FCC Radio Test Report

FCC ID: 2AJK2TYPE-C

Original Grant

Report No.	:	TB-FCC149518
Applicant	:	Zhuhai Tianqin IT Co.,Ltd.
Equipment Under Test (EUT)		
EUT Name	:	GPS/BD GPS TRACKER
Model No.	:	TYPE-C
Series No.	:	N/A
Brand Name	:	Roadcool
Receipt Date	:	2016-08-01
Test Date	:	2016-08-03 to 2016-08-23
Issue Date	:	2016-08-24
Standards	:	FCC Part 2 FCC Part 22 Subpart H, FCC Part 24 Subpart E, 2015 ANSI/TIAC63.26: 2015
Conclusions	:	**PASS** In the configuration tested, the EUT complied with the standards specified above, The EUT technically complies with the FCC requirements

Test/Witness Engineer : IVAN SU

Approved& Authorized :

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

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1. General Information about EUT

1.1 Client Information

Applicant	:	Zhuhai Tianqin IT Co.,Ltd.
Address	:	No.87 Xinghua Road, Xiangzhou District, Zhuhai, Guangdong, China
Manufacturer	:	Zhuhai Tianqin IT Co.,Ltd.
Address	:	No.87 Xinghua Road, Xiangzhou District, Zhuhai, Guangdong, China

1.2 General Description of EUT (Equipment Under Test)

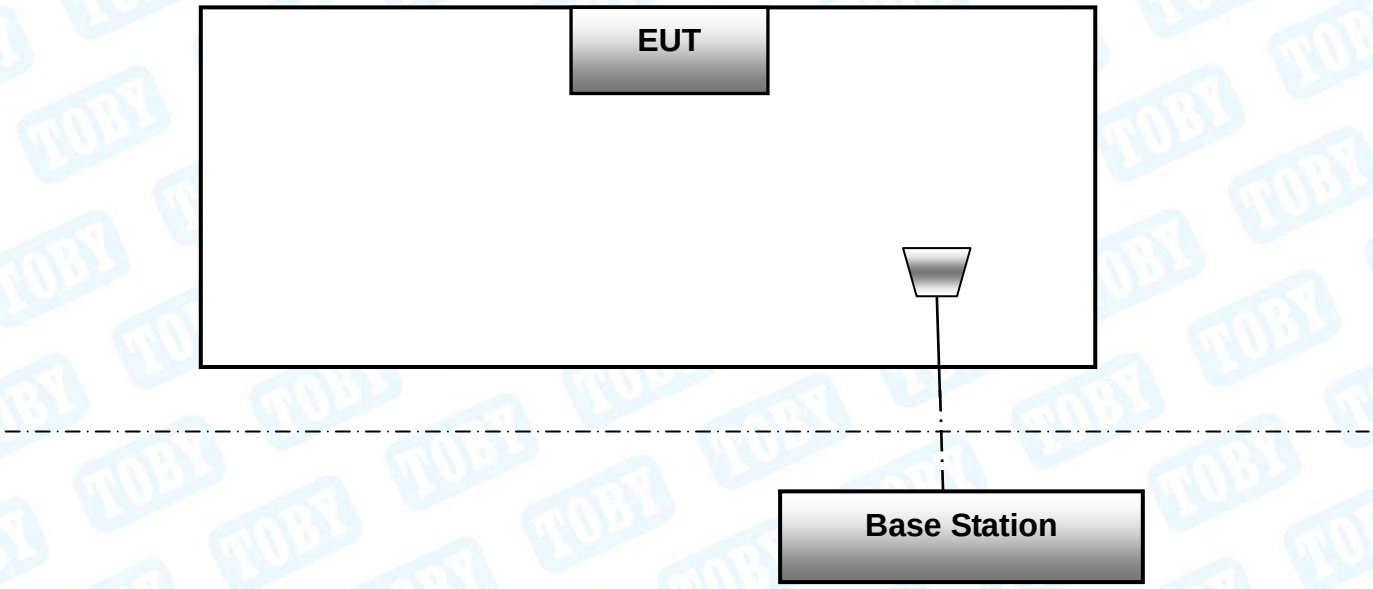
EUT Name	:	GPS/BD GPS TRACKER	
Models No.	:	TYPE-C	
Model Difference	:	N/A	
Product Description	:	Frequency Bands: GSM 850: 824.20MHz-848.80MHz PCS1900: 1850.20MHz-1909.80MHz	
		GSM 850 Power :	Cond:31.70 dBm ERP:30.68 dBm
		PCS 1900 Power :	Cond:28.45 dBm EIRP:26.97 dBm
		Antenna Gain:	GSM 850: 2 dBi PCS 1900: 2 dBi
		Modulation Type:	GSM/GPRS:GMSK
FCC Operating Frequency	:	GSM 850: 824.20MHz-848.80MHz PCS1900: 1850.20MHz-1909.80MHz	
Emission Designator	:	GSM 850: 247KGXW, PCS 1900: 246KGXW GPRS 850: 245KG7W, GPRS 1900: 246KG7W	
Power Supply	:	DC Voltage supplied from DC battery. DC power by Li-ion Battery.	
Power Rating	:	DC 12V by DC battery. DC 3.7V by Li-ion Battery.	
Connecting I/O Port(S)	:	Please refer to the User's Manual	

Note:

(1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

(2) This test report only product for PCS Licensed Transmitter (PCB).

1.3 Block Diagram Showing the Configuration of System Tested



The above block diagram of setup is the normal mode. And more detail please refer to the test setup of each test item of bellow.

1.4 Description of Support Units

The EUT has been tested as an independent unit.

1.5 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

During all testing, EUT is link mode with base station at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range. Frequency range investigated for radiated emission as below：

1. 9kHz~10GHz for GSM850.
2. 9kHz~20GHz for PCS1900.

Test Channel		
Mode	**Channel**	**Frequency(MHz)**
GSM 850	128	824.20
	190	836.60
	251	848.80

PCS 1900	512	1850.20
	661	1880.00
	810	1909.80

Pre-scanning test Mode	**Description**
GSM 850	highest , middle, lowest channels
GPRS 850	highest , middle, lowest channels
GSM 1900	highest , middle, lowest channels
GPRS 1900	highest , middle, lowest channels
Final test Mode	**Description**
GSM 850	highest , middle, lowest channels
GSM 1900	highest , middle, lowest channels

Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

(2) During the testing procedure, the EUT is in link mode with base station emulator at maximum power level in each test mode.

(3) The EUT has GSM, GPRS functions, and after pre-testing, GSM function is the worst case for all the emission tests.

(4) The EUT is considered a portable unit; it was pre-tested on the positioned of each 3 axis, X-plane, Y-plane and Z-plane. The worst case was found positioned on Z-plane as the normal use. Therefore only the test data of this Z-plane was used for radiated emission measurement test.

1.6 Measurement Uncertainty

Test Item	**Parameters**	**Expanded Uncertainty (U_{Lab})**
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	 ±3.42 dB ±3.42 dB
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	±4.60 dB
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	±4.40 dB
Radiated Emission	Level Accuracy: Above 1000MHz	±4.20 dB

1.7 Test Facility

The testing was performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at: 1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, Guangdong, China.
At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)
The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

FCC List No.: (811562)
The Laboratory is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 811562.

IC Registration No.: (11950A-1)
The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A-1.

2. Test Summary

Test Standards and Test Results			
Standard	**Document Title**		
FCC Part 2 (10-1-05 Edition)	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations		
FCC Part 22 (10-1-05 Edition)	Public Mobile Services		
FCC Part 24 (10-1-05 Edition)	Personal Communications Services		
Standard Section	**Test Item**	**Judgment**	**Remark**
2.1046	Conducted RF Output Power	PASS	N/A
24.232(d)	Peak-Average Ratio	PASS	N/A
2.1049; 22.917; 24.238	99% & -26 dB Occupied Bandwidth	PASS	N/A
2.1055; 22.355; 24.235	Frequency Stability	PASS	N/A
2.1051; 2.1057; 22.917; 24.238	Conducted Out of Band Emissions	PASS	N/A
2.1051; 2.1057; 22.917; 24.238	Band Edge	PASS	N/A
22.913; 24.238	Transmitter Radiated Power (EIRP/ERP)	PASS	N/A
2.1053; 2.1057; 22.917; 24.238	Radiated Out of Band Emissions	PASS	N/A
Note: N/A is an abbreviation for Not Applicable.			

3. Test Equipment

AC Main Conducted Emission					
Description	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Due Date**
EMI Test Receiver	ROHDE& SCHWARZ	ESCI	100321	Jul. 22, 2016	Jul. 21, 2017
50ΩCoaxial Switch	Anritsu	MP59B	X10321	Jul. 22, 2016	Jul. 21, 2017
L.I.S.N	Rohde & Schwarz	ENV216	101131	Jul. 22, 2016	Jul. 21, 2017
L.I.S.N	SCHWARZBECK	NNBL 8226-2	8226-2/164	Jul. 22, 2016	Jul. 21, 2017
Radiation Spurious Emission					
Description	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Due Date**
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 22, 2016	Jul. 21, 2017
EMI Test Receiver	Rohde & Schwarz	ESCI	100010/007	Jul. 22, 2016	Jul. 21, 2017
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar. 20, 2016	Mar. 19, 2017
Bilog Antenna	ETS-LINDGREN	3142E	00117542	Mar. 20, 2016	Mar. 19, 2017
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar. 19, 2016	Mar. 18, 2017
Horn Antenna	ETS-LINDGREN	3117	00143209	Mar. 19, 2016	Mar. 18, 2017
Pre-amplifier	Sonoma	310N	185903	Mar. 20, 2016	Mar. 19, 2017
Pre-amplifier	HP	8449B	3008A00849	Mar. 26, 2016	Mar. 25, 2017
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar. 26, 2016	Mar. 25, 2017
Signal Generator	Rohde & Schwarz	SML03	IKW682-054	Mar. 26, 2016	Mar. 25, 2017
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A
Universal Radio Communication Tester	Rohde&Schwarz	CMU200	103903	Jun.23, 2016	Jun.22, 2017
Antenna Conducted Emission					
Description	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Due Date**
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 22, 2016	Jul. 21, 2017
EMI Test Receiver	Rohde & Schwarz	ESCI	100010/007	Jul. 22, 2016	Jul. 21, 2017
Universal Radio Communication Tester	Rohde&Schwarz	CMU200	103903	Jun.23, 2016	Jun.22, 2017

4. Frequency Stability

4.1 Test Standard and Requirement

4.1.1 Test Standard

FCC Part 2.1055
FCC Part 22.355
FCC Part 24.235

4.1.2 Requirement

According to FCC section 22.355 and FCC section 24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

(1) Temperature:

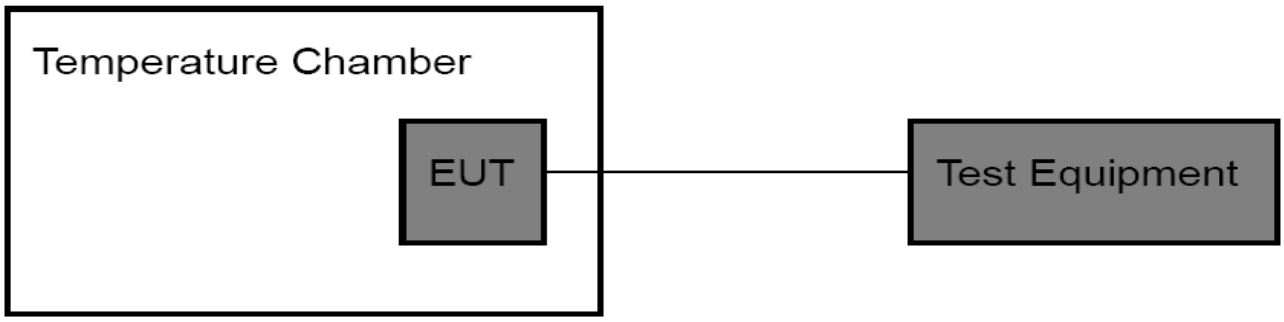
The temperature is varied from -30℃ to +50℃ at intervals of not more than 10℃.

(2) Primary Supply Voltage:

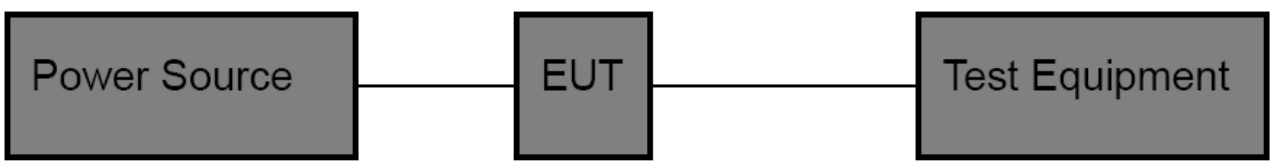
For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacture. The supply voltage shall be measured at input to the cable normally provide with the equipment, or at the power supply terminals if cables are not normally provided.

4.2 Test Setup

For Temperature Test:



For Voltage Test:



4.3 Test Procedure

Test Procedures for Temperature Variation:

(1) The EUT was set up in the thermal chamber and connected with the base station.

(2) With power off, the temperature was decreased to -30℃ and the EUT was stabilized for three hours. Power was applied and the maximum change in frequency was recorded within one minute.

(3) With power off, the temperature was raised in 10℃ set up to 50℃ and the EUT was stabilized for three hours. Power was applied and the maximum change in frequency was recorded within one minute.

(4) If the EUT cannot be turned on at -30℃, the testing lowest temperature will be raised in 10℃ step until the EUT can be turned on.

Test Procedures for Voltage Variation:

(1) The EUT was placed in a temperature chamber at 25±5℃ and connected with the base station.

(2) Reduce the input voltage to specify extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.

(3) The variation in frequency was measured for the worst case.

4.4 EUT Operating Condition

The Equipment Under Test was set to Communication with the Base Station.

3.5 Test Data

Please refer the following pages.

Temperature Variation

Temperature Variation GSM 850 (CH190)				
Temperature (℃)	GSM		GPRS	
	Freq. Dev. (Hz)	Deviation (ppm)	Freq. Dev. (Hz)	Deviation (ppm)
-30	13	0.016	11	0.013
-20	10	0.012	9	0.011
-10	12	0.014	10	0.012
0	11	0.013	12	0.014
10	9	0.011	16	0.019
20	10	0.012	10	0.012
30	15	0.018	12	0.014
40	14	0.017	13	0.016
50	17	0.020	15	0.018
60	12	0.014	11	0.013
Limit	2.5 (ppm)			
Result	PASS			

Temperature Variation GSM 1900 (CH661)				
Temperature (℃)	GSM		GPRS	
	Freq. Dev. (Hz)	Deviation (ppm)	Freq. Dev. (Hz)	Deviation (ppm)
-30	27	0.041	24	0.036
-20	23	0.035	21	0.032
-10	24	0.036	20	0.030
0	26	0.039	18	0.027
10	20	0.030	17	0.026
20	29	0.044	20	0.030
30	21	0.032	22	0.033
40	21	0.032	19	0.029
50	19	0.029	23	0.035
60	22	0.033	21	0.032
Limit	2.5 (ppm)			
Result	PASS			

Voltage Variation

Voltage Variation GSM 850 (CH190)				
Voltage (V)	GSM		GPRS	
	Freq. Dev. (Hz)	Deviation (ppm)	Freq. Dev. (Hz)	Deviation (ppm)
3.15	15	0.018	13	0.016
3.70	12	0.014	10	0.012
4.26	11	0.013	14	0.017
Limit	2.5 (ppm)			
Result	PASS			

Voltage Variation GSM 1900 (CH661)				
Voltage (V)	GSM		GPRS	
	Freq. Dev. (Hz)	Deviation (ppm)	Freq. Dev. (Hz)	Deviation (ppm)
3.15	18	0.027	20	0.030
3.70	16	0.024	14	0.021
4.26	19	0.029	16	0.024
Limit	2.5 (ppm)			
Result	PASS			

5. Conducted RF Output Power

5.1 Test Standard and Limit

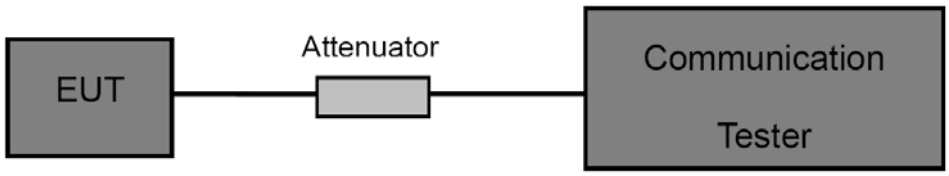
5.1.1 Test Standard

FCC Part 2: 2.1046
FCC Part 22H : 22.913 (a)
FCC Part 24E: 24.232 (c)

5.1.2 Test Limit

GSM850	PCS 1900
38.5 dBm (ERP)	33 dBm (EIRP)

5.2 Test Setup



5.3 Test Procedure

(1) The EUT is coupled to the Base Station with the suitable Attenuator, the path loss is calibrated to correct the reading.
(2) A call is set up by the Base Station to the generic call set up procedure.
(3) Set EUT at maximum power level through base station by power level command.
(4) Then read record the power value from the Base Station in dBm.

5.4 EUT Operating Condition

The EUT was continuously connected with the Base station and transmitting in the max power during the test.

5.5 EUT Operating Condition

GSM 850				
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)
GSM 850	128	824.2	31.70	1.479
	190	836.6	31.64	1.459
	251	848.8	31.65	1.462
GPRS 850 (1 Slot)	128	824.2	31.53	1.422
	190	836.6	31.52	1.419
	251	848.8	31.49	1.409
GPRS 850 (2 Slot)	128	824.2	31.23	1.327
	190	836.6	31.26	1.337
	251	848.8	31.29	1.346
GPRS 850 (3 Slot)	128	824.2	31.42	1.387
	190	836.6	31.31	1.352
	251	848.8	30.98	1.253
GPRS 850 (4 Slot)	128	824.2	31.18	1.312
	190	836.6	31.12	1.294
	251	848.8	31.19	1.315

PCS 1900				
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)
GSM 1900	512	1850.2	28.34	0.682
	661	1880.0	28.13	0.650
	810	1909.8	28.45	0.700
GPRS 1900 (1 Slot)	512	1850.2	27.89	0.615
	661	1880.0	27.74	0.594
	810	1909.8	27.34	0.542
GPRS 1900 (2 Slot)	512	1850.2	27.24	0.530
	661	1880.0	27.58	0.573
	810	1909.8	27.43	0.553
GPRS 1900 (3 Slot)	512	1850.2	27.21	0.526
	661	1880.0	27.19	0.524
	810	1909.8	27.54	0.568
GPRS 1900 (4 Slot)	512	1850.2	27.31	0.538
	661	1880.0	27.41	0.551
	810	1909.8	27.45	0.556

6. Peak-Average Ratio

6.1 Test Standard and Limit

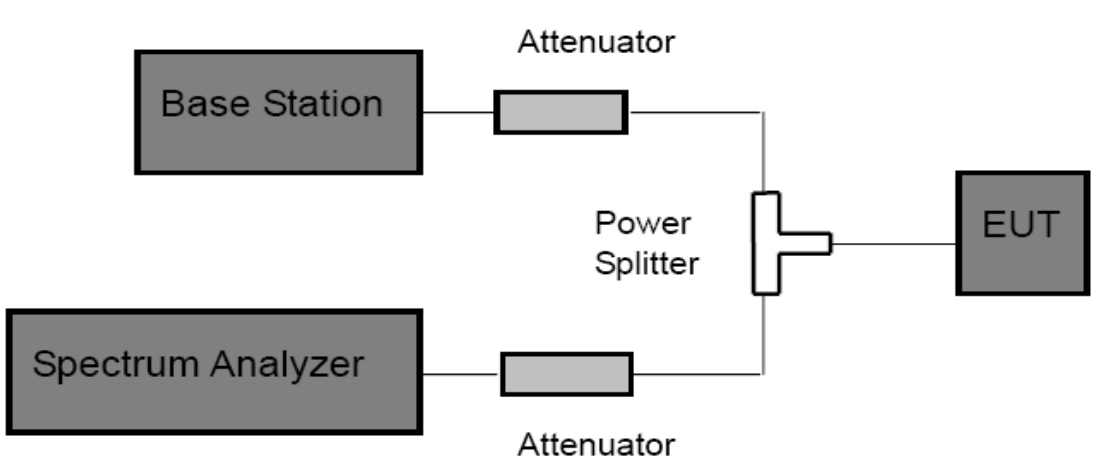
6.1.1 Test Standard

FCC Part 24E: 24.232 (d)

6.1.2 Test Limit

PCS 1900
The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

6.2 Test Setup



6.3 Test Procedure

According with KDB 971168

(1) The signal analyzer's CCDF measurement profile is enabled.
(2) Frequency = carrier center frequency.
(3) Measurement BW>Emission bandwidth of signal.
(4) The signal analyzer was set to collect one million samples to generate the CCDF curve.
(5) The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which of the transmitter is operating at maximum power.

6.4 EUT Operating Condition

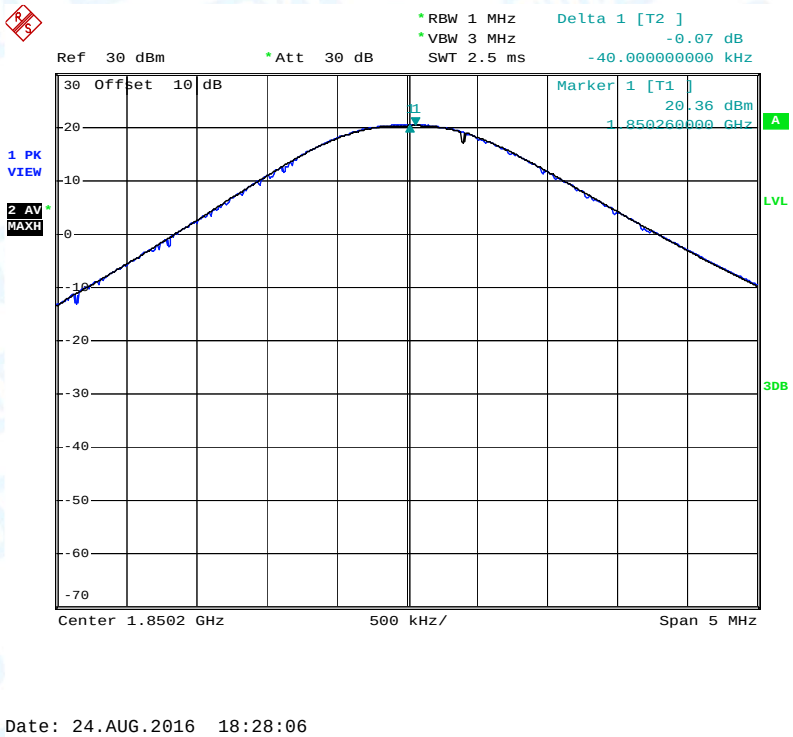
The EUT was continuously connected with the Base station and transmitting in the max power during the test.

6.5 Test Data

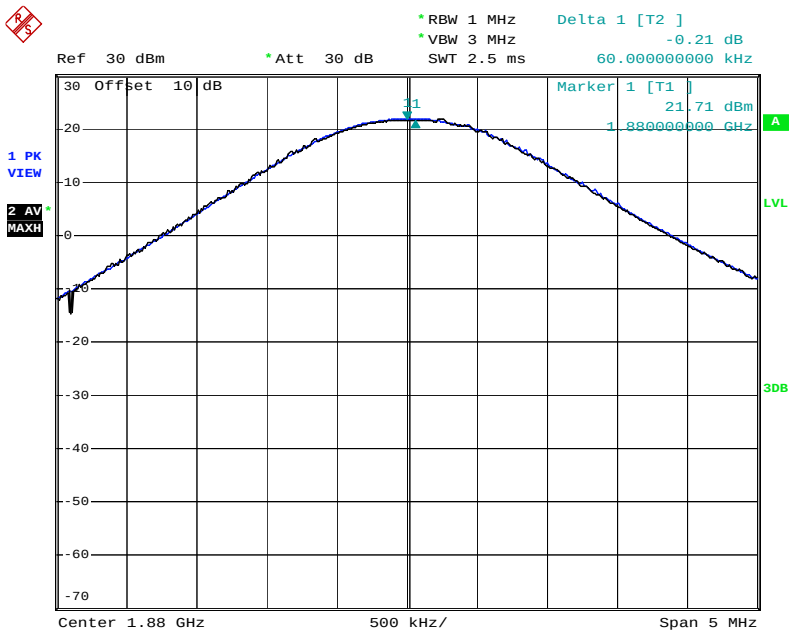
PCS 1900			
Mode	**Channel**	**Frequency (MHz)**	**Peak-Average Ratio (PAR)**
PCS 1900	512	1850.2	0.07
	661	1880.0	0.21
	810	1909.8	0.07

PCS 1900

CH 512



CH 661



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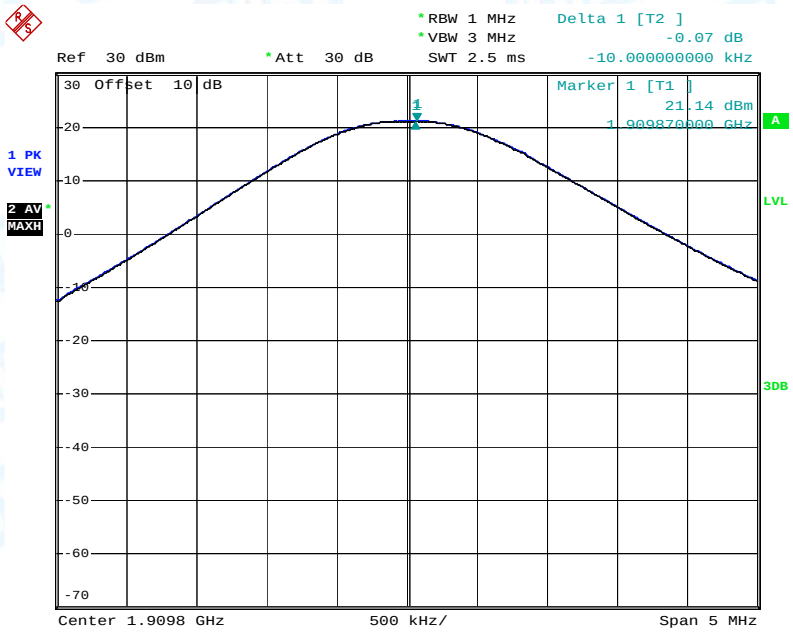
CH 810



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7. Radiated Output Power

7.1 Test Standard and Limit

7.1.1 Test Standard

FCC Part 22H : 22.913 (a)

FCC Part 24E: 24.232 (c)

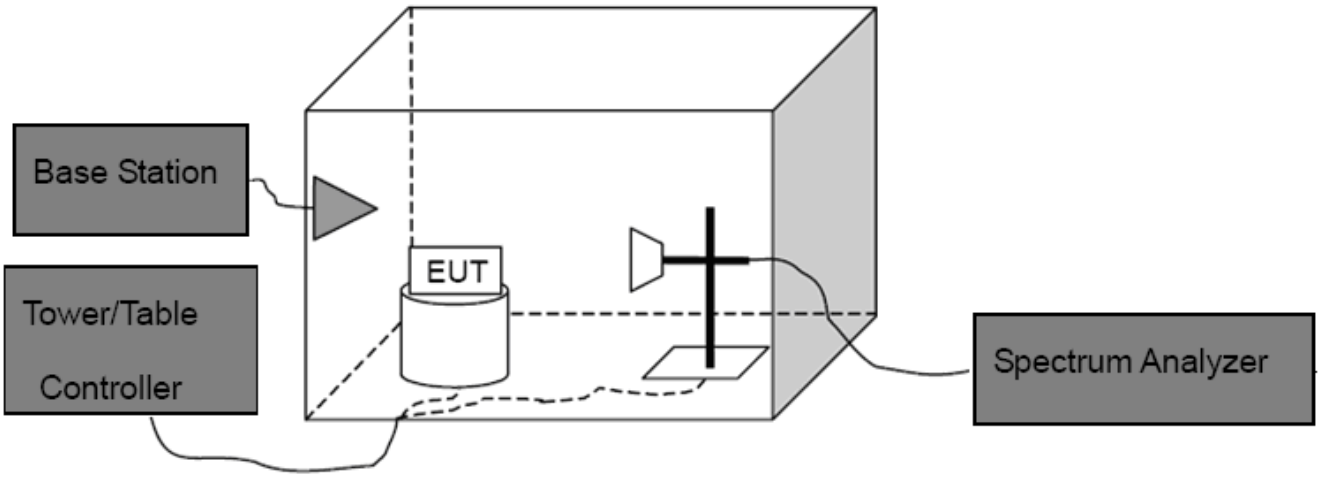
7.1.2 Test Limit

According to FCC Part 22.913 (a), the ERP of Cellular mobile transmitters must not exceed 7 Watts(38.5 dBm).

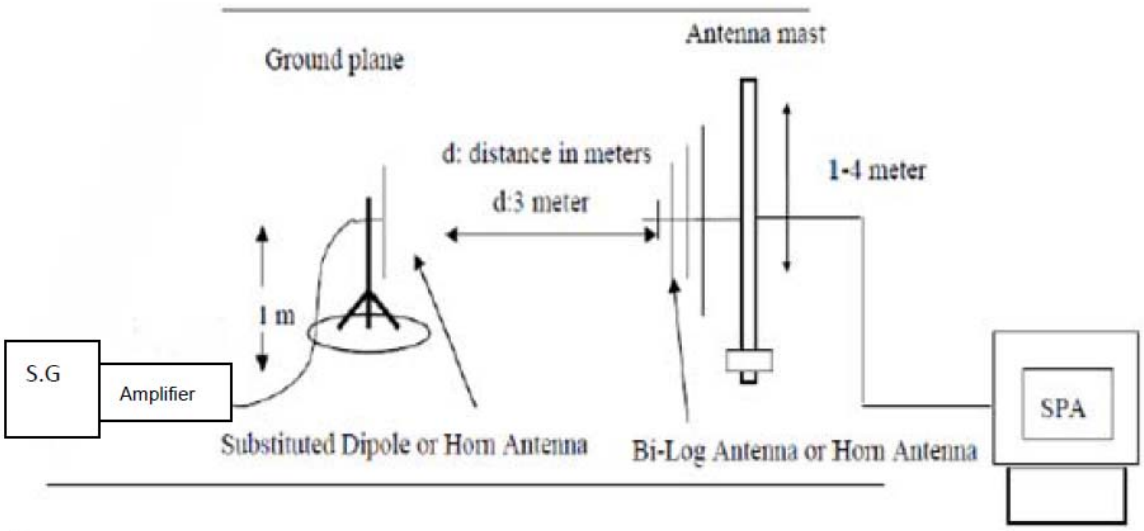
According to FCC Part 24.232 (c), the Mobile/portable stations are limited to 2 Watts(33 dBm) EIRP peak power.

Cellular Band	PCS Band
GSM850	**PCS 1900**
38.5 dBm (ERP)	33 dBm (EIRP)

7.2 Test Setup



Above 1G



Substituted Method

7.3 Test Procedure

(1) The EUT was placed on an non-conductive rotating platform with 0.8 meter height in an anechoic chamber. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and a spectrum analyzer with RBW=3 MHz, VBW=3 MHz and peak detector settings.

(2) During the measurement, the EUT was enforced in maximum power and linked with the Base Station. The highest was recorded from analyzer power level (LVT) from the 360 degrees rotation of the turntable and the test antenna raised and lowered over a range from 1 to 4 meters in both horizontally and vertically polarized orientations.

(3) Effective Isotropic Radiated Power (EIRP) was measured by substitution method according to TIA/EIA-603-D. The EUT was replaced by dipole antenna (for frequency below 1 GHz) or Horn antenna (for frequency above 1 GHz) at same location with same polarize of receiver antenna and then a known power of each measure frequency from S.G. was applied into the dipole antenna or Horn antenna through a TX cable, and then recorded the maximum Analyzer reading through raised and lowered the test antenna.

Note: In test, the S.G Connect the Pre-amplifier(Sonoma 310N Pre-amplifier for frequency below 1 GHz, HP 8449B Pre-amplifier for frequency above 1 GHz)

Then the EUT's EIRP and ERP was calculated with the correction factor:
ERP=S.G.Level +Antenna Gain Cord.(dBd)-Cable Loss(dB)
EIRP=S.G.Level+Antenna Gain Cord.(dBi)-Cable Loss(dB)

7.4 EUT Operating Condition

The EUT was continuously connected with the Base station and transmitting in the max power during the test.

7.5 Test Data

Measurement Data (worst case)

GSM 850								
Mode	Channel	Frequency (MHz)	Antenna (H&V)	SG Level (dBm)	Antenna Factor (dBd)	Cable Loss (dB)	ERP Power (dBm)	ERP Power (W)
GSM 850	128	824.2	H	27.93	3.46	1.26	30.13	1.030
			V	26.11	3.46	1.26	28.31	0.678
	190	836.6	H	28.00	3.82	1.26	30.56	1.138
			V	25.59	3.82	1.26	28.15	0.653
	251	848.8	H	27.78	4.16	1.26	30.68	1.169
			V	25.75	4.16	1.26	28.65	0.733
GPRS 850 (1 Slot)	128	824.2	H	28.06	3.46	1.26	30.26	1.062
			V	25.78	3.46	1.26	27.98	0.628
	190	836.6	H	26.81	3.82	1.26	29.37	0.865
			V	24.79	3.82	1.26	27.35	0.543
	251	848.8	H	27.32	4.16	1.26	30.22	1.052
			V	25.06	4.16	1.26	27.96	0.625
Limit							38.5	7

PCS 1900								
Mode	Channel	Frequency (MHz)	Antenna (H&V)	SG Level (dBm)	Antenna Factor (dBi)	Cable Loss (dB)	EIRP Power (dBm)	EIRP Power (W)
GSM 1900	512	1850.2	H	23.95	5.01	2.59	26.37	0.434
			V	20.95	5.01	2.59	23.37	0.217
	661	1880.0	H	23.75	4.82	2.59	25.98	0.396
			V	20.18	4.82	2.59	22.41	0.174
	810	1909.8	H	25.11	4.45	2.59	26.97	0.498
			V	20.88	4.45	2.59	22.74	0.188
GPRS 1900 (1 Slot)	512	1850.2	H	24.14	5.01	2.59	26.56	0.453
			V	19.45	5.01	2.59	21.87	0.154
	661	1880.0	H	23.76	4.82	2.59	25.99	0.397
			V	18.45	4.82	2.59	20.68	0.117
	810	1909.8	H	24.22	4.45	2.59	26.08	0.406
			V	19.83	4.45	2.59	21.69	0.148
Limit							33	2

8. Occupied Bandwidth

8.1 Test Standard and Limit

8.1.1 Test Standard

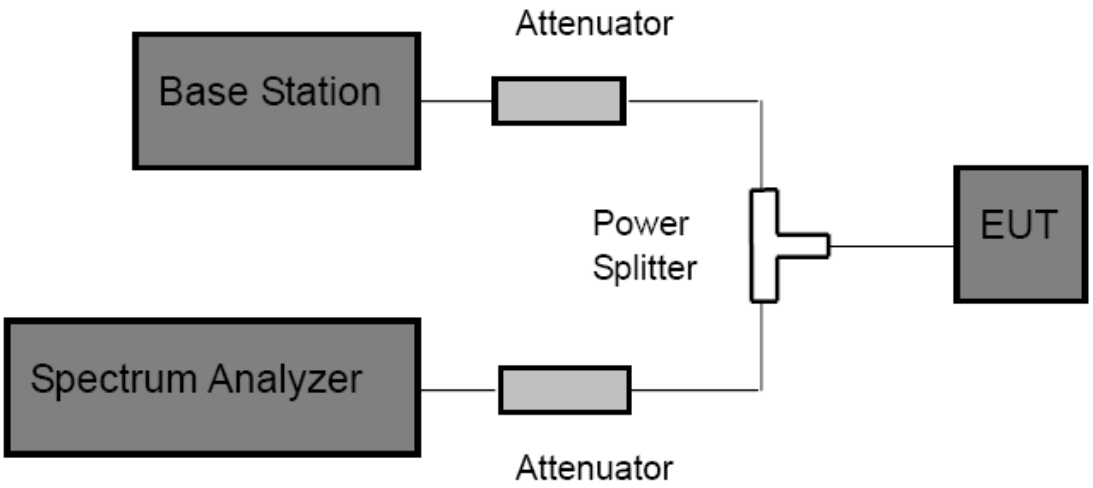
FCC Part 2: 2.1049
FCC Part 22H : 22.913 (a)
FCC Part 24E: 24.232 (c)

8.1.2 Test Requirement

According to FCC section 2.1049, the occupied bandwidth is the frequency bandwidth such that below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Occupied bandwidth is also known as 99% power and -26dBC occupied bandwidths.

8.2 Test Setup



8.3 Test Procedure

(1) The EUT was directly connected to the spectrum analyzer and Base station via power splitter as show in the block diagram above.
(2) The resolution bandwidth of the Spectrum Analyzer is set to at least 1% of the occupied bandwidth.
(3) The low, middle and the high channels are selected to perform tests respectively.
(4) Set the frequency range of the Spectrum Analyzer suitably to capture the waveform; search peak; make a line whose value is 26dB lower than the peak; mark two points which the line intersected the waveform at; finally record the delta of the two points as the occupied bandwidth and the plot.
(5) Set the Spectrum Analyzer Occupied bandwidth function to measure the 99% occupied bandwidth.

8.4 EUT Operating Condition

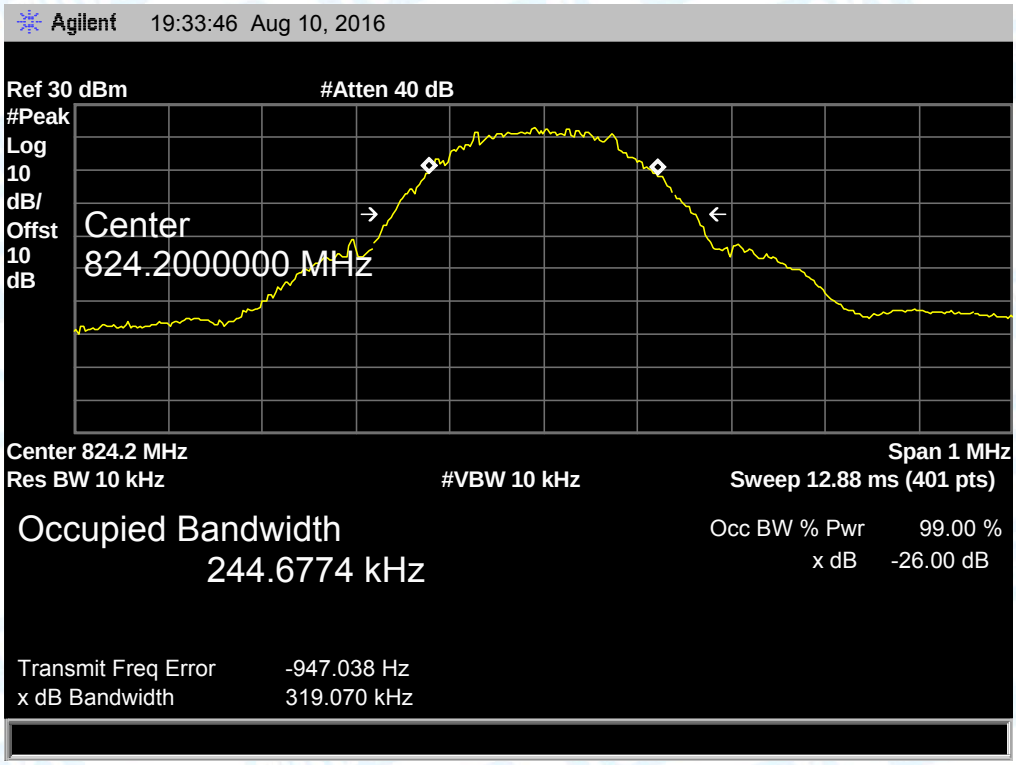
The EUT was continuously connected with the Base station and transmitting in the max power during the test.

8.5 Test Data

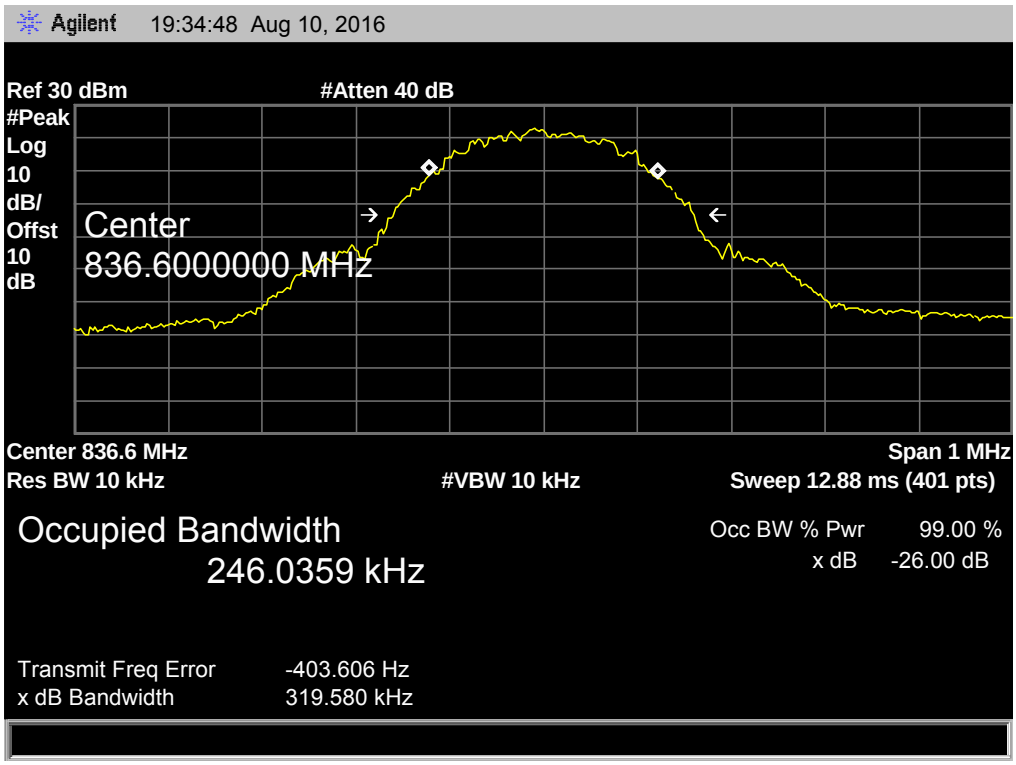
Please refer following pages.

GSM 850				
Mode	**Channel**	**Frequency (MHz)**	**99% OBW (KHz)**	**-26dB Bandwidth (kHz)**
GSM 850	128	824.2	244.6774	319.070
	190	836.6	246.0359	319.580
	251	848.8	246.5330	313.800
GPRS 850 (1 Slot)	128	824.2	243.7525	317.886
	190	836.6	245.0188	321.254
	251	848.8	242.6172	319.604
PCS 1900				
Mode	**Channel**	**Frequency (MHz)**	**99% OBW (KHz)**	**-26dB Bandwidth (kHz)**
GSM 1900	512	1850.2	245.9258	318.139
	661	1880.0	242.4929	317.378
	810	1909.8	246.4619	318.889
GPRS 1900 (1 Slot)	512	1850.2	244.5358	318.756
	661	1880.0	245.6357	310.839
	810	1909.8	241.9389	316.998

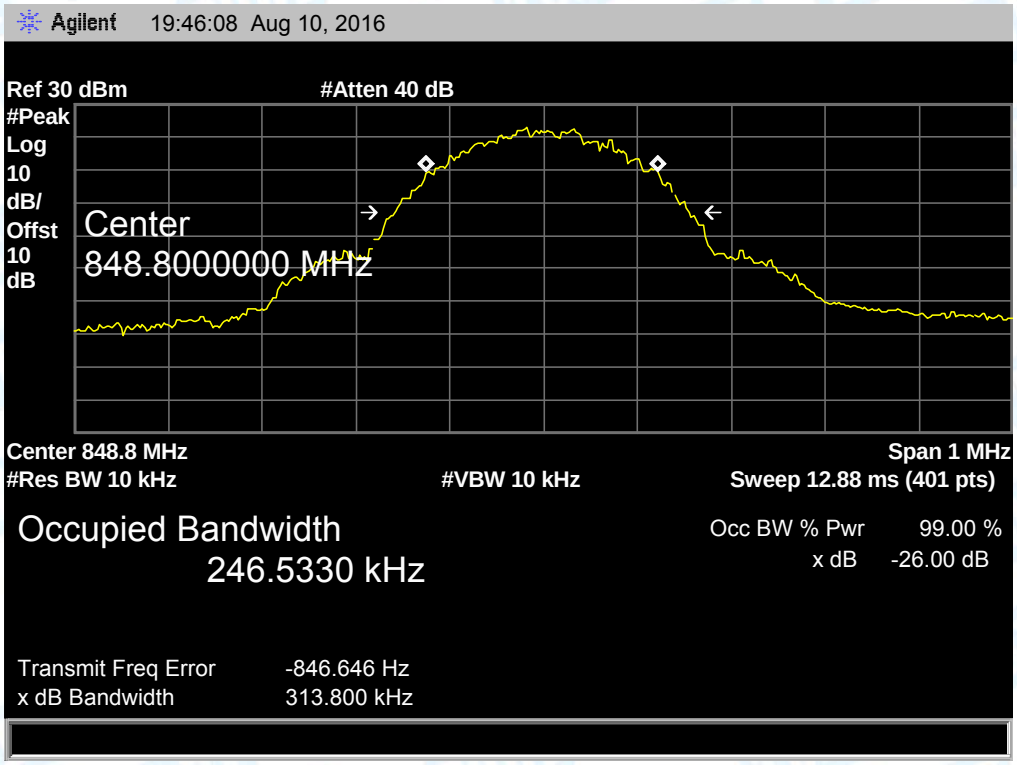
GSM850
CH 128



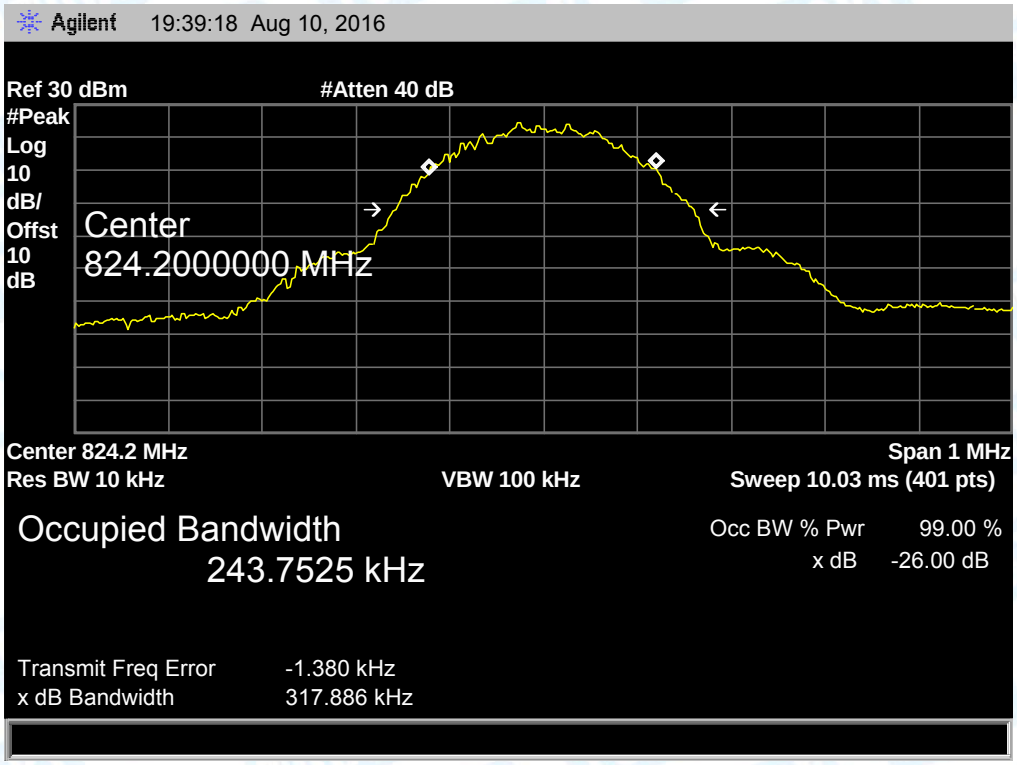
CH 190



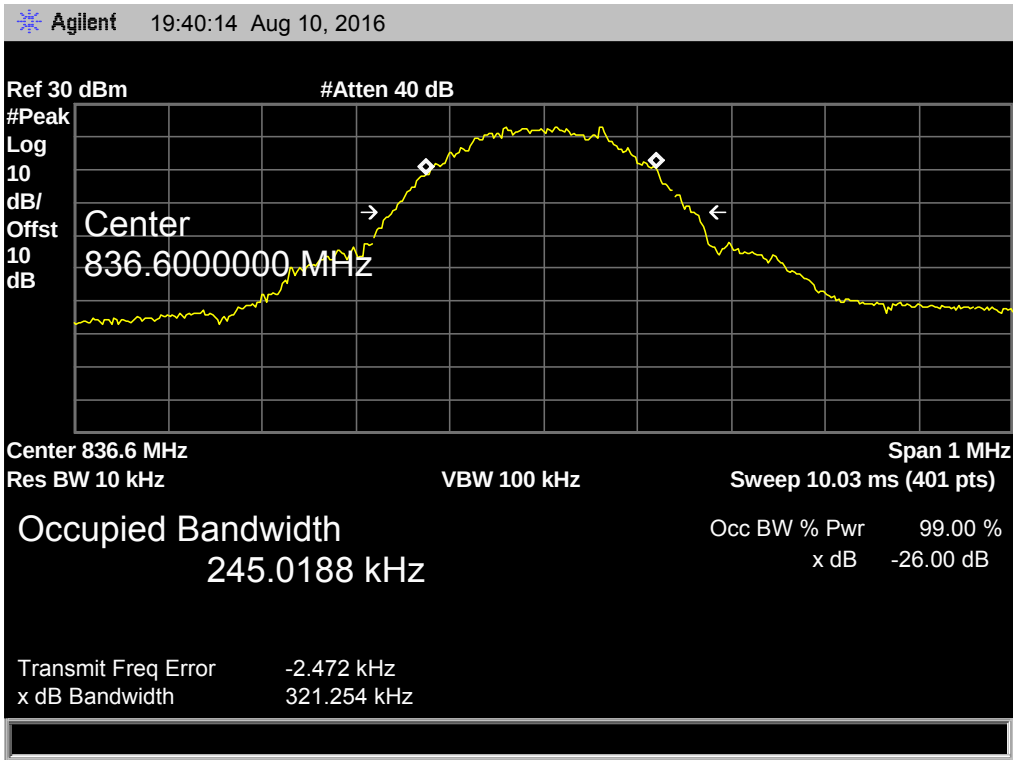
CH 251


Agilent 19:46:08 Aug 10, 2016
Ref 30 dBm
#Atten 40 dB
#Peak
Log
10
dB/
Offst
10
dB
Center
848.8000000 MHz
Center 848.8 MHz
#Res BW 10 kHz
#VBW 10 kHz
Span 1 MHz
Sweep 12.88 ms (401 pts)
Occupied Bandwidth
246.5330 kHz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -846.646 Hz
x dB Bandwidth 313.800 kHz

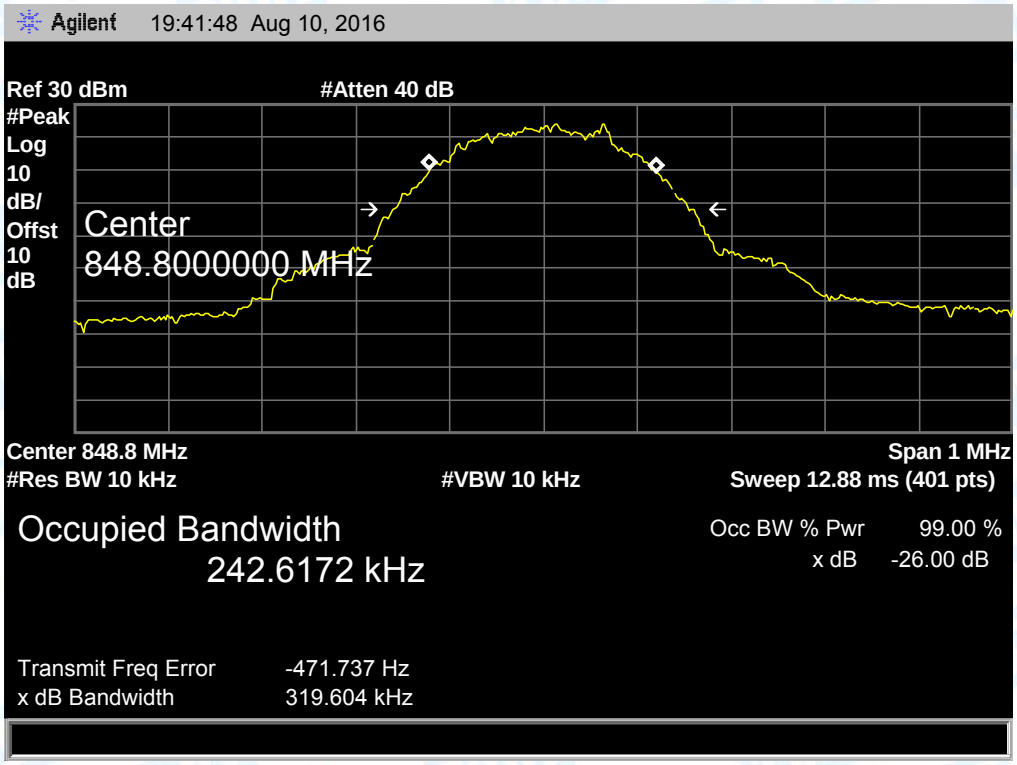
GPRS 850
CH 128



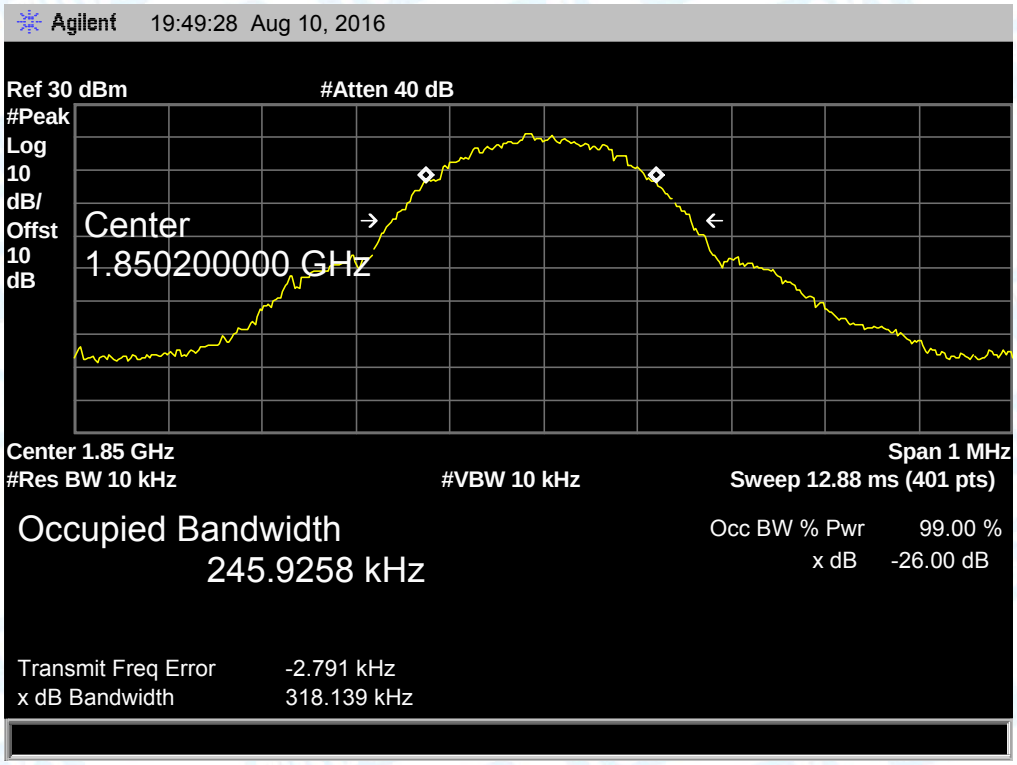
CH 190



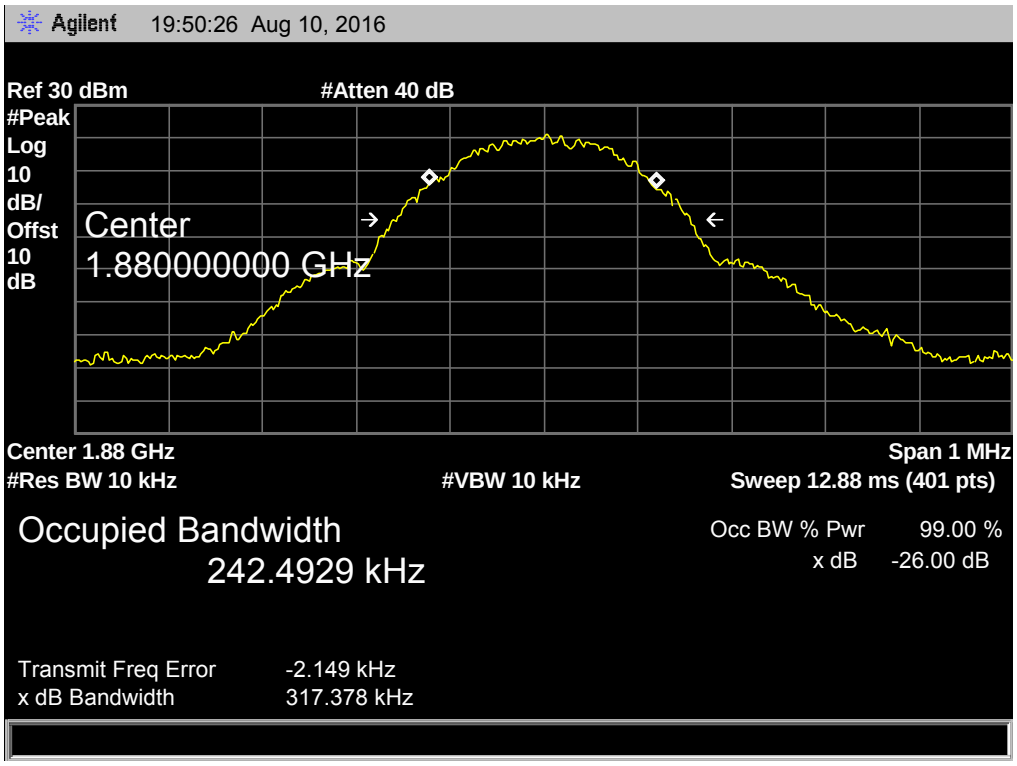
CH 251


Agilent 19:41:48 Aug 10, 2016
Ref 30 dBm
#Atten 40 dB
#Peak
Log
10
dB/
Offst
10
dB
Center
848.8000000 MHz
Center 848.8 MHz
#Res BW 10 kHz
#VBW 10 kHz
Span 1 MHz
Sweep 12.88 ms (401 pts)
Occupied Bandwidth
242.6172 kHz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -471.737 Hz
x dB Bandwidth 319.604 kHz

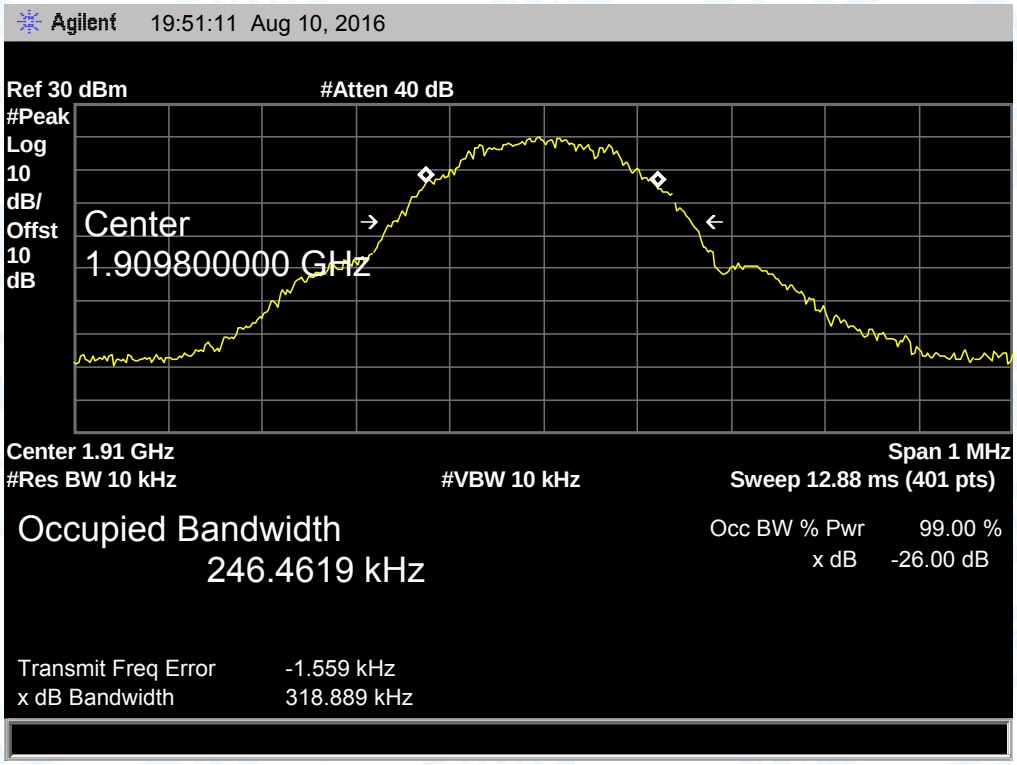
PCS 1900
CH 512



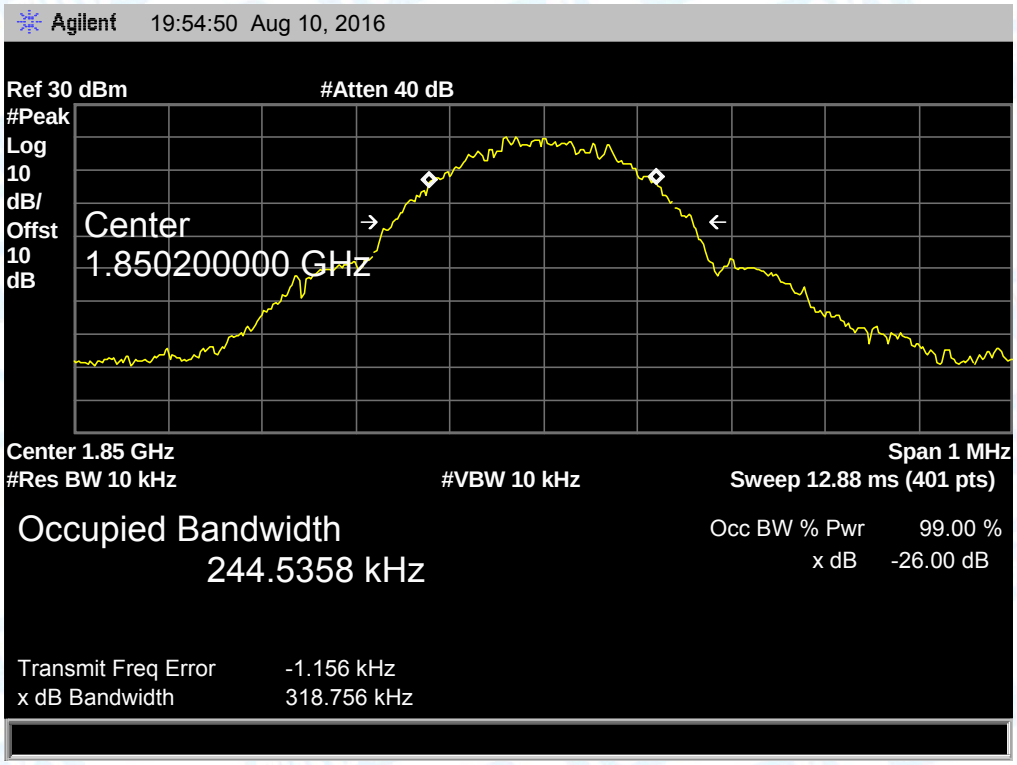
CH 661



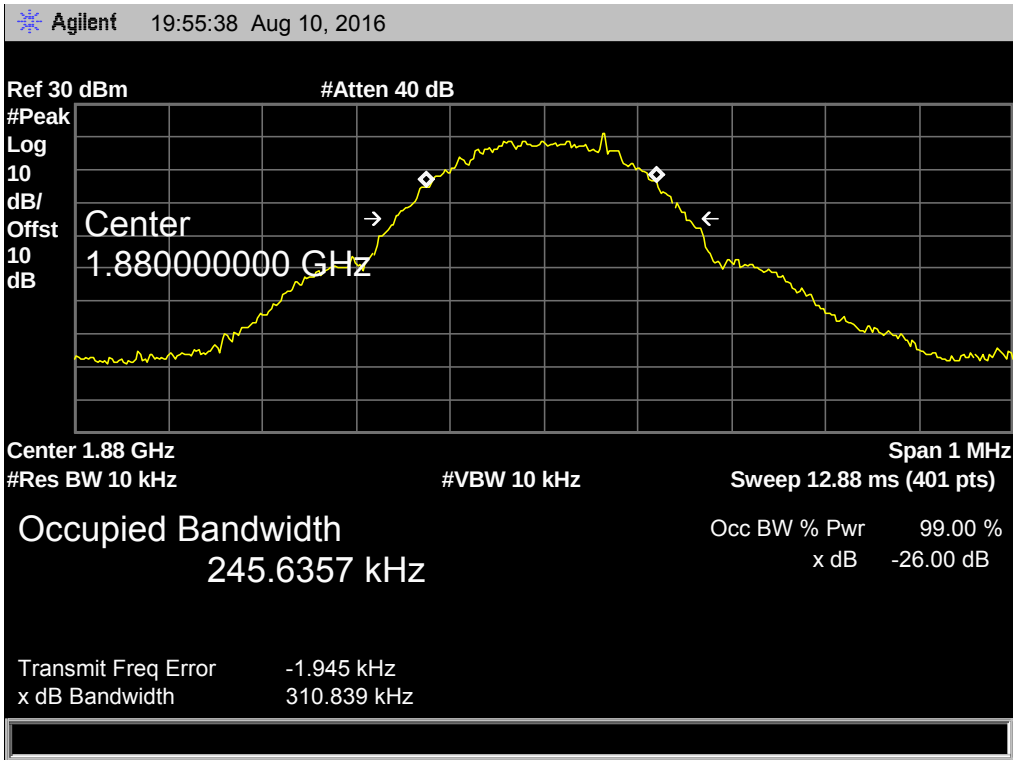
CH 810


Agilent 19:51:11 Aug 10, 2016
Ref 30 dBm
#Atten 40 dB
#Peak
Log
10
dB/
Offst
10
dB
Center
1.909800000 GHz
Center 1.91 GHz
#Res BW 10 kHz
#VBW 10 kHz
Span 1 MHz
Sweep 12.88 ms (401 pts)
Occupied Bandwidth
246.4619 kHz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -1.559 kHz
x dB Bandwidth 318.889 kHz

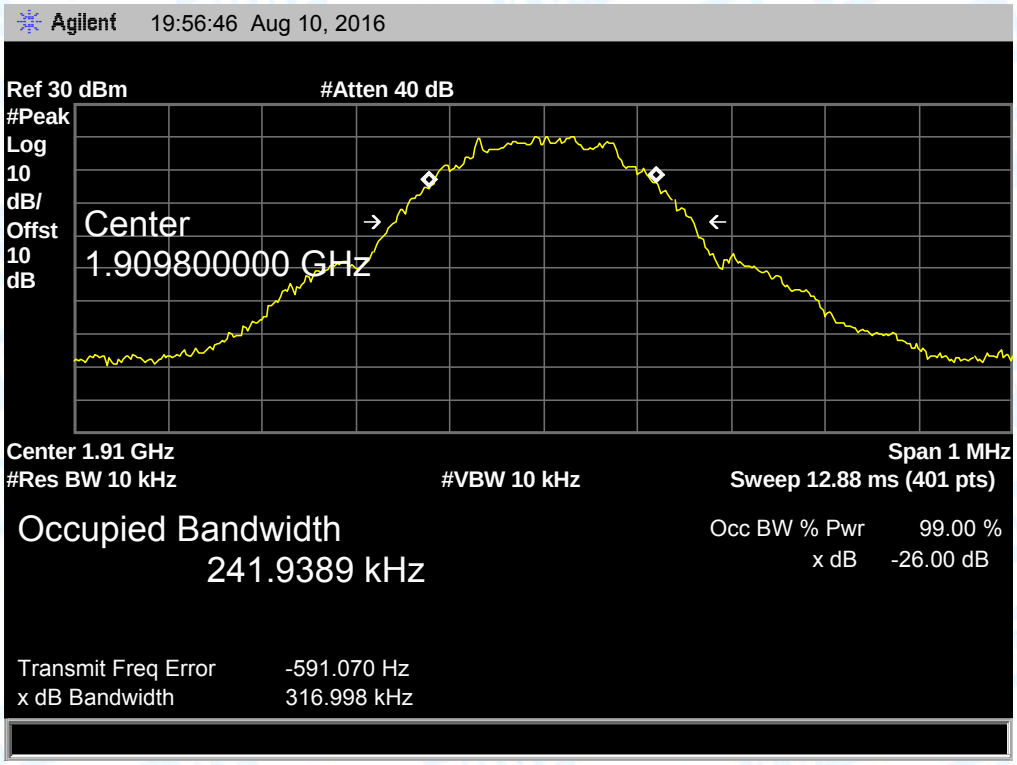
GPRS 1900
CH 512



CH 661



CH 810


Agilent 19:56:46 Aug 10, 2016
Ref 30 dBm
#Atten 40 dB
#Peak
Log
10
dB/
Offst
10
dB
Center
1.909800000 GHz
Center 1.91 GHz
#Res BW 10 kHz
#VBW 10 kHz
Span 1 MHz
Sweep 12.88 ms (401 pts)
Occupied Bandwidth
241.9389 kHz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -591.070 Hz
x dB Bandwidth 316.998 kHz

9. Conducted Out of Band Emissions

9.1 Test Standard and Limit

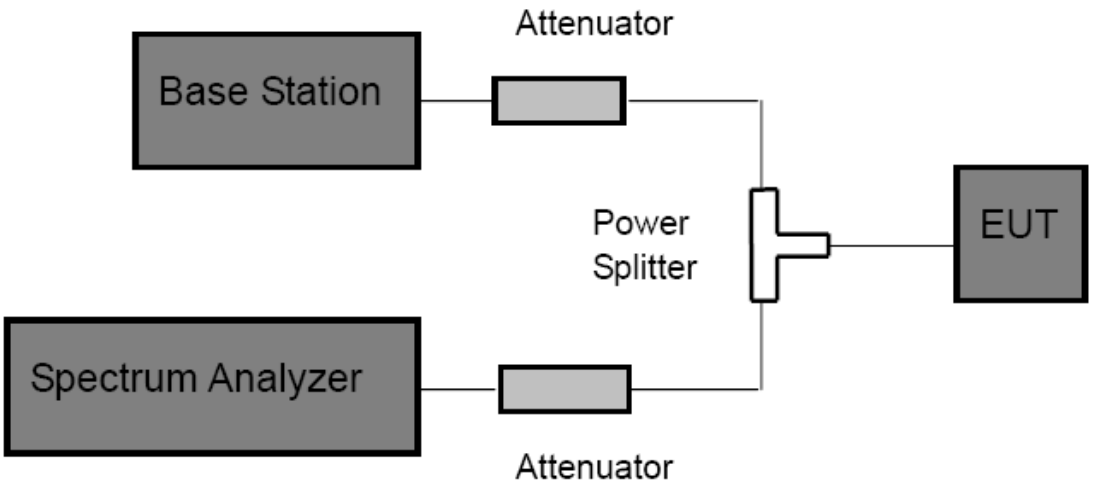
9.1.1 Test Standard

FCC Part 2: 2.1051, 2.1057
FCC Part 22H: 22.917(a)
FCC Part 24E: 24.238(a)

9.1.2 Test Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power(P) by a factor of at least 43+10log(P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

9.2 Test Setup



9.3 Test Procedure

(1) The EUT was directly connected to the spectrum analyzer and Base station via power splitter as show in the block diagram above.
(2) Spectrum Setting:
Frequency bellow 1 GHz: RBW=100 kHz, VBW=300 kHz.
Frequency above 1 GHz: RBW=1 MHz, VBW=3 MHz.
(3) The low, middle and high channels of each band and mode's spurious emissions for 30 MHz to 10th Harmonic were measured by Spectrum analyzer.

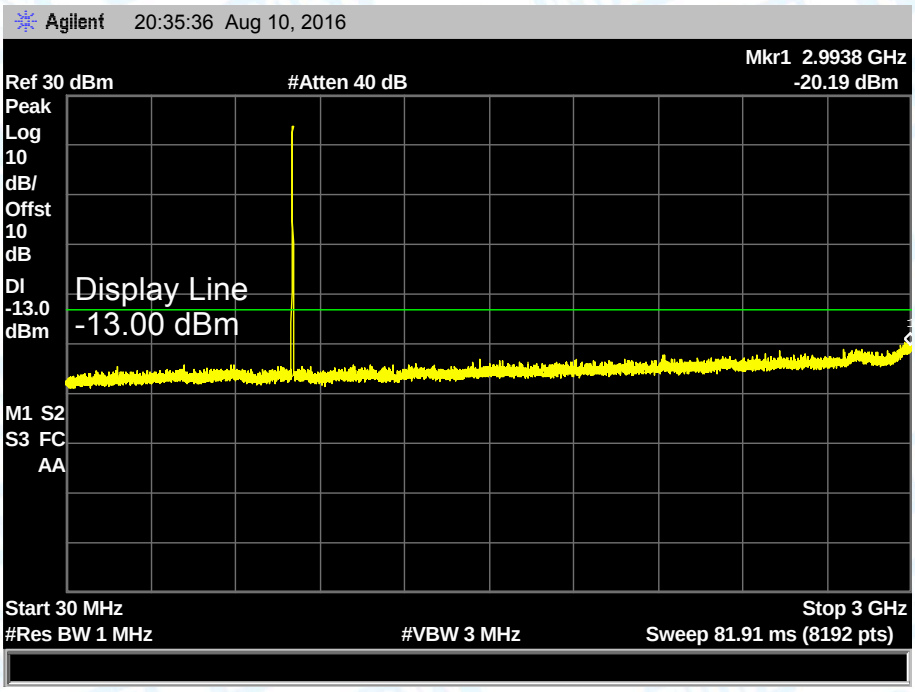
9.4 EUT Operating Condition

The EUT was continuously connected with the Base station and transmitting in the max power during the test.

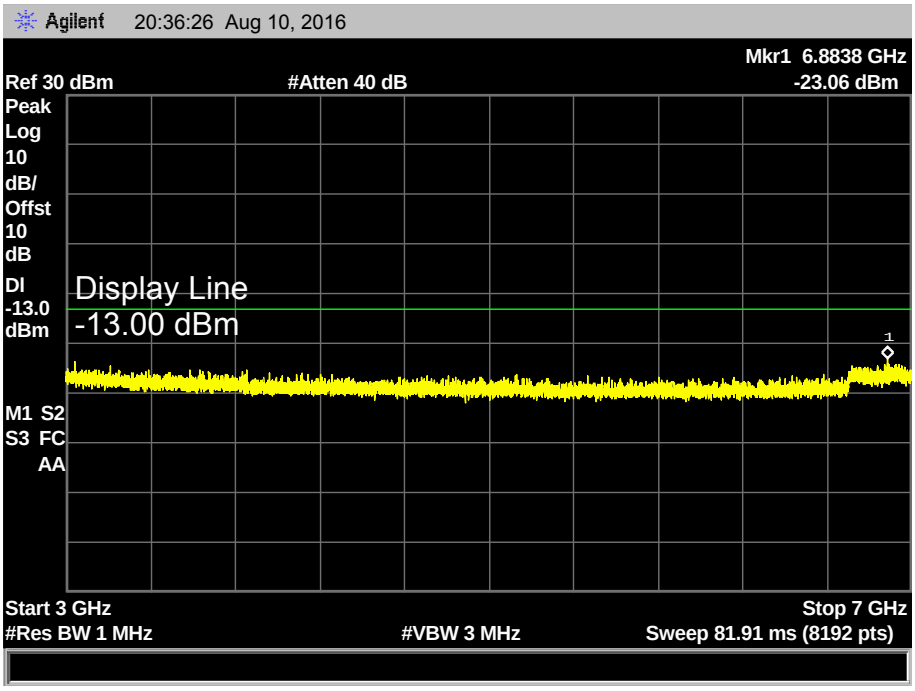
9.5 Test Data

Please refer following plots:

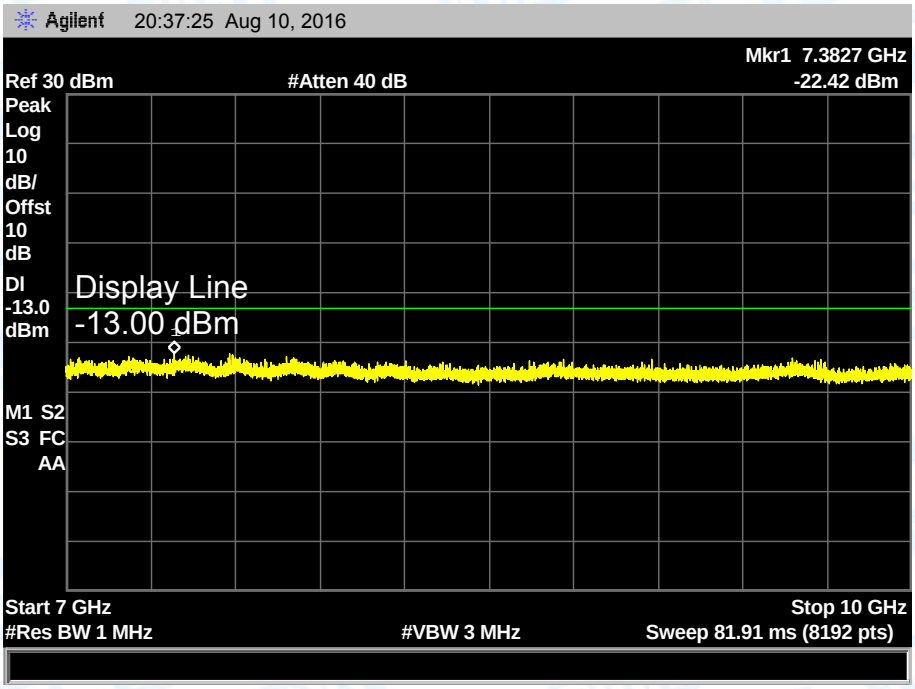
GSM850 CH 128
30 MHz~ 3 GHz



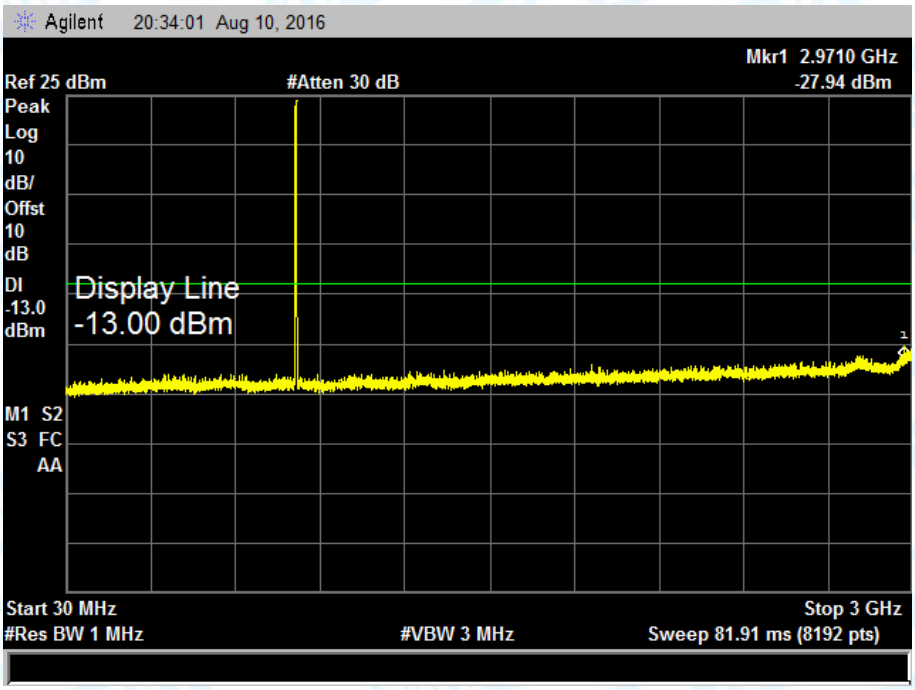
3 GHz~7 GHz



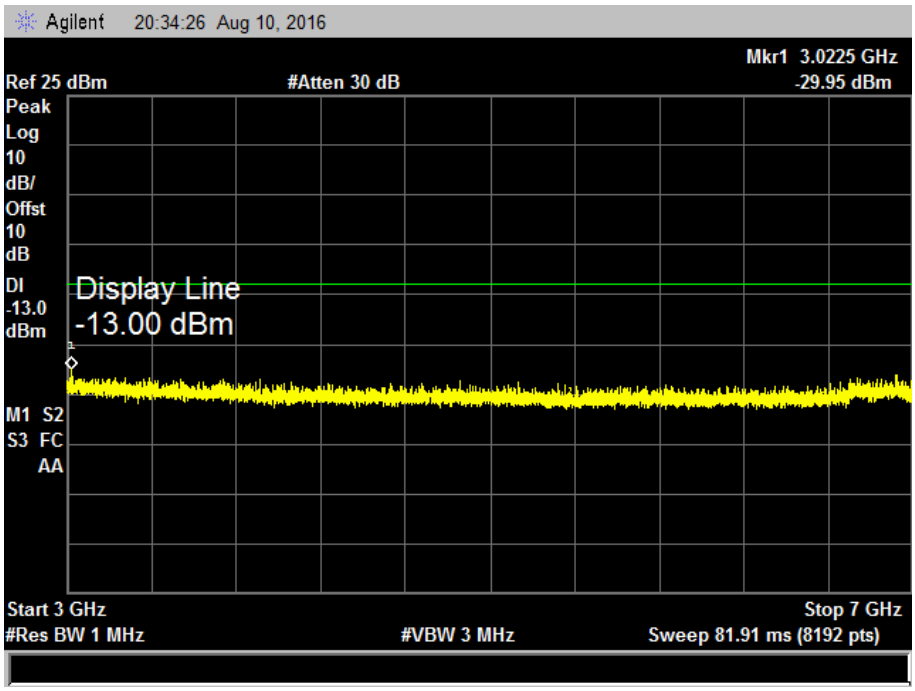
7 GHz~10 GHz


Agilent 20:37:25 Aug 10, 2016
Mkr1 7.3827 GHz
Ref 30 dBm
#Atten 40 dB
-22.42 dBm
Peak
Log
10
dB/
Offst
10
dB
Dl
-13.0
dBm
Display Line
-13.00 dBm
M1 S2
S3 FC
AA
Start 7 GHz
Stop 10 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 81.91 ms (8192 pts)

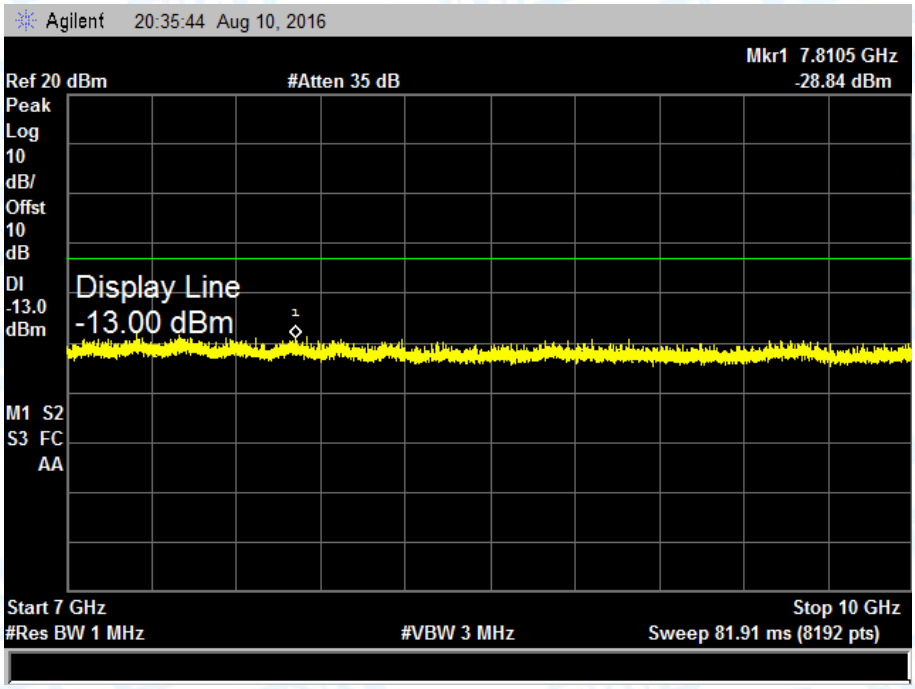
GSM850 CH 190
30 MHz~ 3 GHz



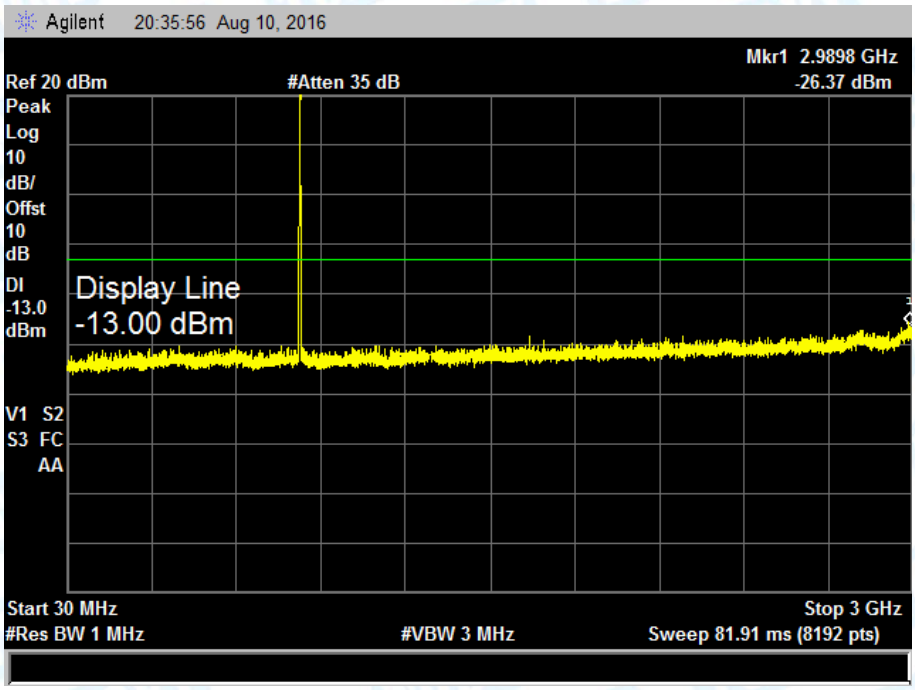
3 GHz~7 GHz



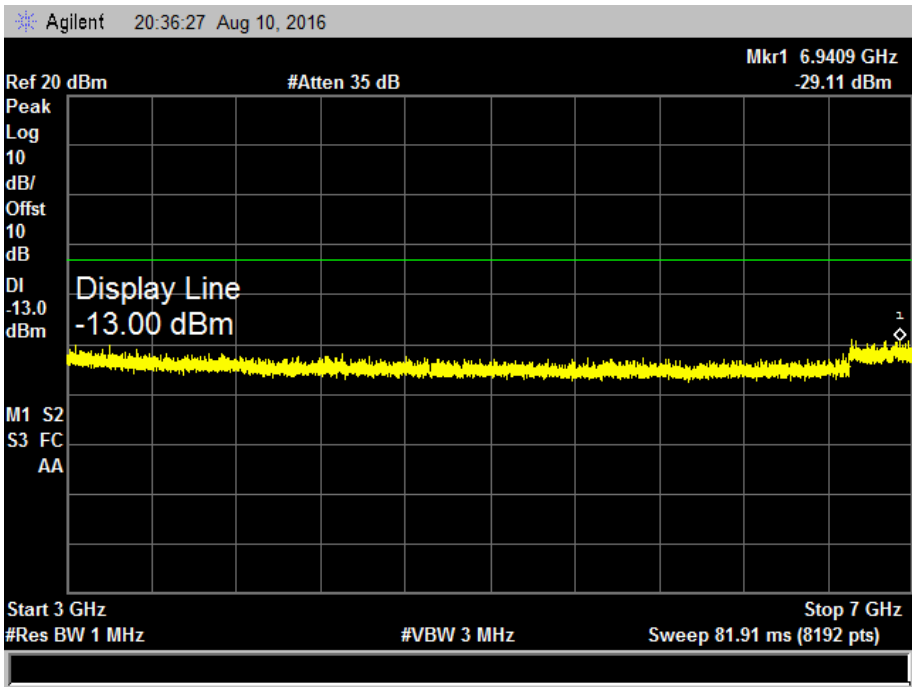
7 GHz~10 GHz


Agilent 20:35:44 Aug 10, 2016
Mkr1 7.8105 GHz
-28.84 dBm
Ref 20 dBm
#Atten 35 dB
Peak
Log
10
dB/
Offst
10
dB
Display Line
-13.00 dBm
DI
-13.0
dBm
M1 S2
S3 FC
AA
Start 7 GHz
#Res BW 1 MHz
#VBW 3 MHz
Stop 10 GHz
Sweep 81.91 ms (8192 pts)

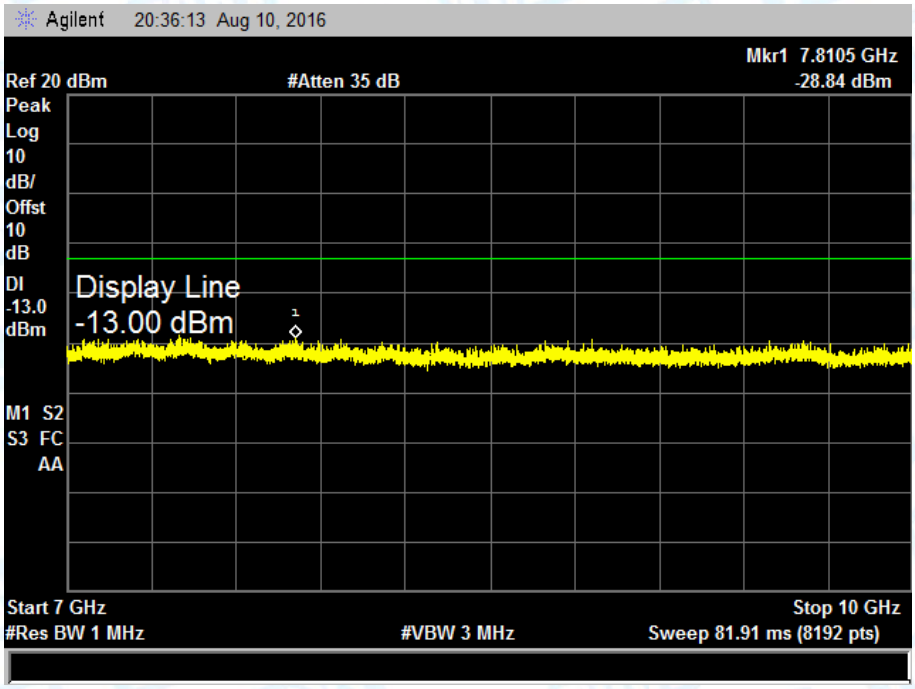
GSM850 CH 251
30 MHz~ 3 GHz



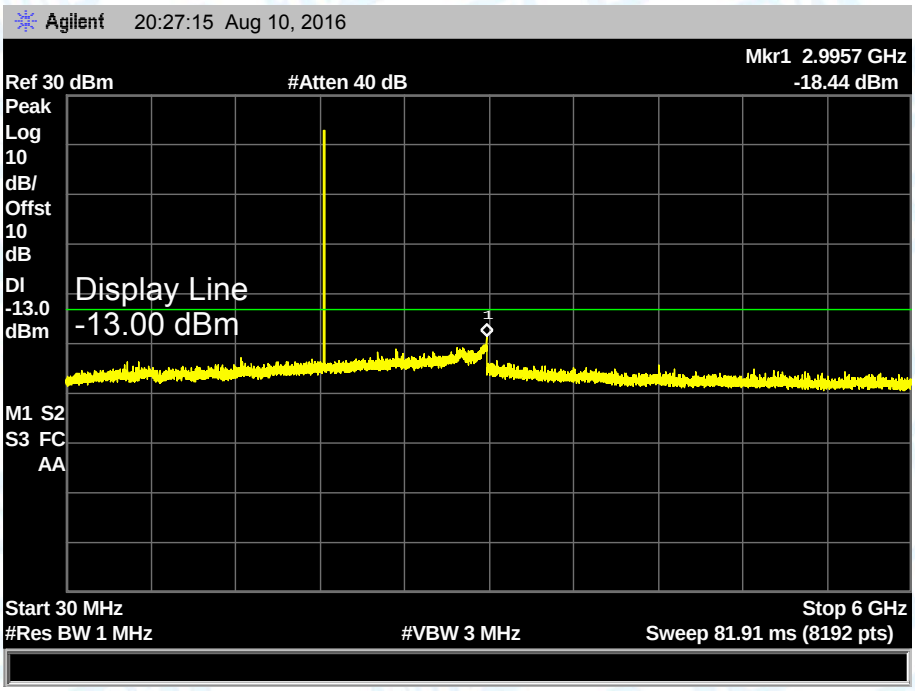
3 GHz~7 GHz



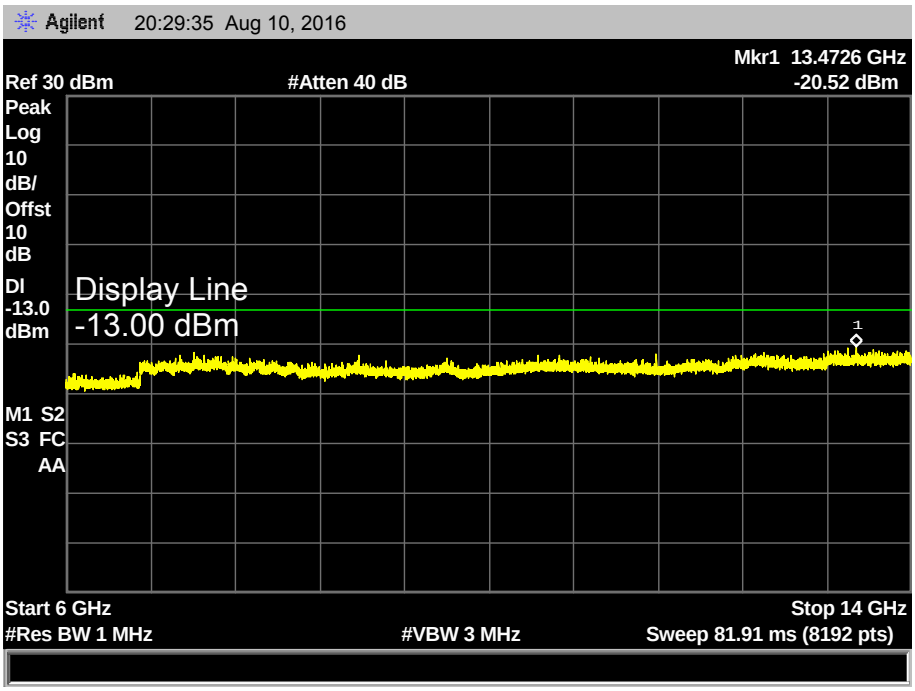
7 GHz~10 GHz


Agilent 20:36:13 Aug 10, 2016
Mkr1 7.8105 GHz
-28.84 dBm
Ref 20 dBm
#Atten 35 dB
Peak
Log
10
dB/
Offst
10
dB
Dl
-13.0
dBm
Display Line
-13.00 dBm
M1 S2
S3 FC
AA
Start 7 GHz
#Res BW 1 MHz
#VBW 3 MHz
Stop 10 GHz
Sweep 81.91 ms (8192 pts)

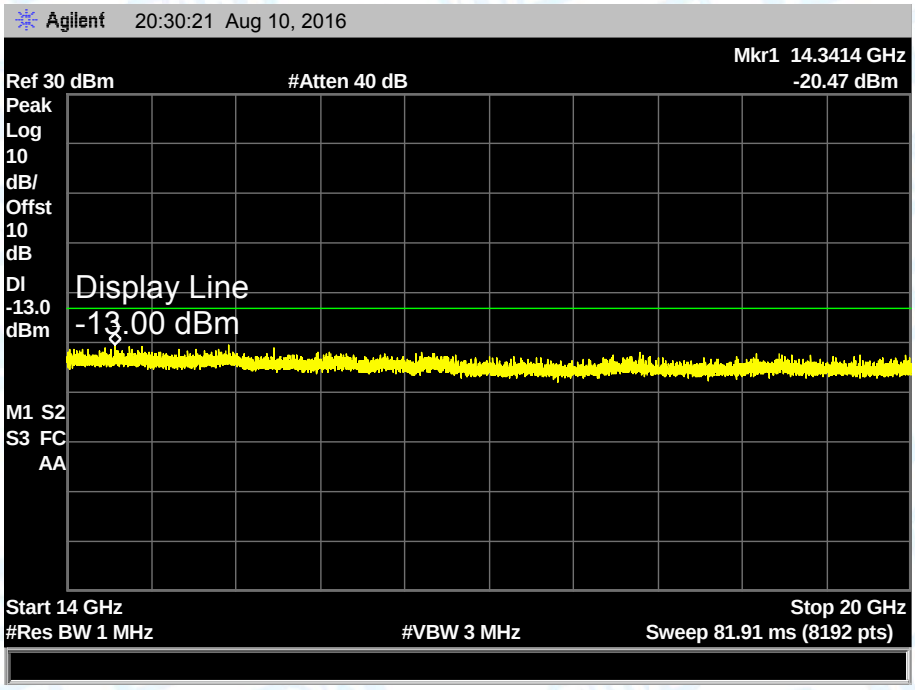
PCS 1900 CH 512
30 MHz~ 6 GHz



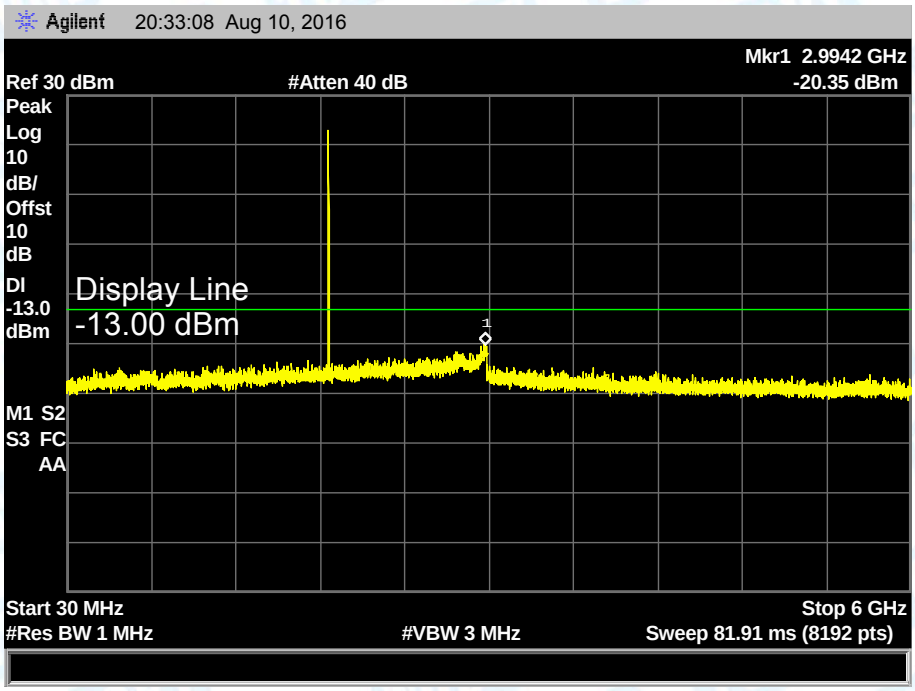
6 GHz~14 GHz



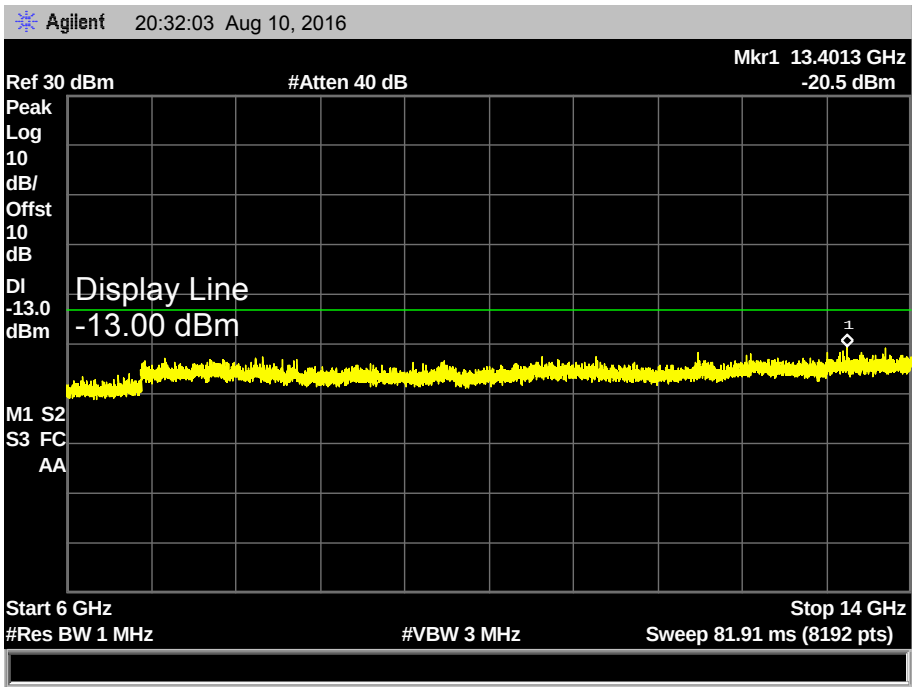
14 GHz~20 GHz


Agilent 20:30:21 Aug 10, 2016
Mkr1 14.3414 GHz
Ref 30 dBm
#Atten 40 dB
-20.47 dBm
Peak
Log
10
dB/
Offst
10
dB
Dl
-13.0
dBm
Display Line
-13.00 dBm
M1 S2
S3 FC
AA
Start 14 GHz
Stop 20 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 81.91 ms (8192 pts)

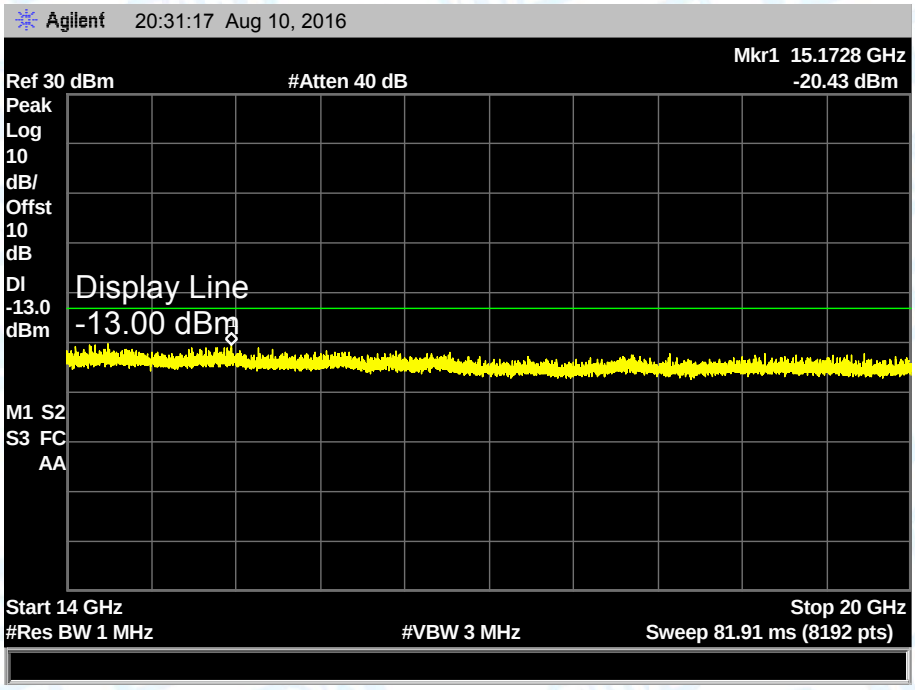
PCS 1900 CH 661
30 MHz~ 6 GHz



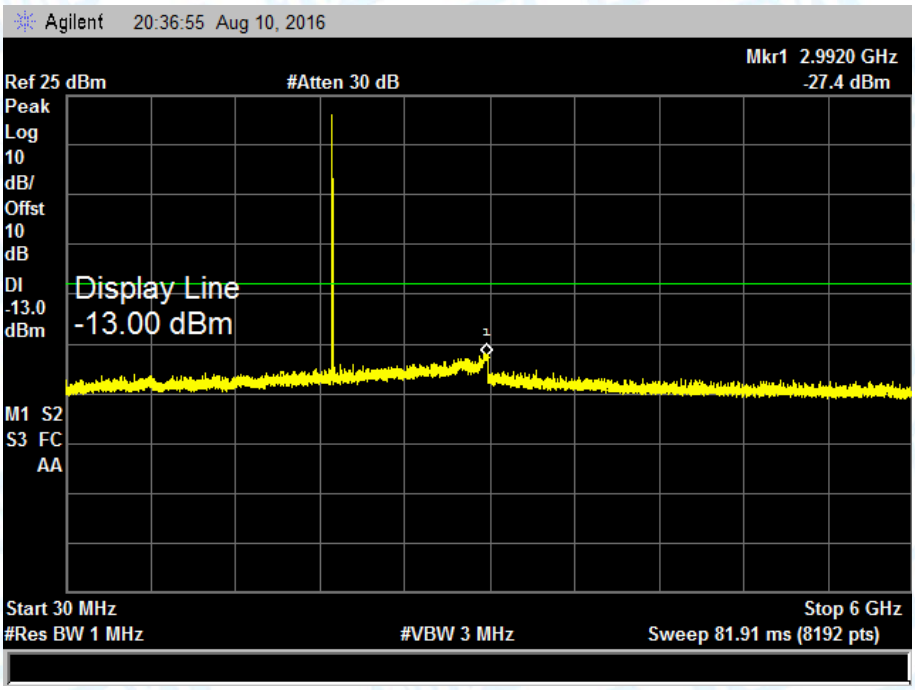
6 GHz~14 GHz



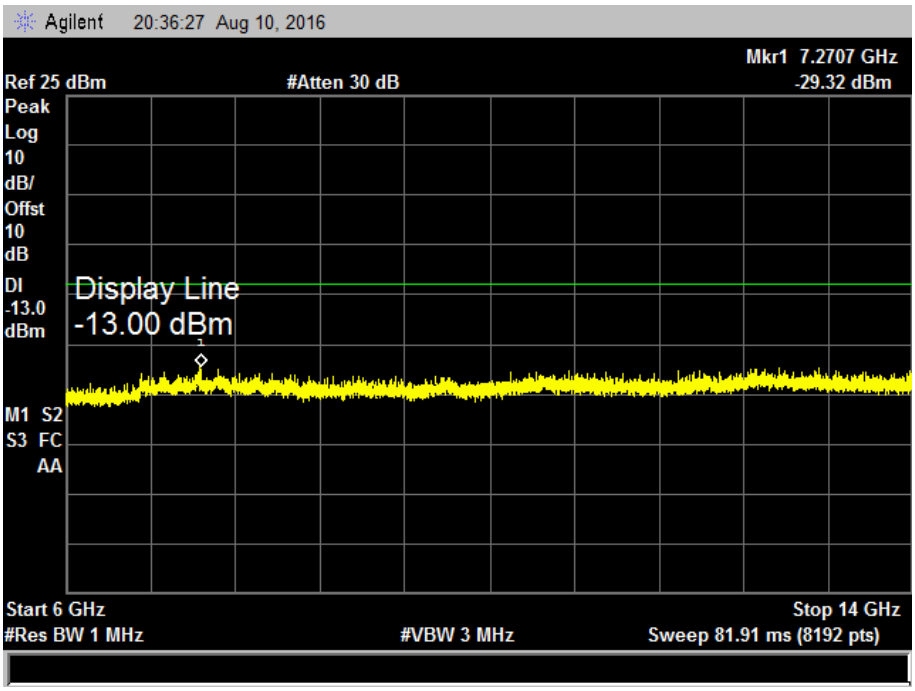
14 GHz~20 GHz


Agilent 20:31:17 Aug 10, 2016
Mkr1 15.1728 GHz
Ref 30 dBm
#Atten 40 dB
-20.43 dBm
Peak
Log
10
dB/
Offst
10
dB
Dl
-13.0
dBm
Display Line
-13.00 dBm
M1 S2
S3 FC
AA
Start 14 GHz
Stop 20 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 81.91 ms (8192 pts)

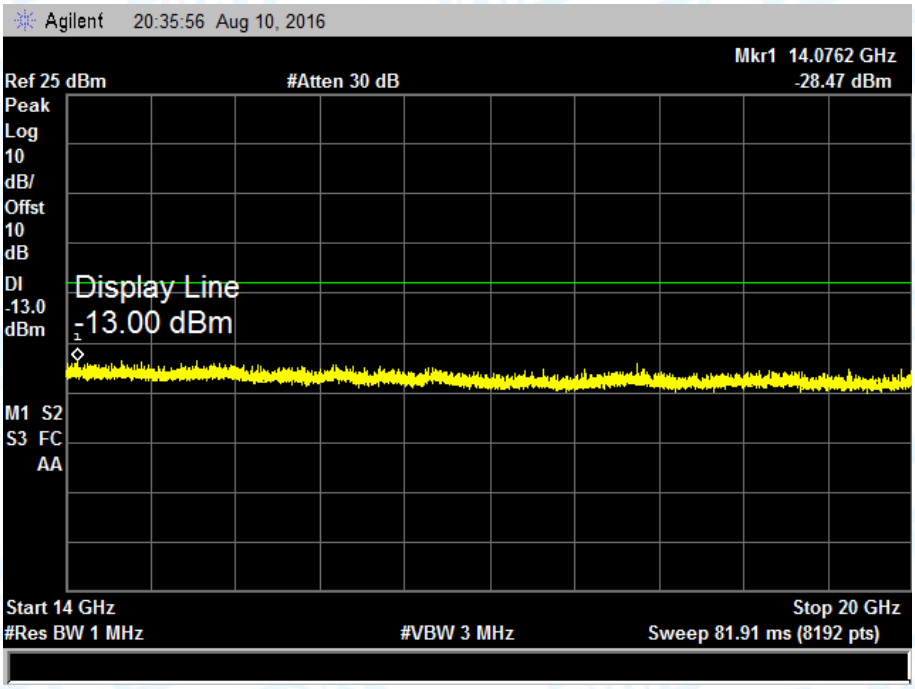
PCS 1900 CH 810
30 MHz~ 6 GHz



6 GHz~14 GHz



14 GHz~20 GHz


Agilent 20:35:56 Aug 10, 2016
Mkr1 14.0762 GHz
-28.47 dBm
Ref 25 dBm
#Atten 30 dB
Peak
Log
10
dB/
Offst
10
dB
Display Line
-13.00 dBm
DI
-13.0
dBm
M1 S2
S3 FC
AA
Start 14 GHz
#Res BW 1 MHz
#VBW 3 MHz
Stop 20 GHz
Sweep 81.91 ms (8192 pts)

10. Band Edge Test

10.1 Test Standard and Limit

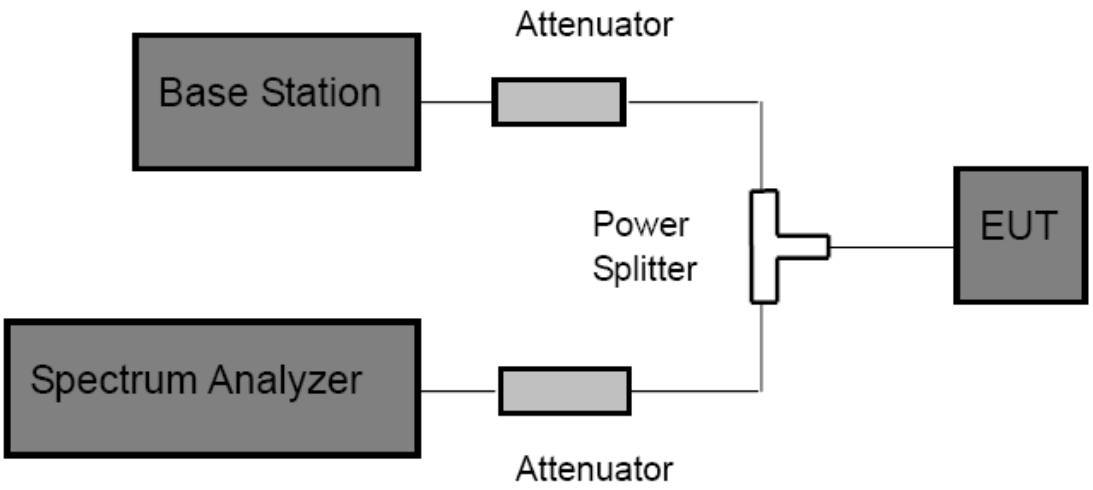
10.1.1 Test Standard

FCC Part 2: 2.1051, 2.1057
FCC Part 22H: 22.917(a)
FCC Part 24E: 24.238(a)

10.1.2 Test Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power(P) by a factor of at least 43+10log(P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

10.2 Test Setup



10.3 Test Procedure

(1) The EUT was directly connected to the spectrum analyzer and Base station via power splitter as show in the block diagram above.
(2) Spectrum Setting:
GSM and PCS: RBW=3 kHz, VBW=10 kHz, Span 1 MHz, Detector: Peak Mode.
WCDMA: RBW=100 kHz, VBW=300 kHz, Span 5 MHz, Detector: Peak Mode.
(3) The band edges of low and high channels for the highest RF powers were measured.

10.4 EUT Operating Condition

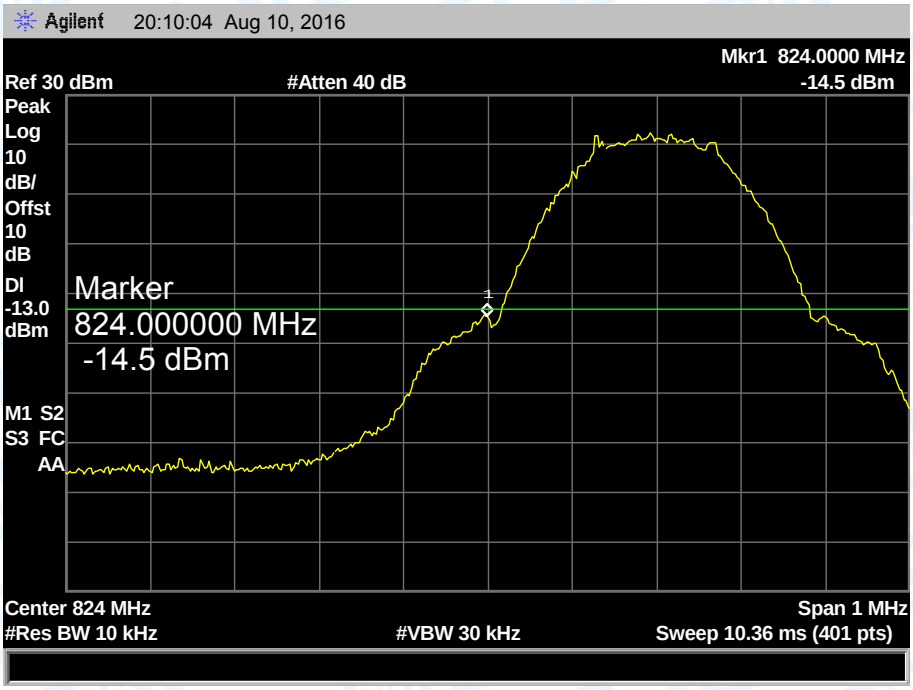
The EUT was continuously connected with the Base station and transmitting in the max power during the test.

10.5 Test Data

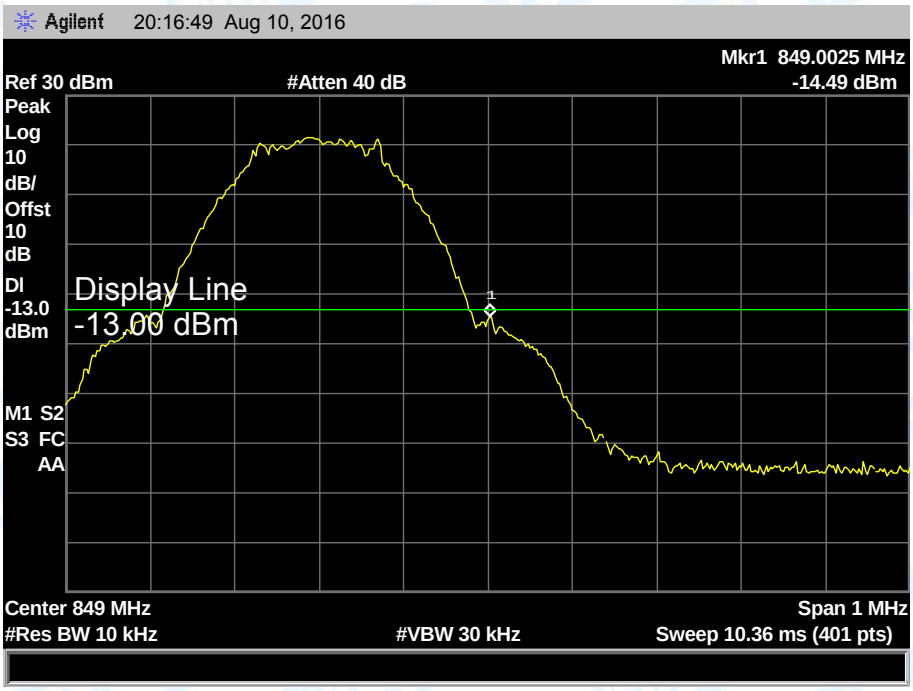
Please refer the following plots:

Band edge emission:

Test Mode:	GSM850

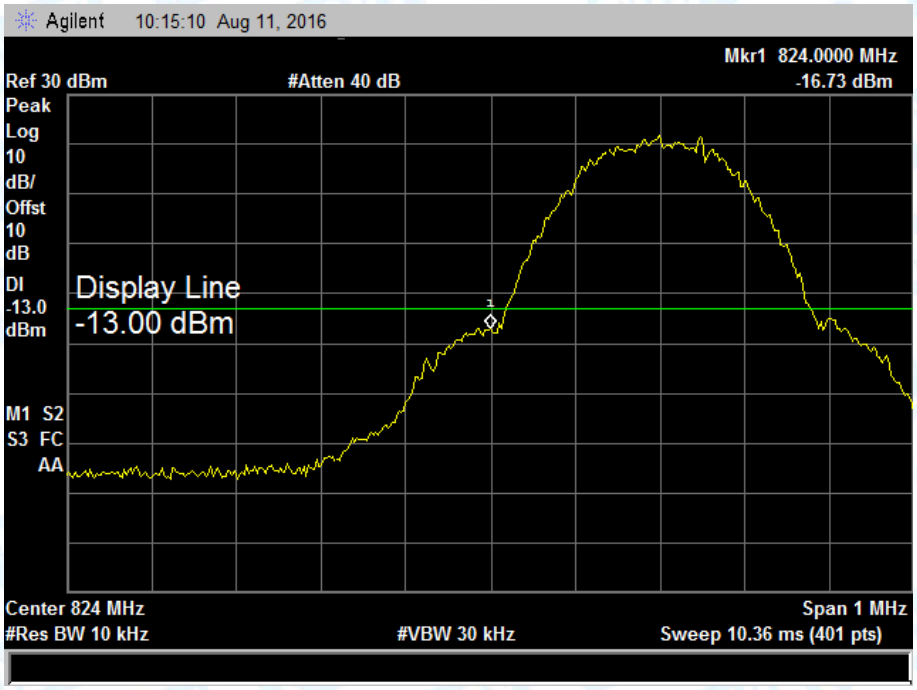


Lowest channel

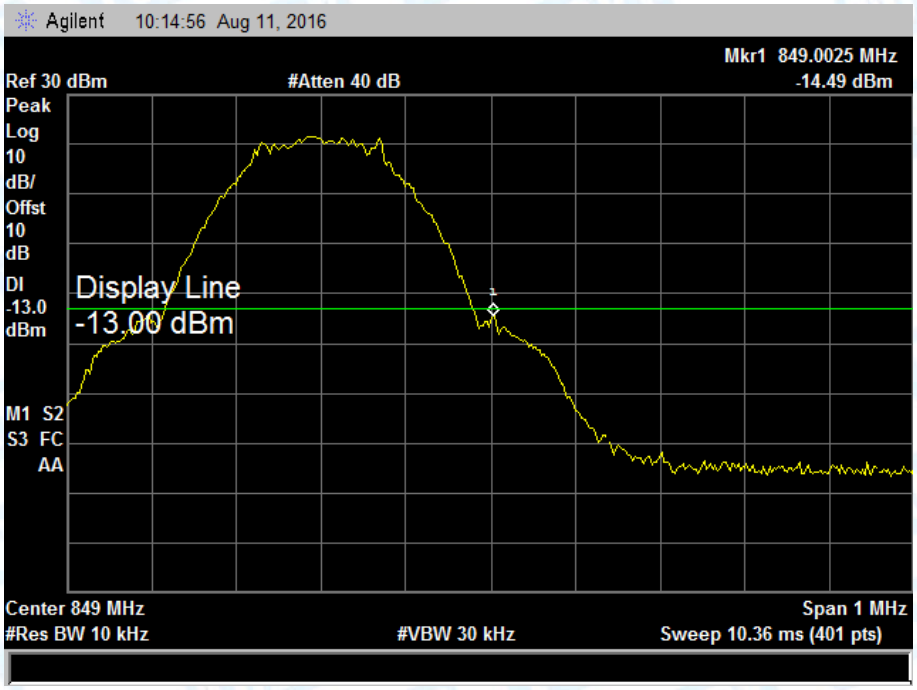


Highest channel

Test Mode:	GPRS850

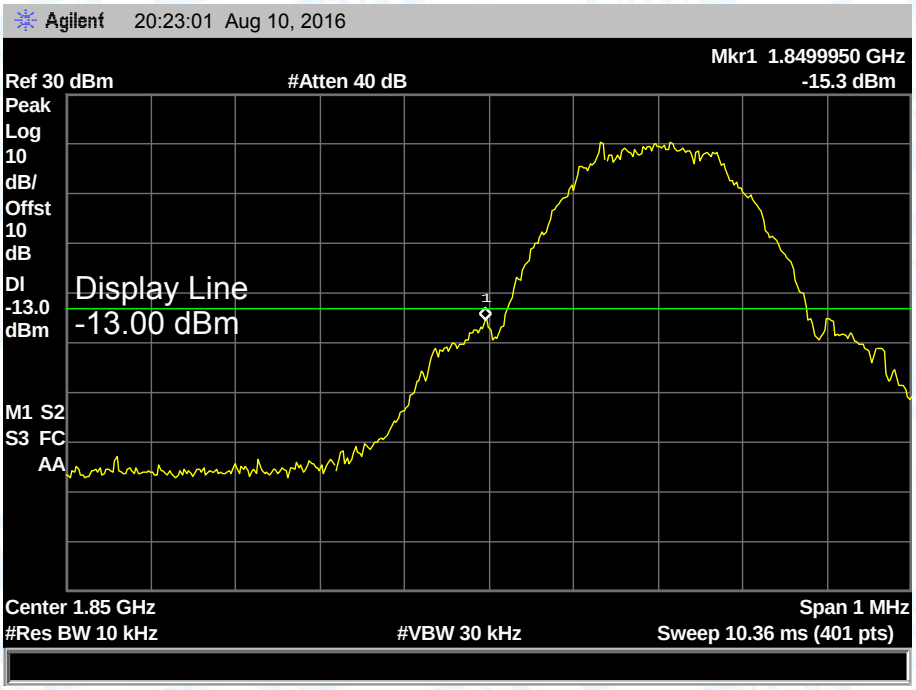


Lowest channel

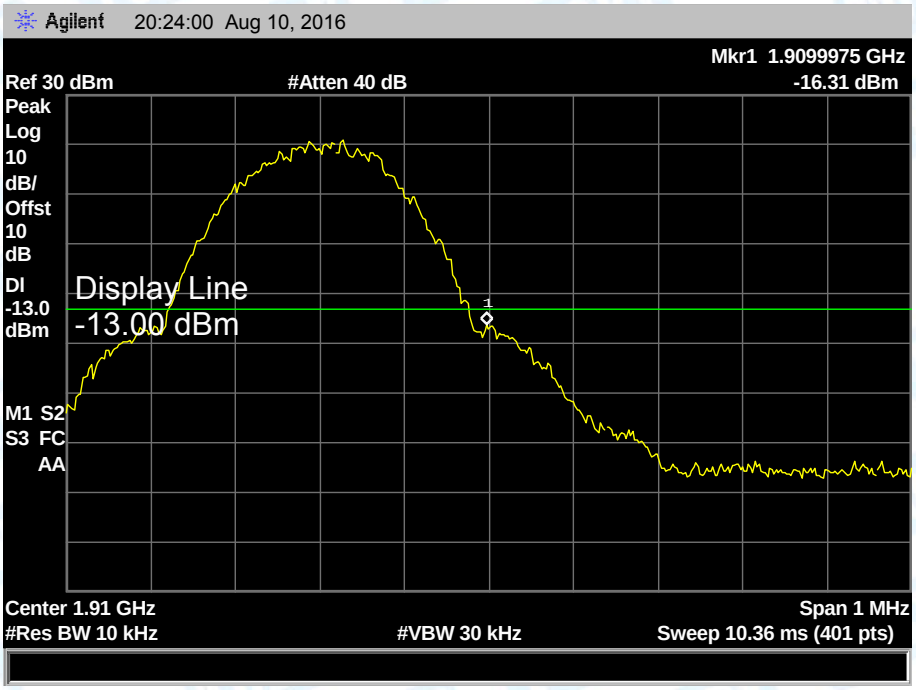


Highest channel

Test Mode:	PCS1900

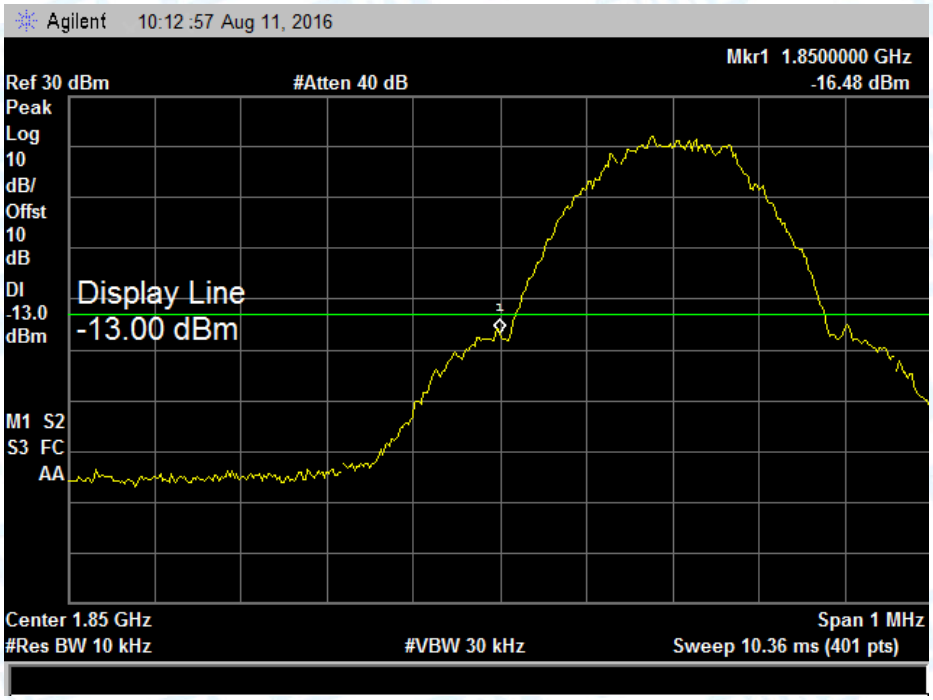


Lowest channel

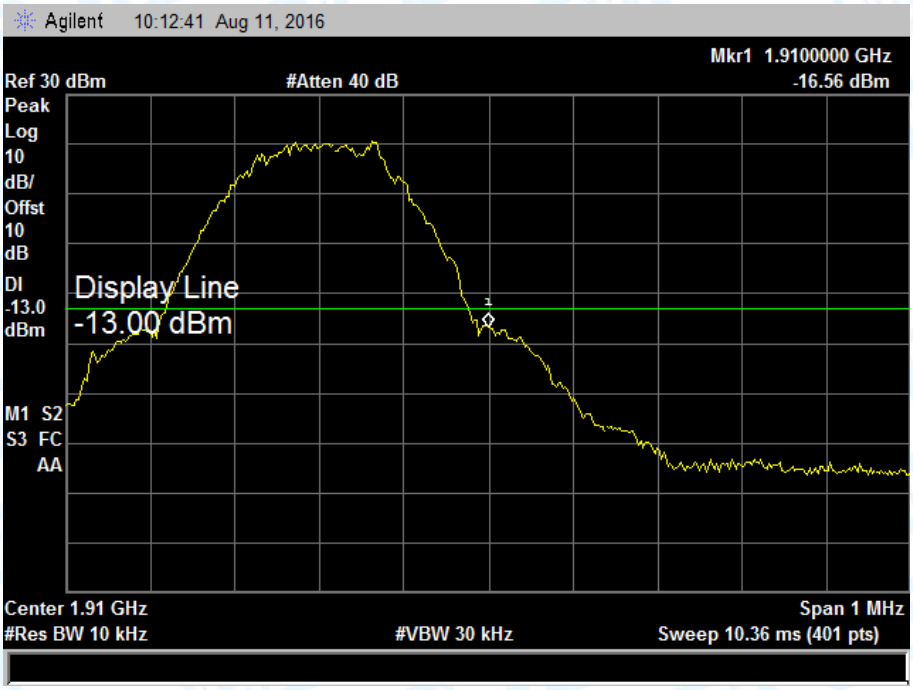


Highest channel

Test Mode:	GPRS1900



Lowest channel



Highest channel

11. Radiated Out Band of Emissions

11.1 Test Standard and Limit

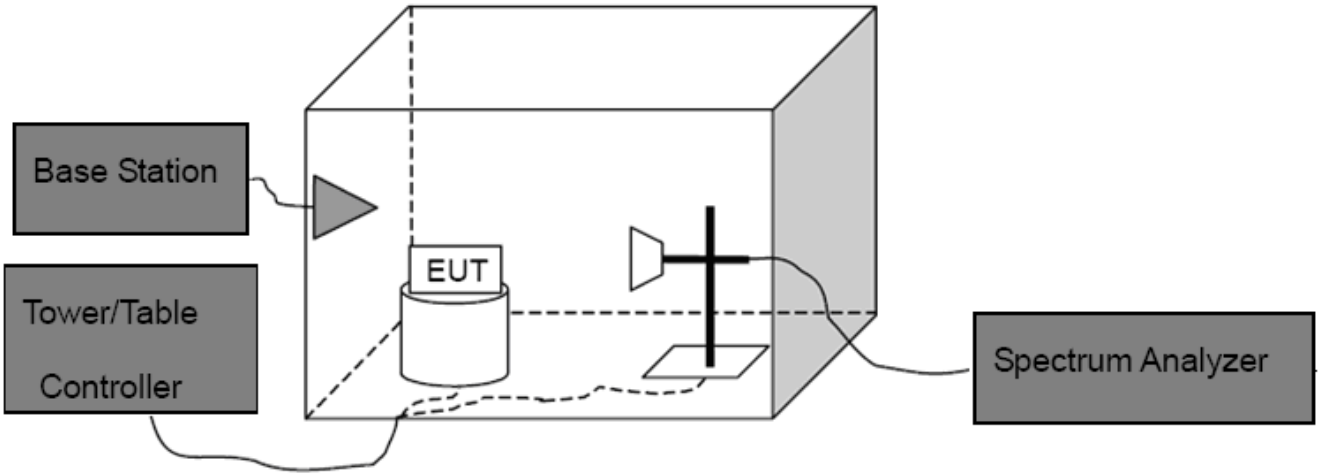
11.1.1 Test Standard

FCC Part 2: 2.1053, 2.1057
FCC Part 22H: 22.917
FCC Part 24E: 24.238

11.1.2 Test Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power(P) by a factor of at least 43+10log(P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

11.2 Test Setup



11.3 Test Procedure

(1) The test system setup as show in the block diagram above.
(2) The EUT was placed on an non-conductive rotating platform in an anechoic chamber. The radiated spurious emissions from 30MHz to 10th harmonious of fundamental frequency were measured at 3 m with a test antenna and a spectrum analyzer with RBW=1 MHz, VBW=1 MHz, peak detector settings.
(3) During the measurement, the EUT was enforced in maximum power and linked with a base station. All the spurious emissions at 3m were measured by rotation of the turntable and the test antenna raised and lowered over a range from 1 to 4 meters in both horizontally and vertically polarized orientations.
(4) When found the maximum level of emissions from the EUT. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB=10 log(TX power in Watts/0.001)-the absolute level
Spurious attenuation limit in dB=43+10 log(power out in Watts)

11.4 EUT Operating Condition

The EUT was continuously connected with the Base station and transmitting in the max power during the test.

11.5 Test Data

Please refer the following pages.

Measurement Data (worst case)

Test mode:	GSM850						
Channel:	Middle			Date of Test:	2016-08-16		
Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
	Polarization (H&V)	Read Level (dBm)	Antenna Correct Factor (dBi)	Cable Loss (dB)	Emission Level (dBm)		
1673.20	Horizontal	-33.26	7.49	3.97	-22.26	-13.00	Pass
2509.80	H	-38.06	7.03	5.05	-20.53		
3346.40	H	-50.50	12.48	5.98	-31.11		
4183.00	H	---	---	---	---		
5019.60	H	---	---	---	---		
5856.20	H	---	---	---	---		
1673.20	Vertical	-37.70	8.02	3.97	-23.26	-13.00	Pass
2509.80	V	-43.45	10.47	5.05	-21.48		
3346.40	V	-51.45	16.92	5.98	-30.43		
4183.00	V	---	---	---	---		
5019.60	V	---	---	---	---		
5856.20	V	---	---	---	---		

Test mode:	GPRS850						
Channel:	Middle			Date of Test:	2016-08-16		
Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
	Polarization (H&V)	Read Level (dBm)	Antenna Correct Factor (dBi)	Cable Loss (dB)	Emission Level (dBm)		
1673.20	Horizontal	-32.16	7.49	3.97	-21.16	-13.00	Pass
2509.80	H	-39.94	7.03	5.05	-22.41		
3346.40	H	-49.93	12.48	5.98	-30.54		
4183.00	H	---	---	---	---		
5019.60	H	---	---	---	---		
5856.20	H	---	---	---	---		
1673.20	Vertical	-37.66	8.02	3.97	-23.22	-13.00	Pass
2509.80	V	-43.71	10.47	5.05	-21.74		
3346.40	V	-54.15	16.92	5.98	-33.13		
4183.00	V	---	---	---	---		
5019.60	V	---	---	---	---		
5856.20	V	---	---	---	---		

Remark: 1, The testing has been conformed to 10*836.6MHz=8,366MHz.
2, All other emissions more than 30 dB below the limit.
3, Emission Level= Read Level+ Antenna Correct Factor +Cable Loss

Test mode:	PCS1900						
Channel:	Middle			Date of Test:	2016-08-16		
Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
	Polarization (H&V)	Read Level (dBm)	Antenna Correct Factor (dBi)	Cable Loss (dB)	Emission Level (dBm)		
3760.00	Horizontal	-46.21	14.70	6.12	-25.39	-13.00	Pass
5640.00	H	-47.68	13.67	7.86	-26.15		
7520.00	H	-54.16	14.27	9.54	-30.35		
9400.00	H	---	---	---	---		
11280.00	H	---	---	---	---		
13160.00	H	---	---	---	---		
3760.00	Vertical	-46.71	15.81	6.12	-24.78	-13.00	Pass
5640.00	V	-47.01	13.80	7.86	-25.35		
7520.00	V	-54.18	13.40	9.54	-31.24		
9400.00	V	---	---	---	---		
11280.00	V	---	---	---	---		
13160.00	V	---	---	---	---		

Test mode:	GPRS1900						
Channel:	Middle			Date of Test:	2016-08-16		
Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
	Polarization (H&V)	Read Level (dBm)	Antenna Correct Factor (dBi)	Cable Loss (dB)	Emission Level (dBm)		
3760.00	Horizontal	-46.21	14.70	6.12	-25.39	-13.00	Pass
5640.00	H	-47.68	13.67	7.86	-26.15		
7520.00	H	-54.16	14.27	9.54	-30.35		
9400.00	H	---	---	---	---		
11280.00	H	---	---	---	---		
13160.00	H	---	---	---	---		
3760.00	Vertical	-46.71	15.81	6.12	-24.78	-13.00	Pass
5640.00	V	-47.01	13.80	7.86	-25.35		
7520.00	V	-54.18	13.40	9.54	-31.24		
9400.00	V	---	---	---	---		
11280.00	V	---	---	---	---		
13160.00	V	---	---	---	---		

Remark: 1, The testing has been conformed to 10*1880.0MHz=18,800MHz.
2, All other emissions more than 30 dB below the limit.
3, Emission Level= Read Level+ Antenna Correct Factor +Cable Loss

------End of Report------