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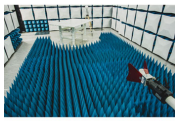

MEASUREMENT REPORT
FCC Part 15F ULTRA WIDEBAND

Applicant Name:
Samsung Electronics Co., Ltd.
129, Samsung-ro,
Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:
06/11 - 08/07/2020
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2008190137-19.A3L

FCC ID:	**A3LSMF916JPN**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model(s):	SCG05
EUT Type:	Portable Handset
ISED Classification:	Ultra Wideband (UWB)
ISED Specification(s):	RSS-220 Issue 1, Amendment 1
UWB Classification:	Hand-held Communication Device
Test Procedure(s):	ANSI C63.10-2013, KDB 393764 D01

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and has been tested in accordance with the measurement procedures specified in ANSI C63.4-2014 (See Test Report). These measurements were performed with no deviation from the standards. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Randy Ortanez
President

ACCREDITED
TESTING CERT#2041.01

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and Innovation, Science and Economic Development Canada.

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST located in Columbia, MD 21046, U.S.A.

- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.

- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).

- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMF916JPN**. The test data contained in this report pertains only to the emissions due to the digital circuitry of the EUT.

Test Device Serial No.: 0030M, 0027M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1900, WCDMA/HSPA, Multi-band LTE, 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer

2.3 Test Configuration

The EUT was tested per the guidance of Section 10 of ANSI C63.10-2013. The EUT setup procedures of ANSI C63.10-203 were used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Section 3.2 for AC line conducted emissions test setups, 3.3 for radiated emissions test setups.

For more information please see Section 7.0 for test data and the test setup photos document for the test setup photographs.

2.4 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedure described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2014) was used in the measurement of the EUT.

Deviation from measurement procedure…….....None

3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 10'x16'x9' shielded enclosure. The shielded enclosure is manufactured by ETS Lindgren RF Enclosures. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is an ETS Lindgren Model LPRX-4X30 (100dB Attenuation, 14kHz-18GHz) and the two EMI/RFI filters are ETS Lindgren Model LRW-2030-S1 (100dB Minimum Insertion Loss, 14kHz – 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference groundplane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 7.7. The EMI Receiver mode of the Agilent MXA was used to perform AC line conducted emissions testing.

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3.3 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Clause 5, Figure 5.7 of ANSI C63.4-2014. A raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. . An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 474788 D01.

3.4 Environmental Conditions

The temperature is controlled within range of 15ºC to 35ºC. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

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4.0 ANTENNA REQUIREMENTS

Except from §15.203 of the FCC Rules/Regulations:

“An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- The antenna(s) of the EUT are permanently attached
- There are no provisions for a connection to an external antenna

The EUT complies with the requirements of §15.203.

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5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (±dB)
Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07

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6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	WL25-1	Conducted Cable Set (25GHz)	7/2/2020	Annual	7/2/2021	WL25-1
-	WL40-1	Conducted Cable Set (40GHz)	3/13/2020	Annual	3/13/2021	WL40-1
Anritsu	ML2495A	Power Meter	12/17/2019	Annual	12/17/2020	941001
Anritsu	MA2411B	Pulse Power Sensor	12/4/2019	Annual	12/4/2020	846215
Anritsu	ML2496A	Power Meter	11/6/2019	Annual	11/6/2020	1405003
Anritsu	MS46322A	Vector Network Analyzer	8/19/2019	Annual	8/19/2020	1521001
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2019	Biennial	10/10/2021	121034
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	2/14/2019	Biennial	2/14/2021	125518
ETS-Lindgren	3816/2NM	Line Impedance Stabilization Network	7/9/2020	Biennial	7/9/2022	114451
ETS-Lindgren	3115	Double Ridged Guide Horn 750MHz - 18GHz	3/12/2020	Biennial	3/12/2022	150693
Pasternack	NMLC-2	Line Conducted Emissions Cable (NM)	1/9/2020	Annual	1/9/2021	NMLC-2
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	11/1/2019	Annual	11/1/2020	100040
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	7/15/2020	Annual	7/15/2021	100342
Rohde & Schwarz	TS-PR40	26.5-40 GHz Pre-Amplifier	11/1/2019	Annual	11/1/2020	100037
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/23/2019	Annual	9/23/2020	100348
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/10/2020	Annual	2/10/2021	102134
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/21/2020	Annual	2/21/2021	102133
Solar Electronics	8012-50-R-24-BNC	Line Impedance Stabilization Network	10/1/2019	Biennial	10/1/2021	310233
Sunol	DRH-118	Horn Antenna (1-18GHz)	10/3/2019	Biennial	10/3/2021	A050307
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	7/27/2020	Biennial	7/27/2022	A051107
Sunol	DRH-118	Horn Antenna (1-18 GHz)	8/27/2019	Biennial	8/27/2021	A042511

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

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7.0 TEST DATA

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMF916JPN

FCC Classification: Ultra Wideband (UWB)

ISED Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
RSS-220 [2], RSS-220 [5.1],	10dB Bandwidth	≥ 500MHz	RADIATED	PASS	Section 7.2
RSS-220 [5.3]	Cessation Time	Transmission shall cease in less than 10s		PASS	Section 7.3
RSS-220 [5.3]	Maximum Peak Power	< 0dBm EIRP in 50MHz BW			Section 7.4
RSS-220 [5.3]	Maximum Average Emission in the range of 3100 – 10600 MHz	< -41.3 EIRP in dBm			Section 7.4
RSS-220 [5.3]	Radiated Emissions Above 960MHz	See table in 15.519(c) for details			Section 7.4, 7.5
RSS-220 [5.3]	Radiated Emissions in the 1164 – 1240Mhz and 1559 – 1610MHz GPS Bands	See table in 15.519 (d) for details			Section 7.5
RSS-220 [5.3], RSS-220 [3.4], RSS-Gen	Radiate Emissions Below 960MHz	Emissions in restricted bands must meet the radiated limits detailed in 15.209			Section 7.6
RSS-Gen	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits (RSS-Gen)	LINE CONDUCTED	PASS	Section 7.7

Table 7-1. Summary of Test Results

Note:

The equipment was capable of operating on two antennas in two separate modes [HPRF and BPRF] as well as with different preambles. Care was taken to ensure the worst case modes were investigated and reported.

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7.2 10dB Bandwidth

§15.503(a), 15.519(b)

Test Overview and Limit

Per the definition of 15.503, the UWB Bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna.

The 10dB bandwidth of the UWB signal must remain fully within the 3100 – 10,600MHz band. The 10dB bandwidth of the UWB signal must also be greater than or equal to 500MHz.

Test Procedures Used

ANSI C63.10-2013 Section 10.1

Test Settings

1. RBW = 1MHz
2. VBW = 3MHz
3. Detector = Peak
4. Span was set wide enough to capture the 10dB points of the signal
5. Trace mode = max hold
6. Sweep = 2s
7. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-1. Test Instrument and Measurment Setup

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ANT	CH	Preamble Id	CONFIG	Mode	PAYLOAD [Bytes]	FL [GHz]	FH [GHz]	fM [GHz]	BW [MHz]	Min BW [MHz]	Pass/Fail
1	9	9	SP0	BPRF	4	7.621	8.238	7.929	617.38	500	P
1	9	9	SP1	BPRF	4	7.621	8.238	7.929	617.38	500	P
1	9	9	SP3	BPRF	4	7.669	8.230	7.950	560.90	500	P
1	9	10	SP0	BPRF	4	7.641	8.219	7.930	578.00	500	P
1	9	10	SP1	BPRF	4	7.643	8.206	7.925	563.00	500	P
1	9	10	SP3	BPRF	4	7.735	8.331	8.033	596.00	500	P
1	9	11	SP0	BPRF	4	7.630	8.298	7.964	668.00	500	P
1	9	11	SP1	BPRF	4	7.631	8.258	7.945	627.00	500	P
1	9	11	SP3	BPRF	4	7.674	8.268	7.971	594.00	500	P
1	9	12	SP0	BPRF	4	7.636	8.229	7.933	593.00	500	P
1	9	12	SP1	BPRF	4	7.636	8.238	7.937	602.00	500	P
1	9	12	SP3	BPRF	4	7.671	8.249	7.960	578.00	500	P
1	9	27	SP0	BPRF	4	7.512	8.099	7.806	587.00	500	P
1	9	27	SP1	BPRF	4	7.675	8.254	7.965	579.00	500	P
1	9	27	SP3	BPRF	4	7.678	8.269	7.974	591.00	500	P
2	9	9	SP0	BPRF	4	7.643	8.178	7.911	535.44	500	P
2	9	9	SP1	BPRF	4	7.642	8.236	7.939	594.00	500	P
2	9	9	SP3	BPRF	4	7.685	8.233	7.959	548.99	500	P
2	9	10	SP0	BPRF	4	7.641	8.177	7.909	536.00	500	P
2	9	10	SP1	BPRF	4	7.642	8.178	7.910	536.00	500	P
2	9	10	SP3	BPRF	4	7.663	8.179	7.921	516.00	500	P
2	9	11	SP0	BPRF	4	7.714	8.214	7.964	500.00	500	P
2	9	11	SP1	BPRF	4	7.676	8.215	7.946	539.00	500	P
2	9	11	SP3	BPRF	4	7.600	8.100	7.850	500.00	500	P
2	9	12	SP0	BPRF	4	7.679	8.214	7.947	535.00	500	P
2	9	12	SP1	BPRF	4	7.676	8.202	7.939	526.00	500	P
2	9	12	SP3	BPRF	4	7.703	8.209	7.956	506.00	500	P
2	9	27	SP0	BPRF	4	7.721	8.225	7.973	504.00	500	P
2	9	27	SP1	BPRF	4	7.720	8.225	7.973	505.00	500	P
2	9	27	SP3	BPRF	4	7.706	8.207	7.957	501.00	500	P

Table 7-2. UWB 10dB Bandwidth Summary

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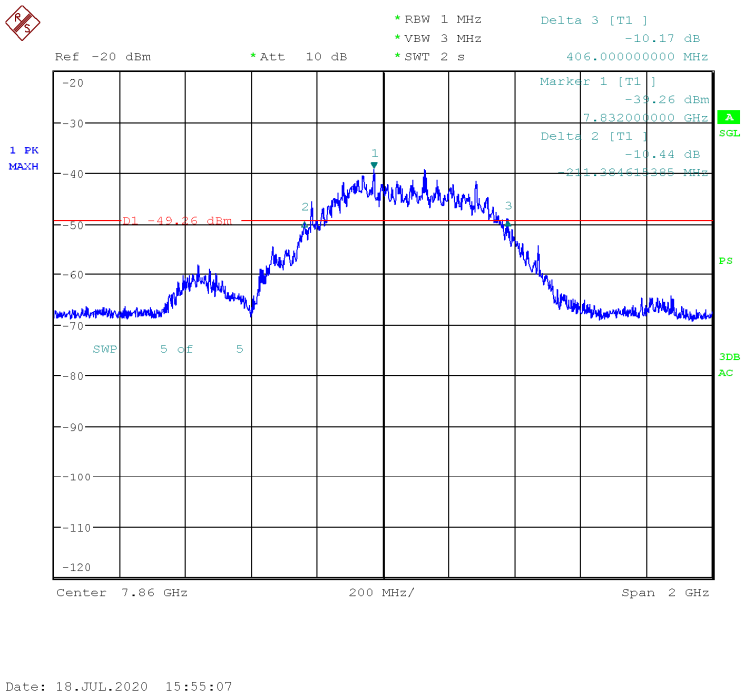
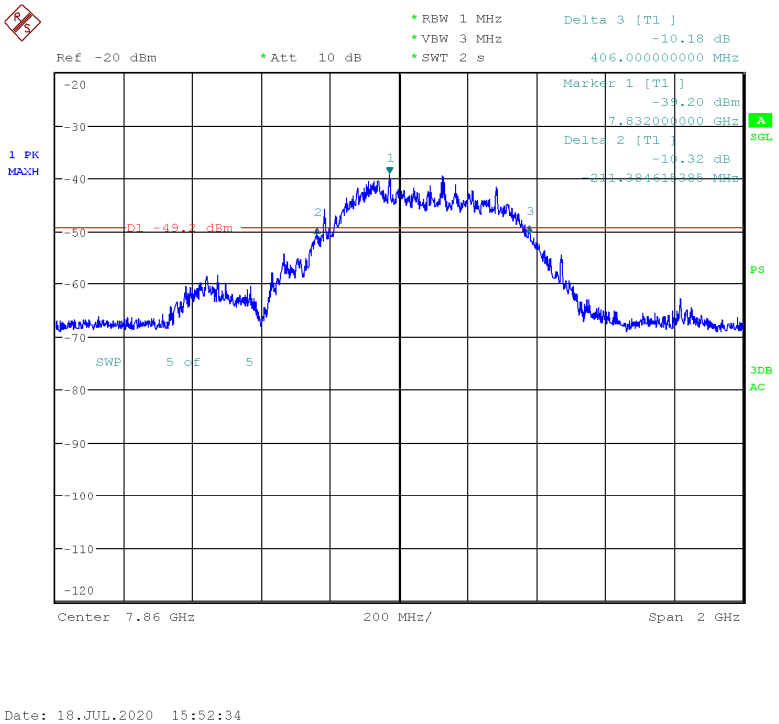
Bandwidth Results



Plot 7-1. BANDWIDTH Plot - ANT1 - CH.9 - SP0 – Preamble 9



Plot 7-2. BANDWIDTH Plot - ANT1 - CH.9 – SP1 – Preamble 9

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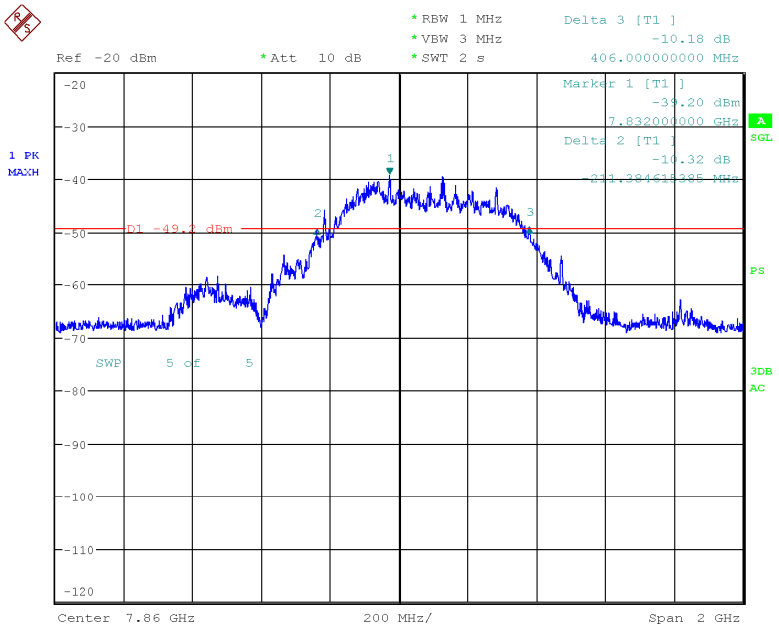

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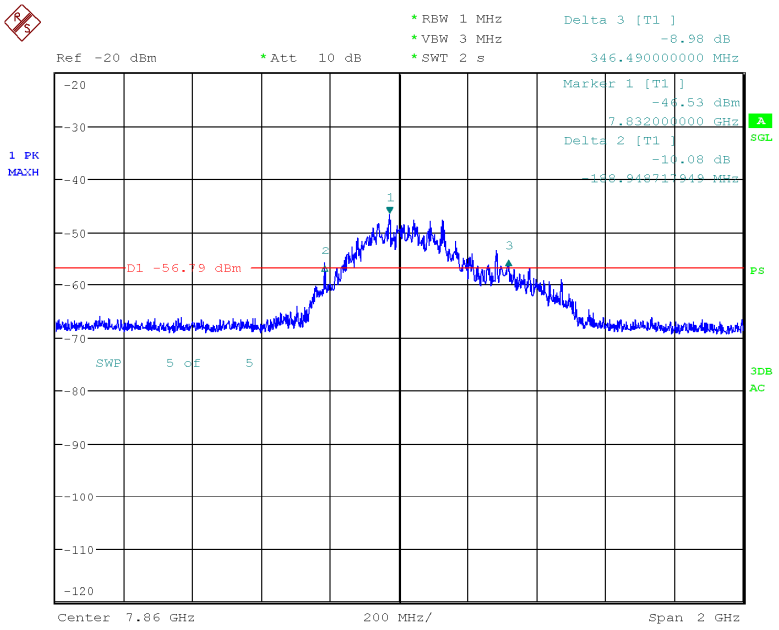
Plot 7-3. BANDWIDTH Plot - ANT1 - CH.9 – SP3 – Preamble 9



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Plot 7-4. BANDWIDTH Plot – ANT2 - CH.9 - SP0 – Preamble 9

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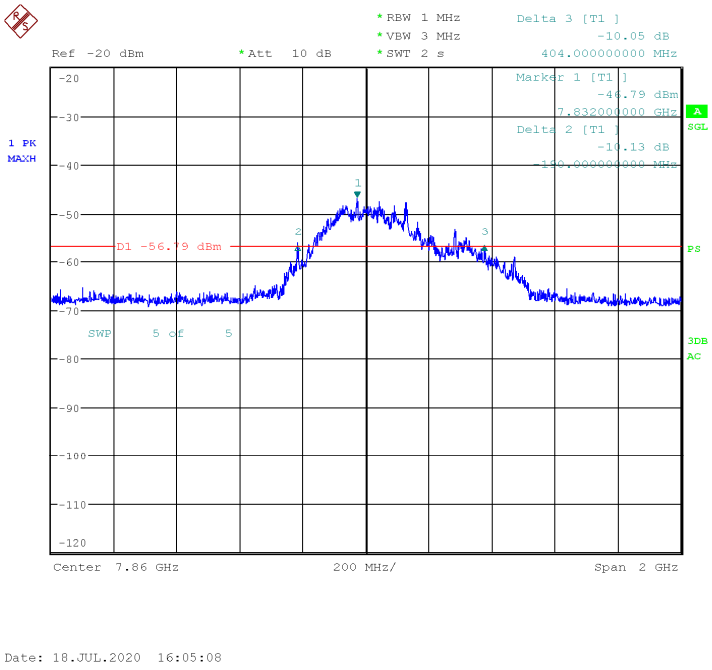
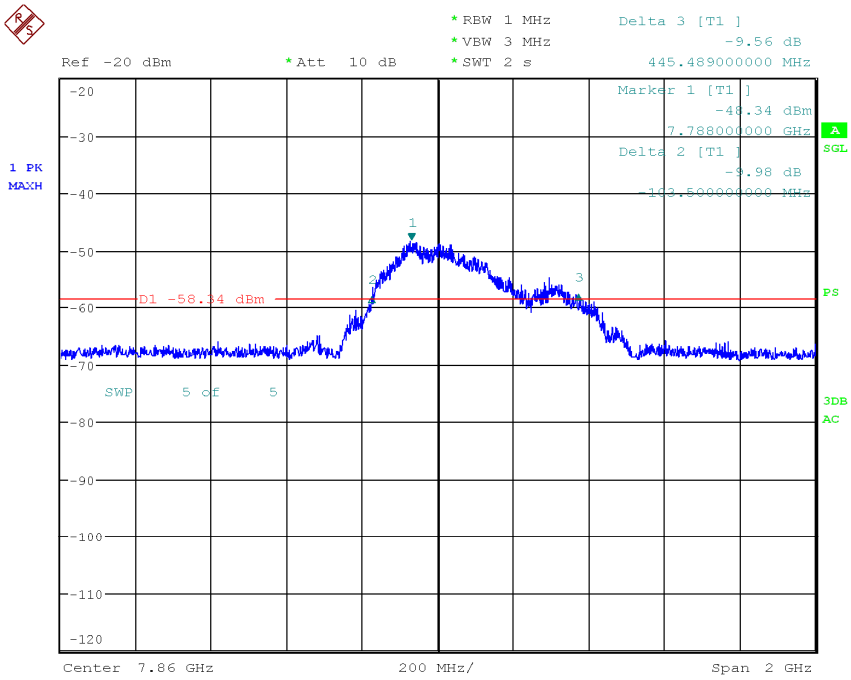


Plot 7-5. BANDWIDTH Plot – ANT2 - CH.9 – SP1 – Preamble 9



Plot 7-6. BANDWIDTH Plot – AN2 - CH.9 – SP3 – Preamble 9

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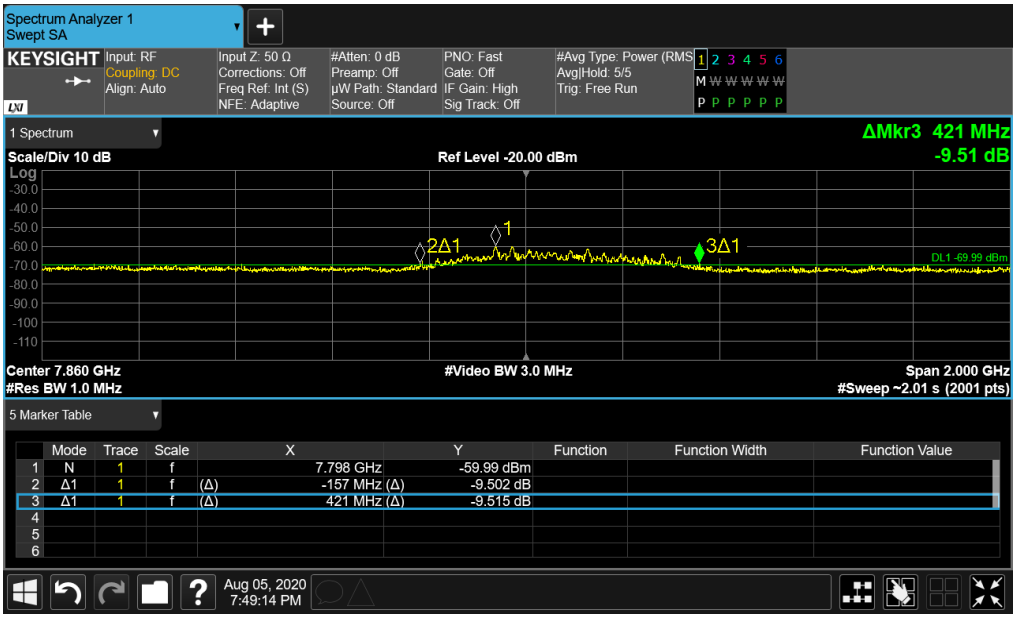
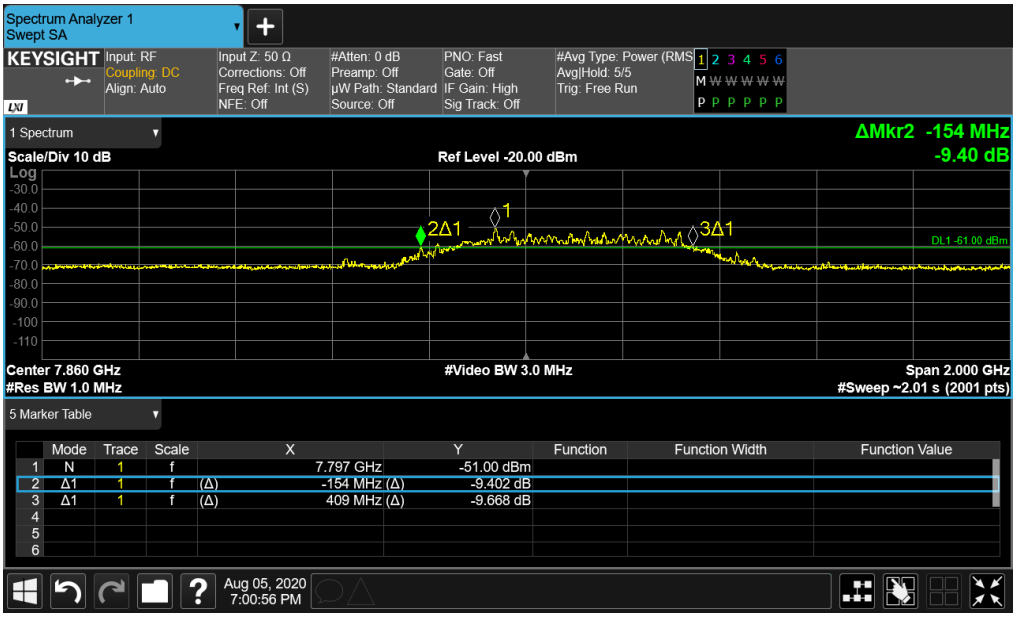


Plot 7-7. BANDWIDTH Plot - ANT1 - CH.9 - SP0 – Preamble 10



Plot 7-8. BANDWIDTH Plot - ANT1 - CH.9 – SP1 – Preamble 10

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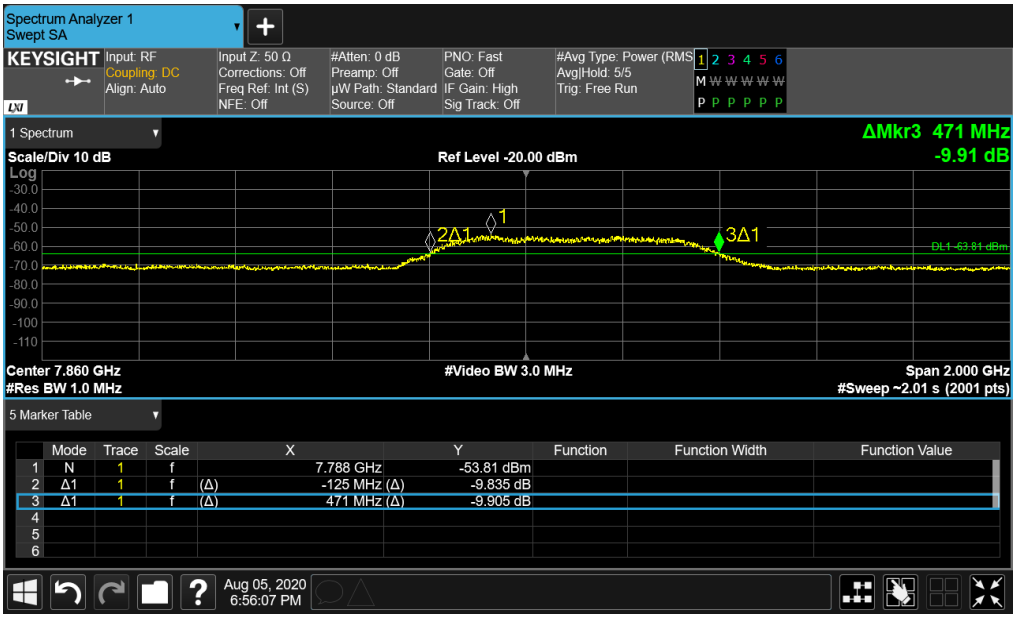
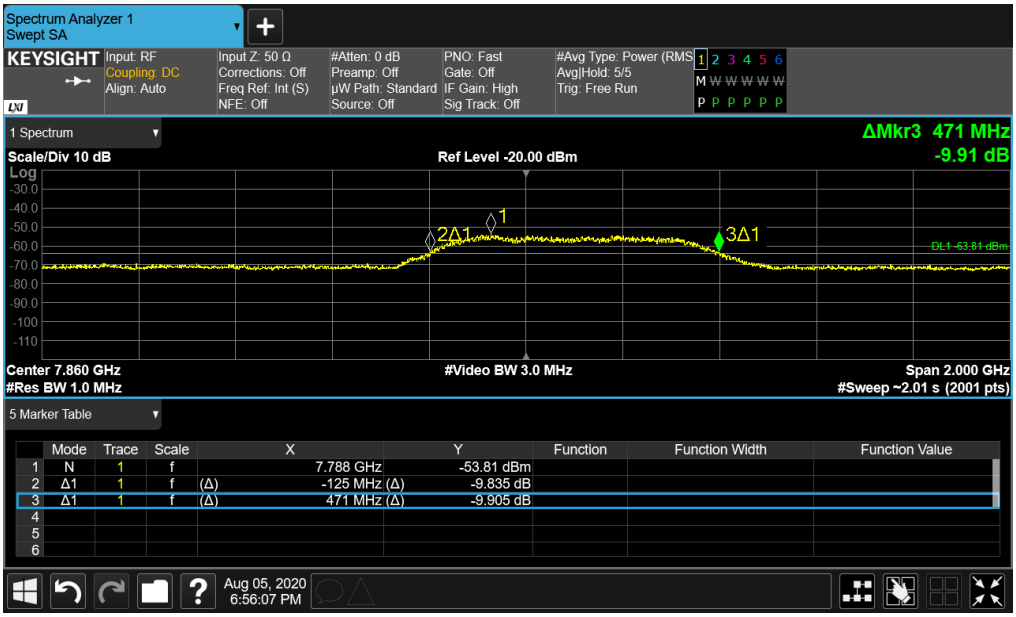


Plot 7-9. BANDWIDTH Plot - ANT1 - CH.9 – SP3 – Preamble 10



Plot 7-10. BANDWIDTH Plot – ANT2 - CH.9 - SP0 – Preamble 10

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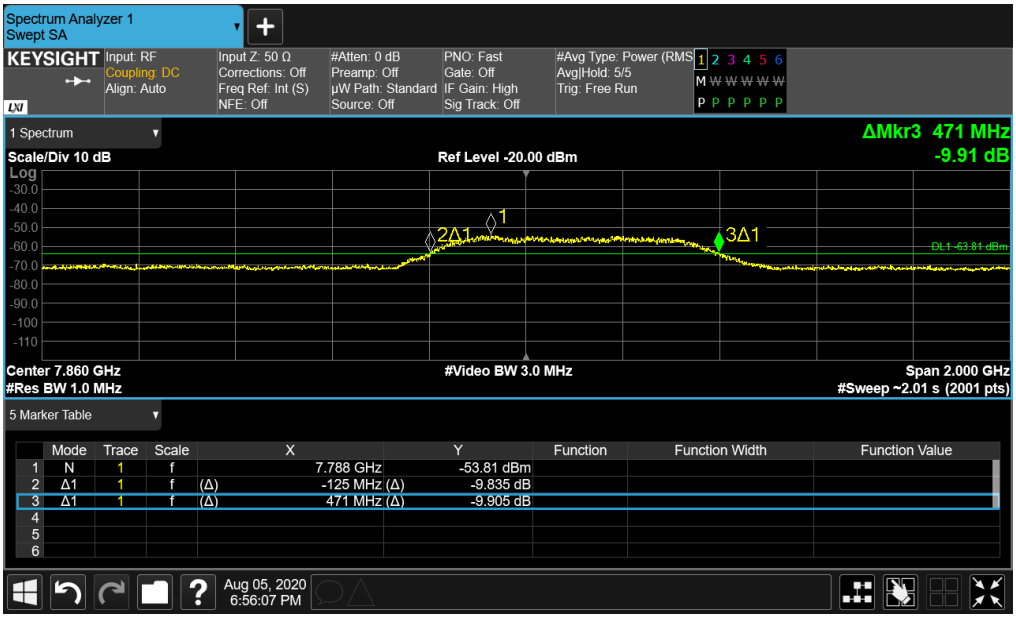
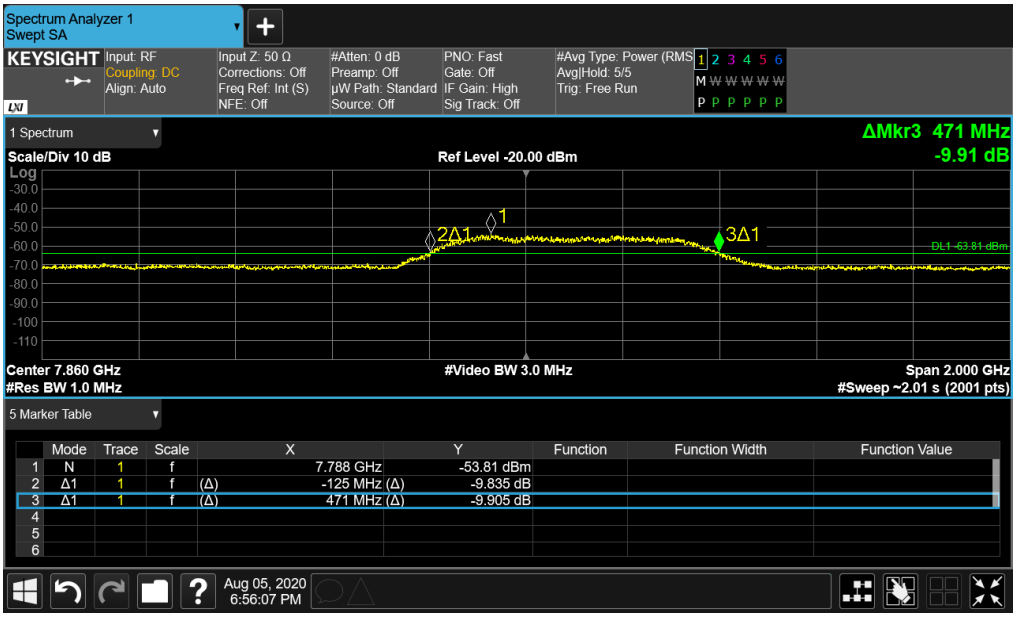


Plot 7-11. BANDWIDTH Plot – ANT2 - CH.9 – SP1 – Preamble 10



Plot 7-12. BANDWIDTH Plot – ANT2 - CH.9 – SP3 – Preamble 10

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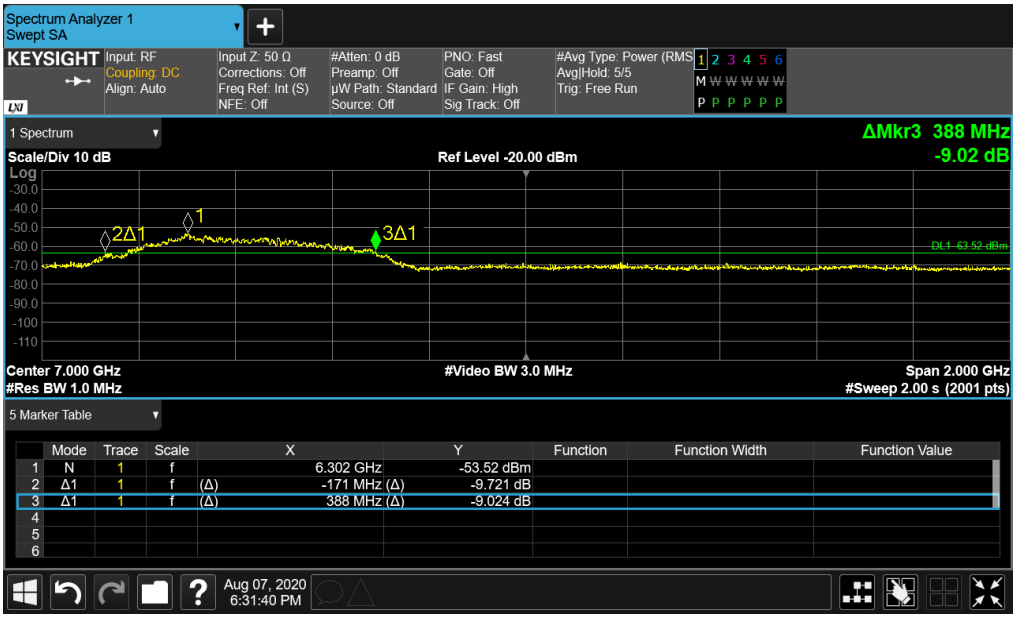
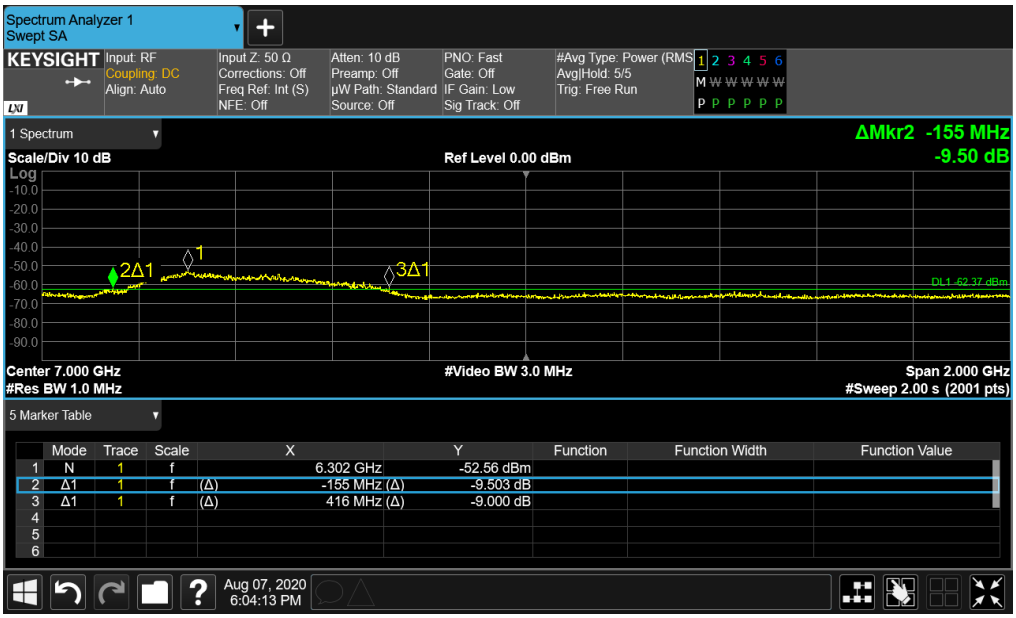


Plot 7-13. BANDWIDTH Plot - ANT1 - CH.9 - SP0 – Preamble 11



Plot 7-14. BANDWIDTH Plot - ANT1 - CH.9 – SP1 – Preamble 11

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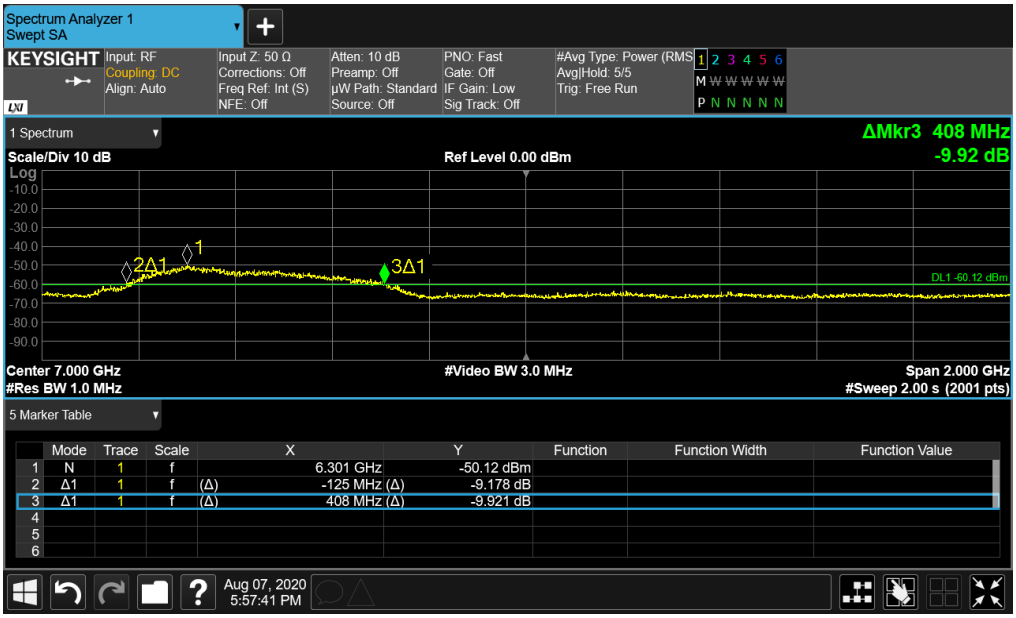
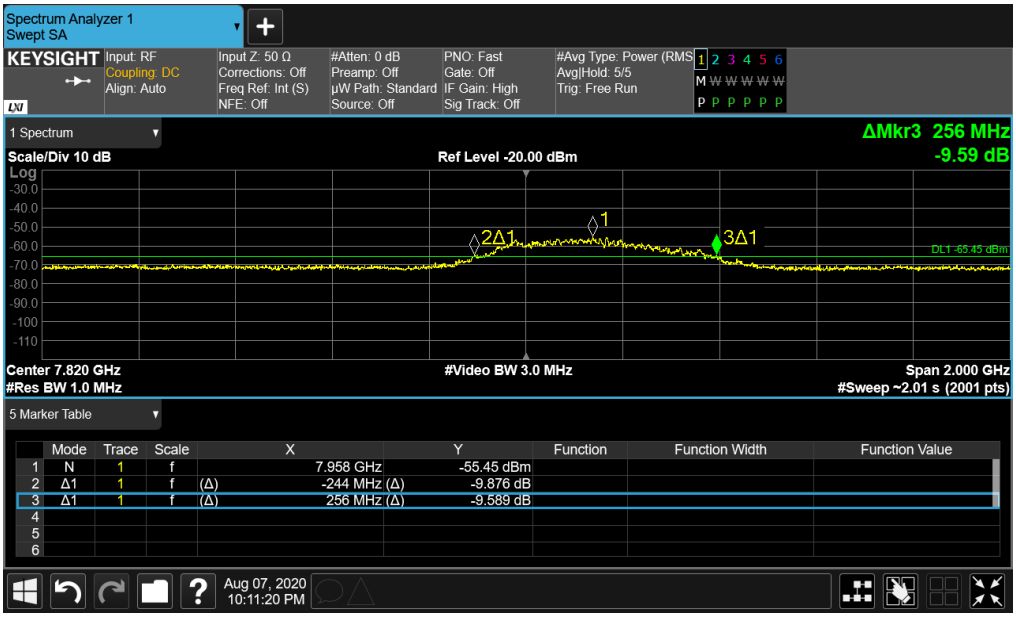


Plot 7-15. BANDWIDTH Plot - ANT1 - CH.9 – SP3 – Preamble 11



Plot 7-16. BANDWIDTH Plot – ANT2 - CH.9 - SP0 – Preamble 11

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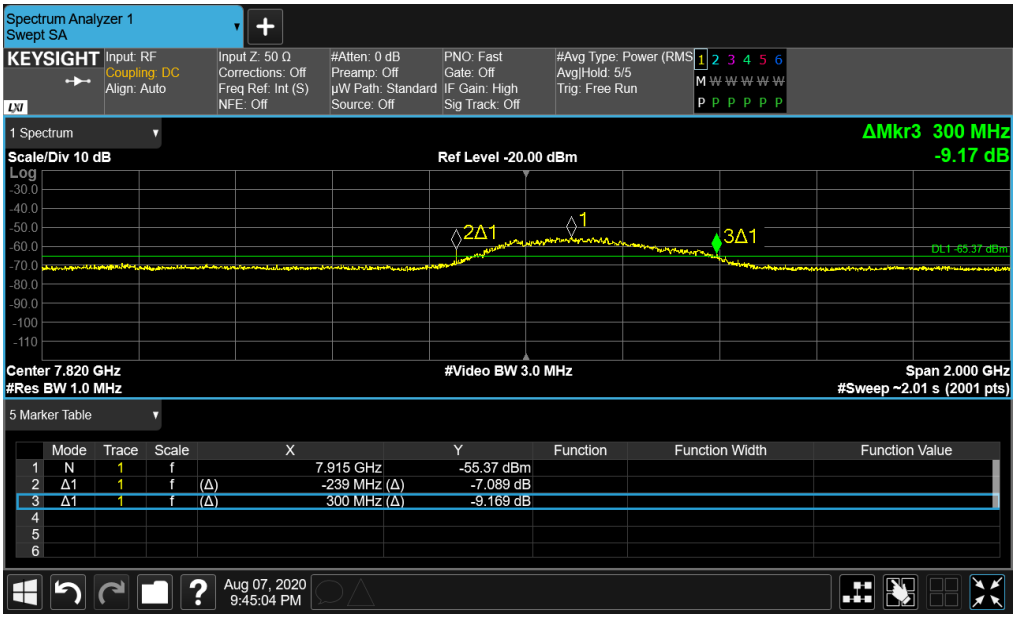
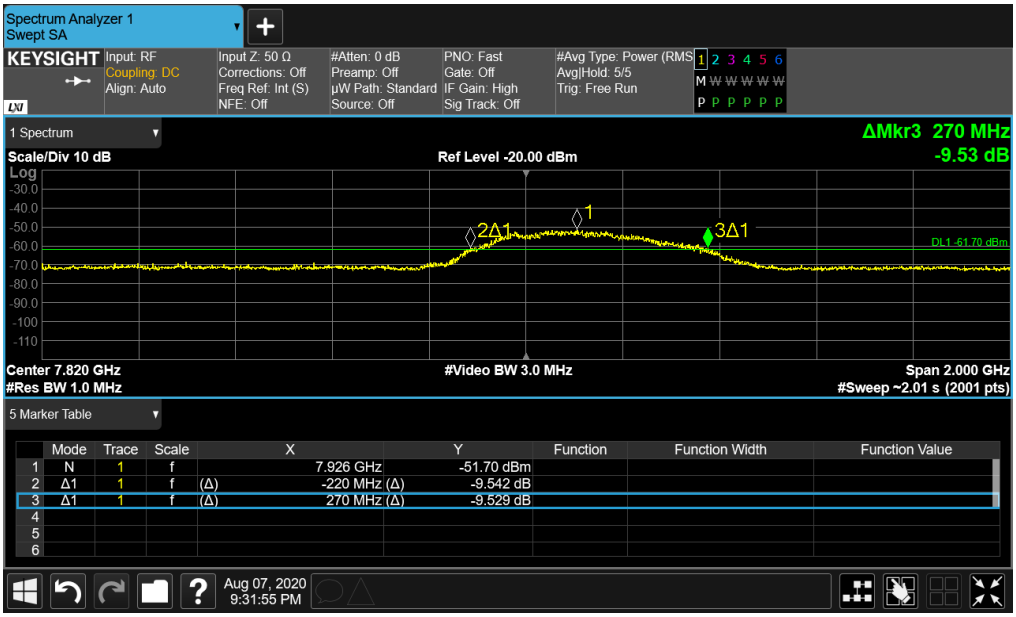


Plot 7-17. BANDWIDTH Plot – ANT2 - CH.9 – SP1 – Preamble 11



Plot 7-18. BANDWIDTH Plot – ANT2 - CH.9 – SP3 – Preamble 11

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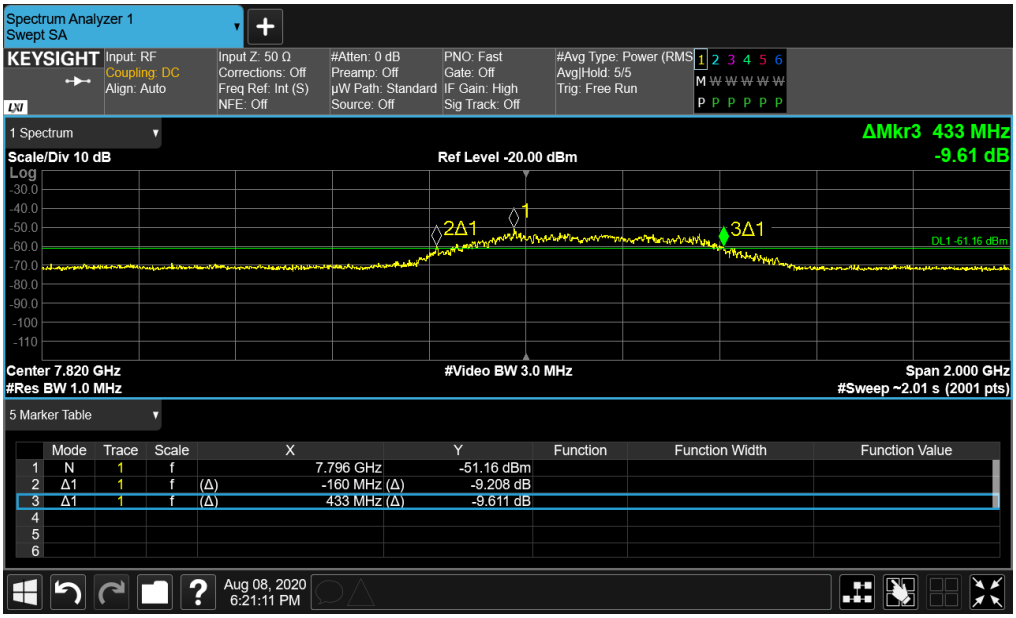
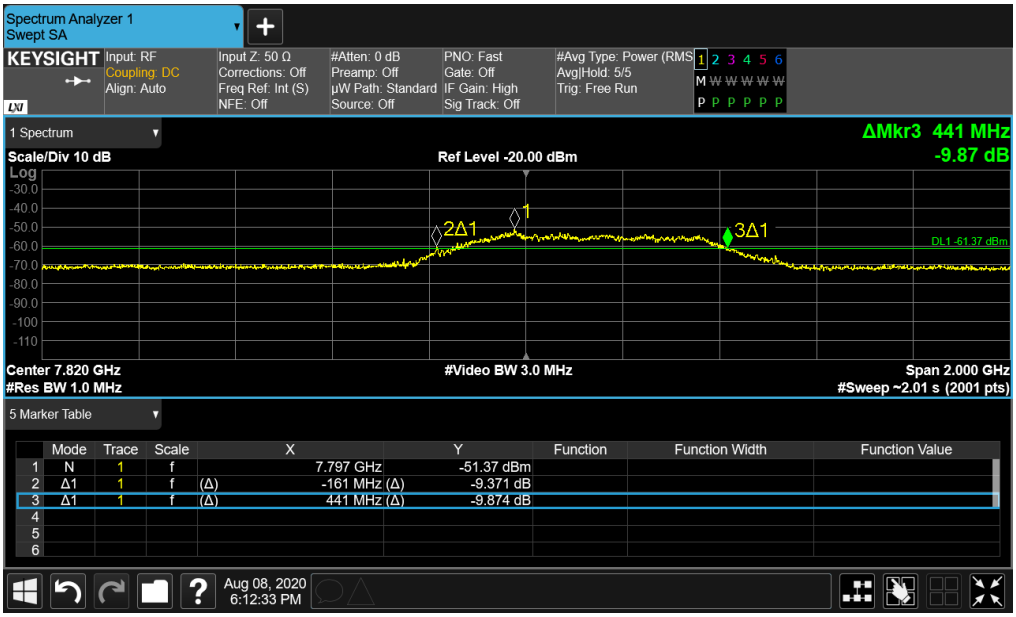


Plot 7-19. BANDWIDTH Plot 7-- ANT1 - CH.9 - SP0 – Preamble 12



Plot 7-20. BANDWIDTH Plot 7-- ANT1 - CH.9 – SP1 – Preamble 12

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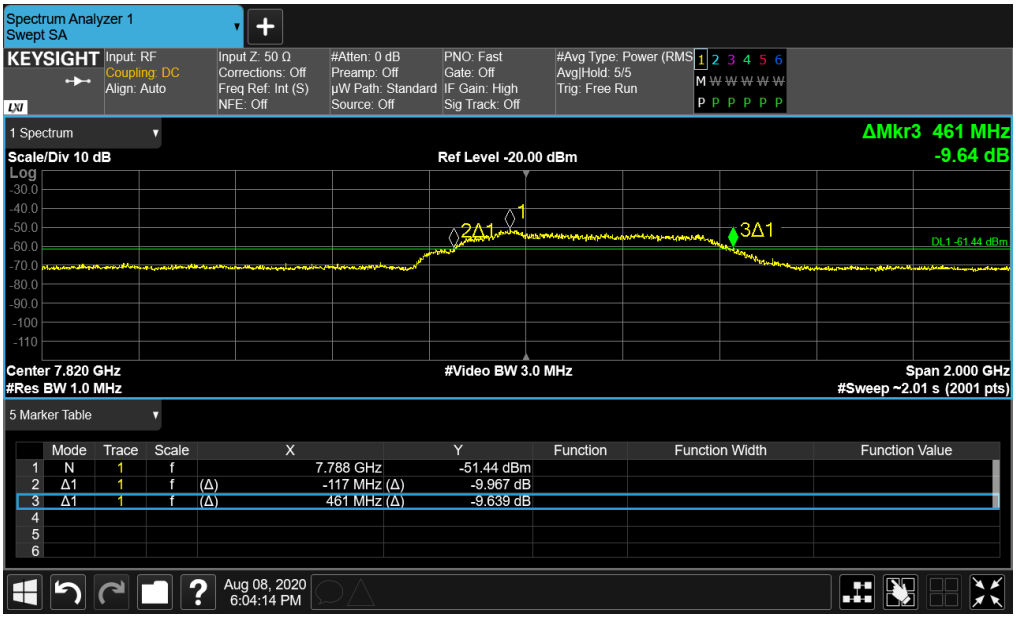
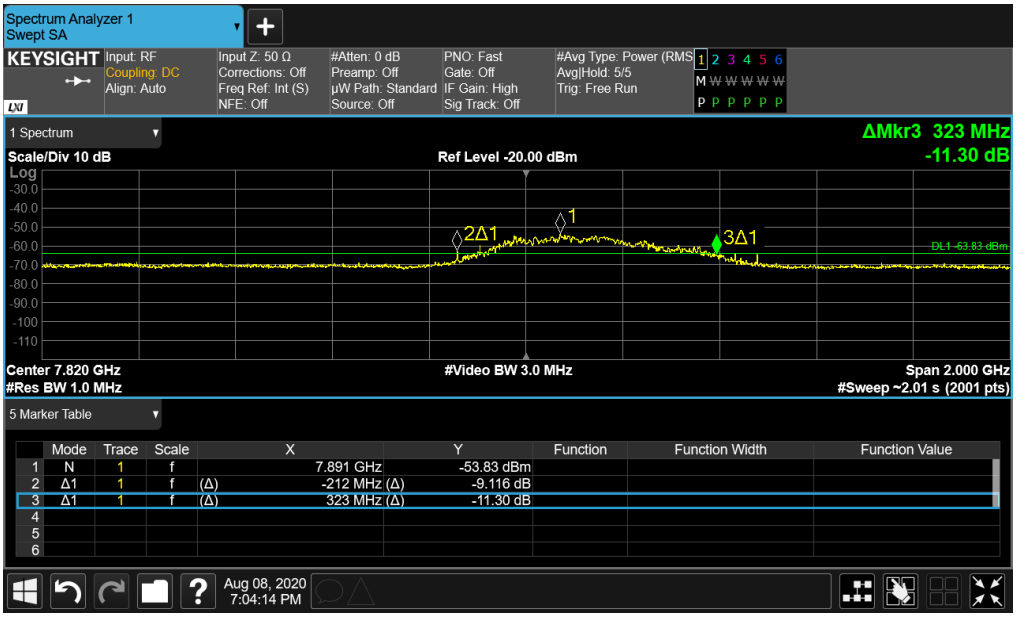


Plot 7-21. BANDWIDTH Plot 7-- ANT1 - CH.9 – SP3 – Preamble 12



Plot 7-22. BANDWIDTH Plot 7-– ANT2 - CH.9 - SP0 – Preamble 12

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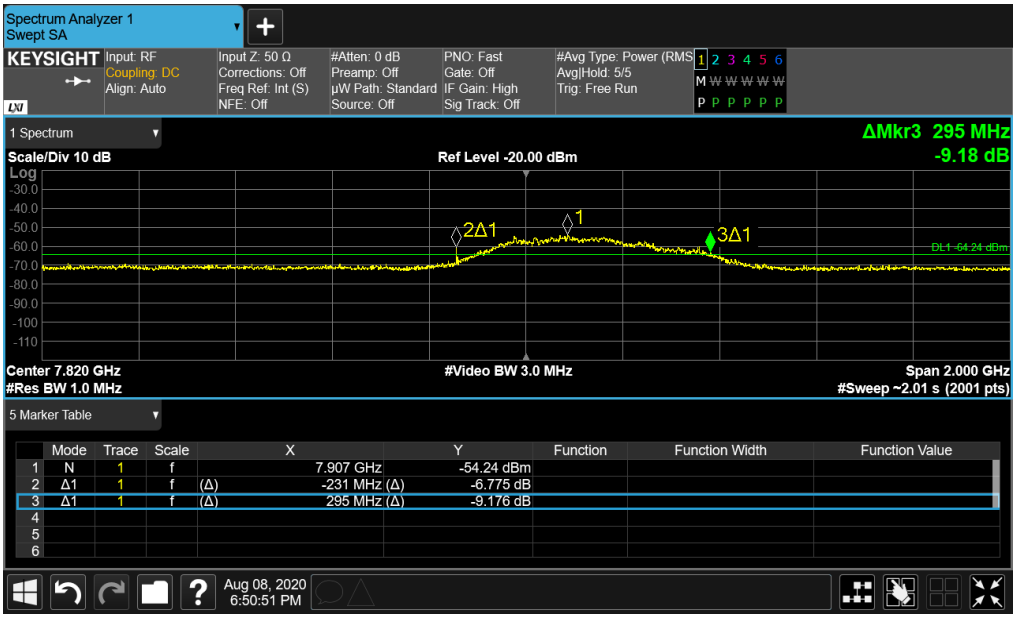
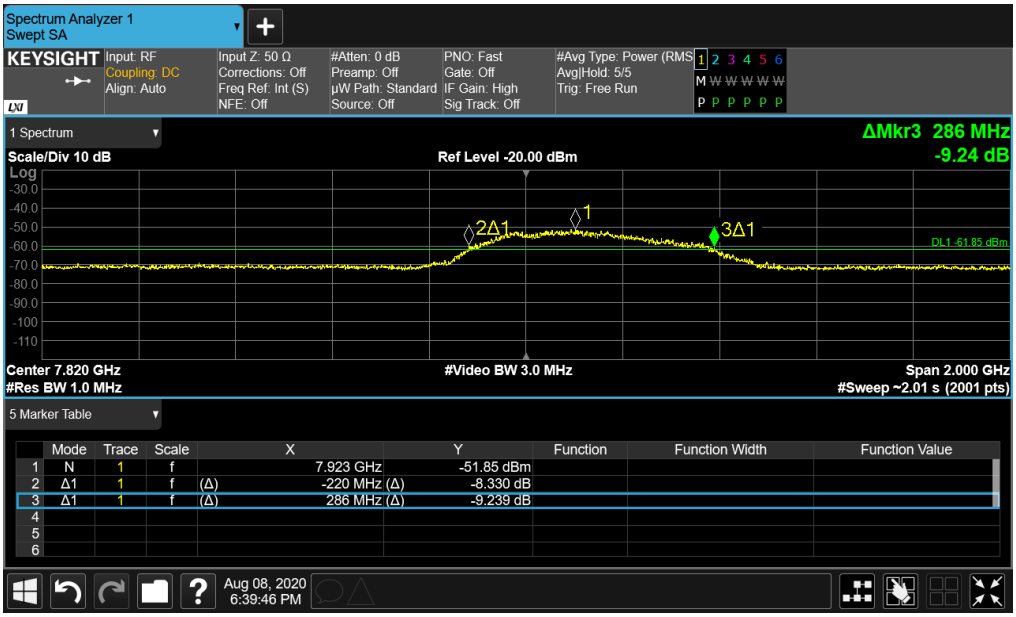


Plot 7-23. BANDWIDTH Plot – ANT2 - CH.9 – SP1 – Preamble 12



Plot 7-24. BANDWIDTH Plot – ANT2 - CH.9 – SP3 – Preamble 12

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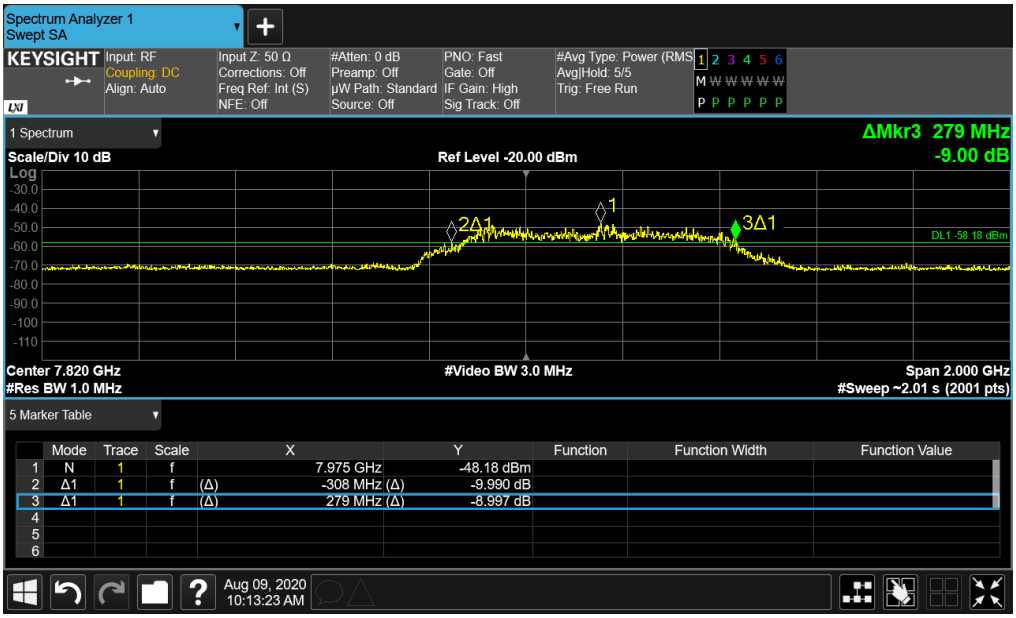
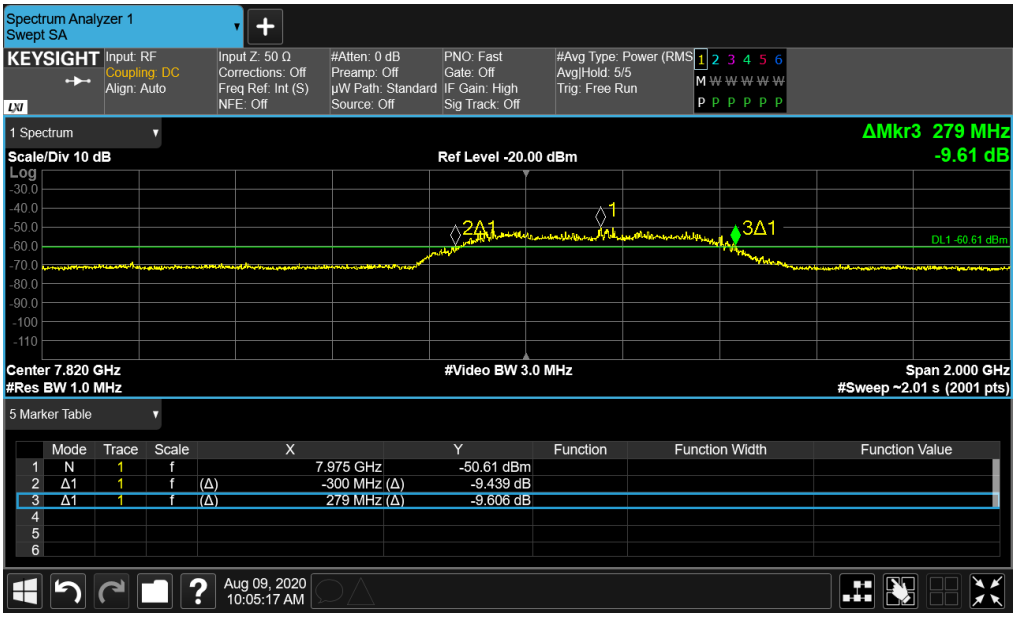


Plot 7-25. BANDWIDTH Plot – ANT1 - CH.9 - SP0 – Preamble 27



Plot 7-26. BANDWIDTH Plot – ANT1 - CH.9 – SP1 – Preamble 27

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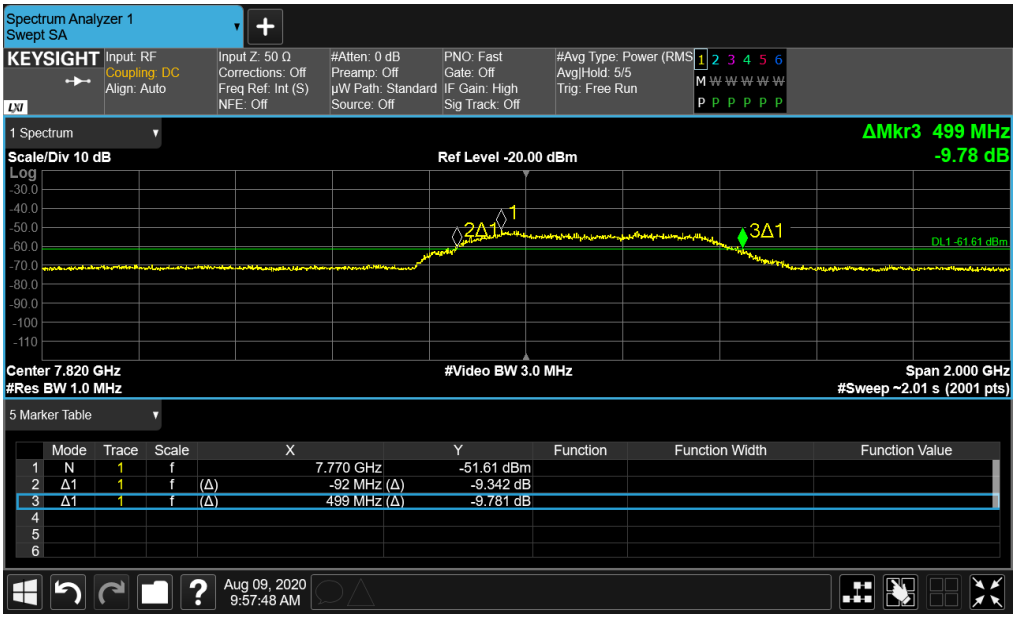
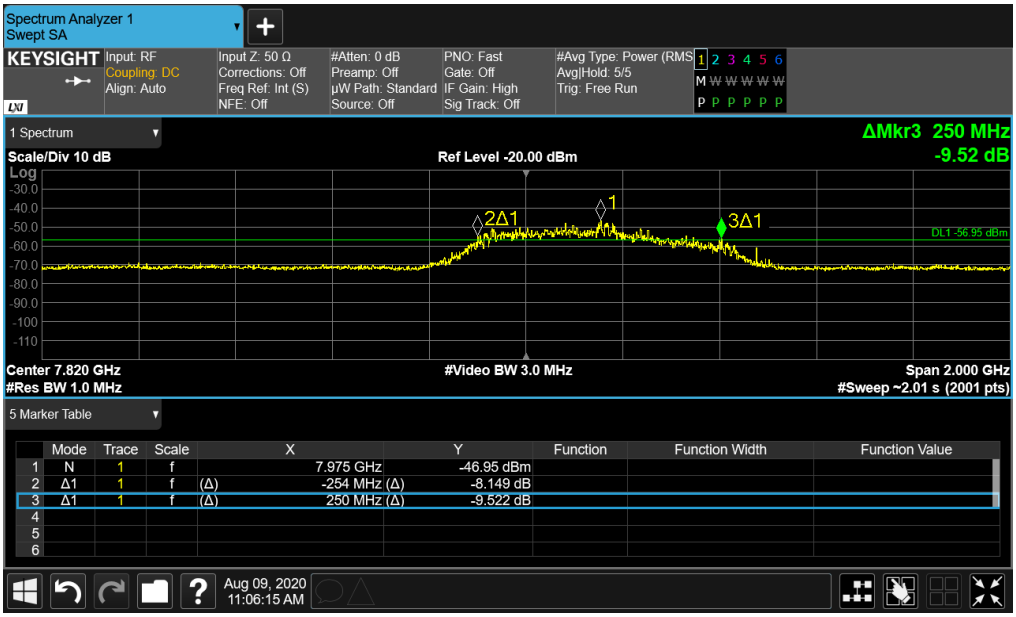


Plot 7-27. BANDWIDTH Plot – ANT1 - CH.9 – SP3 – Preamble 27



Plot 7-28. BANDWIDTH Plot – ANT2 - CH.9 - SP0 – Preamble 27

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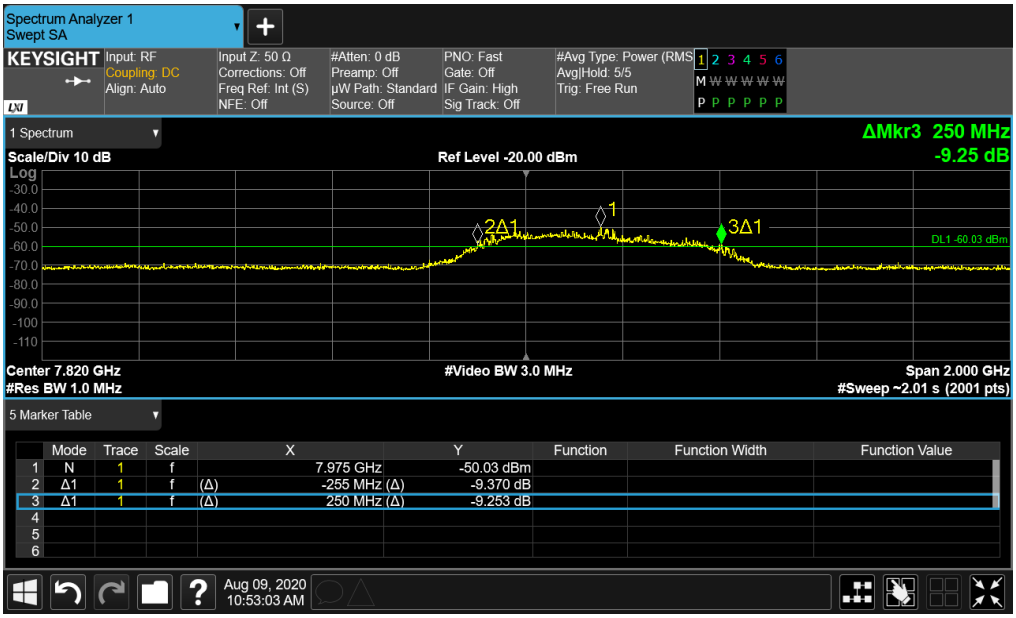
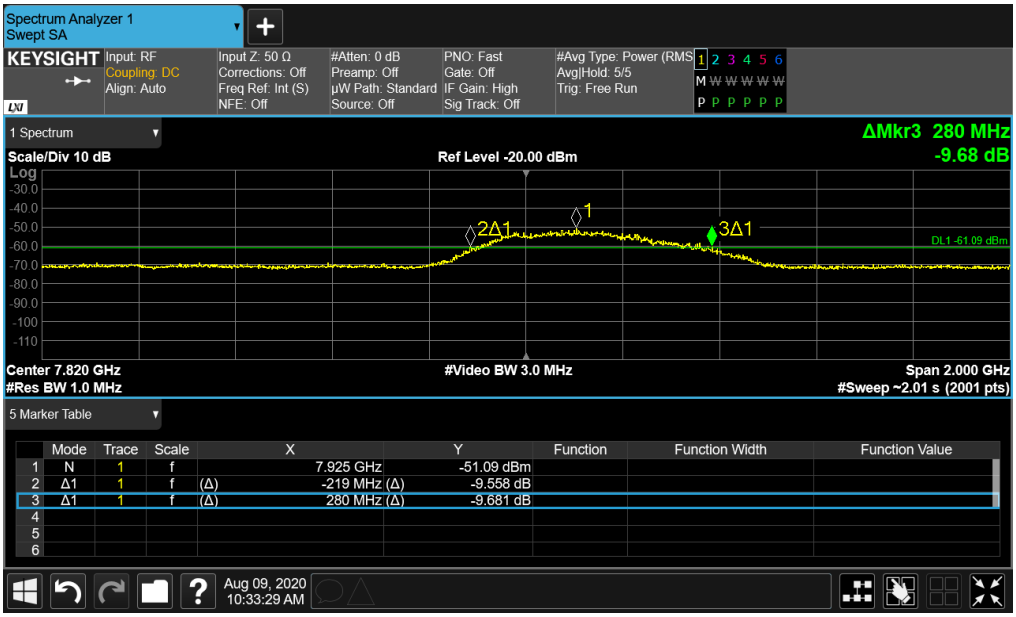


Plot 7-29. BANDWIDTH Plot – ANT2 - CH.9 – SP1 – Preamble 27



Plot 7-30. BANDWIDTH Plot – ANT2 - CH.9 – SP3 – Preamble 27

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7.3 Cessation Time

§15.519(a)(1)

Test Overview and Limit

§15.519(a)(1) A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgment from the associated receiver that its transmission is being received an acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

Test Settings

1. RBW = 1MHz
2. VBW = 3MHz
3. Span = 0 Span Mode
4. Sweep time shall be sufficient to demonstrate EUTs compliance with the rule part.
5. Vertical Markers are placed to indicate the point in which the receiver ceases acknowledging the EUT and the point 10s after.

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-2. Test Instrument and Measurement Setup

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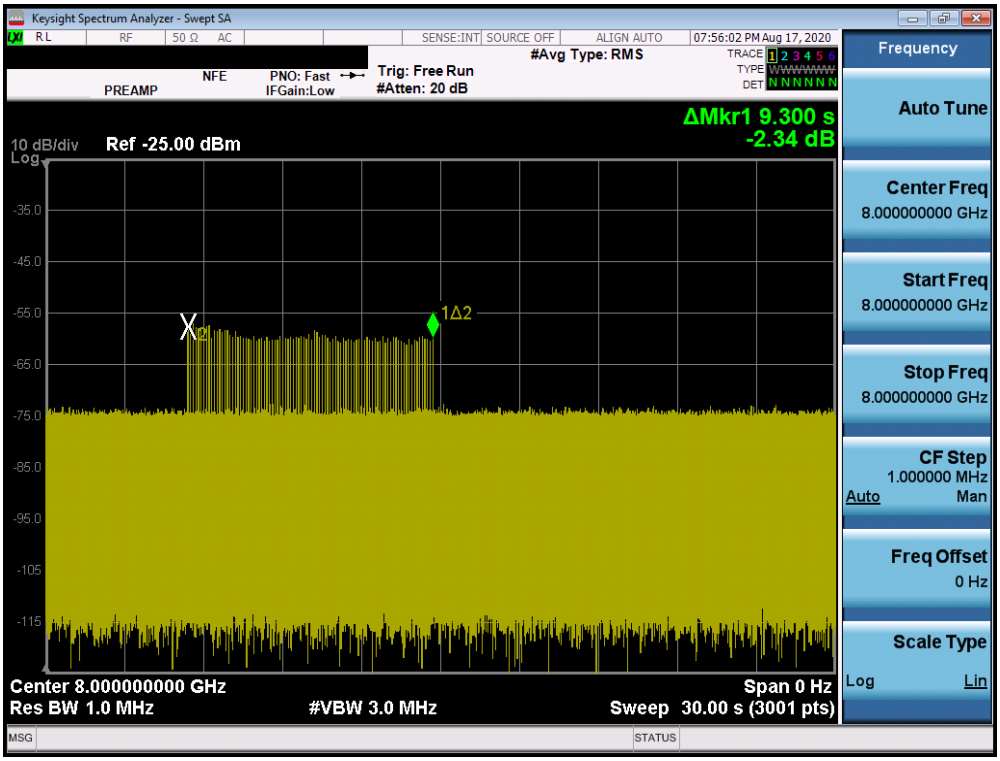

Plot 7-31. Cessation Time Plot

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7.4 Peak Power and Maximum Average Emissions

§15.519(e), §15.519(c)

Test Overview and Limit

15.519 (3)(e) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fM. That limit is 0 dBm EIRP.

15.519 (3)(c) The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
3100 - 10600	-41.3

Test Procedures Used

ANSI C63.10-2013

Test Settings

Peak:

1. Analyzer frequency set to the frequency of the radiated spurious emission of interest
2. RBW = 50MHz, VBW = 80MHz
3. Detector = Peak
4. Sweep time = 2s
5. Trace mode = max hold
6. Trace was allowed to stabilize

Average:

1. Analyzer frequency set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz, VBW = 3MHz
3. Detector = Average-RMS (for Average)
4. Sweep time = 2s
5. Sweep Points = 2001 (1ms integration period per measurement bin)
6. Trace mode = max hold
7. Trace was allowed to stabilize

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RESULTS – BPRF

ANT	CH	MODE	Meas. Ant.	FM [GHz]	Peak Power (dBm/50MHz)	Peak Limit (dBm/50MHz)	Margin [dB]
1	9	SP1	V	7.831	-8.58	0	-8.58
2	9	SP0	V	7.732	-8.33	0	-8.33

Table 7-3. BPRF Highest Peak Power Results

CH	CH	MODE	Meas. Ant.	FM [GHz]	Average Power (dBm/50MHz)	Average Limit (dBm/MHz)	Margin [dB]
1	9	SP3	V	7.860	-44.58	-41.3	-3.28
2	9	SP3	V	7.860	-44.27	-41.3	-2.97

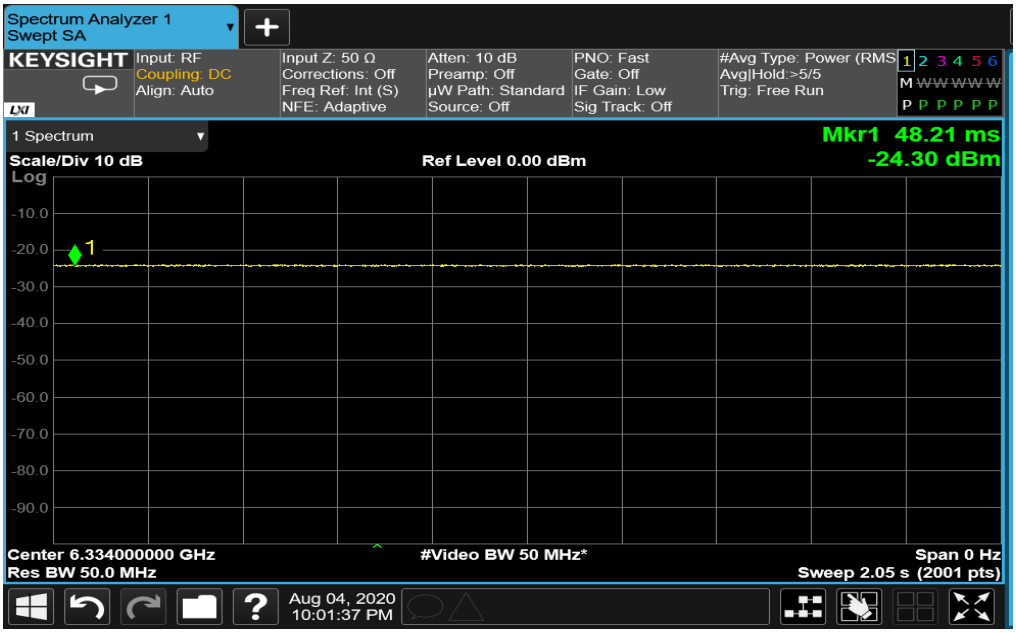
Table 7-4. BPRF Highest Average Power Results

Sample Calculation:

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the EIRP level is calculated by applying the additional factors shown below for a test distance of 3 meter

.

RSE EIRP (dBm) = Analyzer Level (dBm) + 107 + AFCL (dB/m) + 20Log(Dm) – 104.8



Plot 7-32. UWB Peak Power Measurement - ANT 1 - CH.5 – SP1 – BPRF

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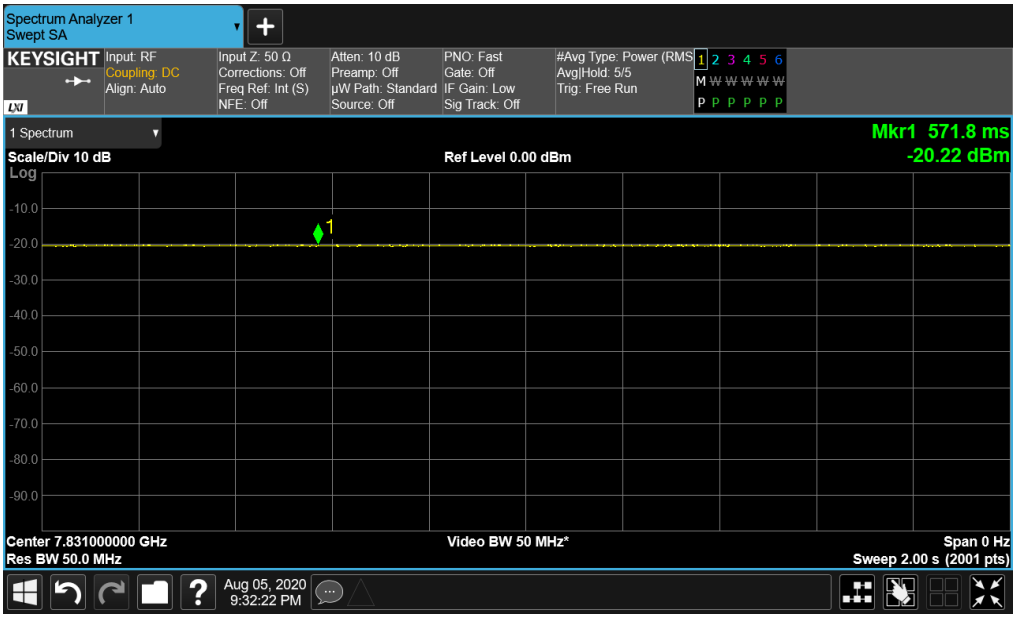
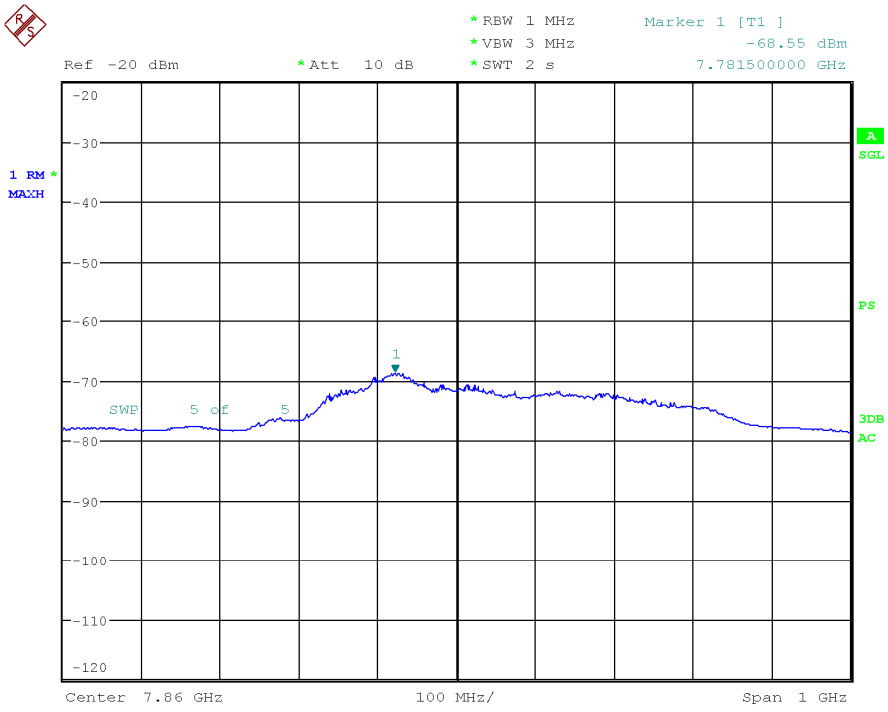


Plot 7-33. UWB Peak Power Measurement - ANT 1 - CH.9 – SP1 – BPRF



Plot 7-34. UWB Average Power Measurement - ANT 1 - CH.9 – SP3 - BPRF

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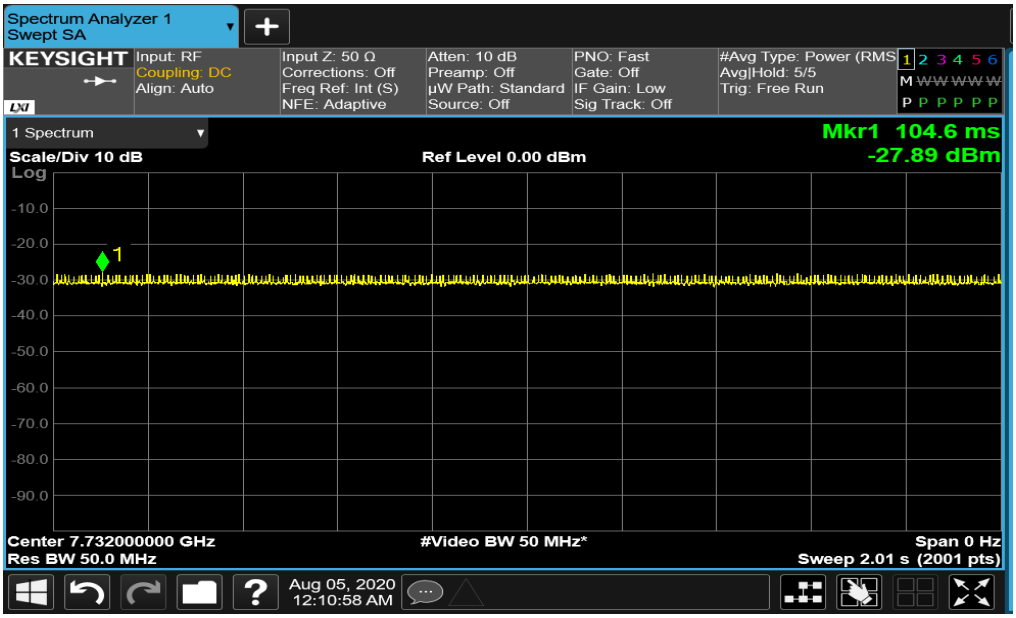
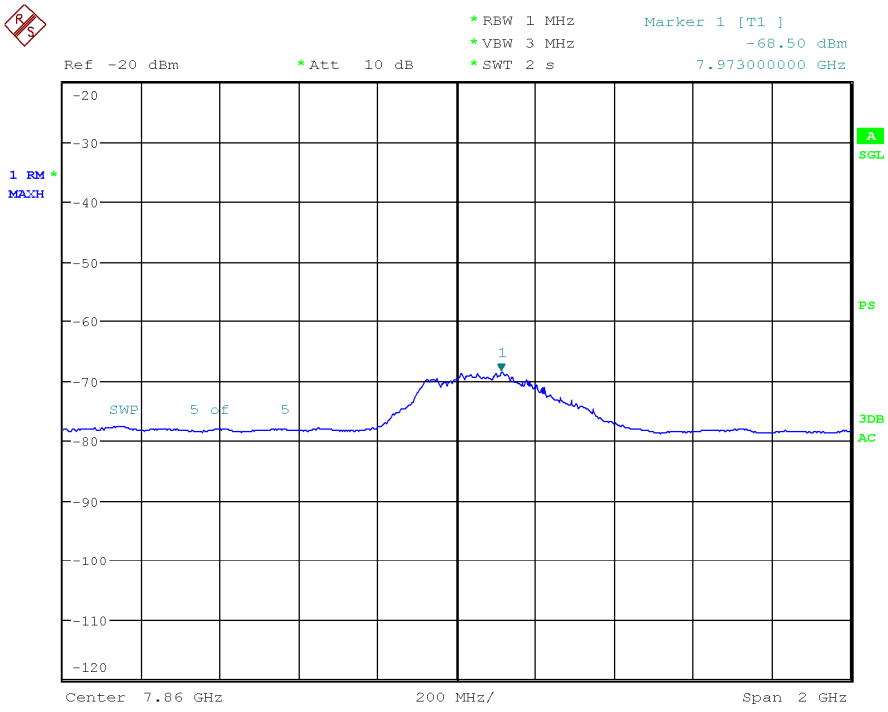


Plot 7-35. UWB Peak Power Measurement - ANT 2 - CH.9 - SP0 – BPRF



Date: 18.JUL.2020 17:15:02

Plot 7-36. UWB Average Power Measurement - ANT 2 - CH.9 – SP3 - BPRF

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RESULTS – HPRF

ANT	CH	MODE	Meas. Ant.	FM [GHz]	Peak Power (dBm/50MHz)	Peak Limit (dBm/50MHz)	Margin [dB]
1	9	SP0	V	7.975	-10.95	0	-10.95
2	9	SP0	V	7.925	-2.92	0	-2.92

Table 7-5. HPRF Highest Peak Power Results

CH	CH	MODE	Meas. Ant.	FM [GHz]	Average Power (dBm/50MHz)	Average Limit (dBm/MHz)	Margin [dB]
1	9	SP3	V	7.783	-44.20	-41.3	-2.90
2	9	SP3	V	7.971	-43.50	-41.3	-2.20

Table 7-6. HPRF Highest Average Power Results

Sample Calculation

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the EIRP level is calculated by applying the additional factors shown below for a test distance of 3 meter

.

RSE EIRP (dBm) = Analyzer Level (dBm) + 107 + AFCL (dB/m) + 20Log(Dm) – 104.8

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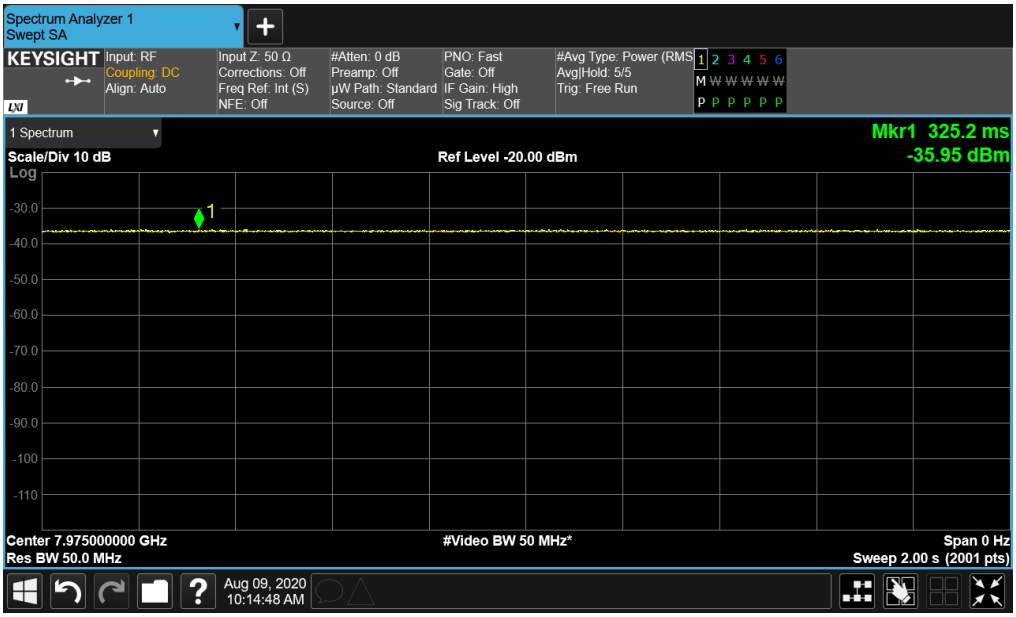
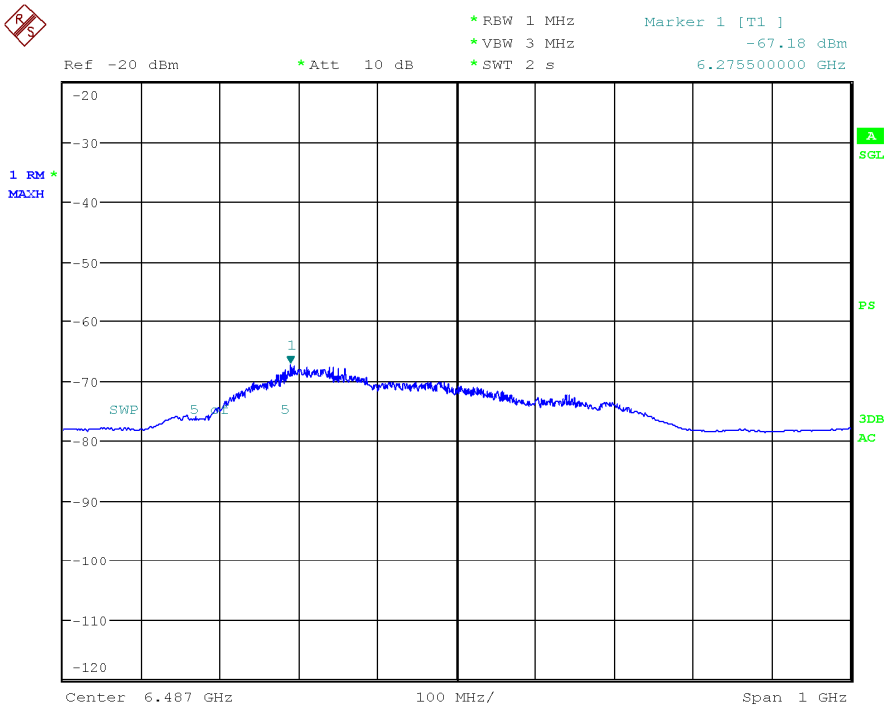


Plot 7-37. UWB Peak Power Measurement - ANT 1 - CH.9 - SP0 – HPRF



Plot 7-38. UWB Average Power Measurement - ANT 1 - CH.9 – SP3 – HPRF

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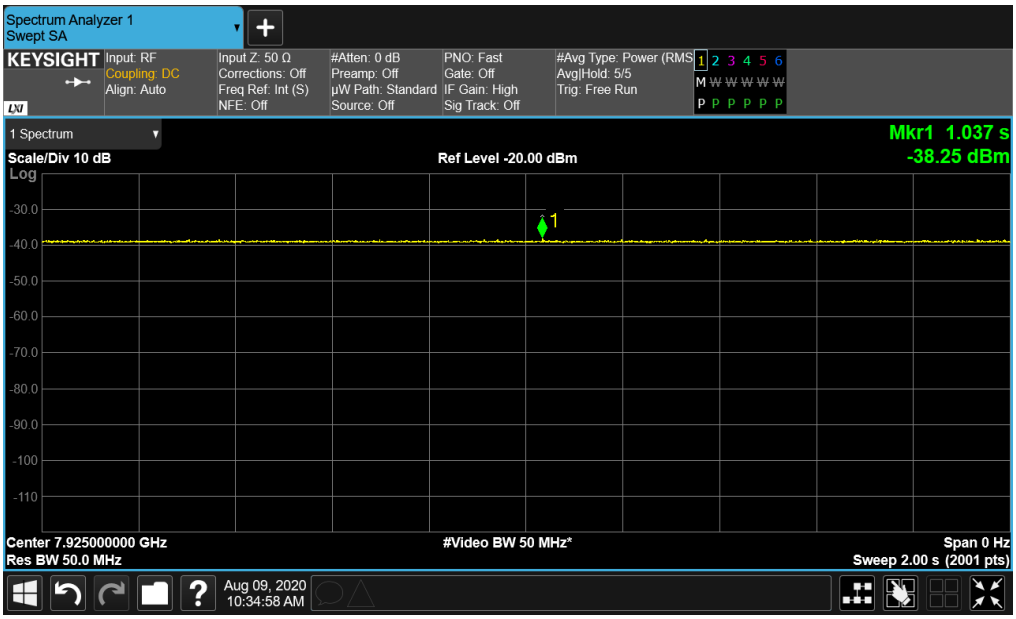
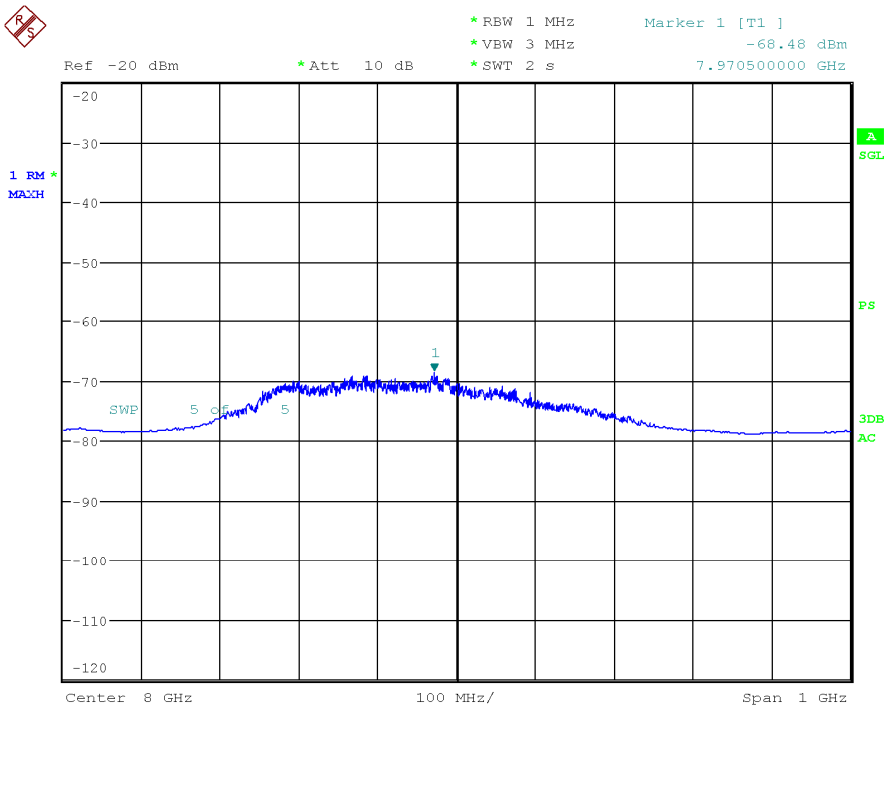


Plot 7-39. UWB Peak Power Measurement - ANT 2 - CH.9 – SP3 – HPRF



Plot 7-40. UWB Average Power Measurement - ANT 2 - CH.9 - SP0 – HPRF

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7.5 Radiated Measurement Data above 960MHz

§15.519 (c), §15.519(d), §15.209(a)

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at maximum power and at the appropriate frequencies. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

§15.519(c)

Frequency in MHz	EIRP in dBm
960-1610	-75.3
1610-1990	-63.3
1990-3100	-61.3
3100-10600	-41.3
Above 10600	-61.3

Table 7-7. Above 960MHz Average Limits

§15.519(d)

Frequency in MHz	EIRP in dBm
1164-1240	-85.3
1559-1610	-85.3

Table 7-8. Above 960MHz Average Limits

Test Procedures Used

ANSI C63.10-2013

Test Settings

Average EIRP Measurements

1. Analyzer frequency set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz (3kHz for emissions in the GPS bands)
3. VBW = 3MHz (30kHz for the emissions in the GPS bands)
4. Detector = RMS
5. Sweep time = auto couple
6. Trace mode = trace averaging
7. Trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown test setup photos provided.

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Test Notes

1. All modes of operation were investigated and the worst-case emissions are reported.
2. The RBW for measurements in the GPS Bands were reduced to 3kHz in order to show compliance.
3. Pre-scan plots that are included are not corrected for antenna factors, cable losses, or pre-amplifier gains. The plots are only for the purpose of spurious emission identification.
4. All readings are calibrated by a signal generator with accuracy traceable to the National Institute of Standards and Technology (NIST).
5. AFCL (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)

Sample Calculation

The raw radiated spurious level is converted to field strength in dBuV/m. Then, the EIRP RSE level is calculated by applying the additional factors shown below for a test distance of 3 meter

.

RSE EIRP (dBm) = Analyzer Level (dBm) + 107 + AFCL (dB/m) + 20Log(Dm) – 104.8

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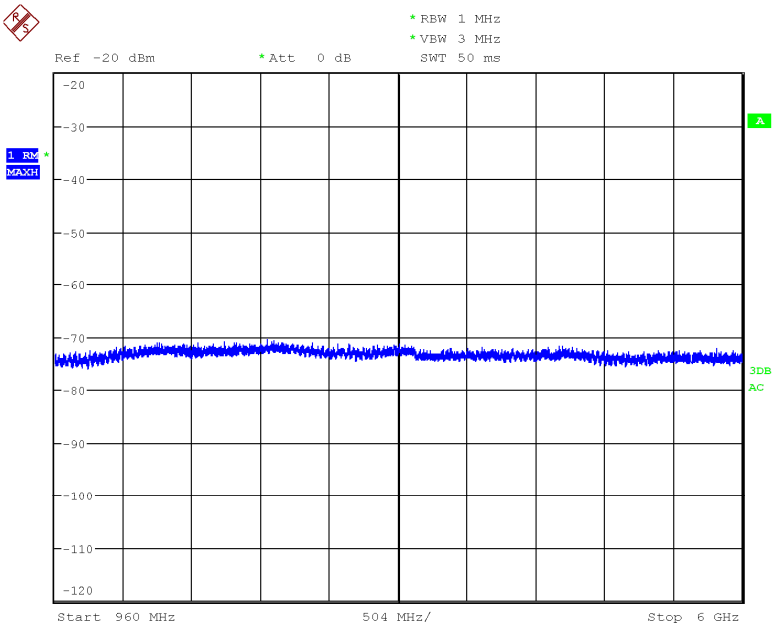
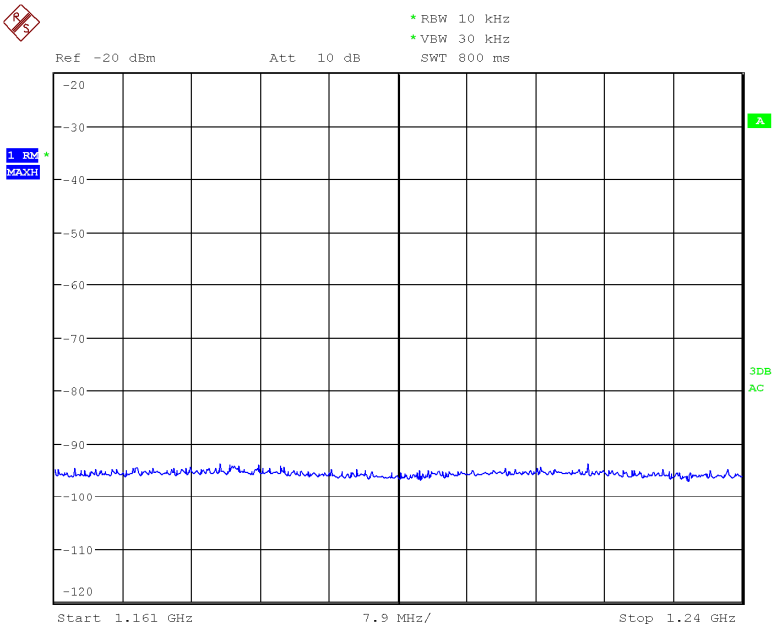
Channel 9 ANTENNA 1:



Plot 7-41. Radiated Spurious Pre-Scan 960 - 6000 MHz - CH.9 - ANT 1



Plot 7-42. Radiated Spurious Pre-Scan 1161 - 1240 MHz - CH.9 - ANT 1

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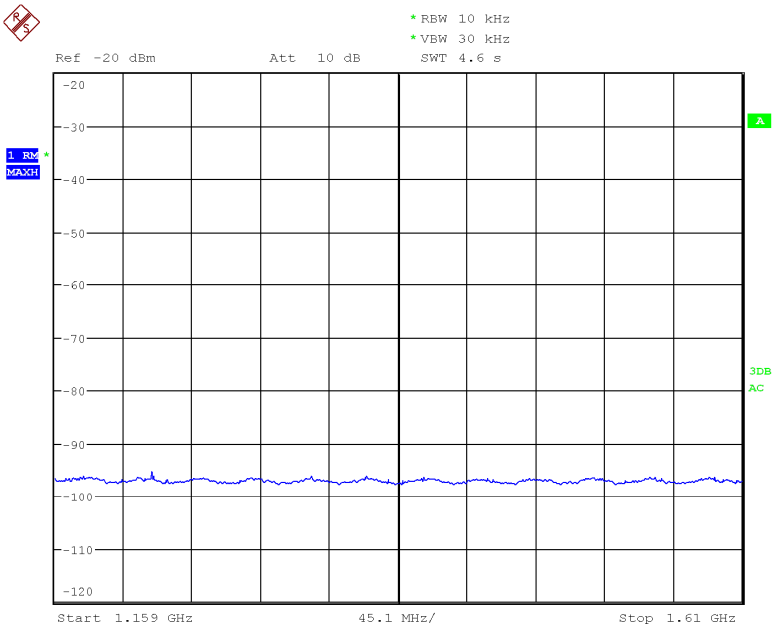
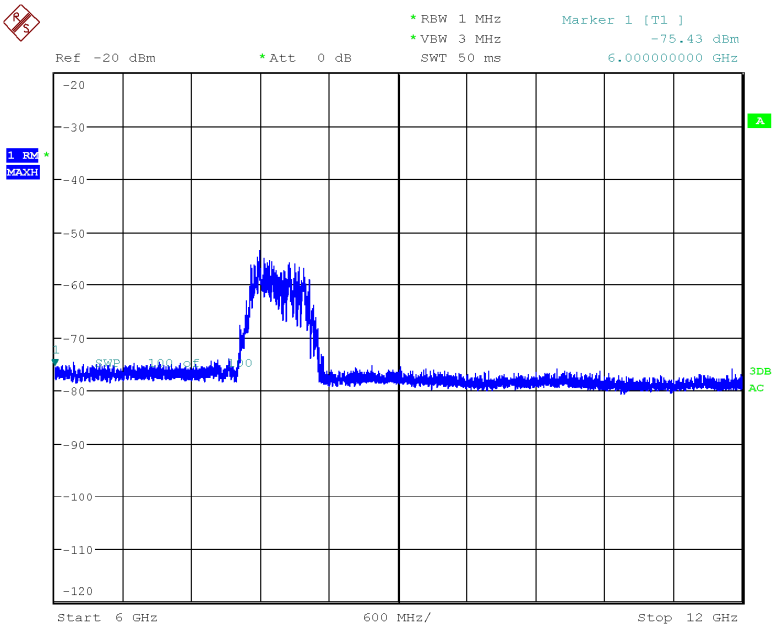


Plot 7-43. Radiated Spurious Pre-Scan 1559 - 1610 MHz - CH.9 - ANT 1



Plot 7-44. Radiated Spurious Pre-Scan 6000 - 12000 MHz - CH.9 - ANT 1

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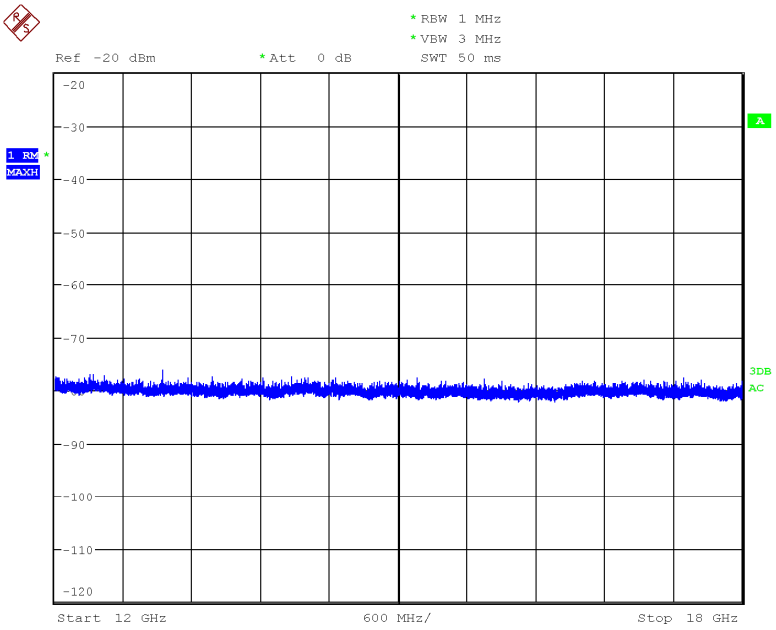
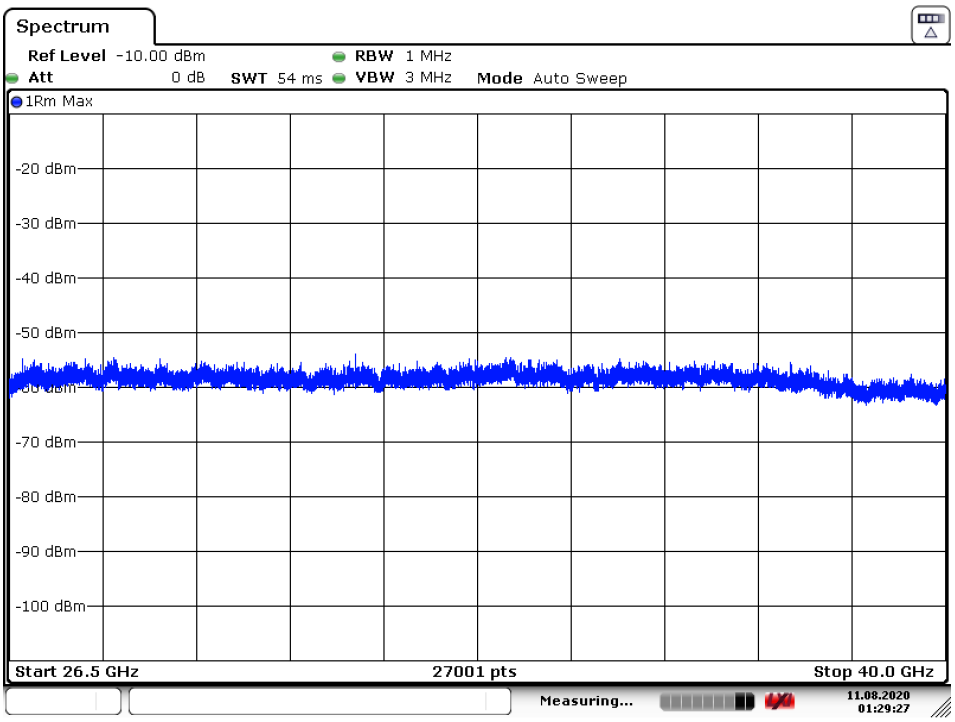


Date: 10.AUG.2020 23:47:46

Plot 7-45. Radiated Spurious Pre-Scan 12000 - 18000 MHz - CH.9 - ANT 1



Date: 11.AUG.2020 01:29:27

Plot 7-46. Radiated Spurious Pre-Scan 18 – 26.5 GHz - CH.9 - ANT 1

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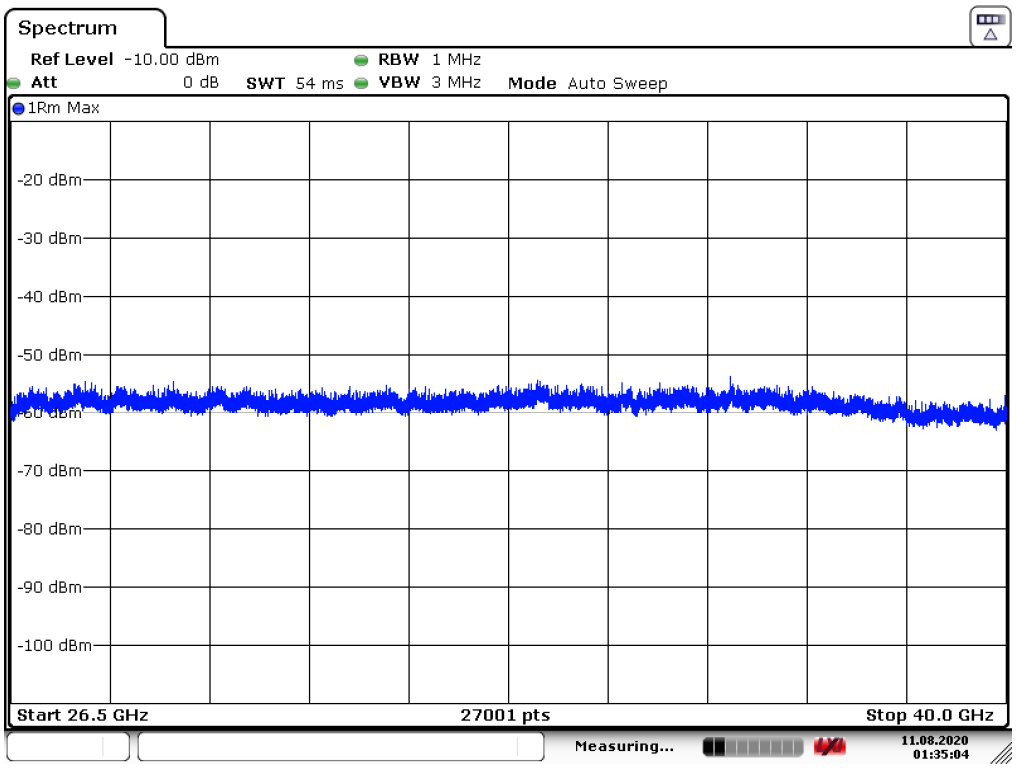

Plot 7-47. Radiated Spurious Pre-Scan 26.5 – 40.0 GHz - CH.9 - ANT 1

Channel:	9
Frequency (MHz):	8000
Preamble id:	9
Payload	4
Config	1

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1102	Avg	H	-	-	-96.24	-7.41	-91.81	-75.30	-16.51
3024	Avg	H	-	-	-91.55	-0.62	-80.32	-70.00	-10.32
7421	Avg	H	-	-	-91.88	8.41	-71.63	-41.30	-30.33
11324	Avg	H	-	-	-101.66	12.58	-77.24	-61.30	-15.94

Table 7-9. Radiated Spurious Emissions CH. 9 – ANT1

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1218	Avg	H	-	-	-105.11	3.82	-89.45	-75.30	-14.15
1578	Avg	H	-	-	-107.04	5.75	-89.45	-75.30	-14.15

Table 7-10. Radiated Spurious Emissions CH. 9 – ANT1 – GPS BANDs

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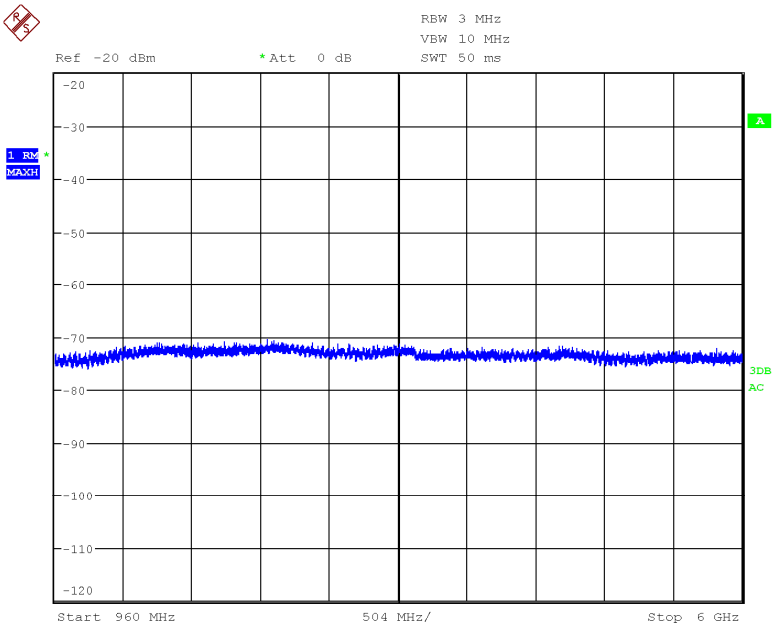
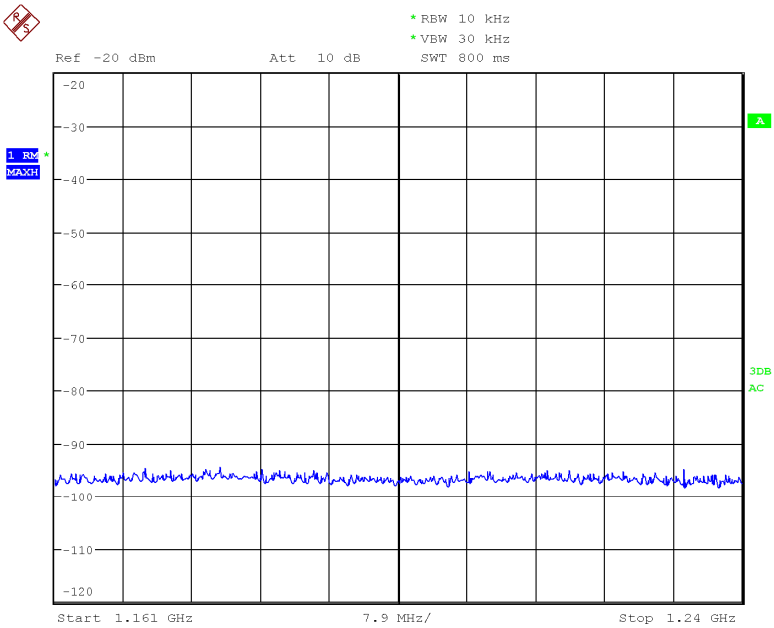
Channel 9 ANTENNA 2:



Date: 10.AUG.2020 23:45:48

Plot 7-48. Radiated Spurious Pre-Scan 960 - 6000 MHz - CH.9 - ANT 2



Date: 12.AUG.2020 23:54:10

Plot 7-49. Radiated Spurious Pre-Scan 1161 - 1240 MHz - CH.9 - ANT 2

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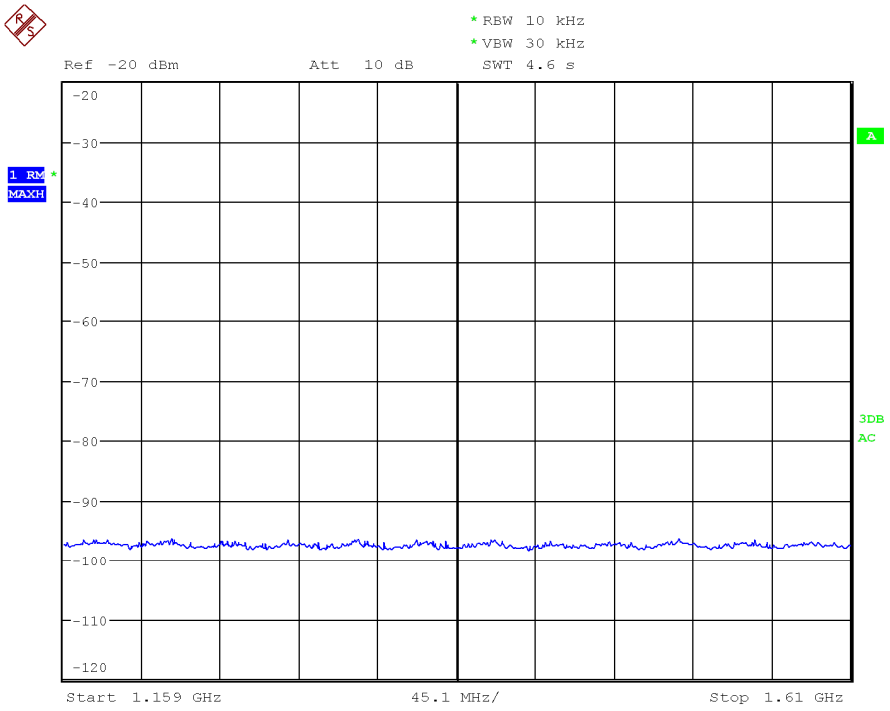
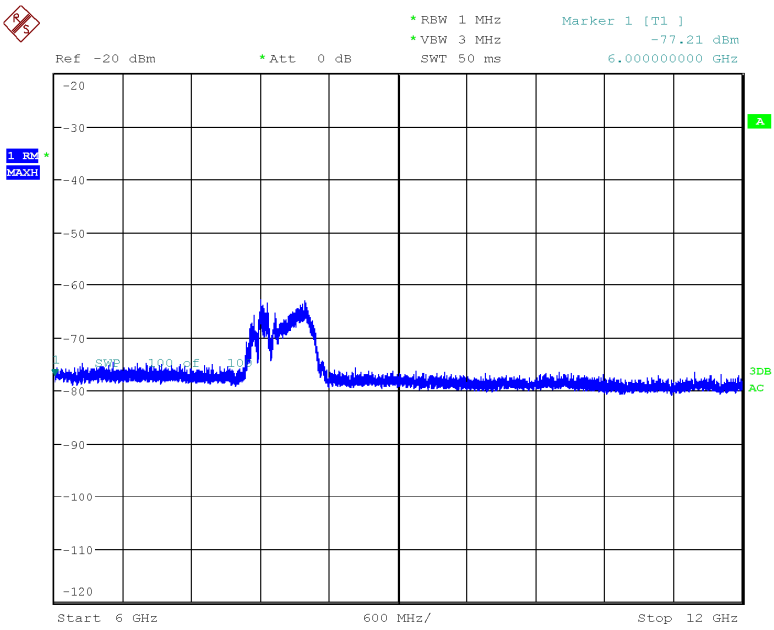


Date: 12.AUG.2020 23:50:59

Plot 7-50. Radiated Spurious Pre-Scan 1559 - 1610 MHz - CH.9 - ANT 2



Date: 11.AUG.2020 01:10:43

Plot 7-51. Radiated Spurious Pre-Scan 6000 - 12000 MHz - CH.9 - ANT 2

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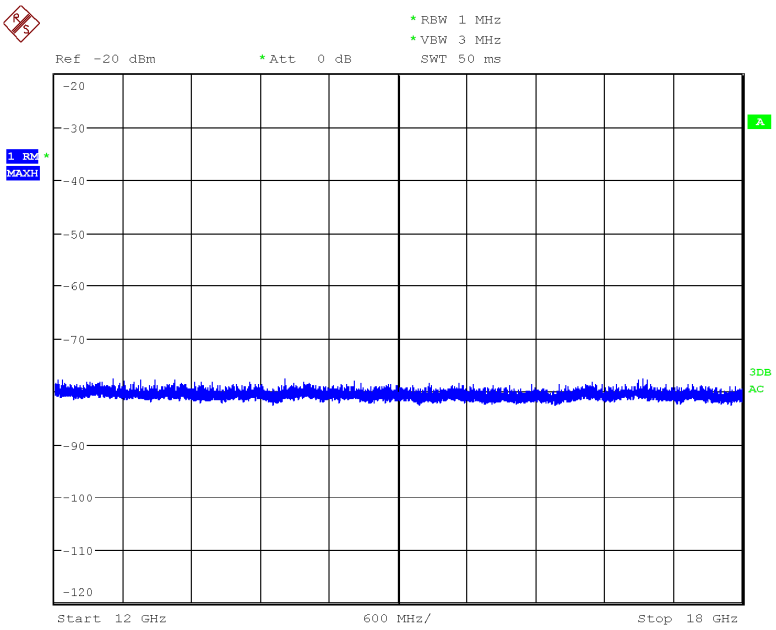
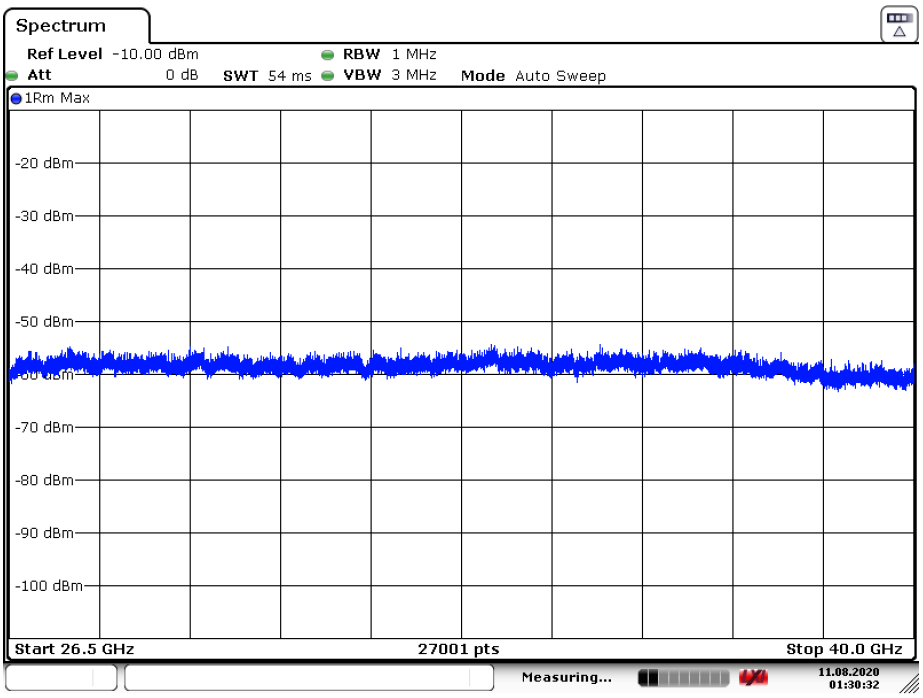


Date: 10.AUG.2020 23:48:59

Plot 7-52. Radiated Spurious Pre-Scan 12000 - 18000 MHz - CH.9 - ANT 2



Date: 11.AUG.2020 01:30:31

Plot 7-53. Radiated Spurious Pre-Scan 18 – 26.5 GHz - CH.9 - ANT 2

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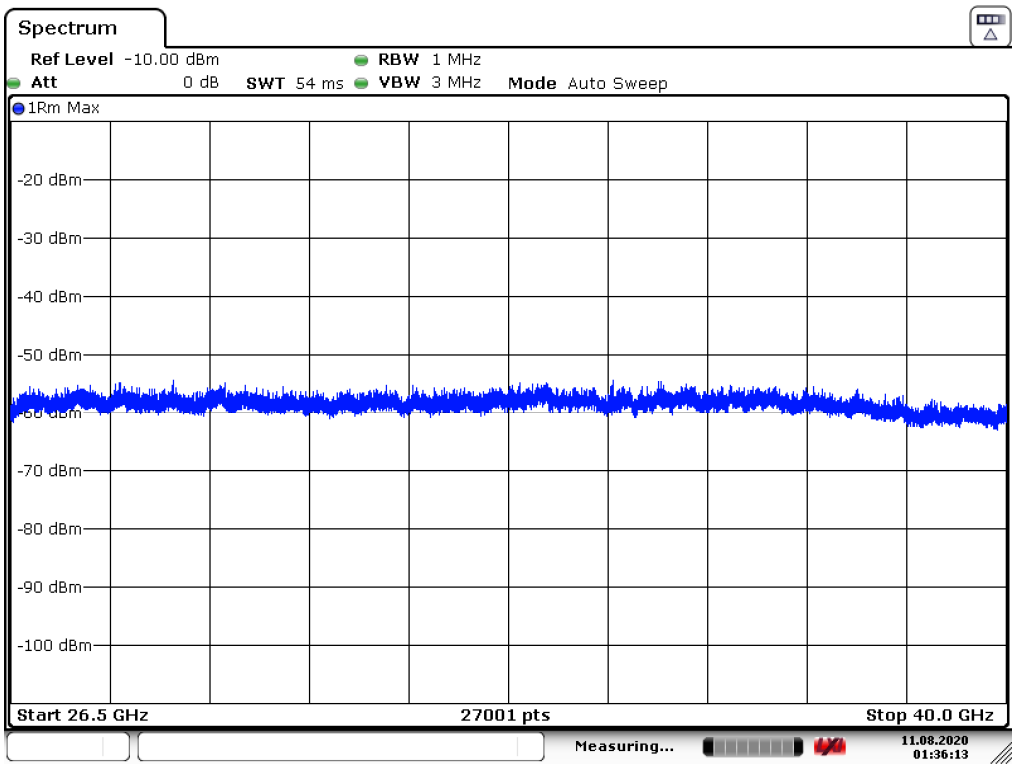

Plot 7-54. Radiated Spurious Pre-Scan 26.5 – 40.0 GHz - CH.9 - ANT 2

Channel:	9
Frequency (MHz):	8000
Preamble id:	9
Payload	4
Config	1

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1046	Peak	H	-	-	-104.21	-6.88	-99.25	-75.30	-23.95
1682	Avg	H	-	-	-93.21	-6.36	-87.73	-70.00	-17.73
2224	Peak	H	-	-	-89.96	-3.58	-81.70	-70.00	-11.70
7521	Avg	H	-	-	-89.32	8.30	-69.18	-41.30	-27.88

Table 7-11. Radiated Spurious Emissions CH. 9 – ANT2

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1224	Avg	H	-	-	-105.63	3.82	-89.97	-75.30	-14.67
1582	Peak	H	-	-	-106.41	5.75	-88.82	-75.30	-13.52

Table 7-12. Radiated Spurious Emissions CH. 9 – ANT2 – GPS BANDs

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7.6 Radiated Spurious Emissions Measurements – Below 1GHz

§15.209(a), §15.519(c)

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-17 per Section 15.209 and RSS-Gen (8.9).

Frequency	Field Strength [μV/m]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

Table 7-13. Radiated Limits

Test Procedures Used

ANSI C63.10-2013

Test Settings

Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

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Test Setup

The EUT and measurement equipment were set up as shown in the diagrams below.

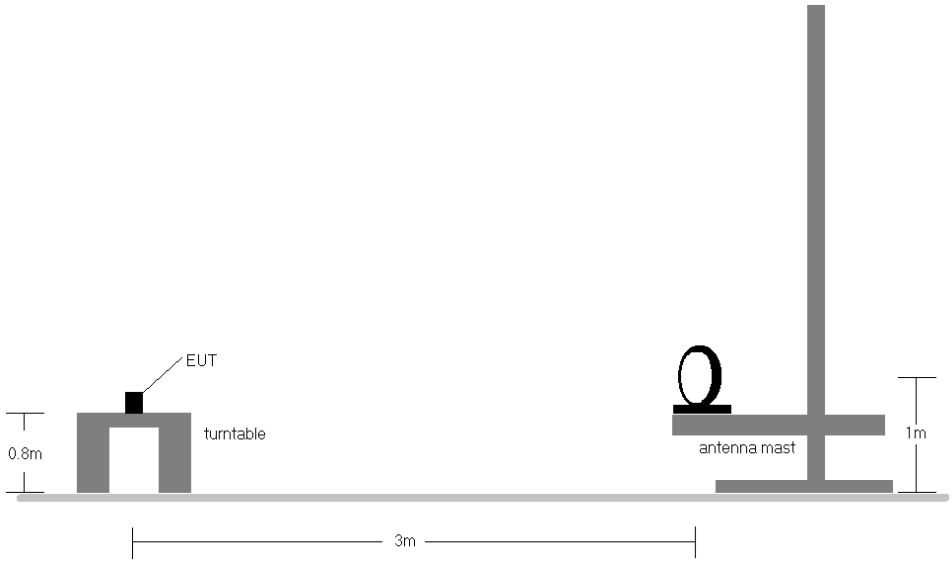

Figure 7-3. Radiated Test Setup < 30Mhz

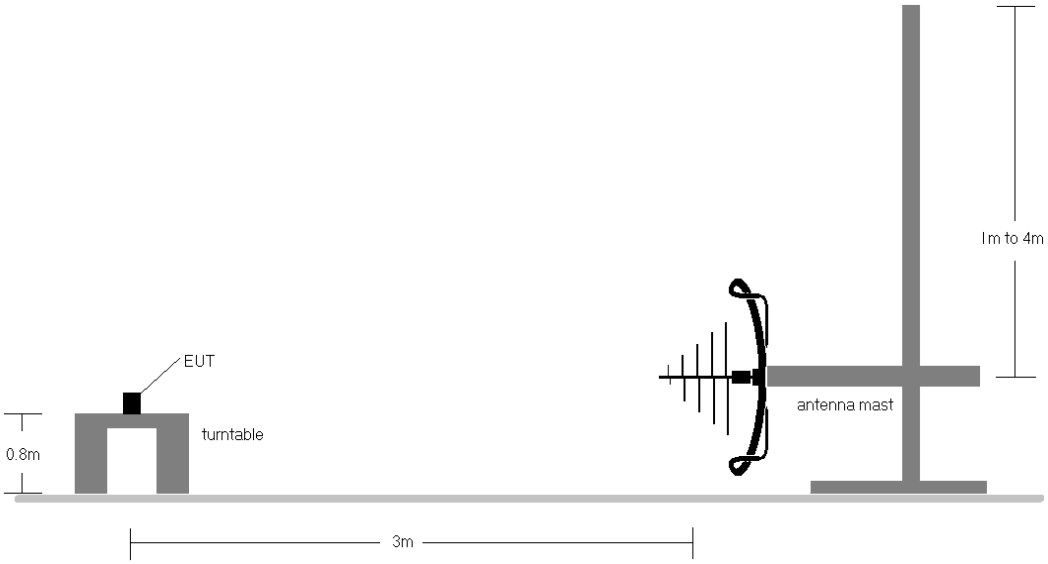

Figure 7-4. Radiated Test Setup < 1GHz

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Test Notes

1. All emissions lying in restricted bands specified in §15.205 and RSS-Gen(8.10) are below the limit shown in Table 7-17.
2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes.
3. The spectrum is investigated using a peak detector and final measurements are recorded using CISPR quasi peak detector. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
4. Emissions were measured at a 3 meter test distance.
5. Emissions are investigated while operating on the center channel of the mode, band, and modulation that produced the worst case results during the transmitter spurious emissions testing.
6. No spurious emissions were detected within 20dB of the limit below 30MHz.
7. The results recorded using the broadband antenna is known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.
8. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. There were no emissions detected in the 30MHz – 1GHz frequency range, as shown in the subsequent plots.

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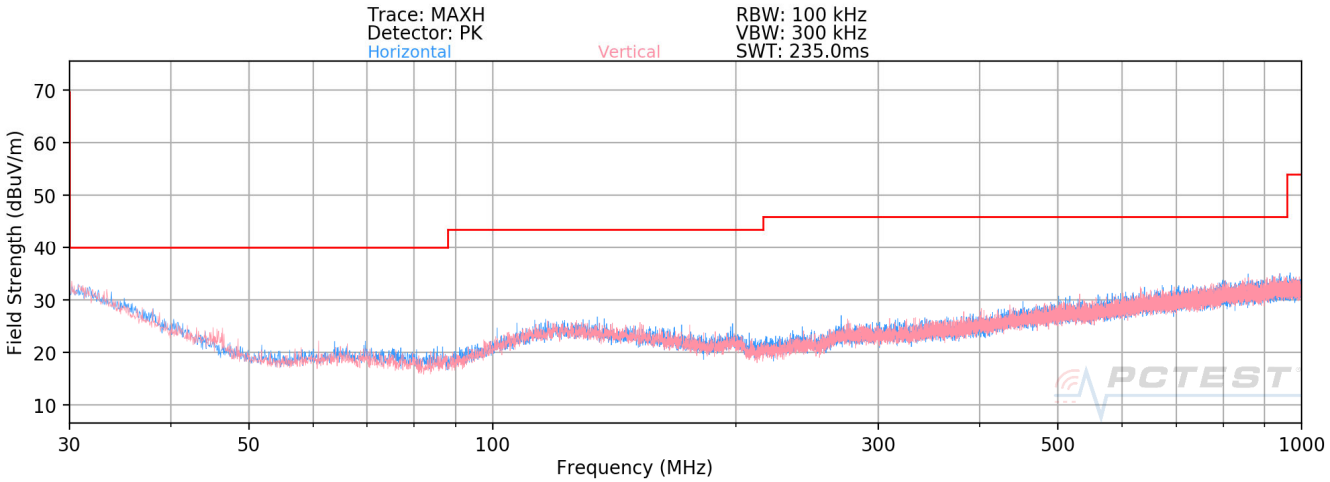
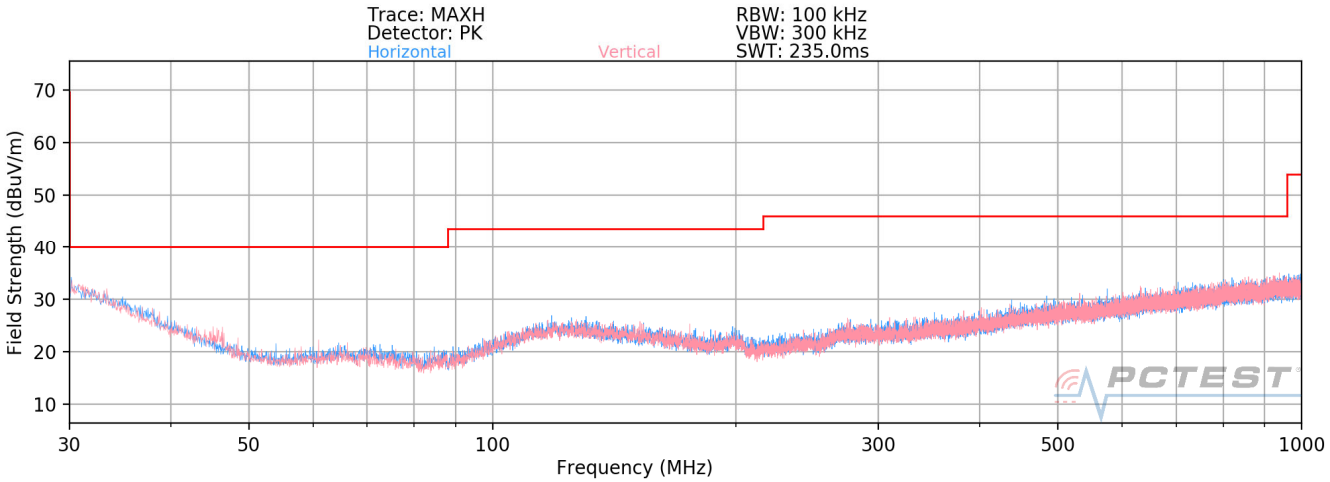


Plot 7-55. 30MHz - 1 GHz Pre-Scan Plots ANT1



Plot 7-56. 30MHz - 1 GHz Pre-Scan Plots ANT2

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7.7 Line Conducted Measurement Data

§15.207

Test Overview and Limit

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in 15.207.

Frequency of emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

Table 7-14. Conducted Limits

*Decreases with the logarithm of the frequency.

Test Procedures Used

ANSI C63.4-2014

Test Settings

Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = RMS
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

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Test Setup

The EUT and measurement equipment were set up as shown in the test setup photos provided.

Test Notes

1. All Modes of operation were investigated and the worst-case emissions are reported.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.107 and ICES-003.
3. L1 = Phase; N = Neutral
4. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
5. QP/AV Level (dBµV) = QP/AV Reading (dBµV) + Factor (dB)
6. Margin (dB) = QP/AV Limit (dBµV) – QP/AV Level (dBµV)
7. Traces shown in plot are made using a peak detector.
8. Deviations to the Specifications: None.

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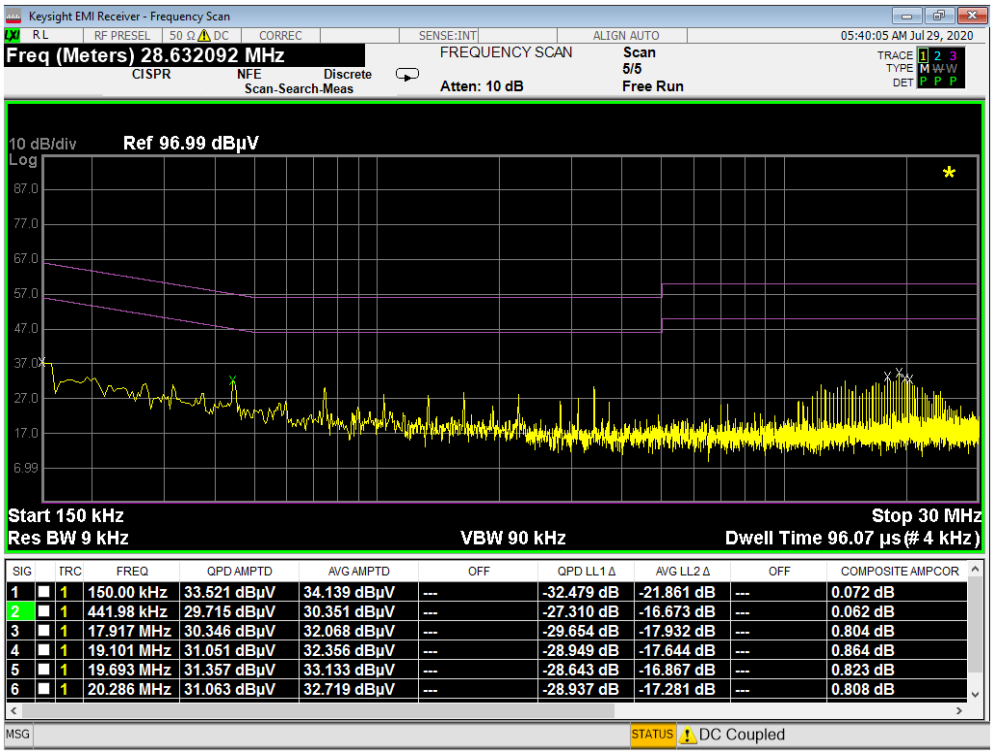
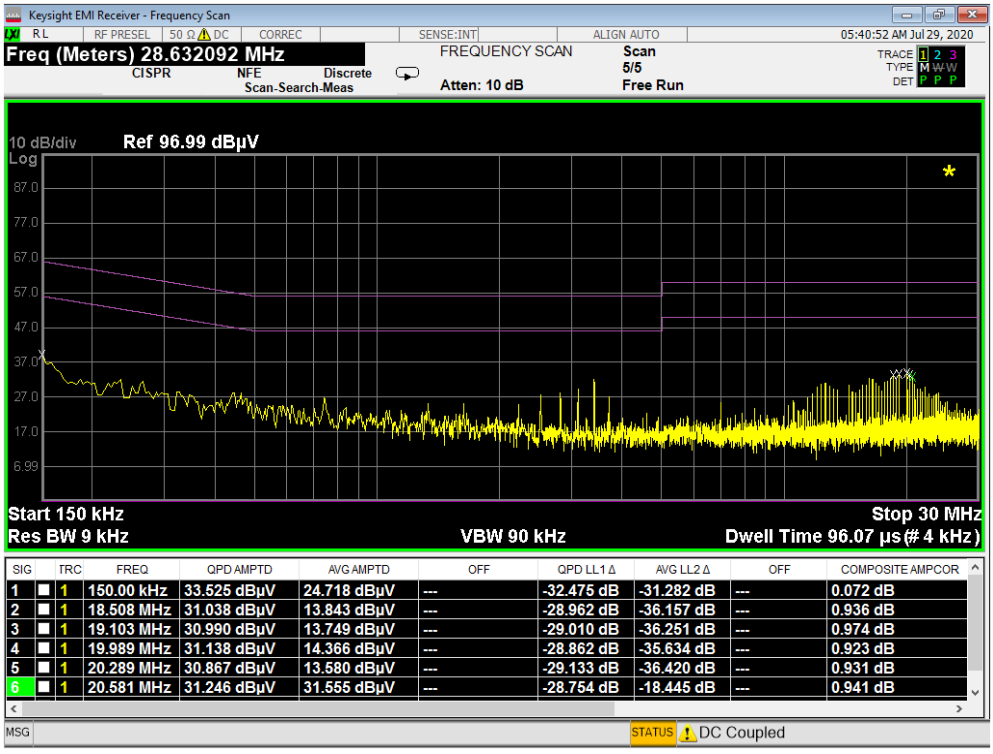


Plot 7-57. Line Conducted Plot (L1)



Plot 7-58. Line Conducted Plot (N)

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMF916JPN** has been tested to comply with the requirements specified in §15.519 and §15.521 of the FCC rules.

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