



Subject: Application for an Initial Grant of Equipment
 Authorization under FCC ID: AS5ONEBTS-27,
 Covering the New RRH2X60-1900 Product.

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March 27, 2012

EXHIBIT 9: TEST REPORT

INTRODUCTION:

The exhibits presented in this test report demonstrate that Alcatel-Lucent's new -48V WCDMA **RRH2X60-1900** twin Remote Radio Head product, which will be deployed in combination with the 9396 d2U Digital Baseband Unit (BBU), is in full compliance with all requirements of the Rules of the Commission as specified in the Code of Federal Regulations (CFR), Title 47 – Telecommunication; Part 24, Subpart E – Broadband PCS; Section 24.238 - Emission Limitations for Broadband PCS Equipment.; effective October 1, 2011. All testing was performed in accordance with CFR 47, Part 2, Subpart J – Equipment Authorization Procedures; effective October 1, 2011. It also demonstrates compliance with the spurious emissions limitations specified in ETSI TS 125 141 V7.15.0 (2010-02): Universal Mobile Telecommunications System (UMTS); Base Station Conformance Testing (FDD), (3GPP TS 25.141, Version 7.15.0, Release 7). This standard was the guideline used in the design of this product.

The -48V WCDMA **RRH2X60-1900** twin Remote Radio Head product consists of the principle RF components: (1) Transceiver (TRX), (2) Power Amplifier Unit (PAU), and (3) 60 MHz bandwidth transmit/receive filters covering the cellular frequency spectrum: 1930 — 1990 MHz.

As a Transceiver System, all conducted RF characteristics and emissions measurements were performed at the transmit antenna terminal (downlink), using a production product. All testing was performed by Global Product Compliance Laboratory (GPCL), Murray Hill, NJ.

APPLICABLE FCC RULES AND INDUSTRY STANDARDS:

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 2.1055	Measurements required: Frequency stability.
Part 2.1057	Frequency Spectrum to be Investigated
Part 24.238	Emission Limitations for Broadband PCS Equipment
ETSI	TS 125 141 V7.15.0 (2010-02): Universal Mobile Telecommunications System (UMTS); Base Station (BS) Conformance Testing (FDD), (3GPP TS 25.141, Version 7.15.0, Release 7).
ETSI	TS 125 104 V8.3.0 (2008-06): Universal Mobile Telecommunications System (UMTS); Base Station (BS) Radio Transmission and Reception (FDD), (3GPP TS 25.104, Version 8.3.0, Release 8).
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 rated RF power at the downlink (DL) antenna terminal is **60 Watts (+47.8 dBm)** total composite power for each of 2 DL transmit antenna terminals (RF paths) designated as Tx1 and Tx2. The fundamental frequencies can be either a single 60 W carrier per Tx1 and Tx2, or 2 carriers at 30W/C per Tx1 and Tx2. The RF power measured at the antenna terminal for each configuration, across the 60 MHz, 1930 — 1990 MHz, frequency band is tabulated below.

The carrier channel frequencies used represent the lowest settable, mid band and the highest settable frequencies for both single carriers at 60W, and for 2 adjacent carriers at 30W/C operation. These are tabulated below.

1900 MHz Single Carrier Test Frequencies at 60W (+47.8 dBm)

PCS Frequency	PCS Frequency Block	UARFCN Channel Number	Carrier Center Frequency
A1	Lowest Settable Channel	12	1932.5 MHz
A3	Highest Settable Channel	62	1942.5 MHz
D	Block Center	87	1947.5 MHz
B1	Lowest Settable Channel	112	1952.5 MHz
B3	Highest Settable Channel	162	1962.5 MHz
E	Block Center	187	1967.5 MHz
F	Block Center	212	1972.5 MHz
C3	Lowest Settable Channel	237	1977.5 MHz
C5	Highest Settable Channel	287	1987.5 MHz

1900 MHz Two Carrier Test Frequencies at 30W/C (+44.8 dBm/C)
Contiguous Multiple Carrier Test Frequencies at 30/C (+44.8 dBm/C)

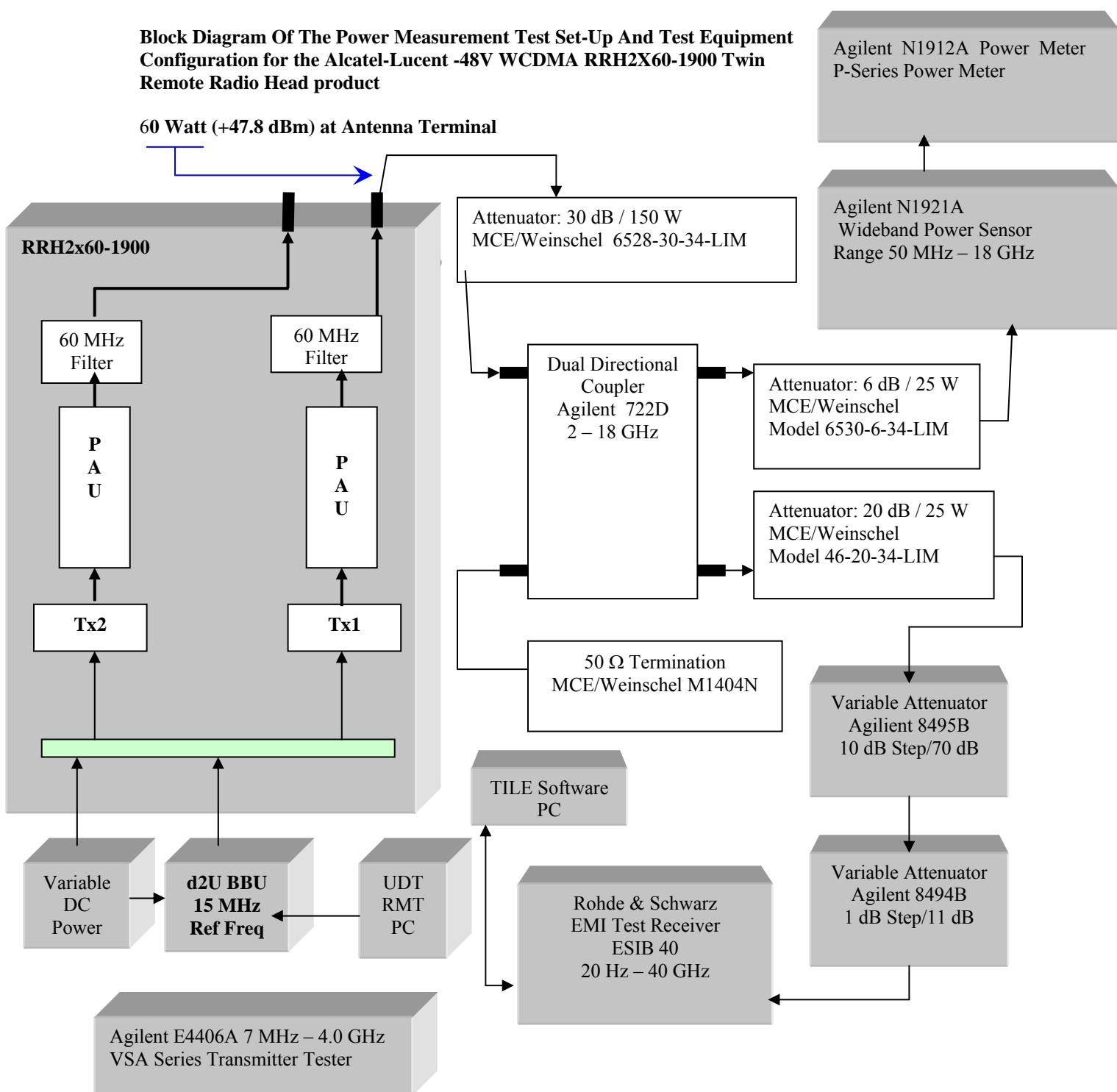
PCS Frequency Block	UARFCN DL Channel No.	Carrier Center Frequency
A1 + A2	12 + 32	1932.5 + 1937.5 MHz
B2 + B3	137 + 162	1957.5 + 1962.5 MHz
C4 + C5	262 + 287	1982.5 + 1987.5 MHz

Note: UARFCN = UTRA Absolute Radio Frequency Channel Number

Results: The -48V WCDMA **RRH2X60-1900** Twin Remote Radio Head product is compliant with the manufacturer's rated power level at the transmit antenna terminal for the above listed carrier frequencies.

Block Diagram Of The Power Measurement Test Set-Up And Test Equipment Configuration for the Alcatel-Lucent -48V WCDMA RRH2x60-1900 Twin Remote Radio Head product

60 Watt (+47.8 dBm) at Antenna Terminal



PART 2.1047 MEASUREMENTS REQUIRED: MODULATION CHARACTERISTICS

The modulation accuracy was measured at the Equipment Antenna Terminal (EAC) for each of the *single carrier* test frequencies and power levels previously cited, i.e., the lowest and highest settable carrier frequencies for Blocks A, B and C; and the center frequency of Blocks D, E and F. The data is tabulated below. However, for brevity, only the highest (1987.5 MHz) settable carrier frequency will be displayed and is representative of all measurements.

In accordance with ETSI TS 25.141, the Error Vector Magnitude (EVM) was measured for two test modulation (TM) schemes:

- 1) **TM1-64** with 68 active channels: 64 voice + 4 control (QPSK). **Limit: EVM RMS < 17.5 %**
- 2) **TM 5-44** with 44 active channels: 30 voice + 8 HSDPA (High Speed Downlink Packet Access) channels + 6 control (16QAM). **Limit: EVM RMS < 12.5 %.**

In each test, the power level was set to Pmax: 60W (47.8 dBm). The test equipment used was an Agilent E4406A VSA Series Transmitter Tester. Modulation accuracy measurement mode was Composite EVM, using the Peak/Average Metrics.

RMS Error Vector Magnitude (EVM) Measurement Summary at the Antenna Terminal**Tx1 @ TM1-64 (QPSK) - Single Carrier at 60W (47.8 dBm)**

Cellular Freq Band	UMTS 850 Carrier Tx1 @ 60W (47.8 dBm) TM1-64 (QPSK)	UARFCN Channel Number	Carrier Center Frequency	Modulation Accuracy Average < 17.5 %	Modulation Accuracy Peak Hold < 17.5 %
A1	Lowest Settable Channel	12	1932.5 MHz	6.09 %	7.10 %
A3	Highest Settable Channel	62	1942.5 MHz	6.35 %	7.27 %
D	Block Center	87	1947.5 MHz	6.37 %	7.25 %
B1	Lowest Settable Channel	112	1952.5 MHz	6.35 %	6.93 %
B3	Highest Settable Channel	162	1962.5 MHz	6.44 %	7.05 %
E	Block Center	187	1967.5 MHz	6.65 %	7.28 %
F	Block Center	212	1972.5 MHz	6.68 %	7.30 %
C3	Lowest Settable Channel	237	1977.5 MHz	6.35 %	7.12 %
C5	Highest Settable Channel	287	1987.5 MHz	6.48 %	7.19 %

RMS Error Vector Magnitude (EVM) Measurement Summary at the Antenna Terminal

Tx1 @ TM5-44 (16QAM) - Single Carrier at 60W (47.8 dBm)

Cellular Freq Band	UMTS 850 Carrier Tx1 @ 60W (47.8 dBm) TM5-44 (16QAM)	UARFCN Channel Number	Carrier Center Frequency	Modulation Accuracy Average < 17.5 %	Modulation Accuracy Peak Hold < 17.5 %
A1	Lowest Settable Channel	12	1932.5 MHz	5.32 %	6.25 %
A3	Highest Settable Channel	62	1942.5 MHz	5.18 %	6.19 %
D	Block Center	87	1947.5 MHz	5.16 %	6.16 %
B1	Lowest Settable Channel	112	1952.5 MHz	5.16 %	6.12 %
B3	Highest Settable Channel	162	1962.5 MHz	5.16 %	6.08 %
E	Block Center	187	1967.5 MHz	5.17 %	6.09 %
F	Block Center	212	1972.5 MHz	5.18 %	5.63 %
C3	Lowest Settable Channel	237	1977.5 MHz	4.96 %	6.06 %
C5	Highest Settable Channel	287	1987.5 MHz	5.12 %	5.71 %

RMS Error Vector Magnitude (EVM) Measurement Summary at the Antenna Terminal

Tx2 @ TM1-64 (QPSK) - Single Carrier at 60W (47.8 dBm)

Cellular Freq Band	UMTS 850 Carrier Tx2 @ 60W (47.8 dBm) TM1-64 (QPSK)	UARFCN Channel Number	Carrier Center Frequency	Modulation Accuracy Average < 17.5 %	Modulation Accuracy Peak Hold < 17.5 %
A1	Lowest Settable Channel	12	1932.5 MHz	6.34 %	6.86 %
A3	Highest Settable Channel	62	1942.5 MHz	6.27 %	7.15 %
D	Block Center	87	1947.5 MHz	6.27 %	6.82 %
B1	Lowest Settable Channel	112	1952.5 MHz	6.34 %	6.93 %
B3	Highest Settable Channel	162	1962.5 MHz	6.37 %	7.10 %
E	Block Center	187	1967.5 MHz	6.24 %	6.81 %
F	Block Center	212	1972.5 MHz	6.38 %	6.98 %
C3	Lowest Settable Channel	237	1977.5 MHz	6.34 %	7.11 %
C5	Highest Settable Channel	287	1987.5 MHz	6.28 %	6.65 %

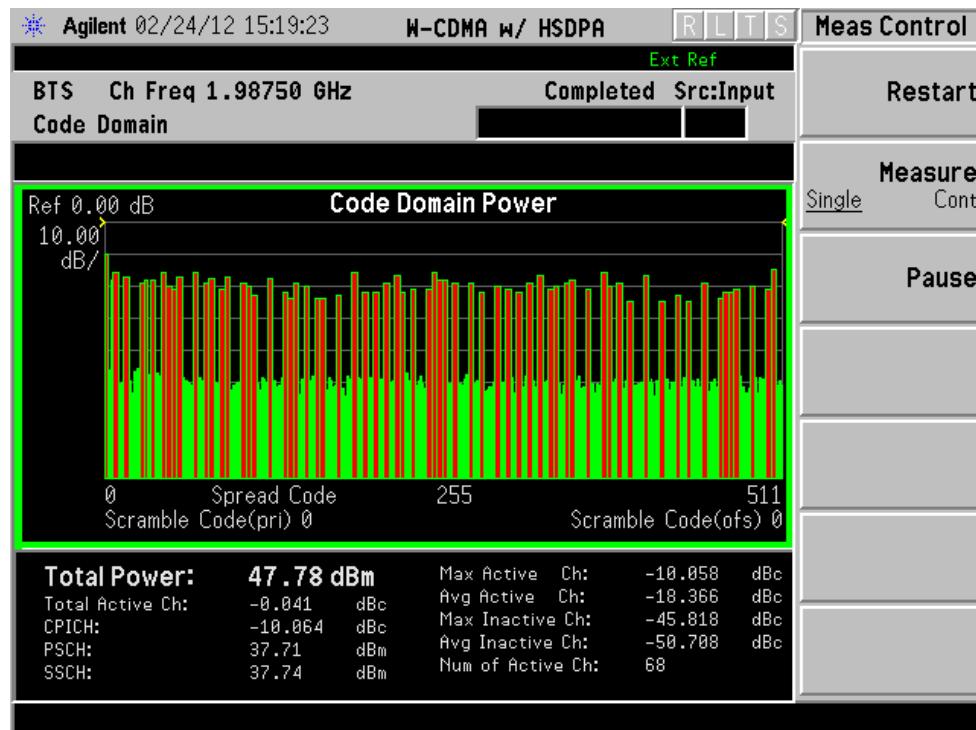
Minimum Standard Requirement: The minimum standard requirement is that the RMS Error Vector Magnitude (EVM) shall be less than 17.5% for TM1-64 (QPSK) and less than 12.5% for TM5-44 (16QAM).

Test Set-up and Configuration: Same as previously used for Part 2.1046 RF Power Measurement, with exception that the ESIB-40 EMI Test Receiver is replaced by Agilent E4406A VSA Series Transmitter Tester, 7 MHz – 4.0 GHz

RESULTS: The -48V WCDMA **RRH2X60-1900** Twin Remote Radio Head product demonstrated full compliance with the modulation accuracy requirements specified in ETSI TS 25.141. All channels measured were less than the 12.5% RMS EVM limitation. The plots for each channel are recorded and stored on file. For brevity, only the highest carrier frequencies will be displayed in this exhibit, since they are representative for all.

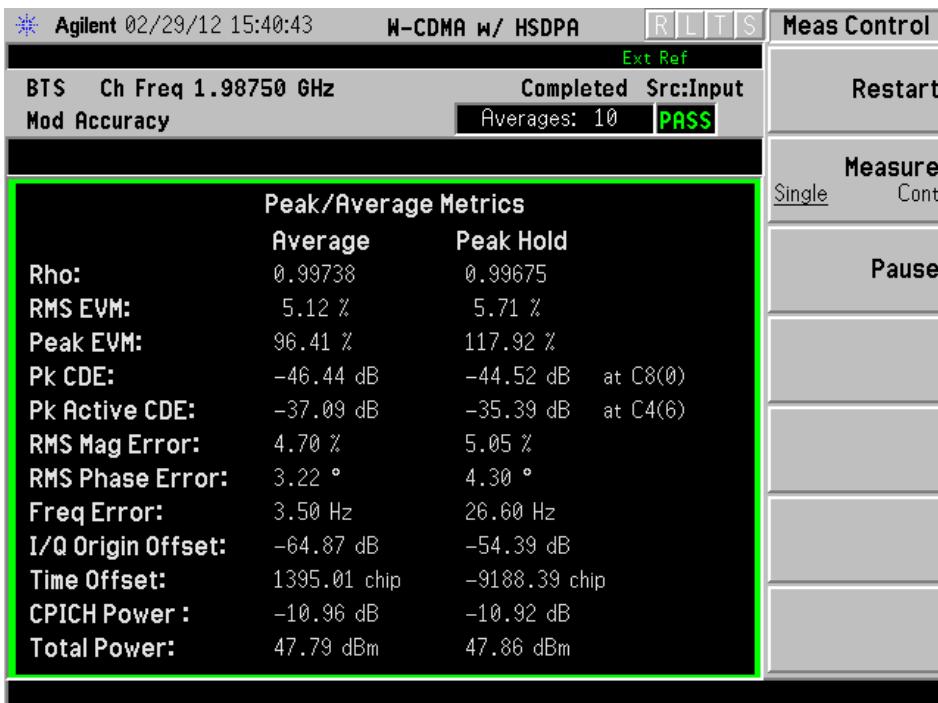
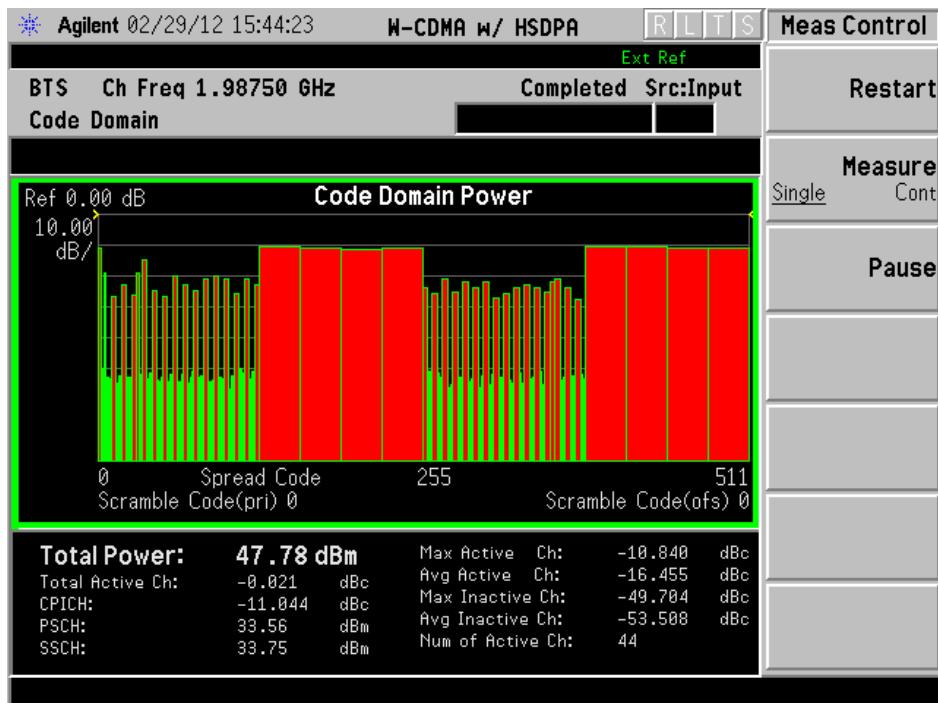
Test Modulation: TM1-64 with 68 active channels: 64 voice + 4 control (QPSK). Limit: EVM RMS < 17.5 %

Tx1 @ TM1-64 (QPSK) - Single Carrier at 60W (47.8 dBm) - 1987.5 MHz



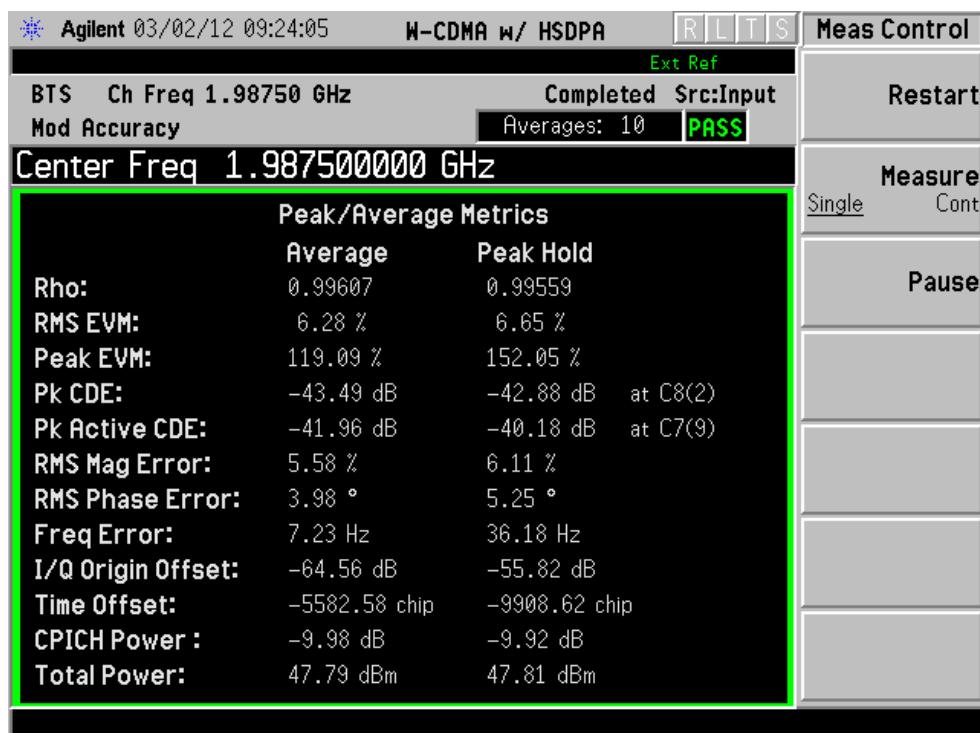
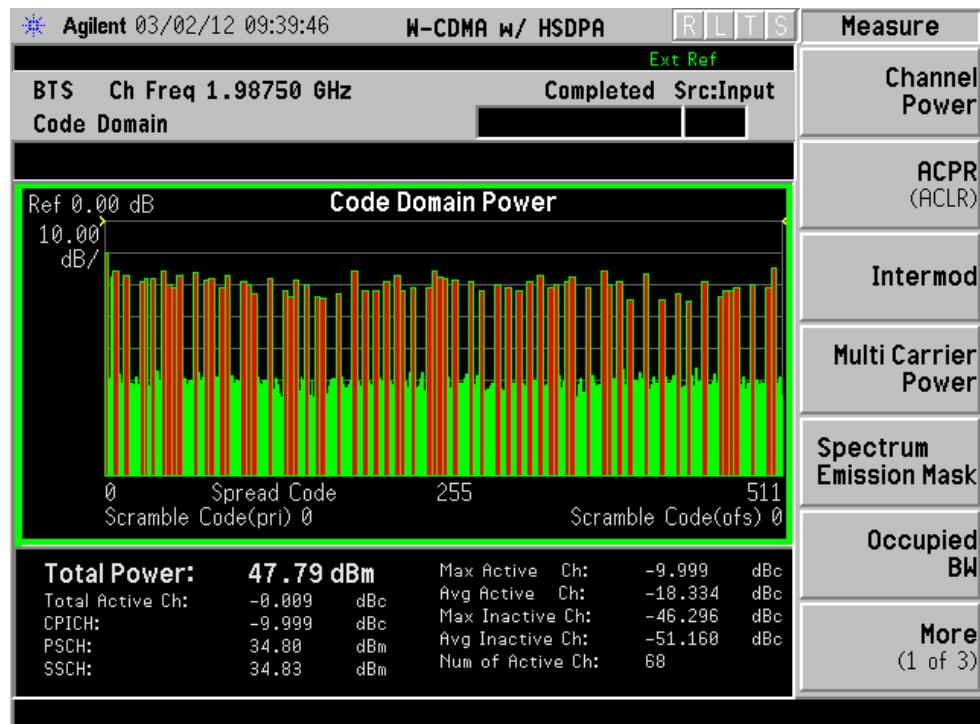
Test Modulation: TM 5-44 with 44 active channels: 30 voice + 8 HSDPA (High Speed Downlink Packet Access) channels + 6 control (16QAM). Limit: EVM RMS < 12.5 %.

Tx1 @ TM5-44 (16QAM) - Single Carrier at 60W (47.8 dBm) - 1987.5 MHz



Test Modulation: TM1-64 with 68 active channels: 64 voice + 4 control (QPSK). Limit: EVM RMS < 17.5 %

Tx2 @ TM1-64 (QPSK) - Single Carrier at 60W (47.8 dBm) - 1987.5 MHz



PART 2.1049 MEASUREMENTS REQUIRED: OCCUPIED BANDWIDTH - Method 1

The occupied bandwidth was measured at the Equipment Antenna Terminal (EAC) for the previously cited Single-Carrier and Two-Carrier frequencies. The configurations and power levels evaluated were:

- 1) Tx1 @ 60W single carrier at TM1-64
- 2) Tx1 @ 60W single carrier at TM5-44
- 3) Tx2 @ 60W single carrier at TM1-64
- 4) Tx1 @ 30W/C: two adjacent carriers at TM1-64
- 5) Tx1 @ 30W/C: two adjacent carriers at TM5-44

Compliance was demonstrated for the ETSI TS 25.141 emission masks, using both the TM1-64 and TM5-44 test modulations, for the above configurations as indicated.

The occupied bandwidth was measured by two methods:

1. The carrier 99% power bandwidth, which is also the necessary bandwidth, using an Agilent E4406A VSA Series Transmitter Tester 7MHz-4.0 GHz. This measurement was for a single carrier only.
2. Emission mask limitation using a Rohde & Schwarz ESIB-40 EMI Test Receiver, to demonstrate compliance with the ETSI TS 25.141 emission mask requirements and with Part 22.917. This measurement was performed for both a single-carrier and for two-carrier operation.

Method 1: The carrier 99% power bandwidth was measured at the Equipment Antenna Terminal (EAC) for each of the single carrier configurations above at 60W (47.8 dBm) for both TM1-64 (QPSK) and TM5-44 (16QAM) test modulations.

Test Modulation: (1) TM1-64 with 68 active channels: 64 voice + 4 control (QPSK).
 (2) TM 5-44 with 44 active channels: 30 voice + 8 HSDPA (High Speed Downlink Packet Access) channels + 6 control (16QAM).

Tx1 @ TM1-64 (QPSK) - Single Carrier at 60W (47.8 dBm)

Cellular Freq Band	UMTS 1900 MHz Carrier 60W (47.8 dBm)	UARFCN Channel Number	Carrier Center Frequency	Measured Carrier 99% Power Bandwidth TM1-64	Measured Carrier 99% Power Bandwidth TM5-44
A1	Lowest Settable Channel	12	1932.5 MHz	4.1853 MHz	4.2124 MHz
A3	Highest Settable Channel	62	1942.5 MHz	4.1876 MHz	4.1936 MHz
D	Block Center	87	1947.5 MHz	4.1591 MHz	4.1939 MHz
B1	Lowest Settable Channel	112	1952.5 MHz	4.1663 MHz	4.1566 MHz
B3	Highest Settable Channel	162	1962.5 MHz	4.1688 MHz	4.1648 MHz
E	Block Center	187	1967.5 MHz	4.1880 MHz	4.1482 MHz
F	Block Center	212	1972.5 MHz	4.1237 MHz	4.1329 MHz
C3	Lowest Settable Channel	237	1977.5 MHz	4.1361 MHz	
C5	Highest Settable Channel	287	1987.5 MHz	4.1759 MHz	4.1598 MHz

Test Modulation: TM1-64 with 68 active channels: 64 voice + 4 control (QPSK).

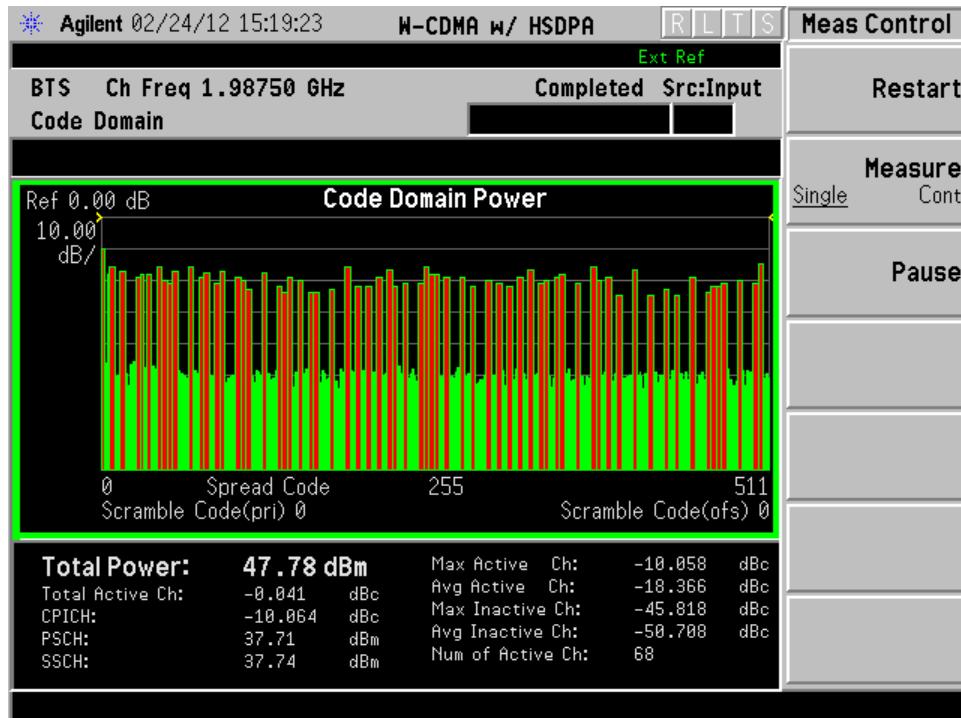
Tx2 @ TM1-64 (QPSK) - Single Carrier at 60W (47.8 dBm)

Cellular Freq Band	UMTS 1900 MHz Carrier 60W (47.8 dBm)	UARFCN Channel Number	Carrier Center Frequency	Measured Carrier 99% Power Bandwidth TM1-64
A1	Lowest Settable Channel	12	1932.5 MHz	4.1627 MHz
A3	Highest Settable Channel	62	1942.5 MHz	4.1670 MHz
D	Block Center	87	1947.5 MHz	4.1472 MHz
B1	Lowest Settable Channel	112	1952.5 MHz	4.1649 MHz
B3	Highest Settable Channel	162	1962.5 MHz	4.1667 MHz
E	Block Center	187	1967.5 MHz	4.1809 MHz
F	Block Center	212	1972.5 MHz	4.1451 MHz
C3	Lowest Settable Channel	237	1977.5 MHz	4.1518 MHz
C5	Highest Settable Channel	287	1987.5 MHz	4.1830 MHz

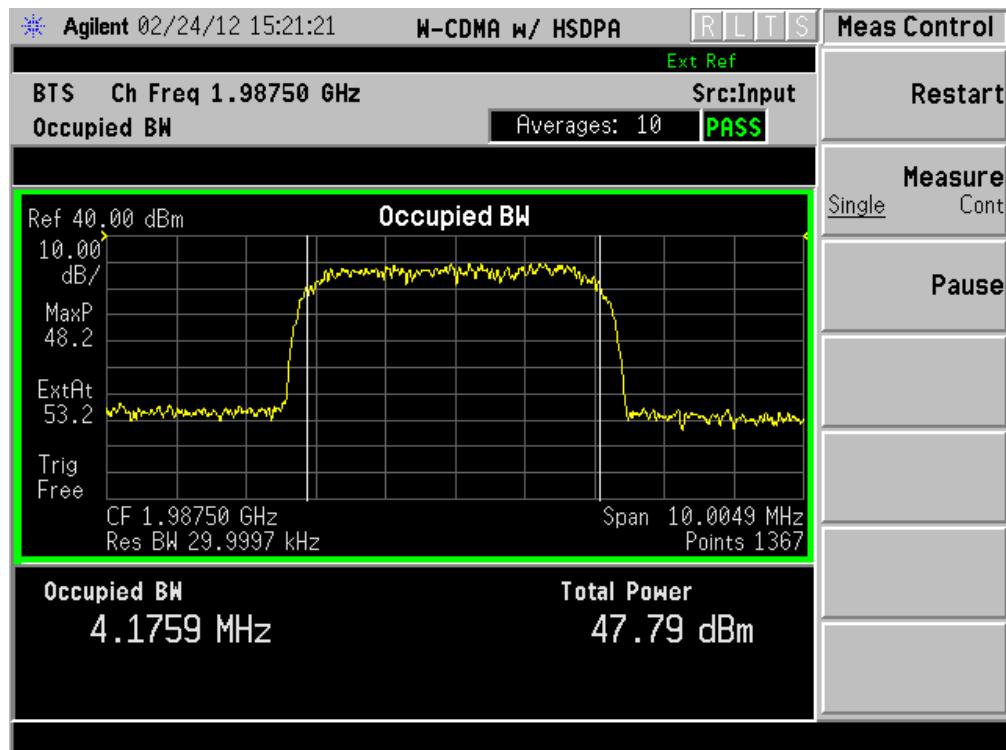
Results: The 99% occupied bandwidth measurement confirms that the carrier's emission designator to be 4M20F9W. The plots for each channel are recorded and stored on file. For brevity, only the highest carrier frequency will be displayed in this exhibit, since they are representative for all.

Test Modulation: TM1-64 with 68 active channels: 64 voice + 4 control (QPSK).

Tx1 @ TM1-64 (QPSK) - Single Carrier at 60W (47.8 dBm) - 1987.5 MHz

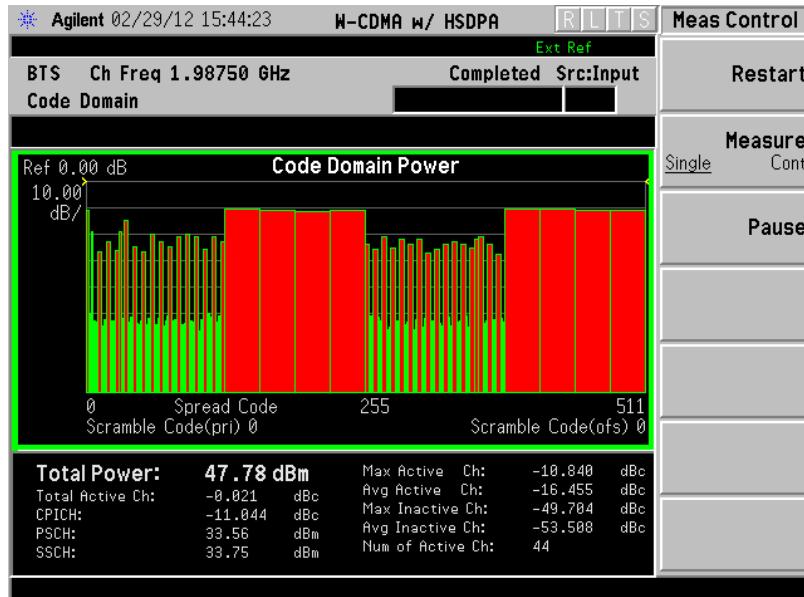


99% Occupied Bandwidth

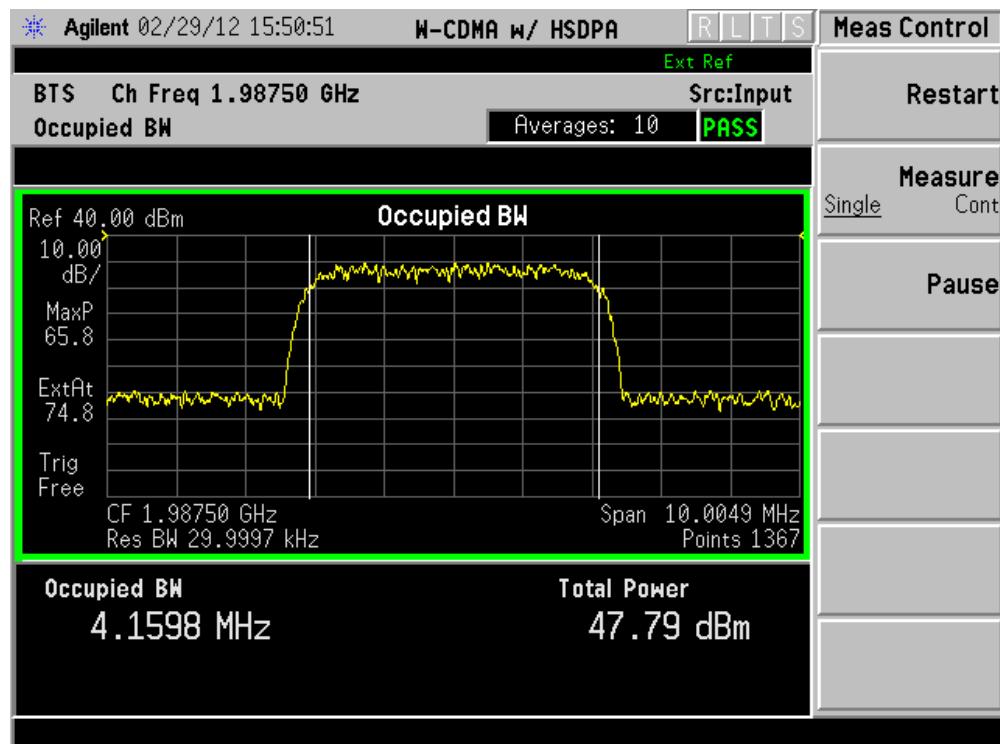


Test Modulation: TM 5-44 with 44 active channels: 30 voice + 8 HSDPA (High Speed Downlink Packet Access) channels + 6 control (16QAM).

Tx1 @ TM5-44 (16QAM) - Single Carrier at 60W (47.8 dBm) - 1987.5 MHz

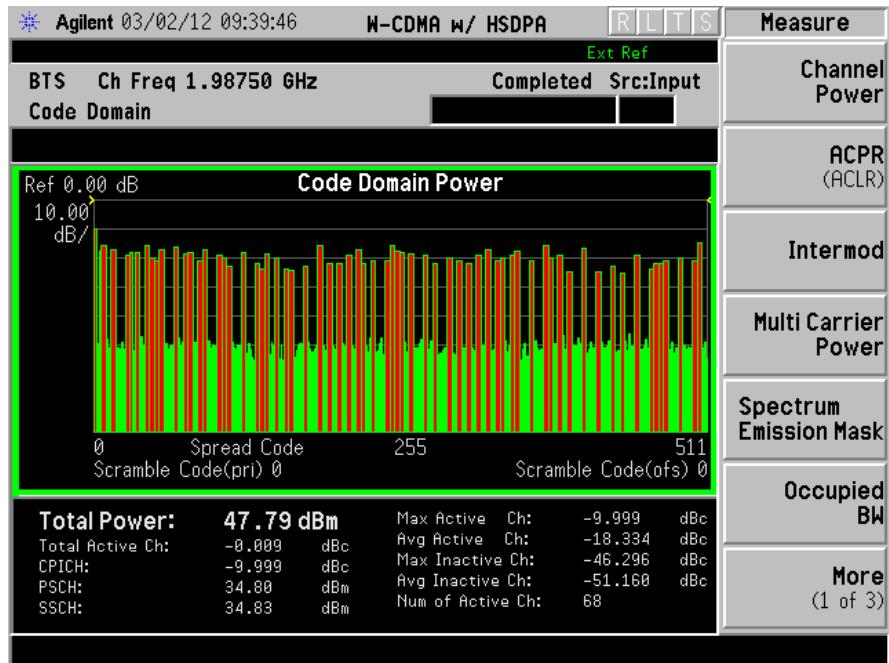


99% Occupied Bandwidth

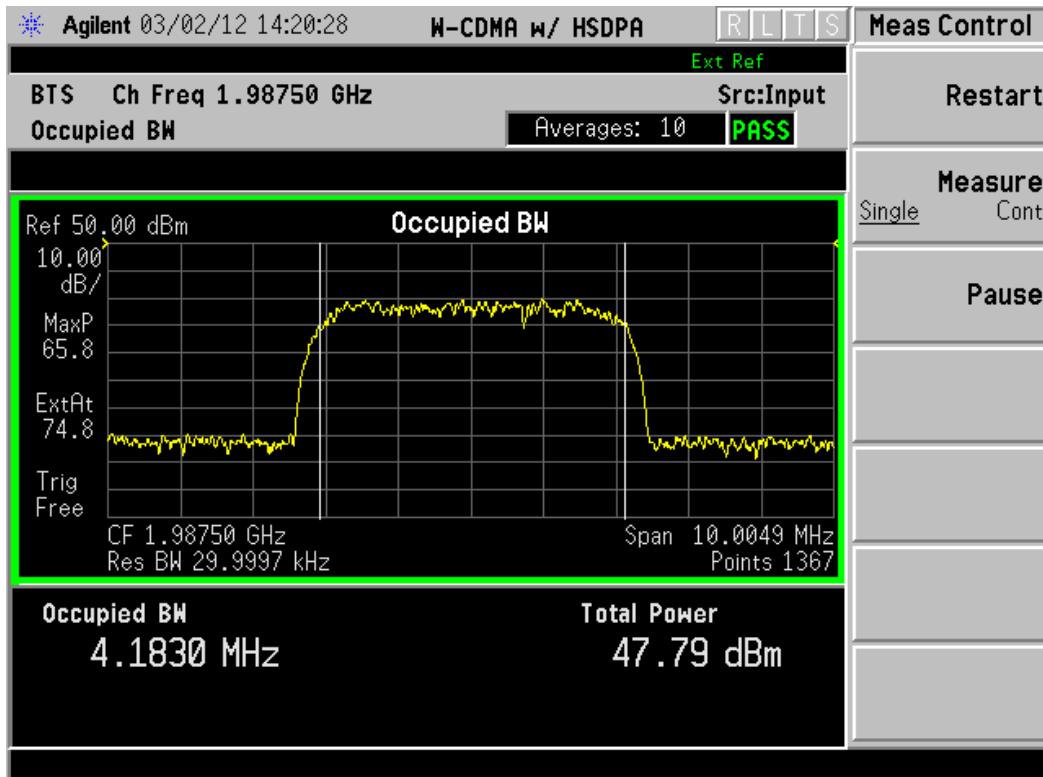


Test Modulation: TM1-64 with 68 active channels: 64 voice + 4 control (QPSK).

Tx2 @ TM1-64 (QPSK) - Single Carrier at 60W (47.8 dBm) - 1987.5 MHz



99% Occupied Bandwidth



PART 2.1049 MEASUREMENTS REQUIRED: OCCUPIED BANDWIDTH - Method 2

Method 2. Emission mask limitation using a Rohde & Schwarz ESIB-40 EMI Test Receiver with Total Integrated Laboratory Environment (TILE) test software.

Compliance with the ETSI TS 25.141 occupied bandwidth emission mask requirements and with Part 22.917 was demonstrated using a Rohde & Schwarz ESIB-40 EMI Test Receiver, in combination with the Total Integrated Laboratory Environment (TILE) EMI test software, by ETS-Lindgren. The occupied bandwidth/emission mask compliance measurements were performed for both a single-carrier and for two-carrier operation, with both TM1-64 and TM5-44 ETSI test modulations.

Measurements were performed at the Equipment Antenna Terminal (EAC) for the following configurations:

- 1) Tx1 @ 60W single carrier at TM1-64
- 2) Tx1 @ 60W single carrier at TM5-44
- 3) Tx2 @ 60W single carrier at TM1-64
- 4) Tx1 @ 30W/C: two adjacent carriers at TM1-64
- 5) Tx1 @ 30W/C: two adjacent carriers at TM5-44

The same UARFCN channels as previously cited were repeated. The emission mask used to demonstrate compliance was as specified in ETSI TS 25.141 for $P \geq +43$ dBm. The mask attenuation values were based on a 30 kHz resolution bandwidth, which made the modulated 5 MHz carrier to be offset by -22.218 dB, in accordance with the equation:

$$\text{Carrier Offset} = 10 \log (30 \text{ kHz}/5 \text{ MHz}) = -22.218 \text{ dB}$$

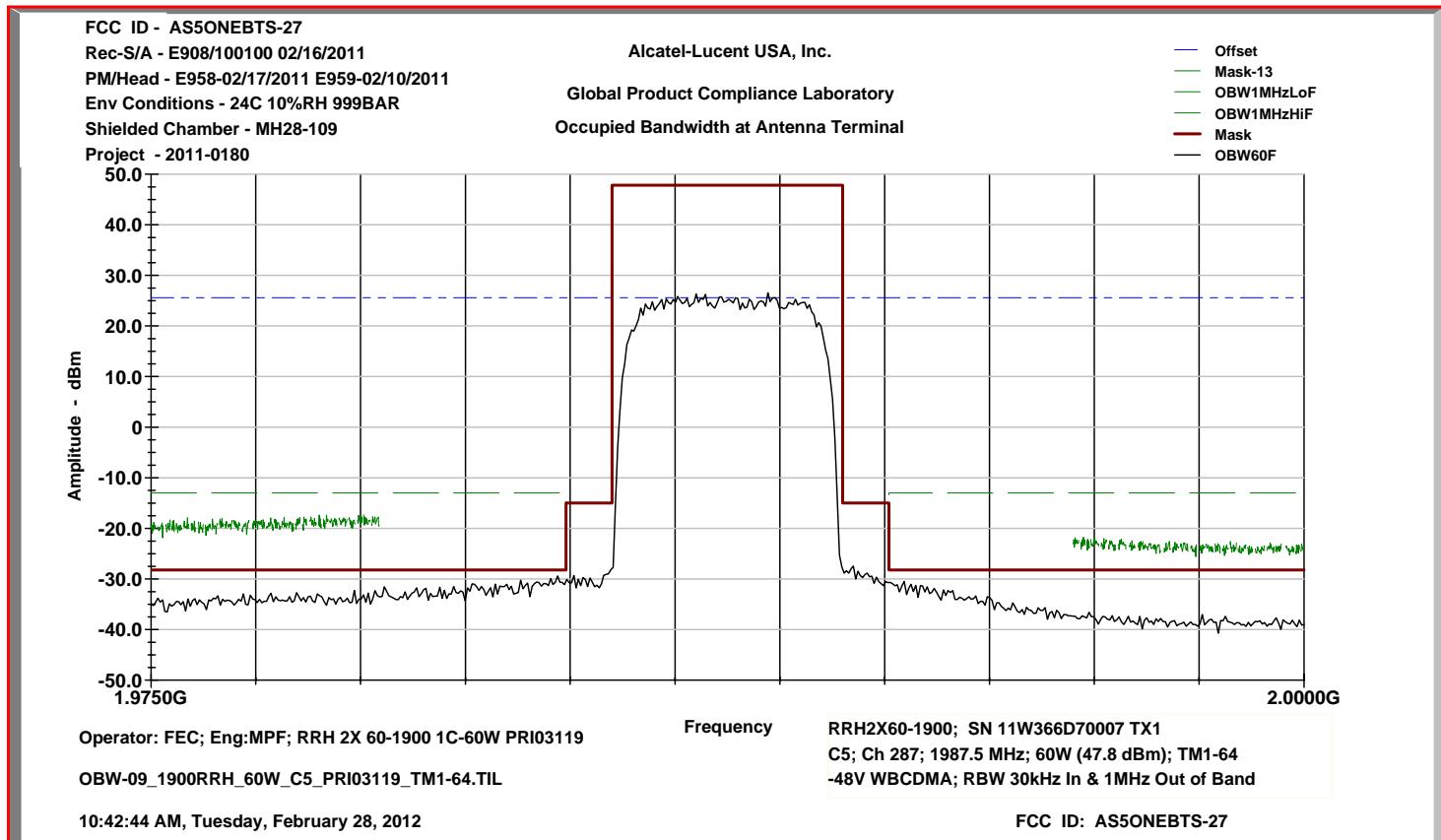
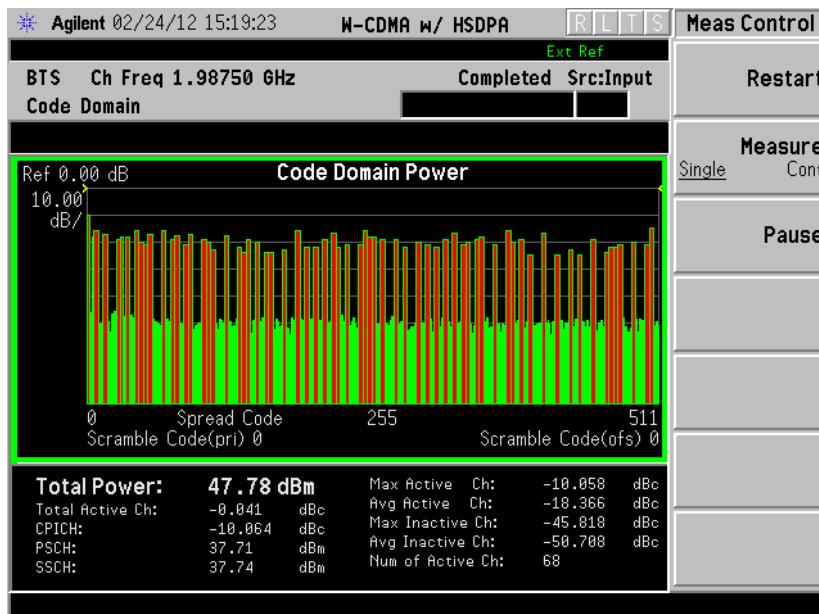
The plots for each channel measured are recorded and stored on file. For brevity, only the highest single-carrier (1987.5 MHz) and two-carrier (1982.5 + 1987.5 MHz) frequencies will be displayed in this exhibit, as done previously.

Test Set-up and Configuration: Same as previously used for Part 2.1046 RF Power Measurement.

RESULTS: All UARFCN channels measured demonstrate compliance with the emission mask specified by ETSI TS 25.141; the carriers do not exceed the mask limitation. The data plots attached below show characteristics consistent with all measurements. For brevity, only the highest single-carrier (1987.5 MHz) and two-carrier (1982.5 + 1987.5 MHz) frequencies will be displayed in this exhibit.

1) Tx1 @ 60W single carrier at TM1-64

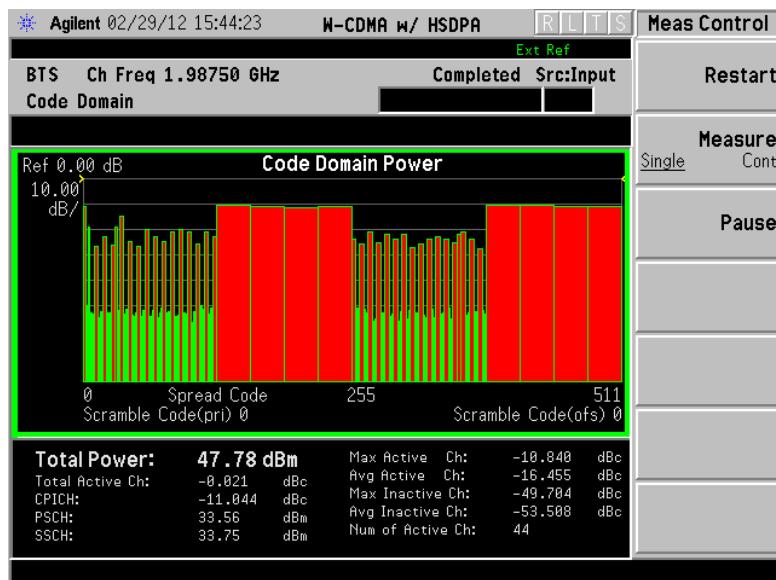
Test Modulation: TM1-64 with 68 active channels: 64 voice + 4 control (QPSK) - 60W
 Tx1 @ TM1-64 (QPSK) - Single Carrier at 60W (47.8 dBm) - 1987.5 MHz



2) Tx1 @ 60W single carrier at TM5-44

Test Modulation: TM 5-44 with 44 active channels: 30 voice + 8 HSDPA (High Speed Downlink Packet Access) channels + 6 control (16QAM).

Tx1 @ TM5-44 (16QAM) - Single Carrier at 60W (47.8 dBm) - 1987.5 MHz



FCC ID - AS5ONEBTS-27

Rec-S/A - E704/100121 09/14/2011

PM/Head - E949-02/01/2012 E950-12/19/2011

Env Conditions - 24C 12%RH 1010BAR

Shielded Chamber - MH28-109

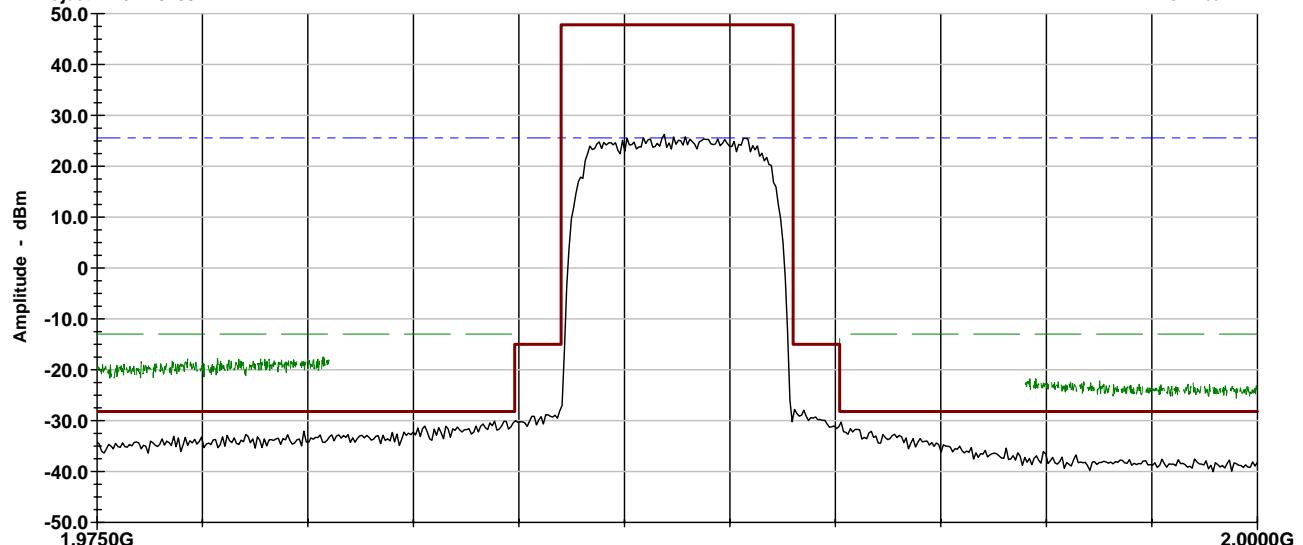
Project - 2011-0180

Alcatel-Lucent USA, Inc.

Global Product Compliance Laboratory

Occupied Bandwidth at Antenna Terminal

Offset
Mask-13
OBW1MHzLoF
OBW1MHzHiF
Mask
OBW60F



Operator: FEC; Eng:MPF; RRH 2X 60-1900 1C-60W PRI03119

Frequency

RRH2X60-1900; SN 11W366D70007 TX1

OBW-18_1900RRH_60W_C5_PRI03119_TM5-44.TIL

C5; Ch 287; 1987.5 MHz; 60W (47.8 dBm); TM5-44

04:21:42 PM, Wednesday, February 29, 2012

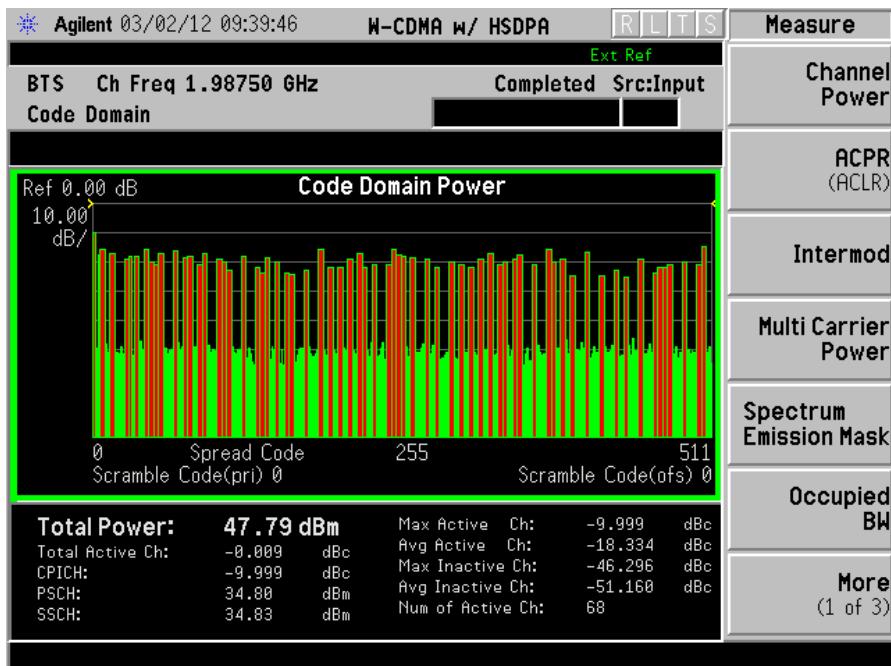
-48V WBCDMA; RBW 30kHz In & 1MHz Out of Band

FCC ID: AS5ONEBTS-27

3) Tx2 @ 60W single carrier at TM1-64

Test Modulation: TM1-64 with 68 active channels: 64 voice + 4 control (QPSK).

Tx2 @ TM1-64 (QPSK) - Single Carrier at 60W (47.8 dBm) -1987.5 MHz



FCC ID - AS5ONEBTS-27

Rec-S/A - E704/100121 09/14/2011

PM/Head - E949-02/01/2012 E950-12/19/2011

Env Conditions - 24C 21%RH 1007BAR

Shielded Chamber - MH28-109

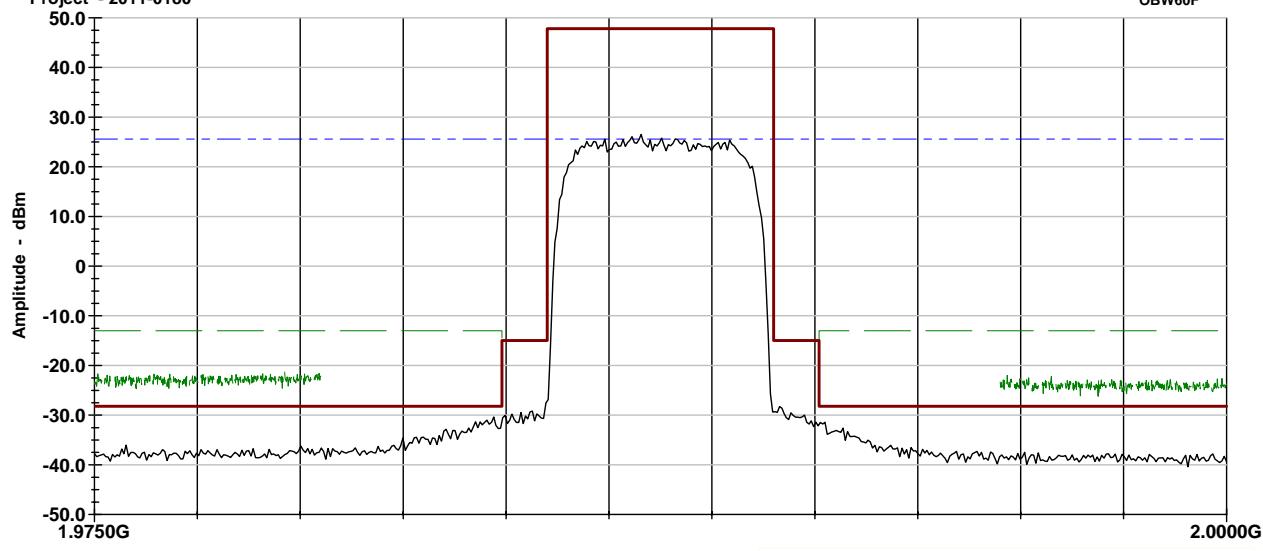
Project - 2011-0180

Alcatel-Lucent USA, Inc.

Global Product Compliance Laboratory

Occupied Bandwidth at Antenna Terminal

Offset
Mask-13
OBW1MHzLoF
OBW1MHzHiF
Mask
OBW60F



Operator: FEC; Eng:MPF; RRH 2X 60-1900 1C-60W PRI03119

Frequency

RRH2X60-1900; SN 11W366D70007 TX2

OBW-33_1900RRH_60W_C5_PRI03119_TM1-64.TIL

C5; Ch 287; 1987.5 MHz; 60W (47.8 dBm); TM1-64

-48V WBCDMA; RBW 30kHz In & 1MHz Out of Band

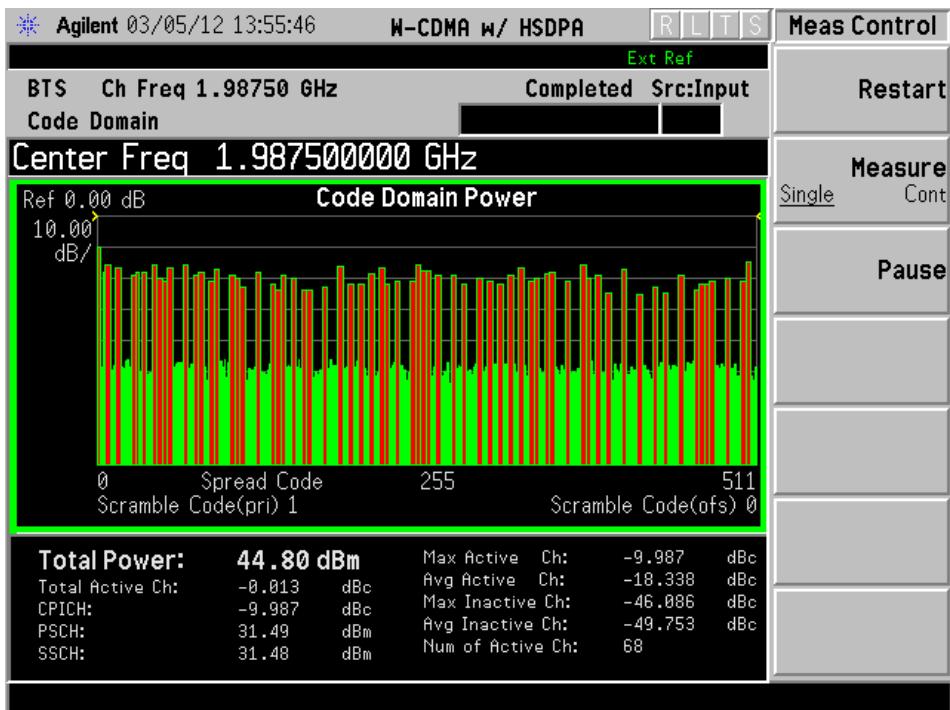
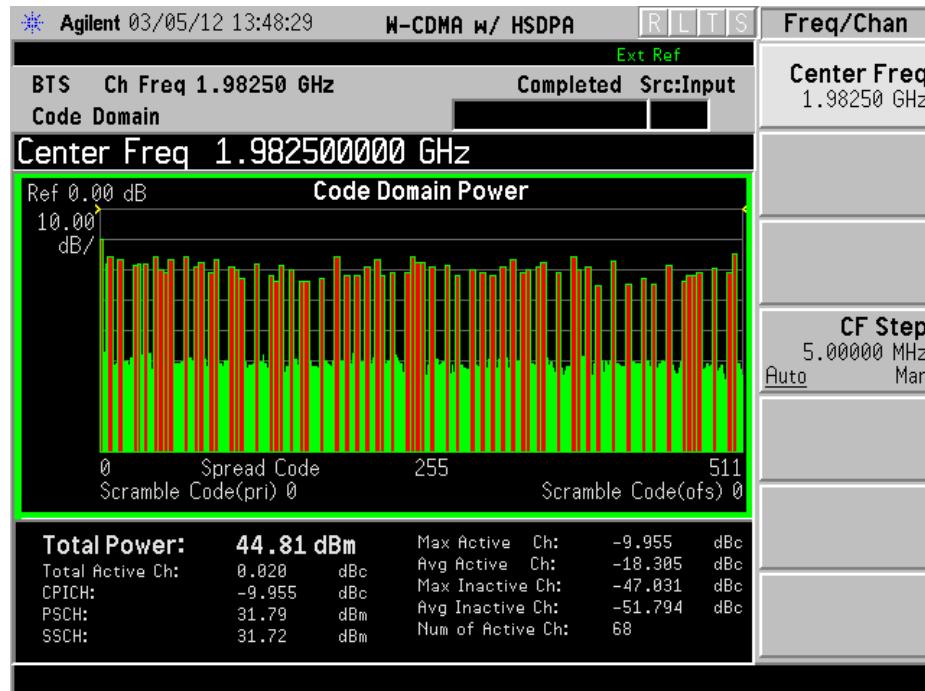
09:55:38 AM, Friday, March 02, 2012

FCC ID: AS5ONEBTS-27

4) Tx1 @ 30W/C: two adjacent carriers at TM1-64

Test Modulation: TM1-64 with 68 Active Channels: 64 voice + 4 control (QPSK) - 30W/C with Total Composite Power 60W

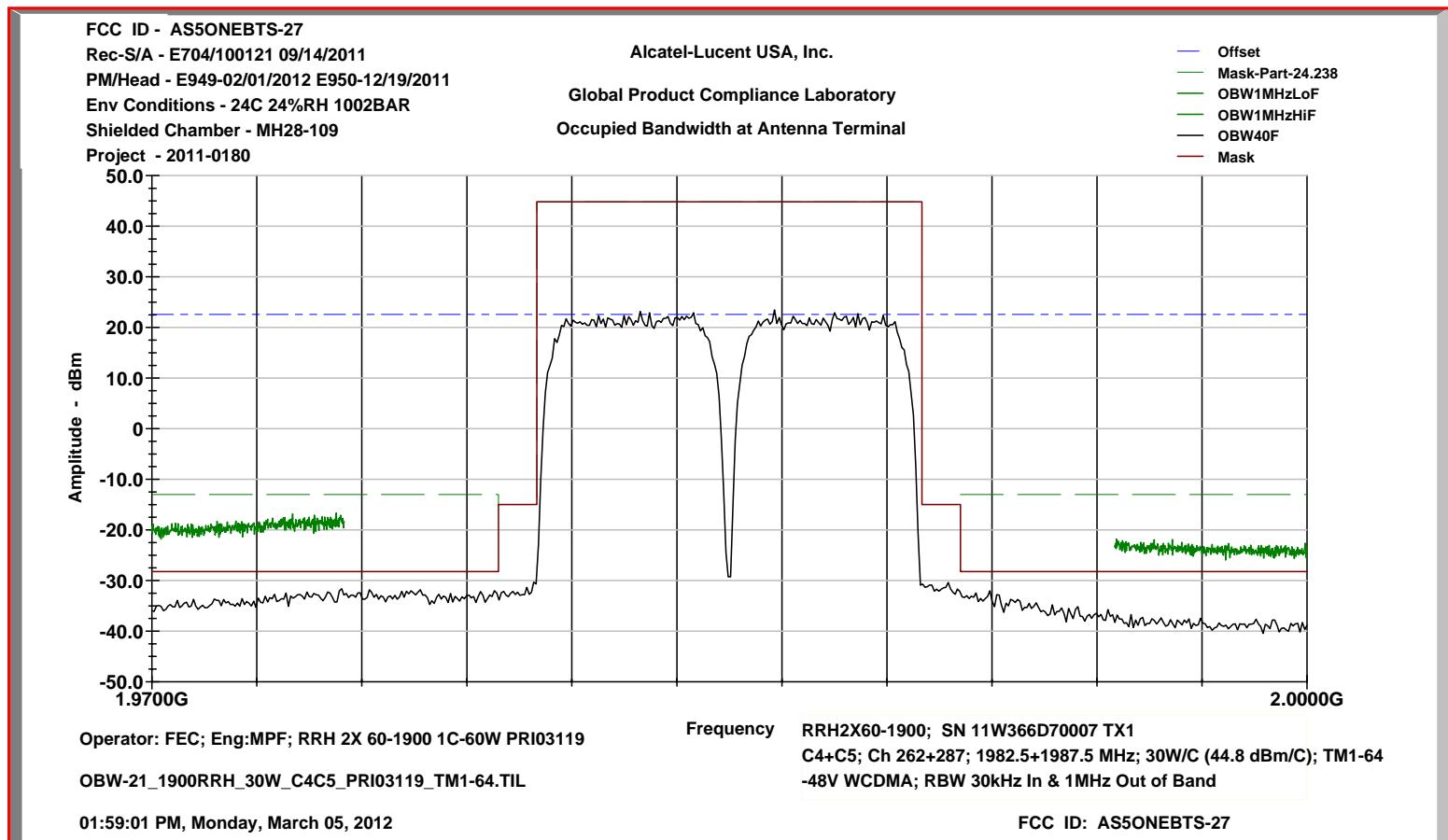
TM1-64 (QPSK) - Two Adjacent Carriers at 30W/C (44.8 dBm/C) - 1982.5 + 1987.5 MHz



4) Tx1 @ 30W/C: two adjacent carriers at TM1-64

Test Modulation: TM1-64 with 68 Active Channels: 64 voice + 4 control (QPSK) - 30W/C with Total Composite Power 60W

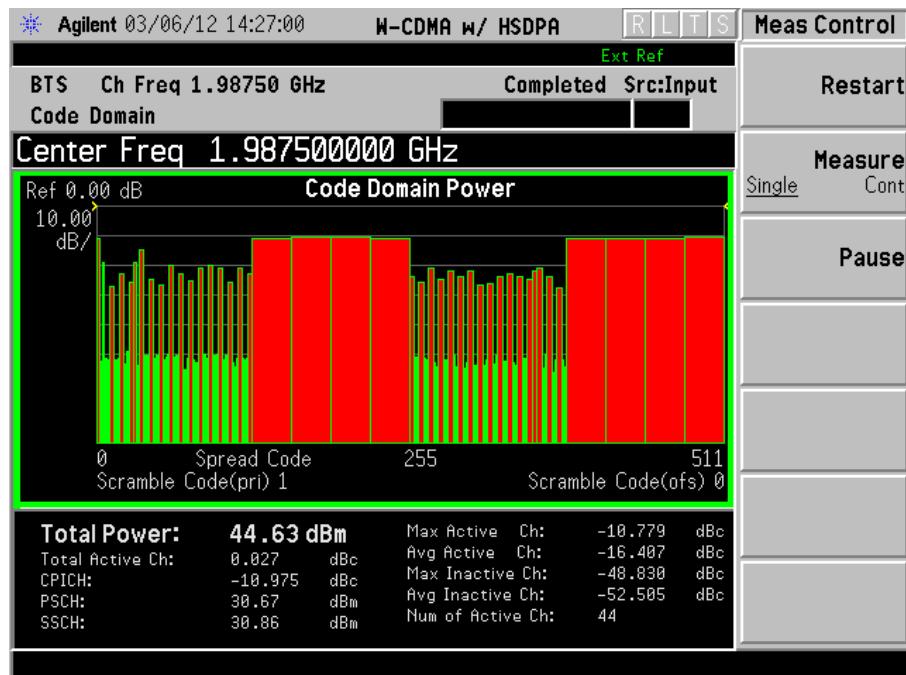
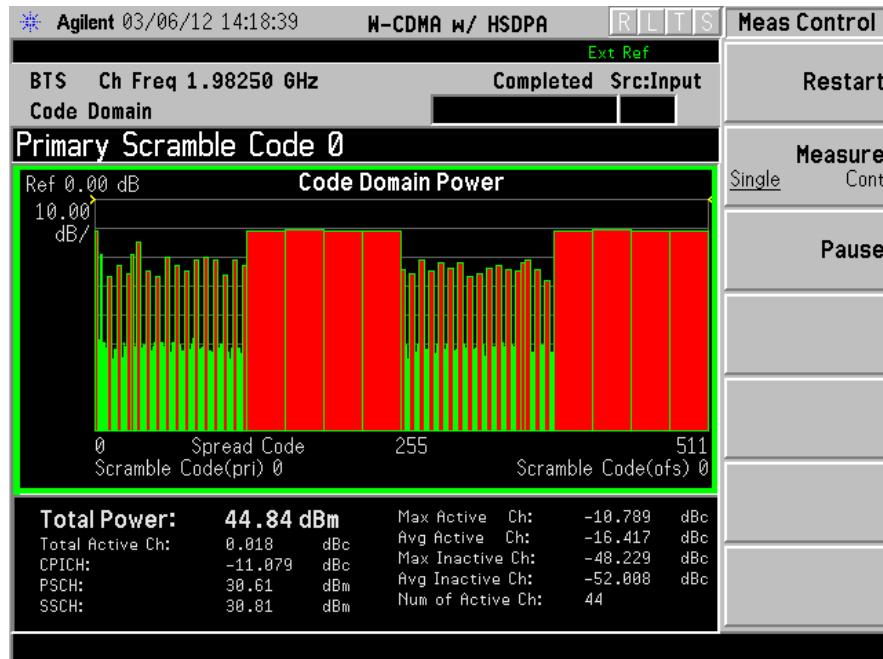
TM1-64 (QPSK) - Two Adjacent Carriers at 30W/C (44.8 dBm/C) - 1982.5 + 1987.5 MHz



5) Tx1 @ 30W/C: two adjacent carriers at TM5-44

Test Modulation: TM 5-44 with 44 active channels: 30 voice + 8 HSDPA (High Speed Downlink Packet Access) channels + 6 control (16QAM) - 30W/C with Total Composite Power 60W

TM5-44 (16QAM) - Two Adjacent Carriers at 30W/C (44.8 dBm/C) - 1982.5 + 1987.5 MHz



5) Tx1 @ 30W/C: two adjacent carriers at TM5-44

Test Modulation: TM 5-44 with 44 active channels: 30 voice + 8 HSDPA (High Speed Downlink Packet Access) channels + 6 control (16QAM) - 30W/C with Total Composite Power 60W

TM5-44 (16QAM) - Two Adjacent Carriers at 30W/C (44.8 dBm/C) - 1982.5 + 1987.5 MHz

FCC ID - AS5ONEBTS-27

Rec-S/A - E704/100121 09/14/2011

PM/Head - E949-02/01/2012 E950-12/19/2011

Env Conditions - 24C 10%RH 999BAR

Shielded Chamber - MH28-109

Project - 2011-0180

Alcatel-Lucent USA, Inc.

Global Product Compliance Laboratory

Occupied Bandwidth at Antenna Terminal

Offset

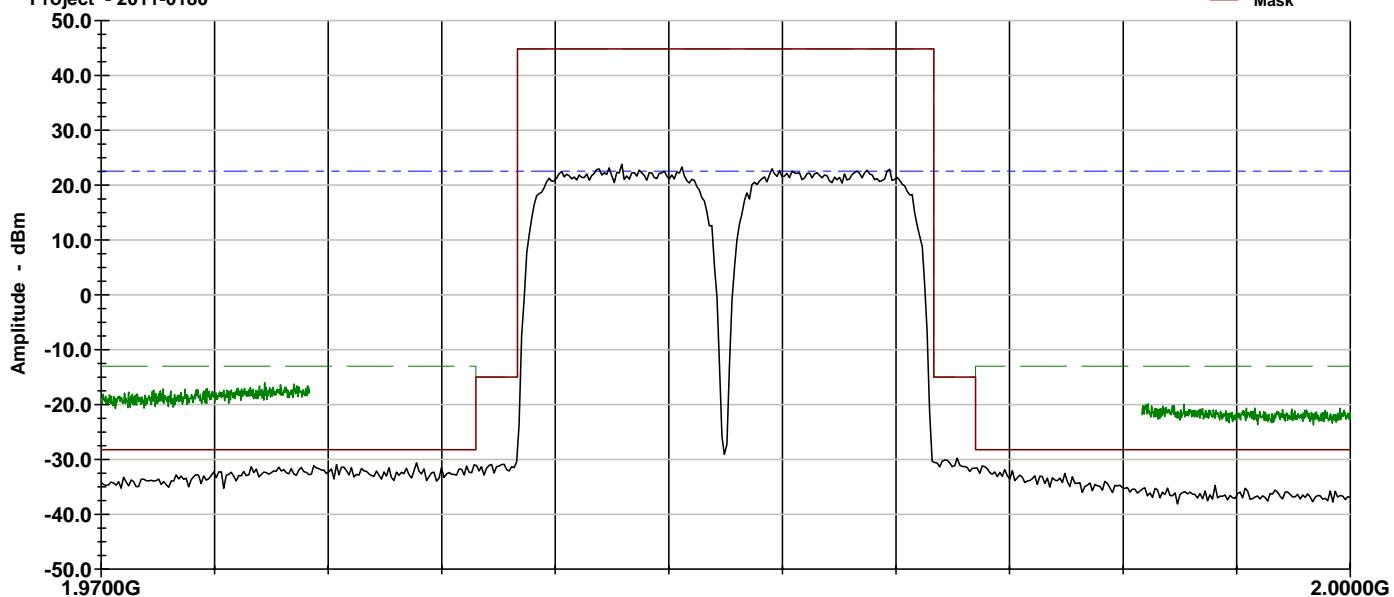
Mask-Part-24.238

OBW1MHzLoF

OBW1MHzHiF

OBW40F

Mask



Operator: FEC; Eng:MPF; RRH 2X 60-1900 1C-60W PRI03119

Frequency RRH2X60-1900; SN 11W366D70007 TX1

OBW-24_1900RRH_30W_C4C5_PRI03119_TM5-44.TIL

C4+C5; Ch 262+287; 1982.5+1987.5 MHz; 30W/C (44.8 dBm/C); TM5-44

-48V WCDMA; RBW 30kHz In & 1MHz Out of Band

03:39:04 PM, Tuesday, March 06, 2012

FCC ID: AS5ONEBTS-27

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.

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 22.917 (a) ... the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dBc. The power P is the average carrier power measured at the EAC (antenna) terminal in Watts. Setting the power level at EAC as shown below, produces the corresponding emission attenuation below the carrier in dBc, which all equate to -13 dBm.

- 1) 1C at $P = 60W$; Required Spurious Emission Attenuation = 60.78 dBc (-13.0 dBm)
- 2) 2C at $P = 30W/C$; Required Spurious Emission Attenuation = 57.77 dBc (-13.0 dBm)

Part 22.917 (b) specifies the required Resolution Bandwidth (RBW) to be 100 kHz 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. Hence, the measurement equipment must be adjusted and configured to provide an instrumentation noise floor that is at least 20 dB or more below the $43 + 10 \log (P)$ dBc limit. The pertinent test parameters are:

1. Frequency Spectrum:	10 MHz to 20 GHz
2. Resolution Bandwidth:	1MHz or greater (Part 24.238)
3. Emission Limitation:	$43 + 10 \log (P)$ dBc
4. Instrumentation Noise Floor:	at least 20 dB greater than " $43 + 10 \log (P)$ dBc"

Test Set-up and Configuration: Same as previously used for Part 2.1046 RF Power Measurement.

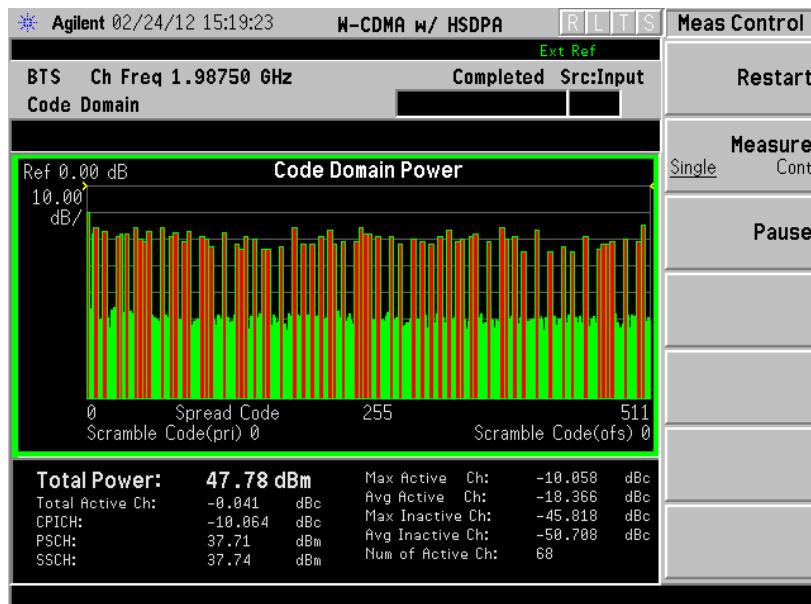
Method of Measurement:

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 this exhibit. The software package is: *TILE/IC* (*Total Integrated Laboratory Environment/Instrument Control System*); purchased and licensed from ETS-Lindgren. The TILE/IC software was able to sufficiently suppress the noise floor by measuring the spectrum in a sequential series of short segments using a peak detector, perform mathematical corrections to each segment, and then sequentially compile all the segments into a continuous graphical display. These measurements were performed in combination with an appropriate instrumentation low-pass filter and high-pass filter, installed at the input terminal of the spectrum analyzer.

Results: For each UMTS carrier, there were no reportable emissions. Data plots for each carrier, previously displayed under 2.1049, are attached to this exhibit.

Tx1 @ 60W single carrier at TM1-64

Test Modulation: TM1-64 with 68 active channels: 64 voice + 4 control (QPSK) - 60W
 Tx1 @ TM1-64 (QPSK) - Single Carrier at 60W (47.8 dBm) - 1987.5 MHz



FCC ID - AS5ONEBTS-27

Rec-S/A - E908/100100 02/16/2011

PM/Head - E958-02/17/2011 E959-02/10/2011

Env Conditions - 24C 10%RH 999BAR

Shielded Chamber - MH28-109

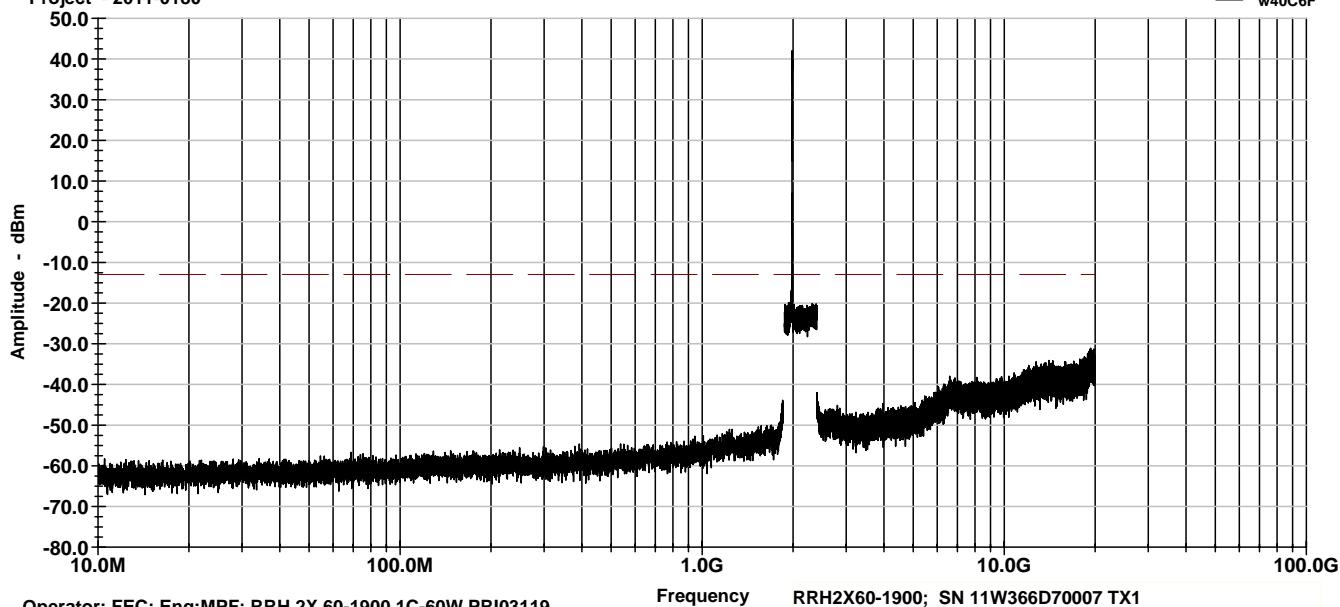
Project - 2011-0180

Alcatel-Lucent USA, Inc.

Global Product Compliance Laboratory

Conducted Emissions at Antenna Terminal

— FCClimit
 — w40C1F
 — w40C2F
 — w40C3F
 — w40C4F
 — w40C5F
 — w40C6F



Operator: FEC; Eng:MPF; RRH 2X 60-1900 1C-60W PRI03119

OBW-09_1900RRH_60W_C5_PRI03119_TM1-64.TIL

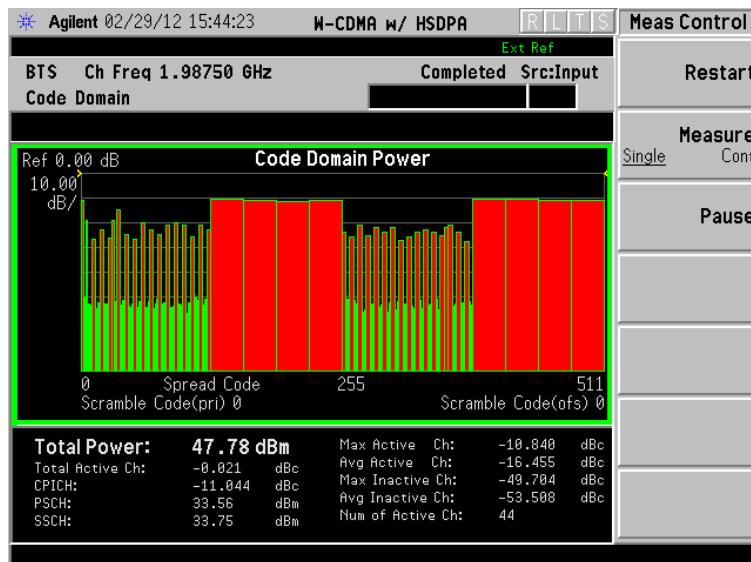
10:33:57 AM, Tuesday, February 28, 2012

FCC ID: AS5ONEBTS-27

2) Tx1 @ 60W single carrier at TM5-44

Test Modulation: TM 5-44 with 44 active channels: 30 voice + 8 HSDPA (High Speed Downlink Packet Access) channels + 6 control (16QAM).

Tx1 @ TM5-44 (16QAM) - Single Carrier at 60W (47.8 dBm) - 1987.5 MHz



FCC ID - AS5ONEBTS-27

Rec-S/A - E704/100121 09/14/2011

PM/Head - E949-02/01/2012 E950-12/19/2011

Env Conditions - 24C 12%RH 1010BAR

Shielded Chamber - MH28-109

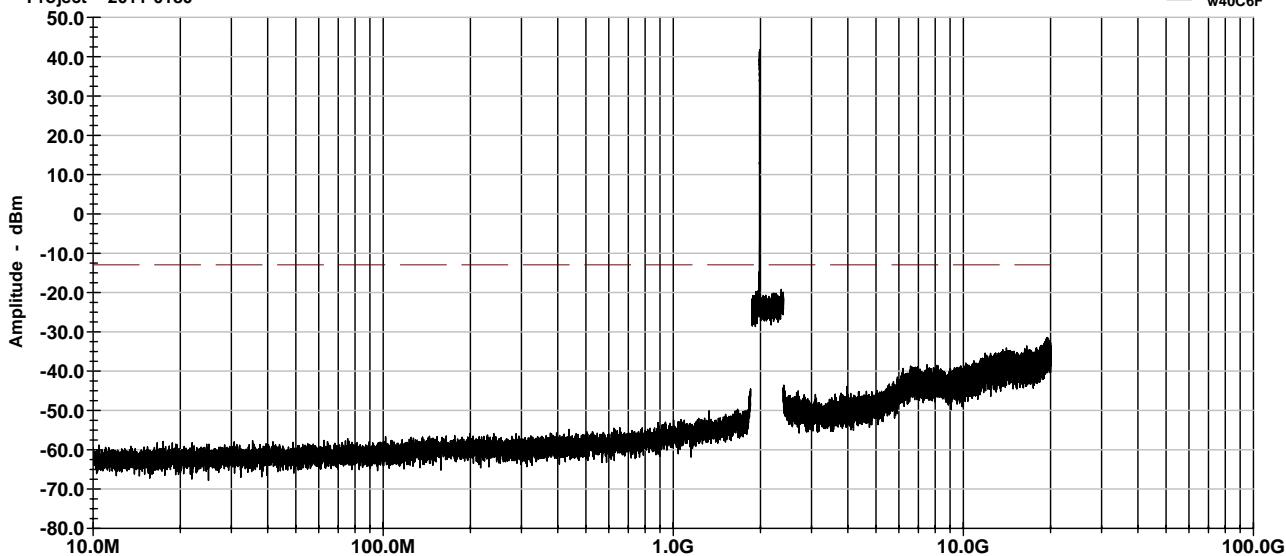
Project - 2011-0180

Alcatel-Lucent USA, Inc.

Global Product Compliance Laboratory

Conducted Emissions at Antenna Terminal

— FCCLimit
 — w40C1F
 — w40C2F
 — w40C3F
 — w40C4F
 — w40C5F
 — w40C6F



Operator: FEC; Eng:MPF; RRH 2X 60-1900 1C-60W PRI03119

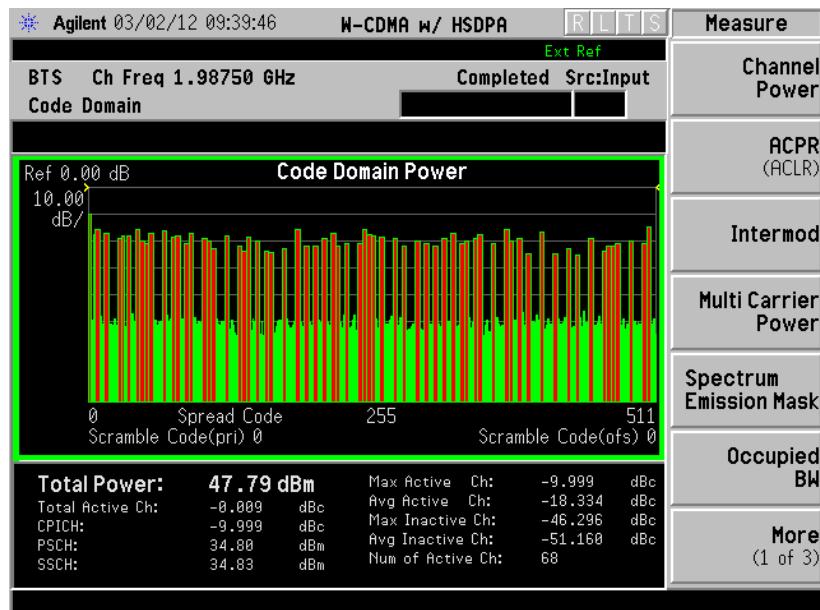
OBW-18_1900RRH_60W_C5_PRI03119_TM5-44.TIL

04:23:25 PM, Wednesday, February 29, 2012

FCC ID: AS5ONEBTS-27

3) Tx2 @ 60W single carrier at TM1-64

Test Modulation: TM1-64 with 68 active channels: 64 voice + 4 control (QPSK).
Tx2 @ TM1-64 (QPSK) - Single Carrier at 60W (47.8 dBm) -1987.5 MHz



FCC ID - AS5ONEBTS-27

Rec-S/A - E704/100121 09/14/2011

PM/Head - E949-02/01/2012 E950-12/19/2011

Env Conditions - 24C 21%RH 1007BAR

Shielded Chamber - MH28-109

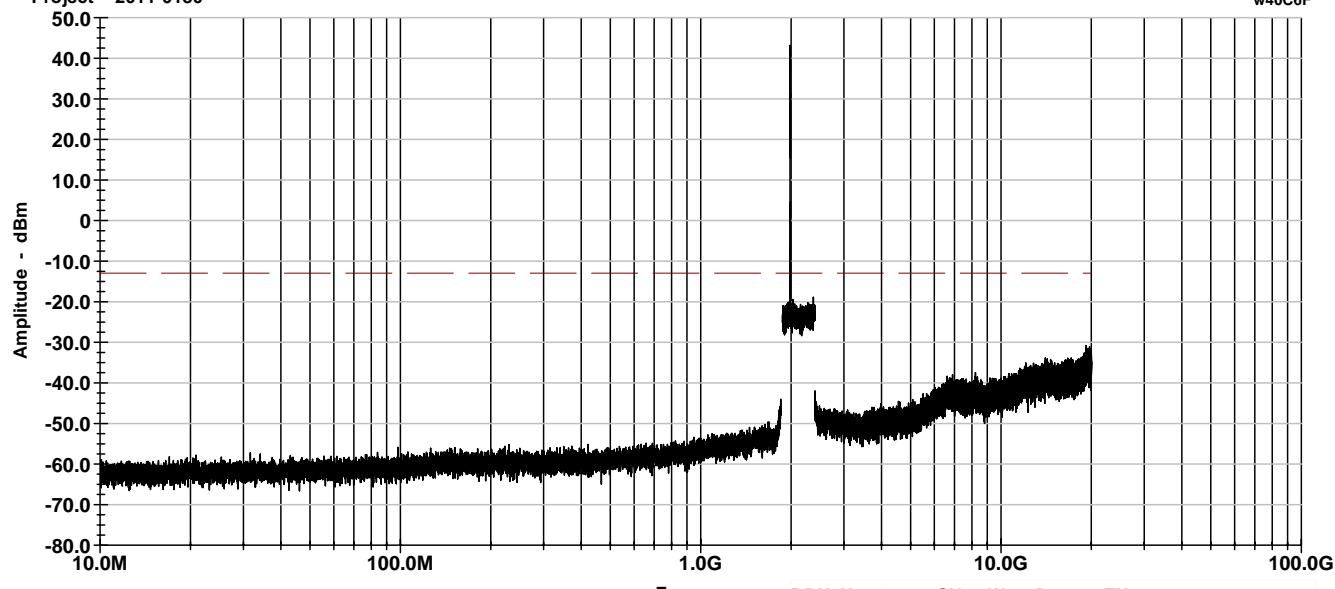
Project - 2011-0180

Alcatel-Lucent USA, Inc.

Global Product Compliance Laboratory

Conducted Emissions at Antenna Terminal

— FCCLimit
 — w40C1F
 — w40C2F
 — w40C3F
 — w40C4F
 — w40C5F
 — w40C6F



Operator: FEC; Eng:MPF; RRH 2X 60-1900 1C-60W PRI03119

Frequency RRH2X60-1900; SN 11W366D70007 TX2

OBW-33_1900RRH_60W_C5_PRI03119_TM1-64.TIL

C5; Ch 287; 1987.5 MHz; 60W (47.7 dBm); TM1-64

-48V WBCDMA; RBW 1 MHz

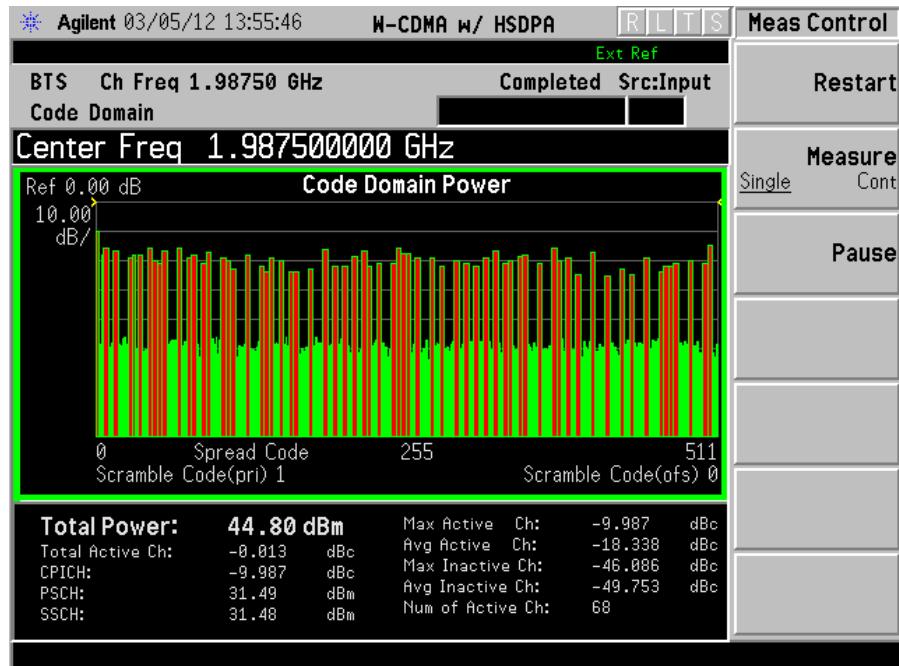
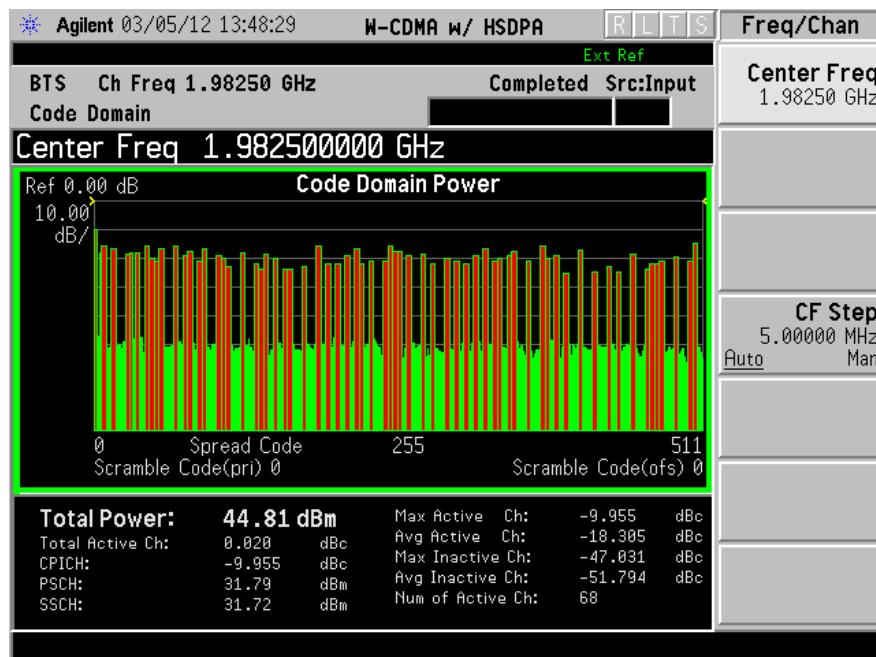
10:10:19 AM, Friday, March 02, 2012

FCC ID: AS5ONEBTS-27

4) Tx1 @ 30W/C: two adjacent carriers at TM1-64

Test Modulation: TM1-64 with 68 Active Channels: 64 voice + 4 control (QPSK) - 30W/C with Total Composite Power 60W

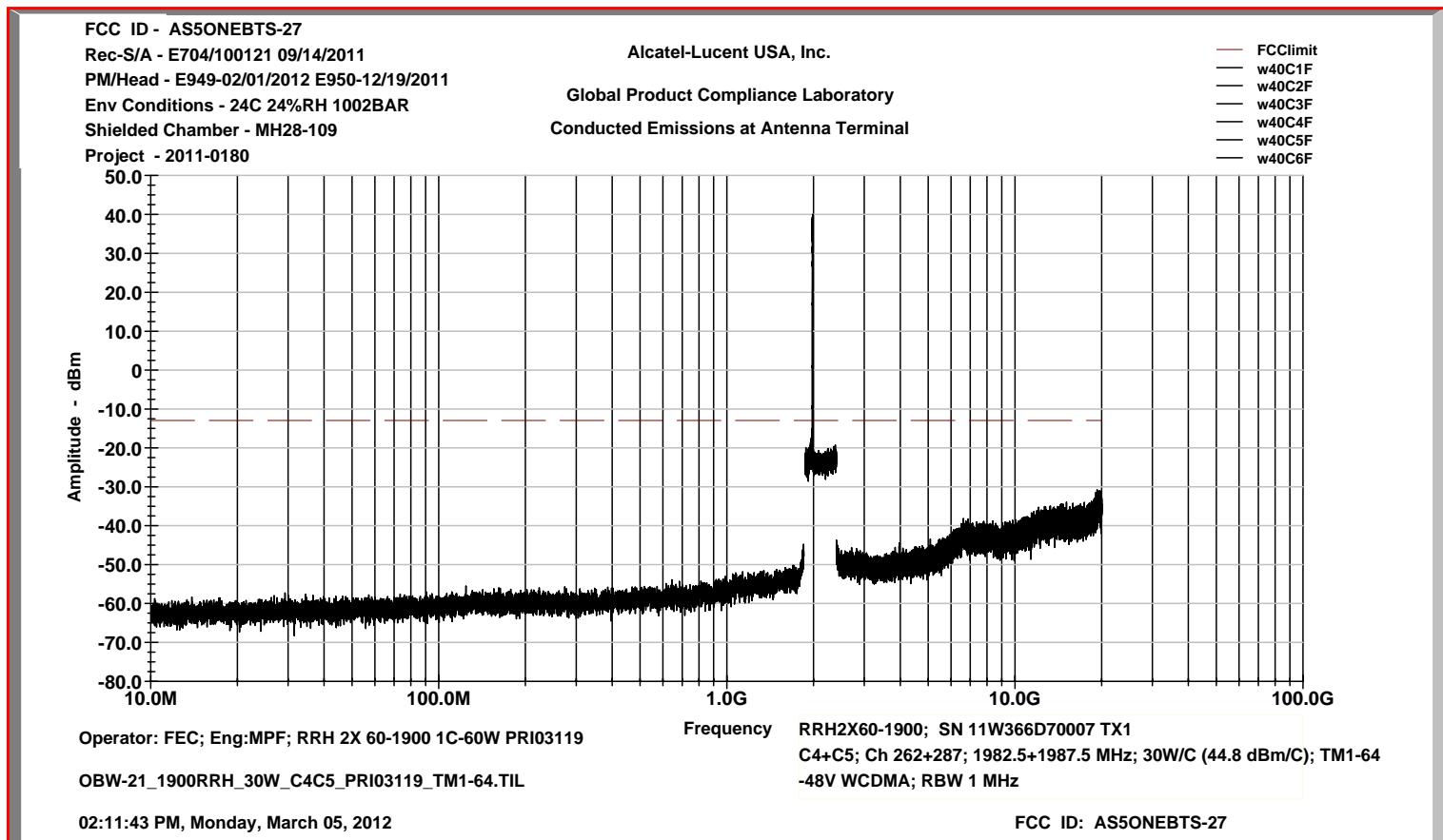
TM1-64 (QPSK) - Two Adjacent Carriers at 30W/C (44.8 dBm/C) - 1982.5 + 1987.5 MHz



4) Tx1 @ 30W/C: two adjacent carriers at TM1-64

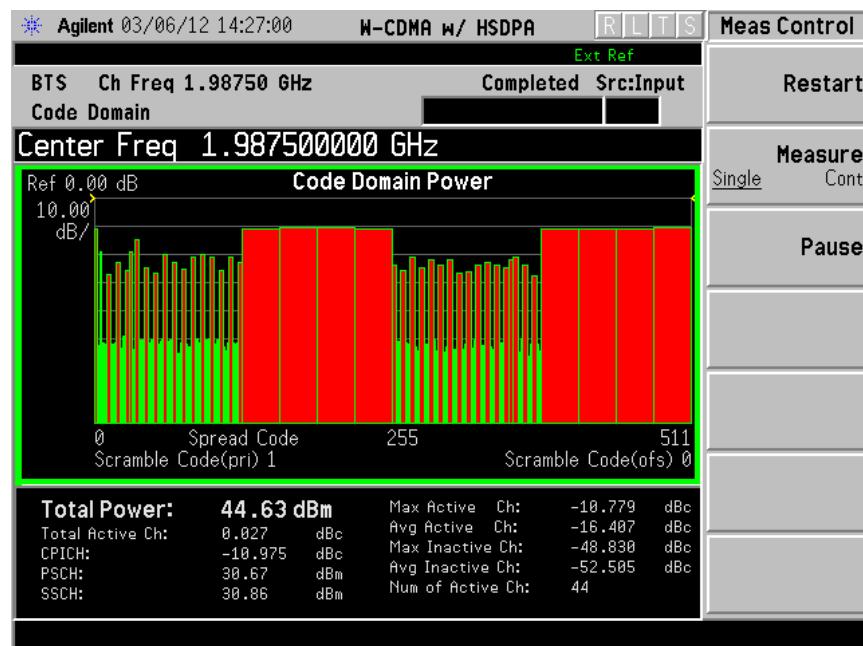
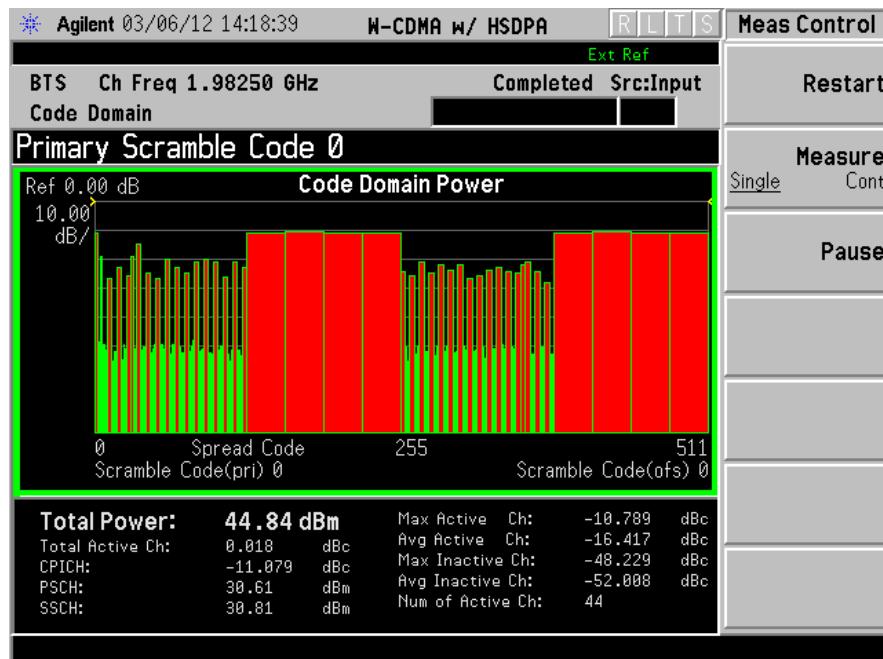
Test Modulation: TM1-64 with 68 Active Channels: 64 voice + 4 control (QPSK) - 30W/C with Total Composite Power 60W

TM1-64 (QPSK) - Two Adjacent Carriers at 30W/C (44.8 dBm/C) - 1982.5 + 1987.5 MHz



5) Tx1 @ 30W/C: two adjacent carriers at TM5-44

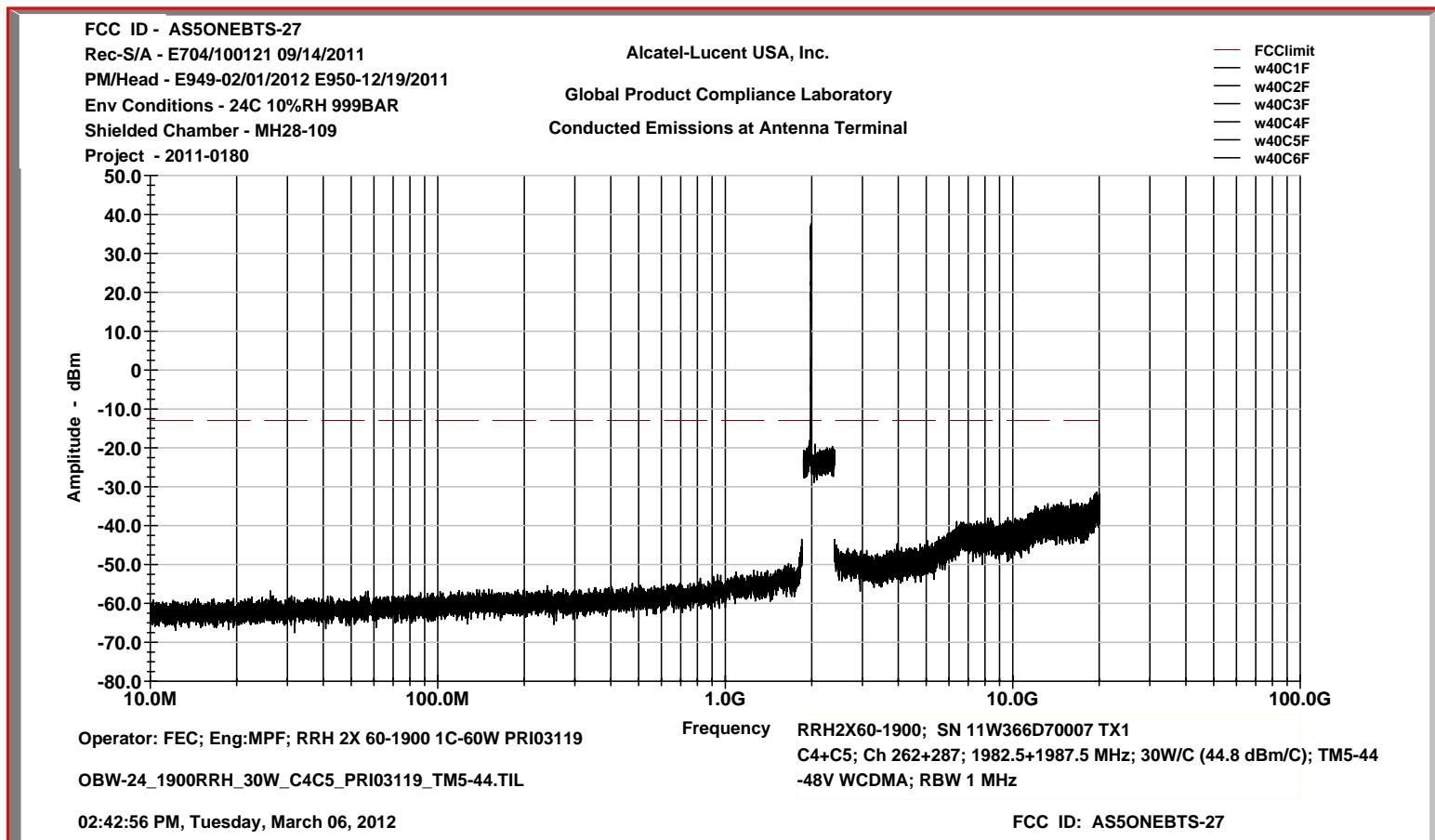
Test Modulation: TM 5-44 with 44 active channels: 30 voice + 8 HSDPA (High Speed Downlink Packet Access) channels + 6 control (16QAM) - 30W/C with Total Composite Power 60W
 TM5-44 (16QAM) - Two Adjacent Carriers at 30W/C (44.8 dBm/C) - 1982.5 + 1987.5 MHz



5) Tx1 @ 30W/C: two adjacent carriers at TM5-44

Test Modulation: TM 5-44 with 44 active channels: 30 voice + 8 HSDPA (High Speed Downlink Packet Access) channels + 6 control (16QAM) - 30W/C with Total Composite Power 60W

TM5-44 (16QAM) - Two Adjacent Carriers at 30W/C (44.8 dBm/C) - 1982.5 + 1987.5 MHz



PART 2.1053 MEASUREMENTS REQUIRED: FIELD STRENGTH OF SPURIOUS RADIATION

This test was performed with a single 60W carrier at each DL Tx terminal:

$$\begin{aligned} \text{Tx1} &= 1952.5 \text{ MHz at 60W} \\ \text{Tx2} &= 1967.5 \text{ MHz at 60W} \end{aligned}$$

Single test modulation was sufficient: ETSI TM1-64. As required, the frequency range investigated was from 30 MHz to 20 GHz (10th harmonic of the carrier).

The equipment under test (EUT) was setup and the measurements performed following **ANSI/TIA-603-C-2004 Land Mobile FM or PM Communications Equipment Measurement and Performance Standards**. The EUT was installed and operated as in the normal mode of operation with external alarm cables connected. Field strength measurements of radiated spurious emissions were evaluated in a semi-anechoic chamber (FCC Site RN 439234), using an EUT-to-Antenna separation of 3-meters. Test software was Vasona by EMiSoft.

The spectrum from 10 MHz to the tenth harmonic of the carrier 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 2.1057 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:

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

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

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

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

Where: E = Field Intensity in Volts/ meter
P = Transmitted Power in watts = 60W

R = Distance in meters = 3 m

Results:

Over the out-of-band spectrum investigated from 30 MHz to the tenth harmonic of the carrier (20 GHz), the power levels of all emissions observed were >> 20 dB below the 82.23 dB μ V/meter limit. Therefore, there were no reportable radiated spurious emissions.

PART 2.1055 MEASUREMENTS REQUIRED: FREQUENCY STABILITY

The frequency stability was measured at the Equipment Antenna Terminal (EAC) of the RF Remote Radio Head (RRH) for a single carrier set to 1960.0 MHz, which corresponds to mid PCS frequency band. The procedure required by the FCC is specified in CFR 47, Part 2, Subpart J – Equipment Authorization Procedures, Section 2.1055 – Measurements Required: Frequency Stability, Effective: October 01, 2011. The requirements for base station/land station equipment, are summarized as:

Section 2.1055(a)(1): The frequency stability shall be measured with variation of ambient temperature from -30°C to $+50^{\circ}\text{C}$

Section 2.1055(b): Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10°C through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

Section 2.1055(d)(1): The frequency stability shall be measured with variation of primary supply voltage from 85% to 115% of the nominal value.

Frequency Stability Limitation:

The frequency stability is the measurement of the carrier center frequency deviation from its assigned value as a function of (1) temperature variation from -30°C to $+50^{\circ}\text{C}$, in $+10^{\circ}\text{C}$ increments, and (2) variation of supply voltage, at the equipment frame power input terminals, from 85% to 115% of the nominal value. This is a lengthy procedure and is performed one time with a single UMTS 1900 carrier set to 1960.0 MHz. The required tolerance limit for UMTS 1900 base station/land station equipment is specified in ETSI TS 25.141 as ± 0.05 ppm.

Results:

The -48V WCDMA **RRH2X60-1900** Twin Remote Radio Head product, subject of this application for certification under FCC ID: AS5ONEBTS-27, demonstrated full compliance with the requirements of FCC Rule Part 2.1055. The frequency stability for all measurements were well within the required ± 0.05 ppm. The measurement results are summarized below.

TRANSMIT FREQUENCY ERROR

Spec: $F_{tx} \pm 50\text{ppb} = 1960.0\text{MHz} \pm 98.0\text{Hz}$

Test frequency: 1960.0MHz (Middle channel);

Test Modulation: TM4 with a single active channel

P_out max: 60W (47.8dBm)

Stabilized temperature (°C)	TX 1					
	Supply voltage: @85% of nominal (-48V-15%=-40.8V)		Supply voltage: @100% of nominal (i.e. -48.0V)		Supply voltage: @115% of nominal (-48V+15%=-55.2V)	
Indoor RRH	Measured Tx Freq Error (Hz)	Deviation [Note 2] (ppb)	Measured Tx Freq Error (Hz)	Deviation [Note 2] (ppb)	Measured Tx Freq Error (Hz)	Deviation [Note 2] (ppb)
-30 C	17.34	8.85	17.84	9.10	17.12	8.73
-20 C	15.90	8.11	16.15	8.24	15.83	8.08
-10 C	20.46	10.44	19.67	10.04	18.89	9.64
0 C	16.89	8.62	16.46	8.40	16.25	8.29
+10 C	16.78	8.56	17.16	8.76	16.87	8.61
+20 C	17.38	8.87	16.92	8.63	17.45	8.90
+30 C	19.49	9.94	18.85	9.62	19.62	10.01
+40 C	18.25	9.31	18.76	9.57	17.48	8.92
+50 C	18.22	9.30	17.92	9.14	18.65	9.52

Stabilized temperature (°C)	TX 2					
	Supply voltage: @85% of nominal (-48V-15%=-40.8V)		Supply voltage: @100% of nominal (i.e. -48.0V)		Supply voltage: @115% of nominal (-48V+15%=-55.2V)	
Indoor RRH	Measured Tx Freq Error (Hz)	Deviation [Note 2] (ppb)	Measured Tx Freq Error (Hz)	Deviation [Note 2] (ppb)	Measured Tx Freq Error (Hz)	Deviation [Note 2] (ppb)
-30 C	18.66	9.52	17.86	9.11	18.12	9.24
-20 C	18.33	9.35	18.65	9.52	17.91	9.14
-10 C	18.10	9.23	17.96	9.16	17.45	8.90
0 C	19.00	9.69	18.62	9.50	18.16	9.27
+10 C	15.70	8.01	19.25	9.82	15.68	8.00
+20 C	16.54	8.44	16.36	8.35	17.45	8.90
+30 C	16.43	8.38	15.96	8.14	16.84	8.59
+40 C	16.68	8.51	16.58	8.46	16.46	8.40
+50 C	19.83	10.12	18.34	9.36	18.96	9.67

FCC 47 CFR 2.1055 Frequency Error Measurement: results of Transmit Frequency Error for RH1900

Note 2. Calculation of deviation in ppm: Deviation = 50 x (measured freq error in Hz) / 98.0;

e.g. Deviation = 50 x 7.77 / 98.0 = 3.96ppb.



Test Report Prepared By: _____

Michael P. Farina
GPCL FCC Compliance Engineer

March 27, 2012

Date