Subject: **Application for Class II Permissive Change, under FCC ID: AS5ONEBTS-27, Both to Add the 20 MHz Emission Designator and to Document MIMO Limitation Exception for the RRH 2x60-1900 Model.**

Michael P. Farina
Alcatel-Lucent USA Inc.
600-700 Mountain Avenue, MH28-114M
Murray Hill, NJ 07974-0636
E-Mail: Michael.Farina@alcatel-lucent.com

June 26, 2015

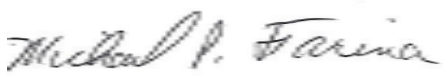
EXHIBIT 9: TEST REPORT

ATTESTATION:

All tests were performed by qualified staff members of:

Global Product Compliance Laboratory (GPCL)
Alcatel-Lucent USA, Inc.
600-700 Mountain Avenue
Murray Hill, New Jersey 07974-0636

All tests of emissions and emission characteristics conducted to the transmit port (antenna terminal) were either performed or directed by me and radiated emissions testing was also directed by me. As Project Lead Engineer, I was responsible for the definition and execution of all EMC/EMI testing.



Michael P. Farina
Member of Technical Staff
Global Product Compliance Laboratory (GPCL)
Alcatel-Lucent USA, Inc.
600-700 Mountain Avenue
Murray Hill, New Jersey 07974-0636
Desk: 908-582-3857

INTRODUCTION:

FCC ID: AS5ONEBTS-27 covers two separate Alcatel-Lucent products (1) RRH 2x60-1900 and (2) RRH 2x60-1900A. Both are dual technology, WCDMA and LTE, Remote Radio Heads (RRH), and both have the same (a) frequency determining and stabilization circuitry, and (b) transmit power rating 60 W (47.78 dBm) at each of the two Tx antenna terminals. They differ primarily by the manufacturer of their respective power amplifiers.

The purpose and objective of this application for a Class II Permissive Change, under FCC ID: AS5ONEBTS-27, is to add the LTE 20 MHz emission bandwidth and designator to the original RRH2x60-1900 model filing. However, in accordance with Rule Part 24.238 (b), certain out-of-band emissions exceed the 2x2 MIMO limitation by ≤ 2.55 dB. Since this model has been deployed (original Grant dated 3/30/12), the FCC has agreed to accept this permissive change without explicit compliance to the KDB pub 662911 D01 v02r01 *Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc).* The FCC response is per Tracking Number 928292.

Three LTE (Long Term Evolution) modulation schemes are supported**:** QPSK, 16QAM and 64QAM. Design and operation employs the guidelines set forth in ETSI TS 36.104 *LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception (3GPP TS 36.104 version 10.9.0 Release 10).* Full compliance has been demonstrated with FCC Part 24 — Personal Communications Services, § 24.238 Emission Limitations for Broadband PCS Equipment, following the procedural requirements specified in Part 2 —Frequency Allocations And Radio Treaty Matters; General Rules And Regulations Subpart J — Equipment Authorization Procedures. The spectrum covered is Rule Part 24E, 1930 – 1990 MHz.

In accordance with Sec. 2.1043 *Changes In Certificated Equipment*, only the characteristics affected by this Class II Change need to be reported. As such, the applicable measurements affected are contained in these Test Report Exhibits, and all other Exhibits submitted with the initial filing, that remain unchanged, need not be repeated.

APPLICABLE FCC RULES AND INDUSTRY STANDARDS:

The specific test procedures that are both required for and are applicable to this Class II certification are listed below. Note that Frequency Stability measurements need not be repeated.

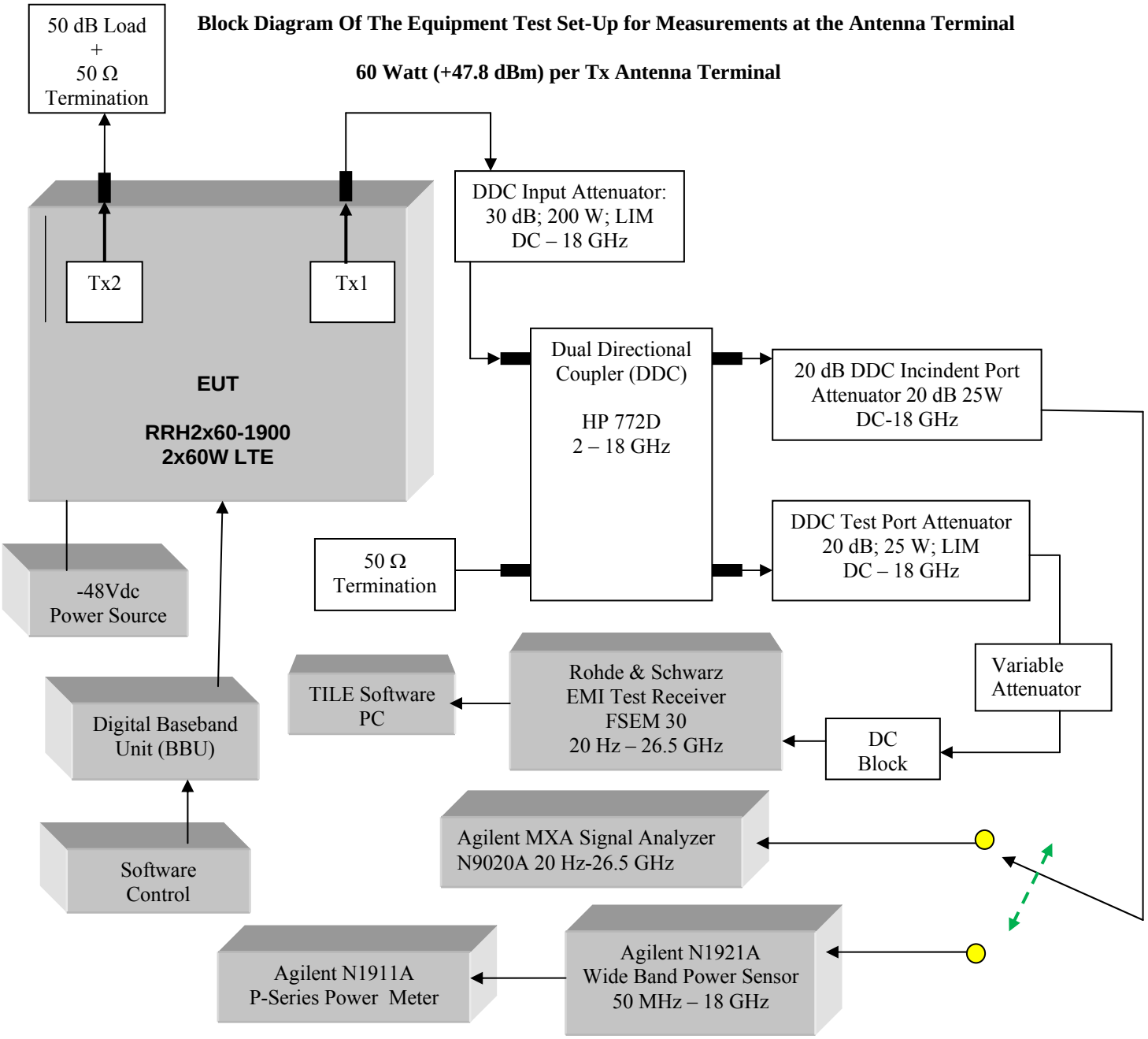
Part 2.1046	RF Power Output
Part 2.1047	Modulation Characteristics
Part 2.1049	Occupied Bandwidth
Part 2.1051	Spurious Emissions at the Antenna Terminals.
Part 2.1053	Field Strength of Spurious Radiation
Part 2.1057	Frequency Spectrum to be Investigated
Part 24	Personal Communications Services; Subpart E — Broadband PCS
Part 24.238	Emission Limitations for Broadband PCS Equipment
ETSI	TS 36.104 *LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception (3GPP TS 36.104 version 10.9.0 Release 10)*
ANSI C63.4-2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic in the Range of 9 kHz to 40 GHz; September 15, 2009.

PART 2.1046 MEASUREMENTS REQUIRED: RF POWER OUTPUT

The RF power of the single 20 MHz BW carrier, tuned to the lowest settable frequency 1940 MHz (Block A +D center frequency) and to the highest settable frequency 1980 MHz (Block F+C center frequency), were measured at 60 W (47.8 dBm) long term average power at a single transmit terminal (Tx1) and for 2 LTE test modulation schemes: QPSK and 64QAM. The RF power was measured and confirmed prior to each test.

Block Diagram Of The Equipment Test Set-Up for Measurements at the Antenna Terminal

60 Watt (+47.8 dBm) per Tx Antenna Terminal

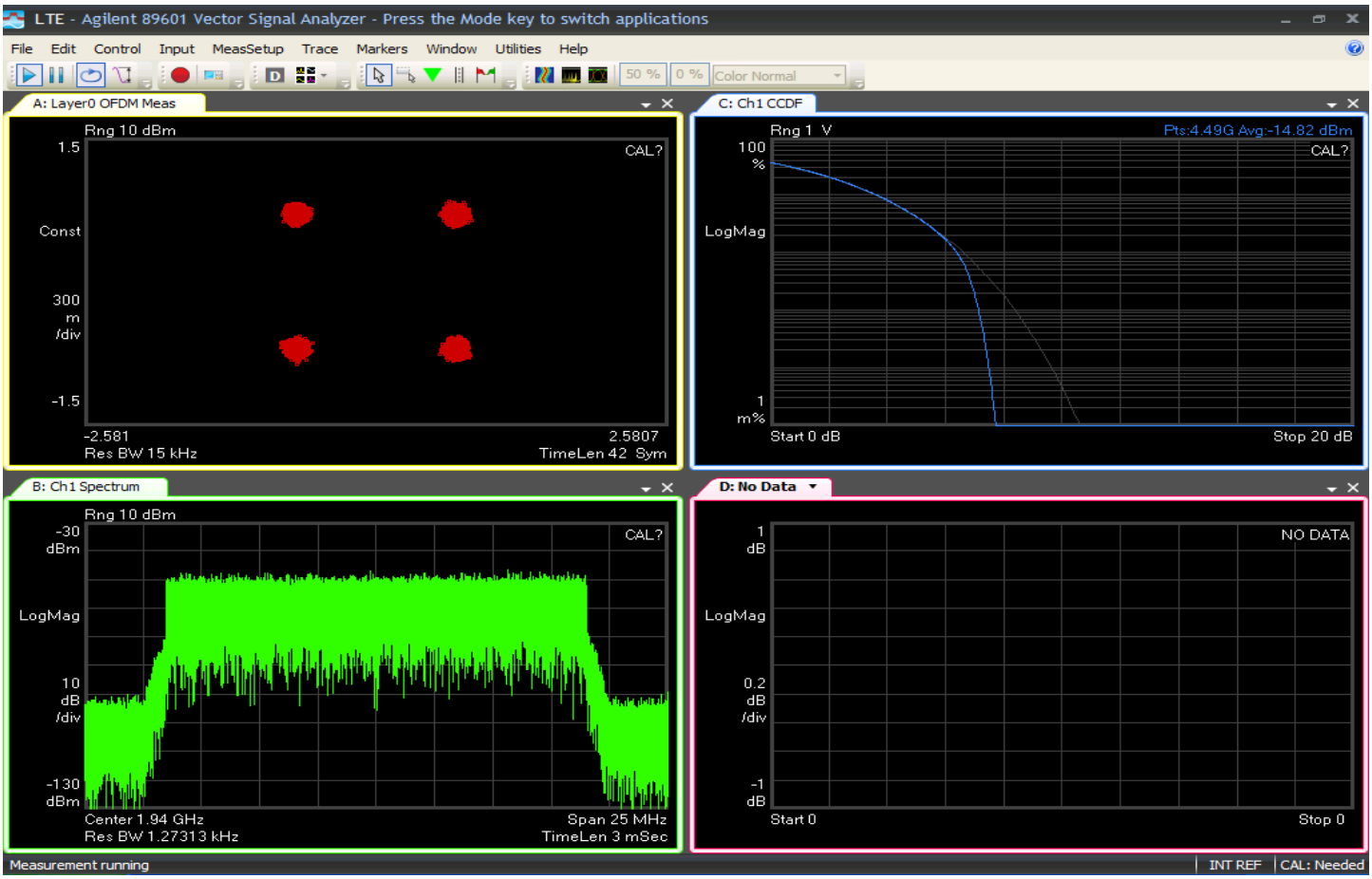


PART 2.1047 MEASUREMENTS REQUIRED: MODULATION CHARACTERISTICS

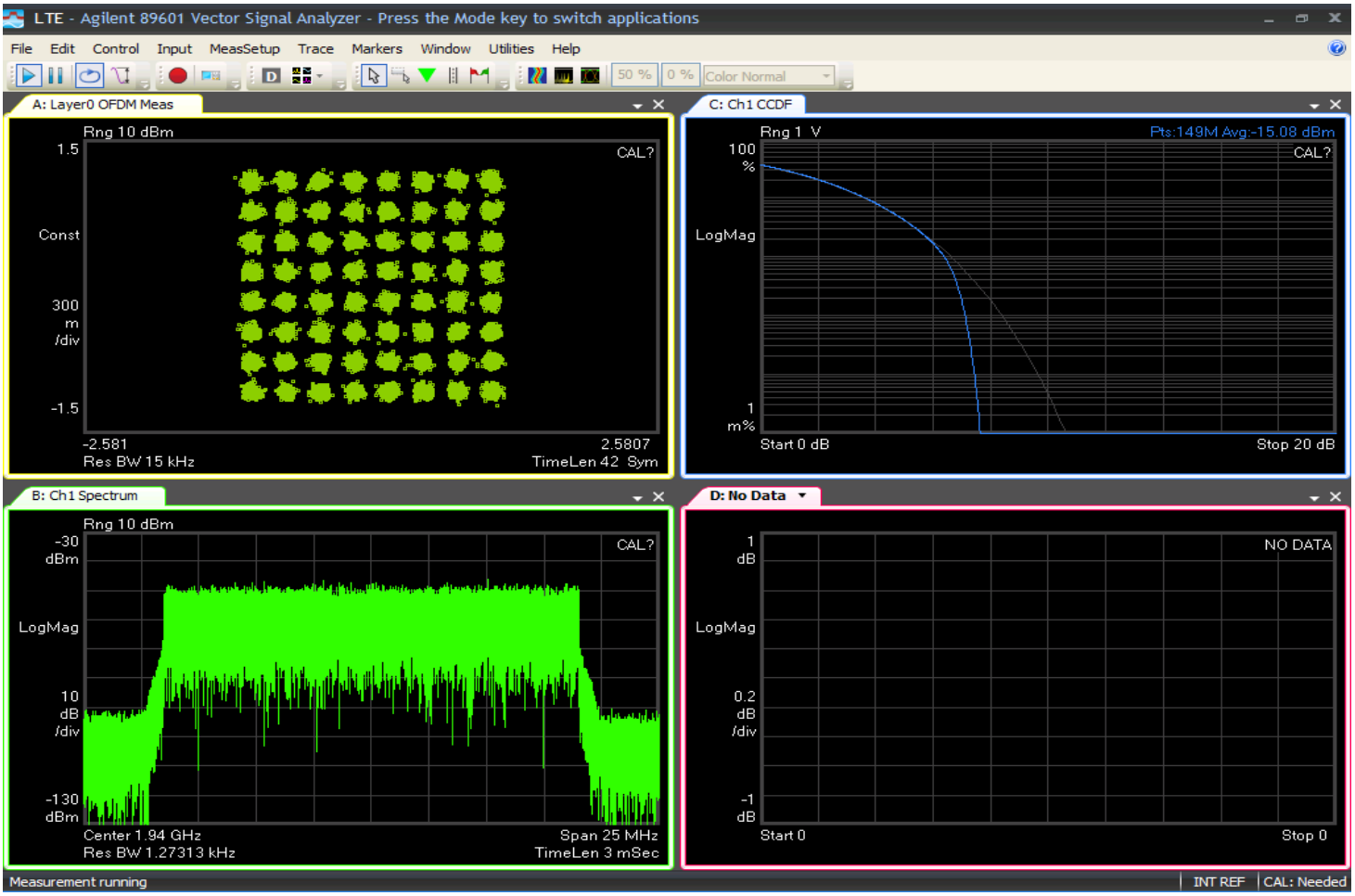
The LTE modulation characteristics were measured and recorded at Tx1 for the LTE test modulation schemes: QPSK, and 64QAM, for the lowest settable and the highest settable carriers tabulated below.

Frequency Block	Fundamental Center Frequency	Emission Bandwidth	RF Power
A+D: 1930 – 1950 MHz	1940 MHz	20 MHz	60 W (47.8 dBm)
F+C: 1970 – 1990 MHz	1980 MHz	20- MHz	60 W (47.8 dBm)

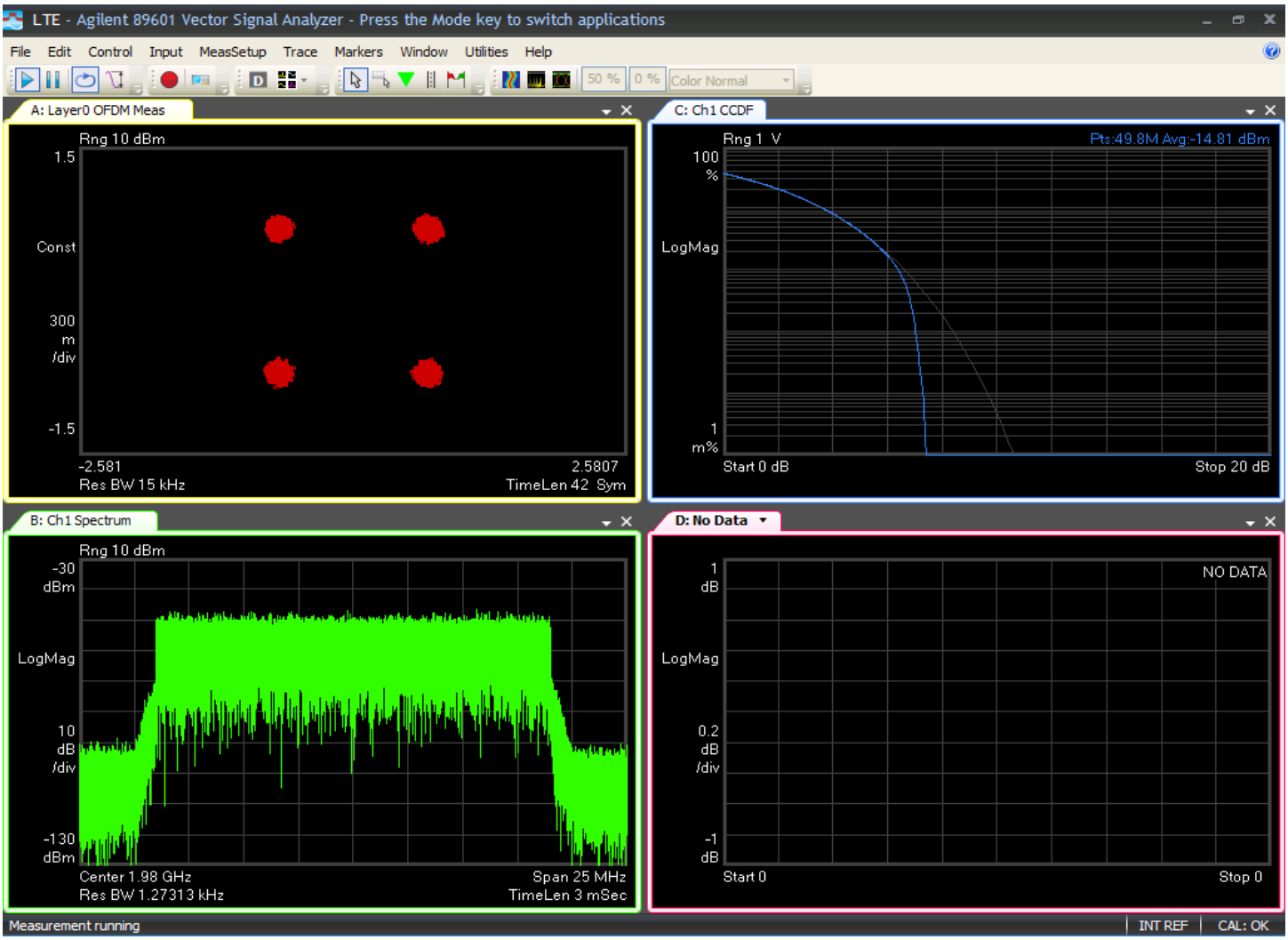
Modulation Schemes for Tx1 1940 MHz, BW 20 MHz
LTE QPSK
Tx1 1940 MHz, 60W (47.8 dBm), 20 MHz BW



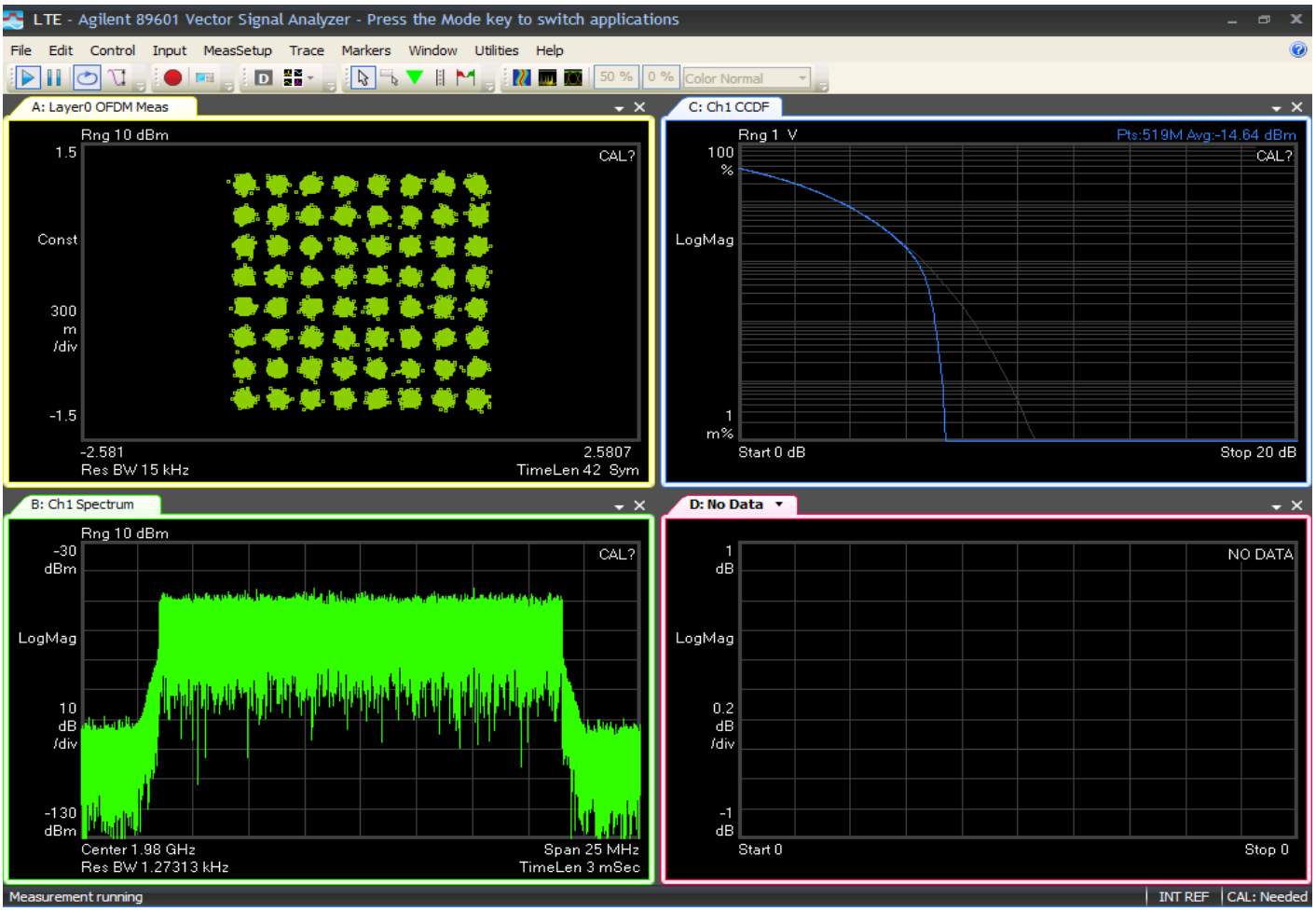
Modulation Schemes for Tx1 1940 MHz, BW 20 MHz
LTE 64QAM
Tx1 1940 MHz, 60W (47.8 dBm), 20 MHz BW



Modulation Schemes for Tx1 1980 MHz, BW 20MHz
LTE QPSK
Tx1 1980 MHz, 60W (47.8 dBm), 20 MHz BW



Modulation Schemes for Tx1 1980 MHz, BW 20 MHz
LTE 64QAM
Tx1 1980 MHz, 60W (47.8 dBm), 20 MHz BW



PART 2.1049 MEASUREMENTS REQUIRED: OCCUPIED BANDWIDTH – 99% POWER BANDWIDTH

Both the 99% Power Bandwidth (In-Band), which defines the emission designator, and the Emission Mask Compliance (Out-Of-Band) were measured and recorded at Tx1 for each of the LTE test modulation schemes: QPSK and 64QAM, for the lowest settable and the highest settable carriers tabulated below.

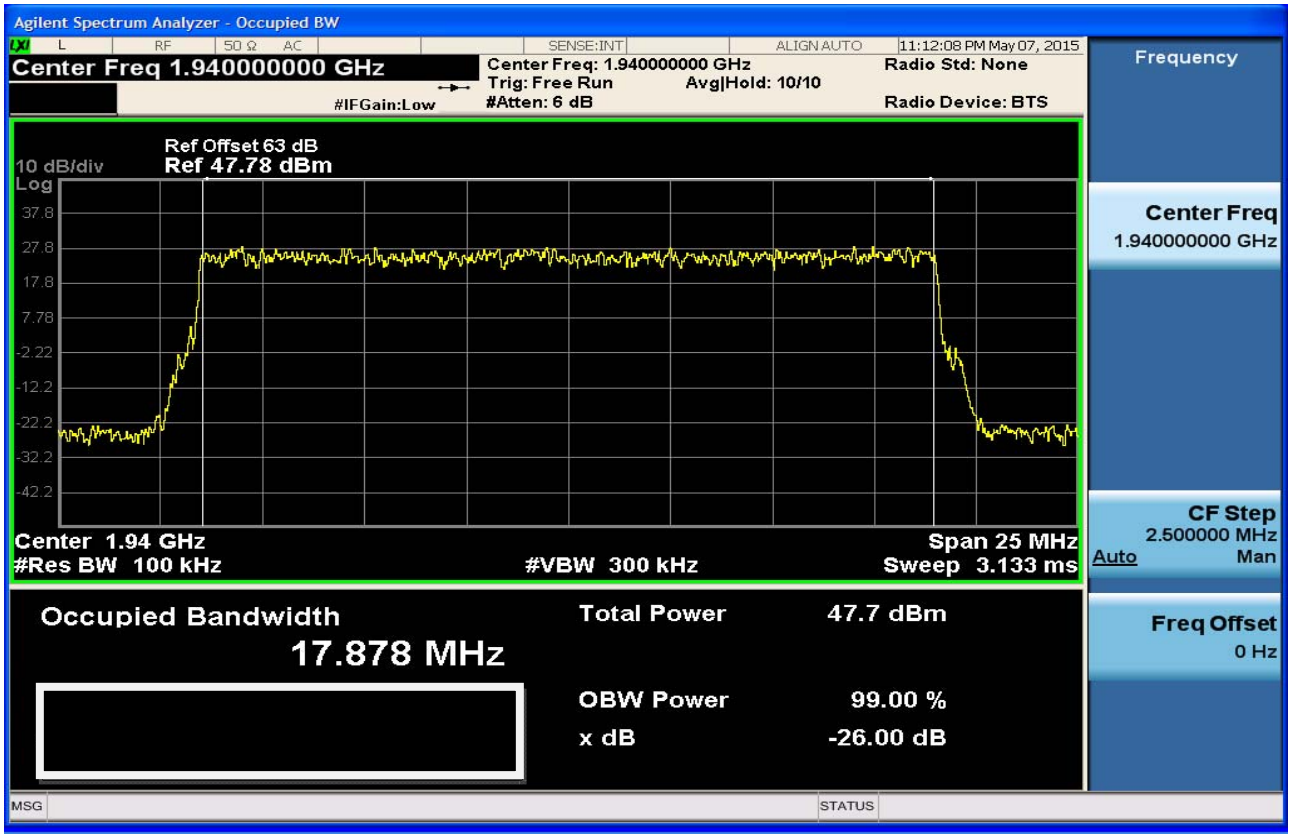
Frequency Block	Fundamental Center Frequency	Emission Bandwidth	RF Power
A+D: 1930 – 1950 MHz	1940 MHz	20 MHz	60 W (47.8 dBm)
F+C: 1970 – 1990 MHz	1980 MHz	20 MHz	60 W (47.8 dBm)

Compliance was demonstrated by each of the two methods:

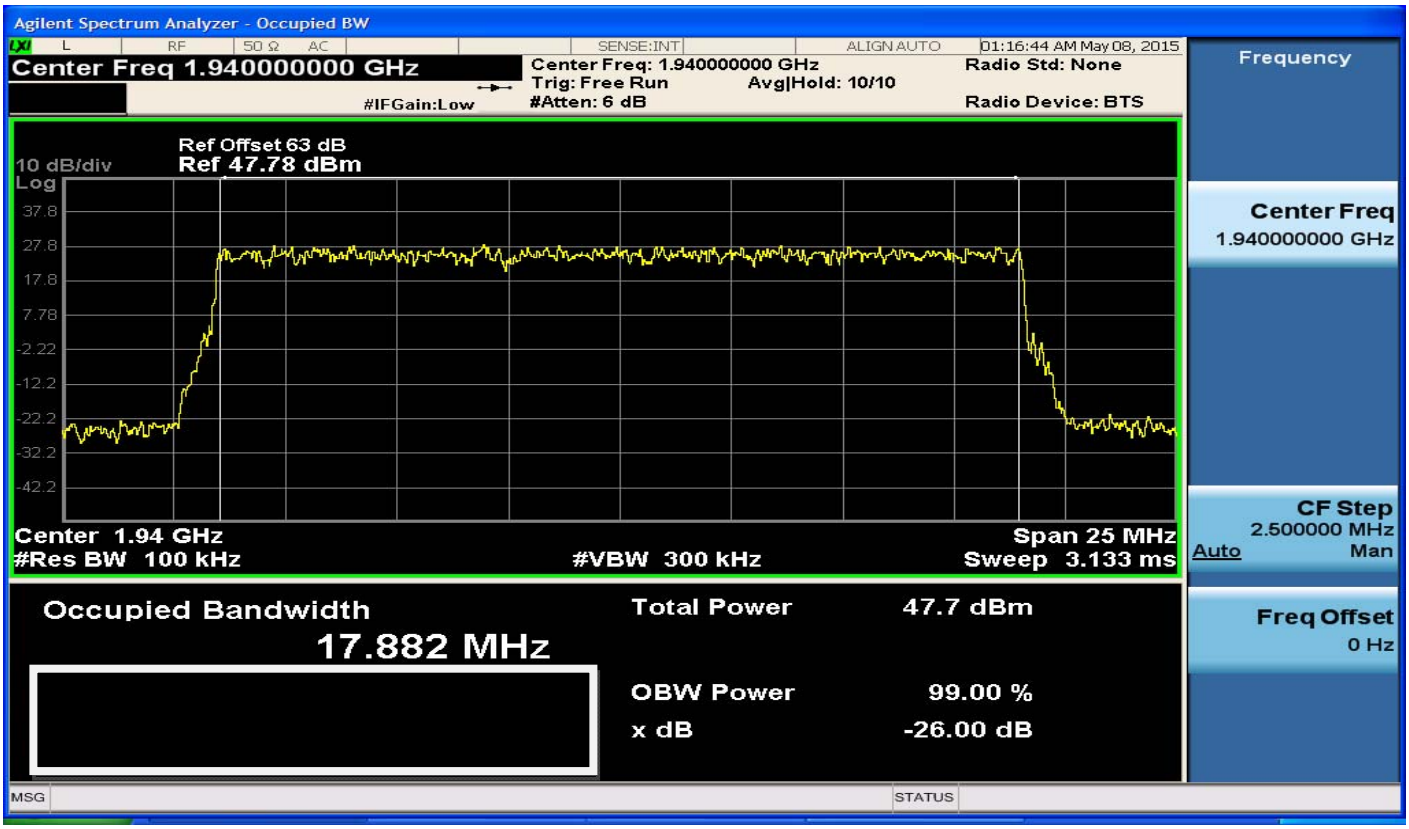
1. The carrier 99% Power Bandwidth, which defines the necessary bandwidth declared in the emission designator, using an Agilent MXA Signal Analyzer N9020A 20 Hz – 26.5 GHz.

2. In lieu of the ETSI TS 36.104 emission mask limitation, emission masks were abstracted and assembled from Part 24.238 (a) and (b), incorporating the additional 2x2 MIMO limitation from KDB pub 662911 D01 v02r01 *Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc).*

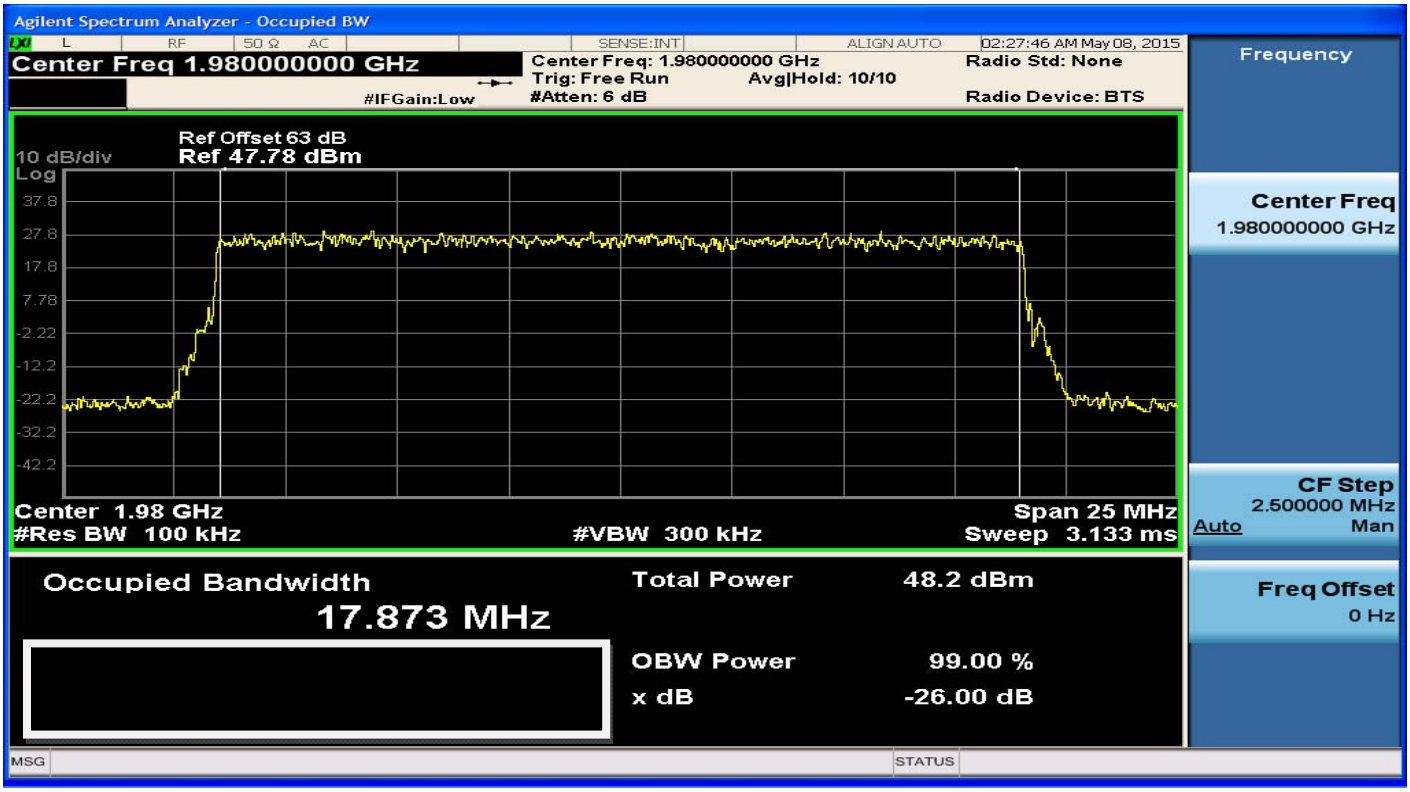
99% Power Bandwidth
LTE QPSK
Tx1 1940 MHz, 60 W (47.8 dBm), 20 MHz BW



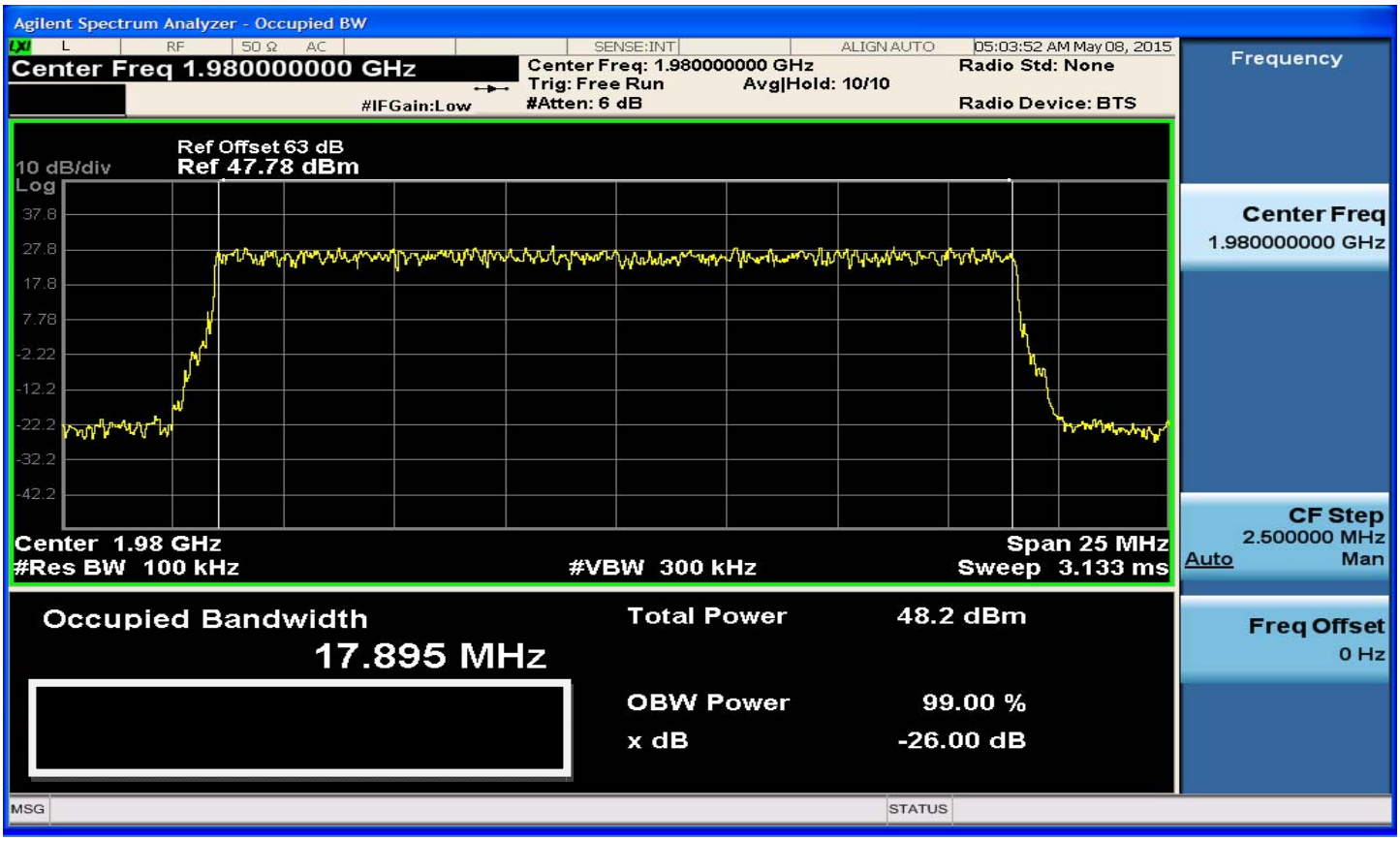
99% Power Bandwidth
LTE 64QAM
Tx1 1940 MHz, 60 W (47.8 dBm), 20 MHz BW



99% Power Bandwidth
LTE QPSK
Tx1 1980 MHz, 60 W (47.8 dBm), 20 MHz BW



99% Power Bandwidth
LTE 64QAM
Tx1 1980 MHz, 60 W (47.8 dBm), 20 MHz BW



99% Power Bandwidth Results Summary

Frequency Block	Fundamental Center Frequency	Emission Bandwidth	RF Power	LTE Modulation	Measured % Power Bandwidth (MHz)
A+D: 1930 – 1950 MHz	1940 MHz	20 MHz	60W (47.8 dBm)	QPSK	17.878
	1940 MHz	20 MHz	60W (47.8 dBm)	64QAM	17.882
F+C: 1970 – 1990 MHz	1980 MHz	20 MHz	60 W (47.8 dBm)	QPSK	17.873
	1980 MHz	20 MHz	60W (47.8 dBm)	64QAM	17.895

The average 99% Power Bandwidth, i.e. the Necessary Bandwidth, rounded off to 1 decimal point determines the emission designator to be:

17M9F9W at 20 MHz BW

PART 2.1049 MEASUREMENTS REQUIRED: OCCUPIED BANDWIDTH – EMISSION MASK

Method 2. Emission mask limitation using an EMI Test Receiver

In lieu of the ETSI TS 36.104 emission mask limitation, emission masks were abstracted and assembled from Part 24.238 (a) and (b), incorporating the additional 2x2 MIMO limitation from KDB pub 662911 D01 v02r01 *Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc).*

§24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth 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 at least 26 dB below the transmitter power.

Emission Mask Compliance (Out-Of-Band) was measured and recorded at Tx1 for each of the lowest settable and the highestnsettable LTE carriers tabulated below. Two LTE test modulation schemes were utilized: QPSK and 64QAM.

Frequency Block	Fundamental Center Frequency	Emission Bandwidth	RF Power
A+D: 1930 – 1950 MHz	1940 MHz	20 MHz	60 W (47.8 dBm)
F+C: 1970 – 1990 MHz	1980 MHz	20 MHz	60 W (47.8 dBm)

The measurement resolution bandwidth (RBW) for a fundamental bandwidth of 20 MHz, in a spectrum > 1GHz, is 100 kHz, as specified in *3GPP TS 36.104 version 10.9.0 Release 10, Table 6.6.3.3-2: Additional operating band unwanted emission limits for E-UTRA bands>1GHz*. In accordance with Part 24.238, the *out of band emissions* must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB, based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz. The limitation for RBW 100 kHz + 2x2 MIMO (i.e., 10 log N) is calculated as follows:

47.78 dBm – (43 + 10 log(60) dB) – 10log 100 kHz/1 MHz – 10log 2
47.78 dBm – 60.78 dBc – 10.0 dB – 3.0 dB = -26.0 dBm

However, in the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission may be employed.

47.78 dBm – (43 + 10 log(60) dB) – 10log 100 kHz/200 kHz – 10log 2
47.78 dBm – 60.78 dBc – 3.0 dB – 3.0 dB = -19.0 dBm

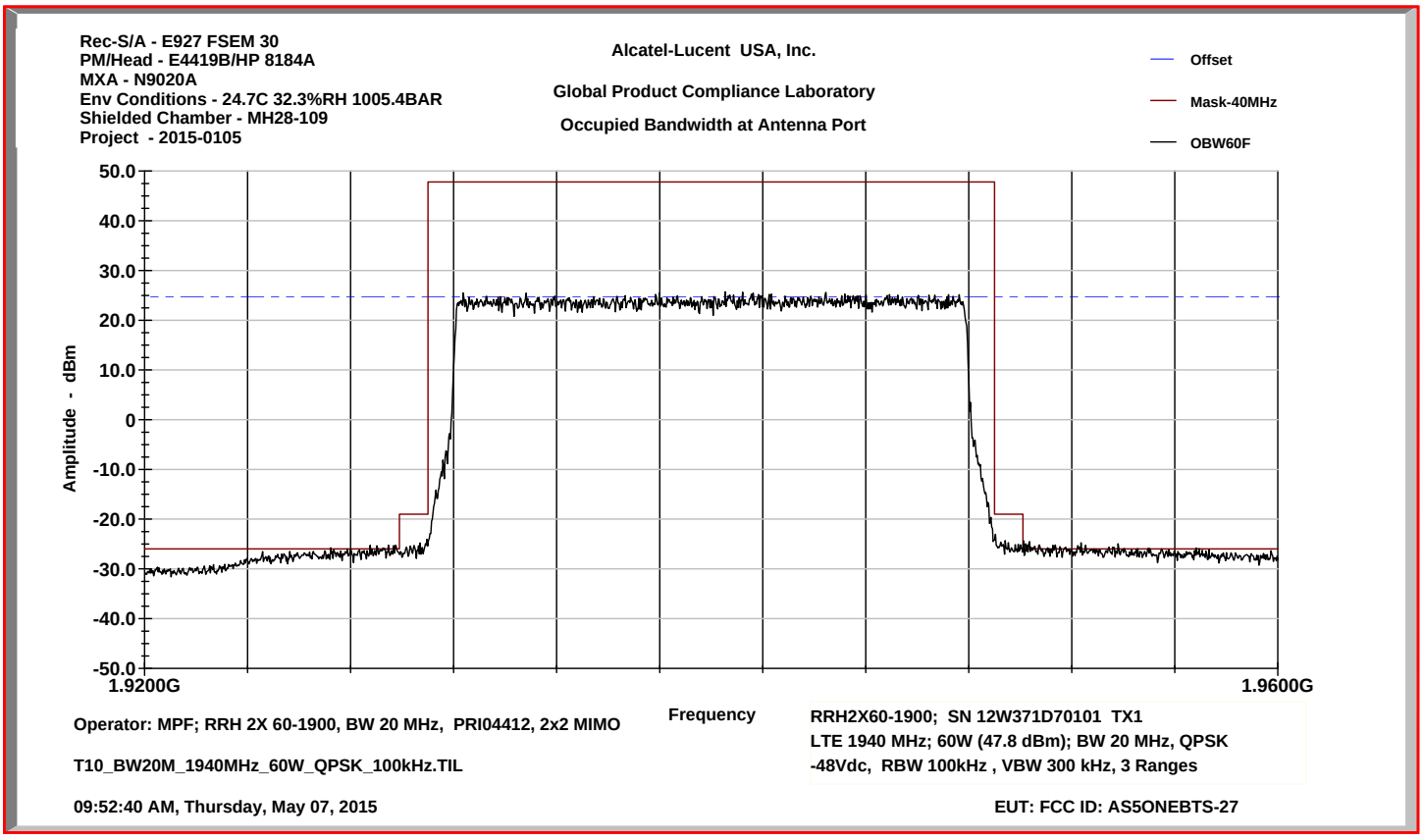
Using an RBW 100 kHz, the *carrier offset* is calculated at 10 log (100 kHz/20 MHz) = -23.0 dBc. This results in the 60 W (47.78 dBm) carrier being offset to 24.8 dBm.

The occupied bandwidth and out-of-band emissions of the EUT at the external antenna connector (EAC) were measured using a Rohde & Schwarz EMI Receiver, FSEM 30, 20 Hz - 26.5 GHz, in combination with Total Integrated Laboratory Environment (TILE) EMI test software, by ETS-Lindgren. The RF power level was set to 60 W (47.78 dBm) and continuously measured/monitored using a calibrated RF power meter and sensor. Through the use of calibrated RF attenuators and dual directional coupler (DDC), the RF power input to the FSEM 30 was maintained at approximately -10 dBm.

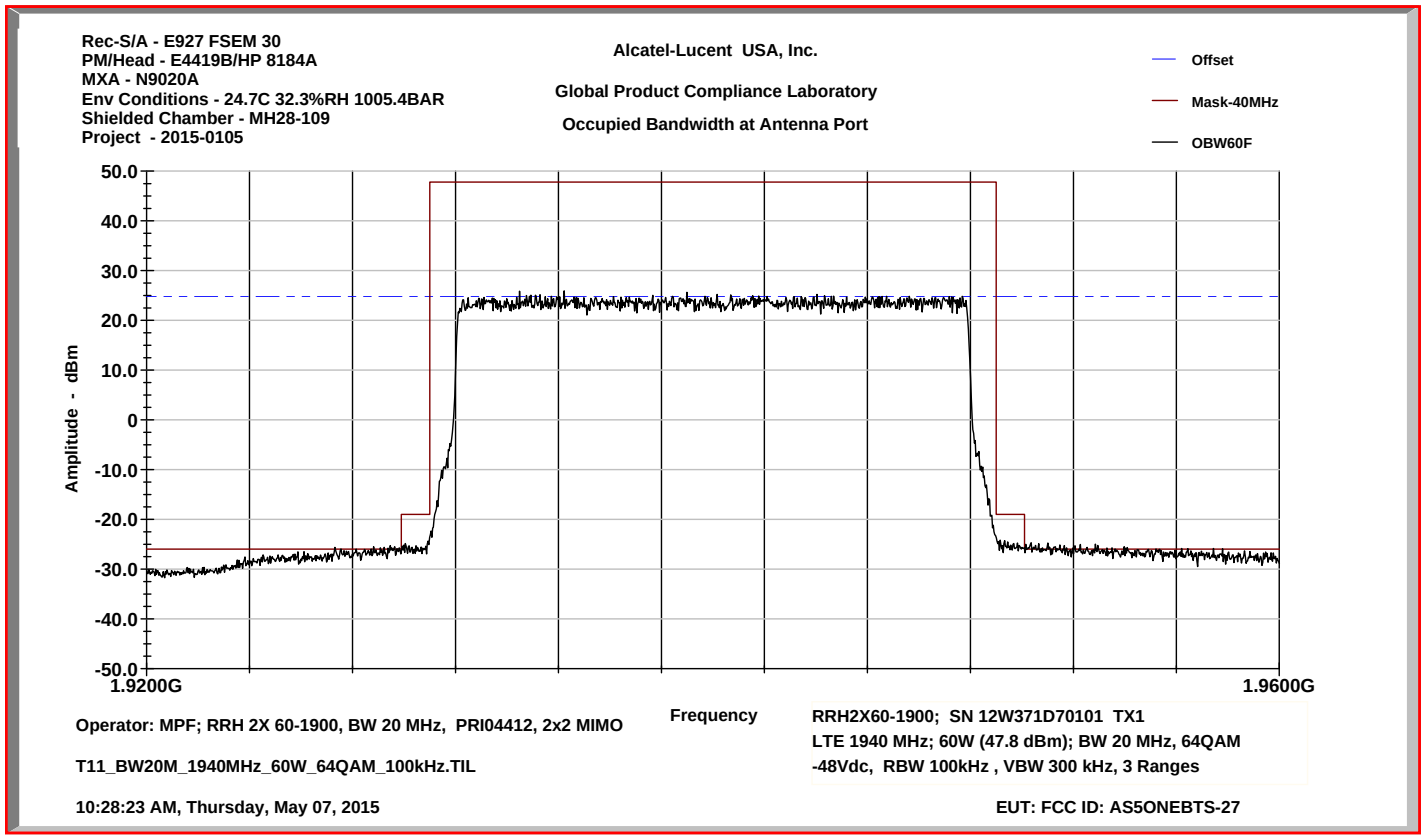
However, in accordance with Rule Part 24.238 (b), certain out-of-band emissions exceed the 2x2 MIMO limitation by ≤ 2.55 dB. Since this model has been deployed, since the original Grant dated 3/30/12, the FCC has agreed to accept this permissive change without explicit compliance to the KDB pub 662911 D01 v02r01 *Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc).* (FCC Tracking Number 928292)

The resulting measurements and limitations are displayed on the following pages.

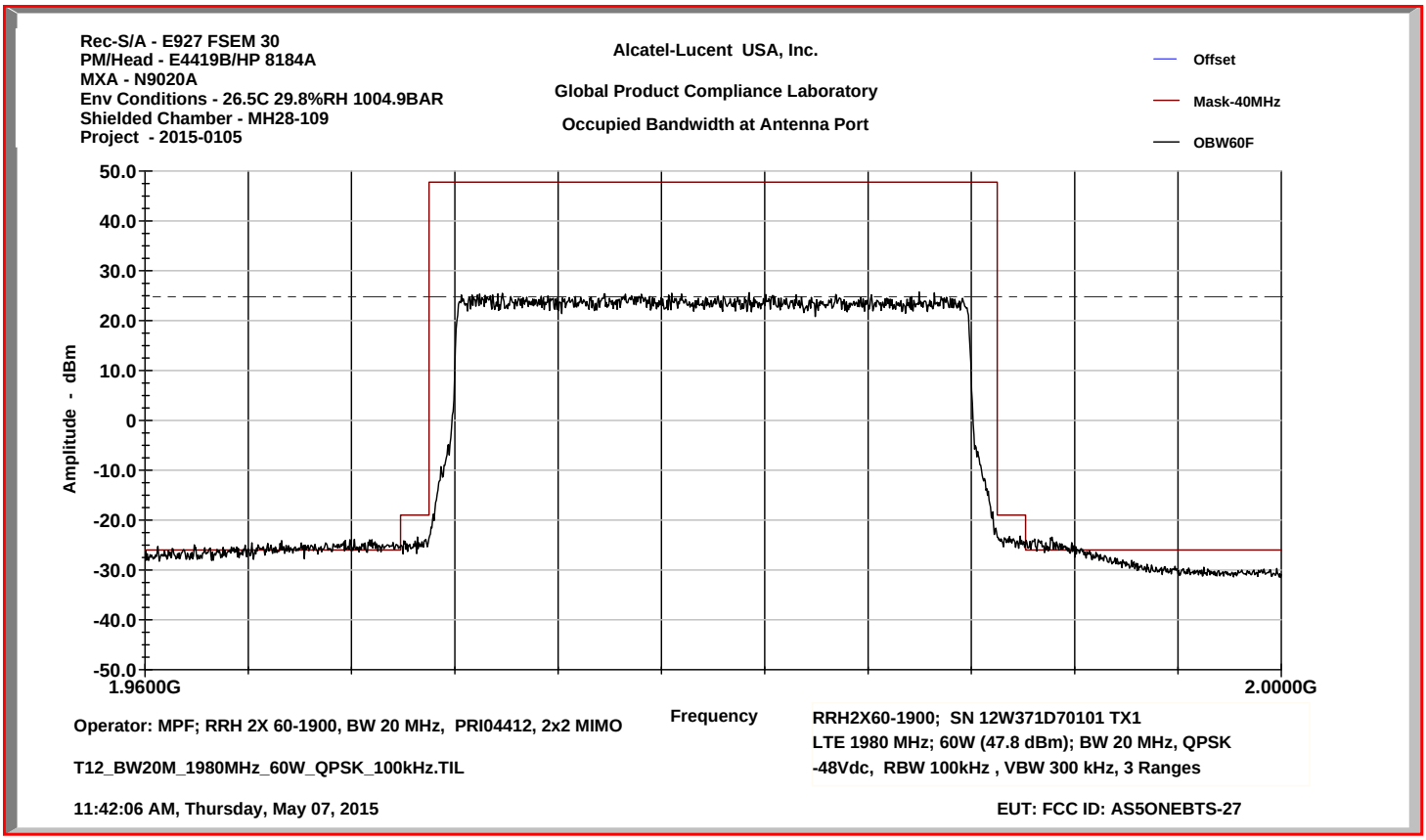
Emission Mask Compliance for Tx1 1940 MHz, BW 20 MHz
LTE QPSK
Tx1 1940 MHz, 60W (47.8 dBm), 20 MHz BW



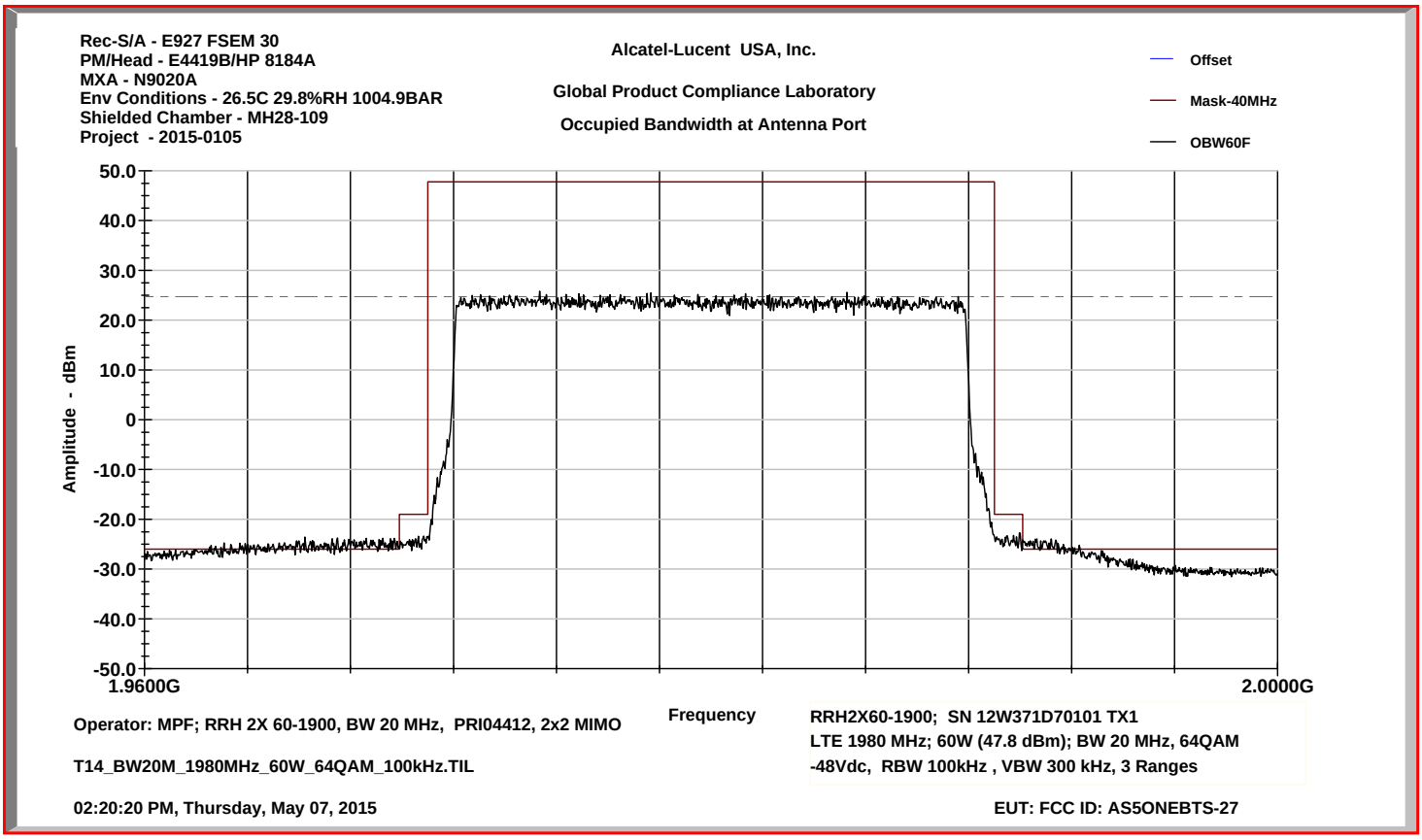
Emission Mask Compliance for Tx1 1940 MHz, BW 20 MHz
LTE 64QAM
Tx1 1940 MHz, 60W (47.8 dBm), 20 MHz BW



Emission Mask Compliance for Tx1 1980 MHz, BW 20 MHz
LTE QPSK
Tx1 1980 MHz, 60W (47.8 dBm), 20 MHz BW



Emission Mask Compliance for Tx1 1980 MHz, BW 20 MHz
LTE 64QAM
Tx1 1980 MHz, 60W (47.8 dBm), 20 MHz BW



PART 2.1051 MEASUREMENTS REQUIRED: SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS.

This test procedure is an extension of the occupied bandwidth measurement at the Equipment Antenna Connector (EAC) terminal, i.e., the downlink transmit antenna, using the same carrier frequencies, configurations, power level settings and test modulations, as in the preceding *PART 2.1049 MEASUREMENTS REQUIRED: OCCUPIED BANDWIDTH – EMISSION MASK.*

In accordance with Part 2.1057(a), the required frequency spectrum to be investigated extends from the lowest RF signal generated to the 10^{th} harmonic of the carrier at the EAC terminal. The emission limits at the antenna terminal are specified in §24.238(a)(b) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. In accordance with Part 2.1051, "the magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified"; i.e., these are not reportable.

In order to suppress the instrumentation noise floor sufficient to detect and measure spurious signals that have power levels as low as 20 dB below the required limit, an EMC software package was employed to drive the spectrum analyzer, collect and compile the acquired data, perform mathematical corrections to the data by incorporating pre-measured path losses into the software, and then generate a graphical display as shown in the following exhibits. The software package is: *TILE/IC (Total Integrated Laboratory Environment/Instrument Control System)*; purchased and licensed from ETS-Lindgren. The instrumentation noise floor is suppressed by the software's ability to split the spectrum being measured into many small segments/ranges and then sequentially compile them for the continuous graphical display. Using a 1 MHz RBW, the measured spectrum 10 MHz – 20 GHz was broken into segments, less than 250 MHz per segment, and then mathematically combined by the previously cited TILE software as displayed in the following data plots.

In accordance with §24.238(a)(b), unwanted emissions must be suppressed by

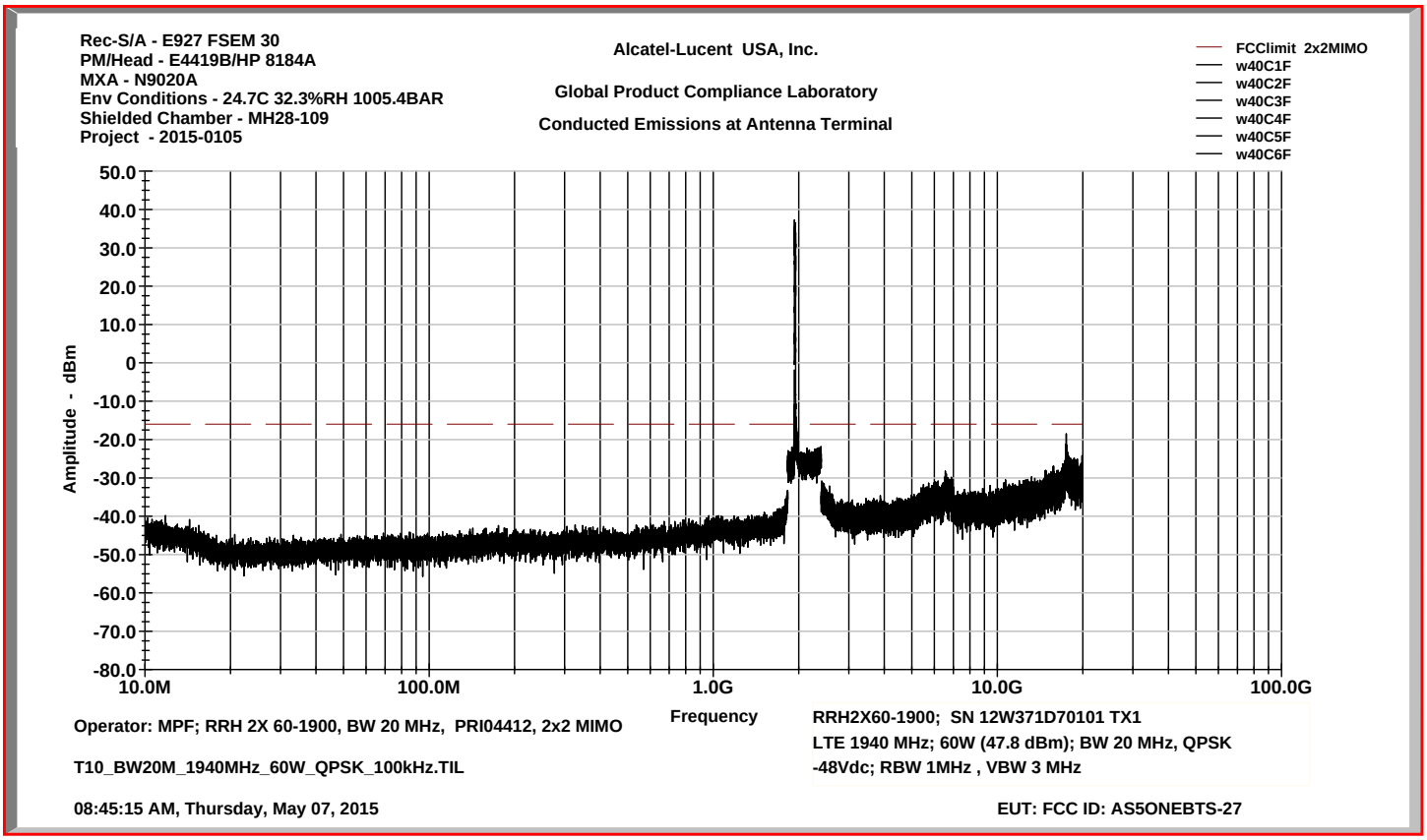
43 + 10 log 60W = 60.78 dBc, which equates to -13 dBm

Consistent with 2x2 MIMO requirements, an additional 3 dB attenuation is required, in accordance with:

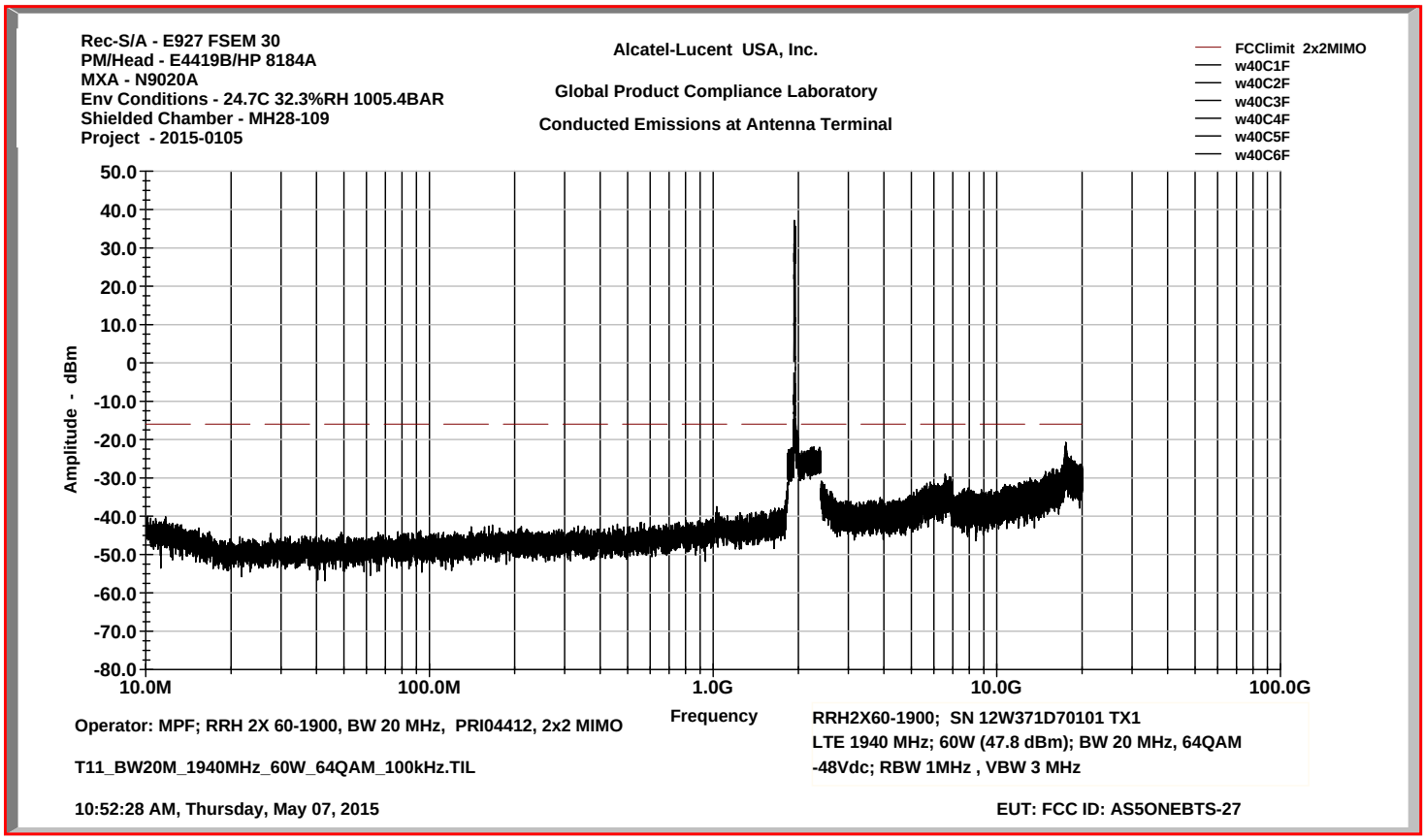
43 + 10 log P + 10 log (Nant)
43 + 10 log 60W + 10 log 2 = 63.79 dBc, which equates to - 16 dBm

where, Nant is the number of outputs, i.e., transmit antenna terminals.

Conducted Emission Compliance for Tx1 1940 MHz, BW 20 MHz
LTE QPSK
Tx1 1940 MHz, 60W (47.8 dBm), 20 MHz BW

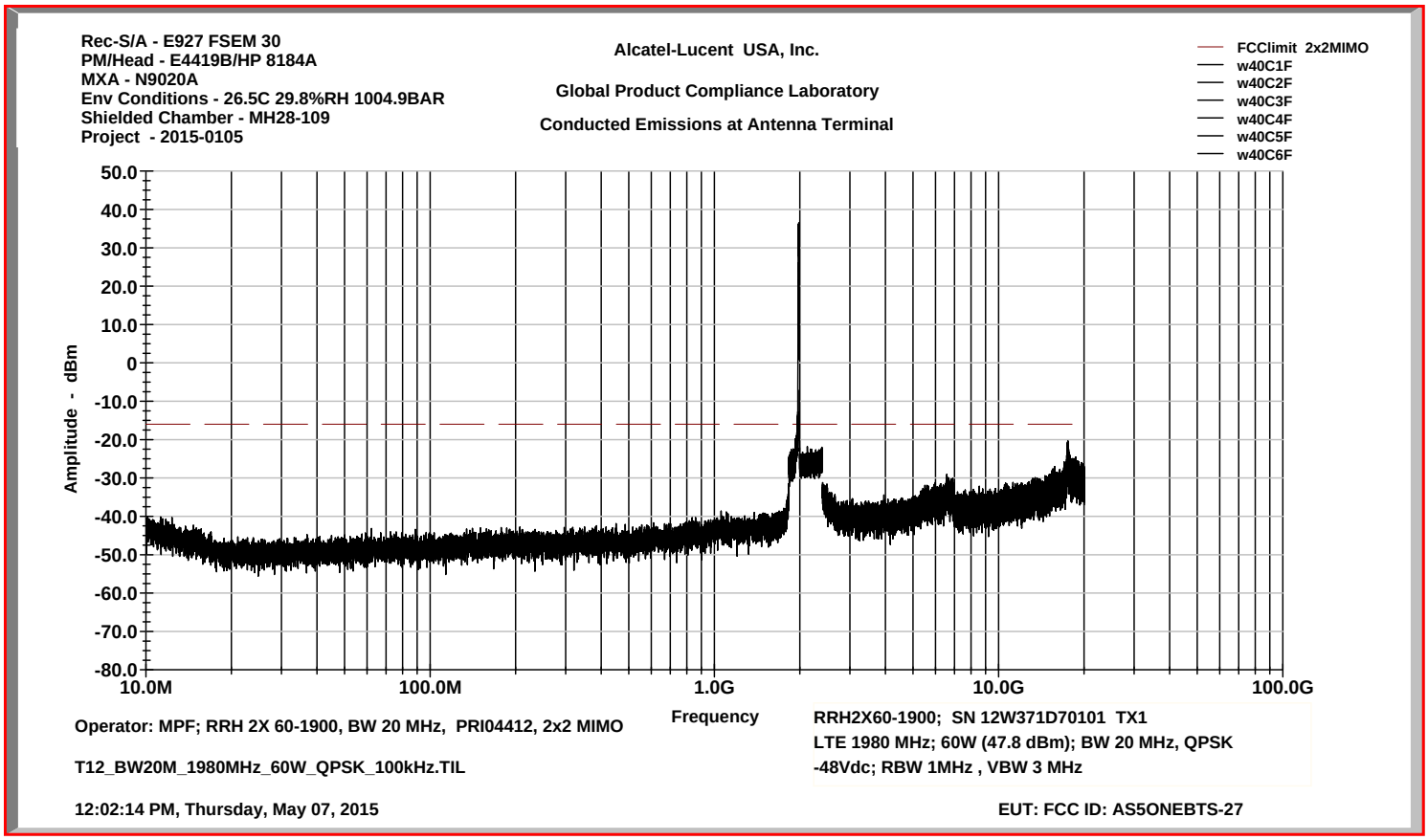


Conducted Emission Compliance for Tx1 1940 MHz, BW 20 MHz
LTE 64QAM
Tx1 1940 MHz, 60W (47.8 dBm), 20 MHz BW



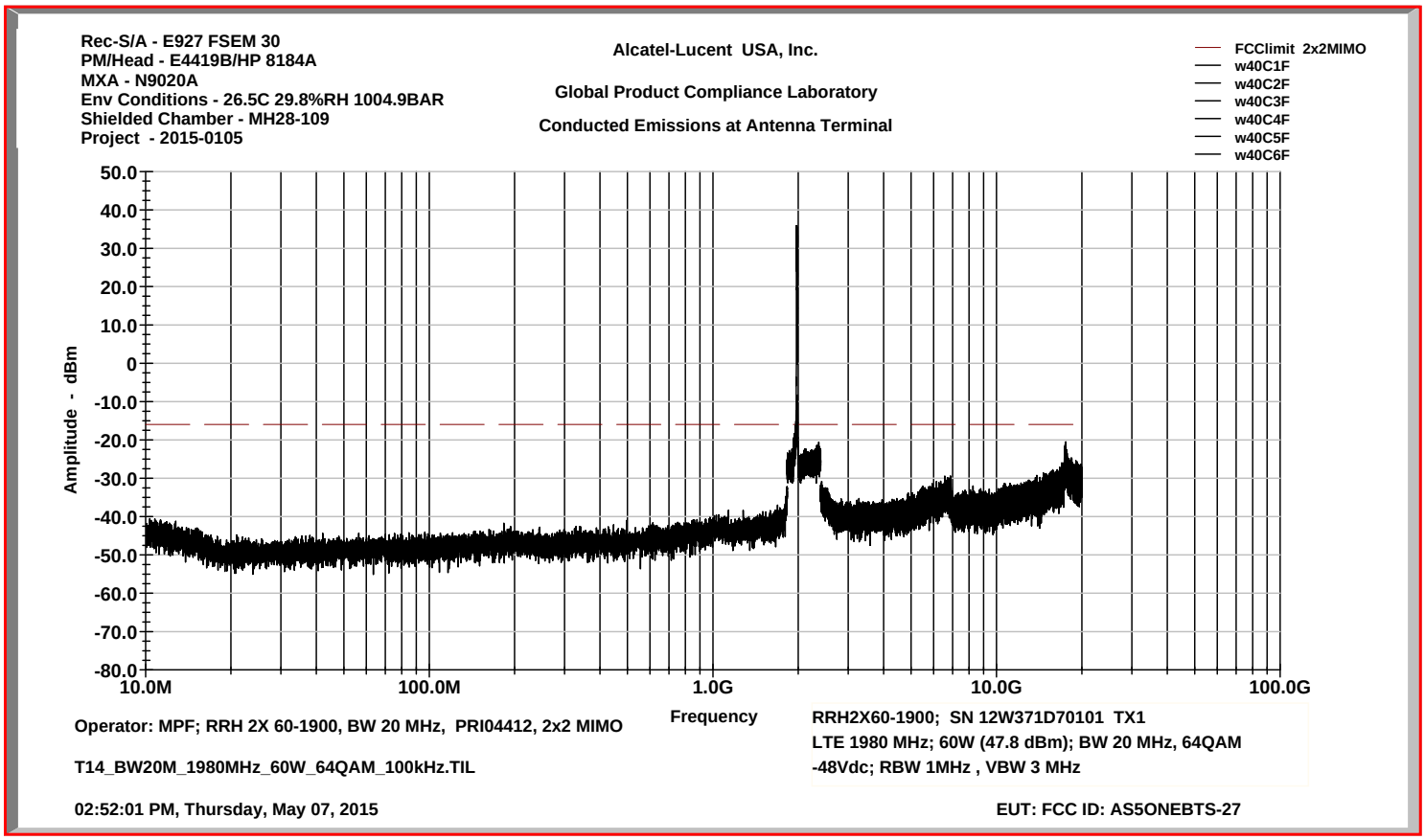
Conducted Emission Compliance for Tx1 1980 MHz, BW 20 MHz

LTE QPSK
Tx1 1980 MHz, 60W (47.8 dBm), 20 MHz BW



Conducted Emission Compliance for Tx1 1980 MHz, BW 20 MHz

LTE 64QAM
Tx1 1980 MHz, 60W (47.8 dBm), 20 MHz BW



PART 2.1053 MEASUREMENTS REQUIRED: FIELD STRENGTH OF SPURIOUS RADIATION

Radiated spurious emissions (RE) were investigated over the spectrum 30 MHz – 20 GHz for a single 2xMIMO carrier/fundamental configuration:

Carrier	Carrier Center Frequency	Emission Bandwidth	Test Modulation
Highest Frequency	1980 MHz	20 MHz	64QAM

The equipment under test (EUT) was configured as recommended for *floor standing equipment,* following the guidelines of ANSI C63.4-2009. The EUT was installed and operated as in the *normal mode of operation.* Field strength measurements of radiated spurious emissions were evaluated in a 3m semi-anechoic chamber (FCC Site RN 515091), using an EUT-to-Antenna separation of 3-meters. Test software was Vasona by EMiSoft.

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 2.1057 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:

$$\text{Pmeas (dBm)} + \text{Cable Loss(dB)} + \text{Antenna Factor(dB)} + 107\ (\text{dB}\mu\text{V/dBm}) - \text{Amplifier Gain (dB)} = \text{Field Strength (dB}\mu\text{V/m)}$$

Section 27.53 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.

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

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

Where: E = Field Intensity in Volts/ meter R = Distance in meters = 3 m
P = Transmitted Power in watts = 60W

Results: Complies - Over the out-of-band spectrum investigated from 30 MHz to the tenth harmonic of the carrier (20GHz), the power levels of all emissions observed were greater than 20 dB below the 82.23 dB μV/meter limit. **Therefore, there were no reportable radiated spurious emissions.**

PART 2.1055 MEASUREMENTS REQUIRED: FREQUENCY STABILITY

ALREADY PROVIDED IN THE ORIGINAL FILING
NO ADDITIONAL INFORMATION ADDED

LIST OF TEST EQUIPMENT

Measurement of Emissions Conducted to the Transmit Port/Antenna Terminal

Equipment Function	Manufacturer	Model	Serial Number	Calibration Date	Next Due Date	GPCL
Spectyrum Analyzer	Rohde & Schwarz	FSEM 30 20 Hz – 26.5 GHz	DE35291	5/23/14	5/23/16	E927
MXA Signal Analyzer	Agilent	N9020A 10 Hz – 3.6GHz	MY52090740	7/24/14	7/24/16	---
Power Meter	Agilent	E4419B EPM-Series Power Meter	GB39511110	11 JUL 13	11 JUL 15	---
Power Meter Sensor	Hewlett-Packard	HP 8481A		9 FEB 15	9 FEB 16	---
Dual Directional Coupler	Hewlett-Packard	HP 772D 2 – 18 GHz	2839A01045	NR	NR	E1136
Attenuator (Input)	Weinschel Corp	66-30-34 30 dB, 150 W	BJ4512	NR	NR	
Attenuator (Incident)	MCEWeinschel	49-10-34-LIM DC – 18 GHz 10 dB, 25 W	BN3120	NR	NR	
Attenuator (Test Port)	MCE/Weinschel	46-20-34-LIM DC – 18 GHz 20 dB, 25 W	BN3126	NR	NR	
Termination (Reflected)	MCE/Weinschel	M1404N	8936	NR	NR	
Regulated Power Supply	Electronic Measurements, Inc.	TCR 50T200	---	NR	NR	
Variable Attenuator	Agilent	8495B/ 70 dB	MY42140029	NR	NR	
Variable Attenuator	Agilent	8494B/ 11 dB	MY41111301	NR	NR	

Radiated Emissions Test Equipment List

Test Equipment List
RE/AR5/2015-0104

Manufacturer	Model	Serial Number	Type	Description	GPCL ID	Last Cal	Interval	Status
Rohde & Schwarz	ESIB40	100044	Test Receiver	EMI (20Hz to 40 GHz)-150 +30dBM	E567	2/7/2014	24	Active
Sonoma Instrument Co.	310	185794	Amplifier	9KHz-1GHz	E507	6/17/2014	24	Active
Test Equipment Connection	SAS-521-2	408	Bilogical Antenna	25 - 2000 MHz	E601	2/13/2015	24	Active
Weinschel	2-6	BX3438	Attenuator	6 dB DC-18GHz 5 Watt	E889	3/5/2014	24	Active
ETS Lindgren	3117	00135198	Horn Antenna	Double-Ridged Waveguide Horn 1-18 GHz	E1073	12/10/2014	24	Active
Agilent	8449B	3008A01740	Amplifier	Pre-Amplifier 1-26.5GHz	E1166	1/17/2014	24	Active
EMC Test Systems	3116	2539	Horn Antenna	Double Ridged Horn 18-40 GHz	E513	3/19/2015	24	Active
EMC Test Systems	2090	1577	Multi-Device Controller	Multi-Device Controller	E555	na	0	Active
Trilithic	5HC2850/18050-1.8-KK	200113078	High Pass Filter	PCS 2.85GHz - 18.05GHz	E1116	na	0	Active