



Subject: **Application for Class II Permissive Change under FCC ID: AS5BBTRX-13 to Add the 5 MHz + 15 MHz Configuration.**

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October 4, 2013

EXHIBIT 9: TEST REPORT

INTRODUCTION:

The original submittal covered single carrier configurations of 10 MHz, 15 MHz and 20 MHz; plus non-contiguous configurations of 10 + 10 MHz, 10 + 5 MHz and 5 + 10 MHz, operated in a 2x120W MIMO mode. This Class II Permissive Change requests authorization for the additional non-contiguous configurations of 5 + 15 MHz and 15 + 5 MHz, also operated in a 2x120W MIMO mode. Both the original and this Class II filing employ three LTE modulation schemes: QPSK, 16QAM and 64QAM. The authorized 45 MHz spectrum is specified in Rule Part 27.5: 2110 – 2155 MHz Down Link (DL) paired with 1710 – 1755 MHz Up Link (UL).

In accordance with Sec. 2.1043 *Changes In Certificated Equipment*, only the characteristics affected by the change need to be reported. As such, the applicable measurements affected are contained in the Test Report Exhibits, and all other Exhibits submitted with the initial/original filing, that remain unchanged will not be repeated. All initial exhibits, that were granted permanent confidentiality and are unchanged, continue to remain confidential, and will not be repeated with this submission.

Full compliance has been demonstrated with FCC Part 27 — Miscellaneous Wireless Communications Services, Subpart C — Technical Standards, § 27.53 Emission Limits., following the procedural requirements specified in Part 2 — Frequency Allocations And Radio Treaty Matters; General Rules And Regulations Subpart J — Equipment Authorization Procedures.

Under FCC ID: AS5BBTRX-13, the **LTE TRDU2X120-AWS**, is designed to be operated and marketed in the Alcatel-Lucent 9712 cabinet systems. Each **TRDU2X120-AWS** contains two identical transceiver paths and ports. Each transceiver port can either output 60W or 120W maximum at the external antenna connector (EAC). The 120W output per antenna port can consist of either 10+10 MHz, 10+5 MHz or 15+5 MHz configured as two non-contiguous carriers. The **LTE TRDU2X120-AWS** will typically be operated in Multiple Input and Multiple Output (MIMO) mode using multiple antennas.

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 27 Miscellaneous Wireless Communications Services; Subpart C —Technical Standards
- Part 27.53 Emission Limits.

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.

TEST FREQUENCIES AND TEST CONFIGURATIONS:

§ 27.4 Terms and definitions.

Advanced Wireless Service (AWS). A radiocommunication service licensed pursuant to this part for the frequency bands specified in § 27.5(h) or § 27.5(j).

§ 27.5 Frequencies.

(h) *1710-1755 MHz and 2110-2155 MHz bands.* The following frequencies are available for licensing pursuant to this part in the 1710-1755 MHz and 2110-2155 MHz bands:

- (1) Three paired channel blocks of 10 megahertz each are available for assignment as follows:
 - Block A: 1710-1720 MHz and 2110-2120 MHz;
 - Block B: 1720-1730 MHz and 2120-2130 MHz; and
 - Block F: 1745-1755 MHz and 2145-2155 MHz.
- (2) Three paired channel blocks of 5 megahertz each are available for assignment as follows:
 - Block C: 1730-1735 MHz and 2130-2135 MHz;
 - Block D: 1735-1740 MHz and 2135-2140 MHz; and
 - Block E: 1740-1745 MHz and 2140-2145 MHz.

Down Link Test Frequencies

Frequency Block	Block BW
A: 2110 - 2120	10 MHz
B: 2120 - 2130	10 MHz
C: 2130 - 2135	5 MHz
D: 2135 - 2140	5 MHz
E: 2140 - 2145	5 MHz
F: 2145 - 2155	10 MHz

15 + 5 MHz and 5 + 15 MHz Test Configurations with QPSK, 16QAM and 64QAM

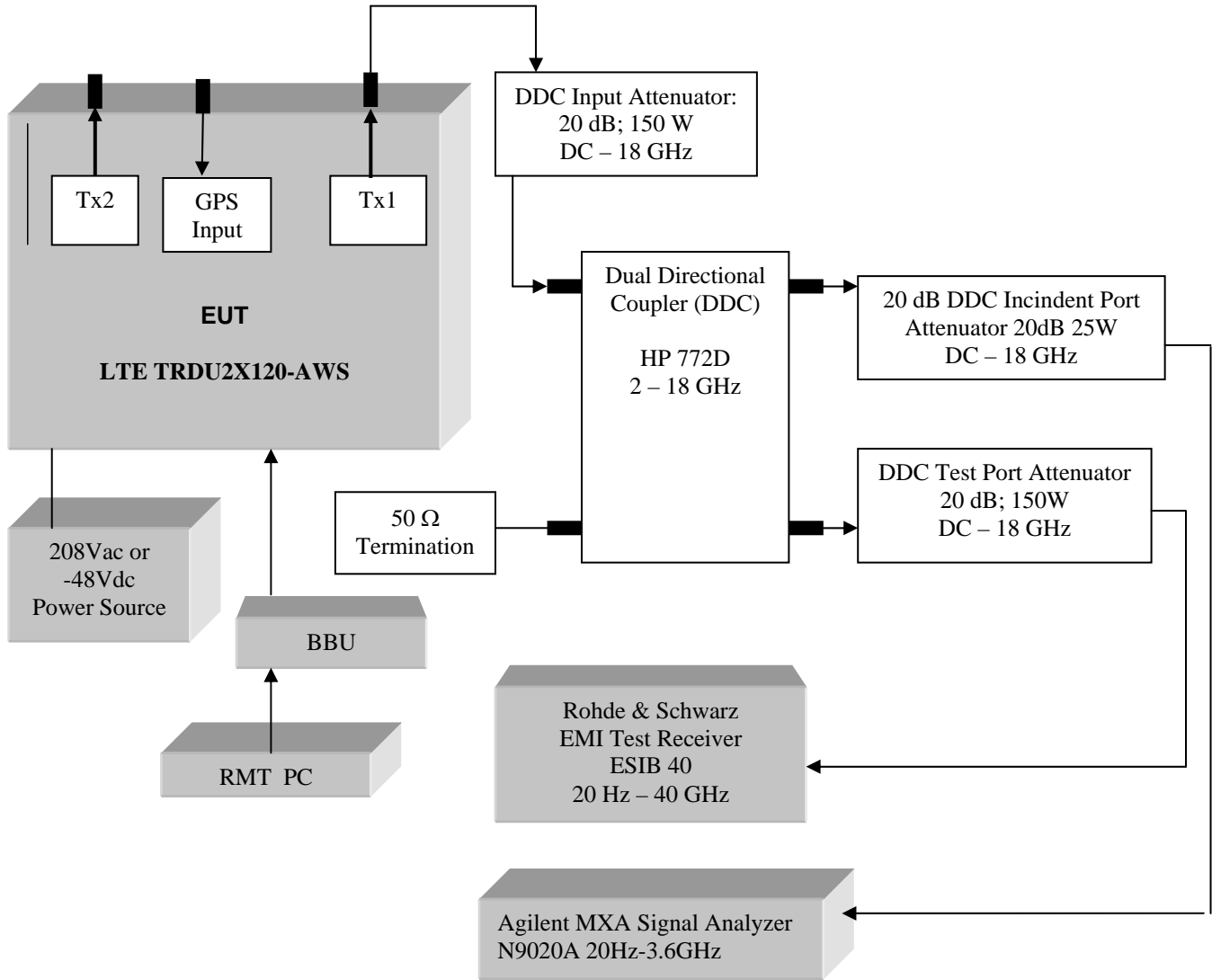
Test Number and Configuration	Freq Block	15 MHz Carrier	Freq Block	5 MHz Carrier
Test #1 - 15 + 5 MHz	A+B1	2117.5	F2	2152.5
Test #2 - 15 + 5 MHz	B+C	2127.5	E	2142.5
Test #3 - 15 + 5 MHz	C+D+E	2137.5	F2	2152.5
Test #4 - 5 + 15 MHz	C	2147.5	E+F	2132.5

PART 2.1046 MEASUREMENTS REQUIRED: RF POWER OUTPUT

The RF power of the single 5 MHz and 15 MHz BW carriers were individually measured at 60 W (47.8 dBm) long term average power at each transmit terminal (Tx1 and Tx2) and for each of the 3 test modulation schemes: QPSK, 16QAM 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

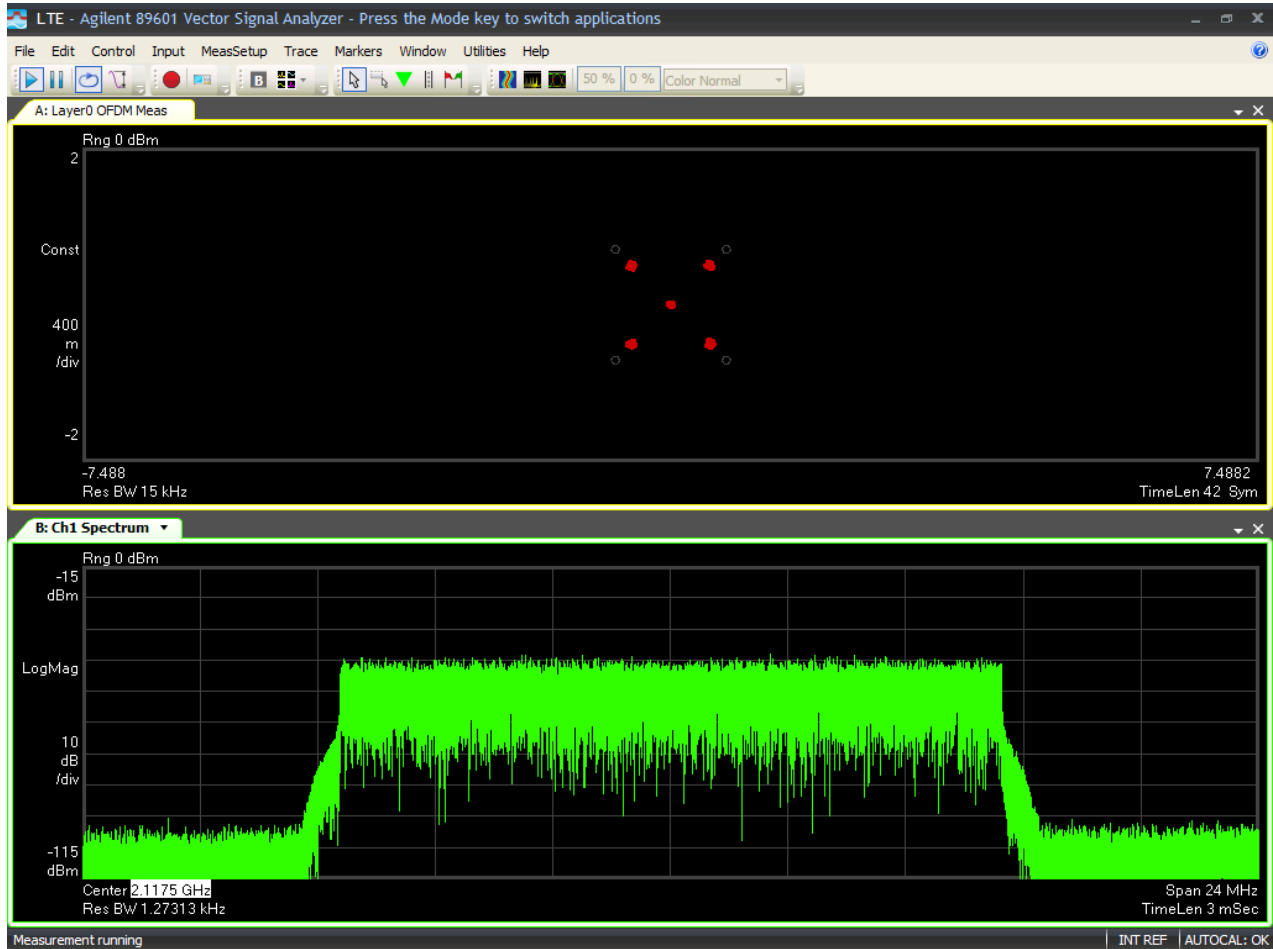


PART 2.1047 MEASUREMENTS REQUIRED: MODULATION CHARACTERISTICS

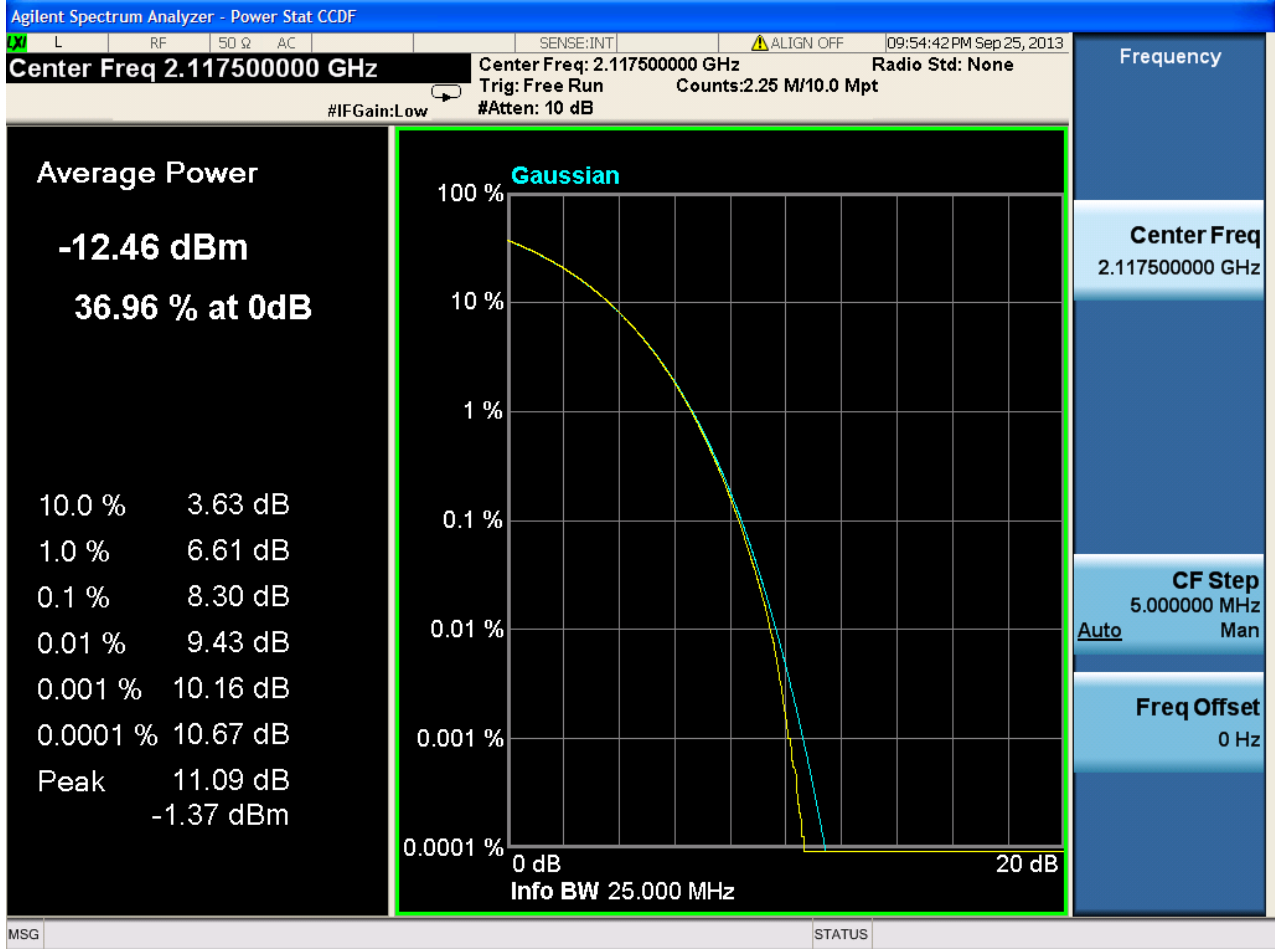
The LTE modulation characteristics and PAR were measured and recorded for each carrier in each of the four test configurations, and for each of the three modulation schemes: QPSK, 16QAM and 64QAM. Since there is no discernible distinction between the measured data plots, and for brevity, the Test #1 configuration will be displayed as representative of all four configurations.

Test Number and Configuration	Freq Block	15 MHz Carrier	Freq Block	5 MHz Carrier
Test #1 - 15 + 5 MHz	A+B1	2117.5	F2	2152.5

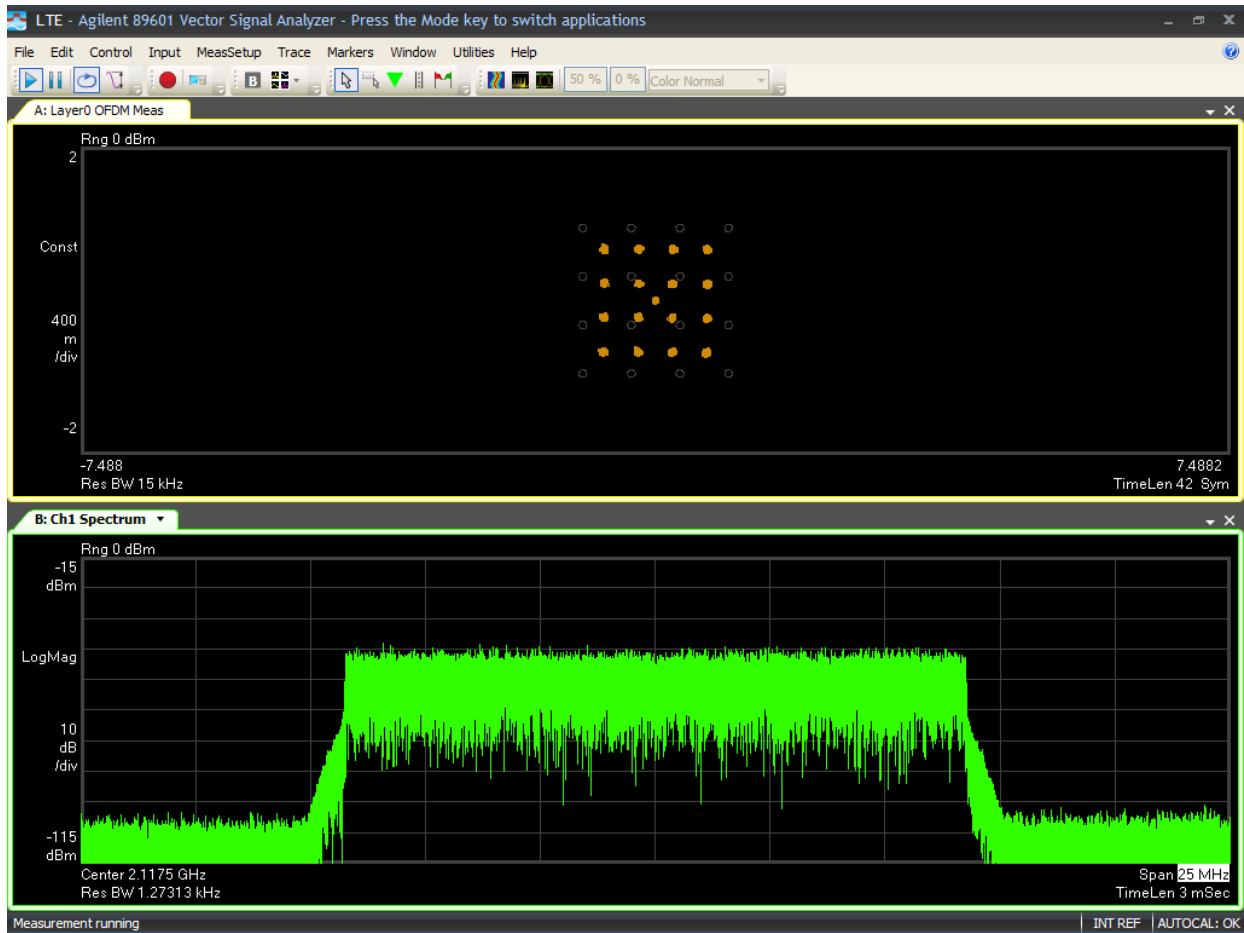
**15 MHz Carrier at 2117.5 MHz
QPSK**



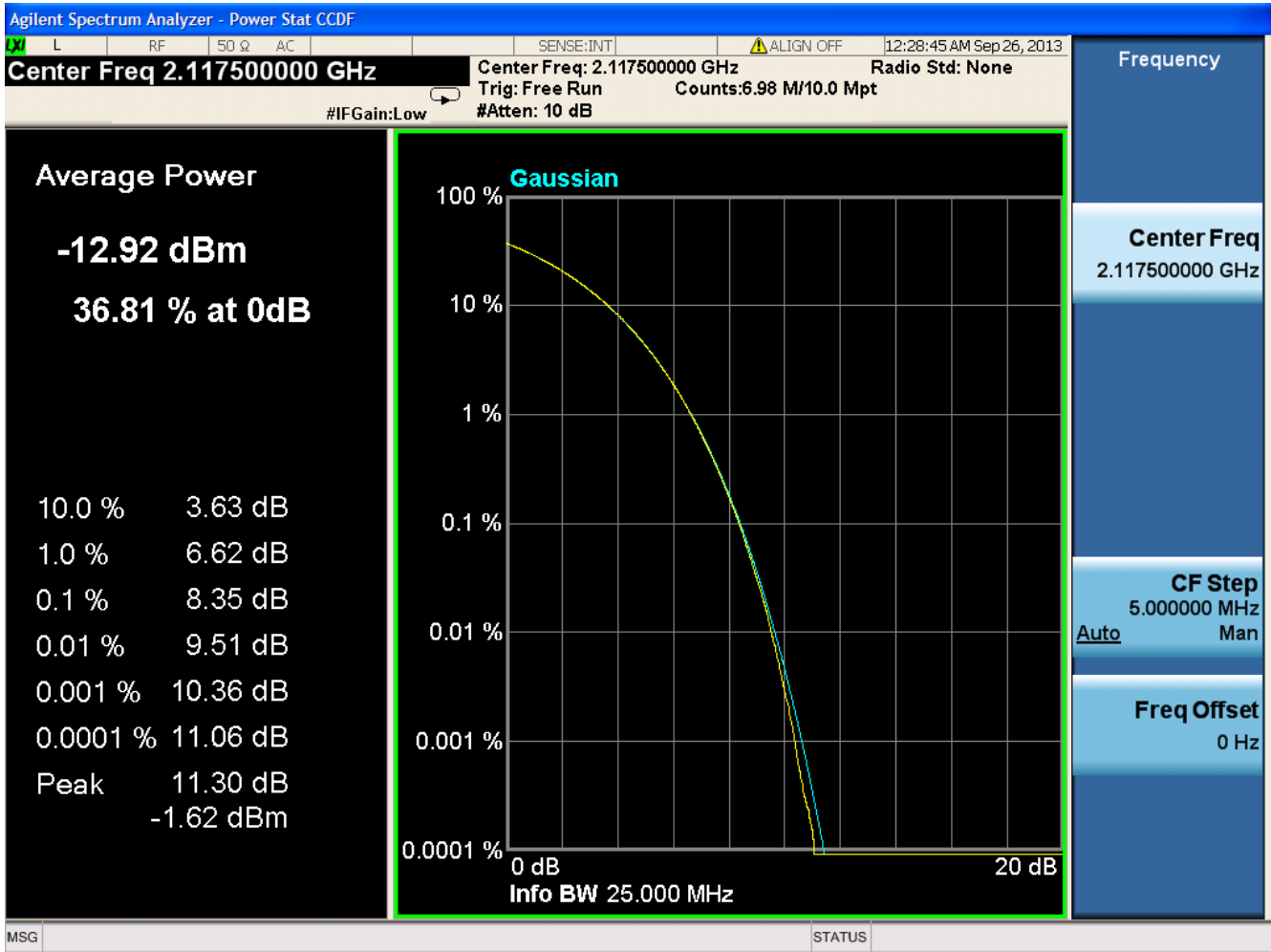
15 MHz Carrier at 2117.5 MHz
QPSK PAR



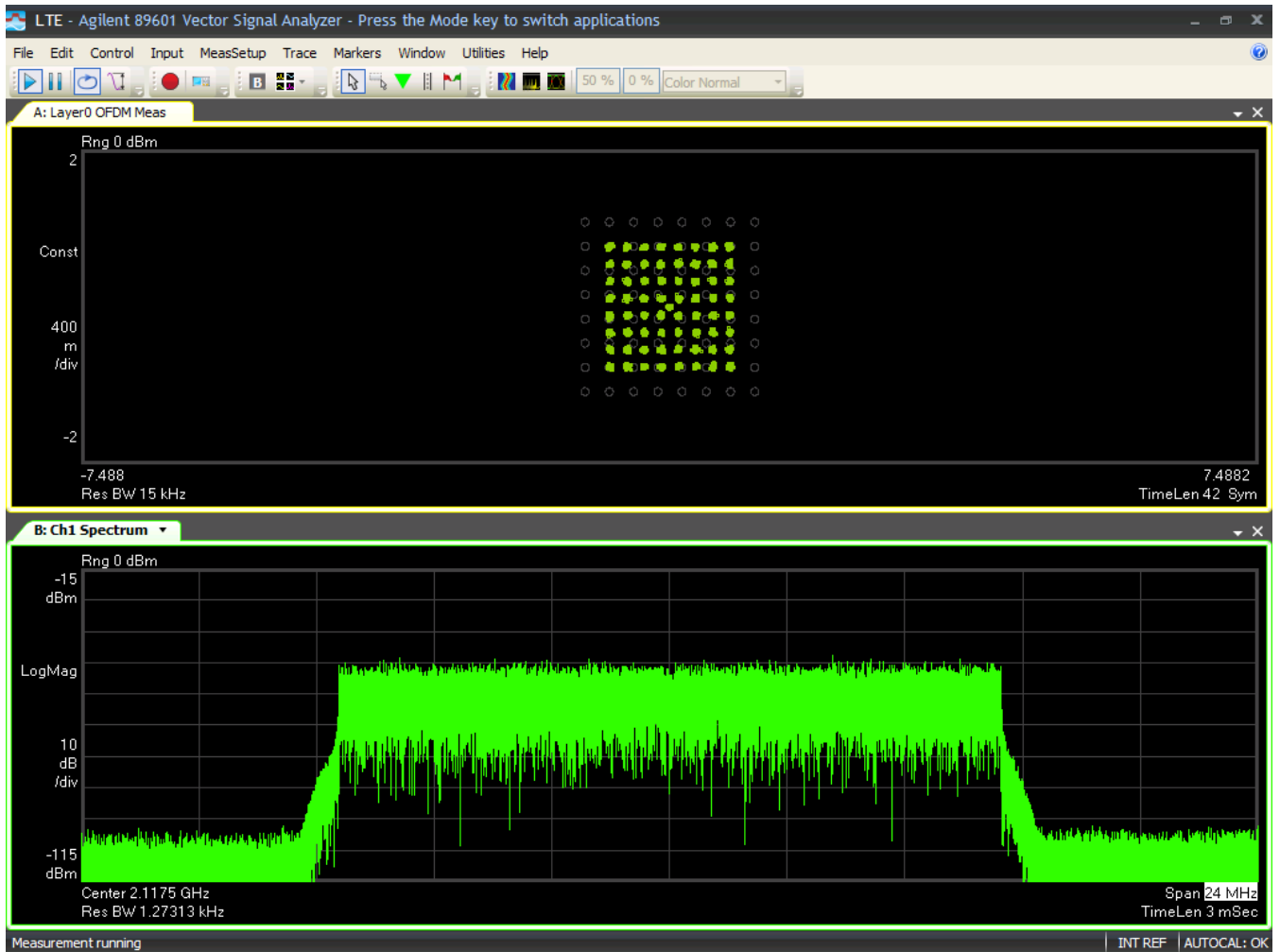
15 MHz Carrier at 2117.5 MHz
16QAM



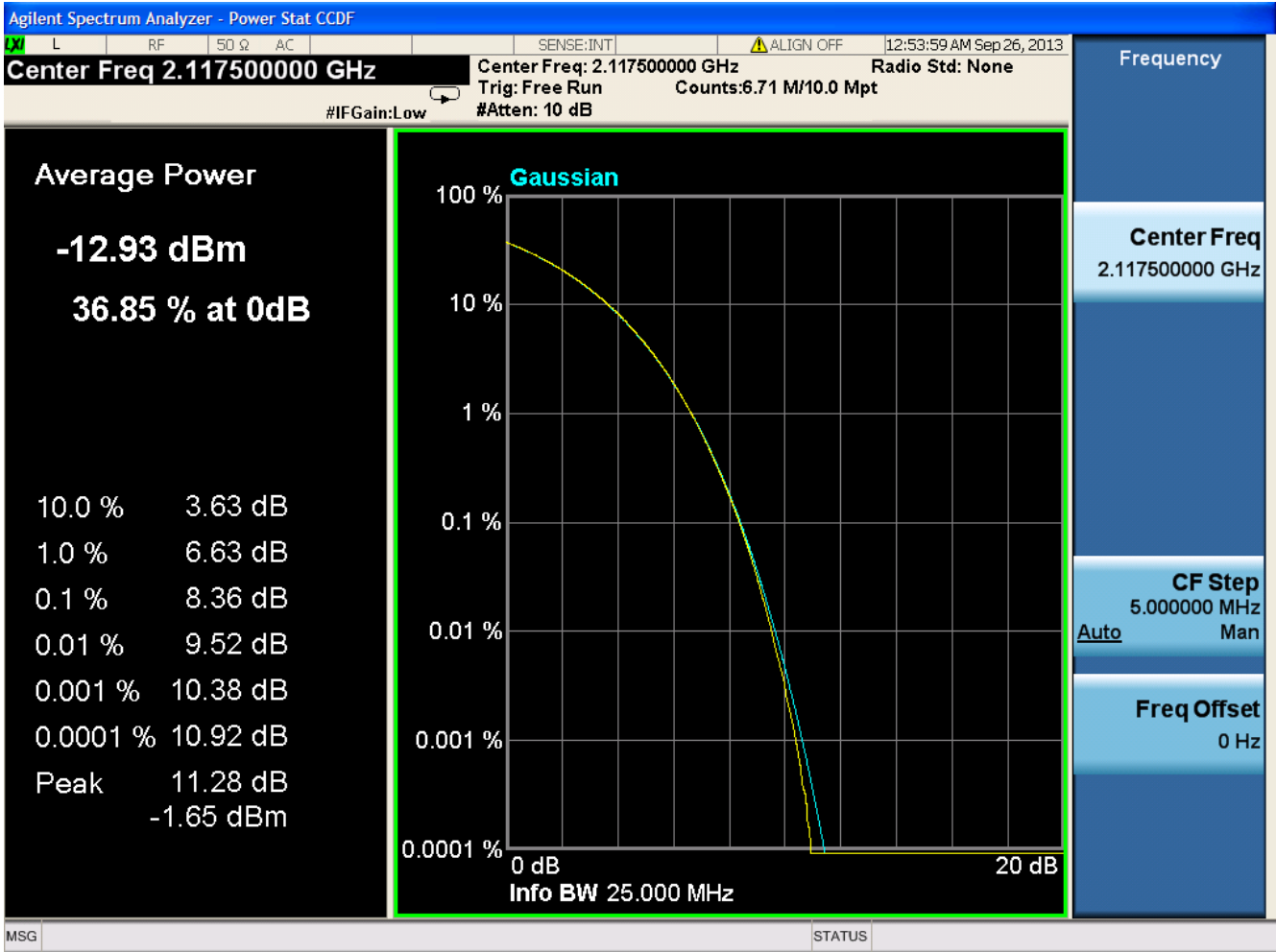
15 MHz Carrier at 2117.5 MHz
16QAM PAR



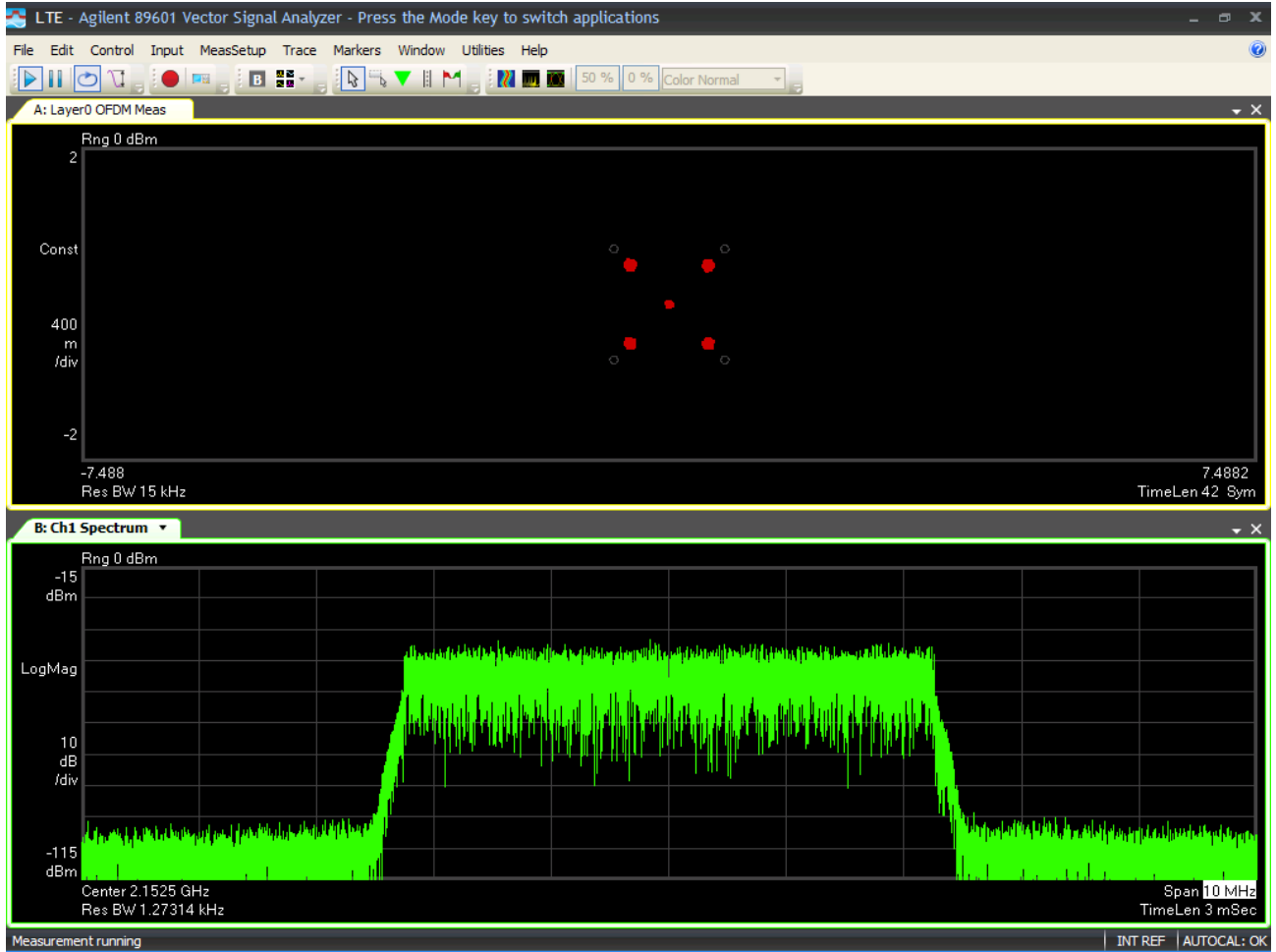
15 MHz Carrier at 2117.5 MHz
64QAM



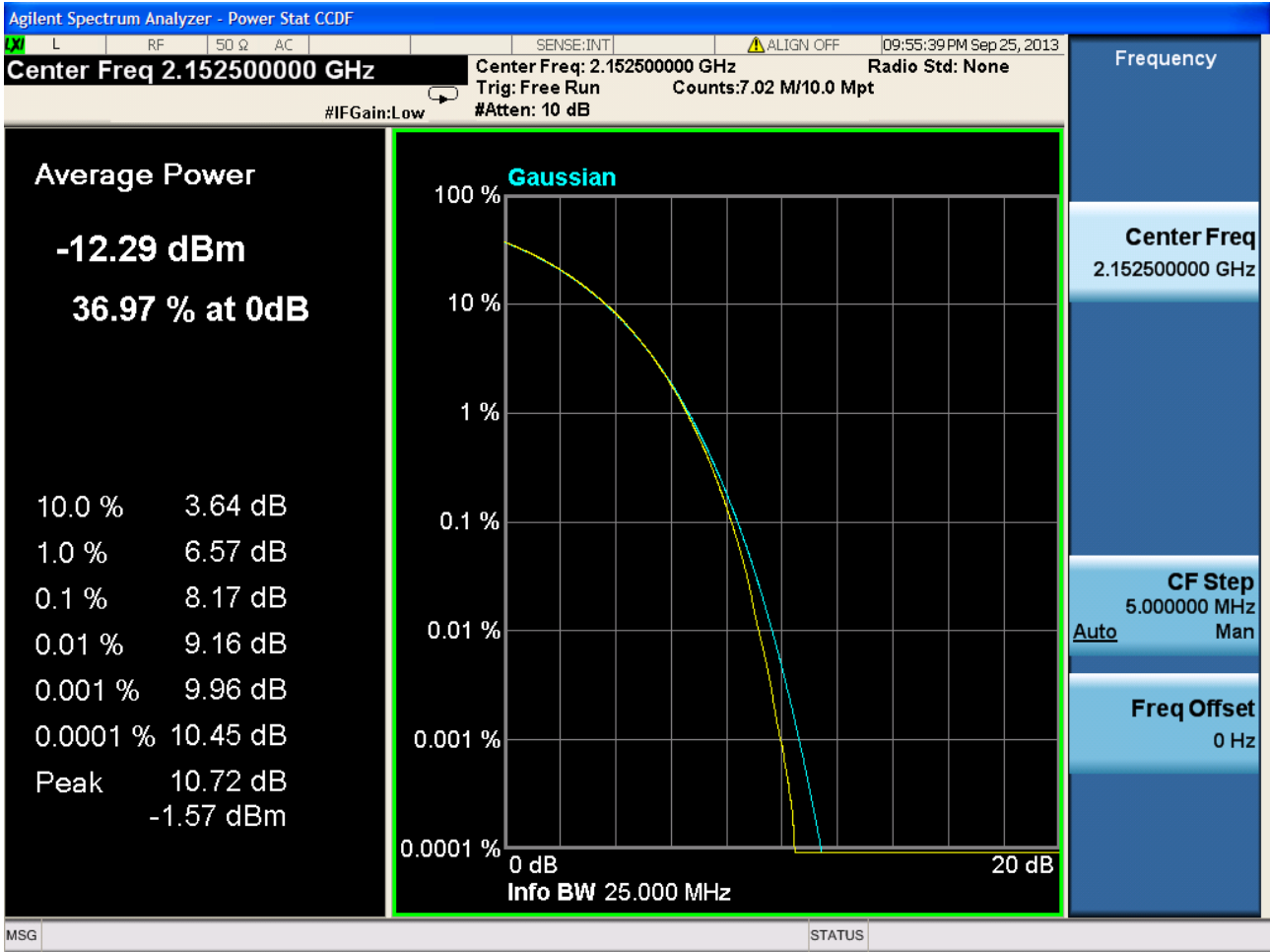
15 MHz Carrier at 2117.5 MHz
64QAM PAR



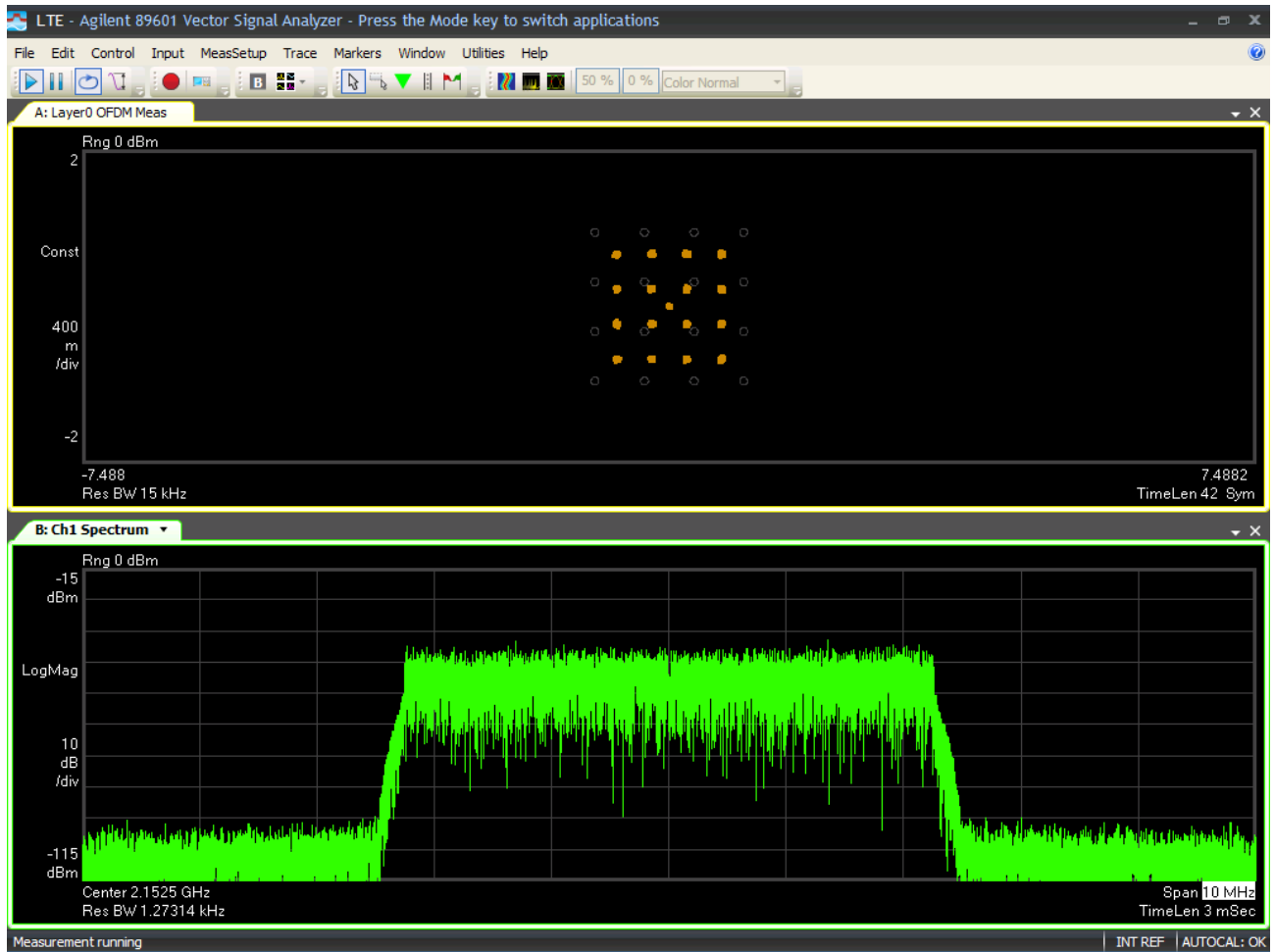
5 MHz Carrier at 2152.5 MHz
QPSK



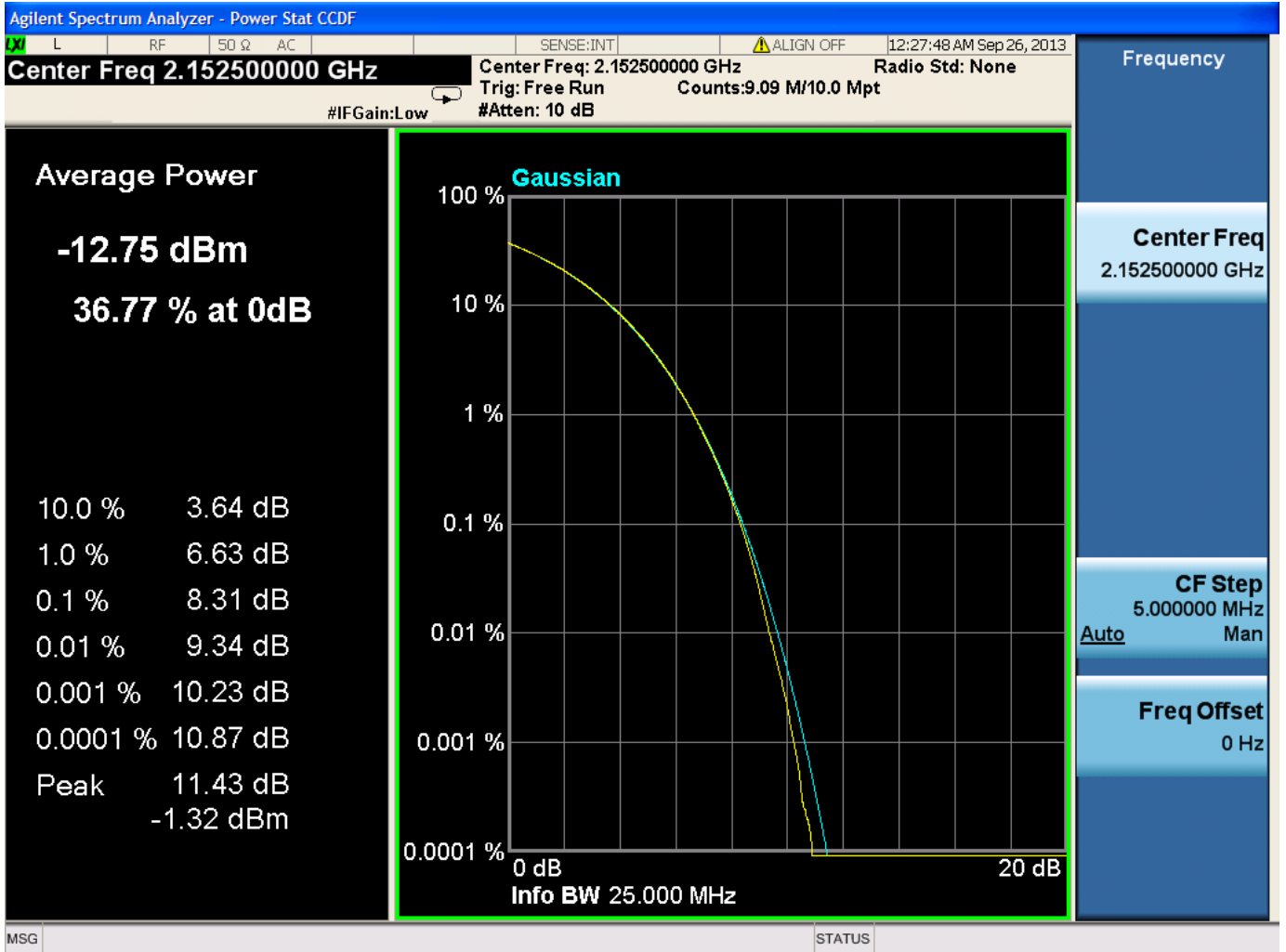
5 MHz Carrier at 2152.5 MHz
QPSK PAR



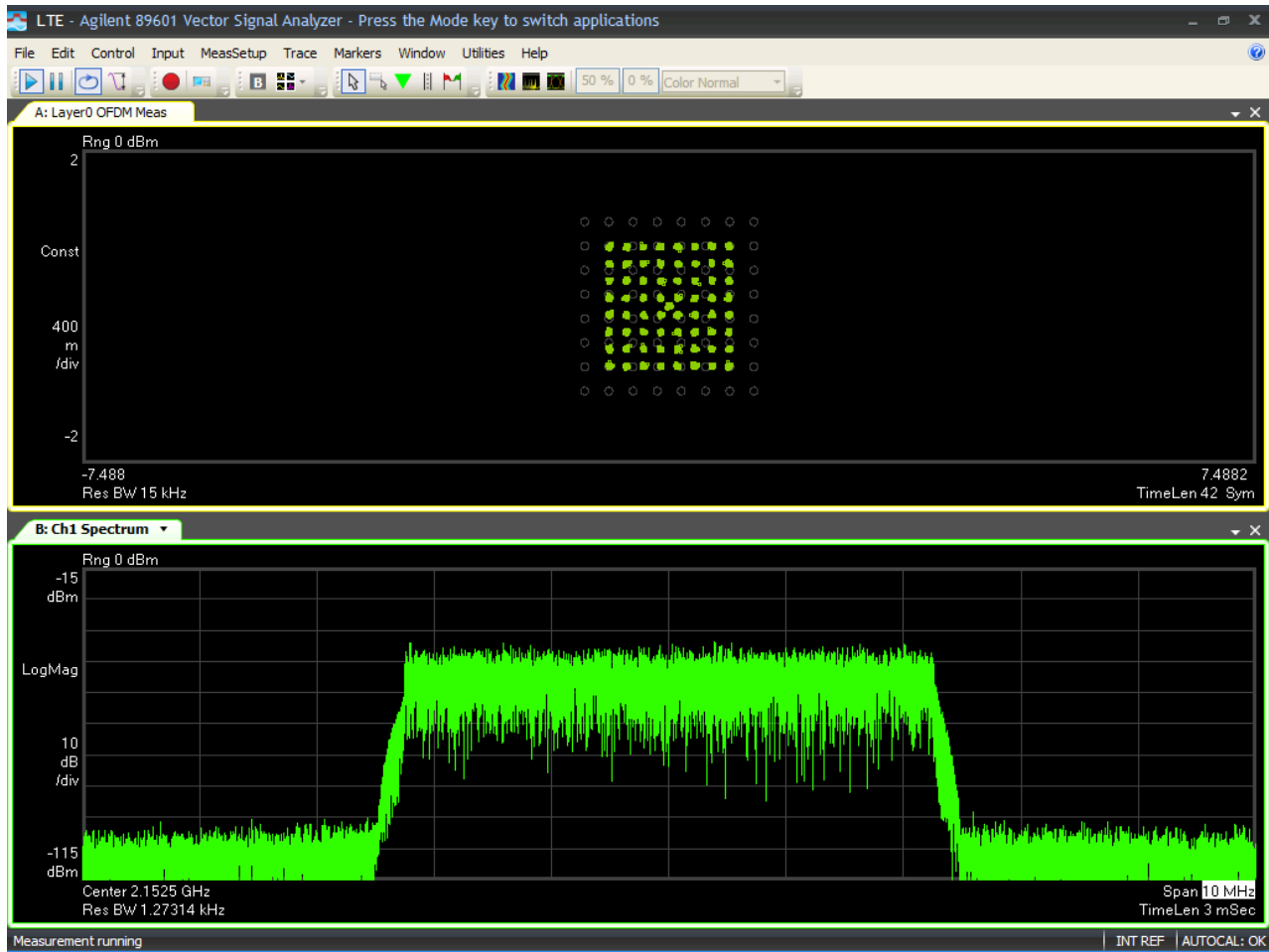
5 MHz Carrier at 2152.5 MHz
16QAM



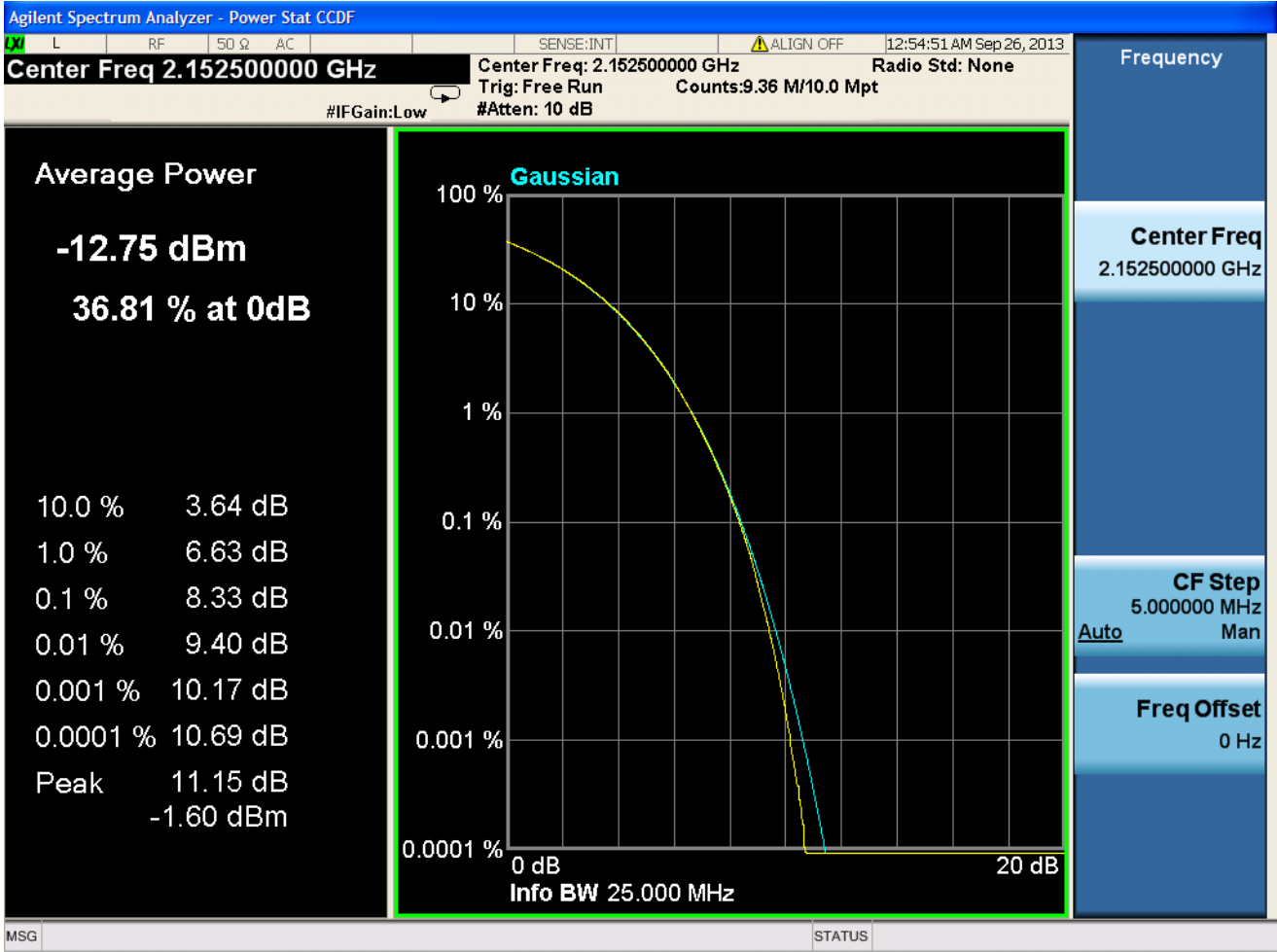
5 MHz Carrier at 2152.5 MHz
16QAM PAR



5 MHz Carrier at 2152.5 MHz
64QAM



5 MHz Carrier at 2152.5 MHz
64QAM PAR



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

§ 2.1049 Measurements required: Occupied bandwidth.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

(h) Transmitters employing digital modulation techniques—when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.

The 99% Power Occupied Bandwidth was measured and recorded for each carrier in each of the four test configurations, and for each of the three modulation schemes: QPSK, 16QAM and 64QAM. Since there is negligible discernible distinction between the measured data plots, and for brevity, the **Test #1 configuration will be displayed as representative of all four configurations. However, the measured values will be tabulated below.**

Test Number and Configuration	Freq Block	15 MHz Carrier	Freq Block	5 MHz Carrier
Test #1 - 15 + 5 MHz	A+B1	2117.5	F2	2152.5

The carrier 99% Power Bandwidth, which defines the necessary bandwidth declared in the emission designator, is measured using an Agilent MXA Signal Analyzer N9020A 20 Hz – 3.6 GHz. All measurements were performed at each Equipment Antenna Terminal (EAC): Tx1 and Tx2.

15 + 5 MHz and 5 + 15 MHz Test Configurations with QPSK Modulation

Test Number and Configuration	Freq Block	15 MHz Carrier	99% OBW	Freq Block	5 MHz Carrier	99% OBW
Test #1 - 15 + 5 MHz	A+B1	2117.5	13.364 MHz	F2	2152.5	4.5154 MHz
Test #2 - 15 + 5 MHz	B+C	2127.5	13.450 MHz	E	2142.5	4.4886 MHz
Test #3 - 15 + 5 MHz	C+D+E	2137.5	13.387 MHz	F2	2152.5	----
Test #4 - 5 + 15 MHz	C	2147.5	13.418 MHz	E+F	2132.5	4.4810 MHz

15 + 5 MHz and 5 + 15 MHz Test Configurations with 16QAM Modulation

Test Number and Configuration	Freq Block	15 MHz Carrier	99% OBW	Freq Block	5 MHz Carrier	99% OBW
Test #1 - 15 + 5 MHz	A+B1	2117.5	13.377 MHz	F2	2152.5	4.4980 MHz
Test #2 - 15 + 5 MHz	B+C	2127.5	13.365 MHz	E	2142.5	4.5047 MHz
Test #3 - 15 + 5 MHz	C+D+E	2137.5	13.393 MHz	F2	2152.5	----
Test #4 - 5 + 15 MHz	C	2147.5	13.415 MHz	E+F	2132.5	4.4802 MHz

15 + 5 MHz and 5 + 15 MHz Test Configurations with 64QAM Modulation

Test Number and Configuration	Freq Block	15 MHz Carrier	99% OBW	Freq Block	5 MHz Carrier	99% OBW
Test #1 - 15 + 5 MHz	A+B1	2117.5	13.376 MHz	F2	2152.5	4.5144 MHz
Test #2 - 15 + 5 MHz	B+C	2127.5	13.404 MHz	E	2142.5	4.4986 MHz
Test #3 - 15 + 5 MHz	C+D+E	2137.5	13.407 MHz	F2	2152.5	----
Test #4 - 5 + 15 MHz	C	2147.5	13.406 MHz	E+F	2132.5	4.4984 MHz

Test #1 - 15 MHz Carrier at 2117.5 MHz
QPSK

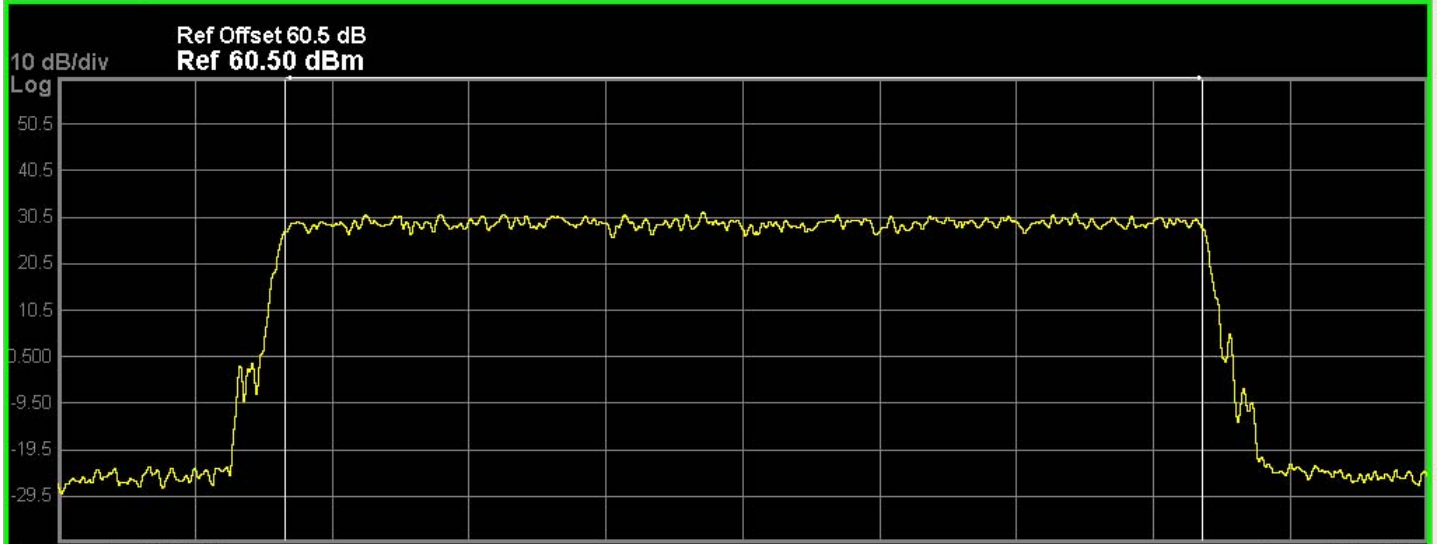
Agilent Spectrum Analyzer - Occupied BW

L RF 50 Ω AC SENSE:INT ALIGN OFF 03:50:30 AM Oct 03, 2013

Center Freq 2.11750000 GHz Center Freq: 2.11750000 GHz Radio Std: None

PASS #IFGain:Low Trig: Free Run Avg|Hold:> 10/10 Radio Device: BTS

#Atten: 10 dB



Center 2.118 GHz
Res BW 180 kHz

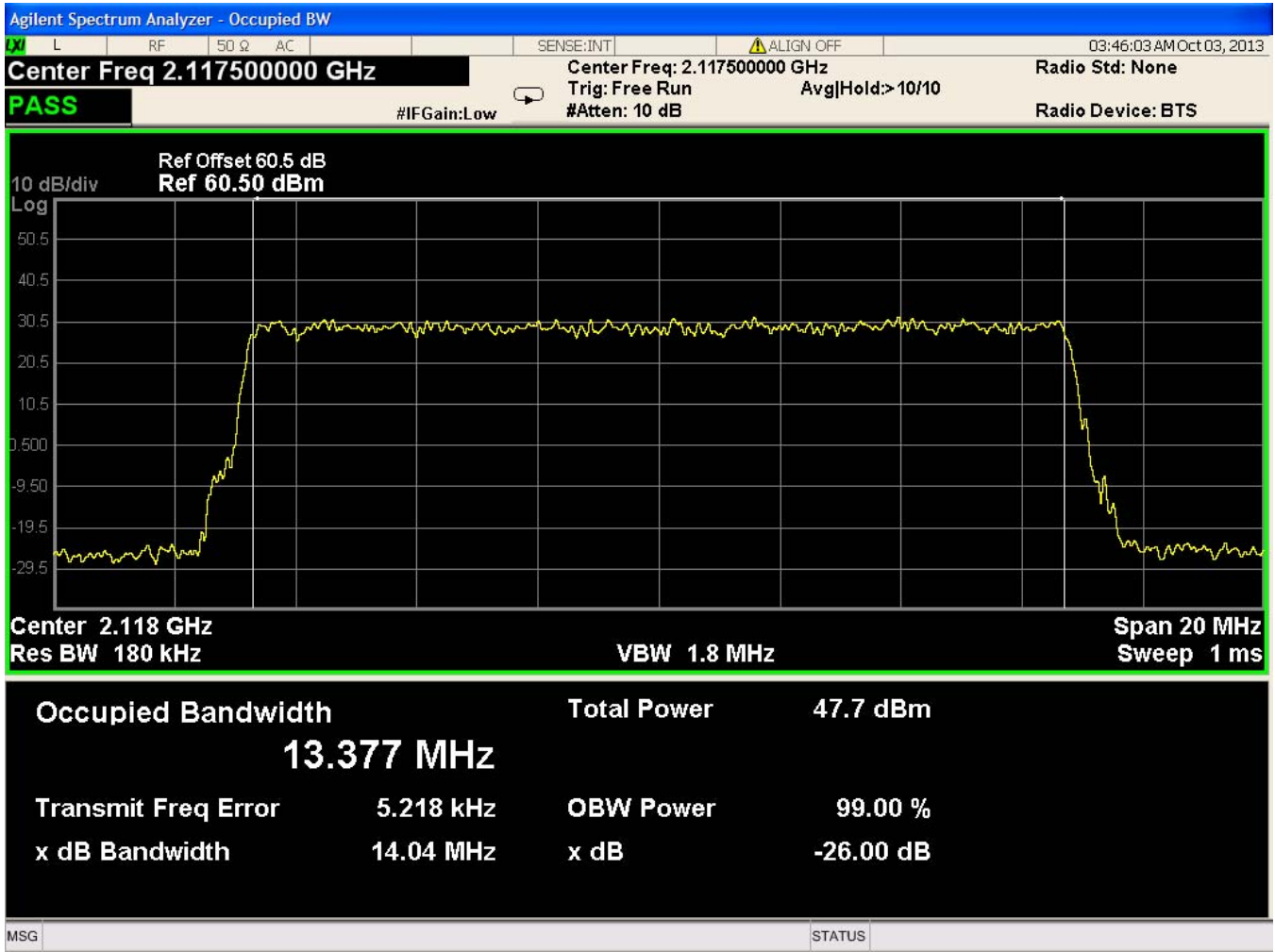
Span 20 MHz
Sweep 1 ms

VBW 1.8 MHz

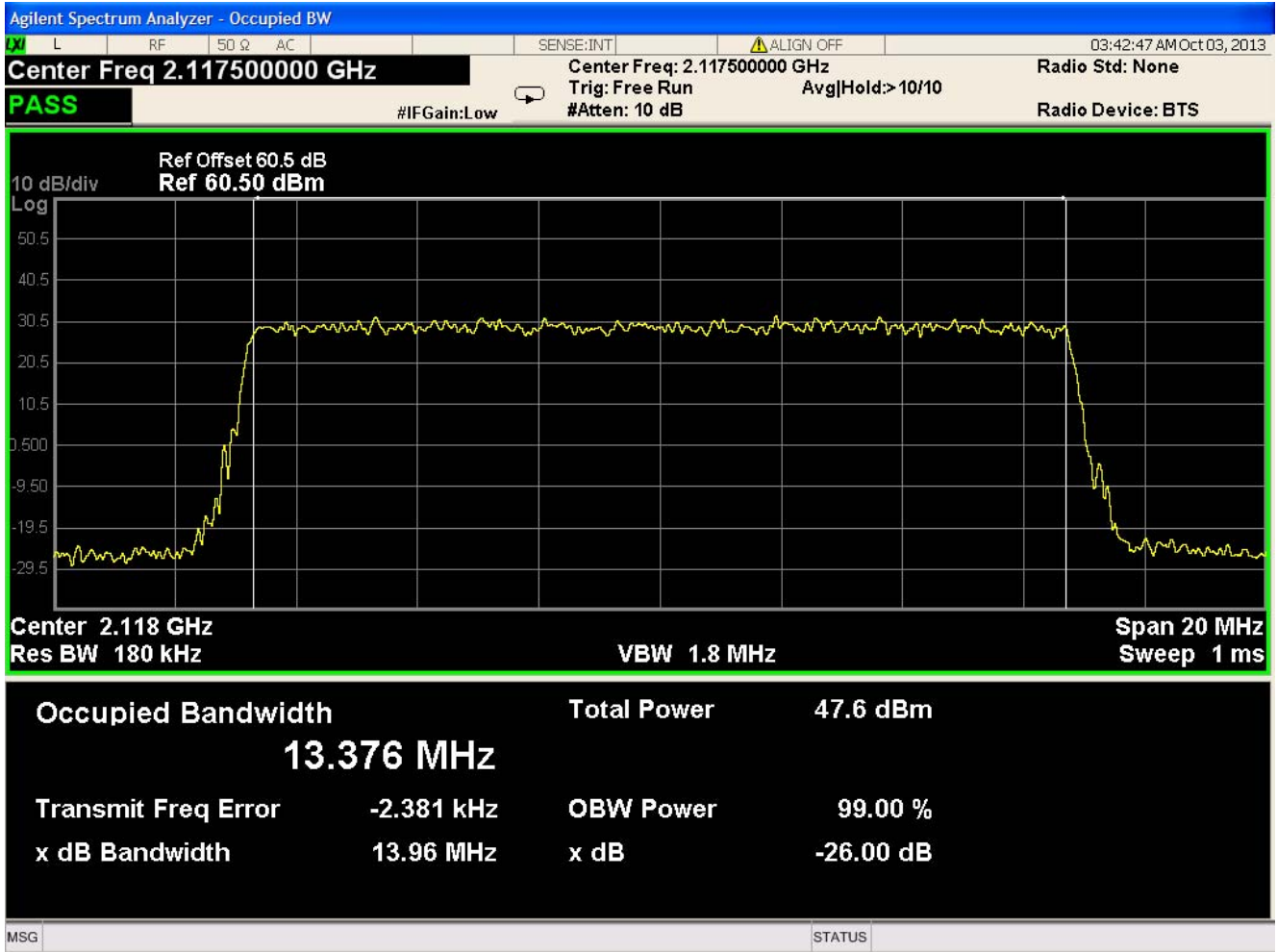
Occupied Bandwidth	Total Power	47.7 dBm
13.364 MHz		
Transmit Freq Error	22.727 kHz	OBW Power 99.00 %
x dB Bandwidth	13.96 MHz	x dB -26.00 dB

MSG STATUS

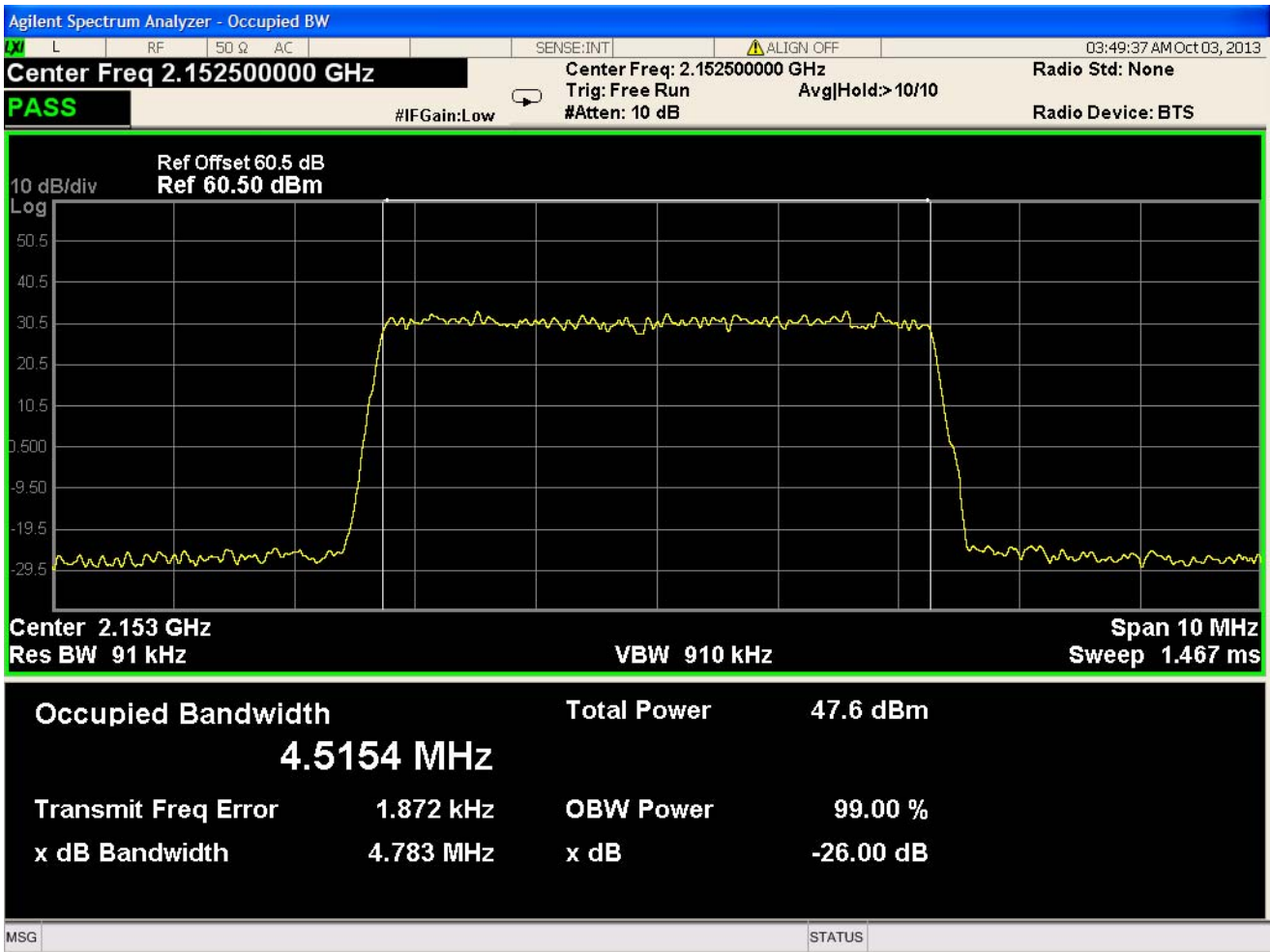
Test #1 - 15 MHz Carrier at 2117.5 MHz
16QAM



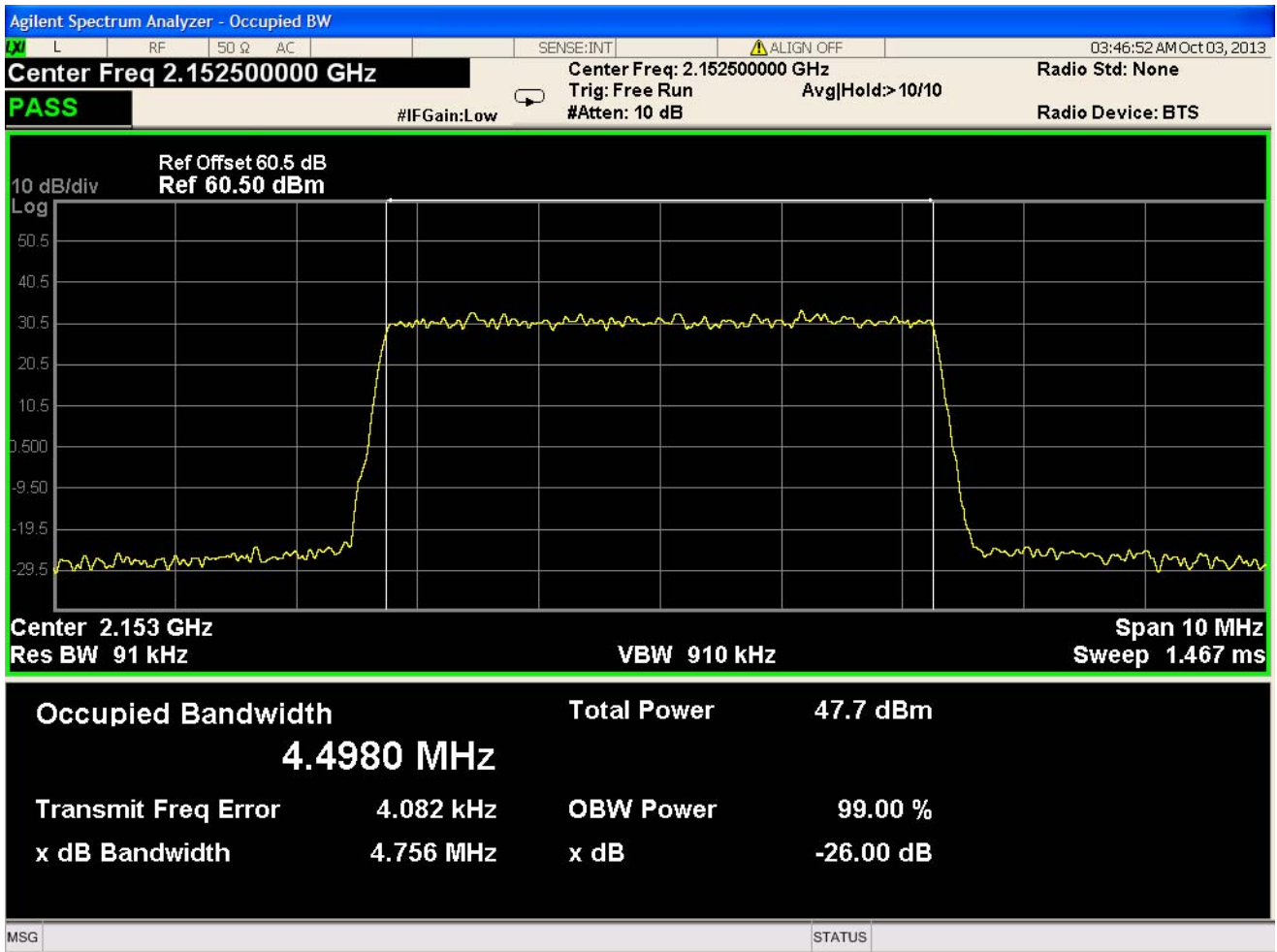
Test #1 - 15 MHz Carrier at 2117.5 MHz
64QAM



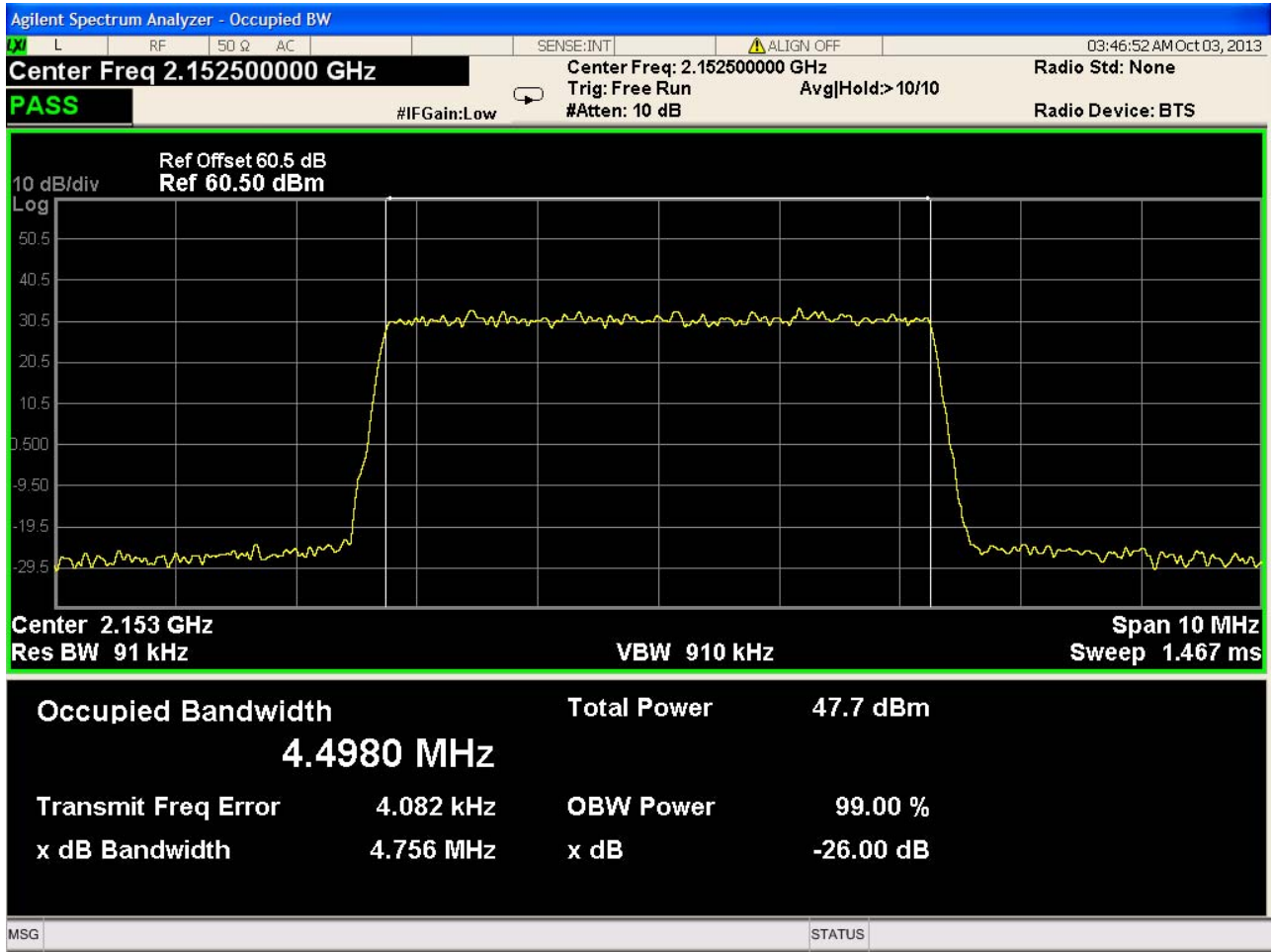
Test #1 - 5 MHz Carrier at 2152.5 MHz
QPSK



Test #1 - 5 MHz Carrier at 2152.5 MHz
16QAM



Test #1 - 5 MHz Carrier at 2152.5 MHz
64QAM



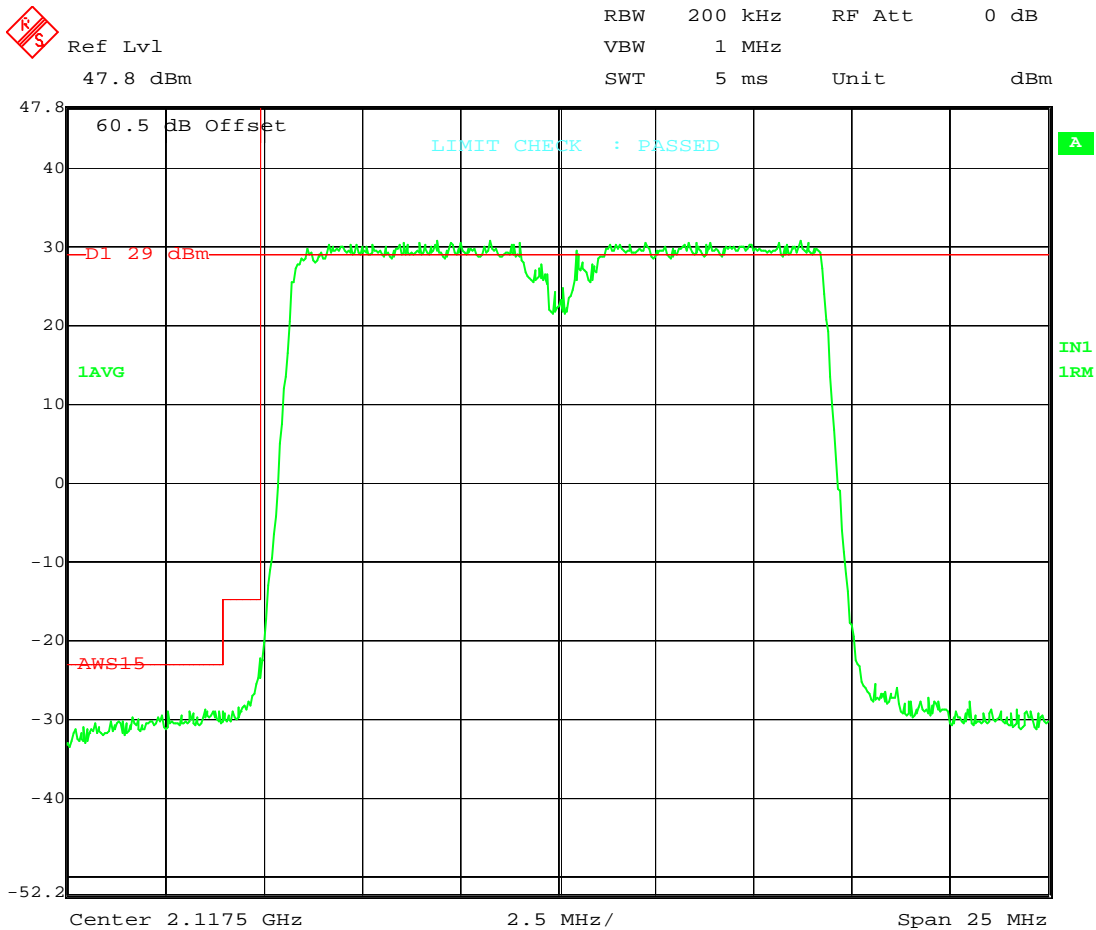
PART 2.1049 MEASUREMENTS REQUIRED: OCCUPIED BANDWIDTH – EMISSION MASK

The emission mask limitation was demonstrated for compliance with § 27.53 Emission Limits. All measurements were made following the procedure detailed in the original filing. The limits were suppressed an additional 3 dB for compliance with 2xMIMO.

The emission mask compliance was measured and recorded for each carrier in each of the four test configurations, and for each of the three modulation schemes: QPSK, 16QAM and 64QAM. Since there is negligible discernible distinction between the measured data plots, and for brevity, the **Test #1 configuration will be displayed as representative of all four configurations. Note that for Test #1, the individual carriers of the 15 + 5 MHz configuration were plotted separately/individually.**

Test Number and Configuration	Freq Block	15 MHz Carrier	Freq Block	5 MHz Carrier
Test #1 - 15 + 5 MHz	A+B1	2117.5	F2	2152.5

**15 MHz Carrier at 2117.5 MHz
QPSK**

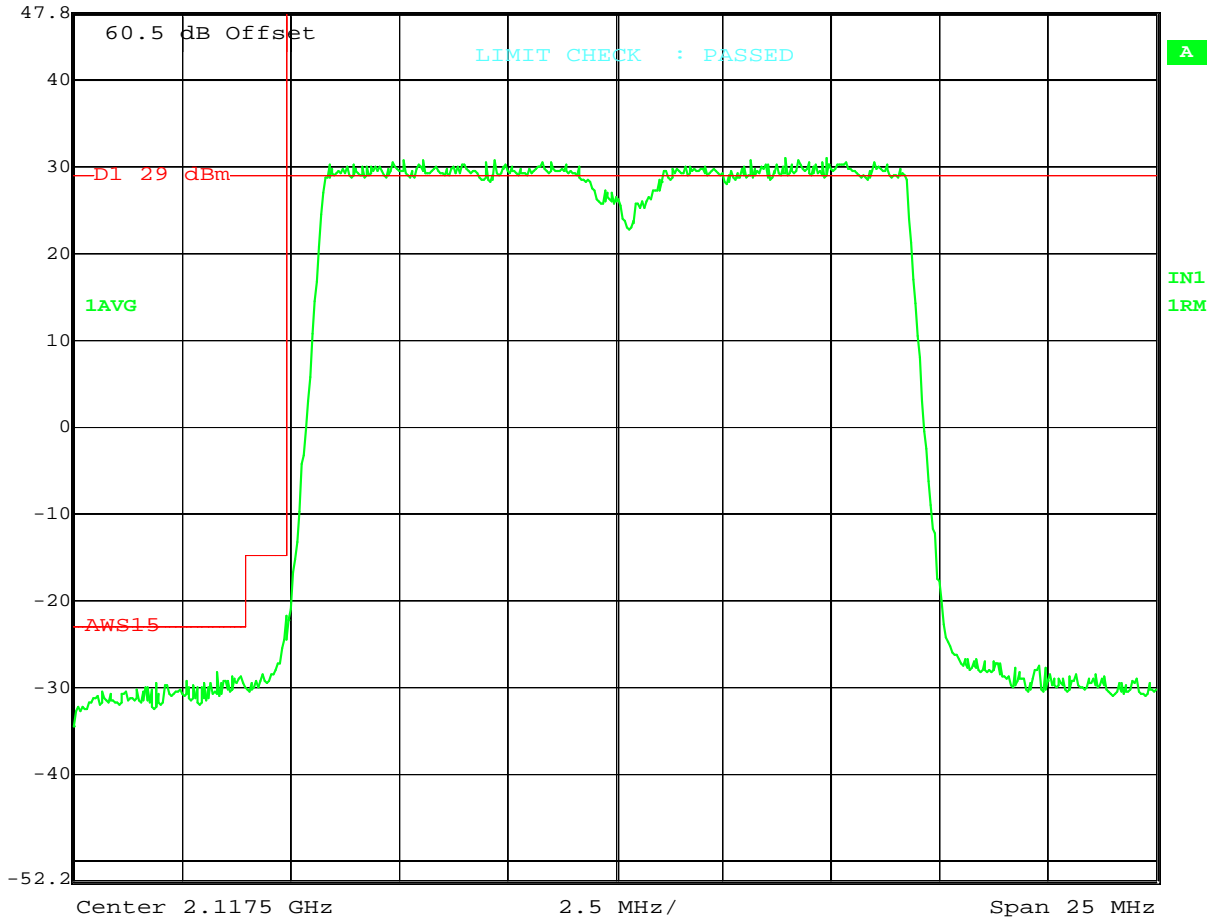


Title: Occupied Bandwidth; TRDU2X60-AWS Light Radio; ENG: JY
 Comment A: -48VDC; 2C; BLK (A+B1)+(F2); 2117.5MHz; 15+5MHz BW; PWR:120W
 QPSK; FCC PRT 27; FCCID:AS5BBTRX-13
 Date: 25.SEP.2013 06:53:26

15 MHz Carrier at 2117.5 MHz
16QAM



Ref Lvl	RBW	200 kHz	RF Att	0 dB
47.8 dBm	VBW	1 MHz	Unit	dBm
	SWT	5 ms		



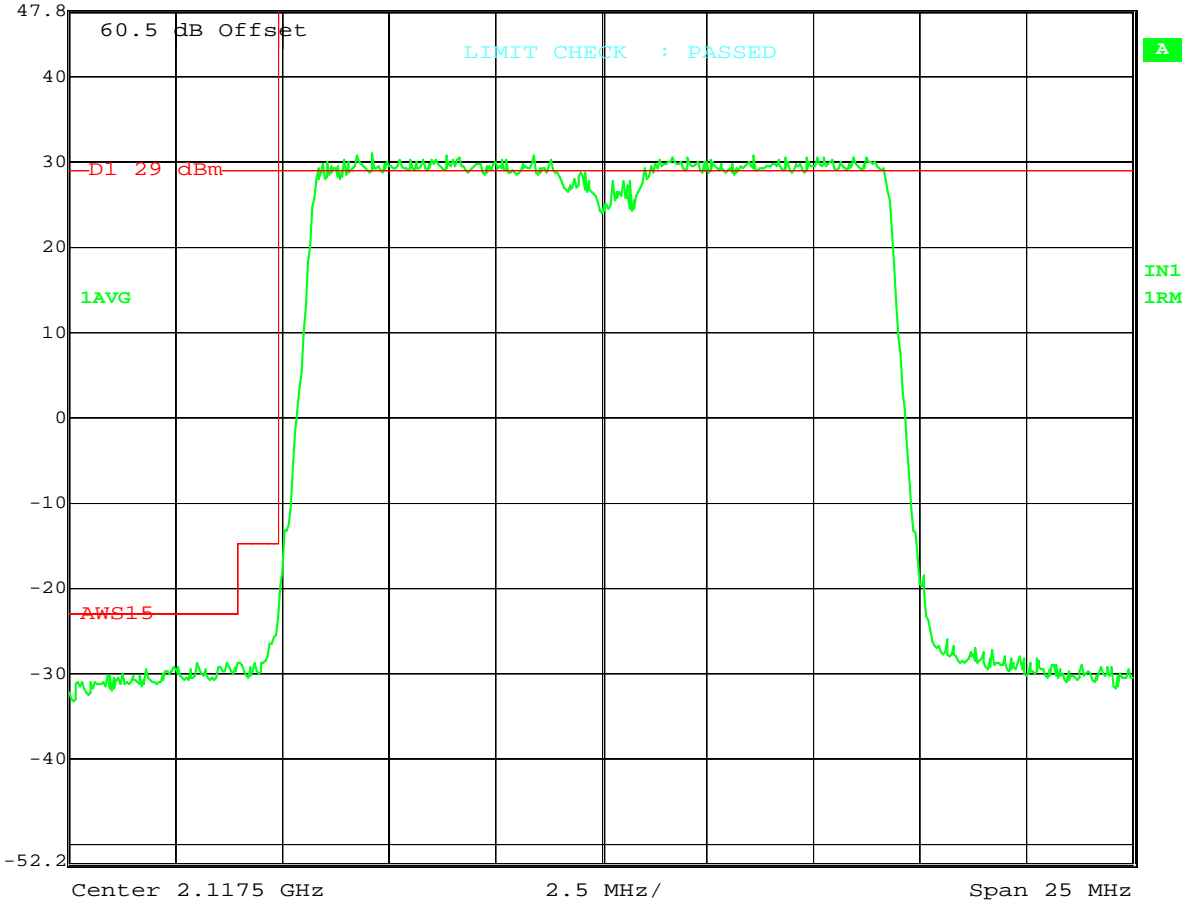
Title: Occupied Bandwidth; TRDU2X60-AWS Light Radio; ENG: JY
 Comment A: -48VDC; 2C; BLK (A+B1)+(F2); 2117.5MHz; 15+5MHz BW; PWR:120W
 16QAM; FCC PRT 27; FCCID:AS5BBTRX-13
 Date: 25.SEP.2013 08:40:12

15 MHz Carrier at 2117.5 MHz
64QAM



Ref Lvl
47.8 dBm

RBW 200 kHz RF Att 0 dB
VBW 1 MHz
SWT 5 ms Unit dBm



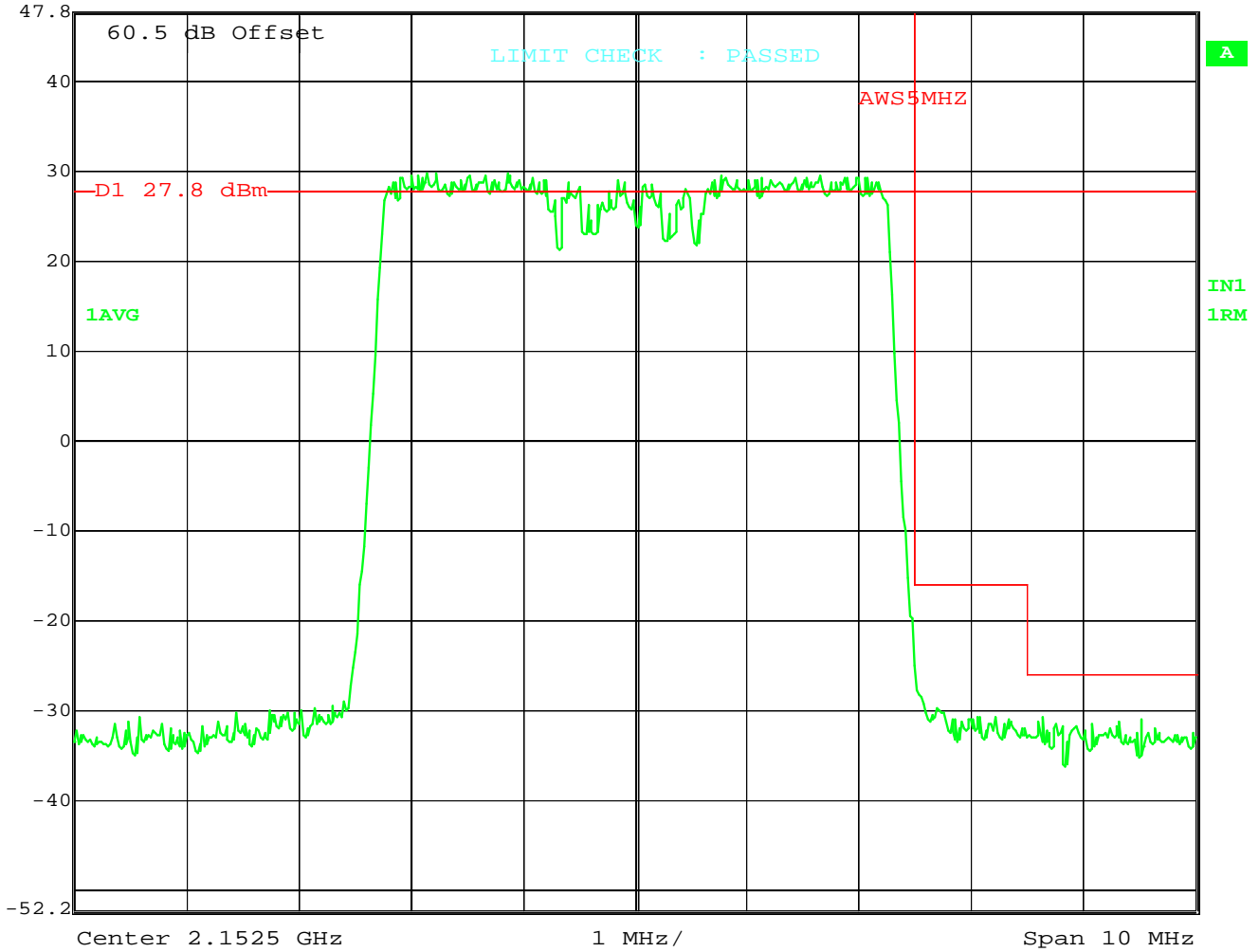
Title: Occupied Bandwidth; TRDU2X60-AWS Light Radio; ENG: JY
Comment A: -48VDC; 2C; BLK (A+B1)+(F2); 2117.5MHz; 15+5MHz BW; PWR:120W
64QAM; FCC PRT 27; FCCID:AS5BBTRX-13
Date: 25.SEP.2013 09:03:06

5 MHz Carrier at 2152.5 MHz
QPSK



Ref Lvl
47.8 dBm

RBW 50 kHz RF Att 0 dB
VBW 1 MHz
SWT 10 ms Unit dBm



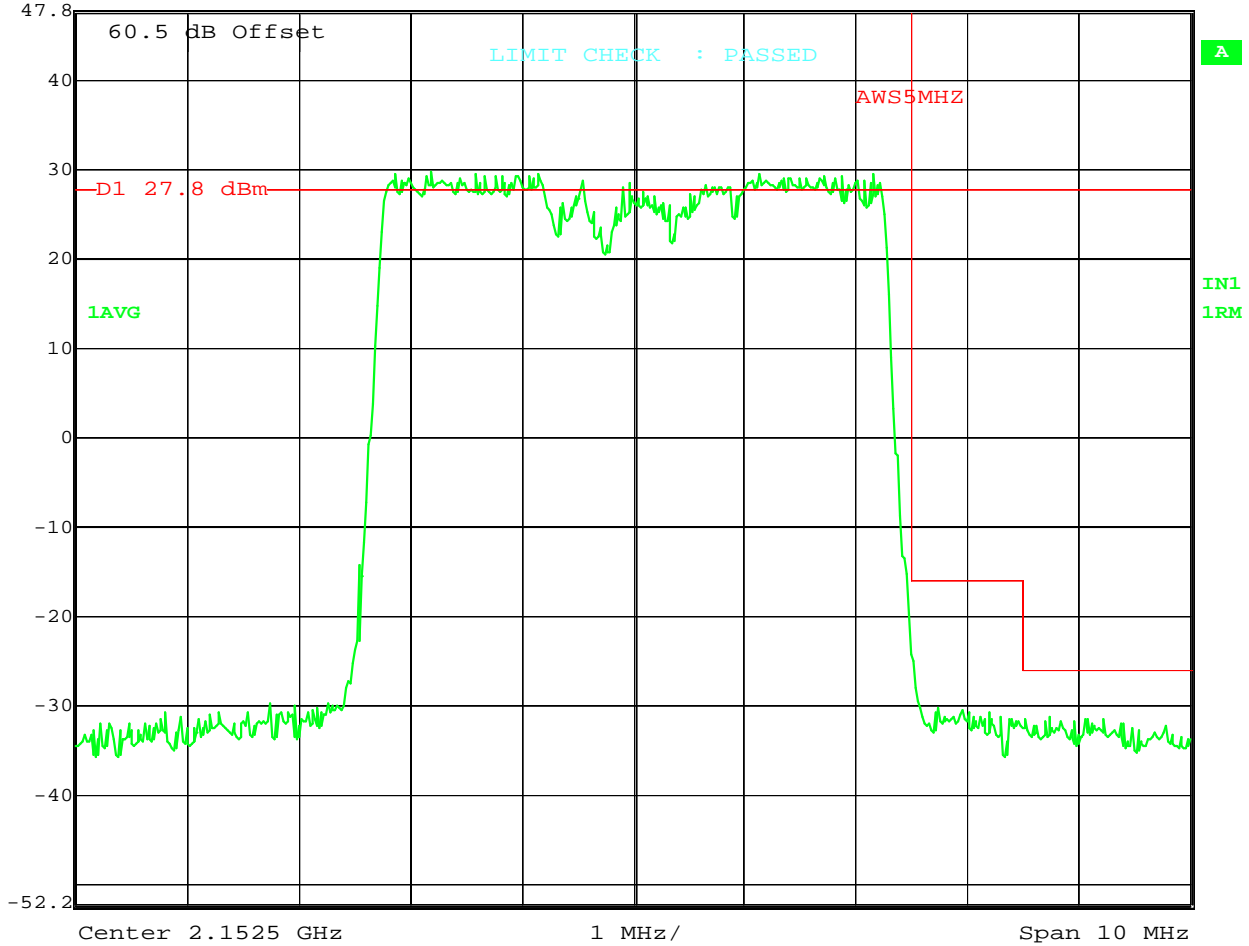
Title: Occupied Bandwidth; TRDU2X60-AWS Light Radio; ENG: JY
Comment A: -48VDC; 2C; BLK (A+B1)+(F2); 2152.5MHz; 15+5MHz BW; PWR:120W
QPSK; FCC PRT 27; FCCID:AS5BBTRX-13
Date: 25.SEP.2013 06:59:16

5 MHz Carrier at 2152.5 MHz
16QAM



Ref Lvl
47.8 dBm

RBW 50 kHz RF Att 0 dB
VBW 1 MHz
SWT 10 ms Unit dBm

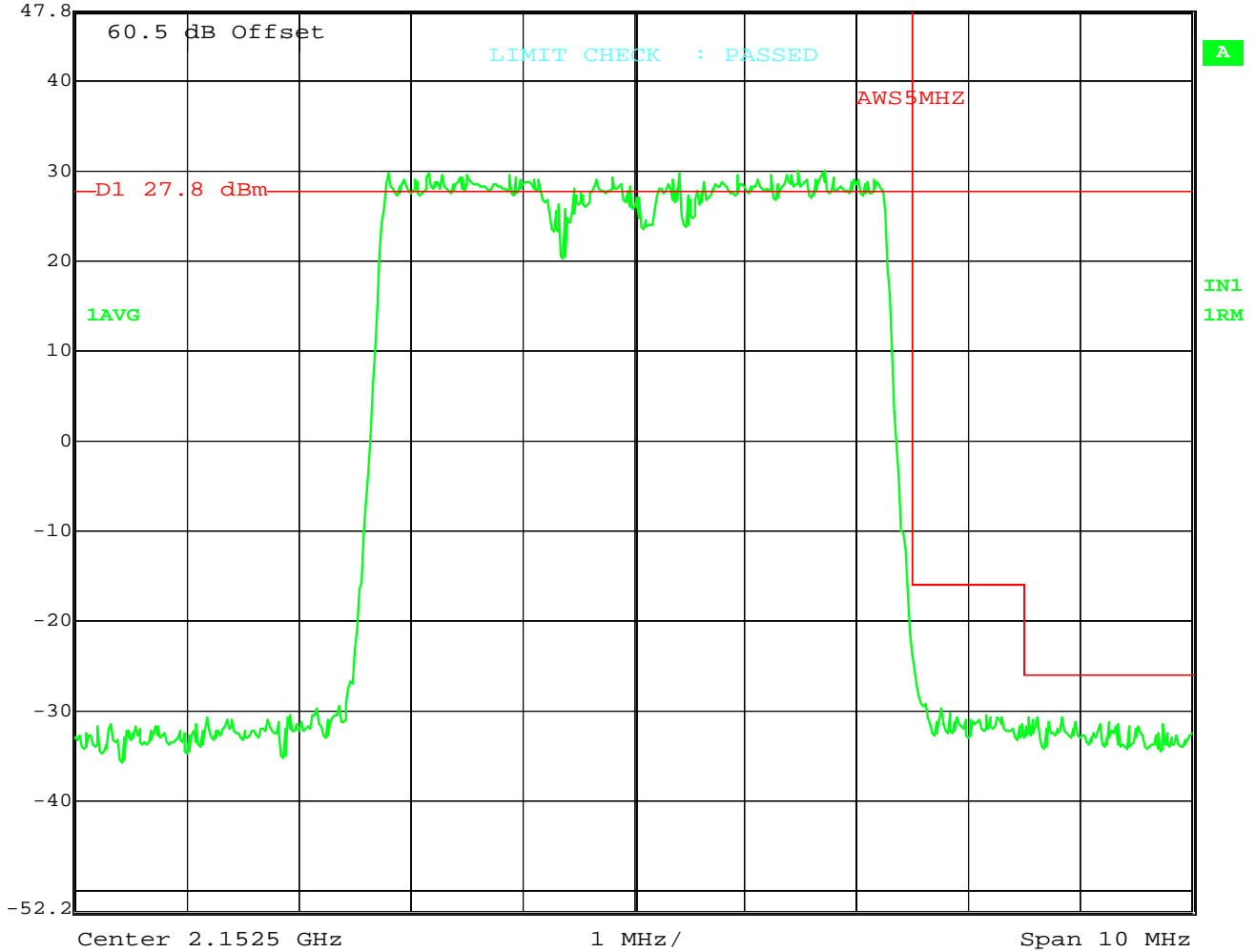


Title: Occupied Bandwidth; TRDU2X60-AWS Light Radio; ENG: JY
Comment A: -48VDC; 2C; BLK (A+B1)+(F2); 2152.5MHz; 15+5MHz BW; PWR:120W
16QAM; FCC PRT 27; FCCID:AS5BBTRX-13
Date: 25.SEP.2013 08:40:55

5 MHz Carrier at 2152.5 MHz
64QAM



Ref Lvl	RBW	50 kHz	RF Att	0 dB
47.8 dBm	VBW	1 MHz	Unit	dBm
	SWT	10 ms		



Title: Occupied Bandwidth; TRDU2X60-AWS Light Radio; ENG: JY
 Comment A: -48VDC; 2C; BLK (A+B1)+(F2); 2152.5MHz; 15+5MHz BW; PWR:120W
 64QAM; FCC PRT 27; FCCID:AS5BBTRX-13
 Date: 25.SEP.2013 09:03:42

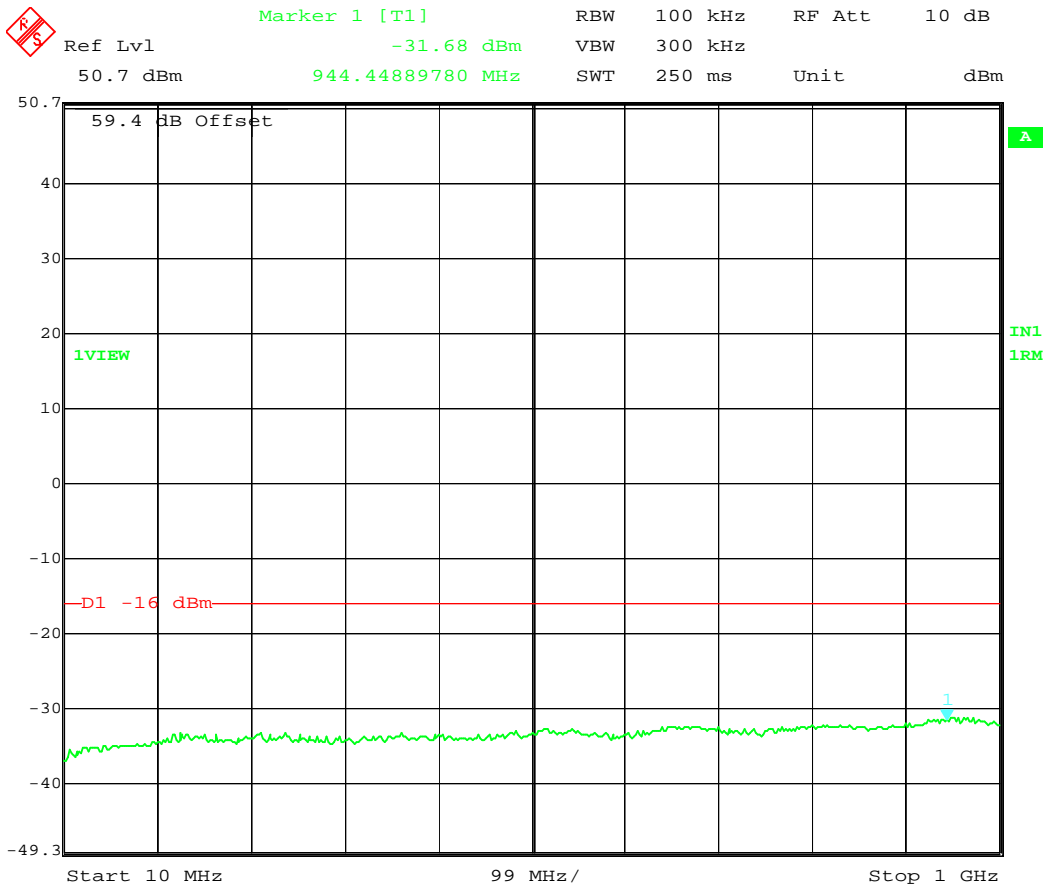
PART 2.1051 MEASUREMENTS REQUIRED: SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS.

In accordance with Part 2.1057(a), the required frequency spectrum to be investigated extends from the lowest RF signal generated to the 10th harmonic of the carrier at the EAC terminal. **The emission limits at the antenna terminal are specified in Part 27.53** 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.

The conducted spurious emissions were measured and recorded for each of the four test configurations, and for each of the three modulation schemes: QPSK, 16QAM and 64QAM. Since there is no discernible distinction between the measured data plots, and for brevity, the **Test #1 configuration will be displayed as representative of all four configurations and for a single test modulation 64QAM.** The spectrum of measurement was 10 MHz – 22 GHz.

Test Number and Configuration	Freq Block	15 MHz Carrier	Freq Block	5 MHz Carrier
Test #1 - 15 + 5 MHz	A+B1	2117.5	F2	2152.5

**Test #1 15 + 5 MHz 64QAM
10 MHz – 1 GHz**

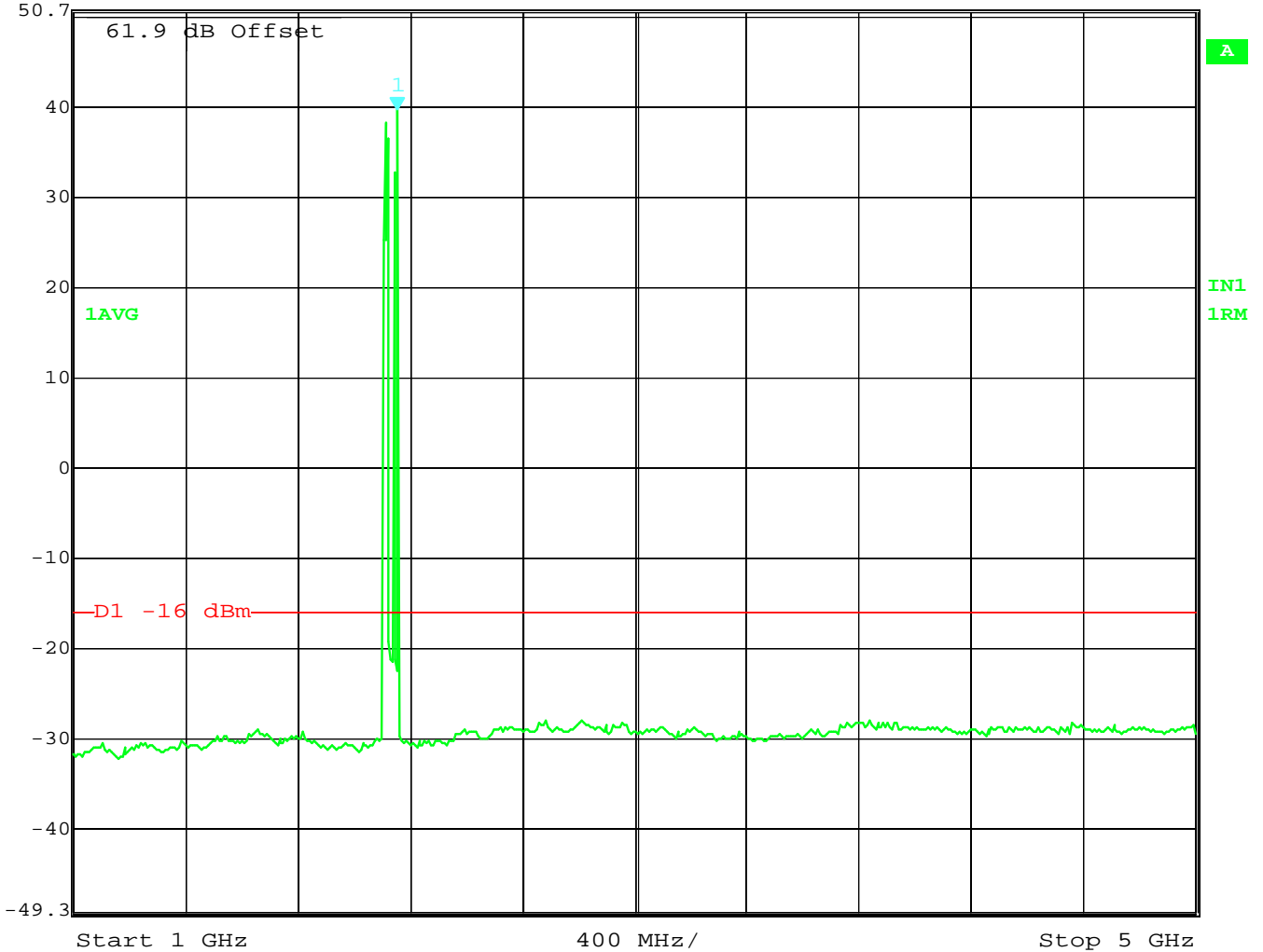


Title: Spurious Emission; TRDU2X60-AWS Light Radio; ENG: JY
 Comment A: -48VDC; 2C; BLK (A+B1)+(F2); 2117.5+2152.5MHz; 15+5MHz BW
 PWR:120W; 64QAM; FCC PRT 27; FCCID:AS5BBTRX-13
 Date: 25.SEP.2013 09:10:08

Test #1 15 + 5 MHz 64QAM
1 GHz - 5 GHz



Ref Lvl	Marker 1 [T1]	RBW	1 MHz	RF Att	0 dB
50.7 dBm	39.61 dBm	VBW	3 MHz		
	2.15430862 GHz	SWT	10 ms	Unit	dBm

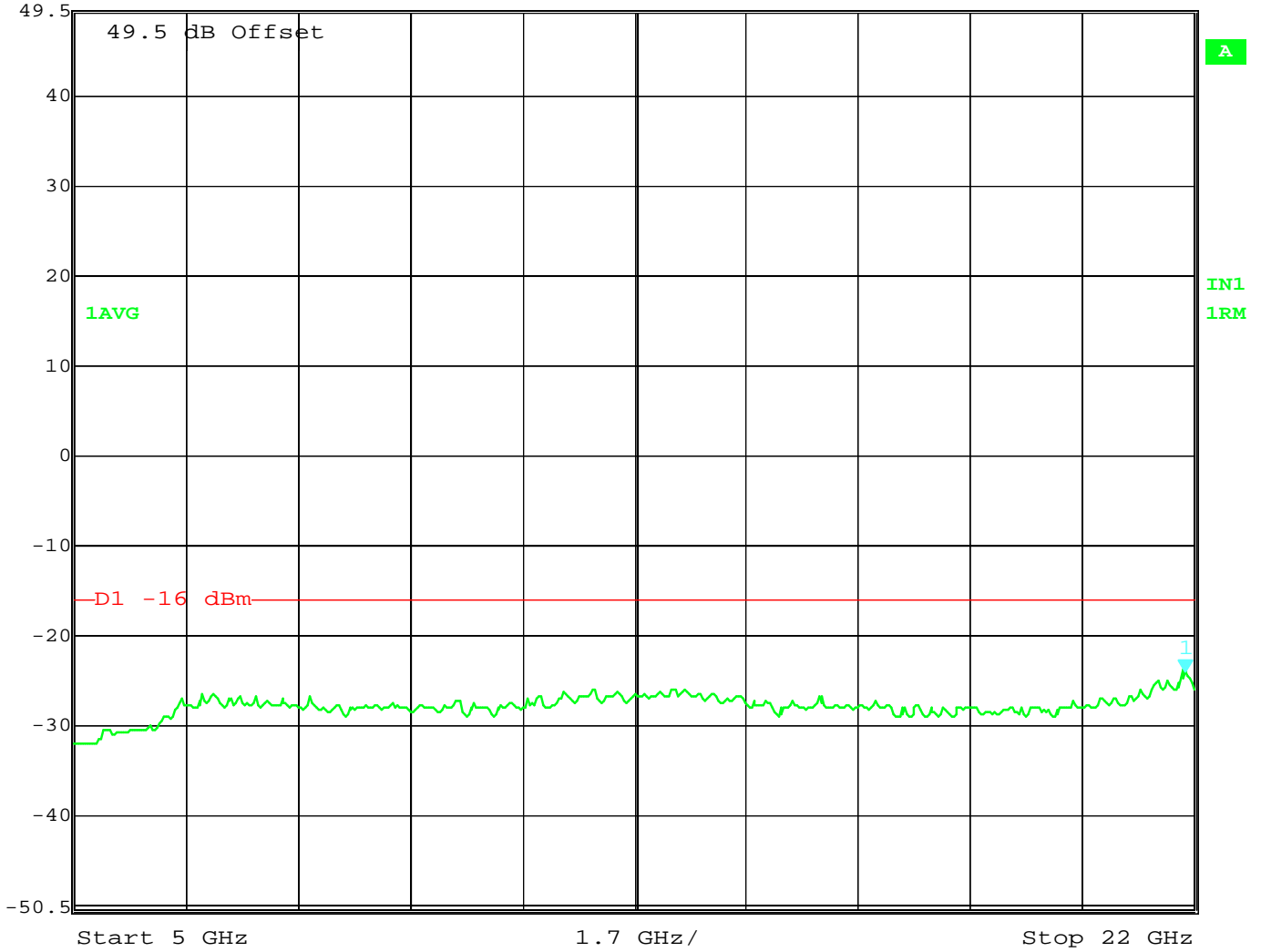


Title: Spurious Emission; TRDU2X60-AWS Light Radio; ENG: JY
 Comment A: -48VDC; 2C; BLK (A+B1)+(F2); 2117.5+2152.5 MHz; 15+5MHz BW
 PWR:120W; 64QAM; FCC PRT 27; FCCID:AS5BBTRX-13
 Date: 25.SEP.2013 09:10:55

Test #1 15 + 5 MHz 64QAM
5 GHz - 22 GHz



Ref Lvl	Marker 1 [T1]	RBW	1 MHz	RF Att	10 dB
49.5 dBm	-24.19 dBm	VBW	3 MHz		
	21.86372745 GHz	SWT	170 ms	Unit	dBm



Title: Spurious Emission; TRDU2X60-AWS Light Radio; ENG: JY
 Comment A: -48VDC; 2C; BLK (A+B1)+(F2); 2117.5+2152.5 MHz; 15+5MHz BW
 PWR:120W; 64QAM; HPF; FCC PRT 27; FCCID:AS5BBTRX-13
 Date: 25.SEP.2013 09:11:47

PART 2.1053 MEASUREMENTS REQUIRED: FIELD STRENGTH OF SPURIOUS RADIATION

The **LTE TRDU2X120-AWS**, is designed to be operated and marketed in the Alcatel-Lucent 9712 cabinet systems. Each **TRDU2X120-AWS** contains two identical transceiver paths and ports. Each transceiver port can either output 60W or 120W maximum at the external antenna connector (EAC). The 120W output per antenna port can consist of either 10+10 MHz, 10+5 MHz or 15+5 MHz configured as two non-contiguous carriers. The **LTE TRDU2X120-AWS** will typically be operated in Multiple Input and Multiple Output (MIMO) mode using multiple antennas. The radiated emissions test was focused on the 15 + 5 MHz and 5 + 15MHz configurations with QPSK modulation. Spectrum of measurement was 30 MHz – 22 GHz.

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 896745), 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:

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

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
P = Transmitted Power in watts = 60W

R = Distance in meters = 3 m

Results: Complies - Over the out-of-band spectrum investigated from 30 MHz to the tenth harmonic of the carrier (22 GHz), the power levels of all emissions observed were >> 20 dB below the 82.23 dB $\mu\text{V/meter}$ 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**