



# RF TEST REPORT

<b>Applicant</b>	TP-LINK TECHNOLOGIES CO.,LTD.
<b>FCC ID</b>	TE7C5LV1
<b>Brand</b>	TP-LINK
<b>Product</b>	C5L FDD-LTE Smartphone
<b>Model</b>	TP601C
<b>Report No.</b>	RXA1511-0187RF02R3
<b>Issue Date</b>	February 23, 2016

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2/ FCC CFR 47 Part 24H**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Handwritten signature of Lingling Kang in black ink.

*Reviewed by: Lingling Kang/ Manager*

Handwritten signature of Kai Xu in black ink.

*Approved by: Kai Xu/ Director*



## TA Technology (Shanghai) Co., Ltd.

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### Summary of measurement results

No.	Test Case	Clause in FCC rules	Verdict
1	RF power output	2.1046	PASS
2	Effective Isotropic Radiated power	24.232	PASS
3	Occupied Bandwidth	2.1049	PASS
4	Band Edge Compliance	24.238	PASS
5	Peak-to-Average Power Ratio	24.232/KDB 971168 D01(5.7)	PASS
6	Frequency Stability	2.1055 / 24.235	PASS
7	Spurious Emissions at Antenna Terminals	2.1051 / 24.238	PASS
8	Radiates Spurious Emission	2.1053 / 24.238	PASS
Date of Testing: November 14, 2015~ November 23, 2015			



## 1. Test Laboratory

### 1.1. Notes of the test report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd**. The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above. This report must not be used by the client to claim product certification, approval, or endorsement by CNAS or any government agencies.

### 1.2. Test facility

#### **CNAS (accreditation number:L2264)**

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

#### **FCC (recognition number is 428261)**

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

#### **IC (recognition number is 8510A)**

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

#### **VCCI (recognition number is C-4595, T-2154, R-4113, G-766)**

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

#### **A2LA (Certificate Number: 3857.01)**

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.



### 1.3. Testing Location

Company: TA Technology (Shanghai) Co., Ltd.  
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## 2. General Description of Equipment under Test

### Client Information

<b>Applicant</b>	TP-LINK TECHNOLOGIES CO., LTD.
<b>Applicant address</b>	Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park,Shennan Rd, Nanshan, Shenzhen,China
<b>Manufacturer</b>	TP-LINK TECHNOLOGIES CO., LTD.
<b>Manufacturer address</b>	Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park,Shennan Rd, Nanshan, Shenzhen,China

### Accessory Equipment Details

Name	Model	Manufacturer	Capacity	S/N
Battery	NBL-45A2000	TP-LINK TECHNOLOGIES CO., LTD.	2000mAh	B1151006100980

### General information

Model:	TP601C		
Product IMEI:	SIM 1: 868788020000379 SIM 2: 868788020001385		
Hardware Version:	P1		
Software Version:	H10S100D03B20151015R1003		
Power Supply:	Battery/AC adapter		
Antenna Type:	Internal Antenna		
Test Mode(s):	GSM1900; WCDMA Band II; LTE Band II;		
Test Modulation:	(GSM)GMSK,8PSK; (WCDMA)QPSK; (LTE)QPSK,16QAM		
GPRS/EGPRS Multislot Class:	12		
HSDPA UE Category:	14		
HSUPA UE Category:	6		
DC-HSDPA UE Category:	24		
HSPA+ UE Category:	14		
Maximum E.I.R.P.	GSM 1900: 28.71 dBm WCDMA Band II: 21.9 dBm LTE Band II: 22.81dBm		
Rated Power Supply Voltage:	3.8V		
Extreme Voltage:	Minimum: 3.6V Maximum: 4.35V		
Extreme Temperature:	Lowest: 0°C Highest: +45°C		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	GSM1900	1850 ~ 1910	1930 ~ 1990
	WCDMA Band II	1852 ~ 1908	1932 ~ 1988
	LTE Band II	1850 ~ 1910	1930 ~ 1990

Note: The information of the EUT is declared by the manufacturer.  
Please refer to the specifications or user manual for details.



### **3. Applied Standards**

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC CFR47 Part 2 (2014)**

**FCC CFR 47 Part 24H (2014)**

**ANSI/TIA 603-D (2010)**

**KDB 971168 D01 Power Meas License Digital Systems v02r02**

### 4. Test Configuration

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes. EUT stand-up position (Z axis), lie-down position (X, Y axis). Receiver antenna polarization (horizontal and vertical), the worst emission was found in position (Z axis, vertical polarization) and the worst case was recorded.

All mode and data rates and positions and RB size and modulations were investigated.

Subsequently, only the worst case emissions are reported.

The following testing in GSM/WCDMA/LTE is set based on the maximum RF Output Power.

The following testing in different Bandwidth is set to detail in the following table:

Test modes are chosen to be reported as the worst case configuration below for GSM 1900 and WCDMA Band II:

	Test items	Modes	Modulation
Conducted Test cases	RF power output	GSM 1900	GSM/GPRS/EGPRS
		WCDMA Band II	RMC/HSDPA/HSUPA/DC-HSDPA/HSPA+
	Effective Isotropic Radiated power	GSM 1900	GSM/GPRS/EGPRS
		WCDMA Band II	RMC
	Occupied Bandwidth	GSM 1900	GSM/GPRS/EGPRS
		WCDMA Band II	RMC
	Band Edge Compliance	GSM 1900	GSM/GPRS/EGPRS
		WCDMA Band II	RMC
	Peak-to-Average Power Ratio	GSM 1900	GSM/GPRS/EGPRS
		WCDMA Band II	RMC
	Frequency Stability	GSM 1900	GSM/GPRS/EGPRS
		WCDMA Band II	RMC
Spurious Emissions at Antenna Terminals	GSM 1900	GPRS	
	WCDMA Band II	RMC	
Radiated Test cases	Radiates Spurious Emission	GSM 1900	GPRS
		WCDMA Band II	RMC



Test modes are chosen to be reported as the worst case configuration below for LTE Band II:

Test items	Bandwidth (MHz)						Modulation		RB			Test Channel		
	1.4	3	5	10	15	20	QPSK	16QAM	1	50%	100%	L	M	H
RF power output	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Effective Isotropic Radiated power	O	O	O	O	O	O	O	O	-	-	O	O	O	O
Occupied Bandwidth	O	O	O	O	O	O	O	O	-	-	O	O	O	O
Band Edge Compliance	O	O	O	O	O	O	O	O	O	-	O	O	-	O
Peak-to-Average Power Ratio	O	O	O	O	O	O	O	O	-	-	O	O	O	O
Frequency Stability	O	O	O	O	O	O	O	O	-	-	O	-	O	-
Conducted Spurious Emissions	O	O	O	O	O	O	O	-	O	-	-	O	O	O
Radiates Spurious Emission	O	O	O	O	O	O	O	-	O	-	-	O	O	O
Note	1. The mark "O" means that this configuration is chosen for testing. 2. The mark "-" means that this configuration is not testing.													

## 5. Test Case Results

### 5.1.RF Power Output

#### Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

#### Methods of Measurement

During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

#### Test Setup



The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

#### Limits

No specific RF power output requirements in part 2.1046.

#### Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 2$ ,  $U = 0.4$  dB.

**Test Results**

<b>GSM 1900</b>		<b>Conducted Power(dBm)</b>		
		Channel 512	Channel 661	Channel 810
		1850.2(MHz)	1880(MHz)	1909.8(MHz)
GSM	Results	<b>28.34</b>	<b>28.40</b>	<b>28.71</b>
GPRS (GMSK)	1TXslot	<b>28.33</b>	<b>28.42</b>	<b>28.67</b>
	2TXslots	26.74	26.89	27.15
	3TXslots	25.42	25.47	25.82
	4TXslots	23.56	23.72	23.78
EGPRS (8PSK)	1TXslot	<b>25.26</b>	<b>25.35</b>	<b>25.23</b>
	2TXslots	22.24	22.45	22.52
	3TXslots	20.12	21.96	21.04
	4TXslots	19.55	19.74	19.76

Note:

- 1) The maximum RF Output Power numbers are marks in bold.
- 2) The following testing in GPRS/EGPRS is set to 1TXslot based on the maximum RF Output Power.

<b>WCDMA Band II</b>		<b>Conducted Power(dBm)</b>		
		Channel 9262	Channel 9400	Channel 9538
		1852.4(MHz)	1880(MHz)	1907.6(MHz)
<b>RMC</b>		<b>21.90</b>	<b>21.63</b>	<b>21.41</b>
<b>HSDPA</b>	Sub - Test 1	21.88	21.60	21.37
	Sub - Test 2	21.84	21.45	21.40
	Sub - Test 3	21.87	21.67	21.34
	Sub - Test 4	21.78	21.73	21.35
<b>HSUPA</b>	Sub - Test 1	20.75	20.59	20.15
	Sub - Test 2	19.43	19.29	18.84
	Sub - Test 3	20.17	19.90	19.32
	Sub - Test 4	19.46	19.38	18.79
	Sub - Test 5	20.81	20.62	20.31
<b>DC-HSDPA</b>	Sub - Test 1	21.69	21.38	21.20
	Sub - Test 2	21.63	21.34	21.15
	Sub - Test 3	21.47	21.15	21.05
	Sub - Test 4	21.50	21.19	21.08
<b>HSPA+</b>	16QAM	20.52	20.26	20.21

Note:

- 1) The maximum RF Output Power numbers are marks in bold.
- 2) The following testing in RMC based on the maximum RF Output Power.



LTE FDD Band 2				Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				18607/1850.7	18900/1880	19193/1909.3
1.4MHz	QPSK	1	0	22.71	22.81	22.78
		1	2	22.78	22.79	22.55
		1	5	22.64	22.52	22.68
		3	0	22.46	22.34	22.47
		3	2	22.44	22.42	22.22
		3	3	22.36	22.32	22.22
	16QAM	6	0	21.57	21.56	21.49
		1	0	21.80	21.79	22.04
		1	2	22.01	21.83	21.38
		1	5	21.37	21.02	21.37
		3	0	21.46	21.40	21.33
		3	2	21.53	21.49	21.20
		3	3	21.27	21.36	21.08
		6	0	20.67	20.34	20.28
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				18615/1851.5	18900/1880	19185/1908.5
3MHz	QPSK	1	0	22.65	22.66	22.68
		1	7	22.73	22.69	22.50
		1	14	22.54	22.47	22.53
		8	0	22.14	22.07	22.20
		8	4	22.17	22.10	22.00
		8	7	22.14	22.05	21.95
		15	0	21.47	21.51	21.44
	16QAM	1	0	21.65	21.69	21.94
		1	7	21.96	21.73	21.33
		1	14	21.27	20.92	21.22
		8	0	21.19	21.18	21.11
		8	4	21.26	21.22	20.93
		8	7	20.95	21.14	20.81
		15	0	20.58	20.27	20.21



Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				18625/1852.5	18900/1880	19175/1907.5
5MHz	QPSK	1	0	22.66	22.69	22.70
		1	13	22.74	22.71	22.51
		1	24	22.56	22.48	22.56
		12	0	21.49	21.41	21.54
		12	6	21.51	21.45	21.33
		12	13	21.47	21.39	21.29
		25	0	21.49	21.52	21.45
	16QAM	1	0	21.68	21.71	21.96
		1	13	21.97	21.75	21.34
		1	24	21.29	20.94	21.25
		12	0	20.53	20.51	20.44
		12	6	20.60	20.56	20.27
		12	13	20.30	20.47	20.15
		25	0	20.60	20.28	20.22
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				18650/1855	18900/1880	19150/1905
10MHz	QPSK	1	0	22.67	22.72	22.72
		1	25	22.75	22.73	22.52
		1	49	22.58	22.49	22.59
		25	0	21.52	21.43	21.56
		25	13	21.53	21.48	21.34
		25	25	21.48	21.41	21.31
		50	0	21.51	21.53	21.46
	16QAM	1	0	21.71	21.73	21.98
		1	25	21.98	21.77	21.35
		1	49	21.31	20.96	21.28
		25	0	20.55	20.52	20.45
		25	13	20.62	20.58	20.29
		25	25	20.33	20.48	20.17
		50	0	20.62	20.29	20.23
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				18675/1857.5	18900/1880	19125/1902.5



15MHz	QPSK	1	0	22.69	22.75	22.74
		1	38	22.76	22.75	22.53
		1	74	22.60	22.50	22.62
		36	0	21.55	21.45	21.58
		36	18	21.55	21.51	21.35
		36	39	21.49	21.43	21.33
		75	0	21.53	21.54	21.47
	16QAM	1	0	21.74	21.75	22.00
		1	38	21.99	21.79	21.36
		1	74	21.33	20.98	21.31
		36	0	20.57	20.53	20.46
		36	18	20.64	20.60	20.31
		36	39	20.36	20.49	20.19
		75	0	20.64	20.30	20.26
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				18700/1860	18900/1880	19100/1900
20MHz	QPSK	1	0	22.70	22.78	22.76
		1	50	22.77	22.77	22.54
		1	99	22.62	22.51	22.65
		50	0	21.58	21.47	21.60
		50	25	21.57	21.54	21.36
		50	50	21.50	21.45	21.35
		100	0	21.55	21.55	21.48
	16QAM	1	0	21.77	21.77	22.02
		1	50	22.00	21.81	21.37
		1	99	21.35	21.00	21.34
		50	0	20.59	20.54	20.47
		50	25	20.66	20.62	20.33
		50	50	20.39	20.50	20.21
		100	0	20.65	20.33	20.27

Note:

- 1) The following testing in worst case based on the maximum RF Output Power.

## 5.2. Effective Isotropic Radiated Power

### Ambient condition

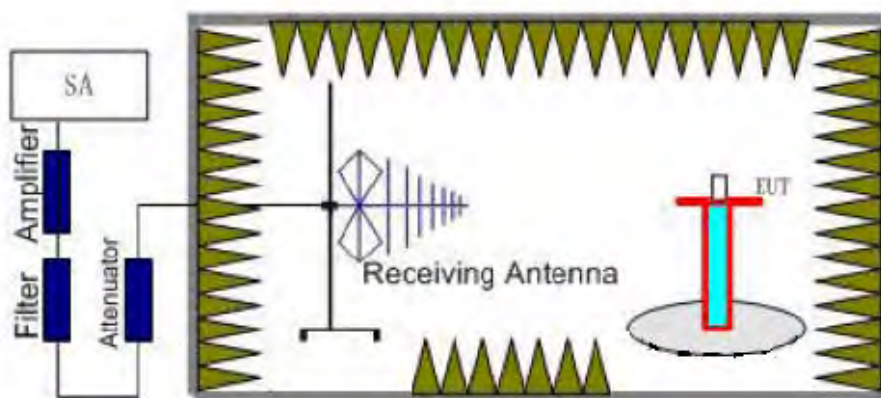
Temperature	Relative humidity
21°C ~25°C	40%~60%

### Methods of Measurement

The measurement procedures in ANSI/TIA 603-D are used.

1. The EUT was placed on a turntable with 1.5 meter height in a fully anechoic chamber.
2. The EUT was set at 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. GSM operating modes: Set RBW= 1MHz, VBW= 3MHz, RMS detector over burst;  
UMTS operating modes: Set RBW= 100 KHz, VBW= 300 KHz, RMS detector over frame, and use channel power option with bandwidth=5MHz, per section 4.0 of KDB 971168 D01.
4. The table was rotated 360 degrees to determine the position of the highest radiated power.
5. The height of the receiving antenna is adjusted to look for the maximum ERP/EIRP.
6. Taking the record of maximum ERP/EIRP.
7. A dipole antenna was substituted in place of the EUT and was driven by a signal generator.
8. The conducted power at the terminal of the dipole antenna is measured.
9. Repeat step 3 to step 5 to get the maximum ERP/EIRP of the substitution antenna.
10.  $ERP/EIRP = P_s + E_t - E_s + G_s = P_s + R_t - R_s + G_s$   
 $P_s$  (dBm) : Input power to substitution antenna.  
 $G_s$  (dBi or dBd) : Substitution antenna Gain.  
 $E_t = R_t + AF$   
 $E_s = R_s + AF$   
 $AF$  (dB/m) : Receive antenna factor  
 $R_t$  : The highest received signal in spectrum analyzer for EUT.  
 $R_s$  : The highest received signal in spectrum analyzer for substitution antenna.

### Test Setup



### Limits



Rule Part 24.232(b) specifies that "Mobile/portable stations are limited to 2 watts EIRP. Peak power" and Rule Part 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage".

Limit (EIRP)

 $\leq 2 \text{ W}$  (33 dBm)

### Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 2$ ,  $U = 1.19 \text{ dB}$

### Test Results:

Mode	Polarization	Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	EIRP (dBm)	Conclusion
GSM 1900	H	1850.2	-29.760	-55.38	0	1.92	27.54	Pass
	H	1880	-30.470	-55.84	0	1.94	27.31	Pass
	H	1909.8	-30.870	-55.78	0	1.90	26.81	Pass
	V	1850.2	-30.240	-56.18	0	1.92	27.86	Pass
	V	1880	-32.000	-56.61	0	1.94	26.55	Pass
	V	1909.8	-33.010	-56.64	0	1.90	25.53	Pass
GPRS 1900	H	1850.2	-29.480	-55.38	0	1.92	27.82	Pass
	H	1880	-30.450	-55.84	0	1.94	27.33	Pass
	H	1909.8	-28.930	-55.78	0	1.90	28.75	Pass
	V	1850.2	-29.970	-56.18	0	1.92	28.13	Pass
	V	1880	-31.610	-56.61	0	1.94	26.94	Pass
	V	1909.8	-32.820	-56.64	0	1.90	25.72	Pass
EGPRS 1900	H	1850.2	-30.200	-55.38	0	1.92	27.10	Pass
	H	1880	-30.270	-55.84	0	1.94	27.51	Pass
	H	1909.8	-29.580	-55.78	0	1.90	28.10	Pass
	V	1850.2	-30.960	-56.18	0	1.92	27.14	Pass
	V	1880	-32.050	-56.61	0	1.94	26.50	Pass
	V	1909.8	-32.800	-56.64	0	1.90	25.74	Pass
WCDMA Band II	H	1852.4	-37.200	-55.22	0	1.91	19.93	Pass
	H	1880	-36.960	-55.84	0	1.94	20.82	Pass
	H	1907.6	-36.490	-55.78	0	1.92	21.21	Pass
	V	1852.4	-40.370	-56.19	0	1.91	17.73	Pass
	V	1880	-40.140	-56.61	0	1.94	18.41	Pass
	V	1907.6	-39.910	-56.77	0	1.92	18.78	Pass





LTE Band II								
bandwidth	Polarization	Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	EIRP (dBm)	Conclusion
1.4 MHz (QPSK)	H	1850.7	-36.367	-54.89	0	1.90	20.42	Pass
	H	1880	-37.252	-56.66	0	1.92	21.33	Pass
	H	1909.3	-38.277	-58.09	0	1.91	21.72	Pass
	V	1850.7	-41.350	-55.05	0	1.90	15.60	Pass
	V	1880	-44.050	-56.41	0	1.92	14.28	Pass
	V	1909.3	-44.750	-57.85	0	1.91	15.01	Pass
1.4 MHz (16QAM)	H	1850.7	-36.867	-54.89	0	1.90	19.92	Pass
	H	1880	-37.752	-56.66	0	1.92	20.83	Pass
	H	1909.3	-38.777	-58.09	0	1.91	21.22	Pass
	V	1850.7	-41.850	-55.05	0	1.90	15.1	Pass
	V	1880	-44.550	-56.41	0	1.92	13.78	Pass
	V	1909.3	-45.250	-57.85	0	1.91	14.51	Pass
3 MHz (QPSK)	H	1851.5	-37.405	-54.93	0	1.91	19.43	Pass
	H	1880	-38.412	-56.66	0	1.94	20.19	Pass
	H	1908.5	-39.001	-58.08	0	1.91	20.99	Pass
	V	1851.5	-42.630	-55.04	0	1.91	14.32	Pass
	V	1880	-45.170	-56.41	0	1.94	13.18	Pass
	V	1908.5	-45.530	-57.86	0	1.91	14.24	Pass
3 MHz (16QAM)	H	1851.5	-38.175	-54.93	0	1.91	18.66	Pass
	H	1880	-39.152	-56.66	0	1.94	19.45	Pass
	H	1908.5	-39.671	-58.08	0	1.91	20.32	Pass
	V	1851.5	-43.280	-55.04	0	1.91	13.67	Pass
	V	1880	-45.800	-56.41	0	1.94	12.55	Pass
	V	1908.5	-46.150	-57.86	0	1.91	13.62	Pass
5 MHz (QPSK)	H	1852.5	-37.378	-54.98	0	1.92	19.52	Pass
	H	1880	-38.442	-56.66	0	1.94	20.16	Pass
	H	1907.5	-39.245	-58.05	0	1.90	20.71	Pass
	V	1852.5	-42.870	-55.14	0	1.92	14.19	Pass
	V	1880	-45.230	-56.41	0	1.94	13.12	Pass
	V	1907.5	-45.820	-57.97	0	1.90	14.05	Pass
5 MHz (16QAM)	H	1852.5	-37.918	-54.98	0	1.92	18.98	Pass
	H	1880	-39.182	-56.66	0	1.94	19.42	Pass
	H	1907.5	-39.845	-58.05	0	1.90	20.11	Pass
	V	1852.5	-43.500	-55.14	0	1.92	13.56	Pass
	V	1880	-45.920	-56.41	0	1.94	12.43	Pass
	V	1907.5	-46.490	-57.97	0	1.90	13.38	Pass
10 MHz (QPSK)	H	1855	-36.717	-55.09	0	1.91	20.28	Pass
	H	1880	-37.482	-56.66	0	1.94	21.12	Pass



LTE Band II								
bandwidth	Polarization	Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	EIRP (dBm)	Conclusion
	H	1905	-38.604	-58.01	0	1.92	21.33	Pass
	V	1855	-39.170	-55.08	0	1.91	17.82	Pass
	V	1880	-39.640	-56.41	0	1.94	18.71	Pass
	V	1905	-40.010	-57.81	0	1.92	19.72	Pass
10 MHz (16QAM)	H	1855	-37.347	-55.09	0	1.91	19.65	Pass
	H	1880	-38.052	-56.66	0	1.94	20.55	Pass
	H	1905	-39.254	-58.01	0	1.92	20.68	Pass
	V	1855	-39.760	-55.08	0	1.91	17.23	Pass
	V	1880	-39.940	-56.41	0	1.94	18.41	Pass
	V	1905	-40.450	-57.81	0	1.92	19.28	Pass
15 MHz (QPSK)	H	1857.5	-38.072	-55.23	0	1.93	19.09	Pass
	H	1880	-38.792	-56.66	0	1.94	19.81	Pass
	H	1902.5	-39.443	-57.95	0	1.92	20.43	Pass
	V	1857.5	-43.520	-55.24	0	1.93	13.65	Pass
	V	1880	-45.620	-56.41	0	1.94	12.73	Pass
	V	1902.5	-46.110	-57.69	0	1.92	13.50	Pass
15 MHz (16QAM)	H	1857.5	-38.942	-55.23	0	1.93	18.22	Pass
	H	1880	-39.362	-56.66	0	1.94	19.24	Pass
	H	1902.5	-40.353	-57.95	0	1.92	19.52	Pass
	V	1857.5	-44.190	-55.24	0	1.93	12.98	Pass
	V	1880	-46.120	-56.41	0	1.94	12.23	Pass
	V	1902.5	-46.620	-57.69	0	1.92	12.99	Pass
20 MHz (QPSK)	H	1860	-36.182	-55.35	0	1.93	21.10	Pass
	H	1880	-37.482	-56.66	0	1.94	21.12	Pass
	H	1900	-38.165	-57.86	0	1.92	21.62	Pass
	V	1860	-42.800	-55.31	0	1.93	14.44	Pass
	V	1880	-44.030	-56.41	0	1.94	14.32	Pass
	V	1900	-44.930	-57.66	0	1.92	14.65	Pass
20 MHz (16QAM)	H	1860	-36.802	-55.35	0	1.93	20.48	Pass
	H	1880	-38.092	-56.66	0	1.94	20.51	Pass
	H	1900	-38.775	-57.86	0	1.92	21.01	Pass
	V	1860	-43.420	-55.31	0	1.93	13.82	Pass
	V	1880	-44.600	-56.41	0	1.94	13.75	Pass
	V	1900	-45.550	-57.66	0	1.92	14.03	Pass

### 5.3.Occupied Bandwidth

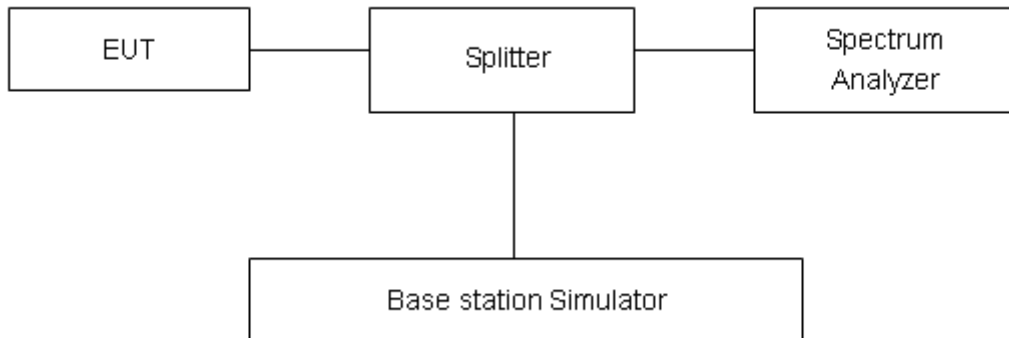
#### Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

#### Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer. RBW is set to 3kHz, VBW is set to 10kHz for GSM 1900, RBW is set to 51kHz, VBW is set to 160kHz for WCDMA Band II and RBW is set to 51kHz, VBW is set to 160kHz for LTE Band II 1.4MHz and RBW is set to 100kHz,VBW is set to 300kHz for LTE Band II 3MHz and RBW is set to 300kHz,VBW is set to 1MHz for LTE Band II 10/15/20MHz. 99% power and -26dBc occupied bandwidths are recorded. Spectrum analyzer plots are included on the following pages.

#### Test Setup



#### Limits

No specific occupied bandwidth requirements in part 2.1049.

#### Measurement Uncertainty

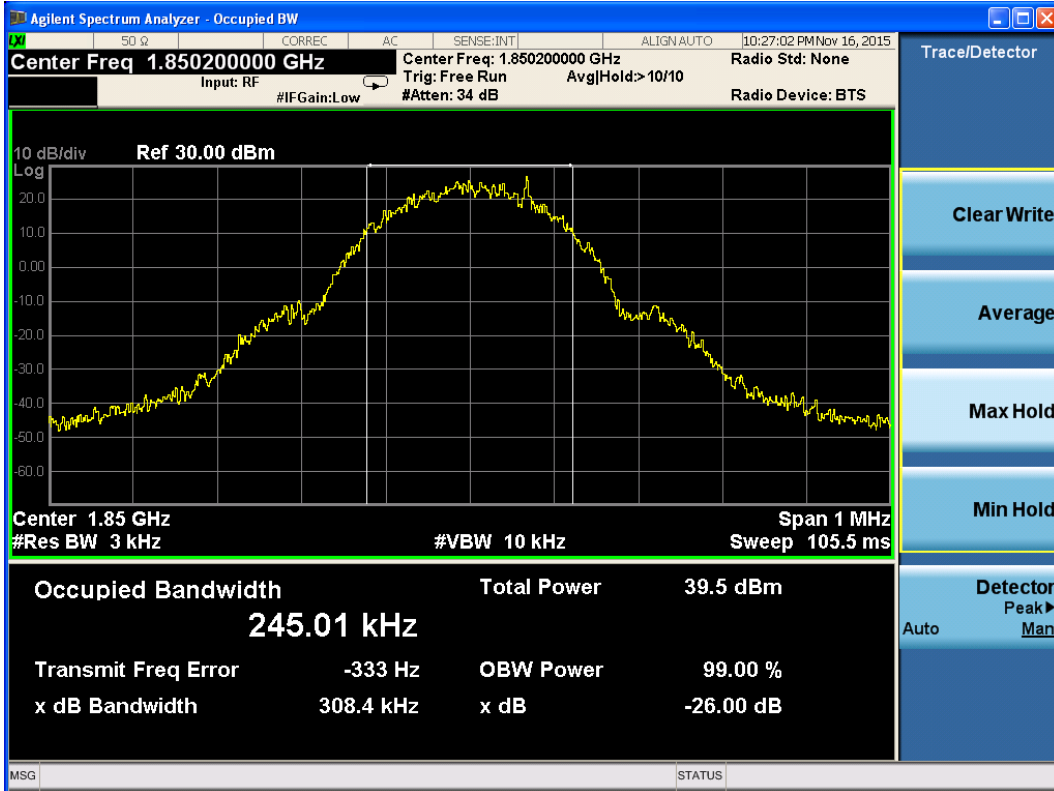
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 2$ ,  $U = 624\text{Hz}$ .

**Test Result**

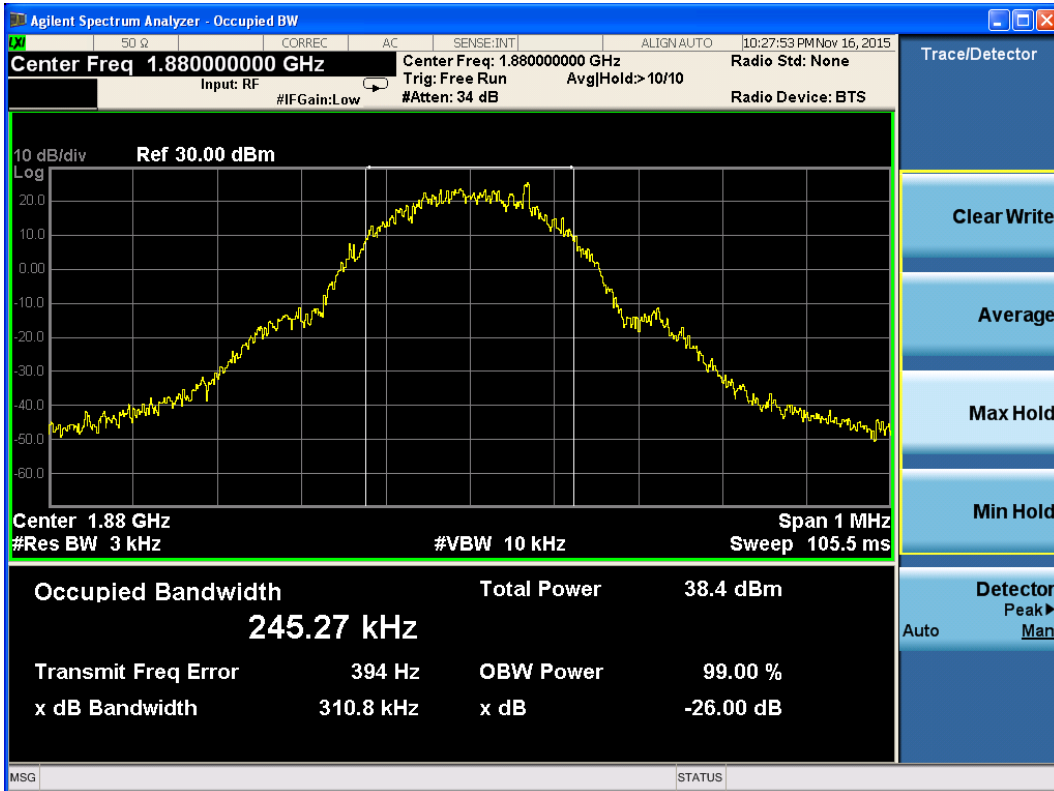
Mode	Channel	Frequency (MHz)	99% Power Bandwidth (kHz)	-26dBc Bandwidth(kHz)
<b>GSM 1900 (GSM)</b>	512	1850.2	245.01	308.4
	661	1880.0	245.27	310.8
	810	1909.8	246.31	312.7
<b>GPRS 1900 (GMSK)</b>	512	1850.2	246.16	312.4
	661	1880.0	246.21	313.0
	810	1909.8	246.88	315.4
<b>EGPRS 1900 (8-PSK)</b>	512	1850.2	246.48	303.9
	661	1880.0	245.82	303.0
	810	1909.8	243.52	308.6
<b>WCDMA Band II (RMC)</b>	9262	1852.4	4153.0	4703
	9400	1880	4157.2	4713
	9538	1907.6	4146.7	4693



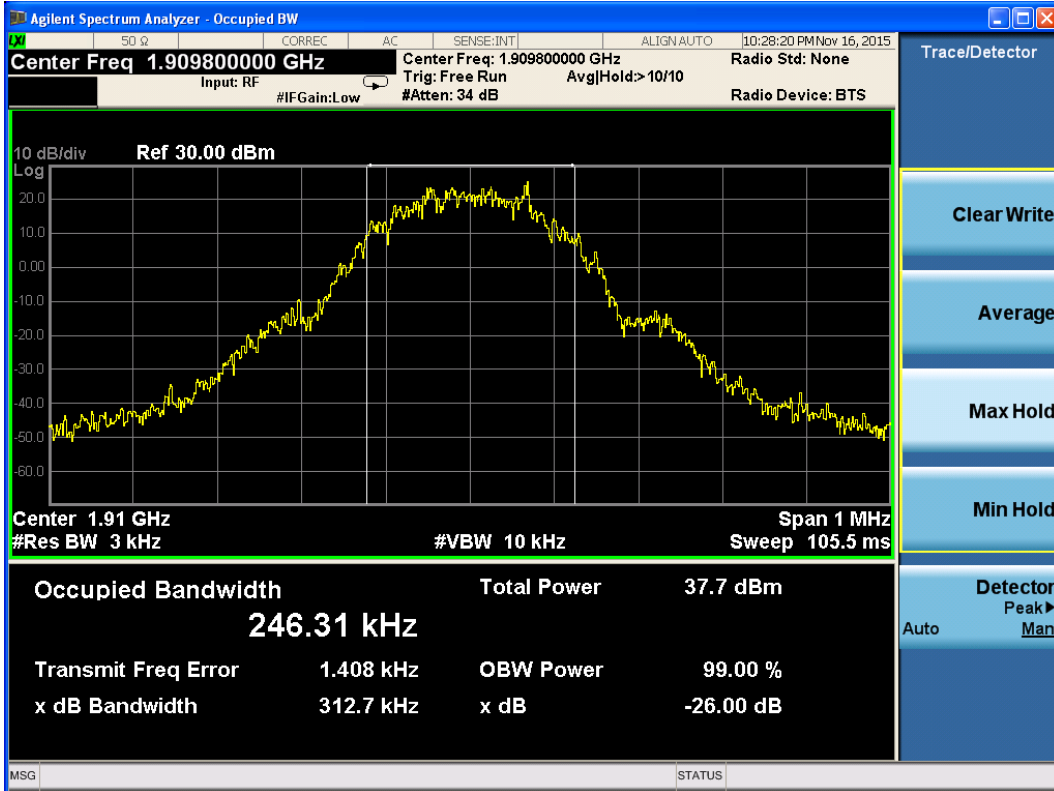
LTE Band II		Channel	Frequency (MHz)	99% Power Bandwidth (MHz)	-26dBc Bandwidth(MHz)
Bandwidth	Modulation				
1.4MHz	QPSK	18607	1850.7	1.1163	1.369
		18900	1880.0	1.1185	1.353
		19193	1909.3	1.1269	1.374
	16QAM	18607	1850.7	1.1238	1.341
		18900	1880.0	1.1181	1.351
		19193	1909.3	1.1296	1.351
3MHz	QPSK	18615	1851.5	2.7518	3.063
		18900	1880	2.7475	3.086
		19185	1908.5	2.7454	3.067
	16QAM	18615	1851.5	2.7430	3.069
		18900	1880	2.7455	3.056
		19185	1908.5	2.7392	3.074
5MHz	QPSK	18625	1852.5	4.5172	5.042
		18900	1880	4.5331	5.052
		19175	1907.5	4.5104	5.033
	16QAM	18625	1852.5	4.5397	5.022
		18900	1880	4.5262	5.031
		19175	1907.5	4.5465	5.059
10MHz	QPSK	18650	1855	9.0401	10.17
		18900	1880	9.0460	10.06
		19150	1905	9.0814	10.09
	16QAM	18650	1855	9.0323	10.02
		18900	1880	9.0587	10.06
		19150	1905	9.0478	10.05
15MHz	QPSK	18675	1857.5	13.505	14.71
		18900	1880	13.475	14.73
		19125	1902.5	13.526	14.86
	16QAM	18675	1857.5	13.543	14.76
		18900	1880	13.520	14.72
		19125	1902.5	13.522	14.77
20MHz	QPSK	18700	1860	17.918	19.43
		18900	1880	17.834	19.23
		19100	1900	18.019	19.67
	16QAM	18700	1860	17.954	19.50
		18900	1880	17.887	19.23
		19100	1900	17.979	19.55



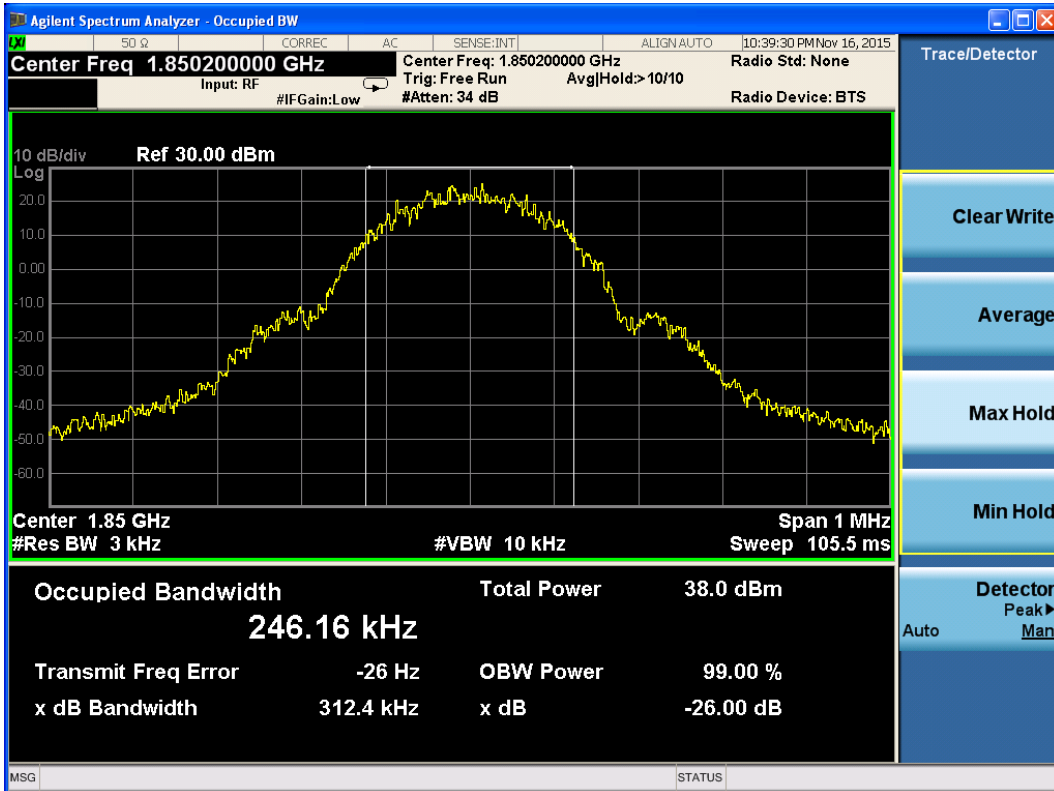
GSM1900 GSM CH512 Occupied Bandwidth



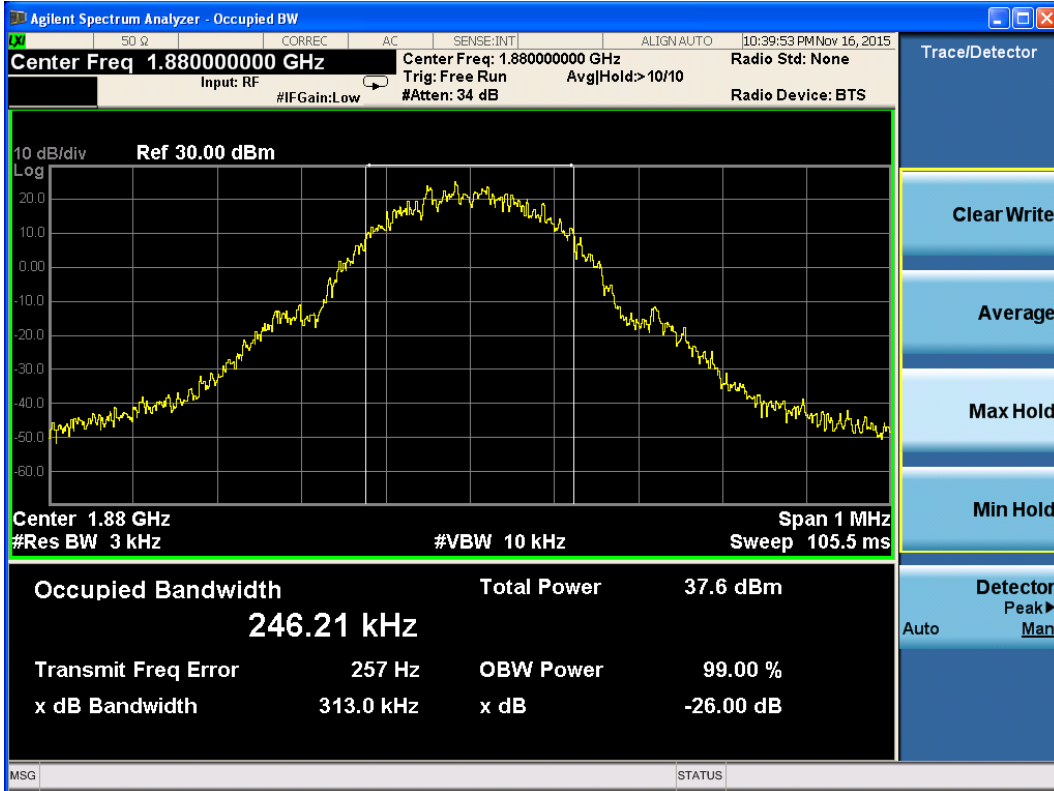
GSM 1900 GSM CH661 Occupied Bandwidth



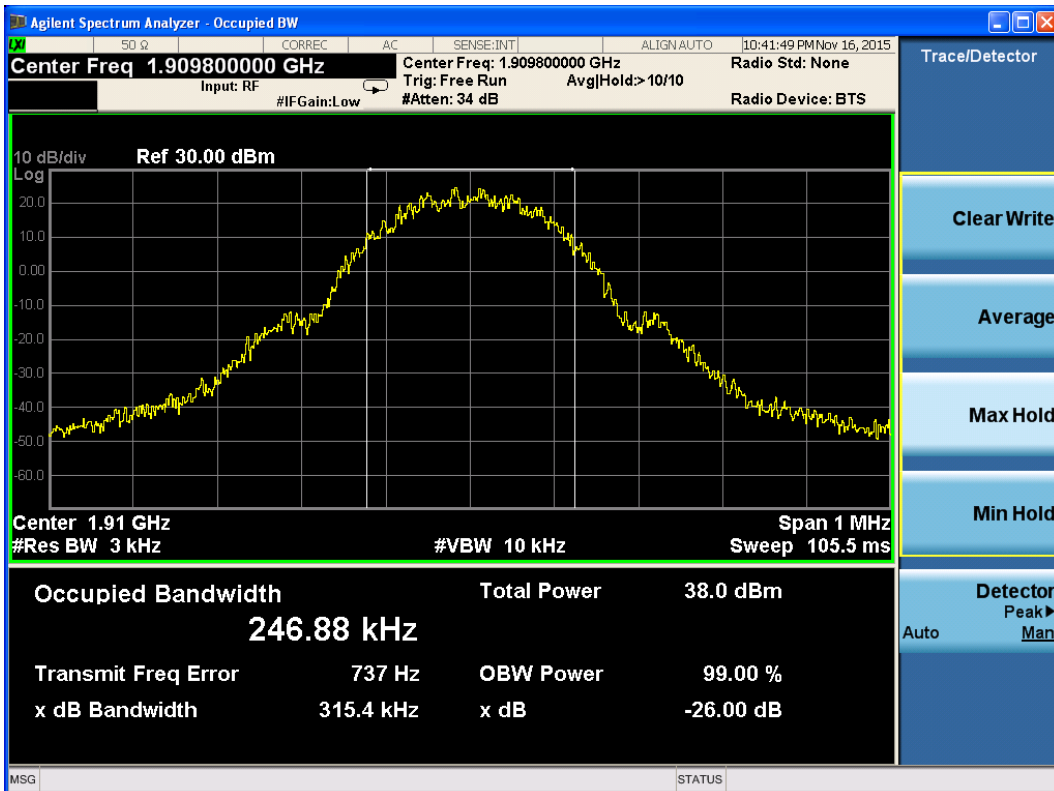
GSM 1900 GSM CH810 Occupied Bandwidth



GSM1900 GPRS CH512 Occupied Bandwidth

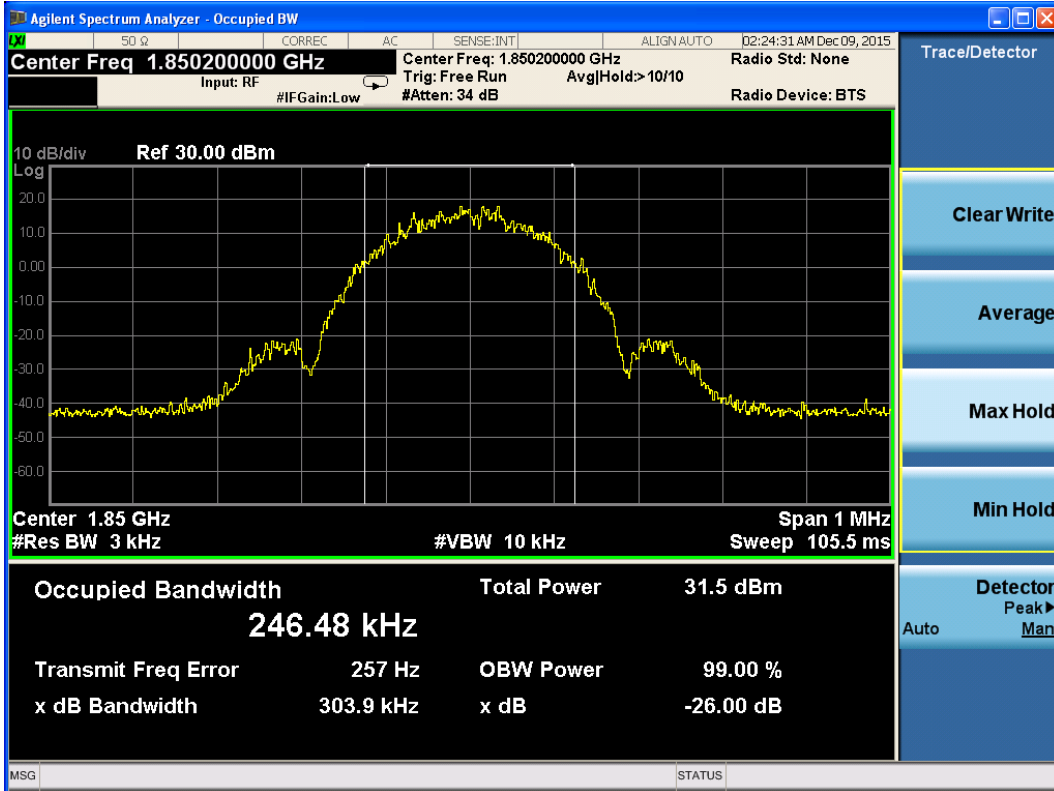


GSM 1900 GPRS CH661 Occupied Bandwidth

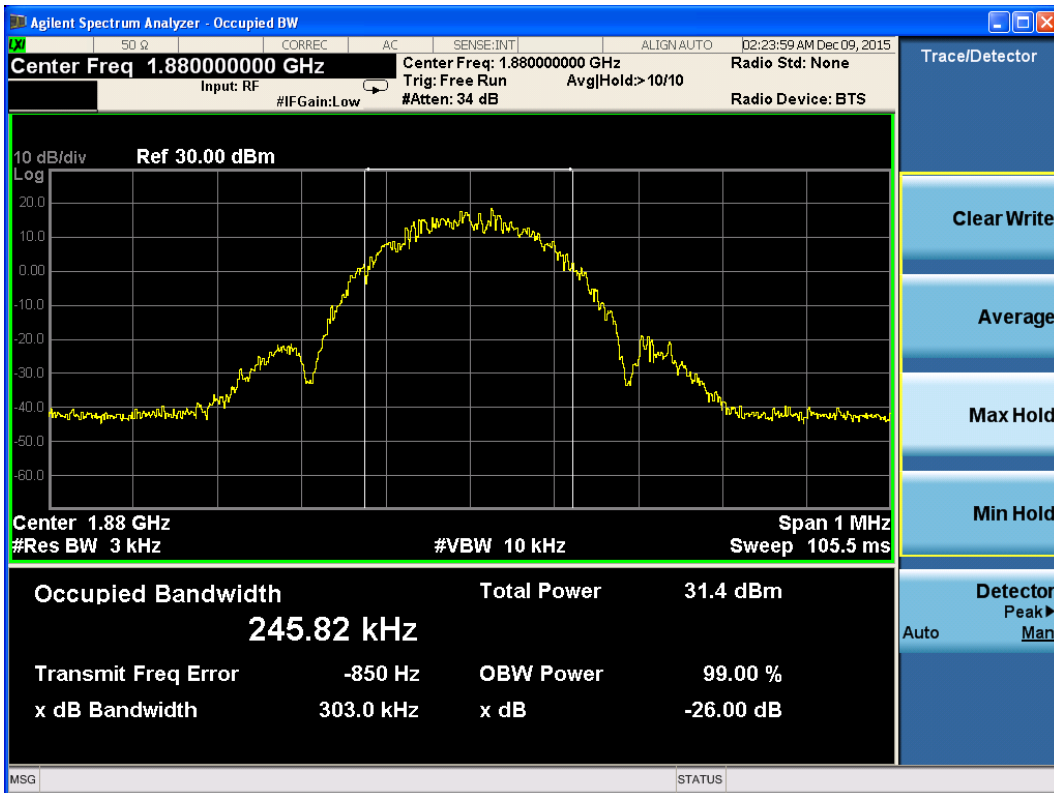


GSM 1900 GPRS CH810 Occupied Bandwidth

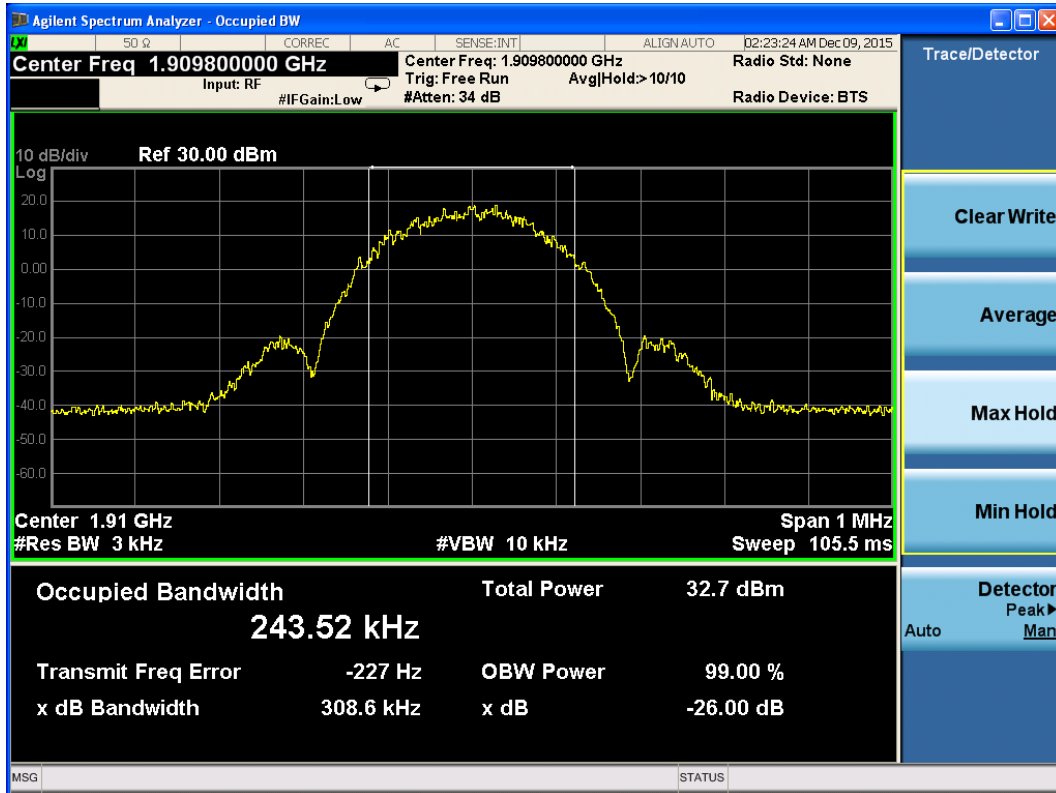




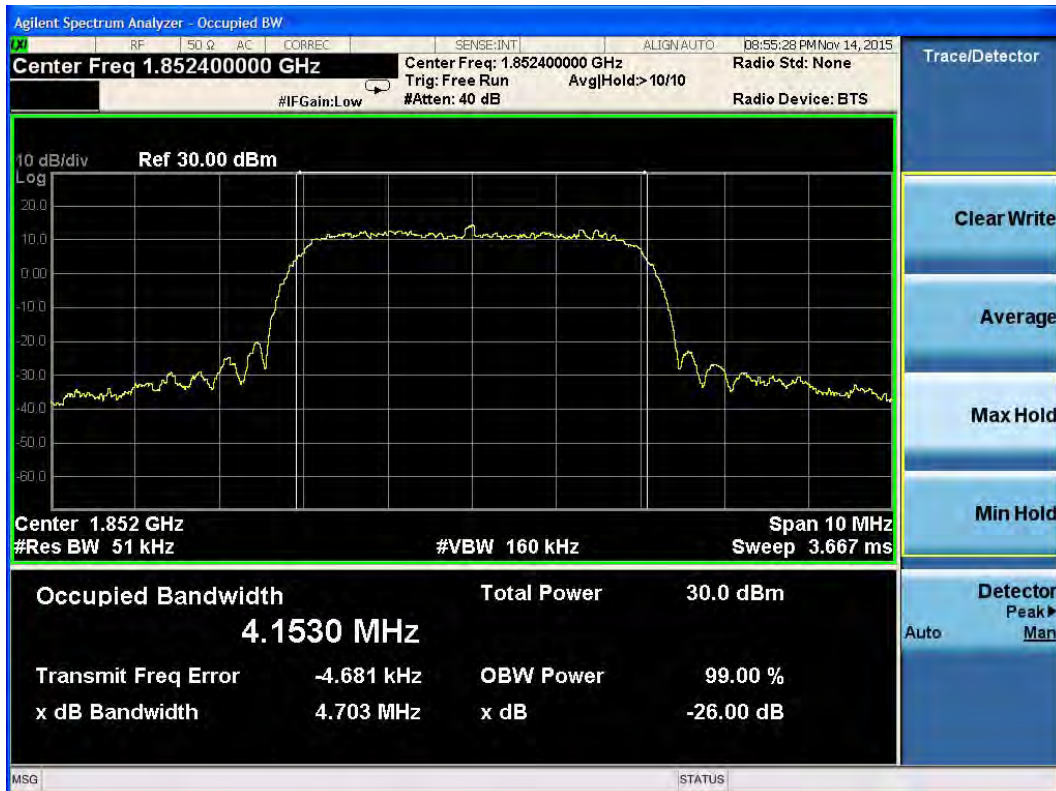
GSM1900 EGPRS CH512 Occupied Bandwidth



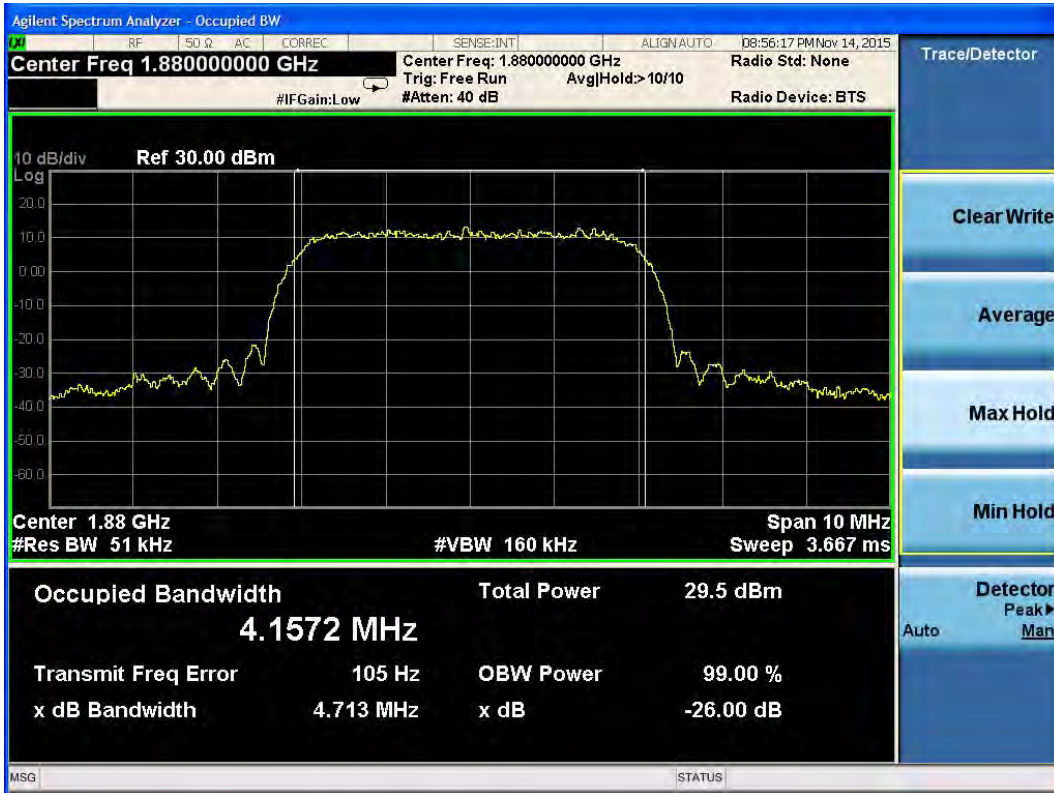
GSM 1900 EGPRS CH661 Occupied Bandwidth



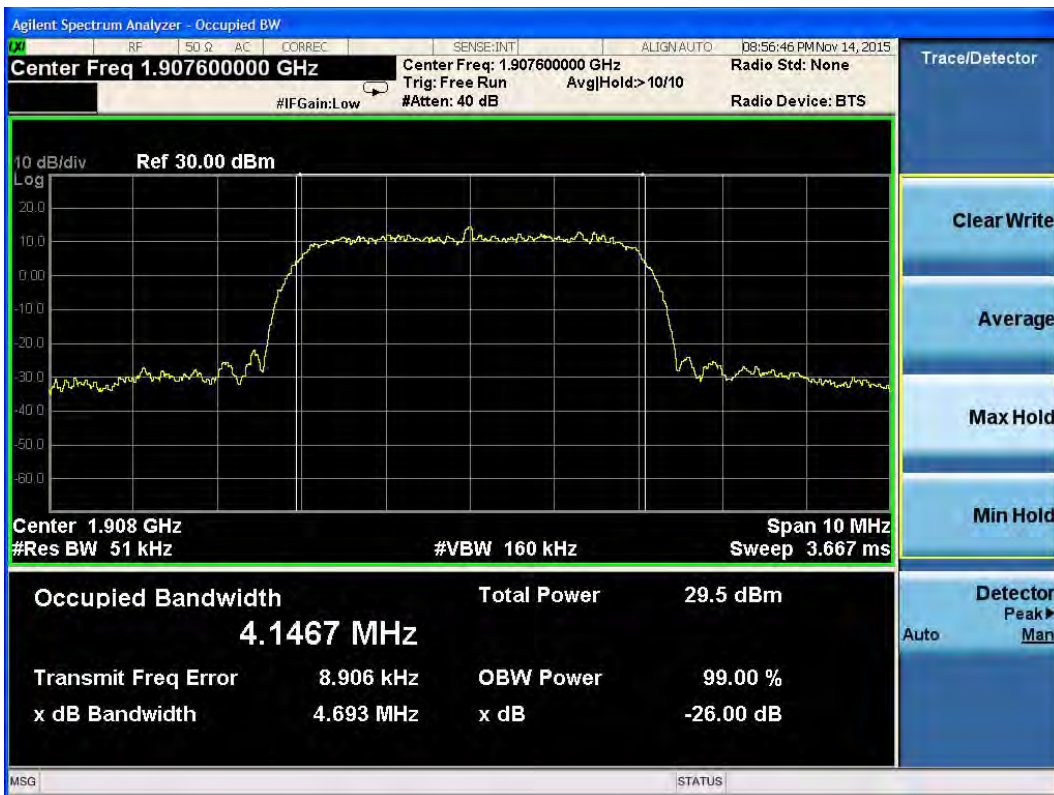
GSM 1900 EGPRS CH810 Occupied Bandwidth



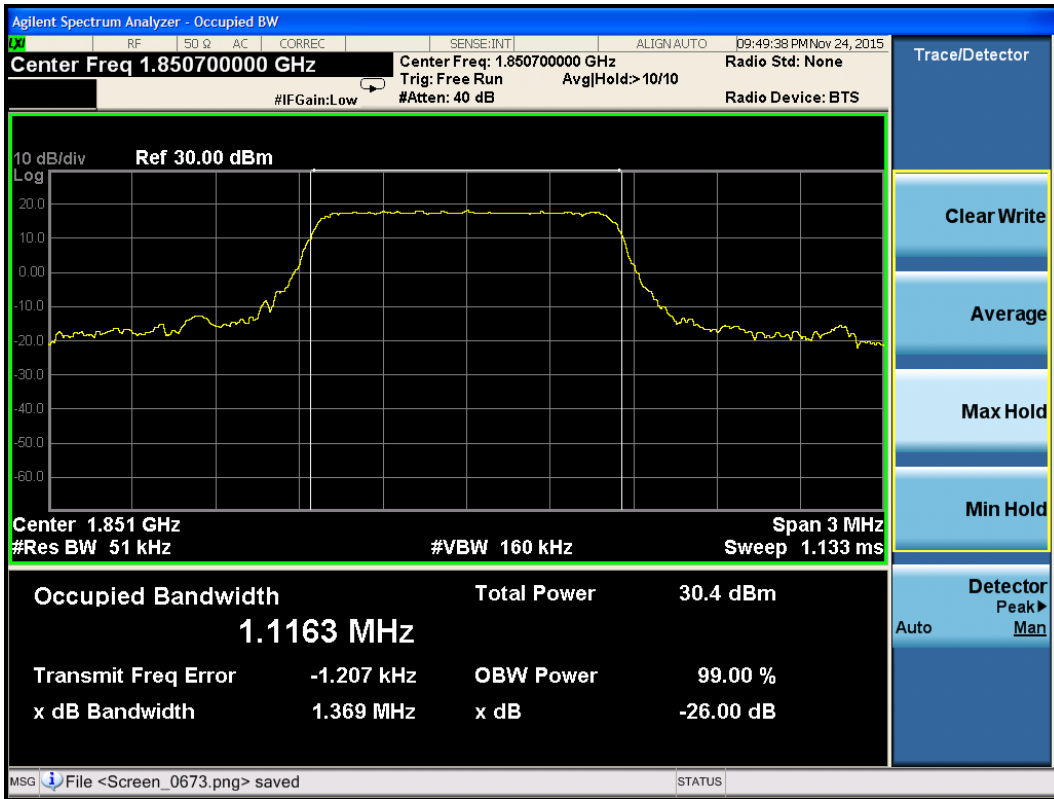
WCDMA Band II RMC CH9262



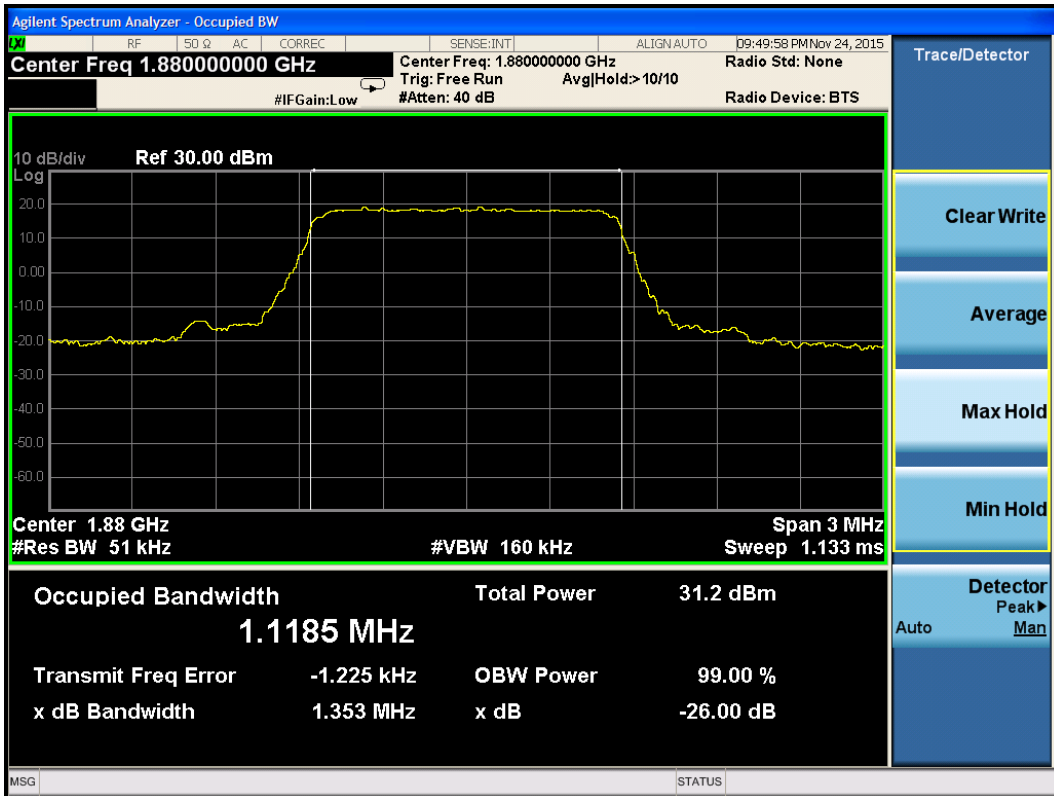
WCDMA Band II RMC CH9400



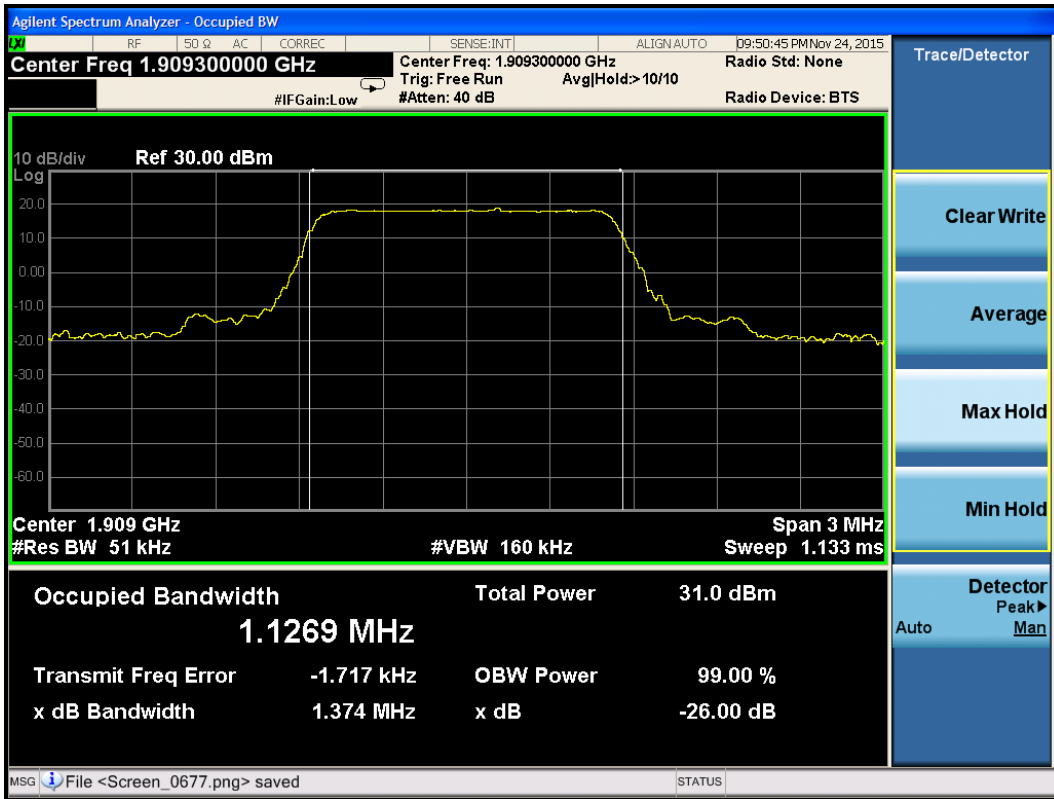
WCDMA Band II RMC CH9538



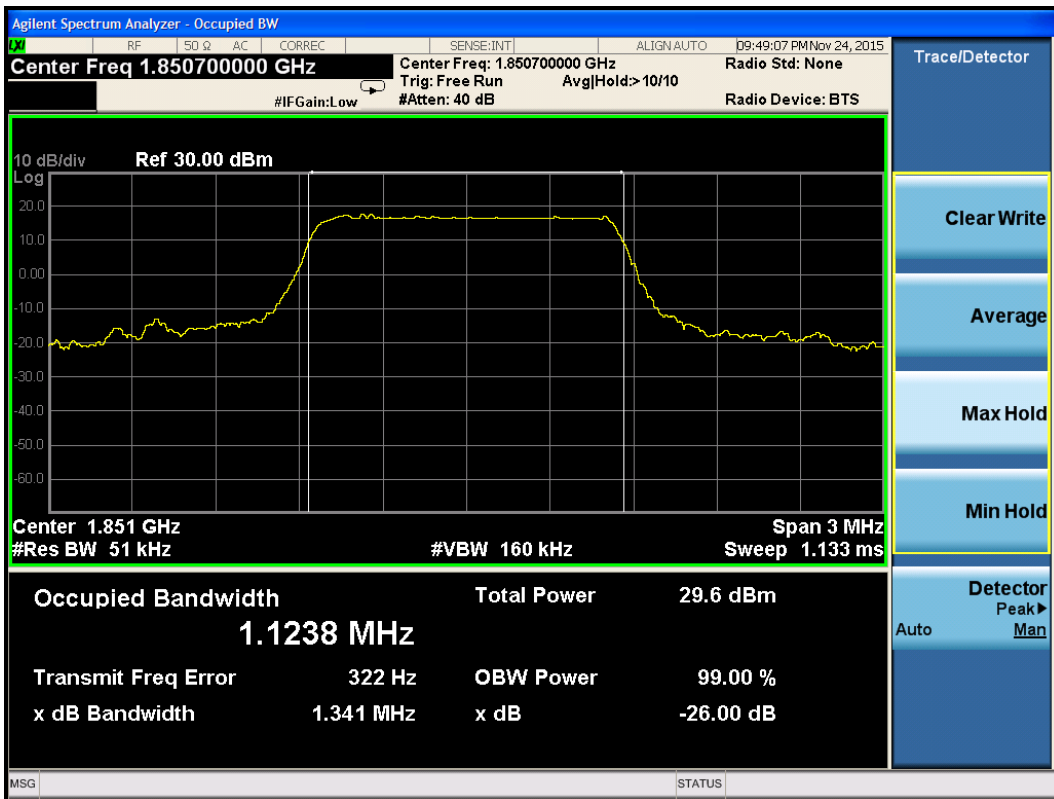
LTE Band II 1.4MHz QPSK CH18607



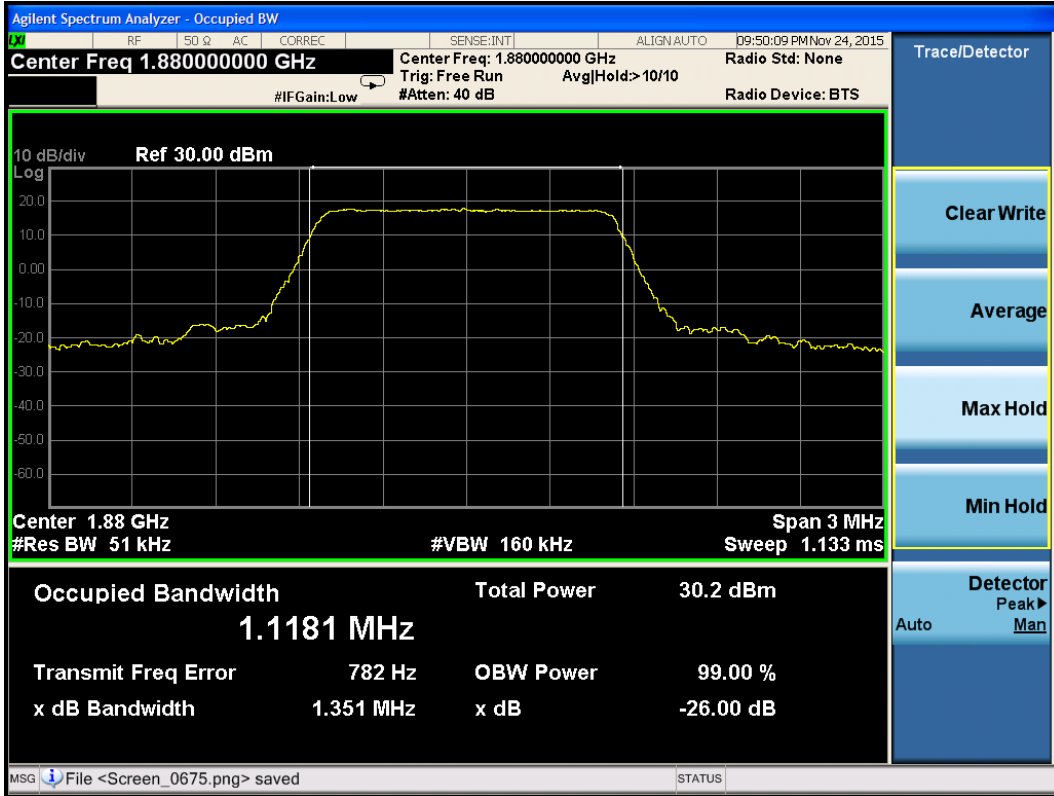
LTE Band II 1.4MHz QPSK CH18900



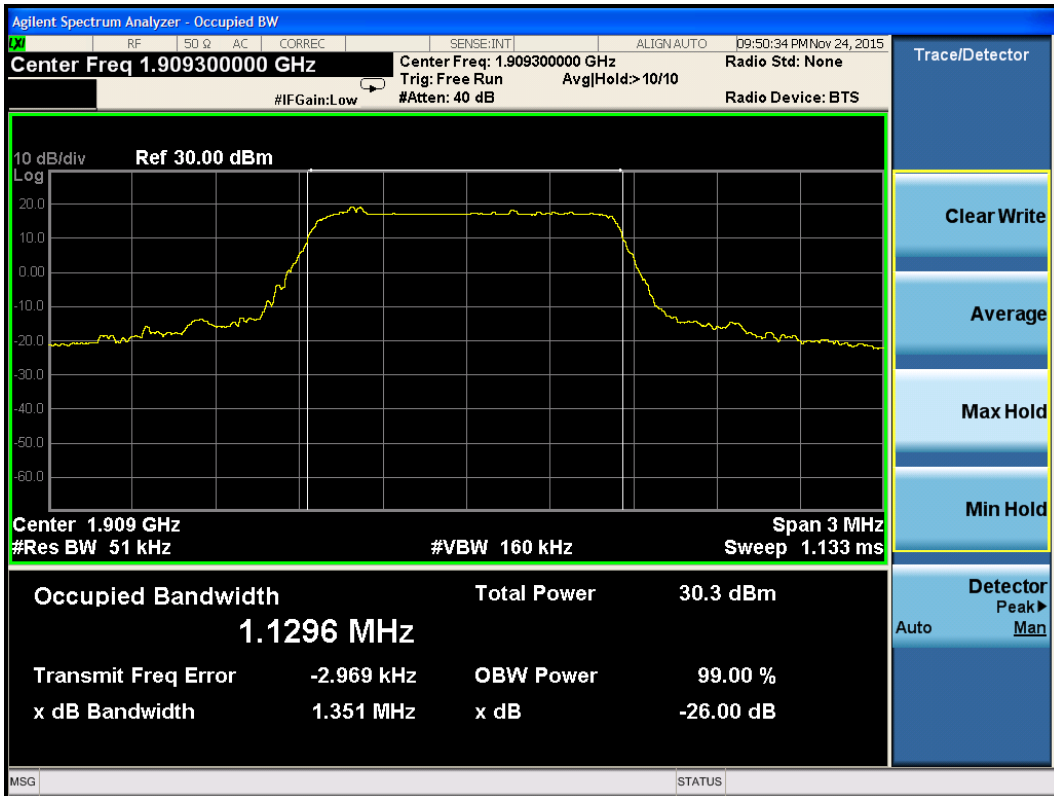
LTE Band II 1.4MHz QPSK CH19193



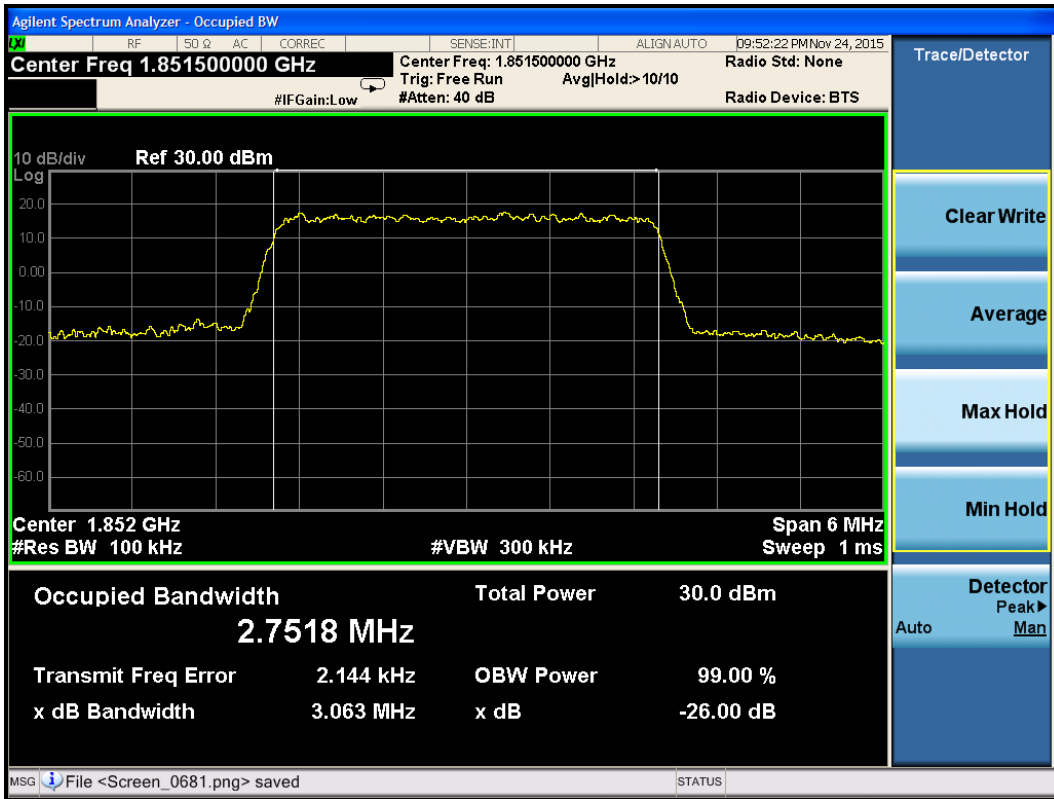
LTE Band II 1.4MHz 16QAM CH18607



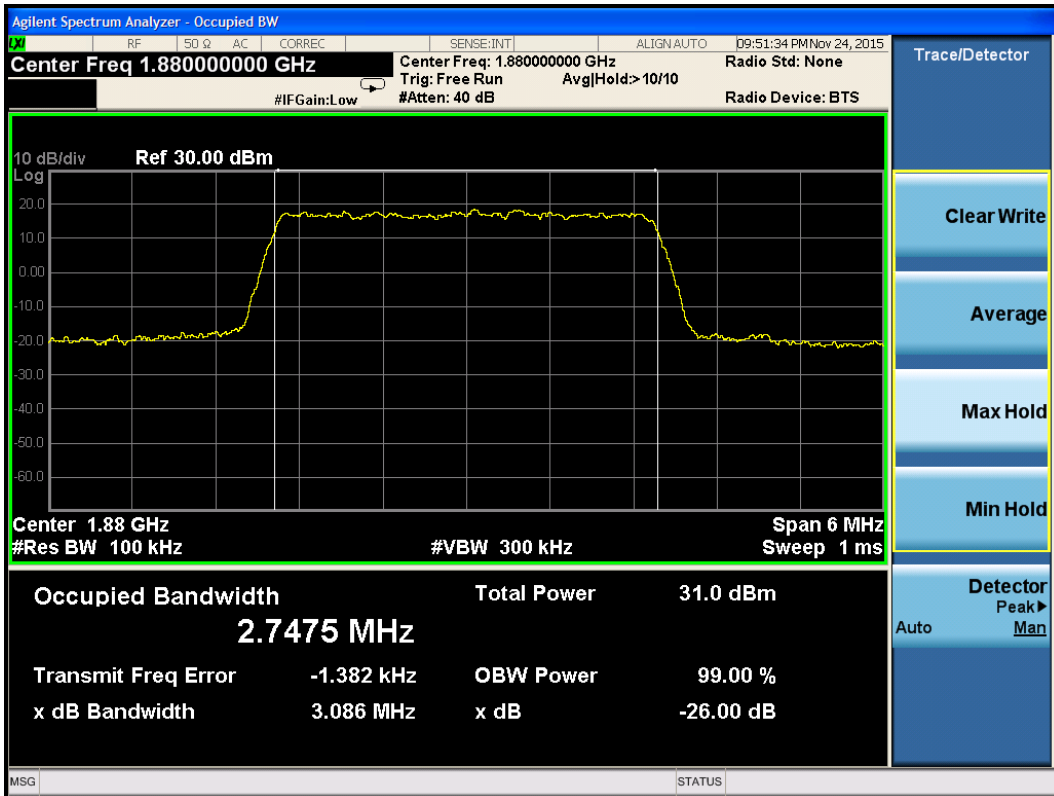
LTE Band II 1.4MHz 16QAM CH18900



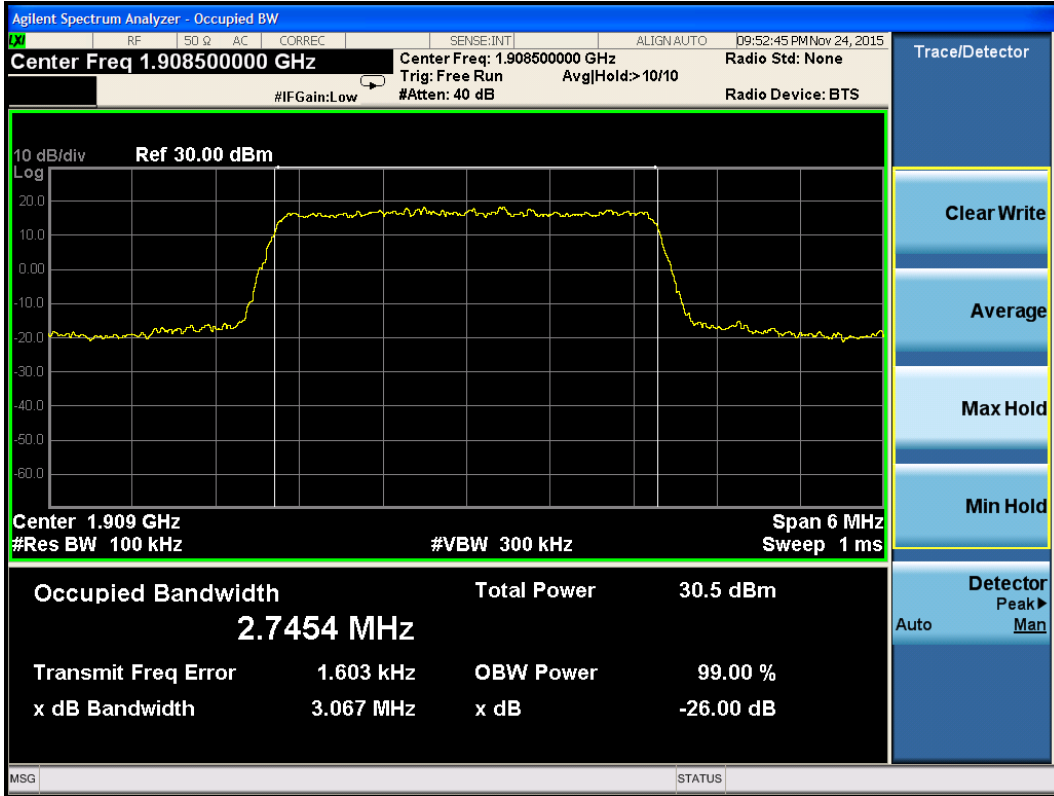
LTE Band II 1.4MHz 16QAM CH19193



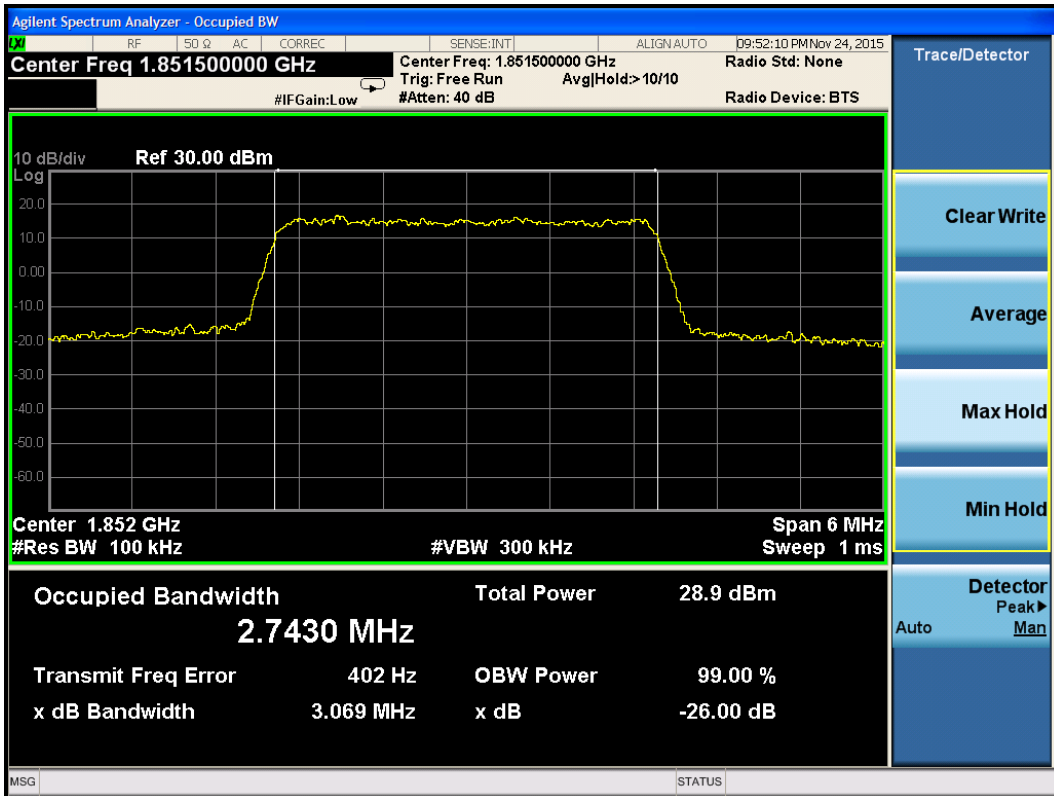
LTE Band II 3MHz QPSK CH18615



LTE Band II 3MHz QPSK CH18900

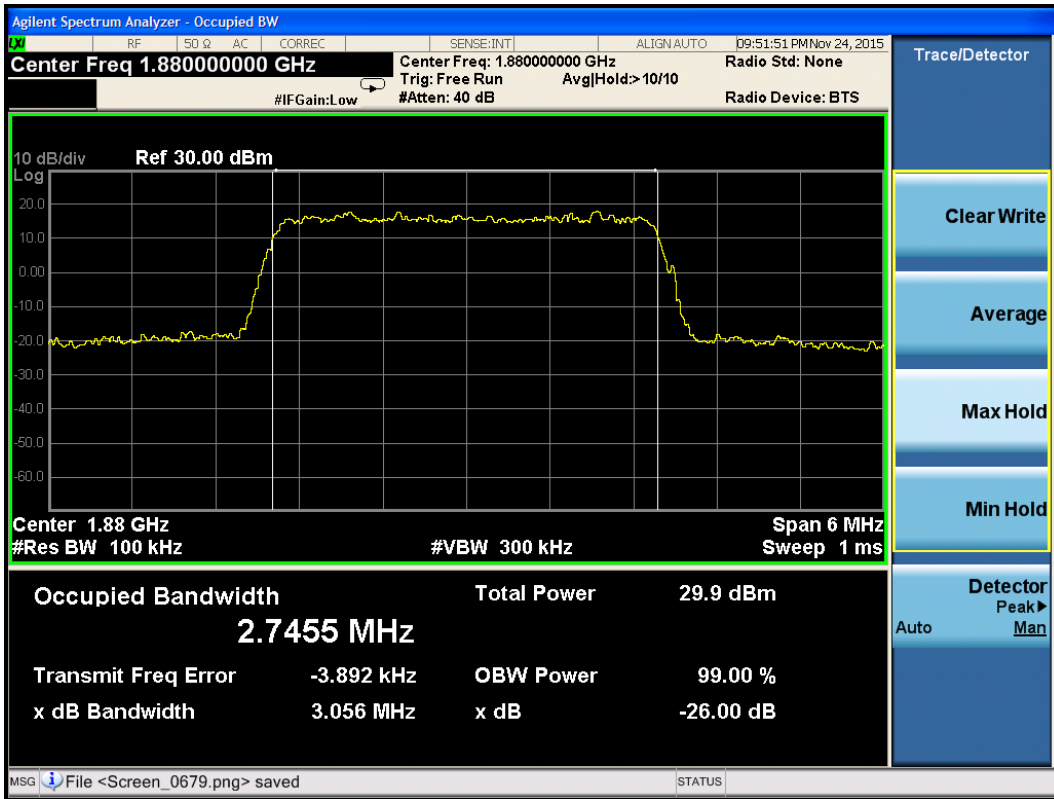


LTE Band II 3MHz QPSK CH19185

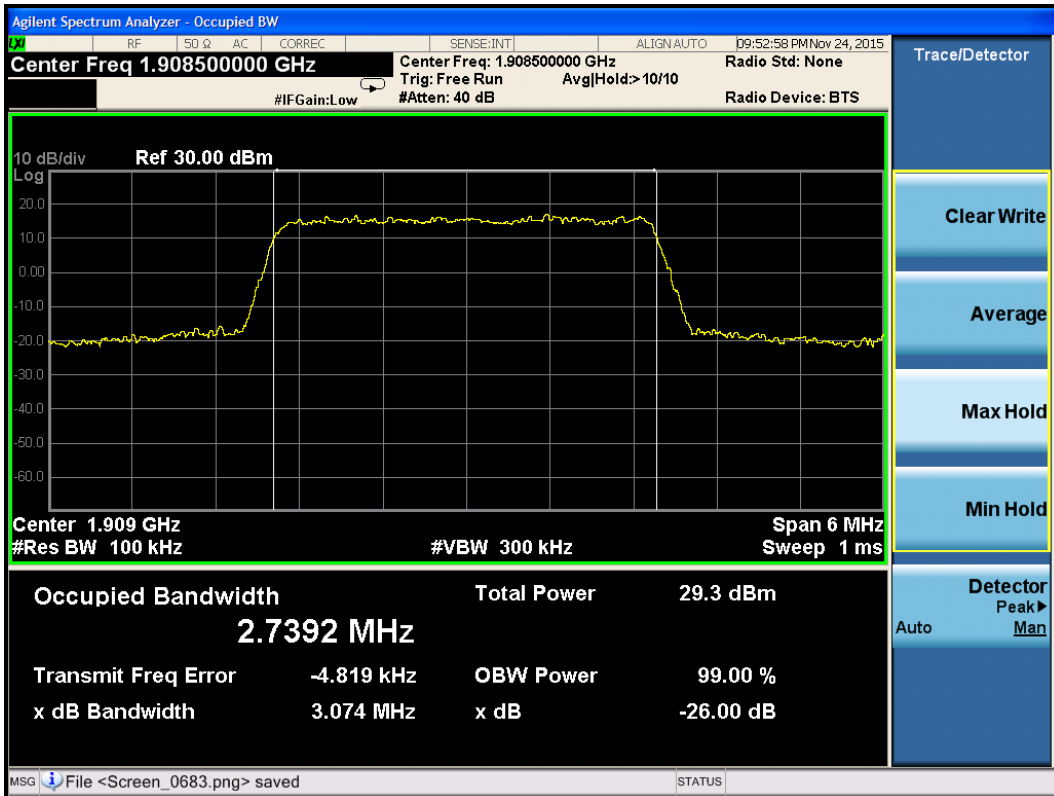


LTE Band II 3MHz 16QAM CH18615

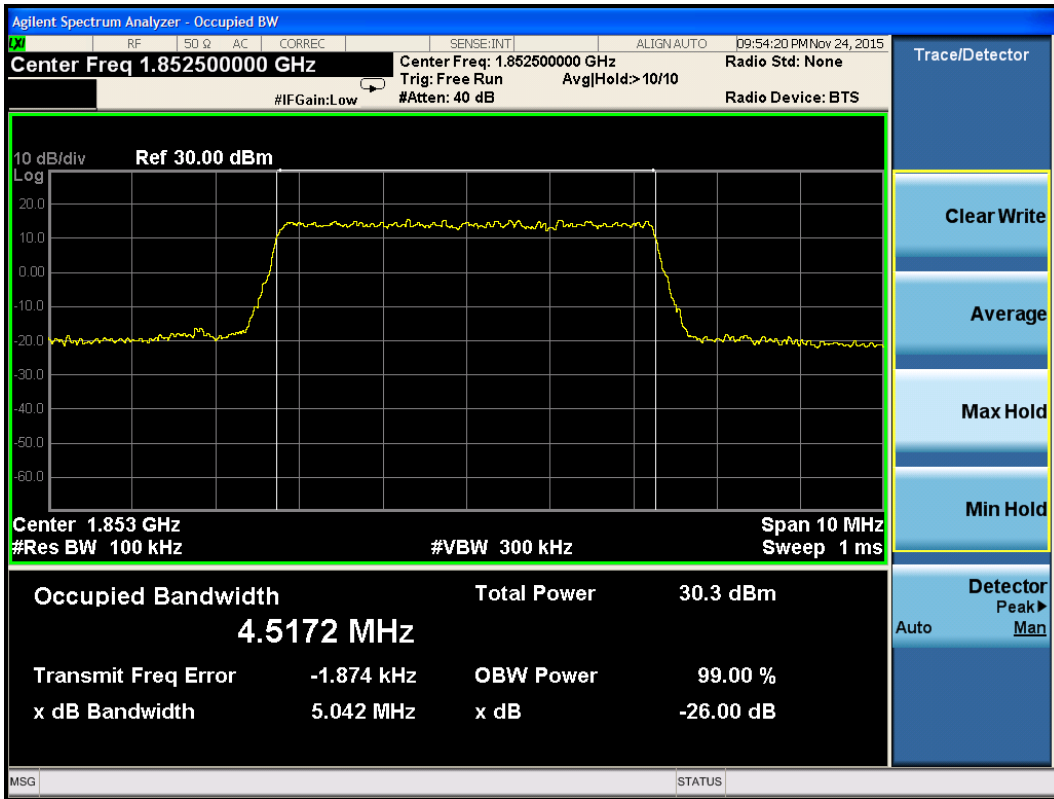




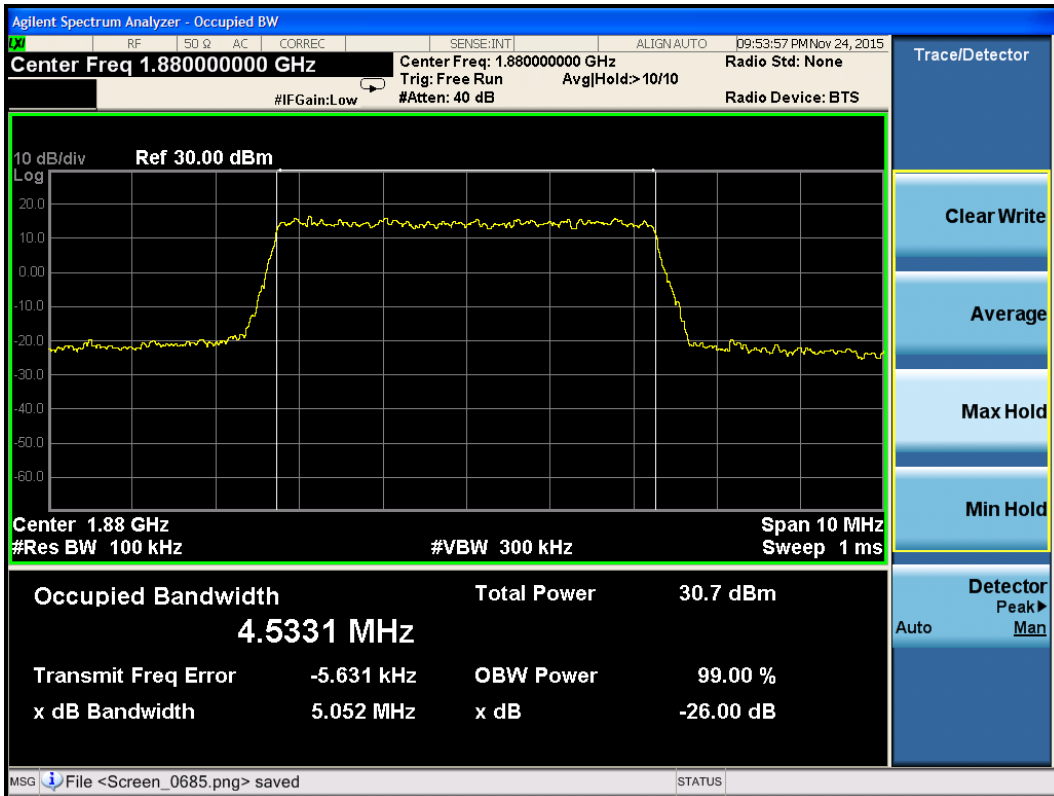
LTE Band II 3MHz 16QAM CH18900



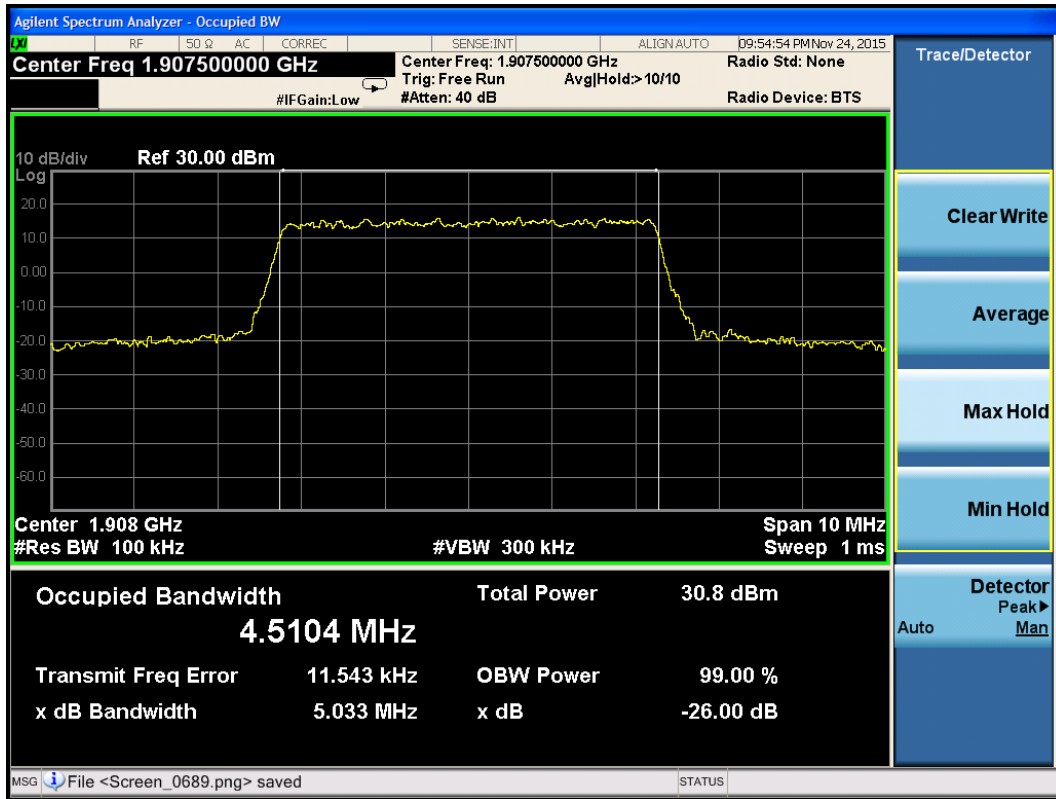
LTE Band II 3MHz 16QAM CH19185



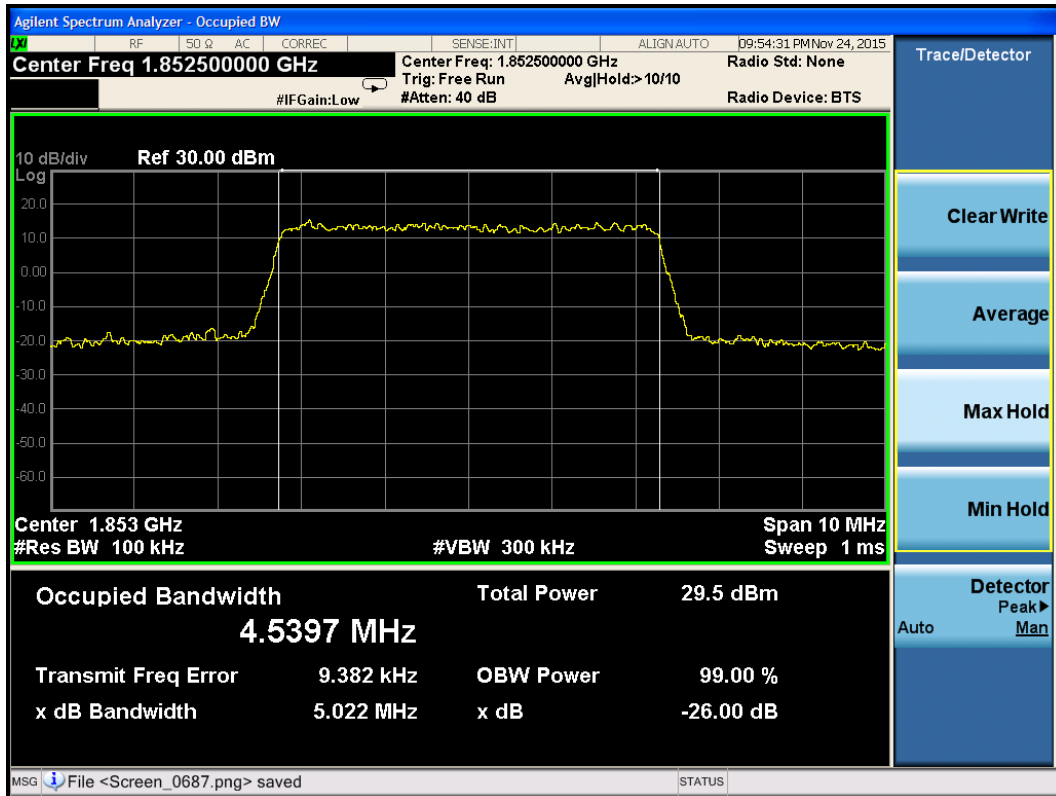
LTE Band II 5MHz QPSK CH18625



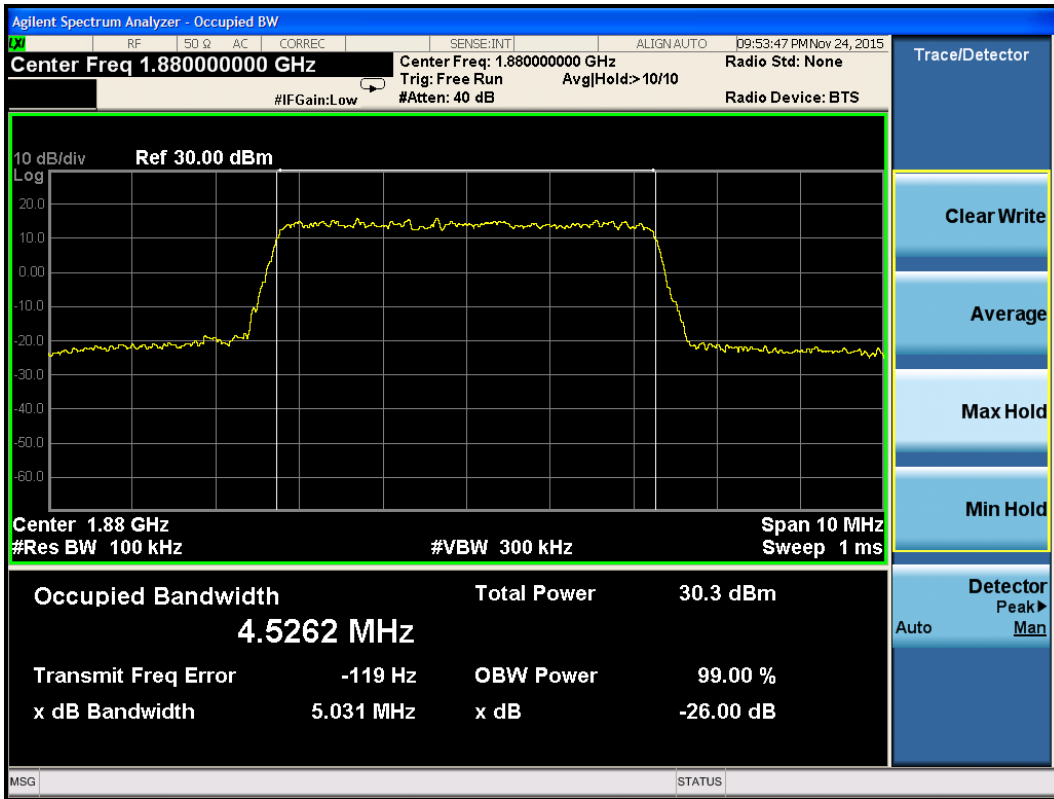
LTE Band II 5MHz QPSK CH18900



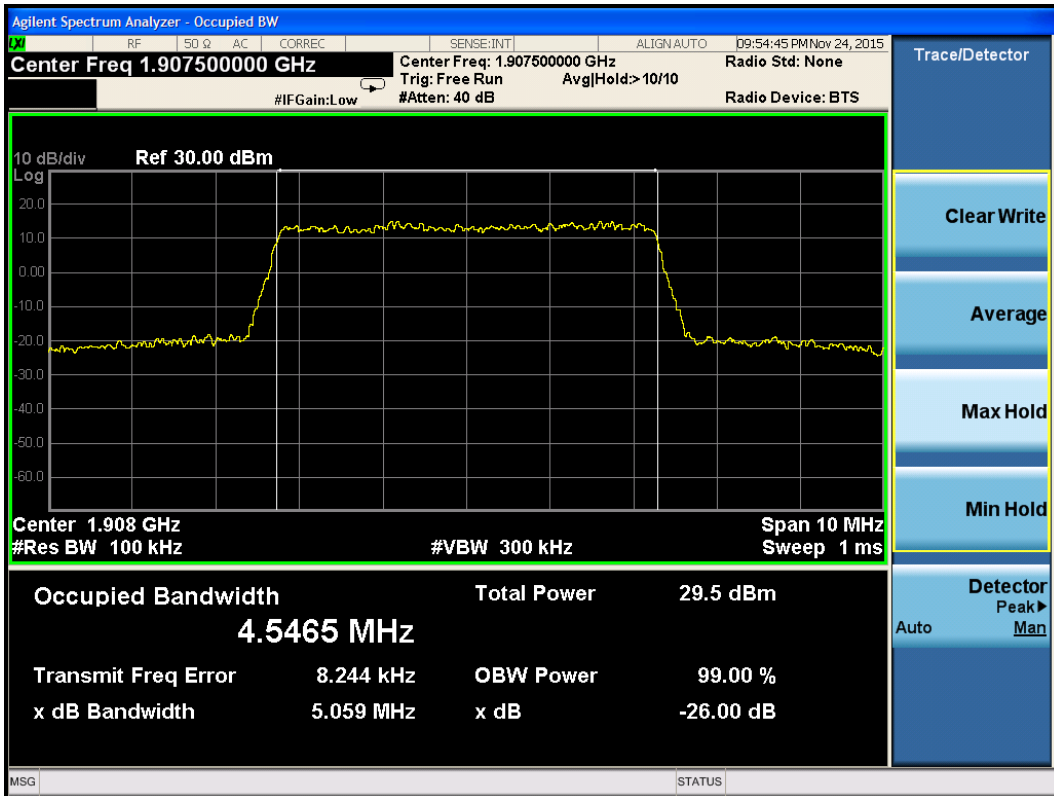
LTE Band II 5MHz QPSK CH19175



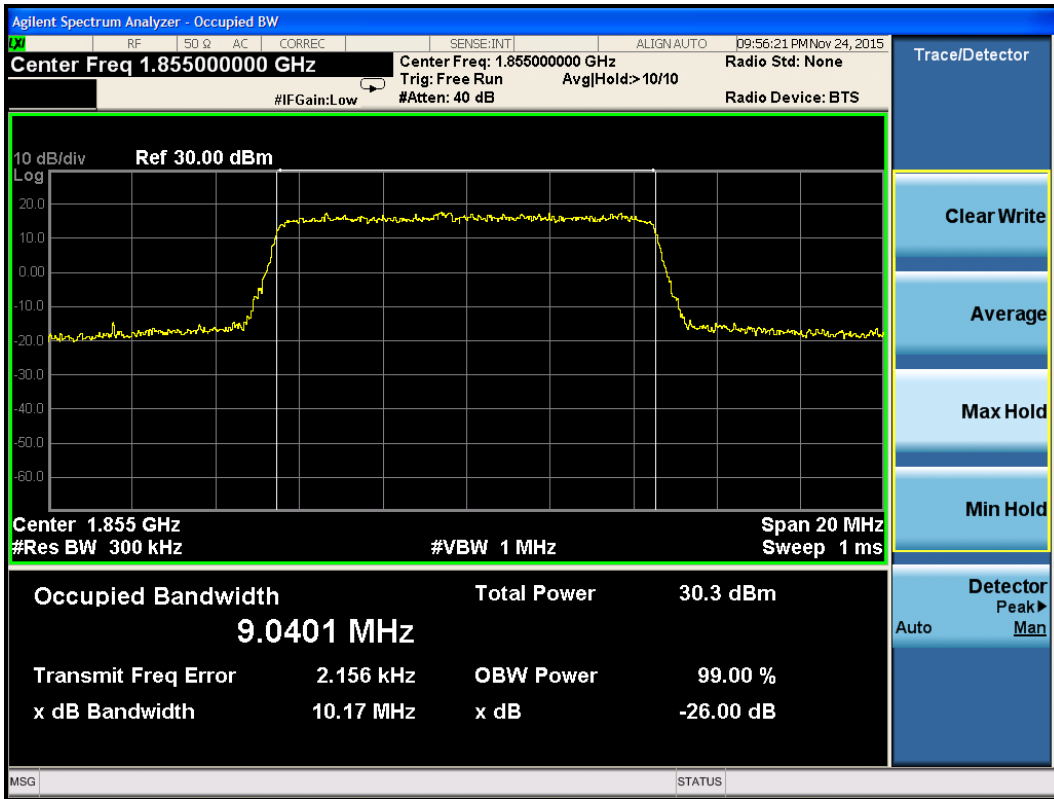
LTE Band II 5MHz 16QAM CH18625



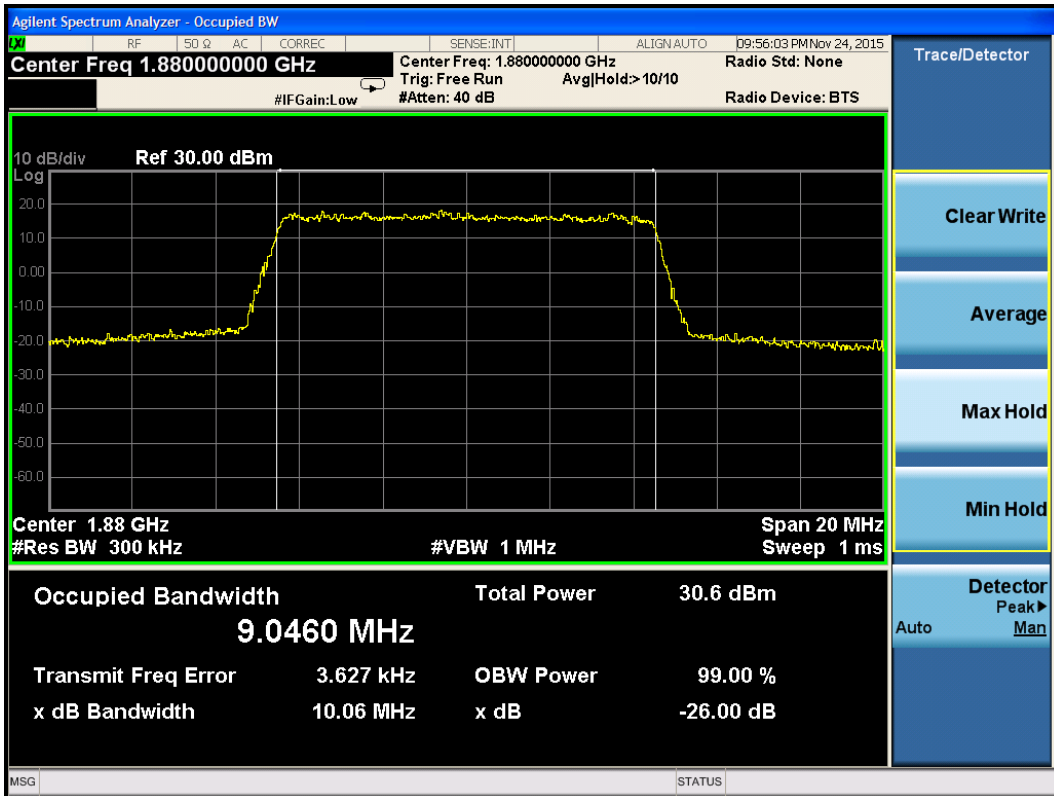
LTE Band II 5MHz 16QAM CH18900



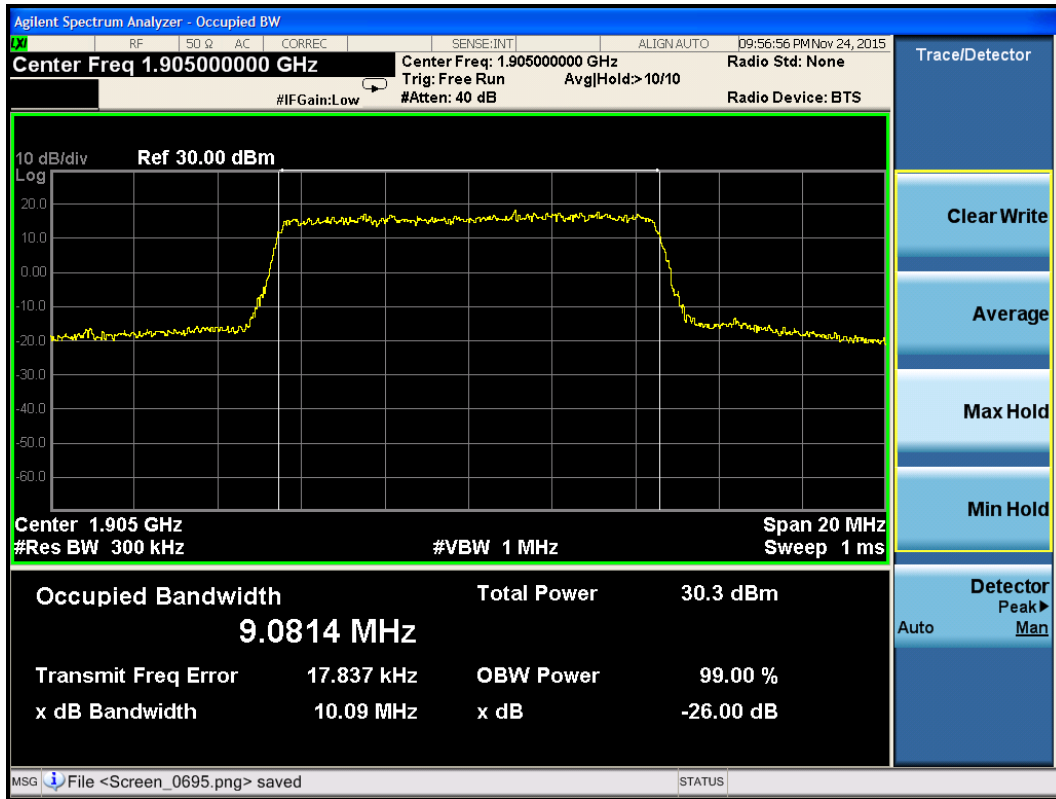
LTE Band II 5MHz 16QAM CH19175



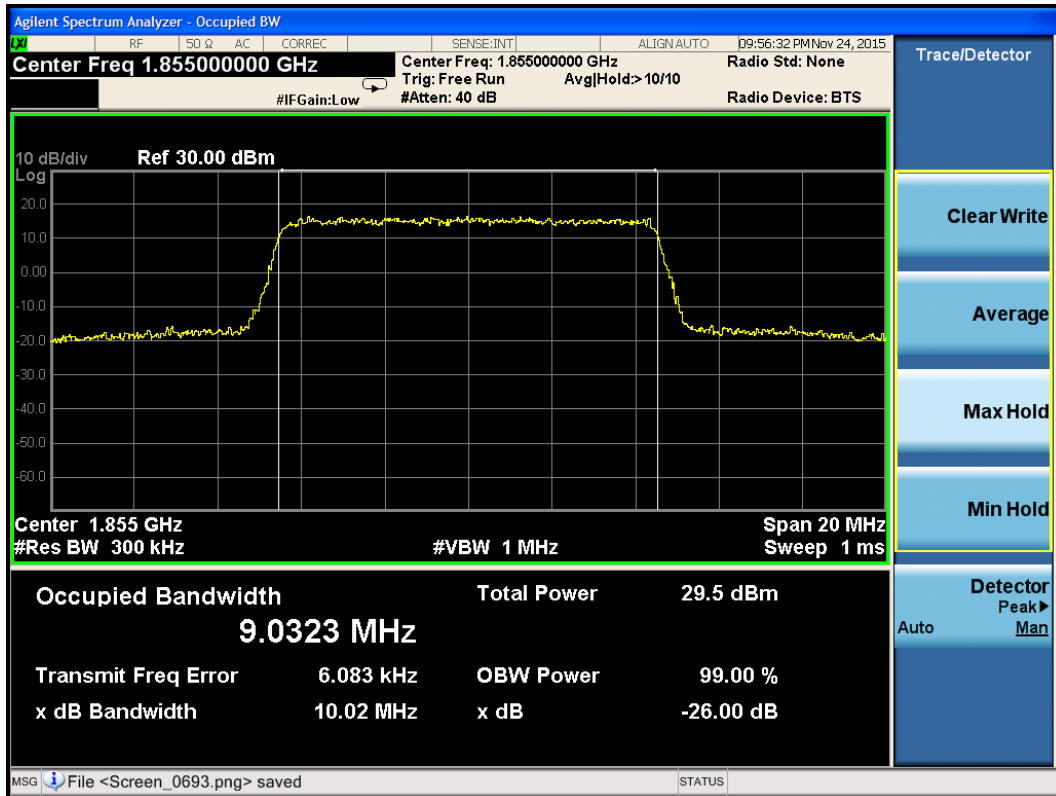
LTE Band II 10MHz QPSK CH18650



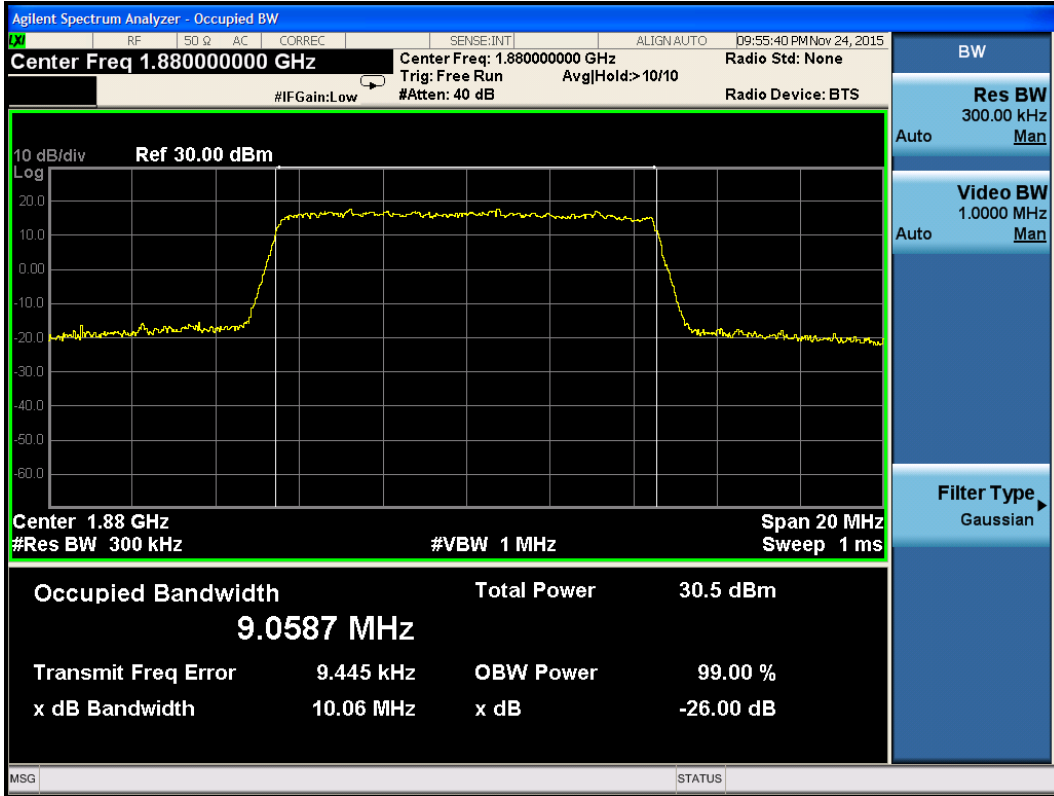
LTE Band II 10MHz QPSK CH18900



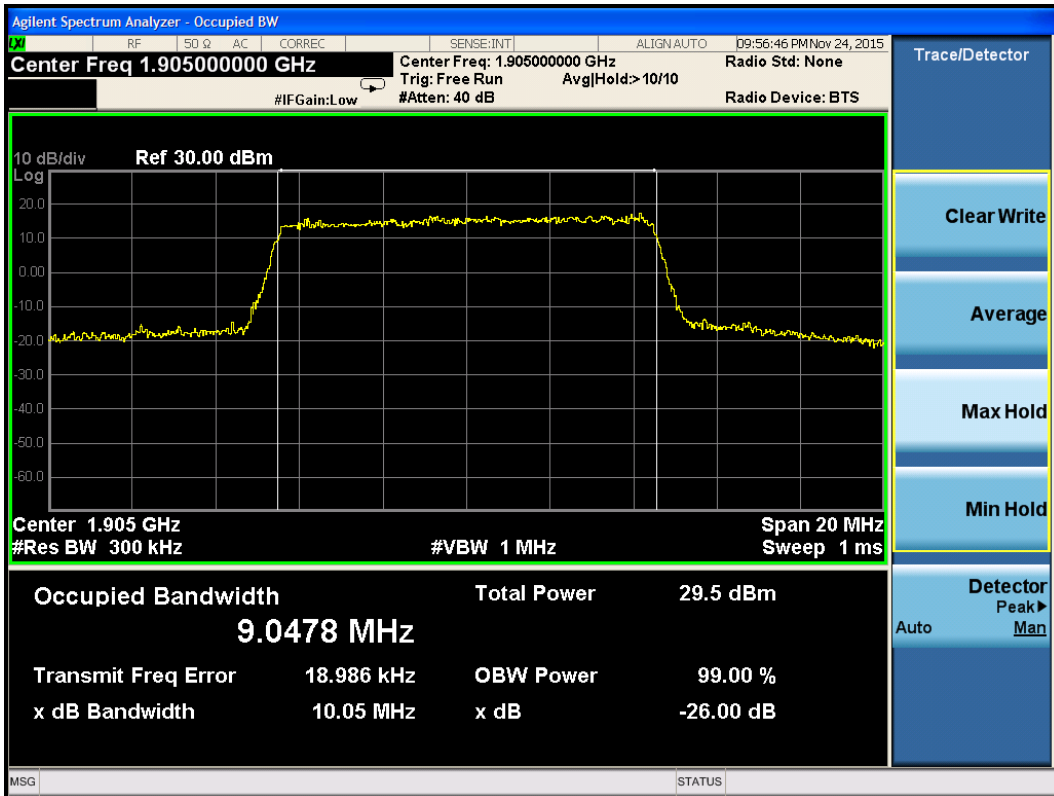
LTE Band II 10MHz QPSK CH19150



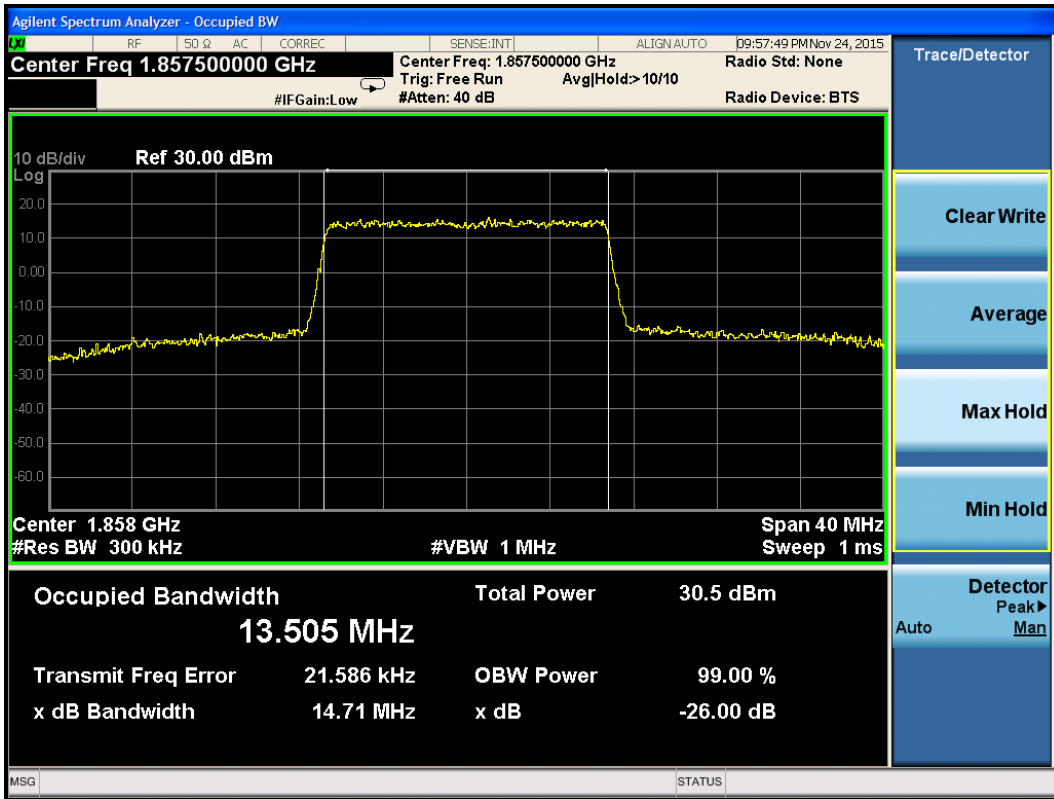
LTE Band II 10MHz 16QAM CH18650



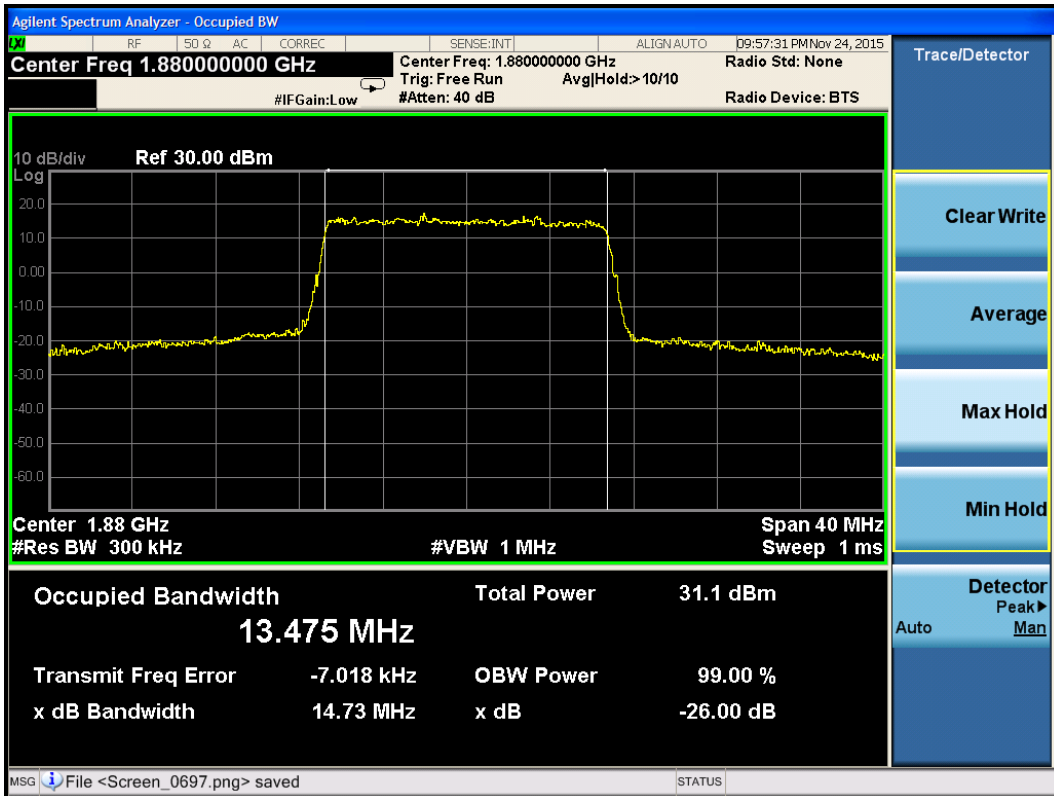
LTE Band II 10MHz 16QAM CH18900



LTE Band II 10MHz 16QAM CH19150

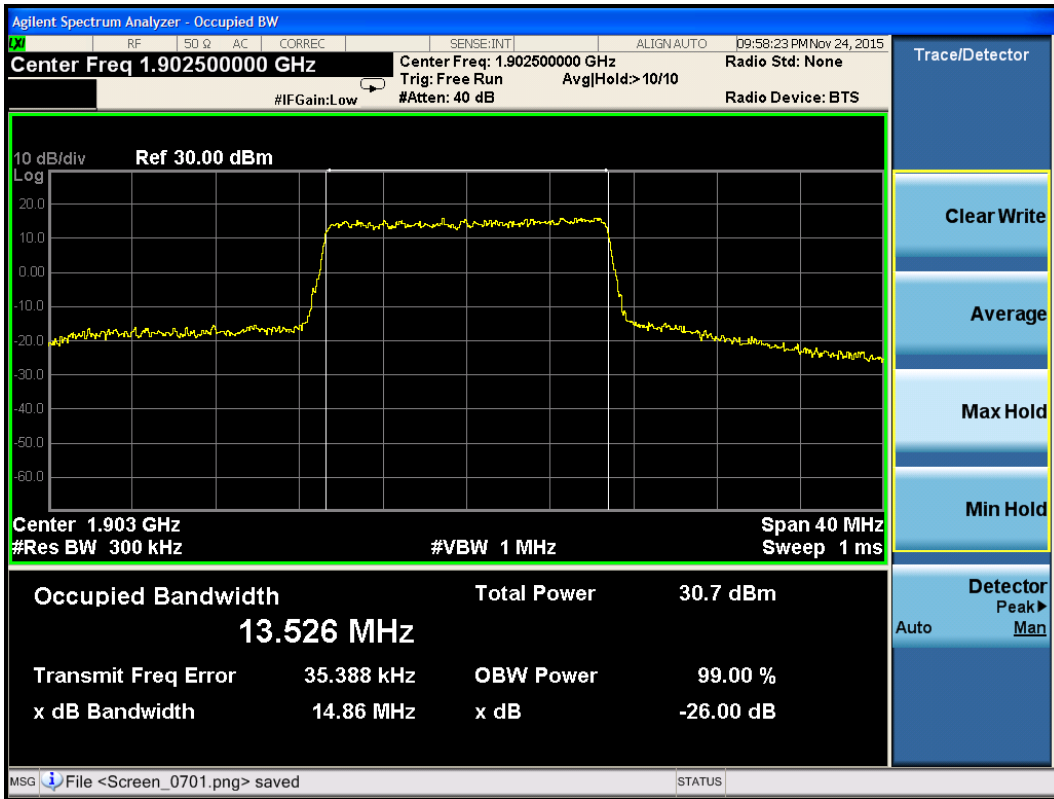


LTE Band II 15MHz QPSK CH18675

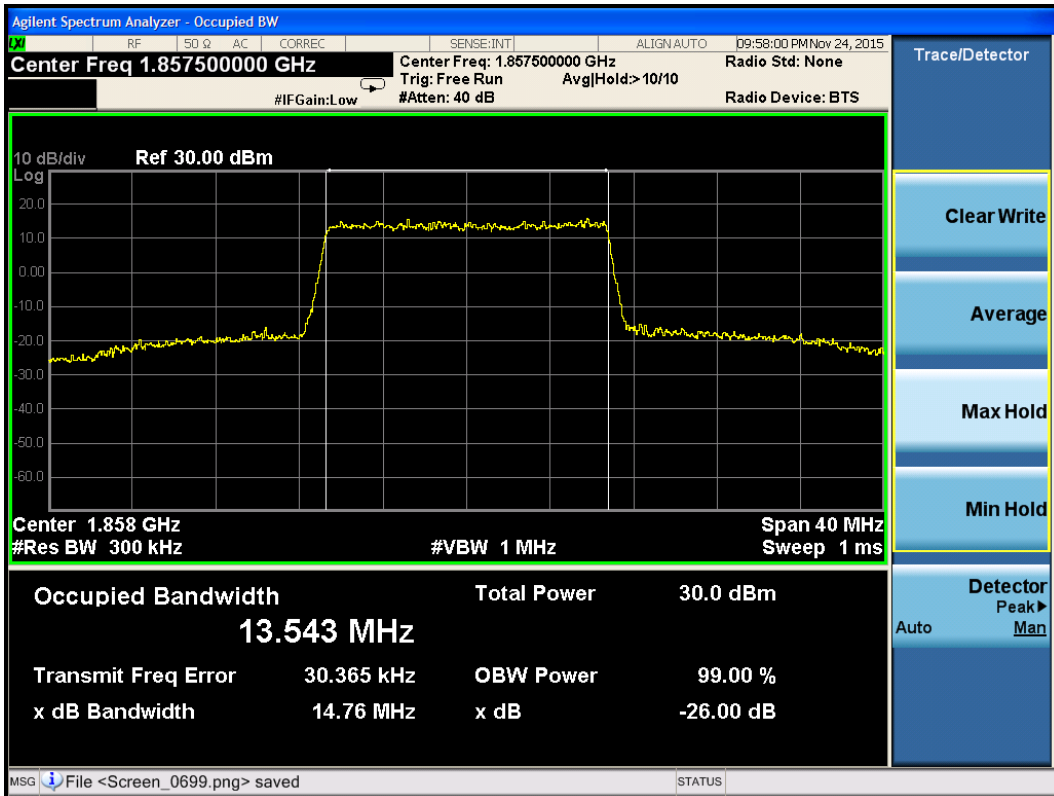


LTE Band II 15MHz QPSK CH18900

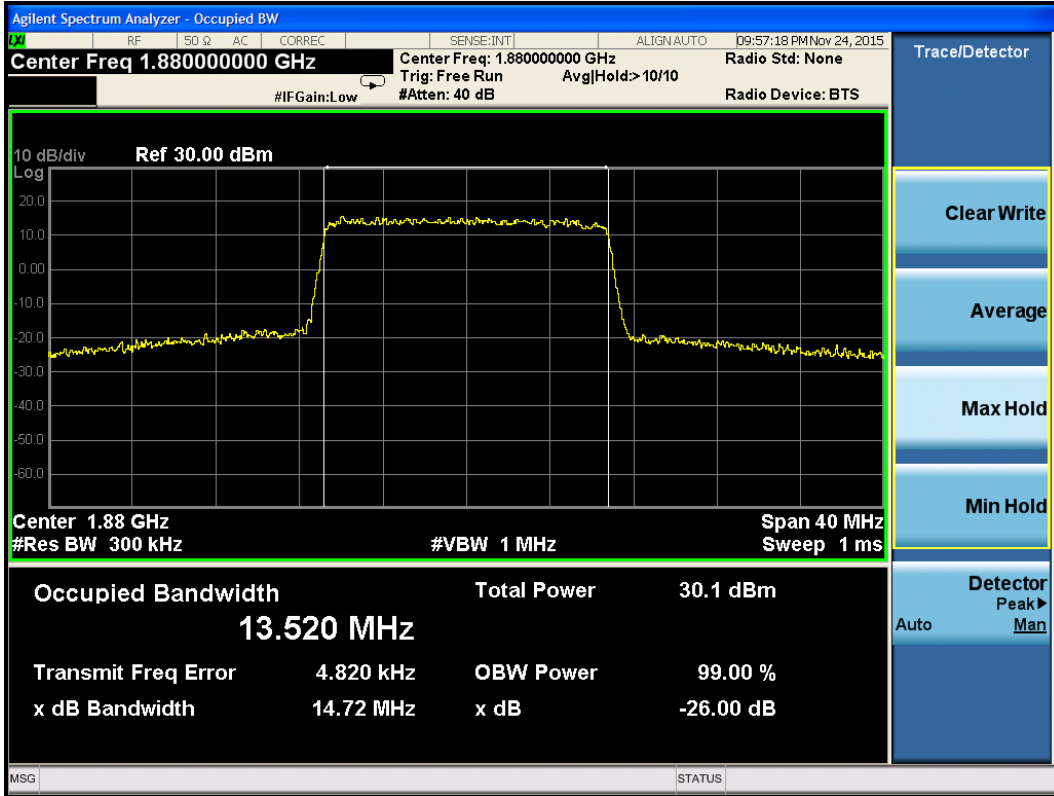




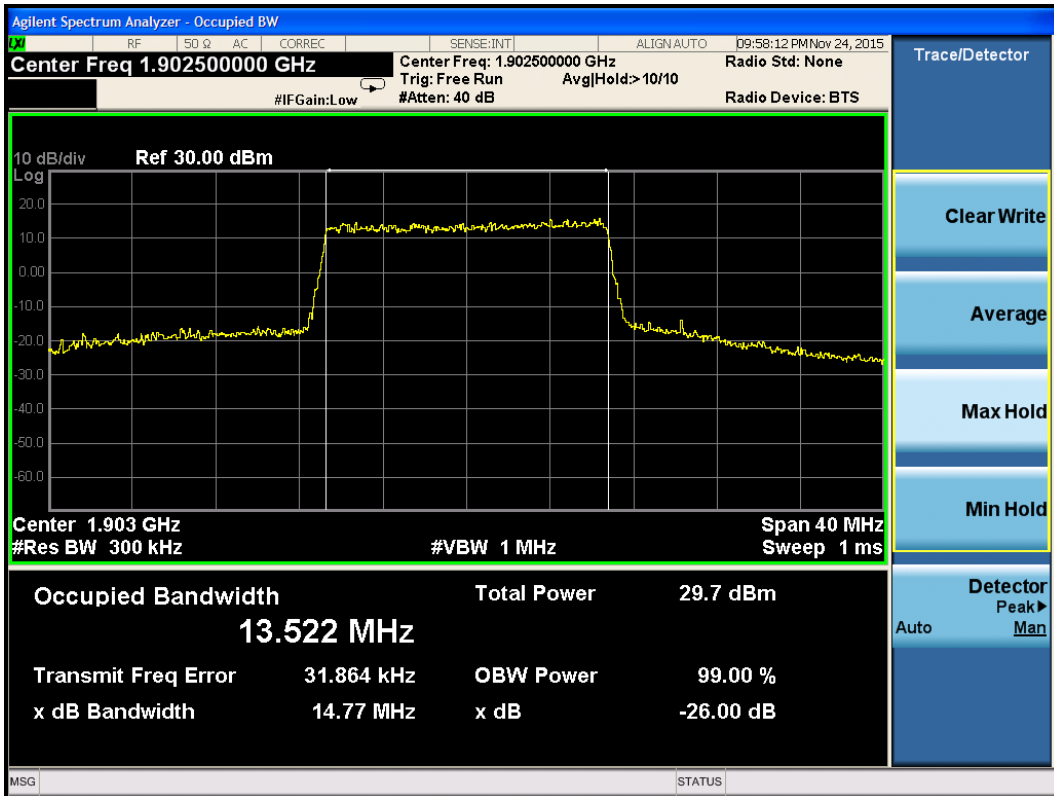
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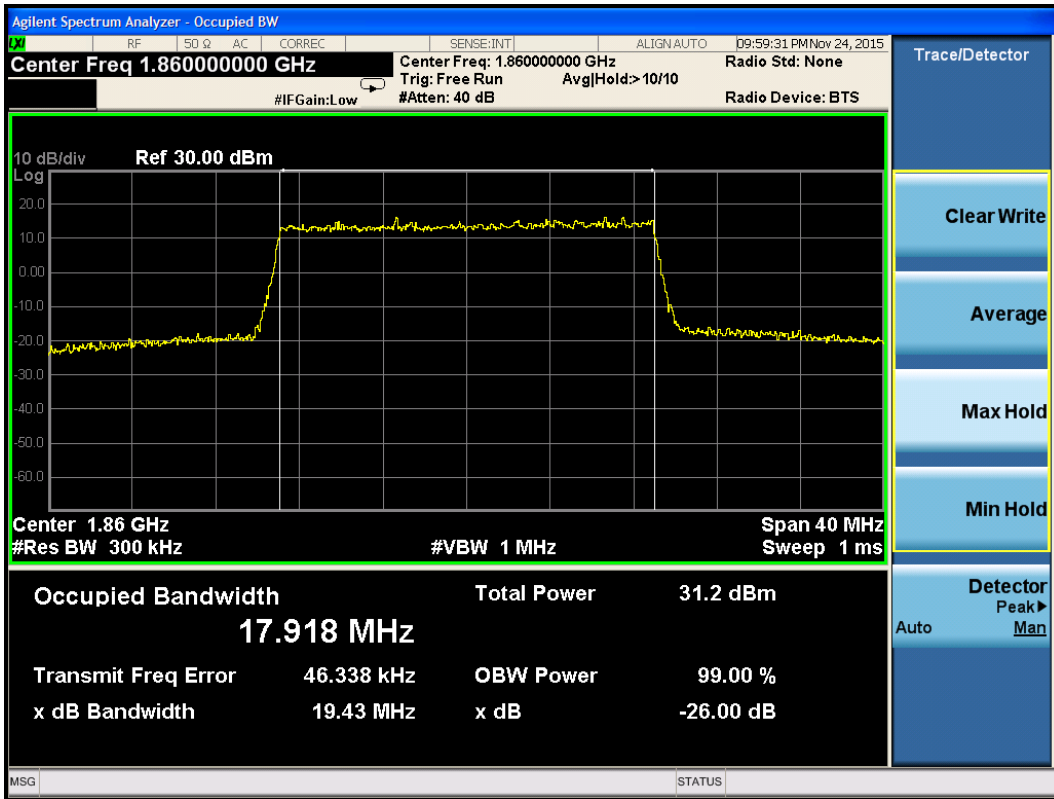
LTE Band II 15MHz 16QAM CH18675



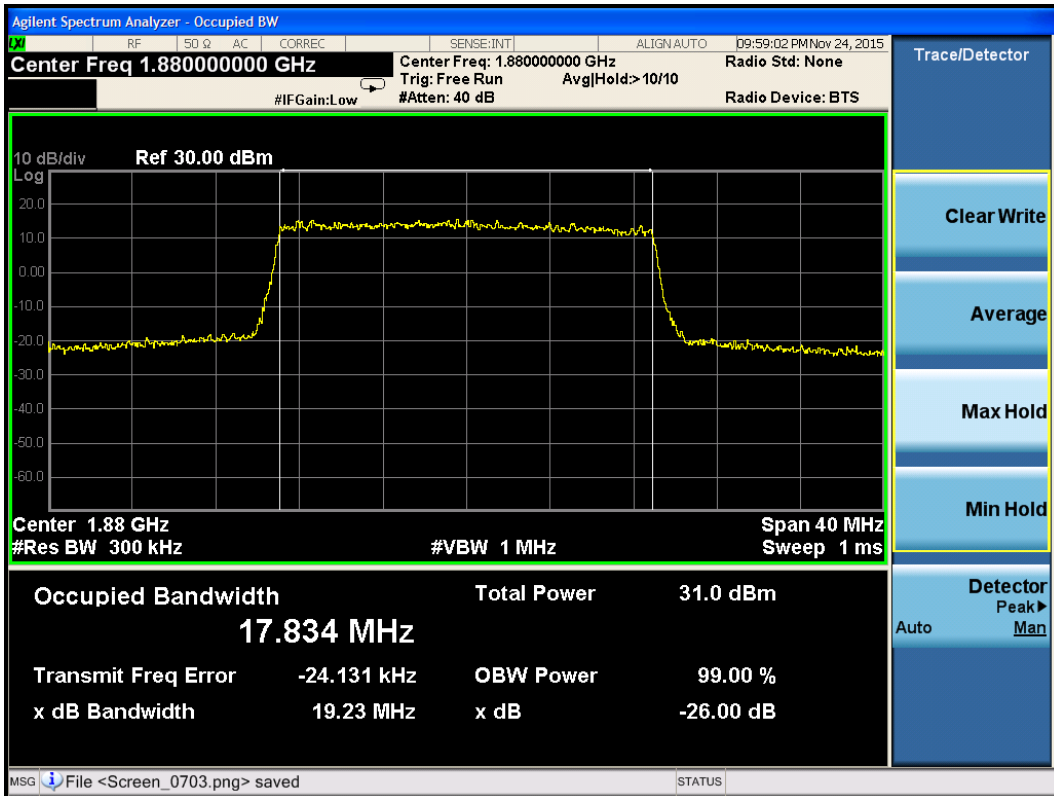
LTE Band II 15MHz 16QAM CH18900



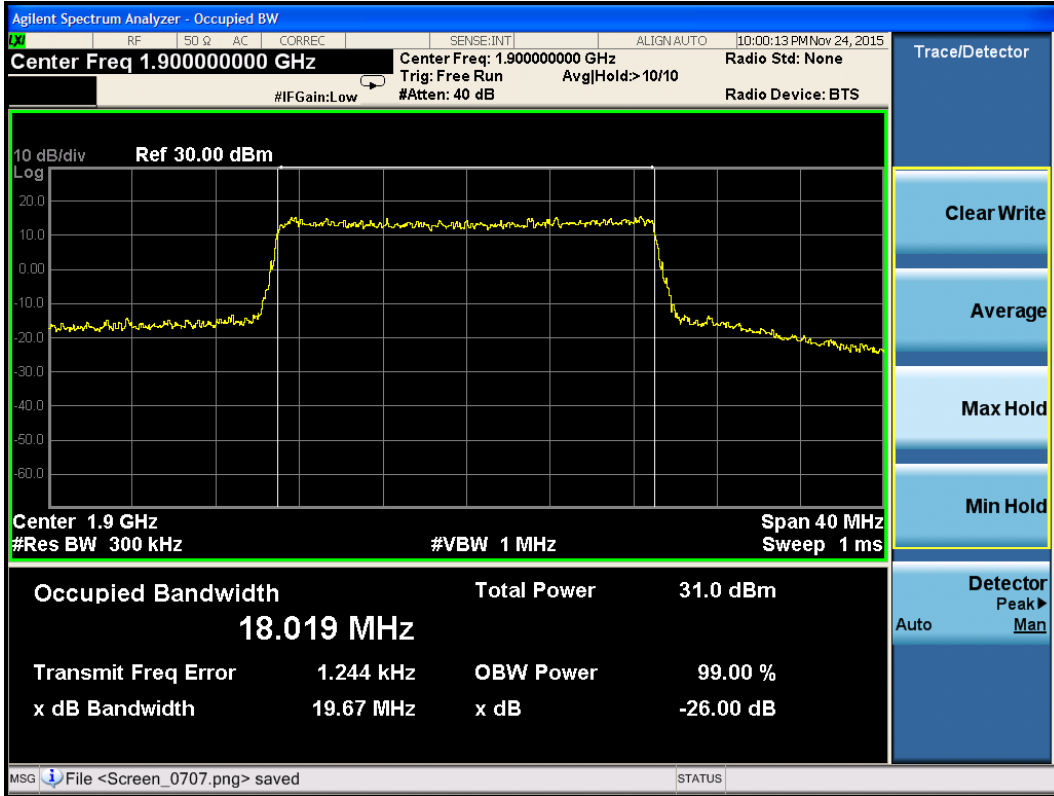
LTE Band II 15MHz 16QAM CH19125



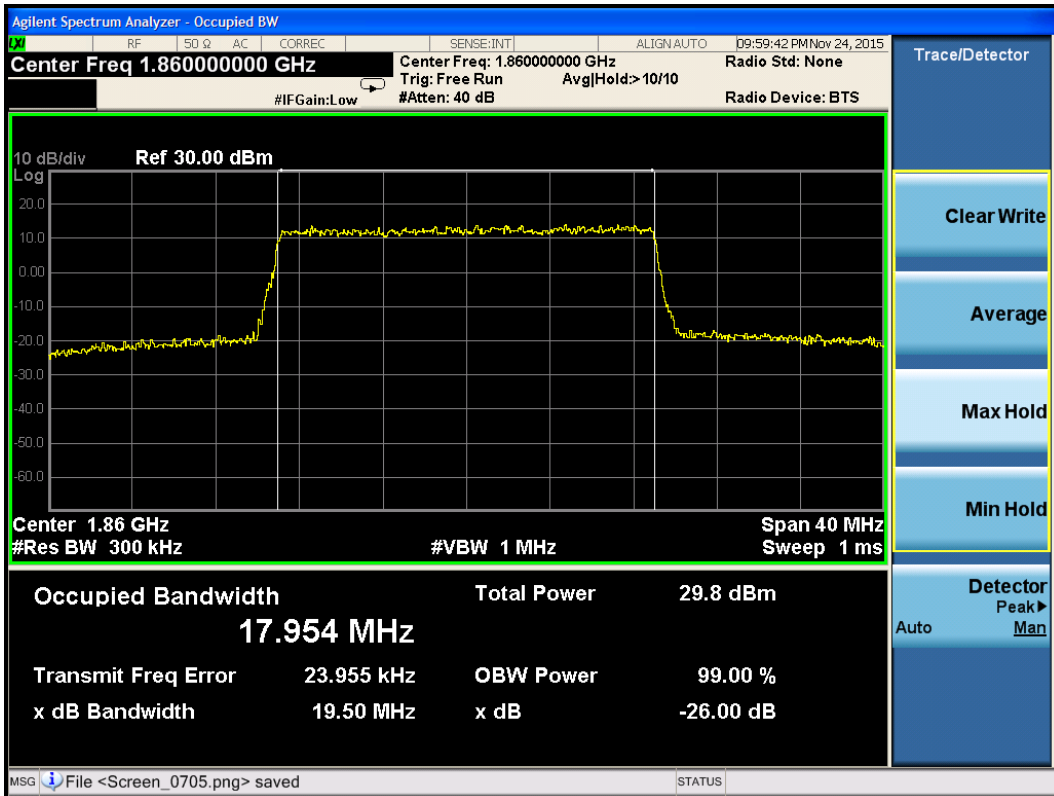
LTE Band II 20MHz QPSK CH18700



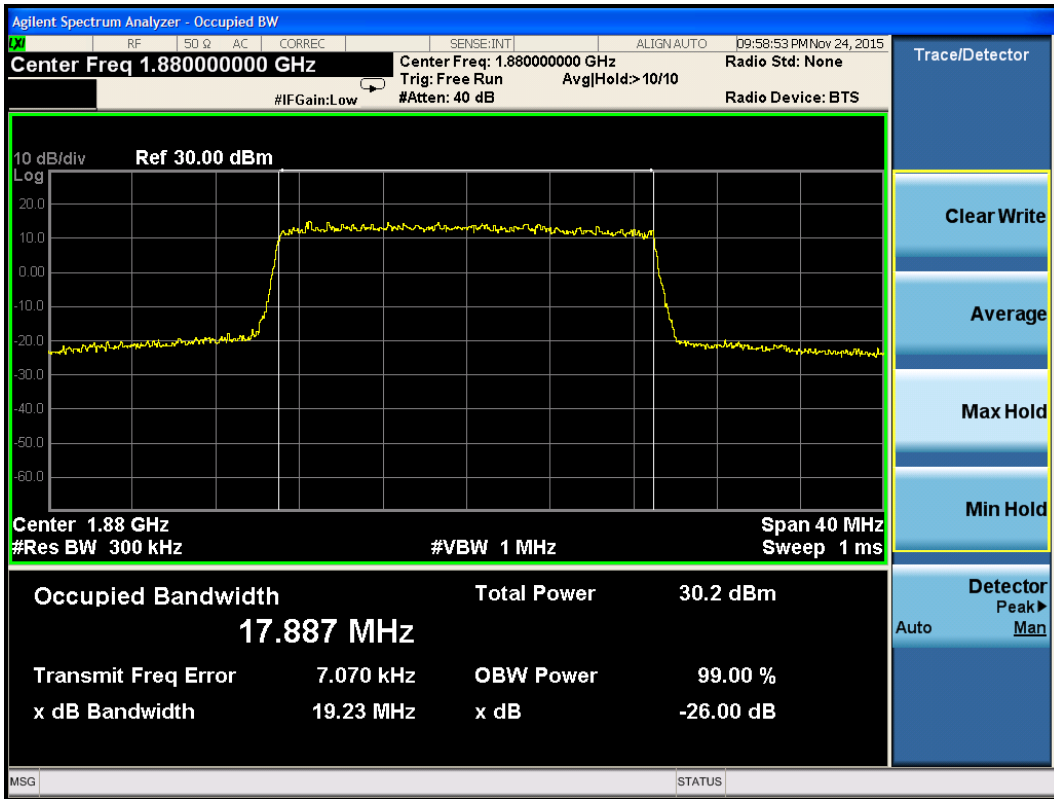
LTE Band II 20MHz QPSK CH18900



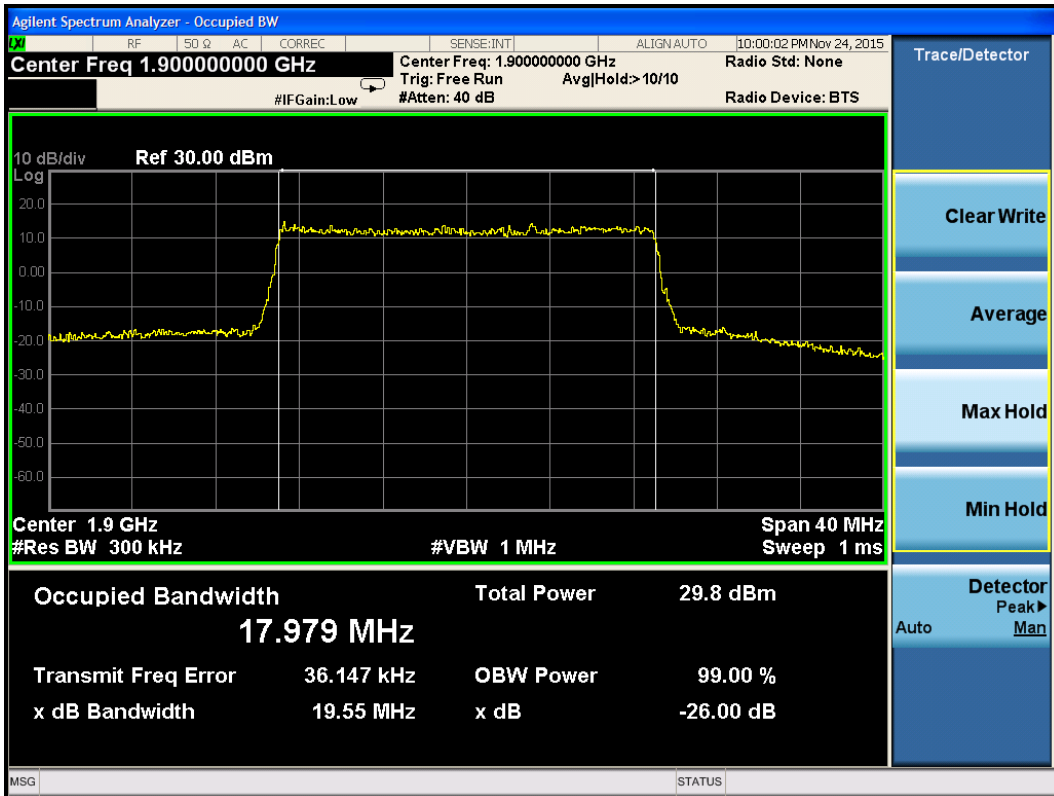
LTE Band II 20MHz QPSK CH19100



LTE Band II 20MHz 16QAM CH18700



LTE Band II 20MHz 16QAM CH18900



LTE Band II 20MHz 16QAM CH19100

### 5.4. Band Edge Compliance

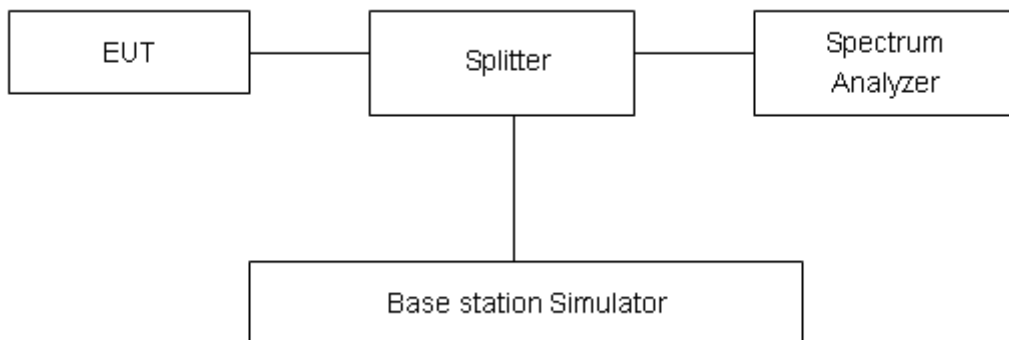
**Ambient condition**

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

**Method of Measurement**

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The band edge of the lowest and highest channels were measured. The Average detector is used and RBW is set to 3kHz, VBW is set to 10kHz for GSM 1900, RBW is set to 51kHz, VBW is set to 160kHz for WCDMA Band II and RBW is set to 15kHz, VBW is set to 51kHz for LTE Band II. Spectrum analyzer plots are included on the following pages.

**Test Setup**



**Limits**

Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log<sub>10</sub> (P) dB.”

Limit	-13 dBm
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**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 1.96$ ,  $U=0.684$ dB.



## Test Result:

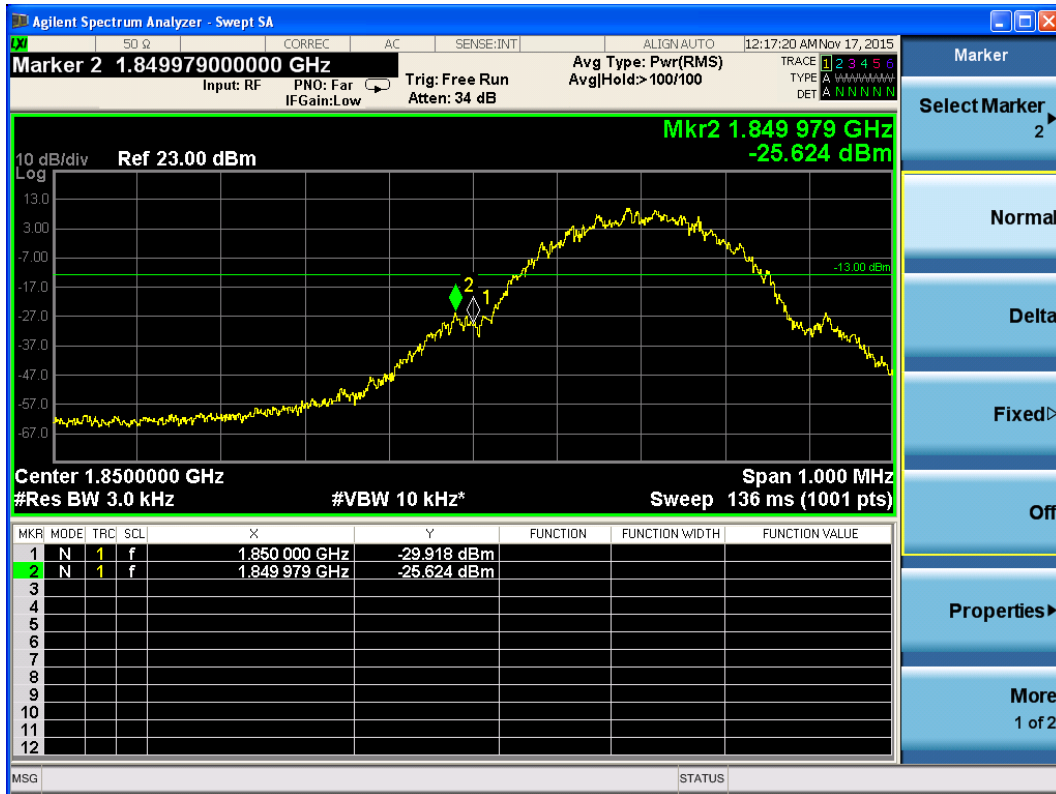
Mode	Carrier frequency (MHz)	Reference value (dBm)	Limit (dBm)	Conclusion
GSM 1900 (GSM)	1850.0	-25.624	-13	PASS
	1910.0	-27.153	-13	PASS
GPRS 1900 (GMSK)	1850.0	-29.097	-13	PASS
	1910.0	-27.951	-13	PASS
EGPRS 1900 (8-PSK)	1850.0	-36.687	-13	PASS
	1910.0	-39.202	-13	PASS
WCDMA Band II RMC	1850	-27.522	-13	PASS
	1910	-27.198	-13	PASS

LTE Band II		RB	Carrier frequency (MHz)	Reference value (dBm)	Limit (dBm)	Conclusion
Bandwidth	Modulation					
1.4MHz	QPSK	1	1850	-24.942	-13	PASS
			1910	-26.237	-13	PASS
		100%	1850	-27.109	-13	PASS
			1910	-27.982	-13	PASS
	16QAM	1	1850	-26.803	-13	PASS
			1910	-27.244	-13	PASS
		100%	1850	-28.104	-13	PASS
			1910	-27.955	-13	PASS
3MHz	QPSK	1	1850	-18.812	-13	PASS
			1910	-20.085	-13	PASS
		100%	1850	-27.179	-13	PASS
			1910	-26.710	-13	PASS
	16QAM	1	1850	-20.211	-13	PASS
			1910	-21.934	-13	PASS
		100%	1850	-28.578	-13	PASS
			1910	-28.567	-13	PASS
5MHz	QPSK	1	1850	-22.447	-13	PASS
			1910	-22.728	-13	PASS
		100%	1850	-28.218	-13	PASS
			1910	-27.085	-13	PASS
	16QAM	1	1850	-23.300	-13	PASS
			1910	-22.537	-13	PASS

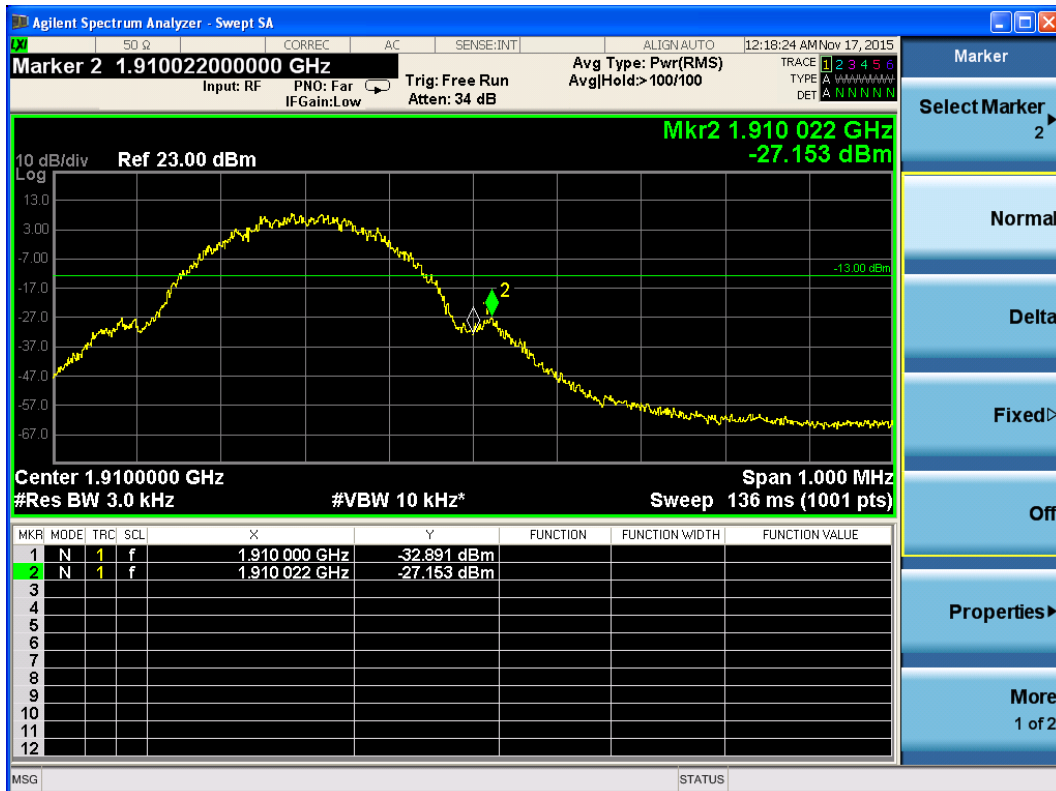


LTE Band II		RB	Carrier frequency (MHz)	Reference value (dBm)	Limit (dBm)	Conclusion
Bandwidth	Modulation					
		100%	1850	-29.169	-13	PASS
			1910	-27.277	-13	PASS
10MHz	QPSK	1	1850	-30.949	-13	PASS
			1910	-31.201	-13	PASS
		100%	1850	-28.407	-13	PASS
			1910	-27.026	-13	PASS
	16QAM	1	1850	-29.661	-13	PASS
			1910	-29.436	-13	PASS
		100%	1850	-30.558	-13	PASS
			1910	-28.259	-13	PASS
15MHz	QPSK	1	1850	-27.239	-13	PASS
			1910	-26.203	-13	PASS
		100%	1850	-28.152	-13	PASS
			1910	-25.101	-13	PASS
	16QAM	1	1850	-31.164	-13	PASS
			1910	-29.000	-13	PASS
		100%	1850	-29.524	-13	PASS
			1910	-26.379	-13	PASS
20MHz	QPSK	1	1850	-28.564	-13	PASS
			1910	-30.843	-13	PASS
		100%	1850	-29.639	-13	PASS
			1910	-25.232	-13	PASS
	16QAM	1	1850	-31.505	-13	PASS
			1910	-32.380	-13	PASS
		100%	1850	-30.430	-13	PASS
			1910	-26.332	-13	PASS

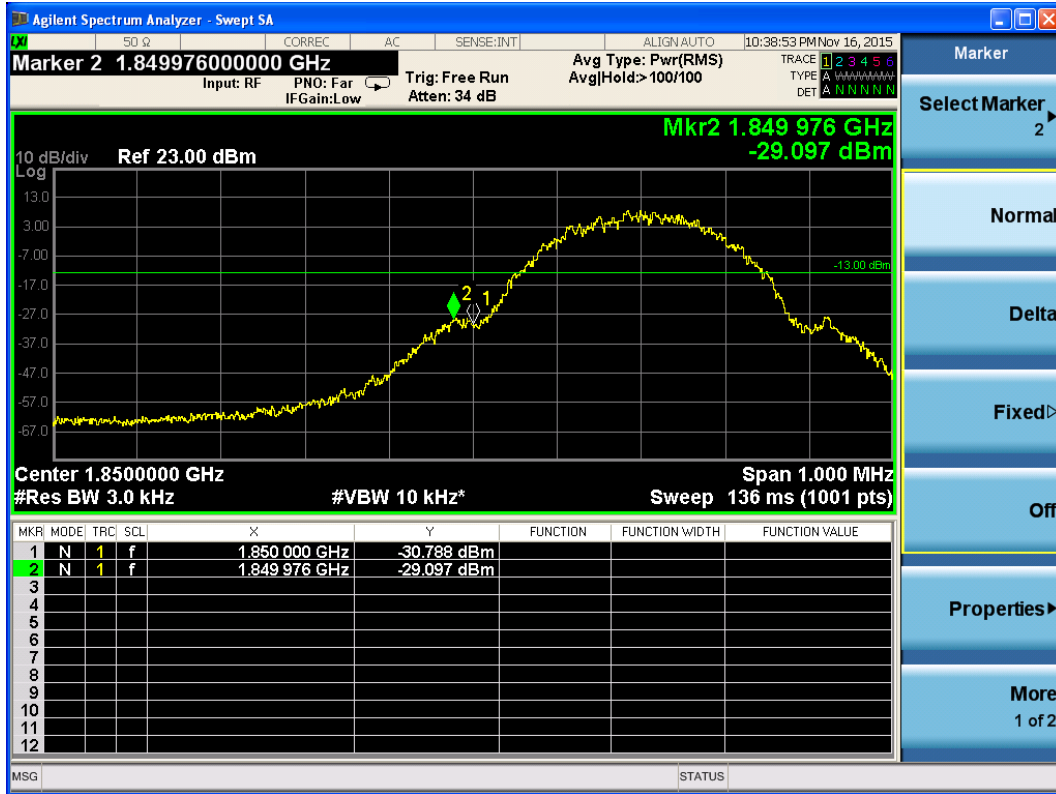




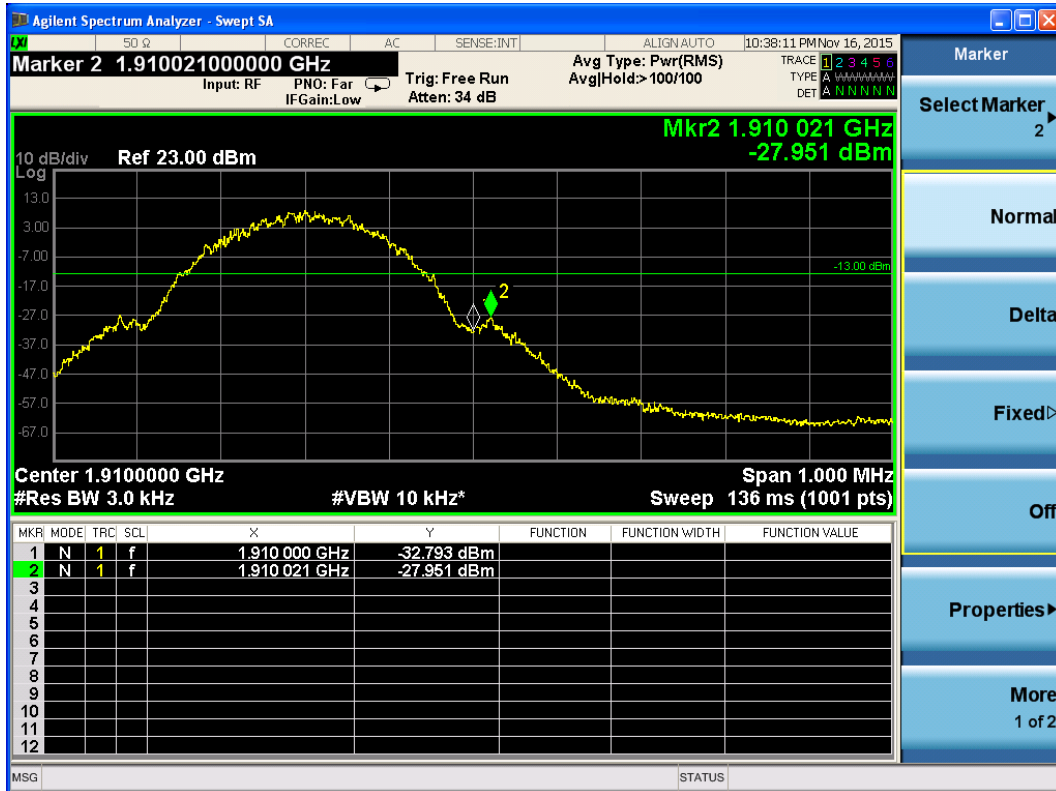
GSM 1900 CH512



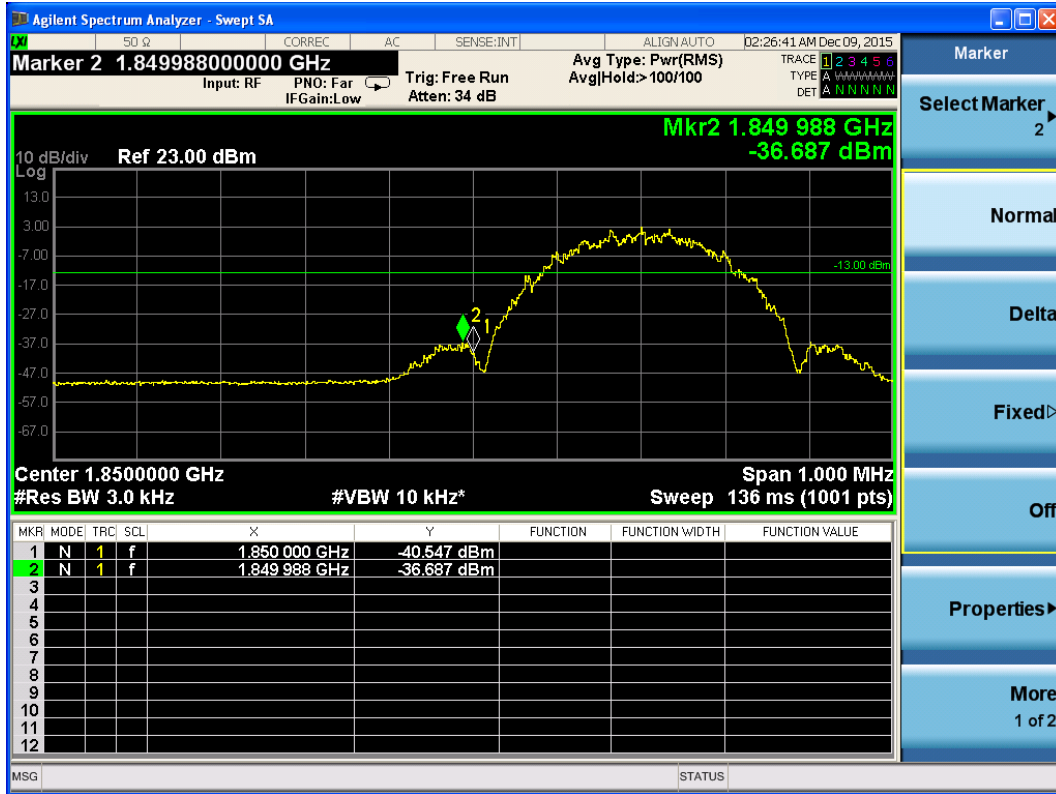
GSM1900 CH810



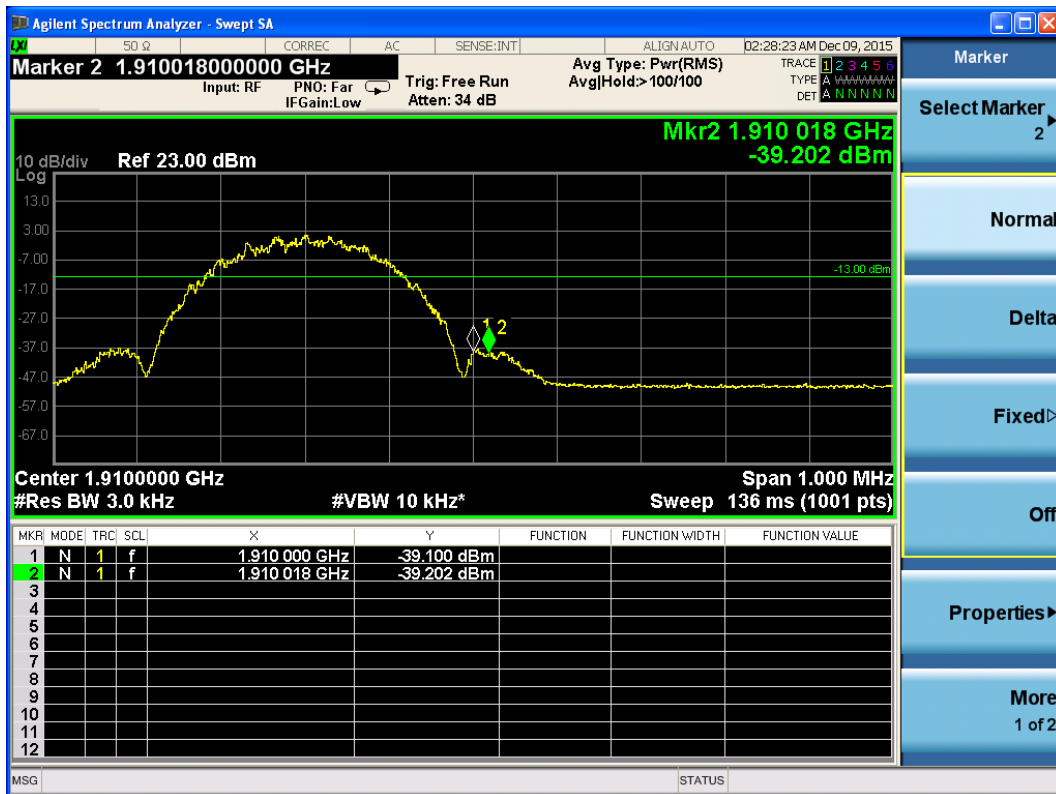
GSM 1900 GPRS CH512



GSM1900 GPRS CH810



GSM 1900 EGPRS CH512



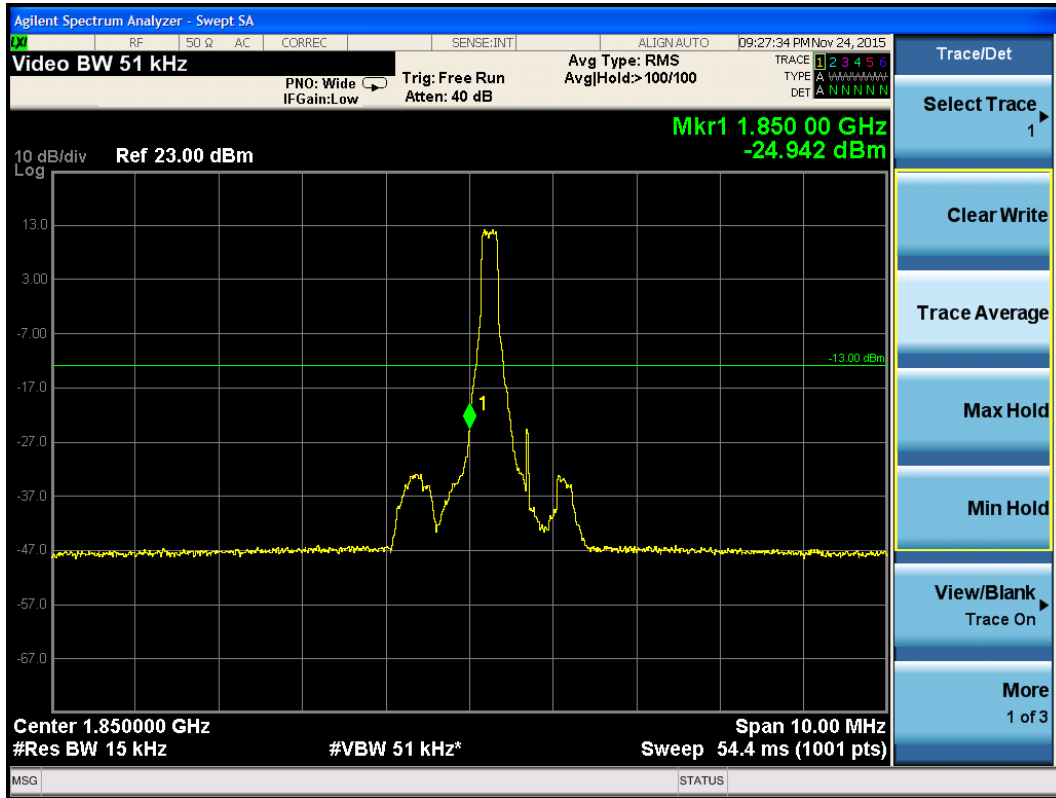
GSM1900 EGPRS CH810



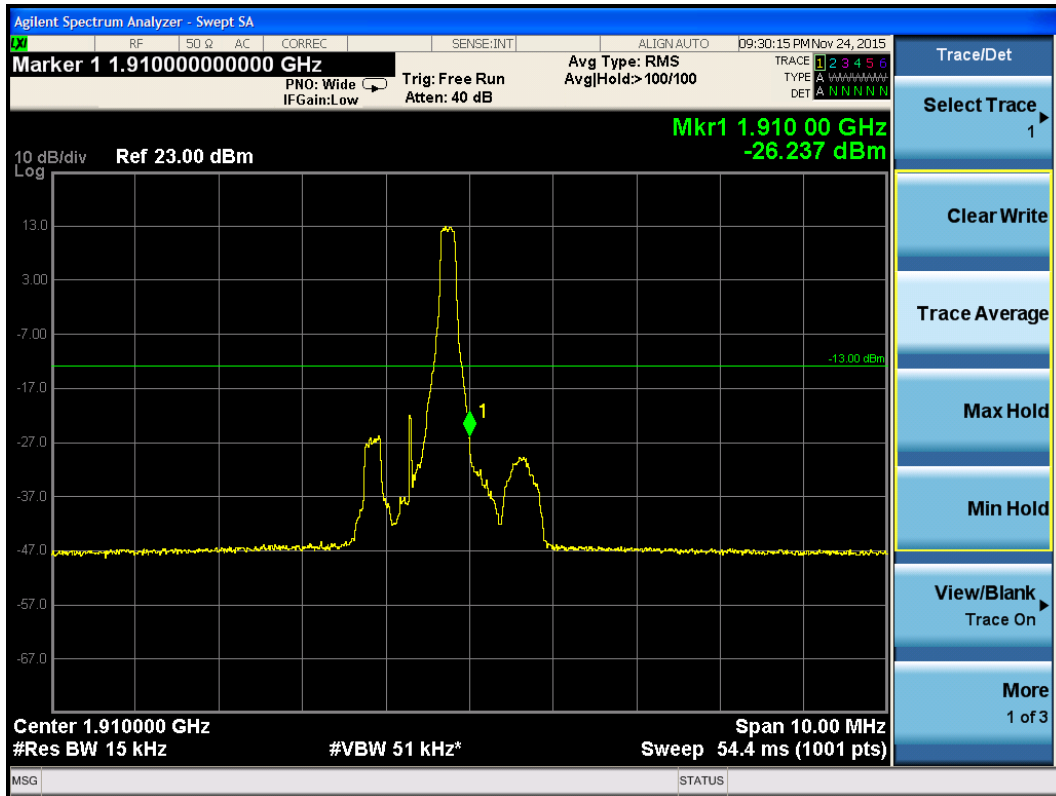
WCDMA Band II CH9262



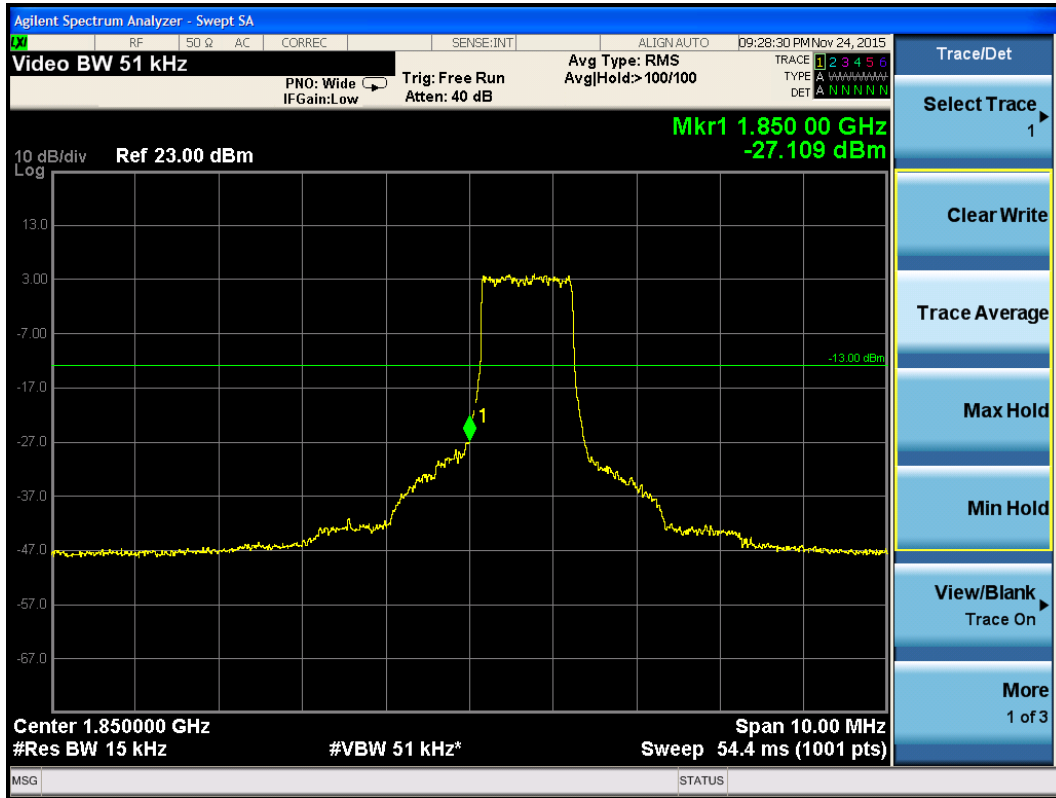
WCDMA Band II CH9538



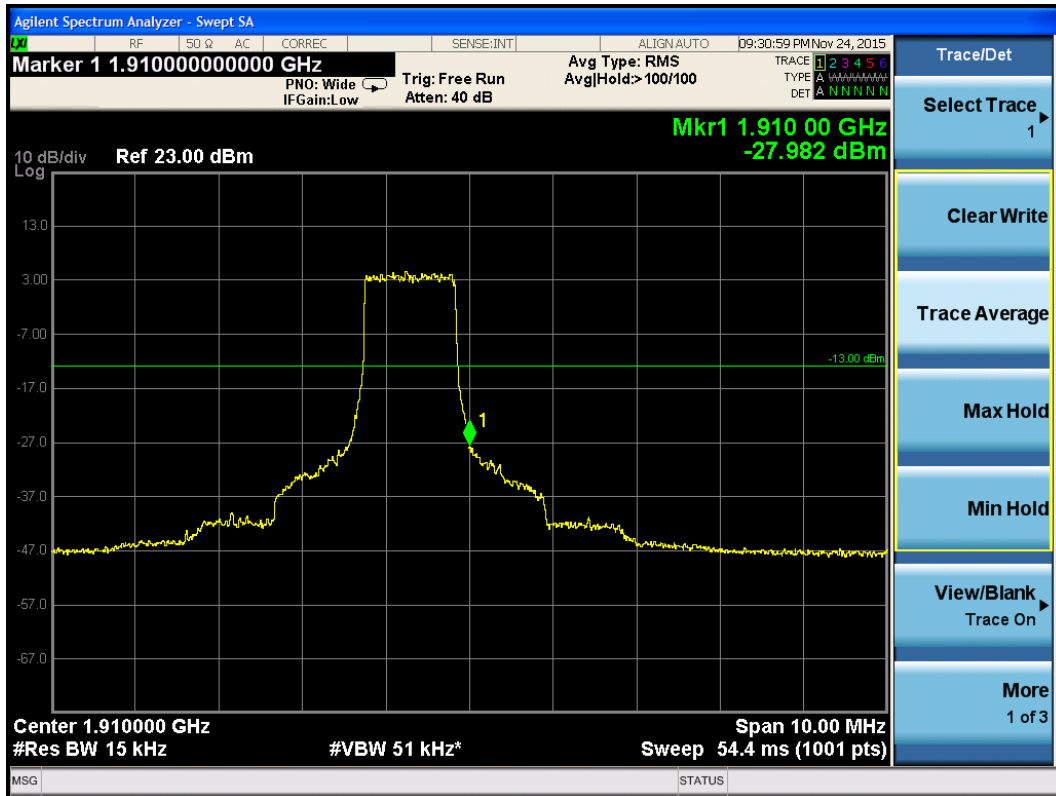
LTE Band II 1.4MHz QPSK 1RB CH18607



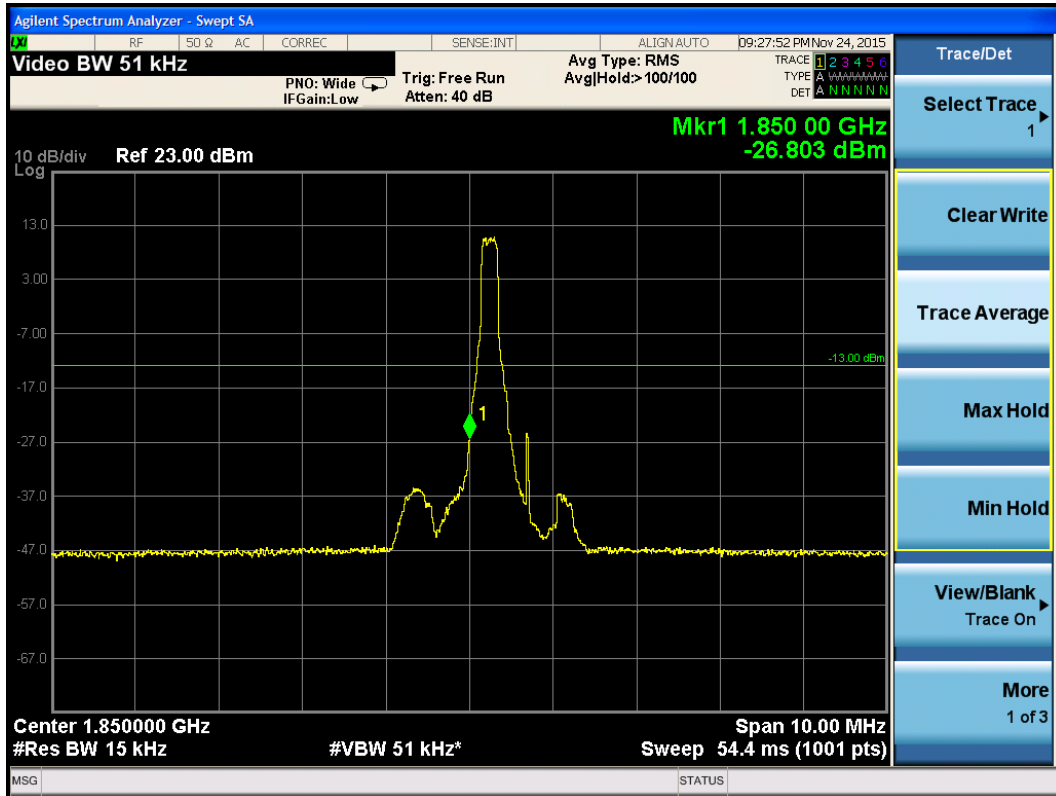
LTE Band II 1.4MHz QPSK 1RB CH19193



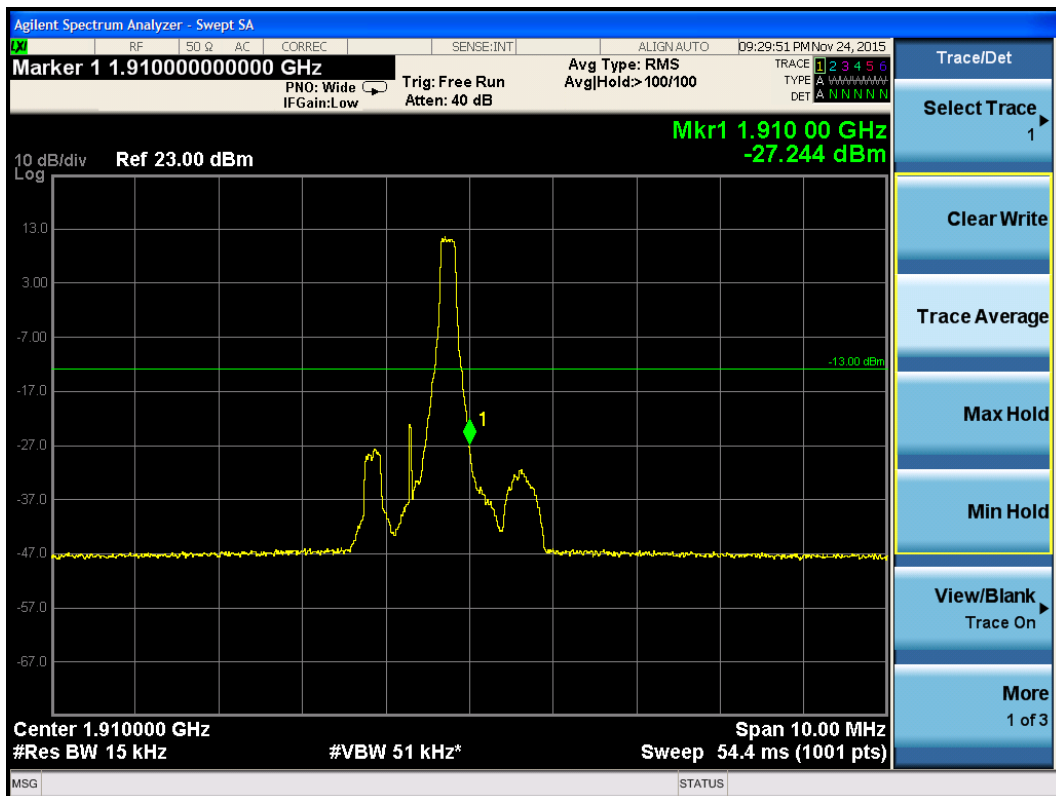
LTE Band II 1.4MHz QPSK 100%RB CH18607



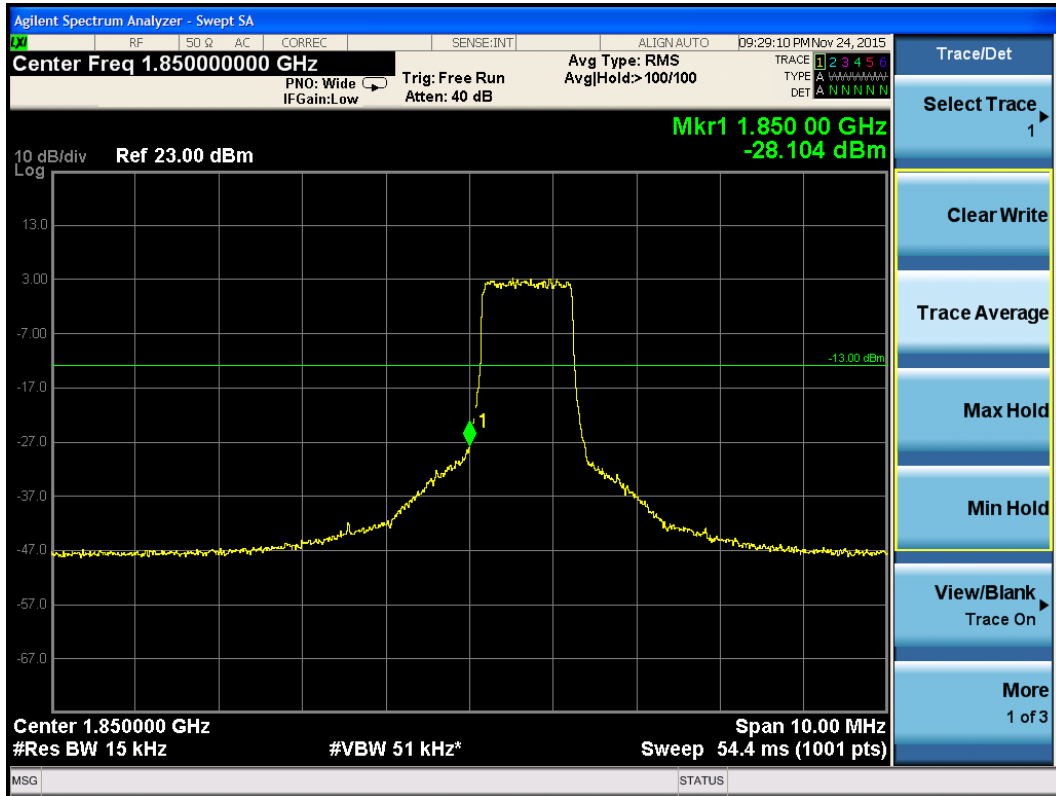
LTE Band II 1.4MHz QPSK 100%RB CH19193



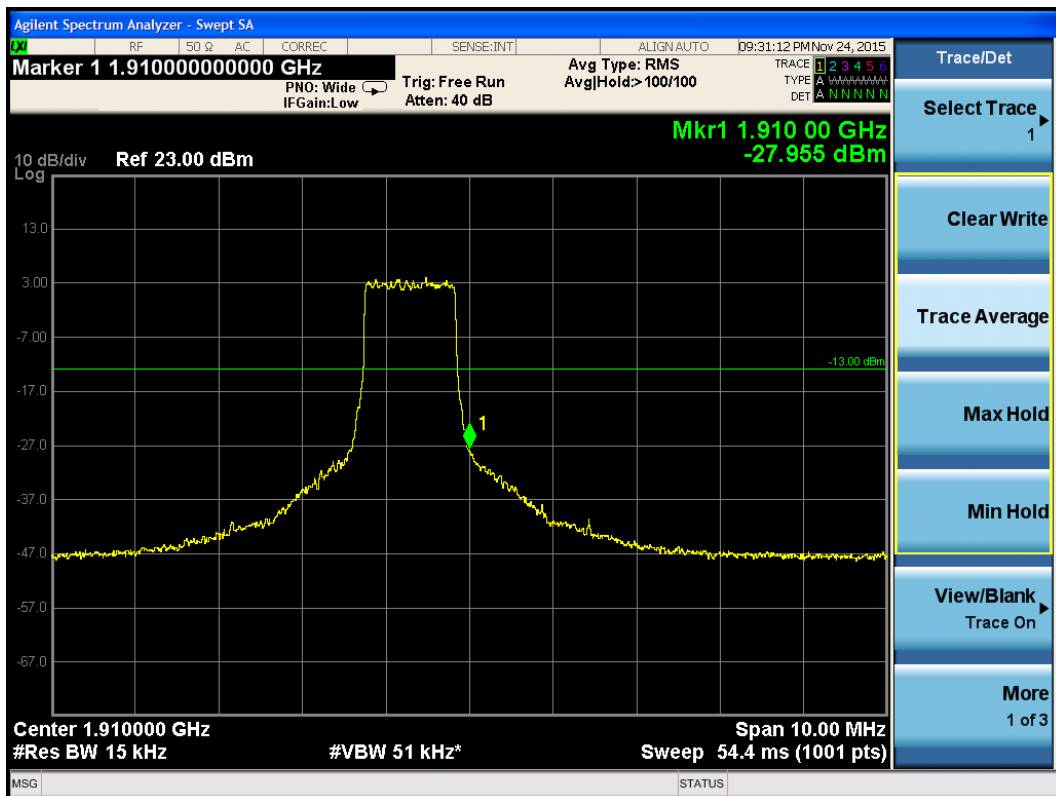
LTE Band II 1.4MHz 16QAM 1RB CH18607



LTE Band II 1.4MHz 16QAM 1RB CH19193

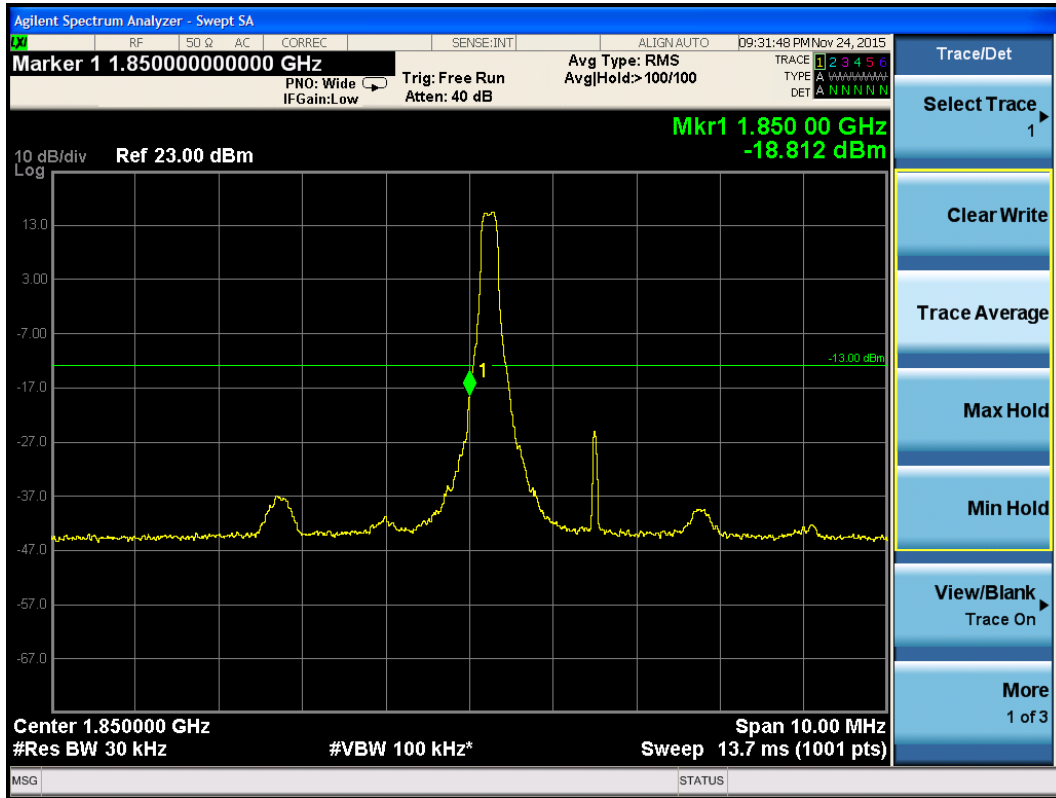


LTE Band II 1.4MHz 16QAM 100%RB CH18607

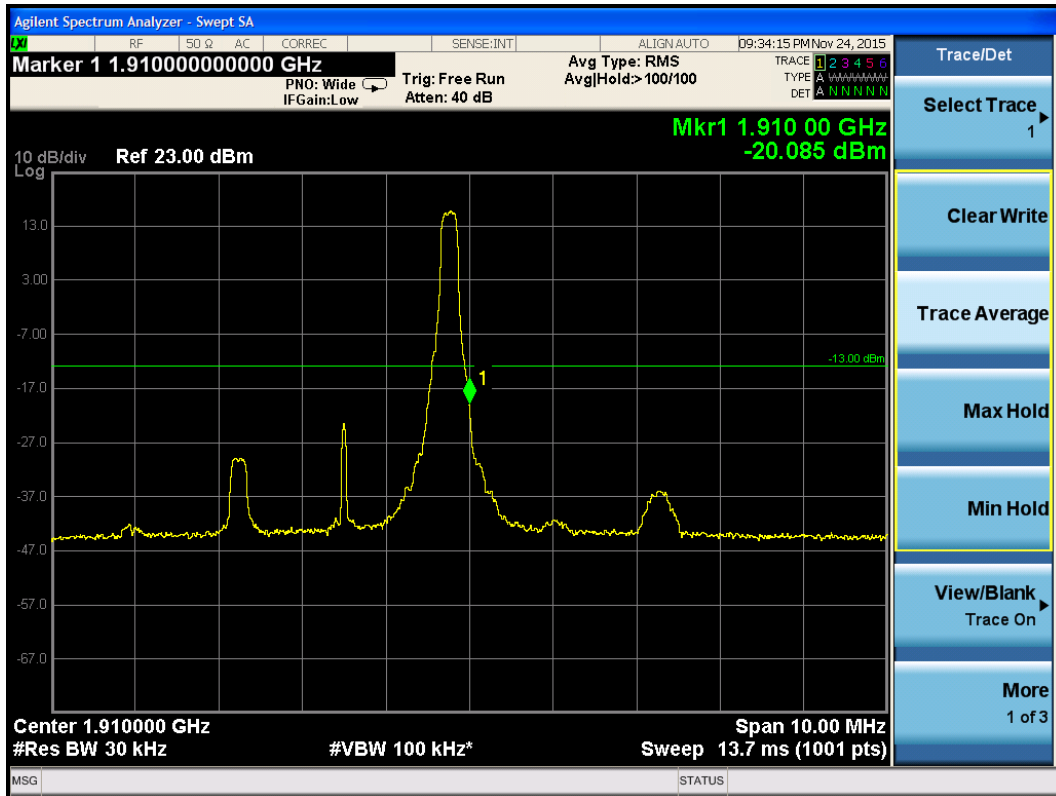


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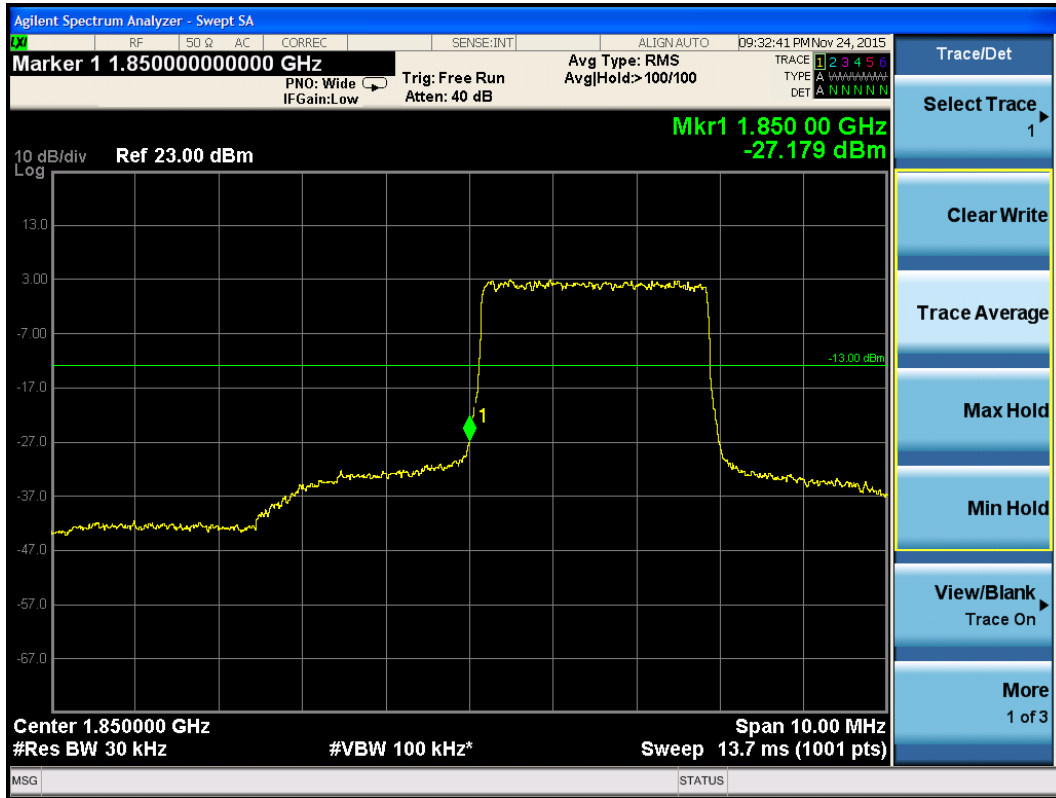




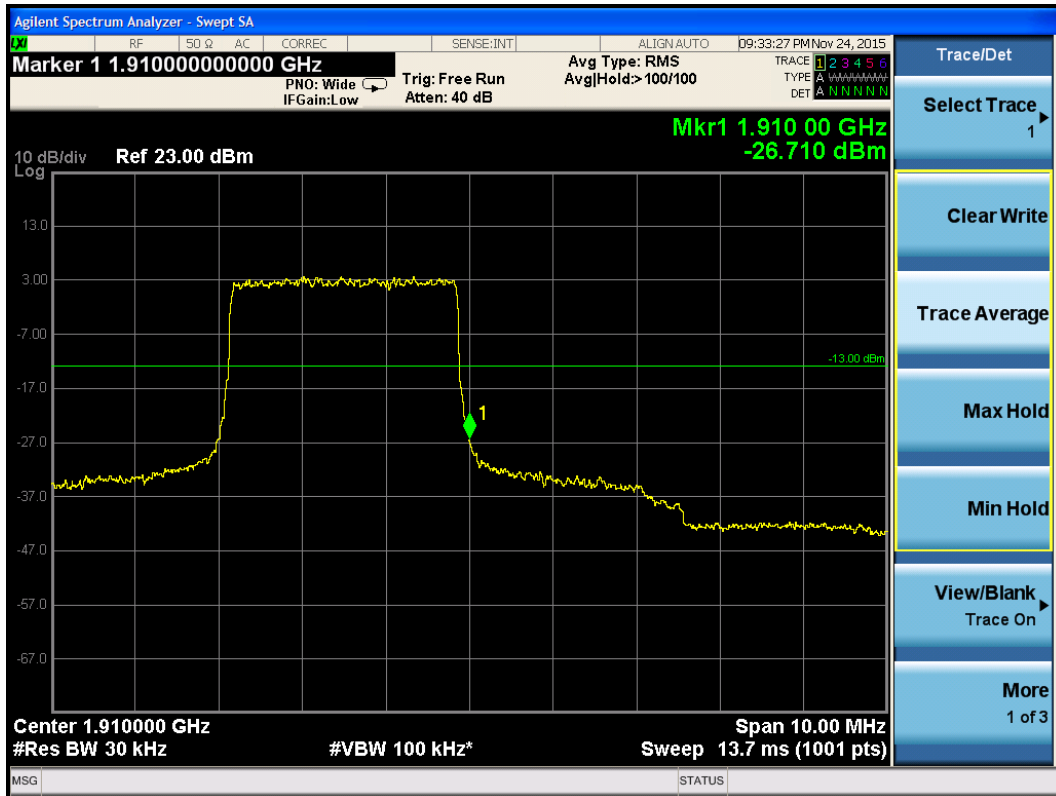
LTE Band II 3MHz QPSK 1RB CH18615



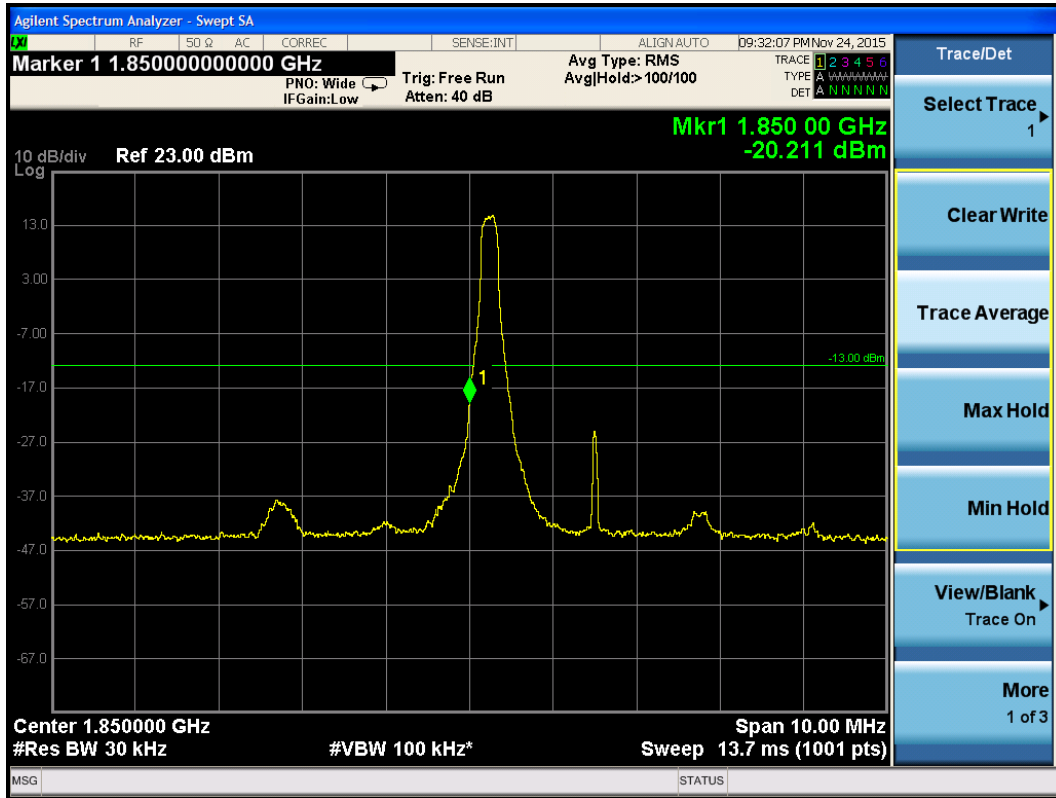
LTE Band II 3MHz QPSK 1RB CH19185



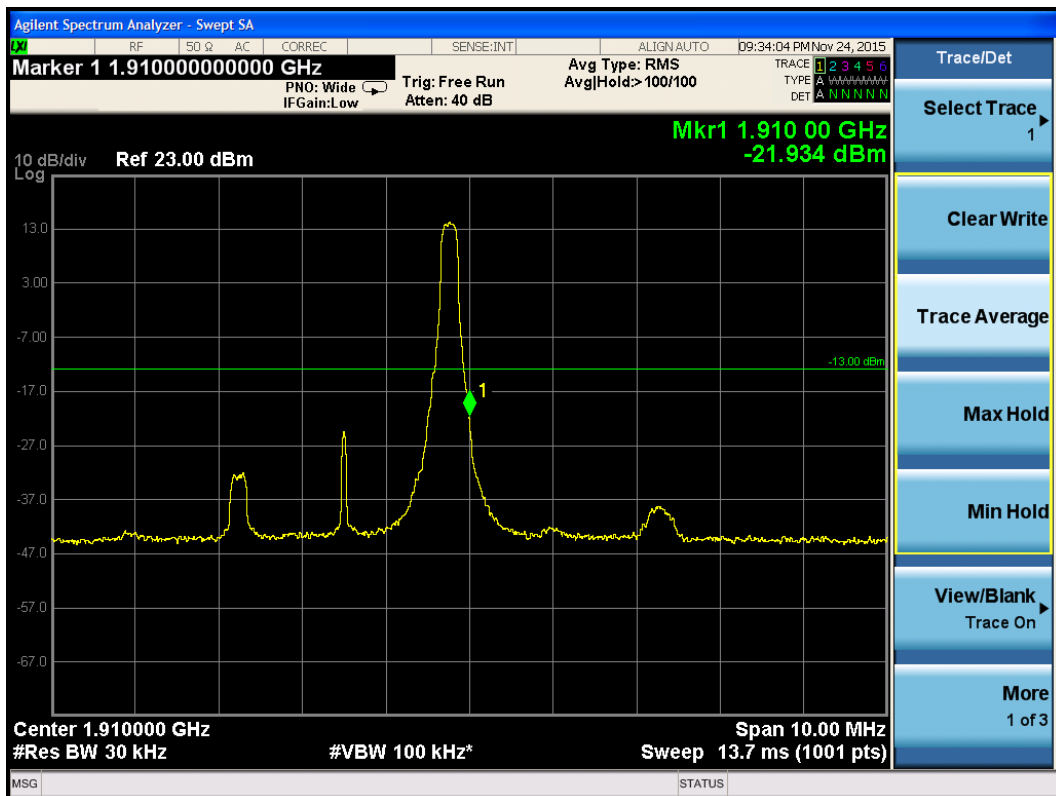
LTE Band II 3MHz QPSK 100%RB CH18615



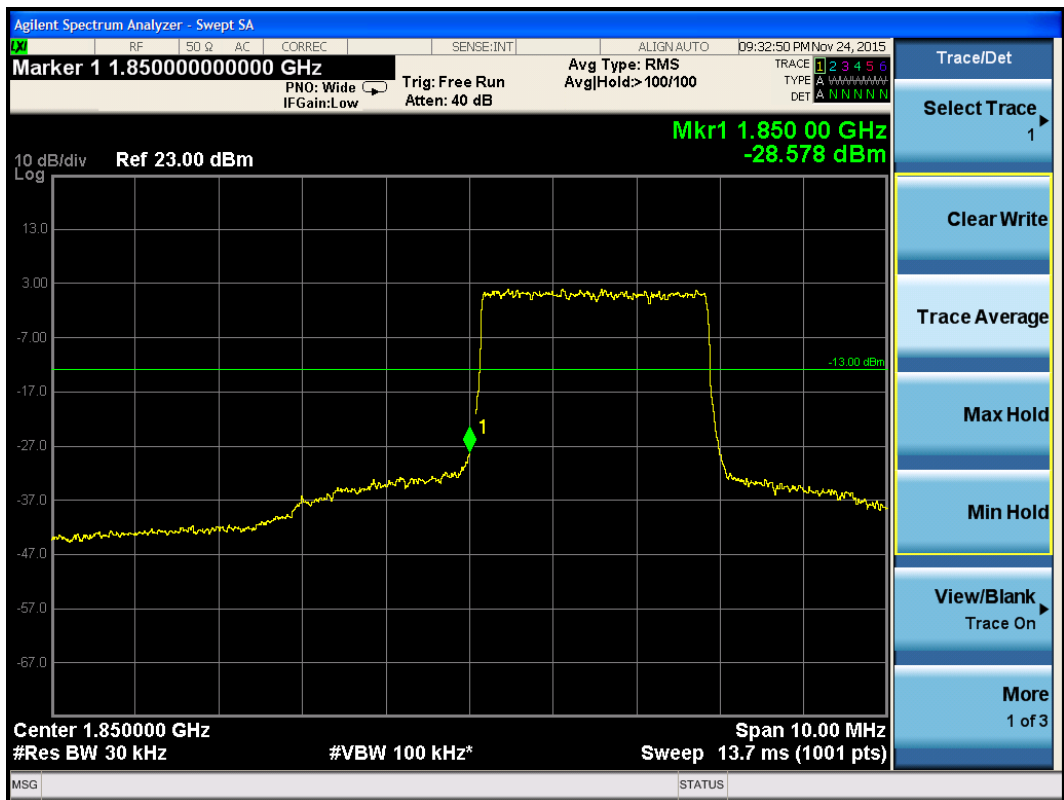
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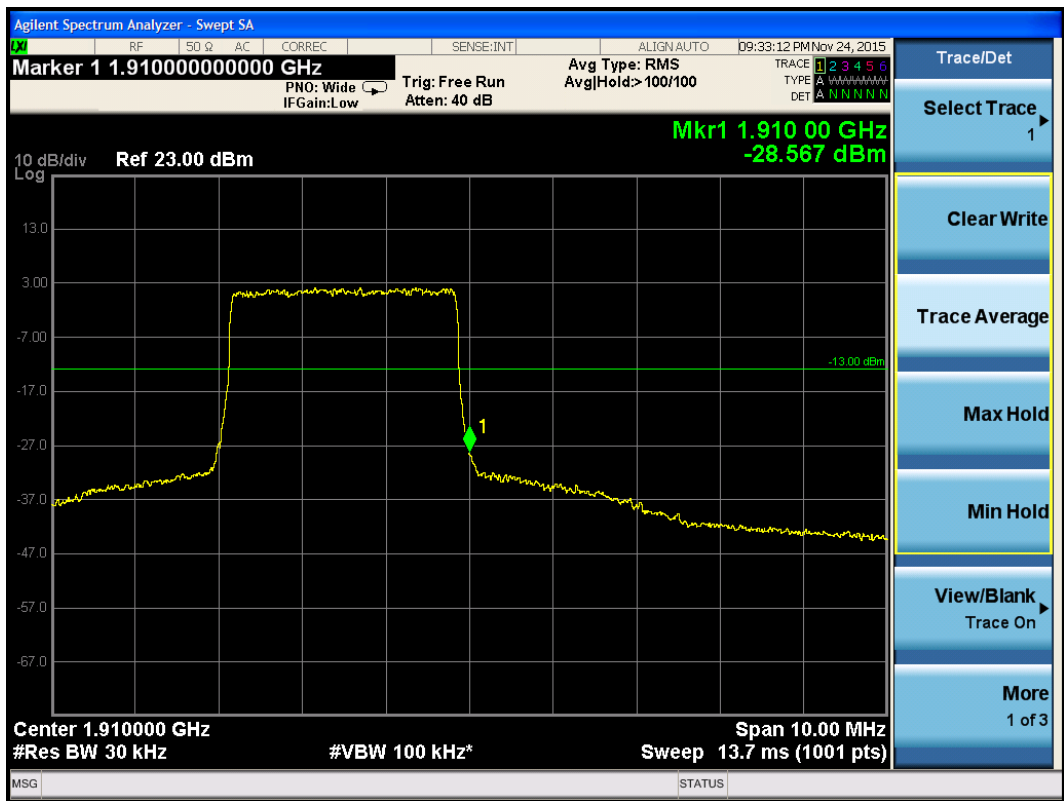
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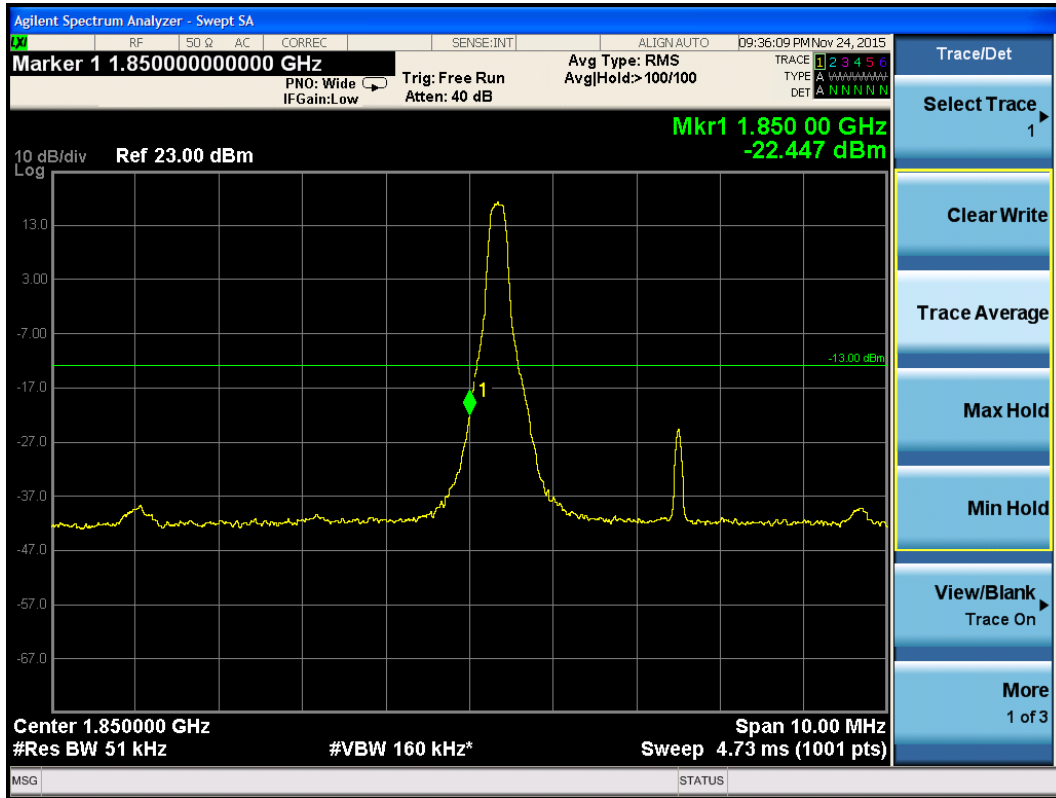
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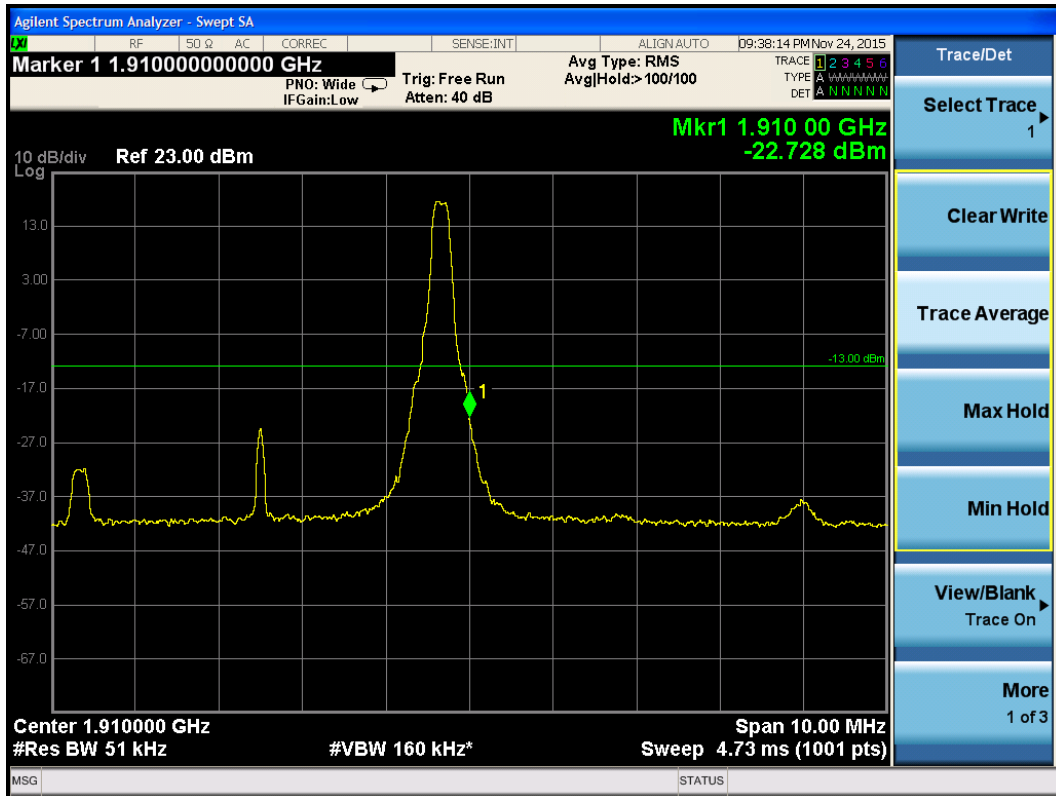
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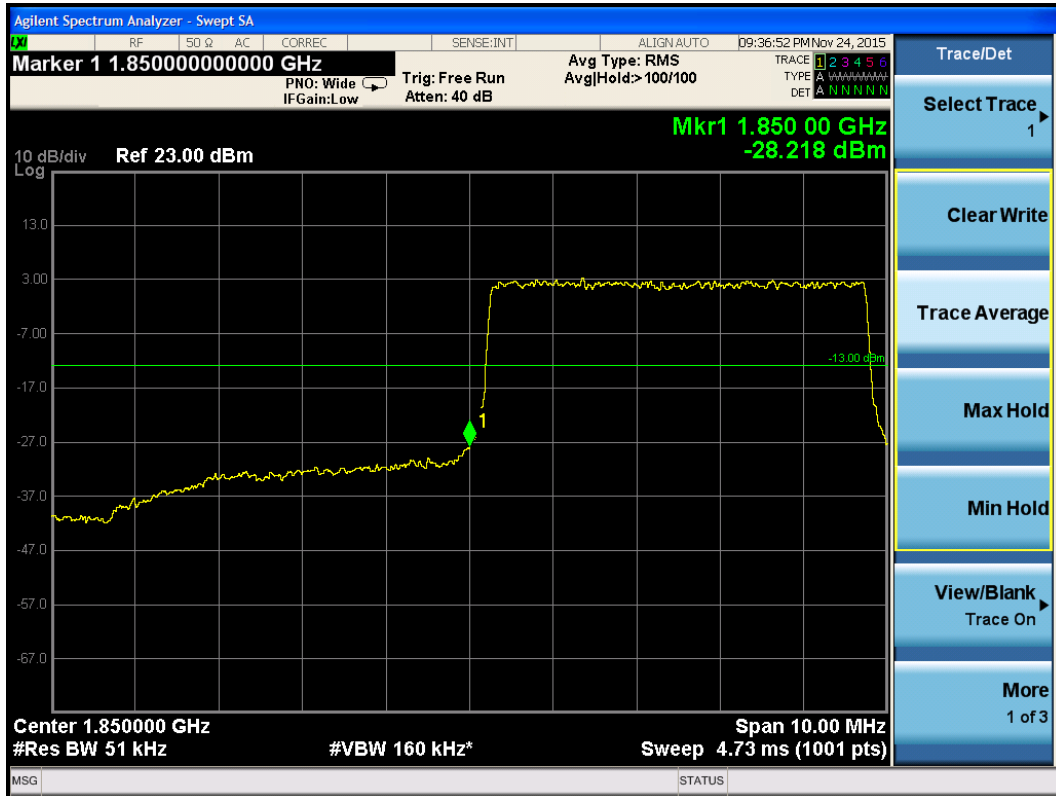
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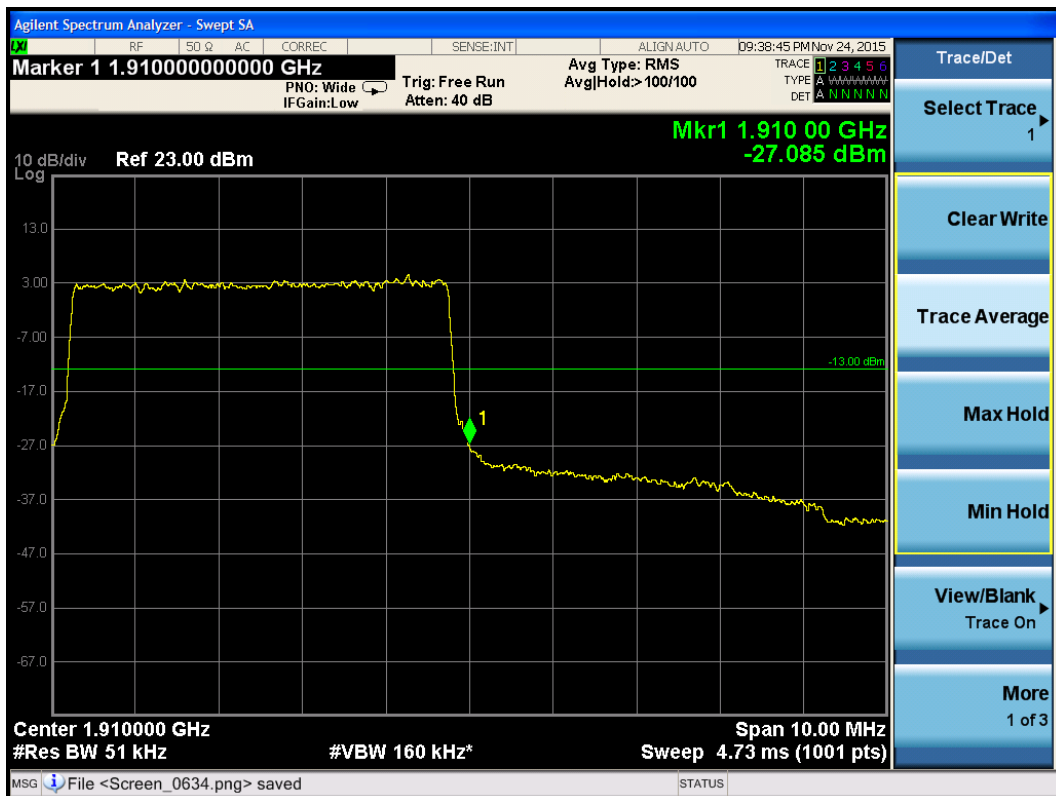
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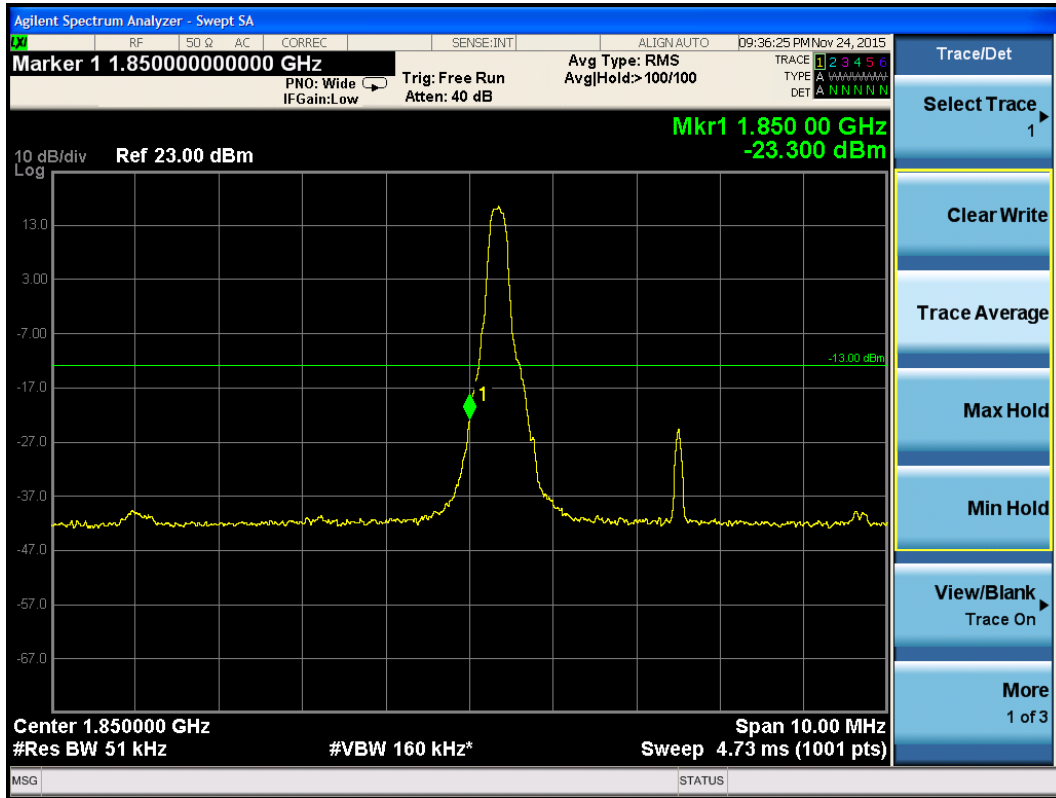
LTE Band II 5MHz QPSK 1RB CH19175



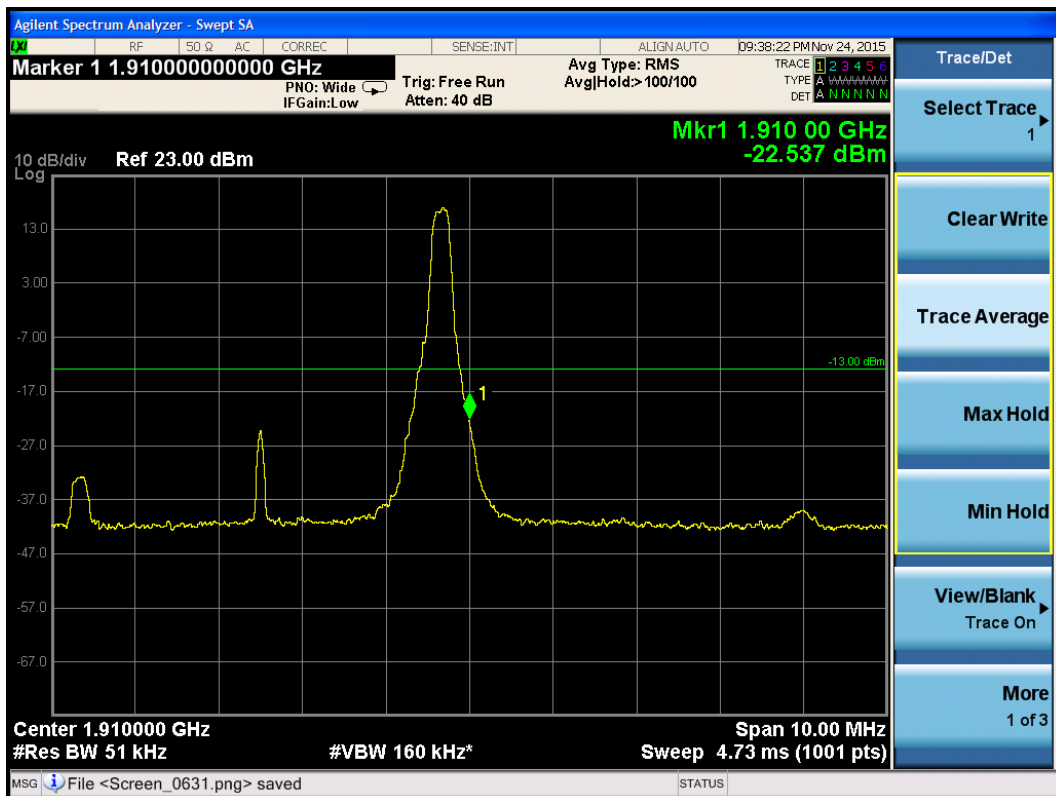
LTE Band II 5MHz QPSK 100%RB CH18625



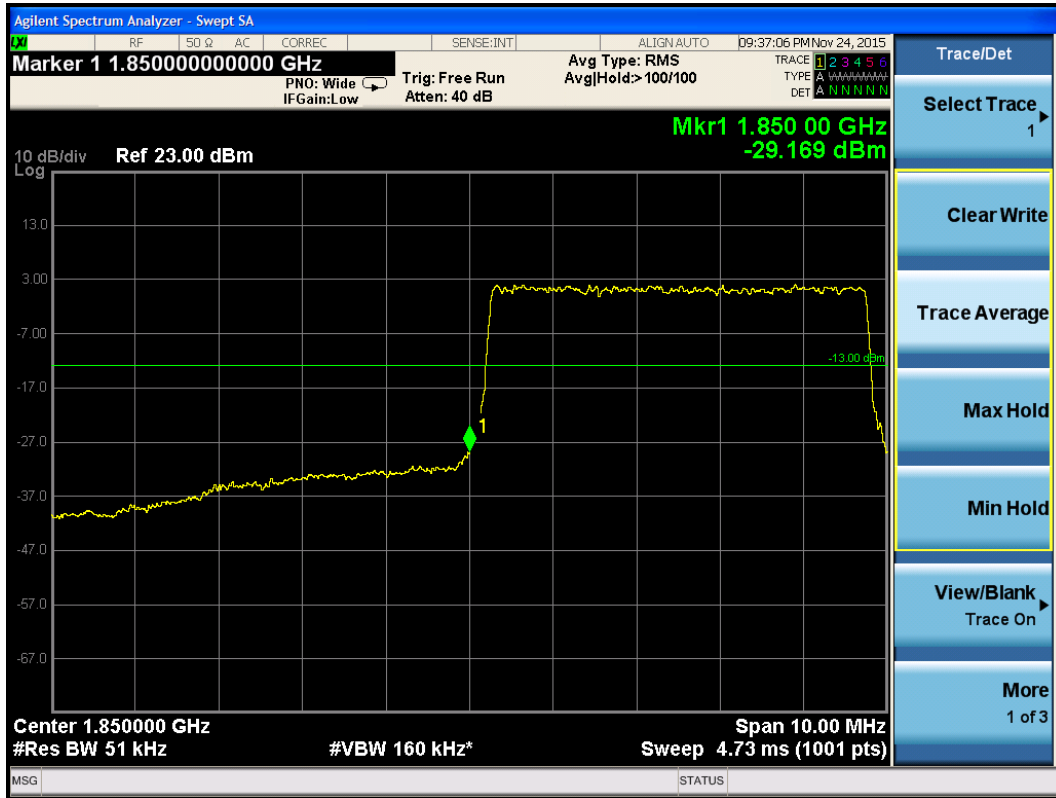
LTE Band II 5MHz QPSK 100%RB CH19175



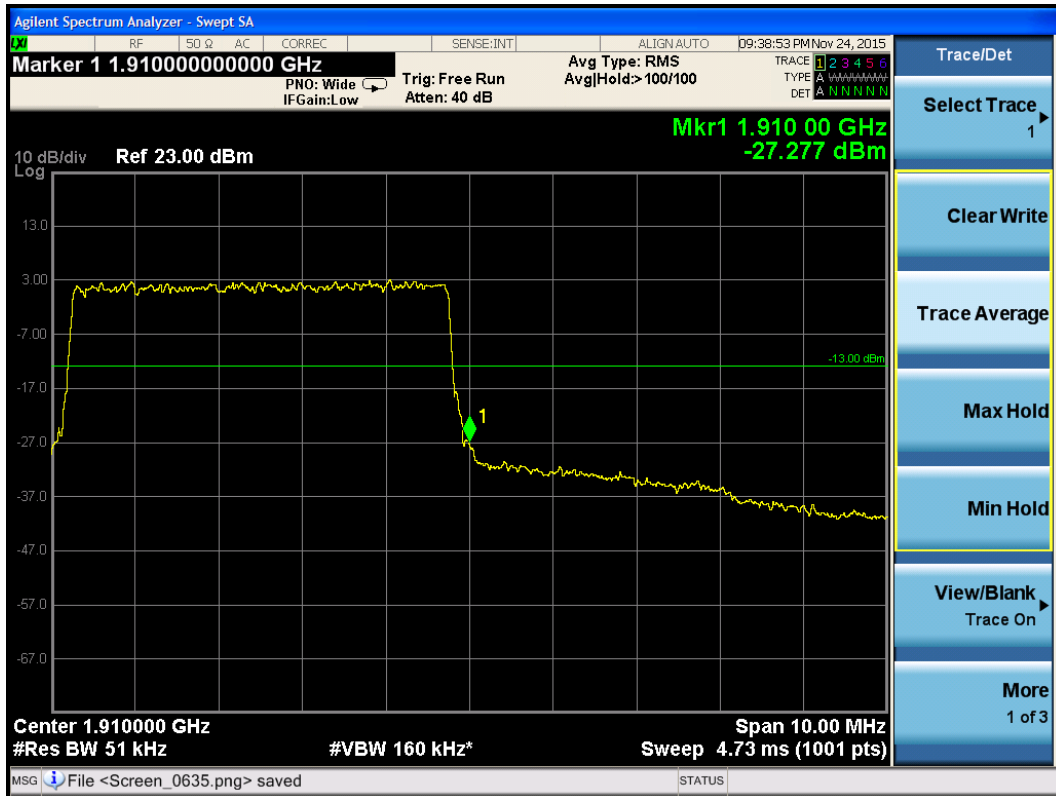
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LTE Band II 5MHz 16QAM 1RB CH19175

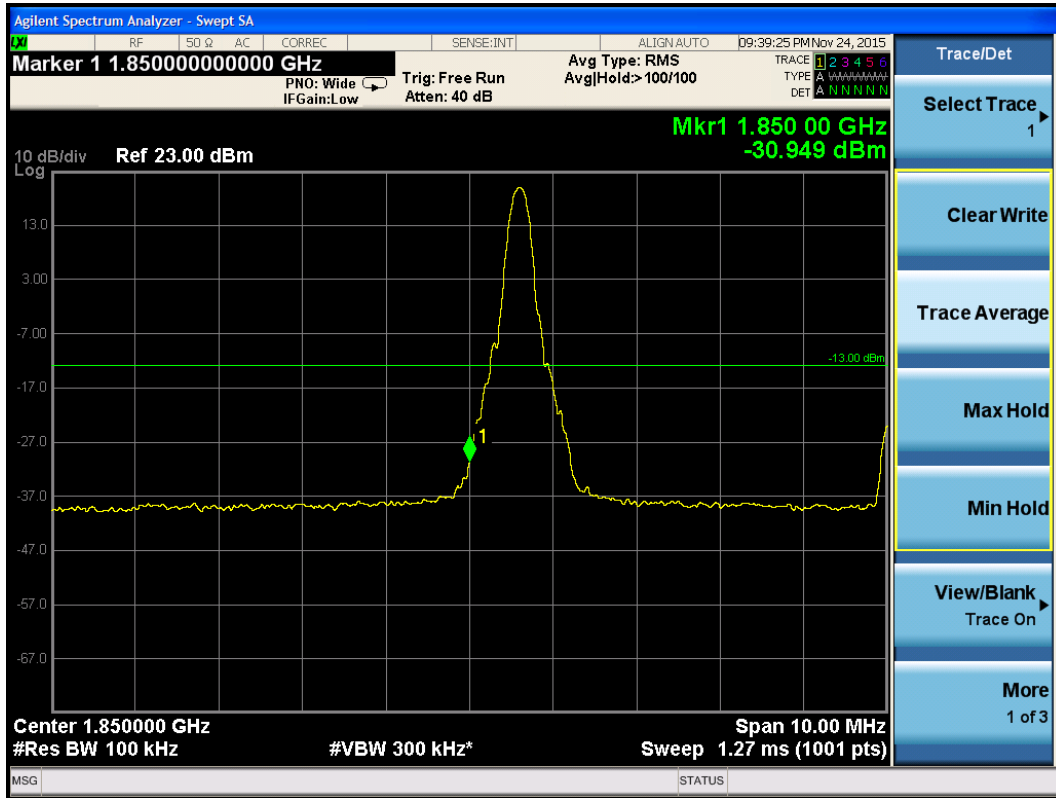


LTE Band II 5MHz 16QAM 100%RB CH18625

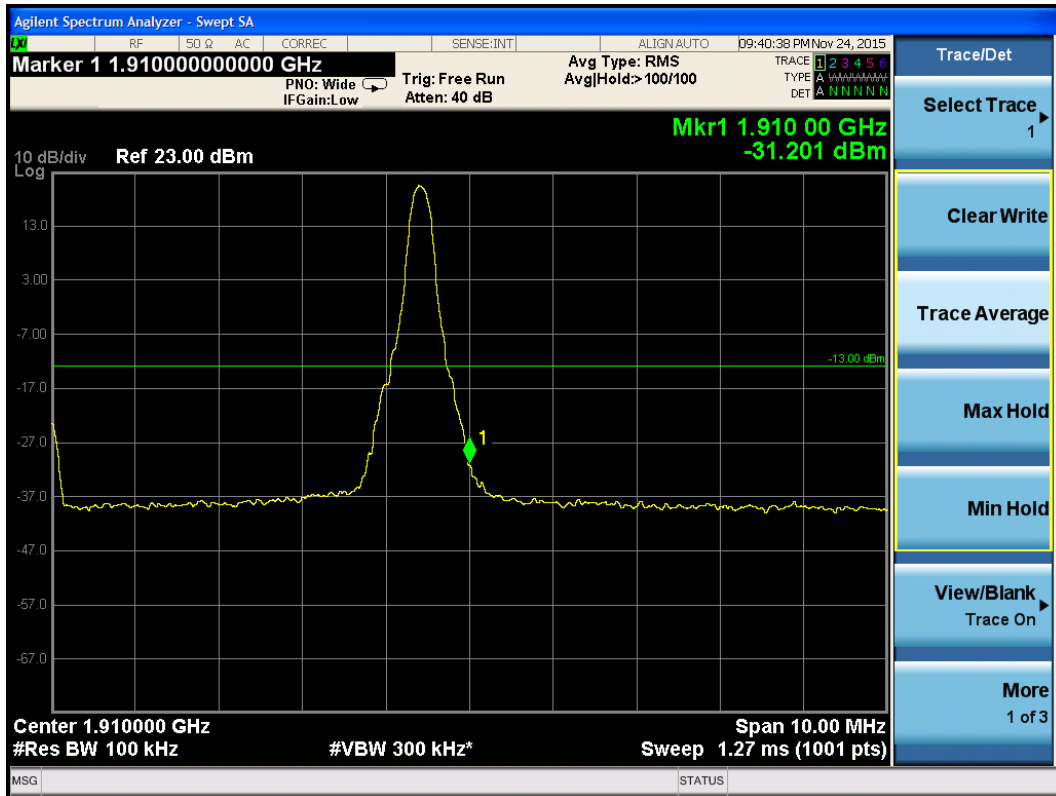


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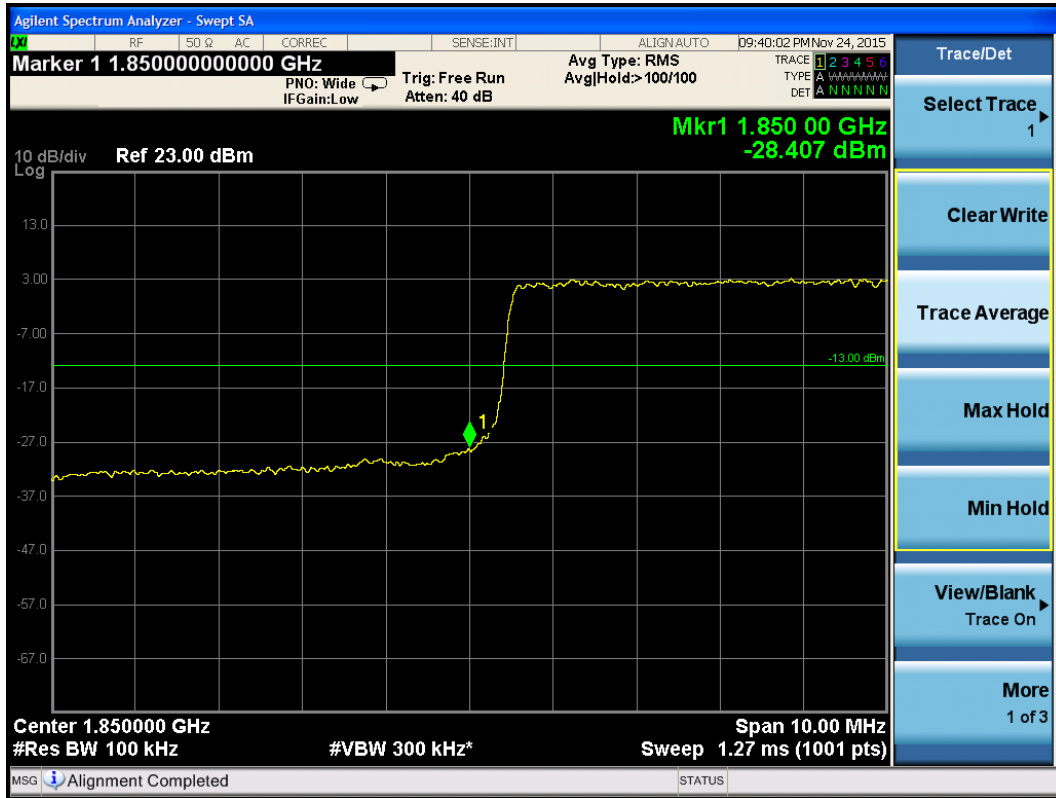




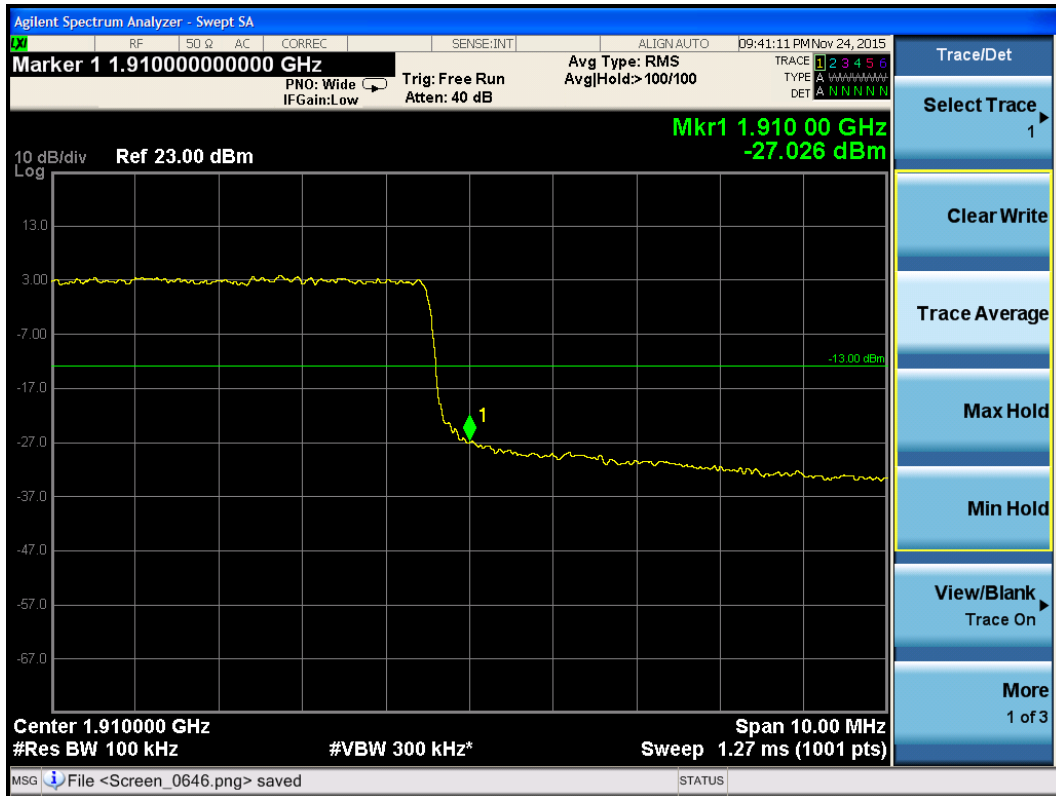
LTE Band II 10MHz QPSK 1RB CH18650



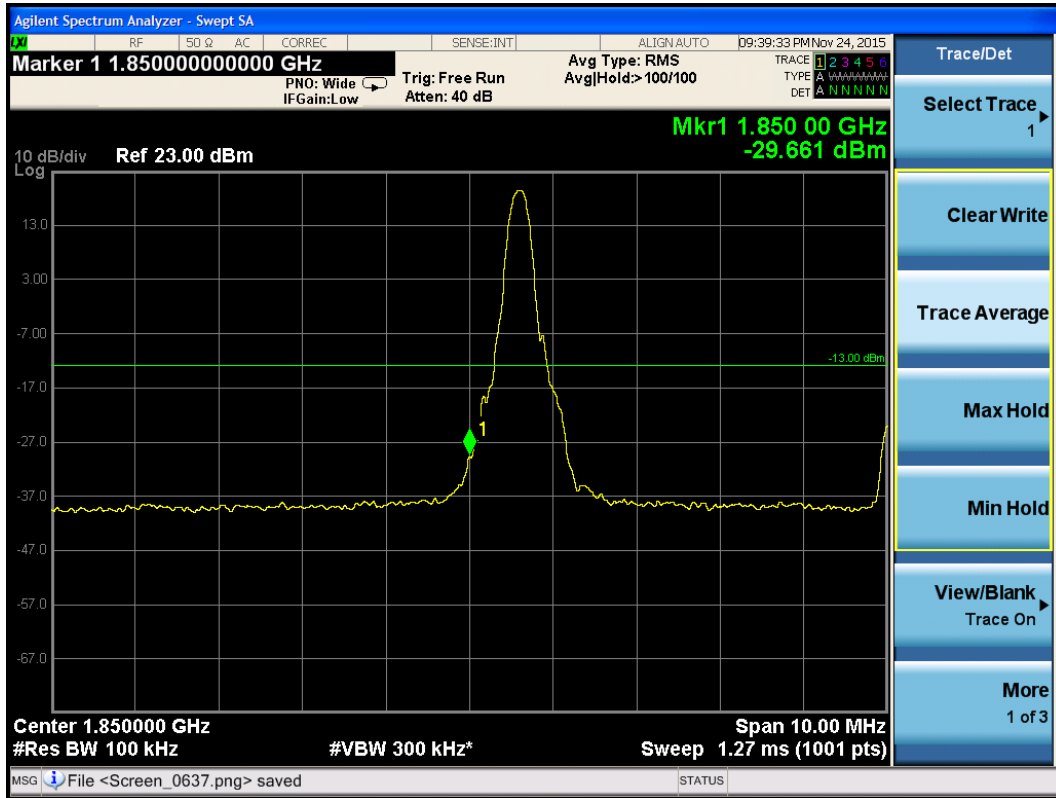
LTE Band II 10MHz QPSK 1RB CH19150



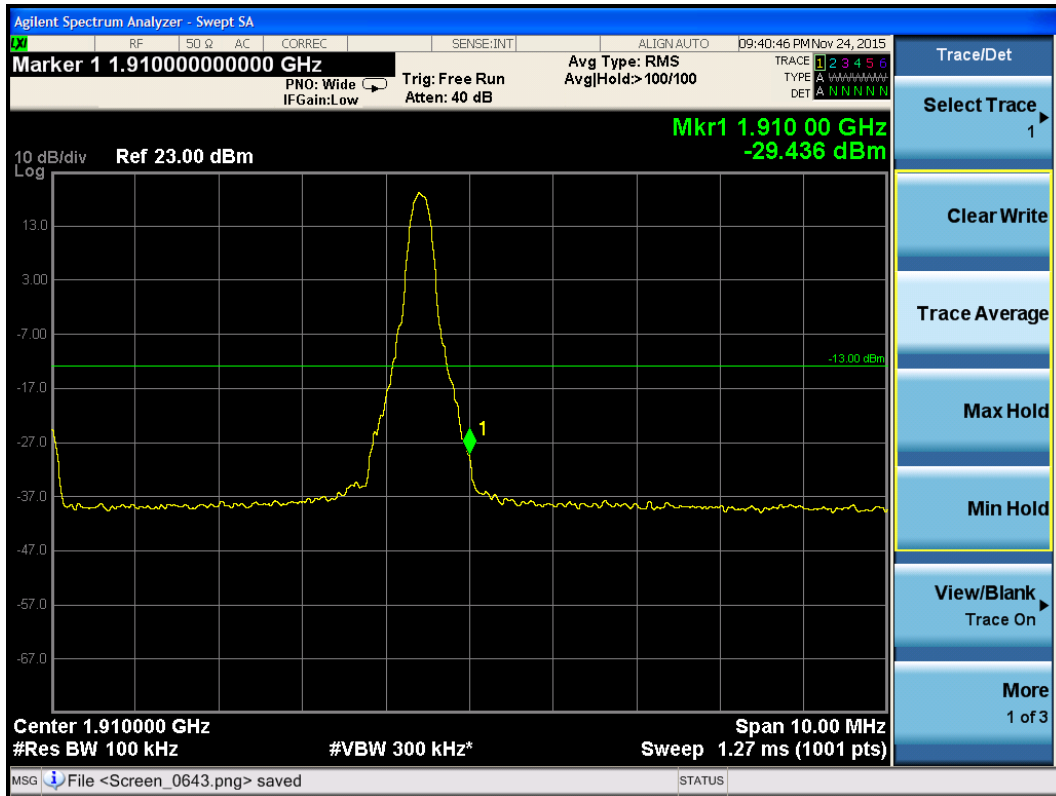
LTE Band II 10MHz QPSK 100%RB CH18650



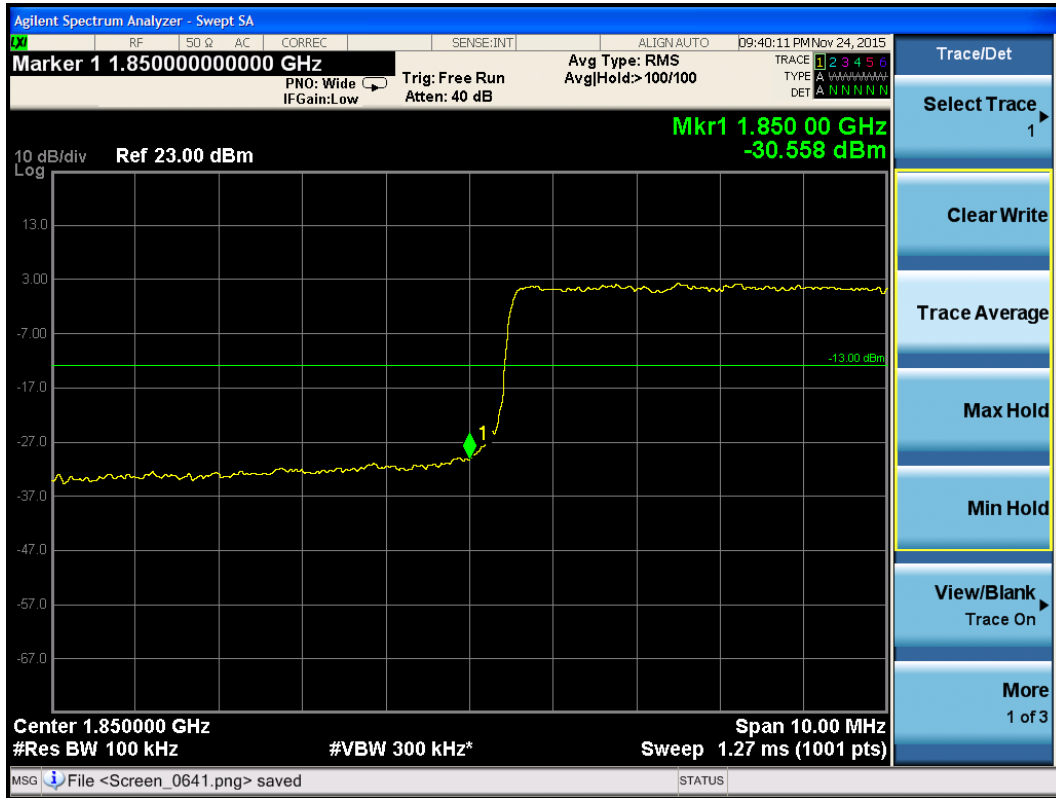
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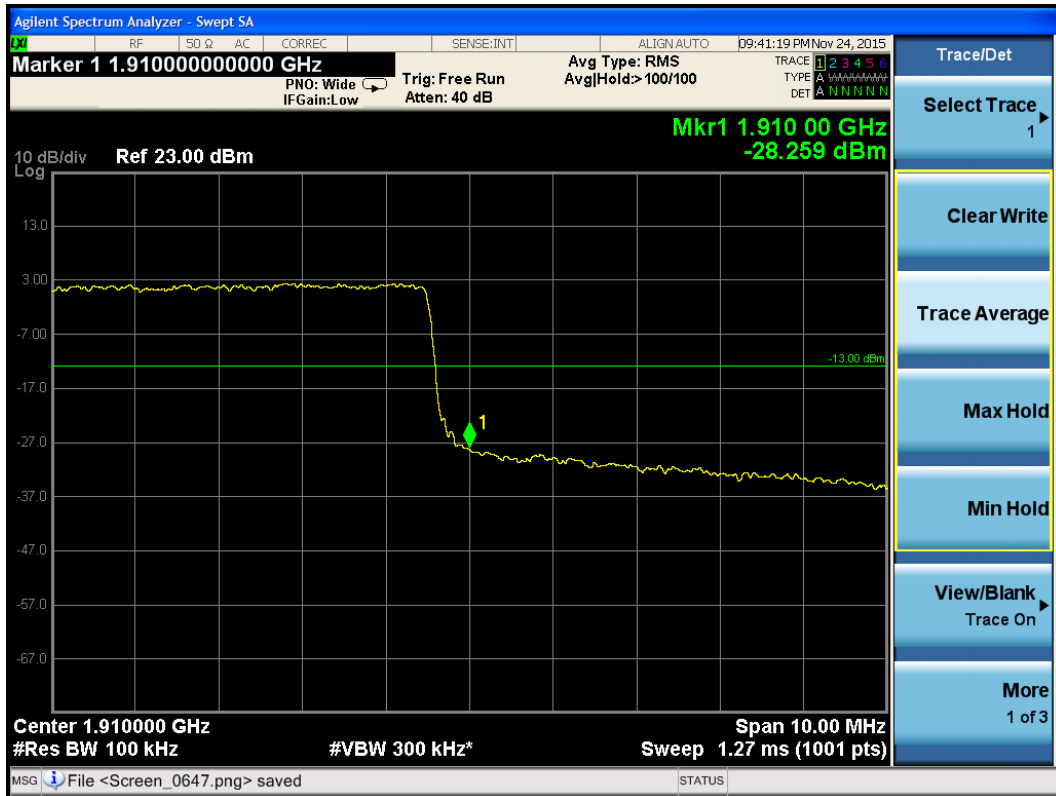
LTE Band II 10MHz 16QAM 1RB CH18650



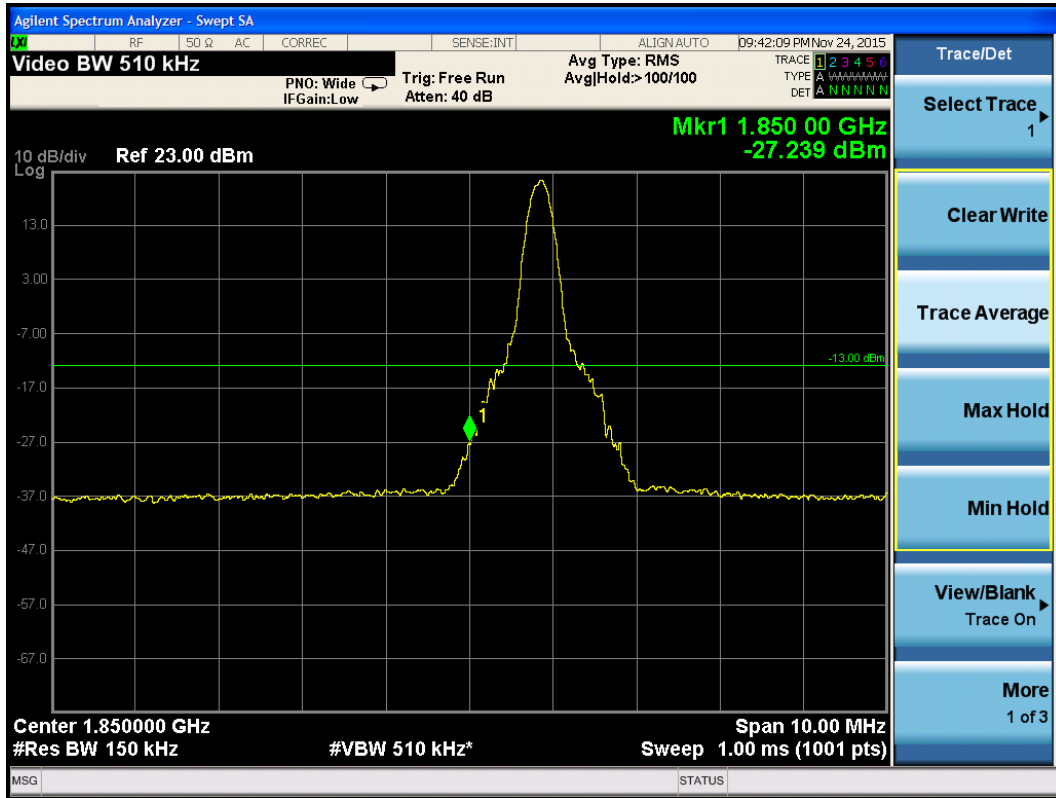
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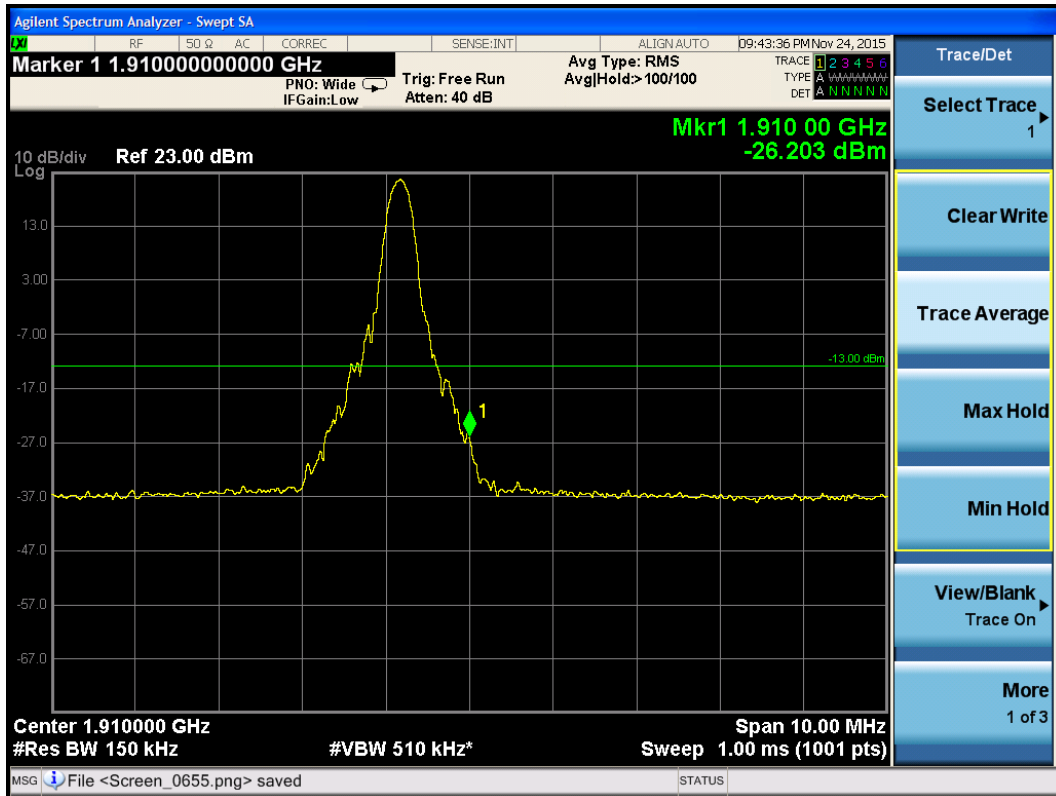
LTE Band II 10MHz 16QAM 100%RB CH18650



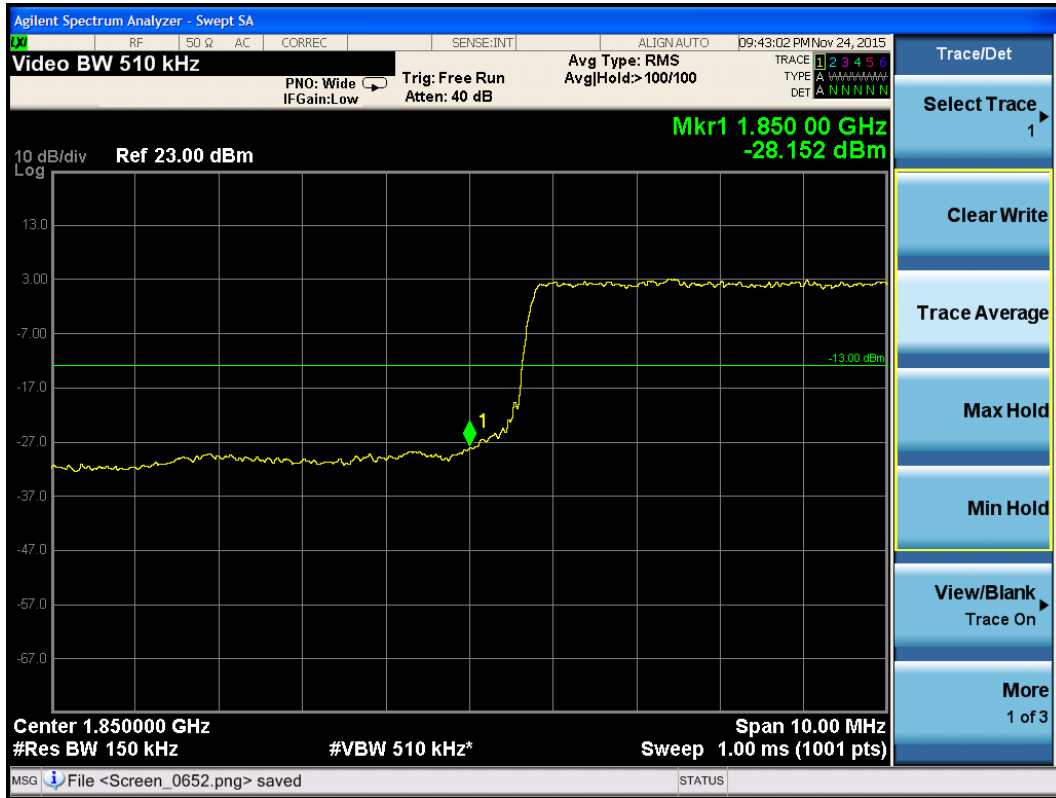
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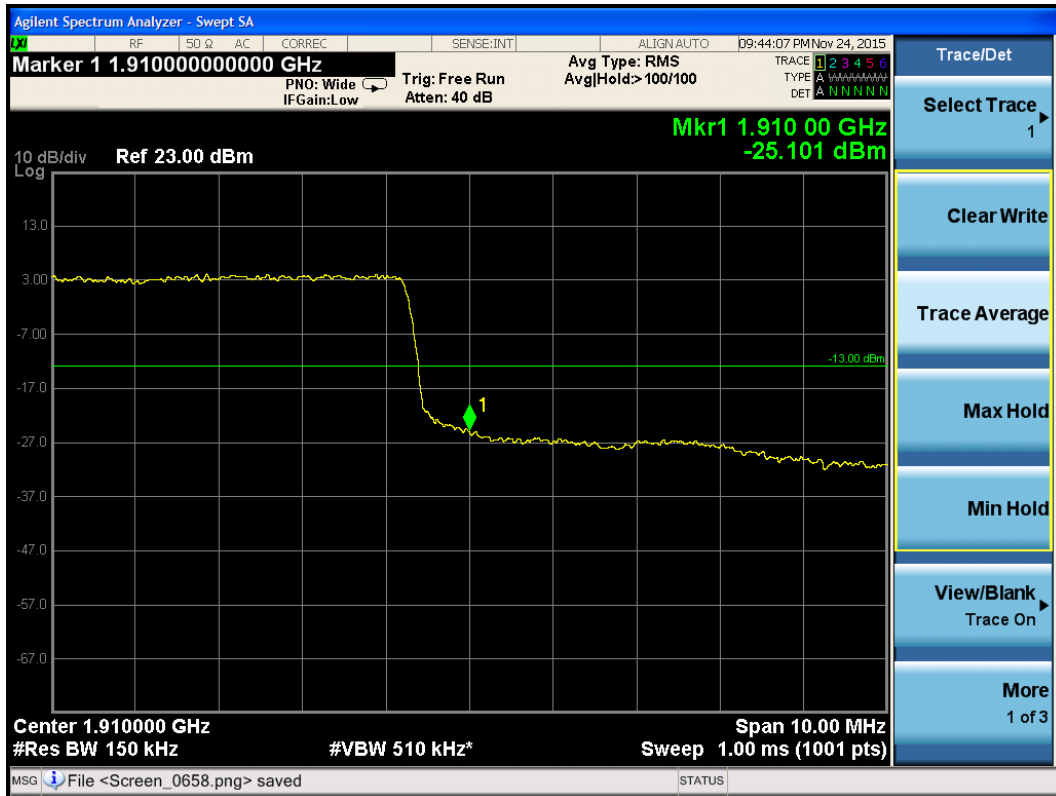
LTE Band II 15MHz QPSK 1RB CH18675



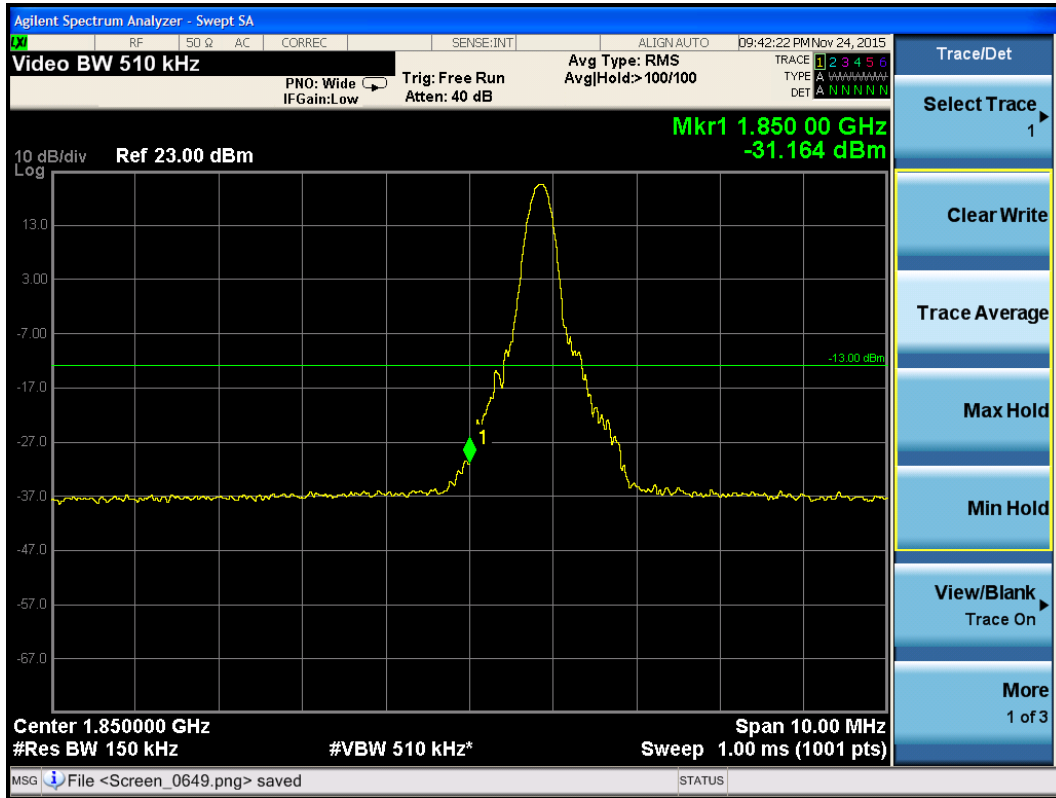
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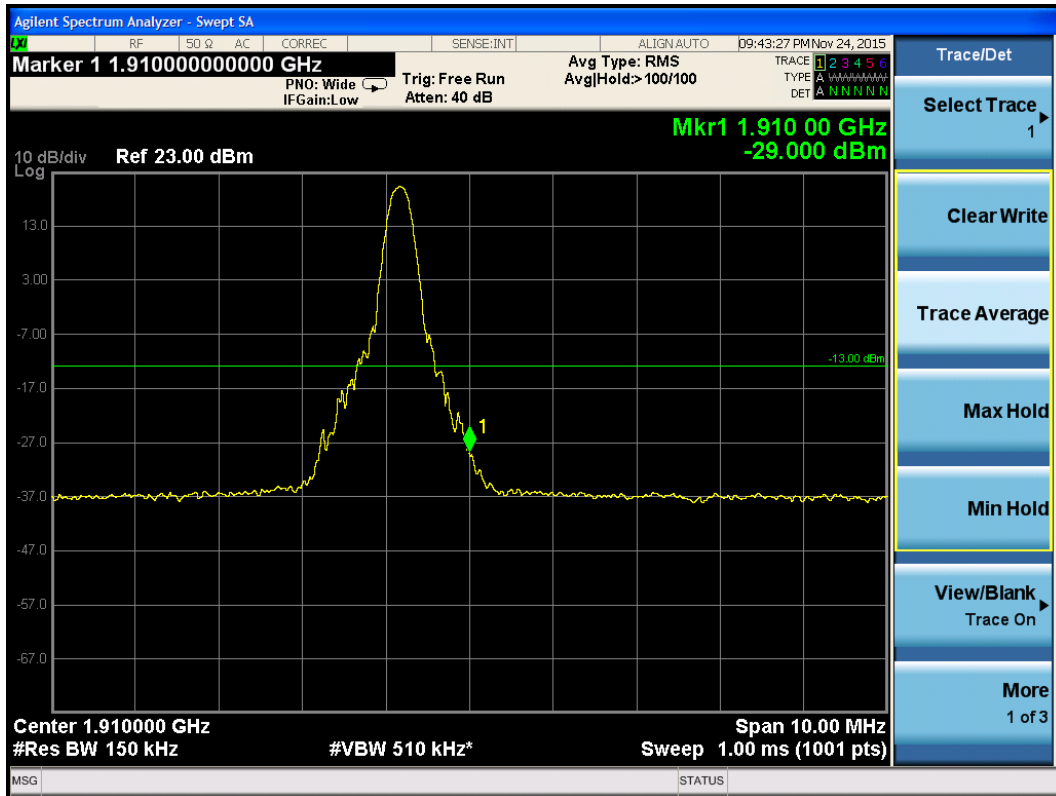
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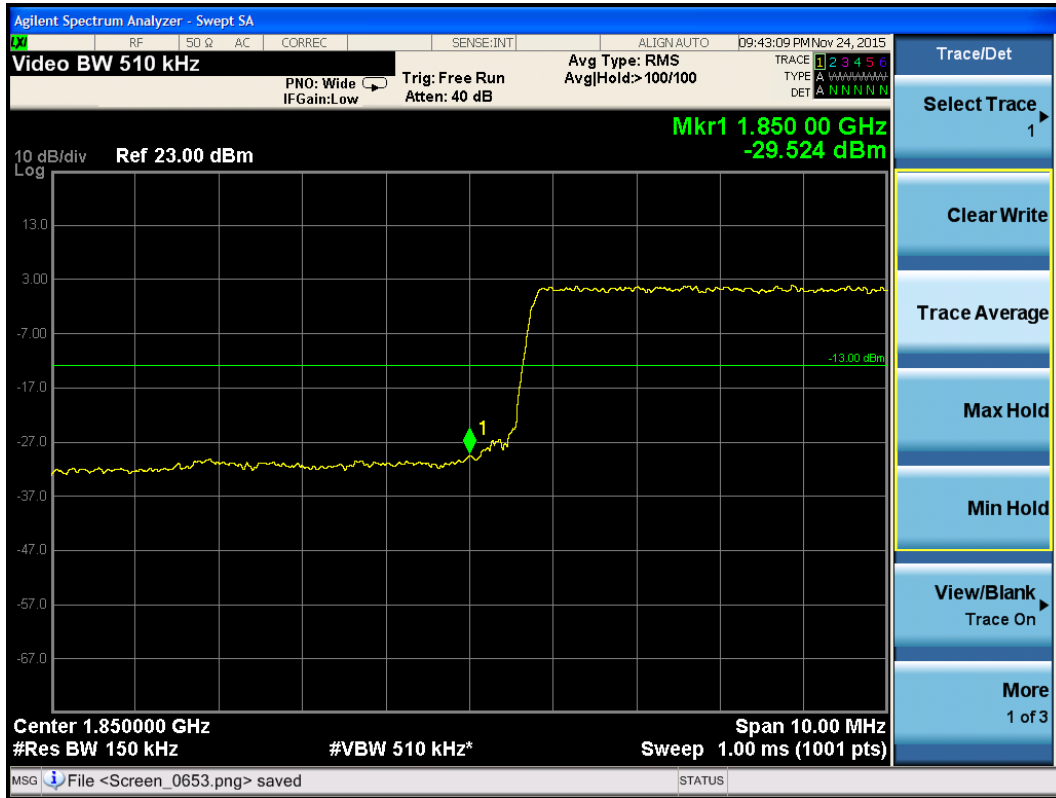
LTE Band II 15MHz QPSK 100%RB CH19125



LTE Band II 15MHz 16QAM 1RB CH18675



LTE Band II 15MHz 16QAM 1RB CH19125

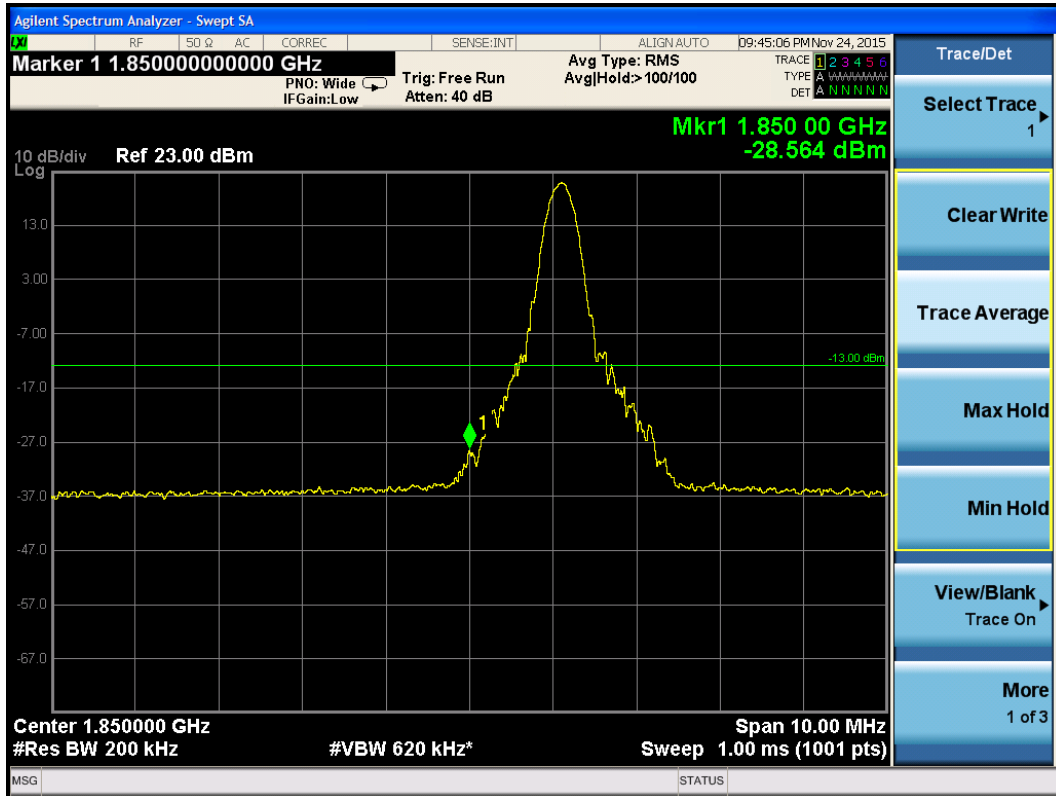


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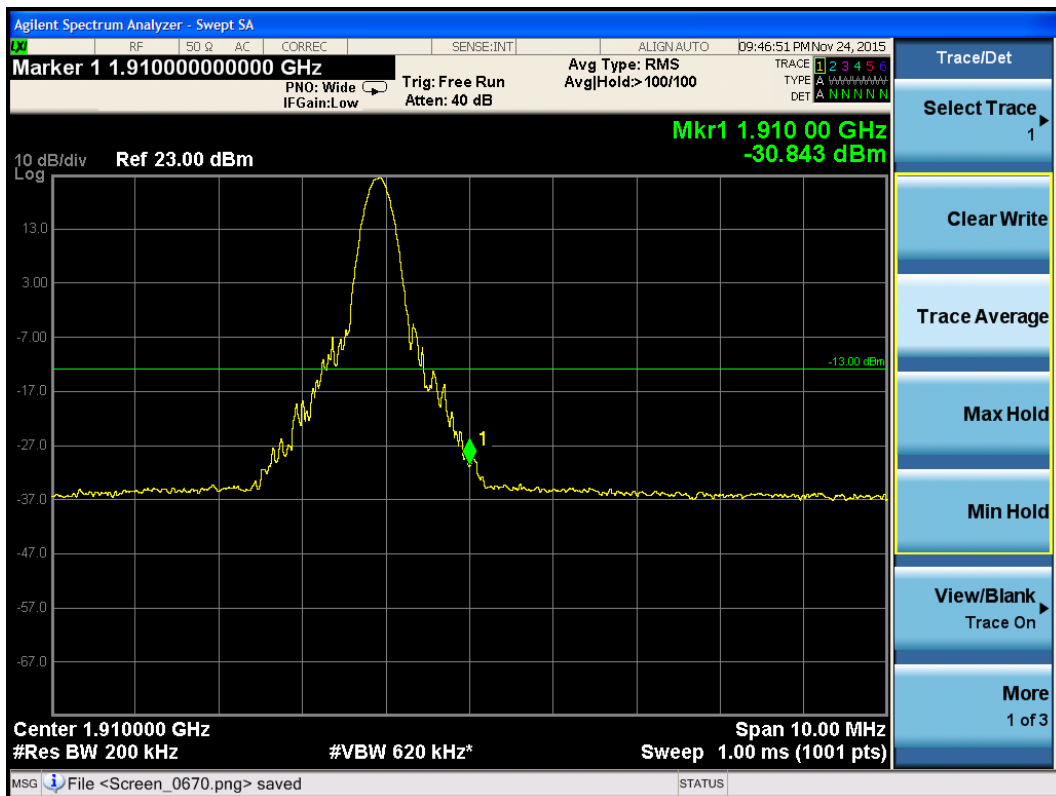


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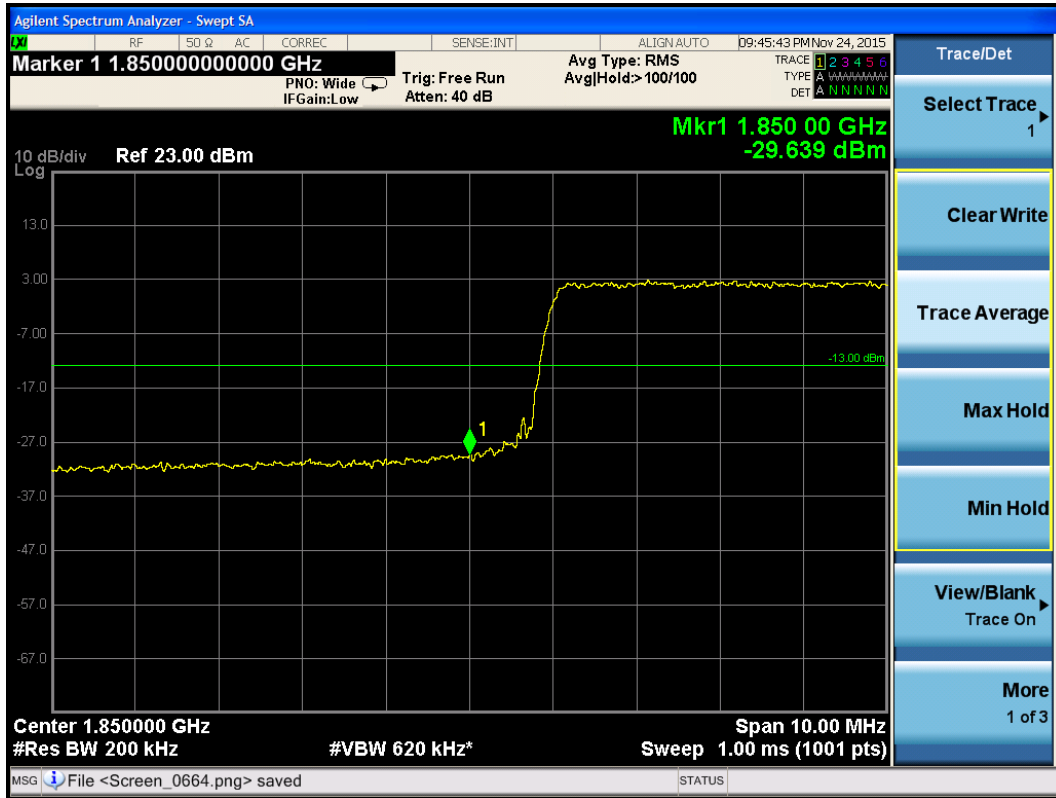




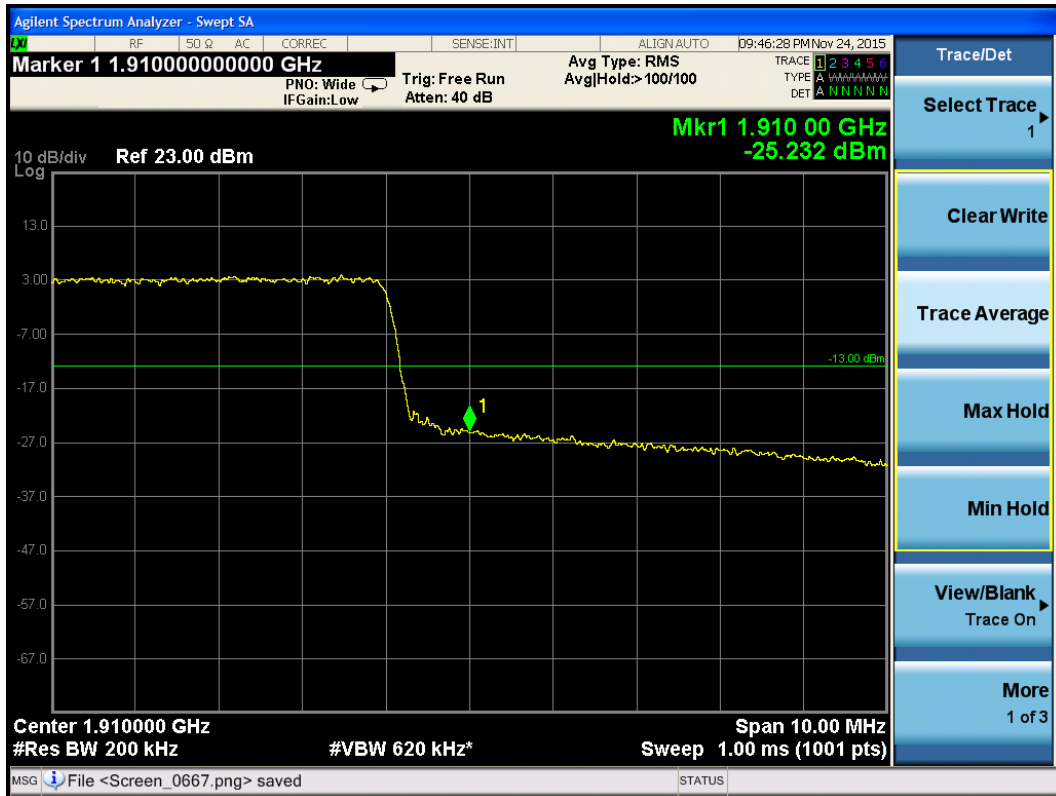
LTE Band II 20MHz QPSK 1RB CH18700



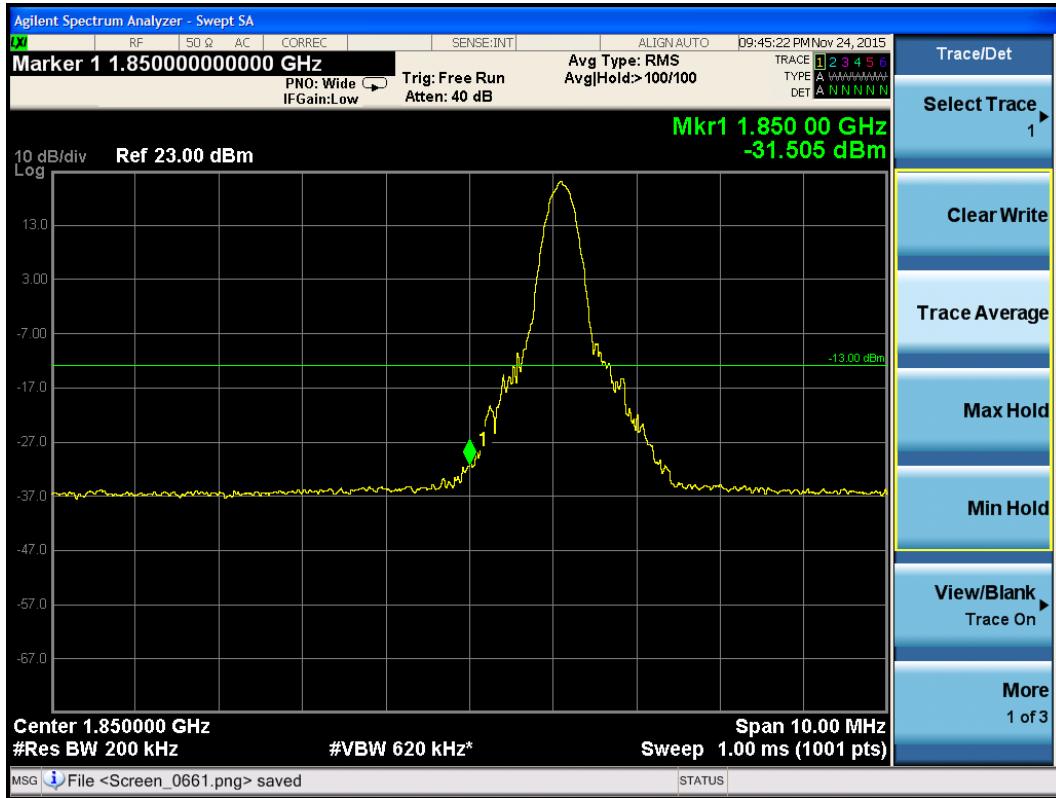
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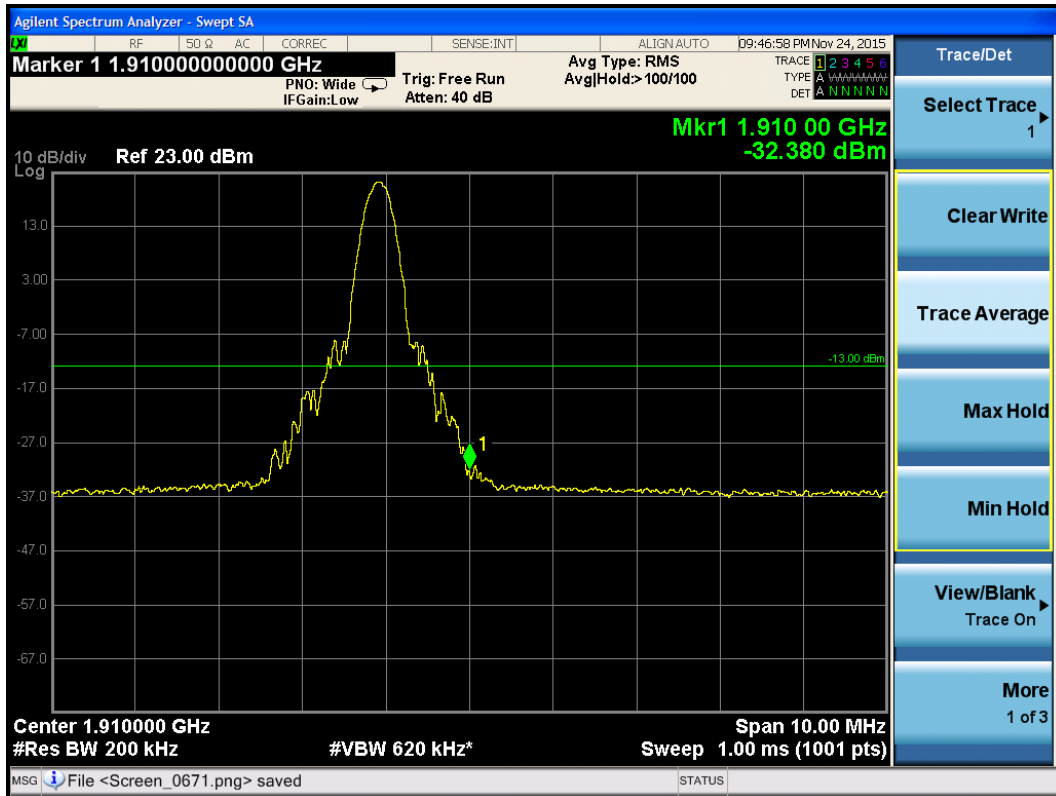
LTE Band II 20MHz QPSK 100%RB CH18700



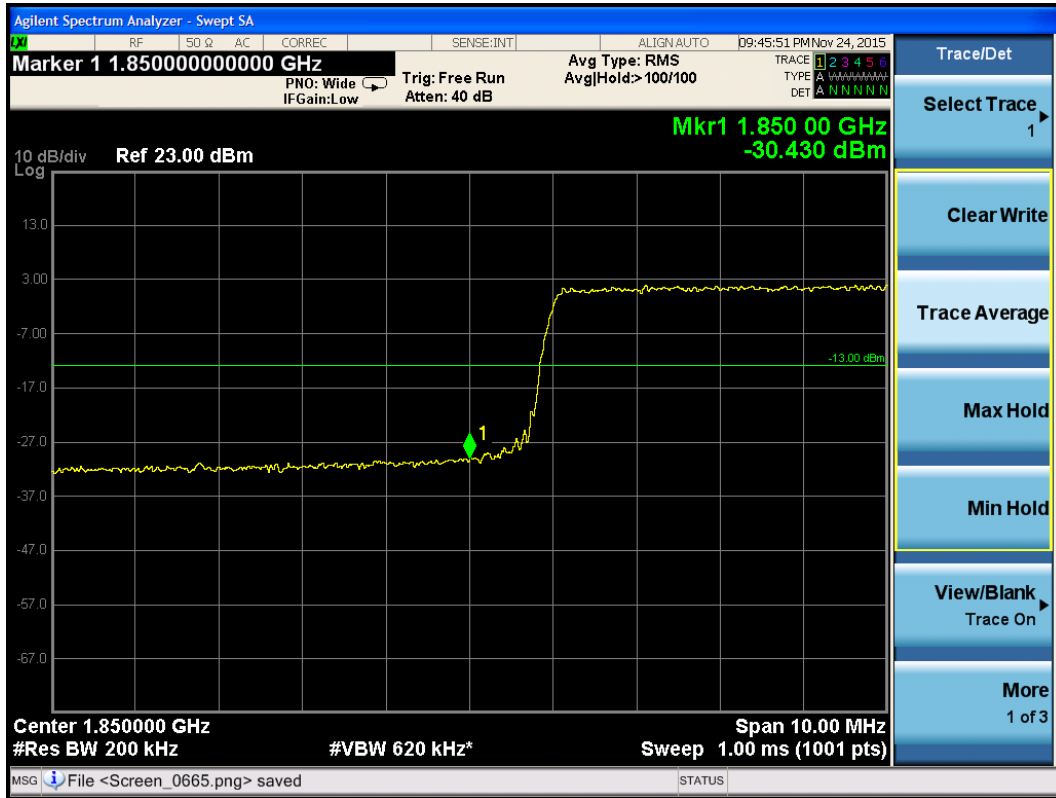
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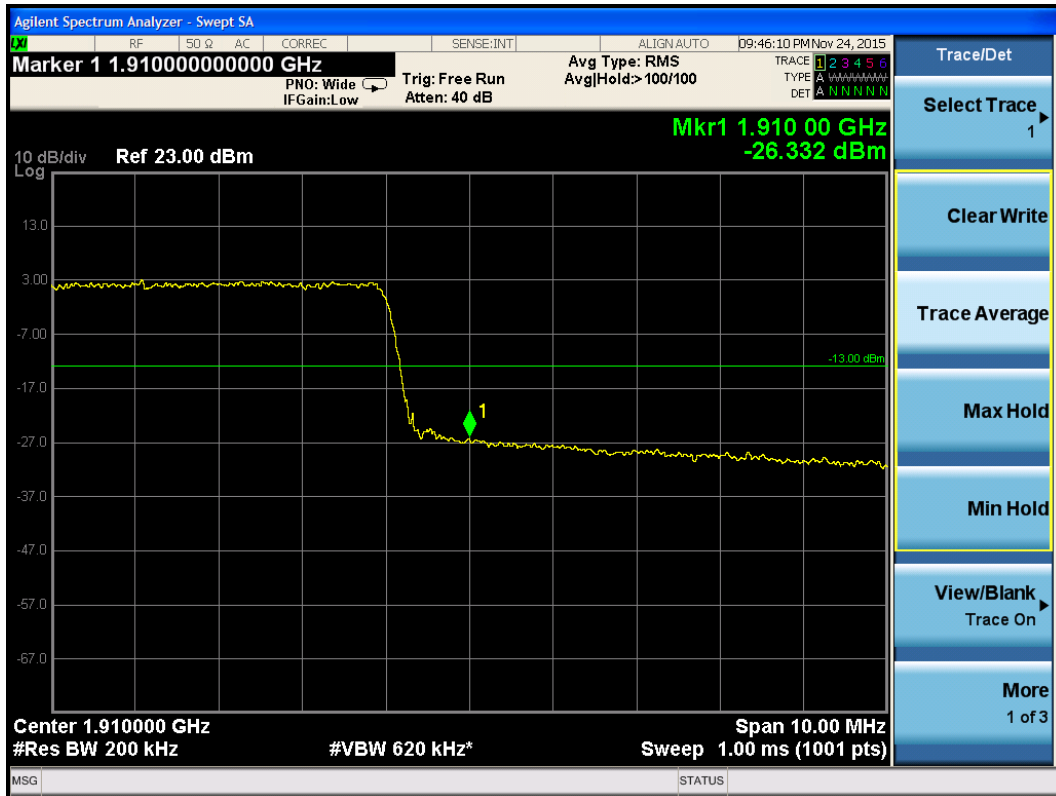
LTE Band II 20MHz 16QAM 1RB CH18700



LTE Band II 20MHz 16QAM 1RB CH19100



LTE Band II 20MHz 16QAM 100%RB CH18700



LTE Band II 20MHz 16QAM 100%RB CH19100

### 5.5. Peak-to-Average Power Ratio (PAPR)

#### Ambient condition

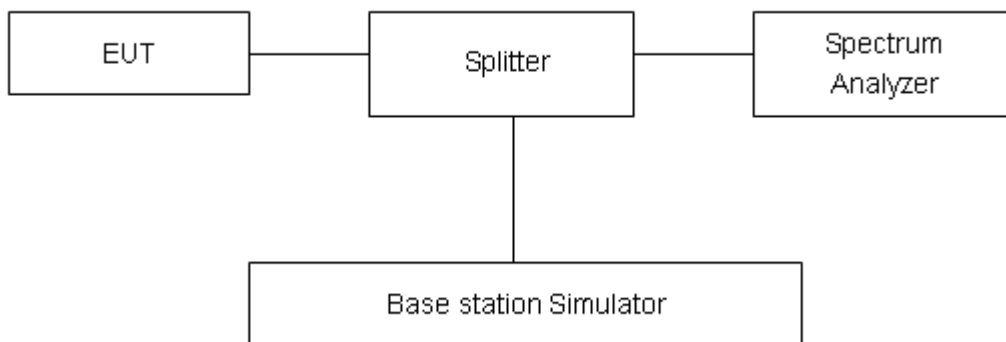
Temperature	Relative humidity
21°C ~25°C	40%~60%

#### Methods of Measurement

Measure the total peak power and record as PPK. And measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

$$PAPR (dB) = PPk (dBm) - PAvg (dBm).$$

#### Test Setup



#### Limits

In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB in 24.232(d).

#### Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor  $k = 2$ ,  $U = 0.4$  dB.

**Test Results**

Mode	Channel	Frequency (MHz)	Peak(dBm)	Avg(dBm)	PAPR(dB)	Conclusion
<b>GSM 1900 (GSM)</b>	512	1850.2	28.463	28.34	0.123	PASS
	661	1880	28.428	28.4	0.028	PASS
	810	1909.8	28.727	28.71	0.017	PASS
<b>GPRS 1900 (GMSK)</b>	512	1850.2	28.334	28.33	0.004	PASS
	661	1880	28.453	28.42	0.033	PASS
	810	1909.8	28.678	28.67	0.008	PASS
<b>EGPRS 1900 (8-PSK)</b>	512	1850.2	25.302	25.26	0.042	PASS
	661	1880	25.376	25.35	0.026	PASS
	810	1909.8	25.258	25.23	0.028	PASS
<b>WCDMA Band II (RMC)</b>	9262	1852.4	25.24	21.9	3.34	PASS
	9400	1880	25.07	21.63	3.44	PASS
	9538	1907.6	26.12	21.41	4.71	PASS



LTE Band II		Channel	Frequency (MHz)	Peak (dBm)	Avg (dBm)	PAPR (dB)	Conclusion
Modulation	Bandwidth						
1.4MHz	QPSK	18607	1850.7	22.45	21.57	0.88	PASS
		18900	1880.0	22.17	21.56	0.61	PASS
		19193	1909.3	22.22	21.49	0.73	PASS
	16QAM	18607	1850.7	21.48	20.67	0.81	PASS
		18900	1880.0	21.18	20.34	0.84	PASS
		19193	1909.3	21.4	20.28	1.12	PASS
3MHz	QPSK	18615	1851.5	22.12	21.47	0.65	PASS
		18900	1880	22.22	21.51	0.71	PASS
		19185	1908.5	22.51	21.44	1.07	PASS
	16QAM	18615	1851.5	21.3	20.58	0.72	PASS
		18900	1880	20.95	20.27	0.68	PASS
		19185	1908.5	20.93	20.21	0.72	PASS
5MHz	QPSK	18625	1852.5	22.36	21.49	0.87	PASS
		18900	1880	22.34	21.52	0.82	PASS
		19175	1907.5	21.99	21.45	0.54	PASS
	16QAM	18625	1852.5	21.48	20.6	0.88	PASS
		18900	1880	21.31	20.28	1.03	PASS
		19175	1907.5	21.08	20.22	0.86	PASS
10MHz	QPSK	18650	1855	22.67	21.51	1.16	PASS
		18900	1880	22.66	21.53	1.13	PASS
		19150	1905	22.65	21.46	1.19	PASS
	16QAM	18650	1855	21.81	20.62	1.19	PASS
		18900	1880	21.63	20.29	1.34	PASS
		19150	1905	21.4	20.23	1.17	PASS
15MHz	QPSK	18675	1857.5	22.8	21.53	1.27	PASS
		18900	1880	22.86	21.54	1.32	PASS
		19125	1902.5	22.68	21.47	1.21	PASS
	16QAM	18675	1857.5	21.99	20.64	1.35	PASS
		18900	1880	21.51	20.3	1.21	PASS
		19125	1902.5	21.55	20.26	1.29	PASS
20MHz	QPSK	18700	1860	22.9	21.55	1.35	PASS
		18900	1880	22.77	21.55	1.22	PASS
		19100	1900	22.63	21.48	1.15	PASS
	16QAM	18700	1860	21.88	20.65	1.23	PASS
		18900	1880	21.6	20.33	1.27	PASS
		19100	1900	21.44	20.27	1.17	PASS

## 5.6. Frequency Stability

### Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

### Method of Measurement

#### 1. Frequency Stability (Temperature Variation)

The temperature inside the climate chamber is varied from 0°C to +50°C in 10°C step size,

(1) With all power removed, the temperature was decreased to 0°C and permitted to stabilize for three hours.

(2) Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.

(3) Repeat the above measurements at 10°C increments from 0°C to +50°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.

#### 2. Frequency Stability (Voltage Variation)

The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery-operating end point which shall be specified by the manufacturer.

This transceiver is specified to operate with an input voltage of between 3.6 V and 4.35 V, with a nominal voltage of 3.8V.

### Test setup

