

**EXHIBIT 11****TEST REPORT**

This test report presents the measurement data required by the Commission for certifying the Class II Permissive Change of the Alcatel-Lucent 1900 RRH 2x60 Distributed Base Station, subject of this application, for LTE application and operation in the domestic PCS A, B, C, D, E and F bands (1930-1990MHz), E-UTRAN Band II, under AS5ONEBTS-27.

As stated before, the distributed wireless RRH base station system is comprised of two separate modules 1) the BBU and 2) the RRH. These two modules are interconnected by CPRI through optic fiber or metallic coax cables. All RF functionality is contained in the RRH, including transceiver, power amplifier and transmitting and receiving filters. The BBU provides the digital I and Q baseband signals, plus the timing reference signal to the RRH. The BBU and RRH units can be co-located or remotely located.

The 1900 LTE RRH 2x60W has two antenna ports and supports transmit diversity and/or 2x2 MIMO operation. The 1900 LTE RRH 2x60W can provide up to 60 Watts (47.8dBm) per LTE carrier (5MHz or 10MHz bandwidth carriers), 60 Watts (47.8dBm) per port and 120 Watts (50.8dBm) per RRH at the base station transmitting antenna terminals. The 1900 LTE RRH 2x60W is powered by -48VDC and available in indoor and outdoor versions.

As stated before, the hardware of the 1900 LTE RRH is identical to that of the 1900 UMTS RRH. In 1900 LTE RRH, there are no modifications in the transmitting and receiving frequency ranges, the basic carrier frequency determining circuitry, the basic modulation circuit, the network interface circuitry and the major RF components (transmitter and power amplifier) which were certified under AS5ONEBTS-27 for the 1900 UMTS RRH. Therefore, only the characteristics impacted by LTE technology were evaluated.

All testing results submitted in this report were performed on the -48VDC 1900 2x60W LTE RRH during the period of November 30~ December 7, 2012. The above 1900 2x60W LTE RRH passed FCC Part 15 Class A radiated emissions requirements.

The measurement results have demonstrated that Alcatel-Lucent 1900 2x60W LTE RRH is in full compliance with the Rules of the Commission.

**SUBEXHIBIT 11.1****Section 2.1033 (c)(14) REQUIRED MEASUREMENT DATA**

The required measurement data is presented in the following exhibits as follows:

SUBEXHIBIT 11.2	Section 2.1046	Measurements Required: RF Power Output
SUBEXHIBIT 11.3	Section 2.1047	Modulation Characteristics
SUBEXHIBIT 11.4	Section 2.1049, 24.238	Measurements Required: Occupied Bandwidth and Out-of-Band Emissions
SUBEXHIBIT 11.5	Sections 2.1051, 24.238	Measurements Required: Spurious Emissions at Antenna Terminals
SUBEXHIBIT 11.6	Sections 2.1053, 24.238	Measurements Required: Field Strength of Spurious Radiation
SUBEXHIBIT 11.8	Section 2.947	List of Test Equipment Used

**SUBEXHIBIT 11.2****Section 2.1046 MEASUREMENT REQUIRED: RF POWER OUTPUT**

This test is a measurement of the total RF power level transmitted at the antenna-transmitting terminal (J4), as shown in the accompanying test set-up diagram. The radio was tuned to a channel which is transmitting in the 1930-1990 MHz frequency band. The power level of the base station was calibrated to allow the base station to operate at the manufacturer's maximum rated mean power level, i.e., +47.8dBm (60W) per carrier for LTE and +47.8 dBm (60W) per port at the antenna-transmitting terminal.

For LTE, the RF power output with QPSK, 16QAM and 64QAM modulation were measured respectively.

Power measurements were made with a Power Meter in the average mode. The test set-up for conducting the RF power output measurement is shown in the following figure. Before the testing was started, the Base Station was given a sufficient "warm-up" period as required.

The maximum rated mean power at the antenna transmitting terminal was measured for a single carrier (both 5MHz and 10MHz bandwidth) with LTE technology across the PCS band 1930-1990MHz. The RF power output measured for each configuration was shown as "Ref Lvl" in the plots provided in SubExhibit 11.4.

For 5MHz bandwidth carrier, two carriers which correspond to the lowest and highest carriers in each A, B and C bands and one carrier in each D, E and F bands were measured with QPSK, 16QAM and 64QAM modulations, respectively.

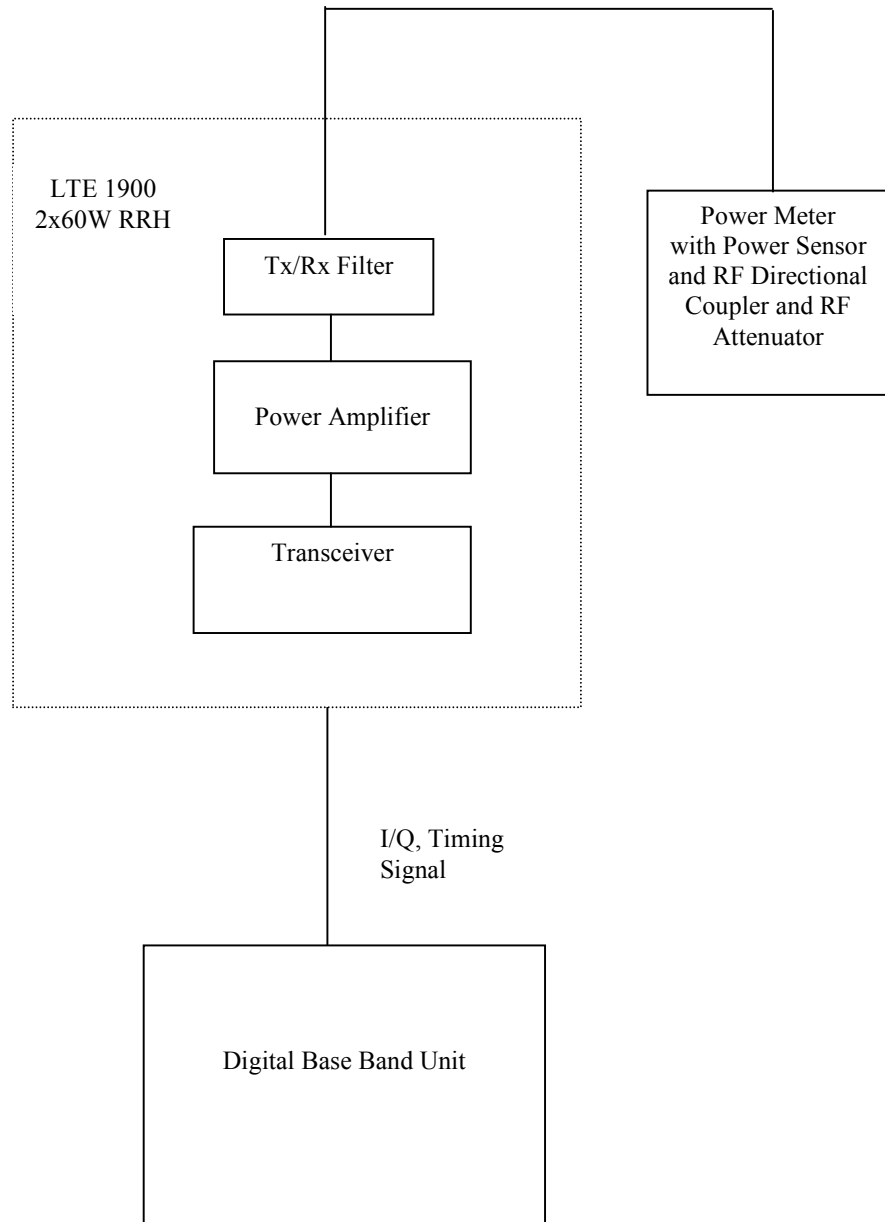
For 10MHz bandwidth carrier, two carriers which are near the low band edge and the high band edge in each A, B and C bands were measured with QPSK, 16QAM and 64QAM modulations, respectively.

The Peak-to-Average Power Ratio (PAPR) has also been evaluated as well per KDB 971168 for both 5MHz bandwidth carrier and 10MHz bandwidth carrier with QPSK, 16QAM and 64QAM modulations, respectively. The PAPR values of all carriers measured are below 13dB.

**Results:**

The maximum rated mean RF power outputs of the Alcatel-Lucent LTE 2x60W 1900 RRH at its antenna transmitting terminals across the PCS frequency band 1930 – 1990 MHz measured are 60W (+47.8 dBm) per carrier and 60W (+47.8 dBm) per port, within  $\pm 1$ dB derivation, and are in full compliance with the Rules of the Commission.

**FIGURE 11.2.1 TEST SET-UP FOR MEASUREMENT OF  
RADIO FREQUENCY POWER OUTPUT**



**SUBEXHIBIT 11.3****Section 2.1047 MEASUREMENT REQUIRED: MODULATION CHARACTERISTICS**

The 1900 2x60W LTE RRH supports LTE technology. The LTE utilizes Orthogonal Frequency Division Multiplex (OFDM) modulation technique, where the data is distributed over a large number of closely spaced orthogonal subcarriers. The subcarriers are modulated with conventional modulation scheme, such as QPSK, 16QAM and 64QAM.

In LTE, the modulation characteristics for QPSK, 16QAM and 64QAM modulations are measured.

The measurement was performed for QPSK, 16QAM and 64QAM, respectively, where the carrier power level was adjusted to the rated maximum mean power +47.8dBm (60W) at the output terminal,

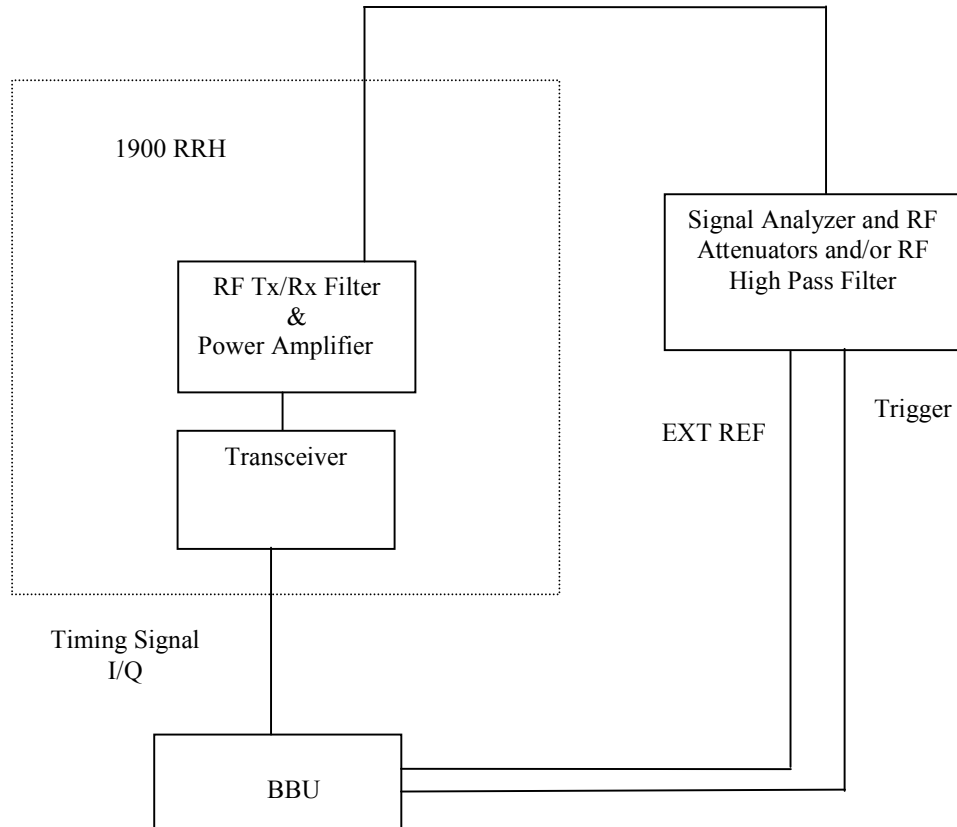
The measurements were performed at the antenna transmitting terminal of the base station system with an Agilent N9020A MXA Signal Analyzer which was calibrated in accordance with ISO 9001 process.

The test set-up diagram is given in the Figure 11.3.1, where the Agilent N9020A MXA used the external signals from the base station as its trigger source and time reference.

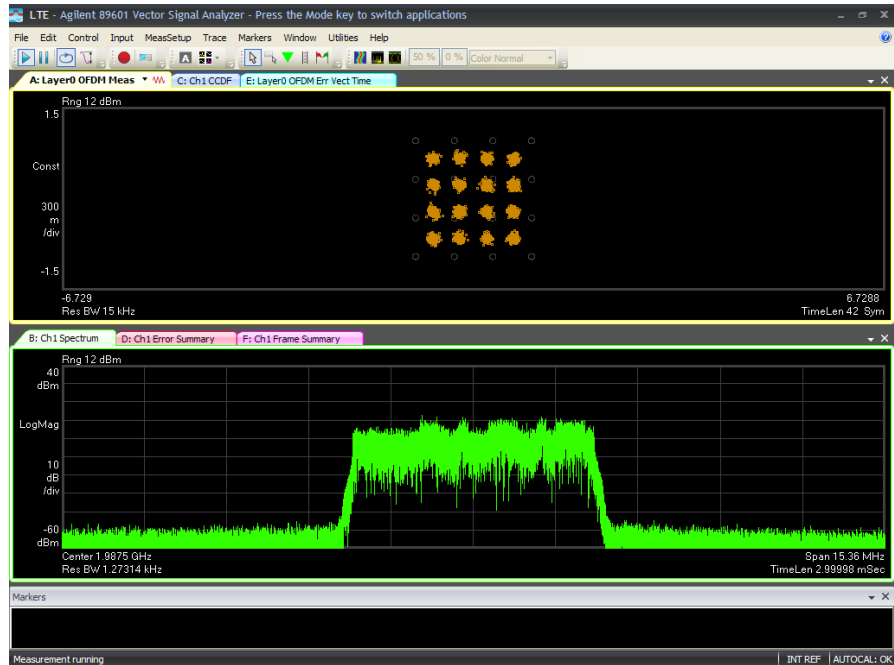
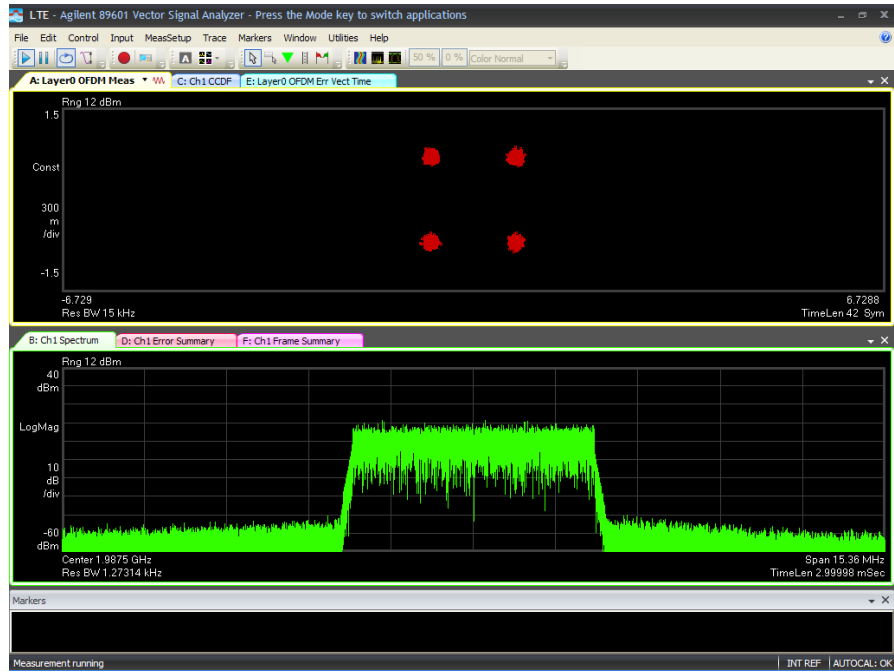
**Results:**

Figure 11.3.2 shows three representative screen plots of the modulation measurement at 1987.5MHz C band for a 5MHz LTE carrier, in QPSK, 16QAM and 64QAM modulations, respectively. Figure 11.3.3 shows three representative screen plots of the modulation measurement at 1985MHz C band for a 10MHz LTE carrier, in QPSK, 16QAM and 64QAM modulations, respectively. They are in compliance with the Rules of the Commission for measurement requirement for modulation characteristics of the LTE 1900 2x60W RRH.

**FIGURE 11.3.1 TEST SET-UP FOR MEASUREMENT OF MODULATION ACCURACY, OCCUPIED BANDWIDTH AND OUT-OF-BAND EMISSIONS**



**FIGURE 11.3.2 SCREEN PLOTS OF MODULATION MEASUREMENT AT 1987.50 MHZ, C BAND, 5MHZ LTE WITH QPSK, 16QAM AND 64QAM MODULATIONS**



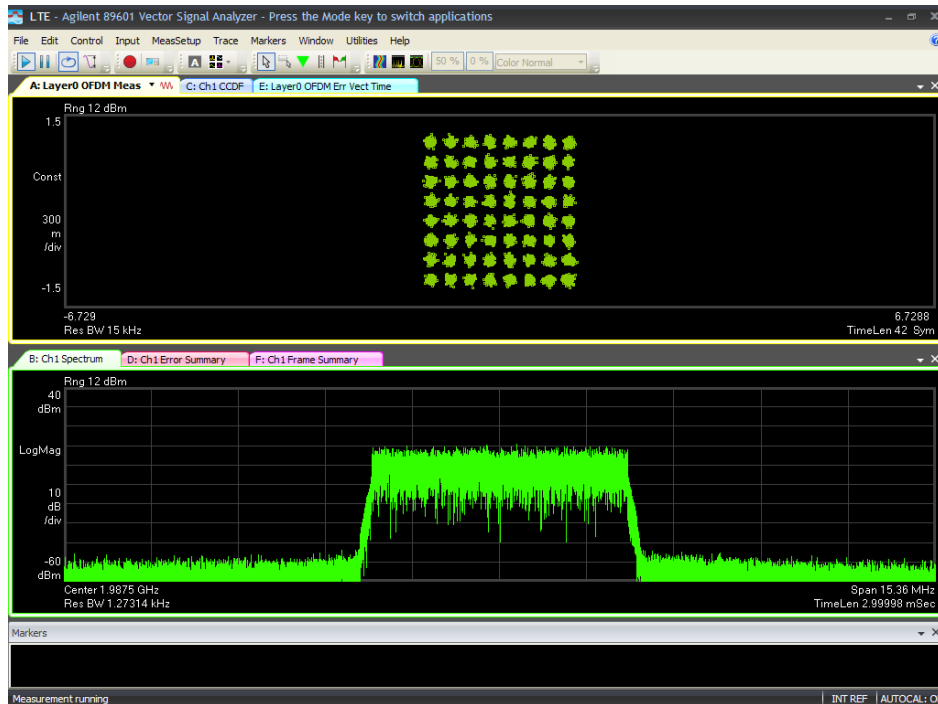
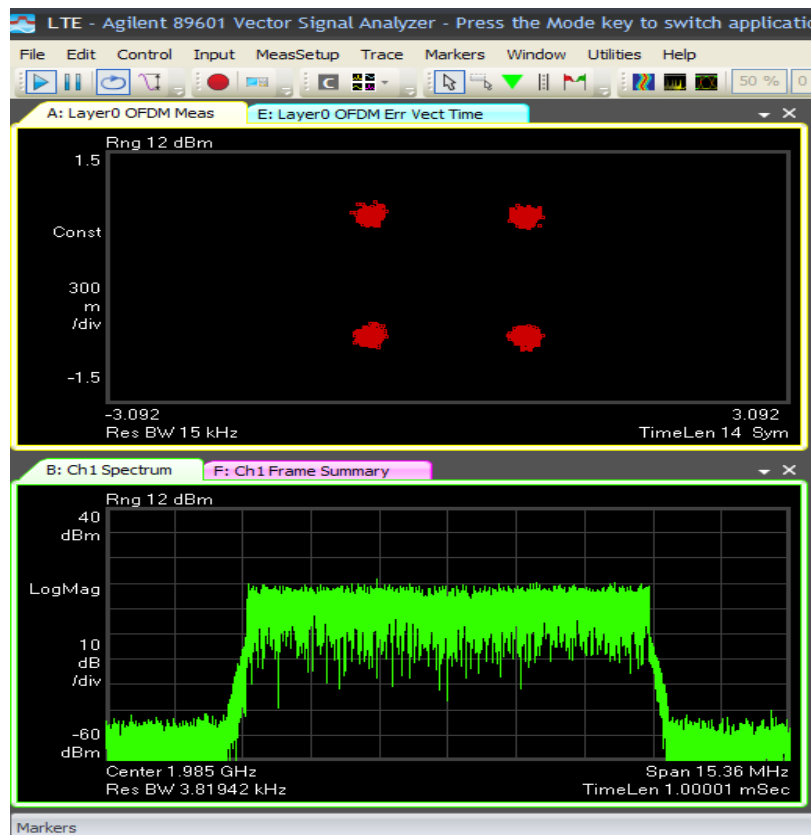
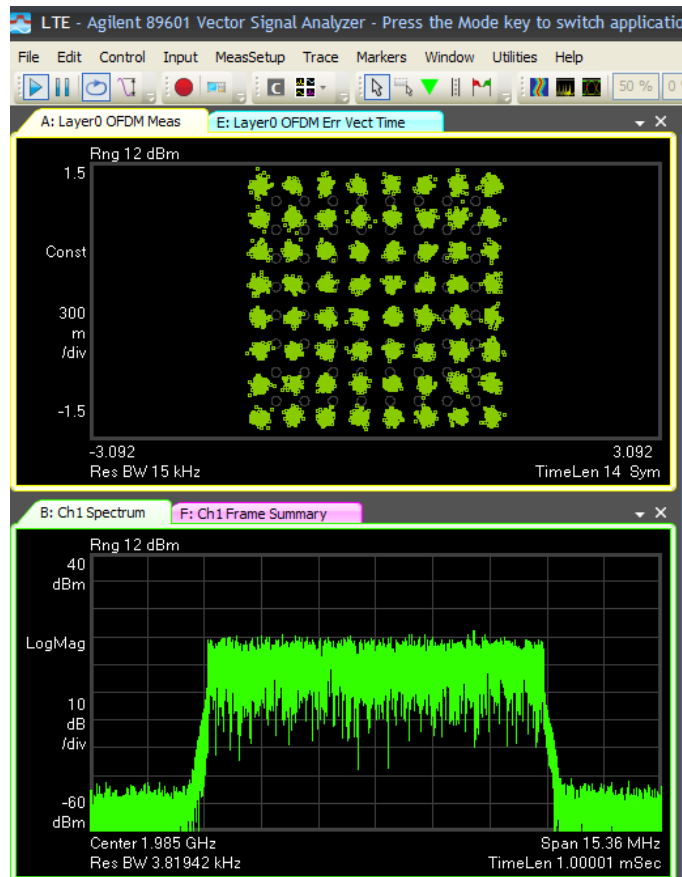
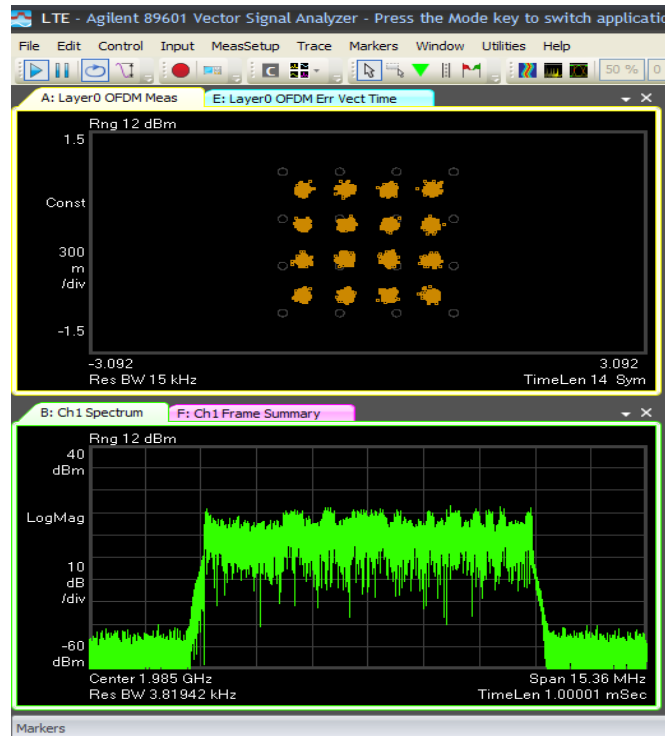


FIGURE 11.3.3 SCREEN PLOTS OF MODULATION MEASUREMENT AT 1985 MHz, C BAND, 10MHZ LTE WITH QPSK, 16QAM AND 64QAM MODULATIONS







## SUBEXHIBIT 11.4

**Section 2.1049 MEASUREMENT REQUIRED: OCCUPIED BANDWIDTH AND OUT-OF-BAND EMISSIONS**

The 1900 LTE 2x60W RRH transmits in the domestic 1900 Band (Tx: 1930-1990 MHz and Rx: 1850-1910 MHz) with LTE and 2x60W.

The two 60MHz bandwidth PCS spectrum is divided into 6 blocks (A, B, C, D, E and F) as shown in the following table.

**Table 11.4.1 PCS Bands**

PCS Blocks	Tx Frequency (MHz)	Rx Frequency (MHz)	Bandwidth (MHz)
A	1930 - 1945	1850 - 1865	15
B	1950 - 1965	1870 - 1885	15
C	1975 - 1990	1895 - 1910	15
D	1945 - 1950	1865 - 1870	5
E	1965 - 1970	1885 - 1890	5
F	1970 - 1975	1890 - 1895	5

The 1900 LTE RRH 2x60W Distributed Base station system supports one-carrier and multiple-carrier configurations per transmitting path with LTE technology. However, the current software release supports one 5MHz or one 10MHz LTE single carrier per transmitting path only.

The occupied bandwidth and out-of-band emissions measurements were made at the antenna transmitting terminal (J4) for one 5 MHz LTE carrier on the two channels which correspond to the lowest and highest available LTE channels in each of the PCS A, B and C frequency bands with QPSK, 16QAM and 64QAM modulations, respectively. At each of the carrier frequencies, the carrier power level at the antenna terminal was adjusted to the maximum rated mean power +47.8 dBm (60W).

The minimum emission requirements and the setting of measurement equipment for the occupied bandwidth measurement of a 1900 carrier were specified in FCC Part 24.238. The FCC's requirements are tabulated in the following table, where MIMO requirement/margin is not included.

**Table 11.4.2 FCC Part 24.238 Transmitter Unwanted Emission Limits**

Frequency	Required Minimum Attenuation below the Mean Carrier Power $P$	Minimum Resolution Bandwidth of Spectrum Analyzer
1MHz Bands Immediately Outside the Transmitting Frequency Band	$(43 + P \text{ dBW}) \text{ dBc}$	50kHz for 5MHz carrier and 100kHz for 10MHz carrier
Outside the above Frequency Range	$(43 + P \text{ dBW}) \text{ dBc}$	1 MHz

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

The measurements were performed with a Rohde & Schwarz EMI Receiver, which was calibrated in accordance with ISO 9001 process. The test set-up diagram is same as the one shown in the Figure 11.3.1.

For the 99% occupied bandwidth measurement, the spectrum analyzer was set with a 200 kHz resolution bandwidth and 20 MHz span.

For the out-of-band emissions measurement, the spectrum analyzer was set with a 40MHz span. The emissions outside the above span were evaluated in Measurement Required: Out-of-block Spurious Conducted Emissions.

For a 5MHz LTE carrier measurement, the spectrum analyzer was set with a 50 kHz resolution bandwidth as shown in the plot of the occupied bandwidth measurement attached in the following pages. The top of the spectrum analyzer display reticule, i.e., Ref Lvl, was set to the maximum mean output power of the LTE carrier if measured with a resolution bandwidth greater than the carrier bandwidth 5 MHz. Thus the maximum mean output power of the LTE carrier, measured with a 50 kHz resolution bandwidth, aligns with the top of the spectrum analyzer display reticule (Ref Lvl) minus 20dB for a 5MHz carrier. The 20 dB offset for a 5MHz LTE carrier was due to the fact that  $10 \log (50\text{kHz}/5\text{MHz}) = -20 \text{ dB}$ .

For a 10MHz LTE carrier measurement, the spectrum analyzer was set with a 100 kHz resolution bandwidth as shown in the plots of the occupied bandwidth measurement attached in the following pages. The top of the spectrum analyzer display reticule, i.e., Ref Lvl, was set to the maximum mean output power of the LTE carrier if measured with a resolution bandwidth greater than the carrier bandwidth 10 MHz. Thus the maximum mean output power of the LTE carrier, measured with a 100 kHz resolution bandwidth, aligns with the top of the spectrum analyzer display reticule (Ref Lvl) minus 20dB for a 10MHz carrier. The 20 dB offset for a 10MHz LTE carrier was due to the fact that  $10 \log (100\text{kHz}/10\text{MHz}) = -20 \text{ dB}$ .

Two 99% Occupied Bandwidth plots were submitted which have the largest bandwidth among all the modulations QPSK, 16QAM and 64 QAM evaluated for a 5MHz LTE carrier and a 10MHz LTE carrier, respectively.

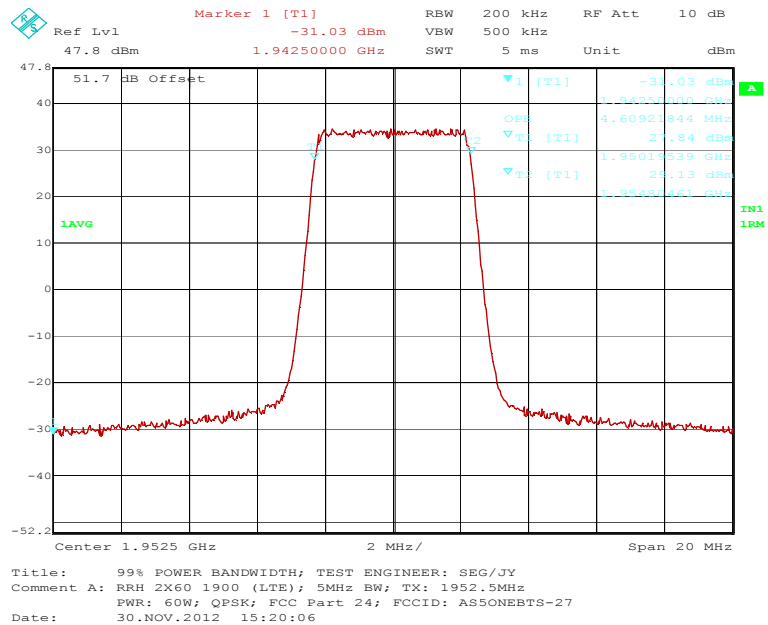
One emission plot is submitted for each 5MHz carrier and 10MHz carrier, respectively, which has the least margin among all PCS channels evaluated with QPSK, 16QAM or 64QAM modulations. The limits specified in FCC Part 24.238 are displayed in the plots.

### **Results:**

From the occupied bandwidth and out-of-band plots attached in the following, it can be seen that all the waveforms are under the required FCC emission mask with more than 3dB margin. The measurement results demonstrate the full compliance with the Rules of the Commission at the lowest, middle and highest channels of PCS band.

FIGURE 11.4.1 99% OCCUPIED BANDWIDTH PLOTS

(a) 5MHZ LTE CHANNEL 1952.50 MHz B BAND WITH QPSK MODULATION  
— 4.61MHZ



(b) 10MHZ LTE CHANNEL 1955 MHz B BAND WITH 16QAM MODULATION — 8.98MHZ

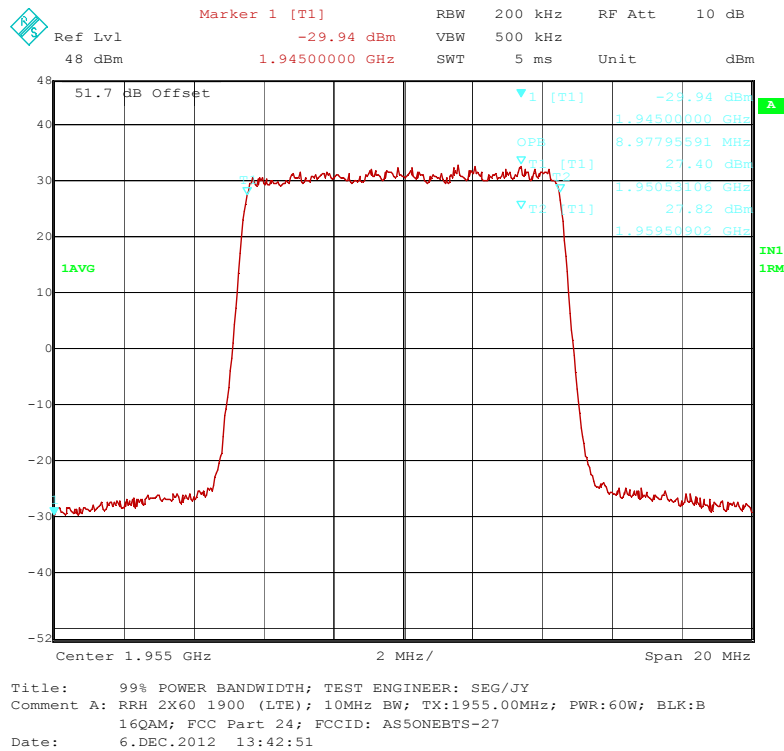
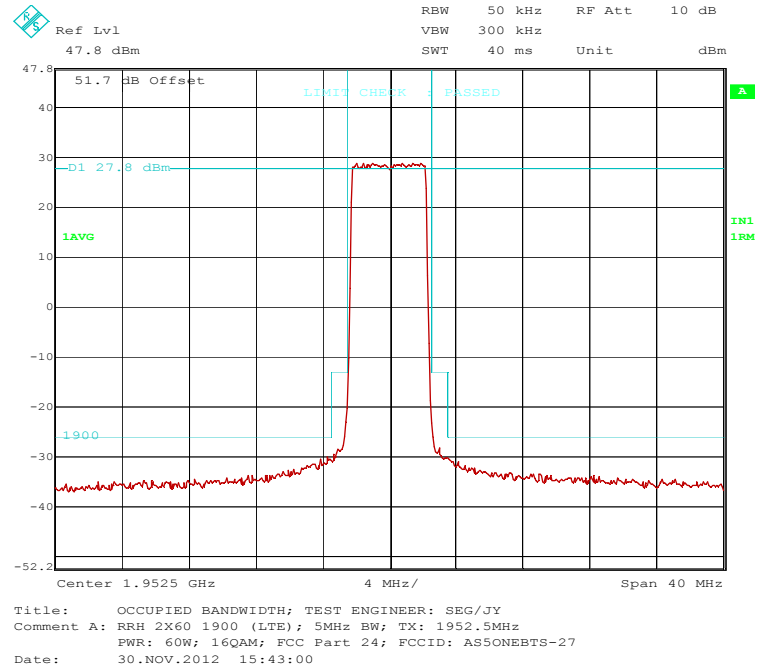
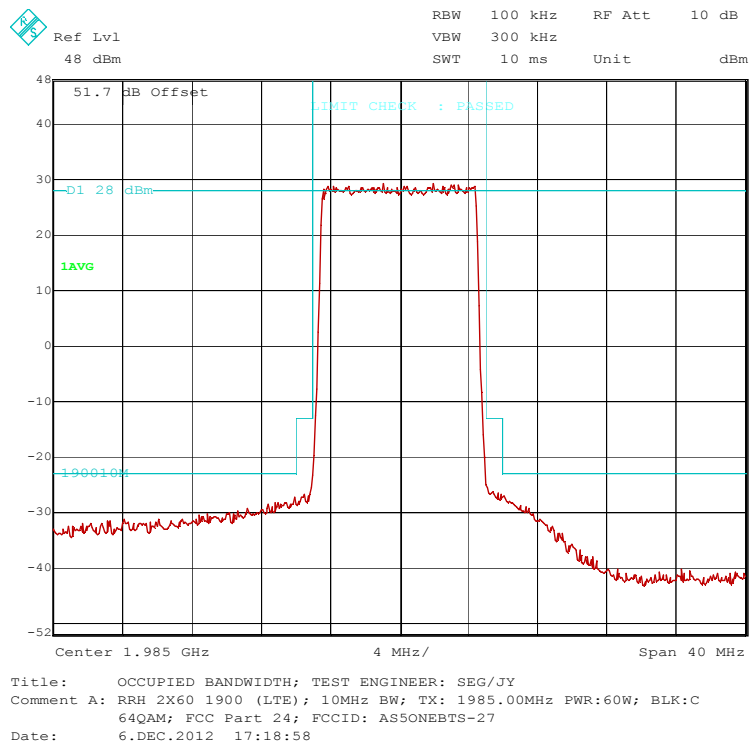


FIGURE 11.4.2 OCCUPIED BANDWIDTH AND OUT-OF-BAND EMISSIONS PLOTS

## (a) LTE, B BAND, 1952.50MHZ, 5MHZ, 60W/C, 16QAM



## (b) LTE, C BAND, 1985.0MHZ, 10MHZ, 60W/C, 64QAM



**SUBEXHIBIT 11.5****Section 2.1051 MEASUREMENT REQUIRED: SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS**

The out-of-block spurious emissions at the antenna transmitting terminal were investigated from 10 MHz to the 10<sup>th</sup> harmonic of the carrier or 20 GHz, per Section 2.1057(a)(1).

The carrier setup and configurations are same as in Sub-exhibit 11.4.

The emission limitations and the setting of measurement equipment for the unwanted emissions measurement of 5MHz or 10MHz LTE carrier were specified in 24.238 and provided in Sub-exhibit 11.4.

For the mean output power of +47.8 dBm (60 W) at J4, the required spurious emissions attenuation per  $(43 + P \text{ dBW}) \text{ dBc}$ , is 60.8dBc. FCC CFR 47, Sections 2.1051 and 2.1057(c) specify that the spurious emissions attenuated more than 20 dB below the permissible value need not be reported. So the reportable limit is -80.8 dBc.

The measurements were performed with a Rohde & Schwarz EMI Receiver, which was calibrated in accordance with ISO 9001 process. The test set-up diagram is given in the Figure 11.3.1.

The carrier power level at the antenna transmitting terminal was calibrated before the conducted spurious emissions testing for each test.

The spectrum analyzer was set to a 1MHz resolution bandwidth. The r.m.s detector was used.

The spurious emissions in the frequency range of 10MHz to 20GHz are well under the required emission limit with more than 23dB margins for all QPSK, 16QAM and 64QAM modulations evaluated. Therefore, there are no reportable emissions.

**Results:**

The out-of-block spurious emissions of the Alcatel-Lucent LTE 1900 RRH2x60W in the entire spectrum investigated (10MHz to 20GHz) are under the required emission limit with sufficient margins. The measurement results demonstrate that the subject of the application is in full compliance with the Rules of the Commission.

**SUBEXHIBIT 11.6****Section 2.1053 MEASUREMENT REQUIRED: FIELD STRENGTH OF SPURIOUS RADIATION**

The field strength measurements of radiated spurious emissions were made in a FCC (Site Registration Number: 515091) and IC (Filing Number: 6933F-5) registered three meter semi-anechoic chamber AR-5 which is maintained by Alcatel-Lucent in Murray Hill, New Jersey.

The -48VDC LTE 1900 2x60W RRH was investigated from 30 MHz to the 10<sup>th</sup> harmonic of the carrier or 20 GHz, per Section 2.1057(a)(1). The equipment under test (EUT) was configured as in the normal mode of the installation and operation. The recommendations of ANSI C63.4–2009 were followed for EUT testing setup and cabling.

The base station was configured to transmit one 5MHz LTE carrier on each Tx1 and Tx2 with the maximum mean power of 60W each. The test models used for configuring LTE carriers were described in Sub-exhibit 11.4. All carriers were transmitting to non-radiating 50  $\Omega$  resistive loads.

The emission limitations and the setting of measurement equipment for the conducted spurious emissions measurement of a 1900 carrier were specified in 24.238 and shown in Sub-Exhibit 11.4.

By using the relation between the electric field strength of an ideal dipole and its excitation power given in Reference Data for Radio Engineers, page 676, 4<sup>th</sup> edition, ITT Corp., the emission limit calculated equals

Frequency of Emission (MHz)	Separation Distance (m)	E (dB $\mu$ V/m)	Detector/RBW
10-20,000	3	84.1	Average/1MHz

The field strength of radiated spurious emissions measured was determined by

$$E \text{ (dB}\mu\text{V/m)} = V_{\text{meas}} \text{ (dB}\mu\text{V)} + \text{Cable Loss (dB)} + \text{Antenna Factor (dB1/m)}.$$

Sections 2.1051 and 2.1057(c) specify that the spurious emissions attenuated more than 20 dB below the permissible value need not be reported. Therefore, the reportable limit plus 3dB for MIMO operation at 3 meter is 61.1 dB $\mu$ V/m.

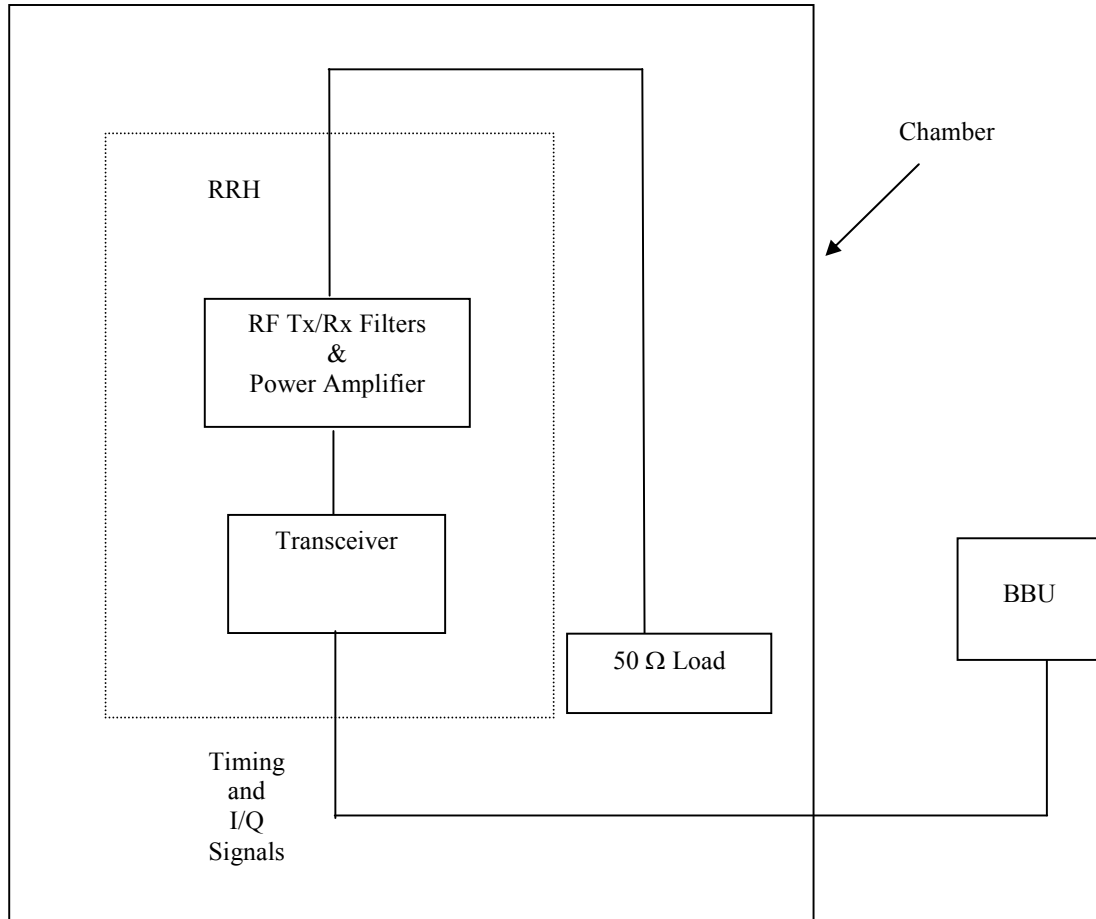
All the measurement equipment used, including antennas, was calibrated in accordance with ISO 9001 process. The EUT setup diagram is given in the Figure 11.6.1.

The spurious emissions evaluated are well under the required reportable emissions limit specified in Section 24.238 for all QPSK, 16QAM and 64QAM modulations evaluated. Therefore, there are no reportable emissions.

**Results:**

Over the frequency spectrum investigated (30MHz to 20GHz), no reportable radiated spurious emissions were detected. The measurement results of the Alcatel-Lucent LTE 1900 2x60W RRH, subject of this application, demonstrate the full compliance with the Rules of the Commission.

**FIGURE 11.6.1 EUT FOR MEASUREMENT OF RADIATED SPURIOUS EMISSIONS**





**SUBEXHIBIT 11.7****Section 2.947 LISTING OF TEST EQUIPMENT USED**

<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Calibrated Date</b>	<b>Due Cal. Date</b>
Power Meter	HP	437B	3125U21135	10/2/2012	10/2/2013
Power Sensor	HP	8481A	US372994629	9/5/2012	9/5/2013
EMI Test Receiver (20Hz to 40 GHz)	Rohde & Schwarz	ESIB40	100101	5/23/2012	5/23/2013
EMI Test Receiver (20Hz to 40 GHz)	Rohde & Schwarz	ESIB40	100100	3/28/2012	3/28/2013
MXA	Agilent	N9020A	MY50510383	4/07/2011	4/07/2013
Spectrum Analyzer 9kHz-26.5GHz	Agilent	E7405A	MY45110440	3/2/2012	3/2/2013
Attenuator 5dB (5W)	Weinschel	2-6	BX3432	1/23/2012	1/23/2013
Attenuator (100 W)	Weinschel	47-30-34, E796	BX1061	9/27/2012	9/27/2013
Attenuator (150W)	Weinschel	66-20-34, E 816	BW7319	9/27/2012	9/27/2013
PCS High Pass Filter	Trilithic	5HC2850/1805 0-1.8-KK	200113078	NA	NA
Directional Coupler	HP	778D, E372	18300	N/A	N/A
Biological Antenna 25-2000MHz	A.H. Systems	SAS-521-2	458	12/27/2011	12/27/2012
Double Ridged Horn Ant. 1-18GHz	EMCO	3115	9909-5914	9/12/2012	9/12/2014
Double Ridged Horn Ant. 18-40GHz	EMC Test System	3116	2537	9/27/2011	12/27/2012
Pre-amplifier 1-26.5GHz	Hewlett-Packard	8449B	3008A01267	7/23/2012	7/23/2013
Pre-amplifier 9kHz-1GHz	Sonoma Instrument	310N	186750	7/23/2012	7/23/2013