



# ***TT210 FCC Part 22 & 24 Test Report***

*June 27, 2011*

**80-JC010-1 Rev A**





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TT210 FCC Part 22 & 24 Test Report

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# TT210 FCC Part 22 & 24 Test Report

<b>FCC Part 22&amp; 24 Certification</b>	
FCC ID:	<b>J9CTT210Q1WW</b>
Model:	<b>TT210</b>

<b>STATEMENT OF CERTIFICATION</b>	
<i>The data, data evaluation and equipment configuration represented herein are a true and accurate representation of the measurements of the sample's radio frequency interference emissions characteristics as of the dates and at the times of the test under the conditions herein specified.</i>	
Test performed by:	QUALCOMM Incorporated 5775 Morehouse Drive San Diego, CA 92121-1714
Report Prepared by:	QUALCOMM Incorporated 5775 Morehouse Drive San Diego, CA 92121-1714
Tests that required an OATS site were performed by CETECOM.	

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## ***1. Introduction and Purpose***

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This document provides FCC test data for the Qualcomm TT210 Trailer Tracks device. The test results included in this report are limited to conducted test results. Radiated testing was performed at CETECOM Germany, and the test results are contained in the TT210 FCC Part 22 & 24 Radiated Test Report.

## ***2. Description of Device Under Test***

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The Trailer Tracks service is the Qualcomm wireless system for identifying and locating trailers and containers for the trucking industry. This service provides cost-effective wireless status monitoring and management of trailers and containers. The TT210 system sends status information over-the-air (OTA) to the customer using WWAN functionality. The Trailer Tracks service is a comprehensive, end-to-end trailer/container identification and location system, consisting of rugged mobile hardware, reliable network services, robust host software, and extensive data integration capabilities. The DUT is a pre-production sample.

### 3. Test Result Summary

FCC/IC Rule	Description of Test	Result	Page
§2.1046	RF Power Output	Complies	3
§2.1049	Occupied Bandwidth	Complies	5
§22.359, 24.238, 27.53(g)	Block Edge Requirement	Complies	12
§2.1051, 22.917, 24.238(a), 27.53	Out of Band Emission at Antenna Terminals	Complies	17
§2.1055, 22.355, 24.235, 27.54	Frequency Stability vs. Temperature vs. Voltage	Complies	46
§1.1310, 2.1091	RF Exposure	Complies	See MPE Report
§2.1053, 22.917, 24.238(a), 27.55	Field Strength of Spurious Radiation	Complies	See Radiated Test Report

## 4. RF Power Output Verification

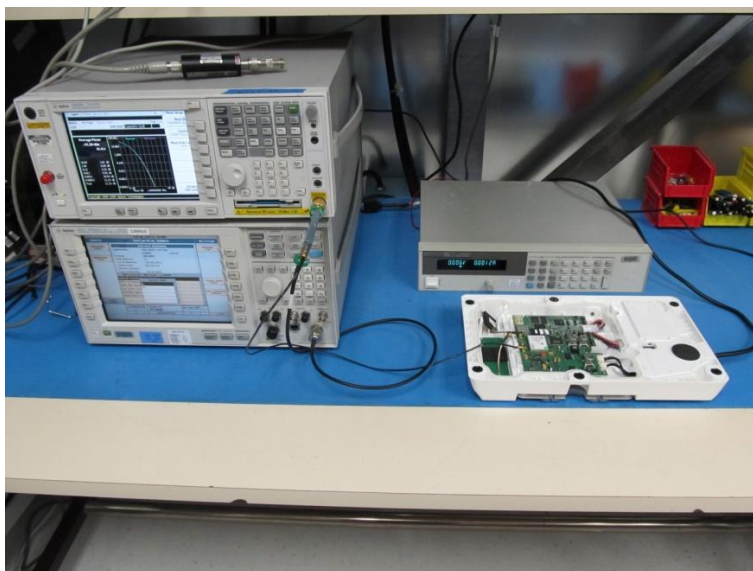
<b>FCC:</b>	§ 2.1046
<b>Limit:</b>	n/a
<b>DUT SN</b>	121000668

### 4.1 Measurement Procedures

As shown in the figures below, connect the transmitter output of the TT210 module to the communication test set (Agilent 8960) and PSA Spectrum Analyzer and configure it to operate at maximum power in a call. Measure the power at three equally spaced operating frequencies for each band.

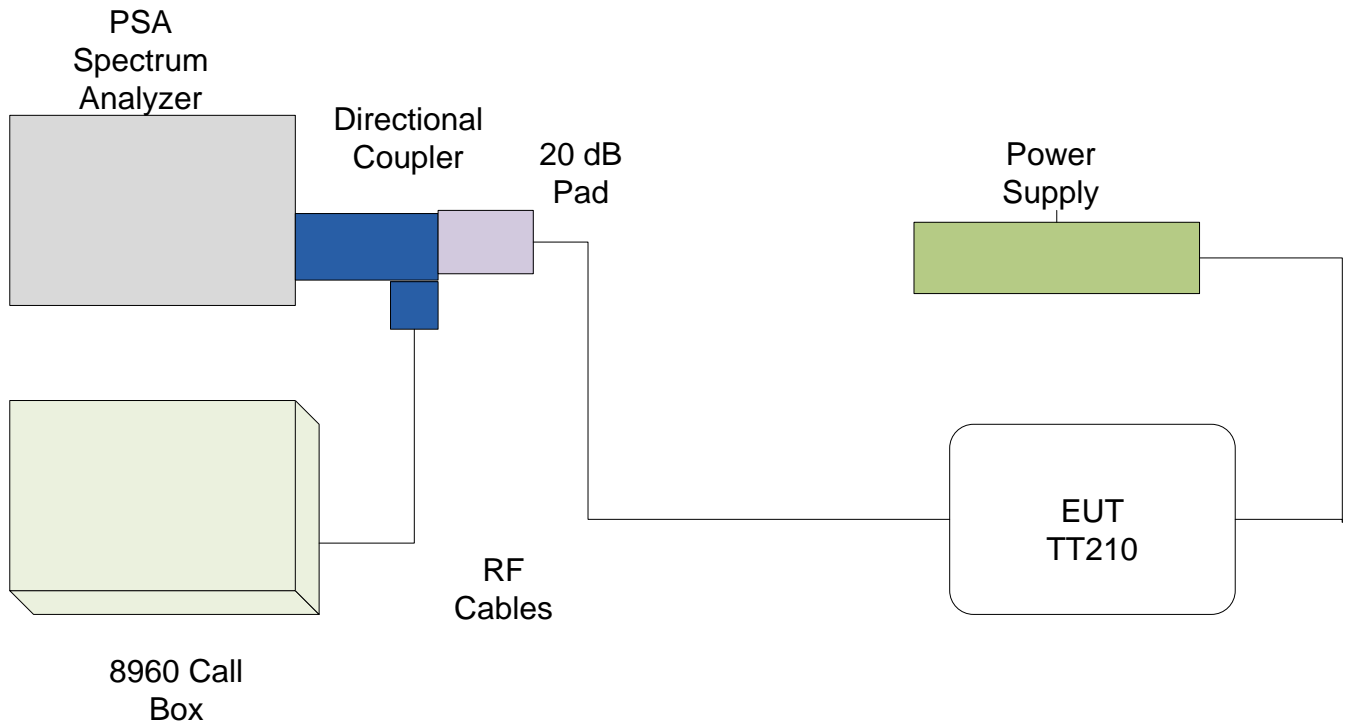
The relevant cable loss is measured for the specific frequencies under test and added as a correction factor for all the tests.

**Figure 1 Conducted Test Setup Photo**





**Figure 2 Conducted Test Setup Diagram**



**4.2 Test Results**

GSM/GPRS

Mode	GSM850 Channel Power (dBm)			GSM1900 Channel Power (dBm)			Peak/Average
	128	190	251	512	661	810	
<b>GSM (1UL Slot)</b>	32.37	32.26	32.44	29.77	30.23	30.14	<b>Peak</b>
<b>GSM (1UL Slot)</b>	22.54	22.15	22.73	21.02	20.87	20.44	<b>Average</b>
<b>GPRS (2 UL slots)</b>	32.51	32.39	32.53	29.37	29.65	29.44	<b>Peak</b>
<b>GPRS (2 UL slots)</b>	25.45	25.67	25.12	23.77	23.56	23.24	<b>Average</b>

## 5. Occupied Bandwidth

<b>FCC:</b>	§2.1049
<b>Limit:</b>	n/a
<b>DUT SN</b>	121000668
<b>Modes Tested</b>	GSM/GPRS (2 UL Slots)

### 5.1 Test Procedures

As the figure below indicates, the transmitter output is connected to a calibrated coaxial cable and coupler. The other end of coupler was connected to the spectrum analyzer. Measured the occupied bandwidth (defined as the 99% power bandwidth) with the appropriate personality features integrated in the PSA.

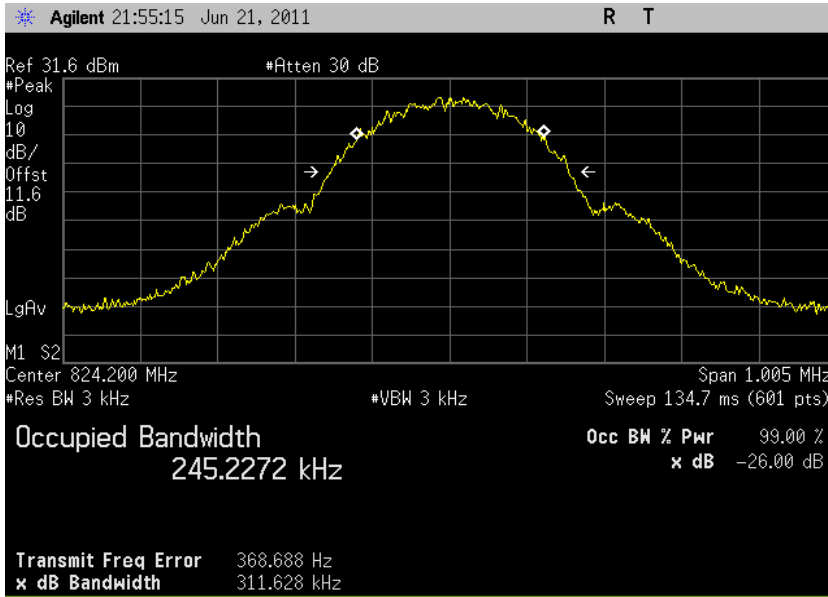
### 5.2 Test Results

The occupied bandwidth was measured at low, mid and high channel in each band.

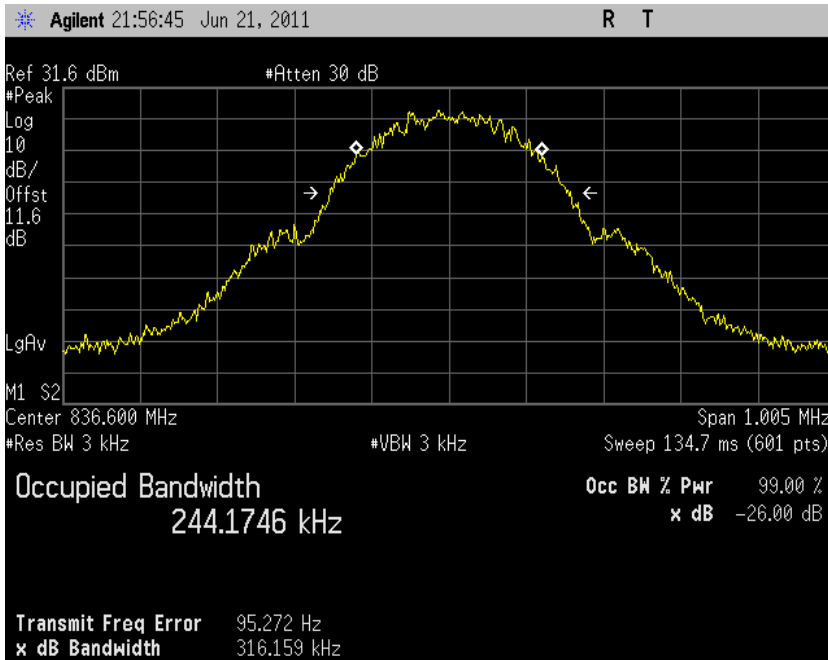
Mode	Frequency (MHz)	Channel	99% Occupied Bandwidth (kHz)	Corresponding Plot number
<b>GSM/GMSK</b>	<b>824.2</b>	<b>128 (low)</b>	245.23	Plot 5.2 - 1
	<b>836.6</b>	<b>190 (mid)</b>	244.17	Plot 5.2 - 2
	<b>848.8</b>	<b>251 (high)</b>	242.38	Plot 5.2 - 3
	<b>1850.2</b>	<b>512 (low)</b>	246.66	Plot 5.2 - 4
	<b>1880</b>	<b>661 (mid)</b>	244.14	Plot 5.2 - 5
	<b>1909.8</b>	<b>810 (high)</b>	244.30	Plot 5.2 - 6
<b>GPRS/GMSK</b>	<b>824.2</b>	<b>128 (low)</b>	239.60	Plot 5.2 - 7
	<b>836.6</b>	<b>190 (mid)</b>	240.81	Plot 5.2 - 8
	<b>848.8</b>	<b>251 (high)</b>	238.63	Plot 5.2 - 9
	<b>1850.2</b>	<b>512 (low)</b>	240.87	Plot 5.2 - 10
	<b>1880</b>	<b>661 (mid)</b>	237.98	Plot 5.2 - 11
	<b>1909.8</b>	<b>810 (high)</b>	237.38	Plot 5.2 - 12

### 5.3 Plots

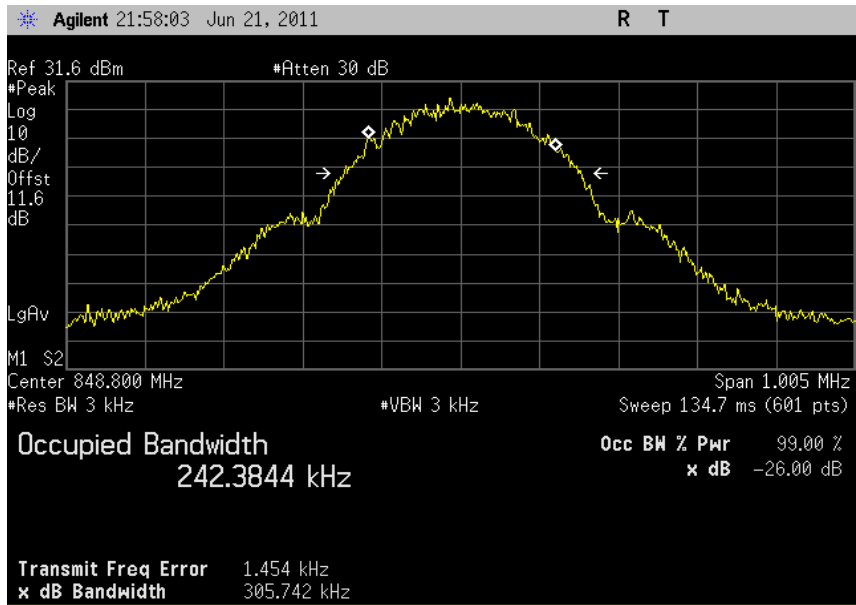
Plot 5.2 -1 ( Ch128, GSM GMSK)



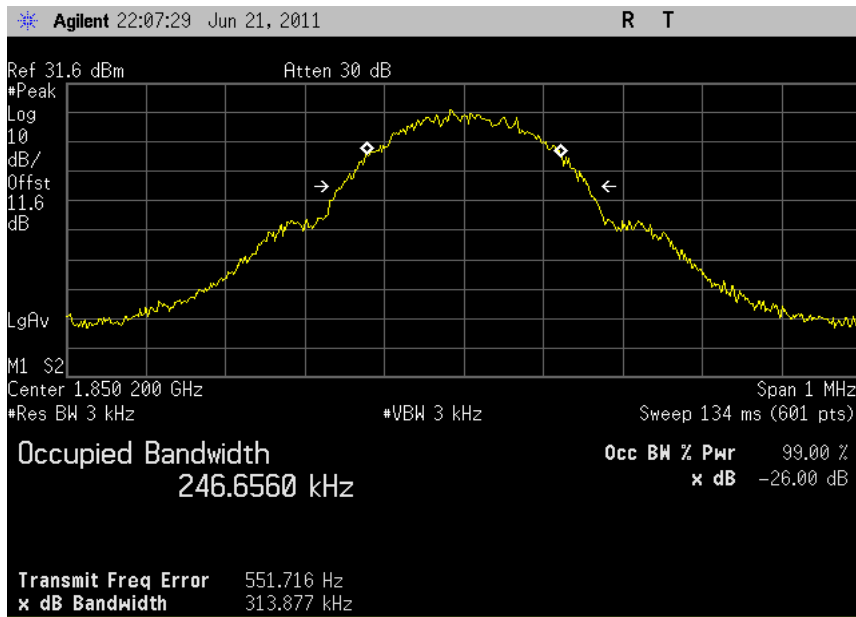
Plot 5.2-2 (Ch. 190, GSM GMSK)



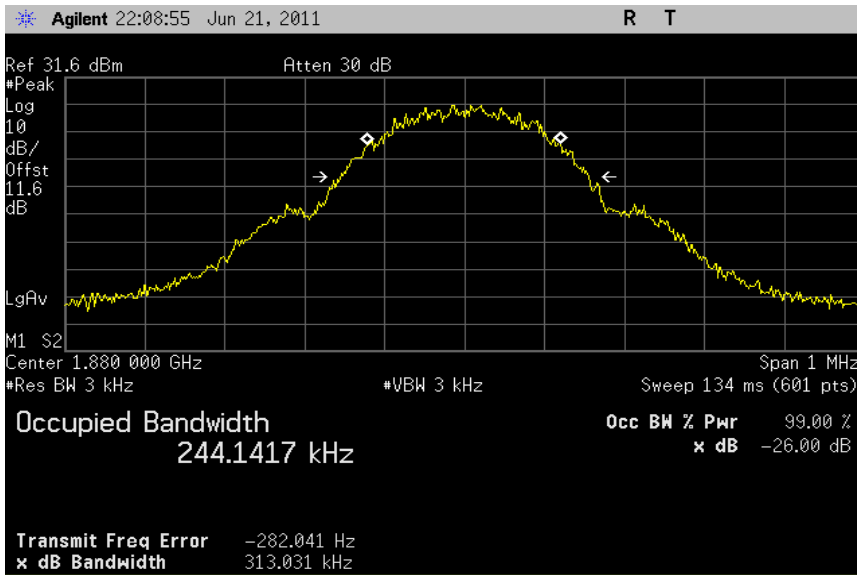
Plot 5.2-3 (Ch. 251, GSM GMSK)



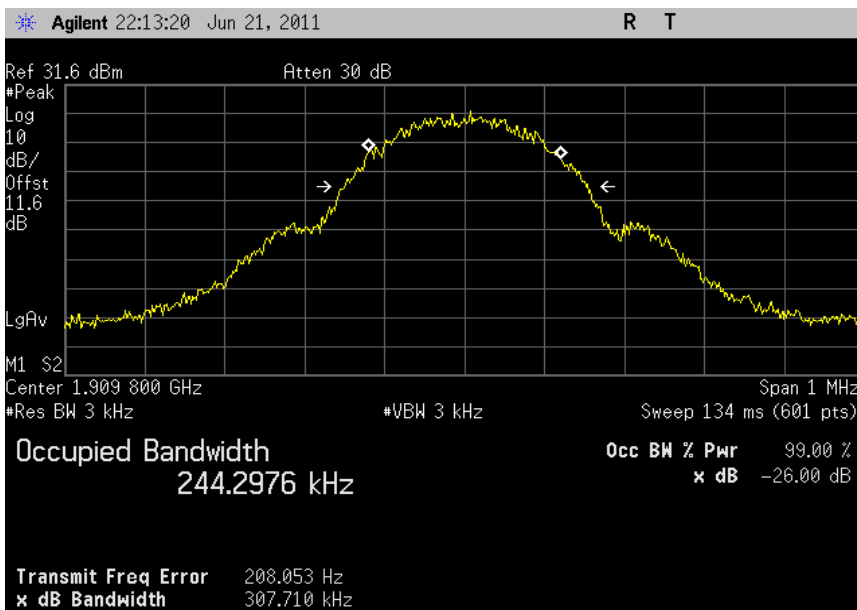
Plot 5.2-4 (Ch. 512, GSM GMSK)



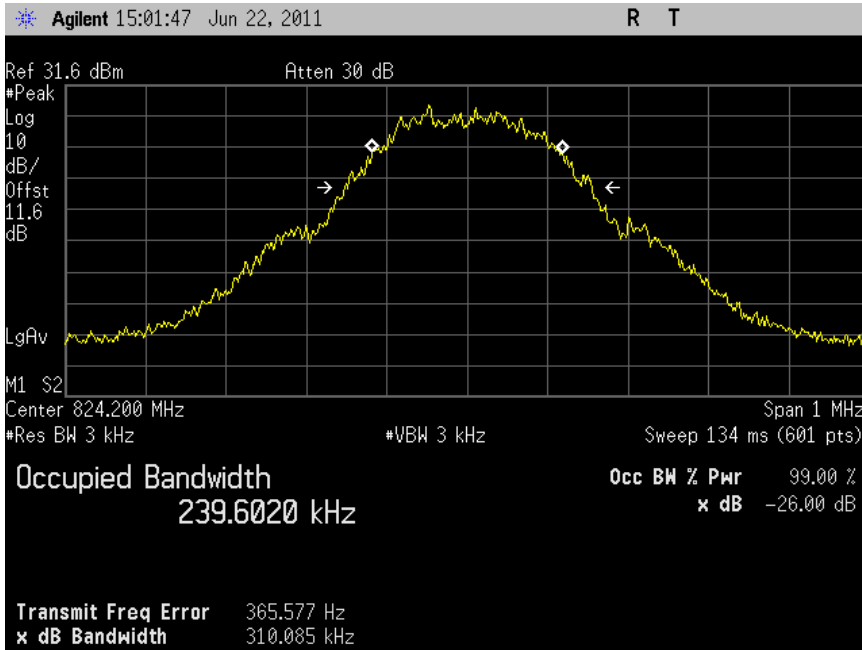
Plot 5.2-5 (Ch. 661, GSM GMSK)



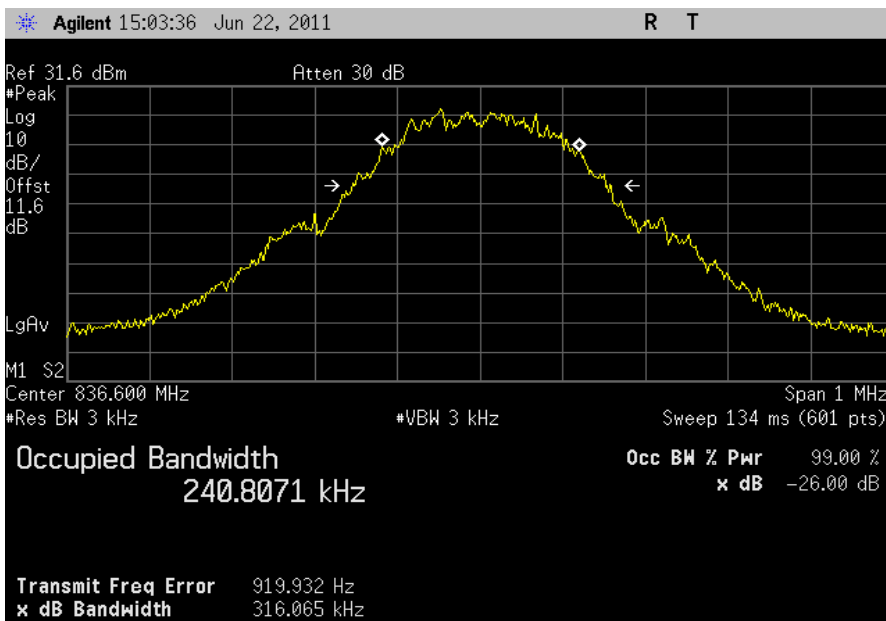
Plot 5.2-6 (Ch. 810, GSM GMSK)



Plot 5.2-7 (Ch. 128, GPRS GMSK)



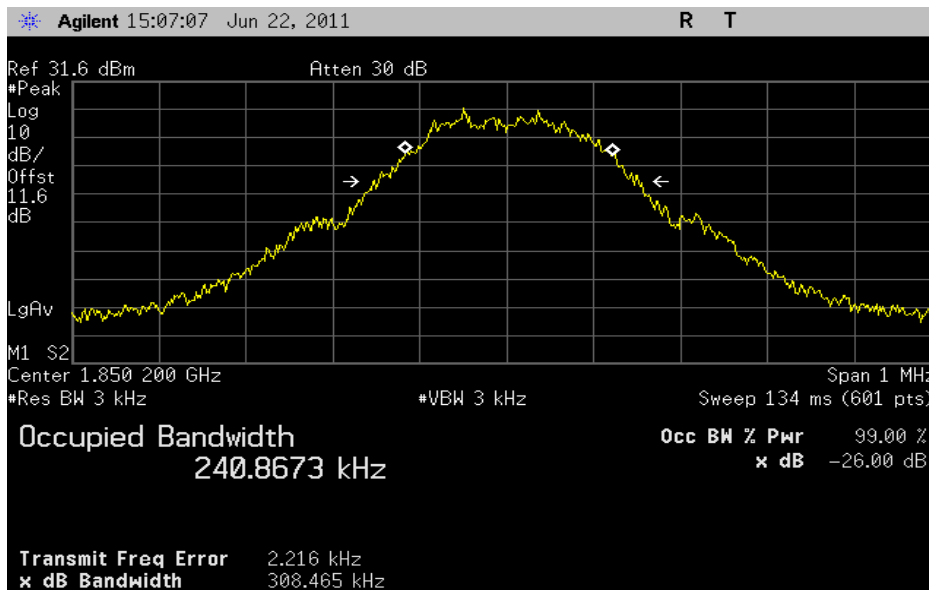
Plot 5.2-8 (Ch. 190, GPRS GMSK)



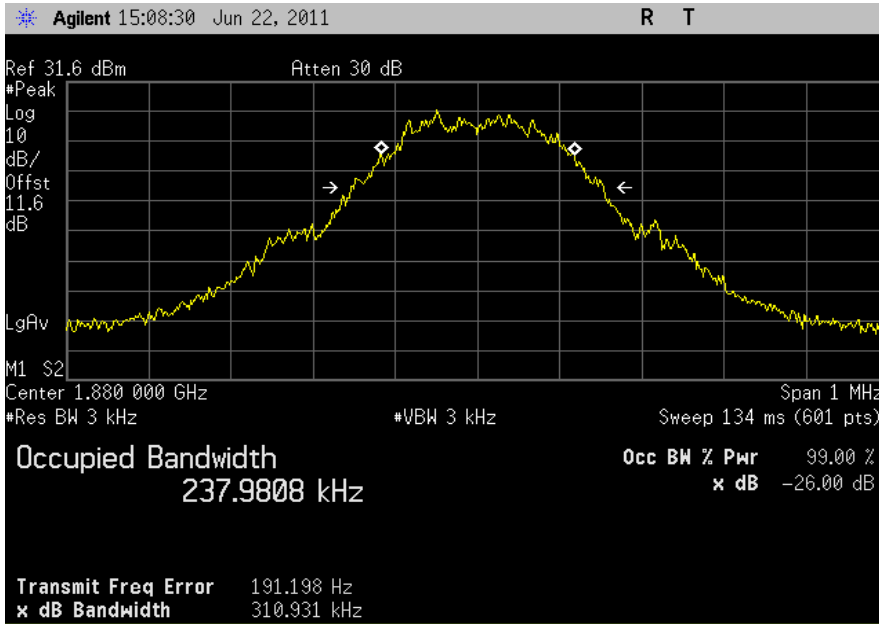
Plot 5.2-9 (Ch. 251, GPRS GMSK)



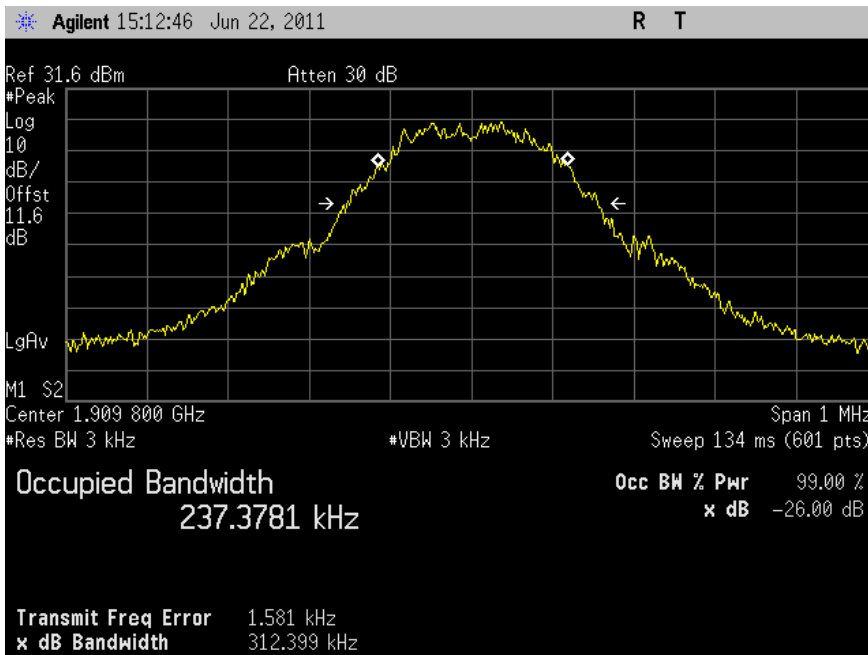
Plot 5.2-10 (Ch. 512, GPRS GMSK)



Plot 5.2-11 (Ch. 661, GPRS GMSK)



Plot 5.2-12 (Ch. 810, GPRS GMSK)





## 6. Block Edge Compliance

<b>FCC:</b>	§22.359, 24.238, 27.53(g)
<b>Limit:</b>	-13dBm
<b>DUT SN</b>	121000668
<b>Modes Tested</b>	GSM /GPRS (2 UL)

### 6.1 Test Procedures

As shown in Figure below, connected the RF output to the 8960; configured the TT210 to operate at maximum power. The block edge emissions are measured at the required operating frequencies in each band on the spectrum analyzer.

For each block edge measurement:

Set the spectrum analyzer span to include the block edge frequency (824, 848, 1850, 1910 MHz)

Set a marker to point the corresponding block edge frequency in each test case

Set display line at -13dBm

Set resolution bandwidth to at least 1% of emission BW (3kHz)

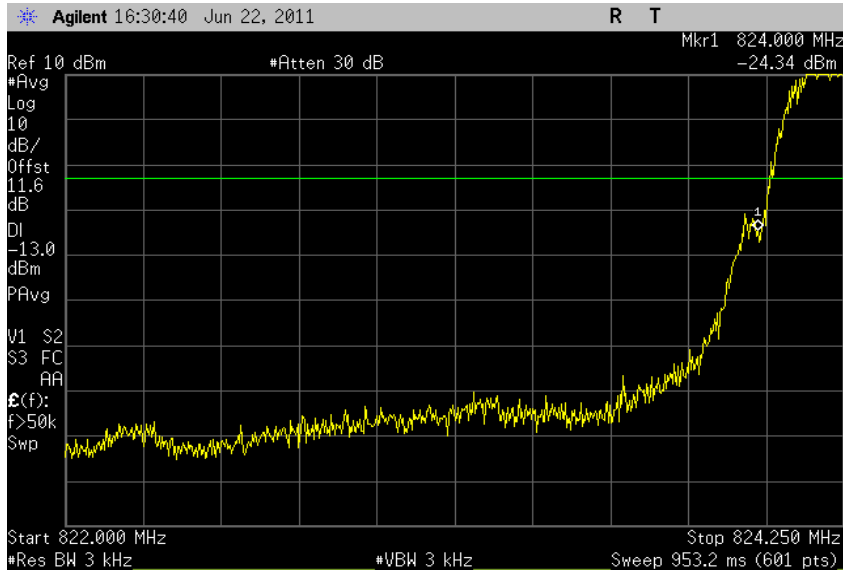
### 6.2 Test Results

The test was conducted at block edges in each band.

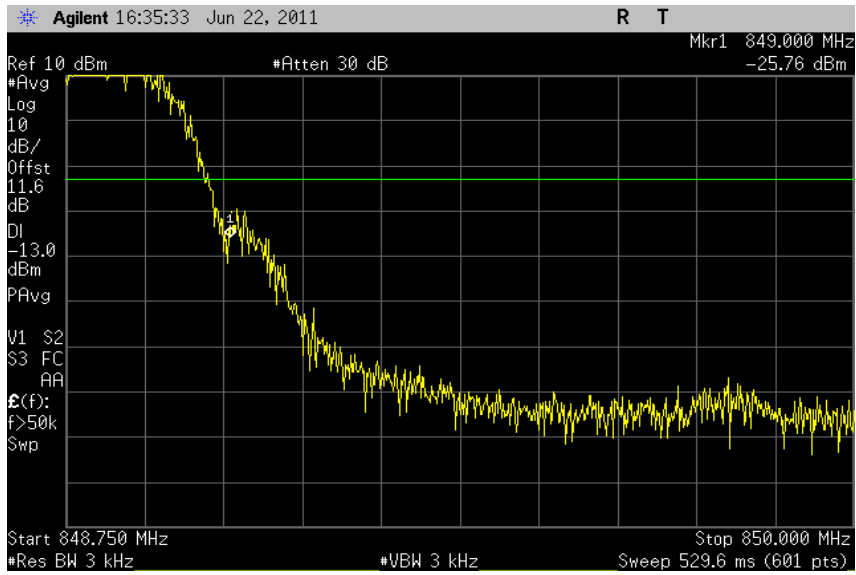
Mode	Frequency (MHz)	Channel Tested	Corresponding Plot number	Test Result
GSM/GMSK	824	128 (low)	Plot 6.2 - 1	Complies
	849	251 (high)	Plot 6.2 - 2	Complies
	1850	512 (low)	Plot 6.2 - 3	Complies
	1910	810 (high)	Plot 6.2 - 4	Complies
GPRS/GMSK	824	128 (low)	Plot 6.2 - 5	Complies
	849	251 (high)	Plot 6.2 - 6	Complies
	1850	512 (low)	Plot 6.2 - 7	Complies
	1910	810 (high)	Plot 6.2 - 8	Complies

Plots

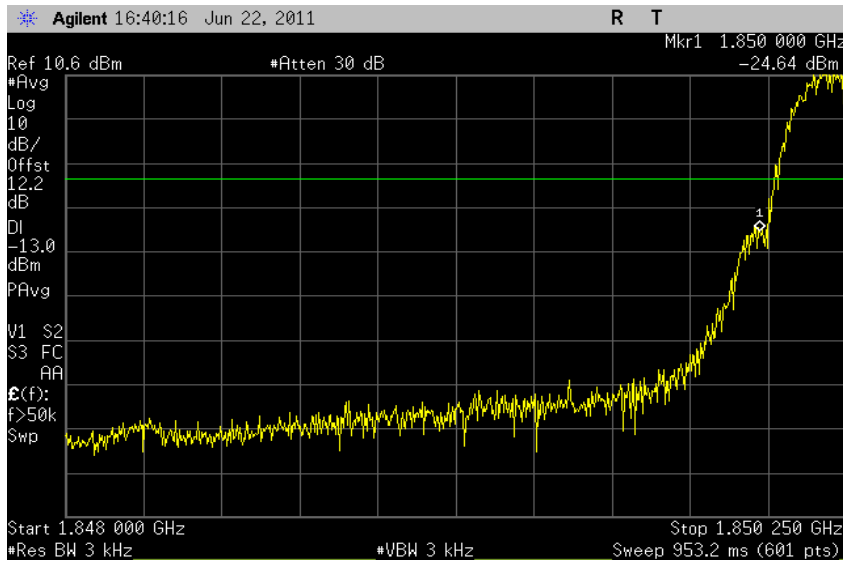
Plot 6.2 - 1 (Ch128, GSM GMSK)



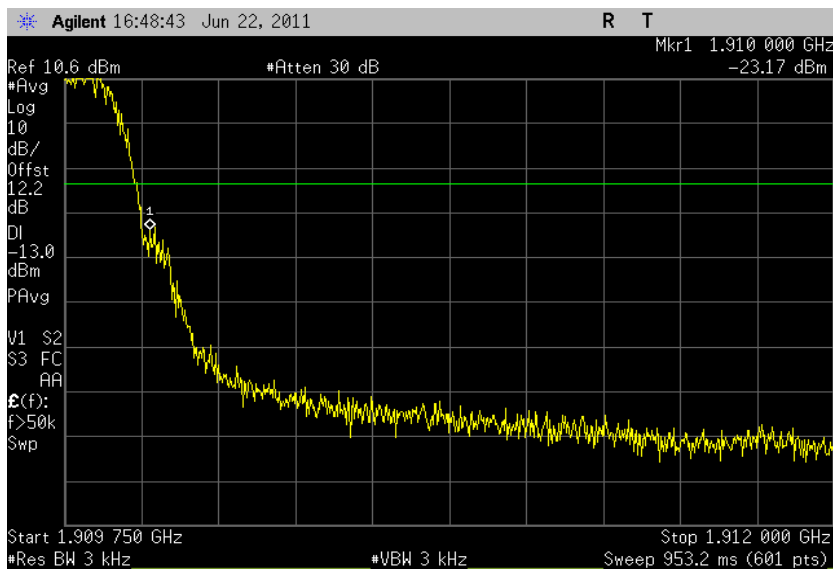
Plot 6.2 - 2 (Ch251, GSM GMSK)



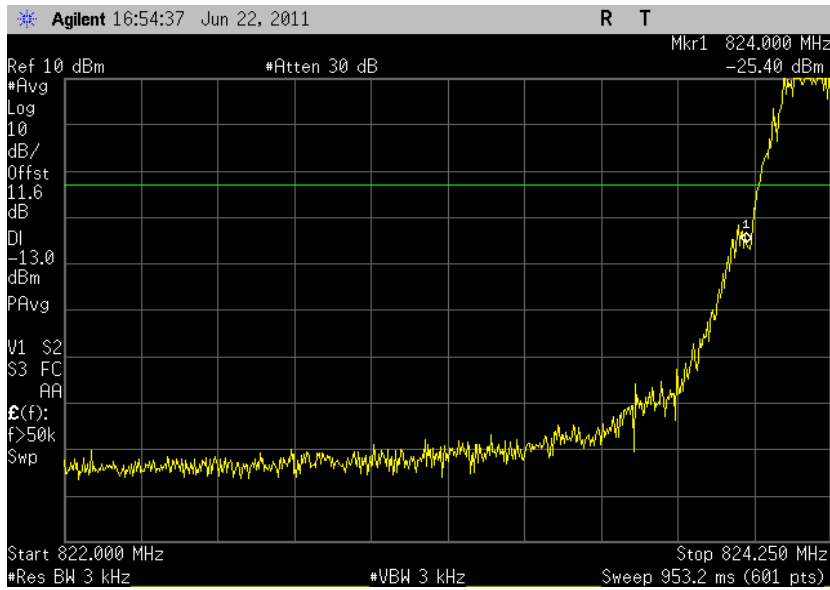
Plot 6.2 - 3 (Ch512, GSM GMSK)



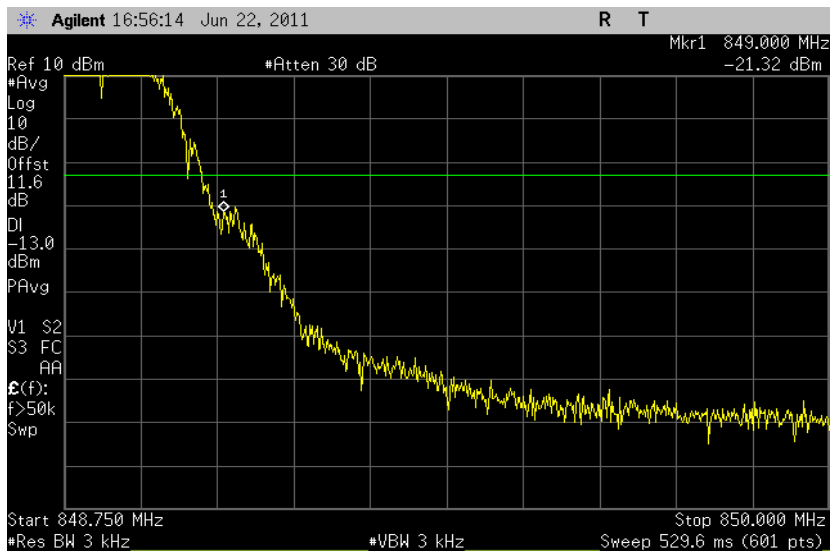
Plot 6.2 - 4 (Ch810, GSM GMSK)



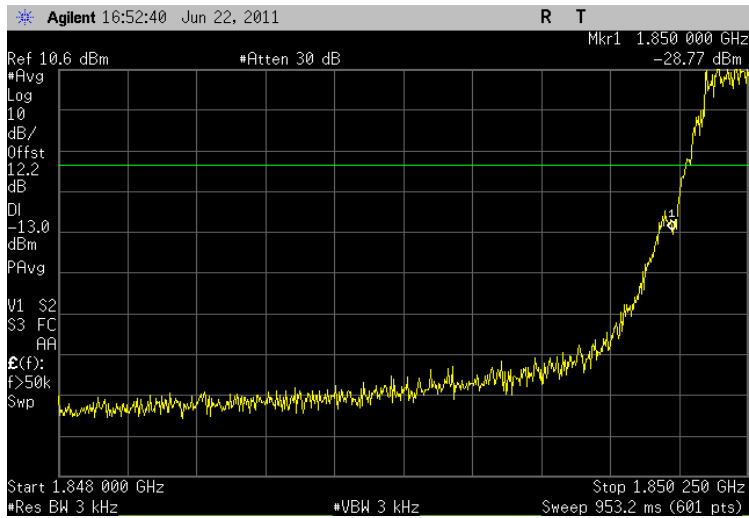
Plot 6.2 - 5 (Ch128, GPRS GMSK)



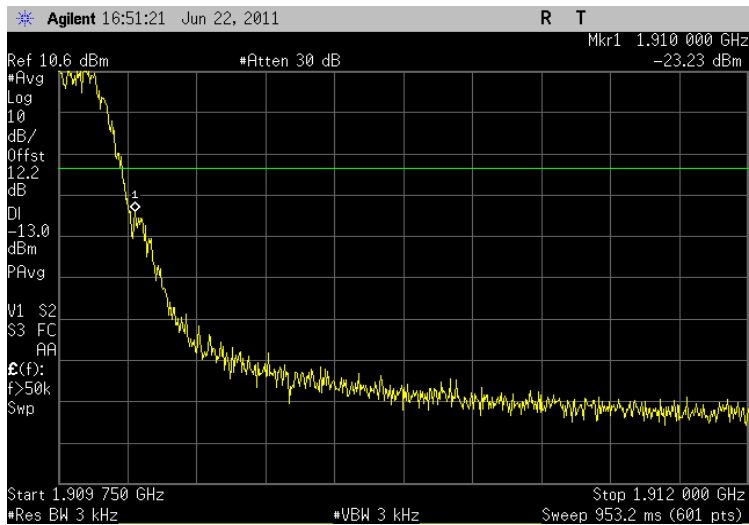
Plot 6.2 - 6 (Ch251, GPRS GMSK)



Plot 6.2 - 7 (Ch512, GPRS GMSK)



Plot 6.2 - 8 (Ch810, GPRS GMSK)



## ***7. Out of Band Emission at Antenna Terminals***

<b>FCC:</b>	§22.901(d), 22.917, 24.238 (a), 27.53
<b>Limit:</b>	-13dBm
<b>DUT SN</b>	121000668
<b>Modes Tested</b>	GSM /GPRS (2 UL)

### **7.1 Test Procedure**

As shown in the figure below, the RF output to the spectrum analyzer is connected through a calibrated coaxial cable. Scan the out-of-band emission up to 10<sup>th</sup> harmonics. Set RBW and VBW as 100 kHz for the measurement below 1GHz, and 1MHz for testing above 1GHz. The spectrum analyzer is set to max hold in order to capture the transmitter and transmitter harmonics within the trace sweeps.

**7.2 Test Results**

The test was conducted at low, mid and high channel in each band.

Test Result Summary- GSM Channels 128/190/251

Mode	Frequency Range Tested	Tx Channel	Corresponding Plot number	Test Result
GSM/GMSK	0 ~ 1 GHz	128	Plot 7.2 - 1	Complies
	1-5 GHz	128	Plot 7.2 - 2	Complies
	5-10 GHz	128	Plot 7.2 - 3	Complies
	10-20 GHz	128	Plot 7.2 - 4	Complies
	0 ~ 1 GHz	190	Plot 7.2 - 5	Complies
	1-5 GHz	190	Plot 7.2 - 6	Complies
	5-10 GHz	190	Plot 7.2 - 7	Complies
	10-20 GHz	190	Plot 7.2 - 8	Complies
	0 ~ 1 GHz	251	Plot 7.2 - 9	Complies
	1-5 GHz	251	Plot 7.2 - 10	Complies
	5-10 GHz	251	Plot 7.2 - 11	Complies
	10-20 GHz	251	Plot 7.2 - 12	Complies

**7.3 Test Result Summary- GSM Channels 512/661/810**

Mode	Frequency Range Tested	Tx Channel	Corresponding Plot number	Test Result
GSM/GMSK	0 ~ 1 GHz	512	Plot 7.2 – 13	Complies
	1-5 GHz	512	Plot 7.2 – 14	Complies
	5-10 GHz	512	Plot 7.2 – 15	Complies
	10-20 GHz	512	Plot 7.2 – 16	Complies
	0 ~ 1 GHz	661	Plot 7.2 – 17	Complies
	1-5 GHz	661	Plot 7.2 – 18	Complies
	5-10 GHz	661	Plot 7.2 – 19	Complies
	10-20 GHz	661	Plot 7.2 – 20	Complies
	0 ~ 1 GHz	810	Plot 7.2 – 21	Complies
	1-5 GHz	810	Plot 7.2 – 22	Complies
	5-10 GHz	810	Plot 7.2 – 23	Complies
	10-20 GHz	810	Plot 7.2 - 24	Complies



**7.4 Test Result Summary- GPRS Channels 128/190/251**

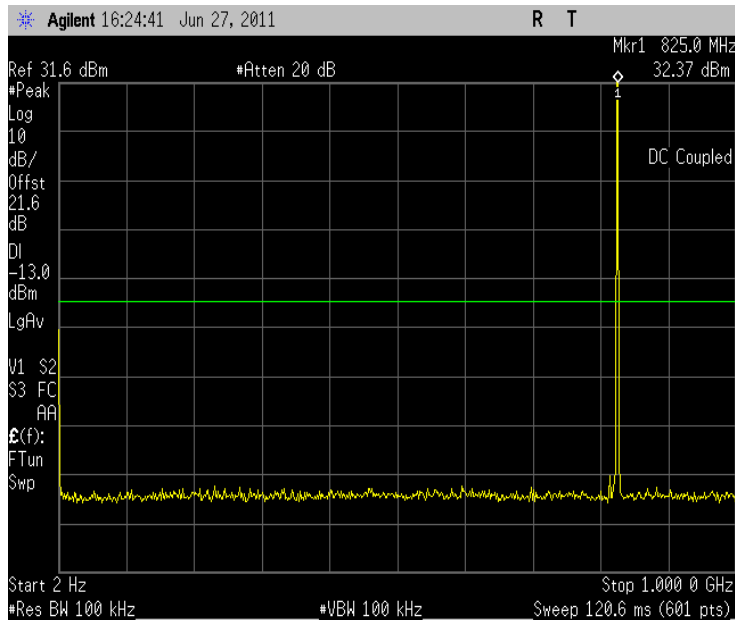
Mode	Frequency Range Tested	Tx Channel	Corresponding Plot number	Test Result
GPRS/GMSK	0 ~ 1 GHz	128	Plot 7.2 – 25	Complies
	1-5 GHz	128	Plot 7.2 – 26	Complies
	5-10 GHz	128	Plot 7.2 – 27	Complies
	10-20 GHz	128	Plot 7.2 – 28	Complies
	0 ~ 1 GHz	190	Plot 7.2 – 29	Complies
	1-5 GHz	190	Plot 7.2 – 30	Complies
	5-10 GHz	190	Plot 7.2 – 31	Complies
	10-20 GHz	190	Plot 7.2 – 32	Complies
	0 ~ 1 GHz	251	Plot 7.2 – 33	Complies
	1-5 GHz	251	Plot 7.2 – 34	Complies
	5-10 GHz	251	Plot 7.2 – 35	Complies
	10-20 GHz	251	Plot 7.2 - 36	Complies

**7.5 Test Result Summary- GPRS Channels 512/661/810**

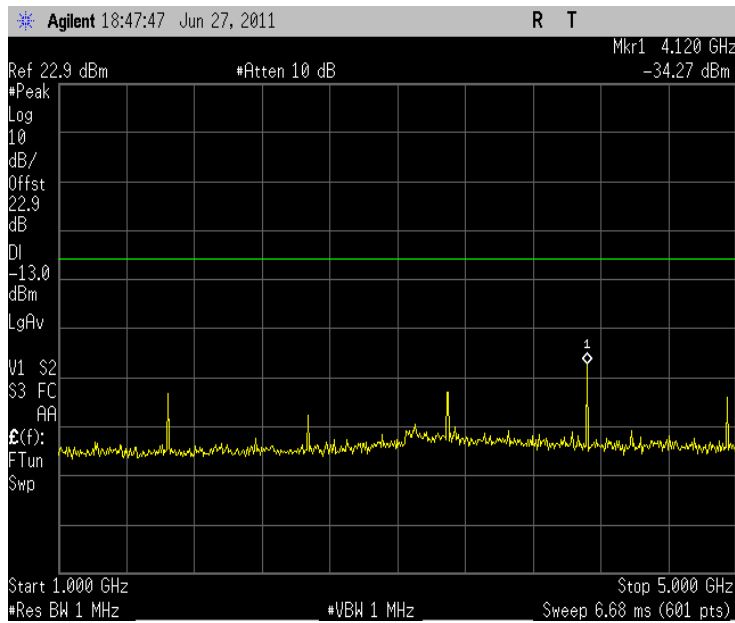
Mode	Frequency Range Tested	Tx Channel	Corresponding Plot number	Test Result
GPRS/GMSK	0 ~ 1 GHz	512	Plot 7.2 – 37	Complies
	1-5 GHz	512	Plot 7.2 – 38	Complies
	5-10 GHz	512	Plot 7.2 – 39	Complies
	10-20 GHz	512	Plot 7.2 – 40	Complies
	0 ~ 1 GHz	661	Plot 7.2 – 41	Complies
	1-5 GHz	661	Plot 7.2 – 42	Complies
	5-10 GHz	661	Plot 7.2 – 43	Complies
	10-20 GHz	661	Plot 7.2 – 44	Complies
	0 ~ 1 GHz	810	Plot 7.2 – 45	Complies
	1-5 GHz	810	Plot 7.2 – 46	Complies
	5-10 GHz	810	Plot 7.2 – 47	Complies
	10-20 GHz	810	Plot 7.2 - 48	Complies

## 7.6 Plots

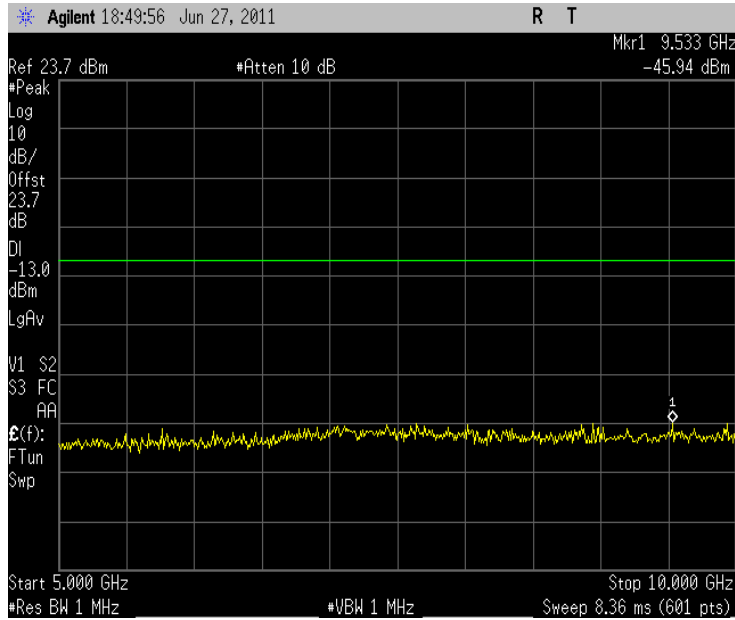
Plot 7.2 - 1 (GSM/GMSK Ch128)



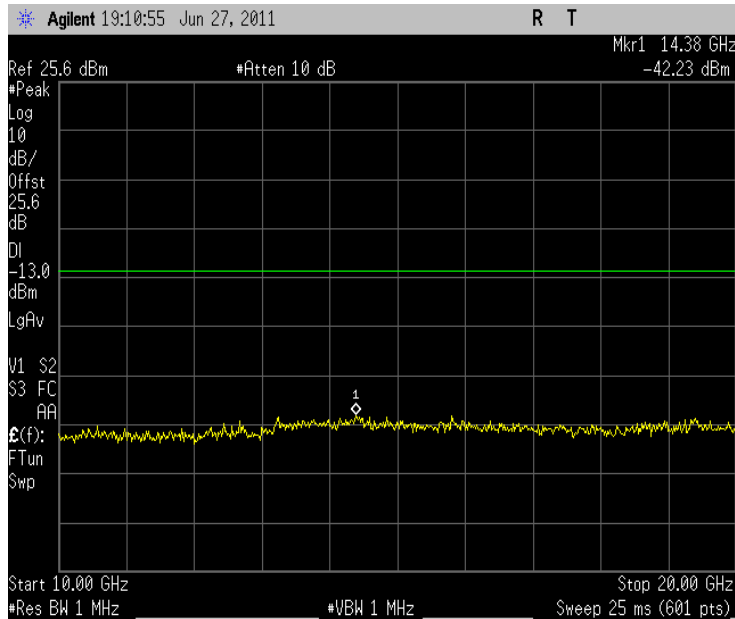
Plot 7.2 - 2 (GSM/GMSK Ch128)



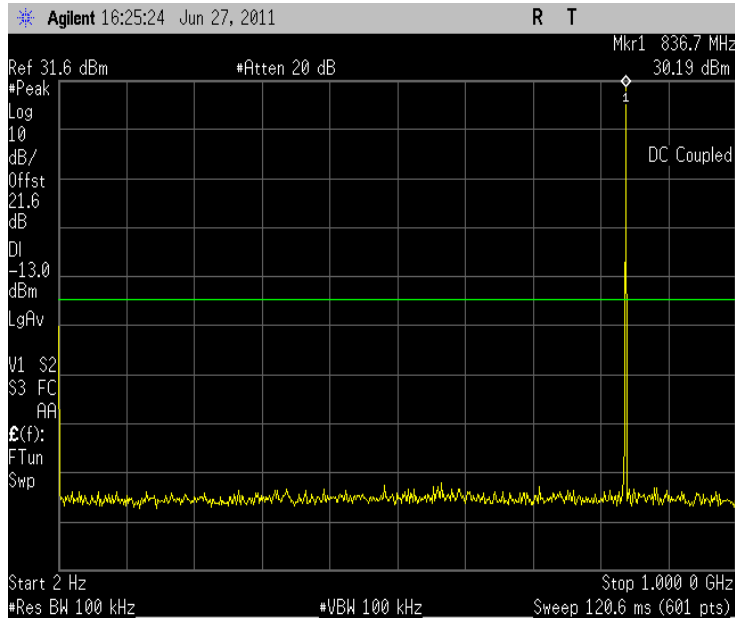
Plot 7.2 - 3 (GSM/GMSK Ch128)



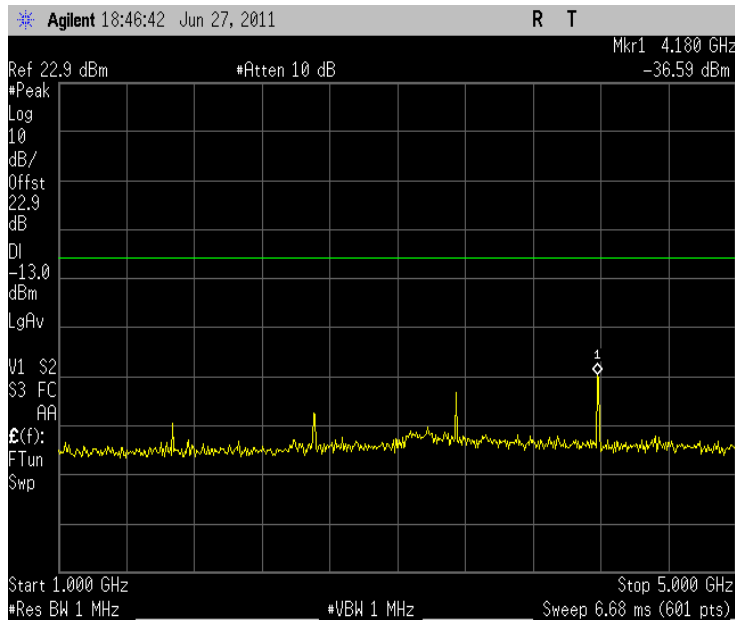
Plot 7.2 - 4 (GSM/GMSK Ch128)



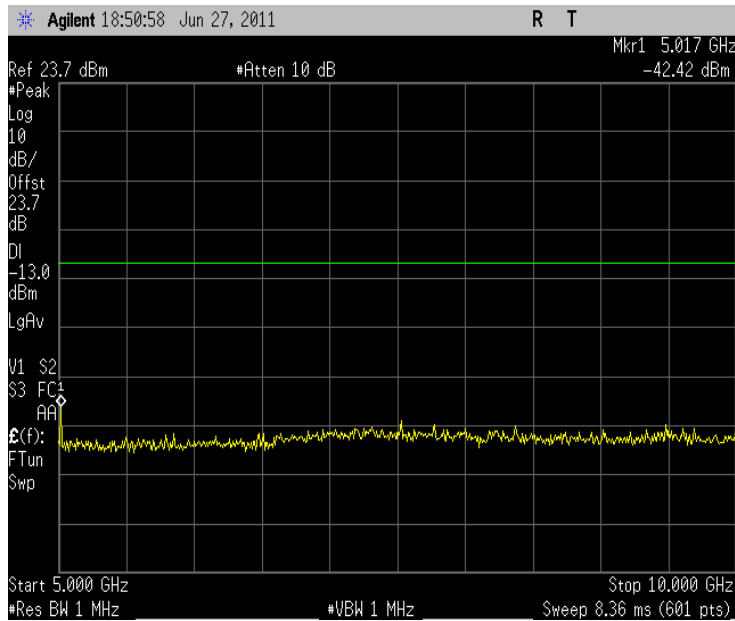
Plot 7.2 - 5 (GSM/GMSK Ch190)



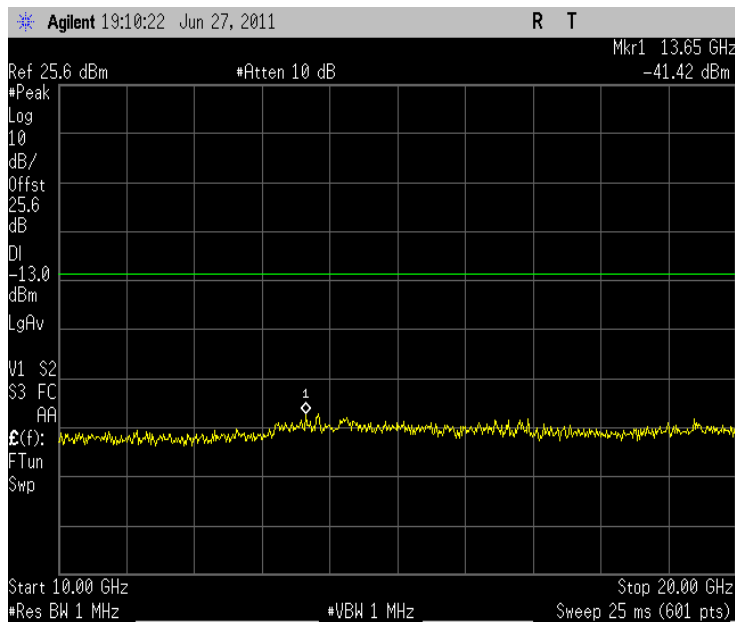
Plot 7.2 - 6 (GSM/GMSK Ch190)



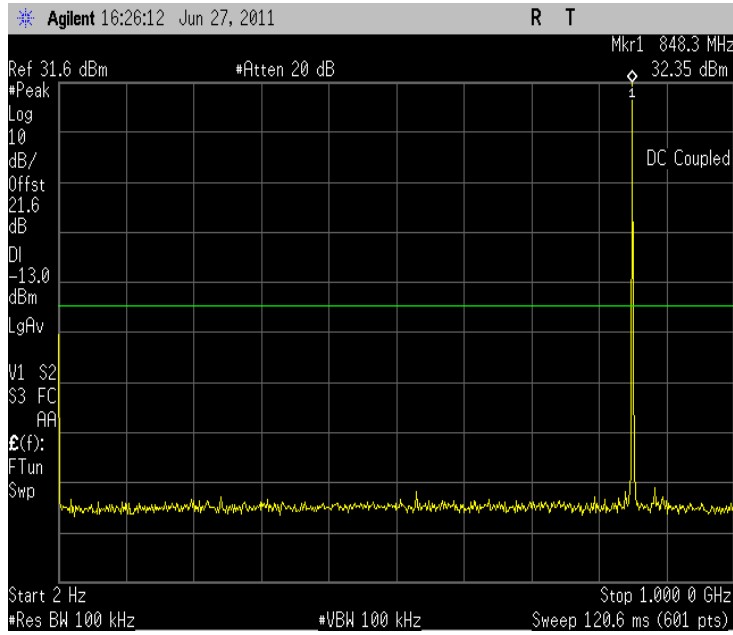
Plot 7.2 - 7 (GSM/GMSK Ch190)



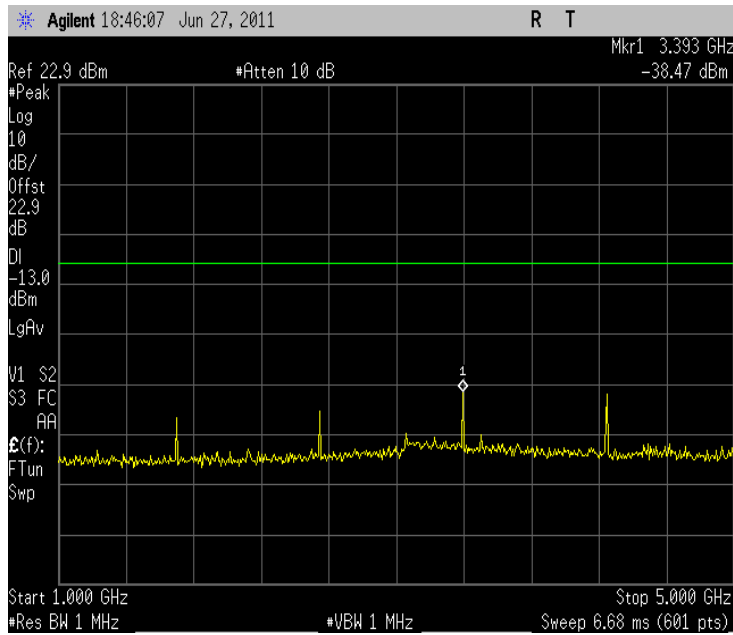
Plot 7.2 - 8 (GSM/GMSK Ch190)



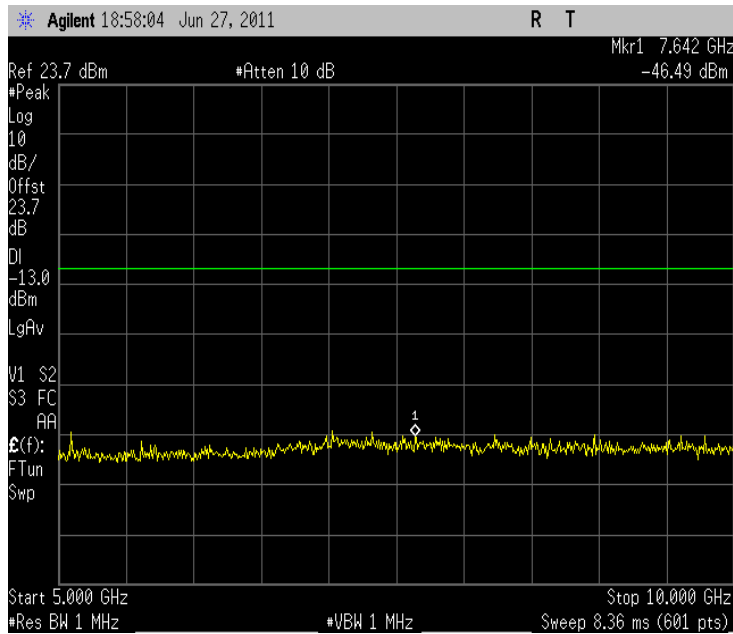
Plot 7.2 - 9 (GSM/GMSK Ch251)



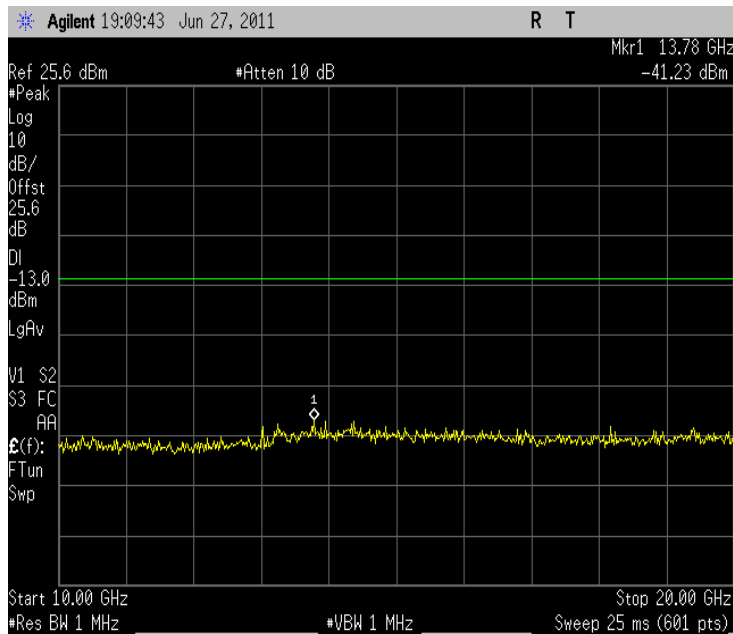
Plot 7.2 - 10 (GSM/GMSK Ch251)



Plot 7.2 - 11 (GSM/GMSK Ch251)

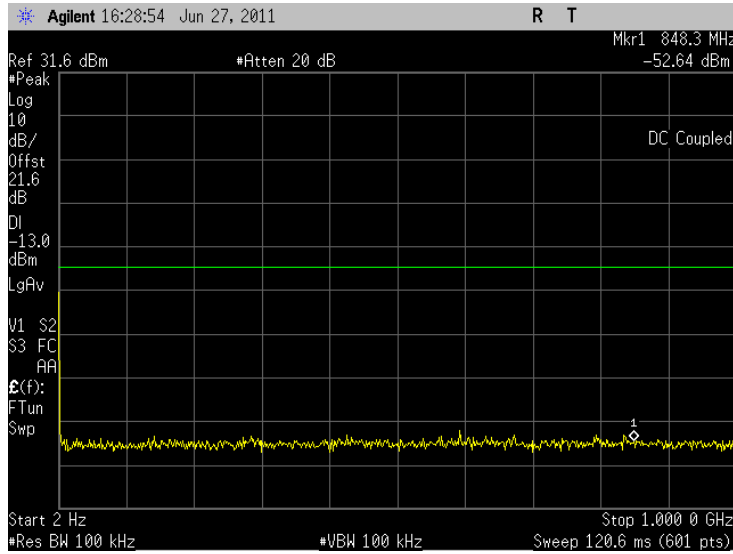


Plot 7.2 - 12 (GSM/GMSK Ch251)

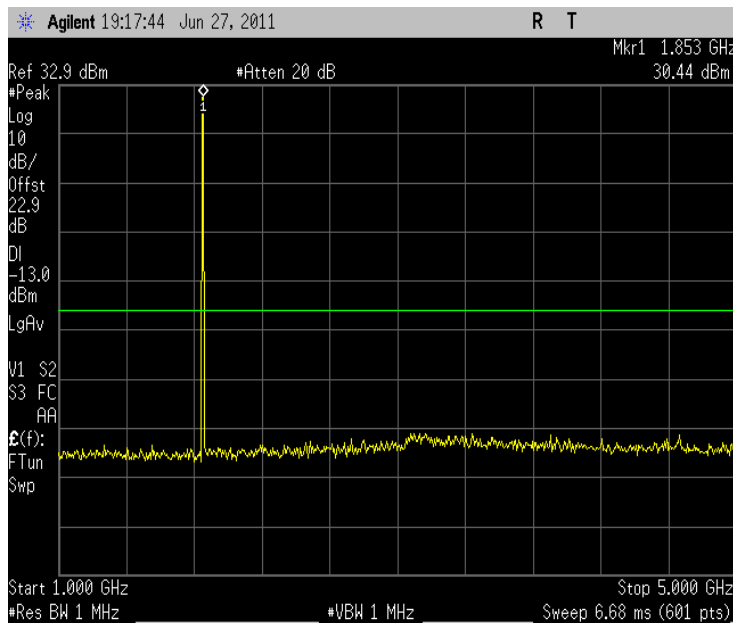




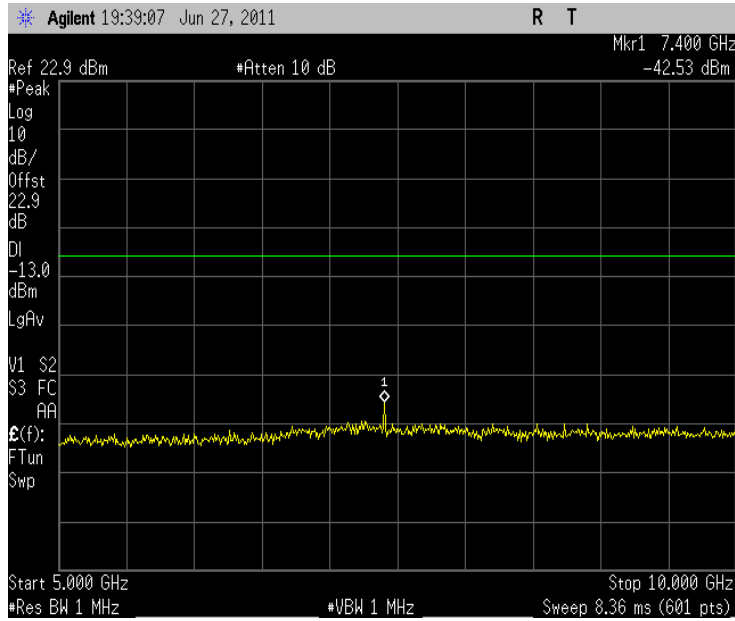
Plot 7.2 - 13 (GSM/GMSK Ch512)



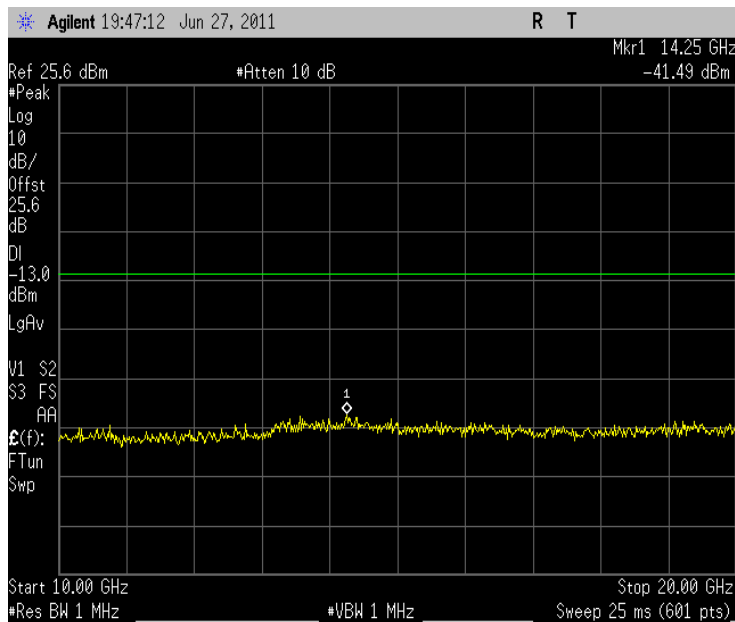
Plot 7.2 - 14 (GSM/GMSK Ch512)



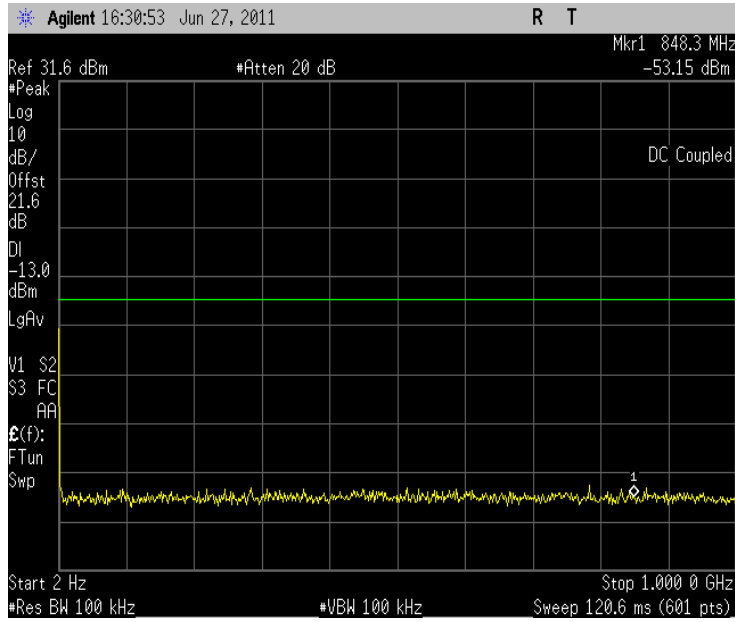
Plot 7.2 - 15 (GSM/GMSK Ch512)



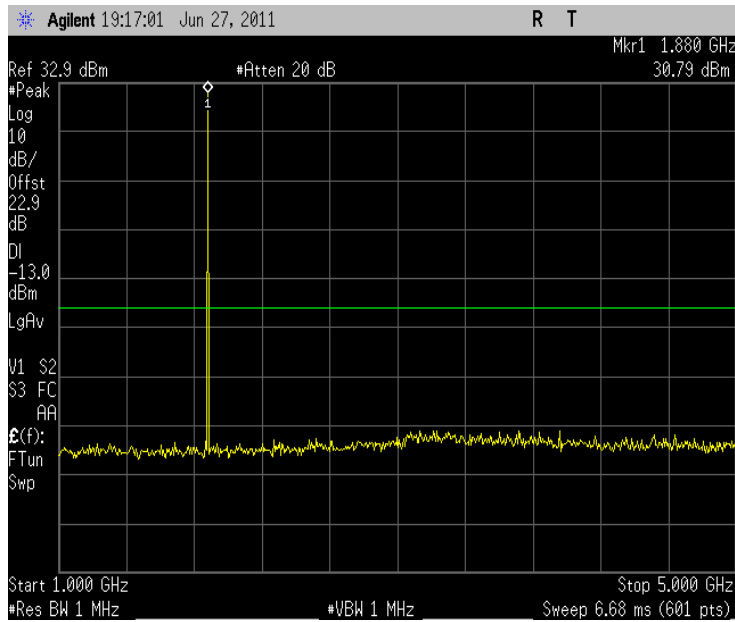
Plot 7.2 - 16 (GSM/GMSK Ch512)



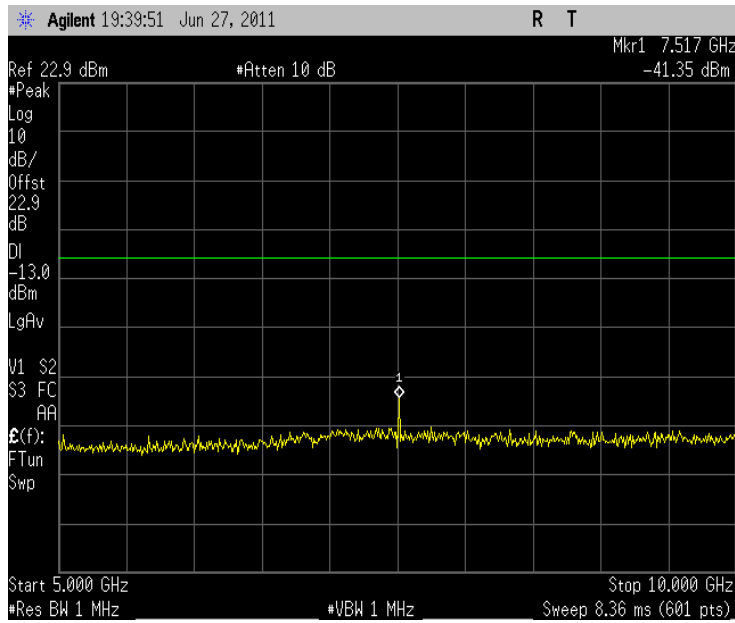
Plot 7.2 - 17 (GSM/GMSK Ch661)



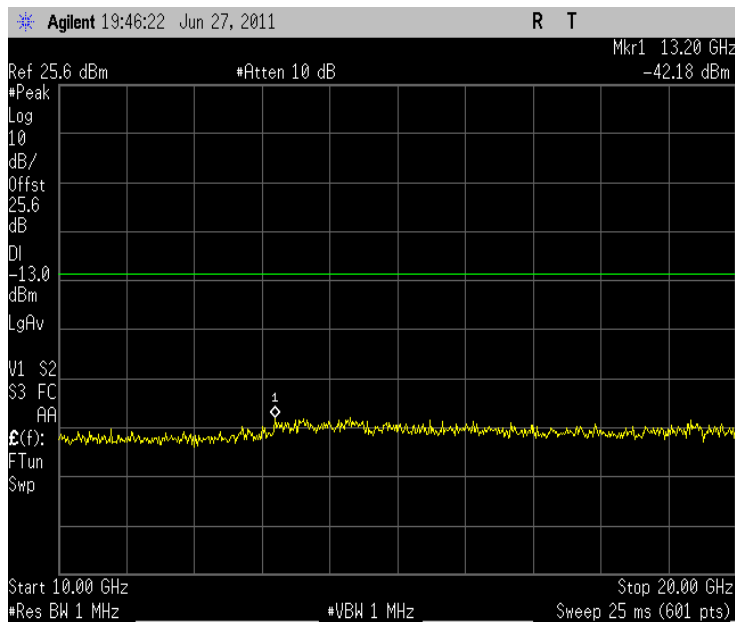
Plot 7.2 - 18 (GSM/GMSK Ch661)



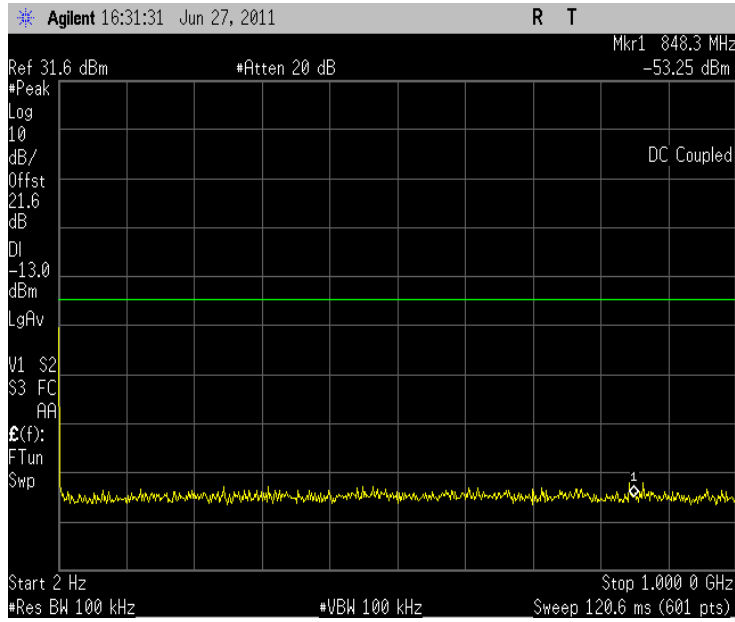
Plot 7.2 - 19 (GSM/GMSK Ch661)



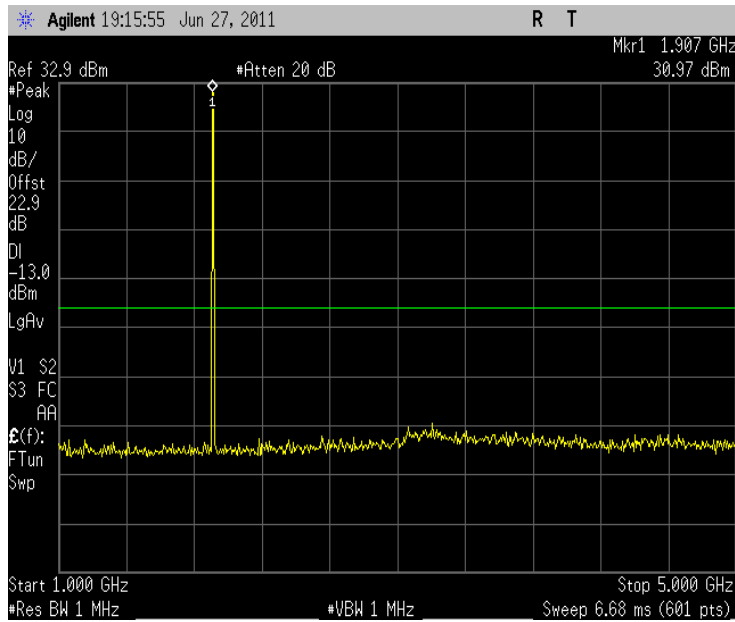
Plot 7.2 - 20 (GSM/GMSK Ch661)



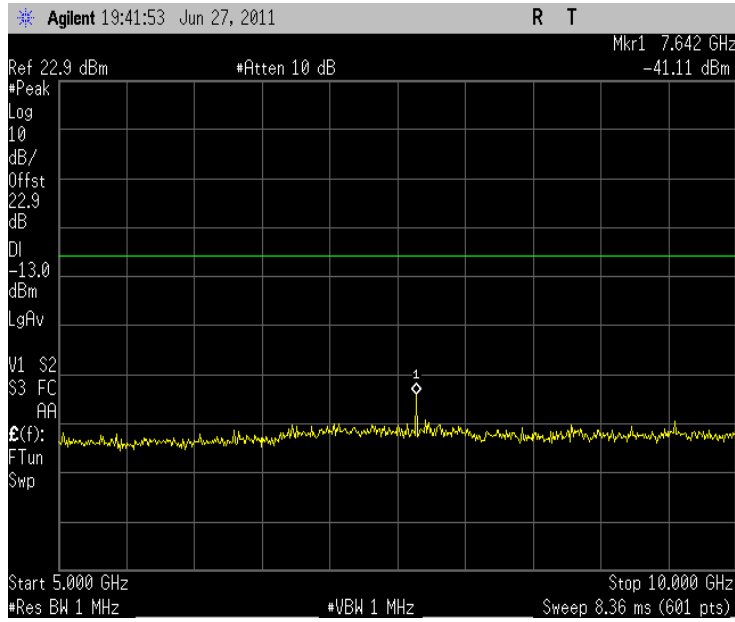
Plot 7.2 - 21 (GSM/GMSK Ch810)



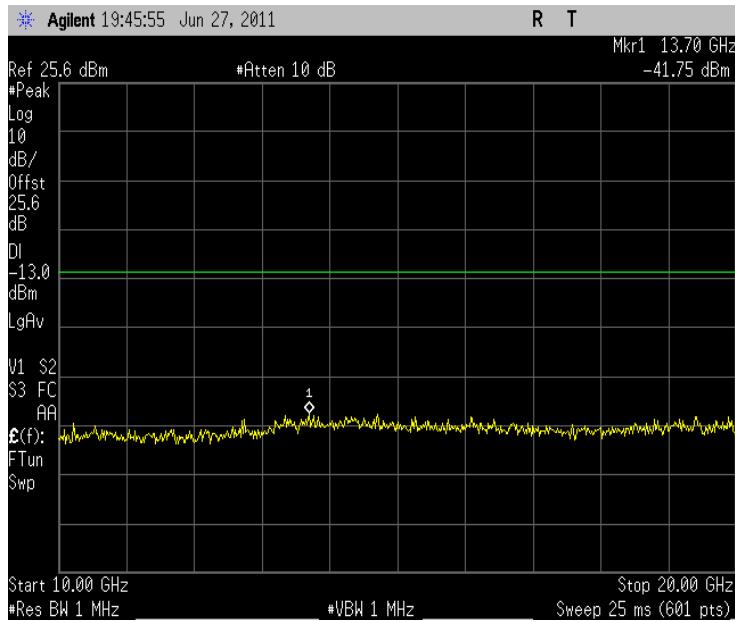
Plot 7.2 - 22 (GSM/GMSK Ch810)



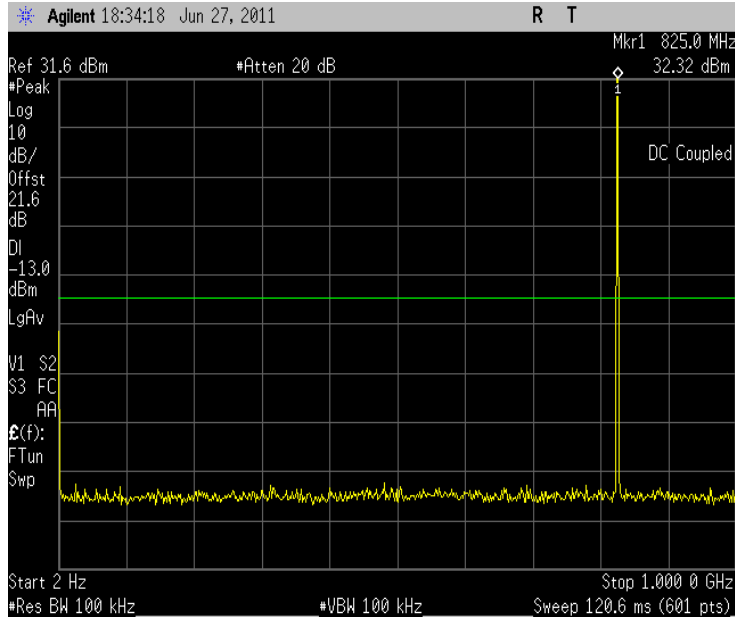
Plot 7.2 - 23 (GSM/GMSK Ch810)



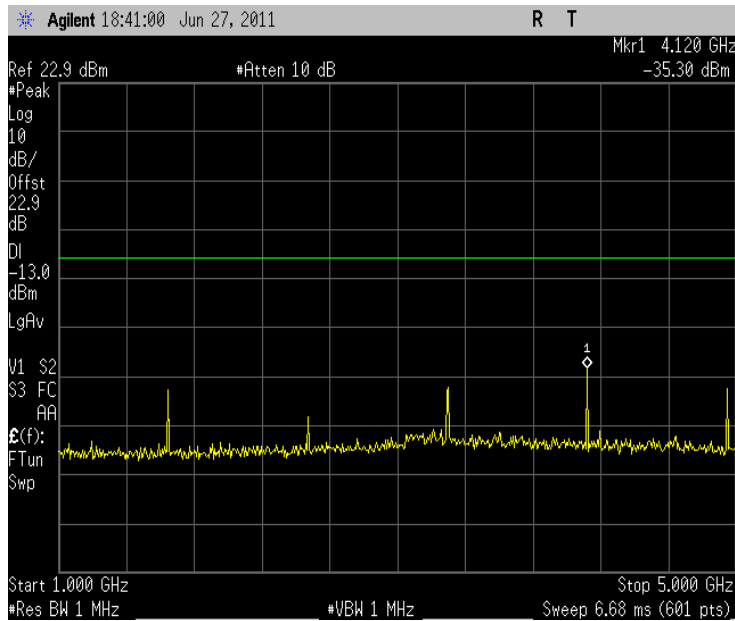
Plot 7.2 - 24 (GSM/GMSK Ch810)



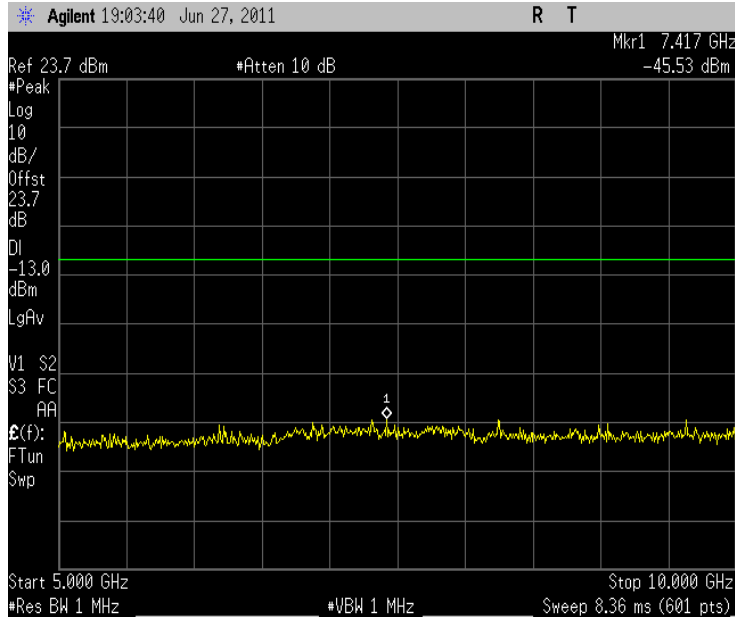
Plot 7.2 - 25 (GPRS/GMSK Ch128)



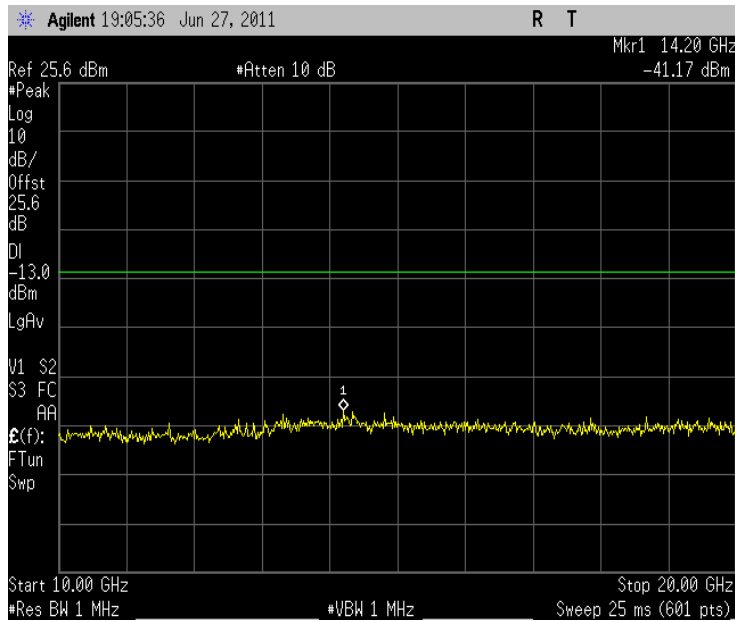
Plot 7.2 - 26 (GPRS/GMSK Ch128)



Plot 7.2 - 27 (GPRS/GMSK Ch128)

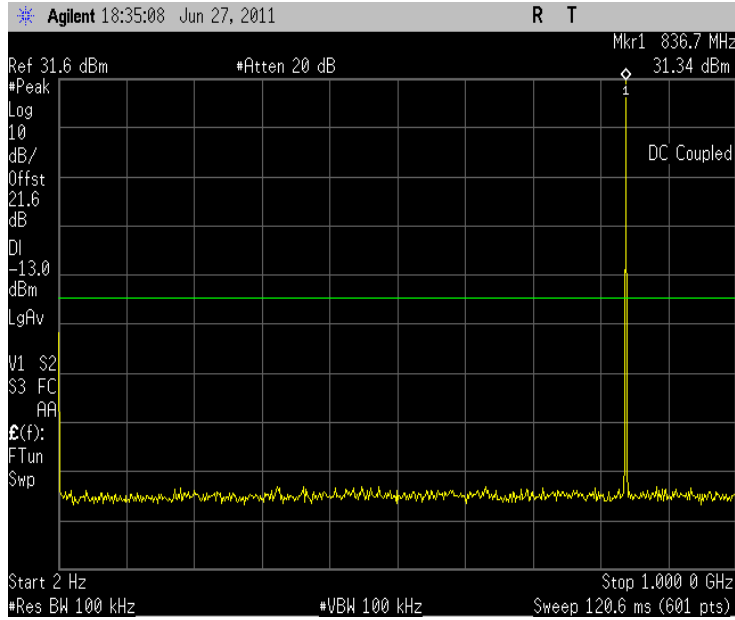


Plot 7.2 - 28 (GPRS/GMSK Ch128)

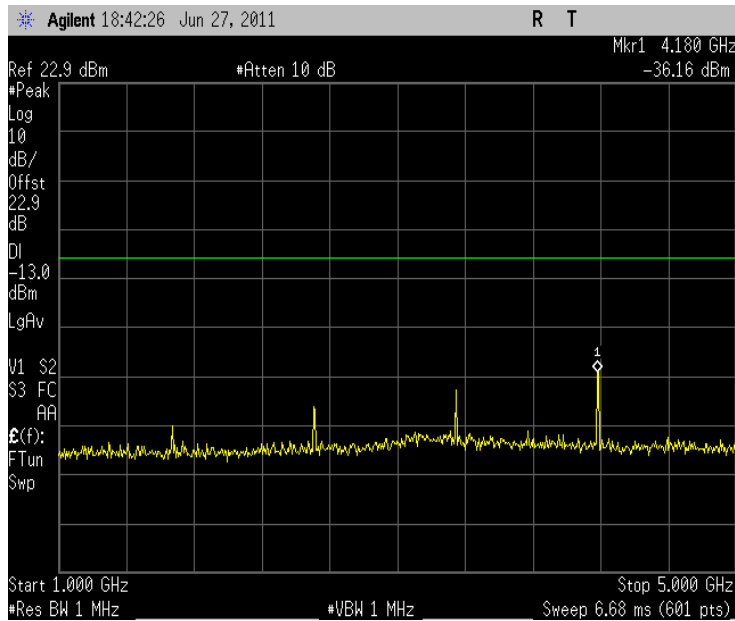




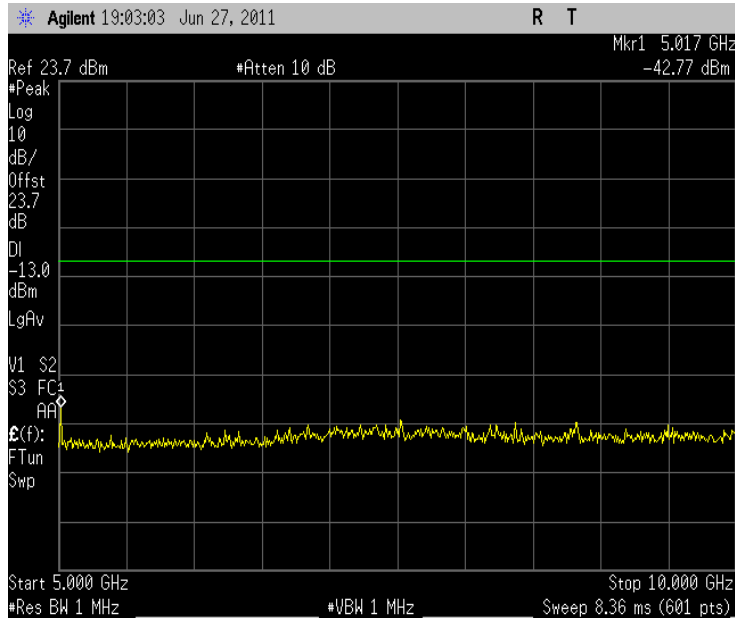
Plot 7.2 - 29 (GPRS/GMSK Ch190)



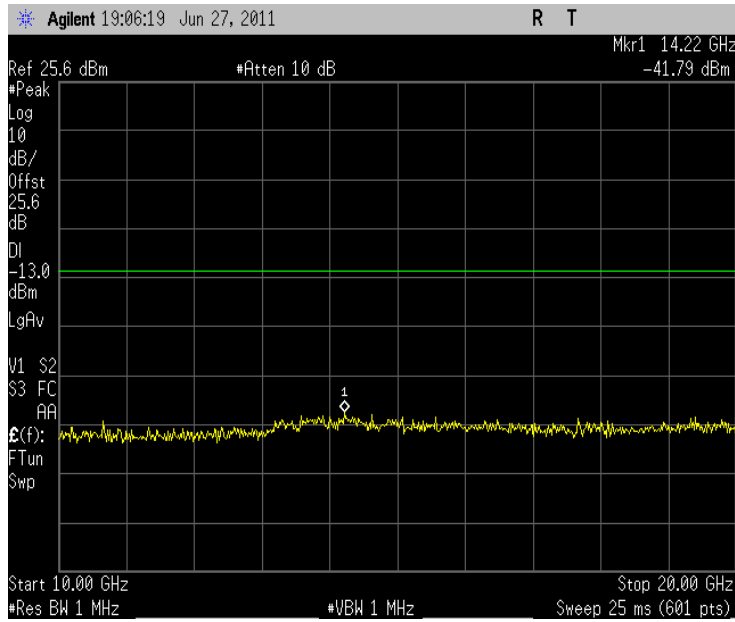
Plot 7.2 - 30 (GPRS/GMSK Ch190)



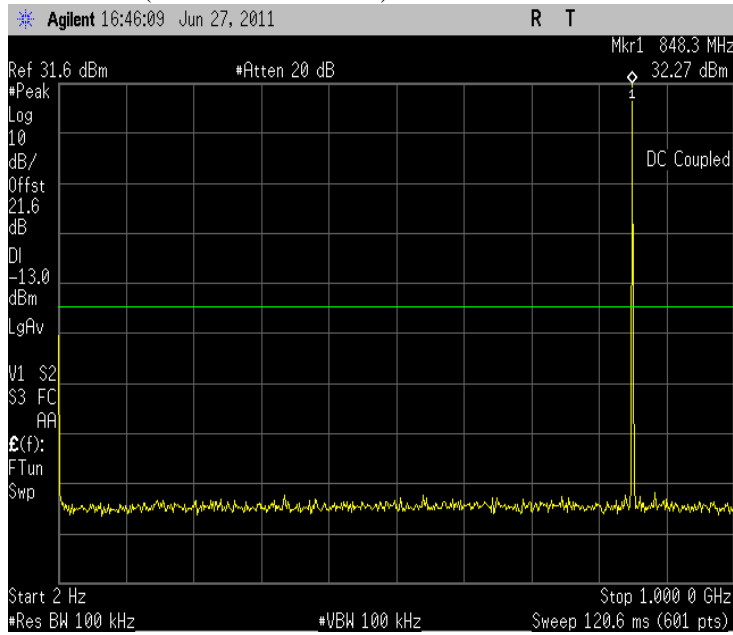
Plot 7.2 - 31 (GPRS/GMSK Ch190)



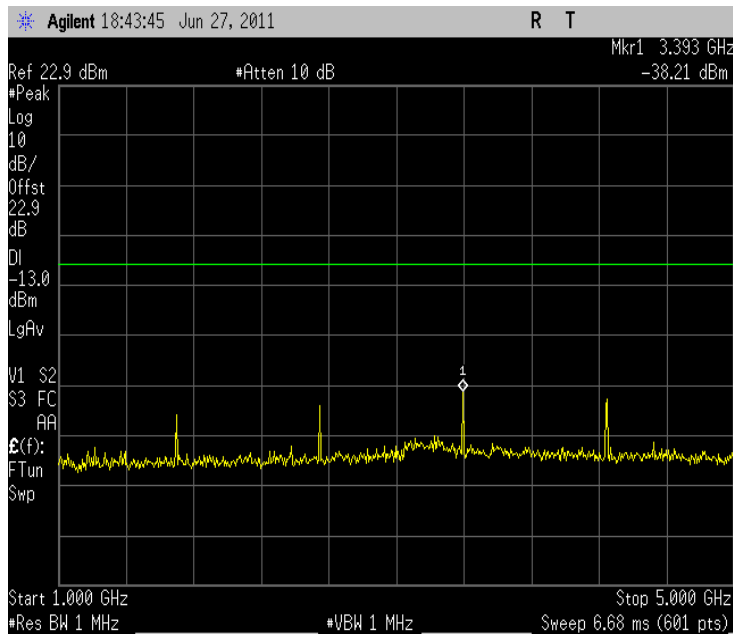
Plot 7.2 - 32 (GPRS/GMSK Ch190)



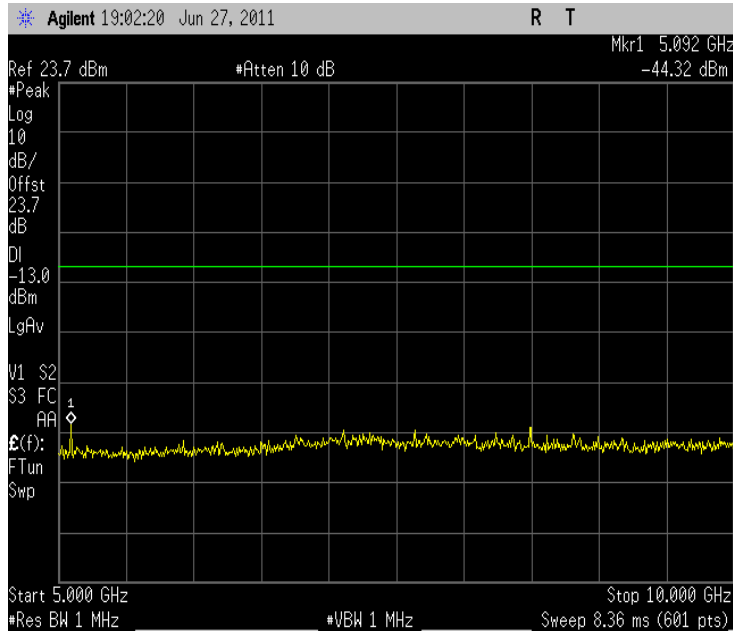
Plot 7.2 - 33 (GPRS/GMSK Ch251)



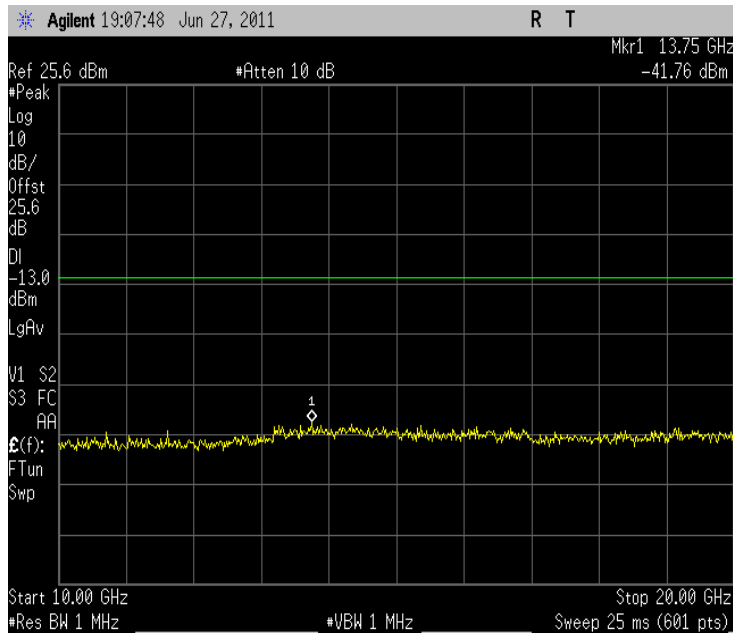
Plot 7.2 - 34 (GPRS/GMSK Ch251)



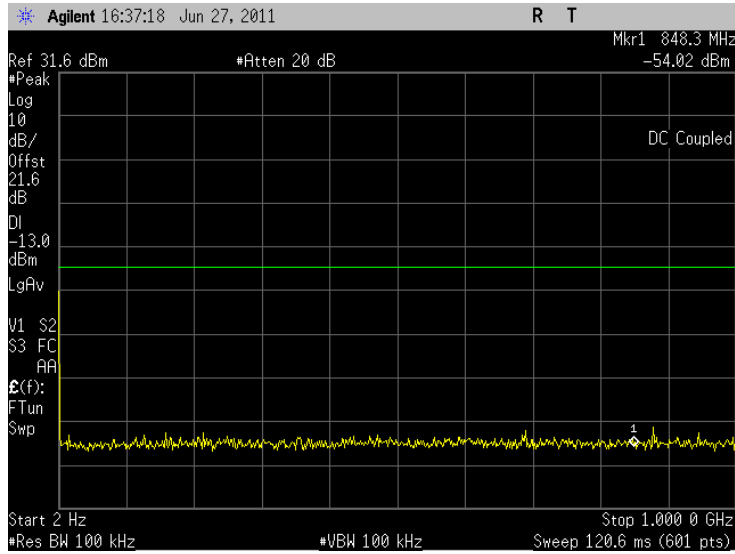
Plot 7.2 - 35 (GPRS/GMSK Ch251)



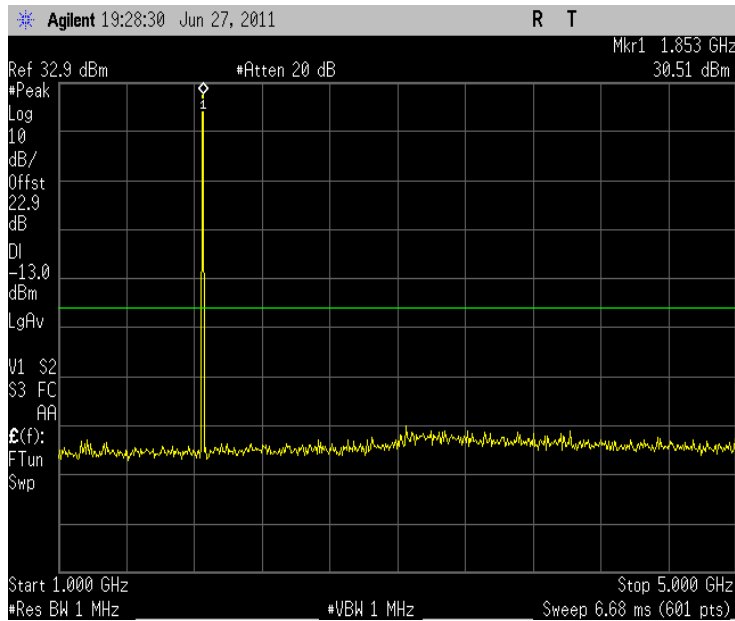
Plot 7.2 - 36 (GPRS/GMSK Ch251)



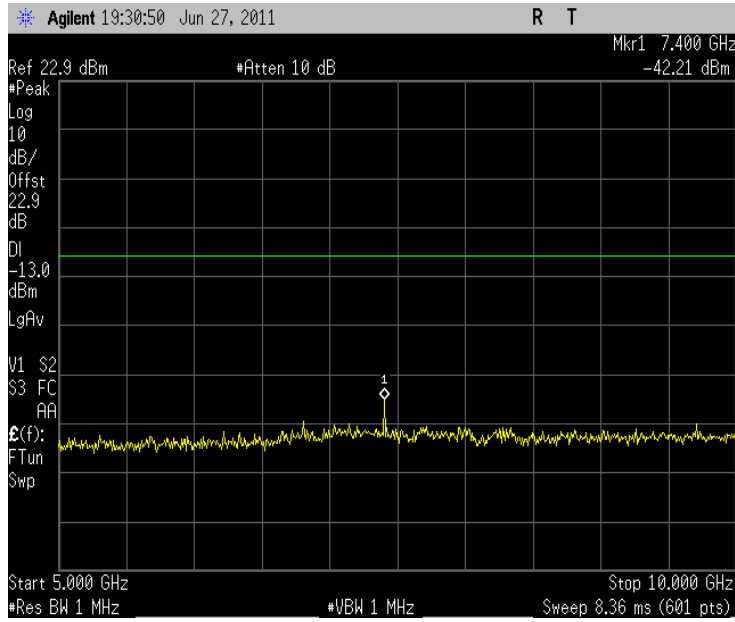
Plot 7.2 - 37 (GPRS/GMSK Ch512)



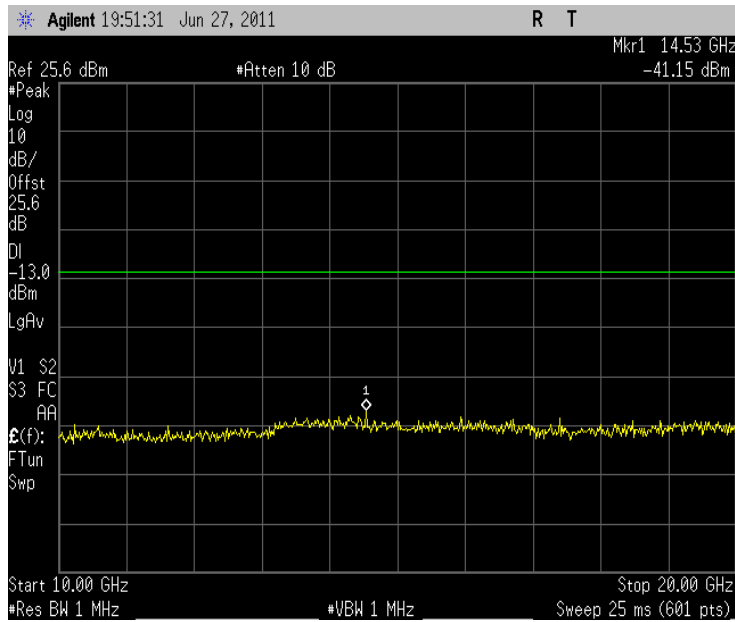
Plot 7.2 - 38 (GPRS/GMSK Ch512)



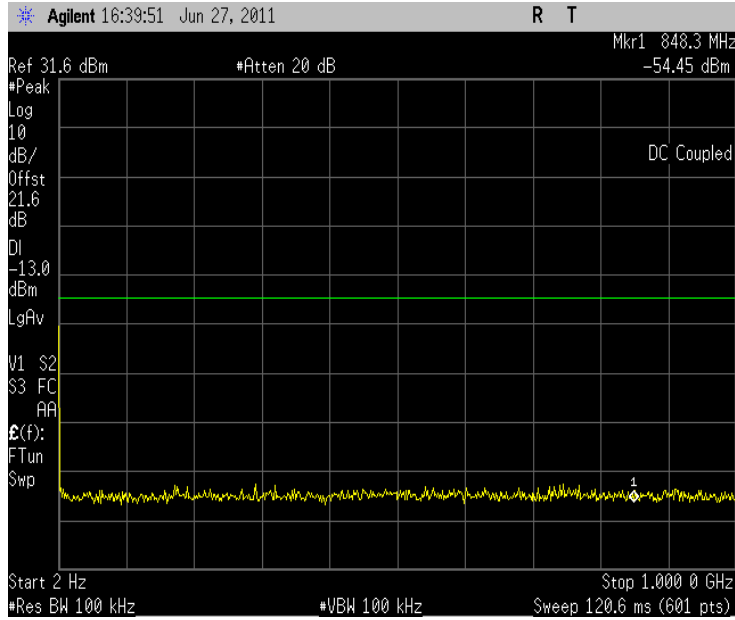
Plot 7.2 - 39 (GPRS/GMSK Ch512)



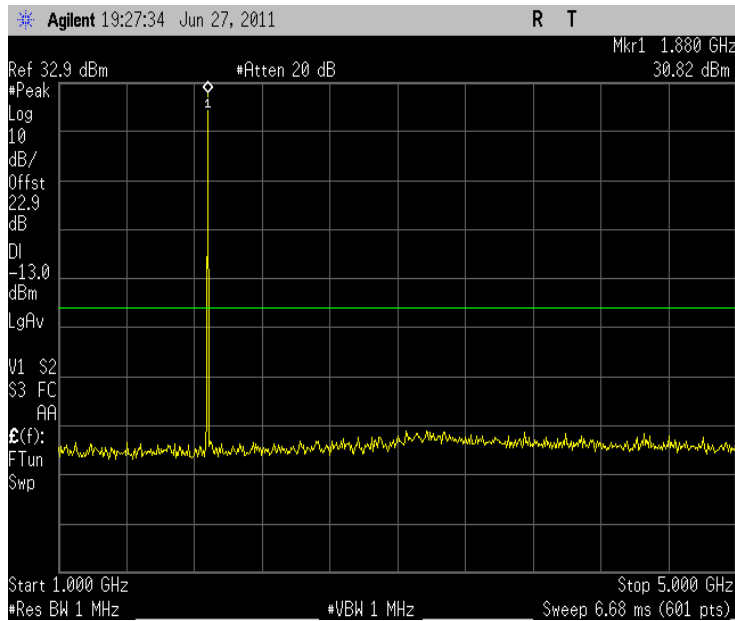
Plot 7.2 - 40 (GPRS/GMSK Ch512)



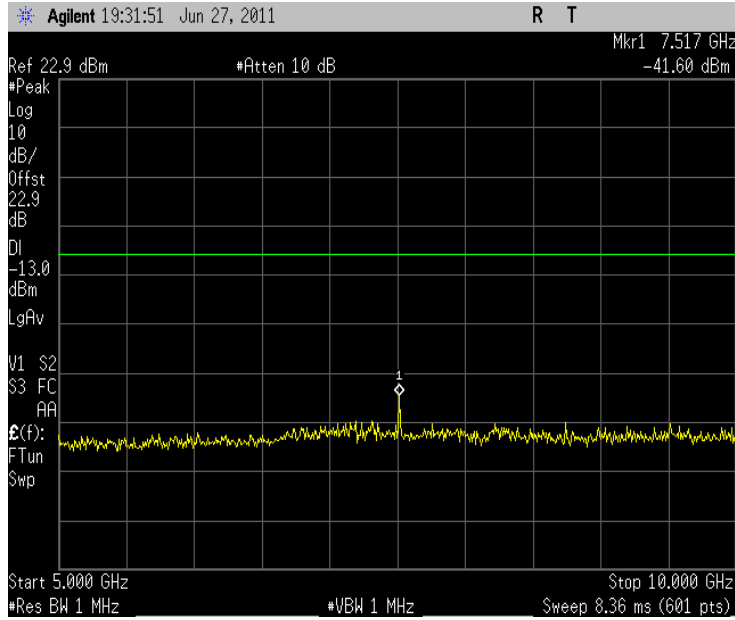
Plot 7.2 - 41 (GPRS/GMSK Ch661)



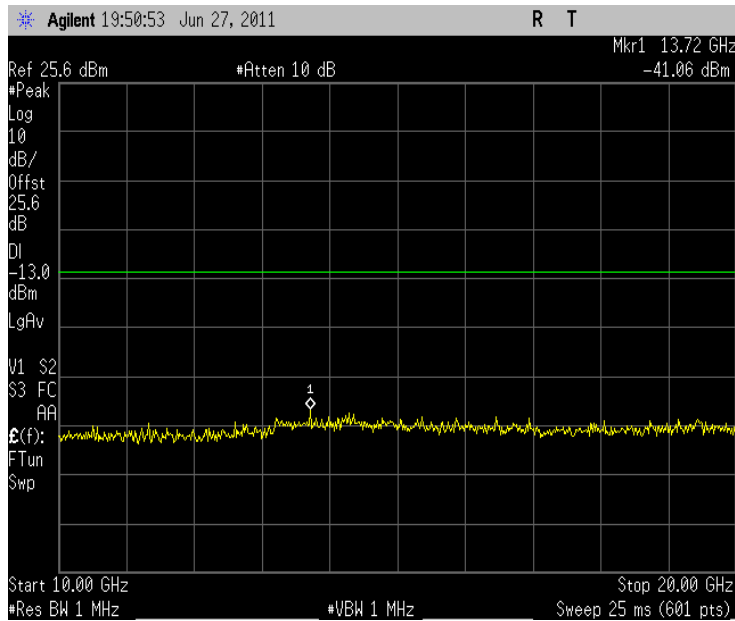
Plot 7.2 - 42 (GPRS/GMSK Ch661)



Plot 7.2 - 43 (GPRS/GMSK Ch661)

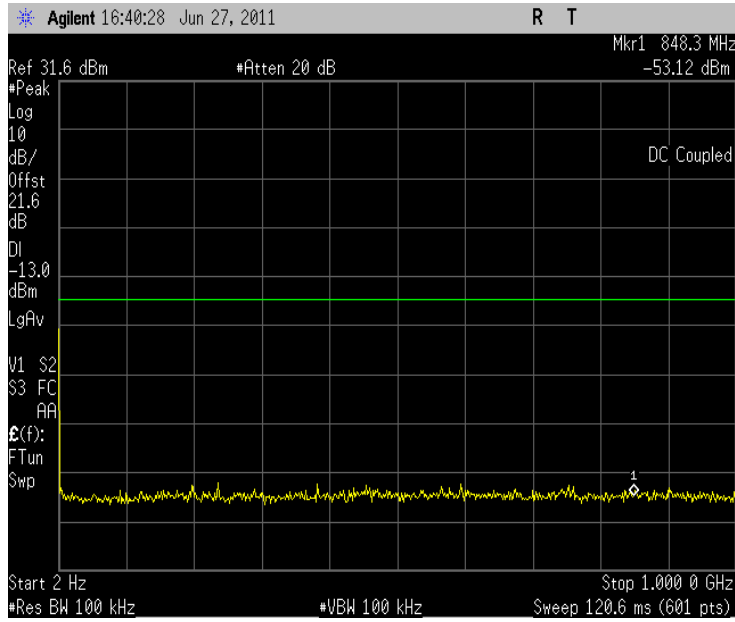


Plot 7.2 - 44 (GPRS/GMSK Ch661)

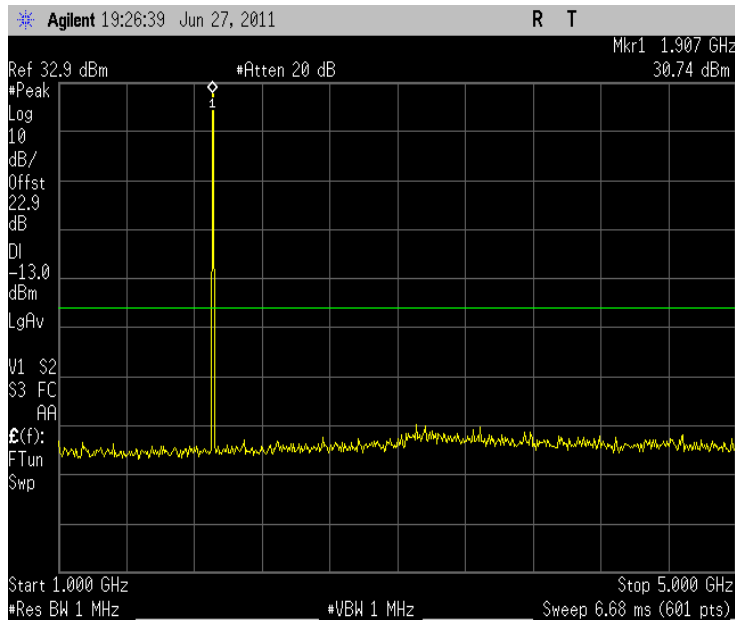




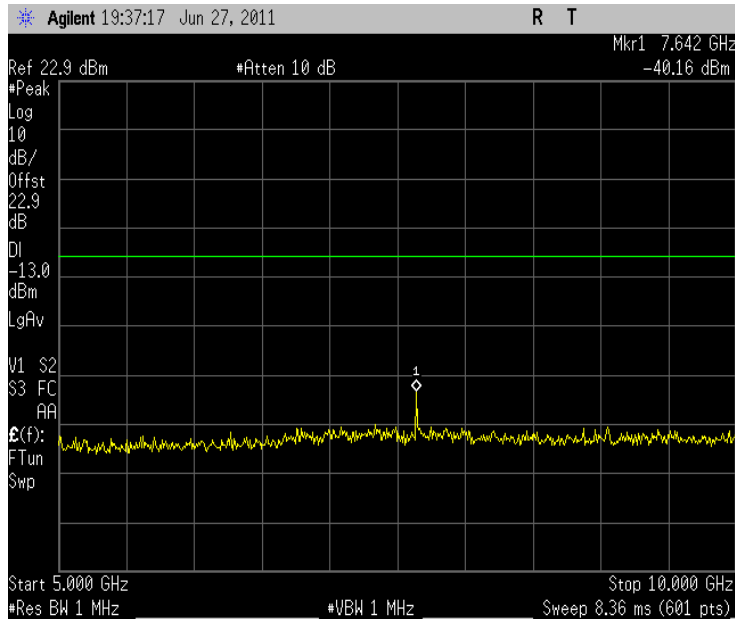
Plot 7.2 - 45 (GPRS/GMSK Ch810)



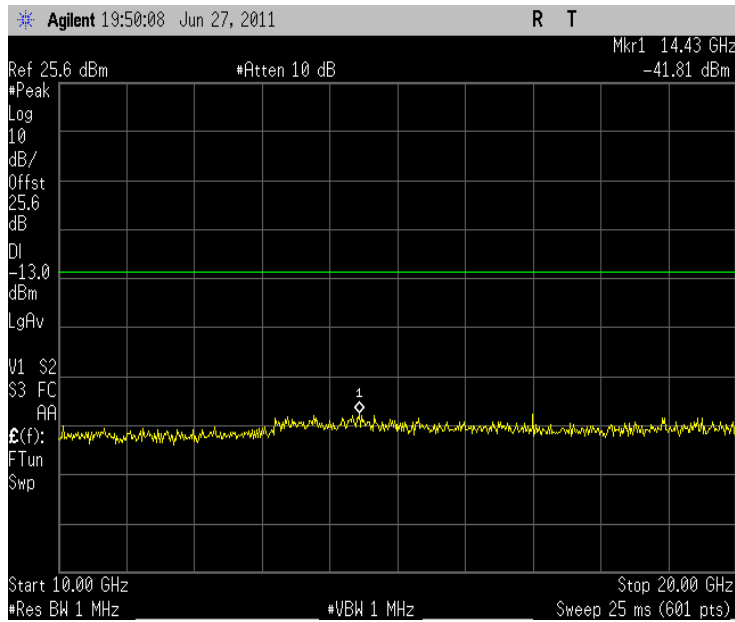
Plot 7.2 - 46 (GPRS/GMSK Ch810)



Plot 7.2 - 47 (GPRS/GMSK Ch810)



Plot 7.2 - 48 (GPRS/GMSK Ch810)



## 8. Frequency Stability

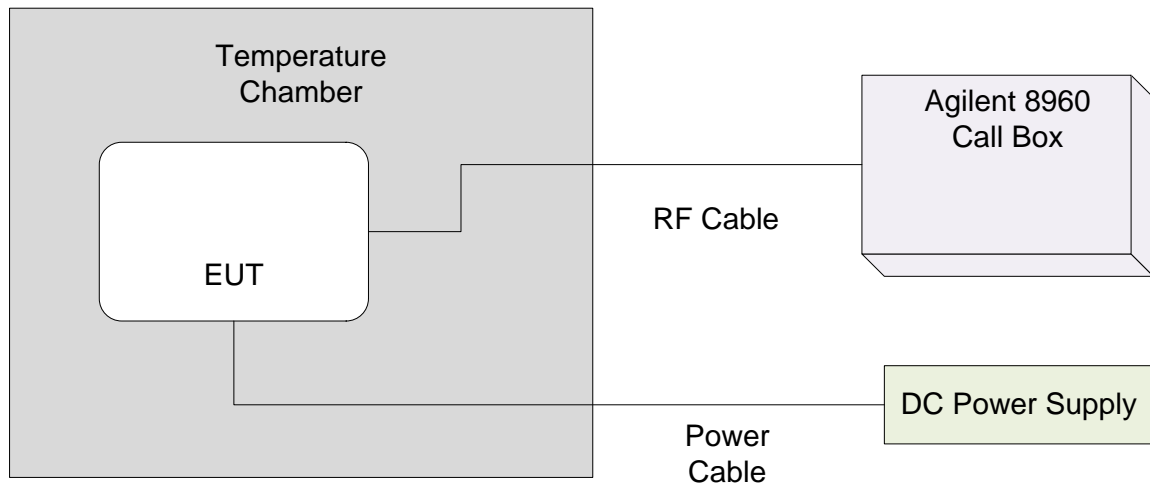
<b>FCC:</b>	§22.359, 24.238, 27.53(g)
<b>Limit:</b>	±2.5ppm
<b>DUT SN</b>	121000668

### 8.1 Test Procedure

As the test setup indicates, placed the TT210 inside the temperature chamber. Measured the transmitting frequency error at 24 degrees C (ambient temperature) with DC voltage varying at 10.0 volts to 12.0 volts to 20.0 volts (minimum, nominal and maximum voltages of the device), and then set the temperature to -30 degrees C and allow it to stabilize. After 1 hour soak time, take the measurement on transmitting frequency error at -30 degrees in the same manner. As an incremental of 10 degrees C, repeat the same process until +60 degrees C is completed.

An 8960 call box was used for frequency error measurements

**Figure 3 Frequency Stability Test Setup**

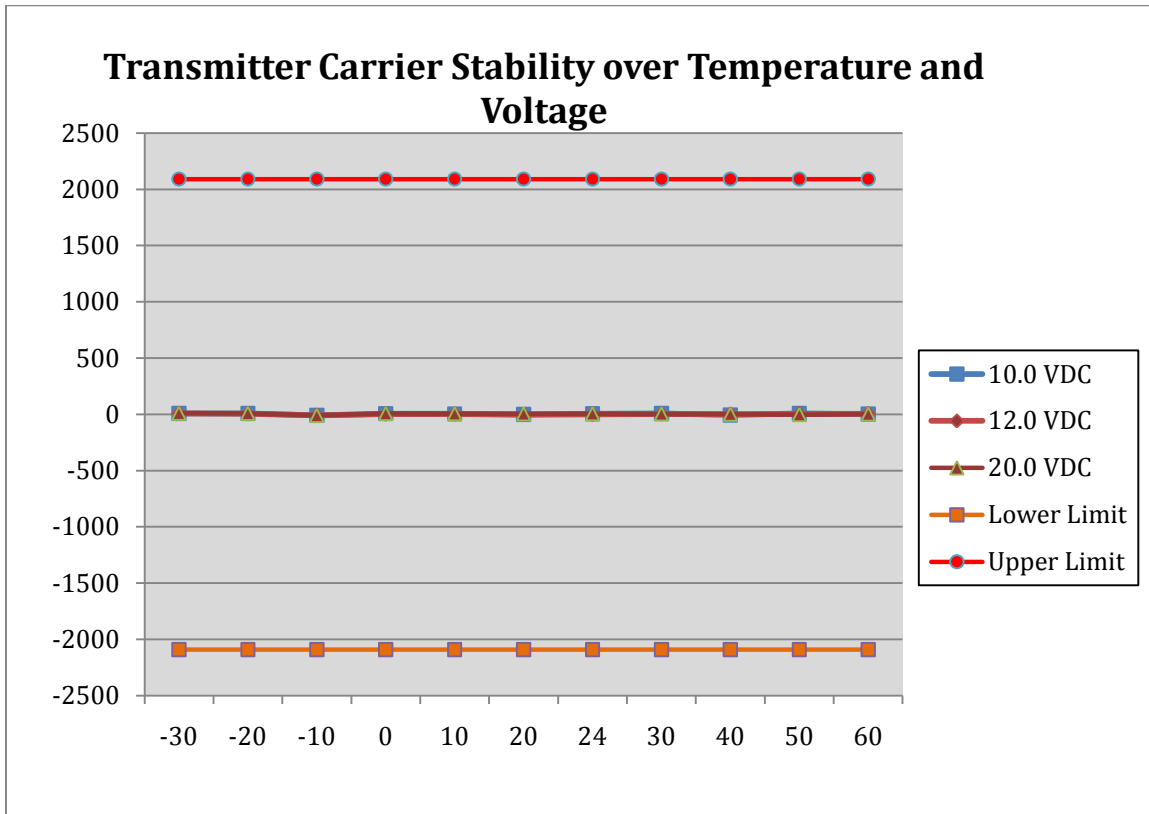


### 8.2 Test Results

The test was conducted at mid channel in each band.

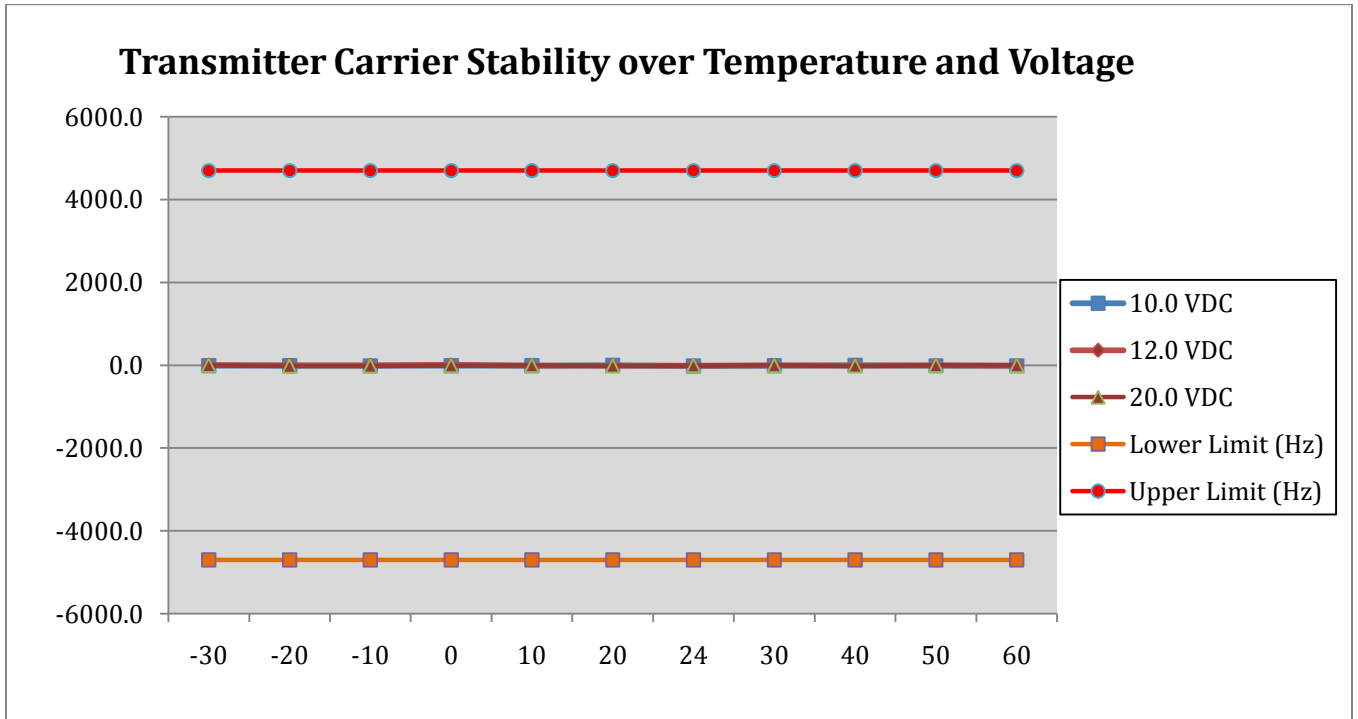
<b>Operation Mode:</b>	GMSK	<b>Channel:</b>	190
<b>Tx Frequency:</b>	836.6MHz	<b>Voltage:</b>	12.0 VDC nominal (10-20 VDC)
<b>Limit:</b>	±2.5ppm (±2091Hz)		

Temperature (°C)	Deviation of Carrier (Hz)			Specification (Hz)	
	10.0V	12.0V	20.0V	Lower limit	Upper limit
-30	7.29	8.0	9.4	-2091	2091
-20	8.49	3.7	8.6	-2091	2091
-10	-9.46	-8.4	-10.4	-2091	2091
0	5.93	1.3	7.4	-2091	2091
10	3.63	1.2	5.5	-2091	2091
20	-0.18	-2.3	4.0	-2091	2091
24	4.88	-1.6	5.2	-2091	2091
30	8.04	2.3	3.5	-2091	2091
40	-7.15	2.0	1.2	-2091	2091
50	7.64	3.5	-2.8	-2091	2091
60	1.55	4.7	2.1	-2091	2091



<b>Operation Mode:</b>	GMSK	<b>Channel:</b>	661
<b>Tx Frequency:</b>	1880MHz	<b>Voltage:</b>	12.0 VDC nominal (10-20 VDC)
<b>Limit:</b>	±2.5ppm (±4700Hz)		

Temperature (°C)	Deviation of Carrier (Hz)			Specification (Hz)	
	10.0V	12.0V	20.0V	Lower limit	Upper limit
-30	-8.9	7.2	-1.7	-4700	4700
-20	-10.5	0.3	-20.5	-4700	4700
-10	-14.7	-1.3	-16.1	-4700	4700
0	-11.3	9.5	-9.0	-4700	4700
10	-8.6	-12.8	-5.7	-4700	4700
20	-0.2	-14.0	-16.4	-4700	4700
24	-17.2	-8.6	-8.9	-4700	4700
30	-10.8	-5.5	-6.2	-4700	4700
40	-1.2	-8.8	-15.6	-4700	4700
50	-13.5	-1.1	-4.3	-4700	4700
60	-13.9	-7.1	-4.9	-4700	4700



## 9. Test Equipment

The following test equipment was used.

Model	Manufacturer	Description	S/N	Cal Due Date
8960 Series 10 E5515C	Agilent	Wireless Communication Set	K113695	07/21/2011
E4440A PSA Series	Agilent	Spectrum Analyzer	K130220	8/25/2011
6632B	Hewlett Packard	Power Supply	PK90763	4/4/2012
Model 105	TestEquity	Temperature Chamber	K162535	09/22/2011

The firmware built in the Agilent 8960 is as follows, and has been validated to support the testing for the TT210

Call Box	Technology	Firmware Rev
8960	GSM/GPRS/EDGE	A.11.12