

### 3.3 Conducted spurious emission

#### 3.3.1 Specification

- FCC Rules Part 2.1051
- FCC Rules Part 27.53 (m)

#### 3.3.2 Test Description

The antenna port spurious emissions were measured at the RF output terminal of the EUT with external attenuation on the RF input of the spectrum analyzer. Analyzer plots utilizing a 1MHz resolution bandwidth and no video filtering were made for each modulation type from 30 MHz to 26.5 GHz

The peak conducted power of spurious emissions, up to the 10<sup>th</sup> harmonic of the transmit frequency, were investigated to ensure they were less than or equal to the limit. Emissions close to the limit were measured using an RMS detector.

The antenna port spurious emissions were measured on port 1,2 under the three types of modulation mode which are QPSK, 16QAM and 64QAM, and resource block was 100~100.

UL/DL Allocation : Configuration 3

Dw/GP/UP length : Configuration 8

#### 3.3.3 Test Procedure

The method used is as detailed in FCC KDB 935210 D05 v01.

The power of any emission outside of the authorized operating frequency ranges (2496 ~ 2690 MHz) must be attenuated below the transmitting power (P) by a factor of at least as specified in this section.

The EUT antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable.

The evaluation was repeated for all modulations.

The evaluation was done in frequency band from 30MHz ~ 26.5GHz without band edges test.

#### 3.3.4 Test equipment list

Equipment	Model Name	Manufacturer
EUT	HX-2500-MIMO	Corning Optical Communications Wireless, Inc.
Signal Generator	N5182A	Agilent
Spectrum Analyzer	N9020A	Agilent
Attenuator	PE7019-20	Pasternack
DC Power Supply	6674A	Agilent

#### 3.3.5 Test condition

- Test place: Shield Room
- Test environment: 22.5 °C, 42.5 % R.H.

### 3.3.6 Test results

- Port1 Spurious emissions (30 MHz ~ 26.5 GHz)

Bandwidth	Modulation	Operation frequency [MHz]	Frequency range of spurious emission [MHz]	Level of spurious emission [dBm]	Limit [dBm]	Result
LTE 5 MHz	QPSK	2498.5	30 to 1 000	-53.90	-13.0	Pass
		2593.0		-54.03		
		2687.5		-53.53		
		2498.5	1 000 to 26 500	Not Peak Found		
		2593.0		Not Peak Found		
		2687.5		Not Peak Found		
	16QAM	2498.5	30 to 1 000	-54.17		
		2593.0		-53.64		
		2687.5		-53.63		
		2498.5	1 000 to 26 500	Not Peak Found		
		2593.0		Not Peak Found		
		2687.5		Not Peak Found		
	64QAM	2498.5	30 to 1 000	-53.54		
		2593.0		-53.35		
		2687.5		-53.53		
		2498.5	1 000 to 26 500	Not Peak Found		
		2593.0		Not Peak Found		
		2687.5		Not Peak Found		
LTE 20 MHz	QPSK	2506.0	30 to 1 000	-53.64		
		2593.0		-53.57		
		2680.0		-53.63		
		2506.0	1 000 to 26 500	Not Peak Found		
		2593.0		Not Peak Found		
		2680.0		Not Peak Found		
	16QAM	2506.0	30 to 1 000	-53.64		
		2593.0		-53.56		
		2680.0		--53.30		
		2506.0	1 000 to 26 500	Not Peak Found		
		2593.0		Not Peak Found		
		2680.0		Not Peak Found		
	64QAM	2506.0	30 to 1 000	-53.84		
		2593.0		-53.59		
		2680.0		-53.65		
		2506.0	1 000 to 26 500	Not Peak Found		
		2593.0		Not Peak Found		
		2680.0		Not Peak Found		

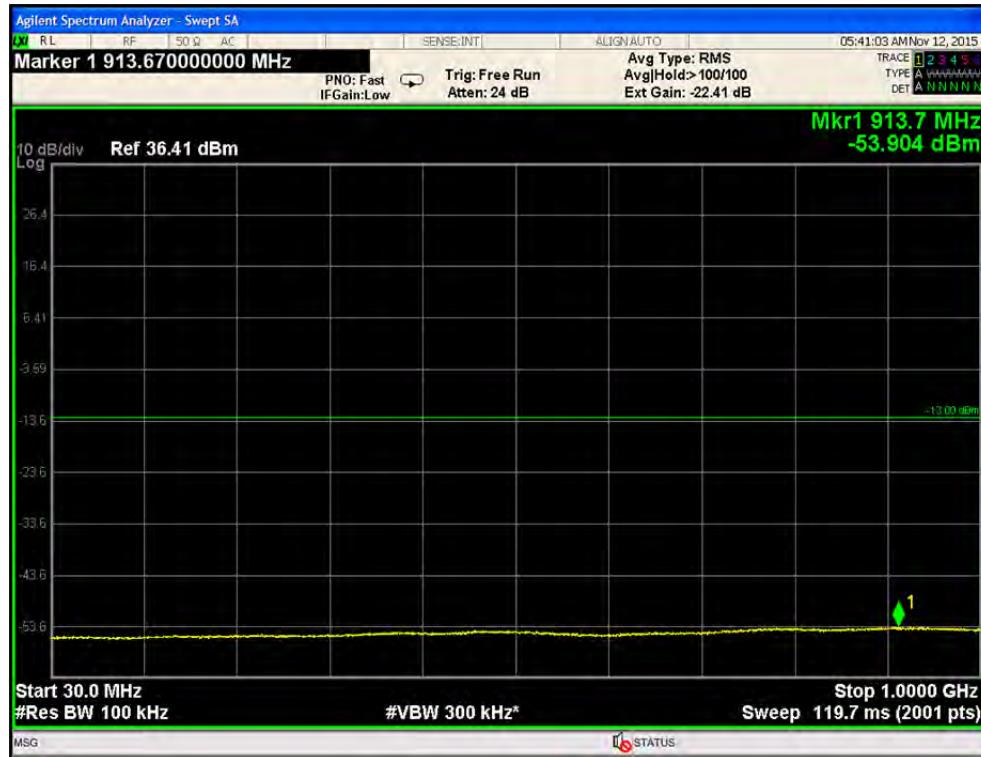
**• Port2 Spurious emissions (30 MHz ~ 26.5 GHz)**

Bandwidth	Modulation	Operation frequency [MHz]	Frequency range of spurious emission [MHz]	Level of spurious emission [dBm]	Limit [dBm]	Result
LTE 5 MHz	QPSK	2498.5	30 to 1 000	-53.55	-13.0	Pass
		2593.0		-53.56		
		2687.5		-53.52		
		2498.5	1 000 to 26 500	Not Peak Found		
		2593.0		Not Peak Found		
		2687.5		Not Peak Found		
	16QAM	2498.5	30 to 1 000	-53.47		
		2593.0		-54.06		
		2687.5		-53.60		
		2498.5	1 000 to 26 500	Not Peak Found		
		2593.0		Not Peak Found		
		2687.5		Not Peak Found		
	64QAM	2498.5	30 to 1 000	-53.61		
		2593.0		-52.91		
		2687.5		-53.48		
		2498.5	1 000 to 26 500	Not Peak Found		
		2593.0		Not Peak Found		
		2687.5		Not Peak Found		
LTE 20 MHz	QPSK	2506.0	30 to 1 000	-53.83		
		2593.0		-53.73		
		2680.0		-53.60		
		2506.0	1 000 to 26 500	Not Peak Found		
		2593.0		Not Peak Found		
		2680.0		Not Peak Found		
	16QAM	2506.0	30 to 1 000	-53.59		
		2593.0		-53.59		
		2680.0		-53.59		
		2506.0	1 000 to 26 500	Not Peak Found		
		2593.0		Not Peak Found		
		2680.0		Not Peak Found		
	64QAM	2506.0	30 to 1 000	-53.54		
		2593.0		-53.65		
		2680.0		-53.60		
		2506.0	1 000 to 26 500	Not Peak Found		
		2593.0		Not Peak Found		
		2680.0		Not Peak Found		

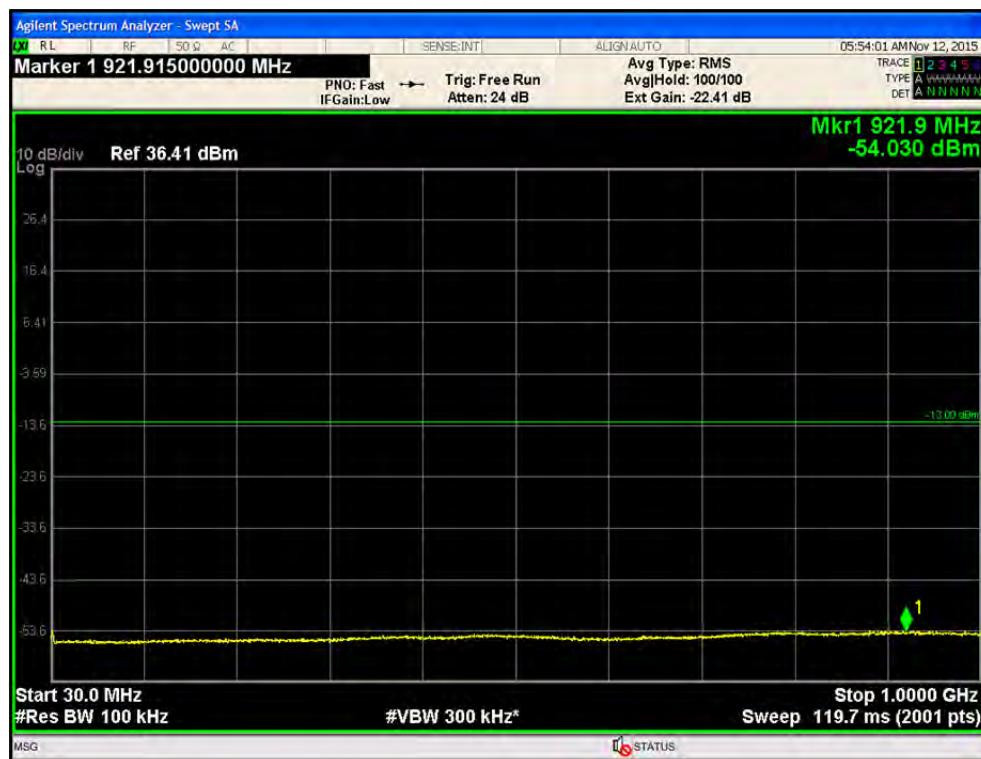
### 3.3.8 Plots of spurious emissions

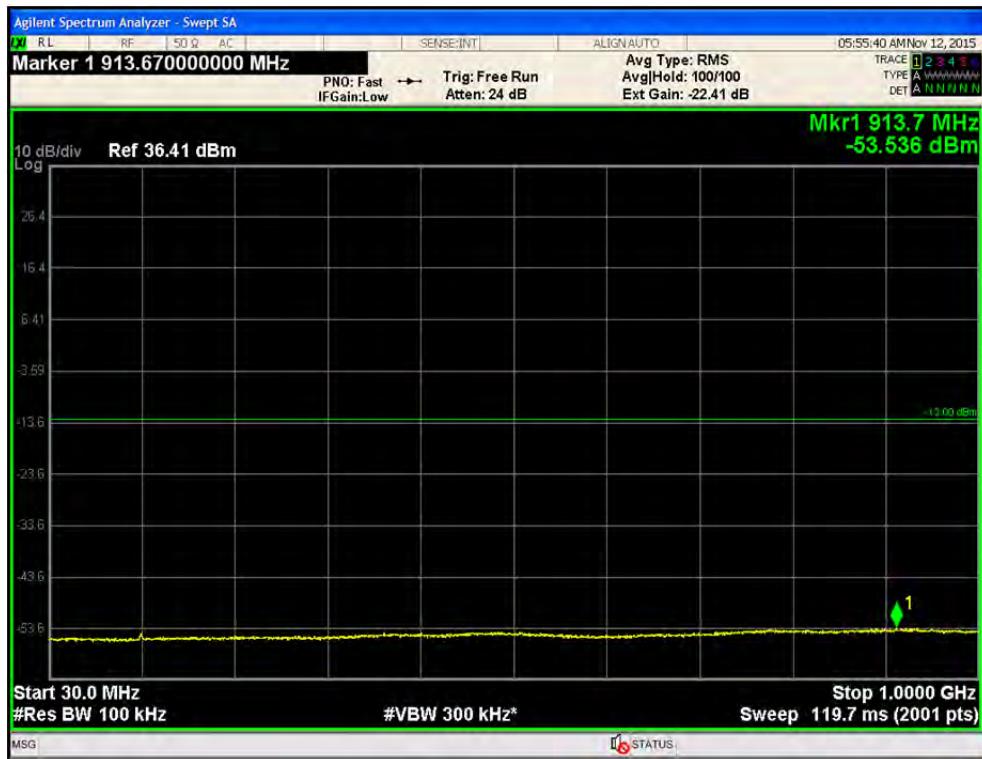
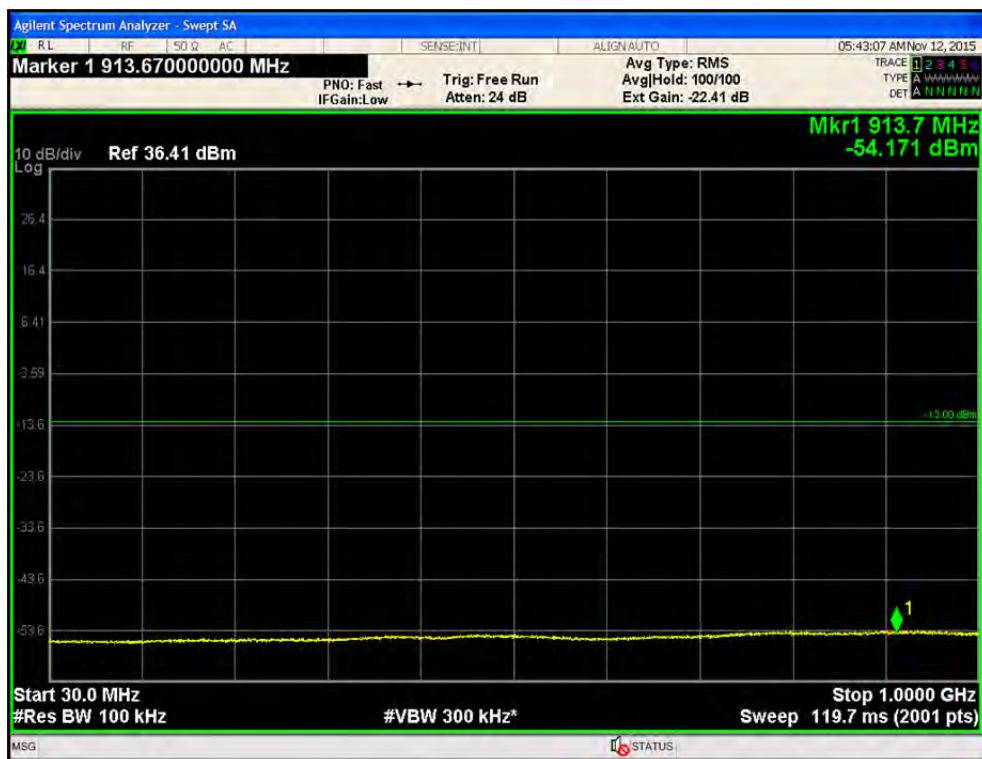
#### 3.3.8.1 30MHz ~ 1GHz Spurious emissions

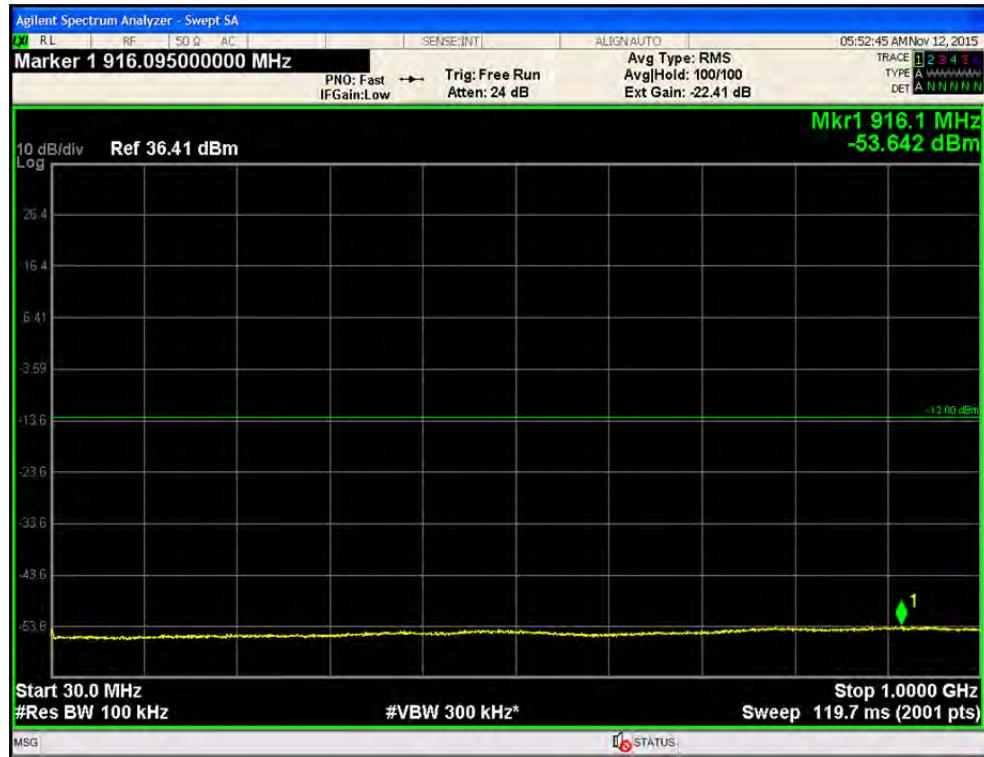
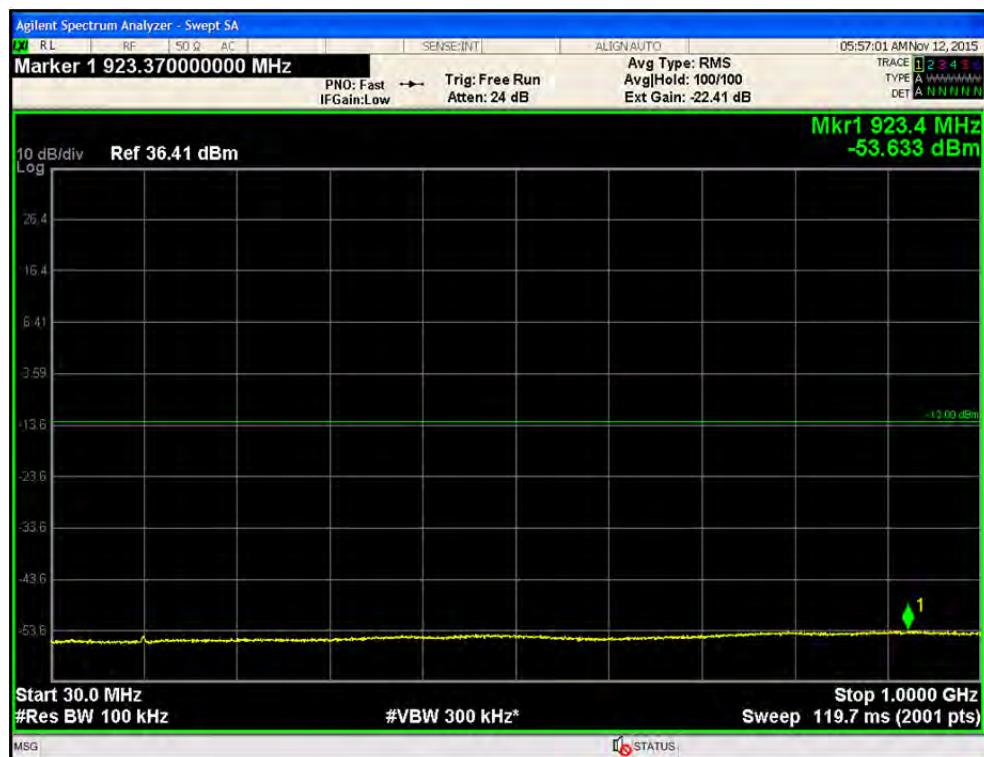
- Port1/ LTE 5M / 2498.5 MHz / QPSK

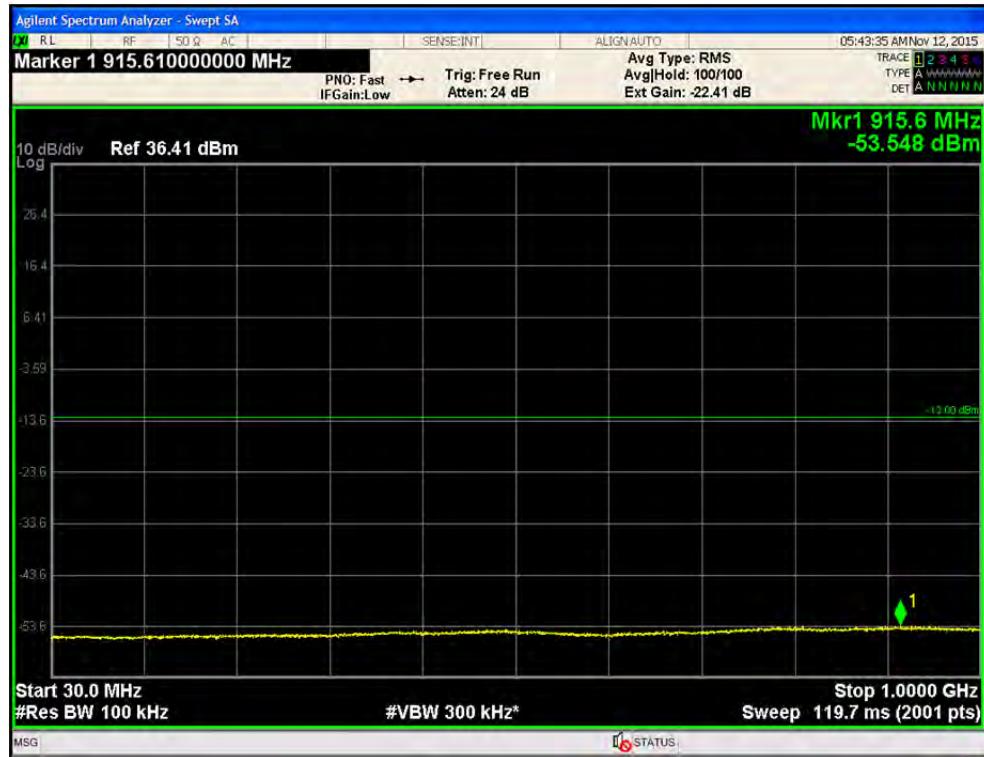


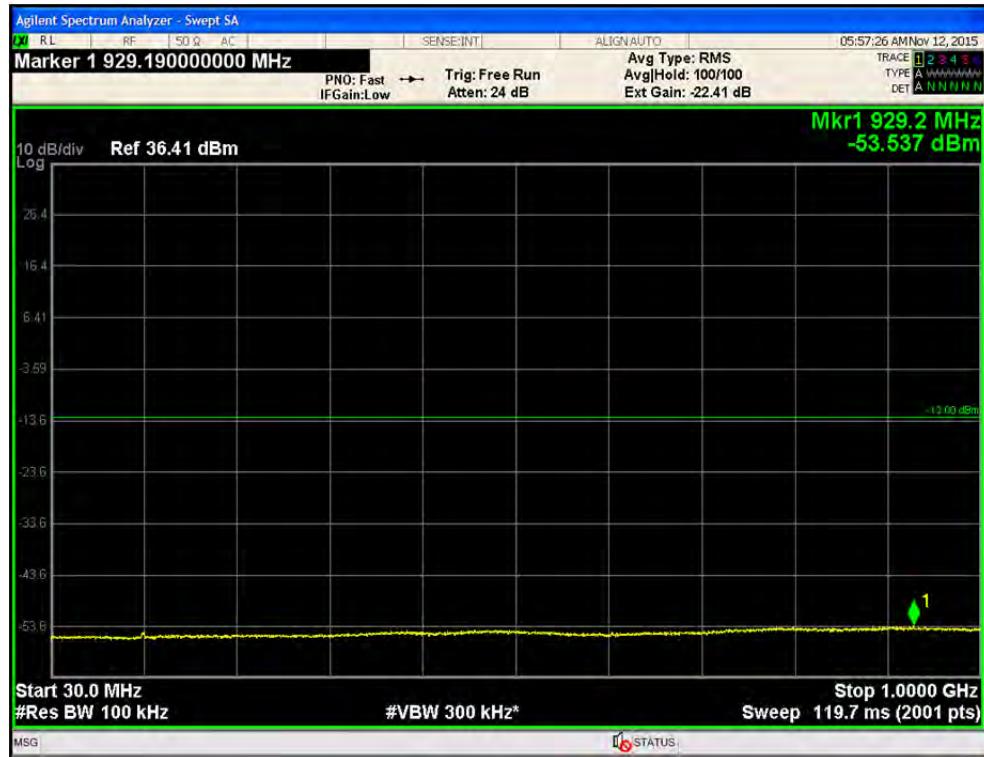
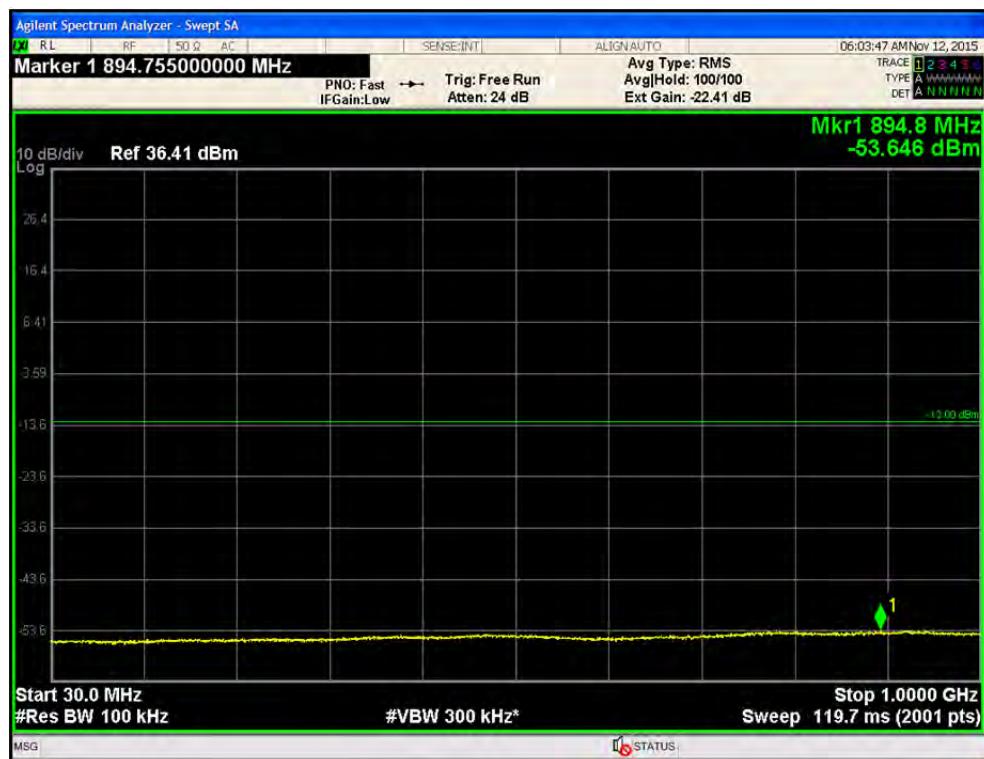
- Port1/ LTE 5M / 2593.0 MHz / QPSK

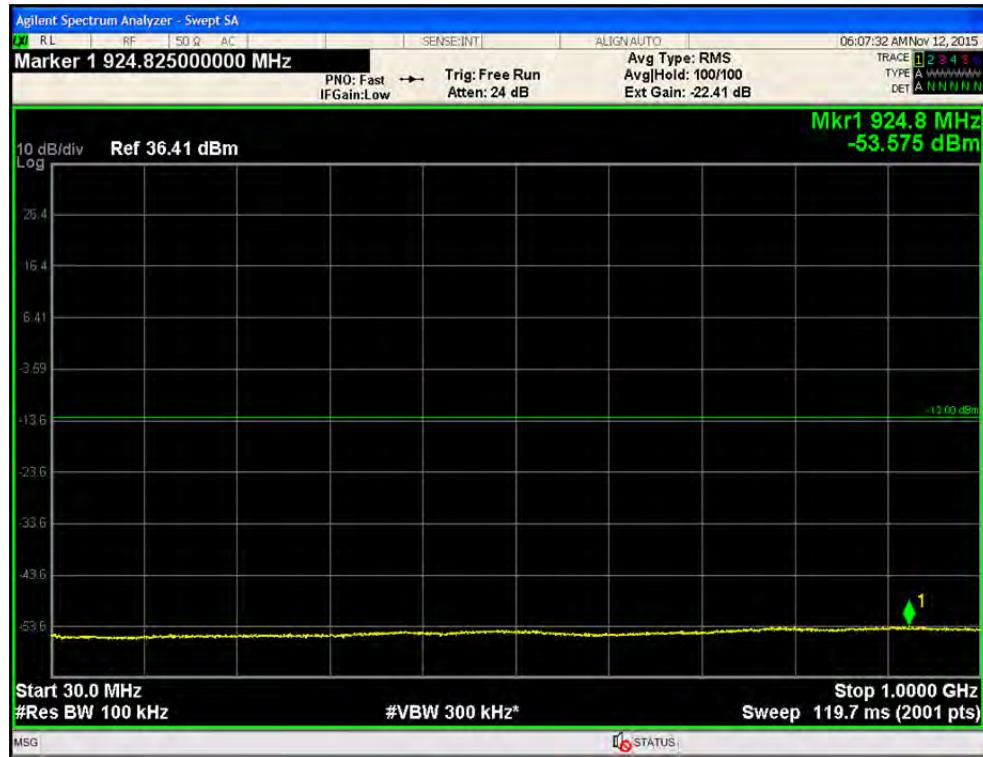


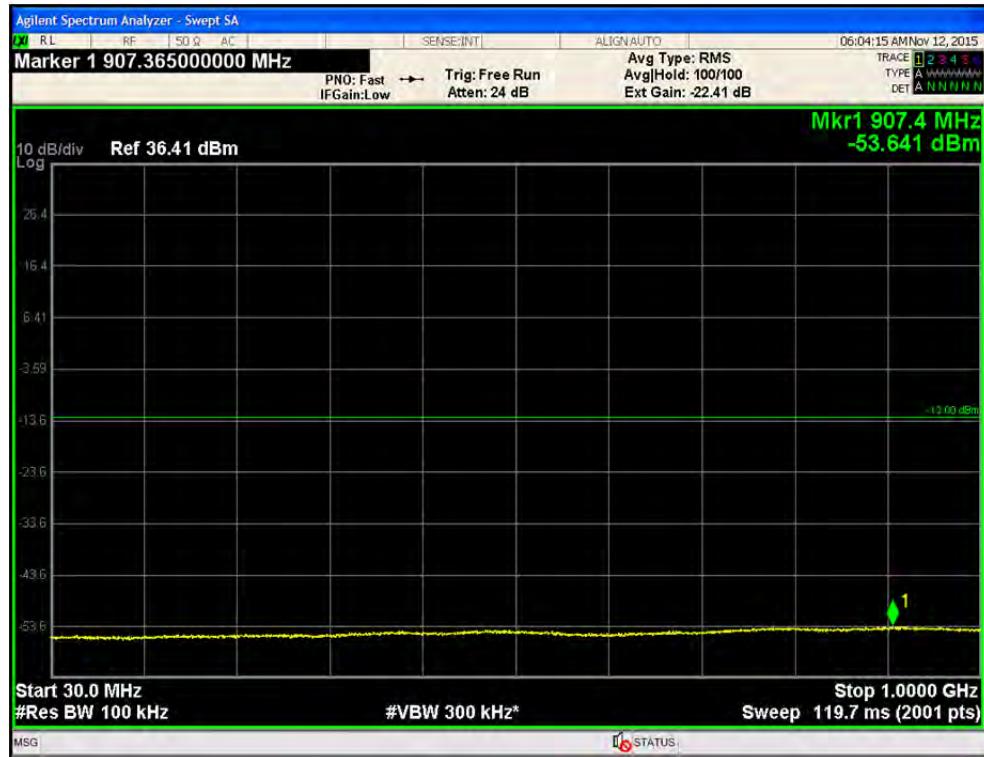
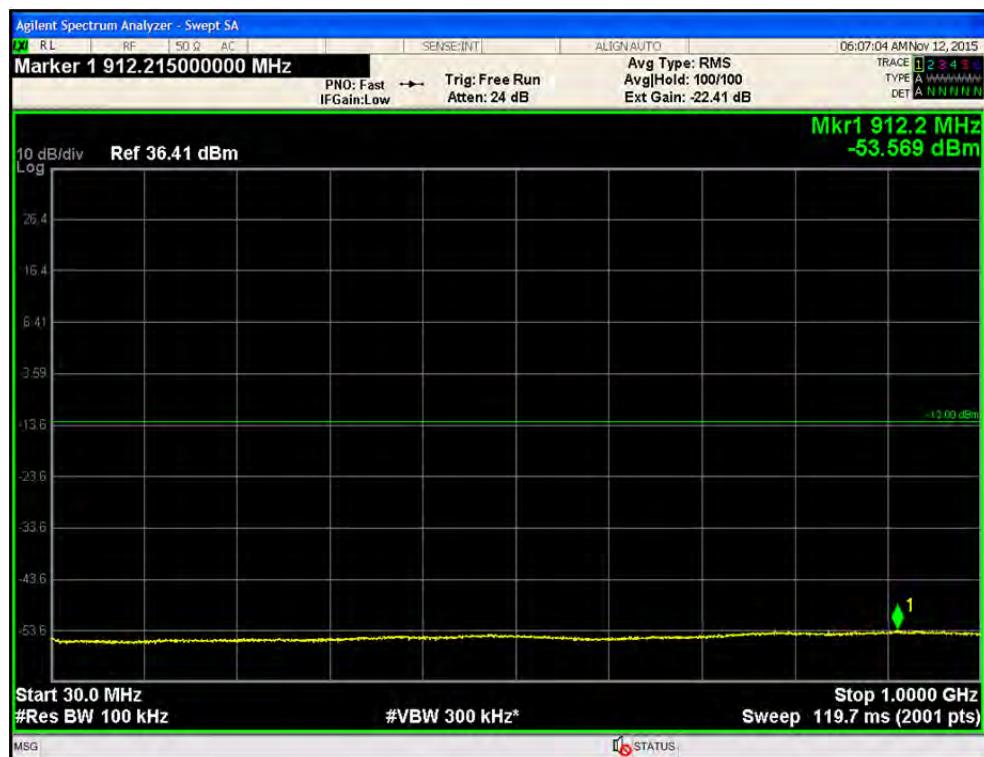
**•Port1/ LTE 5M / 2687.5 MHz / QPSK****•Port1/ LTE 5M / 2498.5 MHz / 16QAM**

**•Port1/ LTE 5M / 2593.0 MHz / 16QAM****•Port1/ LTE 5M / 2687.5 MHz / 16QAM**

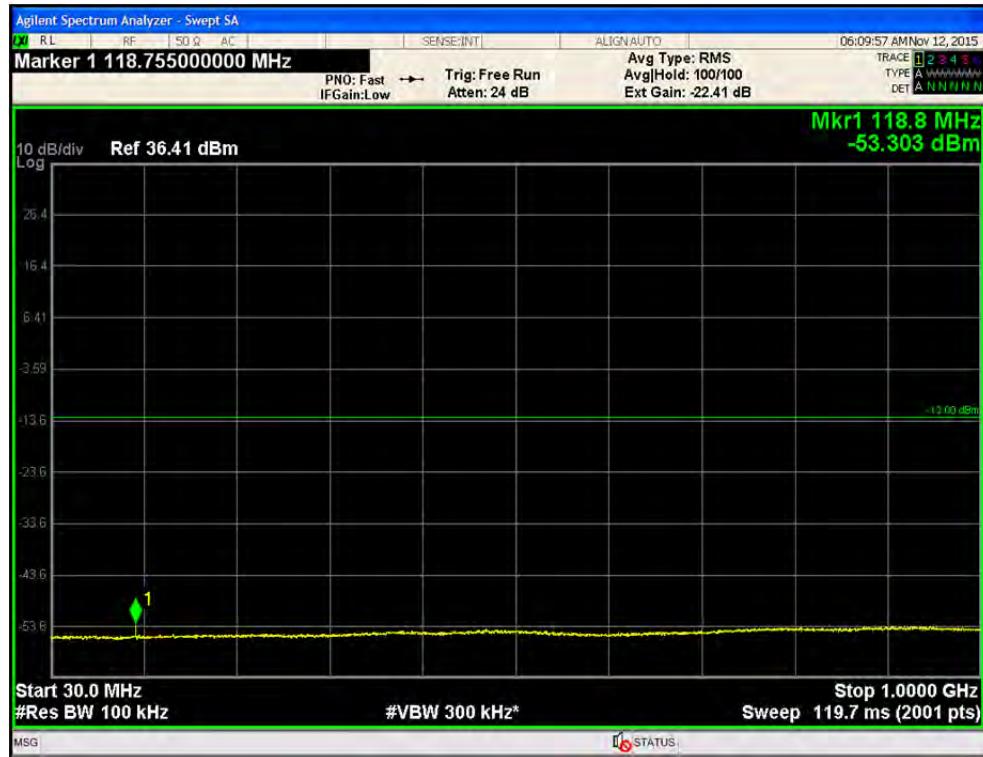
**•Port1/ LTE 5M / 2498.5 MHz / 64QAM**

**•Port1/ LTE 5M / 2593.0 MHz / 64QAM**


**•Port1/ LTE 5M / 2687.5 MHz / 64QAM**

**•Port1/ LTE 20M / 2506.0 MHz / QPSK**


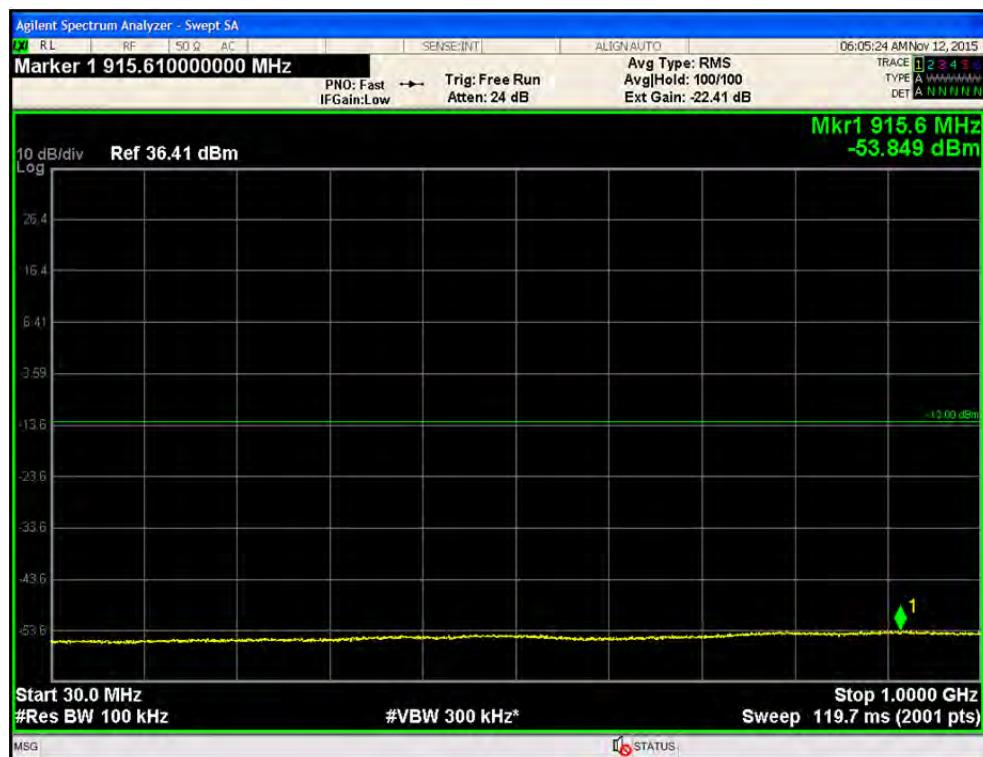
**•Port1/ LTE 20M / 2593.0 MHz / QPSK**

**•Port1/ LTE 20M / 2680.0 MHz / QPSK**

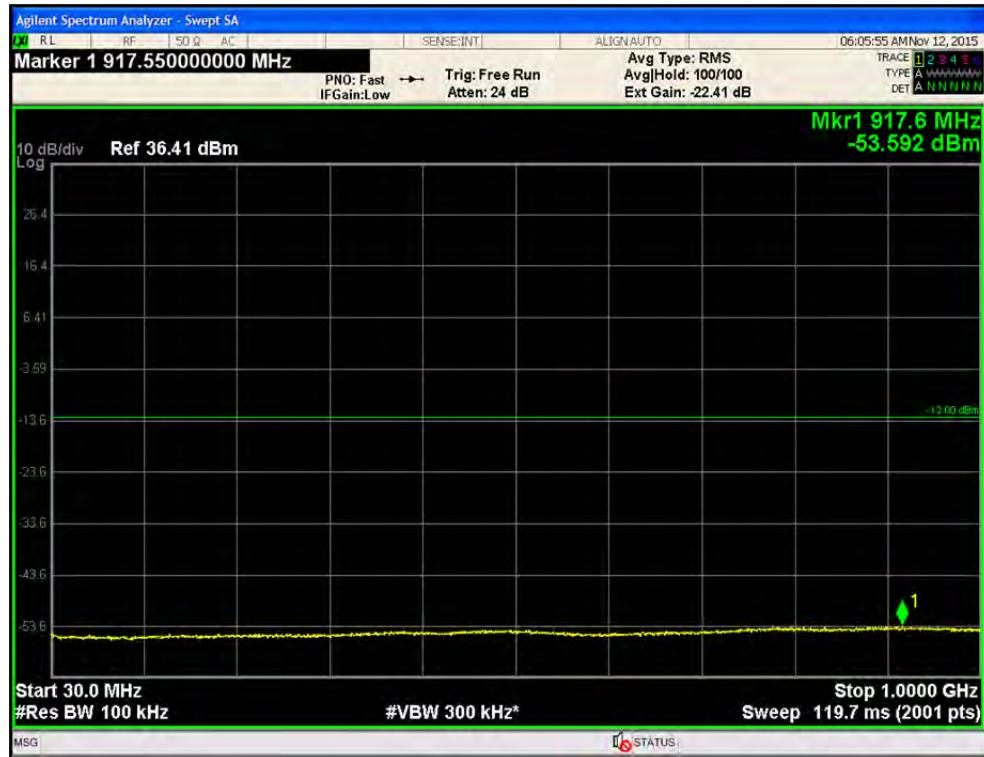
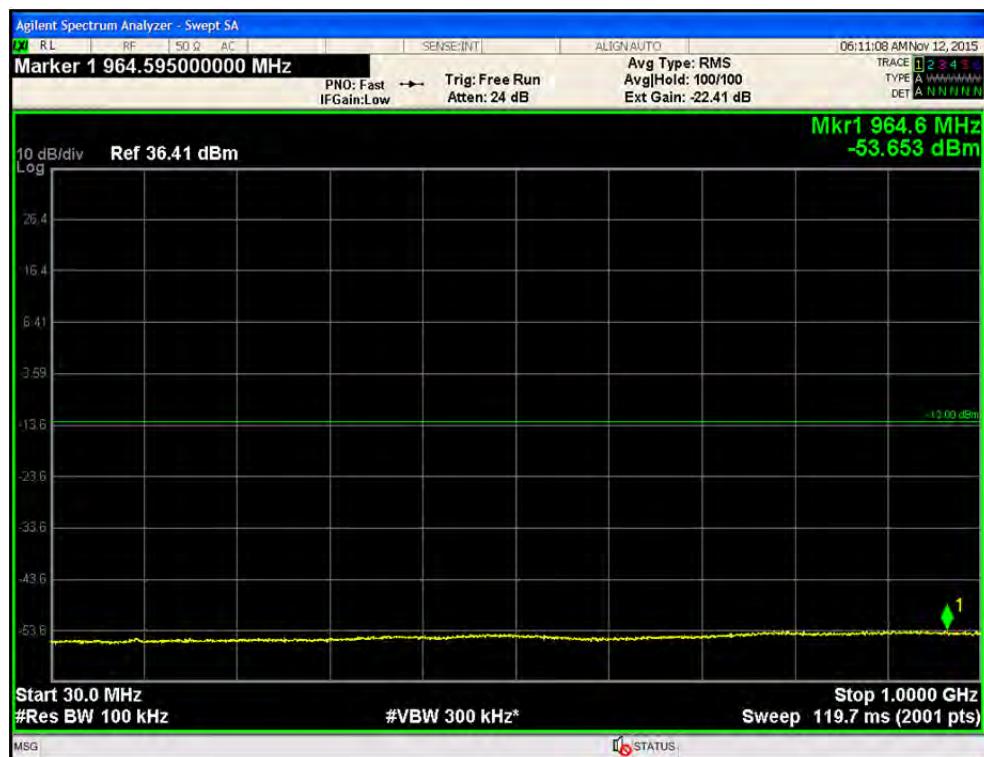

**•Port1/ LTE 20M / 2506.0 MHz / 16QAM****•Port1/ LTE 20M / 2593.0 MHz / 16QAM**

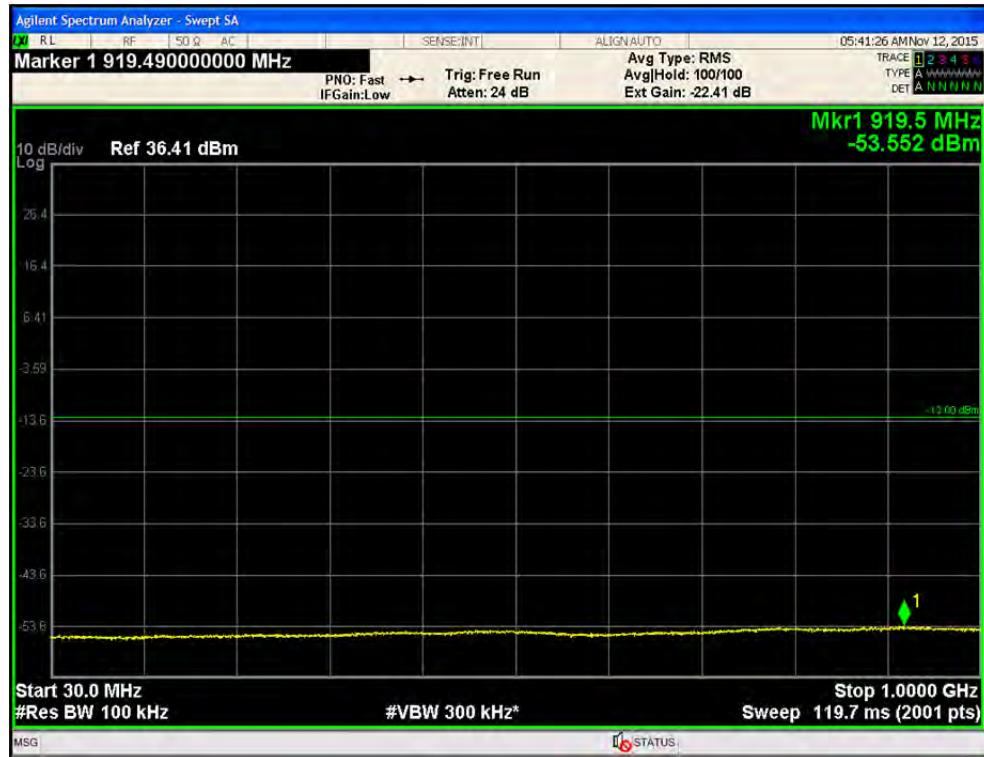
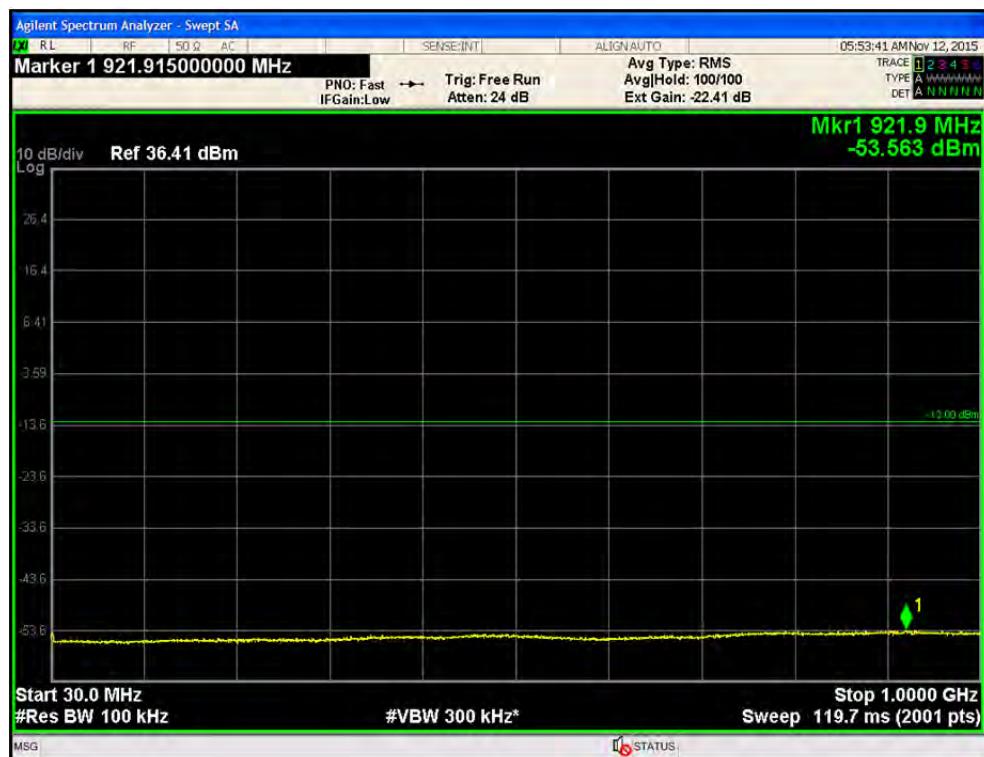
## •Port1/ LTE 20M / 2680.0 MHz / 16QAM



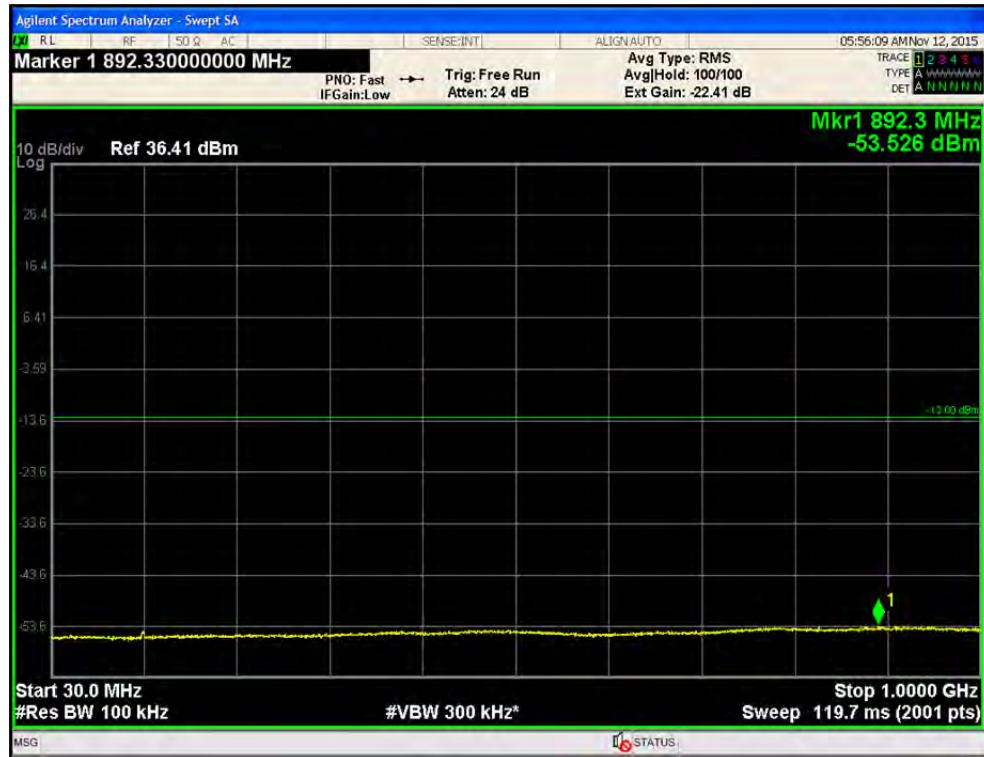
## •Port1/ LTE 20M / 2506.0 MHz / 64QAM



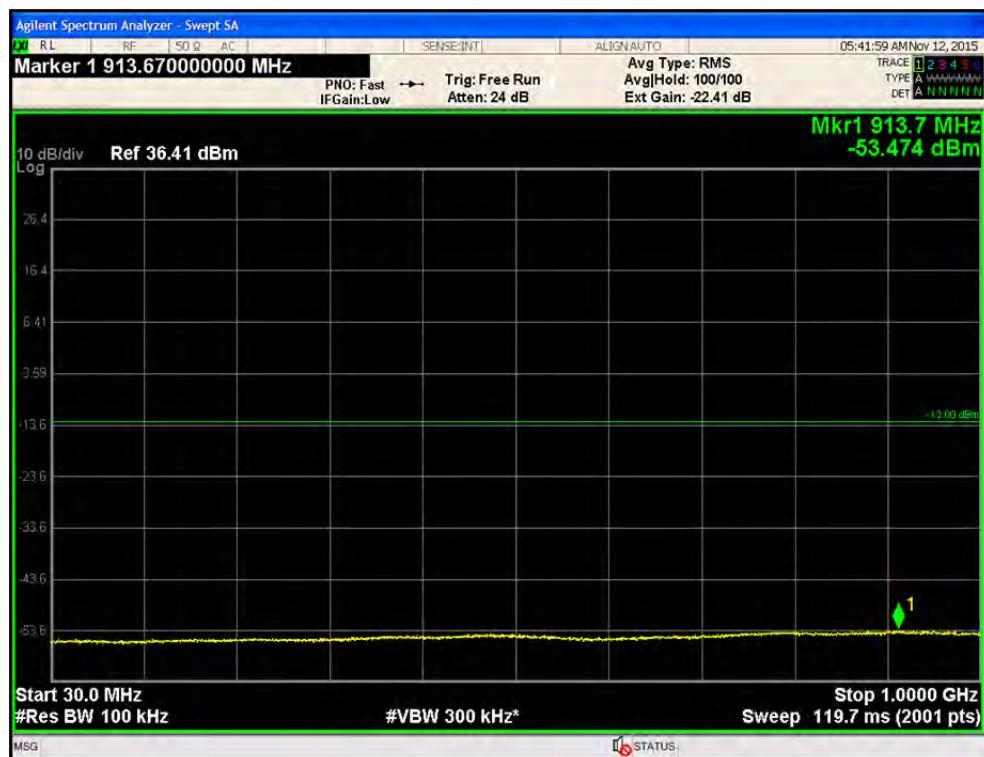
**•Port1/ LTE 20M / 2593.0 MHz / 64QAM**

**•Port1/ LTE 20M / 2680.0 MHz / 64QAM**


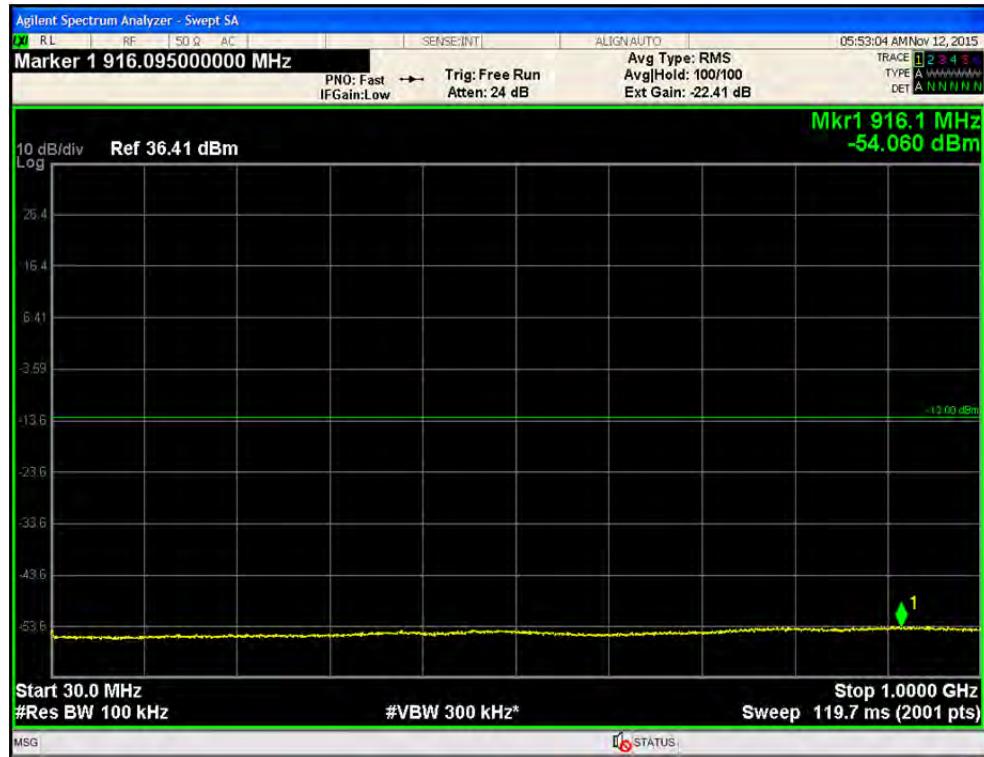
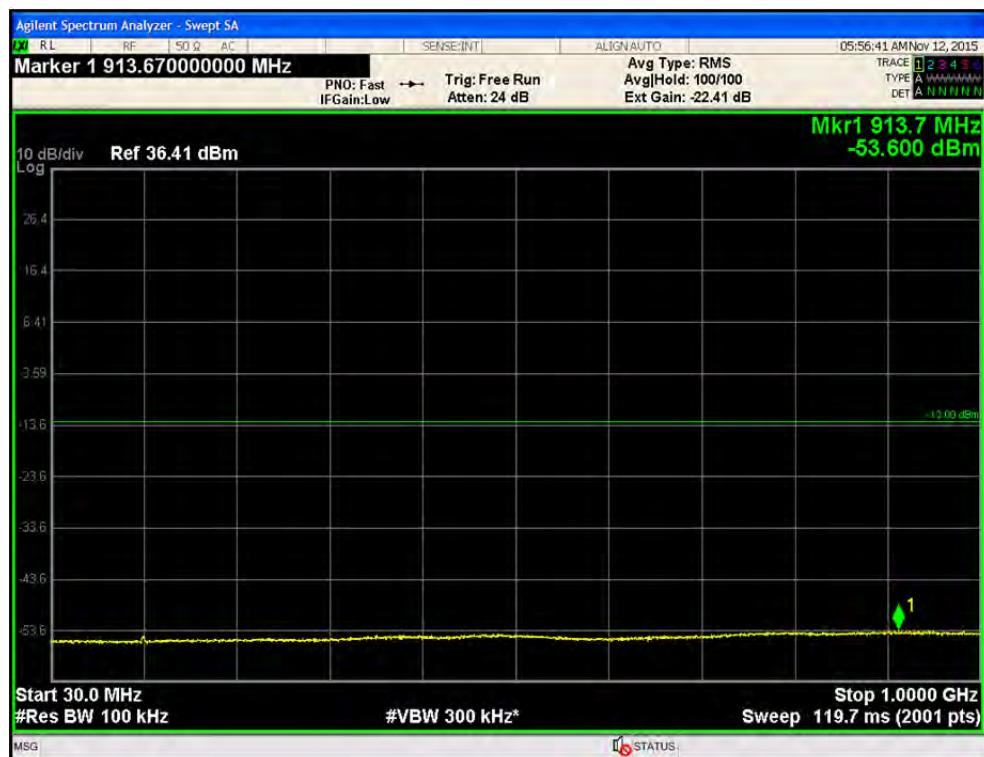
**•Port2/ LTE 5M / 2498.5 MHz / QPSK****•Port2/ LTE 5M / 2593.0 MHz / QPSK**

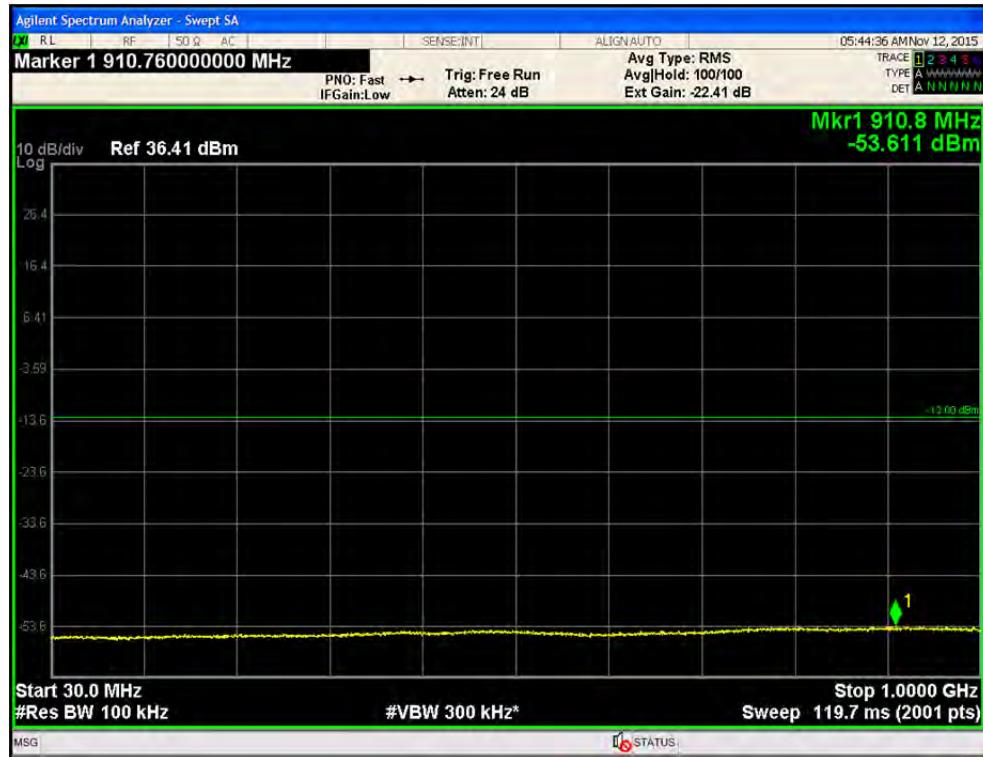
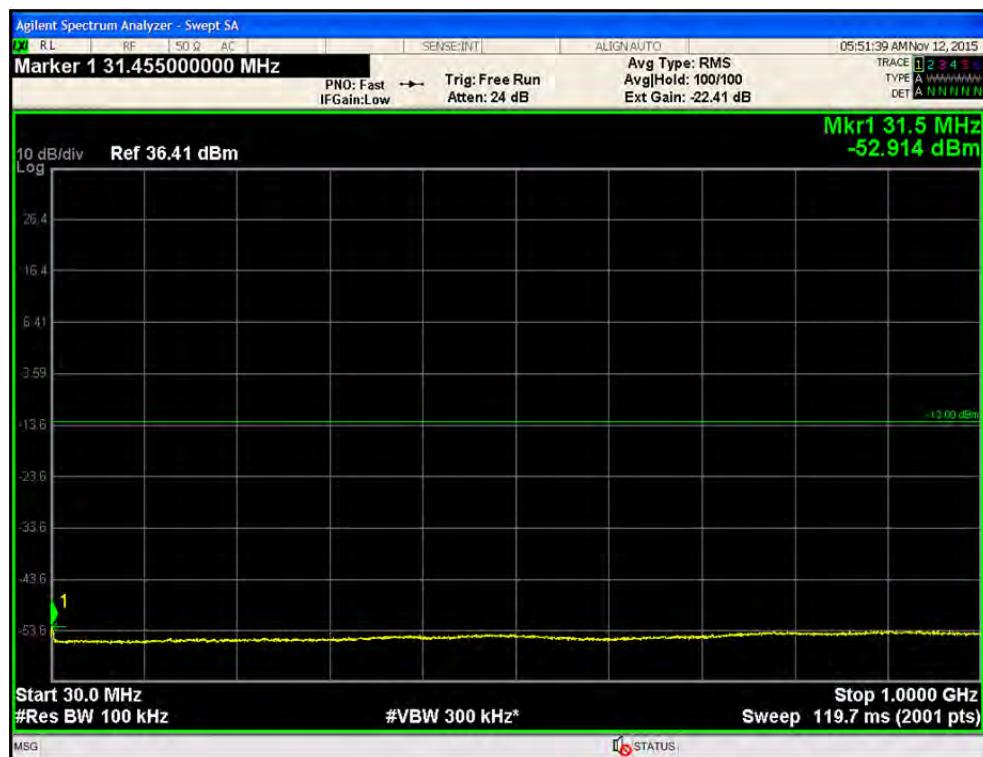
## •Port2/ LTE 5M / 2687.5 MHz / QPSK

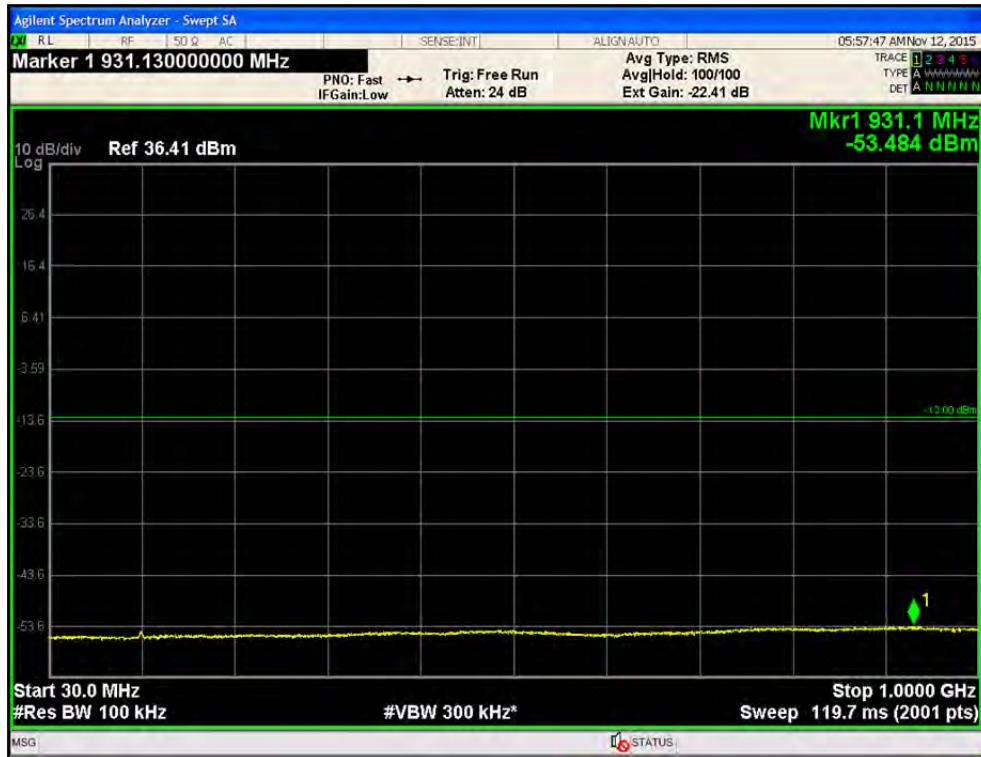
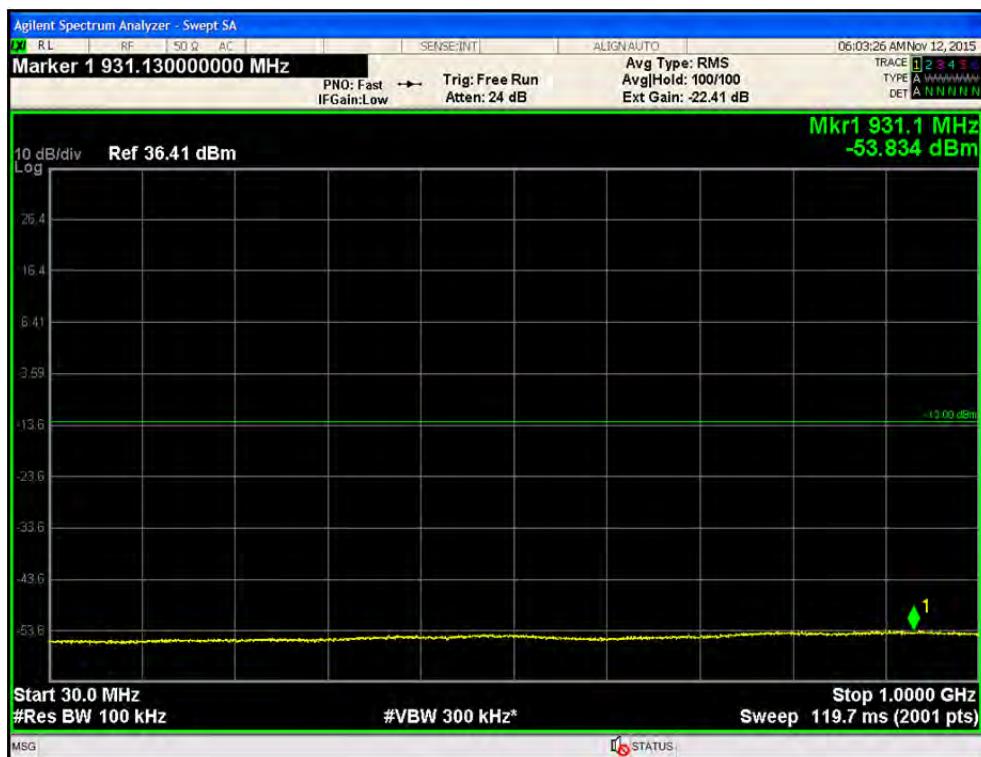


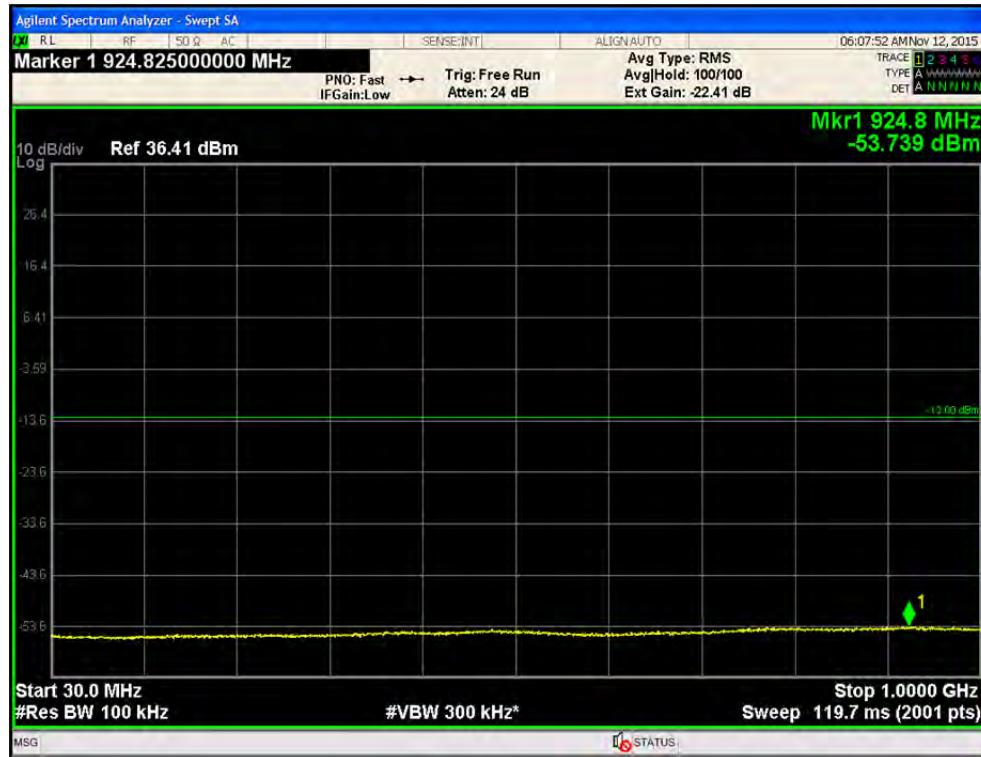
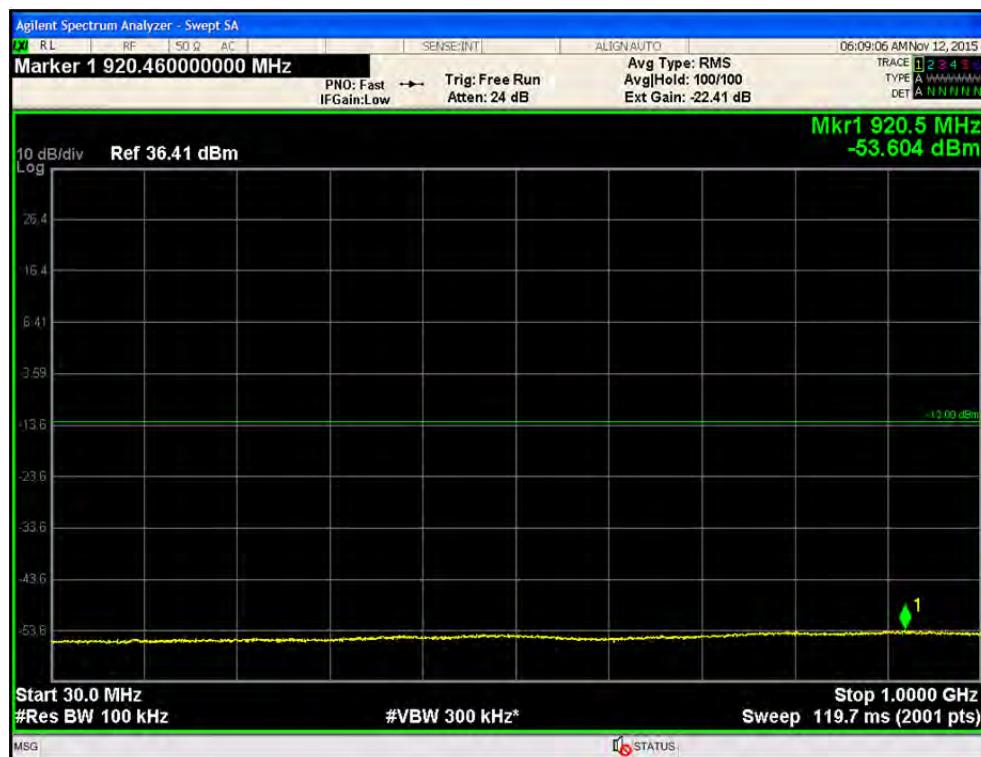
## •Port2/ LTE 5M / 2498.5 MHz / 16QAM

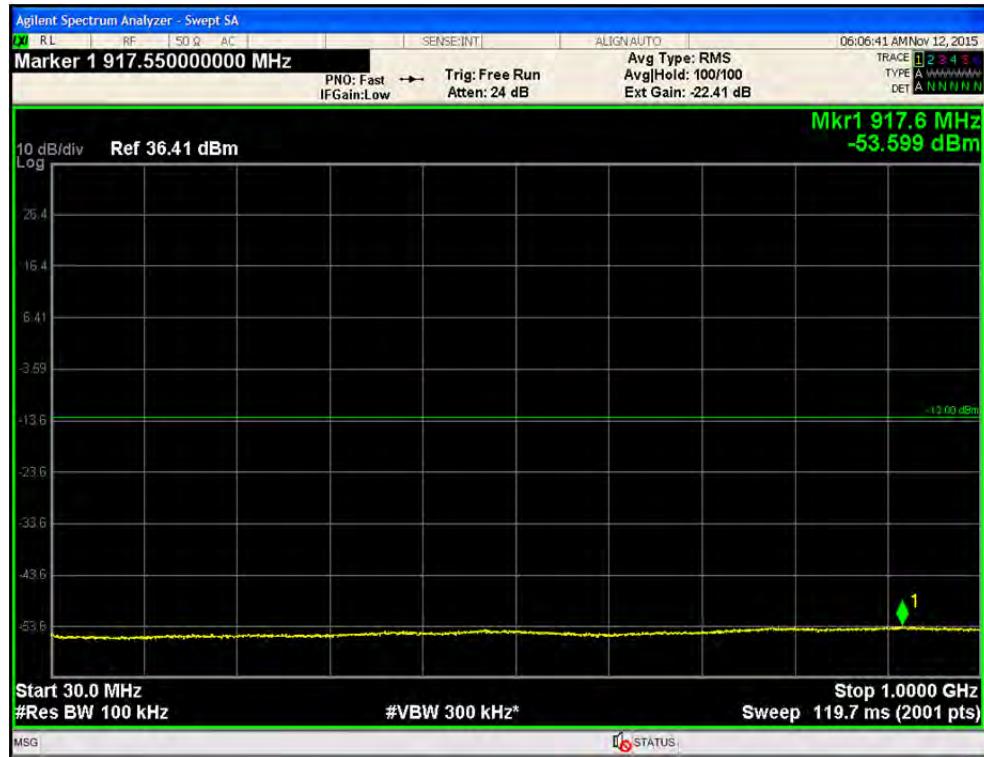
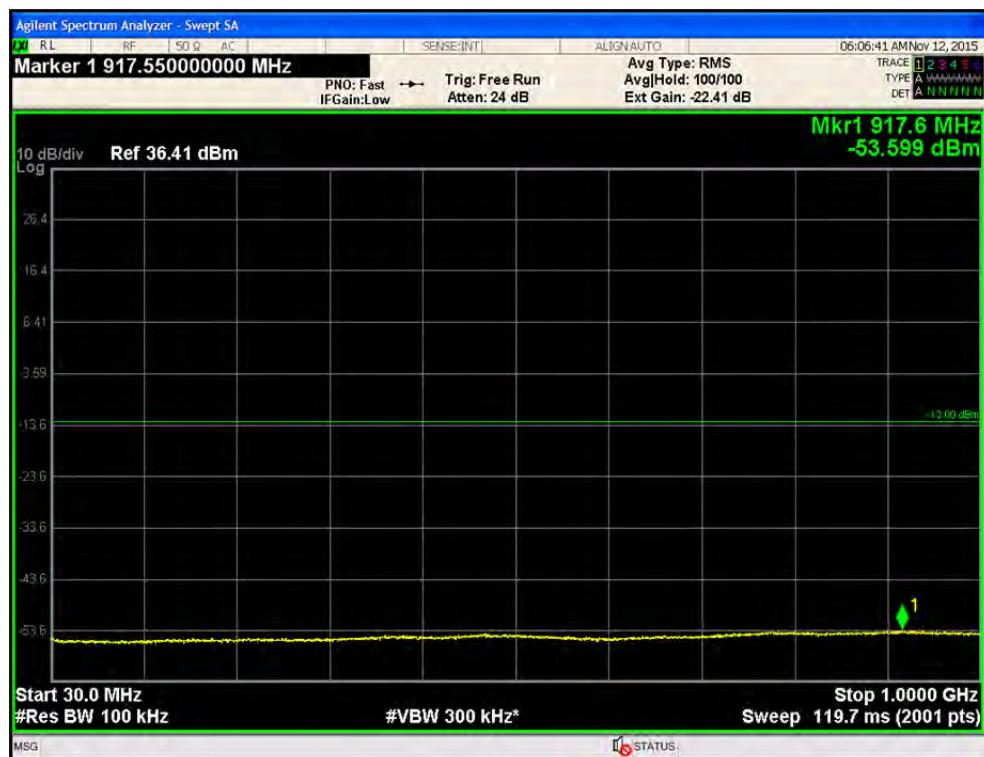


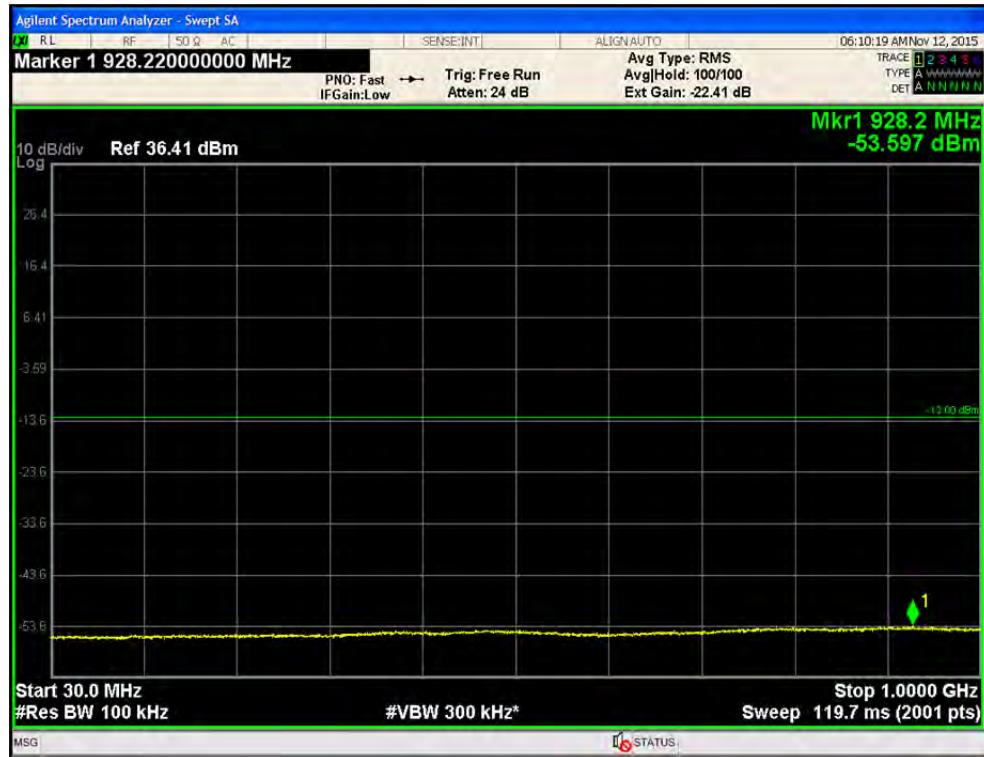
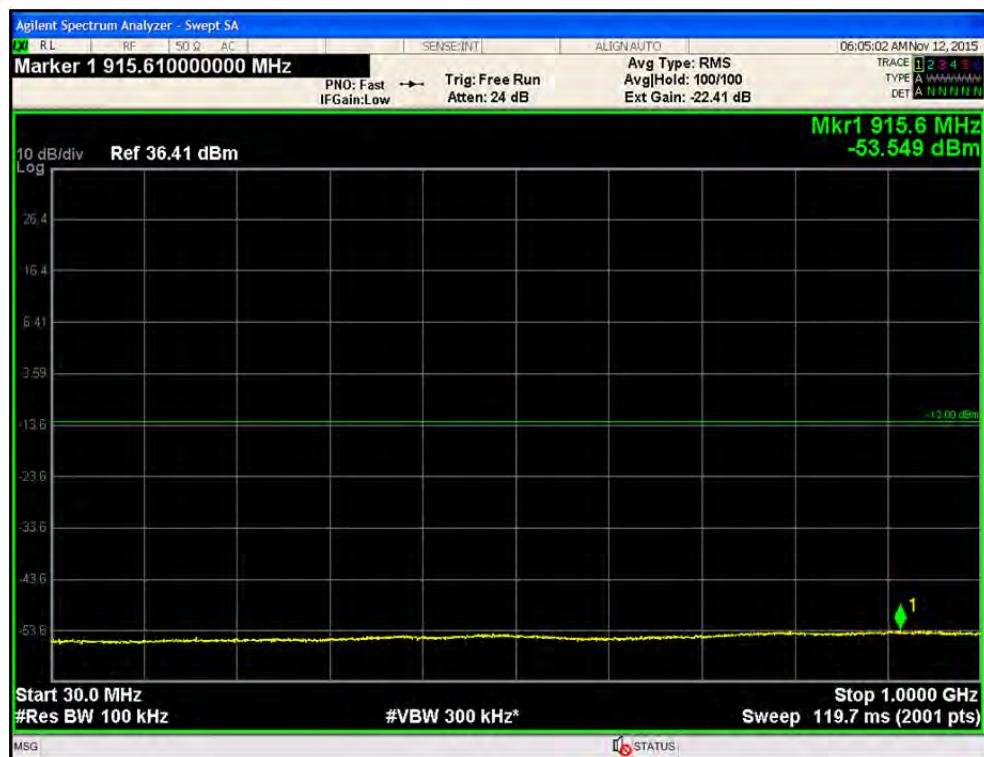
**•Port2/ LTE 5M / 2593.0 MHz / 16QAM****•Port2/ LTE 5M / 2687.5 MHz / 16QAM**

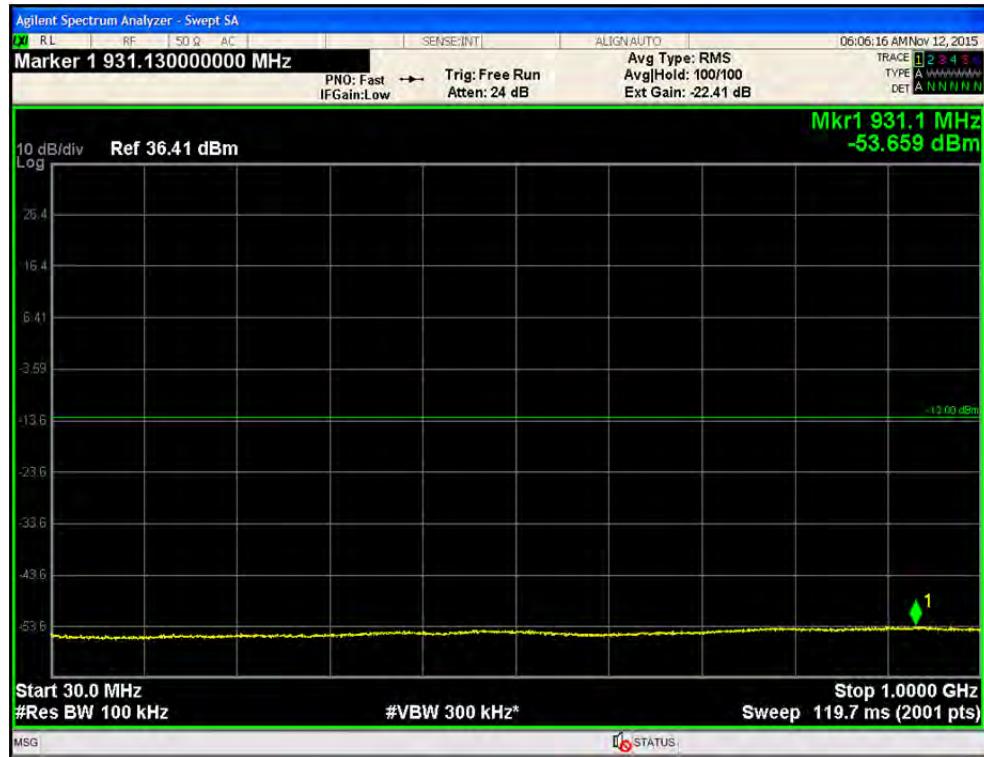
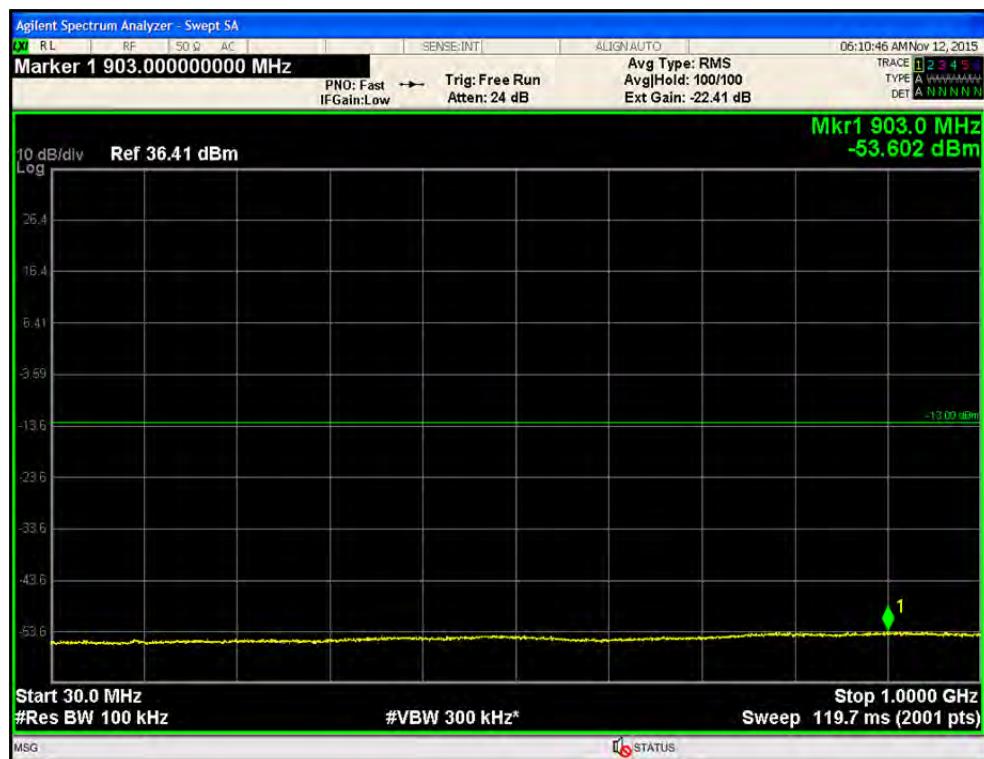
**•Port2/ LTE 5M / 2498.5 MHz / 64QAM****•Port2/ LTE 5M / 2593.0 MHz / 64QAM**

**•Port2/ LTE 5M / 2687.5 MHz / 64QAM****•Port2/ LTE 20M / 2506.0 MHz / QPSK**

**•Port2/ LTE 20M / 2593.0 MHz / QPSK****•Port2/ LTE 20M / 2680.0 MHz / QPSK**

**•Port2/ LTE 20M / 2506.0 MHz / 16QAM****•Port2/ LTE 20M / 2593.0 MHz / 16QAM**

**•Port2/ LTE 20M / 2680.0 MHz / 16QAM****•Port2/ LTE 20M / 2506.0 MHz / 64QAM**

**•Port2/ LTE 20M / 2593.0 MHz / 64QAM****•Port2/ LTE 20M / 2680.0 MHz / 64QAM**

### 3.3.8.2 1GHz ~ 26.5GHz Spurious emissions

- Port1/ LTE 5M / 2498.5 MHz / QPSK



- Port1/ LTE 5M / 2593.0 MHz / QPSK



**•Port1/ LTE 5M / 2687.5 MHz / QPSK**

**•Port1/ LTE 5M / 2498.5 MHz / 16QAM**


## •Port1/ LTE 5M / 2593.0 MHz / 16QAM



## •Port1/ LTE 5M / 2687.5 MHz / 16QAM



**•Port1/ LTE 5M / 2498.5 MHz / 64QAM**

**•Port1/ LTE 5M / 2593.0 MHz / 64QAM**


**•Port1/ LTE 5M / 2687.5 MHz / 64QAM**

**•Port1/ LTE 20M / 2506.0 MHz / QPSK**


**•Port1/ LTE 20M / 2593.0 MHz / QPSK**

**•Port1/ LTE 20M / 2680.0 MHz / QPSK**


**•Port1/ LTE 20M / 2506.0 MHz / 16QAM**

**•Port1/ LTE 20M / 2593.0 MHz / 16QAM**


**•Port1/ LTE 20M / 2680.0 MHz / 16QAM**

**•Port1/ LTE 20M / 2506.0 MHz / 64QAM**


**•Port1/ LTE 20M / 2593.0 MHz / 64QAM**

**•Port1/ LTE 20M / 2680.0 MHz / 64QAM**


### 3.4 Transmitter conducted output power

#### 3.4.1 Specification

- FCC Part 2.1046
- FCC Part 27.50 (h)

#### 3.4.2 Test Description

The measurement were performed in max output power transmitting mode at all channel of the 2496 MHz ~ 2690 MHz frequency ranges.

The EUT output power was connected to the spectrum analyzer through appropriate attenuator. The output power was measured using a spectrum analyzer Channel Power function.

Main, booster and base stations. (i) The maximum EIRP of a main, booster or base station shall not exceed  $33 \text{ dBW} + 10\log(X/Y) \text{ dBW}$ , where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition, except as provided in paragraph (h)(1)(ii) of this section.

Transmitter Conducted Output power was measured on port 1 and port 2 under the three types of modulation mode which are QPSK, 16QAM and 64QAM and resource block was 25~100.

UL/DL Allocation : Configuration 3

Dw/GP/UP length : Configuration 8

#### 3.4.3 Test Procedure

The test procedure used is as detailed in FCC KDB 935210 D05 v01

The test was performed at three frequencies (low, middle and high) at each band using all applicable modulation.

RF output power was measured by channel power measurement function of the spectrum analyzer with RMS mode.

#### 3.4.4 Test equipment list

Equipment	Model Name	Manufacturer
EUT	HX-2500-MIMO	Corning Optical Communications Wireless Inc.
MHU	HX-2500-MHU	Corning Optical Communications Wireless Inc.
Signal Generator	N5182A	Agilent
Spectrum Analyzer	N9020A	Agilent
Attenuator	PE7019-20	Pasternack
DC Power Supply	6674A	Agilent

#### 3.4.5 Test condition

- Test place: Shield Room
- Test environment: 22.5 °C, 42.5 % R.H.

### 3.4.6 Test results

- Port1

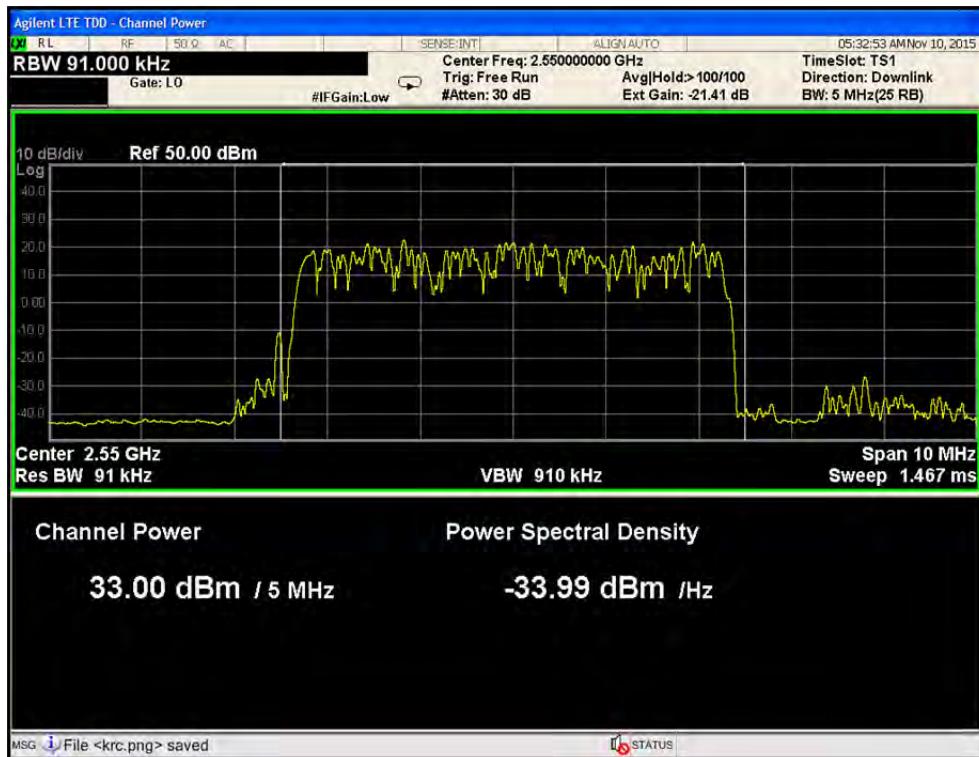
Bandwidth	Modulation	Frequency [MHz]	Output Level [dBm]	Antenna Gain [dBi]	EIRP [dBm]	EIRP [W]	Limit [W]
5 MHz	QPSK	2498.5	33.00	15.00	48.00	63.09	1811.34
		2593.0	32.90	15.00	47.90	61.65	
		2687.5	32.97	15.00	47.97	62.66	
	16QAM	2498.5	33.00	15.00	48.00	63.09	
		2593.0	32.98	15.00	47.98	62.80	
		2687.5	33.09	15.00	48.09	64.41	
	64QAM	2498.5	32.97	15.00	47.97	62.66	
		2593.0	32.99	15.00	47.99	62.95	
		2687.5	33.06	15.00	48.06	63.97	
10 MHz	QPSK	2501.0	33.00	15.00	48.00	63.09	3622.42
		2593.0	32.99	15.00	47.99	62.95	
		2685.0	33.01	15.00	48.01	63.24	
	16QAM	2501.0	32.97	15.00	47.97	62.66	
		2593.0	33.02	15.00	48.02	63.38	
		2685.0	32.97	15.00	47.97	62.66	
	64QAM	2501.0	32.93	15.00	47.93	62.08	
		2593.0	33.01	15.00	48.01	63.24	
		2685.0	33.02	15.00	48.02	63.38	
15 MHz	QPSK	2503.5	32.95	15.00	47.95	62.37	5432.50
		2593.0	33.11	15.00	48.11	64.71	
		2682.5	32.95	15.00	47.95	62.37	
	16QAM	2503.5	32.97	15.00	47.97	62.66	
		2593.0	33.08	15.00	48.08	64.26	
		2682.5	33.01	15.00	48.01	63.24	
	64QAM	2503.5	32.94	15.00	47.94	62.23	
		2593.0	32.97	15.00	47.97	62.66	
		2682.5	32.95	15.00	47.95	62.37	
20 MHz	QPSK	2506.0	32.99	15.00	47.99	62.95	7244.35
		2593.0	33.01	15.00	48.01	63.24	
		2680.0	33.03	15.00	48.03	63.53	
	16QAM	2506.0	32.97	15.00	47.97	62.66	
		2593.0	32.93	15.00	47.93	62.08	
		2680.0	32.97	15.00	47.97	62.66	
	64QAM	2506.0	33.01	15.00	48.01	63.24	
		2593.0	33.03	15.00	48.03	63.53	
		2680.0	32.99	15.00	47.99	62.95	

- Port2

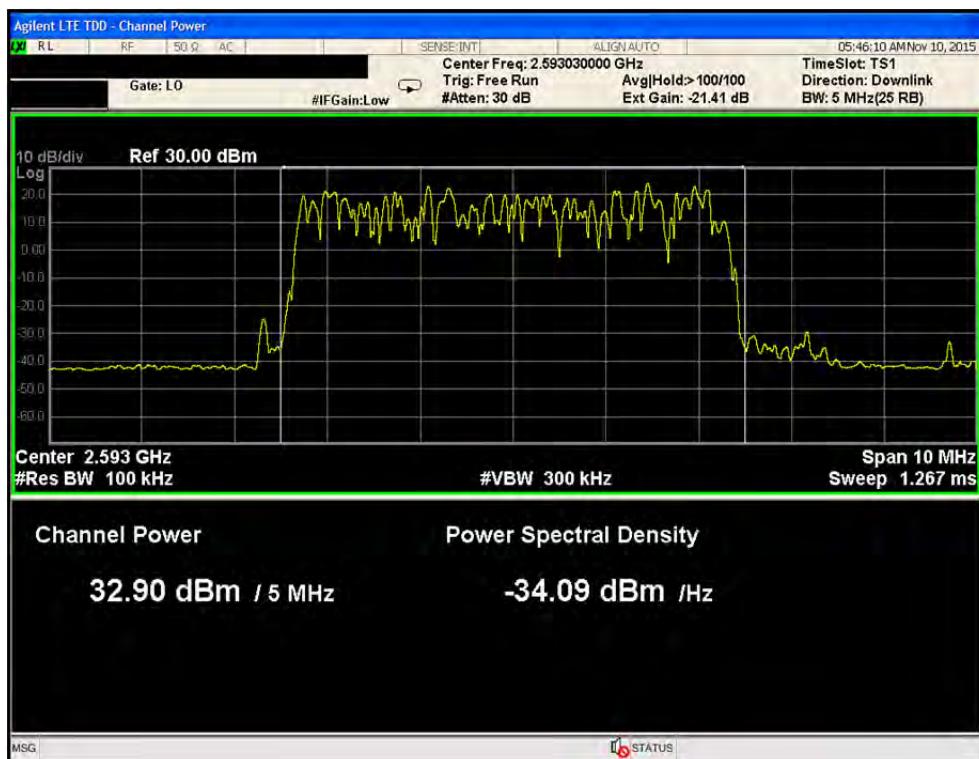
Bandwidth	Modulation	Frequency [MHz]	Output Level [dBm]	Antenna Gain [dBi]	EIRP [dBm]	EIRP [W]	Limit [W]
5 MHz	QPSK	2498.5	32.99	15.00	47.99	62.95	1811.34
		2593.0	33.05	15.00	48.05	63.82	
		2687.5	32.93	15.00	47.93	62.08	
	16QAM	2498.5	33.03	15.00	48.03	63.53	
		2593.0	32.93	15.00	47.93	62.08	
		2687.5	33.05	15.00	48.05	63.82	
	64QAM	2498.5	32.99	15.00	47.99	62.95	
		2593.0	32.99	15.00	47.99	62.95	
		2687.5	33.02	15.00	48.02	63.38	
10 MHz	QPSK	2501.0	32.93	15.00	47.93	62.08	3622.42
		2593.0	32.98	15.00	47.98	62.80	
		2685.0	32.95	15.00	47.95	62.37	
	16QAM	2501.0	32.95	15.00	47.95	62.37	
		2593.0	32.94	15.00	47.94	62.23	
		2685.0	32.93	15.00	47.93	62.08	
	64QAM	2501.0	32.94	15.00	47.94	62.23	
		2593.0	33.04	15.00	48.04	63.67	
		2685.0	33.00	15.00	48.00	63.09	
15 MHz	QPSK	2503.5	32.99	15.00	47.99	62.95	5432.50
		2593.0	33.02	15.00	48.02	63.38	
		2682.5	33.02	15.00	48.02	63.38	
	16QAM	2503.5	33.04	15.00	48.04	63.67	
		2593.0	33.02	15.00	48.02	63.38	
		2682.5	32.97	15.00	47.97	62.66	
	64QAM	2503.5	32.99	15.00	47.99	62.95	
		2593.0	33.00	15.00	48.00	63.09	
		2682.5	32.96	15.00	47.96	62.51	
20 MHz	QPSK	2506.0	32.96	15.00	47.96	62.51	7244.35
		2593.0	33.01	15.00	48.01	63.24	
		2680.0	32.94	15.00	47.94	62.23	
	16QAM	2506.0	32.92	15.00	47.92	61.94	
		2593.0	32.98	15.00	47.98	62.80	
		2680.0	32.98	15.00	47.98	62.80	
	64QAM	2506.0	32.90	15.00	47.90	61.65	
		2593.0	32.93	15.00	47.93	62.08	
		2680.0	32.96	15.00	47.96	62.51	

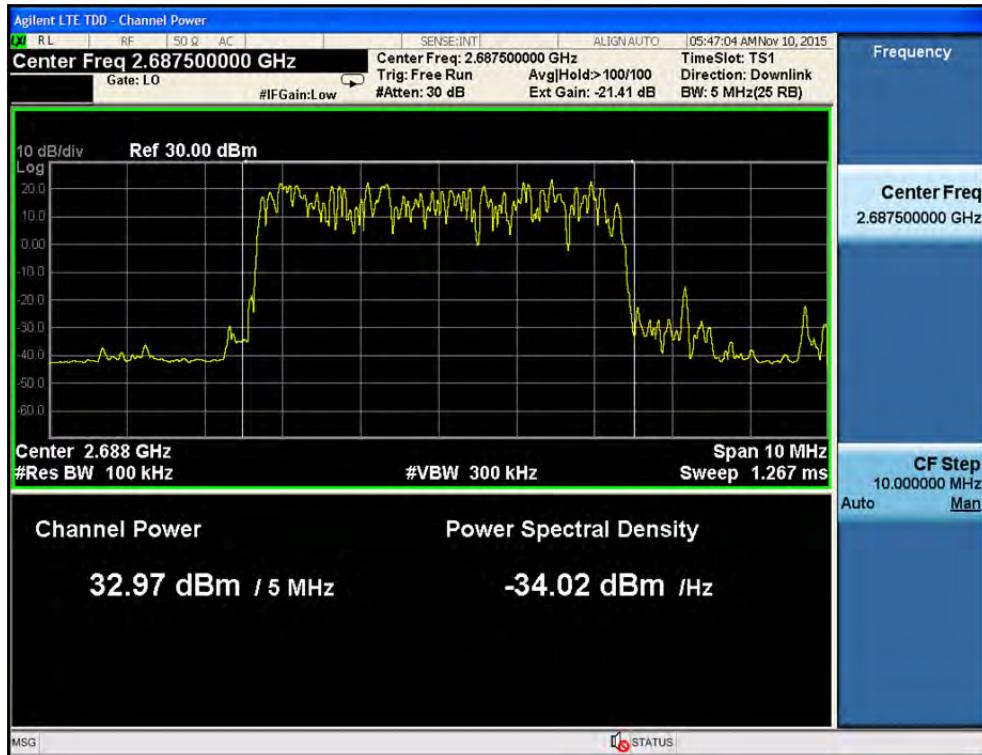
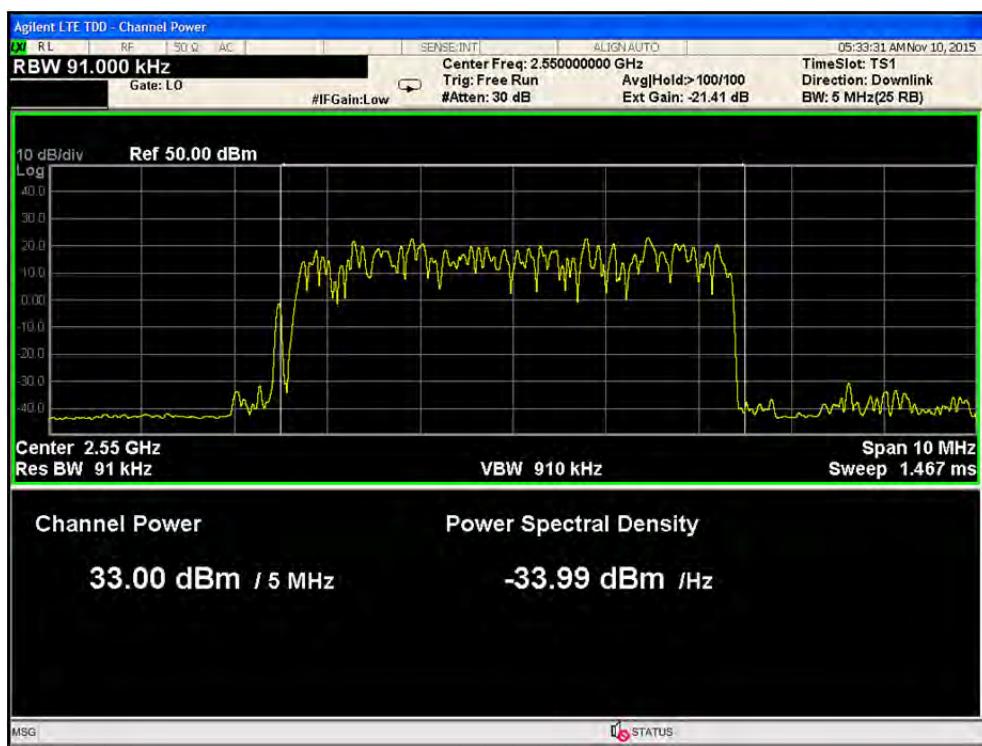
### 3.4.7 Test Plots

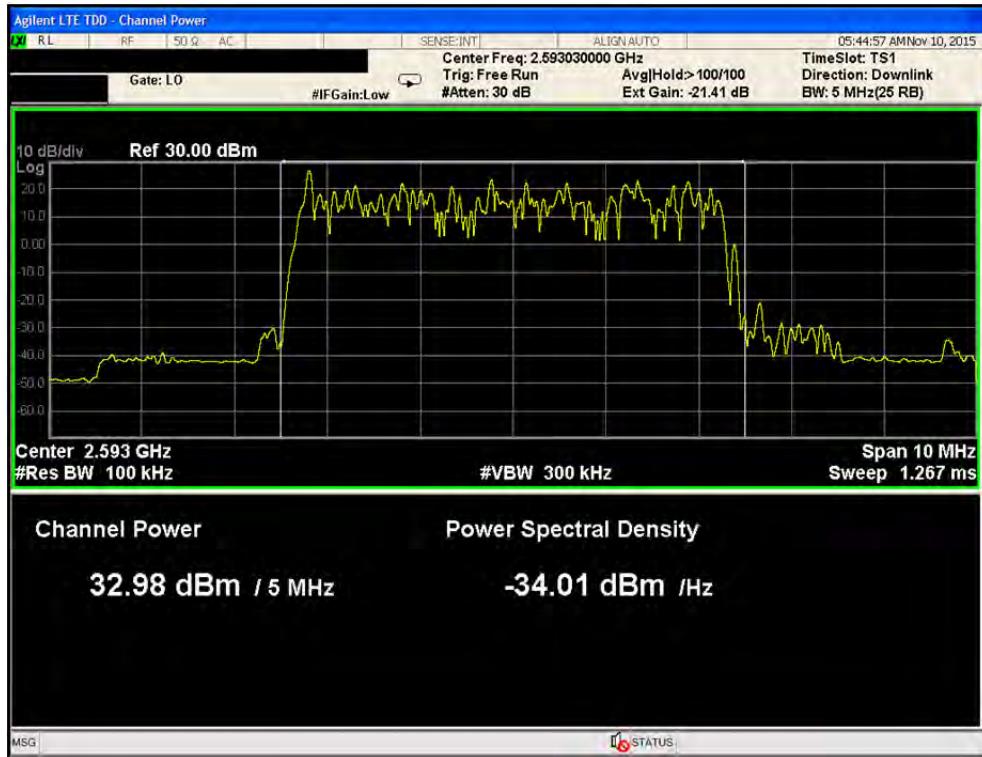
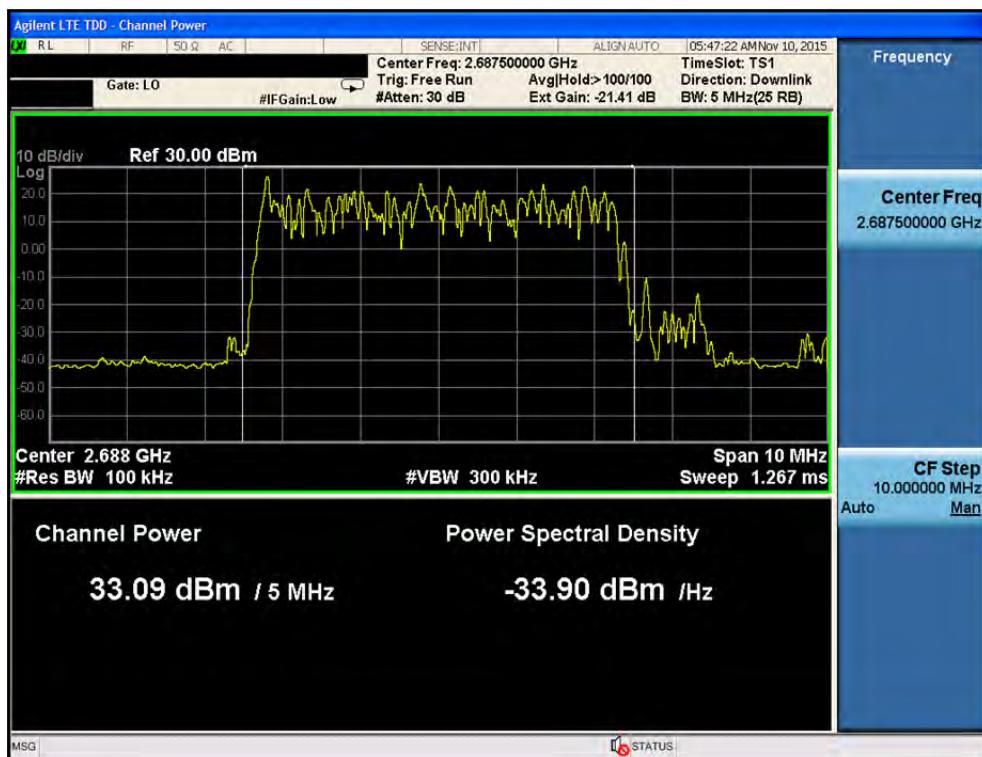
#### • Port1/ LTE 5M / 2498.5 MHz / QPSK

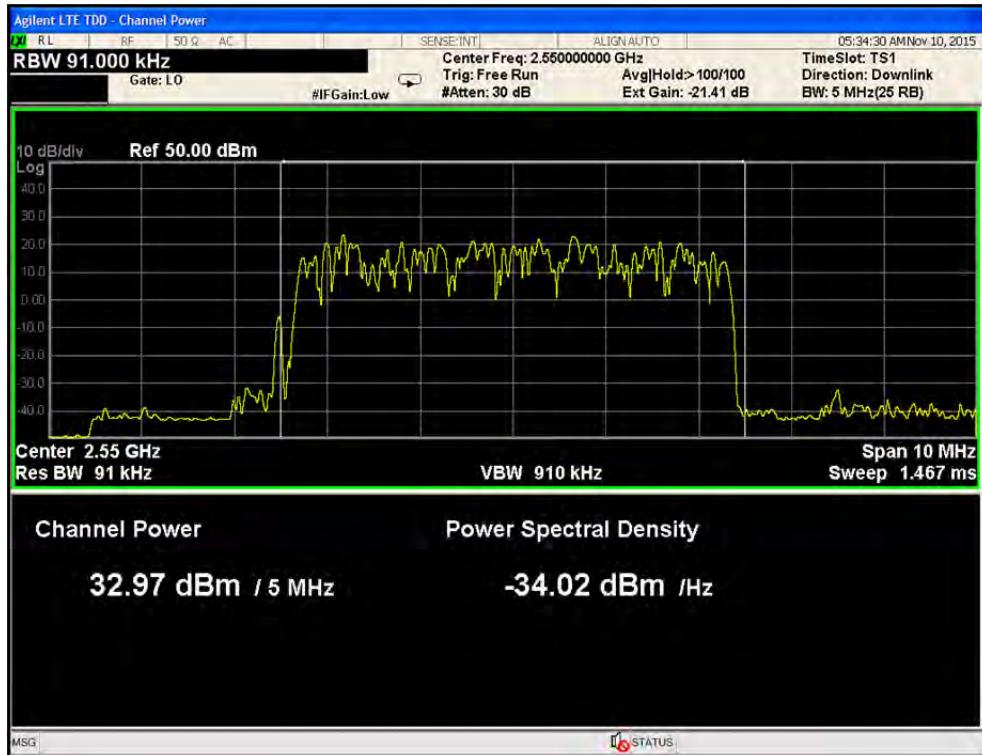
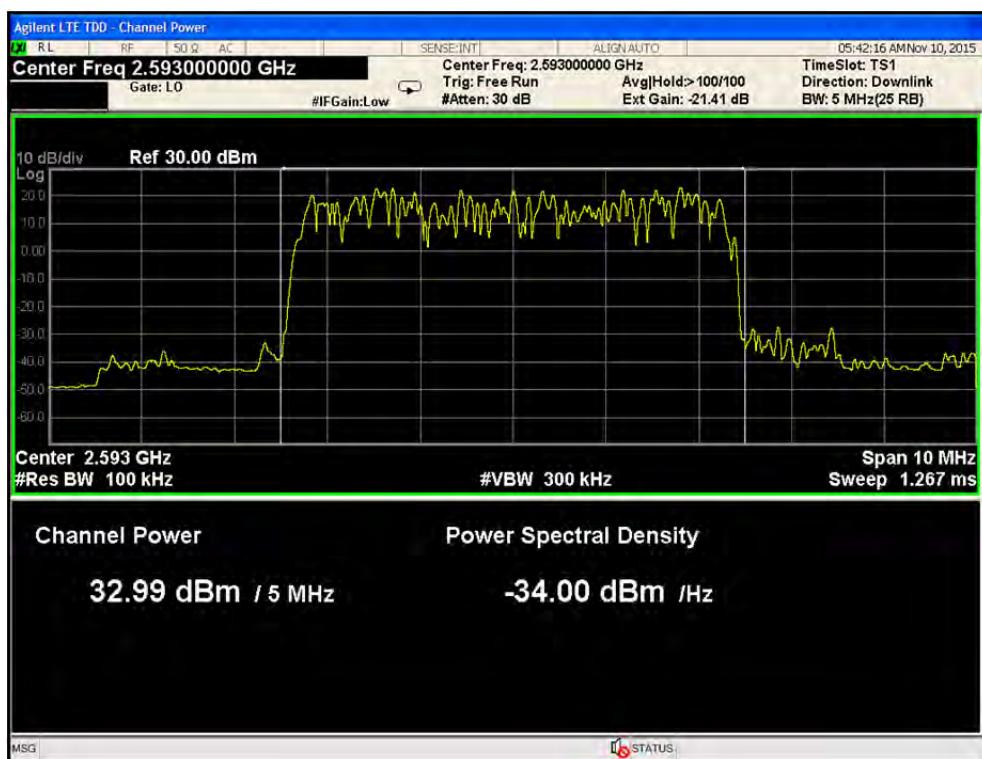


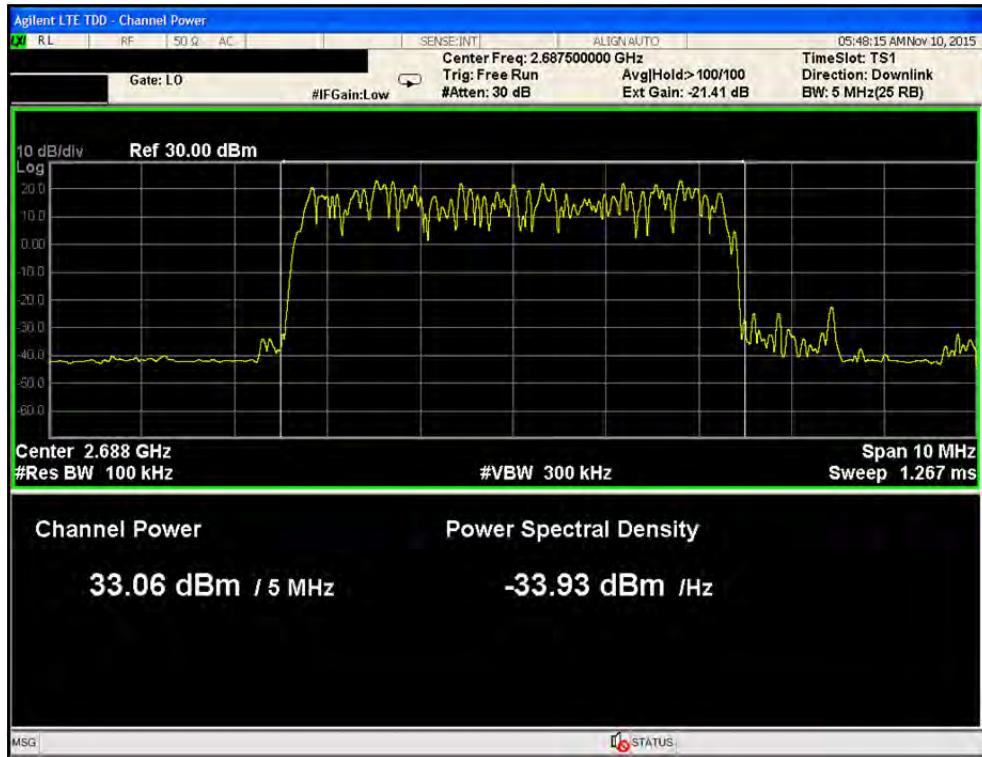
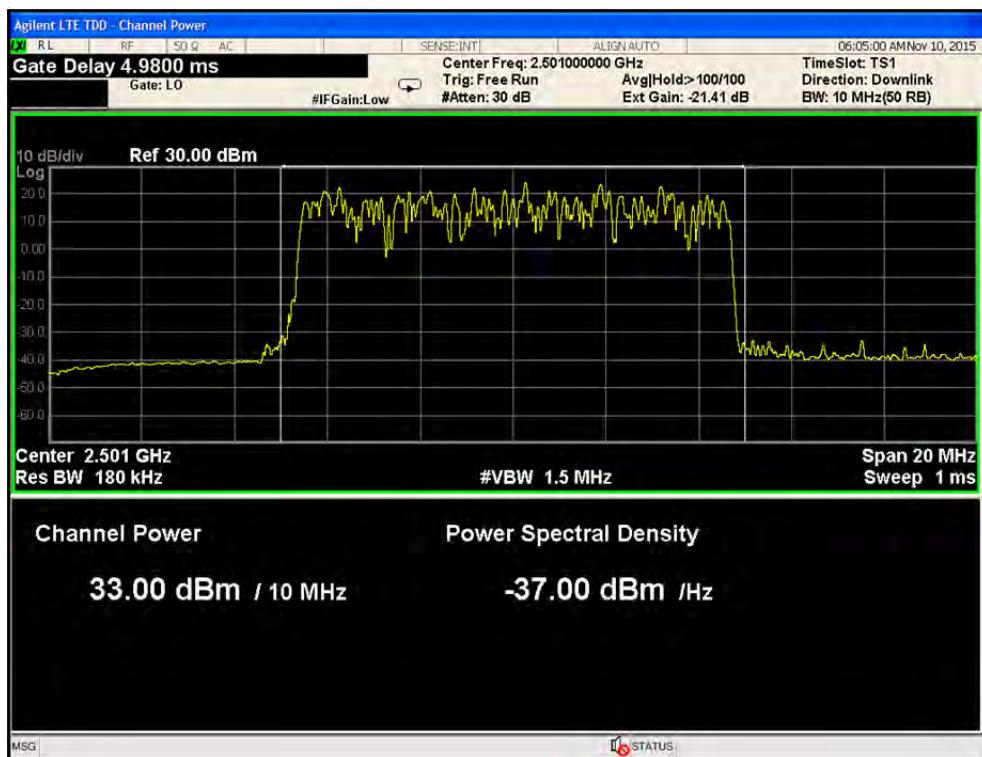
#### • Port1/ LTE 5M / 2593.0 MHz / QPSK

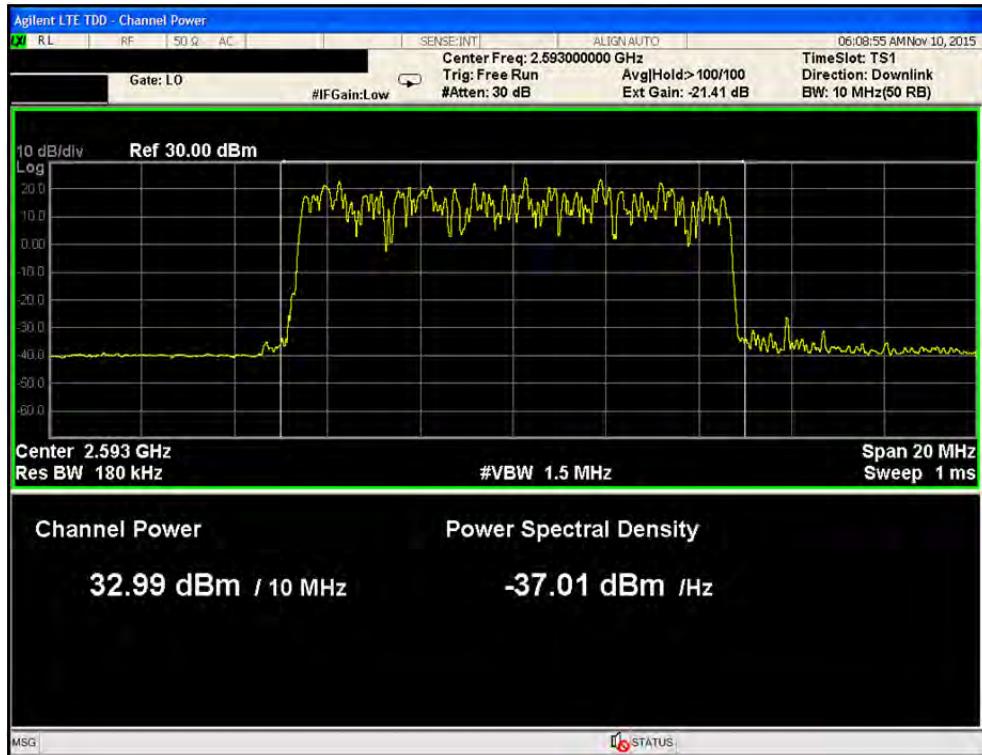
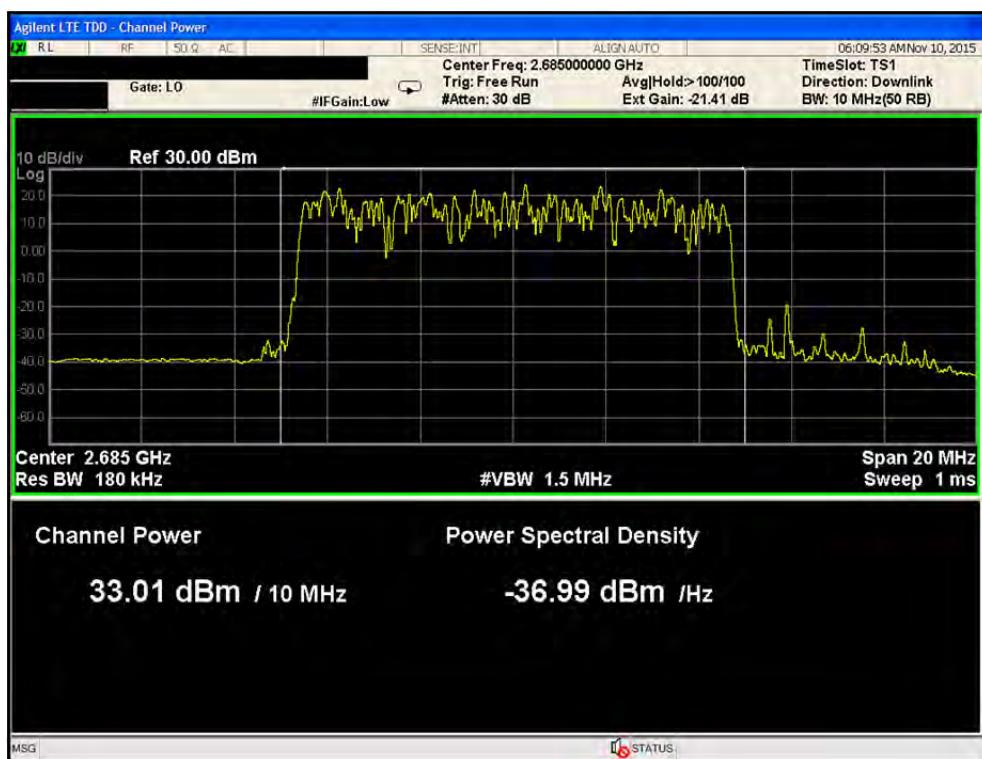


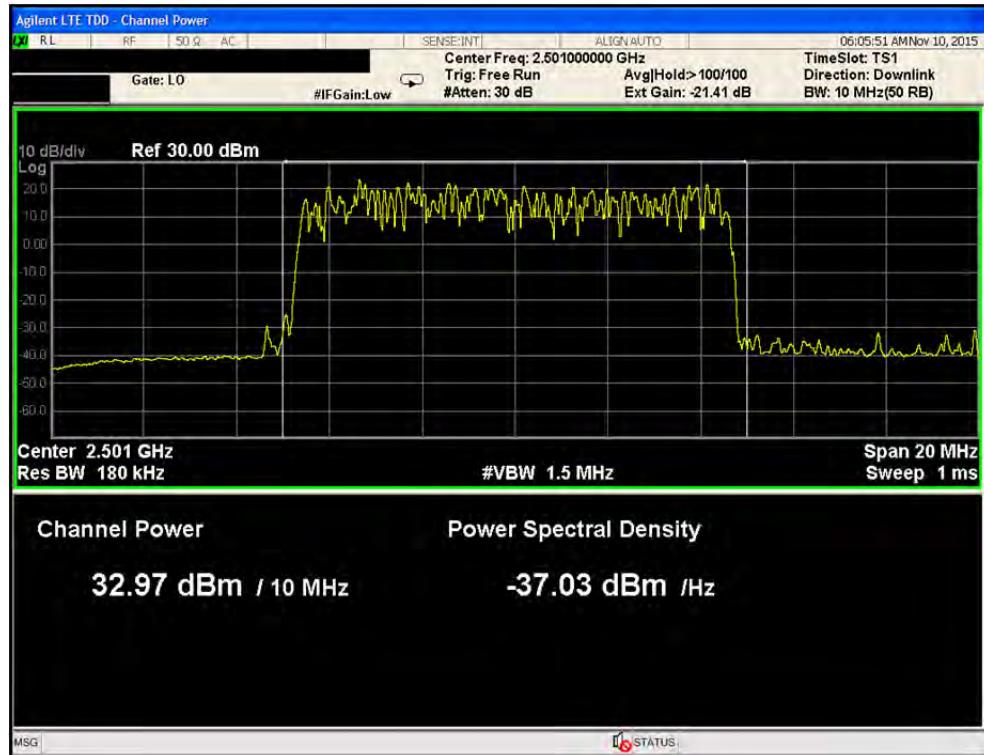
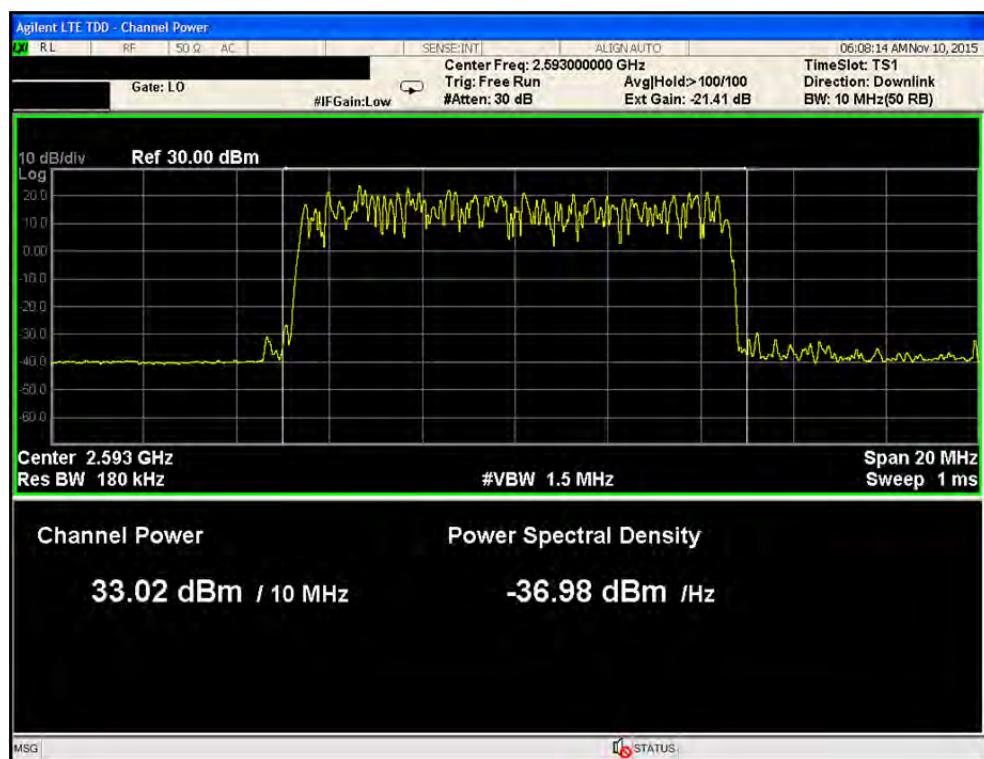
**•Port1/ LTE 5M / 2687.5 MHz / QPSK**

**•Port1/ LTE 5M / 2498.5 MHz / 16QAM**


**•Port1/ LTE 5M / 2593.0 MHz / 16QAM**

**•Port1/ LTE 5M / 2687.5 MHz / 16QAM**


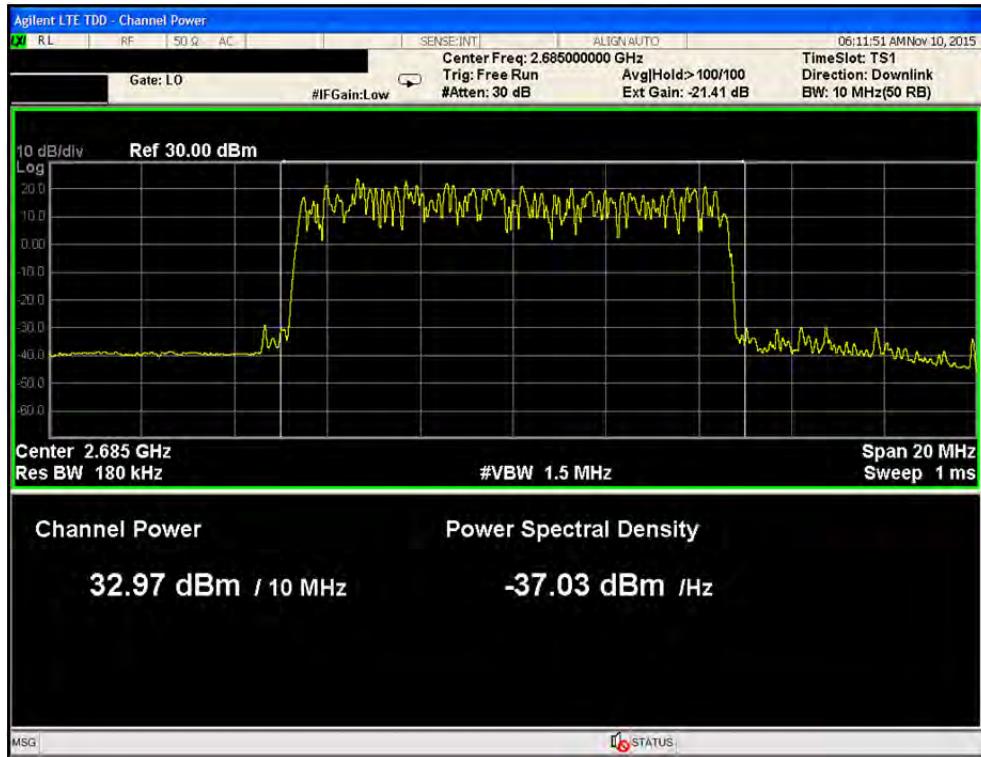
**•Port1/ LTE 5M / 2498.5 MHz / 64QAM****•Port1/ LTE 5M / 2593.0 MHz / 64QAM**

**•Port1/ LTE 5M / 2687.5 MHz / 64QAM****•Port1/ LTE 10M / 2501.0 MHz / QPSK**

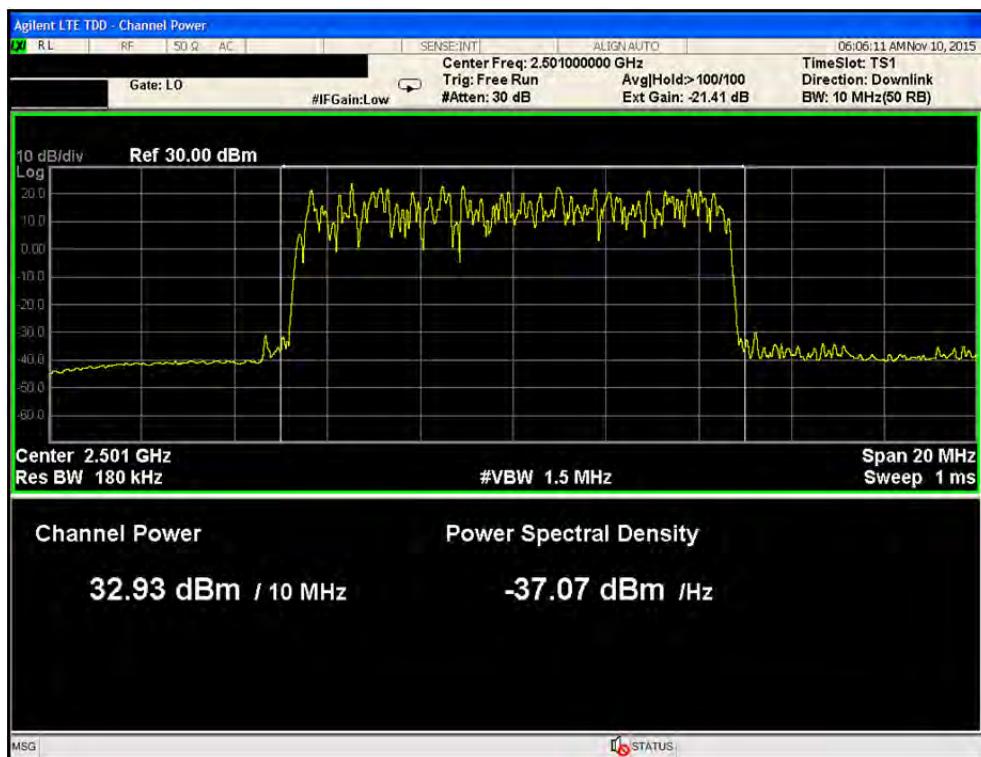
**•Port1/ LTE 10M / 2593.0 MHz / QPSK****•Port1/ LTE 10M / 2685.0 MHz / QPSK**

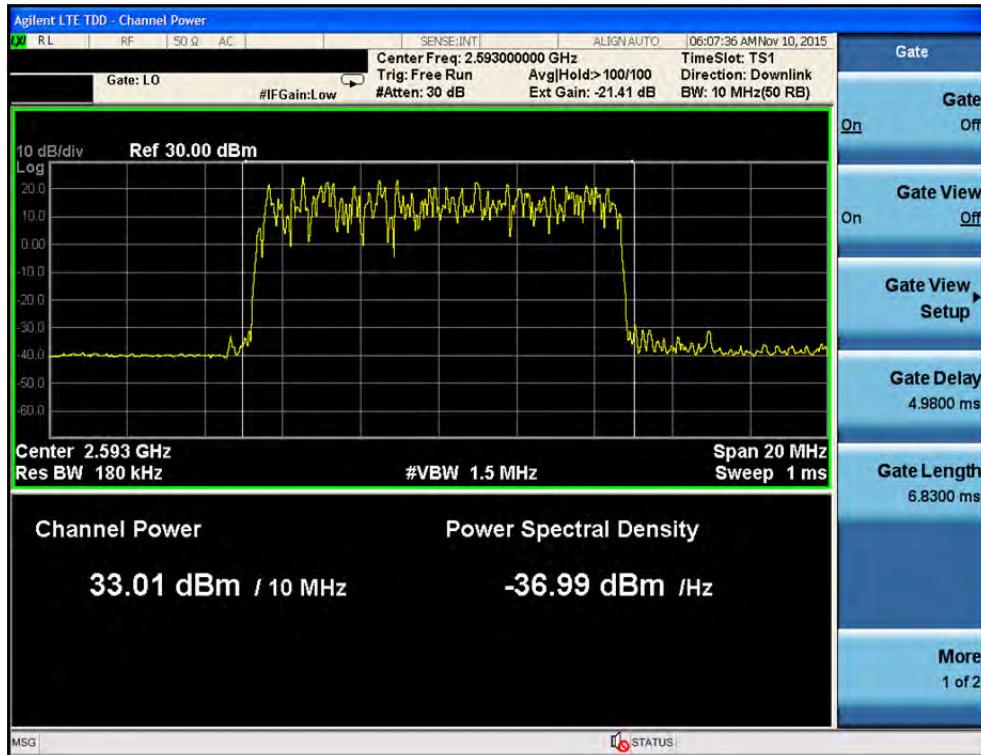
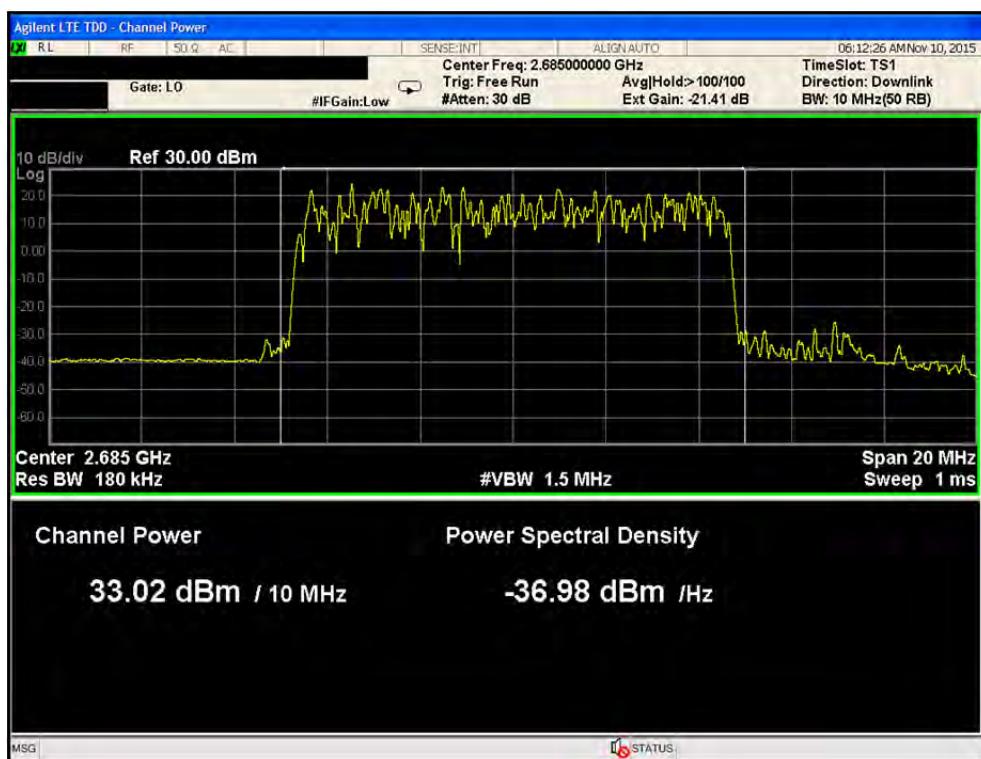
**•Port1/ LTE 10M / 2501.0 MHz / 16QAM****•Port1/ LTE 10M / 2593.0 MHz / 16QAM**

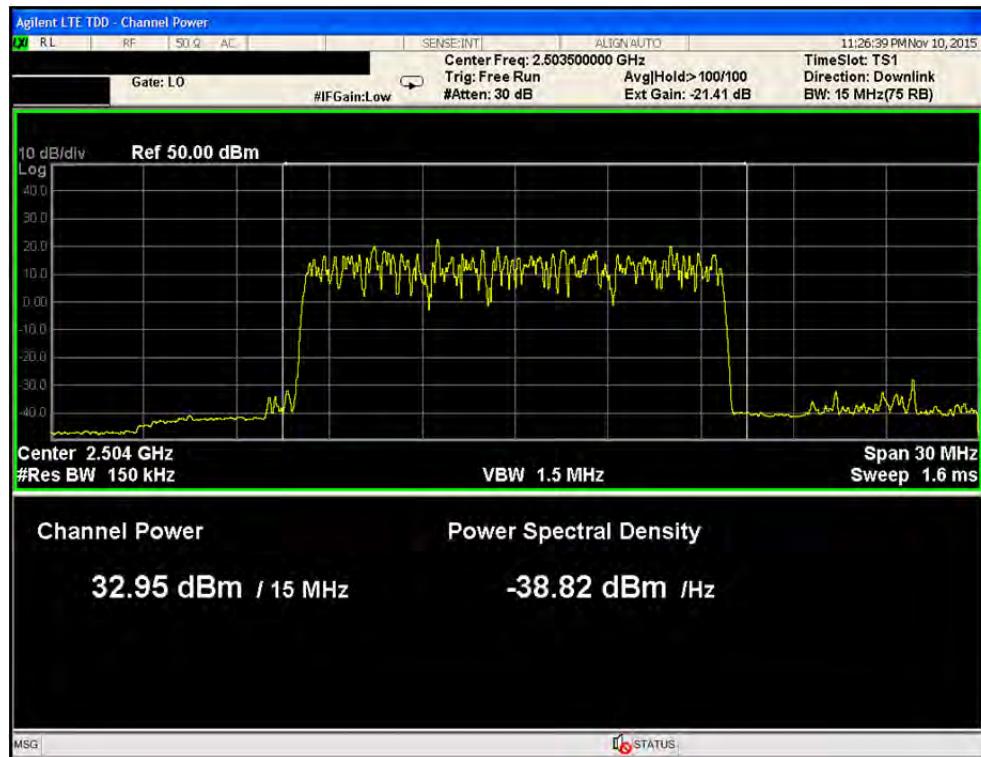
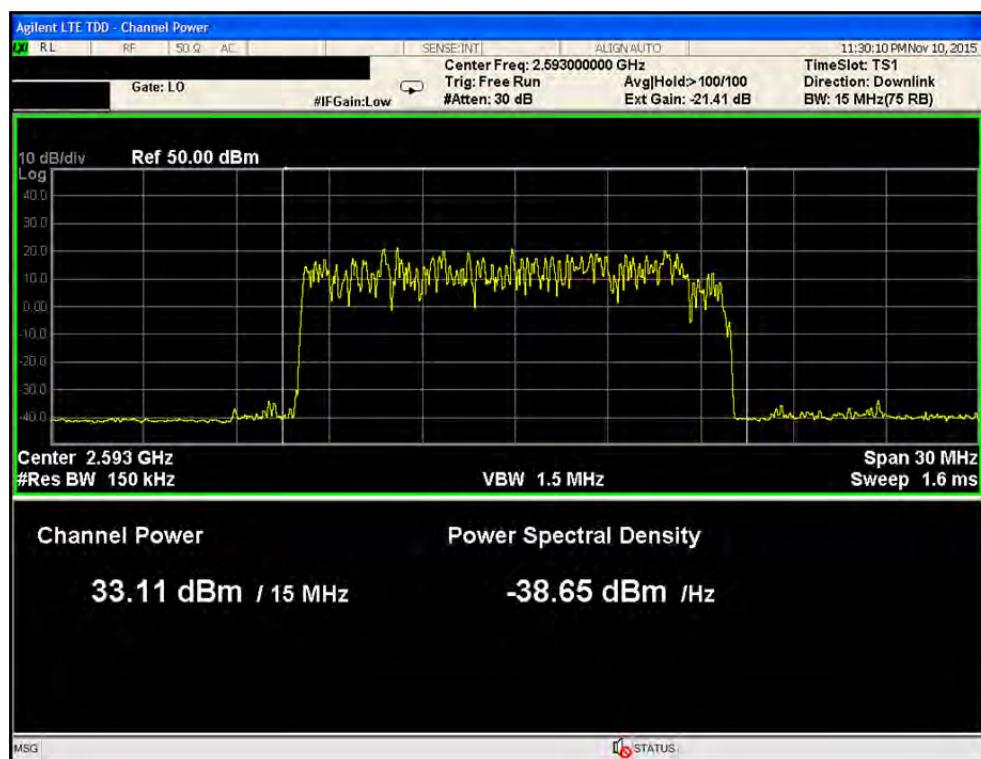
- Port1/ LTE 10M / 2685.0 MHz / 16QAM

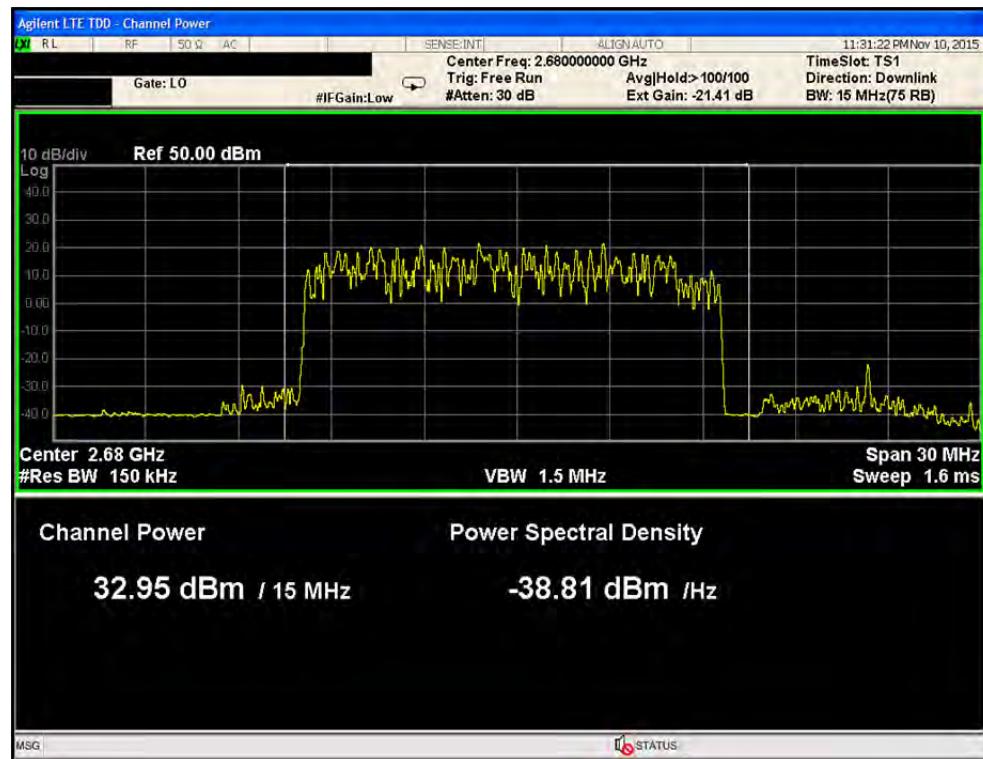
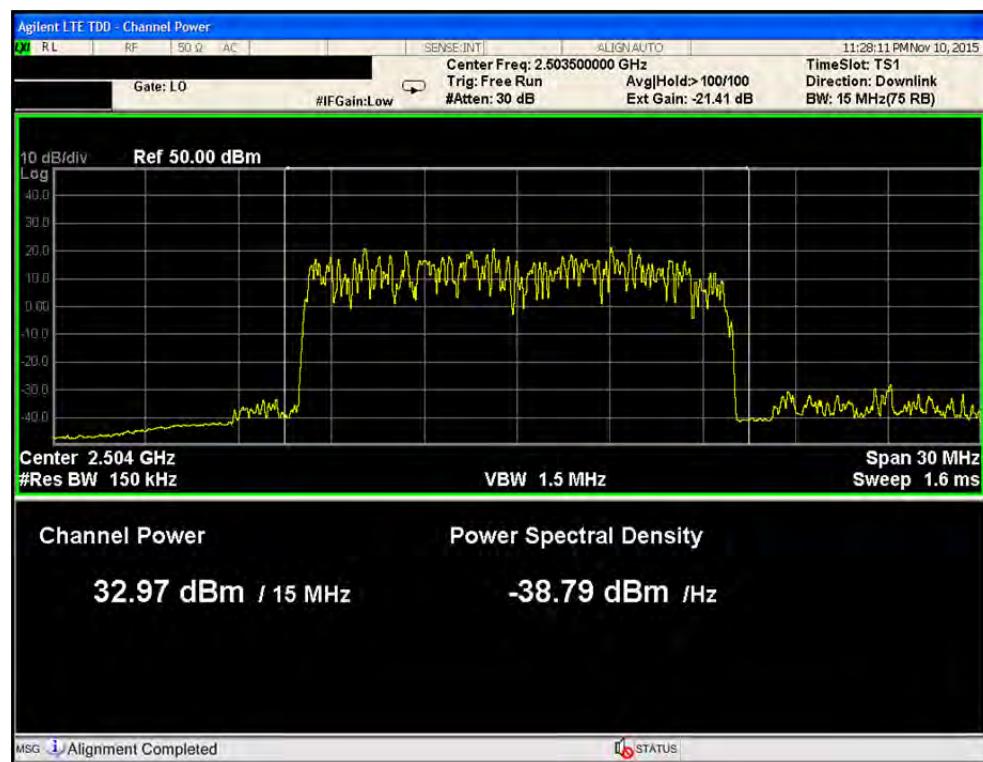


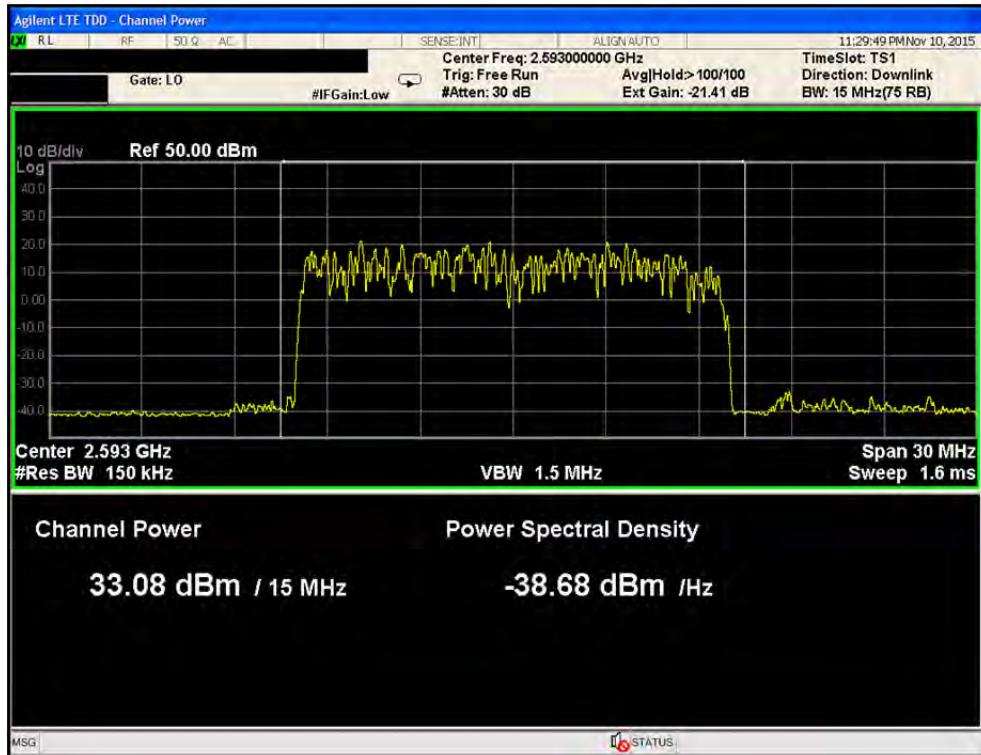
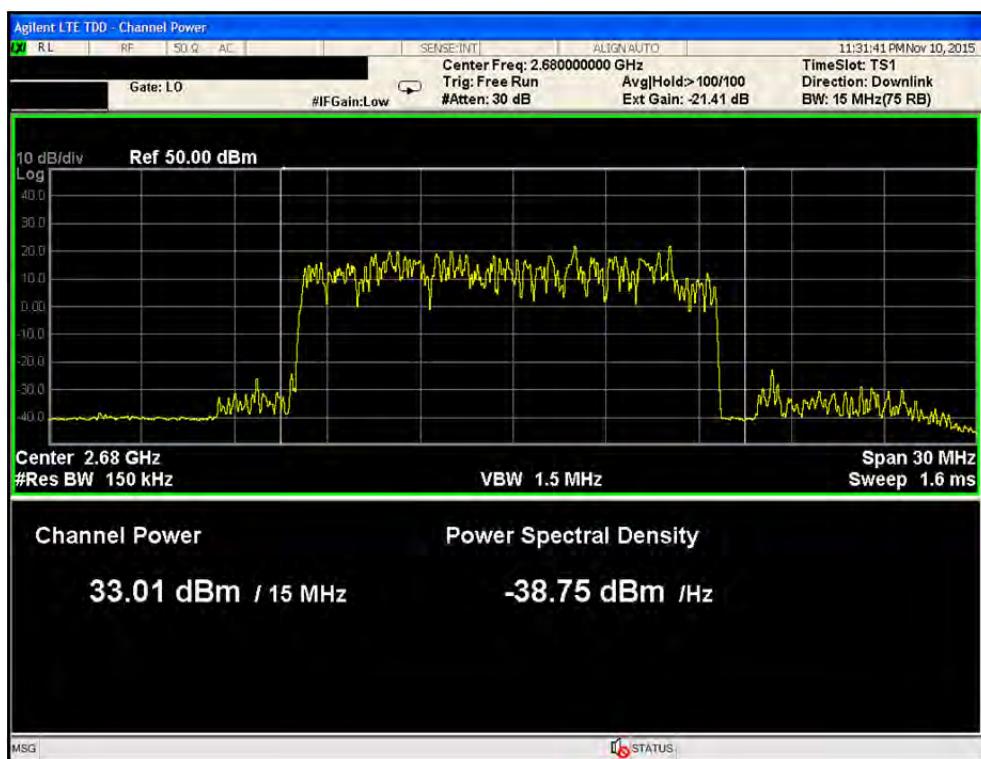
- Port1/ LTE 10M / 2501.0 MHz / 64QAM

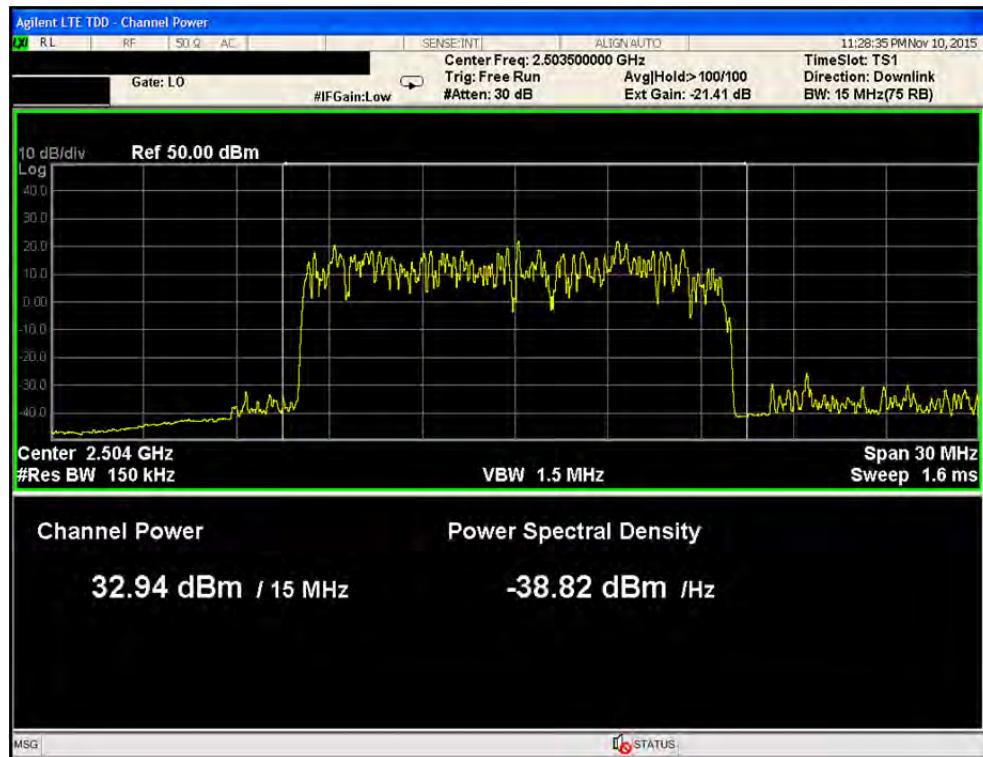
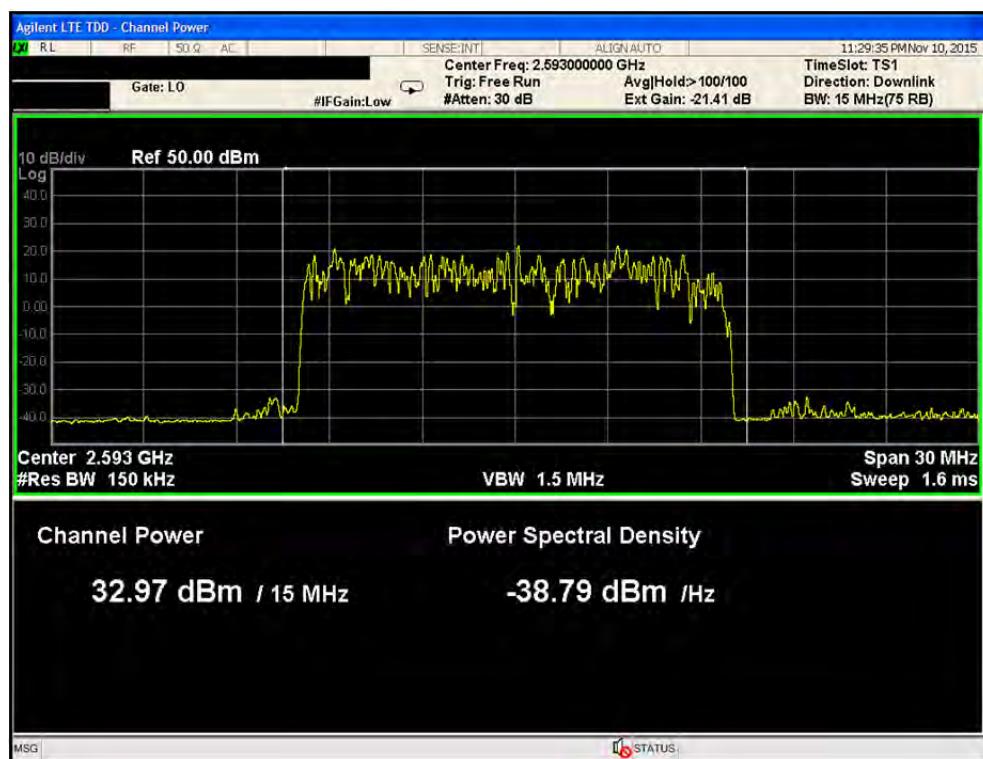


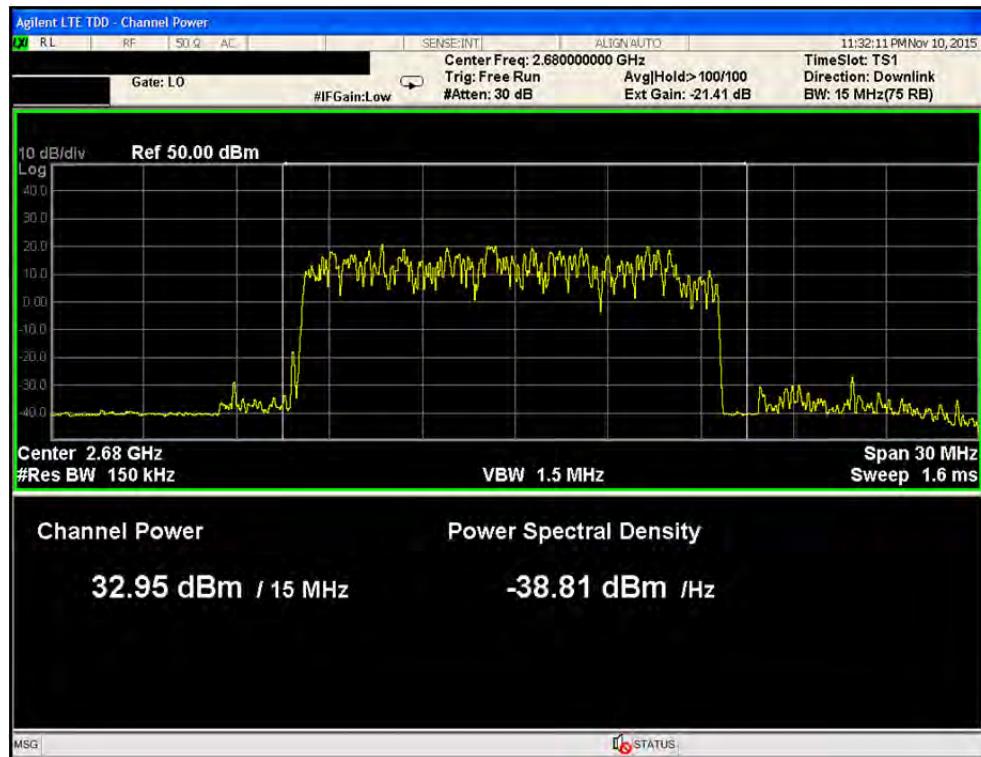
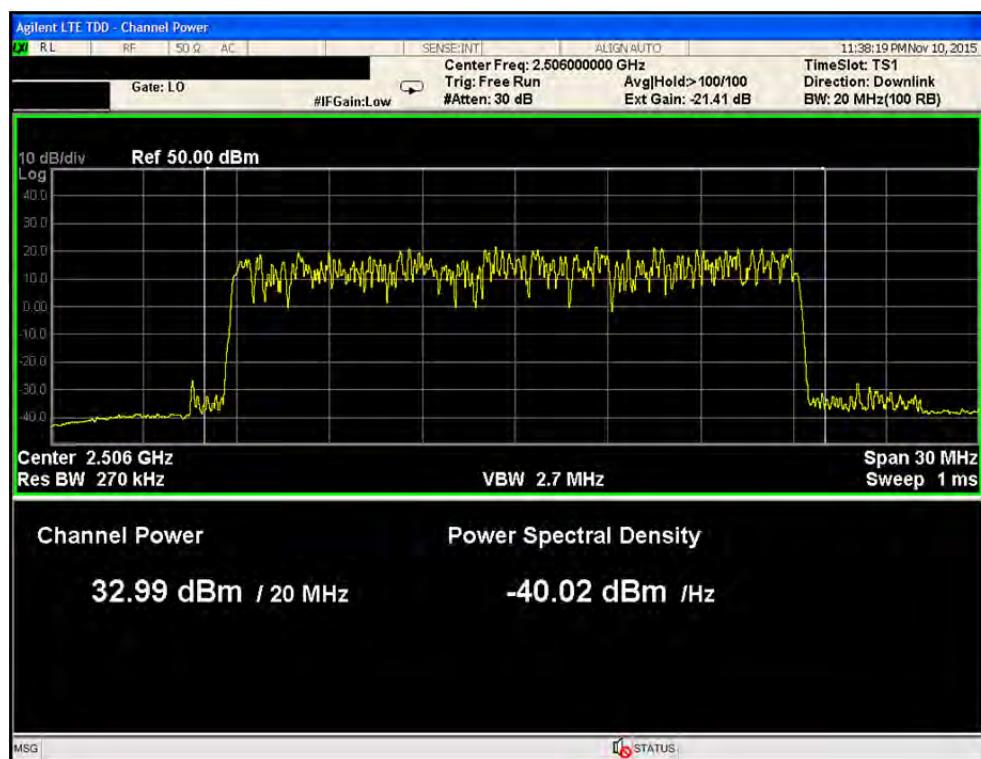
**•Port1/ LTE 10M / 2593.0 MHz / 64QAM**

**•Port1/ LTE 10M / 2685.0 MHz / 64QAM**


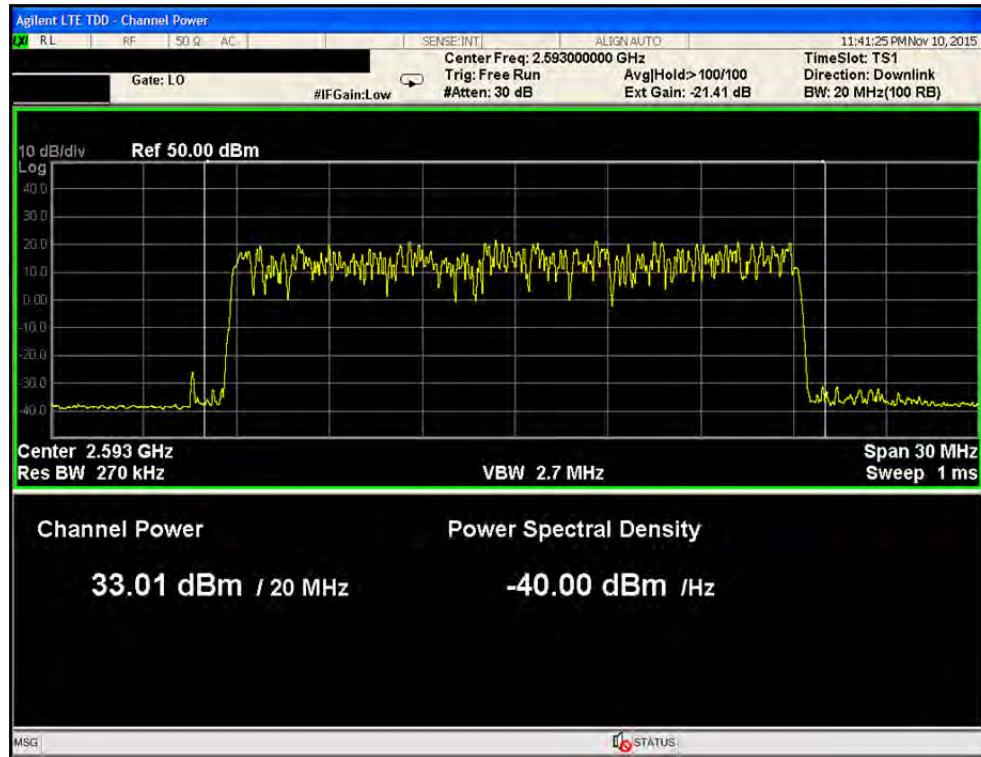
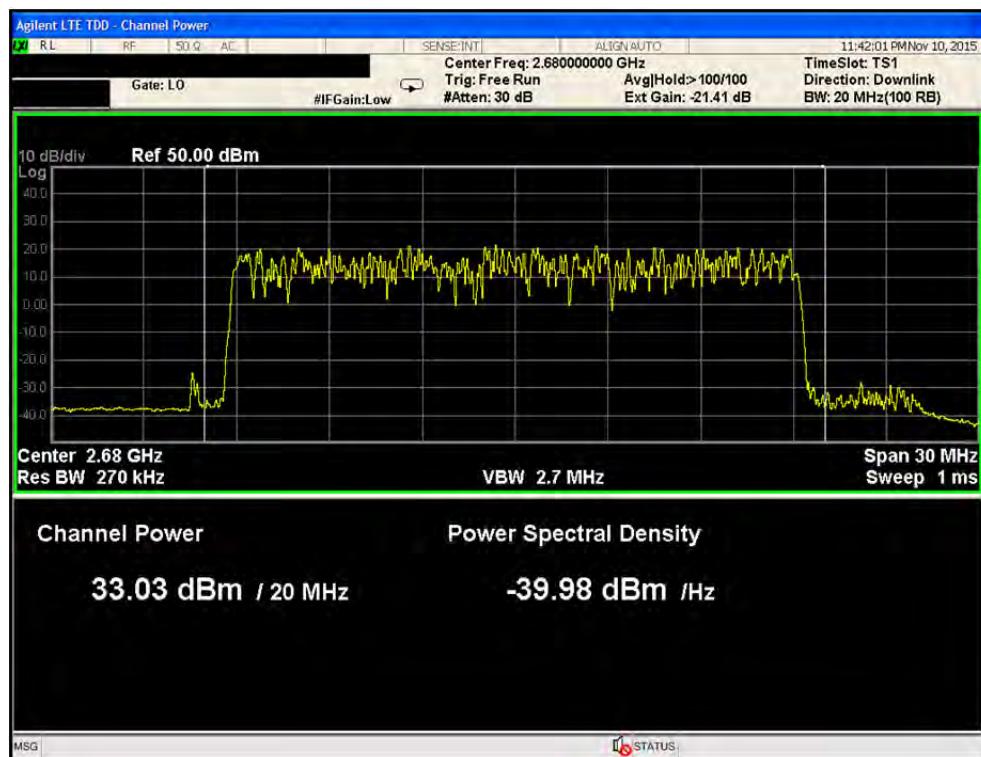
**•Port1/ LTE 15M / 2503.5 MHz / QPSK****•Port1/ LTE 15M / 2593.0 MHz / QPSK**

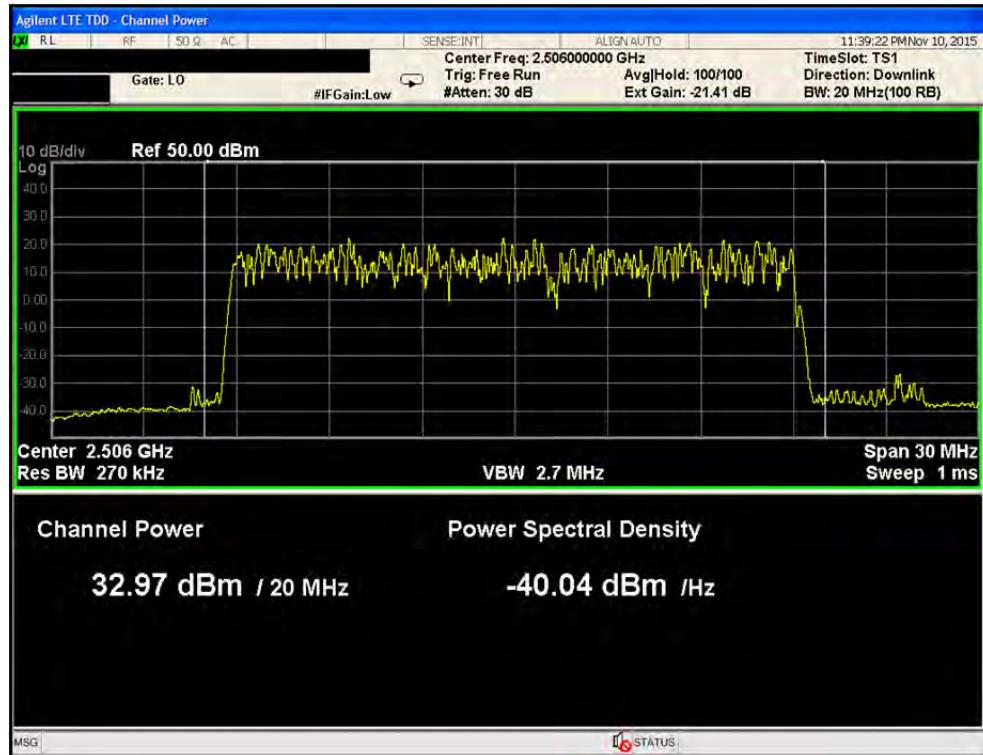
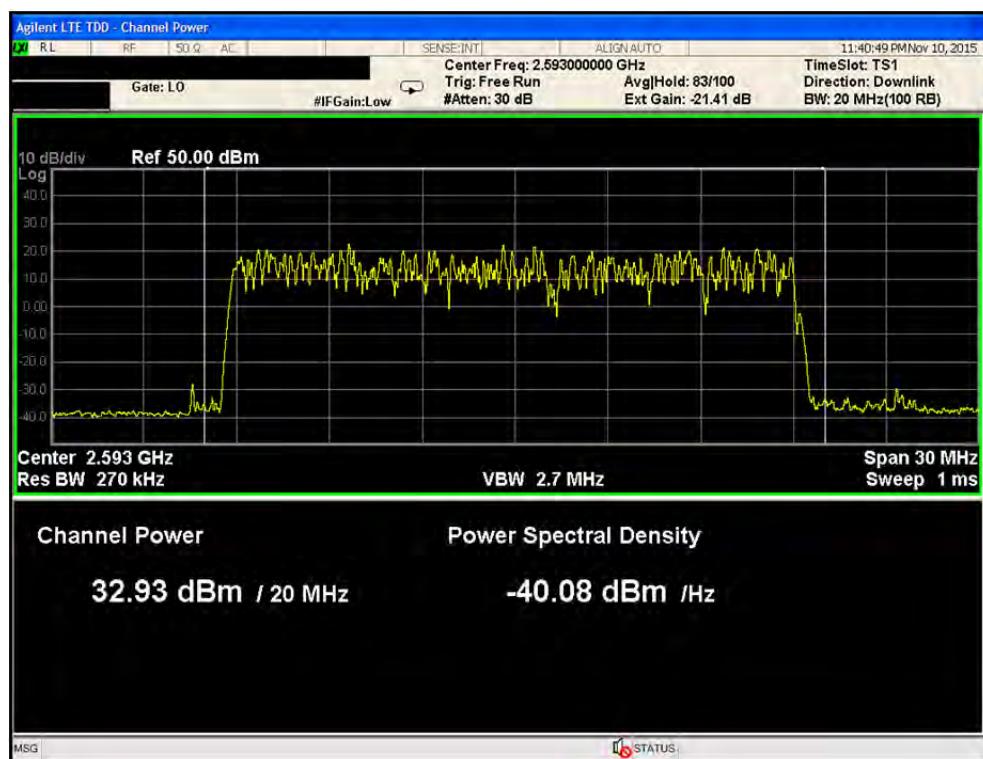
**•Port1/ LTE 15M / 2682.5 MHz / QPSK****•Port1/ LTE 15M / 2503.5 MHz / 16QAM**

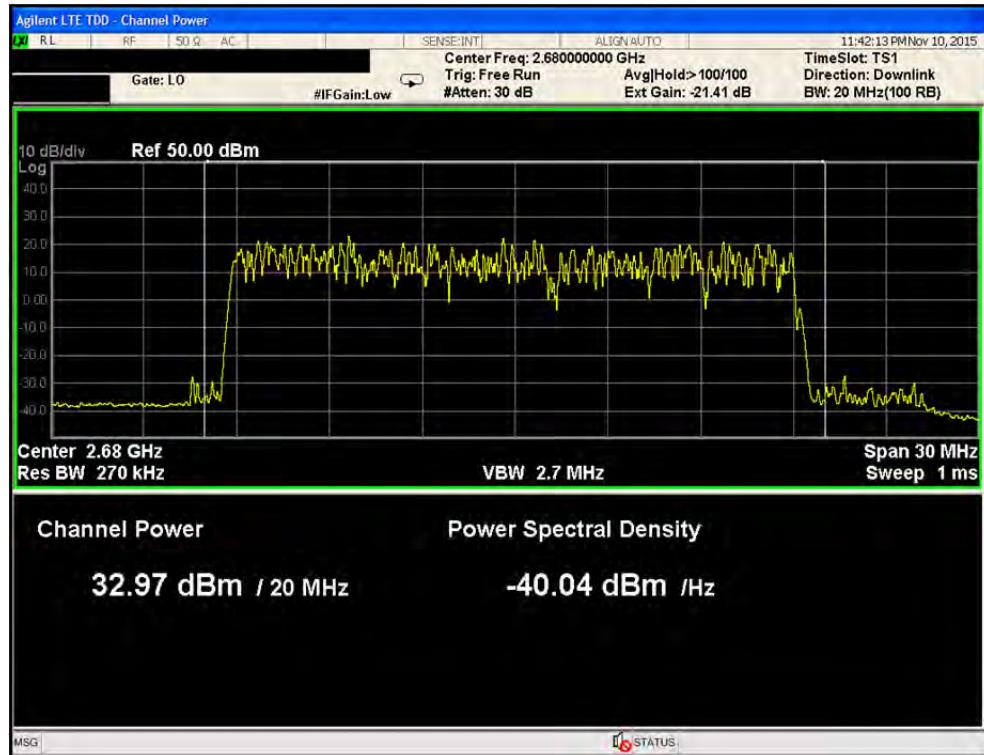
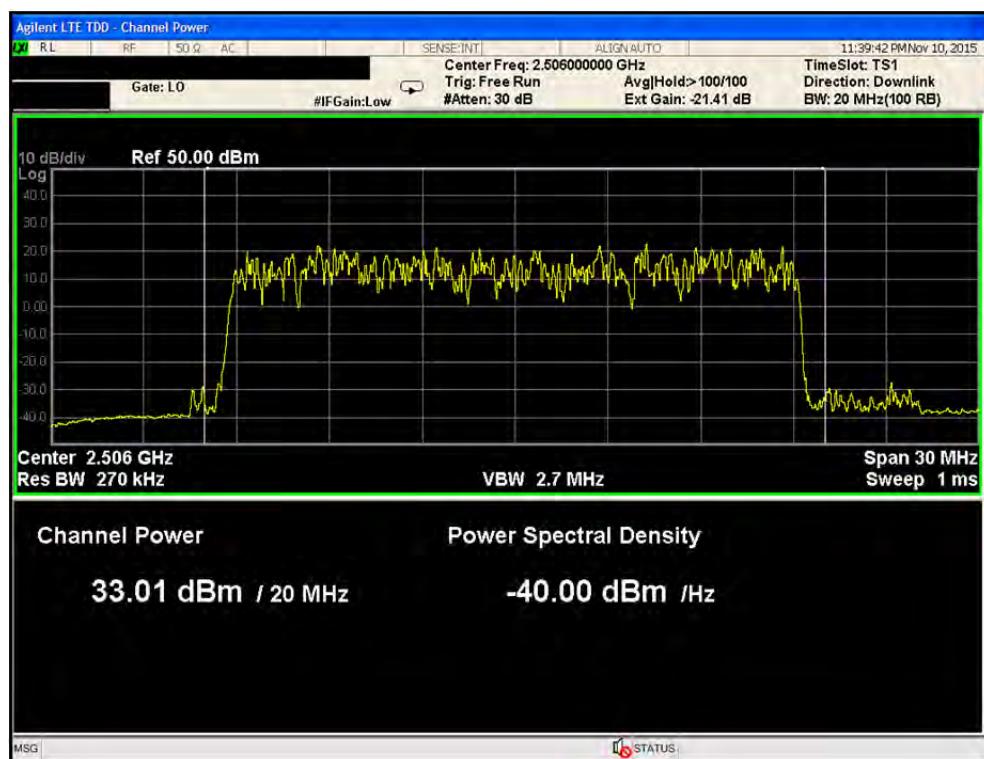
**•Port1/ LTE 15M / 2593.0 MHz / 16QAM****•Port1/ LTE 15M / 2682.5 MHz / 16QAM**

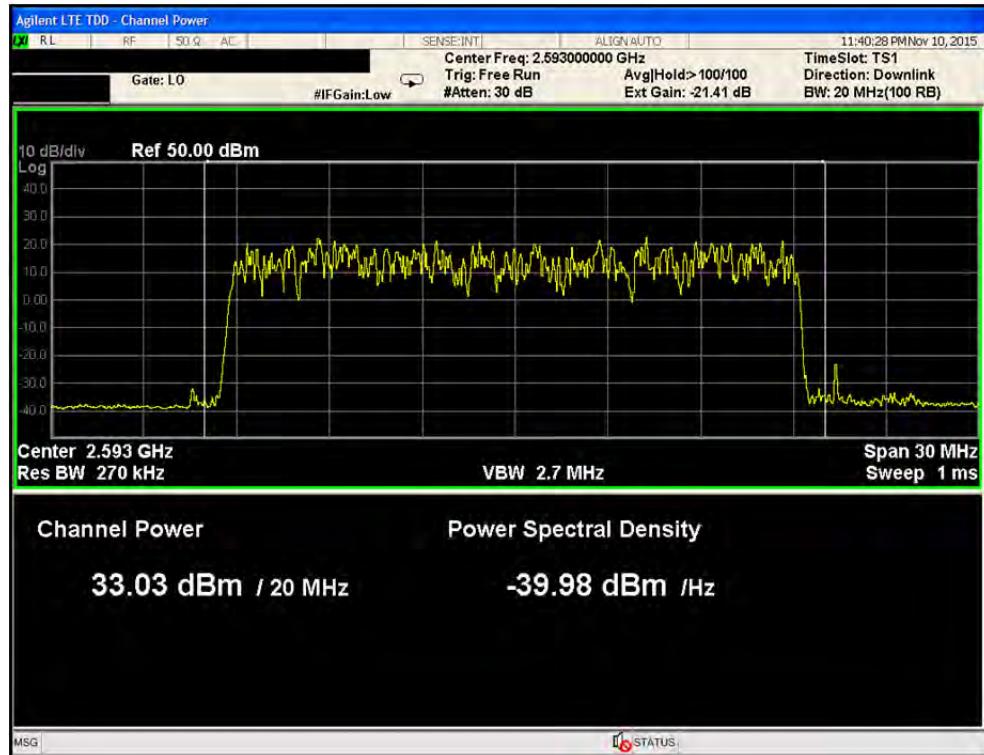
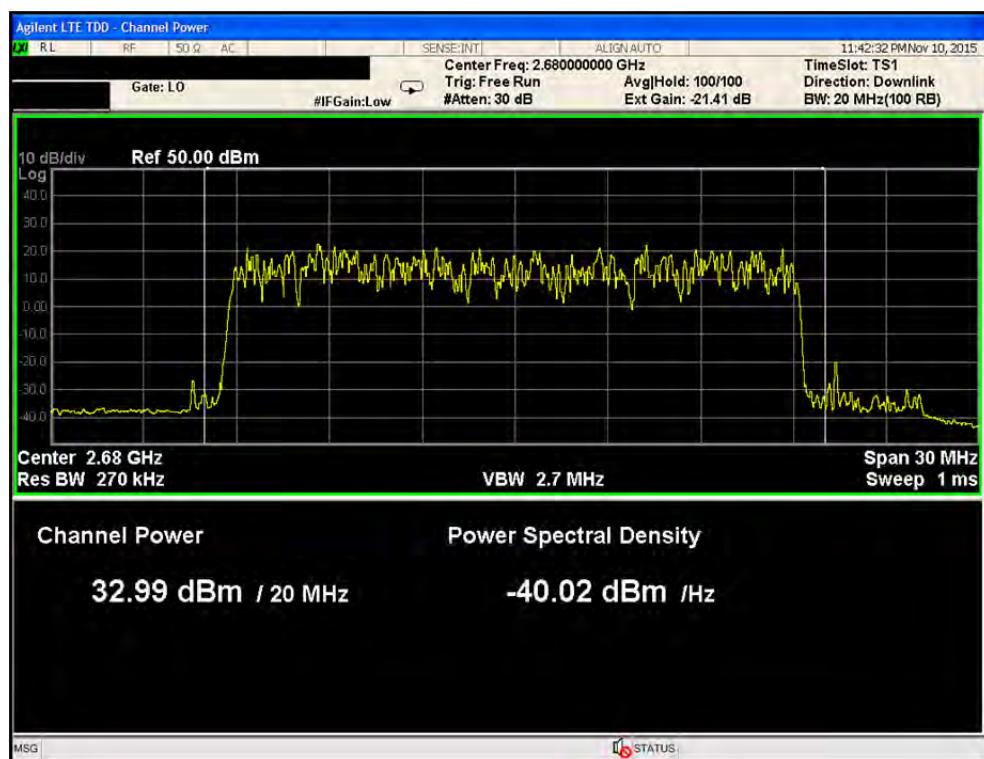
**•Port1/ LTE 15M / 2503.5 MHz / 64QAM****•Port1/ LTE 15M / 2593.0 MHz / 64QAM**

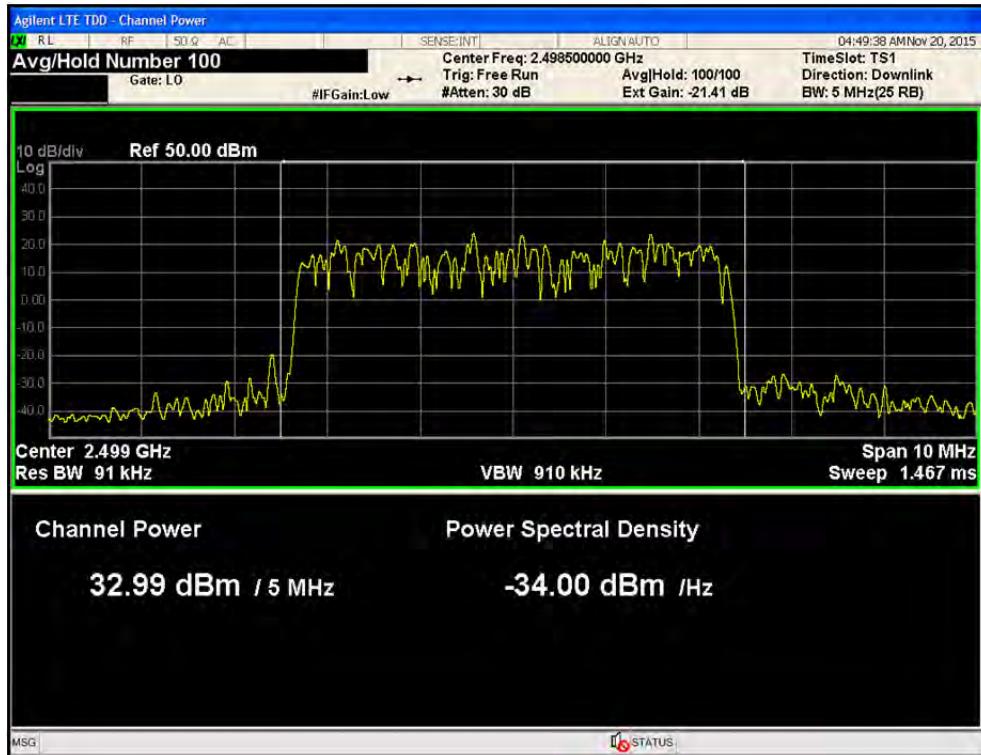
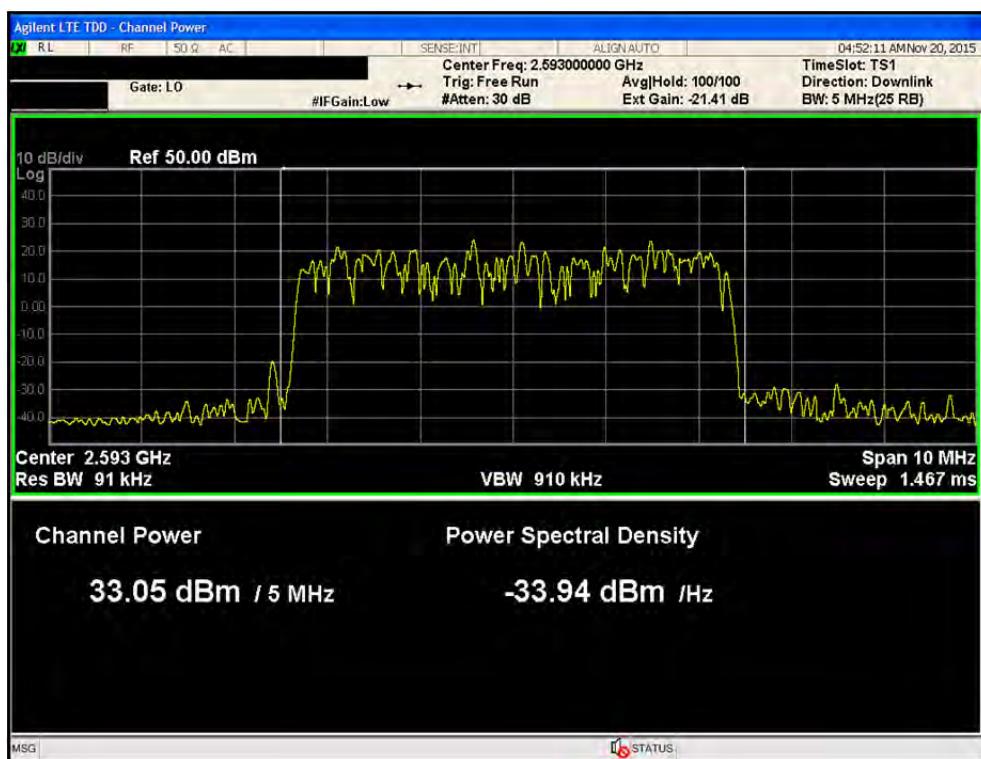
**•Port1/ LTE 15M / 2682.5 MHz / 64QAM****•Port1/ LTE 20M / 2506.0 MHz / QPSK**

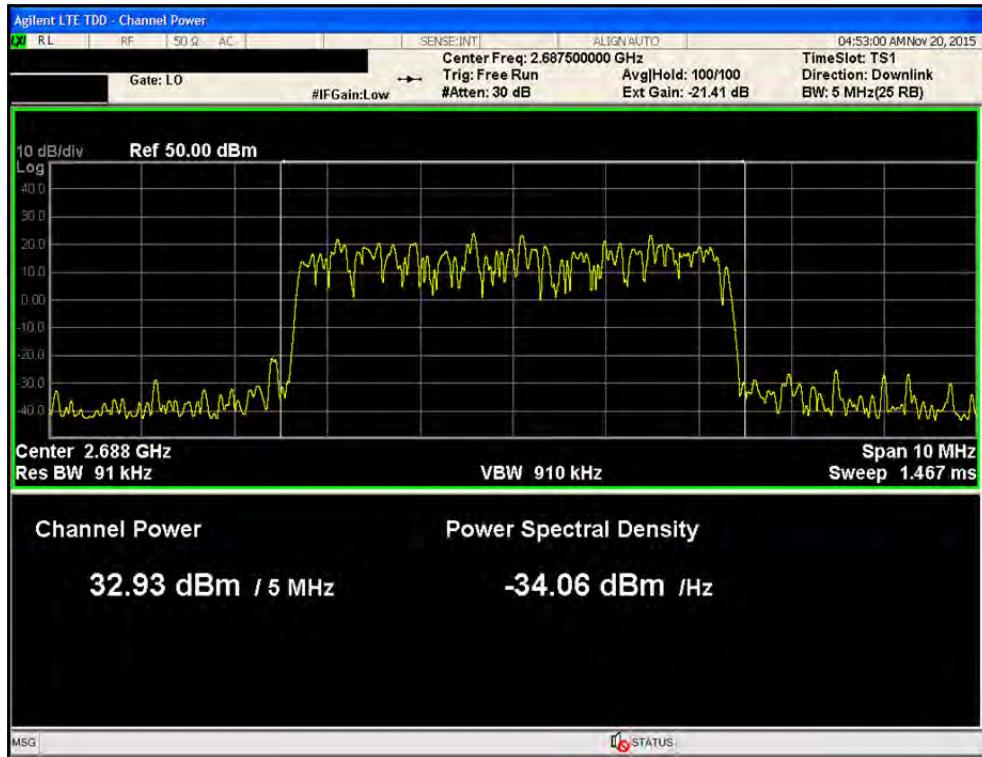
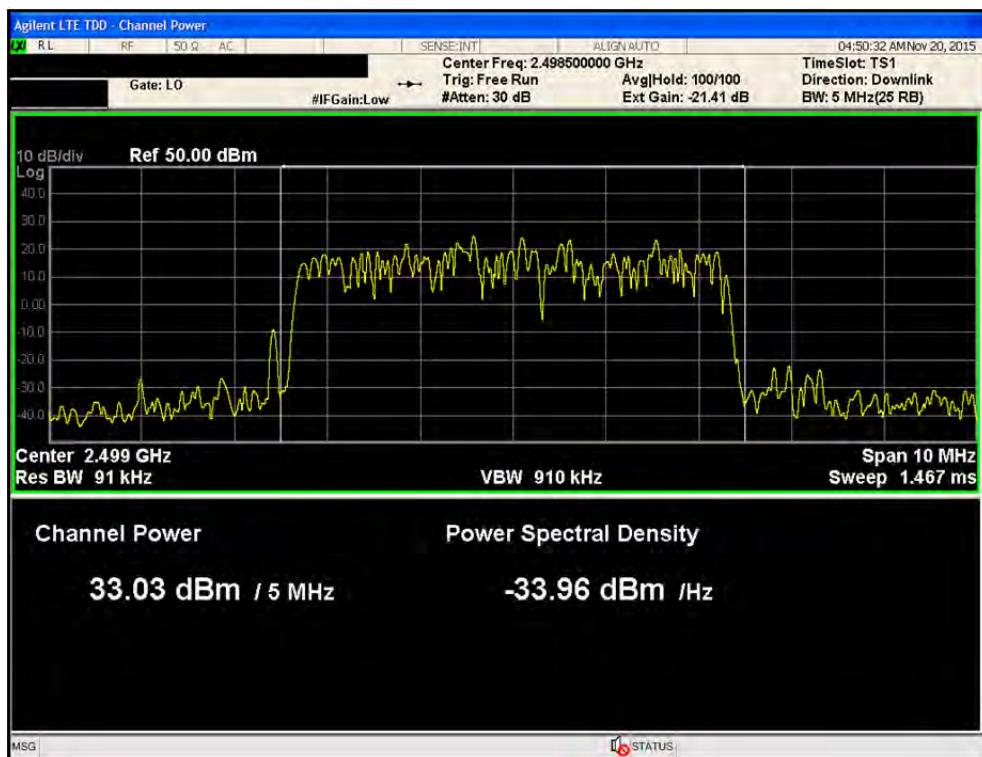
**•Port1/ LTE 20M / 2593.0 MHz / QPSK****•Port1/ LTE 20M / 2680.0 MHz / QPSK**

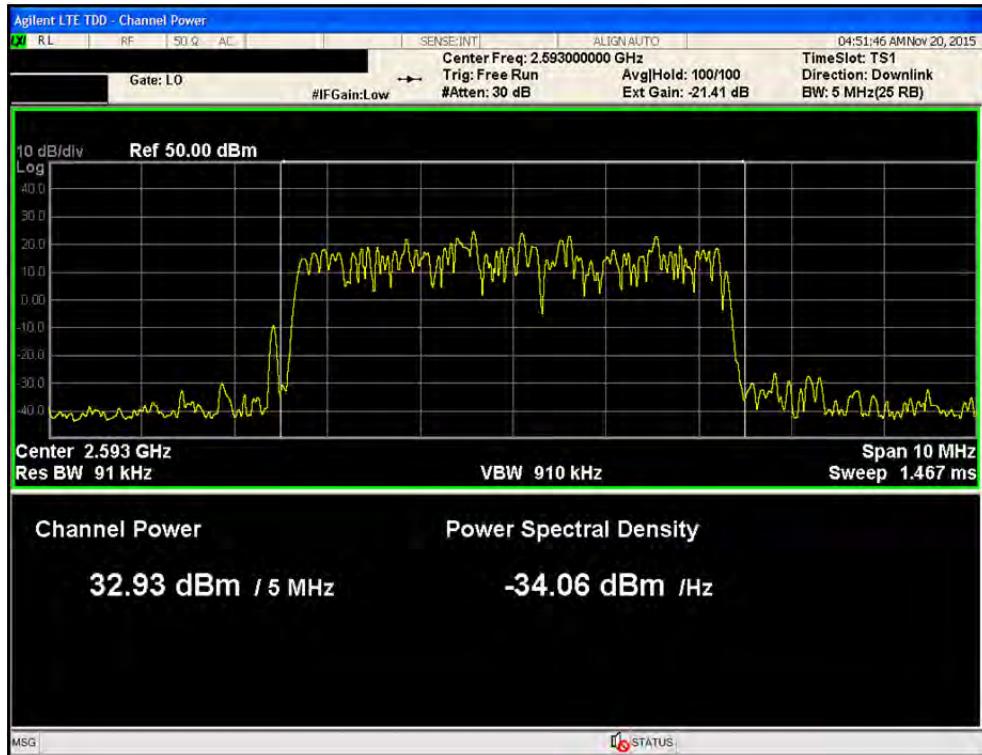
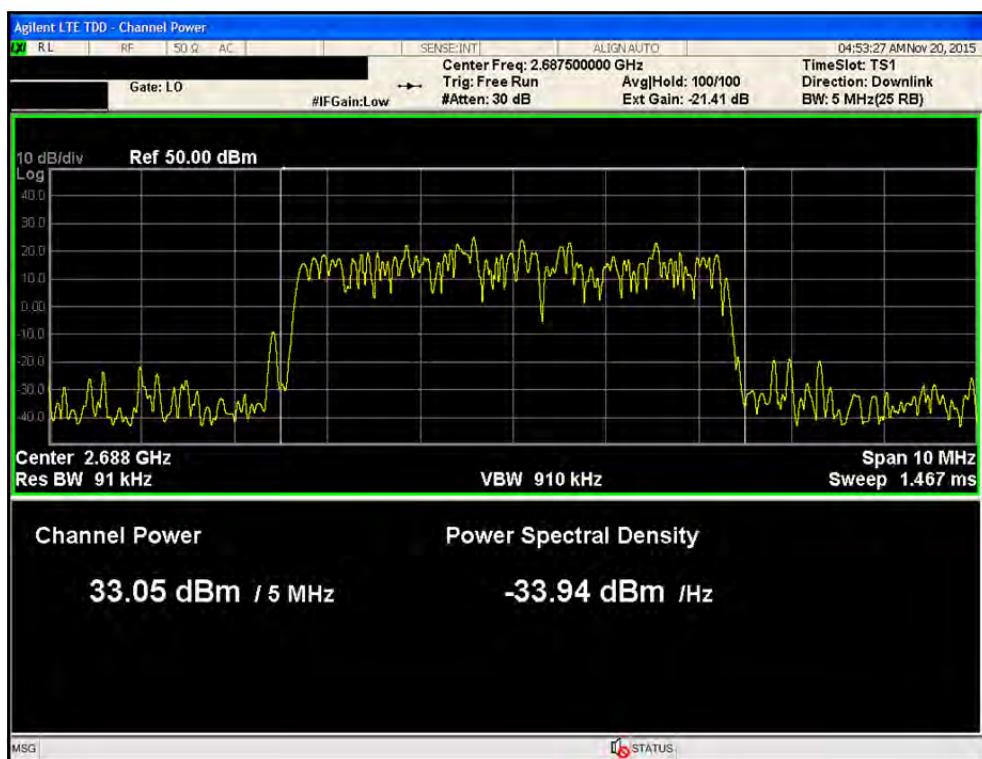
**•Port1/ LTE 20M / 2506.0 MHz / 16QAM****•Port1/ LTE 20M / 2593.0 MHz / 16QAM**

**•Port1/ LTE 20M / 2680.0 MHz / 16QAM****•Port1/ LTE 20M / 2506.0 MHz / 64QAM**

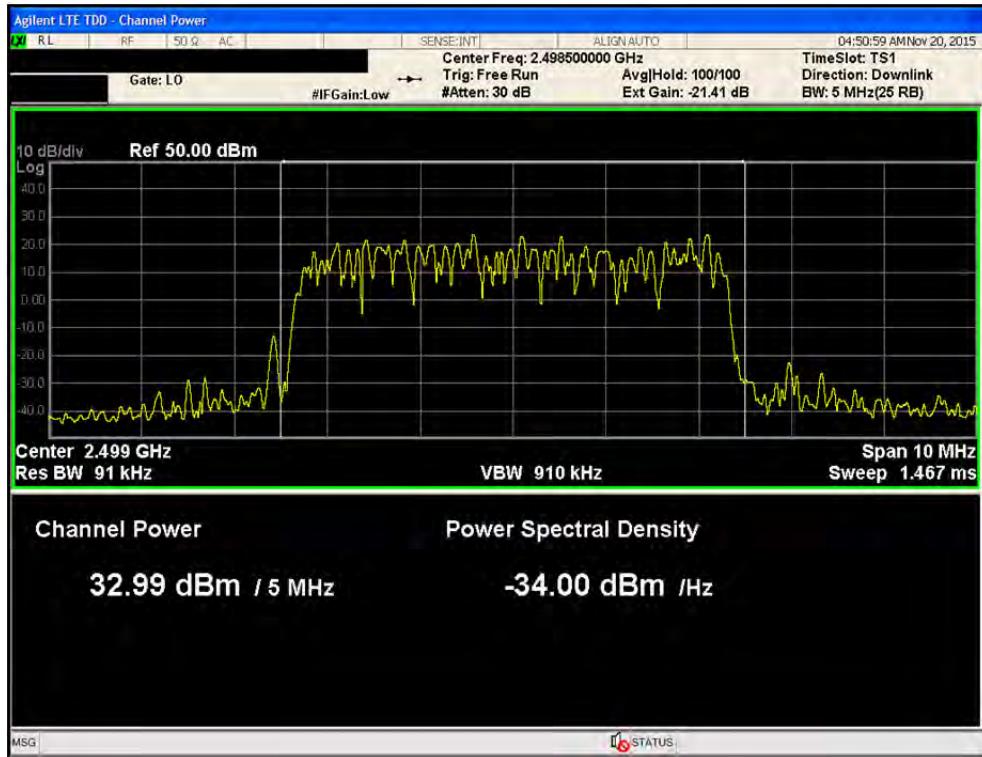
**•Port1/ LTE 20M / 2593.0 MHz / 64QAM****•Port1/ LTE 20M / 2680.0 MHz / 64QAM**

**•Port2/ LTE 5M / 2498.5 MHz / QPSK****•Port2/ LTE 5M / 2593.0 MHz / QPSK**

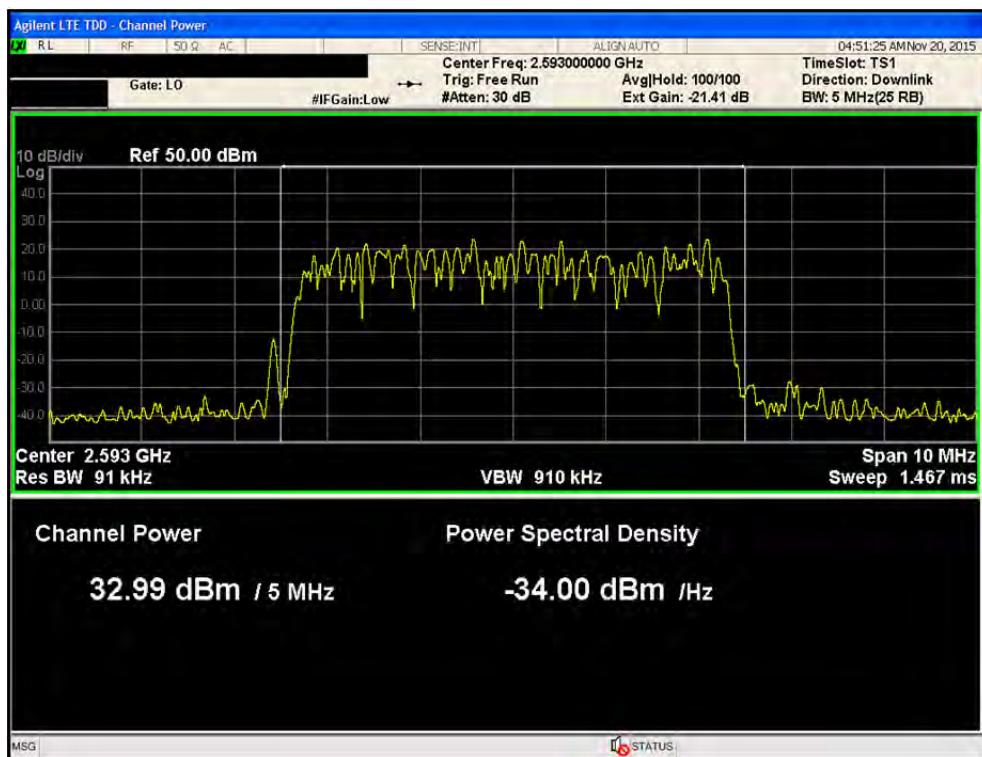
**•Port2/ LTE 5M / 2687.5 MHz / QPSK**

**•Port2/ LTE 5M / 2498.5 MHz / 16QAM**


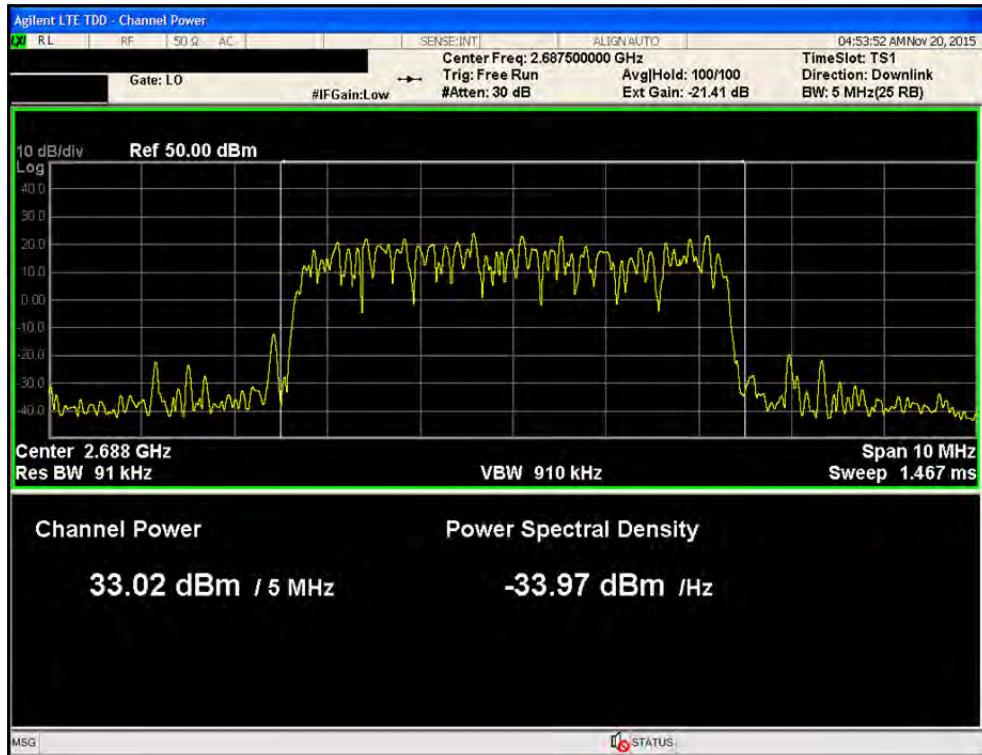
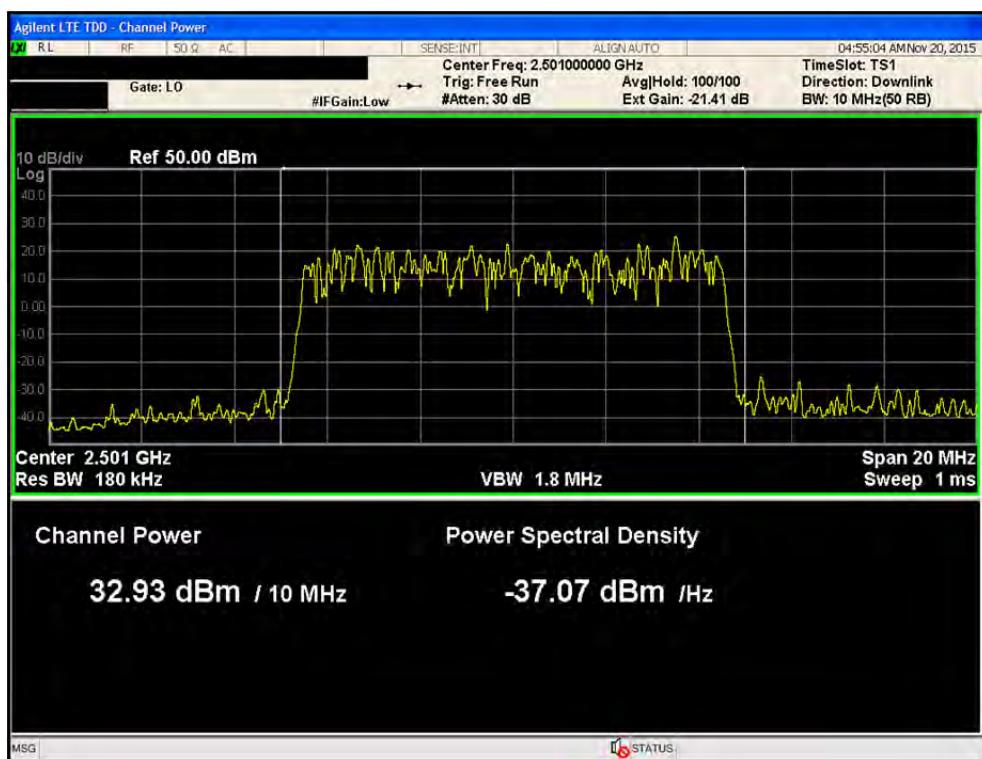
**•Port2/ LTE 5M / 2593.0 MHz / 16QAM****•Port2/ LTE 5M / 2687.5 MHz / 16QAM**

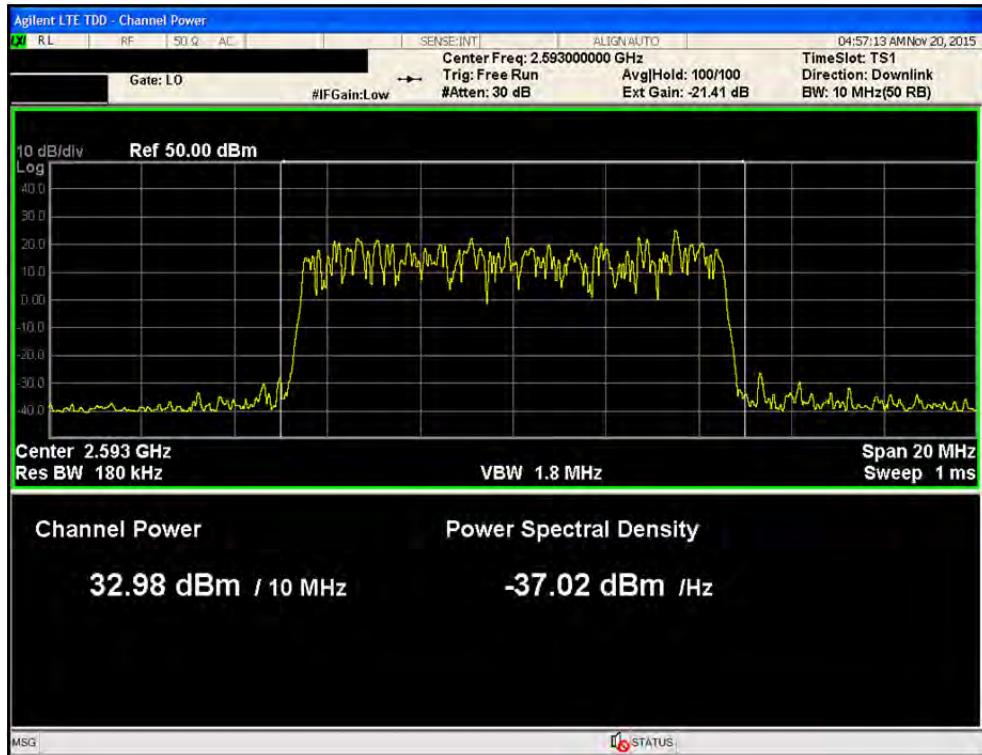
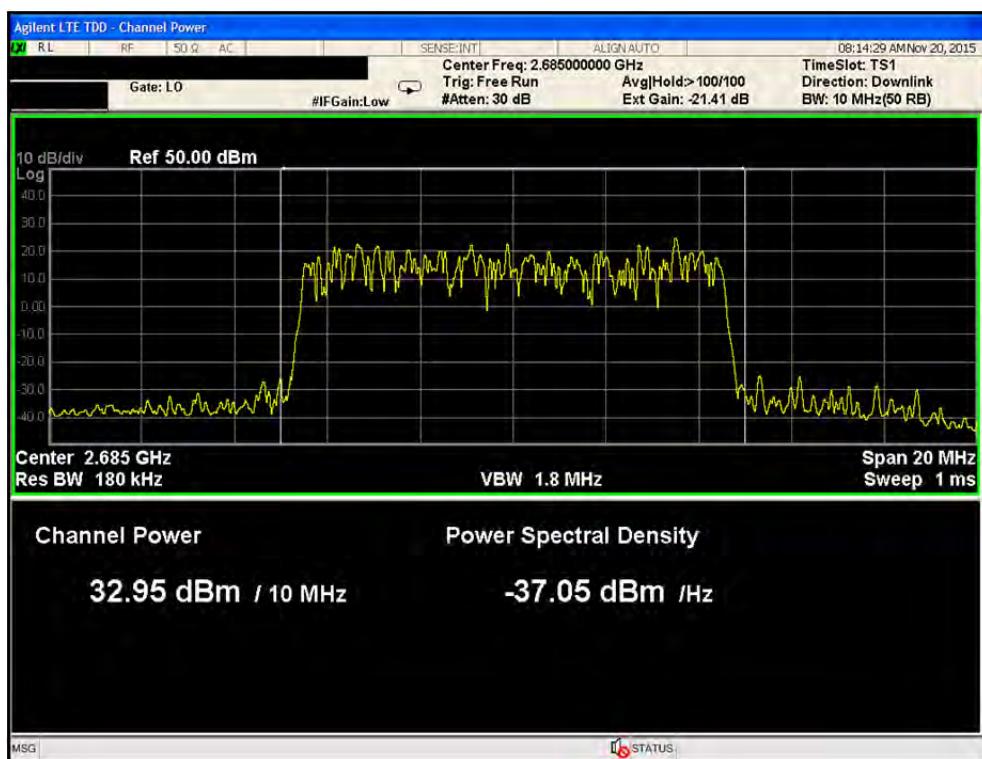
## •Port2/ LTE 5M / 2498.5 MHz / 64QAM

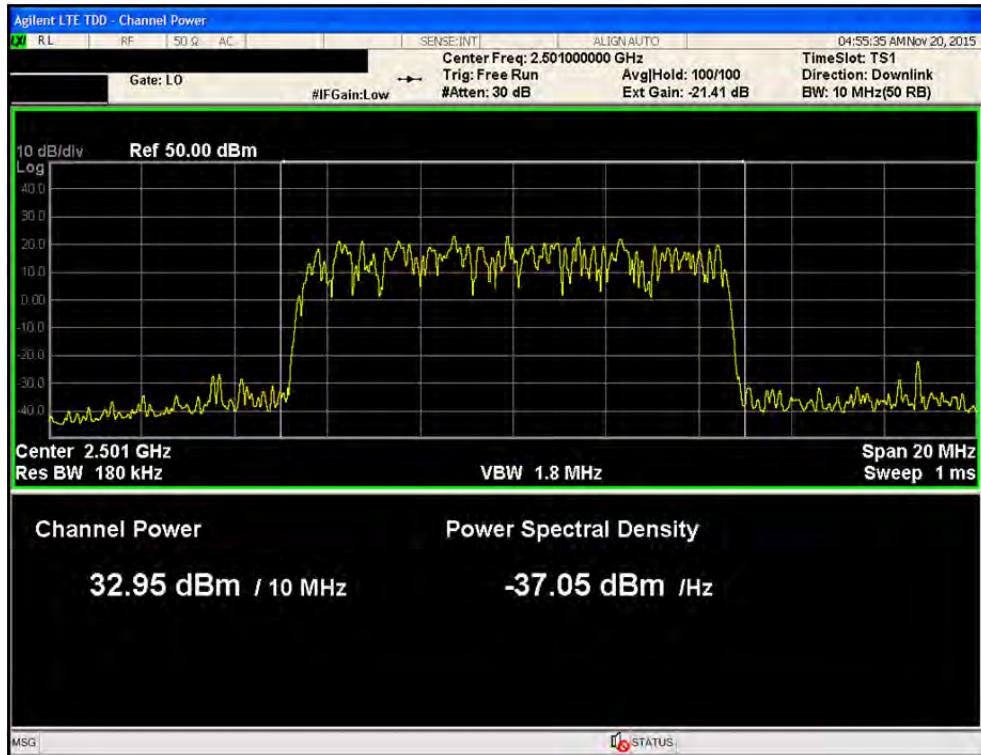
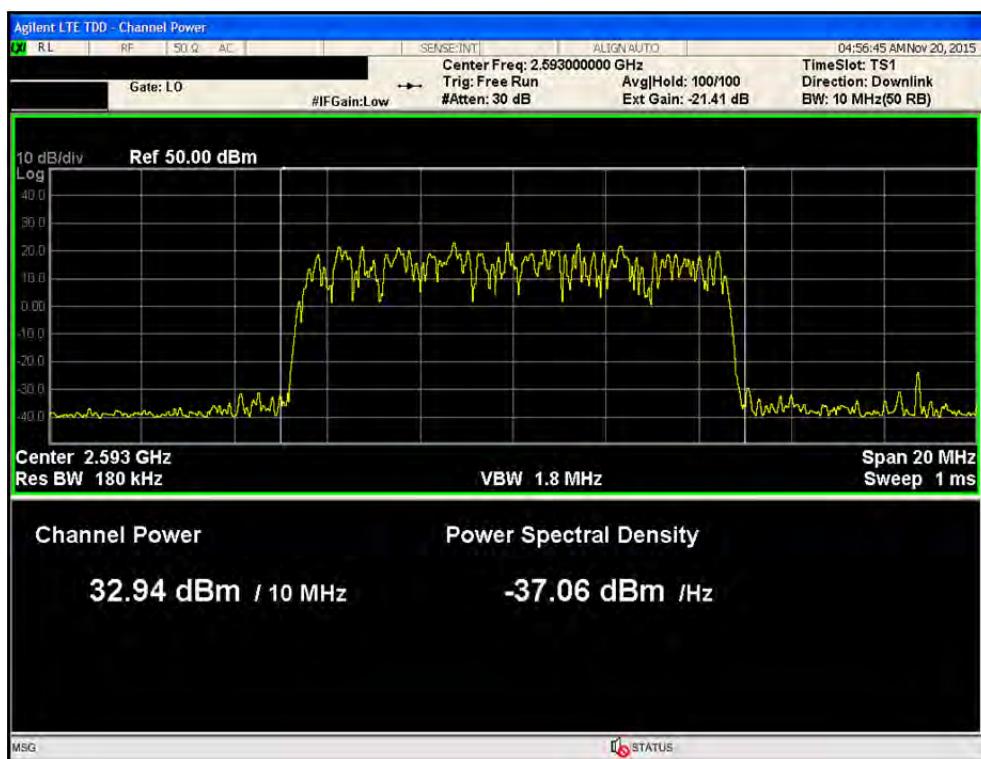


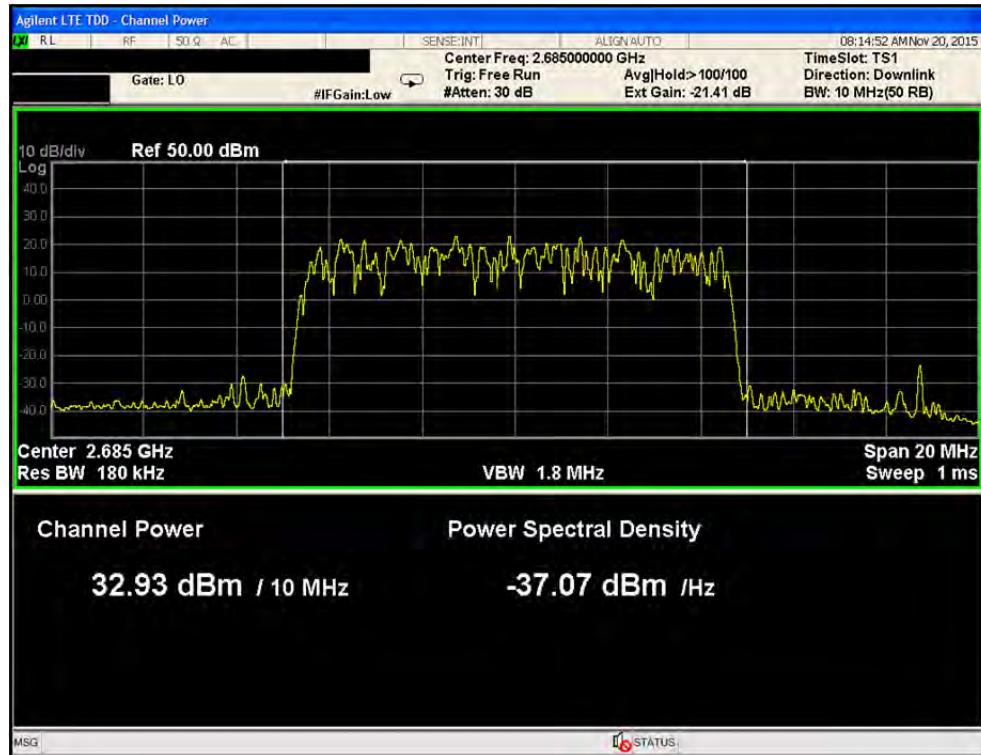
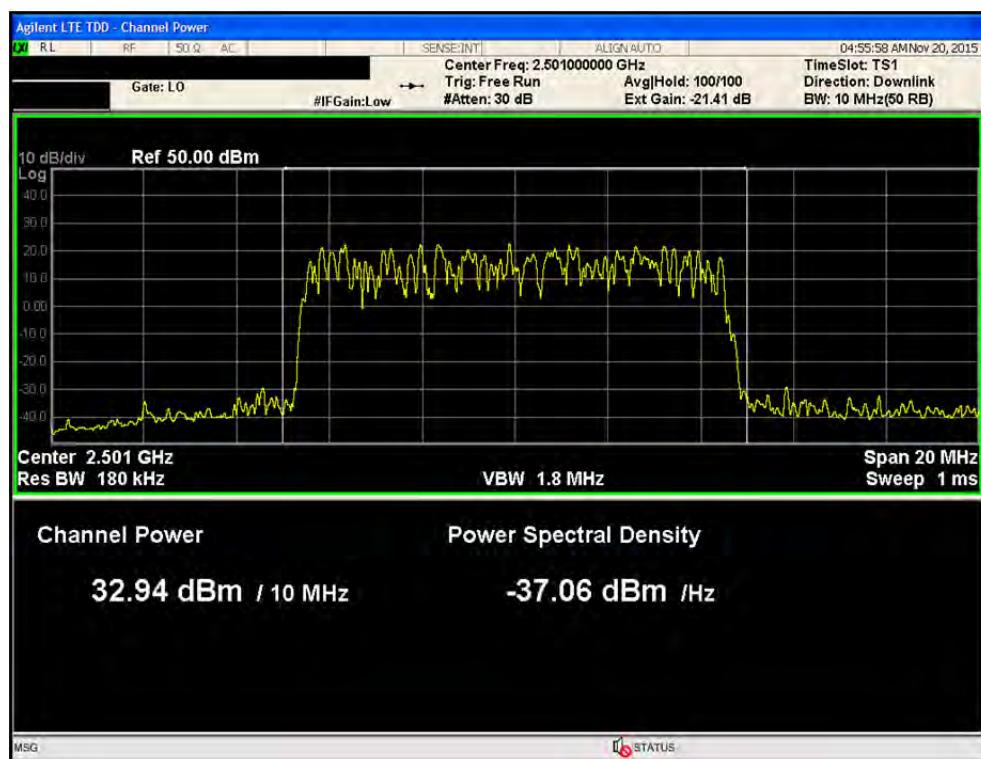
## •Port2/ LTE 5M / 2593.0 MHz / 64QAM



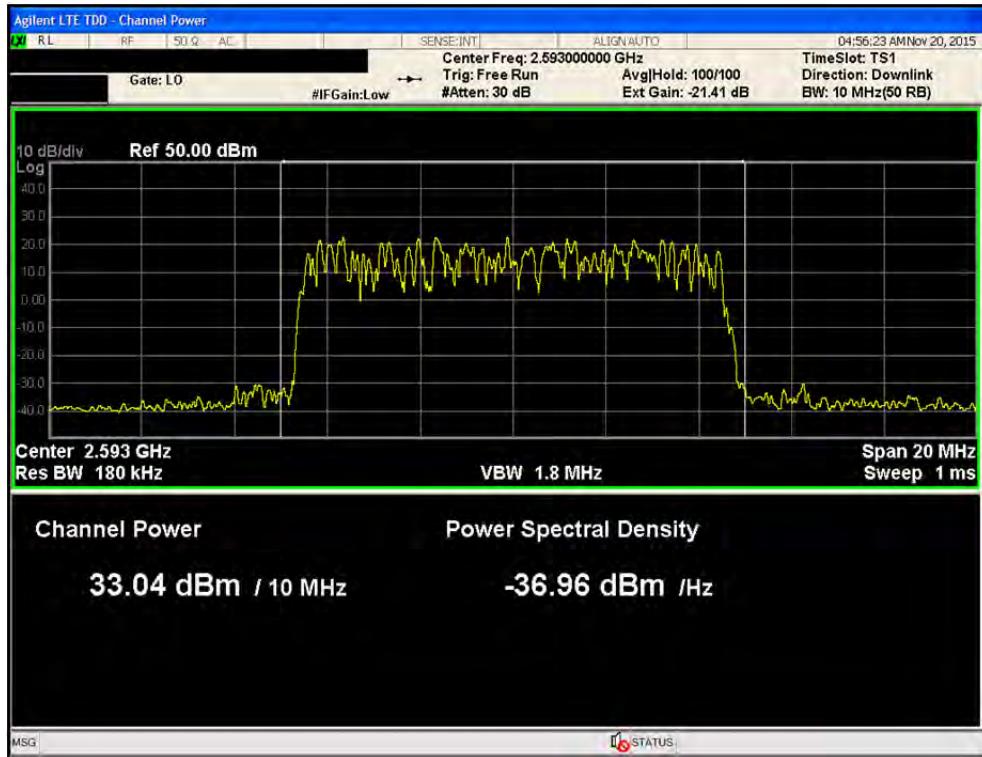
**•Port2/ LTE 5M / 2687.5 MHz / 64QAM****•Port2/ LTE 10M / 2501.0 MHz / QPSK**

**•Port2/ LTE 10M / 2593.0 MHz / QPSK**

**•Port2/ LTE 10M / 2685.0 MHz / QPSK**


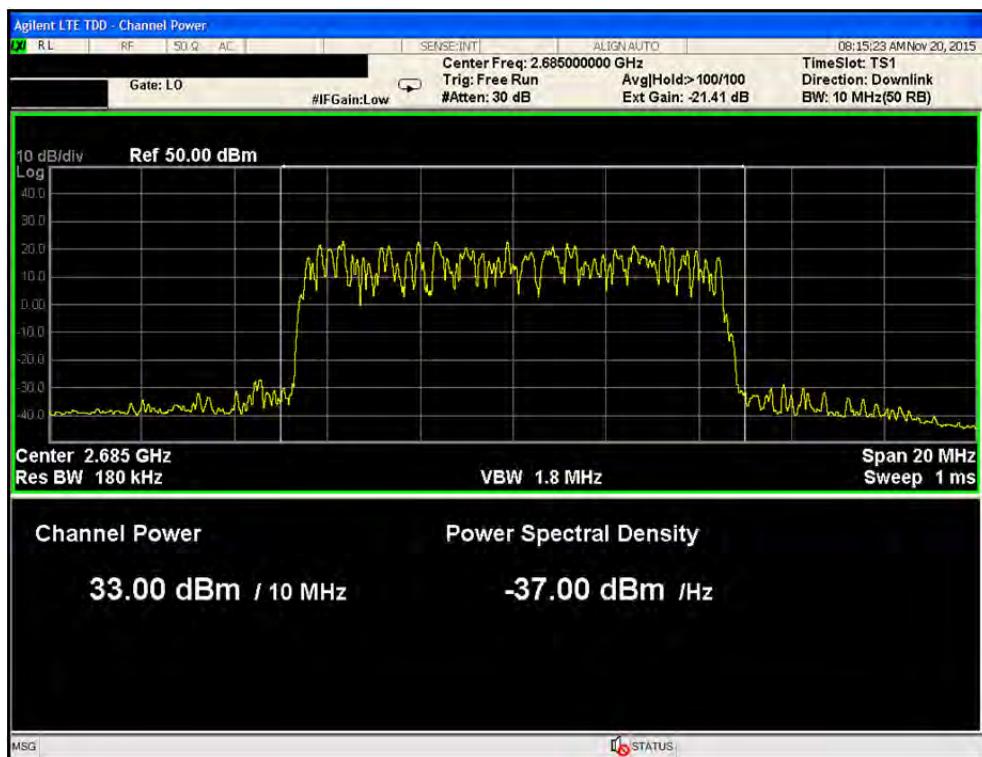
**•Port2/ LTE 10M / 2501.0 MHz / 16QAM****•Port2/ LTE 10M / 2593.0 MHz / 16QAM**

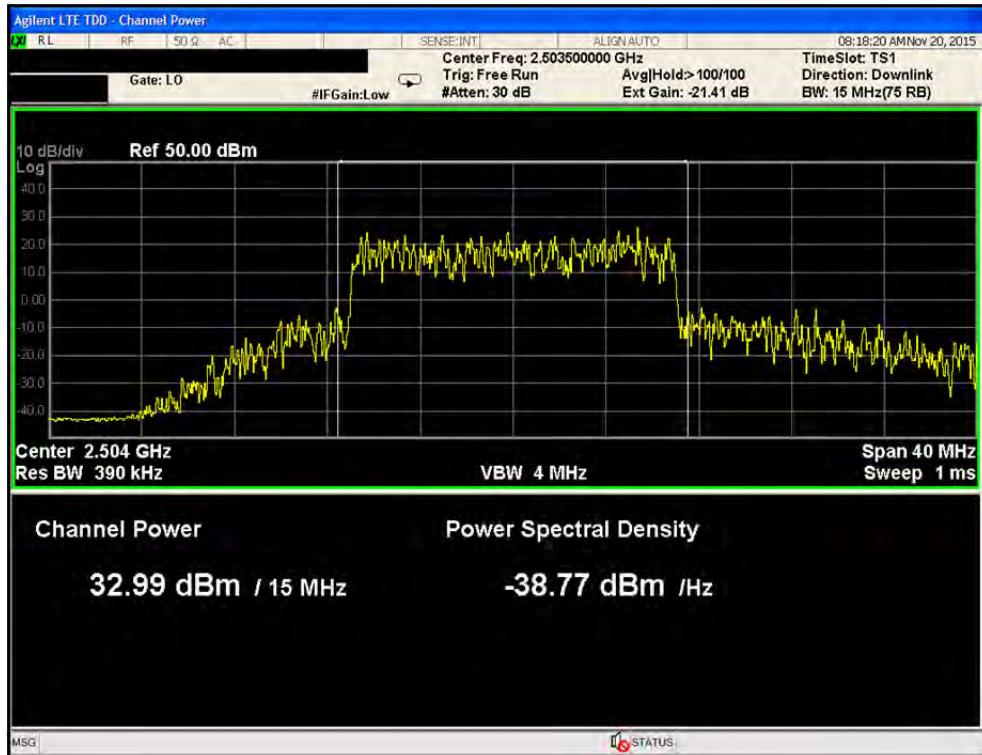
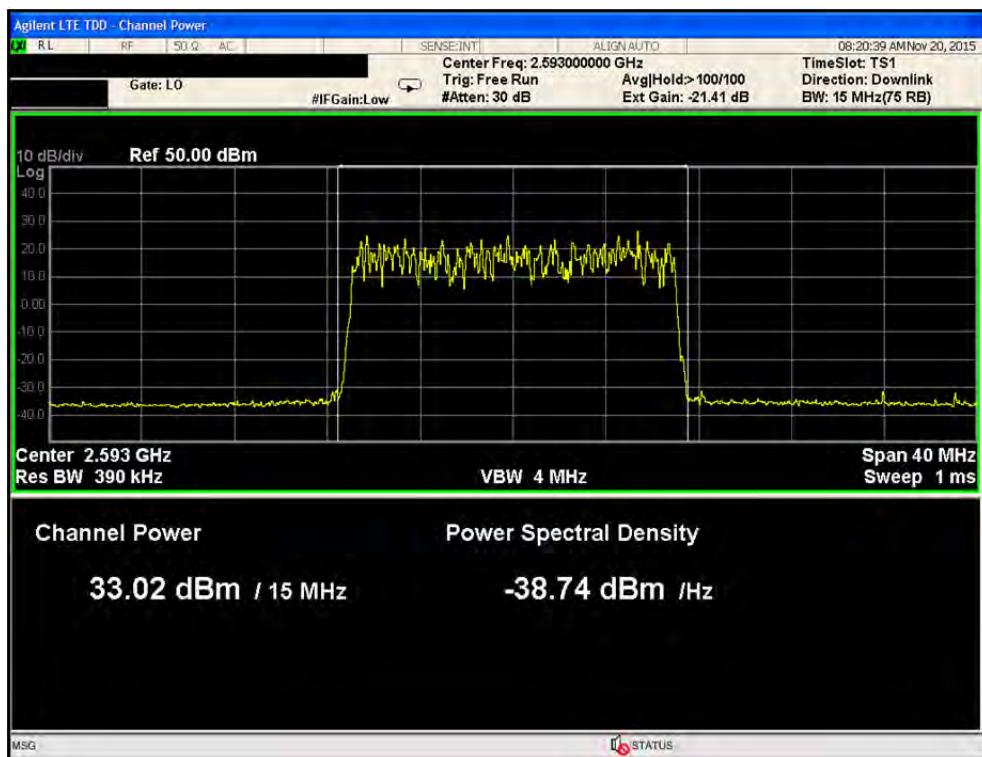
**•Port2/ LTE 10M / 2685.0 MHz / 16QAM****•Port2/ LTE 10M / 2501.0 MHz / 64QAM**

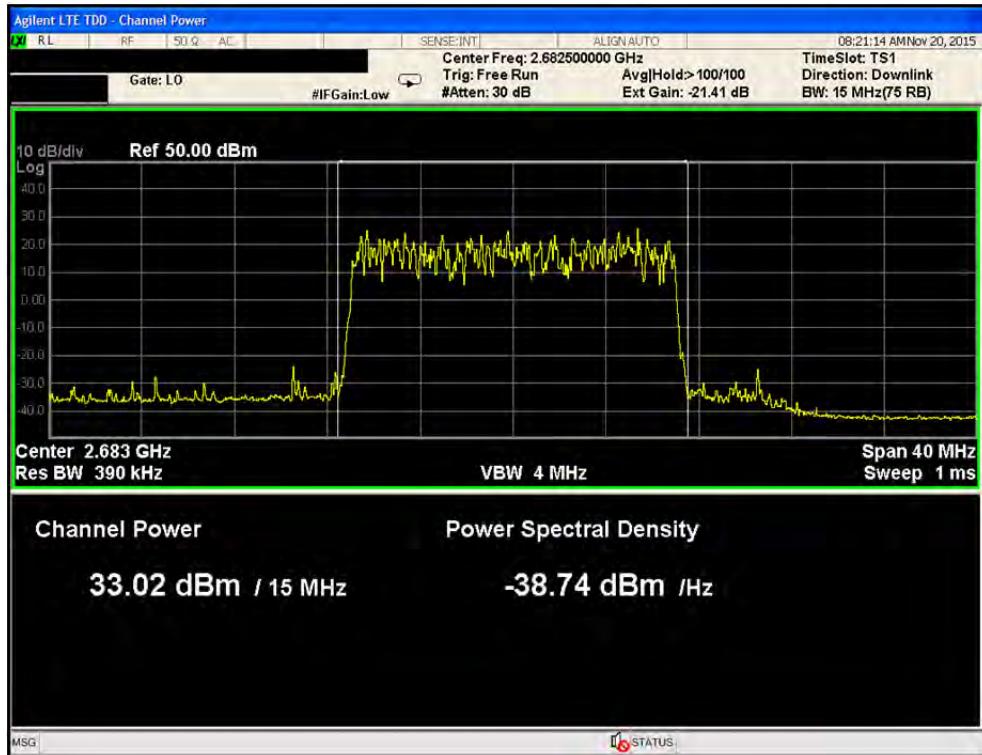
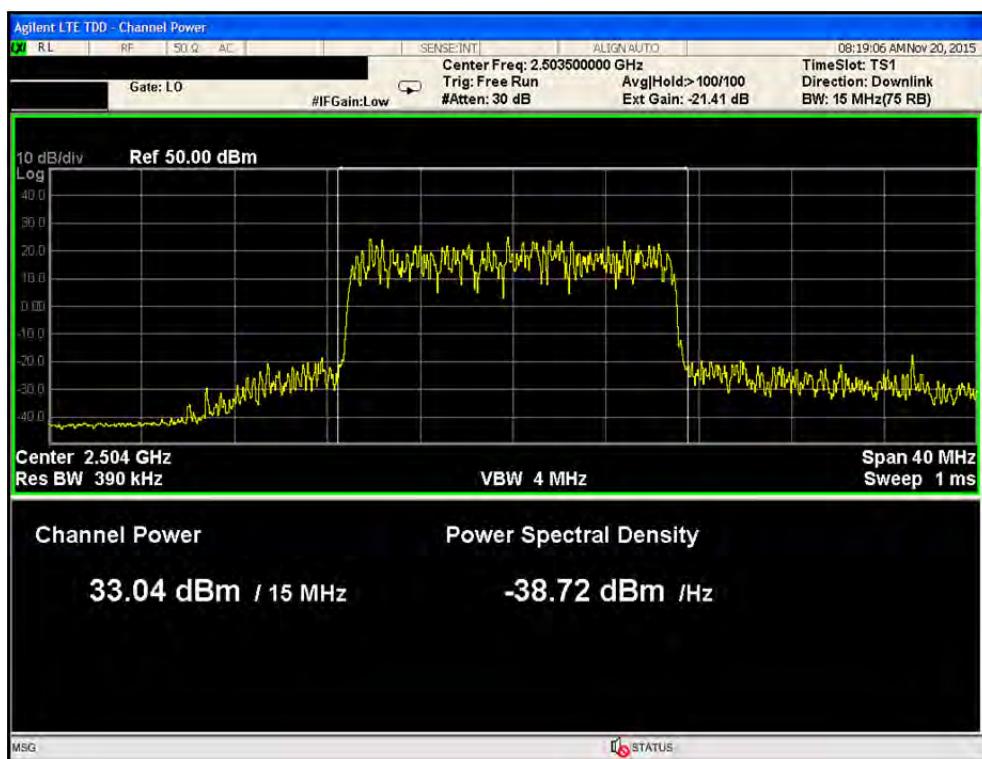
- Port2/ LTE 10M / 2593.0 MHz / 64QAM

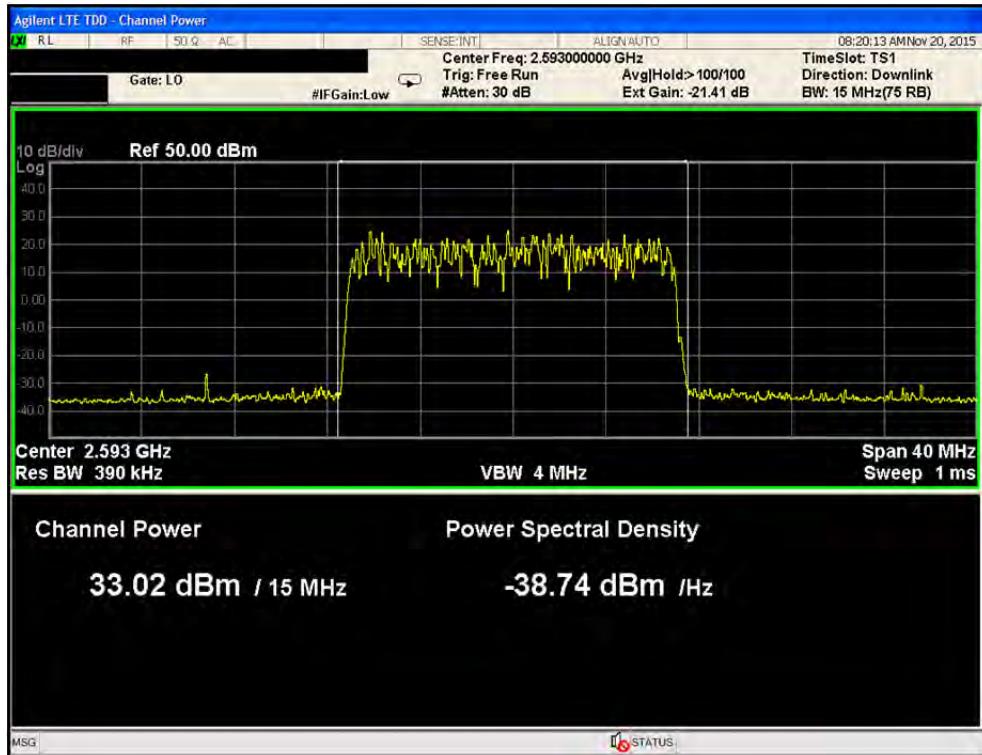
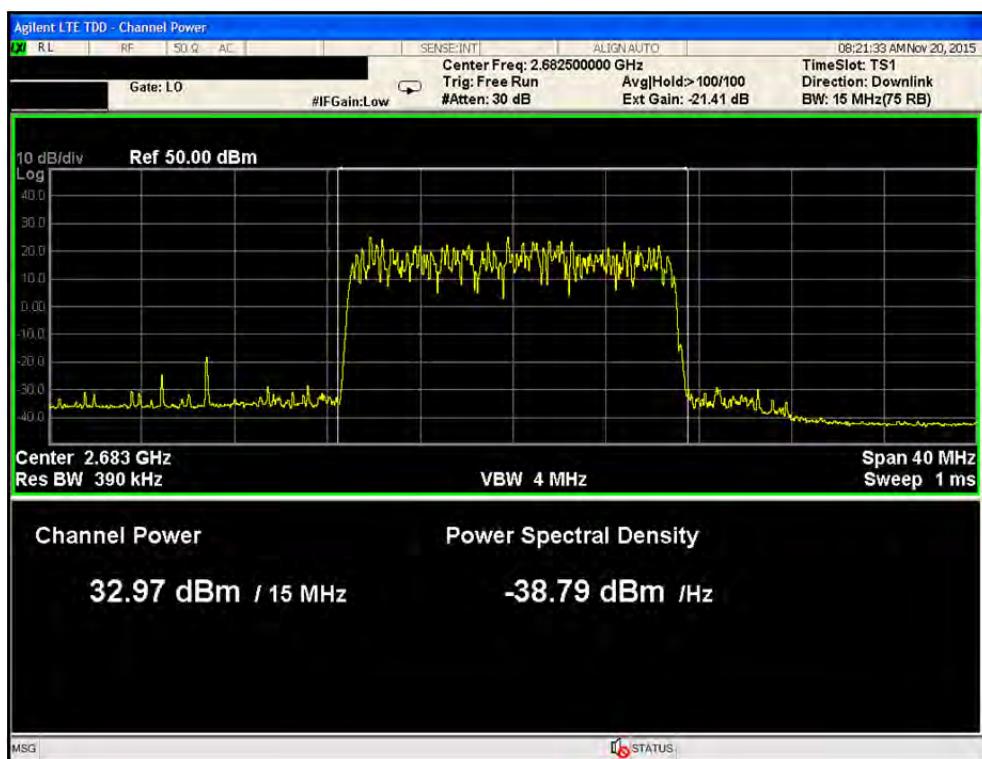


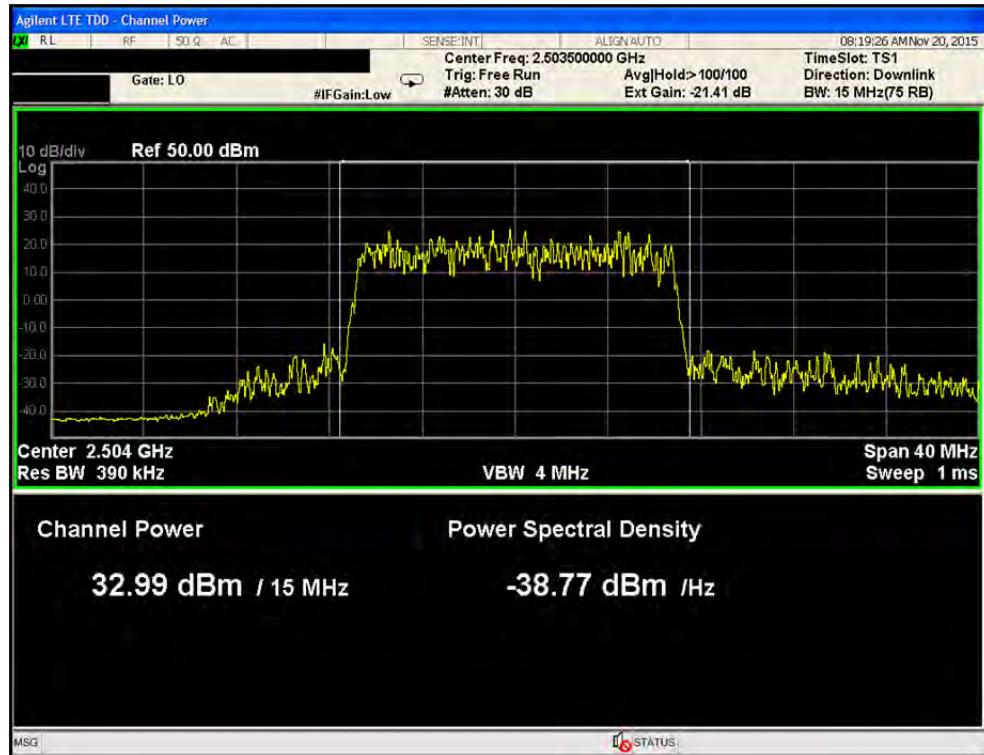
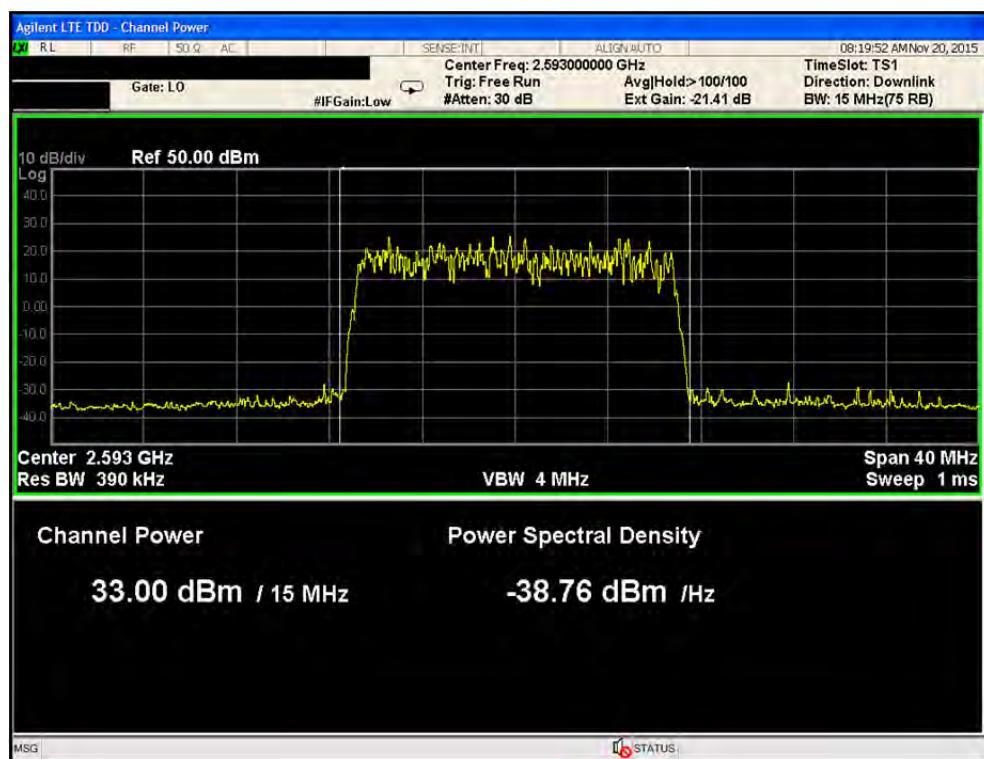
- Port2/ LTE 10M / 2685.0 MHz / 64QAM

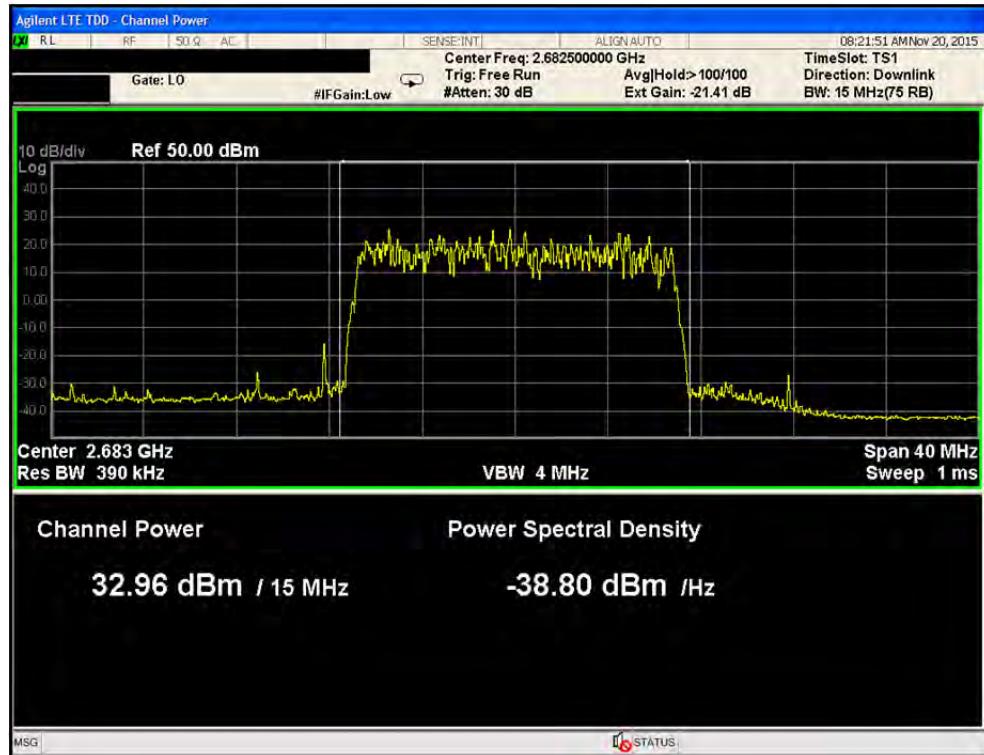
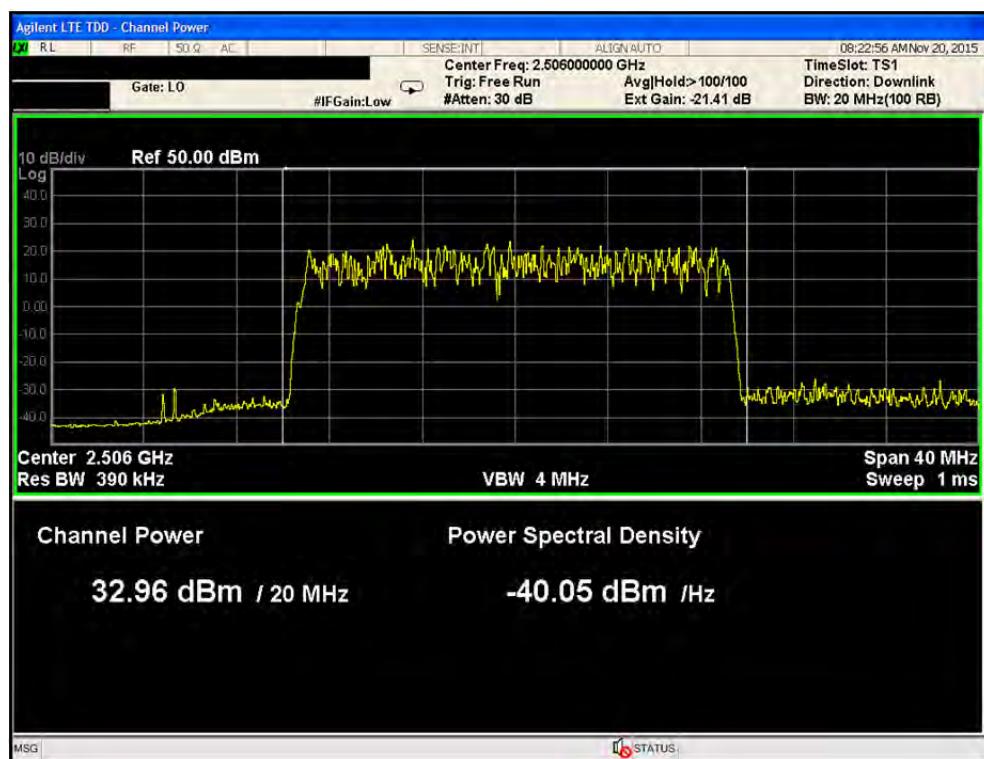


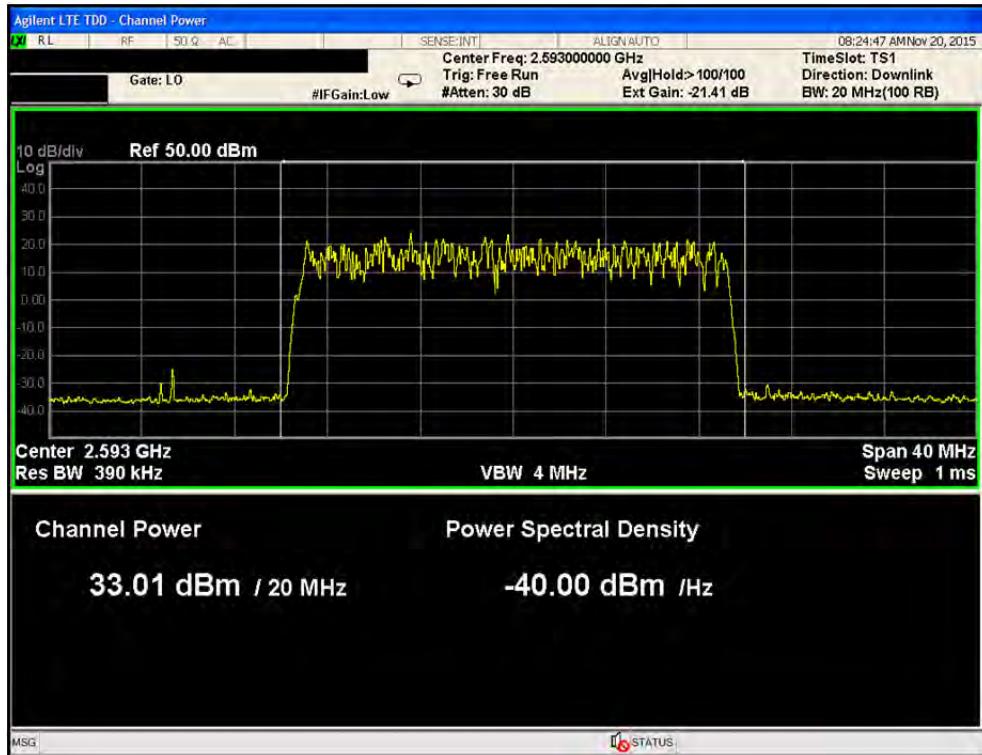
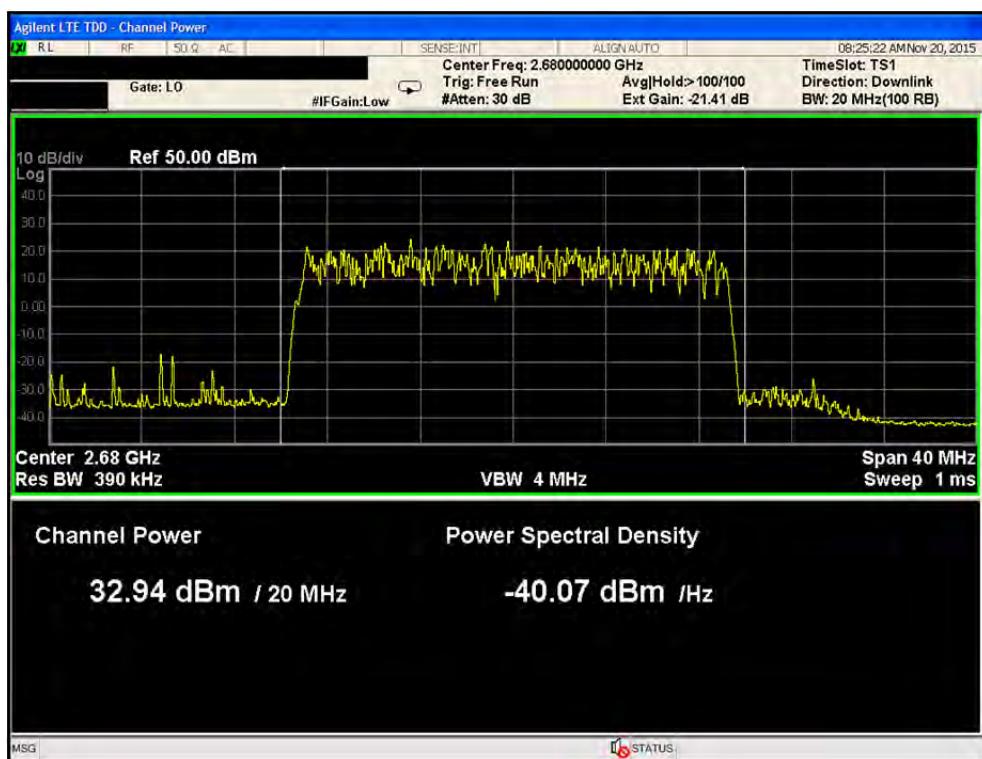
**•Port2/ LTE 15M / 2503.5 MHz / QPSK****•Port2/ LTE 15M / 2593.0 MHz / QPSK**

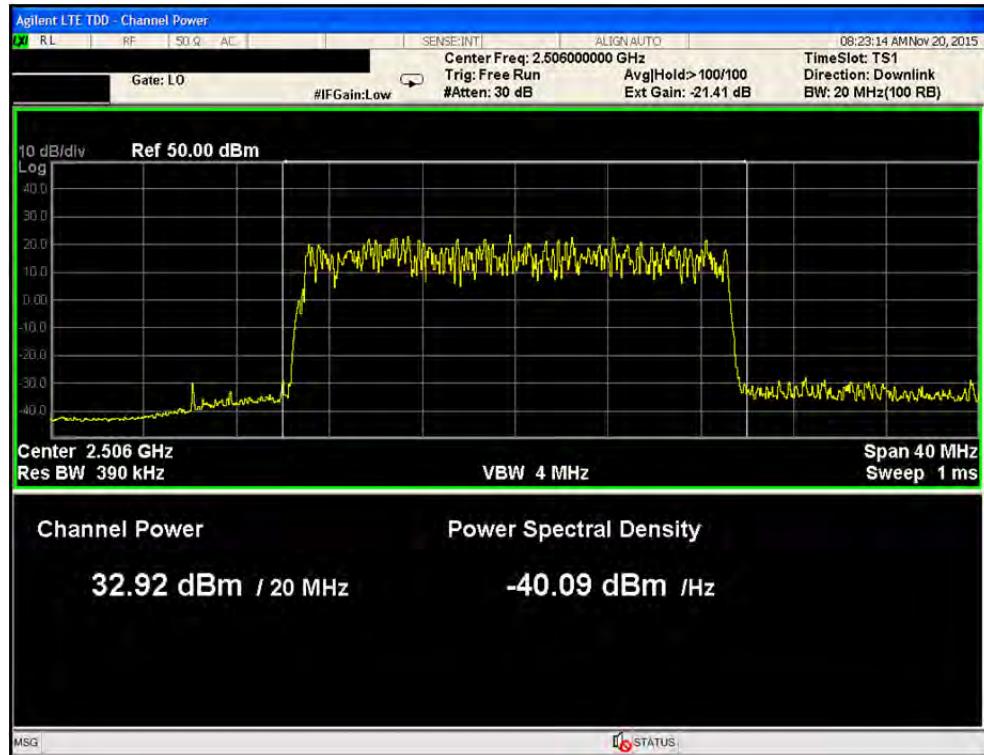
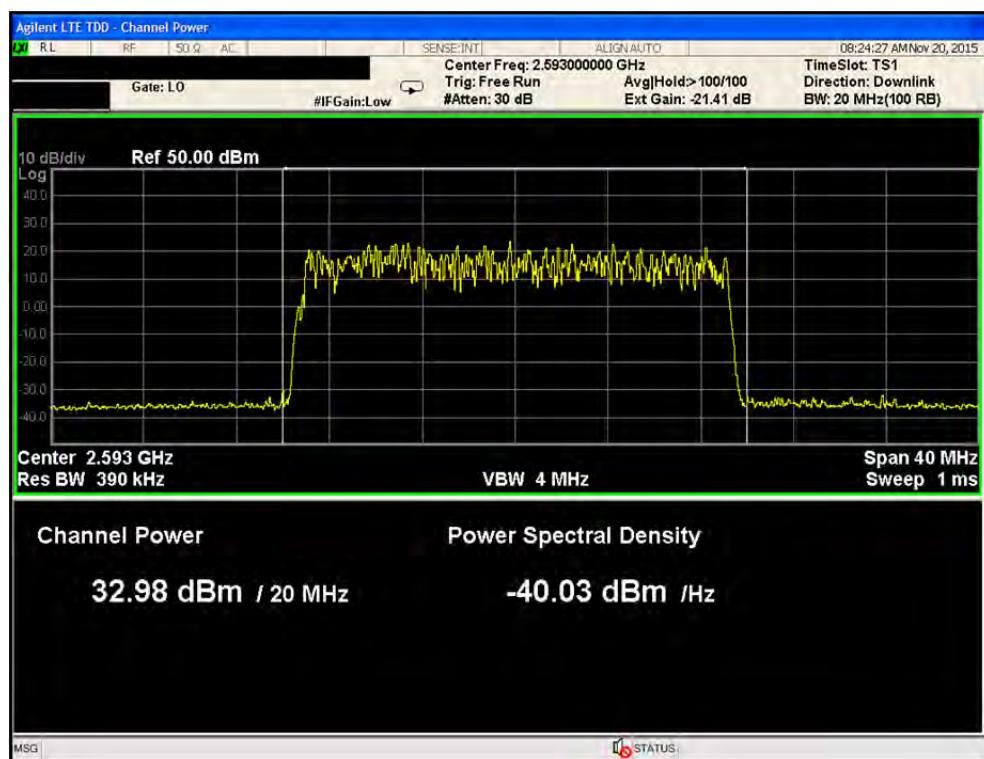
**•Port2/ LTE 15M / 2682.5 MHz / QPSK****•Port2/ LTE 15M / 2503.5 MHz / 16QAM**

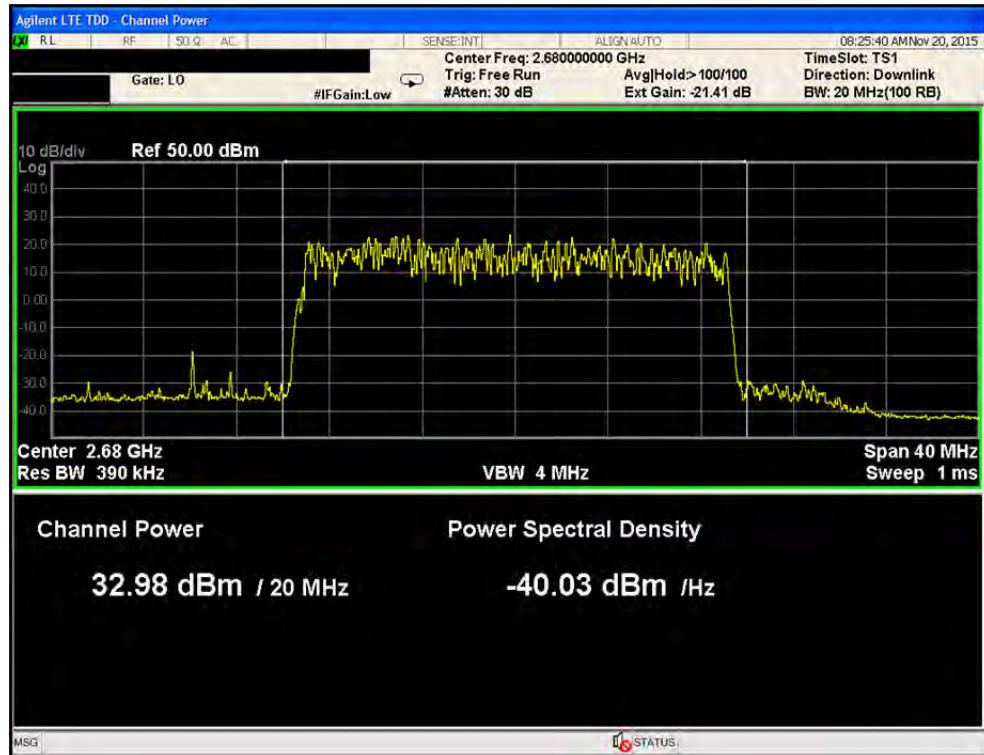
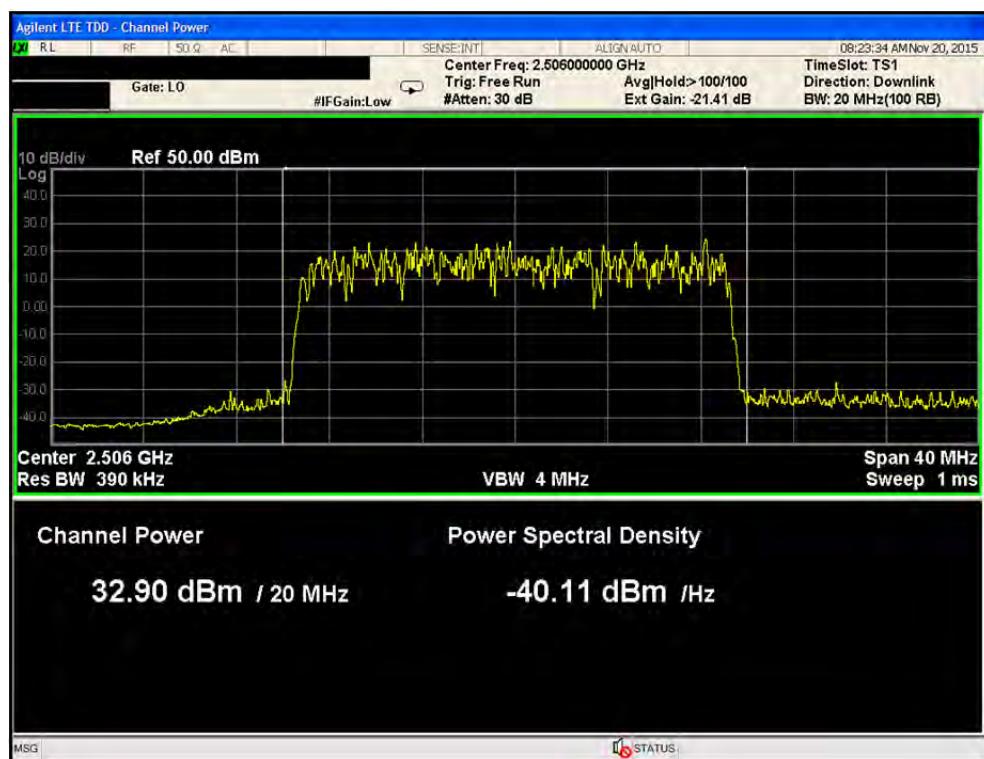
**•Port2/ LTE 15M / 2593.0 MHz / 16QAM****•Port2/ LTE 15M / 2682.5 MHz / 16QAM**

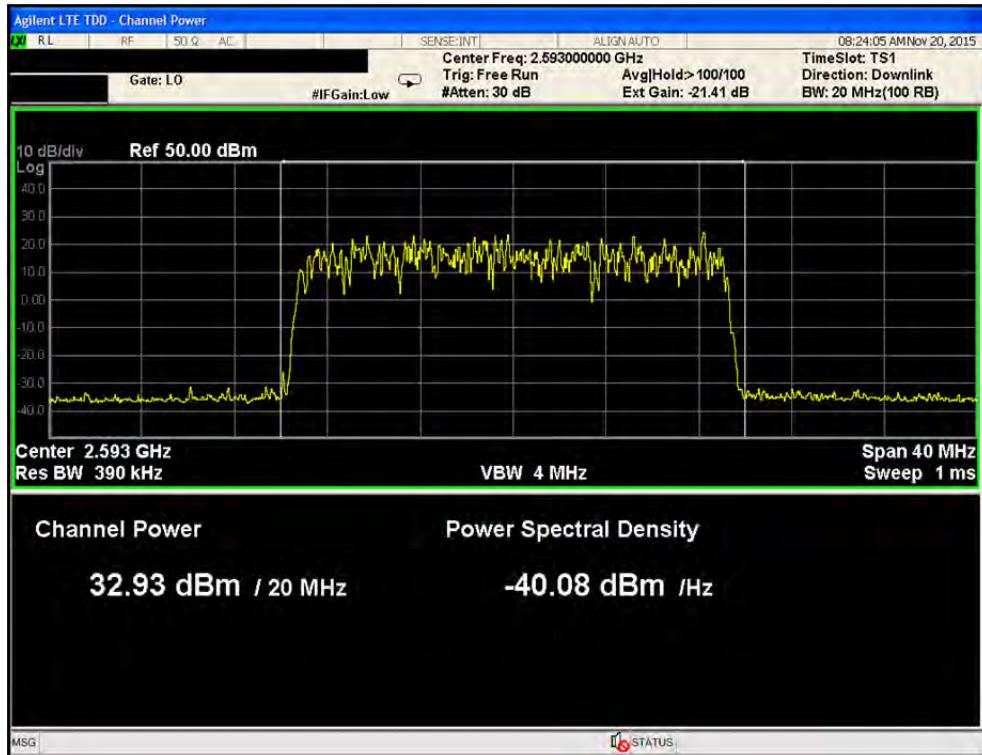
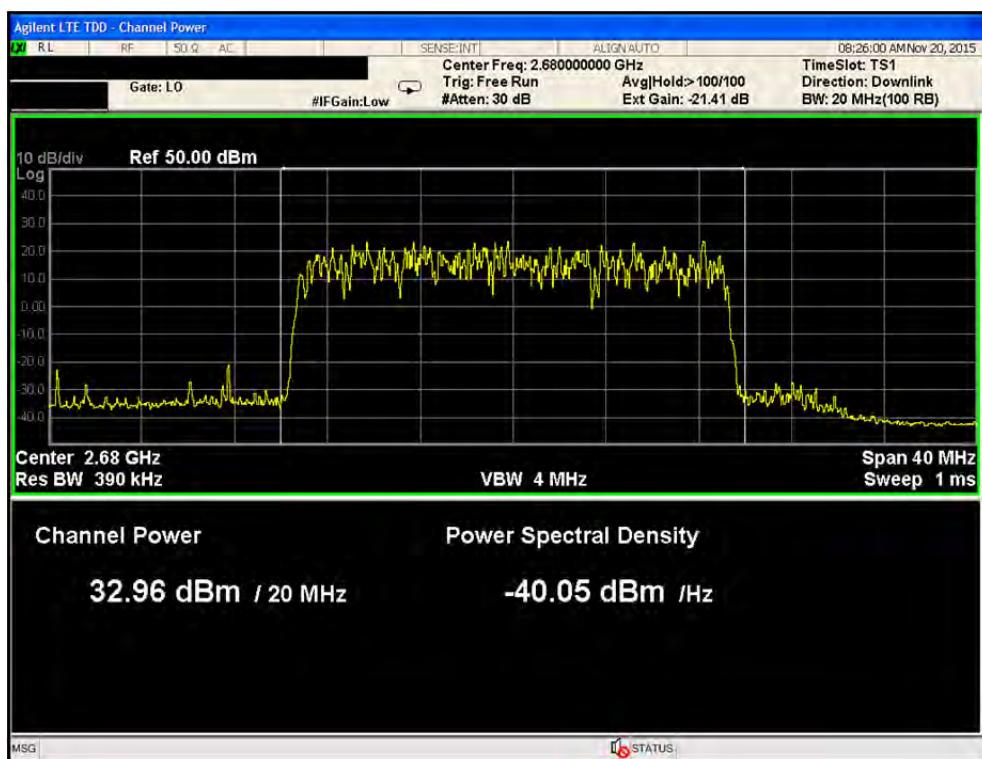
**•Port2/ LTE 15M / 2503.5 MHz / 64QAM****•Port2/ LTE 15M / 2593.0 MHz / 64QAM**

**•Port2/ LTE 15M / 2682.5 MHz / 64QAM****•Port2/ LTE 20M / 2506.0 MHz / QPSK**

**•Port2/ LTE 20M / 2593.0 MHz / QPSK****•Port2/ LTE 20M / 2680.0 MHz / QPSK**

**•Port2/ LTE 20M / 2506.0 MHz / 16QAM****•Port2/ LTE 20M / 2593.0 MHz / 16QAM**

**•Port2/ LTE 20M / 2680.0 MHz / 16QAM****•Port2/ LTE 20M / 2506.0 MHz / 64QAM**

**•Port2/ LTE 20M / 2593.0 MHz / 64QAM****•Port2/ LTE 20M / 2680.0 MHz / 64QAM**

### 3.5 Radiated spurious emission

#### 3.5.1 Specification

- FCC Part 2.1053
- FCC Part 27.53

#### 3.5.2 Test Description

The highest gain antenna to be used with the EUT was tested for final measurements. The EUT was configured for the lowest and the highest transmit frequency. For each configuration, the spectrum was scanned throughout the specified range. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63. 10:2009). A preamp and high pass filter were used for this test in order to provide sufficient measured sensitivity.

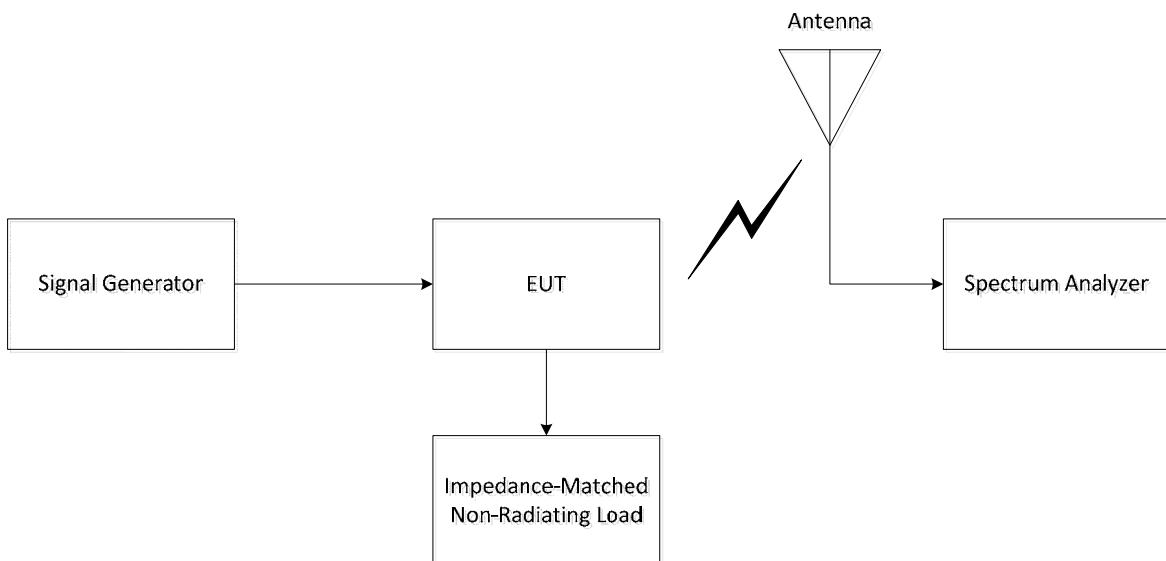
For licensed transmitters, the FCC reference TIA/EIA-603 as the measurement procedure standard. TIA/EIA-603 Section 2.2.12 describes a method for measuring radiated spurious emission that utilizes an antenna substitution method:

At an approved test site, the transmitter is place on a remotely controlled turntable, and the measurement antenna is place 3 meters from the transmitter.

The transmitter is place on a remotely controlled turntable, and the measurement antenna is placed 3 meters from the transmitter. The turntable azimuth is varied to maximize the level of spurious emissions. The height of the measurement antenna is also varied from 1 to 4 meters. The amplitude and frequency of the highest emission are noted. The transmitter is then replaced with a 1/2 wave dipole that is successively tuned to each of the highest spurious emission for emissions below 1 GHz, and a horn antenna for emission above 1 GHz.

A signal generator is connected to the dipole (horn antenna for frequency above 1GHz), and its output is adjusted to match the level previously noted for each frequency. The output of the signal generator is recorded, and by factoring in the cable loss to the antenna and its gain; the power(dBm) into an ideal 1/2 wave dipole antenna is determined for each radiated emission.

#### 3.5.3 Set-Up



### 3.5.4 Test equipment list

Equipment	Model Name	Manufacturer
EUT	HX-2500-MIMO	Corning Optical Communications Wireless, Inc.
Signal Generator	N5182A	Agilent
Spectrum Analyzer	N9020A	Agilent
EMI Test Receiver	ESS	R&S
Bi-conical Antenna	VHA9103	R&S
Spectrum Analyzer	FSP	R&S
Log Periodic Antenna	VULP9118A	R&S
Turn table	DS 1500 S-1t-O	Innco GmbH
Antenna mast	MA4000-O	Innco GmbH
Controller	CO 2000	Innco GmbH

### 3.5.5 Test condition

- Test place: Shield Room
- Test environment: 22.5 °C, 42.5 % R.H.

### 3.5.6 Test results

#### • LTE 5 MHz / 2498.5 MHz / 64QAM

Frequency [MHz]	S/A [dBuV]	S/G [dBm]	Antenna gain [dBi]	Antenna polarity [H/V]	Cable loss [dB]	Total [dBm]	Limit [dBm]	Margin [dB]
60.01	17.20	-73.90	0.90	V	0.92	-73.92	-13.00	60.92
70.74	30.60	-59.10	1.34	V	0.97	-58.73	-13.00	45.73
91.83	27.00	-70.10	1.98	V	1.04	-69.16	-13.00	56.16
102.32	45.00	-45.10	1.39	V	1.07	-44.78	-13.00	31.78
112.40	28.15	-57.74	1.34	V	1.09	-57.49	-13.00	44.49
114.04	22.00	-52.45	0.97	V	1.26	-52.74	-13.00	39.74

#### • LTE 5 MHz / 2593.0 MHz / 64QAM

Frequency [MHz]	S/A [dBuV]	S/G [dBm]	Antenna gain [dBi]	Antenna polarity [H/V]	Cable loss [dB]	Total [dBm]	Limit [dBm]	Margin [dB]
60.01	17.10	-74.20	0.90	V	0.92	-74.22	-13.00	61.22
70.76	30.90	-58.70	1.34	V	0.97	-58.33	-13.00	45.33
91.84	27.10	-69.90	1.98	V	1.04	-68.96	-13.00	55.96
102.34	45.20	-45.00	1.39	V	1.07	-44.68	-13.00	31.68
112.42	28.40	-57.46	1.34	V	1.09	-57.21	-13.00	44.21
114.05	21.98	-52.62	0.97	V	1.26	-52.91	-13.00	39.91

#### • LTE 5 MHz / 2687.5 MHz / 64QAM

Frequency [MHz]	S/A [dBuV]	S/G [dBm]	Antenna gain [dBi]	Antenna polarity [H/V]	Cable loss [dB]	Total [dBm]	Limit [dBm]	Margin [dB]
60.03	17.40	-73.87	0.90	V	0.92	-73.89	-13.00	60.89
70.75	30.80	-58.81	1.34	V	0.97	-58.44	-13.00	45.44
91.84	27.20	-69.81	1.98	V	1.04	-68.87	-13.00	55.87
102.34	45.40	-44.78	1.39	V	1.07	-44.46	-13.00	31.46
112.41	28.30	-57.35	1.34	V	1.09	-57.10	-13.00	44.10
114.04	22.10	-52.36	0.97	V	1.26	-52.65	-13.00	39.65

Here, S/A is Spectrum Analyzer, S/G is Signal Generator, H is Horizontal and V is Vertical.

**• LTE 20 MHz / 2506 MHz / 64QAM**

Frequency [MHz]	S/A [dBuV]	S/G [dBm]	Antenna gain [dBi]	Antenna polarity [H/V]	Cable loss [dB]	Total [dBm]	Limit [dBm]	Margin [dB]
60.01	17.80	-73.52	0.90	V	0.92	-73.54	-13.00	60.54
70.72	31.00	-58.58	1.34	V	0.97	-58.21	-13.00	45.21
91.72	27.20	-69.81	1.99	V	1.04	-68.86	-13.00	55.86
102.33	45.40	-44.79	1.39	V	1.07	-44.47	-13.00	31.47
112.43	28.40	-57.27	1.34	V	1.09	-57.02	-13.00	44.02
174.05	25.40	-56.41	1.82	H	1.35	-55.94	-13.00	42.94

**• LTE 20 MHz / 2593 MHz / 64QAM**

Frequency [MHz]	S/A [dBuV]	S/G [dBm]	Antenna gain [dBi]	Antenna polarity [H/V]	Cable loss [dB]	Total [dBm]	Limit [dBm]	Margin [dB]
60.02	18.00	-73.31	0.90	V	0.92	-73.33	-13.00	60.33
70.71	31.20	-58.36	1.34	V	0.97	-57.99	-13.00	44.99
91.73	27.40	-69.60	1.99	V	1.04	-68.65	-13.00	55.65
102.32	45.30	-44.87	1.39	V	1.07	-44.55	-13.00	31.55
112.44	28.60	-57.09	1.34	V	1.09	-56.84	-13.00	43.84
174.04	25.50	-56.30	1.82	H	1.35	-55.83	-13.00	42.83

**• LTE 20 MHz / 2680 MHz / 64QAM**

Frequency [MHz]	S/A [dBuV]	S/G [dBm]	Antenna gain [dBi]	Antenna polarity [H/V]	Cable loss [dB]	Total [dBm]	Limit [dBm]	Margin [dB]
60.03	18.10	-73.20	0.90	V	0.92	-73.22	-13.00	60.22
70.73	31.30	-58.25	1.34	V	0.97	-57.88	-13.00	44.88
91.73	27.50	-69.51	1.99	V	1.04	-68.56	-13.00	55.56
102.32	45.50	-44.62	1.39	V	1.07	-44.30	-13.00	31.30
112.43	28.50	-57.20	1.34	V	1.09	-56.95	-13.00	43.95
174.04	25.40	-56.40	1.82	H	1.35	-55.93	-13.00	42.93

### 3.6 Frequency stability

#### 3.6.1 Specification

- FCC Rules Part 2.1055
- FCC Rules Part 27.54

#### 3.6.2 Test Description

A direct connect measurement was made between the EUT antenna cable and a spectrum analyzer. The spectrum analyzer is equipped with a precision frequency reference that exceeds the stability requirement of the EUT.

Measurements were made at the edges of the main transmit bands as called out on the data sheets. Testing was done with an absence of modulation in a CW mode of operation.

The primary supply voltage was varied from 85 % to 115 % of the nominal voltage using a temperature chamber, the transmit frequency was recorded at the extremes of the specified temperature (-30 °C to +50 °C)

#### 3.6.3 Test Procedure

The method used is as detailed in FCC KDB 935210 D05 v01.

The EUT was set up to the applicable test frequency with modulation. The EUT antenna terminal was conducted to the spectrum analyzer through an external attenuator (at the output test) and an appropriate coaxial cable.

The MAKER function was using for these evaluation.

#### 3.6.4 Test equipment list

Equipment	Model Name	Manufacturer
EUT	HX-2500-MIMO	Corning Optical Communications Wireless Inc.
MHU	HX-2500-MHU	Corning Optical Communications Wireless Inc.
Signal Generator	N5182A	Agilent
Spectrum Analyzer	N9020A	Agilent
Attenuator	PE7019-20	Pasternack
DC power supply	6674A	Agilent
Temp. / Humid. Chamber	SJ-1016-TH	Seo Jin

#### 3.6.5 Test condition

- Test place: Temperature and Humidity Chamber
- Test environment: 22.5 °C, 42.5 % R.H.

### 3.6.6 Test result

#### • Port1 / 2 506 MHz

Voltage [%]	Supplied power [Vdc]	Temperature [°C]	Frequency [MHz]	Deviation [ppm]	Limit [ppm]
85	40.8	-30	2 506	-0.004700	1.50
		-20		0.000199	
		-10		0.001100	
		0		0.004099	
		+10		-0.000400	
		+20 (ref.)		-0.012700	
		+30		0.000400	
		+40		0.007699	
		+50		-0.009200	
		-30		0.005799	
100	48.0	-20		-0.008299	
		-10		0.017300	
		0		0.017199	
		+10		-0.004799	
		+20 (ref.)		0.004099	
		+30		-0.005700	
		+40		0.005899	
		+50		-0.008500	
		-30		0.011600	
		-20		0.014200	
115	55.2	-10		-0.002799	
		0		0.011099	
		+10		0.011499	
		+20 (ref.)		-0.004600	
		+30		-0.011400	
		+40		-0.013599	
		+50		0.000999	

**• Port1 / 2 593 MHz**

Voltage [%]	Supplied power [Vdc]	Temperature [°C]	Frequency [MHz]	Deviation [ppm]	Limit [ppm]
85	40.8	-30	2 593	-0.006999	1.50
		-20		0.008399	
		-10		0.008100	
		0		-0.000800	
		+10		-0.004499	
		+20 (ref.)		0.019700	
		+30		0.010300	
		+40		0.005400	
		+50		0.000199	
		-30		-0.001999	
100	48.0	-20		0.000599	1.50
		-10		-0.010900	
		0		-0.003499	
		+10		0.014699	
		+20 (ref.)		0.013299	
		+30		0.000999	
		+40		0.000299	
		+50		0.004799	
		-30		-0.075200	
		-20		-0.003900	
115	55.2	-10	2 593	-0.004600	1.50
		0		-0.001599	
		+10		-0.011199	
		+20 (ref.)		0.001900	
		+30		-0.004899	
		+40		-0.001100	
		+50		0.000000	
		-30		-0.075200	
		-20		-0.003900	
		-10		-0.004600	

**• Port1 / 2 680 MHz**

Voltage [%]	Supplied power [Vdc]	Temperature [°C]	Frequency [MHz]	Deviation [ppm]	Limit [ppm]
85	40.8	-30	2 680	0.000800	1.50
		-20		-0.006199	
		-10		-0.013400	
		0		-0.009799	
		+10		0.002299	
		+20 (ref.)		-0.005099	
		+30		-0.016399	
		+40		0.002500	
		+50		0.017000	
		-30		0.017000	
100	48.0	-20		-0.006000	1.50
		-10		0.003200	
		0		0.001299	
		+10		-0.000100	
		+20 (ref.)		0.026100	
		+30		-0.014999	
		+40		-0.004799	
		+50		-0.008699	
		-30		-0.000199	
		-20		0.020100	
115	55.2	-10	2 680	0.008999	1.50
		0		0.004199	
		+10		0.020899	
		+20 (ref.)		-0.016499	
		+30		0.007100	
		+40		-0.013800	
		+50		0.005400	
		-30		-0.000199	
		-20		0.020100	
		-10		0.008999	

**• Port2 / 2 506 MHz**

Voltage [%]	Supplied power [Vdc]	Temperature [°C]	Frequency [MHz]	Deviation [ppm]	Limit [ppm]
85	40.8	-30	2 352.5	-0.012499	1.50
		-20		0.010399	
		-10		-0.025700	
		0		0.011099	
		+10		0.021800	
		+20 (ref.)		0.008699	
		+30		-0.001800	
		+40		0.002600	
		+50		0.002999	
		-30		-0.001100	
100	48.0	-20		-0.003399	1.50
		-10		0.007900	
		0		-0.002500	
		+10		0.023799	
		+20 (ref.)		-0.003600	
		+30		0.006499	
		+40		-0.011899	
		+50		-0.007999	
		-30		-0.015900	
		-20		0.002299	
115	55.2	-10	2 352.5	0.008500	1.50
		0		0.031400	
		+10		0.006599	
		+20 (ref.)		-0.008399	
		+30		0.005499	
		+40		0.004799	
		+50		0.021200	

**• Port2 / 2 593 MHz**

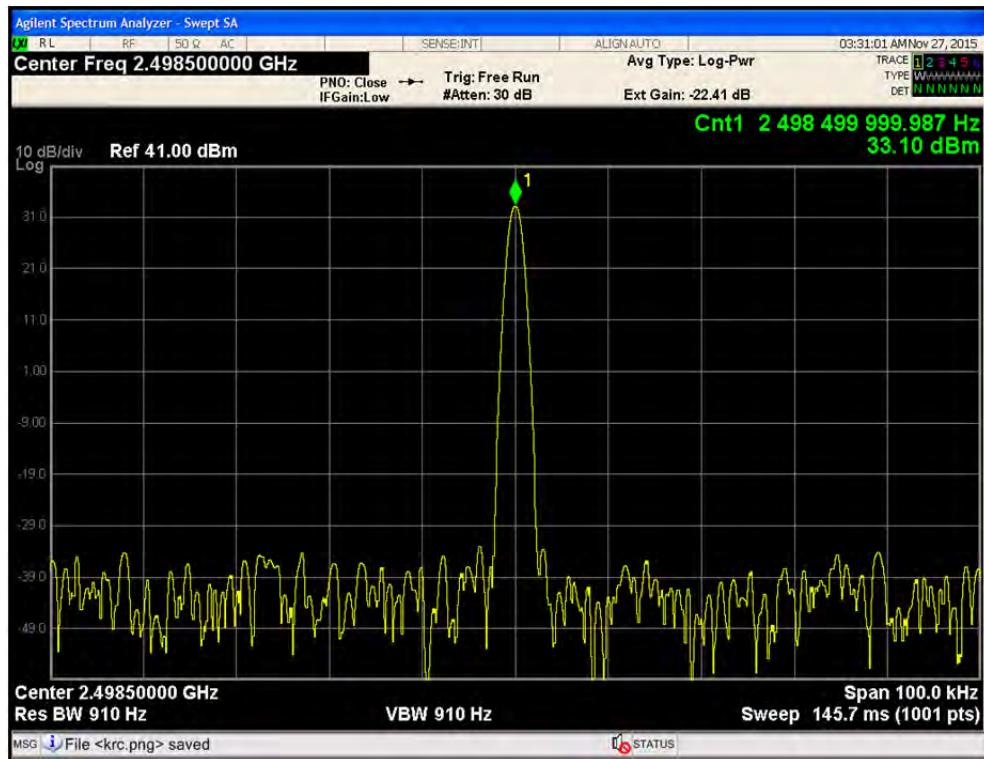
Voltage [%]	Supplied power [Vdc]	Temperature [°C]	Frequency [MHz]	Deviation [ppm]	Limit [ppm]
85	40.8	-30	2 593	0.007599	1.50
		-20		-0.010799	
		-10		0.023399	
		0		0.016799	
		+10		-0.006899	
		+20 (ref.)		-0.002699	
		+30		-0.006299	
		+40		-0.006700	
		+50		0.009699	
		-30		0.000699	
100	48.0	-20		0.016499	1.50
		-10		0.013100	
		0		-0.007599	
		+10		0.010300	
		+20 (ref.)		0.006700	
		+30		-0.003799	
		+40		-0.000699	
		+50		-0.003499	
		-30		-0.005700	
		-20		0.002699	
115	55.2	-10	2 593	-0.002699	1.50
		0		0.018199	
		+10		-0.009600	
		+20 (ref.)		0.006400	
		+30		-0.007900	
		+40		0.003099	
		+50		0.006100	

**• Port2 / 2 680 MHz**

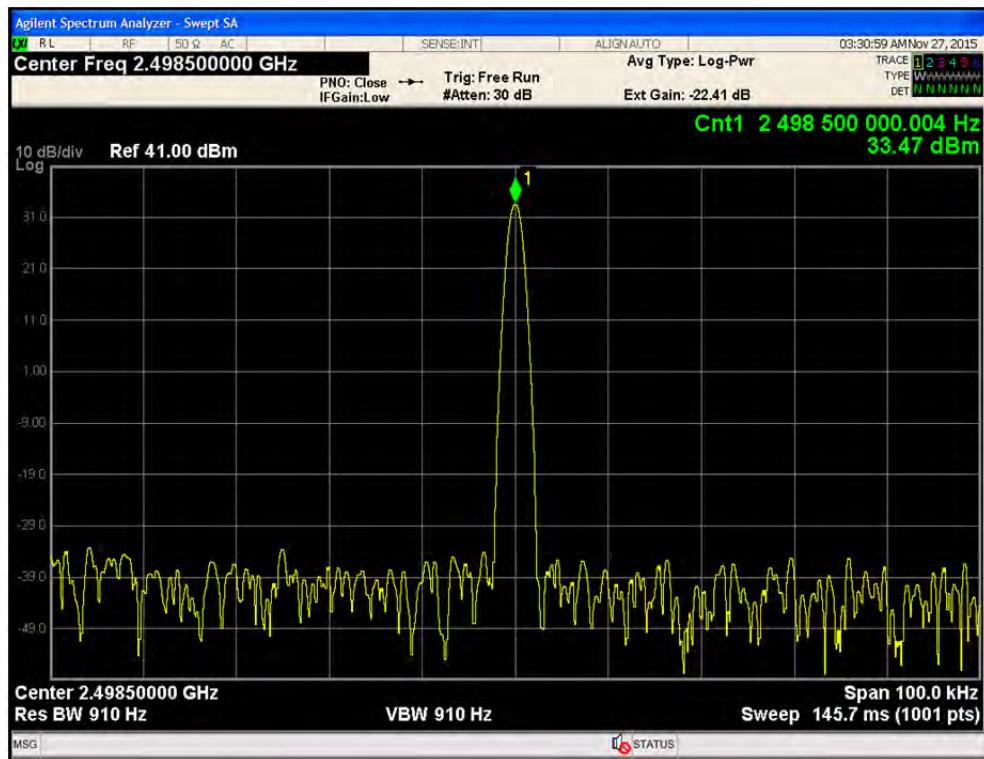
Voltage [%]	Supplied power [Vdc]	Temperature [°C]	Frequency [MHz]	Deviation [ppm]	Limit [ppm]
85	40.8	-30	2 680	0.010300	1.50
		-20		0.009799	
		-10		0.006199	
		0		0.007900	
		+10		-0.005000	
		+20 (ref.)		0.021100	
		+30		0.005599	
		+40		0.003200	
		+50		-0.012199	
		-30		0.018899	
100	48.0	-20		-0.012700	1.50
		-10		-0.004099	
		0		-0.001500	
		+10		0.001200	
		+20 (ref.)		-0.003399	
		+30		-0.002099	
		+40		-0.001599	
		+50		0.011400	
		-30		0.012199	
		-20		-0.006000	
115	55.2	-10	2 680	0.015500	1.50
		0		0.003399	
		+10		-0.000800	
		+20 (ref.)		-0.006000	
		+30		0.019100	
		+40		-0.006999	
		+50		0.005400	
		-30		0.012199	
		-20		-0.006000	
		-10		0.015500	

### 3.6.7 Test Plots

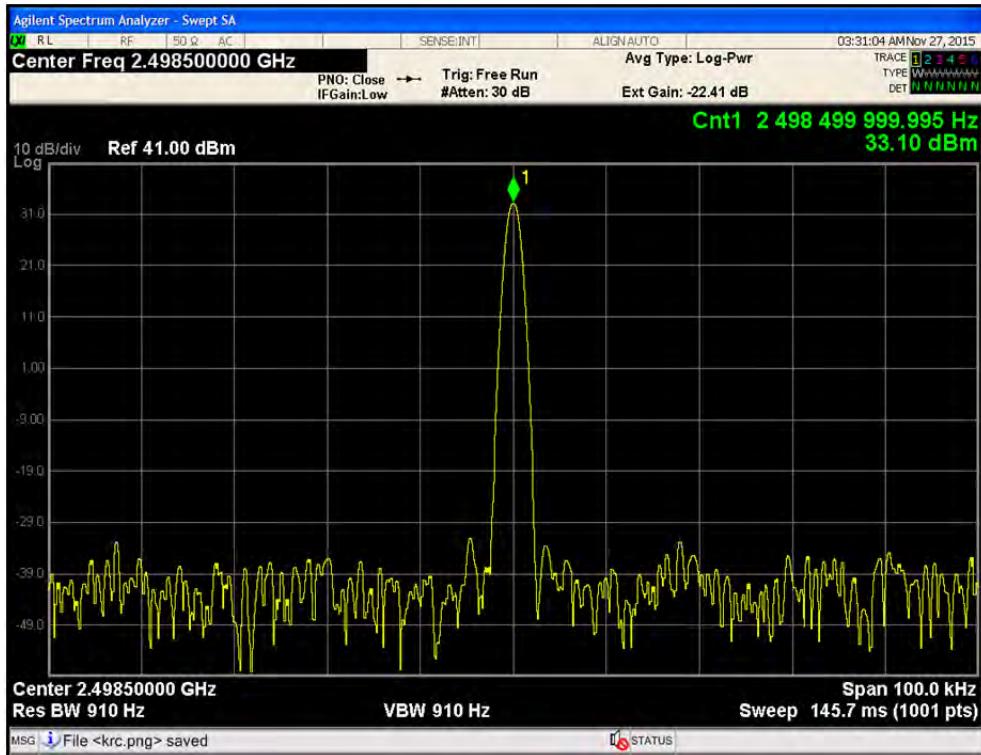
- Port1 / 2 498.5 MHz / 85 %



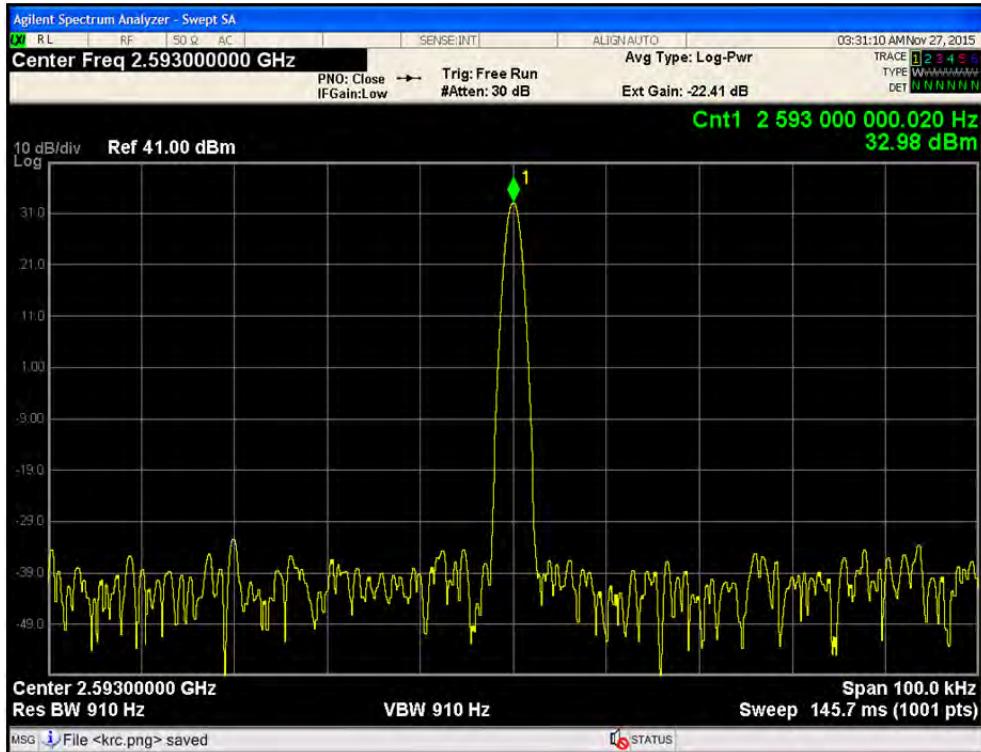
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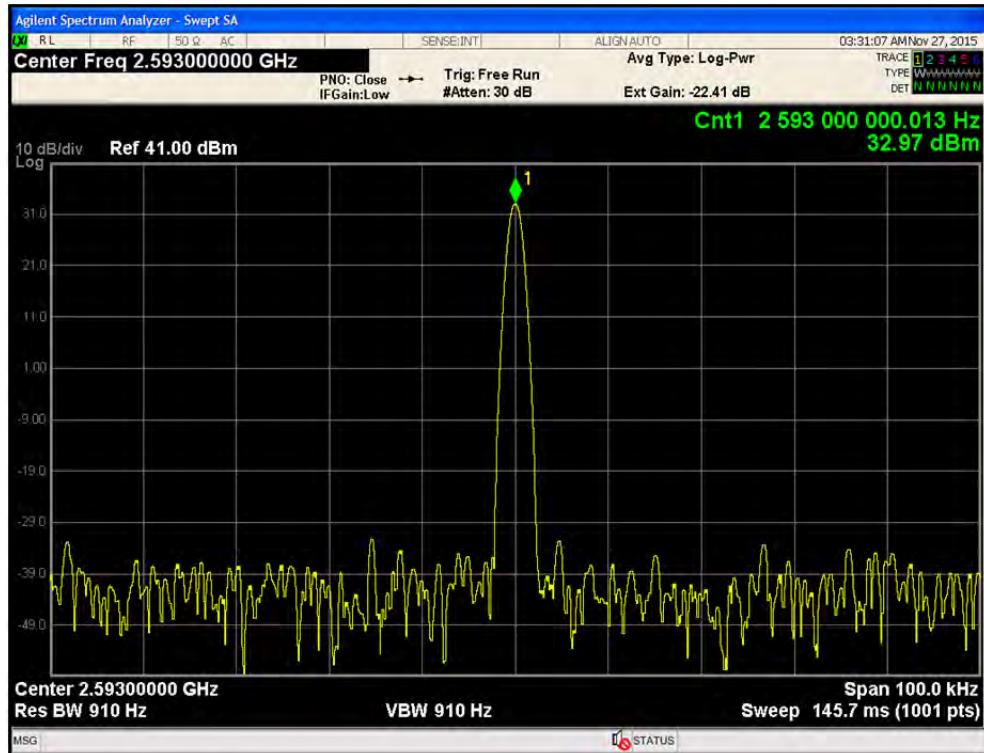
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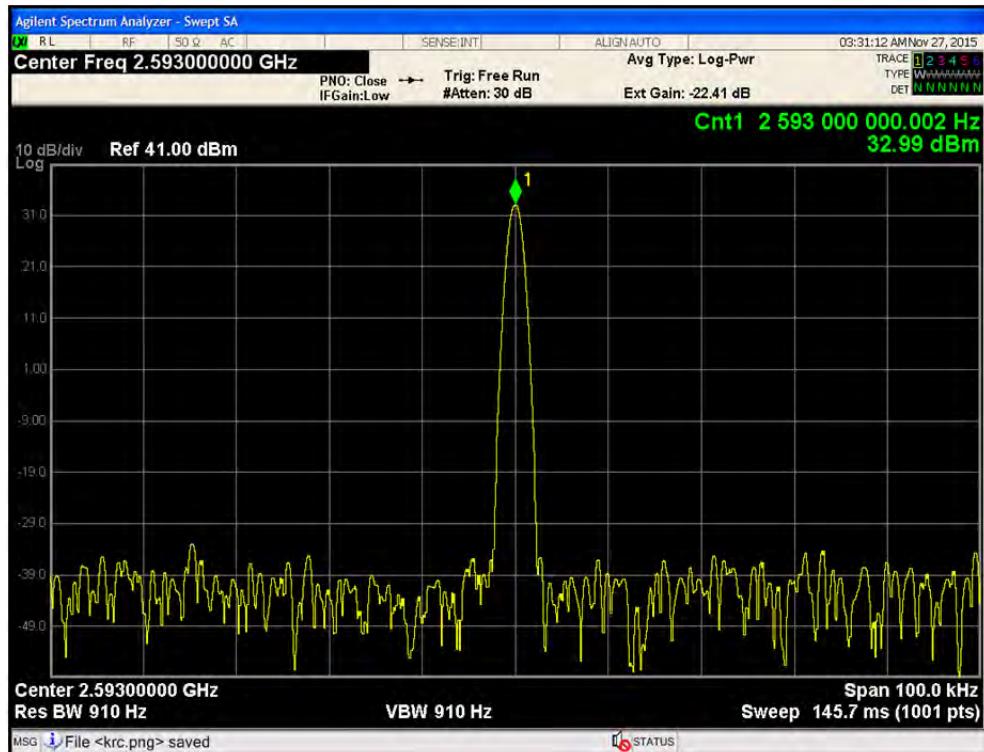
- Port1 / 2 593 MHz / 85 %



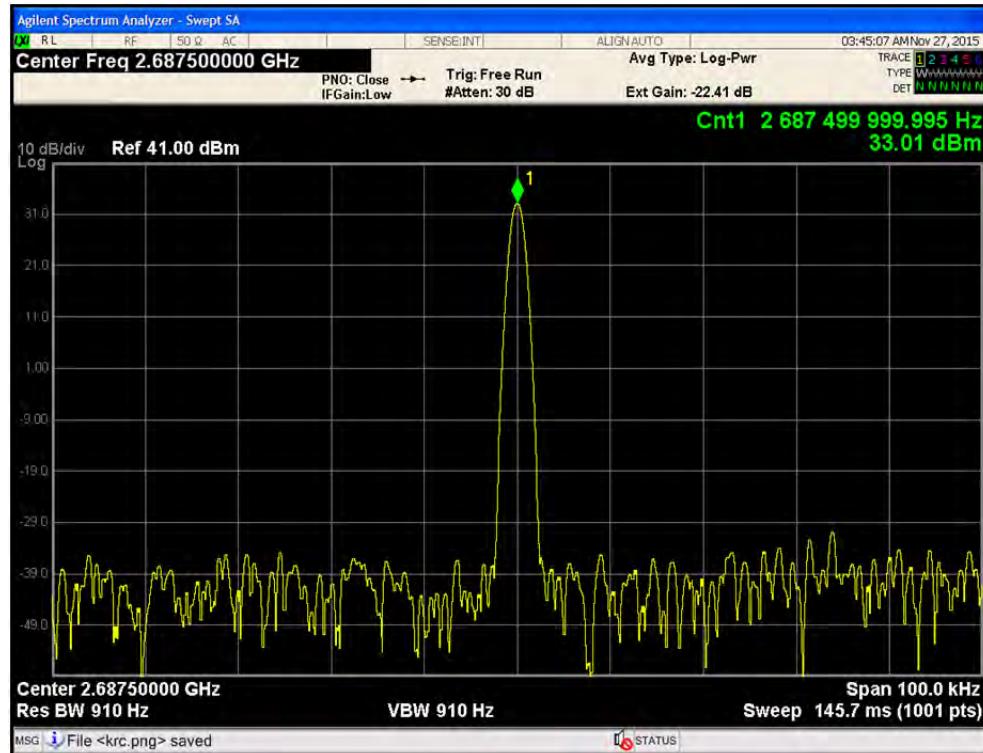
- Port1 / 2 593 MHz / 100 %



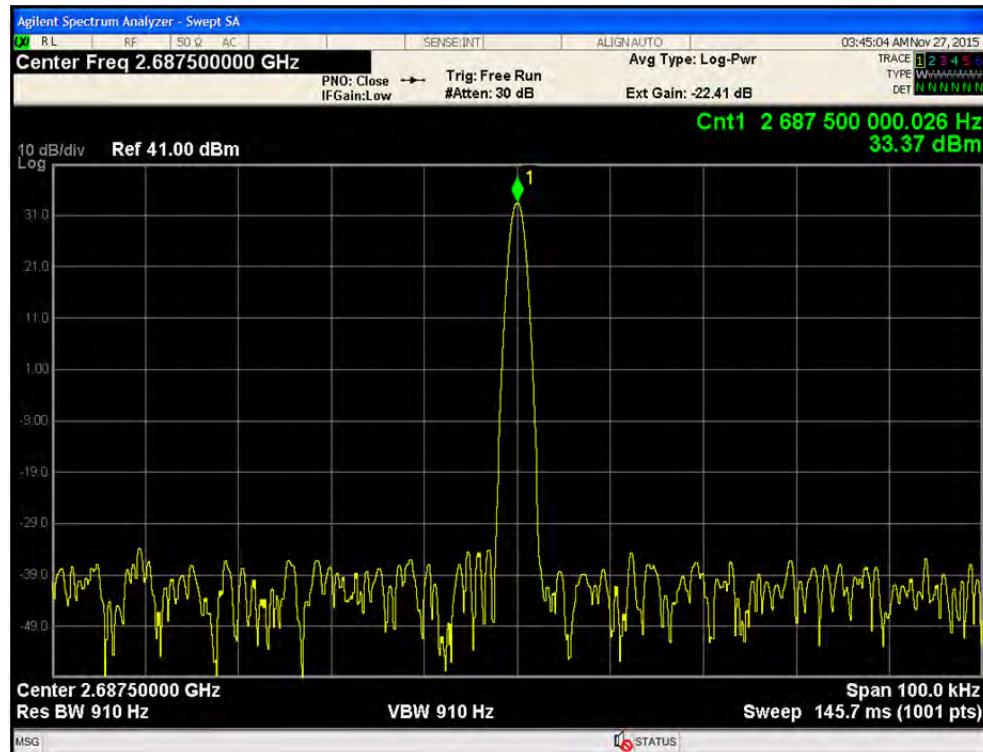
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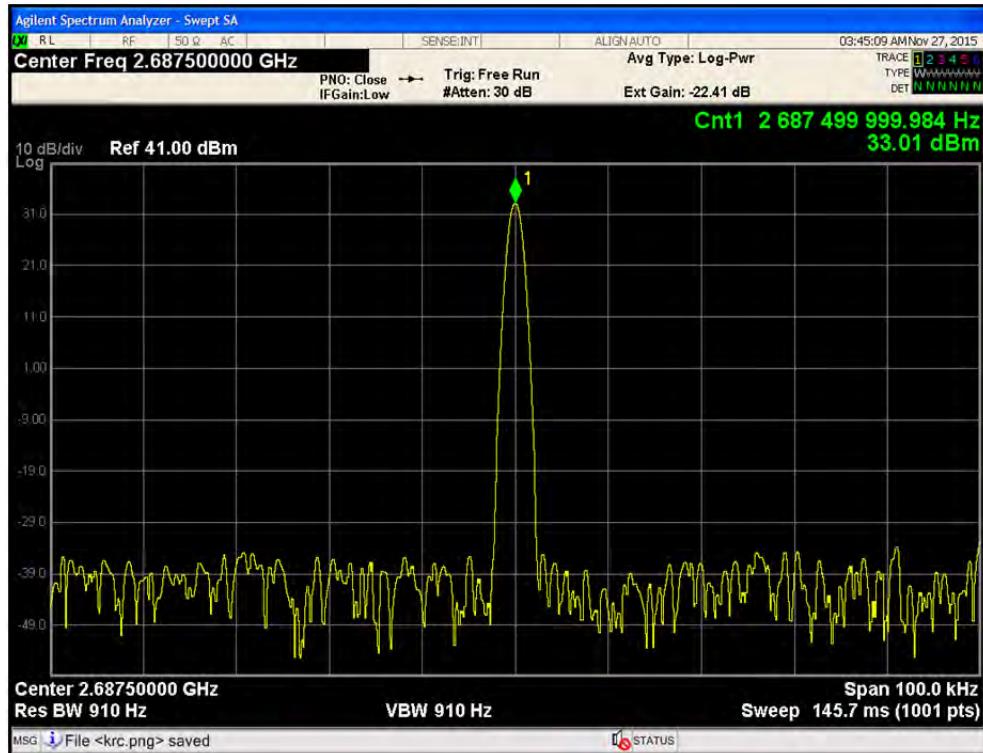
- Port1 / 2 687.5 MHz / 85 %



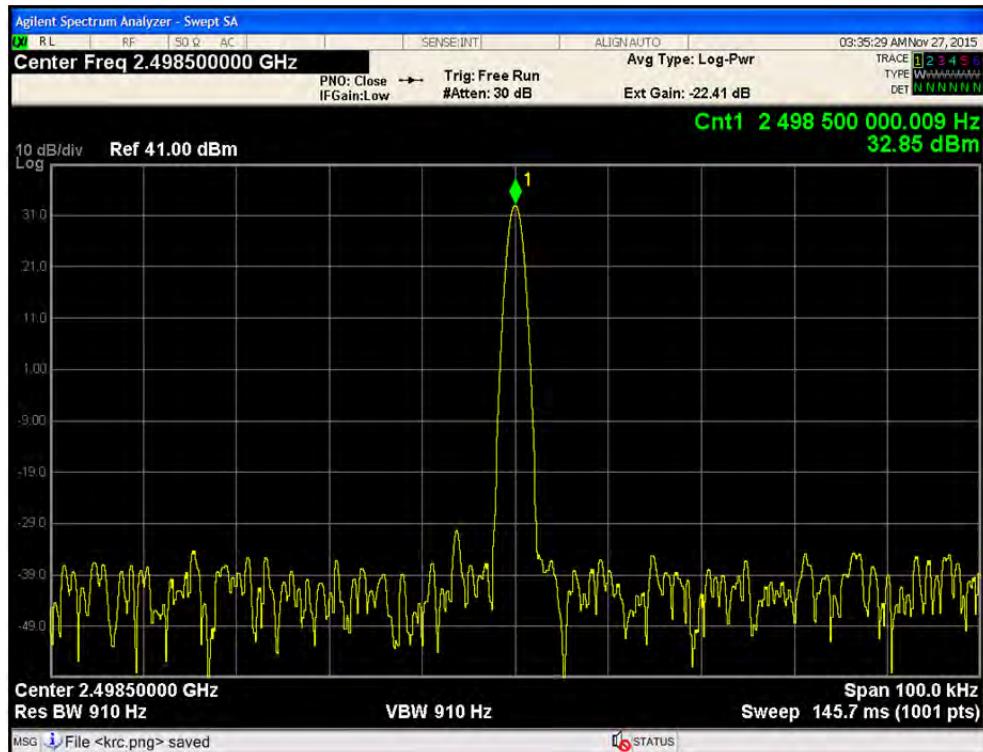
- Port1 / 2 687.5 MHz / 100 %



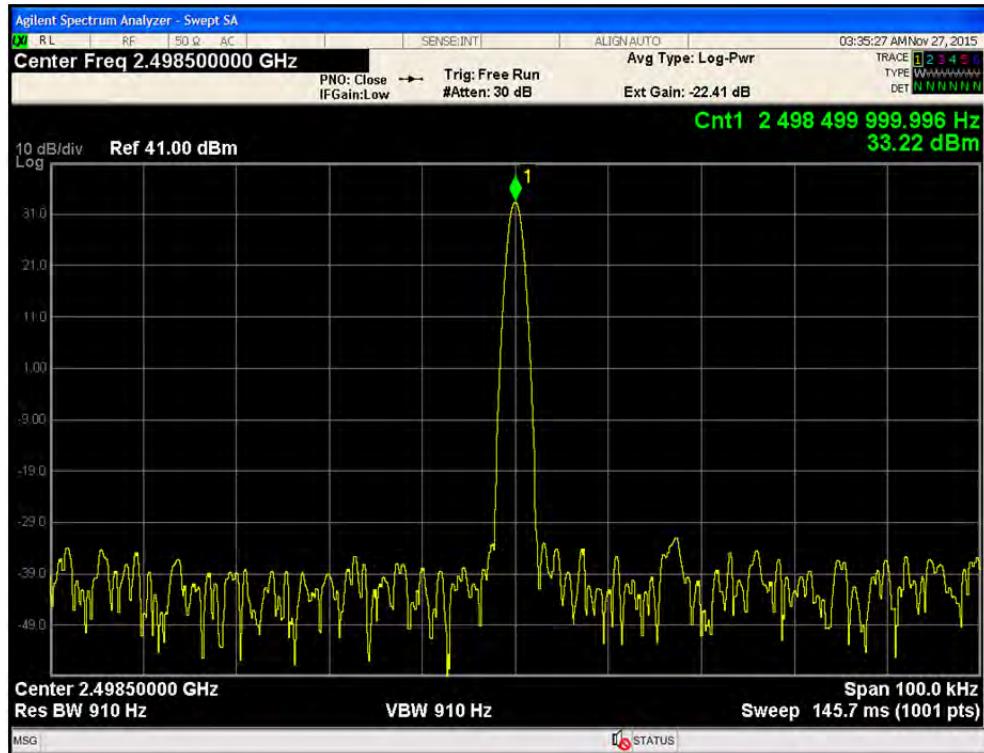
- Port1 / 2 687.5 MHz / 115 %



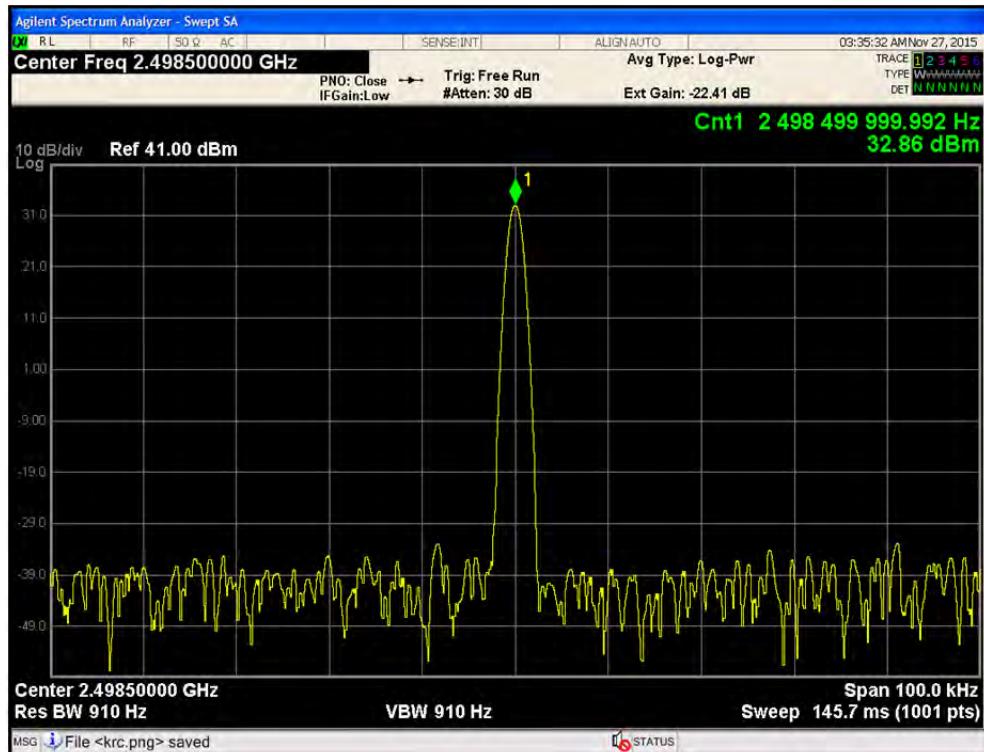
- Port2 / 2 498.5 MHz / 85 %



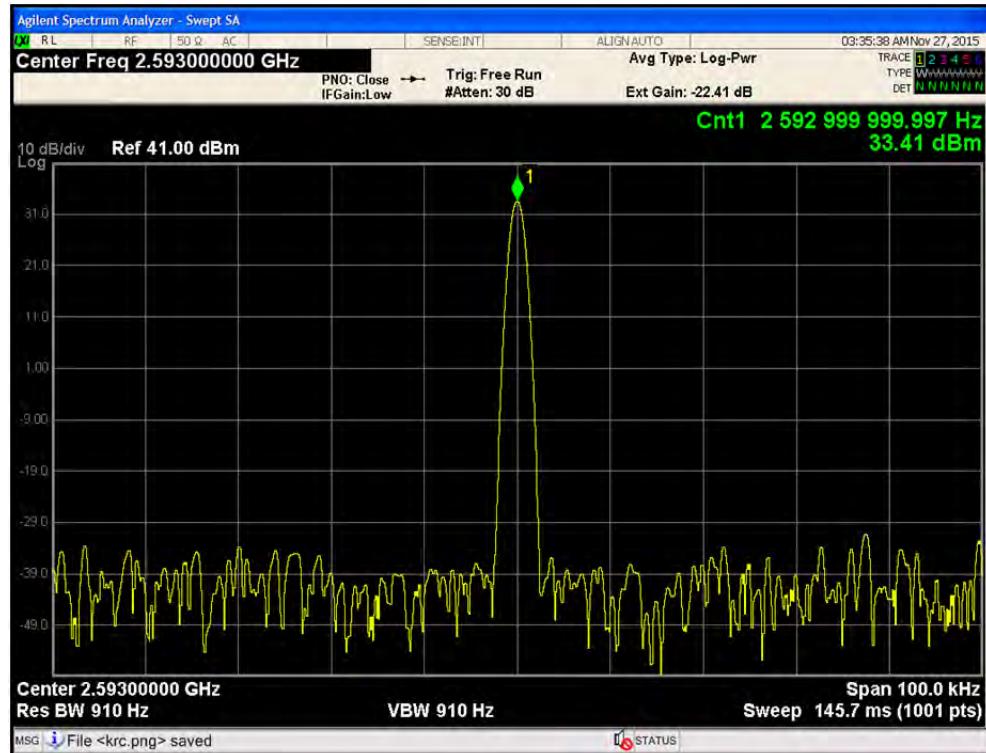
- Port2 / 2 498.5 MHz / 100 %



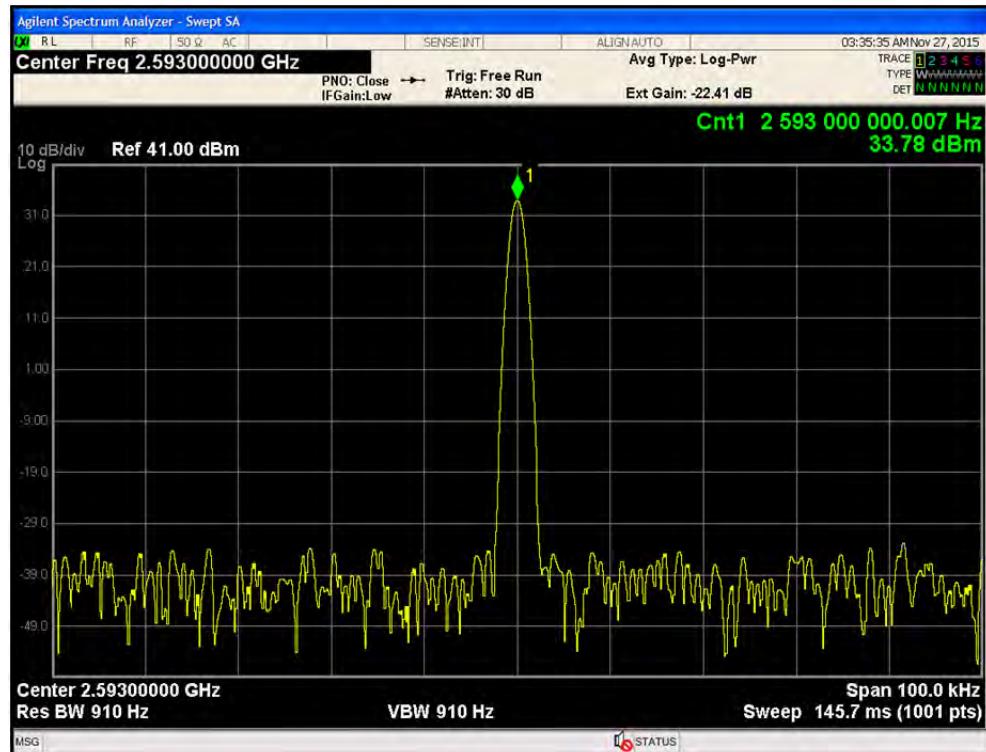
- Port2 / 2 498.5 MHz / 115 %



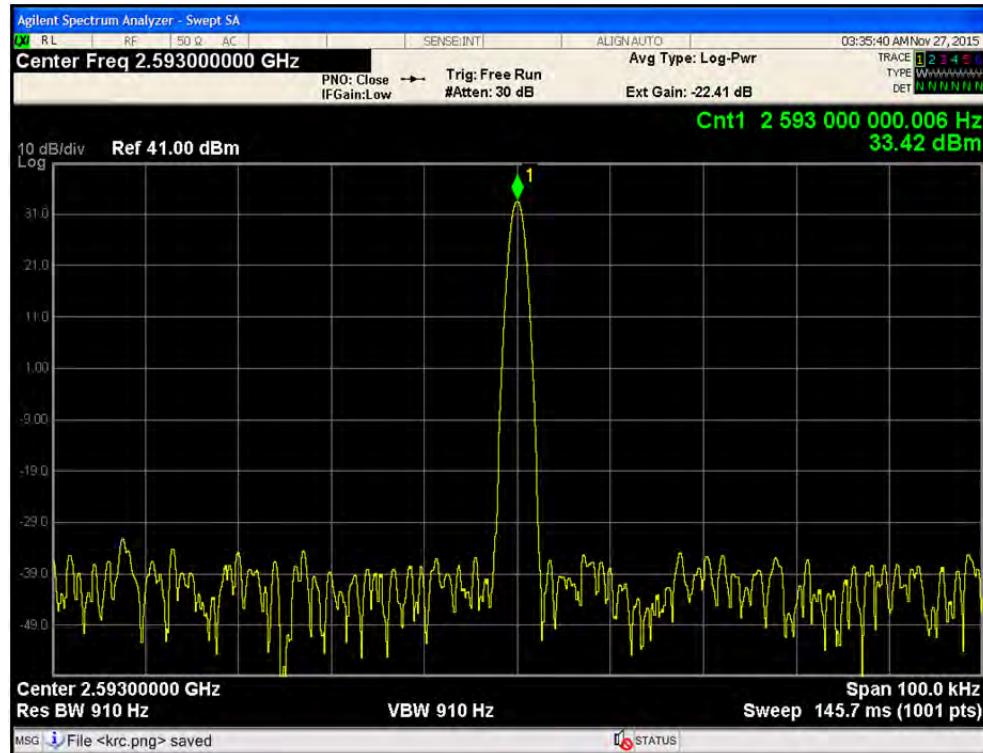
- Port2 / 2 593 MHz / 85 %



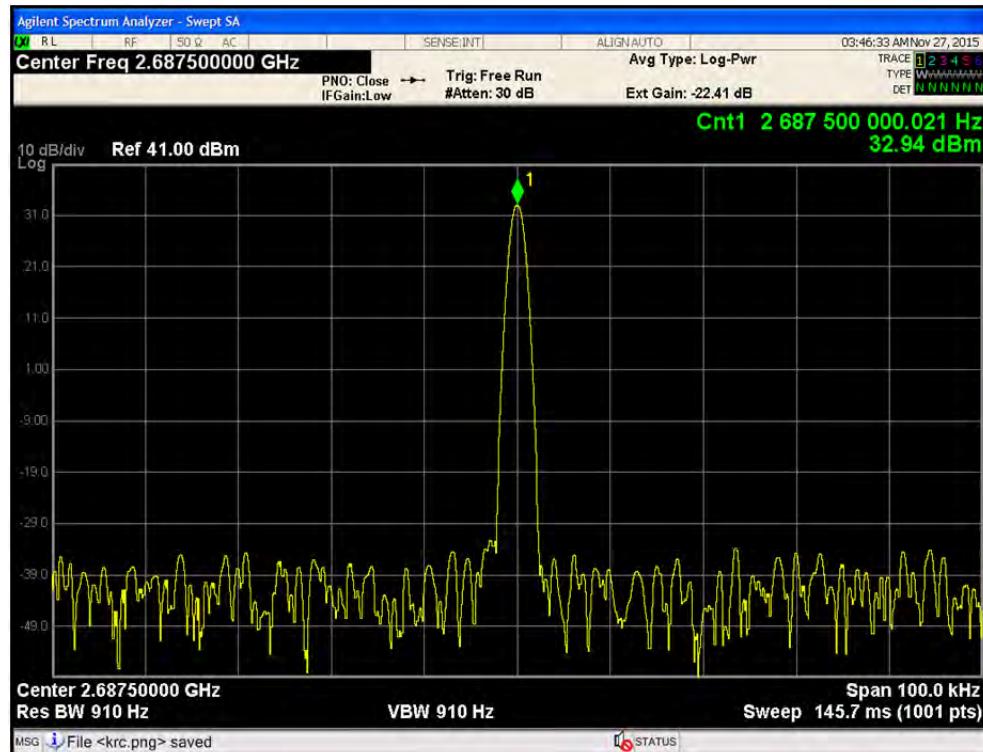
- Port2 / 2 593 MHz / 100 %



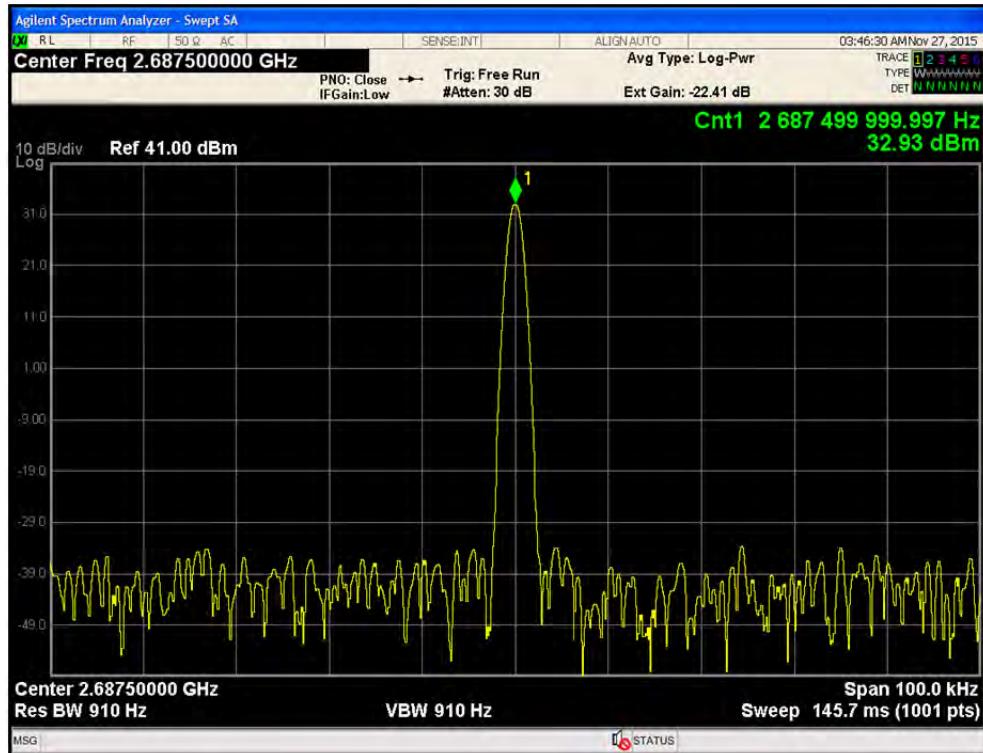
- Port2 / 2 593 MHz / 115 %



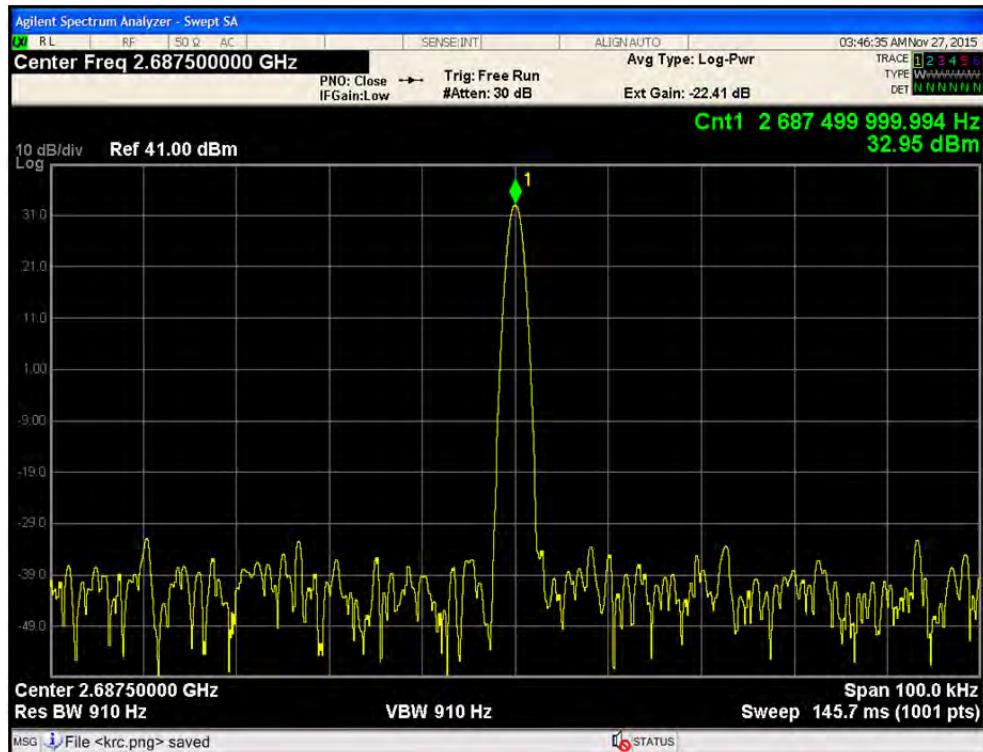
- Port2 / 2 687.5 MHz / 85 %



- Port2 / 2 687.5 MHz / 100 %



- Port2 / 2 687.5 MHz / 115 %



#### 4. RF exposure statement

According to FCC Part1 Section 1.1307~1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Frequency Range [MHz]	Electric Field Strength [V/m]	Magnetic Field Strength [A/m]	Power Density [mW/cm <sup>2</sup> ]	Averaging Time [minute]
<b>Limits for General Population/Uncontrolled Exposure</b>				
0.3 – 1.34	614	1.63	100	30
1.34 – 30	824/f	2.19/f	180/f <sup>2</sup>	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	-	-	f/1500	30
1500 – 100 000	-	-	1.0	30

#### Limits for General Population/Uncontrolled Exposure

Here, f = frequency in MHz

#### 4.1 Friis transmission formula

$$P_d = (P_{out} \times G) / (4\pi r^2)$$

P<sub>d</sub> = Power density

P<sub>out</sub> = power input to antenna

G = power gain

r = distance to the center of radiation of the antenna

## 4.2 Information of Antenna

- Service antenna model name: **D5777i / Galtronics Corporation Ltd.**

Electrical Specification		
Frequency Range		2360 MHz ~ 2700 MHz
Polarization		Dual slant 45°
Band Width		910 MHz
Gain		≥ 15 dBi
Beam width	Horizontal	27°
	Vertical	27°
VSWR		≤ 1.7:1
Impedance		50 Ω
IMD (3 <sup>rd</sup> )		-150dBc (@ 2x43dBm )
Maximum input power		250 W

Mechanical Specification	
Operating Temperature	-40° ~ +70°
Weight	~10 kg
Length	787 mm
Width	627 mm
Height	145 mm
RoHS	compliant
Ingress Protection	IP65(Outdoor)
Radome Color	White
Wind Survival Rating	241 km/h



#### 4.3 Calculation of MPE at 100 cm

##### • Port1 / 64QAM

Bandwidth	Frequency [MHz]	Output power [dBm]	Antenna gain [dBi]	EIRP		Power density [mW/cm <sup>2</sup> ]	Limit [mW/cm <sup>2</sup> ]
				[dBm]	[W]		
LTE 5 MHz	2498.5	32.97	15.00	47.97	62.66	0.377237	1
	2593.0	32.99	15.00	47.99	62.95	0.378978	
	2687.5	33.06	15.00	48.06	63.97	0.385136	
LTE 10 MHz	2501.0	32.93	15.00	47.93	62.08	0.373778	1
	2593.0	33.01	15.00	48.01	63.24	0.380727	
	2685.0	33.02	15.00	48.02	63.38	0.381605	
LTE 15 MHz	2503.5	32.94	15.00	47.94	62.23	0.374640	1
	2593.0	32.97	15.00	47.97	62.66	0.377237	
	2682.5	32.95	15.00	47.95	62.37	0.375504	
LTE 20 MHz	2506.0	33.01	15.00	48.01	63.24	0.380727	1
	2593.0	33.03	15.00	48.03	63.53	0.382485	
	2680.0	32.99	15.00	47.99	62.95	0.378978	

##### • Port2 / 64QAM

Bandwidth	Frequency [MHz]	Output power [dBm]	Antenna gain [dBi]	EIRP		Power density [mW/cm <sup>2</sup> ]	Limit [mW/cm <sup>2</sup> ]
				[dBm]	[W]		
LTE 5 MHz	2498.5	32.99	15.00	47.99	62.95	0.378978	1
	2593.0	32.99	15.00	47.99	62.95	0.378978	
	2687.5	33.02	15.00	48.02	63.38	0.381605	
LTE 10 MHz	2501.0	32.94	15.00	47.94	62.23	0.374640	1
	2593.0	33.04	15.00	48.04	63.67	0.383367	
	2685.0	33.00	15.00	48.00	63.09	0.379852	
LTE 15 MHz	2503.5	32.99	15.00	47.99	62.95	0.378978	1
	2593.0	33.00	15.00	48.00	63.09	0.379852	
	2682.5	32.96	15.00	47.96	62.51	0.376639	
LTE 20 MHz	2506.0	32.90	15.00	47.90	61.65	0.371205	1
	2593.0	32.93	15.00	47.93	62.08	0.373778	
	2680.0	32.96	15.00	47.96	62.51	0.376639	

**• Port1 + Port2 / 64QAM**

Bandwidth	Frequency [MHz]	Output power [dBm]	Antenna gain [dBi]	EIRP		Power density [mW/cm <sup>2</sup> ]	Limit [mW/cm <sup>2</sup> ]
				[dBm]	[W]		
LTE 5 MHz	2498.5	35.98	15.00	50.98	125.31	0.754422	1
	2593.0	35.99	15.00	50.99	125.60	0.756161	
	2687.5	36.04	15.00	51.04	127.05	0.764917	
LTE 10 MHz	2501.0	35.93	15.00	50.93	123.87	0.745786	
	2593.0	36.00	15.00	51.00	125.89	0.757904	
	2685.0	36.00	15.00	51.00	125.89	0.757904	
LTE 15 MHz	2503.5	35.96	15.00	50.96	124.73	0.750956	
	2593.0	35.98	15.00	50.98	125.31	0.754422	
	2682.5	35.95	15.00	50.95	124.45	0.749229	
LTE 20 MHz	2506.0	35.94	15.00	50.94	124.16	0.747506	
	2593.0	35.97	15.00	50.97	125.02	0.752687	
	2680.0	35.97	15.00	50.97	125.02	0.752687	

## 5. Test equipment list

The listing below denotes the test equipment for the test(s).

No.	Equipment	Model	Manufacturer	Serial Number	Calibration Due date
1	Spectrum analyzer	N9020A	Agilent	MY48010456	2016.01.20
2	Signal generator	N5182A	Agilent	MY49060695	2016.01.19
3	Attenuator	AF115A-09-34	Weinschel	18405	2016.01.20
4	Attenuator	PE7019-20	PASTERNACK	TEMP_1	2016.11.30
5	Biconical antenna	VHA9103	Schwarzbeck	2217	2017.11.04
6	Log-Periodic antenna	VULP9118A	Schwarzbeck	382	2017.11.04
7	Horn antenna	BBHA-9120D	Schwarzbeck	395	2017.06.05
8	Horn antenna	FR6517	Orbit Technology	0511106	2016.08.07
9	EMI Test Receiver	ESS	R&S	833776/011	2016.08.26
10	Preamp	8449B	Agilent	3008A02013	2016.04.16
11	RF Amplifier	SCU01	R&S	10020	2016.08.26
12	Turn table	DS 1500 S-1t-O	Innco GmbH	N/A	N/A
13	Turn table	ALL1.5TT	AIRLINK LAB	N/A	N/A
14	Antenna mast	MA4000-O	Innco GmbH	N/A	N/A
15	Antenna mast	ALL2.2MA	AIRLINK LAB	N/A	N/A
16	Controller	CO 2000	Innco GmbH	N/A	N/A
17	Controller	ALL-TC-V1.0	AIRLINK LAB	N/A	N/A