NOKIA Bell Labs

NVLAP LAB CODE: 100275-0

FCC Certification Test Report

Product Evaluated

LR16.1 RRH 1900A
(FCC ID: AS5ONEBTS-27)

Customer

Alcatel-Lucent USA, Inc

600-700 Mountain Avenue
Murray Hill, New Jersey 07974-0636 USA

Test Laboratory

Global Product Compliance Laboratory
Alcatel-Lucent USA, Inc
600-700 Mountain Avenue, Rm 5B-108
Murray Hill, New Jersey 07974-0636 USA

Date: May 23, 2016

Revisions

Date	Revision	Section	Change
	0		Initial Release

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Prepared By: Steve Gordon

Signed: Steve Gordon 5/51/2016
Compliance Engineer

Approved By: Ray Johnson

Signed: Raymond J Johnson 5/31/2016
Technical Manager

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1. ATTESTATION OF TEST RESULTS

Company Name	Alcatel-Lucent USA, Inc.
FCC ID	AS5ONEBTS-27
Product Name	LR16.1 RRH 1900A
Model Name	RRH2x60 – 1900A
Part No	3JR39501AA01
Serial Number(s)	15W329D90004
Test Standard(s)	47 CFR FCC Part 24
Reference(s)	• 47 CFR FCC Part 2 and Part 24 • FCC KDB 971168 D01 • ANSI C63 .26 (2015)
Operating Frequency Band	PCS (Tx: 1930 -1990 MHz and Rx: 1850-1910 MHz), E-UTRAN Band 2
Technology	LTE
Test Frequency Range	10MHz – 20 GHz
Operation Mode(s)	2x2 MIMO
Submission Type	Class II Permissive Change
FCC Part 15 Subpart B Compliance	Compliance with Class B
Test Date	May 5 – May 31, 2016
Test Laboratory	Global Product Compliance Laboratory 600-700 Mountain Avenue, Rm 5B-108 Murray Hill, New Jersey 07974-0636 USA

This is to certify that the above product has been evaluated and found to be in compliance with the Rules and Regulations set forth in the above standard(s). The data and the descriptions about the test setup, procedures and configuration presented in this report are accurate. The results of testing in this report apply only to the product/system which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Per the requirement of Section 2.911(d) Certification of Technical Test Data, I hereby certify that the technical test data are the results of tests either performed or supervised by me.

Steve Gordon
Member of Technical Staff
Global Product Compliance Laboratory
Alcatel-Lucent USA, Inc

2. SUMMARY OF THE TEST RESULTS

47 CFR FCC Sections	Description of Tests	Compliance Results	Notes
2.1046	**RF Power Output**	**Yes**	
2.1047	**Modulation Characteristics**	**Yes**	
2.1049, 24.238	**(a) Occupied Bandwidth** **(b) Out-of-Band Emissions**	**Yes**	
2.1051, 24.238	**Spurious Emissions at Antenna Terminals**	**Yes**	
2.1053, 24.238	**Field Strength of Spurious Radiation**	**Yes**	
2.1055, 24.235	**Measurement of Frequency Stability**	**NR**	

NR: Not Required
NA: Not Applicable

2.1 Measurement Uncertainty

The results of the calculations to estimate uncertainties for the several test methods and standards are shown in the Table below. These are the worst-case values.

Worst-Case Estimated Measurement Uncertainties

Standard, Method or Procedure	Condition	Frequency MHz	Expanded Uncertainty (k=2)
a. Classical Emissions, (*e.g.*, ANSI C63.4, CISPR 11, 14, 22, *etc.*, using ESHS 30,	Conducted Emissions	0.009 - 30	±3.5 dB
	Radiated Emissions (AR-6 Semi-Anechoic Chamber)	30 MHz – 200MHz H 30 MHz – 200 MHz V 200 MHz – 1000 MHz H 200 MHz – 1000 MHz V 1 GHz- 18 GHz	±4.79 dB ±5.12 dB ±4.79 dB ±4.91 dB ±3.3 dB

2.2 Measurement uncertainty for Antenna Port Testing:

- 9 kHz to 20 MHz: Frequency = 10 Hz, Amplitude = 0.5 dB
- 20 MHz to 1 GHz: Frequency = 100Hz, Amplitude = 0.5 dB
- 1 GHz to 10 GHz: Frequency = 10 kHz, Amplitude = 0.5 dB

3. GENERAL INFORMATION

3.1 Product Descriptions

The equipment under test (EUT) has the following specifications.

Table 3.1.1 Product Specifications

Specification Items	Description
Product Type	Compact Base Station (2Tx, 2Rx), 2x2 MIMO
Radio Type	Intentional Transceiver
Power Type	-48 VDC
Modulation	QPSK, 16QAM, 64QAM
Operating Frequency Range	Tx 1930-1990 MHz/Rx 1850-1910 MHz
Channel Bandwidth	5+5, 10 +5 MHz
Max Conducted Power (Rated)	47.8 dBm per carrier,47.8 dBm per port
Software Version	NEM LR16.1_D1.12
Hardware Version	RRH 2x60 MIMO
Antenna(s)	Refer to Section 3.2

The EUT supports the following carrier configurations:

Table 3.1.2 EUT Supported Configurations

Carrier Bandwidth (MHz)	Maximum No of Carriers per Path	Technology	Supported?
5+5	2	LTE	√
10+5	2	LTE	√

The operating band consists of the following blocks and spectrum:

Table 3.1.3 EUTRAN 2, PCS Band

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

3.2 Antenna Information

The product does not incorporate integrated antennas.

4. REQUIRED MEASUREMENTS AND RESULTS

The EUT is a Class II Permissive Change. Per 47CFR FCC Section 2.1033(c)(14), the following certification tests are required by Section 2.1046 through Section 2.1057. The measurement was conducted in accordance with the procedures set out in Section 2.1041.

47 CFR FCC Sections	Description of Tests	Compliance Results	Notes
2.1046	**RF Power Output**	**Yes**	
2.1047	**Modulation Characteristics**	**Yes**	
2.1049, 24.238	**(a) Occupied Bandwidth** **(b) Out-of-Band Emissions**	**Yes**	
2.1051, 24.238	**Spurious Emissions at Antenna Terminals**	**Yes**	
2.1053, 24.238	**Field Strength of Spurious Radiation**	**Yes**	
2.1055, 24.235	**Measurement of Frequency Stability**	**NR**	

NR: Not Required
NA: Not Applicable

4.1 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, as shown in the accompanying test set-up diagram. The radio was tuned to a channel which is transmitting continuously in its operating 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 LTE carrier at the antenna-transmitting terminal.

4.1.1 RF Power Output Measurement

Power measurements were conducted with a broadband Power Meter in the average mode per KDB 971168 D01. Before the testing was started, the Base Station was given a sufficient "warm-up" period as required.

The maximum rated mean power per carrier, per port and per unit at the antenna transmitting terminal was measured for LTE carriers at 5+5 MHz and 10+5 MHz carrier bandwidths with QPSK, 16QAM and 64QAM modulation respectively across the entire operating frequency band.
The maximum rated mean RF power outputs of the EUT measured are given in Table 4.1.1. The RF power output measured for each configuration was also shown as "Ref Lvl" in the plots provided in Sections 4.3 and 4.4.

Table 4.1.1 The Maximum Average RF Output Power of the EUT- Measured

Transmit Configuration	Measurement Configuration	Maximum Average RF Output Power		Maximum Derivation
		Watts	dBm	dB
2xMIMO	Per Antenna Port	60	47.8	⩽±1

4.1.1.1 RF Power Output Results:

The maximum mean RF power outputs of the EUT measured at its antenna transmitting terminals were measured in full compliance with the Rules of the Commission and are listed above.

4.1.2 Peak-to-Average Power Ratio Measurement

The Peak-to-Average Power Ratio (PAPR) of the EUT has also been measured per KDB 971168 D01 procedures for both 5MHz and 10MHz carriers at the lowest, middle and highest available channels of the operating band for QPSK, 16QAM and 64QAM, respectively. The PAPR values (0.1% probability) of the EUT measured are all below 13dB. The maximum PAPR value measured is given in Table 4.1.2 and the plot below.

Table 4.1.2 The Maximum PAPR Value at 0.1% probability of the EUT

Configuration	Maximum PAPR Value at 0.1% probability (dB)
1980 MHz, 64QAM, 10MHz	8.02

4.1.2.1 Peak-to-Average Power Ratio Results:

The maximum Peak-to-Average Power Ratio (PAPR) of the EUT measured at its antenna transmitting terminals were measured to be in full compliance with the ≤ 13 dB Rules of the Commission and are listed above.

Figure 4.1.1 Test Set-Up for Measurement of
Radio Frequency Power Output

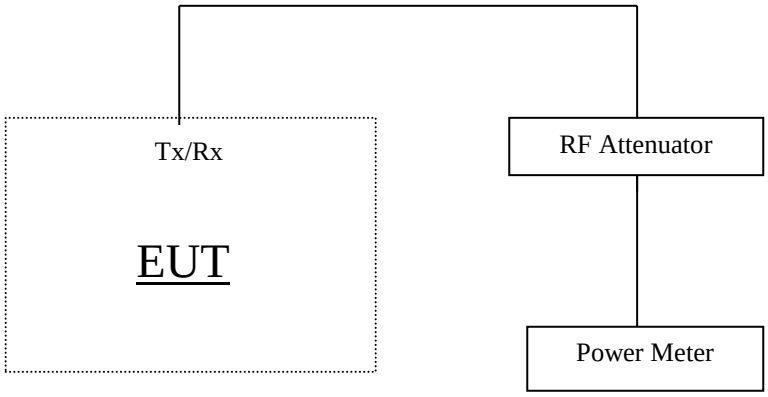
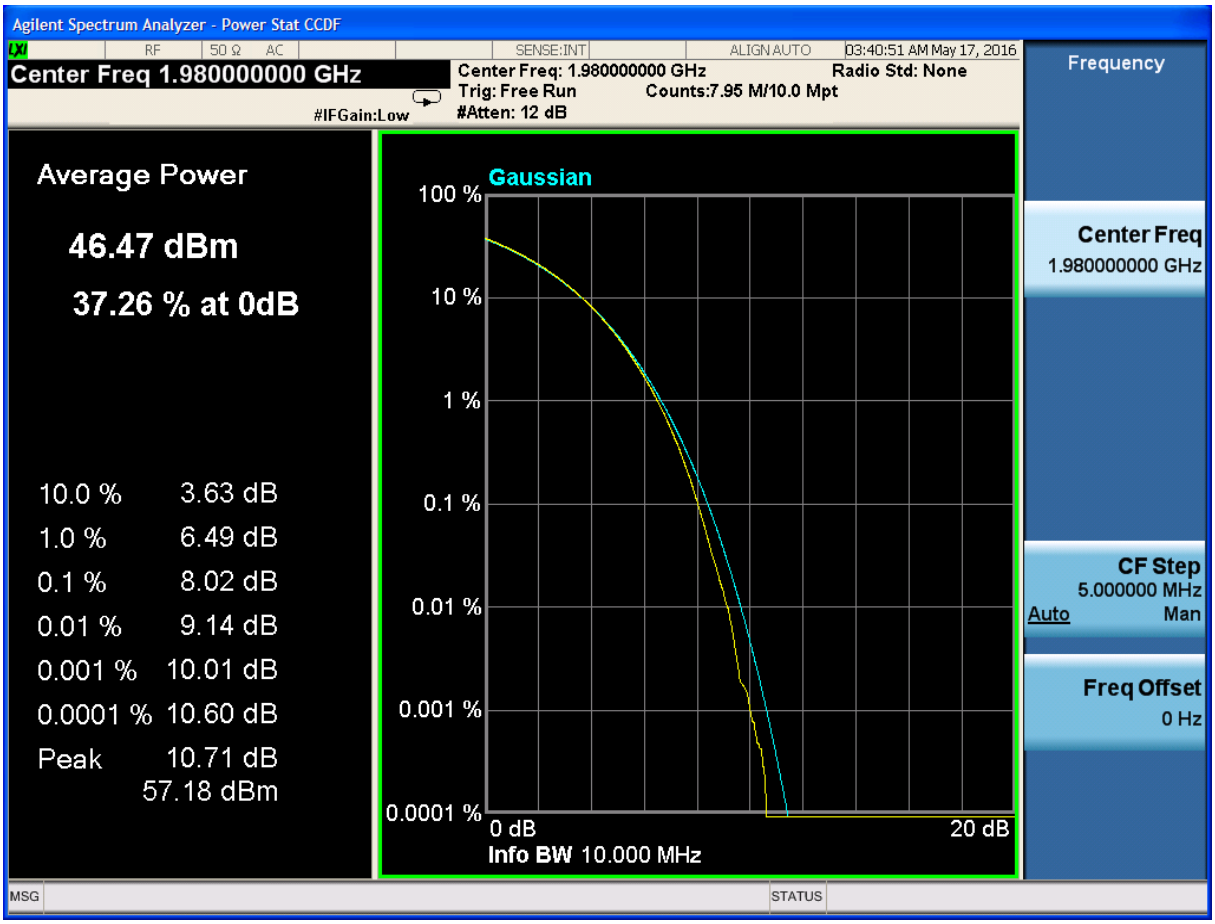


Figure 4.1.2 PAPR Plot Measured with the Maximum Value



4.2 Section 2.1047 MEASUREMENT REQUIRED: MODULATION CHARACTERISTICS

The EUT supports LTE technology only. The LTE utilizes Orthogonal Frequency Division Multiplexing (OFDM) which splits the carrier frequency bandwidth into many small subcarriers. Each individual subcarrier is modulated with QPSK, 16QAM and 64QAM digital modulation formats.

In QPSK, there are 4 possible symbol states and each symbol carries 2 bits of information. In 16QAM, there are 16 possible symbol states and each 16-QAM symbol carries 4 bits of information. While in 64QAM, there are 64 possible symbol states and each 64-QAM symbol carries 6 bits of information. Higher-order modulation, where the constellations become more dense, is more sensitive to poor channel conditions than the lower-order modulation.

The modulation characteristics measurement of LTE carriers measures the difference between the ideal symbols and the measured symbols after the equalization. The measurement was performed for QPSK, 16QAM and 64QAM, respectively, where the carrier power level was adjusted to the maximum rated mean power at the antenna terminal.

4.2.1 Modulation Characteristics Measurement

The measurements were performed at the antenna transmitting terminal of the base station system with a signal analyzer which was calibrated in accordance with ISO 9001 process.
The test set-up diagram is given in the Figure 4.2.1, where the signal analyzer used the external signals from the base station as its trigger source and time reference.
Figure 4.2.2 shows screen plots of the modulation measurement for an LTE carrier in QPSK/16QAM and 64QAM modulations, respectively.

4.2.1.1 Modulation Measurements Results:

The modulation characteristics of the EUT measured are in full compliance with the Rules of the Commission.

Figure 4.2.1 Test Set-Up for Measurement of Modulation Characteristics, Occupied Bandwidth and Out-of-Band Emissions

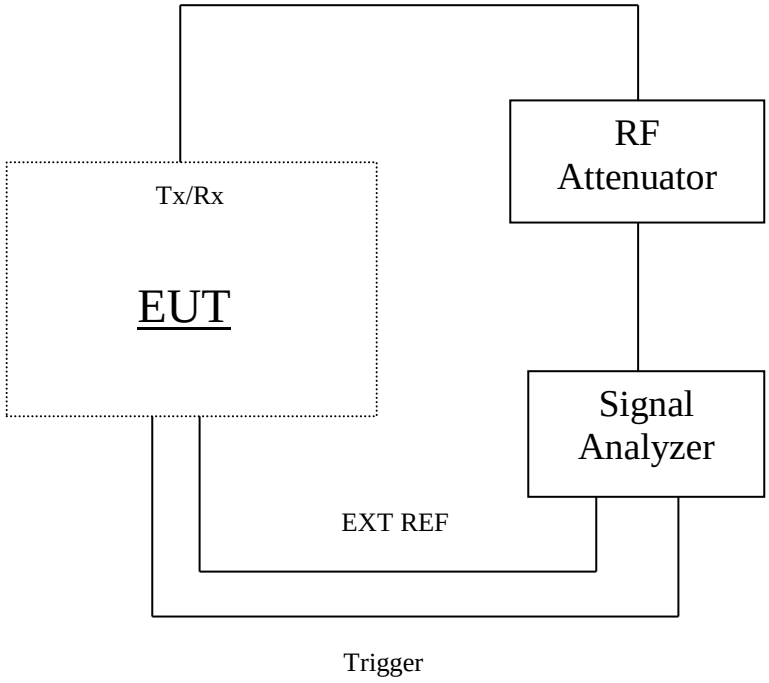
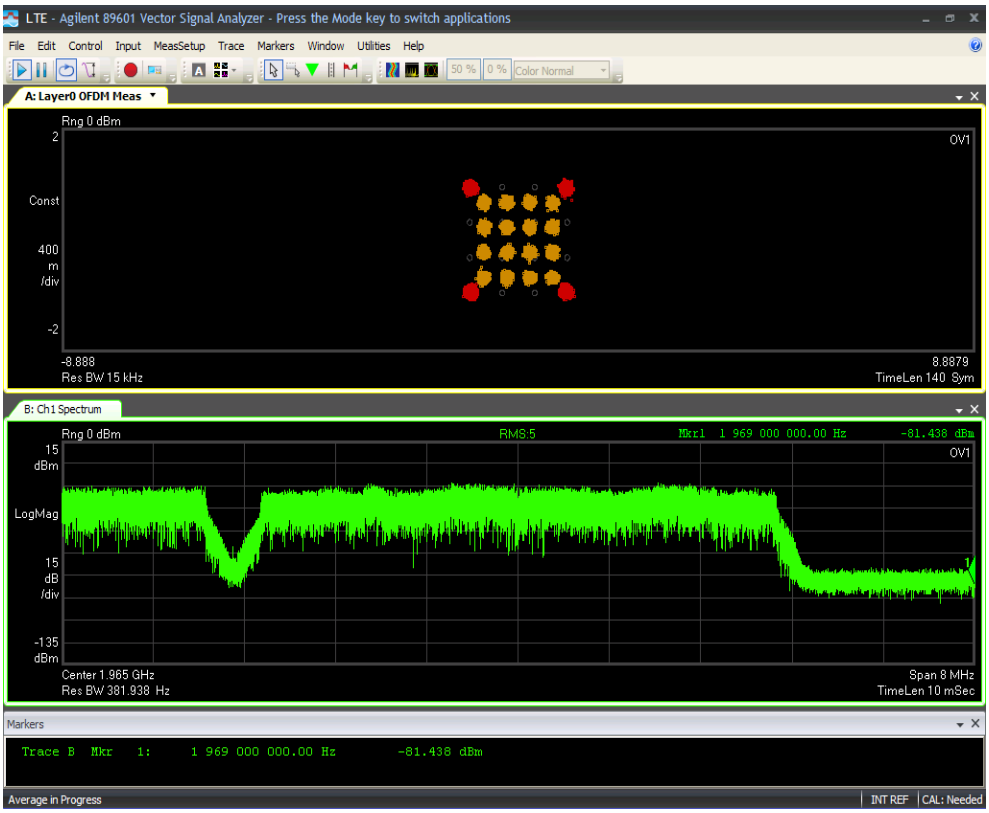
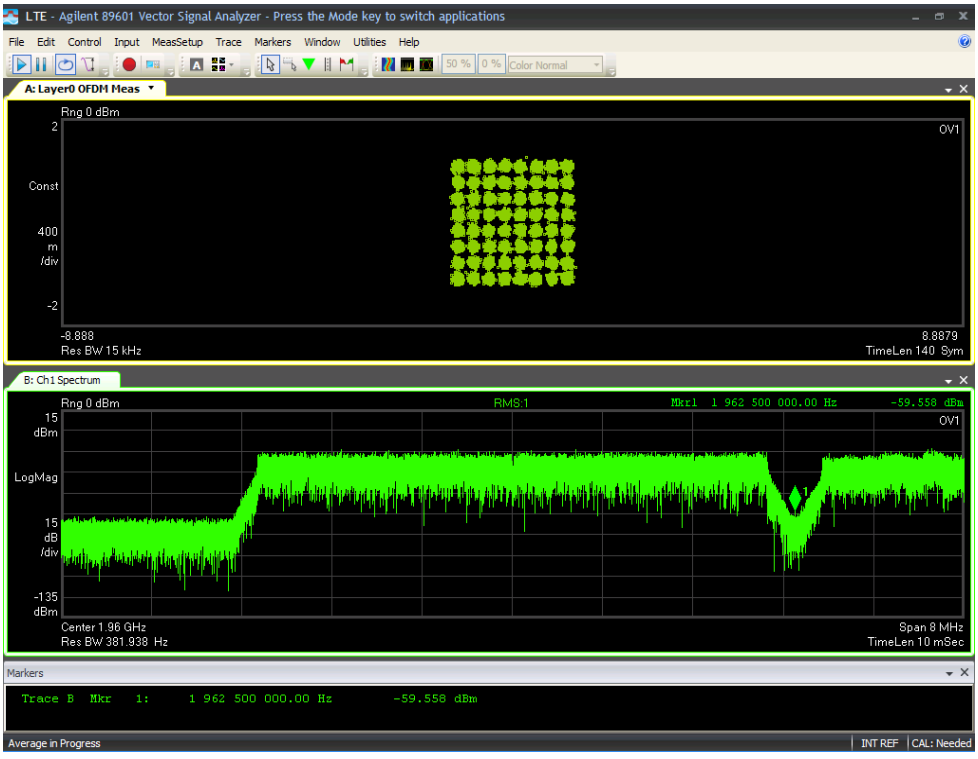


FIGURE 4.2.2 Modulation Measurement for a 10 MHz LTE Carrier at 1960 MHz with QPSK/16QAM AND 64QAM Modulations





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

This test measures the Occupied Bandwidth of the transmitting carrier and the Out of Band Emissions in the frequency spectrum immediately outside and adjacent to the transmitting carrier(s).

The occupied bandwidth (OBW) is usually defined either as the 99% power OBW or a relative OBW. The 99% OBW is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated or conducted are each equal to 0.5 percent of the total mean power radiated or conducted by a given emission. The relative OBW 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 by at least X dB below the transmitter power, where the value of X is typically specified as 26.

Per KDB 971168 D01 v02r02, the relative OBW must be measured and reported when it is specified in the applicable rule part; otherwise, the 99% OBW shall be measured and reported. The OBW shall be measured when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment is operated.

4.3.1 Measurement of Occupied Bandwidth

The operating blocks and carrier configurations supported are provided in Section 3.1 Product Descriptions. The EUT transmitting band for wireless communication is governed by the FCC rules in CFR 47, Part 24, Subpart E. The minimum emission requirements and the setting of measurement equipment for the out-of-band emissions measurement of carriers were specified in FCC Part 24.238. The FCC's requirements are tabulated in the following table:

Table 4.3.1 FCC Part 24.238 Transmitter Unwanted Emission Limits

Frequency	Required Minimum Attenuation below the Mean Carrier Power *P*	Resolution Bandwidth of Spectrum Analyzer
1MHz Bands Immediately Outside the Transmitting Frequency Band	(43 + P dBW) dBc = -13dBm*	50kHz for 5 &10MHz carrier
Outside the above Frequency Range	(43 + P dBW) dBc = -13dBm*	1MHz

*For NxMIMO, the limit is reduced by 10·*log*(N) dB.

The above requirement was used as the required emission limit mask in the out-of-band emissions measurement.

The occupied bandwidth and out-of-band emissions measurements were made at the antenna transmitting terminal for QPSK, 16QAM and 64QAM modulations, respectively. The appropriate E-UTRA test model specified in 3GPP TS 36.141 was used for LTE carriers.

The measurements were performed with a spectrum analyzer in compliance with the procedure and requirements of ANSI C63.26. The test set-up diagram is same as the one shown in the Figure 4.3.1.

The 26dB occupied bandwidth measurement of an LTE carrier was measured per FCC KDB 971168. For the out-of-band emissions measurement, the spectrum analyzer was set with a resolution bandwidth which is equal to at least 1% of carrier bandwidth and a video bandwidth which is equal to at least 3xRBW as shown in the plots of the occupied bandwidth measurement attached in the following pages. The emissions outside the above spans were evaluated in Measurement Required: Out-of-block Spurious Conducted Emissions. The top of the carrier measured with a resolution bandwidth which is equal to 1% of carrier bandwidth was 20 dB below the LTE carrier power measured with a resolution bandwidth greater than the carrier bandwidth (if available) or a wideband power meter. This 20dB offset was due to the fact that 10 log (BW/1% *BW) = 20 dB. The RMS average detector was used in all above measurements. The measurement met the requirements of ANSI C63.26 paragraphs 5.2.4.4.1 and 5.7 which require that the number of points in the sweep be > 2 × Span/RBW.

For multiple carriers, the measurements were made at the antenna terminal for various configurations from adjacent channels to farthest separated channels across the operating band. The measurement was performed for QPSK, 16QAM and 64QAM modulations, respectively. The total carrier power level at the antenna terminal was adjusted to the maximum rated mean power +47.8 dBm (60W) per port.

The following channels are measured:

Table 4.3.2 (a) Channels Tested for Occupied Bandwidth and Out-of-Band Emissions

Bandwidth	EARFCN Band	DL Frequency (MHz)	Modulations
5 + 5 MHz Contiguous	**A**	1932.5 + 1937.5	QPSK, 16QAM, 64QAM
5 + 5 MHz Contiguous	**B**	1960 + 1965	QPSK, 16QAM, 64QAM
5 + 5 MHz Contiguous	**C1+C2**	1977.5 + 1982.5	QPSK, 16QAM, 64QAM
5 + 5 MHz Non-Contiguous	**A+D**	1932.5 + 1947.5	QPSK, 16QAM, 64QAM
5 + 5 MHz Non-Contiguous	**F+C2**	1972.5 + 1987.5	QPSK, 16QAM, 64QAM
10 + 5 MHz Contiguous	**A + A'**	1935 + 1942.5	QPSK, 16QAM, 64QAM
10 + 5 MHz Contiguous	**A'D + D**	1940 + 1947.5	QPSK, 16QAM, 64QAM
10 + 5 MHz Contiguous	**C1C2 + C2**	1980 + 1987.5	QPSK, 16QAM, 64QAM
10 + 5 MHz Non-Contiguous	**AA' + D**	1935 + 1947.5	QPSK, 16QAM, 64QAM

Bandwidth	EARFCN Band	DL Frequency (MHz)	Modulations
10 + 5 MHz Non-Contiguous	**B + E**	1955 + 1967.5	QPSK, 16QAM, 64QAM
10 + 5 MHz Non-Contiguous	**FC1 + C2**	1975 + 1987.5	QPSK, 16QAM, 64QAM

4.3.1.1 Mask Parameters

(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.

4.3.2 Results:

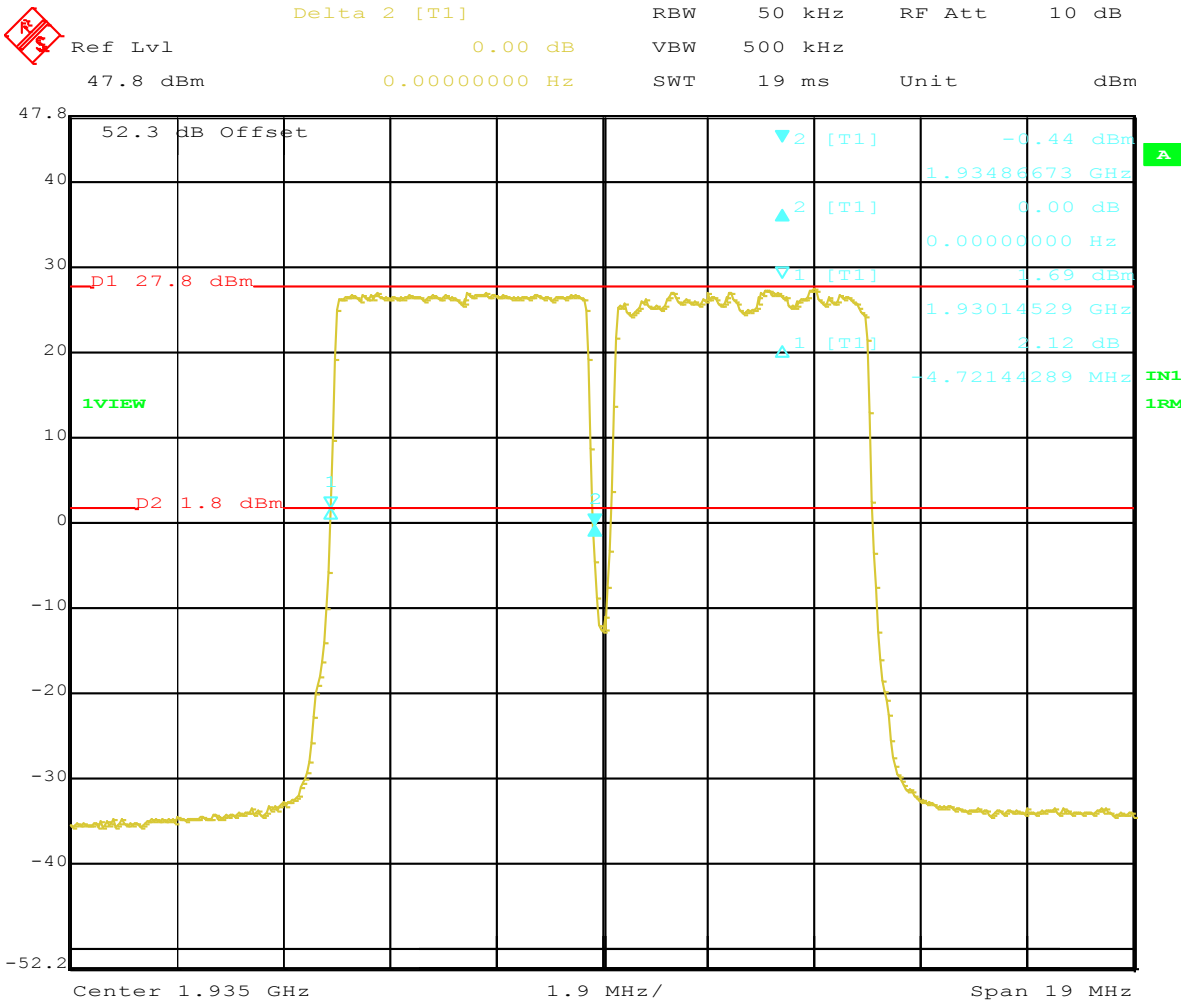
The occupied bandwidth plots which gave the widest occupied bandwidth for each bandwidth with QPSK/16QAM and 64 QAM were submitted, respectively. The limits specified in FCC Part 24.238 are displayed in the plots where 3dB margin for 2x2 MIMO is included.

From the out-of-band emissions plots attached below, it can be seen that all the emissions are under the required FCC emission masks for MIMO operation.

The measurement results of the occupied bandwidth and the out-of-band emissions demonstrate the full compliance with the Rules of the Commission for the operating band.

FIGURE 4.3.1

26 dB BANDWIDTH PLOTS



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Comment A: LR16.1 RRH 1900A; 5+5MHz BW;1932.5 64QAM;1937.5 QPSK&16QAM
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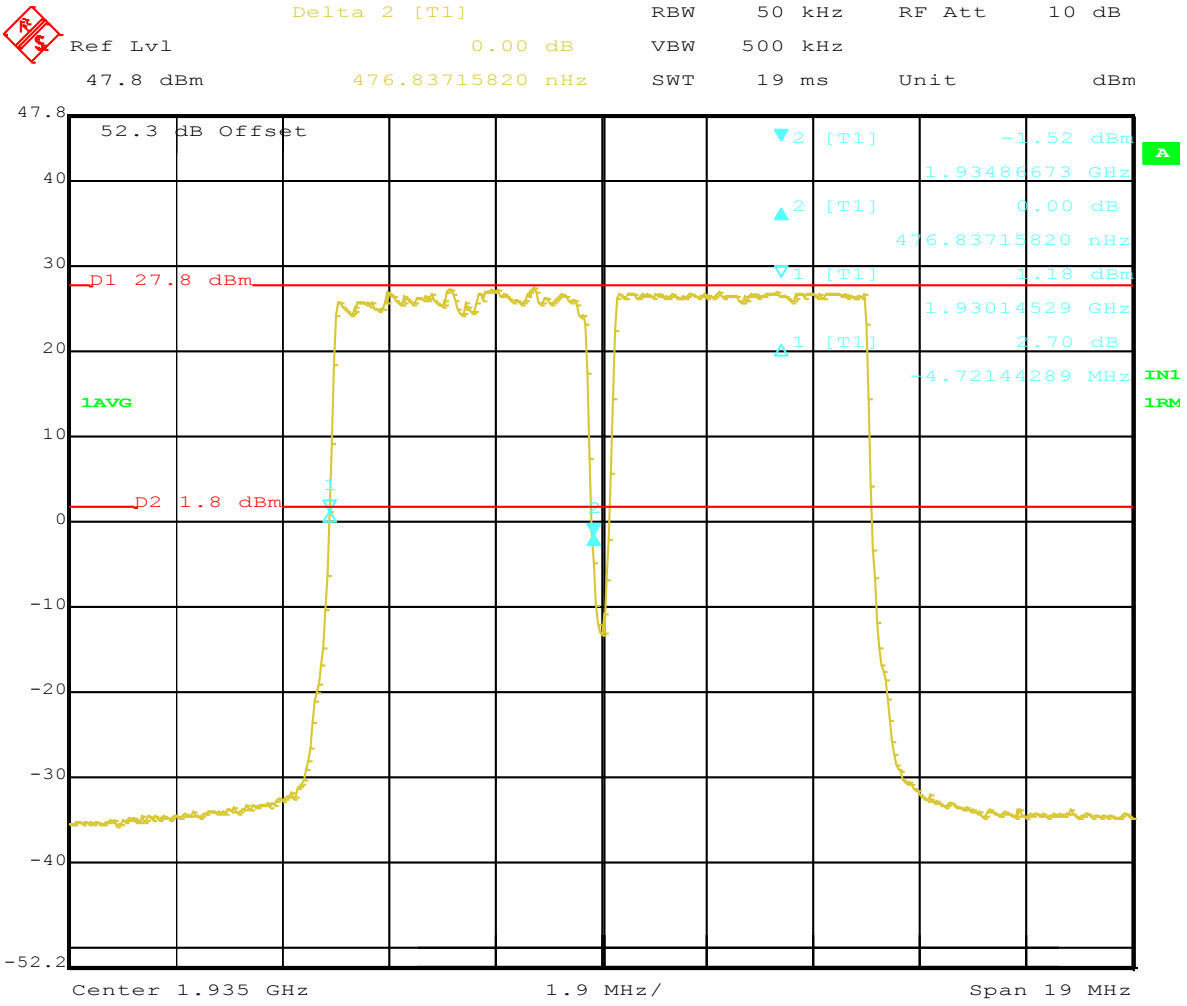

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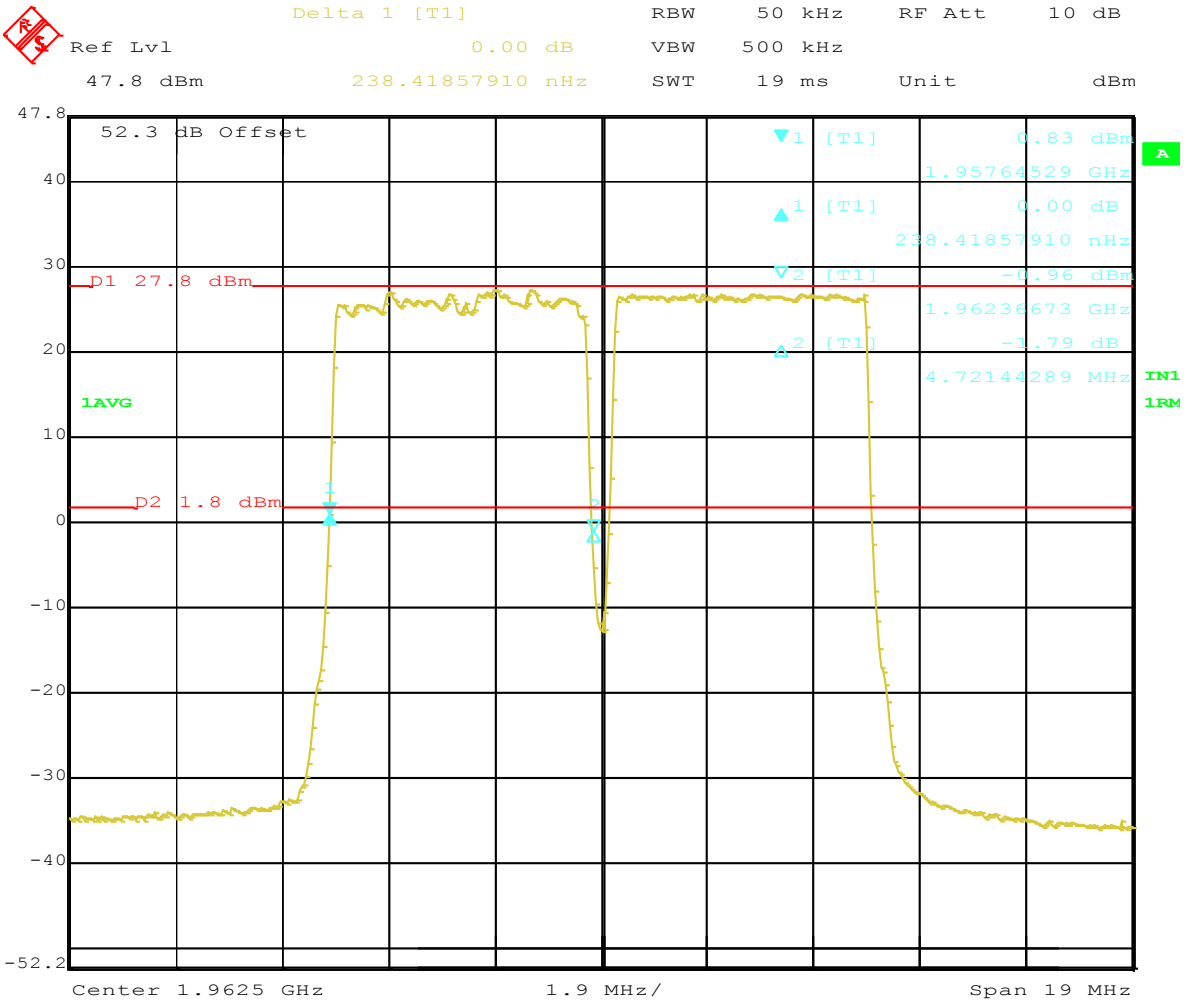
Test Performed on May 6th 2016

Contiguous Carriers

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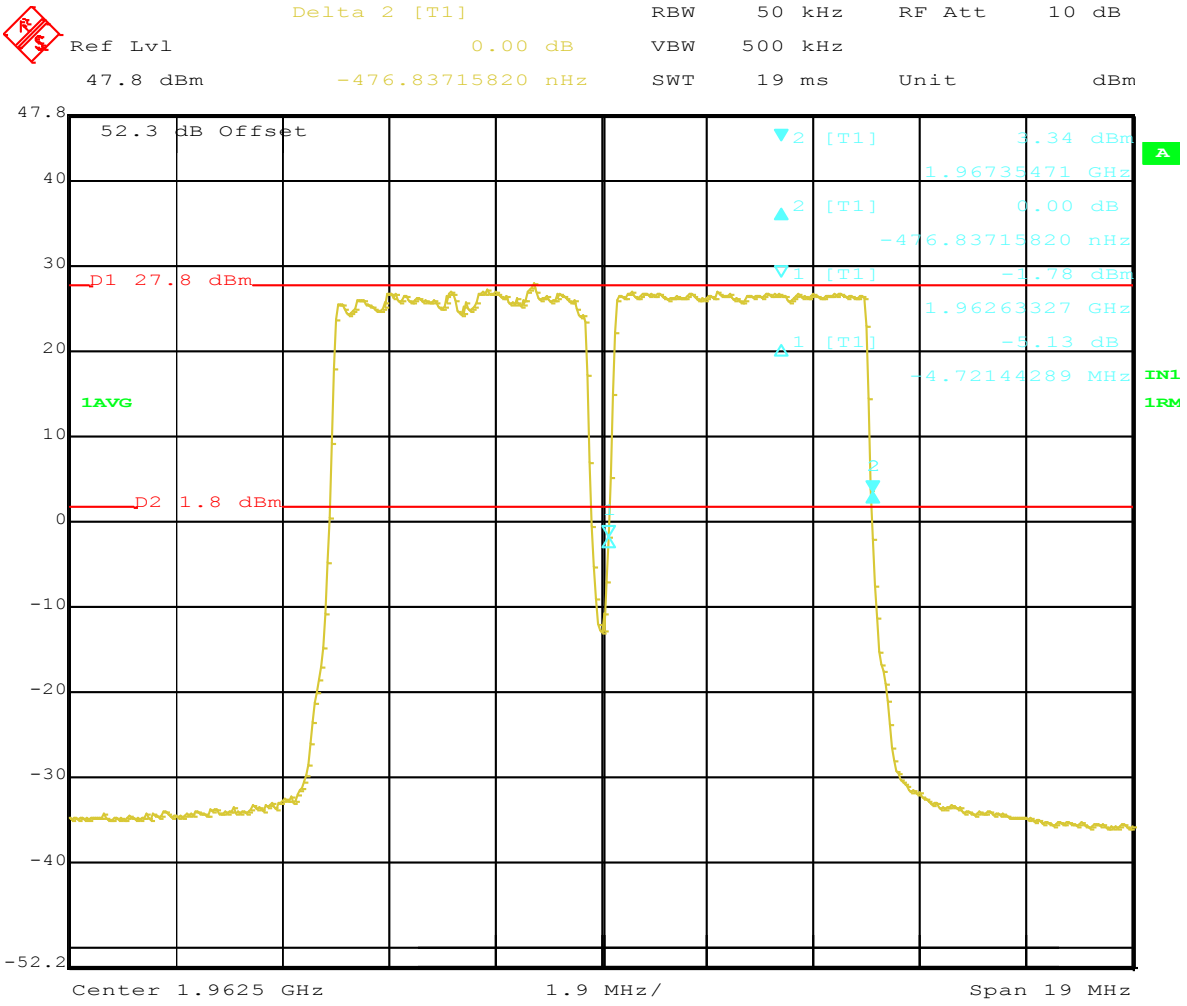
Contiguous Carriers



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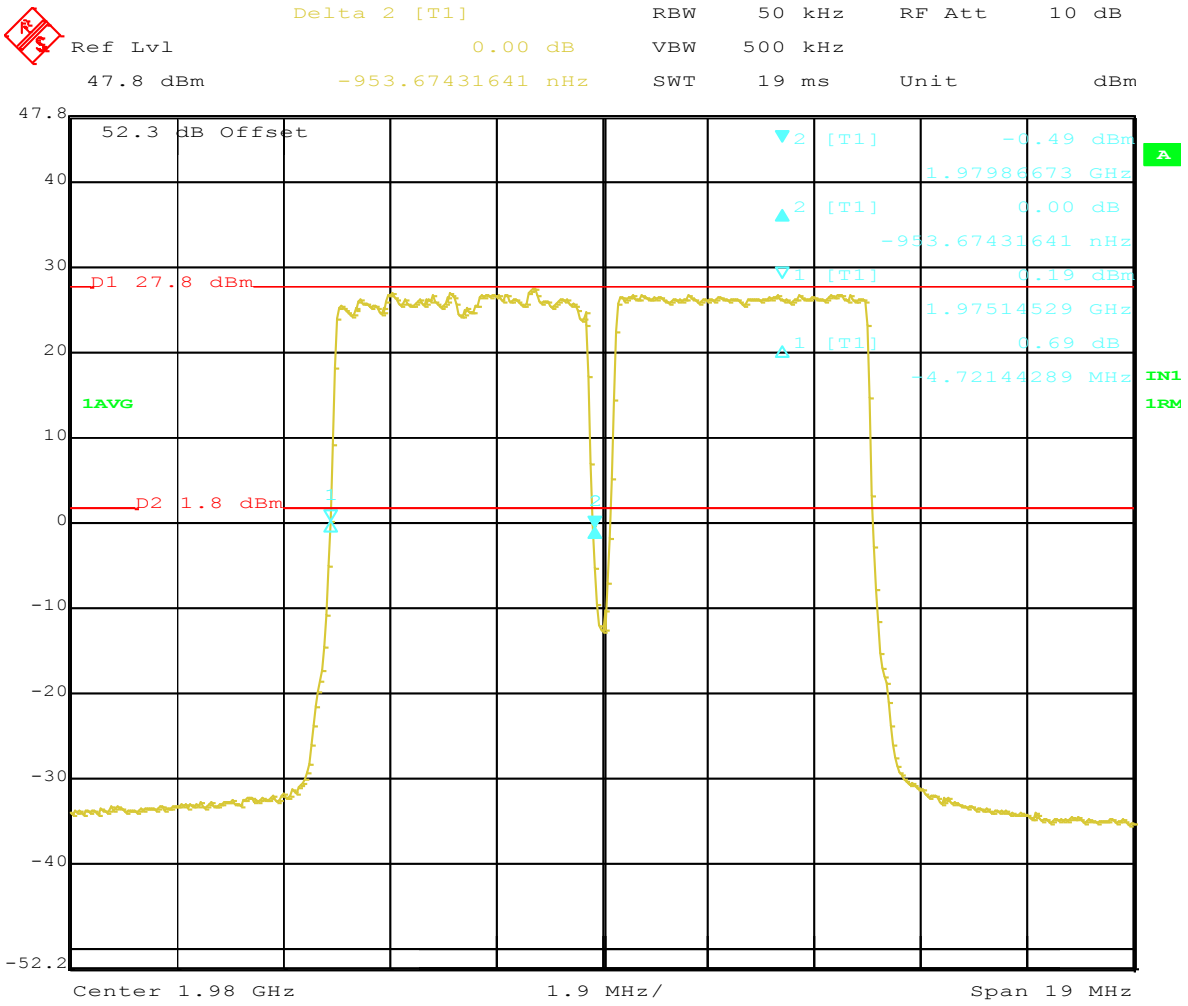
Contiguous Carriers



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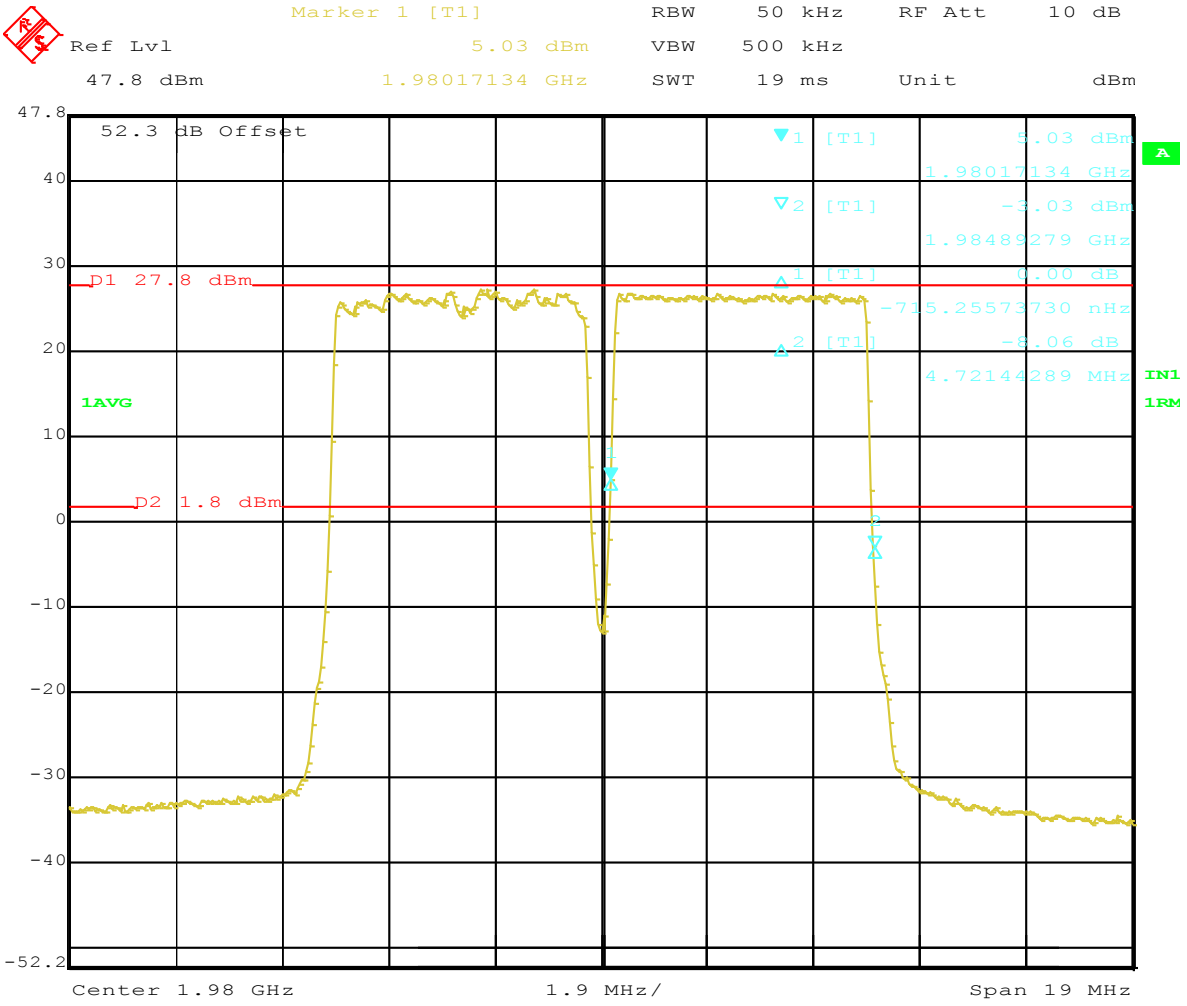
Contiguous Carriers



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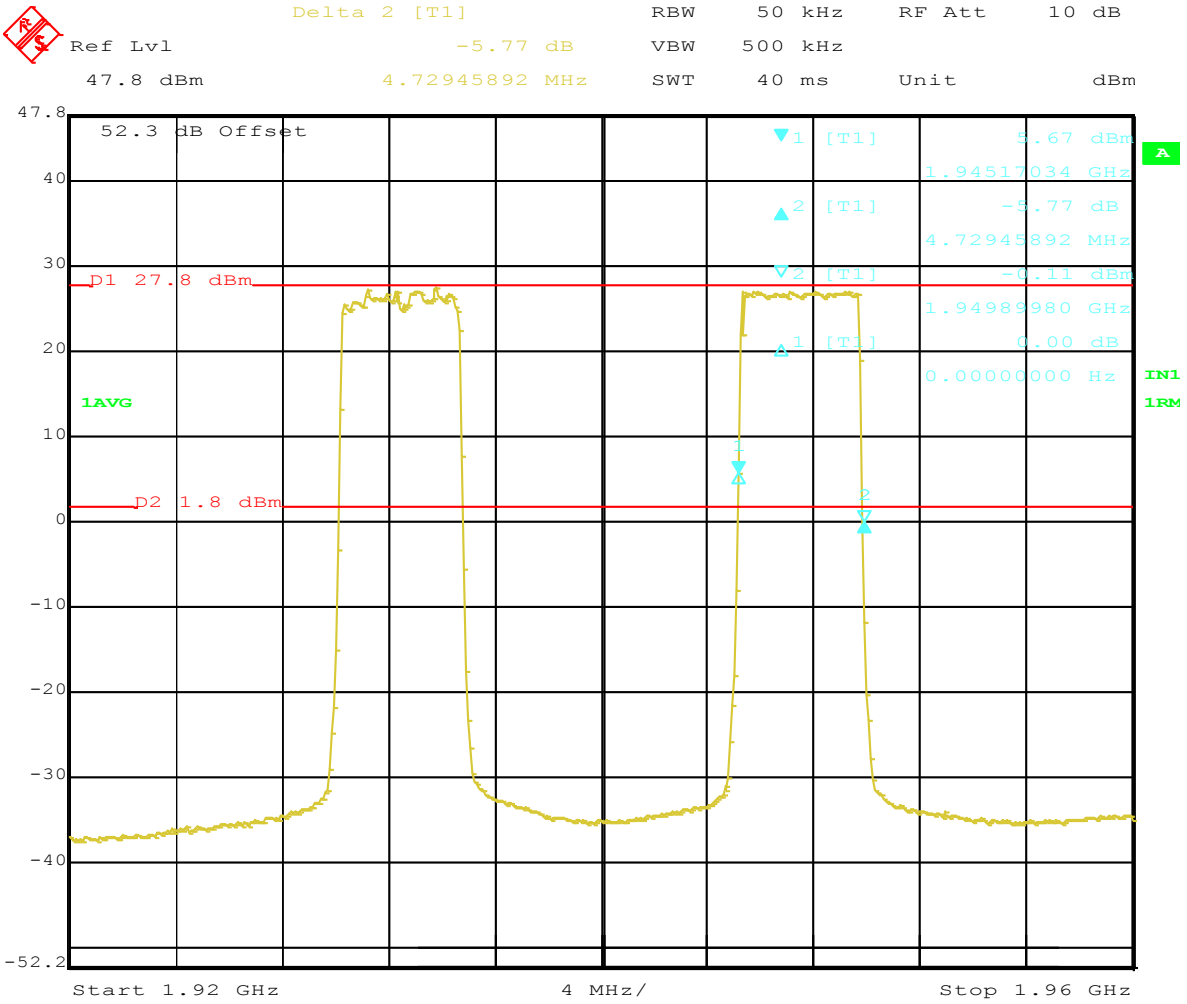


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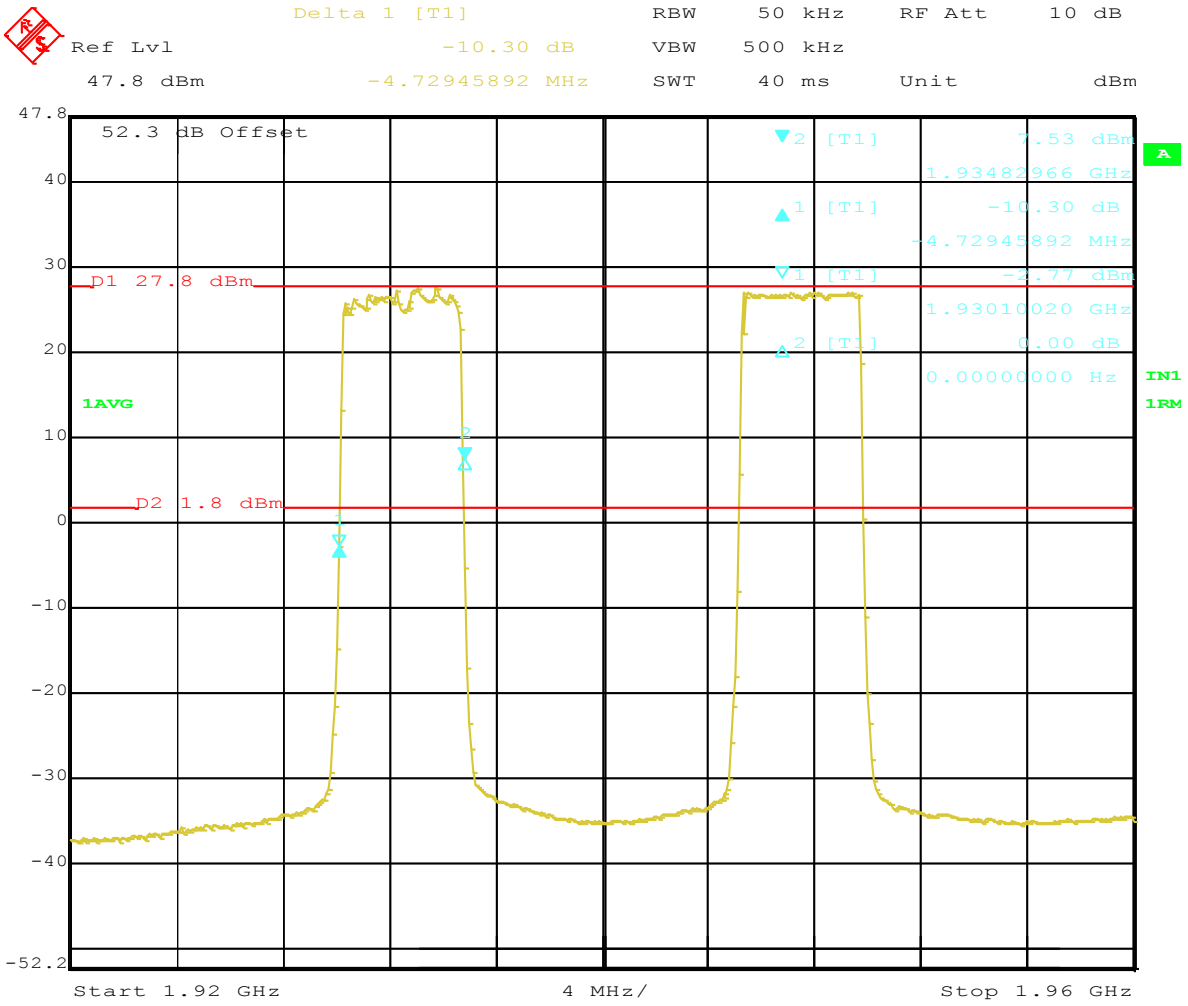
Non-Contiguous Carriers limited to a maximum of 10 MHz apart.



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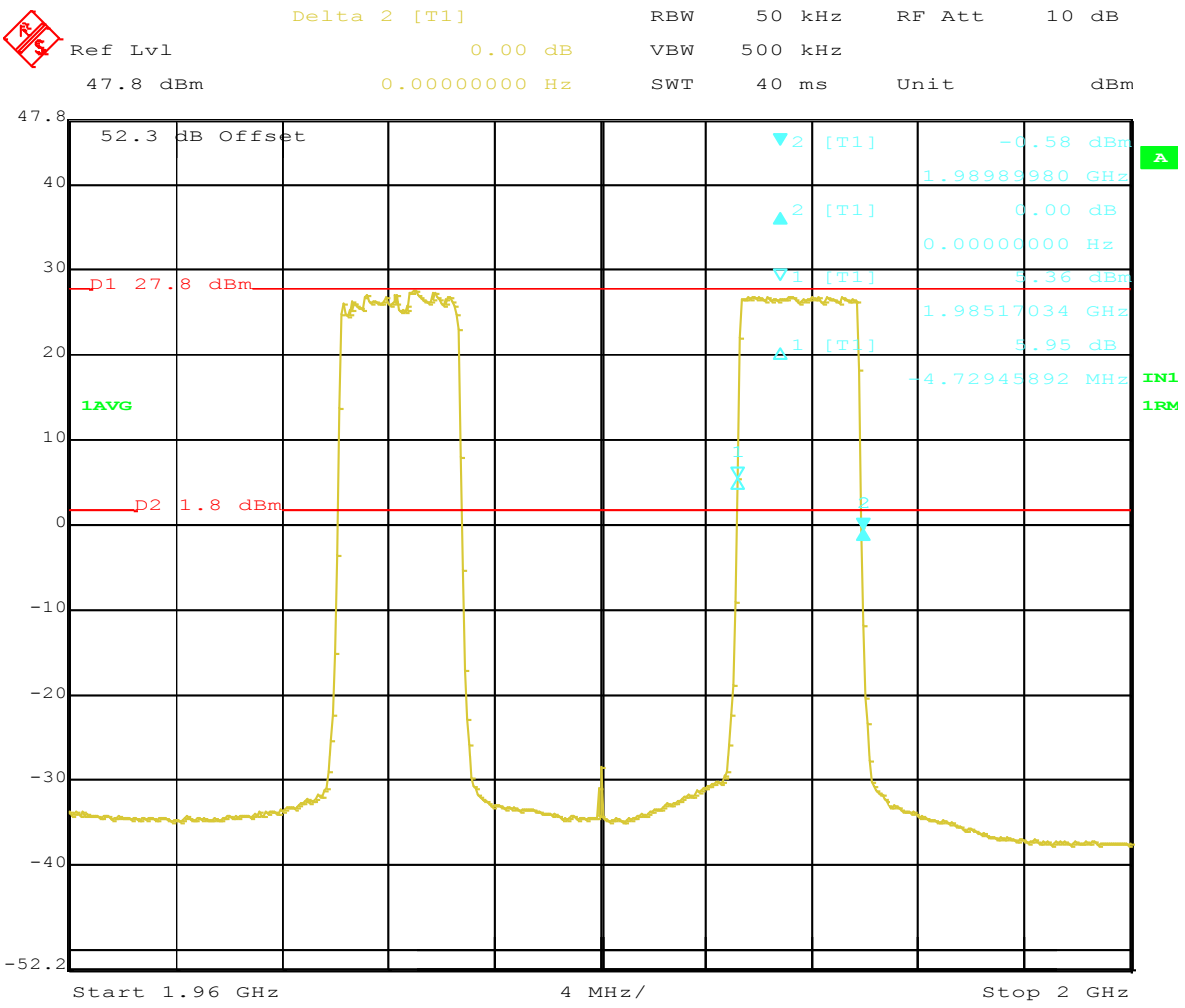

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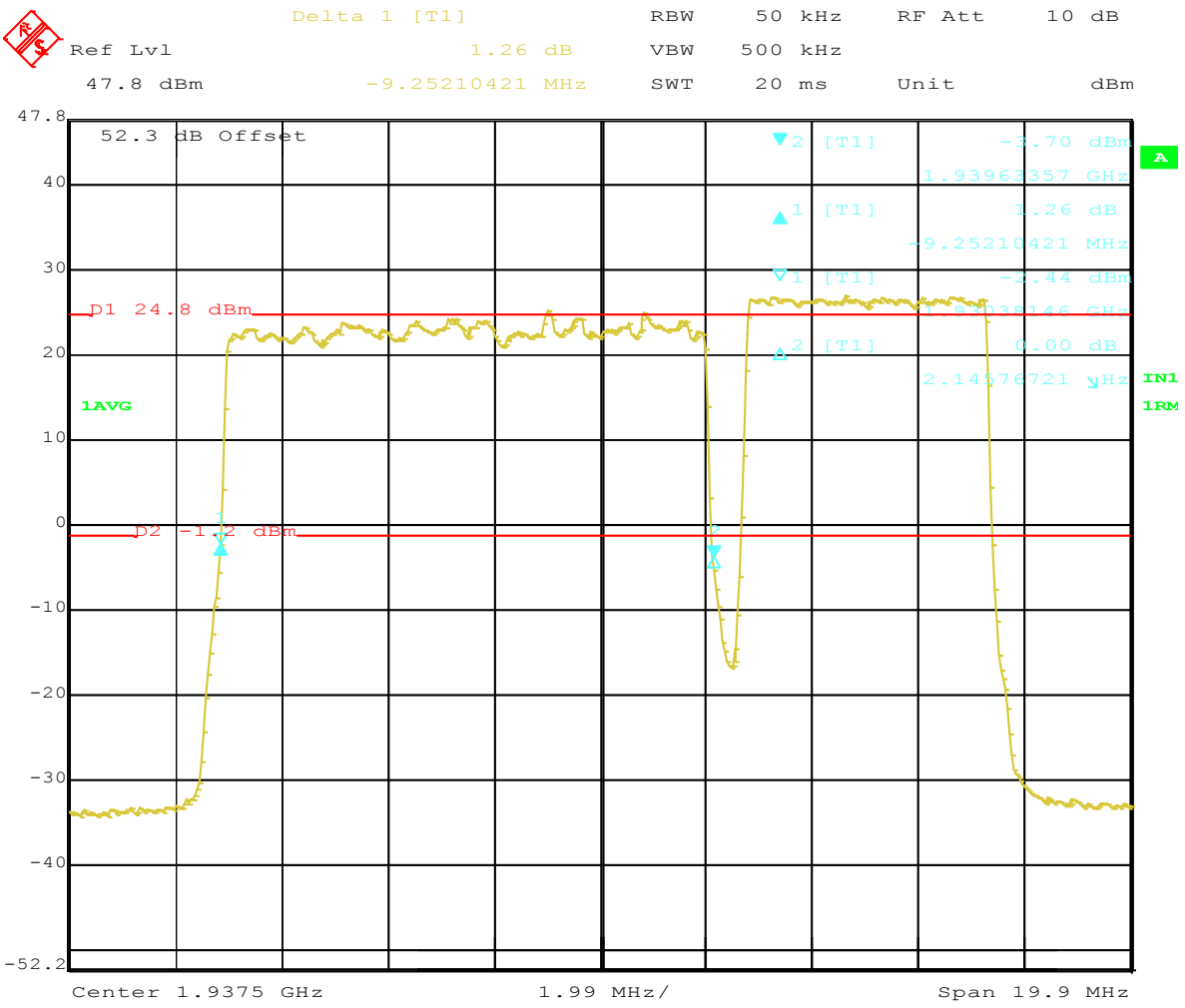

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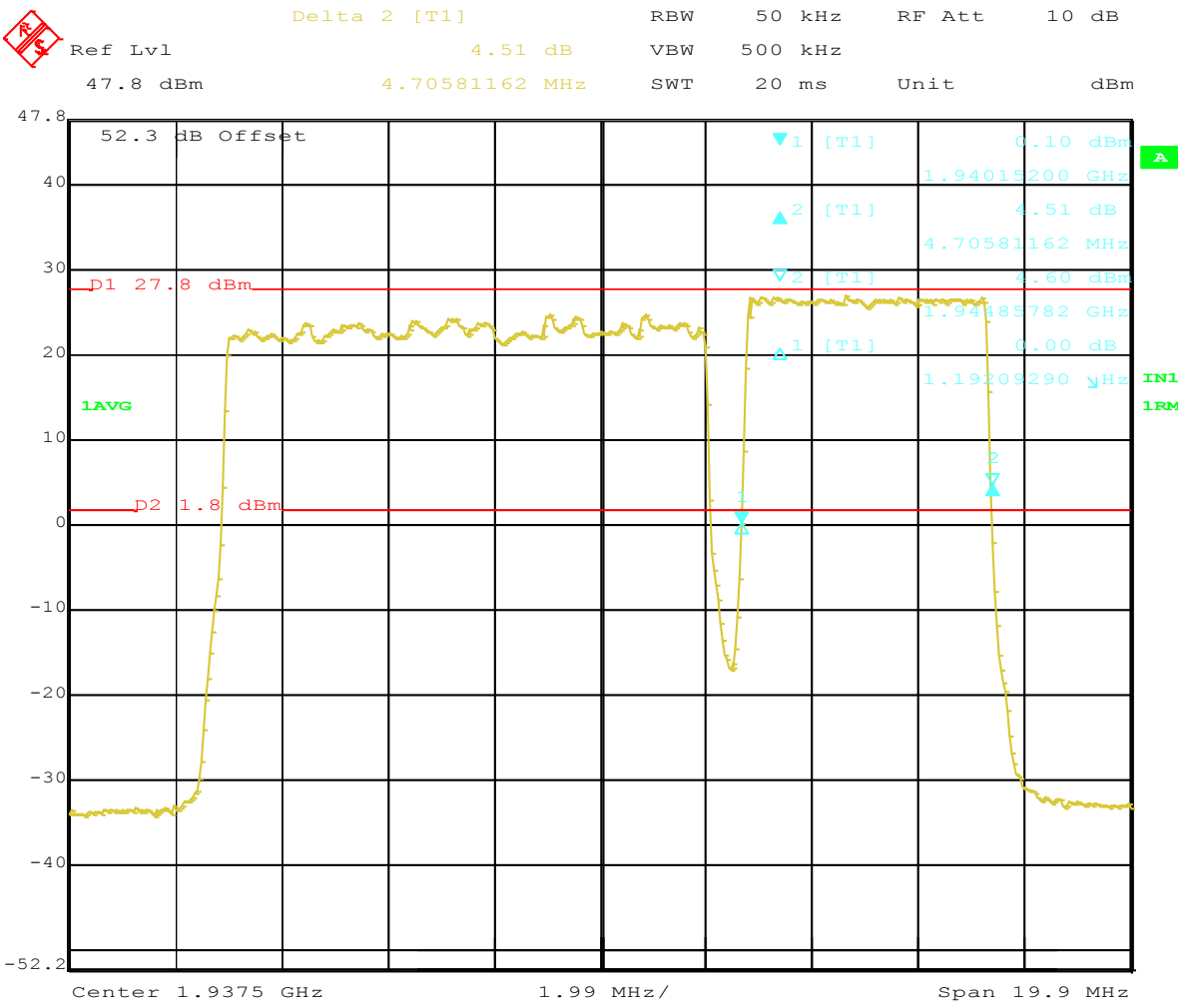
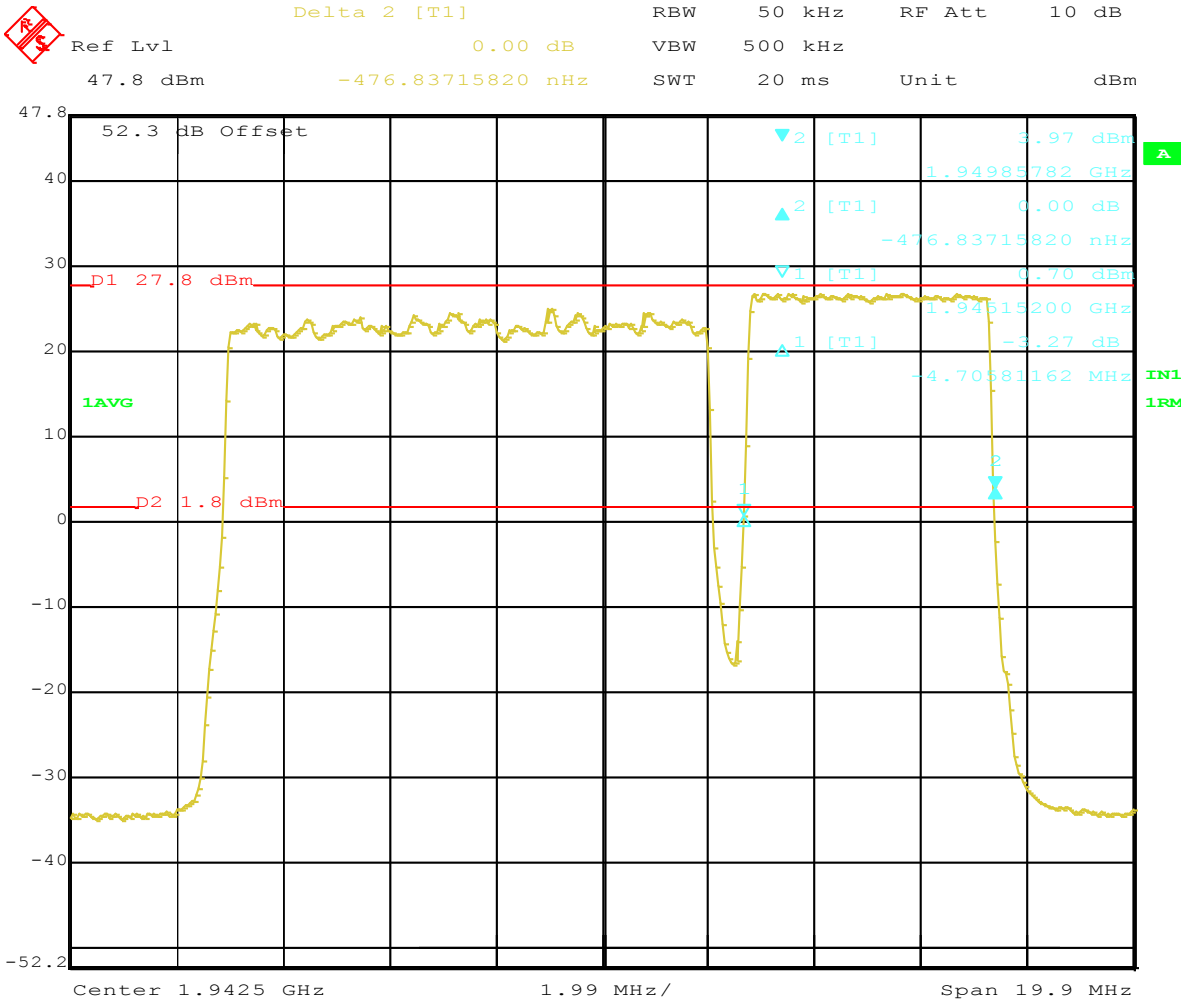
Date: 17.MAY.2016 15:00:32

Contiguous Carriers



Title: 26dB BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A: LR16.1 RRH 1900A; 10+5MHz BW;1935 QPSK&16QAM;1942.5 64QAM
PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date: 17.MAY.2016 15:01:54

Contiguous Carriers

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Title:      26dB BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 10+5MHz BW;1940 QPSK&16QAM;1947.5 64QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       18.MAY.2016  08:38:03
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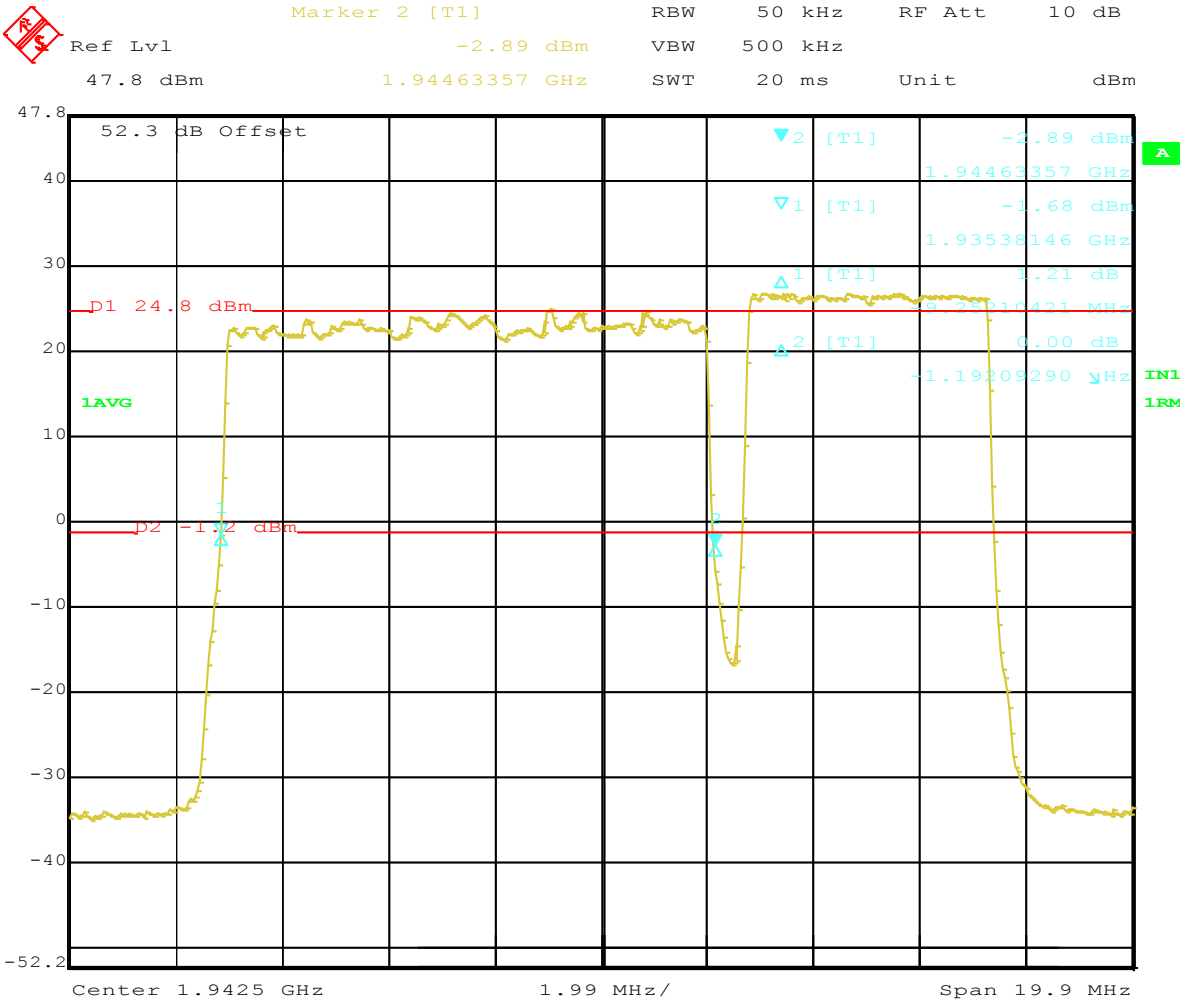
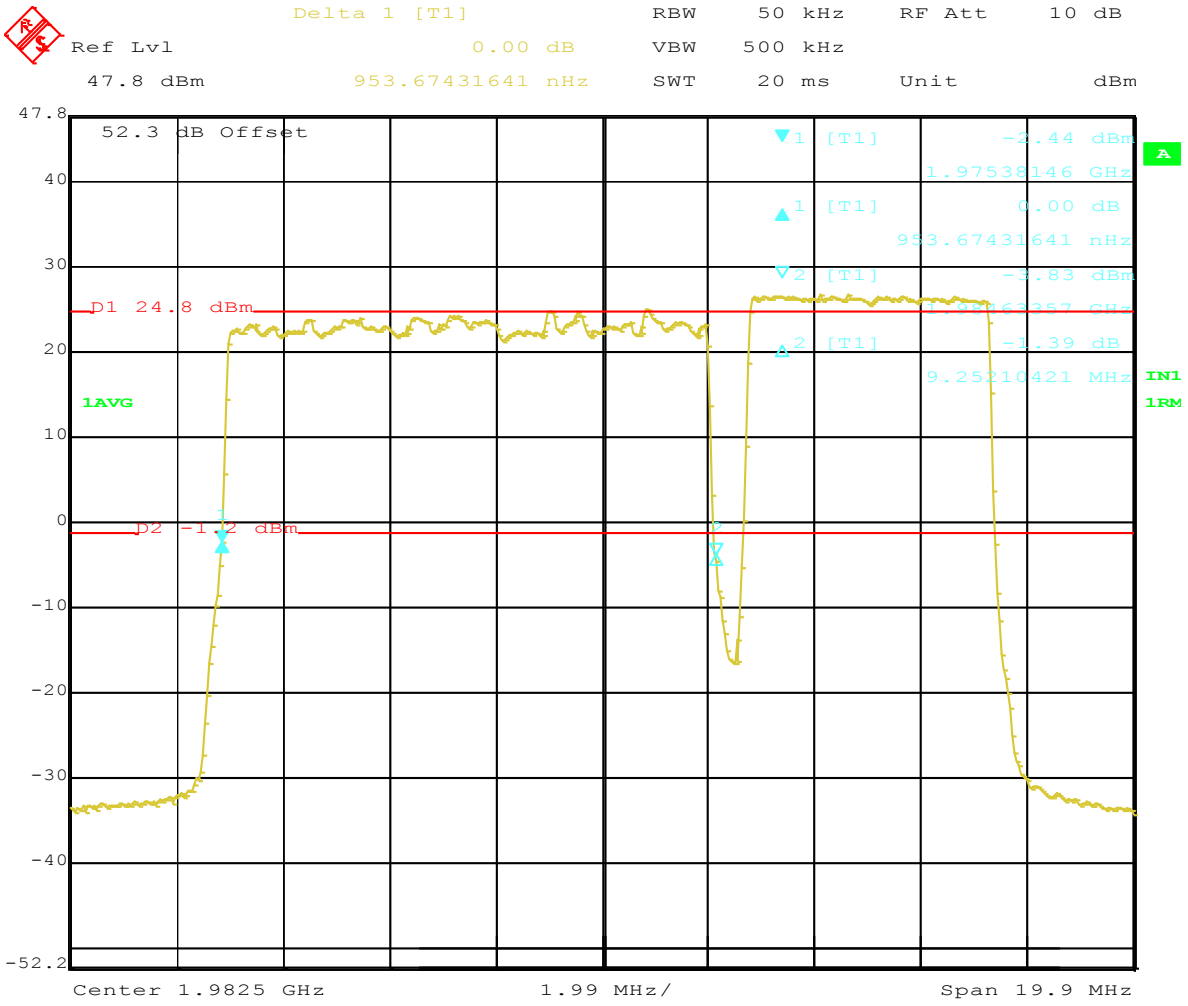
Contiguous Carriers



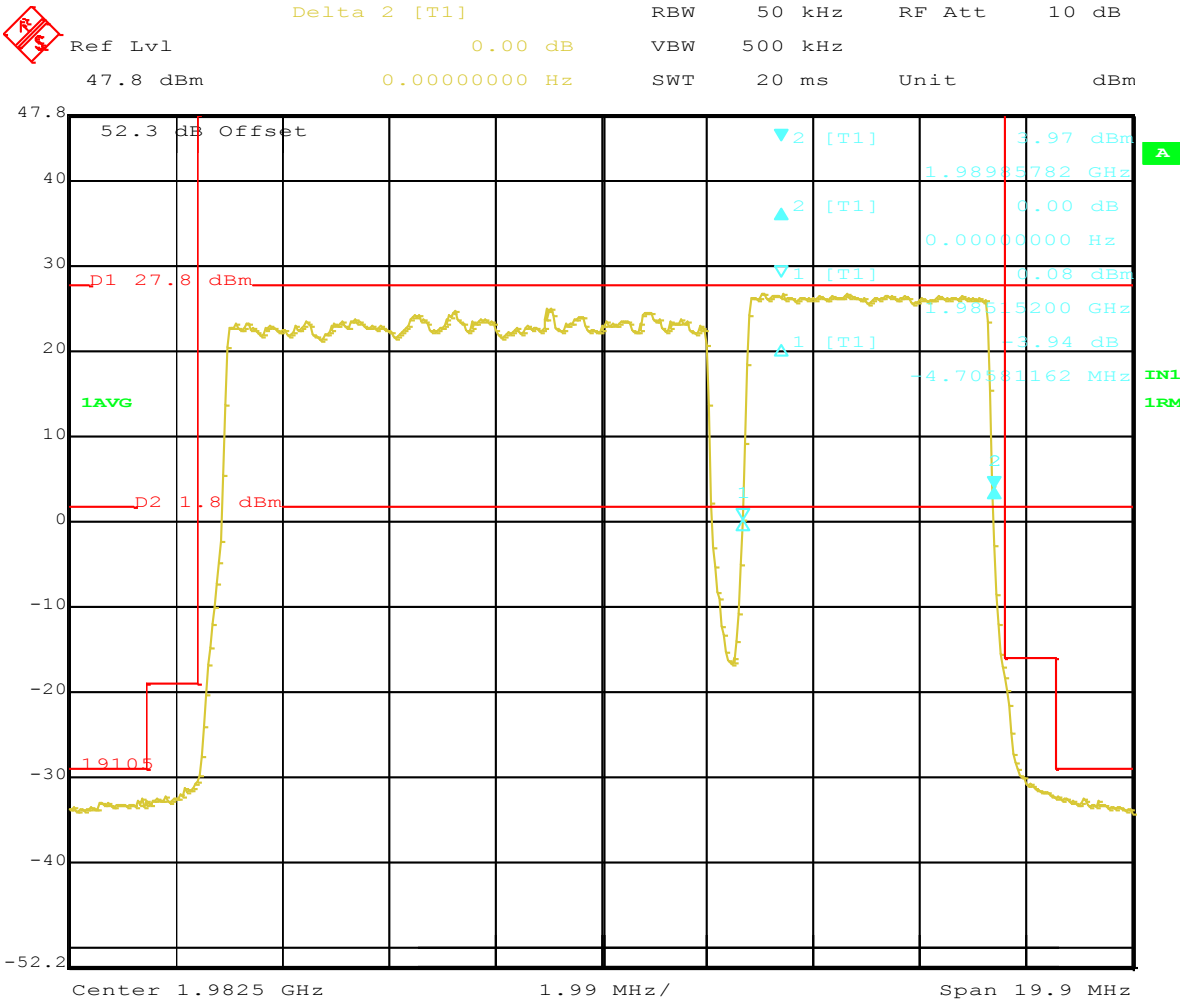
Title: 26dB BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A: LR16.1 RRH 1900A; 10+5MHz BW;1940 QPSK&16QAM;1947.5 64QAM
PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date: 18.MAY.2016 08:39:35

Contiguous Carriers



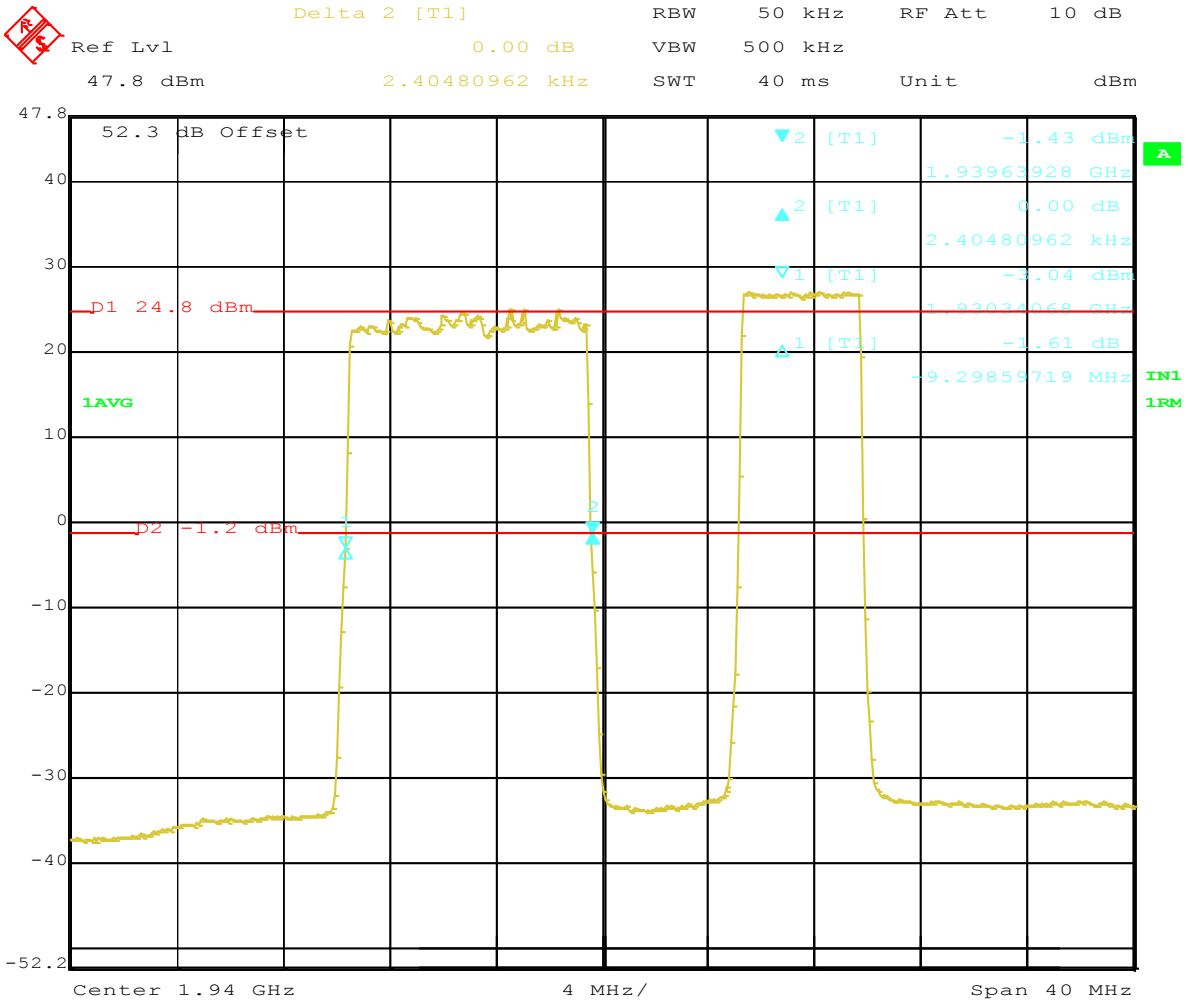
Title: 26dB BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A: LR16.1 RRH 1900A; 10+5MHz BW;1980 QPSK&16QAM;1987.5 64QAM
PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date: 18.MAY.2016 09:35:39

Contiguous Carriers



Title: 26dB BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A: LR16.1 RRH 1900A; 10+5MHz BW;1980 QPSK&16QAM;1987.5 64QAM
PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date: 18.MAY.2016 09:33:28

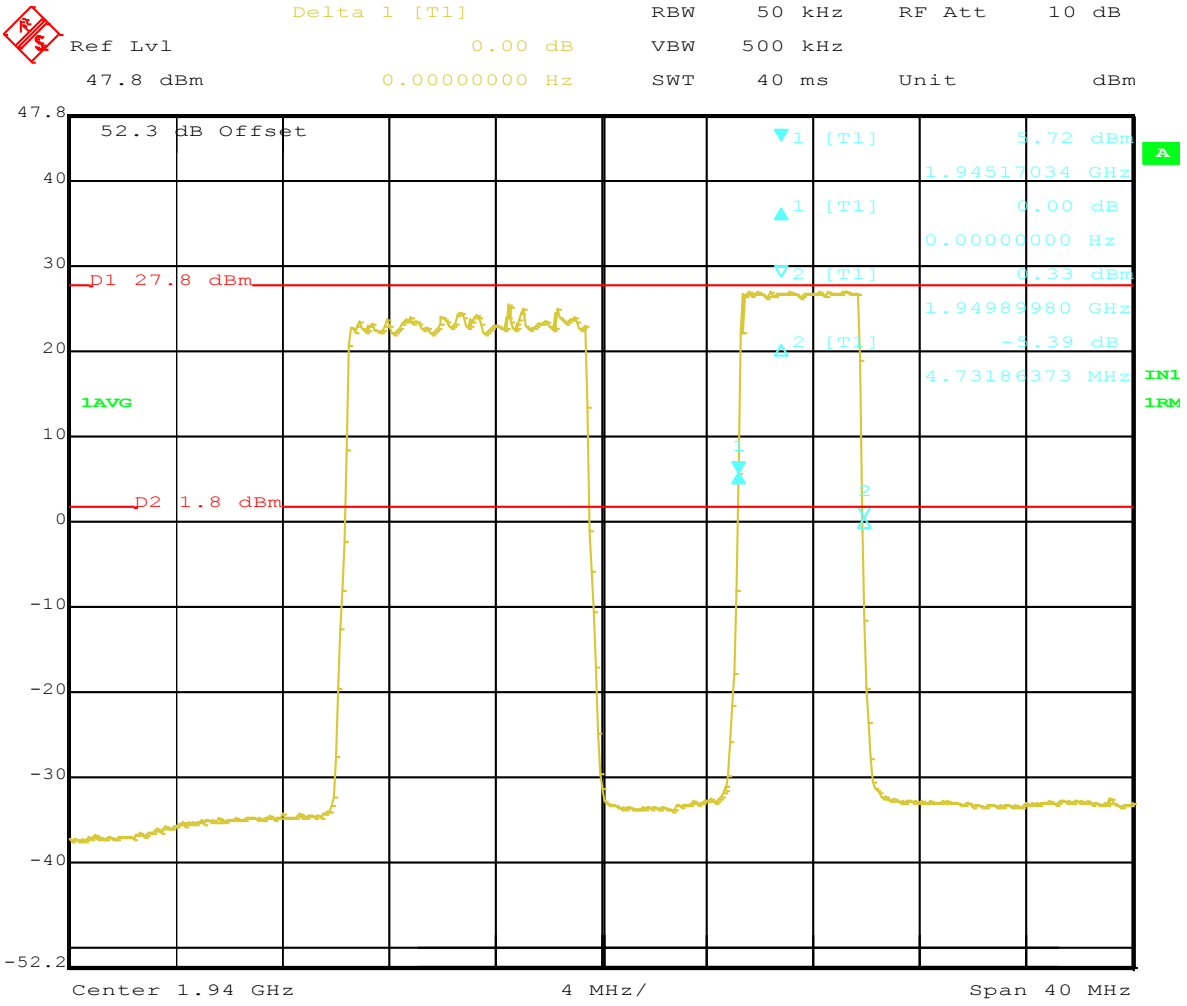
Contiguous Carriers



Title: 26dB BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A: LR16.1 RRH 1900A; 10+5MHz BW;1935 QPSK&16QAM;1947.5 64QAM
PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date: 6.JAN.1997 03:47:51

Test Performed on May 17th 2016

Non-Contiguous Carriers

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Title:      26dB BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 10+5MHz BW;1935 QPSK&16QAM;1947.5 64QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       6.JAN.1997  03:49:11
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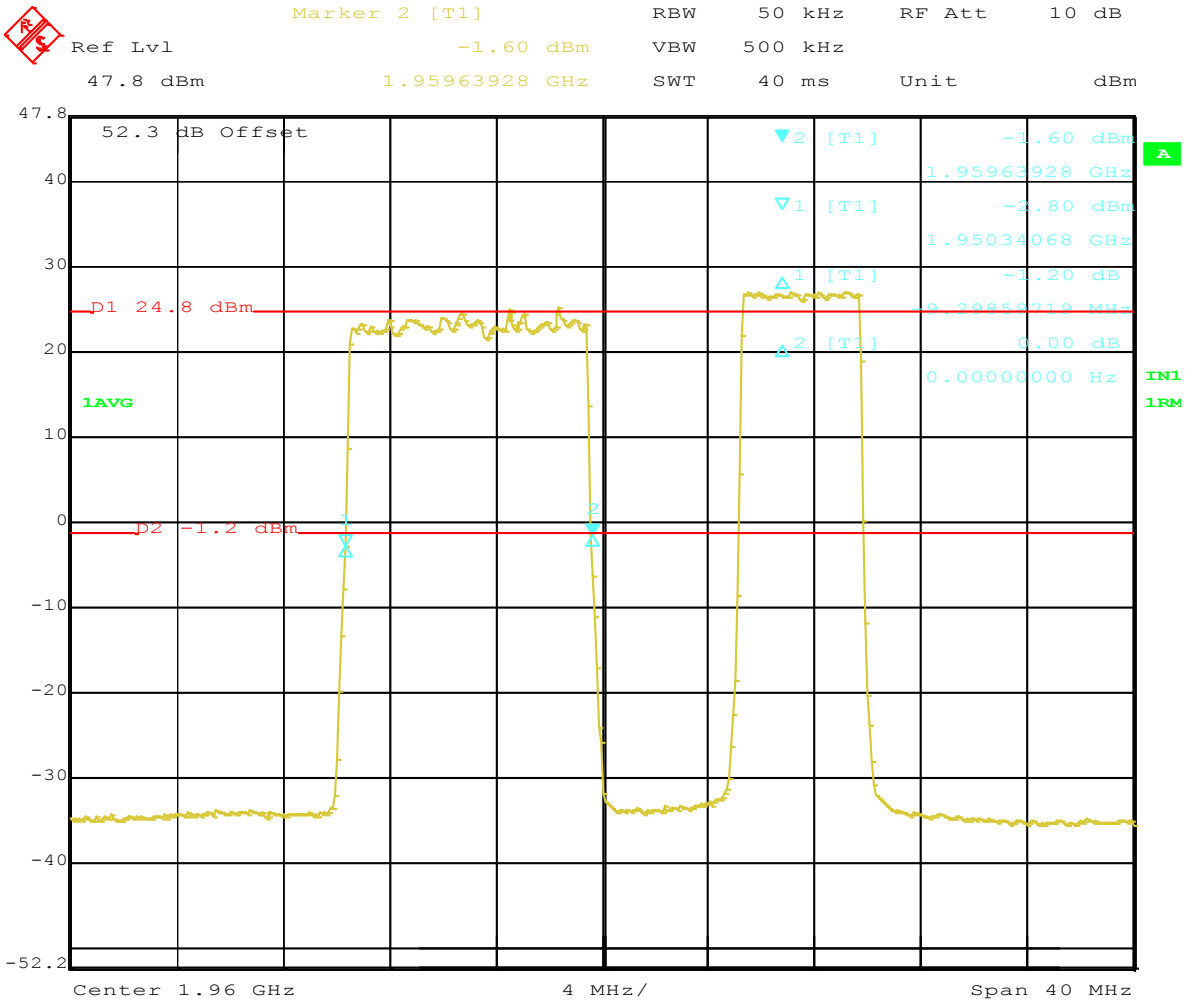
Test Performed on May 17th 2016

Non-Contiguous Carriers

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Title:      26dB BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 10+5MHz BW;1955 QPSK&16QAM;1967.5 64QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       6.JAN.1997  02:08:09
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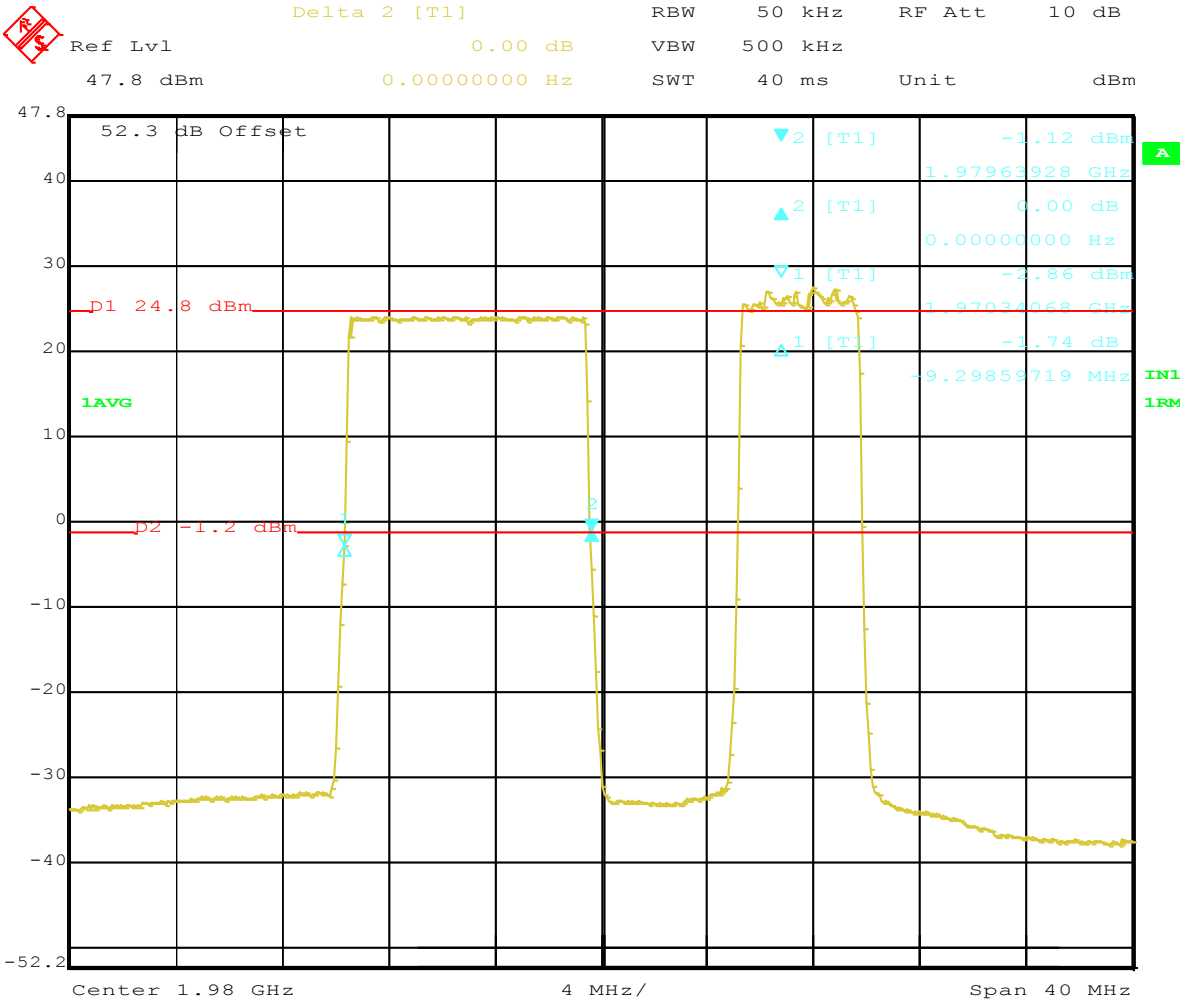
Test Performed on May 17th 2016

Non-Contiguous Carriers

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Title:      26dB BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 10+5MHz BW;1975 64QAM;1987.5 QPSK&16QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       5.JAN.1997  05:56:34
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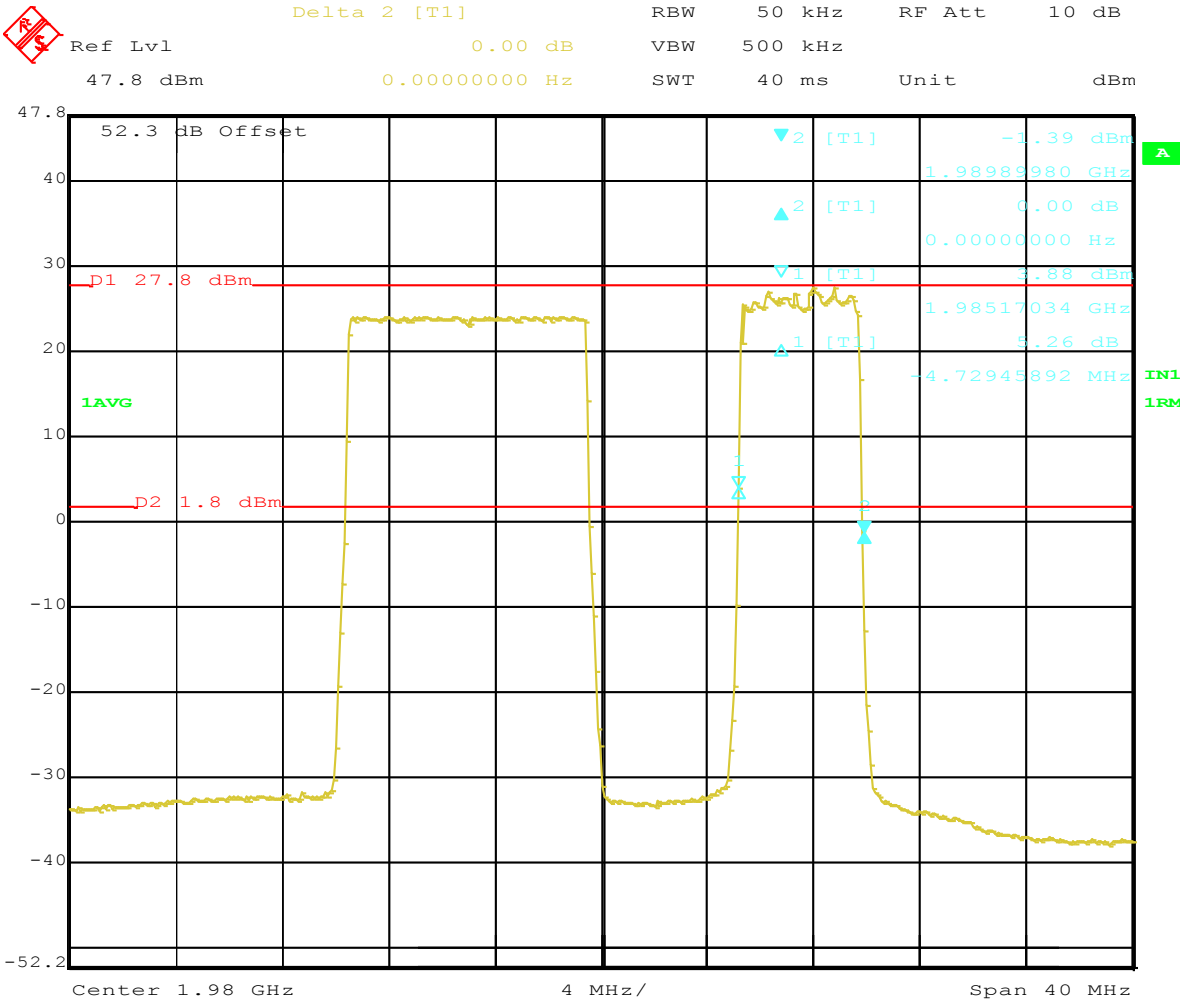
Test Performed on May 16th 2016

Non-Contiguous Carriers




```
Title:      26dB BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 10+5MHz BW;1975 64QAM;1987.5 QPSK&16QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       5.JAN.1997  05:54:37
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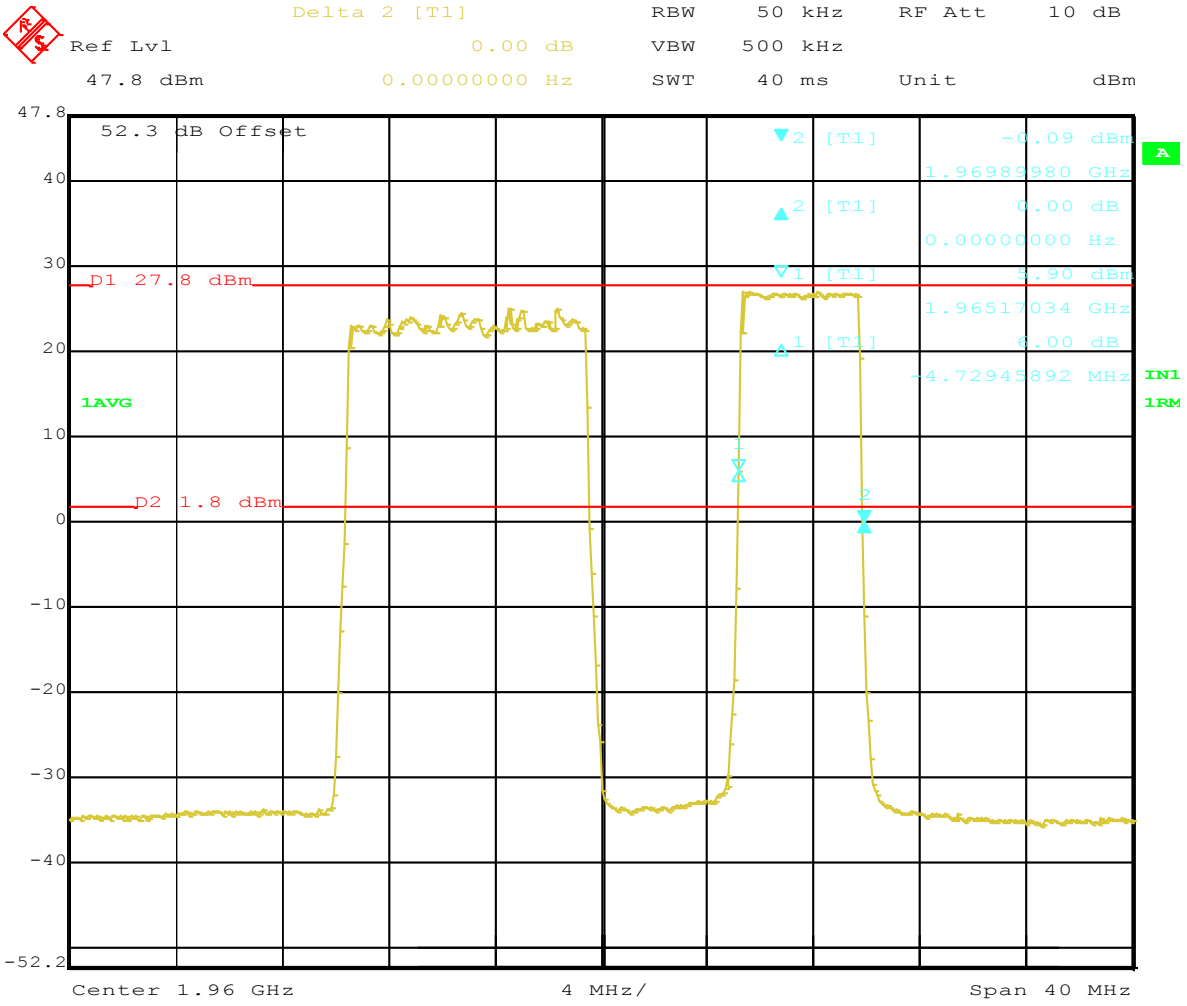
Test Performed on May 16th 2016

Non-Contiguous Carriers

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Title:      26dB BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 10+5MHz BW;1955 QPSK&16QAM;1967.5 64QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       6.JAN.1997  02:09:42
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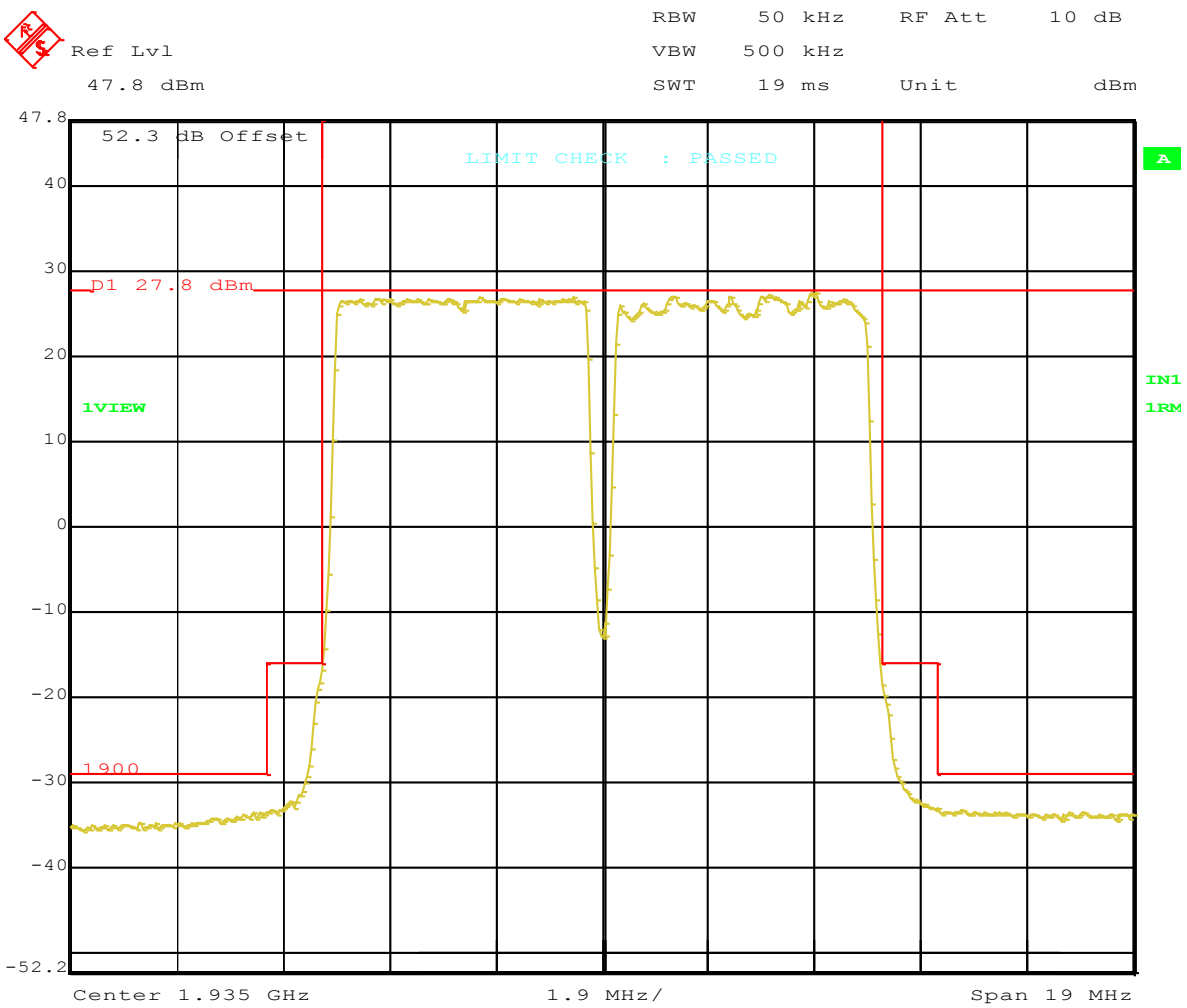
Test Performed on May 17th 2016

Non-Contiguous Carriers

FIGURE 4.3.2

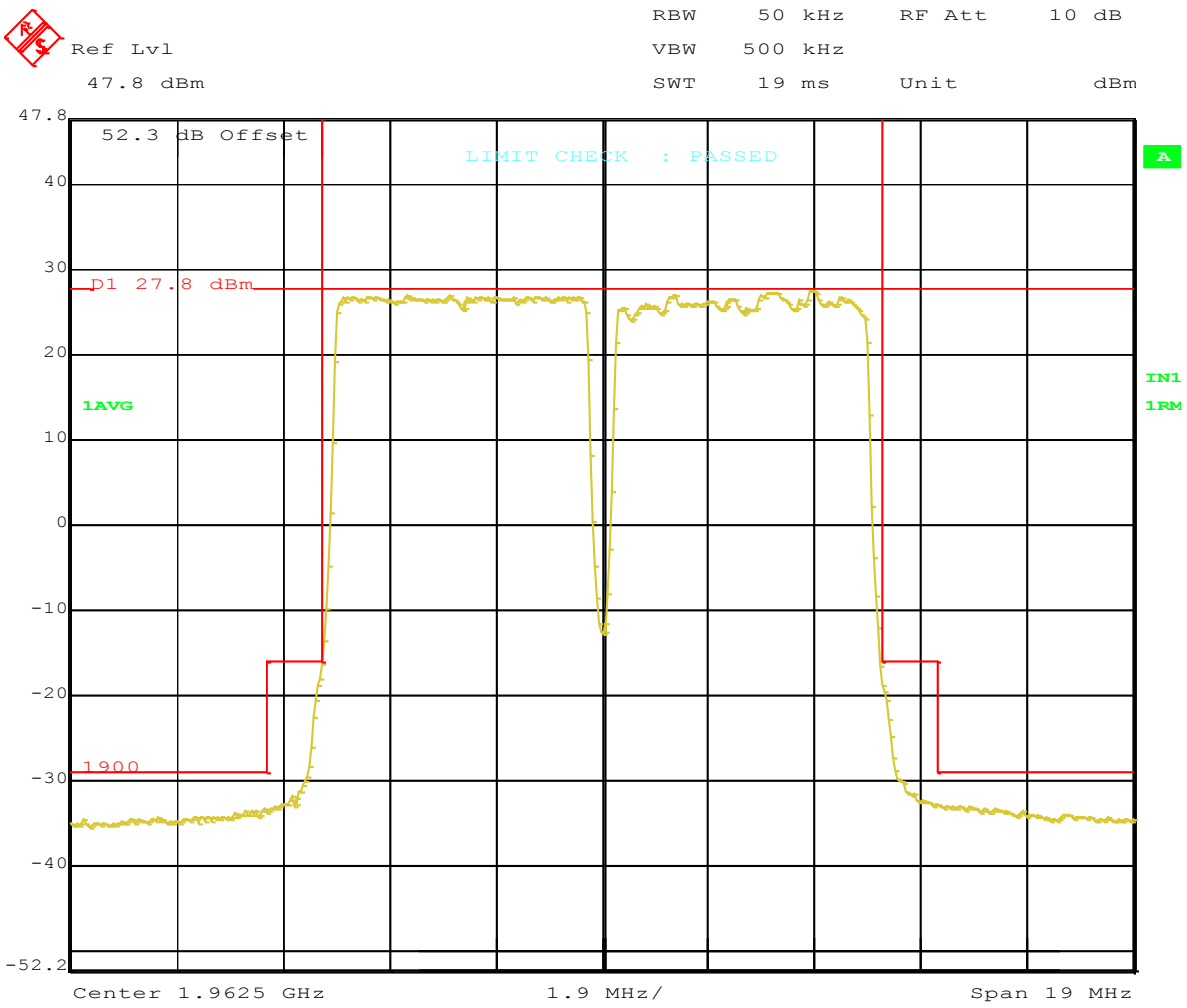
OCCUPIED BANDWIDTH PLOTS



Title: OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A: LR16.1 RRH 1900A; 5+5MHz BW;1932.5 64QAM;1937.5 QPSK&16QAM
PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date: 5.JAN.1997 02:58:06

Test Performed on May 6th 2016

Contiguous Carriers

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Title:      OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 5+5MHz BW;1960 64QAM;1965 QPSK&16QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       5.JAN.1997  03:34:55
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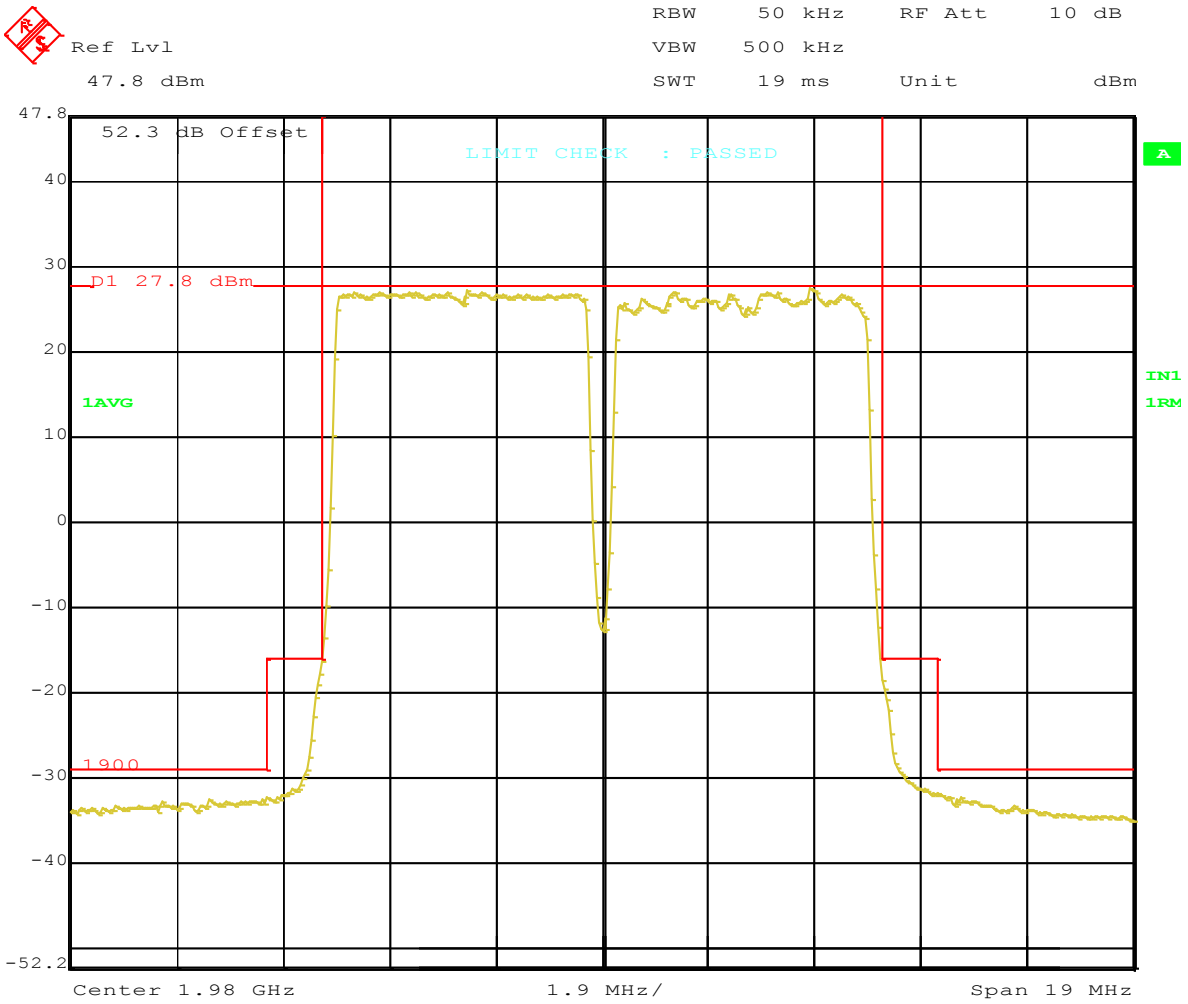
Test Performed on May 6th 2016

Contiguous Carriers

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Title:      OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 5+5MHz BW;1977.5 64QAM;1982.5 QPSK&16QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       5.JAN.1997  05:33:48
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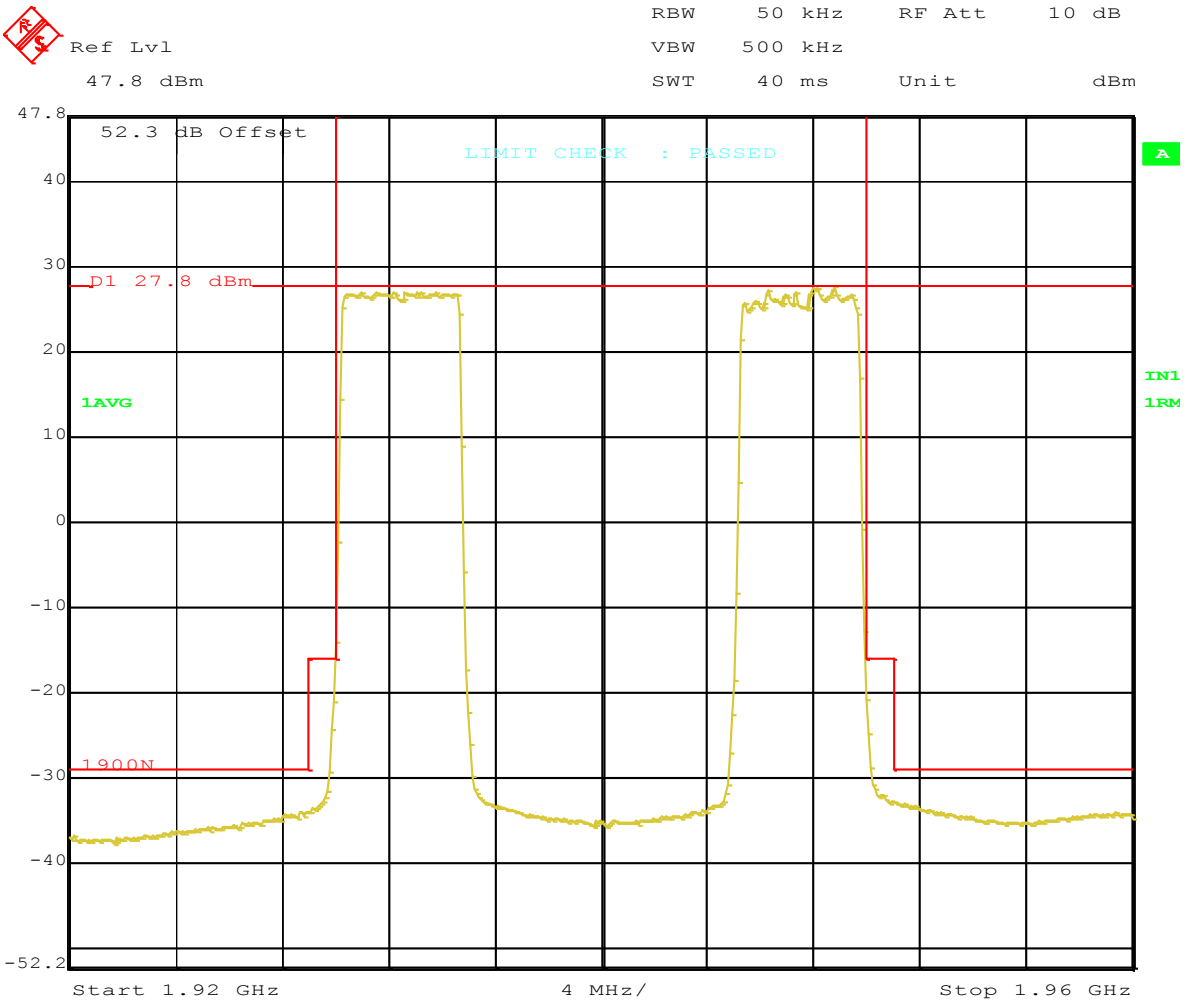
Test Performed on May 6th 2016

Contiguous Carriers

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Title:      OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 5+5MHz BW;1932.5 64QAM;1947.5 QPSK&16QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       1.JAN.1997  01:40:05
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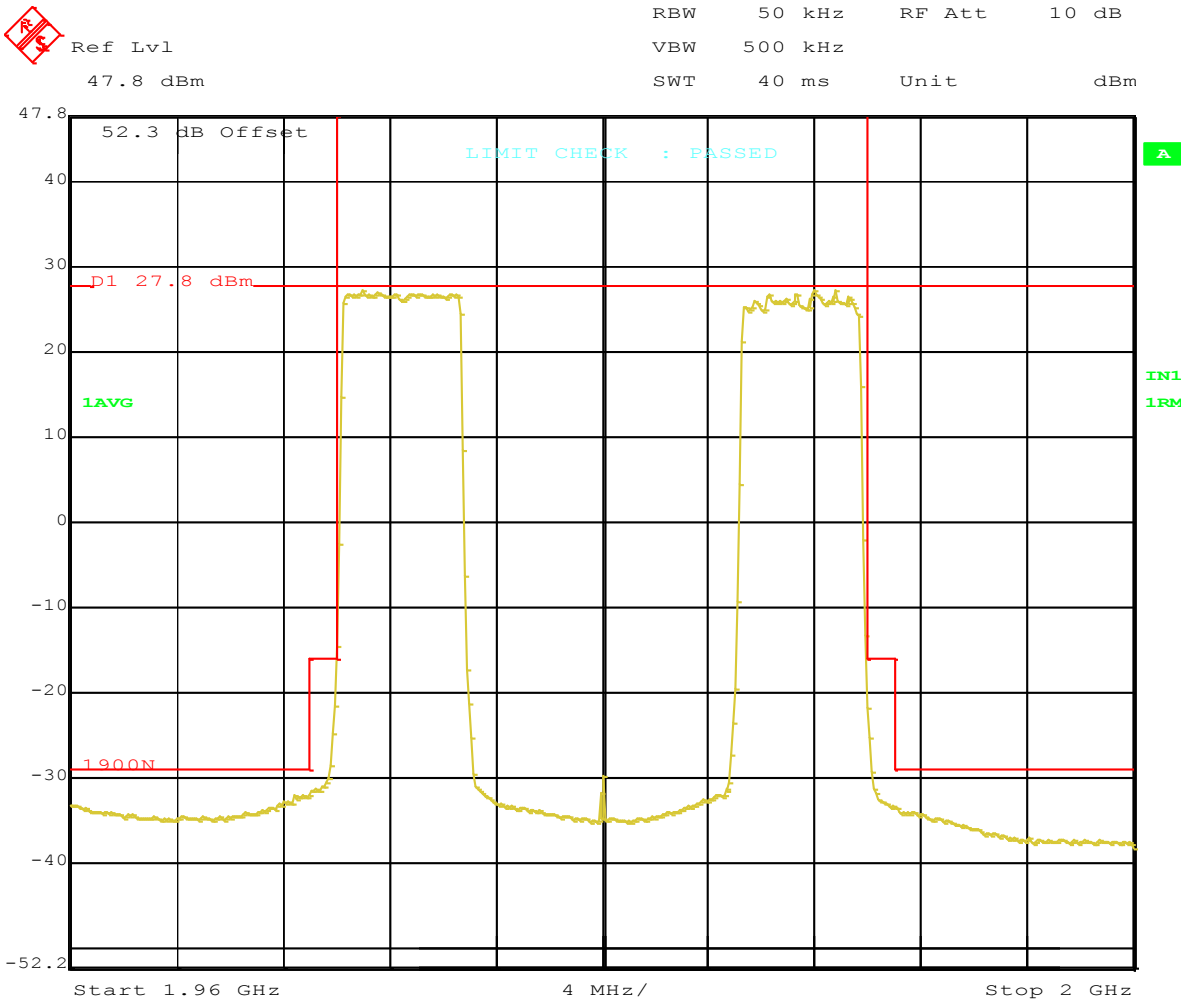
Non-Contiguous Carriers limited to a maximum of 10 MHz apart.

Test Performed on May 11th 2016

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Title:      OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 5+5MHz BW;1972.5 64QAM;1987.5 QPSK&16QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       2.JAN.1997  01:05:55
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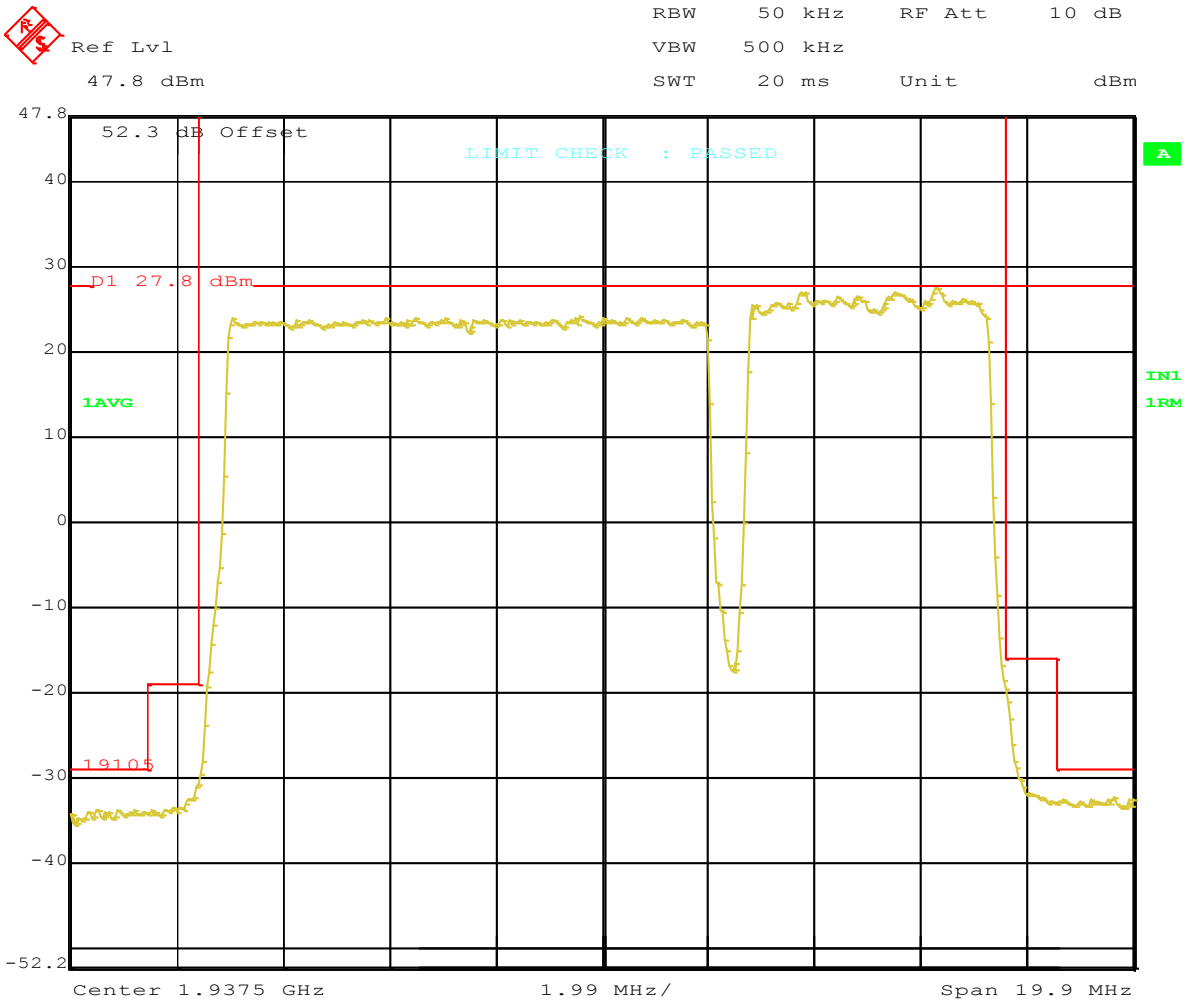
Non-Contiguous Carriers limited to a maximum of 10 MHz apart.

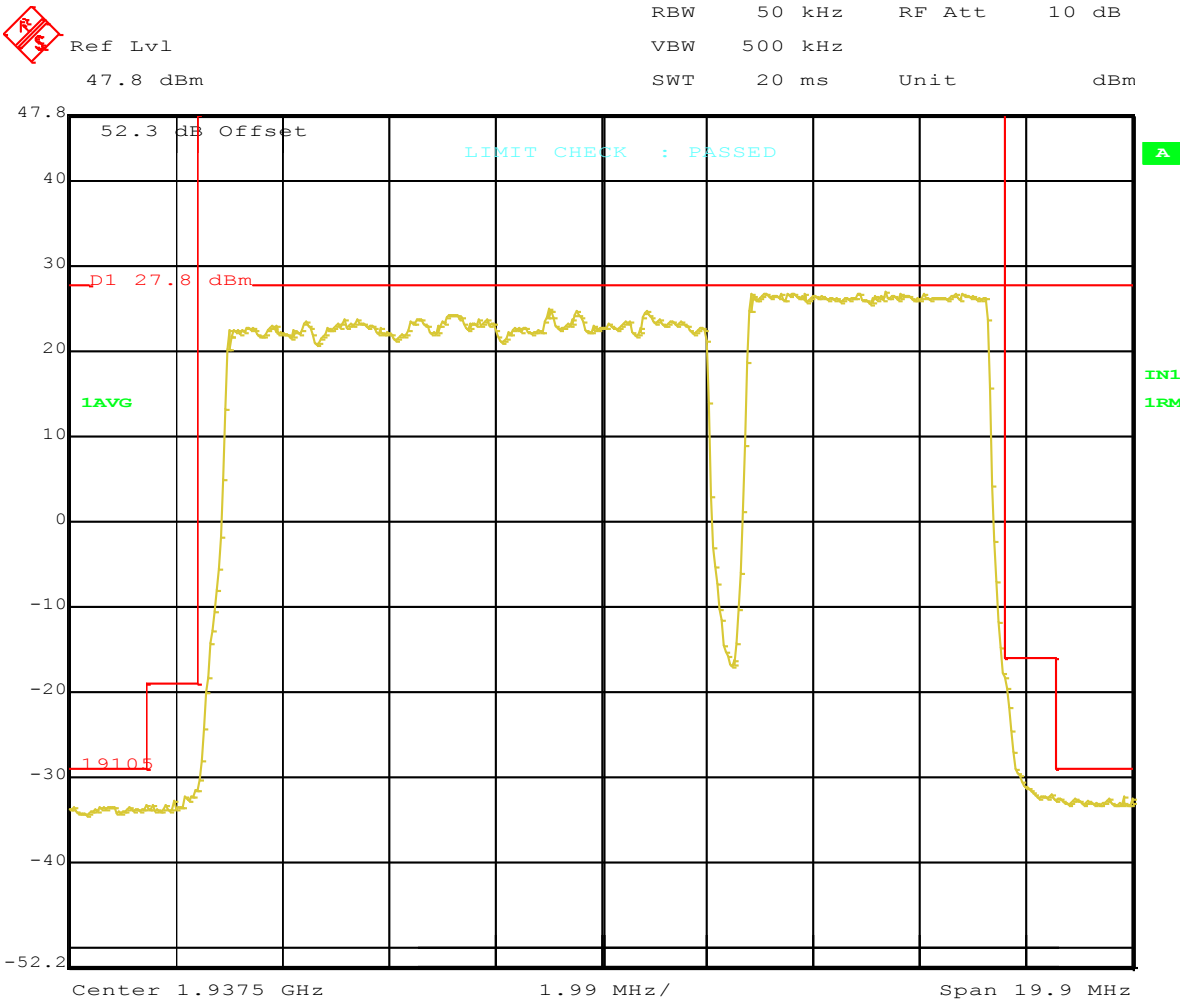
Test Performed on May 12th 2016



Title: OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A: LR16.1 RRH 1900A; 10+5MHz BW;1935 64QAM;1942.5 QPSK&16QAM
PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date: 2.JAN.1997 06:18:27

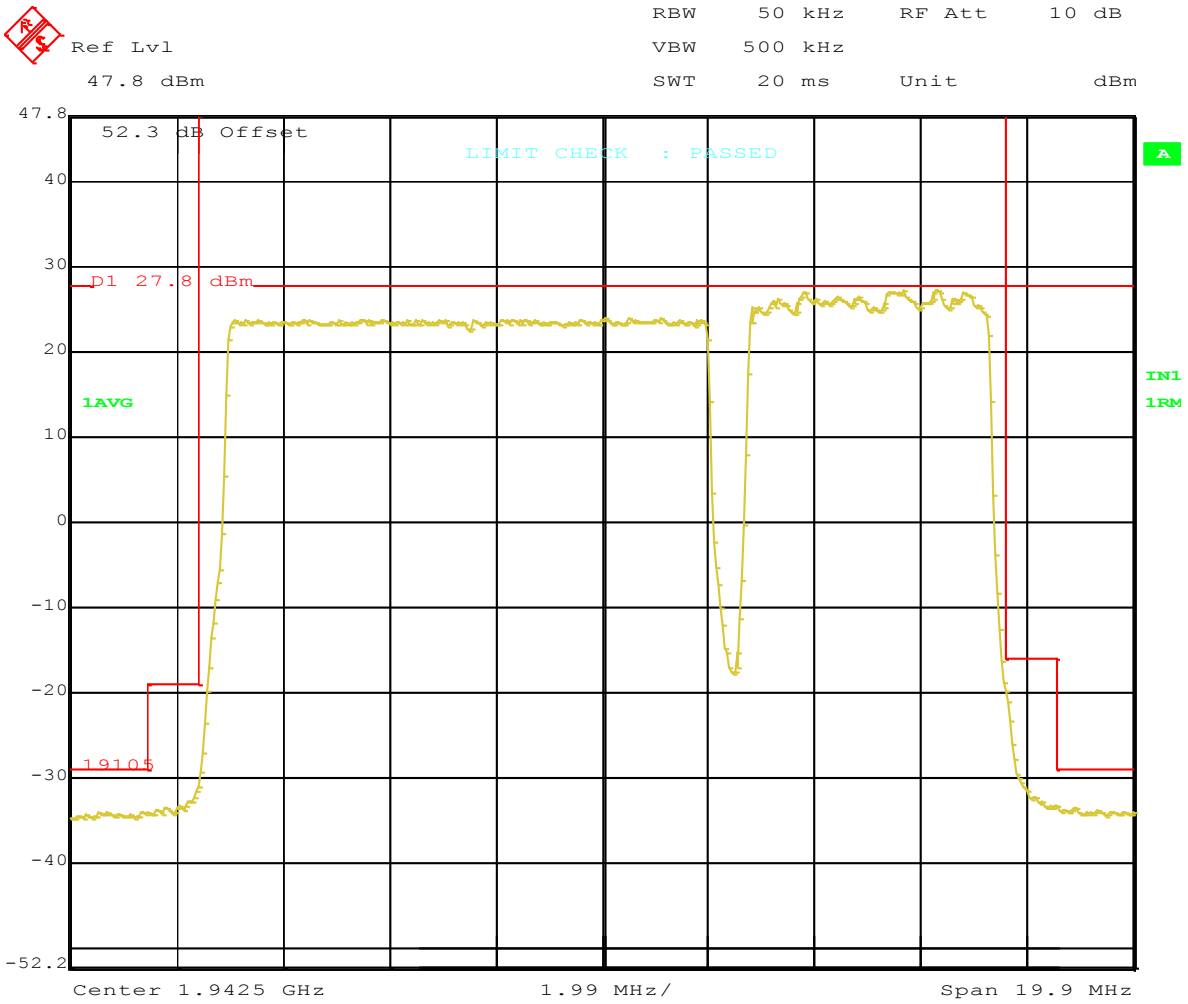
Test Performed on May 12th 2016

Contiguous Carriers



Title: OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A: LR16.1 RRH 1900A; 10+5MHz BW;1935 QPSK&16QAM;1942.5 64QAM
PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date: 17.MAY.2016 15:03:16

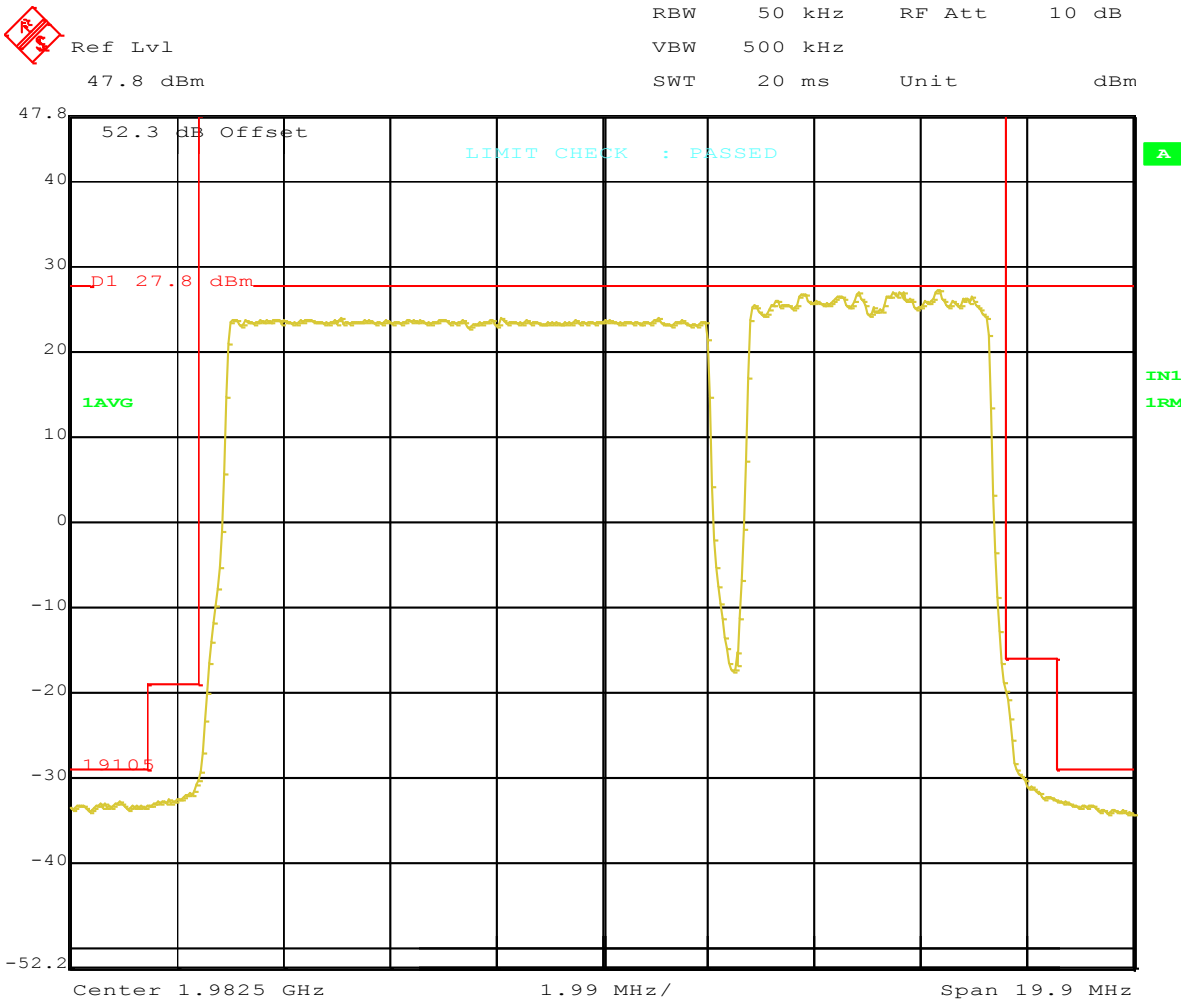
Contiguous Carriers



Title: OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A: LR16.1 RRH 1900A; 10+5MHz BW;1940 64QAM;1947.5 QPSK&16QAM
PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date: 5.JAN.1997 00:03:43

Test Performed on May 6th 2016

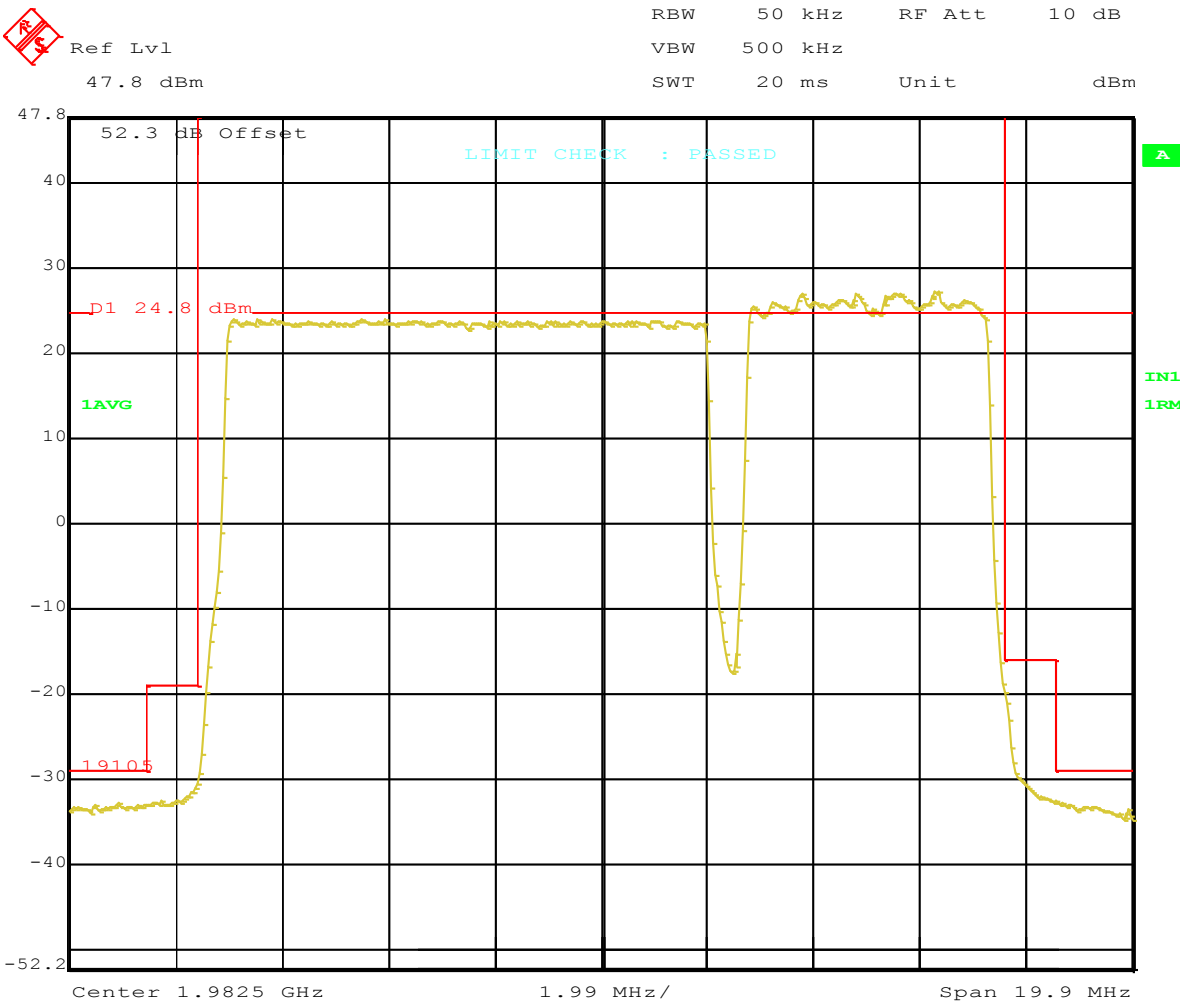
Contiguous Carriers



Title: OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A: LR16.1 RRH 1900A; 10+5MHz BW;1980 64QAM;1987.5 QPSK&16QAM
PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date: 5.JAN.1997 03:02:29

Test Performed on May 6th 2016

Contiguous Carriers

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Title:      OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 10+5MHz BW;1980 64QAM;1987.5 QPSK&16QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       5.JAN.1997  03:03:04
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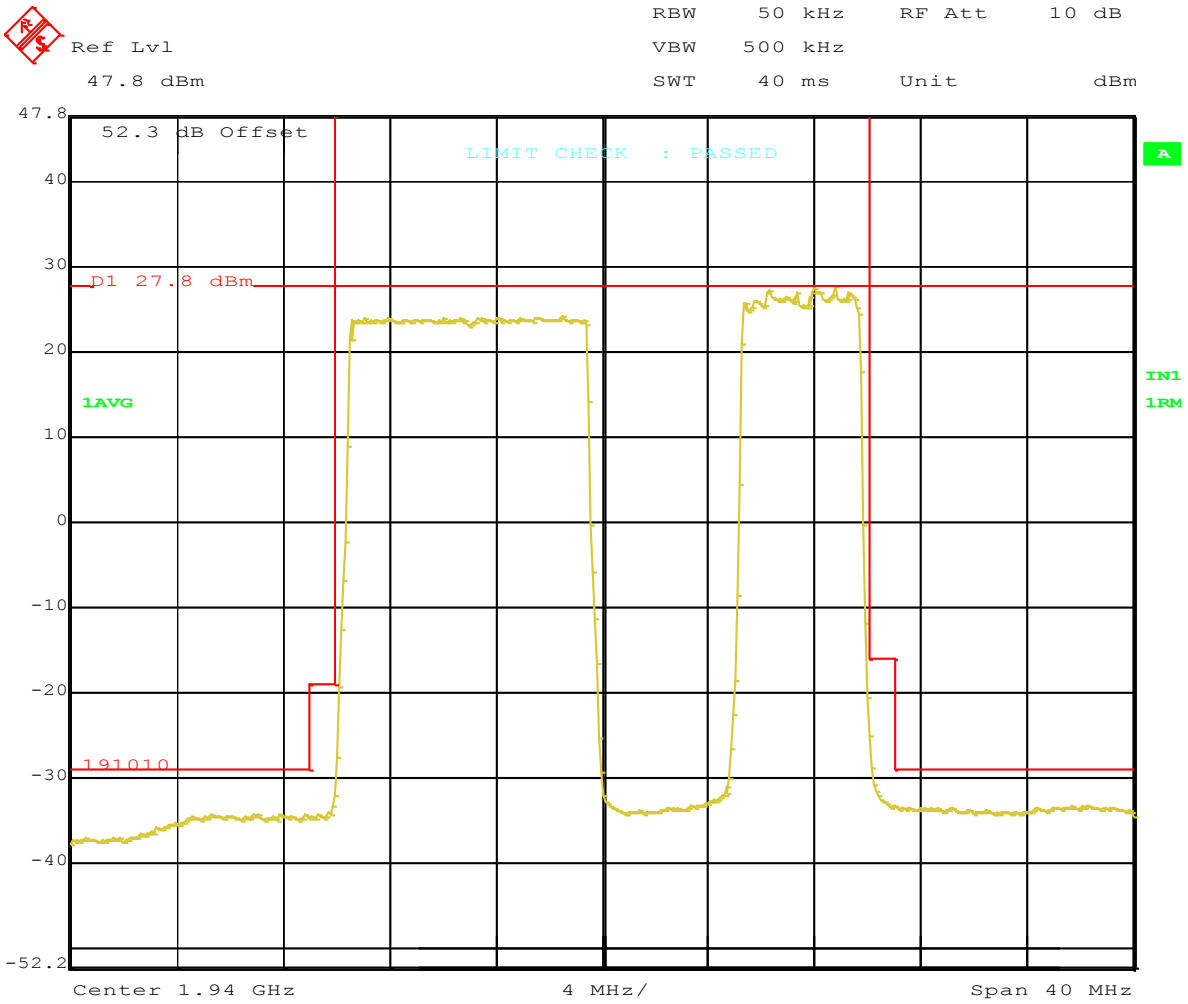
Test Performed on May 6th 2016

Contiguous Carriers

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Title:      OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 10+5MHz BW;1935 64QAM;1947.5 QPSK&16QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       5.JAN.1997  07:13:18
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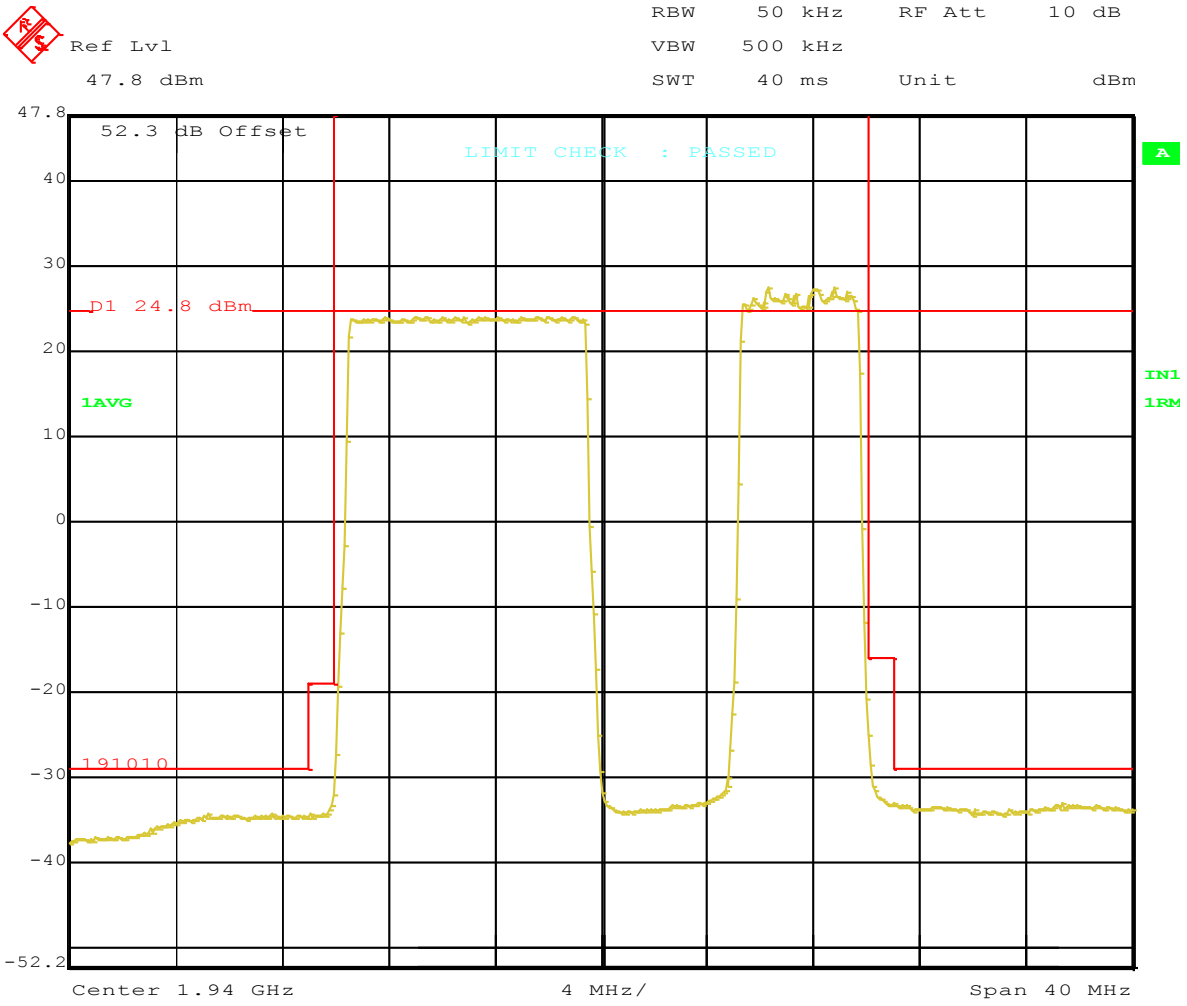
Test Performed on May 16th 2016

Non-Contiguous Carriers

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Title:      OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 10+5MHz BW;1935 64QAM;1947.5 QPSK&16QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       5.JAN.1997  07:13:55
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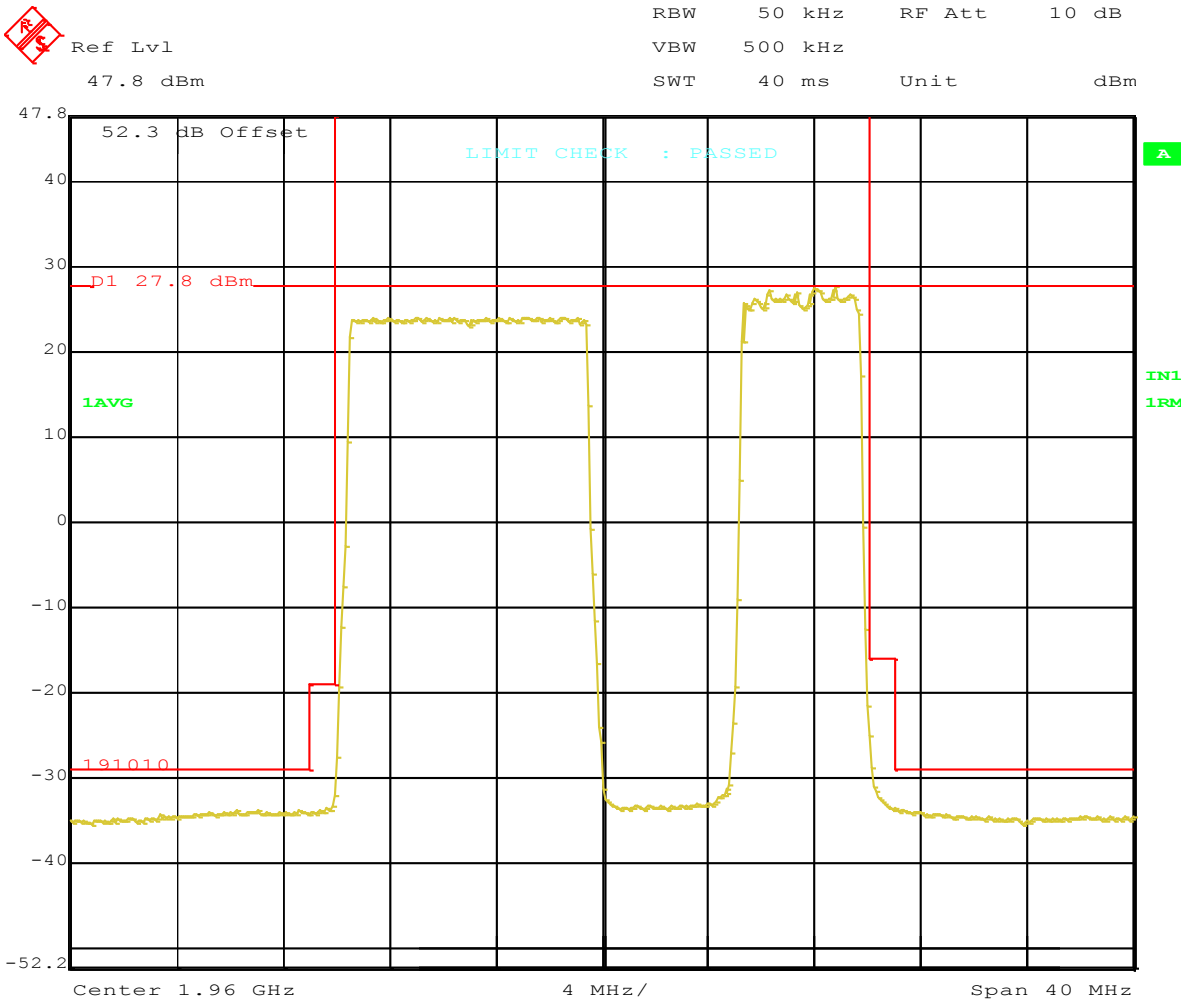
Test Performed on May 16th 2016

Non-Contiguous Carriers

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Title:      OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 10+5MHz BW;1955 64QAM;1967.5 QPSK&16QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       6.JAN.1997  00:57:20
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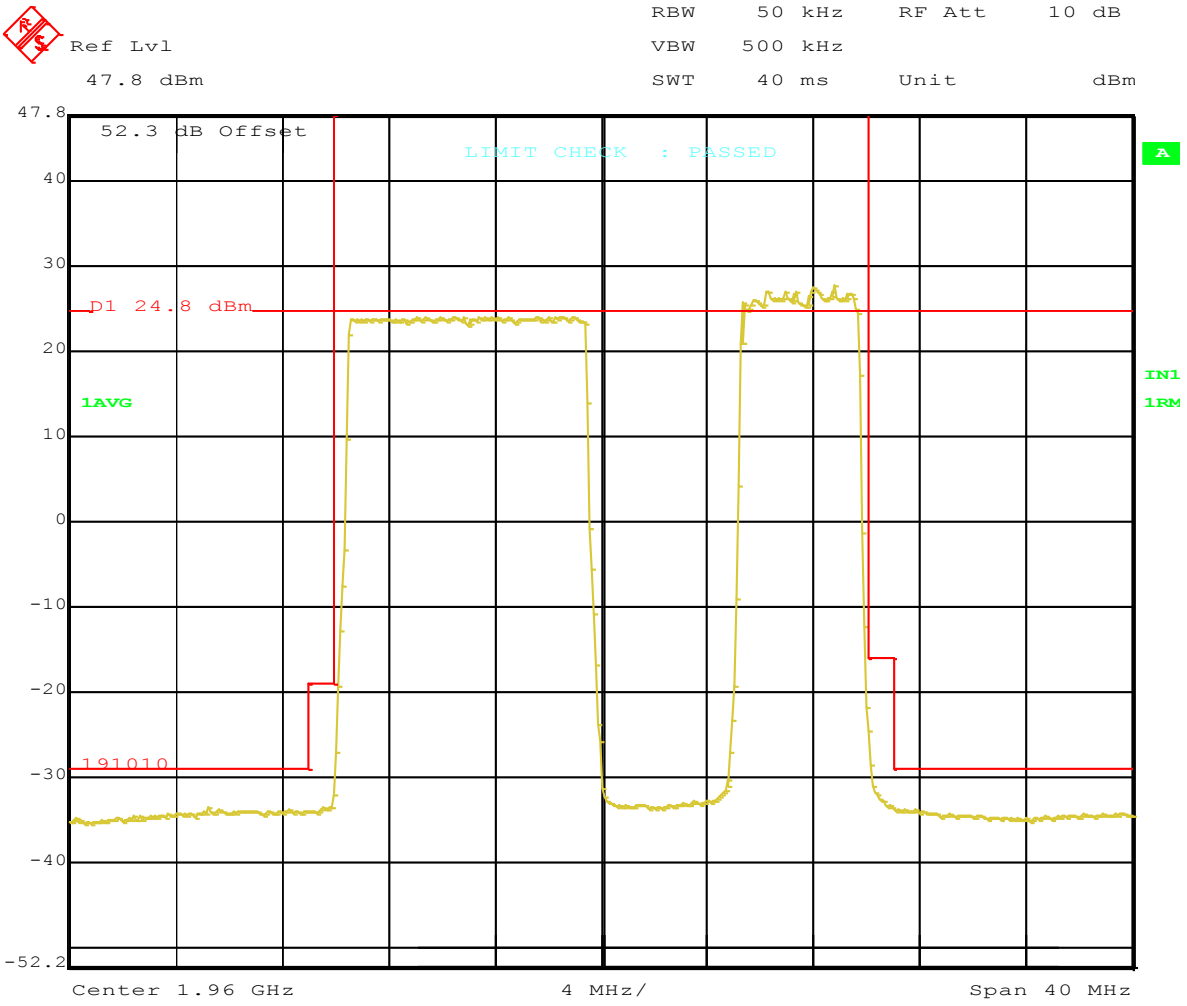
Test Performed on May 17th 2016

Non-Contiguous Carriers

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Title:      OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 10+5MHz BW;1955 64QAM;1967.5 QPSK&16QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       6.JAN.1997  00:56:32
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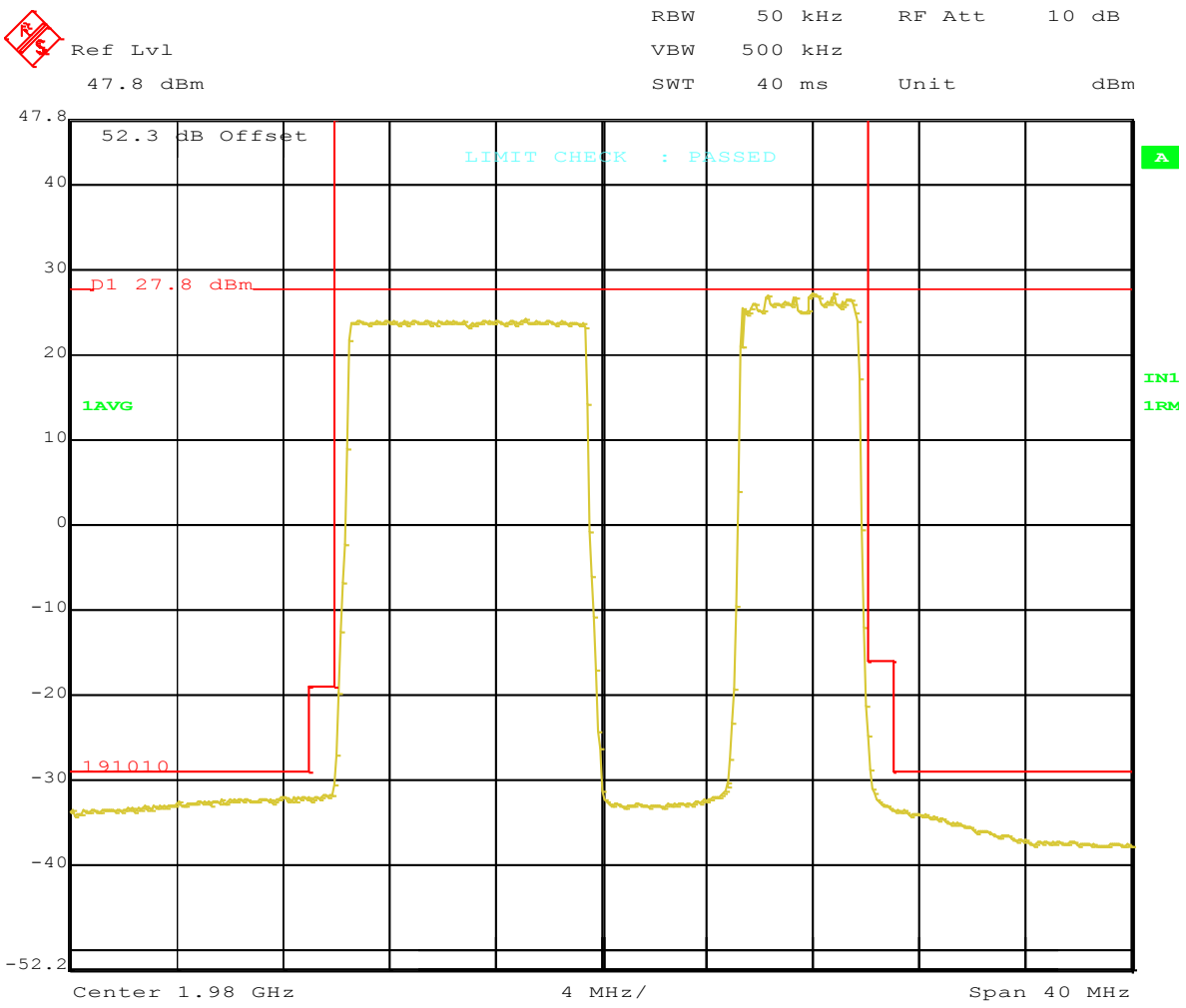
Test Performed on May 17th 2016

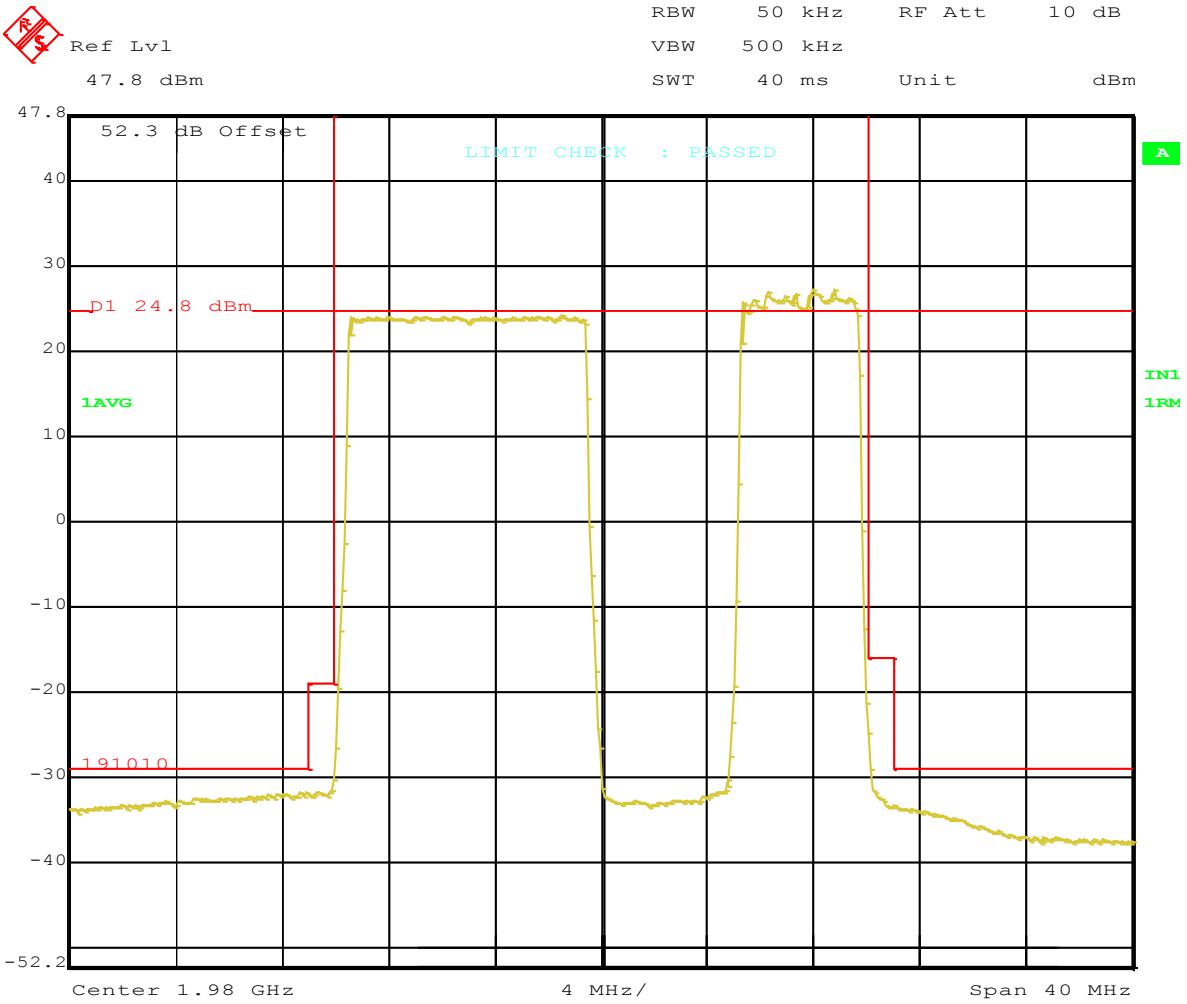
Non-Contiguous Carriers



Title: OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A: LR16.1 RRH 1900A; 10+5MHz BW;1975 64QAM;1987.5 QPSK&16QAM
PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date: 5.JAN.1997 05:52:06

Test Performed on May 16th 2016

Non-Contiguous Carriers

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Title:      OCCUPIED BANDWIDTH; TEST ENGINEER: SEG; PORT RX1
Comment A:  LR16.1 RRH 1900A; 10+5MHz BW;1975 64QAM;1987.5 QPSK&16QAM
            PWR:60W; 2x2 MIMO; FCC PRT 24; FCCID:AS5ONEBTS-27
Date:       5.JAN.1997  05:51:20
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Test Performed on May 16th 2016

Non-Contiguous Carriers

4.4 Section 2.1051 MEASUREMENT REQUIRED: SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS

This test measures the emissions of spurious signals which may come from harmonic, parasitic, intermodulation and frequency conversion products and are outside the necessary bandwidth but exclude out-of-band emissions.

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

The measurement configurations and carrier setup were the same as in Section 4.3. The emission limits and the setting of measurement equipment for the unwanted emissions measurement were given in Table 4.3.3 and provided in Table 4.4.1, where per FCC CFR 47, Sections 2.1051 and 2.1057(c), the spurious emissions attenuated more than 20 dB below the permissible value need not be reported.

Table 4.4.1 Conducted Spurious Emissions Limit

Frequency of Emission (MHz)	Required Limit (2x2 MIMO) (dBm)	Reportable Limit (dBm)	Detector/RBW
10-20,000	-16	-36	Average/1MHz

The measurements were performed with a spectrum analyzer, which was calibrated in accordance with ISO 9001 process. 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 RMS average detector was used.

The measurement met the requirements of ANSI C63.26 paragraphs 5.2.4.4.1 and 5.7 which require that the number of points in the sweep be > 2 × Span/RBW.

The spurious emissions in the frequency range measured are well under the required reportable emission limit for all carrier bandwidth with QPSK, 16QAM and 64QAM modulations evaluated. Therefore, there are no reportable emissions.

4.4.1 Results:

The worst case out-of-block spurious emissions in the entire spectrum investigated are reported on the plots below. The measurement results demonstrate that the subject of the application is in full compliance with the Rules of the Commission.

FIGURE 4.3.3

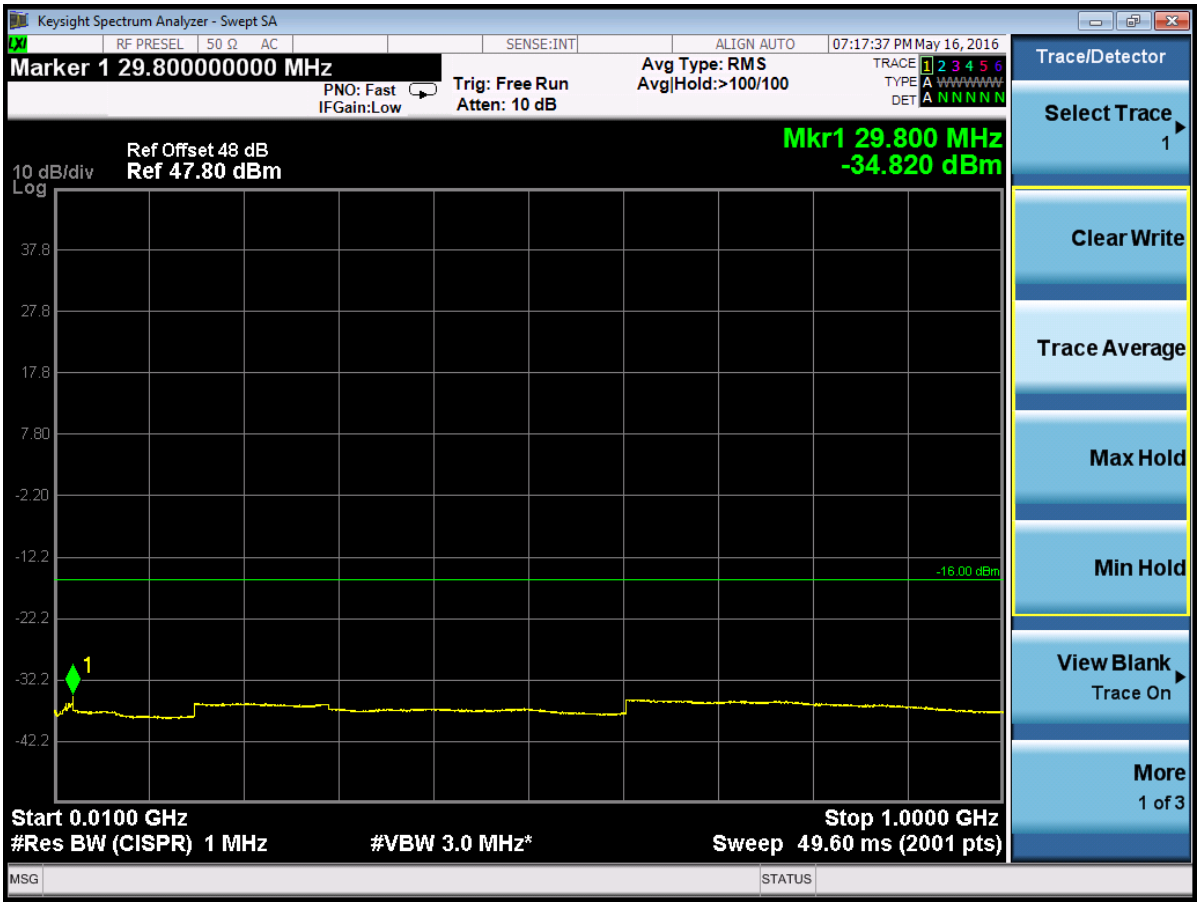
TX SPURIOUS EMISSIONS PLOTS

(WORST CASE DATA)

10 +5 MHz BANDWIDTH

1940 MHz - 64QAM

1947.5 MHz – QPSK/16QAM

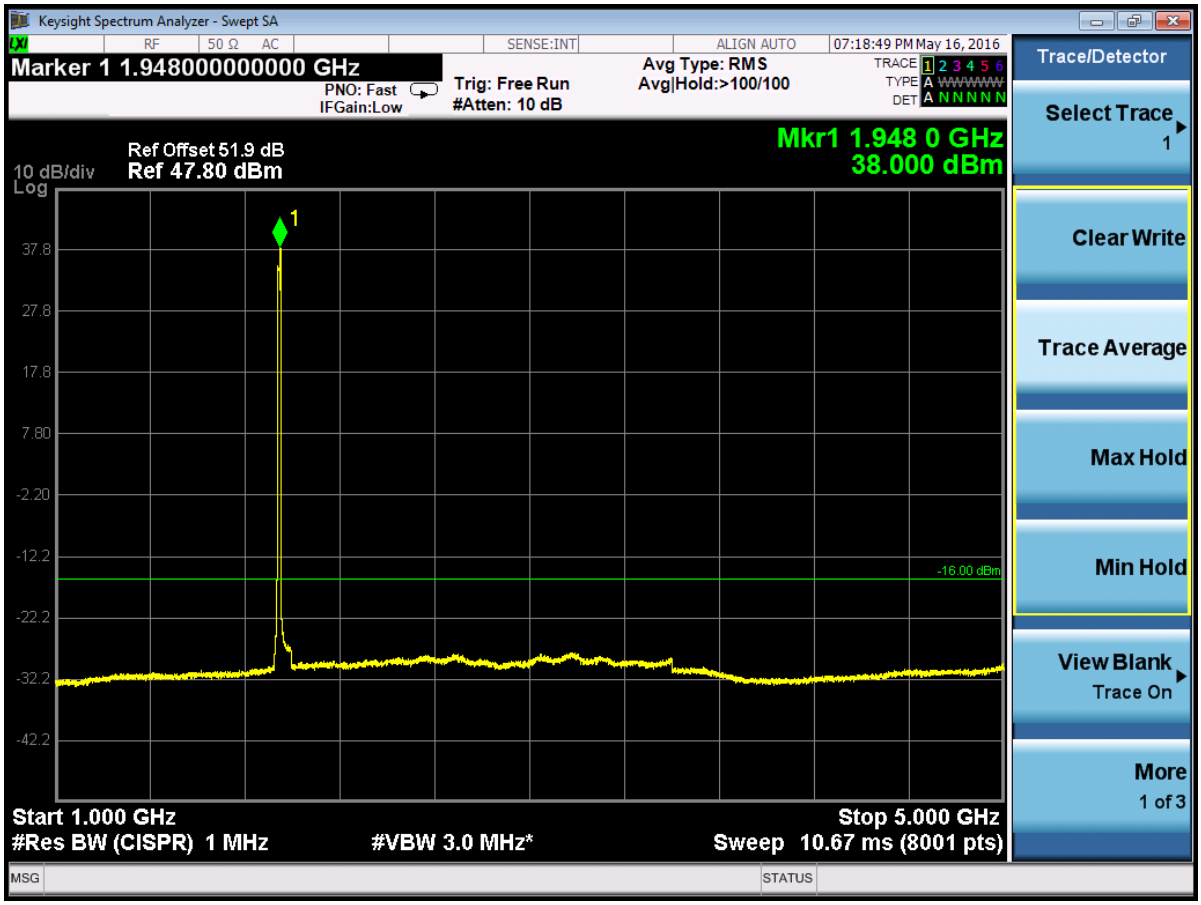


TX Spurious Emissions; Test Engineer: SEG; Port TX1

LR 16.1 RRH 1900A; 10+5 MHz BW Contiguous; 1940 MHz 64QAM, 1947.5 MHz QPSK &

16QAM; Power: 60 Watts; 2x2 MIMO; FCC Part 24; FCCID: AS5ONEBTS-27

Contiguous Carriers

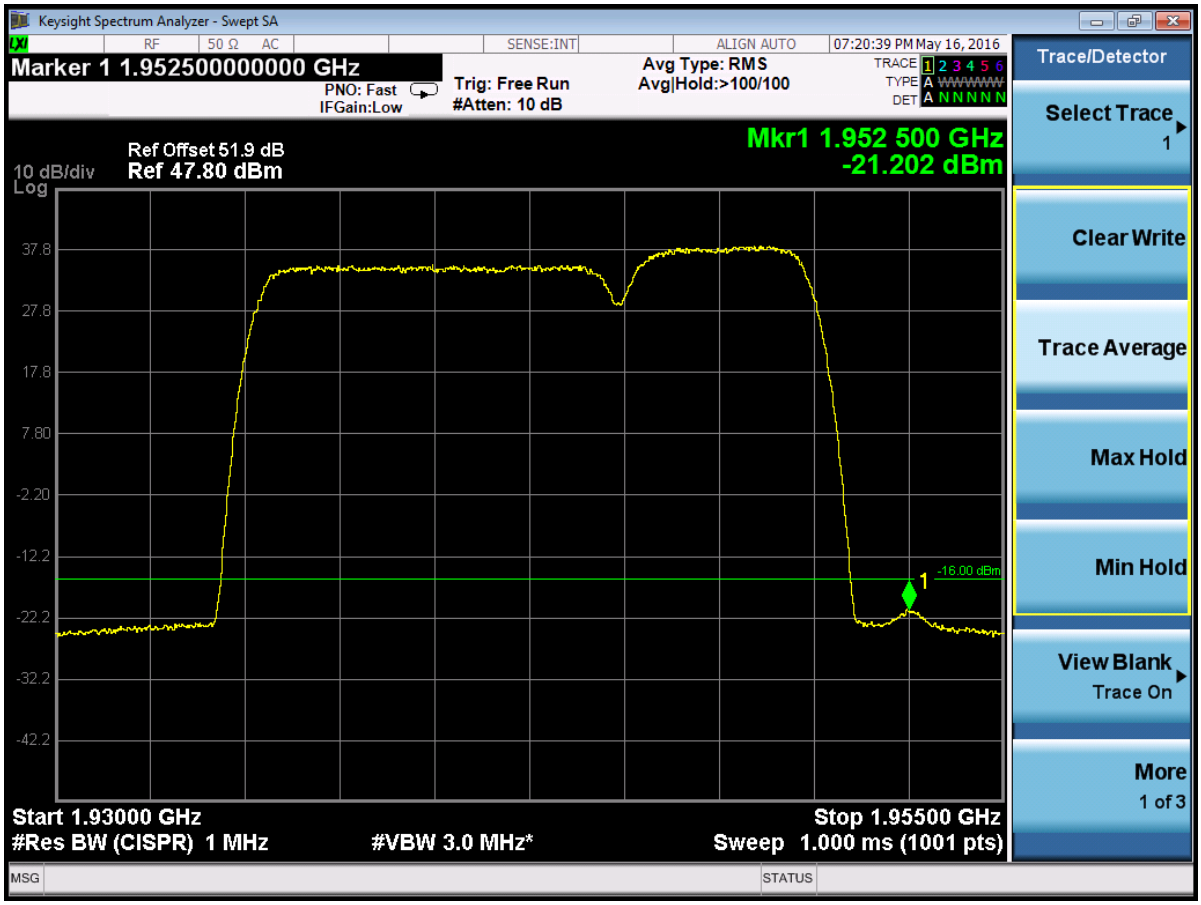


TX Spurious Emissions; Test Engineer: SEG; Port TX1

LR 16.1 RRH 1900A; 10+5 MHz BW Contiguous; 1940 MHz 64QAM, 1947.5 MHz QPSK &

16QAM; Power: 60 Watts; 2x2 MIMO; FCC Part 24; FCCID: AS5ONEBTS-27

Contiguous Carriers



TX Spurious Emissions; Test Engineer: SEG; Port TX1

LR 16.1 RRH 1900A; 10+5 MHz BW Contiguous; 1940 MHz 64QAM, 1947.5 MHz QPSK &

16QAM; Power: 60 Watts; 2x2 MIMO; FCC Part 24; FCCID: AS5ONEBTS-27

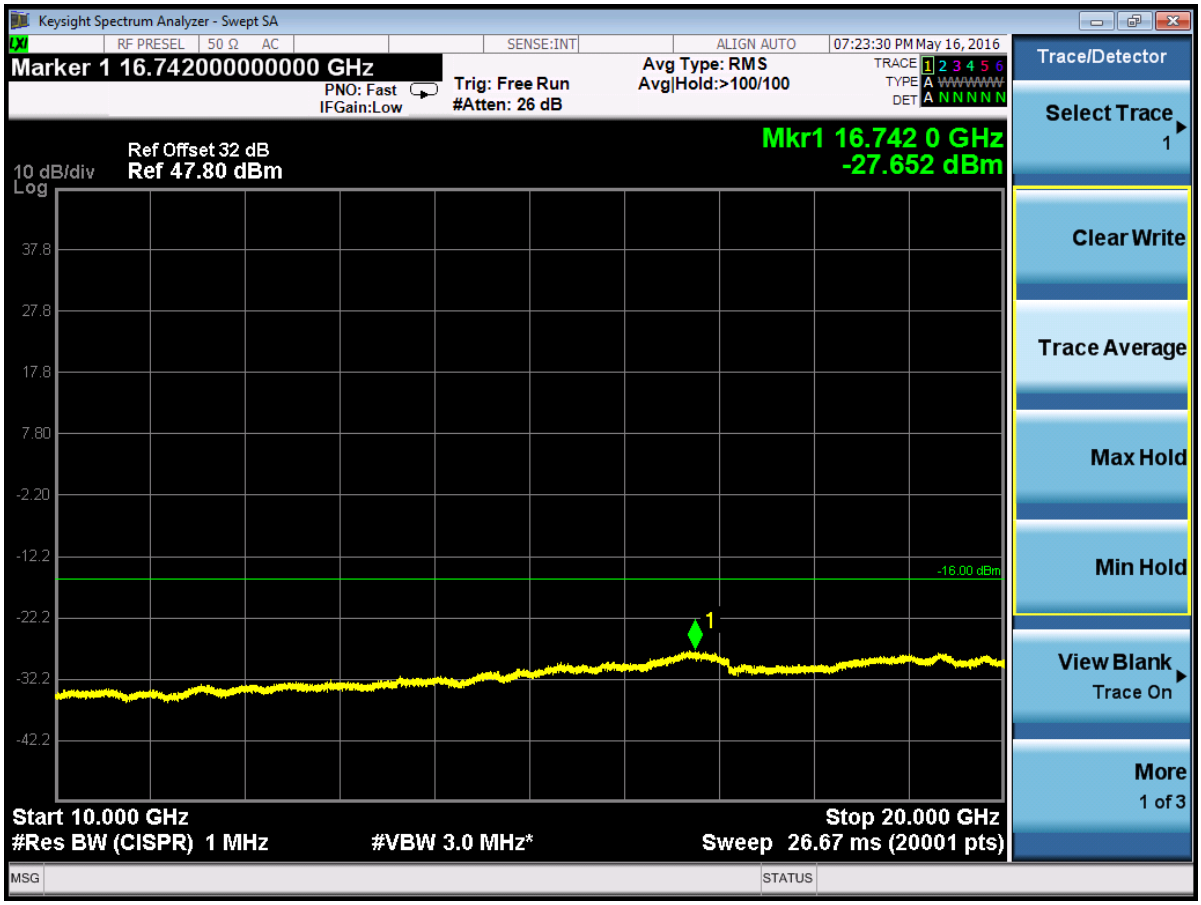
Contiguous Carriers

TX Spurious Emissions; Test Engineer: SEG; Port TX1

LR 16.1 RRH 1900A; 10+5 MHz BW Contiguous; 1940 MHz 64QAM, 1947.5 MHz QPSK &

16QAM; Power: 60 Watts; 2x2 MIMO; FCC Part 24; FCCID: AS5ONEBTS-27

Contiguous Carriers



TX Spurious Emissions; Test Engineer: SEG; Port TX1

LR 16.1 RRH 1900A; 10+5 MHz BW Contiguous; 1940 MHz 64QAM, 1947.5 MHz QPSK &

16QAM; Power: 60 Watts; 2x2 MIMO; FCC Part 24; FCCID: AS5ONEBTS-27

Contiguous Carriers

4.5 Section 2.1055 MEASUREMENT REQUIRED: FREQUENCY STABILITY

This measurement evaluates the frequency difference between the actual transmit carrier frequency and the specified transmit frequency assignment. Only the portion of the transmitter system containing the frequency determining and stabilizing circuitry need be put in an environmental chamber and subjected to the temperature variation test per FCC Section 2.1055. The unit which provides baseband signals, such as BBU (baseband unit), can be located outside the chamber if it is a separated unit.

The EUT transmits in the 1930-1990 MHz frequency band with LTE technology with 2x2 MIMO.

4.5.1 Frequency Stability Results:

This EUT was previously tested during the original filing process. For this Class II Permissive Change, new data is not required.

4.6 Section 2.1053 MEASUREMENT REQUIRED: FIELD STRENGTH OF SPURIOUS RADIATION

This measurement evaluates the spurious emissions that may be radiated directly from the EUT cabinet, circuits or power leads under normal conditions of installation and operation. The EUT was investigated from 30 MHz to the 10th harmonic of the carrier, per Section 2.1057(a)(1).

The EUT transmits in the 1930-1990 MHz frequency band with LTE technology and 2x2 MIMO. It was configured as in the normal mode of the installation and operation with the maximum power output per Table 4.6.1. The test model used for configuring the LTE carrier was described in Section 4.3. All carriers were transmitting to non-radiating 50 Ω resistive loads.

Table 4.6.1 EUT Configurations

Config No	No of Carriers/Port	Tx1 (freq)	Tx2 (CH/freq)	Power/c (dBm)	Carrier BW (MHz)	Modulations
1	2	1932.5 + 1937.5 MHz	1932.5 + 1937.5 MHz	47.8	5 + 5	QPSK/ 16QAM & 64QAM
2	2	1975 + 1987.5 MHz	1975 + 1987.5 MHz	47.8	10 + 5	QPSK/ 16QAM & 64QAM

The emission limits and the setting of measurement equipment for the spurious emissions measurement were given in Section 4.3. FCC 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. 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, 4th edition, ITT Corp., the emission limit calculated for electric field strength and its reportable limit equal:

Table 4.6.2 Calculated Radiated Spurious Emission Limit in Electrical Field Strength

Frequency Range (MHz)	Measurement Distance (m)	Required E Limit (2x2 MIMO) (dBμV/m)	Reportable E Limit (dBμV/m)	Detector/RBW
10-20,000	3	81.1	61.1	Average/1MHz

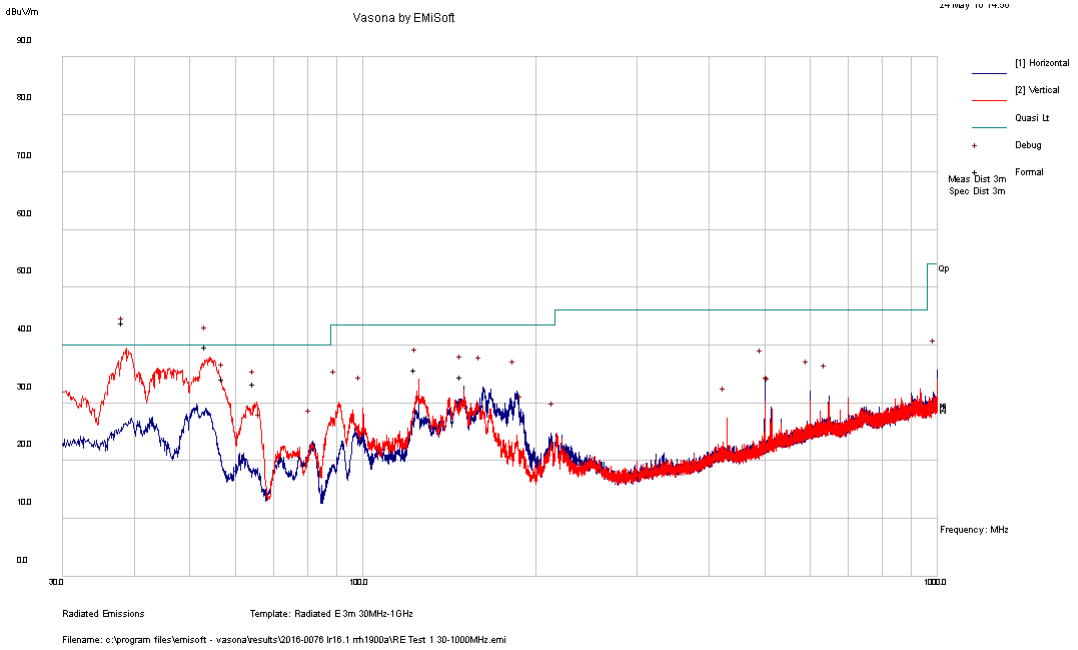
The field strength of radiated spurious emissions measured was determined by

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

Field strength measurements of radiated spurious emissions were made at a semi anechoic room of Global Product Compliance Laboratories of Alcatel-Lucent Murray Hill which was detailed in Section 6. The recommendations of ANSI C63.4 and ANSI C63.26 were followed for EUT testing setup, cabling, and measurement approach and procedures. All the measurement equipment used, including antennas, was calibrated in accordance with ISO 9001 process. The EUT setup diagram is given in the Figure 4.6.1. The minimum margin measured per Table 4.6.2 is more than 20dB.

RADIATED EMISSIONS DATA
(Worst Case)

T1 RE 30 MHz – 1 GHz FCC Class B



Results Title:	Radiated E 3m 30MHz-1GHz
File Name:	c:\program files\emisoft - vasona\results\2016-0076 lr16.1 rrh1900a\RE Test 1 30-1000MHz.emi
Test Laboratory:	GPCL AR6-MH 23C, 44%RH, 996mB
Test Engineer:	GM
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	Nokia
EUT Details:	LR16.1 RRH 1900A
Configuration:	EMI Receiver E704, Pre-Amp E512, Ant E602, 6 dB Pad E887, Res BW 100KHz VBW 300KHz. Radiated Emissions 30-1000MHz FCC A 3 Meter Distance RJ45 cover removed
Date:	2016-05-24 14:56:41

FORMAL DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
38.753	49.86	6.59	-17.9	38.57	Quasi Max	V	100	307	40	-1.43	Pass	
54.048	51.64	6.6	-23.9	34.37	Quasi Max	V	128	284	40	-5.63	Pass	
57.703	47.03	6.62	-24.8	28.89	Quasi Max	V	112	352	40	-11.11	Pass	
65.302	46.97	6.66	-25.7	27.97	Quasi Max	V	173	133	40	-12.03	Pass	
124.974	37.69	7.07	-14.3	30.5	Quasi Max	V	207	339	43.5	-13	Pass	
149.99	35.09	7.16	-13.1	29.2	Quasi Max	H	129	196	43.5	-14.3	Pass	

PREVIEW DATA

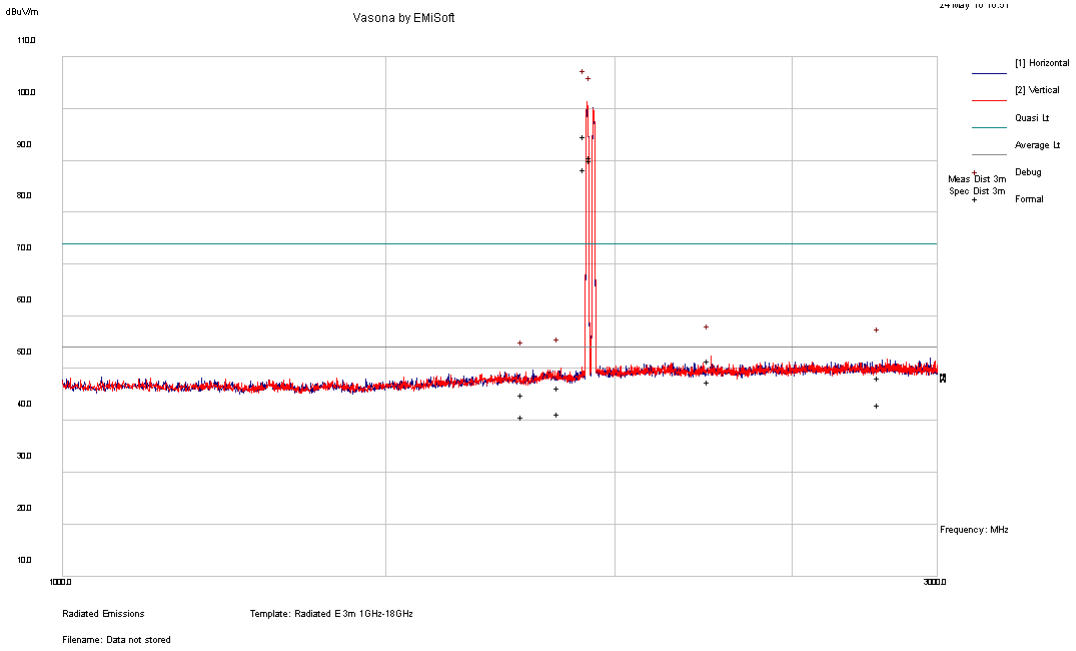
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
38.7535	50.75	6.59	-17.9	39.45	Preview	V	100	270	40	-0.55	Pass	
54.0481	55.2	6.6	-23.9	37.93	Preview	V	100	225	40	-2.07	Pass	

PREVIEW DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
57.7034	49.68	6.62	-24.8	31.53	Preview	V	100	45	40	-8.47	Pass	
125.038	41.23	7.07	-14.3	34.05	Preview	V	300	0	43.5	-9.45	Pass	
65.3026	49.18	6.66	-25.7	30.18	Preview	V	200	90	40	-9.82	Pass	
149.952	38.76	7.16	-13.1	32.87	Preview	H	100	225	43.5	-10.63	Pass	
161.88	40.5	7.2	-15	32.68	Preview	H	100	225	43.5	-10.82	Pass	
185.351	42.74	7.28	-18	31.99	Preview	H	100	0	43.5	-11.51	Pass	
499.996	39.21	7.92	-13.2	33.89	Preview	H	195	90	46	-12.11	Pass	
90.6974	43.61	6.88	-20.3	30.18	Preview	V	100	315	43.5	-13.32	Pass	
600.036	34.68	8.05	-10.7	32.02	Preview	H	195	0	46	-13.98	Pass	
99.9319	40.21	6.95	-18	29.17	Preview	V	100	315	43.5	-14.33	Pass	
646.208	33.23	8.11	-10.1	31.22	Preview	H	295	270	46	-14.78	Pass	
81.8477	38.94	6.8	-22.3	23.39	Preview	H	195	0	40	-16.61	Pass	
512.597	34.32	7.94	-13	29.27	Preview	H	395	45	46	-16.73	Pass	
514.425	33.97	7.94	-13	28.96	Preview	V	200	180	46	-17.04	Pass	
67.0341	41.57	6.67	-25.4	22.79	Preview	V	200	90	40	-17.21	Pass	
190.834	37.14	7.29	-18.5	25.91	Preview	H	100	45	43.5	-17.59	Pass	
999.9	33.15	9.01	-6.5	35.66	Preview	H	100	270	54	-18.34	Pass	
430.064	33.95	7.8	-14.4	27.38	Preview	V	200	315	46	-18.62	Pass	
217.094	37.02	7.36	-19.6	24.77	Preview	V	100	315	46	-21.23	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

T2 RE 1 GHz – 3 GHz FCC Class B



Results Title:	Radiated E 3m 1GHz-18GHz
File Name:	c:\program files\emisoft - vasona\results\2016-0076 lr16.1 rrh1900a\RE Test 2 1-3GHz.emi
Test Laboratory:	GPCL AR6-MH 23C, 44%RH, 996mB
Test Engineer:	GM
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	Nokia
EUT Details:	LR16.1 RRH 1900A
Configuration:	EMI Receiver E704, Pre-Amp E123, Ant E1073, 6 dB Pad E887, Res BW 1MHz VBW 3MHz. Radiated Emissions 1-3GHz FCC A 3 Meter Distance RJ45 cover removed
Date:	2016-05-24 16:52:08

FORMAL DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
1932.35	83.03	9.47	-3.86	88.65	AvgMax	V	120	19	54	34.65	Fail	Carrier
1946.81	78.47	9.46	-3.78	84.16	AvgMax	H	120	270	54	30.16	Fail	Carrier
1946.81	78.99	9.46	-3.78	84.68	Peak	H	120	270	74	10.68	Fail	Carrier
1932.35	76.8	9.47	-3.86	82.41	Peak	V	120	19	74	8.41	Fail	Carrier
2257.86	38.78	9.33	-2.62	45.49	AvgMax	V	294	109	54	-8.51	Pass	
2796.97	29.55	9.13	-1.55	37.14	AvgMax	V	126	287	54	-16.86	Pass	
1869.69	30	9.5	-4.22	35.28	AvgMax	V	175	248	54	-18.72	Pass	
1788.48	29.85	9.54	-4.71	34.68	AvgMax	V	123	24	54	-19.32	Pass	
2796.97	34.75	9.13	-1.55	42.34	Peak	V	126	287	74	-31.66	Pass	
2257.86	34.69	9.33	-2.62	41.4	Peak	V	294	109	74	-32.6	Pass	
1869.69	35.05	9.5	-4.22	40.33	Peak	V	175	248	74	-33.67	Pass	

FORMAL DATA

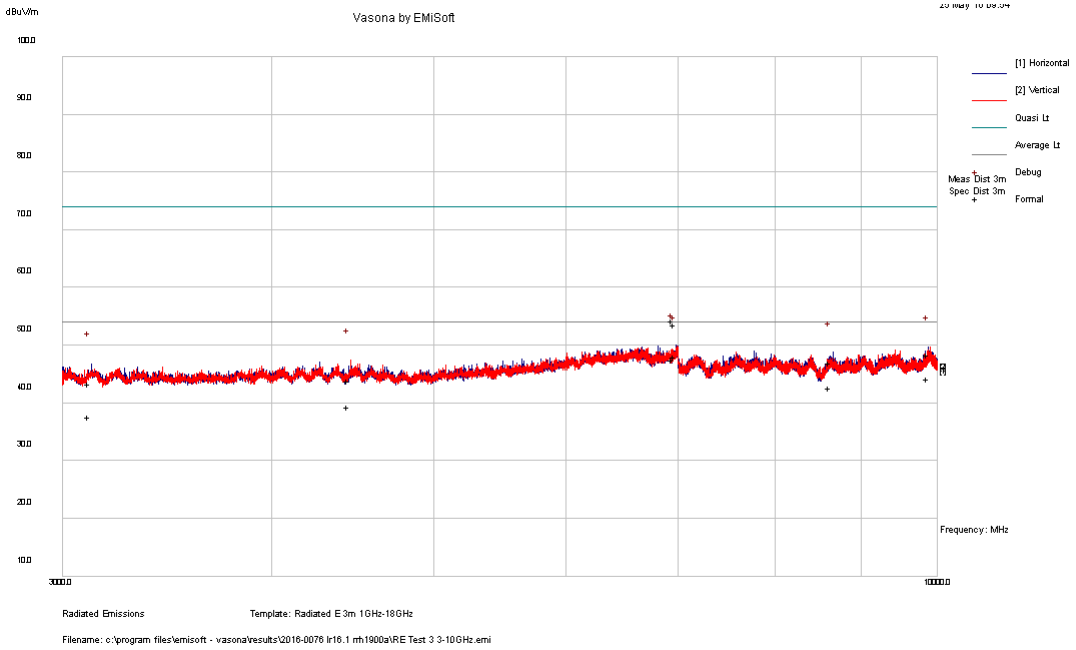
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
1788.48	34.22	9.54	-4.71	39.06	Peak	V	123	24	74	-34.94	Pass	

PREVIEW DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
1932.35	95.78	9.47	-3.86	101.39	Preview	V	200	0	54	47.39	Fail	
1946.81	94.39	9.46	-3.78	100.08	Preview	H	100	0	54	46.08	Fail	
2257.86	45.56	9.33	-2.62	52.27	Preview	V	100	135	54	-1.73	Pass	
2796.97	44.04	9.13	-1.55	51.62	Debug	V	100	317	54	-2.38	Pass	
1788.48	44.38	9.54	-4.71	49.21	Debug	V	100	317	54	-4.79	Pass	
1869.69	44.57	9.5	-4.22	49.85	Debug	V	100	317	54	-4.15	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

T3 RE 3 GHz – 10 GHz FCC Class B



Results Title:	Radiated E 3m 1GHz-18GHz
File Name:	c:\program files\emisoft - vasona\results\2016-0076 lr16.1 rrh1900a\RE Test 3 3-10GHz.emi
Test Laboratory:	GPCL AR6-MH 23C, 44%RH, 996mB
Test Engineer:	GM
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	Nokia
EUT Details:	LR16.1 RRH 1900A
Configuration:	EMI Receiver E704, Pre-Amp E123, Ant E1073, HPF E1116, Res BW 1MHz VBW 3MHz. Radiated Emissions 3-10GHz FCC A 3 Meter Distance RJ45 cover removed
Date:	2016-05-25 09:54:50

FORMAL DATA

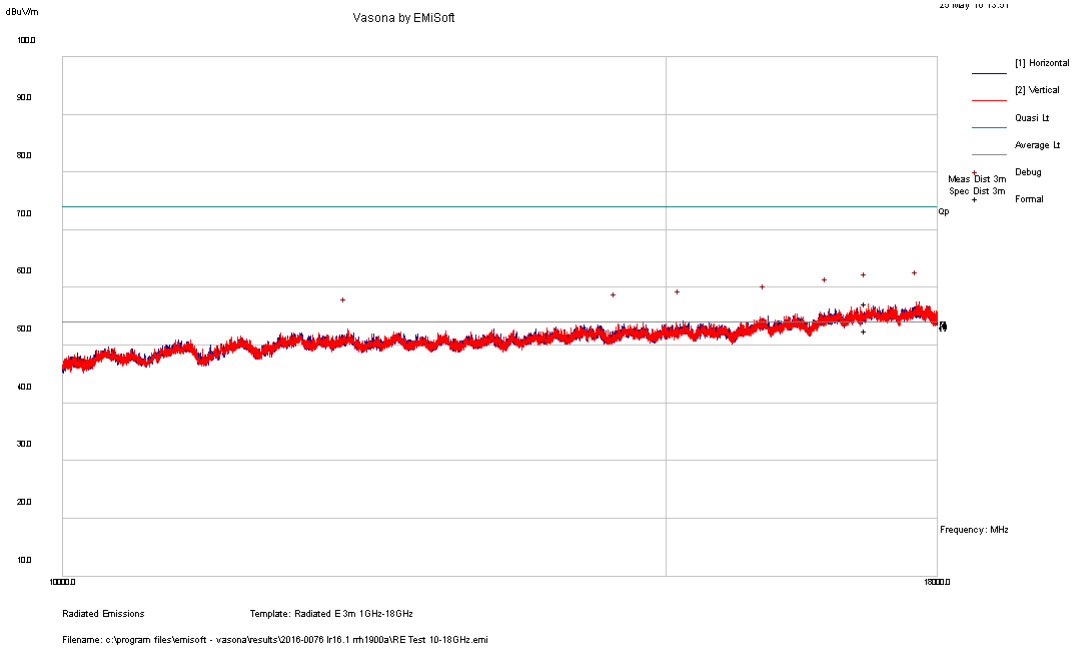
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
6994.36	34.61	6.09	1.92	42.61	AvgMax	V	229	47	54	-11.39	Pass	
6975.06	34.17	6.09	1.92	42.17	AvgMax	H	220	67	54	-11.83	Pass	
9897.82	30.14	6.3	2.49	38.93	AvgMax	V	246	38	54	-15.07	Pass	
8656.45	29.4	6.12	1.71	37.23	AvgMax	H	223	98	54	-16.77	Pass	
4462.52	29.08	4.75	0.19	34.03	AvgMax	V	341	93	54	-19.97	Pass	
3121.86	29.1	4.33	-1.2	32.22	AvgMax	H	219	349	54	-21.78	Pass	
6975.06	40.94	6.09	1.92	48.94	Peak	H	220	67	74	-25.06	Pass	
6994.36	40.19	6.09	1.92	48.2	Peak	V	229	47	74	-25.8	Pass	
9897.82	34.17	6.3	2.49	42.96	Peak	V	246	38	74	-31.04	Pass	
8656.45	33.87	6.12	1.71	41.71	Peak	H	223	98	74	-32.29	Pass	
4462.52	33.63	4.75	0.19	38.57	Peak	V	341	93	74	-35.43	Pass	
3121.86	34.9	4.33	-1.2	38.02	Peak	H	219	349	74	-35.98	Pass	

PREVIEW DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
6975.06	41.93	6.09	1.92	49.94	Preview	H	400	88	54	-4.06	Pass	
3121.86	43.65	4.33	-1.2	46.77	Debug	H	100	354	54	-7.23	Pass	
8656.45	40.78	6.12	1.71	48.62	Debug	H	100	354	54	-5.38	Pass	
6994.36	41.68	6.09	1.92	49.69	Debug	V	100	354	54	-4.31	Pass	
4462.52	42.43	4.75	0.19	47.37	Debug	V	100	354	54	-6.63	Pass	
9897.82	40.8	6.3	2.49	49.59	Debug	V	100	354	54	-4.41	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

T4 RE 10 GHz – 18 GHz FCC Class B



Results Title:	Radiated E 3m 1GHz-18GHz
File Name:	c:\program files\emisoft - vasona\results\2016-0076 lr16.1 rrh1900a\RE Test 4 10-18GHz.emi
Test Laboratory:	GPCL AR6-MH 23C, 44%RH, 996mB
Test Engineer:	GM
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	Nokia
EUT Details:	LR16.1 RRH 1900A
Configuration:	EMI Receiver E704, Pre-Amp E123, Ant E1073, HPF E1116, Res BW 1MHz VBW 3MHz. Radiated Emissions 10-18GHz FCC A 3 Meter Distance RJ45 cover removed
Date:	2016-05-25 13:57:39

FORMAL DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
17779.8	29.64	8.91	9.28	47.83	AvgMax	H	166	122	54	-6.17	Pass	
17185.1	29.37	8.64	9.23	47.25	AvgMax	V	199	331	54	-6.75	Pass	
16739.8	29.14	7.67	9	45.8	AvgMax	H	354	224	54	-8.2	Pass	
16060.8	28.88	7.86	7.82	44.56	AvgMax	H	259	260	54	-9.44	Pass	
14523.8	29.71	6.91	7.84	44.46	AvgMax	V	182	150	54	-9.54	Pass	
15169.3	29.56	7.17	7.51	44.24	AvgMax	H	145	340	54	-9.76	Pass	
12115.2	29.59	7.01	5.76	42.36	AvgMax	V	158	130	54	-11.64	Pass	
17779.8	34.38	8.91	9.28	52.58	Peak	H	166	122	74	-21.42	Pass	
17185.1	34.04	8.64	9.23	51.91	Peak	V	199	331	74	-22.09	Pass	
16739.8	34.1	7.67	9	50.77	Peak	H	354	224	74	-23.23	Pass	
14523.8	34.43	6.91	7.84	49.17	Peak	V	182	150	74	-24.83	Pass	

FORMAL DATA

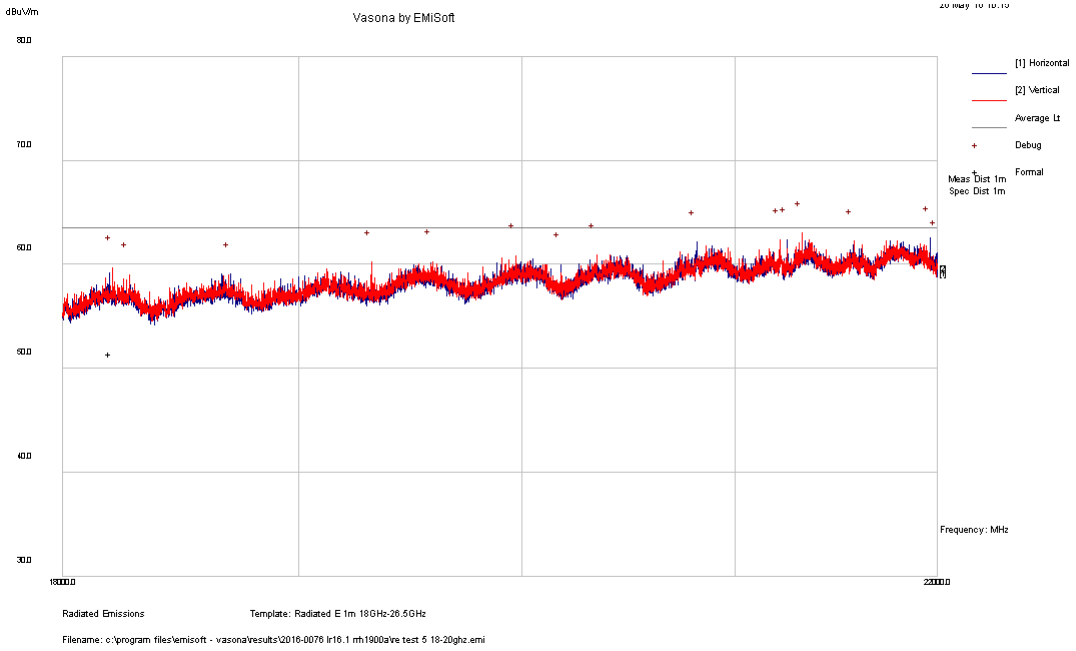
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
15169.3	34.44	7.17	7.51	49.12	Peak	H	145	340	74	-24.88	Pass	
16060.8	33.18	7.86	7.82	48.86	Peak	H	259	260	74	-25.14	Pass	
12115.2	34.38	7.01	5.76	47.15	Peak	V	158	130	74	-26.85	Pass	

PREVIEW DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
17779.8	39.28	8.91	9.28	57.47	Debug	H	400	88	54	3.47	Fail	
17185.1	39.24	8.64	9.23	57.12	Debug	V	100	0	54	3.12	Fail	
16739.8	39.58	7.67	9	56.25	Debug	H	100	18	54	2.25	Fail	
16060.8	39.25	7.86	7.82	54.93	Debug	H	100	155	54	0.93	Fail	
15169.3	39.42	7.17	7.51	54.1	Debug	H	100	0	54	0.1	Fail	
14523.8	38.8	6.91	7.84	53.54	Debug	V	100	0	54	-0.46	Pass	
12115.2	39.93	7.01	5.76	52.7	Debug	V	100	0	54	-1.3	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement.
Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies.
Failure in preview data does not necessarily constitute failure in formal data.

T5 RE 18 GHz – 20 GHz FCC Class B



Results Title:	Radiated E 1m 18GHz-26.5GHz
File Name:	c:\program files\emisoft - vasona\results\2016-0076 lr16.1 rrh1900a\re test 5 18-20ghz.emi
Test Laboratory:	GPCL AR6-MH 23C, 44%RH, 996mB
Test Engineer:	GM
Test Software:	Vasona by EMISoft, version 2.161
Equipment:	Nokia
EUT Details:	LR16.1 RRH 1900A QPSK & 16QAM 1932.5MHz 5MHz BW, 64QAM 1947.5MHz 5MHz BW
Configuration:	EMI Receiver E704, Pre-Amp E123, Ant E513, Res BW 1MHz VBW 3MHz. Radiated Emissions 18-20GHz FCC A 3 Meter Distance RJ45 cover removed
Date:	2016-05-26 10:35:03

FORMAL DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
21581.5	30.83	7.85	13.77	52.44	AvgMax	V	122	310	63.5	-11.06	Pass	
21964	30.83	7.84	13.71	52.38	AvgMax	H	132	0	63.5	-11.12	Pass	
21999.2	30.83	7.84	13.71	52.37	AvgMax	H	125	31	63.5	-11.13	Pass	
21254.4	30.42	7.86	13.81	52.08	AvgMax	H	180	71	63.5	-11.42	Pass	
21328.3	30.28	7.85	13.8	51.93	AvgMax	V	144	241	63.5	-11.57	Pass	
20817.9	30.28	7.77	13.65	51.7	AvgMax	H	192	238	63.5	-11.8	Pass	
21220.6	29.7	7.86	13.81	51.36	AvgMax	V	152	15	63.5	-12.14	Pass	
20344.5	30.28	7.53	13.35	51.17	AvgMax	V	150	230	63.5	-12.33	Pass	
20180.6	29.08	7.45	13.38	49.91	AvgMax	H	113	263	63.5	-13.59	Pass	
19974	29.08	7.35	13.4	49.84	AvgMax	V	175	243	63.5	-13.66	Pass	
19593.8	29.08	7.26	13.35	49.7	AvgMax	V	190	234	63.5	-13.8	Pass	

FORMAL DATA

Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
19323.8	28.75	7.2	13.16	49.11	AvgMax	V	182	198	63.5	-14.39	Pass	
18208.2	29.4	6.89	12.12	48.41	AvgMax	V	190	50	63.5	-15.09	Pass	
18708.1	28.75	7.03	12.53	48.32	AvgMax	H	132	64	63.5	-15.18	Pass	
18278.1	28.92	6.91	12.17	48	AvgMax	V	186	351	63.5	-15.5	Pass	

PREVIEW DATA

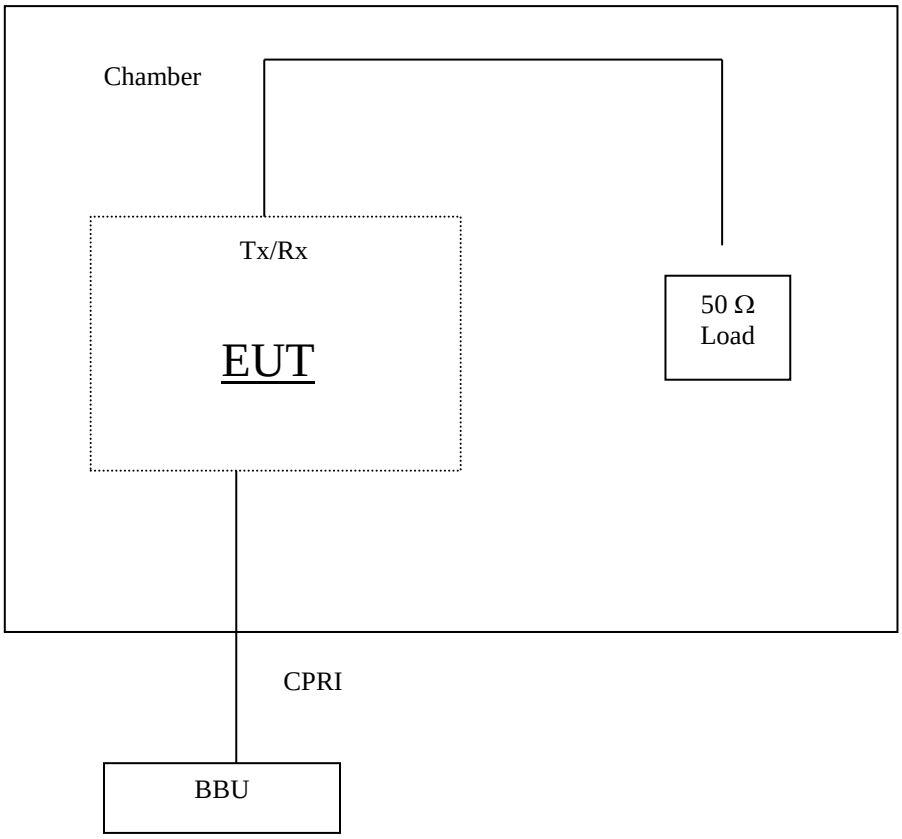
Freq. (MHz)	Raw (dBuV)	Cable (dB)	Factor (dB)	Level (dBuV/m)	Emission Type	Pol (H/V)	Ht (cm)	Az (deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail	Comments
21328.3	41.36	7.85	13.8	63.01	Preview	V	200	220	63.5	-0.49	Pass	
21964	40.94	7.84	13.71	62.49	Preview	H	150	22	63.5	-1.01	Pass	
21254.4	40.72	7.86	13.81	62.38	Preview	H	200	352	63.5	-1.12	Pass	
21220.6	40.69	7.86	13.81	62.35	Preview	V	100	22	63.5	-1.15	Pass	
21581.5	40.63	7.85	13.77	62.25	Preview	V	200	22	63.5	-1.25	Pass	
20817.9	40.72	7.77	13.65	62.14	Preview	H	150	286	63.5	-1.36	Pass	
21999.2	39.58	7.84	13.71	61.13	Preview	H	150	330	63.5	-2.37	Pass	
20344.5	40.03	7.53	13.35	60.92	Preview	V	150	264	63.5	-2.58	Pass	
19974	40.08	7.35	13.4	60.83	Preview	V	150	176	63.5	-2.67	Pass	
19593.8	39.66	7.26	13.35	60.28	Preview	V	100	44	63.5	-3.22	Pass	
19323.8	39.87	7.2	13.16	60.22	Preview	V	100	22	63.5	-3.28	Pass	
20180.6	39.13	7.45	13.38	59.96	Preview	H	150	110	63.5	-3.54	Pass	
18208.2	40.67	6.89	12.12	59.68	Preview	V	150	176	63.5	-3.82	Pass	
18708.1	39.51	7.03	12.53	59.07	Preview	H	100	352	63.5	-4.43	Pass	
18278.1	39.92	6.91	12.17	59.01	Preview	V	100	264	63.5	-4.49	Pass	

Note: Preview data was measured using a peak detector to identify frequencies of interest for formal measurement. Formal data consist of all frequencies in the preview list within 6 dB of specification limit or the top six frequencies. Failure in preview data does not necessarily constitute failure in formal data.

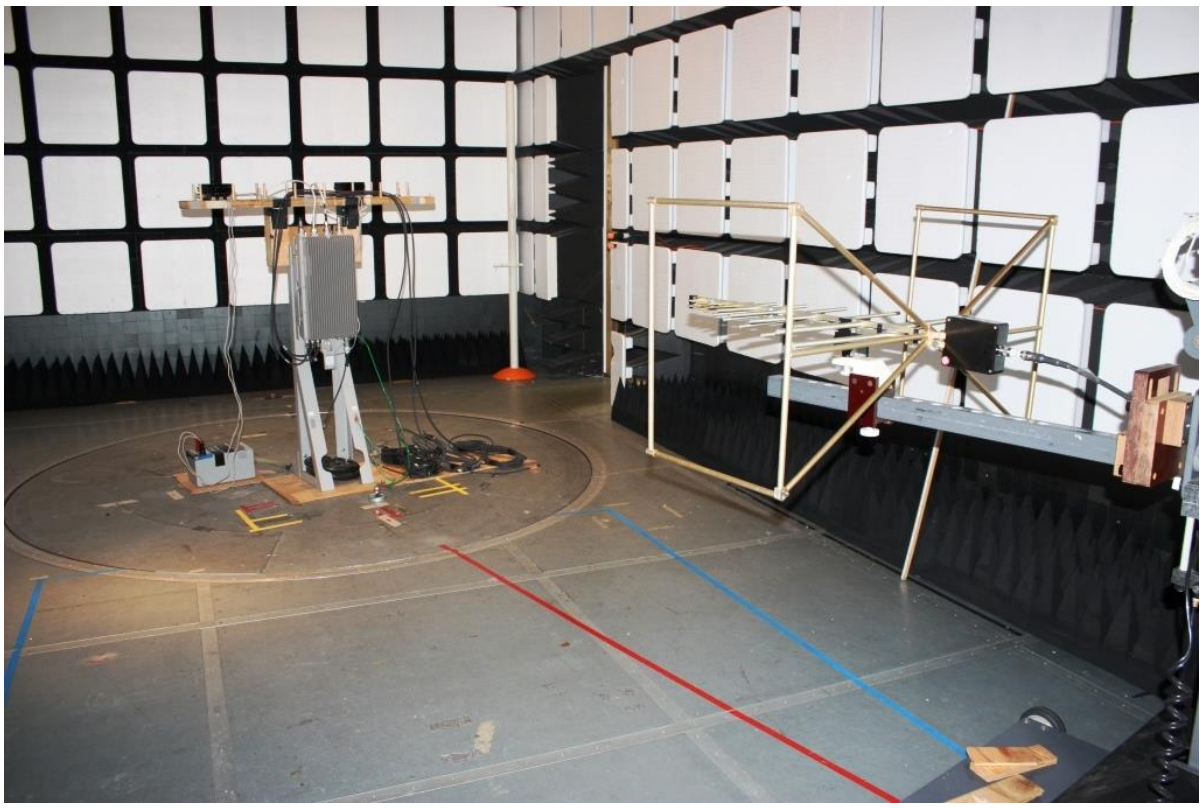
4.6.1 Field Strength of Radiated Emissions Results:

Over the frequency spectrum investigated no reportable radiated spurious emissions were detected. The measurement results of the EUT, subject of this application, demonstrate the full compliance with the Rules of the Commission.

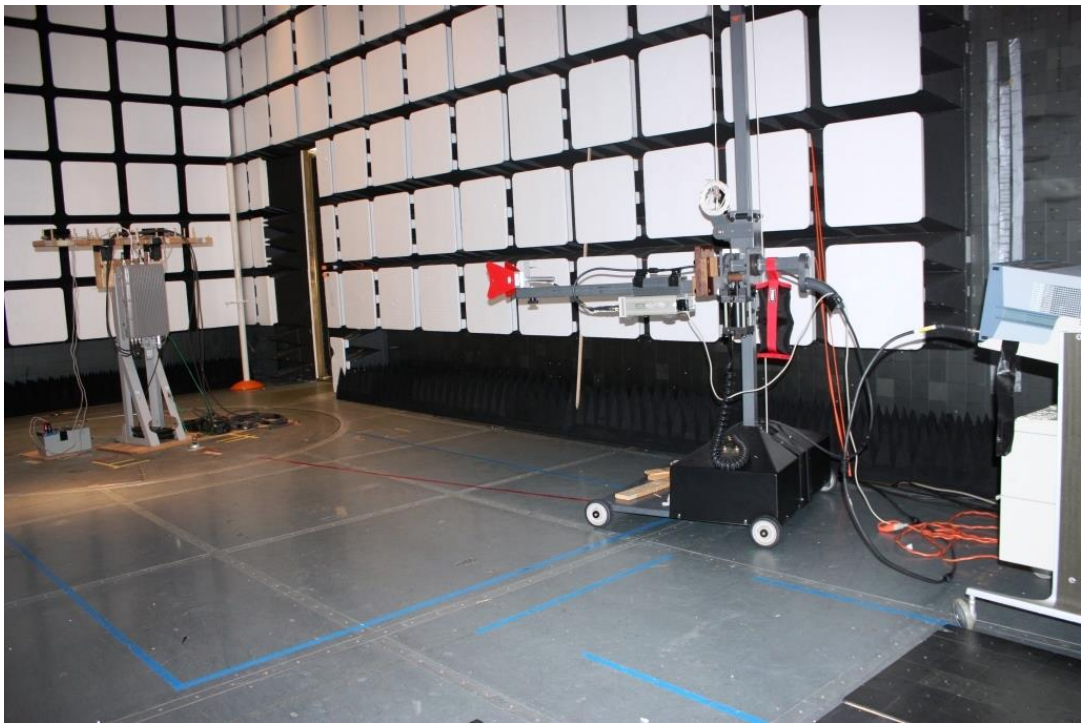
Figure 4.6.1 Test Set-Up for Measurement of Radiated Spurious Emissions



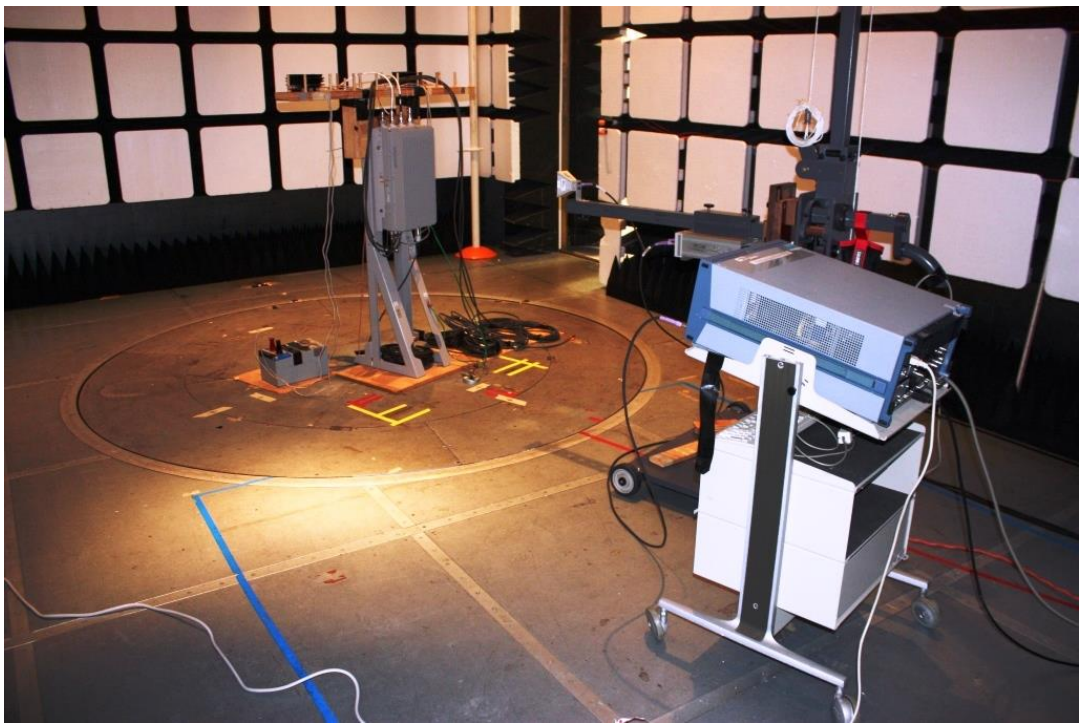
PHOTOGRAPHS OF EUT DURING FINAL RADIATED EMISSIONS TESTING
30 MHz – 1 GHz



1 GHz – 18 GHz



18 GHz – 20 GHz



4.7 LIST OF TEST EQUIPMENT

Table 5.1 List of Test Equipment

Asset ID	Manufacturer	Type	Description	Model	Serial	Calibration Date	Calibration Due	Calibration Type	Status
E602	A.H. Systems Inc.	Bilogical Antenna	25 - 2000 MHz	SAS-521-2	410	2014-10-22	2016-10-22	Requires Calibration	Active
E1119	Extech	Data Logger	Pressure Humidity Temp data logger	SD700	Q668960	2014-08-06	2016-08-06	Requires Calibration	Active
E704	Rohde & Schwarz	Test Receiver	EMI (20Hz to 40 GHz)-150 +30dBM	ESIB40	100121	2016-04-28	2018-04-28	Requires Calibration	Active
E512	Sonoma Instrument Co.	Amplifier	9KHz-1GHz	310N	185826	2016-02-04	2018-02-04	Requires Calibration	Active
E887	Weinschel	Attenuator	6 dB DC-18GHz 5 Watt	2-6	BX3430	2016-03-11	2018-03-11	Requires Calibration	Active

4.8 FACILITIES AND ACCREDITATION

All measurement facilities at Alcatel-Lucent Global Product Compliance Laboratory (GPCL) used to collect the measurement data in the test report are located at 600-700 Mountain Avenue, Murray Hill, New Jersey 07974-0636 USA.

The field strength measurements of radiated spurious emissions are made in a FCC and IC registered three meter semi-anechoic chamber AR6 (FCC Site Registration Number: 353147, IC Filing Number: 6933F-7) which is maintained by Alcatel-Lucent in Murray Hill, New Jersey. The sites were constructed and are continuously in conformance with the requirements of ANSI C63.4 and CISPR Publication 22.

Alcatel-Lucent Global Product Compliance Laboratory is accredited with the US Department of Commerce National Institute of Standards and Technology's National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 7 Code of Federal Regulations for offering test services for selected test methods in Electromagnetic Compatibility; Voluntary Control Council for Interference (VCCI), Japan; Australian Communications and Media Authority (ACMA). The laboratory is ISO 9001:2008 Certified.

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 100275-0

Alcatel-Lucent, Global Product Compliance Lab
Murray Hill, NJ

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2015-09-14 through 2016-09-30
Effective Dates

For the National Voluntary Laboratory Accreditation Program