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FCC Certification Test Report

Class II Permissive Change

Product Evaluated

B25 RRH 4X30

(FCC ID: AS5BBTRX-22)

Customer

Alcatel-Lucent USA, Inc

600-700 Mountain Avenue
Murray Hill, New Jersey 07974-0636 USA

Test Laboratory

Global Product Compliance Laboratory

Alcatel-Lucent USA, Inc
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Date: November 30, 2016

Revisions

Date	Revision	Section	Change
11/30/2016	0		Initial Release

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Prepared By: W. Steve Majkowski NCE

Signed:  11/30/2016

Compliance Engineer

Approved By: Ray Johnson

Signed:  10/30/2016

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1. ATTESTATION OF TEST RESULTS

Company Name	Alcatel-Lucent USA, Inc.
FCC ID	AS5BBTRX-22
Product Name	**B25 RRH 4X30**
Model Name	**B25 RRH 4X30**
Part No	3JR53349ABAA-01M
Serial Number(s)	# LBALLU-YD160603Q6H
Test Standard(s)	47 CFR FCC Part 24
Reference(s)	• 47 CFR FCC Part 2 and Part 24 • FCC KDB 971168 D01 • ANSI C63.26 (2015)
Operating Frequency Band	PCS (Tx: 1930-1995 MHz and Rx: 1850-1910MHz), E-UTRAN Band 25
Technology	LTE
Test Frequency Range	10MHz – 20GHz
Operation Mode(s)	2x60W MIMO
Submission Type	Class II Permissiove Change
FCC Part 15 Subpart B Compliance	Compliance with Class B
Test Date	November 10 - 17, 2016
Test Laboratory	Global Product Compliance Laboratory 600-700 Mountain Avenue, Rm 5B-108 Murray Hill, New Jersey 07974-0636 USA

This is to certify that the above product has been evaluated and found to be in compliance with the Rules and Regulations set forth in the above standard(s). The data and the descriptions about the test setup, procedures and configuration presented in this report are accurate. The results of testing in this report apply only to the product/system which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Per the requirement of Section 2.911(d) Certification of Technical Test Data, I hereby certify that the technical test data are the results of tests either performed or supervised by me.

W. Steve Majkowski NCE
Member of Technical Staff
Global Product Compliance Laboratory
Alcatel-Lucent USA, Inc.

2. SUMMARY OF THE TEST RESULTS

47 CFR FCC Sections	Description of Tests	Compliance Results	Notes
2.1046	**RF Power Output**	**Yes**	
2.1047	**Modulation Characteristics**	**YES**	
2.1049, 24.238	**(a) Occupied Bandwidth** **(b) Out-of-Band Emissions**	**Yes**	
2.1051, 24.238	**Spurious Emissions at Antenna Terminals**	**Yes**	
2.1053, 24.238	**Field Strength of Spurious Radiation**	**Yes**	
2.1055, 24.235	**Measurement of Frequency Stability**	**NR**	

NR: Not Required
NA: Not Applicable

2.1 Measurement Uncertainty

The results of the calculations to estimate uncertainties for the several test methods and standards are shown in the Table below. These are the worst-case values.

Worst-Case Estimated Measurement Uncertainties

Standard, Method or Procedure	Condition	Frequency MHz	Expanded Uncertainty (k=2)
a. Classical Emissions, (*e.g.*, ANSI C63.4, CISPR 11, 14, 22, *etc.*, using ESHS 30,	Conducted Emissions	0.009 - 30	±3.5 dB
	Radiated Emissions (AR-6 Semi-Anechoic Chamber)	30 MHz – 200MHz H 30 MHz – 200 MHz V 200 MHz – 1000 MHz H 200 MHz – 1000 MHz V 1 GHz- 18 GHz	±5.1 dB ±5.1 dB ±4.7 dB ±4.7 dB ±3.3 dB

2.2 Measurement uncertainty for Antenna Port Testing:

- 9 kHz to 20 MHz: Frequency = 10 Hz, Amplitude = 0.5 dB
- 20 MHz to 1 GHz: Frequency = 100Hz, Amplitude = 0.5 dB
- 1 GHz to 10 GHz: Frequency = 10 kHz, Amplitude = 0.5 dB

3. GENERAL INFORMATION

3.1 Product Descriptions

The equipment under test (EUT) has the following specifications.

Table 3.1.1 Product Specifications

Specification Items	Description
Product Type	Compact Base Station (4Tx, 4Rx), 4x4 MIMO
Radio Type	Intentional Transceiver
Power Type	-48VDC
Modulation	QPSK, 16QAM, 64QAM
Operating Frequency Range	Tx 1930-1995 MHz/Rx 1850-1910 MHz
Channel Bandwidth	5, 10, 15, 20 MHz, 5+5 MHz and 10+15 MHz
Max Conducted Power (Rated)	47.8 dBm per port for 2xMIMO , 44.8 dBm per port for 4xMIMO
Software Version	NEM LR16.2_D1.12
Hardware Version	RRH 4x30 MIMO
Antenna(s)	Refer to Section 3.2

The EUT supports the following carrier configurations:

Table 3.1.2 EUT Supported Configurations

Carrier Bandwidth (MHz)	Maximum No of Carriers per Path	Technology	Supported?
5	1	LTE	√
10	1	LTE	√
15	1	LTE	√
20	1	LTE	√
5+5	2	LTE	√
10+15	2	LTE	√

The operating band consists of the following blocks and spectrum:

Table 3.1.3 EUTRAN 25, PCS Band

PCS Blocks	Tx Downlink Frequency Range (MHz)	Rx Uplink Frequency Range (MHz)	Width of Block (MHz)
A	1930 - 1945	1850 - 1865	15
D	1945 - 1950	1865 - 1870	5
B	1950 - 1965	1870 - 1885	15
E	1965 - 1970	1885 - 1890	5
F	1970 - 1975	1890 - 1895	5
C	1975 - 1990	1895 - 1910	15
G	1990 - 1995	1910 - 1915	5

3.2 Antenna Information

The product does not incorporate integrated antennas.

4. REQUIRED MEASUREMENTS AND RESULTS

The EUT is a Class II Permissive Change. Per 47CFR FCC Section 2.1033(c)(14), the following certification tests are required by Section 2.1046 through Section 2.1057. The measurement was conducted in accordance with the procedures set out in Section 2.1041.

47 CFR FCC Sections	Description of Tests	Required	Notes
2.1046	**RF Power Output**	**Yes**	
2.1047	**Modulation Characteristics**	**Yes**	
2.1049, 24.238	**(a) Occupied Bandwidth** **(b) Out-of-Band Emissions**	**Yes**	
2.1051, 24.238	**Spurious Emissions at Antenna Terminals**	**Yes**	
2.1053, 24.238	**Field Strength of Spurious Radiation**	**Yes**	
2.1055, 24.235	**Measurement of Frequency Stability**	**NR**	

4.1 Section 2.1046 MEASUREMENT REQUIRED: RF POWER OUTPUT

This test is a measurement of the total RF power level transmitted at the antenna-transmitting terminal. The product was configured for test as shown in Figure 4.1.1 below and allowed to warm up and stabilize per KDB 971168 D01 and ANSI C63.26.

For LTE transmit carrier operation, the **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System** is specified to provide a continuous maximum power output of 120 Watts as the sum total of RF output power of its Transmit antenna terminals. It does this by either providing 60W (47.78 dBm +/- 1 dB) for all of the carriers at either its Tx1 / Tx2 transmit antenna terminals or by providing 30W (44.77 dBm +/- 1 dB) for all of the carriers at the Tx1, Tx2, Tx3 & Tx4 transmit antenna terminals.

For this Class II Change, the operation of the 2x60W MIMO mode was evaluated with a single 5 MHz carrier. This is the highest spectral density operating mode for the product.

4.1.1 RF Power Output Measurement

Power measurements were conducted with a broadband Power Meter in the average mode per KDB 971168 D01. The applied signal from an **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System / AS5BBTRX-22**, met the recommended characteristics as defined in **3GPP TS 36.211 V9.1.0 (2010-03) titled:** 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation (Release 9).

The maximum rated mean power at the antenna transmitting terminal was measured with combined QPSK +- 16QAM and with 64QAM modulation respectively. This power level is documented on each data sheet for Occupied bandwidth and Conducted spurious emissions.

4.1.1.1 RF Power Output Results

The measured RF power outputs of the EUT are given in Table 4.1.1.1 The RF power output was measured for the 2x60W MIMO configuration as addressed by this Class II Change. The measured performance was in full compliance with the Rules of the Commission This detailed on each of the plots comments in Sections 4.3 and 4.4.

Table 4.1.1.1 Measured Maximum Average RF Output Power of the EUT

PCS Block	Port	Carrier Center Frequency, MHz	Tx Configuration	Modulation	Measured Transmit Power Watts	Measured Transmit Power dBm
A	Tx1	1932.5	5MHz 2xMIMO	QPSK+16QAM	60	47.8
A	Tx1	1932.5	5MHz 2xMIMO	64QAM	60	47.8
A	Tx1	1942.5	5MHz 2xMIMO	64QAM	60	47.8
D	Tx1	1947.5	5MHz 2xMIMO	64QAM	60	47.8
B	Tx1	1952.5	5MHz 2xMIMO	64QAM	60	47.8
B	Tx1	1962.5	5MHz 2xMIMO	64QAM	60	47.8
E	Tx2	1967.5	5MHz 2xMIMO	64QAM	60	47.8
F	Tx2	1972.5	5MHz 2xMIMO	64QAM	60	47.8
C	Tx2	1977.5	5MHz 2xMIMO	64QAM	60	47.8
C	Tx2	1987.5	5MHz 2xMIMO	64QAM	60	47.8
G	Tx2	1992.5	5MHz 2xMIMO	QPSK + 16QAM	60	47.8
G	Tx2	1992.5	5MHz 2xMIMO	64QAM	60	47.8

4.1.2 Peak-to-Average Power Ratio Measurement

The Peak-to-Average Power Ratio (PAPR) of the EUT has also been measured per KDB 971168 D01 using the setup in Figure 4.1.1 below. These measurements were made for the 5 MHz 2x60W carriers as tabulated in Table 4.1.2.

For either the combined QPSK+16QAM modulation or for 64QAM the PAPR values (0.1% probability) of the EUT were measured to be below the 13dB requirement. The maximum PAPR value for each measured configuration is given in Table 4.1.2. Sample measurements are shown in the plots in Figure 4.1.2 below.

Table 4.1.2 The Maximum PAPR Value at 0.1% probability of the EUT

PCS Block	Frequency, MHz	Bandwidth MHz	Modulation	Maximum PAPR Value at 0.1% probability (dB)
A1	1932.5	5	64QAM	7.0
A1	1932.5	5	QPSK-16QAM	7.0
A5	1942.5	5	64QAM	6.8
D	1947.5	5	64QAM	6.8
B1	1952.5	5	64QAM	6.9
B5	1962.5	5	64QAM	6.8
E	1967.5	5	64QAM	6.8
F	1972.5	5	64QAM	6.5
C1	1977.5	5	64QAM	6.5
C5	1987.5	5	64QAM	6.5
G	1992.5	5	64QAM	6.8
G	1992.5	5	QPSK-16QAM	6.8

4.1.2.1 Peak-to-Average Power Ratio Results:

The maximum Peak-to-Average Power Ratio (PAPR) of the EUT measured at its antenna transmitting terminals were measured to be in full compliance with the ≤ 13 dB Rules of the Commission and are listed above.

Figure 4.1.1 Test Set-Up for Measurement of

Radio Frequency Power Output

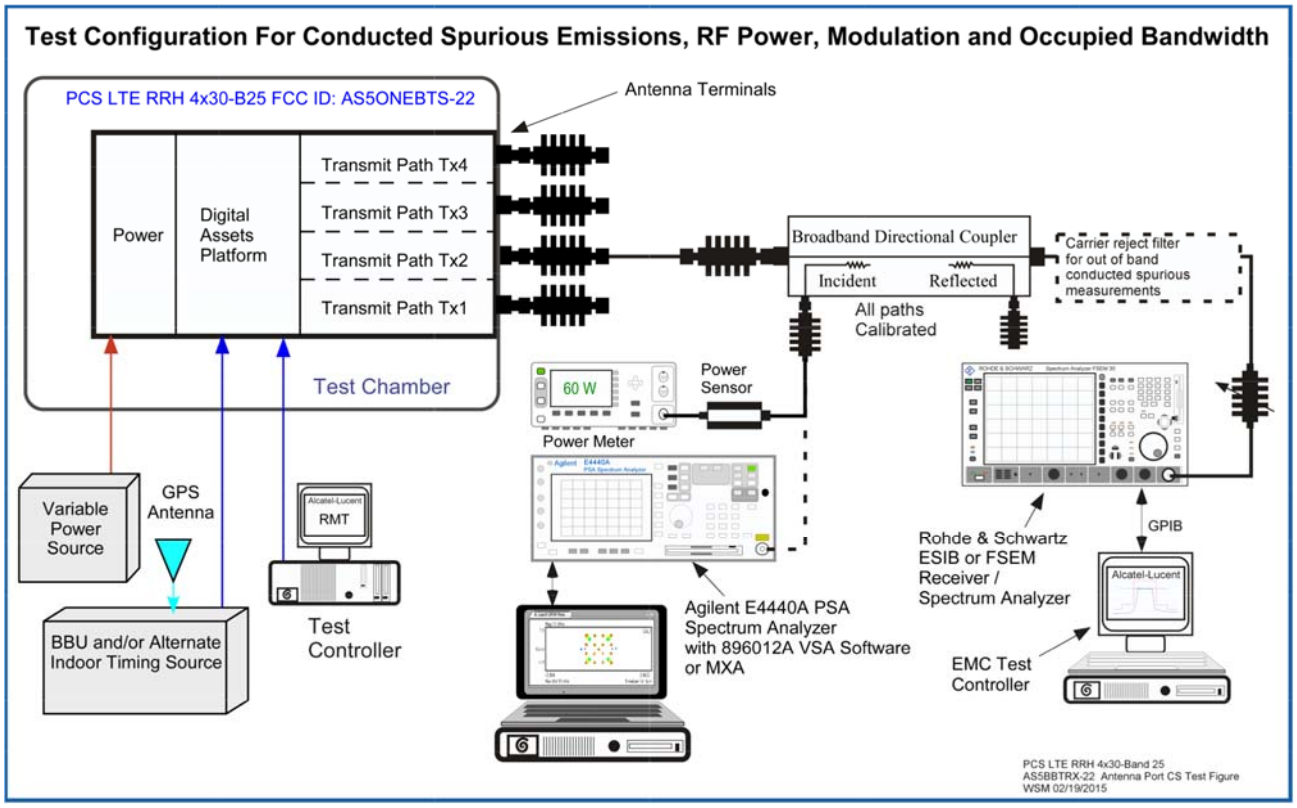
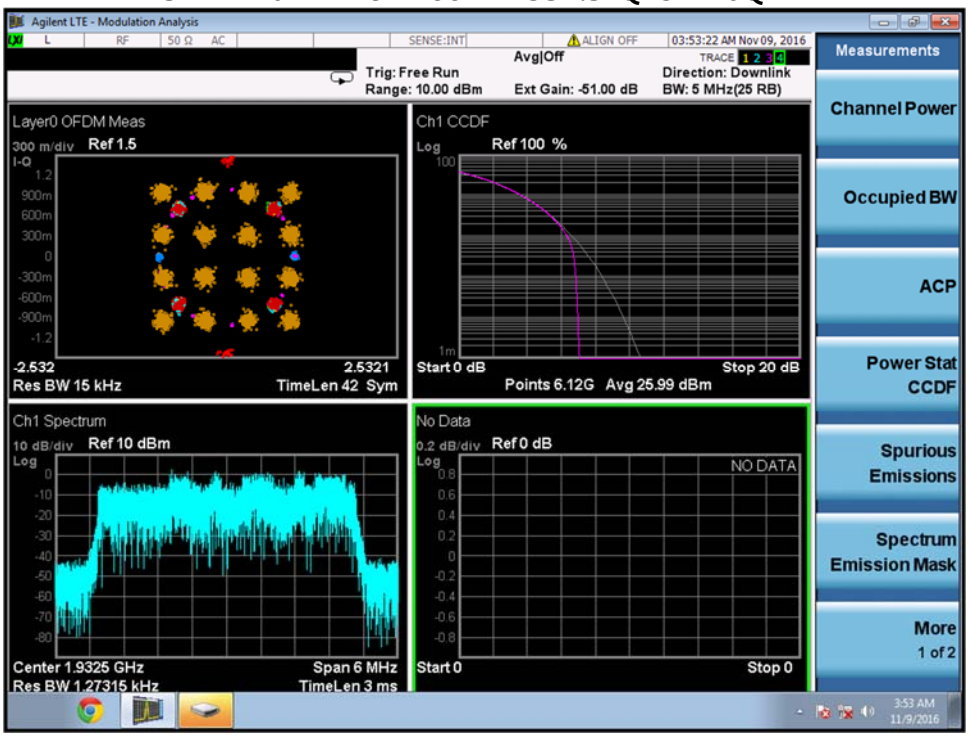
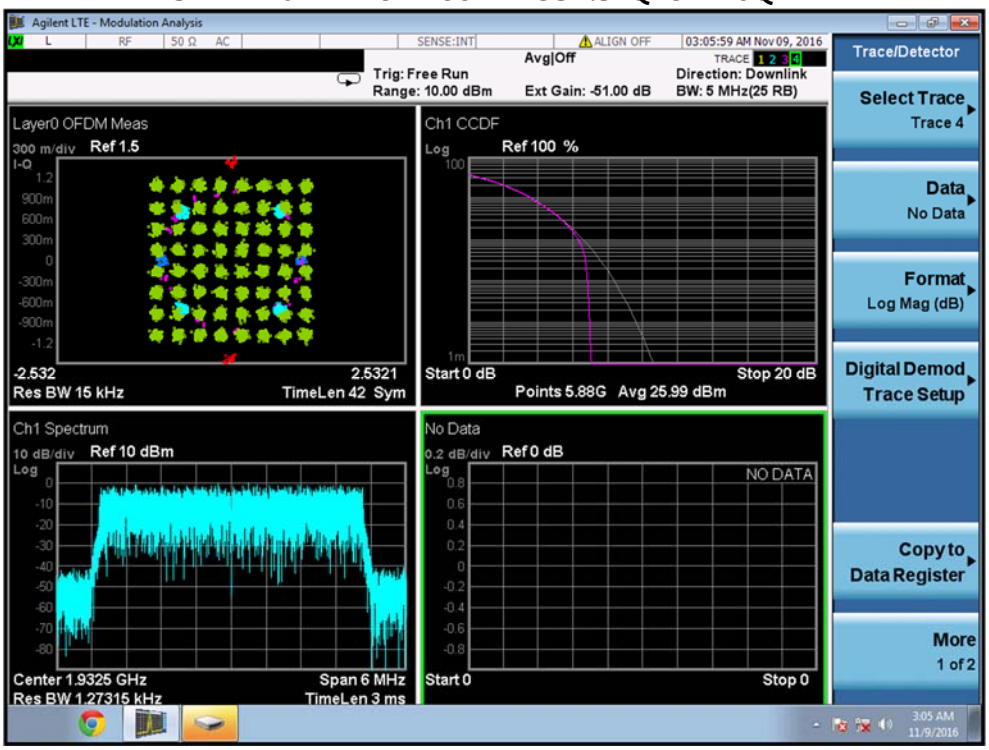


Figure 4.1.2 Modulation and PAPR Plots Measured with the Maximum Value
5 MHz Bandwidth Block A 1932.5 QPSK-16QAM



5 MHz Bandwidth Block A 1932.5 QPSK-16QAM



4.2 Section 2.1047 MEASUREMENT REQUIRED: MODULATION CHARACTERISTICS

The **B25 RRH 4X30** supports LTE technologies. LTE utilizes Orthogonal Frequency Division Multiplexing (OFDM) which splits the carrier frequency bandwidth into many small subcarriers. Each individual subcarrier is modulated with QPSK, 16QAM or 64QAM digital modulation formats.

In QPSK, there are 4 possible symbol states and each symbol carries 2 bits of information. In 16QAM, there are 16 possible symbol states and each 16-QAM symbol carries 4 bits of information. While in 64QAM, there are 64 possible symbol states and each 64-QAM symbol carries 6 bits of information. Higher-order modulation, where the constellations become more dense, is more sensitive to poor channel conditions than the lower-order modulation.

The modulation characteristics measurement of LTE carriers measures the difference between the ideal symbols and the measured symbols after the equalization. The measurement was performed for the combined QPSK + 16QAM configuration and for the 64QAM configuration at the band ends and for the 64QAM configuration at all of the channels as documented in table 4.2 below.

Table 4.2 Modulation Results

PCS Block	Port	Transmit Power Watts	Signal Bandwidth, MHz	Modulation	Carrier Center Frequency, MHz	Modulation Pass/ Fail	PAR Pass/ Fail
A	Tx1	60	5	QPSK +16QAM	1932.5	Pass	Pass
A	Tx1	60	5	64QAM	1932.5	Pass	Pass
A	Tx1	60	5	64QAM	1942.5	Pass	Pass
D	Tx1	60	5	64QAM	1947.5	Pass	Pass
B	Tx1	60	5	64QAM	1952.5	Pass	Pass
B	Tx1	60	5	64QAM	1962.5	Pass	Pass
E	Tx2	60	5	64QAM	1967.5	Pass	Pass
F	Tx2	60	5	64QAM	1972.5	Pass	Pass
C	Tx2	60	5	64QAM	1977.5	Pass	Pass
C	Tx2	60	5	64QAM	1987.5	Pass	Pass
G	Tx2	60	5	QPSK +16QAM	1992.5	Pass	Pass
G	Tx2	60	5	64QAM	1992.5	Pass	Pass

4.2.1 Modulation Characteristics Measurement

The measurements were performed at the antenna transmitting terminal of the base station system with a signal analyzer which was calibrated in accordance with ISO 9001 process.
The test set-up diagram is given in the Figure 4.1.1, where the signal analyzer used the external signals from the base station as its trigger source and time reference.
Figure 4.2.2 shows two representative screen plots of the modulation measurement for an LTE carrier in QPSK +16QAM and 64QAM modulations, respectively.

4.2.1.1 Modulation Measurements Results:

The modulation characteristics of the EUT measured are in full compliance with the Rules of the Commission.

Figure 4.2.1 Test Set-Up for Measurement of Modulation, Occupied Bandwidth and Out-of-Band Emissions

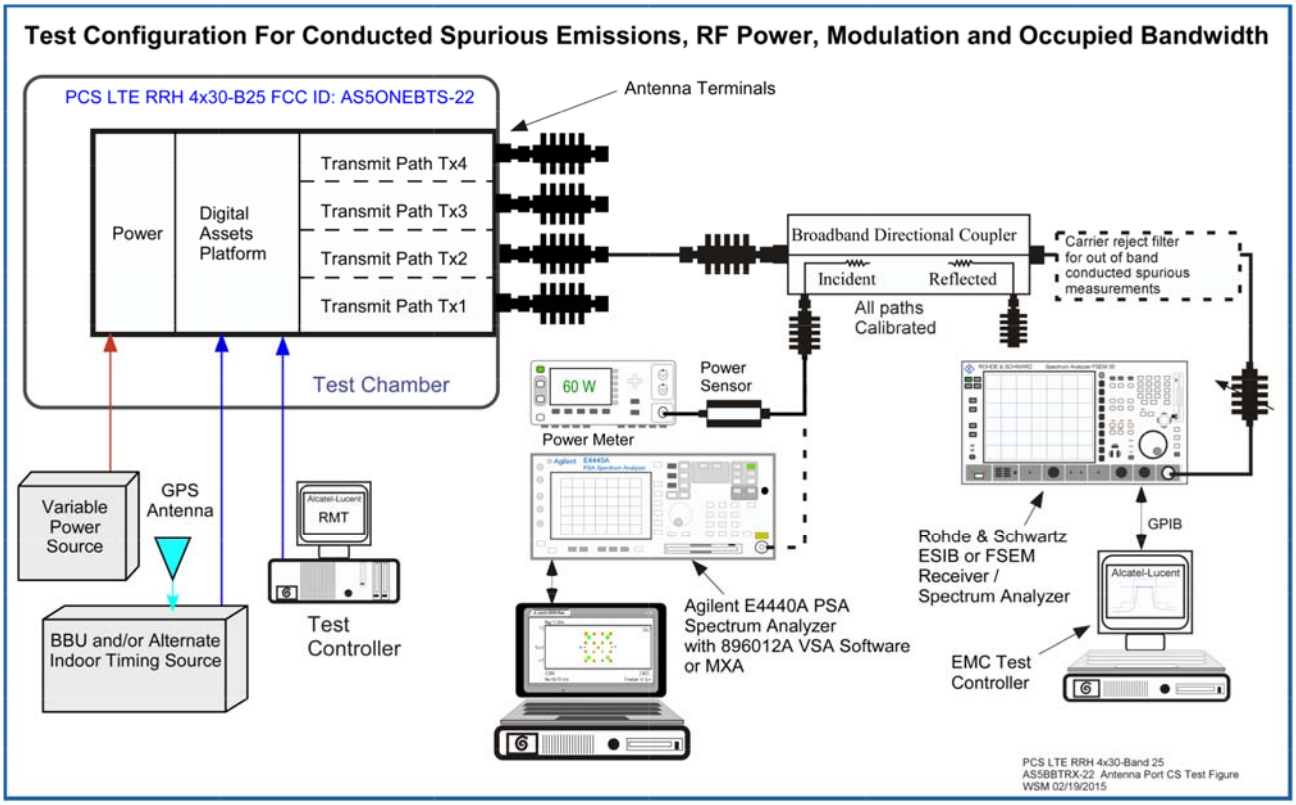
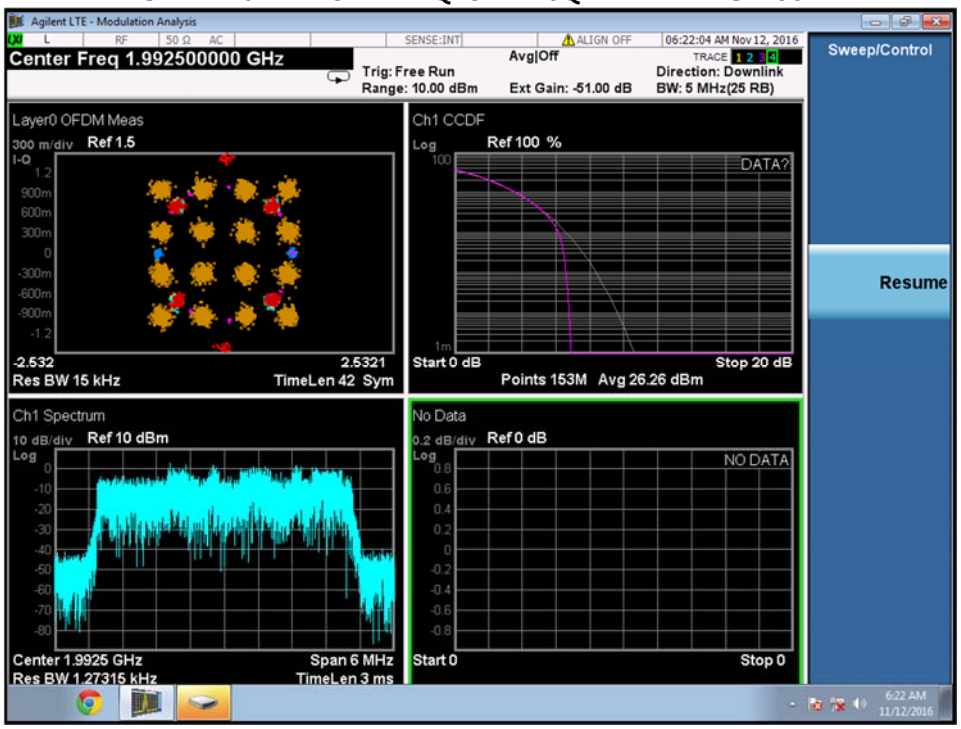
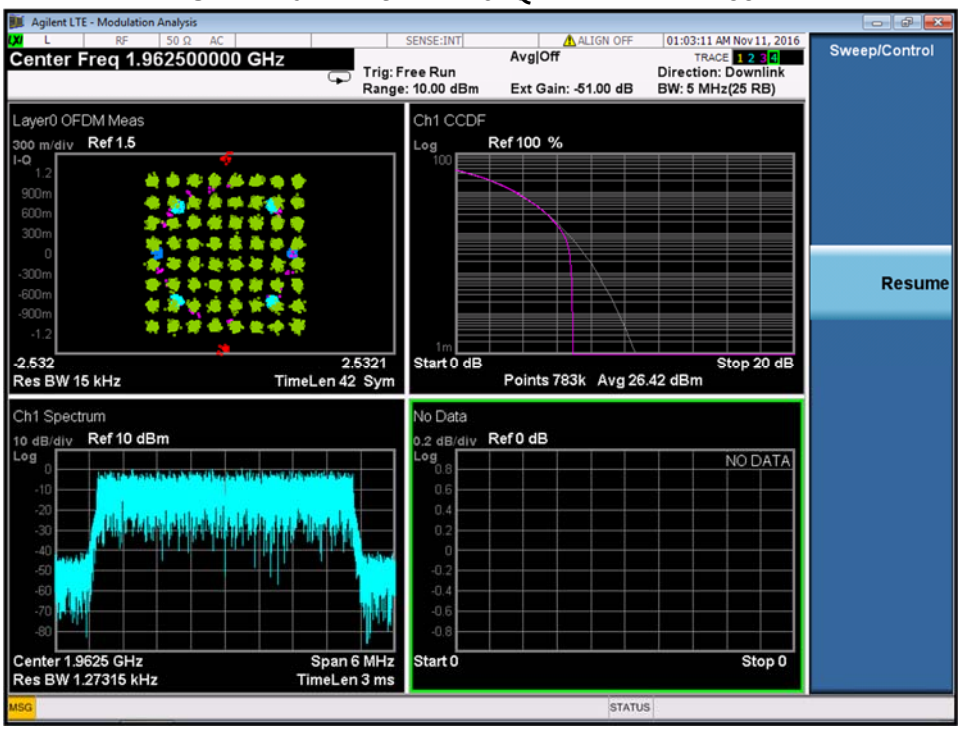


FIGURE 4.2.2 Modulation Measurements

5 MHz Bandwidth QPSK + 16QAM G Block



5 MHz Bandwidth 64QAM B Block



4.3 Section 2.1049 MEASUREMENT REQUIRED: OCCUPIED BANDWIDTH AND EDGE of BLOCK EMISSIONS

This test measures the Occupied Bandwidth of the transmitting carrier and the Edge of-Block Emissions in the frequency spectrum immediately outside and adjacent to the transmitting carrier(s).

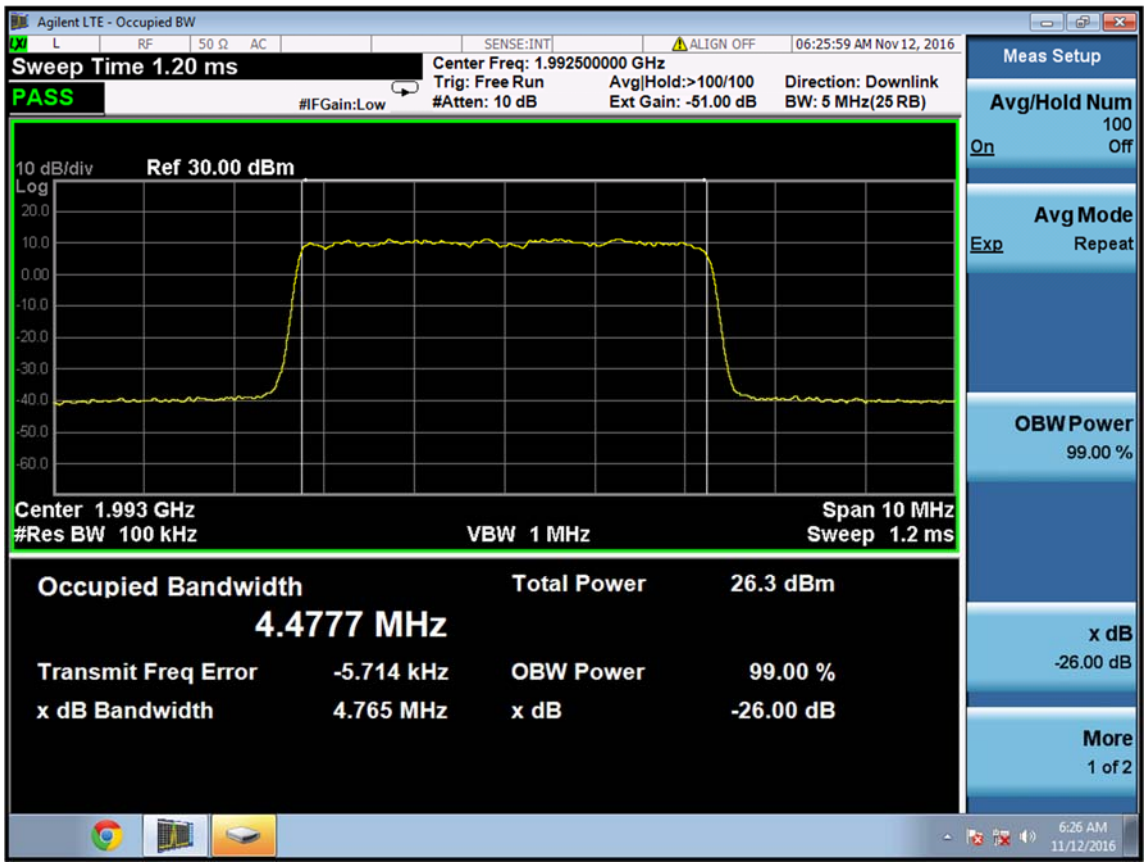
The occupied bandwidth (OBW) is usually defined either as the 99% power OBW or a relative OBW. The 99% OBW is the signal bandwidth such that, below its lower and above its upper frequency limits, the mean power radiated or conducted are each equal to 0.5 percent of the total mean power radiated or conducted by a given emission. The relative OBW is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated by at least X dB below the transmitter power, where the value of X is typically specified as 26.

Per KDB 971168 D01 v02r02, the relative OBW must be measured and reported when it is specified in the applicable rule part; otherwise, the 99% OBW shall be measured and reported. The OBW shall be measured when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment is operated.

4.3.1 Results Occupied Bandwidth (Signal Bandwidth)

The measured 99% occupied bandwidth and -26 dB relative bandwidth was measured with a Keysite MXA signal analyzer. The results are in Figure 4.3 .1 below and shows that the measured signal is within the parameters of the 5M00F9W emissions designator. .

FIGURE 4.3.1- Occupied Bandwidth - Typical Mask Depiction



4.3.2 Occupied Bandwidth-Edge of Block Emissions

Classical Occupied Bandwidth – Edge of Block Emissions is an evaluation of the transmit carrier compliance with edge of block/edge of band requirements. This measurement documents the product's ability to maintain compliance with FCC Parts 2 and 24 limitations on emissions outside the block of operation.

The **B25 RRH 4X30** Distributed Base station system supports single-carrier and multiple-carrier configurations with CDMA and LTE technologies. This evaluation only addresses 5MHz 2x60W operation. All power adjustments were performed prior to other measurements and for this test all carriers were set to 60W. The measurements are described below.

The occupied bandwidth of each of the signals identified in Table 4.3.2 was measured using a Rohde & Schwarz ESIB-40 EMI Receiver/ Spectrum Analyzer, a PC based instrumentation controller using TILE™ software and calibrated RF attenuation and coupled signal path. The measurement process meets the requirements of ANSI C63.26 and ISO17025. The RF power level was measured and adjusted via the test setup in Figure 4.3. The set RF output from the transmitter was reduced by calibrated broadband attenuators to amplitudes usable by the spectrum analyzer and power meter. The attenuation factors are reflected in the displayed values of the charts. The typical occupied bandwidth measurement displays the signal adjusted to the reference level corresponding to the corrected RF power level for the signal bandwidth and given resolution bandwidth (RBW). This set-point was performed as follows:

For each test the power calibration was individually verified at the transmitter antenna connection (J4) with a power meter by using the test setup depicted in Figure 4.3. The power calibration was performed to calibrate the spectrum analyzers power measurement against the more accurate power meter measurement. This provides a specific reference for both the measured 30kHz RBW Occupied Bandwidth signal at the signal reference line and the 3 MHz RBW measurement against the power calibration line which is the below the "Top of Mask" limit. The "Top of Mask" limit corresponds to a single carrier signal at the specified power level of 60W / 47.78 dBm if measured with an RBW greater than the emissions bandwidth. Since the power calibration measurements was performed with a 3 MHz RBW a power calibration line equal to 10 log(3MHz/Emissions Bandwidth). The specific levels are specified in Table 4.3.2.3 which has limits for all of the measurements.

The transmitter output was configured to provide a 60W/ 47.78 dBm LTE carriers. In each occupied bandwidth measurement there are two traces which track each other a given distance apart in amplitude. The top trace is the power calibration trace and this carrier is set to the power calibration line. The second trace is the occupied bandwidth measurement. The power calibration measurements is performed along with each Occupied Bandwidth measurement. The signals measured at RBW's of 3 MHz and 30 kHz were corrected for path loss and were plotted against the mask limit. As part of the calibration between the power meter measurement and the test analyzer, software was used to place the 3 MHz RBW signal at the carrier power calibration line for the specific carriers signal. The carrier as measured with 3 MHz and 30kHz RBW were corrected with the same attenuation factors. The two measurements are co-plotted on the same graph. A typical single carrier example is shown in Figure 4.3.2.3 which depicts a single 5 MHz carrier inside the D Block mask.

The test procedure above, calibrates the carrier power against the Mask and accurately places the measured occupied bandwidth carrier at the -22.2 dBm reference line. All of the plots are presented with a sufficiently wide frequency span for the specific signals or Block of interest. This allows for ease of comparison of the multi-carrier performance. This data was electronically recorded using the TILE™ software and electronically placed in the Occupied Bandwidth Data Sheets. These sheets contain data for multiple mixed carrier configurations for "Left Edge of Block", and "Right Edge of Block" across the PCS Band.

4.3.2.1 Requirements

The Limit in 47 CFR 24.238(a)(b) for emissions in the 1 MHz band immediately outside and adjacent to a licensees frequency block is:

Emissions <1 MHz outside the Block *when measured with a RBW of 1%* of the emissions Bandwidth shall be attenuated by :

-{43+10log (mean power output in watts)} = -13 dBm

The Limit in 47 CFR 24.238(a) for emissions outside a licensees frequency block is:

Emissions >1 MHz outside the Block, *when measured with a RBW of 1 MHz*, shall be attenuated by :

-{43+10log (mean power output in watts)} = -13 dBm.

The requirement of FCC Part 24.238 was used as the required emission limit mask in the LTE measurement. The sampling average was used in all measurement.

4.3.2.2 Measurement Offset and MIMO

The spectrum analysis output plots shows the peak of the LTE channel signal at the reference line that is 22.22 dB below the top of Mask reference of the spectrum analyzer. For the LTE system there is no carrier without modulation. Since the LTE signal is broadband and 5 MHz wide, all measurements performed at narrower resolution bandwidths needs to be evaluated with limits adjusted for the reduction in signal energy. The following relationship was used to provide the correct level for an unmodulated carrier vs. the modulated signal.

10*log (Resolution Bandwidth/ Transmit Bandwidth) = Signal Offset (1)

For the peak of the 5 MHz LTE signal measured with a RBW of 30 kHz the signal offset is:

Signal Offset = 10*log (30 kHz /5 MHz) = -22.22 dB

Since the 5 MHz LTE signal is wider than the 3 MHz spectrum analyzer setting used for power calibration a power calibration line must be placed below the top of mask. The offset for the power calibration line is:

Power Calibration Offset = 10*log (3 MHz /5 MHz) = -2.218 dB

For MIMO operation the limits must be adjusted per the equation:

MIMO Offset = 10LOG(n) where n= MIMO Value

For 2x MIMO = 10LOG(n)= 3.01 dB

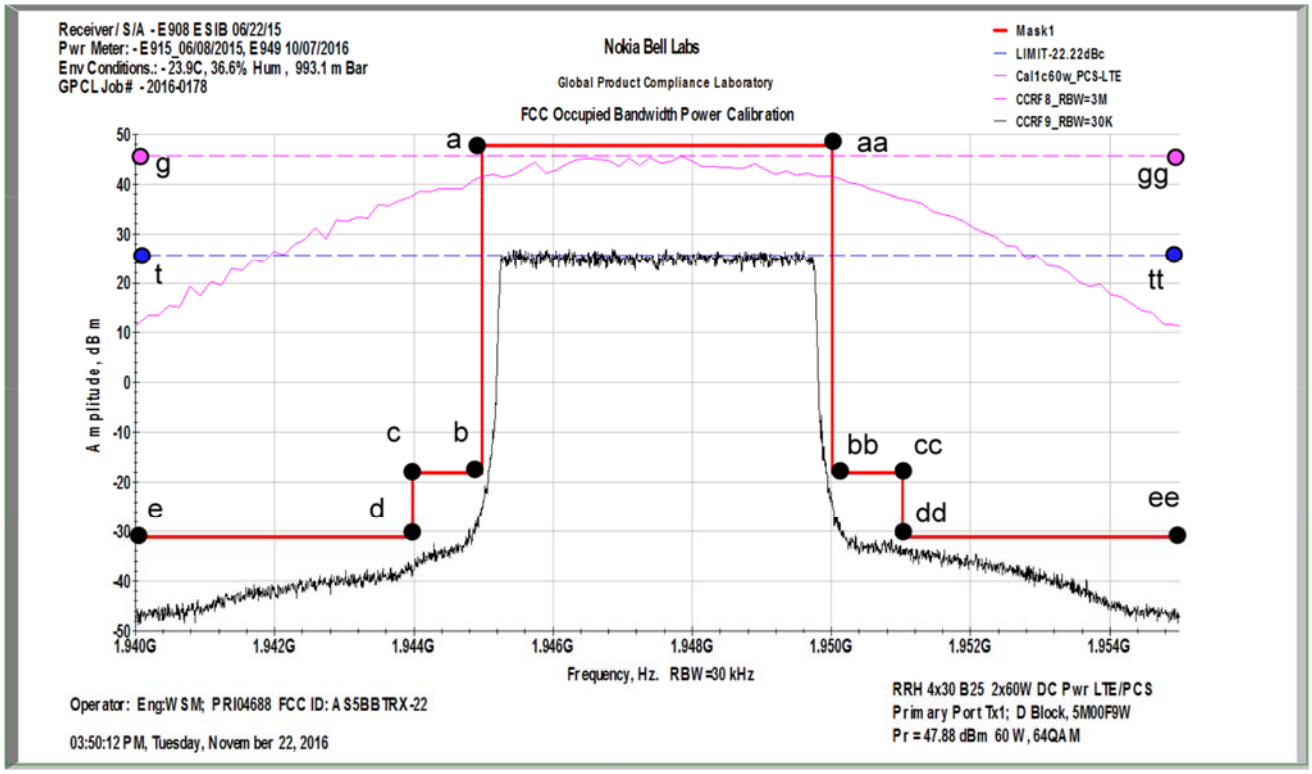
4.3.2.3 Mask Parameters

Limits which are specified as appropriate at a given RBW can be measured and evaluated at other RBW's if the limit is adjusted per equation (1). Table 4.3.2.3, below, identifies all of the limits and calibrations line levels used on the Occupied Bandwidth Masks to evaluate Out of Band Emissions. The line designations are as identified on the sample OBW chart Figure 4.3.2.3

Table 4.3.2.3 Mask Parameters

Carrier Power line a-aa		Signal BW	Measurement RBW		Power Calibration Line g-gg		Signal Offset Reference level Line t-tt		"n" x MIMO	MIMO Factor	Limit for 1st MHz Outside the Block Lines c-b & bb-cc		Limit for Beyond the 1st MHz Outside the Block Lines e-d & dd-ee	
			OBW	RF Power	Offset	Level								
W	dBm	MHz	MHz	MHz	dB	dBm	dBc	dBm	n	dB	dBm	dBc	dBm	dBc
60	47.78	5	0.03	3	-2.22	45.56	-22.22	25.56	2	3.01	-18.23	-66.01	-31.24	-79.02

Figure 4.3.2.3 Mask Parameters



The occupied bandwidth and out-of-band emissions measurements were made at the antenna transmitting terminal for QPSK, 16QAM and 64QAM modulations, respectively. The appropriate E-UTRA test model specified in 3GPP TS 36.141 was used for LTE carriers.

The measurements were performed with a spectrum analyzer and in compliance with the procedure and requirements of ANSI C63.26. The test set-up diagram is same as the one shown in the Figure 4.3.1.

Testing was performed for the combined QPSK+16QAM and for the 64QAM modulations, respectively. The total carrier power level at the antenna terminal was adjusted to the maximum rated mean power 47.8 dBm (60W) for 2xMIMO configurations.

4.3.2.4 Results Occupied Bandwidth-Edge of Block Emissions

The occupied bandwidth plots for operation at the left side and right side of all PCS Block are below. The mask accurately depicts the limits for the specific blocks to determine compliance with FCC Part 24.238. The mask limits include the appropriate considerations for 2x60W MIMO operation. The plots for the left side of A Block and the right side of G Block contain data for both modulation configurations QPSK+16QAM and 64QAM respectively.

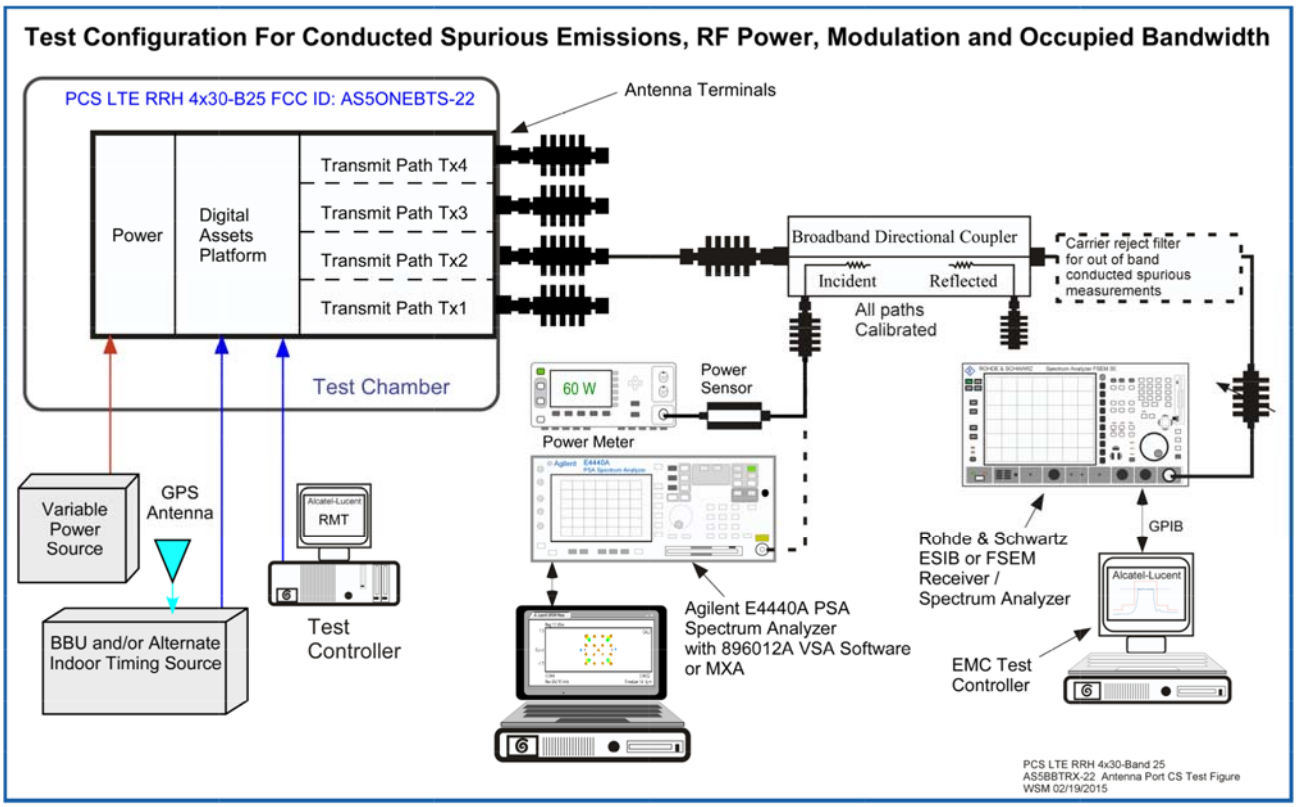
From the out-of-band emissions plots attached below, it can be seen that all the emissions are under the required FCC emission masks for MIMO operation.

The measurement results of the occupied bandwidth and the out-of-band emissions as documented in the plots and Table 4.3.2.4 demonstrate the full compliance with the Rules of the Commission for the operating band.

Table 4.3.2.4 Compliance Tabulation of Occupied Bandwidth-Edge of Block Measurements

PCS Block	Port #	Transmit Power Watts	Signal Bandwidth MHz	Modulation	Carrier Center Frequency MHz	Occupied Bandwidth and Out of Band Emissions Measurement	Compliance Status
A	Tx1	60	5	QPSK+16QAM	1932.5	Yes	Pass
A	Tx1	60	5	64QAM	1932.5	Yes	Pass
A	Tx1	60	5	64QAM	1942.5	Yes	Pass
D	Tx1	60	5	64QAM	1947.5	Yes	Pass
B	Tx1	60	5	64QAM	1952.5	Yes	Pass
B	Tx1	60	5	64QAM	1962.5	Yes	Pass
E	Tx2	60	5	64QAM	1967.5	Yes	Pass
F	Tx2	60	5	64QAM	1972.5	Yes	Pass
C	Tx2	60	5	64QAM	1977.5	Yes	Pass
C	Tx2	60	5	64QAM	1987.5	Yes	Pass
G	Tx2	60	5	QPSK+16QAM	1992.5	Yes	Pass
G	Tx2	60	5	64QAM	1992.5	Yes	Pass

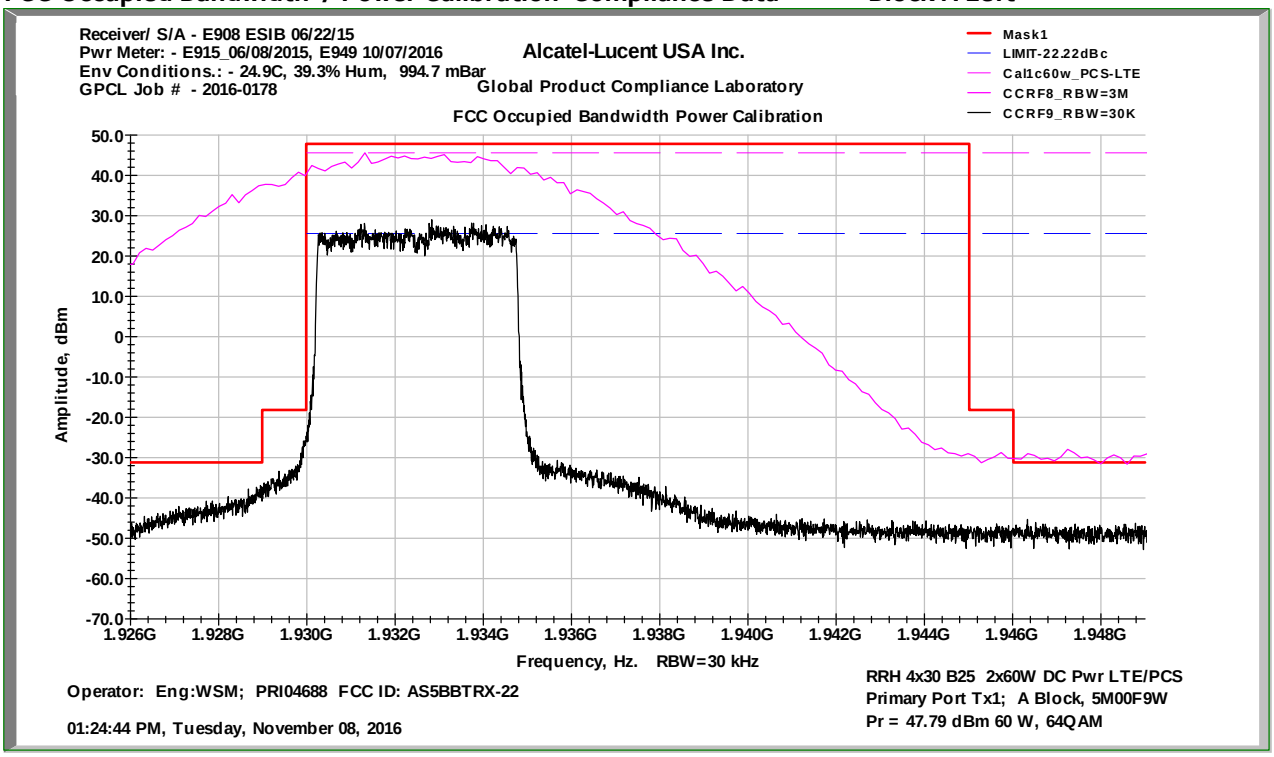
Figure 4.3.2 Test Set-Up for Measurement of Occupied Bandwidth and Out-of-Band Emissions



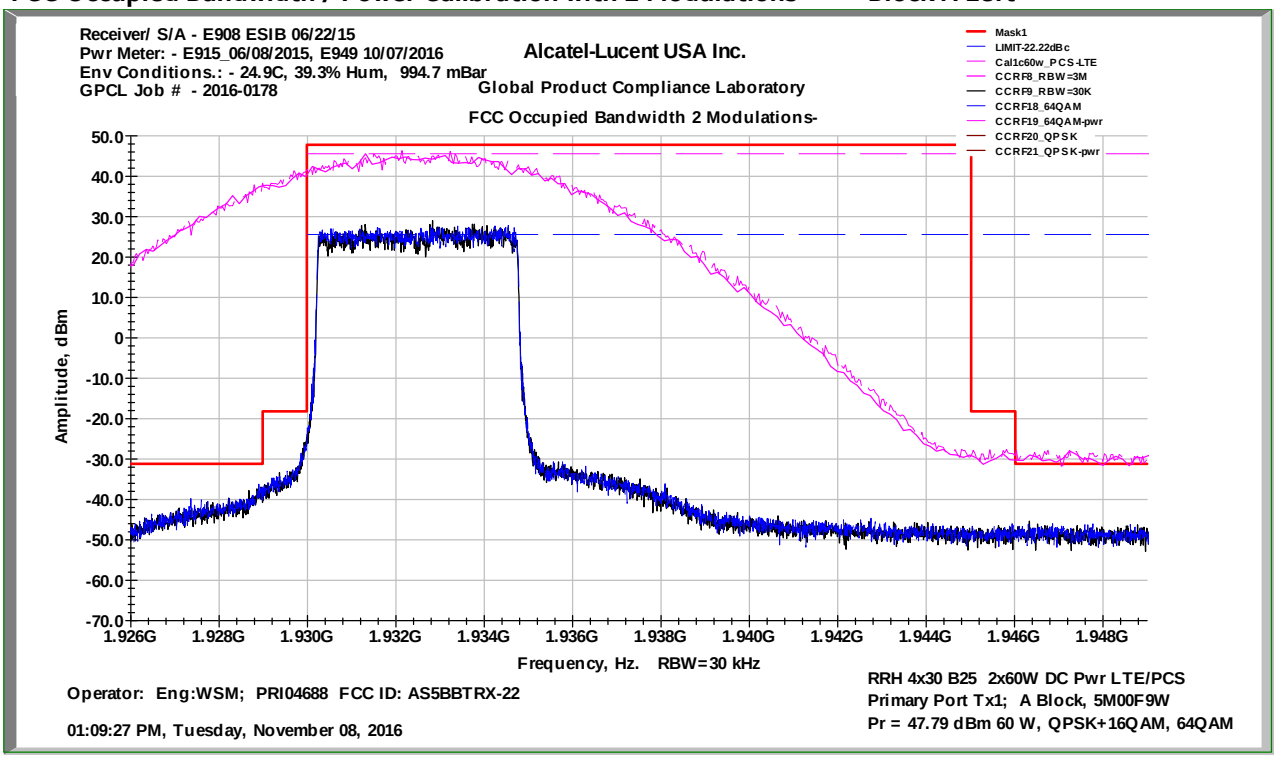
Transmitter Measurements of Occupied Bandwidth and Edge of Band Emissions for Alcatel-Lucent USA Inc.

PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System FCC ID: AS5BBTRX-22

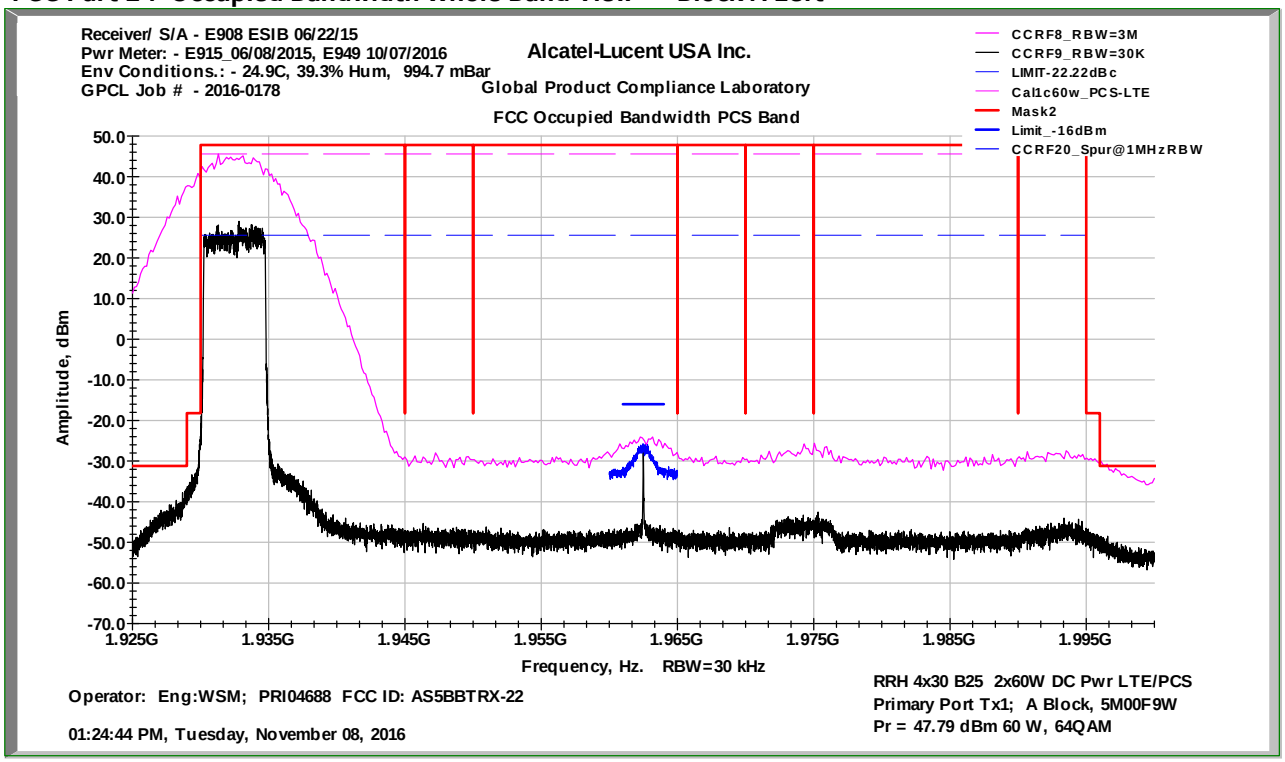
FCC Occupied Bandwidth / Power Calibration Compliance Data Block A Left



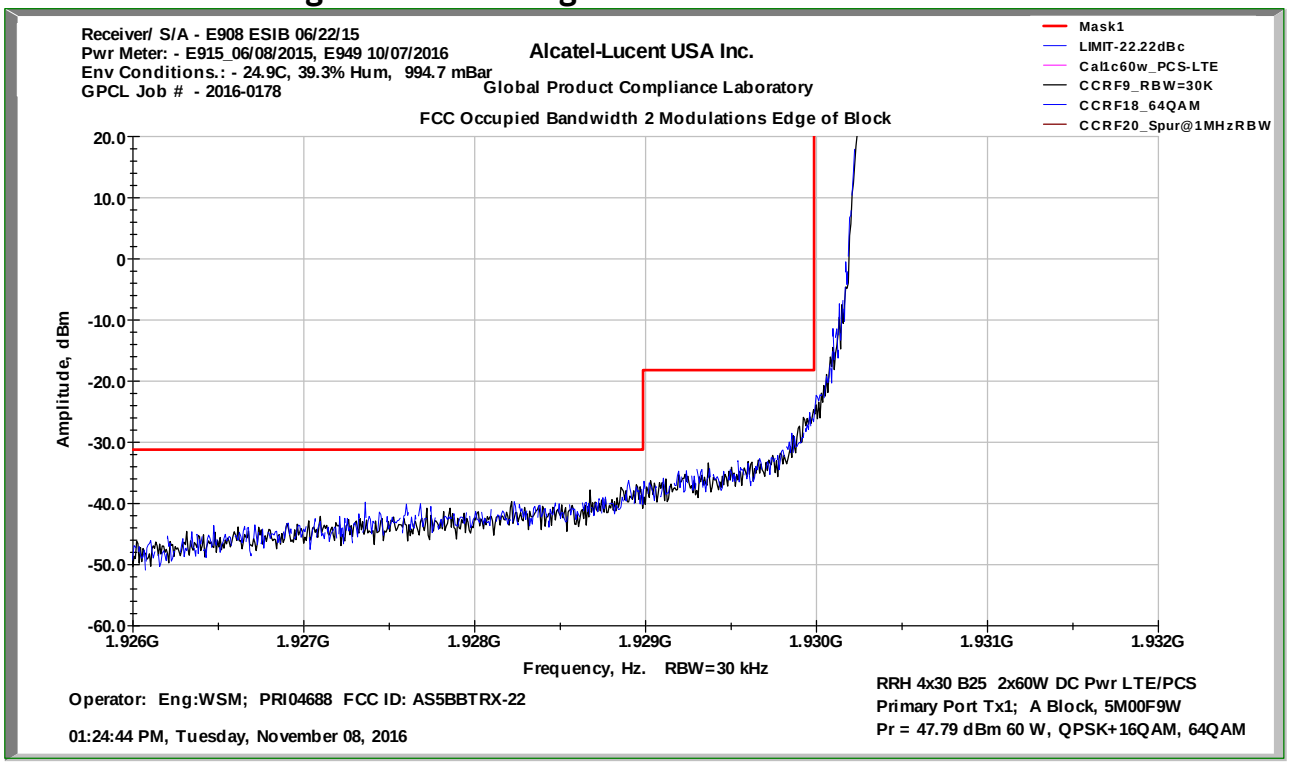
FCC Occupied Bandwidth / Power Calibration with 2 Modulations Block A Left



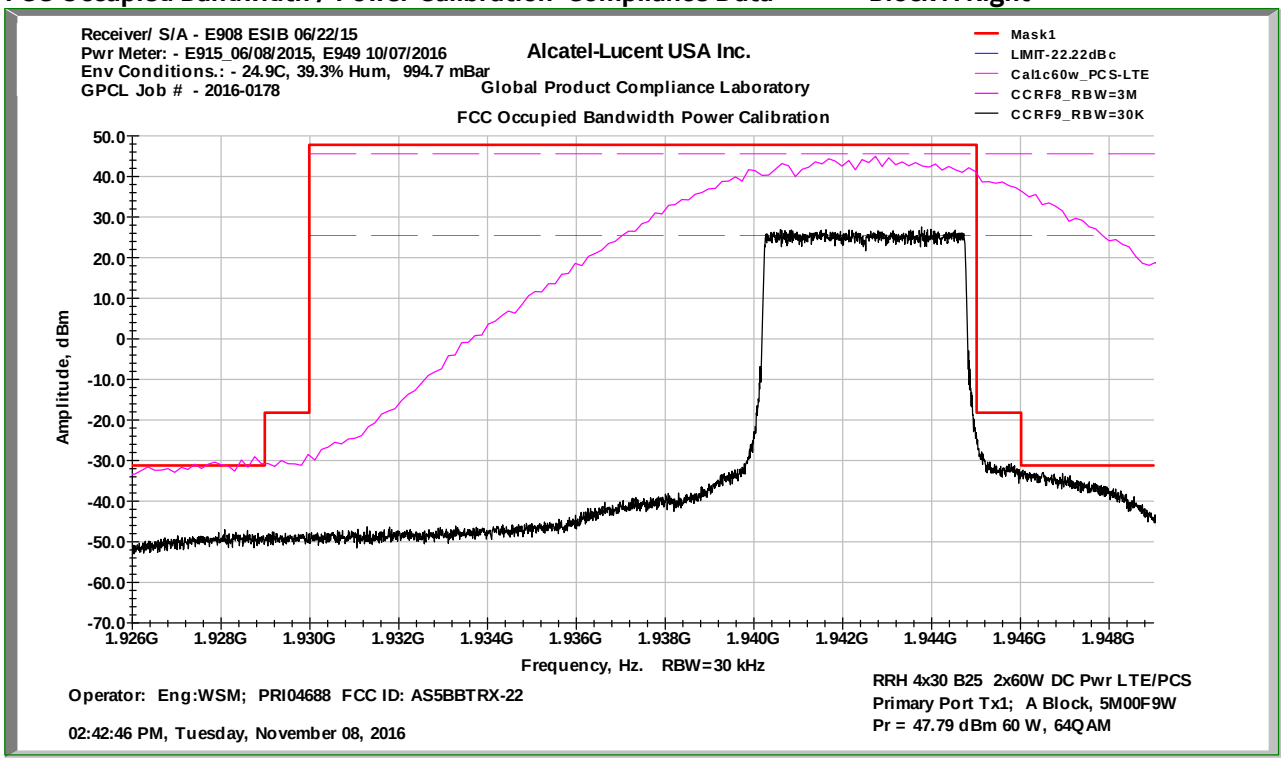
FCC Part 24 Occupied Bandwidth Whole Band View Block A Left



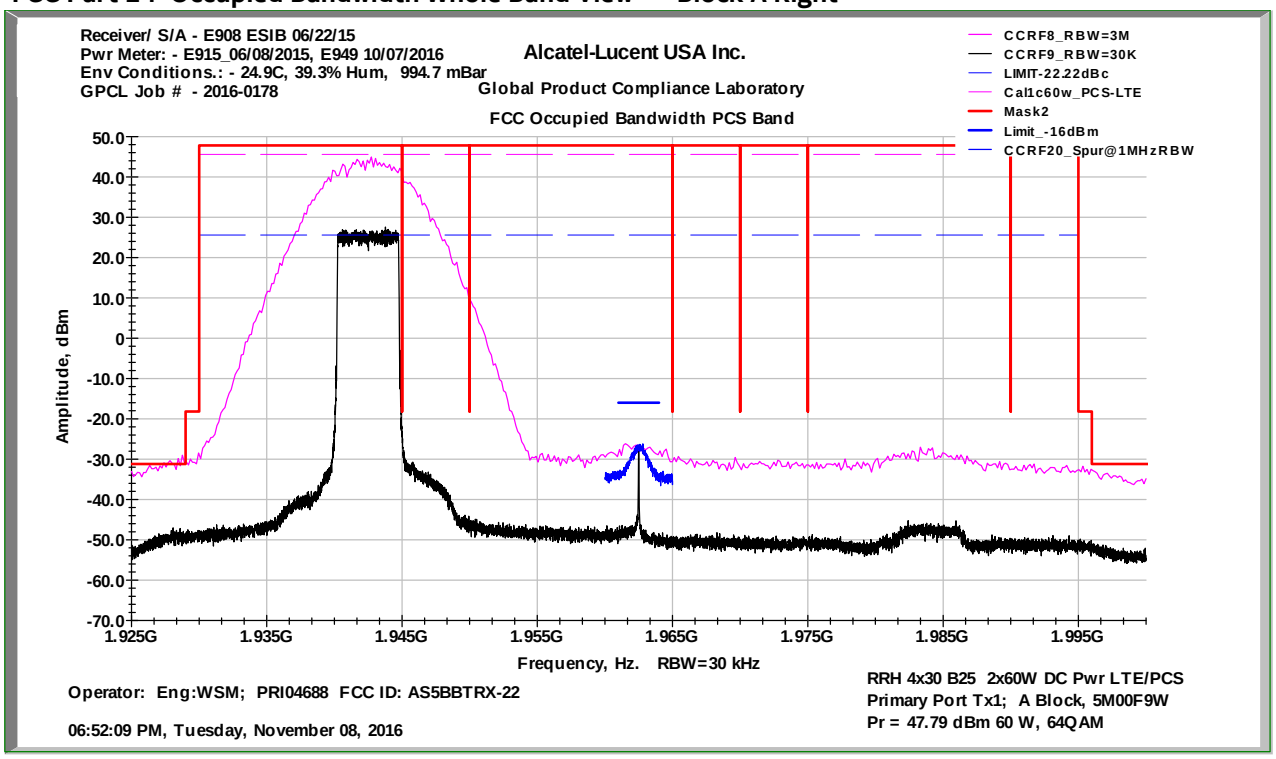
FCC Part 24 Band Edge Emissions Margin Block A Left



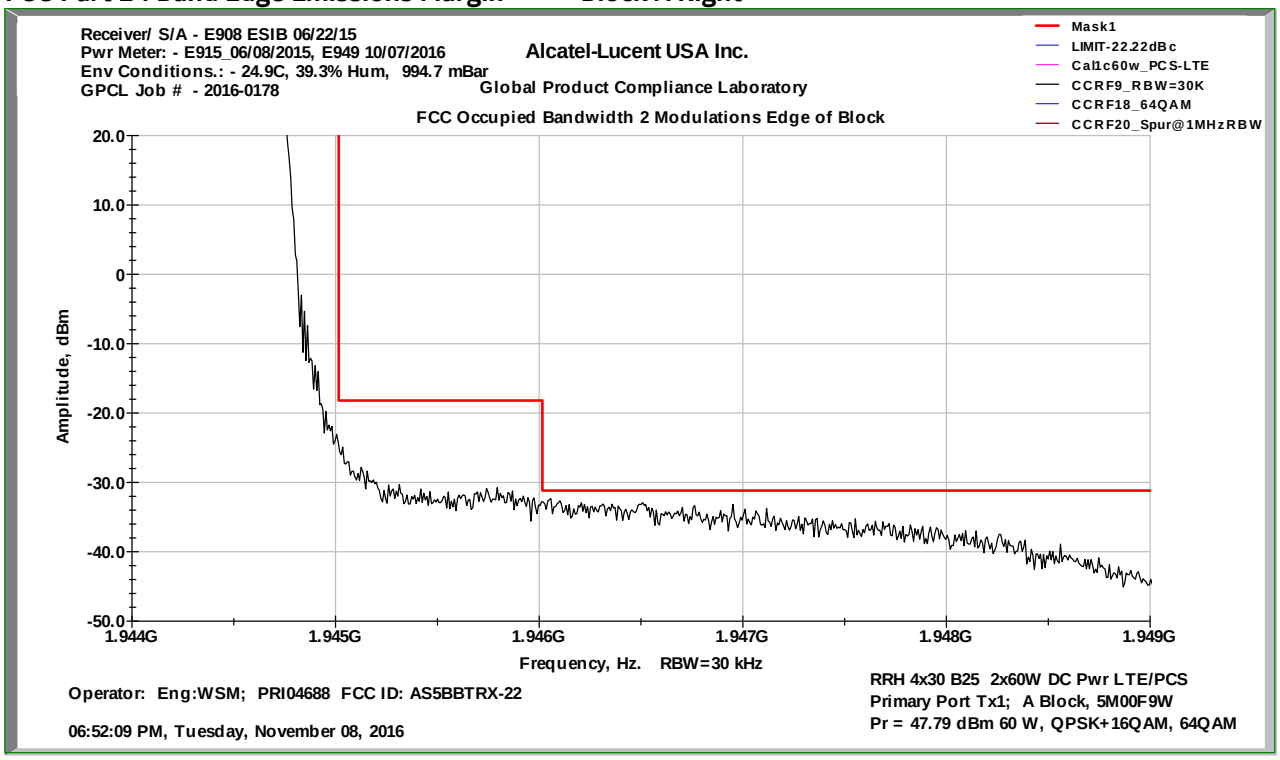
FCC Occupied Bandwidth / Power Calibration Compliance Data Block A Right



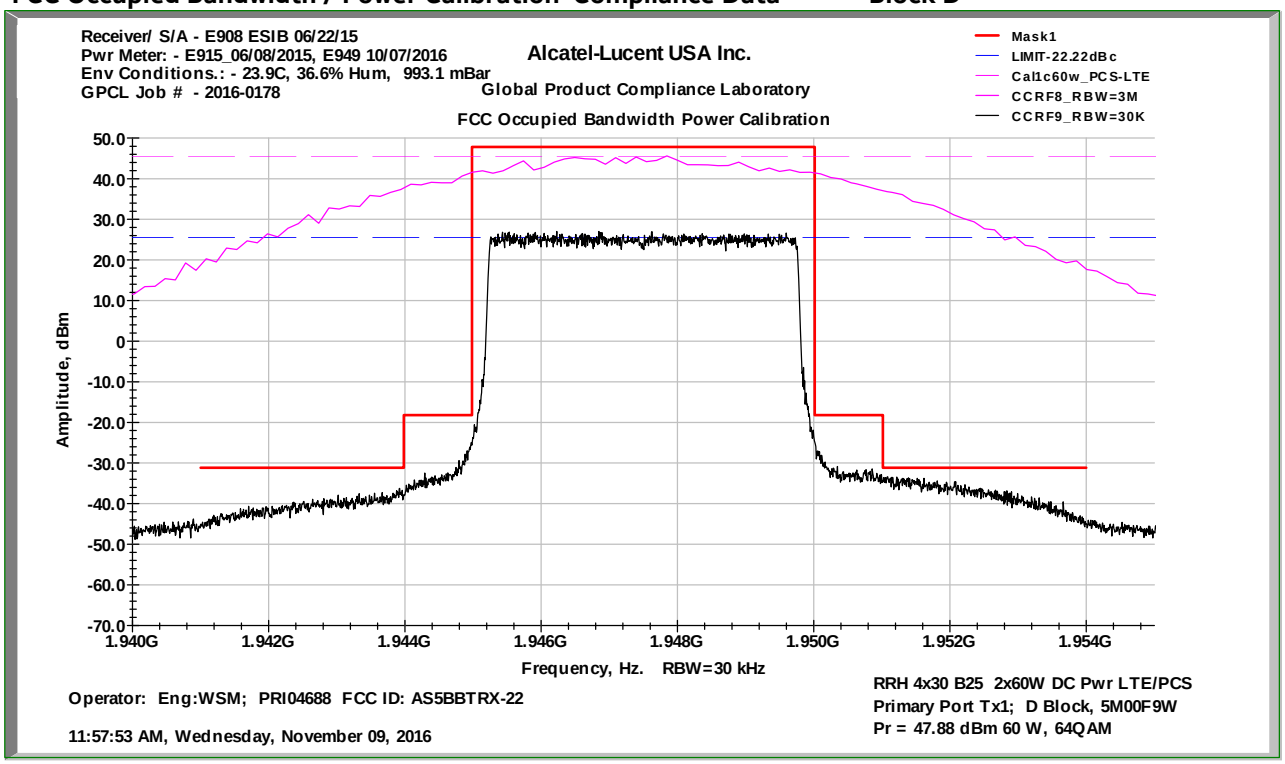
FCC Part 24 Occupied Bandwidth Whole Band View Block A Right



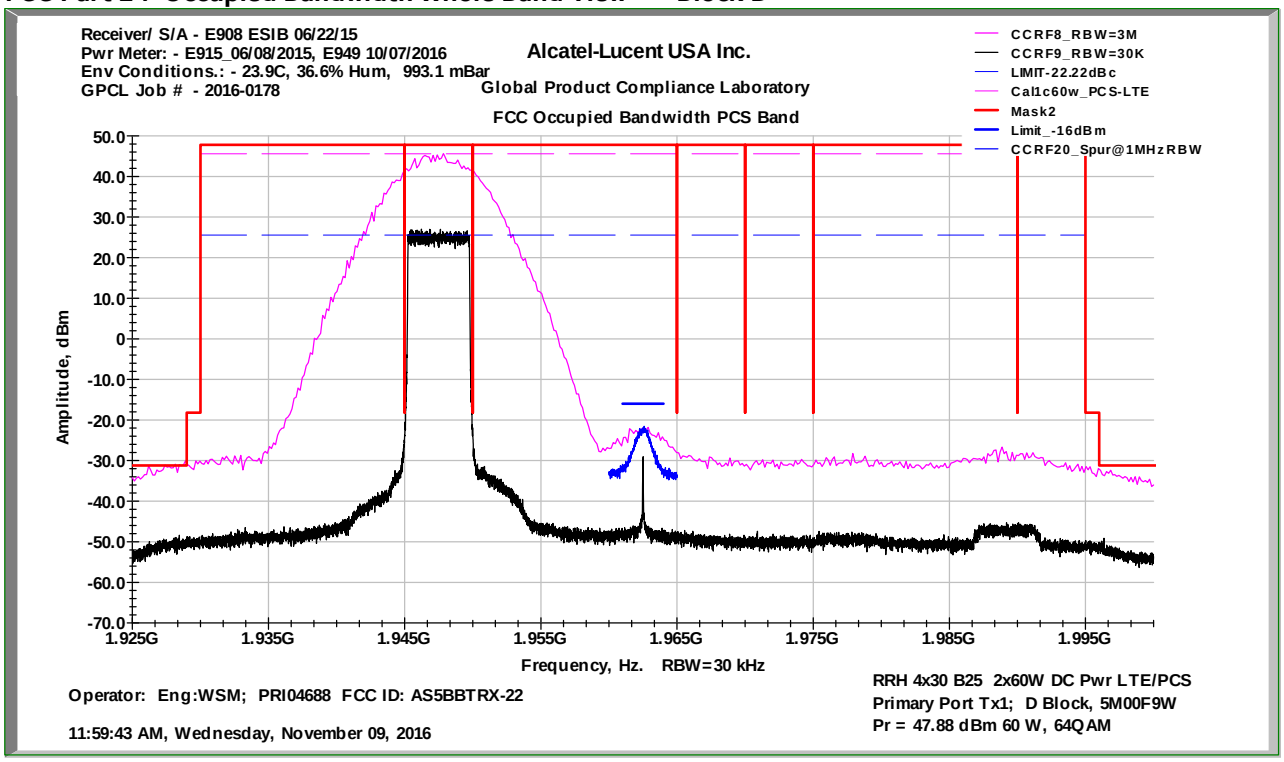
FCC Part 24 Band Edge Emissions Margin Block A Right



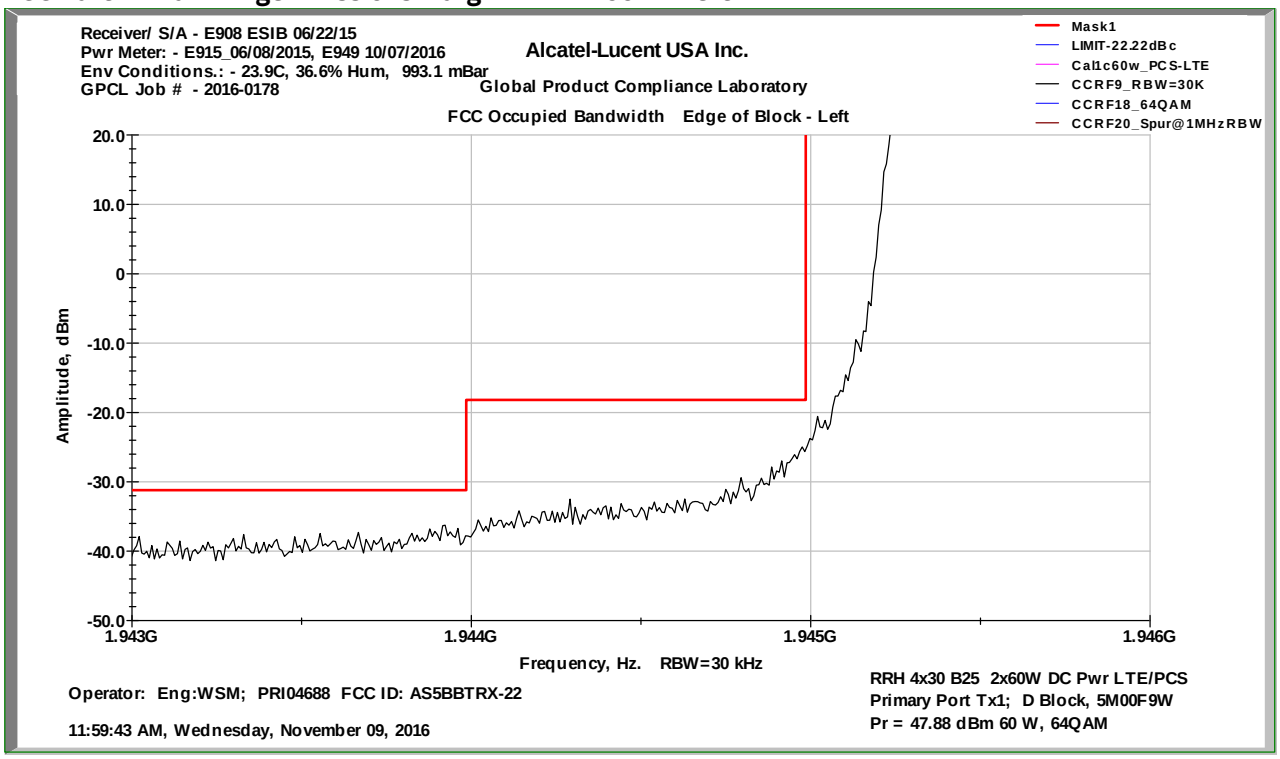
FCC Occupied Bandwidth / Power Calibration Compliance Data Block D



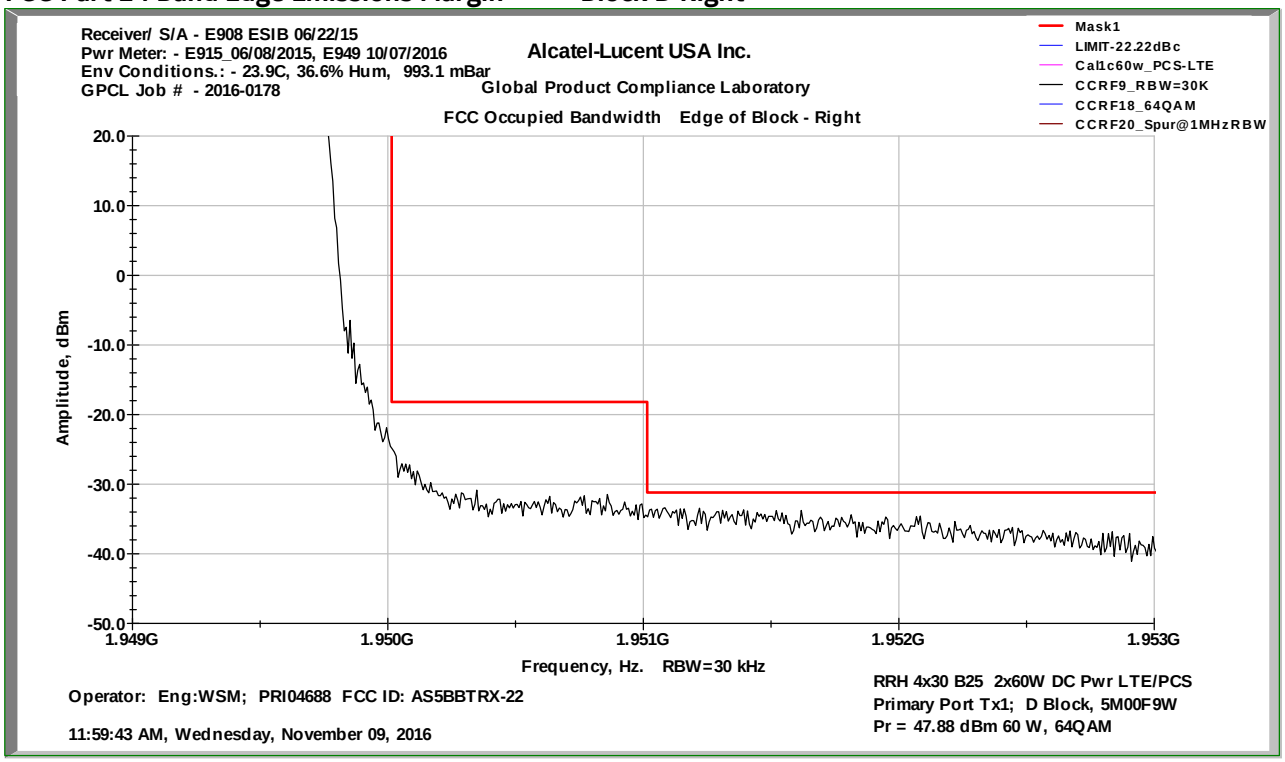
FCC Part 24 Occupied Bandwidth Whole Band View Block D



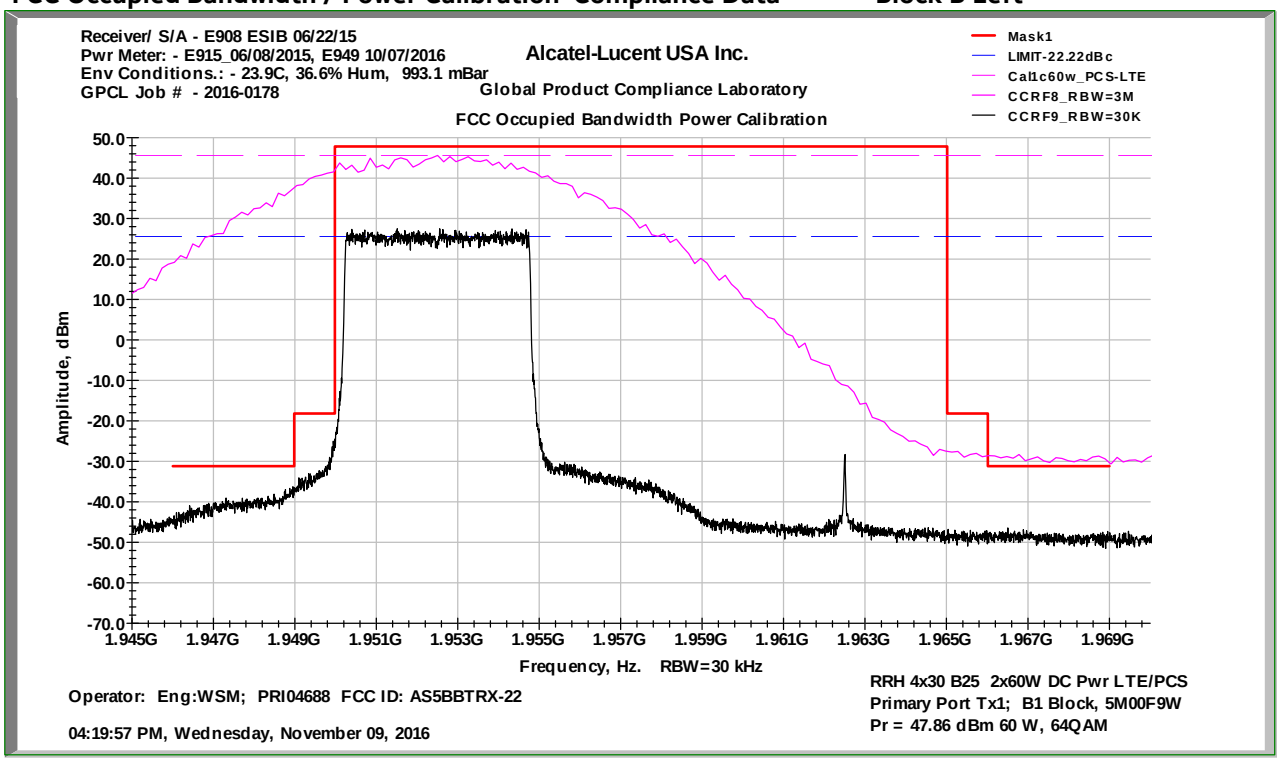
FCC Part 24 Band Edge Emissions Margin Block D Left



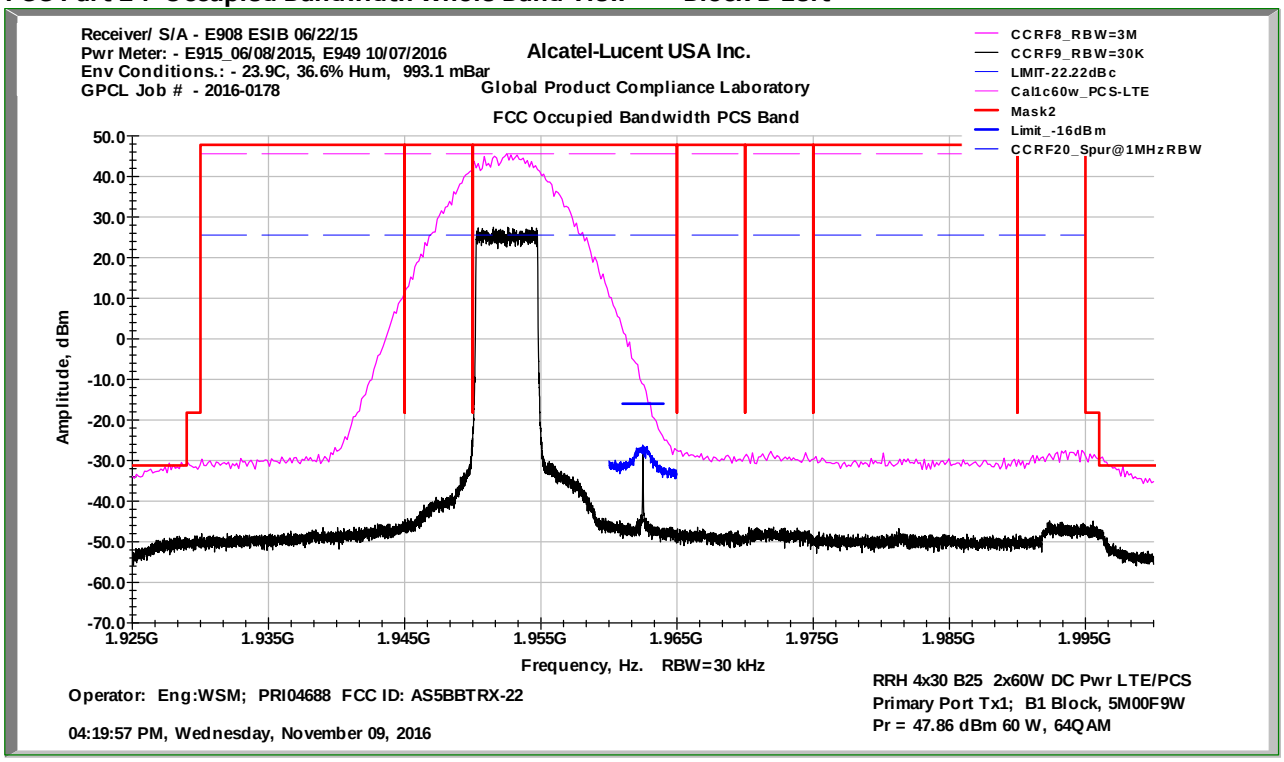
FCC Part 24 Band Edge Emissions Margin Block D Right



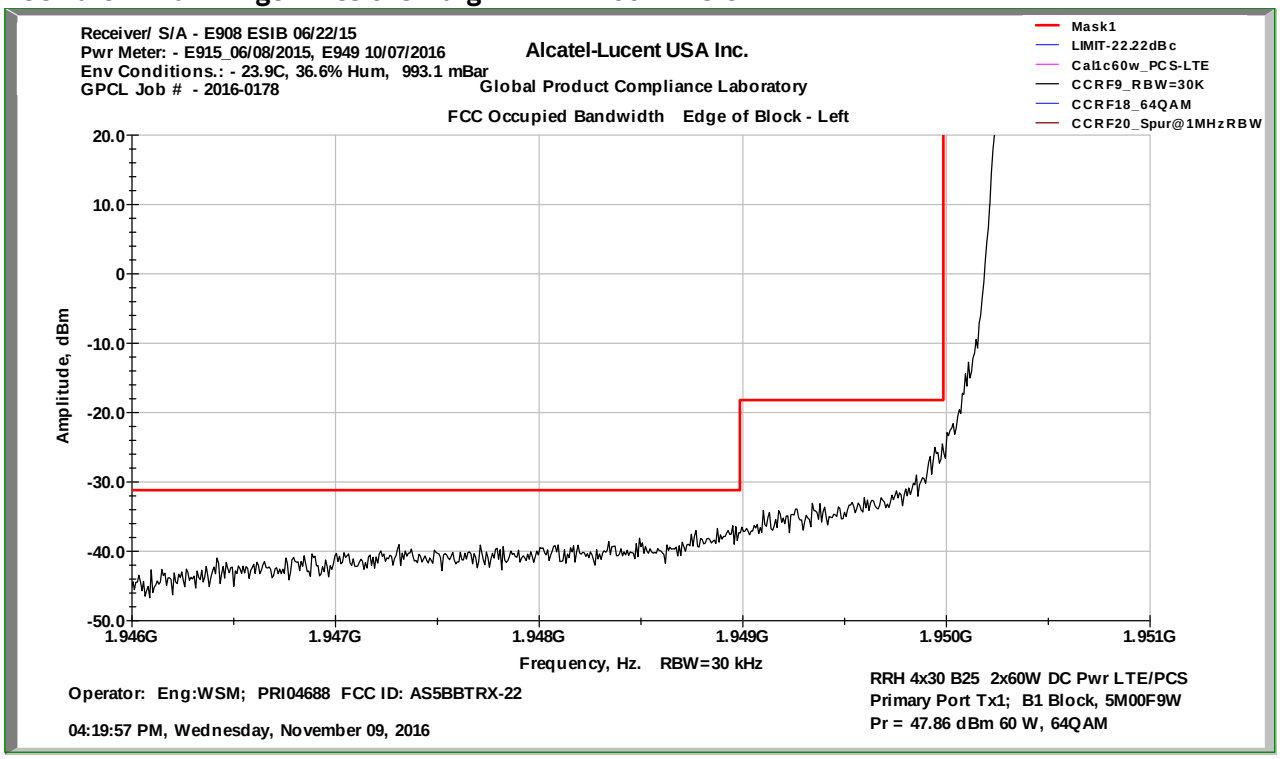
FCC Occupied Bandwidth / Power Calibration Compliance Data Block B Left



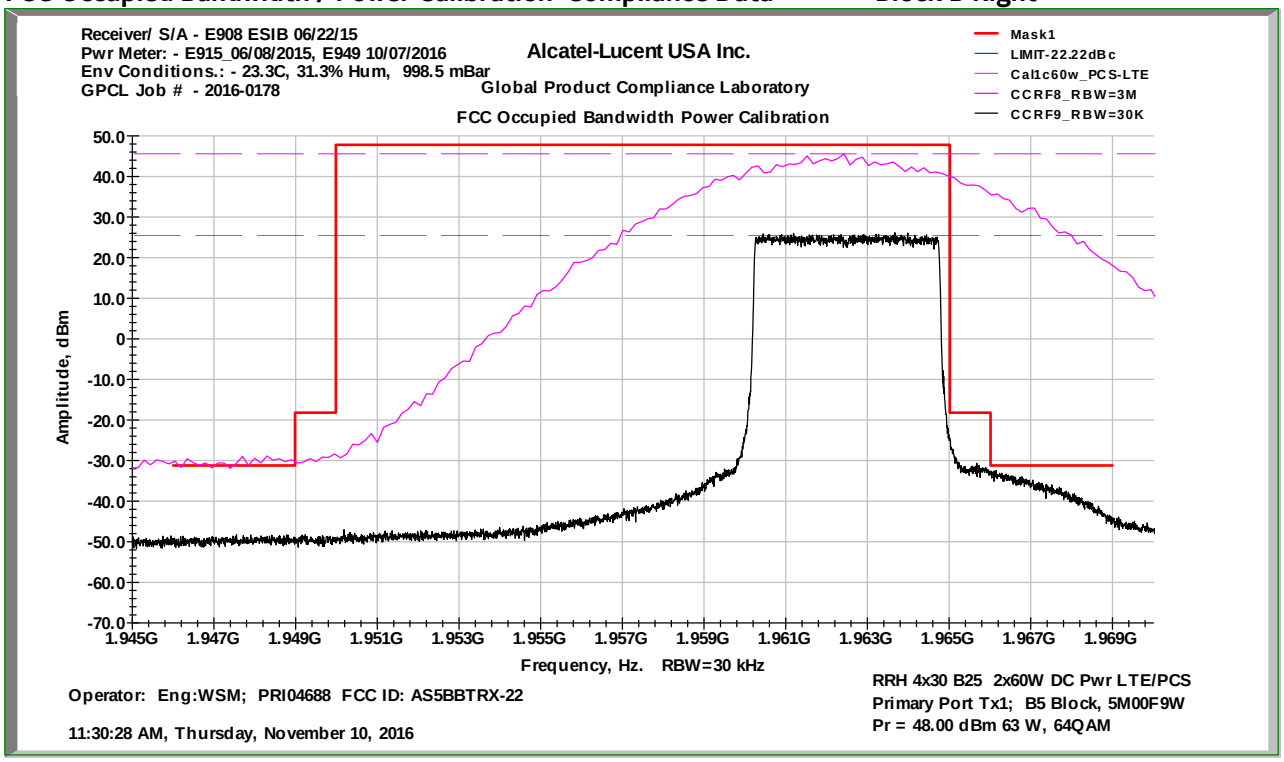
FCC Part 24 Occupied Bandwidth Whole Band View Block B Left



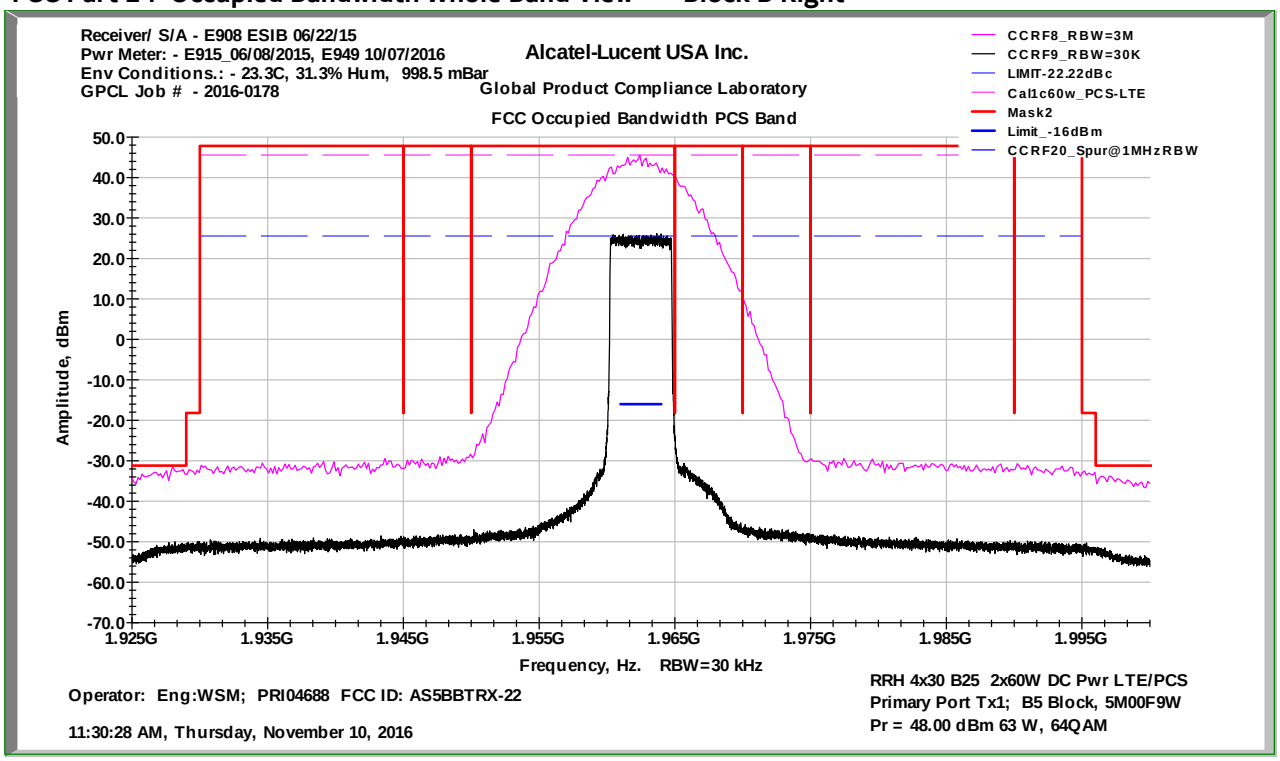
FCC Part 24 Band Edge Emissions Margin Block B Left



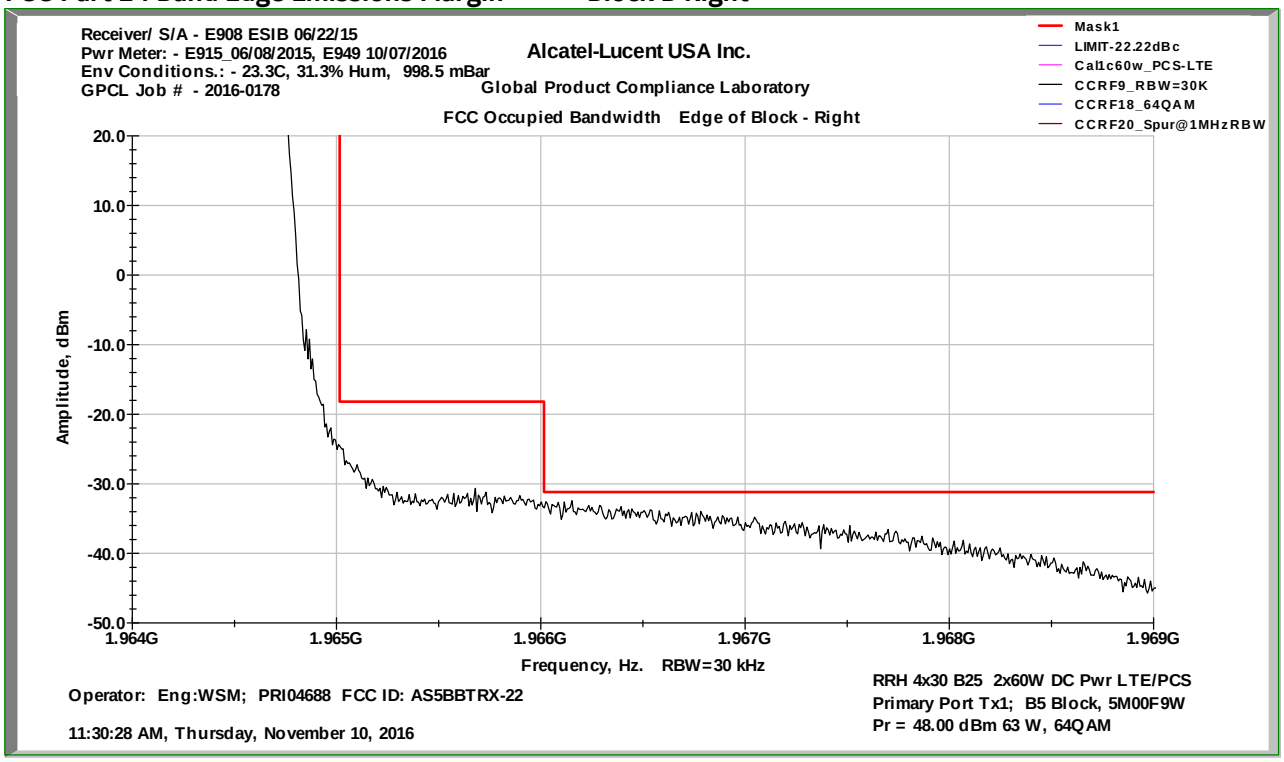
FCC Occupied Bandwidth / Power Calibration Compliance Data Block B Right



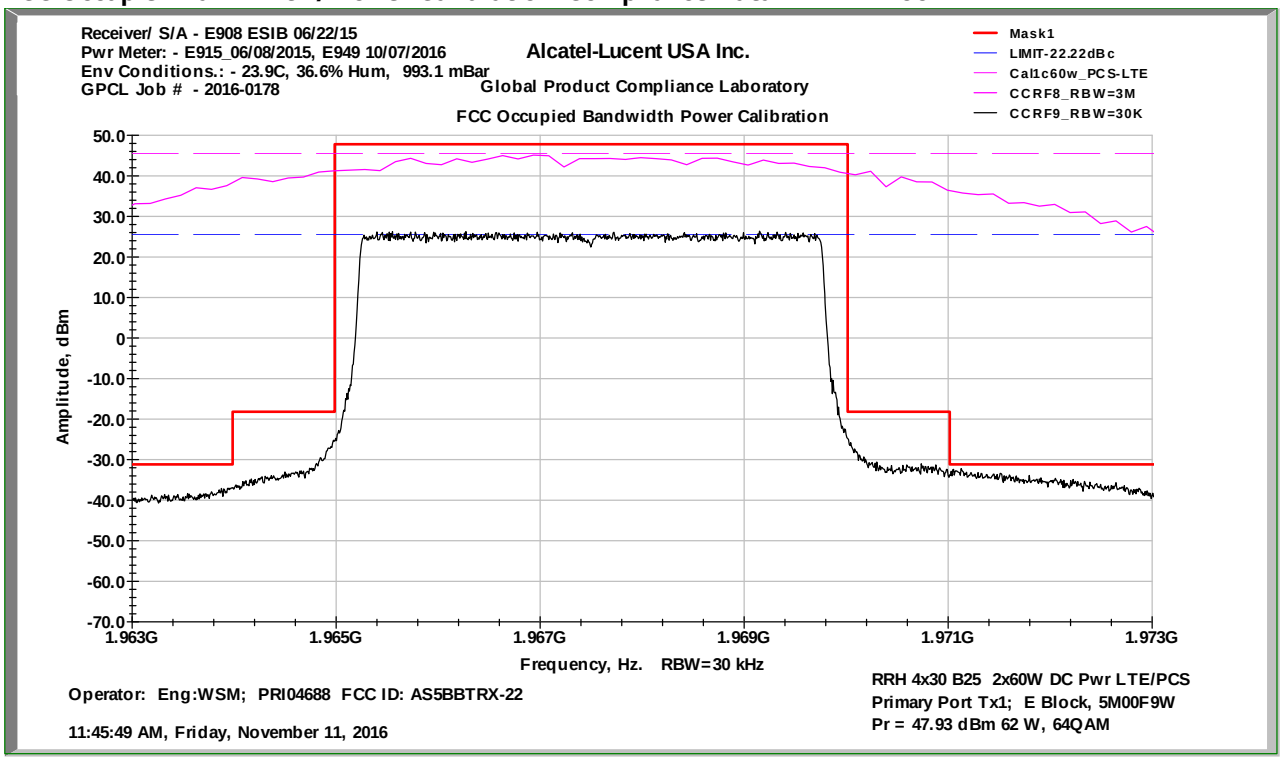
FCC Part 24 Occupied Bandwidth Whole Band View Block B Right



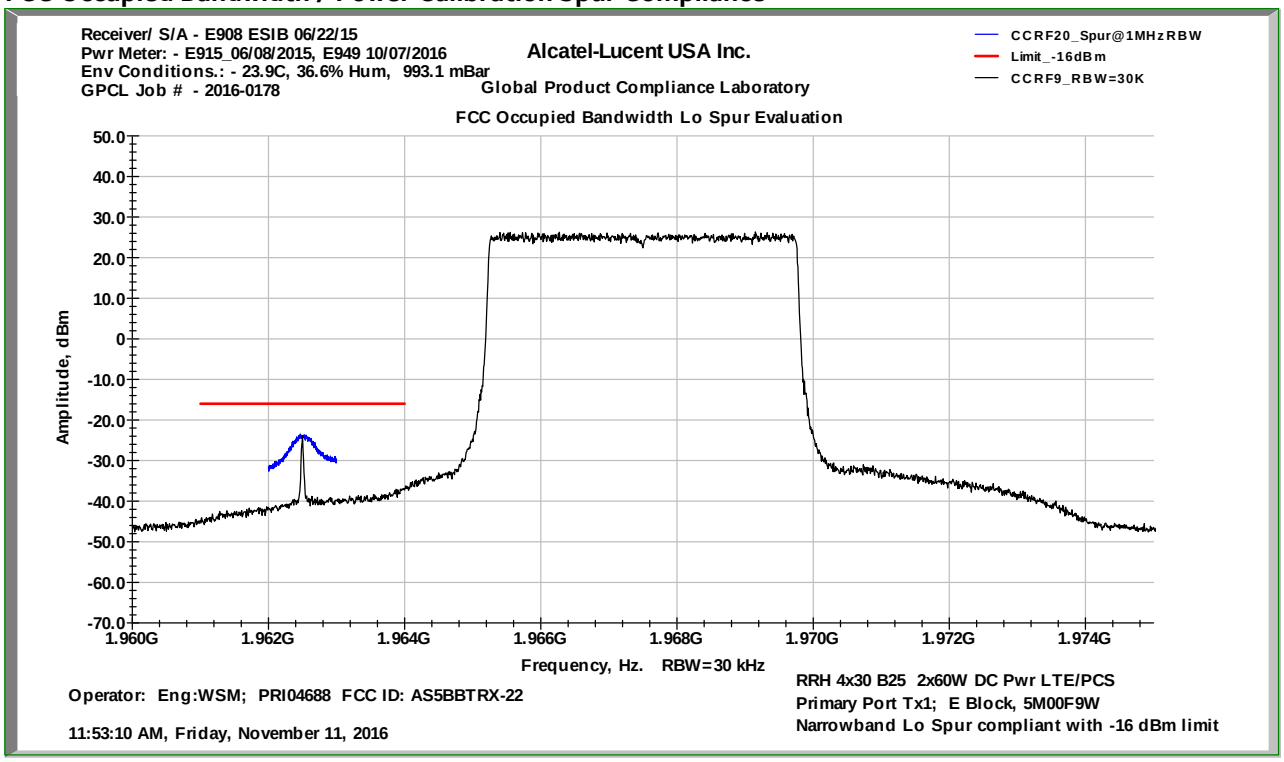
FCC Part 24 Band Edge Emissions Margin Block B Right



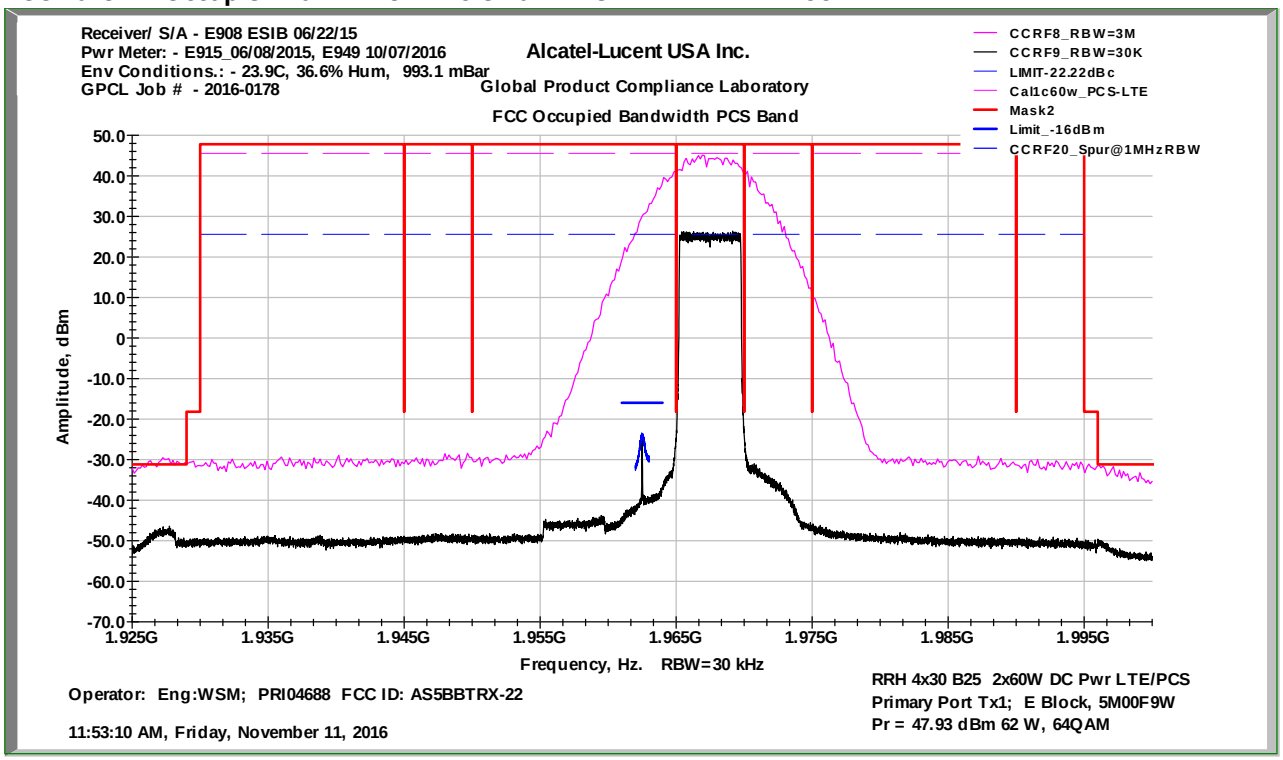
FCC Occupied Bandwidth / Power Calibration Compliance Data Block E



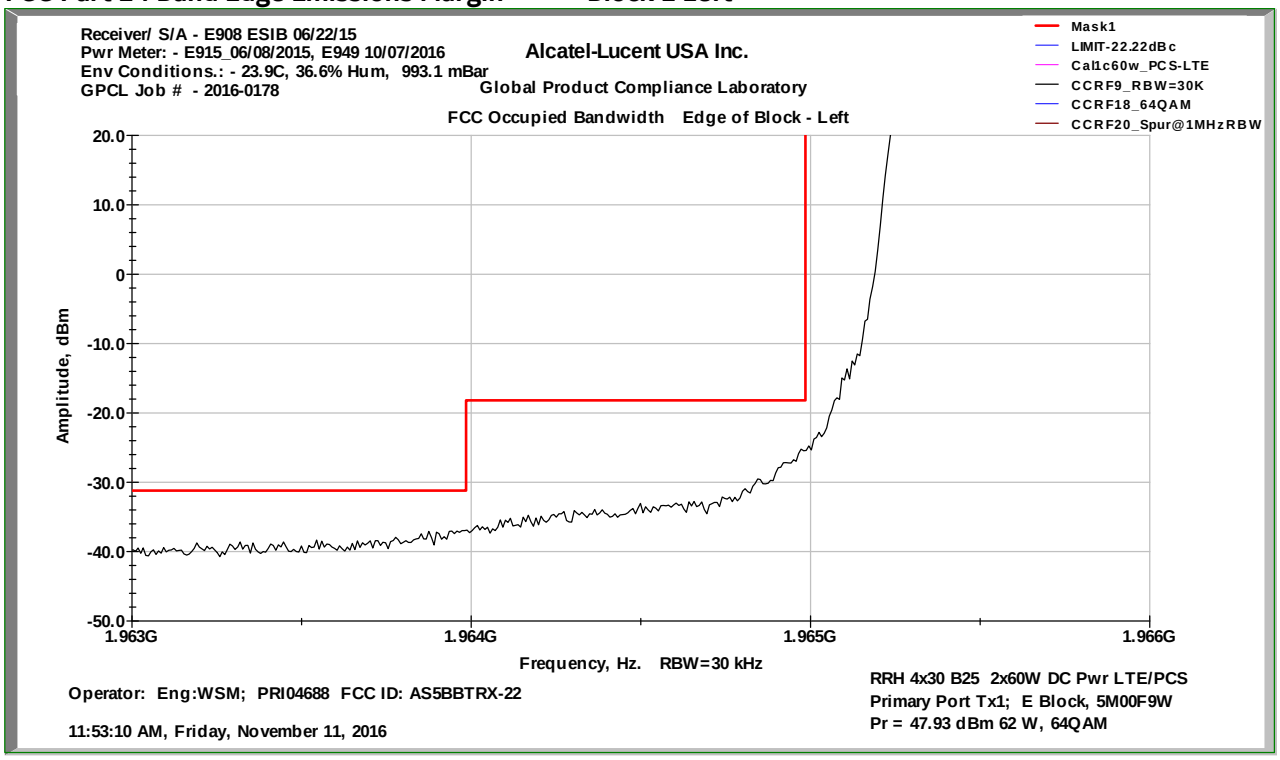
FCC Occupied Bandwidth / Power Calibration Spur Compliance



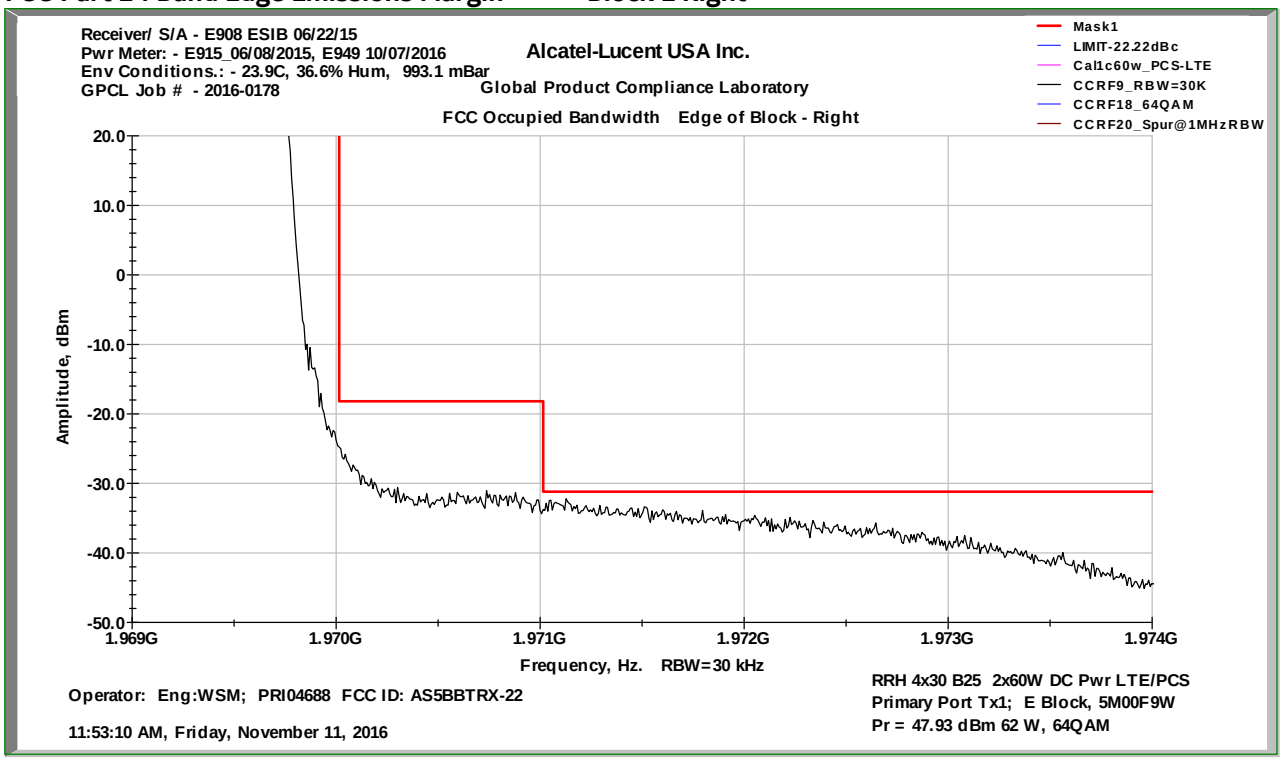
FCC Part 24 Occupied Bandwidth Whole Band View Block E



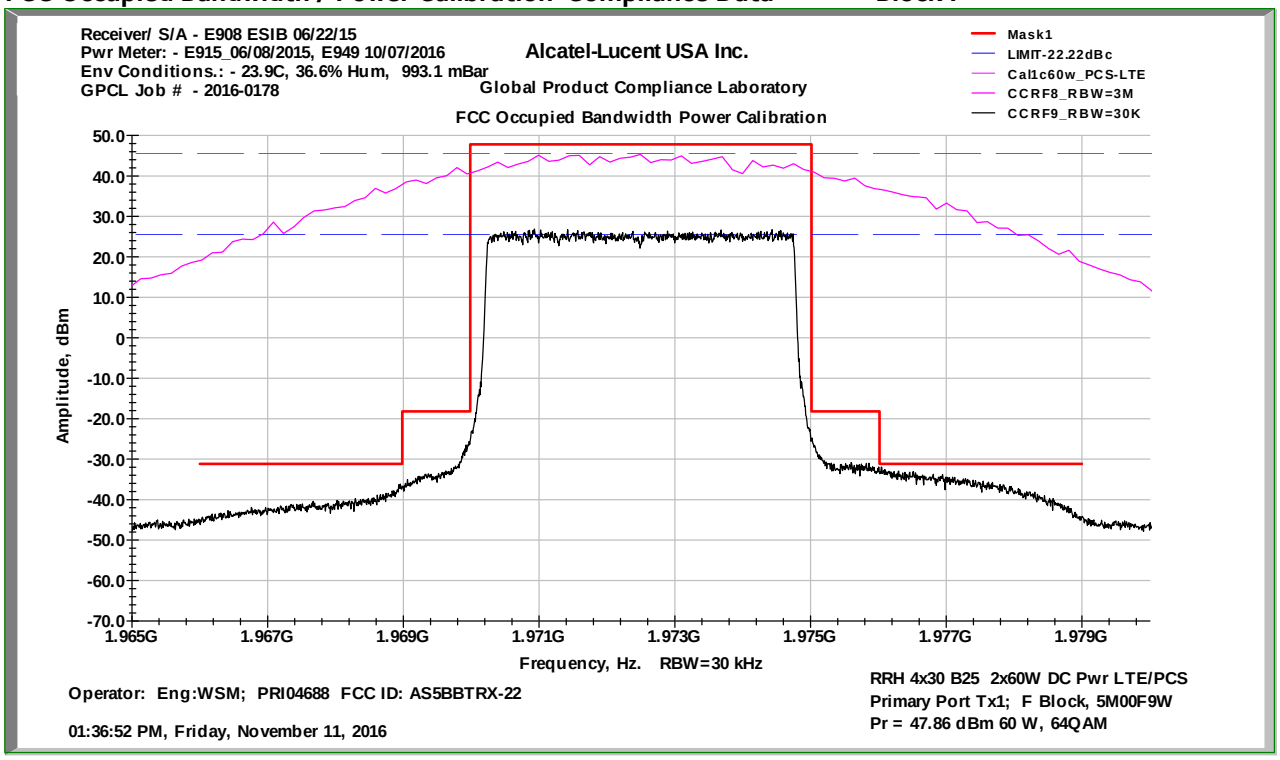
FCC Part 24 Band Edge Emissions Margin Block E Left



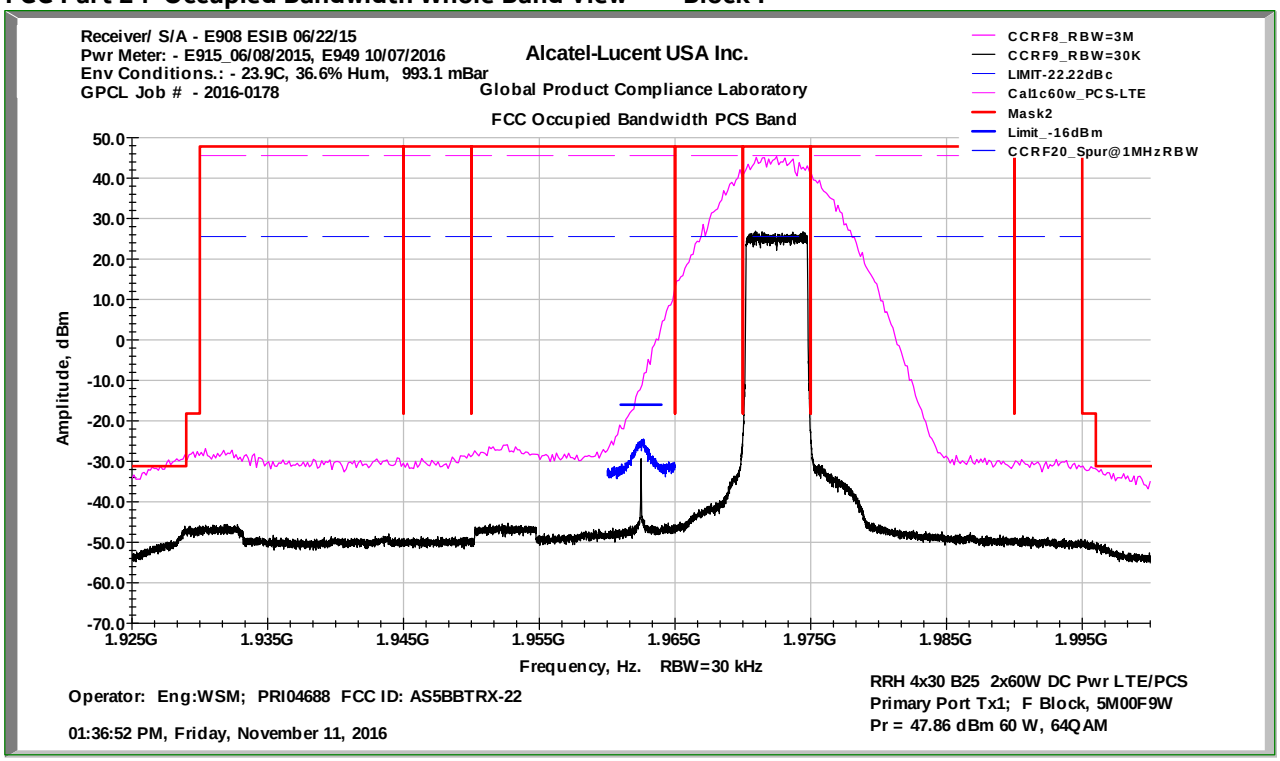
FCC Part 24 Band Edge Emissions Margin Block E Right



FCC Occupied Bandwidth / Power Calibration Compliance Data Block F



FCC Part 24 Occupied Bandwidth Whole Band View Block F



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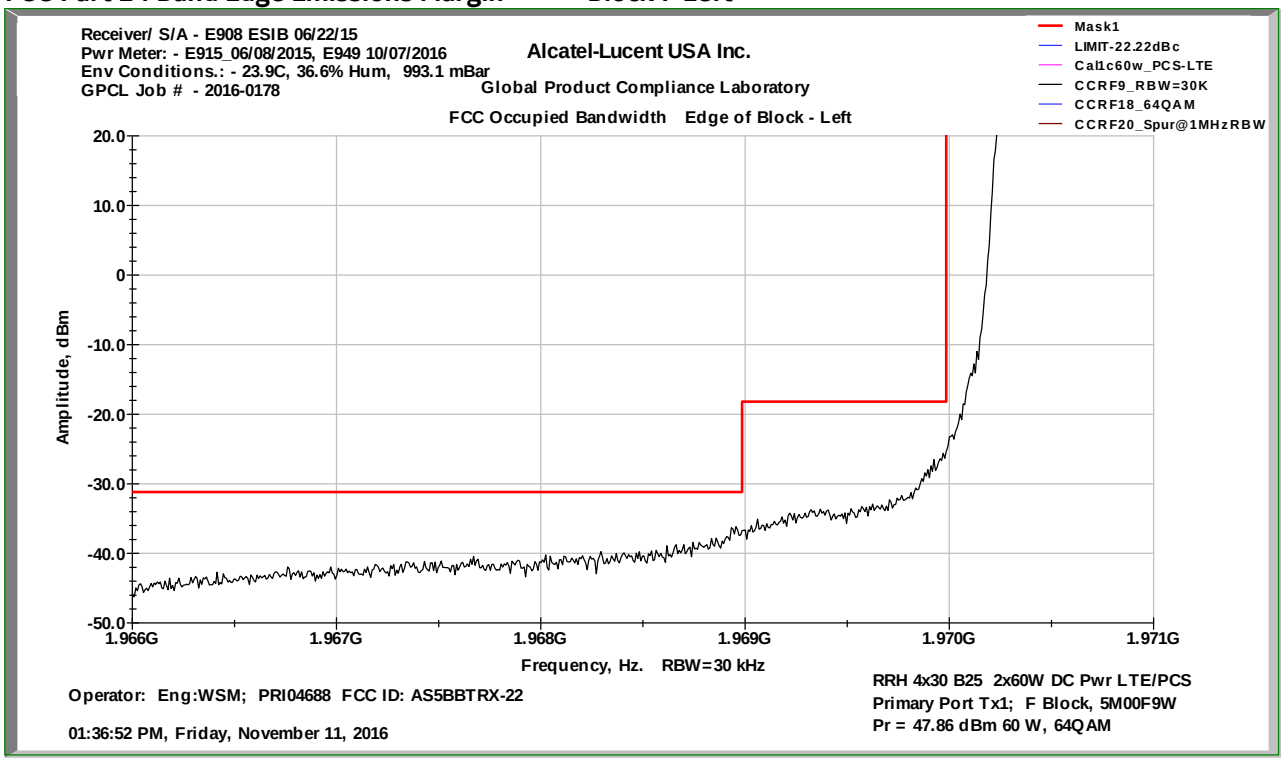
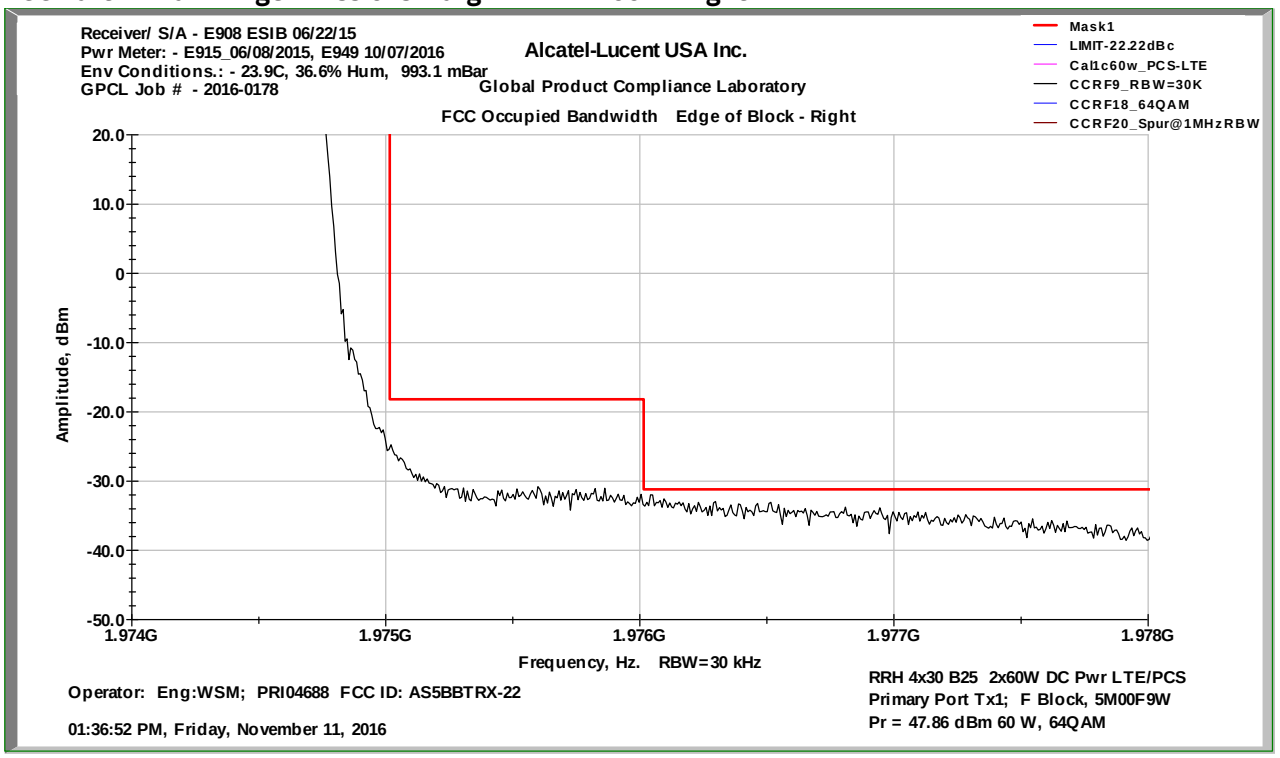
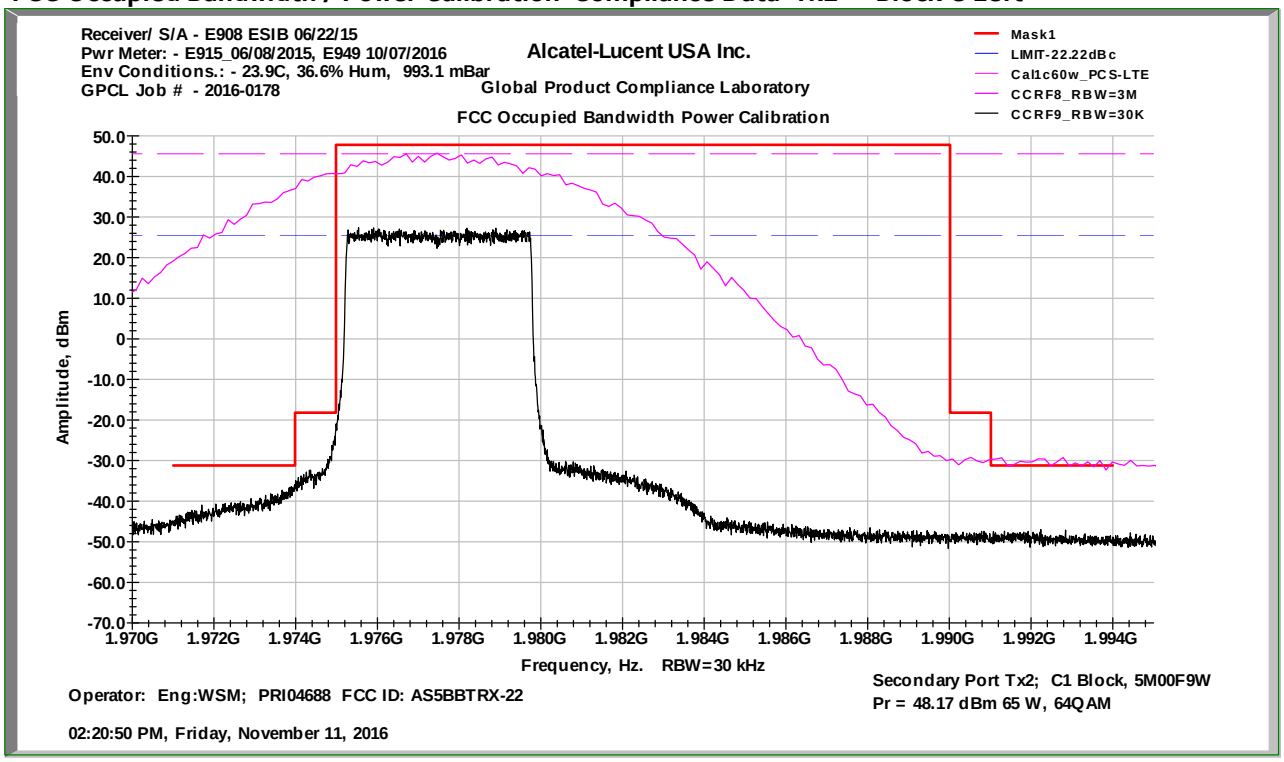


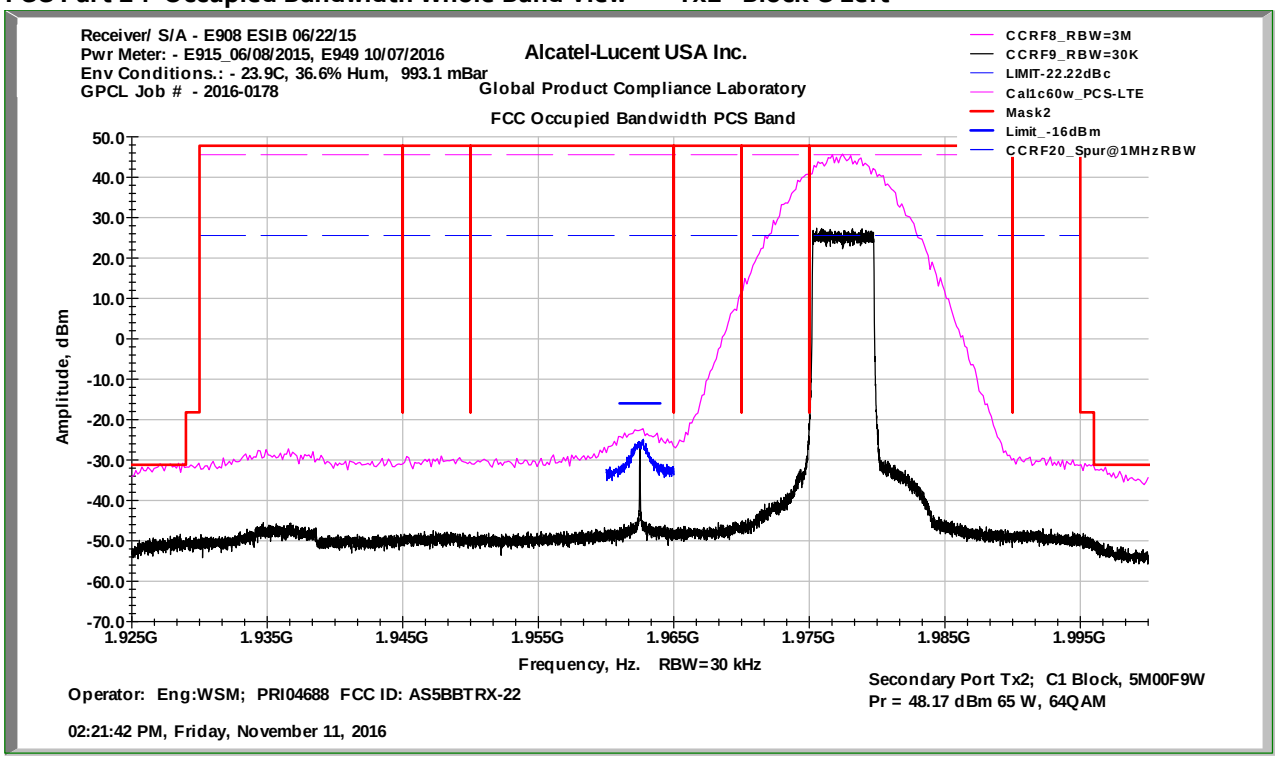
FCC Part 24 Band Edge Emissions Margin Block F Right



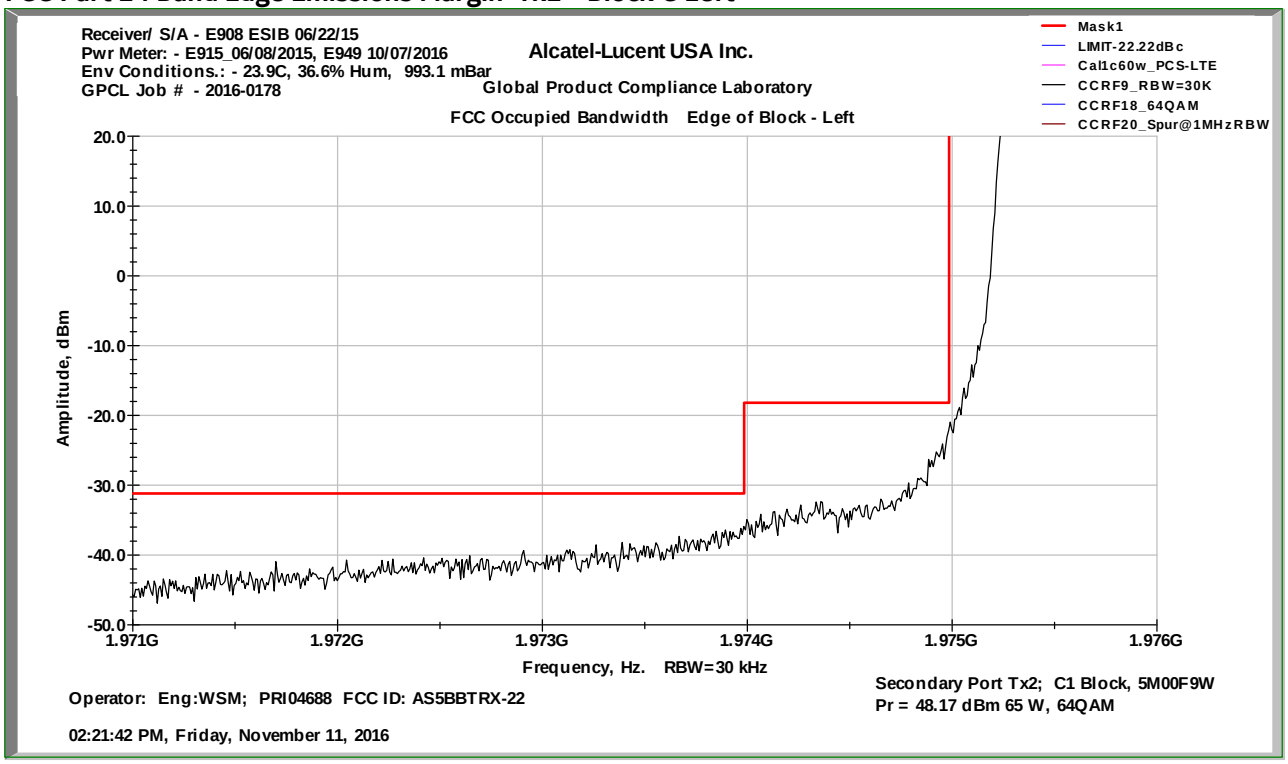
FCC Occupied Bandwidth / Power Calibration Compliance Data Tx2 Block C Left



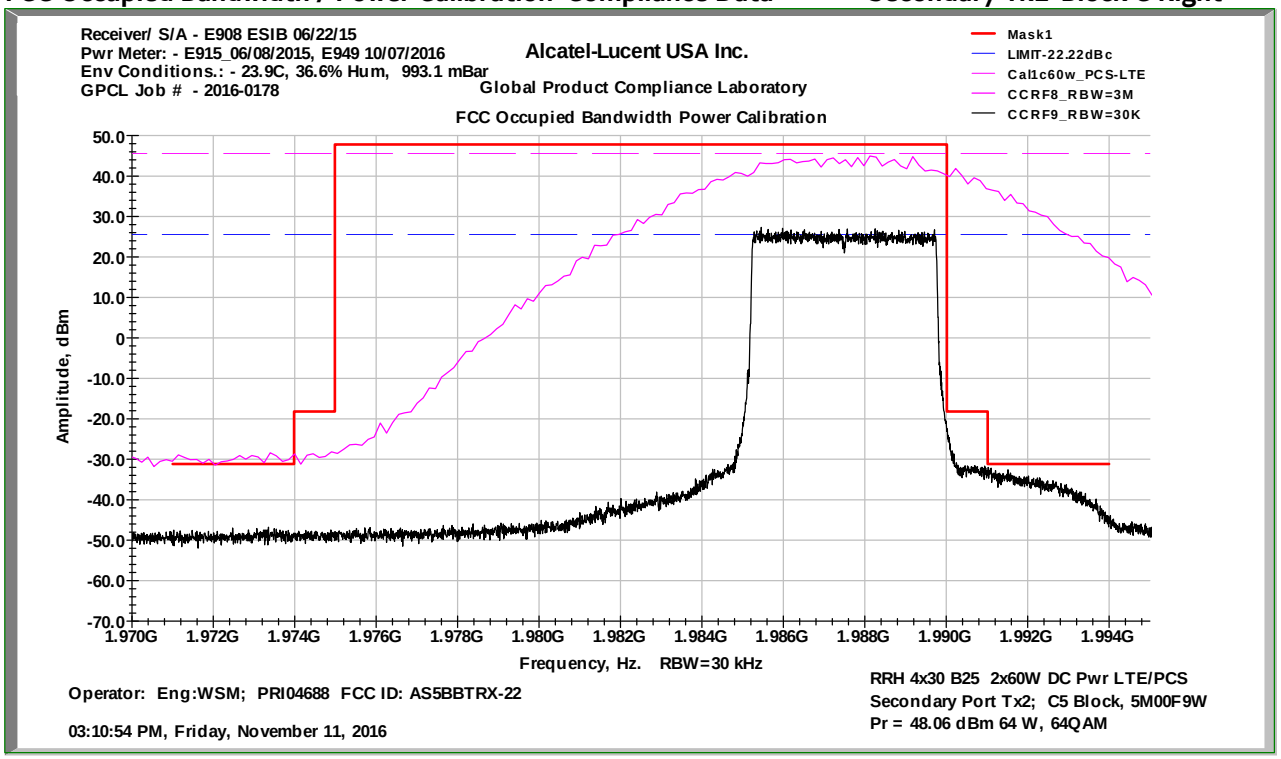
FCC Part 24 Occupied Bandwidth Whole Band View Tx2 Block C Left



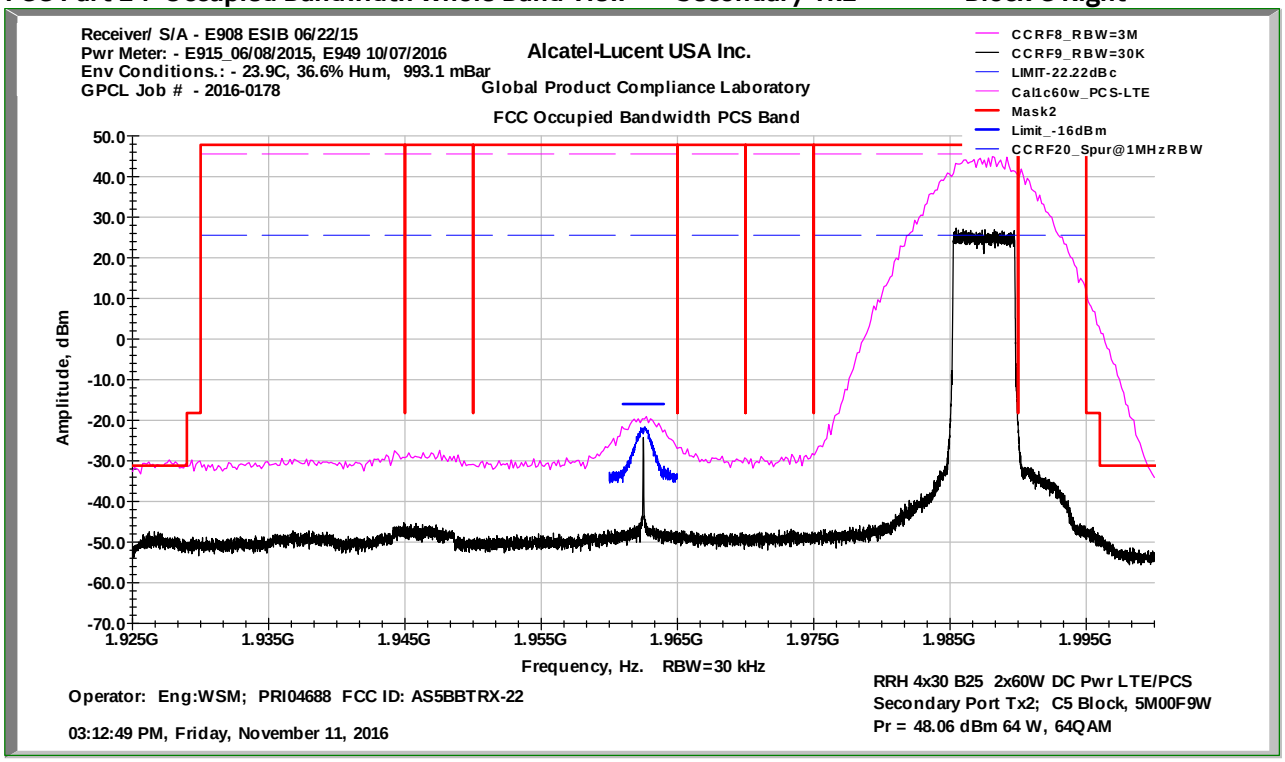
FCC Part 24 Band Edge Emissions Margin Tx2 Block C Left



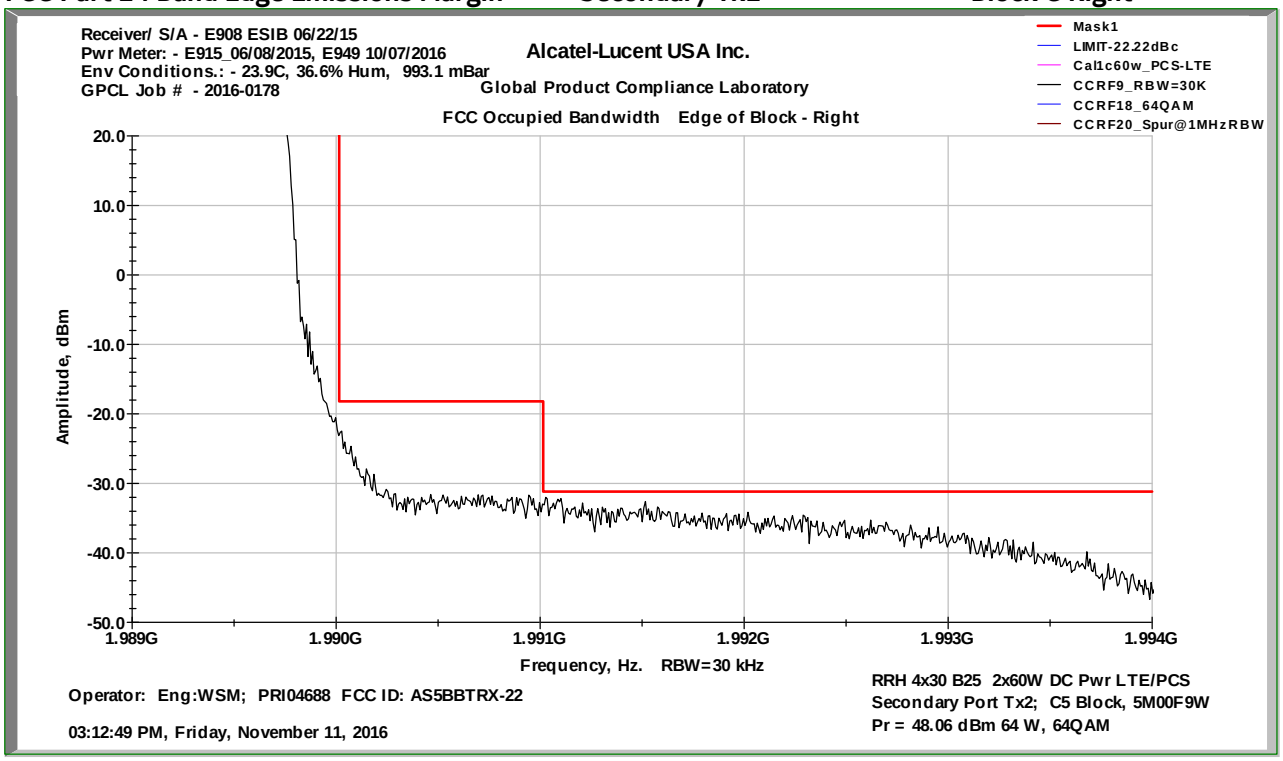
FCC Occupied Bandwidth / Power Calibration Compliance Data Secondary Tx2 Block C Right



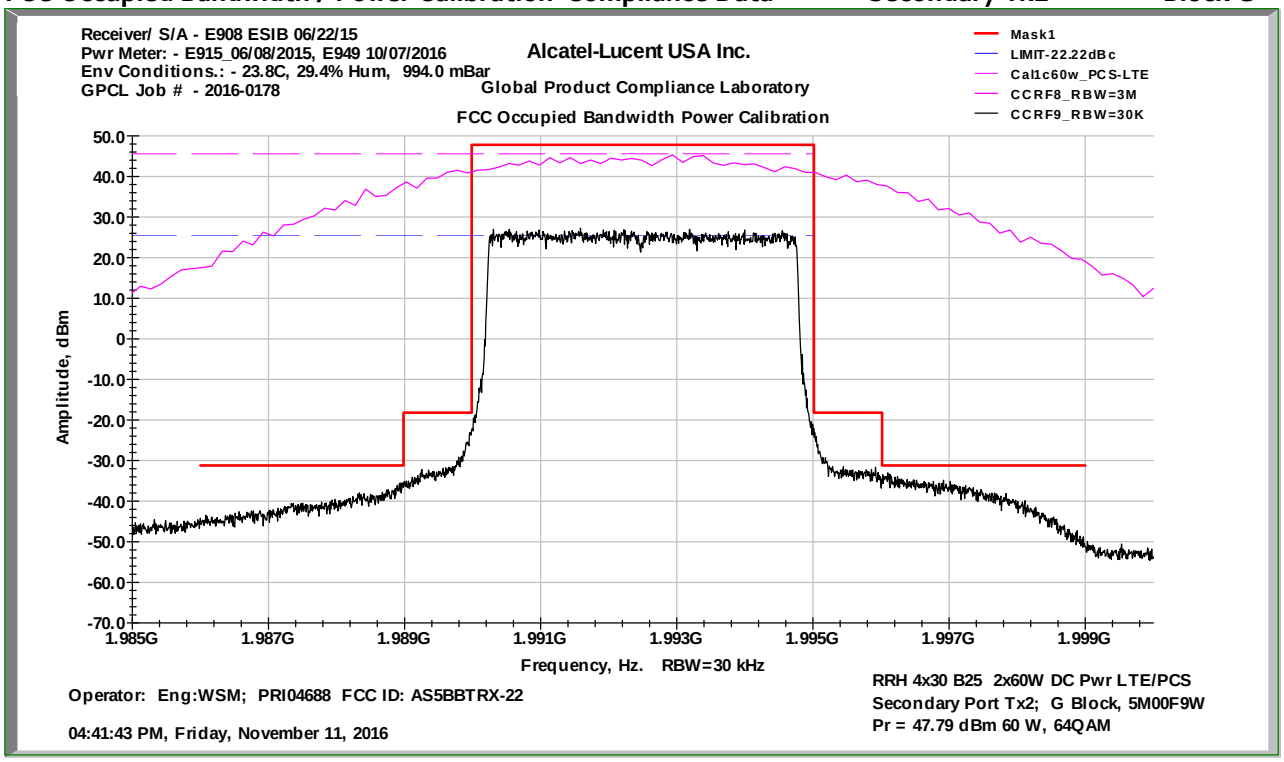
FCC Part 24 Occupied Bandwidth Whole Band View Secondary Tx2 Block C Right



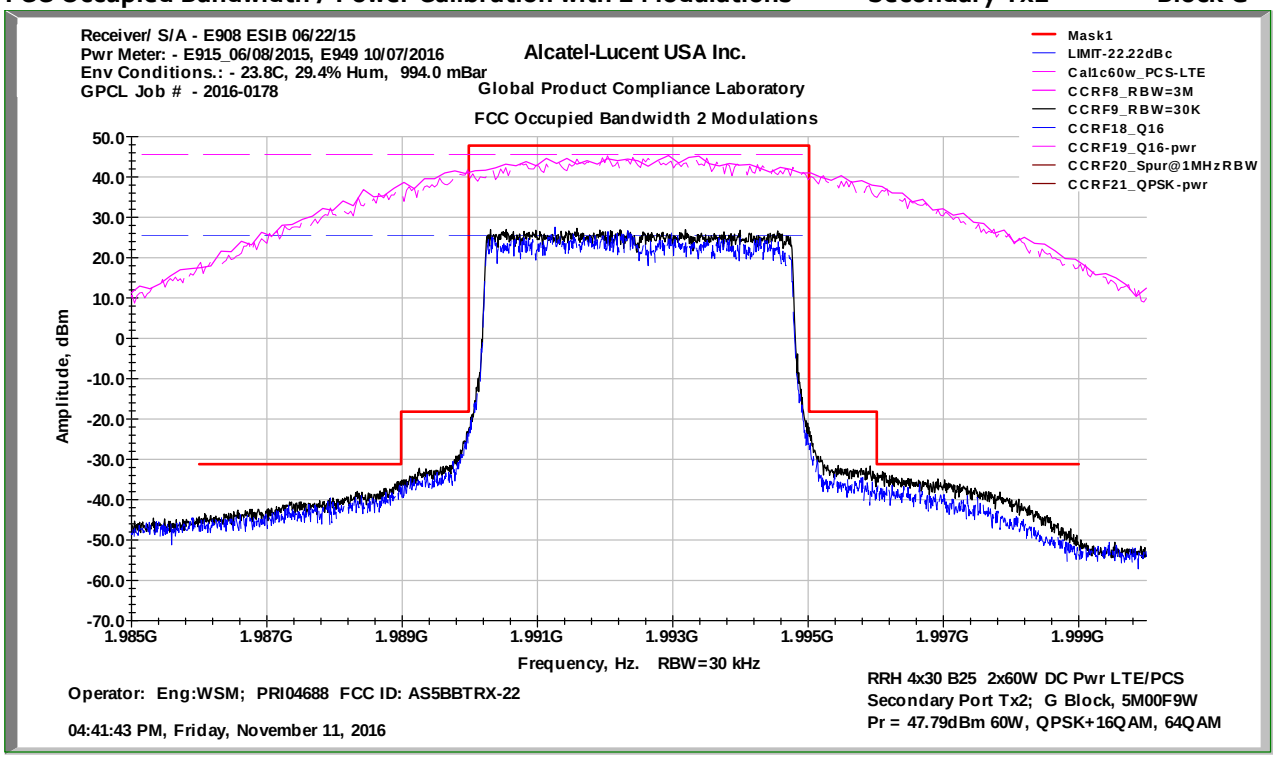
FCC Part 24 Band Edge Emissions Margin Secondary Tx2 Block C Right



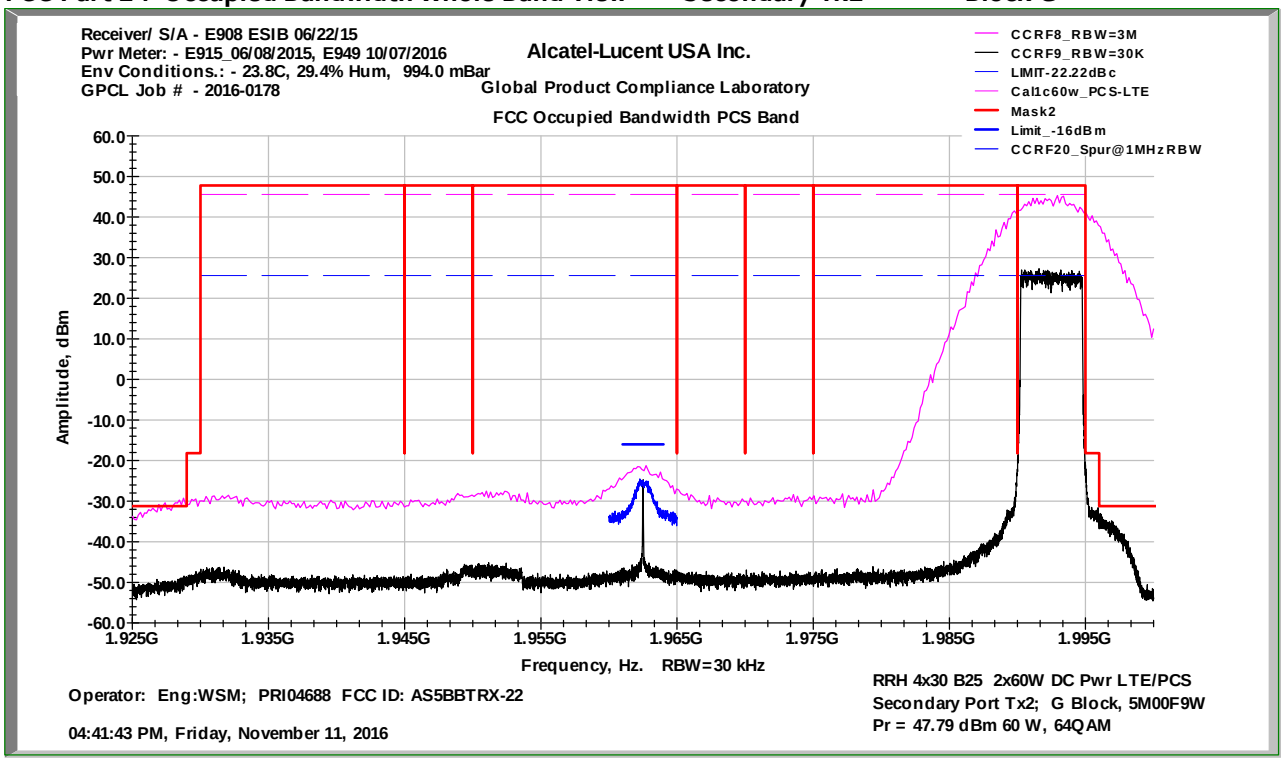
FCC Occupied Bandwidth / Power Calibration Compliance Data Secondary Tx2 Block G



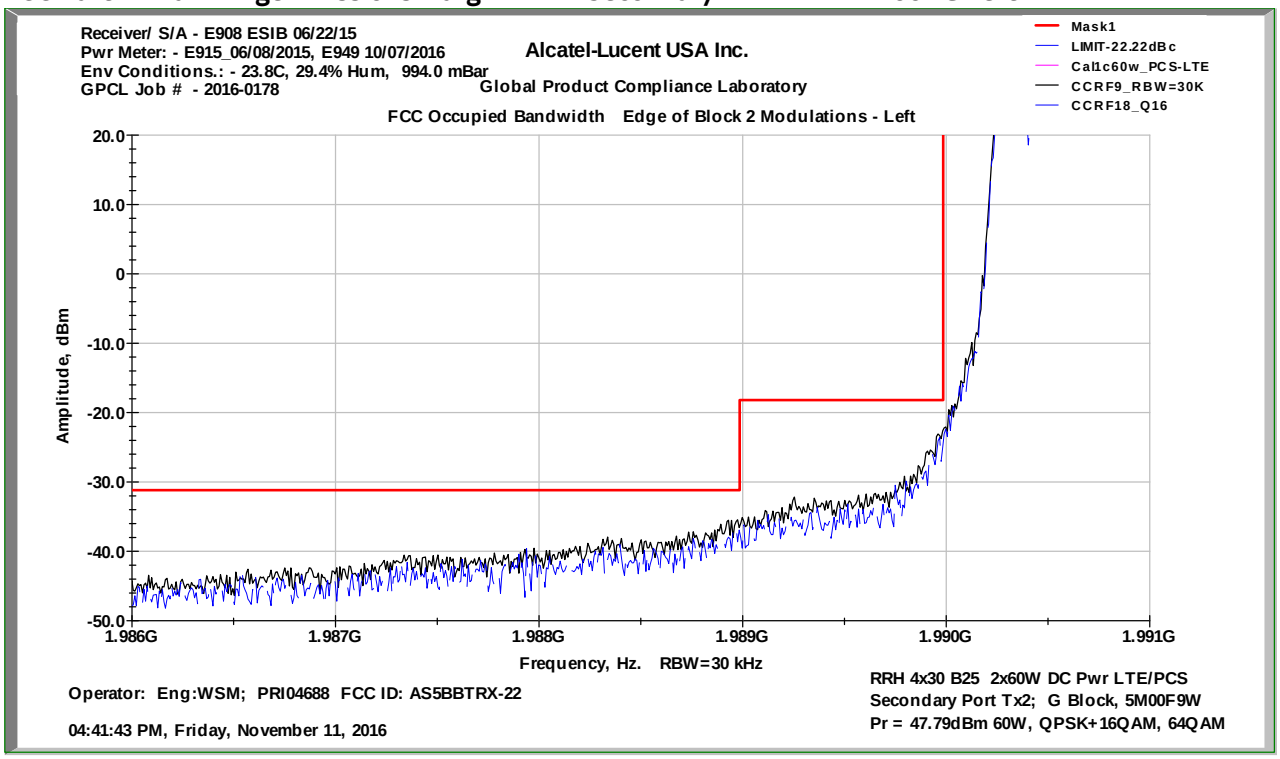
FCC Occupied Bandwidth / Power Calibration with 2 Modulations Secondary Tx2 Block G



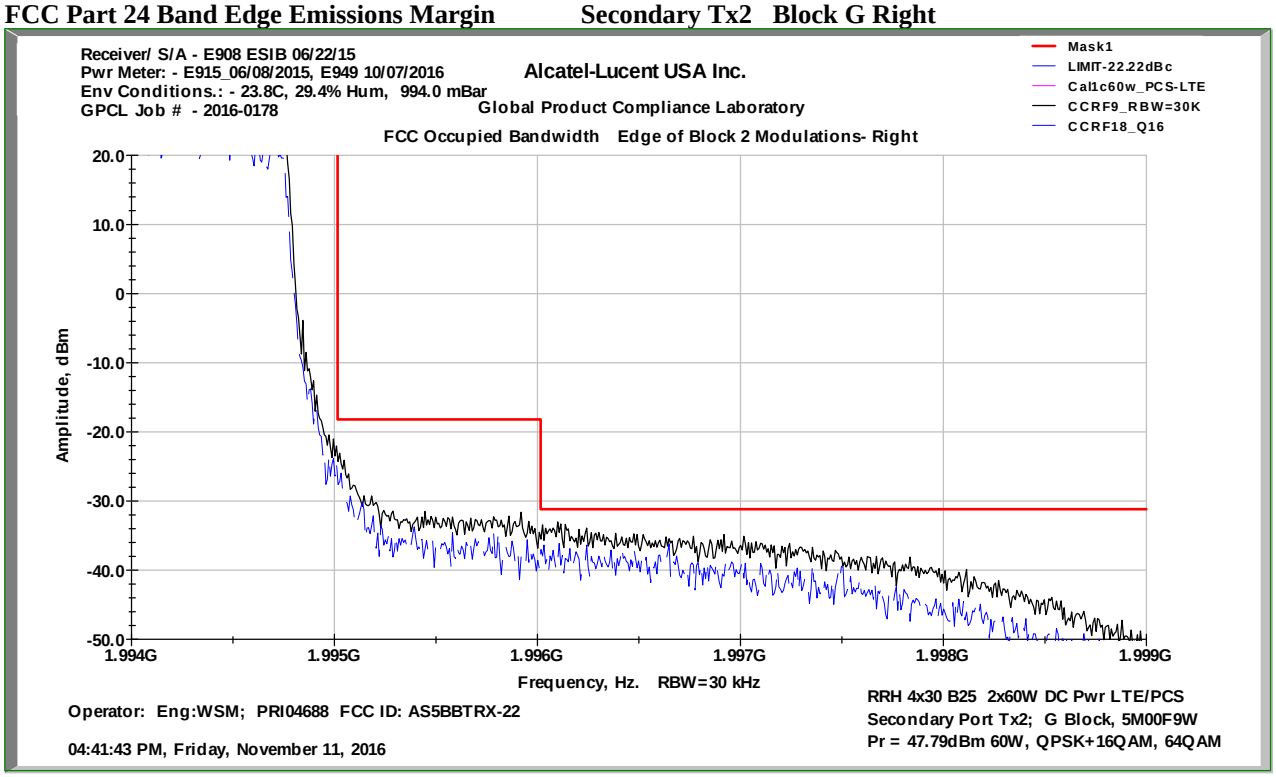
FCC Part 24 Occupied Bandwidth Whole Band View Secondary Tx2 Block G



FCC Part 24 Band Edge Emissions Margin Secondary Tx2 Block G Left



FCC Part 24 Band Edge Emissions Margin Secondary Tx2 Block G Right



4.4 Section 2.1051 MEASUREMENT REQUIRED: SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS

This test measures the emissions of spurious signals which may come from harmonic, parasitic, intermodulation and frequency conversion products and are outside the necessary bandwidth but exclude out-of-band emissions.

4.4.1 Section 2.1051 Spurious Emissions at Antenna Terminals

Spurious Emissions at the antenna terminals were investigated per Section 2.1057(a)(1) over the frequency range of 10 MHz to 20 GHz which is beyond the 10th harmonic of the carrier frequency. A test coupler which incorporates a low inter-mod broadband RF attenuator was used to reduce the transceiver's amplitude to a level usable by the spectrum analyzer. The test configuration is shown in Figure 4.4.1 which documents the test set up used for the measurements. In this set up the complete RF test path was calibrated over the 10 MHz-20 GHz range and it allows for RF power to be measured and monitored during the test.

The spurious measurements were made using an automated test system. The test system consists of a Rohde & Schwarz ESIB-40 Test Receiver/ Spectrum Analyzer, a PC based computer test controller, calibrated test hardware and a TILE ™ software program to acquire the test data. This system provides for measurements to be performed in compliance with ANSI C63.26 and our ISO17025 process. The measurement meets the ANSI C63.26 requirements in paragraphs 5.2.4.4.1 and 5.7 which requires that the number of points in the sweep be > 2 × Span/RBW. The volume of collected data is greater than 1 $x10^5$ data points over the frequency range of 10 MHz to 20 GHz. The automated test system provides for a presentation of the data in an accurate and compact form for FCC review.
Measurements were performed for all of the test configurations in Table 4.4.4 and these match the test configurations used for Occupied Bandwidth / Edge of Band Emissions, RF Power and modulation.

4.4.2 Required Limit

The required emission limitation specified in **47CFR 24.238 1-Oct-2010** was applied to these tests. Based upon the criterion given in Section 24.238 of the Code and as developed in Exhibit 14, the required emission limit in 47 CFR 24.238(a) for emissions outside a licensees frequency block is:
Emissions >1 MHz outside the Block, *when measured with a RBW of 1 MHz*, shall be attenuated by :

-{43+10log (mean power output in watts)} = -13 dBm.

In order to account for the spectral adding of identical signals from the primary and diversity ports, per KDB 662911 D01 Multiple Transmitter Output v01r01, the level needs be adjusted by 10LOG(n) where n= number of outputs.

The adjustment for n=2 is: 3.01 dB = 10LOG(2)

Therefore the limit for emissions >1 MHz outside a licensees frequency block when measured with a RBW of 1 MHz is:

-13 dBm – 3.01 dB = -16.01 dBm

The carrier signal shown on these plots was measured at a resolution Bandwidths of 3 MHz. This was done so that the carrier plot correctly and accurately depicts the carrier output power in relation to the spurious signals and the defined limit.

4.4.3 Operational Configuration

The modulation used in this evaluation are described in the pertinent standards documents which include **3GPP TS 36.211 V9.1.0 (2010-03)** titled**:** 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation (Release 9). The modulation is Orthogonal Frequency Division Multiple Access (OFDMA) which is processed into an uplink IF signal. The input data stream is divided into several parallel sub-streams of reduced data rate and each sub-stream is transmitted on a separate orthogonal sub-carrier. The sub-carriers are modulated using either QPSK, or 64QAM. There is no single measure of the modulation quality other than to verify that the subcarrier modulation constellations visual orientation match the symbol and amplitude criteria is consistent with QPSK and 64QAM.

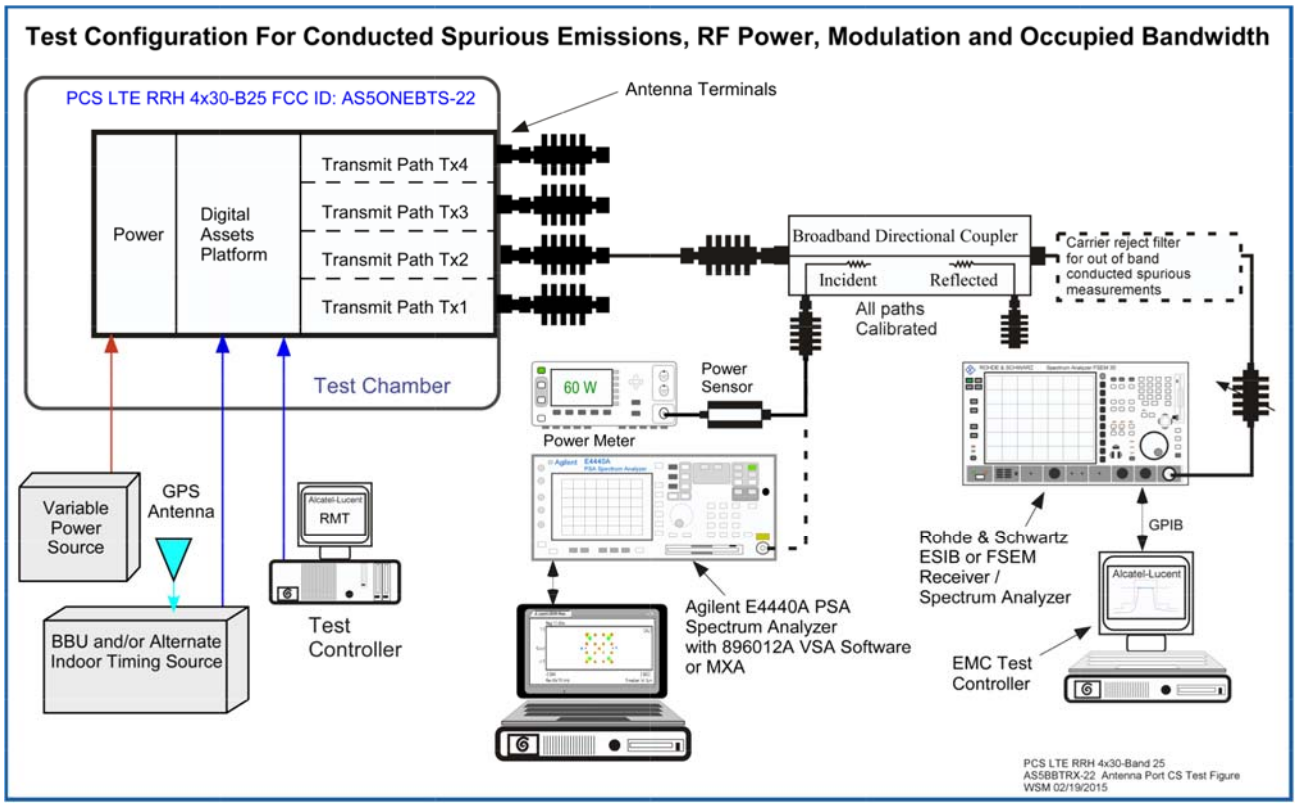
4.4.4 Results:

Over the required frequency spectrum investigated for the EUT, no reportable out-of-block spurious emissions were detected. The out-of-block spurious emissions in the entire spectrum investigated are under the required reportable emission limit. The measurement results demonstrate that the subject of the application is in full compliance with the Rules of the Commission.

Table 4.4.4 Compliance Tabulation of Conducted Spurious Emissions Measurements

PCS Block	Port #	Transmit Power Watts	Signal Bandwidth MHz	Modulation	Carrier Center Frequency MHz	Conducted Spurious Emissions Measurement	Compliance Status
A	Tx1	60	5	QPSK+16QAM	1932.5	Yes	Pass
A	Tx1	60	5	64QAM	1932.5	Yes	Pass
A	Tx1	60	5	64QAM	1942.5	Yes	Pass
D	Tx1	60	5	64QAM	1947.5	Yes	Pass
B	Tx1	60	5	64QAM	1952.5	Yes	Pass
B	Tx1	60	5	64QAM	1962.5	Yes	Pass
E	Tx2	60	5	64QAM	1967.5	Yes	Pass
F	Tx2	60	5	64QAM	1972.5	Yes	Pass
C	Tx2	60	5	64QAM	1977.5	Yes	Pass
C	Tx2	60	5	64QAM	1987.5	Yes	Pass
G	Tx2	60	5	QPSK+16QAM	1992.5	Yes	Pass
G	Tx2	60	5	64QAM	1992.5	Yes	Pass

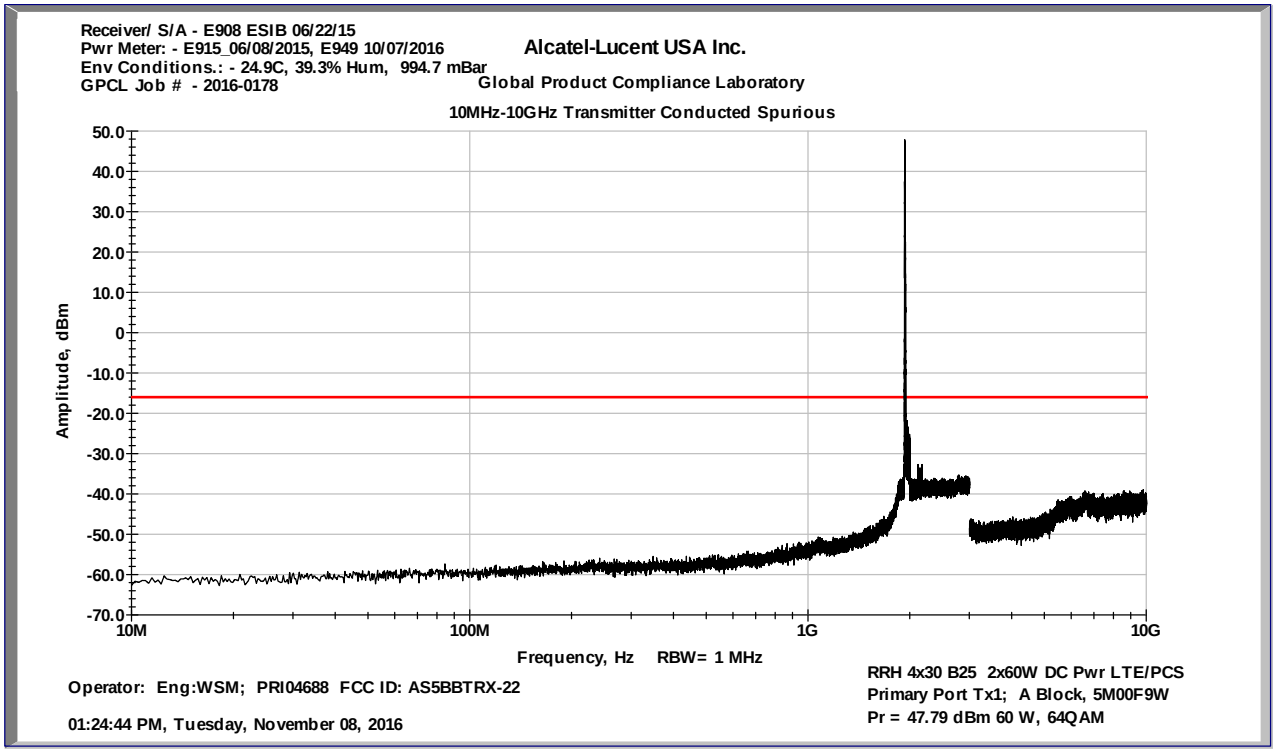
Figure 4.4.1 Test Set-Up for Measurement of Conducted Spurious Emissions



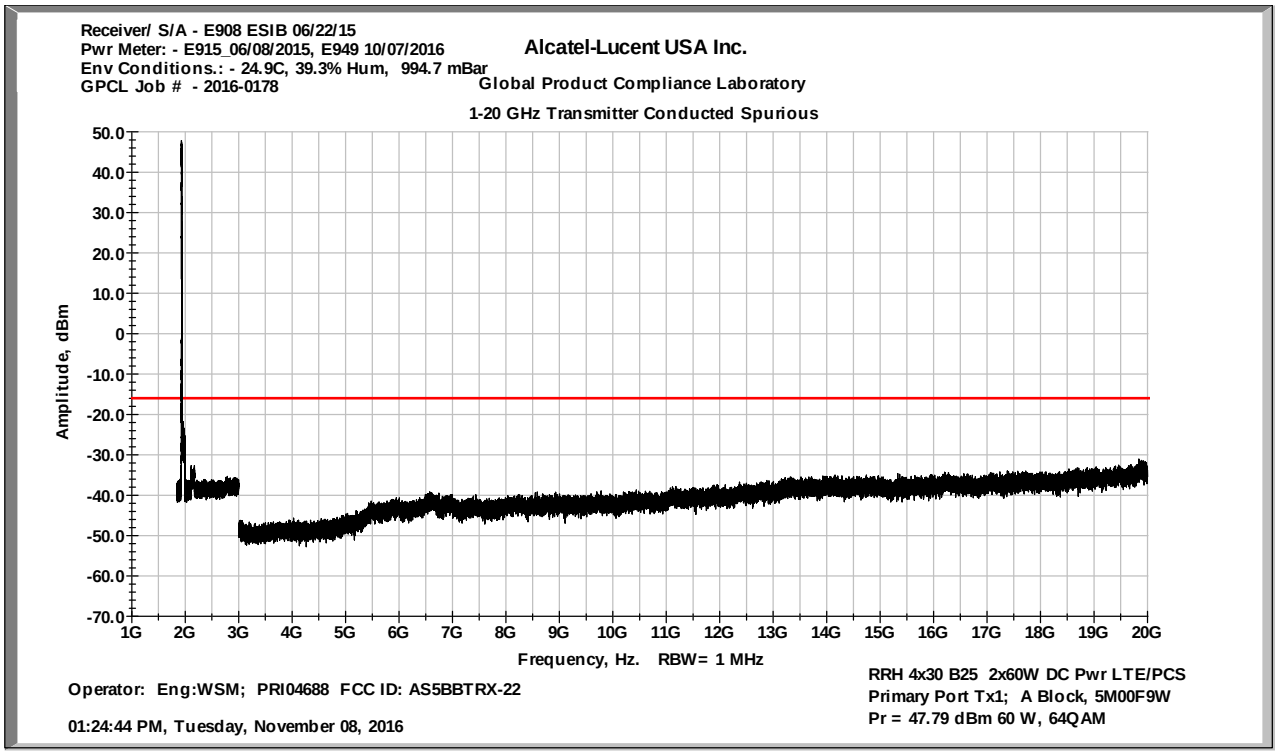
Transmitter Measurements
of
Conducted Spurious Emissions
for
Alcatel-Lucent USA Inc.

PCS LTE RRH 4x30 Band 25
Outdoor Transceiver System
FCC ID: AS5BBTRX-22

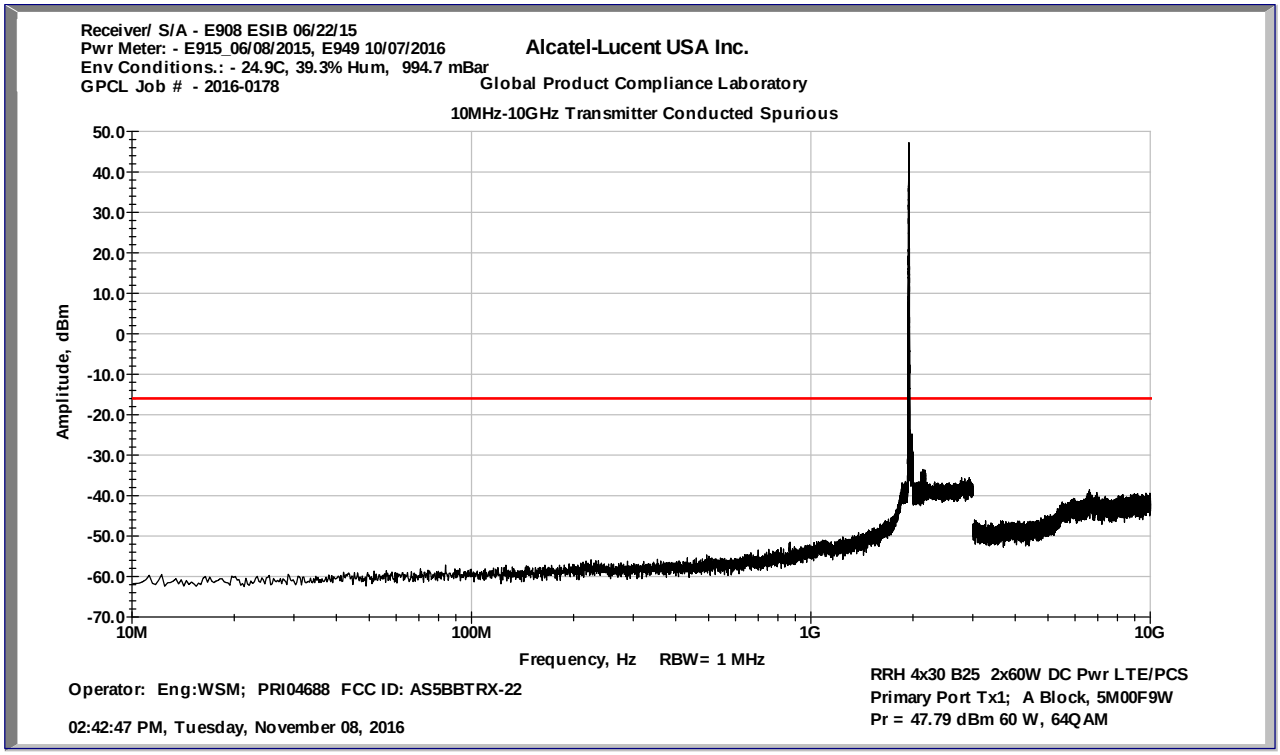
FCC Part 24 Conducted Spurious Emissions 10 MHz – 10 GHz Primary Tx1 Block A Left



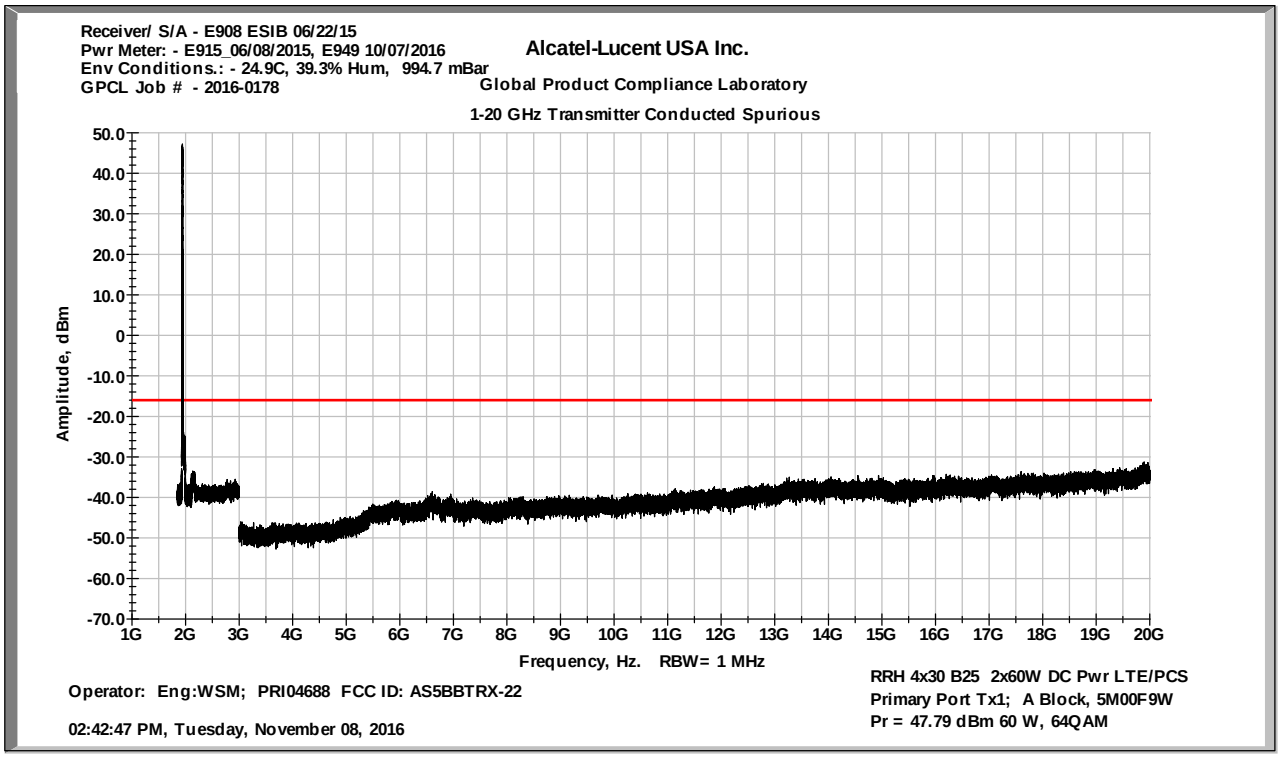
FCC Part 24 Conducted Spurious Emissions 1 GHz – 20 GHz Primary Tx1 Block A Left



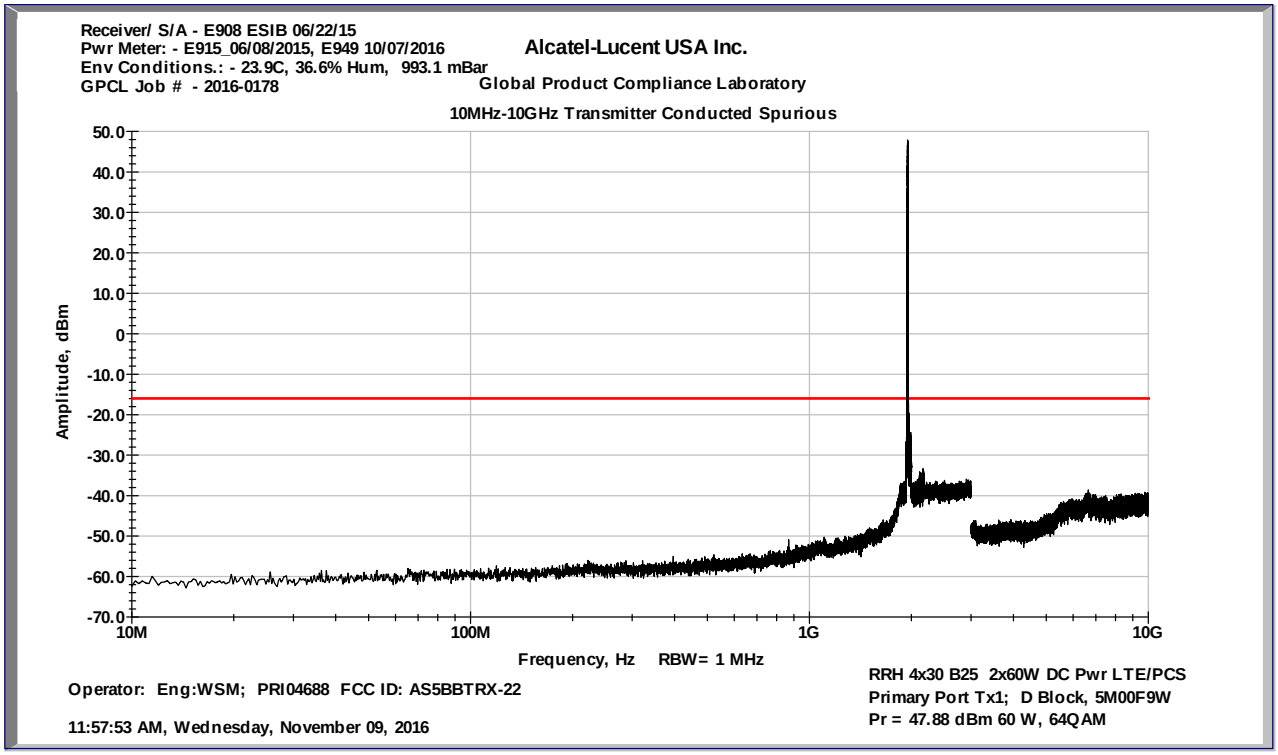
FCC Part 24 Conducted Spurious Emissions 10 MHz – 10 GHz Primary Tx1 Block A Right



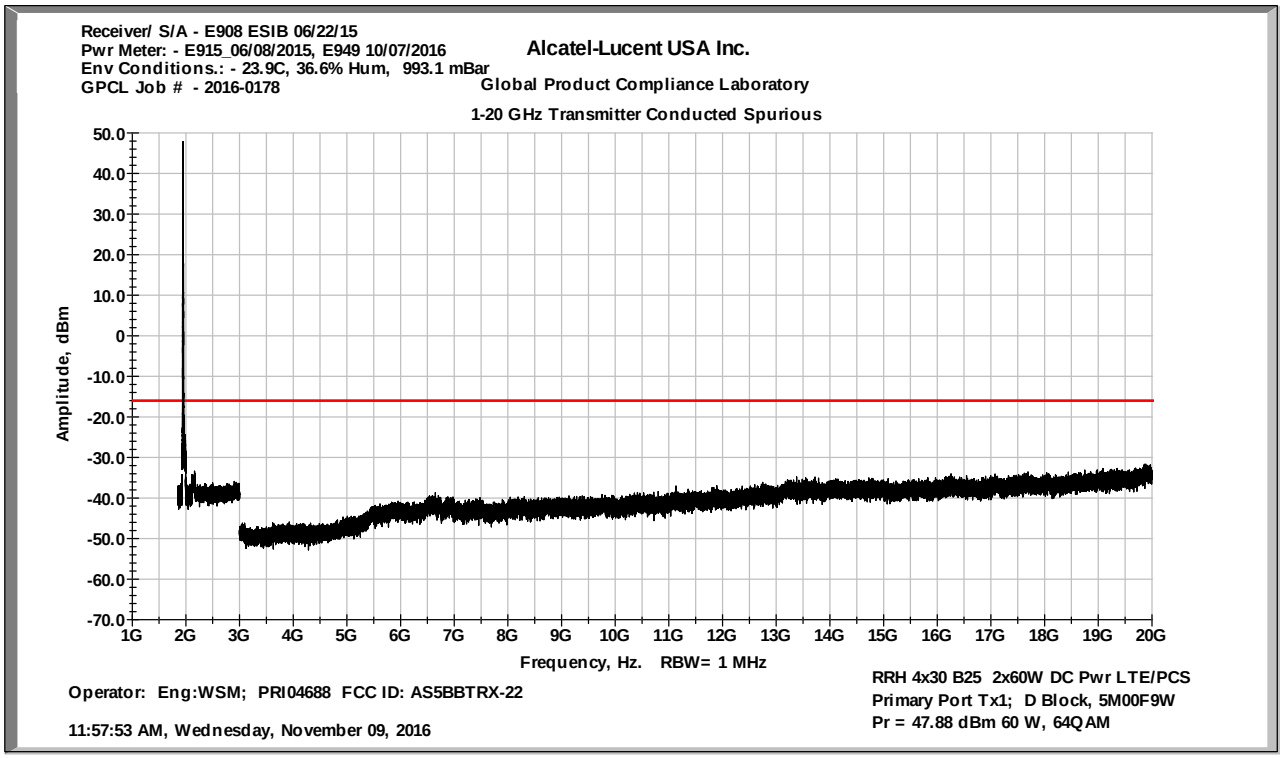
FCC Part 24 Conducted Spurious Emissions 1 GHz – 20 GHz Primary Tx1 Block A Right



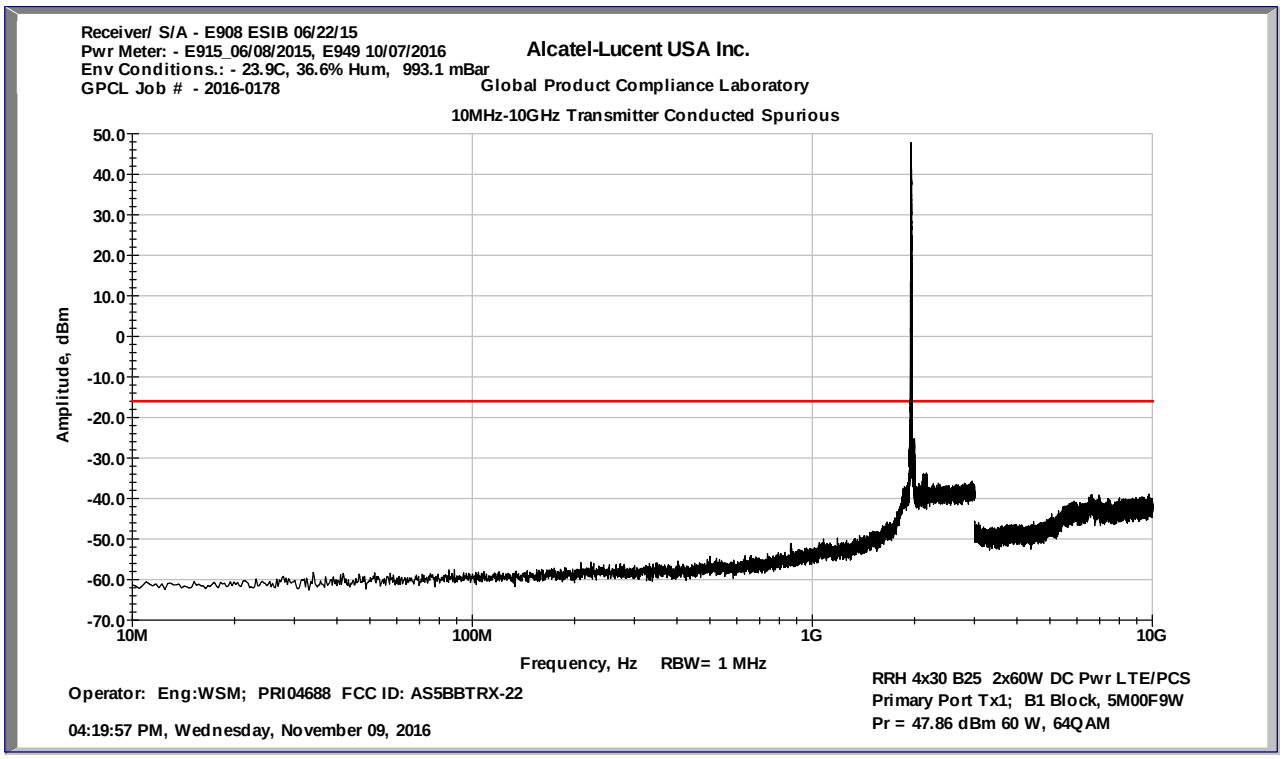
FCC Part 24 Conducted Spurious Emissions 10 MHz – 10 GHz Primary Tx1 Block D



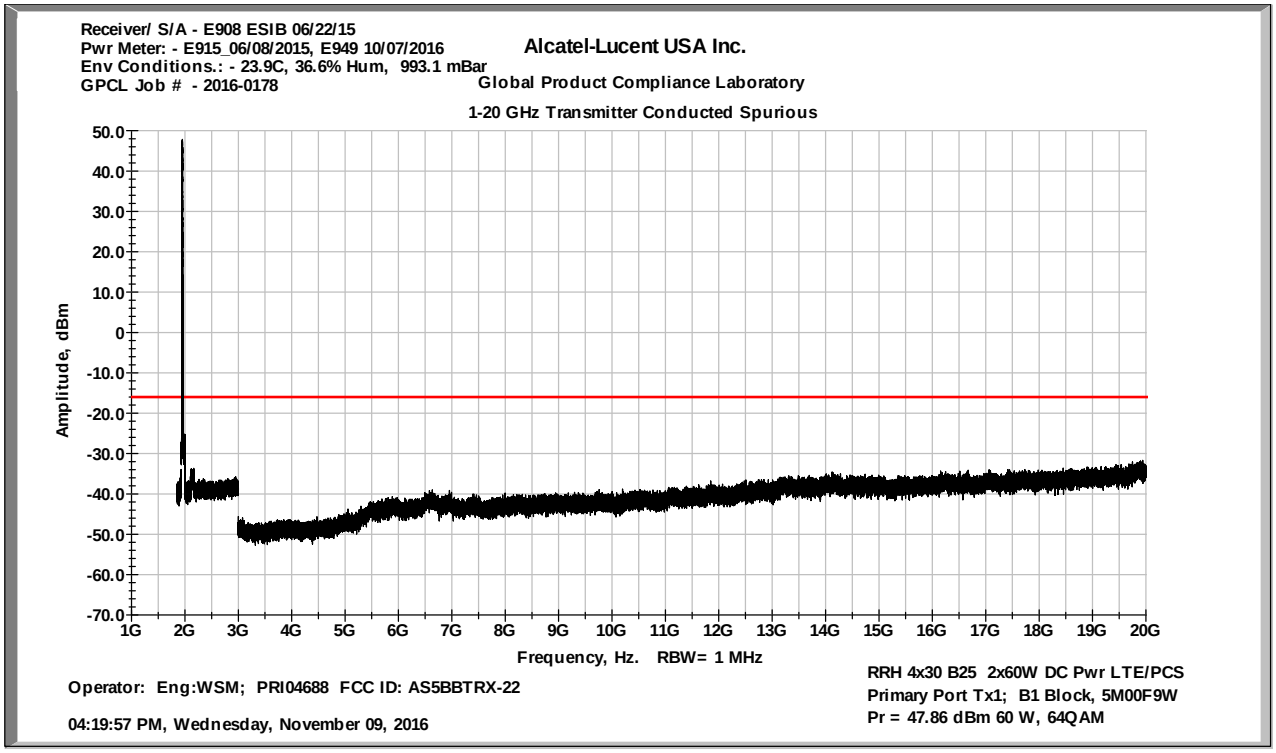
FCC Part 24 Conducted Spurious Emissions 1 GHz – 20 GHz Primary Tx1 Block D



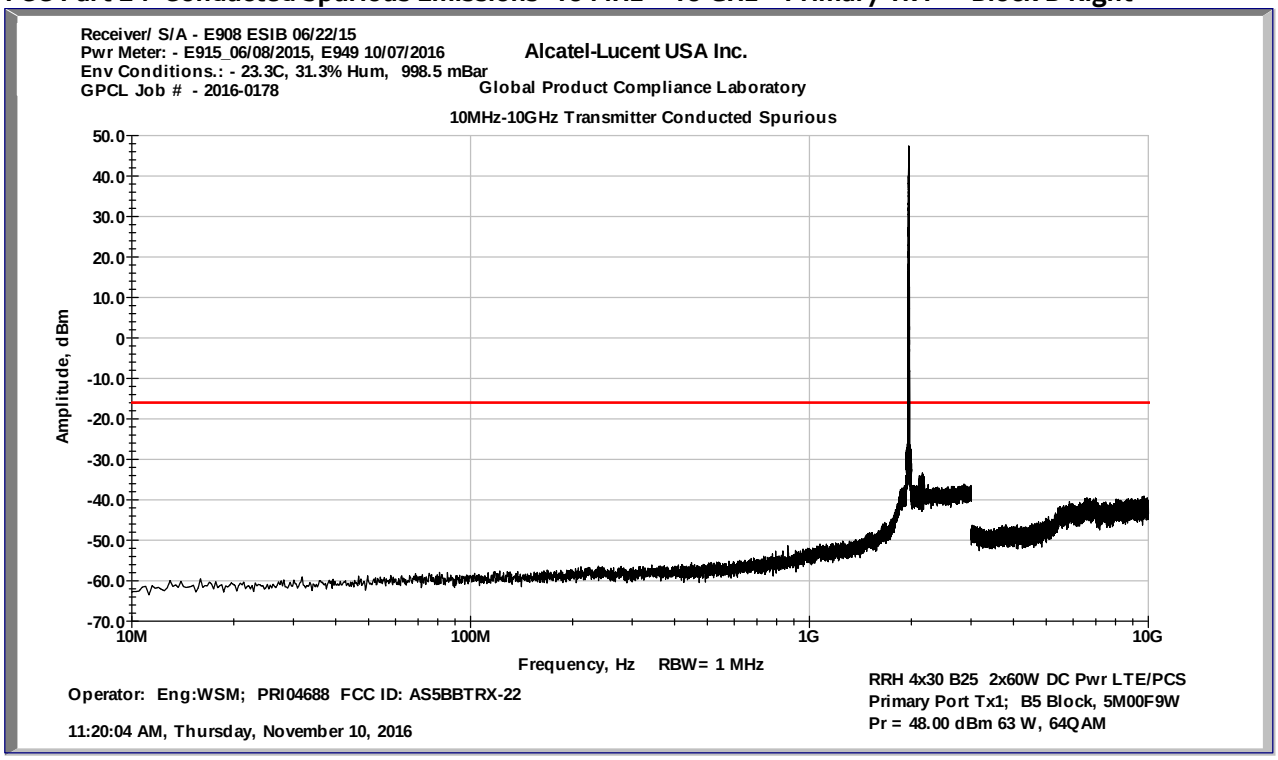
FCC Part 24 Conducted Spurious Emissions 10 MHz – 10 GHz Primary Tx1 Block B Left



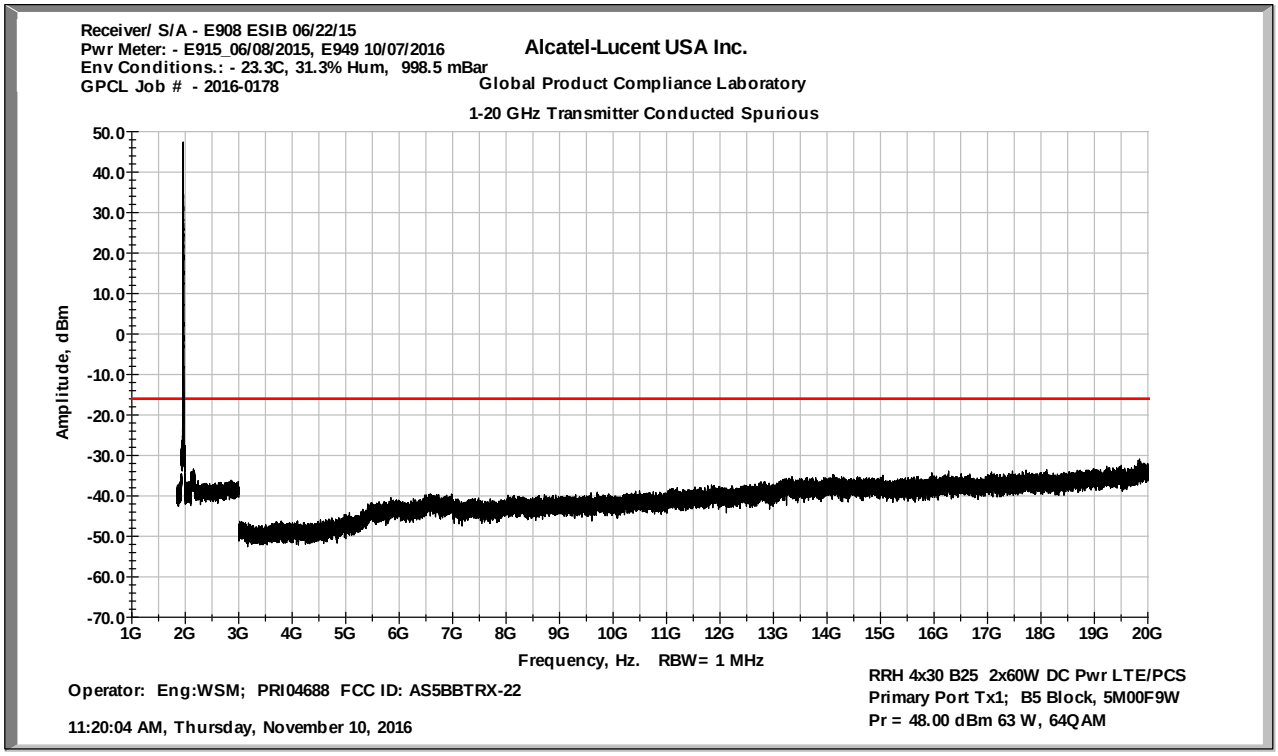
FCC Part 24 Conducted Spurious Emissions 1 GHz – 20 GHz Primary Tx1 Block B Left



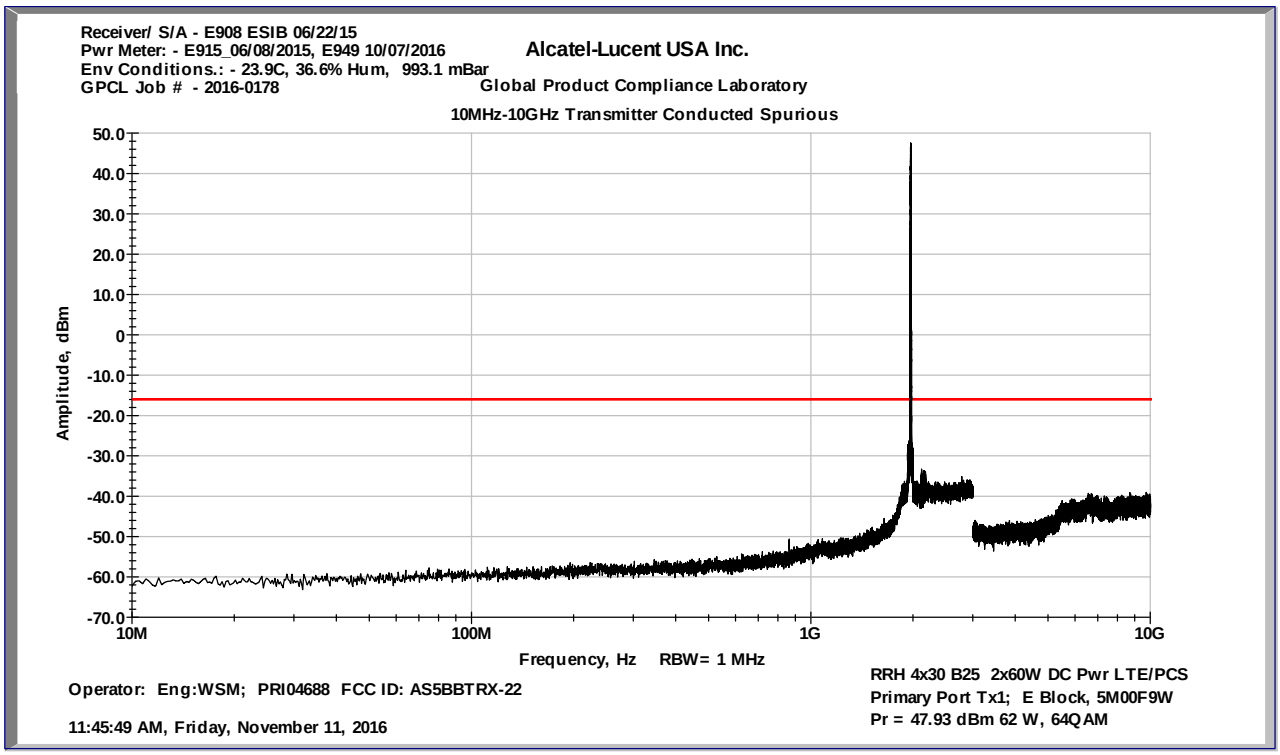
FCC Part 24 Conducted Spurious Emissions 10 MHz – 10 GHz Primary Tx1 Block B Right



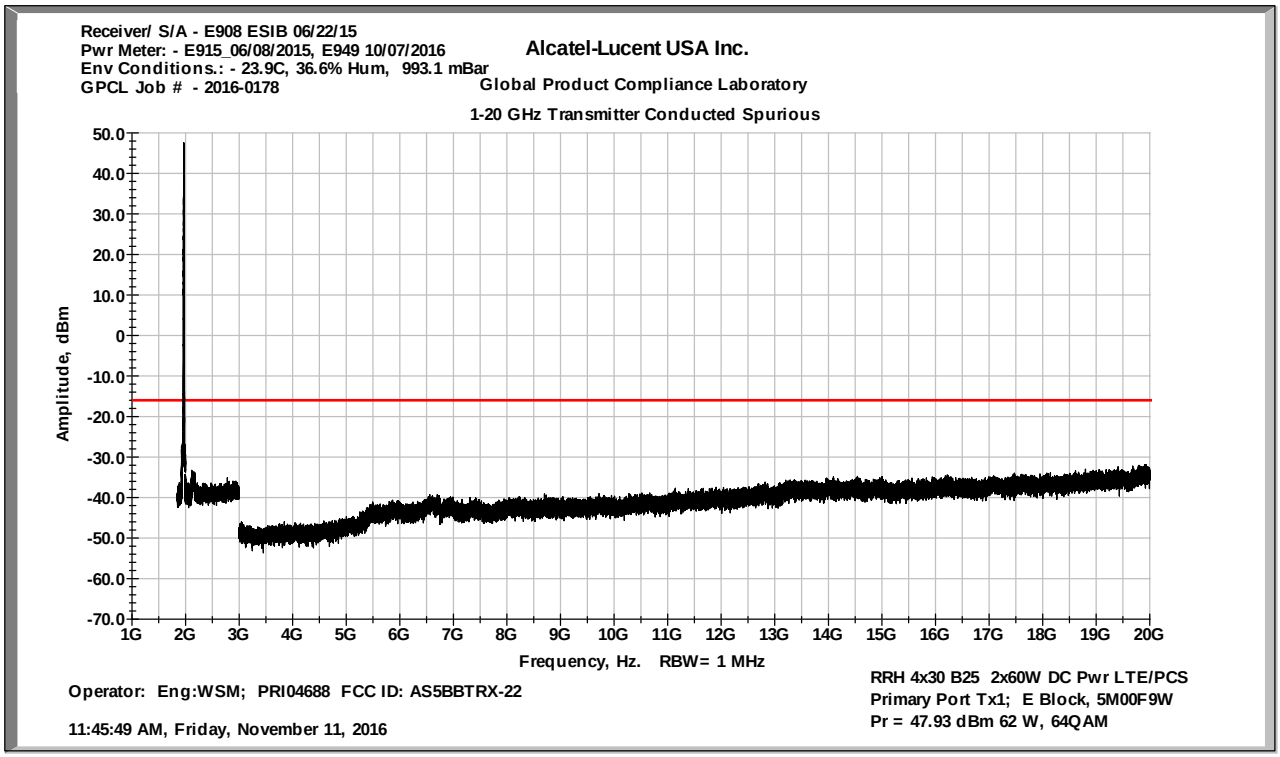
FCC Part 24 Conducted Spurious Emissions 1 GHz – 20 GHz Primary Tx1 Block B Right



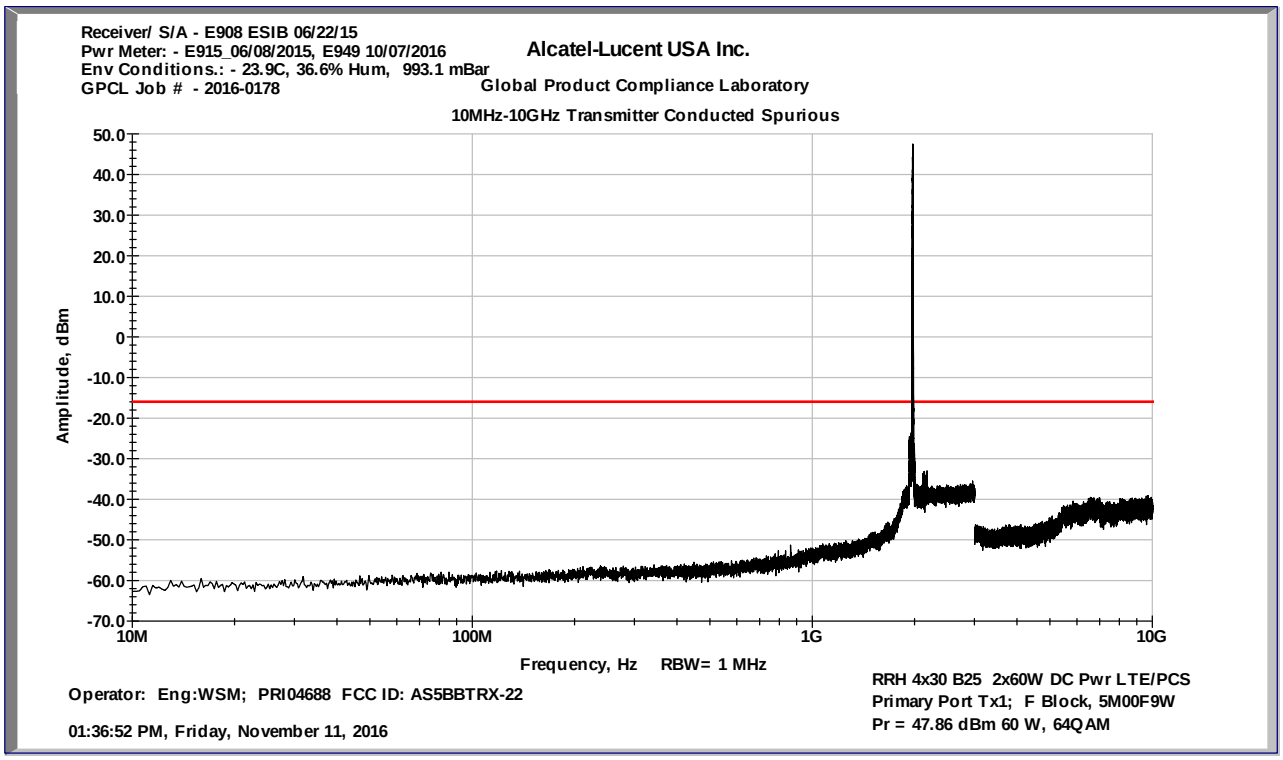
FCC Part 24 Conducted Spurious Emissions 10 MHz – 10 GHz Primary Tx1 Block E



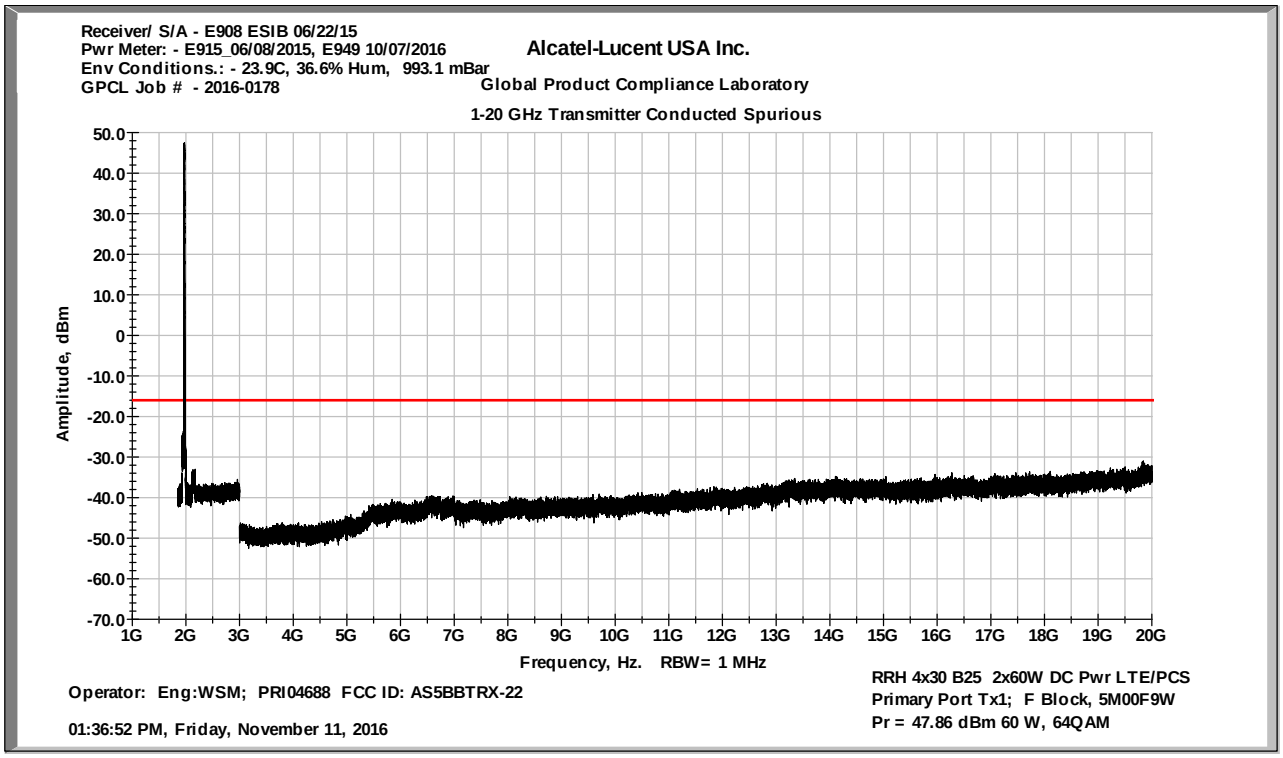
FCC Part 24 Conducted Spurious Emissions 1 GHz – 20 GHz Primary Tx1 Block E



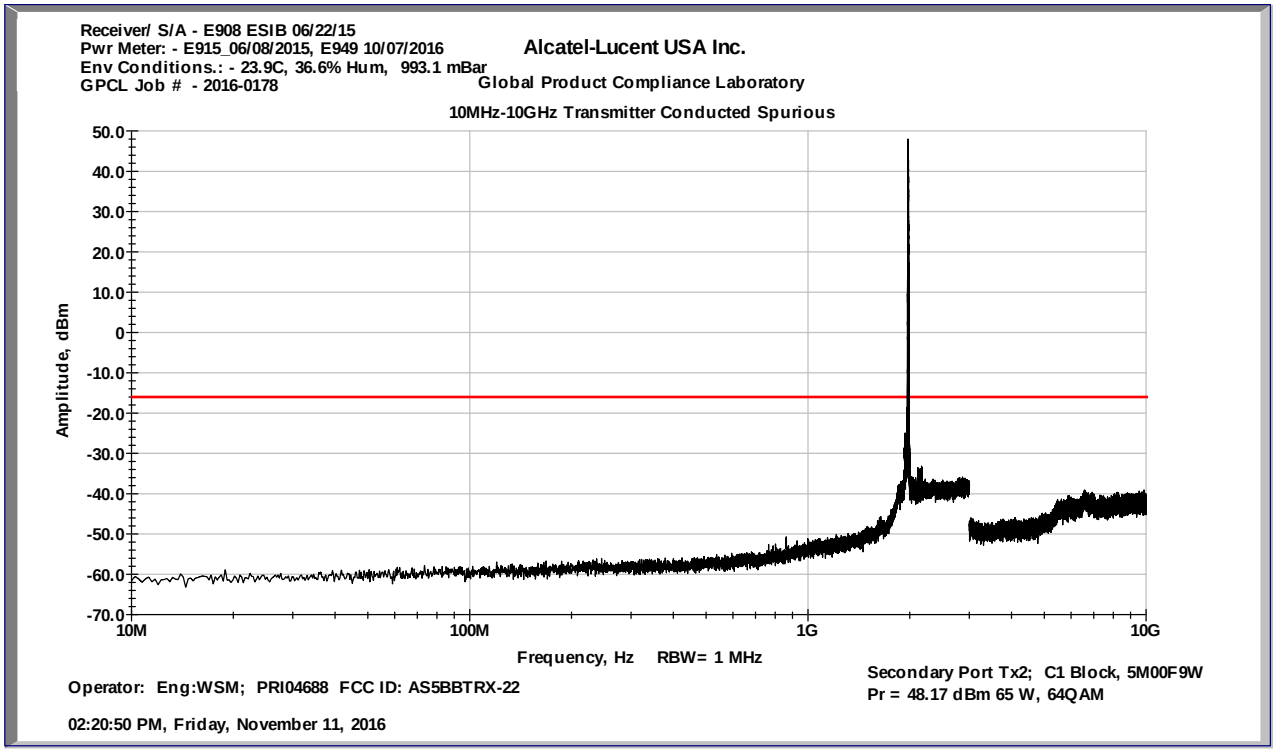
FCC Part 24 Conducted Spurious Emissions 10 MHz – 10 GHz Primary Tx1 Block F



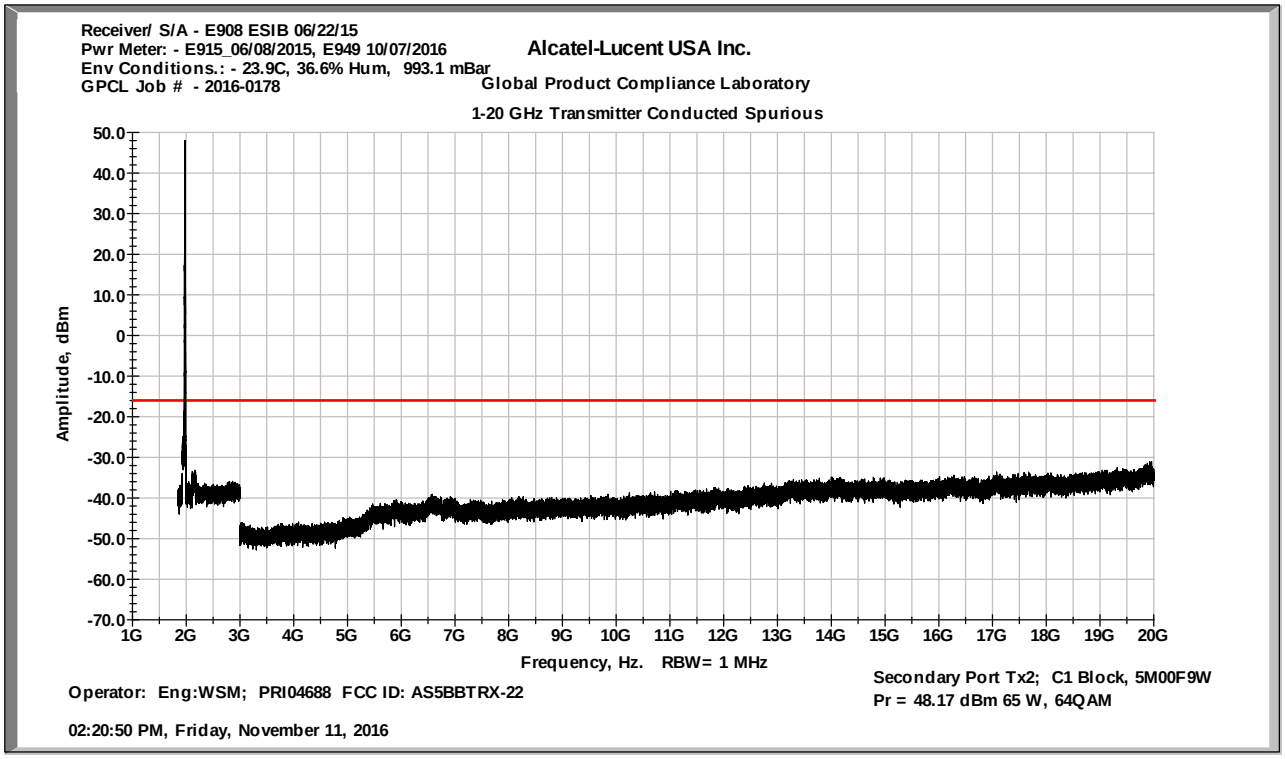
FCC Part 24 Conducted Spurious Emissions 1 GHz – 20 GHz Primary Tx1 Block F



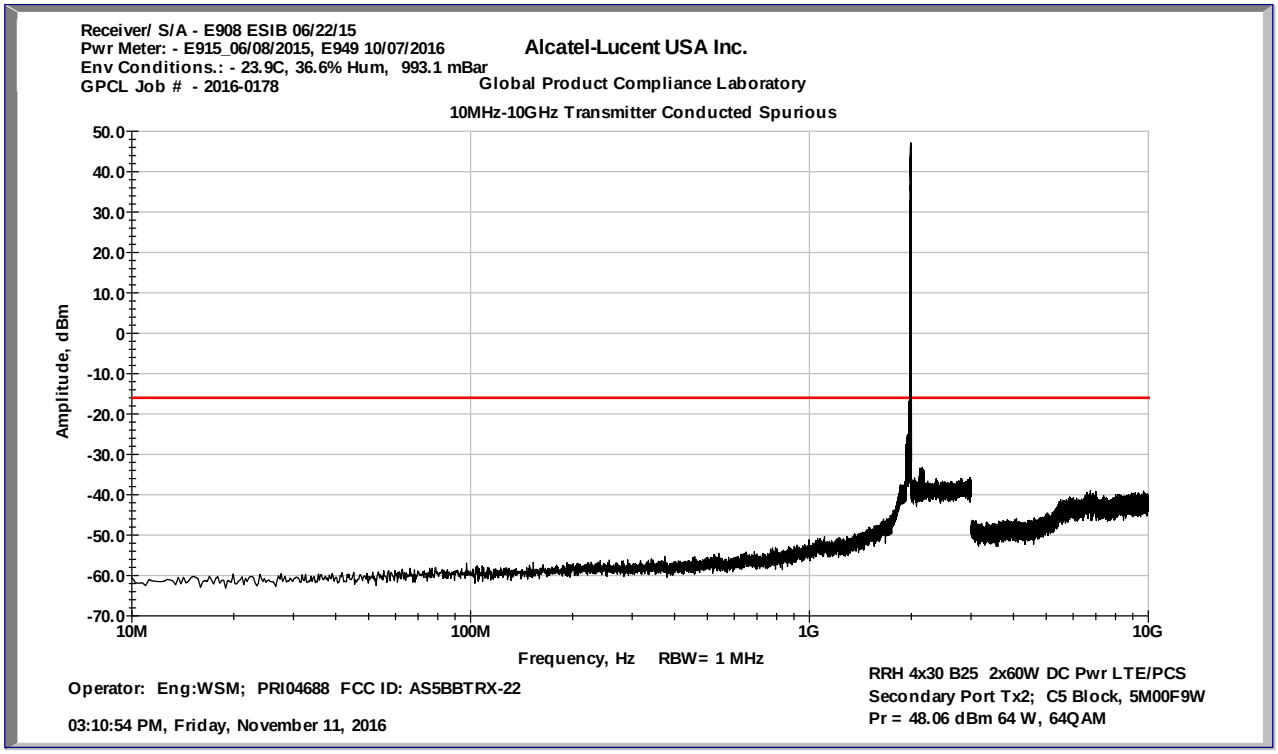
FCC Part 24 Conducted Spurious Emissions 10 MHz – 10 GHz Secondary Tx2 Block C Left



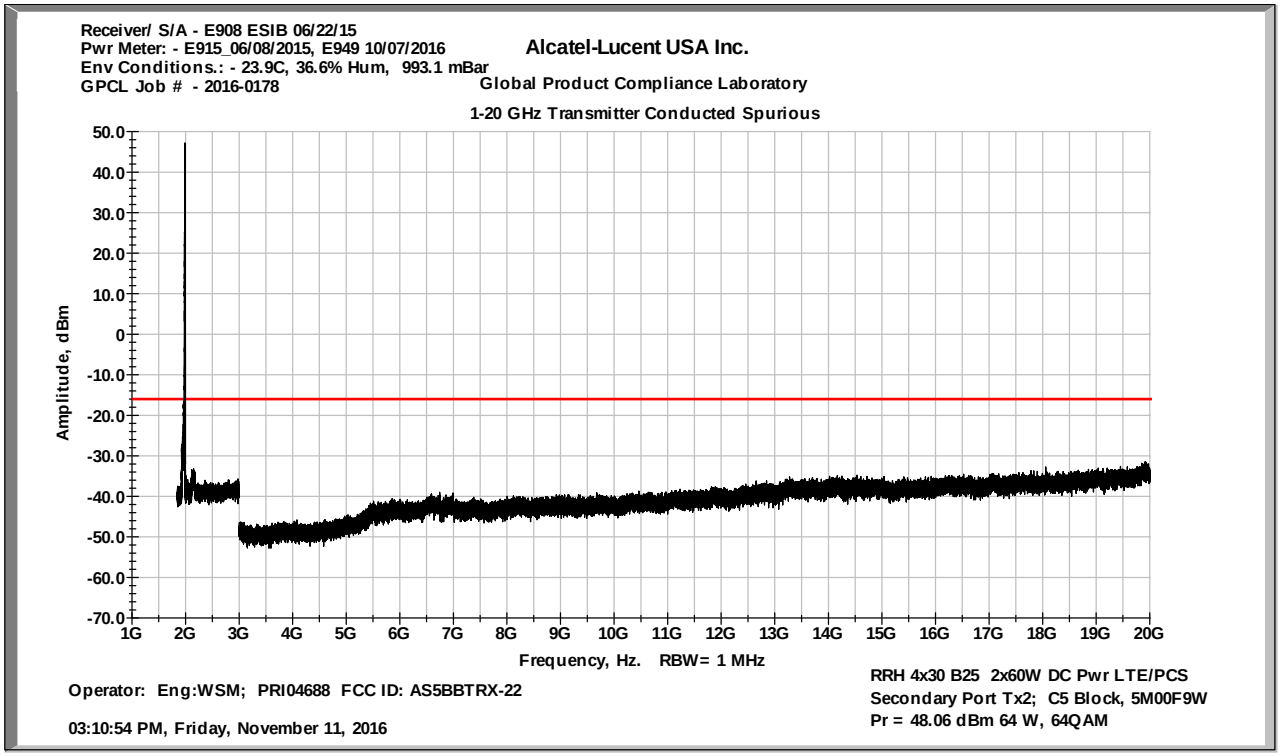
FCC Part 24 Conducted Spurious Emissions 1 GHz – 20 GHz Secondary Tx2 Block C Left



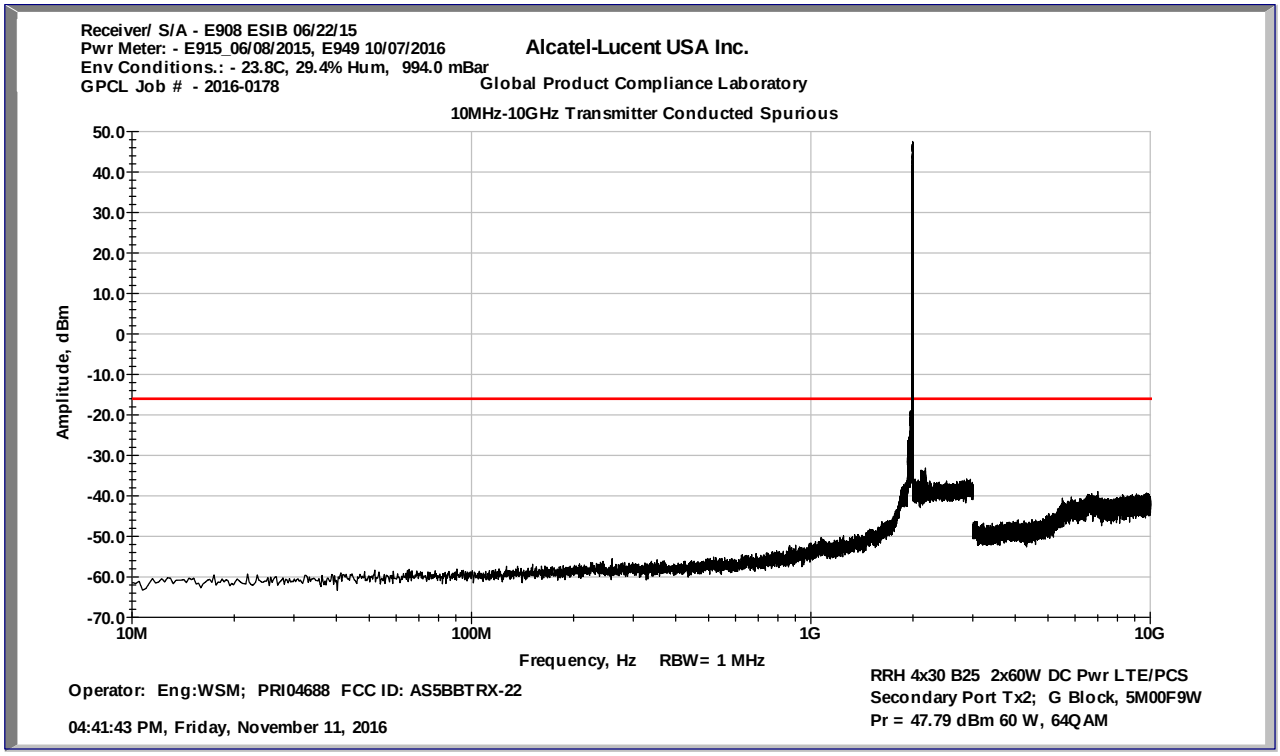
FCC Part 24 Conducted Spurious Emissions 10 MHz – 10 GHz Secondary Tx2 Block C Right



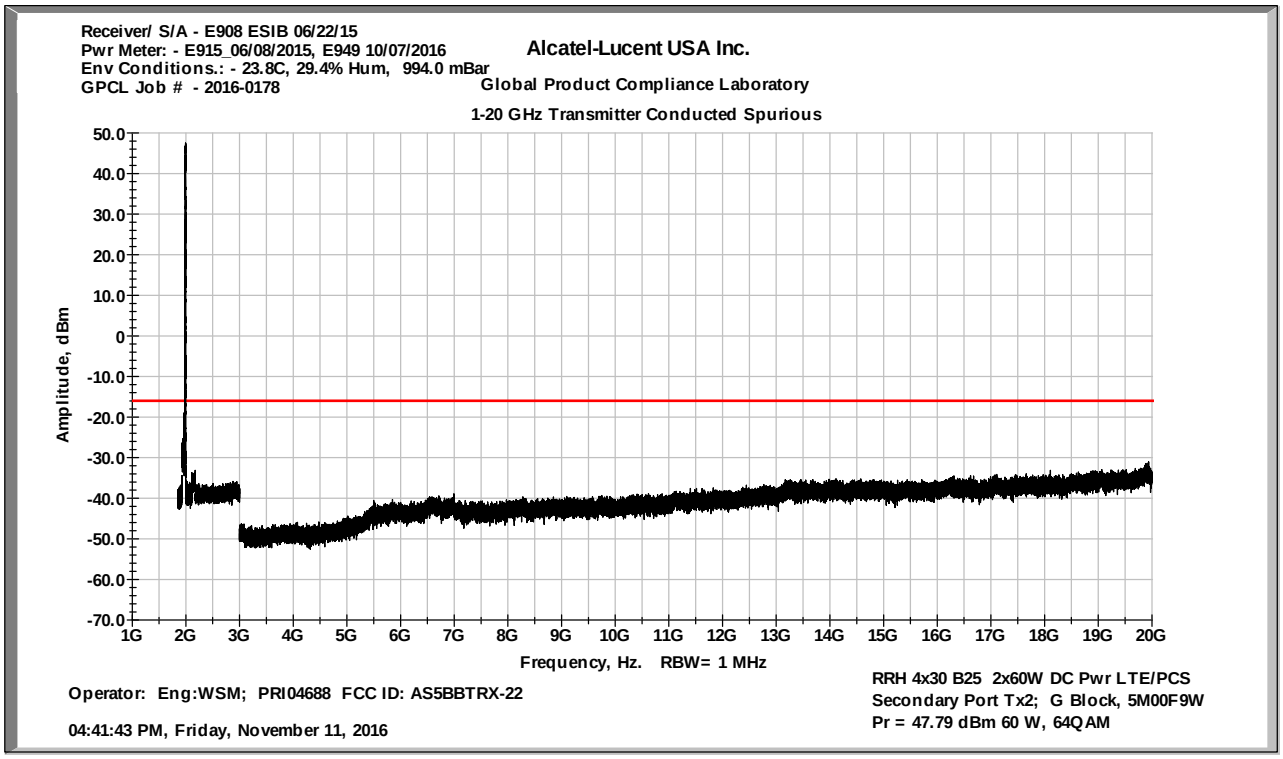
FCC Part 24 Conducted Spurious Emissions 1 GHz – 20 GHz Secondary Tx2 Block C Right



FCC Part 24 Conducted Spurious Emissions 10 MHz – 10 GHz Secondary Tx2 Block G



FCC Part 24 Conducted Spurious Emissions 1 GHz – 20 GHz Secondary Tx2 Block G



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4.5 Section 2.1055 MEASUREMENT REQUIRED: FREQUENCY STABILITY

This measurement evaluates the frequency difference between the actual transmit carrier frequency and the specified transmit frequency assignment. Only the portion of the transmitter system containing the frequency determining and stabilizing circuitry need be put in an environmental chamber and subjected to the temperature variation test per FCC Section 2.1055. The unit which provides baseband signals, such as BBU (baseband unit), can be located outside the chamber if it is a separated unit.

4.5.1 Frequency Stability Results:

This EUT was previously tested during the original filing process. There were no changes to the frequency generating or stabilizing circuitry of this product.
For this Class II Permissive Change, new data is not required.

4.6 Section 2.1053 MEASUREMENT REQUIRED: FIELD STRENGTH OF SPURIOUS RADIATION

The field strength measurements of radiated spurious emissions were made in a FCC registered three meter semi-anechoic chamber AR-6, (Site Registration Number: 909064) and IC (Filing Number: 6933F-6) which is maintained by Nokia Bell Labs in Murray Hill, New Jersey.

The **B25 RRH 4X30** (EUT) was configured in semi-anechoic chamber AR-6 as in the normal field installation and the recommendations of ANSI C63.4–2009 were followed for EUT testing setup and cabling. The EUT was configured to operate per the E-UTRA test model specified in 3GPP TS 36.141.

The base station was configured to transmit a 2x MIMO 5 MHz LTE carrier in B Block at 1967.5 with the maximum mean power of 60W (47.8dBm). All carriers were transmitting to non-radiating 50 Ω resistive loads.

Table 4.5.1 EUT Configurations

Config No	No of Carriers/Port	Tx Frequency)	Power/c (dBm)	Carrier BW (MHz)	Modulations
1	1	1967.5 MHz	47.8	5	64QAM

Section 24.238 and 2.1053 contains the requirements for the levels of spurious radiation as a function of the EIRP of the unmodulated carrier. The reference level for the unmodulated carrier is calculated as the field produced by an isotropic radiator excited by the transmitter output power according to the following relation taken from Reference Data for Radio Engineers, page 27-7, 6th edition, IT&T Corp.

$$E = (120\pi P)^{1/2} = [(30*P)^{1/2}] / R$$

$$20 \log (E*10^{6}) - (43 + 10 \log P) = 82.23 \text{ dB } \mu V/\text{meter}$$

Where: E = Field Intensity in Volts/ meter R = Distance in meters = 3 m

P = Transmitted Power in watts = 60 W

The field strength of radiated spurious emissions measured was determined by

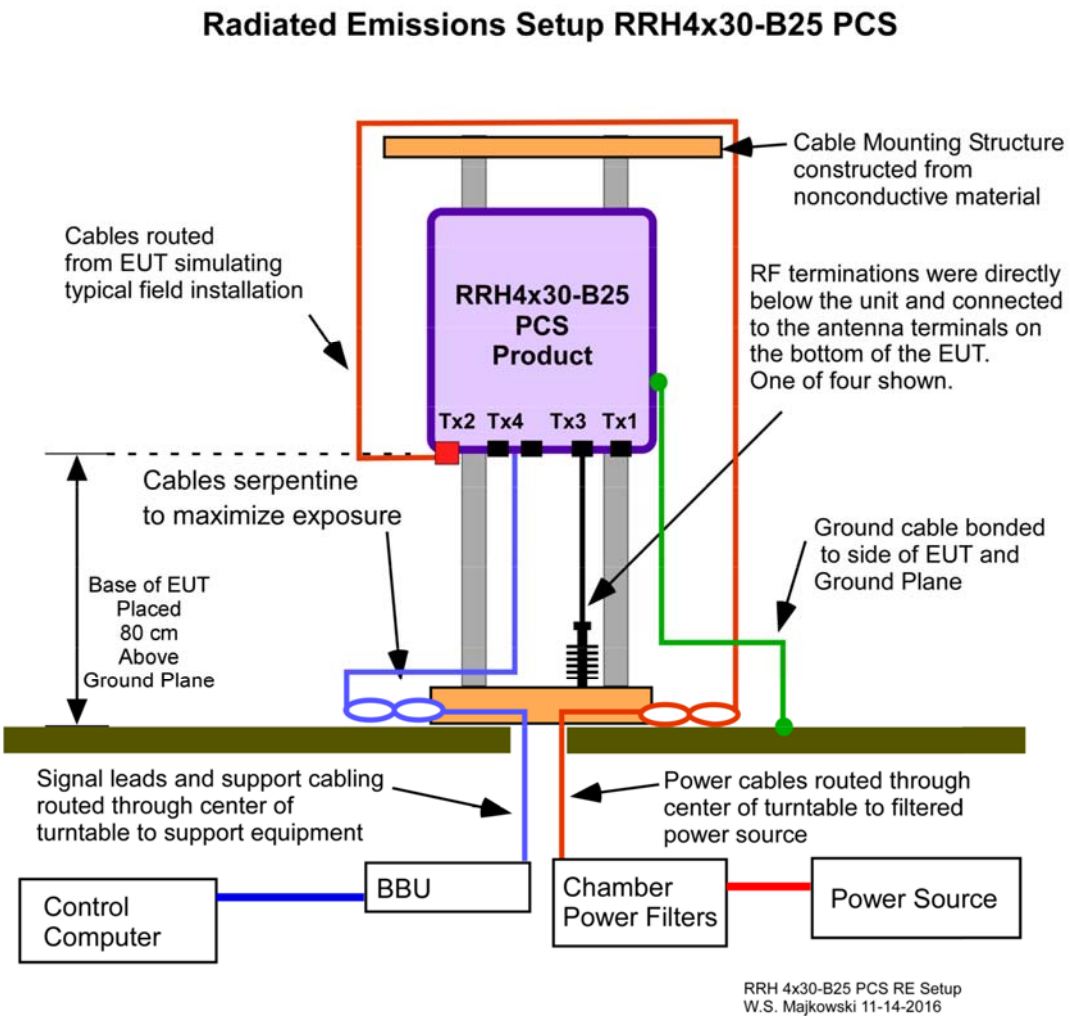
$$E(\text{dB}\mu\text{V/m}) = V_{meas}(\text{dB}\mu\text{V}) + \text{Cable Loss (dB)} + \text{Antenna Factor (dBi/m)}.$$

Field strength measurements of radiated spurious emissions were made at a semi anechoic room of Global Product Compliance Laboratories of Nokia Bell Laboratories in Murray Hill NJ which was detailed in Section 6. The recommendations of ANSI C63.4 and ANSI C63.26 were followed for EUT testing setup, cabling, and measurement approach and procedures. All the measurement equipment used, including antennas, was calibrated in accordance with ISO 9001 process. The EUT setup diagram is given in the Figure 4.6.1. The minimum margin measured per Table 4.6.2 is more than 20dB.

4.6.1 Field Strength of Radiated Emissions Results:

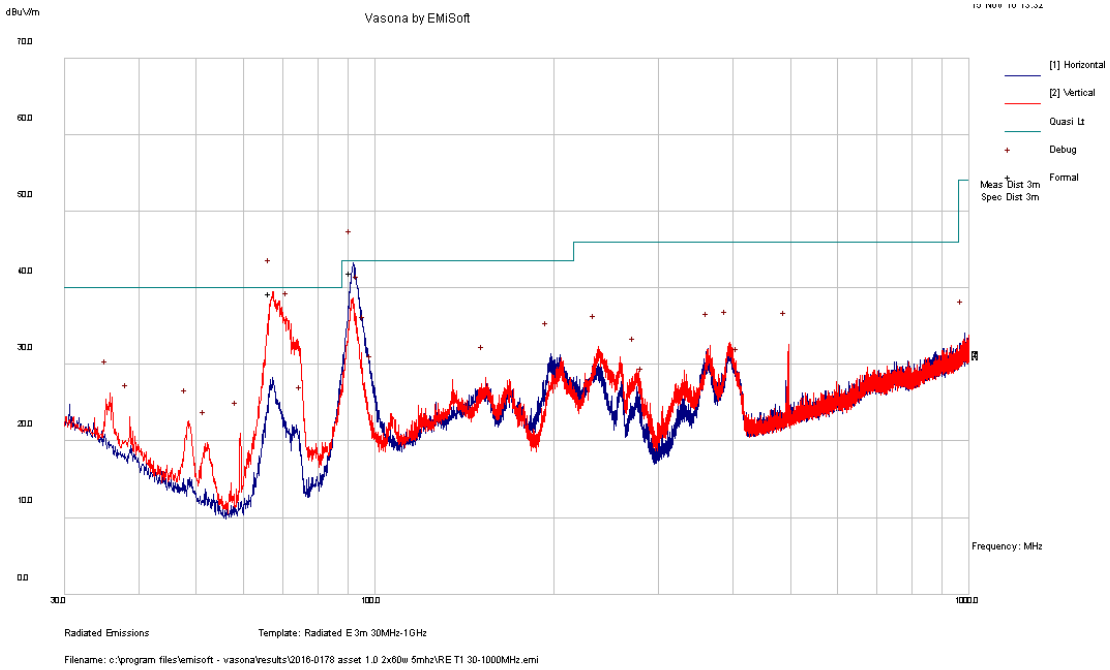
For this particular test, the field strength of any spurious radiation, measured at 3m, is required to be less than 82.23 dBμV/meter. Emissions equal to or less than 62.23 dBμV/meter are not reportable and may be verified using field strength measurements and broadband antennas. Over the out of band spectrum investigated from 10 MHz to beyond the tenth harmonic of the carrier (20GHz), no reportable spurious emissions were detected. This demonstrates that the B25 RRH 4X30 / FCC ID: AS5BBTRX-22, the subject of this application, complies with Sections 2.1053, 24.238 and 2.1057 of the Rules.

Figure 4.6.1 Test Set-Up for Measurement of Radiated Spurious Emissions



Radiated Emissions Data

T1 RE 30MHz-1GHz FCC B Final



Results Title:	Radiated E 3m 30MHz-1GHz
File Name:	c:\program files\emisoft - vasona\results\2016-0178 asset 1.0 2x60w 5mhz\RE T1 30-1000MHz.emi
Test Laboratory:	GPCL AR6-MH 23C, 35%RH, 993mB
Test Engineer:	GM
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	NOKIA
EUT Details:	2016-0178 PRI04688 NOKIA Asset 1.0 PCS RRH 5MHz 60W update
Configuration:	GR-1089 Radiated Emissions 30-1000MHz Spectrum Analyzer E704, Preamp E512, ANT E601, 6dB Pad E887
Date:	2016-11-15 14:09:40

FORMAL DATA

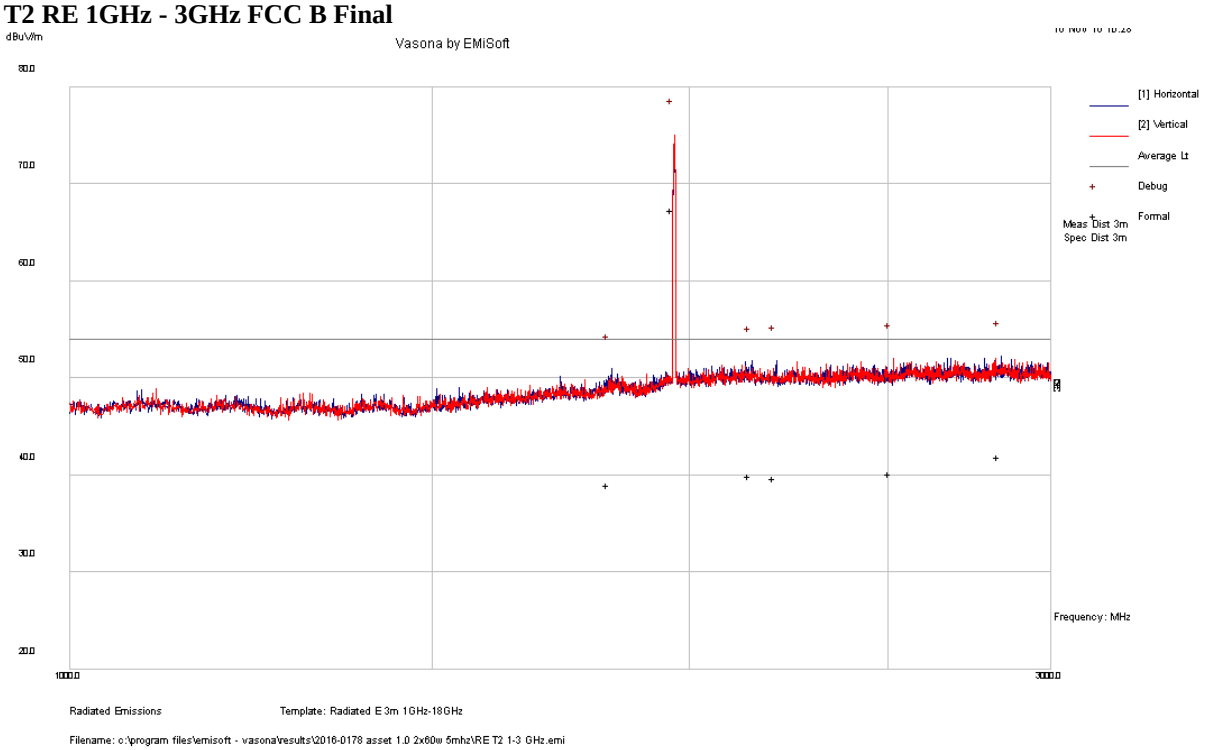
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
67.266	54.03	6.67	-25.6	35.13	Quasi Max	V	102	104	40	-4.87	Pass	
91.834	51.05	6.89	-20.1	37.85	Quasi Max	H	176	194	43.5	-5.65	Pass	
72.092	50.6	6.7	-24.8	32.53	Quasi Max	V	139	87	40	-7.47	Pass	
72.092	50.6	6.7	-24.8	32.53	Quasi Max	V	139	87	40	-7.47	Pass	
94.448	48	6.91	-19.4	35.49	Quasi Max	H	160	15	43.5	-8.01	Pass	
94.448	48	6.91	-19.4	35.49	Quasi Max	H	160	15	43.5	-8.01	Pass	
96.869	42.02	6.93	-18.8	30.13	Quasi Max	H	189	349	43.5	-13.37	Pass	
96.869	42.02	6.93	-18.8	30.13	Quasi Max	H	189	349	43.5	-13.37	Pass	
197.278	40.21	7.31	-19.6	27.94	Quasi Max	H	118	14	43.5	-15.56	Pass	
197.278	40.21	7.31	-19.6	27.94	Quasi Max	H	118	14	43.5	-15.56	Pass	

PREVIEW DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
91.8517	56.53	6.89	-20.1	43.33	Preview	H	190	180	43.5	-0.17	Pass	
67.3226	58.42	6.67	-25.6	39.53	Preview	V	100	90	40	-0.47	Pass	
72.1323	53.39	6.7	-24.8	35.33	Preview	V	100	90	40	-4.67	Pass	
94.4489	49.96	6.91	-19.4	37.45	Preview	H	190	0	43.5	-6.05	Pass	
96.9499	44	6.93	-18.8	32.13	Preview	H	190	0	43.5	-11.37	Pass	
197.279	43.66	7.31	-19.6	31.39	Preview	H	100	0	43.5	-12.11	Pass	
394.665	40.67	7.74	-15.6	32.85	Preview	V	100	135	46	-13.15	Pass	
496.052	38.47	7.91	-13.8	32.63	Preview	V	100	90	46	-13.37	Pass	
366.481	41.42	7.68	-16.6	32.52	Preview	V	100	270	46	-13.48	Pass	
35.7715	35.83	6.6	-16.1	26.33	Preview	V	100	0	40	-13.67	Pass	
237.102	42.77	7.41	-17.9	32.29	Preview	V	100	315	46	-13.71	Pass	
153.415	35.08	7.18	-14	28.24	Preview	V	100	225	43.5	-15.26	Pass	
99.7395	38.16	6.95	-18.1	26.98	Preview	H	190	0	43.5	-16.52	Pass	
275.579	40.19	7.49	-18.3	29.37	Preview	V	100	225	46	-16.63	Pass	
38.6573	34.41	6.59	-17.8	23.22	Preview	V	100	90	40	-16.78	Pass	
75.98	40	6.74	-23.8	22.92	Preview	V	100	90	40	-17.08	Pass	
48.5651	38.19	6.57	-22.2	22.58	Preview	V	100	180	40	-17.42	Pass	
411.884	35.21	7.77	-15	28.01	Preview	H	100	315	46	-17.99	Pass	
59.2425	39.41	6.63	-25	20.99	Preview	V	100	135	40	-19.01	Pass	
982.786	31.82	8.97	-6.64	34.15	Preview	H	100	270	54	-19.85	Pass	
52.2204	36.5	6.58	-23.4	19.74	Preview	V	100	135	40	-20.26	Pass	
285.102	36.09	7.5	-18.2	25.41	Preview	V	100	225	46	-20.59	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

T2 RE 1GHz - 3GHz FCC B Final



Results Title:	Radiated E 3m 1GHz-3GHz
File Name:	c:\program files\emisoft - vasona\results\2016-0178 asset 1.0 2x60w 5mhz\RE T2 1-3 GHz.emi
Test Laboratory:	GPCL AR6-MH 23C, 35%RH, 989mB
Test Engineer:	GM
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	NOKIA
EUT Details:	2016-0178 PRI04688 NOKIA Asset 1.0 B25 RRH-4x30 AR1.0 1.9675MHz 2x60W 5 MHz operation. (LTE RF-Assets) 3JR53349ABAA S/N LBALLU-YD160603Q6H
Configuration:	GR-1089 Radiated Emissions 1-3 GHz Spectrum Analyzer E704, Preamp E123, ANT E1073, 6dB Pad E887
Date:	2016-11-16 10:28:15

FORMAL DATA

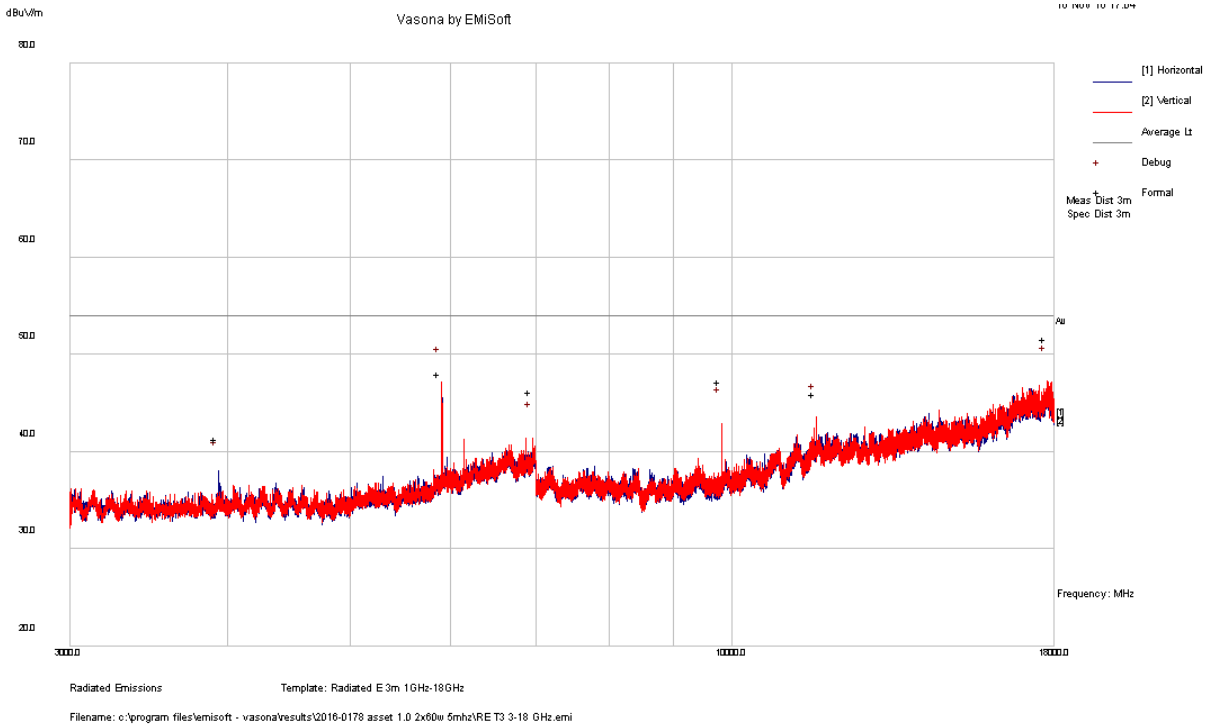
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
1968.52	57.91	9.45	-3.65	63.71	AvgMax	V	100	295	54	9.71	N/A	Tx Carrier
2837.43	30.69	9.12	-1.51	38.31	AvgMax	H	278	269	54	-15.69	Pass	
2514.15	29.24	9.23	-1.89	36.59	AvgMax	V	164	303	54	-17.41	Pass	
2146.99	30	9.38	-2.98	36.39	AvgMax	H	273	358	54	-17.61	Pass	
2207.22	29.55	9.35	-2.78	36.12	AvgMax	H	168	243	54	-17.88	Pass	
1833.43	30.28	9.52	-4.44	35.37	AvgMax	H	244	202	54	-18.63	Pass	

PREVIEW DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
1968.52	69.24	9.45	-3.65	75.04	Preview	V	100	220	54	21.04	Fail	
2837.43	44.59	9.12	-1.51	52.2	Preview	H	290	88	54	-1.8	Pass	
2514.15	44.59	9.23	-1.89	51.93	Debug	V	100	353	54	-2.07	Pass	
2207.22	45.13	9.35	-2.78	51.7	Debug	H	100	353	54	-2.3	Pass	
2146.99	45.24	9.38	-2.98	51.64	Debug	H	100	353	54	-2.36	Pass	
1833.43	45.68	9.52	-4.44	50.76	Debug	H	100	353	54	-3.24	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

T3 RE 3GHz -18GHz FCC B Final



Results Title:	Radiated E 3m 3GHz-18GHz
File Name:	c:\program files\emisoft - vasona\results\2016-0178 asset 1.0 2x60w 5mhz\RE T3 3-18 GHz.emi
Test Laboratory:	GPCL AR6-MH 23C, 31%RH, 990mB
Test Engineer:	GM
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	NOKIA
EUT Details:	2016-0178 PRI04688 NOKIA Asset 1.0 B25 RRH-4x30 AR1.0 1.9675MHz 2x60W 5 MHz operation. (LTE RF-Assets) 3JR53349ABAA S/N LBALLU-YD160603Q6H
Configuration:	GR-1089 Radiated Emissions 3-18 GHz Preview Scan performed @ 100KHz RBW and 300KHz VBW, Spectrum Analyzer E704, Preamp E123, ANT E1073, HPF E1116
Date:	2016-11-17 08:56:20

FORMAL DATA

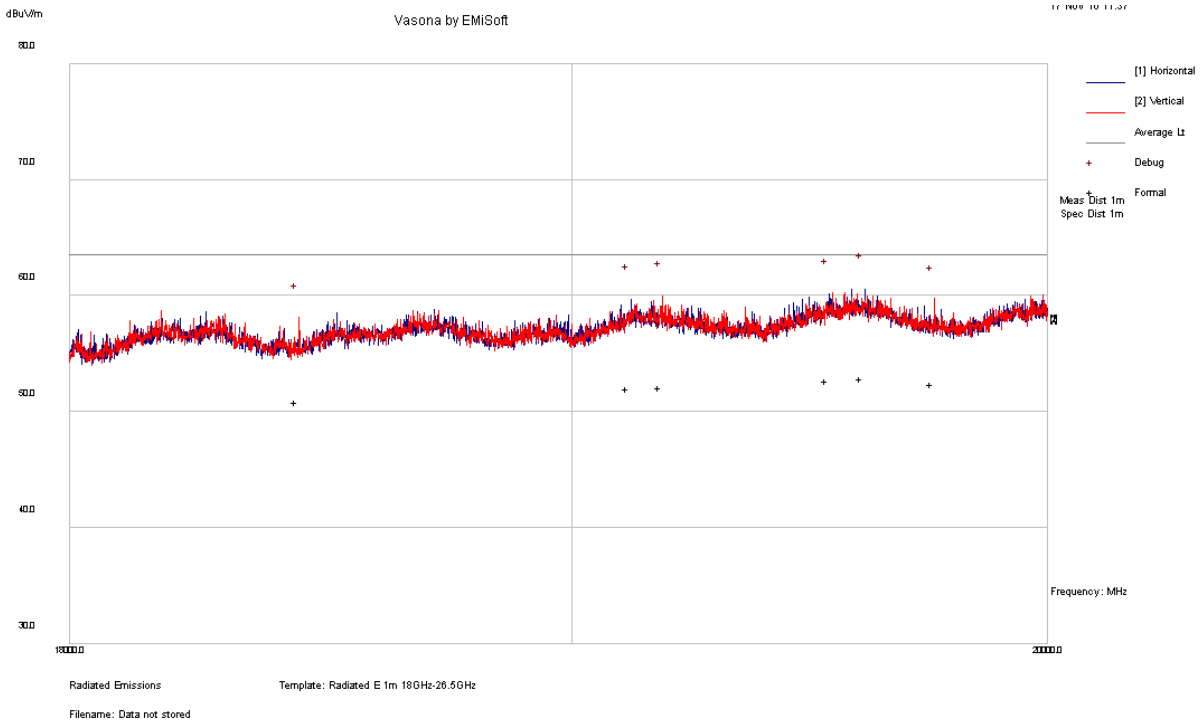
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
17773.4	29.78	8.92	9.28	47.98	AvgMax	V	252	350	54	-6.02	Pass	
5903.66	37.48	5.39	1.52	44.39	AvgMax	V	100	357	54	-9.61	Pass	
9830.49	34.94	6.3	2.43	43.67	AvgMax	V	114	357	54	-10.33	Pass	
6968.63	34.6	6.09	1.92	42.61	AvgMax	V	358	84	54	-11.39	Pass	
11674.6	29.49	7.62	5.2	42.31	AvgMax	V	156	339	54	-11.69	Pass	
3935.02	33.35	4.6	-0.19	37.76	AvgMax	H	126	152	54	-16.24	Pass	

PREVIEW DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
17773.4	29.02	8.92	9.28	47.21	Debug	V	100	308	54	-6.79	Pass	
5903.66	40.19	5.39	1.52	47.1	Debug	V	100	352	54	-6.9	Pass	
11674.6	30.43	7.62	5.2	43.25	Debug	V	99	353	54	-10.75	Pass	
9830.49	34.18	6.3	2.43	42.91	Debug	V	100	242	54	-11.09	Pass	
6968.63	33.38	6.09	1.92	41.39	Debug	V	390	176	54	-12.61	Pass	
3935.02	33.12	4.6	-0.19	37.53	Debug	H	99	353	54	-16.47	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

T4 RE 18 GHz – 20 GHz FCC B Final



Results Title:	Radiated E 1m 18GHz-20GHz
File Name:	c:\program files\emisoft - vasona\results\2016-0178 asset 1.0 2x60w 5mhz\RE T4 18-20 GHz.emi
Test Laboratory:	GPCL AR6-MH 23C, 32%RH, 998mB
Test Engineer:	GM
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	NOKIA
EUT Details:	2016-0178 PRI04688 NOKIA Asset 1.0 B25 RRH-4x30 AR1.0 1.9675MHz 2x60W 5 MHz operation. (LTE RF-Assets) 3JR53349ABAA S/N LBALLU-YD160603Q6H
Configuration:	GR-1089 Radiated Emissions 18-20 GHz Preview Scan performed @ 1000MHz RBW and 3000MHz VBW, Spectrum Analyzer E704, Preamp E123, ANT E513,
Date:	2016-11-17 11:38:58

FORMAL DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
19609.8	29.24	7.27	13.36	49.86	AvgMax	H	104	280	63.5	-13.64	Pass	
19535.2	29.08	7.25	13.35	49.68	AvgMax	H	188	271	63.5	-13.82	Pass	
19758.2	28.76	7.3	13.37	49.43	AvgMax	V	118	294	63.5	-14.07	Pass	
19187.2	28.92	7.16	13.01	49.09	AvgMax	V	100	318	63.5	-14.41	Pass	
19122	28.92	7.15	12.94	49.01	AvgMax	H	152	273	63.5	-14.49	Pass	
18450.9	28.59	6.96	12.29	47.84	AvgMax	V	108	14	63.5	-15.66	Pass	

PREVIEW DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
19609.8	39.94	7.27	13.36	60.56	Preview	H	100	44	63.5	-2.94	Pass	
19535.2	39.49	7.25	13.35	60.08	Debug	H	100	354	63.5	-3.42	Pass	
19187.2	39.71	7.16	13.01	59.88	Debug	V	100	354	63.5	-3.62	Pass	
19122	39.57	7.15	12.94	59.66	Debug	H	100	354	63.5	-3.84	Pass	
19758.2	38.89	7.3	13.37	59.57	Debug	V	100	354	63.5	-3.93	Pass	
18450.9	38.78	6.96	12.29	58.03	Debug	V	100	354	63.5	-5.47	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

4.6.2 List of Radiated Emissions Test Equipment

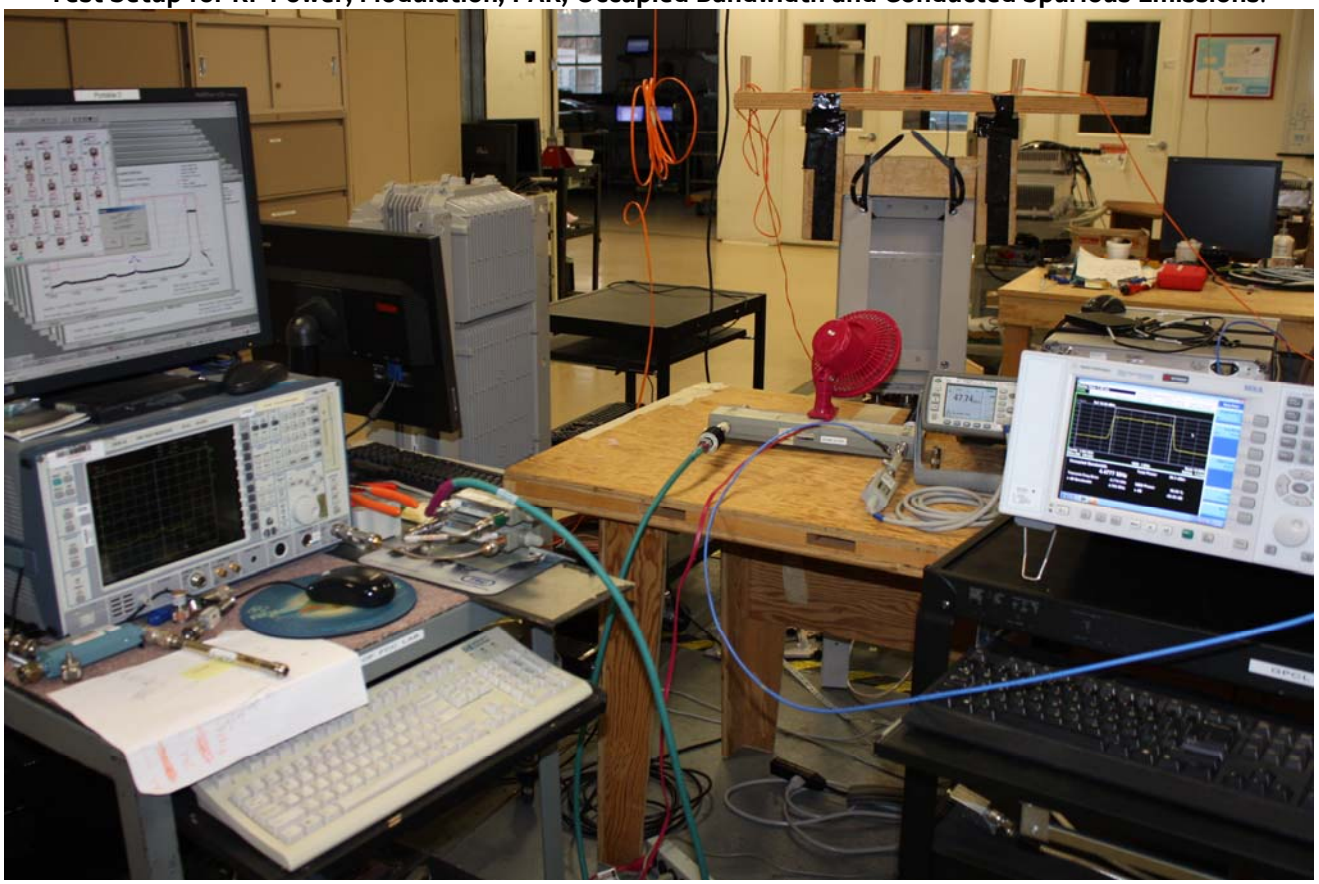
Asset ID	Manufacturer	Type	Details	Model	Serial	Calibration Date	Calibration Due	Calibration Type	Status
E602	A.H. Systems Inc.	Bilogical Antenna	25 - 2000 MHz	SAS-521-2	410	2014-10-22	2016-11-22	Required	Active
E1073	ETS Lindgren	Horn Antenna	Double-Ridged Waveguide Horn 1-18 GHz	3117	00135198	2014-12-10	2016-12-10	Required	Active
E1119	Extech	Data Logger	Pressure Humidity Temp data logger	SD700	Q668960	2016-08-15	2018-08-15	Required	Active
E123	Hewlett Packard	Pre-Amplifier	Preamplifier 1-26.5 GHz	8449B	3008A00426	2015-11-20	2017-11-20	Required	Active
E704	Rohde & Schwarz	Test Receiver	EMI (20Hz to 40 GHz	ESIB40	100121	2016-04-28	2018-04-28	Required	Active
E512	Sonoma Instrument Co.	Amplifier	9KHz-1GHz	310N	185826	2016-02-04	2018-02-04	Required	Active
E1116	Trilithic	High Pass Filter	PCS 2.85GHz - 18.05GHz	5HC2850 / 18050-1.8-KK	200113078			Verification Required	Active
E887	Weinschel	Attenuator	6 dB DC-18GHz 5 Watt	2-6	BX3430	2016-03-11	2018-03-11	Required	Active
E513	EMC Test Systems	Horn Antenna	Double Ridged Horn 18-40 GHz	3116	2539	2015-03-19	2017-03-19	Required	Active

4.7 PHOTOGRAPHS OF THE TEST SETUPS

Response:
The photographs of the test setups for the **B25 RRH 4x30W, FCC ID; FCC ID: AS5BBTRX-22** are attached below.

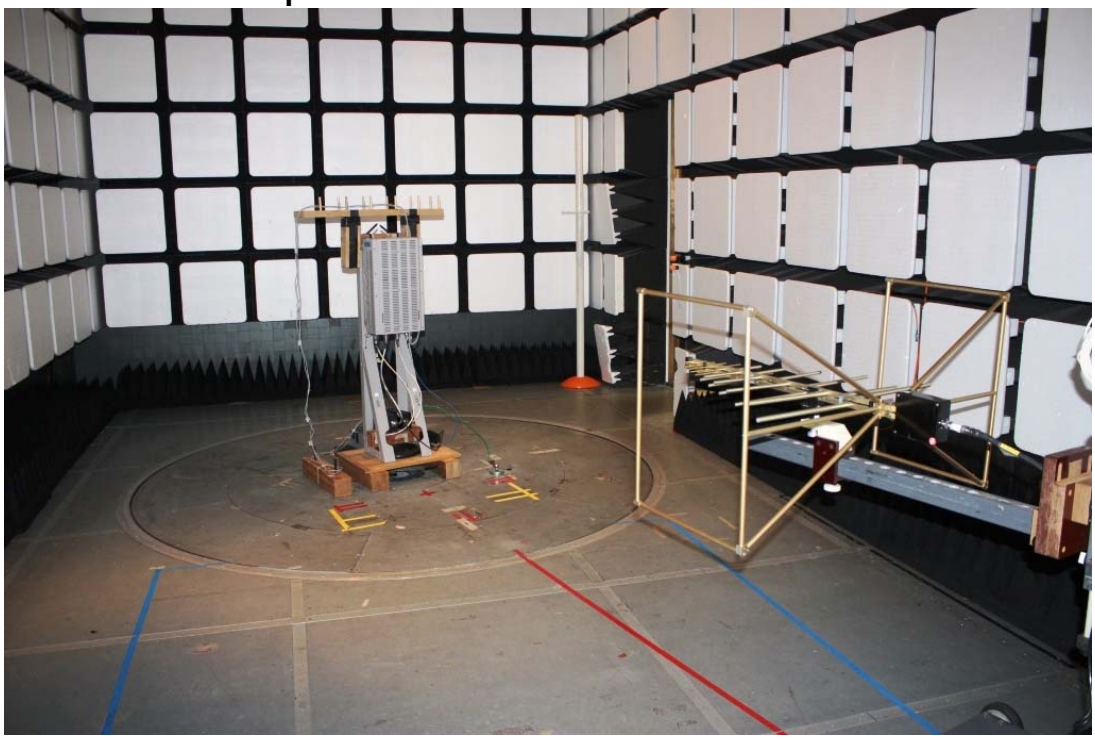
4.7.1 Transmitter Antenna Port Measurements

Test Setup for RF Power, Modulation, PAR, Occupied Bandwidth and Conducted Spurious Emissions.

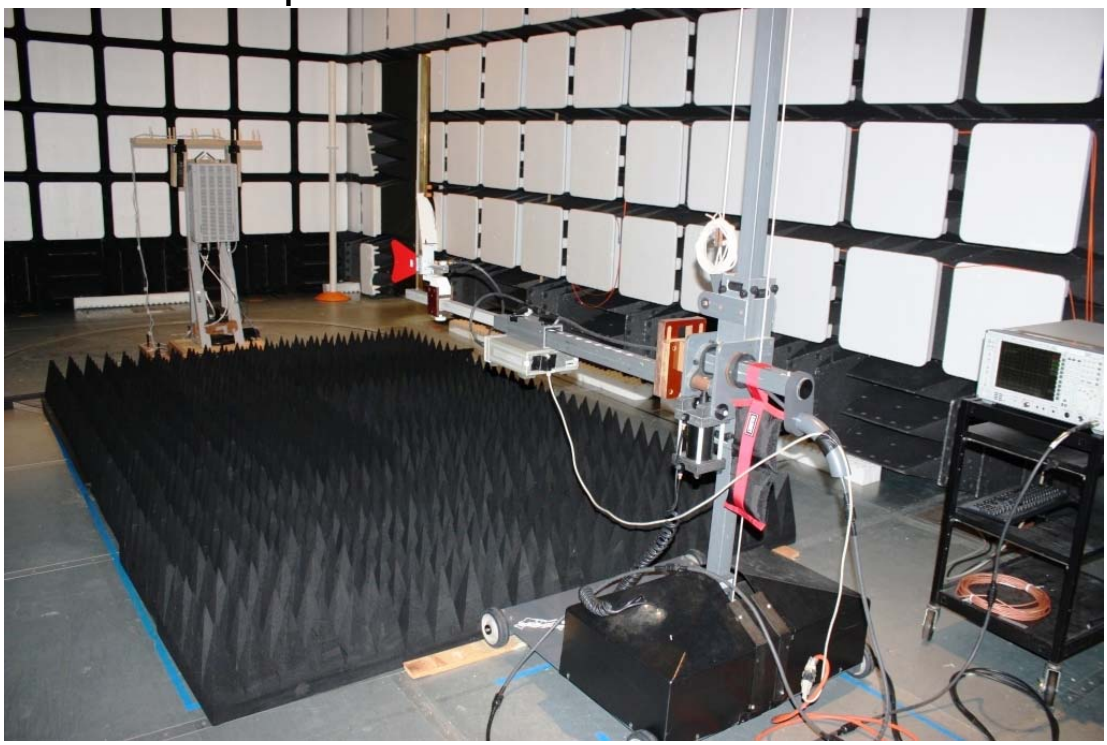


4.7.2 Radiated Test Setup

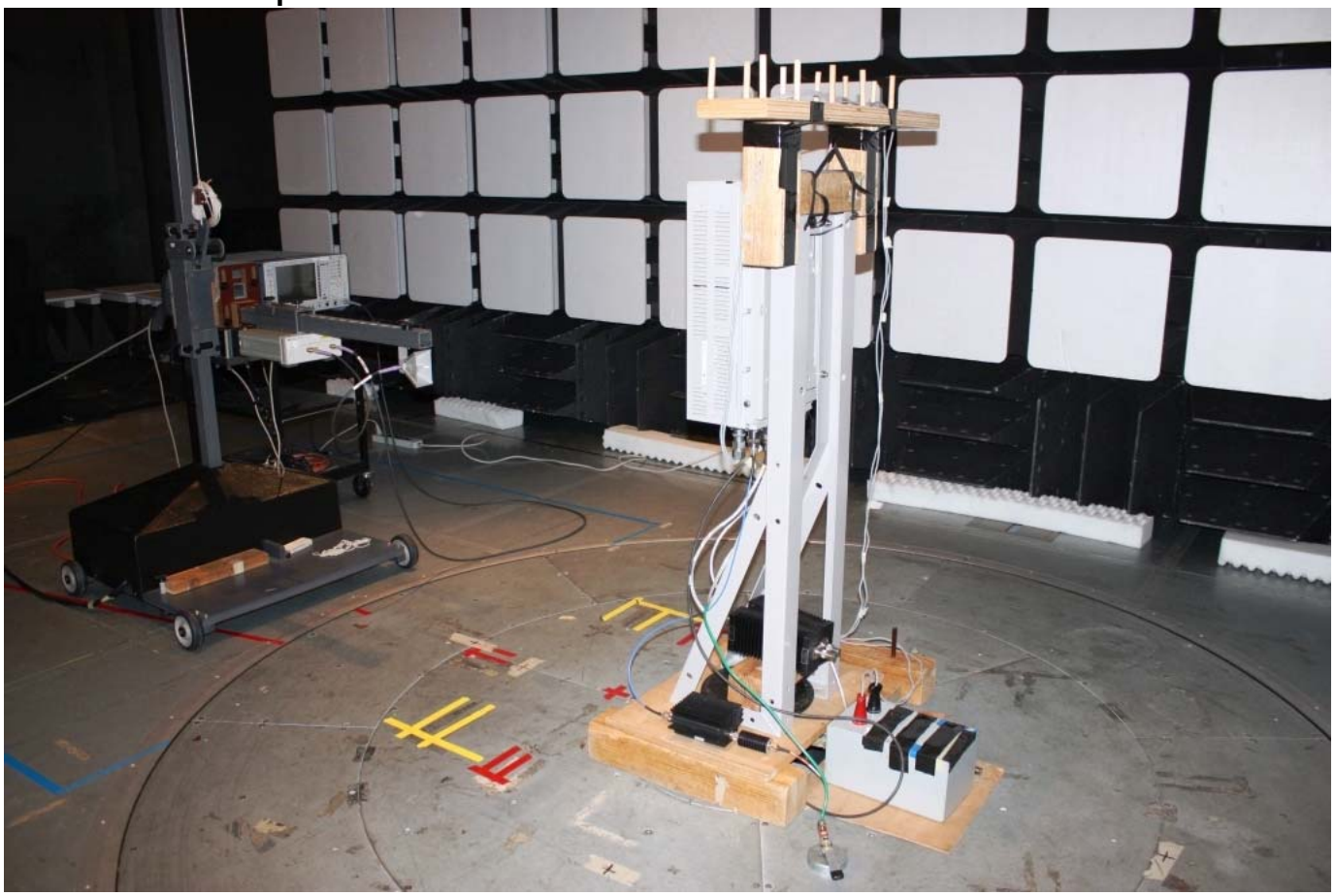
Radiated Test Setup 30 MHz – 1 GHz



Radiated Test Setup 1 GHz – 18 GHz



Radiated Test Setup 18 GHz- 20 GHz



4.8 FACILITIES AND ACCREDITATION

All measurement facilities at Alcatel-Lucent Global Product Compliance Laboratory (GPCL), A member of the Nokia family of companies, used to collect the measurement data in the test report are located at 600-700 Mountain Avenue, Murray Hill, New Jersey 07974-0636 USA.

The field strength measurements of radiated spurious emissions were made in a FCC registered three meter semi-anechoic chamber AR-6, (Site Registration Number: 909064) and IC (Filing Number: 6933F) which is maintained in Murray Hill, New Jersey. The sites were constructed and are continuously in conformance with the requirements of ANSI C63.4 and CISPR Publication 22.

Alcatel-Lucent Global Product Compliance Laboratory is accredited with the US Department of Commerce National Institute of Standards and Technology's National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 7 Code of Federal Regulations for offering test services for selected test methods in Electromagnetic Compatibility; Voluntary Control Council for Interference (VCCI), Japan; Australian Communications and Media Authority (ACMA). The laboratory is ISO 9001:2008 Certified.

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 100275-0

Nokia, Global Product Compliance Lab
Murray Hill, NJ

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2016-09-09 through 2017-09-30
Effective Dates

DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA *

For the National Voluntary Laboratory Accreditation Program