



Electromagnetic Compatibility Test Report

Test Report No: MOT 161007

Issued on: October 16, 2007

Product Name:

Smart Rider - M990 Professional Install

Model: FLN3872A

FCC ID: IHDP56HN1

IC: 1090-56HN1

**Tested According to
FCC 47 CFR, Part 22 & Part 24**

Tests Performed for

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1633.01

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1633.01

Test Report details:

Issued on: 16.10.2007

Assessment information:

This report contains an assessment of the EUT against Electromagnetic Compatibility based upon tests carried out on the samples submitted. The results contained in this report relate only to the items tested. Manufactured products will not necessarily give identical results due to production and measurement tolerances. QualiTech, EMC Lab does not assume responsibility for any conclusion and generalization drawn from the test results with regards to other specimens or samples of type of the equipment represented by test item.

The EUT was set up and exercised using the configuration, modes of operation and arrangements defined in this report only.

Modifications:

Modifications made to the EUT

None.

Modifications made to the Test Standard

None.

Summary of Compliance Status

FCC 47 CFR, Part 24

Test Spec. Clause	Test Case	Remarks
§24.232 (c)	EIRP Peak Power, Radiated	Pass
§24.232 (c)	EIRP Peak Power, Conducted	Pass
§24.235 & §2.1055	Frequency Stability	Pass
§24.238 & §2.1049	Occupied Bandwidth	Pass
§24.238	Out of Band Emissions - radiated	Pass
§24.238	Out of Band Emissions - conducted	Pass
§24.238	Block Edge Emissions - conducted	Pass

FCC 47 CFR, Part 22

Test Spec. Clause	Test Case	Remarks
§22.913(a)(2)	EIRP Peak Power, Radiated	Pass
§22.913(a)(2)	EIRP Peak Power, Conducted	Pass
§22.355 & §2.1055	Frequency Stability	Pass
§22.917(b) & §2.1049	Occupied Bandwidth	Pass
§22.917(a)	Out of Band Emissions - radiated	Pass
§22.917(b)	Out of Band Emissions - conducted	Pass
§22.917(b)	Block Edge Emissions - conducted	Pass

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1. General Description

Description of the EUT system/test Item:

Product name: Smart Rider - M990 Professional Install

Model: FLN3872A

FCC ID: IHDP56HN1

IC: 109O-56HN1

EUT Description:

The Smart Rider - M990 Professional Install, a GSM high tier fixed mobile car phone powered from 12 / 24V vehicle battery.

It provides not only voice services but also high-speed data services, entertainment, information, advanced network connection, BT connections, GPS navigation services etc.

The Smart Rider / M990-PI is a Professional Install configuration that requires a fixed installation by Motorola service shop and is supporting external microphone & speaker and external antennas (GPS & GSM). It's Main Unit (shown in the picture below) can be detached from its base unit (cradle) (when not in use).

It incorporates a Quad-band GSM/GPRS/EDGE g24 module, new big color screen and integrated GPS and Bluetooth components. With the stylish look and full features set, it is targeted to a broad band of markets looking for exclusivity like business men, limousines and private cars looking for stylish communication and navigation solution

It supports internal Microphone and Speaker and switches automatically to External MIC and Speaker while connecting these acoustic devices to the M990 octopus cable.

Bands and Modulations:

Radio	Transmitter Modulation	Freq. Band	Nominal Output Power
GPRS Multislot Class 10 / Power class 4	GMSK	824.2 - 848.8 MHz	32.0 dBm
GPRS Multislot Class 10 / Power class 1		1850.2 - 1909.8 MHz	29.0 dBm
EDGE Multislot Class 10 / Power class E2	8PSK	824.2 - 848.8 MHz	26.5 dBm
		1850.2 - 1909.8 MHz	24.5 dBm
Bluetooth class 2	GFSK	2402 - 2480 MHz	1.75 dBm

Product operation models:

Mode	Details
GSM850/1900 and Bluetooth 2.4GHz	Coexistence All Tx/Rx combinations
GPS receive	GPS operational while Bluetooth & GSM850/1900 Transmit full power

2. Method of Measurements

2.1. Radiated Peak Output Power Measurements:

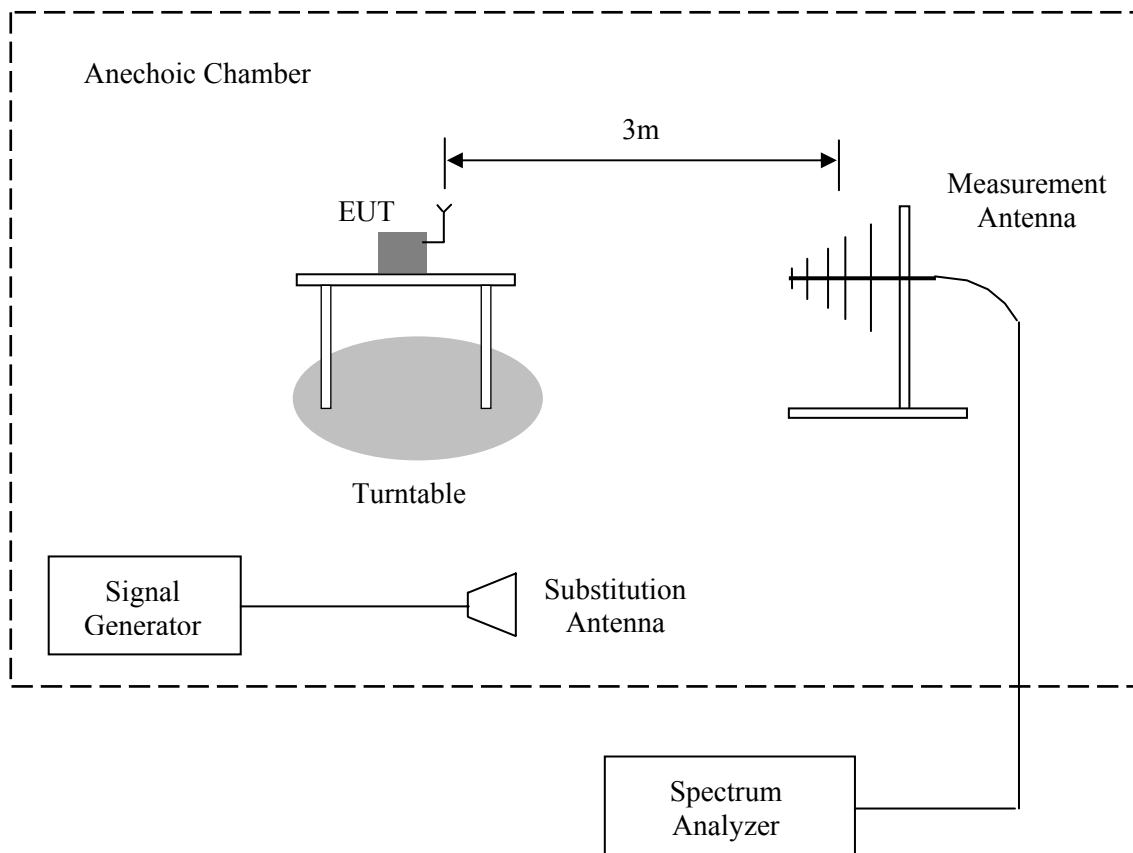
During the testing process, the EUT was controlled via dedicated software. The EUT was operated at maximum power, continuous transmission and PRBS data modulation.

The EUT was placed in an anechoic chamber, on a non-metallic table/support, 0.8m above the turntable, at 3 meter from the receive antenna, and its position where the maximum antenna gain occurs was identified. See test Setup # 1.

The peak emission was measured and recorded.

Using the Substitution Method in accordance to TIA/EIA 603, an antenna with a known gain substituted the EUT, and an RF signal source was connected to the antenna input by means of coaxial cable with known loss. The signal source level was adjusted until the previously recorded maximum reading was obtained. The power source reading was corrected for the cable loss, and the antenna gain was added to obtain the EIRP/ERP peak power. EIRP/ERP measurements were made at the upper, center, and lower carrier frequencies (1850.2MHz, 1879.8MHz, 1909.8 MHz or 824.2MHz, 836.6MHz, 848.8MHz).

Test Setup # 1



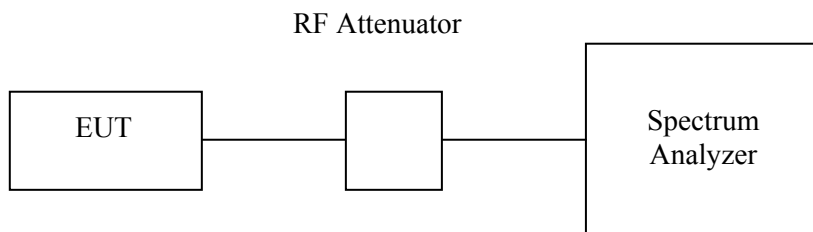
2.2. Conducted Peak Output Power Measurements:

During the testing process, the EUT was controlled via dedicated software. The EUT was operated at maximum power, continuous transmission and PRBS data modulation.

The transmitter output was connected to the Spectrum Analyzer via an RF attenuator, and peak output power was measured with an Impulse Bandwidth of 5MHz, in video trigger mode. See test Setup # 2.

Average output Power was also measured using a Power Meter instead of the Spectrum Analyzer.

Test Setup # 2



2.3. Radiated Out of Band Emissions Measurements:

During the testing process, the EUT was controlled via dedicated software. The EUT was operated at maximum power, continuous transmission and PRBS data modulation.

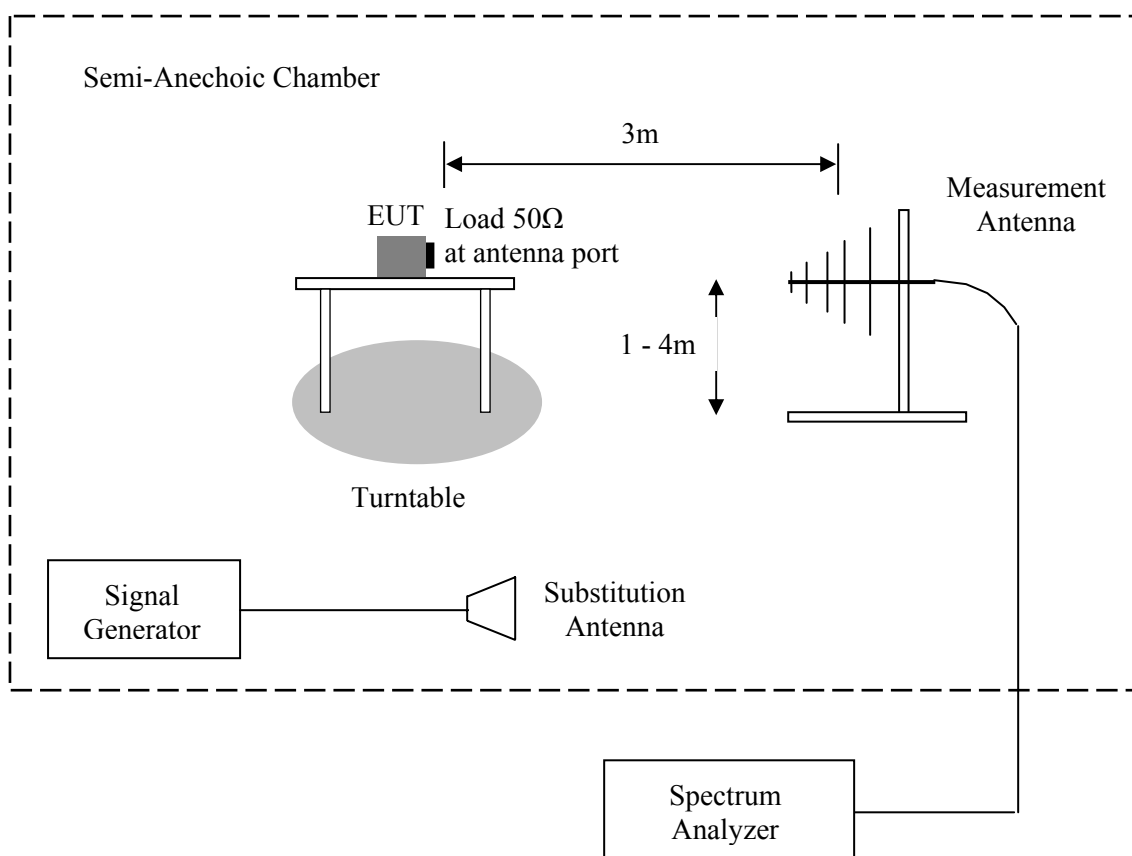
The antenna output was terminated with 50 Ω load.

The spectrum was scanned from 30MHz to the 10th harmonic of the highest frequency generated within the EUT, which is the transmitted carrier that can be as high as 1910MHz. For each spurious frequency, the antenna mast was raised and lowered from 1 to 4 meters and the turntable was rotated 360degrees to obtain a maximum reading on the spectrum analyzer. The maximum readings were recorded.

Radiated emissions measurements were made at the upper, center, and lower carrier frequencies of the 850/1900 bands (1850.2MHz, 1879.8MHz, 1909.8 MHz and 824.2MHz, 836.6MHz, 848.8MHz).

After all spurious emissions were recorded; the EUT was replaced with a substitution antenna in accordance to TIA/EIA 603, with a known gain fed by a signal generator. With the signal generator tuned to a particular spurious frequency, the antenna mast was raised and lowered from 1 to 4 meters to obtain a maximum reading on the spectrum analyzer. The signal source level was adjusted until a reading at the spectrum analyzer identical to the previously recorded spurious readings was obtained. The power readings in dBm was corrected for the cable loss, and compared to the §24.238 limits.

Test Setup # 3



2.4. Conducted Out of Band Emissions Measurements:

During the testing process, the EUT was controlled via dedicated software. The EUT was operated at maximum power, continuous transmission and PRBS data modulation.

The transmitter output was connected to the input of the Spectrum analyzer through a specialized antenna connector provided by the manufacturer, and an attenuator as specified. The external attenuators and cable loss were added to the reading. See test Setup # 4.

For spurious emissions measurement, the spectrum from 10MHz to 20GHz was investigated with the transmitter set to the lowest, middle and highest channel frequencies.

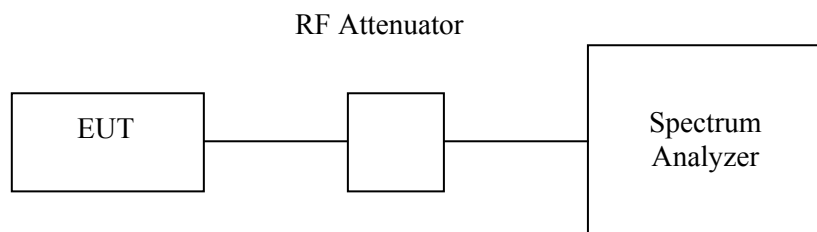
For Block Edge measurements, in 1MHz bands immediately outside and adjacent to the frequency block, conducted emissions were measured using a RBW of 1% of the occupied BW.

2.5. Occupied BW Measurements:

The transmitter output was connected to the input of the Spectrum analyzer through a specialized antenna connector provided by the manufacturer, and an attenuator as specified.

The RBW was set approximately 1% of the emission BW. Peak detector was used, and the view button was used to capture the emission. The maximum width of the emission, that is 26dB down from the peak of the emission was measured. This was compared with the analyzer, and RBW was readjusted and measurement repeated until the RBW/EBW ratio was approximately 1%.

Test Setup # 4



2.6. Radiated Emission measurements:

During the testing process, the EUT was controlled via dedicated software. The EUT was operated in receive mode.

Measurements were performed at a 3-meter measurement distance in the semi-anechoic chamber in order to evaluate the radiated electromagnetic interference characteristics of the EUT. The EUT was placed on a non-metallic table/support, 0.8m above the turntable, was configured, arranged and operated in a manner consistent with typical application and load conditions.

An appropriate antenna depending upon the frequency range, per ANSI C63.4-2003 clause 4.1.5 was used. While the turntable was being rotated, the height of the antenna was varied from 1 to 4m for the frequency range of 9kHz to 25GHz. The highest radiated emission was detected by manipulating the system cables to the worst-case position. This process was repeated for both antenna polarizations.

The amplitudes of worst-case emission were measured with the detector modes and resolution bandwidths over various frequency ranges according to the requirements of ANSI C63.4-2003 clause 4.2.

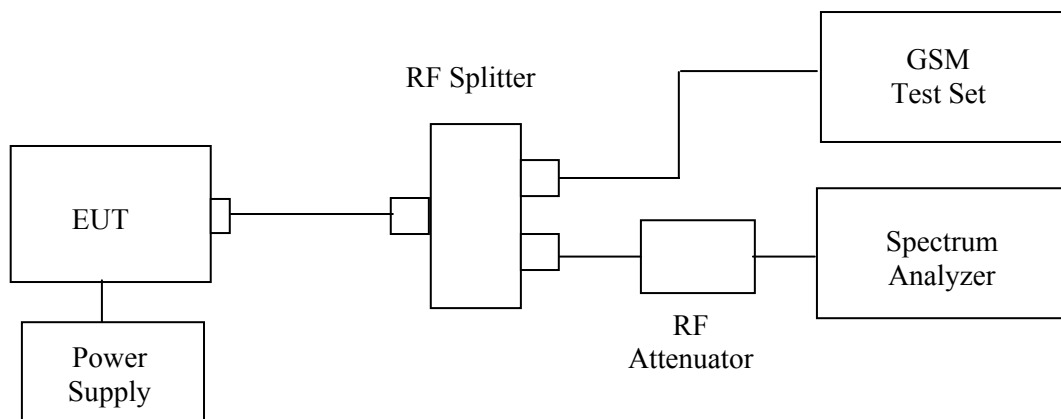
2.7. Frequency stability measurements:

During the process of testing, the EUT was controlled via Willtek 4202S GSM test set in “BS Call” mode on center channel, 836.6/1880MHz, under AFC lock, with settings to operate at maximum power transmission and proper modulation. See Setup # 5.

With the EUT powered with 7.2 V, the carrier frequency was measured at room temperature. Carrier frequency measurement was repeated at 10°C increments from -30°C to +50°C. At least 1 hour was allowed at each temperature un-powered, before measurement was made. The measurements were made within 2 minutes of powering up the EUT, to prevent significant self-warming.

With the EUT powered with 7.2 V, the carrier frequency was re-measured at room temperature. Supply voltage was varied from 7.2 V to 8.2 V in steps of 0.2V, re-measuring carrier frequency at each voltage.

Test Setup # 5



3. FCC 47 CFR, Part 24: Report of Measurements and examinations

3.1. Conducted Peak Output Power

Reference document:	47 CFR §24.232 (c)		
Test Requirements:	Mobile/portable stations are limited to 2 watts EIRP peak power		
Test setup:	See sec 2.2	Pass	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: Impulse BW 5MHz, VBW: 3MHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Reference Plots 3.1.1 - 3.1.6	

Test results

Modulation: GPRS Class 10

Frequency [MHz]	Peak Output Power* [dBm]	Peak Output Power* [Watt]	Antenna Gain [dBi]	Calculated EIRP [dBm]	Limit EIRP [dBm]	Margin [dB]	Reference
1850.2	24.39	0.275	5	29.39	33	-3.61	Plot 3.1.1
1880.0	24.98	0.315	5	29.98	33	-3.02	Plot 3.1.2
1909.8	24.54	0.284	5	29.54	33	-3.46	Plot 3.1.3

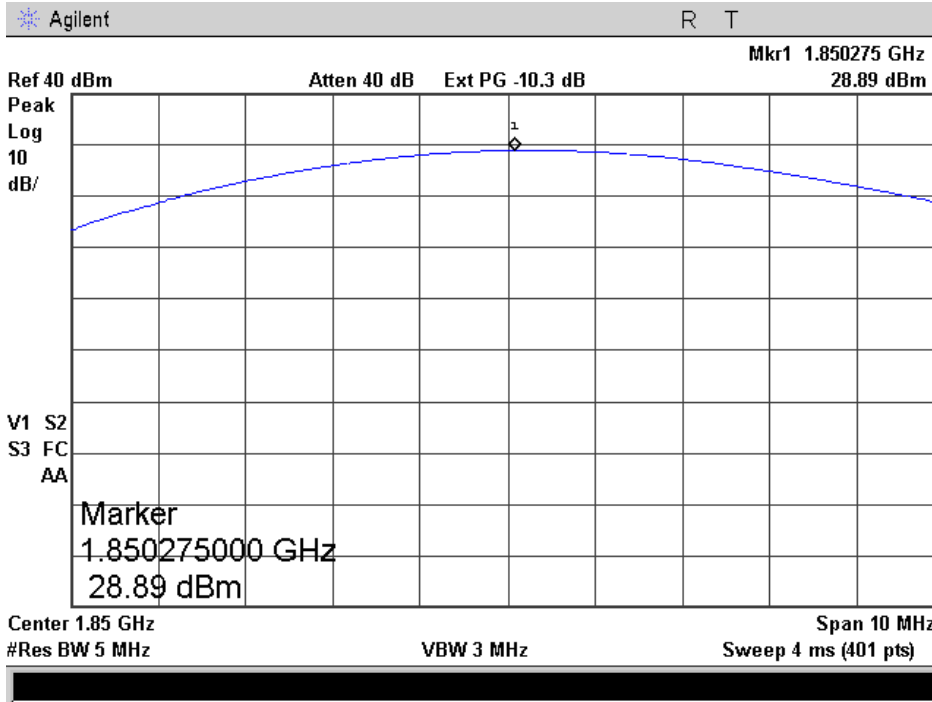
*Corrected for attenuations and cables loss (including 5m antenna cable, 0.9dB/m loss).

Modulation: EDGE 8PSK

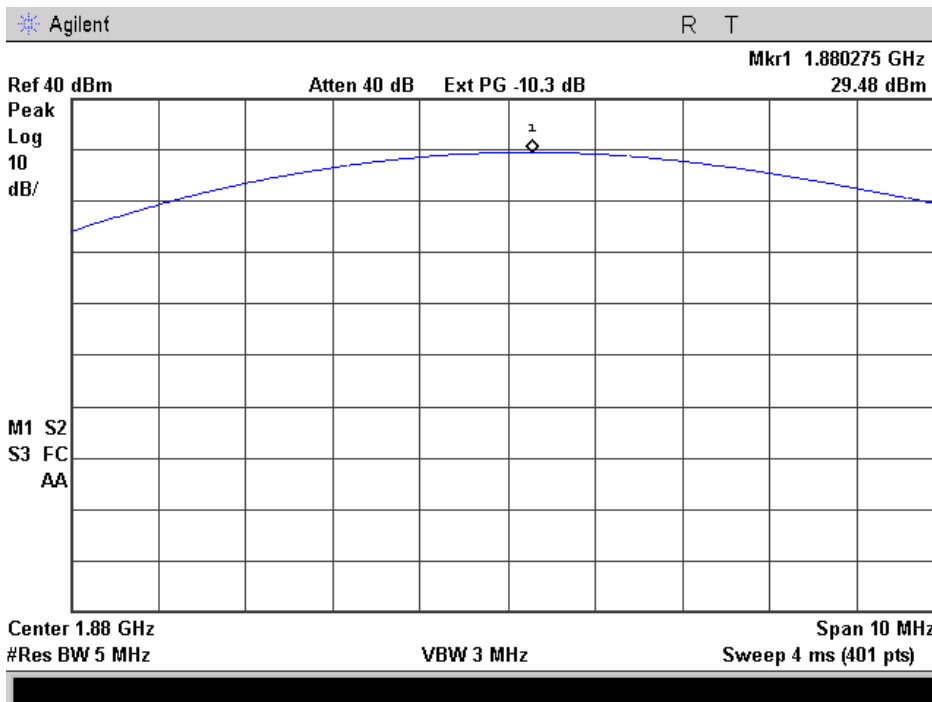
Frequency [MHz]	Peak Output Power* [dBm]	Peak Output Power* [Watt]	Antenna Gain [dBi]	Calculated EIRP [dBm]	Limit EIRP [dBm]	Margin [dB]	Ref. Plots
1850.2	22.57	0.181	5	27.57	33	-5.43	Plot 3.1.4
1880.0	22.23	0.167	5	27.23	33	-5.77	Plot 3.1.5
1909.8	22.21	0.167	5	27.21	33	-5.79	Plot 3.1.6

*Corrected for attenuations and cables loss (including 5m antenna cable, 0.9dB/m loss).

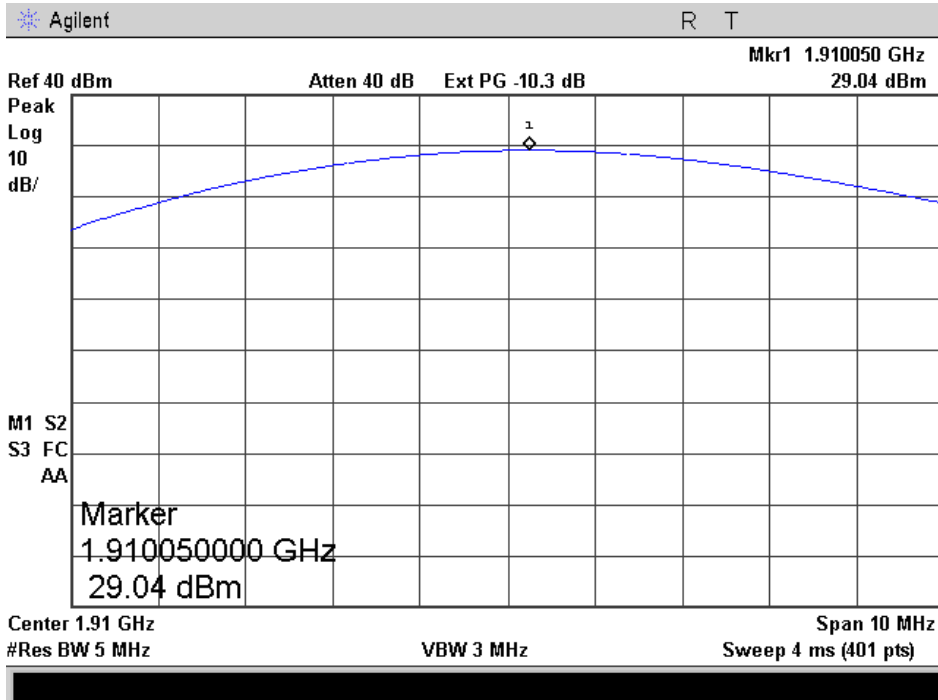
Modulation: GPRS Class 10
Frequency 1850.2 MHz
Plot 3.1.1



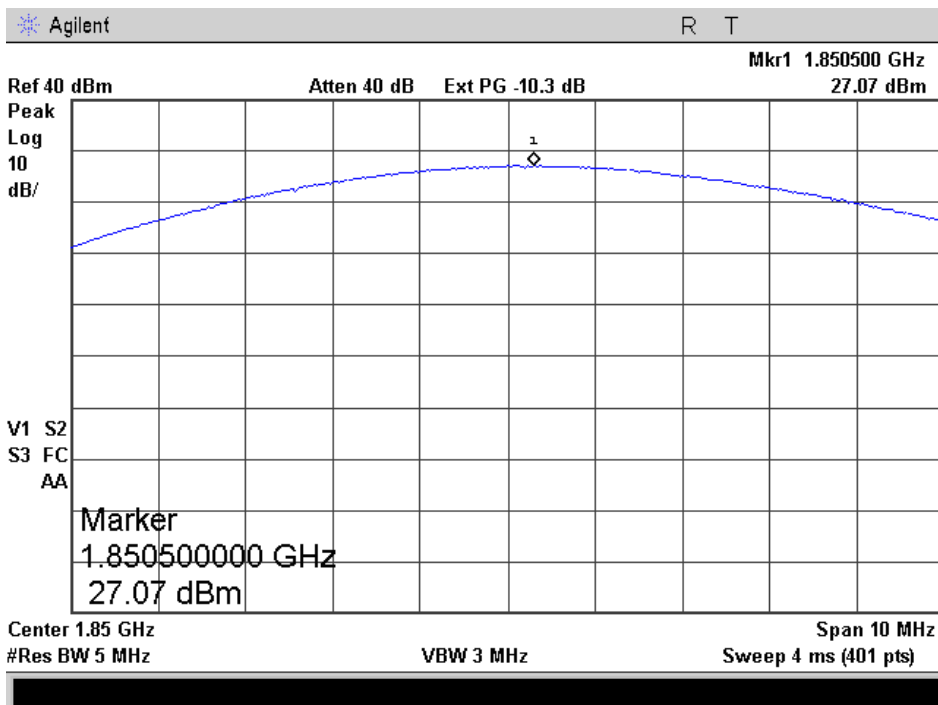
Frequency 1880.0 MHz
Plot 3.1.2



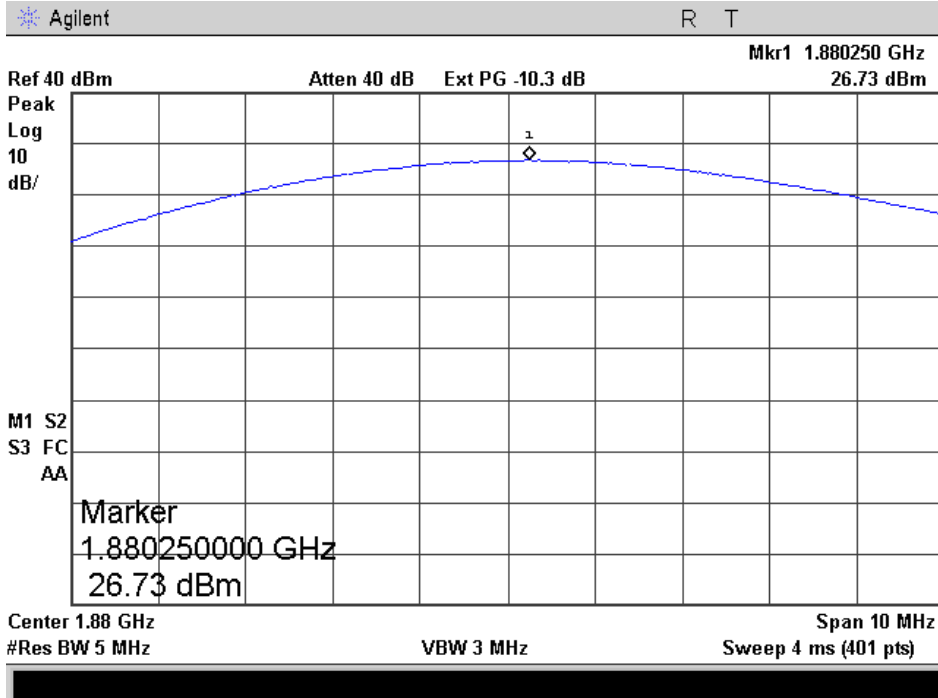
Frequency 1909.8 MHz
Plot 3.1.3



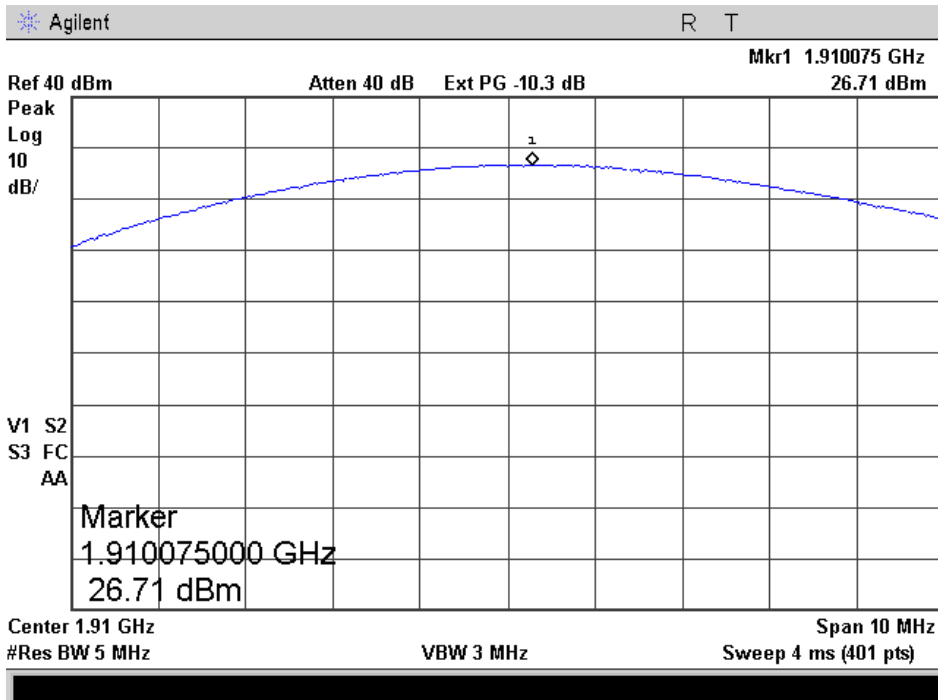
Modulation: 8PSK
Frequency 1850.2 MHz
Plot 3.1.4



Frequency 1880.0 MHz
Plot 3.1.5



Frequency 1909.8 MHz
Plot 3.1.6



3.2. Radiated Peak Output Power

Reference document:	47 CFR §24.232 (c)		
Test Requirements:	Mobile/portable stations are limited to 2 watts EIRP peak power		
Date of Test:	15.08.2006	Pass	
Test setup:	See Sec. 2.1		
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 3MHz, VBW: 3MHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Reference Plots 3.2.1 - 3.2.6	

Test results: GPRS Class 10

Frequency [MHz]	Signal Source Output* [dBm]	Antenna Gain [dBi]	Calculated EIRP [dBm]	Limit EIRP [dBm]	Margin [dB]	Reference
1850.2	23.7	7.1	30.8	33	-2.2	Plot 3.2.1
1880	23.9	7.2	31.1	33	-1.9	Plot 3.2.2
1909.8	24.3	7.3	31.6	33	-1.4	Plot 3.2.3

*Corrected for cable loss

Test results: EDGE 8PSK

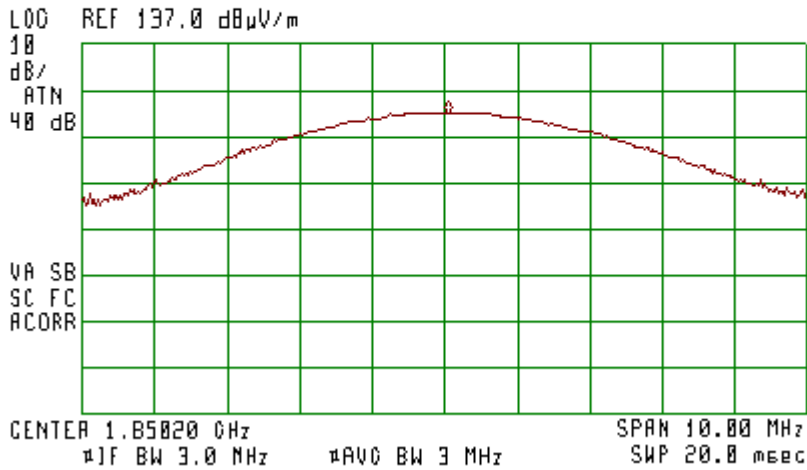
Frequency [MHz]	Signal Source Output* [dBm]	Antenna Gain [dBi]	Calculated EIRP [dBm]	Limit EIRP [dBm]	Margin [dB]	Reference
1850.2	21.3	7.1	28.4	33	-4.6	Plot 3.2.4
1880	20.7	7.2	27.9	33	-5.1	Plot 3.2.5
1909.8	21.5	7.3	28.8	33	-4.2	Plot 3.2.6

*Corrected for cable loss

GPRS Class 10
Frequency 1850.2 MHz
Vertical & Horizontal Polarization
Plot 3.2.1



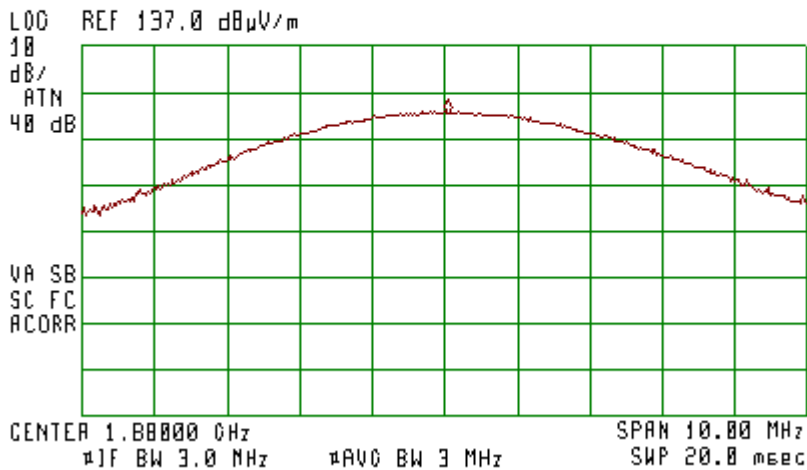
ACTV DET: PEAK
MERS DET: PEAK QP AVG
MKR 1.85025 GHz
122.02 dB μ V/m



Frequency 1880 MHz
Vertical & Horizontal Polarization
Plot 3.2.2



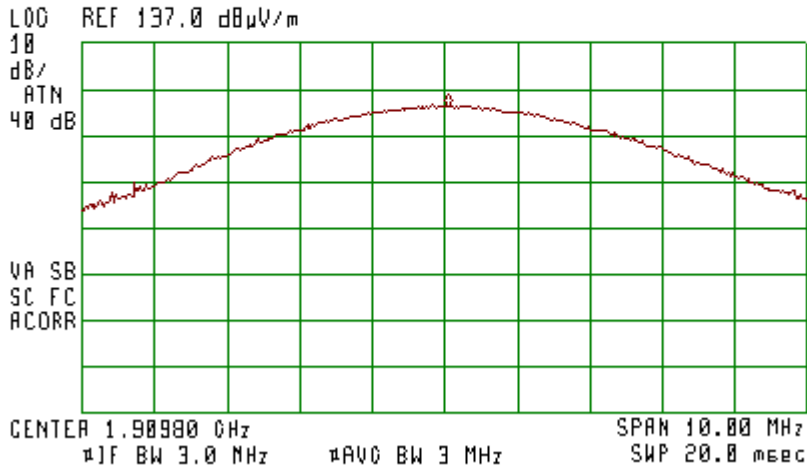
ACTV DET: PEAK
MERS DET: PEAK QP AVG
MKR 1.88005 GHz
122.66 dB μ V/m



Frequency 1909.8 MHz
Vertical & Horizontal Polarization
Plot 3.2.3



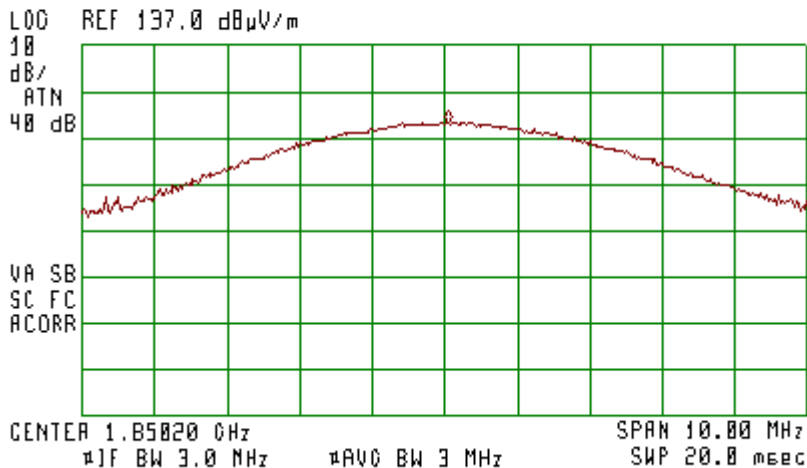
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.90985 GHz
123.30 dB μ V/m



8PSK
Frequency 1850.2 MHz
Vertical & Horizontal Polarization
Plot 3.2.4



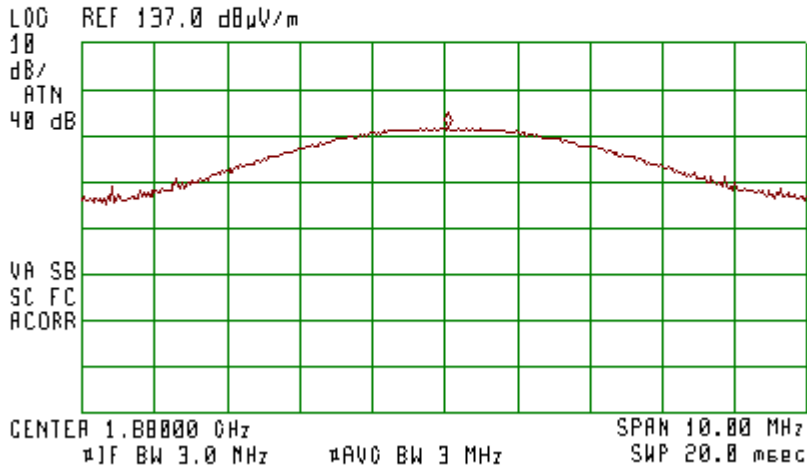
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.85025 GHz
120.20 dB μ V/m



Frequency 1880 MHz- 8PSK
Vertical & Horizontal Polarization
Plot 3.2.5



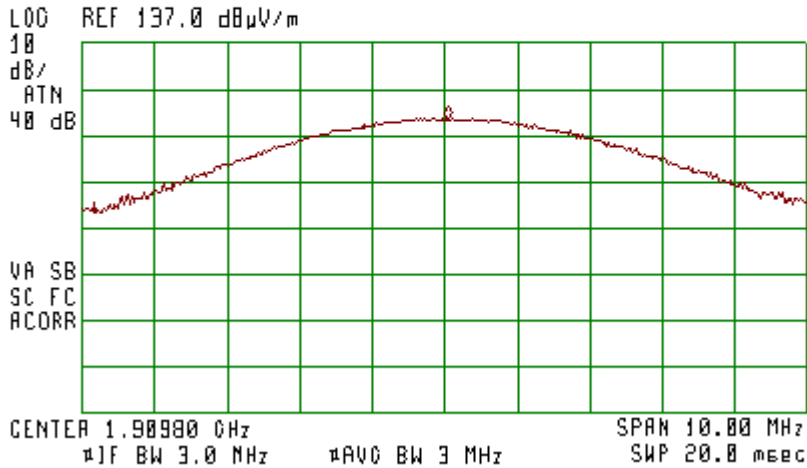
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.88885 GHz
118.90 dB μ V/m



Frequency 1909.8 MHz - 8PSK
Vertical & Horizontal Polarization
Plot 3.2.6



ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.90985 GHz
120.38 dB μ V/m



3.3. Frequency stability

Reference document:	47 CFR §24.235 & §2.1055		
Test Requirements:	The frequency stability shall be to ensure that the fundamental emissions stay within the authorized frequency block.		
Test setup:	See Sec. 2.7	Pass	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	-	

Test results

AFC Frequency error vs. Voltage

Voltage [Vdc]	Frequency Error [Hz]	Frequency Error [%]	Frequency Error [ppm]	Limit [ppm]	Test Result
Carrier frequency at 22°C (12 VDC): 1880MHz					
10.8-33	No Frequency Error observed				Pass

AFC Frequency error vs. Temperature

Temperature [°C]	Frequency Error [Hz]	Frequency Error [%]	Frequency Error [ppm]	Limit [ppm]	Margin [ppm]
Carrier frequency at 22°C (12 VDC): 1880MHz					
-30	-19	-0.00000227	-0.022711	0.1	Pass
-20	-18	-0.00000215	-0.0215157	0.1	Pass
-10	-13	-0.00000155	-0.0155391	0.1	Pass
0	-11	-0.00000131	-0.0131485	0.1	Pass
10	2	0.00000024	0.00239063	0.1	Pass
20	5	0.00000060	0.00597657	0.1	Pass
30	9	0.00000108	0.01075783	0.1	Pass
40	10	0.00000120	0.01195314	0.1	Pass
50	13	0.00000155	0.01553909	0.1	Pass

3.4. Occupied Bandwidth

Reference document:	47 CFR §24.238 & §2.1049		
Test Requirements:	The occupied bandwidth that is the frequency bandwidth outside of which all emission are attenuated at least 26 dB below the transmitter power.		
Test setup:	See sec 2.5	Pass	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 3kHz, VBW: 3kHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Reference Plots 3.4.1 - 3.4.6	

Test results:

Modulation: GPRS Class 10

Frequency [MHz]	-26dBc Occupied Bandwidth	Reference
1850.2	330	Plot 3.4.1
1880.0	310	Plot 3.4.2
1909.8	310	Plot 3.4.3

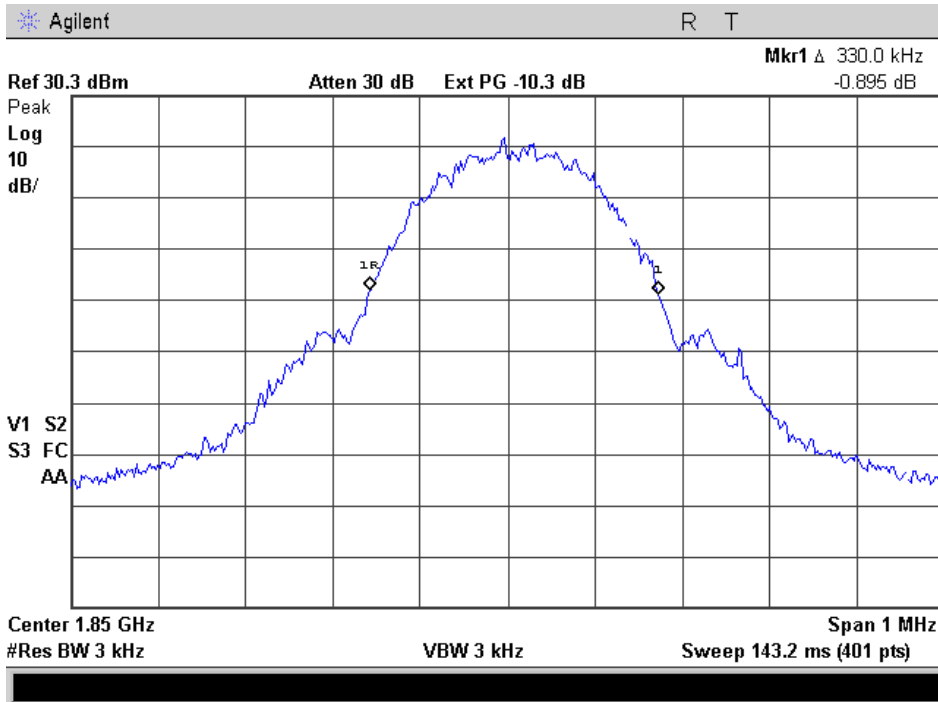
*§24.38(b) requires a measurement bandwidth of at least 1% of the -26dBc Occupied Bandwidth. From these results, a resolution BW of 3 kHz was used.

Modulation: EDGE 8PSK

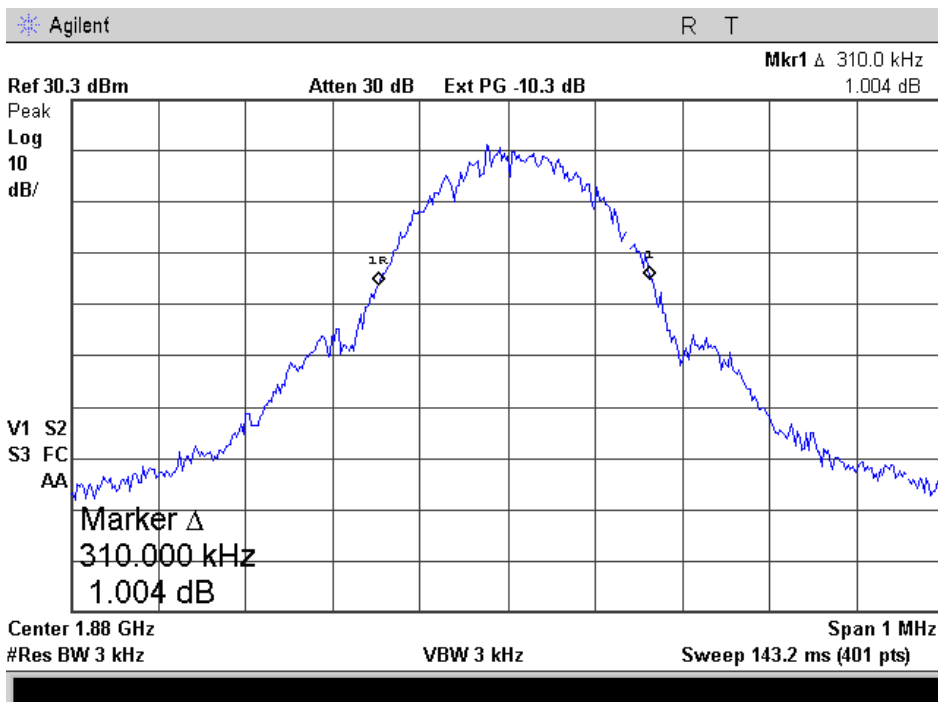
Frequency [MHz]	-26dBc Occupied Bandwidth	Reference
1850.2	302.5	Plot 4.4.4
1880.0	305.0	Plot 4.4.5
1909.8	307.5	Plot 4.4.6

*§24.238(b) requires a measurement bandwidth of at least 1% of the -26dBc Occupied Bandwidth. From these results, a resolution BW of 3 kHz was used.

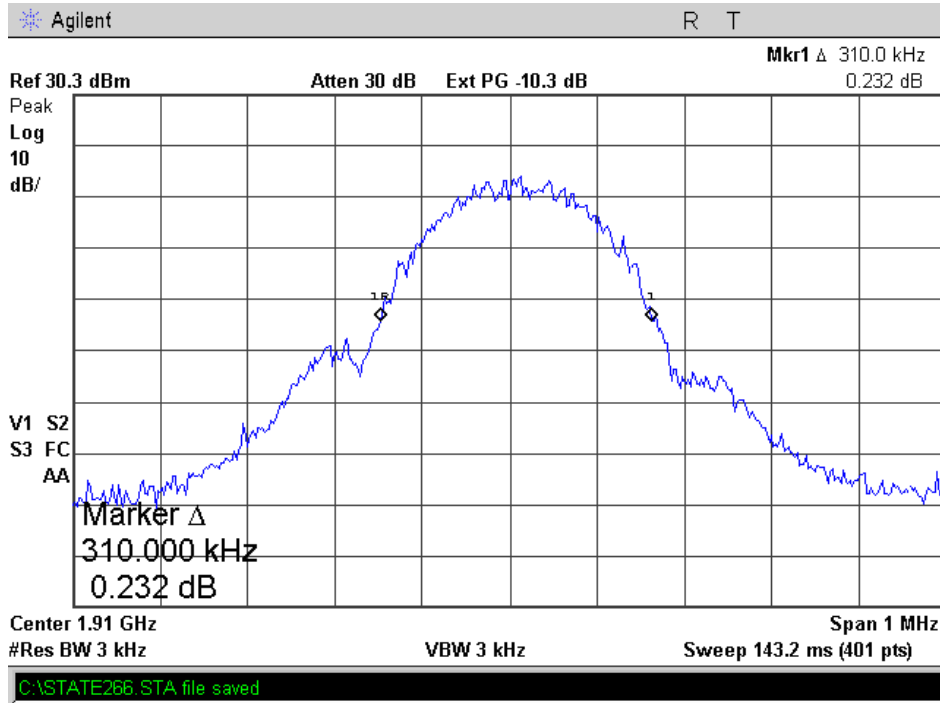
Modulation: GPRS Class 10
Frequency 1850.2MHz, -26dBc
Plot 3.4.1



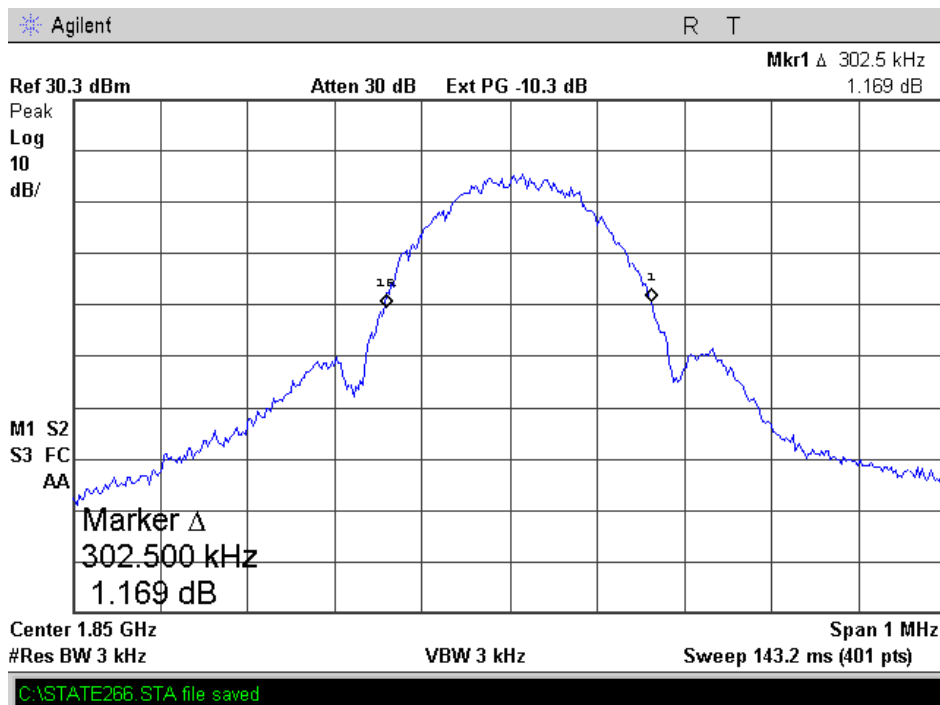
Frequency 1880MHz, -26dBc
Plot 3.4.2



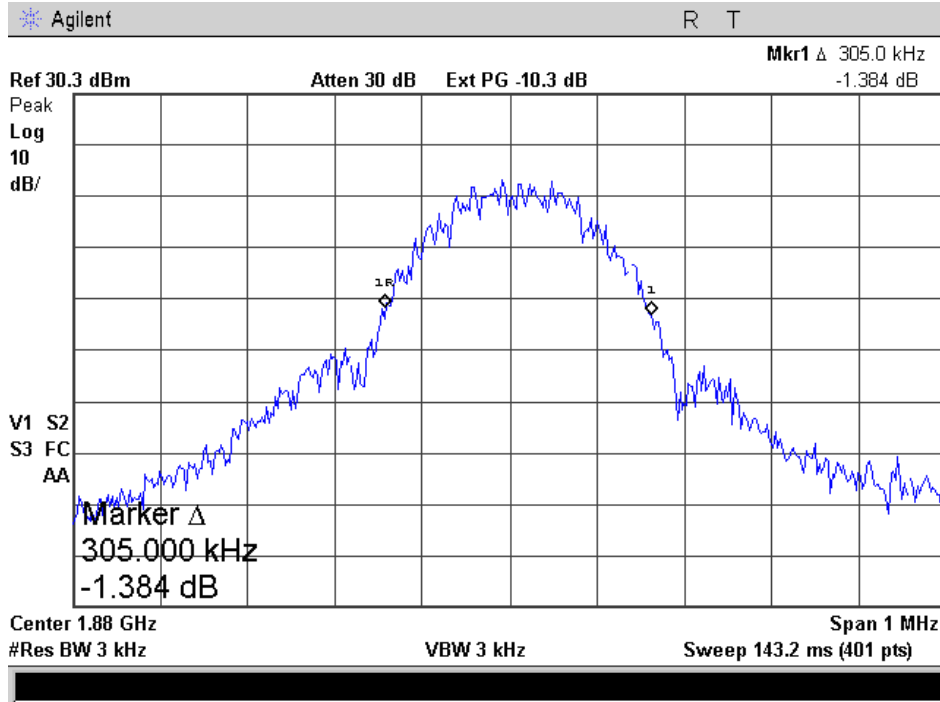
Frequency 1909.8MHz, -26dBc
Plot 3.4.3



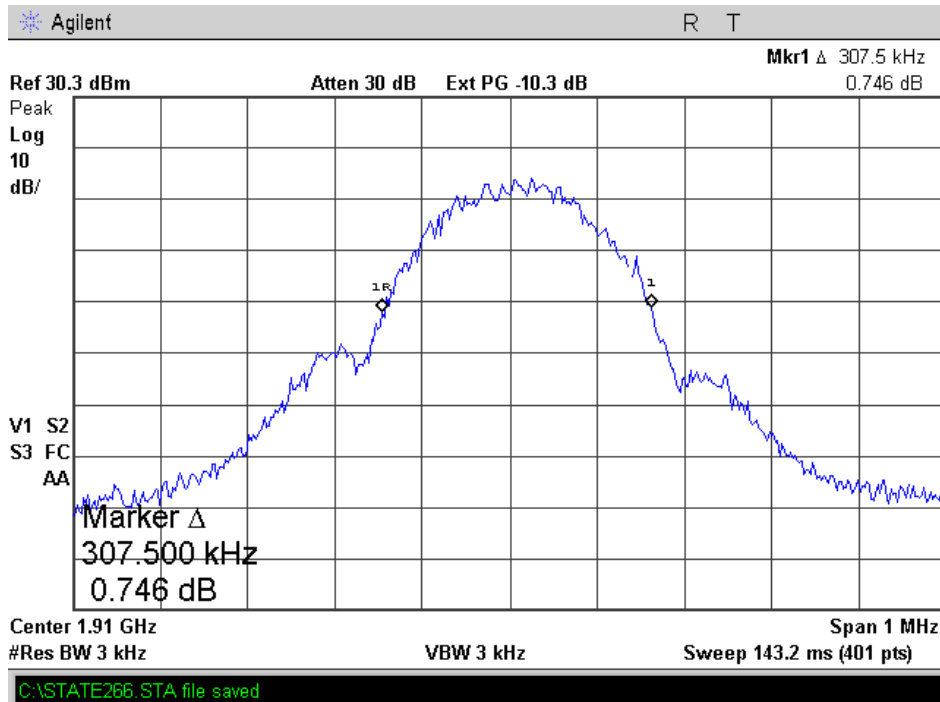
Modulation: 8PSK
Frequency 1850.2MHz, -26dBc
Plot 3.4.4



Frequency 1880MHz, -26dBc
Plot 3.4.5



Frequency 1909.8MHz, -26dBc
Plot 3.4.6



3.5. Out of Band Emissions - Radiated

Reference document:	47 CFR §24.238		
Test Requirements:	The power of any emission outside of the authorized operating frequency block shall be attenuated below the transmitting power (P, in Watts) by a factor of at least 43+10log(P) dB*.		
Test setup:	See Sec. 2.3	Pass	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	f <1GHz: RBW: 120kHz, VBW: 1MHz f >1GHz: RBW: 1MHz, VBW: 3MHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Reference Plots 3.5.1 - 3.5.12	

*It translates to a limit of -13dBm

Test results:

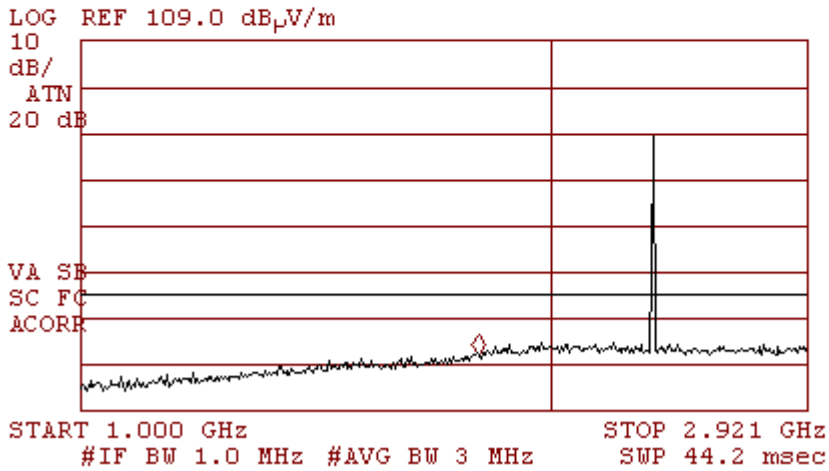
Frequency [MHz]	Radiated Emission Level [dBμV/m]	Radiated Emission Level* ERP [dBm]	Limit [dBm]	Margin [dB]	Result
1850.2	126.63	30.0	Carrier		
11101.2	48.75	-28.17	-13.0	-15.17	Pass
1880.0	124.01	30.7	Carrier		
11280	51.41	-26.9	-13.0	-13.9	Pass
1909.8	122.05	28.2	Carrier		
9549	46.78	-31.9	-13.0	-18.9	Pass
11458.81	50.51	-27.7	-13.0	-14.7	Pass

$$\text{Radiated Emission [dBm]} = \text{Measured [dBm]} - \text{Cable Loss [dB]} + \text{Substitution Antenna Gain [dBd]}$$

Lowest frequency
Horizontal & Vertical Polarization
Plot 3.5.1

/s/

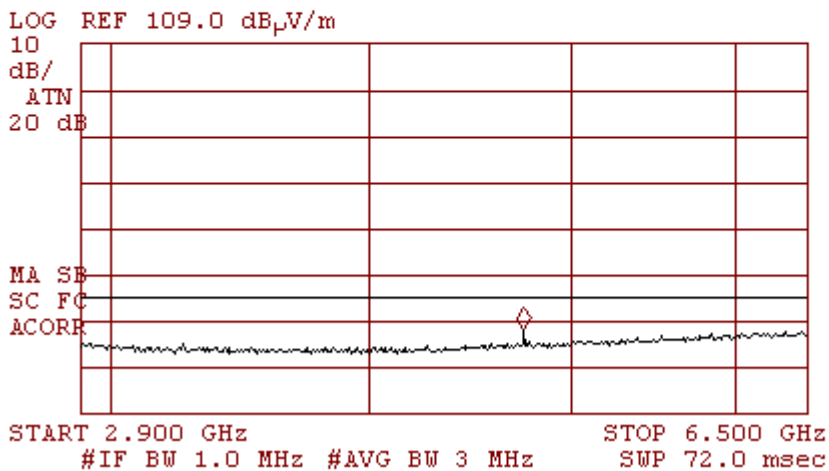
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.821 GHz
40.87 dB μ V/m



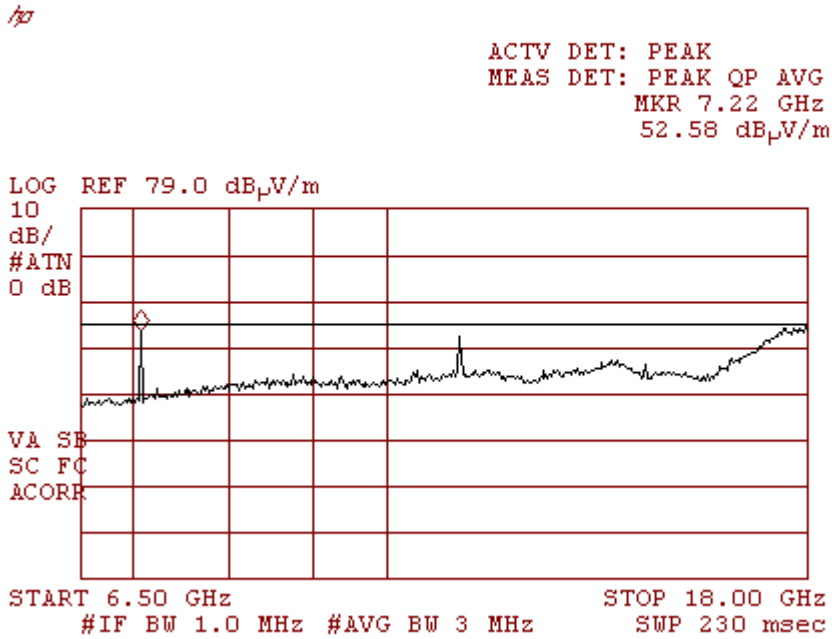
Horizontal & Vertical Polarization
Plot 3.5.2

/s/

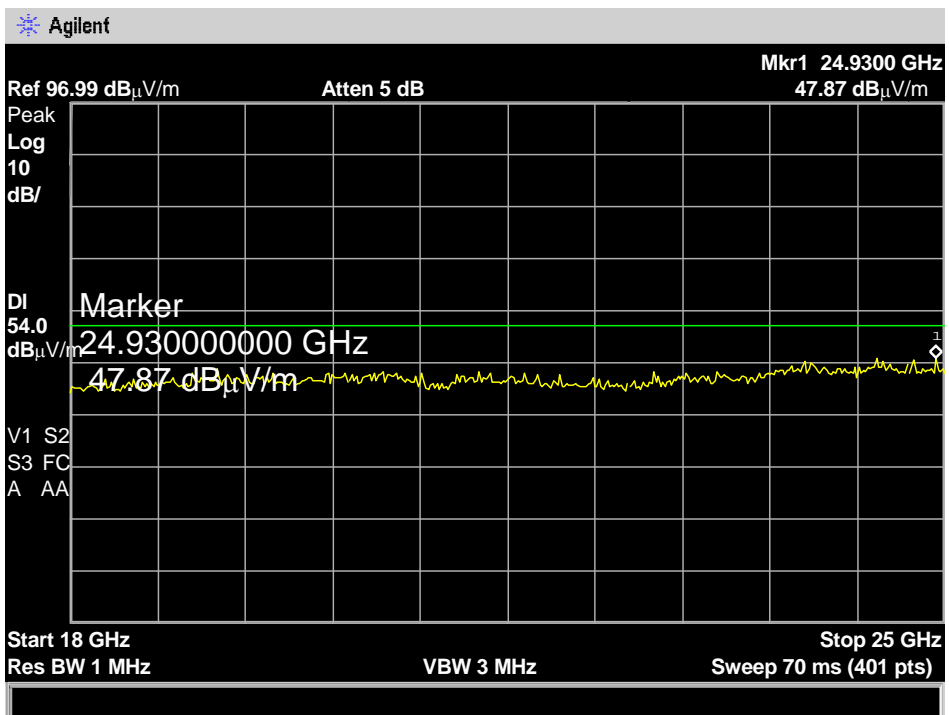
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.811 GHz
47.19 dB μ V/m



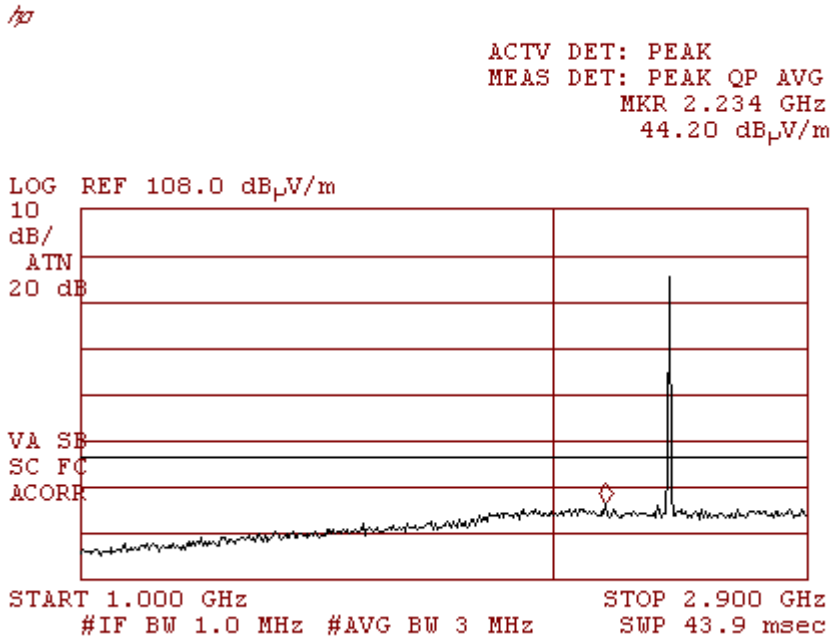
Horizontal & Vertical Polarization
Plot 3.5.3



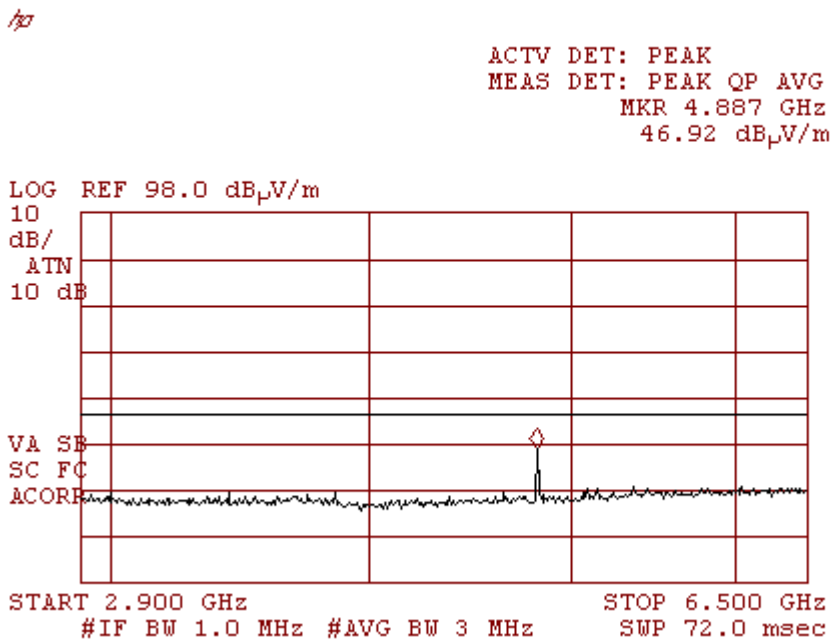
Horizontal & Vertical Polarization
Plot 3.5.4



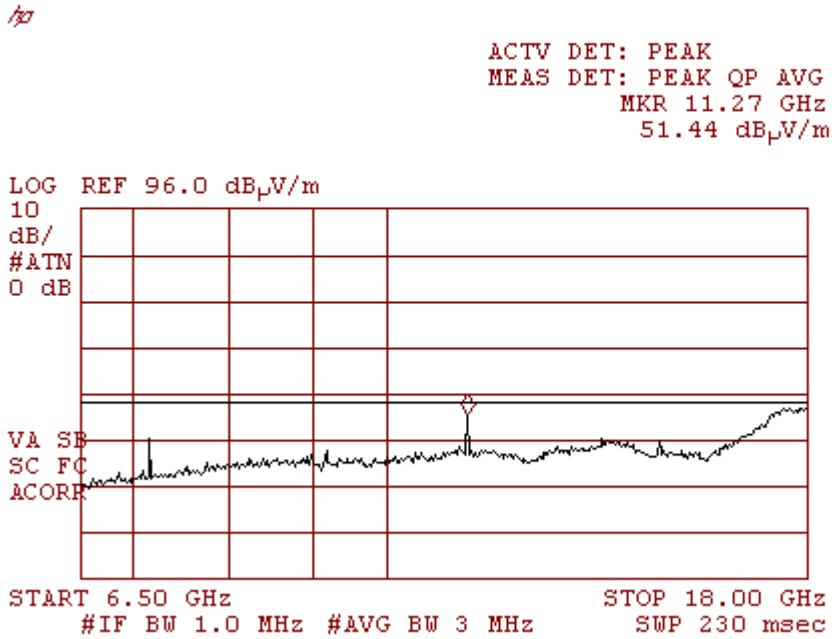
Middle frequency
Horizontal & Vertical Polarization
Plot 3.5.5



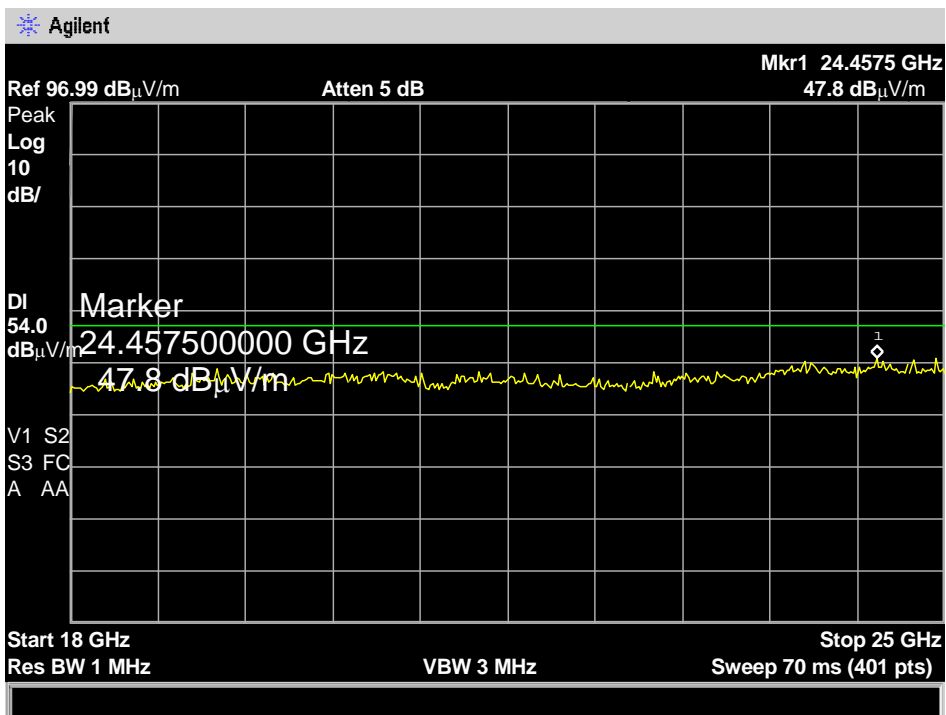
Horizontal & Vertical Polarization
Plot 3.5.6



Horizontal & Vertical Polarization
Plot 3.5.7



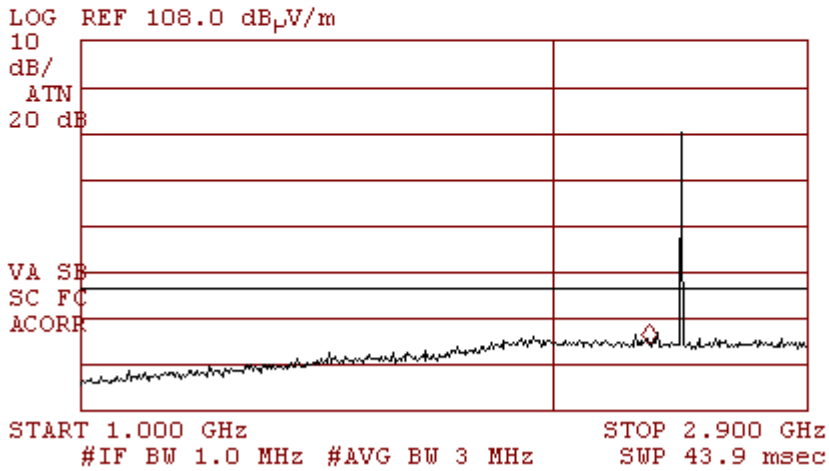
Horizontal & Vertical Polarization
Plot 3.5.8



**Highest frequency
Horizontal & Vertical Polarization
Plot 3.5.9**

hp

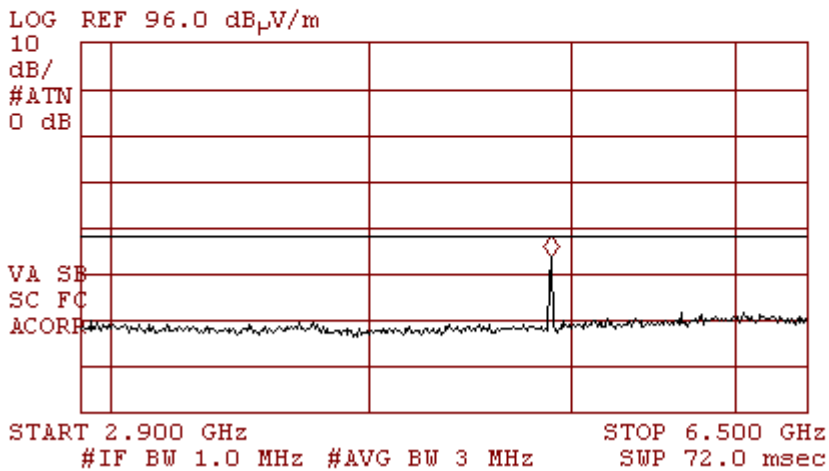
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.378 GHz
42.22 dB μ V/m



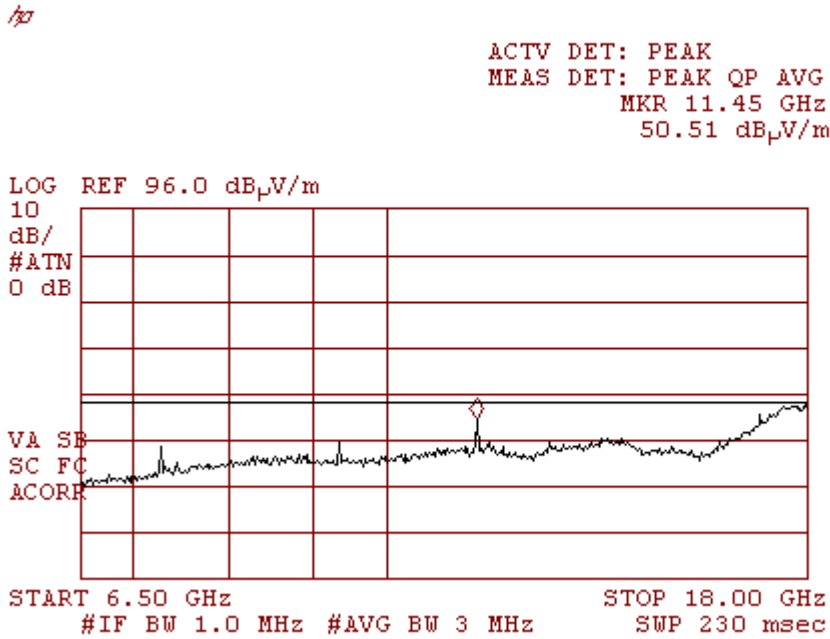
**Horizontal & Vertical Polarization
Plot 3.5.10**

hp

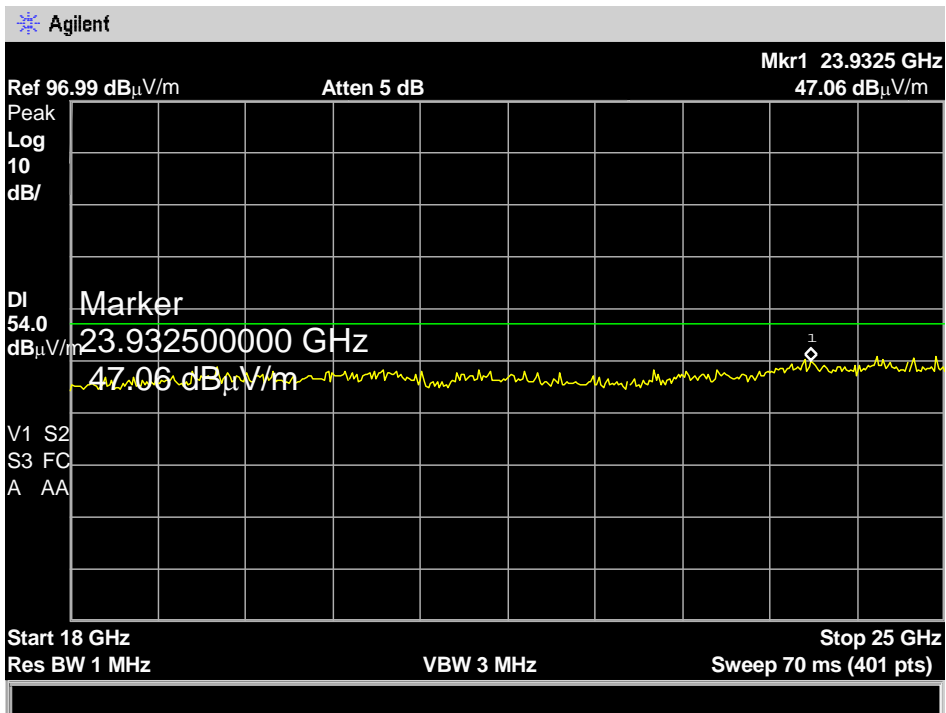
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.974 GHz
49.69 dB μ V/m



Horizontal & Vertical Polarization
Plot 3.5.11



Horizontal & Vertical Polarization
Plot 3.5.12



3.6. Out of Band Emissions - Conducted

Reference document:	47 CFR §24.238		
Test Requirements:	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.		
Test setup:	See sec 2.4	Pass	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW:1 MHz, VBW: 1 MHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Reference Plots 3.6.1 - 3.6.18	

Test results:

Modulation: GPRS Class 10

Frequency [MHz]	Spurious Emission Level* [dBm]	Limit [dBc]	Reference	Actual Attenuation [dBc]	Margin [dB]	Result
1850.2	28.89					Carrier
All Spurious at least 15 dB blow the limit		41.9	Plot 3.6.1- Plot 3.6.3	>57dBc	>15dB	Pass
1880.0	29.48					Carrier
All Spurious at least 15 dB blow the limit		42.5	Plot 3.6.4- Plot 3.6.6	>58dBc	>15dB	Pass
1909.8	29.04					Carrier
All Spurious at least 15 dB blow the limit		42.0	Plot 3.6.7- Plot 3.6.9	>57dBc	>15dB	Pass

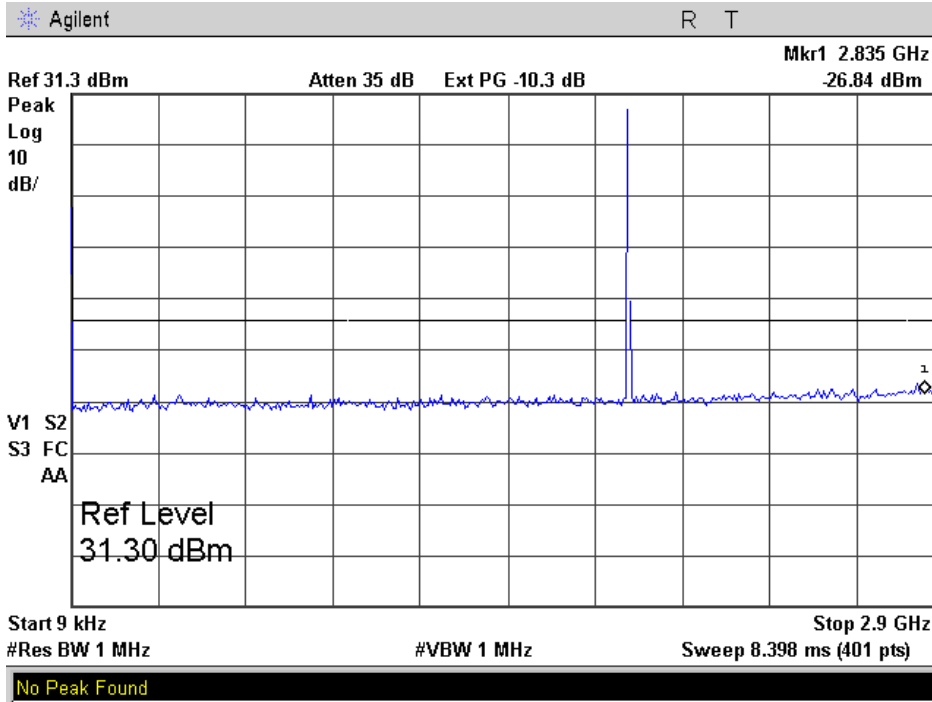
* Spurious Emission [dBm] = Measured [dBm] - Attenuations [dB]

Modulation: EDGE 8PSK

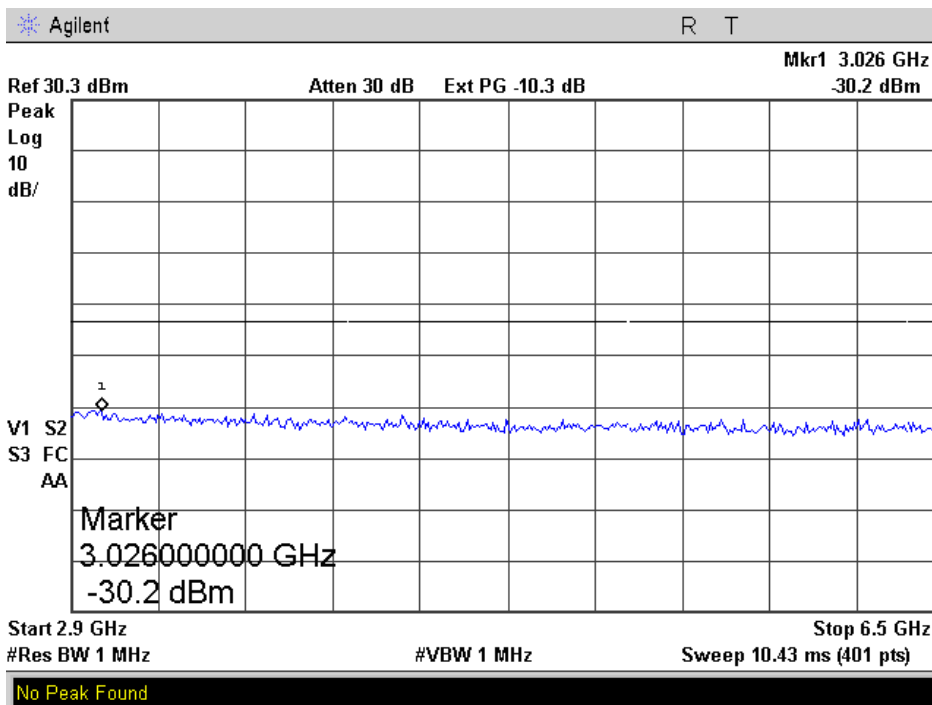
Frequency [MHz]	Spurious Emission Level* [dBm]	Limit [dBc]	Ref plot	Actual Attenuation [dBc]	Margin [dB]	Result
1850.2	27.07					Carrier
All Spurious at least 15 dB blow the limit		40.0	Plot 3.6.10- Plot 3.6.12	>55dBc	>15dB	Pass
1880.0	26.73					Carrier
All Spurious at least 15 dB blow the limit		39.7	Plot 3.6.13- Plot 3.6.15	>55dBc	>15dB	Pass
1909.8	26.71					Carrier
All Spurious at least 15 dB blow the limit		39.7	Plot 3.6.16- Plot 3.6.18	>55dBc	>15dB	Pass

* Spurious Emission [dBm] = Measured [dBm] - Attenuations [dB]

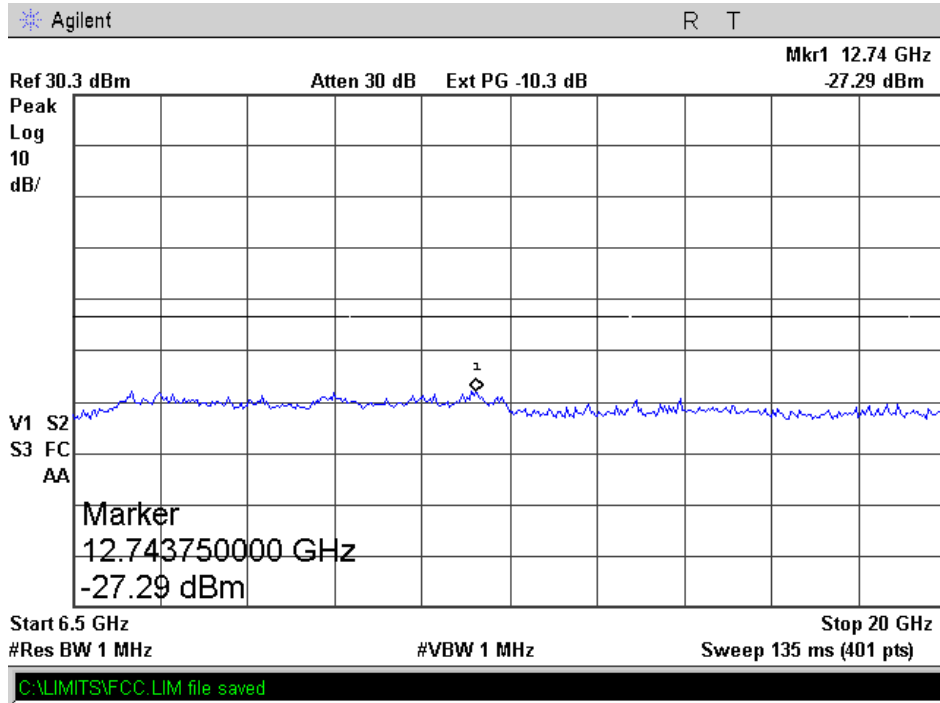
Modulation: GPRS Class 10
Frequency 1850.2 MHz
Plot 3.6.1



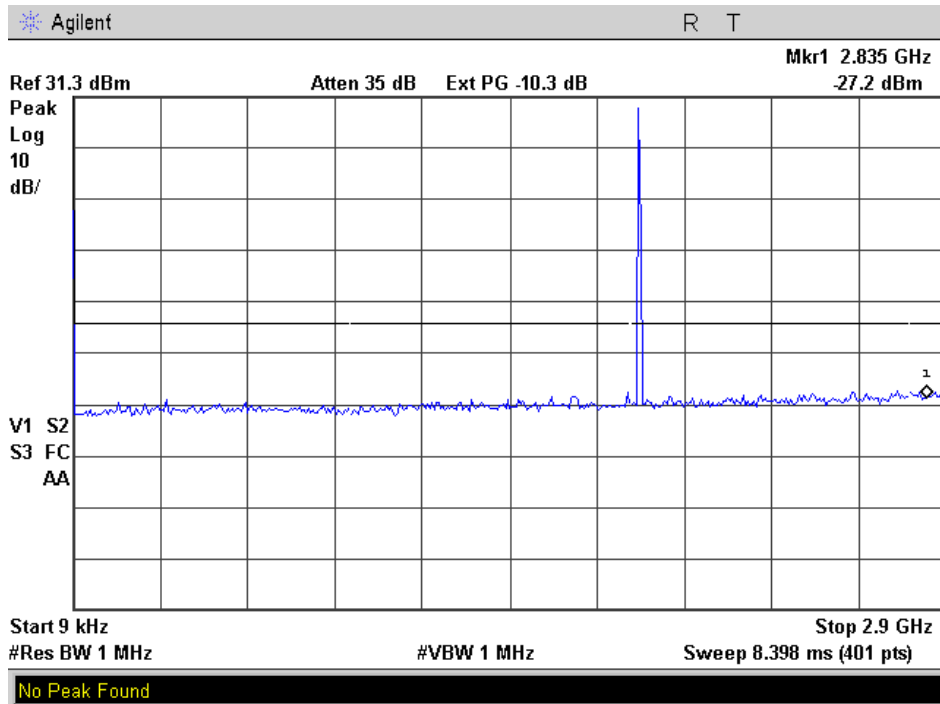
Plot 3.6.2



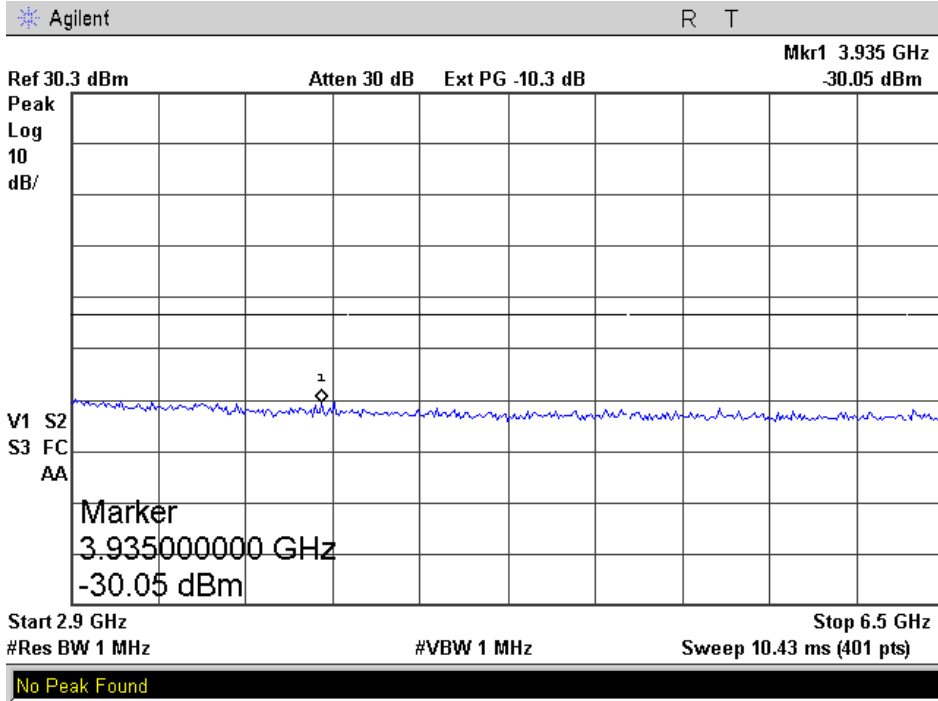
Plot 3.6.3



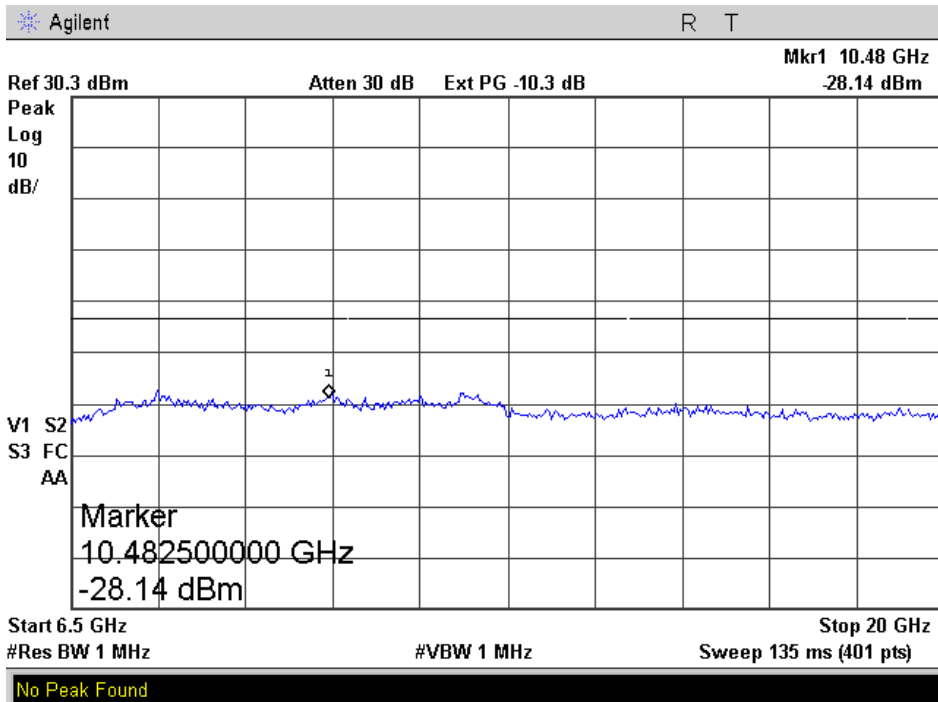
Frequency 1880 MHz
Plot 3.6.4



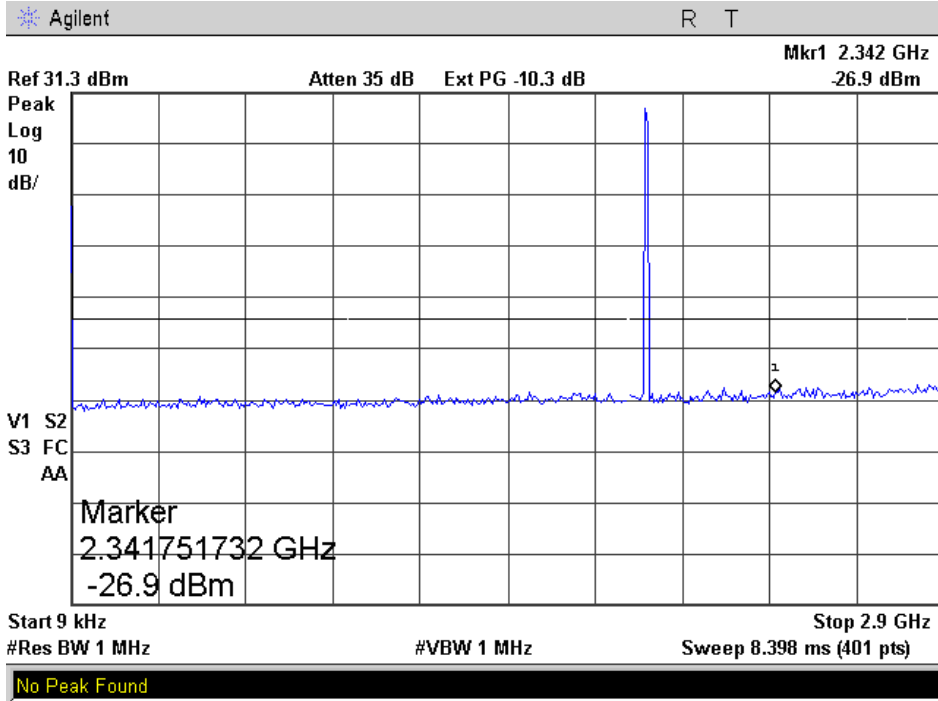
Plot 3.6.5



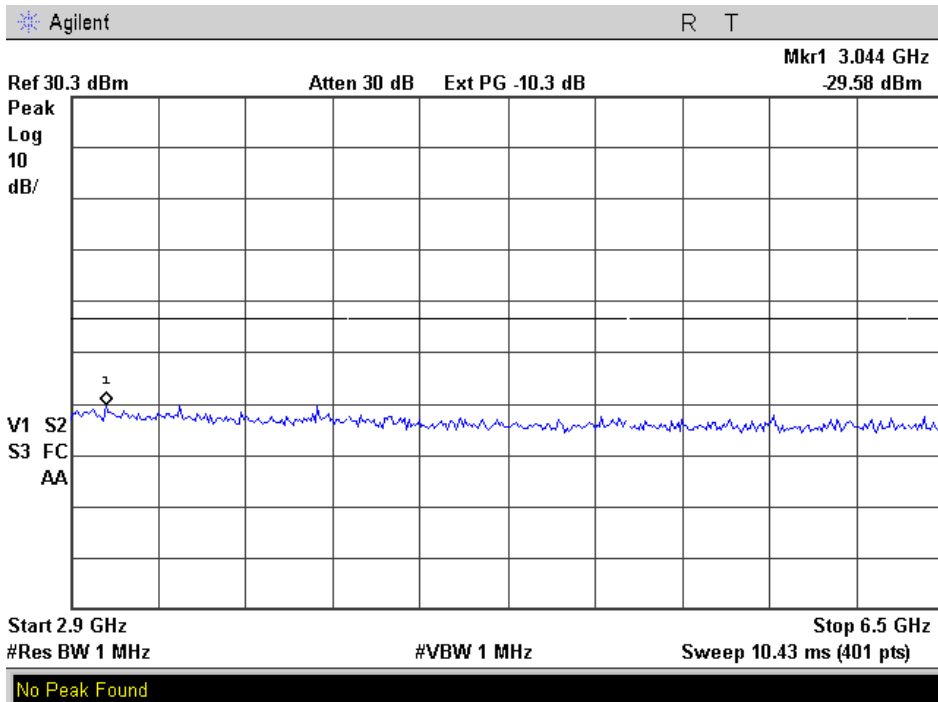
Plot 3.6.6



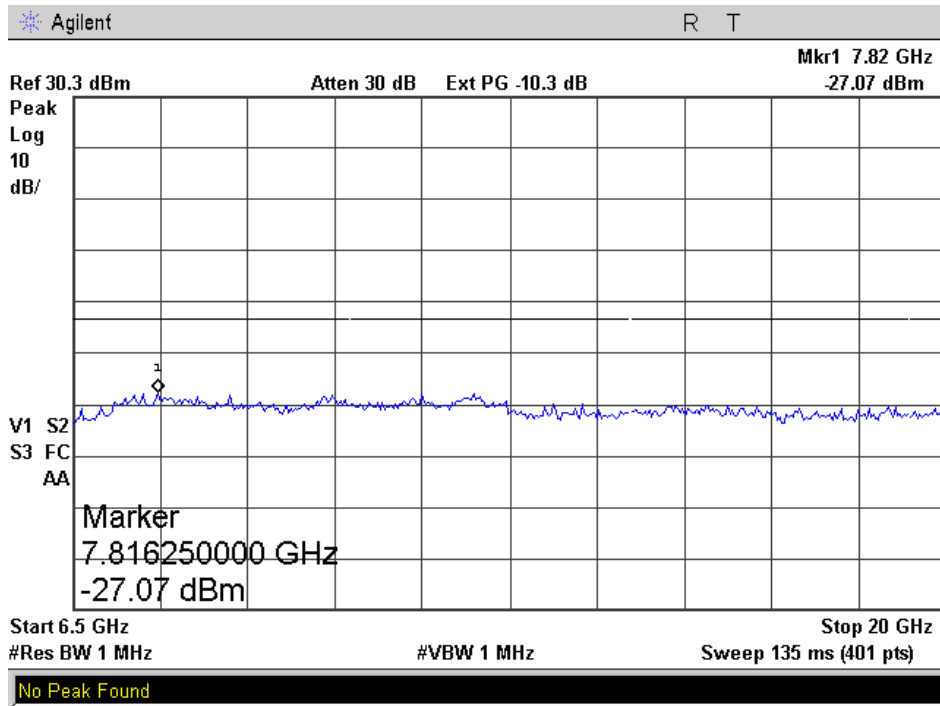
Frequency 1909.8 MHz
Plot 3.6.7



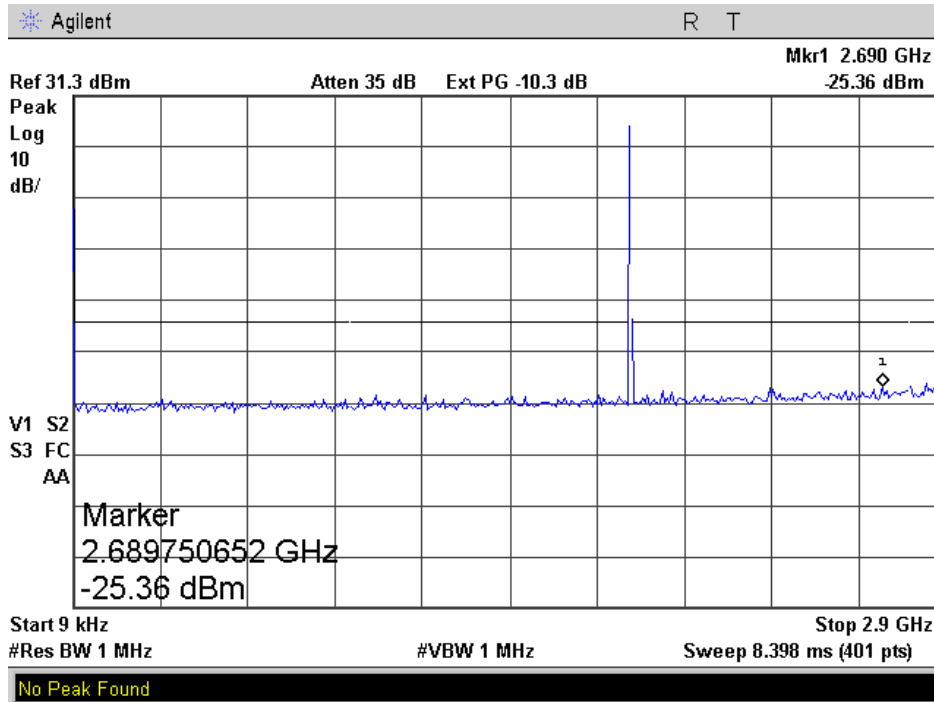
Plot 3.6.8



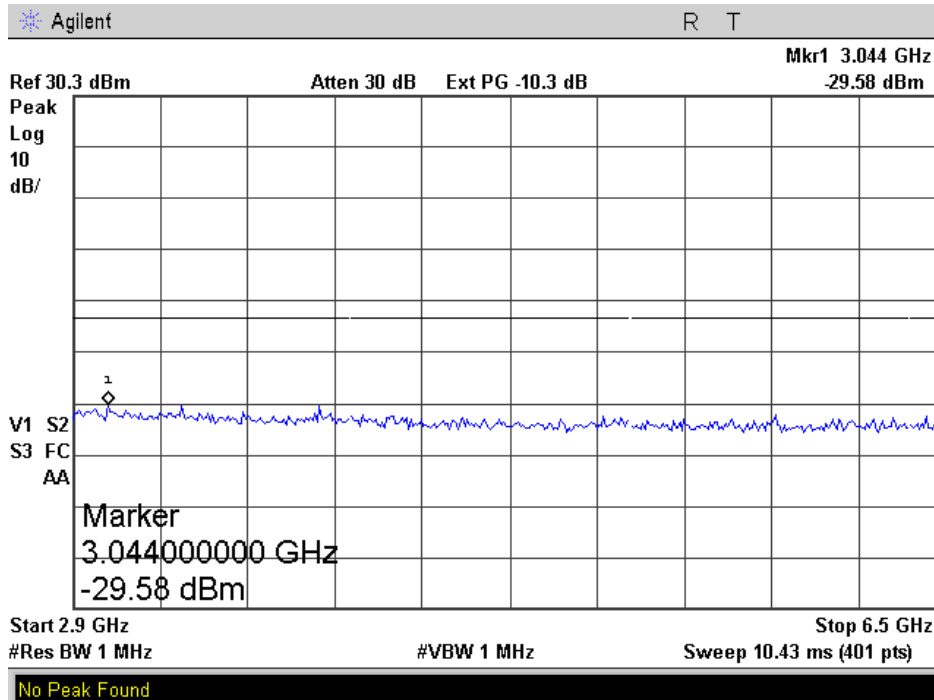
Plot 3.6.9



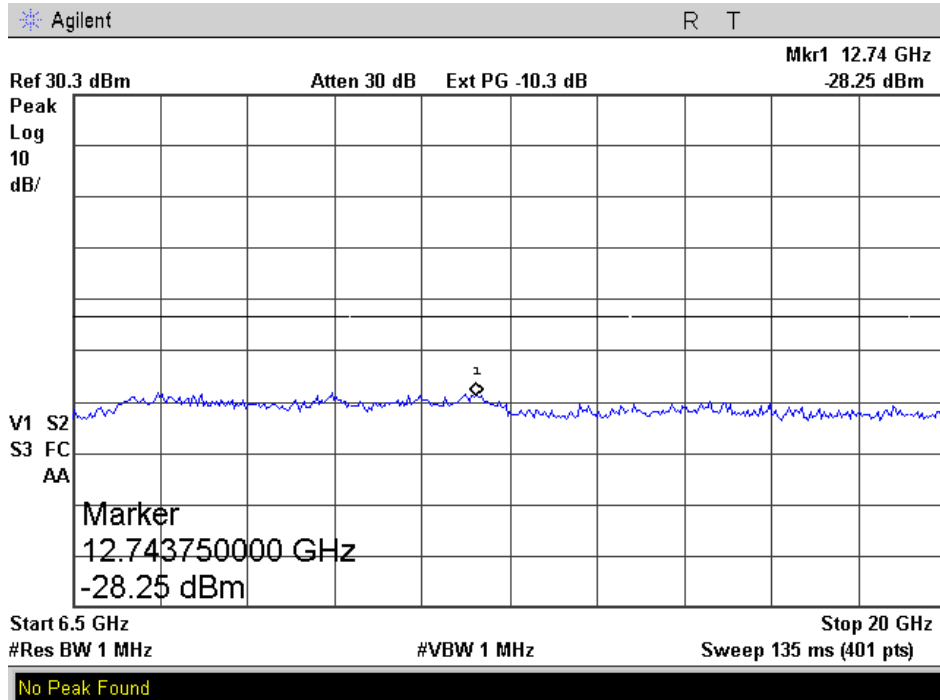
Modulation: 8PSK
Frequency 1850.2 MHz
Plot 3.6.10



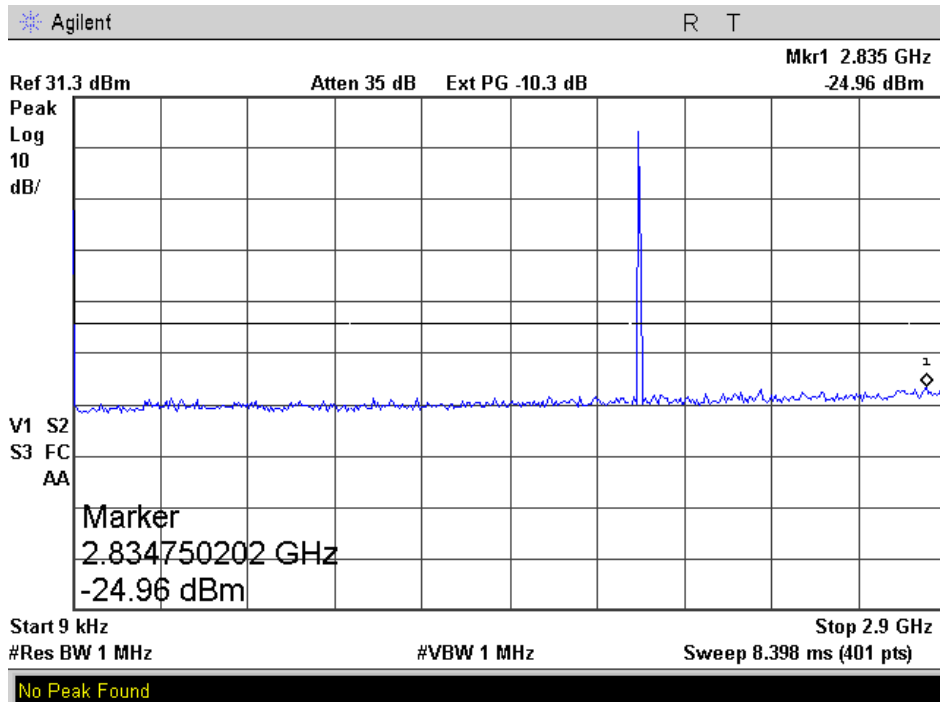
Plot 3.6.11



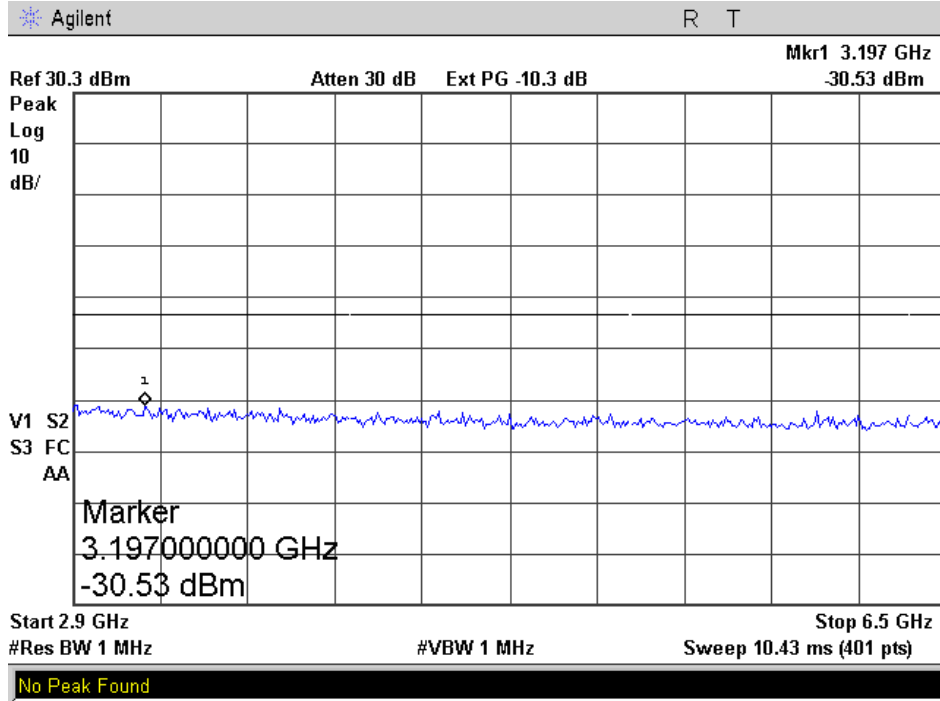
Plot 3.6.12



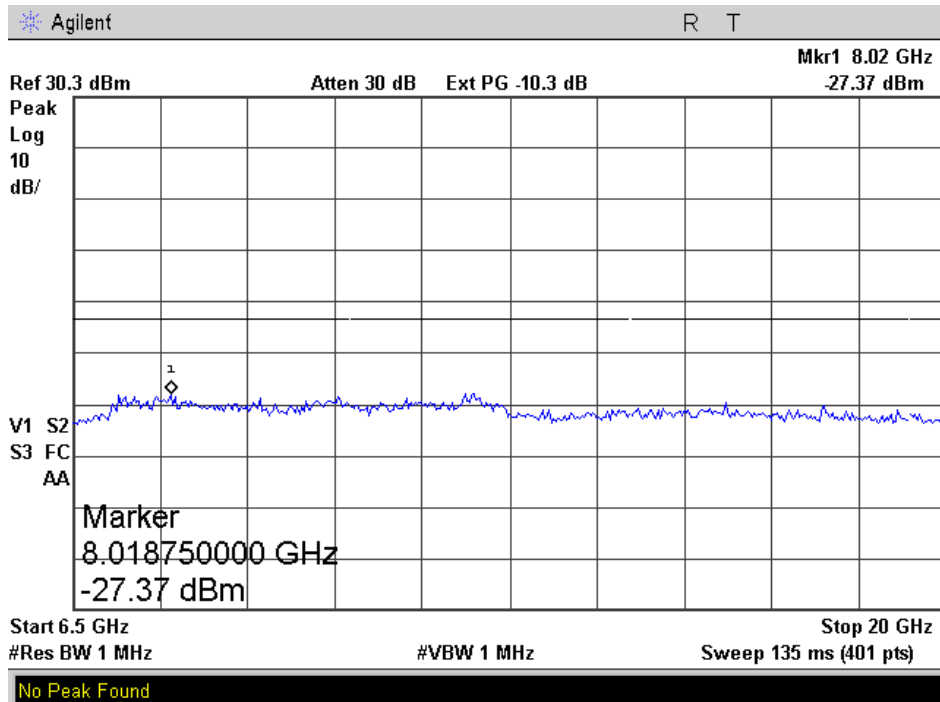
Frequency 1880 MHz
Plot 3.6.13



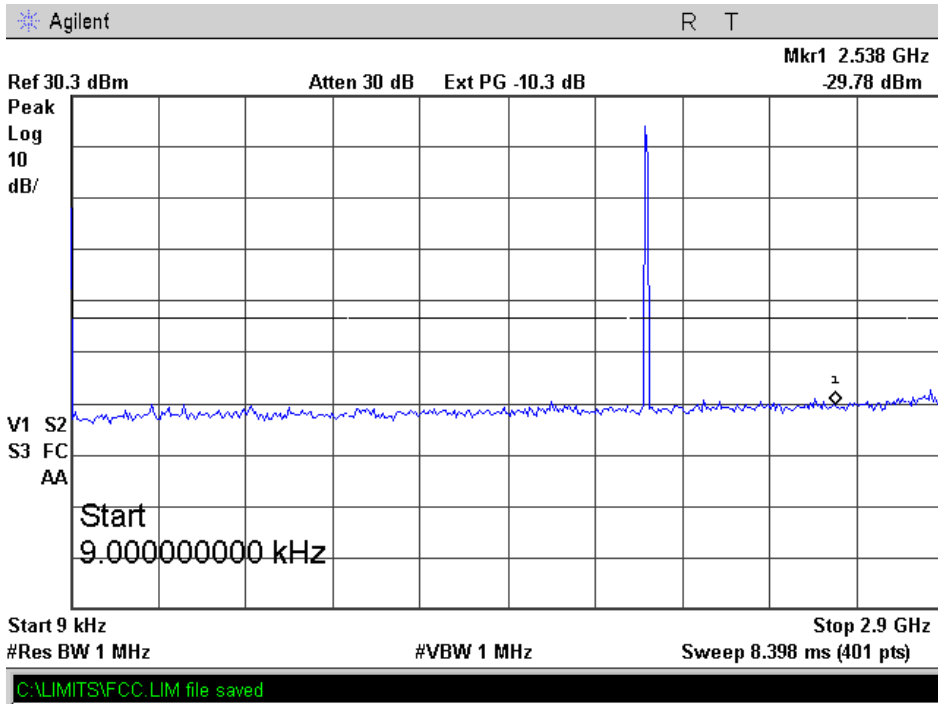
Plot 3.6.14



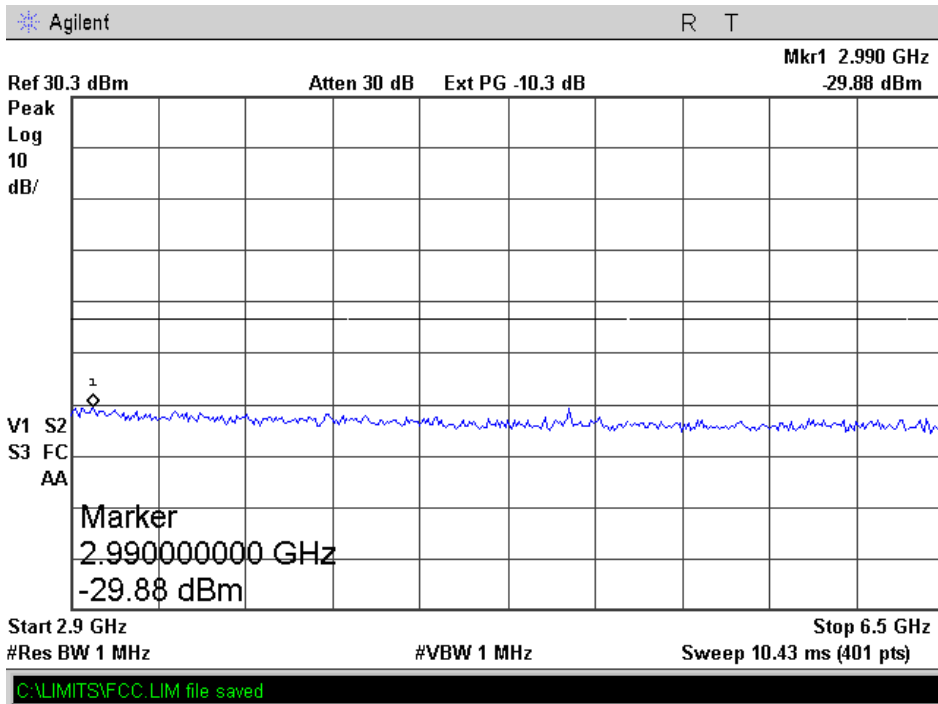
Plot 3.6.15



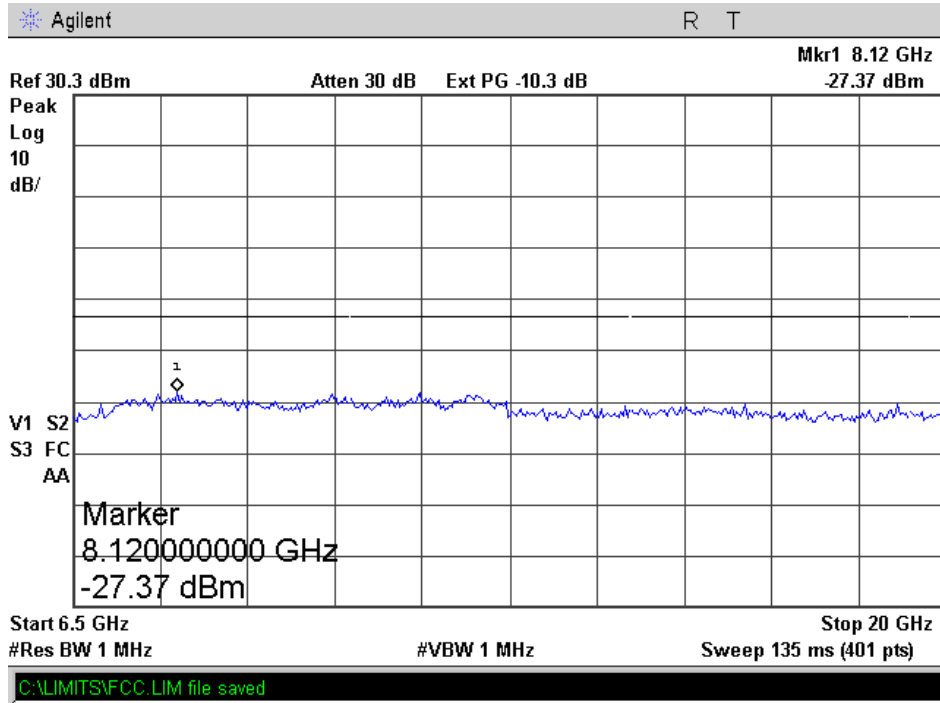
Frequency 1909.8 MHz
Plot 3.6.16



Plot 3.6.17



Plot 3.6.18



3.7. Block Edge Emissions - conducted

Reference document:	47 CFR §24.238		
Test Requirements:	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. In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 1% of the EBW may be employed.		
Test setup:	See sec 2.4	Pass	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 3kHz, VBW: 3kHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Reference Plots 3.7.1 - 3.7.4	

Test results:

Modulation: GPRS Class 10

Frequency [MHz]	Spurious Emission Level* [dBm]	Limit [dBc]	Actual Attenuation below frequency of operation [dBc]	Reference	Margin [dB]	Result
1850.2	28.89					Carrier
1849.985	-16.52	41.9	45.41	Plot 3.7.1	-3.41	Pass
1909.8	29.04					Carrier
1910.02	-15.43	42.0	42.04	Plot 3.7.2	-2.43	Pass

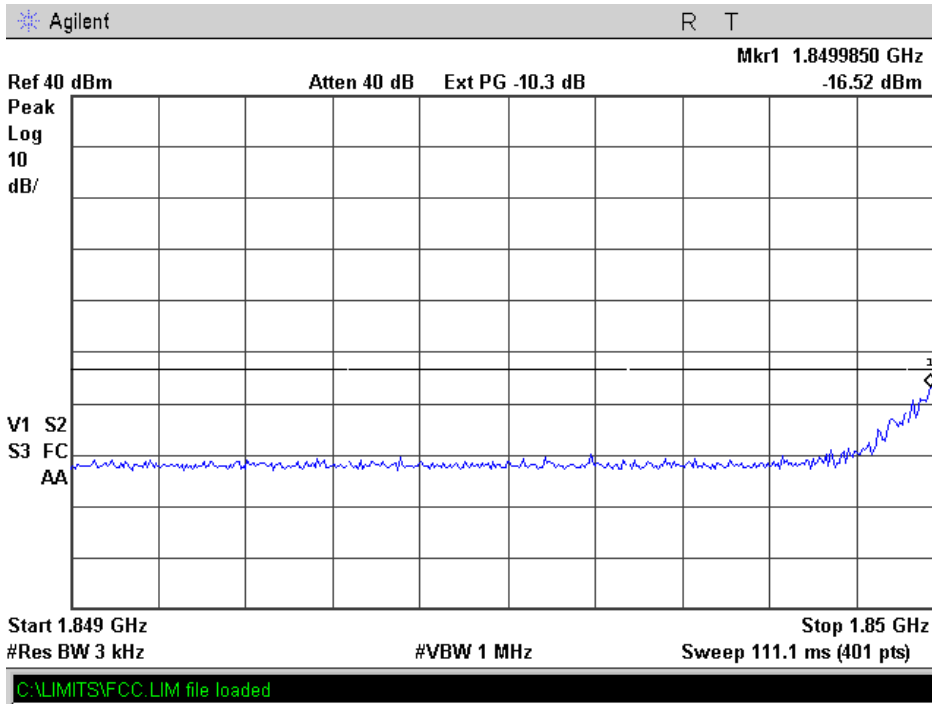
* Spurious Emission [dBm] = Measured [dBm] – Attenuations [dB]

Modulation: EDGE 8PSK

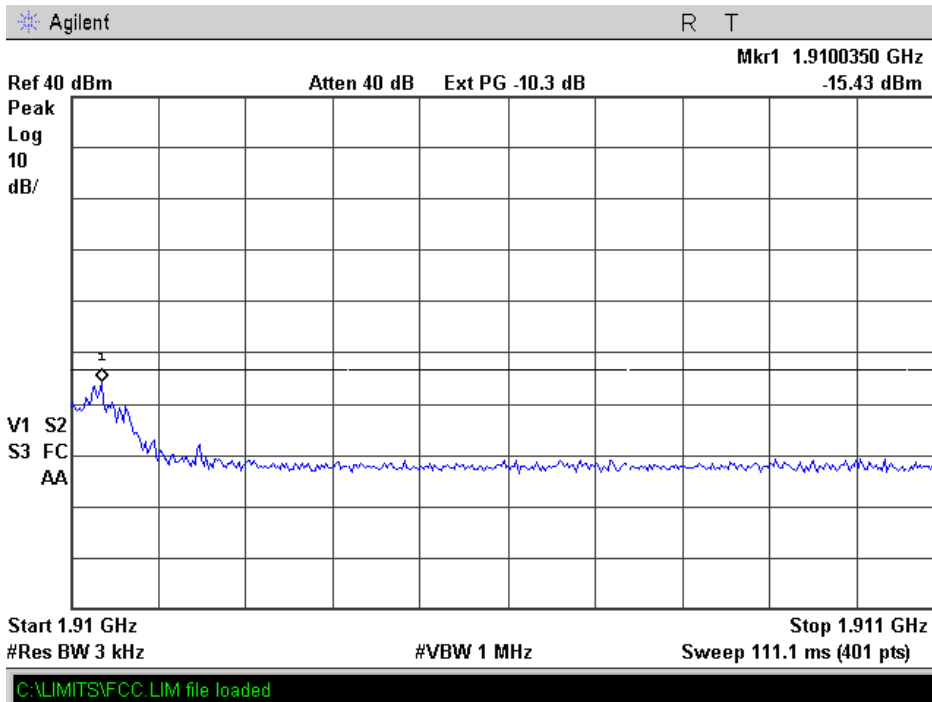
Frequency [MHz]	Spurious Emission Level* [dBm]	Limit [dBc]	Actual Attenuation below frequency of operation [dBc]	Ref plot	Margin [dB]	Result
1850.2	27.07					Carrier
1849.985	-17.67	40.0	44.74	Plot 3.7.3	-4.77	Pass
1909.8	26.71					Carrier
1910.02	-15.43	39.7	42.14	Plot 3.7.4	-2.44	Pass

* Spurious Emission [dBm] = Measured [dBm] – Attenuations [dB]

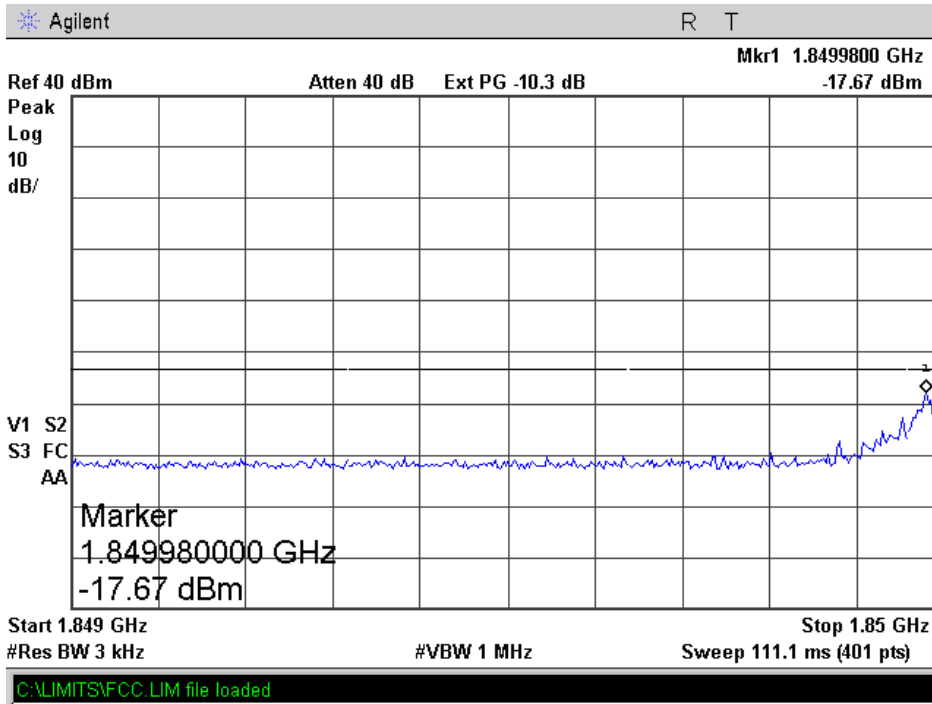
Modulation: GPRS Class 10
Plot 3.7.1



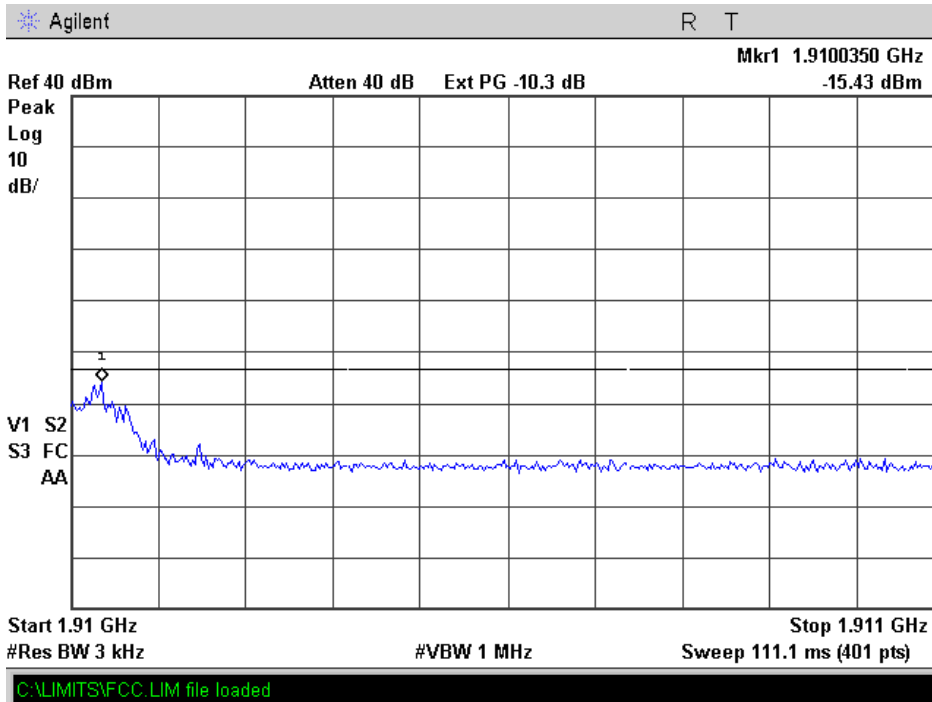
Plot 3.7.2



Modulation: 8PSK
Plot 3.7.3



Plot 3.7.4



4. FCC 47 CFR, Part 22: Report of Measurements and examinations

4.1. Conducted Peak Output Power

Reference document:	47 CFR §22.913 (a) (2)		
Test Requirements:	Mobile stations are limited to 7 watts EIRP peak power		
Test setup:	See sec 2.2	Pass	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: Impulse BW5MHz, VBW: 3MHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Reference Plots 4.1.1 - 4.1.6	

Test results

Modulation: GPRS Class 10

Frequency [MHz]	Peak Output Power* [dBm]	Peak Output Power* [Watt]	Antenna Gain [dBd]	Calculated ERP [dBm]	Limit [dBm]	Margin [dB]	Reference
824.2	29.36	0.863	3	32.36	38	-5.64	Plot 4.1.1
836.6	29.52	0.895	3	32.52	38	-5.48	Plot 4.1.2
848.8	29.50	0.891	3	32.5	38	-5.50	Plot 4.1.3

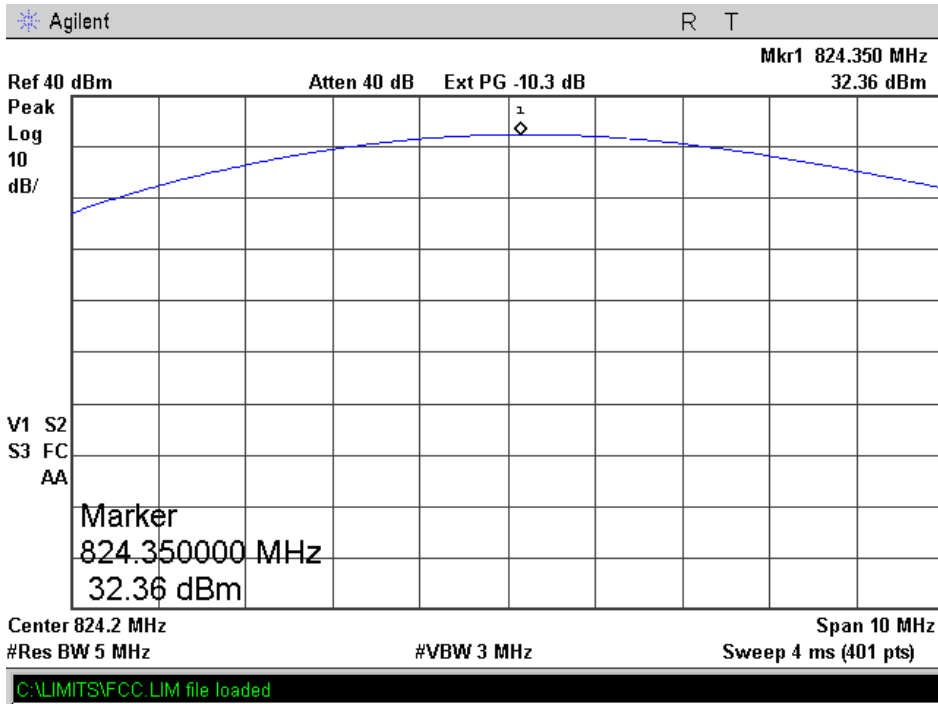
*Corrected for attenuations and cables loss (including 5m antenna cable)

Modulation: EDGE 8PSK

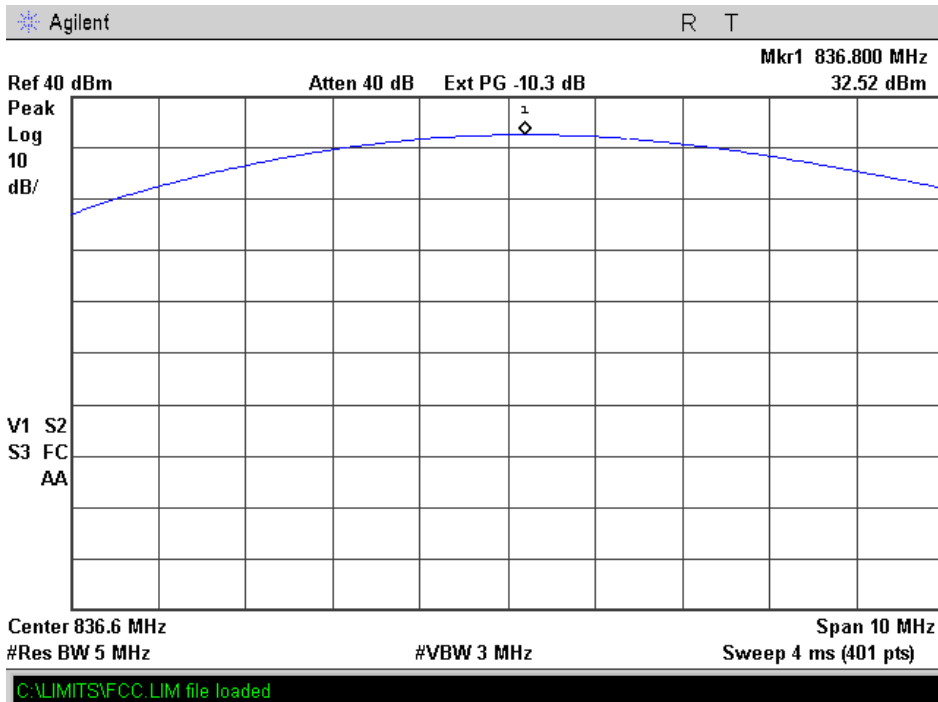
Frequency [MHz]	Peak Output Power* [dBm]	Peak Output Power* [Watt]	Antenna Gain [dBd]	Calculated ERP [dBm]	Limit [dBm]	Margin [dB]	Reference
824.2	26.65	0.462	3	29.65	38	-8.35	Plot 4.1.4
836.6	26.74	0.472	3	29.74	38	-8.26	Plot 4.1.5
848.8	26.68	0.465	3	29.68	38	-8.32	Plot 4.1.6

*Corrected for attenuations and cables loss

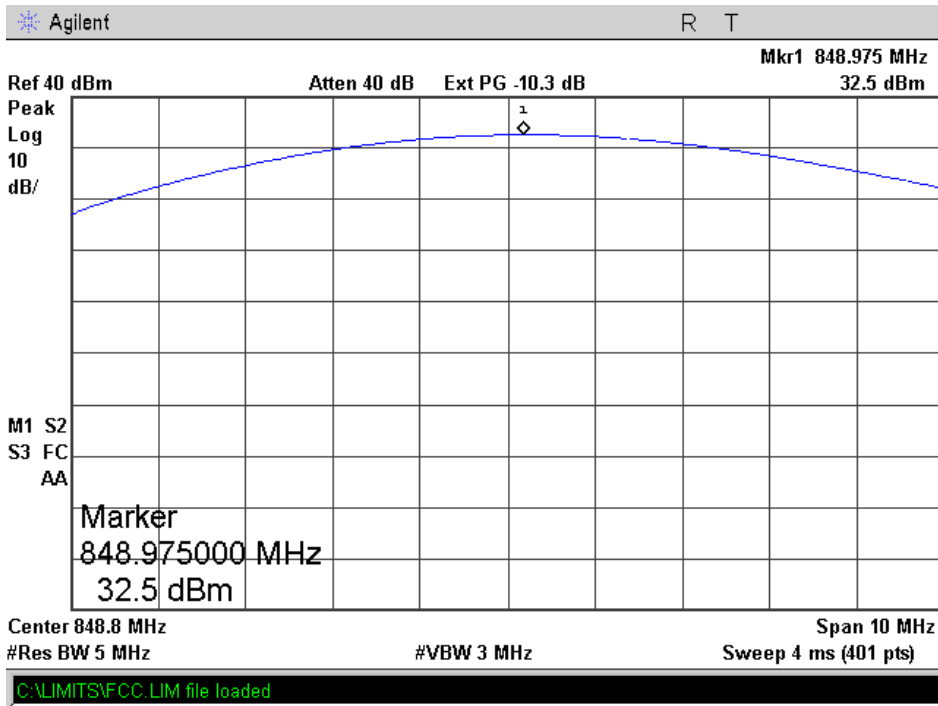
Modulation: GPRS Class 10
Plot 4.1.1



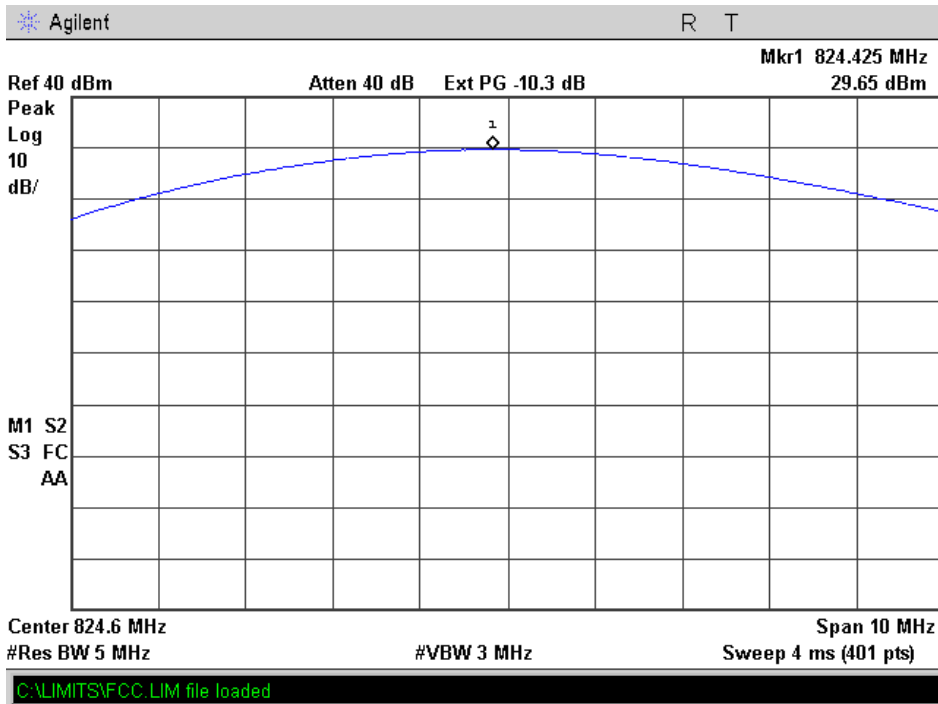
Plot 4.1.2



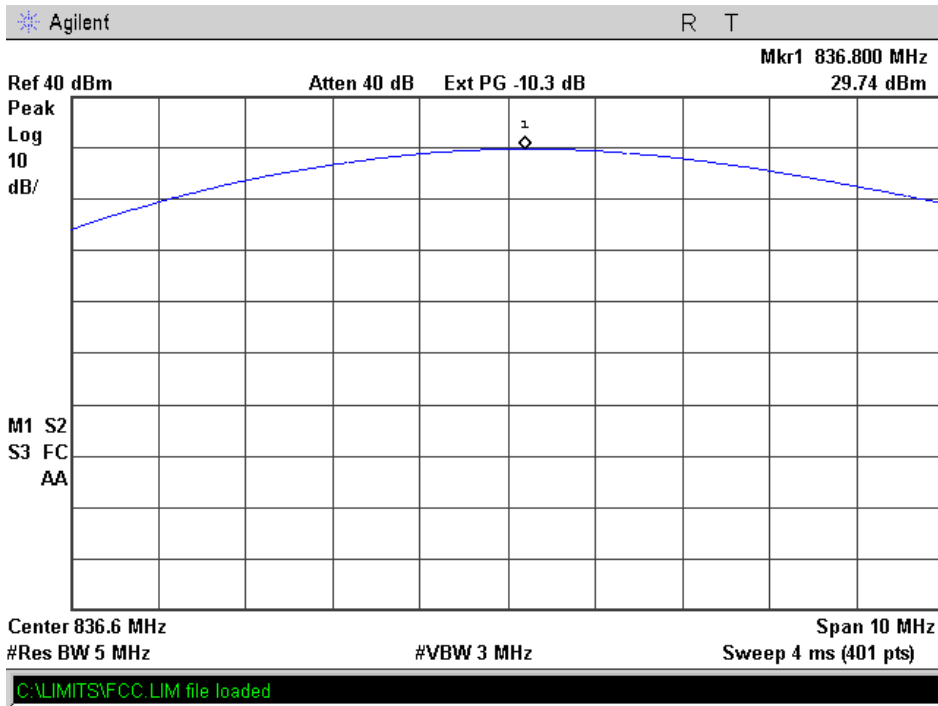
Plot 4.1.3



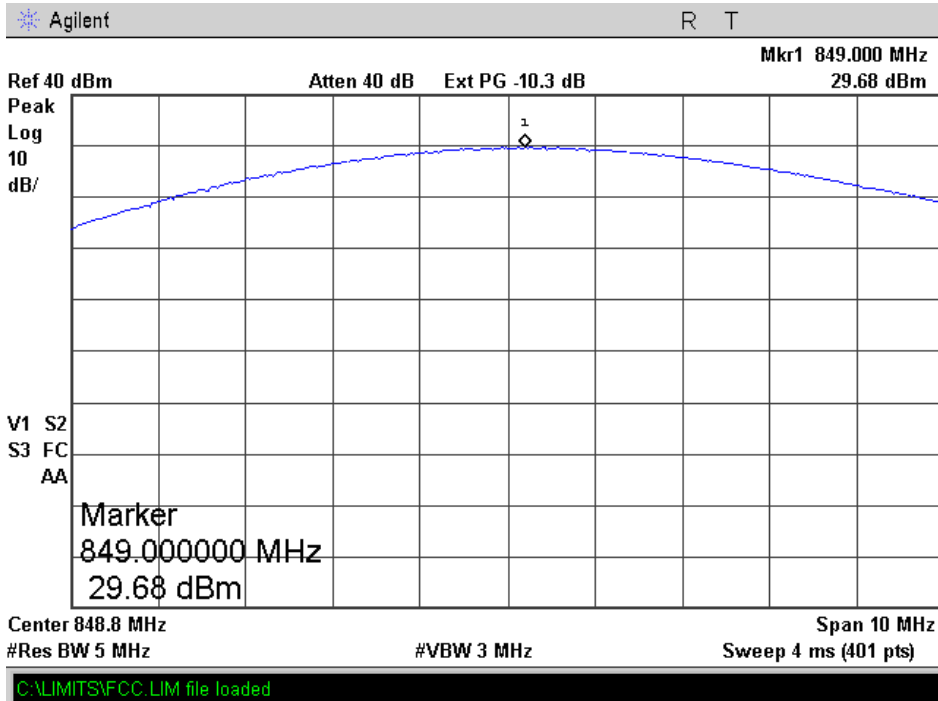
Modulation: 8PSK
Plot 4.1.4



Plot 4.1.5



Plot 4.1.6



4.2. Radiated Peak Output Power

Reference document:	47 CFR §22.913 (a)(2)		
Test Requirements:	Mobile/Auxiliary test transmitters are limited to 7 watts ERP peak power		
Test setup:	See Sec. 2.1	Pass	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 3MHz, VBW: 3MHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Reference Plots 4.2.1 - 4.2.6	

Test results: GPRS Class 10

Frequency [MHz]	Signal Source Output* [dBm]	Antenna Gain [dBd]	Calculated ERP [dBm]	Limit [dBm]	Margin [dB]	Ref. Plot
824.2	26.8	4.76	31.56	38	-6.44	4.2.1
836.6	26.6	4.66	31.26	38	-6.74	4.2.2
848.8	26.4	4.56	30.96	38	-7.04	4.2.3

*Corrected for cable loss

Test results: EDGE 8PSK

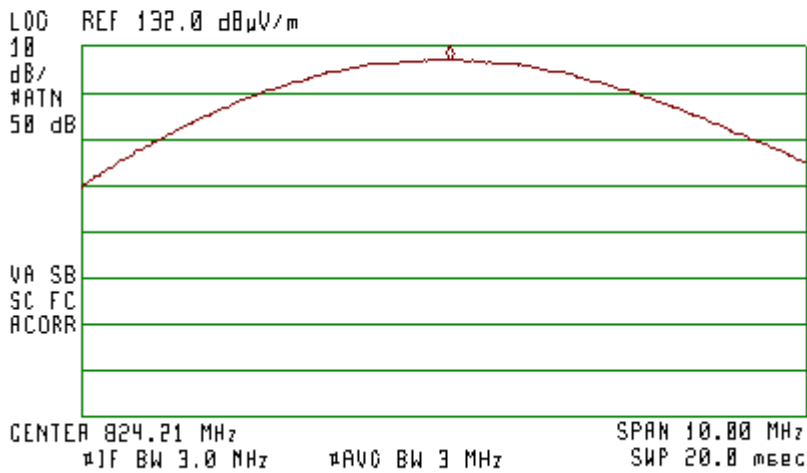
Frequency [MHz]	Signal Source Output* [dBm]	Antenna Gain [dBd]	Calculated ERP [dBm]	Limit [dBm]	Margin [dB]	Ref. Plot
824.2	22.9	4.76	27.66	38	-10.34	4.2.4
836.6	23.2	4.66	27.86	38	-10.14	4.2.5
848.8	22.8	4.56	27.36	38	-10.64	4.2.6

*Corrected for cable loss

GPRS Class 10
Frequency 824.2 MHz
Vertical & Horizontal Polarization
Plot 4.2.1



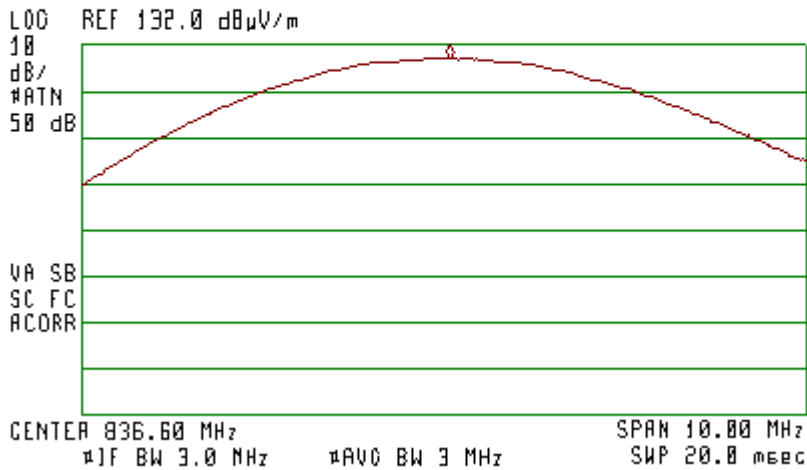
ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKA 824.28 MHz
129.13 dB μ V/m



Frequency 836.6 MHz
Vertical & Horizontal Polarization
Plot 4.2.2



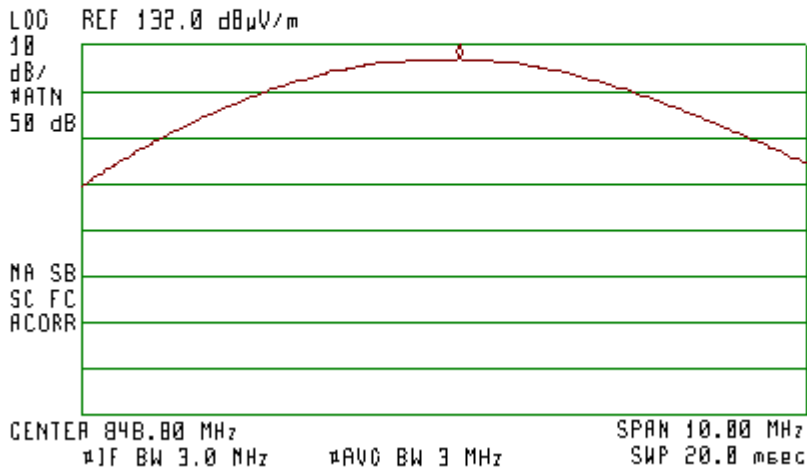
ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKA 836.68 MHz
129.16 dB μ V/m



Frequency 848.8 MHz
Vertical & Horizontal Polarization
Plot 4.2.3



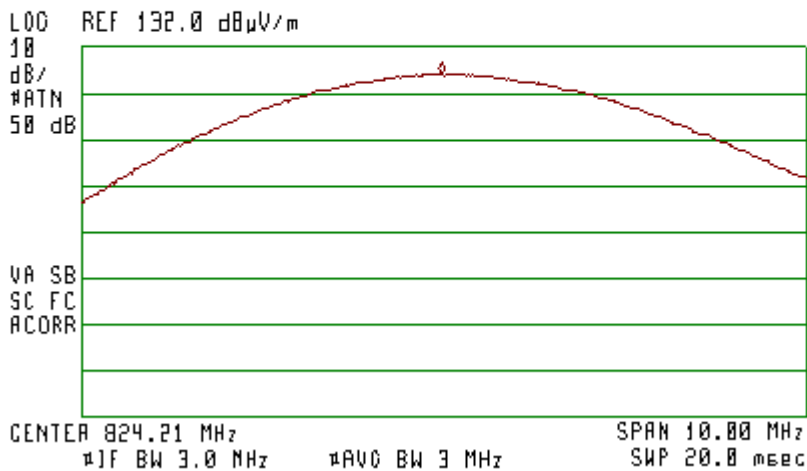
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKA 849.00 MHz
129.06 dB μ V/m



8PSK
Frequency 824.2 MHz
Vertical & Horizontal Polarization
Plot 4.2.4



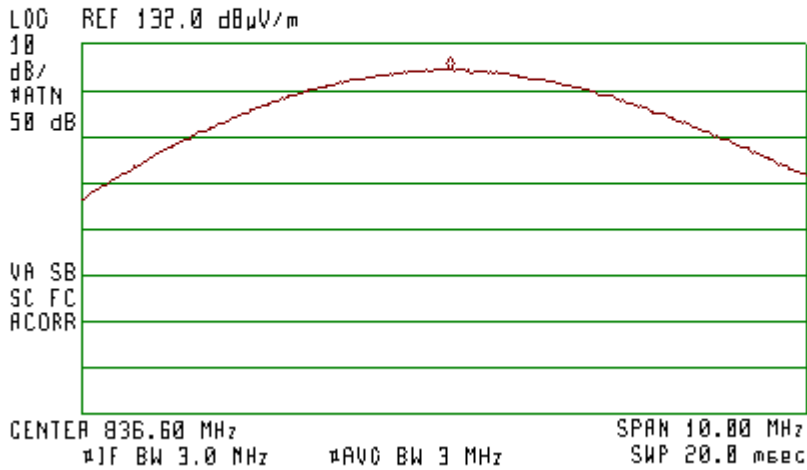
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKA 824.16 MHz
126.11 dB μ V/m



Frequency 836.6 MHz
Vertical & Horizontal Polarization
Plot 4.2.5



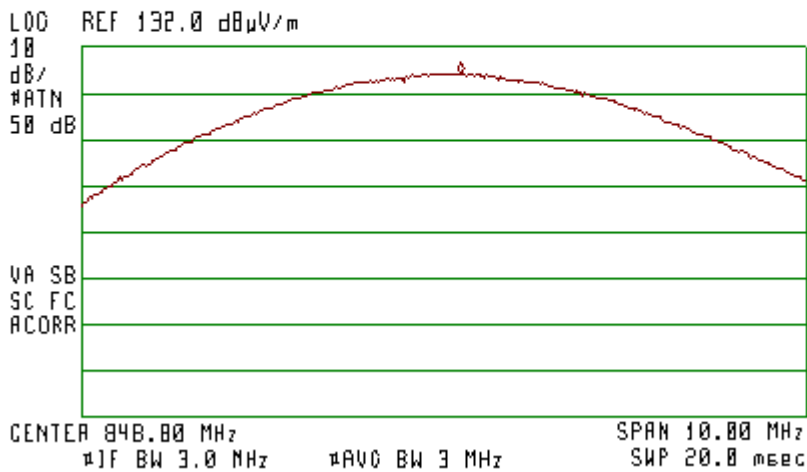
ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKA 836.68 MHz
126.40 dB μ V/m



Frequency 848.8 MHz
Vertical & Horizontal Polarization
Plot 4.2.6



ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKA 849.83 MHz
126.19 dB μ V/m



4.3. Frequency stability

Reference document:	47 CFR §22.355 & §2.1055		
Test Requirements:	The frequency stability shall be less than 2.5 ppm .		
Test setup:	See Sec. 2.7	Pass	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	-	

Test results

AFC Frequency error vs. Voltage

Voltage [V]	Frequency Error [Hz]	Frequency Error [%]	Frequency Error [ppm]	Limit [ppm]	Test Result
Carrier frequency at 22°C (12 VDC): 836.6MHz					
10.8-33	No Frequency Error observed				Pass

AFC Frequency error vs. Temperature

Temperature [°C]	Frequency Error [Hz]	Frequency Error [%]	Frequency Error [ppm]	Limit [ppm]	Margin [ppm]
Carrier frequency at 22°C (12 VDC): 836.6MHz					
-30	-17	-0.00000203	-0.0203203	2.5	Pass
-20	-15	-0.00000179	-0.0179297	2.5	Pass
-10	-16	-0.00000191	-0.019125	2.5	Pass
0	-9	-0.00000108	-0.0107578	2.5	Pass
10	5	0.00000060	0.00597657	2.5	Pass
20	9	0.00000108	0.01075783	2.5	Pass
30	11	0.00000131	0.01314846	2.5	Pass
40	13	0.00000155	0.01553909	2.5	Pass
50	14	0.00000167	0.0167344	2.5	Pass

4.4. Occupied Bandwidth

Reference document:	47 CFR §22.917 & §2.1049		
Test Requirements:	The occupied bandwidth, that is the frequency bandwidth outside of which all emission are attenuated at least 26 dB below the transmitter power.		
Test setup:	See sec 2.5	Pass	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 3kHz, VBW: 3kHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Reference Plots 4.4.1 - 4.4.6	

Test results:

Modulation: GPRS Class 10

Frequency [MHz]	-26dBc Occupied Bandwidth	Reference
824.2	307.5	Plot 4.4.1
836.6	310	Plot 4.4.2
848.8	317.5	Plot 4.4.3

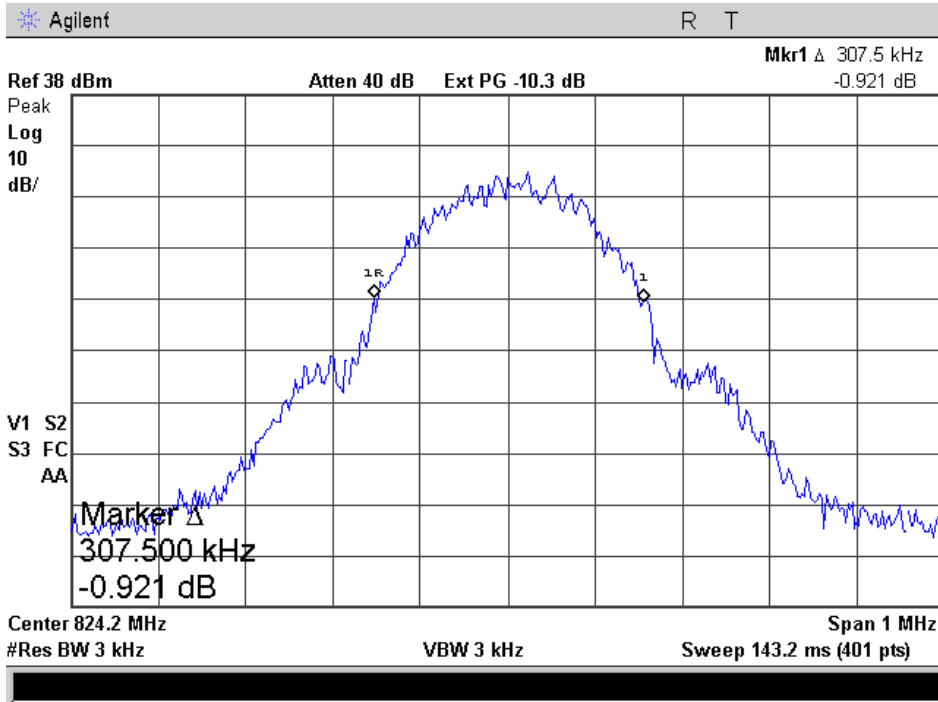
*§22.917 (b) requires a measurement bandwidth of at least 1% of the -26dBc Occupied Bandwidth. From these results, a resolution BW of 3kHz was used.

Modulation: 8PSK

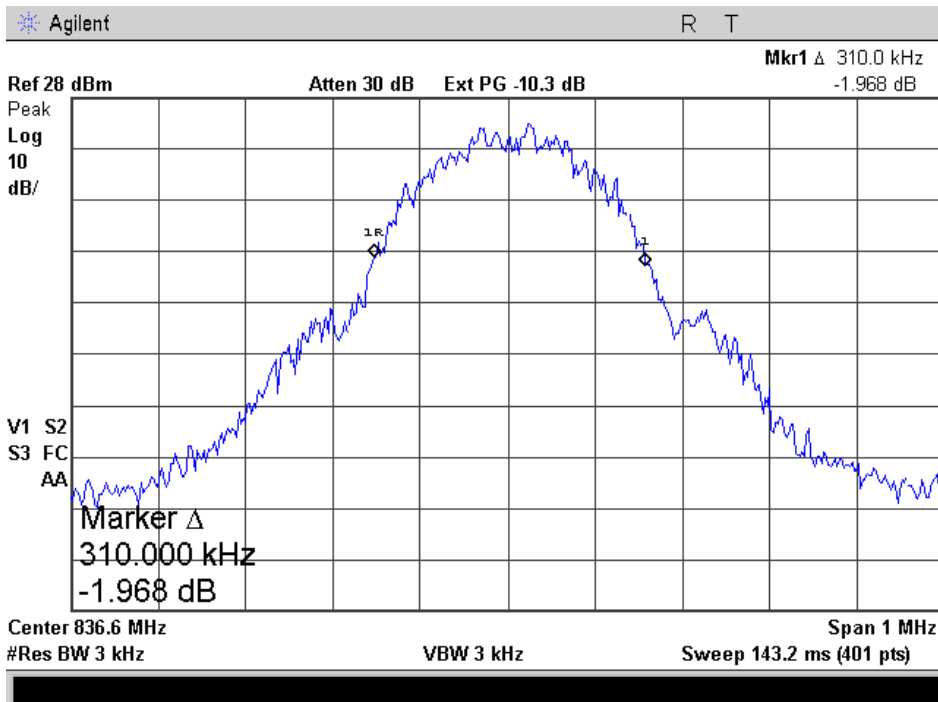
Frequency [MHz]	-26dBc Occupied Bandwidth	Reference
824.2	305	Plot 4.4.4
836.6	310	Plot 4.4.5
848.8	302.5	Plot 4.4.6

*§22.917 (b) requires a measurement bandwidth of at least 1% of the -26dBc Occupied Bandwidth. From these results, a resolution BW of 3 kHz was used.

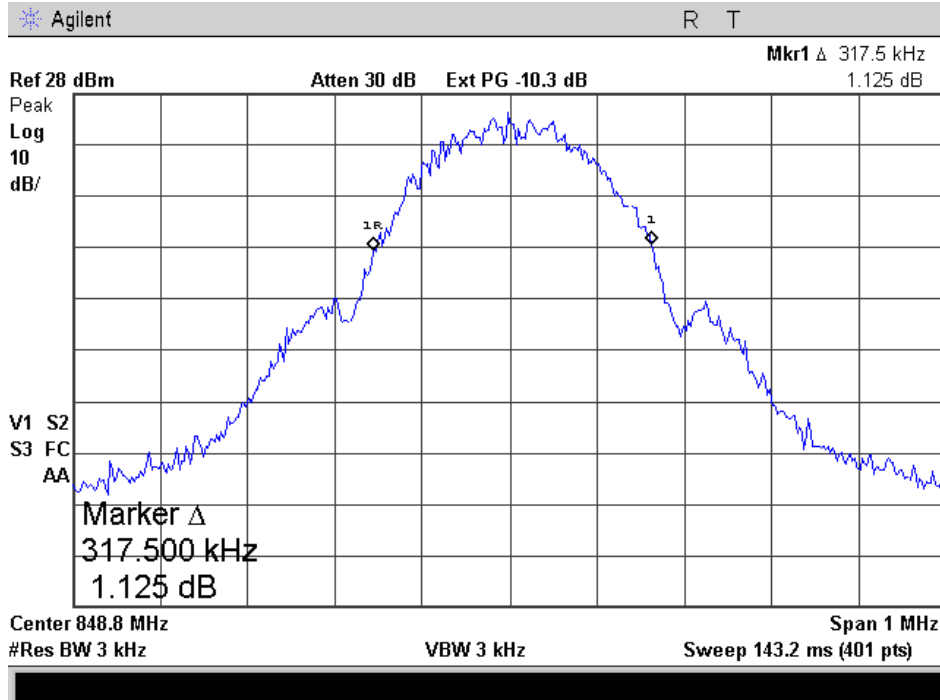
Modulation: GPRS Class 10
Frequency 824.2, -26dBc
Plot 4.4.1



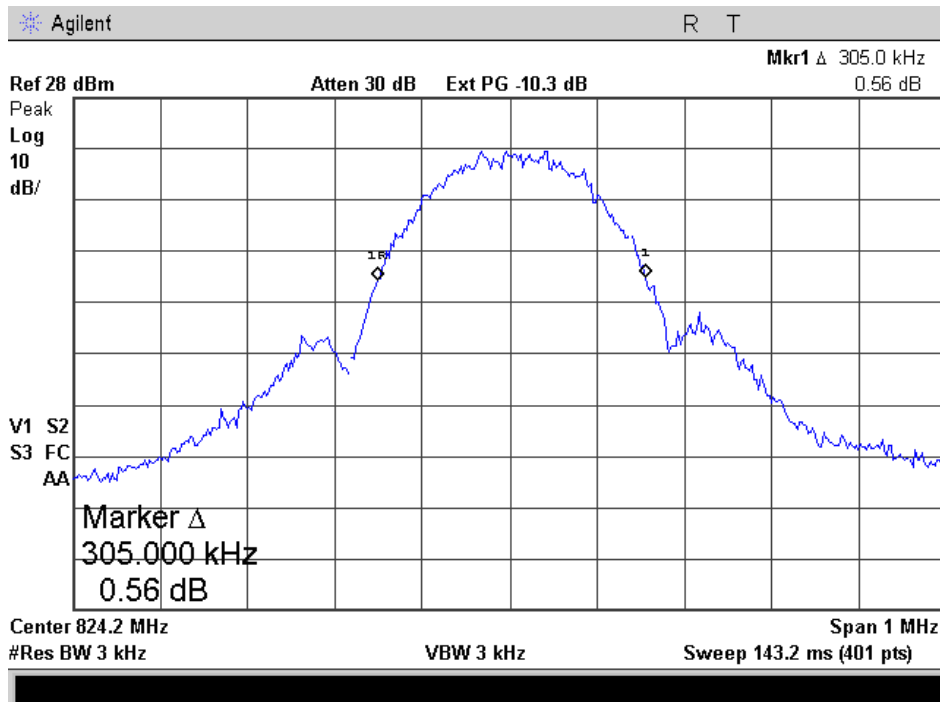
Frequency 836.6, -26dBc
Plot 4.4.2



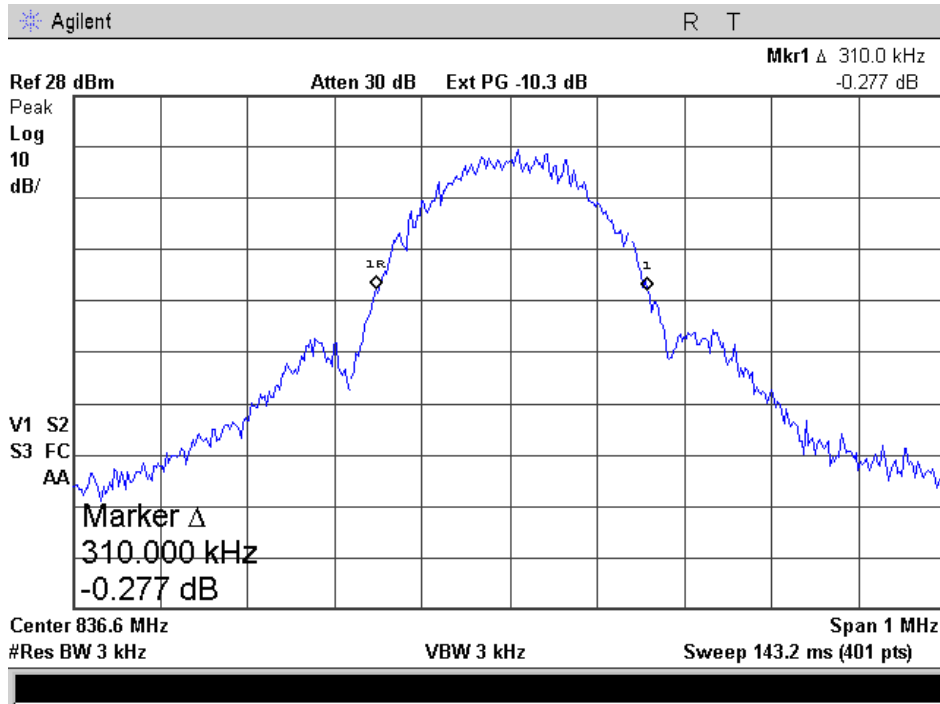
Frequency 848.8, -26dBc
Plot 4.4.3



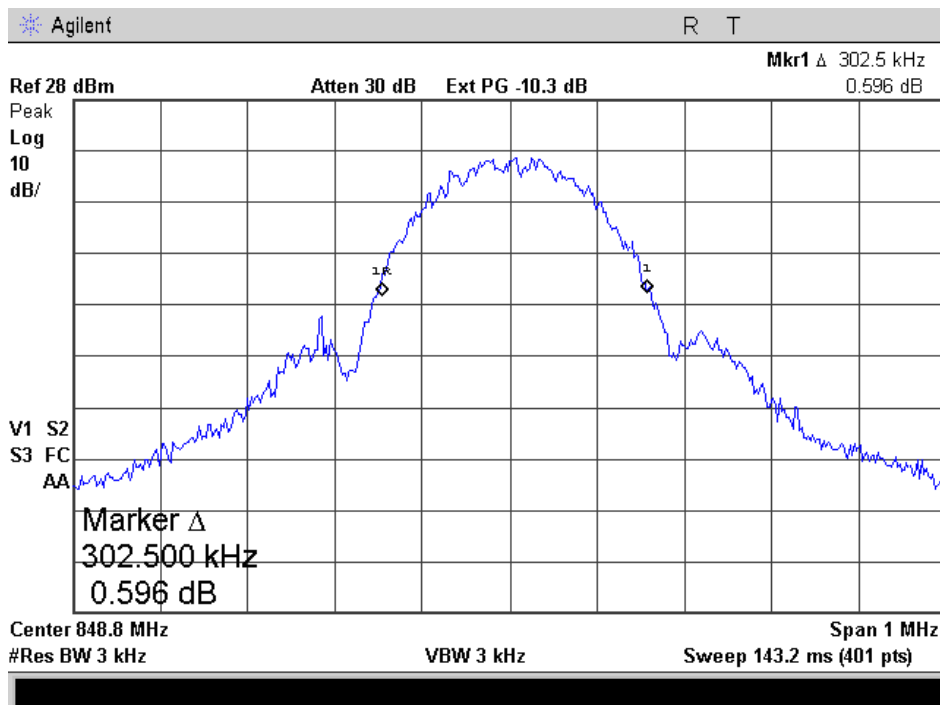
Modulation: 8PSK
Frequency 824.2, -26dBc
Plot 4.4.4



Frequency 836.6, -26dBc
Plot 4.4.5



Frequency 848.8, -26dBc
Plot 4.4.6



4.5. Out of Band Emissions - Radiated

Reference document:	47 CFR §22.917(a)		
Test Requirements:	The power of any emission outside of the authorized operating frequency shall be attenuated below the transmitting power (P, in Watts) by a factor of at least 43+10log(P) dB*.		
Test setup:	See Sec. 2.3	Pass	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	f <1GHz: RBW: 120kHz, VBW: 1MHz f >1GHz: RBW: 1MHz, VBW: 3MHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Reference Plots 4.5.1- 4.5.18	

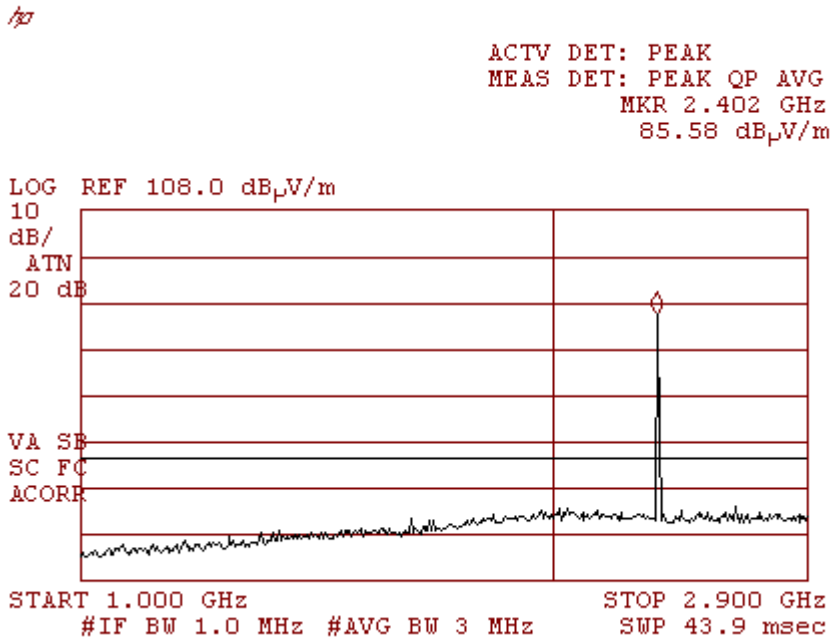
*It translates to a limit of -13dBm

Test results:

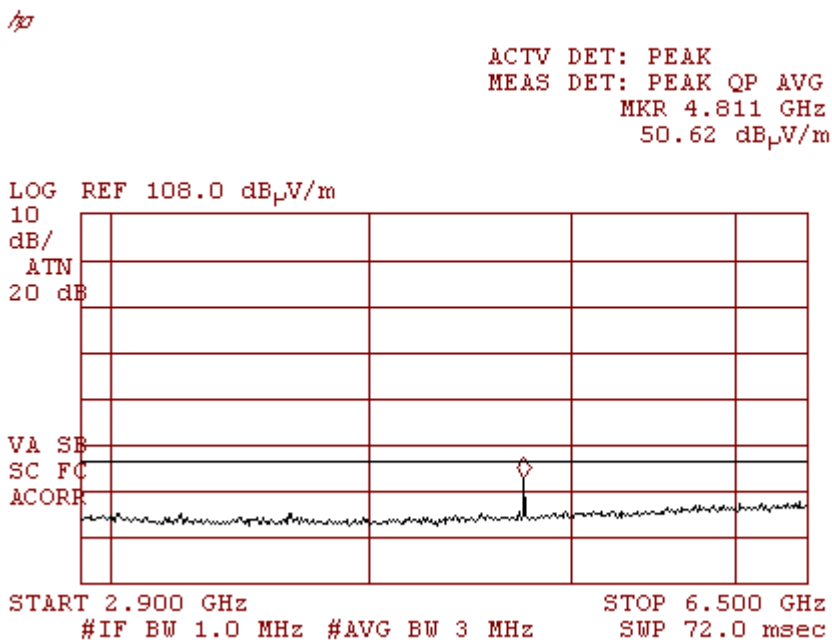
Frequency [MHz]	Radiated Emission Level [dBμV/m]	Spurious Emission Level* ERP [dBm]	Limit [dBm]	Margin [dB]	Result
824.2	127.53	29.01		Carrier	
836.6	128.3	29.91		Carrier	
848.6	128.24	29.61		Carrier	
All peak readings were at least 20 dB below the limit.			-13.0		Pass

*Spurious Emission [dBm] = Measured [dBm] - Cable Loss [dB] + Substitution Antenna Gain [dBd]

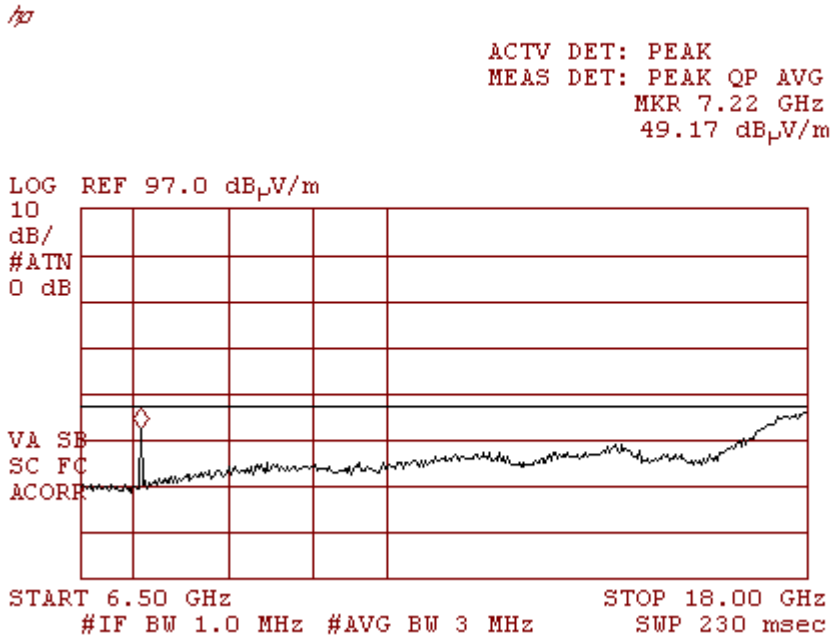
Simultaneously Operated: Bluetooth & GSM 850
Worst case of each type of modulation
Lowest frequency
Horizontal & Vertical Polarization
Plot 4.5.1



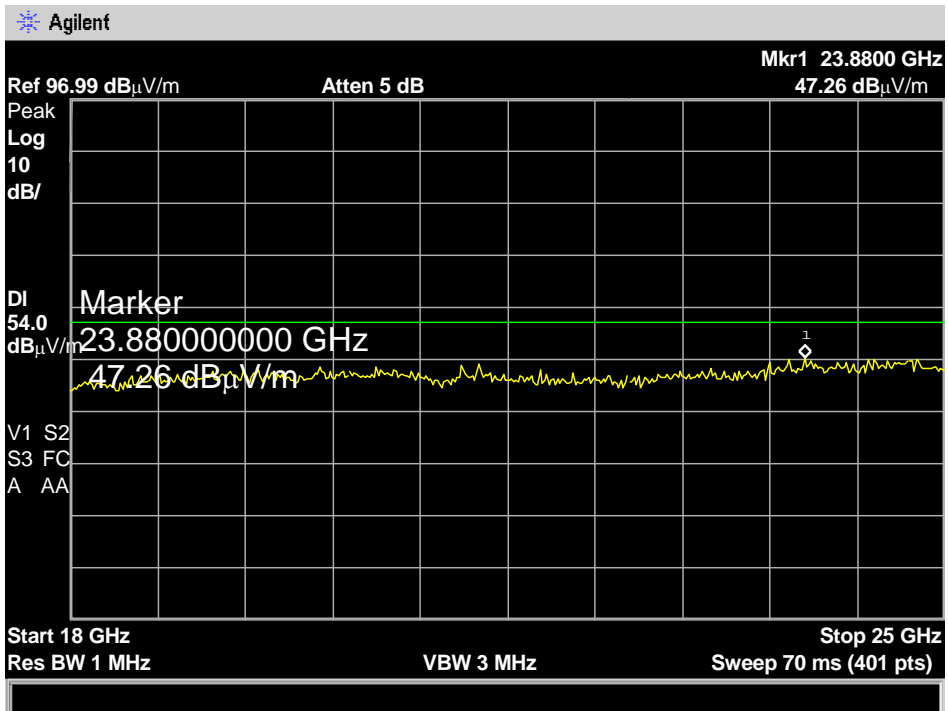
Horizontal & Vertical Polarization
Plot 4.5.2



Horizontal & Vertical Polarization
Plot 4.5.3



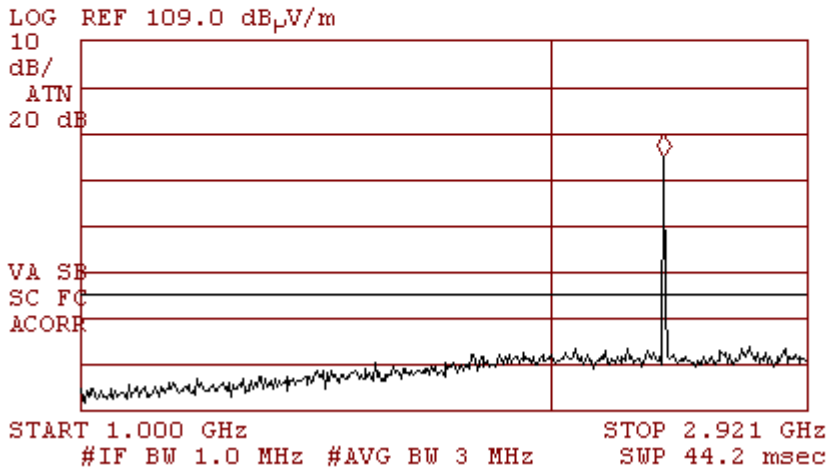
Horizontal & Vertical Polarization
Plot 4.5.4



**Middle frequency
Horizontal & Vertical Polarization
Plot 4.5.5**

hp

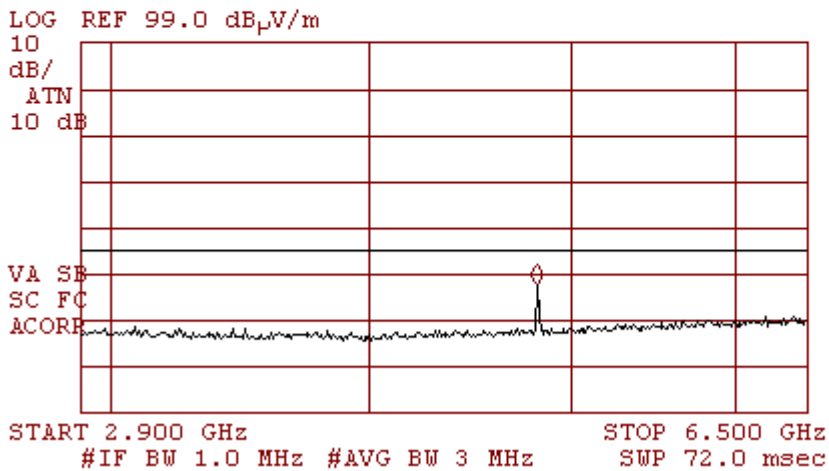
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.441 GHz
83.97 dB μ V/m



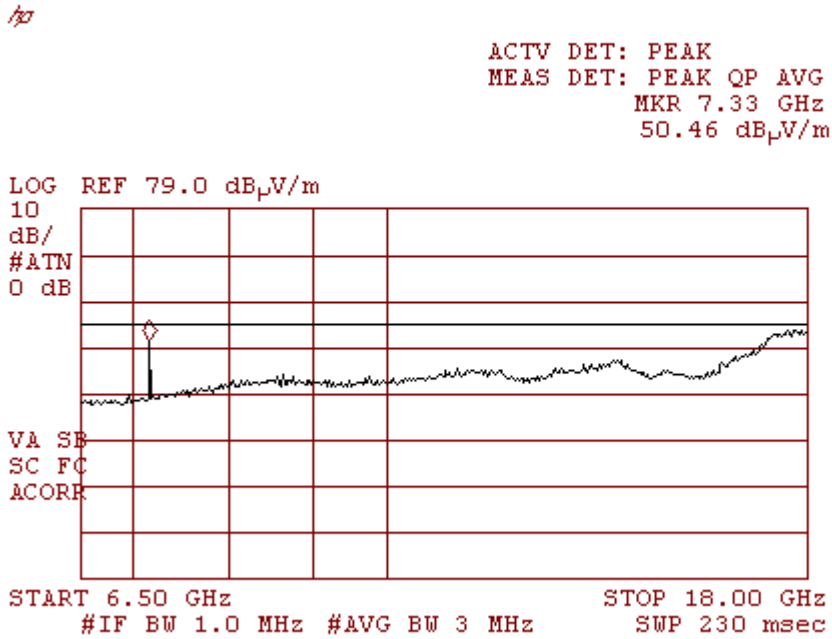
**Horizontal & Vertical Polarization
Plot 4.5.6**

hp

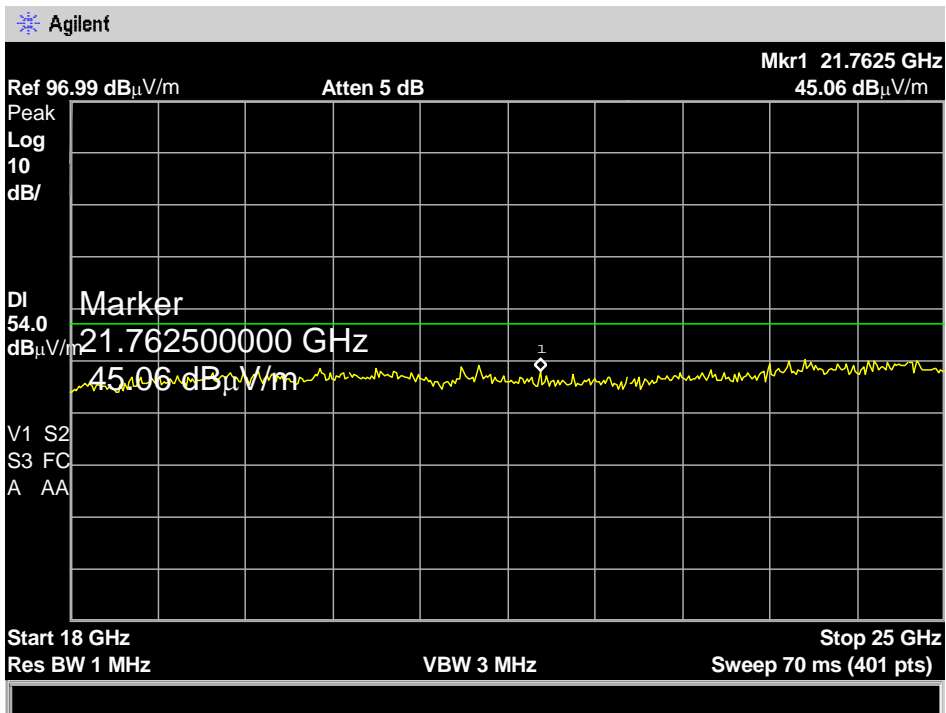
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.887 GHz
46.62 dB μ V/m



Horizontal & Vertical Polarization
Plot 4.5.7



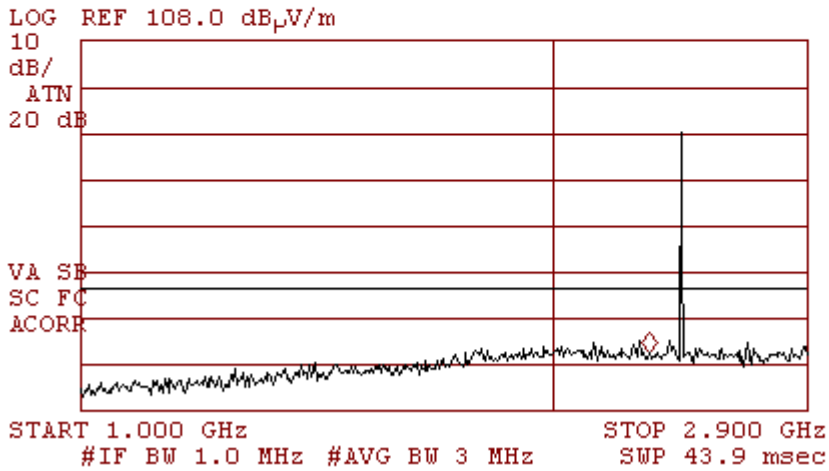
Horizontal & Vertical Polarization
Plot 4.5.8



**Highest frequency
Horizontal & Vertical Polarization
Plot 4.5.9**

hp

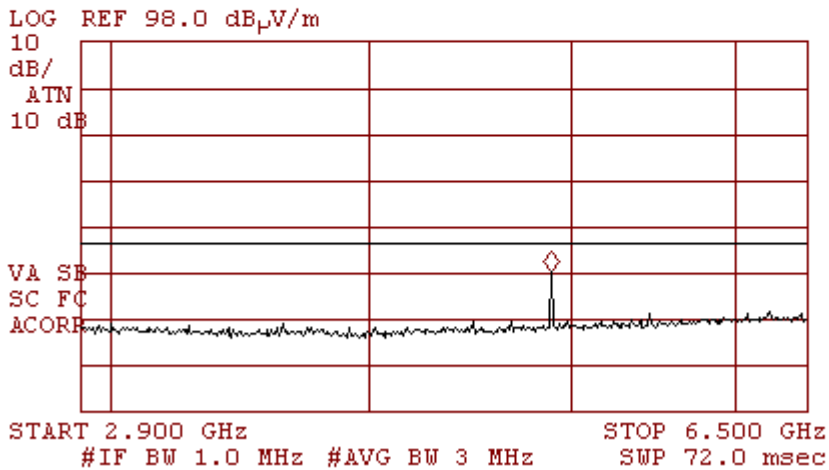
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.378 GHz
40.39 dB μ V/m



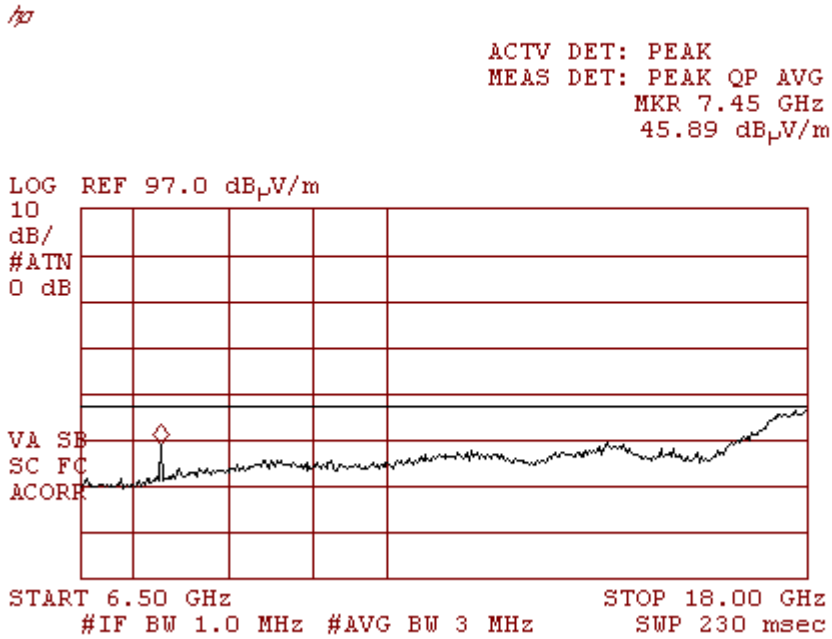
**Horizontal & Vertical Polarization
Plot 4.5.10**

hp

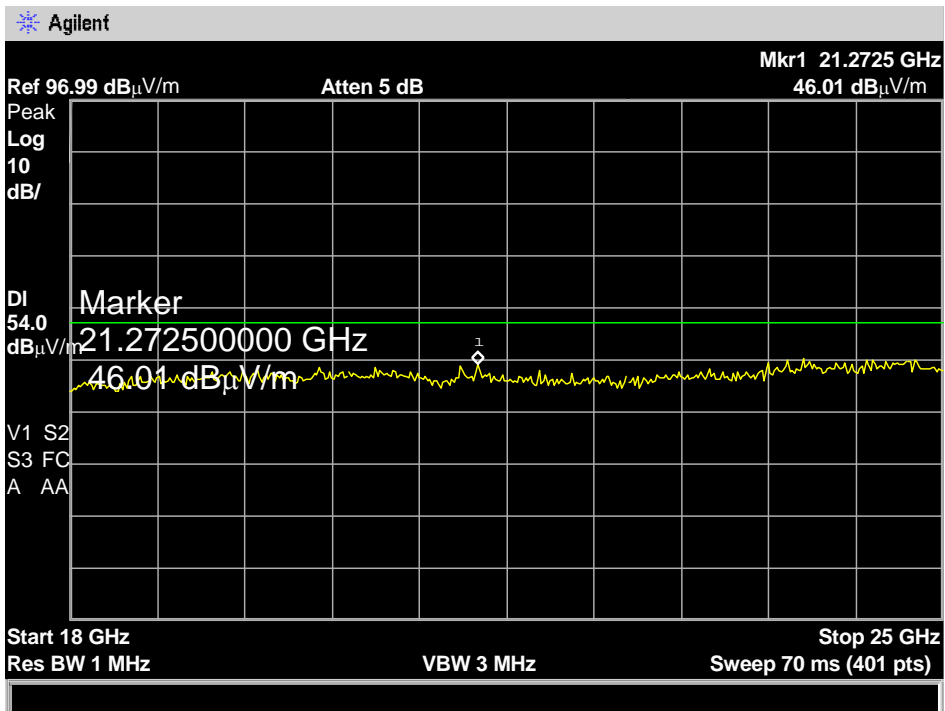
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.974 GHz
48.10 dB μ V/m



Horizontal & Vertical Polarization
Plot 4.5.11



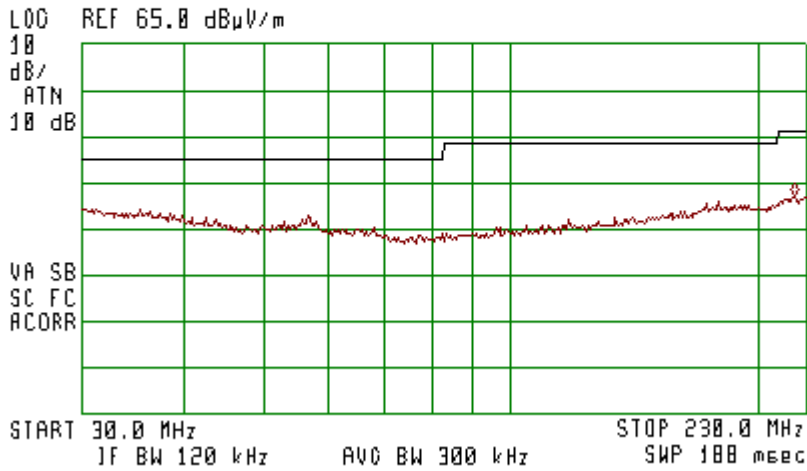
Horizontal & Vertical Polarization
Plot 4.5.12



Lowest frequency
Worst case of each Band and modulation
Vertical & Horizontal Polarization
Plot 4.5.13



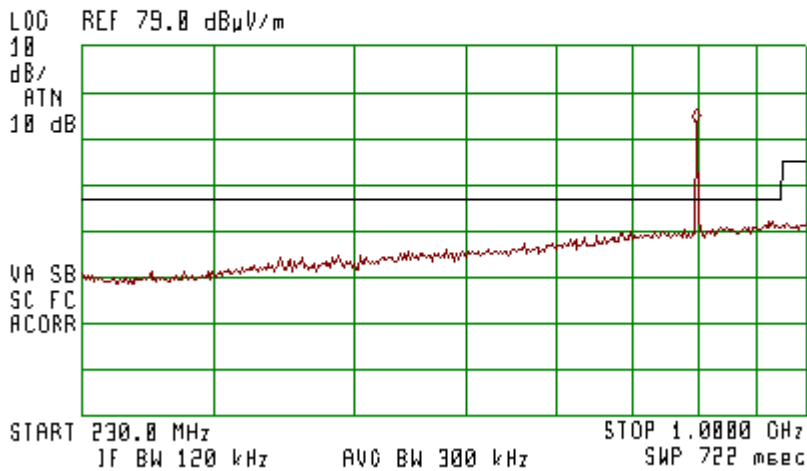
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 224.0 MHz
32.17 dB μ V/m



Plot 4.5.14



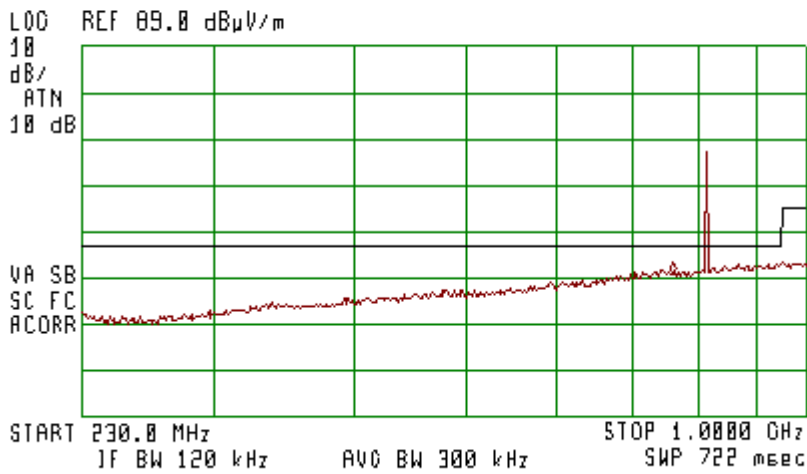
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 822.4 MHz
62.45 dB μ V/m



Middle Frequency
Plot 4.5.15

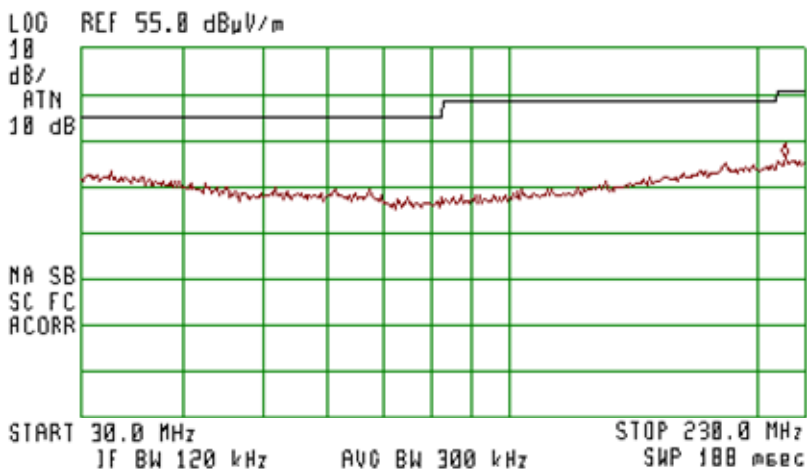


ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKR 784.5 MHz
39.66 dB μ V/m



Plot 4.5.16

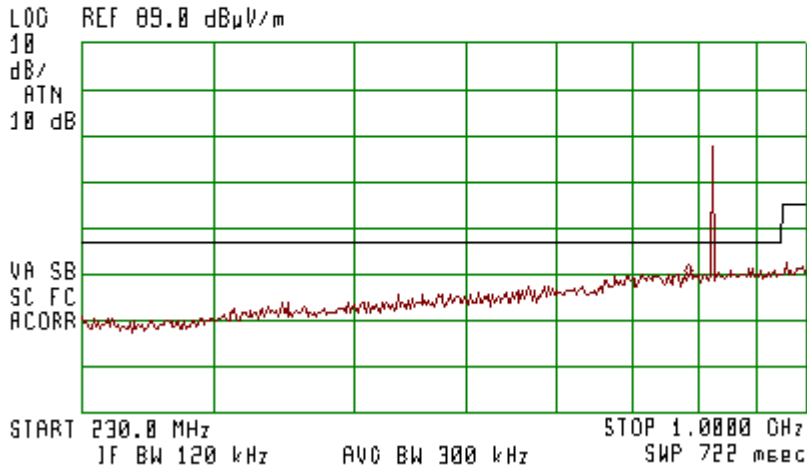
ACTV DET: PEAK
MERS DET: PEAK OP AVG
MKR 219.8 MHz
31.39 dB μ V/m



Highest Frequency
Plot 4.5.17

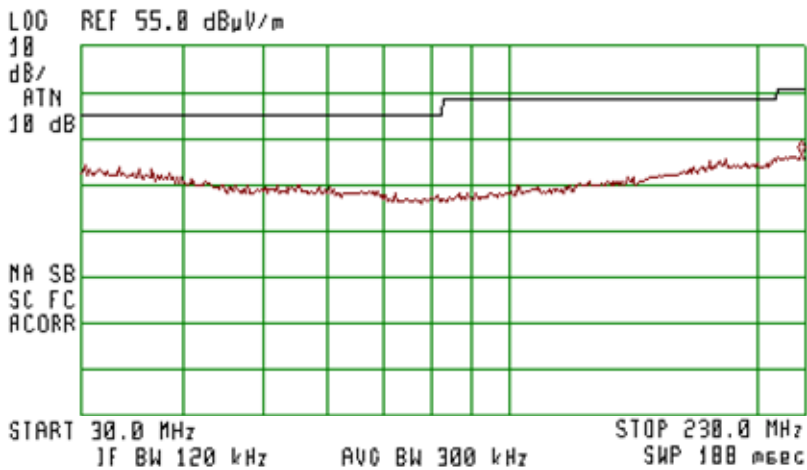


ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 807.8 MHz
38.14 dB μ V/m



Plot 4.5.18

ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 227.4 MHz
31.80 dB μ V/m



4.6. Out of Band Emissions - Conducted

Reference document:	§22.917(b)		
Test Requirements:	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.		
Test setup:	See sec 2.4	Pass	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 1MHz, VBW: 3 MHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Reference Plots 4.6.1 - 4.6.18	

Test results:

Modulation:

Frequency [MHz]	Spurious Emission Level* [dBm]	Limit [dBc]	Ref plot	Actual Attenuation [dBc]	Margin [dB]	Result
824.2	32.36					Carrier
All Spurious at least 10 dB blow the limit		45.4	Plot 4.6.1- Plot 4.6.3	>61	>15dB	Pass
836.6	32.52					Carrier
All Spurious at least 15 dB blow the limit		45.5	Plot 4.6.4- Plot 4.6.6	>61	>15dB	Pass
848.8	32.50					Carrier
All Spurious at least10 dB blow the limit		45.5	Plot 4.6.7- Plot 4.6.9	>61	>15dB	Pass

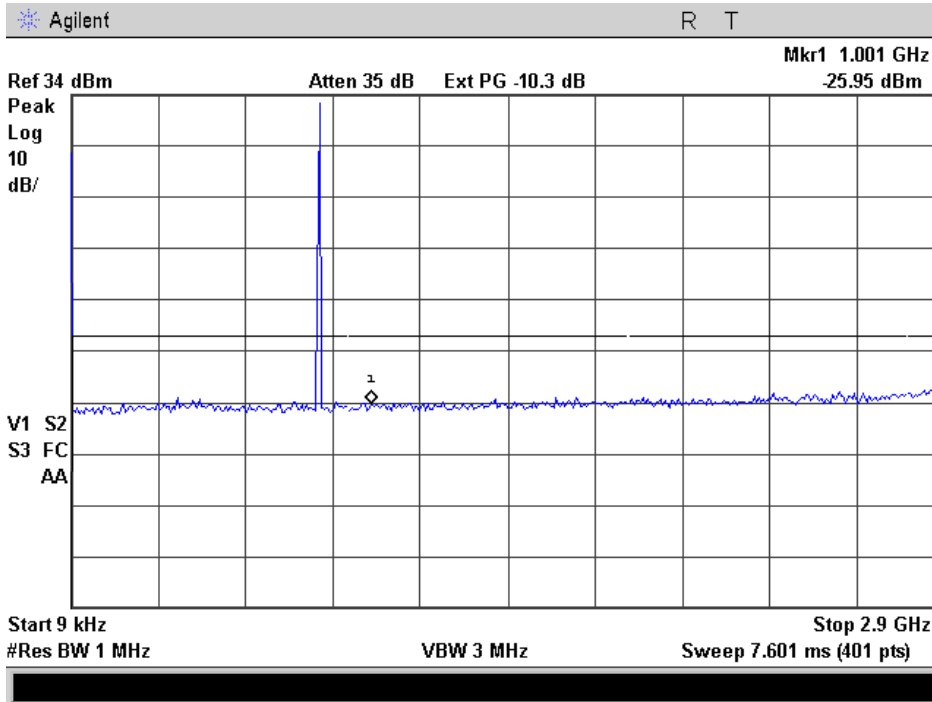
* Spurious Emission [dBm] = Measured [dBm] – Attenuations [dB]

Modulation: EDGE 8PSK

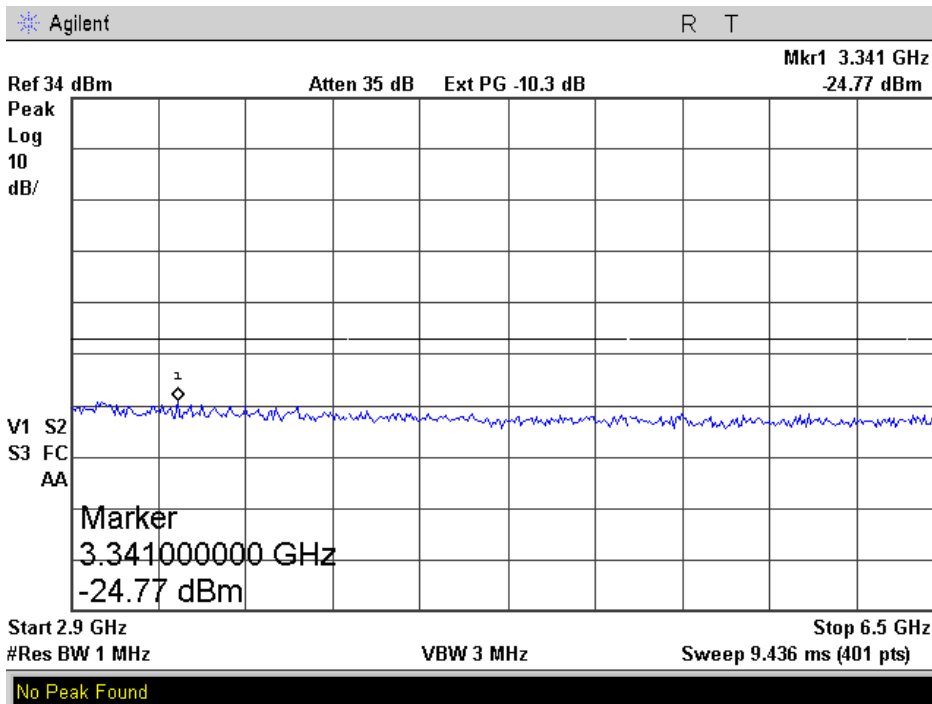
Frequency [MHz]	Spurious Emission Level* [dBm]	Limit [dBc]	Ref plot	Actual Attenuation [dBc]	Margin [dB]	Result
824.2	29.65					Carrier
All Spurious at least 10 dB blow the limit		44.7	Plot 4.6.10- Plot 4.6.12	>61	>15dB	Pass
836.6	29.74					Carrier
All Spurious at least 10 dB blow the limit		44.7	Plot 4.6.13- Plot 4.6.15	>61	>15dB	Pass
848.8	29.68					Carrier
All Spurious at least10 dB blow the limit		44.7	Plot 4.6.16- Plot 4.6.18	>61	>15dB	Pass

* Spurious Emission [dBm] = Measured [dBm] – Attenuations [dB]

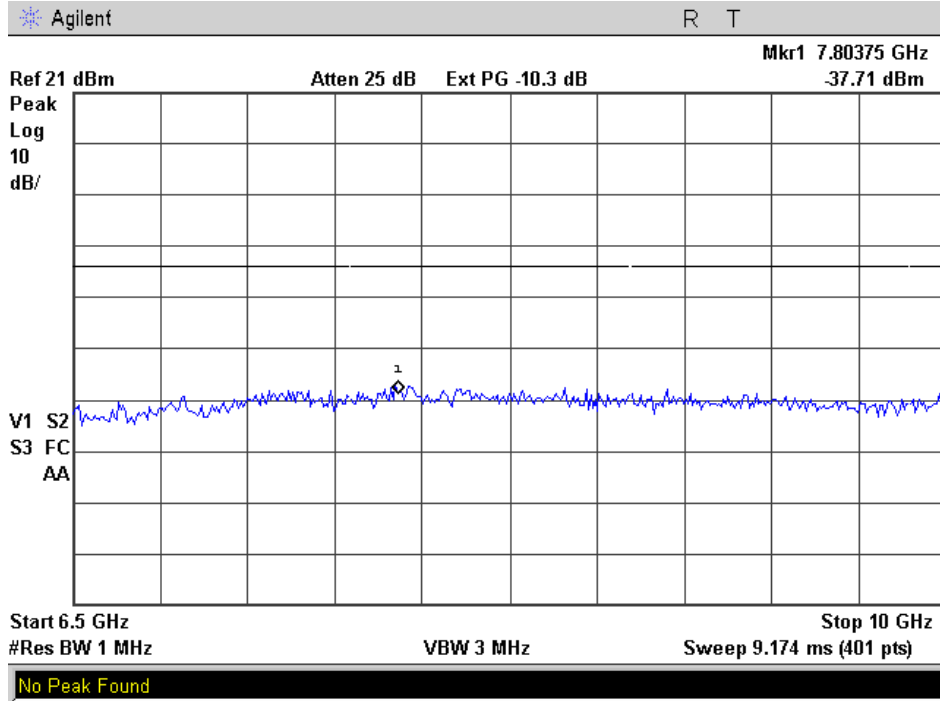
Modulation: GPRS Class 10
Frequency 824.2 MHz
Plot 4.6.1



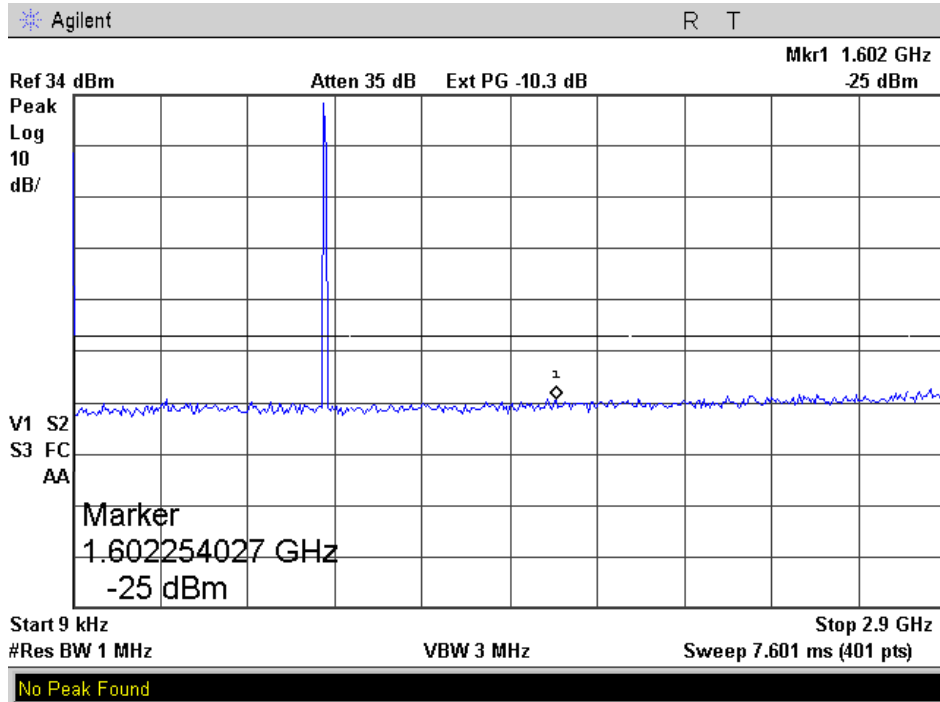
Plot 4.6.2



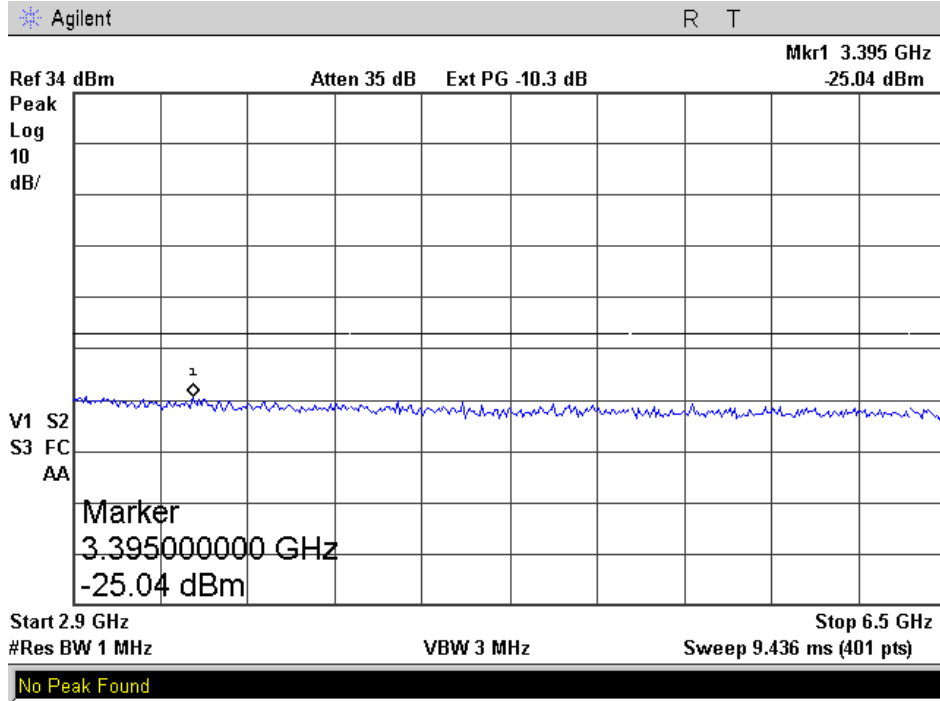
Plot 4.6.3



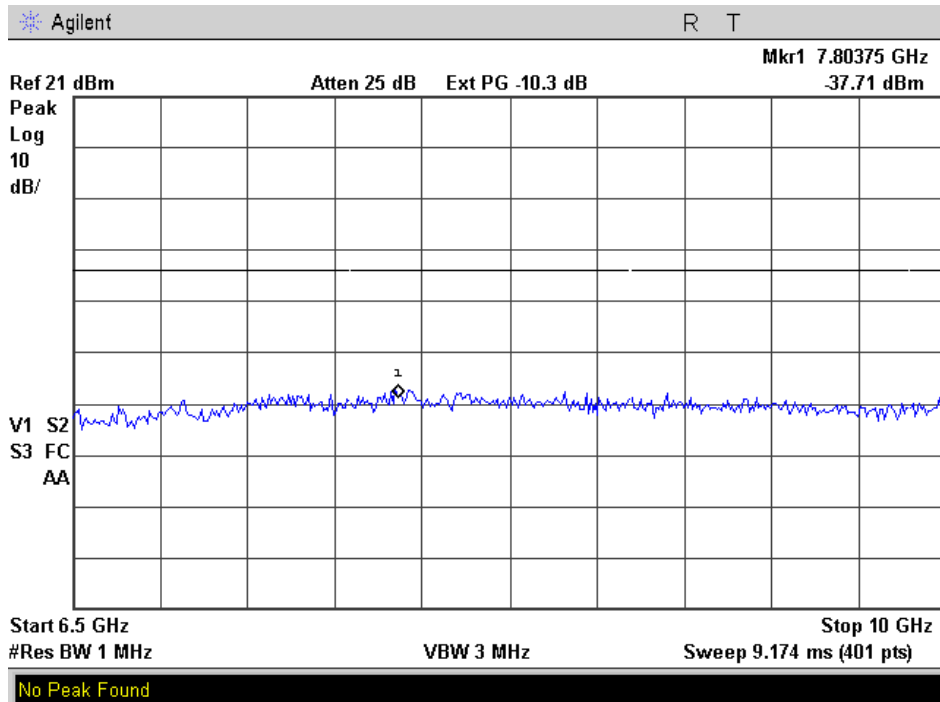
Frequency 836.6 MHz
Plot 4.6.4



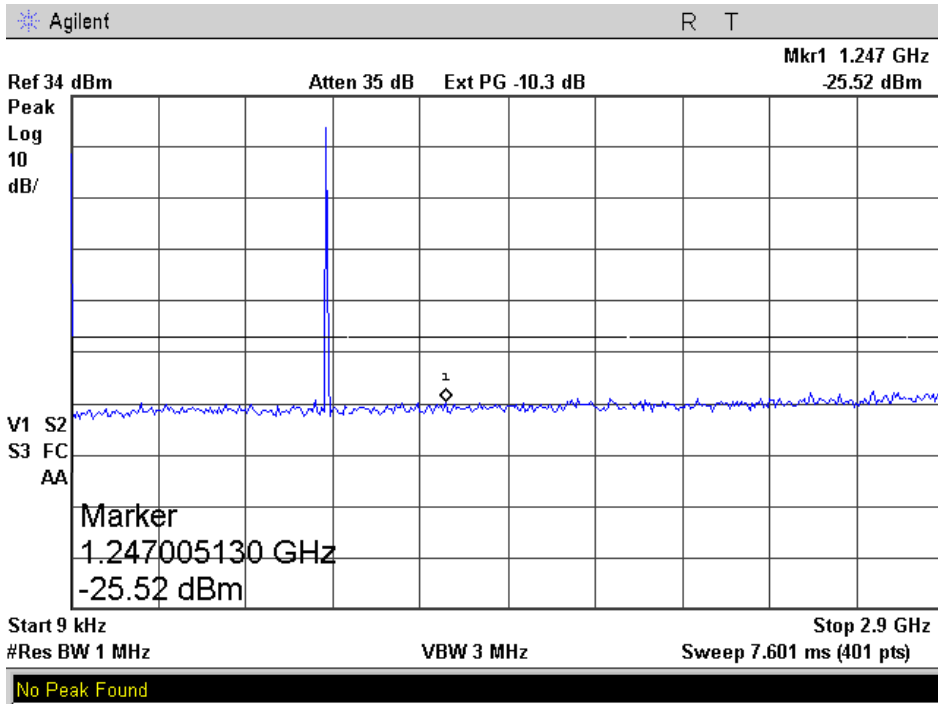
Plot 4.6.5



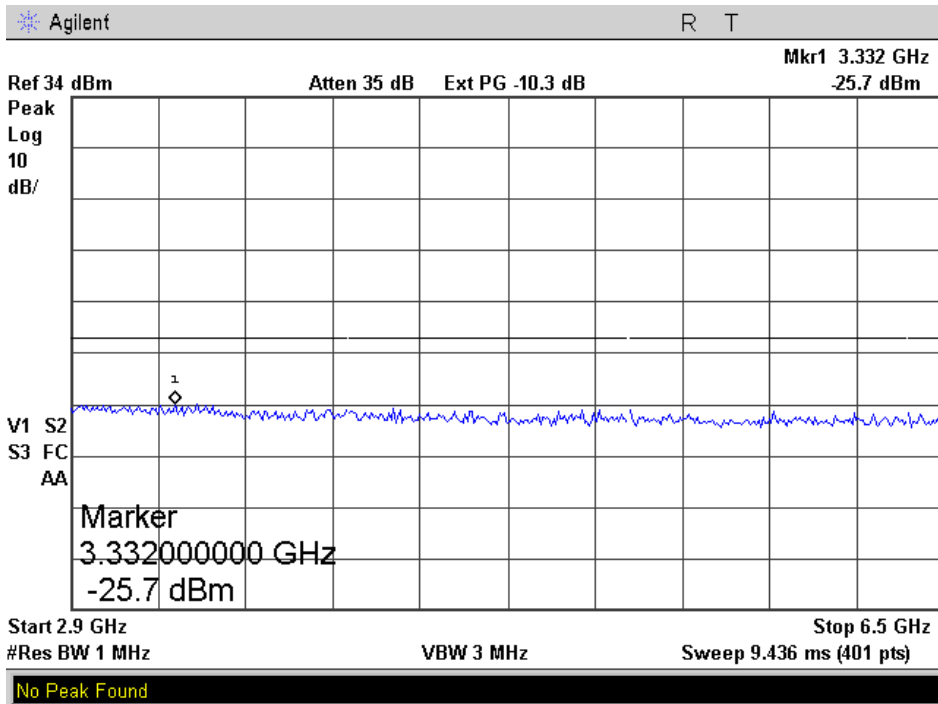
Plot 4.6.6



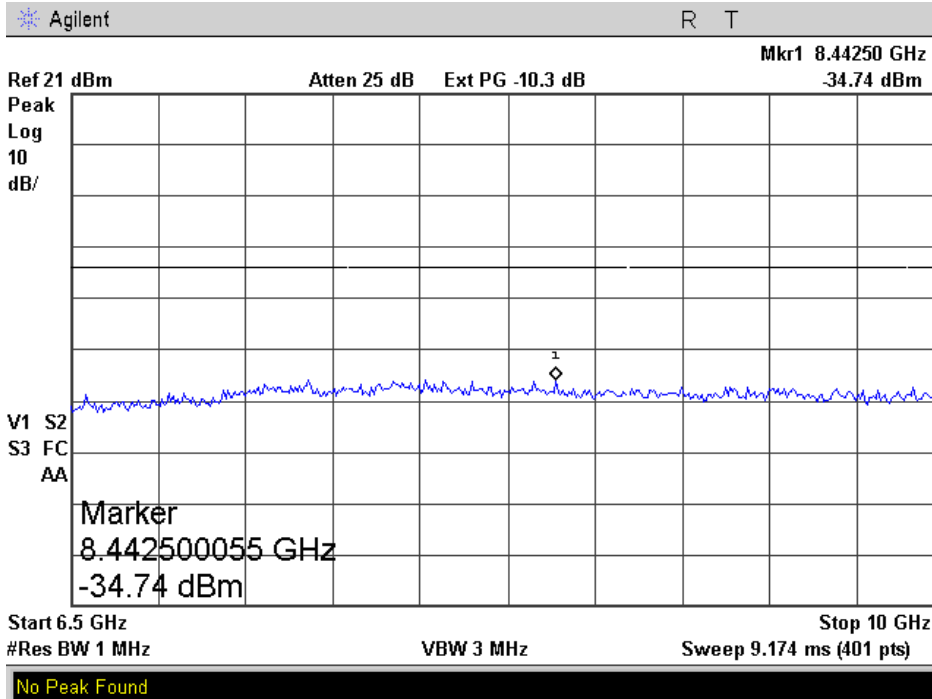
Frequency 848.8 MHz
Plot 4.6.7



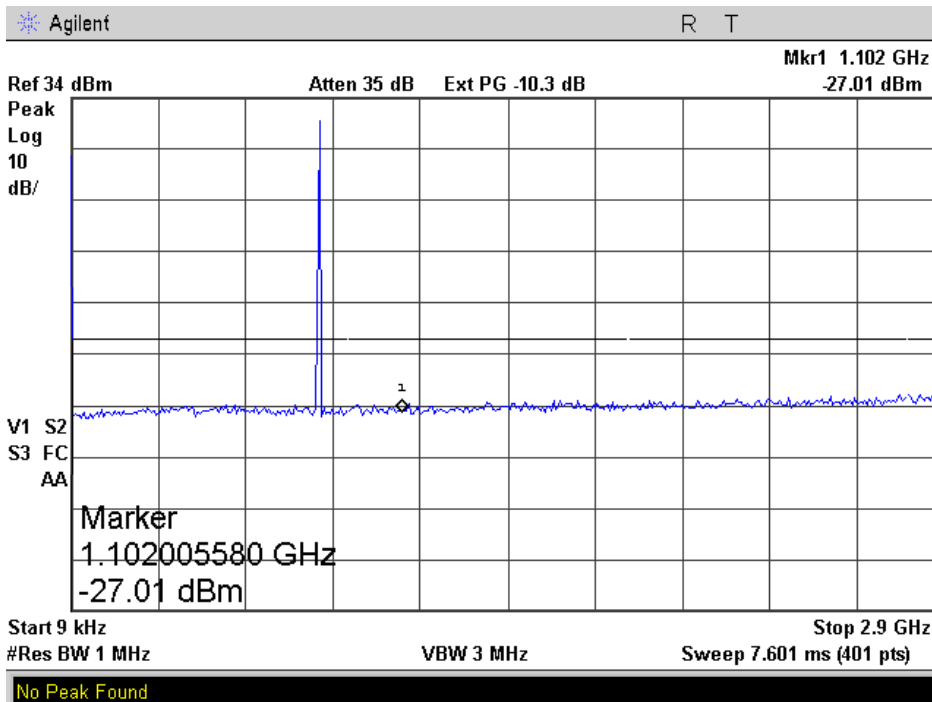
Plot 4.6.8



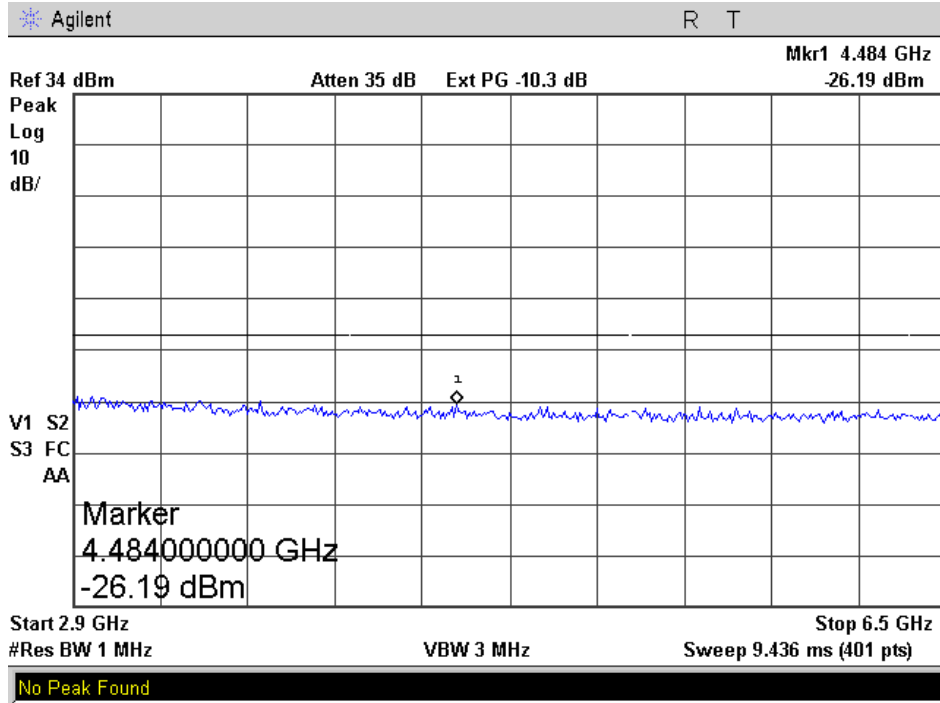
Plot 4.6.9



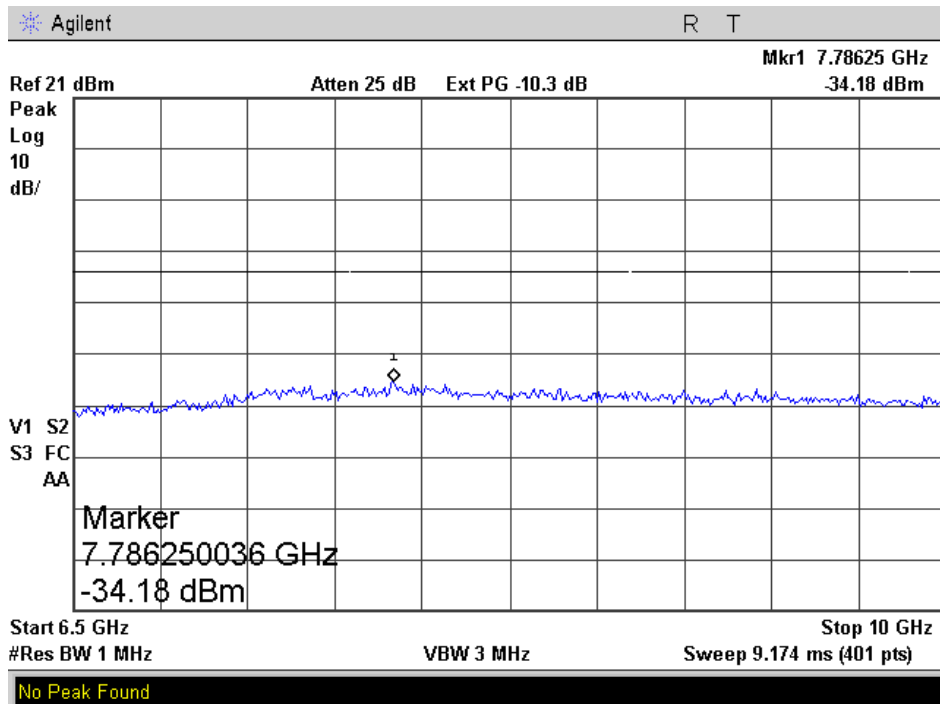
Modulation: 8PSK
Frequency 824.2 MHz
Plot 4.6.10



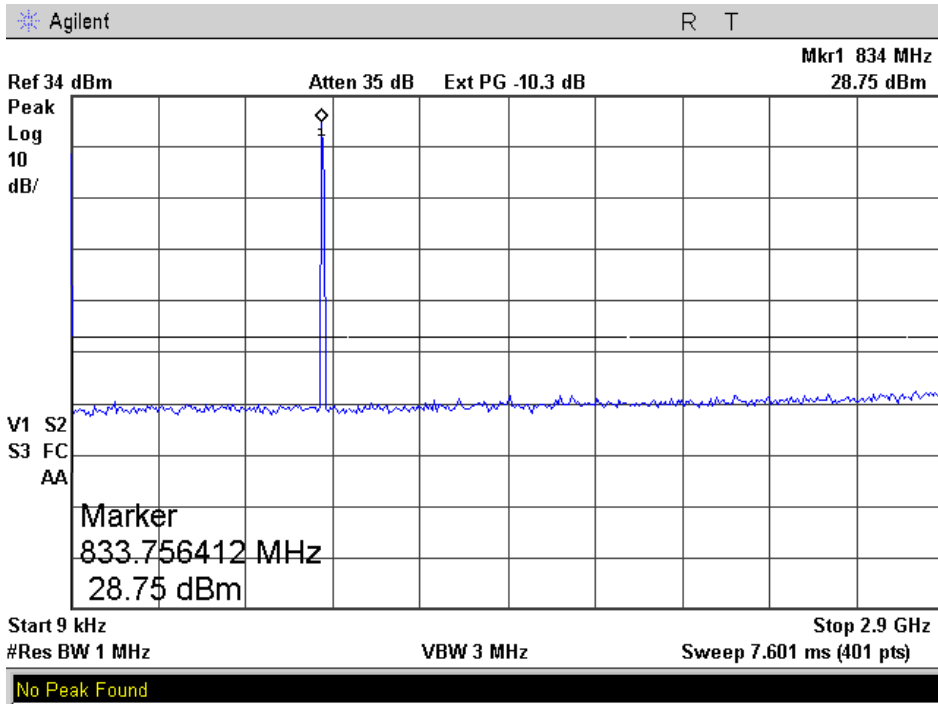
Plot 4.6.11



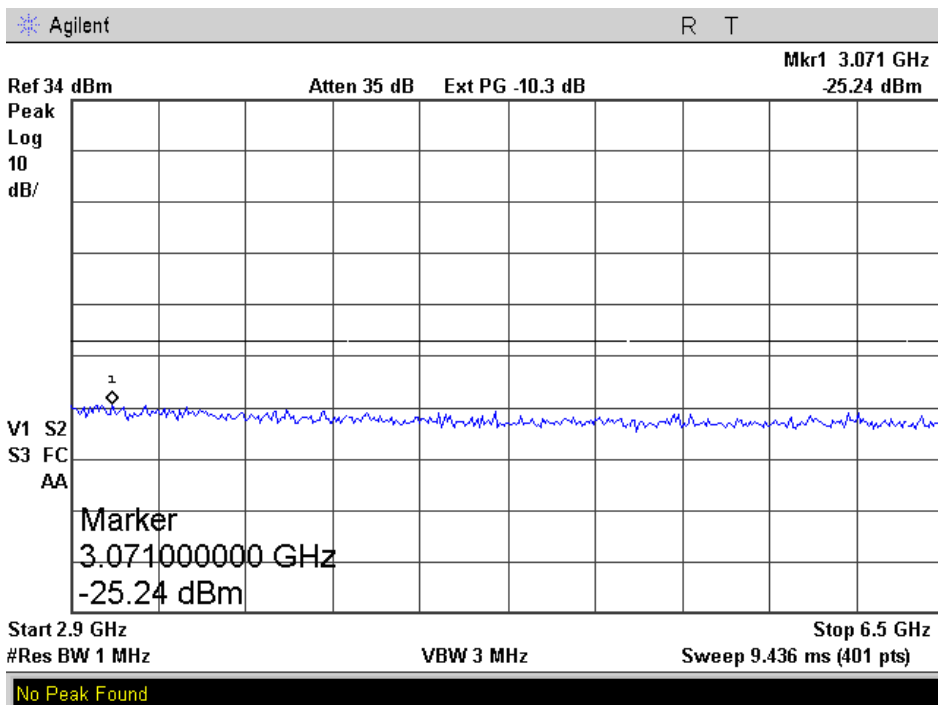
Plot 4.6.12



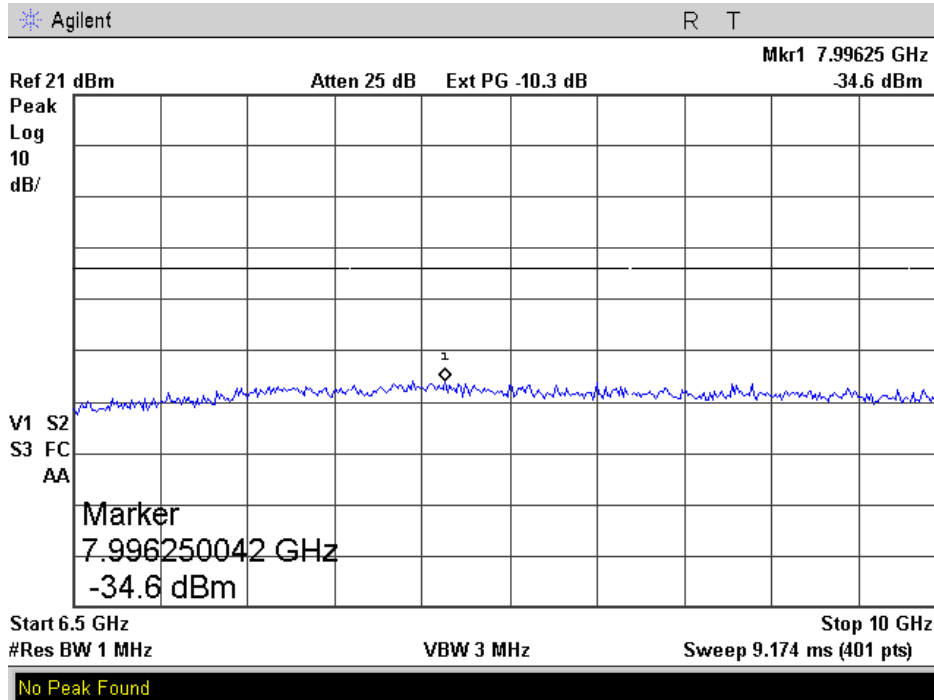
Frequency 836.6 MHz
Plot 4.6.13



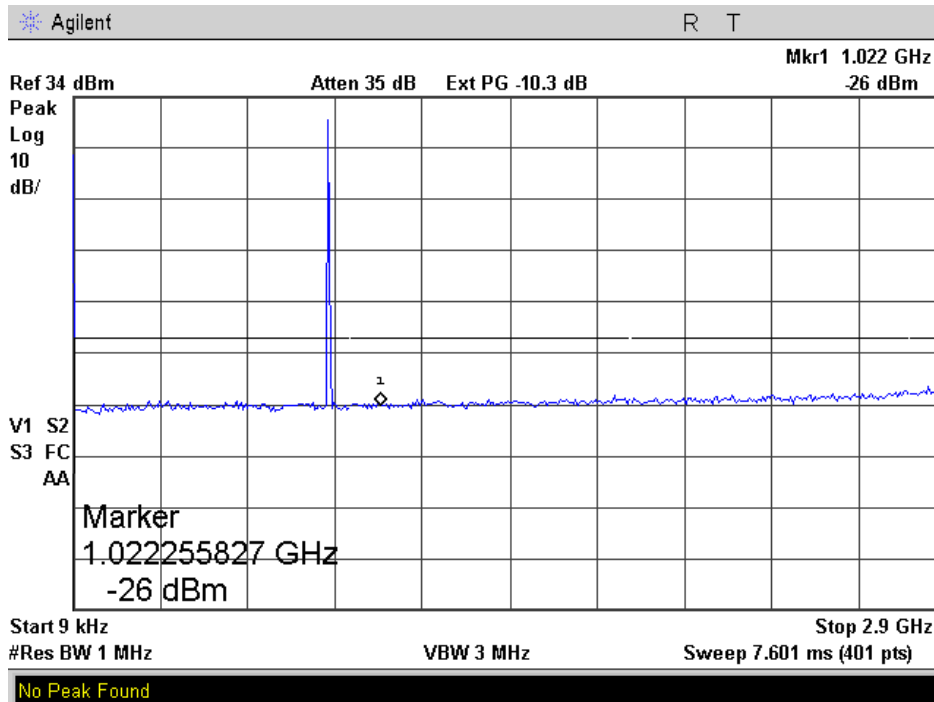
Plot 4.6.14



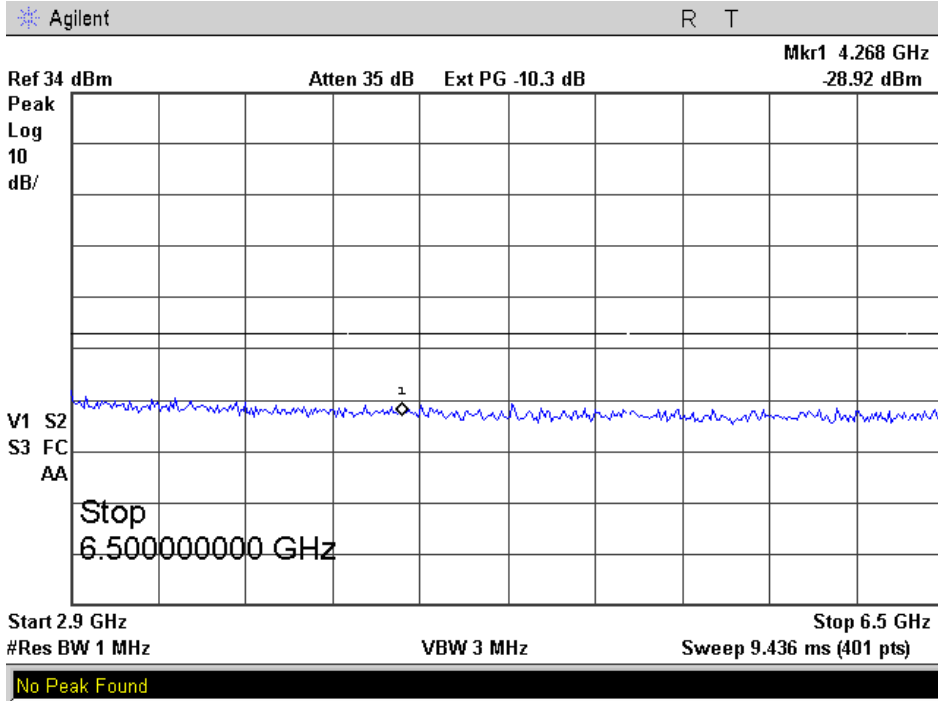
Plot 4.6.15



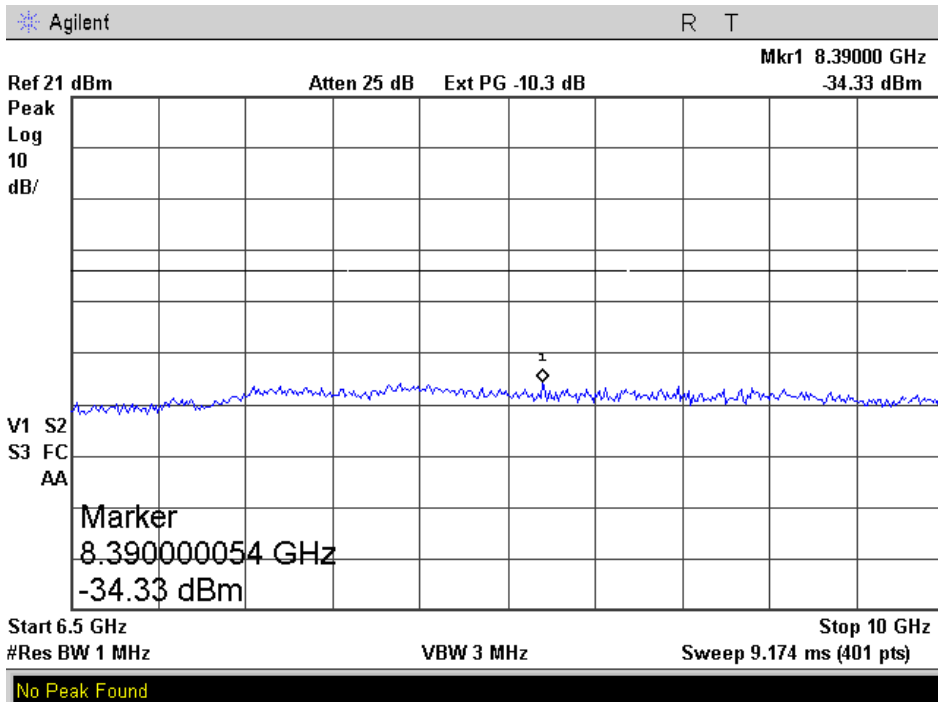
Frequency 848.8 MHz
Plot 4.6.16



Plot 4.6.17



Plot 4.6.18



4.7. Block Edge Emissions - conducted

Reference document:	§22.917(b)		
Test Requirements:	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. In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 1% of the EBW may be employed.		
Test setup:	See sec 2.4	Pass	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 3kHz, VBW: 3kHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Reference Plots 4.7.1 - 4.7.4	

Test results:

Modulation: GPRS Class 10

Frequency [MHz]	Spurious Emission Level* [dBm]	Limit [dBc]	Actual Attenuation below frequency of operation [dBc]	Margin [dB]	Result
824.2	32.36				Carrier
823.982	-14.93	45.4	47.29	-1.49	Pass
848.8	32.50				Carrier
849.027	-14.57	45.5	47.07	-1.57	Pass

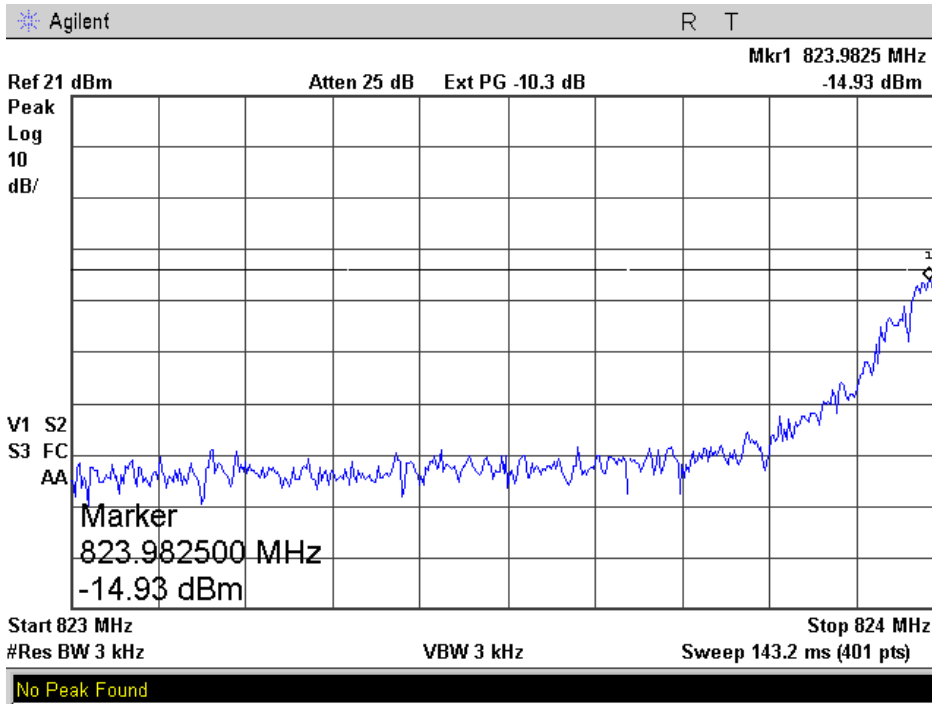
* Spurious Emission [dBm] = Measured [dBm] – Attenuations [dB]

Modulation: EDGE 8PSK

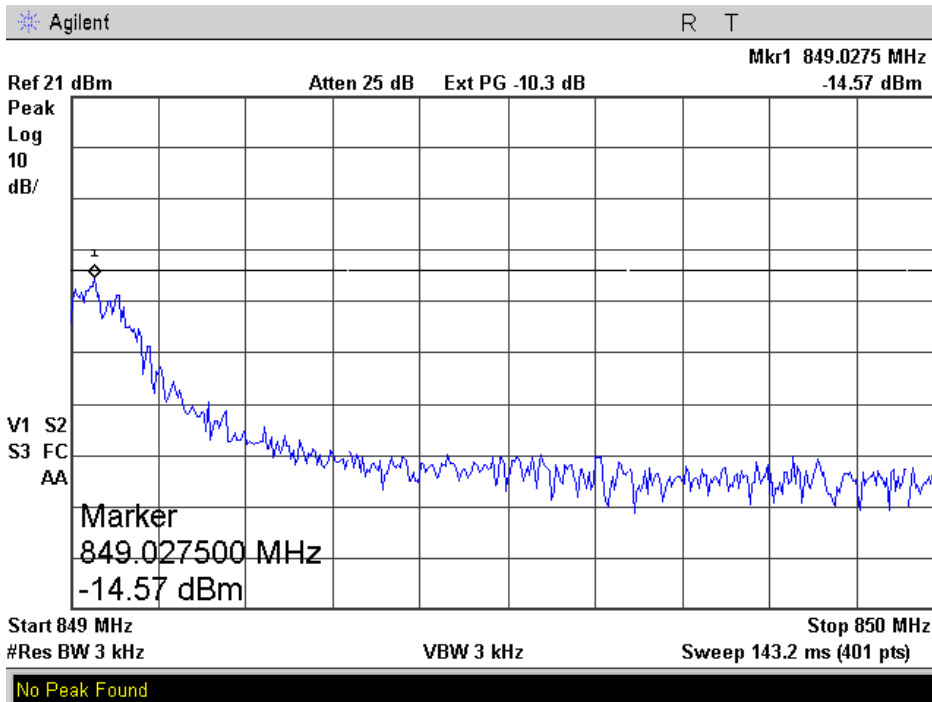
Frequency [MHz]	Spurious Emission Level* [dBm]	Limit [dBc]	Actual Attenuation below frequency of operation [dBc]	Margin [dB]	Result
824.2	29.65				Carrier
823.967	-18.66	42.7	48.31	-5.61	Pass
848.8	29.68				Carrier
849.030	-18.77	42.7	48.45	-5.75	Pass

* Spurious Emission [dBm] = Measured [dBm] – Attenuations [dB]

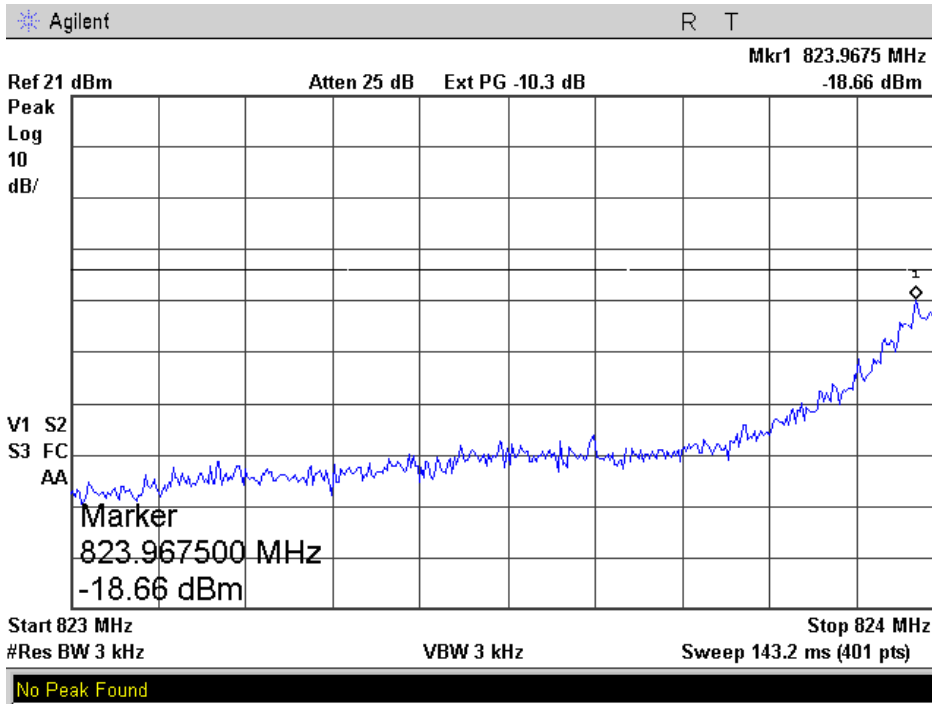
Modulation: GPRS Class 10
Plot 4.7.1



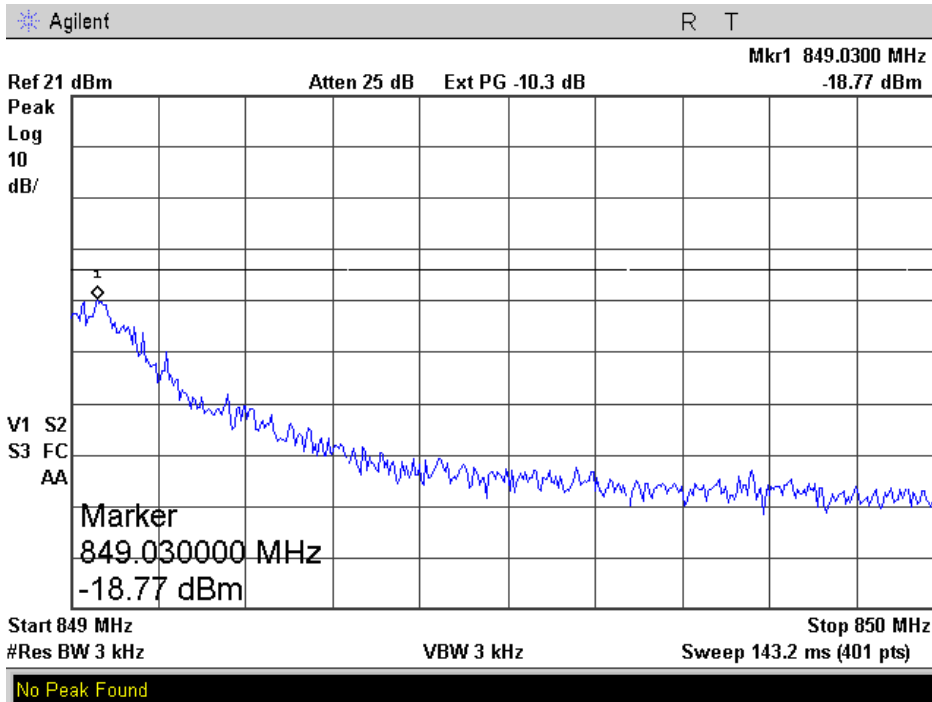
Plot 4.7.2



Modulation: 8PSK
Plot 4.7.3



Plot 4.7.4



5. Appendix

Appendix A: List of Measuring Equipment used:

Equipment	Manufacturer/ Model	Serial Number	Due date
CISPR16 EMI Receiver	HP8546A	3710A00392	30.06.2008
Spectrum Analyzer 9kHz ÷ 22 GHz	HP 8593EM	3536A00131	30.06.2008
Spectrum Analyzer 100 Hz ÷ 26.5 GHz	Agilent E7405A	US41160436	30.06.2008
LNA Amplifier 1 GHz ÷ 18 GHz	AMP – 5D-010180-30-10P-GW	618653	01.01.2008
Dual Ridged Guide Ant.1-18 GHz	EMCO 3115	9602-4677	01.01.2008
Antenna 18 GHz ÷ 26.5 GHz	Alpha Industry 861A/599	505	01.01.2008
Turn table	HD100	100/693	-
Antenna Mast	HD 100	100/693	-
Biconical 20 –200 MHz	Schwarzbeck VHBB9124	9124/0255	30.06.2008
Log-Periodic 200 – 1000 MHz	Schwarzbeck VUSLP9111	VUSLP9111184	30.06.2008
Pre-Amplifier	MiTeq, AMF-5F-18002650-30-10P	945372	01.01.2008
LISN	Fischer 50/250-25-2	-	30.06.2008
Transient Limiter	HP11947A	-	30.06.2008
Notch Filter	Micro-Tronics BRM50702-05	0001	01.01.2008
Antenna 15G-40 GHz	Schwarzbeck BBHA 9170	BBHA9170214	01.01.2008
High pass Filter	Wainwright WHK 1.2/15G-10EF	3	30.06.2008
High pass Filter	Wainwright WHK2.4/18G-10EF	1	30.06.2008
Oven	Tenneg Ten	10.158-5	30.06.2008
LISN	Fischer 50/250-25-2	-	30.06.2008
Transient Limiter	HP11947A	-	30.06.2008

End of the Test Report