

TEST REPORT

MEASUREMENT PER SECTION 2.1033 (C) (14) OF THE RULES**SECTION 2.1033 (c) (14)**

The data required by Section 2.1046 through 2.1057, inclusive, measured in accordance with the procedures set out in Section 2.1041.

RESPONSE:

The following pages include the data required for the **AS5BBTRX-15**, measured in accordance with the procedures set out in Section 2. 1033(c)(14) of the Rules.

Each required measurement and its corresponding exhibit number are:

Measurement: 1	Section 2.1046	RF Power Output - See Measurement 3
Measurement: 2	Section 2.1047 Section 27.50(d)(5)	Modulation Characteristics Peak-to-Average ratio (PAR)
Measurement: 3	Section 2.1049	(a) Emissions Bandwidth (b) Occupied Bandwidth/Band Edge spurious Emissions
Measurement: 4	Section 2.1051	Spurious Emissions at Antenna Terminals
Measurement: 5	Section 2.1053	Field Strength of Spurious Radiation
Measurement: 6	Section 2.1055	Measurement of Frequency Stability
	Section 2.1057	Frequency Spectrum to be Investigated

Measurement 1

FCC Section 2.1046

RF Power output

Refer to **Measurement 3** Occupied Bandwidth/Band Edge Measurement during that measurement RF Output was continuously monitored.

Measurement 2

FCC Section 2.1047 Modulation Characteristics &

Section 27.50(d)(5) Measurement of Peak-to-Average ratio (PAR)

Section 2.1047

Modulation Characteristics

The modulation techniques used are explained in the submission as part section 2.1033 (c) (13). The RF signal at the antenna port was demodulated and verified for correctness of modulation signal used before each test was performed. The attached plots of graphs show the modulation components: In phase (I) and Quadrature (Q) components.

- (1) Quadrature Phase Shift Keying (QPSK) modulation scheme uses 2 bits are transmitted simultaneously (one per channel) and a symbol can be represented by 2 bits. Therefore there are $2^2 = 4$ states (Binary 00 to 11). The theoretical bandwidth is 2bits/second/Hz.
- (2) 16 Quadrature amplitude modulation (QAM): In 16QAM, there 16-states. There are four I values and four Q values, therefore 4 bits are available for represent a symbol. Therefore there are $2^4 = 16$ states (Binary 0000 to 1111). The theoretical bandwidth is 4bits/second/Hz.
- (3) 64 Quadrature amplitude modulation (QAM): In 64QAM: The 64QAM is similar to 16QAM and there will be 64 states and 6 bits are available to represent a symbol.

Time domain LTE (TD-LTE) Modulation is similar to Frequency domain LTE. However TD-LTE uses a single carrier frequency for both uplink and downlink. The TD-RRH transceiver divides the communication time into transmission and reception periods depending on user needs.

Therefore gating technique is used for measuring transmit power and occupied BW. Reference signal derived from GPS and frame trigger from the RRH were input into analyzer. This enables analyzer to measure power and occupied BW only during the transmit cycle.

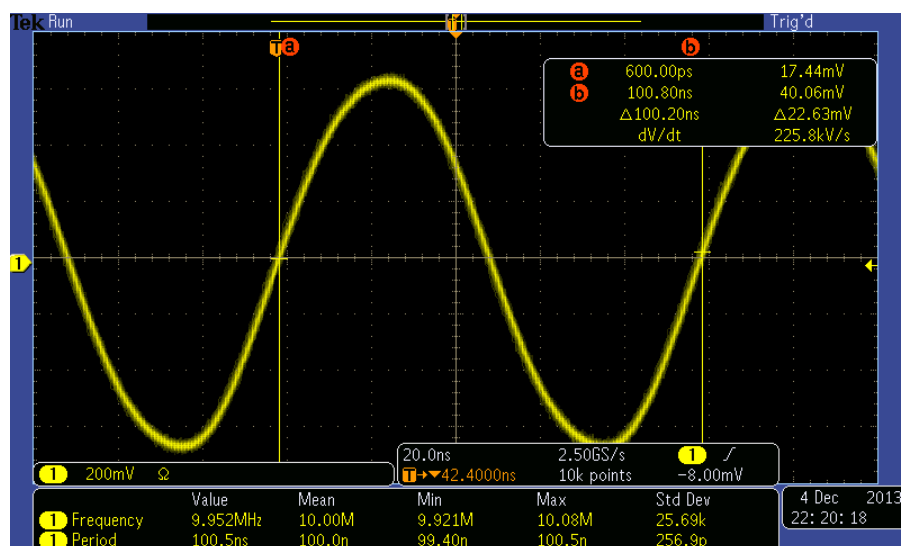
Occupied Bandwidth Measurement:

Spectrum Analyzer was used for Gated spectrum measurements. In addition to RF input from TD-RRH, this analyzer uses following additional inputs:

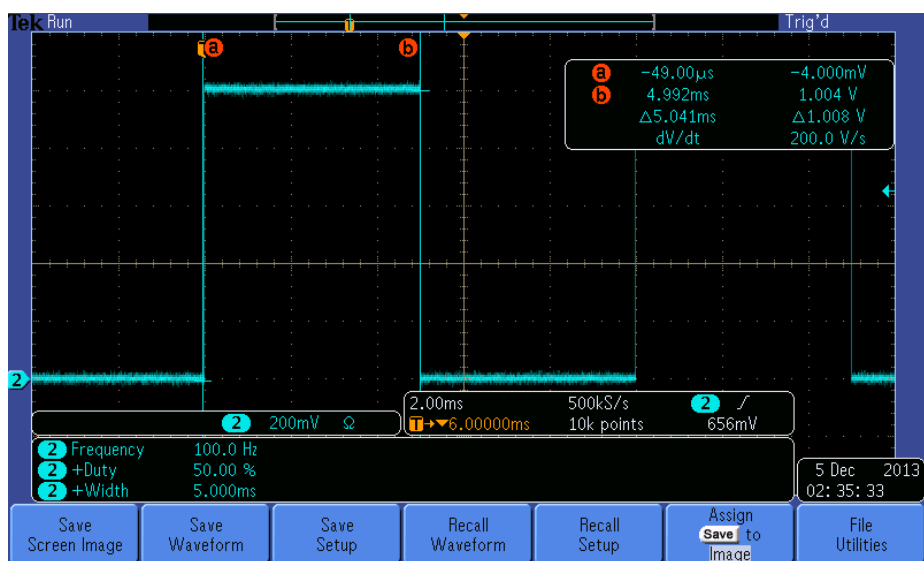
- (1) A 10MHz signal from GPS receiver as reference input signal (Plot 1)
- (2) A 100Hz 50% duty cycle square wave (frame trigger) from the TD-RRH as trigger input (Plot 2)
- (3) Using signals (1) and (2) Spectrum Analyzer produces a trigger pulse having 10ms period and 66.98% duty cycle square wave). Spectrum Analyzer uses this trigger pulse for performing gated measurement.

Gated Power Measurements:

Similarly Signals provided in plot 1&2 were used as inputs to power meters for measuring RF power and Peak to average accurately.



Plot 1



Plot 2

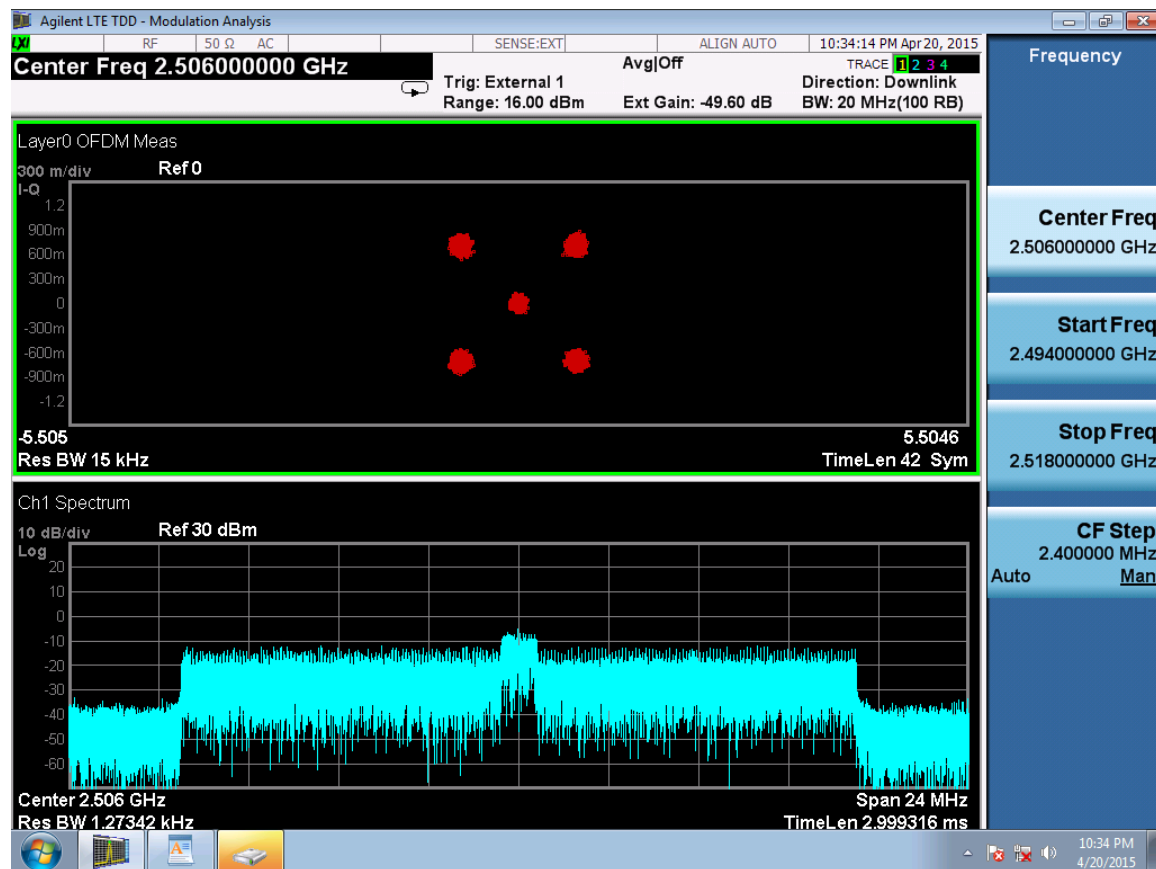
DEMODULATED CONSTELLATIONS (FCC Section 2.1047)
&
Measurement of Peak-to-Average ratio (PAR) Section 27.50(d)(5)

The peak-to-average (PAR) is plotted along with demodulated constellation plots. The plots show that average and peak values in dBm. The difference of peak-to-averages ratio does not exceed 13 dB as required in section 27.50(d) (5).

The list of blocks and bands, tested for QPSK, 16QAM and 64QAM are listed below:

Blocks	Bandwidth (MHz)	Frequency (MHz)	Power (Watts)
Lower	20+10	2496-2516 and 2528-2538	20
Middle	20+10	2572-2592 and 2604-2614	20
Higher	20+10	2648-2668 and 2680-2690	20

QPSK Modulation
2506 MHz (20Hz BW).



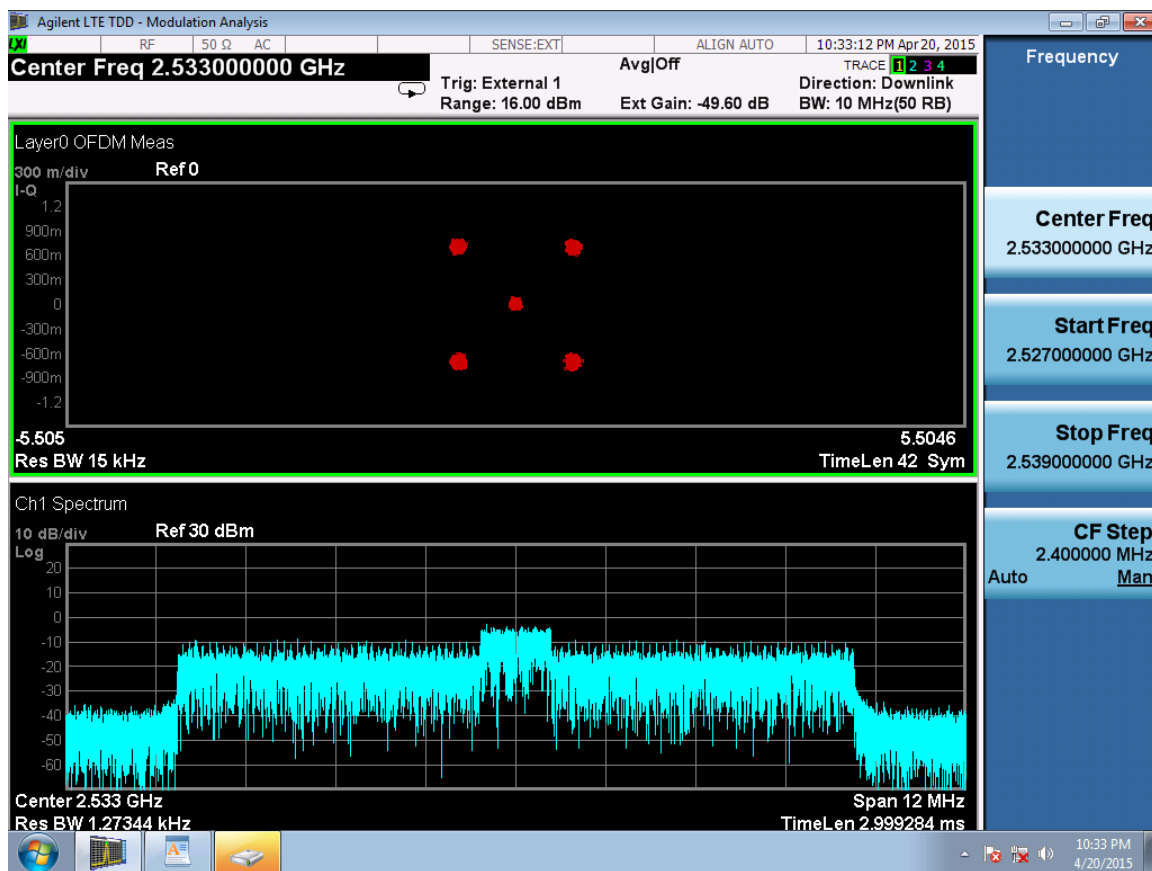
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

FCCID: AS5BBTRX-15

TEST ENGINEER: JY

QPSK Modulation
2533 MHz (10MHz BW).



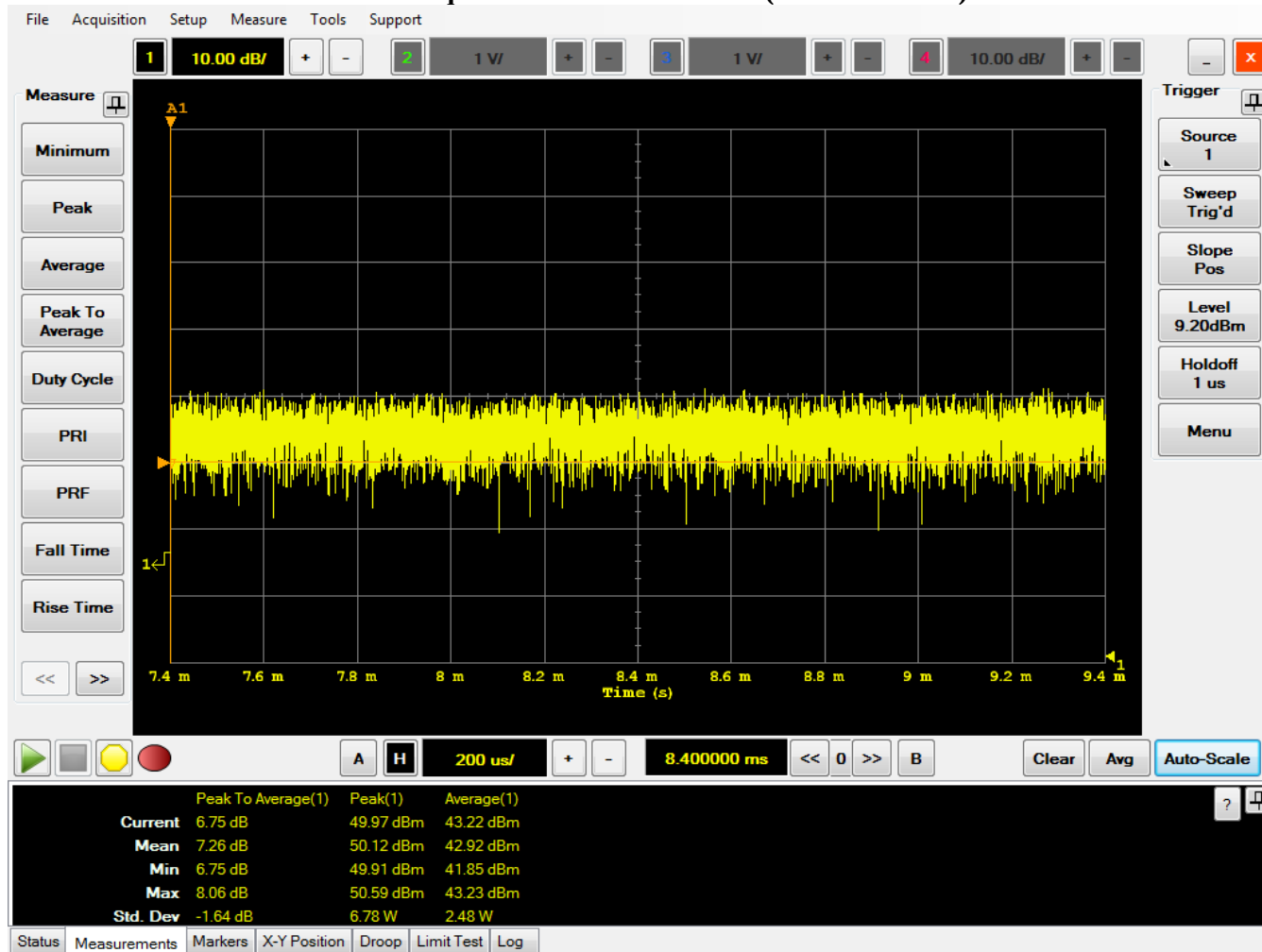
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

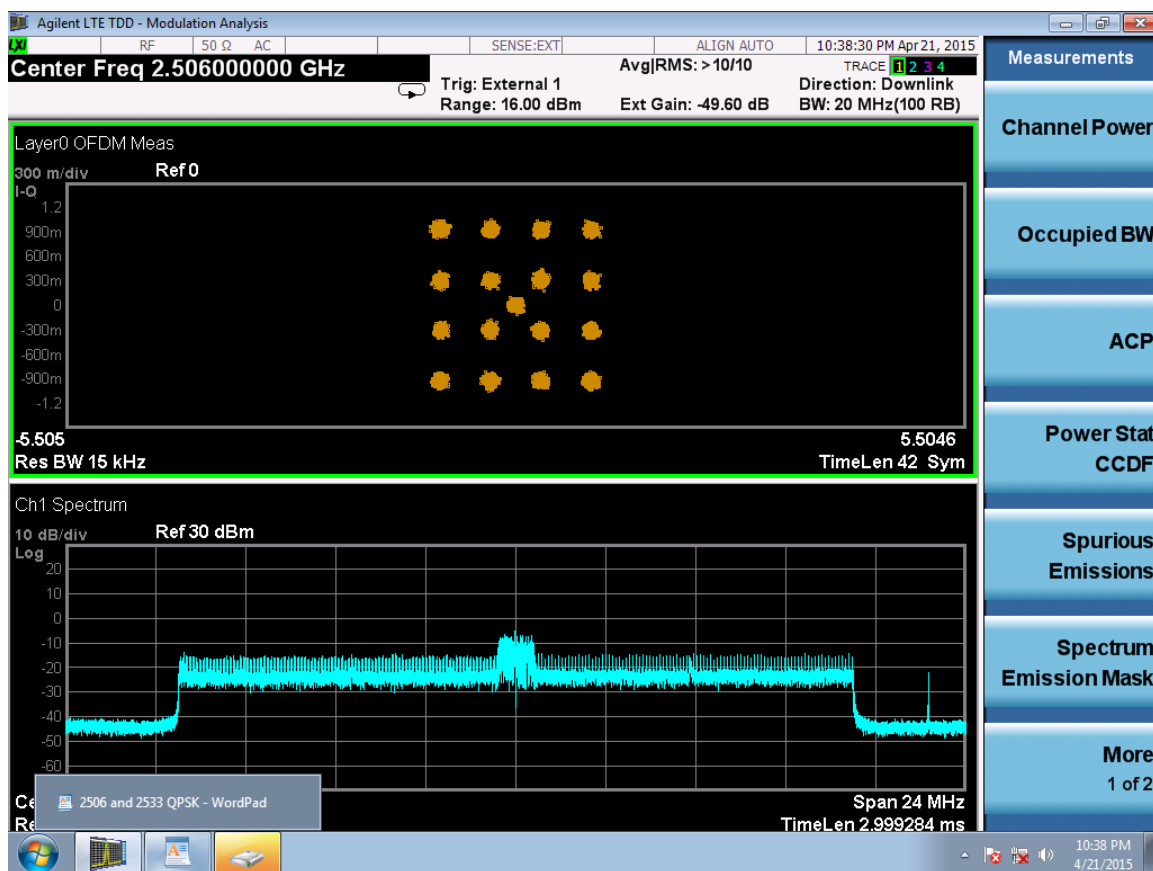
FCCID: AS5BBTRX-15

TEST ENGINEER: JY

Peak to Average
QPSK Modulation
Center Frequencies: 2506&2533 MHz (20+10MHz BW).



16 QAM Modulation
2506 MHz, (20MHz BW).



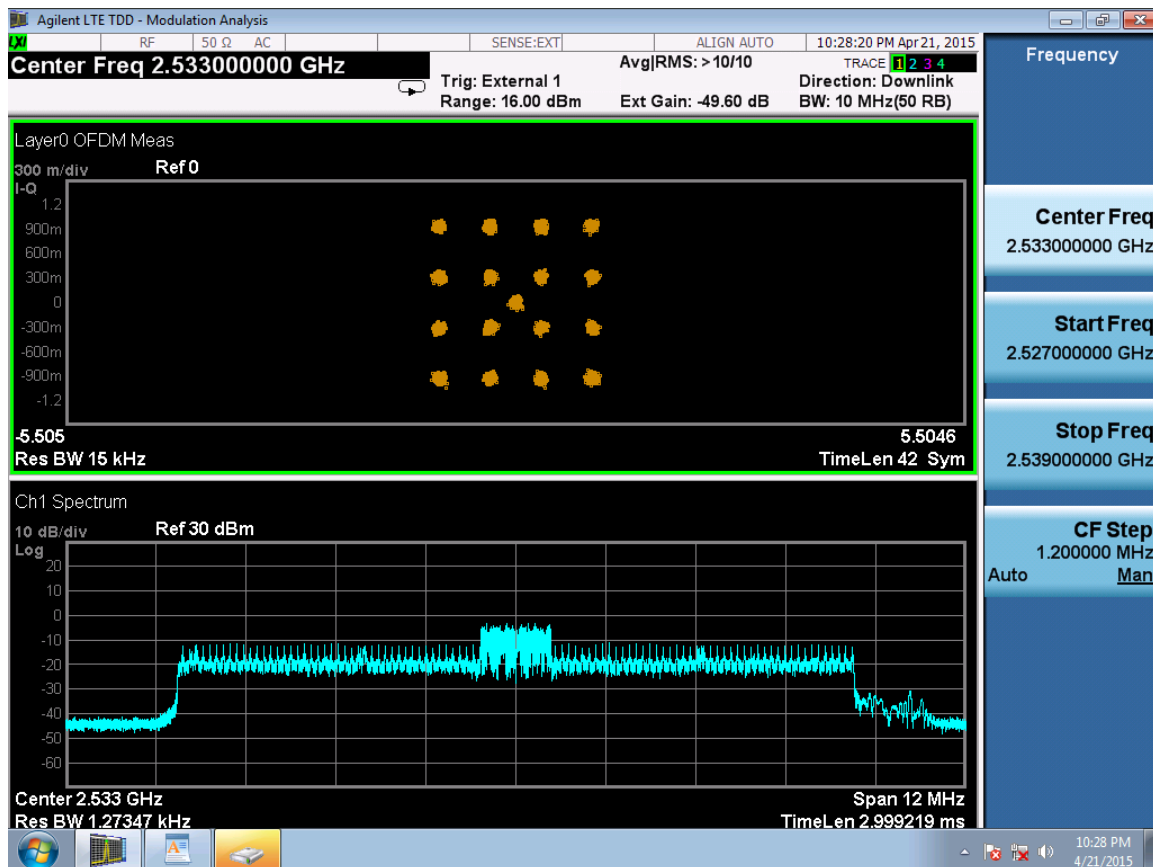
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

FCCID: AS5BBTRX-15

TEST ENGINEER: JY

16 QAM Modulation
2533 MHz, (10MHz BW).



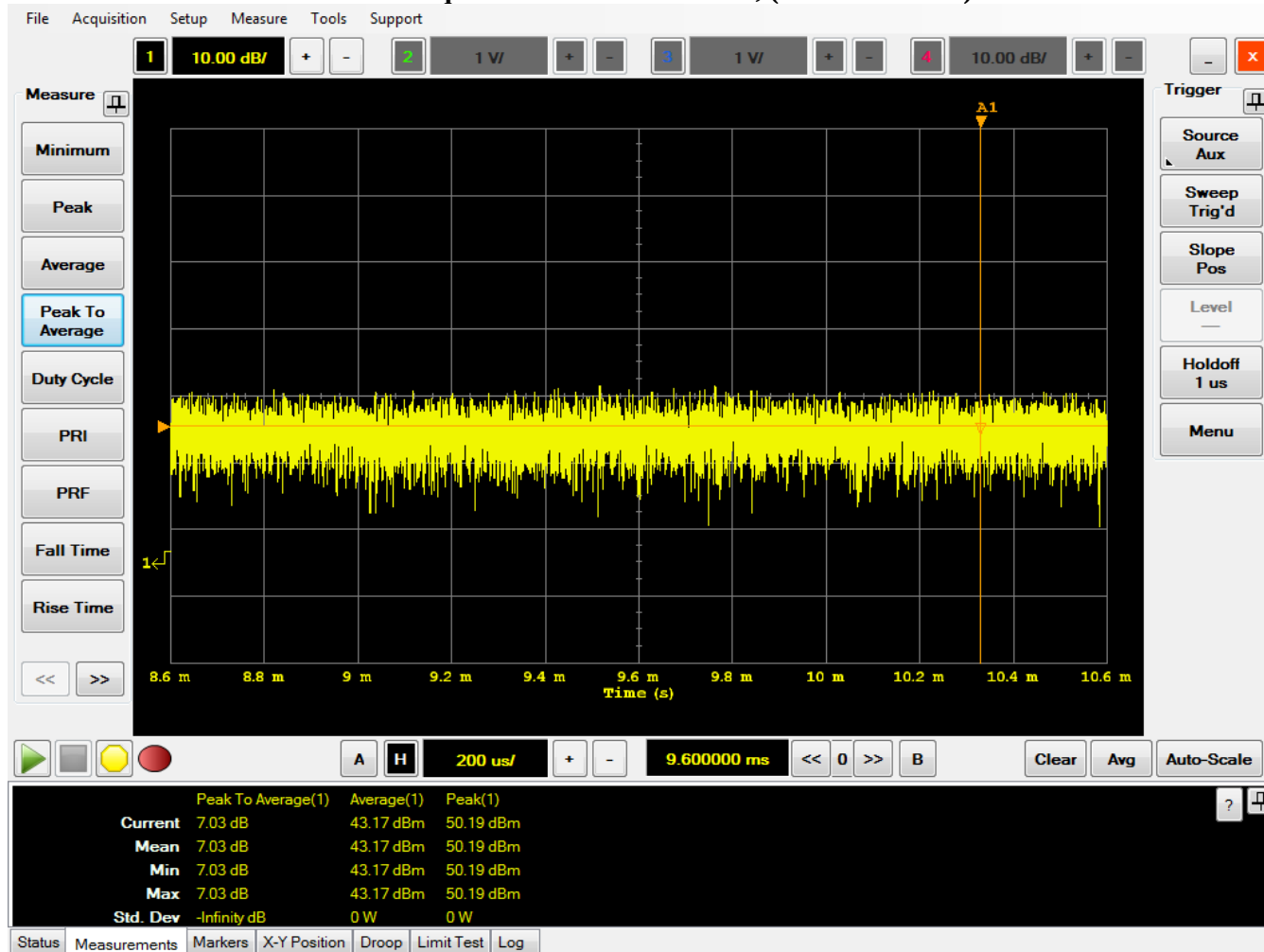
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

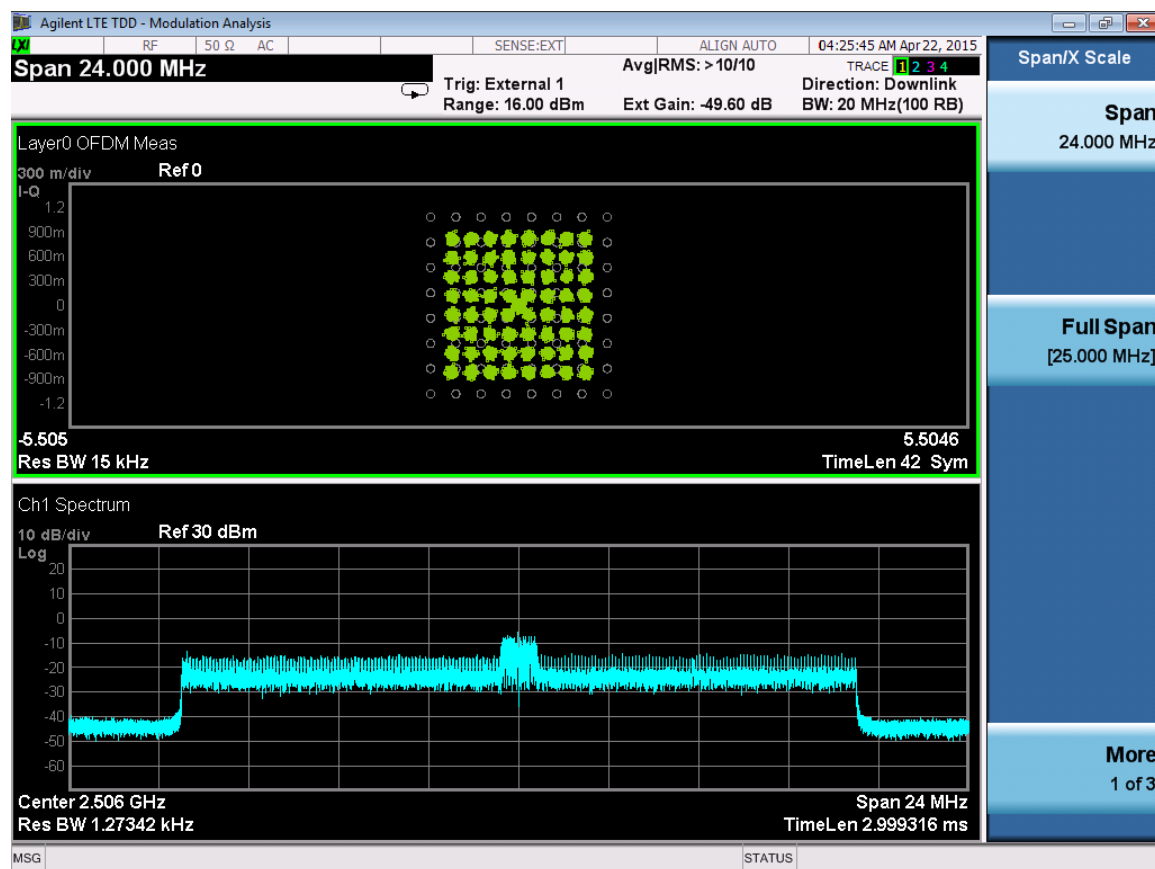
FCCID: AS5BBTRX-15

TEST ENGINEER: JY

Peak to Average
16 QAM Modulation
Center Frequencies: 2506&2533 MHz, (20+10MHz BW).



64 QAM Modulation
2506 MHz, (20MHz BW).



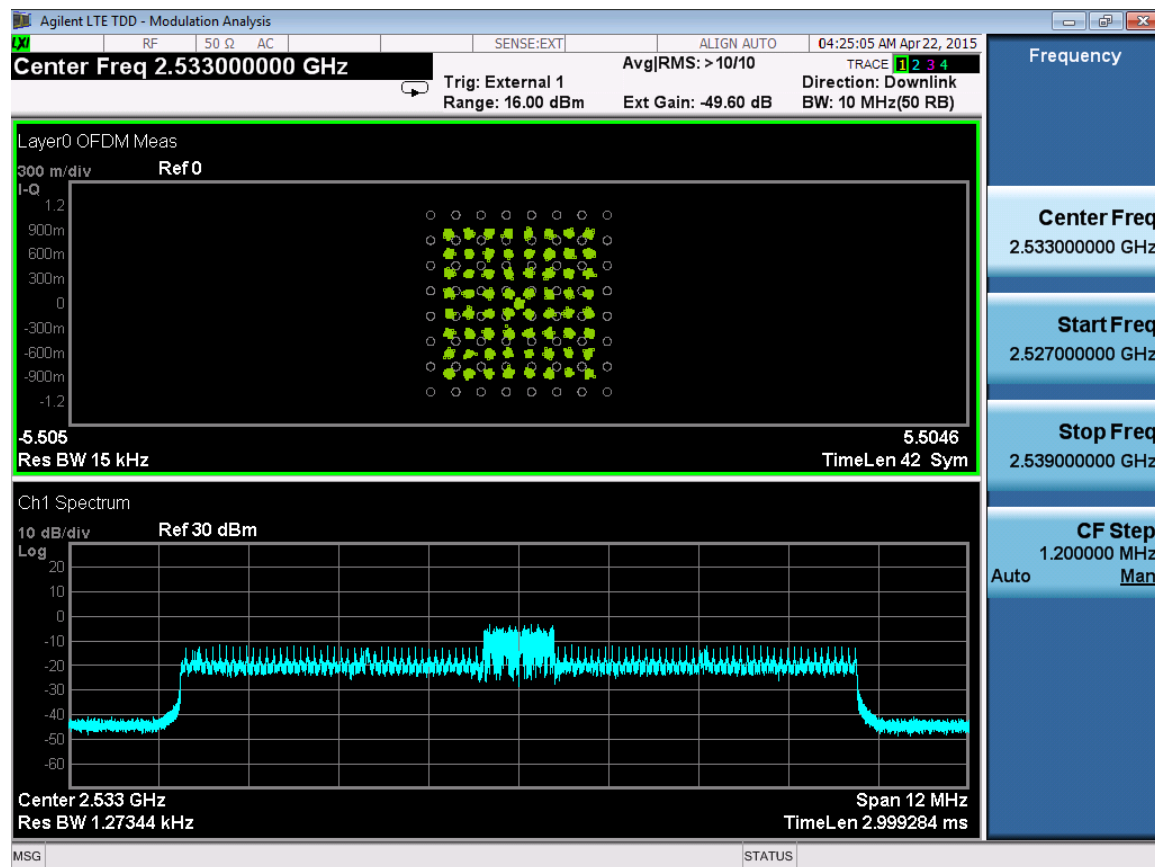
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

FCCID: AS5BBTRX-15

TEST ENGINEER: JY

64 QAM Modulation
2533 MHz, (10MHz BW).



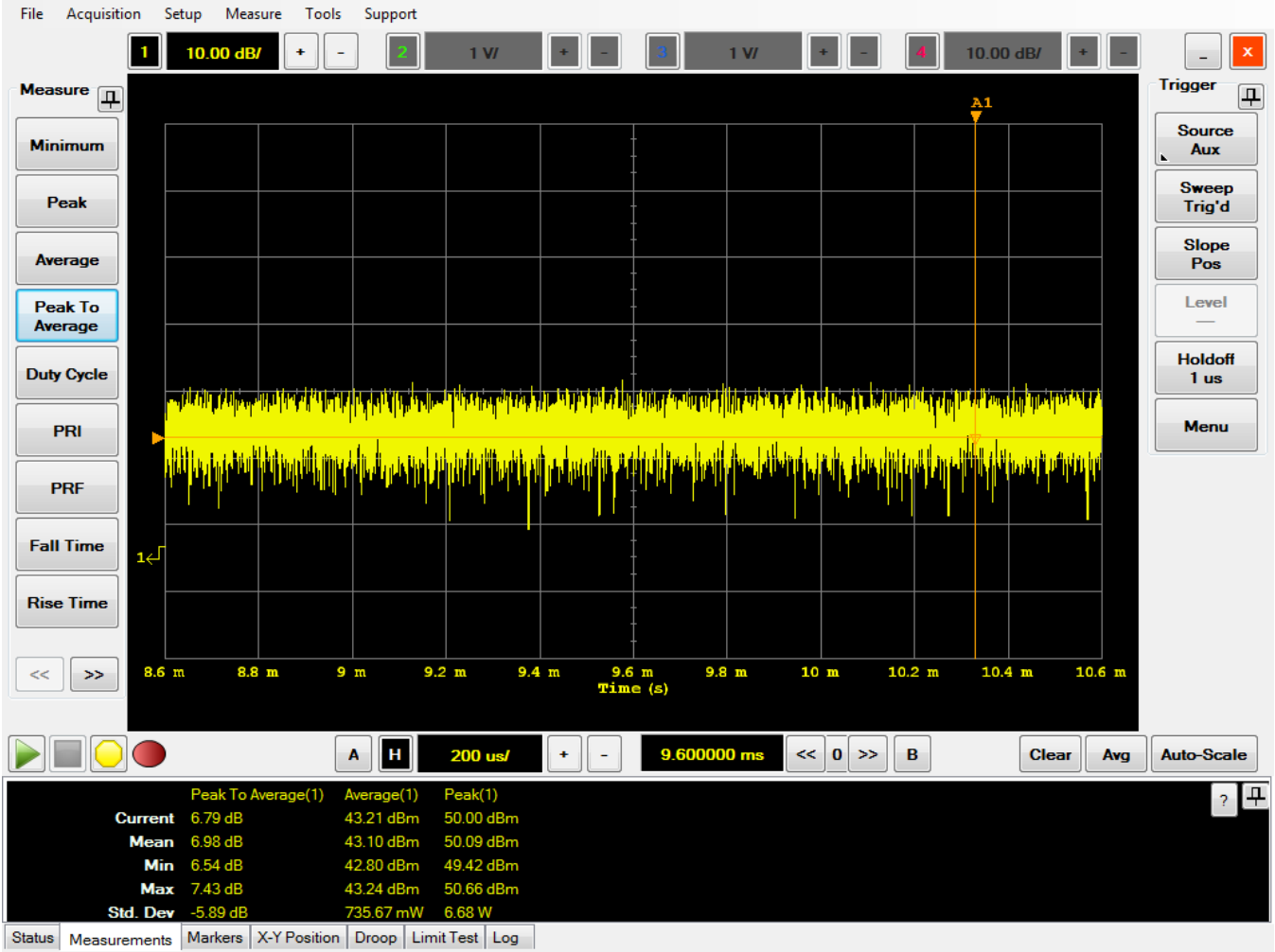
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

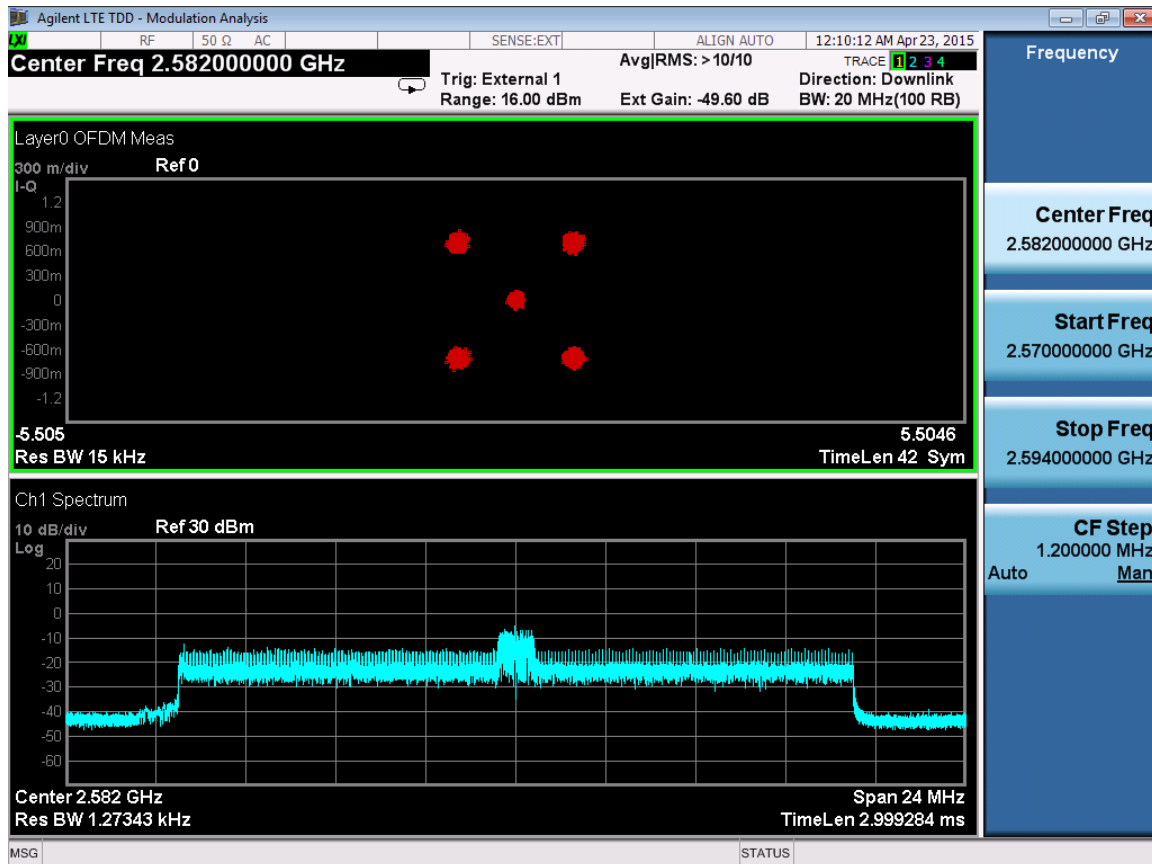
FCCID: AS5BBTRX-15

TEST ENGINEER: JY

Peak to Average
64 QAM Modulation
Center Frequencies: 2506&2533 MHz, (20+10MHz BW).

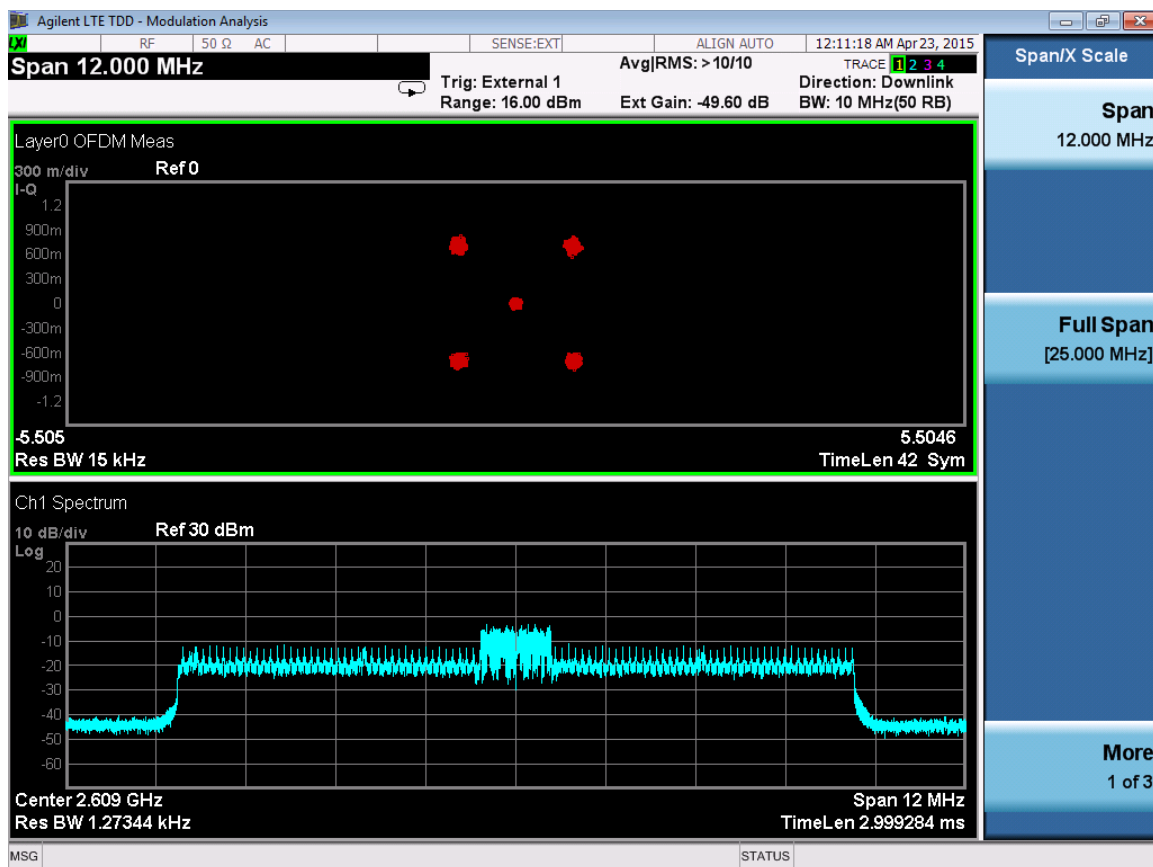


QPSK Modulation
2582 MHz, (20MHz BW).



TDD 8X20 B41RRH
FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)
FCCID: AS5BBTRX-15
TEST ENGINEER: JY

QPSK Modulation
2609 MHz, (10MHz BW).



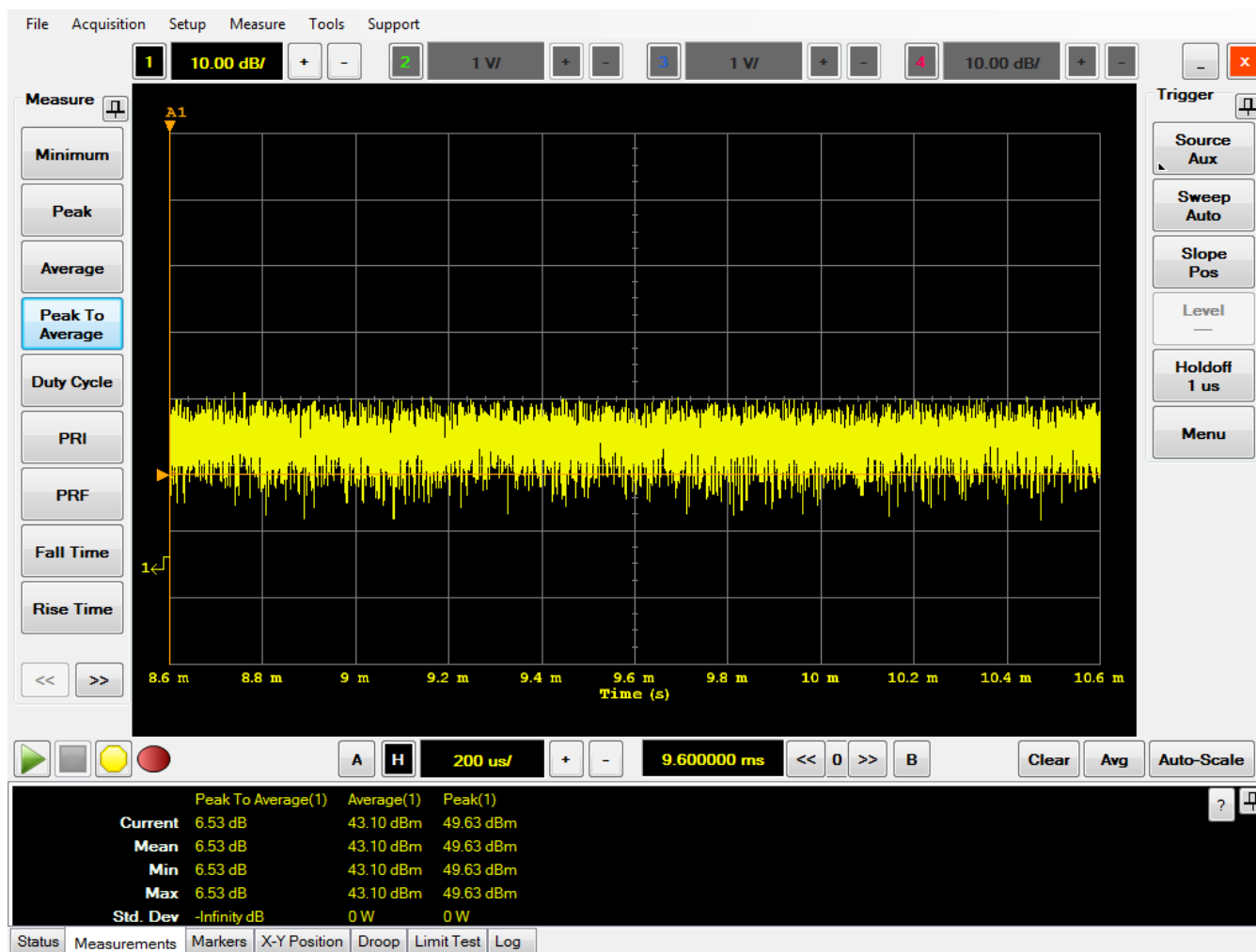
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

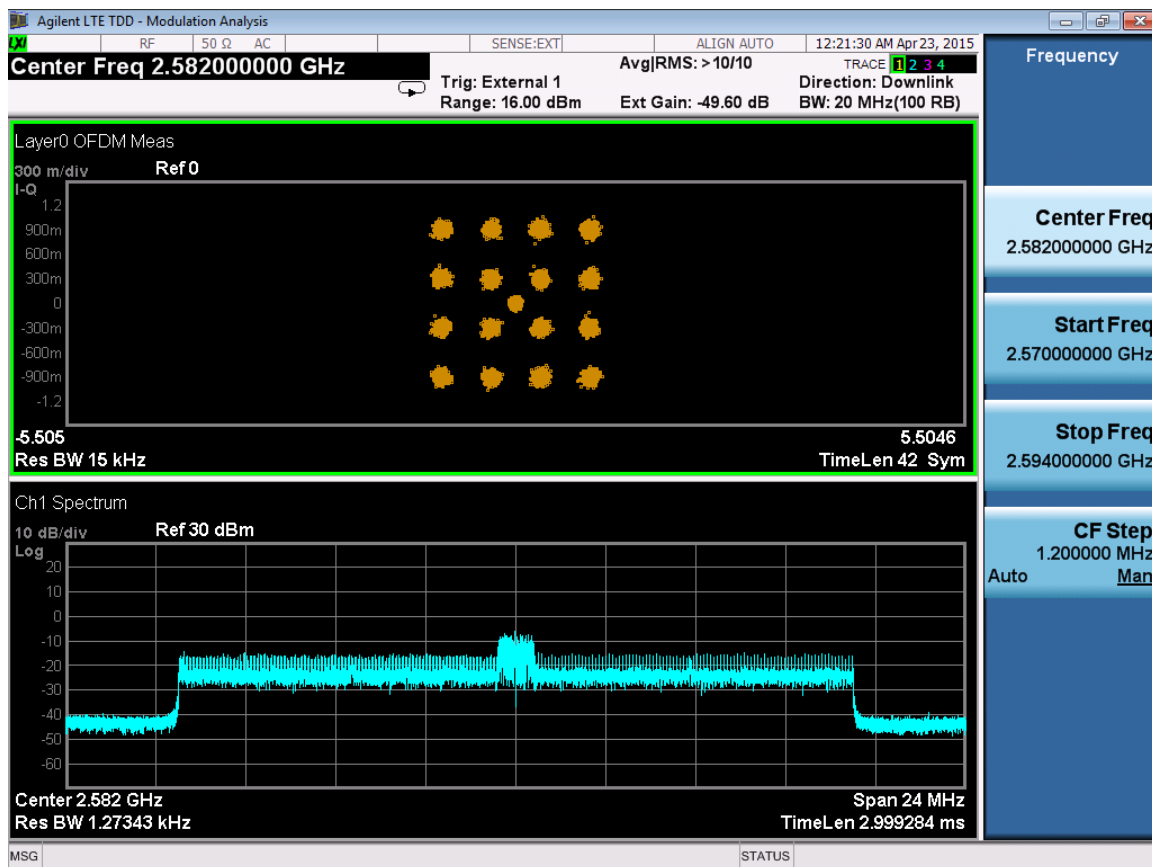
FCCID: AS5BBTRX-15

TEST ENGINEER: JY

**Peak to Average
QPSK Modulation
Center Frequencies: 2582&2609 MHz, (20+10MHz BW).**



16QAM Modulation
2582 MHz, (20MHz BW).



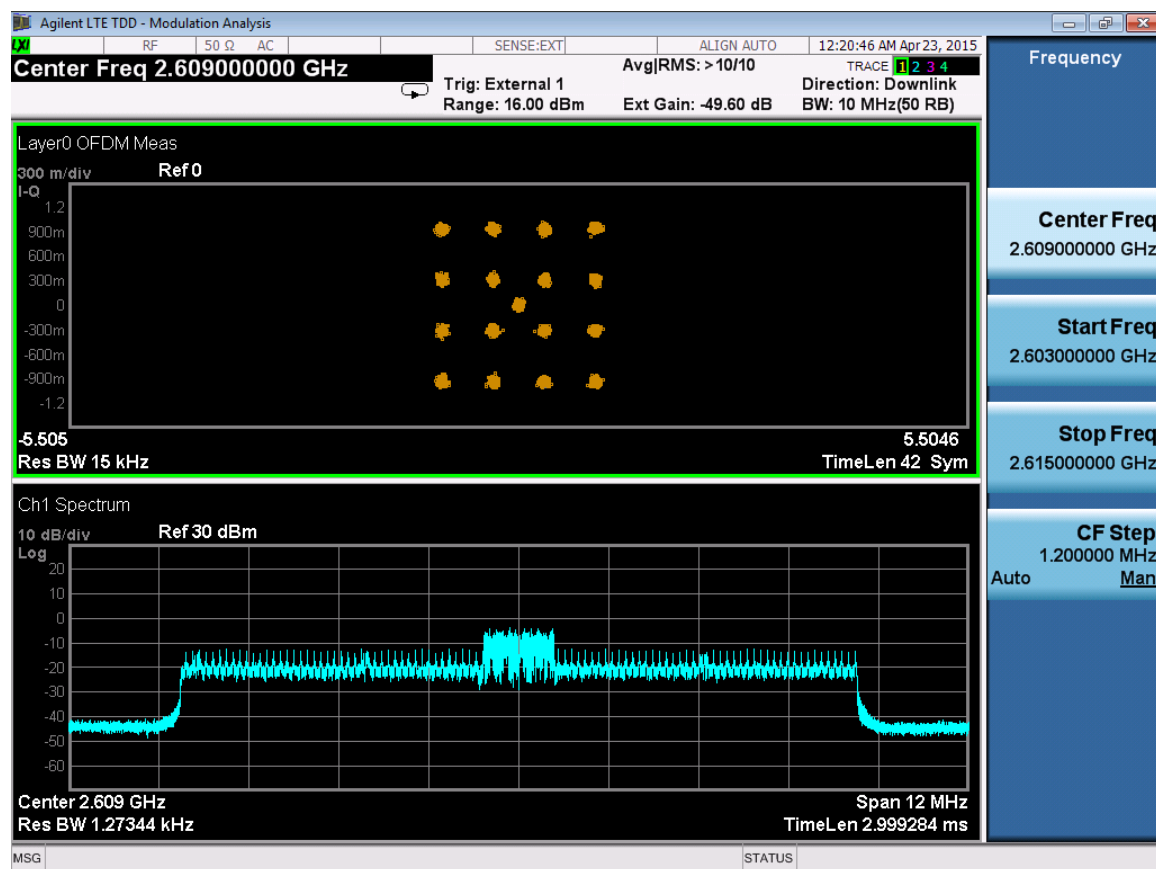
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

FCCID: AS5BBTRX-15

TEST ENGINEER: JY

16QAM Modulation
2609 MHz, (10MHz BW).



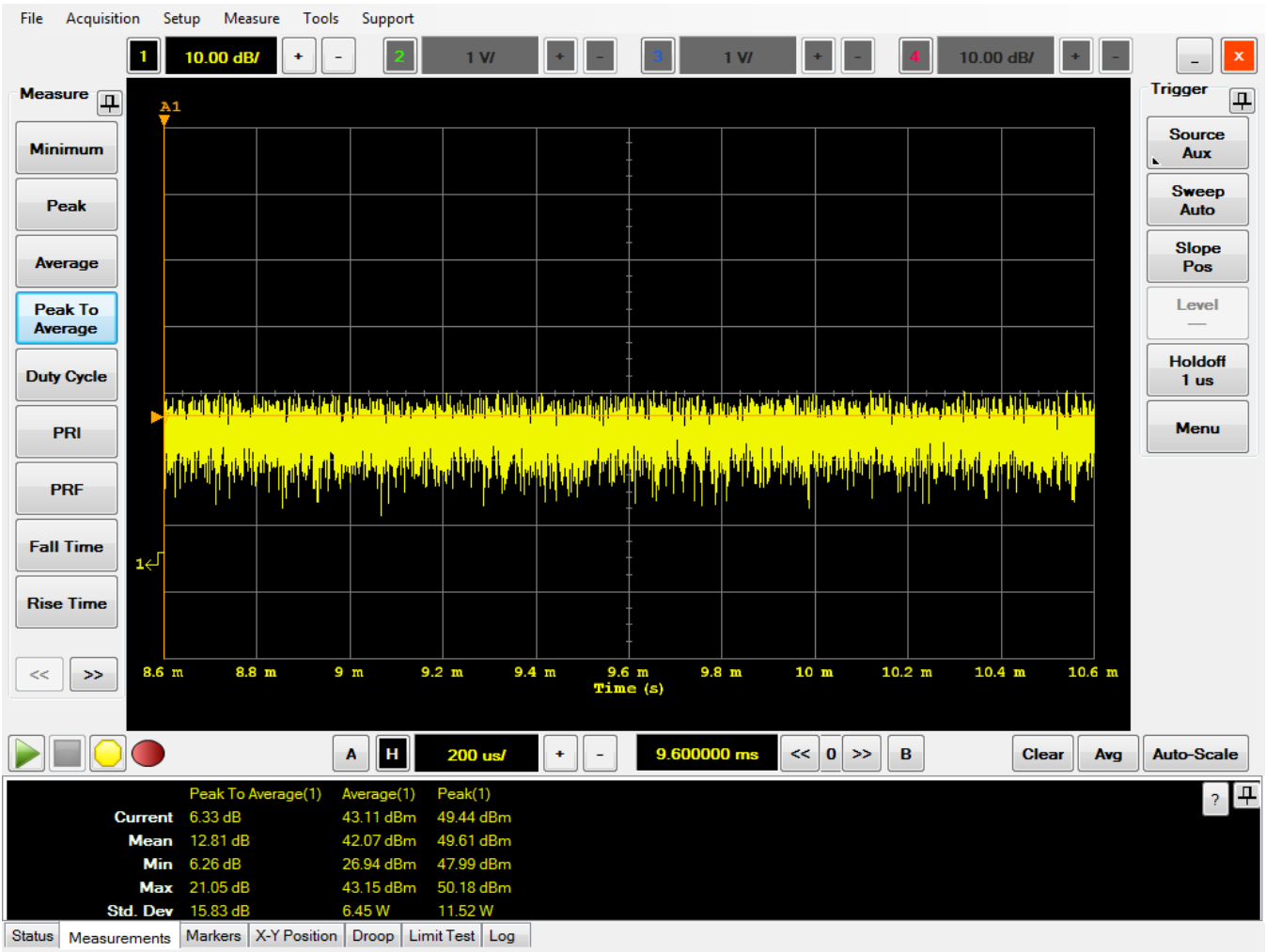
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

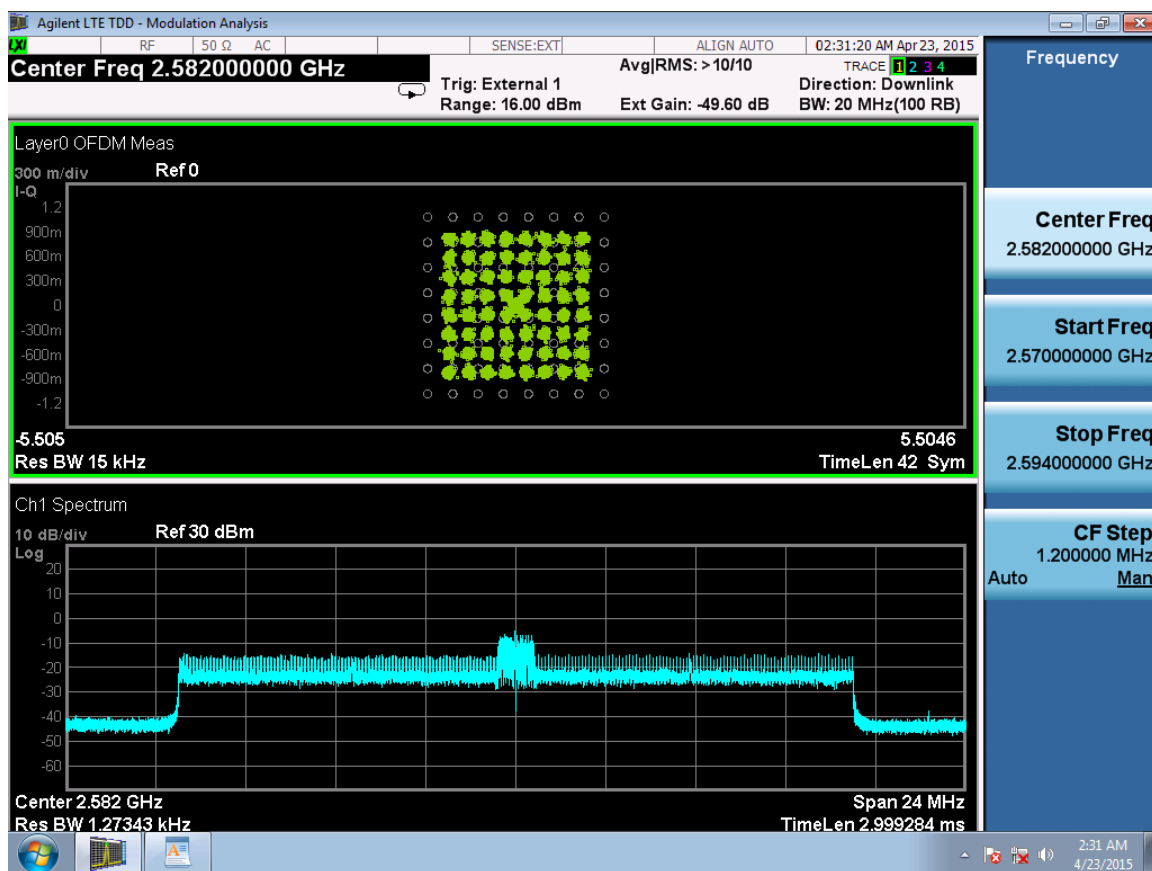
FCCID: AS5BBTRX-15

TEST ENGINEER: JY

Peak to Average
16QAM Modulation
Center Frequencies: 2582&2609 MHz, (20+10MHz BW).



64QAM Modulation
2582 MHz, (20MHz BW).



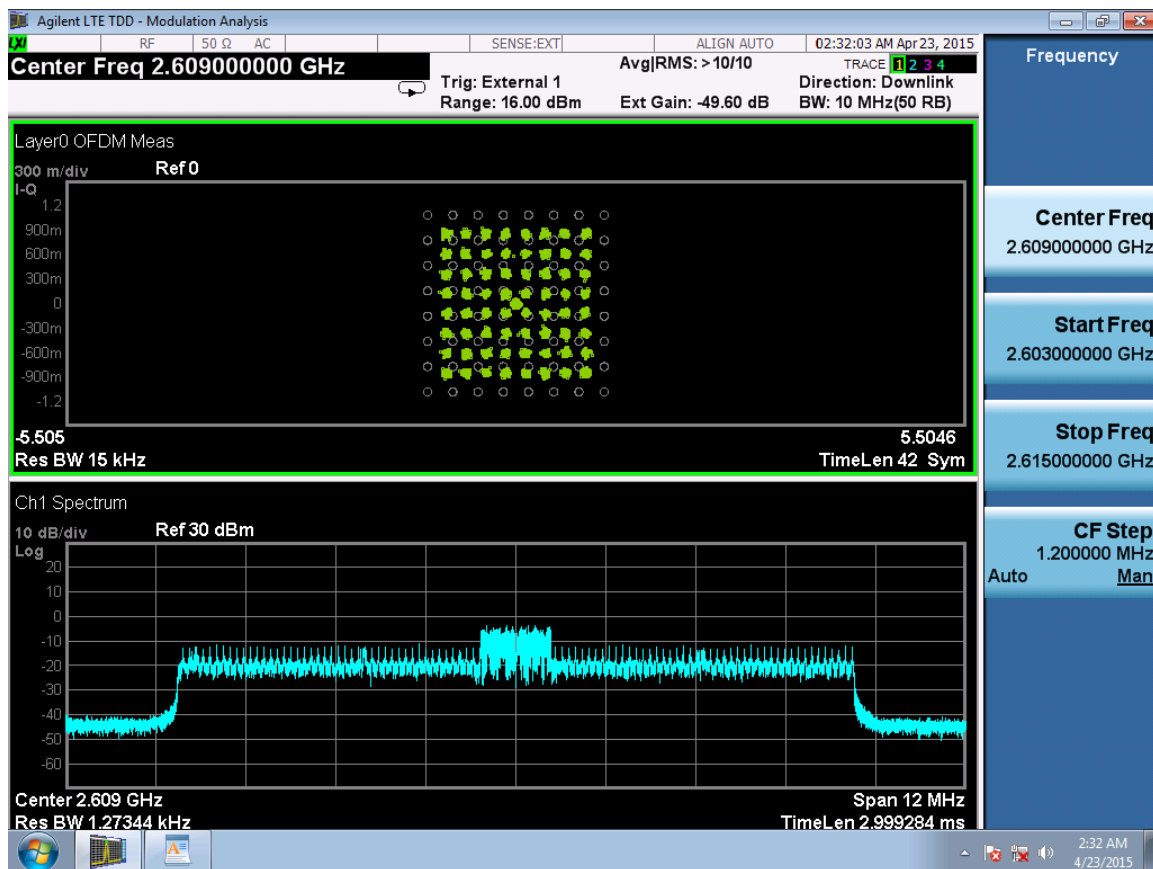
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

FCCID: AS5BBTRX-15

TEST ENGINEER: JY

64QAM Modulation
2609 MHz, (10MHz BW).



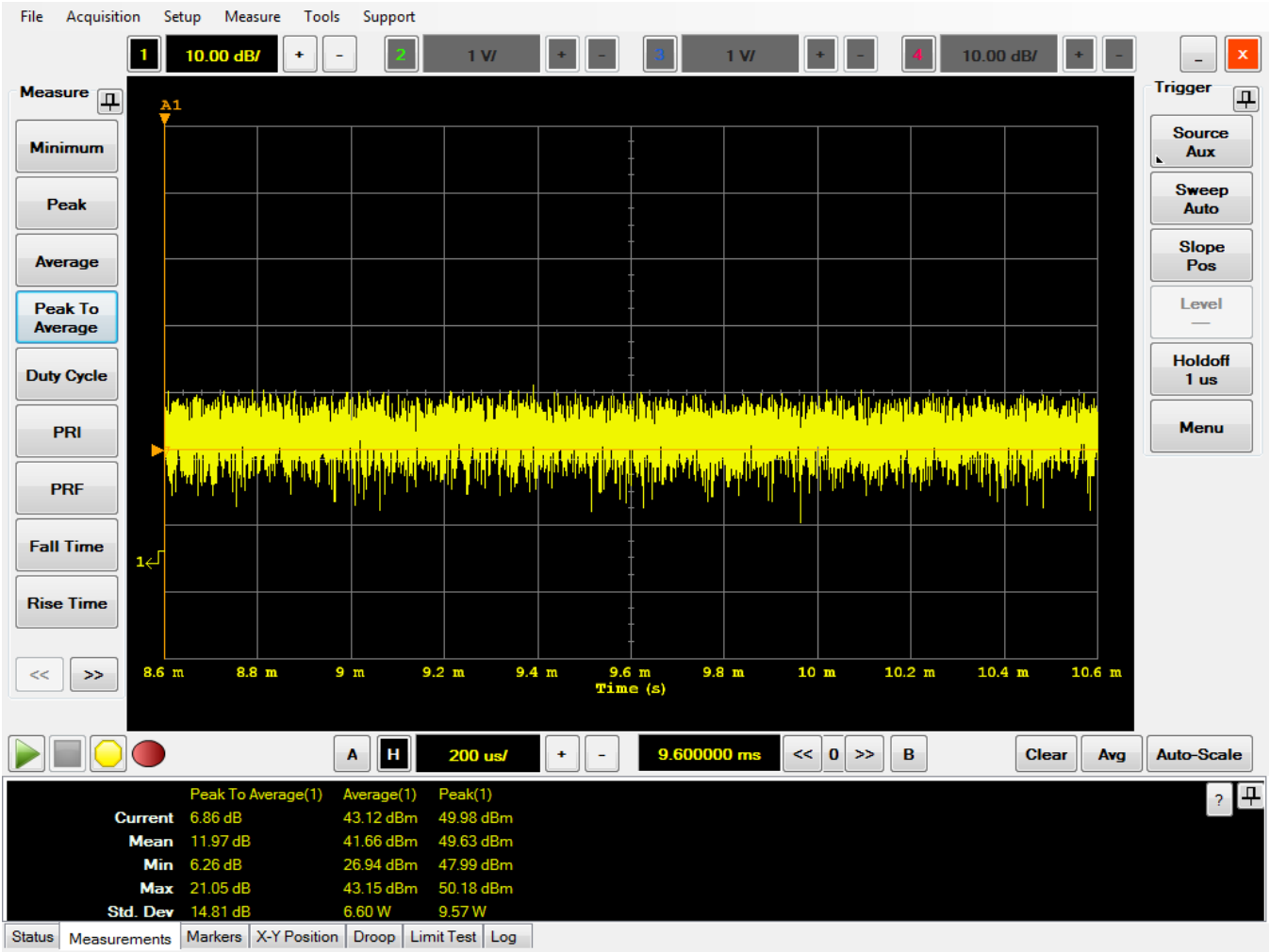
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

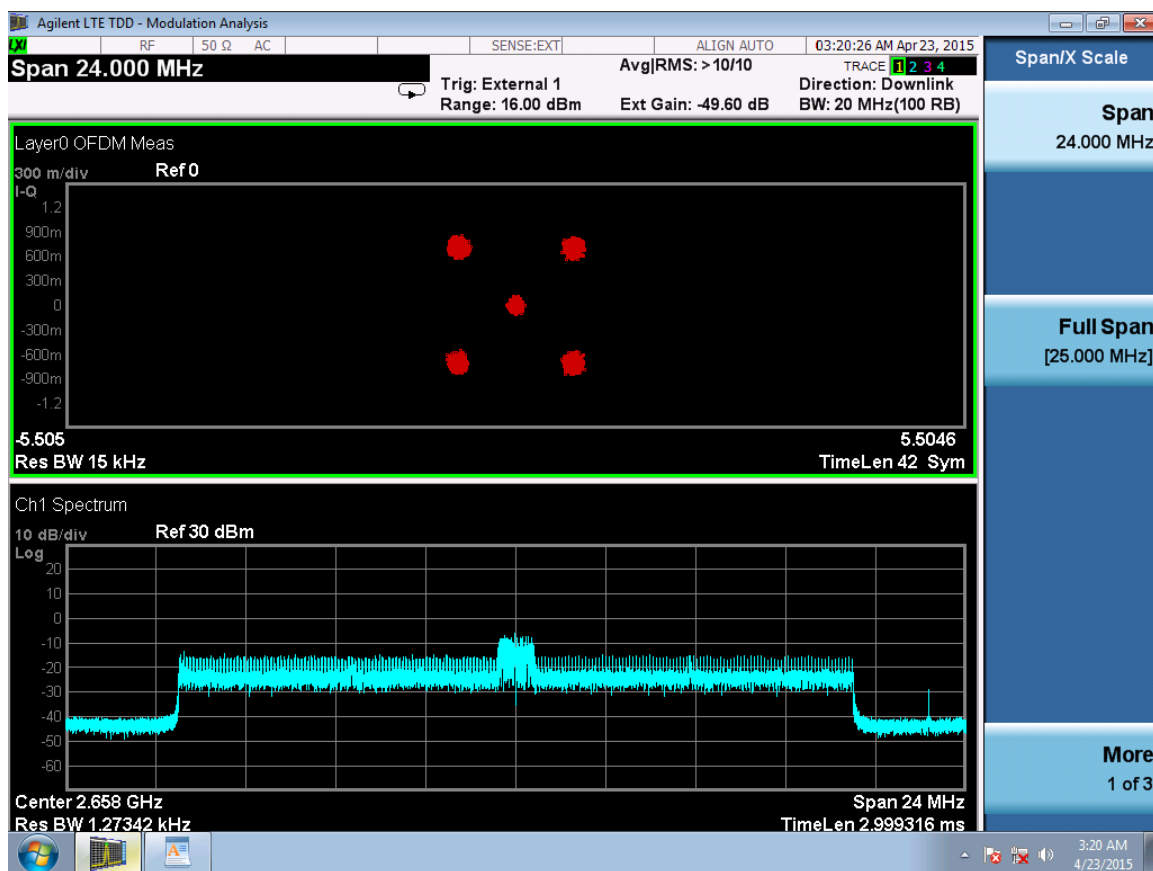
FCCID: AS5BBTRX-15

TEST ENGINEER: JY

Peak to Average
64QAM Modulation
Center Frequencies: 2582&2609 MHz, (20+10MHz BW).



QPSK Modulation
2658 MHz, (20MHz BW).



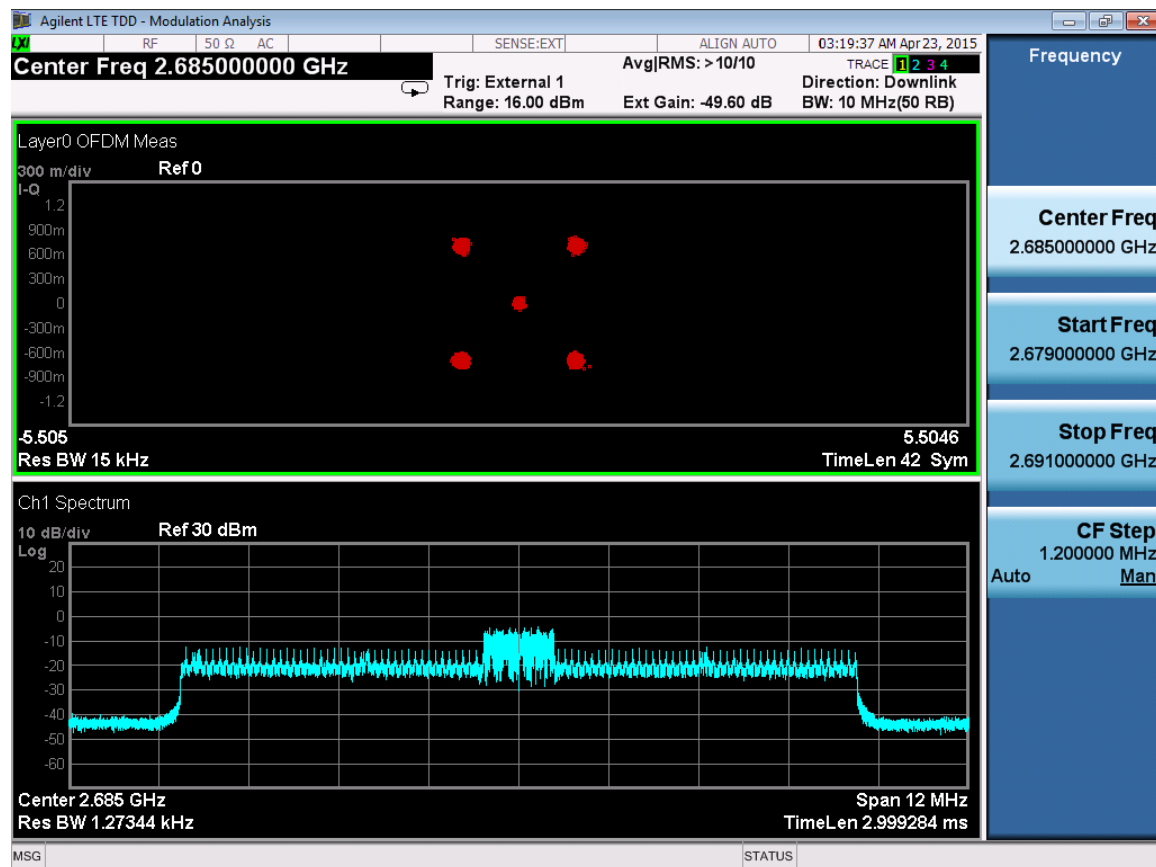
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

FCCID: AS5BBTRX-15

TEST ENGINEER: JY

QPSK Modulation
2685 MHz, (10MHz BW).



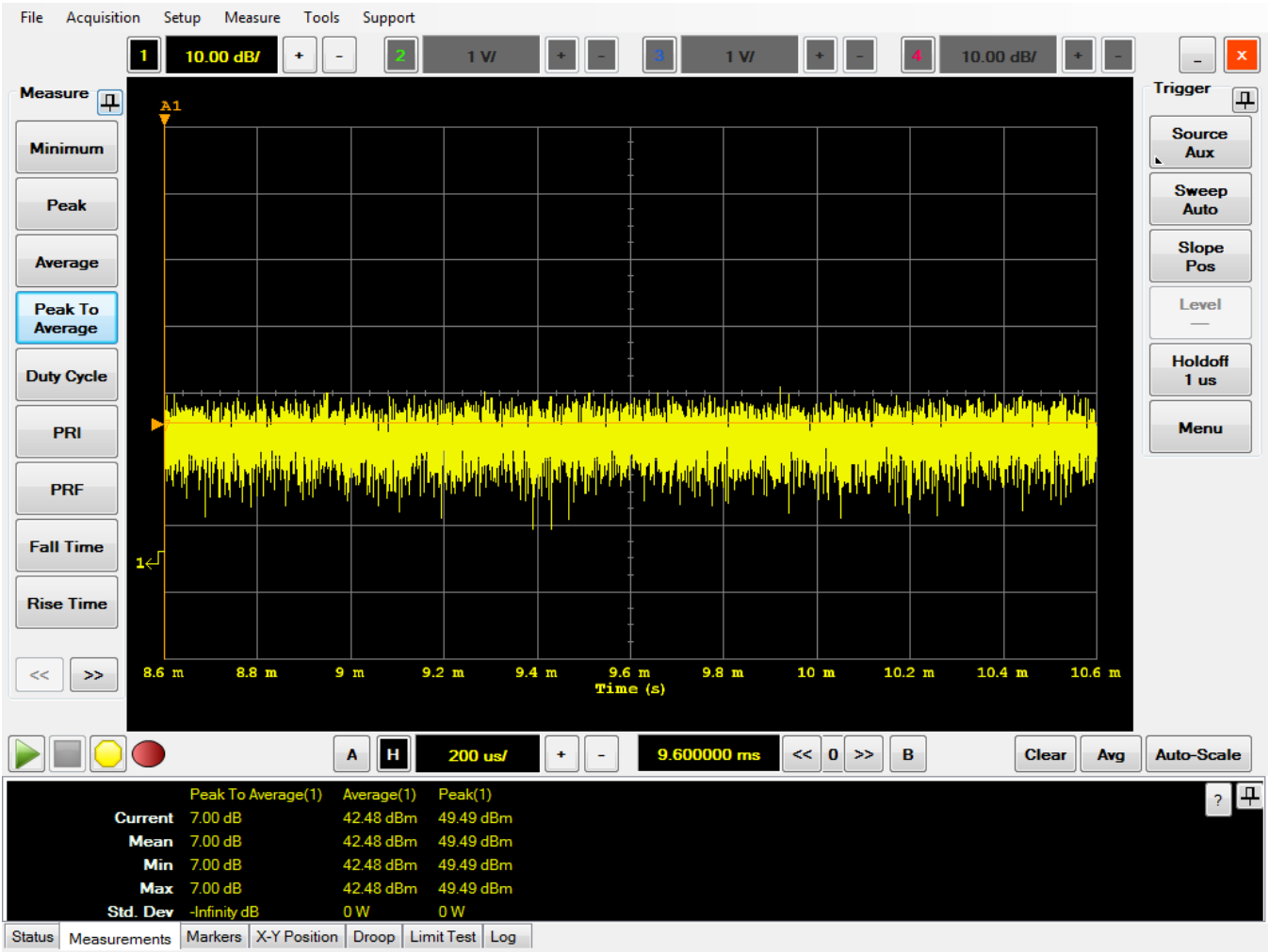
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

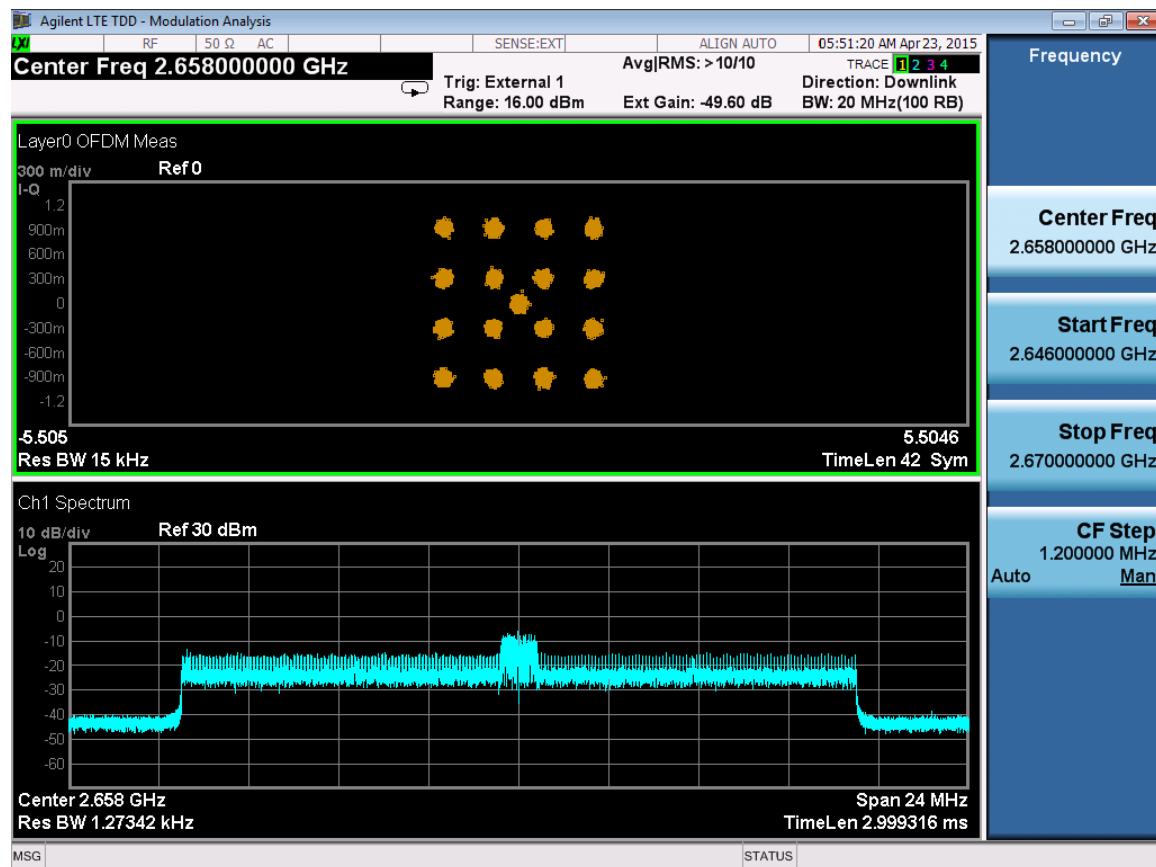
FCCID: AS5BBTRX-15

TEST ENGINEER: JY

Peak to Average
QPSK Modulation
Center Frequencies: 2658&2685 MHz, (20+10MHz BW).



16QAM Modulation
2658 MHz, (20MHz BW).



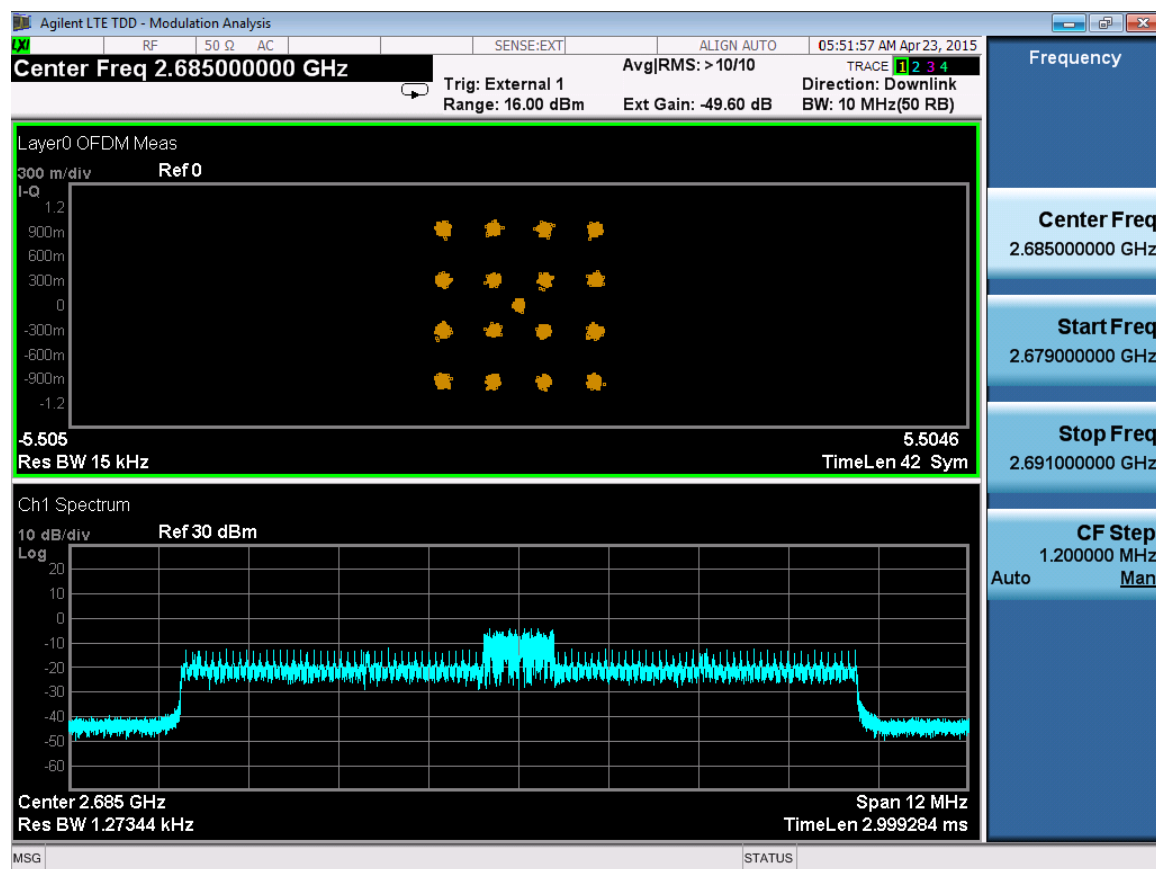
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

FCCID: AS5BBTRX-15

TEST ENGINEER: JY

16QAM Modulation
2685 MHz, (10MHz BW).



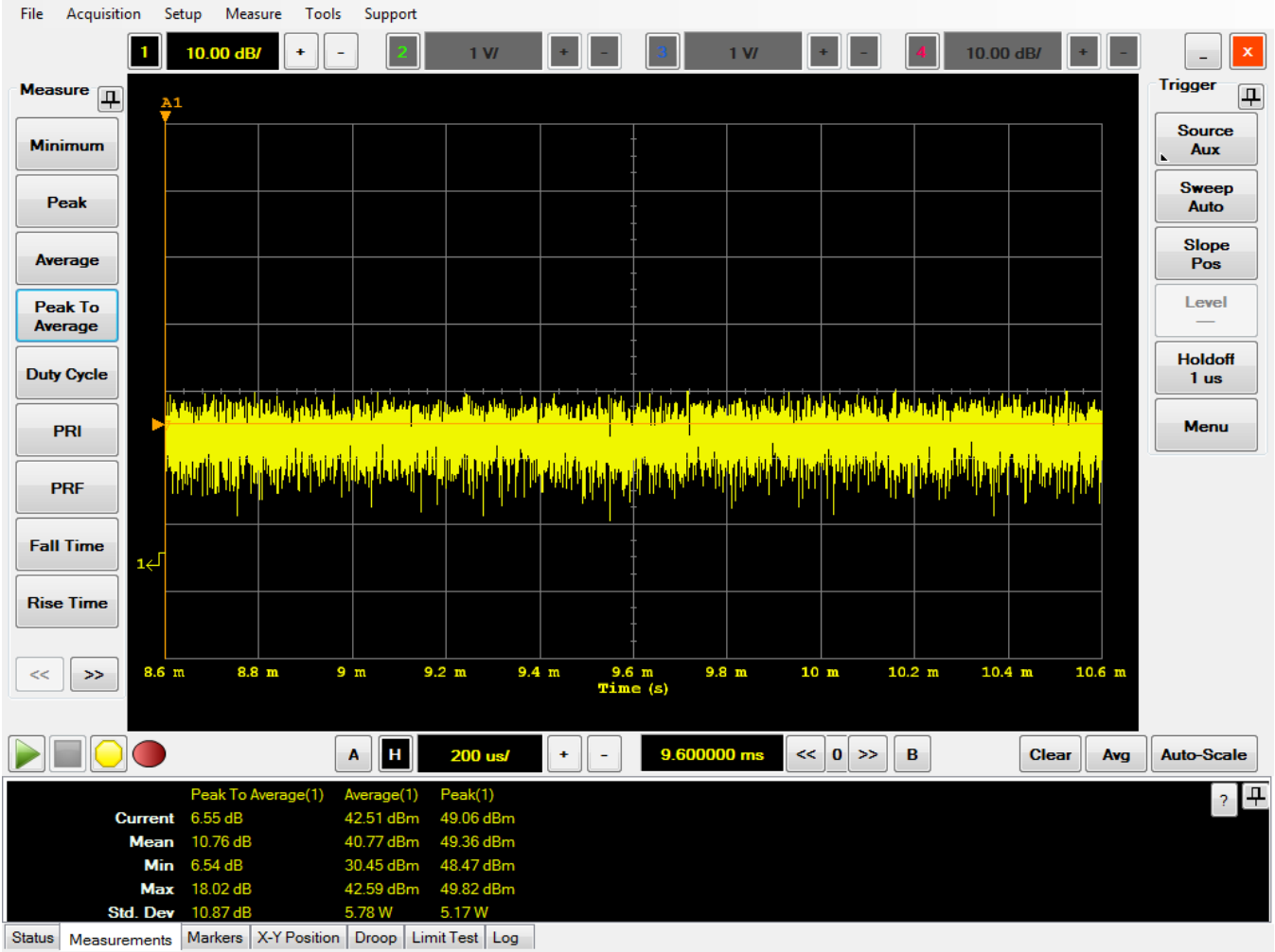
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

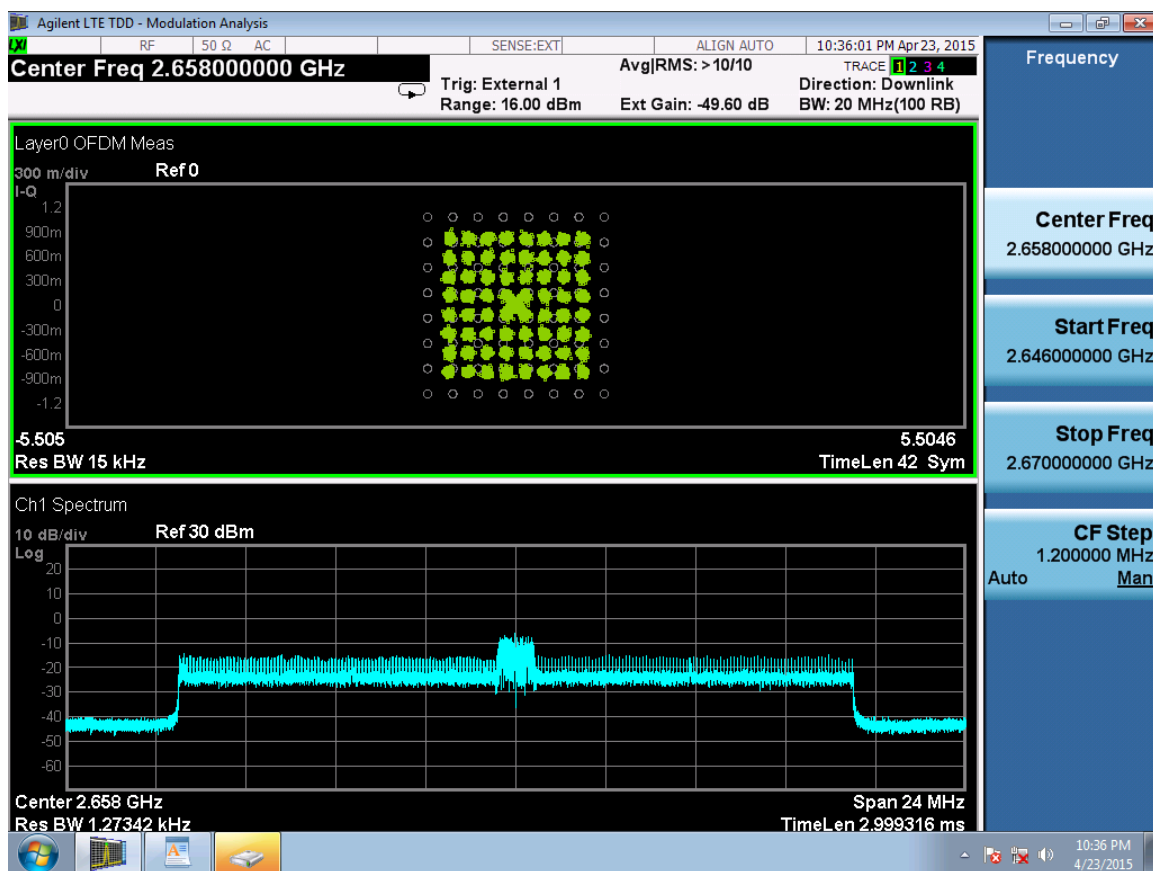
FCCID: AS5BBTRX-15

TEST ENGINEER: JY

Peak to Average
16QAM Modulation
Center Frequencies: 2658&2685 MHz, (20+10MHz BW).



64QAM Modulation
2658 MHz, (20MHz BW).



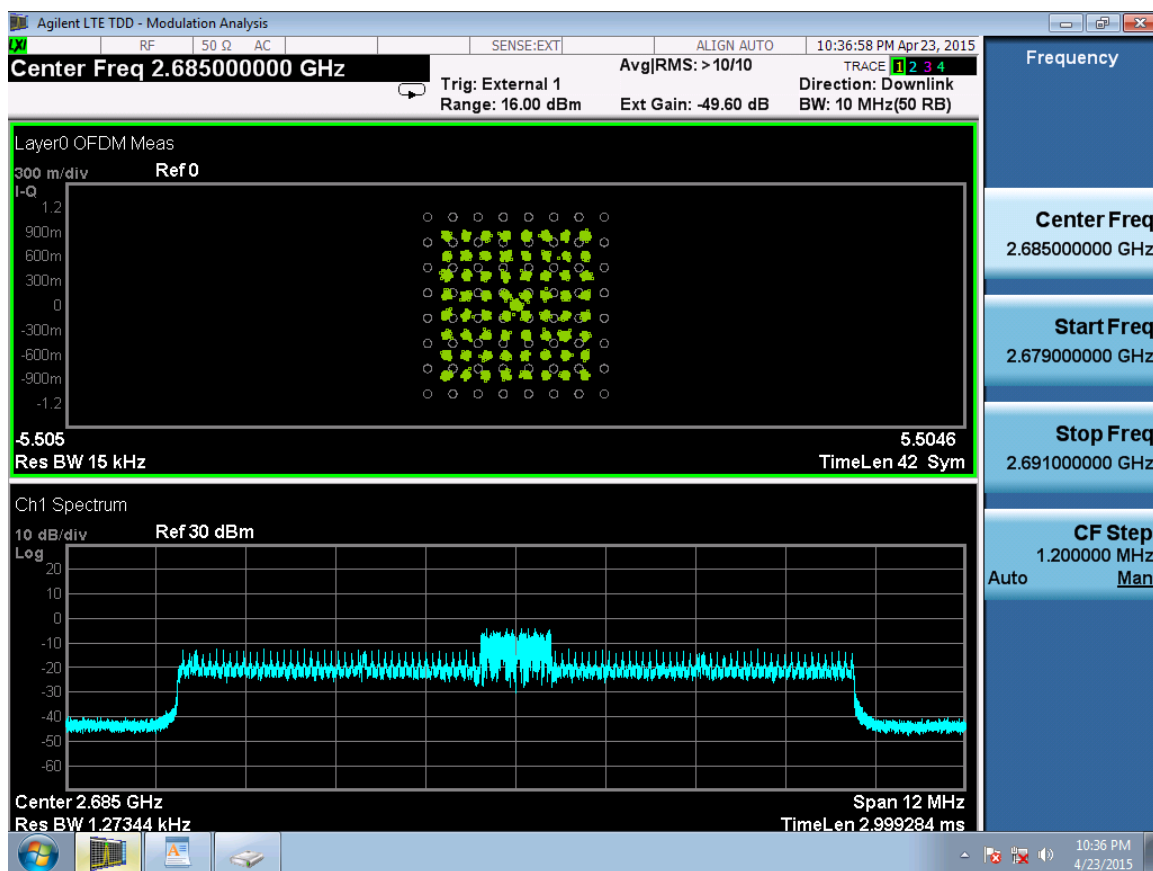
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

FCCID: AS5BBTRX-15

TEST ENGINEER: JY

64QAM Modulation
2685 MHz, (10MHz BW).



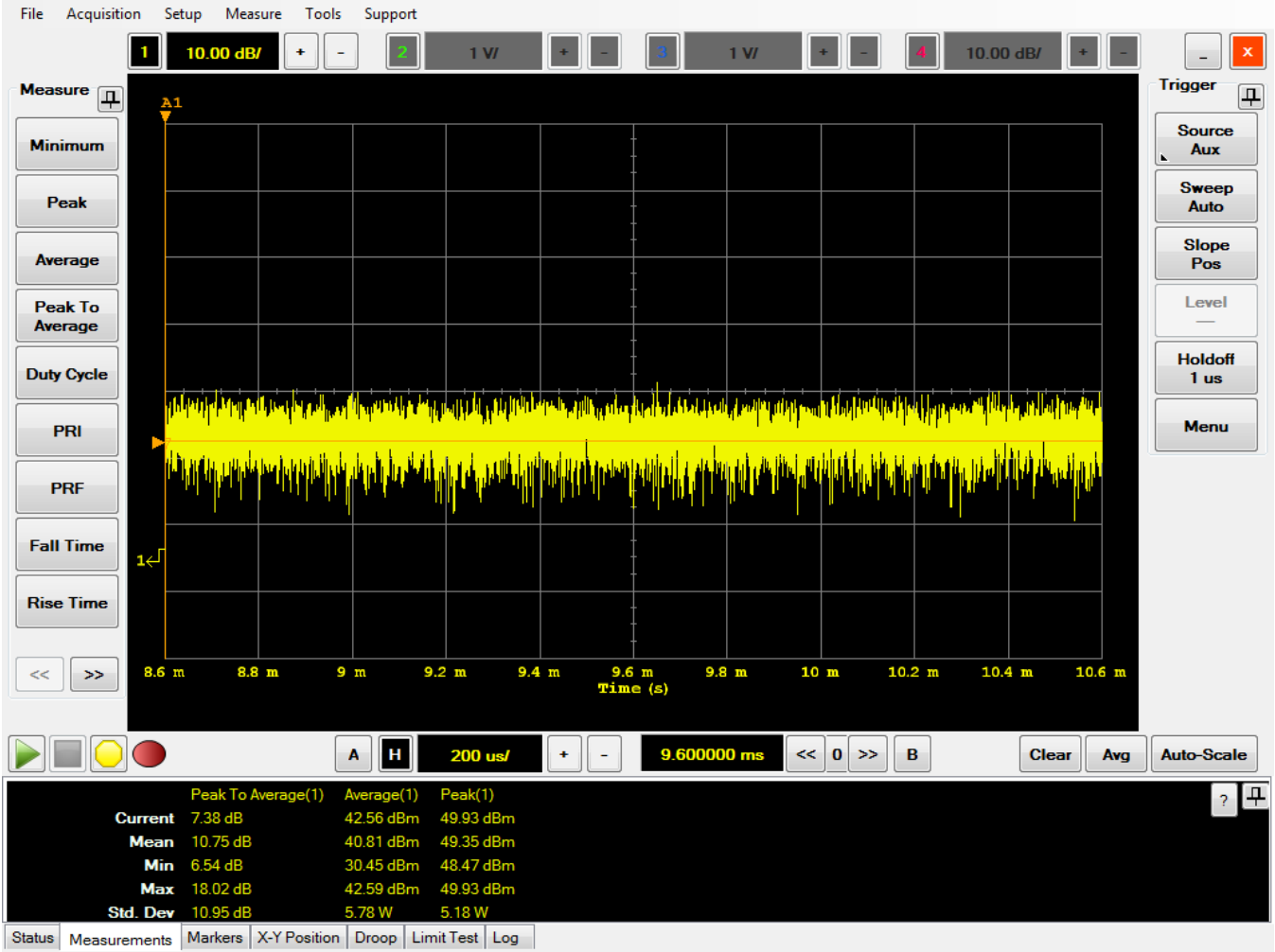
TDD 8X20 B41RRH

FCC Part 27.53; PWR: 20 Watts (8x20W MIMO)

FCCID: AS5BBTRX-15

TEST ENGINEER: JY

Peak to Average
64QAM Modulation
Center Frequencies: 2658&2685 MHz, (20+10MHz BW).



Measurement 3

FCC Section 2.1049

- (a) Emissions Bandwidth Measurement
- (b) Occupied Bandwidth Measurement showing spurious Emissions **1MHz close to Block edges.**

Spectrum Bandwidth Measurement For Emissions Type

FCC approved measurement method for Spectrum Bandwidth.

(A) 26 dB Band width.

This method was used to measure the bandwidth at modulations and highest is recorded. The modulations used are:

1. QPSK
2. 16 QAM
3. 64 QAM

Highest Bandwidth is used for Emissions type designation: 18.50 MHz for 20 MHz Bandwidth, and 9.42MHz for 10 MHz Bandwidth.

Therefore:

Measured Emission type: 18M5F9W (10W) for 20 MHz Bandwidth.

Measured Emission type: **9M42F9W** (10W) for 10 MHz Bandwidth.

The list of blocks and bands, tested for QPSK, 16QAM and 64QAM are listed below:

Blocks	Bandwidth (MHz)	Frequency (MHz)	Power (Watts)
Lower	20+10	2496-2516 and 2528-2538	20
Middle	20+10	2572-2592 and 2604-2614	20
Higher	20+10	2648-2668 and 2680-2690	20

**MEASUREMENT OF EMISSIONS BANDWIDTH
26 dB POWER BANDWIDTH**

**(b) MEASUREMENT OF
SPECTRUM BANDWIDTH
For Emissions Type**

The occupied bandwidth of the Long Term Evolution (LTE) is measured using a Rohde & Schwarz ESU 40 Spectrum Analyzer/Receiver. The emissions bandwidth is described in section 27.53 (m) (v) (6) is used. Accordingly “The emissions 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 26dB below the transmitter power.”

The measurements were made on a “TD-RRH8X20” enclosure in the following configurations:

1. QPSK
2. 16 QAM
3. 64 QAM

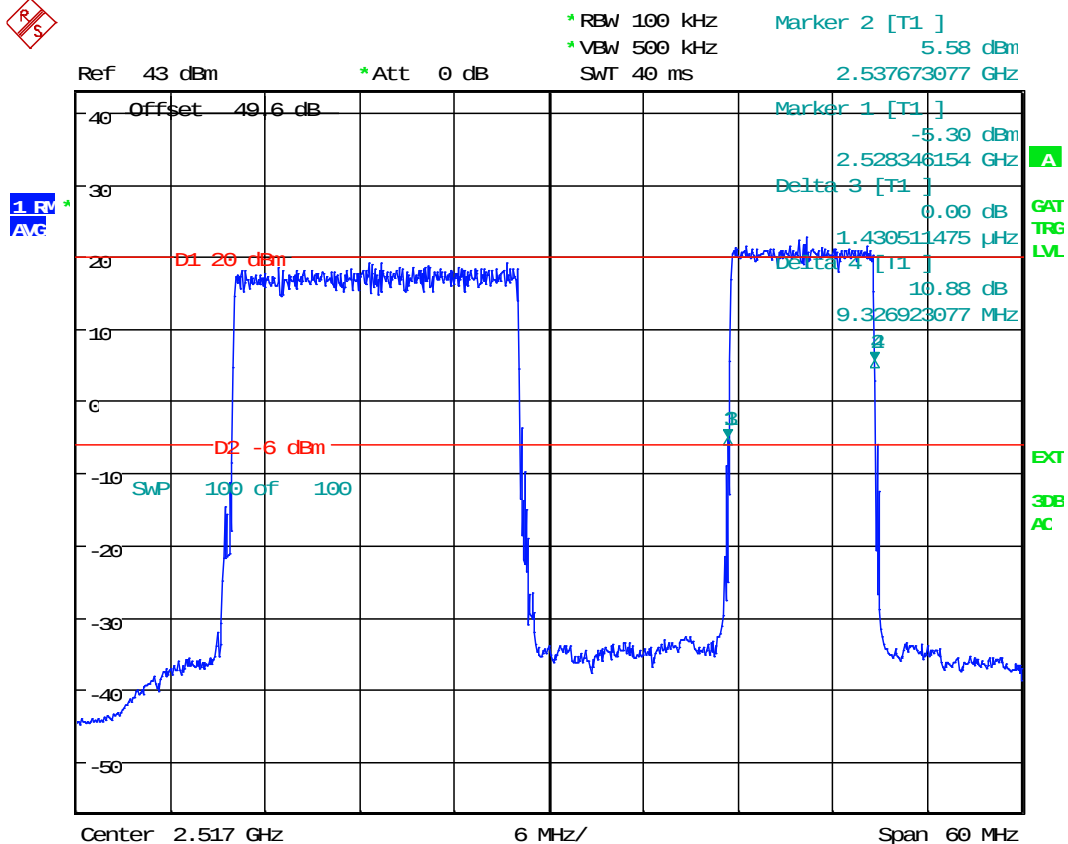
Results:

The plots are provided for QPSK, 16QAM and 64QAM modulations for 20 MHz band and 10MHz bandwidth. The Measured 26dB emissions bandwidth is 18.50 MHz for 20 MHz (10W), 9.42 MHz for 10 MHz (10W) bandwidth.

20+10 MHz Bandwidth
2496-2516MHz (20MHz) and 2528-2538 MHz (10MHz)
(Lower)

8x20 watts (MIMO)

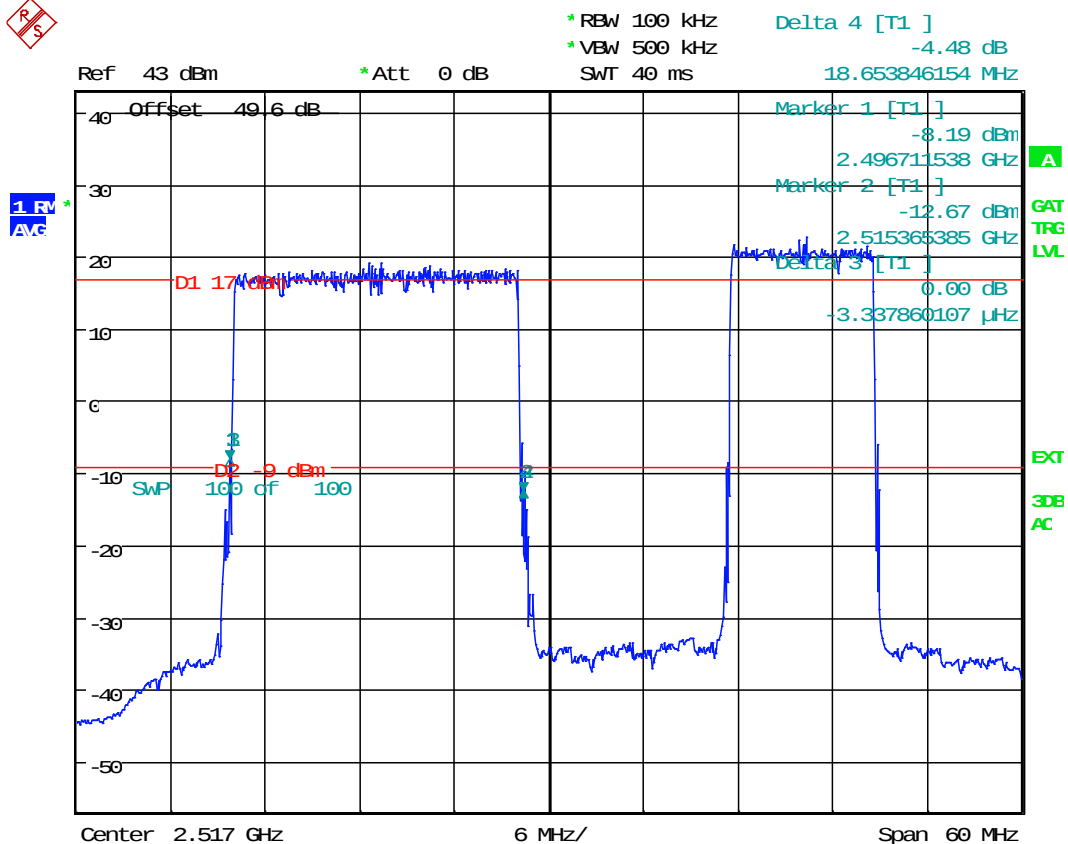
(26dB Bandwidth)



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2506

M&2533M;-48VDC;QPSK;FCCID-AS5BBTRX-15.CII

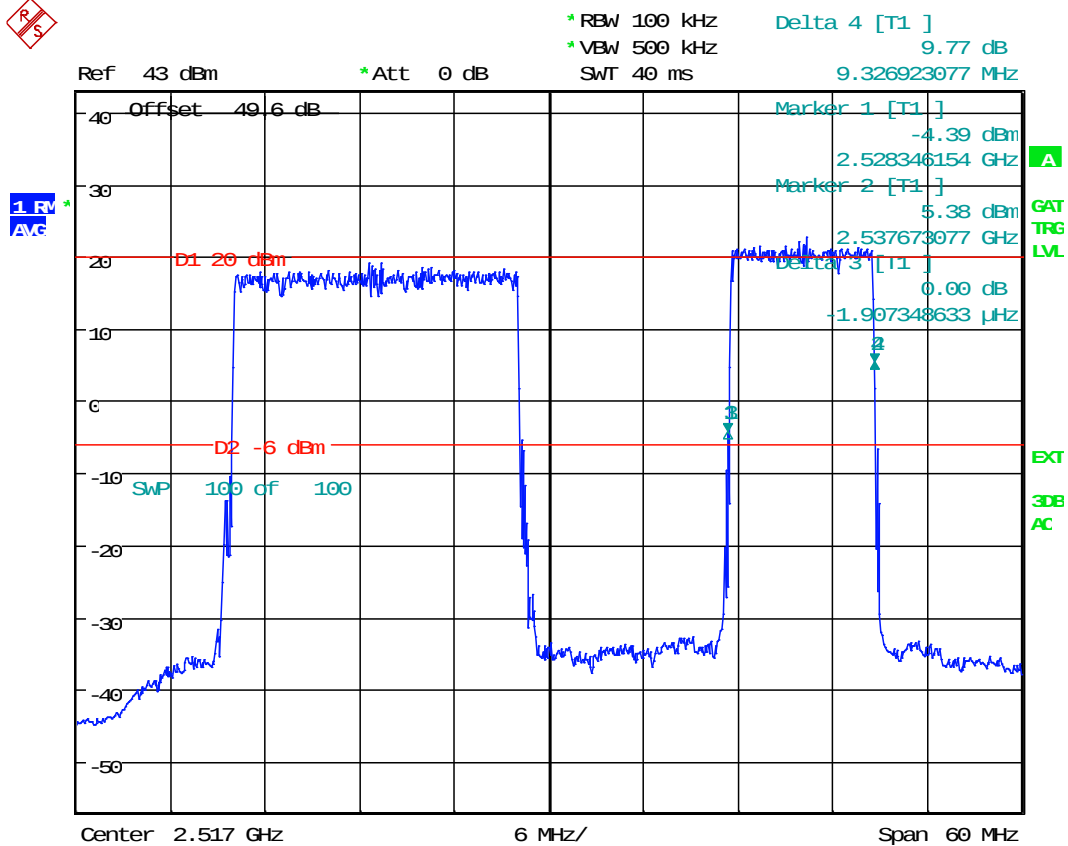
Date: 23.APR.2015 19:59:50



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2506

M&2533M;-48VDC;QPSK;FCCID-AS5BBTRX-15.CII

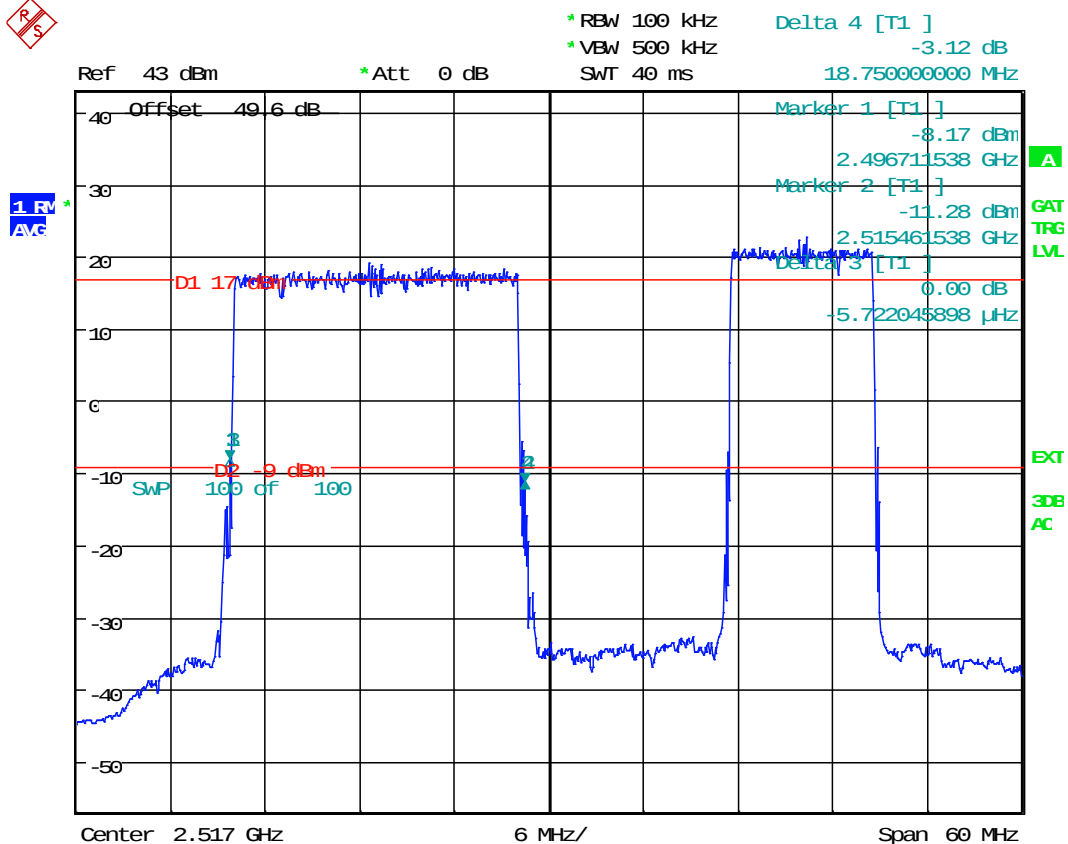
Date: 23.APR.2015 20:00:54



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2506

M&2533M;-48VDC;16QAM;FCCID-AS5BBTRX-15.CII

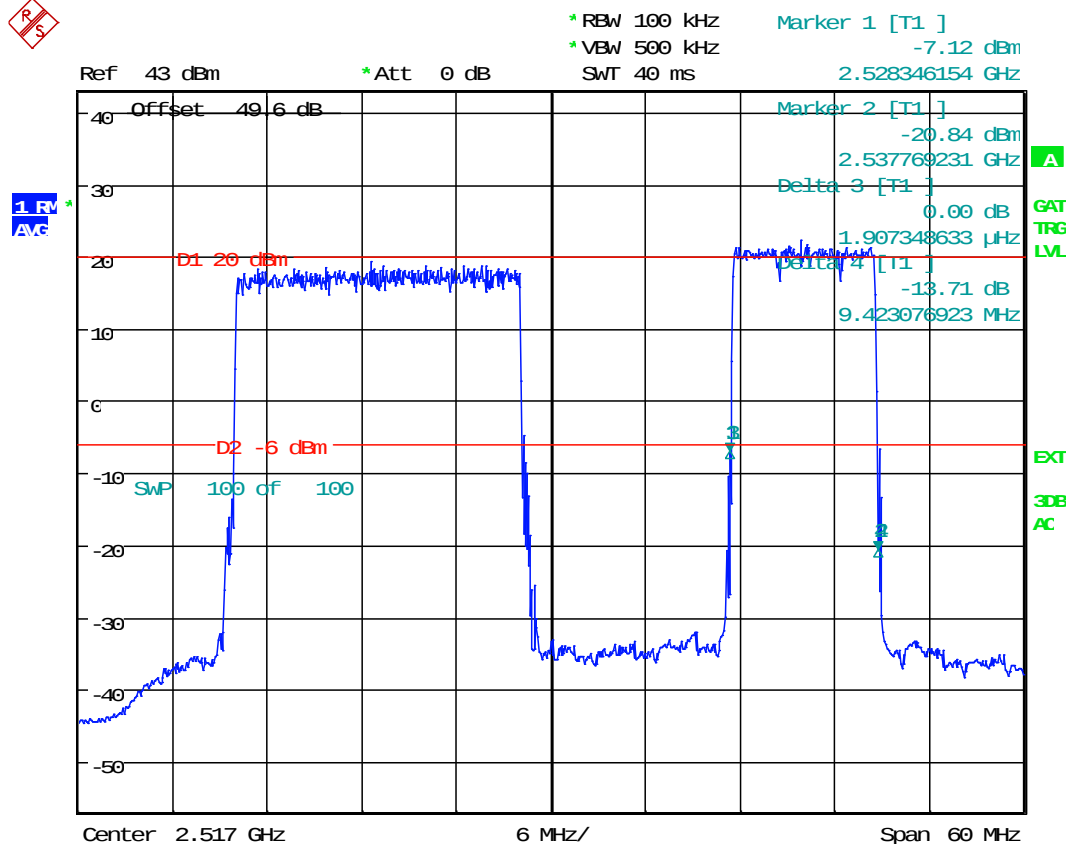
Date: 23.APR.2015 21:58:08



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2506

M&2533M;-48VDC;16QAM;FCCID-AS5BBTRX-15.CII

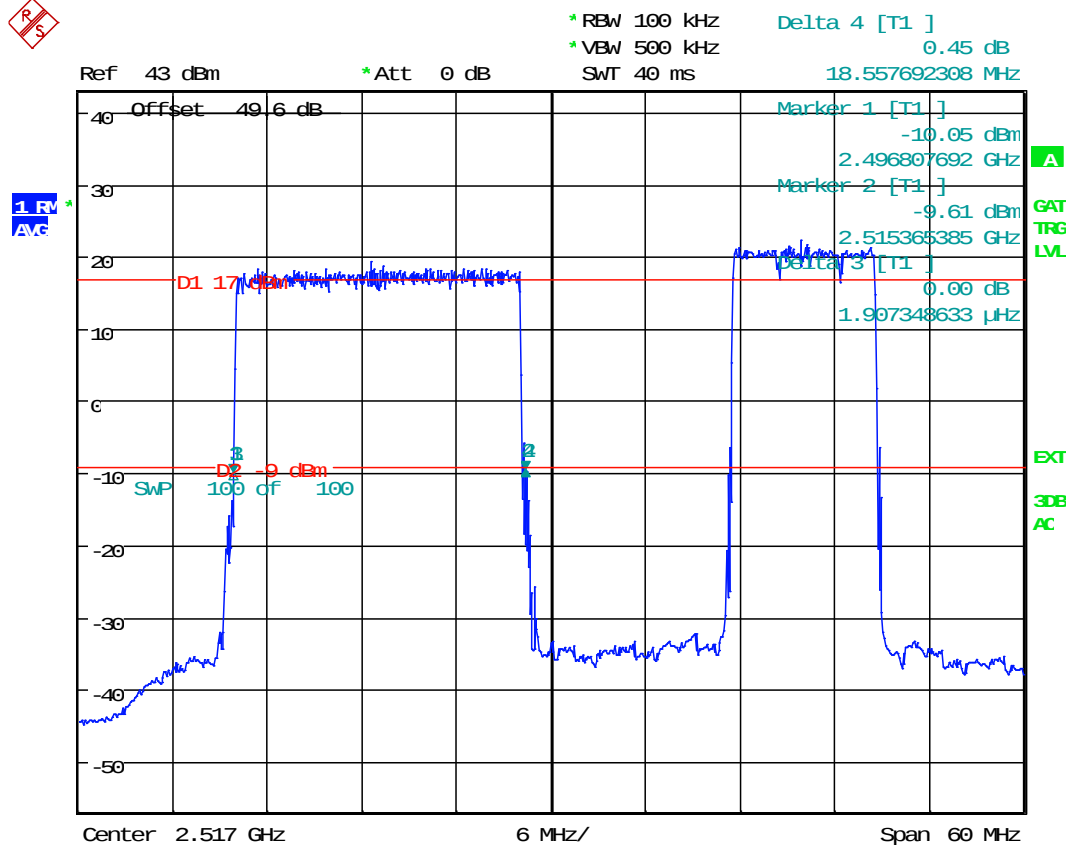
Date: 23.APR.2015 21:58:57



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2506

M&2533M;-48VDC;64QAM;FCCID-AS5BBTRX-15.CII

Date: 24.APR.2015 19:42:19



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2506

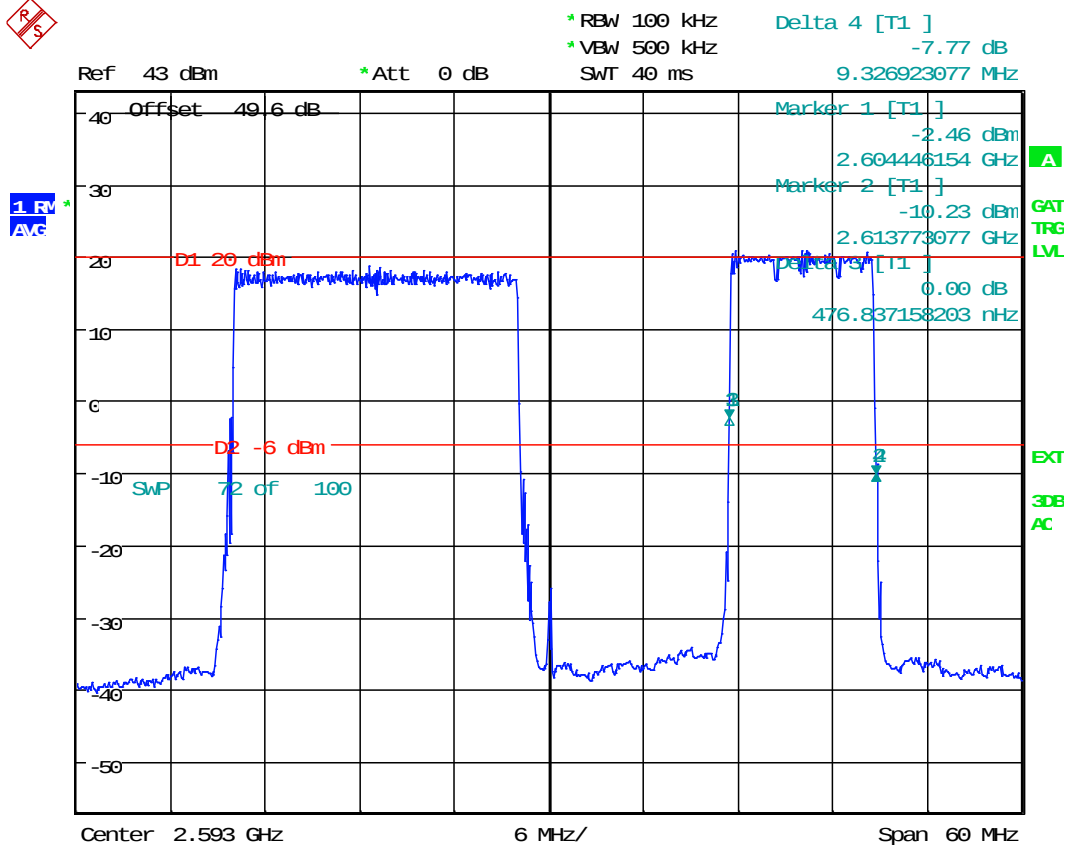
M&2533M;-48VDC;64QAM;FCCID-AS5BBTRX-15.CII

Date: 24.APR.2015 19:43:11

20+10 MHz Bandwidth
2572-2592MHz (20MHz) and 2604-2614MHz (10MHz)
(Middle)

8x20 watts (MIMO)

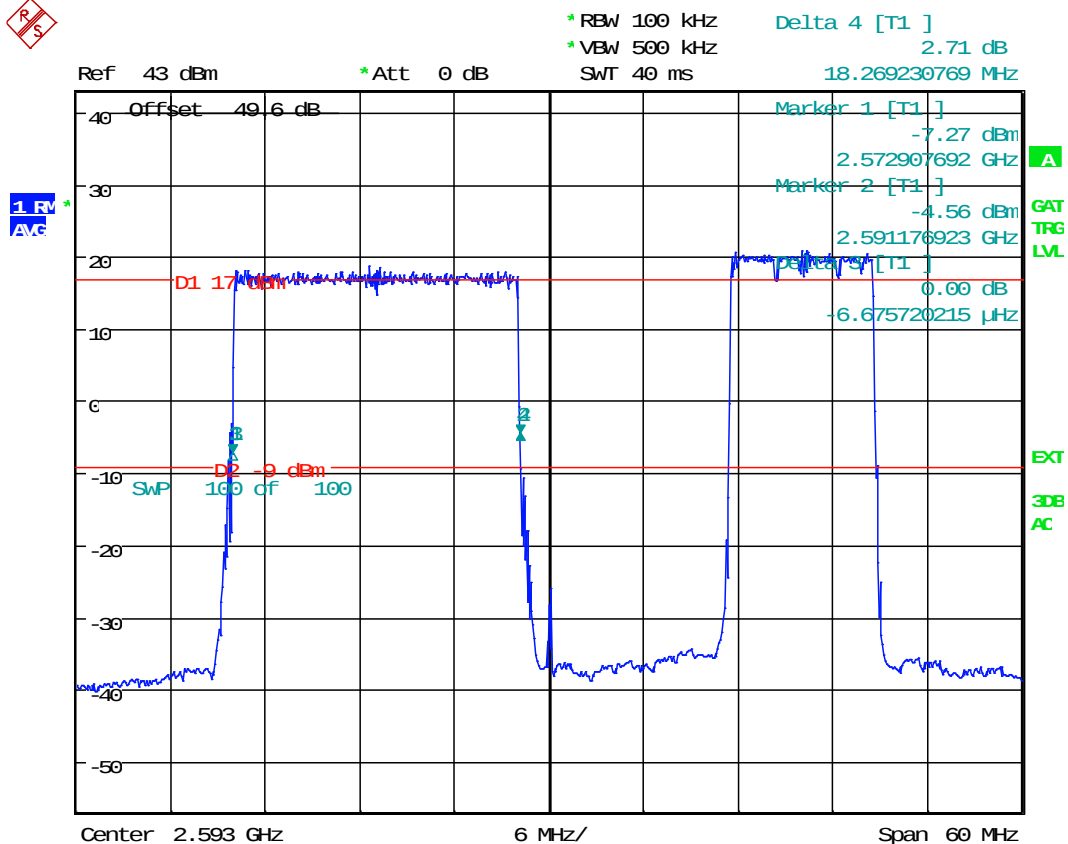
(26dB Bandwidth)



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2582

M&2609M;-48VDC;QPSK;FCCID-AS5BBTRX-15.CII

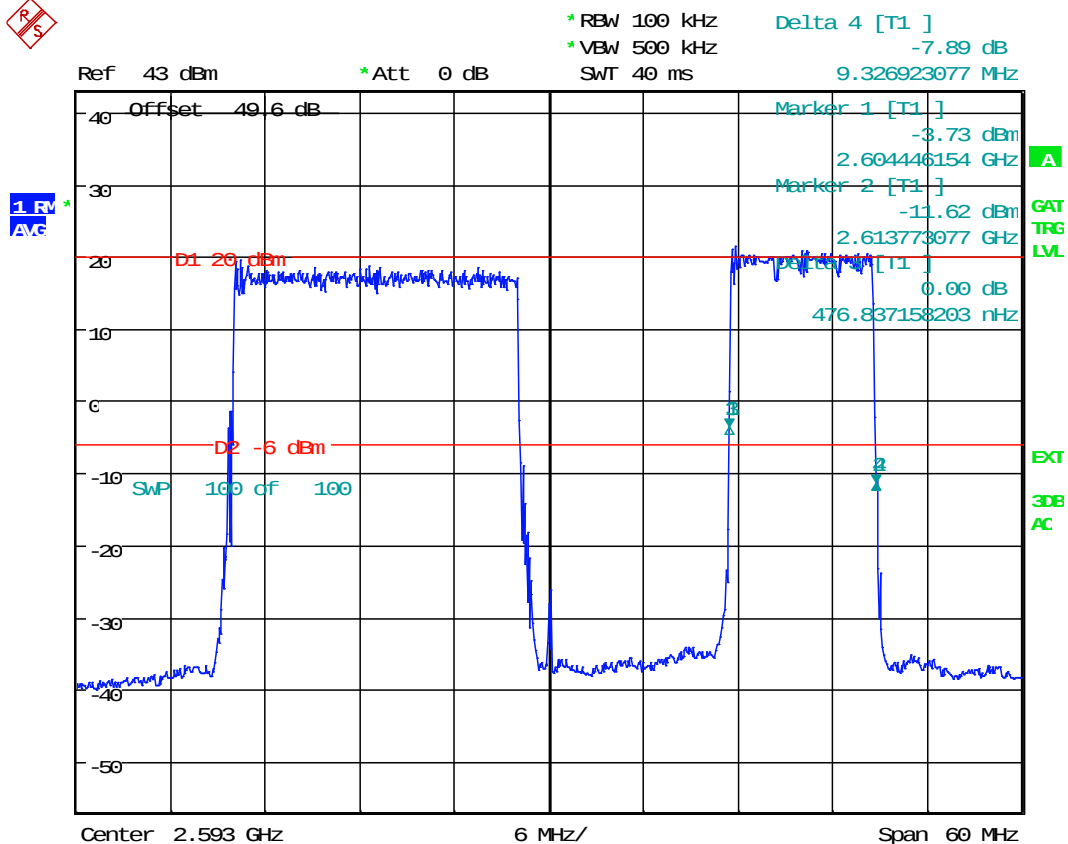
Date: 22.APR.2015 09:28:17



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2582

M&2609M;-48VDC;QPSK;FCCID-AS5BBTRX-15.CII

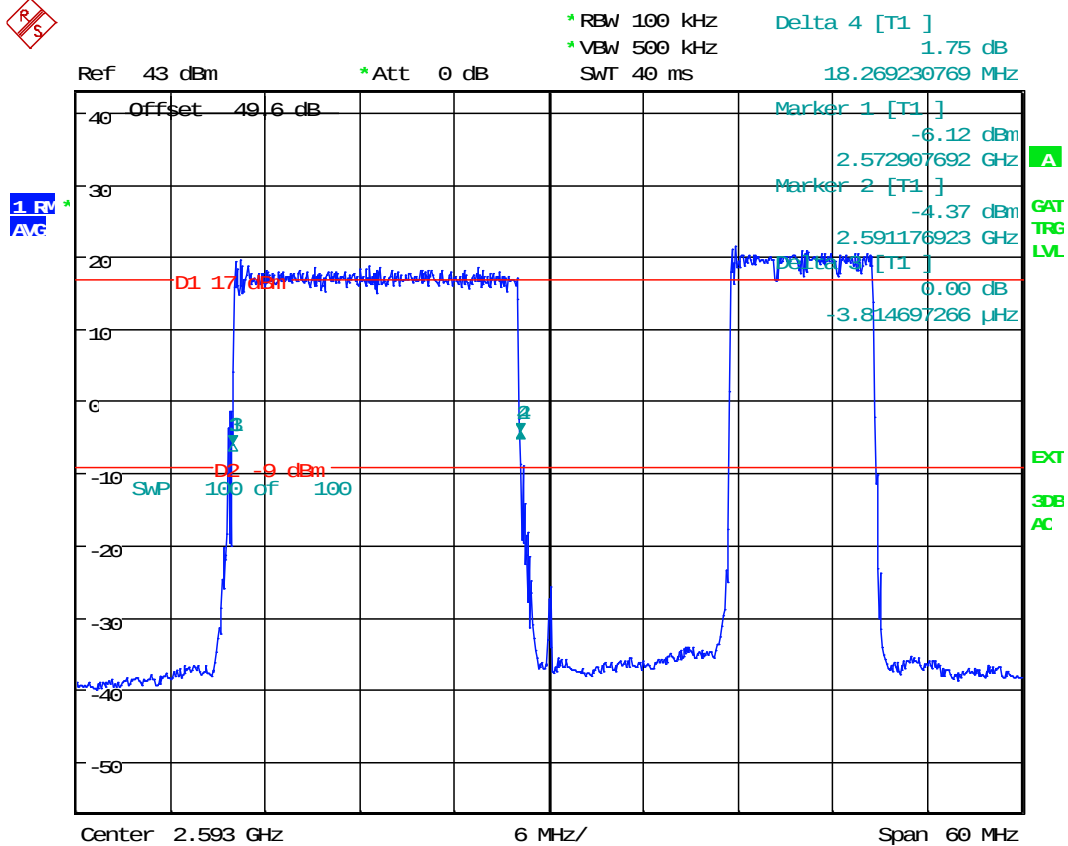
Date: 22.APR.2015 09:29:08



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2582

M&2609M;-48VDC;16QAM;FCCID-AS5BBTRX-15.CII

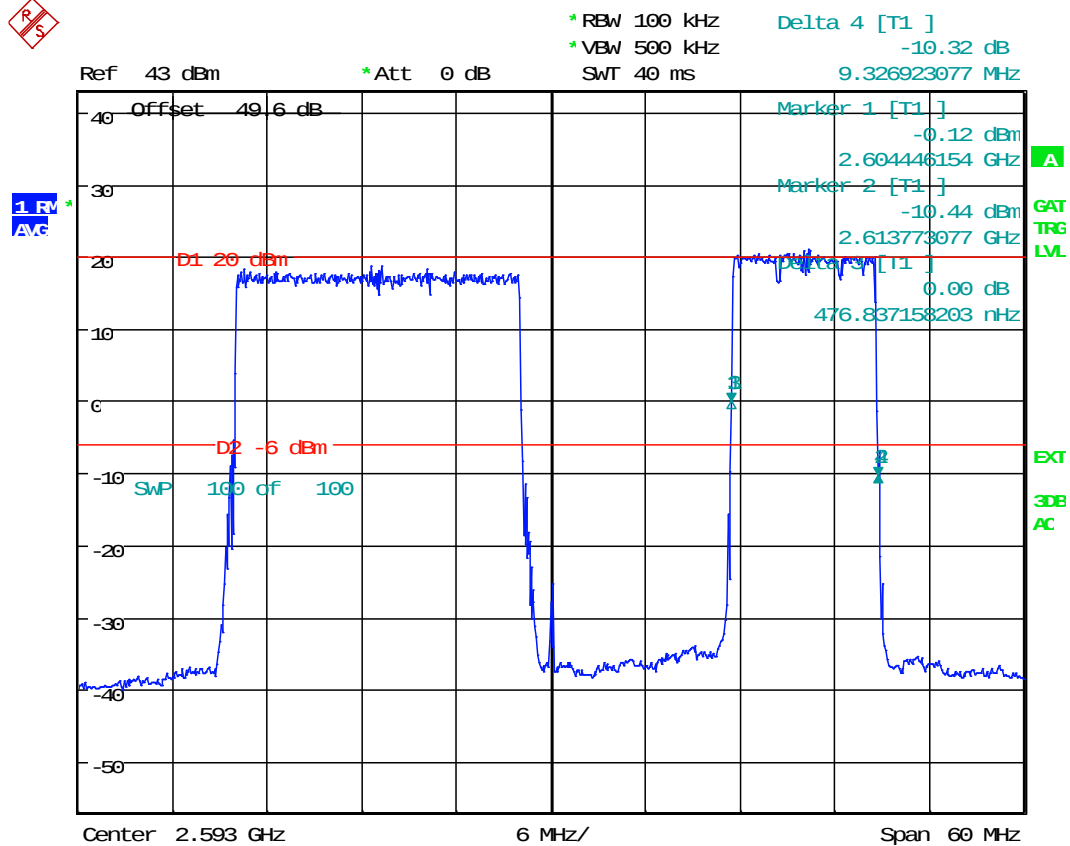
Date: 22.APR.2015 10:01:49



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2582

M&2609M;-48VDC;16QAM;FCCID-AS5BBTRX-15.CII

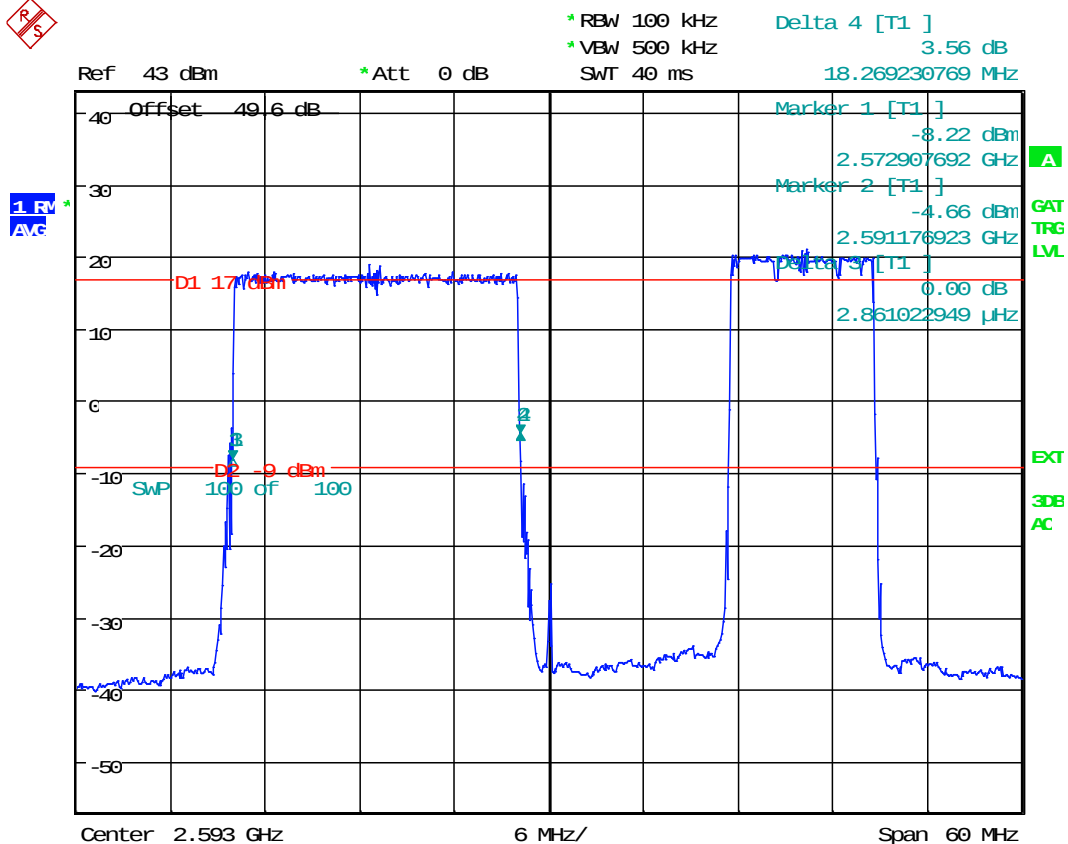
Date: 22.APR.2015 10:02:52



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2582

M&2609M;-48VDC;64QAM;FCCID-AS5BBTRX-15.CII

Date: 22.APR.2015 11:49:24



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2582

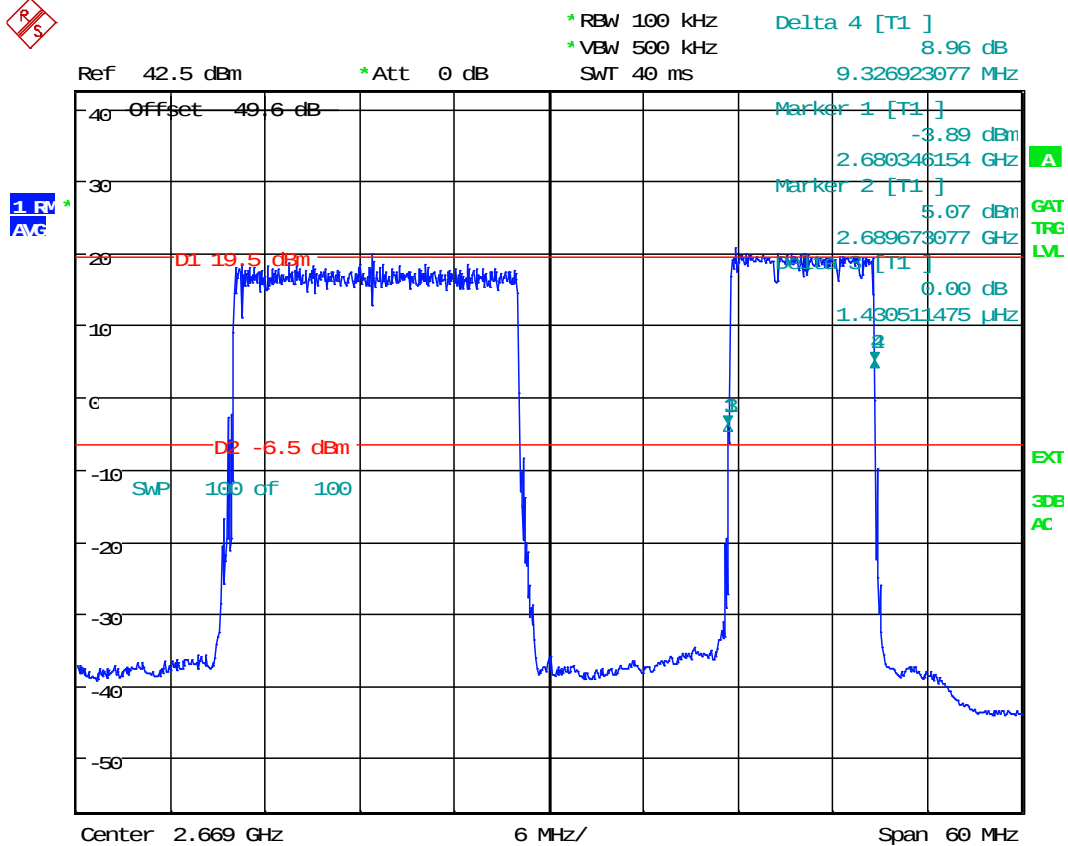
M&2609M;-48VDC;64QAM;FCCID-AS5BBTRX-15.CII

Date: 22.APR.2015 11:50:18

20+10 MHz Bandwidth
2648-2668 MHz (20MHz) and 2680-2690 MHz (10MHz)
(Upper)

8x20 watts (MIMO)

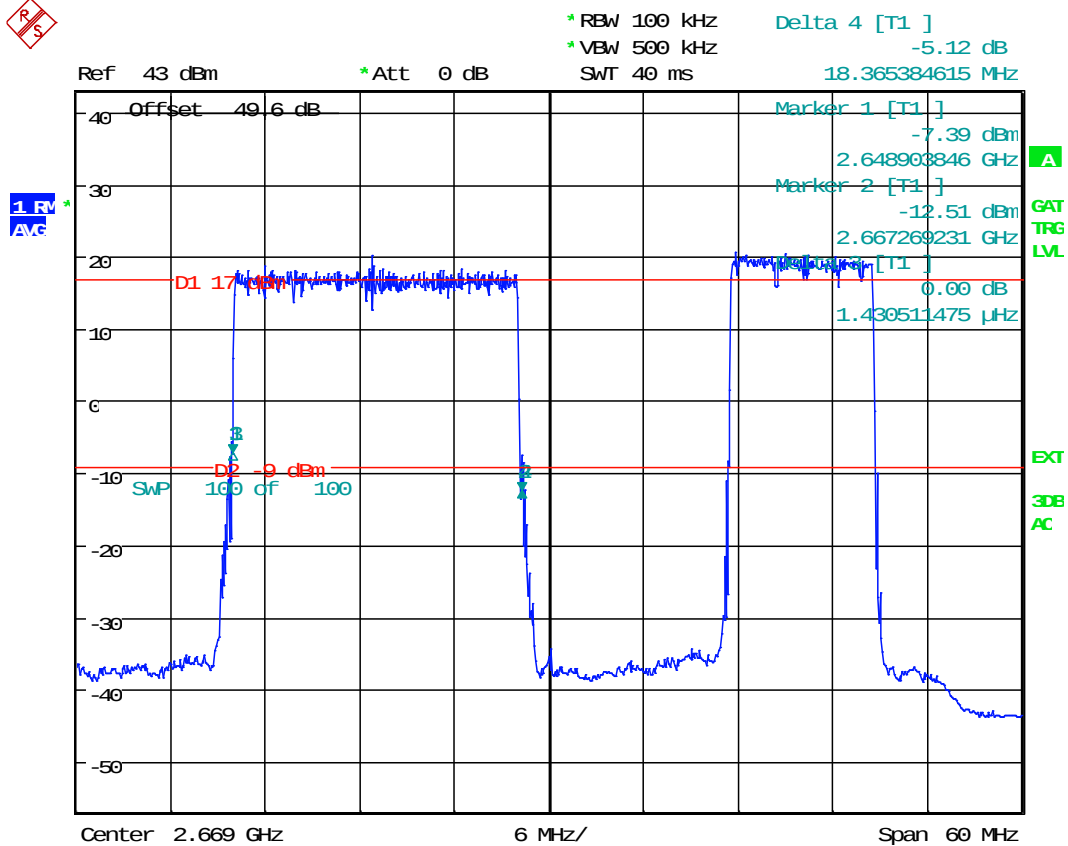
(26dB Bandwidth)



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2658

M&2685M;-48VDC;QPSK;FCCID-AS5BBTRX-15.CII

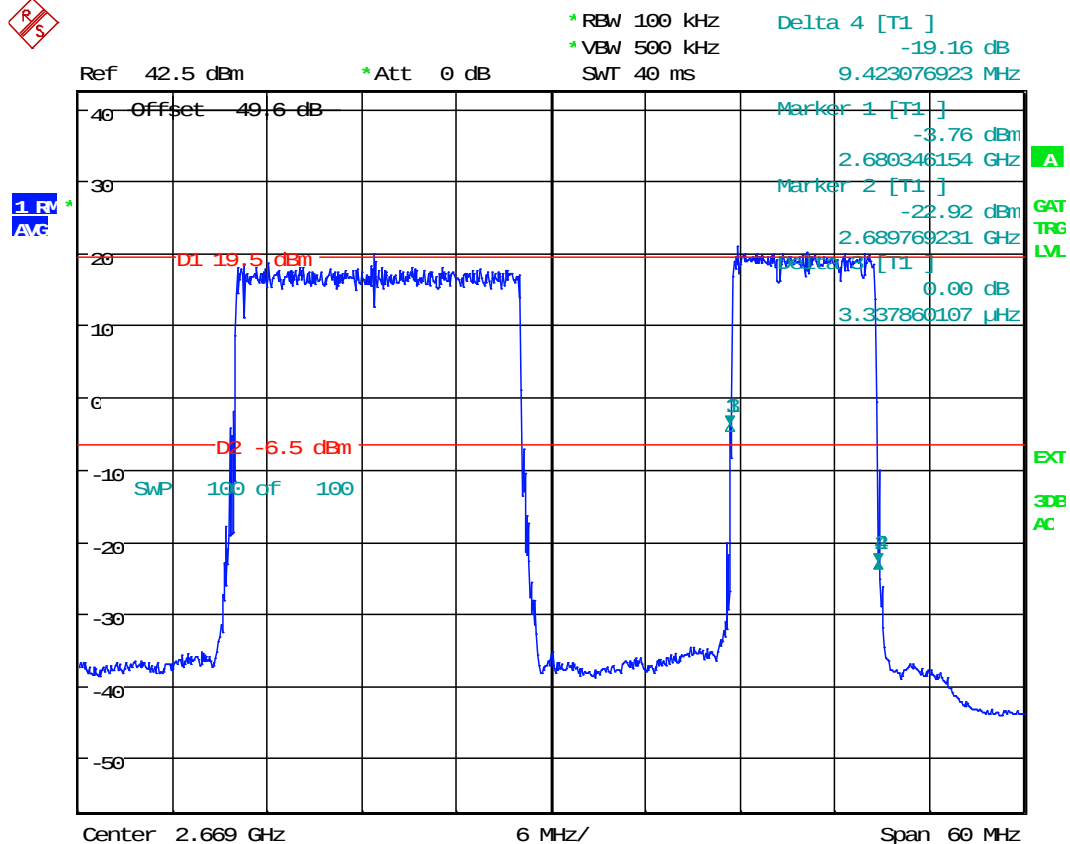
Date: 22.APR.2015 13:53:02



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2658

M&2685M;-48VDC;QPSK;FCCID-AS5BBTRX-15.CII

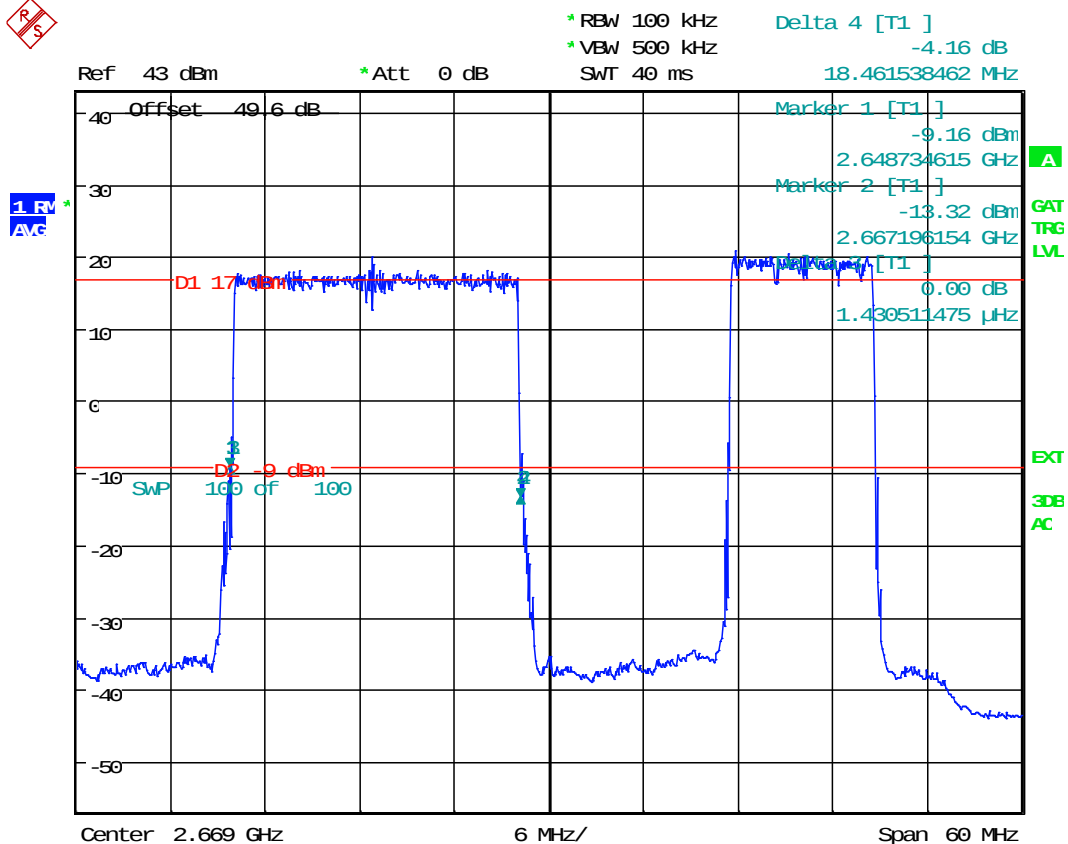
Date: 22.APR.2015 14:13:42



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2658

M&2685M;-48VDC;16QAM;FCCID-AS5BBTRX-15.CII

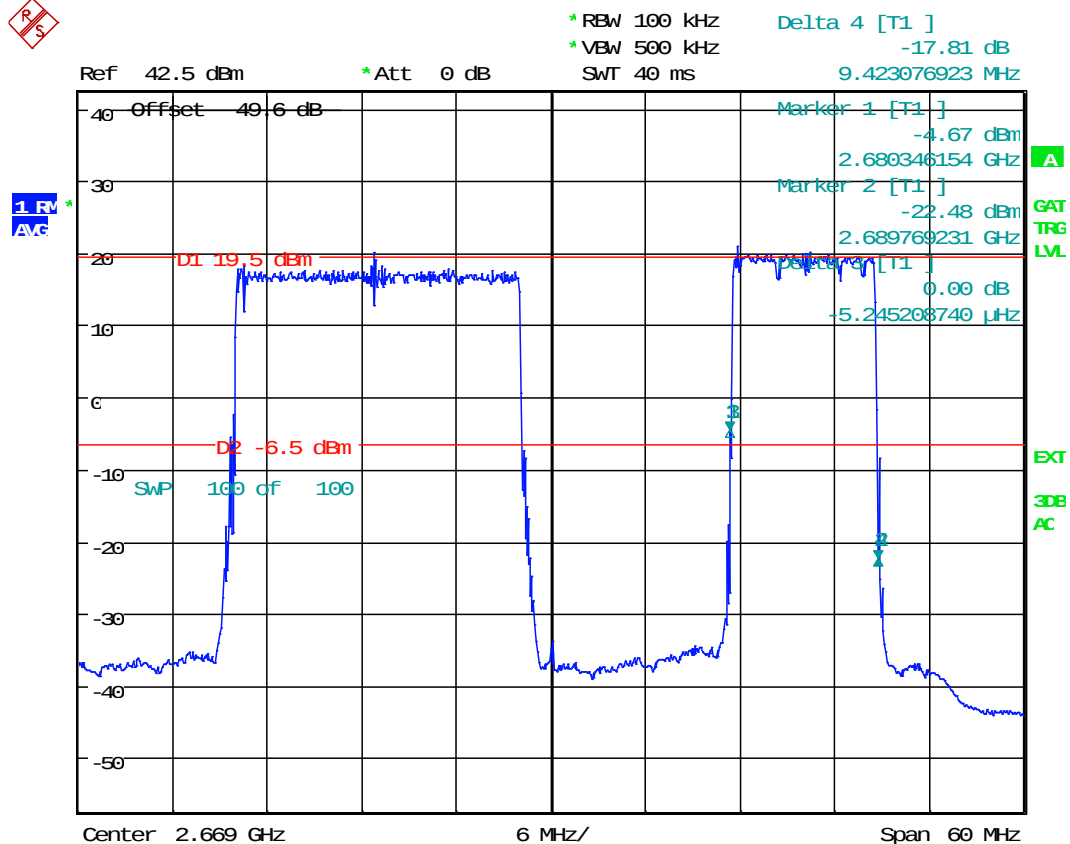
Date: 22.APR.2015 15:03:15



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2658

M&2685M;-48VDC;16QAM;FCCID-AS5BBTRX-15.CII

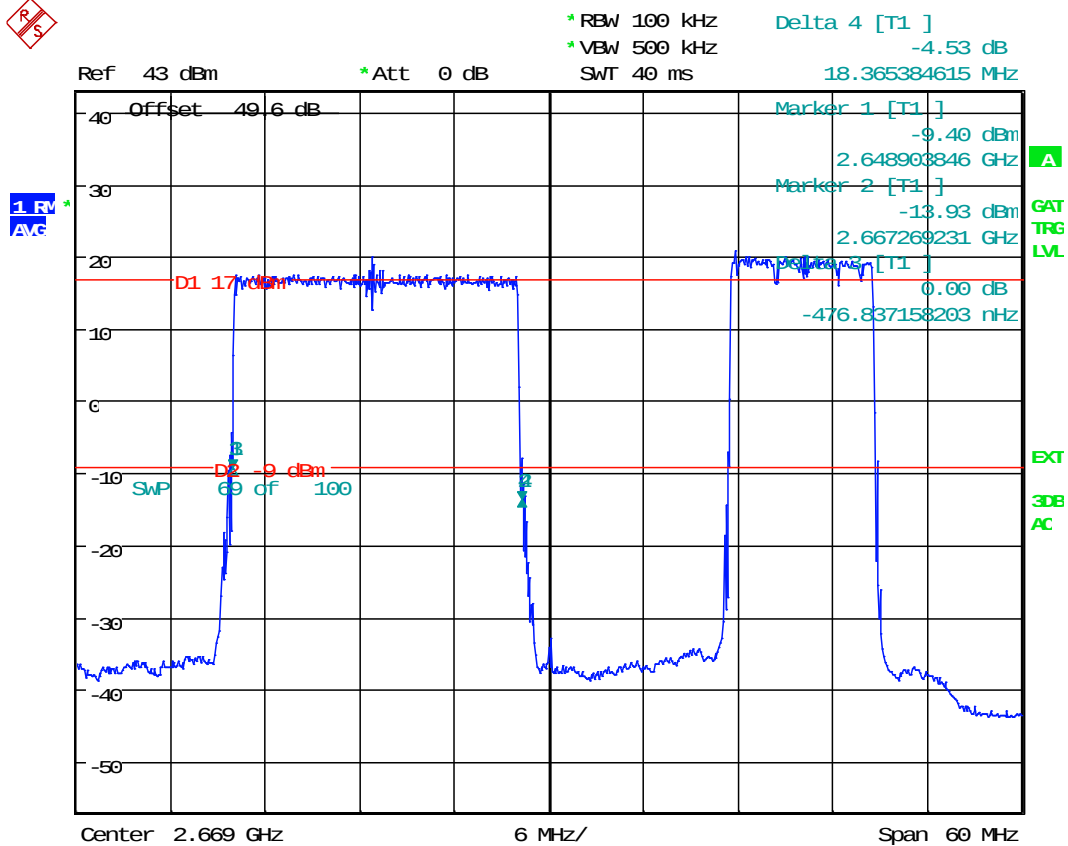
Date: 22.APR.2015 15:05:48



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2658

M&2685M;-48VDC;64QAM;FCCID-AS5BBTRX-15.CII

Date: 23.APR.2015 07:26:29



26dB BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;2658

M&2685M;-48VDC;64QAM;FCCID-AS5BBTRX-15.CII

Date: 23.APR.2015 07:28:21

**MEASUREMENT OF
SPECTRUM MASK/OCCUPIED BANDWIDTH
(1MHz ADJACENT TO CHANNEL EDGE)**
Section 27.53 (m) (v)

**MEASUREMENT OF SPECTRUM MASK
OCCUPIED BANDWIDTH
(1MHz ADJACENT TO CHANNEL EDGE)**

The Spectrum mask close to the center of the carrier frequency (Occupied bandwidth) of the Long Term Evolution (LTE) were measured using a Rohde & Schwarz ESU Spectrum Analyzer/Receiver and. The RF power level was measured using RF power meter as shown in the test setup in Figure A. The RF output from the LTE EAC port to spectrum analyzer was reduced (to an amplitude usable by the spectrum analyzer) by using a calibrated attenuator. This attenuation was offset on the display and the signal for single carrier was adjusted to the corrected RF power level for a 100 kHz resolution bandwidth for 20MHz wide transmit signal, and 100 kHz resolution bandwidth for 10 MHz wide transmit signal. While adjusting the corrected RF power level in the spectrum analyzer, the attenuator and resolution BW of spectrum analyzer were considered.

The measurements were made on a “TD-RRH8X20 (BC41) in RRH enclosure”.

The reference line on the spectrum analyzer display corresponds to level measured by the RF power meter. Occupied Bandwidth plots were made at antenna terminals for an output of 10 Watts (40 dBm)/carrier for 20MHz wide signal and 10 Watts (40 dBm)/carrier for 10MHz wide signal.

Reference signal derived from GPS and frame trigger from the RRH were input into analyzer. This enables analyzer to measure power and occupied BW only during cycle of the transmitter providing accurate measurements. Reference, trigger and duty cycle wave forms are provided in Measurement: (2) Modulation characteristics (response to FCC Section 2.1047)

The frequencies and blocks used were tabulated on the bottom of each plot. The output signals at RF filter were plotted for first, middle and last channels of each frequency band. The TD-RRH8X20 (BC41) is capable of operating in the band of 2496 MHz to 2690MHz. The Base station presently tested was configured to operate at 20 MHz and 10 MHz blocks of composite carrier. Blocks and bands listed in Table below Plots were provided for composite carriers. These frequencies were chosen to show the occupied bandwidth in the blocks in the frequency band in which this radio can be operated. All tests were performed for QPSK, 16QAM and 64QAM modulations.

Block edge requirements:

FCC Section 27.53 (m) (v) (6): *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).*

Pursuant to FCC OET RULES 662911 D01 and D02 for Eight antenna MIMO mode of operations, the FCC limit of -13dBm shall be 9dB more stringent, therefore all channel edge and out of band spurious emissions shall be -22dBm. Further limits are adjusted for lower resolution BW using 10 log (100kHz/1% of channel BW)

FCC, OET Measurement Guidance for Certification of Licensed Digital Transmitters dated June 7, 2013 has been used for all measurements

•

The list of blocks and bands, tested for QPSK, 16QAM and 64QAM are listed below:

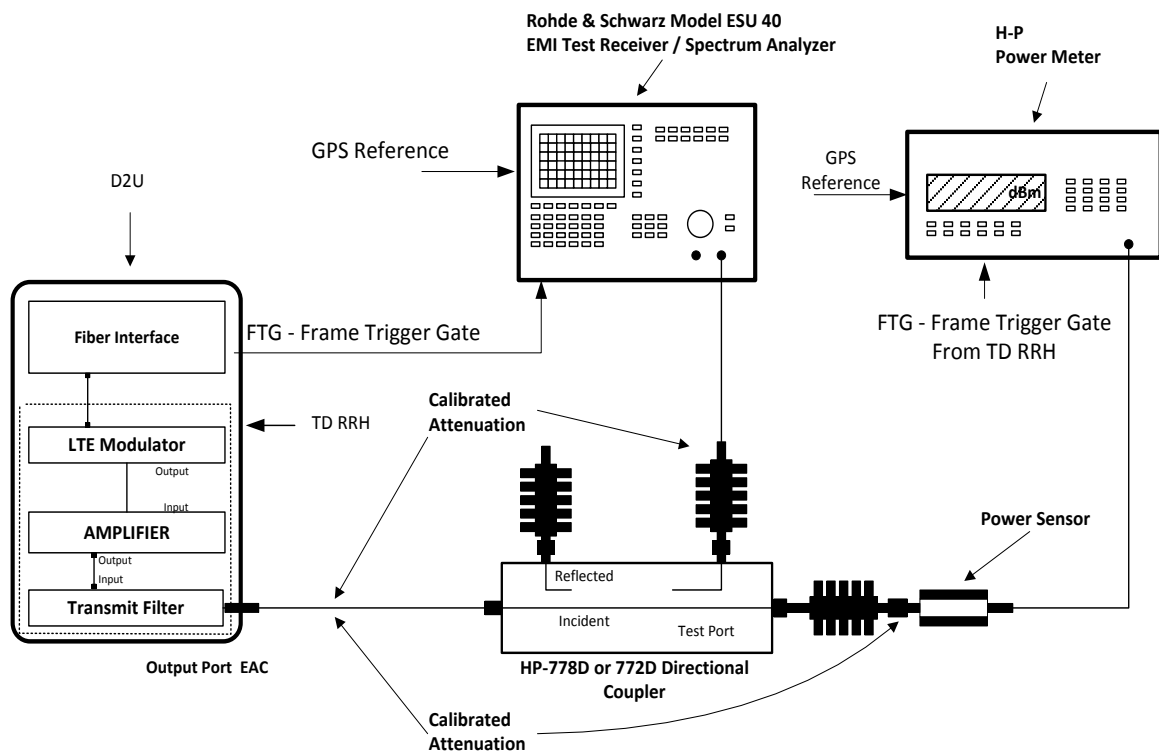
Blocks	Bandwidth (MHz)	Frequency (MHz)	Power (Watts)
Lower	20+10	2496-2516 and 2528-2538	20
Middle	20+10	2572-2592 and 2604-2614	20
Higher	20+10	2648-2668 and 2680-2690	20

Measurement uncertainty:

Frequency: 100 Hz

Amplitude: 0.5 dB

**Figure A. TEST CONFIGURATION FOR SPECTRUM MASK
(OCCUPIED BANDWIDTH)**



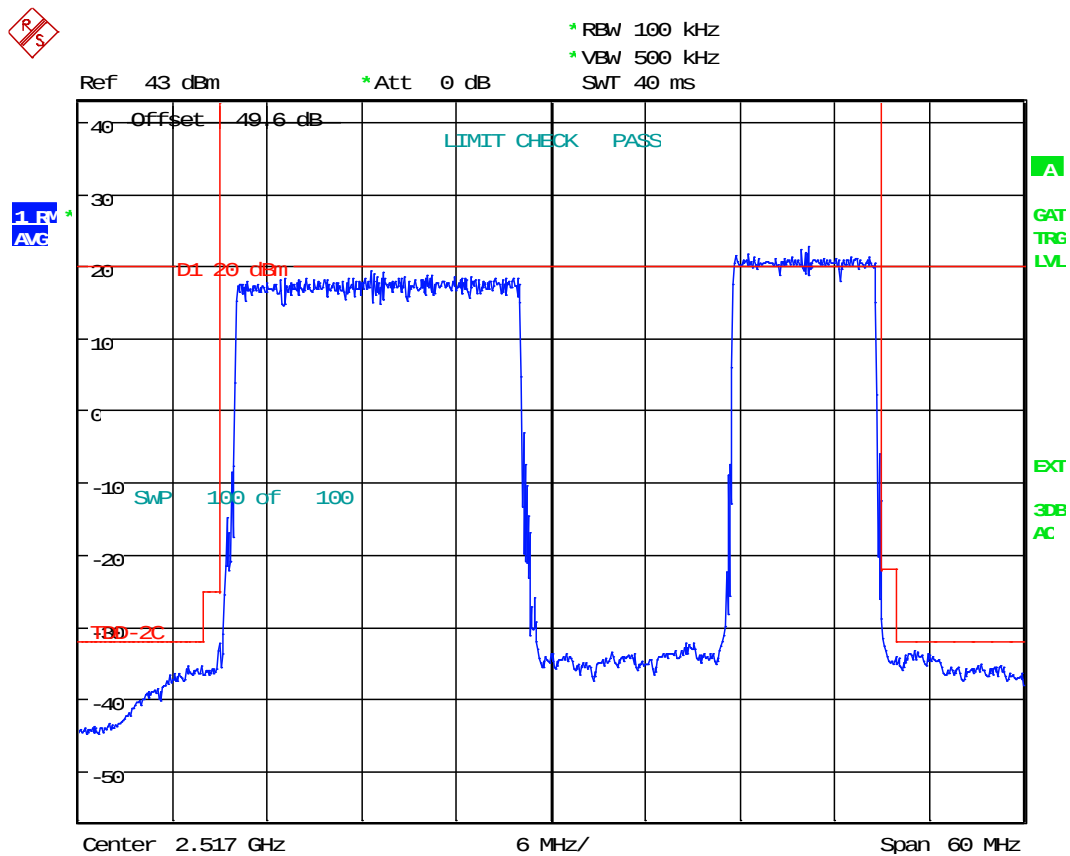
All components are calibrated over the frequency range of interest

**20+10 MHz Bandwidth
2496-2516MHz (20MHz) and 2528-2538MHz (10MHz)
(Lower)**

8x20watts (MIMO)

SPECTRUM MASK/OCCUPIED BANDWIDTH

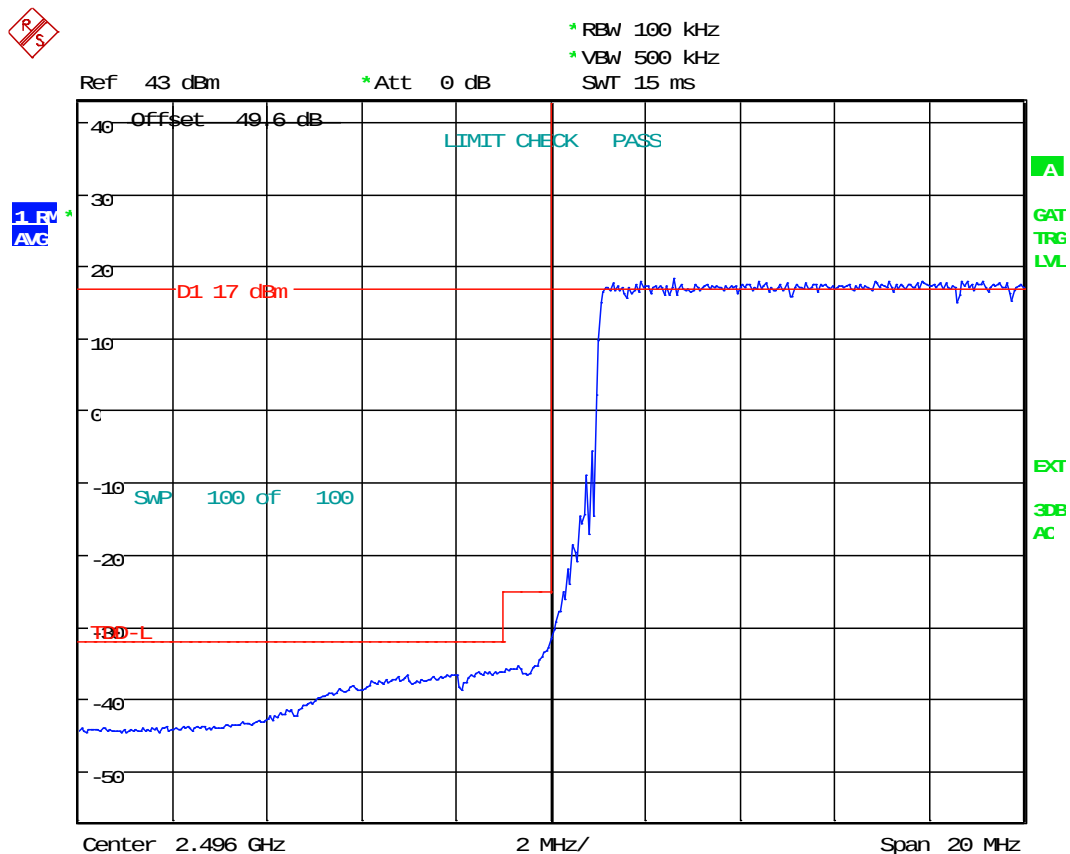
(QPSK, 16QAM and 64QAM Modulations)



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2506M&2533M;-48VDC;QPSK;FCCID-AS5BBTRX-15.CII

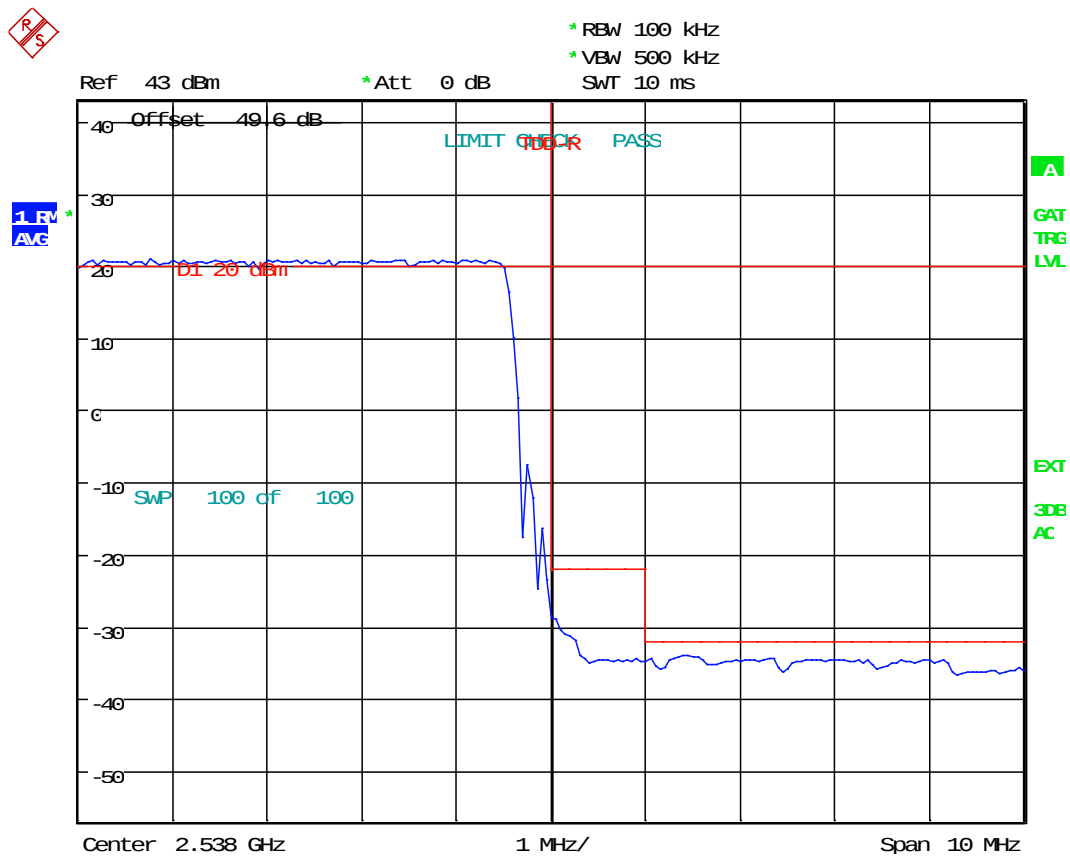
Date: 23.APR.2015 19:53:26



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2506M&2533M;-48VDC;QPSK;FCCID-AS5BBTRX-15.CII

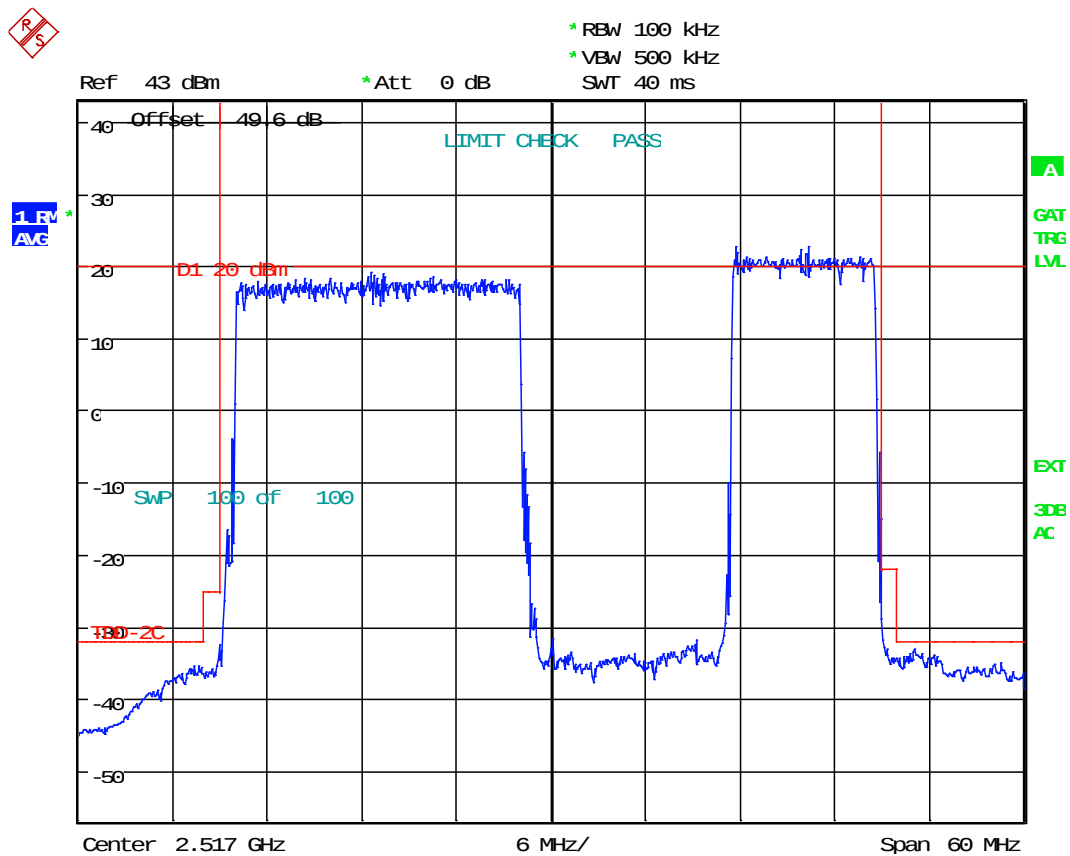
Date: 23.APR.2015 19:54:40



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2506M&2533M;-48VDC;QPSK;FCCID-AS5BBTRX-15.CII

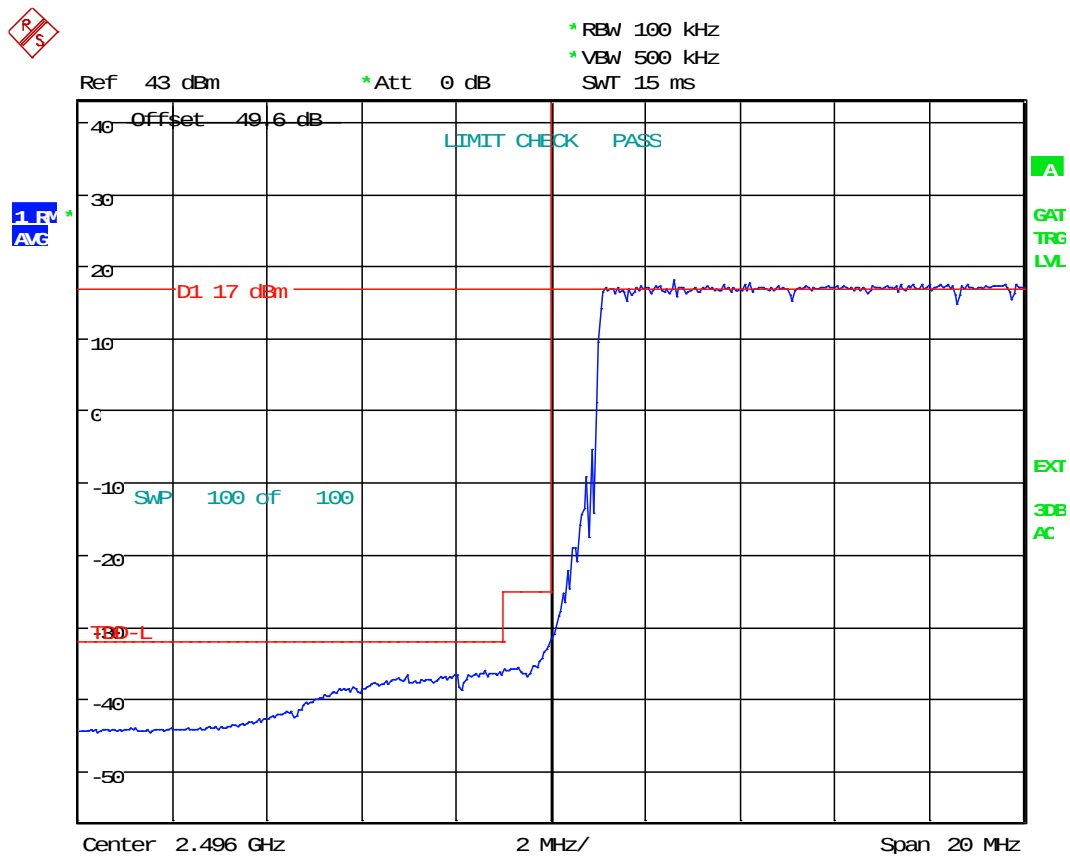
Date: 23.APR.2015 19:57:06



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2506M&2533M;-48VDC;16QAM;FCCID-AS5BBTRX-15.CII

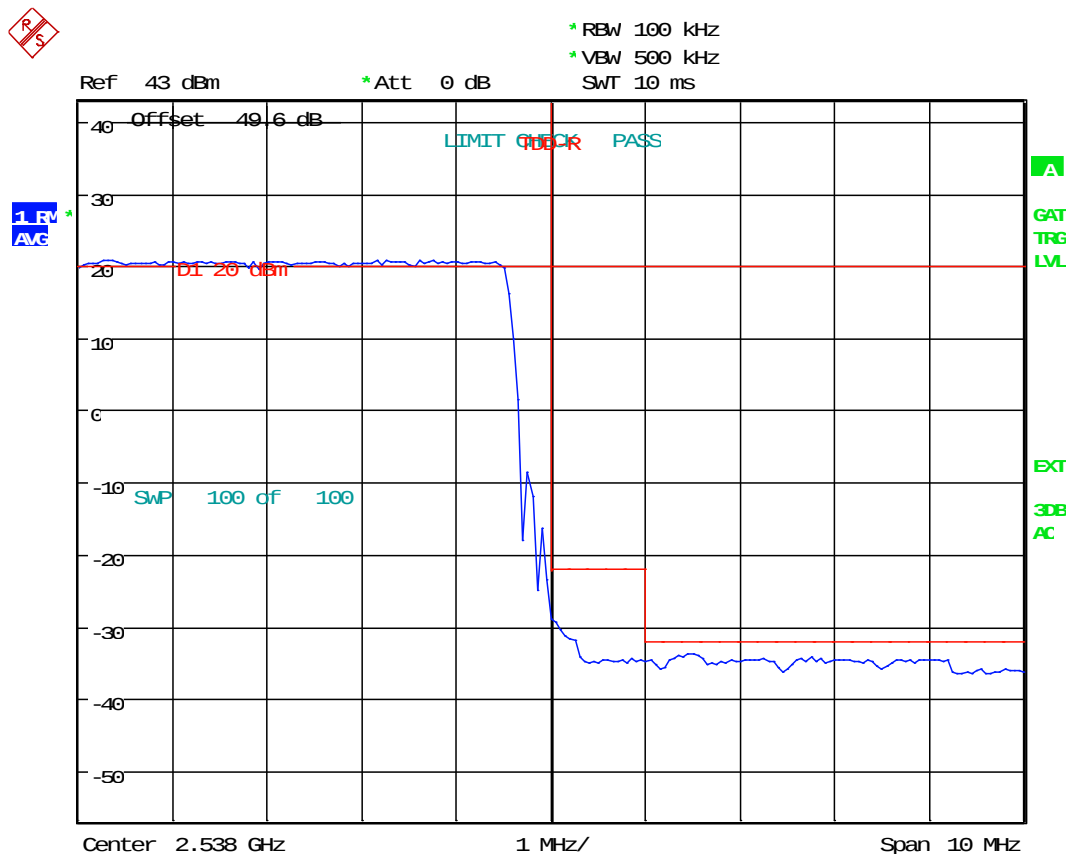
Date: 23.APR.2015 20:13:16



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2506M&2533M;-48VDC;16QAM;FCCID-AS5BBTRX-15.CII

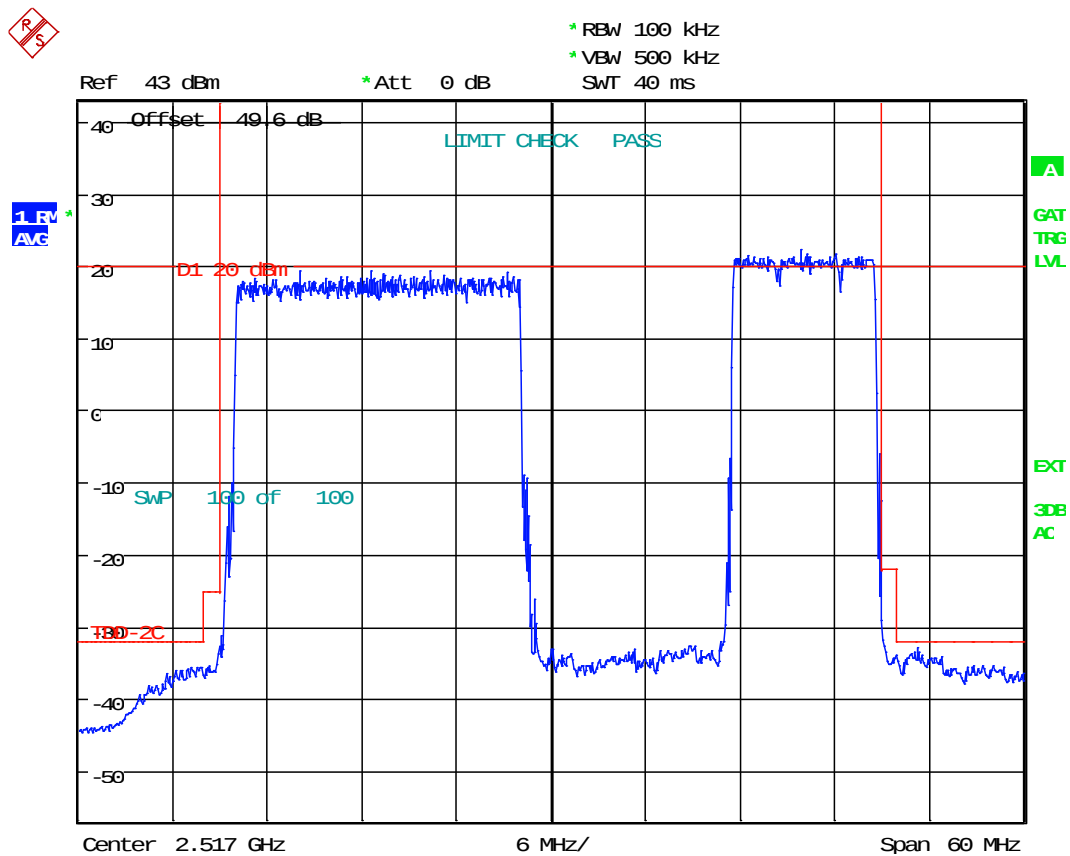
Date: 23.APR.2015 20:14:57



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2506M&2533M;-48VDC;16QAM;FCCID-AS5BBTRX-15.CII

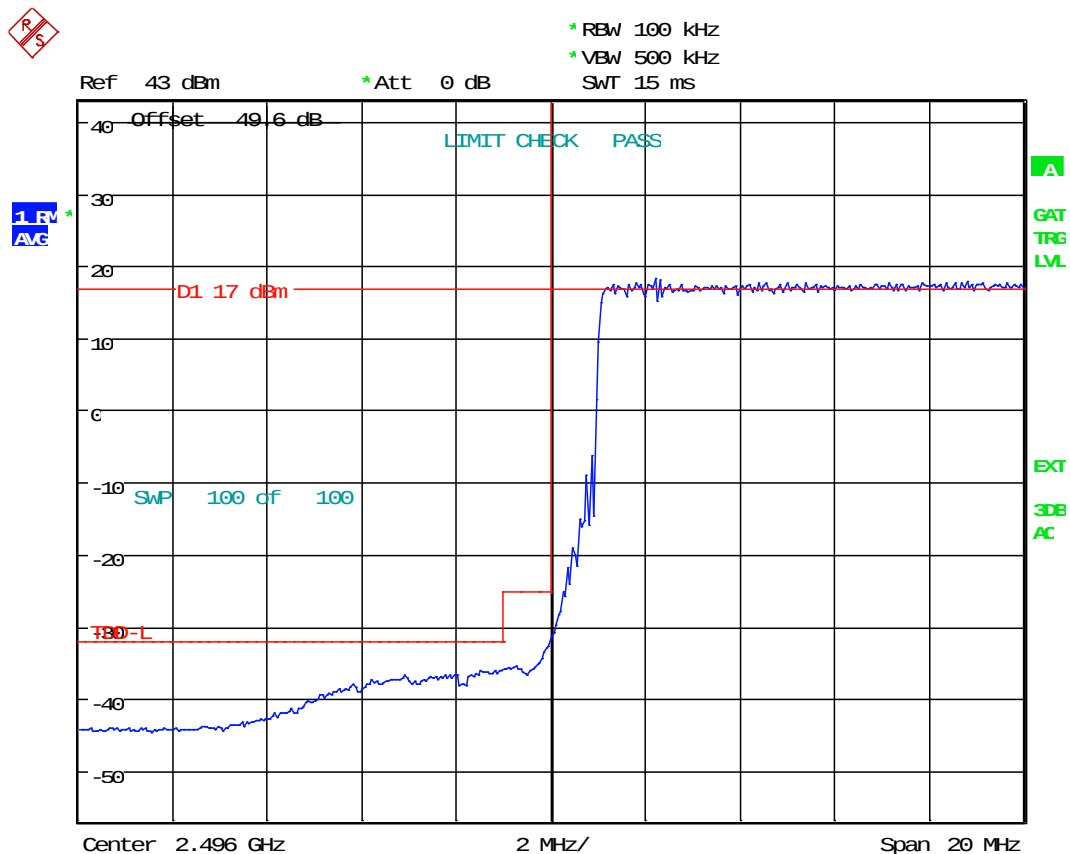
Date: 23.APR.2015 20:17:18



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2506M&2533M;-48VDC;64QAM;FCCID-AS5BBTRX-15.CII

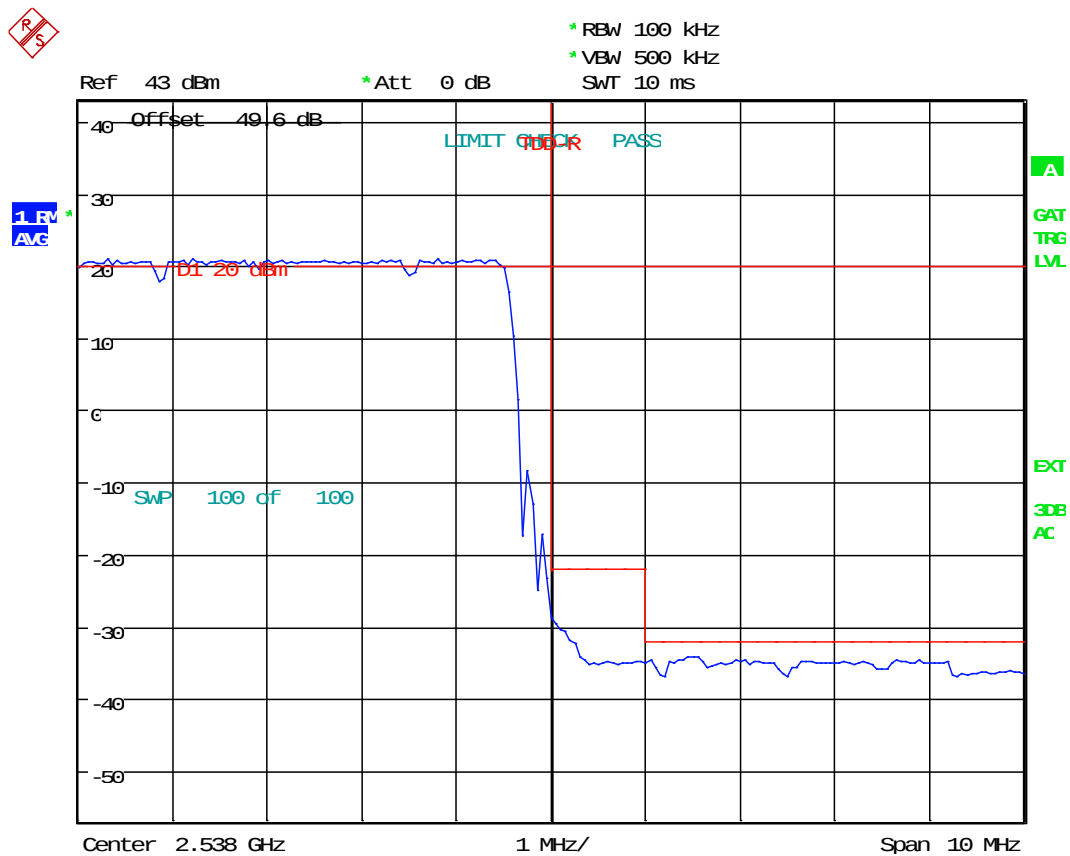
Date: 24.APR.2015 19:36:46



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2506M&2533M;-48VDC;64QAM;FCCID-AS5BBTRX-15.CII

Date: 24.APR.2015 19:38:04



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2506M&2533M;-48VDC;64QAM;FCCID-AS5BBTRX-15.CII

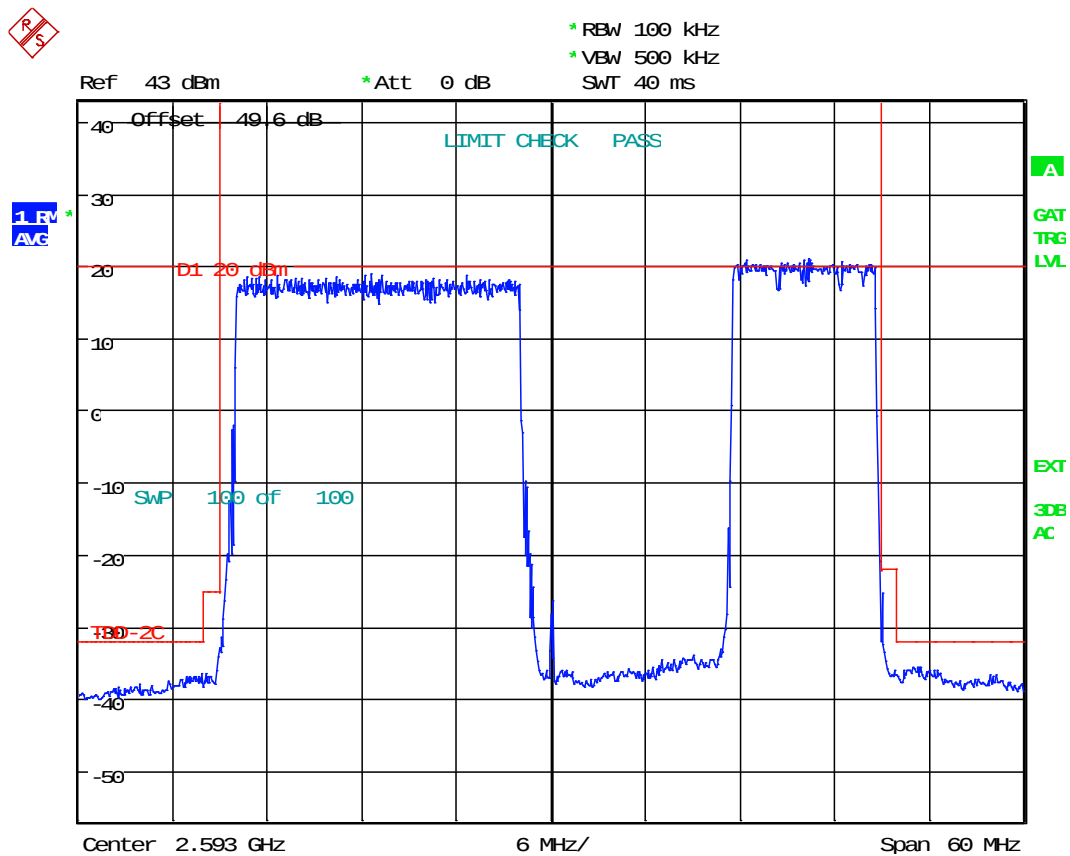
Date: 24.APR.2015 19:39:08

**20+10 MHz Bandwidth
2572-2592 MHz (20MHz) and 2604-2614 MHz (10MHz)
(Middle)**

8x20 watts (MIMO)

SPECTRUM MASK/OCCUPIED BANDWIDTH

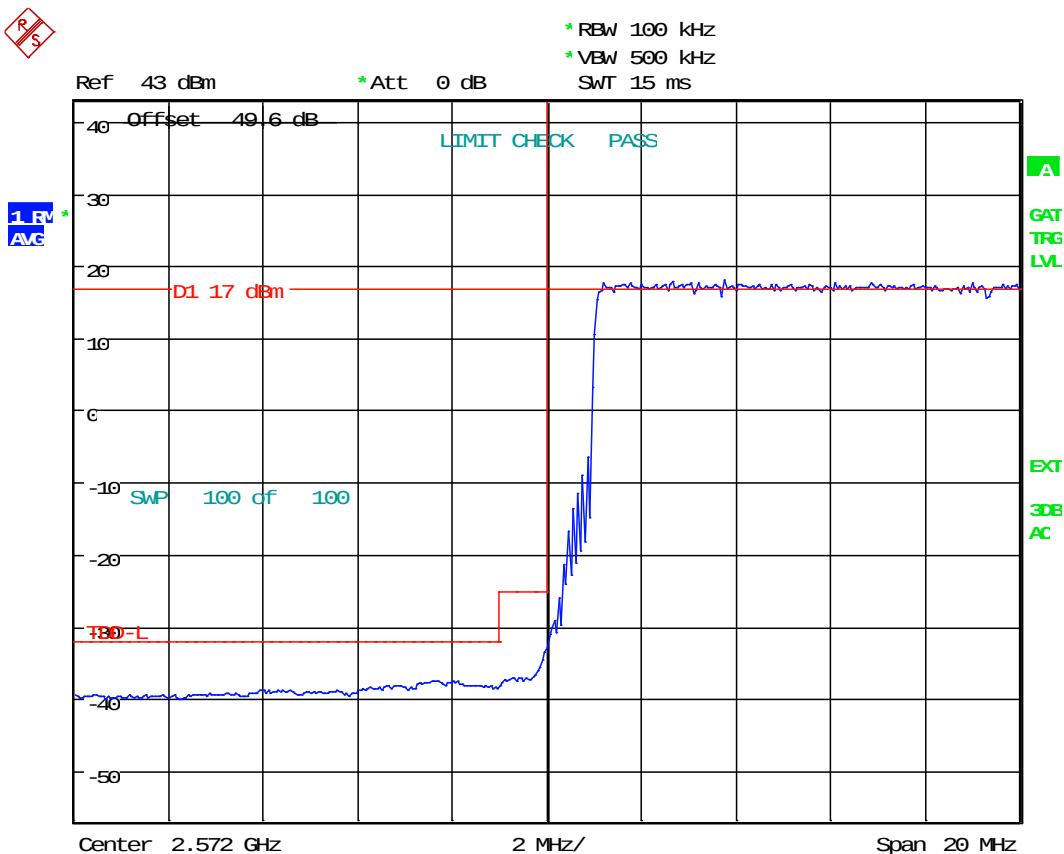
(QPSK, 16QAM and 64QAM Modulations)



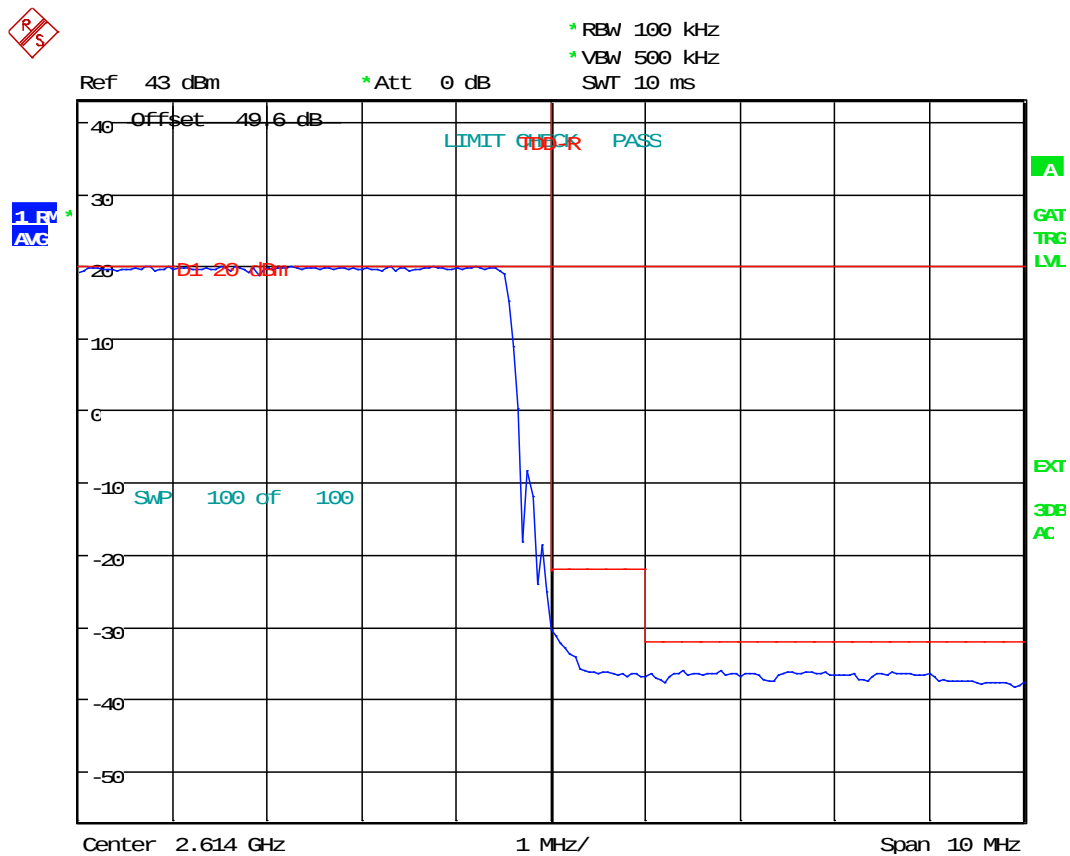
OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2582M&2609M;-48VDC;QPSK;FCCID-AS5BBTRX-15.CII

Date: 22.APR.2015 09:17:17



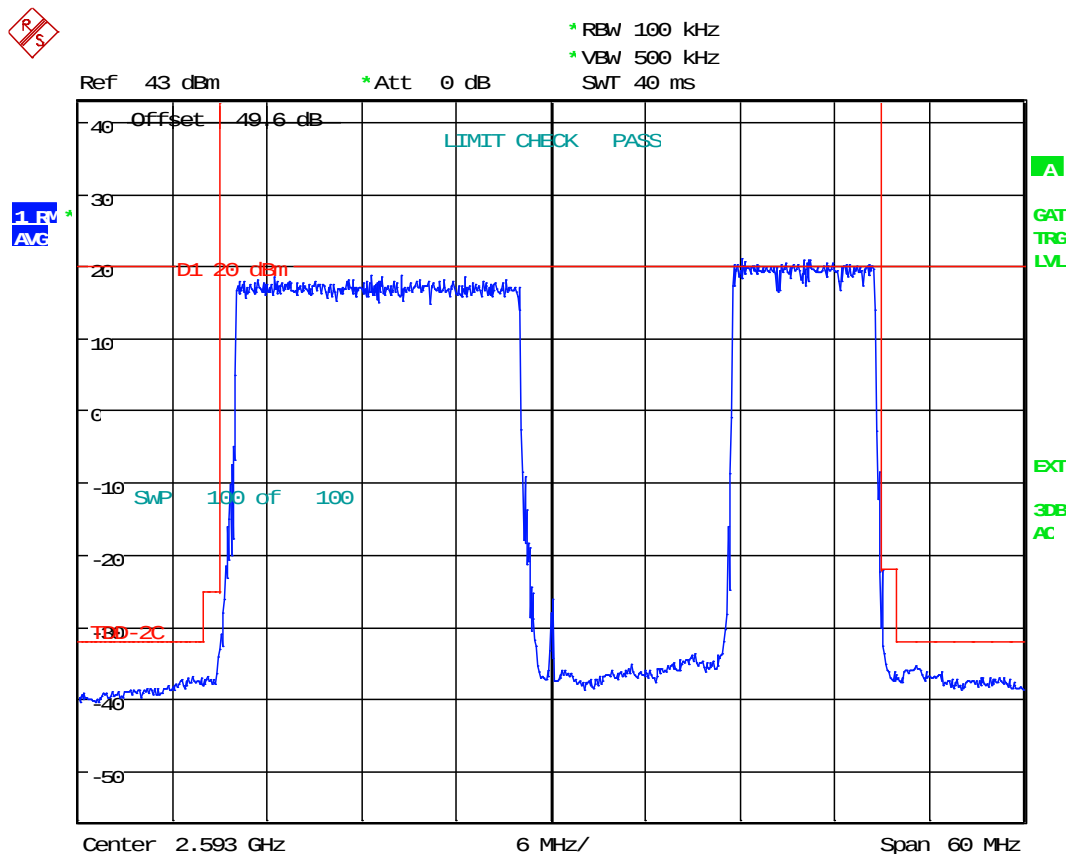
OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;
 2582M&2609M;-48VDC;QPSK;FCCID-AS5BBTRX-15.CII
 Date: 22.APR.2015 10:09:30



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2582M&2609M;-48VDC;QPSK;FCCID-AS5BBTRX-15.CII

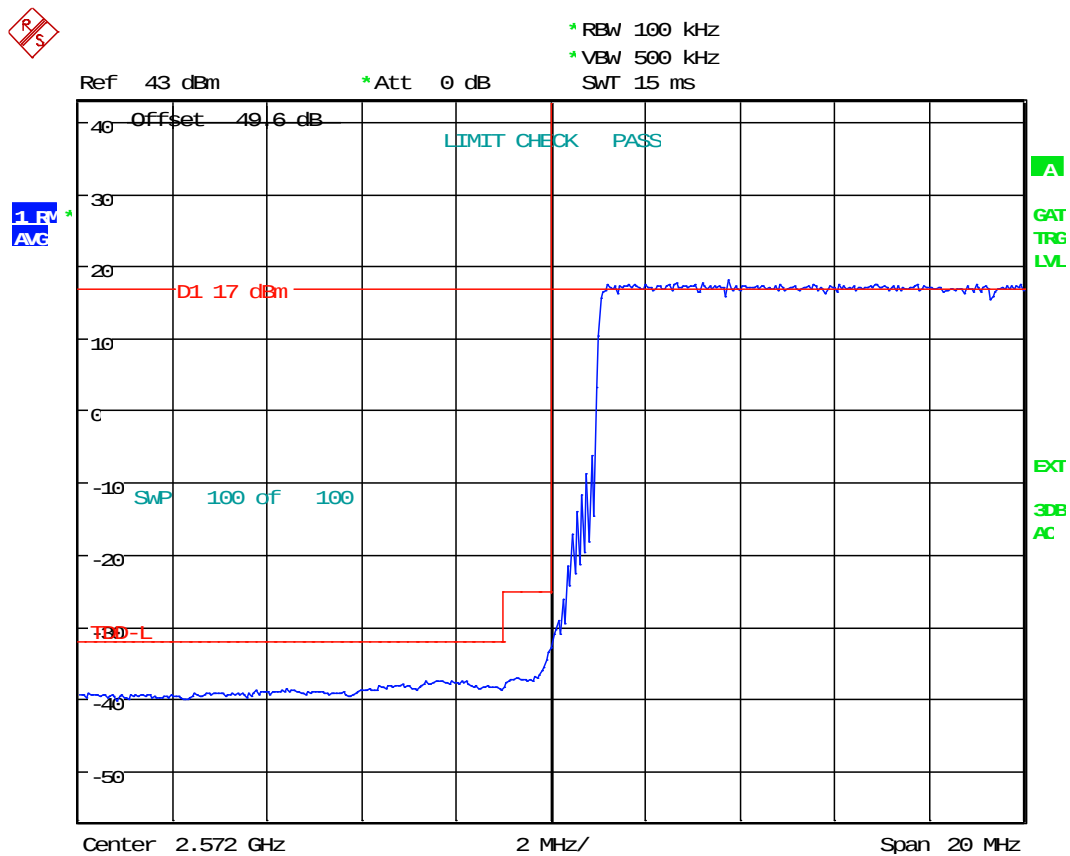
Date: 22.APR.2015 10:11:22



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2582M&2609M;-48VDC;16QAM;FCCID-AS5BBTRX-15.CII

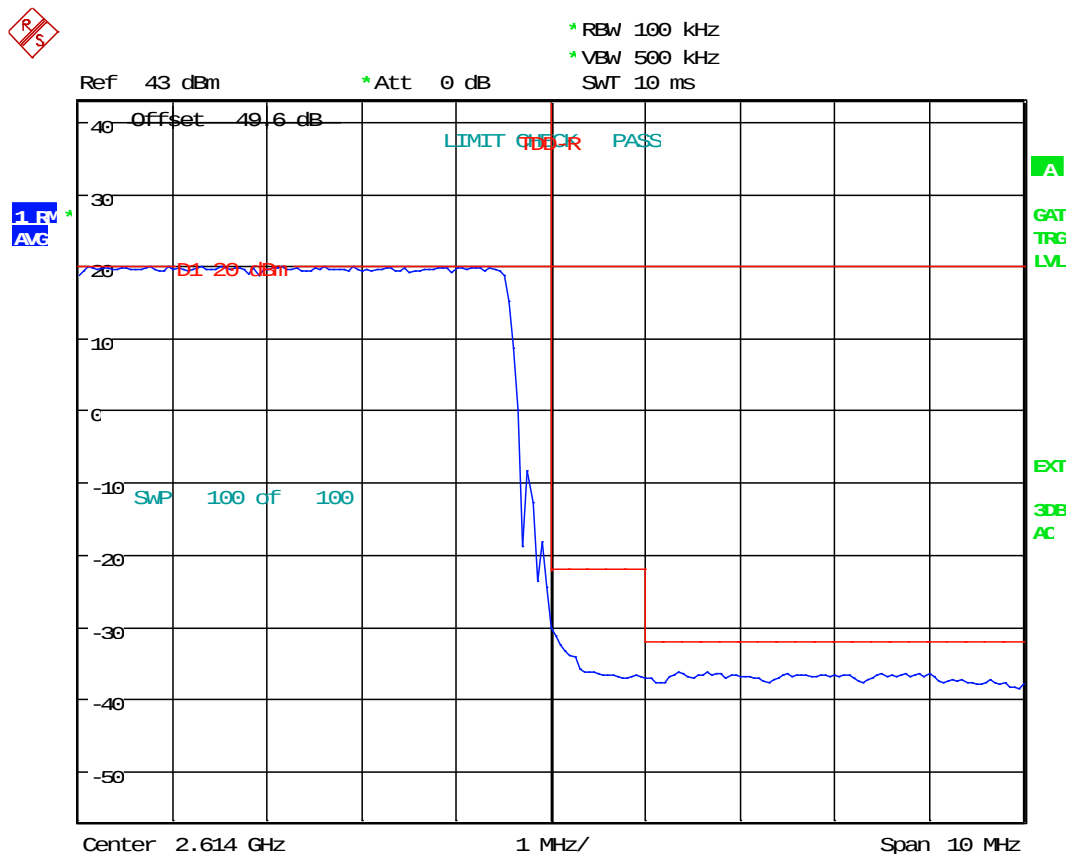
Date: 22.APR.2015 09:58:36



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2582M&2609M;-48VDC;16QAM;FCCID-AS5BBTRX-15.CII

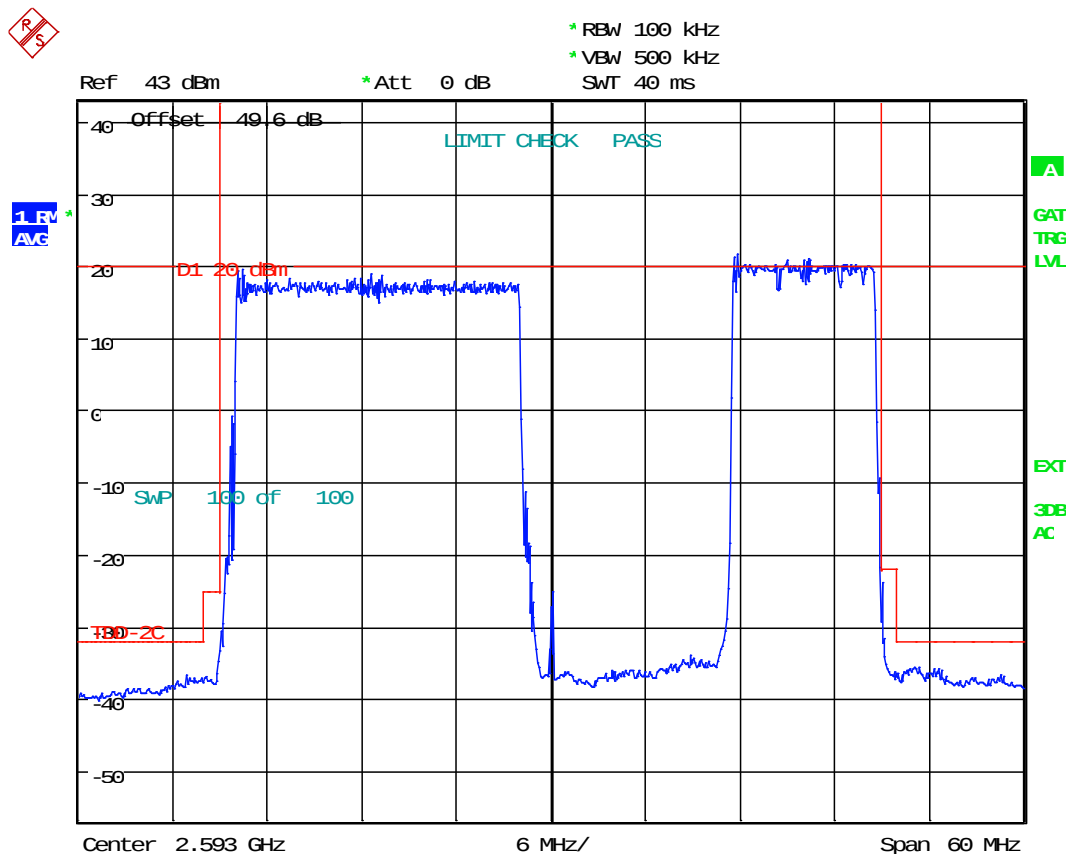
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OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2582M&2609M;-48VDC;16QAM;FCCID-AS5BBTRX-15.CII

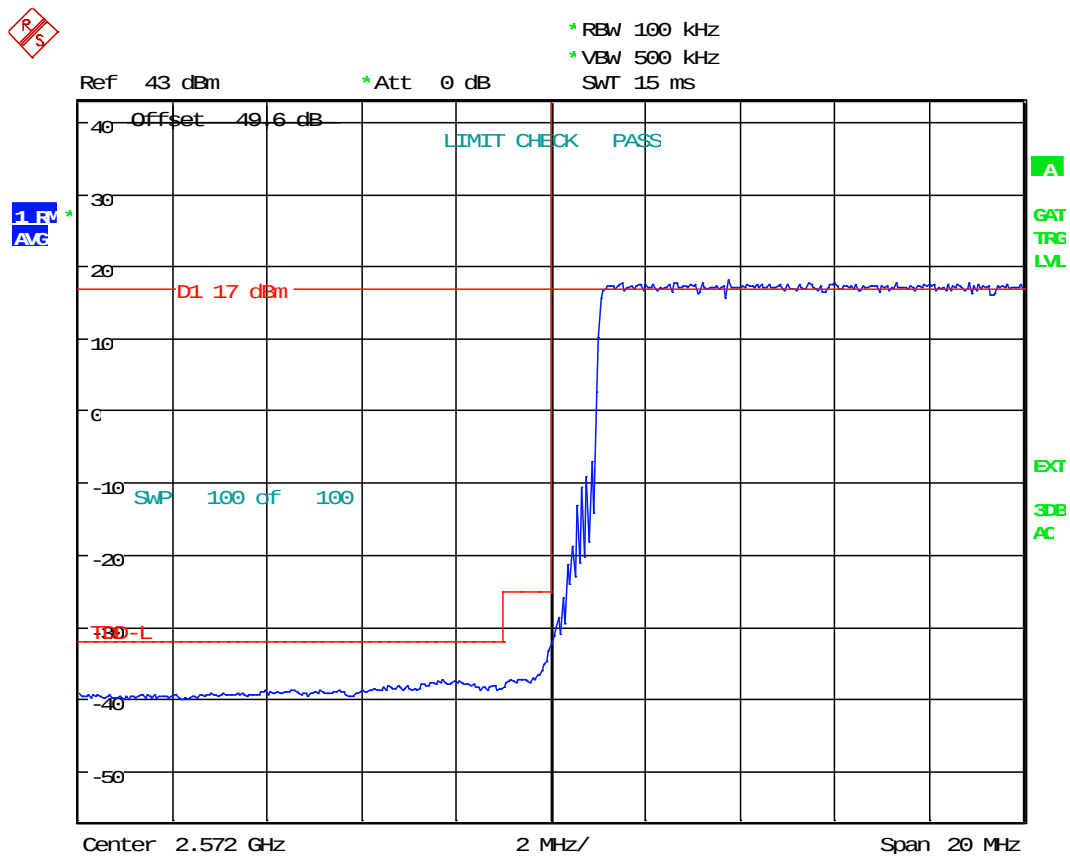
Date: 22.APR.2015 09:54:14



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2582M&2609M;-48VDC;64QAM;FCCID-AS5BBTRX-15.CII

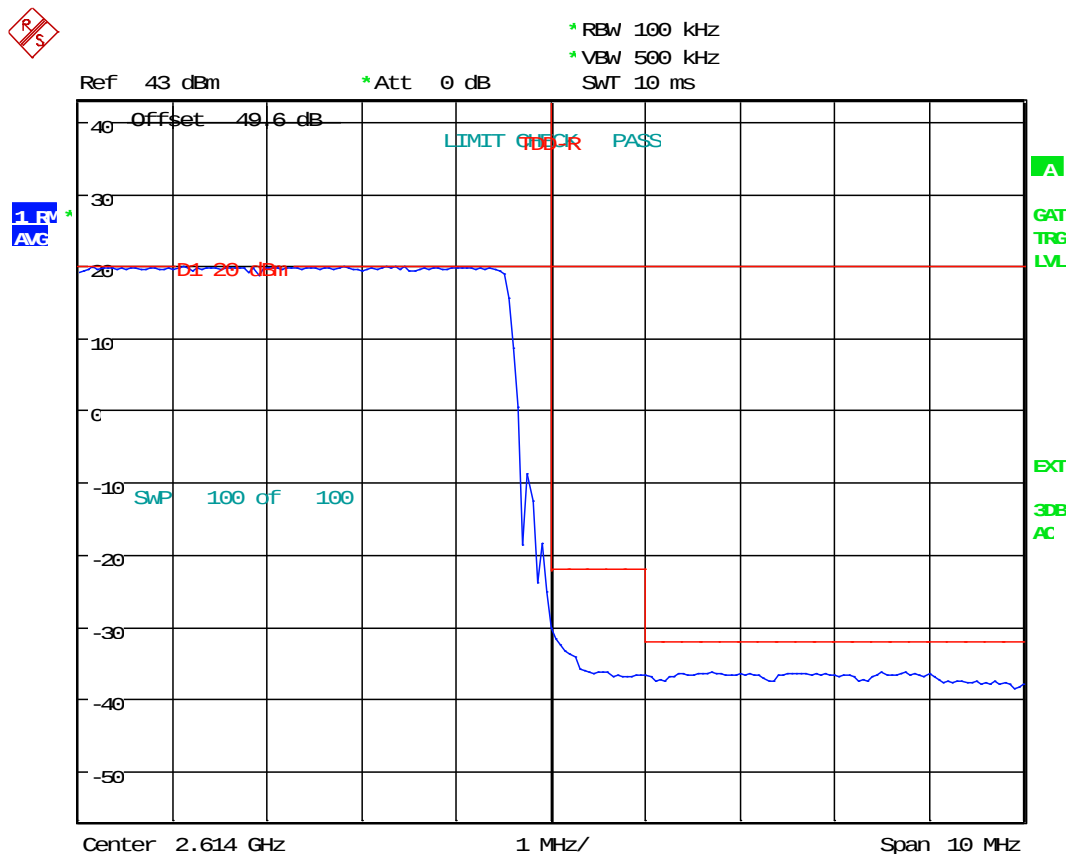
Date: 22.APR.2015 11:43:25



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2582M&2609M;-48VDC;64QAM;FCCID-AS5BBTRX-15.CII

Date: 22.APR.2015 11:45:06



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2582M&2609M;-48VDC;64QAM;FCCID-AS5BBTRX-15.CII

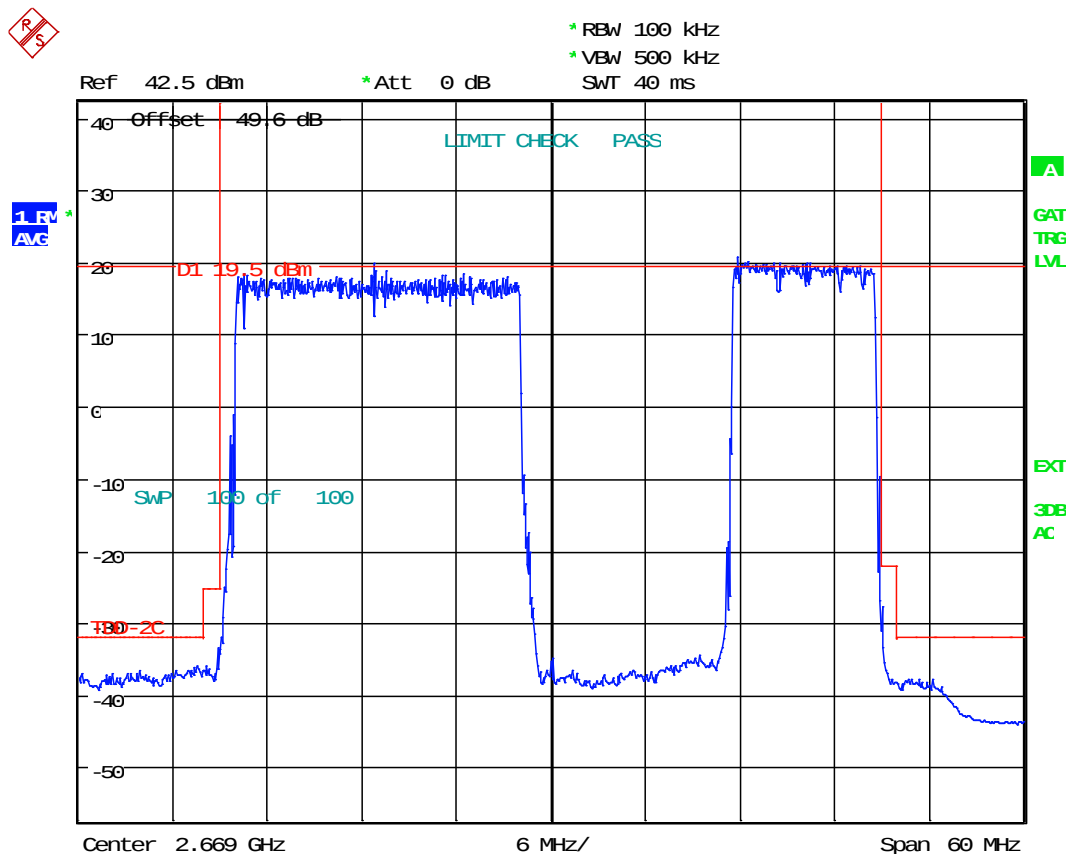
Date: 22.APR.2015 11:46:48

**20+10 MHz Bandwidth
2648-2668 MHz (20MHz) and 2680-2690 MHz (10MHz)
(Higher)**

8x20 watts (MIMO)

SPECTRUM MASK/OCCUPIED BANDWIDTH

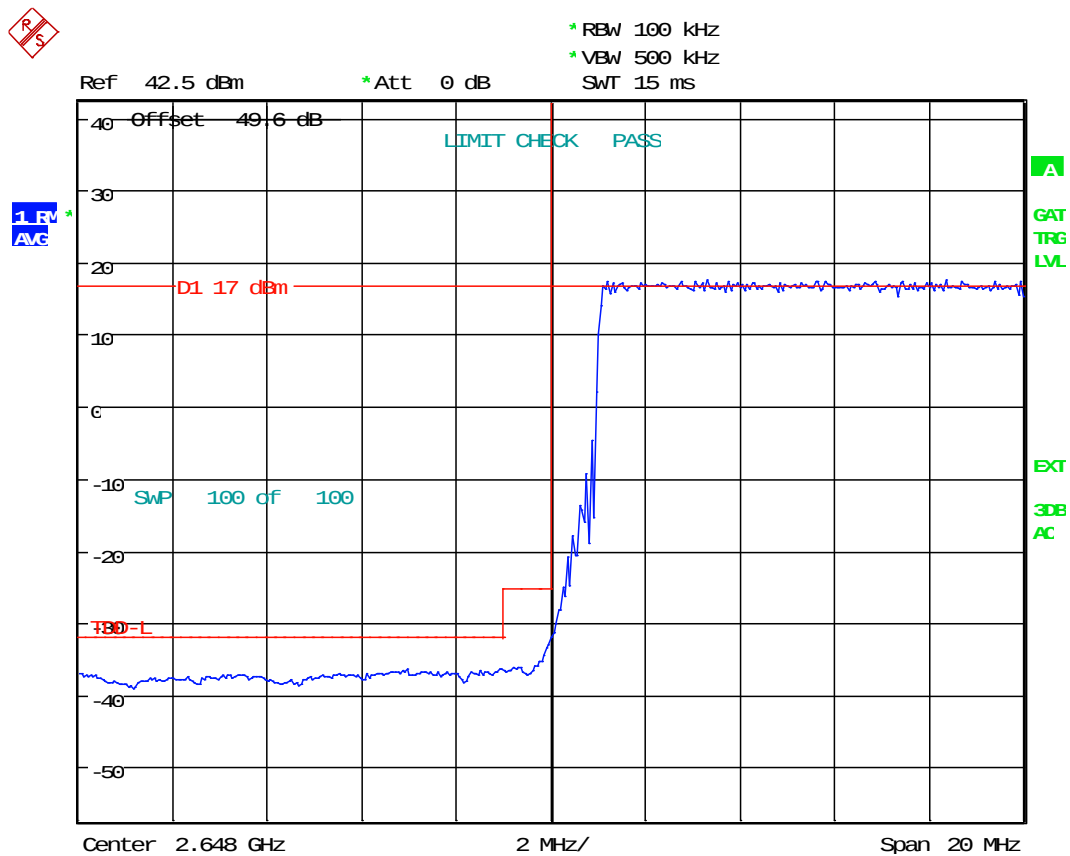
(QPSK, 16QAM and 64QAM Modulations)



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2658M&2685M;-48VDC;QPSK;FCCID-AS5BBTRX-15.CII

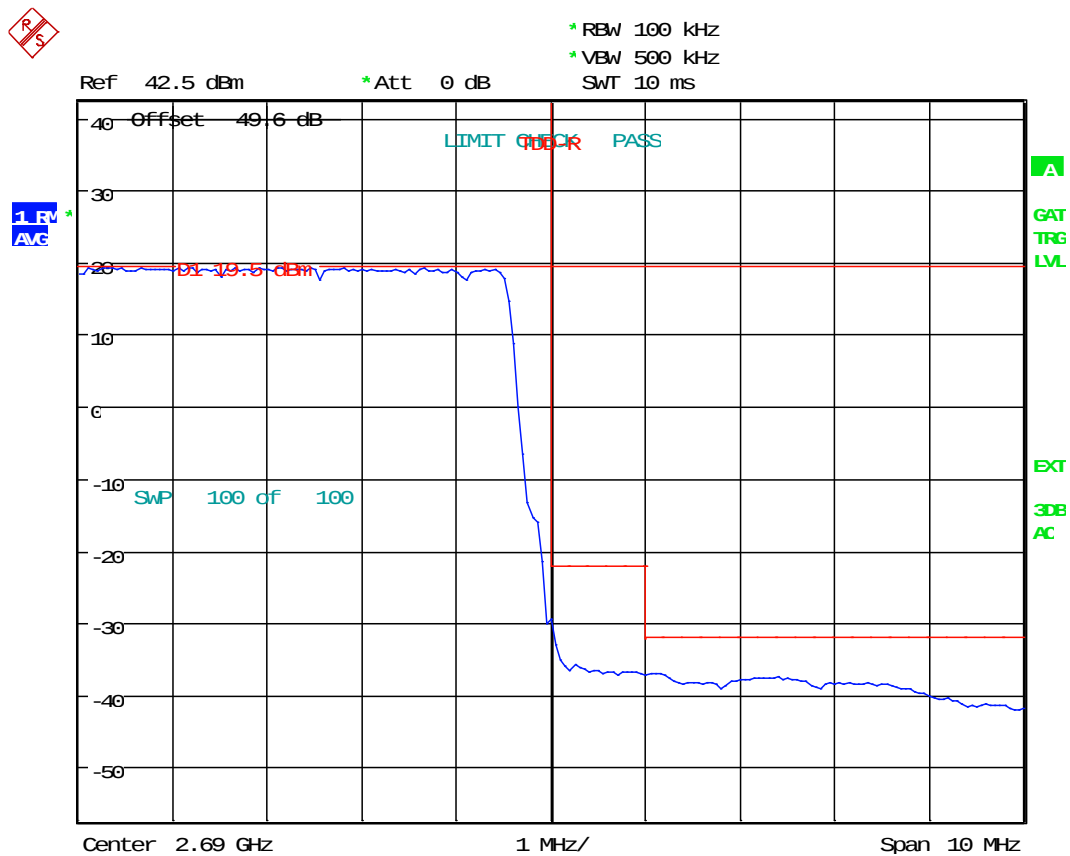
Date: 22.APR.2015 13:34:38



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2658M&2685M;-48VDC;QPSK;FCCID-AS5BBTRX-15.CII

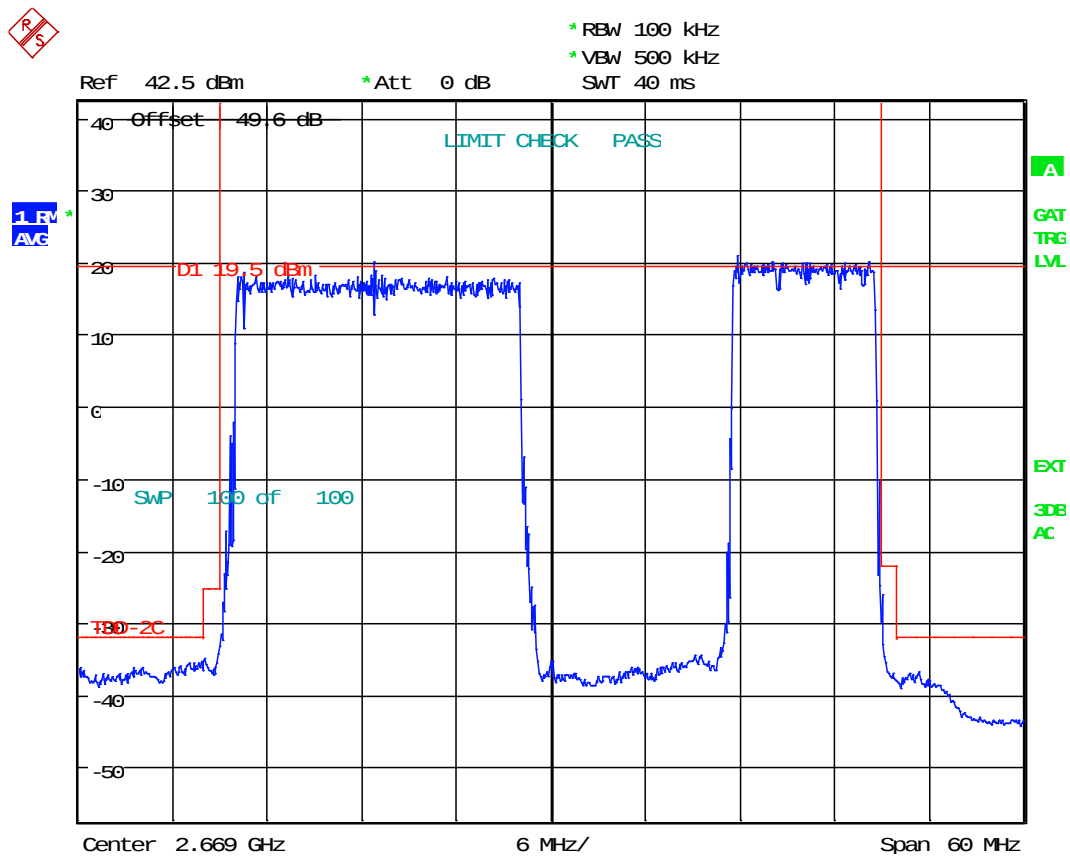
Date: 22.APR.2015 13:37:34



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2658M&2685M;-48VDC;QPSK;FCCID-AS5BBTRX-15.CII

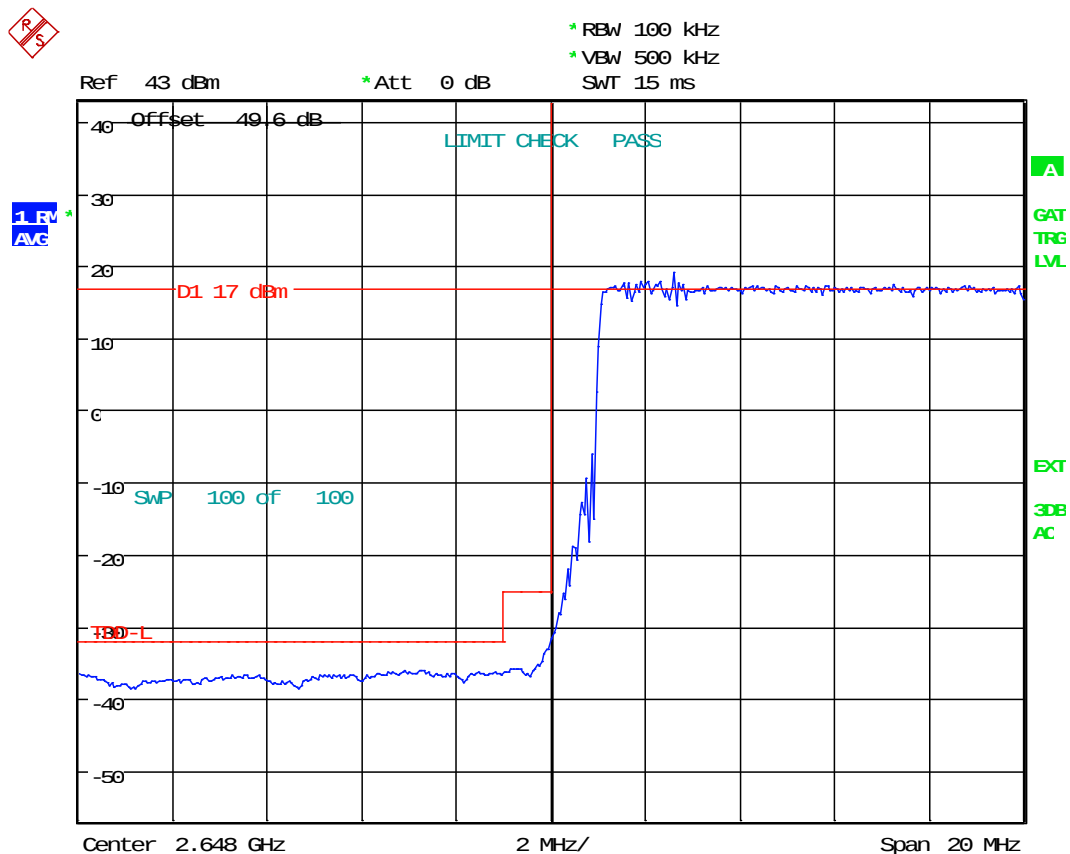
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OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2658M&2685M;-48VDC;16QAM;FCCID-AS5BBTRX-15.CII

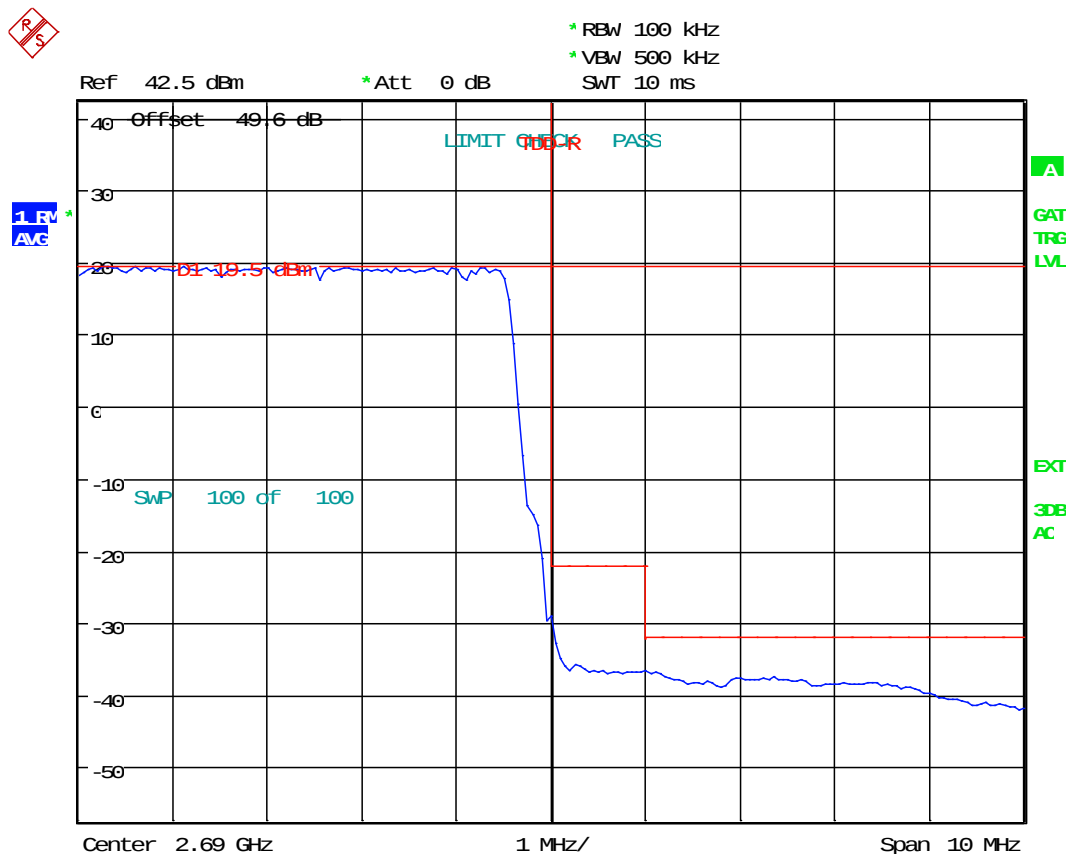
Date: 22.APR.2015 14:56:21



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2658M&2685M;-48VDC;16QAM;FCCID-AS5BBTRX-15.CII

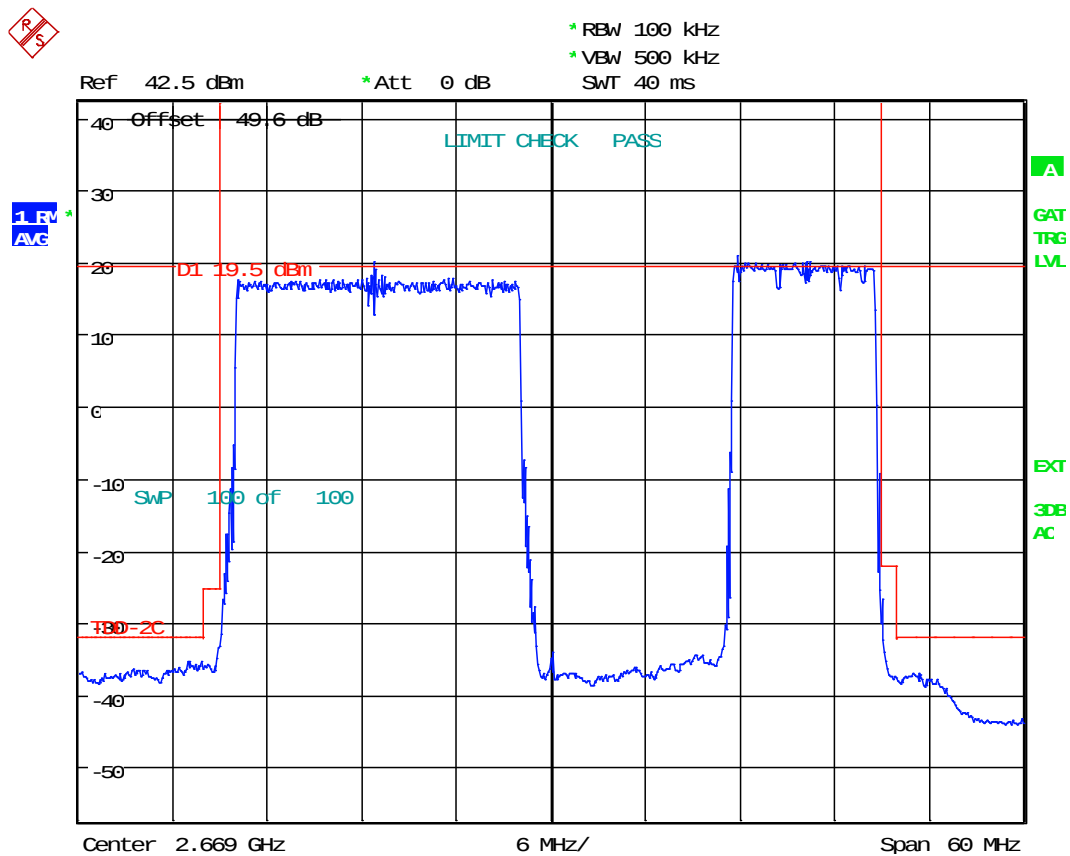
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OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2658M&2685M;-48VDC;16QAM;FCCID-AS5BBTRX-15.CII

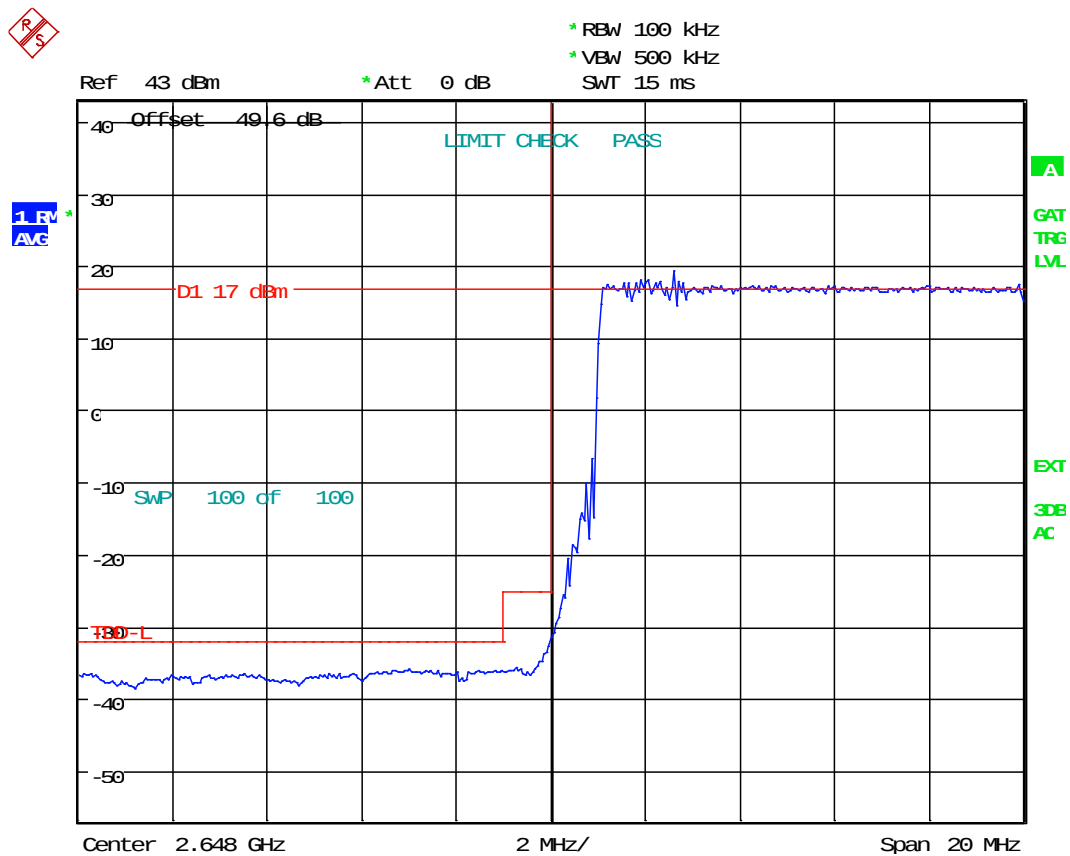
Date: 22.APR.2015 15:00:06



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2658M&2685M;-48VDC;64QAM;FCCID-AS5BBTRX-15.CII

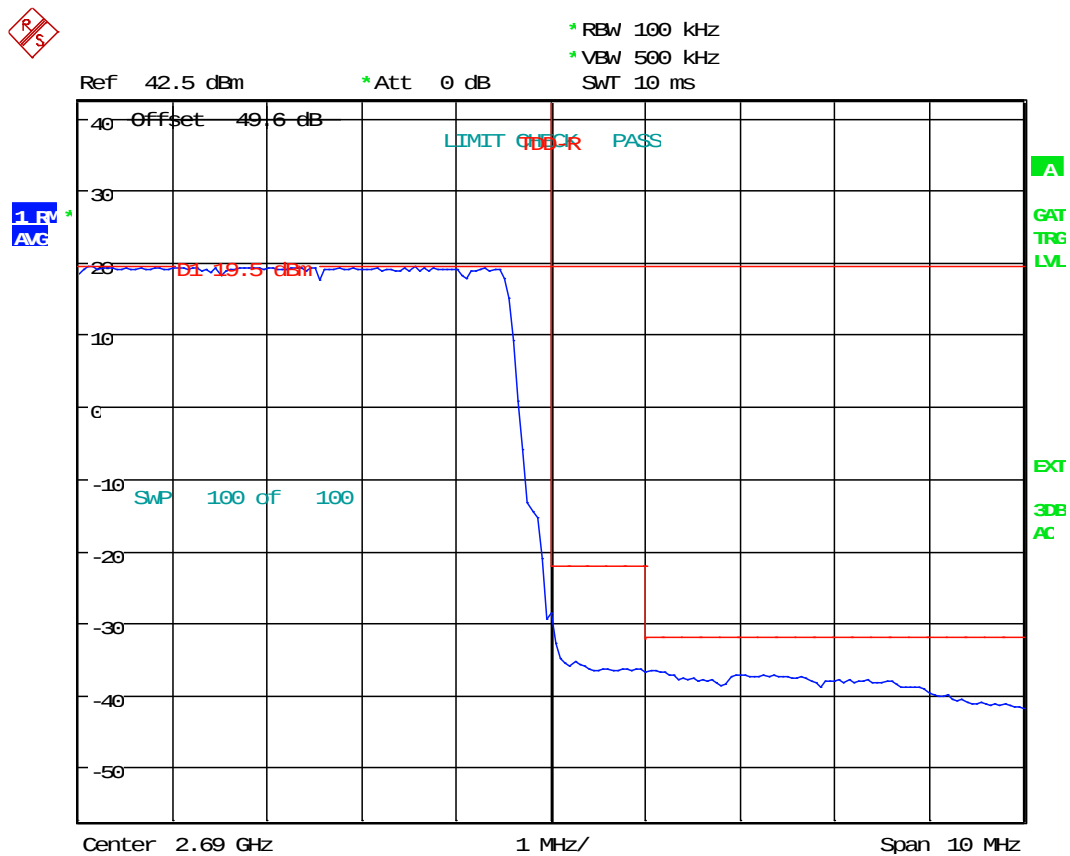
Date: 23.APR.2015 07:17:25



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2658M&2685M;-48VDC;64QAM;FCCID-AS5BBTRX-15.CII

Date: 23.APR.2015 07:21:38



OCCUPIED BANDWIDTH;Test Eng:JY TDD B41 RRH;20+10M BW NC;20W;

2658M&2685M;-48VDC;64QAM;FCCID-AS5BBTRX-15.CII

Date: 23.APR.2015 07:18:43

Measurement 4

**FCC Section 2.1051 and 27.53 (m) (v)
Spurious Emissions at Antenna Transmit Terminals**

Spurious Emissions at Transmit Antenna Terminals

Spurious Emissions at the transmit-antenna terminals were investigated over the frequency range of 9 kHz to the 27 GHz. The test setup is as described in Figure A. Measurements were made using a Rohde & Schwarz ESU (20Hz to 40 GHz) EMI Test receiver. The RF output from the transmitter was reduced (to an amplitude usable by the receivers) using calibrated attenuators. The RF power level was continuously monitored via RF Power Meter as shown in the test setup in Figure A. The required emission limitation is specified in 27.53 (m) (v). Measurements were made at 10W per carrier for 20 MHz Bandwidth, and 10W per carrier for 10MHz Bandwidth at antenna terminals. The measured spurious emission levels were plotted for the frequency range 9 kHz to 27 GHz. The measurements were made using following receiver parameters:

The list of blocks and bands, tested for QPSK, 16QAM and 64QAM are listed below:

Blocks	Bandwidth (MHz)	Frequency (MHz)	Power (Watts)
Lower	20+10	2496-2516 and 2528-2538	20
Middle	20+10	2572-2592 and 2604-2614	20
Higher	20+10	2648-2668 and 2680-2690	20

FCC Section 27.53(m)(v) Based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater

Pursuant to FCC OET RULES 662911 D01 and D02 for two antenna MIMO mode of operations, the FCC limit of -13dBm and Eight MIMO the limit shall be 9dB more stringent, therefore all channel edge and out of band spurious emissions shall be -22dBm.

The tests were performed in following modulation configurations:

- A. QPSK
- B. 16 QAM
- C. 64 QAM

RESULTS:

The magnitude of spurious emissions is within the specification limits of FCC Part 27.53(m) (v).

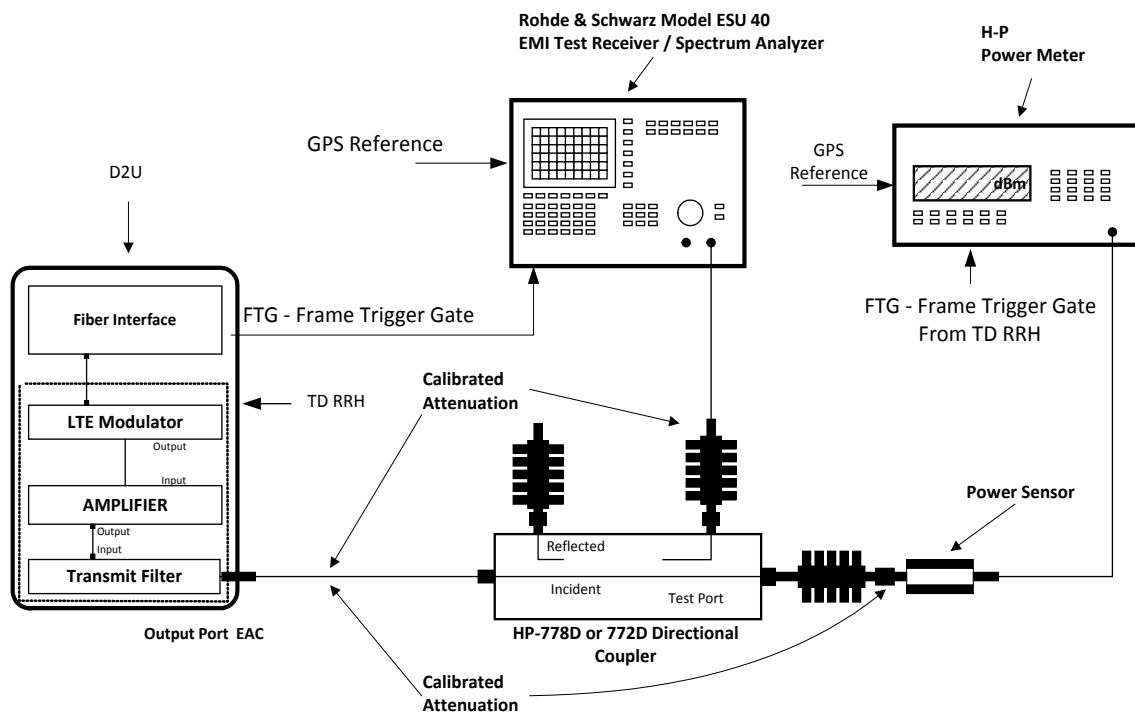
Measurement uncertainty:

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

**Figure A. TEST CONFIGURATION FOR SPECTRUM MASK
(OCCUPIED BANDWIDTH)**

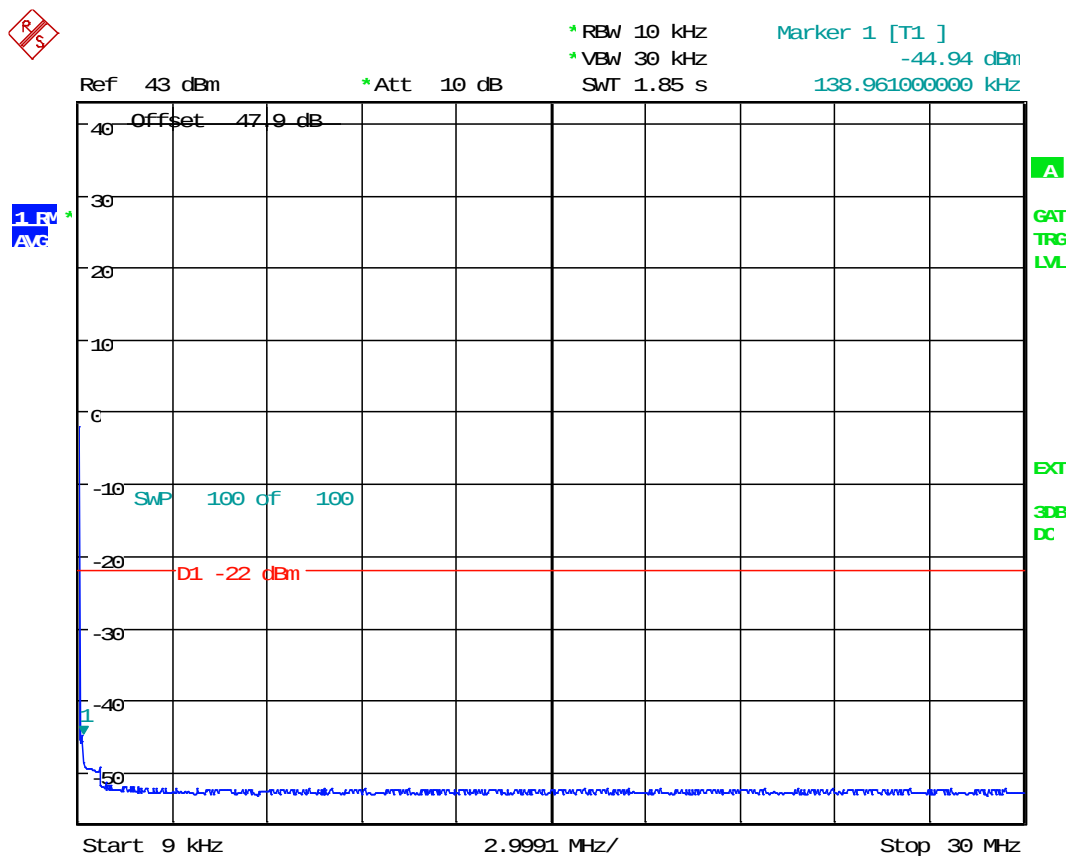


All components are calibrated over the frequency range of interest

**Transmit Port
Antenna Conducted Spurious Emissions**

**20+10 MHz BW
QPSK Modulation
8x20 watts (MIMO)**

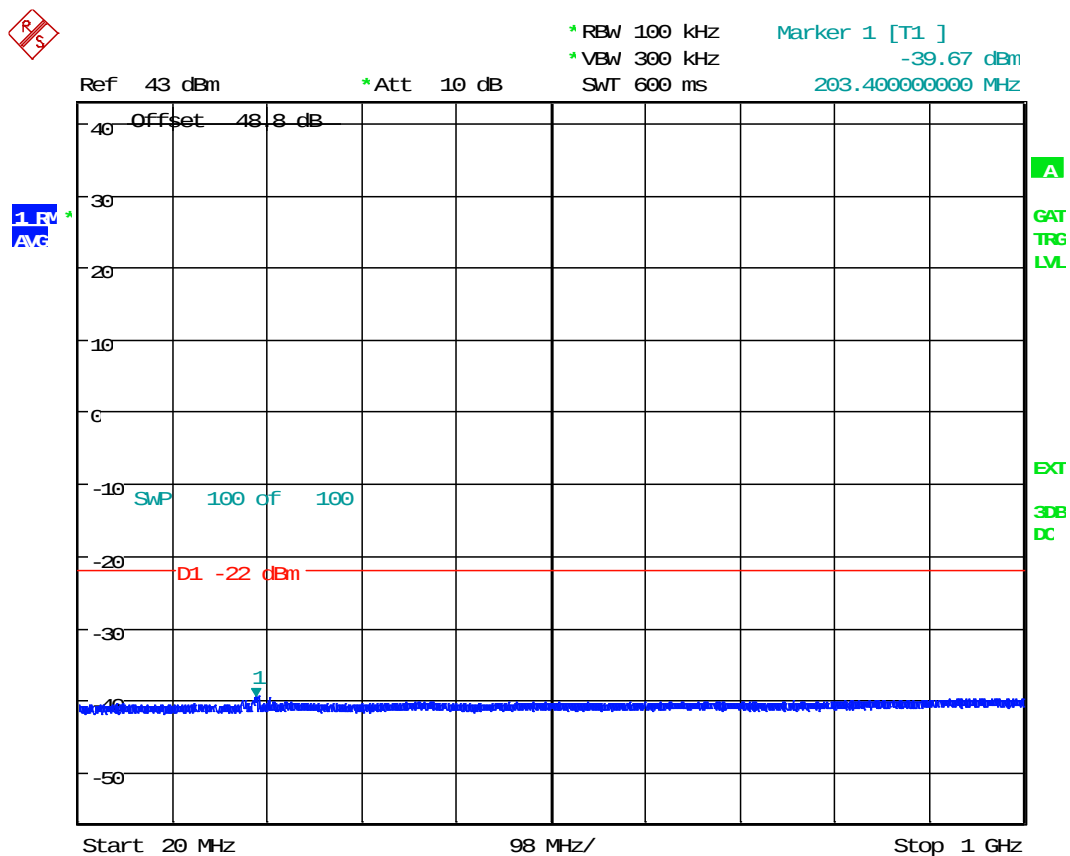
**2496-2516 MHz (20MHz) and 2528-2538 MHz (10MHz)
(Lower)**



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2506M&2533M;-48VDC;QPSK;FCCID-AS5BBTRX-15. CII.

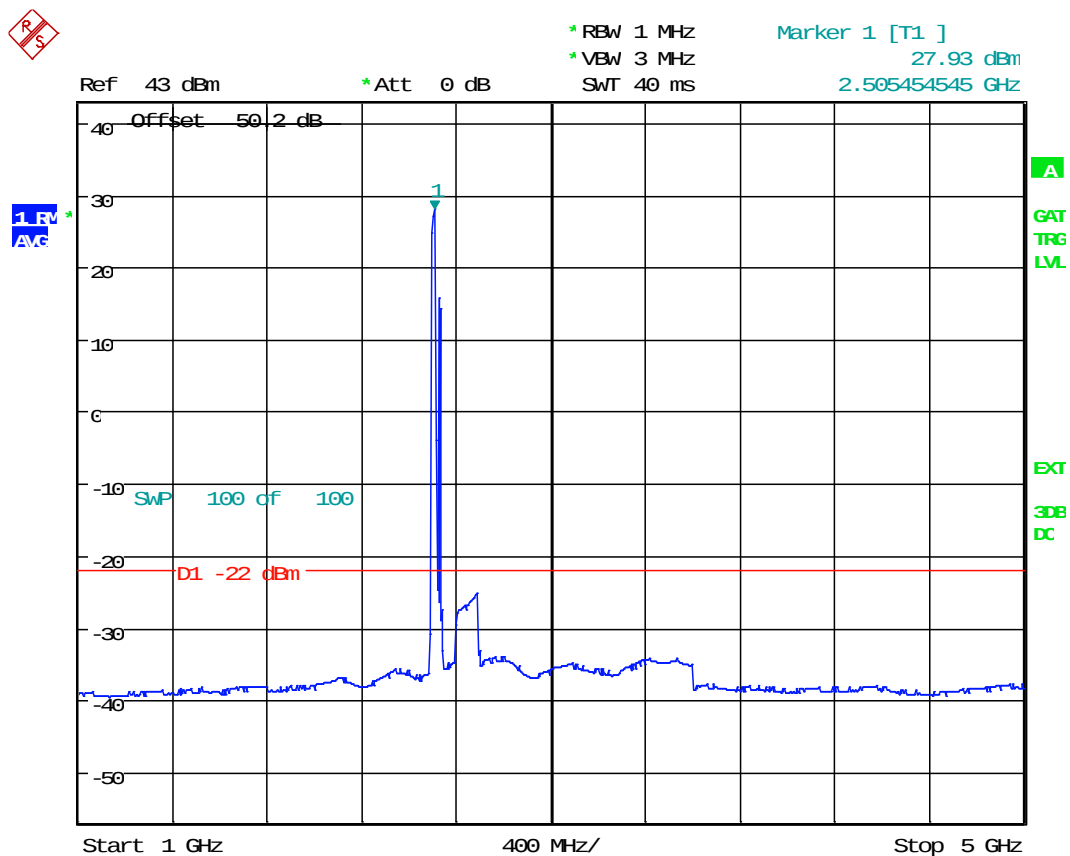
Date: 23.APR.2015 18:03:07



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2506M&2533M;-48VDC;QPSK;FCCID-AS5BBTRX-15. CII.

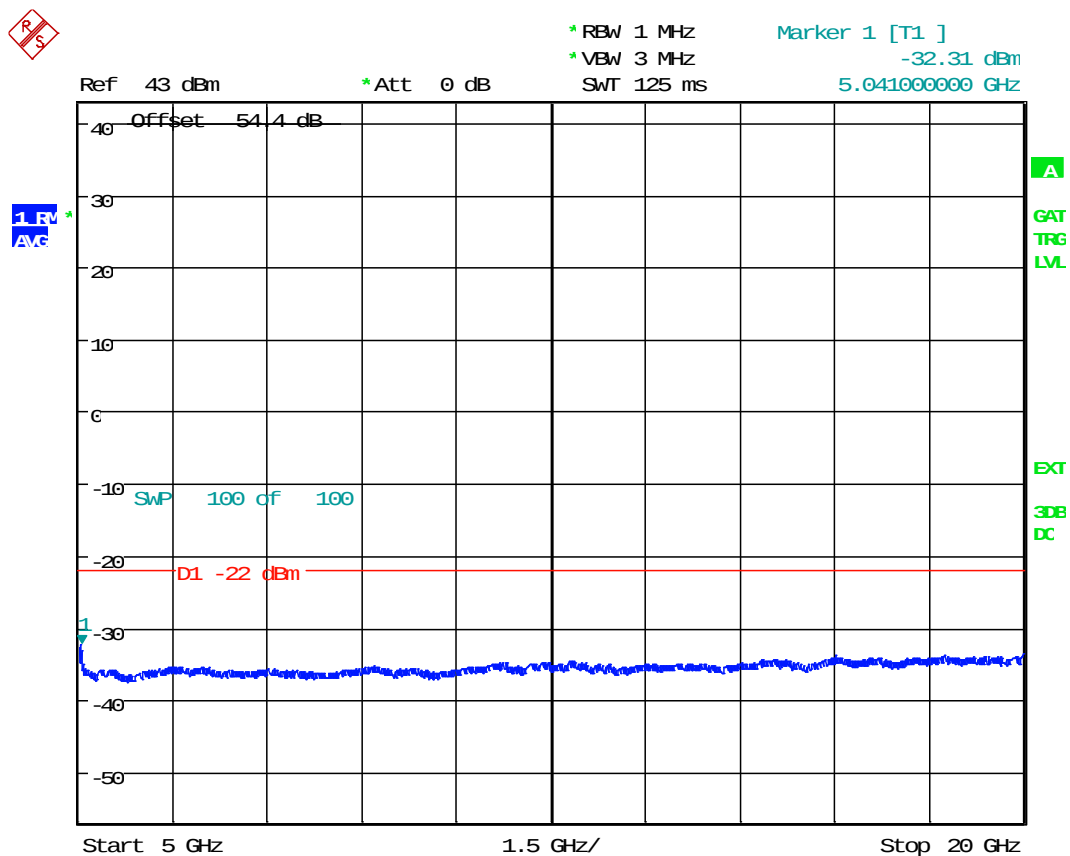
Date: 23.APR.2015 18:16:06



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2506M&2533M;-48VDC;QPSK;FCCID-AS5BBTRX-15. CII.

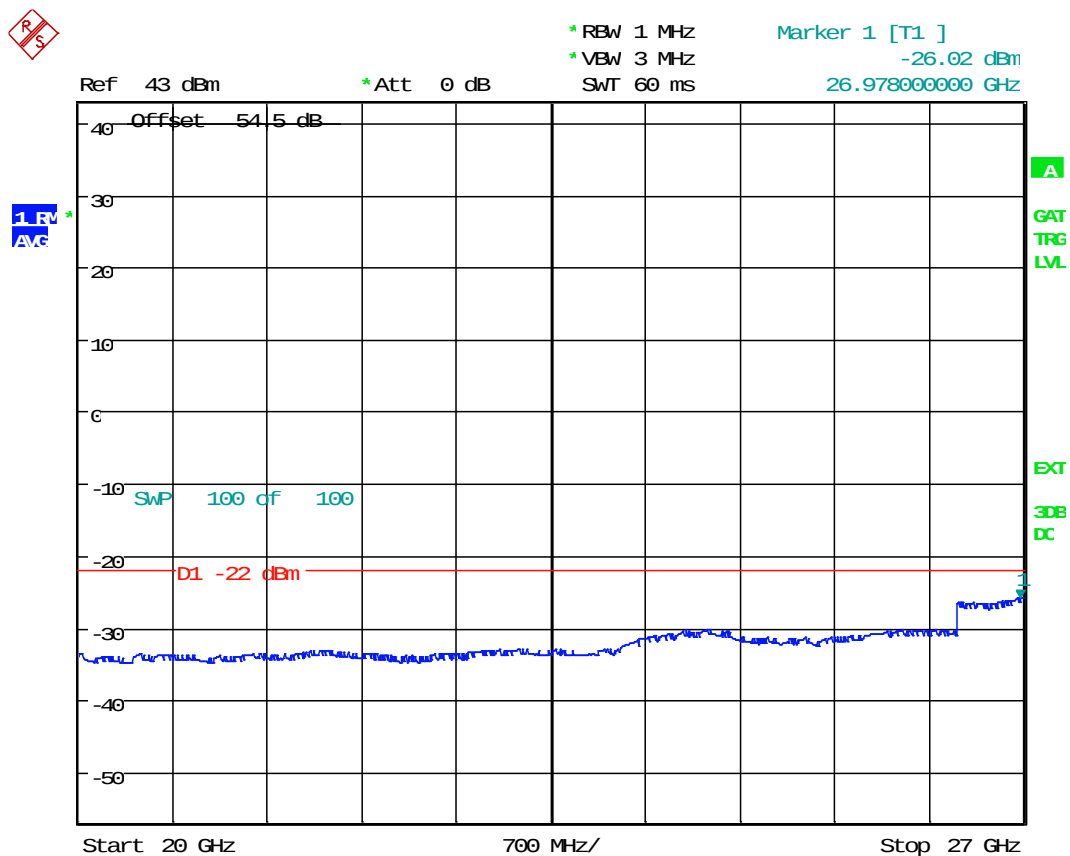
Date: 23.APR.2015 18:18:53



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2506M&2533M;-48VDC;QPSK;FCCID-AS5BBTRX-15. CII.

Date: 23.APR.2015 18:24:11

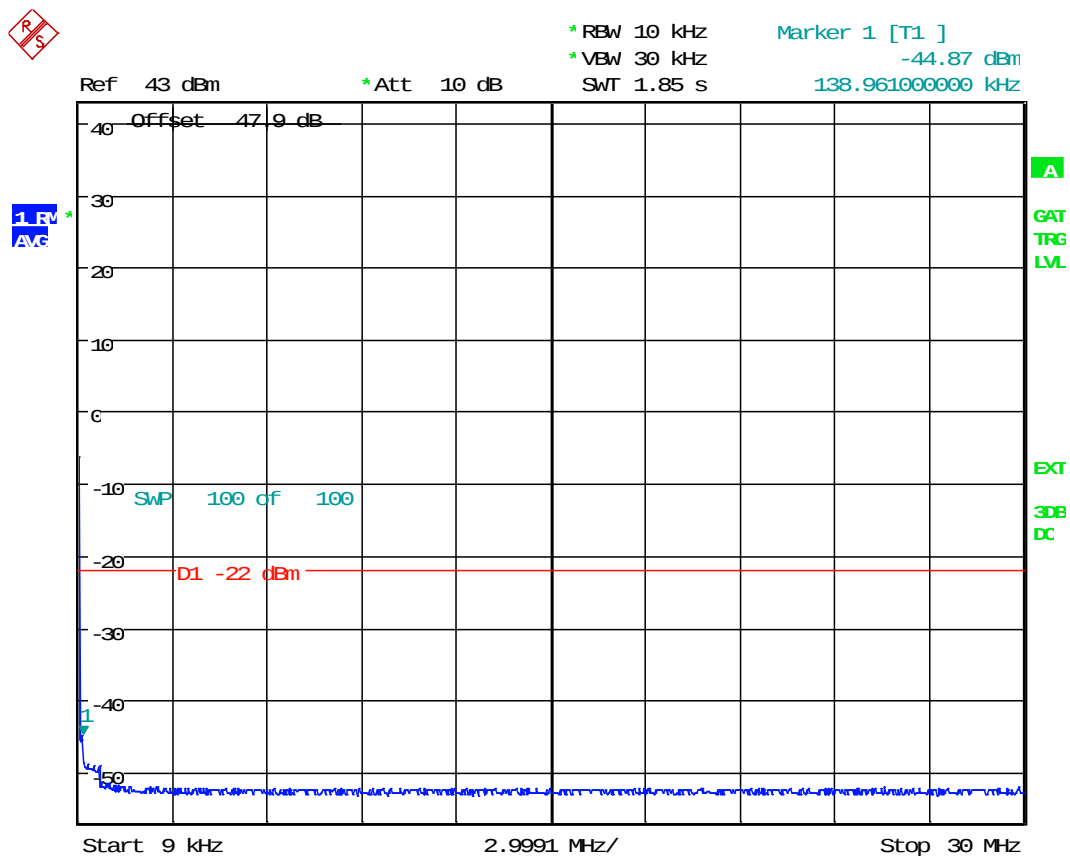


TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2506M&2533M;-48VDC;QPSK;FCCID-AS5BBTRX-15. CII.
 Date: 24.APR.2015 20:10:56

**Transmit Port
Antenna Conducted Spurious Emissions**

**20+10 MHz BW
16QAM Modulation
8x20 watts (MIMO)**

**2496-2516 MHz (20MHz) and 2528-2538 MHz (10MHz)
(Lower)**



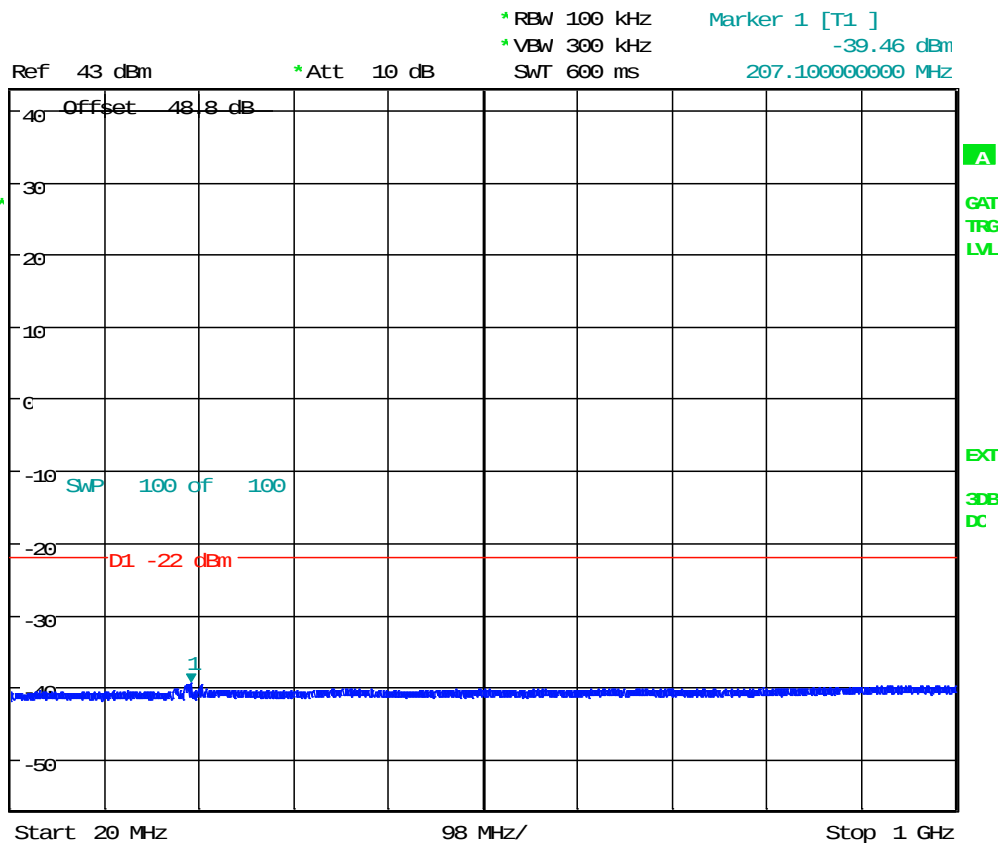
TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2506M&2533M;-48VDC;16QAM;FCCID-AS5BBTRX-15. CII.

Date: 23.APR.2015 21:40:44



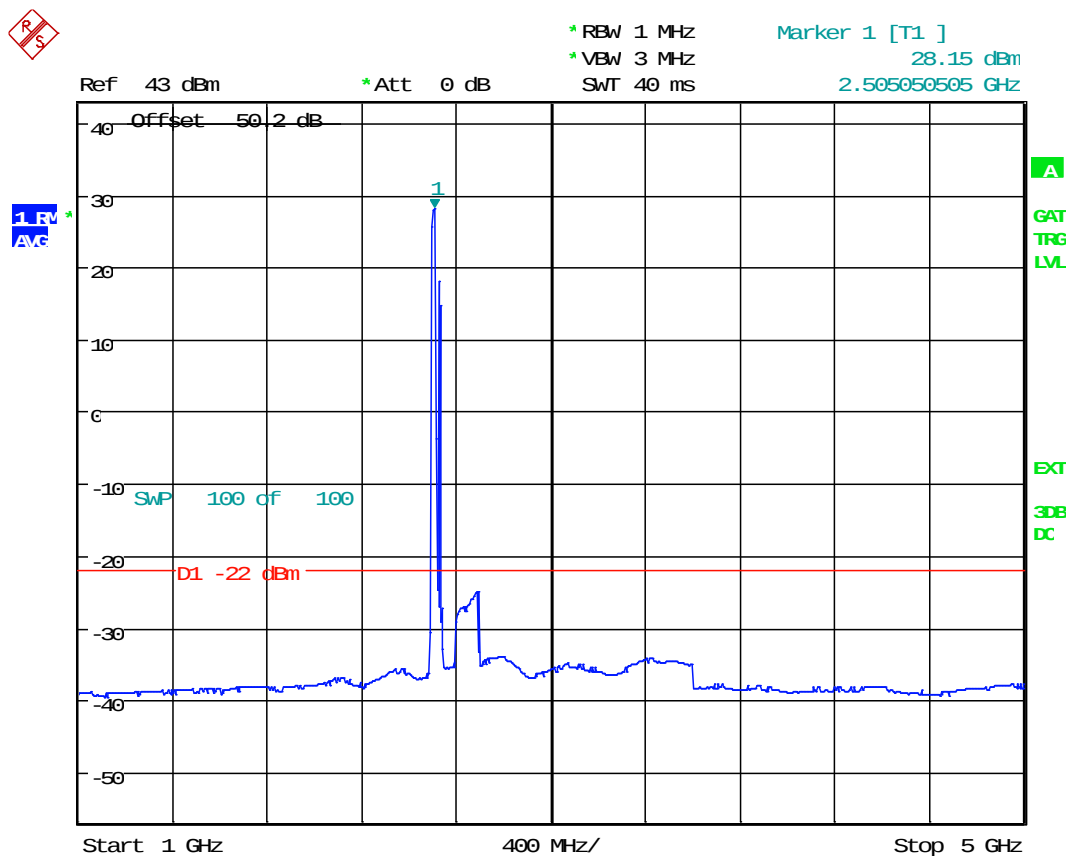
1 RV
AVG



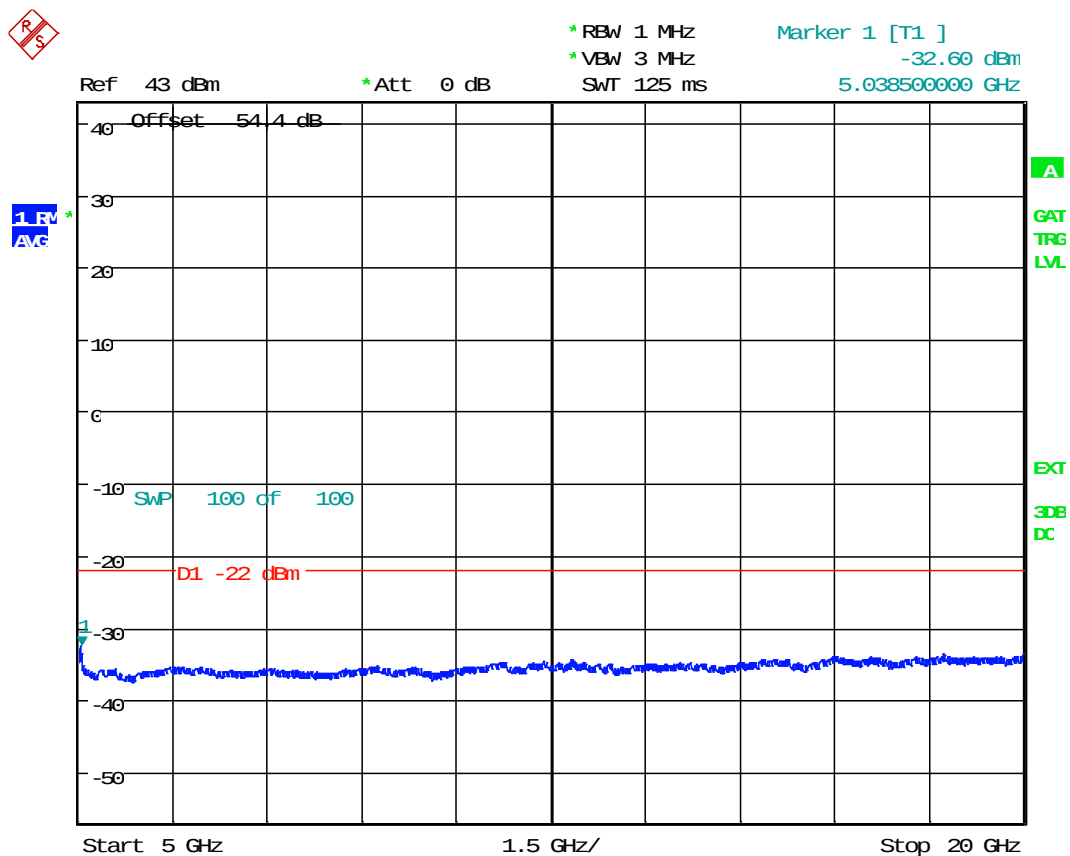
TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2506M&2533M;-48VDC;16QAM;FCCID-AS5BBTRX-15. CII.

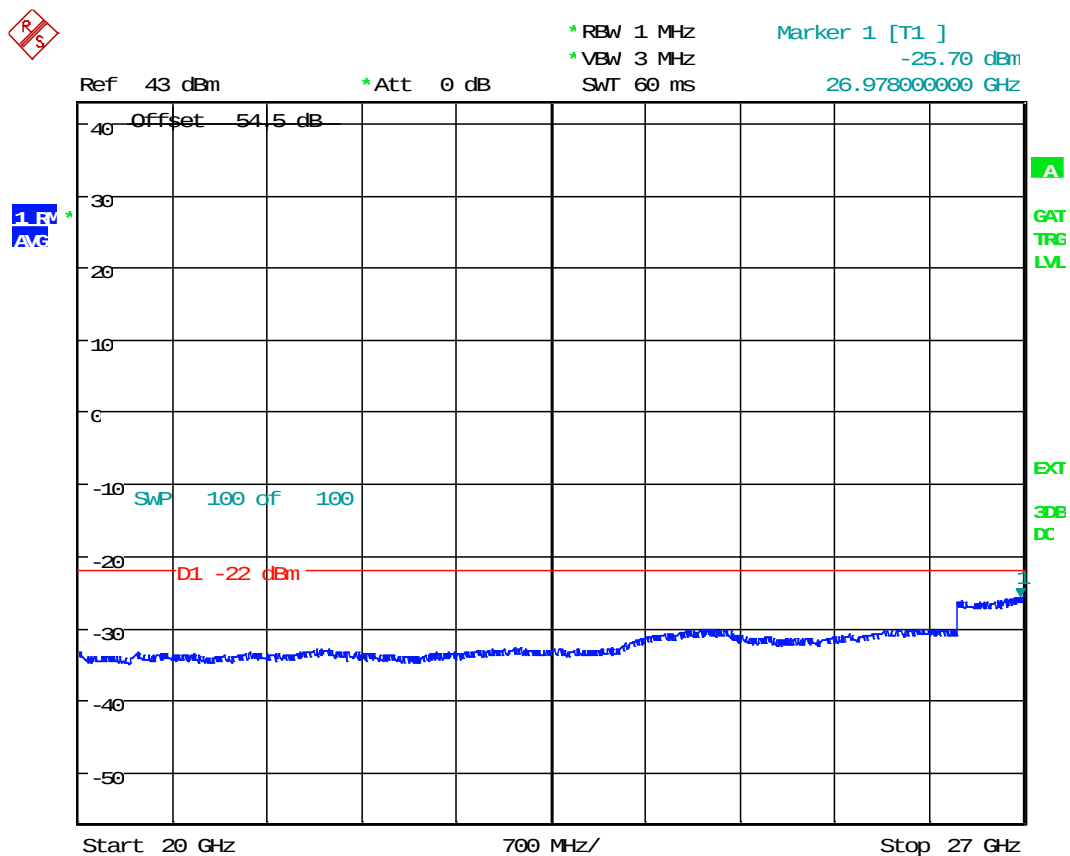
Date: 23.APR.2015 20:32:09



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2506M&2533M;-48VDC;16QAM;FCCID-AS5BBTRX-15. CII.
 Date: 23.APR.2015 20:35:30



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
2506M&2533M;-48VDC;16QAM;FCCID-AS5BBTRX-15. CII.
Date: 23.APR.2015 20:40:57



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2506M&2533M;-48VDC;16QAM;FCCID-AS5BBTRX-15. CII.
 Date: 23.APR.2015 20:43:22

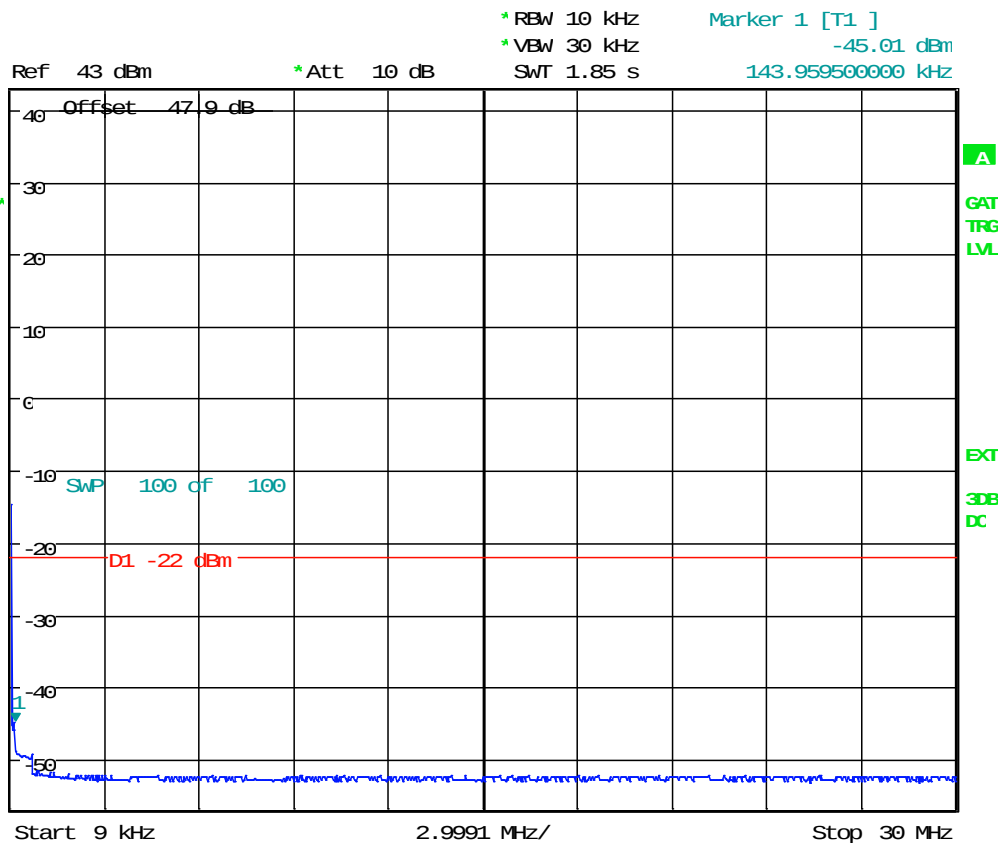
**Transmit Port
Antenna Conducted Spurious Emissions**

**20+10 MHz BW
64QAM Modulation
8x20 watts (MIMO)**

**2496-2516 MHz (20MHz) and 2528-2538 MHz (10MHz)
(Lower)**



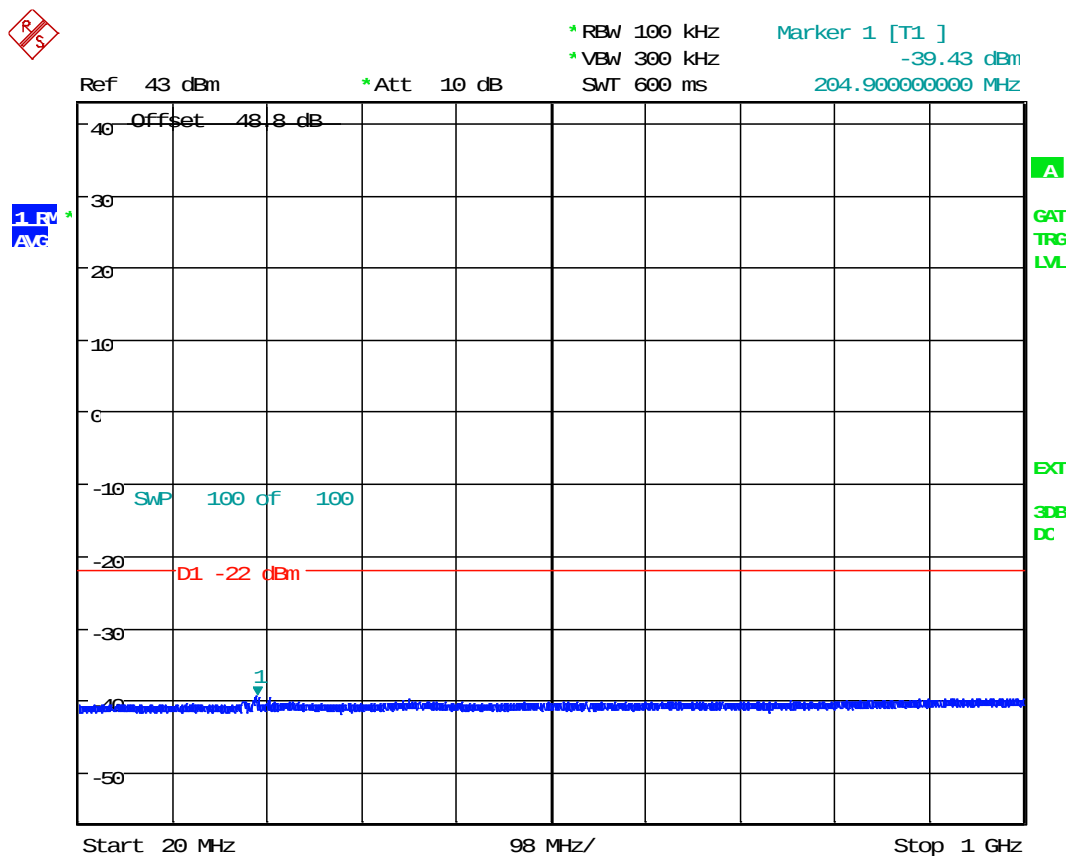
1 RV
AVG



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2506M&2533M;-48VDC;64QAM;FCCID-AS5BBTRX-15. CII.

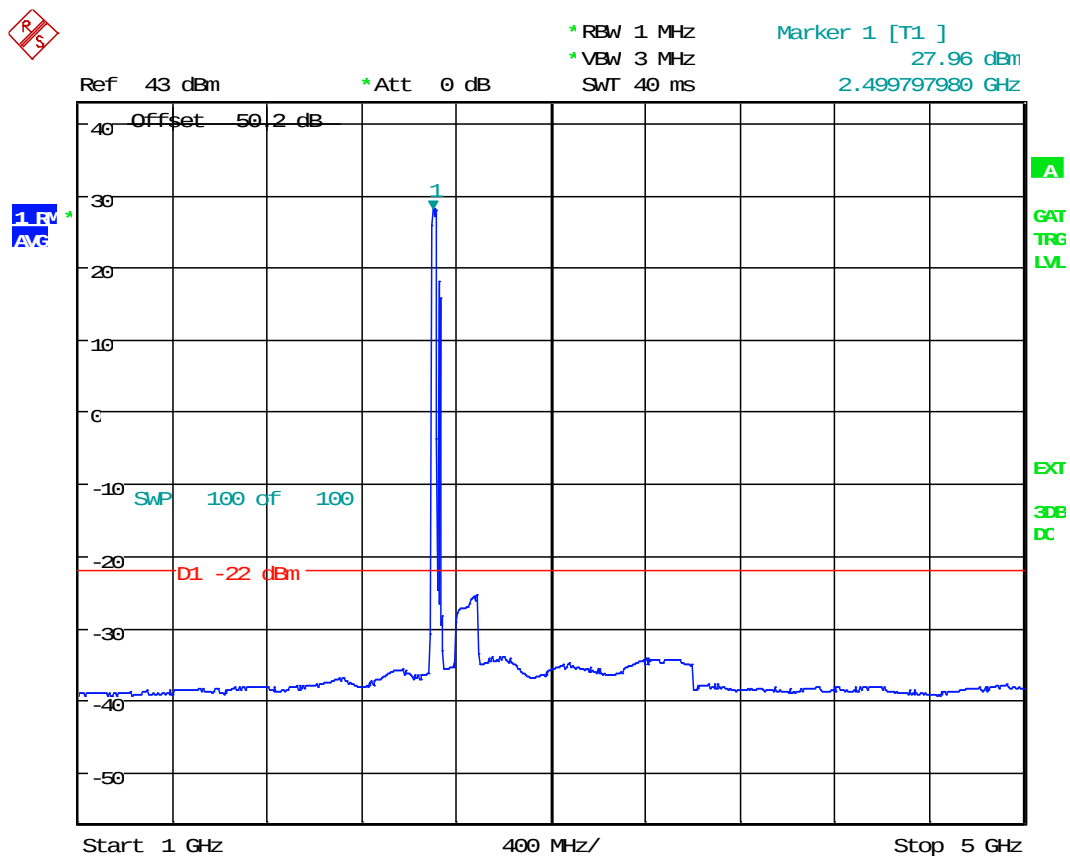
Date: 24.APR.2015 19:04:41



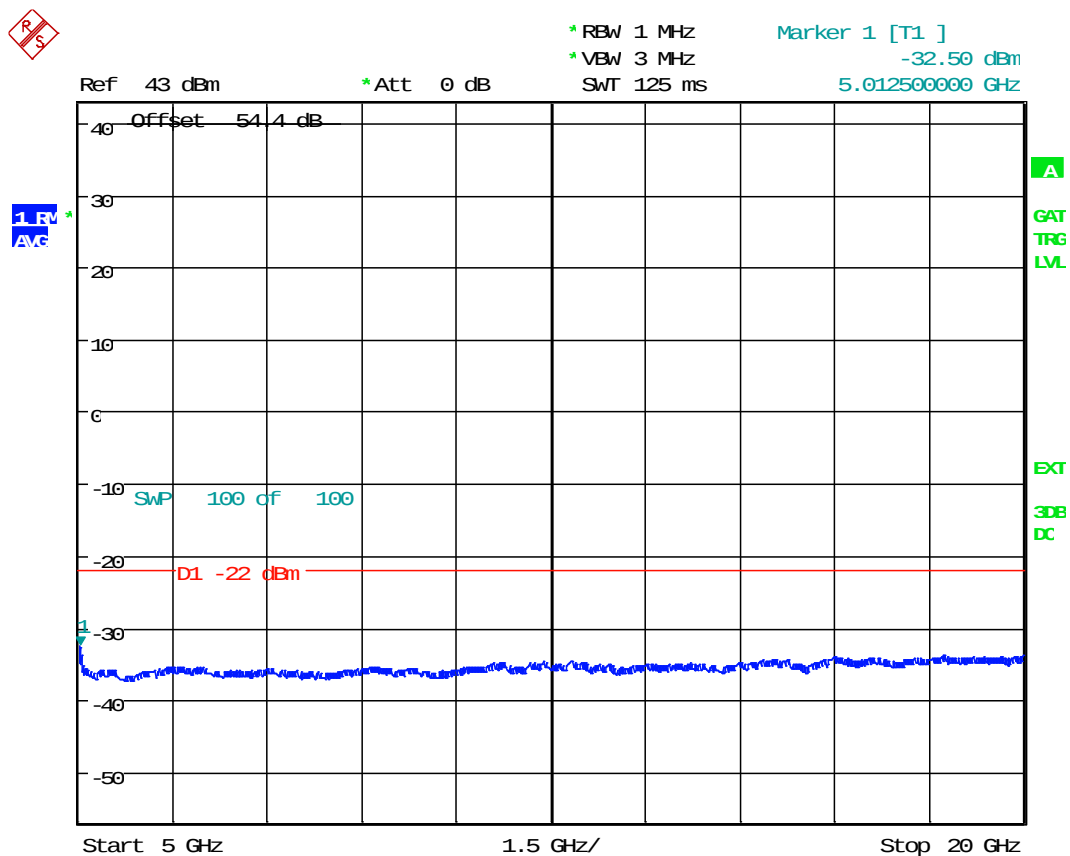
TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2506M&2533M;-48VDC;64QAM;FCCID-AS5BBTRX-15. CII.

Date: 24.APR.2015 19:18:38



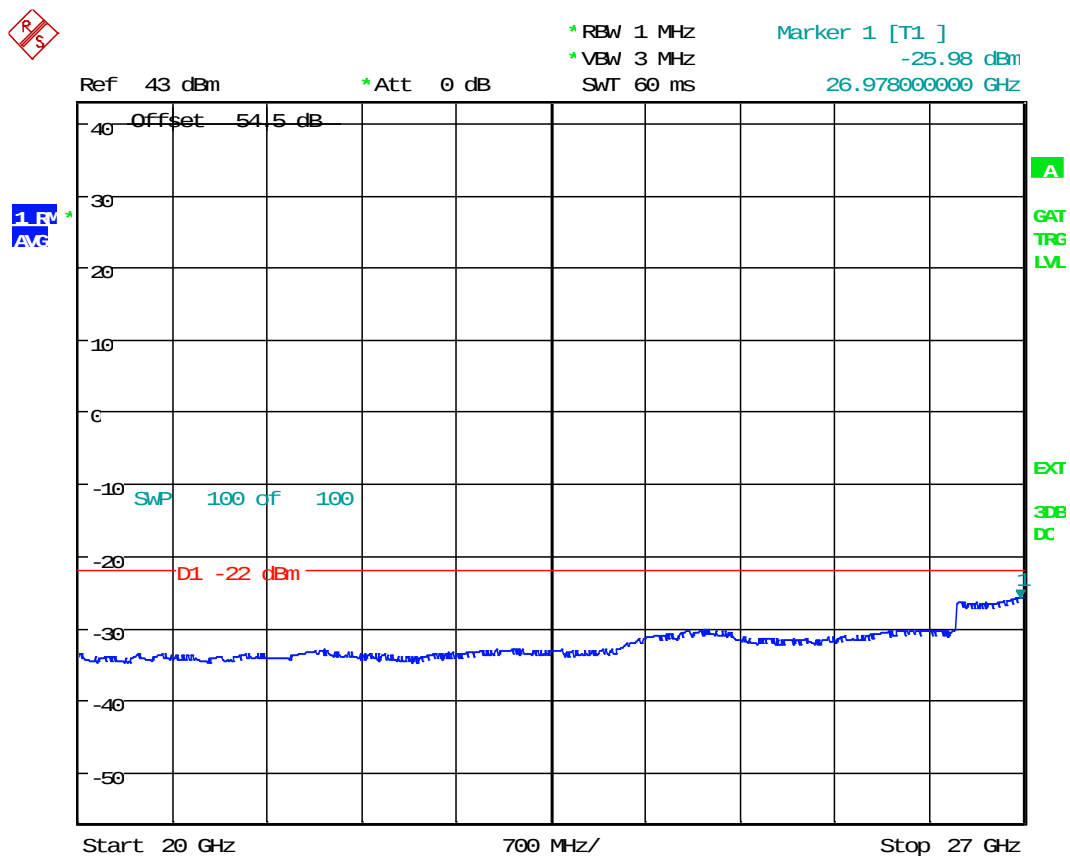
TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2506M&25333M;-48VDC;64QAM;FCCID-AS5BBTRX-15. CII.
 Date: 24.APR.2015 19:23:05



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2506M&2533M;-48VDC;64QAM;FCCID-AS5BBTRX-15. CII.

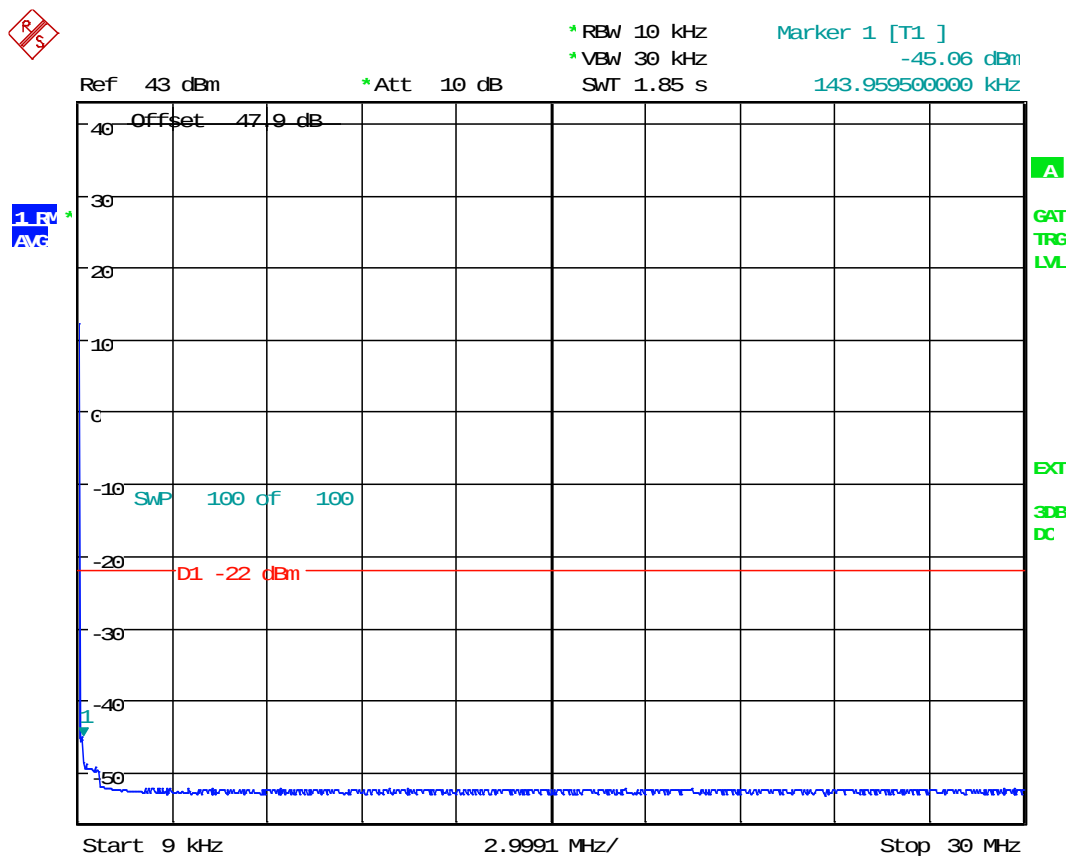
Date: 24.APR.2015 19:29:11



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2506M&2533M;-48VDC;64QAM;FCCID-AS5BBTRX-15. CII.
 Date: 24.APR.2015 19:33:34

**Transmit Port
Antenna Conducted Spurious Emissions**

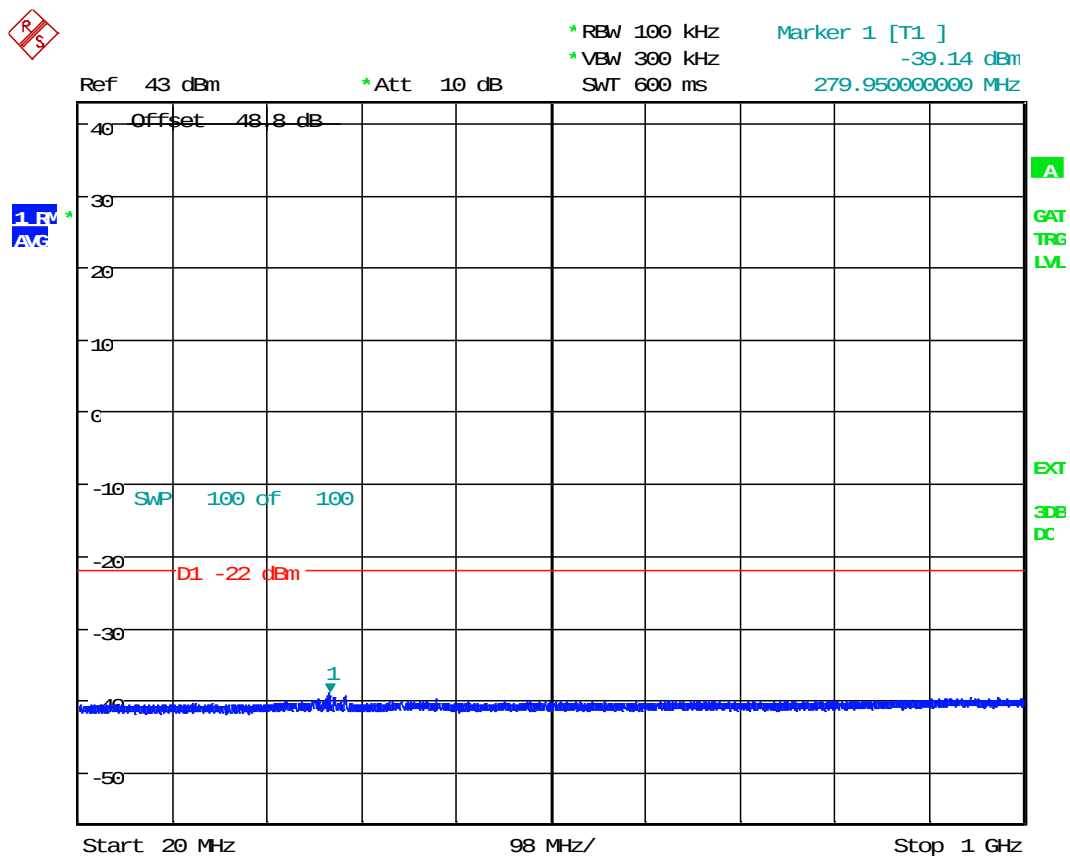
**20+10 MHz BW
QPSK Modulation
2572-2592 MHz (20MHz) and 2604-2614 MHz(10MHz)
(Middle)
8x20 watts (MIMO)**



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2582M&2609M;-48VDC;QPSK;FCCID-AS5BBTRX-15. CII.

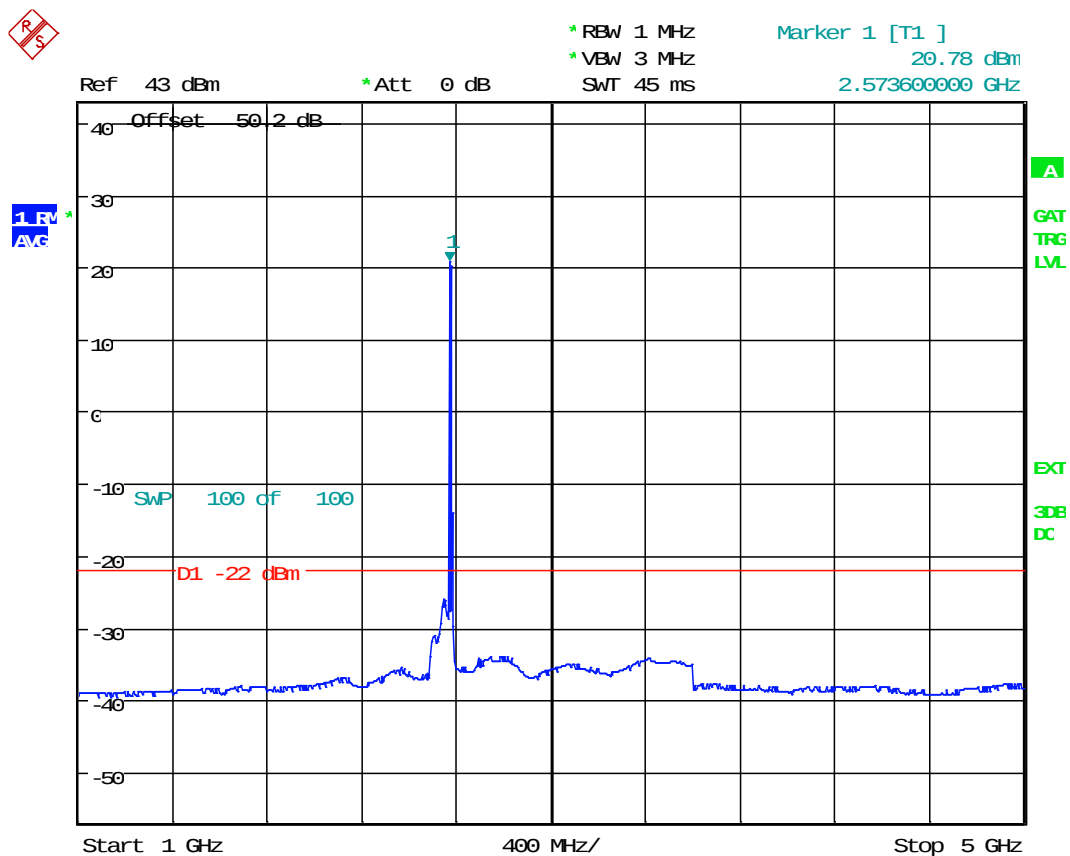
Date: 22.APR.2015 07:17:14



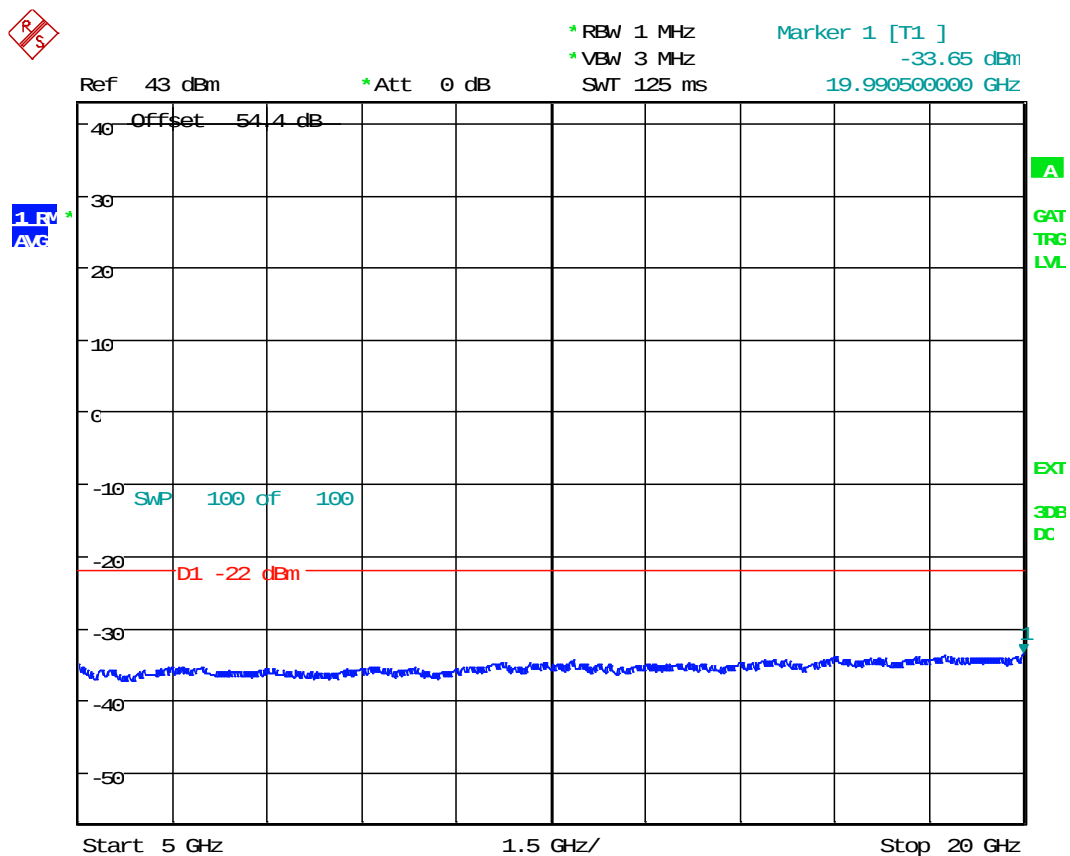
TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2582M&2609M;-48VDC;QPSK;FCCID-AS5BBTRX-15. CII.

Date: 22.APR.2015 07:53:06



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2582M&2609M;-48VDC;QPSK;FCCID-AS5BBTRX-15. CII.
 Date: 22.APR.2015 08:00:19



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2582M&2609M;-48VDC;QPSK;FCCID-AS5BBTRX-15. CII.

Date: 22.APR.2015 08:08:22



* RBW 1 MHz

Marker 1 [T1]

* VBW 3 MHz

-25.77 dBm

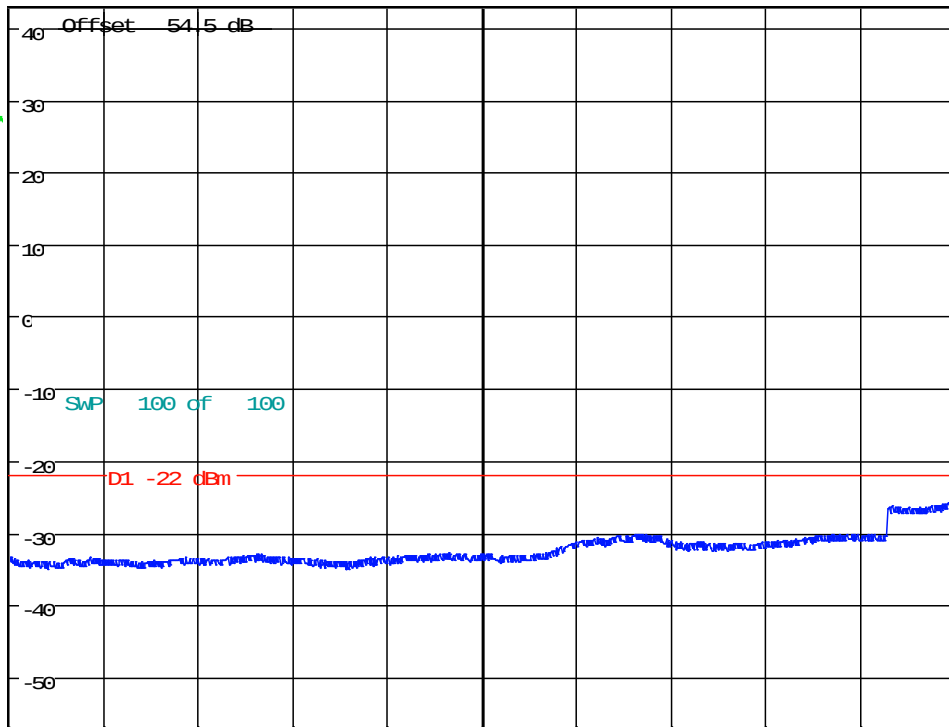
SWT 60 ms

26.999000000 GHz

Ref 43 dBm

* Att 0 dB

1 RV
AVG



Start 20 GHz

700 MHz/

Stop 27 GHz

A

GAT

TRG

LVL

EXT

3DB

DC

TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2582M&2609M;-48VDC;QPSK;FCCID-AS5BBTRX-15. CII.

Date: 22.APR.2015 08:11:58

**Transmit Port
Antenna Conducted Spurious Emissions**

**20+10 MHz BW
16QAM Modulation
2572-2592 MHz (20MHz) and 2604-2614 MHz (10MHz)
(Middle)**

8x20 watts (MIMO)



* RBW 10 kHz

Marker 1 [T1]

* VBW 30 kHz

-44.82 dBm

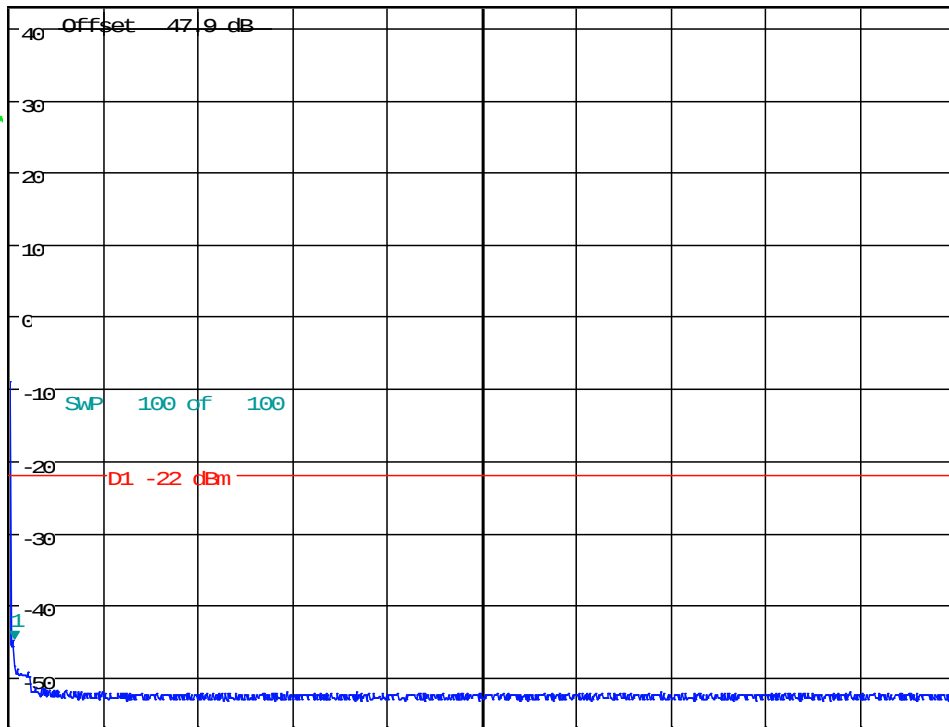
SWT 1.85 s

143.959500000 kHz

Ref 43 dBm

* Att 10 dB

1 RV
AVG



A

GAT
TRG
LVL

EXT
30B
DC

Start 9 kHz

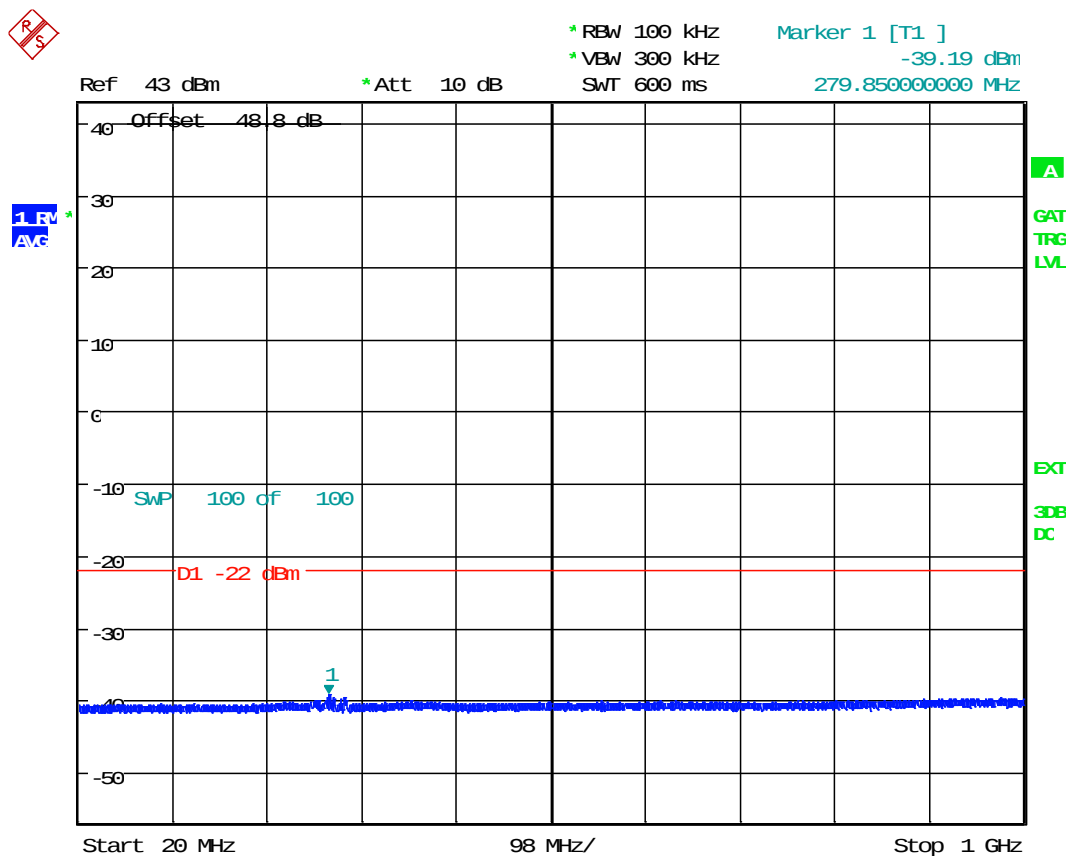
2.9991 MHz/

Stop 30 MHz

TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2582M&2609M;-48VDC;16QAM;FCCID-AS5BBTRX-15. CII.

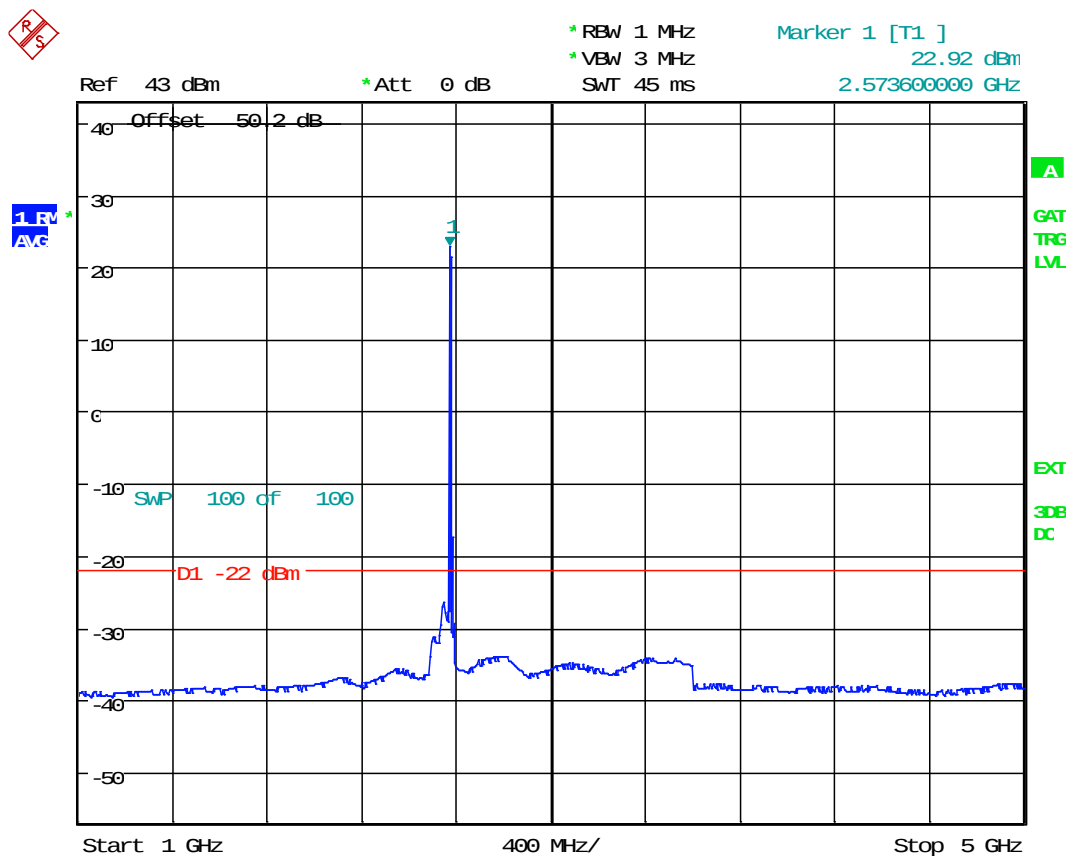
Date: 22.APR.2015 10:53:51



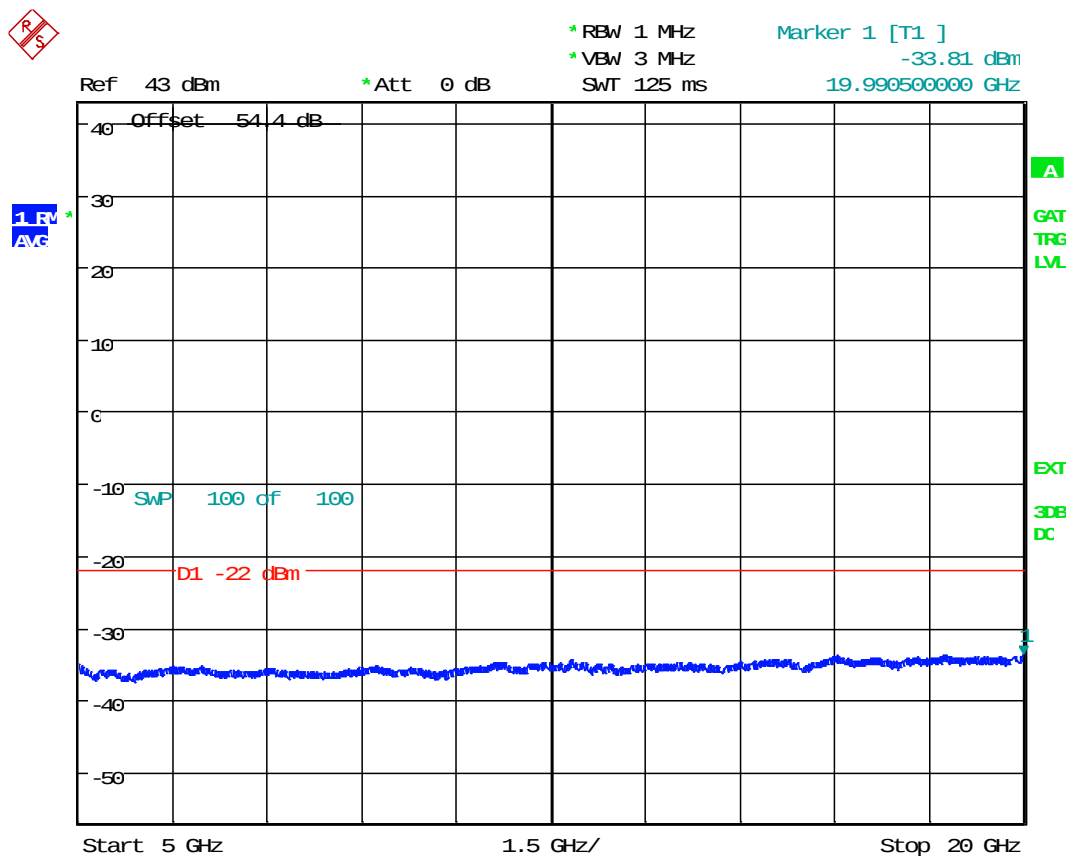
TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2582M&2609M;-48VDC;16QAM;FCCID-AS5BBTRX-15. CII.

Date: 22.APR.2015 11:06:35



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2582M&2609M;-48VDC;16QAM;FCCID-AS5BBTRX-15. CII.
 Date: 22.APR.2015 11:10:01



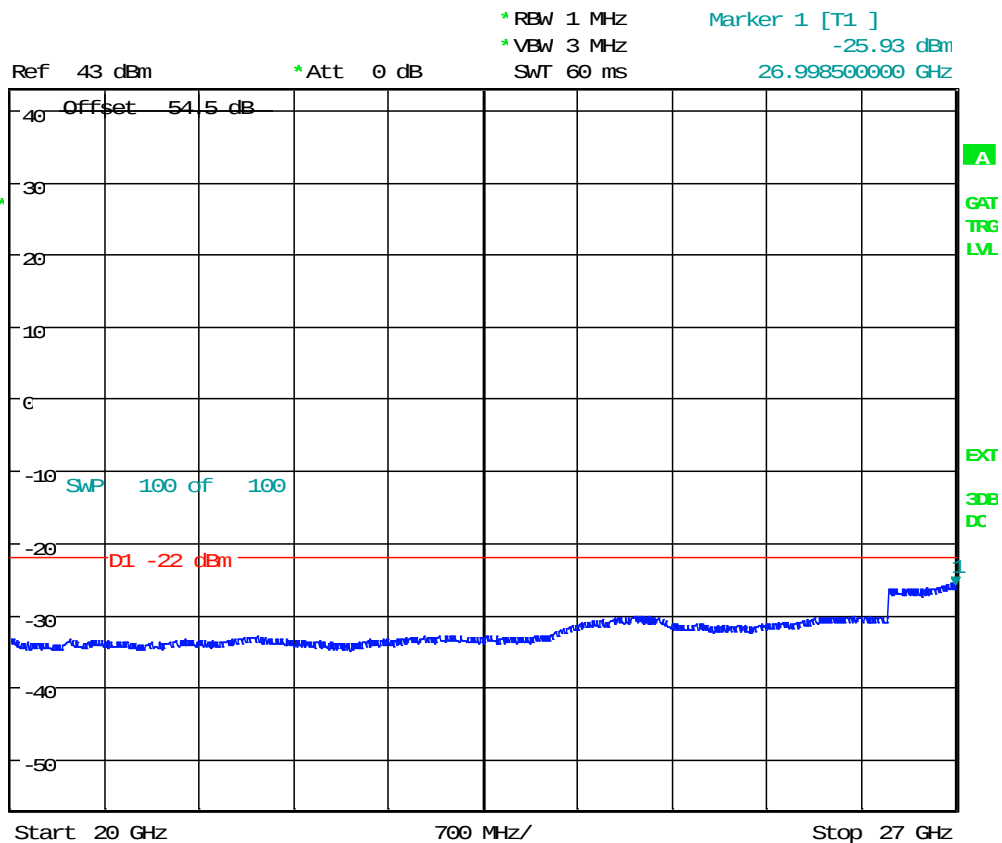
TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2582M&2609M;-48VDC;16QAM;FCCID-AS5BBTRX-15. CII.

Date: 22.APR.2015 11:14:49



1 RV
AVG



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

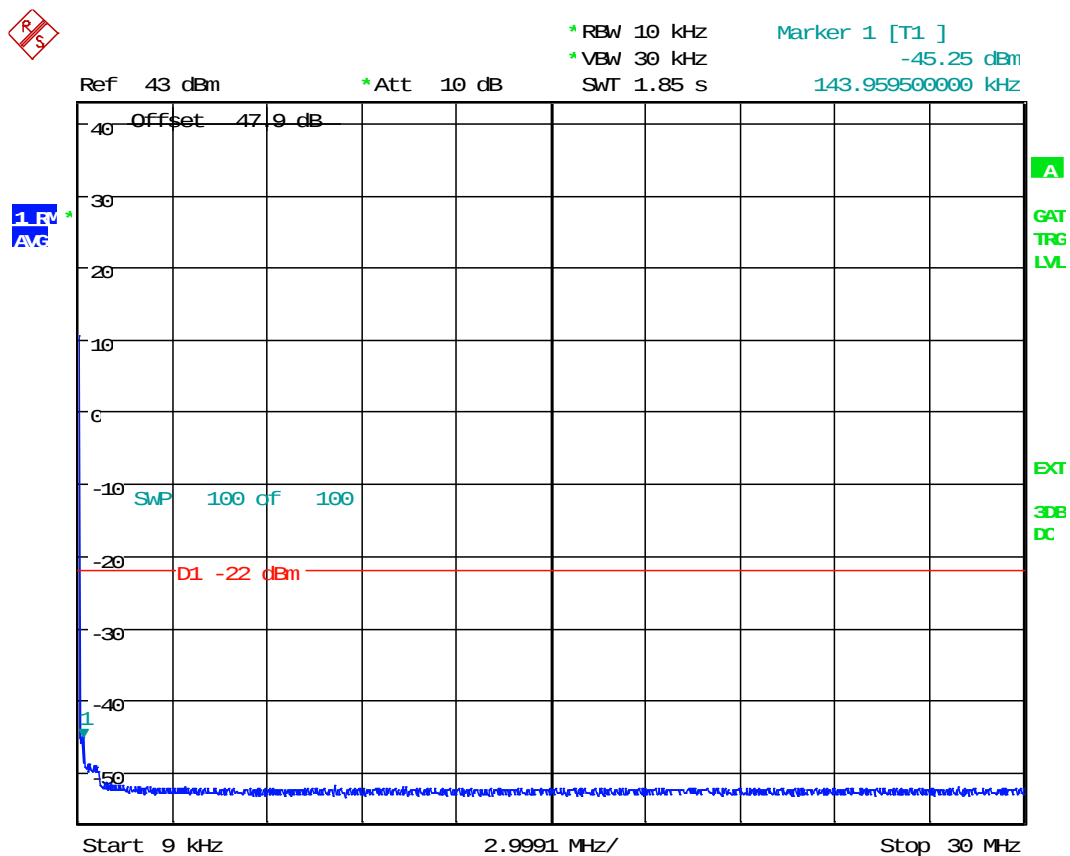
2582M&2609M;-48VDC;16QAM;FCCID-AS5BBTRX-15. CII.

Date: 22.APR.2015 11:17:10

**Transmit Port
Antenna Conducted Spurious Emissions**

**20+10 MHz BW
64QAM Modulation
2572-2592 MHz (20MHz) and 2604-2614 MHz (10MHz)
(Middle)**

8x20 watts (MIMO)



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2582M&2609M;-48VDC;64QAM;FCCID-AS5BBTRX-15. CII.

Date: 22.APR.2015 12:38:54



1 RV
AVG

* RBW 100 kHz

Marker 1 [T1]

* VBW 300 kHz

-39.77 dBm

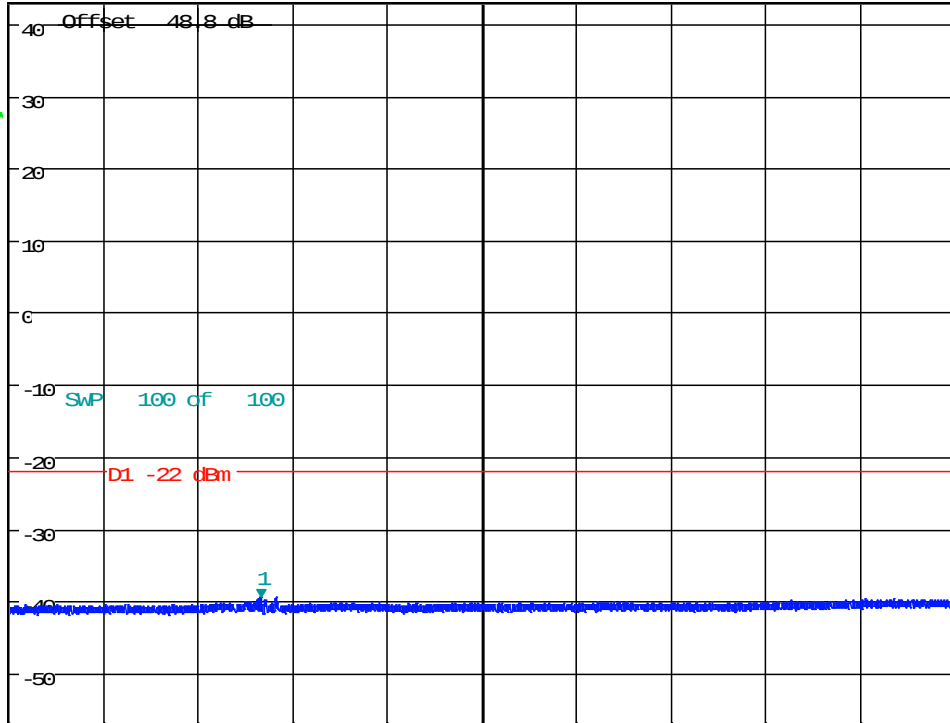
SWT 600 ms

279.950000000 MHz

Ref 43 dBm

* Att 10 dB

Offset 48.8 dB



Start 20 MHz

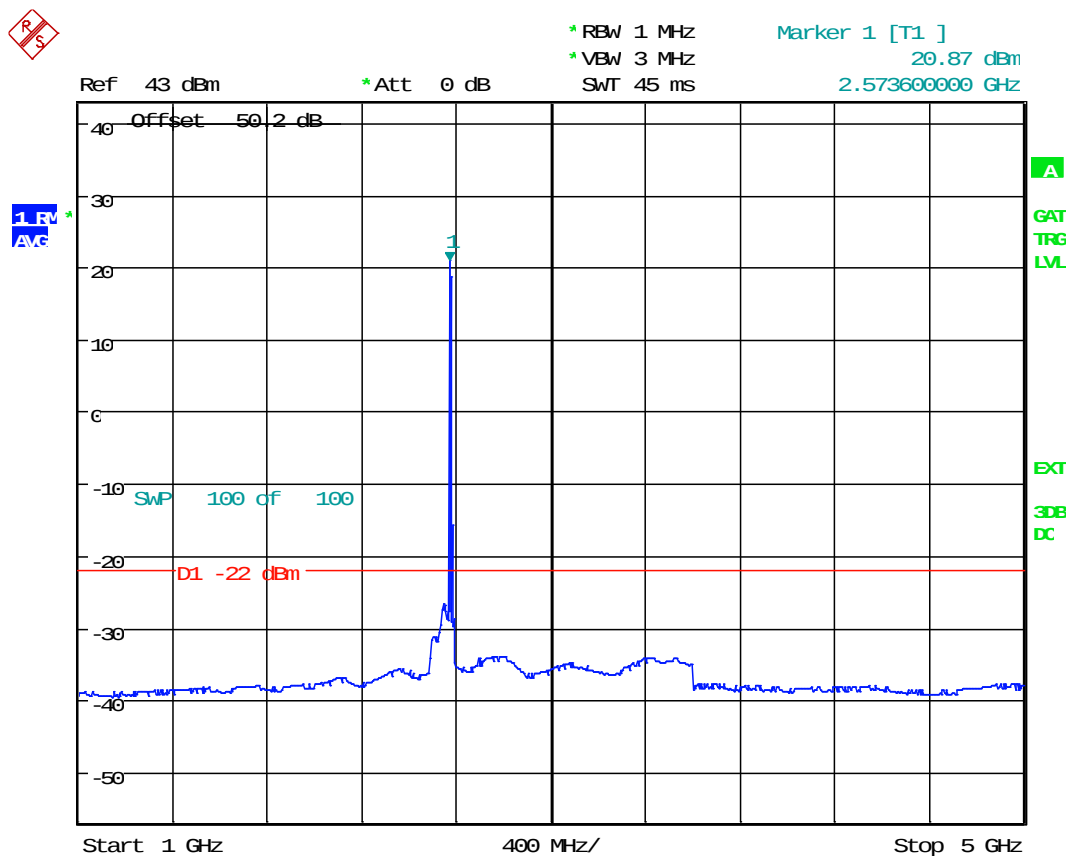
98 MHz/

Stop 1 GHz

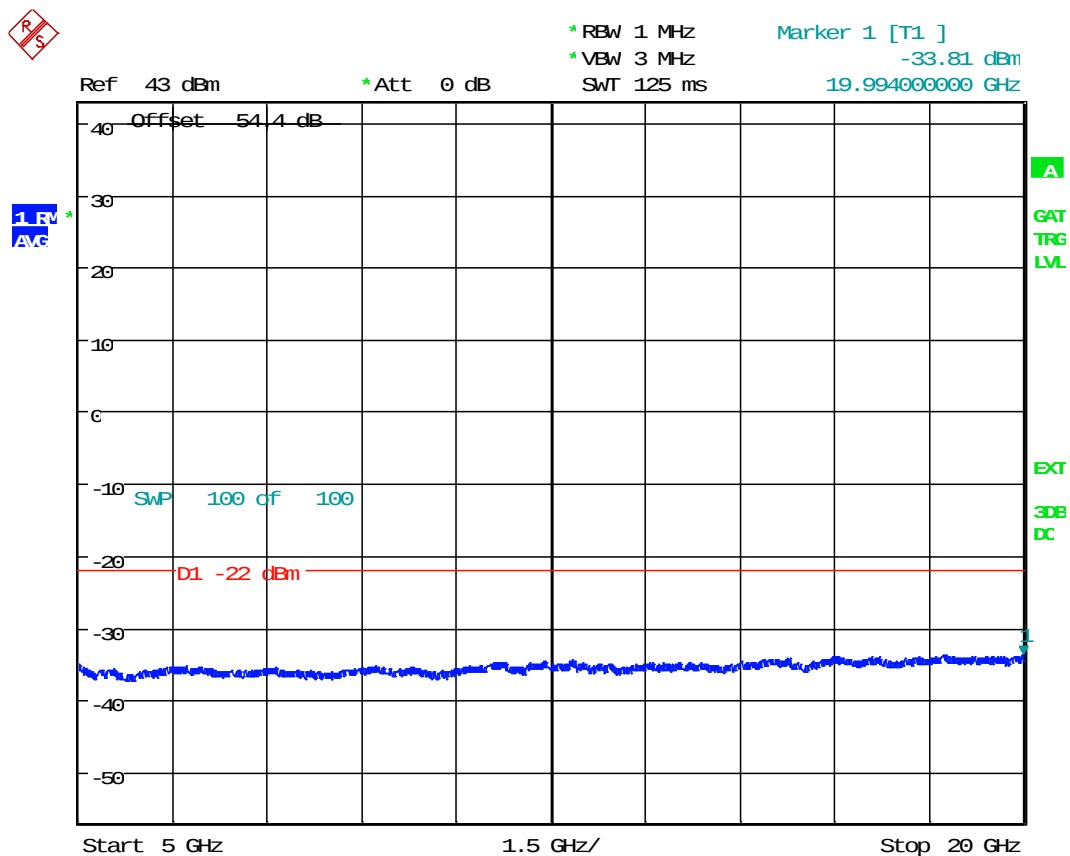
TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2582M&2609M;-48VDC;64QAM;FCCID-AS5BBTRX-15. CII.

Date: 22.APR.2015 11:40:55



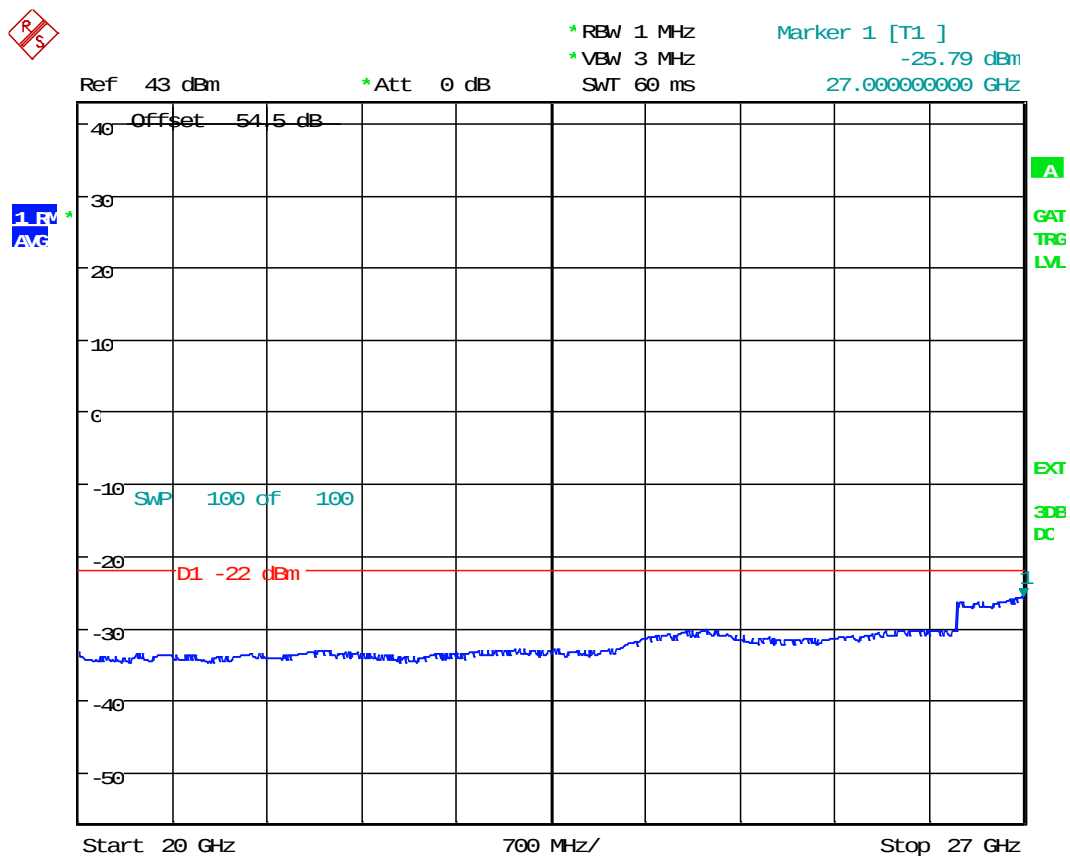
TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2582M&2609M;-48VDC;64QAM;FCCID-AS5BBTRX-15. CII.
 Date: 22.APR.2015 11:28:19



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2582M&2609M;-48VDC;64QAM;FCCID-AS5BBTRX-15. CII.

Date: 22.APR.2015 11:25:26

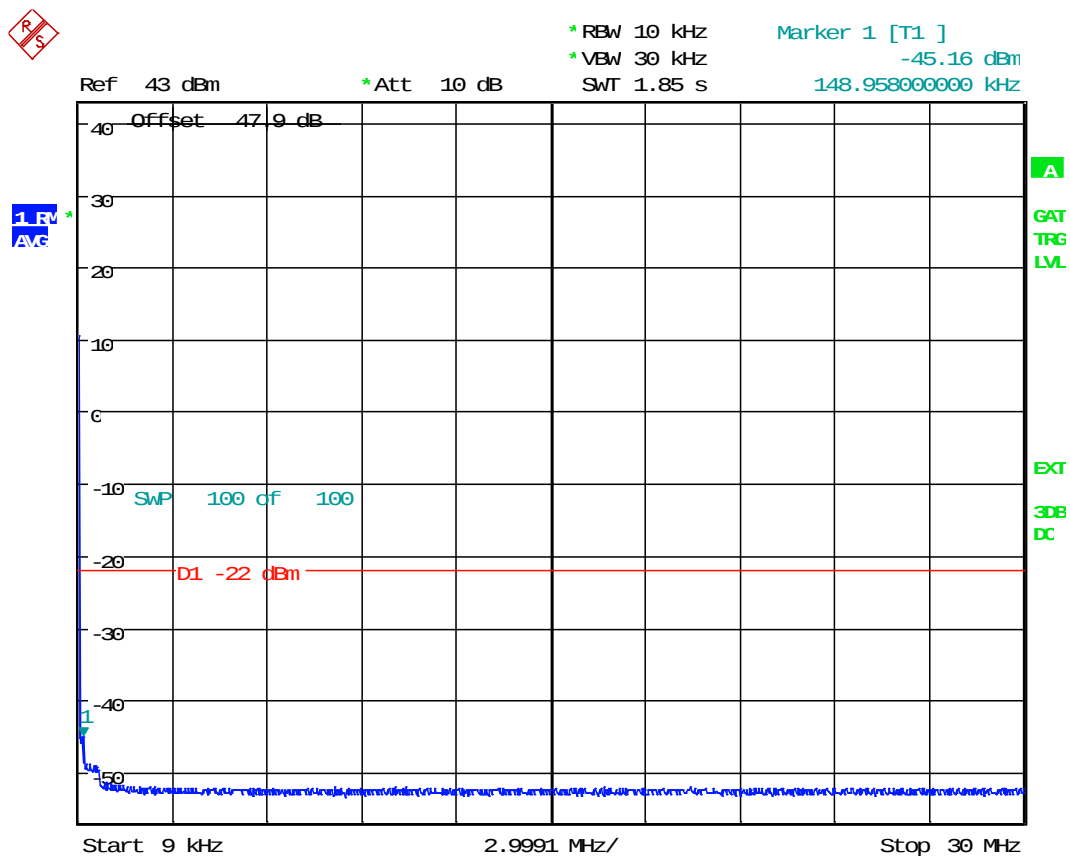


TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2582M&2609M;-48VDC;64QAM;FCCID-AS5BBTRX-15. CII.
 Date: 22.APR.2015 11:20:37

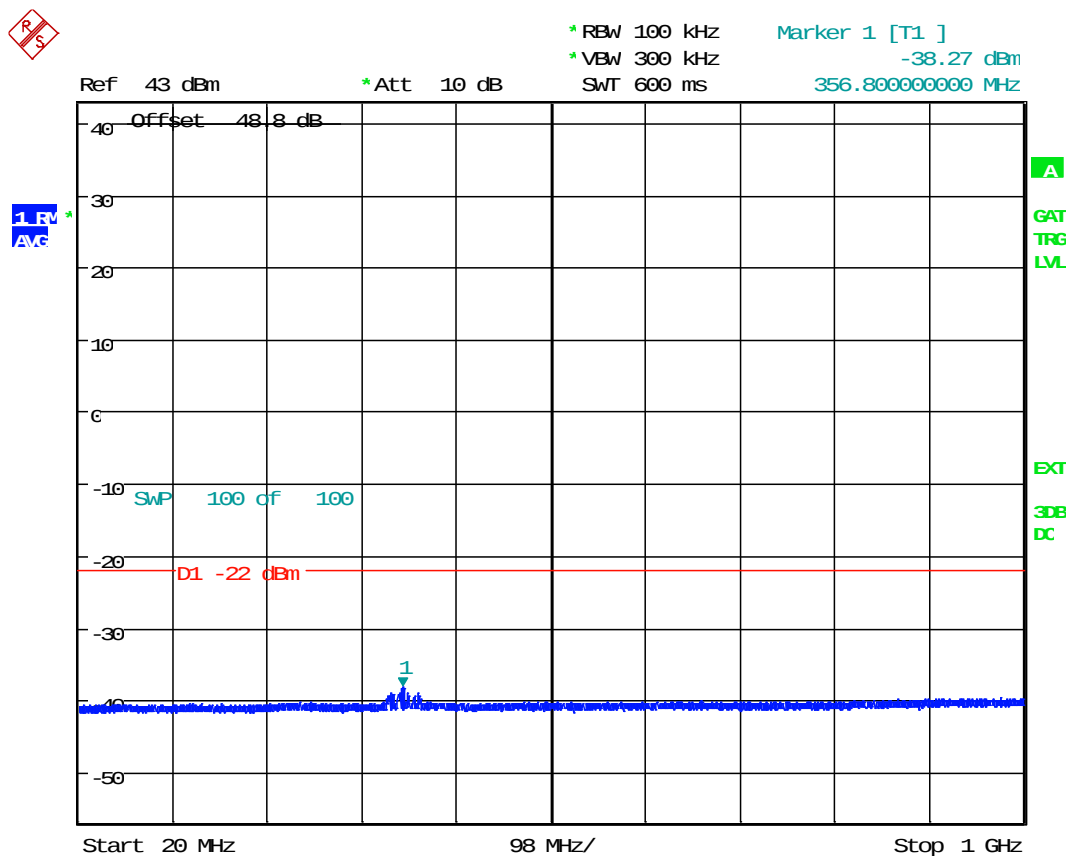
**Transmit Port
Antenna Conducted Spurious Emissions**

**20+10 MHz BW
QPSK Modulation
2648-2668 MHz (20MHz) and 2680-2690 MHz (10MHz)
(Upper)**

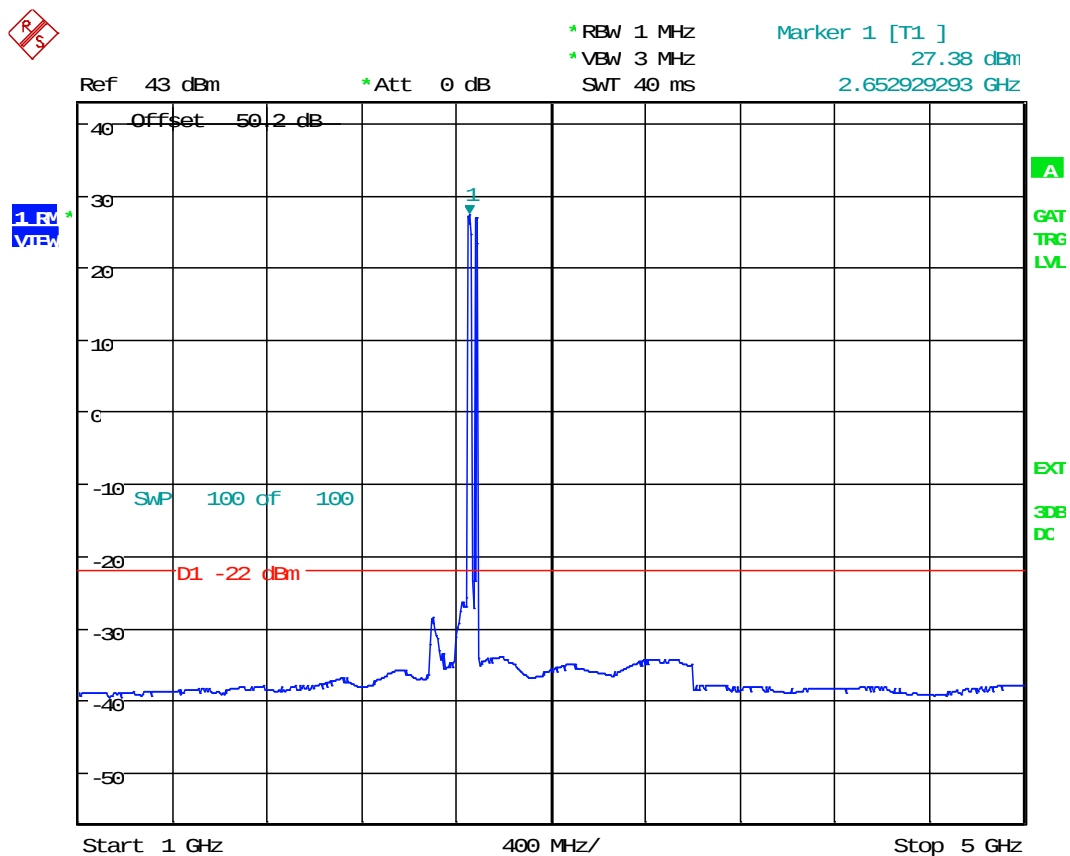
8x20 watts (MIMO)



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2658M&2685M;-48VDC;QPSK;FCCID-AS5BBTRX-15. CII.
 Date: 22.APR.2015 12:42:50



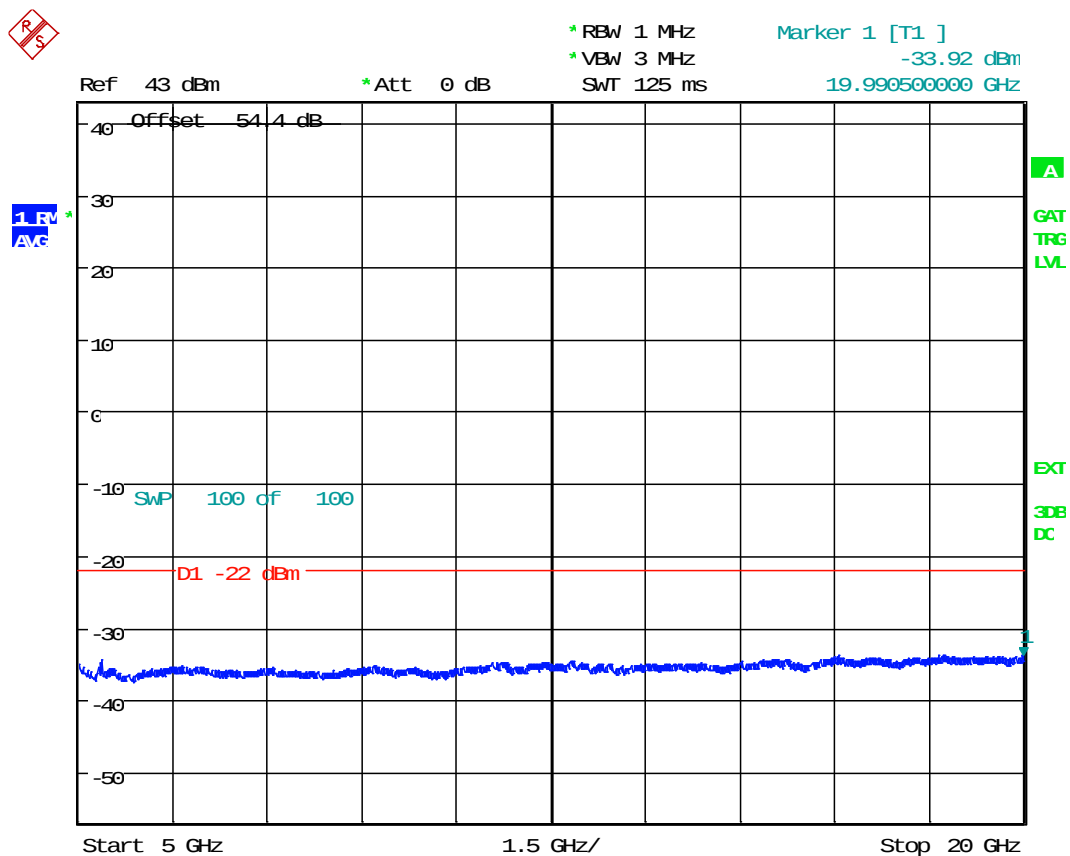
TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2658M&2685M;-48VDC;QPSK;FCCID-AS5BBTRX-15. CII.
 Date: 22.APR.2015 13:04:15



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2658M&2685M;-48VDC;QPSK;FCCID-AS5BBTRX-15. CII.

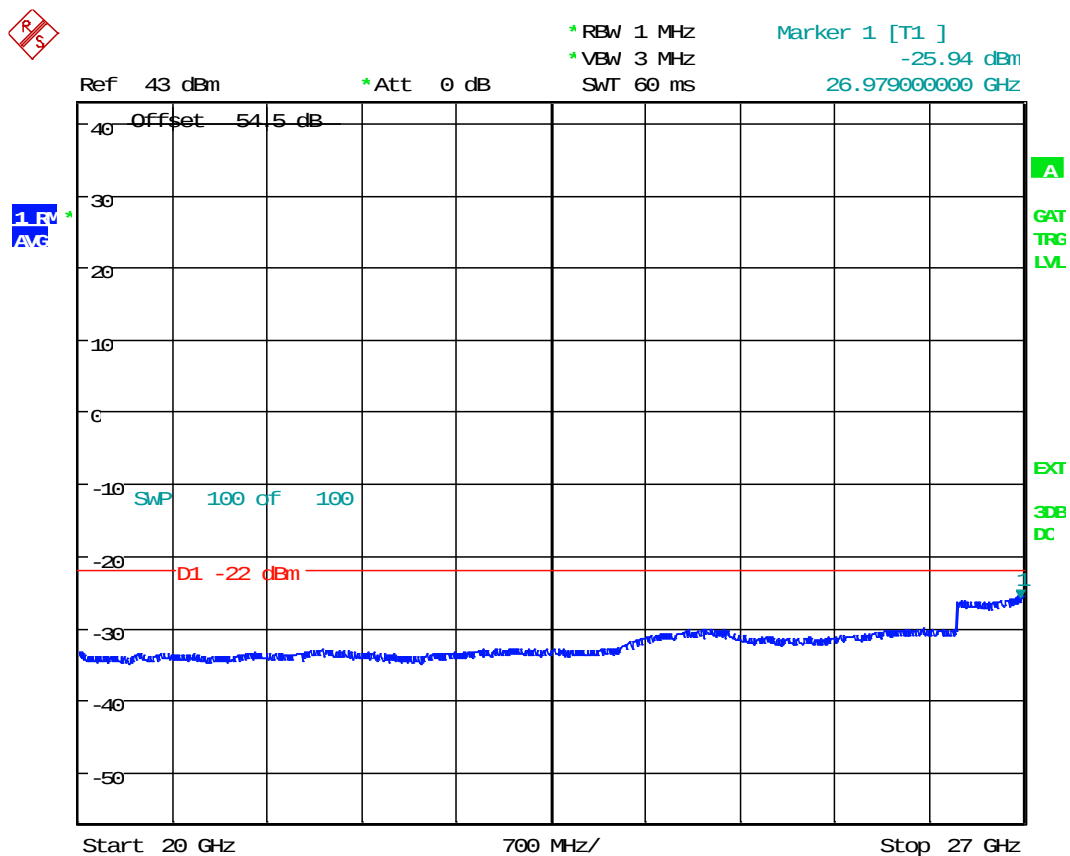
Date: 23.APR.2015 08:10:16



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2658M&2685M;-48VDC;QPSK;FCCID-AS5BBTRX-15. CII.

Date: 22.APR.2015 13:14:47

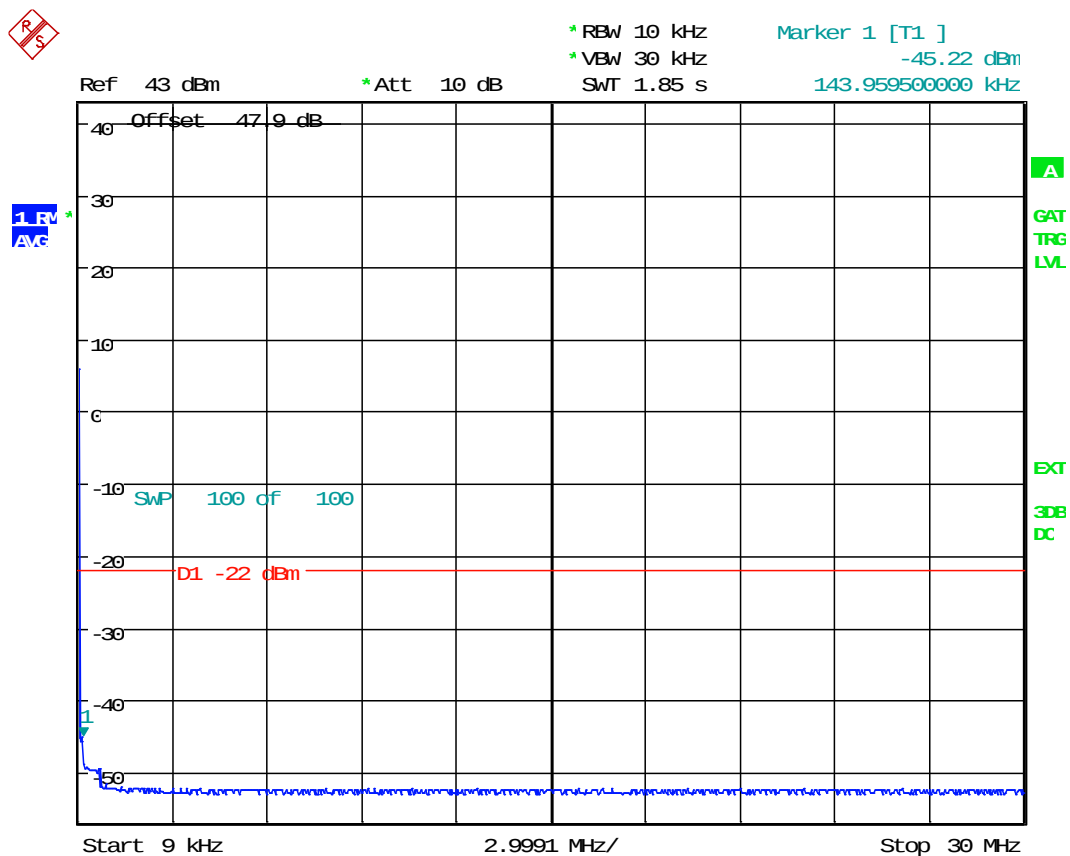


TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2658M&2685M;-48VDC;QPSK;FCCID-AS5BBTRX-15. CII.
 Date: 22.APR.2015 13:17:05

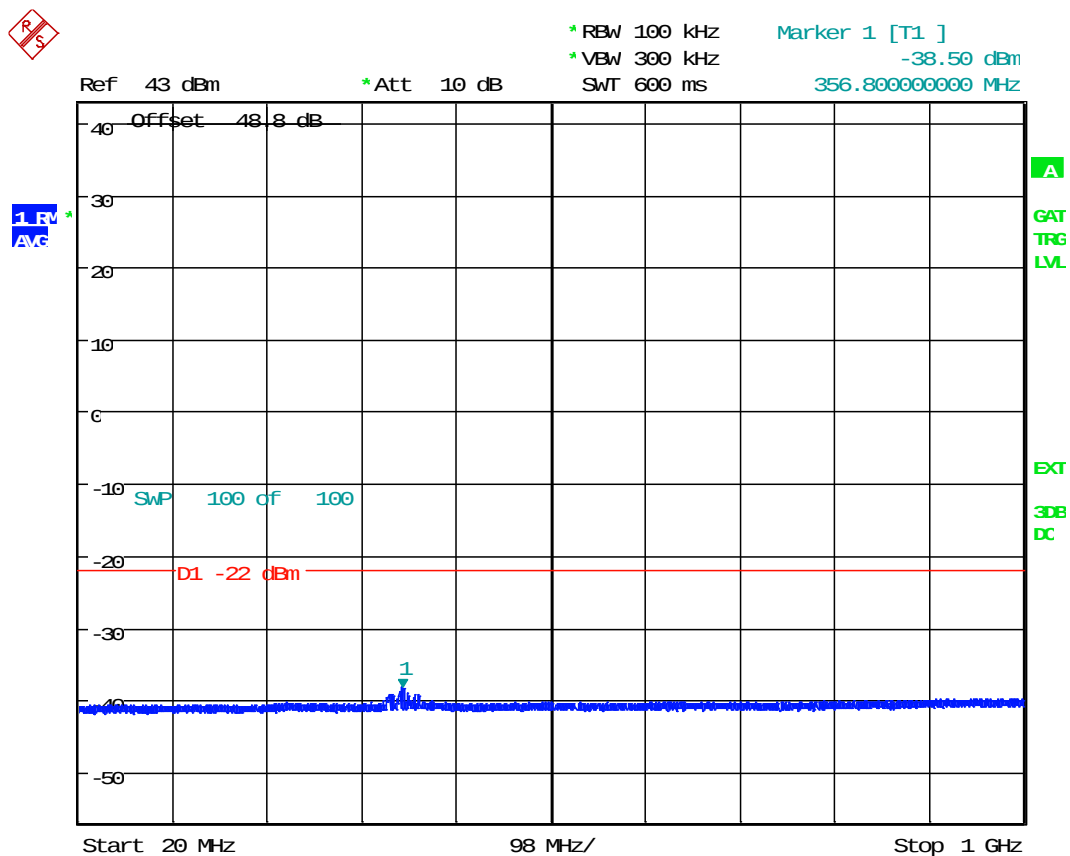
**Transmit Port
Antenna Conducted Spurious Emissions**

**20+10 MHz BW
16QAM Modulation
2648-2668 MHz (20MHz) and 2680-2690 MHz (10MHz)
(Upper)**

8x20 watts (MIMO)



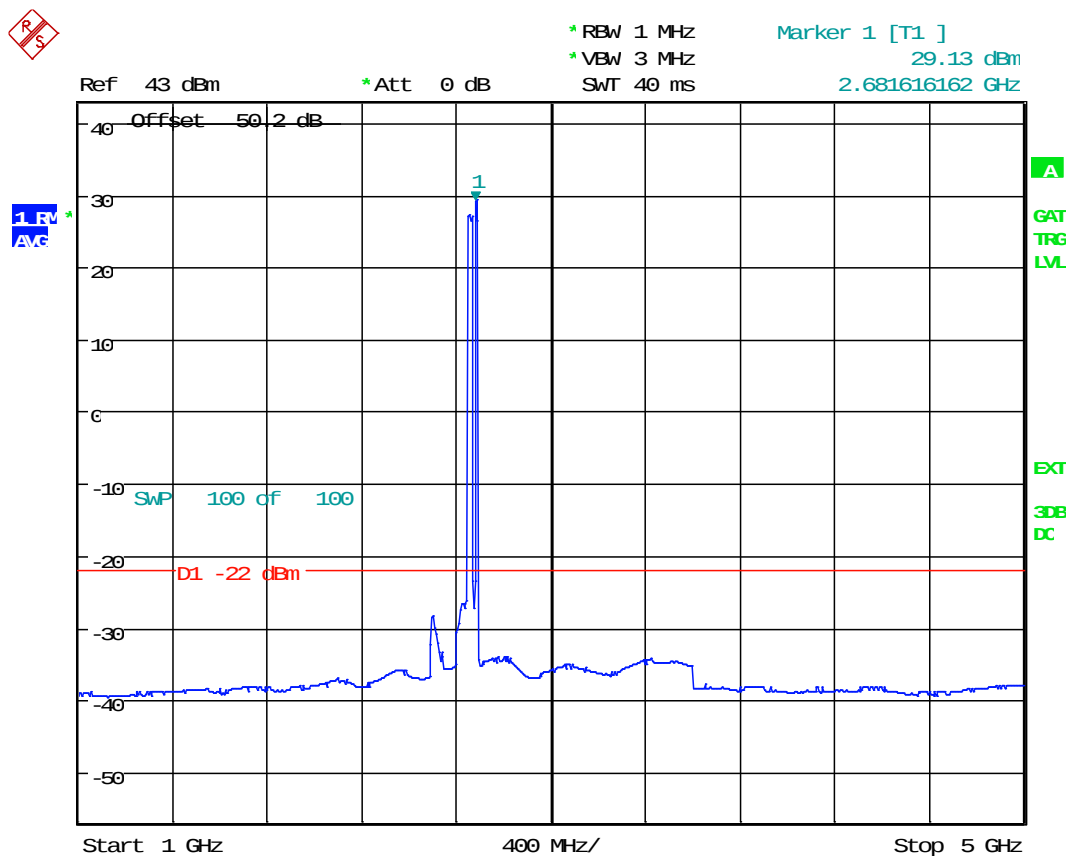
TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2658M&2685M;-48VDC;16QAM;FCCID-AS5BBTRX-15. CII.
 Date: 23.APR.2015 05:48:40



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2658M&2685M;-48VDC;16QAM;FCCID-AS5BBTRX-15. CII.

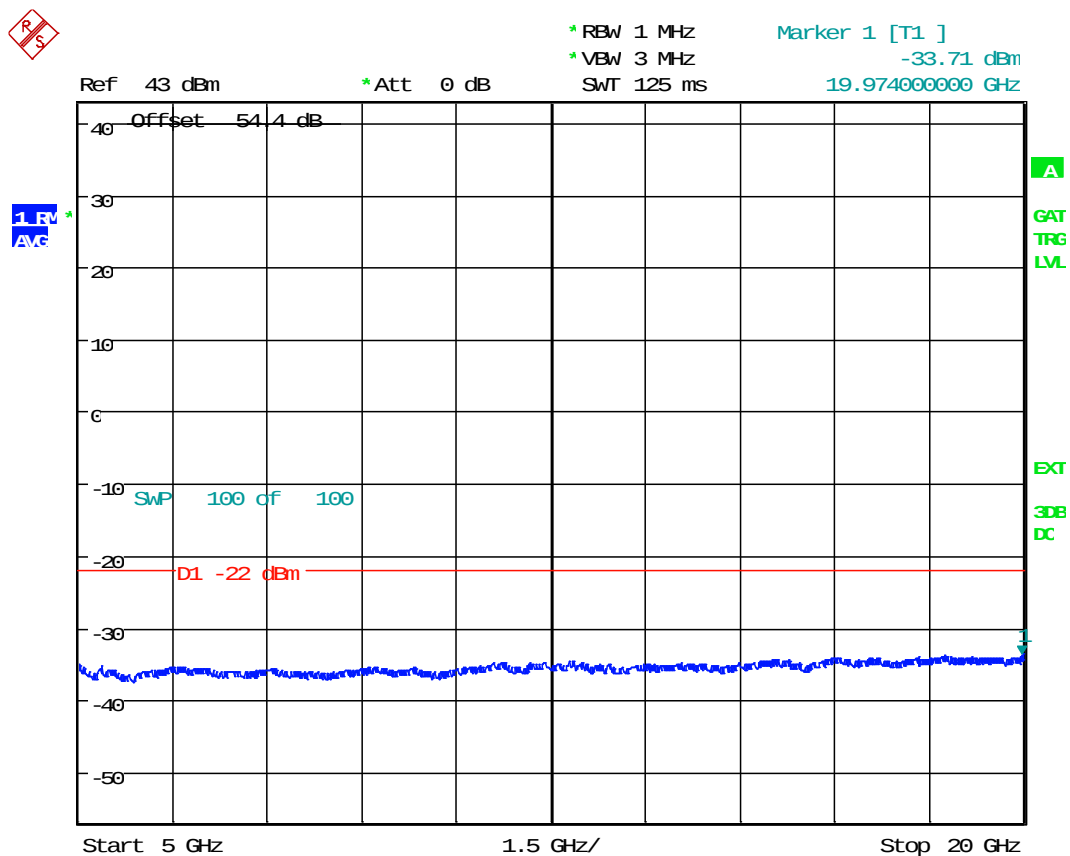
Date: 22.APR.2015 15:45:39



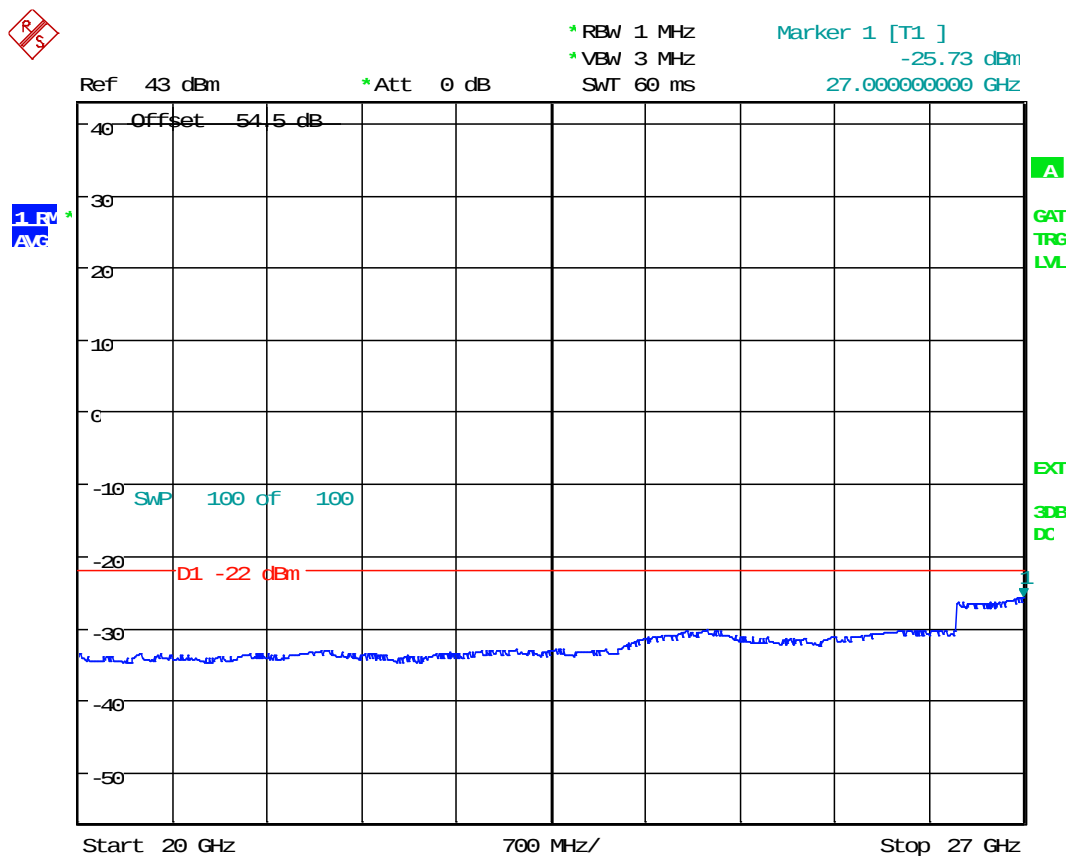
TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2658M&2685M;-48VDC;16QAM;FCCID-AS5BBTRX-15. CII.

Date: 22.APR.2015 15:15:57



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2658M&2685M;-48VDC;16QAM;FCCID-AS5BBTRX-15. CII.
 Date: 22.APR.2015 14:44:10

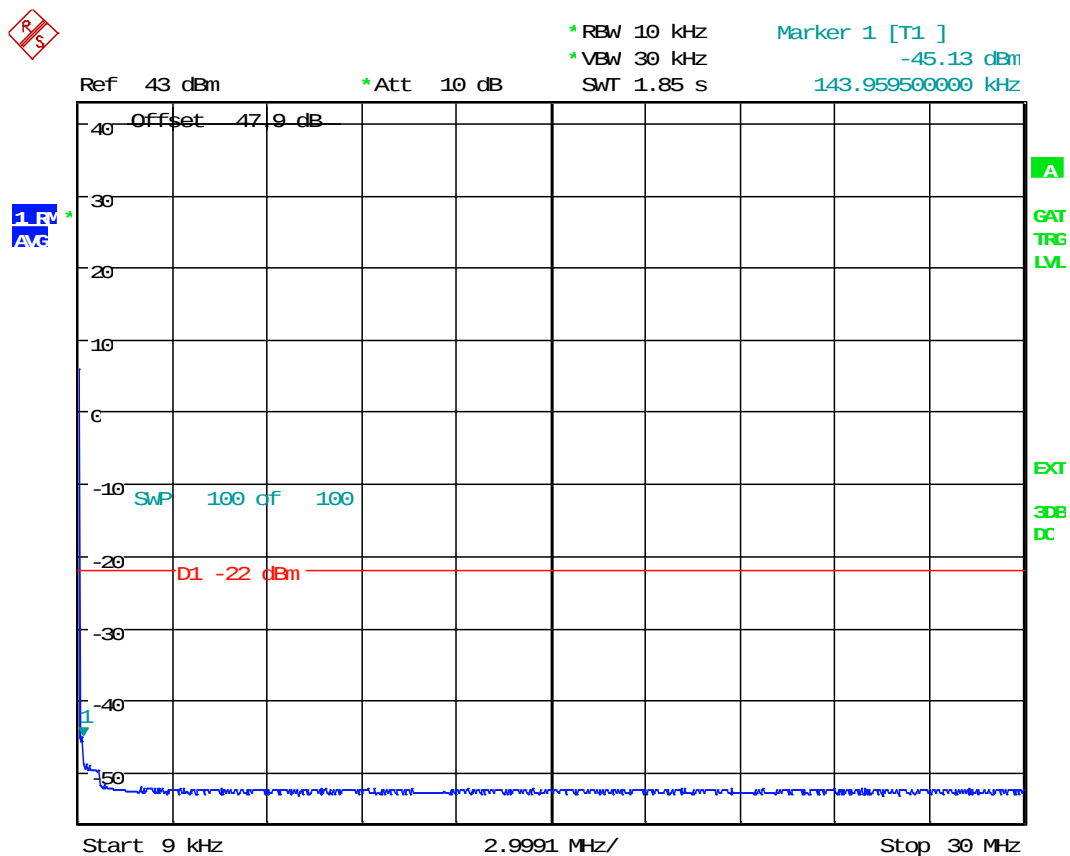


TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2658M&2685M;-48VDC;16QAM;FCCID-AS5BBTRX-15. CII.
 Date: 22.APR.2015 14:37:44

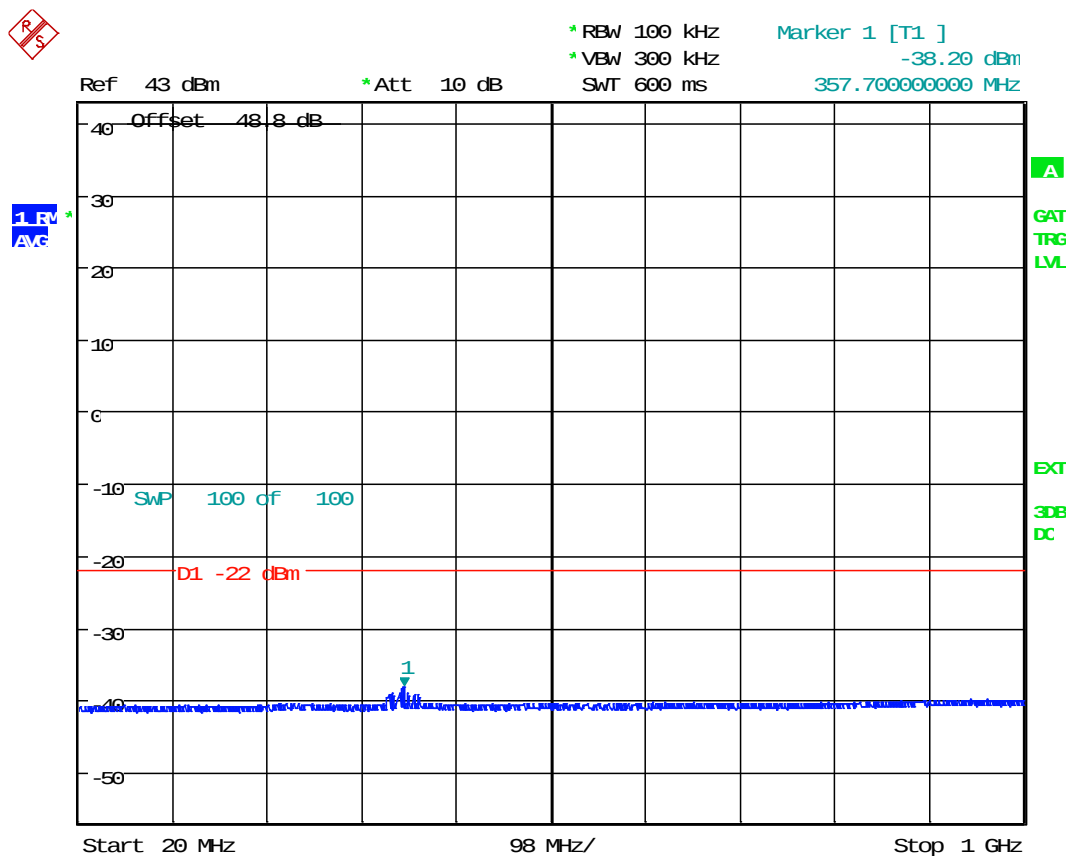
**Transmit Port
Antenna Conducted Spurious Emissions**

**20+10 MHz BW
64QAM Modulation
2648-2668 MHz (20MHz) and 2680-2690 MHz (10MHz)
(Upper)**

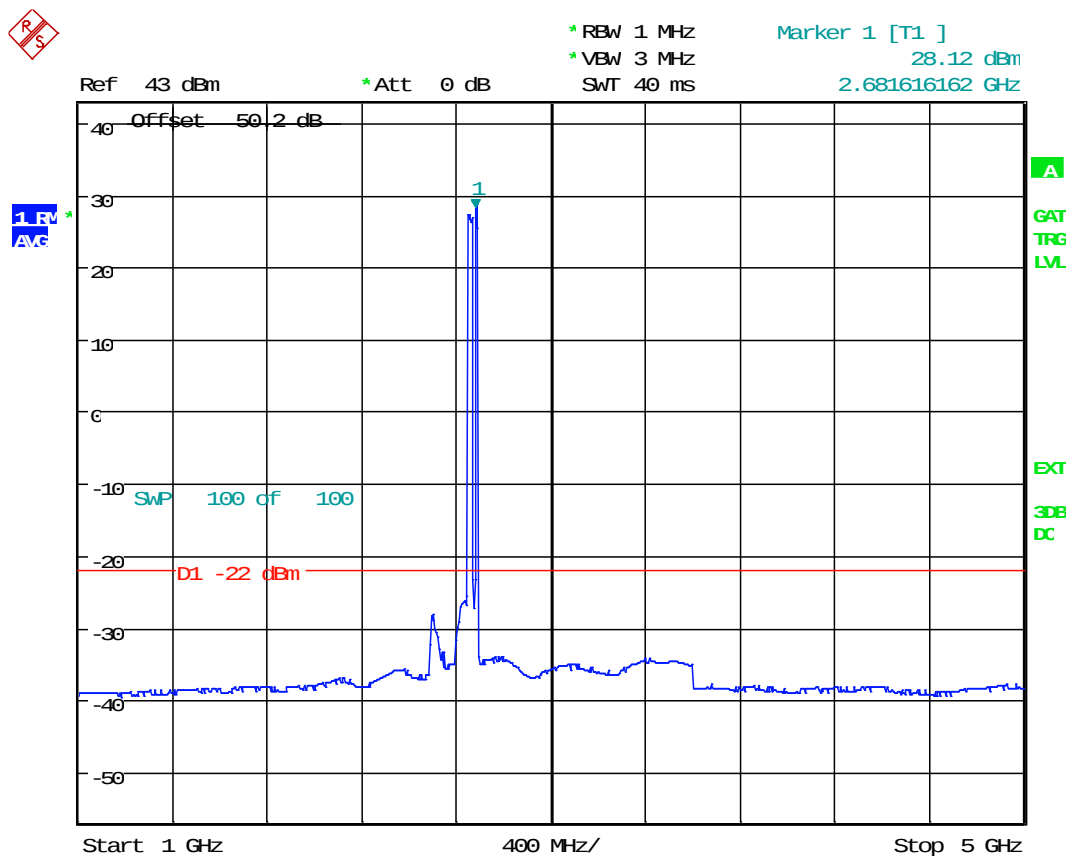
8x20 watts (MIMO)



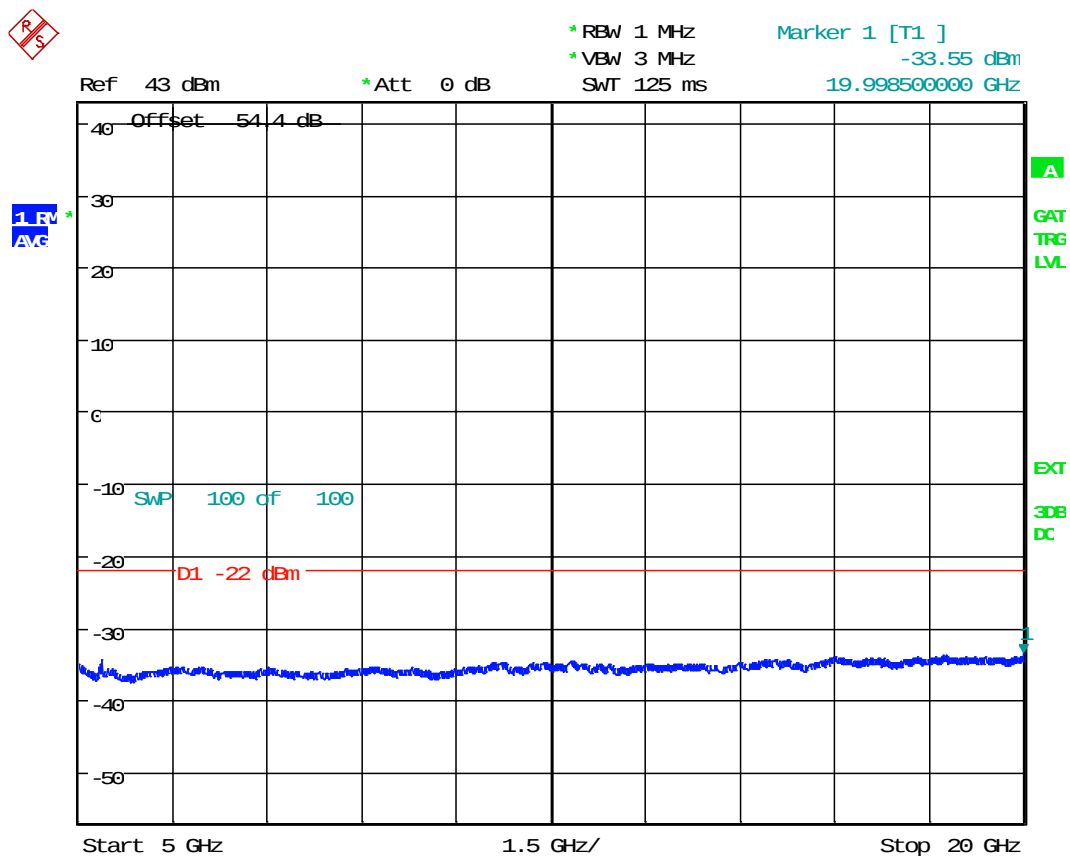
TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
2658M&2685M;-48VDC;64QAM;FCCID-AS5BBTRX-15. CII.
Date: 23.APR.2015 06:01:28



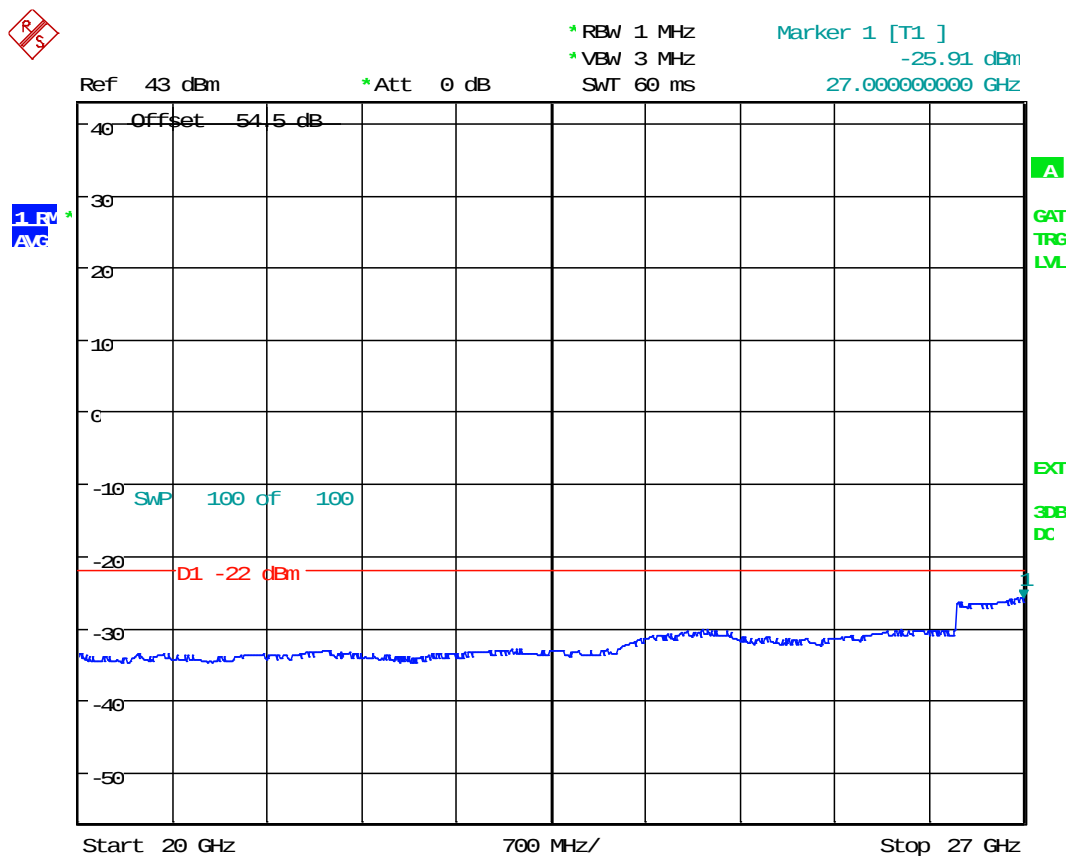
TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2658M&2685M;-48VDC;64QAM;FCCID-AS5BBTRX-15. CII.
 Date: 23.APR.2015 06:56:30



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2658M&2685M;-48VDC;64QAM;FCCID-AS5BBTRX-15. CII.
 Date: 23.APR.2015 06:59:24



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;
 2658M&2685M;-48VDC;64QAM;FCCID-AS5BBTRX-15. CII.
 Date: 23.APR.2015 07:04:30



TX Spurious; Test Eng:JY; TDD B41 RRH ;20M+10M BW NC; 20W;

2658M&2685M;-48VDC;64QAM;FCCID-AS5BBTRX-15. CII.

Date: 23.APR.2015 07:11:24

TEST INSTRUMENTATION**Test Equipment List for Part 27**

Manufacturer	Model	Serial Number	Type	Description	GPCL ID	Last Cal	Interval	Status
Weinschel	74-10-12	1069	Attenuator	10dB 0.05GHz-26GHz 25W	E1156		0	Active
Weinschel	74-10-12	1068	Attenuator	10dB 25Watt 0.05GHz - 26GHz	E1155		0	Active
Weinschel	74-30-12	1065	Attenuator	30dB 25W 0.05GHz- 26GHz	E1154		0	Active
Rohde & Schwarz	ESU40	100246	Test Receiver	EMI 20Hz - 40GHz - 155 dBm +30 dBm	E954	7/10/2014	24	Active
Agilent	N1921A	MY45242502	Power Sensor	-35 - +20 dBm 50 MHz -18 GHz	E949	3/26/2014	12	Active
Agilent	8990B	MY51000319	Power Analyzer	Peak Power Analyzer	E1199	12/15/2014	24	Active
Agilent	N9020A	MY52091828	MXA Signal Analyzer	MXA Signal Analyzer 10Hz-3.8GHz		07/21/2013	24	Active

Measurement -5

FIELD STRENGTH OF SPURIOUS RADIATION SECTION 2.1053 and 27.53 (g)

SECTION 2.1053**FIELD STRENGTH OF SPURIOUS RADIATION**

Field strength measurements of radiated spurious emissions were made at 5 m semi anechoic room of Global Product Compliance Laboratory of Alcatel-Lucent Murray Hill. A complete description and full measurement data for the site is on file with the Commission (FCC File is 515091)

The “**LTE TD-RRH8X20-25** with FCCID: AS5BBTRX-15” was tested at a RF output of 20 Watts at Antenna Interface Connector (AIC) with transmitters operating at 20MHz (10W)+10MHz (10W); Four transmitters were operating Left Edge bands (2496-2516 MHz and 2528-2538 MHz). Two of these transmitters were operating in QPSK and other two were operating in 64QAM. Similarly, other four transmitters were operating Right Edge bands (2648-2668 MHz and 2680-2690MHz). Two of these transmitters were operating in QPSK and other two were operating in 64QAM. These tests were performed in TD-RRH enclosure. The D2Us Base band units (BBU) connected through Fiber optic interface but placed outside the chamber.. During testing, the **TD-RRH8X20-25** AICs were terminated with 50 ohm load. The spectrum from 10 MHz to the 10th harmonic (27 GHz) of the carrier was searched for spurious radiation. Measurements were made according to ANSI C63.4. All emissions more than 20 dB below the specification limit were considered not reportable (Section 2.1057(c)).

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The calculated emission levels were found by:

$$\text{Measured level (dB}\mu\text{V)} + \text{Cable Loss (dB)} + \text{Antenna Factor (dB)} = \text{Field Strength (dB}\mu\text{V/m)}$$

Section 27.53 (m) and 2.1053 contains the requirements for the levels of spurious radiation as a function of frequency.

FCC Section 27.53(m): the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ dB or -13dBm. Pursuant to FCC OET RULES 662911 D01 and D02 for eight antenna MIMO mode of operations, the FCC limit of -13dBm shall be 9dB more stringent, therefore all channel edge and out of band spurious emissions shall be -22dBm.

The reference level for the un-modulated carriers is calculated as the field produced by an ideal isotropic antenna excited by the transmitter output power according to the following relation taken from Recommendation ITU-R, SM.329-11, “*Unwanted emissions in the spurious domain*” January 2011.

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

$$20 \log (E * 106) - (52 + 10 \log P) = 73.2 \text{ dB } \mu\text{V/meter}$$

E = Field Intensity in Volts/meter

P = Transmitted Power in Watts

R = Distance from the ideal isotropic antenna in meters = 3 m

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

RESULTS:

For this particular test, the field strength of any spurious radiation is required to be less than 73.2 dBμV/meter. Reportable measurements are equal to or greater than 53.2 dBμV/meter. Over the spectrum investigated, 10 MHz

to 10th of the carrier (27GHz), no reportable spurious emissions were detected. This demonstrates that the “**LTE TD-RRH8X20-25**” the subject of this application, complies with Sections 2.1053, 27.53 (m) and 2.1057 of the Rules.

Measurement -6

MEASUREMENT OF FREQUENCY STABILITY

(Data already submitted during original filing. For this class II filing change new data is not considered required)

**FREQUENCY SPECTRUM TO BE INVESTIGATED
SECTION 2.1057**

SECTION 2.1057

FREQUENCY SPECTRUM TO BE INVESTIGATED

Frequency Spectrum to be investigated, Measurement Bandwidth and detector function used meet or exceed the Specification contained in Section 2.1057, 27, and 3GPP TS36.104 V8.4.0 (2008-12)

Measurement Instrumentation and Antennas

All instrumentations, antennas and test Chamber used for the purpose of tests contained in the report were in calibration and calibrations are traceable to NIST