



Report No: SYBH(R)044102007EB-1  
FCC ID: QISRRU3801C-19402

# FCC TEST REPORT OF WCDMA NodeB

M/N: RRU3801C

Nov. 2 2007

Reliability Laboratory of Huawei Technologies Co., Ltd.

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**REPORT ON** FCC Test of WCDMA NodeB  
M/N: RRU3801C  
Report No: SYBH(R)044102007EB-1

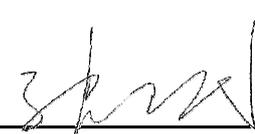
**REGULATION** **FCC CFR47 Part 2;**  
**FCC CFR47 Part 24;**

**CONCLUSION** There are 7 items need to be tested, 7 items have been tested. The sample of the model completely meets the requirements

**Final Judgement: Pass**

**General Manager** 2007-11-02 张兴海   
Date Name signature

**Technical Responsibility For Area of Testing** 2007-11-02 余辉   
Date Name signature

**Test Lab Engineer** 2007-11-02 张卫民   
Date Name signature

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## 1 Summary

The table below summarizes the measurements and results for the EUT. Detailed results and descriptions are shown in the following pages.

table 1. Summary of results

<b>FCC Measurement Specification</b>	<b>FCC Limits Part(s)</b>	<b>Description</b>	<b>Result</b>
2.1046	24.232	Maximum Channel Power	PASS
2.1047	---	Modulation Characteristics	PASS
2.1049	---	Occupied Bandwidth	PASS
2.1051	24.238	Band Edges Compliance	PASS
2.1051	24.238	Spurious Emission at antenna terminal	PASS
2.1053	24.238	Radiated Spurious Emission	PASS
2.1055	24.235	Frequency Stability	PASS

## 2 Product Description

### 2.1 Production Information

#### 2.1.1 General Description

The Equipment under Test (EUT), RRU3801C, can support operating Band II (1900MHz) frequency band. In general, the EUT is connected to baseband processing module through a pair of fibres, and serves one cell or several logical sectors.

The EUT implements radio transmission over the Uu interface, as well as the related control functions. The EUT has the following features:

- | Compact size
- | Easy installation
- | Flexible coverage

It is ideal for the areas with medium or high traffic density.

#### 2.1.2 Support function and Service

The EUT supports the function and service as follows:

table 2. Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Remark
WCDMA voice and data	Modulation: QPSK	TM1*	See Note
HSDPA	Modulation: QPSK+16QAM	TM5*	See Note

Note: \* Refer to 3GPP 25.141 section 6.1.1 for more information of test mode of WCDMA base station.

### 2.2 Modification Information

For original equipment as the EUT, following table is not application.

table 3. Modification Information

Model Number	Board/Module	Original Version	New Version	Modify Information
<b>Not applicable</b>				

### **3 Test Site Description**

The test site of:

***Huawei Technologies Co. Ltd.  
P.O. Box 518129  
Huawei base, bantian,  
Longgang District, Shenzhen, China***

The test site description has been submitted to  and registration granted under the registration number **97456** on April 20, 2006. The test site has been accredited by



and the accredited number is **2174.01** in Jan of 2006.

#### **3.1 Testing Period**

The test have been performed during the period of

Oct. 19, 2007 to Nov. 02, 2007

## 4 Product Description

### 4.1 Technical Characteristics

#### 4.1.1 Frequency Range

table 4. Frequency range for UMTS1900 band

Uplink band:	1850 MHz to 1910 MHz
Downlink band:	1930 MHz to 1990 MHz

#### 4.1.2 Channel Spacing / Separation

table 5. Channel spacing & separation

Channel spacing:	5 MHz
Channel separation:	5 MHz

#### 4.1.3 Type of Emission

table 6. Type of Emission

Emission Designation:	<b>5M0F9W</b>
-----------------------	---------------

Note; Refer to CFR 47 (FCC) part 2, subpart C, section 2.201 and 2.202.

#### 4.1.4 Environmental Requirements

table 7. Environmental Requirements

Minimum temperature:	- 40°C
Maximum temperature:	+ 50°C
Relative Humidity:	5% - 95%RH

#### 4.1.5 Power Source

table 8. Power Source

DC voltage nominal:	 -48V
DC voltage range	-40V ~ -60V

#### 4.1.6 Tune-up Procedure

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (9).

Please reference the document Tune-up Procedure in TCF.

## 4.2 EUT Identification List

### 4.2.1 Board Information

table 9. Board Information

Model Name	Qty.	Hardware Version	Serial	Description
1900M RRU	1	V1.9	21023151691078000004	1900MHz Multi-carrier Transceiver Module

### 4.2.2 Adapter Technical Data

Not Applicable for BTS.

### 4.2.3 Battery Technical Data

Not Applicable for BTS.

### 4.2.4 FCC Identification

**Grantee Code:** QIS  
**Product Code:** RRU3801C-19402  
**FCC Identification:** QISRRU3801C-19402

## 5 Main Test Instruments

table 10. Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (MM.DD.YYYY)
3m Semi Anechoic Chamber	S+M	N/A	N/A	12.28.2007
Test Receiver Display Unit	R&S	ESMI	829214/011	05.29.2008
Test Receiver RF Unit	R&S	ESMI	829550/008	05.29.2008
Receiver	R&S	ESCS30	830245/018	05.29.2008
Pre-Amplifier	Agilent	83017A	3950M00246	05.21.2008
Bi-Log Antenna	Schaffner	CBL 6112B	2941	02.15.2008
Horn Antenna	R&S	HF906	359287/006	11.09.2007
Signal Analyzer	R&S	FSQ26	3604111994	03.19.2008
Temperature Chamber	Weiss	WK11-1000/70	59226029060010	03.11.2008

## 6 Transmitter Measurements

### 6.1 Maximum Channel Power

#### 6.1.1 Test Conditions

table 11. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector

#### 6.1.2 Test Specifications and Limits

##### 6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 24.232

##### 6.1.2.2 Supporting Standards

table 12. Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
EIA/TIA-102-CAAA:1999	Digital C4FM/CQPSK Transceiver Measurement Methods (ANSI/TIA/EIA-102.CAAA-1999)
ETSI TS 125 141 V7.9.0 (2007-10)	Universal Mobile Telecommunications System (UMTS); Base Station (BS) conformance testing (FDD) (3GPP TS 25.141 version 7.9.0 Release 7)

##### 6.1.2.3 Limits

Compliance with part 24.232, in no any case may the peak power of a base station transmitter exceeds 100Watts.

table 13. Limits

Maximum Output Power (Watts)	< 100 Watts
Maximum Output Power (dBm)	< 50 dBm

#### 6.1.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer via the main RF connector. Diversity RF connectors were connected to match load. The EUT was controlled to transmit Maximum power by console computer. Measure and record the Maximum Channel Power of the EUT by the wireless signal analyzer.

Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an RMS equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

**Test setup**

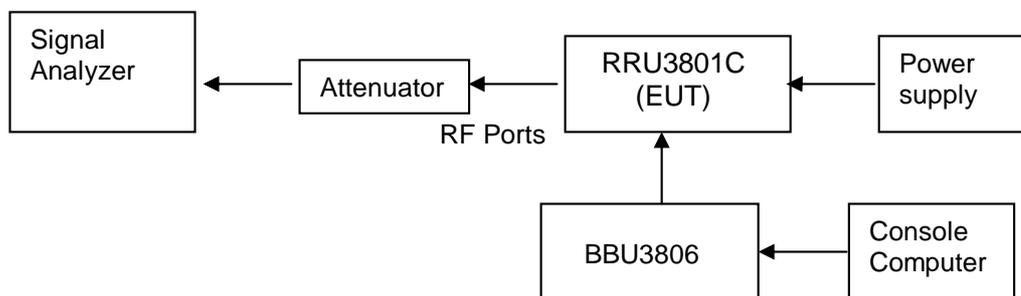


Figure 1. TEST SETUP

**6.1.4 Measurement Results**

The measurements were performed with the test models 1 and test models 5, and test models 1 uses the QPSK modulation only, and the test models 5 includes the 16QAM modulation. The equipment can be configured single carrier and two carriers. For two carriers, the equipment was operated with two adjacent channels, and one channel was measured.

Single carrier:

table 14. Measurement Results for single carrier

TEST CONDITIONS  $T_{nom}(22\text{ }^{\circ}\text{C})$ $V_{nom}(-48\text{V})$  Type of modulation	Maximum Output Power			
	Channel 9662 1932.4 MHz		Channel 9938 1987.6 MHz	
	dBm		dBm	
	Measured	Limit	Measured	Limit
QPSK	45.28	< 50	45.03	< 50
16QAM	45.23	< 50	45.12	< 50

Two carriers:

table 15. Measurement Results for two carriers

TEST CONDITIONS  $T_{nom}(22\text{ }^{\circ}\text{C})$ $V_{nom}(-48\text{V})$  Type of modulation	Maximum Output Power			
	Channel 9662 1932.4 MHz		Channel 9938 1987.6 MHz	
	dBm		dBm	
	Measured	Limit	Measured	Limit
QPSK	46.12	< 50	45.74	< 50
16QAM	46.11	< 50	45.89	< 50

**6.1.5 Conclusion**

The equipment **PASSED** the requirement of this clause.

## 6.2 Modulation Characteristics

### 6.2.1 Test Conditions

table 16. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector

### 6.2.2 Test Specifications and Limits

#### 6.2.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 24

#### 6.2.2.2 Supporting Standards

table 17. Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
EIA/TIA-102-CAAA:1999	Digital C4FM/CQPSK Transceiver Measurement Methods (ANSI/TIA/EIA-102.CAAA-1999)
ETSI TS 125 141 V7.9.0 (2007-10)	Universal Mobile Telecommunications System (UMTS); Base Station (BS) conformance testing (FDD) (3GPP TS 25.141 version 7.9.0 Release 7)

#### 6.2.2.3 Limits

No specific modulation characteristics requirement limits in part 2.1047 and part 24.

table 18. Limits

Limits	<p>QPSK: EVM &lt; 17.5%</p> <p>16QAM: EVM &lt; 12.5%</p>
--------	--

### 6.2.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer via the main RF connector. The other RF connector was connected to match load. The EUT was controlled to transmit Maximum power by console computer. Measure and record the Code Domain Power and the constellation of the EUT by wireless signal analyzer.

#### Test setup

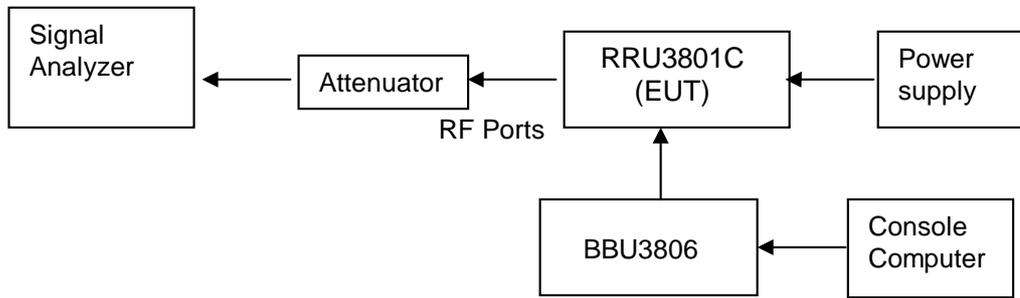


Figure 2. TEST SETUP

### 6.2.4 Measurement Results

The measurements were performed with test models 1 (QPSK) and test models 5 (16QAM). The measurement results are as follows:

table 19. Measurement Results for QPSK

TEST CONDITIONS		EVM (QPSK)		
		Channel 9800 1960 MHz		
		Type	Measured	Limit
$T_{nom}$ (21 °C)	$V_{nom}$ (-48V)	QPSK	9.4%	< 17.5%

table 20. Measurement Results for 16QAM

TEST CONDITIONS		EVM (16QAM)		
		Channel 9800 1960 MHz		
		Type	Measured	Limit
$T_{nom}$ (21 °C)	$V_{nom}$ (-48V)	16QAM	7.9%	< 12.5%

### 6.2.5 Conclusion

The equipment **PASSED** the requirement of this clause. For the detailed measurement results refer to appendix A.

## 6.3 Occupied Bandwidth

### 6.3.1 Test Conditions

table 21. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector

### 6.3.2 Test Specifications and Limits

#### 6.3.2.1 Specification

CFR 47 (FCC) part 2.1049 and part 24

#### 6.3.2.2 Supporting Standards

table 22. Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
EIA/TIA-102-CAAA:1999	Digital C4FM/CQPSK Transceiver Measurement Methods (ANSI/TIA/EIA-102.CAAA-1999)
ETSI TS 125 141 V7.9.0 (2007-10)	Universal Mobile Telecommunications System (UMTS); Base Station (BS) conformance testing (FDD) (3GPP TS 25.141 version 7.9.0 Release 7)

#### 6.3.2.3 Limits

No specific occupied bandwidth requirement in part 24, but the occupied bandwidth was defined in part 2.1049: the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

table 23. Limits

Upper /lower frequency limits	0.5% of the mean power
-------------------------------	------------------------

### 6.3.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer via the one main RF connector. The other RF connector was connected to match load. The EUT was controlled to transmit Maximum power by console computer. Measure and record the Occupied Bandwidth of the EUT by the wireless signal analyzer.

The OBW, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

Refer to 47CFR part2.1049 section (g)&(h).

(g) Transmitter in which the modulating base band comprises not more than three independent channels - when modulated by the full complement of signals for which the transmitter is rated. The

level of modulation for each channel should be set to that prescribed in rule parts applicable to the services for which the transmitter is intended. If specific modulation levels are not set forth in the rules, the tests should provide the manufacturer’s maximum rated condition.

(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudorandom generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at discretion of the user.

Measurement bandwidth (RBW): 30 kHz

**Test Set-up**

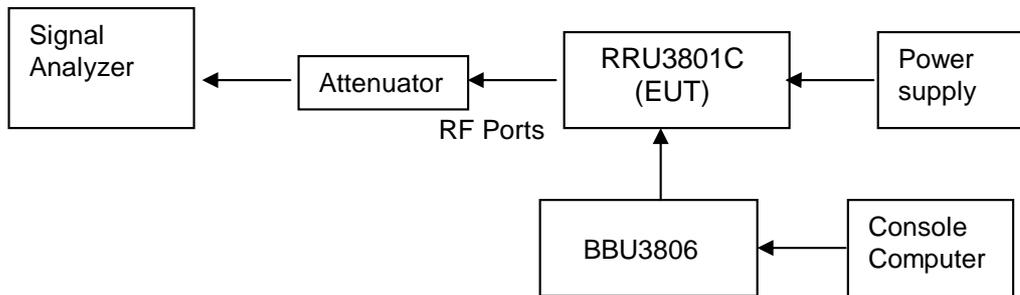


Figure 3. TEST SETUP

**6.3.4 Measurement Results**

The measurements were performed with test models 1 (QPSK) and test models 5 (16QAM). The measurement results are as follows:

table 24. Measurement Results for QPSK

TEST CONDITIONS		Occupied Bandwidth			
T <sub>nom</sub> (20 °C)	V <sub>nom</sub> (-48V)	Channel 9662 1932.4 MHz		Channel 9938 1987.6 MHz	
		Measured (MHz)	Limit (MHz)	Measured (MHz)	Limit (MHz)
99%		4.17	5.0	4.17	5.0

table 25. Measurement Results for 16QAM

TEST CONDITIONS		Occupied Bandwidth			
T <sub>nom</sub> (20 °C)	V <sub>nom</sub> (-48V)	Channel 9662 1932.4 MHz		Channel 9938 1987.6 MHz	
		Measured (MHz)	Limit (MHz)	Measured (MHz)	Limit (MHz)
99%		4.17	5.0	4.17	5.0

### 6.3.5 Conclusion

The equipment **PASSED** the requirement of this clause. For the detailed measurement results refer to appendix B.

## 6.4 Band Edges Compliance

### 6.4.1 Test Conditions

table 26. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector

### 6.4.2 Test Specifications and Limits

#### 6.4.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 24.238

#### 6.4.2.2 Supporting Standards

table 27. Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
EIA/TIA-102-CAAA:1999	Digital C4FM/CQPSK Transceiver Measurement Methods (ANSI/TIA/EIA-102.CAAA-1999)
ETSI TS 125 141 V7.9.0 (2007-10)	Universal Mobile Telecommunications System (UMTS); Base Station (BS) conformance testing (FDD) (3GPP TS 25.141 version 7.9.0 Release 7)

#### 6.4.2.3 Limits

Compliance with part 24.238, all spurious emission must be attenuated below the transmitter power by at least  $43 + 10 \log_{10} P$ . (Whereas P is the rated power of the EUT).

table 28. Limits

Limit	$P - (43 + 10 \log_{10} P) = 10 \log_{10}(1000P) - 43 - 10 \log_{10} P = 30 - 43 = -13 \text{ dBm}$
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### 6.4.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer via the one main RF connector. The other RF connector was connected to match load. The EUT was controlled to transmit Maximum power by console computer. Measure and record the Band Edge Spurious Emissions of the EUT by the wireless signal analyzer.

RBW of 50kHz (more than 1% of 5MHz) was used up to 1MHz away from the band edge .So the FCC rules specify that RBW of 100kHz for measurements of emissions >1MHz away from the band edges.

### Test Set-up

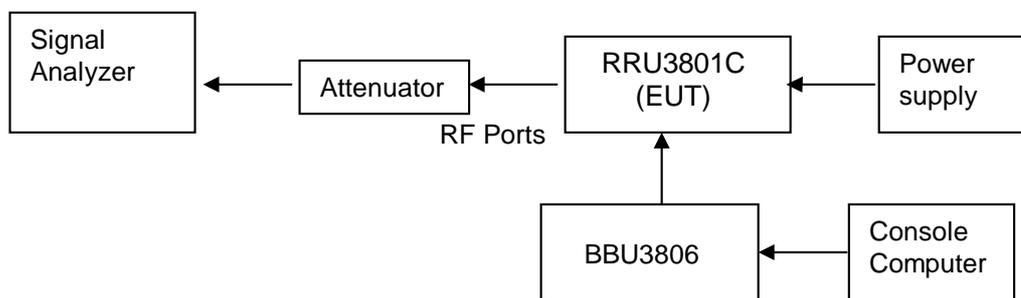


Figure 4. Test Set-up

6.4.4 Measurement Results

The measurements were performed with test models 1 (QPSK) and test models 5 (16QAM). For each test model, the base station was configured single carrier and two carriers. The measurement results are as follows:

**QPSK:**

A. Single Carrier

table 29. Measurement Results for single carrier

Channel Number	Frequency of Band edge [MHz]	Maximum Spurious Level measured [dBm]	FCC limit	Result
9662	1929 to 1930	-14.13 (See appendix C)	< - 13 dBm	Pass
9938	1990 to 1991	-14.18 (See appendix C)	< - 13 dBm	Pass

B. Two Carriers

table 30. Measurement Results for two carriers

Channel Number	Frequency of Band edge [MHz]	Maximum Spurious Level measured [dBm]	FCC limit	Result
9662/9687	1929 to 1930	-16.53 (See appendix C)	< - 13 dBm	Pass
9913/9938	1990 to 1991	-16.23 (See appendix C)	< - 13 dBm	Pass

**16QAM:**

A. Single Carrier

table 31. Measurement Results for single carrier

Channel Number	Frequency of Band edge [MHz]	Maximum Spurious Level measured [dBm]	FCC limit	Result
9662	1929 to 1930	-14.36 (See appendix C)	< - 13 dBm	Pass
9938	1990 to 1991	-13.94 (See appendix C)	< - 13 dBm	Pass

B. Two Carriers

table 32. Measurement Results for two carriers

Channel Number	Frequency of Band edge [MHz]	Maximum Spurious Level measured [dBm]	FCC limit	Result
9662/9687	1929 to 1930	-16.48 (See appendix C)	< - 13 dBm	Pass
9913/9938	1990 to 1991	-15.94 (See appendix C)	< - 13 dBm	Pass

## 6.4.5 Conclusion

The equipment **PASSED** the requirement of this clause. For the detailed measurement results refer to appendix C.

## 6.5 Spurious Emission at Antenna Terminal

### 6.5.1 Test Conditions

table 33. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector

### 6.5.2 Test Specifications and Limits

#### 6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 24.238

#### 6.5.2.2 Supporting Standards

table 34. Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
EIA/TIA-102-CAAA:1999	Digital C4FM/CQPSK Transceiver Measurement Methods (ANSI/TIA/EIA-102.CAAA-1999)
ETSI TS 125 141 V7.9.0 (2007-10)	Universal Mobile Telecommunications System (UMTS); Base Station (BS) conformance testing (FDD) (3GPP TS 25.141 version 7.9.0 Release 7)

#### 6.5.2.3 Limits

Compliance with part 24.238, all spurious emission must be attenuated below the transmitter power by at least  $43 + 10 \log_{10} P$ . (Whereas P is the rated power of the EUT).

table 35. Limits

Limit	$P - (43 + 10 \log_{10} P) = 10 \log_{10}(1000P) - 43 - 10 \log_{10} P = 30 - 43 = -13 \text{ dBm}$
-------	---

### 6.5.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer via the one main connector. The other RF connector was connected to match load. The EUT was controlled to transmit Maximum power by console computer. Measure and record the Spurious Emissions of the EUT by the wireless signal analyzer.

According to 47CFR part 24.238, this defined the measurement bandwidth of as following:  
Measurement bandwidth (RBW) for 9 kHz up to 10<sup>th</sup> harmonic included: 1 MHz;

#### Test Set-up

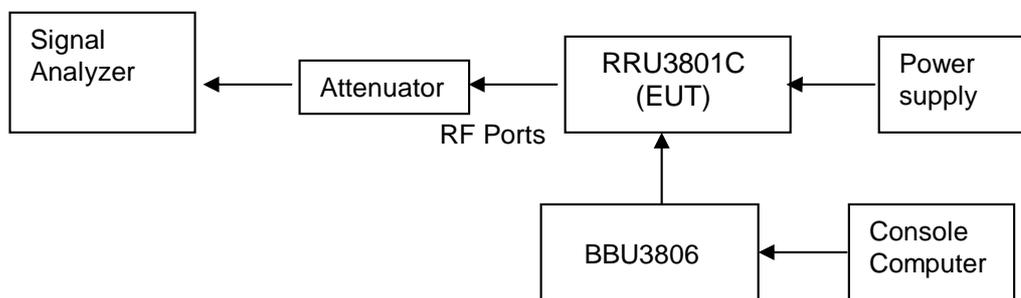


Figure 5. Test Set-up

### 6.5.4 Measurement Results

The measurements were performed with test models 1 (QPSK) and test models 5 (16QAM). For each test model, the base station was configured single carrier and two carriers. The measurement results are as follows:

**QPSK:**

Single carrier:

table 36. Measurement Results for single carrier

Channel Number	Test Range (Frequency)	Power [dBm]	Maximum Spurious Level measured [dBm]	FCC limit	Result
9662	9 kHz ~3GHz	Maximum	-24.30 (See appendix D)	< - 13 dBm/1MHz	Pass
	3GHz~20GHz	Maximum	-23.39 (See appendix D)	< - 13 dBm/1MHz	Pass
9938	9 kHz ~3GHz	Maximum	-24.19 (See appendix D)	< - 13 dBm/1MHz	Pass
	3GHz~20GHz	Maximum	-23.00 (See appendix D)	< - 13 dBm/1MHz	Pass

Two Carriers

table 37. Measurement Results for two carriers

Channel Number	Test Range (Frequency)	Power [dBm]	Maximum Spurious Level measured [dBm]	FCC limit	Result
9662/9687	9 kHz ~3GHz	Maximum	-24.32 (See appendix D)	< - 13 dBm/1MHz	Pass
	3GHz~20GHz	Maximum	-22.96 (See appendix D)	< - 13 dBm/1MHz	Pass
9913/9938	9 kHz ~3GHz	Maximum	-24.26 (See appendix D)	< - 13 dBm/1MHz	Pass
	3GHz~20GHz	Maximum	-22.99 (See appendix D)	< - 13 dBm/1MHz	Pass

**16QAM:**

Single carrier:

table 38. Measurement Results for single carrier

Channel	Test Range	Power	Maximum Spurious Level	FCC limit	Result
---------	------------	-------	------------------------	-----------	--------

Number	(Frequency)	[dBm]	measured [dBm]		
9662	9 kHz ~3GHz	Maximum	-23.99 (See appendix D)	< - 13 dBm/1MHz	Pass
	3GHz~20GHz	Maximum	-22.80 (See appendix D)	< - 13 dBm/1MHz	Pass
9938	9 kHz ~3GHz	Maximum	-23.97 (See appendix D)	< - 13 dBm/1MHz	Pass
	3GHz~20GHz	Maximum	-23.09 (See appendix D)	< - 13 dBm/1MHz	Pass

Two Carriers

table 39. Measurement Results for two carriers

Channel Number	Test Range (Frequency)	Power [dBm]	Maximum Spurious Level measured [dBm]	FCC limit	Result
9662/9687	9 kHz ~3GHz	Maximum	-24.74 (See appendix D)	< - 13 dBm/1MHz	Pass
	3GHz~20GHz	Maximum	-23.09 (See appendix D)	< - 13 dBm/1MHz	Pass
9913/9938	9 kHz ~3GHz	Maximum	-24.10 (See appendix D)	< - 13 dBm/1MHz	Pass
	3GHz~20GHz	Maximum	-23.02 (See appendix D)	< - 13 dBm/1MHz	Pass

6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause. For the detailed measurement results refer to appendix D.

## 6.6 Radiated Spurious Emission

### 6.6.1 Test Conditions

table 40. Test Conditions

Preconditioning:	1 hour
Measured at:	enclosure

### 6.6.2 Test Specifications and Limits

#### 6.6.2.1 Specification

CFR 47 (FCC) part 2.1053 and part 24.238

#### 6.6.2.2 Supporting Standards

table 41. Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
EIA/TIA-102-CAAA:1999	Digital C4FM/CQPSK Transceiver Measurement Methods (ANSI/TIA/EIA-102.CAAA-1999)
ETSI TS 125 141 V7.9.0 (2007-10)	Universal Mobile Telecommunications System (UMTS); Base Station (BS) conformance testing (FDD) (3GPP TS 25.141 version 7.9.0 Release 7)

#### 6.6.2.3 Limits

Compliance with part 24.238, all spurious emission must be attenuated below the transmitter power by at least  $43 + 10 \log_{10} P$ . (Whereas P is the rated power of the EUT).

table 42. Limits

Limit	$P - (43 + 10 \log_{10} P) = 10 \log_{10}(1000P) - 43 - 10 \log_{10} P = 30 - 43 = -13 \text{ dBm}$
-------	---

### 6.6.3 Test Method and Setup

(a) Measurements were made to detect spurious emissions radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data were supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph 2.1049(c) as appropriate. For equipment operating on frequencies below 890 MHz, an Open Field Test is normally required with the measuring instrument antenna located in the far field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurement will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections, which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with the reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

- (b) Measurements specified in paragraph (a) of this section shall be made for the following equipment:
- (1) Those in which the spurious emission are required to be 60 dB or more below the mean power of the transmitter.
  - (2) All equipment operating on frequencies higher than 25 MHz
  - (3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
  - (4) Other types of equipment as required, when deemed necessary by the Commission.

The EUT is equipment with non-integral antenna. And it should test according to part (b) of above section.

BTS is connected to match loads. The console computer controls The EUT to transmitter the maximum power which defined in specification of product. The Base Station operates on a typical channel.

### The test procedure:

- (a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, E.R.P. shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). The EUT was connected to ancillary in order to simulate normal operating conditions with reference to the guidance given in the standard for this type of equipment.
- (b) Test the radiated maximum output power by the R&S test receiver ESMI received from test antenna.
- (c) Use substitution method to verify the Maximum output power. The EUT is substituted by a dipole antenna. The dipole is connected to a signal generator. And then adjust the output level of the signal generator to get the same received power recorded in step (b) on ESMI, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

According to 47CFR part 24.238, this defined the measurement bandwidth of as following:  
Measurement bandwidth (RBW) for 9 kHz up to 10<sup>th</sup> harmonic included: 1 MHz;

### Test setup

#### **Step 1: Pre-test**

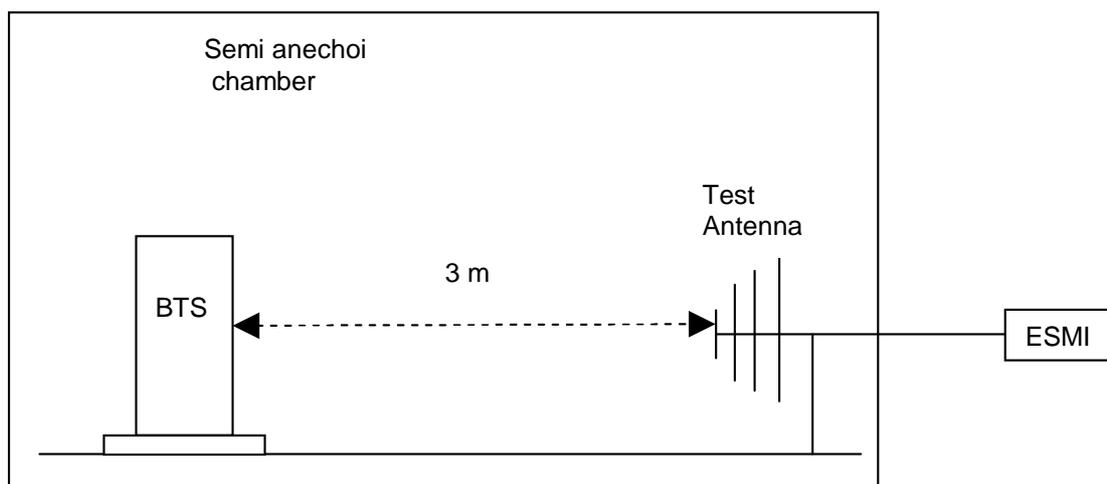


Figure 6. Test Set-up

#### **Step 2: Substitution method to verify the maximum ERP**

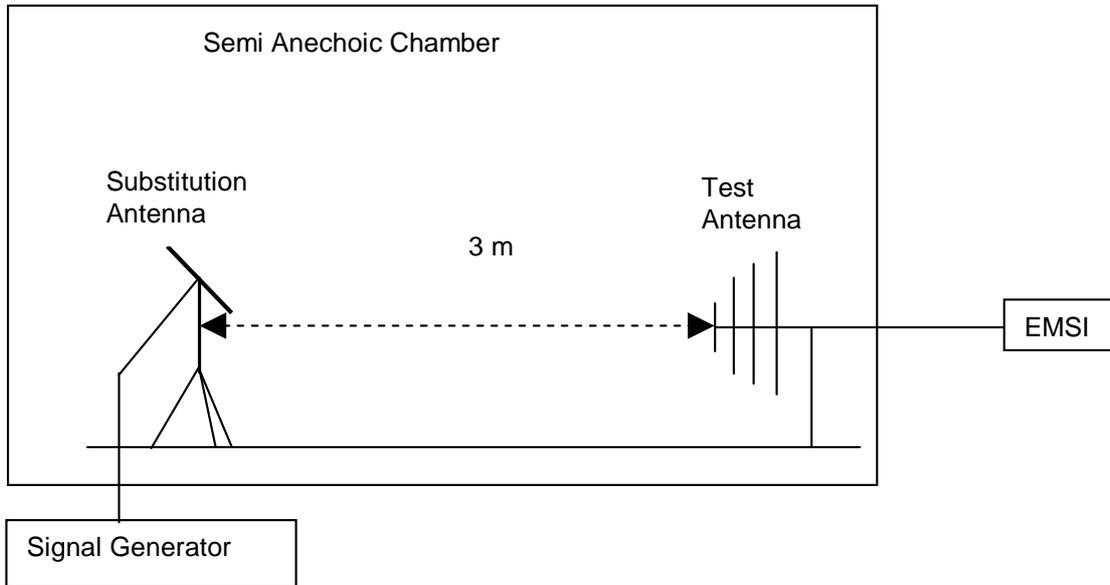


Figure 7. Test Set-up

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.

### 6.6.4 Measurement Results

table 43. Measurement Result

Channel Number	Test Range (Frequency)	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel 9800 1960MHz	30MHz ~20GHz	Maximum	<- 13 dBm (See appendix E)	< - 13 dBm	Pass

### 6.6.5 Conclusion

The equipment **PASSED** the requirement of this clause. For the detailed measurement results refer to appendix E.

## 6.7 Frequency Stability

### 6.7.1 Test Conditions

table 44. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector

### 6.7.2 Test Specifications and Limits

#### 6.7.2.1 Specification

CFR 47 (FCC) part 2.1055 and part 24.235

#### 6.7.2.2 Supporting Standards

table 45. Supporting Standards:

EIA/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
EIA/TIA-102-CAAA:1999	Digital C4FM/CQPSK Transceiver Measurement Methods (ANSI/TIA/EIA-102.CAAA-1999)
ETSI TS 125 141 V7.9.0 (2007-10)	Universal Mobile Telecommunications System (UMTS); Base Station (BS) conformance testing (FDD) (3GPP TS 25.141 version 7.9.0 Release 7)

#### 6.7.2.3 Limits

No specific frequency stability requirement in part 2.1055 and part 24.235.

table 46. Limits

Limits	< $\pm 0.05$ ppm
--------	------------------

### 6.7.3 Test Method and Setup

The frequency stability shall be measured with variation of ambient temperature as follows:

- (1) From  $-30^{\circ}$  to  $+50^{\circ}$  centigrade for all equipment except that specified in subparagraphs (2) and (3) of paragraph 2.1055

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than  $10^{\circ}$  centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

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

- (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
- (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point, which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment.)

**Test Set up**

Connect the EUT to the Wireless Signal Analyzer via the main antenna connector. Then measure the frequency error by the. The other antenna output port was matched with 50 Ω match loads.

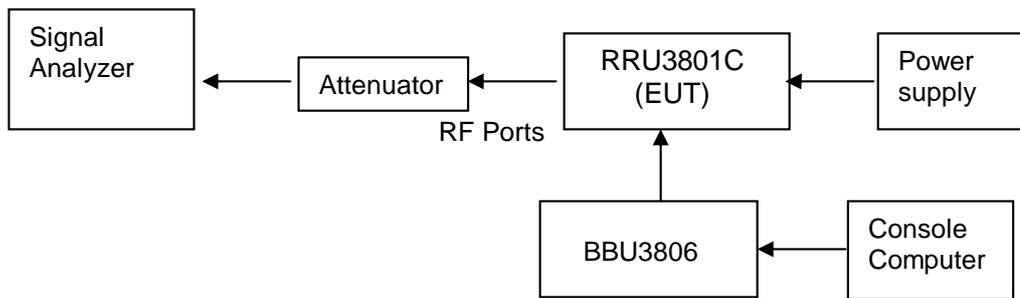


Figure 8. Test Set up

**6.7.4 Measurement Results**

**6.7.4.1 Measurement Results vs. Variation of Temperature**

QPSK: Channel No. 9800 (1960 MHz)

table 47. Measurement Results for QPSK

TEST CONDITIONS		Frequency Stability		
		Measured Max. Frequency Error		Limit (ppm)
		Hz	ppm	
Vnom (-48 V)	-30 °C	18.75	0.0096	0.05
	-20 °C	17.57	0.0090	0.05
	-10 °C	17.88	0.0091	0.05
	0 °C	17.91	0.0091	0.05
	+10 °C	17.75	0.0091	0.05
	+20 °C	17.67	0.0090	0.05
	+30 °C	18.43	0.0094	0.05
	+40 °C	17.13	0.0087	0.05
	+50 °C	18.53	0.0095	0.05

16QAM: Channel No. 9800 (1960 MHz)

table 48. Measurement Results for 16QAM

TEST CONDITIONS		Frequency Stability		
		Measured Max. Frequency Error		Limit (ppm)
		Hz	ppm	
Vnom (-48 V)	-30 °C	15.11	0.0077	0.05
	-20 °C	16.57	0.0085	0.05
	-10 °C	18.12	0.0092	0.05
	0 °C	16.65	0.0085	0.05

	+10 °C	18.43	0.0094	0.05
	+20 °C	18.29	0.0093	0.05
	+30 °C	15.11	0.0077	0.05
	+40 °C	16.62	0.0085	0.05
	+50 °C	17.55	0.0090	0.05

**6.7.4.2 Measurement Results vs. Variation of Voltage**

QPSK: Channel No. 9800 (1960 MHz)

table 49. Measurement Results for QPSK

TEST CONDITIONS		Frequency Stability		
		Measured Max. Frequency Error		Limit (ppm)
		Hz	ppm	
T <sub>nom</sub> (20°C)	85%V <sub>nom</sub> (-40.7V)	18.50	0.0094	0.05
	V <sub>nom</sub> (-48.1V)	17/31	0.0088	0.05
	115%V <sub>nom</sub> (-55.0V)	18.39	0.0094	0.05

16QAM: Channel No. 9800 (1960 MHz)

table 50. Measurement Results for 16QAM

TEST CONDITIONS		Frequency Stability		
		Measured Max. Frequency Error		Limit (ppm)
		Hz	ppm	
T <sub>nom</sub> (20°C)	85%V <sub>nom</sub> (-40.6V)	18.43	0.0094	0.05
	V <sub>nom</sub> (-48V.0)	17.32	0.0088	0.05
	115%V <sub>nom</sub> (-55.2V)	18.11	0.0092	0.05

**6.7.5 Conclusion**

The equipment **PASSED** the requirement of this clause.

## 7 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

table 51. System Measurement Uncertainty

Items		Extended Uncertainty
Band Width	Magnitude (%)	U=0.2%; k=2
Band Edge Compliance	Disturbance Power (dBm)	U=2.0dB; k=2
Conducted Spurious Emission at Antenna Terminal	Disturbance Power (dBm)	U=2.0dB; k=2
Frequency Stability	Frequency Accuracy(ppm)	U=0.21ppm; k=2
Field Strength of Spurious Radiation	ERP (dBm)(30MHz~1G)	U=4.6dB; k=2
	ERP (dBm) (>1G)	U=2.2dB; k=2
Conducted Output Power	Power(dBm)	U=0.39dB; k=2

## 8 Appendices

Appendix A	Modulation Characteristic Measurement	01 - 03	page
Appendix B	Occupied Bandwidth Measurement	04 - 08	page
Appendix C	Band Edge Measurement	09 - 13	page
Appendix D	Spurious Emission at Antenna Terminal	14 - 22	page
Appendix E	Field Strength of Spurious Radiation	23 - 25	page
Appendix F	Photos of Test Setup	26 - 27	page

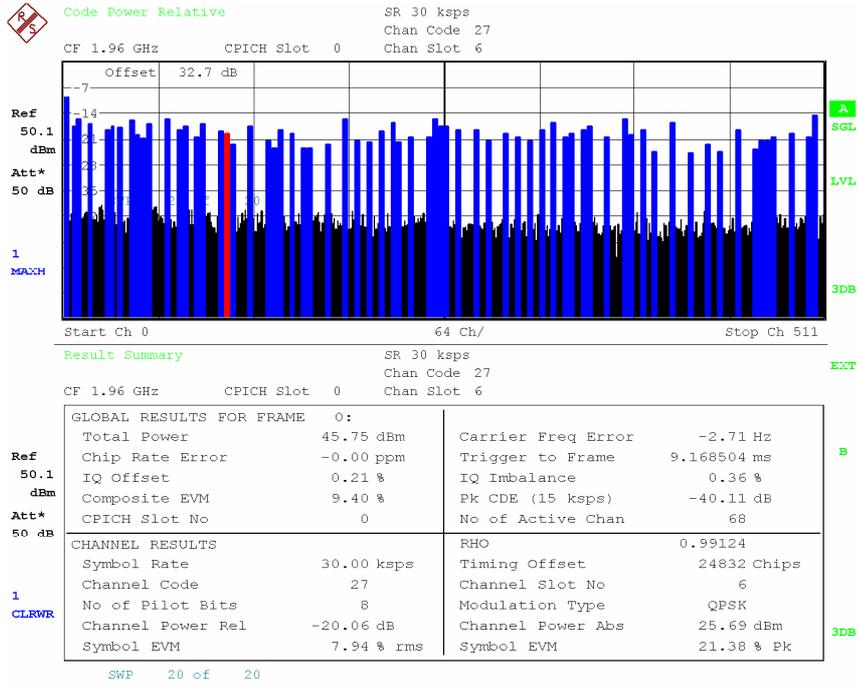
(END OF REPORT)

# Appendix A

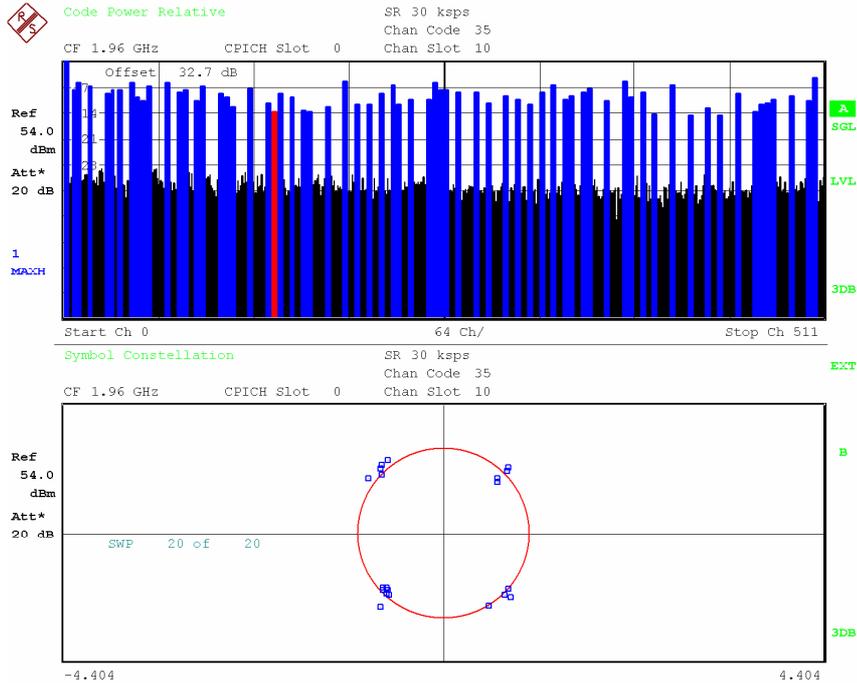
## Modulation Characteristic Measurement According to CFR 47 (FCC) part 2.1047

QPSK:

Channel 9800



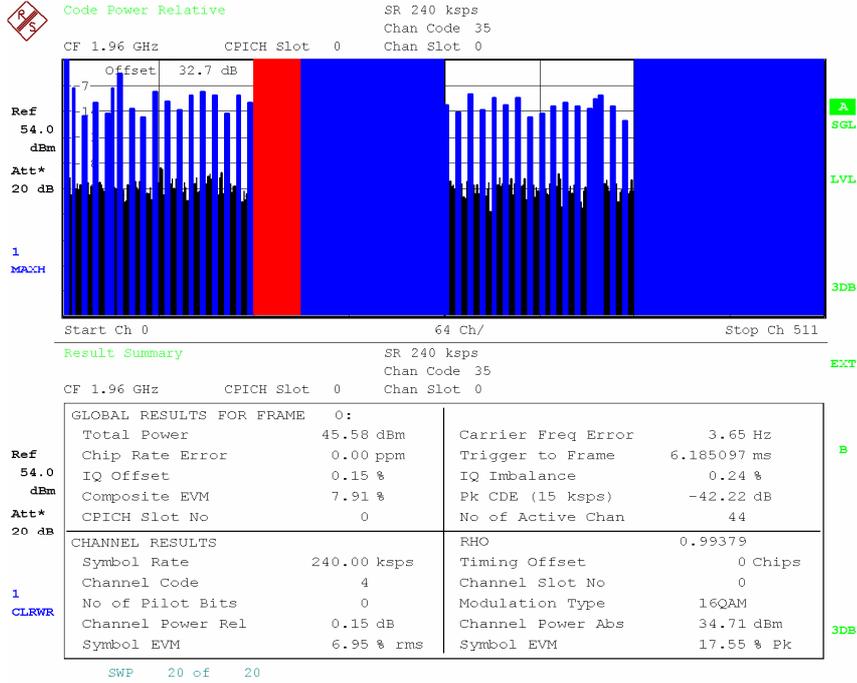
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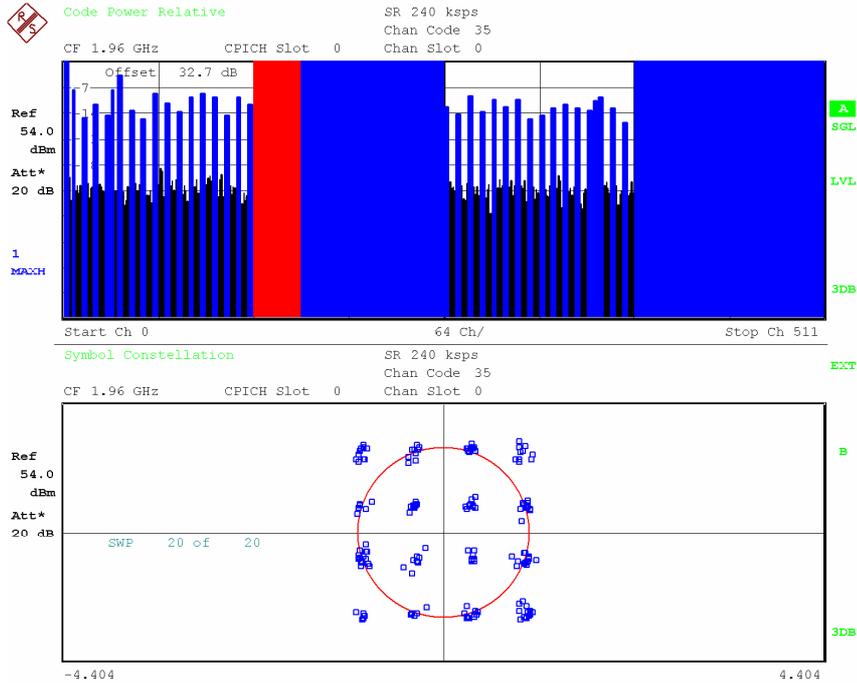
Date: 19.OCT.2007 15:34:11

16QAM:

Channel 9800



Date: 19.OCT.2007 15:35:46



Date: 19.OCT.2007 15:36:31

## **Appendix B**

# Occupied Bandwidth Measurement

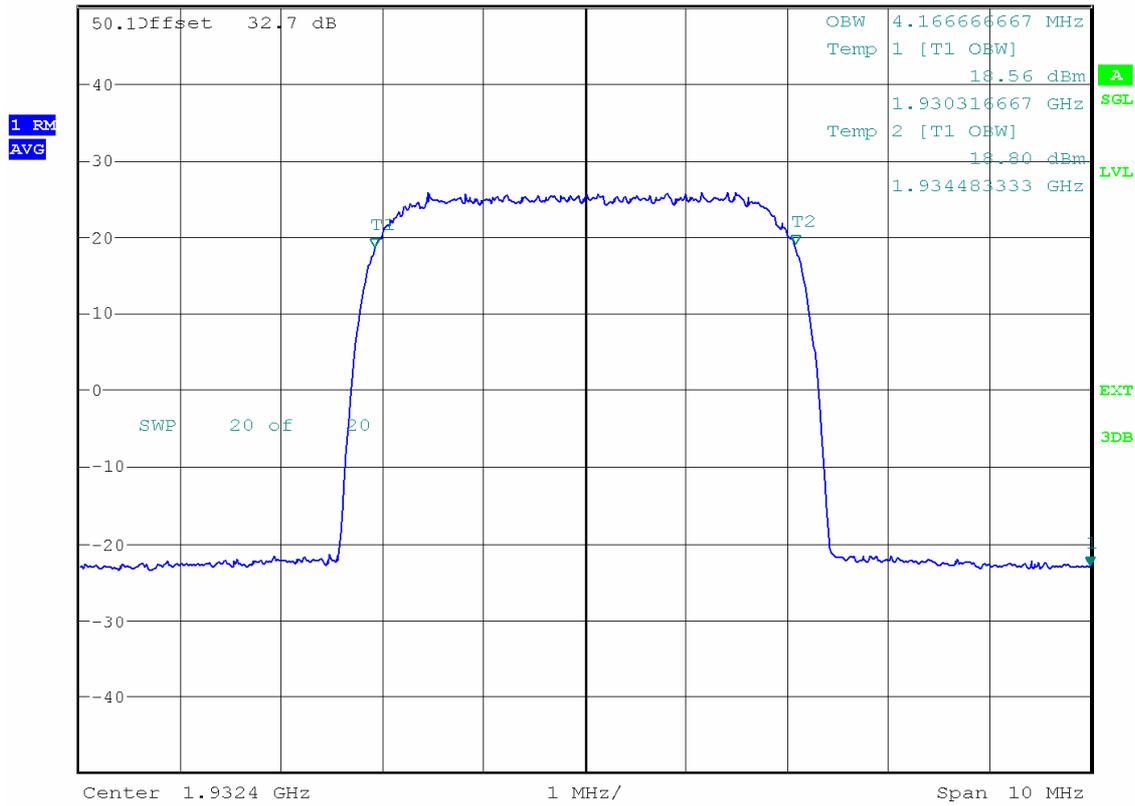
According to CFR 47 (FCC) part 2.1049

# QPSK

## Channel 9662



Ref 50.1 dBm      \*Att 50 dB      \*RBW 30 kHz      Marker 1 [T1 ]  
\*VBW 300 kHz      -23.01 dBm  
\*SWT 200 ms      1.937400000 GHz



Date: 19.OCT.2007 12:30:54

# Channel 9938

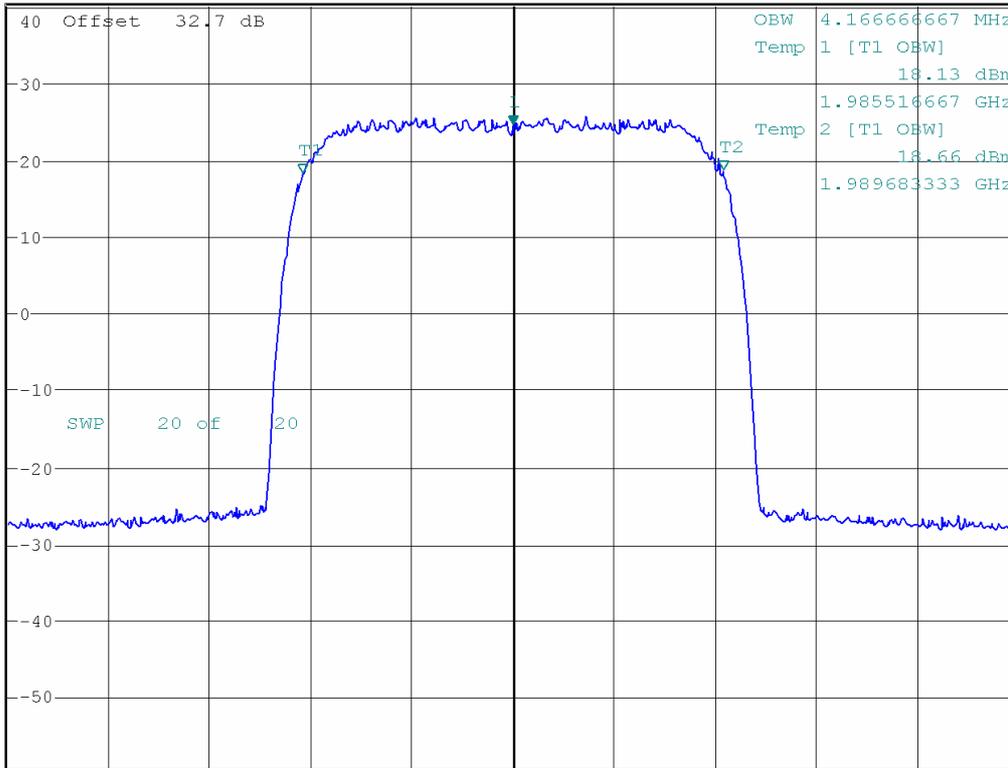


\*RBW 30 kHz      Marker 1 [T1 ]  
 \*VBW 300 kHz      24.47 dBm  
 \*SWT 100 ms      1.987600000 GHz

Ref 40.4 dBm

\*Att 45 dB

1 RM  
 AVG



Center 1.9876 GHz

1 MHz/

Span 10 MHz

Date: 19.OCT.2007 12:41:09

16QAM:

### Channel 9662

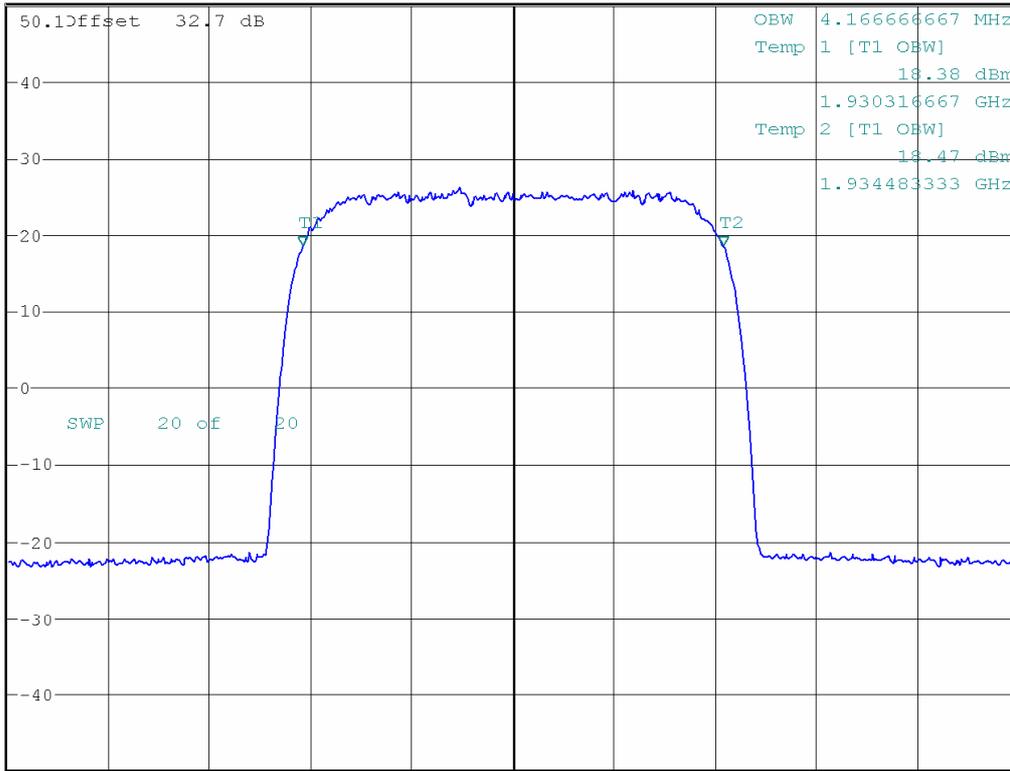


\* RBW 30 kHz      Marker 1 [T1 ]  
\* VBW 300 kHz      -22.47 dBm  
\* SWT 200 ms      1.937400000 GHz

Ref 50.1 dBm

\* Att 50 dB

1 RM  
AVG



Center 1.9324 GHz

1 MHz/

Span 10 MHz

Date: 19.OCT.2007 12:31:47

# Channel 9938

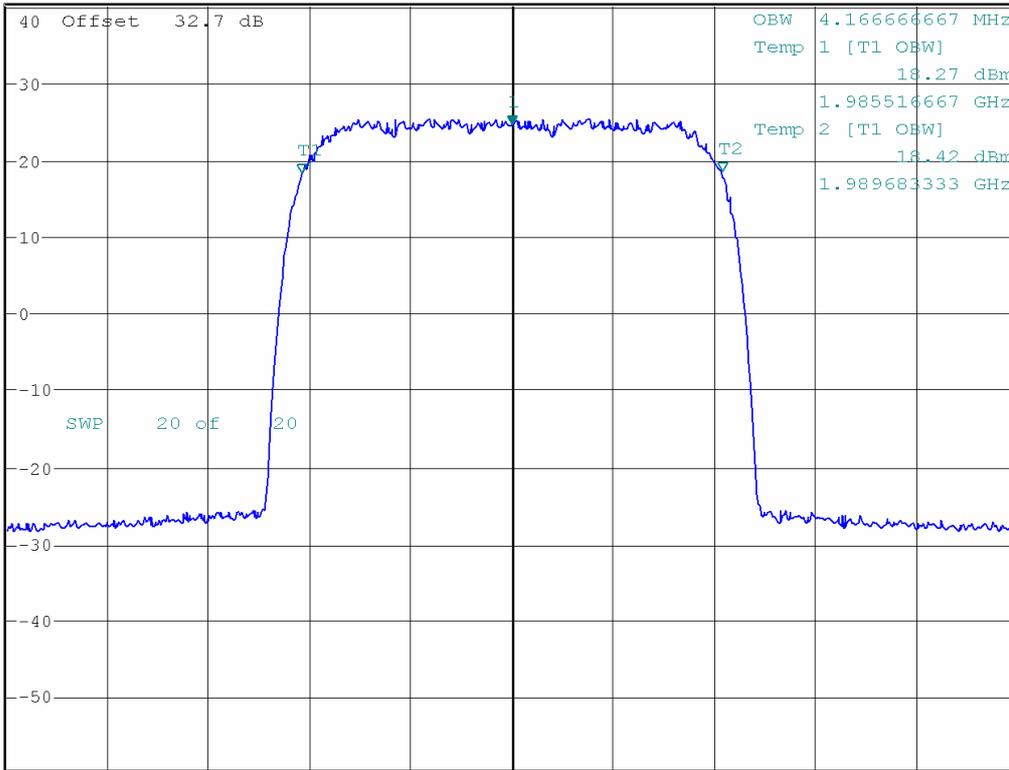


\*RBW 30 kHz      Marker 1 [T1 ]  
 \*VBW 300 kHz      24.54 dBm  
 \*SWT 100 ms      1.987600000 GHz

Ref 40.4 dBm

\*Att 45 dB

1 RM  
 AVG



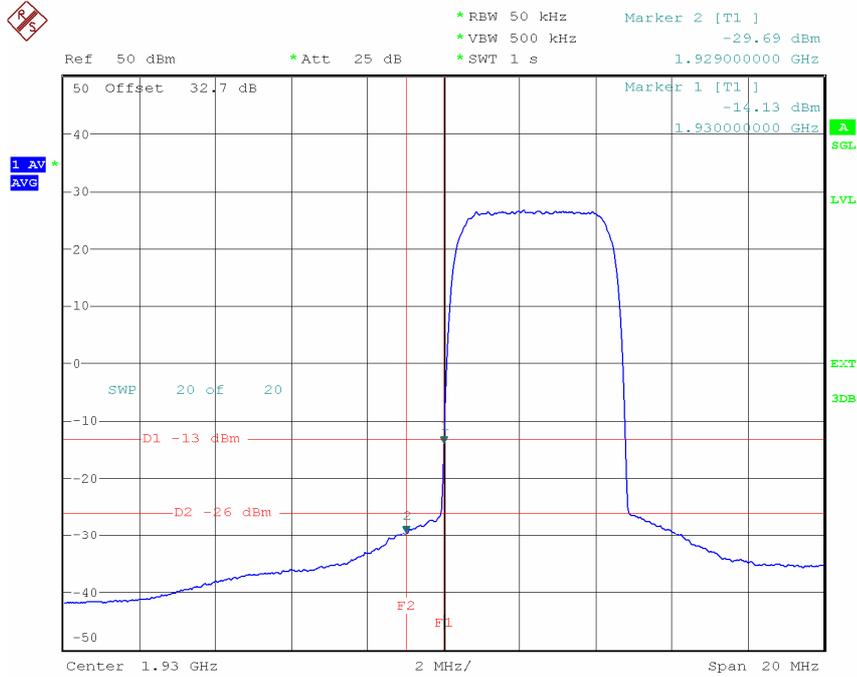
Center 1.9876 GHz      1 MHz/      Span 10 MHz

Date: 19.OCT.2007 12:39:29

# Appendix C

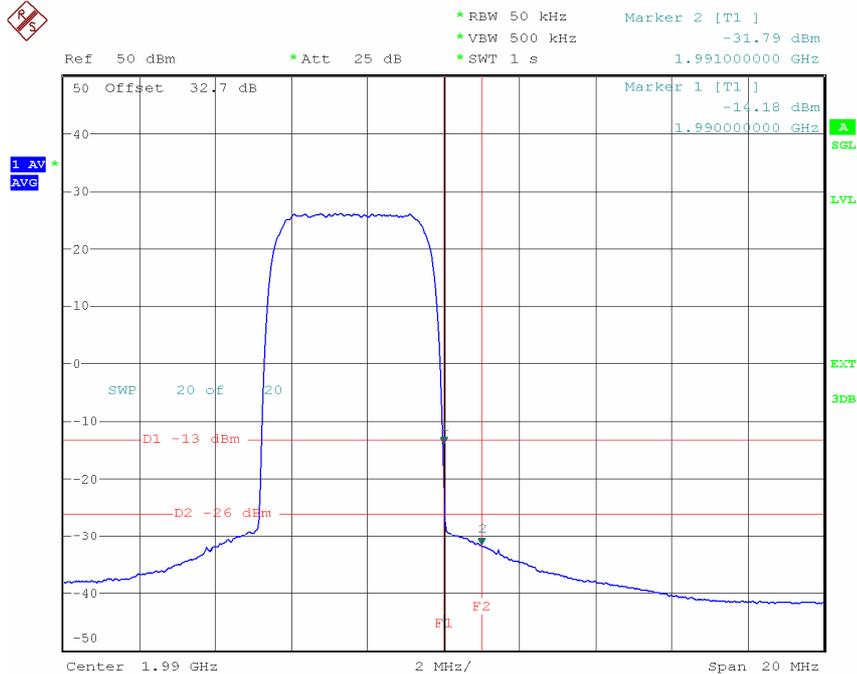
## Band Edge Measurement According to FCC Part 2.1051 & 24.238

# QPSK: A. Single Carrier: Channel Number: 9662



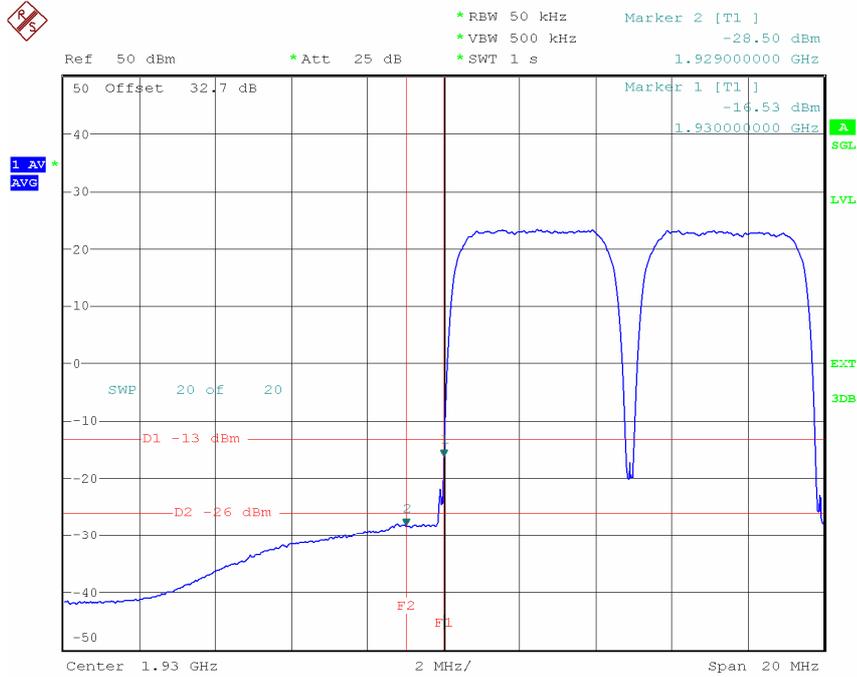
Date: 23.OCT.2007 10:11:28

# Channel Number: 9938



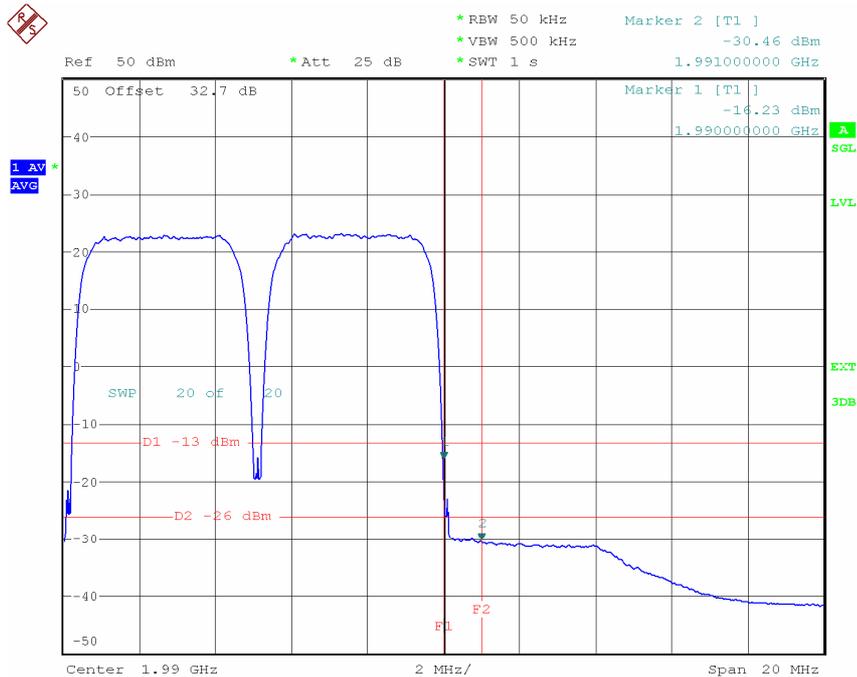
Date: 23.OCT.2007 10:16:58

# QPSK: B. Two Carriers: Channel Number: 9662/9687



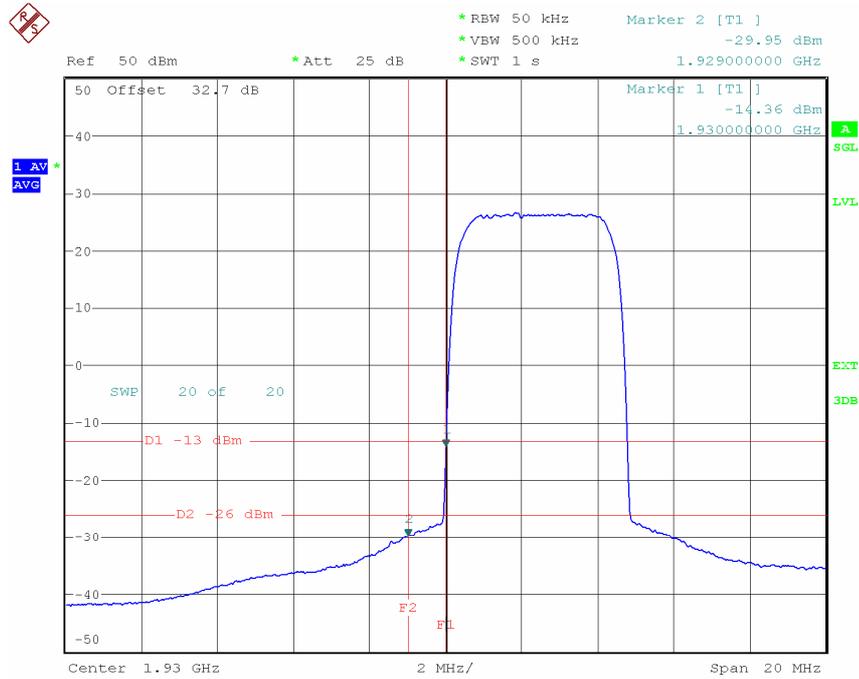
Date: 23.OCT.2007 10:26:02

# Channel Number: 9913/9938



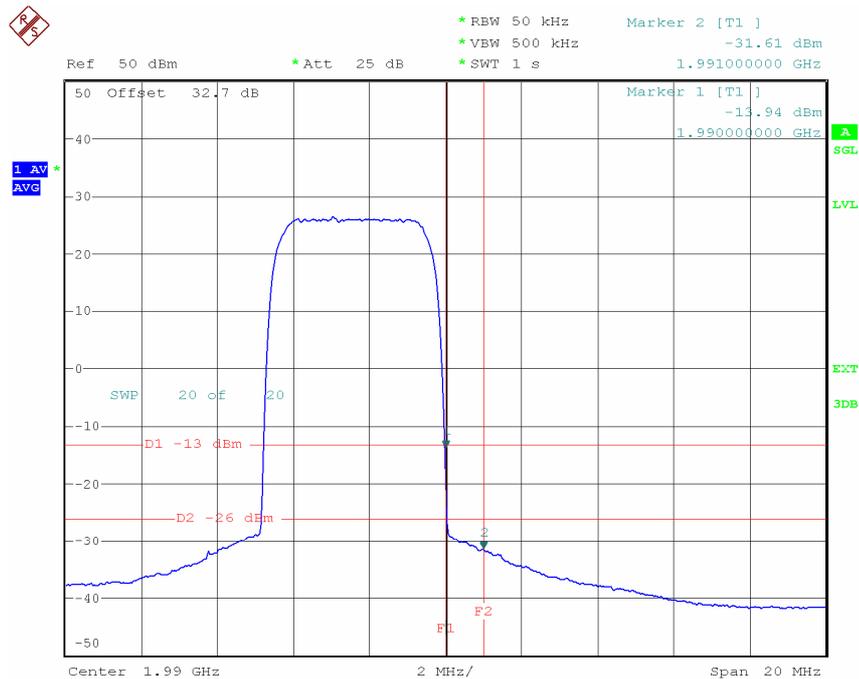
Date: 23.OCT.2007 10:32:05

# 16QAM: A. Single Carrier: Channel Number: 9662



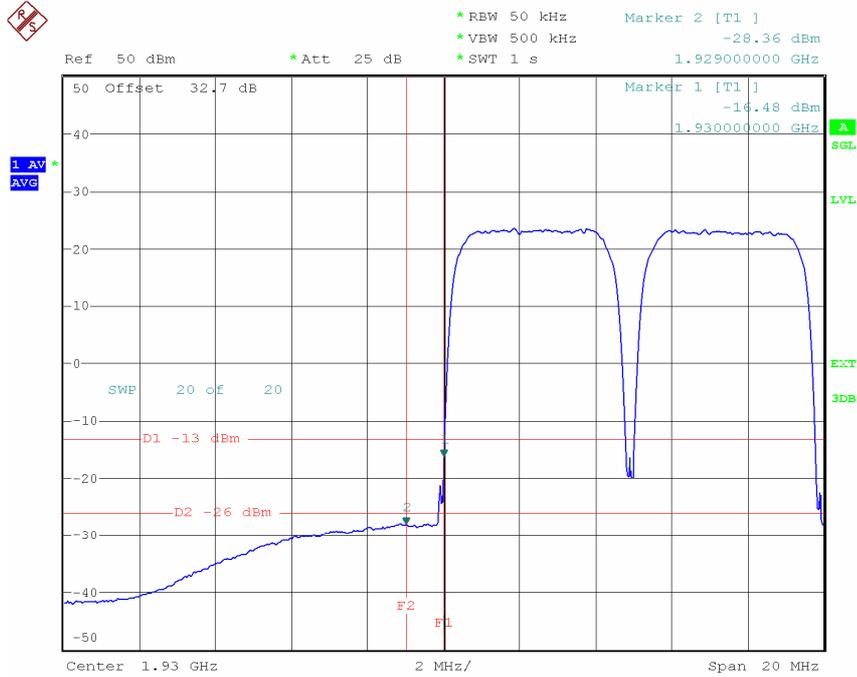
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# Channel Number: 9938



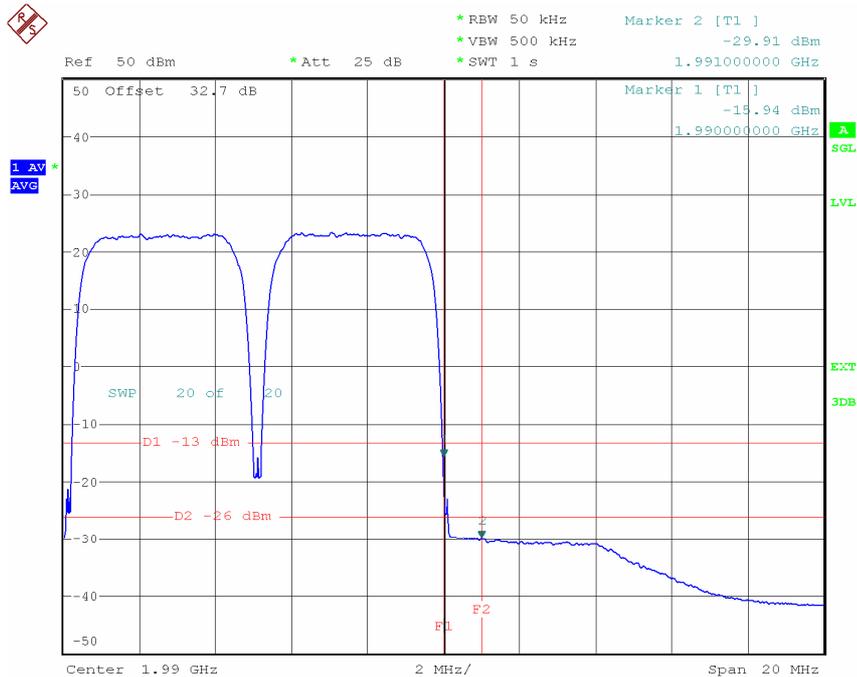
Date: 23.OCT.2007 10:18:34

# 16QAM: B. Two Carriers: Channel Number: 9662/9687



Date: 23.OCT.2007 10:27:39

# Channel Number: 9913/9938



Date: 23.OCT.2007 10:33:46

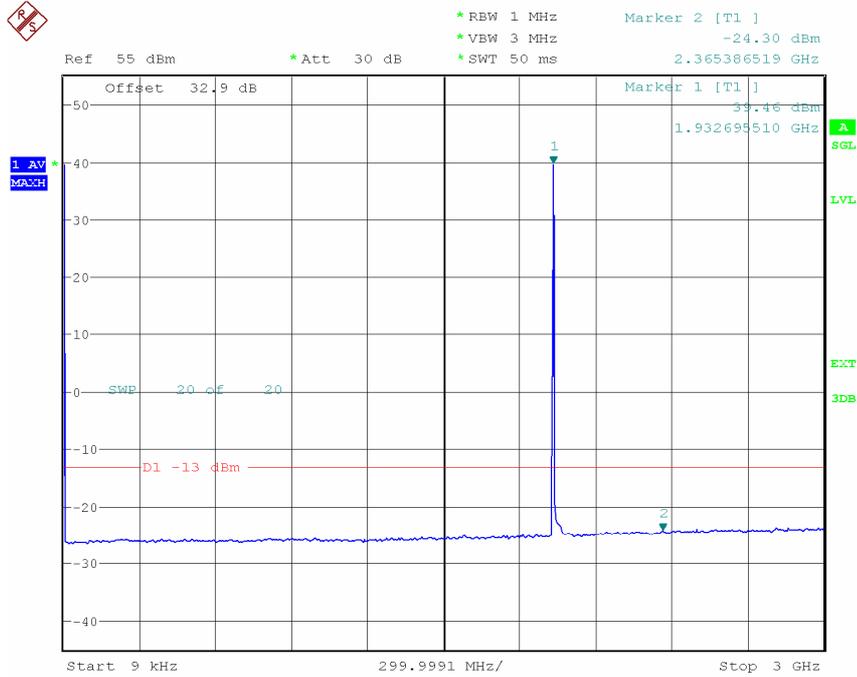
## Appendix D

# Spurious Emission at Antenna Terminal

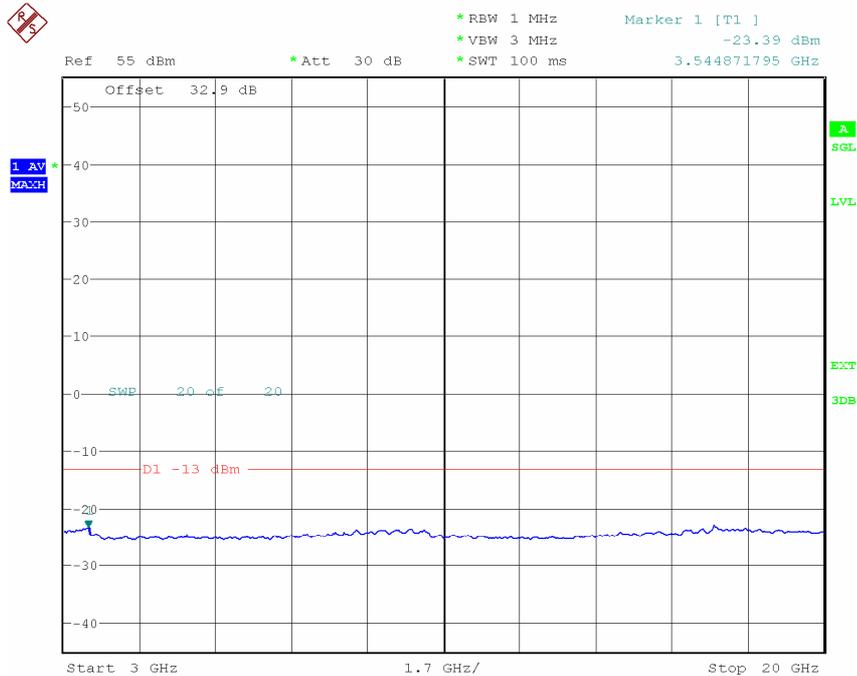
According to FCC Part 2.1051 & 24.238

# QPSK: A. Single Carrier

## Channel Number: 9662

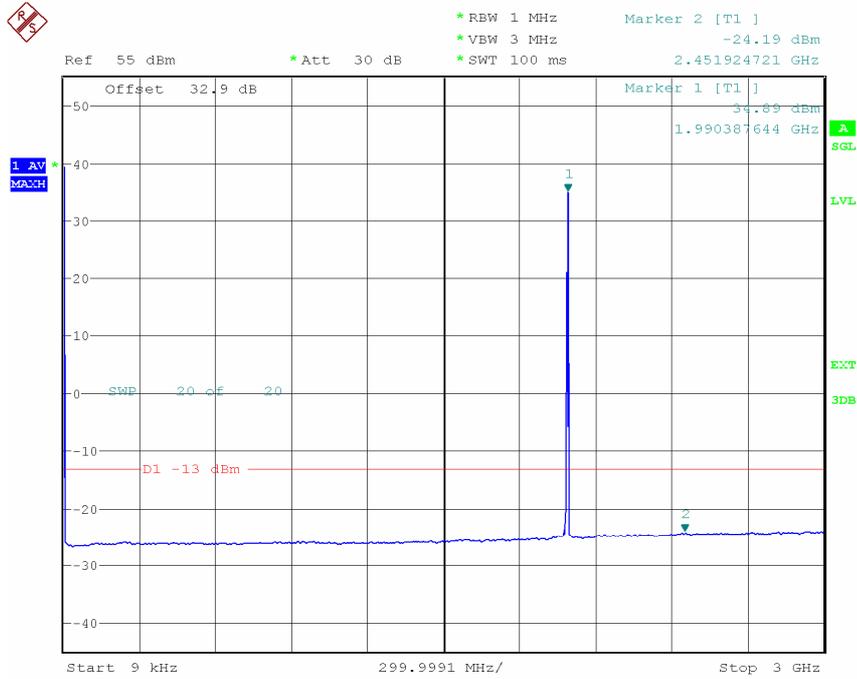


Date: 1.NOV.2007 20:15:35

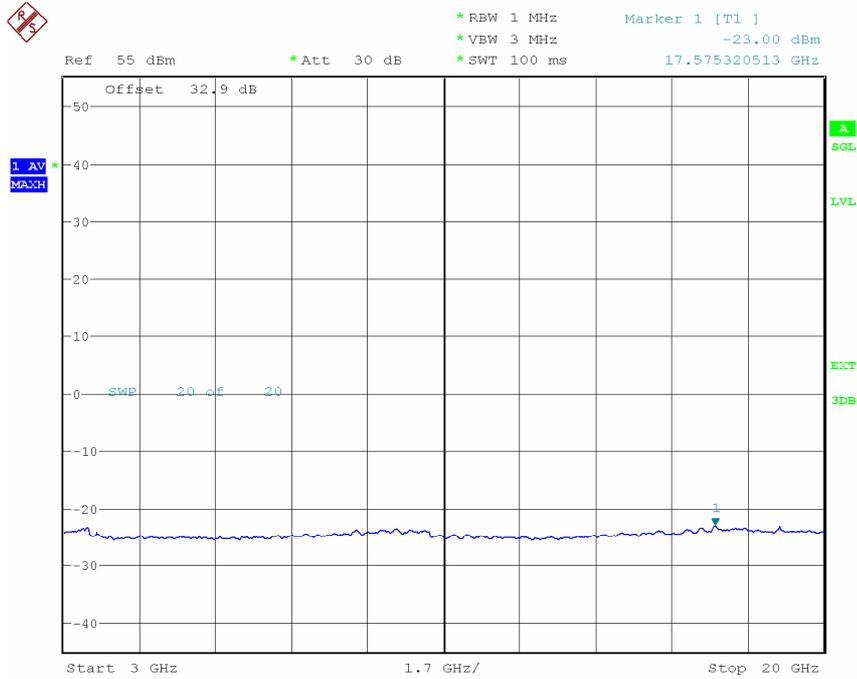


Date: 1.NOV.2007 20:19:06

# Channel Number: 9938



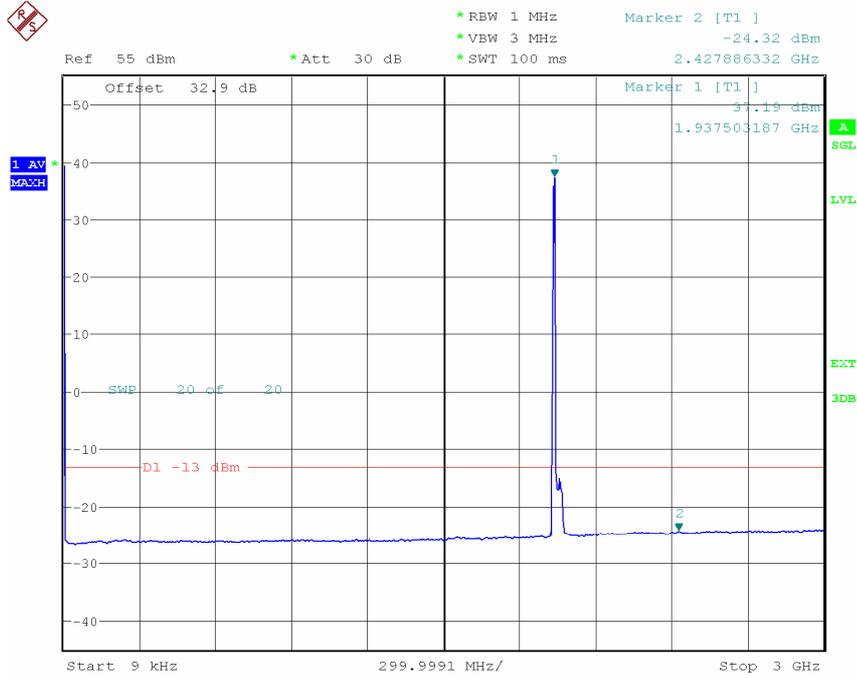
Date: 2.NOV.2007 09:07:21



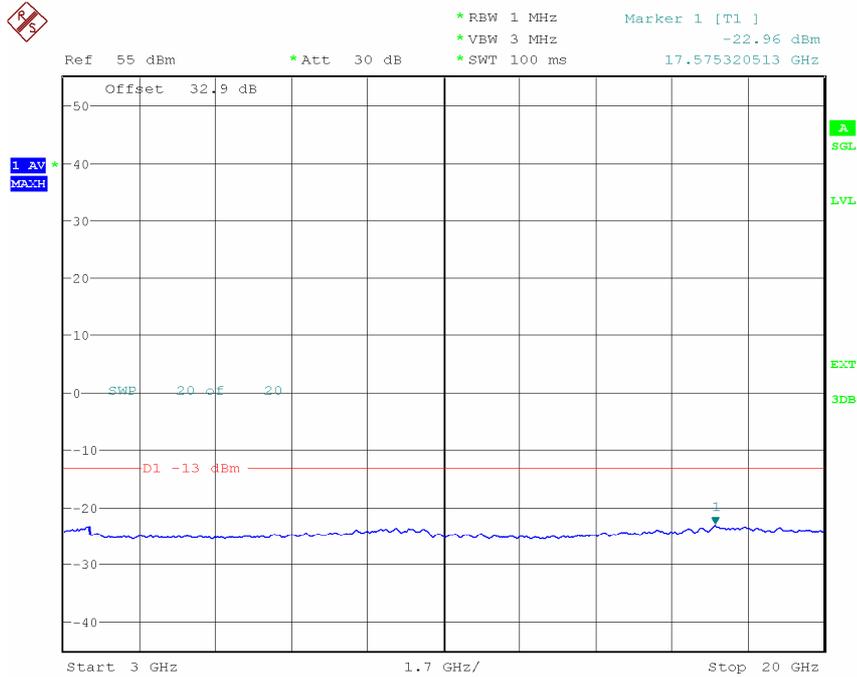
Date: 1.NOV.2007 21:16:38

# QPSK: B. Multiple Carriers:

## Channel Number: 9662/9687

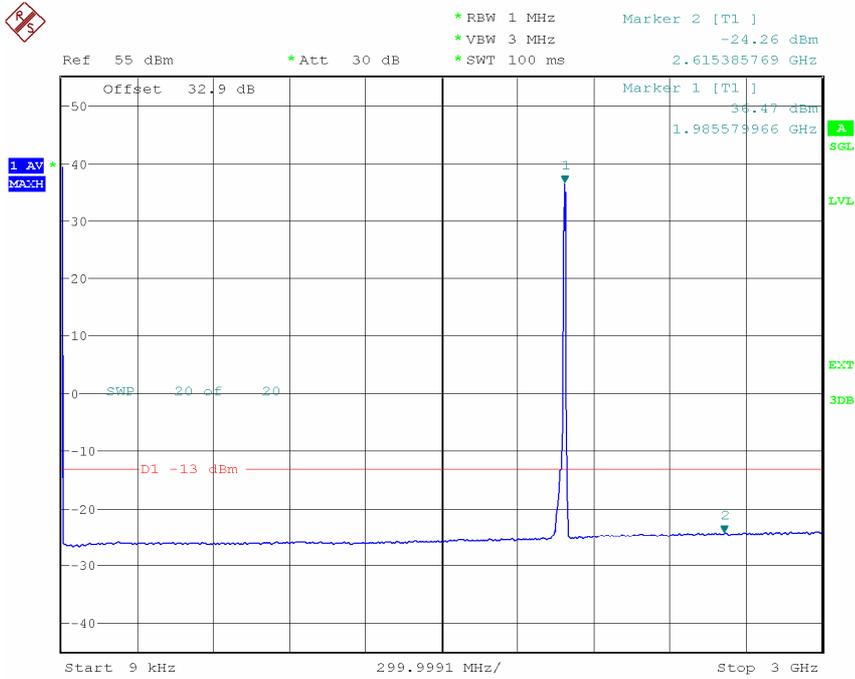


Date: 2.NOV.2007 08:59:35

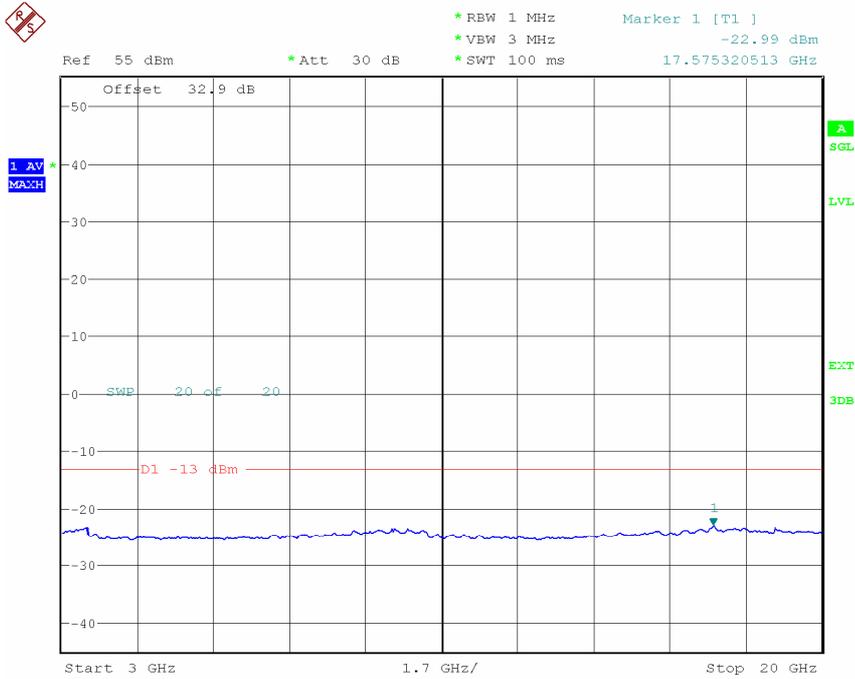


Date: 2.NOV.2007 08:51:55

# Channel Number: 9913/9938



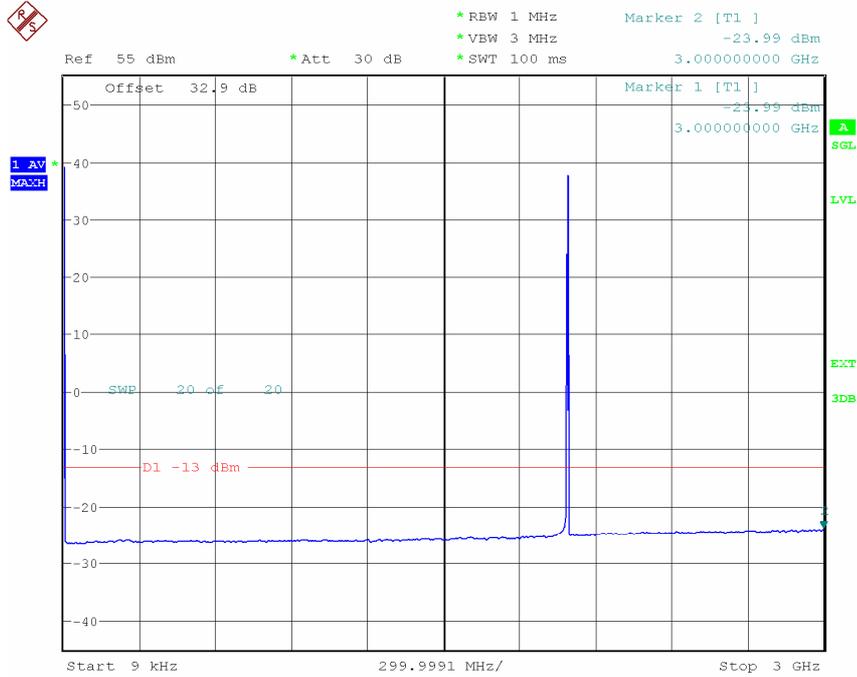
Date: 2.NOV.2007 09:01:55



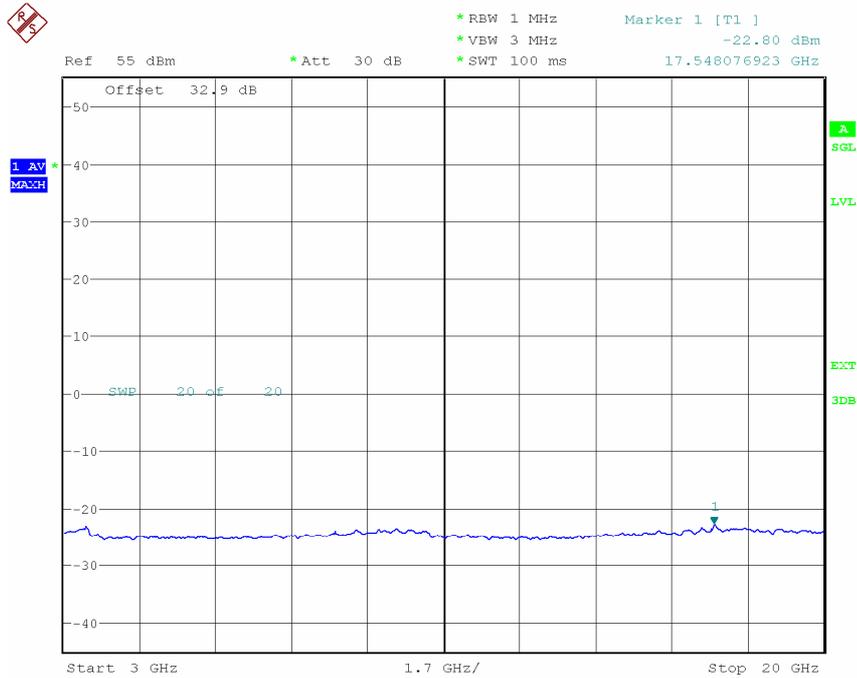
Date: 2.NOV.2007 09:02:39

# 16QAM: A. Single Carrier

## Channel Number: 9662

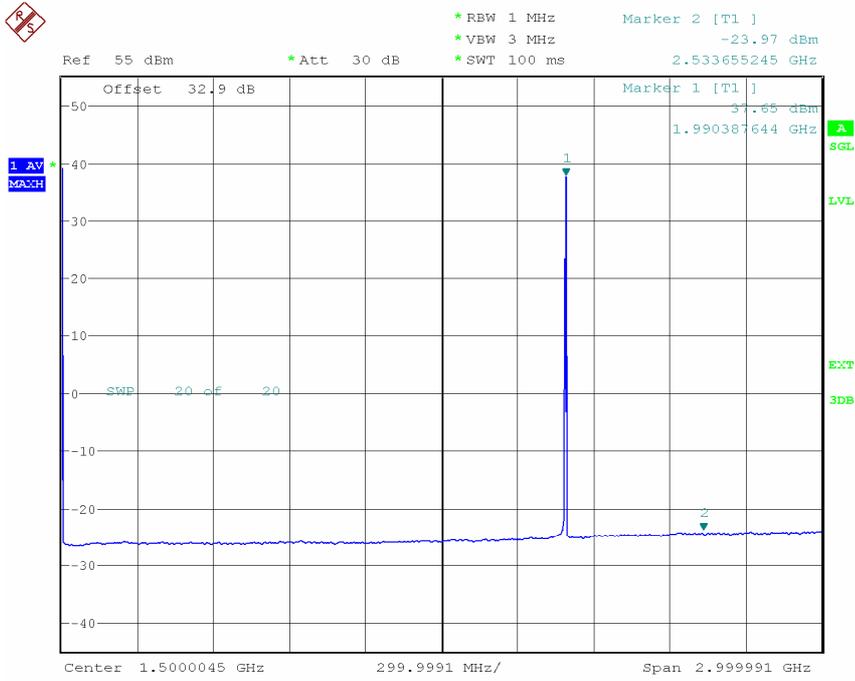


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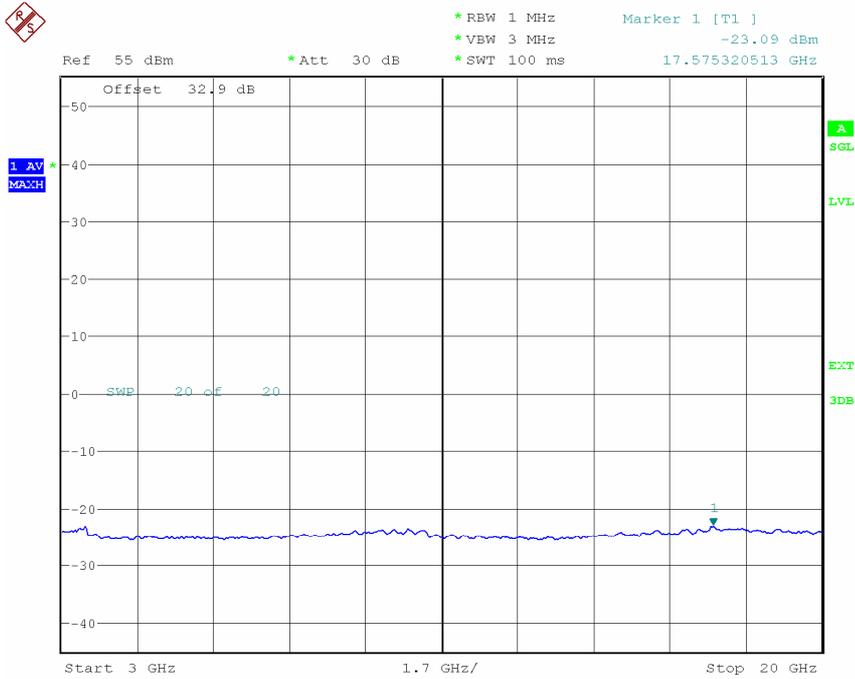


Date: 1.NOV.2007 21:17:43

# Channel Number: 9938

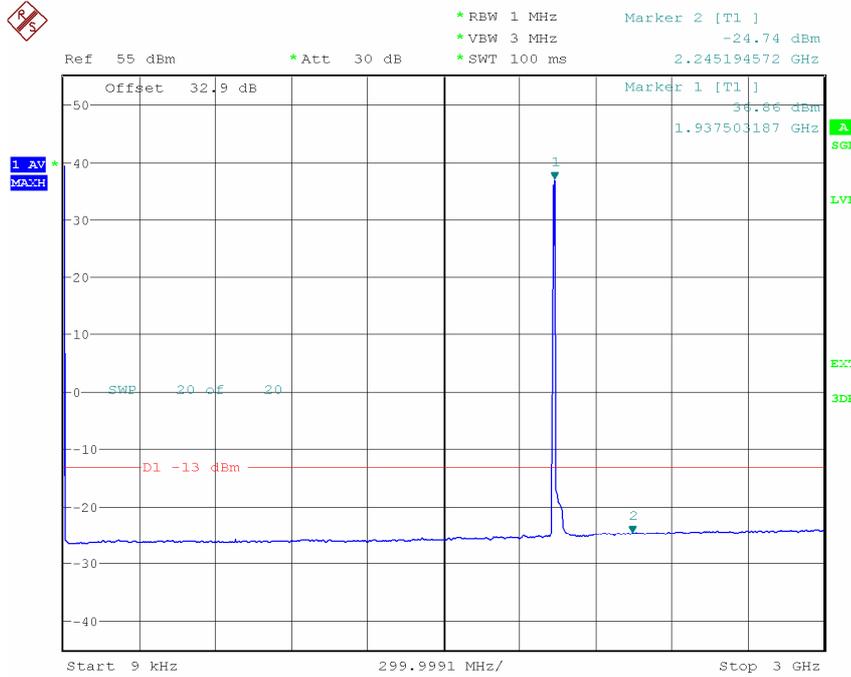


Date: 1.NOV.2007 21:13:35

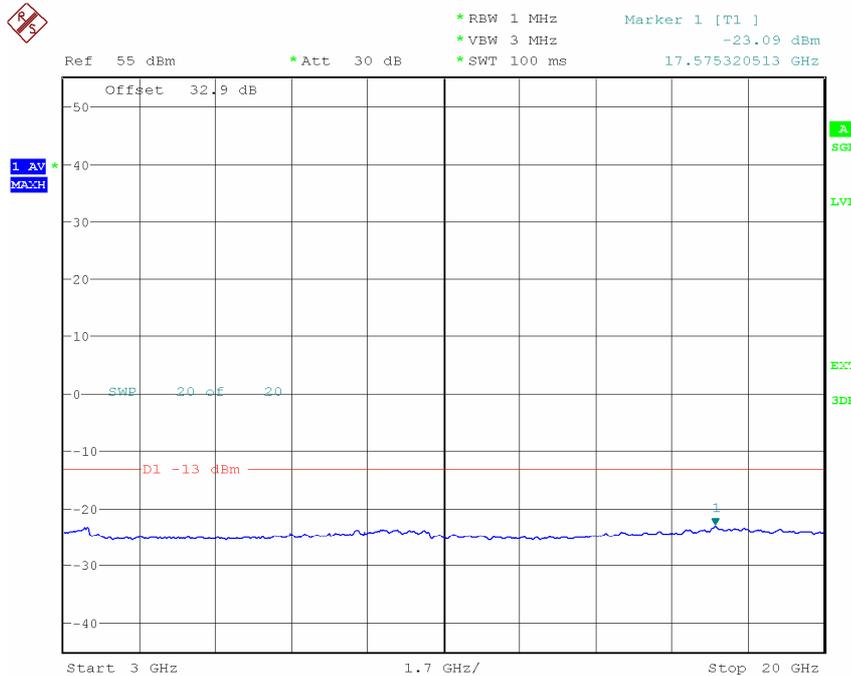


Date: 1.NOV.2007 21:14:27

# 16QAM: B. Multiple Carriers: Channel Number: 9662/9687

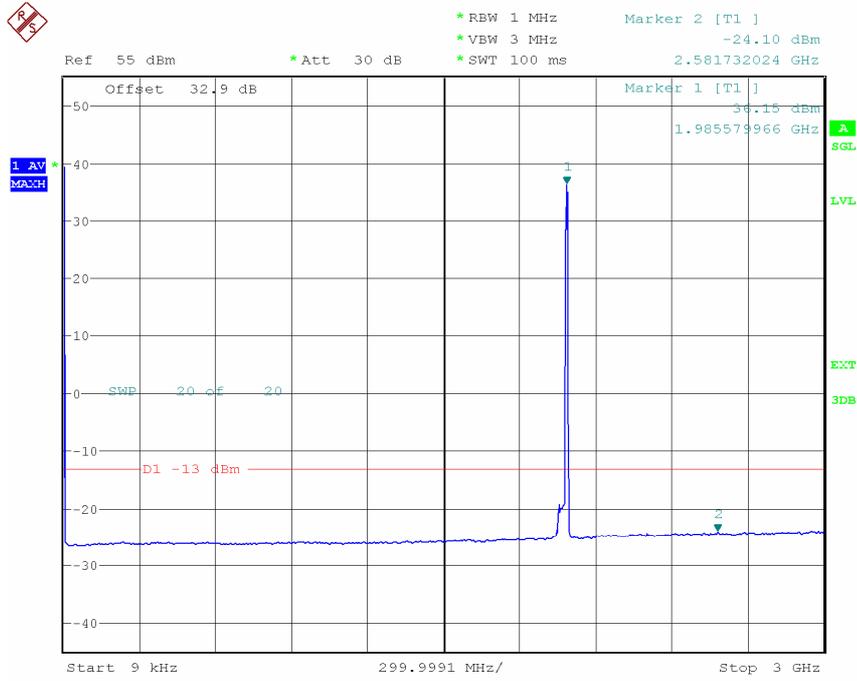


Date: 2.NOV.2007 08:57:30

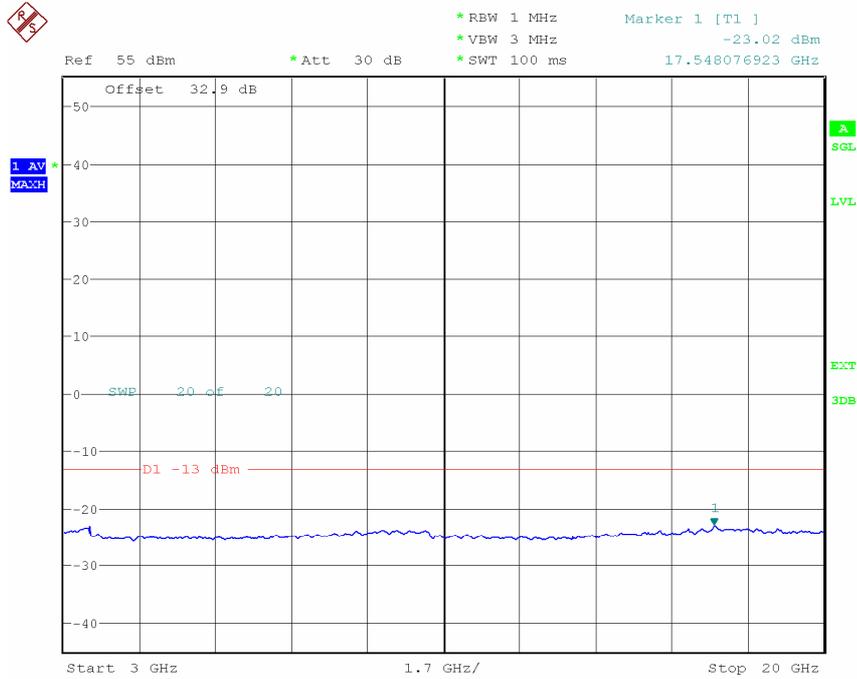


Date: 2.NOV.2007 08:56:01

# Channel Number: 9913/9938



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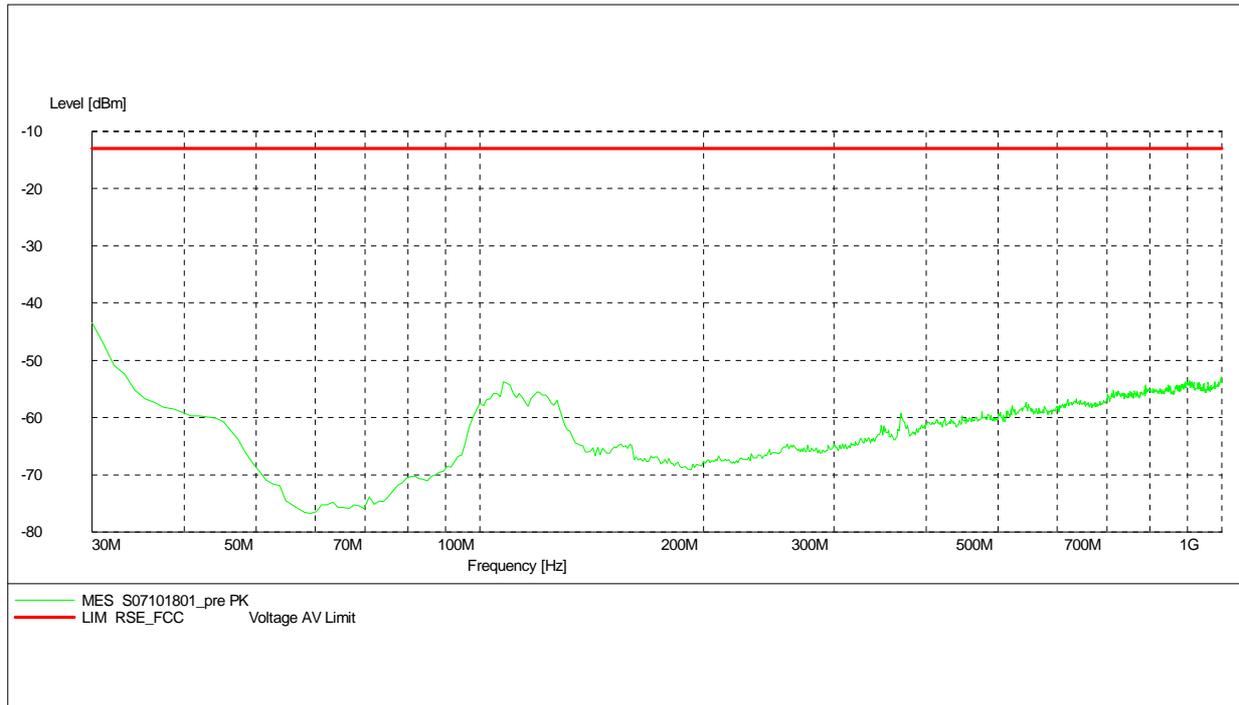


Date: 2.NOV.2007 09:03:26

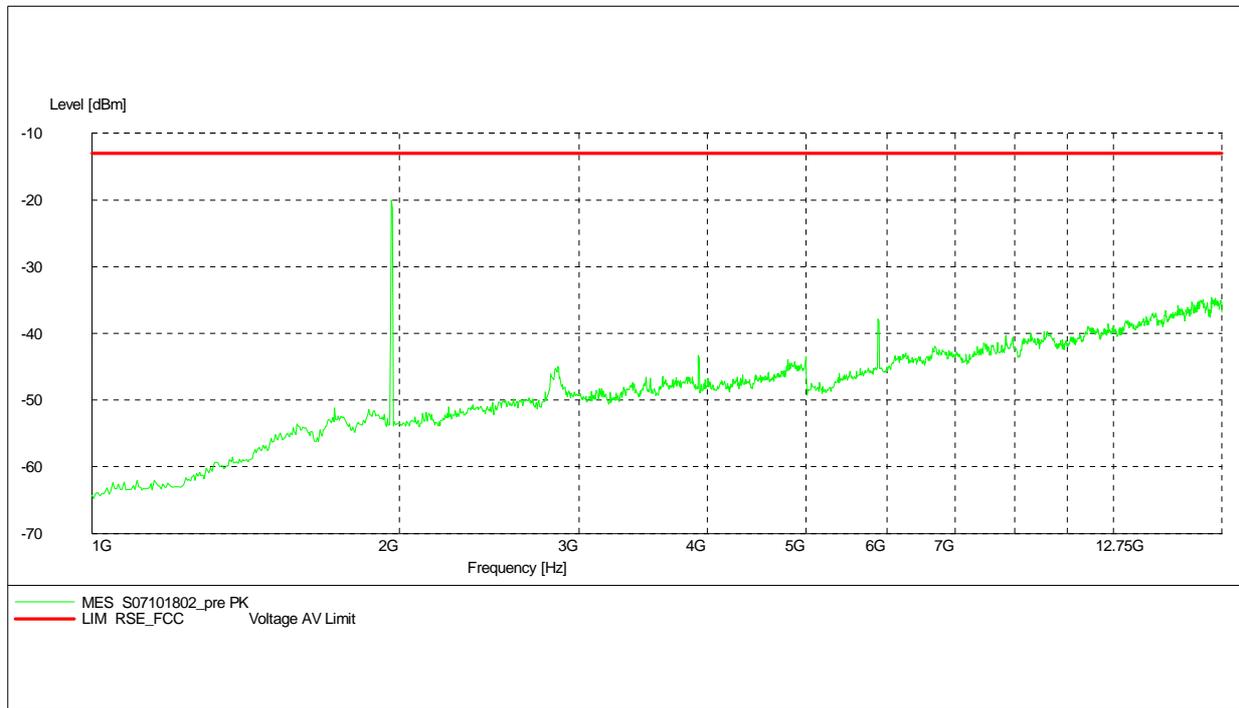
# Appendix E

## Field Strength of Spurious Radiation According to FCC Part 2.1053 & 24.238

### Below 1 GHz



### Above 1 GHz

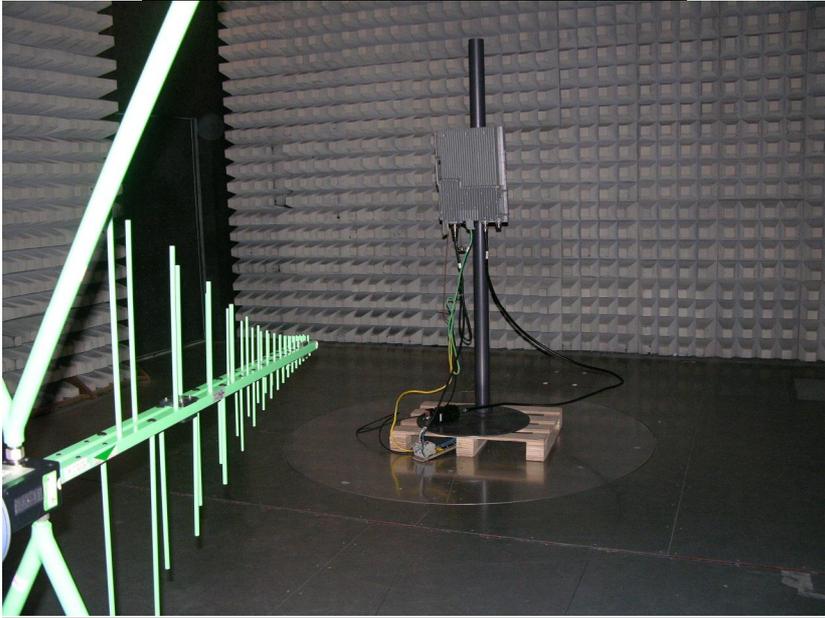


# Appendix F

## Photos of Test Setup

# Radiated Spurious Emissions

Radiated Spurious Disturbance (below 1GHz)



Radiated Spurious Disturbance (above 1GHz)

