Pressure: 100kPa

Device is powered by a provided 5V USB/12V Automotive adaptor

Modification #1 was in place during testing.

Test Equipment:

Asset #	Description	Manufacturer	Model	Calibration Date	Cal Due Date
03420	Signal Generator	Agilent	E4438C	6/9/2017	6/9/2019
P07037	RF Signal Generator	Agilent	E4432B	10/6/2016	10/6/2018
P06544	Cable	Astro Steel	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
02946	Cable	Astro Steel	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
02672	Spectrum Analyzer	Agilent	E4446A	3/2/2017	3/2/2019
P06664	Cable	Gore	PHASEFLEX FJR01N01036.0	3/31/2018	3/31/2020
P07086	Power Divider/Combiner	Anaren	42000	1/24/2017	1/24/2019

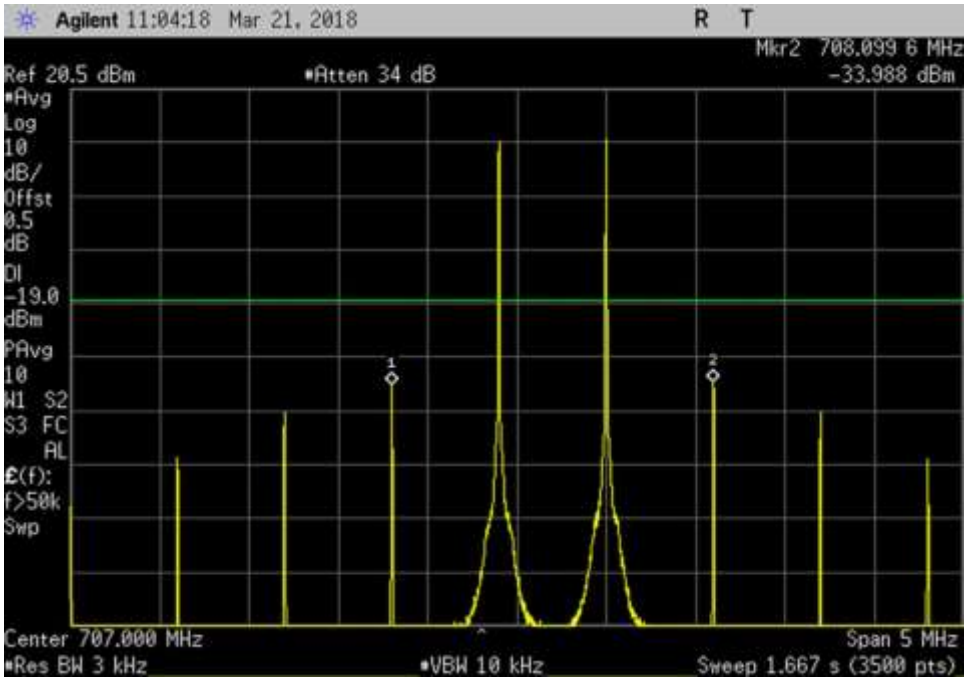
Summary of Results

Pass: As shown on the plots, all intermodulation products are measured below -19dbm limit.

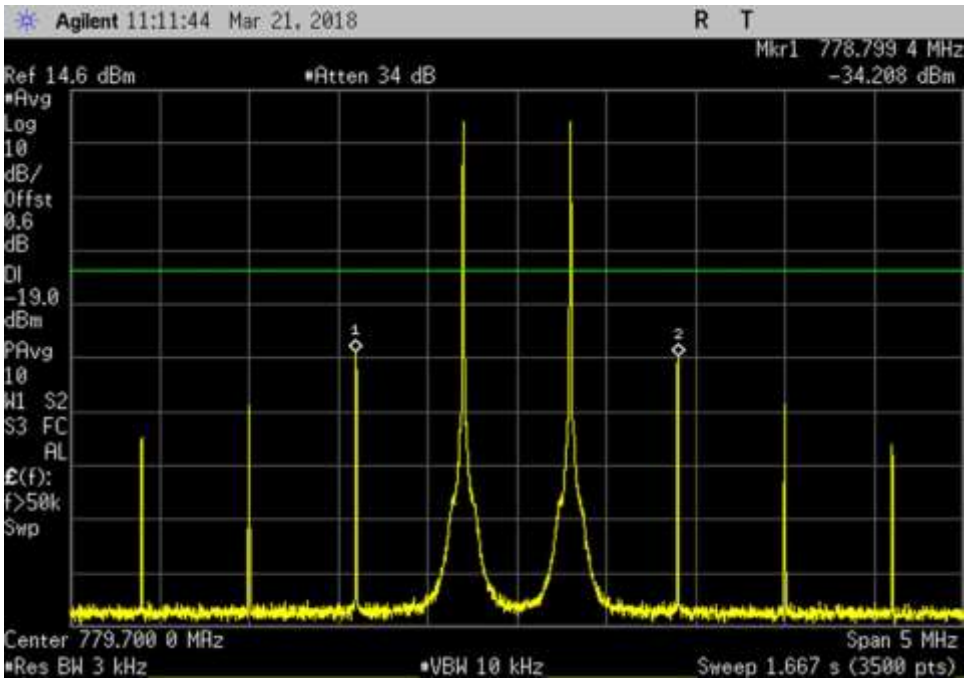
Inter Modulation Product			
Frequency (MHz)	**Pre AGC (dBm)**	**Limit (dBm)**	**Results**
UL 1710-1755	-24.2	-19	Pass
UL 1850-1915	-30.0	-19	Pass
UL 824-894	-24.0	-19	Pass
UL 698-716	-34.0	-19	Pass
UL 776-787	-34.2	-19	Pass
DL 2110-2155	-77.0	-19	Pass
DL 1930-1995	-79.0	-19	Pass
DL 869-894	-91.7	-19	Pass
DL 728-746	-83.3	-19	Pass
DL 746-757	-81.4	-19	Pass

Note: The EUT maintains compliance with the intermodulation limit at input power of AGC+10dB

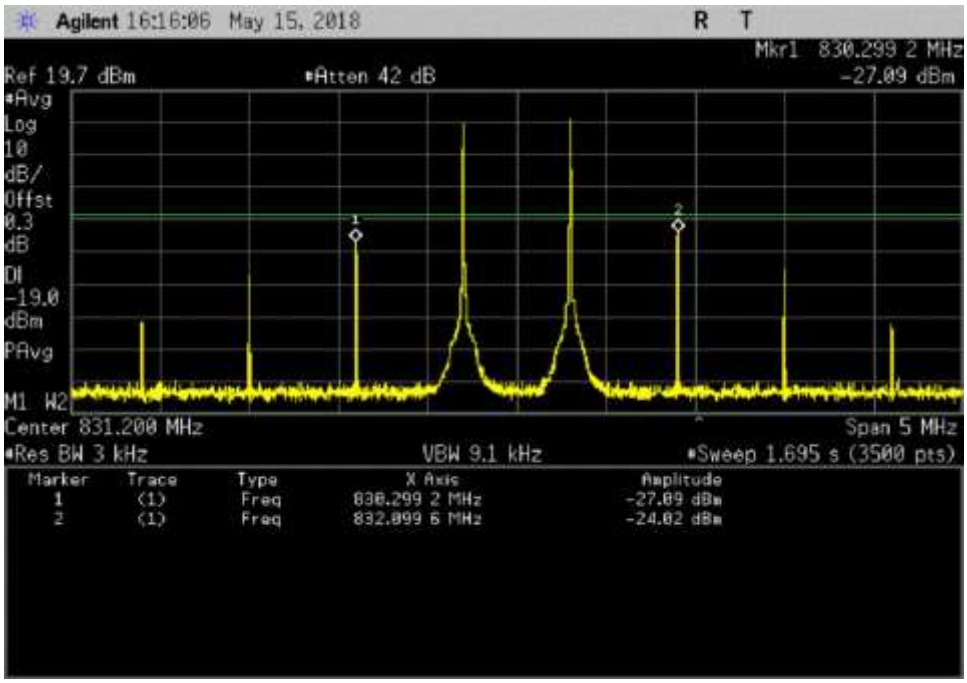
Plots



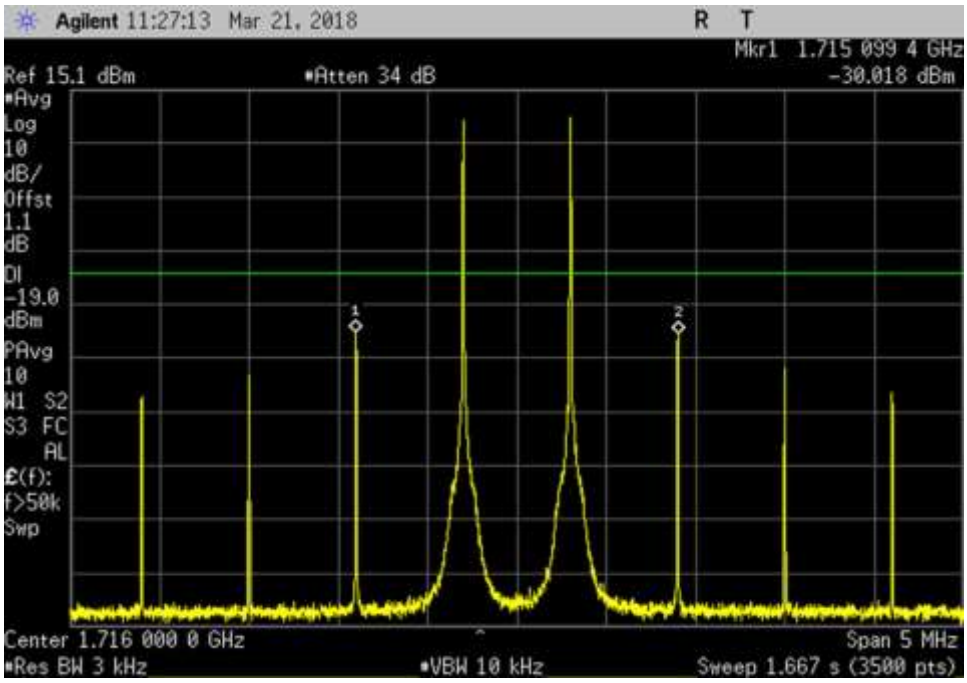
UL_698-716_ 707MHz



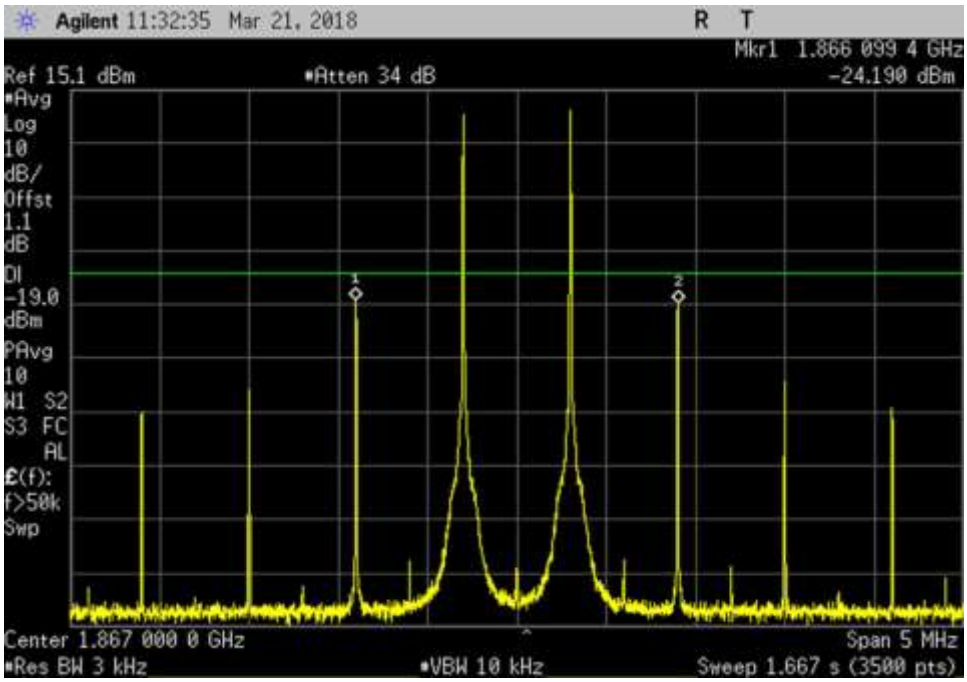
UL_776-787_ 779.7MHz



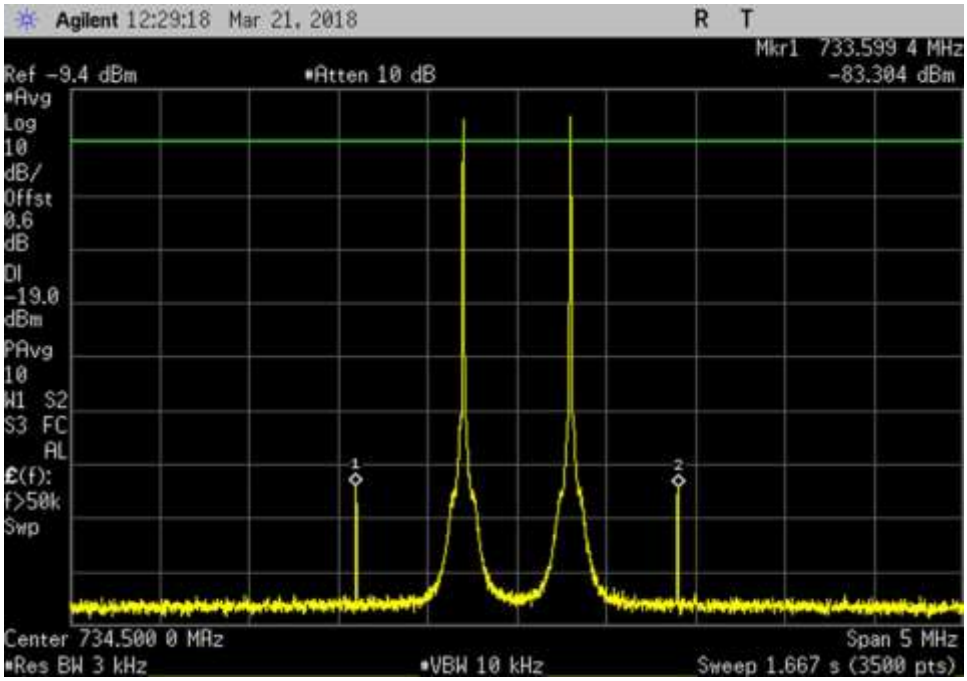
UL_824-849_ 831.2MHz_d



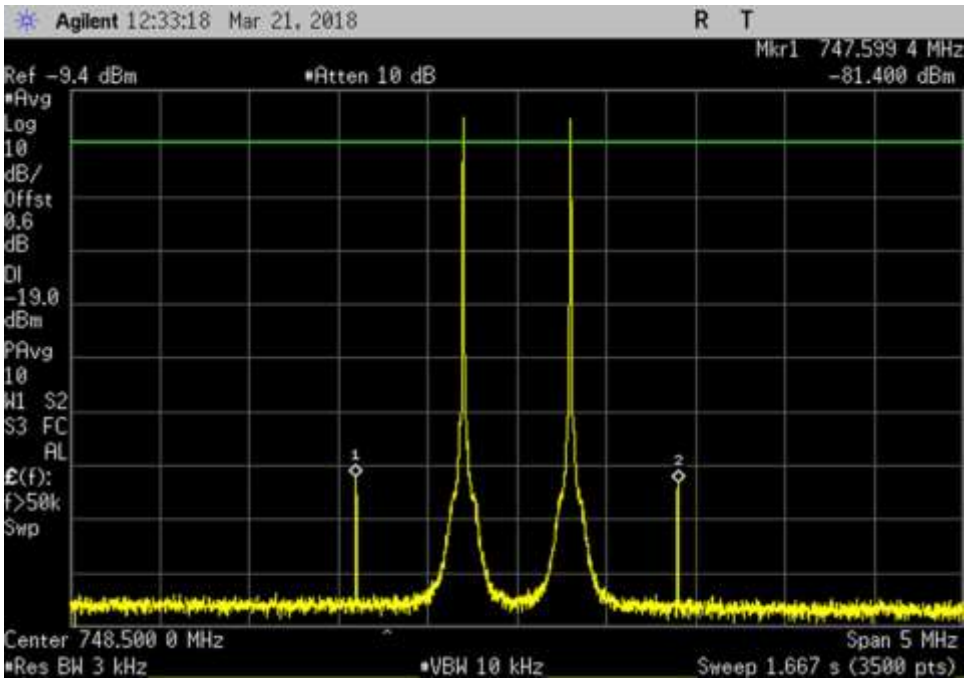
UL_1710-1755_ 1716MHz



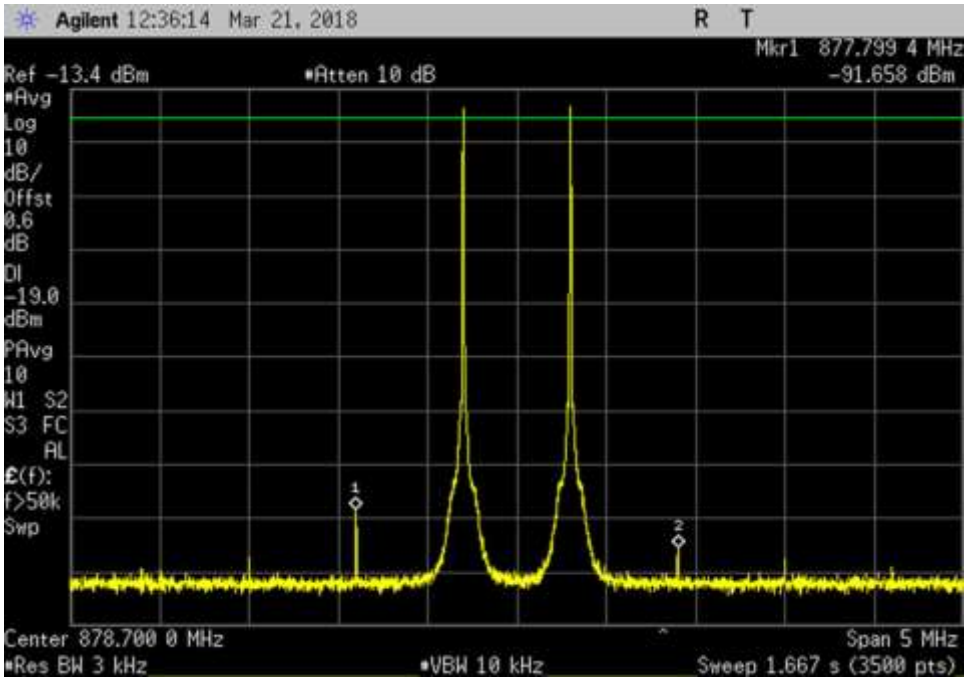
UL_1850-1915_ 1867MHz



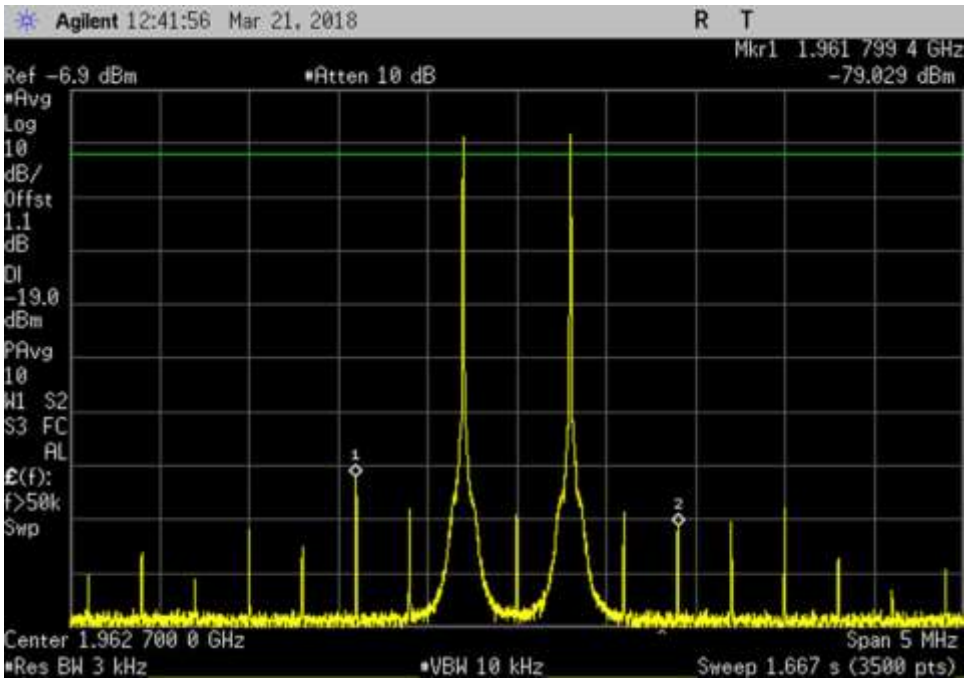
DL_728-746_ 734.5MHz



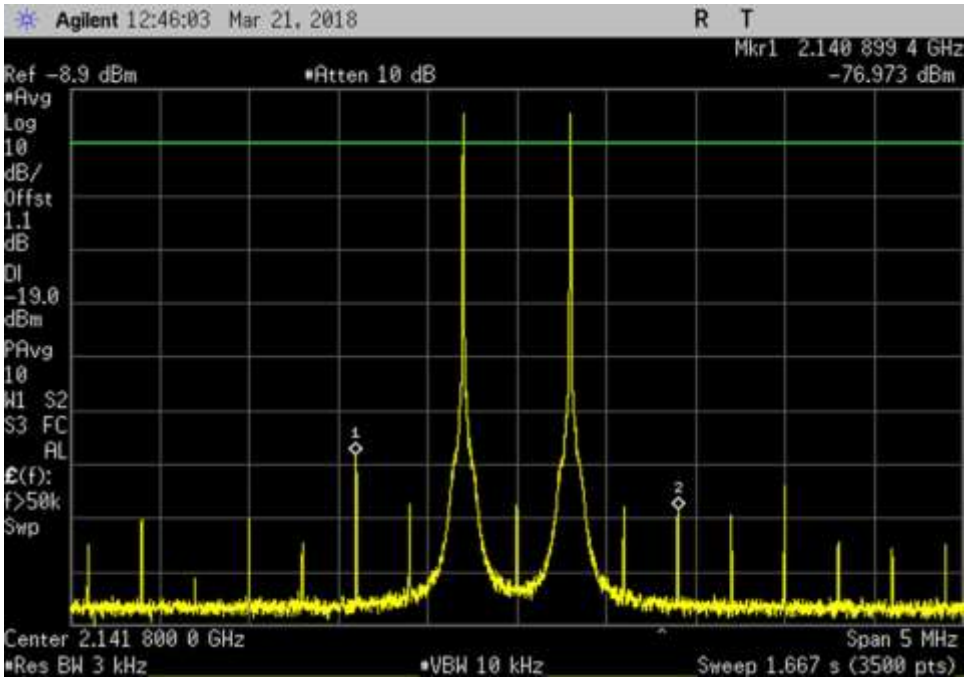
DL_746-757_ 748.5MHz



DL_869-894_ 878.7MHz



DL_1930-1995_ 1962.7MHz



DL_2110-2155_ 2141.8MHz

7.5 Out of Band Emissions

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place. Brea, CA 92821• 714 993 6112
Customer:	Huaptec
Specification:	Section 20.21(e)(8)(i)(E) Out of Band Emission Limits
Work Order #:	**100428** Date: 3/21, 23, and 24, 2018
Test Type:	**Conducted Emissions**
Tested By:	S. Yamamoto
Software:	EMITest 5.03.11

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

General test condition.
The equipment under test (EUT) is a Mobile Wideband Consumer Booster with direct contact coupling (cradle-type) antenna.
The EUT is placed on the test bench. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port.
The EUT Donor port is a MCX type connector and 50-ohm impedance.
The EUT Server/DL port /is type UFL connector and 50-ohm impedance.

Part 22
UL: 824-849MHz
DL: 869-894MHz
Part 24
UL: 1850-1915MHz
DL: 1930-1995MHz
Part 27
UL: 1710-1755MHz, 698-716MHz, 776-787MHz
DL: 2110-2155MHz, 728-746MHz, 746-757MHz

Test procedure:
The test was performed in accordance with the FCC document: 935210 D03 Signal Booster Measurements v04r01, dated October 27, 2017.
Firmware: 2.0

Test environment conditions:
Temperature: 20 -25°C
Relative Humidity: 37-45 %
Pressure: 100kPa

Device is powered by a provided 5V USB/12V Automotive adaptor

Test Equipment:

Asset #	Description	Manufacturer	Model	Calibration Date	Cal Due Date
03420	Signal Generator	Agilent	E4438C	6/9/2017	6/9/2019
P07037	RF Signal Generator	Agilent	E4432B	10/6/2016	10/6/2018
P06544	Cable	Astro Steel	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
02946	Cable	Astro Steel	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
02672	Spectrum Analyzer	Agilent	E4446A	3/2/2017	3/2/2019

Summary of Results

Pass: As indicated in plots below, all OBE are under the limit of -19dBm.

GSM

Low					High			
Out of Band Emission					Out of Band Emission			
Frequency (MHz)	Pre AGC	Limit (dBm)	Results		Frequency (MHz)	Pre AGC	Limit (dBm)	Results
UL 1710-1755	-32.7	-19	Pass		UL 1710-1755	-31.6	-19	Pass
UL 1850-1915	-31.6	-19	Pass		UL 1850-1915	-33.8	-19	Pass
UL 824-849	-32.3	-19	Pass		UL 824-849	-31.1	-19	Pass
UL 698-716	-27.5	-19	Pass		UL 698-716	-28.4	-19	Pass
UL 776-787	-29.4	-19	Pass		UL 776-787	-29.8	-19	Pass
DL 2110-2155	-34.6	-19	Pass		DL 2110-2155	-35.7	-19	Pass
DL 1930-1995	-37.0	-19	Pass		DL 1930-1995	-38.1	-19	Pass
DL 869-894	-36.1	-19	Pass		DL 869-894	-37.7	-19	Pass
DL:728-746	-41.0	-19	Pass		DL:728-746	-35.9	-19	Pass
DL 746-757	-34.2	-19	Pass		DL 746-757	-40.7	-19	Pass

CDMA (alternative 1.25 MHz AWGN)

Low					High			
Out of Band Emission					Out of Band Emission			
Frequency (MHz)	Pre AGC	Limit (dBm)	Results		Frequency (MHz)	Pre AGC	Limit (dBm)	Results
UL 1710-1755	-31.1	-19	Pass		UL 1710-1755	-32.6	-19	Pass
UL 1850-1915	-37.7	-19	Pass		UL 1850-1915	-57.2	-19	Pass
UL 824-849	-30.9	-19	Pass		UL 824-849	-23.3	-19	Pass
UL 698-716	-38.7	-19	Pass		UL 698-716	-38.5	-19	Pass
UL 776-787	-39.9	-19	Pass		UL 776-787	-39.5	-19	Pass
DL 2110-2155	-80.9	-19	Pass		DL 2110-2155	-80.5	-19	Pass
DL 1930-1995	-81.2	-19	Pass		DL 1930-1995	-81.0	-19	Pass
DL 869-894	-84.6	-19	Pass		DL 869-894	-86.8	-19	Pass
DL:728-746	-89.7	-19	Pass		DL:728-746	-87.5	-19	Pass
DL 746-757	-90.1	-19	Pass		DL 746-757	-87.9	-19	Pass

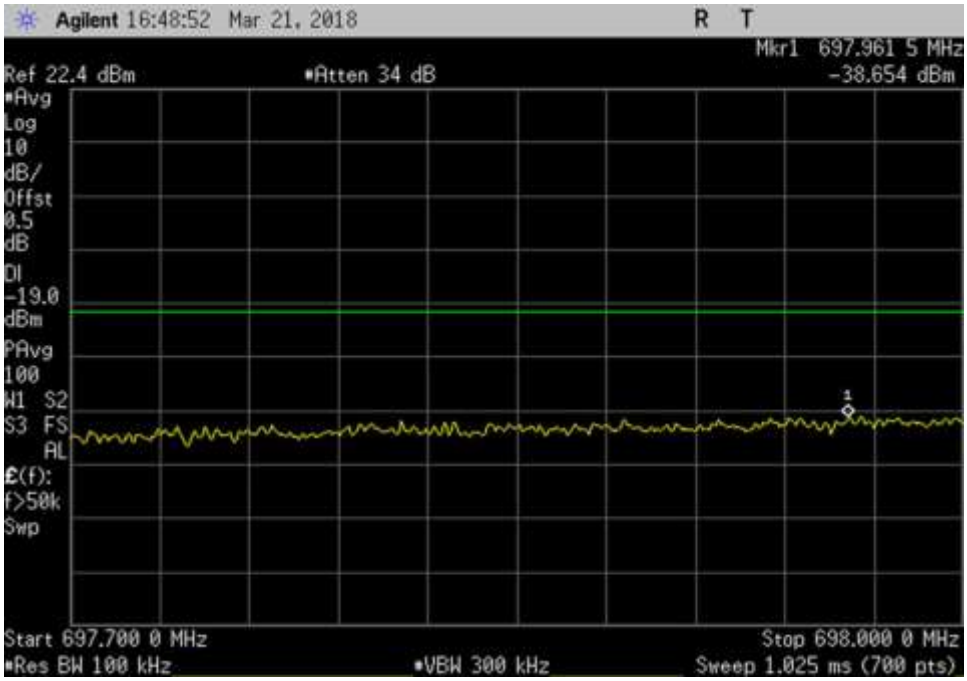
LTE (alternative 4.1MHz AWGN)

Low					High			
Out of Band Emission					Out of Band Emission			
Frequency (MHz)	Pre AGC	Limit (dBm)	Results		Frequency (MHz)	Pre AGC	Limit (dBm)	Results
UL 1710-1755	-25.0	-19	Pass		UL 1710-1755	-22.9	-19	Pass
UL 1850-1915	-30.9	-19	Pass		UL 1850-1915	-35.3	-19	Pass
UL 824-849	-28.7	-19	Pass		UL 824-849	-30.7	-19	Pass
UL 698-716	-29.5	-19	Pass		UL 698-716	-28.5	-19	Pass
UL 776-787	-29.7	-19	Pass		UL 776-787	-33.5	-19	Pass
DL 2110-2155	-39.6	-19	Pass		D L2110-2155	-38.5	-19	Pass
DL 1930-1995	-38.5	-19	Pass		DL 1930-1995	-40.8	-19	Pass
DL 869-894	-59.8	-19	Pass		DL 869-894	-58.7	-19	Pass
DL:728-746	-62.1	-19	Pass		DL:728-746	-56.7	-19	Pass
DL 746-757	-55.6	-19	Pass		DL 746-757	-63.1	-19	Pass

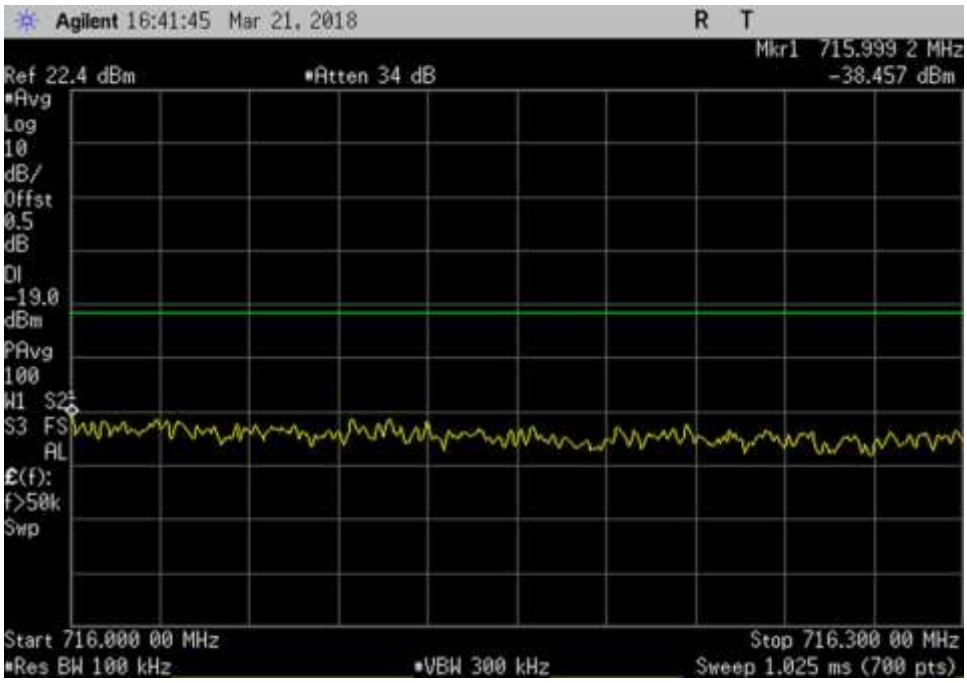
Note: The EUT also maintains compliance with the out-of-band emissions limit at input power indicated in section 5.5.

Plots

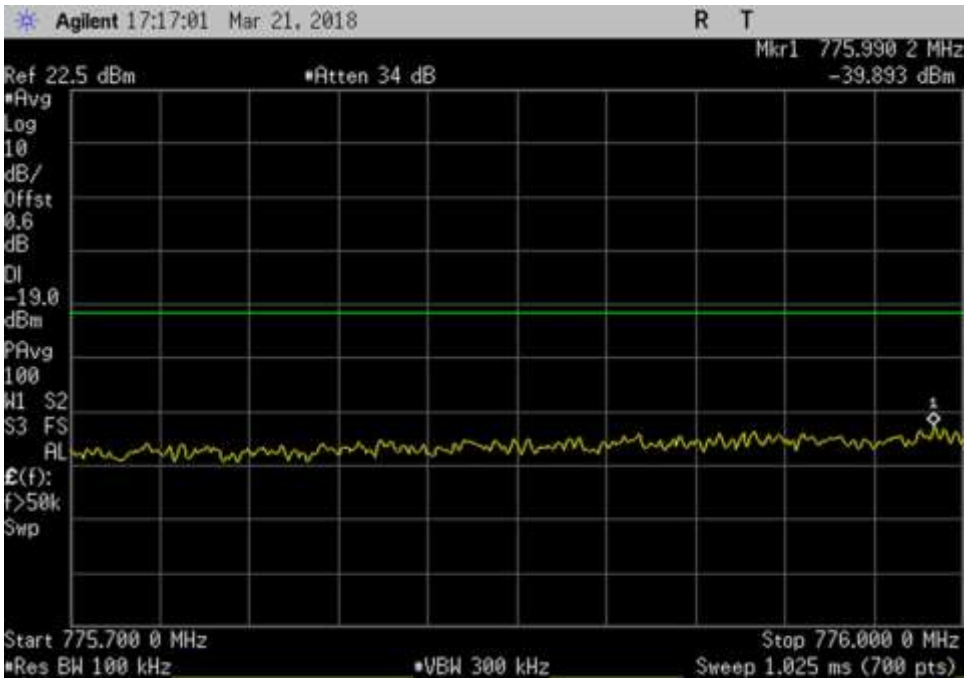
CDMA



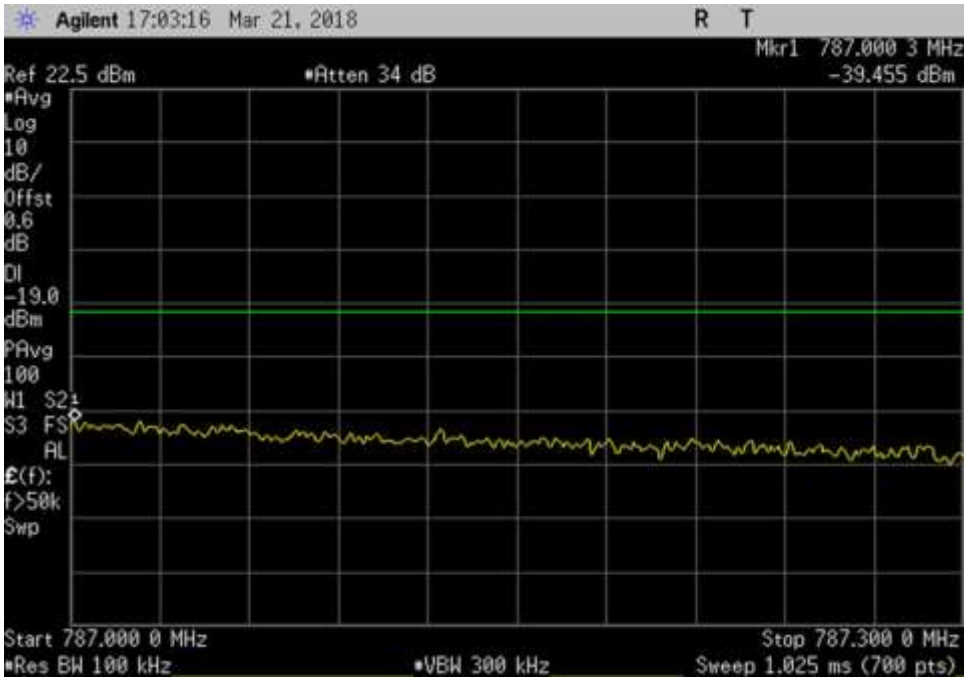
UL_698-716_CDMA_ 697.7- 698MHz_L_PreAGC



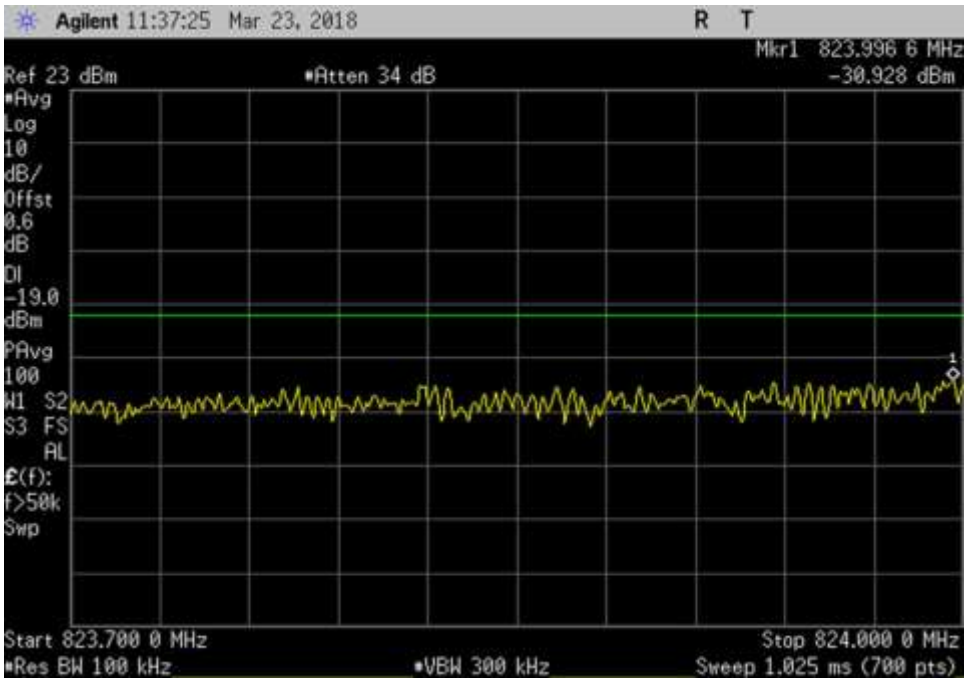
UL_698-716_CDMA_ 716- 716.3MHz_H_PreAGC



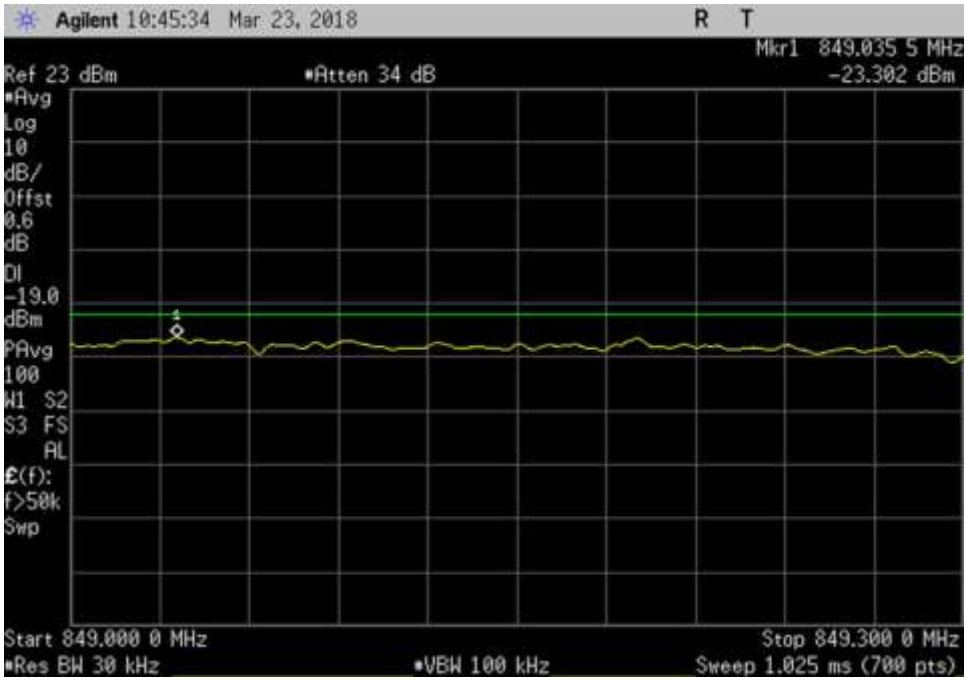
UL_776-787_CDMA_ 775.7- 776MHz_L_PreAGC



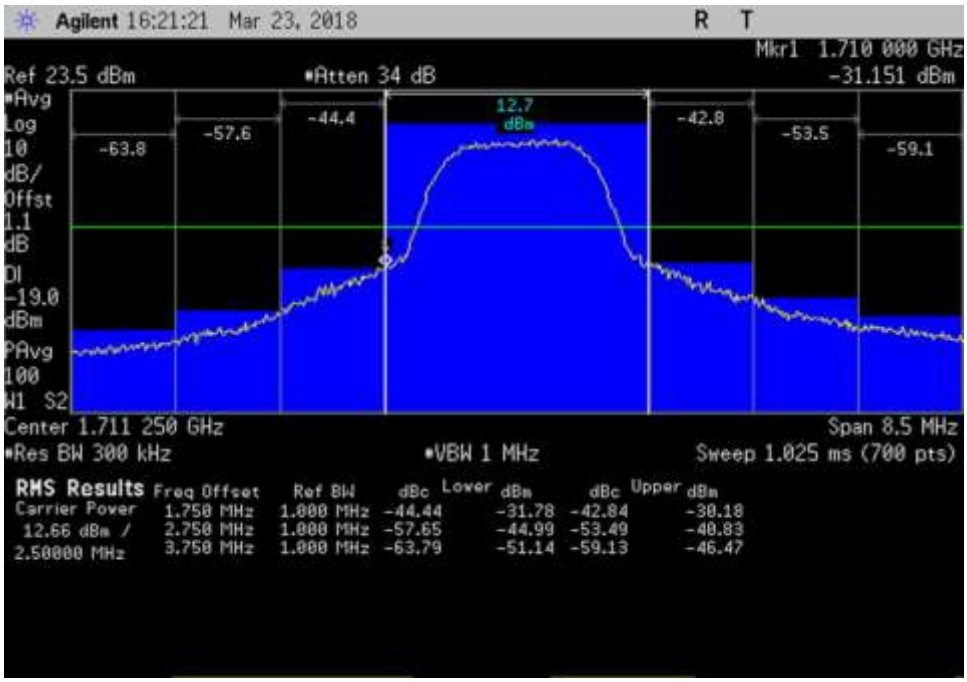
UL_776-787_CDMA_ 787- 787.3MHz_H_PreAGC



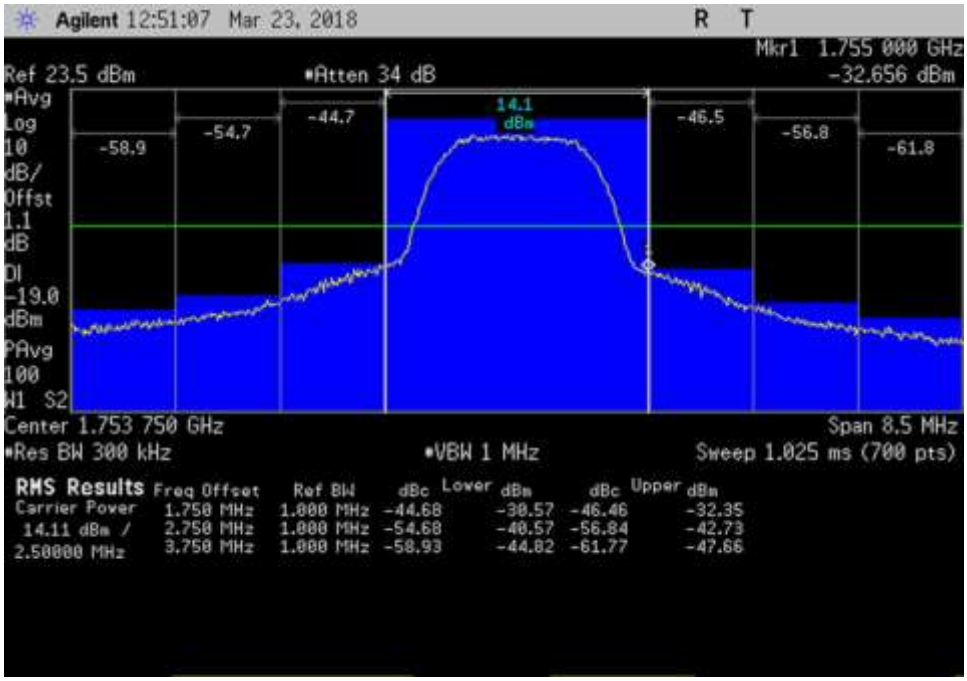
UL_824-849_CDMA_ 823.7- 824MHz_L_PreAGC



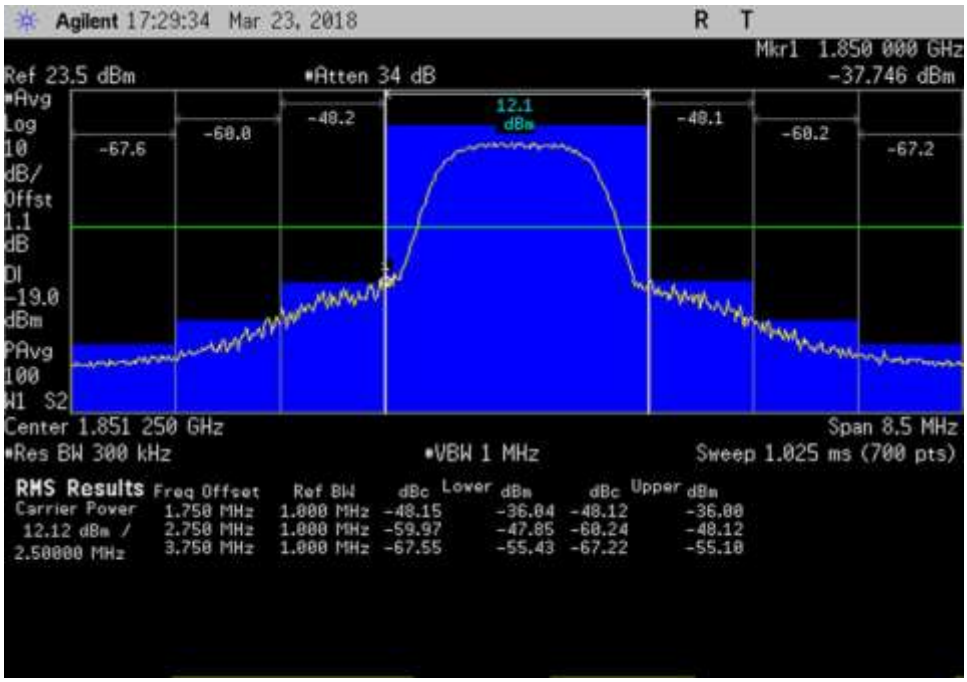
UL_824-849_CDMA_ 849- 849.3MHz_H_PreAGC_30kHz



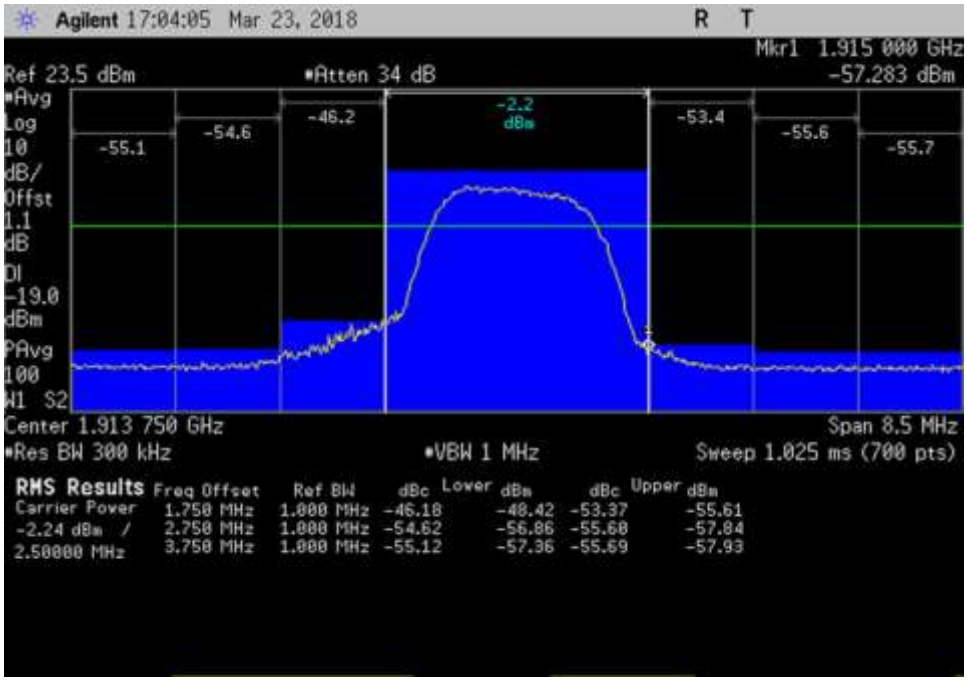
UL_1710-1755_CDMA_ 1707- 1715.5MHz_L_PreAGC



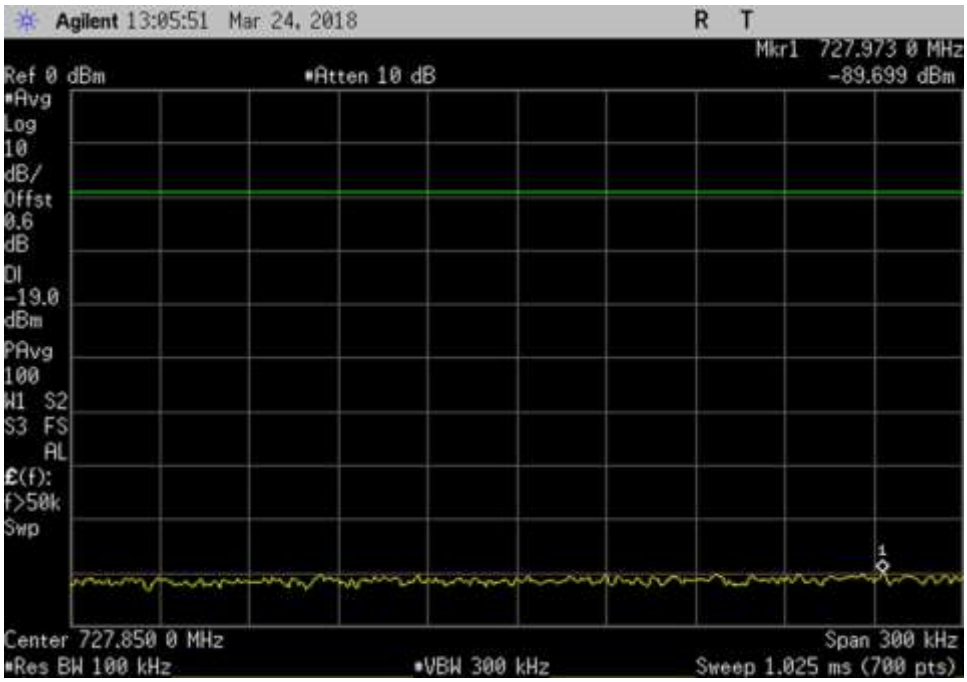
UL_1710-1755_CDMA_ 1749.5- 1758MHz_H_PreAGC



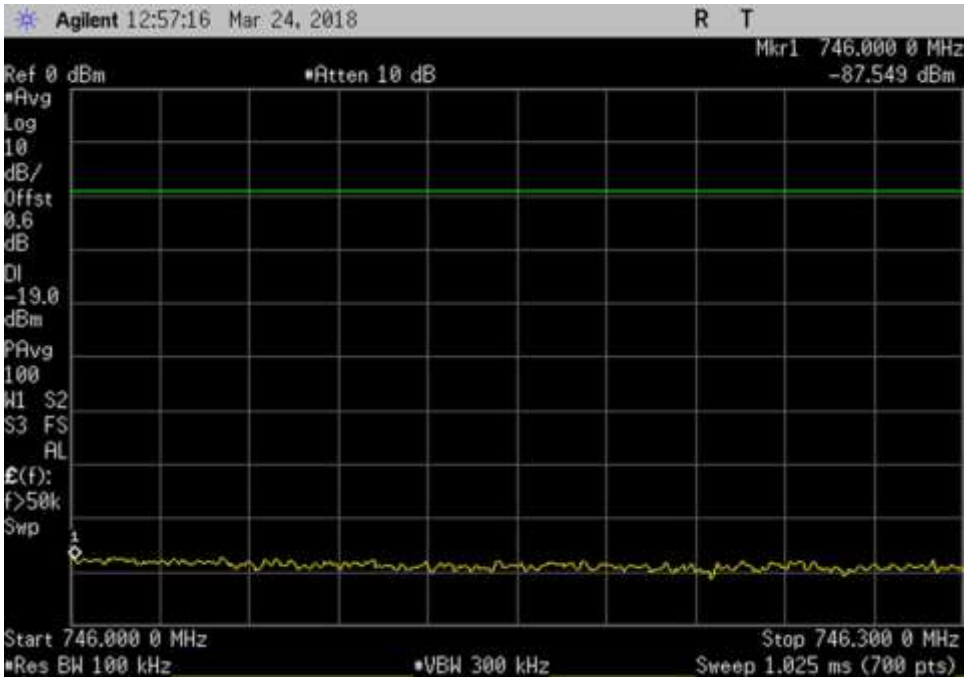
UL_1850-1915_CDMA_ 1847- 1855.5MHz_L_PreAGC



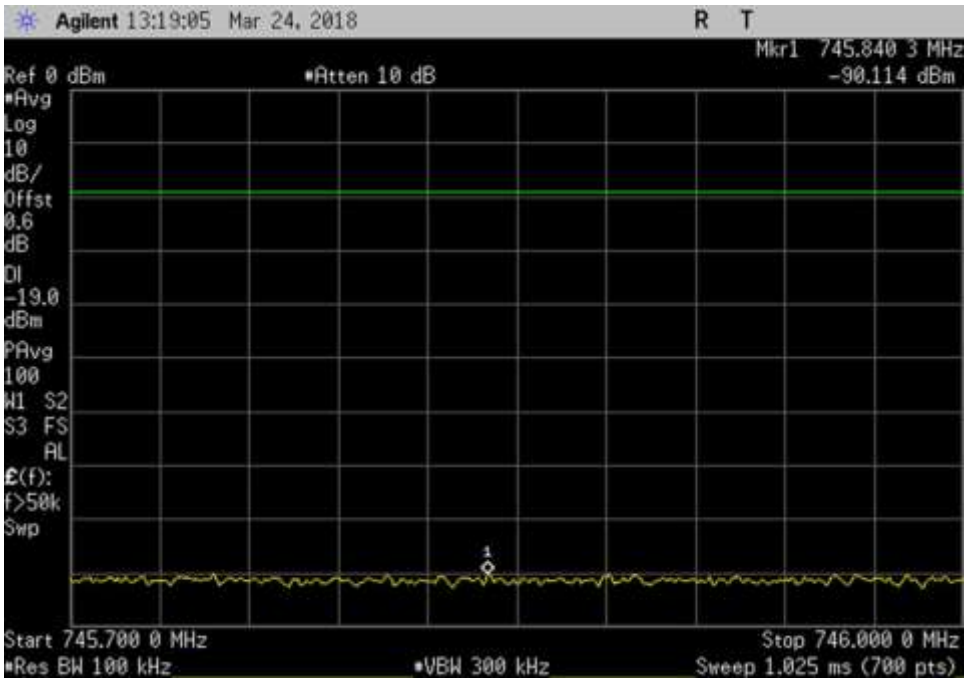
UL_1850-1915_CDMA_ 1909.5- 1918MHz_H_PreAGC



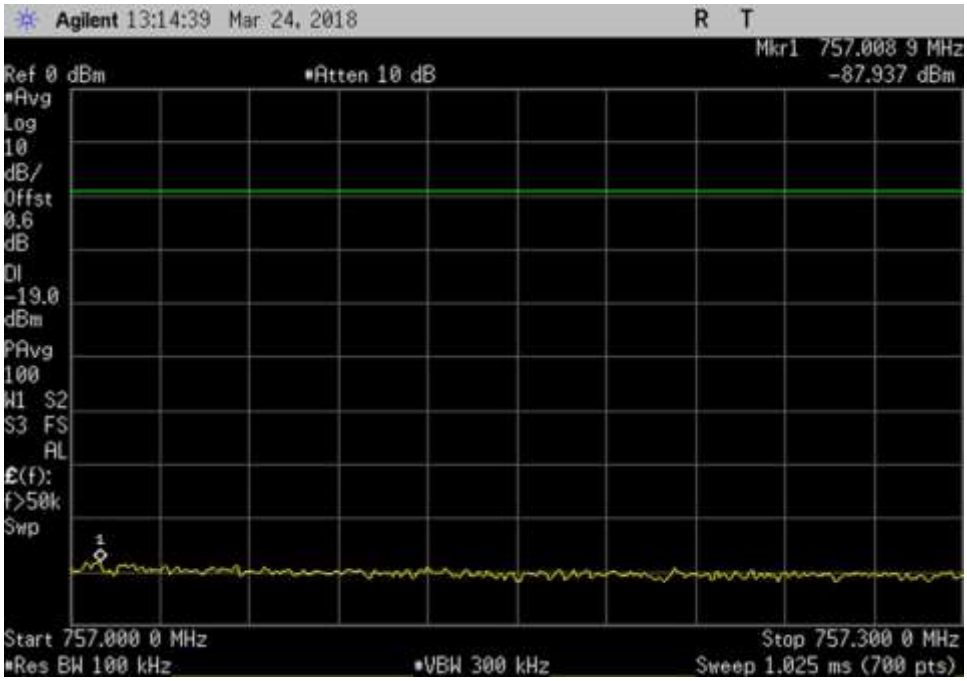
DL_728-746_CDMA_ 727.7- 728MHz_L_PreAGC



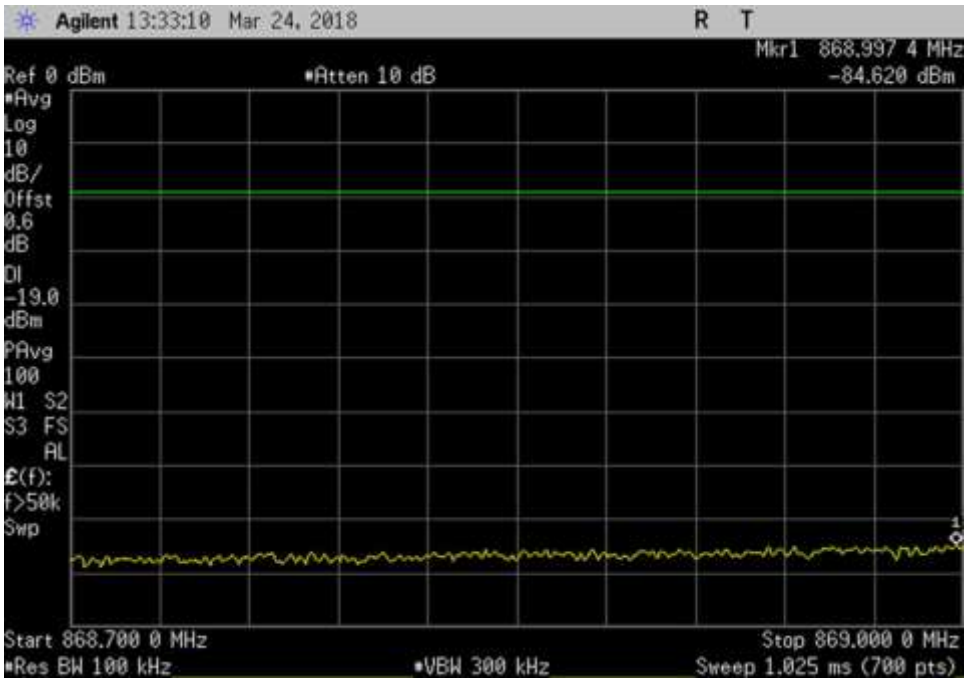
DL_728-746_CDMA_ 746- 746.3MHz_H_PreAGC



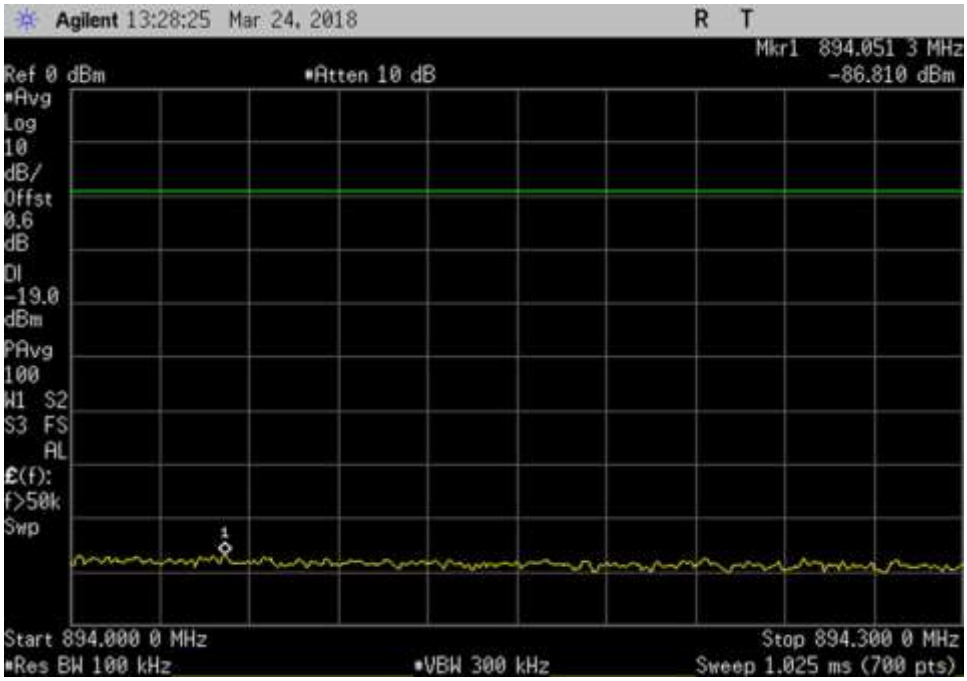
DL_746-757_CDMA_ 745.7- 746MHz_L_PreAGC



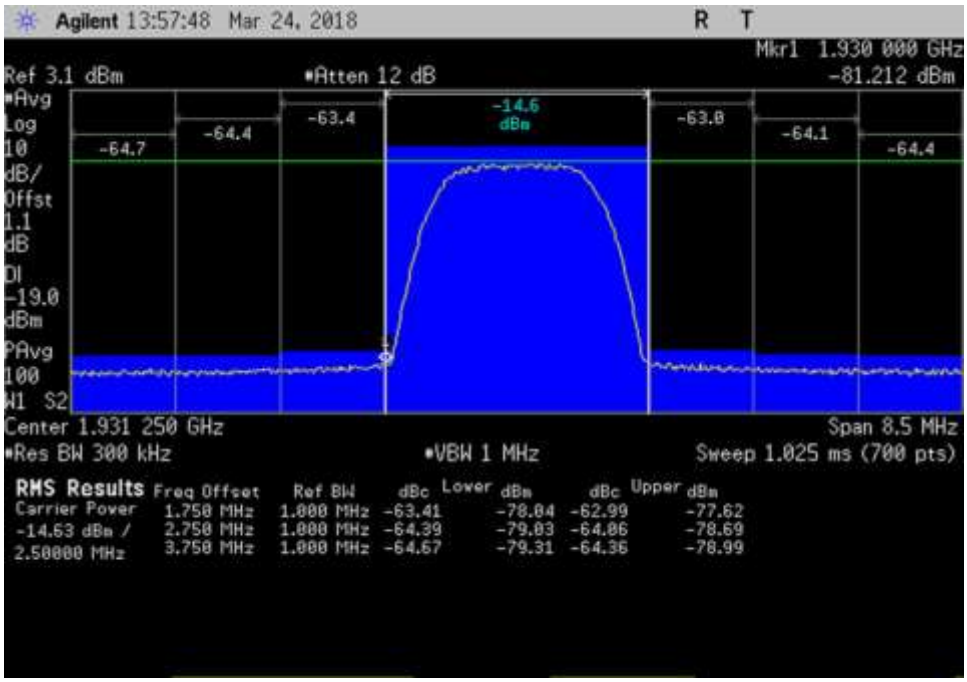
DL_746-757_CDMA_ 757- 757.3MHz_H_PreAGC



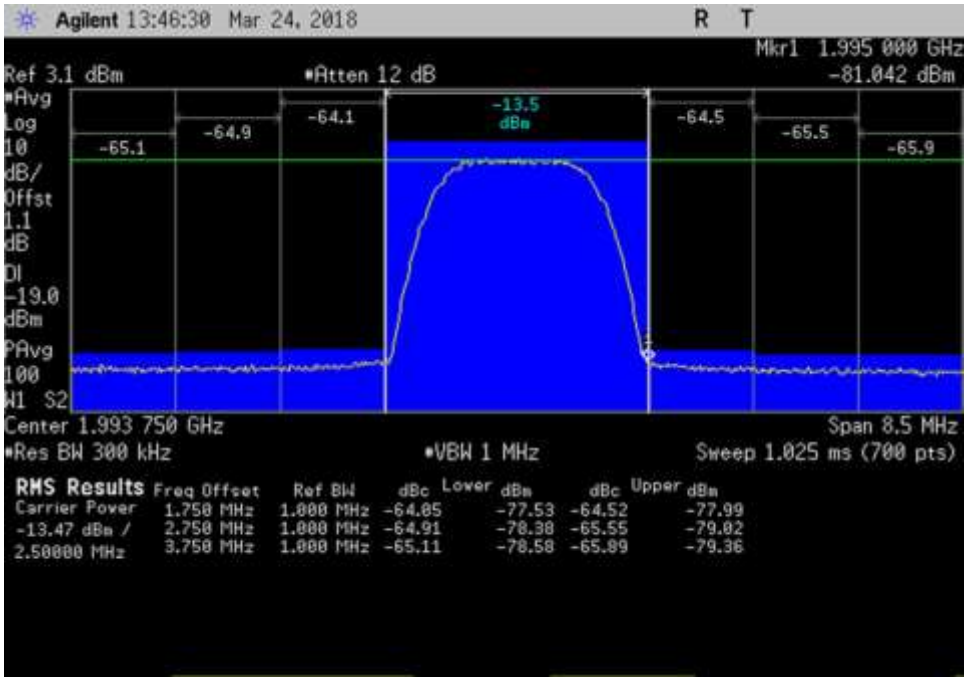
DL_869-894_CDMA_ 868.7- 869MHz_L_PreAGC



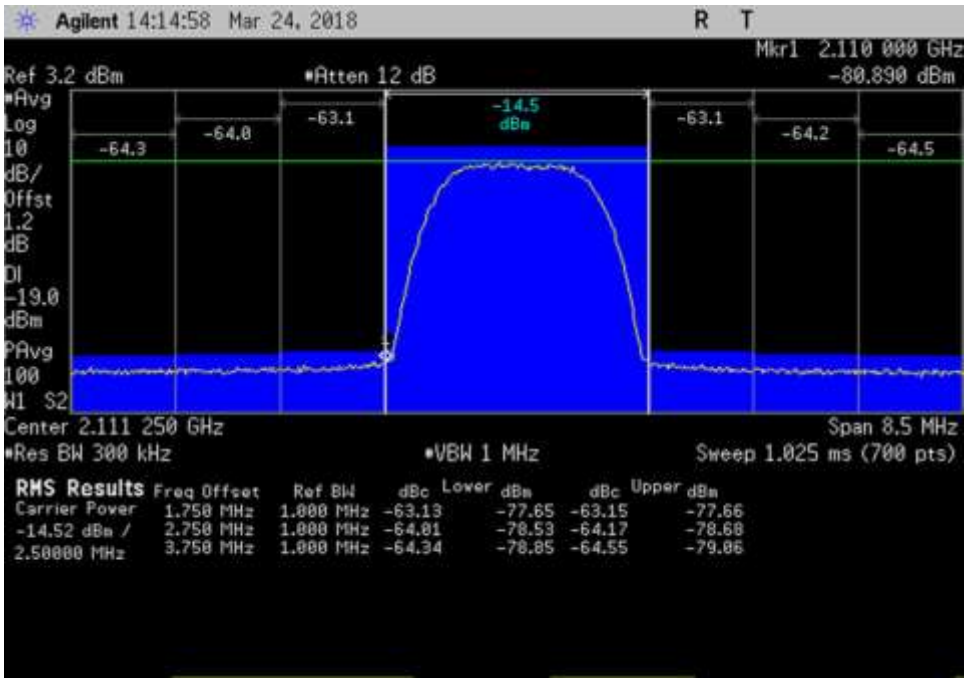
DL_869-894_CDMA_ 894- 894.3MHz_H_PreAGC



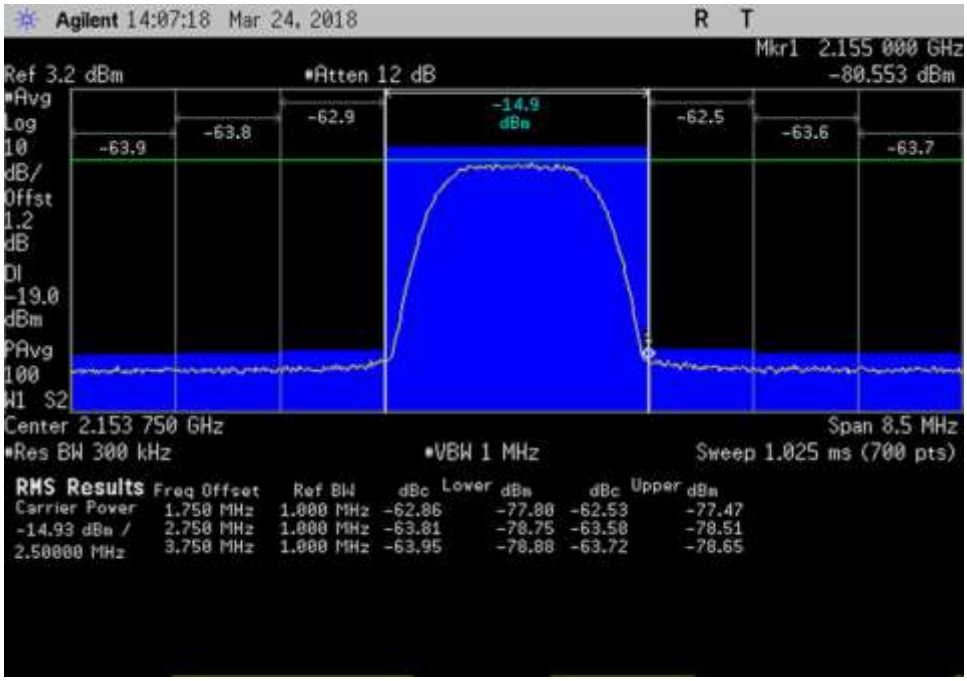
DL_1930-1995_CDMA_ 1927- 1935.5MHz_L_PreAGC



DL_1930-1995_CDMA_ 1989.5- 1998MHz_H_PreAGC

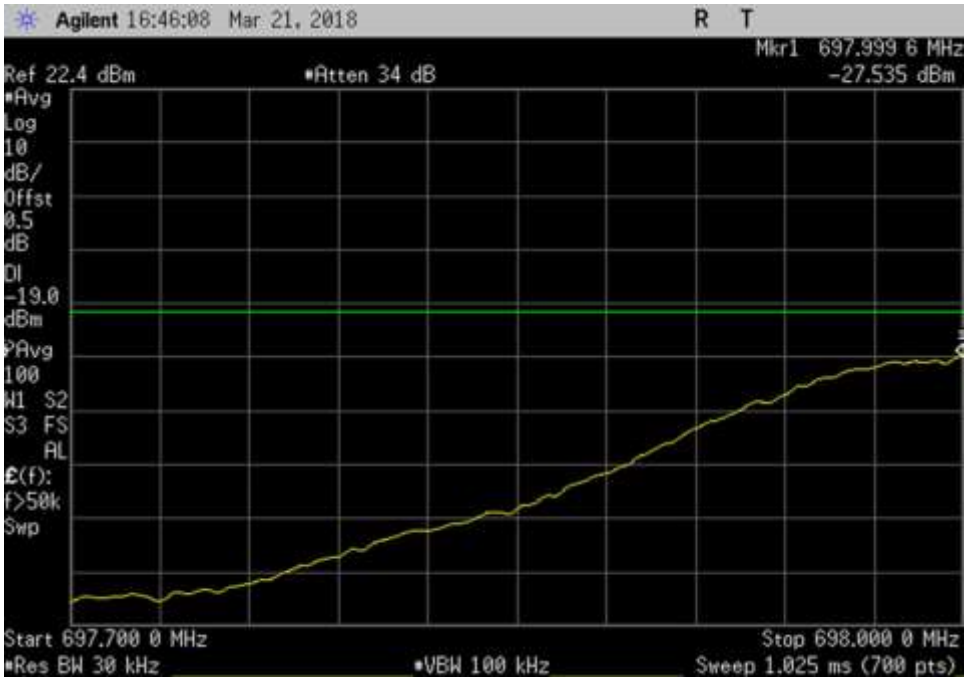


DL_2110-2155_CDMA_ 2107- 2115.5MHz_L_PreAGC



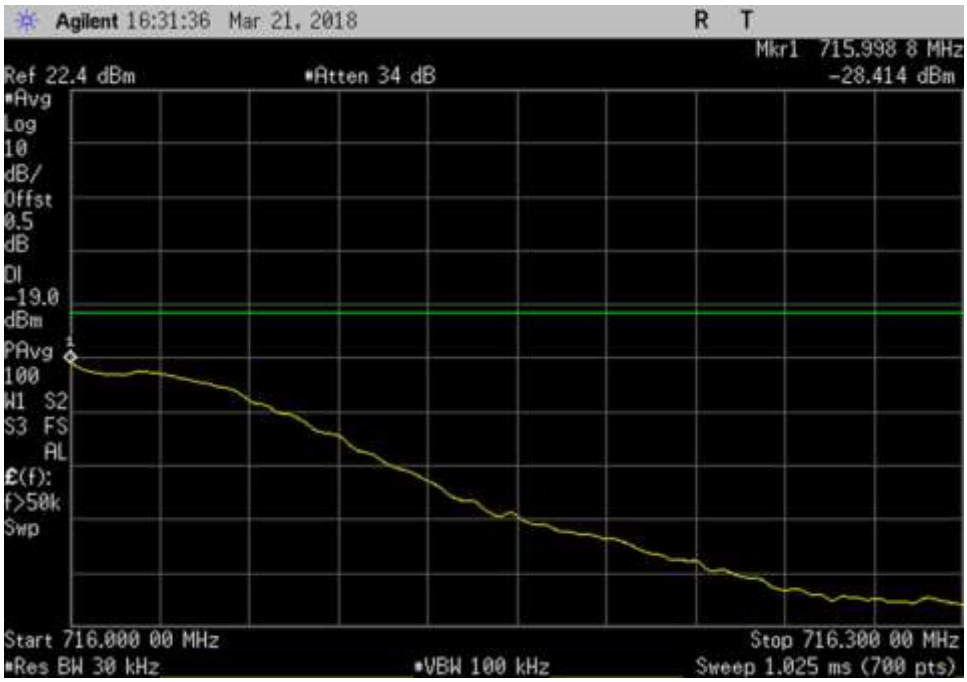
DL_2110-2155_CDMA_ 2149.5- 2158MHz_H_PreAGC

GSM

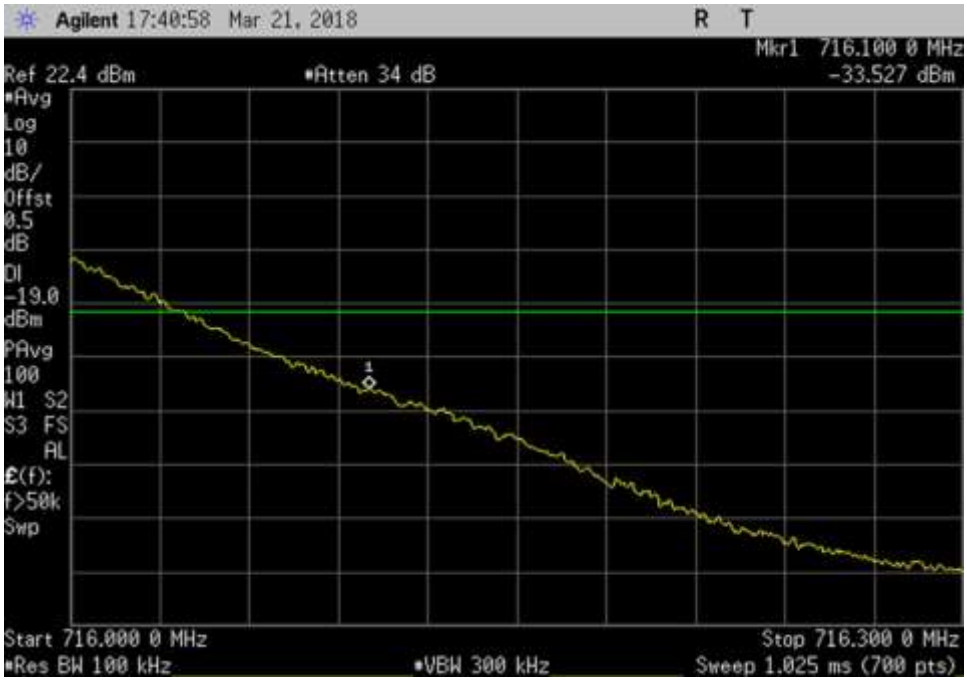


UL_698-716_GSM_ 697.7- 698MHz_L_PreAGC_30kHz

UL_698-716_GSM_ 697.7- 698MHz_L_PreAGC_100kHz



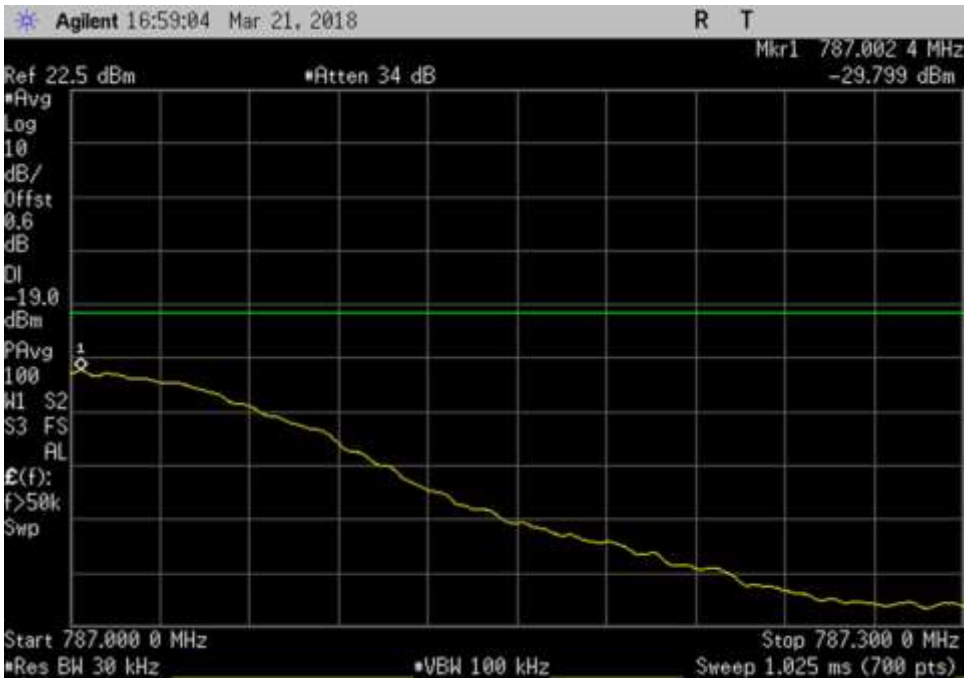
UL_698-716_GSM_ 716- 716.3MHz_H_PreAGC_30kHz



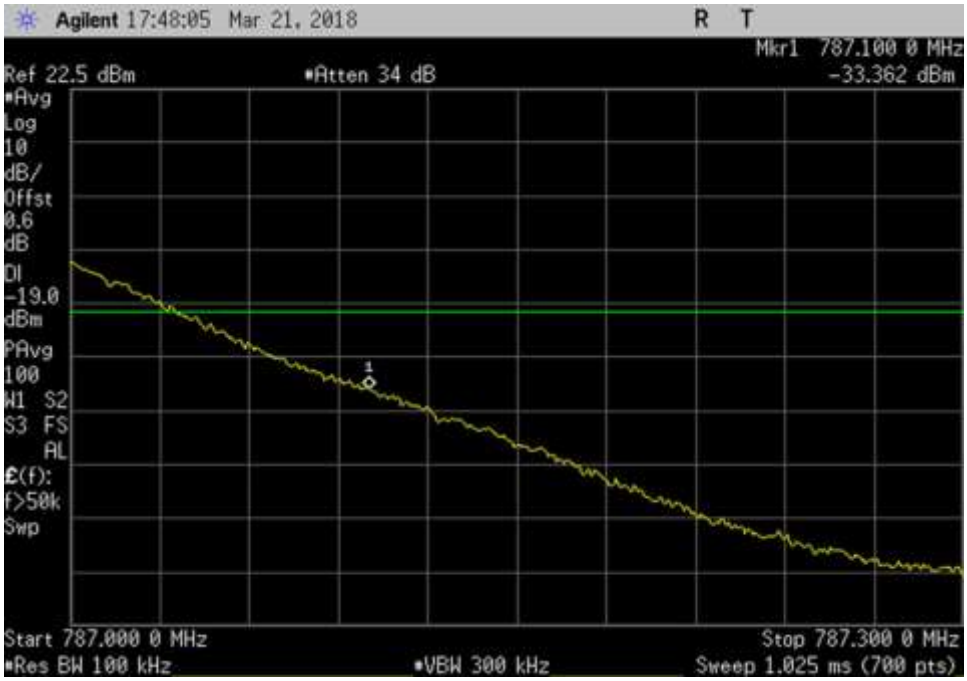
UL_698-716_GSM_ 716- 716.3MHz_H_PreAGC_100kHz

UL_776-787_GSM_ 775.7- 776MHz_L_PreAGC_30kHz

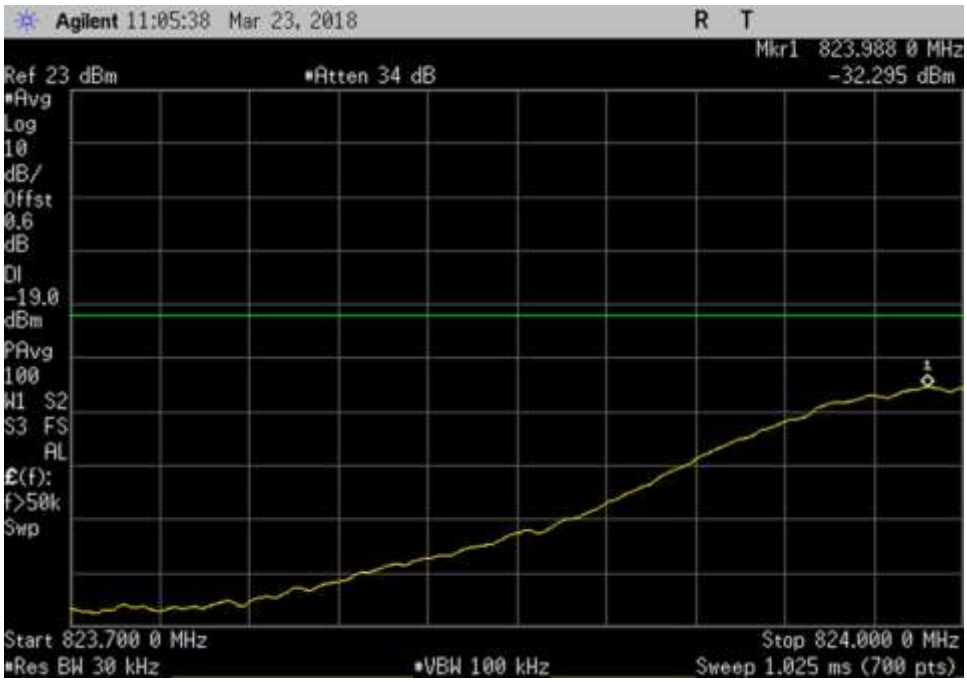
UL_776-787_GSM_ 775.7- 776MHz_L_PreAGC_100kHz



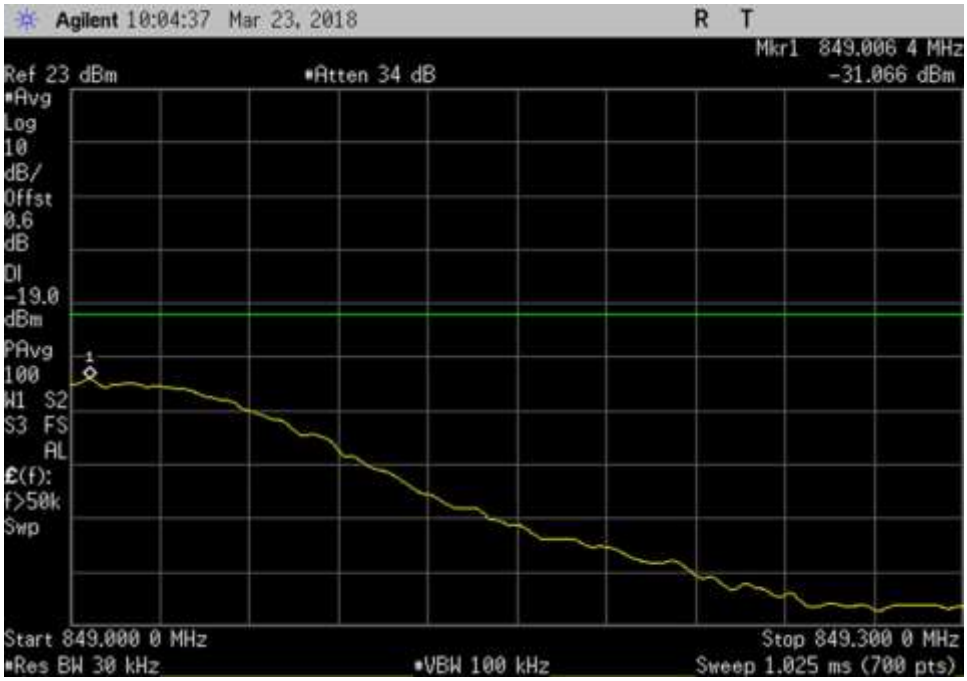
UL_776-787_GSM_ 787- 787.3MHz_H_PreAGC_30kHz



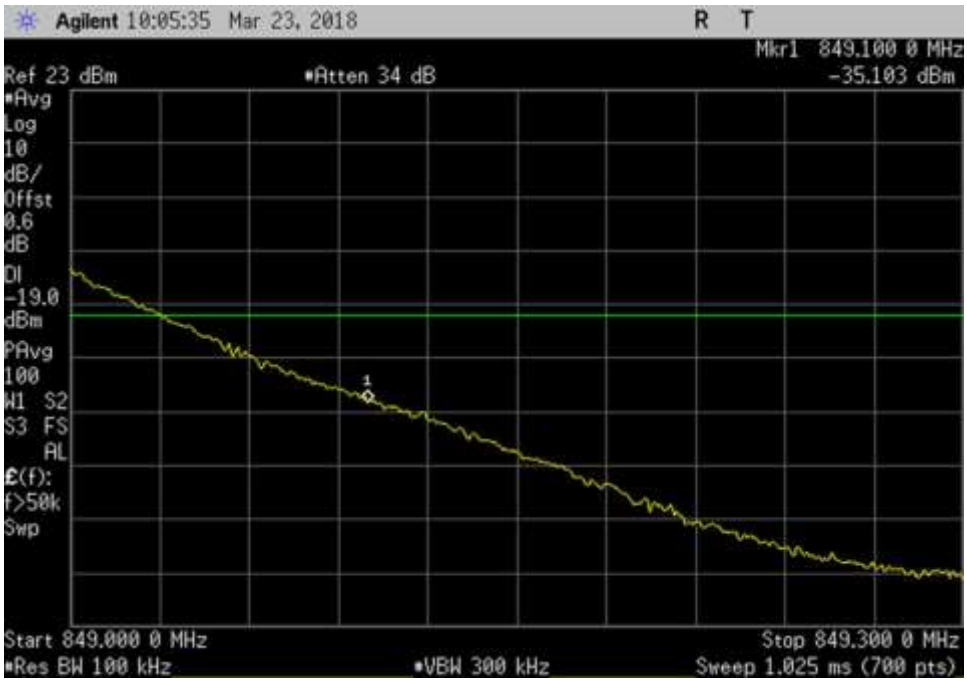
UL_776-787_GSM_ 787- 787.3MHz_H_PreAGC_100kHz



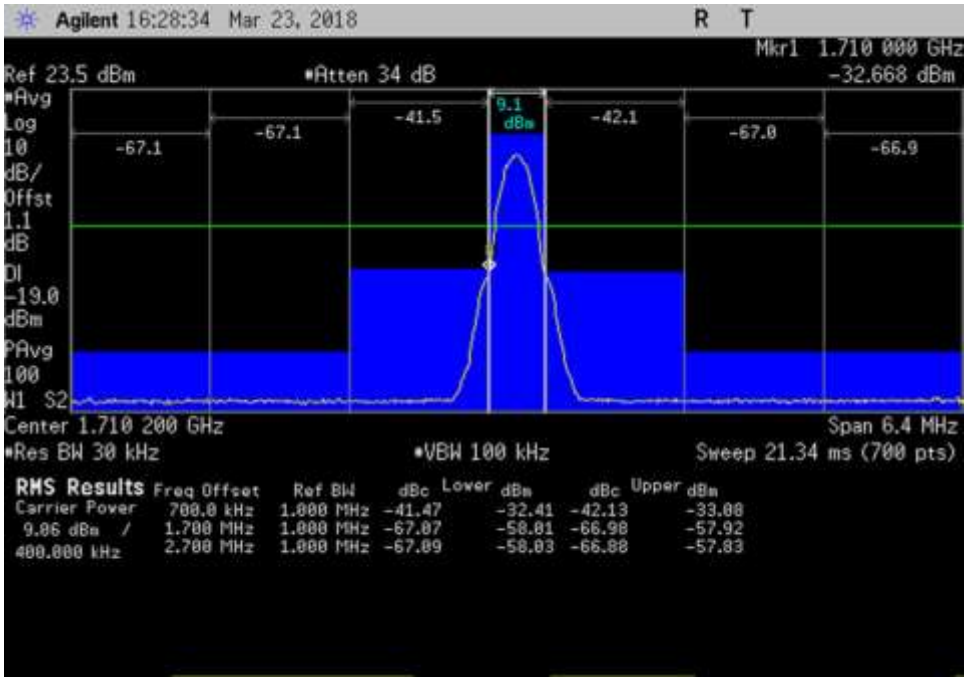
UL_824-849_GSM_ 823.7- 824MHz_L_PreAGC



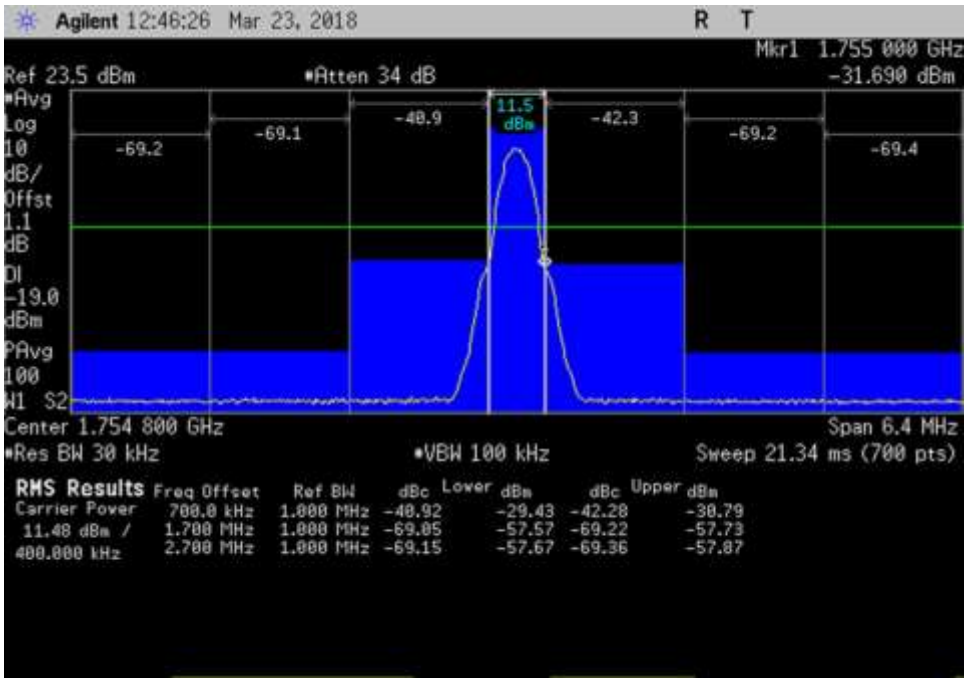
UL_824-849_GSM_ 849- 849.3MHz_H_PreAGC_30kHz



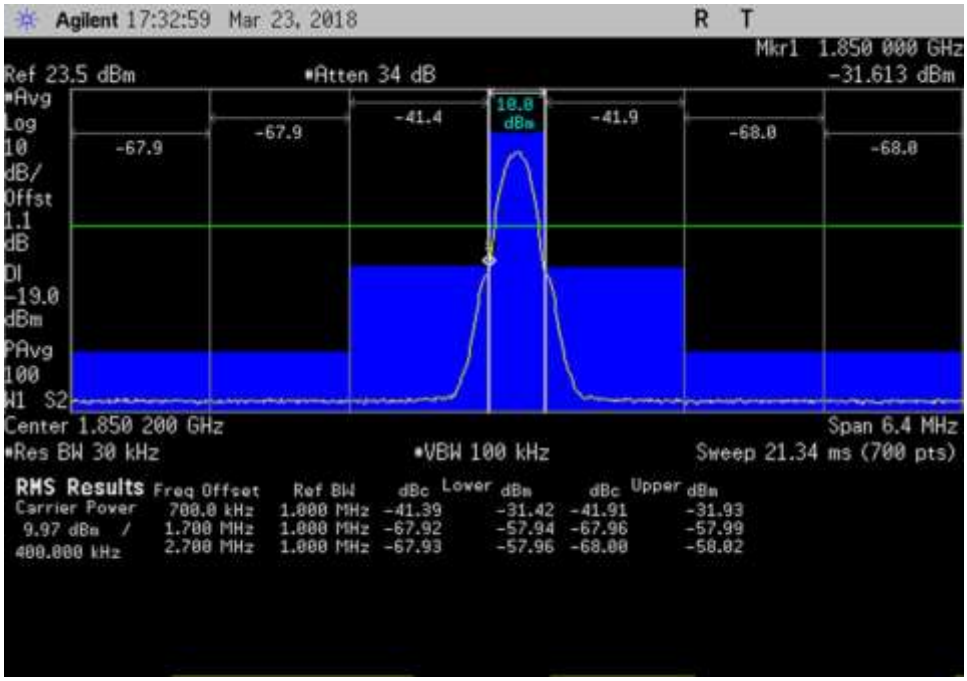
UL_824-849_GSM_ 849- 849.3MHz_H_PreAGC_100kHz



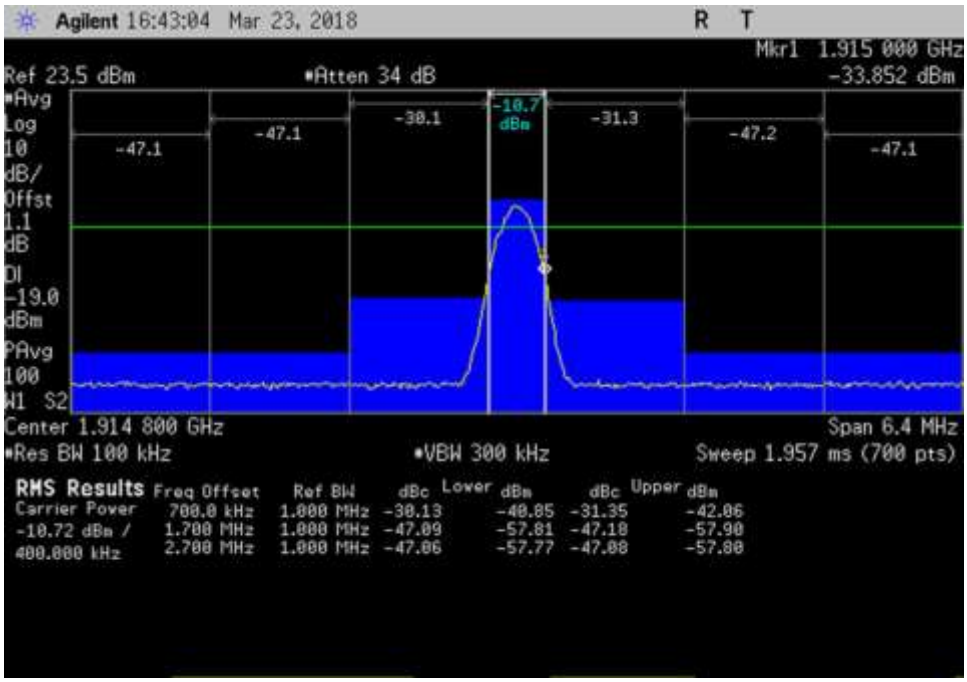
UL_1710-1755_GSM_ 1707- 1713.4MHz_L_PreAGC



UL_1710-1755_GSM_ 1751.6- 1758MHz_H_PreAGC_30kHz

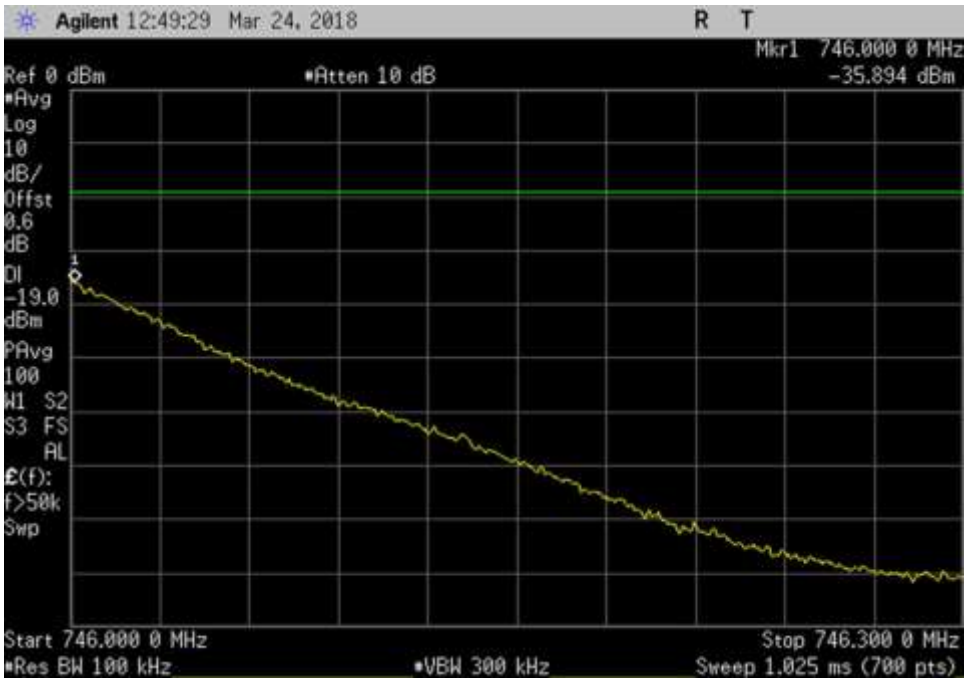


UL_1850-1915_GSM_ 1847- 1853.4MHz_L_PreAGC



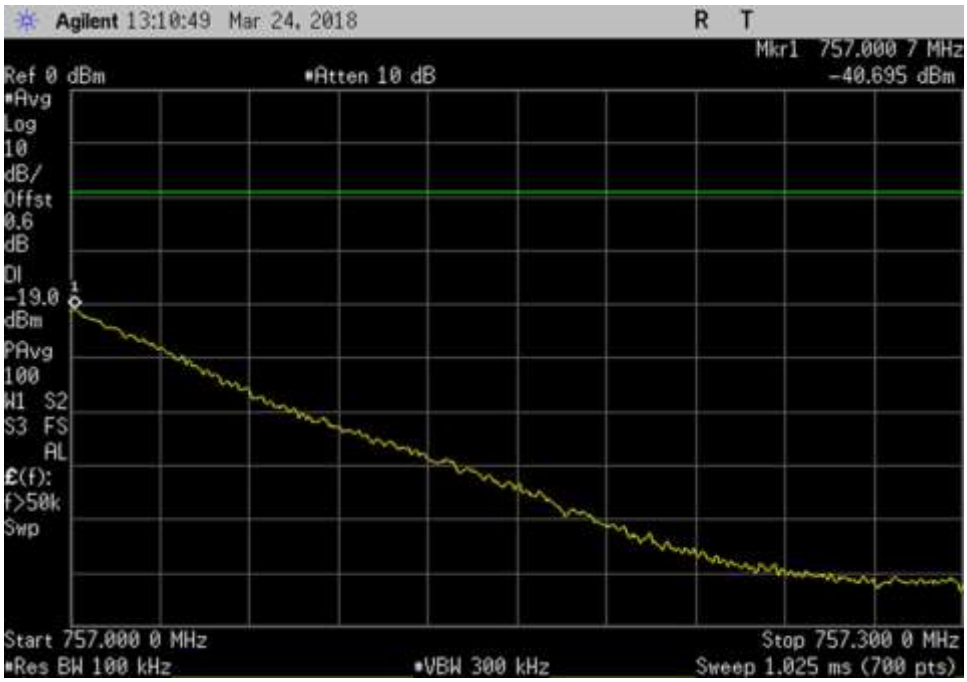
UL_1850-1915_GSM_ 1911.6- 1918MHz_H_PreAGC

DL_728-746_GSM_ 727.7- 728MHz_L_PreAGC



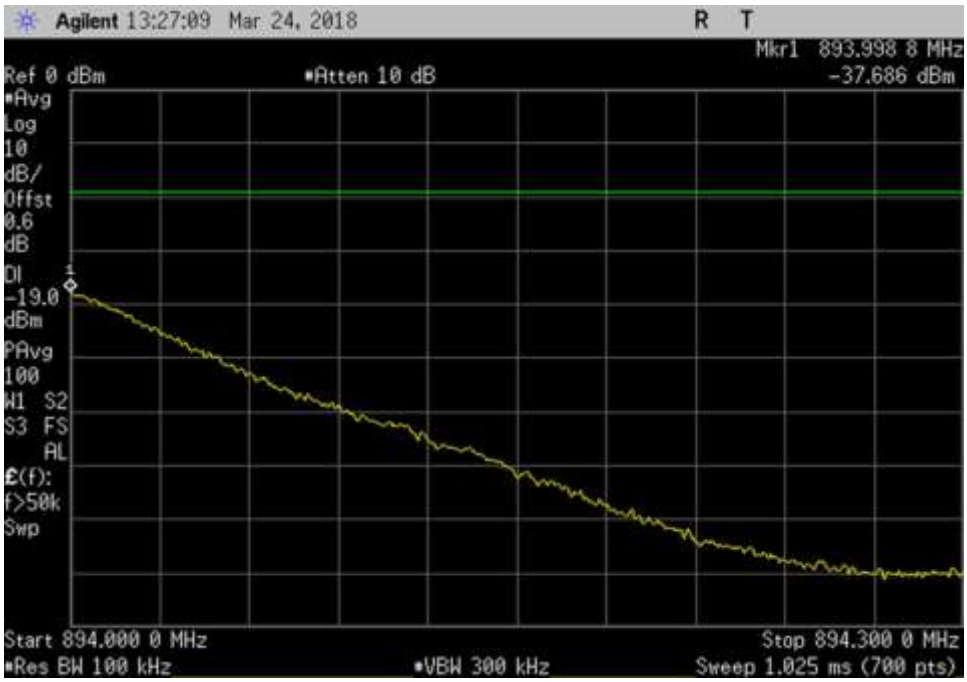
DL_728-746_GSM_ 746- 746.3MHz_H_PreAGC

DL_746-757_GSM_ 745.7- 746MHz_L_PreAGC

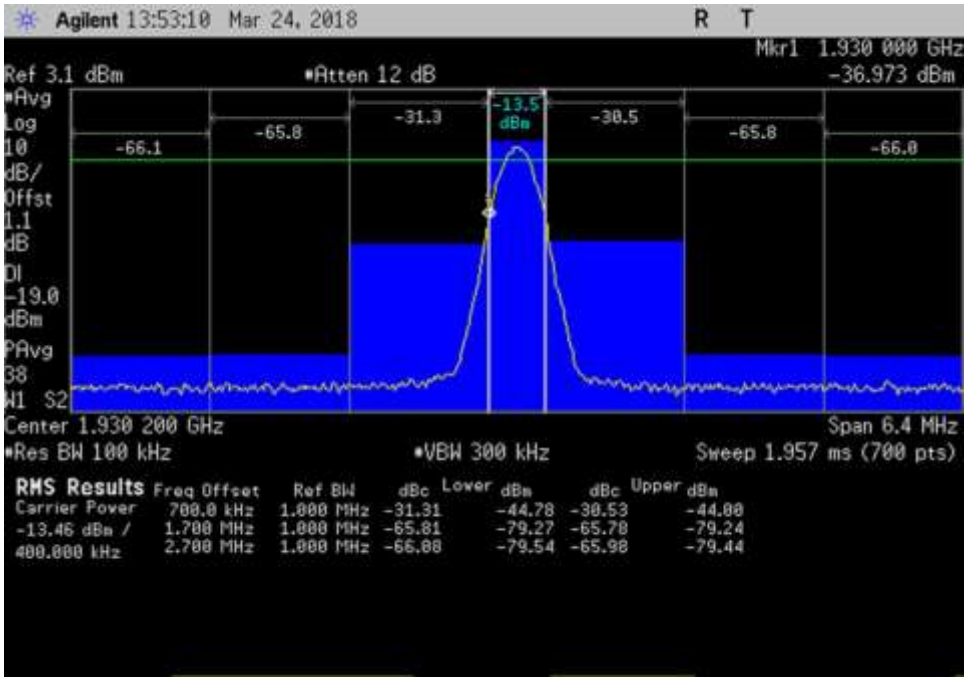


DL_746-757_GSM_ 757- 757.3MHz_H_PreAGC

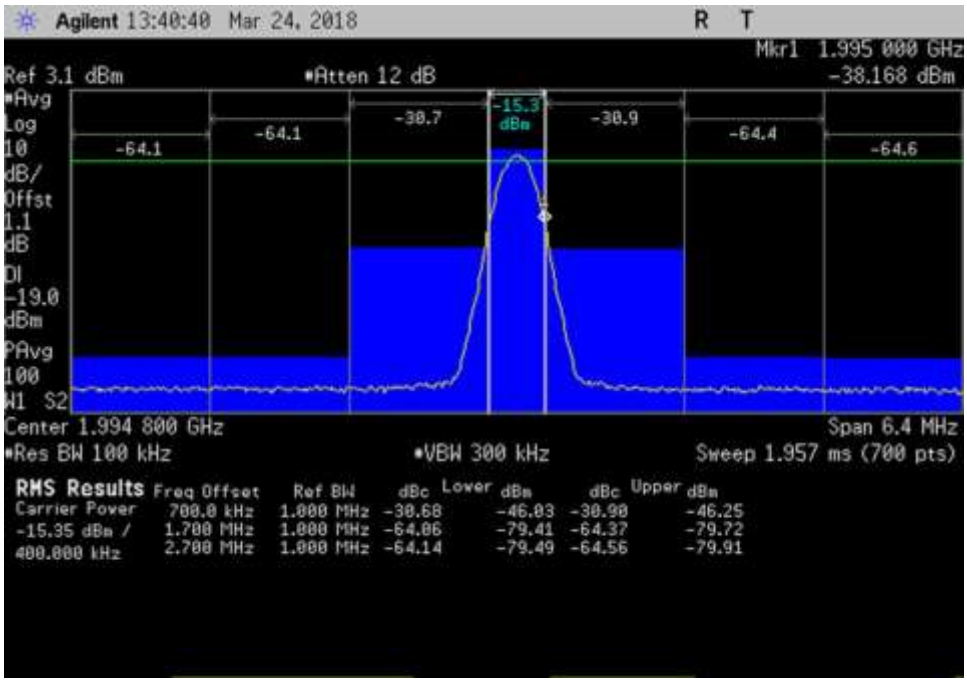
DL_869-894_GSM_ 868.7- 869MHz_L_PreAGC



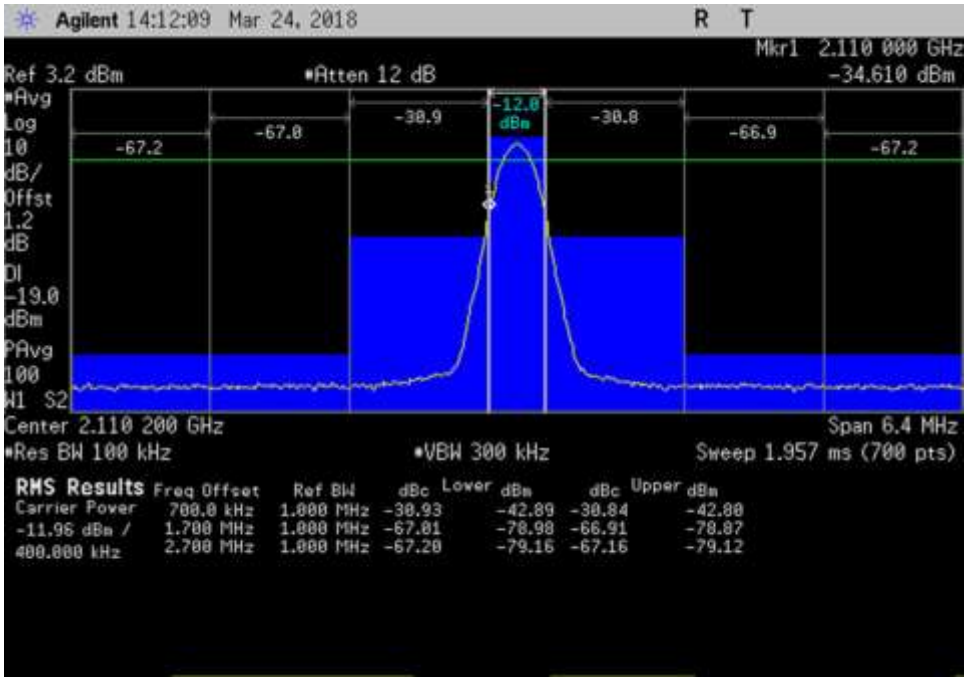
DL_869-894_GSM_ 894- 894.3MHz_H_PreAGC



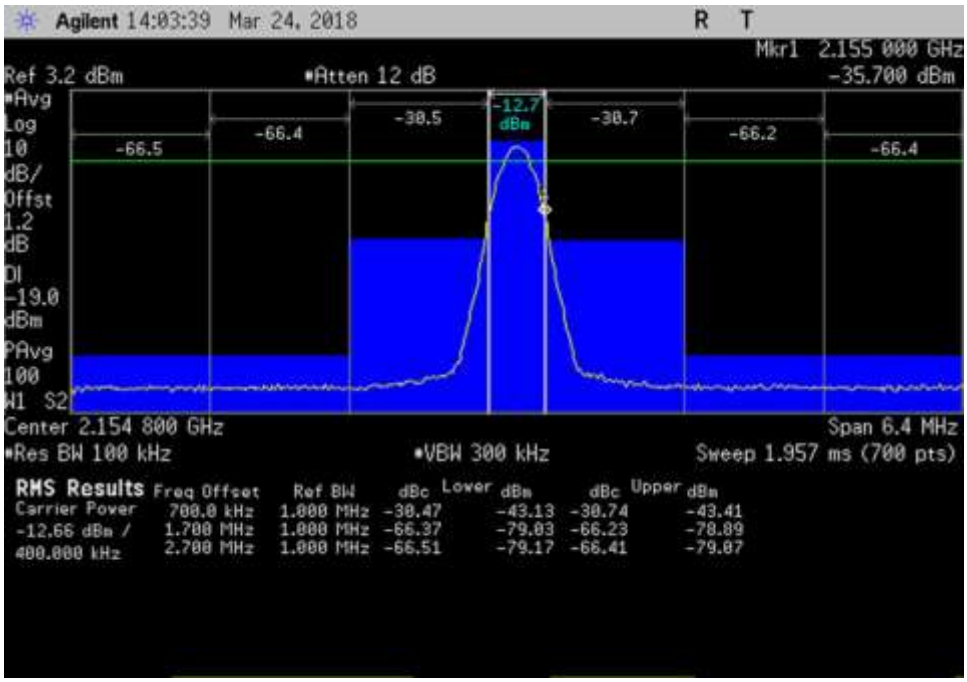
DL_1930-1995_GSM_ 1927- 1933.4MHz_L_PreAGC



DL_1930-1995_GSM_ 1991.6- 1998MHz_H_PreAGC

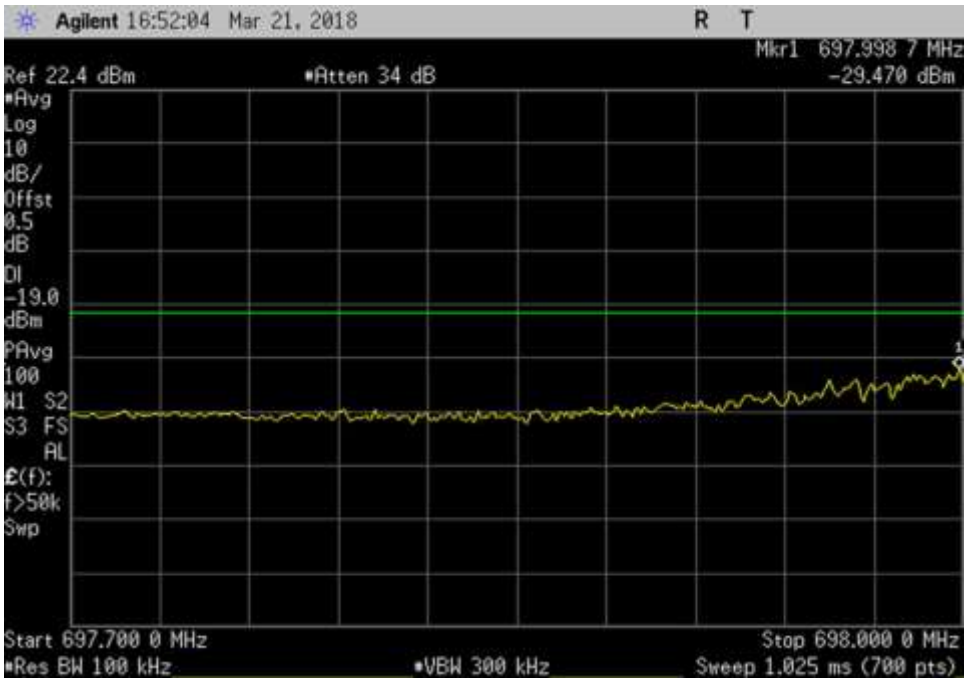


DL_2110-2155_GSM_ 2107- 2113.4MHz_L_PreAGC

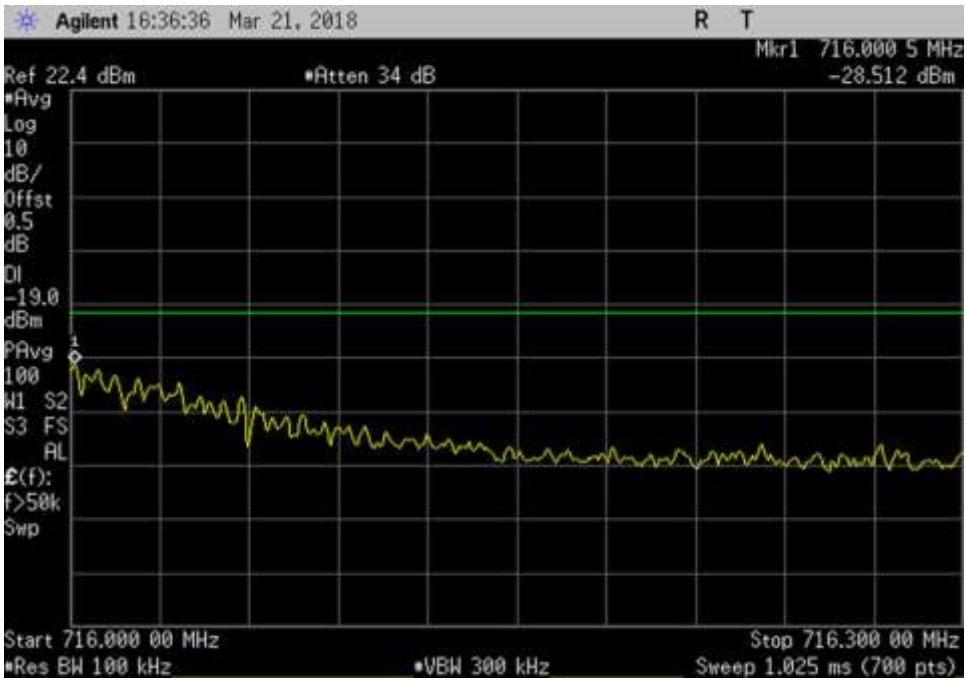


DL_2110-2155_GSM_ 2151.6- 2158MHz_H_PreAGC

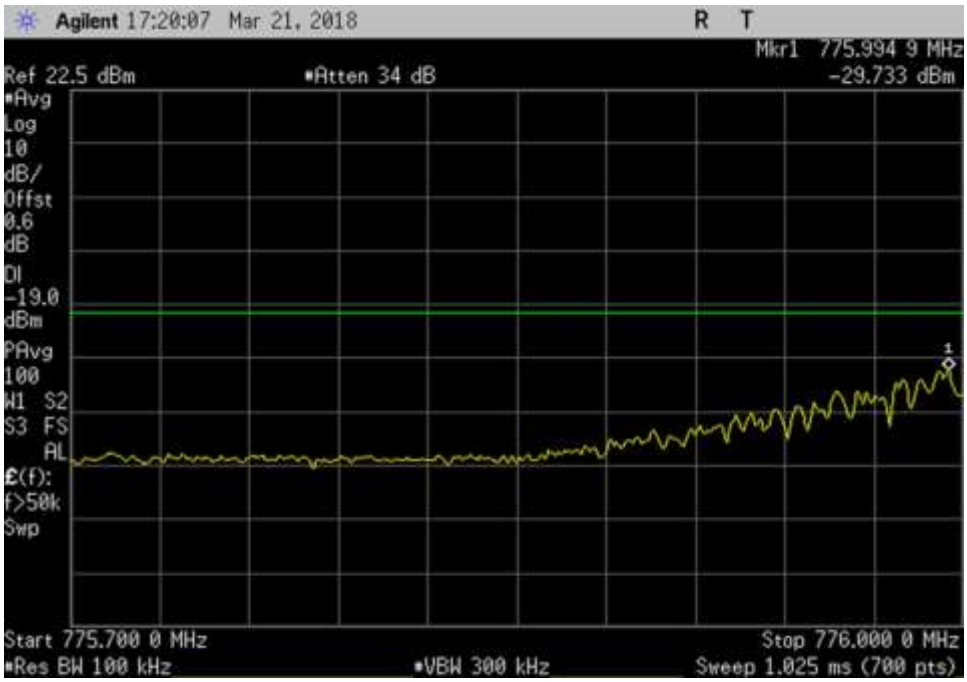
LTE



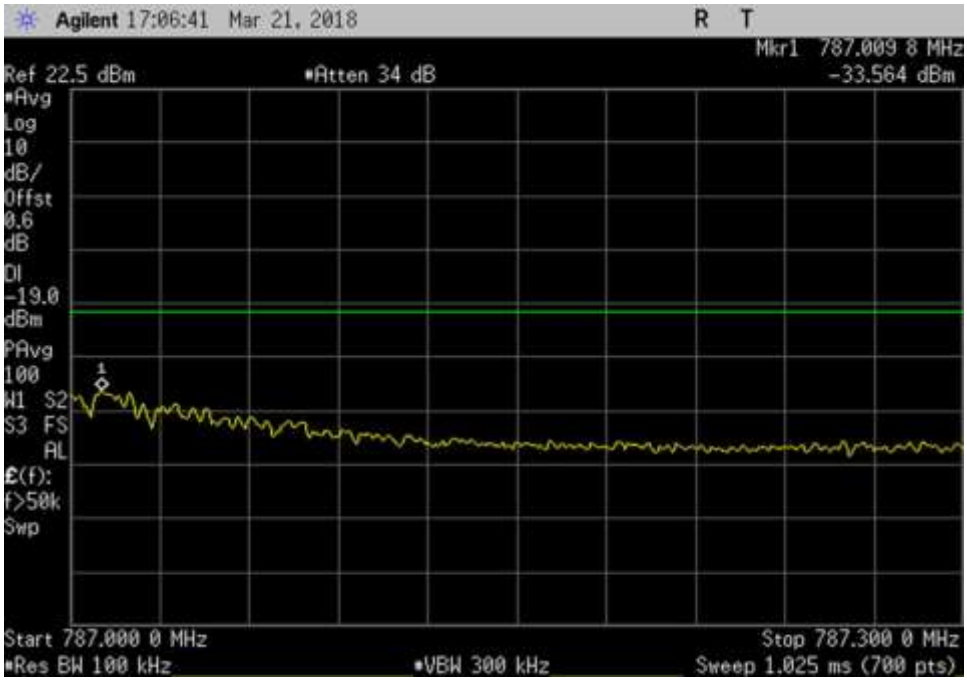
UL_698-716_LTE_ 697.7- 698MHz_L_PreAGC



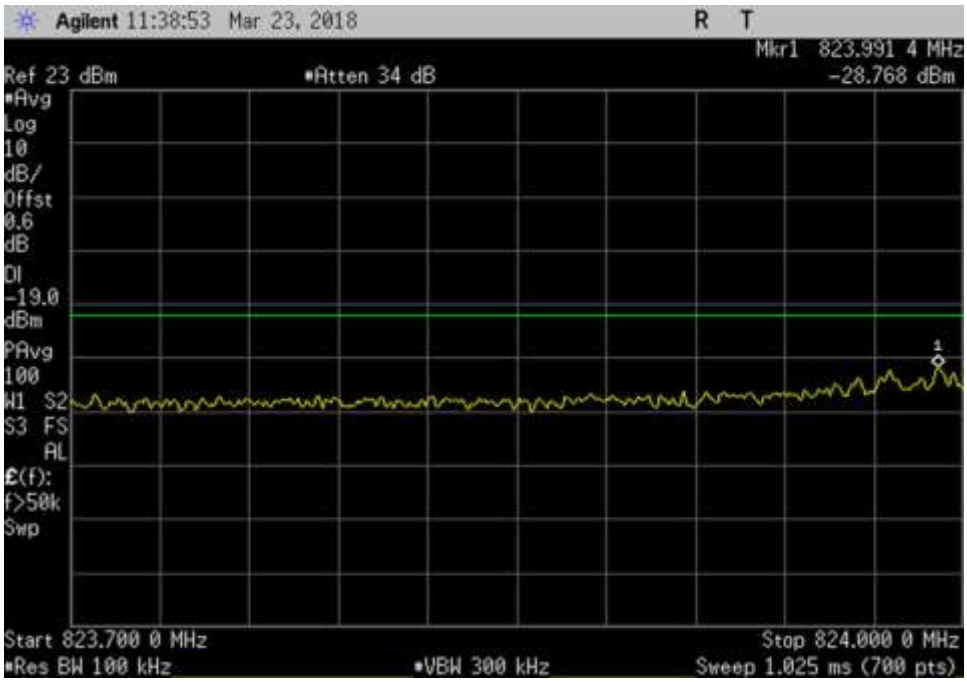
UL_698-716_LTE_ 716- 716.3MHz_H_PreAGC



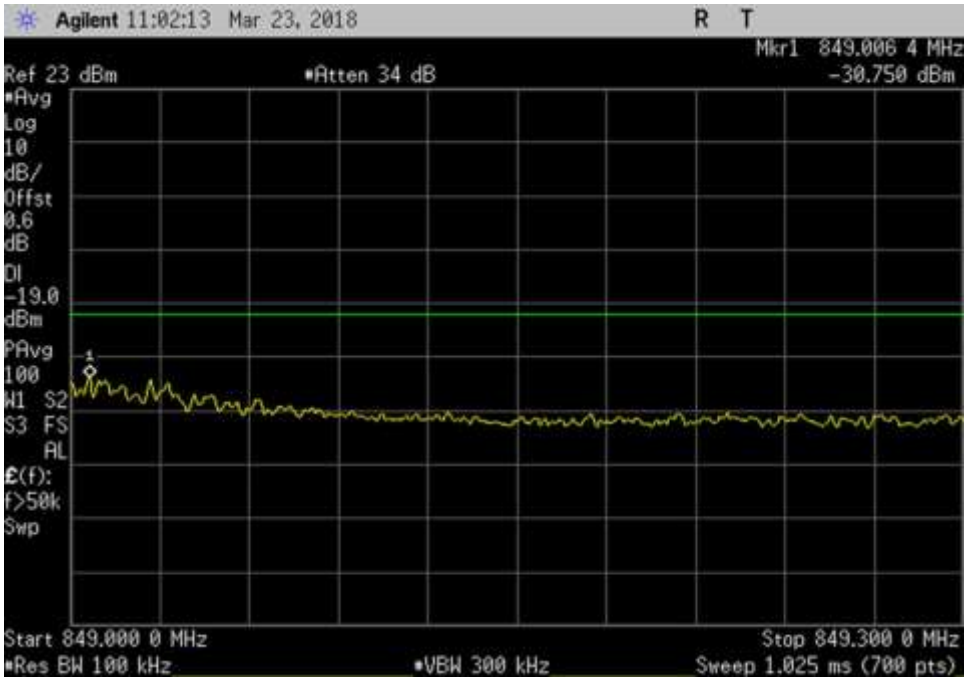
UL_776-787_LTE_ 775.7- 776MHz_L_PreAGC



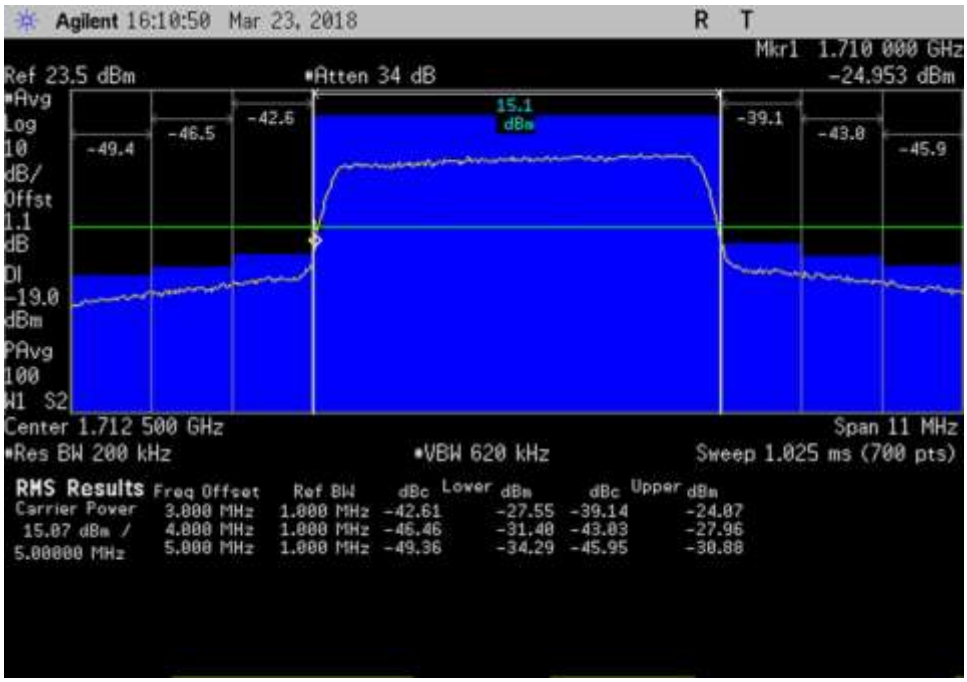
UL_776-787_LTE_ 787- 787.3MHz_H_PreAGC



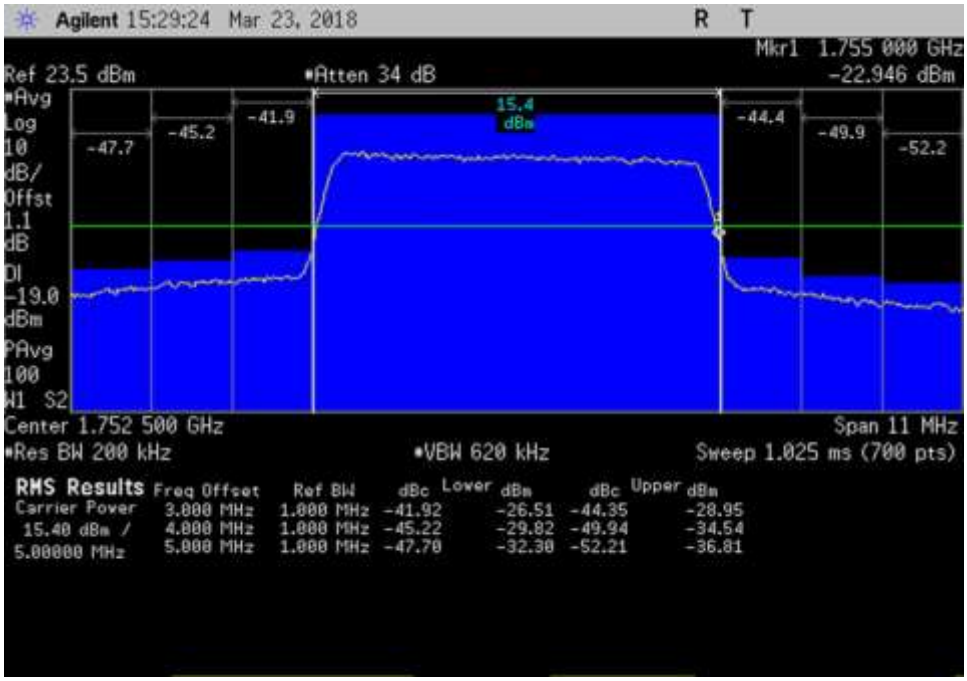
UL_824-849_LTE_ 823.7- 824MHz_L_PreAGC



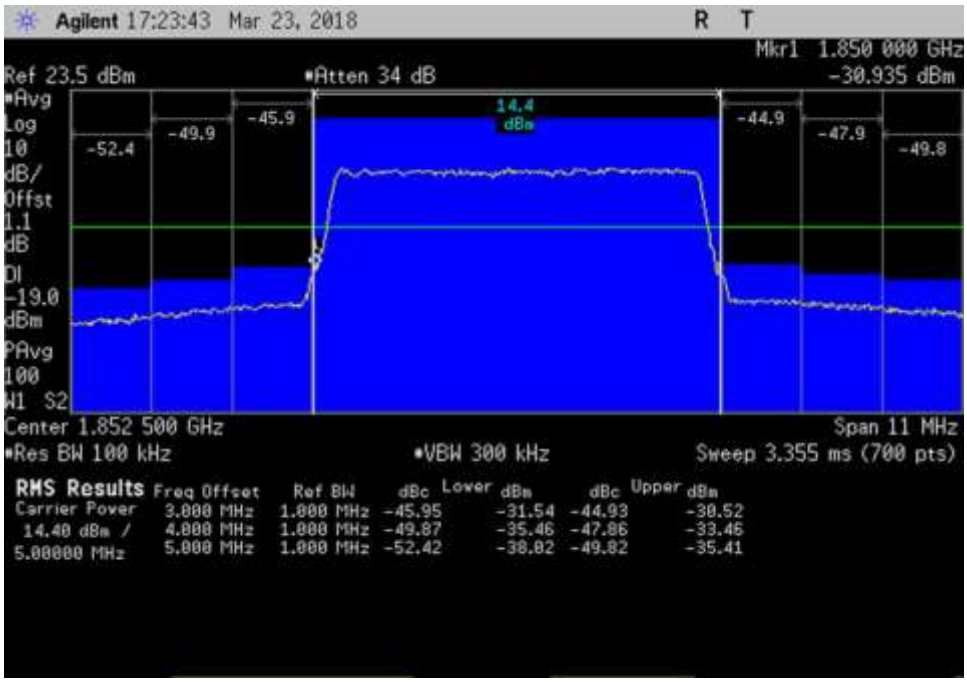
UL_824-849_LTE_ 849- 849.3MHz_H_PreAGC



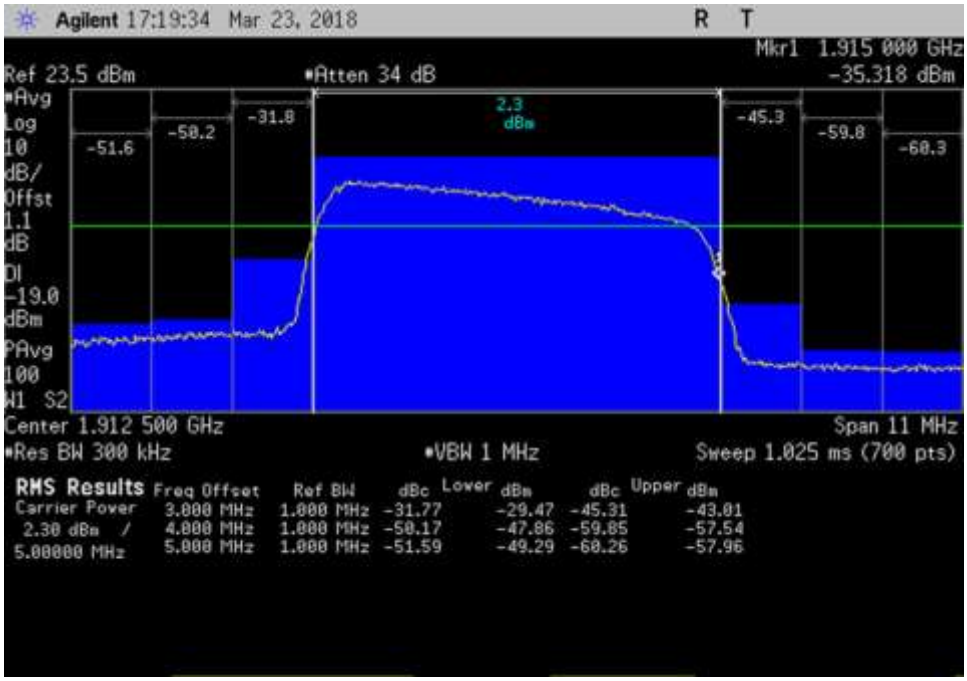
UL_1710-1755_LTE_ 1707- 1718MHz_L_PreAGC



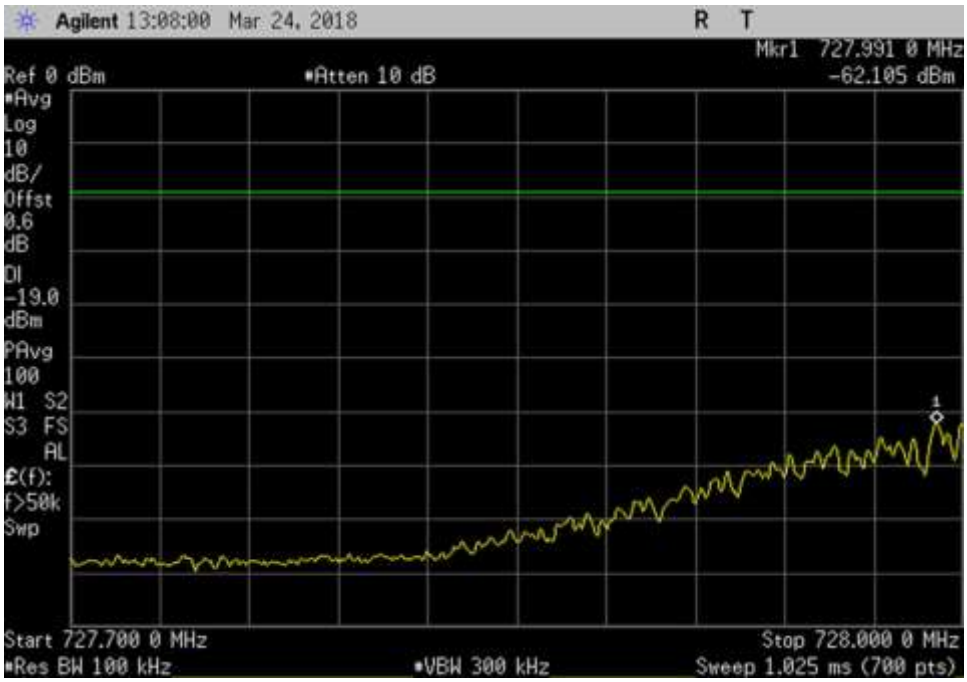
UL_1710-1755_LTE_ 1747- 1758MHz_H_PreAGC



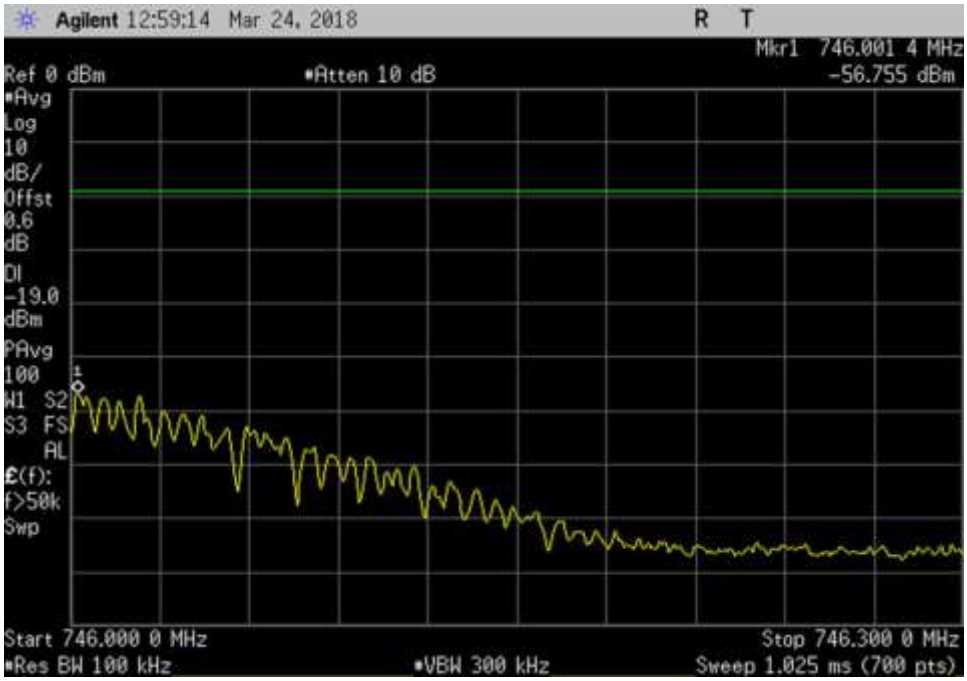
UL_1850-1915_LTE_ 1847- 1858MHz_L_PreAGC



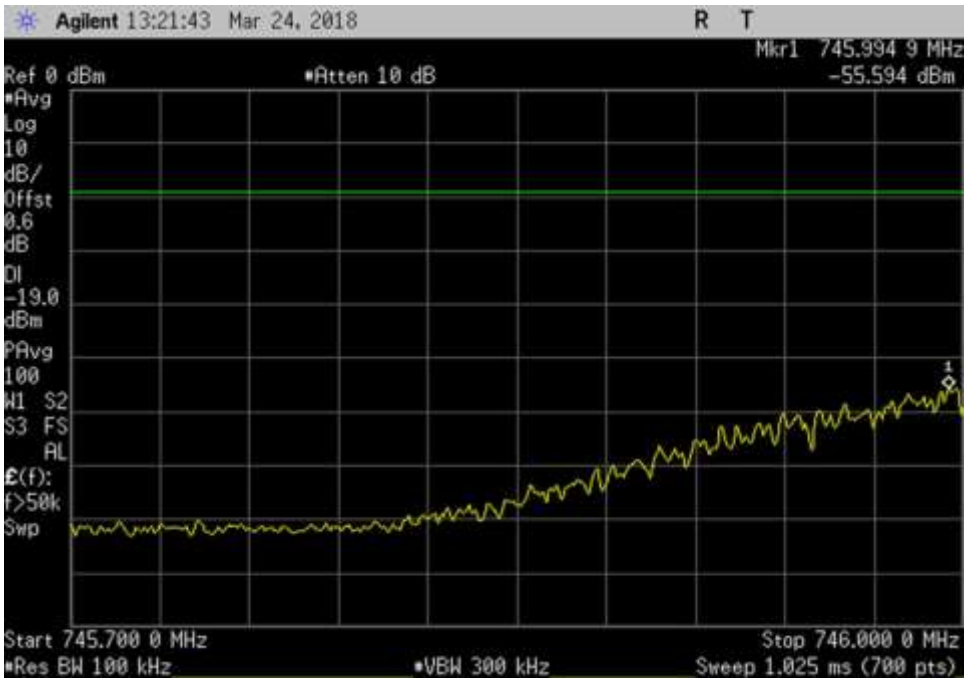
UL_1850-1915_LTE_ 1907- 1918MHz_H_PreAGC



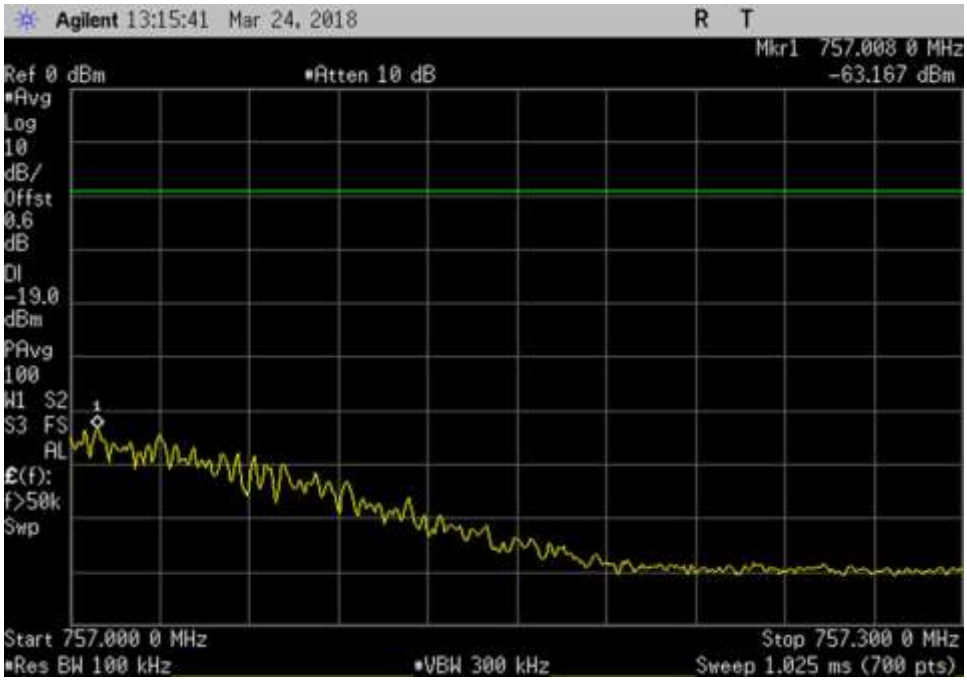
DL_728-746_LTE_ 727.7- 728MHz_L_PreAGC



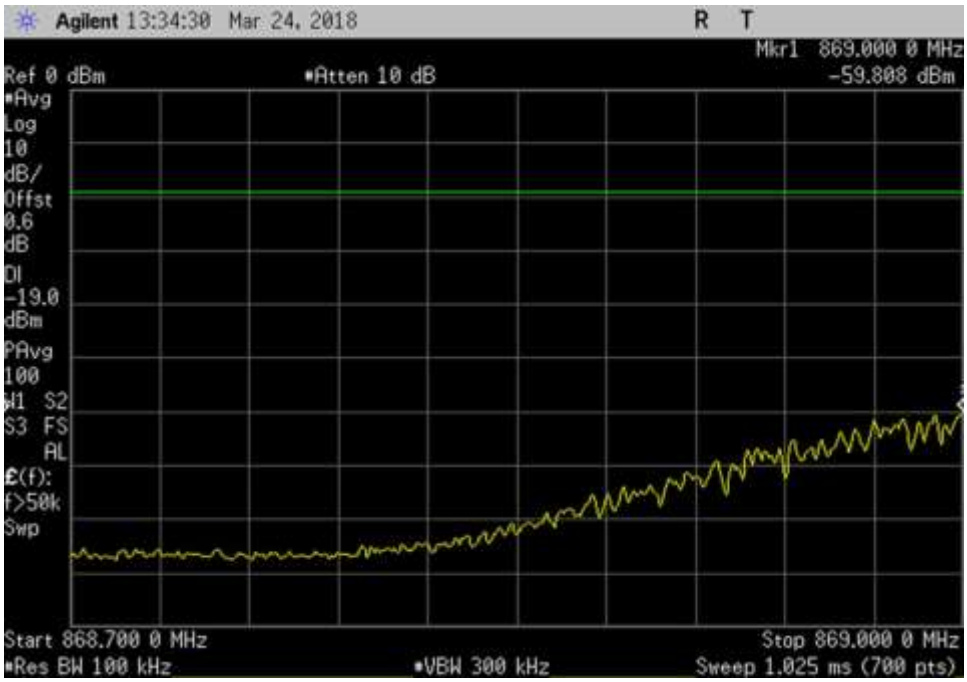
DL_728-746_LTE_ 746- 746.3MHz_H_PreAGC



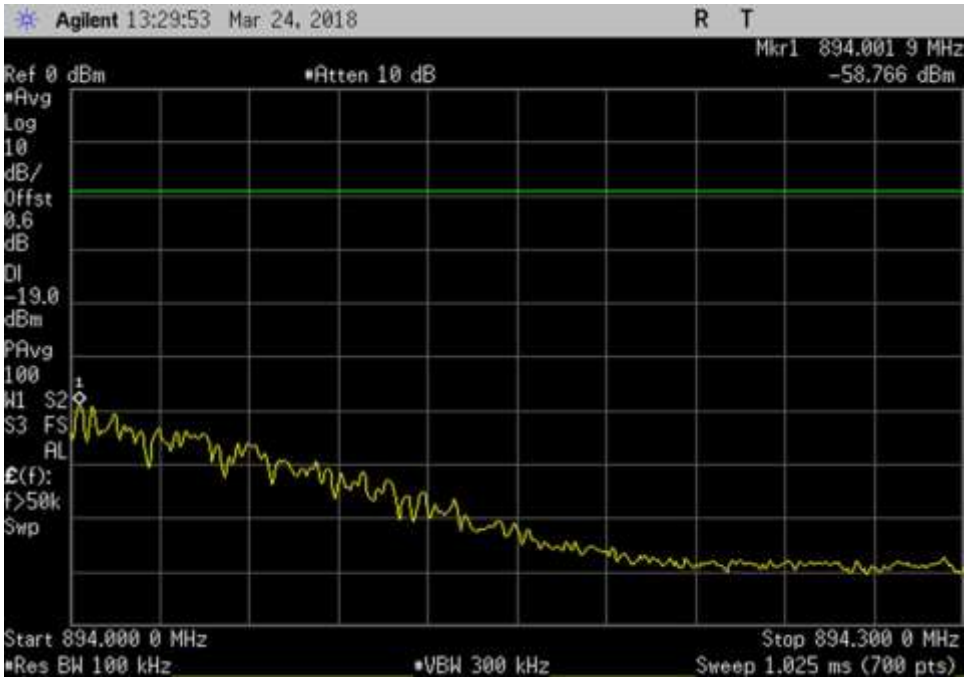
DL_746-757_LTE_ 745.7- 746MHz_L_PreAGC



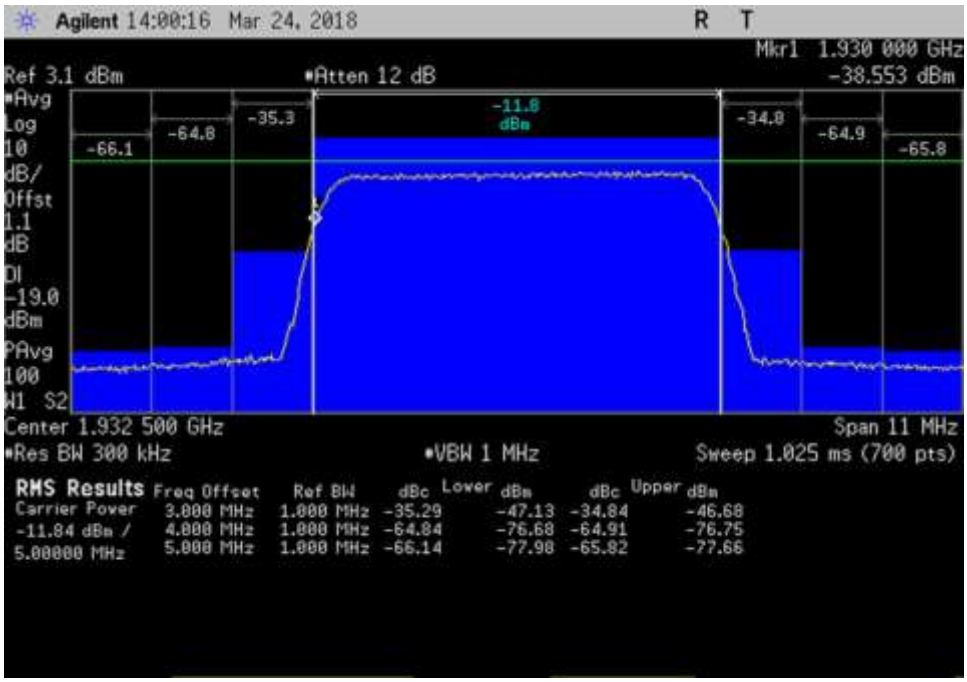
DL_746-757_LTE_ 757- 757.3MHz_H_PreAGC



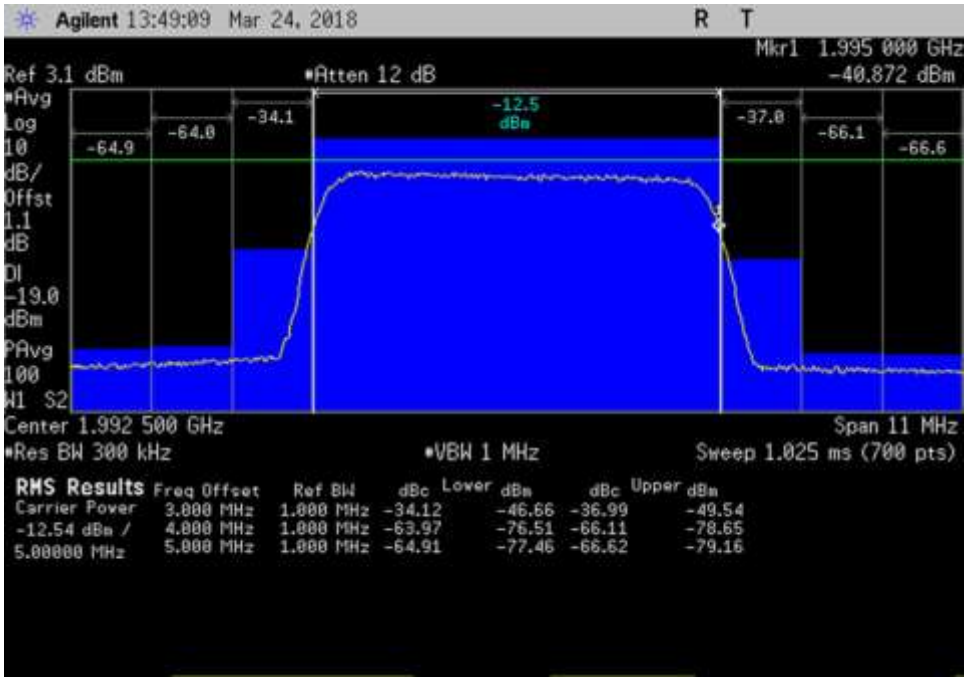
DL_869-894_LTE_ 868.7- 869MHz_L_PreAGC



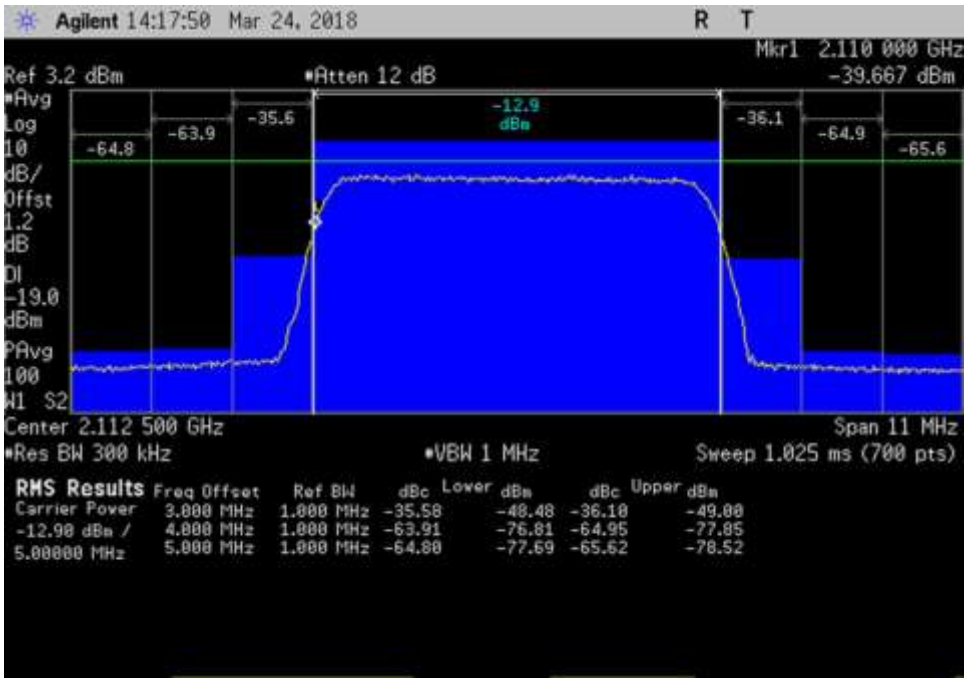
DL_869-894_LTE_ 894- 894.3MHz_H_PreAGC



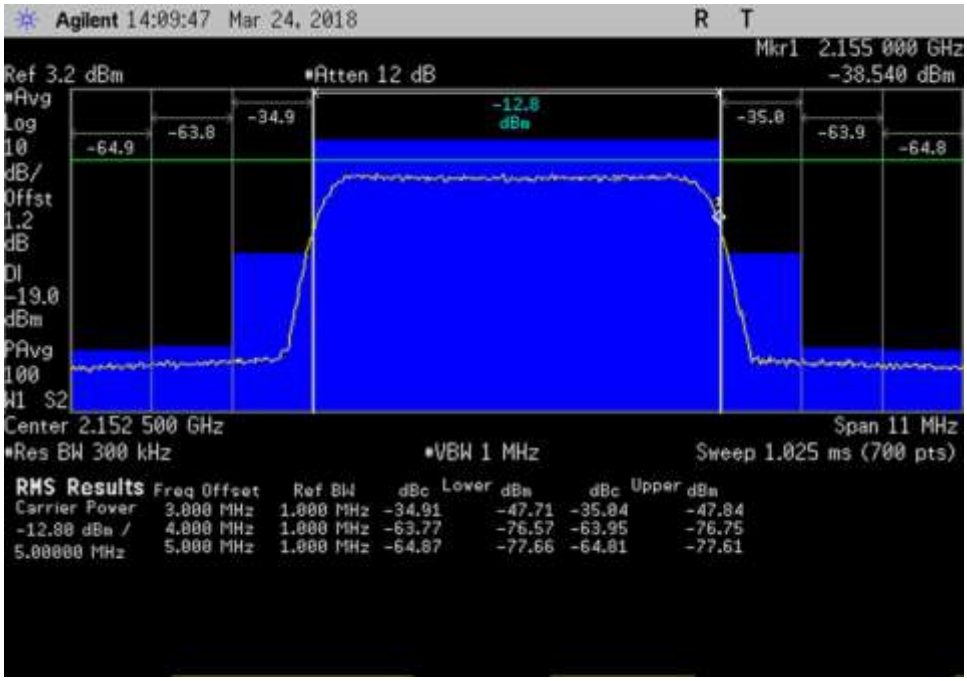
DL_1930-1995_LTE_ 1927- 1938MHz_L_PreAGC



DL_1930-1995_LTE_ 1987- 1998MHz_H_PreAGC



DL_2110-2155_LTE_ 2107- 2118MHz_L_PreAGC



DL_2110-2155_LTE_ 2147- 2158MHz_H_PreAGC

7.6 Conducted Spurious Emissions

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place. Brea, CA 92821• 714 993 6112
Customer:	Huaptec
Specification:	Section 2.1051 Measurements required: Spurious emissions at antenna terminals
Work Order #:	**100428** Date: 3/23 and 24, 2018
Test Type:	**Conducted Emissions**
Tested By:	S. Yamamoto
Software:	EMITest 5.03.11

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

General test condition.
The equipment under test (EUT) is a Mobile Wideband Consumer Booster with direct contact coupling (cradle-type) antenna.
The EUT is placed on the test bench. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port.
The EUT Donor port is a MCX type connector and 50-ohm impedance.
The EUT Server/DL port /is type UFL connector and 50-ohm impedance.

Part 22
UL: 824-849MHz
DL: 869-894MHz
Part 24
UL: 1850-1915MHz
DL: 1930-1995MHz
Part 27
UL: 1710-1755MHz, 698-716MHz, 776-787MHz
DL: 2110-2155MHz, 728-746MHz, 746-757MHz

Test procedure:
The test was performed in accordance with the FCC document: 935210 D03 Signal Booster Measurements v04r01, dated October 27, 2017.
Firmware: 2.0

Test environment conditions:
Temperature: 20 -25°C
Relative Humidity: 37-45 %
Pressure 100kPa

Device is powered by a provided 5V USB/12V Automotive adaptor

Visual inspection of analyzer trace from 9kHz-30MHz, no emission found, trace not included in plot

Test Equipment:

Asset #	Description	Manufacturer	Model	Calibration Date	Cal Due Date
03420	Signal Generator	Agilent	E4438C	6/9/2017	6/9/2019
P07037	RF Signal Generator	Agilent	E4432B	10/6/2016	10/6/2018
P06544	Cable	Astro Steel	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
02946	Cable	Astro Steel	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
02672	Spectrum Analyzer	Agilent	E4446A	3/2/2017	3/2/2019

Summary of Results

Pass: As summarized in plots below, the conducted spurious emissions are within limits.

<u>9 kHz-30 MHz</u>
No Conducted Spurious Emissions were found within 20dB of the limit.

The 1559-1610 band was also investigated and found emission within limits using applied correction. (see calculation below).

Limit Line Calculation*				
Frequency (MHz)	**Antenna Gain- cable loss (dBi)**	**Limit line EIRP (dBW/MHz)**	**Limit line EIRP (dBm)**	**Limit line EIRP corrected (dBm)**
UL 776-787	8.8	-70.0	-40	-48.8

Antenna kitting 11-30400, Antenna gain= +10dBi, cable loss = 1.2

LIMIT LINE FOR SPURIOUS CONDUCTED EMISSION

REQUIRED ATTENUATION = 43+10 LOG P DB

Limit line (dBuV) = V_{dBuv} - Attenuation

$$V_{dBuV} = 20\,\text{Log}\,\frac{V}{1\,x\,10^{-6}}$$
$$= 20\left(\text{Log}\,V - \text{Log}\,1\,x\,10^{-6}\right)$$
$$= 20\,\text{Log}\,V - 20\,\text{Log}1\,x\,10^{-6}$$
$$= 20\,\text{Log}\,V - 20\left(-6\right)$$
$$= 20\,\text{Log}\,V + 120$$

$$\text{Attenuation} = 43 + 10\,\text{Log}\,P$$
$$= 43 + 10\,\text{Log}\,\frac{V^2}{R}$$
$$= 43 + 10\left(\text{Log}\,V^2 - \text{Log}\,R\right)$$
$$= 43 + 10\left(2\,\text{Log}\,V - \text{Log}\,R\right)$$
$$= 43 + 20\,\text{Log}\,V - 10\,\text{Log}\,R$$

Limit line = V_{dBuv} - Attenuation

= 20 Log V + 120 – (43 + 20 Log V – 10Log R)

= 20 Log V + 120 – 43 – 20 Log V + 10Log R

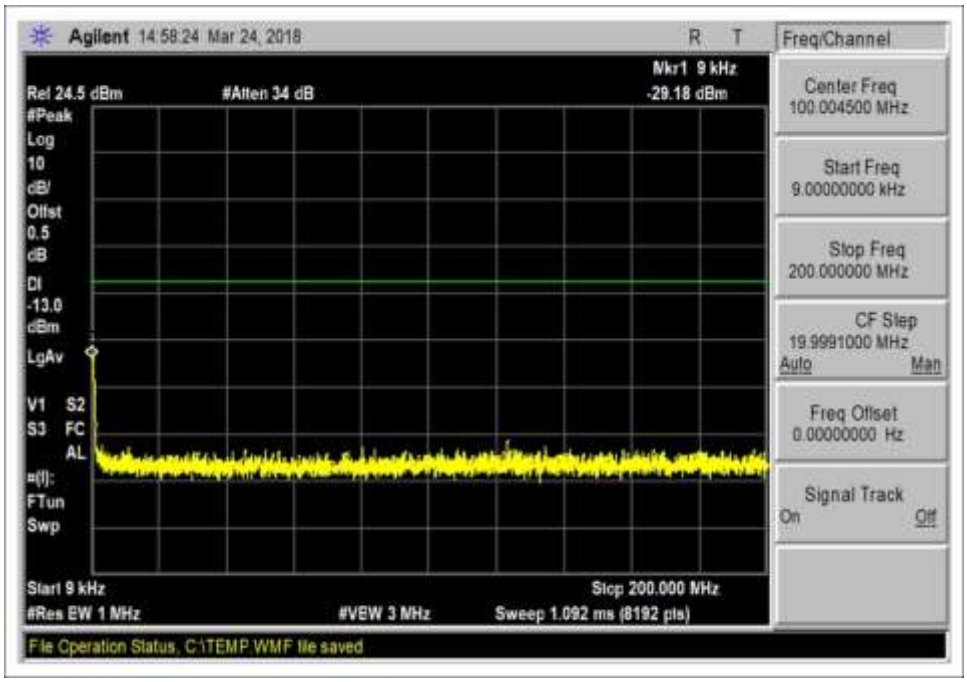
= 20 Log V + 120 – 43 – 20 Log V + 10Log R

= 120 – 43 + 10 Log 50 Note : R = 50 Ω

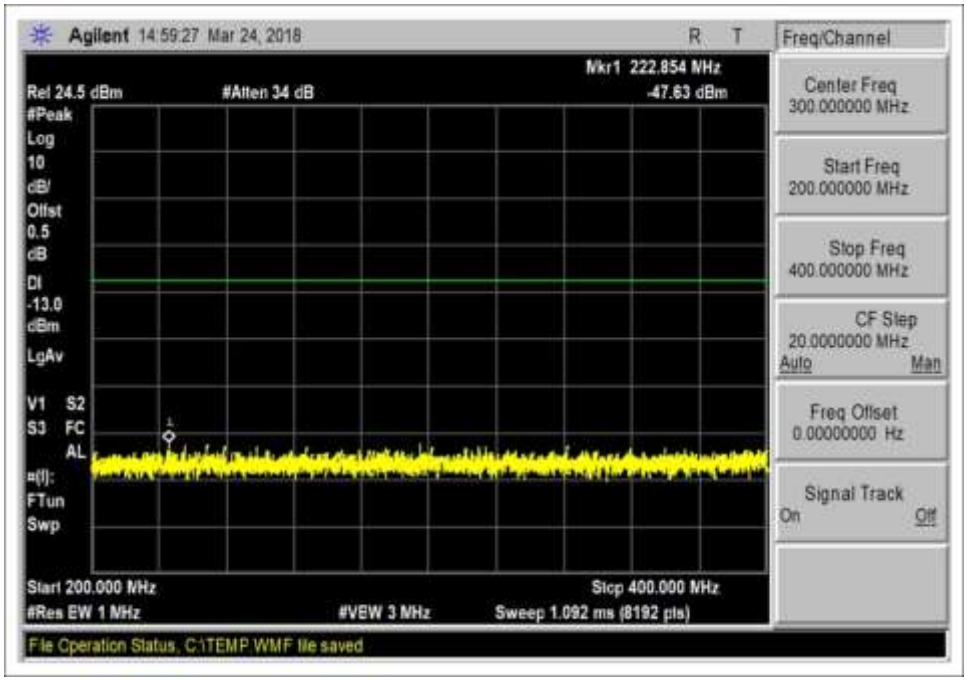
= 120 –43 + 16.897

= 94 dBuV at any power level

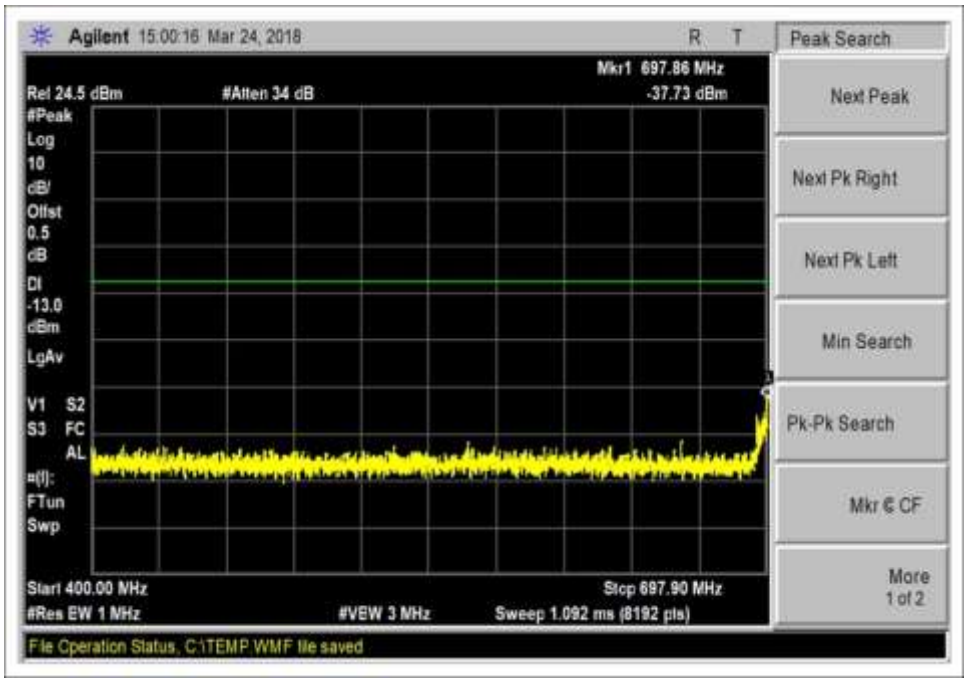
Plots



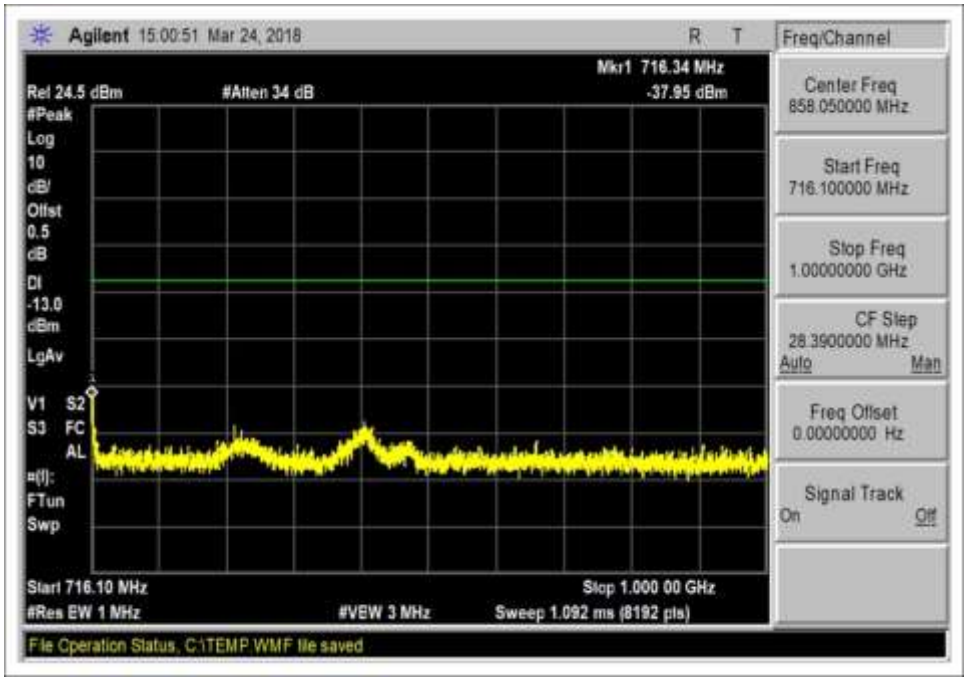
UL_698-716MHz_L1



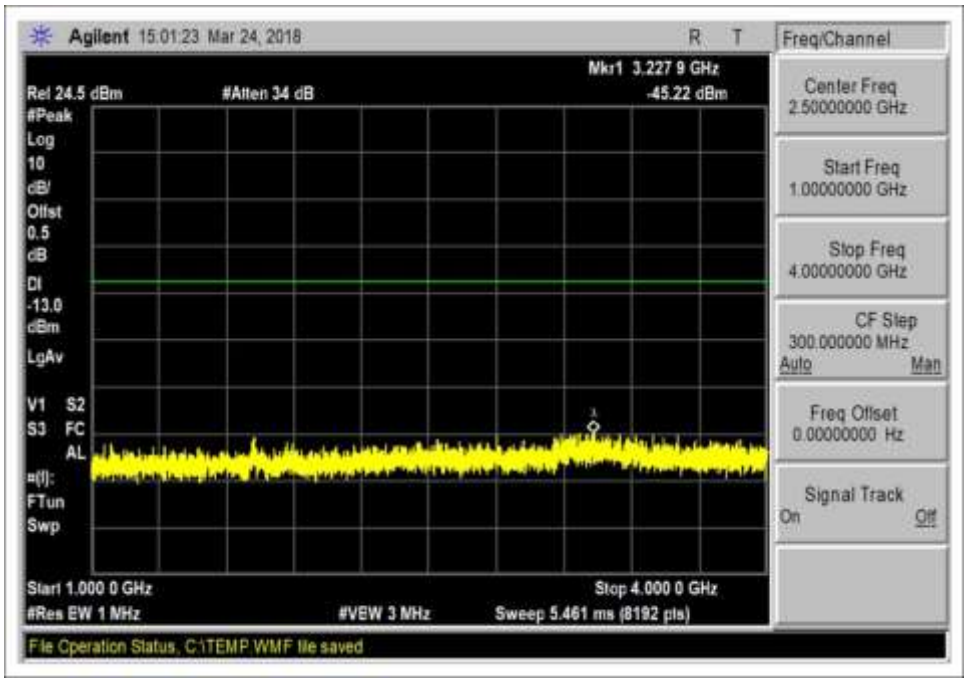
UL_698-716MHz_L2



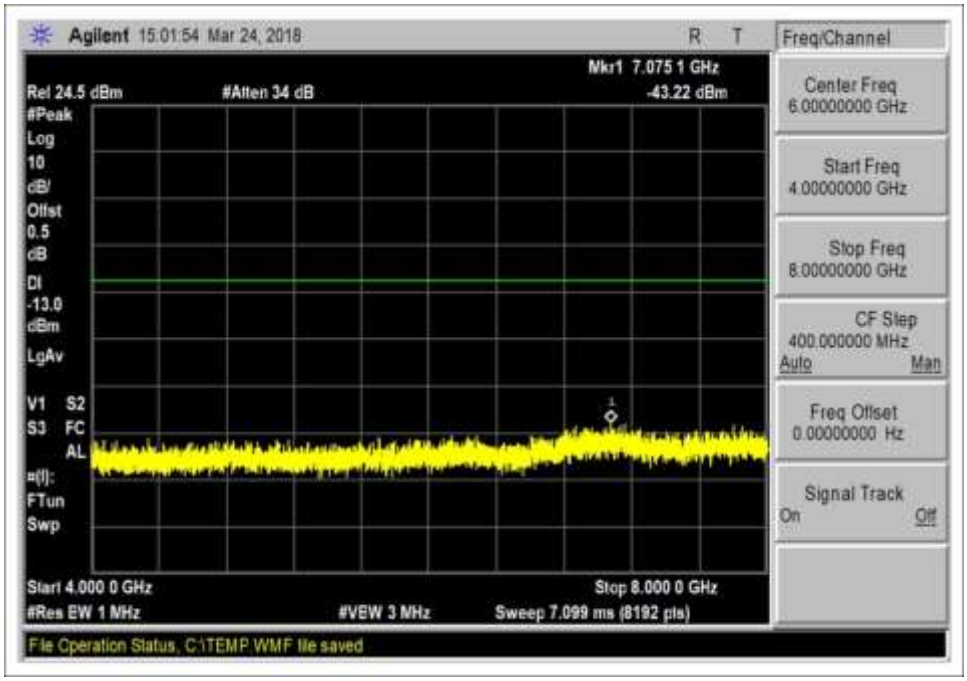
UL_698-716MHz_L3



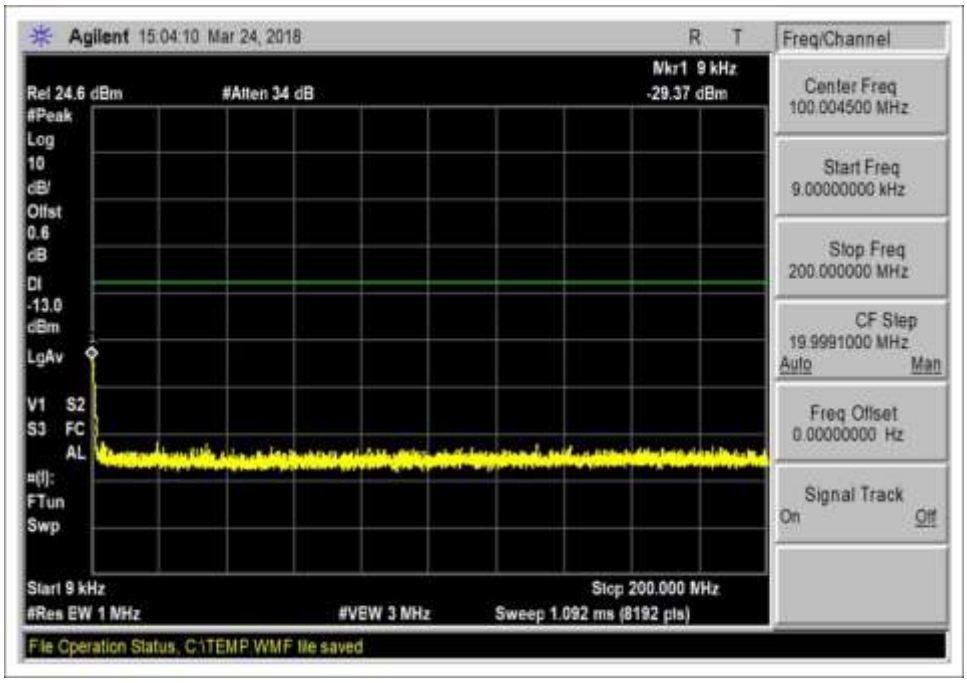
UL_698-716MHz_R1



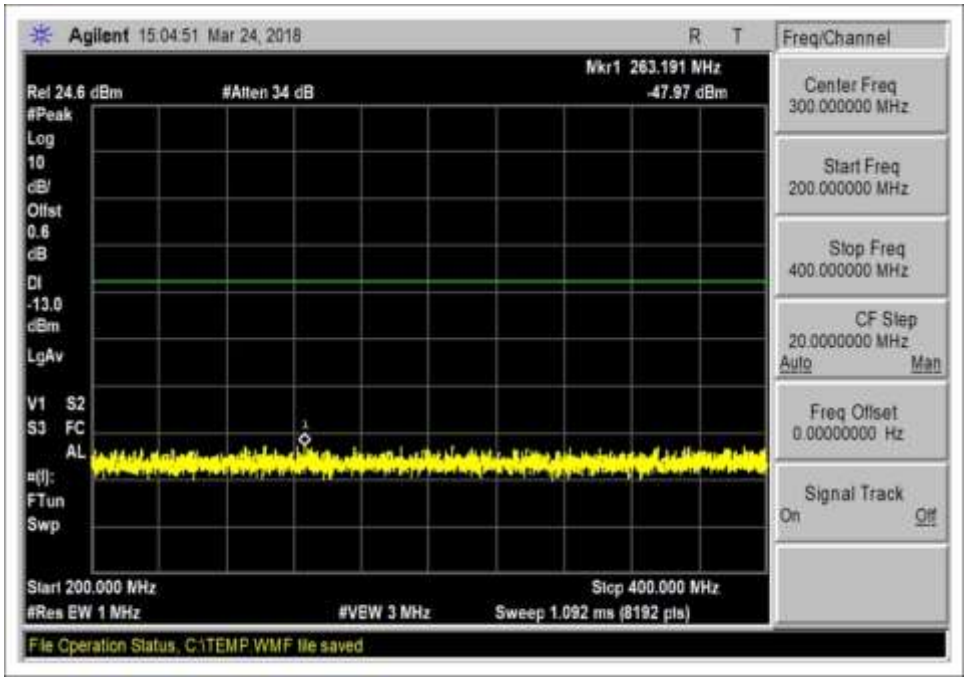
UL_698-716MHz_R2



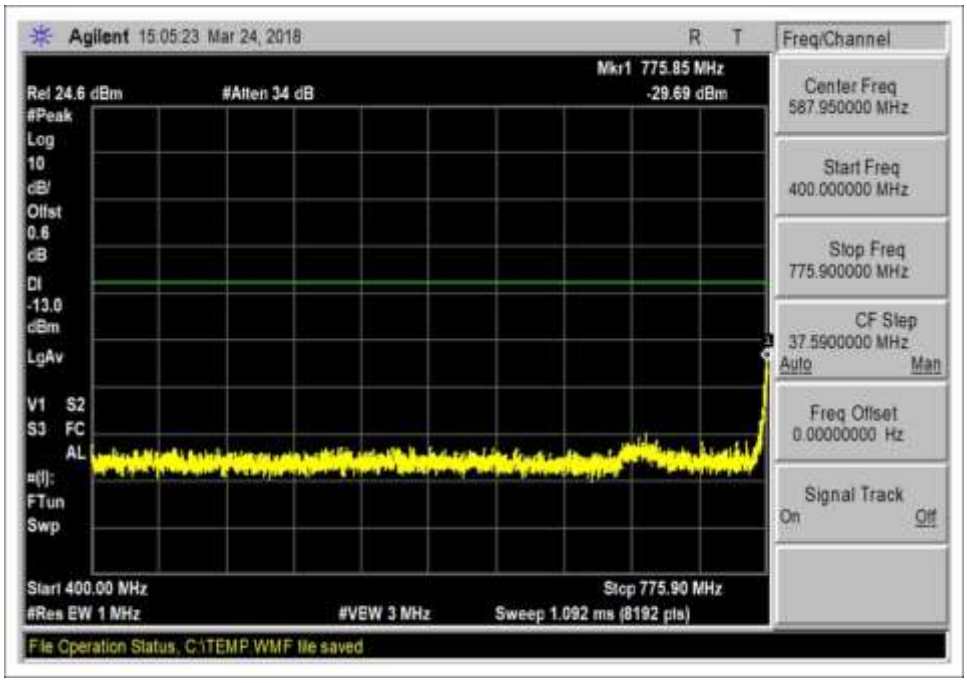
UL_698-716MHz_R3



UL_776-787MHz_L1



UL_776-787MHz_L2



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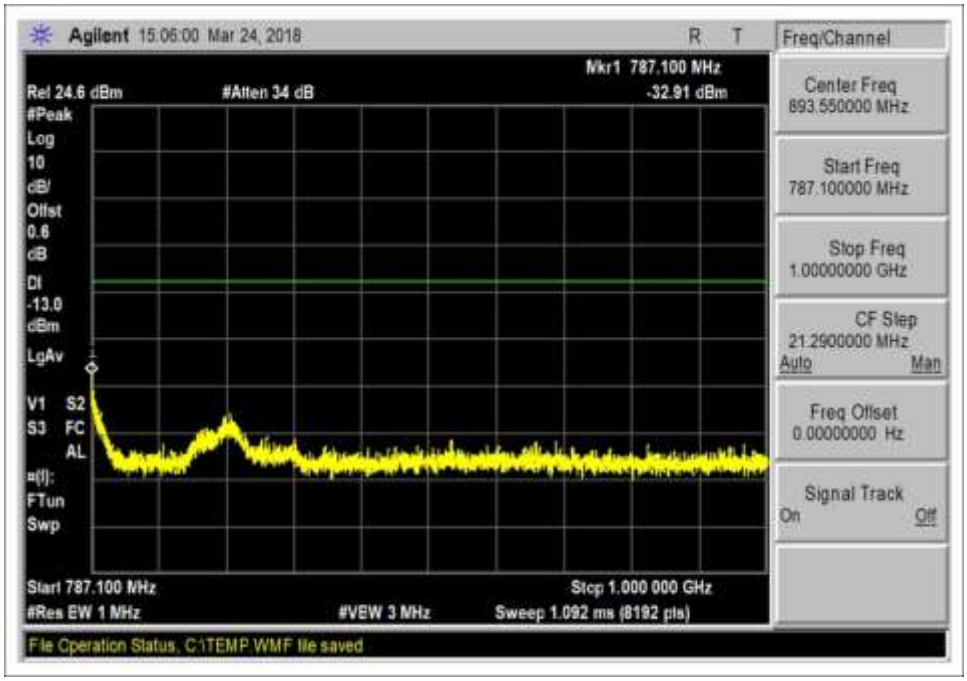
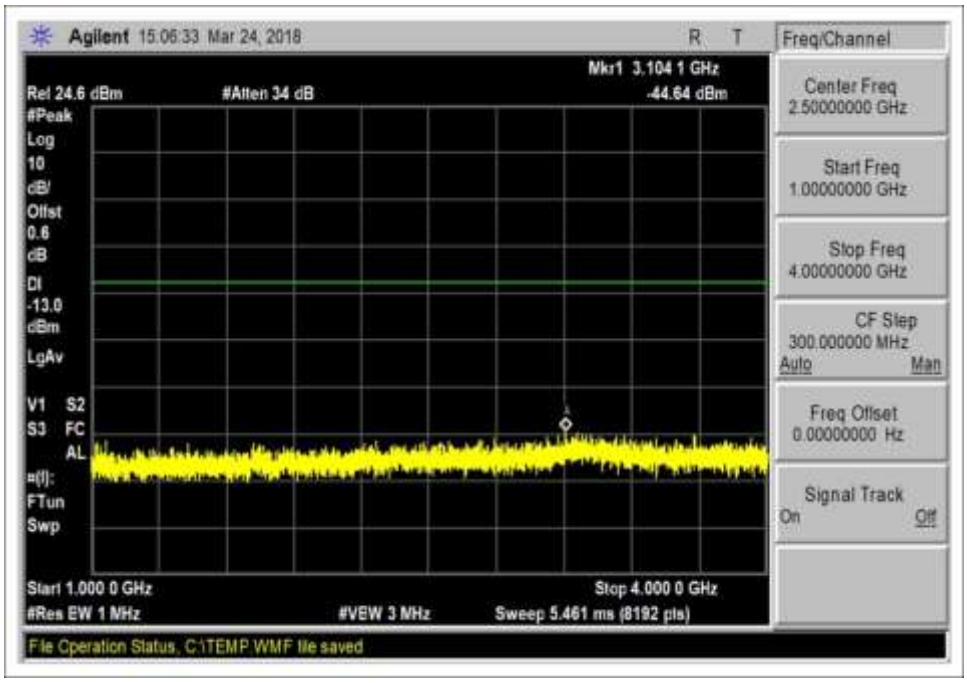


UL_776-787MHz_R1



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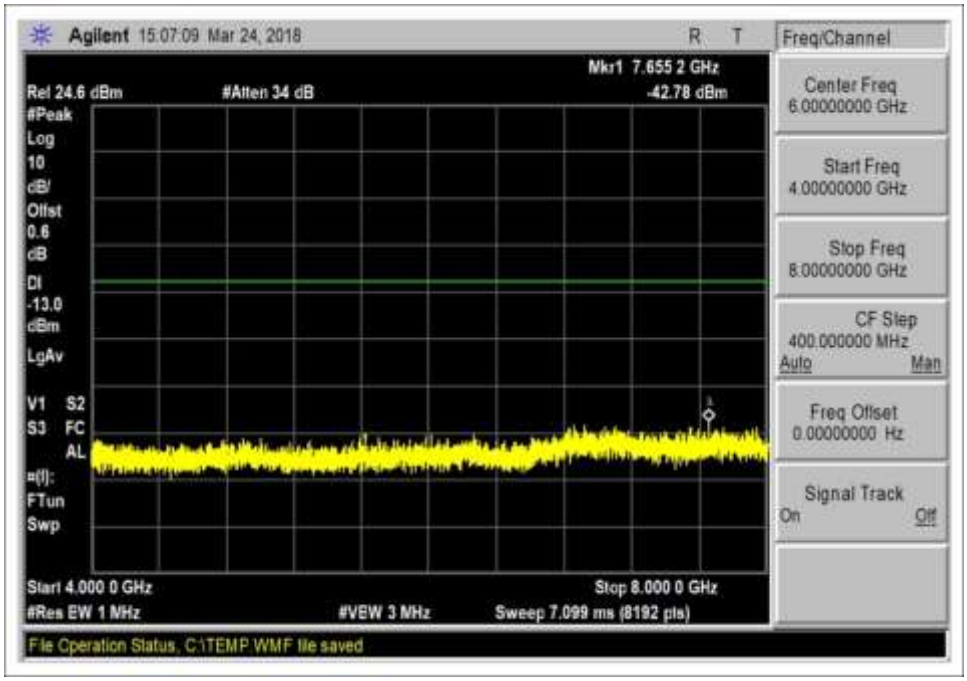
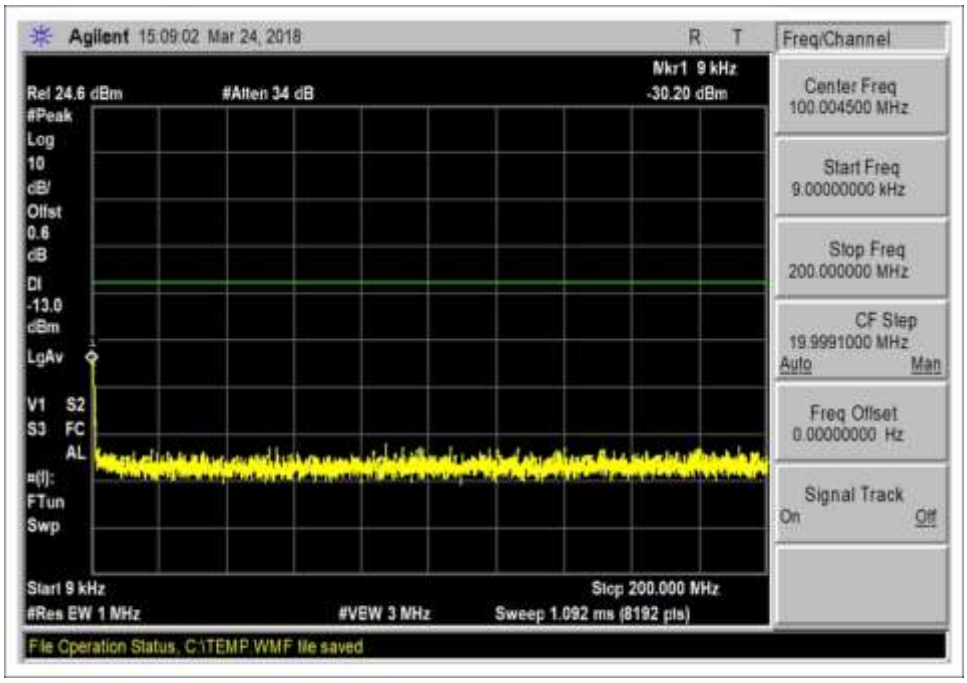
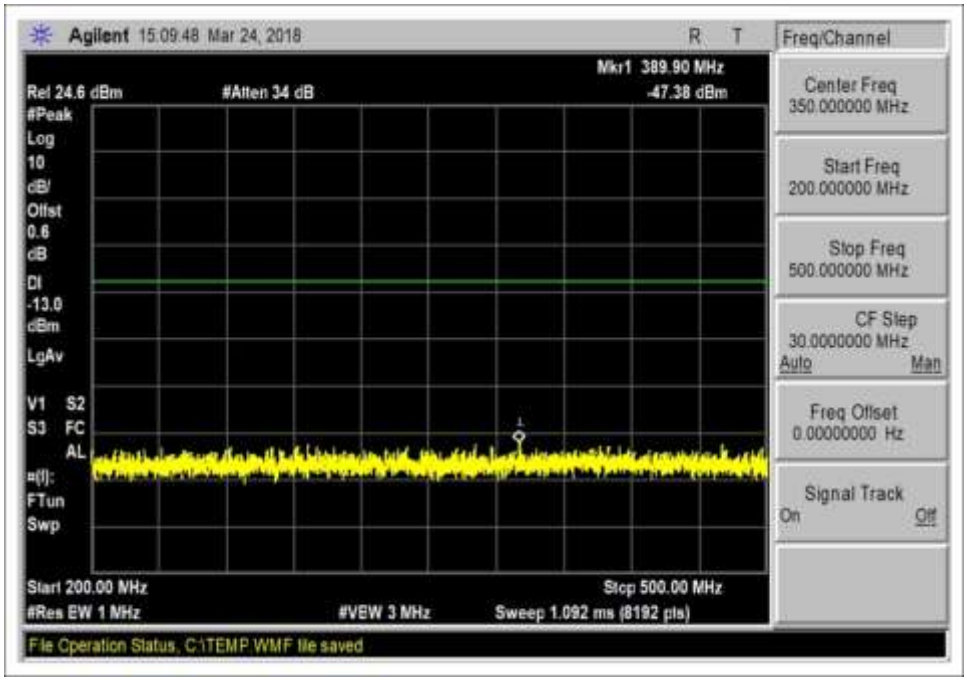


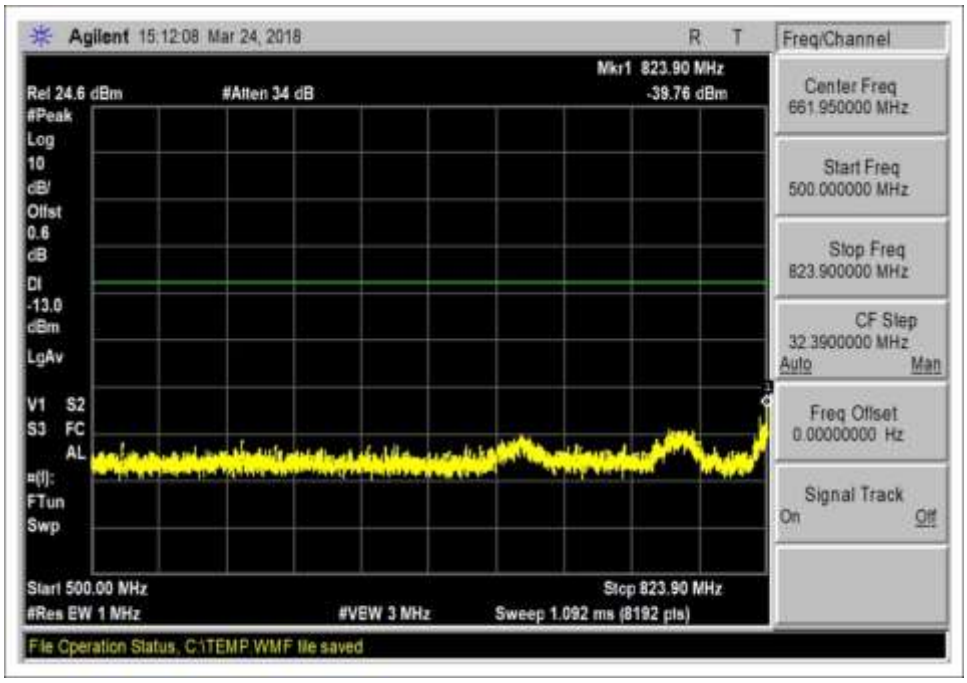
UL_776-787MHz_R3



UL_824-849MHz_L1



UL_824-849MHz_L2



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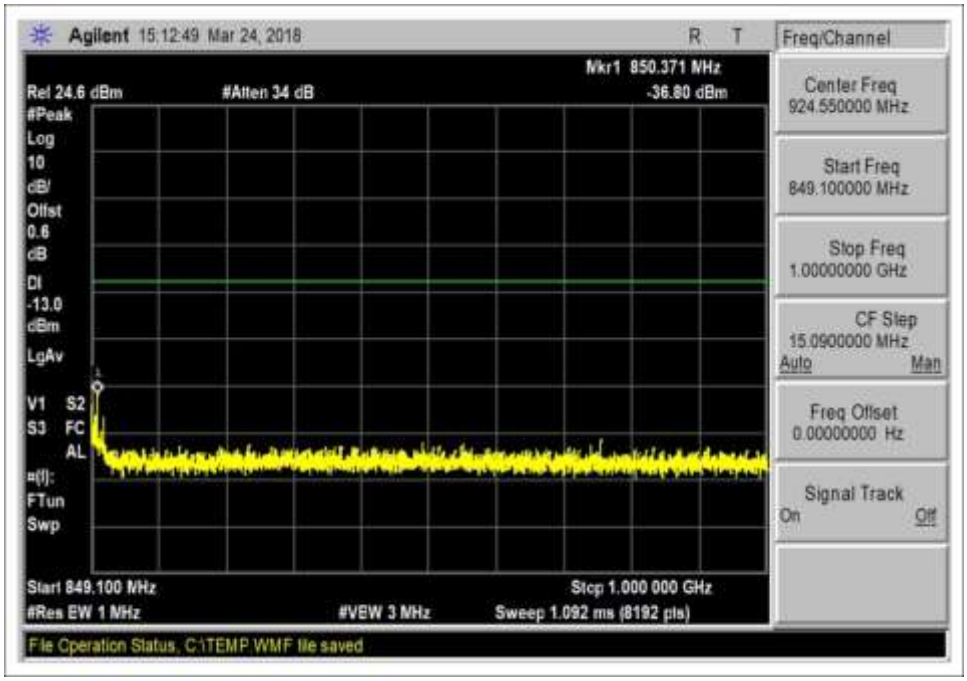
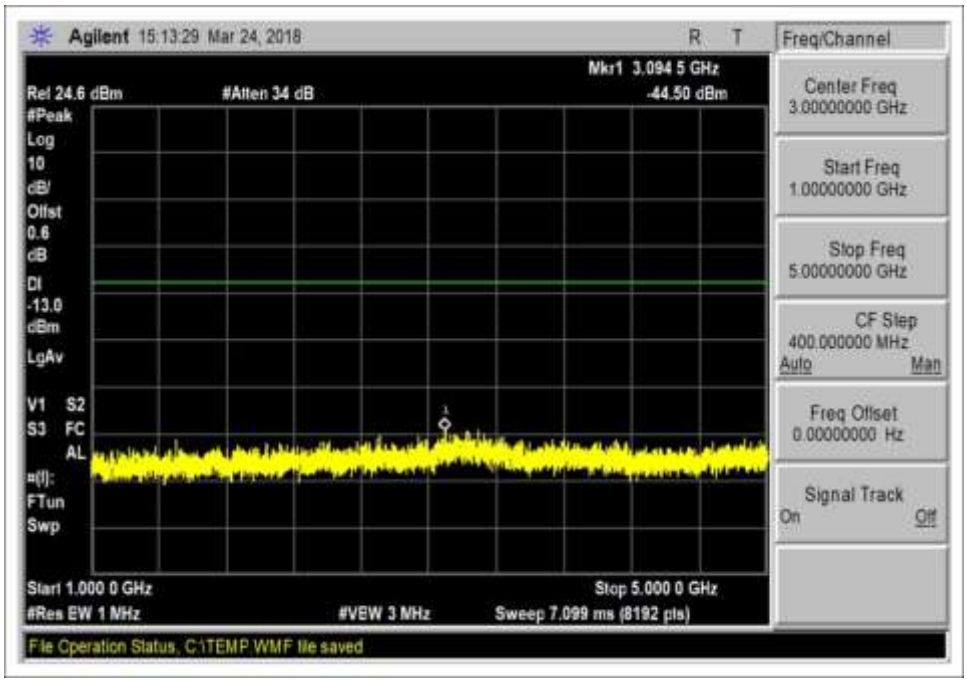
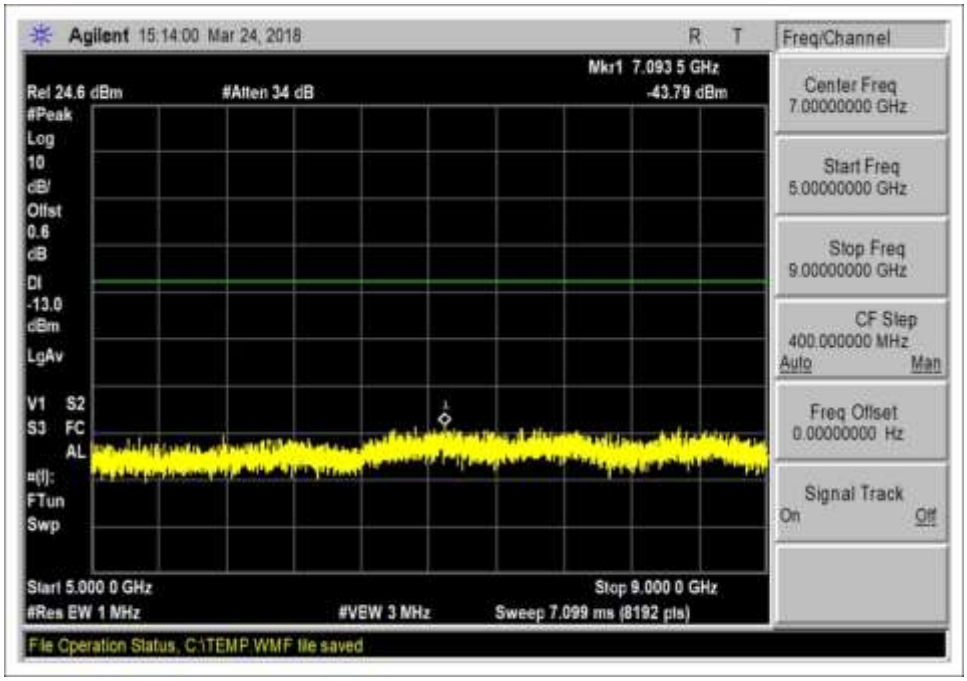


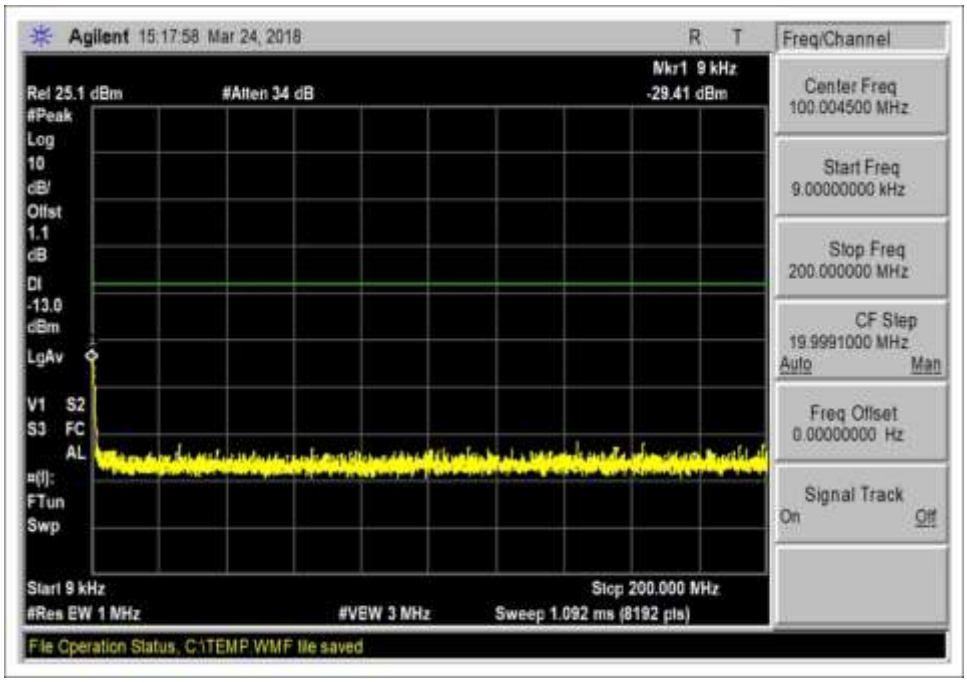
UL_824-849MHz_R1



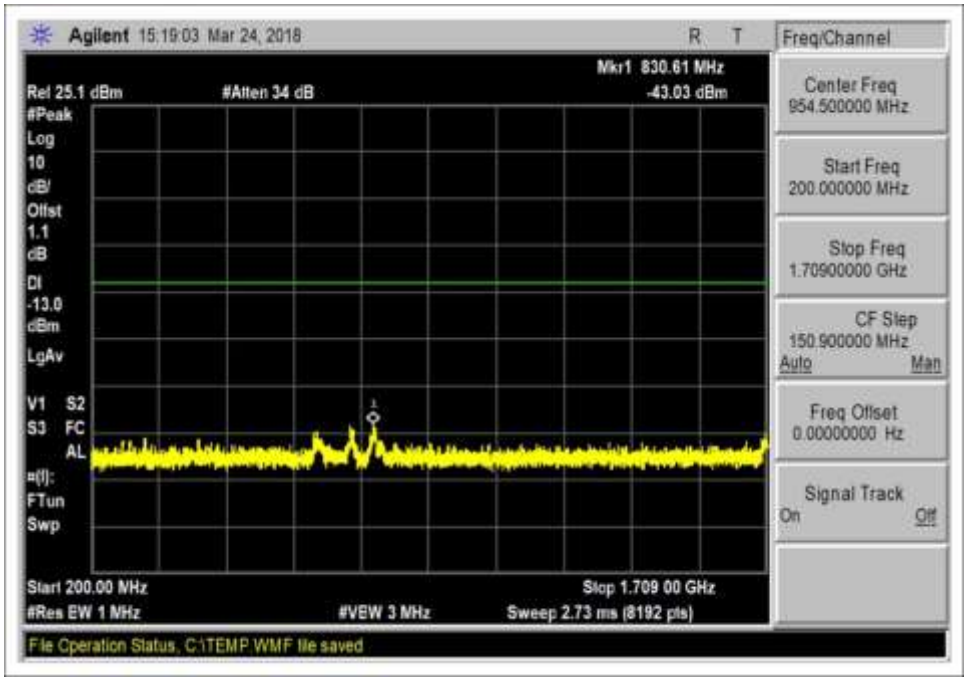
UL_824-849MHz_R2



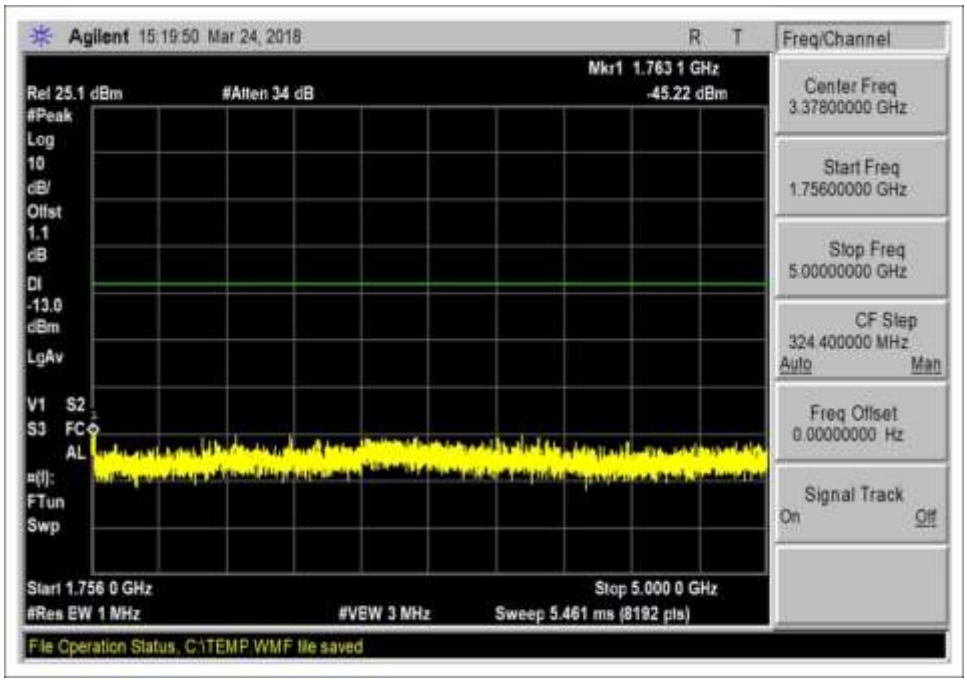
UL_824-849MHz_R3



UL_1710-1755MHz_L1



UL_1710-1755MHz_L2



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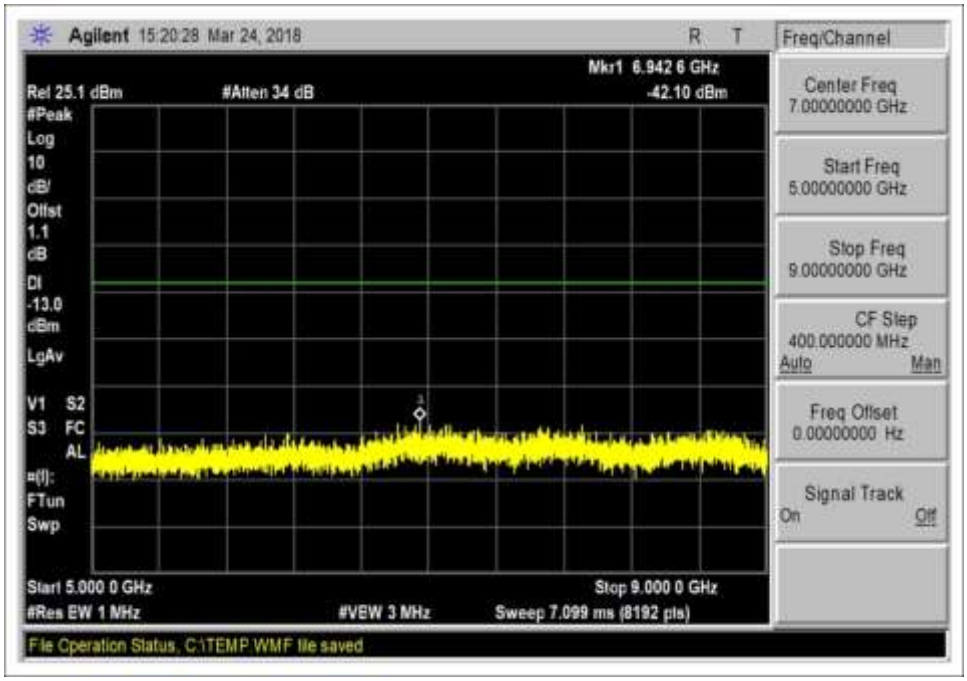

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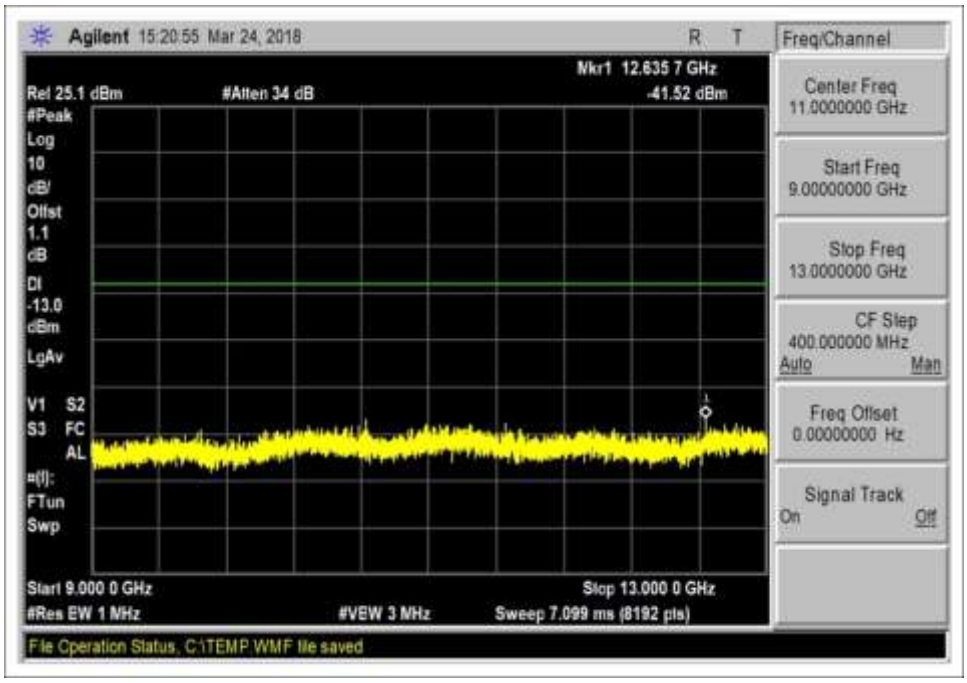

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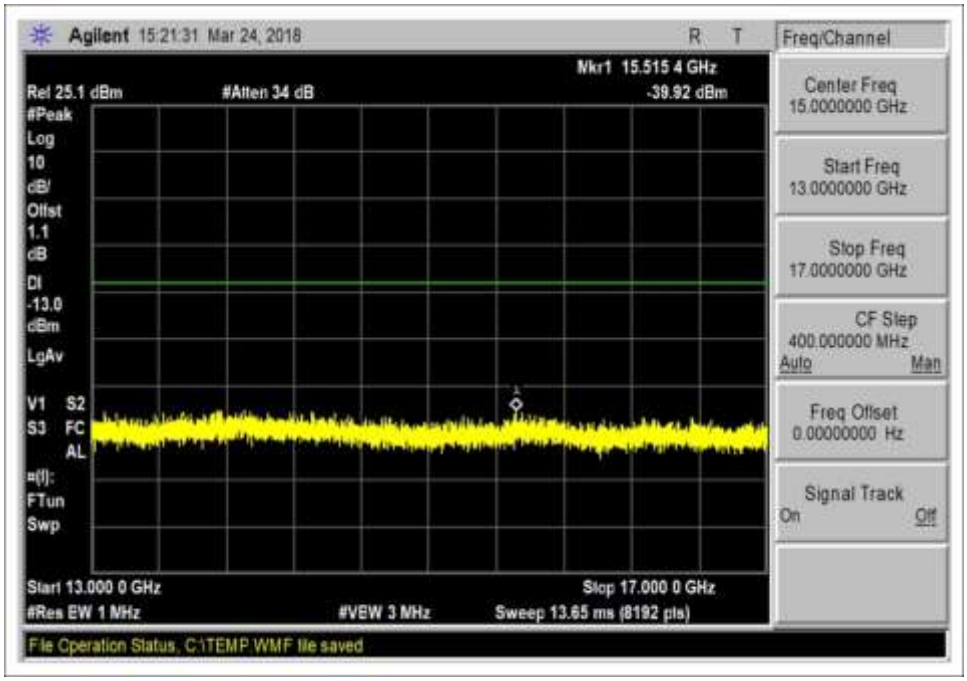
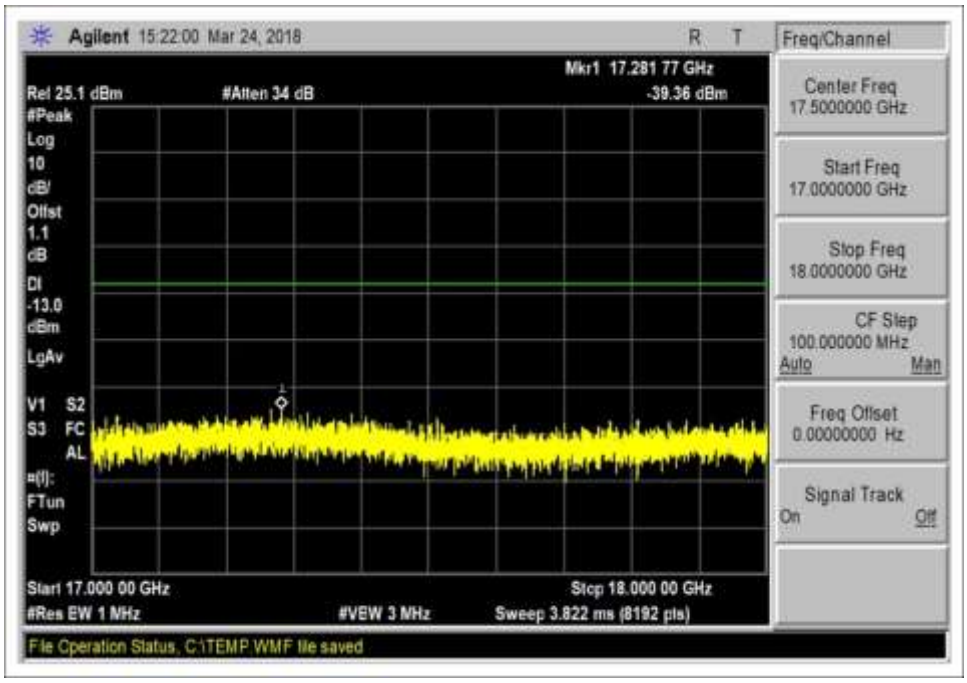
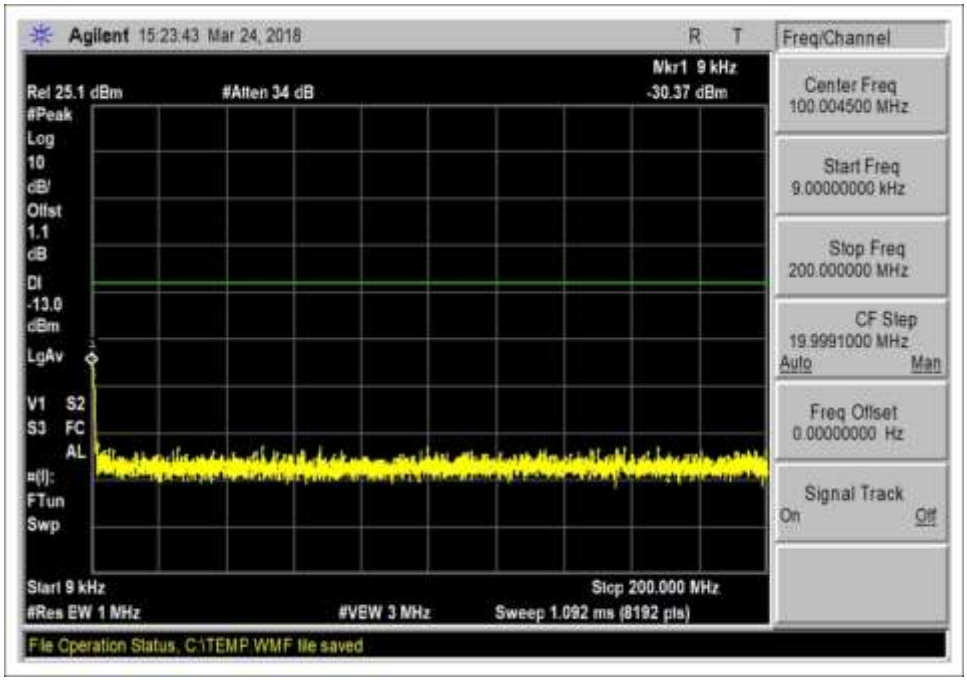


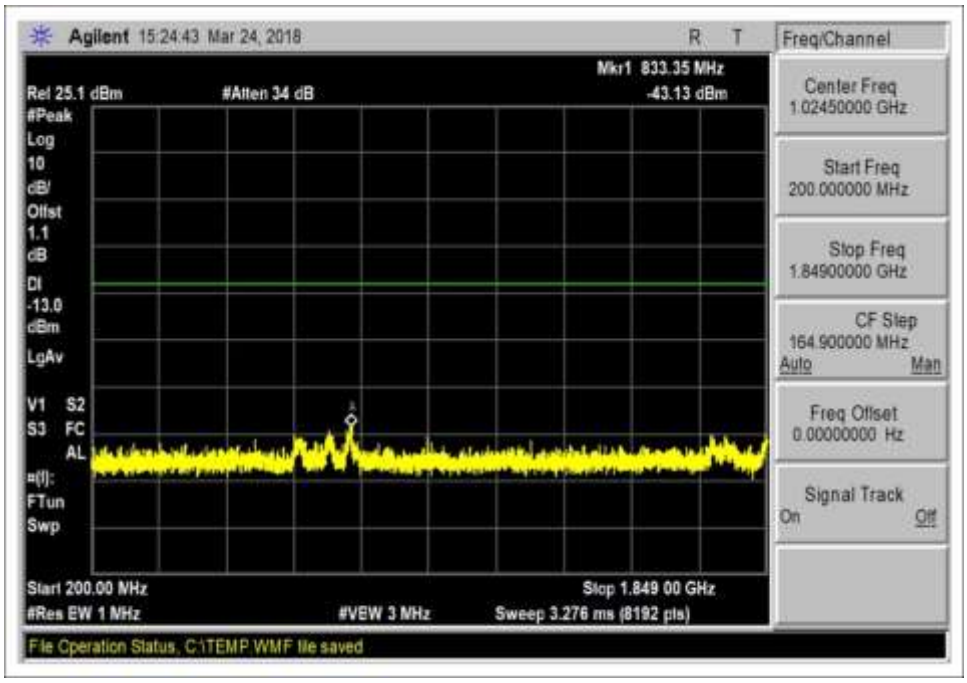
UL_1710-1755MHz_R4



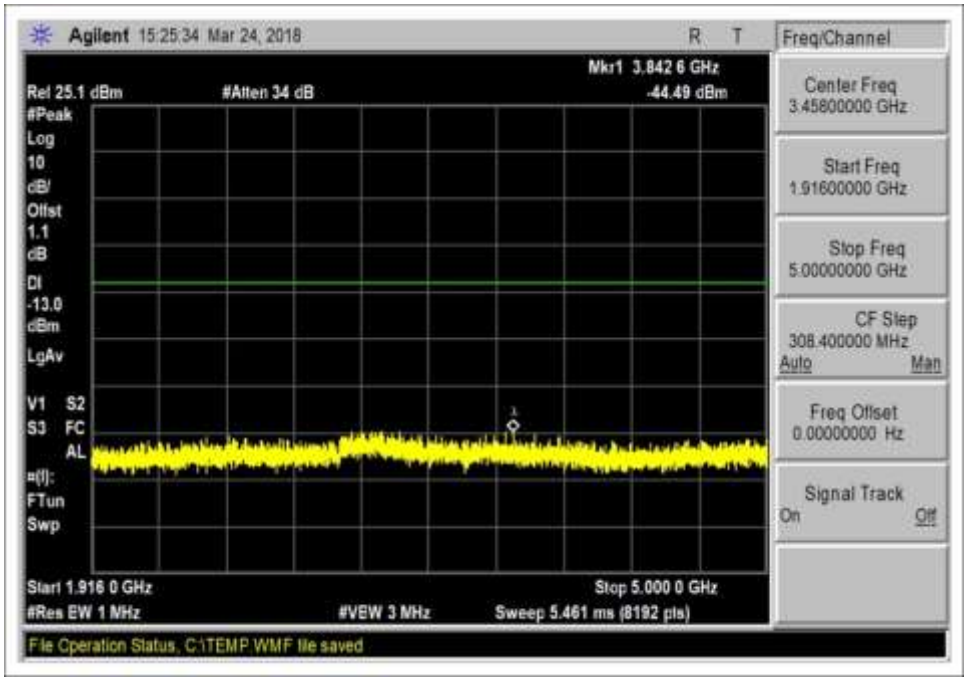
UL_1710-1755MHz_R5



UL_1850-1915MHz_L1



UL_1850-1915MHz_L2



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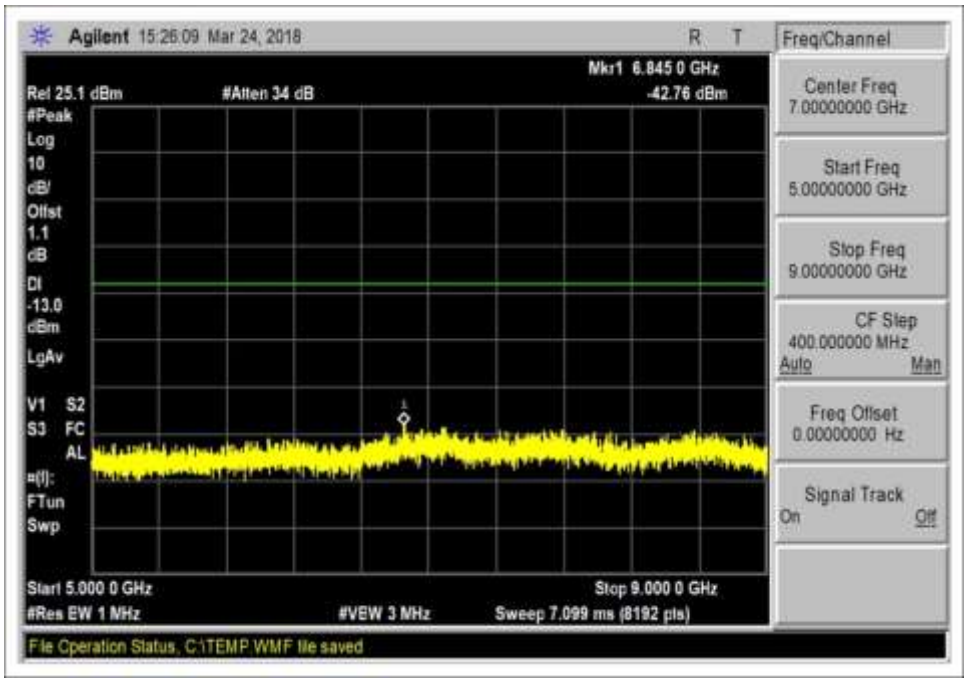

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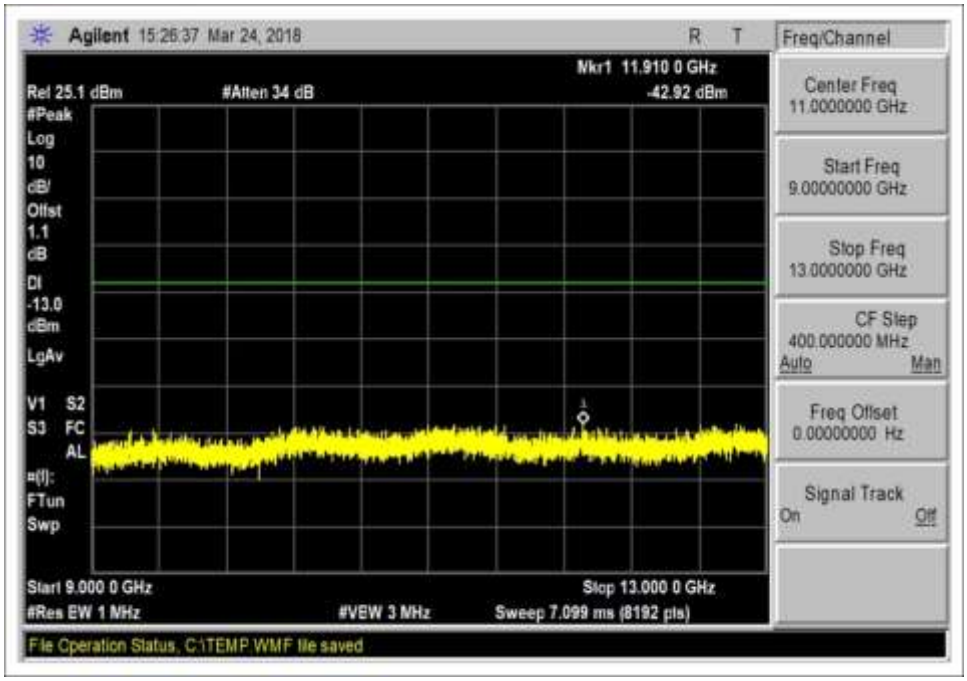

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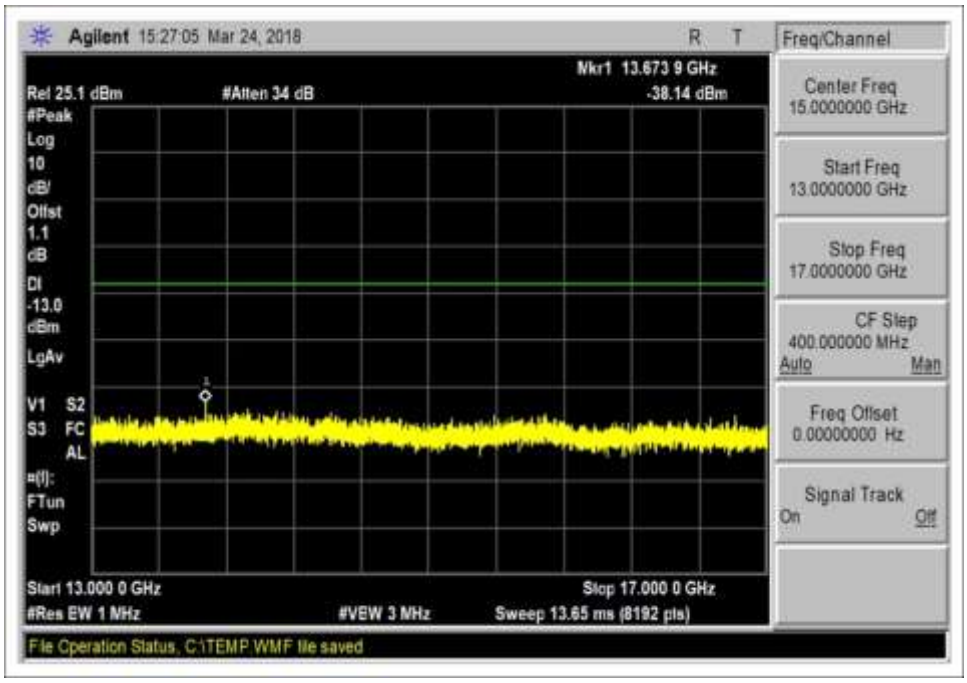

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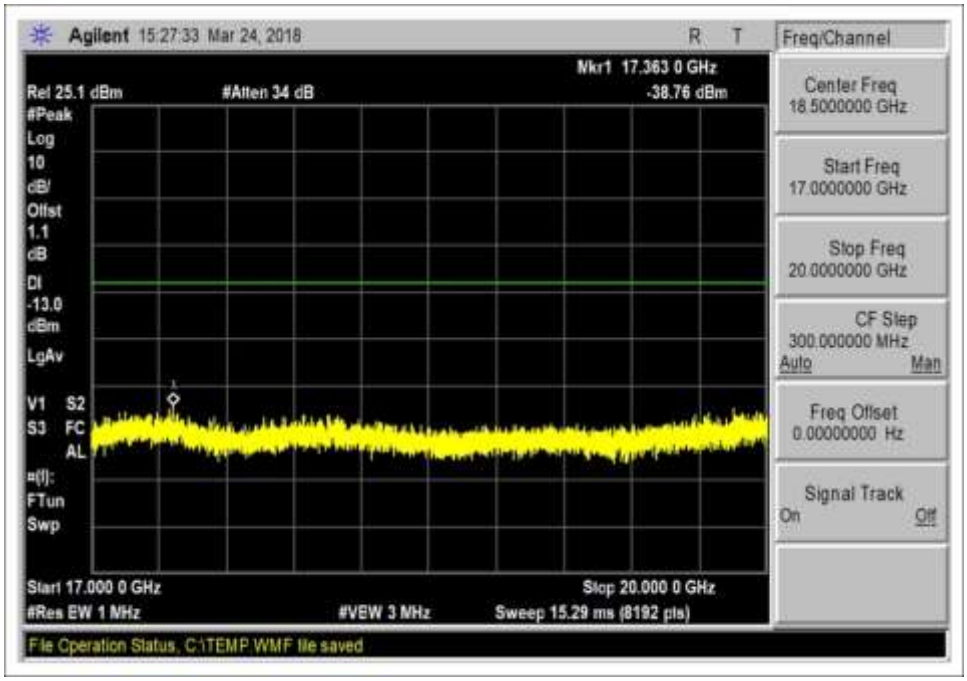

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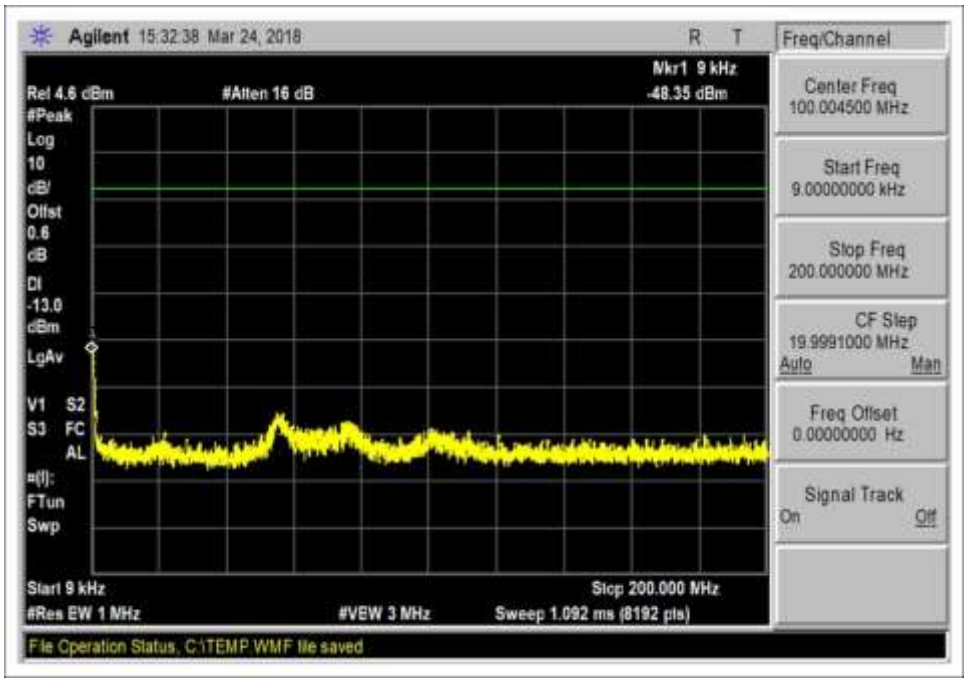
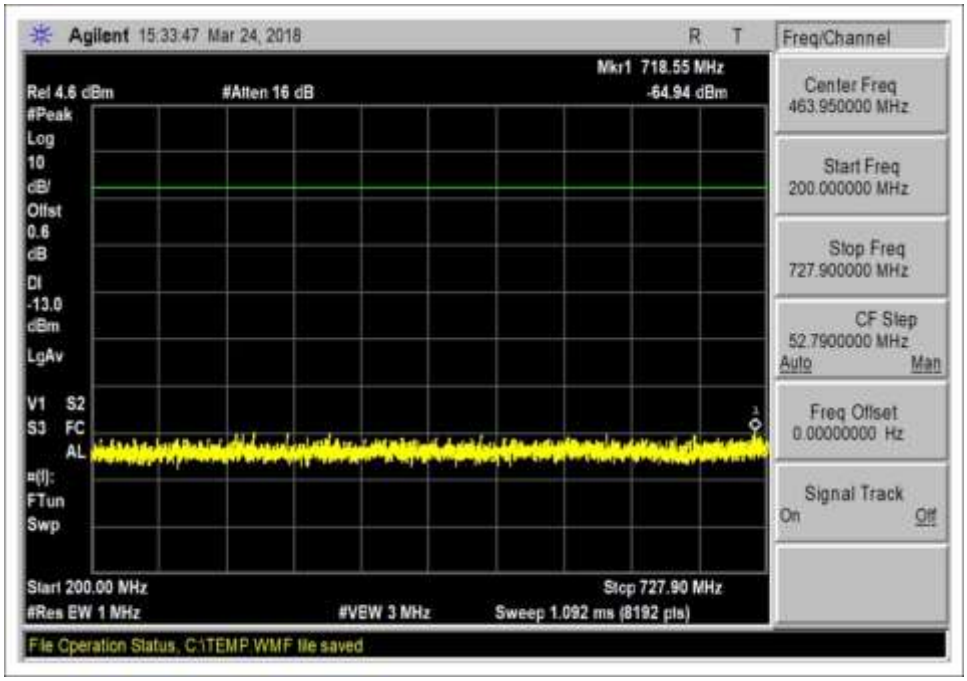
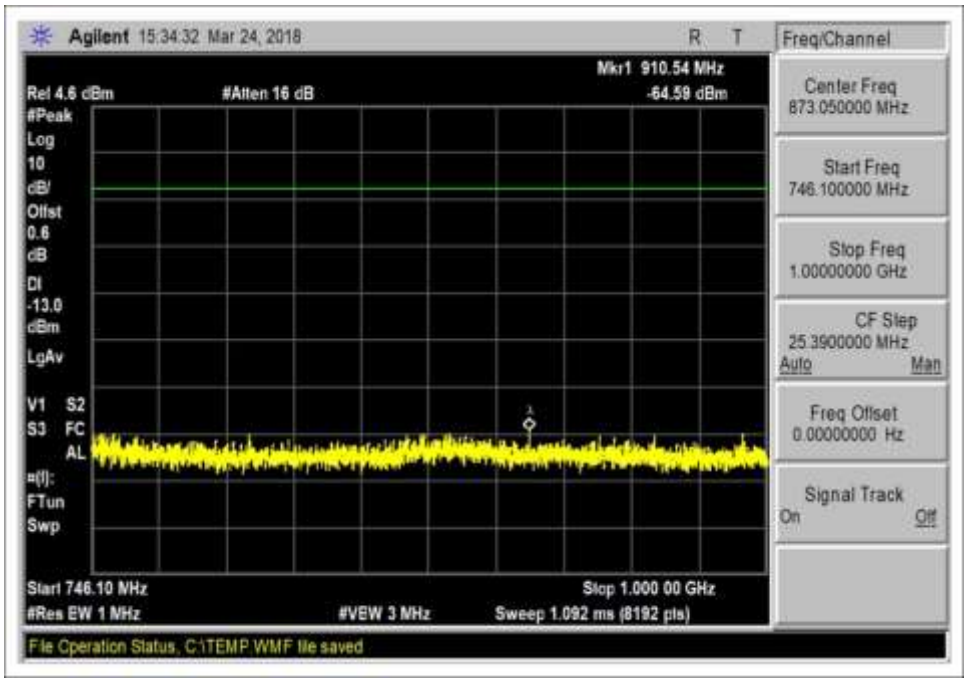


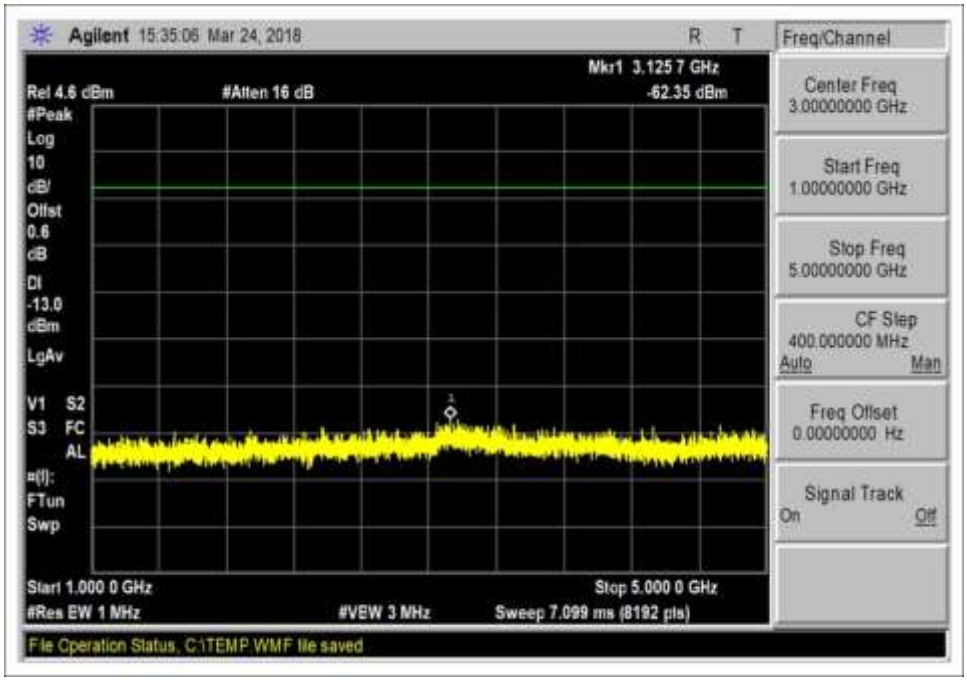
DL_728-746MHz_L1



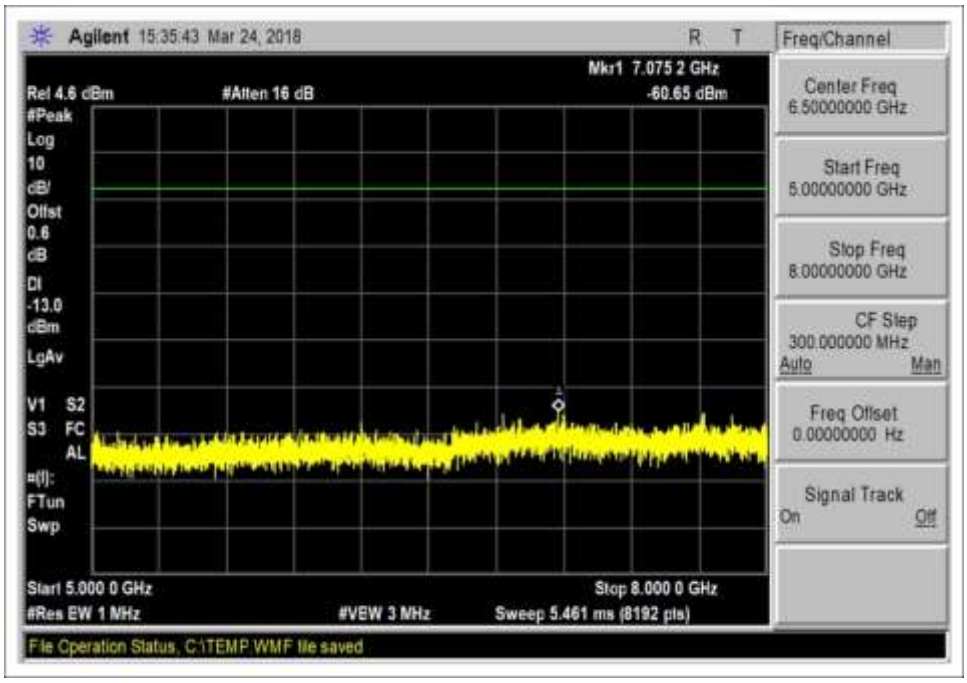
DL_728-746MHz_L2



DL_728-746MHz_R1



DL_728-746MHz_R2



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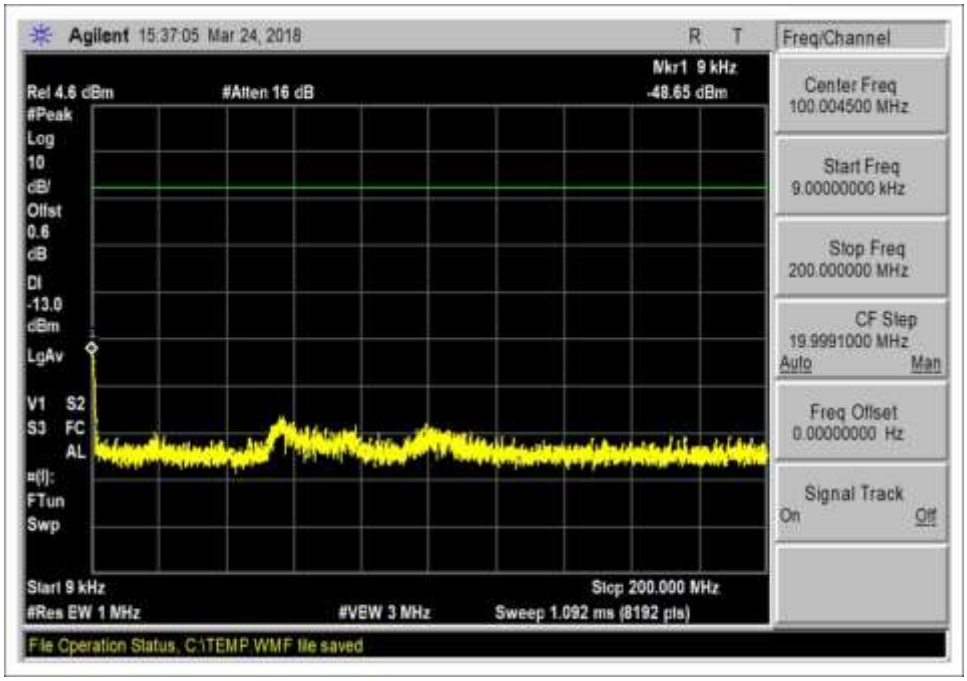
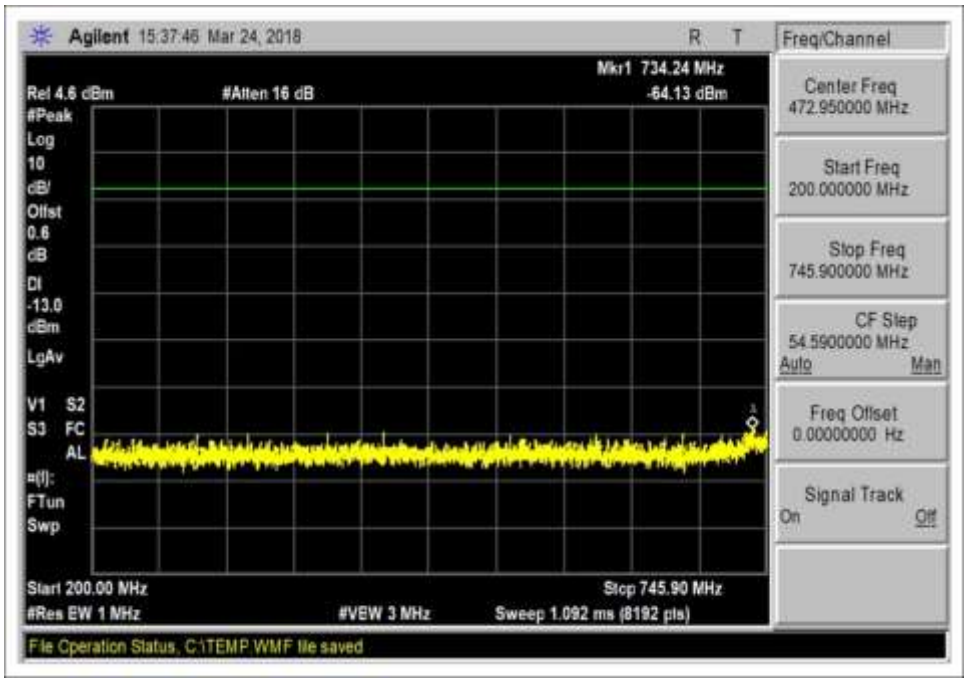
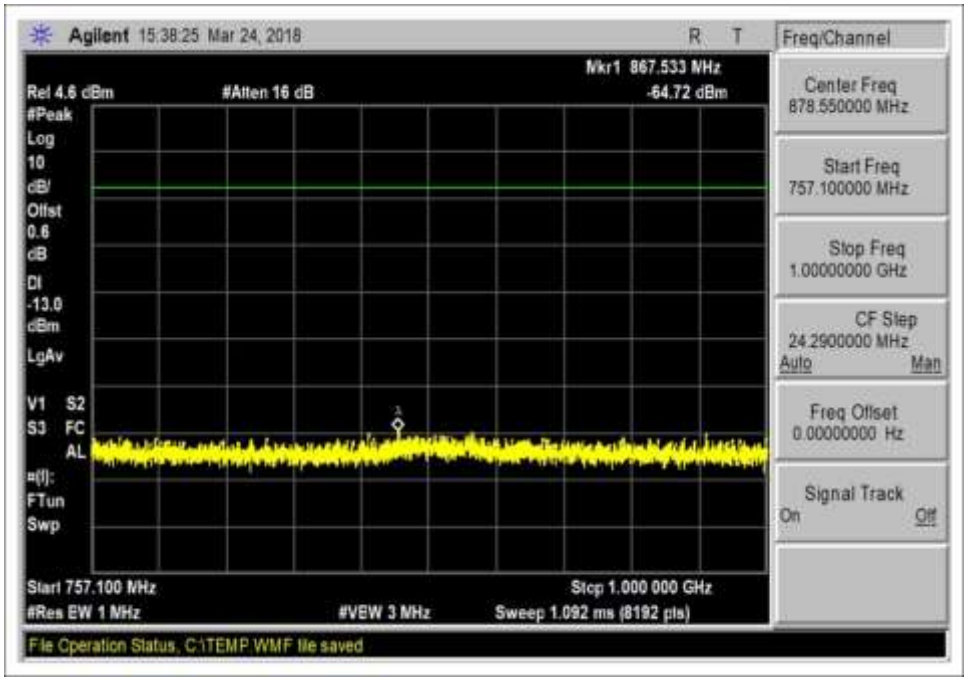


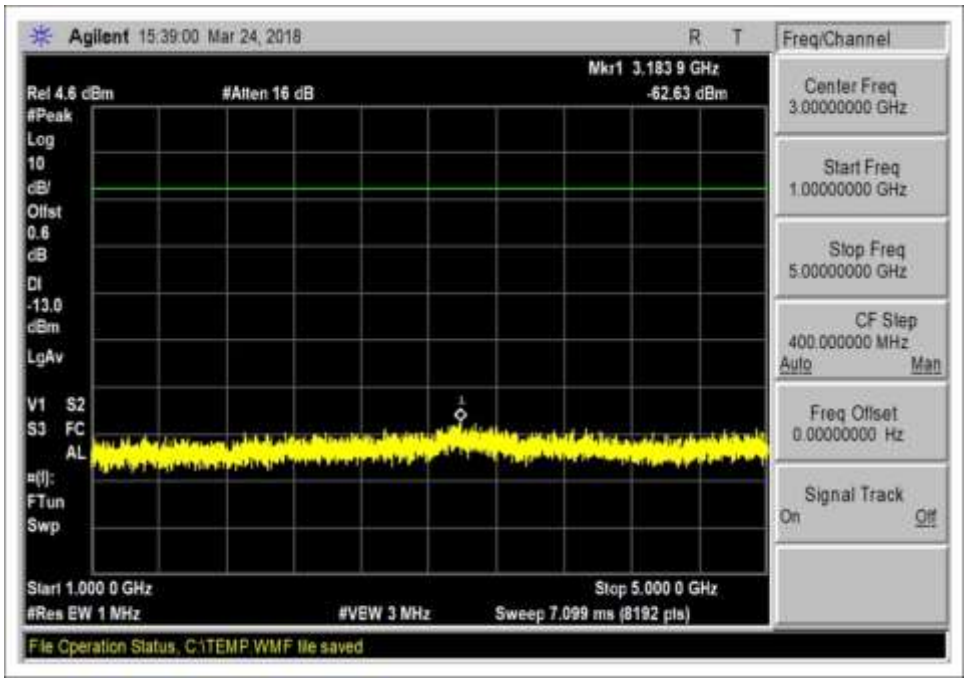
DL_746-757MHz_L1



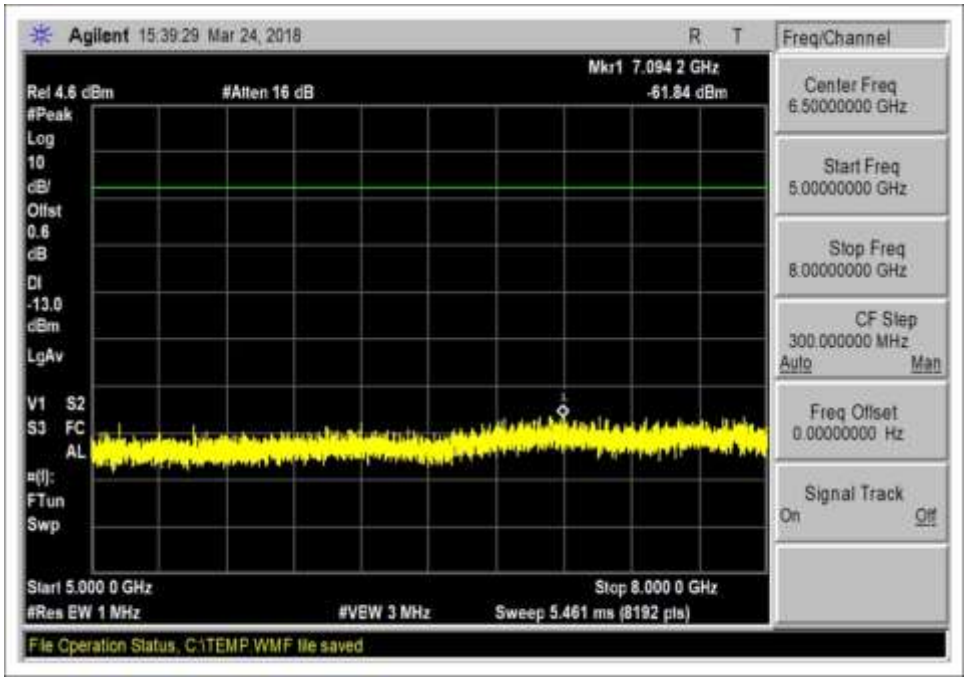
DL_746-757MHz_L2



DL_746-757MHz_R1



DL_746-757MHz_R2



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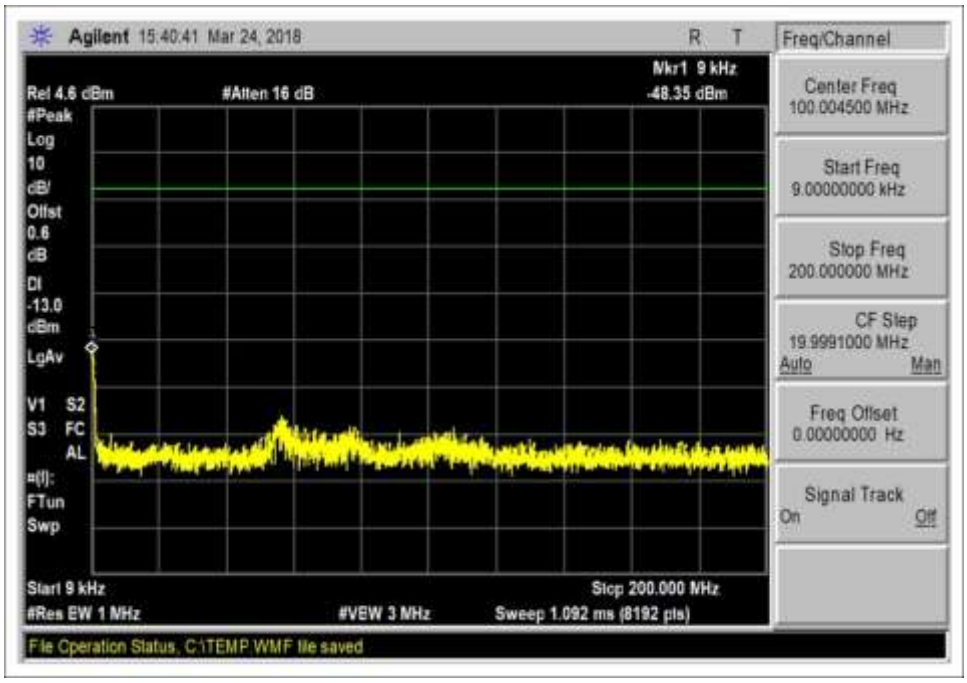
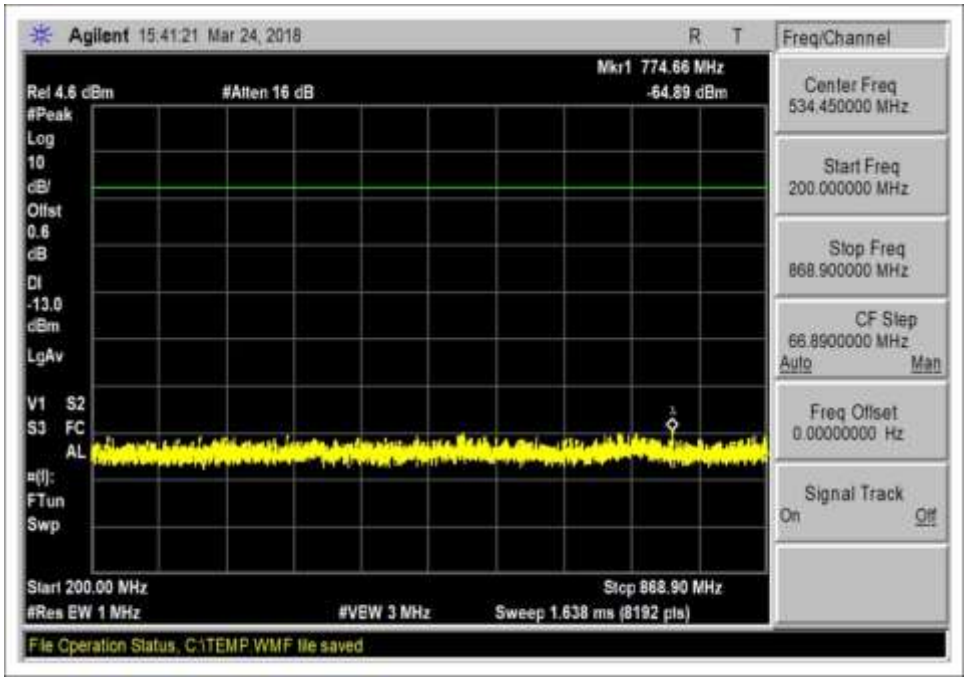


DL_869-894MHz_L1



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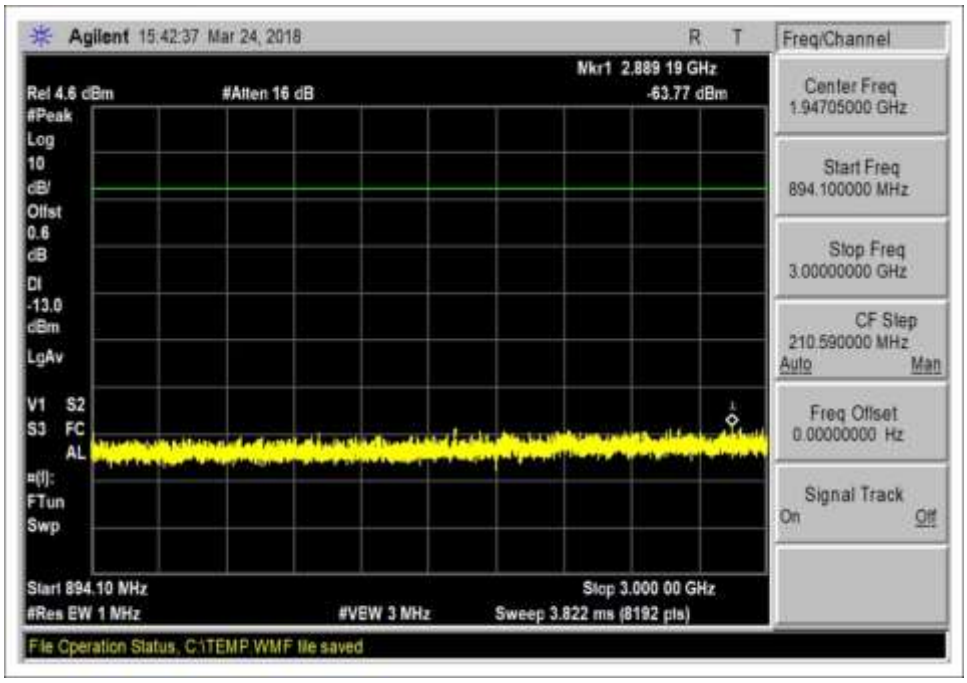

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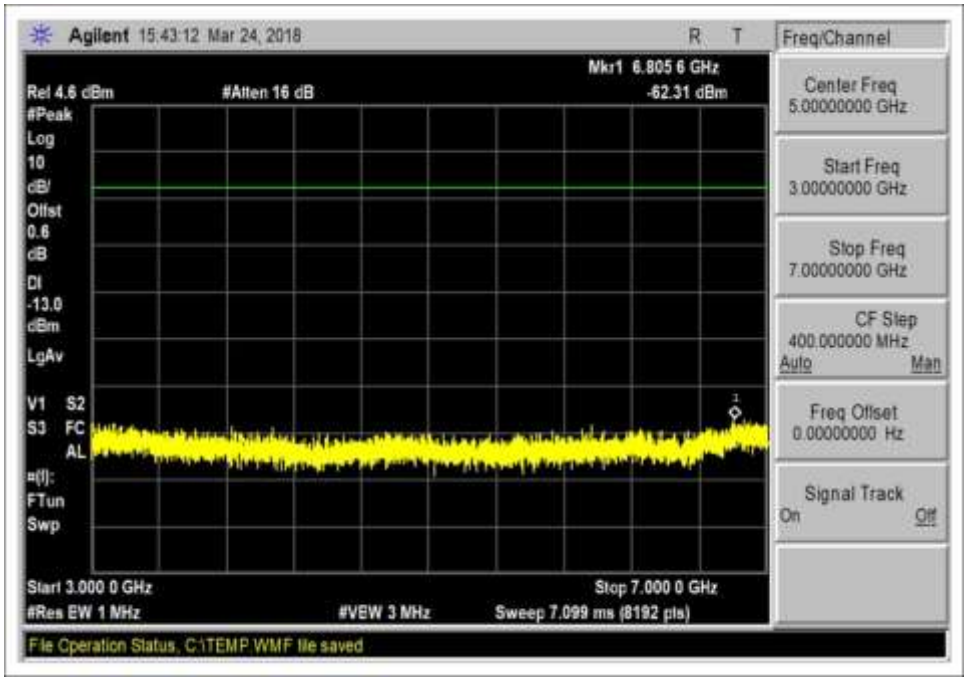

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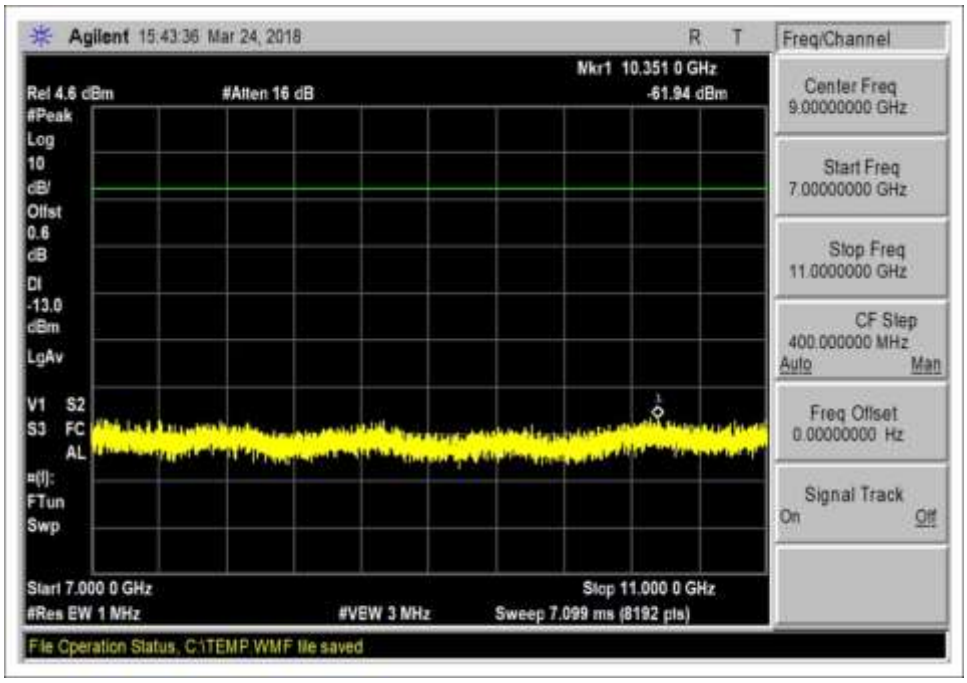

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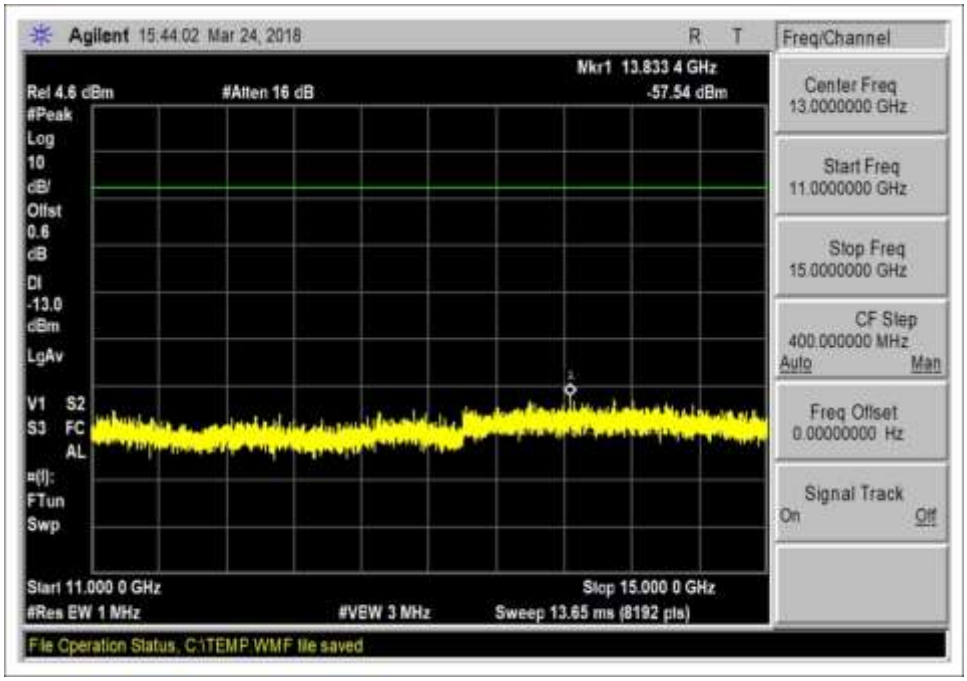

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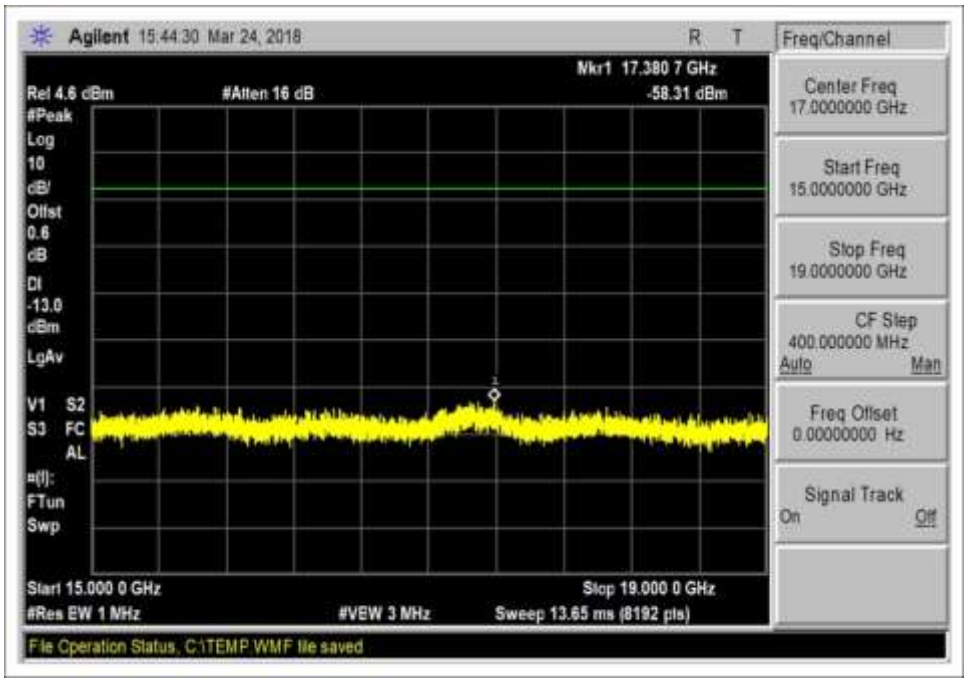
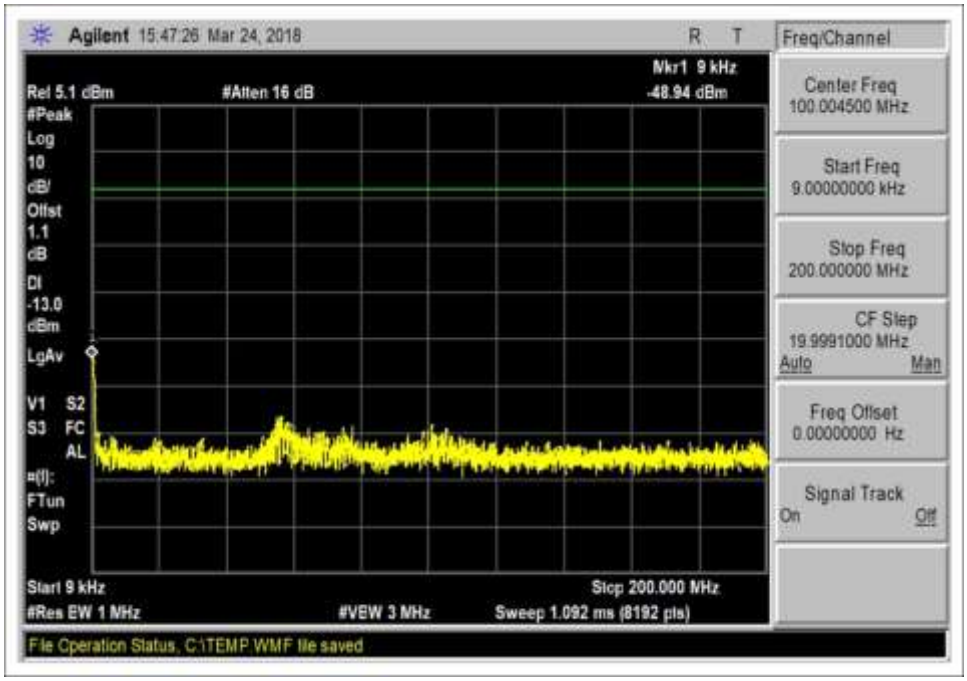
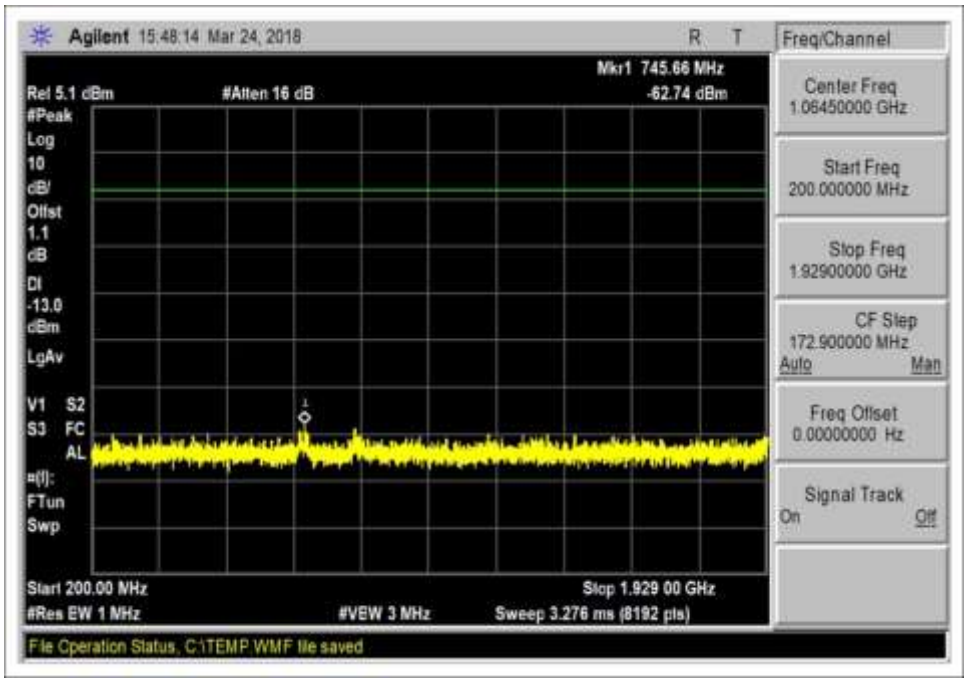


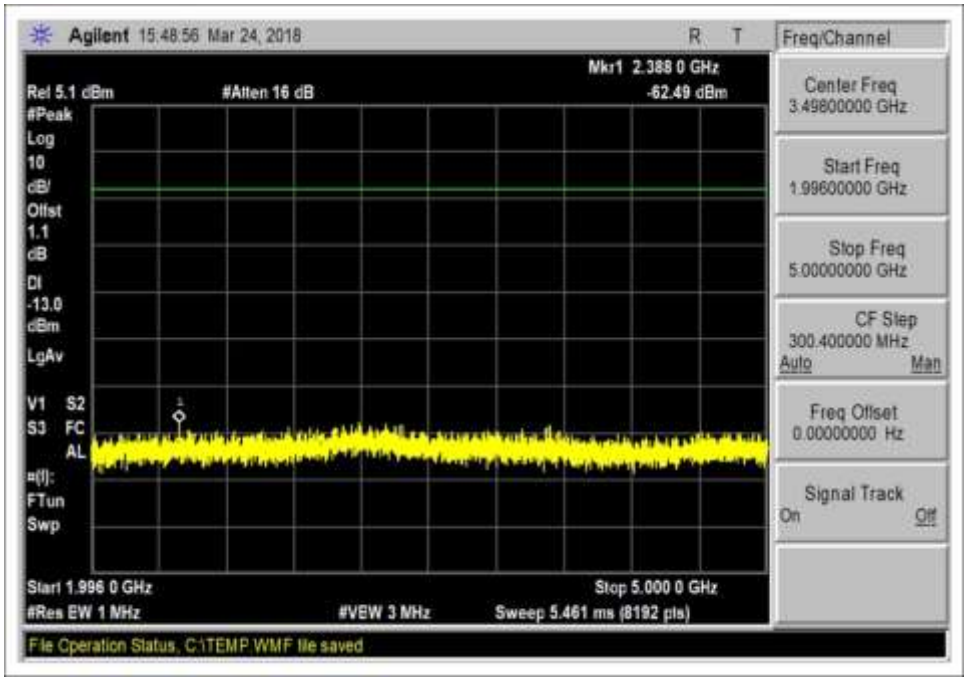
DL_869-894MHz_R5



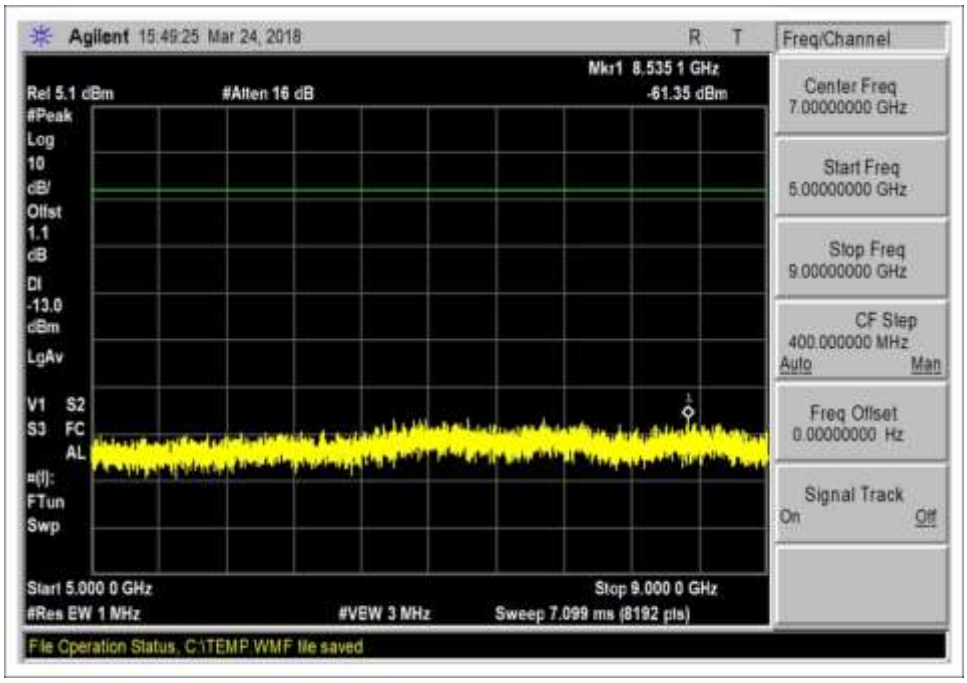
DL_1930-1995MHz_L1



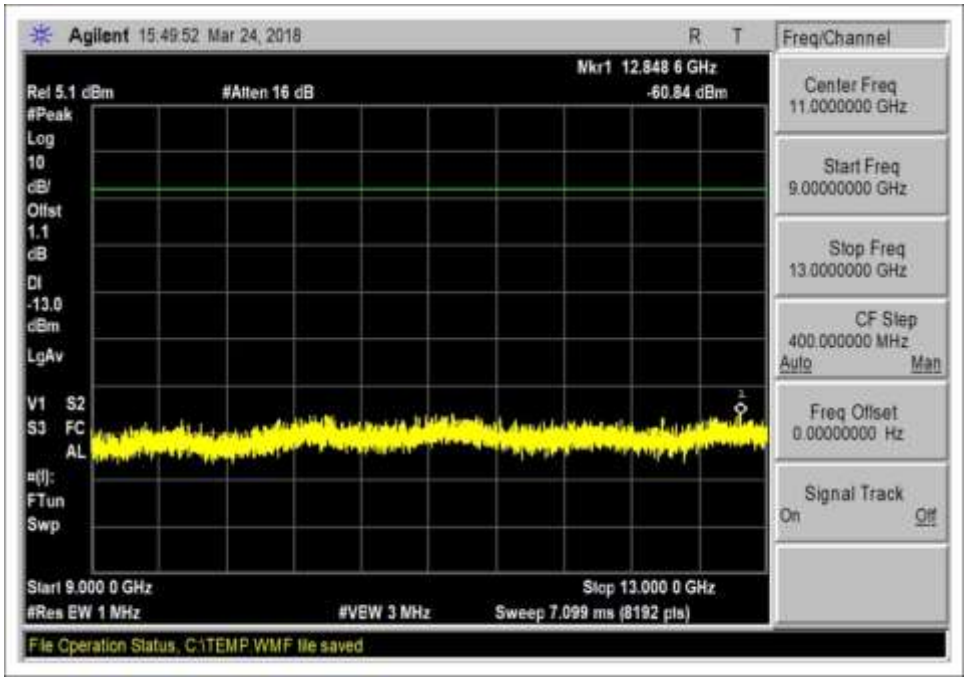
DL_1930-1995MHz_L2



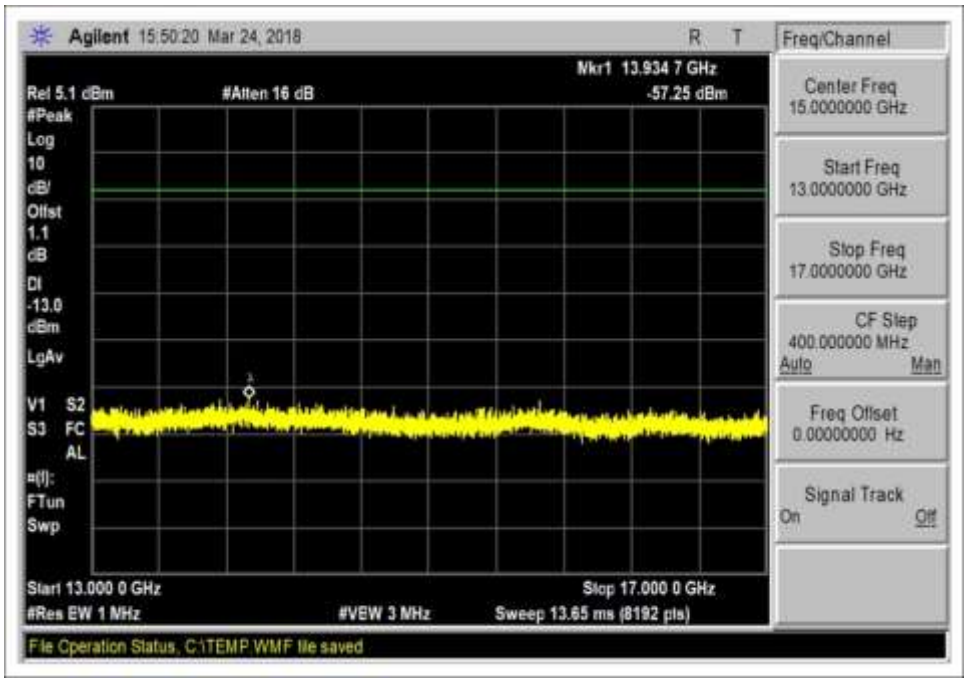
DL_1930-1995MHz_R1



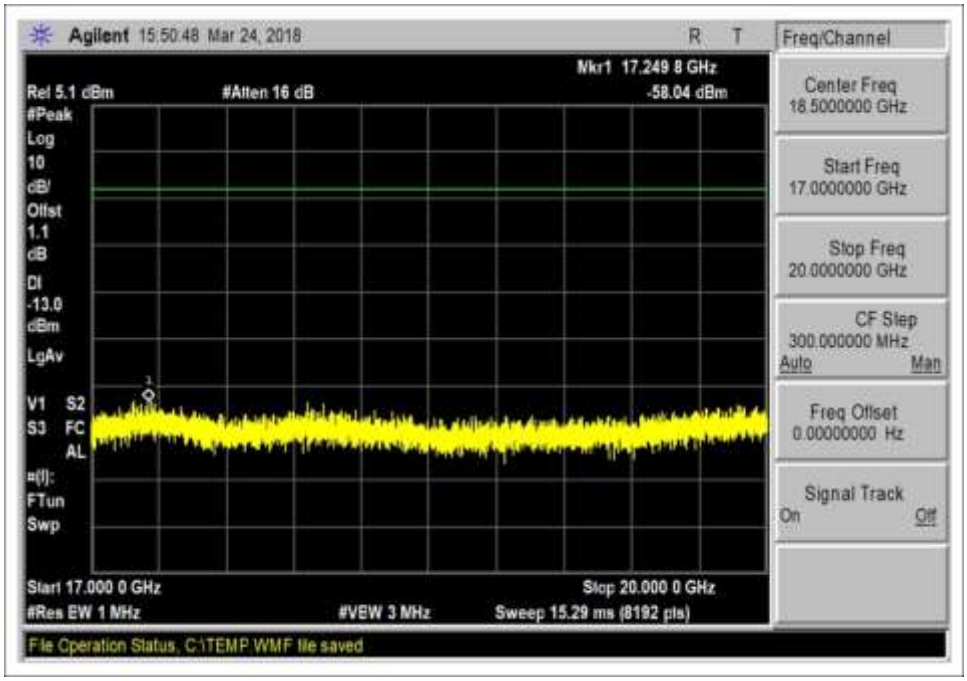
DL_1930-1995MHz_R2



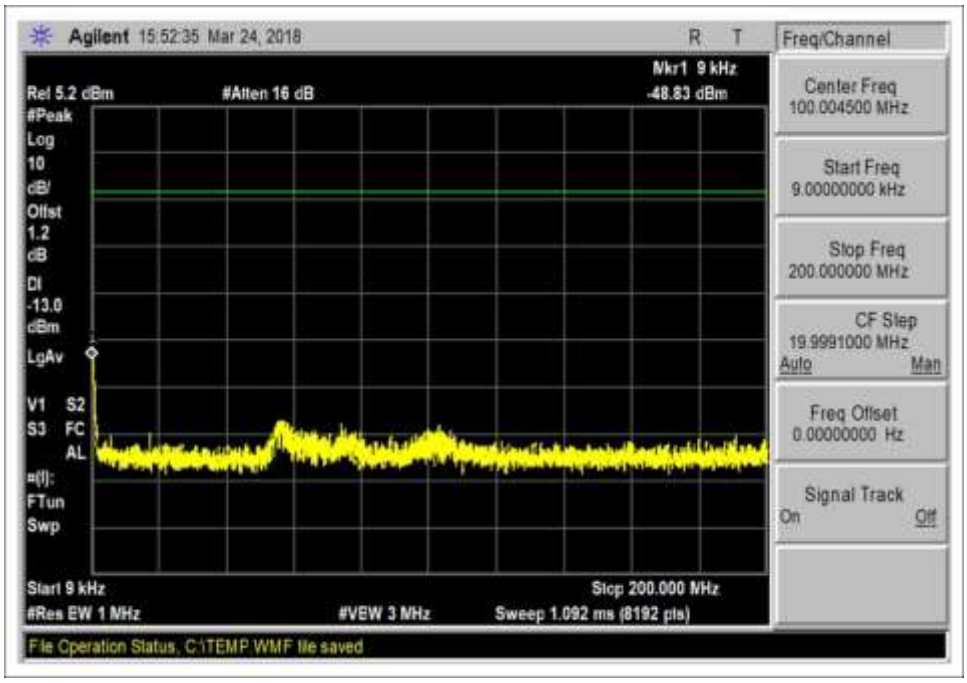
DL_1930-1995MHz_R3



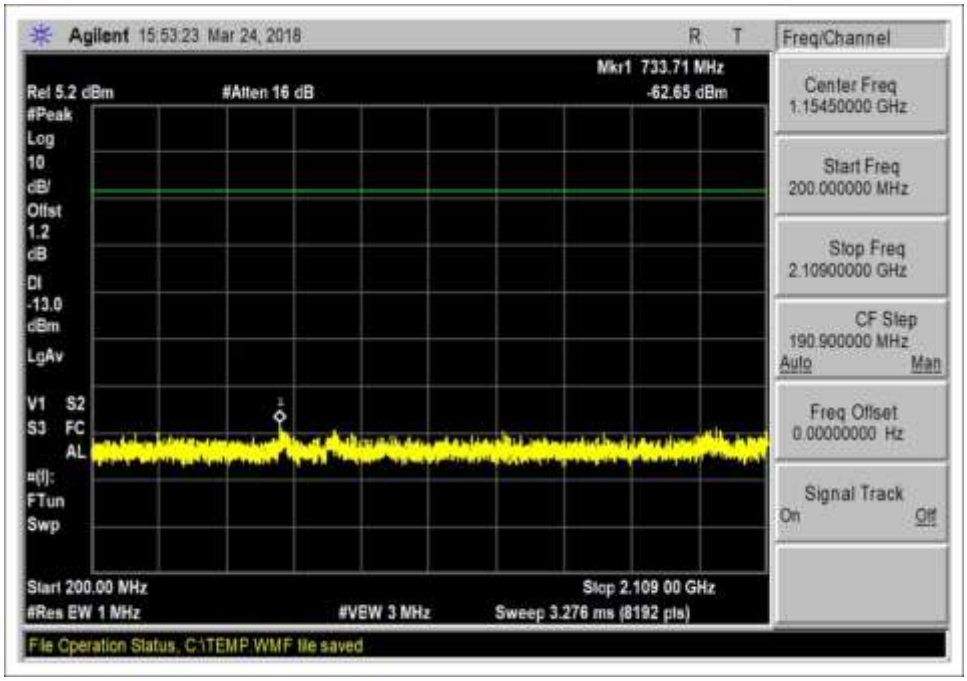
DL_1930-1995MHz_R4



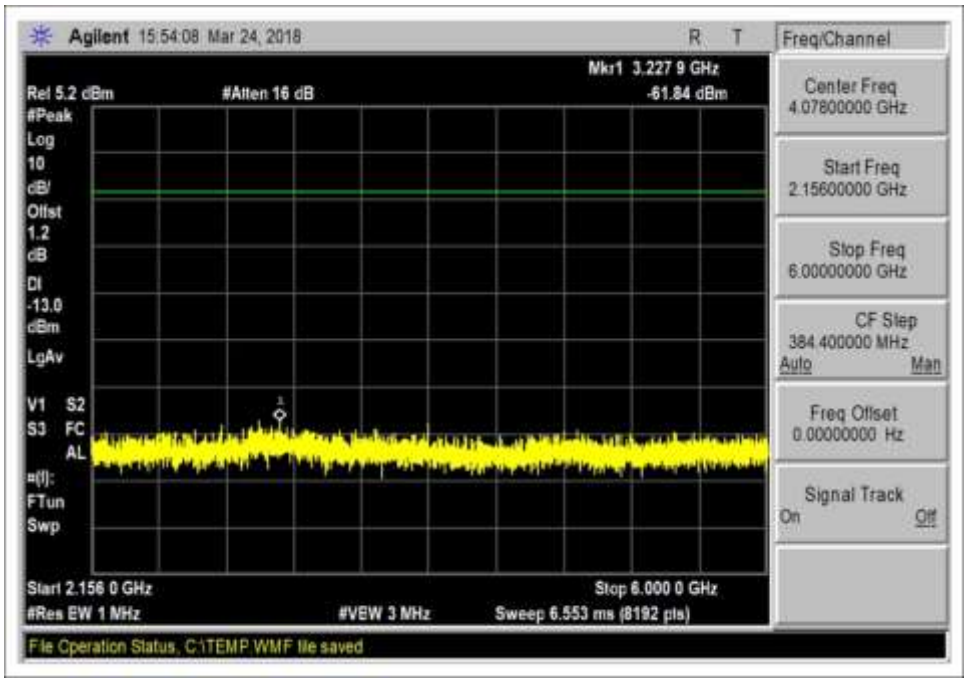
DL_1930-1995MHz_R5



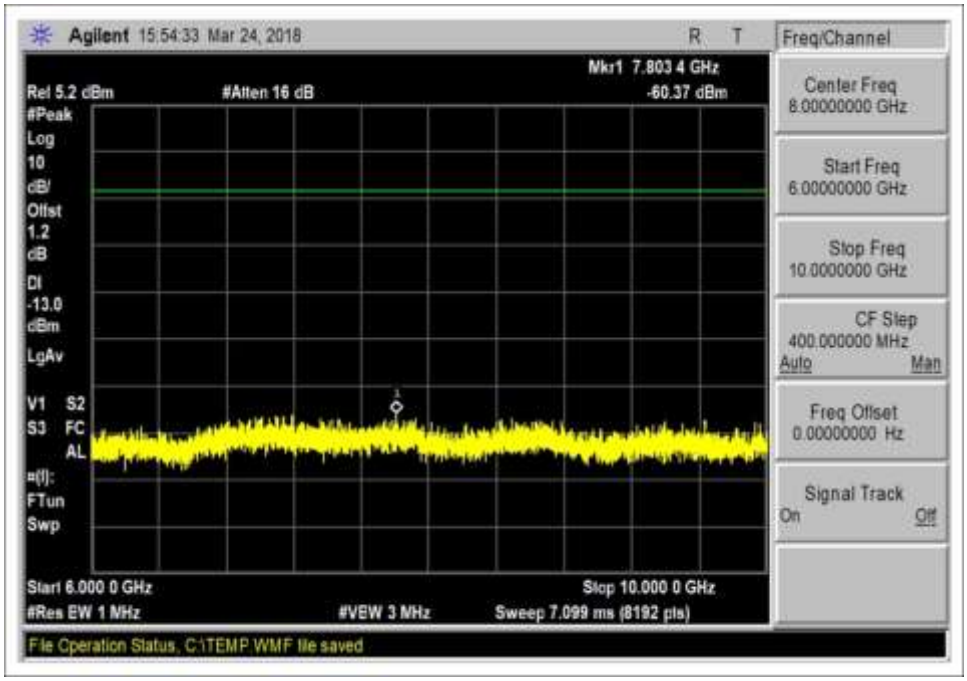
DL_2110-2155MHz_L1



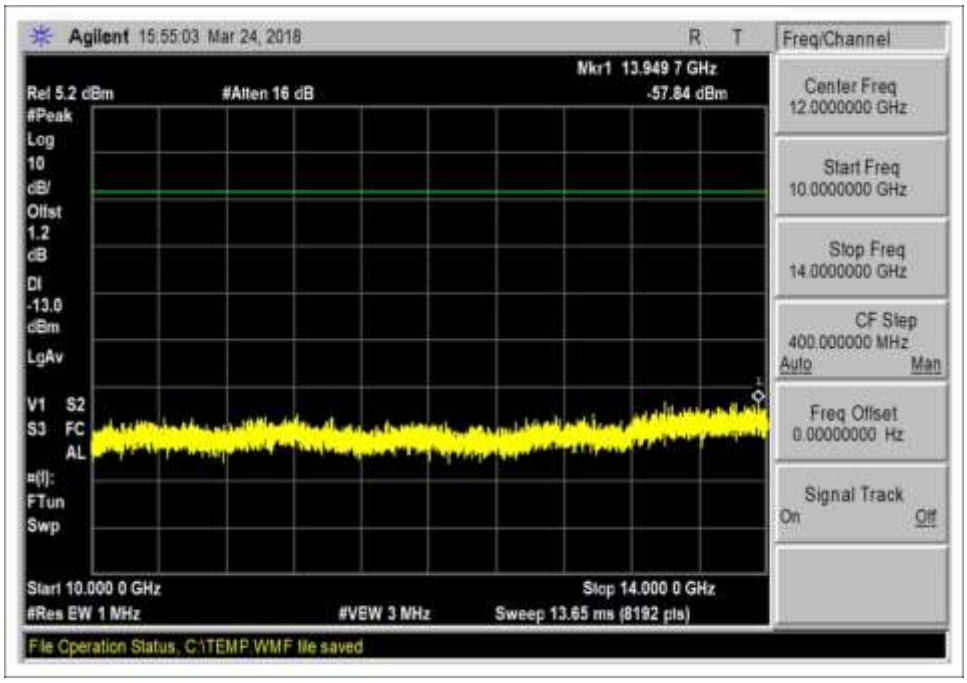
DL_2110-2155MHz_L2



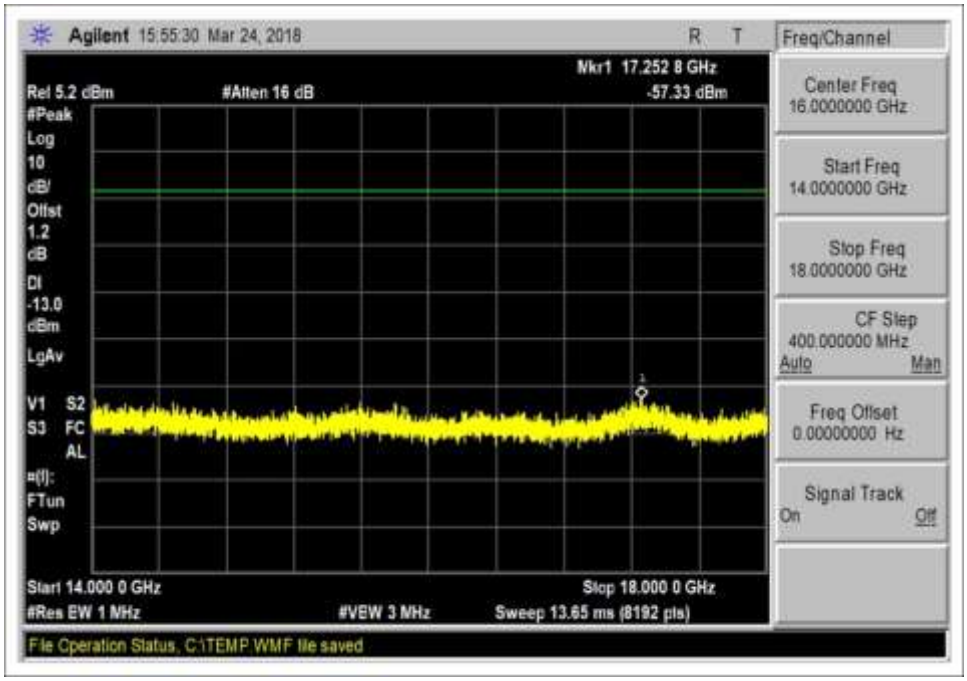
DL_2110-2155MHz_R1



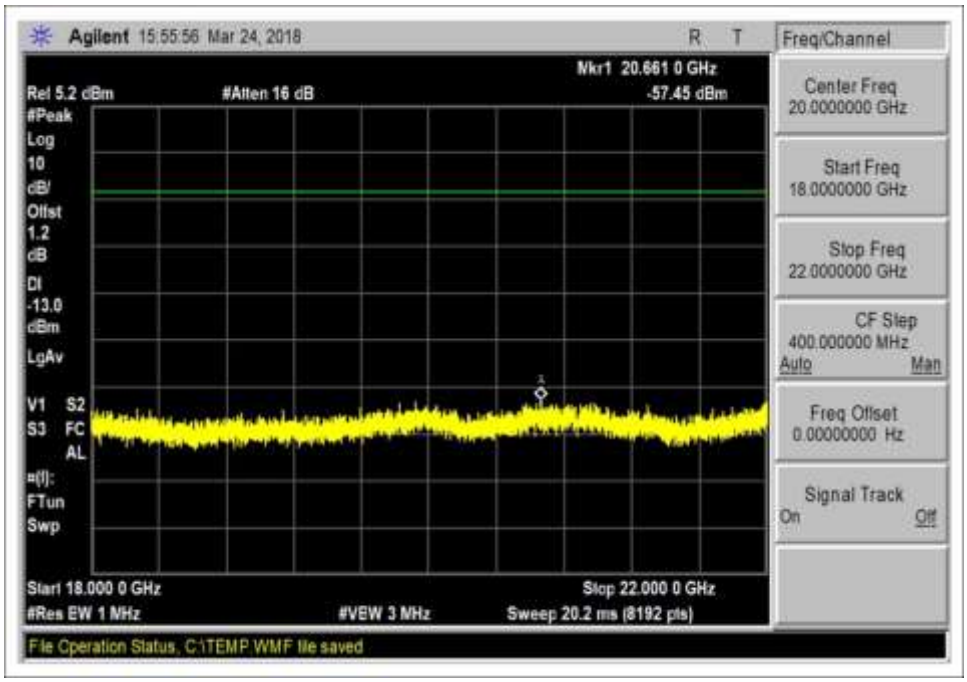
DL_2110-2155MHz_R2



DL_2110-2155MHz_R3



DL_2110-2155MHz_R4



DL_2110-2155MHz_R5

7.7 Noise limit

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place. Brea, CA 92821• 714 993 6112
Customer:	Huaptec
Specification:	Section 20.21(e)(8)(i)(A) Noise Limits. Section 20.21(e)(8)(i)(H) Transmit Power Off Mode
Work Order #:	**100428** Date: 3/20 and 21, 2018
Test Type:	**Conducted Emissions**
Tested By:	S. Yamamoto
Software:	EMITest 5.03.11

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

General test condition.
The equipment under test (EUT) is a Mobile Wideband Consumer Booster with direct contact coupling (cradle-type) antenna.
The EUT is placed on the test bench. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port.
The EUT Donor port is a MCX type connector and 50-ohm impedance.
The EUT Server/DL port /is type UFL connector and 50-ohm impedance.

Part 22
UL: 824-849MHz
DL: 869-894MHz
Part 24
UL: 1850-1915MHz
DL: 1930-1995MHz
Part 27
UL: 1710-1755MHz, 698-716MHz, 776-787MHz
DL: 2110-2155MHz, 728-746MHz, 746-757MHz

Test procedure:
The test was performed in accordance with the FCC document: 935210 D03 Signal Booster Measurements v04r01, dated October 27, 2017.
Firmware: 2.0

Test environment conditions:
Temperature: 20 -25°C
Relative Humidity: 37-45 %
Pressure: 100kPa

Device is powered by a provided 5V USB/12V Automotive adaptor

Test Equipment:

Asset #	Description	Manufacturer	Model	Calibration Date	Cal Due Date
P07037	RF Signal Generator	Agilent	E4432B	10/6/2016	10/6/2018
P06544	Cable	Astro Steel	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
02946	Cable	Astro Steel	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
02672	Spectrum Analyzer	Agilent	E4446A	3/2/2017	3/2/2019
C00082	Directional Coupler	MECA Electronics, Inc.	722-10-1.500V	9/18/2017	9/18/2019
03446	Band Pass Filter	K & L	4FV50-707/H18-O/O	8/16/2017	8/16/2019
03468	Band Pass Filter	K & L	4CS10-781.5/E12.2-O/O	8/16/2017	8/16/2019
03412	Band Pass Filter	Pasternack	PE8705	8/16/2017	8/16/2019
03447	Band Pass Filter	Pasternack	PE8710	8/16/2017	8/16/2019
03414	Band Pass Filter	Pasternack	PE8707	8/16/2017	8/16/2019

Summary of Results

Pass: As demonstrated, measured noise are within the limit. All maximum variable uplink noise timings are within 1 second limit.

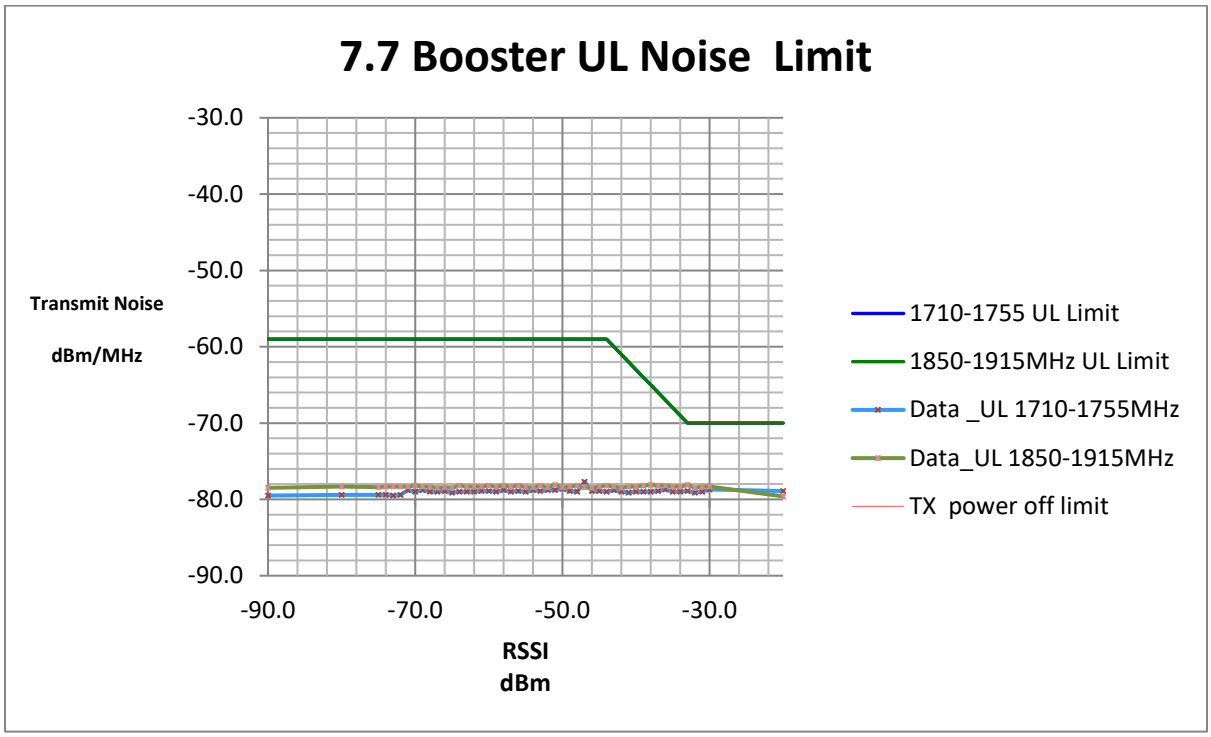
7.7.1 Maximum transmitter noise power level

7.7.1 a-g: Maximum transmitter noise with 50-ohm shielded load

Maximum Noise Power			
Frequency MHz	**Measured dBm./MHz**	**Limit dBm/MHz**	**Margin**
UL 1710-1755	-79.2	-59.0	-20.2
UL 1850-1915	-78.6	-59.0	-19.6
UL 824-849	-76.2	-59.0	-17.2
UL 698-716	-77.9	-59.0	-18.9
UL 776-787	-77.6	-59.0	-18.6
DL 2110-2155	-80.1	-59.0	-21.1
DL 1930-1995	-80.3	-59.0	-21.3
DL 869-894	-79.9	-59.0	-20.9
DL 728-746	-80.2	-59.0	-21.2
DL 746-757	-80.0	-59.0	-21.0

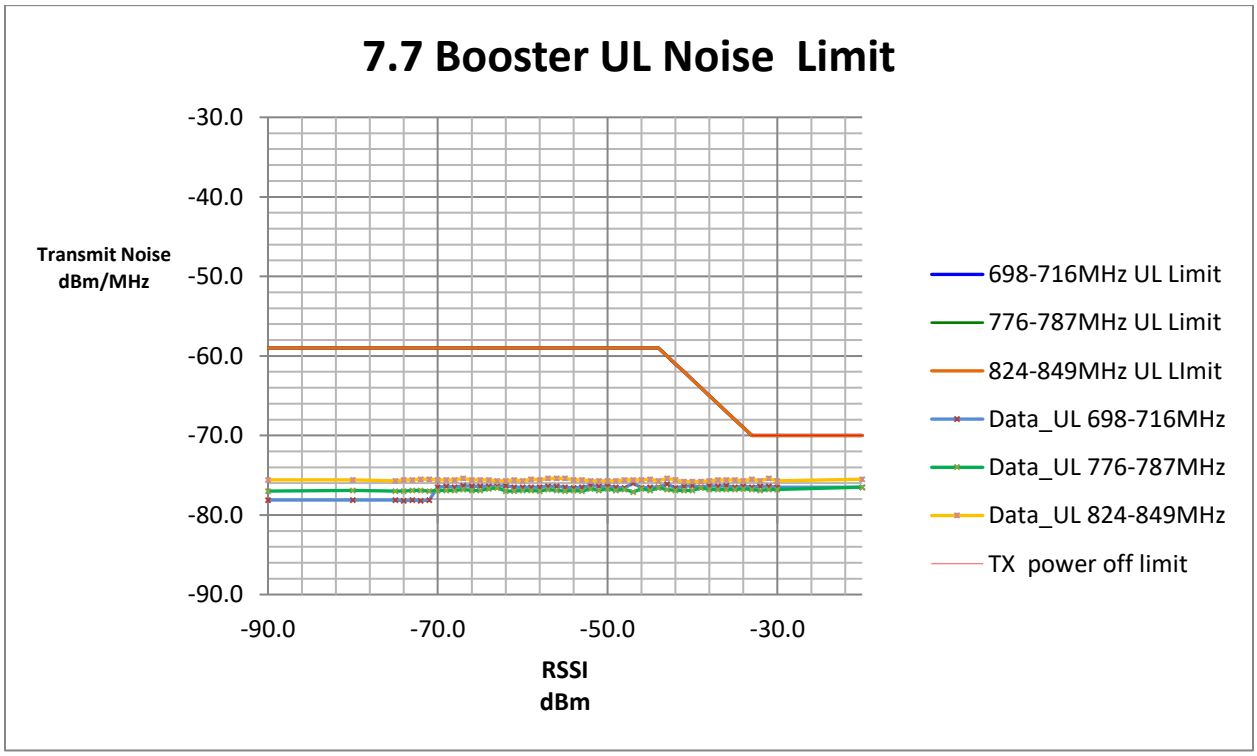
7.7.1 h-n: Maximum transmitter noise when varying the DL signal generator output level with a 4.1MHz AWGN signal.

Note: The internal attenuation for variable noise measurements was set higher than for maximum transmit noise measure.



1710.0 - 1755.0 MHz					
		Limit			Margin
RSSI (dBm)	Measured Noise (dBm/MHz)	RSSI Dependent	Mobile Booster	TX off	
-90.0	-79.5		-59.0		-20.5
-80.0	-79.4		-59.0		-20.4
-75.0	-79.4		-59.0		-20.4
-74.0	-79.4		-59.0		-20.4
-33.0	-78.9	-70.0			-8.9
-34.0	-79.0	-69.0			-10.0
-30.0	-78.7			-70	-8.7

1850.0 - 1915.0 MHz					
		Limit			Margin
RSSI (dBm)	Measured Noise (dBm/MHz)	RSSI Dependent	Mobile Booster	TX off	
-51.0	-78.1		-59.0		-19.1
-70.0	-78.2		-59.0		-19.2
-64.0	-78.2		-59.0		-19.2
-60.0	-78.2		-59.0		-19.2
-33.0	-78.1	-70.0			-8.1
-34.0	-78.3	-69.0			-9.3
-31.0	-78.3			-70	-8.3



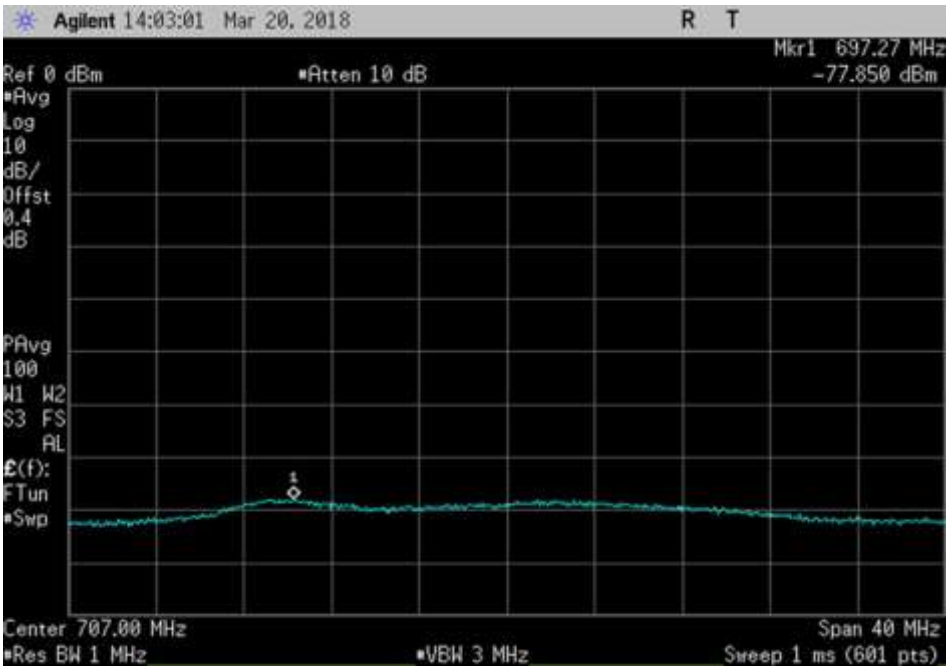
824.0- 849.0 MHz					
		Limit			Margin
RSSI (dBm)	Measured Noise (dBm/MHz)	RSSI Dependent	Mobile Booster	TX off	
-67.0	-75.4		-59.0		-16.4
-57.0	-75.4		-59.0		-16.4
-56.0	-75.4		-59.0		-16.4
-55.0	-75.4		-59.0		-16.4
-33.0	-75.5	-70.0			-5.5
-34.0	-75.7	-69.0			-6.7
-31.0	-75.4			-70	-5.4

698.0- 716.0 MHz					
		Limit			Margin
RSSI (dBm)	Measured Noise (dBm/MHz)	RSSI Dependent	Mobile Booster	TX off	
-47.0	-76.0		-59.0		-17.0
-67.0	-76.3		-59.0		-17.3
-62.0	-76.3		-59.0		-17.3
-52.0	-76.3		-59.0		-17.0
-33.0	-76.5	-70.0			-6.5
-34.0	-76.4	-69.0			-7.4
-32.0	-76.4			-70	-16.1

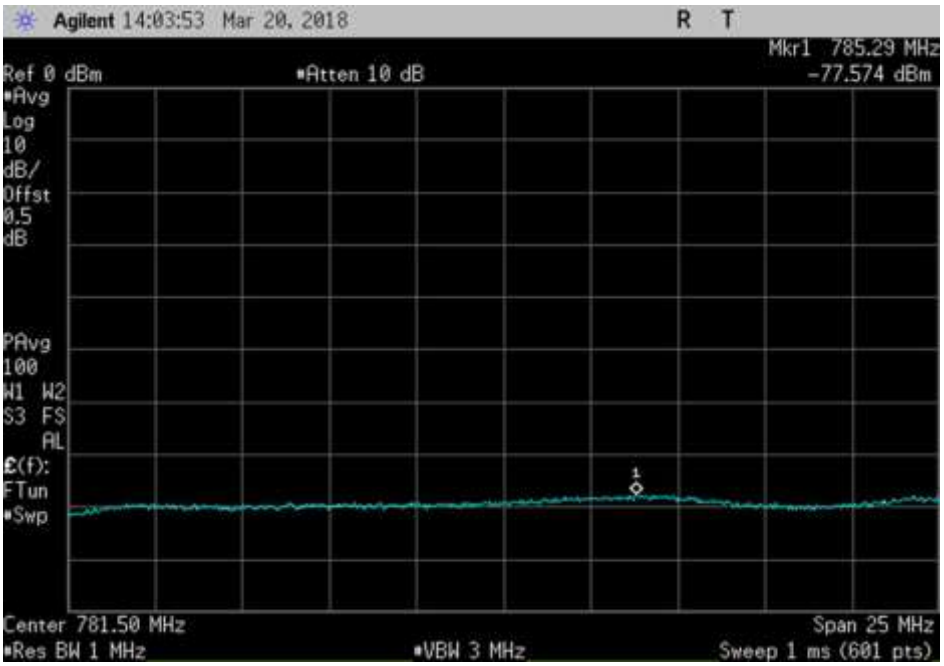
776.0- 787.0 MHz					
		Limit			Margin
RSSI (dBm)	Measured Noise (dBm/MHz)	RSSI Dependent	Mobile Booster	TX off	
-63.0	-76.6		-59.0		-17.6
-44.0	-76.6		-59.0		-17.6
-64.0	-76.7		-59.0		-17.7
-52.0	-76.7		-59.0		-17.7
-43.0	-76.8	-43.0			-16.8
-42.0	-76.9	-42.0			-15.9
-20.0	-76.5				-6.5

7.7.1 Maximum Transmitter Noise Power Level

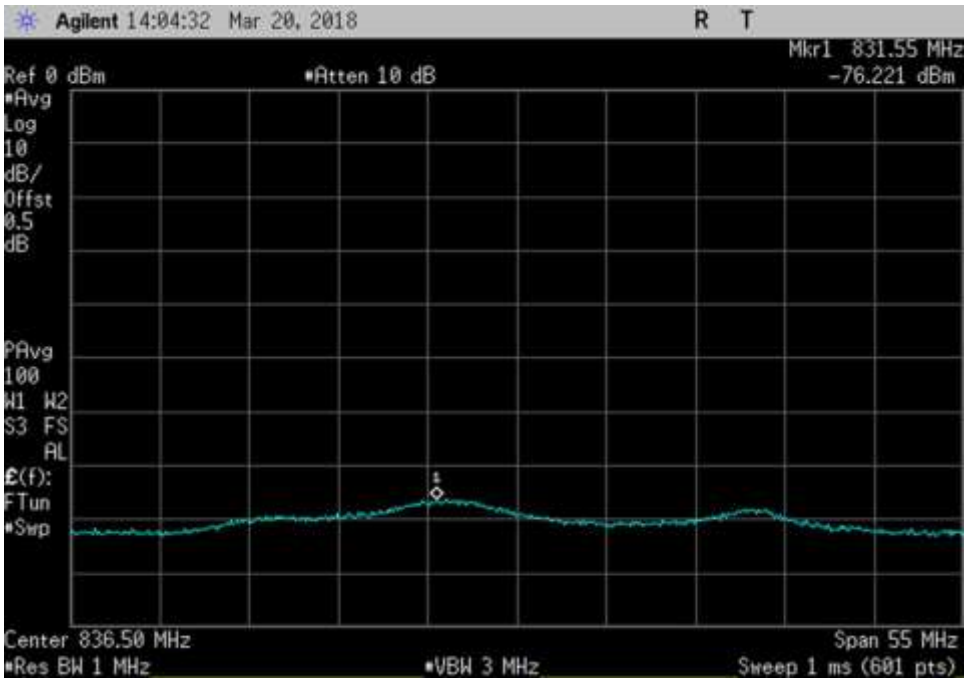
Plots



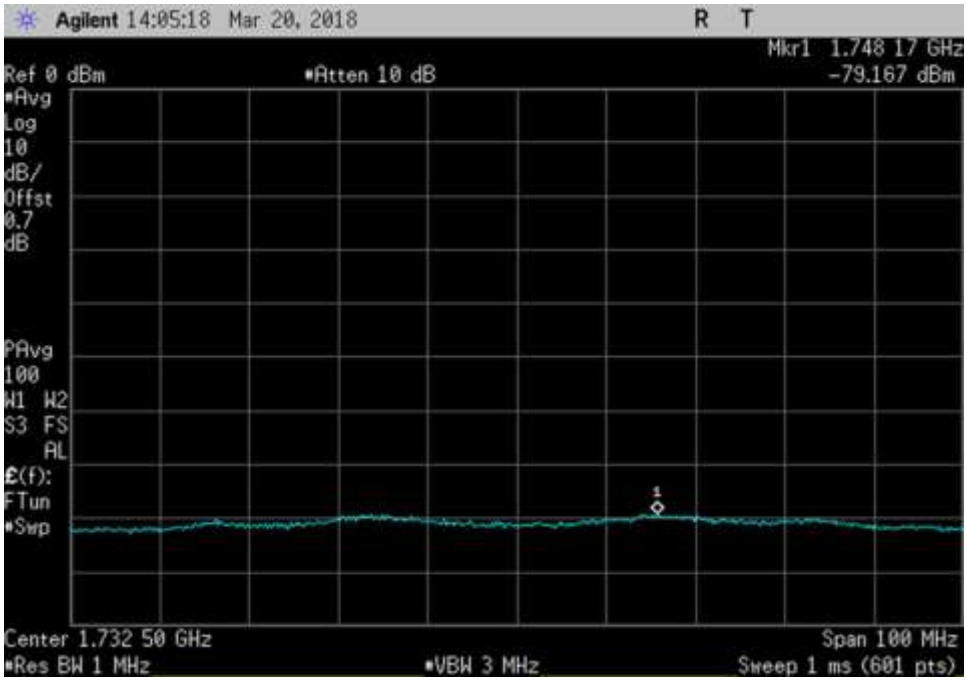
UL_698-716_ 707MHz



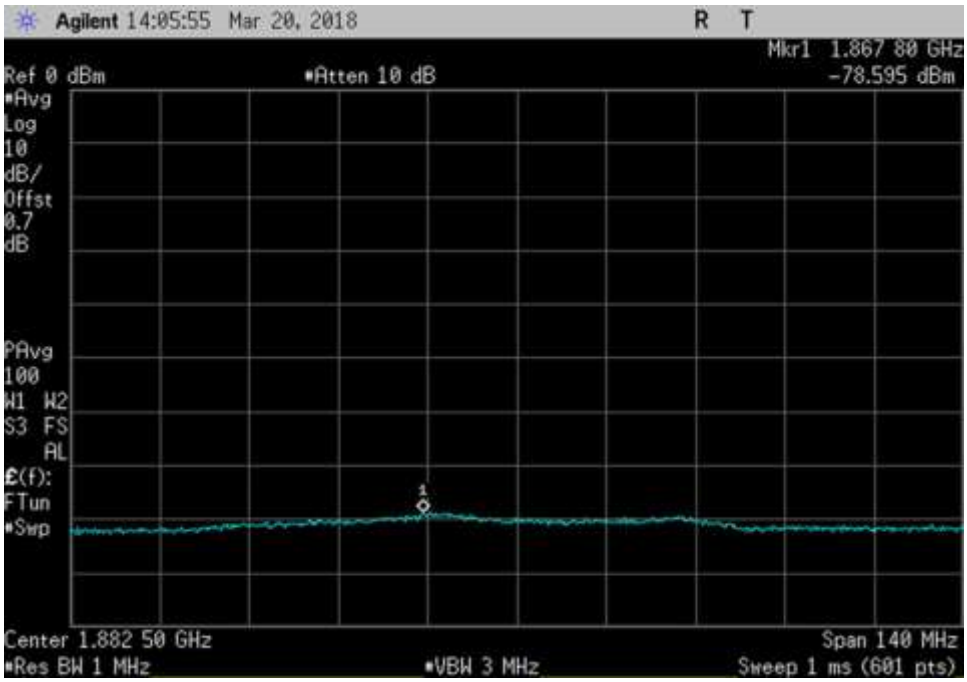
UL_776-787_ 781.5MHz



UL_824-849_ 836.5MHz



UL_1710-1755_ 1732.5MHz



UL_1850-1915_ 1882.5MHz

7.7.2 Variable UL Noise Timing

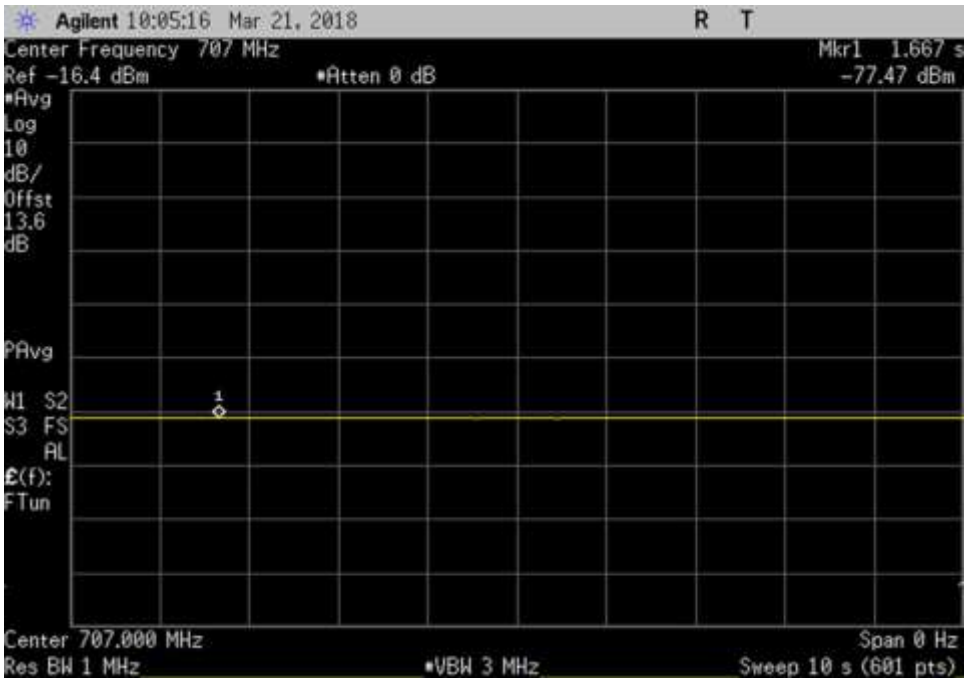
Summary of Results

7.7.2 Variable uplink noise timing

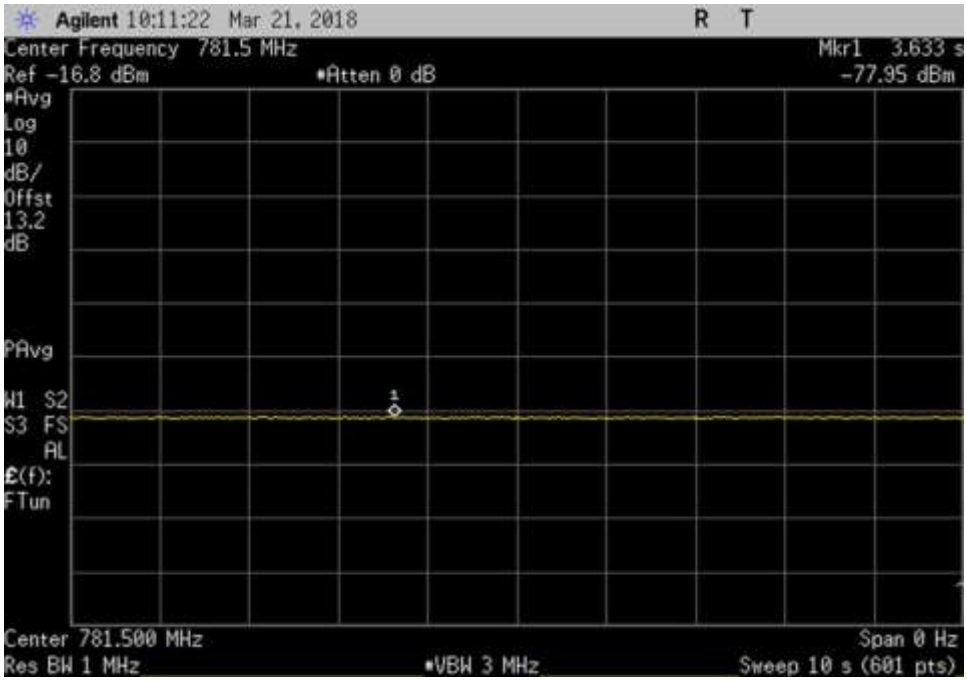
Uplink Noise timing		
Frequency MHz	**Measured Sec**	**Limit sec**
UL1710-1755	<1	1.00
UL1850-1915	<1	1.00
UL824-849	<1	1.00
UL 698-716	<1	1.00
UL776-787	<1	1.00

Note: level of noise power was too low to allow detection of timing.

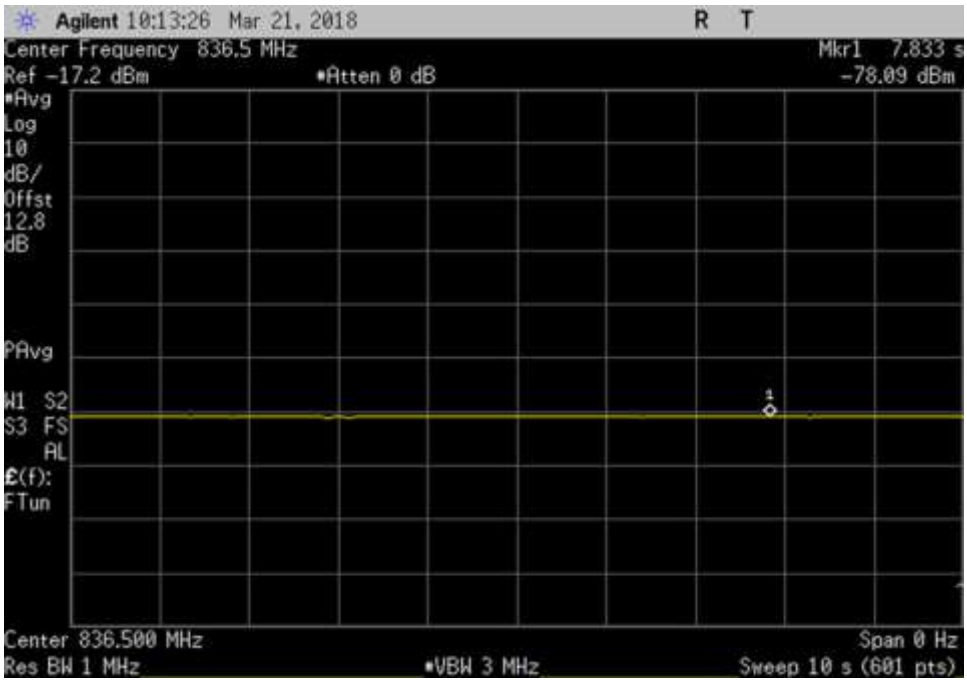
Plots



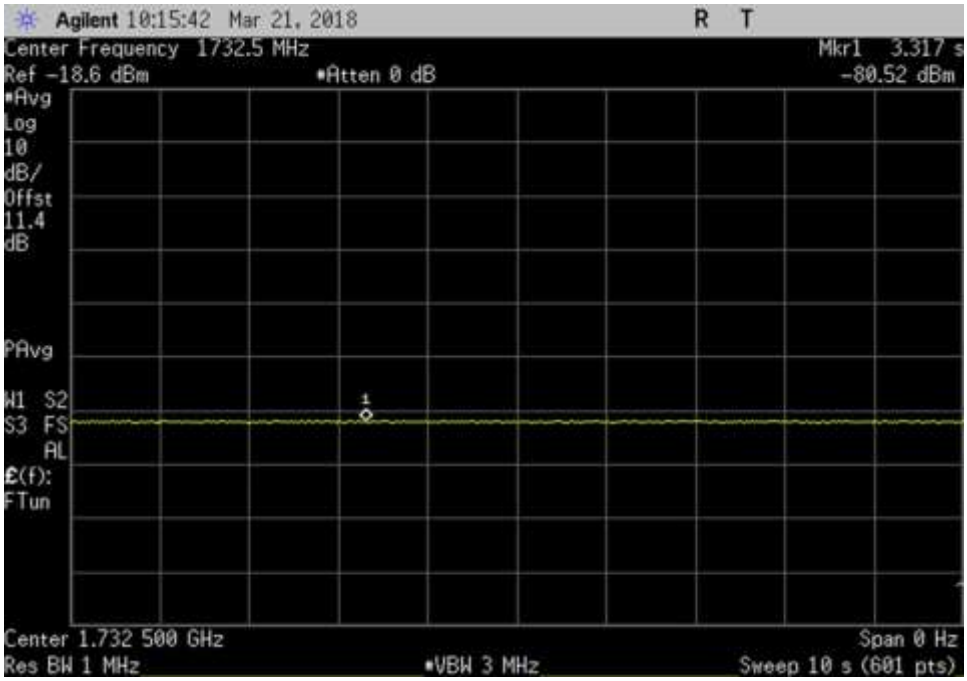
UL_698-716_ 707MHz_VarNoise



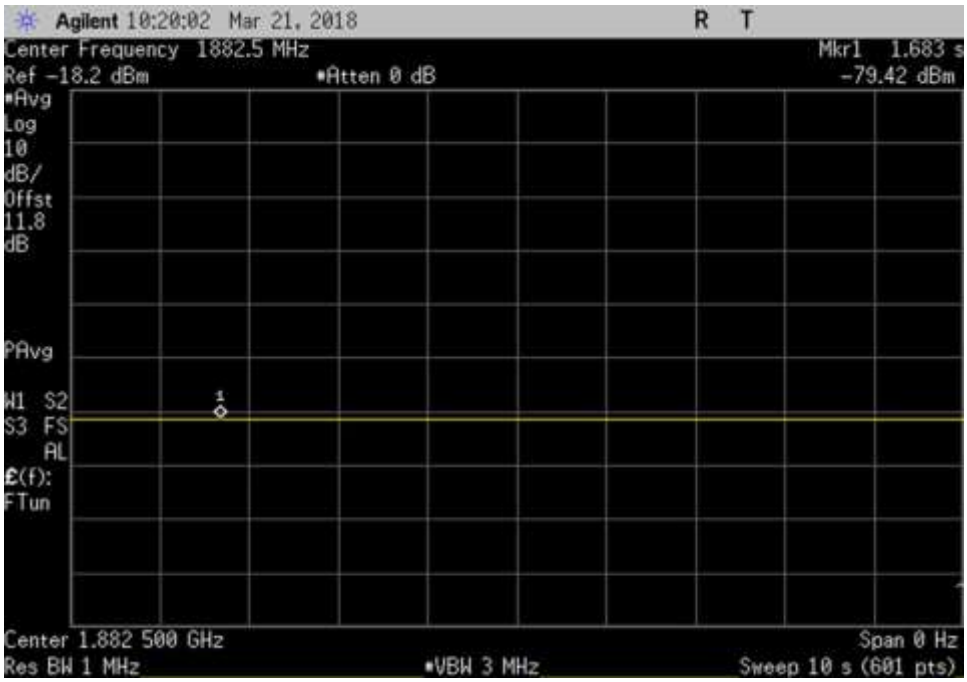
UL_776-787_ 781.5MHz_VarNoise



UL_824-849_ 836.5MHz_VarNoise



UL_1710-1755_ 1732.5MHz_VarNoise



UL_1850-1915_ 1882.5MHz_VarNoise

7.8 Uplink Inactivity

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place. Brea, CA 92821• 714 993 6112		
Customer:	Huaptec		
Specification:	Section 20.21(e)(8)(i)(I) Uplink Inactivity		
Work Order #:	**100428**	Date:	3/26/2018
Test Type:	**Conducted Emissions**		
Tested By:	E. Wong		
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

General test condition.
The equipment under test (EUT) is a Mobile Wideband Consumer Booster with direct contact coupling (cradle-type) antenna.
The EUT is placed on the test bench. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port.
The EUT Donor port is a MCX type connector and 50-ohm impedance.
The EUT Server/DL port /is type UFL connector and 50-ohm impedance.

Part 22
UL: 824-849MHz
DL: 869-894MHz
Part 24
UL: 1850-1915MHz
DL: 1930-1995MHz
Part 27
UL: 1710-1755MHz, 698-716MHz, 776-787MHz
DL: 2110-2155MHz, 728-746MHz, 746-757MHz

Test procedure:
The test was performed in accordance with the FCC document: 935210 D03 Signal Booster Measurements v04r01, dated October 27, 2017.
Firmware: 2.0

Test environment conditions:
Temperature: 20 -25°C
Relative Humidity: 37-45 %
Pressure: 100kPa

Device is powered by a provided 5V USB/12V Automotive adaptor

Test Equipment:

Asset #	Description	Manufacturer	Model	Calibration Date	Cal Due Date
P07037	RF Signal Generator	Agilent	E4432B	10/6/2016	10/6/2018
P06544	Cable	Astro Steel	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
02946	Cable	Astro Steel	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
02672	Spectrum Analyzer	Agilent	E4446A	3/2/2017	3/2/2019
C00082	Directional Coupler	MECA Electronics, Inc.	722-10-1.500V	9/18/2017	9/18/2019
03446	Band Pass Filter	K & L	4FV50-707/H18-O/O	8/16/2017	8/16/2019
03468	Band Pass Filter	K & L	4CS10-781.5/E12.2-O/O	8/16/2017	8/16/2019
03412	Band Pass Filter	Pasternack	PE8705	8/16/2017	8/16/2019
03447	Band Pass Filter	Pasternack	PE8710	8/16/2017	8/16/2019
03414	Band Pass Filter	Pasternack	PE8707	8/16/2017	8/16/2019
06660	Cable	Gore	PHASEFLEX FJR01N01036.0	3/31/2018	3/31/2020

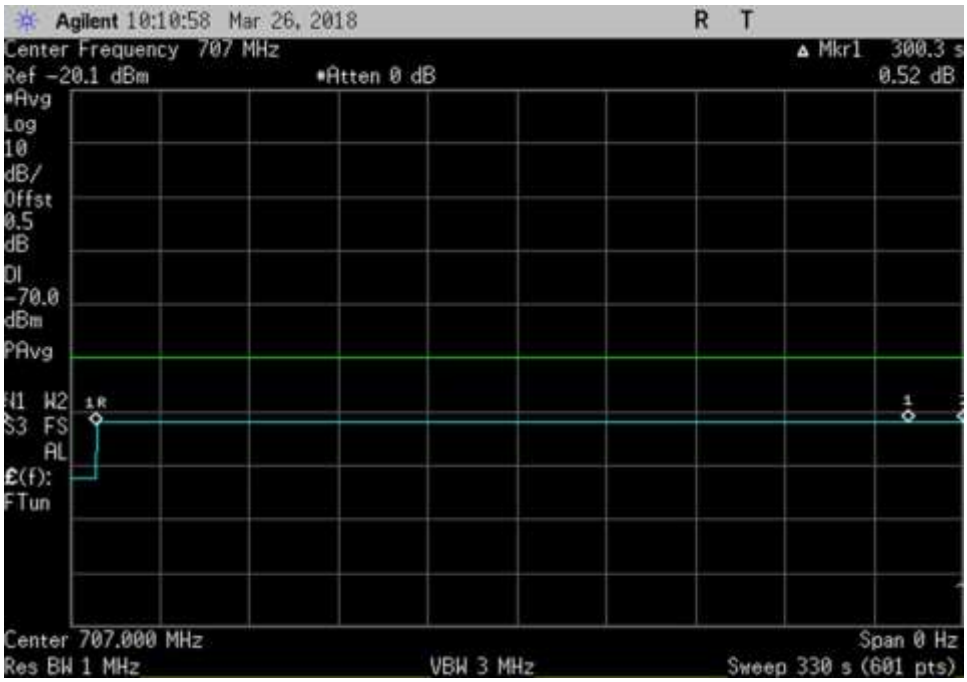
Summary of Results

Pass: As demonstrated, when the booster is not serving an active device connection after 5 minutes the uplink noise power does not exceed -70dBm/MHz

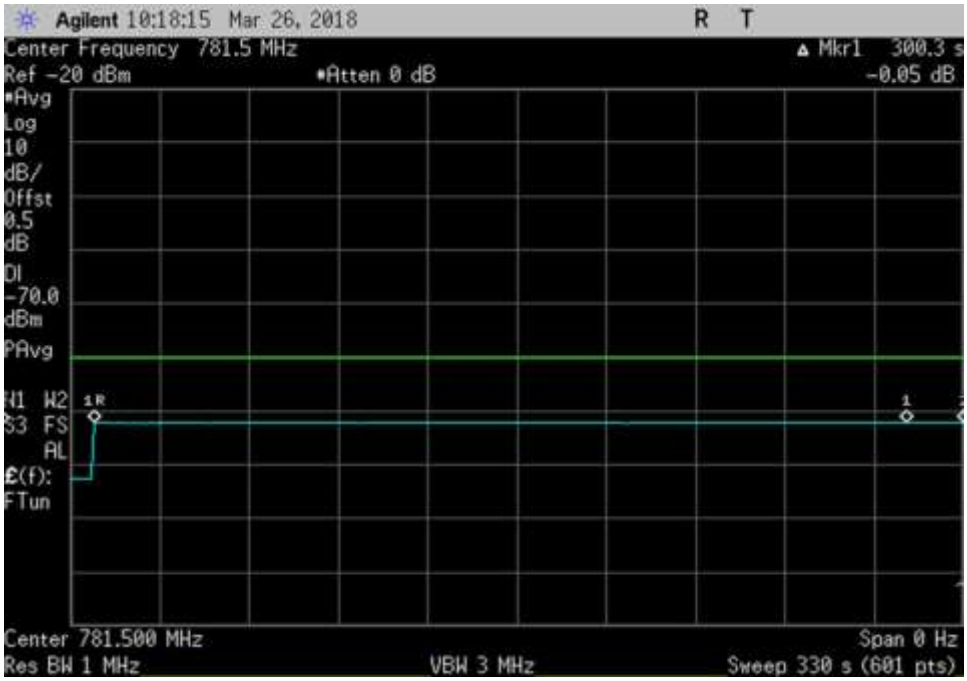
Uplink Inactivity		
Frequency (MHz)	**Measured (Min)**	**Limit (Min)**
UL1710-1755	5.5*	5
UL1850-1915	5.5*	5
UL824-849	5.5*	5
UL 698-716	5.5*	5
UL776-787	5.5*	5

* Measured noise level never exceeds Noise limit upon power up, hence meet comply with requirement.

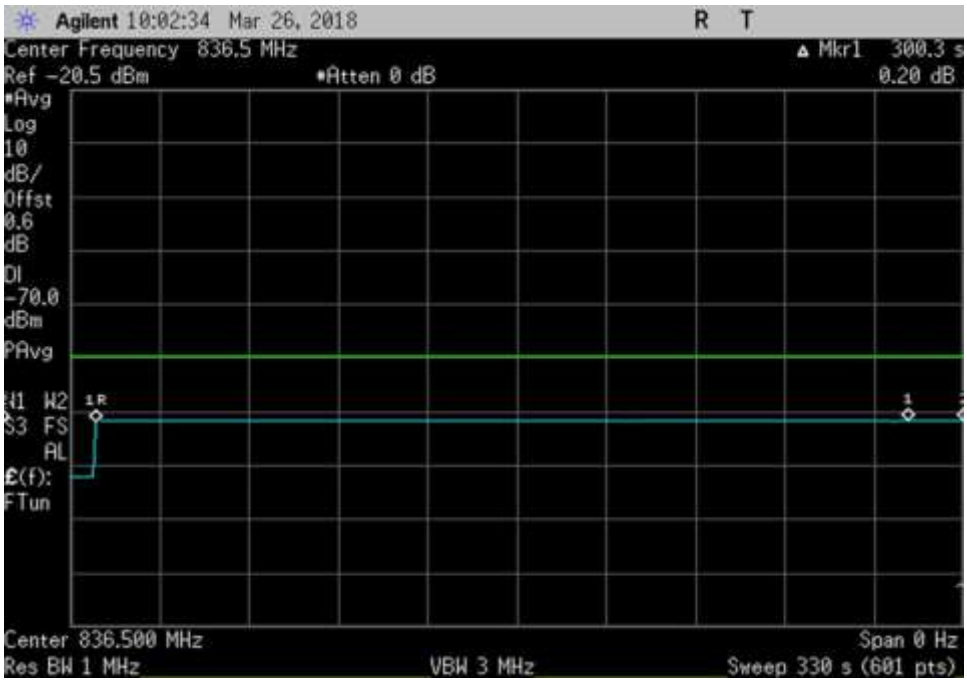
Plots



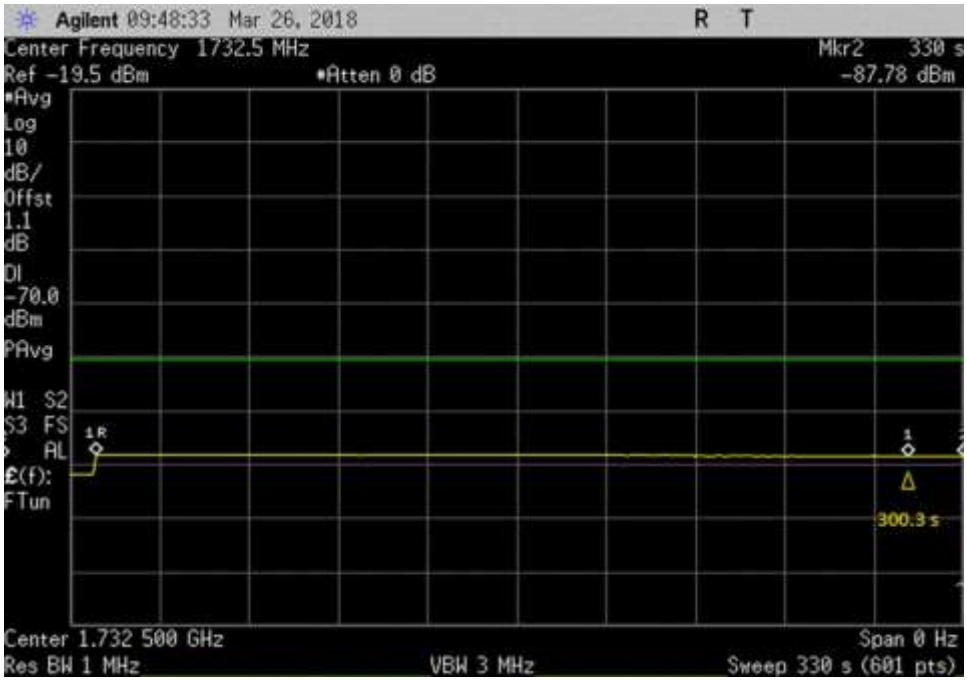
UL_698-716_ 707MHz



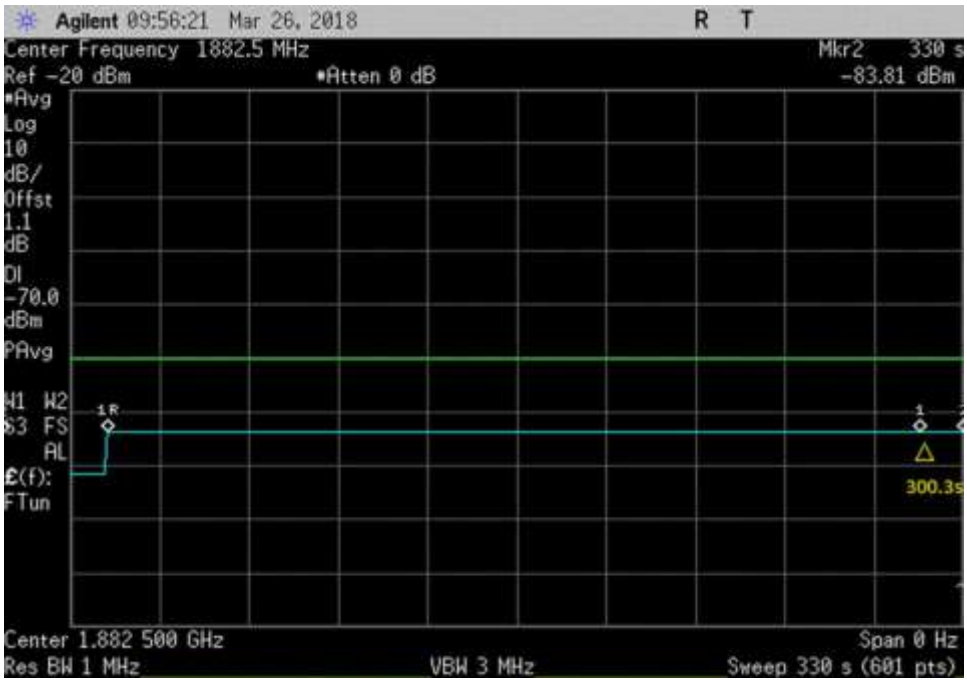
UL_776-787_ 781.5MHz



UL_824-849_ 836.5MHz



UL_1710-1755_ 1732.5MHz_



UL_1850-1915_ 1882.5MHz

7.9 Booster Gain Limit

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc • 110 N. Olinda Place. Brea, CA 92821• 714 993 6112
Customer:	Huaptec
Specification:	Section 20.21(e)(8)(i)(C)(1) Booster Gain Limit. Section 20.21(e)(8)(i)(H) Transmit Power Off Mode
Work Order #:	**100428** Date: 3/26/18
Test Type:	**Conducted Emissions**
Tested By:	E. Wong
Software:	EMITest 5.03.11

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

General test condition.
The equipment under test (EUT) is a Mobile Wideband Consumer Booster with direct contact coupling (cradle-type) antenna.

The EUT is placed on the test bench. Evaluation performed at the Outside (Donor) and Inside (Server) antenna port.
The EUT Donor port is a MCX type connector and 50-ohm impedance.
The EUT Server/DL port /is type UFL connector and 50-ohm impedance.

Part 22
UL: 824-849MHz
DL: 869-894MHz
Part 24
UL: 1850-1915MHz
DL: 1930-1995MHz
Part 27
UL: 1710-1755MHz, 698-716MHz, 776-787MHz
DL: 2110-2155MHz, 728-746MHz, 746-757MHz

Test procedure:
The test was performed in accordance with the FCC document: 935210 D03 Signal Booster Measurements v04r01, dated October 27, 2017.
Firmware: 2.0

Test environment conditions:
Temperature: 20 -25°C
Relative Humidity: 37-45 %
Pressure: 100kPa
Device is powered by a provided 5V USB/12V Automotive adaptor

Measured MSCL

The minimum MSCL are shown in the following table

Uplink Frequency (MHz)	707	781.5	836.5	1732.5	1882.5
Minimum MSCL (dB)	15.14	18.93	16.80	11.42	11.31

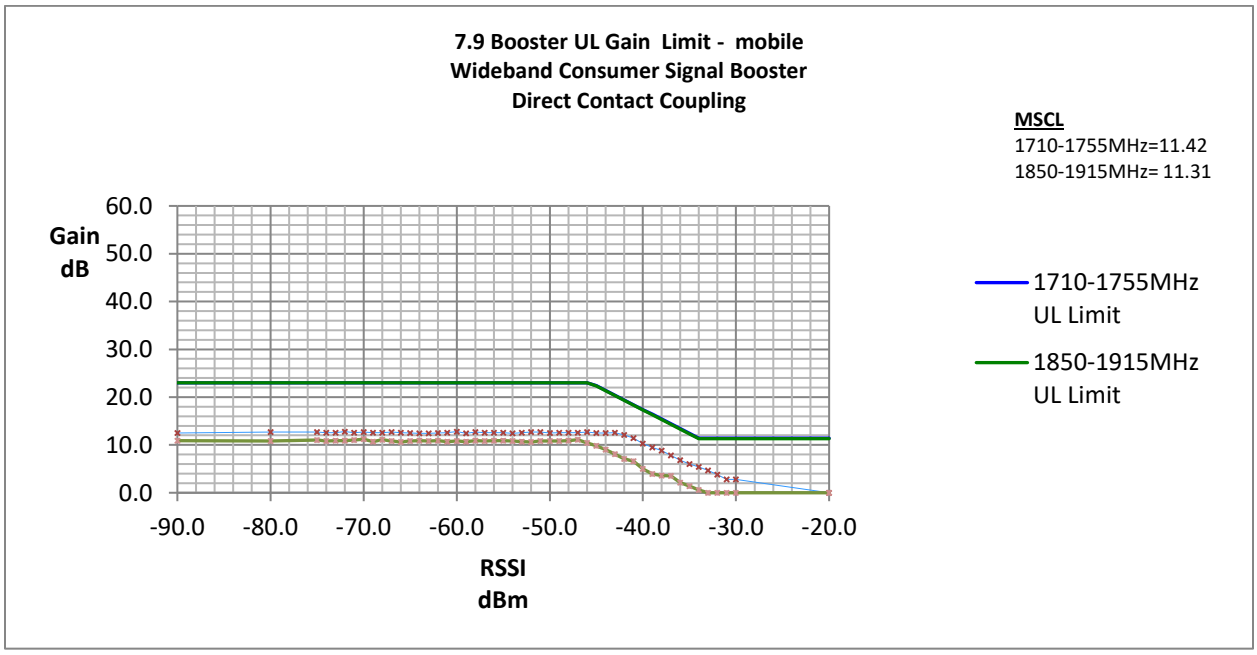
Test Equipment:

Asset #	Description	Manufacturer	Model	Calibration Date	Cal Due Date
P07037	RF Signal Generator	Agilent	E4432B	10/6/2016	10/6/2018
02946	Cable	Astro Steel	32026-29094K-29094K-36TC	12/21/2017	12/21/2019
02672	Spectrum Analyzer	Agilent	E4446A	3/2/2017	3/2/2019
C00082	Directional Coupler	MECA Electronics, Inc	722-10-1.500V	9/18/2017	9/18/2019
06660	Cable	Gore	PHASEFLEX FJR01N01036.0	3/31/2018	3/31/2020

Summary of Results

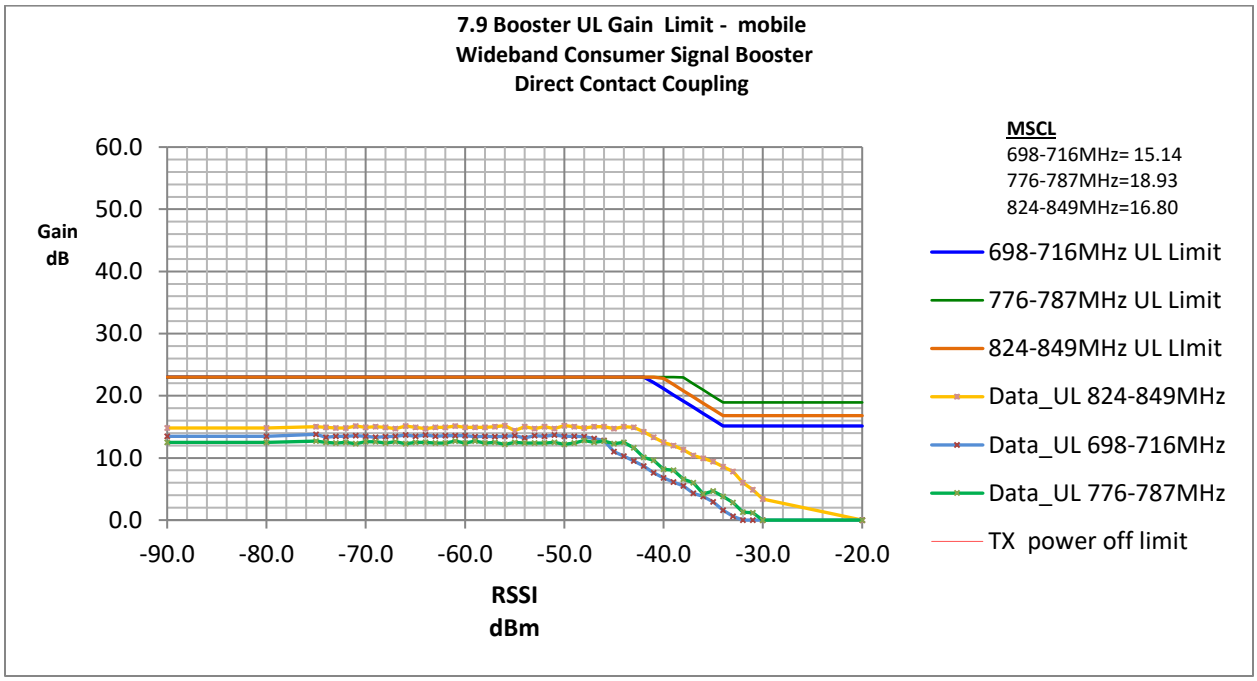
Pass: As demonstrated, computed gains are within the gain limit. All maximum variable uplink gain timings are within 1 second limit.

7.9.1 Variable gain



1710.0- 1755.0 MHz							
				Limit			Margin
RSSI (dBm)	Input (dBm)	Measured Output (dBm)	Measured Gain (dB)	RSSI Dependent	Mobile Booster	TX off	
-60.0	1.7	14.5	12.8	-	23.0	-	-10.2
-72.0	1.7	14.5	12.8	-	23.0	-	-10.2
-46.0	1.7	14.4	12.7	-	23.0	-	-10.3
-35.0	1.7	7.7	6.0	12.4	-	-	-6.4
-38.0	1.7	10.5	8.8	15.4	-	-	-6.6
-34.0	1.7	7.1	5.4	-	-	11.42	-6.0

1850.0 - 1915.0 MHz							
				Limit			Margin
RSSI (dBm)	Input (dBm)	Measured Output (dBm)	Measured Gain (dB)	RSSI Dependent	Mobile Booster	TX off	
-70.0	0.3	11.5	11.2	-	23.0	-	-11.8
-68.0	0.3	11.4	11.1	-	23.0	-	-11.9
-47.0	0.3	11.4	11.1	-	23.0	-	-11.9
-37.0	0.3	3.8	3.5	14.3	-	-	-10.8
-35.0	0.3	1.7	1.4	12.3	-	-	-10.9
-34.0	0.3	0.9	0.6	-	-	11.31	-10.7



824.0- 849.0 MHz							
				Limit			Margin
RSSI (dBm)	Input (dBm)	Measured Output (dBm)	Measured Gain (dB)	RSSI Dependent	Mobile Booster	TX off	
-56.0	-0.3	14.9	15.2	-	23.0	-	-7.8
-50.0	-0.3	14.9	15.2	-	23.0	-	-7.8
-71.0	-0.3	14.8	15.1	-	23.0	-	-7.9
-35.0	-0.3	9.1	9.4	17.8	-	-	-8.4
-36.0	-0.3	9.6	9.9	18.8	-	-	-8.9
-34.0	-0.3	8.3	8.6	-	-	16.8	-8.2

698.0- 716.0 MHz							
				Limit			Margin
RSSI (dBm)	Input (dBm)	Measured Output (dBm)	Measured Gain (dB)	RSSI Dependent	Mobile Booster	TX off	
-75.0	-0.9	12.9	13.8	-	23.0	-	-9.2
-66.0	-0.9	12.8	13.7	-	23.0	-	-9.3
-64.0	-0.9	12.8	13.7	-	23.0	-	-9.3
-35.0	-0.9	2.0	2.9	16.1	-	-	-13.2
-36.0	-0.9	2.9	3.8	17.1	-	-	-13.3
-34.0	-0.9	0.7	1.6	-	-	15.14	-13.5

776.0 - 787.0 MHz							
				Limit			Margin
RSSI (dBm)	Input (dBm)	Measured Output (dBm)	Measured Gain (dB)	RSSI Dependent	Mobile Booster	TX off	
-48.0	-1.6	11.2	12.8	-	23.0	-	-10.2
-75.0	-1.6	11.1	12.7	-	23.0	-	-10.3
-61.0	-1.6	11.1	12.7	-	23.0	-	-10.3
-35.0	-1.6	3.1	4.7	19.9	-	-	-15.2
-37.0	-1.6	4.4	6.0	21.9	-	-	-15.9
-34.0	-1.6	2.2	3.8	-	-	18.9	-15.1

7.9.2 Variable uplink gain timing

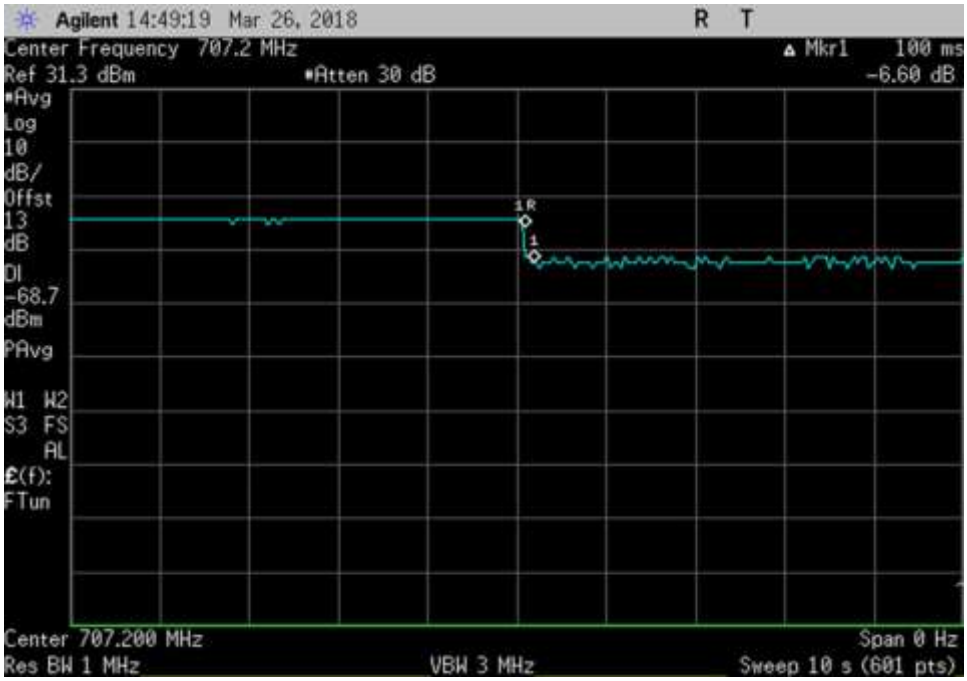
Uplink Gain Timing		
Frequency (MHz)	Measured (Sec)	Limit (Mobile) (sec)
UL 1710-1755	0.30	1.00
UL 1850-1915	0.25	1.00
UL 824-849	0.07	1.00
UL 698-716	0.10	1.00
UL 776-787	0.07	1.00

7.9.1 Maximum Gain

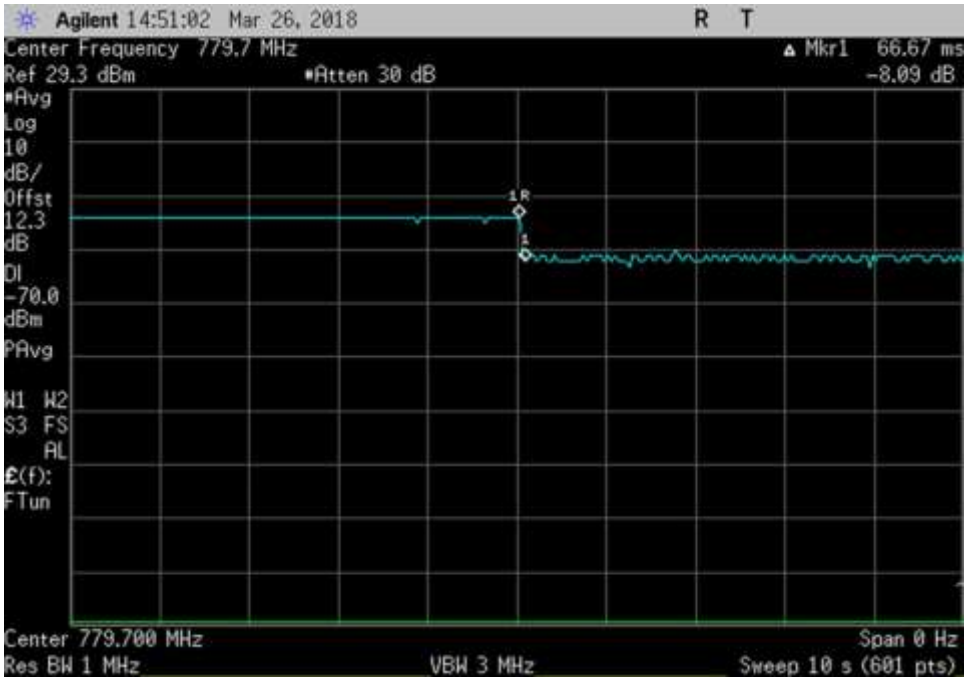
For this subsection, see summary of results of 7.9
7.9.1 Maximum gain

7.9.2 Variable uplink Gain Timing

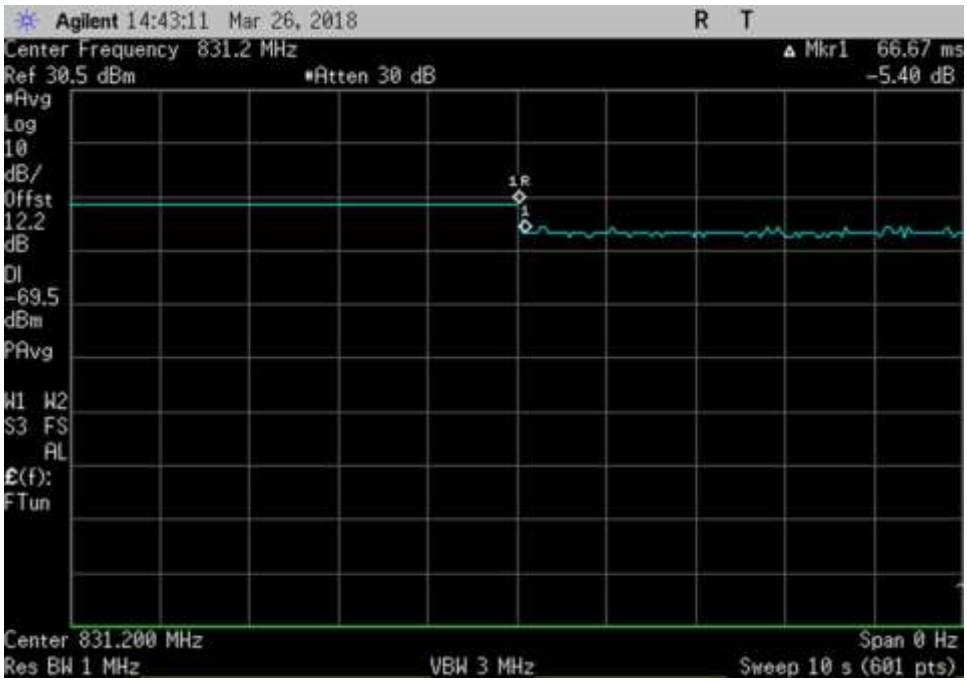
Plots



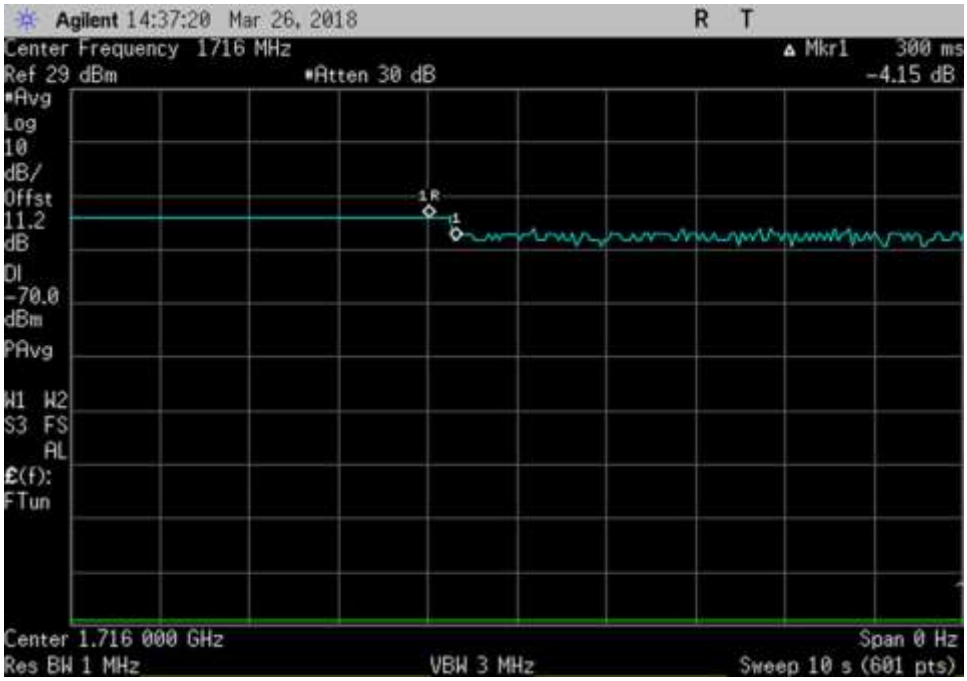
UL_698-716_ 707.2MHz_timing



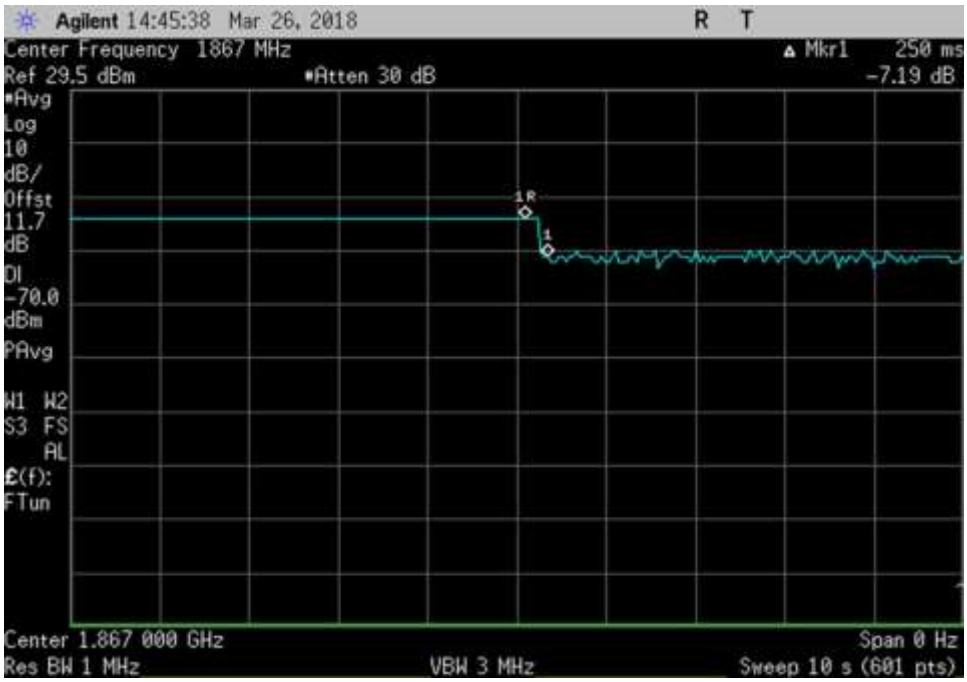
UL_776-787_ 779.7MHz_timing



UL_824-849_ 831.2MHz_timing



UL_1710-1755_ 1716MHz_timing



UL_1850-1915_ 1867MHz_timing