FCC Test Report

Alcatel-Lucent
PCS LTE RRH 4x30 Band 25
Outdoor Transceiver System
Multi Carrier Operation

FCC ID: AS5BBTRX-22

Exhibit 11 Listing of Required Measurements

11. Exhibit 11 FCC Filing Test Report

SECTION 2.1033(c)(14)

The data required by Section 2.1046 through 2.1057, inclusive, measured in accordance with the procedures set out in Section 2.1041.

Response: **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System FCC ID: AS5BBTRX-22**
The lowest clock frequency in the **Alcatel-Lucent's PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System / FCC ID: AS5BBTRX-22** is the 10 MHz reference oscillator. Conducted spurious measurements were performed over the range of 10 MHz to 20 GHz which is above the tenth harmonic of the transmit frequency range.

The following pages include the data required for the Product Certification authorization of the **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System / FCC ID: AS5BBTRX-22**, measured in accordance with the procedures set out in Section 2.1041 of the Rules.

11.1. Listing of Required Measurements

The data required by Section 2.1046 through 2.1057, inclusive, measured in accordance with the procedures set out in Section 2.1041.

Response: In **Alcatel-Lucent's PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System / FCC ID: AS5BBTRX-22**, the lowest clock frequency is the 10 MHz reference oscillator. Conducted spurious measurements were performed over the range of 10 MHz to 20 GHz which is above the tenth harmonic of the transmit frequency range.

The following pages document the data required for the Product Certification authorization of the Alcatel-Lucent's **Remote Radio Head 4x25-B25 Transceiver System / FCC ID: AS5BBTRX-22**, measured in accordance with the procedures set out in Section 2.1041 of the Rules. The Unit under Test, UUT Herein, was identified as serial number LBALLU=YD151700CBM.

Each required measurement and its corresponding exhibit number are:

FCC Filing Exhibit	FCC Regulation	Description
Exhibit 11.1	Section 2.1033(c)(14)	Listing of Required Measurements
Exhibit 11.2		Listing of Test Equipment
Exhibit 11.3	Section 2.1046	Measurement of Radio Frequency Power Output
Exhibit 11.4	Section 2.1047	Measurement of Modulation Characteristics
Exhibit 11.5	Section 2.1049	Measurement of Occupied Bandwidth
Exhibit 11.6	Section 2.1051	Measurement of Spurious Emissions at Antenna
Exhibit 11.7	Section 2.1053	Field Strength of Spurious Radiation
Exhibit 11.8	Section 2.1055	Measurement of Frequency Stability (Not Required)

11.2. Test Equipment

11.2.1. Antenna Port Measurements Test Equipment

The following Equipment used for RF Power, Modulation, Occupied bandwidth, and Conducted Spurious Antenna Port Measurements

Test Equipment List

Manufacturer	Model	Serial Number	Type	Description	GPCL ID	Last Cal	Interval	Status
Agilent Technologies	N1921A	US44510270	Power Sensor	-35 - +20 dBm 50 MHz -18 GHz	E914	6/15/2015	12	Active
Agilent Technologies	N1912A	GB44440226	Power Meter	P-Series Dual Channel	E915	6/17/2014	24	Active
Agilent Technologies	N1921A	MY45101984	Power Meter	P-Series	E950	2/19/2016	24	Active
Agilent Technologies	N1921A	MY45242502	Power Sensor	-35 - +20 dBm 50 MHz -18 GHz	E949	7/31/2015	12	Active
Rohde & Schwarz	ESIB40	100100	Test Receiver	EMI (20Hz to 40 GHz)-150 +30dBM	E908	6/22/2015	24	Active
Agilent Technologies	E4440A	MY45304655	Spectrum Analyzer	PSA Series	E935	9/16/2014	24	Active
Trilithic	10LC1790-3-AA	PCS-LPF-10	Low Pass Filter	PCS	E977	2/1/2016	12	Active
Trilithic	5HC2850/18050-1.8-KK	PCS-HPF-11	High Pass Filter	PCS	E1132	2/1/2016	12	Active

11.2.1.1. Antenna Port Measurements Test Coupler

The RF Test coupler used for antenna port conducted testing is maintained calibration verified as a unit. The individual components are listed below. It is identified as **Blue 150W-Mule-Lim** for Blue-150W- Multi Use Laboratory Equipment **(MULE)**-Low Intermod.

Manufacturer	Model	Serial Number	Type	Description	GPCL ID	Last Cal	Interval	Status
Rohde & Schwarz	ESI	DE25338	Test Receiver	EMI Test Receiver 20Hz-26.5GHz	E1190	6/19/2014	24	Active
Rohde & Schwarz	ESI	DE25338	Test Receiver	EMI Test Receiver 20Hz-26.5GHz	E1190	6/19/2014	24	Active
Extech	SD700	Q679360	Data Logger	Baro Pressure/ Humidity/ Temp /Datalogger	E1139	6/20/2014	24	Active
Agilent Technologies	N1912A	GB44440226	Power Meter	P-Series Dual Channel	E915	6/17/2014	24	Active
Agilent Technologies	N1921A	US44510270	Power Sensor	-35 - +20 dBm 50 MHz - 18 GHz	E914	6/15/2015	12	Active
Agilent Technologies	772D	MY29586115	Directional Coupler	Dual 2-18 GHz	E1003	2/08/2016	12	Active
Weinschel	6530-6-34-LIM	BN3217	Attenuator	6dB DC-18GHz 25 W	E1021	2/08/2016	12	Active
Weinschel	46-10-34-LIM	BN3118	Attenuator	10dB DC-18GHz 25 W	E1022	2/08/2016	12	Active
Weinschel	6528-30-34-LIM	BN4172	Attenuator	30 dB DC-18GHz 150 W	E1006	2/08/2016	12	Active
Hewlett Packard	8495B	MY41110681	Attenuator, Variable Step	Step DC-4GHz 0-100dB	E1045	2/08/2016	12	Active
Hewlett Packard	8494B	MY42140030	Attenuator, Variable Step	Step DC-18GHz 0-11dB	E1046	2/08/2016	12	Active
Weinschel	23-6-34	BC0689	Attenuator Incident Port	6dB, DC-18GHz, 10 W		2/08/2016	12	Active
Weinschel	7003	G3844	DC Block	N Type DC Block 9kHz- 18 GHz		2/08/2016	12	Active
Micro-Coax	UFB197C-1-0960-50U5GL	210525-009	Test Cable	Low Loss Precision N Test Cable		2/1/2016	12	Active
Micro-Coax	UFB197C-1-0240-50U5GL	210524-008	Test Cable	Low Loss Precision N Test Cable		2/1/2016	12	Active

11.2.2. Radiated Spurious Emissions Equipment

The following Equipment was used for Radiated Spurious Measurements in Anechoic Chamber AR-4, **FCC Registered Test Site Number 647637.**

Test Equipment List AR4/RE/2015-0184

Manufacturer	Model	Serial Number	Type	Description	GPCL ID	Last Cal	Interval	Status
Weinschel	2-6	BW2239	Attenuator	6 dB DC-18GHz 5 Watt	E890	6/9/2015	24	Active
ETS Lindgren	3117	00135194	Horn Antenna	Double-Ridged Waveguide Horn 1-18 GHz	E1074	11/25/2014	24	Active
A.H. Systems Inc.	SAS-521-2	457	Bilogical Antenna	25 - 2000 MHz	E766	12/29/2014	24	Active
EMC Test Systems	3116	2539	Horn Antenna	Double Ridged Horn 18-40 GHz	E513	3/19/2015	24	Active
Trilithic	5HC2850/18050-1.8-KK	PCS-HPF-5	High Pass Filter	PCS	E986		12	Active
Weinschel	2-6	BW2239	Attenuator	6 dB DC-18GHz 5 Watt	E890	6/9/2015	24	Active
Weinschel	2/6	CD2545	Attenuator	6dB	E1130	2/27/2015	24	Active
Sonoma Instrument Co.	310N	186750	Amplifier	9kHz-1GHz	E813	7/31/2014	24	Active
Agilent Technologies	E7405A	MY45110440	Spectrum Analyzer	EMC 100Hz - 26.5GHz	E736	6/17/2015	24	Active
Hewlett Packard	8449B	3008A01267	Pre-Amplifier	Preamplifier 1-26.5 GHz	E377	8/8/2014	24	Active
Rohde & Schwarz	ESIB40	100119	Test Receiver	EMI (20Hz to 40 GHz)-150 +30dBM	E936	6/2/2015	24	Active

11.3. Measurement of Radio Frequency Power Output

11.3.1. Section 2.1046 Measurements required: RF power output

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 +2/-4 dB) for all of the carriers at either its Tx1 / Tx2 transmit antenna terminals or by providing 30W (44.77 dBm +2/-4 dB) for all of the carriers at the Tx1, Tx2, Tx3 & Tx4 transmit antenna terminals.

For the demonstration of multicarrier operation the individual carriers were set to 30W each while operating the product in the 2xMIMO mode.

In order to adequately evaluate performance, the occupied bandwidth was measured with each of the sub-carrier modulation factors and co-plotted. 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 power for each carrier was set to the specified 30 W maximum at each measurement frequency to verify the spectral performance at that power level at each specific frequency of interest. Power was also verified for the QPSK and 64QAM modulation configurations. The 99%/-26dB signal bandwidth was measured with a resolution bandwidth of 300 kHz verified the signal is within the parameters of the emissions designator and is documented below.

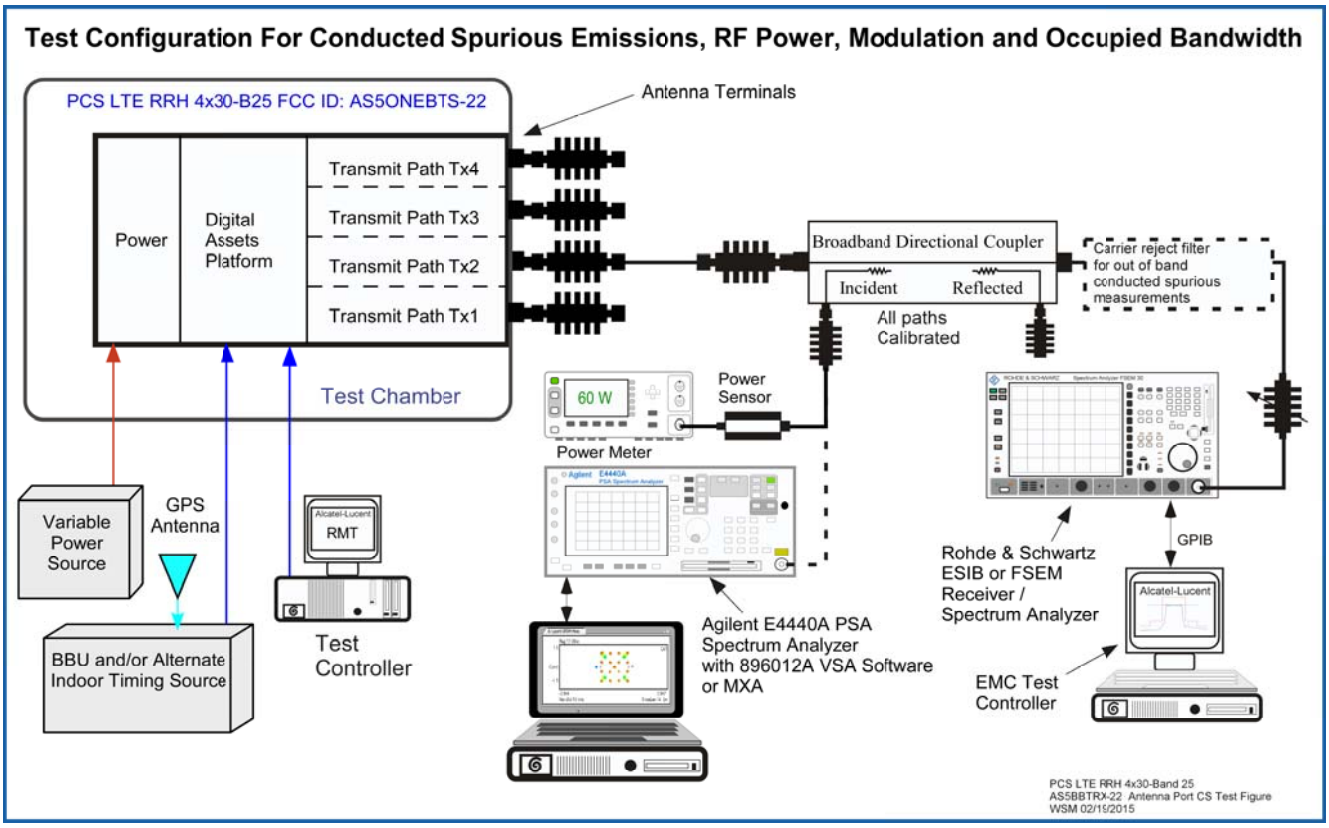
The test arrangements used to measure the radio frequency power output of the **Alcatel-Lucent's PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System / AS5BBTRX-22** is on the following page. Measurements were made respectively at each frequency where Occupied Bandwidth measurements were performed and compliance was documented.

11.3.2. Results RF power output

The **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System / AS5BBTRX-22**was configured in the test setup shown in Figure 11.3 below. For the Total Power from the Primary and Diversity antenna ports the **LTE RRH 4x30 Band 25** delivered a minimum of 120 Watts +2/-0 dB when measured at the antenna output connection. This data is recorded on the Occupied Bandwidth Data Sheets for each frequency Block and in the Table below.

Test #	AWS Block	Port	Transmit Power, 's, Watts	Signal Bandwidth, MHz	Modulation Q16=QPSK/16QAM 64=64QAM	Carrier Center Frequency, MHz	RF Power Pass / Fail
1	A + D	Tx1	30 + 30	5 + 5	Q16 + 64	1932.5 + 1947.5	Pass
2	B + E	Tx1	30 + 30	5 + 5	Q16 + 64	1952.5 +1967.5	Pass
3	C + G	Tx1	30 + 30	5 + 5	Q16 + 64	1977.5 +1992.5	Pass
4	A + F	Tx1	30 + 30	10 + 5	64 + Q16	1935 +1972.5	Pass
5	EF + G	Tx1	30 + 30	10 + 5	Q16 + 64	1970 + 1992.5	Pass
6	A + D	Tx1	30 + 30	10 + 5	Q16 + 64	1935 + 1947.5	Pass
7	A + D	Tx1	30 + 30	15 + 5	Q16 + 64	1937.5 + 1947.5	Pass
8	B + E	Tx1	30 + 30	15 + 5	Q16 + 64	1957.5 + 1967.5	Pass
9	FC + G	Tx1	30 + 30	15 + 5	64 + Q16	1977.5 + 1992.5	Pass
10	A + B	Tx1	30 + 30	10 + 10	Q16 + 64	1935 + 1960	Pass
11	B + EF	Tx1	30 + 30	10 + 10	Q16 + 64	1955 + 1970	Pass
12	C + G	Tx1	30 + 30	10 + 10	Q16 + 64	1980 + 1985	Pass

Figure 11.3 RF Power Test Configuration



11.4. Measurement of Modulation Characteristics

11.4.1. Section 2.1047 Measurement of Modulation Characteristics

The modulation characteristics and accuracy of the output signal of the **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System / FCC ID: AS5BBTRX-22** is a function its **Digital Analog and Power Amplifier** assembly.

11.4.2. Modulation Description

The LTE spectrum while appearing similar to CDMA differs greatly in complexity . The modulation used in evaluating the **PCS LTE RRH 4x30 Band 25 / AS5BBTRX-22** 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 with either QPSK, 16QAM or 64QAM coding. 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, 16QAM and 64QAM.

11.4.3. Modulation Measurement

The **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System** was configured in the test setup shown in Figure A. The antenna connection output was evaluated with an Agilent Transmitter Analyzer consisting of an Agilent E4440A PSA Spectrum Analyzer with 896012A VSA Software. Measurements were performed at the PCS Channels shown in table.
The 99%/-26 dB Occupied Signal Bandwidth was also measured at 30 kHz and 300 kHz and is documented below.

11.4.4. Measurement Results Summary

For each of the PCS channels tested, the **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System** modulated sub-carriers constellations were consistent for the modulation type. All of the modulation plots include the CCDF plot which indicates the Peak to Average Ratio (PAR) of the transmitted signal. For all measurements the PAR was between 8 and 11 dB which is compliant with the CFR which specifies that the PAR be less than 13 dB. The **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System** transmit signal modulation parameters and constellation for 5, 10 and 15 MHz PCS carriers shown in Figures 11.4B, 11.4C and 11.4D below.

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Table 11.4.4 Modulation Results

Test #	AWS Block	Port	Transmit Power, 's, Watts	Signal Bandwidth, MHz	Modulation Q16=QPSK/ 16QAM 64=64QAM	Carrier Center Frequency, MHz	Modulation Pass/ Fail	PAR Pass / Fail
1	A + D	Tx1	30 + 30	5 + 5	Q16 + 64	1932.5 + 1947.5	Pass	Pass
2	B + E	Tx1	30 + 30	5 + 5	Q16 + 64	1952.5 +1967.5	Pass	Pass
3	C + G	Tx1	30 + 30	5 + 5	Q16 + 64	1977.5 +1992.5	Pass	Pass
4	A + F	Tx1	30 + 30	10 + 5	64 + Q16	1935 +1972.5	Pass	Pass
5	EF + G	Tx1	30 + 30	10 + 5	Q16 + 64	1970 + 1992.5	Pass	Pass
6	A + D	Tx1	30 + 30	10 + 5	Q16 + 64	1935 + 1947.5	Pass	Pass
7	A + D	Tx1	30 + 30	15 + 5	Q16 + 64	1937.5 + 1947.5	Pass	Pass
8	B + E	Tx1	30 + 30	15 + 5	Q16 + 64	1957.5 + 1967.5	Pass	Pass
9	FC + G	Tx1	30 + 30	15 + 5	64 + Q16	1977.5 + 1992.5	Pass	Pass
10	A + B	Tx1	30 + 30	10 + 10	Q16 + 64	1935 + 1960	Pass	Pass
11	B + EF	Tx1	30 + 30	10 + 10	Q16 + 64	1955 + 1970	Pass	Pass
12	C + G	Tx1	30 + 30	10 + 10	Q16 + 64	1980 + 1985	Pass	Pass

Figure 11.4 A

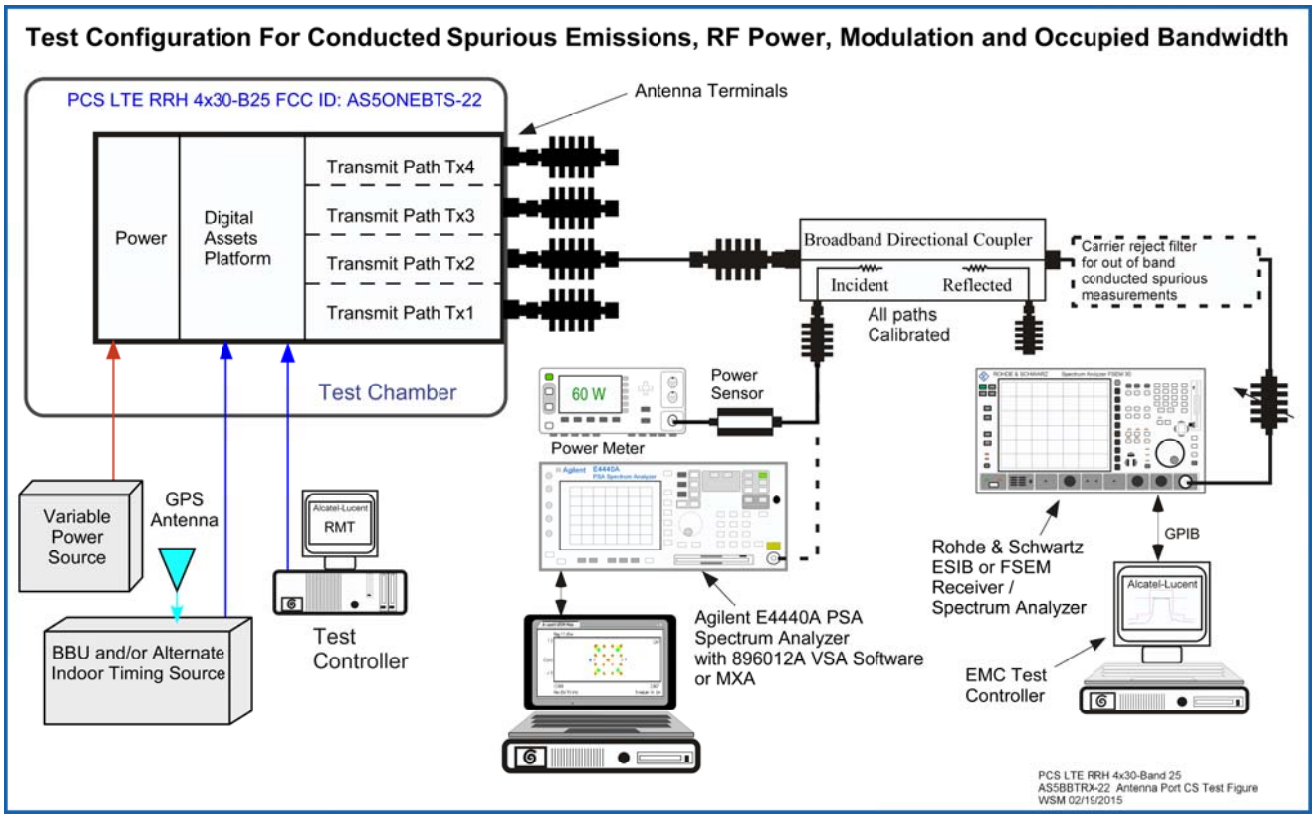


FIGURE 11.4B CODE DOMAIN A BLOCK, QPSK + 16 QAM

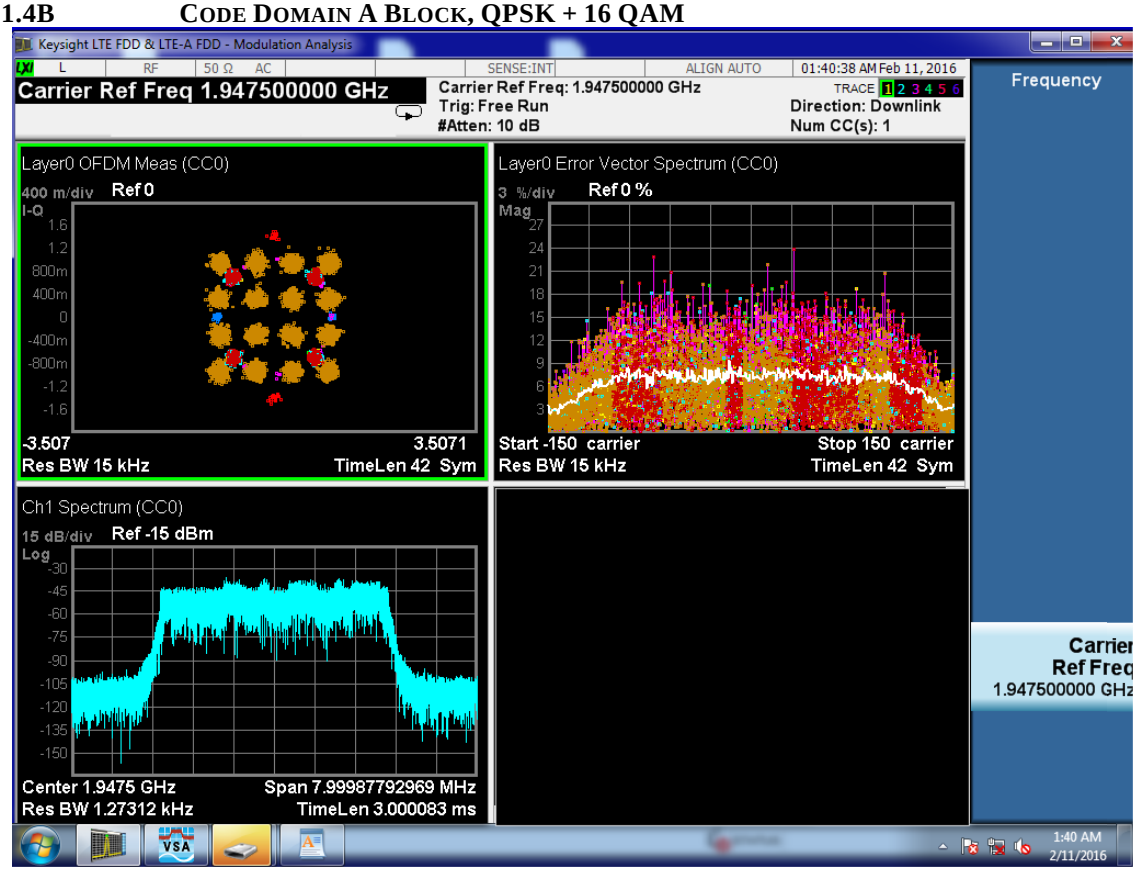


FIGURE 11.4C CODE DOMAIN, 64QAM

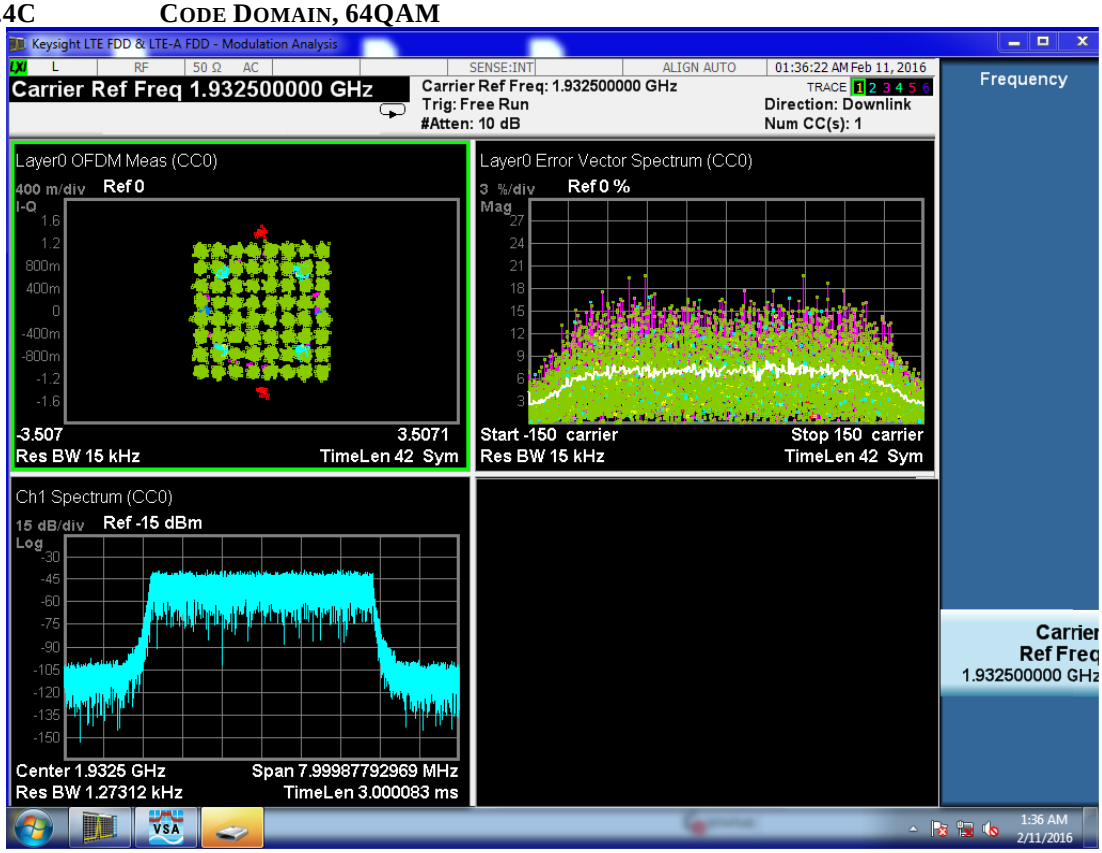
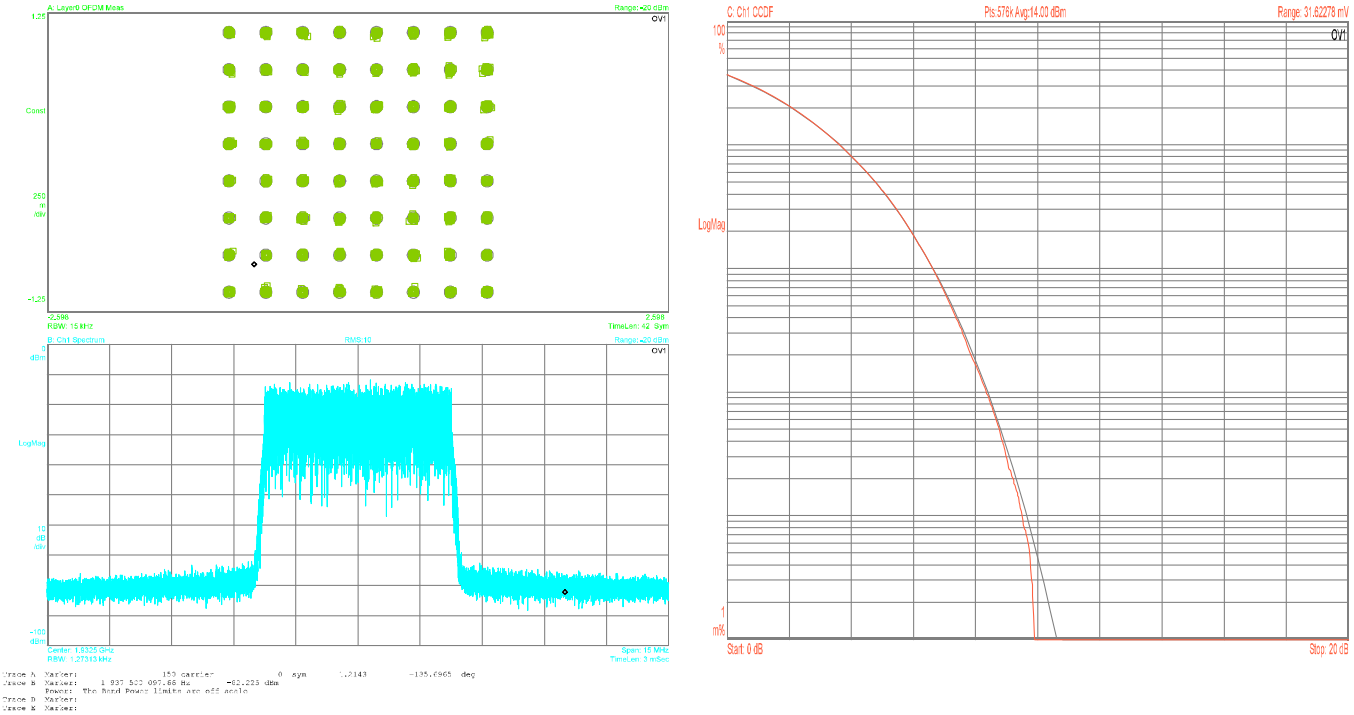
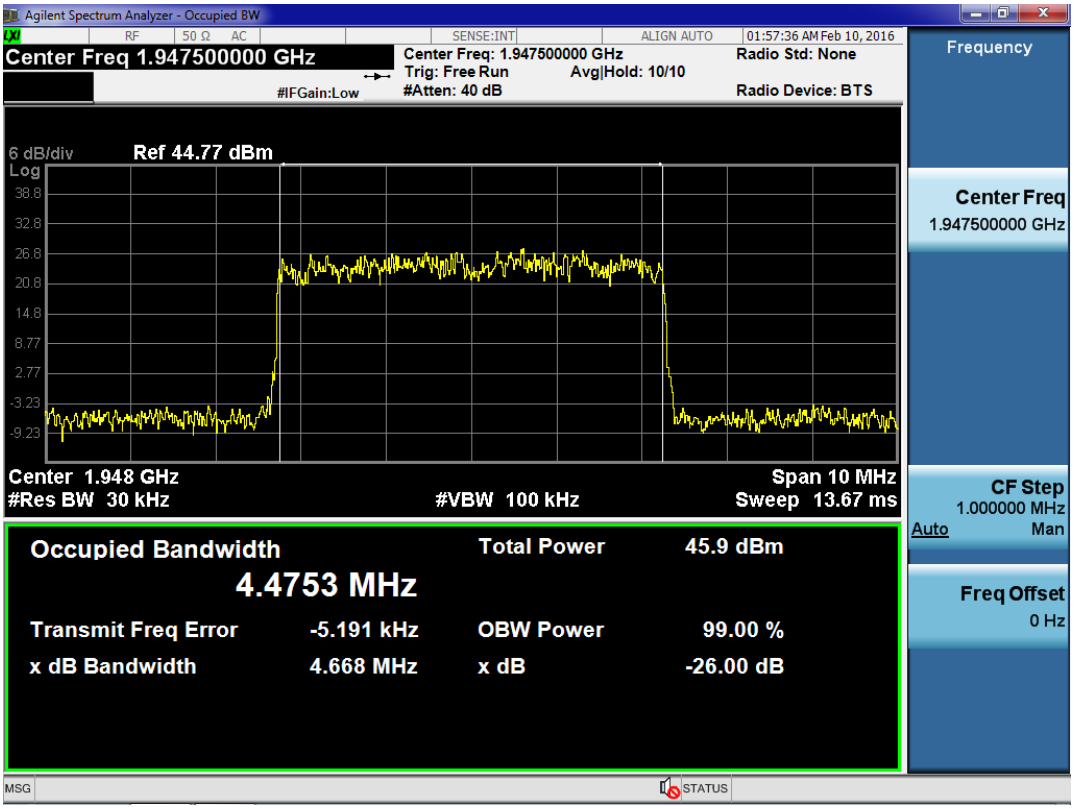


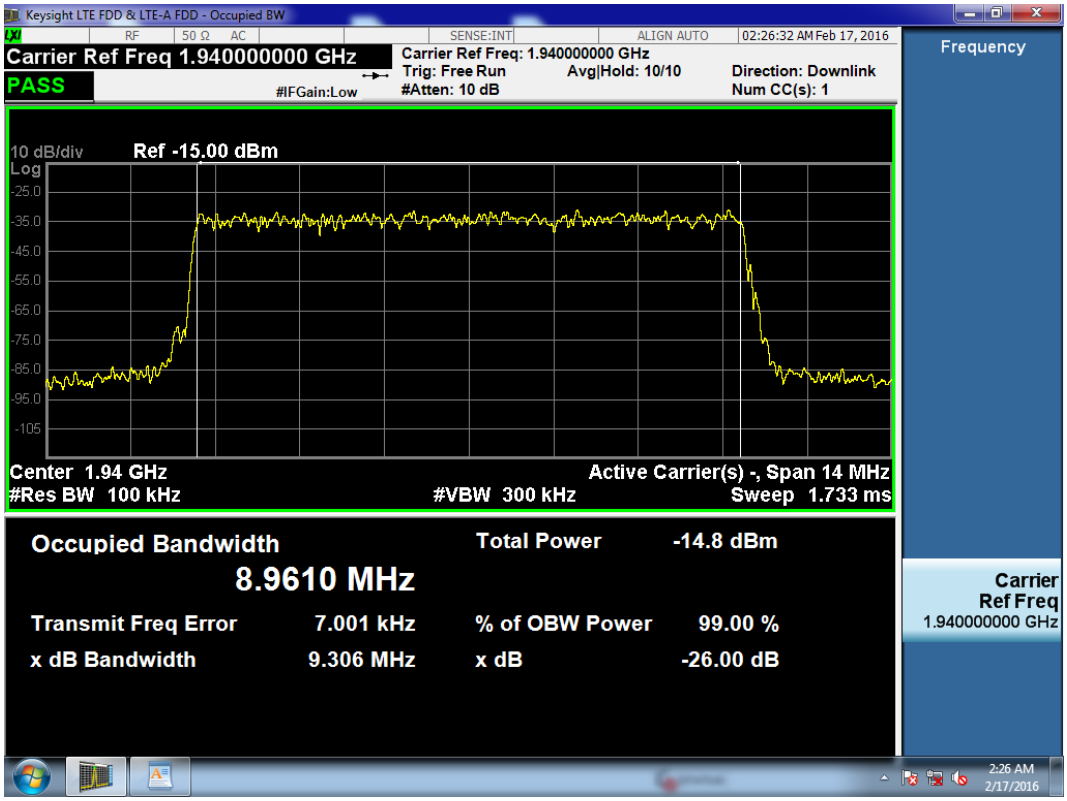
FIGURE 13D CODE DOMAIN A BLOCK, 64QAM 5 MHz 64QAM & PAR= 10dB



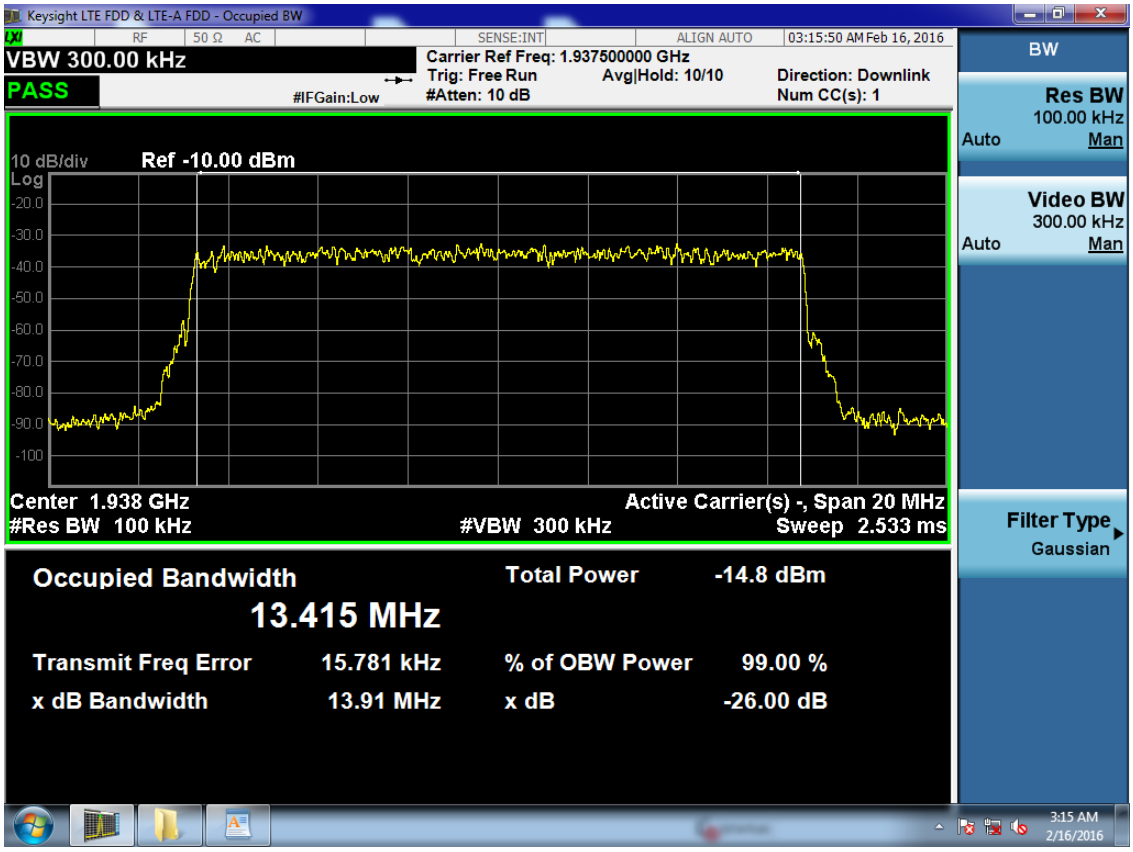
The 5M00F9W 99%/-26 dB Occupied Signal Bandwidth 5 MHz



The 10M0F9W 99%/-26 dB Occupied Signal Bandwidth



The 15M0F9W 99%/-26 dB Occupied Signal Bandwidth



11.5. Measurement of Occupied Bandwidth

11.5.1. Section 2.1049 Measurement Of Occupied Bandwidth

Occupied bandwidth measurements were performed for the test configurations identified in Table 11.5.1 to demonstrate Multicarrier operation across the PCS Bands full bandwidth for Blocks A through G Block. The measurements document compliant multicarrier operation of the **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System / AS5BBTRX-22** with a variety of carrier bandwidths.. This documents the typical performance of the **PCS LTE RRH 4x30 Band 25** while operating with dual mixed 5, 10 or 15 MHz LTE carriers. All power adjustments were performed prior to other measurements and for this test all carriers were set to 30W. The measurements are described below.

The occupied bandwidth of each of the signals identified in Table 11.5.1 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 RF power level was measured and adjusted via the test setup in Figure 11.5A. 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 11.5A. 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/100kHz) 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 30W / 44.77 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 11.5.2 which has limits for all of the measurements.

The transmitter output was configured to provide two 30W/ 44.77 dBm LTE carriers. In each occupied bandwidth measurement there are two traces which track each other a given distance apart in amplitude. One 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 or 100 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 30/100 kHz 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 11.5B which depicts a single 15 MHz carrier inside the A Block mask.

The test procedure above, calibrates the carrier power against the Mask and accurately places the measured occupied bandwidth carrier at the -23.01 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.

11.5.2. Block Organization and Tests Performed

The tests performed consists of the 12 test cases identified below in Table 11.5.1 which identifies 24 individual Occupied Bandwidth measurements which were configured with different modulations as tabulated below. The test configurations were selected to demonstrate the minimum margin performance at all of the block edges.

11.5.3. Signal Configuration

The modulation used in evaluating the **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System / AS5BBTRX-22** 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, 16QAM 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, 16QAM and 64QAM.

11.5.4. Measurements

In order to depict the tolerance lines that are required by Sec 24.238 of the FCC Rules and **3GPP TS 36.211 V9.1.0 (2010-03**, all measurements were made with the resolution bandwidth defined in Table 11.5.1 and the limits were adjusted as described above using equation (1).

The measurement was performed using an automated data collection system which eliminates variability and operator error. The measurements meet the requirements of ANSI C63.26. The test profile deliberately and consistently measures the occupied bandwidth using the required resolution bandwidth and 100x average of the detected signal. The entire 75 MHz span of measurement (65 MHz +/- 5 MHz outside the band) was broken up into as many as 20 individual 3.75 MHz span of measurement. Each of the individual spans provide 2x the number of points as required by ANSI C63.26 are less than 128 times the resolution bandwidth to eliminate aliasing. The use of smaller spans and longer sweep times are the best settings to acquire all spurious signal with the equipment used. This is based on our experience with 47 CFR 24.238 and ANSI C63.26 and KDB guidance.

All of the tolerance lines for the output are referenced to the top of the Occupied Bandwidth mask, which is defined as 44.77 dBm/ zero dBc. For all measurements of the **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System / AS5BBTRX-22** Occupied Bandwidth, the output power was measured / adjusted individually to the 30 W level for each carrier and this is the 44.77 dBm value at the 0 dBc reference line.

Table 11.5.1 Tests Configurations for Occupied Bandwidth

Test #	AWS Block	Port	Transmit Power, 's, Watts	Signal Bandwidth, MHz	Modulation Q16=QPSK/ 16QAM 64=64QAM	Carrier Center Frequency, MHz
1	A + D	Tx1	30 + 30	5 + 5	Q16 + 64	1932.5 + 1947.5
2	B + E	Tx1	30 + 30	5 + 5	Q16 + 64	1952.5 +1967.5
3	C + G	Tx1	30 + 30	5 + 5	Q16 + 64	1977.5 +1992.5
4	A + F	Tx1	30 + 30	10 + 5	64 + Q16	1935 +1972.5
5	EF + G	Tx1	30 + 30	10 + 5	Q16 + 64	1970 + 1992.5
6	A + D	Tx1	30 + 30	10 + 5	Q16 + 64	1935 + 1947.5
7	A + D	Tx1	30 + 30	15 + 5	Q16 + 64	1937.5 + 1947.5
8	B + E	Tx1	30 + 30	15 + 5	Q16 + 64	1957.5 + 1967.5
9	FC + G	Tx1	30 + 30	15 + 5	64 + Q16	1977.5 + 1992.5
10	A + B	Tx1	30 + 30	10 + 10	Q16 + 64	1935 + 1960
11	B + EF	Tx1	30 + 30	10 + 10	Q16 + 64	1955 + 1970
12	C + G	Tx1	30 + 30	10 + 10	Q16 + 64	1980 + 1985

Table 11.5.2 Mask values for OBW and Conducted Spurious measurements at various bandwidths

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
30	44.77	15	0.1	3	-6.99	37.78	-21.76	23.01	2	3.01	-17.77	-62.54	-26.01	-70.78
30	44.77	10	0.1	3	-5.23	39.54	-20.00	24.77	2	3.01	-16.01	-60.78	-26.01	-70.78
30	44.77	5	0.03	3	-2.22	42.55	-22.22	22.55	2	3.01	-18.23	-63.00	-31.24	-76.01

11.5.5. Results

Measurements were performed in both the Primary Tx1 and Diversity Tx2 Transmit ports. In each case the transmitter output was configured with two carriers. The Occupied Bandwidth measurements was performed for the specific PCS Blocks identified in Table 11.5.5 and plotted individually and on a chart showing combined operation inside the entire PCS Band. The configurations were specifically selected to depict Left Edge and the Right Edge of each PCS Block. Measurements were performed for a combined QPSK+16QAM and for 64QAM operation. Modulation parameters were measured and recorded prior to OBW measurement. Edge of block margin plots are documented for each configuration. The PCS Block designation, Carrier center frequencies and RF Power and modulations are tabulated on each Occupied Bandwidth plot. The signals are plotted for each frequency/ channel of interest. These frequencies were chosen to show the occupied bandwidth for the closest block edge channels for which this product can be operated specifically to document compliance with Section 24.229 and 24.238 (c) of the Commission code. The signal used to show the occupied bandwidth is the signal recommended in **3GPP TS 36.211 V9.1.0 (2010-03)**. The power output level was adjusted to provide the documented value on each chart.

RESULTS: The following exhibits illustrate the spectrums investigated and document compliance.

W. Steve Majkowski NCE

Table 11.5.5 Tests Results for Multi Carrier Occupied Bandwidth

Test #	AWS Block	Port	Transmit Power, 's, Watts	Signal Bandwidth, MHz	Modulation Q16=QPSK/ 16QAM 64=64QAM	Carrier Center Frequency, MHz	Occupied Bandwidth Pass/ Fail
1	A + D	Tx1	30 + 30	5 + 5	Q16 + 64	1932.5 + 1947.5	Pass
2	B + E	Tx1	30 + 30	5 + 5	Q16 + 64	1952.5 +1967.5	Pass
3	C + G	Tx1	30 + 30	5 + 5	Q16 + 64	1977.5 +1992.5	Pass
4	A + F	Tx1	30 + 30	10 + 5	64 + Q16	1935 +1972.5	Pass
5	EF + G	Tx1	30 + 30	10 + 5	Q16 + 64	1970 + 1992.5	Pass
6	A + D	Tx1	30 + 30	10 + 5	Q16 + 64	1935 + 1947.5	Pass
7	A + D	Tx1	30 + 30	15 + 5	Q16 + 64	1937.5 + 1947.5	Pass
8	B + E	Tx1	30 + 30	15 + 5	Q16 + 64	1957.5 + 1967.5	Pass
9	FC + G	Tx1	30 + 30	15 + 5	64 + Q16	1977.5 + 1992.5	Pass
10	A + B	Tx1	30 + 30	10 + 10	Q16 + 64	1935 + 1960	Pass
11	B + EF	Tx1	30 + 30	10 + 10	Q16 + 64	1955 + 1970	Pass
12	C + G	Tx1	30 + 30	10 + 10	Q16 + 64	1980 + 1985	Pass

Figure 11.5A Test Setup for Antenna Port Measurements of Occupied Bandwidth

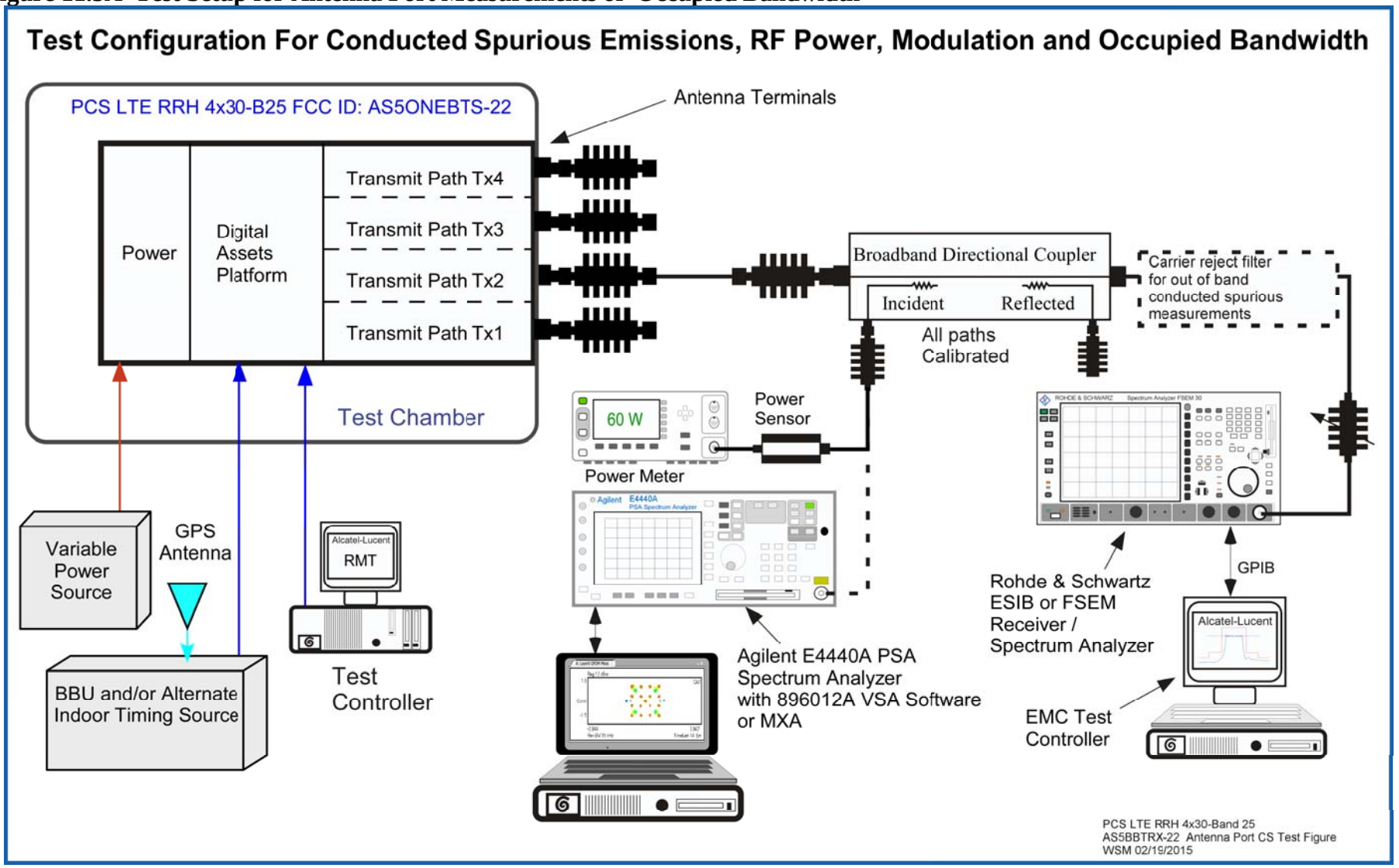


Figure 11.5B Typical Occupied Bandwidth Mask, PCS Block A with 15 MHz Emissions Designator Depicted

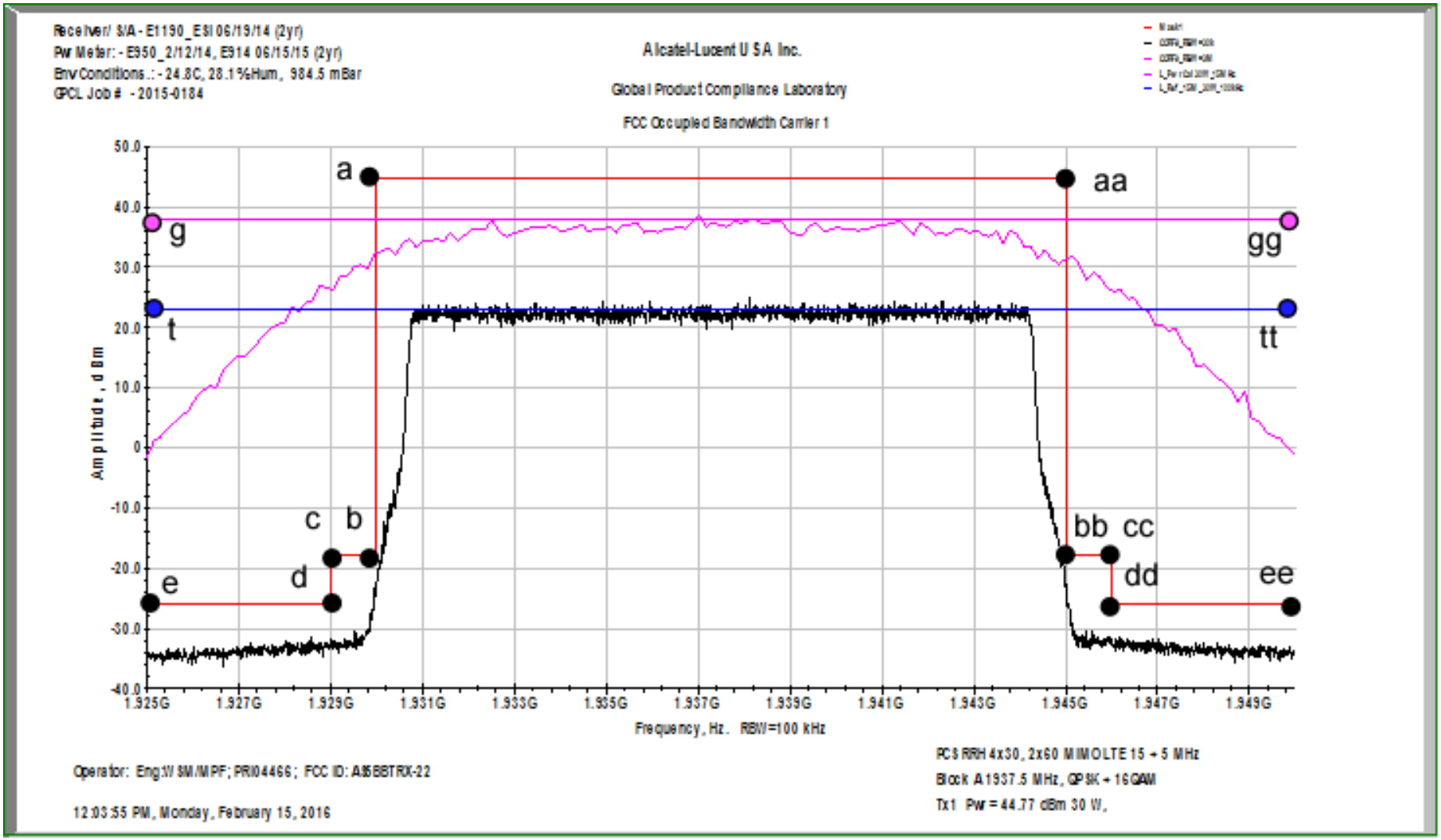
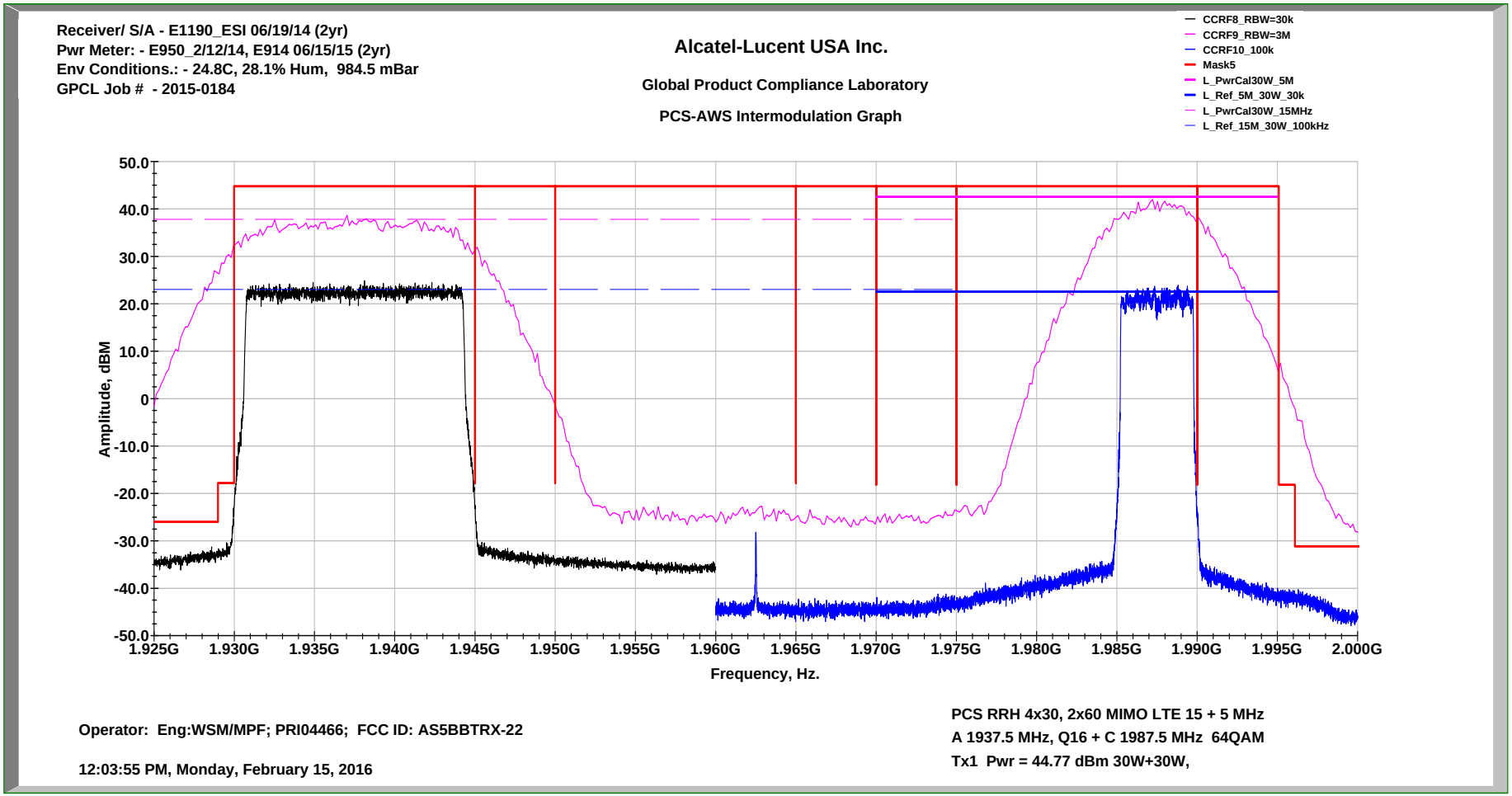
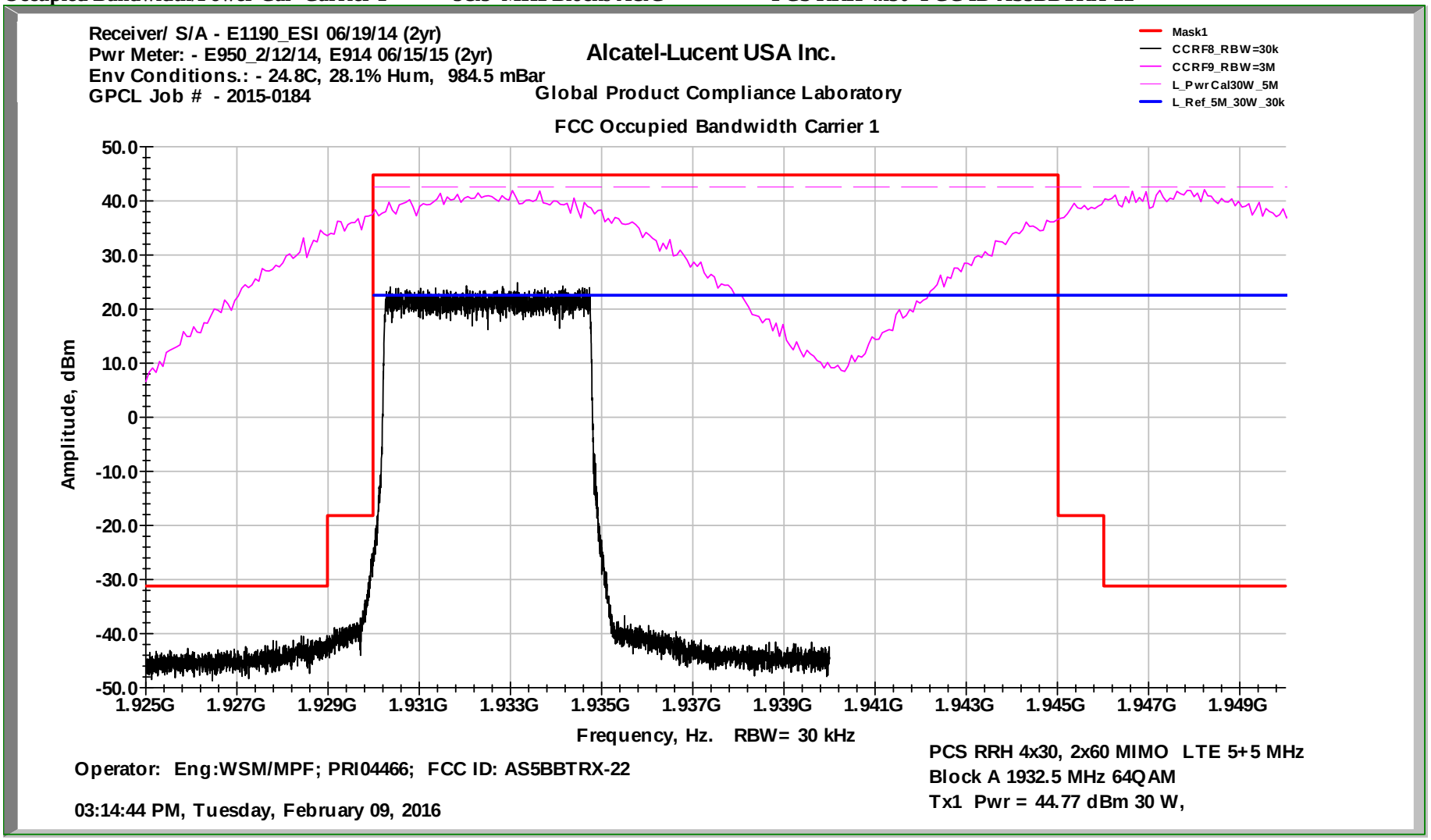


Figure 14 C Occupied Bandwidth Whole Band View Showing Dual Carriers in Different Blocks.

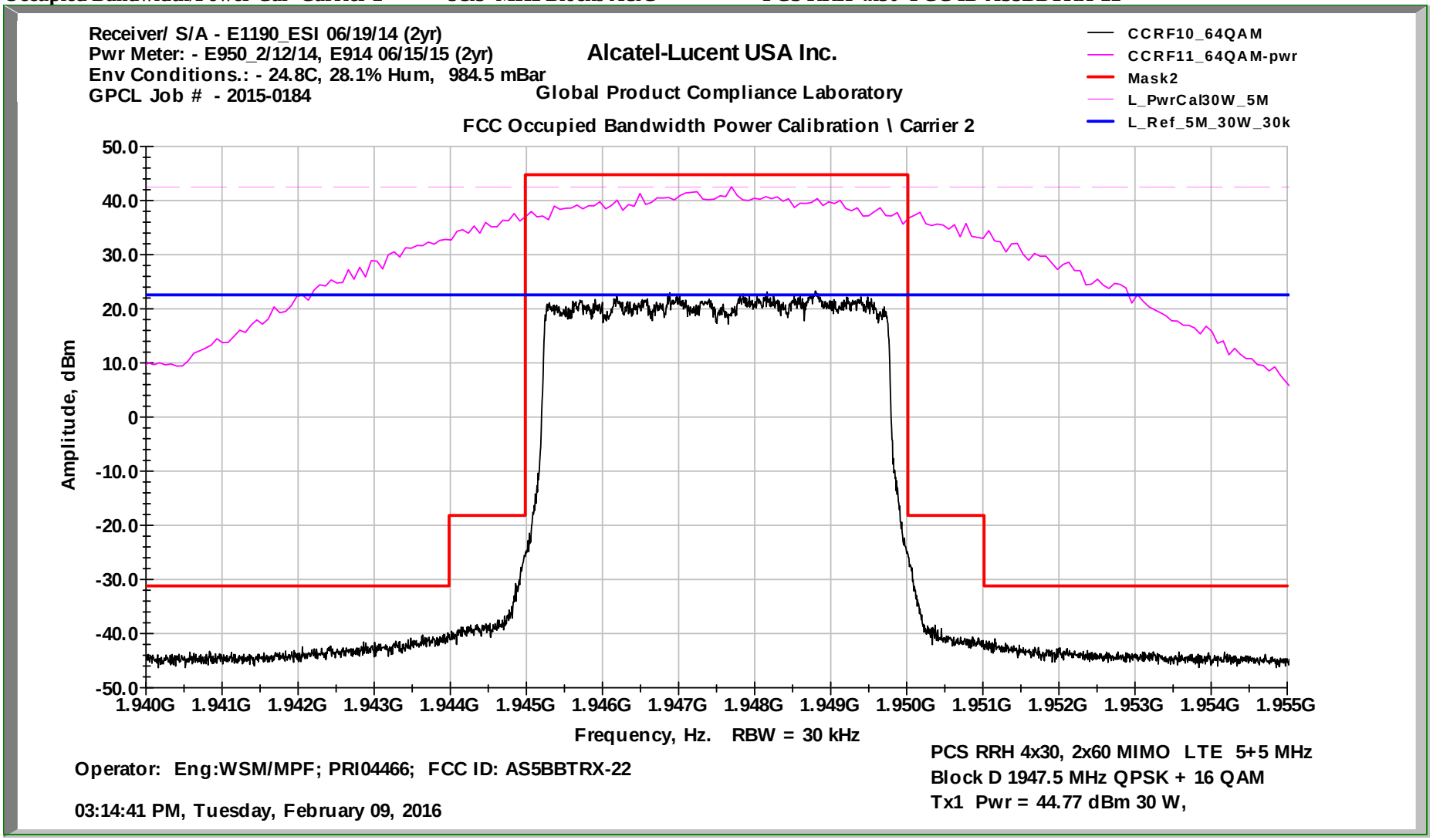


Transmitter Measurements
of
Occupied Bandwidth
for
Alcatel-Lucent USA Inc.
PCS LTE RRH 4x30 Band 25
Outdoor Transceiver System
FCC ID: AS5BBTRX-22

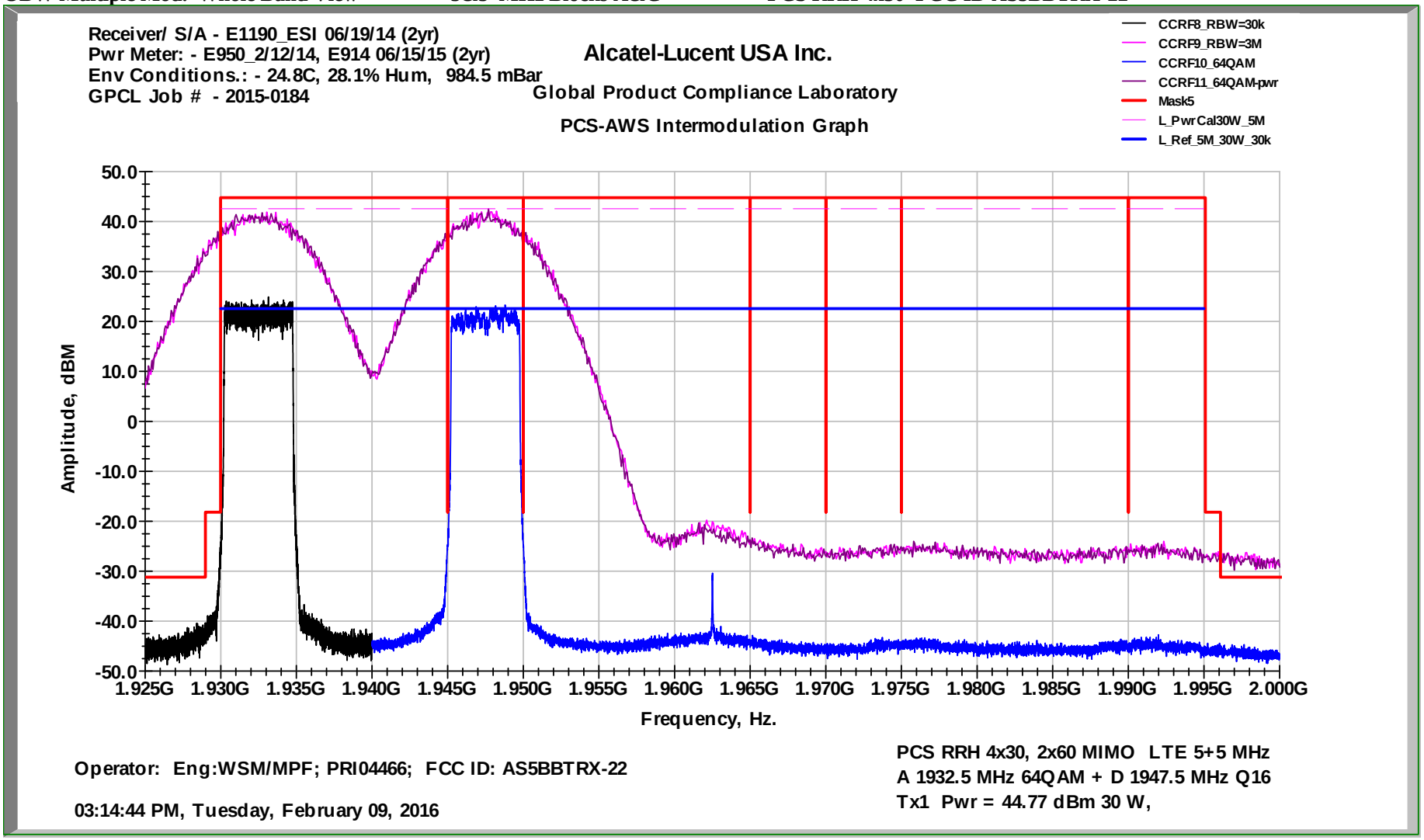
Dual Carrier #1
Occupied Bandwidth/Power Cal -Carrier 1 5&5 MHz Blocks A&C PCS RRH 4x30 FCC ID AS5BBTRX-22



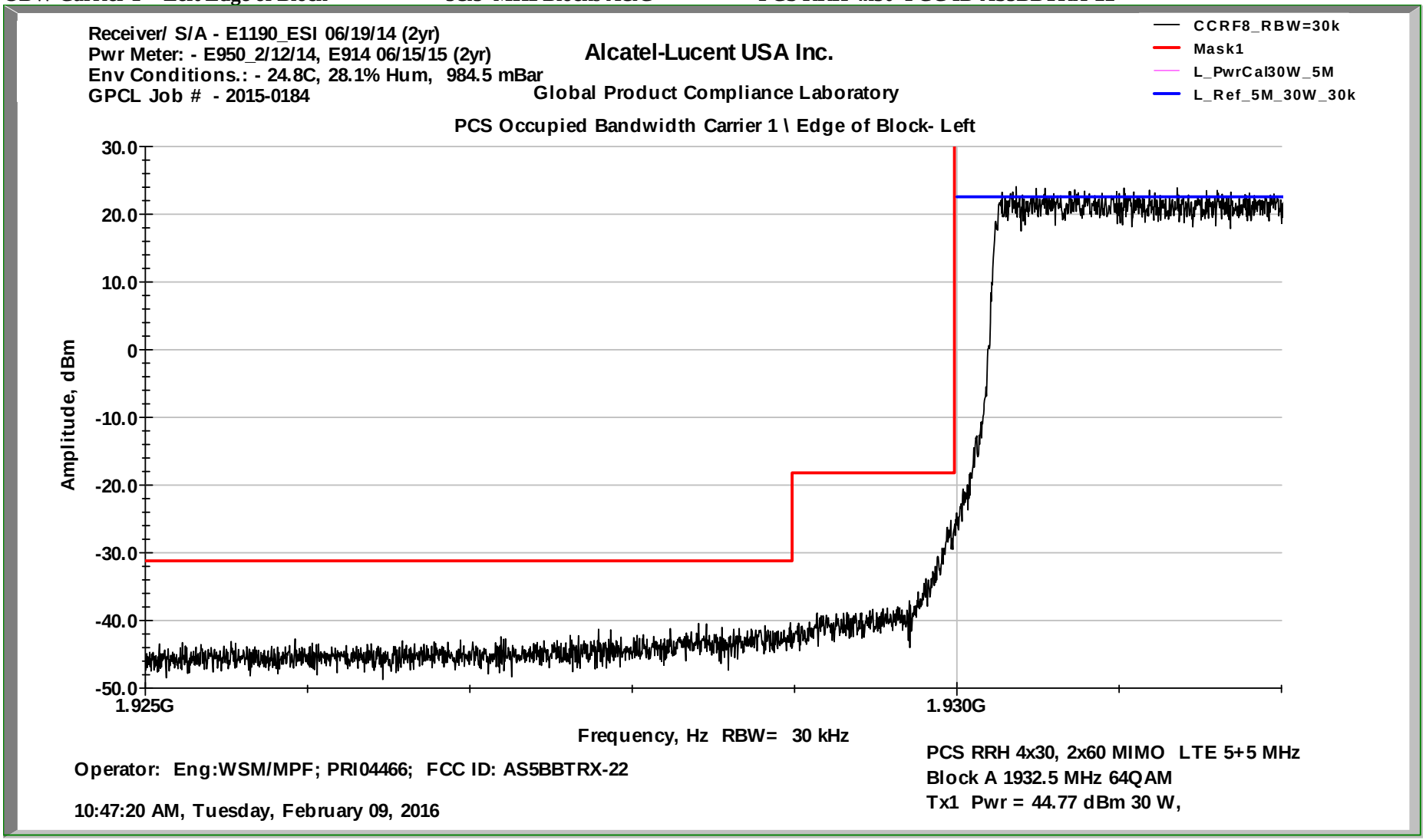
Occupied Bandwidth/Power Cal -Carrier 2 5&5 MHz Blocks A&C PCS RRH 4x30 FCC ID AS5BBTRX-22



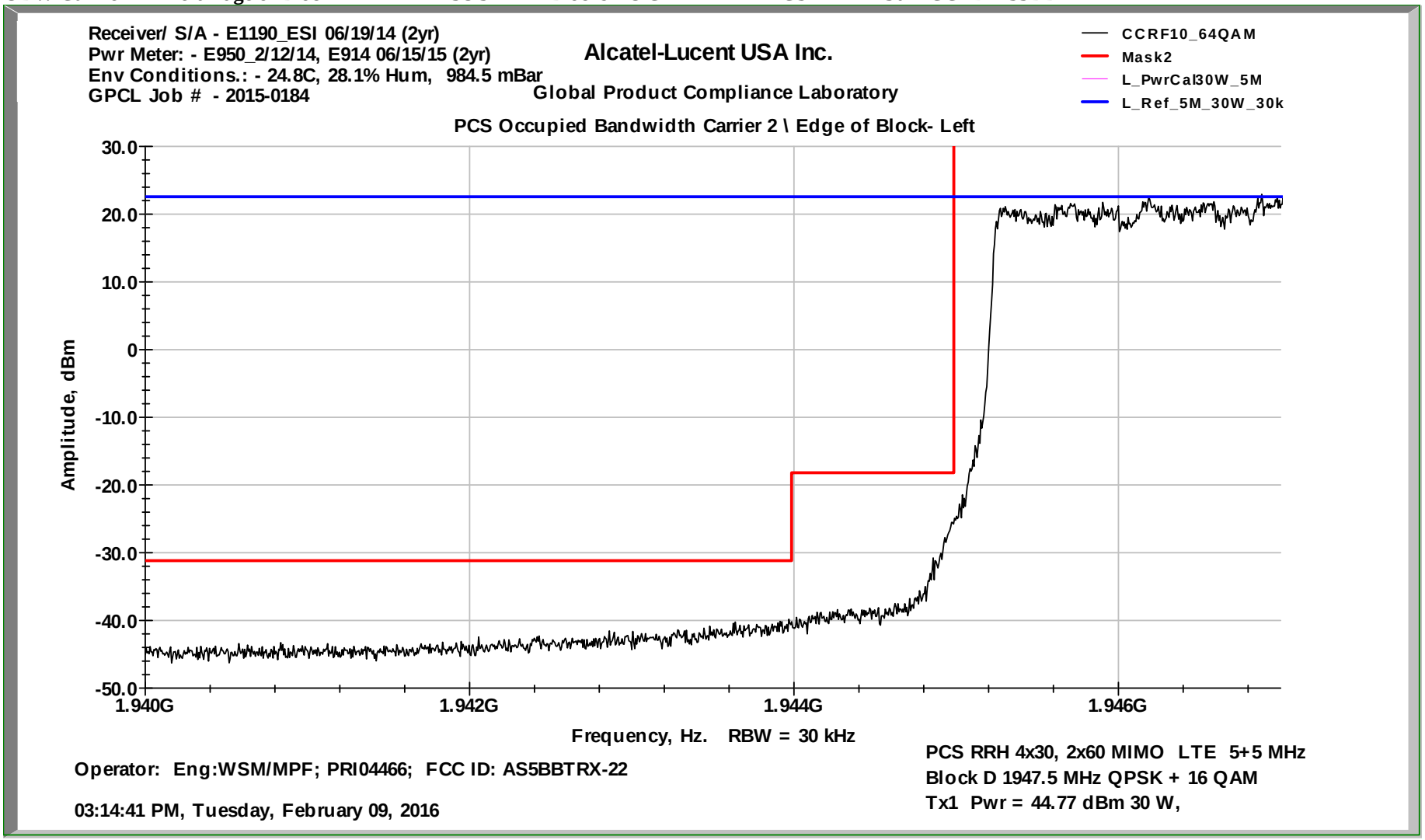
OBW Multiple Mod. Whole Band View 5&5 MHz Blocks A&C PCS RRH 4x30 FCC ID AS5BBTRX-22



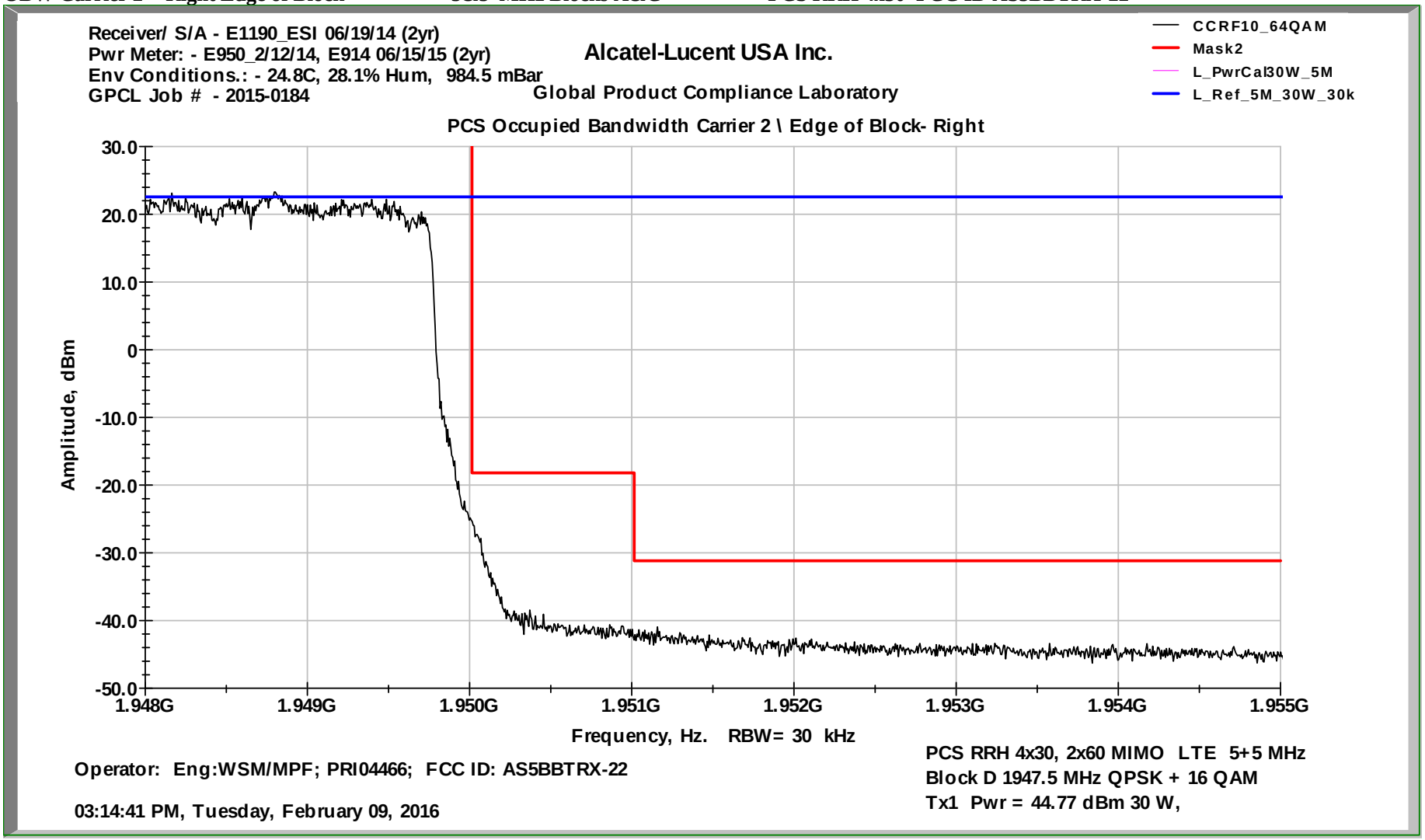
OBW Carrier 1 - Left Edge of Block **5&5 MHz Blocks A&C** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



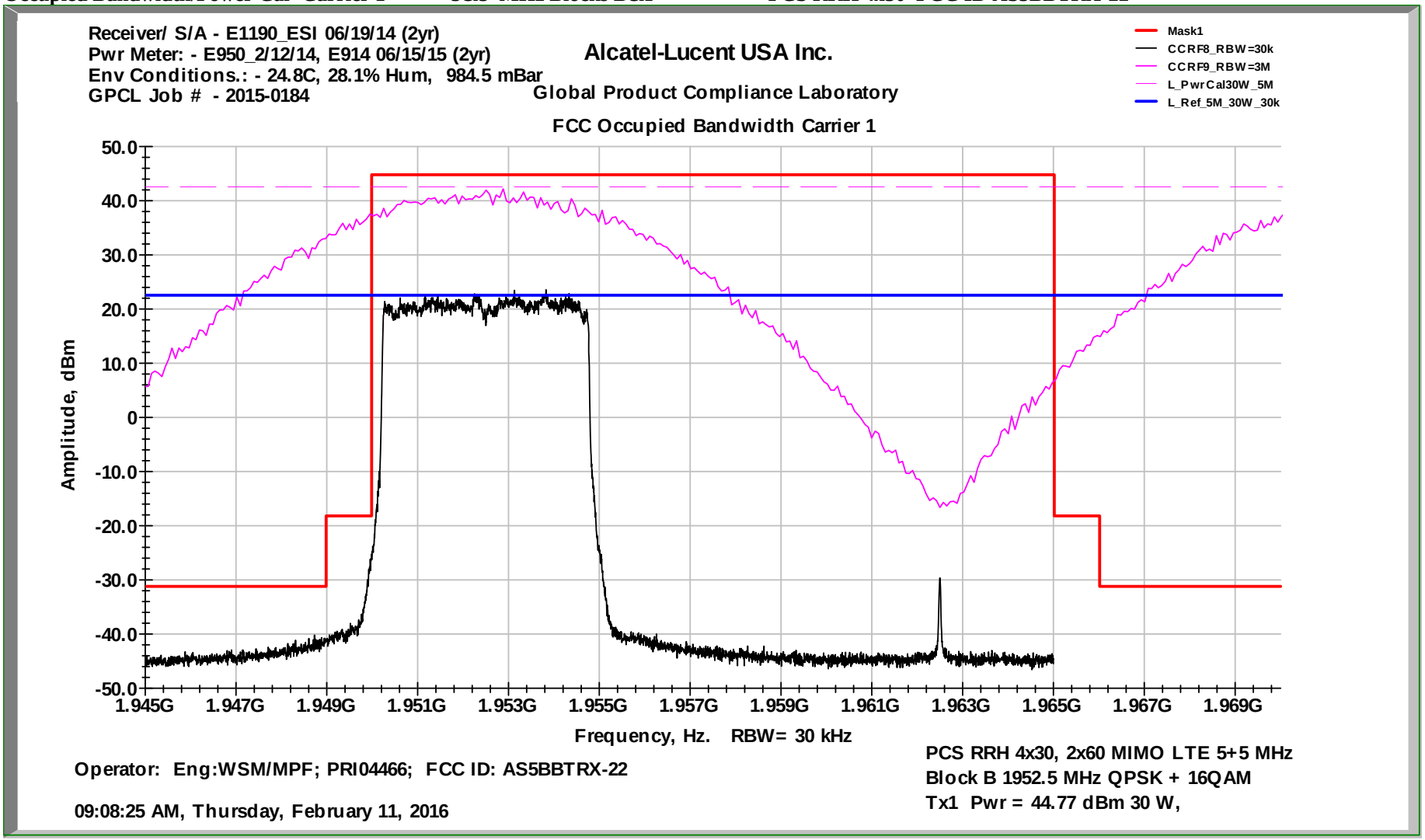
OBW Carrier 2 - Left Edge of Block **5&5 MHz Blocks A&C** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



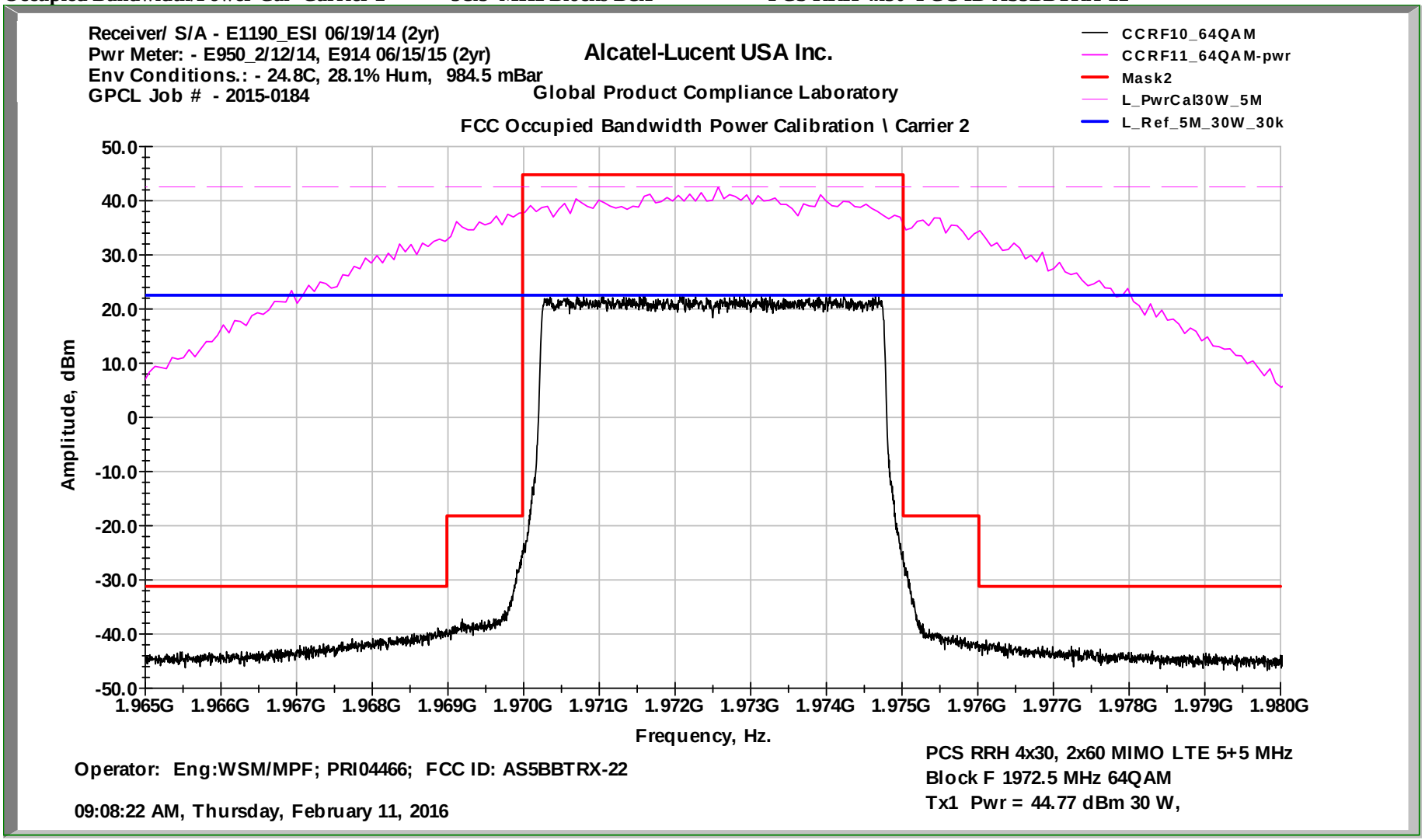
OBW Carrier 2 - Right Edge of Block **5&5 MHz Blocks A&C** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



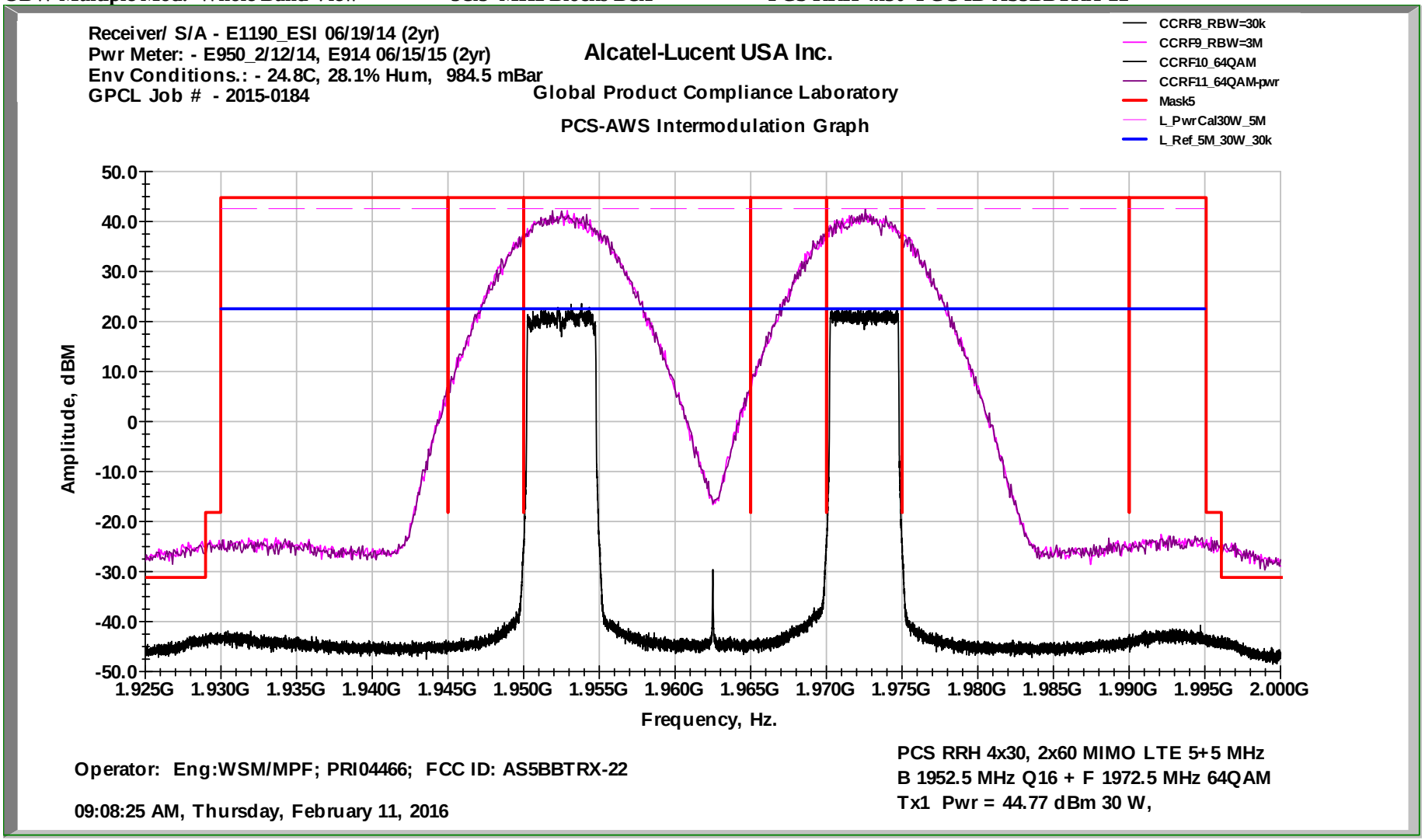
Dual Carrier #2
Occupied Bandwidth/Power Cal -Carrier 1 5&5 MHz Blocks B&F PCS RRH 4x30 FCC ID AS5BBTRX-22



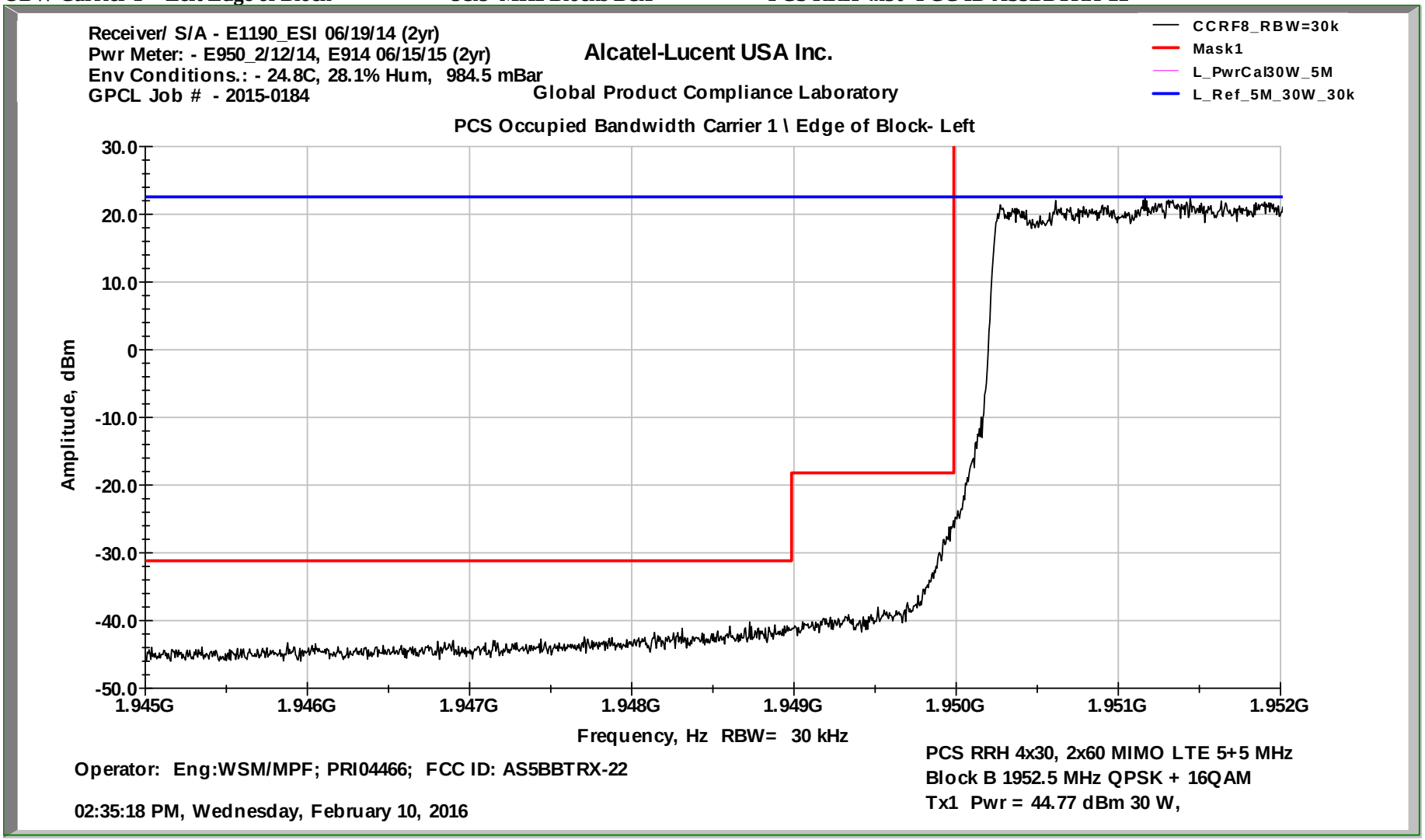
Occupied Bandwidth/Power Cal -Carrier 2 5&5 MHz Blocks B&F PCS RRH 4x30 FCC ID AS5BBTRX-22



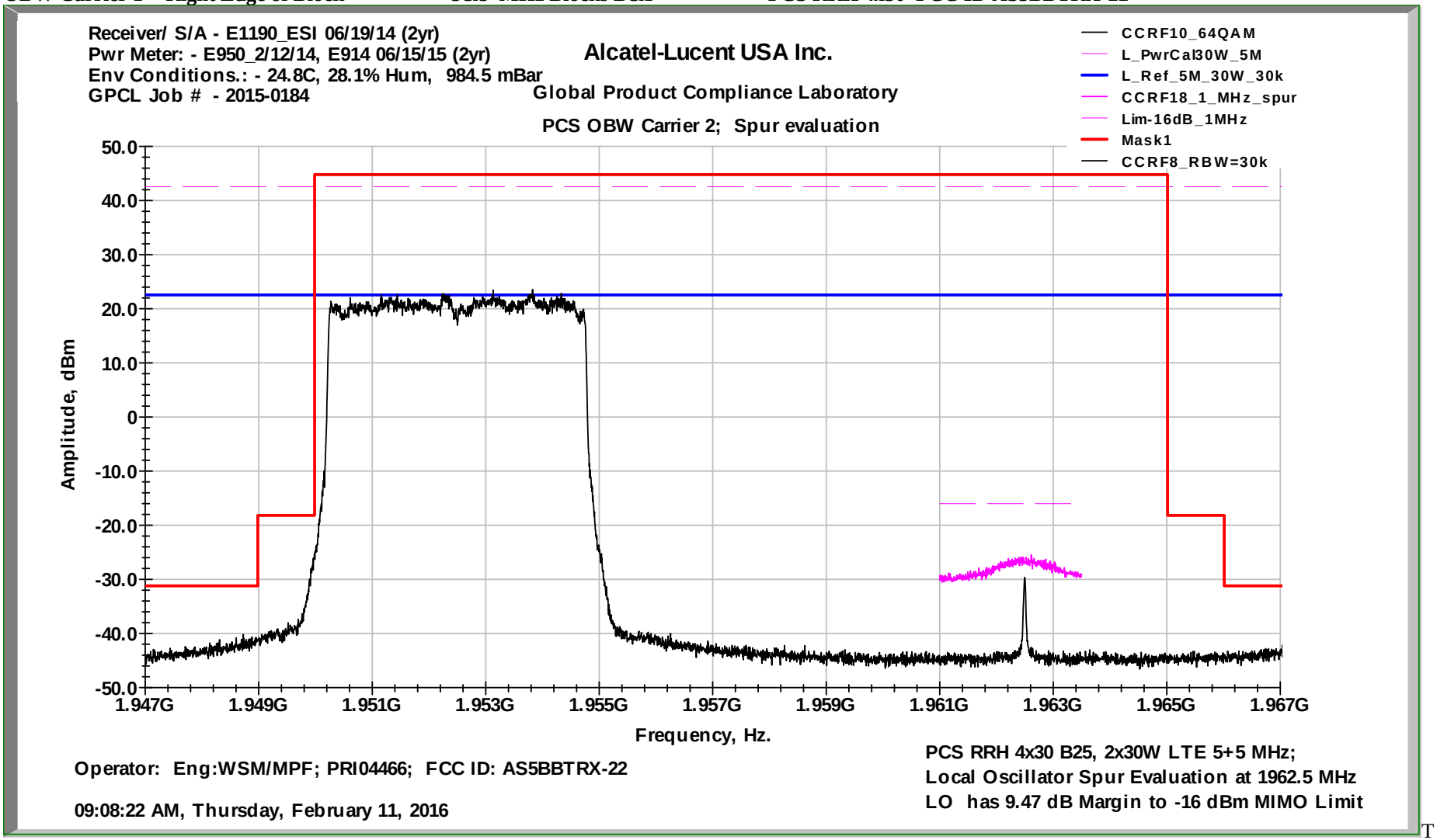
OBW Multiple Mod. Whole Band View **5&5 MHz Blocks B&F** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



OBW Carrier 1 - Left Edge of Block **5&5 MHz Blocks B&F** **PCS RRH 4x30 FCC ID AS5BBTRX-22**

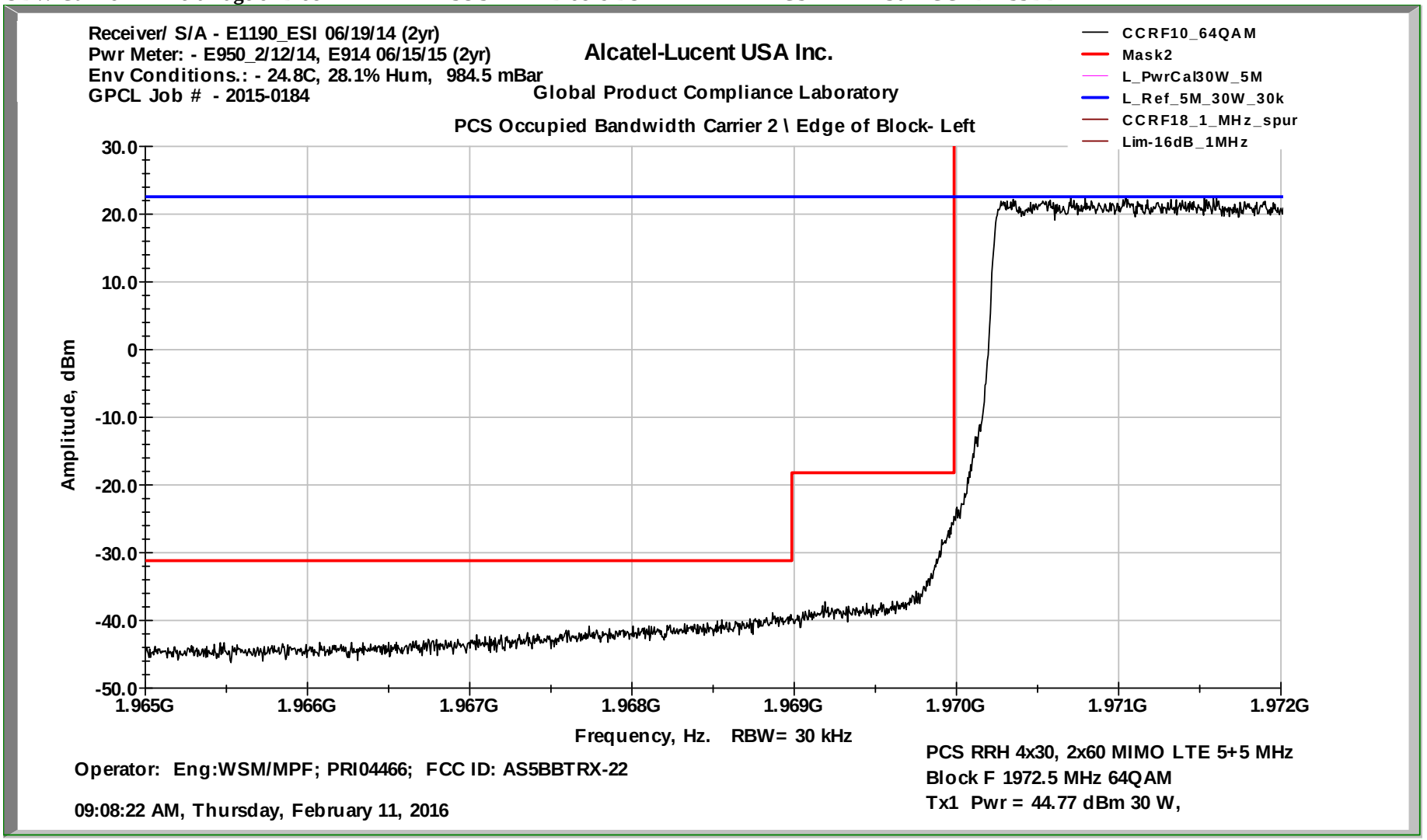


OBW Carrier 1 - Right Edge of Block 5&5 MHz Blocks B&F PCS RRH 4x30 FCC ID AS5BBTRX-22

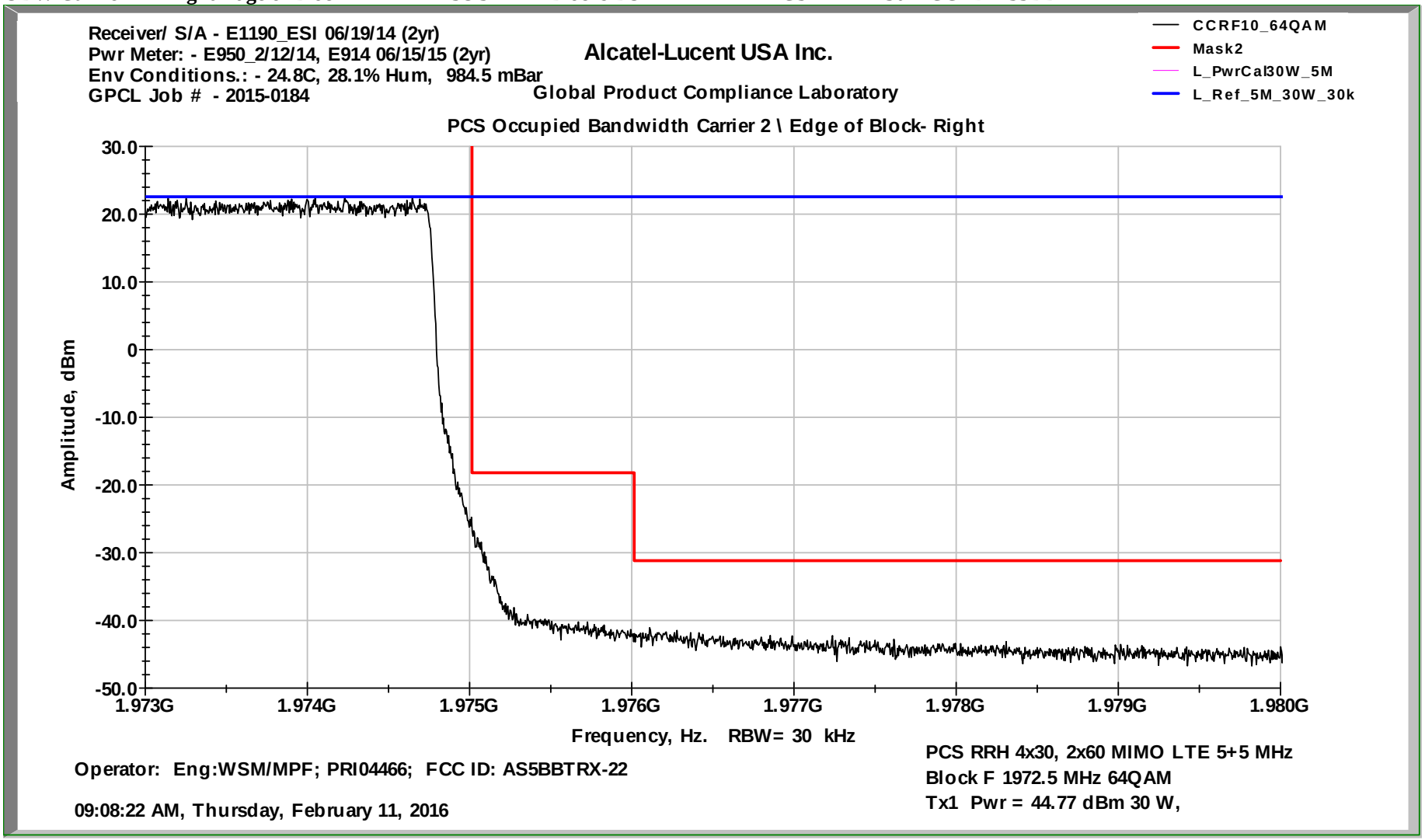


The narrowband spur at 1962.5 MHz is a local oscillator that has been measured to be below the -16 dBm 2x MIMO limit for all carrier combinations. The signal level remainsthe same when measured with 100 kHz, 300 kHz or 1 MHz resolution bandwidth..

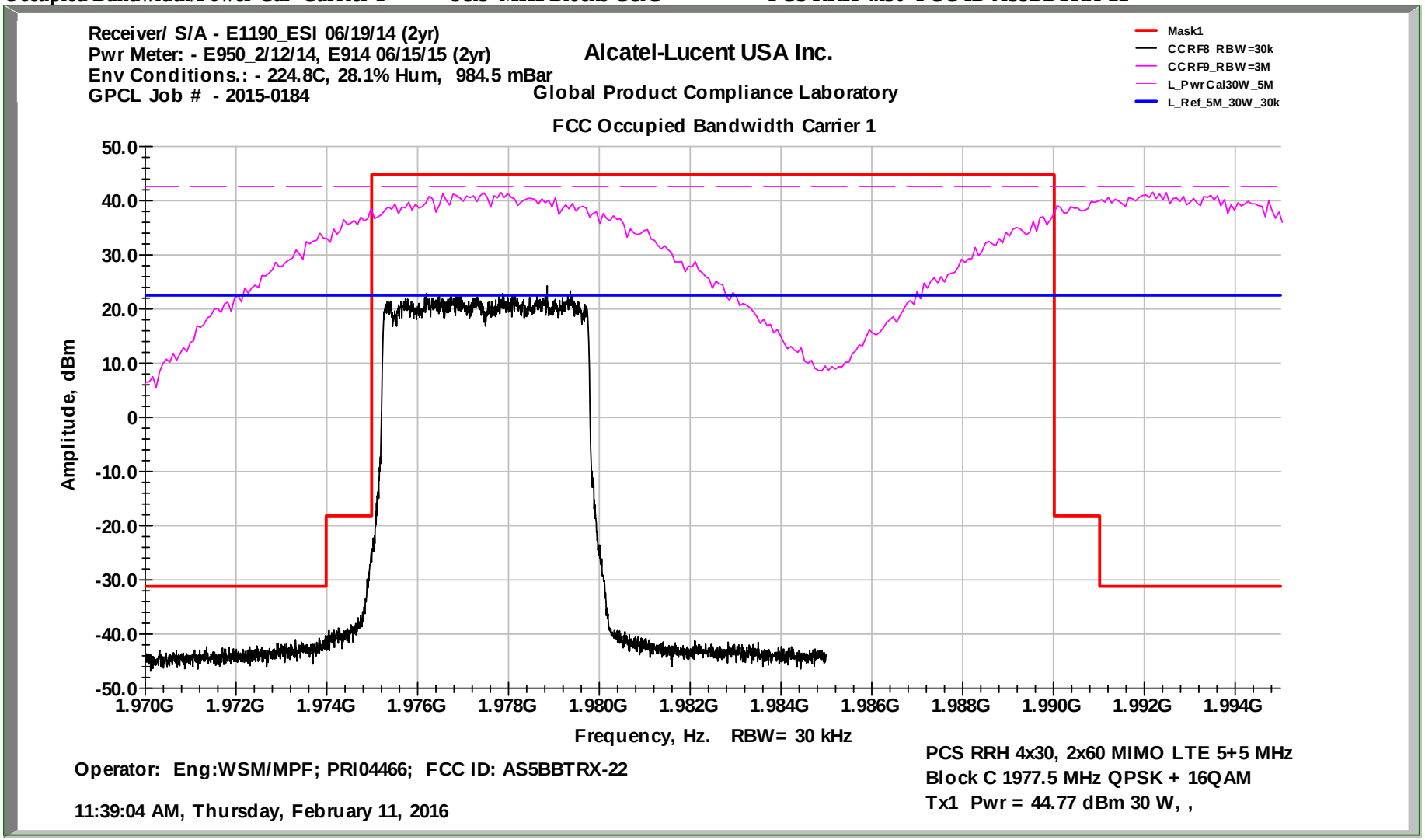
OBW Carrier 2 - Left Edge of Block **5&5 MHz Blocks B&F** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



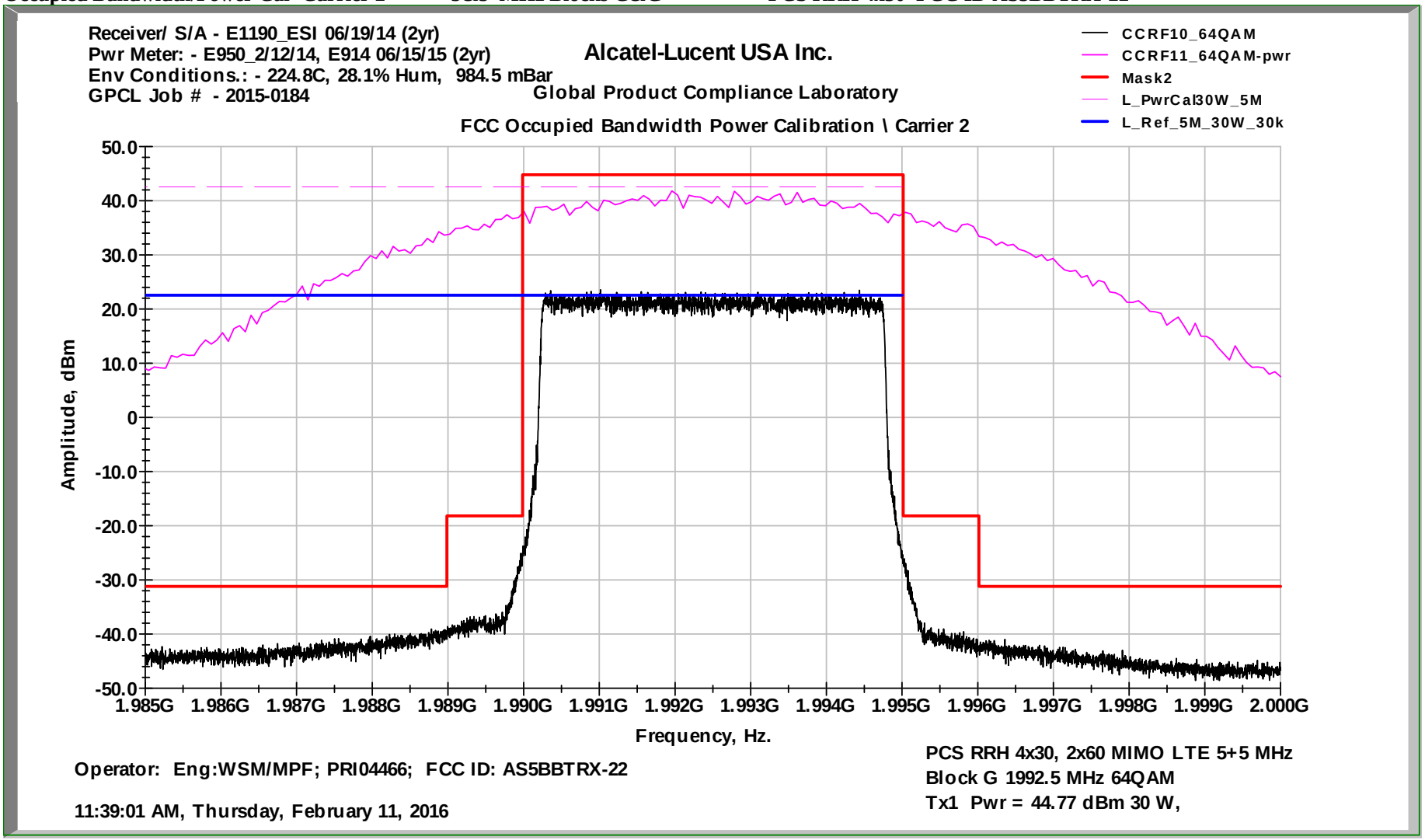
OBW Carrier 2 - Right Edge of Block **5&5 MHz Blocks B&F** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



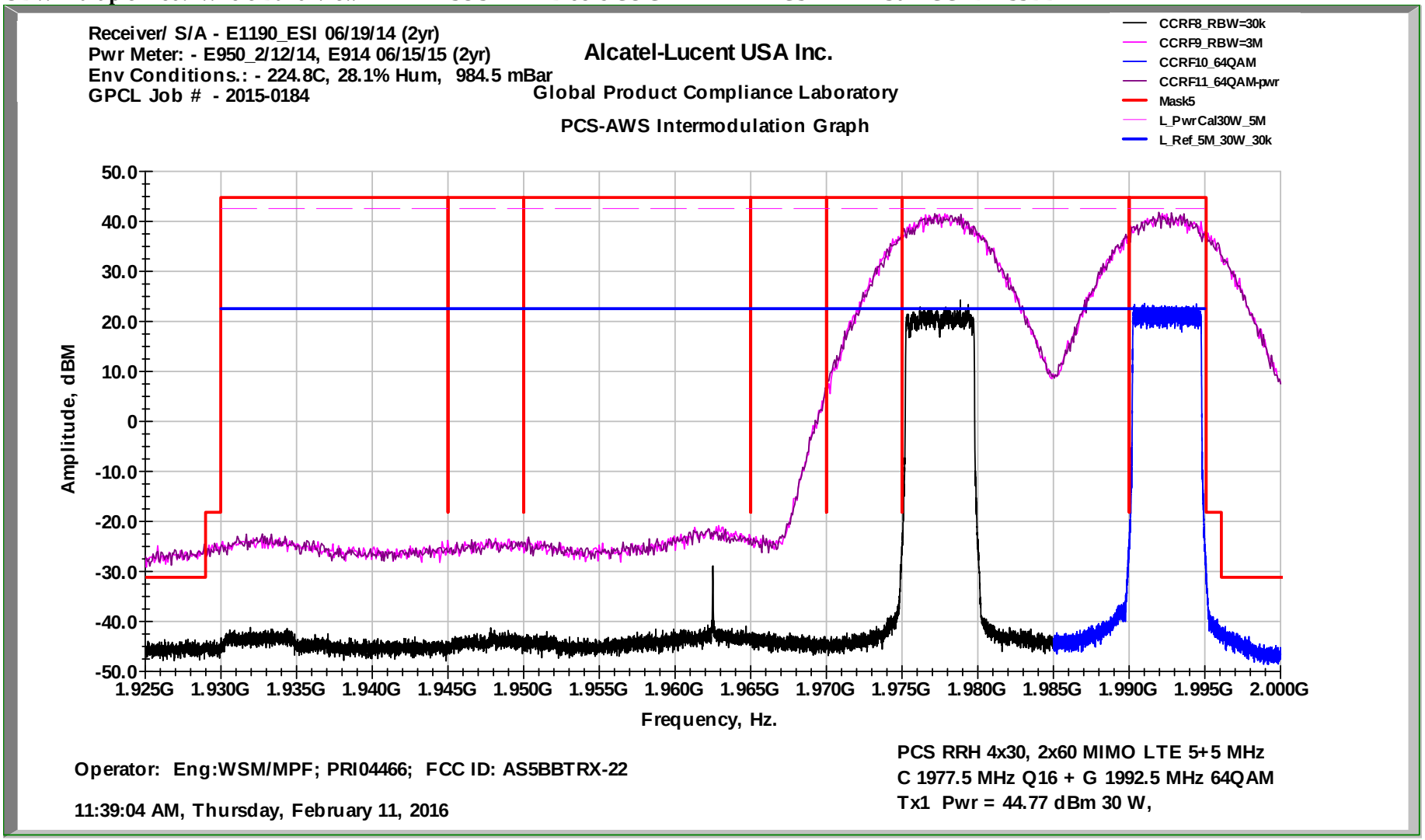
Dual Carrier #3
Occupied Bandwidth/Power Cal -Carrier 1 5&5 MHz Blocks C&G PCS RRH 4x30 FCC ID AS5BBTRX-22



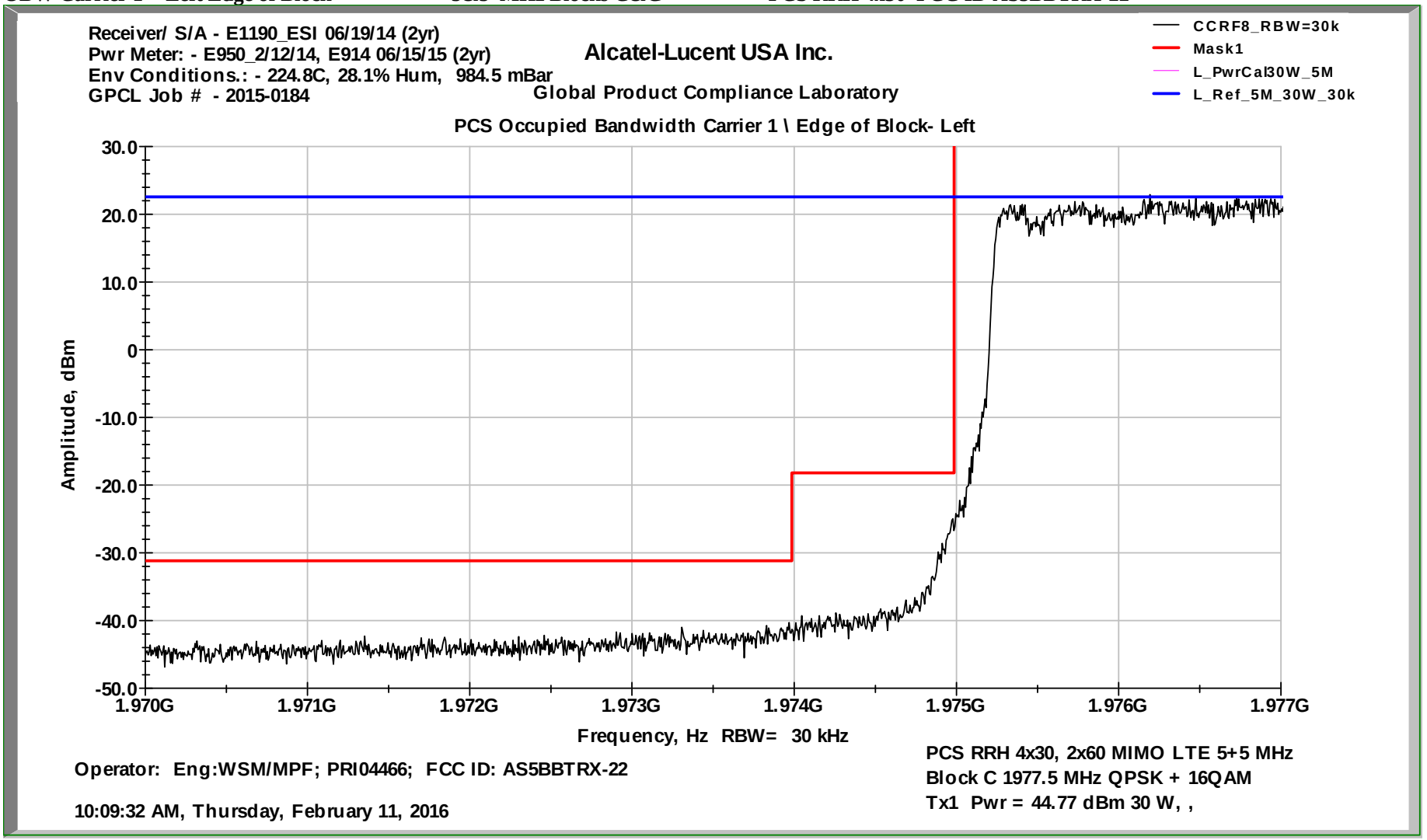
Occupied Bandwidth/Power Cal -Carrier 2 5&5 MHz Blocks C&G PCS RRH 4x30 FCC ID AS5BBTRX-22



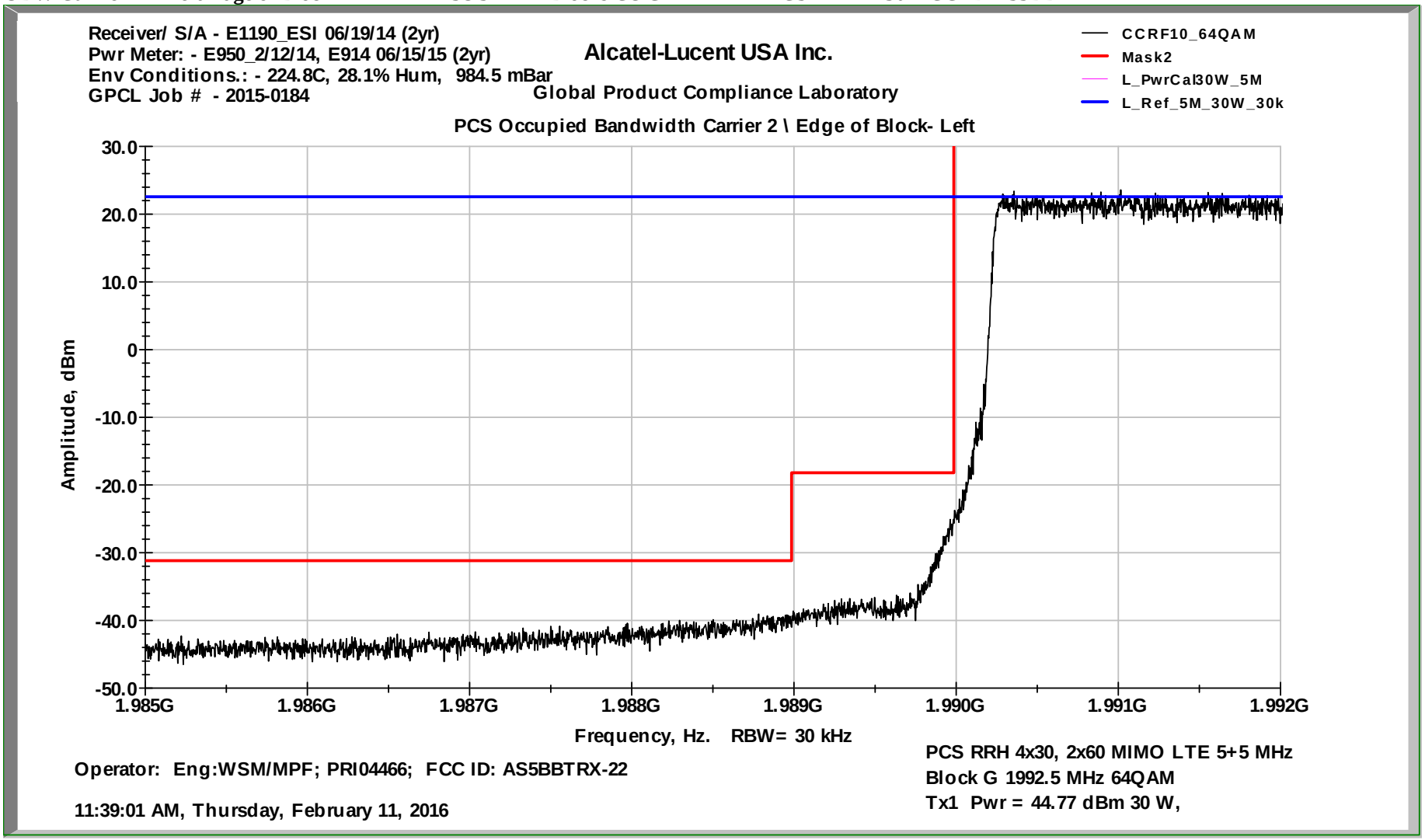
OBW Multiple Mod. Whole Band View 5&5 MHz Blocks C&G PCS RRH 4x30 FCC ID AS5BBTRX-22



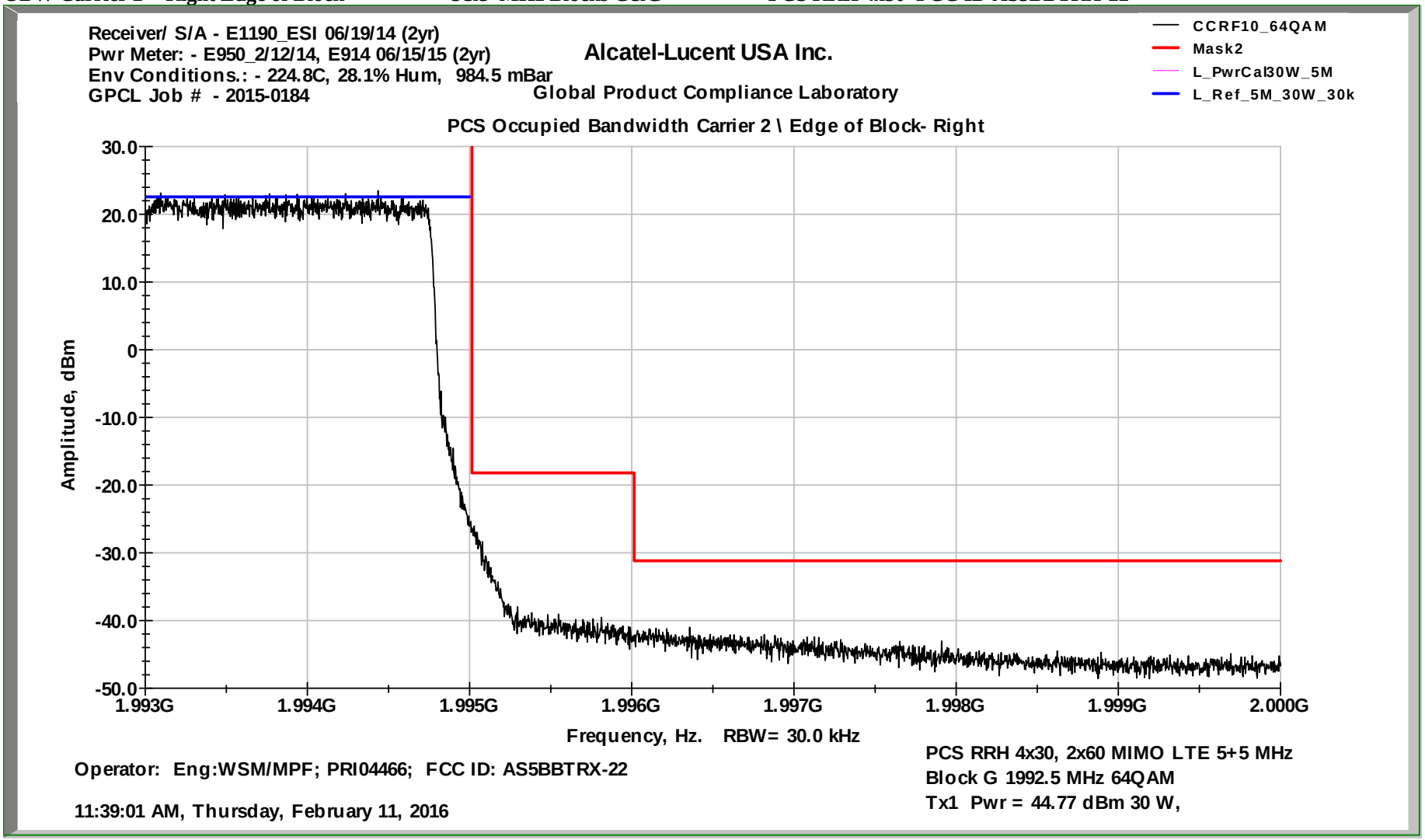
OBW Carrier 1 - Left Edge of Block **5&5 MHz Blocks C&G** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



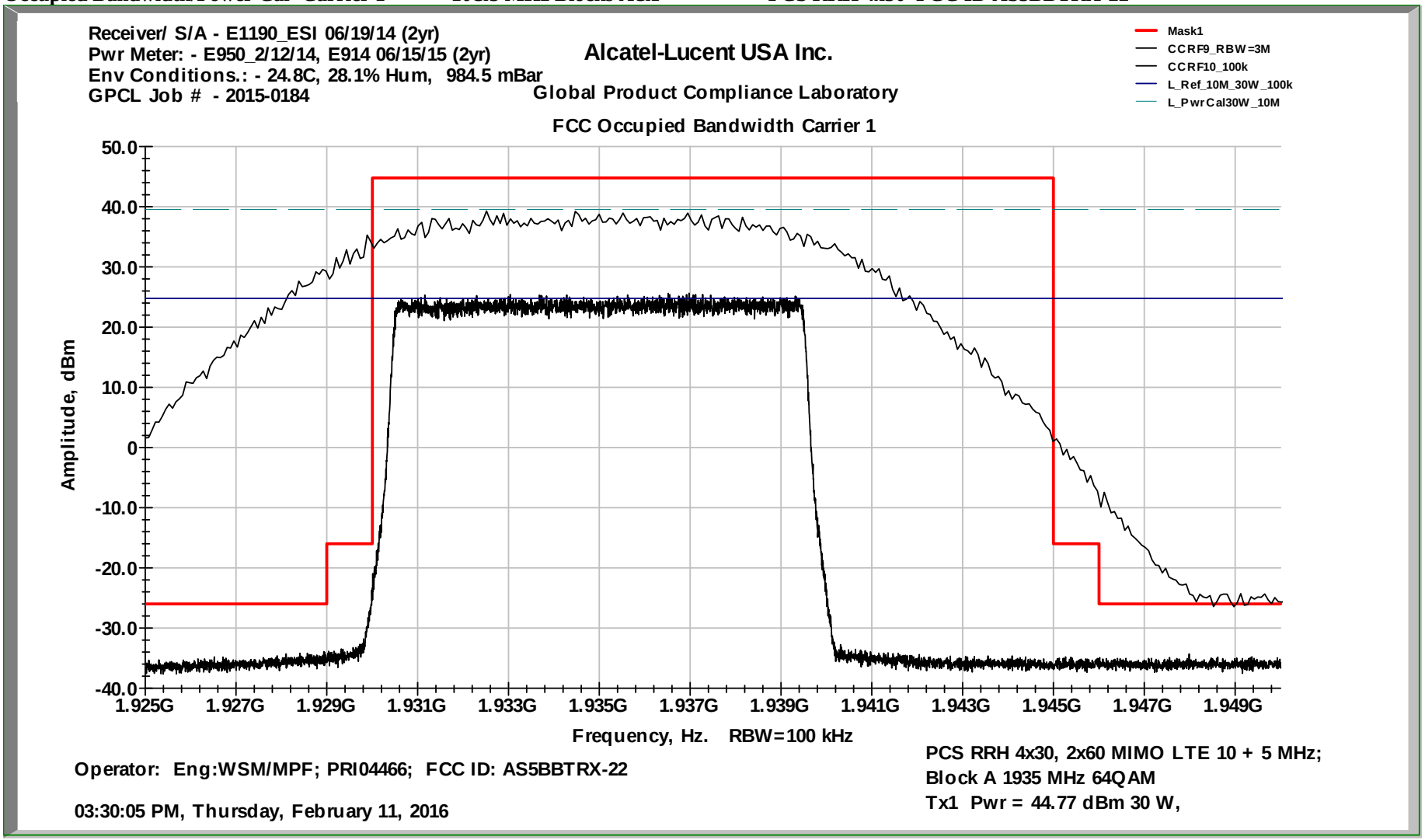
OBW Carrier 2 - Left Edge of Block **5&5 MHz Blocks C&G** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



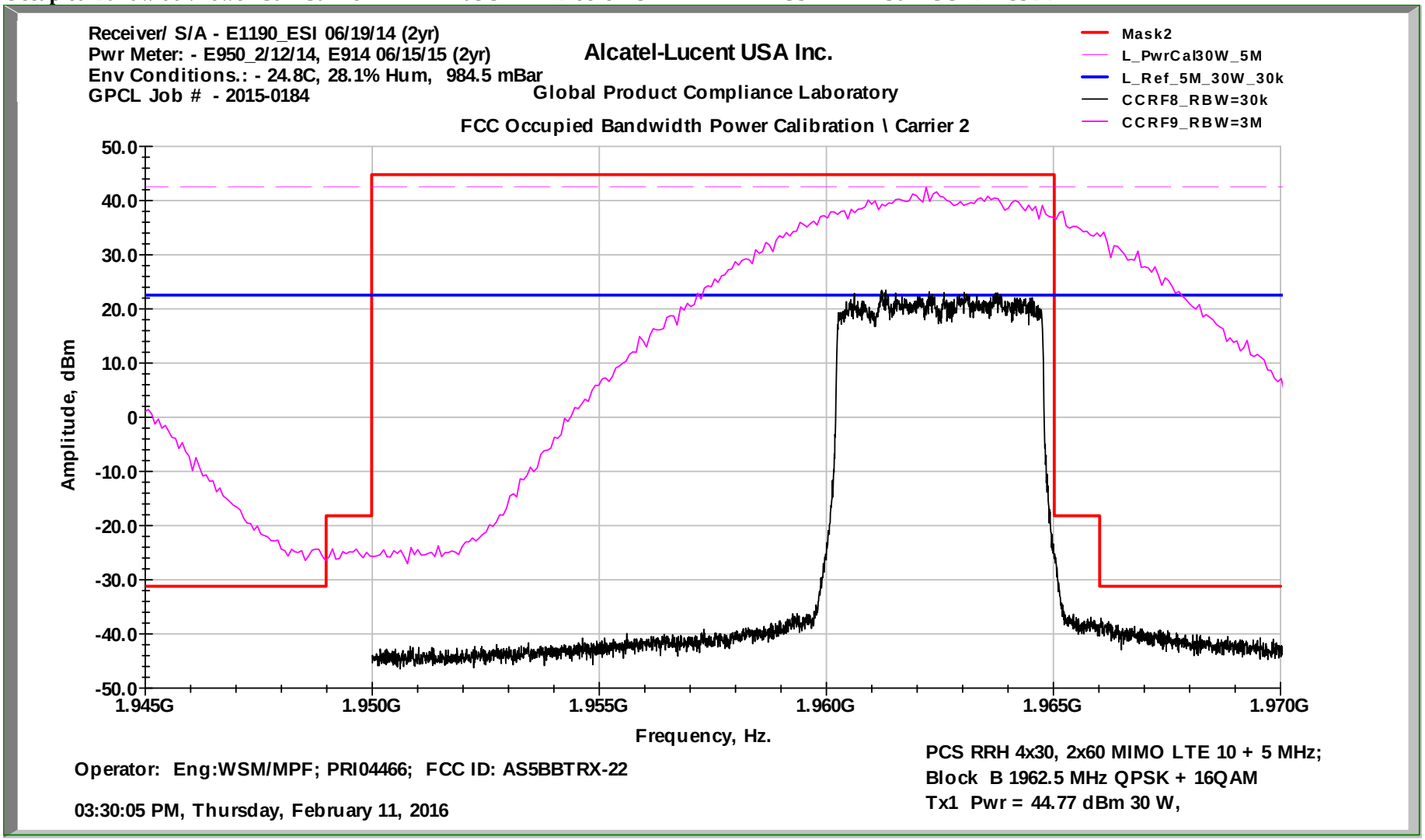
OBW Carrier 2 - Right Edge of Block **5&5 MHz Blocks C&G** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



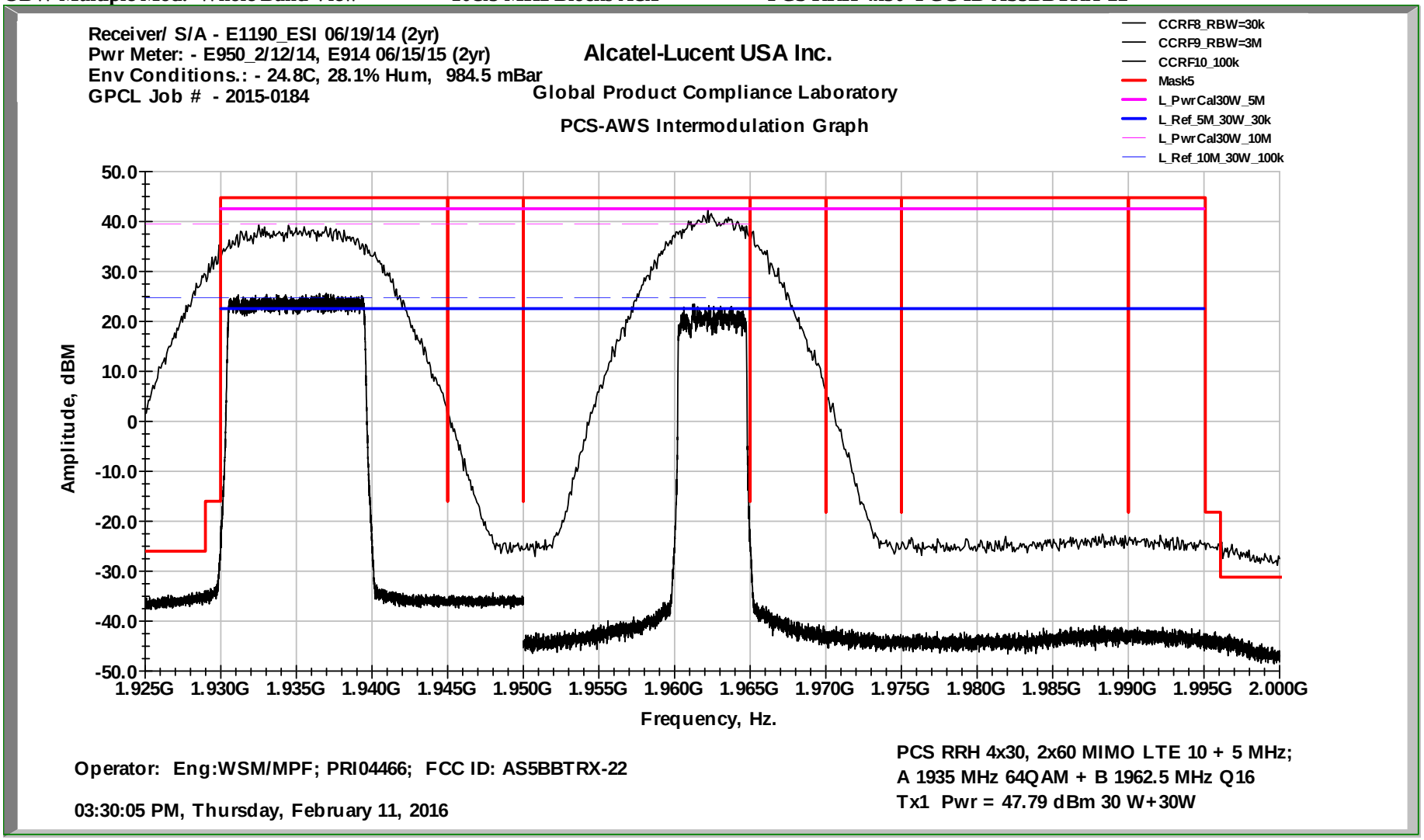
Dual Carrier #4
Occupied Bandwidth/Power Cal -Carrier 1 10&5 MHz Blocks A&F PCS RRH 4x30 FCC ID AS5BBTRX-22



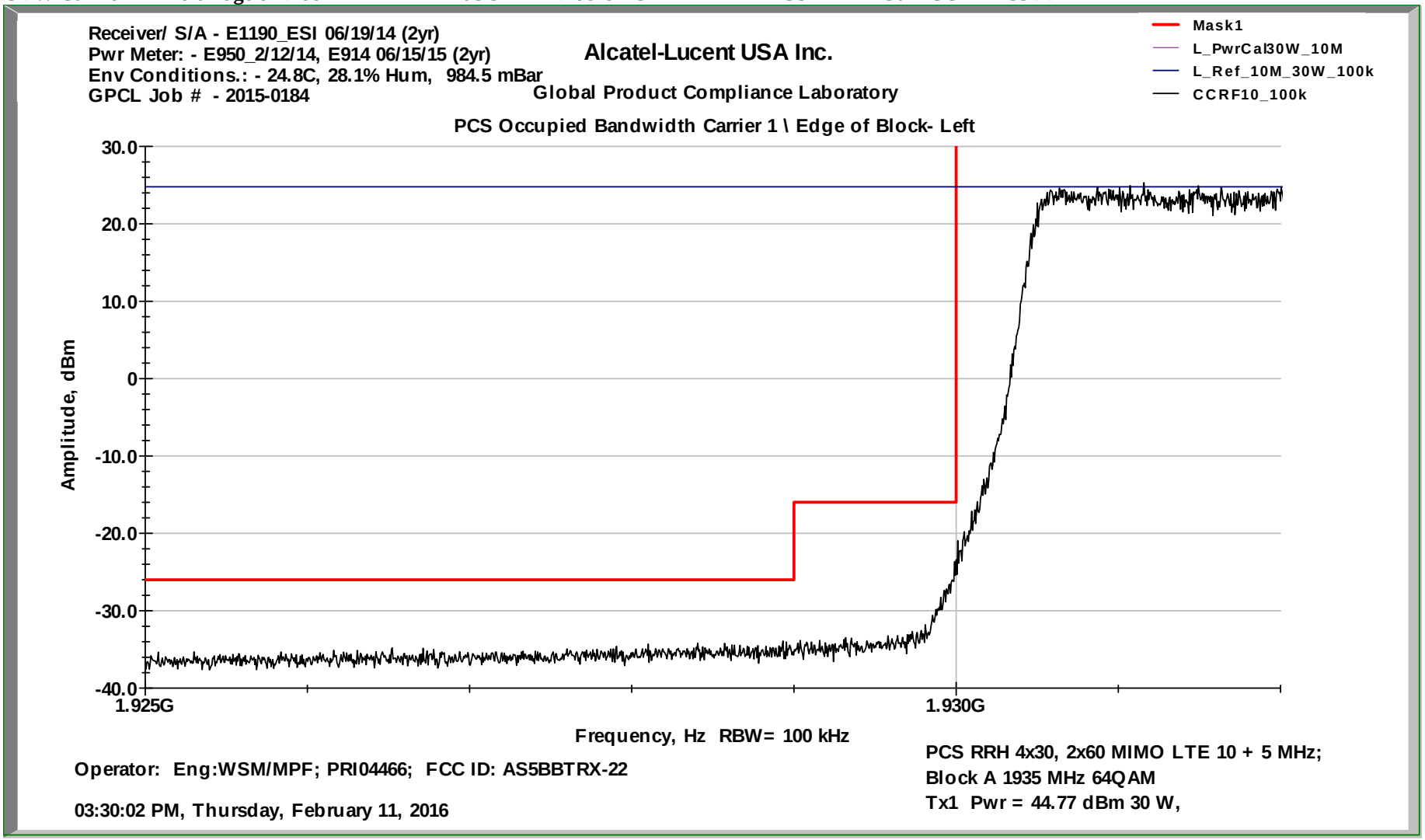
Occupied Bandwidth/Power Cal -Carrier 2 10&5 MHz Blocks A&F PCS RRH 4x30 FCC ID AS5BBTRX-22



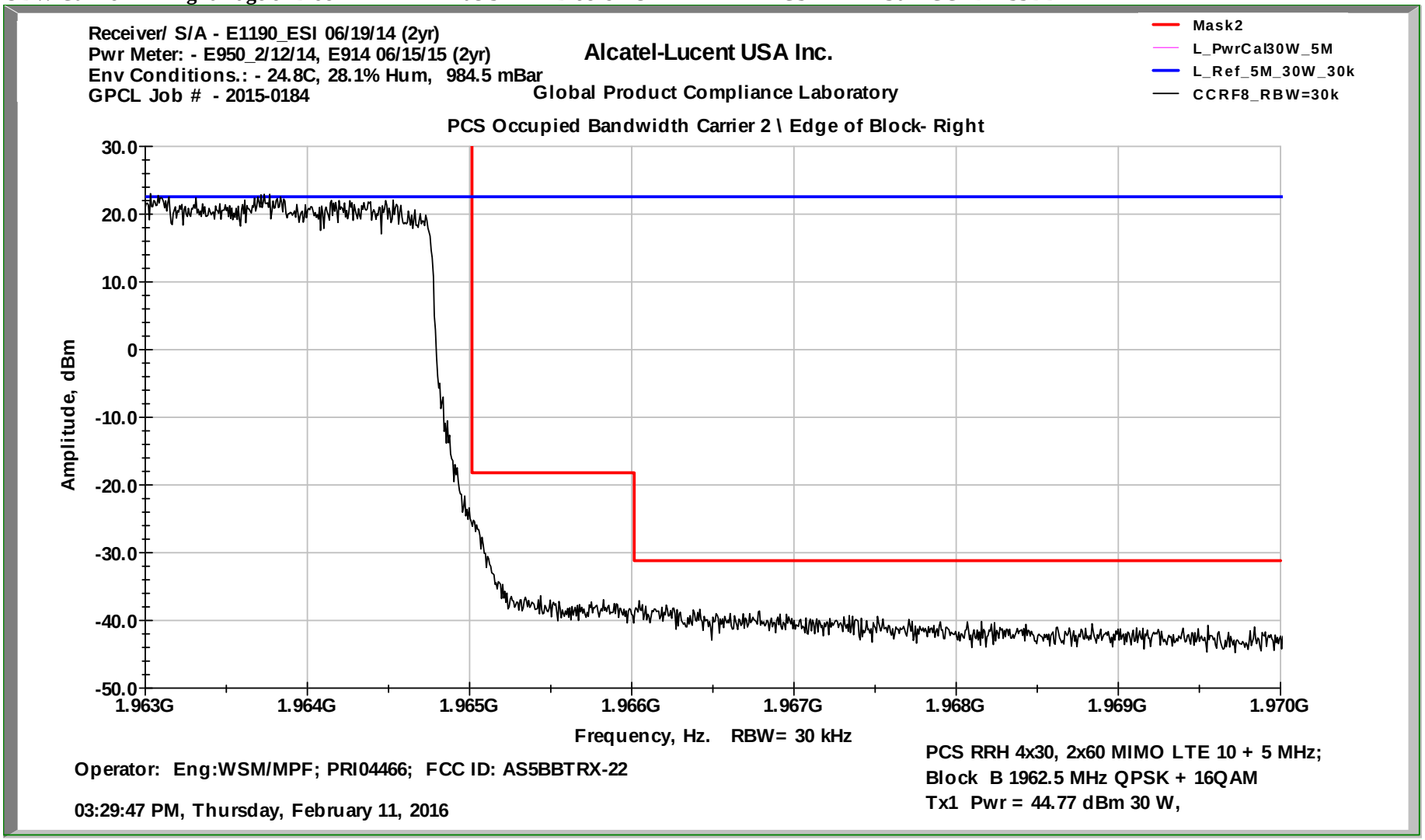
OBW Multiple Mod. Whole Band View **10&5 MHz Blocks A&F** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



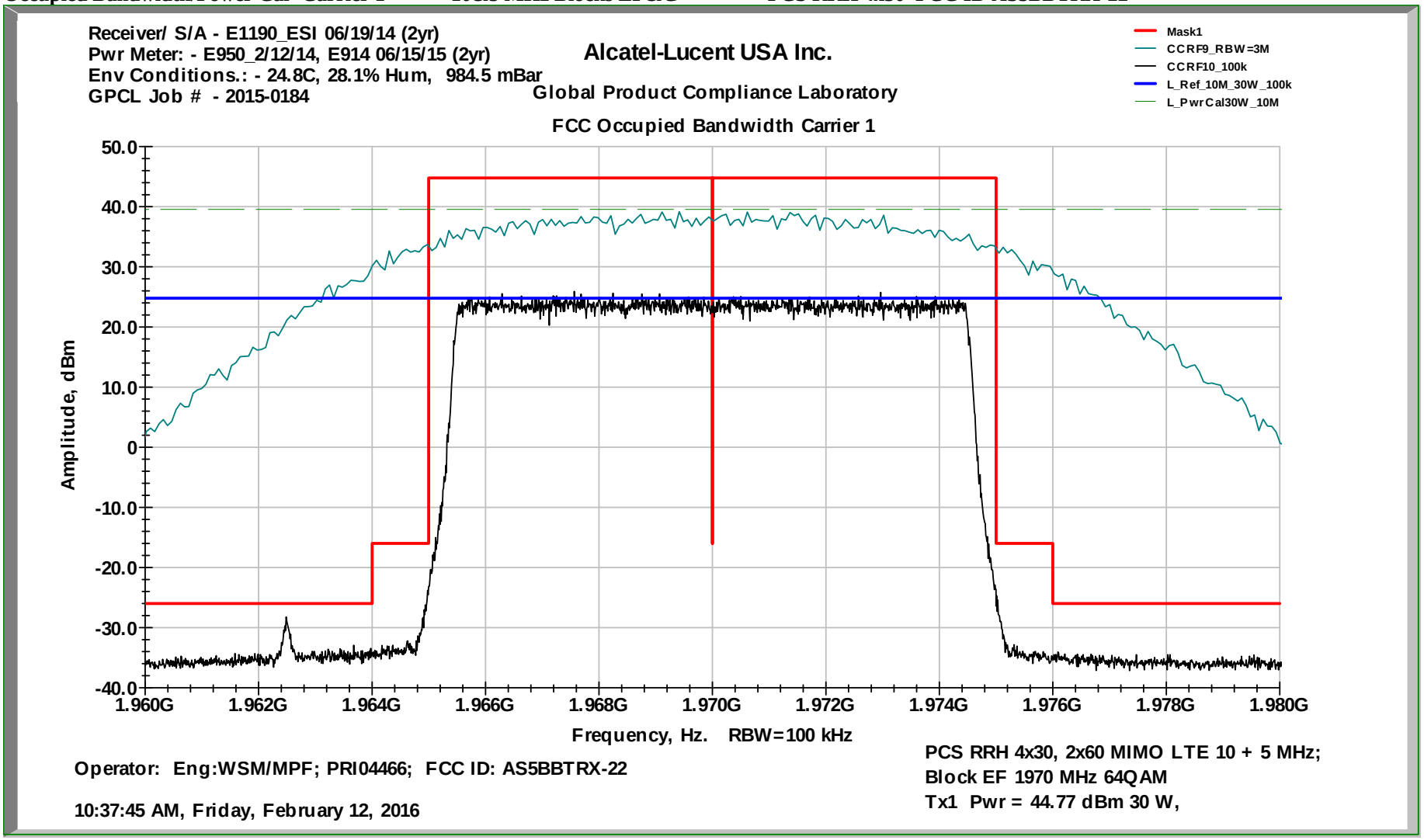
OBW Carrier 1 - Left Edge of Block **10&5 MHz Blocks A&F** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



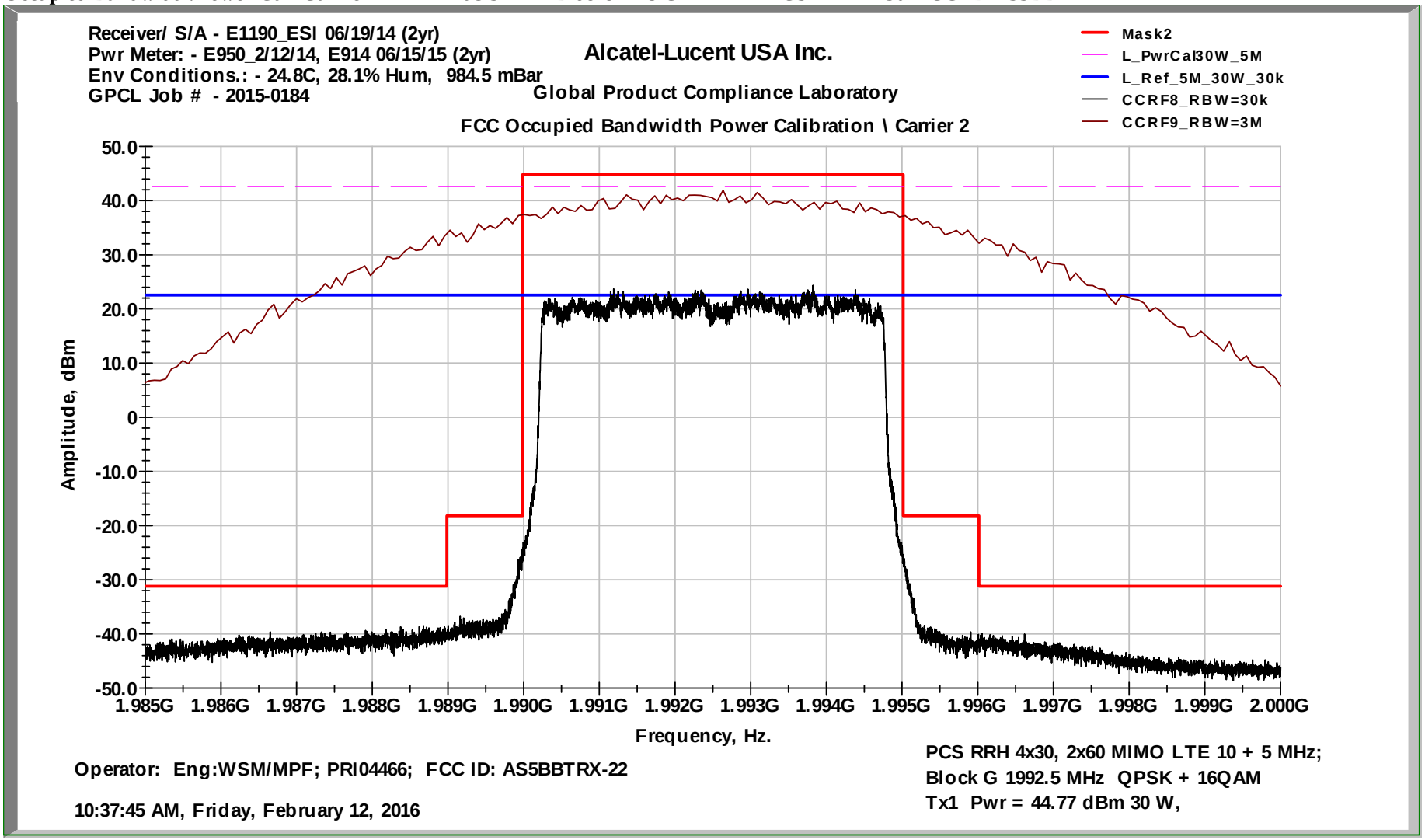
OBW Carrier 2 - Right Edge of Block **10&5 MHz Blocks A&F** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



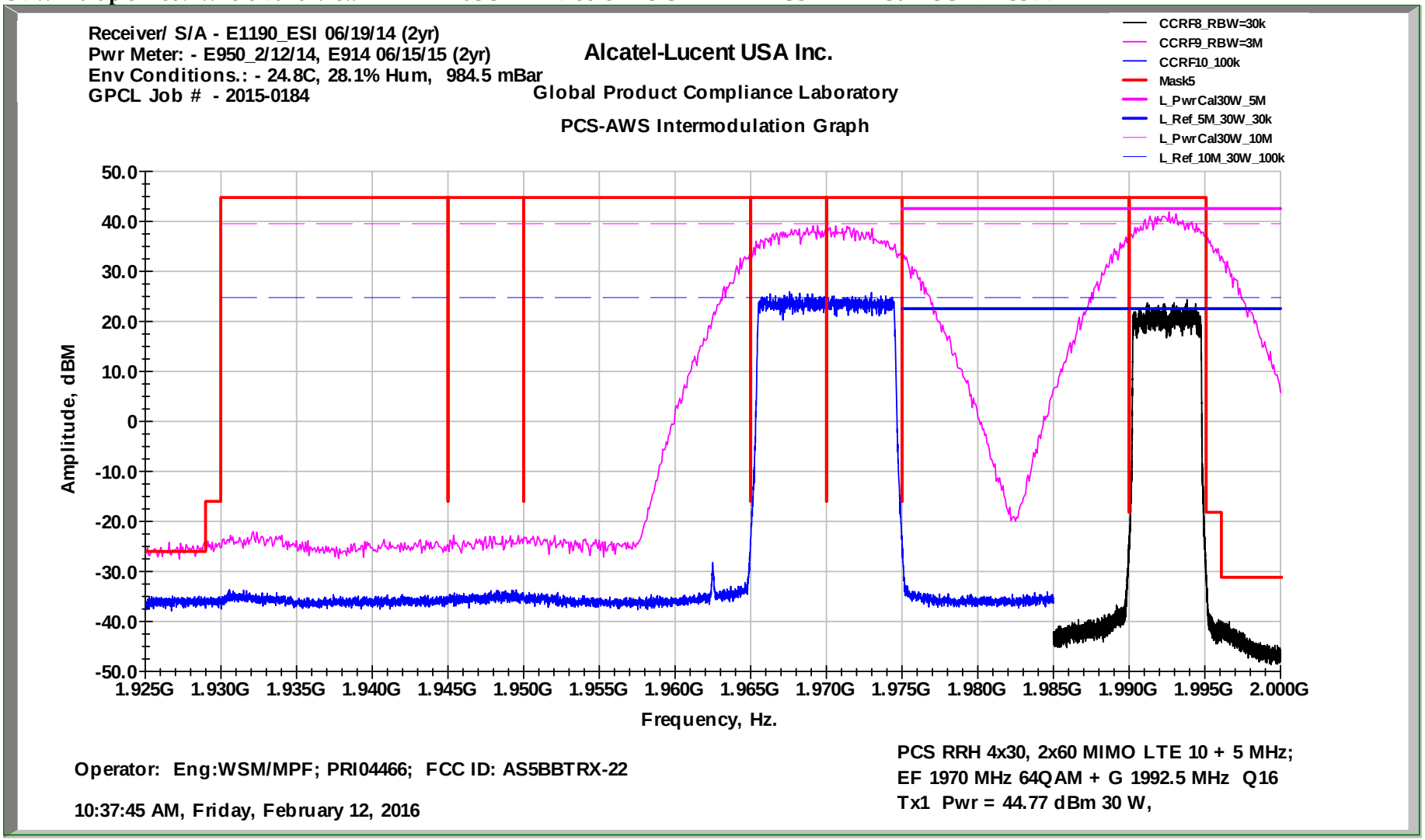
Dual Carrier #5
Occupied Bandwidth/Power Cal -Carrier 1 10&5 MHz Blocks EF&G PCS RRH 4x30 FCC ID AS5BBTRX-22



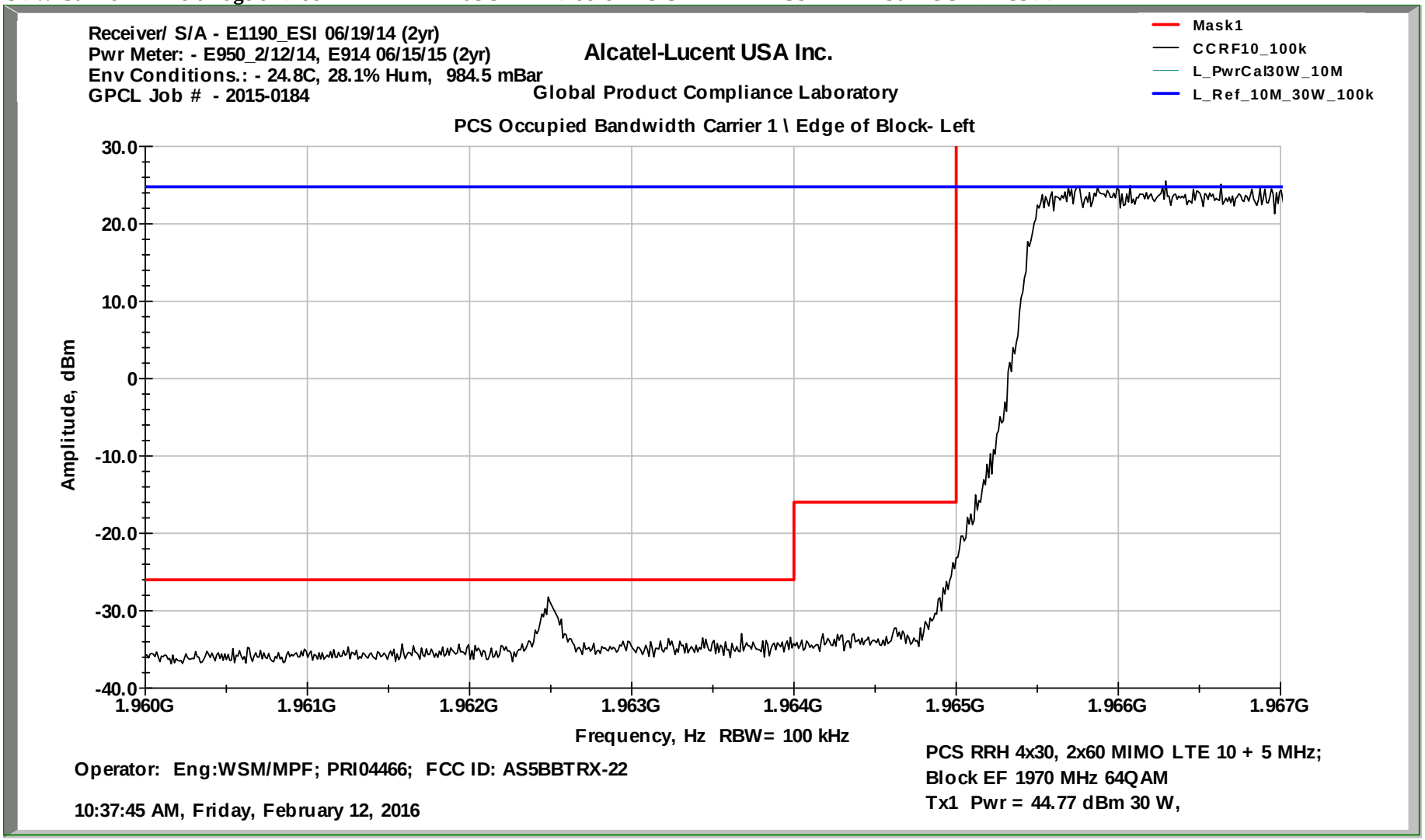
Occupied Bandwidth/Power Cal -Carrier 1 10&5 MHz Blocks EF&G PCS RRH 4x30 FCC ID AS5BBTRX-22



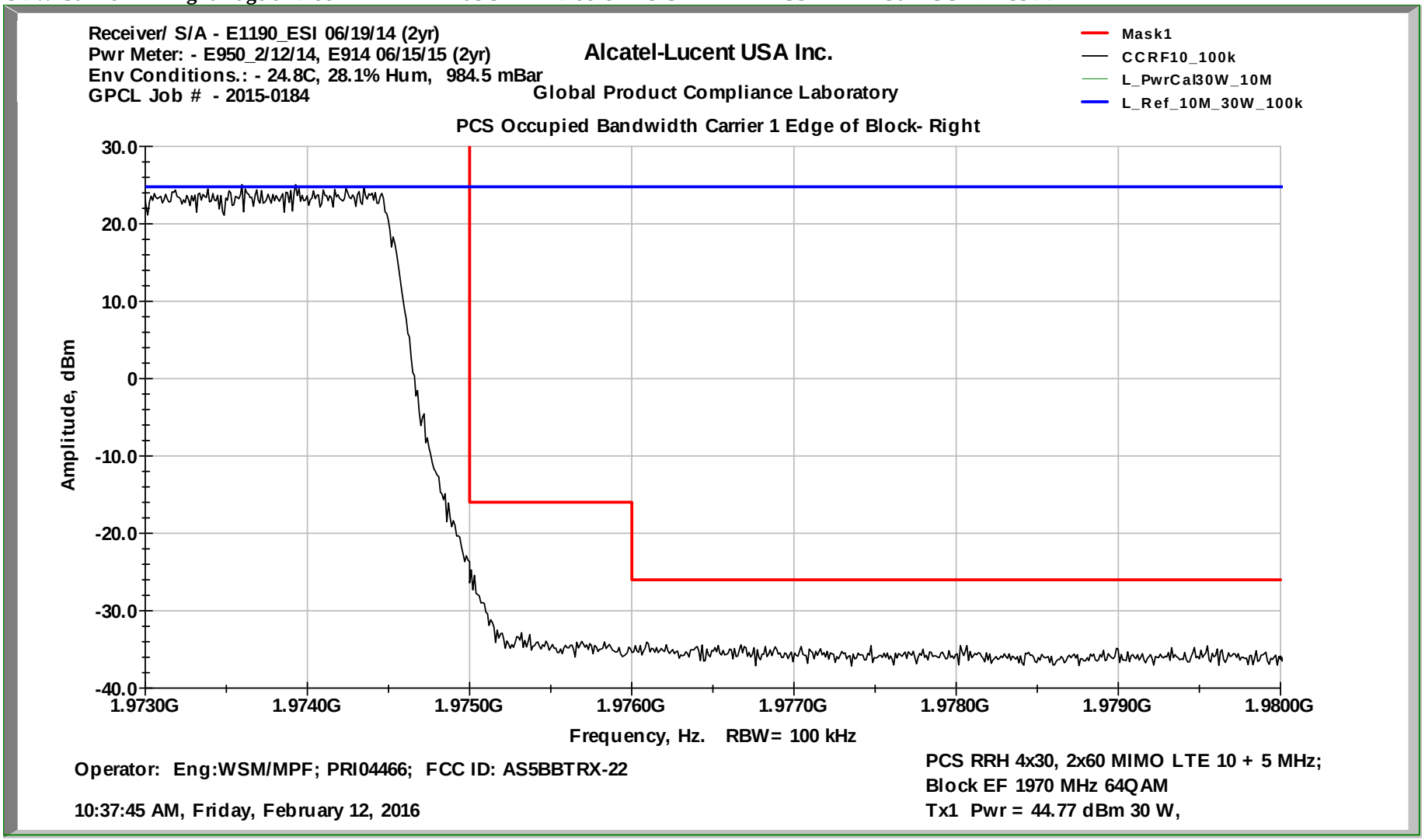
OBW Multiple Mod. Whole Band View **10&5 MHz Blocks EF&G** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



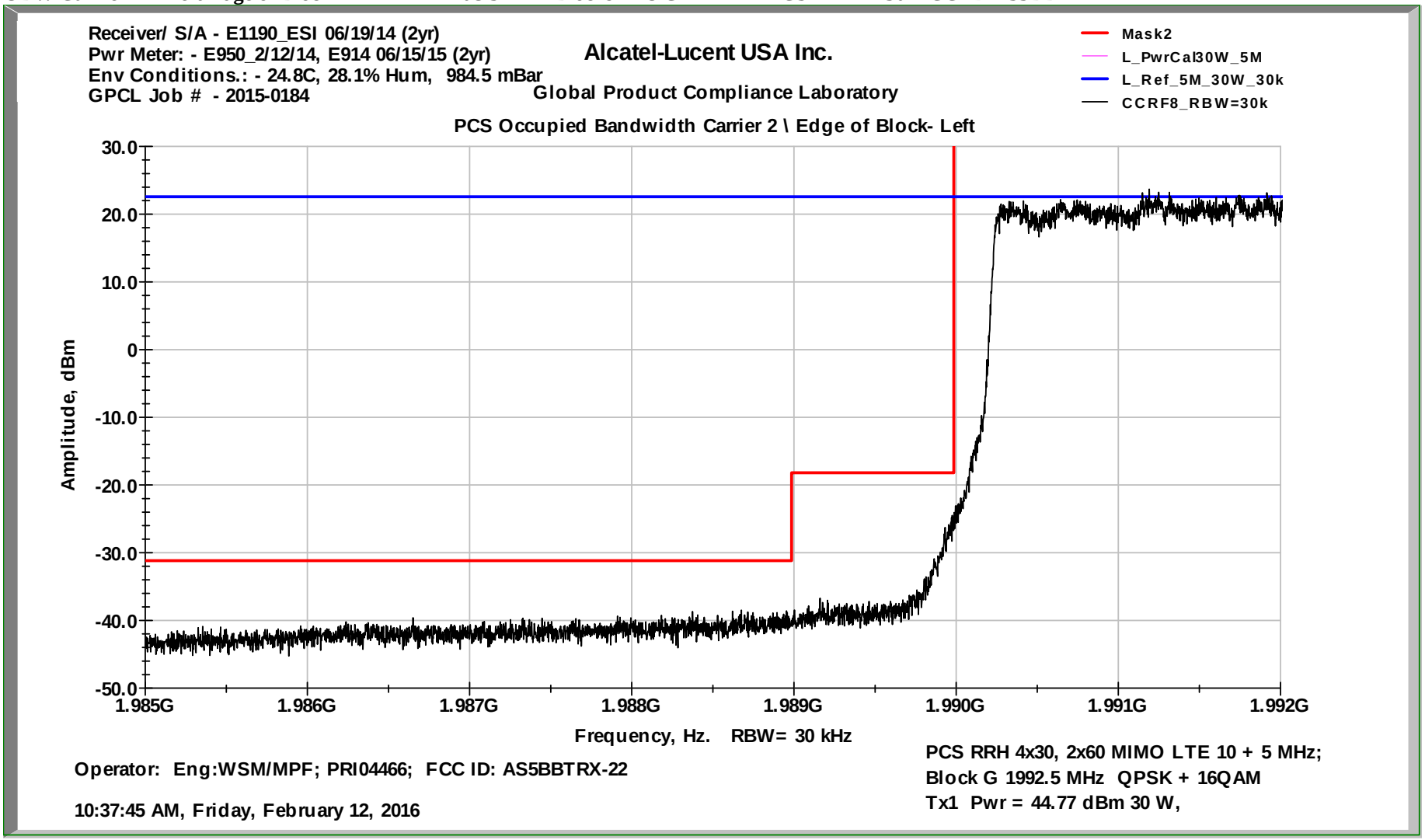
OBW Carrier 1 - Left Edge of Block **10&5 MHz Blocks EF&G** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



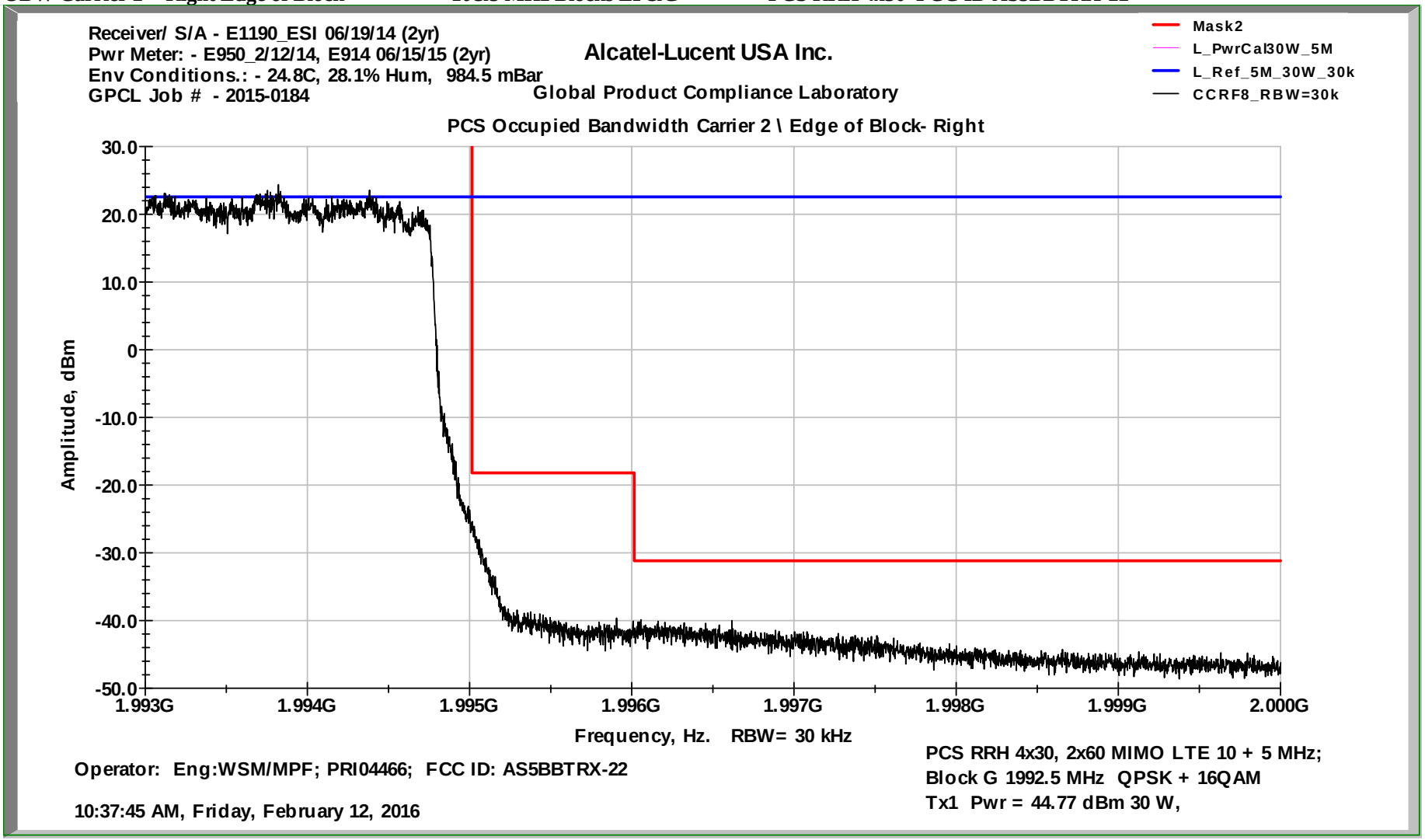
OBW Carrier 1 - Right Edge of Block **10&5 MHz Blocks EF&G** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



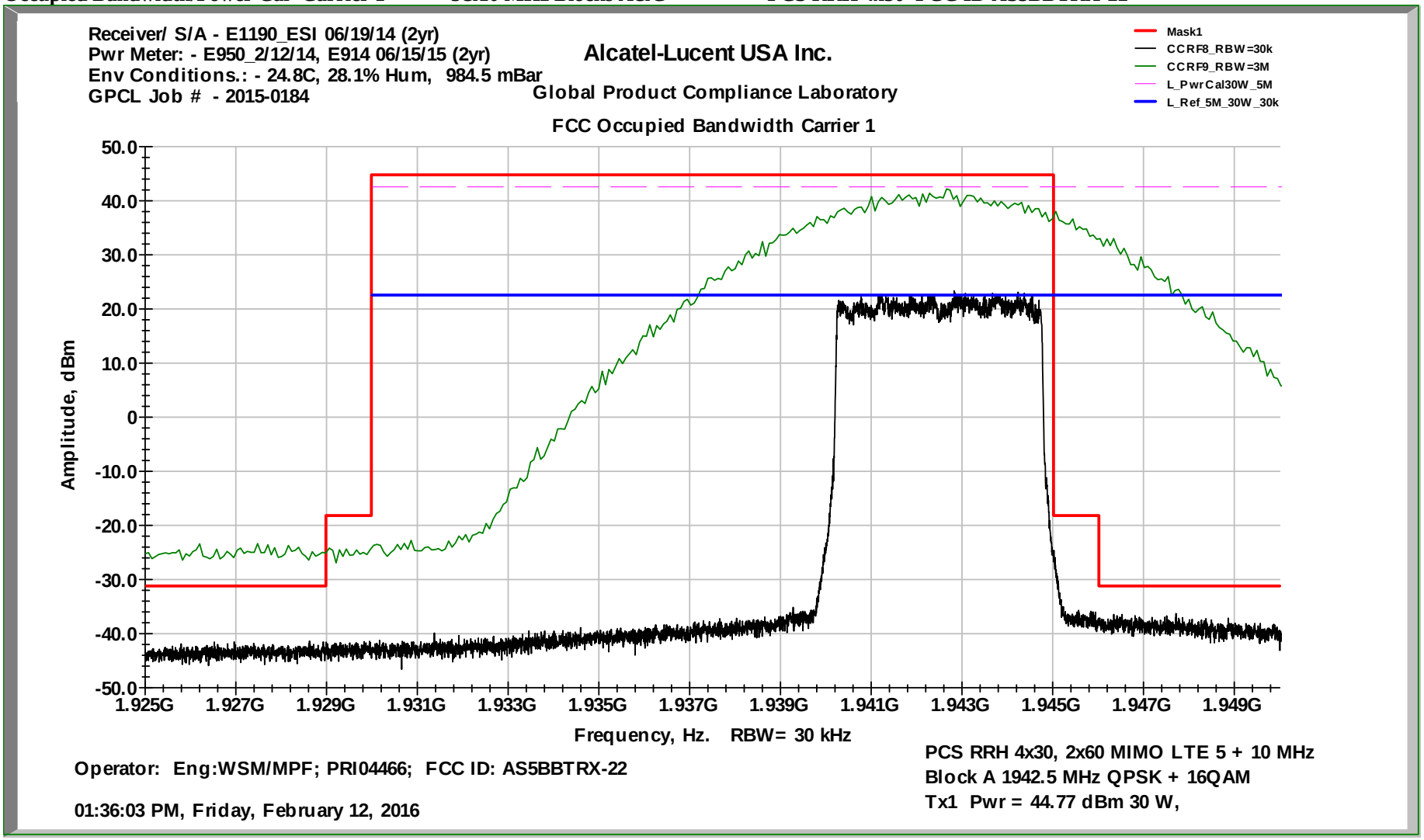
OBW Carrier 2 - Left Edge of Block **10&5 MHz Blocks EF&G** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



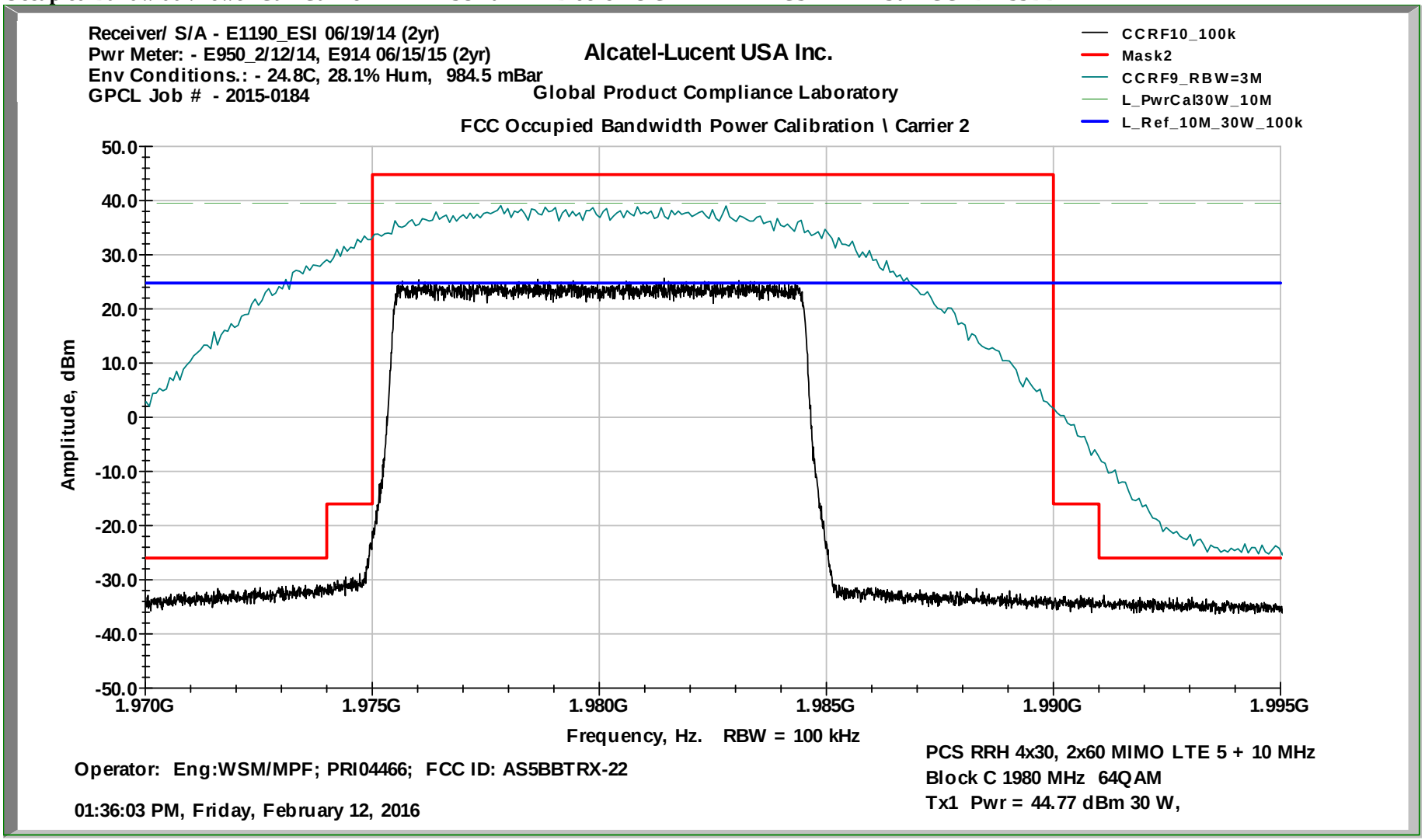
OBW Carrier 2 - Right Edge of Block **10&5 MHz Blocks EF&G** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



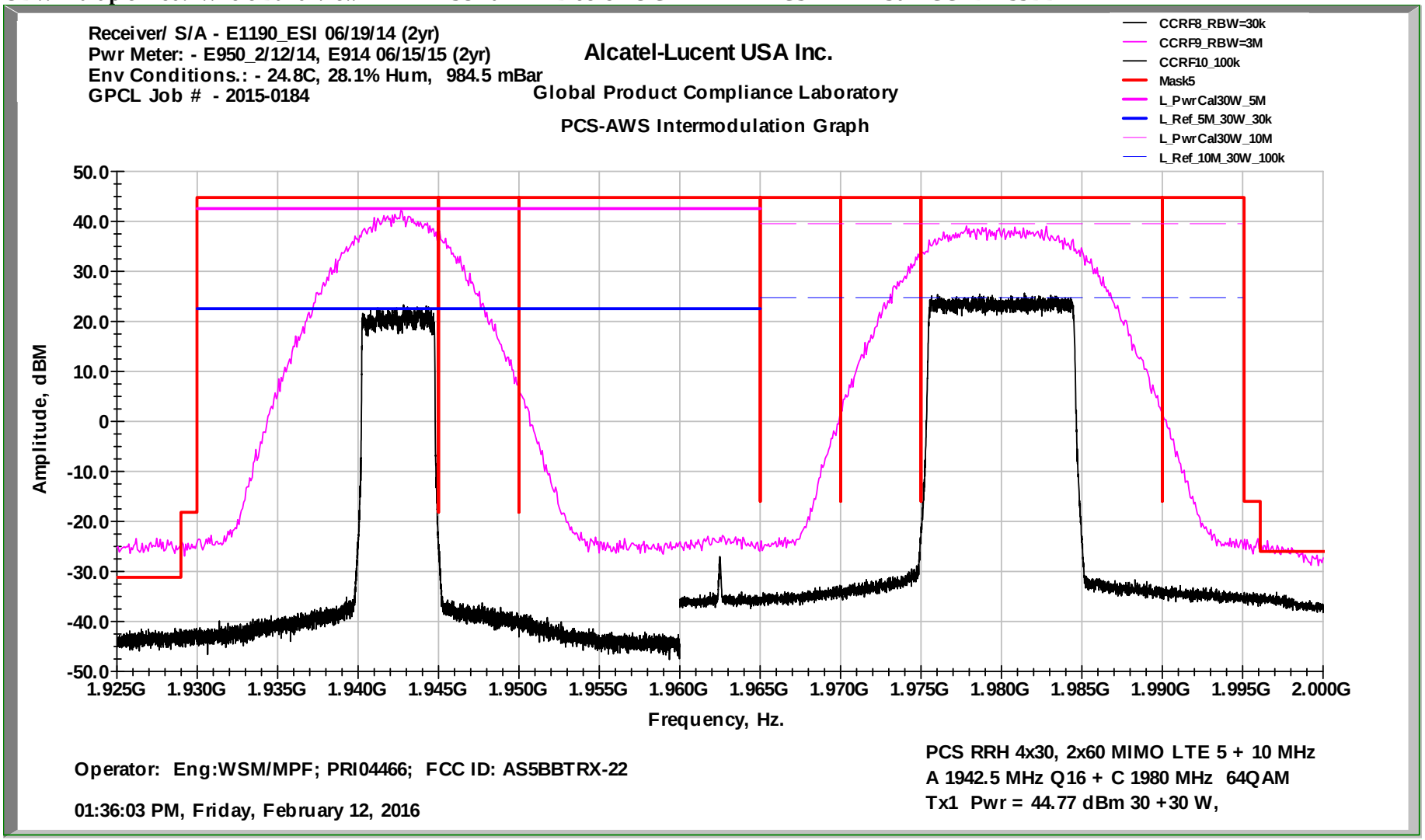
Dual Carrier #6
Occupied Bandwidth/Power Cal -Carrier 1 5&10 MHz Blocks A&C PCS RRH 4x30 FCC ID AS5BBTRX-22



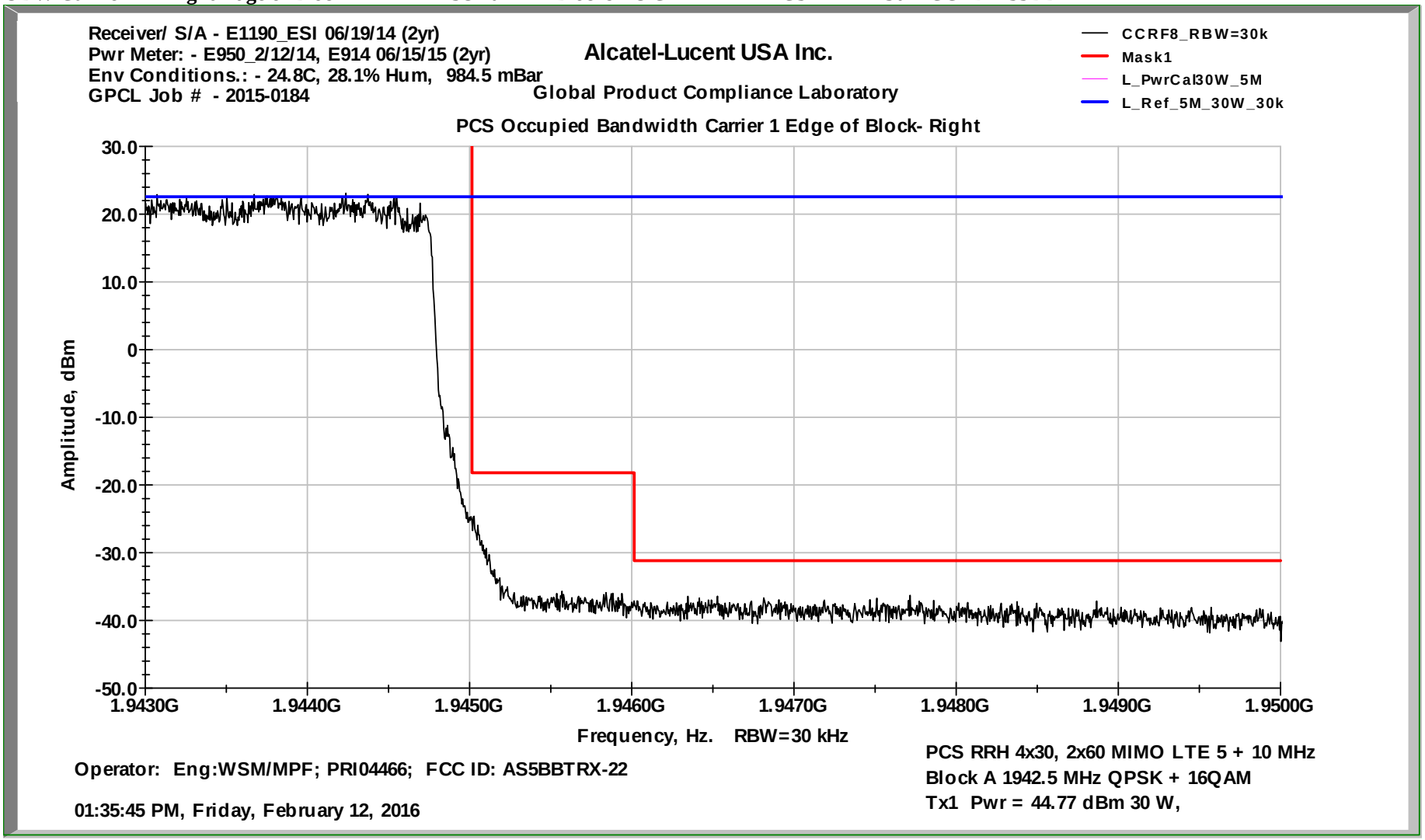
Occupied Bandwidth/Power Cal -Carrier 2 5&10 MHz Blocks A&C PCS RRH 4x30 FCC ID AS5BBTRX-22



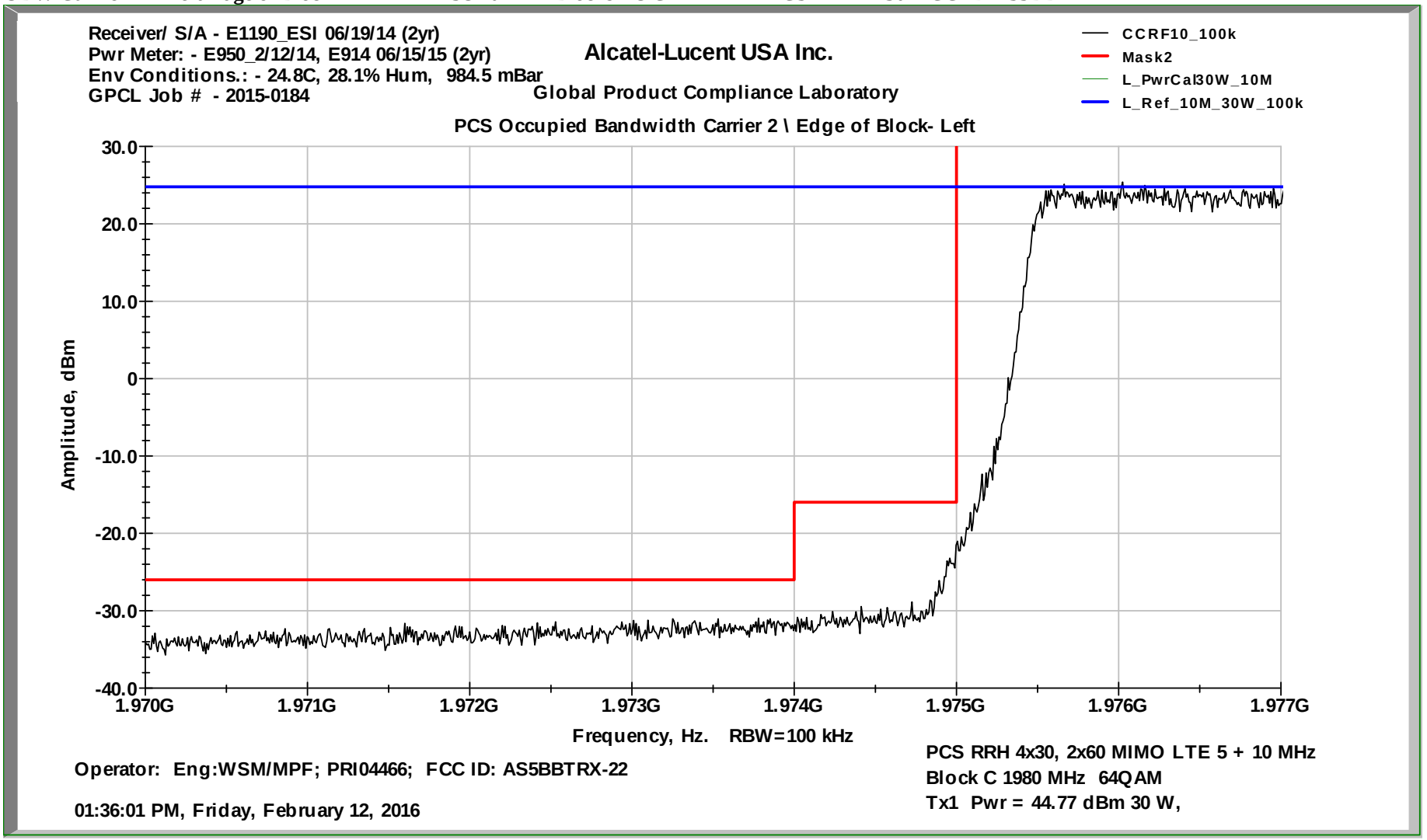
OBW Multiple Mod. Whole Band View **5&10 MHz Blocks A&C** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



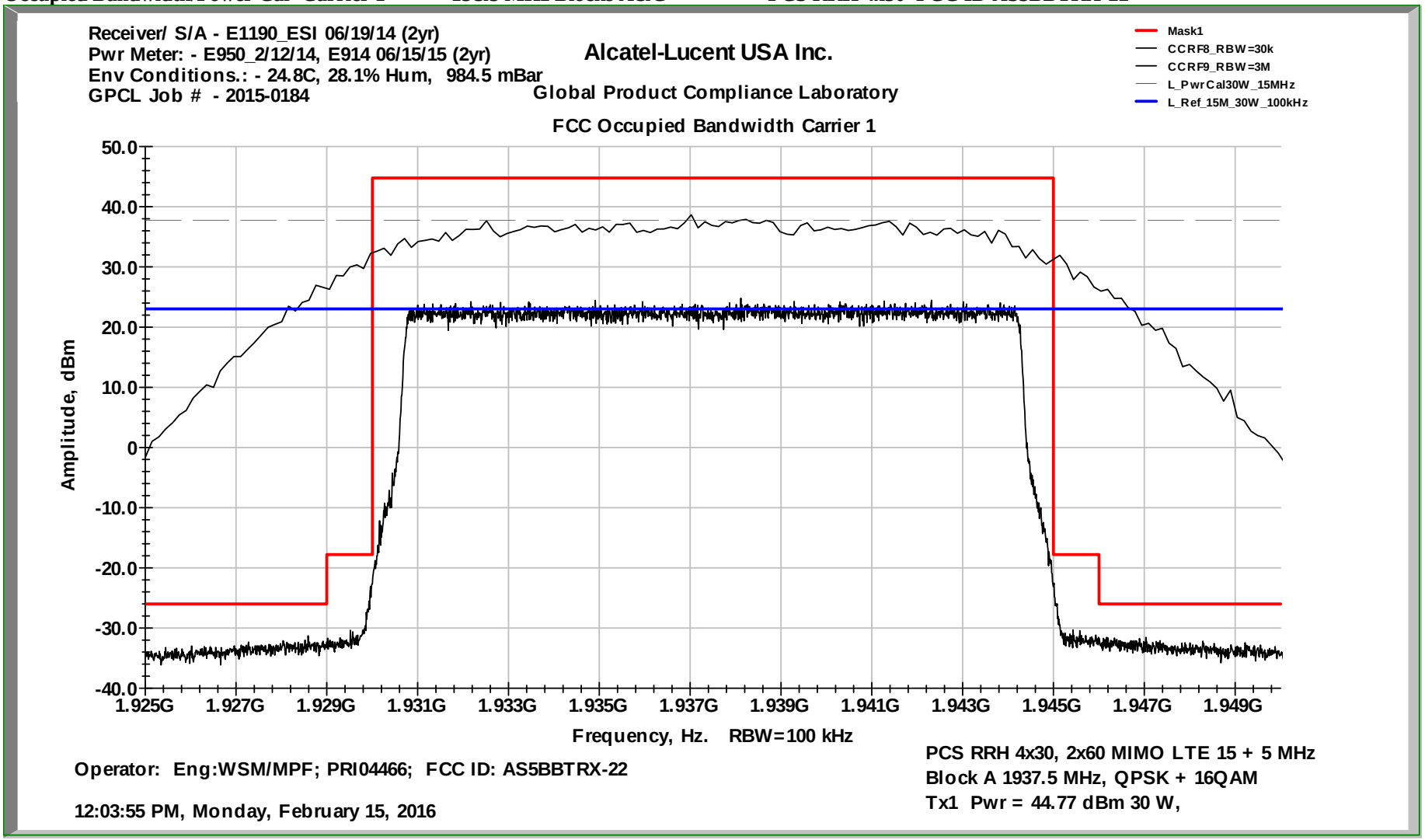
OBW Carrier 1 - Right Edge of Block **5&10 MHz Blocks A&C** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



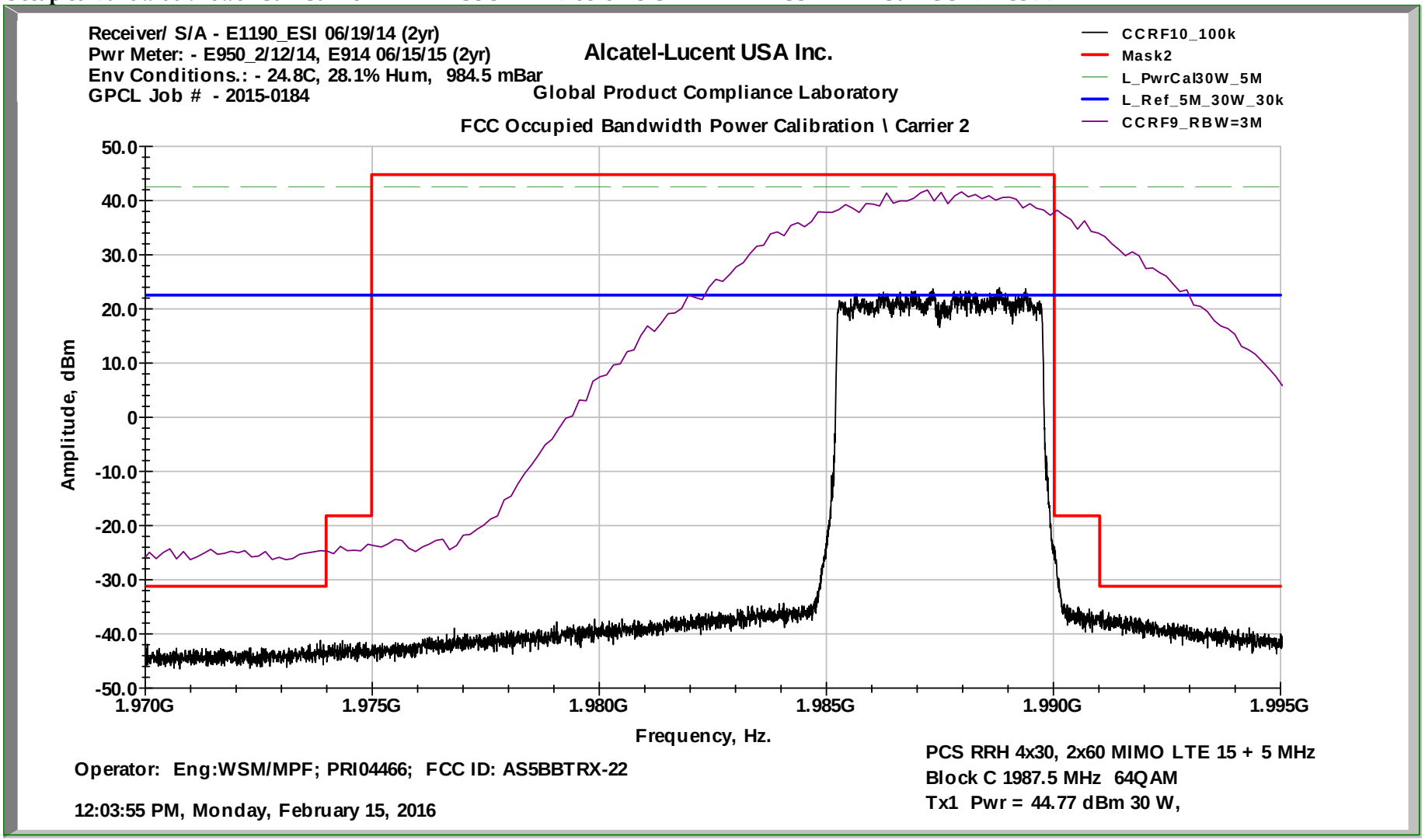
OBW Carrier 2 - Left Edge of Block **5&10 MHz Blocks A&C** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



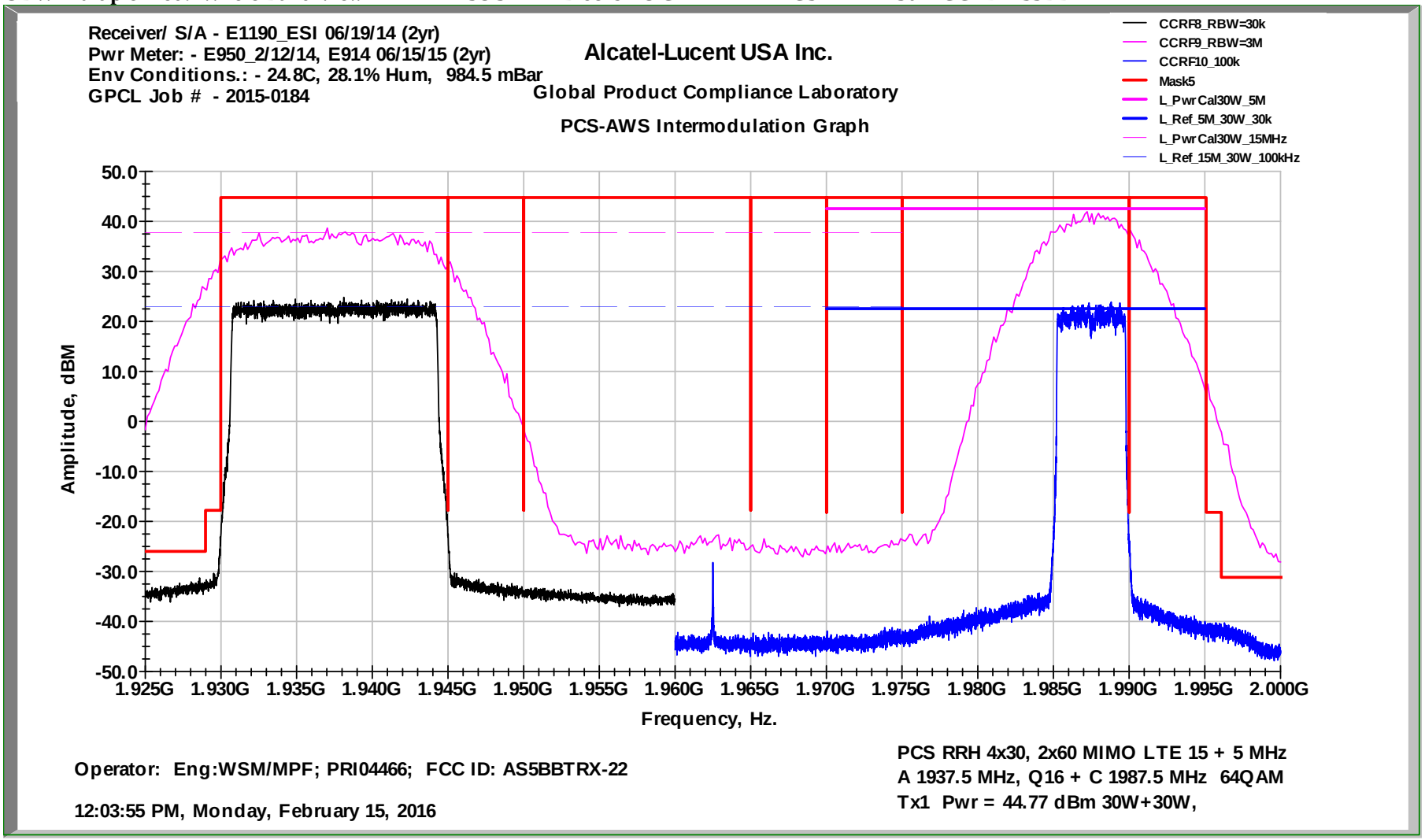
Dual Carrier #7
Occupied Bandwidth/Power Cal -Carrier 1 15&5 MHz Blocks A&C PCS RRH 4x30 FCC ID AS5BBTRX-22



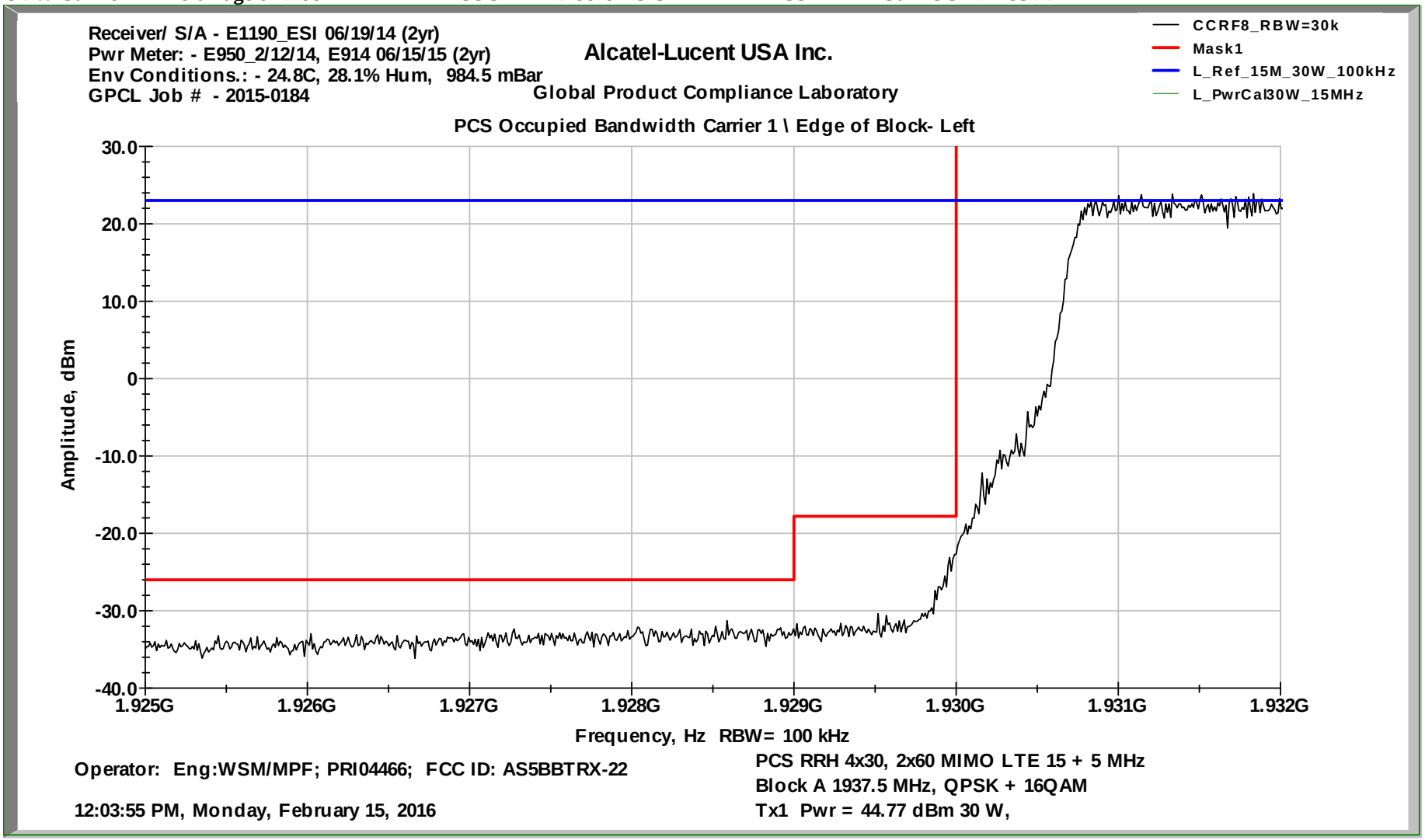
Occupied Bandwidth/Power Cal -Carrier 1 15&5 MHz Blocks A&C PCS RRH 4x30 FCC ID AS5BBTRX-22



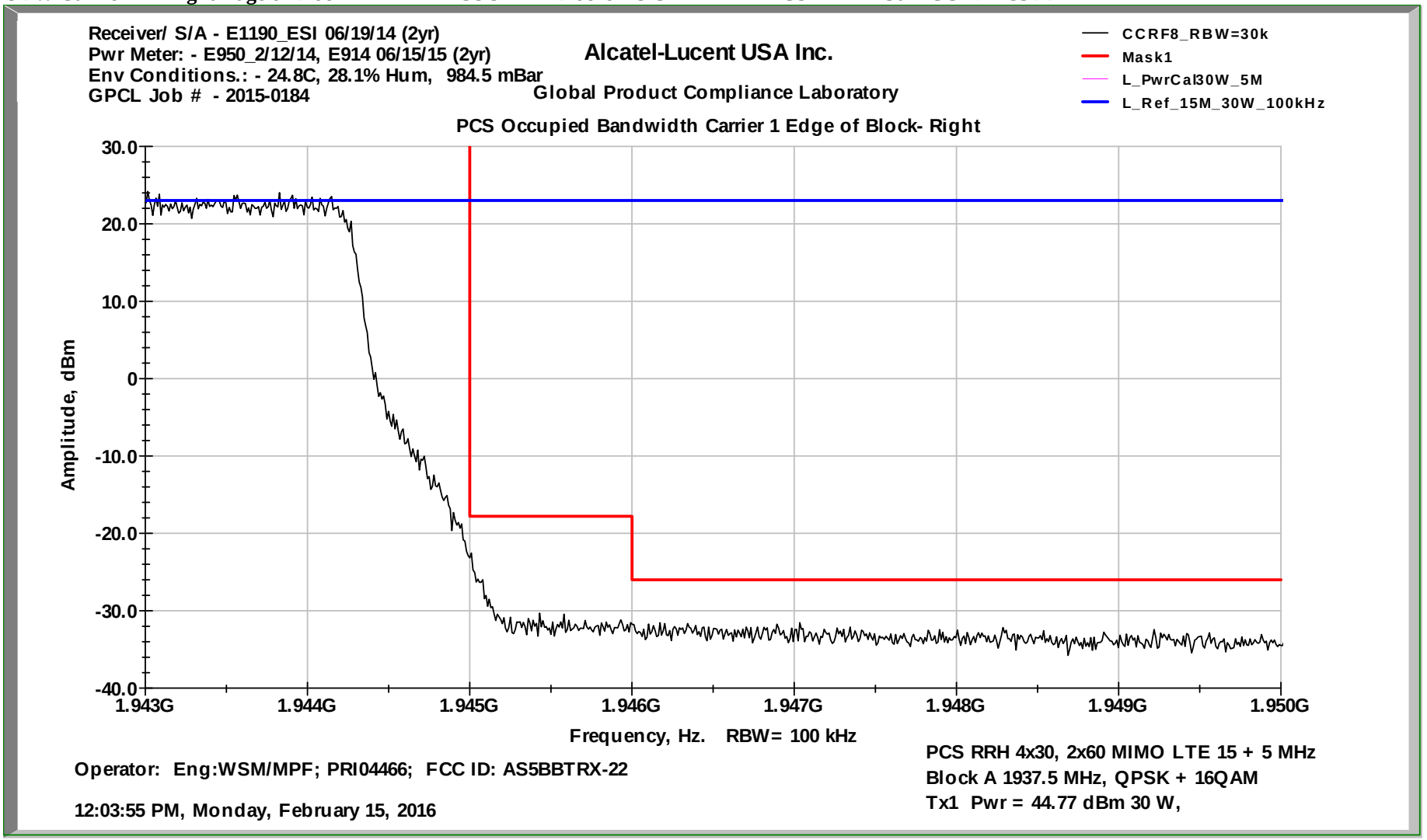
OBW Multiple Mod. Whole Band View 15&5 MHz Blocks A&C PCS RRH 4x30 FCC ID AS5BBTRX-22



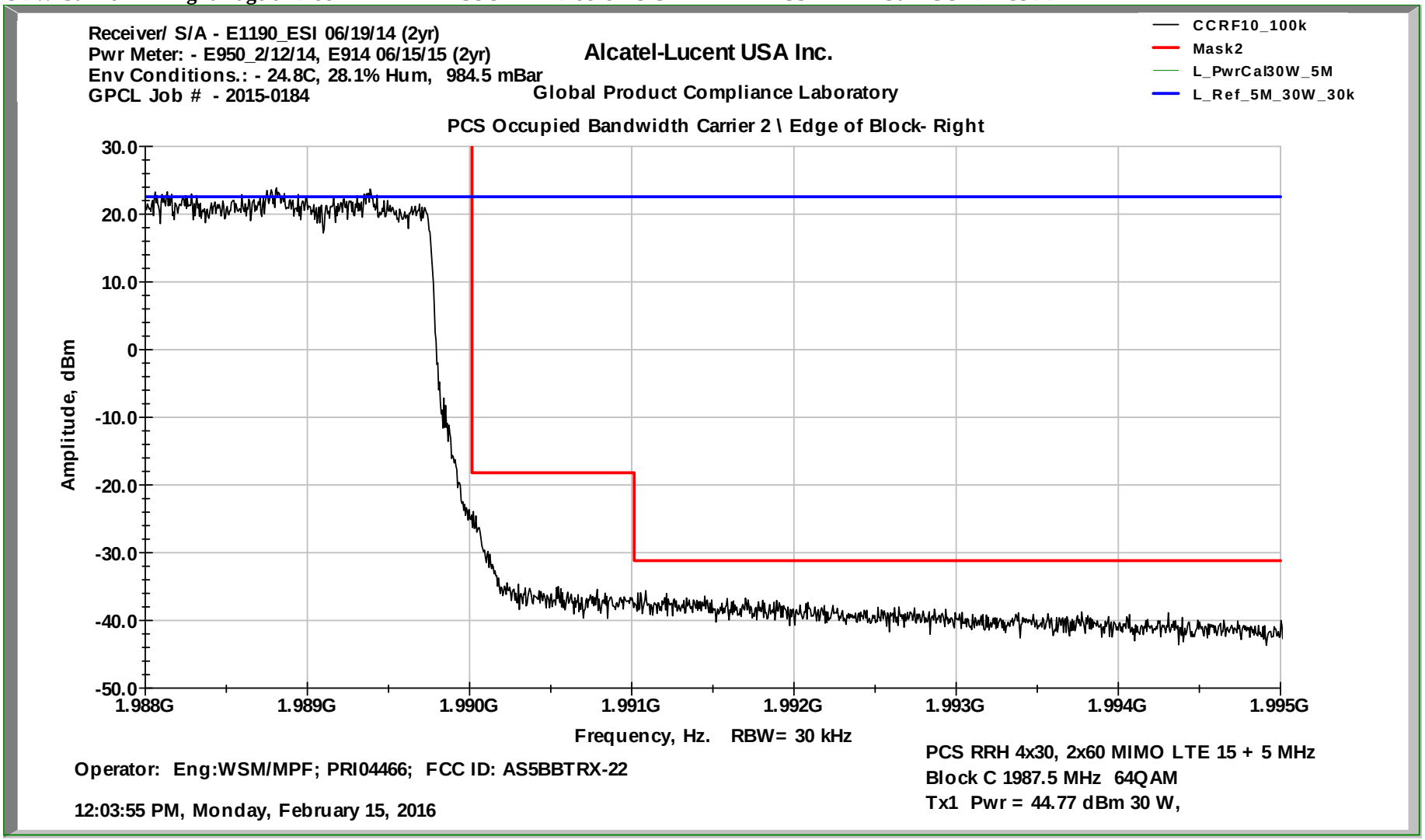
OBW Carrier 1 - Left Edge of Block **15&5 MHz Blocks A&C** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



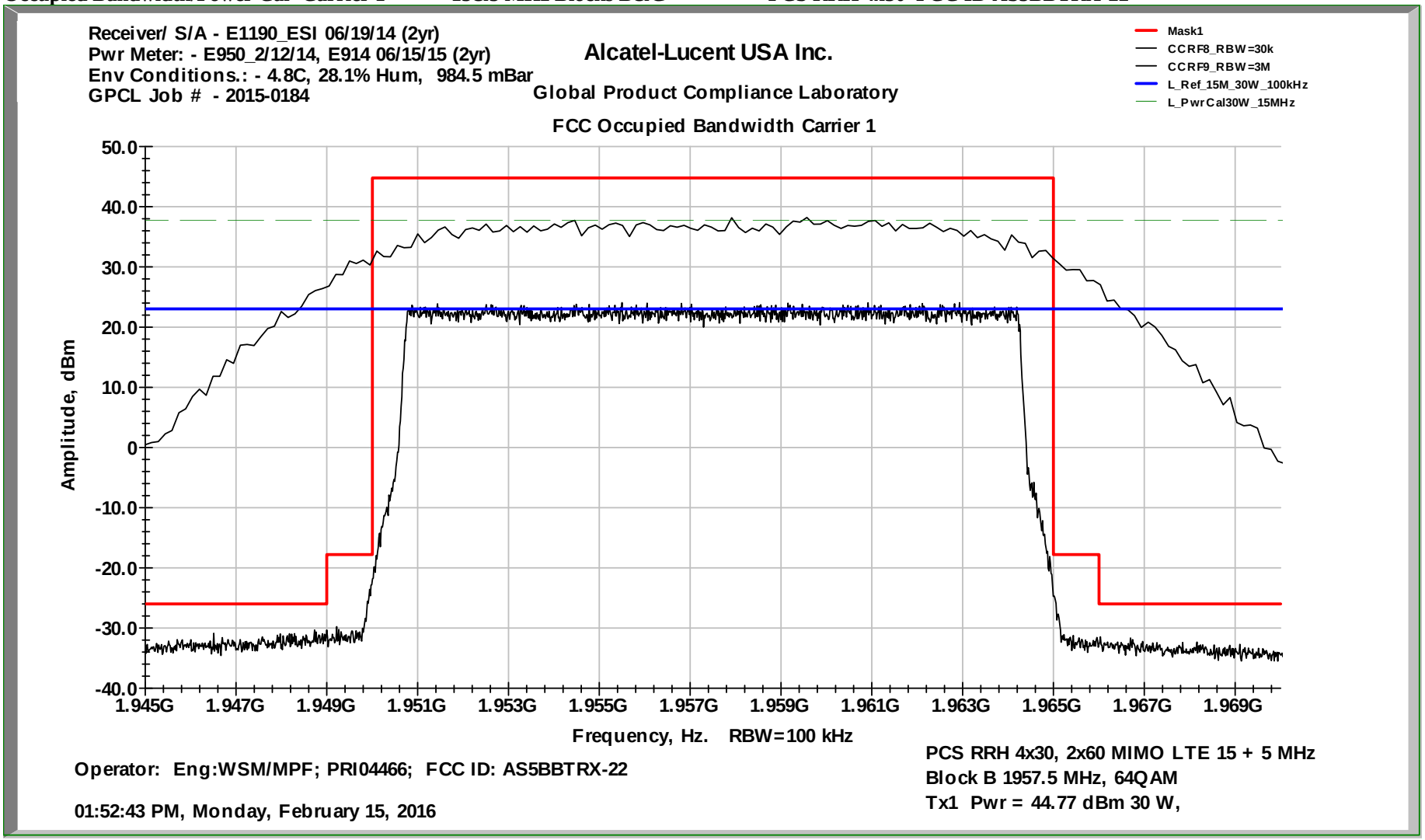
OBW Carrier 1 - Right Edge of Block **15&5 MHz Blocks A&C** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



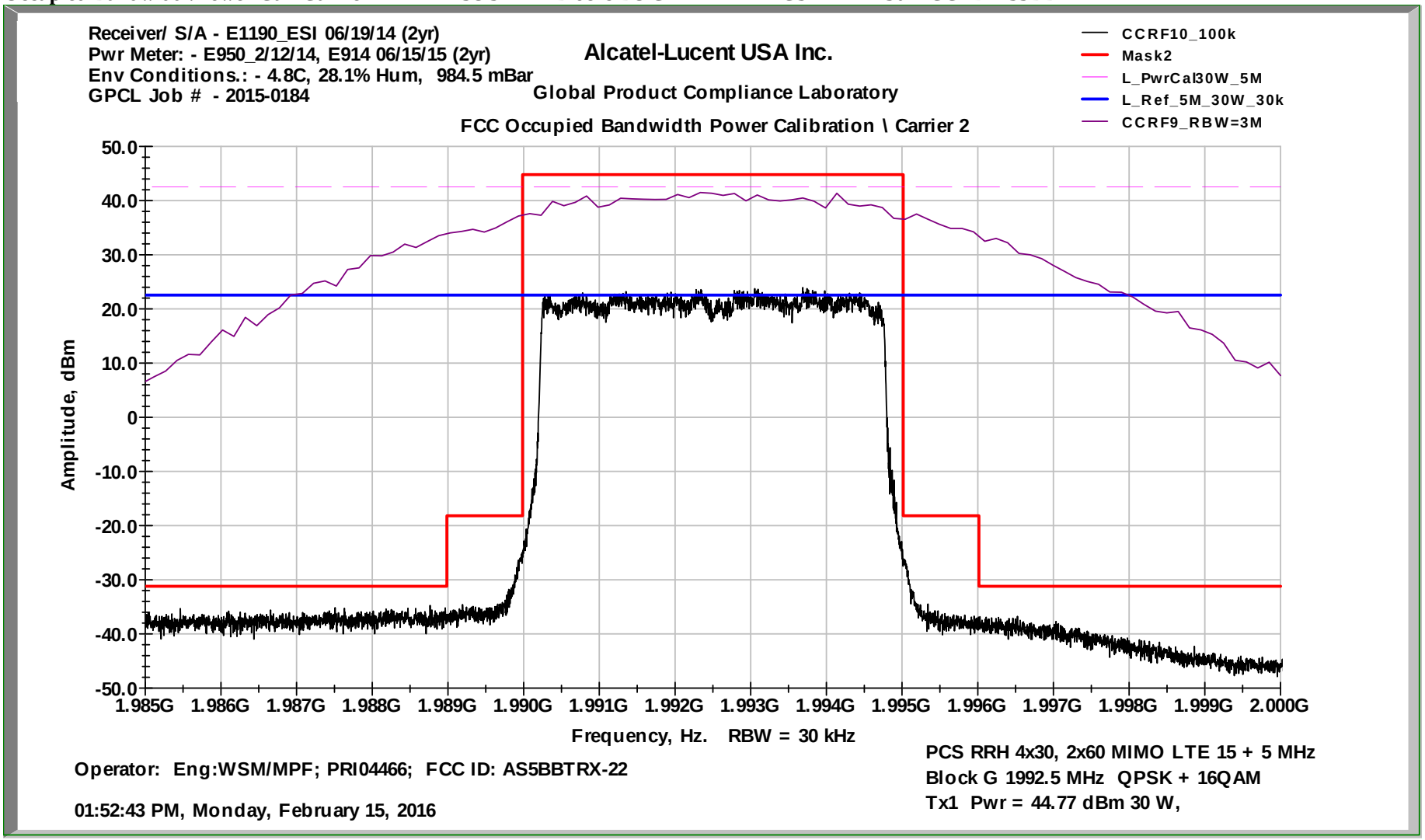
OBW Carrier 2 - Right Edge of Block **15&5 MHz Blocks A&C** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



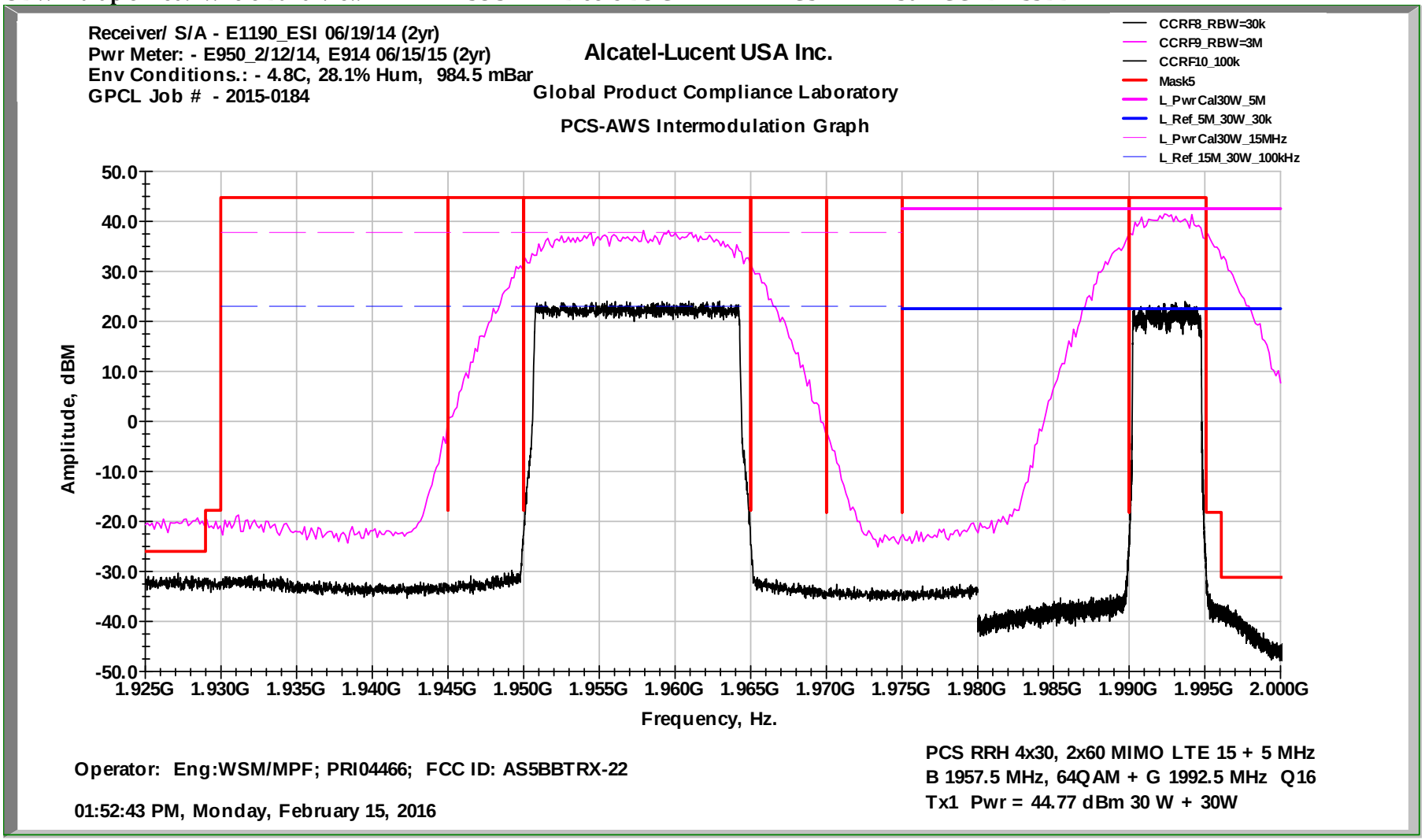
Dual Carrier #8
Occupied Bandwidth/Power Cal -Carrier 1 15&5 MHz Blocks B&G PCS RRH 4x30 FCC ID AS5BBTRX-22



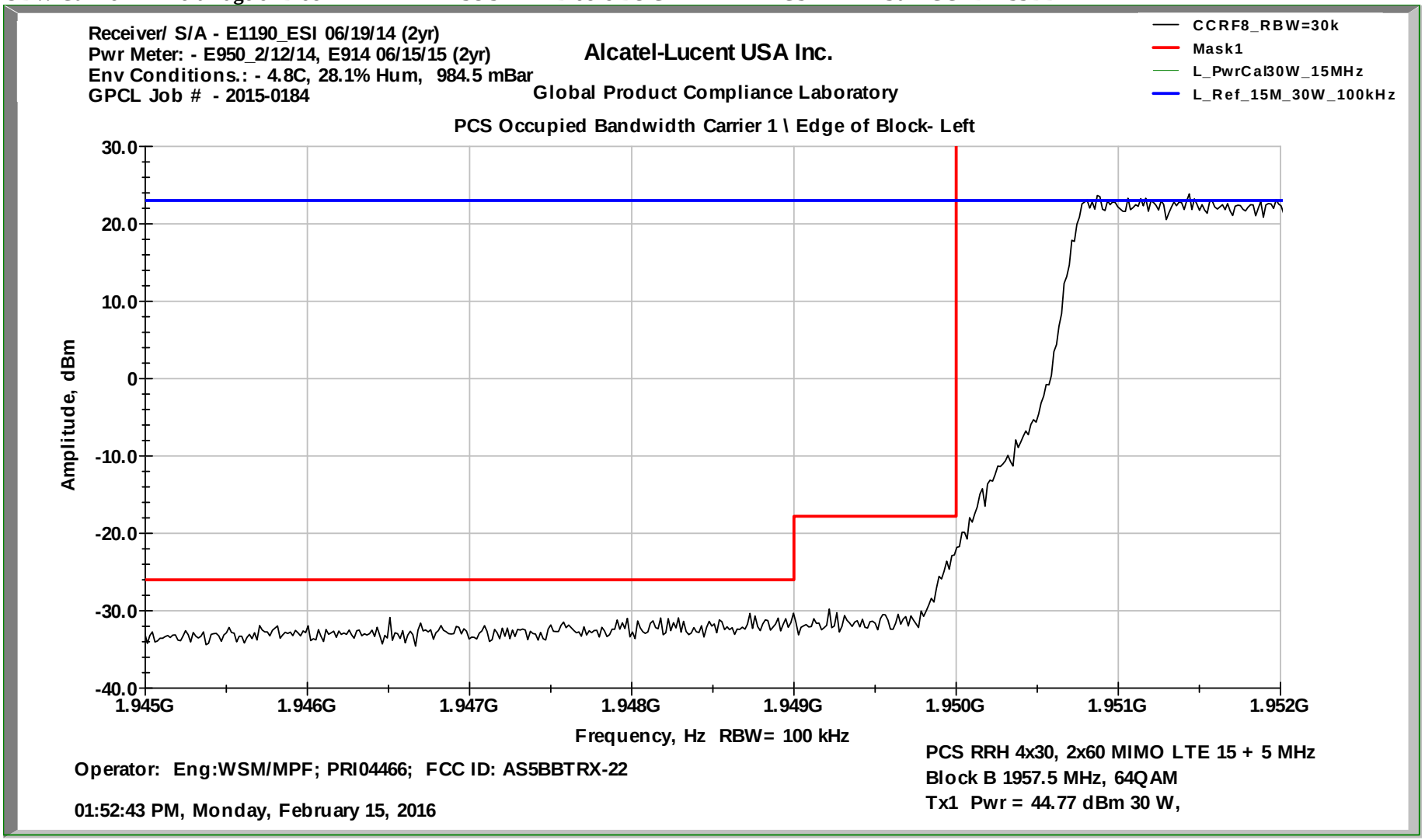
Occupied Bandwidth/Power Cal -Carrier 2 15&5 MHz Blocks B&G PCS RRH 4x30 FCC ID AS5BBTRX-22



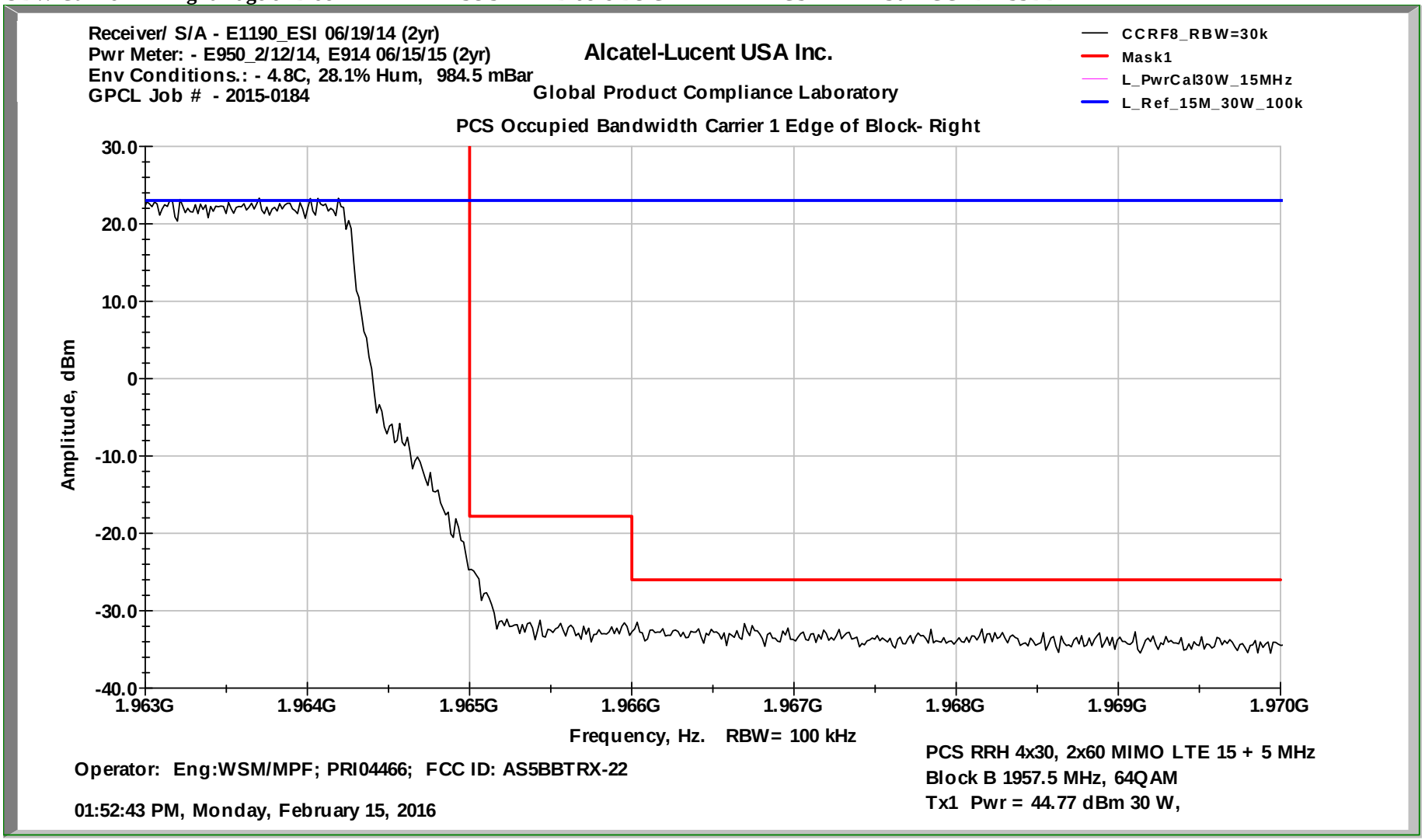
OBW Multiple Mod. Whole Band View **15&5 MHz Blocks B&G** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



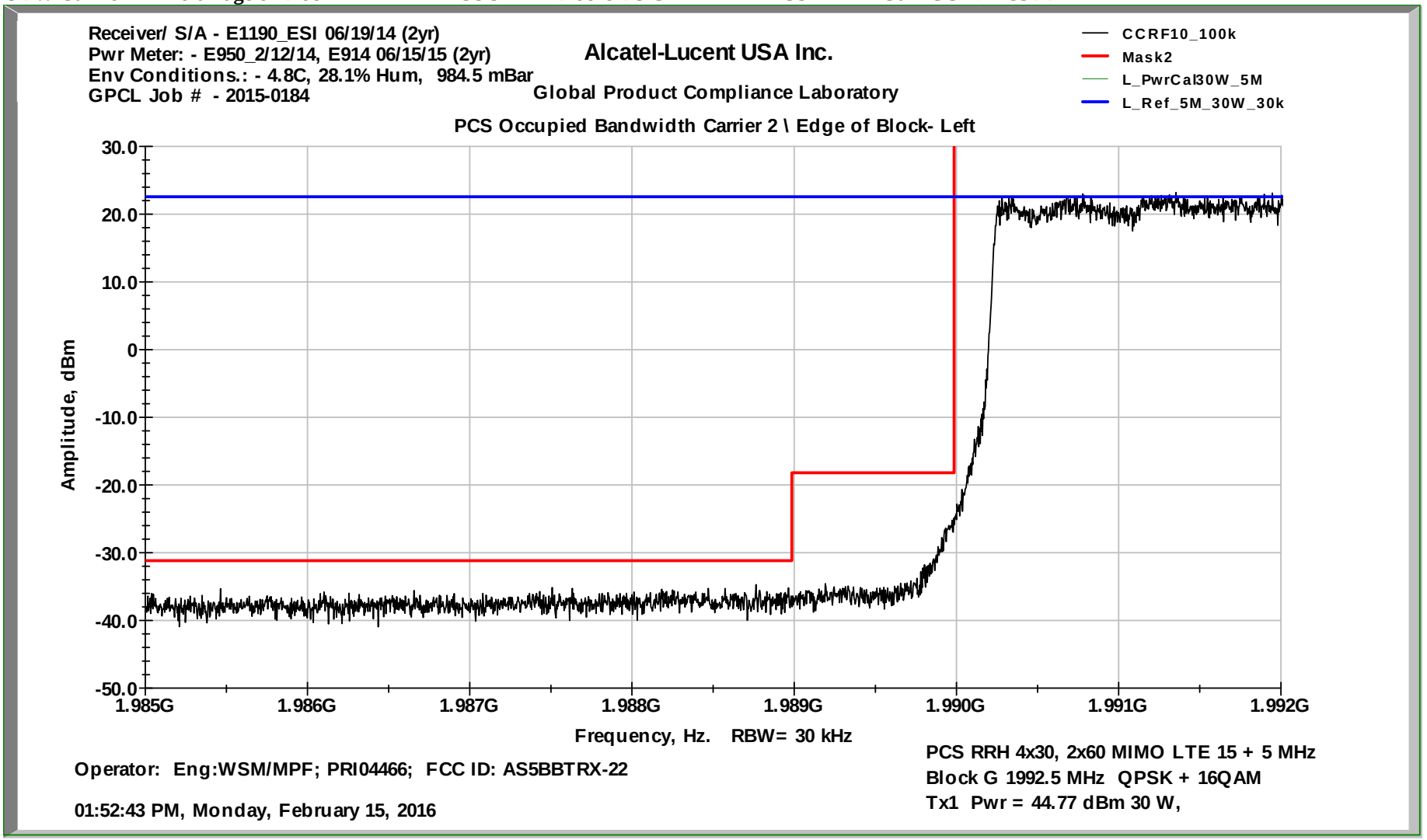
OBW Carrier 1 - Left Edge of Block 15&5 MHz Blocks B&G PCS RRH 4x30 FCC ID AS5BBTRX-22



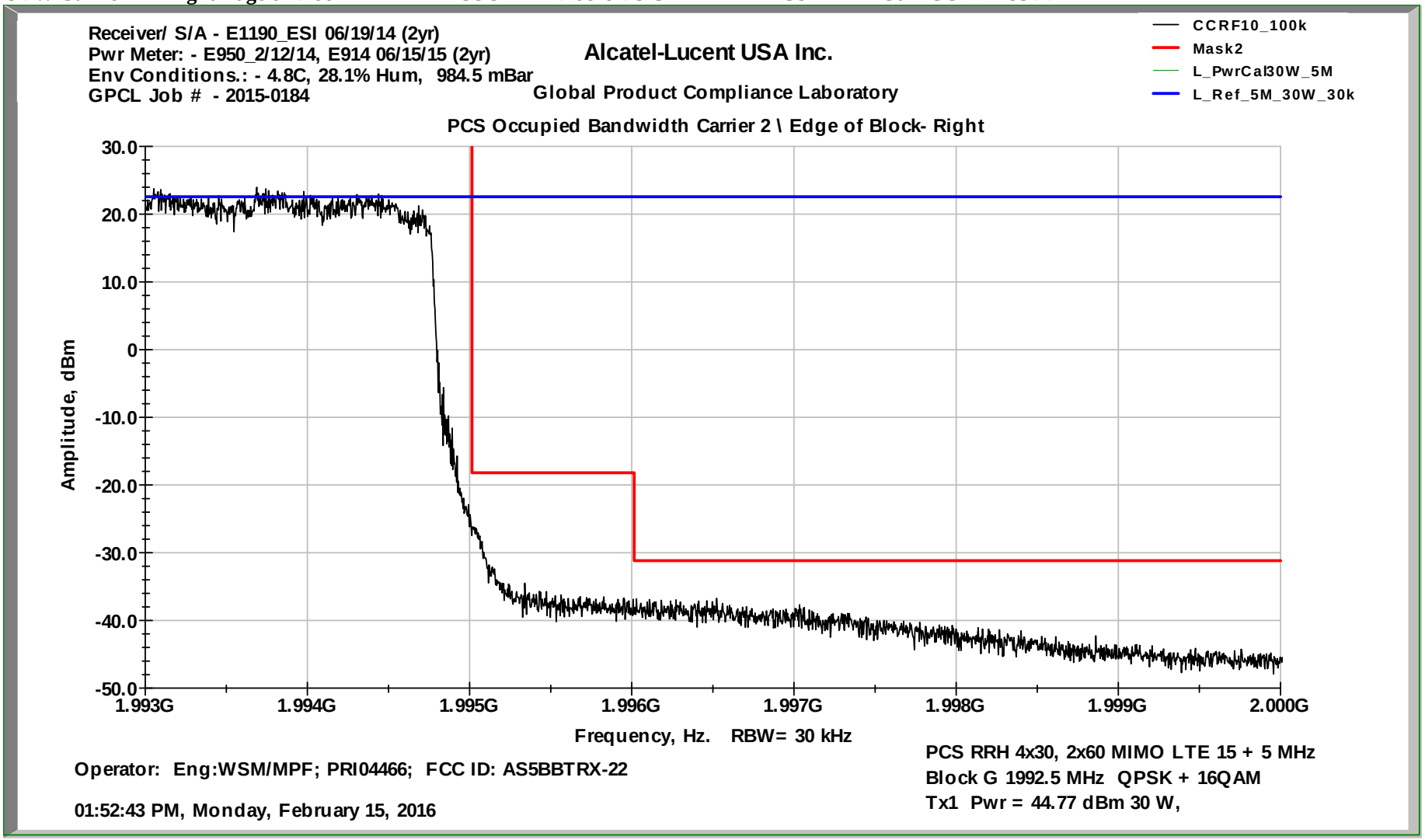
OBW Carrier 1 - Right Edge of Block **15&5 MHz Blocks B&G** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



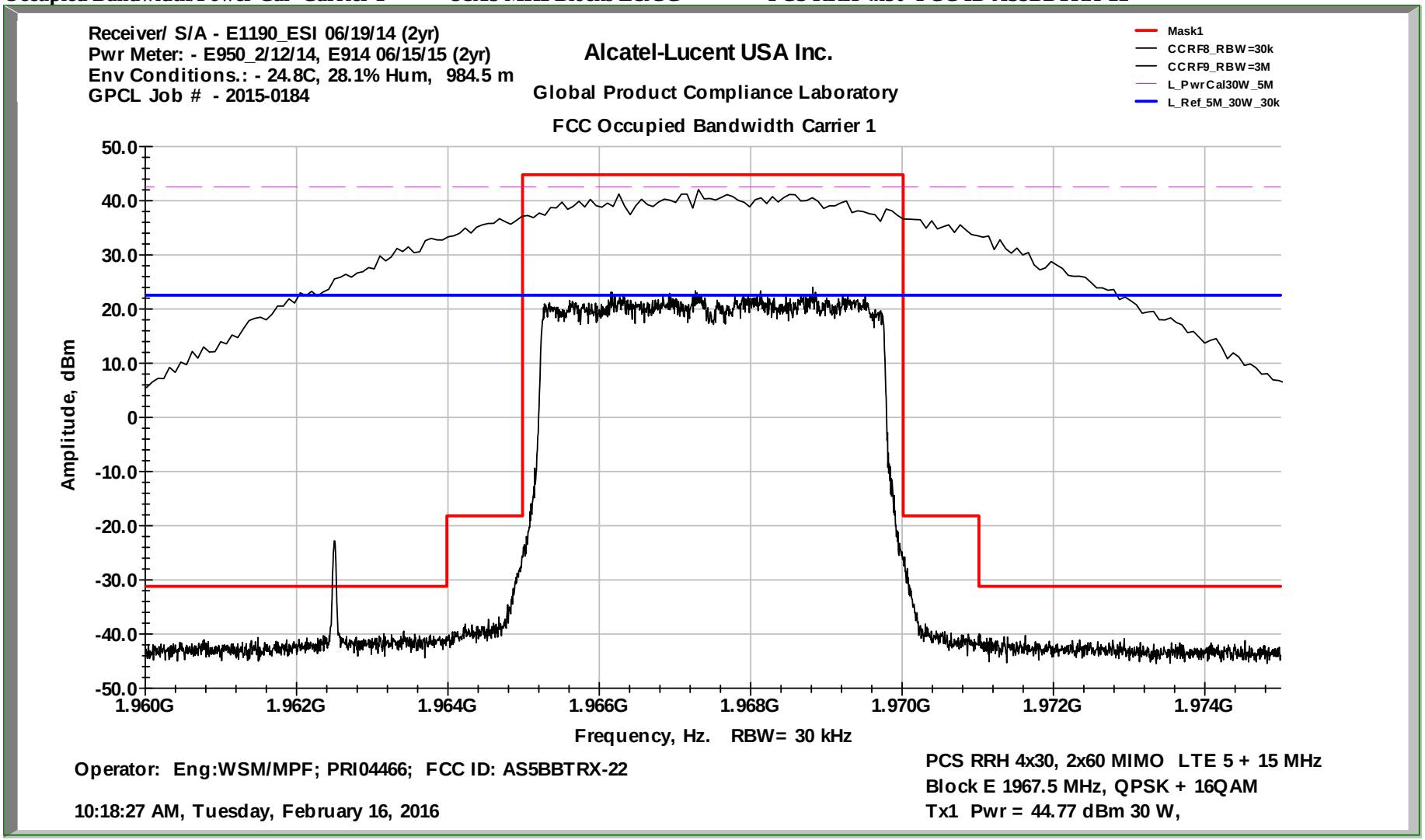
OBW Carrier 2 - Left Edge of Block **15&5 MHz Blocks B&G** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



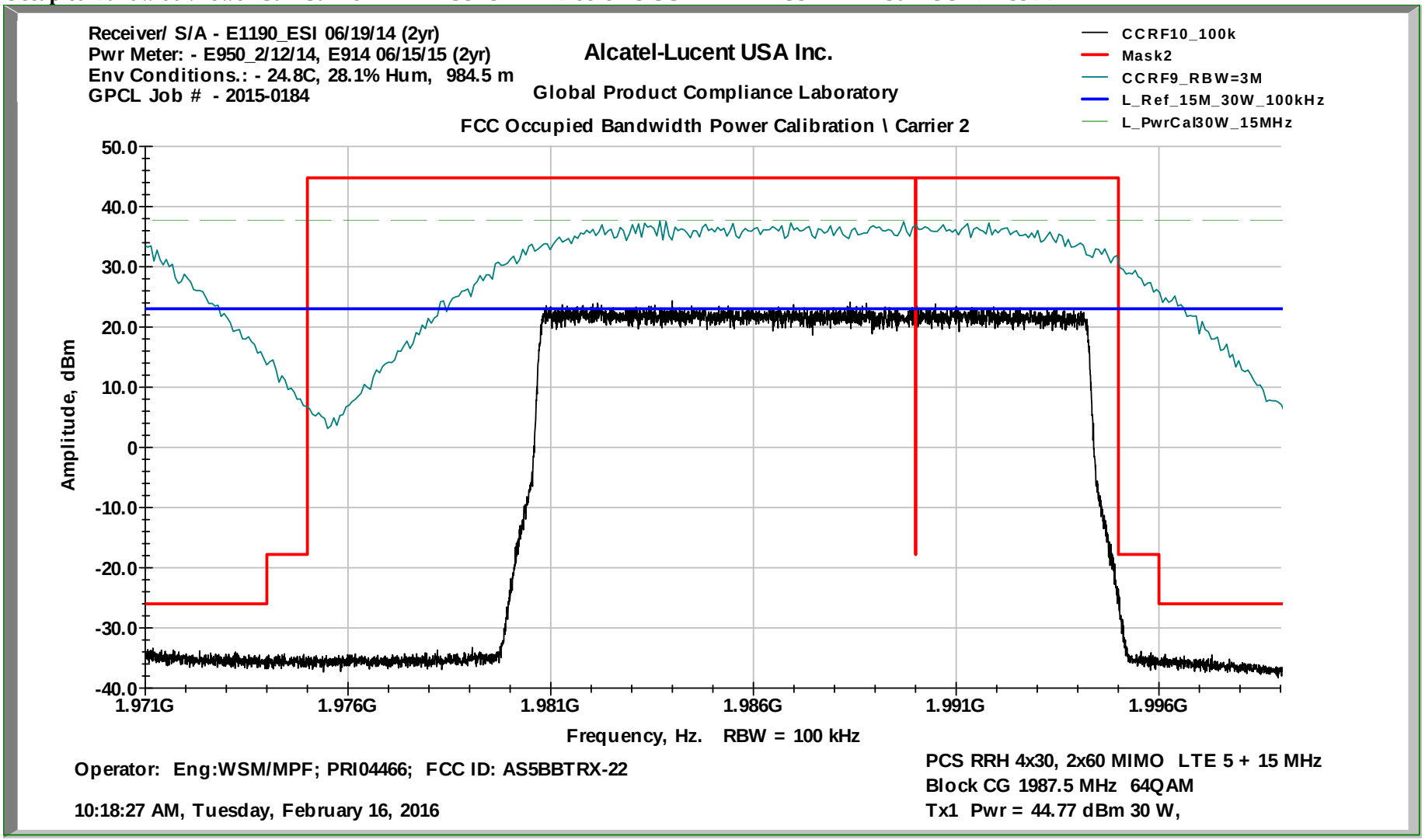
OBW Carrier 2 - Right Edge of Block **15&5 MHz Blocks B&G** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



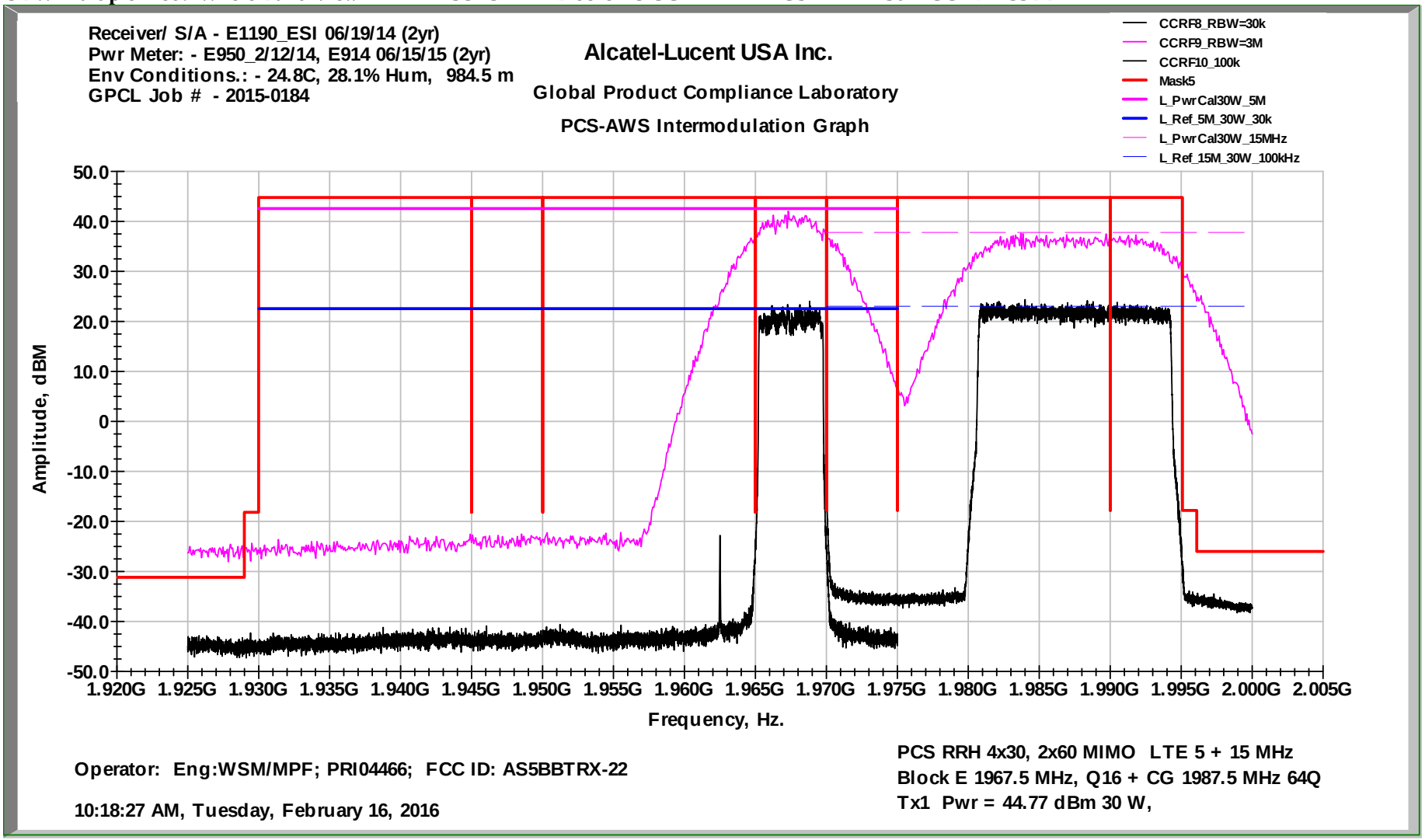
Dual Carrier #9
Occupied Bandwidth/Power Cal -Carrier 1 5&15 MHz Blocks E&CG PCS RRH 4x30 FCC ID AS5BBTRX-22



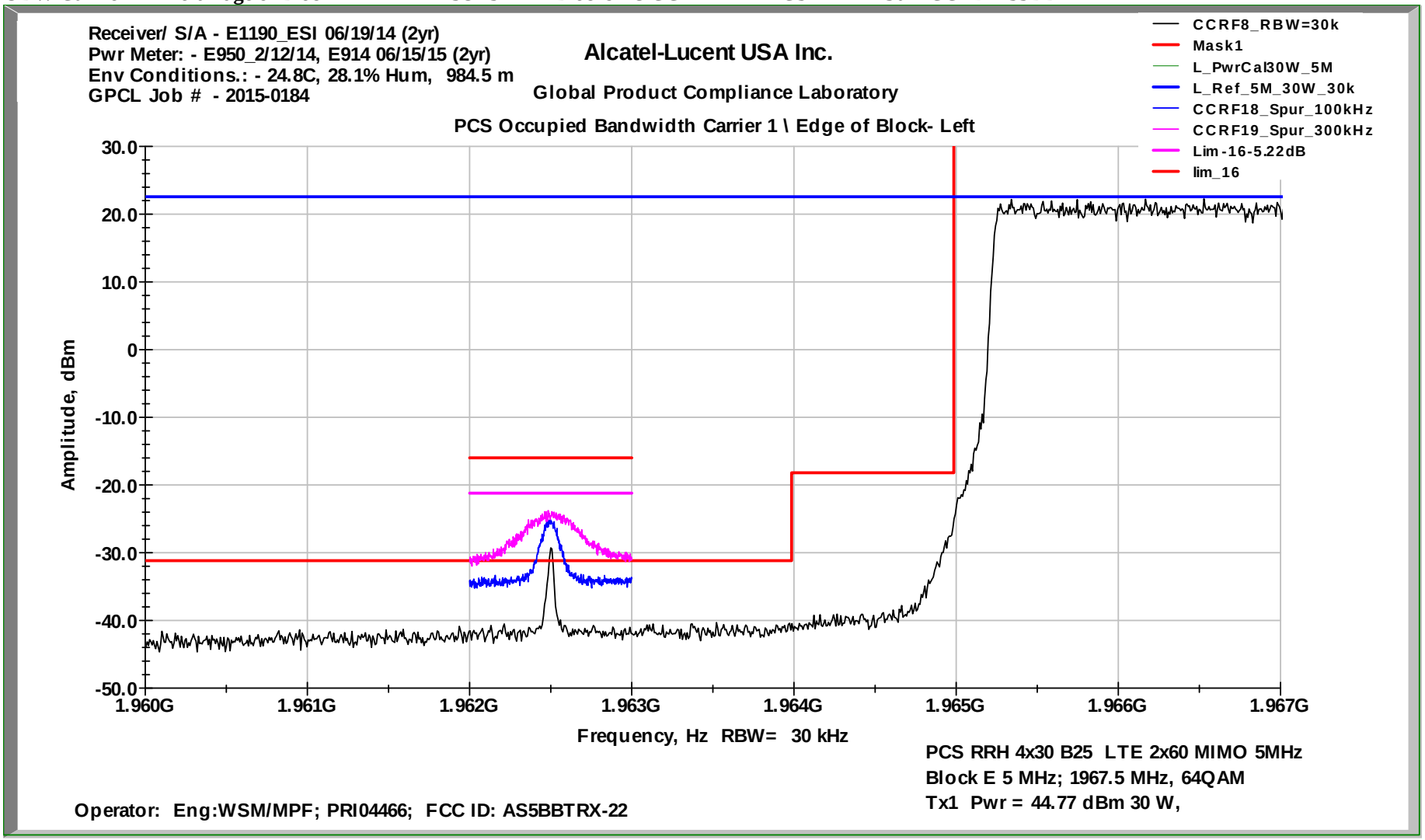
Occupied Bandwidth/Power Cal -Carrier 2 5&15 MHz Blocks E&CG PCS RRH 4x30 FCC ID AS5BBTRX-22



OBW Multiple Mod. Whole Band View 5&15 MHz Blocks E&CG PCS RRH 4x30 FCC ID AS5BBTRX-22

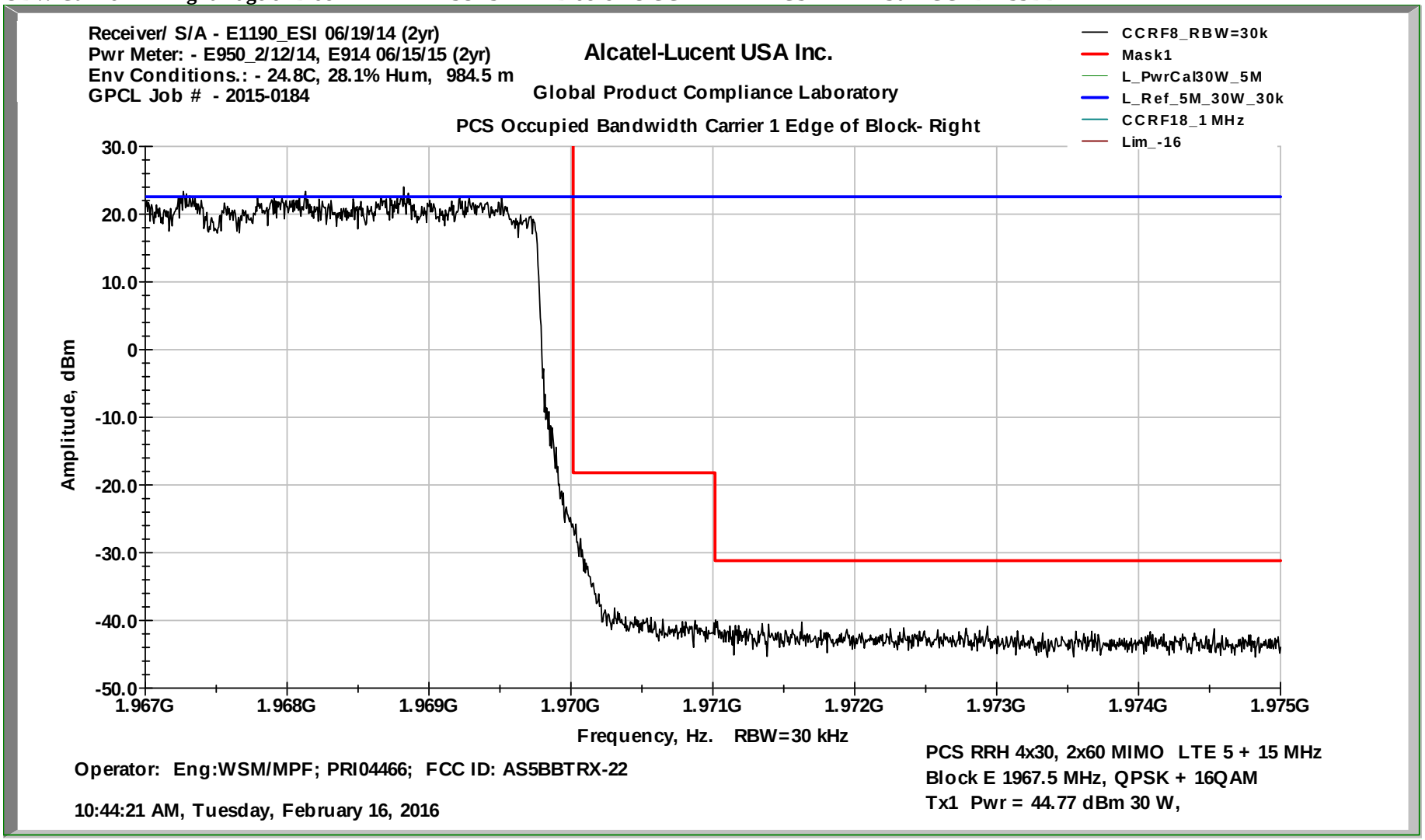


OBW Carrier 1 - Left Edge of Block **5&15 MHz Blocks E&CG** **PCS RRH 4x30 FCC ID AS5BBTRX-22**

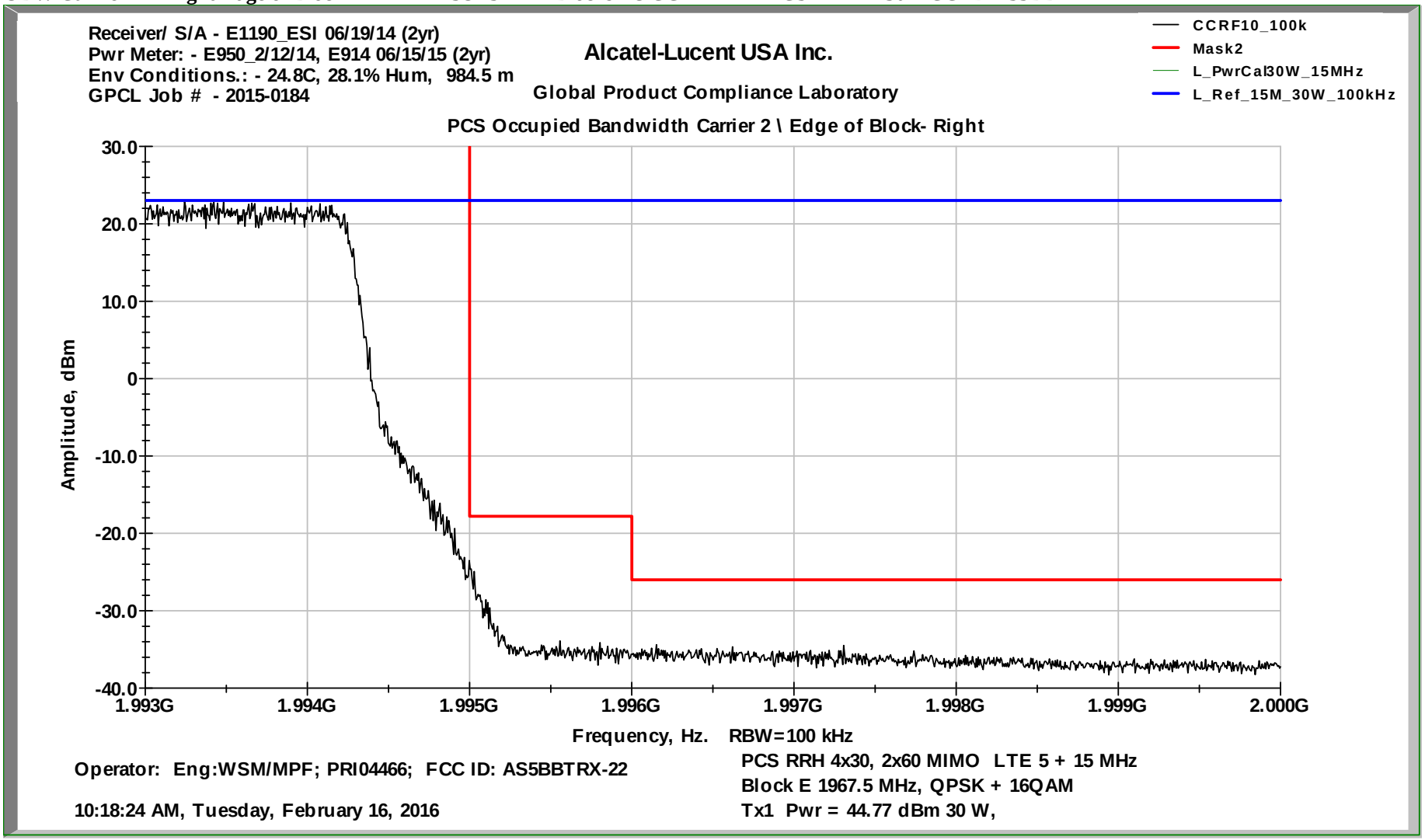


The Local Oscillator Spur is shown above as measured with 30 kHz, 100 kHz and 300 kHz RBW. The spur is clearly a narrowband signal as compared with the transmit carrier. The -16 dBm 2xMIMO limit is displayed(in red) as is -16dBm -5.22 dB which is the bandwidth adjustment for 1 MHz to 300 kHz. The spur is clearly compliant with Part 27 requirements for Out of Band emissions. This spur is stationary and does not change frequency with the transmit frequencies.

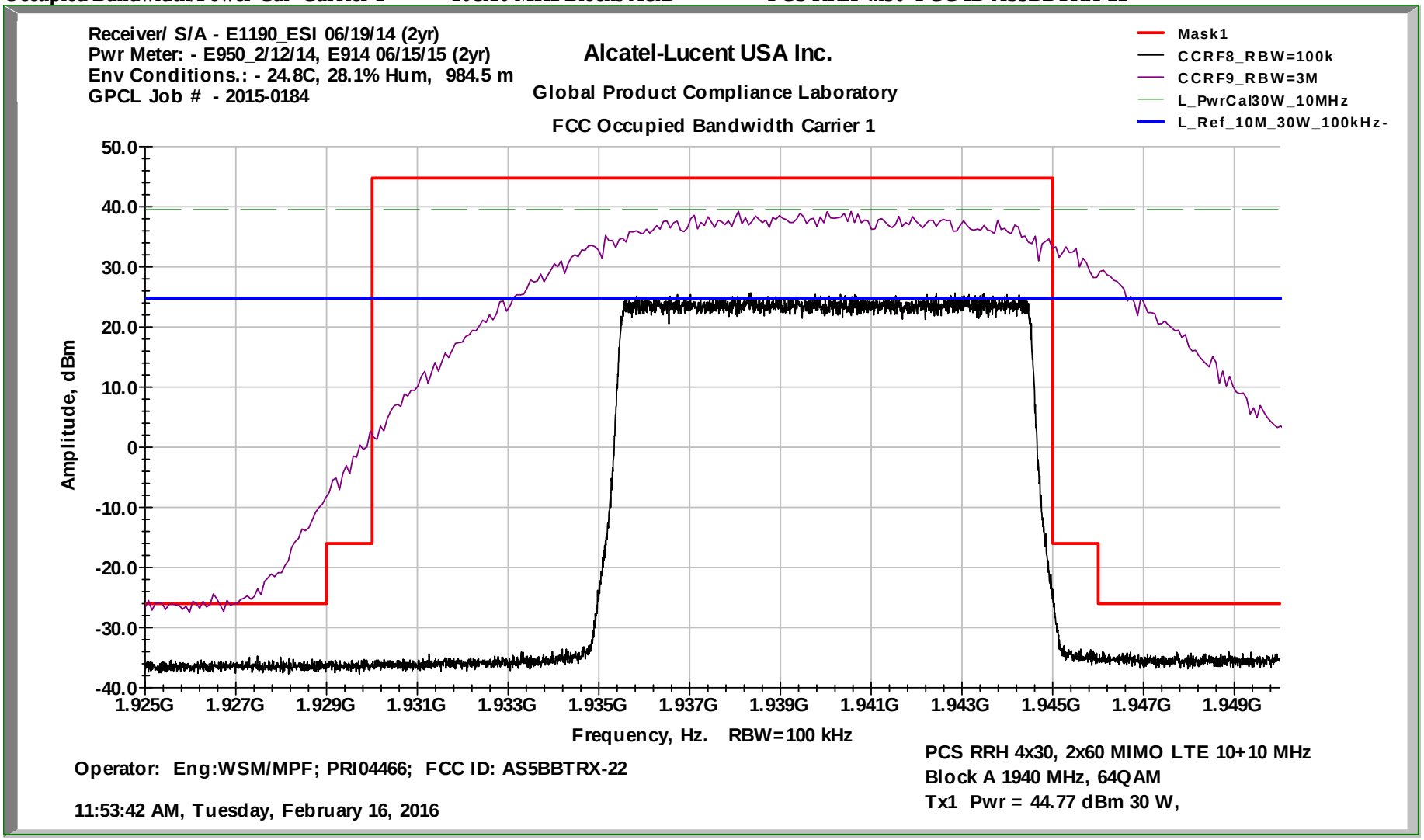
OBW Carrier 1 - Right Edge of Block **5&15 MHz Blocks E&CG** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



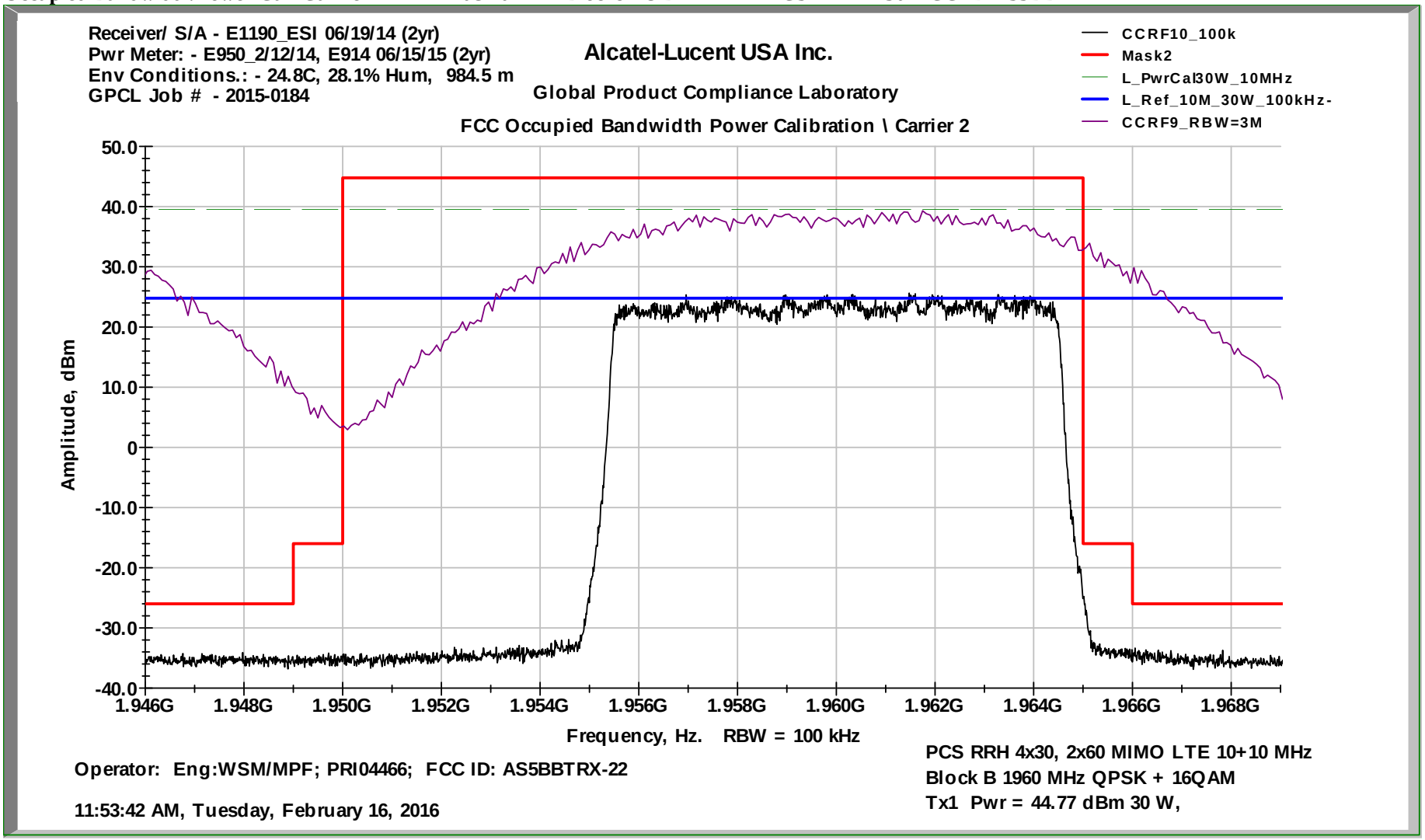
OBW Carrier 2 - Right Edge of Block **5&15 MHz Blocks E&CG** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



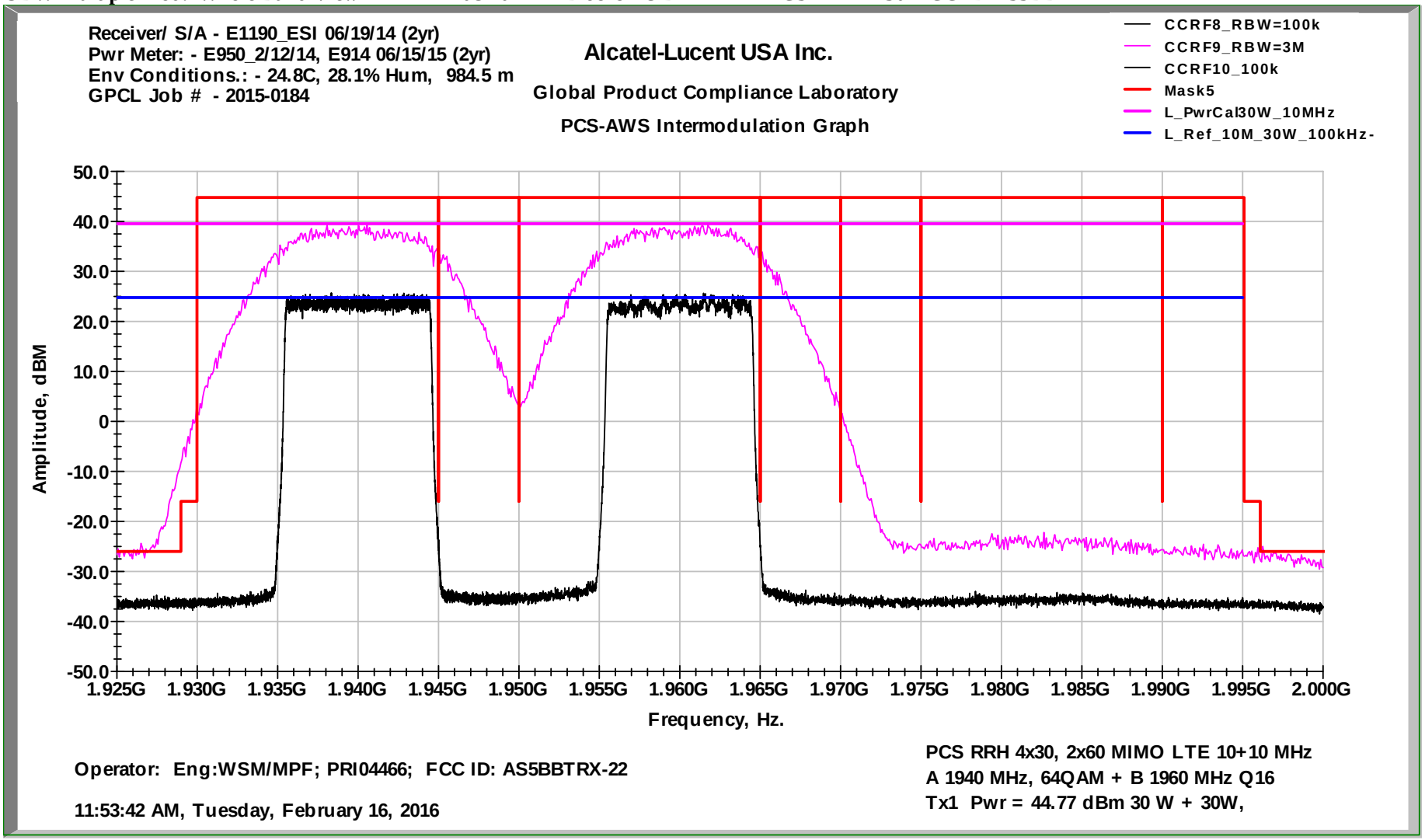
Dual Carrier #10
Occupied Bandwidth/Power Cal -Carrier 1 10&10 MHz Blocks A&B PCS RRH 4x30 FCC ID AS5BBTRX-22



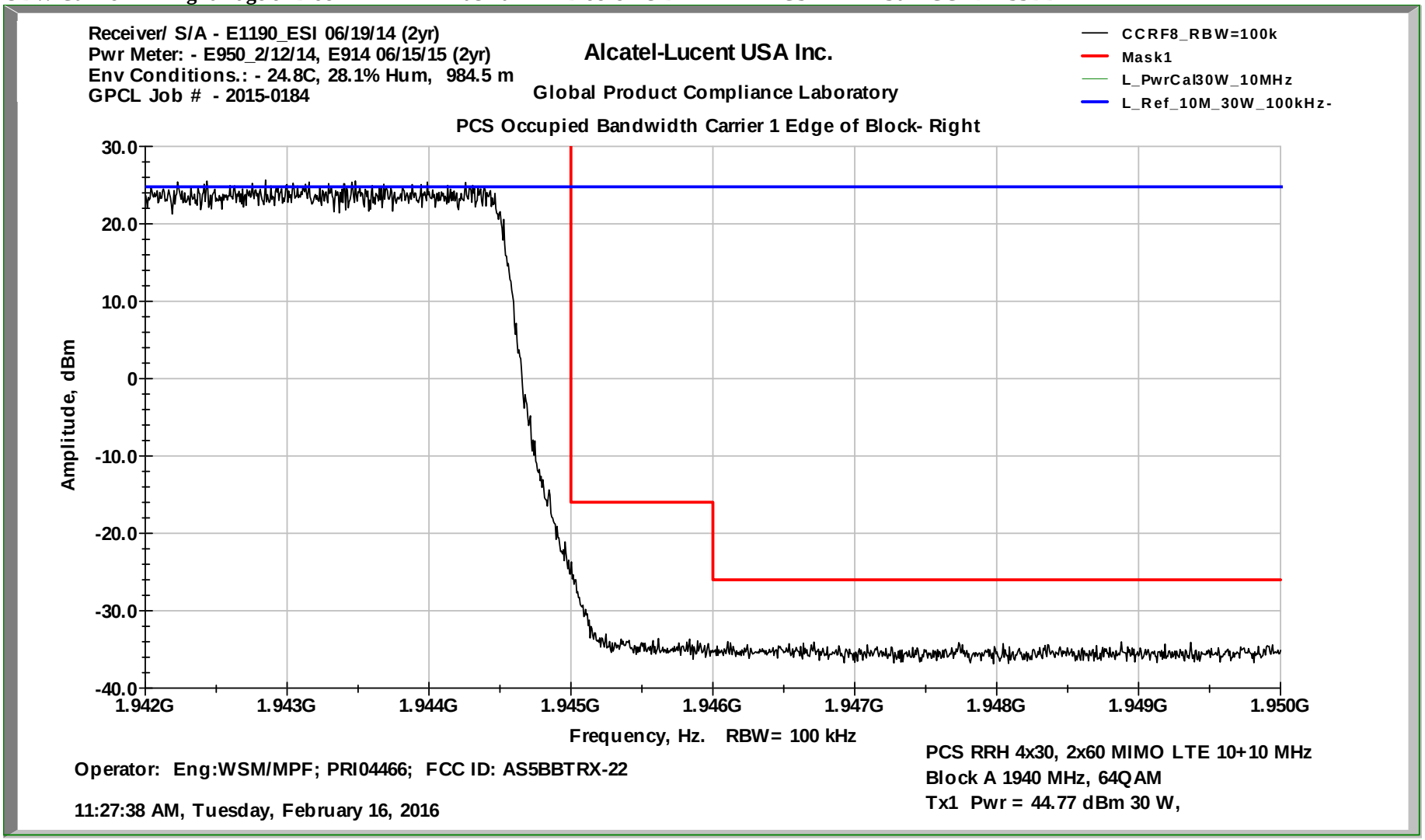
Occupied Bandwidth/Power Cal -Carrier 2 **10&10 MHz Blocks A&B** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



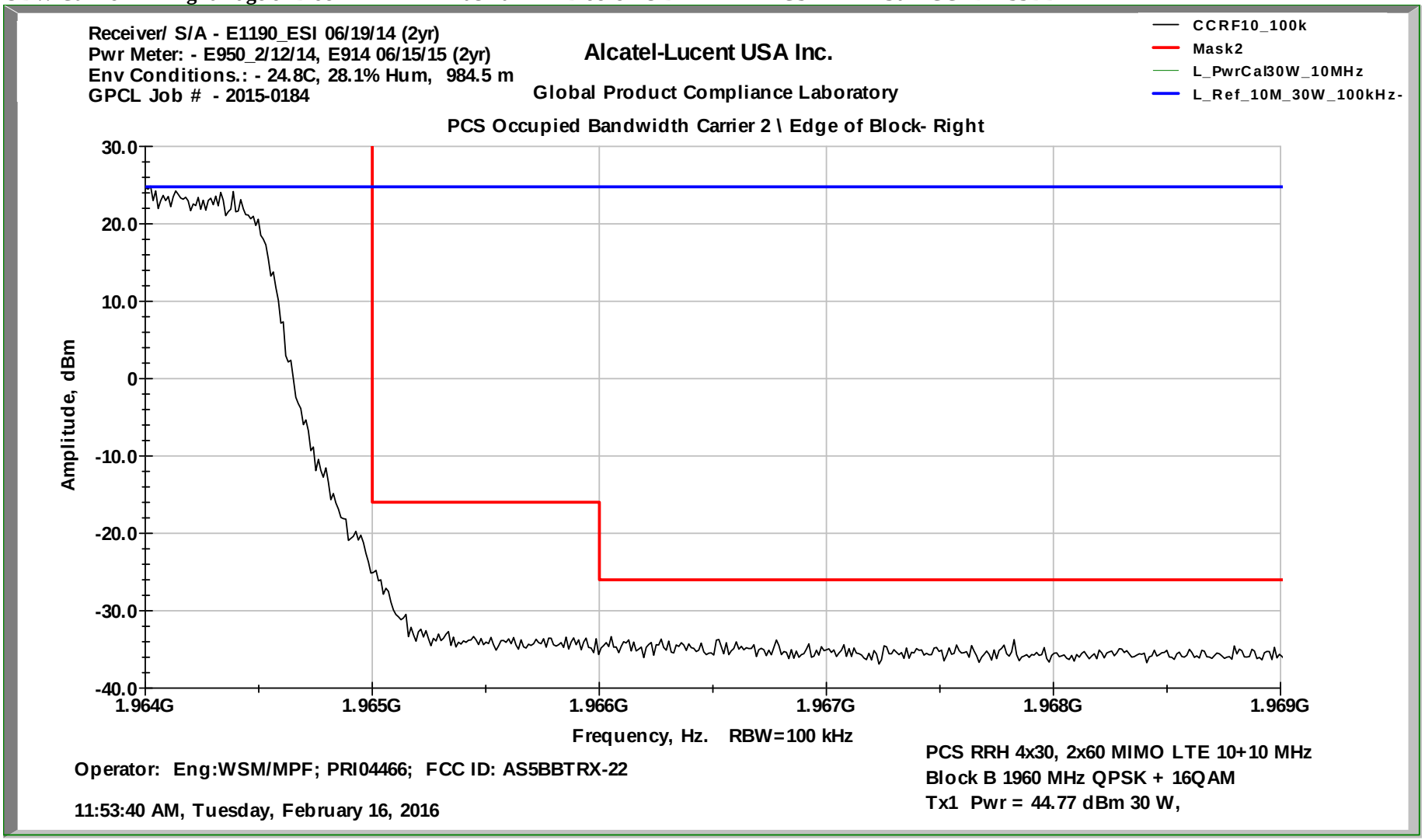
OBW Multiple Mod. Whole Band View **10&10 MHz Blocks A&B** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



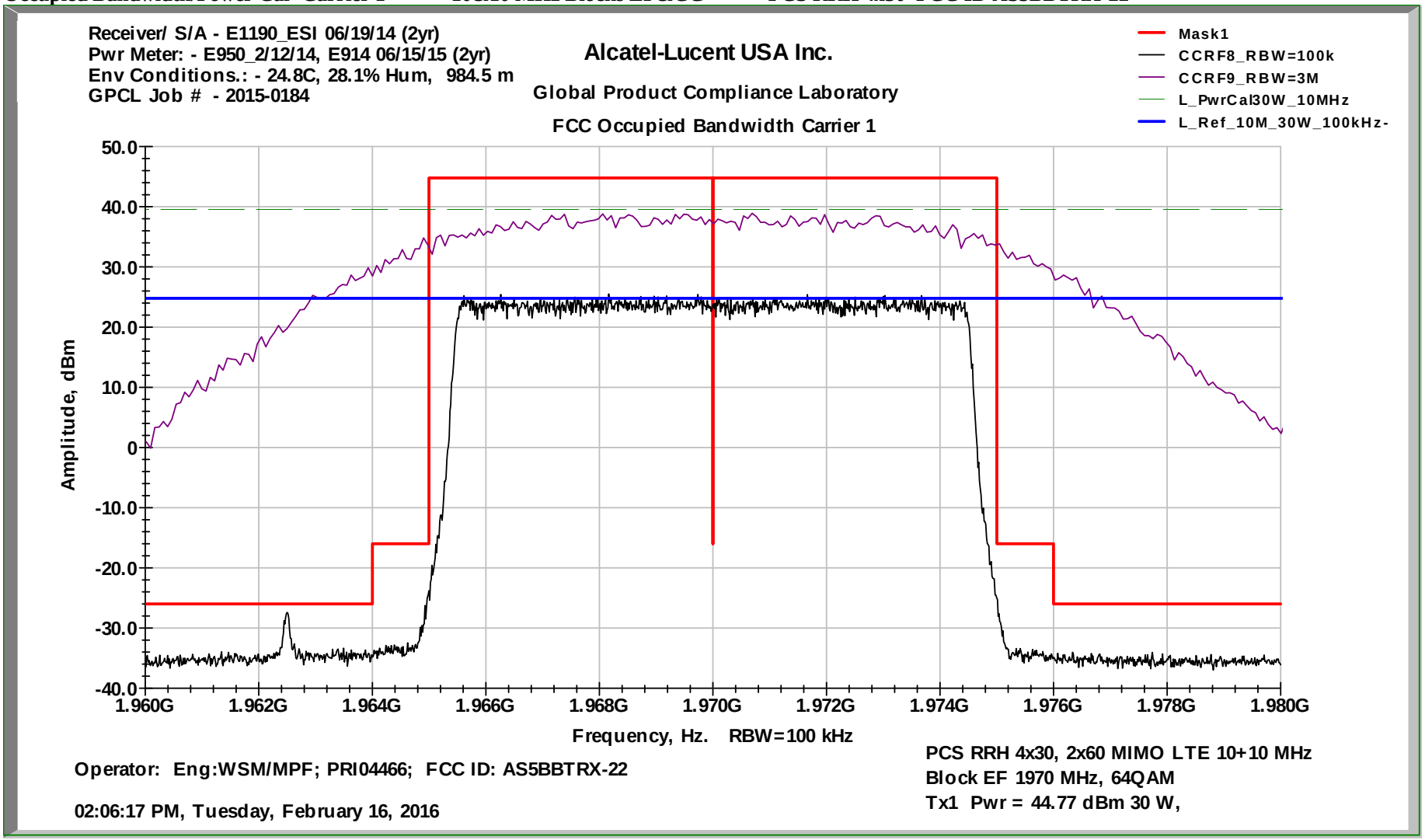
OBW Carrier 1 - Right Edge of Block **10&10 MHz Blocks A&B** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



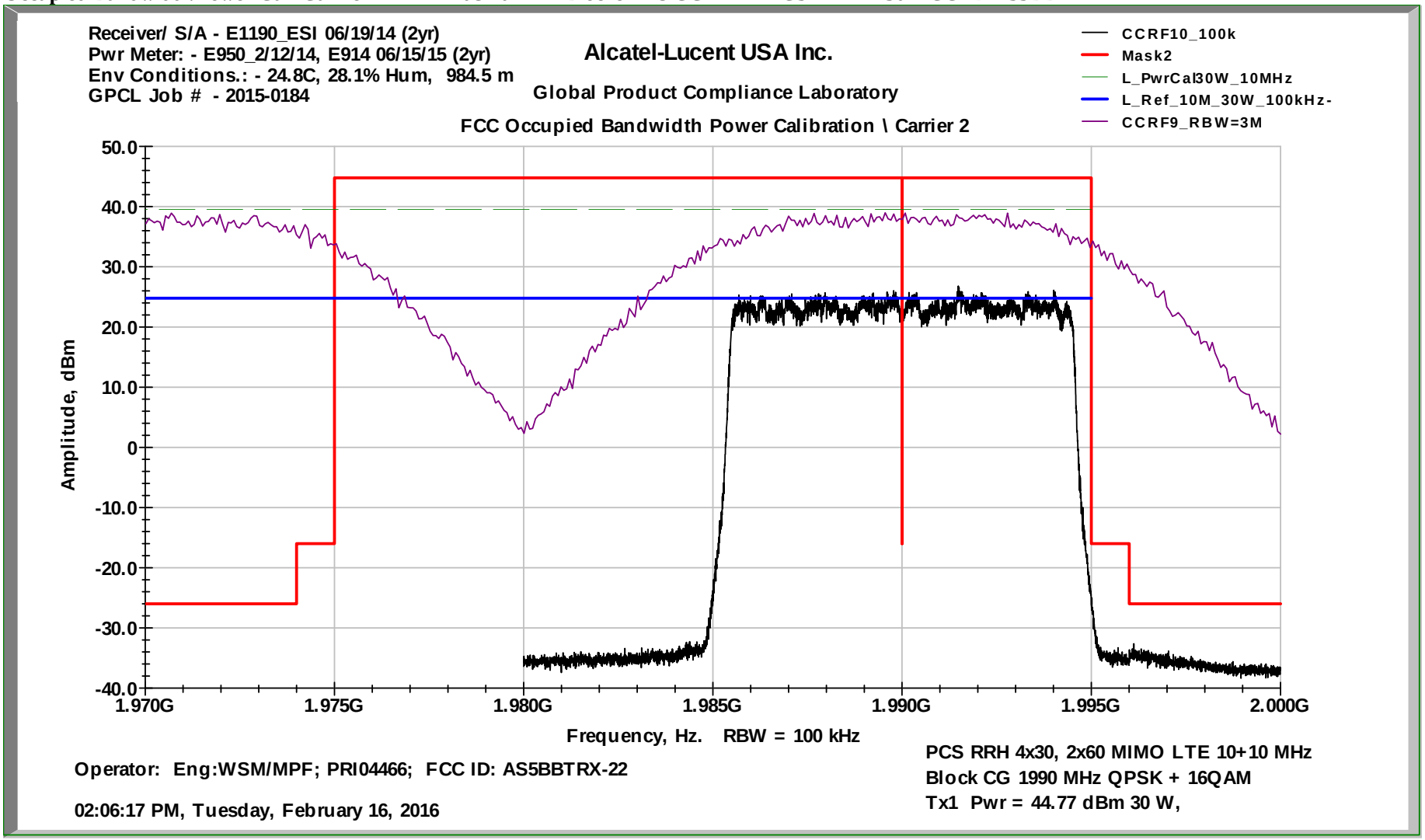
OBW Carrier 2 - Right Edge of Block **10&10 MHz Blocks A&B** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



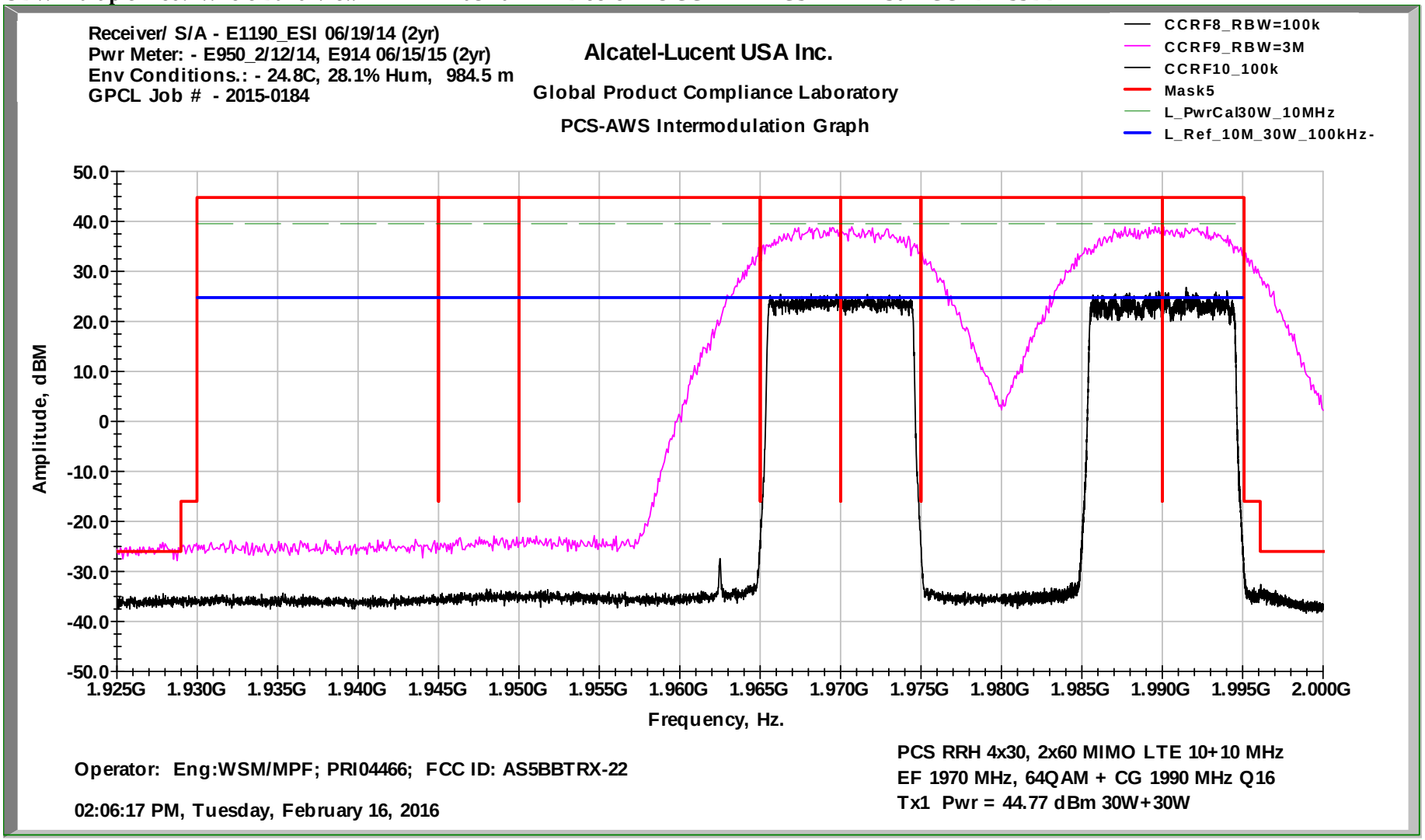
Dual Carrier #11
Occupied Bandwidth/Power Cal -Carrier 1 10&10 MHz Blocks EF&CG PCS RRH 4x30 FCC ID AS5BBTRX-22



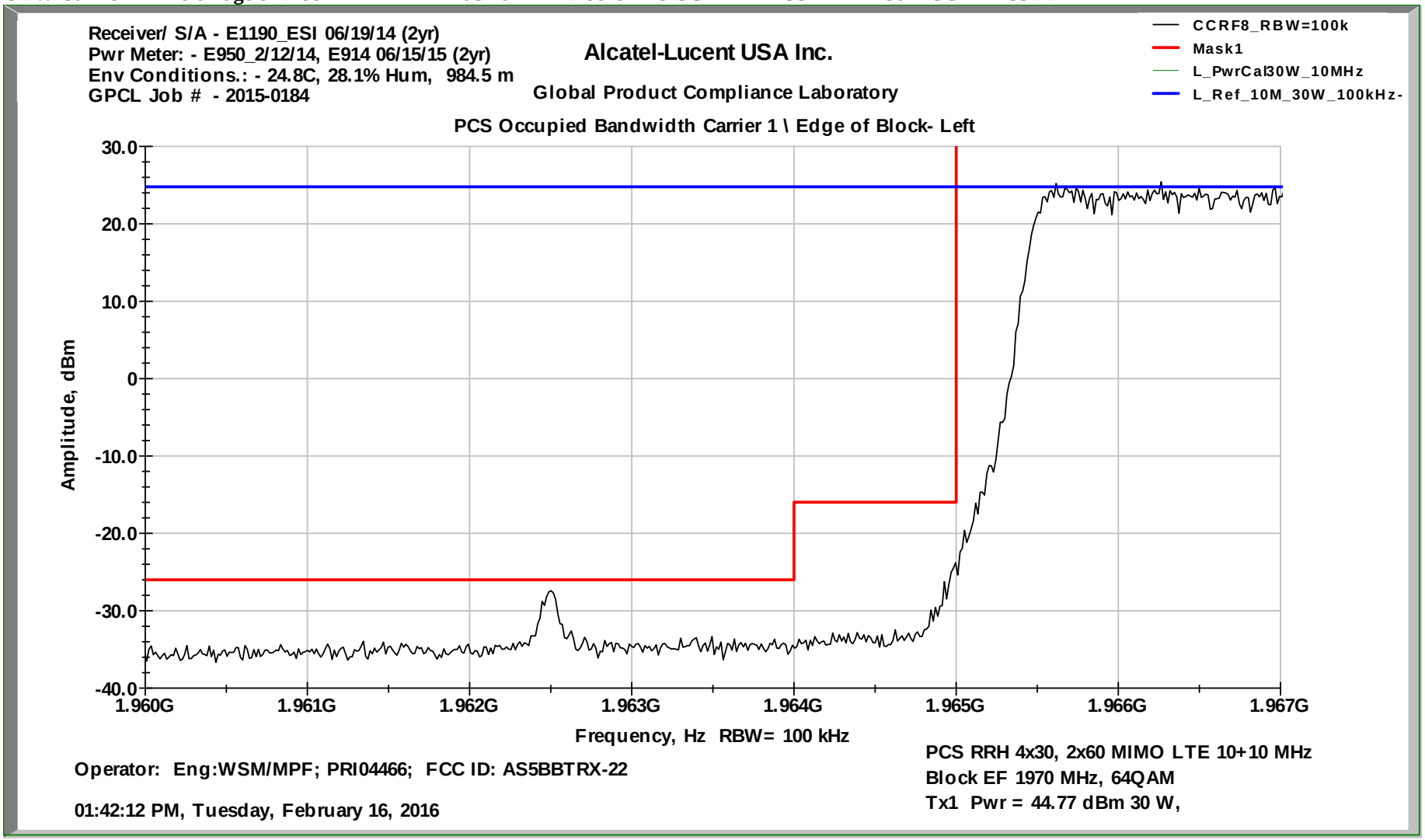
Occupied Bandwidth/Power Cal -Carrier 2 10&10 MHz Blocks EF&CG PCS RRH 4x30 FCC ID AS5BBTRX-22



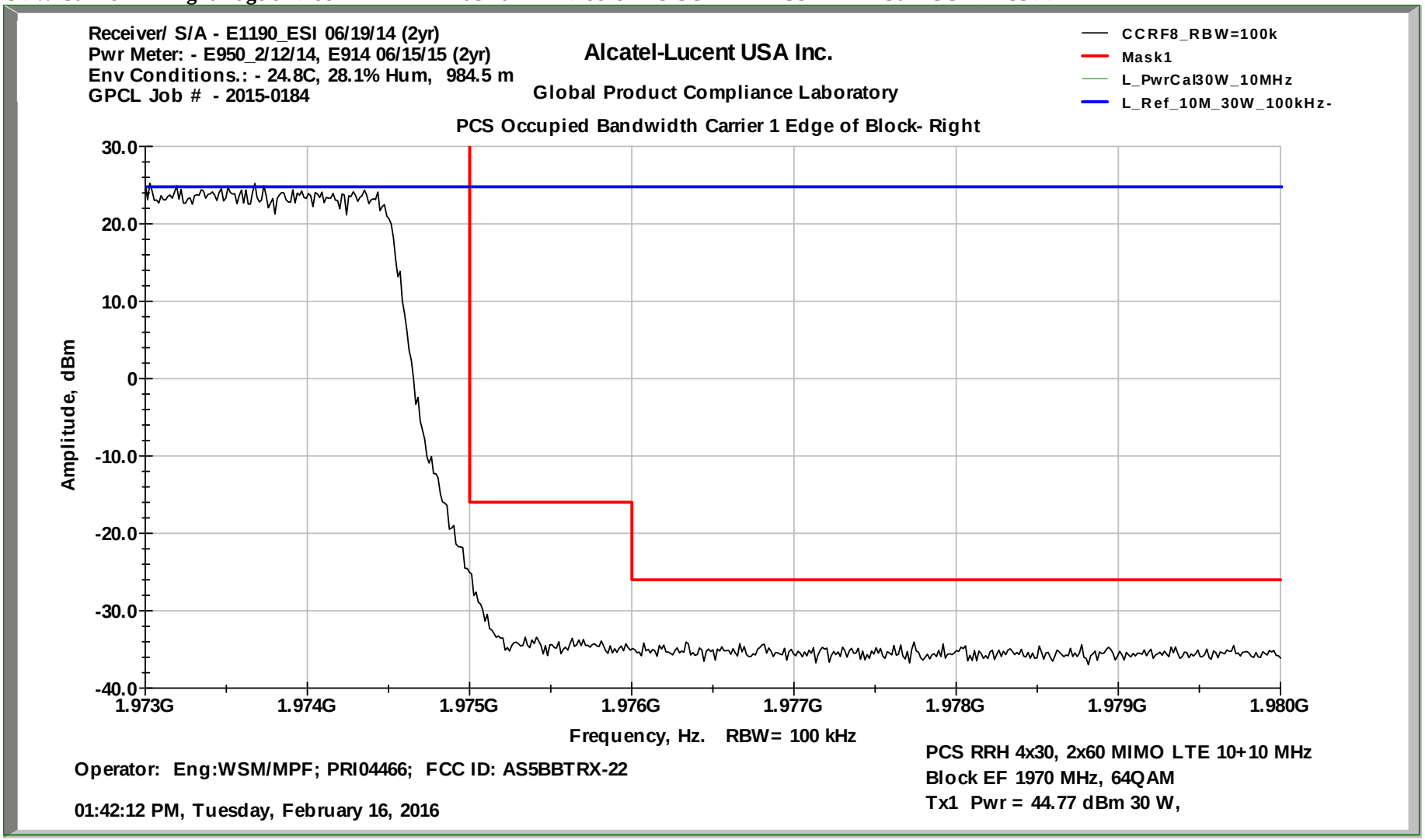
OBW Multiple Mod. Whole Band View **10&10 MHz Blocks EF&CG** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



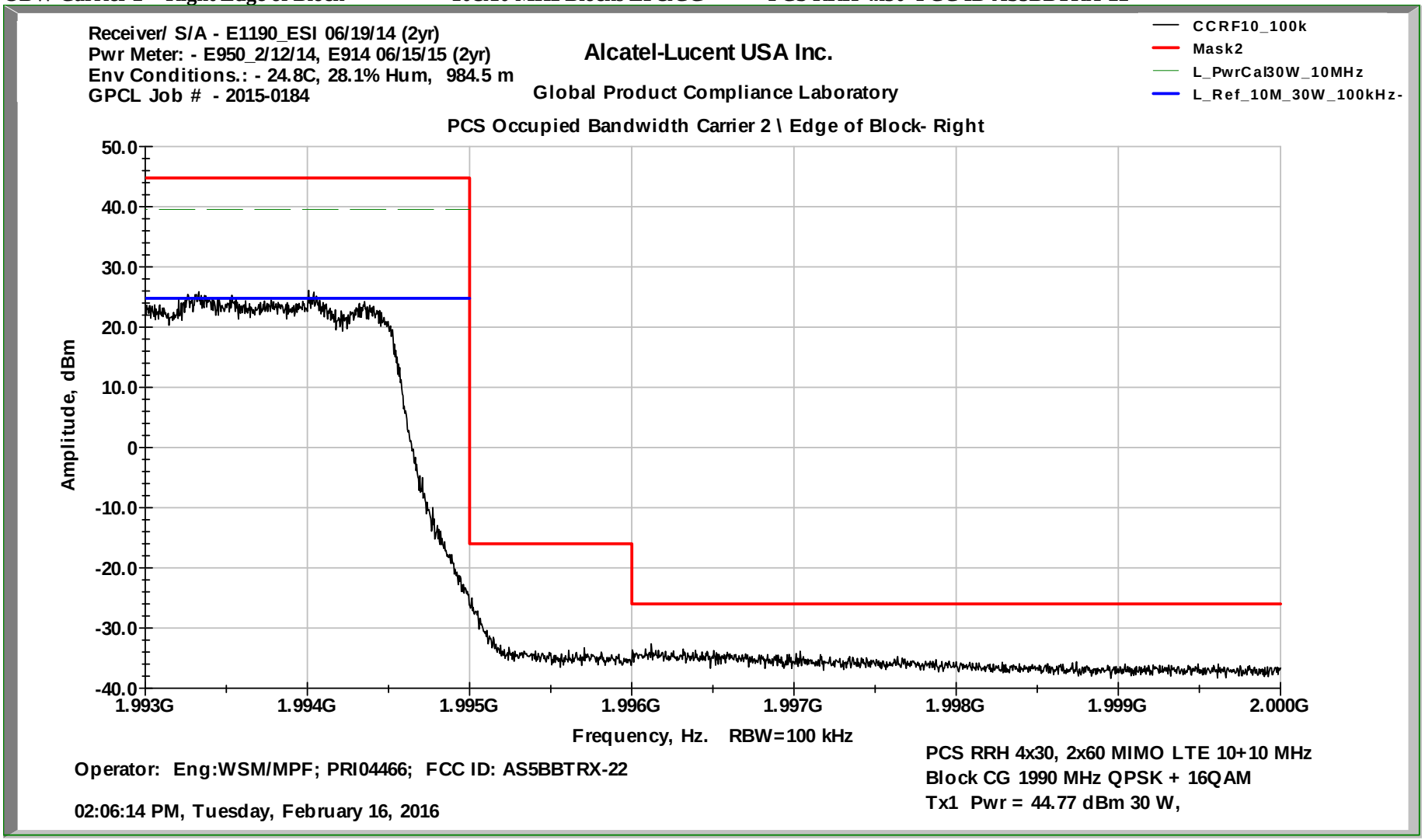
OBW Carrier 1 - Left Edge of Block **10&10 MHz Blocks EF&CG** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



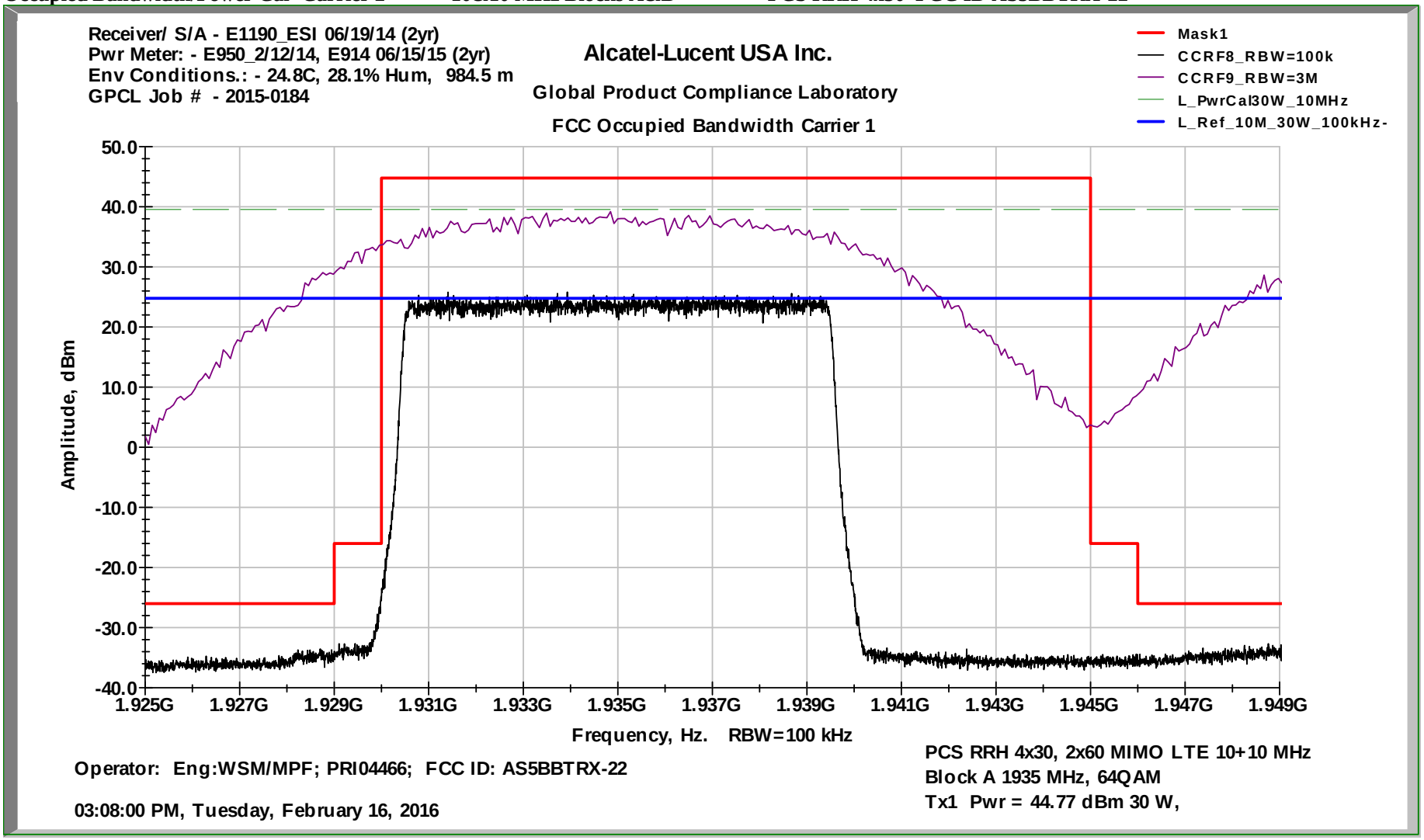
OBW Carrier 1 - Right Edge of Block **10&10 MHz Blocks EF&CG** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



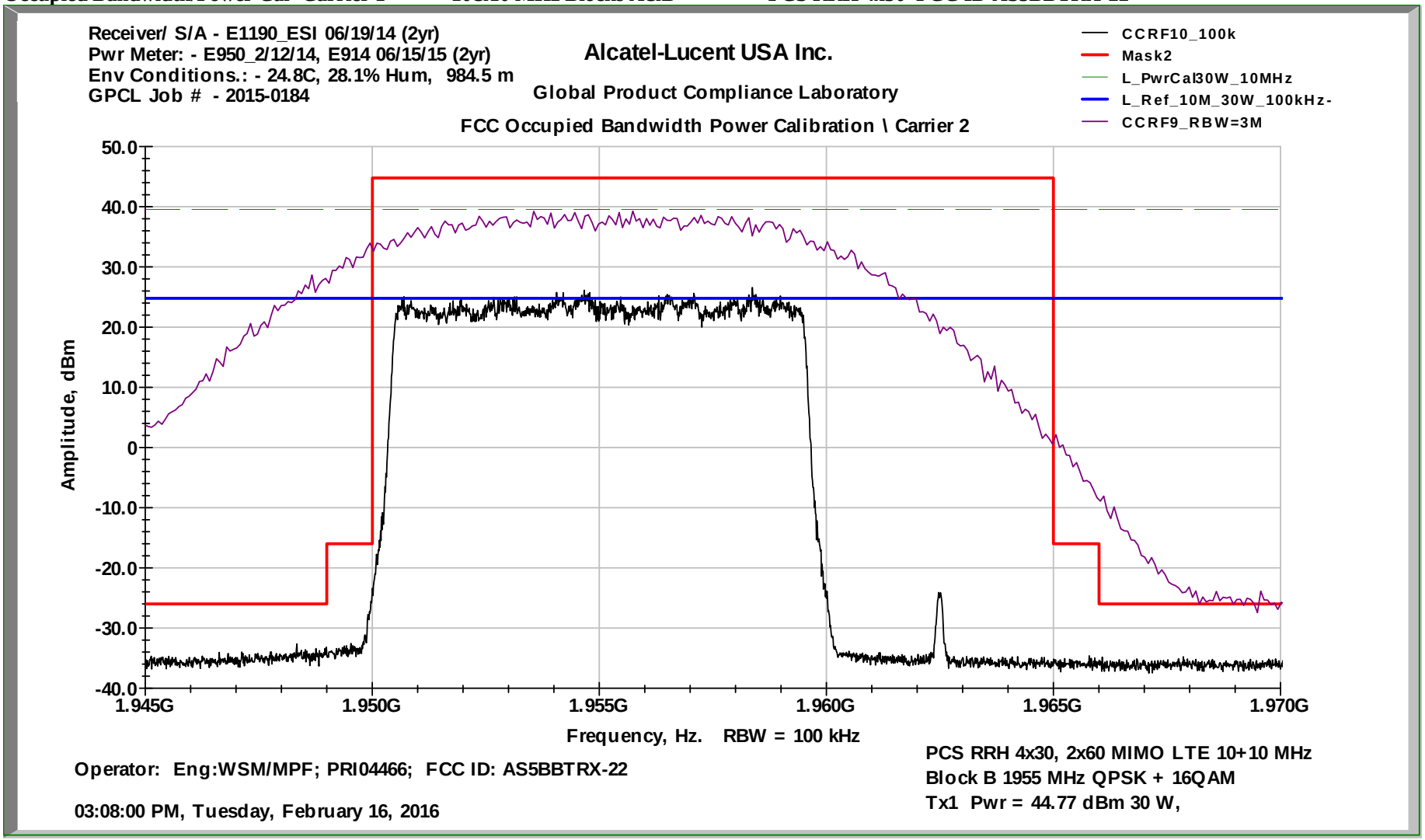
OBW Carrier 2 - Right Edge of Block **10&10 MHz Blocks EF&CG** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



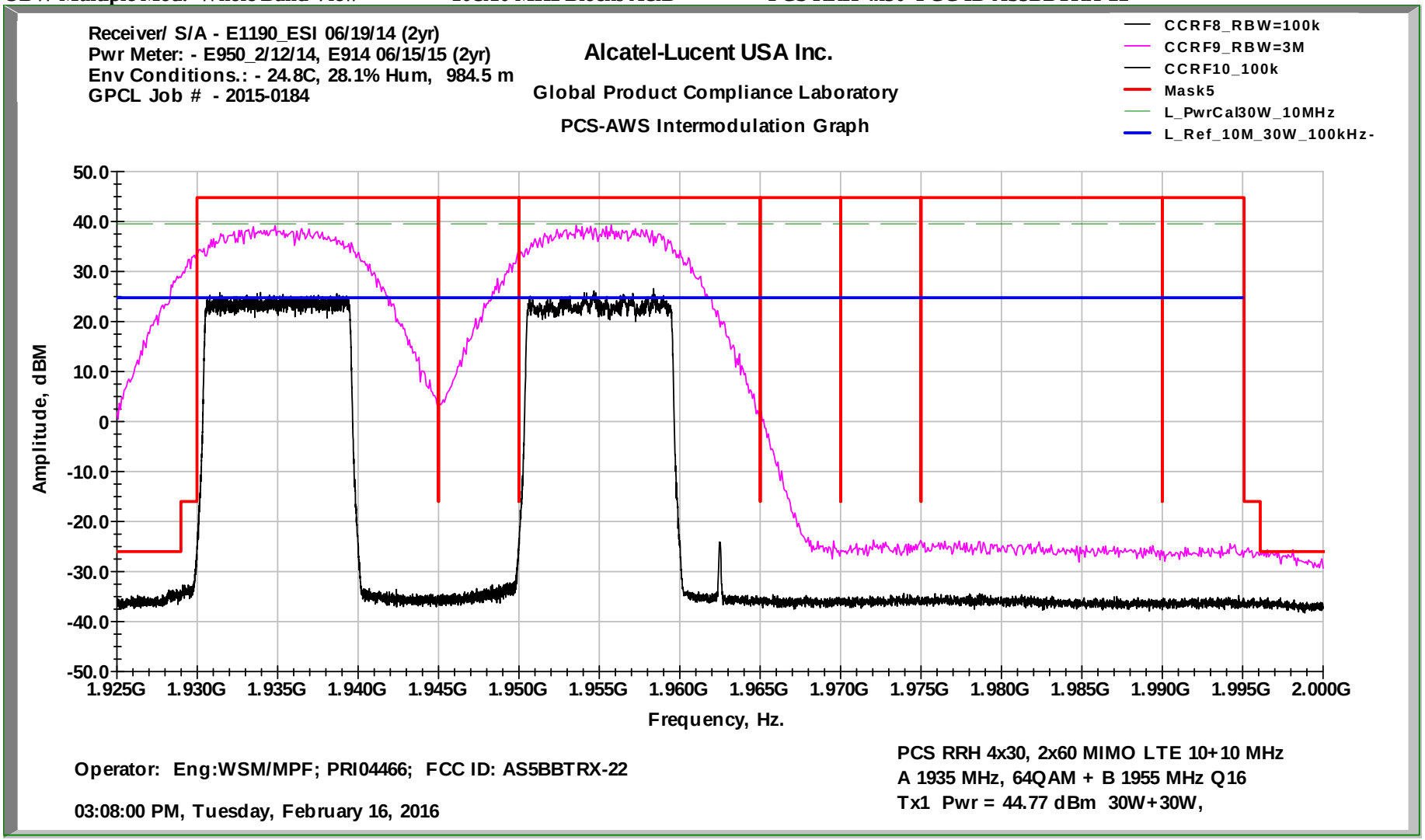
Dual Carrier #12
Occupied Bandwidth/Power Cal -Carrier 2 10&10 MHz Blocks A&B PCS RRH 4x30 FCC ID AS5BBTRX-22



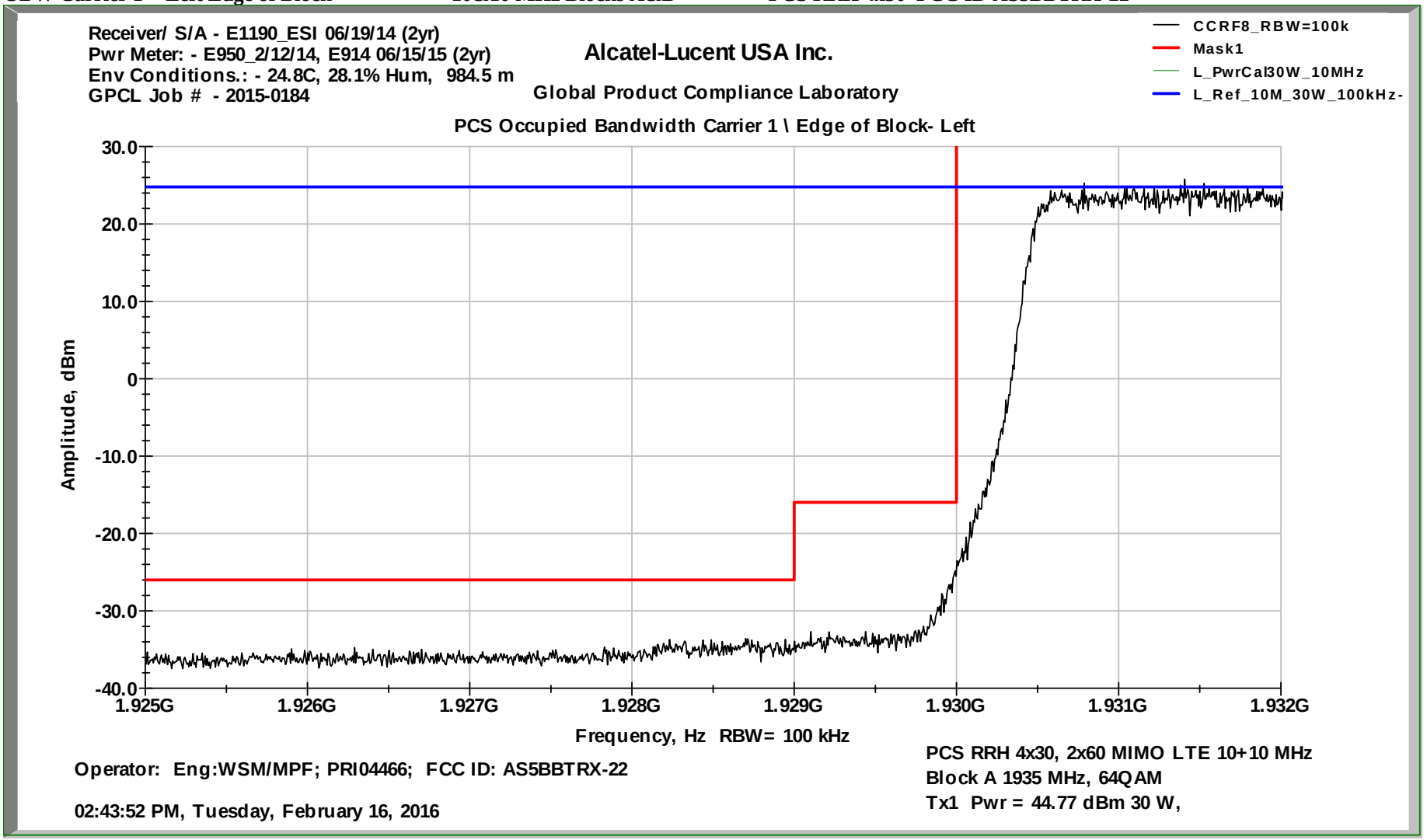
Occupied Bandwidth/Power Cal -Carrier 1 10&10 MHz Blocks A&B PCS RRH 4x30 FCC ID AS5BBTRX-22



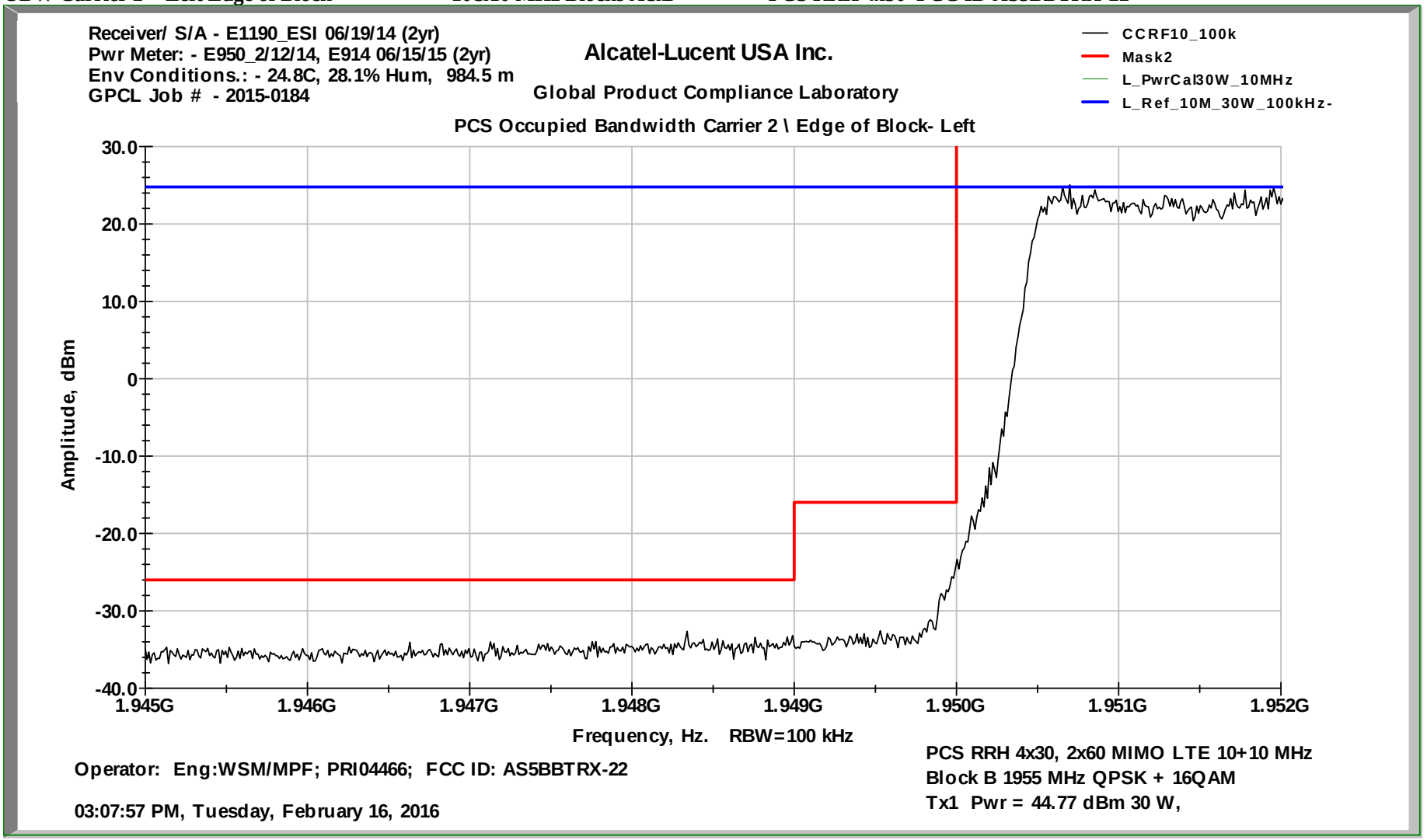
OBW Multiple Mod. Whole Band View **10&10 MHz Blocks A&B** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



OBW Carrier 1 - Left Edge of Block **10&10 MHz Blocks A&B** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



OBW Carrier 2 - Left Edge of Block **10&10 MHz Blocks A&B** **PCS RRH 4x30 FCC ID AS5BBTRX-22**



11.6. Spurious Emissions at the Antenna Terminal

11.6.1. Section 2.1051 Spurious Emissions at Antenna Terminals

Spurious Emissions at the antenna terminals were investigated 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 11.6A 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 allows measurement and presentation of the data in an accurate and compact form for FCC review. The volume of collected data is greater than 1 $x10^5$ data points over the frequency range of 10 MHz to 20 GHz.

11.6.2. 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 :

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

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.

11.6.3. 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.

11.6.4. Conducted Spurious Measurements

Measurements were performed for each of the configurations identified in Table 11.6 below. In each case the transmitter output was configured with two carriers. The Conducted Spurious measurements was performed for the specific PCS Blocks identified in Table 11.6 and plotted individually.

TABLE 11.6.1 PCS Conducted Spurious Compliance Tabulation

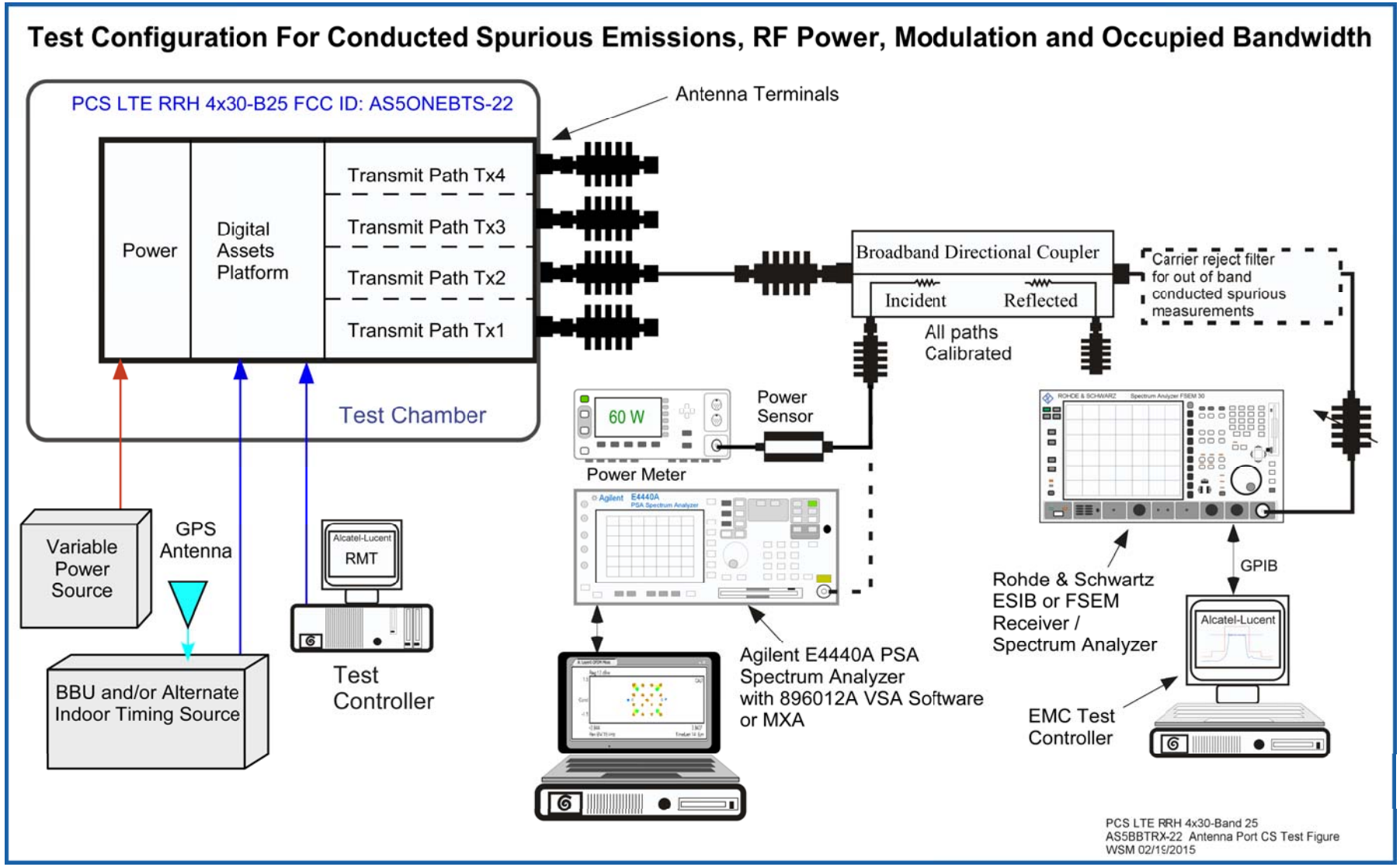
Test #	AWS Block	Port	Transmit Power, 's, Watts	Signal Bandwidth, MHz	Modulation Q16=QPSK/ 16QAM 64=64QAM	Carrier Center Frequency, MHz	Conducted Spurious Emissions Pass/ Fail
1	A + D	Tx1	30 + 30	5 + 5	Q16 + 64	1932.5 + 1947.5	Pass
2	B + E	Tx1	30 + 30	5 + 5	Q16 + 64	1952.5 +1967.5	Pass
3	C + G	Tx1	30 + 30	5 + 5	Q16 + 64	1977.5 +1992.5	Pass
4	A + F	Tx1	30 + 30	10 + 5	64 + Q16	1935 +1972.5	Pass
5	EF + G	Tx1	30 + 30	10 + 5	Q16 + 64	1970 + 1992.5	Pass
6	A + D	Tx1	30 + 30	10 + 5	Q16 + 64	1935 + 1947.5	Pass
7	A + D	Tx1	30 + 30	15 + 5	Q16 + 64	1937.5 + 1947.5	Pass
8	B + E	Tx1	30 + 30	15 + 5	Q16 + 64	1957.5 + 1967.5	Pass
9	FC + G	Tx1	30 + 30	15 + 5	64 + Q16	1977.5 + 1992.5	Pass
10	A + B	Tx1	30 + 30	10 + 10	Q16 + 64	1935 + 1960	Pass
11	B + EF	Tx1	30 + 30	10 + 10	Q16 + 64	1955 + 1970	Pass
12	C + G	Tx1	30 + 30	10 + 10	Q16 + 64	1980 + 1985	Pass

11.6.5. Test Results Summary

Conducted Spurious measurements were performed for on the **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System / FCC ID: AS5BBTRX-22.** The PCS LTE RRH 4x30 Band 25 was configured with a combined output power of 120W at its transmit ports. Conducted Transmit Spurious measurements were performed for each of the configurations identified in Table 11.6. Every PCS test configuration therefore includes a Conducted Spurious measurements at the antenna transmit port as documented in Table 11.6

The attached spectral plots are representative of the Conducted Spurious compliance performance of the **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System / FCC ID: AS5BBTRX-22.** The compliance for all of the representative transmit configurations are documented in Table 11.6. This Table lists PCS Blocks/ Channels tested the amplifier configuration and the status of the performance. The performance data, charts and tables all show that there are no “Out of Block” harmonics or spurious emissions above the applicable limit of -16.01 dBm. The attached table and sample data plots document the results.

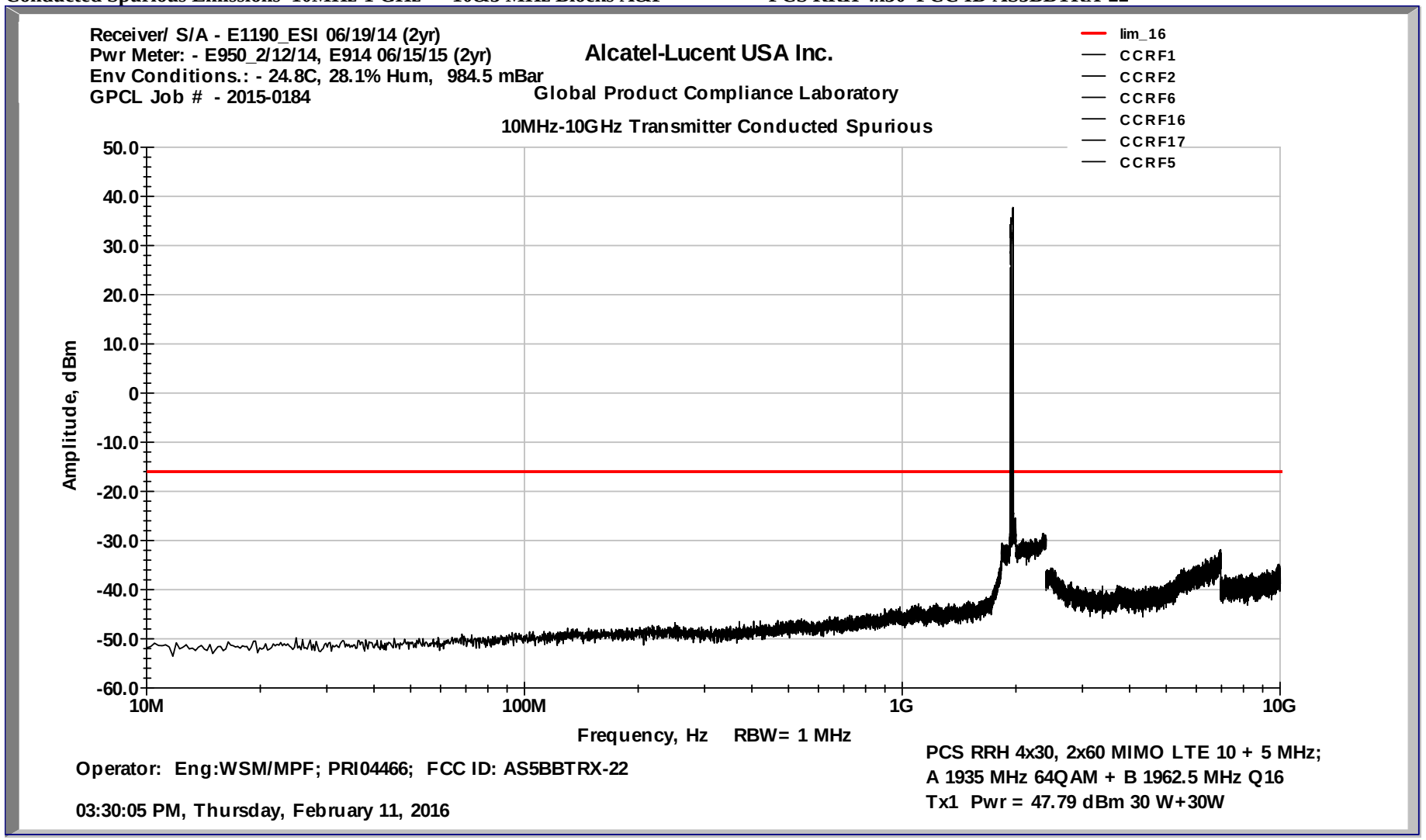
Figure 11.6A Test Setup for Antenna Port Measurement of Conducted Spurious Emissions

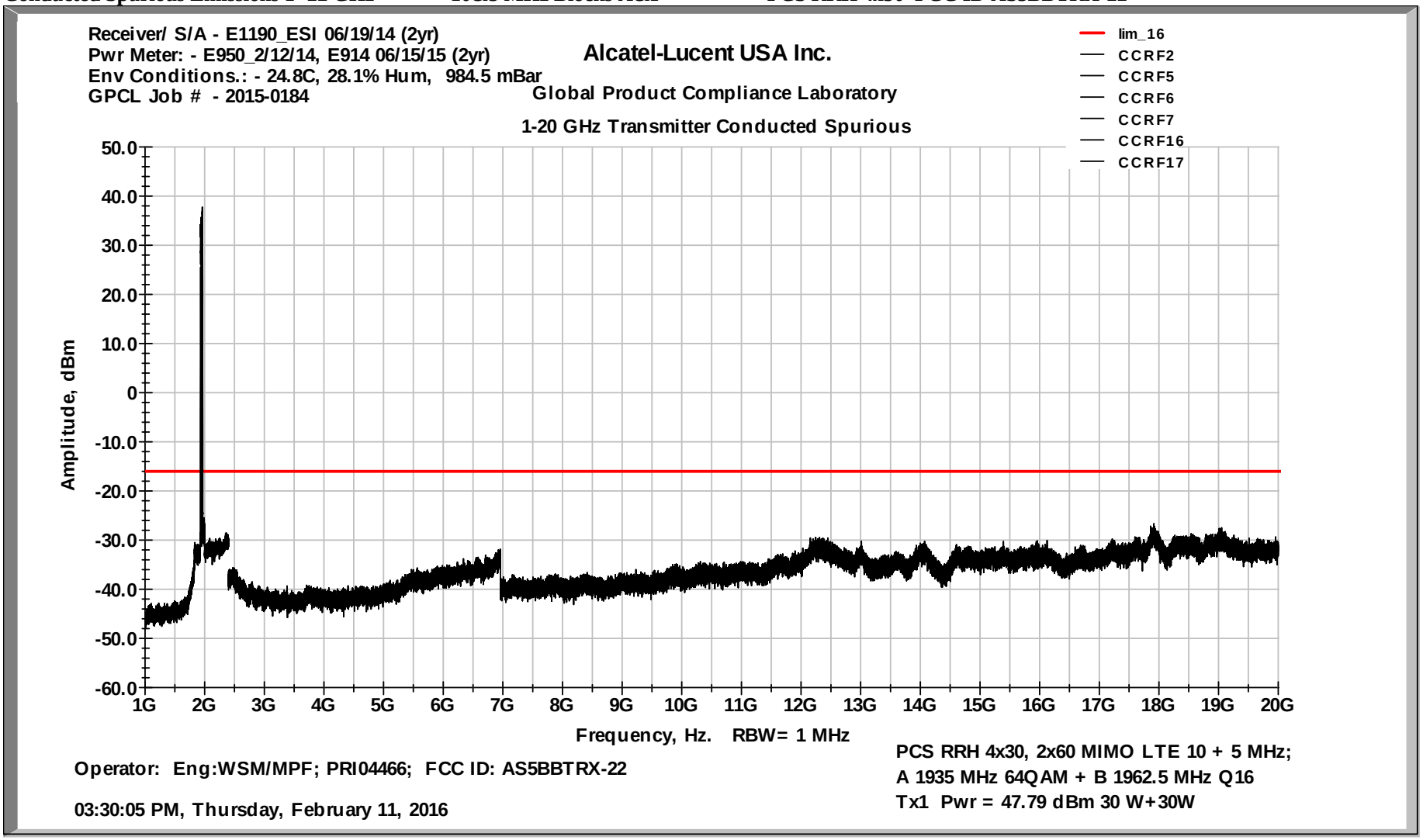


Transmitter Measurements
of
Conducted Spurious Emissions
for
Alcatel-Lucent USA Inc.

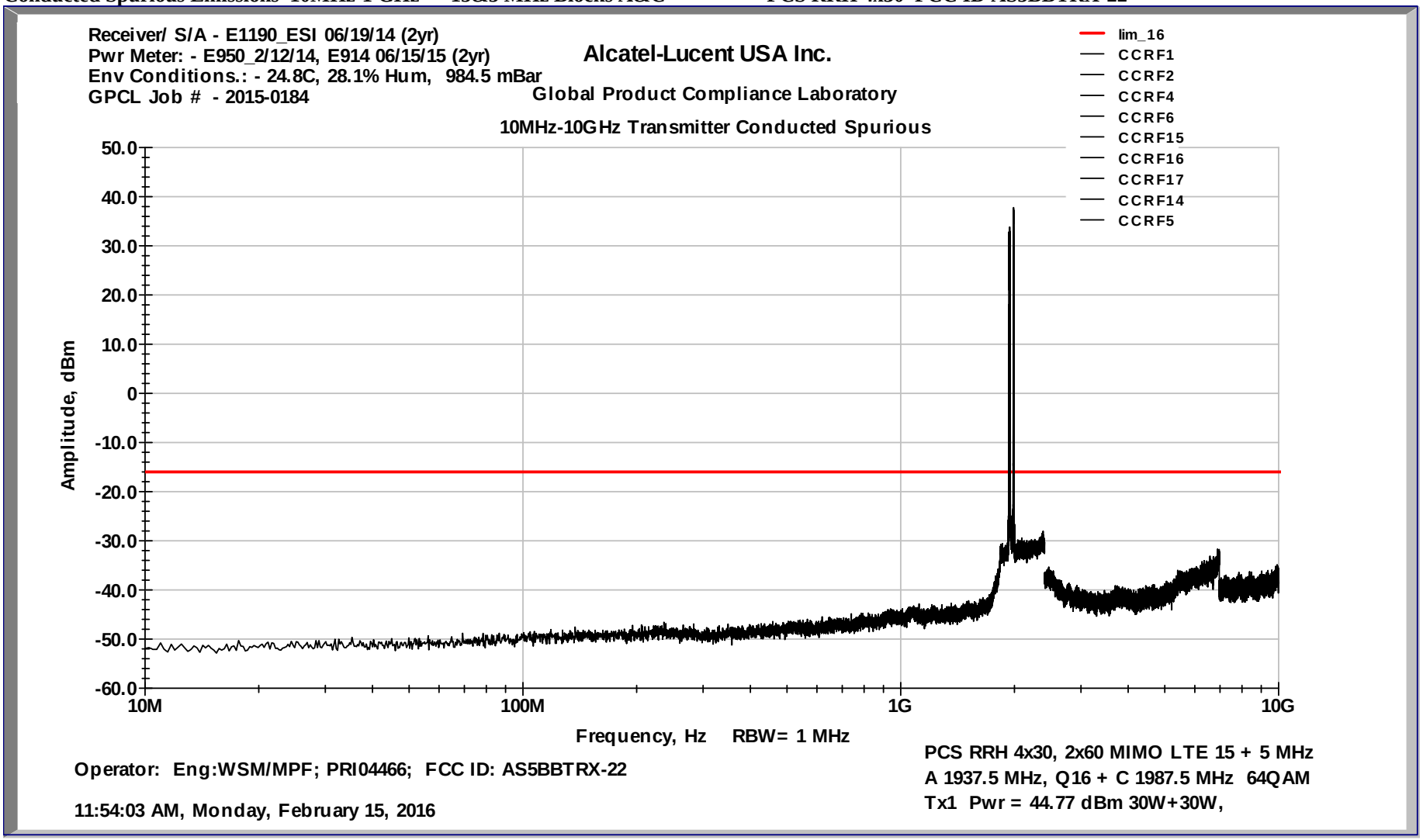
PCS LTE RRH 4x30 Band 25
Outdoor Transceiver System
FCC ID: AS5BBTRX-22

Dual Carrier #4
Conducted Spurious Emissions 10MHz-1 GHz 10&5 MHz Blocks A&F PCS RRH 4x30 FCC ID AS5BBTRX-22

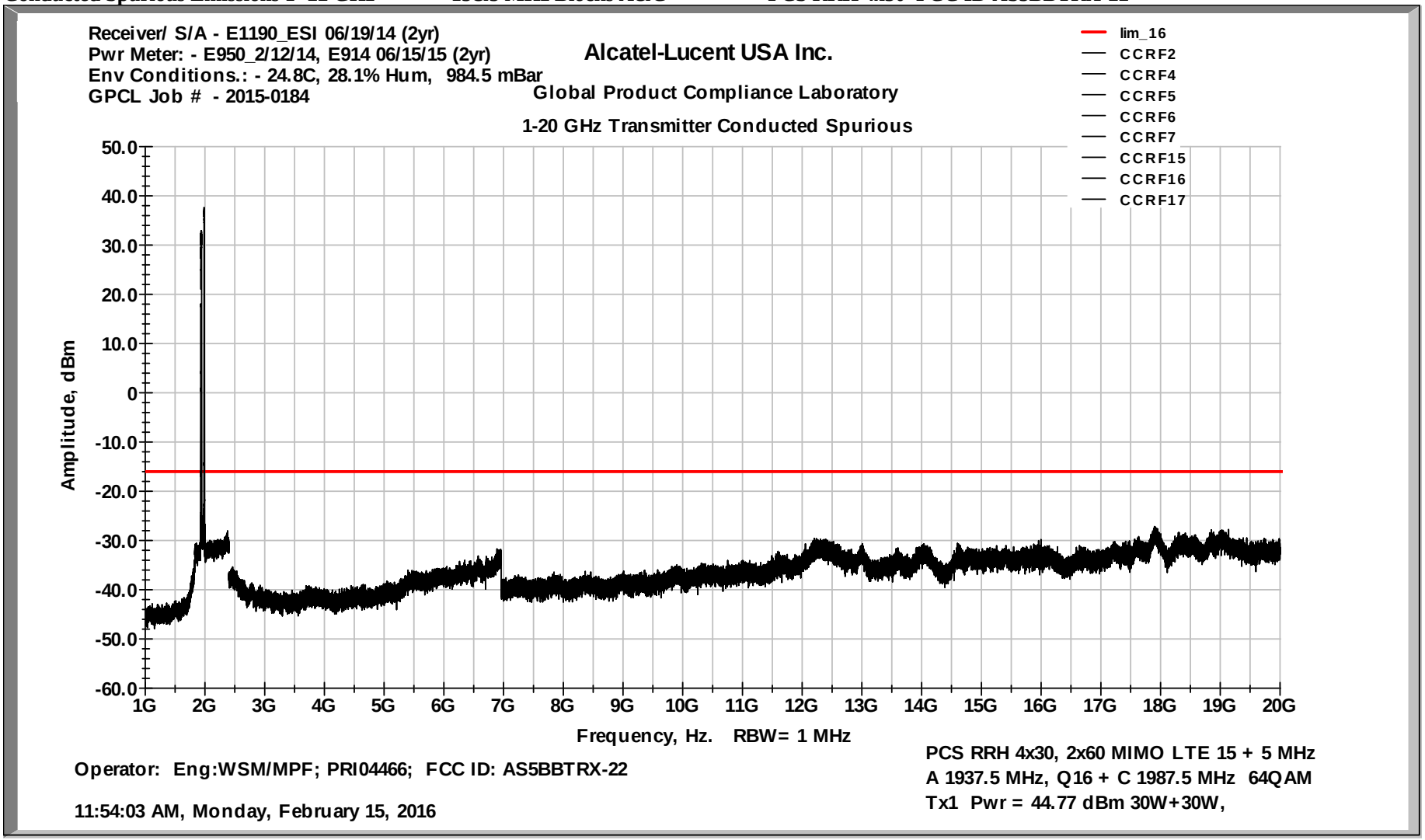



Receiver/ S/A - E1190_ESI 06/19/14 (2yr)
Pwr Meter: - E950_2/12/14, E914 06/15/15 (2yr)
Env Conditions.: - 24.8C, 28.1% Hum, 984.5 mBar
GPCL Job # - 2015-0184
Alcatel-Lucent USA Inc.
Global Product Compliance Laboratory
1-20 GHz Transmitter Conducted Spurious
lim_16
CCRF2
CCRF5
CCRF6
CCRF7
CCRF16
CCRF17
Amplitude, dBm
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
1G
2G
3G
4G
5G
6G
7G
8G
9G
10G
11G
12G
13G
14G
15G
16G
17G
18G
19G
20G
Frequency, Hz. RBW= 1 MHz
Operator: Eng:WSM/MPF; PRI04466; FCC ID: AS5BBTRX-22
03:30:05 PM, Thursday, February 11, 2016
PCS RRH 4x30, 2x60 MIMO LTE 10 + 5 MHz;
A 1935 MHz 64QAM + B 1962.5 MHz Q16
Tx1 Pwr = 47.79 dBm 30 W+30W

Dual Carrier #7
Conducted Spurious Emissions 10MHz-1 GHz 15&5 MHz Blocks A&C PCS RRH 4x30 FCC ID AS5BBTRX-22



Conducted Spurious Emissions 1 -22 GHz 15&5 MHz Blocks A&C PCS RRH 4x30 FCC ID AS5BBTRX-22



11.7. Field Strength Measurements Of Spurious Radiation

11.7.1. Section 2.1053 Field Strength Of Spurious Radiation

Field strength measurements of radiated spurious emissions were evaluated in the AR4 Semi-Anechoic 3m Full Compliance Chamber which is the FCC Registered Test Site, FCC registration number 647637(AR-4). The AR4 Compliance Chamber is maintained by Alcatel-Lucent USA Inc. Global Product Compliance Laboratory in Murray Hill, New Jersey. A complete description and full measurement data for the site have been placed on file with the Commission.

The **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System / FCC ID: AS5BBTRX-22** was configured into a representative field installation and was tested when operating in a worst case test configurations operating 15&5 MHz Emissions designators in PCS Blocks A&G. The spectrum from 10 MHz to the tenth harmonic of the carrier (20 GHz) was searched for spurious radiation. Measurements were made using both horizontally and vertically polarized broadband antennas. Per FCC regulations, the comparison of out of band spurious emissions directly to the limit is appropriately made using the substitution method. However, when the emissions are more than 20 dB below the specification limit, the use of field strength measurements for compliance determination is acceptable and those emissions are considered not reportable (Section 2.1053 and the FCC Interpretive database for 2.1053). For this case the evaluation of acceptable radiated field strength is as follows.

The calculated emission levels were found by:

Pmeas (dBm) + Cable Loss(dB) + Antenna Factor(dB) + 107 (dBμV/dBm) -Amplifier Gain (dB) = Field Strength (dBμV/m)

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.

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

$$20 \log (E*10^{6}) - (43 + 10 \log P) = 71.77 \text{ dB } \mu V/\text{meter}$$

Where: E = Field Intensity in Volts/ meter R = Distance in meters = 10 m
P = Transmitted Power in watts = 120 W

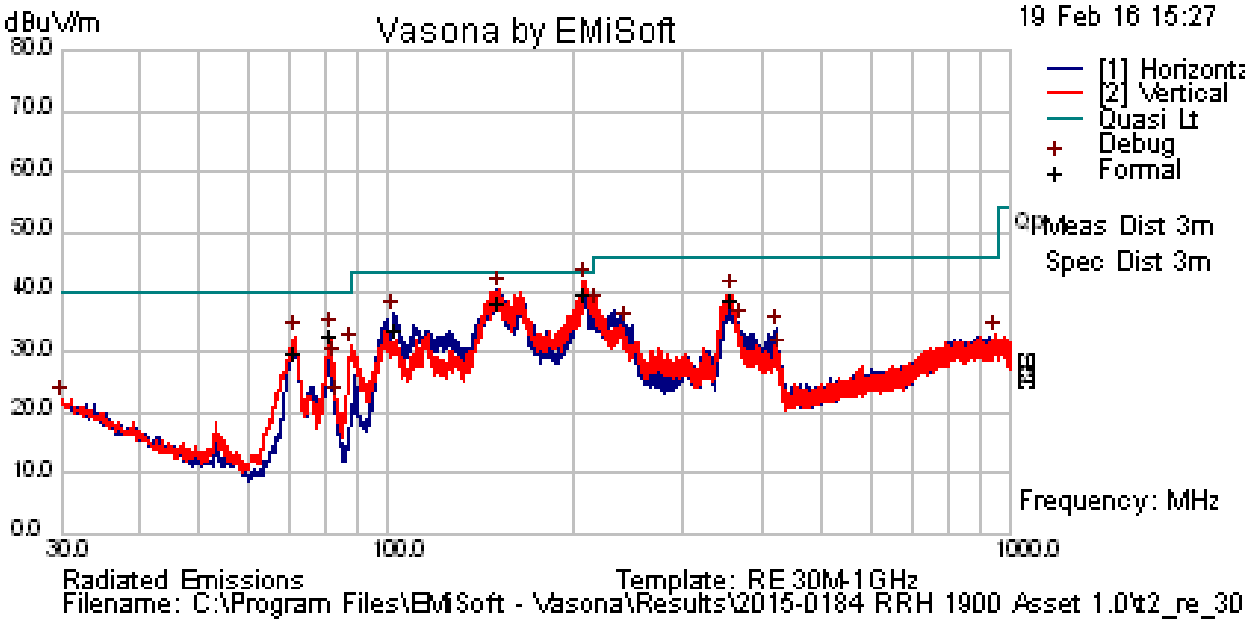
11.7.2. Results

For this particular test, the field strength of any spurious radiation, measured at 10m, is required to be less than 71.8 dBμV/meter (82.23 @ 3m). Emissions equal to or less than 51.8 dBμV/meter at 10m (62.23@ 3m) 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 **PCS LTE RRH 4x30 Band 25 Outdoor Transceiver System / FCC ID: AS5BBTRX-22**, the subject of this application, complies with Sections 2.1053, 24.238 and 2.1057 of the Rules. Although not required for certification, additional testing to 47CFR Part 15 documented compliance with the Class B requirements for radiated emissions. A representative set of measurement scans are included below.

Measurements
of
Radiated Emissions
for
Alcatel-Lucent USA Inc.

PCS LTE RRH4x30 B25
Outdoor Transceiver System
FCC ID: AS5BBTRX-22

T2 Radiated Emissions 30MHz-1GHz FCC Class B

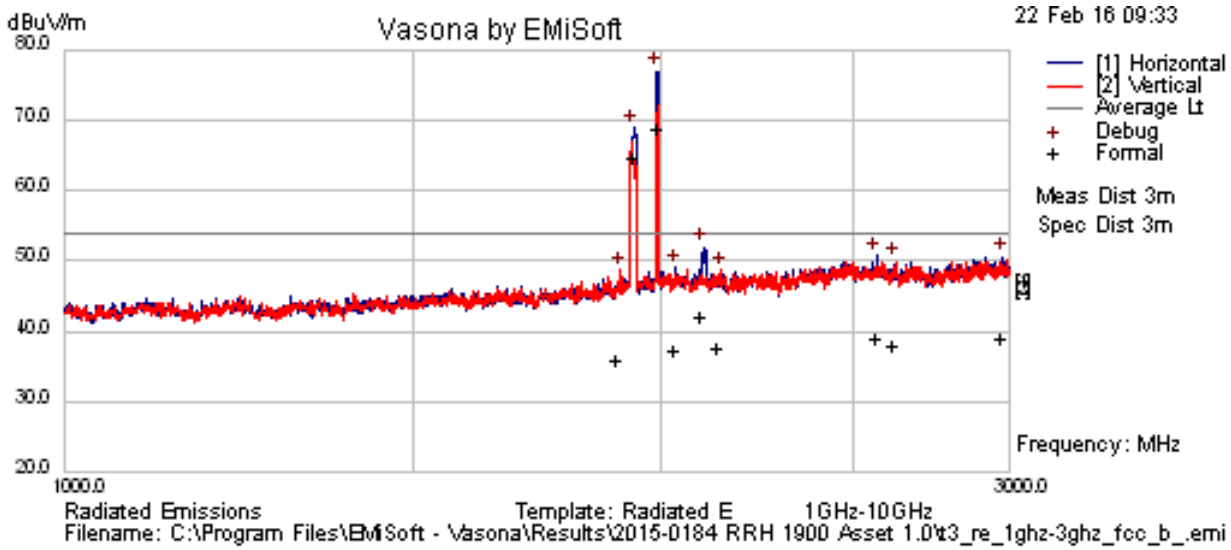


Results Title:	RE 30M-1GHz
File Name:	c:\program files\emisoft - vasona\results\2015-0184 rrh 1900 asset 1.0\t2_re_30m-1G_fccb_revised_dc.emi
Test Laboratory:	AR4-MH, 25C, 33% RH
Test Engineer:	MM
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	Alcatel-Lucent
EUT Details:	RRH 1900 Asset 1.0. 04468 Flextronic Cast Filter. Carriers: 1937.5MHz/15MHz BW/64QAM, 1992.5MHz/5MHz BW/QPSK/16QAM
Configuration:	Agilent E7405A Analyzer (E736) with 120kHz RBW & 300kHz VBW, Bilog Antenna (E766), 6dB attenuator (E1130), FCC Radiated Emissions (30MHz-1GHz) Class B, Closed Door (New and shorter DC power cable)
Date:	2016-02-19 15:27:00

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
207.496	49.84	7.21	-19.6	37.46	Quasi Max	V	171	297	43.5	-6.04	Pass	
150.428	42.68	6.91	-13.6	35.95	Quasi Max	H	103	238	43.5	-7.55	Pass	
80.813	46.97	6.61	-23.1	30.47	Quasi Max	V	115	69	40	-9.53	Pass	
356.33	44.03	7.72	-15.5	36.25	Quasi Max	V	103	299	46	-9.75	Pass	
102.683	42.51	6.55	-17.6	31.51	Quasi Max	H	213	309	43.5	-11.99	Pass	
70.803	46.26	6.03	-24.8	27.52	Quasi Max	V	147	318	40	-12.48	Pass	

T3 Radiated Emissions 1GHz-3GHz FCC Class B

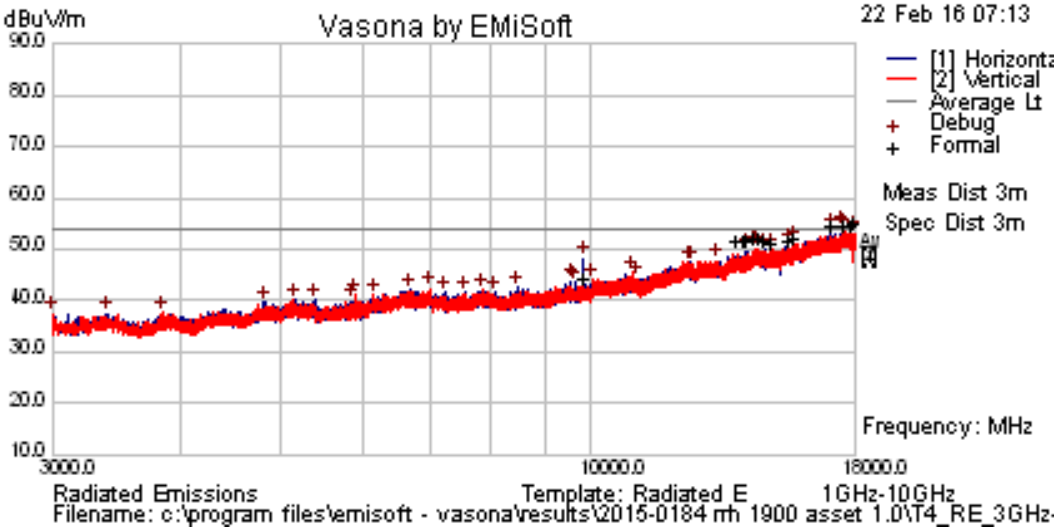


Results Title:	Radiated E 1GHz-10GHz
File Name:	c:\program files\emisoft - vasona\results\2015-0184 rrh 1900 asset 1.0\t3_re_1ghz-3ghz_fcc_b_.emi
Test Laboratory:	AR4-MH, 25C, 33% RH
Test Engineer:	MM
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	Alcatel-Lucent
EUT Details:	RRH 1900 Asset 1.0. 04468 Flextronic Cast Filter. Carriers: 1937.5MHz/15MHz BW/64QAM, 1992.5MHz/5MHz BW/QPSK/16QAM
Configuration:	R&S Analyzer (E936) with 1M RBW and 1M VBW. Antenna (E1074), 6dB pad (E890), FCC Radiated Emissions (1GHz-3GHz) Class B, Closed Door (New and shorter DC power cable)
Date:	2016-02-22 09:33:32

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
1994	63.69	8.99	-5.9	66.78	AvgMax	H	103	121	54	12.78	N/A	Tx Carrier
1941.97	59.89	8.94	-6.21	62.62	AvgMax	H	111	105	54	8.62	N/A	Tx Carrier
2101.47	36.58	9.2	-5.54	40.24	AvgMax	H	103	130	54	-13.76	Pass	
2974.51	30.56	10.67	-4.2	37.03	AvgMax	H	131	50	54	-16.97	Pass	
2572.48	31.34	10.06	-4.38	37.02	AvgMax	H	241	21	54	-16.98	Pass	
2629.19	30.28	10.15	-4.35	36.08	AvgMax	V	354	209	54	-17.92	Pass	
2140.92	31.7	9.28	-5.42	35.57	AvgMax	V	206	105	54	-18.43	Pass	
2035.43	31.94	9.07	-5.75	35.26	AvgMax	H	164	275	54	-18.74	Pass	
1901.83	31.7	8.89	-6.46	34.14	AvgMax	V	277	21	54	-19.86	Pass	

T4 Radiated Emissions 3GHz-18GHz FCC Class B

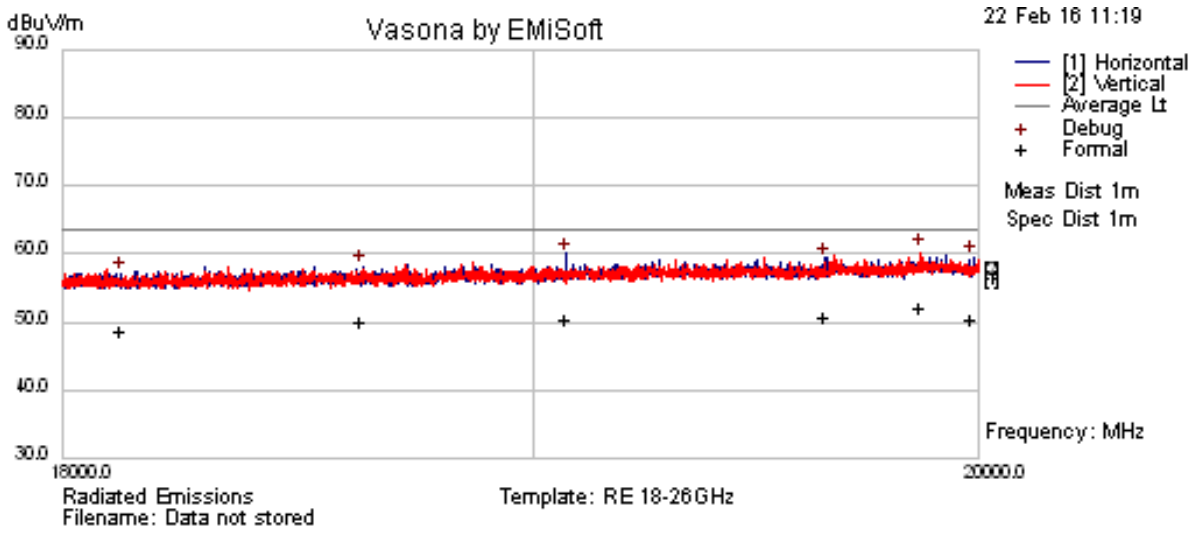


Results Title:	Radiated E 1GHz-10GHz
File Name:	c:\program files\emisoft - vasona\results\2015-0184 rrh 1900 asset 1.0\T4_RE_3GHz-18GHz_FCC_B.emi
Test Laboratory:	AR4-MH, 25C, 33% RH
Test Engineer:	JY
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	Alcatel-Lucent
EUT Details:	RRH 1900 Asset 1.0. 04468 Flextronic Cast Filter. Carriers: 1937.5MHz/15MHz BW/64QAM, 1992.5MHz/5MHz BW/QPSK/16QAM
Configuration:	R&S Analyzer (E936) Prescan with 100kHz RBW & 300kHz VBW, formals with 1M RBW and 1M VBW. Antenna (E1074), HPF (E986), FCC Radiated Emissions (3GHz-18GHz) Class B, Closed Door
Date:	2016-02-22 07:13:59

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
17996.9	30.56	15.47	6.51	52.55	AvgMax	V	187	298	54	-1.45	Pass	
17601.9	30.83	14.82	6.77	52.42	AvgMax	H	150	253	54	-1.58	Pass	
17559	30.69	14.75	6.8	52.24	AvgMax	H	259	58	54	-1.76	Pass	
17075.6	30.83	14.49	6.76	52.07	AvgMax	H	142	9	54	-1.93	Pass	
17902.3	30.14	15.32	6.57	52.04	AvgMax	V	374	307	54	-1.96	Pass	
14398.7	32.28	13.54	4.05	49.87	AvgMax	H	346	106	54	-4.13	Pass	
14523.4	32.03	13.6	4.09	49.72	AvgMax	V	321	26	54	-4.28	Pass	
15780.9	31.58	13.64	4.46	49.68	AvgMax	V	207	197	54	-4.32	Pass	
15532.3	31.58	13.59	4.29	49.46	AvgMax	H	167	286	54	-4.54	Pass	
14178.5	31.94	13.42	3.94	49.3	AvgMax	H	332	79	54	-4.7	Pass	
14709.9	31.56	13.68	3.99	49.24	AvgMax	H	214	31	54	-4.76	Pass	
14104.1	31.82	13.38	3.9	49.11	AvgMax	H	216	258	54	-4.89	Pass	
13876.2	32.05	13.1	3.96	49.1	AvgMax	V	293	116	54	-4.9	Pass	
14968.8	31.57	13.51	3.85	48.92	AvgMax	V	125	50	54	-5.08	Pass	
9830.45	31.94	9.98	-0.11	41.8	AvgMax	H	136	19	54	-12.2	Pass	

T5 Radiated Emissions 18GHz-20GHz FCC Class B



Results Title:	RE 18-26GHz
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Test Laboratory:	AR4-MH, 25C, 33% RH
Test Engineer:	MM
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	Alcatel-Lucent
EUT Details:	RRH 1900 Asset 1.0. 04468 Flextronic Cast Filter. Carriers: 1937.5MHz/15MHz BW/64QAM, 1992.5MHz/5MHz BW/QPSK/16QAM
Configuration:	R&S Analyzer (E936) with 1M RBW and 1M VBW. Antenna (E513) , FCC Radiated Emissions (18GHz-20GHz) Class B, Closed Door
Date:	2016-02-22 11:20:18

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
19868.6	32.5	7.33	10.48	50.3	AvgMax	V	174	171	63.5	-13.2	Pass	
19652	31.09	7.28	10.6	48.96	AvgMax	H	170	141	63.5	-14.54	Pass	
19988.2	30.83	7.36	10.41	48.59	AvgMax	H	139	54	63.5	-14.91	Pass	
19073.8	30.83	7.13	10.54	48.5	AvgMax	H	103	125	63.5	-15	Pass	
18630	30.83	7.01	10.11	47.95	AvgMax	H	136	243	63.5	-15.55	Pass	
18119	30.28	6.87	9.68	46.82	AvgMax	H	188	184	63.5	-16.68	Pass	