



Center for Quality Engineering

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Munich, Dec 11, 2009

Client: Nokia Siemens Networks Oy
Equipment Under Test: Flexi LTE RF Module 730MHz
Manufacturer: Nokia Siemens Networks Oy
Task: Conformance test according to the test specifications mentioned below
Test Specification(s): FCC 47 CFR Part 2 and 27
Result: The EUT complies with the requirements of the specification.

The results relate only to the items tested as described in this test report.

approved by:

Date

Signature

Neuhäusler
Manager Radio System Qualification

Dec 11, 2009

Bauer
Manager EMC

Dec 11, 2009

This document was signed electronically.

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1 Summary

The measurements described in this report were conducted pursuant to 47 CFR § 2.947 and § 2.1041. All applicable paragraphs of the 47 CFR parts 2 and 27 of the most current version of the rules were considered.

The following tests were performed according to the FCC rules in order to verify the compliance of the EUT with the FCC requirements:

Test No.	Measurement	FCC Rule	Page Number of this Report	Result
1	RF Power Output	§ 2.1046, § 27.50, § 27.55	11	compliant
2	Modulation Characteristics	§ 2.1047, § 2.201	15	compliant
3	Occupied Bandwidth	§ 2.1049	16	compliant
4	Spurious Emissions at Antenna Terminals	§ 2.1051, § 2.1057, § 27.53	19	compliant
5	Field Strength of Spurious Radiation	§ 2.1053, § 27.53	24	compliant
6	Frequency Stability	§ 2.1055, § 27.54	26	compliant

Table 1-1: Results – Summary

In accordance with the FCC Rule §15.3 (z) the equipment was tested with the limits that are valid for an *unintentional radiator*.

2 References

2.1 Specifications

No	Standard	Title	Date
[1]	FCC 47 CFR Part 2 and 27	Code of Federal Regulations, Title 47: Telecommunication Part 2: Frequency Allocations and Radio Treaty Matters; General Rules and Regulations Part 27: Miscellaneous Wireless Communications Services	2008-10

2.2 Glossary of Terms

QPSK	Quadrature Phase Shift Keying -Modulation
16QAM	16 Quadrature Amplitude Modulation
64QAM	64 Quadrature Amplitude Modulation
AC	Alternating Current
BTS	Base Transceiver System
BW	Bandwidth
chk	checked against a calibrated reference
cnn	calibration not necessary
DC	Direct Current
EIRP	Equivalent Isotropic Radiated Power
EUT	Equipment Under Test
FCC	Federal Communications Commission
LTE	Long Term Evolution
P	Power
Prat	Rated Output Power
RF	Radio Frequency

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3 General Information

3.1 Identification of Client

Nokia Siemens Networks Oy
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Kaapelitie 4,
FI-90651, Oulu, Finland
Jari Virta

3.2 Test Laboratory

Nokia Siemens Networks Oy
P.O. Box 319,
Kaapelitie 4,
FI-90651, Oulu, Finland
Jari Virta

3.3 Time Schedule

Test No.:	1, 2, 3, 4, 6	5
Start of Test:	Nov 30, 2009	Dec 01, 2009
End of Test:	Dec 04, 2009	Dec 02, 2009

3.4 Participants

Name	Function
Rami Salomäki (NSN)	Testing, Setup of EUT
Jari Veijola (NSN)	Testing, Setup of EUT
Hannu Eskola (NSN)	Testing, Setup of EUT
Sami Riuttanen (NSN)	Testing, Setup of EUT
Jarmo Koskela (NSN)	Testing, Setup of EUT
Stefan Obermaier (SGS CQE)	Editor

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4 Equipment Under Test

The tested equipment is representative for serial production.

4.1 Description of EUT

The BTS performs the full RAN function of LTE system (evolved UTRA). This is sometimes referred to as collapsed RAN, where equivalent functions of former 3G BTS and 3G RNC are all integrated into BTS. BTS is connected directly to the core network via S1 interface, and to mobile stations via Air interface (Uu). In addition BTSs are optionally connected directly to each others via X2 interface for handover purposes.

4.2 Configuration of EUT

The used different EUT configurations are shown by the following tables.

Module Type	Flexi LTE BTS RF module 730MHz	
Frequency Bands	Uplink	Downlink
Block A:	698 - 704	728 - 734
Block B:	704 - 710	734 - 740
Block C:	710 - 716	740 - 746
	Single Carrier	
Rated Output Power (Prat)	30 W	
Channel Bandwidth	5MHz (Config. A), 10 MHz (Config. B)	
	RX	TX
Number of Antenna Ports	2	2
MIMO	Yes	Yes

Table 4-1: Overview of EUT Configuration

The tests were performed with one EUT at the antenna ports TX1 and TX2.

The used different EUT configurations are shown by the following table.

Module Name	Serial-No.	Module Type	Config.
FRLB	L9094700545	RF module	A, B
Other Modules	Module Type		Config.
FSME	System module		A, B
FTLB	Transmission module		A, B

Table 4-2: Configuration of EUT

For a functional description of the modules, please refer to the appropriate related parts and exhibit sections of this certification application.

4.3 Operating Conditions

If not stated otherwise, the following standard setup procedure for the EUT was used:

The transmitter was set up according to 3GPP TS 36.141 E-UTRA Test Models (TM) for all tests:

- E-TM 1.1: QPSK modulation,
- E-TM 3.1: 64QAM modulation,
- E-TM 3.2: 16QAM modulation

The Flexi LTE BTS was supplied with 48 V DC.

During the measurements, one carrier channel was tested at a time. The carrier was set to the maximum power level to ensure the maximum emission amplitudes during all measurements.

During the tests, the eNodeB is transmitting a pseudo random bit pattern on the data channels. This ensures that the measurements of the emission characteristics of the transmitter are pursuant to § 2.1049.

4.4 Compliance Criteria

The EUT must fulfil the requirements (described in the specifications mentioned in chapter 2.1, Specifications) for the selected test cases.

5 General Description of Tests

5.1 Tested Carrier Frequencies

The measurements were done on 3 carrier frequencies, according to the following table:

Config A:

Channel Bandwidth: 5MHz	
Frequency [MHz]	Remark
730.5	lowest possible carrier frequency
737.0	frequency at the middle of the band
743.4	highest possible carrier frequency

Table 5-1: Carrier Frequencies for 5MHz channel bandwidth

Config B:

Channel Bandwidth: 10MHz	
Frequency [MHz]	Remark
733.0	lowest possible carrier frequency
737.0	frequency at the middle of the band
740.9	highest possible carrier frequency

Table 5-2: Carrier Frequencies for 10MHz channel bandwidth

5.2 Modulation Characteristics

The EUT supports QPSK, 16QAM and 64QAM modulation.

5.3 Test Configuration

If not stated otherwise, the following measurement configuration was used to perform all measurements (see figure below).

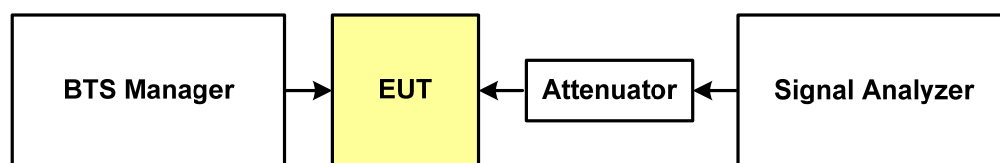


Figure 5-1: Test Configuration (single output)

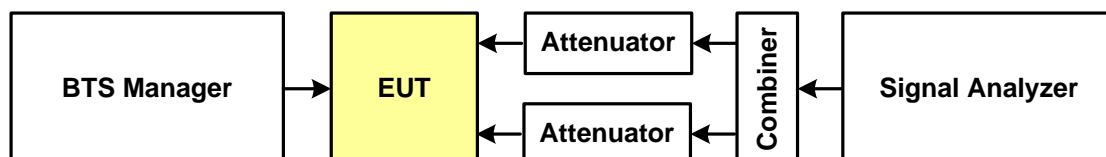


Figure 5-2: Test Configuration (combined output)

The RF output of the transceiver (cell) under test is connected to a signal analyzer via a high power attenuator to protect the input of the signal analyzer from high RF power levels. A

description of the analyzer settings is given in each of the sections describing the measurements. The other transceivers are terminated.

A complete list of the measurement equipment is included on page 33 of this measurement report.

5.4 Calibration of the Test Equipment

All relevant test equipment has a valid calibration from an external calibration laboratory. Additionally the signal analyzer has a built-in self-calibration procedure. This calibration procedure was activated prior to the measurements so that the analyzer is deemed accurate. High quality cables were used to connect the measurement equipment to the EUT. The actual loss of the attenuator and the cables was measured with a high precision network analyzer and taken into account for all measurements.

6 Test Results

6.1 Test No. 1: RF power output (§ 2.1046, § 27.50, § 27.55)

6.1.1 Purpose

The RF power output measurements were performed pursuant to § 2.1046 in order to determine the base station maximum RF output power.

6.1.2 Limits

According to § 27.50, base stations with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz with an antenna height up to 305 meters HAAT. Additionally, according to § 27.55, the power flux density that would be produced by such stations through a combination of antenna height and vertical gain pattern must not exceed 3000 microwatts per square meter on the ground over the area extending to 1 km from the base of the antenna mounting structure.

6.1.3 EUT Operating Condition

The standard setup procedure as described in section 4.3 of this report was used.

6.1.4 Test Configuration

The test configuration used is described in section 5.3 of this report.

6.1.5 Test Procedure and Results

Detachable Antenna:

The peak power at antenna terminals is measured using an in-line peak power meter or a signal analyzer.

Using a signal analyzer the RF power is measured with a frequency sweep across the carrier (see screenshots). The carrier power is calculated from the signal analyzer by integration over the result. The base station maximum output power is the sum of the measured carrier power and the external attenuation (cable loss of the test set up).

The following table shows the measured output powers at the antenna connector. Screenshots of the measurements are included on page 34 onwards of this report.

Config A TX1:

Carrier Frequency	RF Power Output		Result
[MHz]	[dBm]	[W]	
QPSK-Modulation			
730.5	44.55	28.51	compliant
737.0	44.57	28.64	compliant
743.4	44.67	29.31	compliant
16QAM-Modulation			
730.5	44.49	28.12	compliant
737.0	44.61	28.91	compliant
743.4	44.65	29.17	compliant
64QAM-Modulation			
730.5	44.46	27.93	compliant
737.0	44.64	29.11	compliant
743.4	44.67	29.31	compliant
Measurement Uncertainty:		±0.4dB	

Table 6-1: Results – RF Power Output (5 MHz Channel BW, TX1)

Config A TX2:

Carrier Frequency	RF Power Output		Result
[MHz]	[dBm]	[W]	
QPSK-Modulation			
730.5	44.61	28.91	compliant
737.0	44.60	28.84	compliant
743.4	44.70	29.51	compliant
16QAM-Modulation			
730.5	44.56	28.58	compliant
737.0	44.71	29.58	compliant
743.4	44.65	29.17	compliant
64QAM-Modulation			
730.5	44.58	28.71	compliant
737.0	44.67	29.31	compliant
743.4	44.65	29.17	compliant
Measurement Uncertainty:		±0.4dB	

Table 6-2: Results – RF Power Output (5 MHz Channel BW, TX2)

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Config A TX1+TX2 (mathematically combined power):

Carrier Frequency	RF Power Output		Result
[MHz]	[dBm]	[W]	
QPSK-Modulation			
730.5	47.59	57.42	compliant
737.0	47.60	57.48	compliant
743.4	47.70	58.82	compliant
16QAM-Modulation			
730.5	47.54	56.70	compliant
737.0	47.67	58.49	compliant
743.4	47.66	58.34	compliant
64QAM-Modulation			
730.5	47.53	56.64	compliant
737.0	47.67	58.42	compliant
743.4	47.67	58.48	compliant
Measurement Uncertainty:		±0.4dB	

Table 6-3: Results – RF Power Output (5 MHz Channel BW, TX1+TX2)
Config B TX1:

Carrier Frequency	RF Power Output		Result
[MHz]	[dBm]	[W]	
QPSK-Modulation			
733.0	44.62	28.97	compliant
737.0	44.80	30.20	compliant
740.9	44.75	29.85	compliant
16QAM-Modulation			
733.0	44.53	28.38	compliant
737.0	44.71	29.58	compliant
740.9	44.83	30.41	compliant
64QAM-Modulation			
733.0	44.51	28.25	compliant
737.0	44.66	29.24	compliant
740.9	44.75	29.85	compliant
Measurement Uncertainty:		±0.4dB	

Table 6-4: Results – RF Power Output (10 MHz Channel BW, TX1)

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Config B TX2:

Carrier Frequency	RF Power Output		Result
[MHz]	[dBm]	[W]	
QPSK-Modulation			
733.0	44.74	29.79	compliant
737.0	44.70	29.51	compliant
740.9	44.73	29.72	compliant
16QAM-Modulation			
733.0	44.64	29.11	compliant
737.0	44.67	29.31	compliant
740.9	44.77	29.99	compliant
64QAM-Modulation			
733.0	44.65	29.17	compliant
737.0	44.73	29.72	compliant
740.9	44.78	30.06	compliant
Measurement Uncertainty:		±0.4dB	

Table 6-5: Results – RF Power Output (10 MHz Channel BW, TX2)

Config B TX1+TX2 (mathematically combined power):

Carrier Frequency	RF Power Output		Result
[MHz]	[dBm]	[W]	
QPSK-Modulation			
733.0	47.69	58.76	compliant
737.0	47.76	59.71	compliant
740.9	47.75	59.57	compliant
16QAM-Modulation			
733.0	47.60	57.49	compliant
737.0	47.70	58.89	compliant
740.9	47.81	60.40	compliant
64QAM-Modulation			
733.0	47.59	57.42	compliant
737.0	47.71	58.96	compliant
740.9	47.77	59.91	compliant
Measurement Uncertainty:		±0.4dB	

Table 6-6: Results – RF Power Output (10 MHz Channel BW, TX1+TX2)

The base station maximum output power was found to be compliant with the manufacturer's specifications and with all requirements of the FCC rules.

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6.2 Test No. 2: Modulation Characteristics (§ 2.1047, § 2.201)

The occupied bandwidth was measured to be 5 MHz (Config. A) respectively 10 MHz (Config. B), which represents the 99% power bandwidth (see the following section and screenshots on pages 42). Therefore, the modulation characteristic of the base stations transceiver is **5M00F9W** or **10M00F9W**.

No further testing is required under this section of the FCC rules. No measurements other than the occupied bandwidth are required.

The modulation characteristics were found to be compliant with the manufacturer's specifications and with all requirements of the FCC rules.

6.3 Test No. 3: Occupied Bandwidth (§ 2.1049)

6.3.1 Purpose

The measurements are performed to determine the occupied bandwidth of the EUT pursuant to § 2.1049.

6.3.2 Limits

According to § 2.1049 the 99% occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to 0.5% of the emitted power.

6.3.3 EUT Operating Condition

The standard setup procedure as described in section 4.3 of this report was used.

6.3.4 Test Configuration

The test configuration used is described in section 5.3 of this report.

6.3.5 Test Procedure and Results

The 99% occupied bandwidth of the carrier emission is measured using a signal analyzer with Resolution Bandwidth set to 30kHz (less than 1% of bandwidth). (see screenshots on pages 42 for details). The following table summarizes the results:

Config A TX1:

Carrier Frequency [MHz]	Occupied Bandwidth [MHz]	Result
QPSK-Modulation		
730.5	4.4788	compliant
737.0	4.4788	compliant
743.4	4.4788	compliant
16QAM-Modulation		
730.5	4.4706	compliant
737.0	4.4706	compliant
743.4	4.4706	compliant
64QAM-Modulation		
730.5	4.4788	compliant
737.0	4.4788	compliant
743.4	4.4788	compliant
Measurement Uncertainty:		±48kHz

Table 6-7: Results – Occupied Bandwidth (5 MHz Channel BW, TX1)

Config A TX2:

Carrier Frequency [MHz]	Occupied Bandwidth [MHz]	Result
QPSK-Modulation		
730.5	4.4788	compliant
737.0	4.4788	compliant
743.4	4.4788	compliant
16QAM-Modulation		
730.5	4.4706	compliant
737.0	4.4706	compliant
743.4	4.4706	compliant
64QAM-Modulation		
730.5	4.4788	compliant
737.0	4.4788	compliant
743.4	4.4788	compliant
Measurement Uncertainty:		±48kHz

Table 6-8: Results – Occupied Bandwidth (5 MHz Channel BW, TX2)

Config B TX1:

Carrier Frequency [MHz]	Occupied Bandwidth [MHz]	Result
QPSK-Modulation		
733.0	8.9346	compliant
737.0	8.9346	compliant
740.9	8.9346	compliant
16QAM-Modulation		
733.0	8.9346	compliant
737.0	8.9346	compliant
740.9	8.9346	compliant
64QAM-Modulation		
733.0	8.9346	compliant
737.0	8.9346	compliant
740.9	8.9346	compliant
Measurement Uncertainty:		±48kHz

Table 6-9: Results – Occupied Bandwidth (10 MHz Channel BW, TX1)

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Config B TX2:

Carrier Frequency [MHz]	Occupied Bandwidth [MHz]	Result
QPSK-Modulation		
733.0	8.9346	compliant
737.0	8.9346	compliant
740.9	8.9346	compliant
16QAM-Modulation		
733.0	8.9346	compliant
737.0	8.9346	compliant
740.9	8.9346	compliant
64QAM-Modulation		
733.0	8.9346	compliant
737.0	8.9346	compliant
740.9	8.9346	compliant
Measurement Uncertainty:		±48kHz

Table 6-10: Results – Occupied Bandwidth (10 MHz Channel BW, TX2)

The occupied bandwidth was found to be compliant with the manufacturer’s specifications and with all requirements of the FCC rules.

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6.4 Test No. 4: Spurious Emissions at Antenna Terminals (§ 2.1051, § 2.1057, § 27.53)

6.4.1 Purpose

The measurements of the spurious emissions at the equipment output terminals were performed pursuant to § 2.1051 in order to verify that all emissions are below the limits given by § 27.53.

6.4.2 Limits

Compliance with § 27.53 requires that any emission will be sufficiently attenuated. Following requirements have to be fulfilled:

1. According to § 25.53(g):

All emissions outside the band from 728 MHz to 746 MHz shall be attenuated below the transmitter power by at least $43 + 10 \log_{10} P$ dB (P = transmitter power in Watts).

The compliance limit was calculated in the following way:

Maximum transmitter output power [W]: P

Maximum transmitter output power [dBm]: $30 + 10 \log_{10} P$ (conversion from W to dBm)

Attenuation required by FCC: $43 + 10 \log_{10} P$

Compliance limit = Maximum transmitter output power - Required attenuation
 $= 30 + 10 \log_{10} P - (43 + 10 \log_{10} P) = \underline{-13 \text{ dBm}}$

6.4.3 EUT Operating Condition

The standard setup procedure as described in section 4.3 of this report was used.

6.4.4 Test Configuration

The test configuration used is described in section 5.3 of this report.

6.4.5 Test Procedure and Results

Signal analyzer settings:

The tests were carried out in accordance with § 27.53. For all frequency ranges except two (immediately below and above the carrier frequency block) a 1 MHz resolution bandwidth was used for the measurements.

In the 100 kHz frequency bands immediately outside and adjacent to the carrier frequency block a resolution bandwidth is lowered to 1% of the 26 dB occupied bandwidth of the transmitted carrier and at minimum to 30kHz.

According to § 2.1057, all emission including the fundamental frequency of the transceiver and all frequencies up to the 10th harmonic were investigated.

The following tables summarize the worst case detected emission levels (see screenshots on pages 50 for details). The external attenuation (cable loss of the set up) is already added in the results. It can be seen separately as the 'Offset' value in the screenshots.

Config A Lower band edge:

Carrier Frequency: 730.5 MHz			
Frequency Range [MHz]	Emission Frequency [MHz]	Maximum Emission Level [dBm]	Result
QPSK-Modulation			
TX1	728.0	-19.12	compliant
TX2	728.0	-19.15	compliant
TX1 + TX2	728.0	-15.89	compliant
16QAM-Modulation			
TX1	728.0	-18.94	compliant
TX2	728.0	-20.84	compliant
TX1 + TX2	728.0	-15.97	compliant
64QAM-Modulation			
TX1	728.0	-20.04	compliant
TX2	728.0	-19.44	compliant
TX1 + TX2	728.0	-16.58	compliant
Measurement Uncertainty:			f < 1.0GHz: ±1.1dB 1.0GHz ≤ f < 3.6GHz: ±1.2dB 3.6GHz ≤ f < 8.0GHz: ±1.6dB

Table 6-11: Results - Spurious Emissions (Lower band edge) (5 MHz Channel BW)

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Config A Upper band edge:

Carrier Frequency: 743.4 MHz			
Frequency Range [MHz]	Emission Frequency [MHz]	Maximum Emission Level [dBm]	Result
QPSK-Modulation			
TX1	746.0	-32.19	compliant
TX2	746.0	-33.64	compliant
TX1 + TX2	746.0	-30.80	compliant
16QAM-Modulation			
TX1	746.0	-33.77	compliant
TX2	746.0	-33.24	compliant
TX1 + TX2	746.0	-31.36	compliant
64QAM-Modulation			
TX1	746.0	-33.29	compliant
TX2	746.0	-33.93	compliant
TX1 + TX2	746.0	-30.60	compliant
Measurement Uncertainty:			f < 1.0GHz: ±1.1dB 1.0GHz ≤ f < 3.6GHz: ±1.2dB 3.6GHz ≤ f < 8.0GHz: ±1.6dB

Table 6-12: Results - Spurious Emissions (Upper band edge) (5 MHz Channel BW)

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Config A Spurious emissions:

Carrier Frequency: 737.0 MHz			
Frequency Range [MHz]	Emission Frequency [MHz]	Maximum Emission Level [dBm]	Result
QPSK-Modulation			
TX1	920.721	-35.28	compliant
TX2	218.092	-35.27	compliant
TX1 + TX2	224.310	-37.70	compliant
16QAM-Modulation			
TX1	238.301	-35.30	compliant
TX2	219.647	-35.32	compliant
TX1 + TX2	221.201	-37.60	compliant
64QAM-Modulation			
TX1	227.419	-35.35	compliant
TX2	236.746	-35.30	compliant
TX1 + TX2	224.310	-37.60	compliant
Measurement Uncertainty:			f < 1.0GHz: ±1.1dB 1.0GHz ≤ f < 3.6GHz: ±1.2dB 3.6GHz ≤ f < 8.0GHz: ±1.6dB

Table 6-13: Results - Spurious Emissions (5 MHz Channel BW)
Config B Lower band edge:

Carrier Frequency: 733 MHz			
Frequency Range [MHz]	Emission Frequency [MHz]	Maximum Emission Level [dBm]	Result
QPSK-Modulation			
TX1	728.0	-23.01	compliant
TX2	728.0	-22.10	compliant
TX1 + TX2	728.0	-16.00	compliant
16QAM-Modulation			
TX1	728.0	-23.51	compliant
TX2	728.0	-23.66	compliant
TX1 + TX2	728.0	-17.51	compliant
64QAM-Modulation			
TX1	728.0	-23.93	compliant
TX2	728.0	-22.37	compliant
TX1 + TX2	728.0	-17.20	compliant
Measurement Uncertainty:			f < 1.0GHz: ±1.1dB 1.0GHz ≤ f < 3.6GHz: ±1.2dB 3.6GHz ≤ f < 8.0GHz: ±1.6dB

Table 6-14: Results - Spurious Emissions (Lower band edge) (10 MHz Channel BW)

Config B Upper band edge:

Carrier Frequency: 740.9 MHz			
Frequency Range [MHz]	Emission Frequency [MHz]	Maximum Emission Level [dBm]	Result
QPSK-Modulation			
TX1	746.0	-32.13	compliant
TX2	746.0	-30.93	compliant
TX1 + TX2	746.0	-25.26	compliant
16QAM-Modulation			
TX1	746.0	-32.10	compliant
TX2	746.0	-31.15	compliant
TX1 + TX2	746.0	-25.58	compliant
64QAM-Modulation			
TX1	746.0	-31.98	compliant
TX2	746.0	-30.96	compliant
TX1 + TX2	746.0	-25.71	compliant
Measurement Uncertainty:			f < 1.0GHz: ±1.1dB 1.0GHz ≤ f < 3.6GHz: ±1.2dB 3.6GHz ≤ f < 8.0GHz: ±1.6dB

Table 6-15: Results - Spurious Emissions (Upper band edge) (10 MHz Channel BW)

Config B Spurious emissions:

Carrier Frequency: 737.0 MHz			
Frequency Range [MHz]	Emission Frequency [MHz]	Maximum Emission Level [dBm]	Result
QPSK-Modulation			
TX1	228.974	-35.45	compliant
TX2	939.375	-35.28	compliant
TX1 + TX2	230.528	-37.68	compliant
16QAM-Modulation			
TX1	222.756	-35.42	compliant
TX2	219.647	-35.31	compliant
TX1 + TX2	224.310	-37.63	compliant
64QAM-Modulation			
TX1	221.201	-35.41	compliant
TX2	238.301	-35.32	compliant
TX1 + TX2	230.528	-37.69	compliant
Measurement Uncertainty:			f < 1.0GHz: ±1.1dB 1.0GHz ≤ f < 3.6GHz: ±1.2dB 3.6GHz ≤ f < 8.0GHz: ±1.6dB

Table 6-16: Results - Spurious Emissions (10 MHz Channel BW)

The measured conducted emission levels were found to be compliant with the manufacturer's specifications and with all requirements of the FCC rules.

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6.5 Test No. 5: Field Strength of Spurious Radiation (§ 2.1053, § 2.1057, § 27.53)

6.5.1 Purpose

The measurement of spurious radiated emissions was performed pursuant to § 2.1053 and § 2.1057 to verify that the field strength of any spurious emissions radiated directly from the cabinet, control circuits, power leads or intermediate circuit elements are attenuated below the transmitter power P by at least $43 + 10 \log_{10} (P \text{ in Watts})$ dB as is required by § 27.53 (Emission limits).

6.5.2 Limits

Compliance with § 27.53 requires that all spurious emissions be attenuated below the transmitter power by at least $43 + 10 \log_{10} P$ (P = rated maximum transmitter output power in Watts).

The compliance limit was calculated as per the following table:

Rated maximum transmitter output power:	30 W (= 44.8 dBm)
Required attenuation:	$43 + 10 \log_{10} 30 = 57.8 \text{ dB}$

According to § 2.1057, all emissions to the 10th harmonic were investigated.

6.5.3 EUT Operating Condition

The standard setup procedure as described in section 4.3 of this report was used.

6.5.4 Test Configuration

The measurements were performed in an anechoic chamber. The radiated test site complies with the site attenuation requirements listed in ANSI C63.4 1992 and is listed with the FCC.

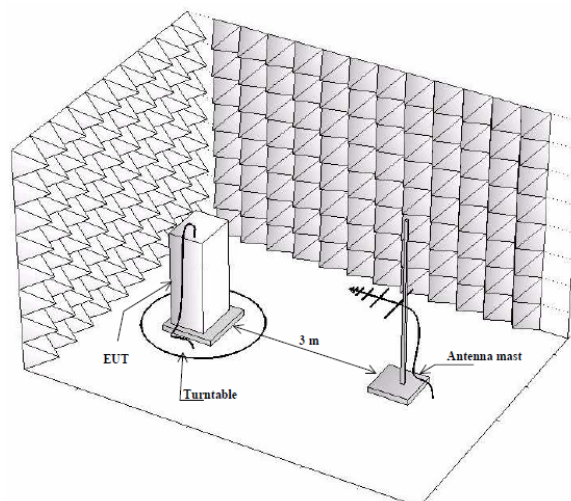


Figure 6-1: Test Configuration

Photographs of the EUT in the anechoic chamber are shown on page 105 of this measurement report.

6.5.5 Test Procedure

TIA/EIA-603-C-2004, Section 2.2.12

The test was performed in a semi-anechoic shielded room. The EUT was placed on a non-conductive 0.8 m high table standing on the turntable. During the test in the frequency range 30-8000 MHz the distance from the EUT to the measuring antenna was 3 m. In order to find the maximum levels of the disturbance radiation the angle of the turntable, the height of the measuring antenna were varied during the tests. The test was performed with the measuring antenna being both in horizontal and vertical polarizations.

Vertical and horizontal polarizations in the frequency range 30-8000 MHz was first measured by using the peak detector. During the peak detector scan the turntable was rotated from 0° to 360° with 30° step with the antenna heights 1.0 m and 2.5 m.

The limit of -13 dBm has been calculated to correspond 84.4 dB (µV/m). Spurious emissions closer than 20 dB to the limit was measured with average detector.

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The EUT was replaced with a reference substitution antenna with a known gain referenced to an isotropic radiator $G_{Antenna[dBi]}$. This antenna was fed with a signal at the spurious frequency $P_{Gen[dBm]}$. The level of the signal was adjusted to repeat the previously measured level. The resulting EIRP is the signal level fed to the reference antenna corrected for gain referenced to an isotropic.

The formula below was used to calculate the EIRP of the EUT.

$$P_{EIRP[dbm]} = P_{Gen[dbm]} - L_{Cable[db]} + G_{Antenna[dBi]}$$

6.5.6 Test Results & Limits

Worst case detected emission levels are reported in the following table (refer to spectral plots included on pages 105 for details). The antenna factor and cable loss is according to the manufacturer's specification.

Config A:

Frequency	Maximum Emission Level	Result
[MHz]	[dBm]	
All	More than 20dB below limit -13 dBm	compliant
Measurement Uncertainty:		±5.4dB

Table 6-17: Results – Field Strength of Spurious Radiation (5 MHz Channel BW)

Config B:

Frequency	Maximum Emission Level	Result
[MHz]	[dBm]	
All	More than 20dB below limit -13 dBm	compliant
Measurement Uncertainty:		±5.4dB

Table 6-18: Results – Field Strength of Spurious Radiation (10 MHz Channel BW)

The measured emission levels were found to be compliant with the manufacturer's specifications and with all requirements of the FCC rules.

6.6 Test No. 6: Frequency Stability (§ 2.1055, § 27.54)

6.6.1 Purpose

Frequency stability measurements were performed to verify that the frequency deviation of the emission stays within the licensee’s frequency block under extreme temperature conditions (-30°C to +50 °C) according to § 2.1055.

6.6.2 Limits

According to § 27.54, the frequency of the fundamental emission is required to stay within the authorized frequency block, independent of the ambient temperature.

6.6.3 EUT Operating Condition

The standard setup procedure as described in section 4.3 of this report was used.

6.6.4 Test Configuration

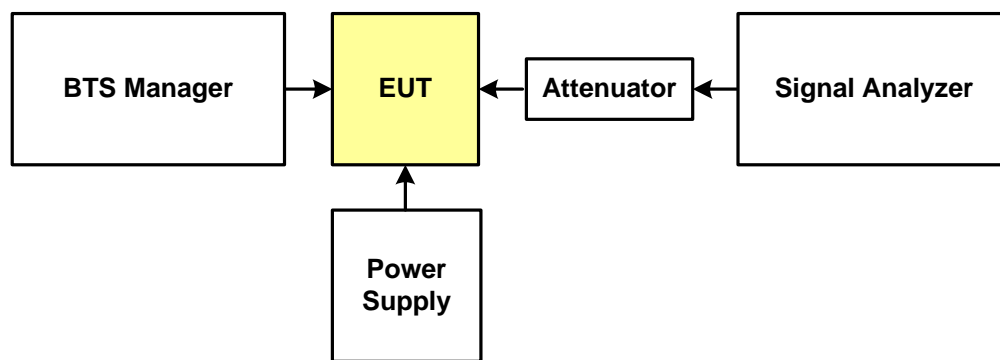


Figure 6-2: Test Configuration for frequency stability with voltage variation

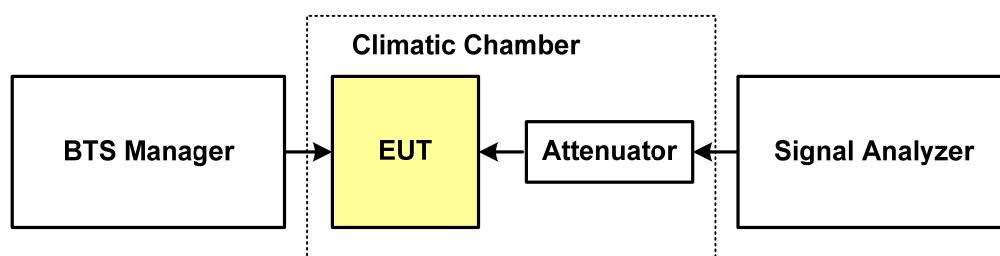


Figure 6-3: Test Configuration for frequency stability with temperature variation

A complete list of the measurement equipment is included on page 33 of this measurement report.

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6.6.5 Test Procedure and Results

Frequency Stability with Temperature Variation:

The input voltage to the EUT is set to the nominal value and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees celsius to +50 degrees celsius. The EUT is allowed to stabilize at each temperature and the frequency error is measured.

Config A TX1:

Carrier Frequency: 737.0 MHz						
Supply Voltage (DC)	Ambient Temperature	Frequency Deviation [ppm]		Manufacturer's Specification		Result
[V]	[°C]	[Hz]	[ppm]	[Hz]	[ppm]	
QPSK Modulation						
-48.0	-30	1.56	0.0021	36	0.05	compliant
-48.0	-20	1.37	0.0019	36	0.05	compliant
-48.0	-10	1.75	0.0024	36	0.05	compliant
-48.0	0	8.61	0.0117	36	0.05	compliant
-48.0	+10	7.91	0.0107	36	0.05	compliant
-48.0	+30	2.97	0.0040	36	0.05	compliant
-48.0	+40	-2.46	-0.0033	36	0.05	compliant
-48.0	+50	-4.98	-0.0068	36	0.05	compliant
16QAM Modulation						
-48.0	-30	2.61	0.0035	36	0.05	compliant
-48.0	-20	2.99	0.0041	36	0.05	compliant
-48.0	-10	3.27	0.0044	36	0.05	compliant
-48.0	0	9.74	0.0132	36	0.05	compliant
-48.0	+10	9.10	0.0123	36	0.05	compliant
-48.0	+30	3.59	0.0049	36	0.05	compliant
-48.0	+40	-2.40	-0.0033	36	0.05	compliant
-48.0	+50	-5.29	-0.0072	36	0.05	compliant
64QAM Modulation						
-48.0	-30	3.43	0.0047	36	0.05	compliant
-48.0	-20	3.14	0.0043	36	0.05	compliant
-48.0	-10	2.28	0.0031	36	0.05	compliant
-48.0	0	11.29	0.0153	36	0.05	compliant
-48.0	+10	9.09	0.0123	36	0.05	compliant
-48.0	+30	5.54	0.0075	36	0.05	compliant
-48.0	+40	-0.12	-0.0002	36	0.05	compliant
-48.0	+50	-3.60	-0.0049	36	0.05	compliant
Measurement Uncertainty:					±1.0 Hz	

Table 6-19: Results – Frequency stability with temp. var. (5 MHz Channel BW, TX1)

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Config A TX2:

Carrier Frequency: 737.0 MHz						
Supply Voltage (DC)	Ambient Temperature	Frequency Deviation [ppm]		Manufacturer's Specification		Result
[V]	[°C]	[Hz]	[ppm]	[Hz]	[ppm]	
QPSK Modulation						
-48.0	-30	3.61	0.0049	36	0.05	compliant
-48.0	-20	3.08	0.0042	36	0.05	compliant
-48.0	-10	2.23	0.0030	36	0.05	compliant
-48.0	0	9.08	0.0123	36	0.05	compliant
-48.0	+10	8.14	0.0110	36	0.05	compliant
-48.0	+30	3.49	0.0047	36	0.05	compliant
-48.0	+40	-0.97	-0.0013	36	0.05	compliant
-48.0	+50	-5.19	-0.0070	36	0.05	compliant
16QAM Modulation						
-48.0	-30	3.51	0.0048	36	0.05	compliant
-48.0	-20	1.94	0.0026	36	0.05	compliant
-48.0	-10	2.22	0.0030	36	0.05	compliant
-48.0	0	10.51	0.0143	36	0.05	compliant
-48.0	+10	8.29	0.0112	36	0.05	compliant
-48.0	+30	2.06	0.0028	36	0.05	compliant
-48.0	+40	-1.59	-0.0022	36	0.05	compliant
-48.0	+50	-5.73	-0.0078	36	0.05	compliant
64QAM Modulation						
-48.0	-30	3.88	0.0053	36	0.05	compliant
-48.0	-20	3.70	0.0050	36	0.05	compliant
-48.0	-10	2.76	0.0037	36	0.05	compliant
-48.0	0	10.29	0.0140	36	0.05	compliant
-48.0	+10	9.48	0.0129	36	0.05	compliant
-48.0	+30	4.70	0.0064	36	0.05	compliant
-48.0	+40	1.19	0.0016	36	0.05	compliant
-48.0	+50	-3.59	-0.0049	36	0.05	compliant
Measurement Uncertainty:					±1.0 Hz	

Table 6-20: Results – Frequency stability with temp. var. (5 MHz Channel BW, TX2)

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Config B TX1:

Carrier Frequency: 737.0 MHz						
Supply Voltage (DC)	Ambient Temperature	Frequency Deviation [ppm]		Manufacturer's Specification		Result
[V]	[°C]	[Hz]	[ppm]	[Hz]	[ppm]	
QPSK Modulation						
-48.0	-30	2.11	0.0029	36	0.05	compliant
-48.0	-20	2.03	0.0028	36	0.05	compliant
-48.0	-10	3.50	0.0047	36	0.05	compliant
-48.0	0	10.12	0.0137	36	0.05	compliant
-48.0	+10	8.53	0.0116	36	0.05	compliant
-48.0	+30	3.98	0.0054	36	0.05	compliant
-48.0	+40	-0.11	-0.0001	36	0.05	compliant
-48.0	+50	-5.64	-0.0077	36	0.05	compliant
16QAM Modulation						
-48.0	-30	2.12	0.0029	36	0.05	compliant
-48.0	-20	1.75	0.0024	36	0.05	compliant
-48.0	-10	1.42	0.0019	36	0.05	compliant
-48.0	0	11.34	0.0154	36	0.05	compliant
-48.0	+10	6.69	0.0091	36	0.05	compliant
-48.0	+30	3.05	0.0041	36	0.05	compliant
-48.0	+40	-0.16	-0.0002	36	0.05	compliant
-48.0	+50	-5.38	-0.0073	36	0.05	compliant
64QAM Modulation						
-48.0	-30	3.39	0.0046	36	0.05	compliant
-48.0	-20	1.60	0.0022	36	0.05	compliant
-48.0	-10	1.05	0.0014	36	0.05	compliant
-48.0	0	10.73	0.0146	36	0.05	compliant
-48.0	+10	7.41	0.0101	36	0.05	compliant
-48.0	+30	2.64	0.0036	36	0.05	compliant
-48.0	+40	-0.88	-0.0012	36	0.05	compliant
-48.0	+50	-4.83	-0.0066	36	0.05	compliant
Measurement Uncertainty:					±1.0 Hz	

Table 6-21: Results – Frequency stability with temp. var. (10 MHz Channel BW, TX1)

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Config B TX2:

Carrier Frequency: 737.0 MHz						
Supply Voltage (DC)	Ambient Temperature	Frequency Deviation [ppm]		Manufacturer's Specification		Result
[V]	[°C]	[Hz]	[ppm]	[Hz]	[ppm]	
QPSK Modulation						
-48.0	-30	2.08	0.0028	36	0.05	compliant
-48.0	-20	2.44	0.0033	36	0.05	compliant
-48.0	-10	3.23	0.0044	36	0.05	compliant
-48.0	0	9.46	0.0128	36	0.05	compliant
-48.0	+10	8.21	0.0111	36	0.05	compliant
-48.0	+30	2.92	0.0040	36	0.05	compliant
-48.0	+40	-0.36	-0.0005	36	0.05	compliant
-48.0	+50	-5.55	-0.0075	36	0.05	compliant
16QAM Modulation						
-48.0	-30	2.17	0.0029	36	0.05	compliant
-48.0	-20	2.90	0.0039	36	0.05	compliant
-48.0	-10	1.70	0.0023	36	0.05	compliant
-48.0	0	10.90	0.0148	36	0.05	compliant
-48.0	+10	9.29	0.0126	36	0.05	compliant
-48.0	+30	0.17	0.0002	36	0.05	compliant
-48.0	+40	0.42	0.0006	36	0.05	compliant
-48.0	+50	-5.50	-0.0075	36	0.05	compliant
64QAM Modulation						
-48.0	-30	2.32	0.0031	36	0.05	compliant
-48.0	-20	1.62	0.0022	36	0.05	compliant
-48.0	-10	1.87	0.0025	36	0.05	compliant
-48.0	0	9.89	0.0134	36	0.05	compliant
-48.0	+10	8.15	0.0111	36	0.05	compliant
-48.0	+30	1.69	0.0023	36	0.05	compliant
-48.0	+40	-0.86	-0.0012	36	0.05	compliant
-48.0	+50	-5.53	-0.0075	36	0.05	compliant
Measurement Uncertainty:					±1.0 Hz	

Table 6-22: Results – Frequency stability with temp. var. (10 MHz Channel BW, TX2)

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Frequency Stability with Voltage Variation:

The EUT is placed in a climatic chamber and allowed to stabilize at +20 degrees celsius for at least 30 minutes. With the voltage input to the EUT set to 85% of the nominal value, the frequency error is measure. This procedure is repeated at 100% and 115% of the nominal value.

Config A TX1:

Carrier Frequency: 737.0 MHz						
Supply Voltage (DC)	Ambient Temperature	Frequency Deviation [ppm]		Manufacturer's Specification		Result
[V]	[°C]	[Hz]	[ppm]	[Hz]	[ppm]	
QPSK Modulation						
-40.8	+20	5.87	0.0080	36	0.05	compliant
-48.0	+20	3.98	0.0054	36	0.05	compliant
-55.2	+20	6.28	0.0085	36	0.05	compliant
16QAM Modulation						
-40.8	+20	6.42	0.0087	36	0.05	compliant
-48.0	+20	5.38	0.0073	36	0.05	compliant
-55.2	+20	6.10	0.0083	36	0.05	compliant
64QAM Modulation						
-40.8	+20	7.05	0.0096	36	0.05	compliant
-48.0	+20	6.23	0.0085	36	0.05	compliant
-55.2	+20	8.82	0.0120	36	0.05	compliant
Measurement Uncertainty:					±1.0 Hz	

Table 6-23: Results – Frequency stability with voltage var. (5 MHz Channel BW, TX1)

Config A TX2:

Carrier Frequency: 737.0 MHz						
Supply Voltage (DC)	Ambient Temperature	Frequency Deviation [ppm]		Manufacturer's Specification		Result
[V]	[°C]	[Hz]	[ppm]	[Hz]	[ppm]	
QPSK Modulation						
-40.8	+20	5.41	0.0073	36	0.05	compliant
-48.0	+20	3.89	0.0053	36	0.05	compliant
-55.2	+20	6.72	0.0091	36	0.05	compliant
16QAM Modulation						
-40.8	+20	5.86	0.0080	36	0.05	compliant
-48.0	+20	4.62	0.0063	36	0.05	compliant
-55.2	+20	7.01	0.0095	36	0.05	compliant
64QAM Modulation						
-40.8	+20	7.16	0.0097	36	0.05	compliant
-48.0	+20	4.97	0.0067	36	0.05	compliant
-55.2	+20	7.37	0.0100	36	0.05	compliant
Measurement Uncertainty:					±1.0 Hz	

Table 6-24: Results – Frequency stability with voltage var. (5 MHz Channel BW, TX2)

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Config B TX1:

Carrier Frequency: 737.0 MHz						
Supply Voltage (DC)	Ambient Temperature	Frequency Deviation [ppm]		Manufacturer's Specification		Result
[V]	[°C]	[Hz]	[ppm]	[Hz]	[ppm]	
QPSK Modulation						
-40.8	+20	5.90	0.0080	36	0.05	compliant
-48.0	+20	4.93	0.0067	36	0.05	compliant
-55.2	+20	7.04	0.0096	36	0.05	compliant
16QAM Modulation						
-40.8	+20	6.68	0.0091	36	0.05	compliant
-48.0	+20	5.70	0.0077	36	0.05	compliant
-55.2	+20	5.72	0.0078	36	0.05	compliant
64QAM Modulation						
-40.8	+20	5.78	0.0078	36	0.05	compliant
-48.0	+20	5.03	0.0068	36	0.05	compliant
-55.2	+20	5.34	0.0072	36	0.05	compliant
Measurement Uncertainty:					±1.0 Hz	

Table 6-25: Results – Frequency stability with voltage var. (10 MHz Channel BW, TX1)
Config B TX2:

Carrier Frequency: 737.0 MHz						
Supply Voltage (DC)	Ambient Temperature	Frequency Deviation [ppm]		Manufacturer's Specification		Result
[V]	[°C]	[Hz]	[ppm]	[Hz]	[ppm]	
QPSK Modulation						
-40.8	+20	6.91	0.0094	36	0.05	compliant
-48.0	+20	5.25	0.0071	36	0.05	compliant
-55.2	+20	4.95	0.0067	36	0.05	compliant
16QAM Modulation						
-40.8	+20	6.42	0.0087	36	0.05	compliant
-48.0	+20	6.84	0.0093	36	0.05	compliant
-55.2	+20	6.50	0.0088	36	0.05	compliant
64QAM Modulation						
-40.8	+20	5.31	0.0072	36	0.05	compliant
-48.0	+20	5.75	0.0078	36	0.05	compliant
-55.2	+20	6.49	0.0088	36	0.05	compliant
Measurement Uncertainty:					±1.0 Hz	

Table 6-26: Results – Frequency stability with voltage var. (10 MHz Channel BW, TX2)

The measured frequency stability was found to be compliant with the manufacturer's specifications and with all requirements of the FCC rules.

7 Test Data and Screenshots

7.1 Part List of the RF Measurement Test Equipment

No.	Test Equipment	Type (Manufacturer)	Serial Number	Calibration date	Calibration due	Test No.
1	Network Analyzer	Hewlett-Packard: HP8753E	US38431868	09/2009	09/2010	1, 2, 3, 4, 6
2	Network Analyzer	Hewlett-Packard: HP8753ES	US39172107	10/2009	10/2010	1, 2, 3, 4, 6
3	Calibration kit	Hewlett-Packard: HP85032B	2919A04843	09/2009	09/2010	1, 2, 3, 4, 6
4	DC power	Sørensen: DHP series	9950C0085	cnn	-	1, 2, 3, 4, 6
5	Signal Analyzer	Rohde & Schwarz: FSQ 26	100364	12/2008	12/2009	1, 2, 3, 4, 6
6	Frequency Standard	Datum 8040	0023006282	01/2009	01/2010	6
7	Temperature/humidity meter	VAISALA: HMI 31	P3730008	01/2009	01/2010	1, 2, 3, 4, 5, 6
8	Environmental chamber	Weiss technik	59226012320 010	05/2009	05/2010	6
9	Attenuator	Narda: 769-30	08413	cnn	-	1, 2, 3, 4, 6
10	Attenuator	Narda: 769-30	07580	cnn	-	4
11	Attenuator	Weinschel: 67-20-33	BM0633	cnn	-	4
12	Attenuator	Weinschel: 47-10-34	BG6557	cnn	-	4
13	Attenuator	Weinschel: 66-10-34	BK1136	cnn	-	4
14	High pass filter	Mini-Circuits: SHP-1000	15542	cnn	-	4
15	Combiner	Weinschel: 1870A	6275	cnn	-	4
16	Semianechoic chamber	Siemens Matsushita 9m × 5m × 6m (room 0039)	Product No S&M B83317-C6019-T232	08/2008	08/2011	5
17	EMI Test Receiver	R&S ESIB 26	100335	07/2009	07/2010	5
18	Horn Antenna	Emco 3115	00075697	06/2009	06/2010	5
19	Bilog Antenna	Chase CBL6112B	2694	06/2009	06/2010	5
20	Signal Generator	R&S SMR 20	1715	07/2009	07/2010	5
21	Amplifier	Miteq AFSX4	791117	cnn	-	5
22	Antenna Mast	Deisel HD240	2401323194	cnn	-	5
23	Mast Controller	Deisel HD100	1001331	cnn	-	5
24	Amplifier	HP 83017A	3123A00444	cnn	-	5

Table 7-1: Part List of the RF Measurement Test Equipment

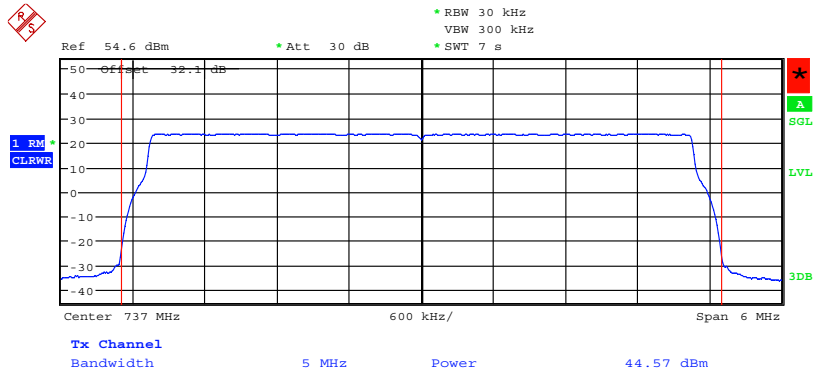
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7.2 Spectral Plots

7.2.1 Test No. 1: RF Power Output

The value 'Power' is the carrier power (RF Power Output) measured by the signal analyzer. 'Offset' is the external attenuation (cable loss of the test set up). The external attenuation is frequency dependant. Thus the various 'Offset' values in the screenshots may differ.

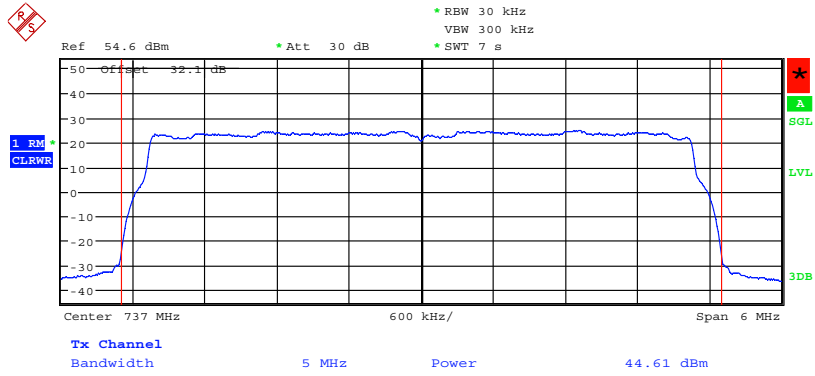
Config A TX1:



Date: 1.DEC.2009 08:01:22

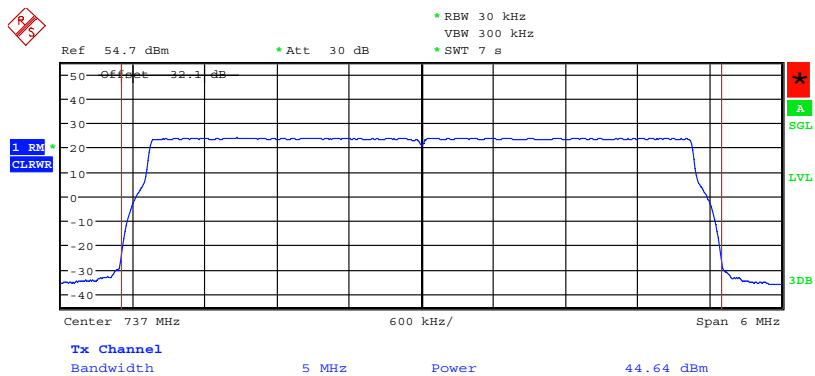
Figure 7-1: RF Power Output – QPSK (737.0 MHz) (5MHz Channel BW)

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Date: 1.DEC.2009 07:49:23

Figure 7-2: RF Power Output – 16QAM (737.0 MHz) (5MHz Channel BW)

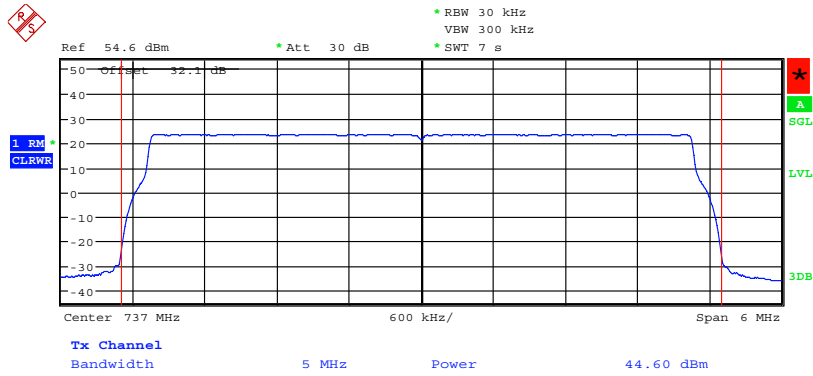


Date: 1.DEC.2009 07:52:29

Figure 7-3: RF Power Output – 64QAM (737.0 MHz) (5MHz Channel BW)

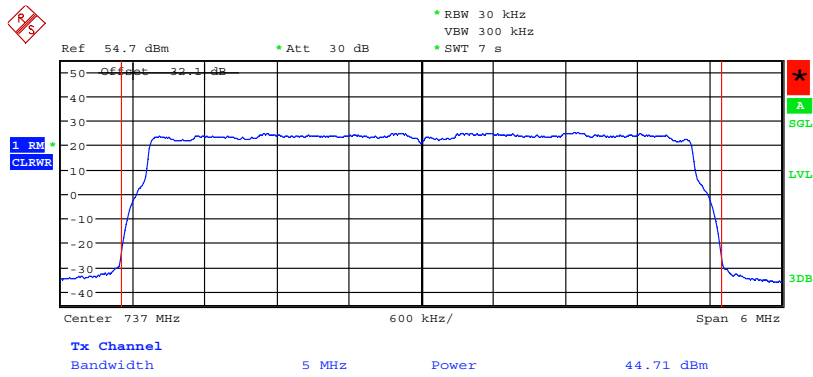
The test report shall not be reproduced except in full without the written approval of the testing laboratory

Config A TX2:



Date: 1.DEC.2009 07:58:05

Figure 7-4: RF Power Output – QPSK (737.0 MHz) (5MHz Channel BW)

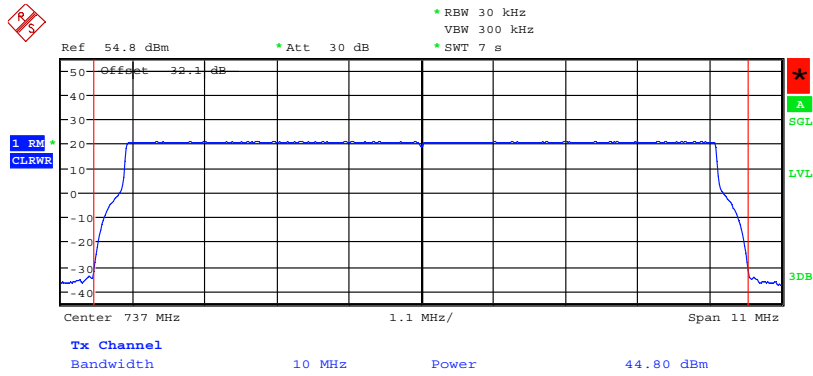


Date: 1.DEC.2009 07:46:13

Figure 7-5: RF Power Output – 16QAM (737.0 MHz) (5MHz Channel BW)

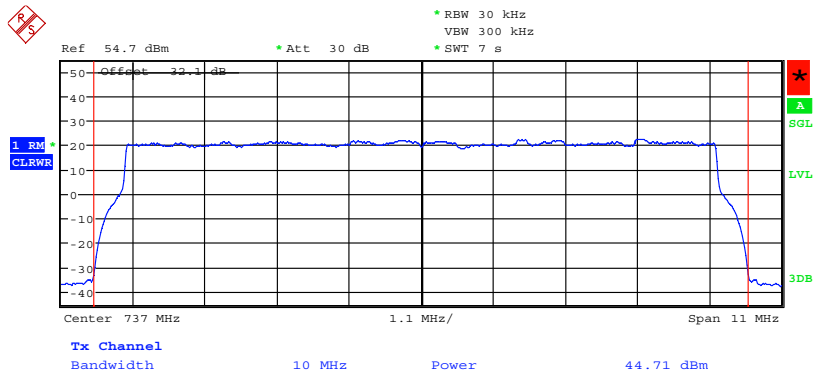
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Config B TX1:



Date: 30.NOV.2009 12:44:39

Figure 7-7: RF Power Output – QPSK (737.0 MHz) (10MHz Channel BW)

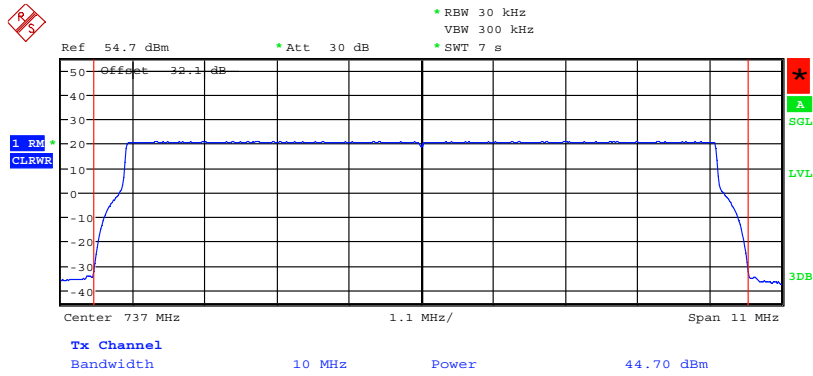


Date: 30.NOV.2009 12:54:47

Figure 7-8: RF Power Output – 16QAM (737.0 MHz) (10MHz Channel BW)

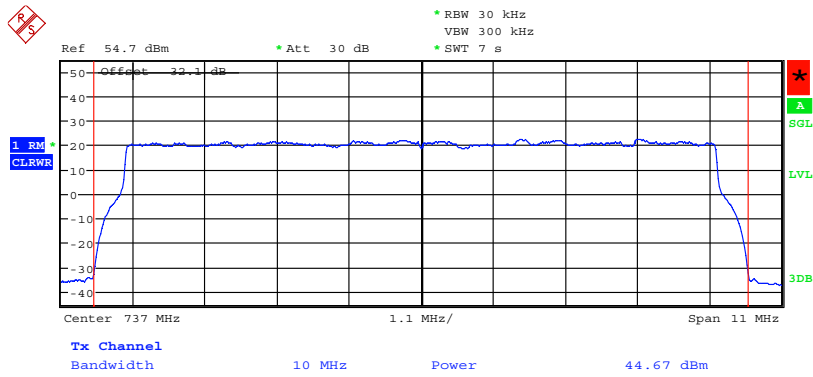
The test report shall not be reproduced except in full without the written approval of the testing laboratory

Config B TX2:



Date: 30.NOV.2009 14:18:22

Figure 7-10: RF Power Output – QPSK (737.0 MHz) (10MHz Channel BW)



Date: 30.NOV.2009 14:26:34

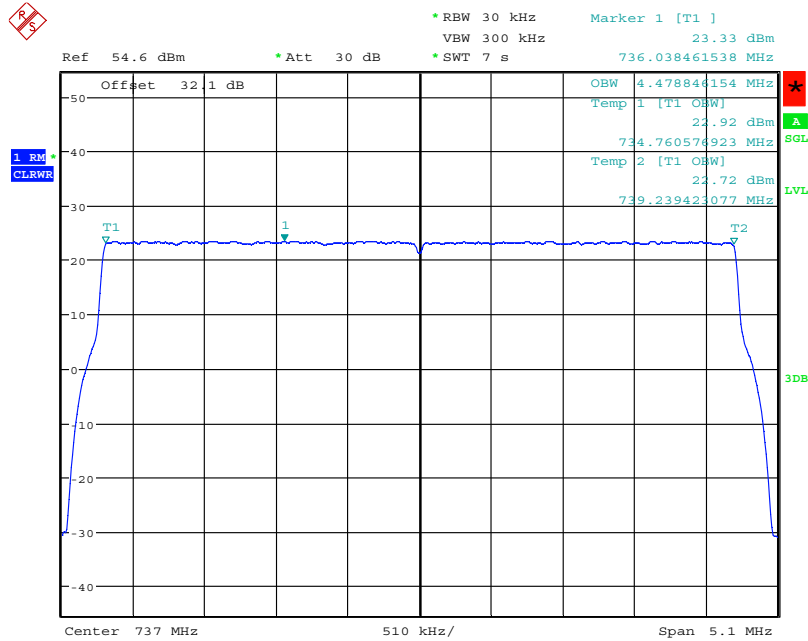
Figure 7-11: RF Power Output – 16QAM (737.0 MHz) (10MHz Channel BW)

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7.2.2 Test No. 3: Occupied Bandwidth

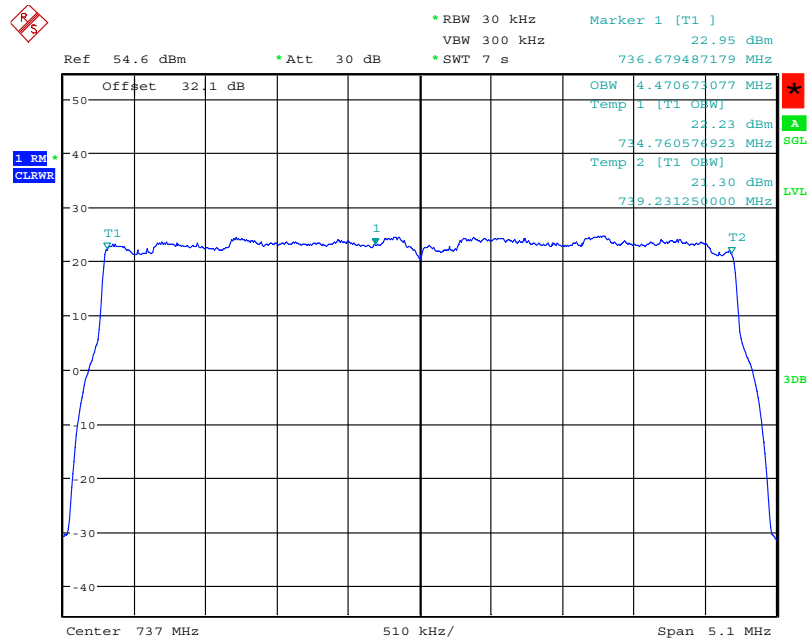
The value 'OPB' is the measured occupied bandwidth.

Config A TX1:



Date: 1.DEC.2009 08:02:00

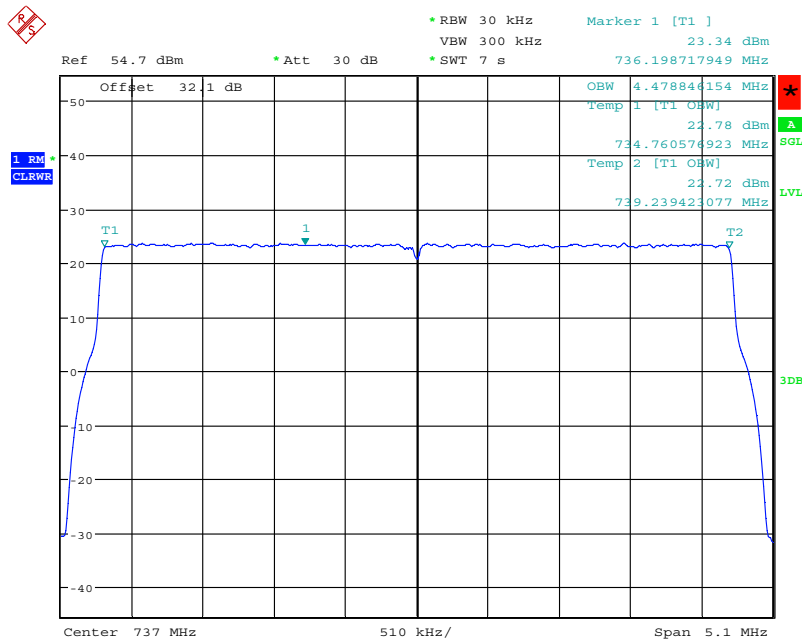
Figure 7-13: Occupied Bandwidth – QPSK (737.0 MHz) (5MHz Channel BW)



Date: 1.DEC.2009 07:50:12

Figure 7-14: Occupied Bandwidth – 16QAM (737.0 MHz) (5MHz Channel BW)

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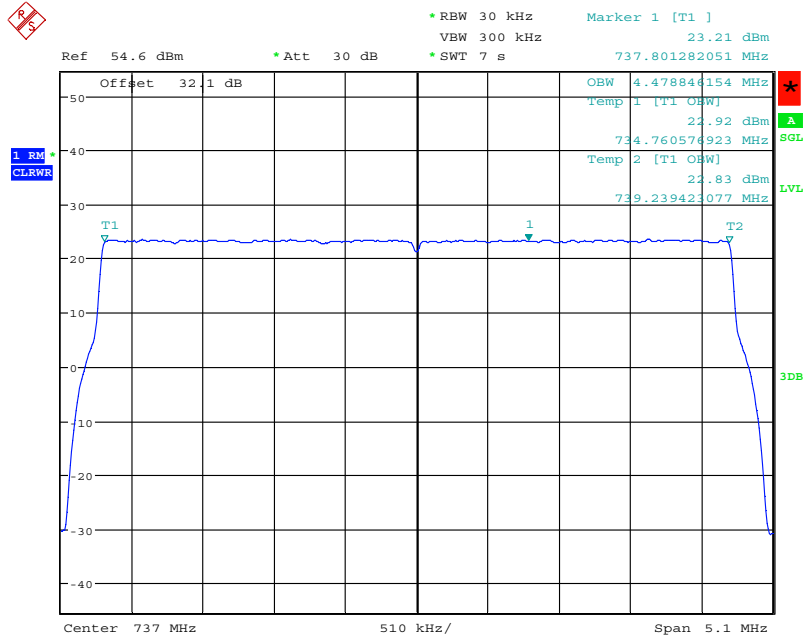


Date: 1.DEC.2009 07:53:17

Figure 7-15: Occupied Bandwidth – 64QAM (737.0 MHz) (5MHz Channel BW)

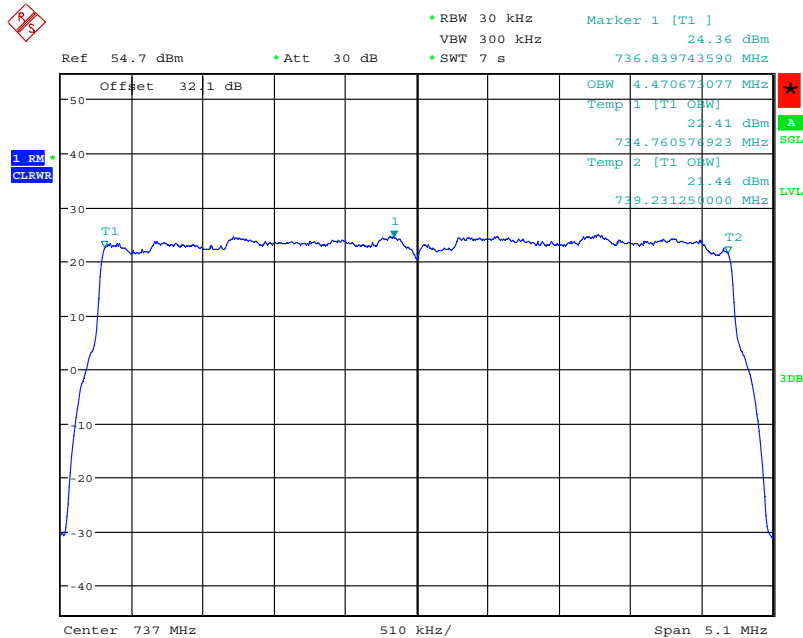
The test report shall not be reproduced except in full without the written approval of the testing laboratory

Config A TX2:



Date: 1.DEC.2009 07:58:48

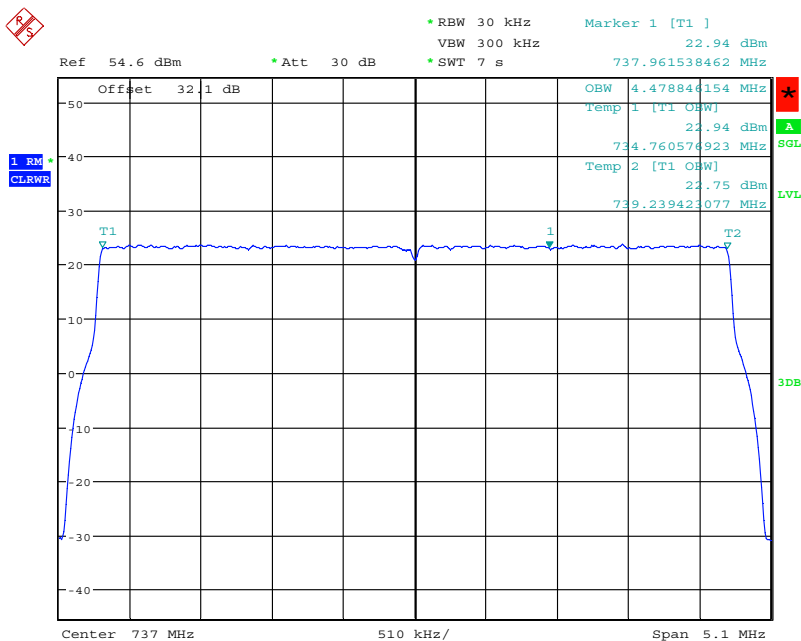
Figure 7-16: Occupied Bandwidth – QPSK (737.0 MHz) (5MHz Channel BW)



Date: 1.DEC.2009 07:46:58

Figure 7-17: Occupied Bandwidth – 16QAM (737.0 MHz) (5MHz Channel BW)

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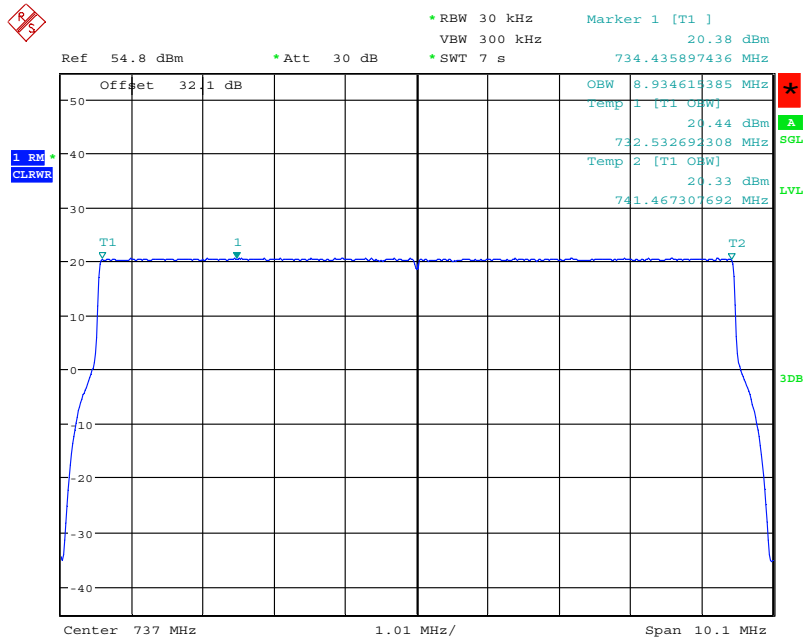


Date: 1.DEC.2009 07:55:48

Figure 7-18: Occupied Bandwidth – 64QAM (737.0 MHz) (5MHz Channel BW)

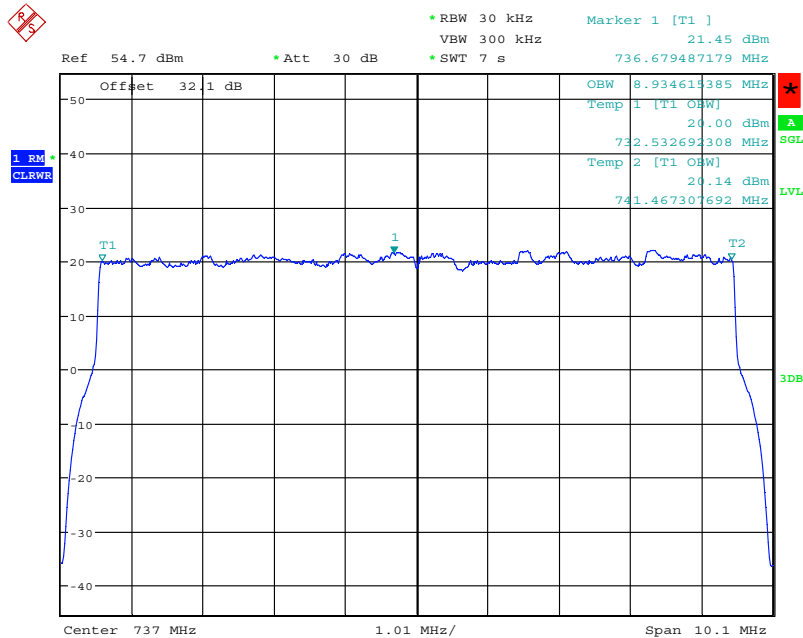
The test report shall not be reproduced except in full without the written approval of the testing laboratory

Config B TX1:



Date: 30.NOV.2009 12:45:53

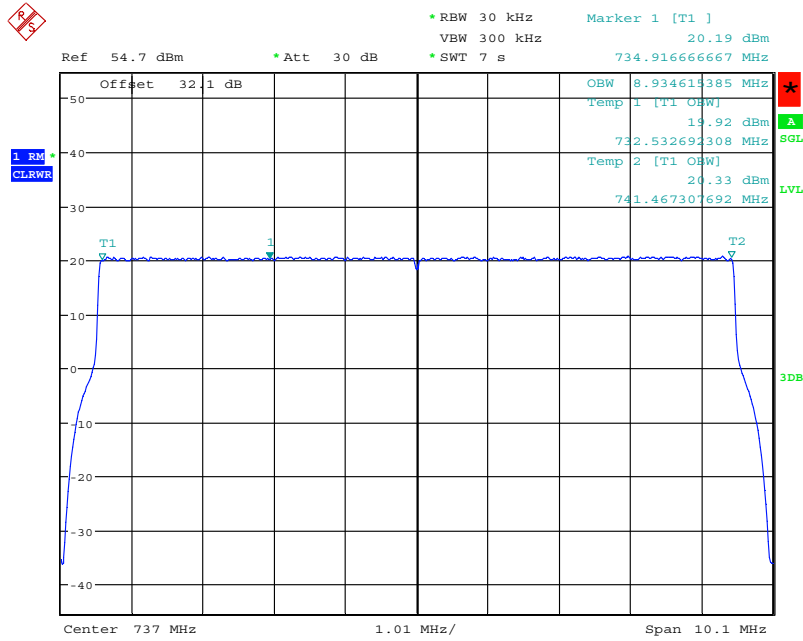
Figure 7-19: Occupied Bandwidth – QPSK (737.0 MHz) (10MHz Channel BW)



Date: 30.NOV.2009 12:55:32

Figure 7-20: Occupied Bandwidth – 16QAM (737.0 MHz) (10MHz Channel BW)

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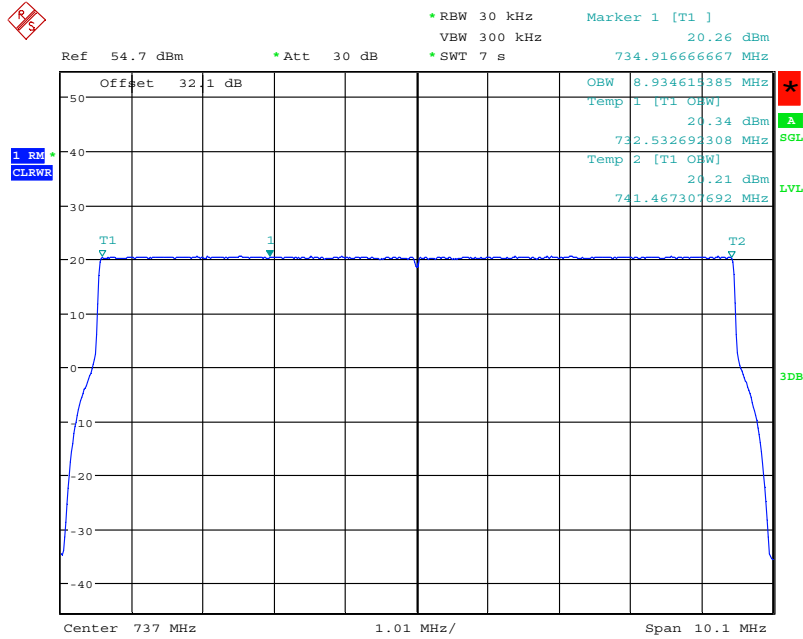


Date: 30.NOV.2009 12:52:15

Figure 7-21: Occupied Bandwidth – 64QAM (737.0 MHz) (10MHz Channel BW)

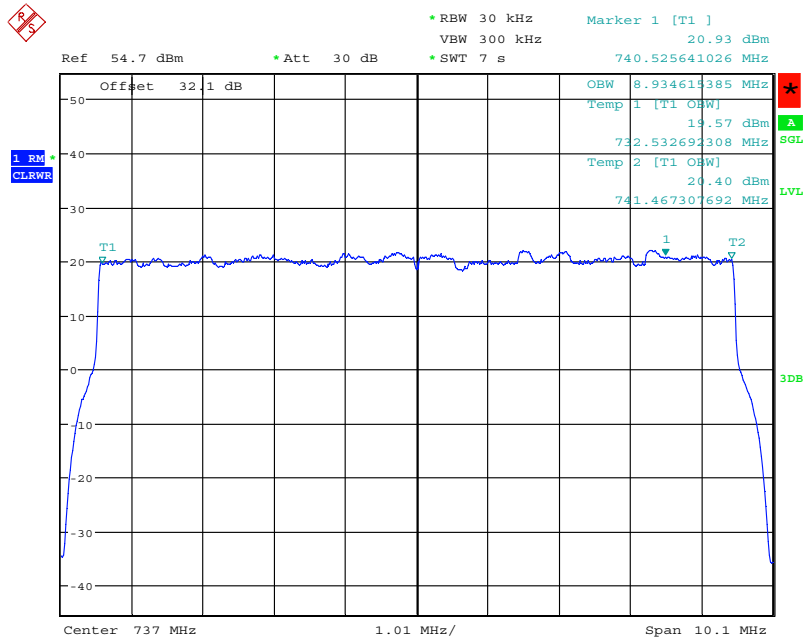
The test report shall not be reproduced except in full without the written approval of the testing laboratory

Config B TX2:



Date: 30.NOV.2009 14:19:15

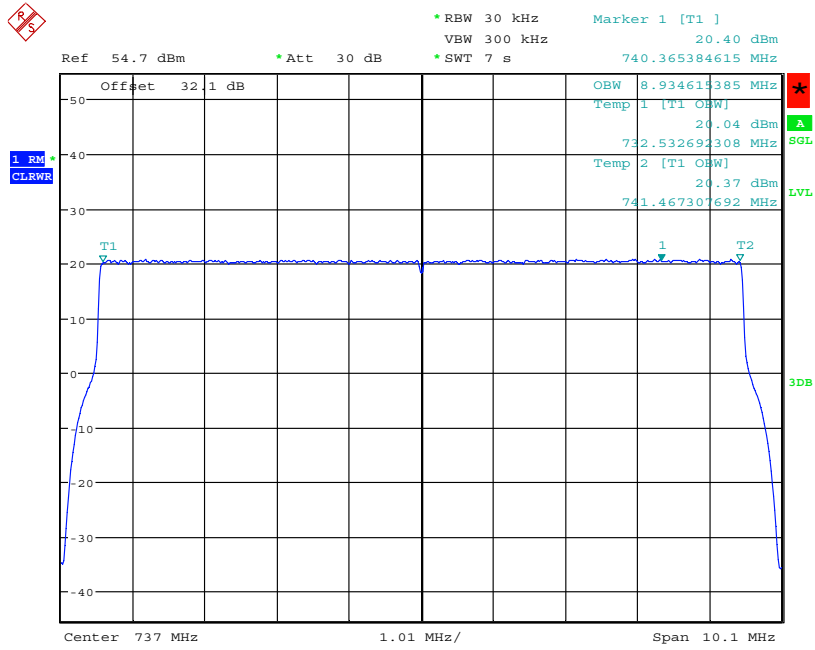
Figure 7-22: Occupied Bandwidth – QPSK (737.0 MHz) (10MHz Channel BW)



Date: 30.NOV.2009 14:27:25

Figure 7-23: Occupied Bandwidth – 16QAM (737.0 MHz) (10MHz Channel BW)

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Date: 30.NOV.2009 14:24:00

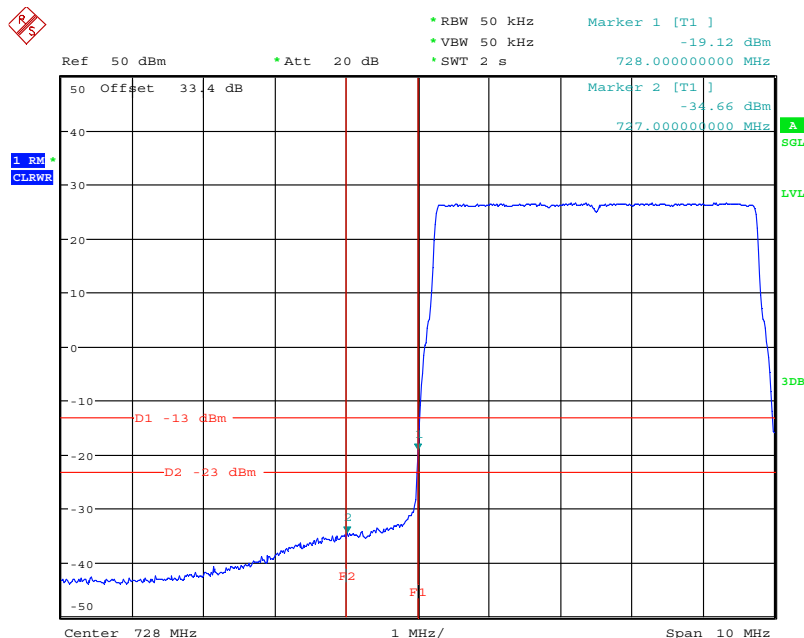
Figure 7-24: Occupied Bandwidth – 64QAM (737.0 MHz) (10MHz Channel BW)

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7.2.3 Test No. 4: Spurious Emissions at the Antenna Terminals

The external attenuation (cable loss of the setup) can be seen as the 'Offset' value in the screenshots. The external attenuation is frequency dependant. Thus the various 'Offset' values in the screenshots may differ.

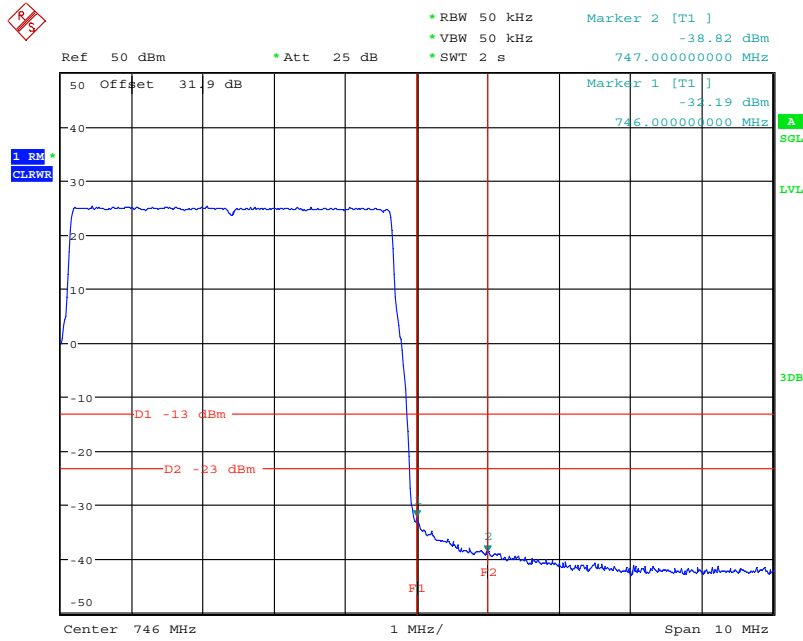
Config A TX1:



Date: 8.DEC.2009 12:43:13

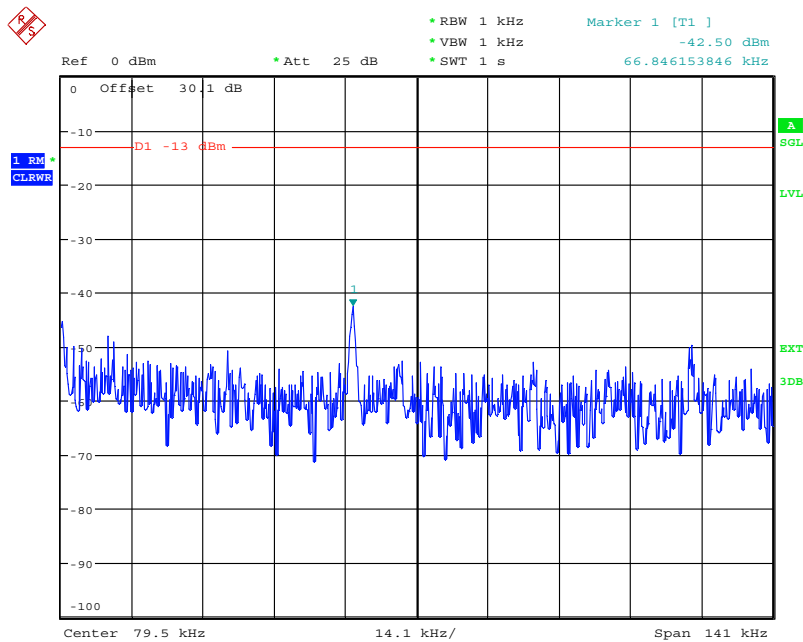
**Figure 7-25: Spurious Emissions (Lower band edge)
 –QPSK (730.5 MHz) (5MHz Channel BW)**

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Date: 1.DEC.2009 09:11:21

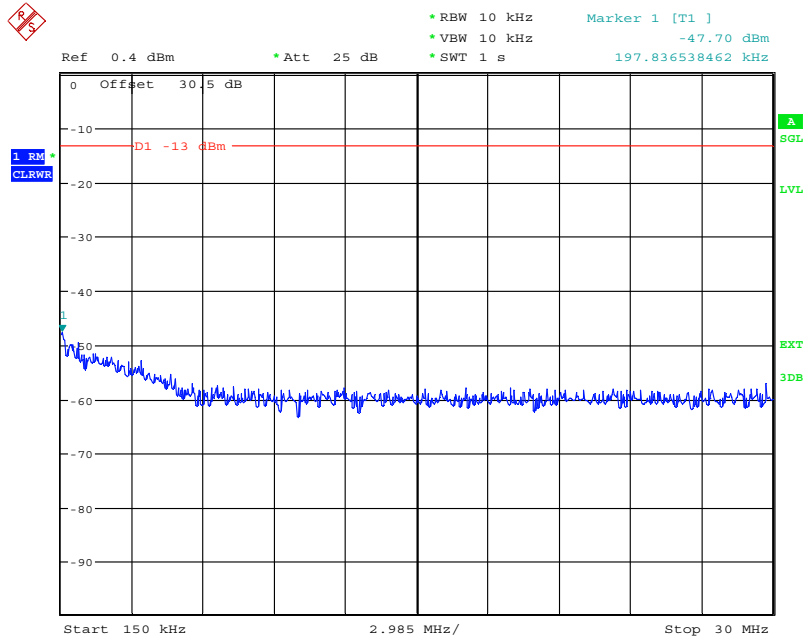
Figure 7-26: Spurious Emissions (Upper band edge) – QPSK (743.4 MHz) (5MHz Channel BW)



Date: 2.DEC.2009 11:33:00

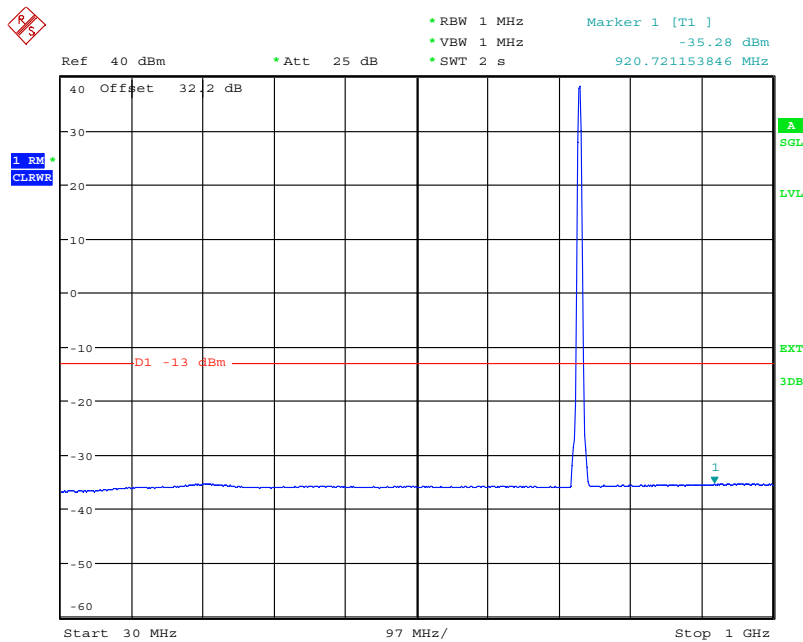
Figure 7-27: Spurious Emissions (9kHz-150kHz) – QPSK (737.0 MHz) (5MHz Channel BW)

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Date: 2.DEC.2009 11:41:17

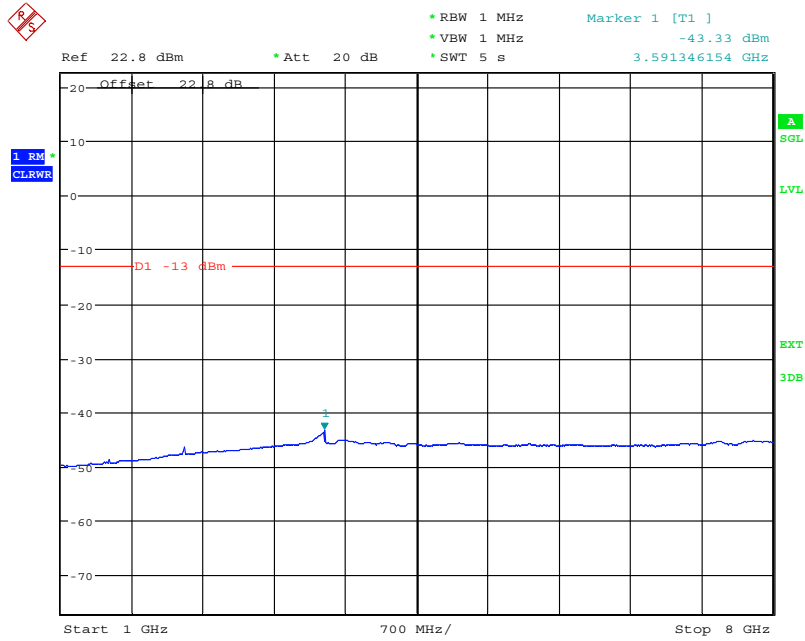
**Figure 7-28: Spurious Emissions (150kHz-30MHz)
– QPSK (737.0 MHz) (5MHz Channel BW)**



Date: 2.DEC.2009 13:36:21

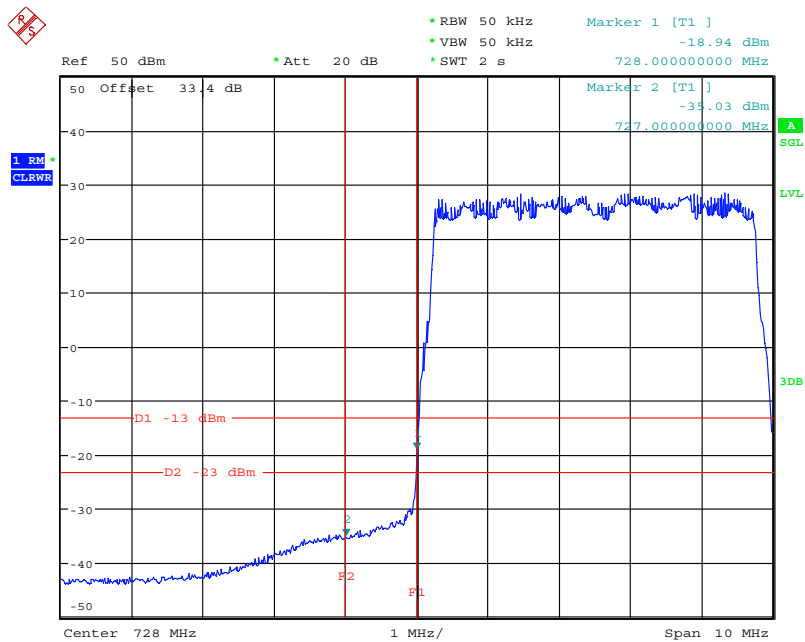
**Figure 7-29: Spurious Emissions (30MHz-1GHz)
– QPSK (737.0 MHz) (5MHz Channel BW)**

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Date: 2.DEC.2009 13:57:30

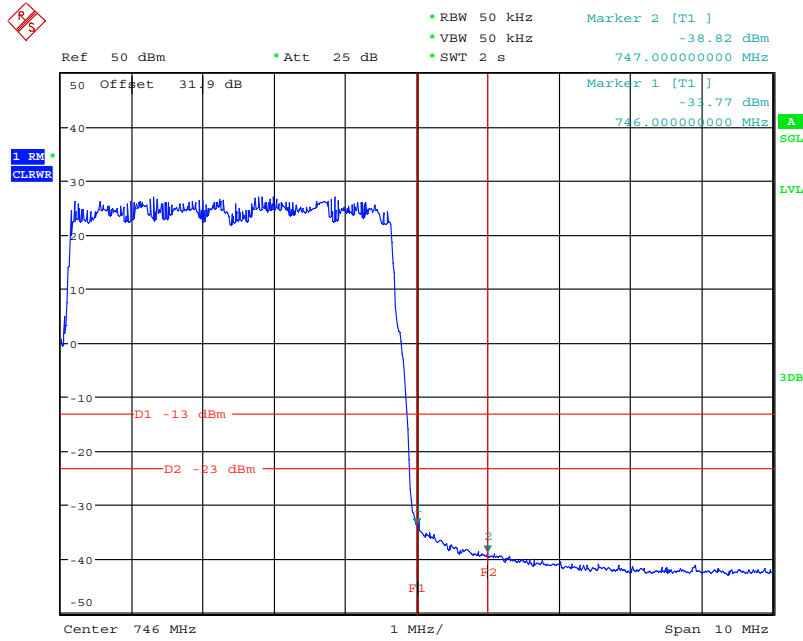
**Figure 7-30: Spurious Emissions (1GHz-8GHz)
– QPSK (737.0 MHz) (5MHz Channel BW)**



Date: 8.DEC.2009 12:46:38

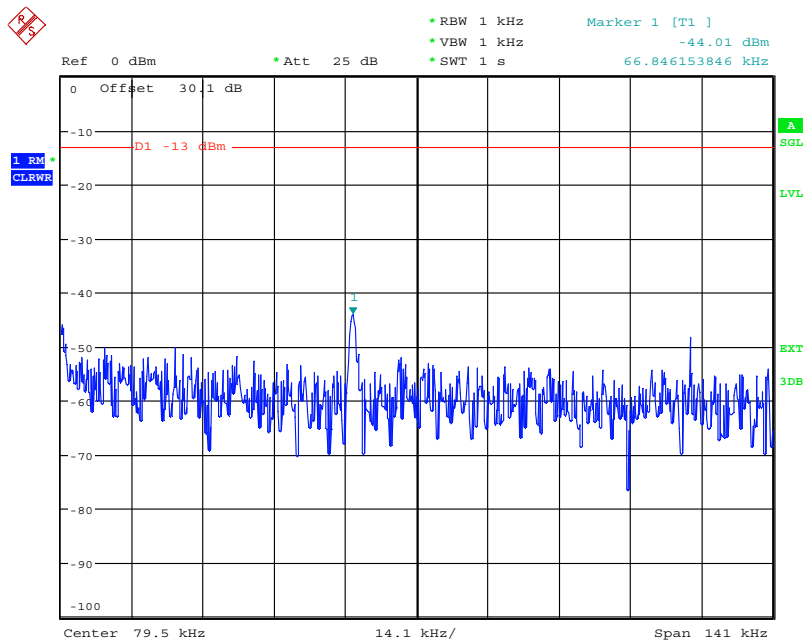
**Figure 7-31: Spurious Emissions (Lower band edge)
– 16QAM (730.5 MHz) (5MHz Channel BW)**

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Date: 1.DEC.2009 09:07:50

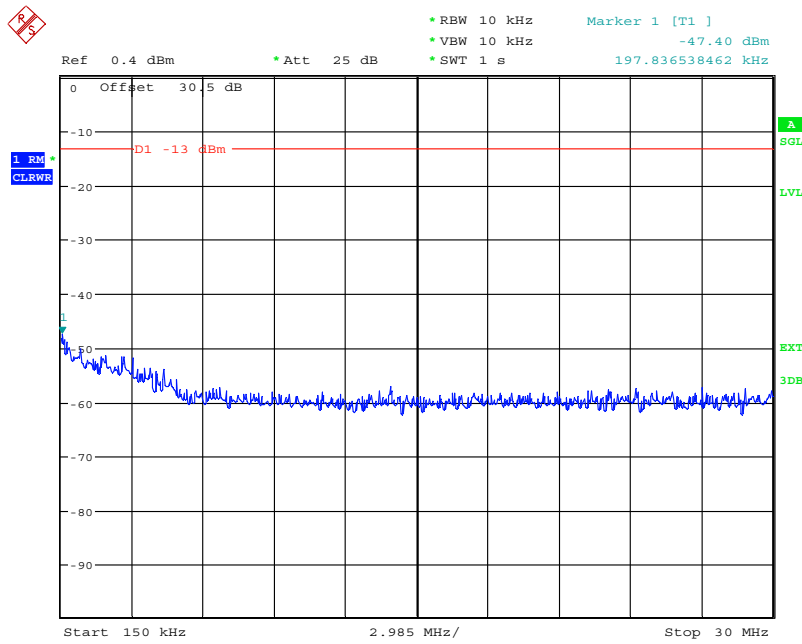
Figure 7-32: Spurious Emissions (Upper band edge) – 16QAM (743.4 MHz) (5MHz Channel BW)



Date: 2.DEC.2009 11:29:53

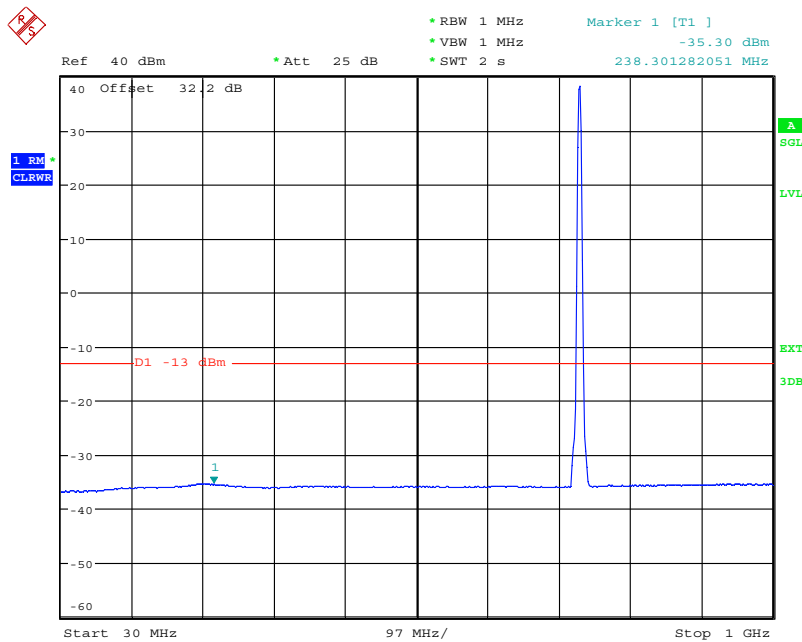
Figure 7-33: Spurious Emissions (9kHz-150kHz) – 16QAM (737.0 MHz) (5MHz Channel BW)

The test report shall not be reproduced except in full without the written approval of the testing laboratory



Date: 2.DEC.2009 11:45:36

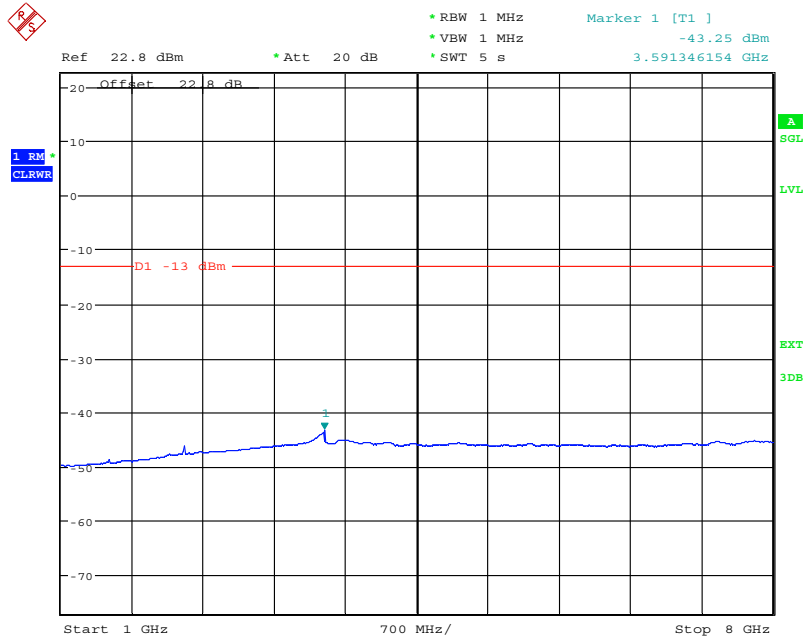
**Figure 7-34: Spurious Emissions (150kHz-30MHz)
- 16QAM (737.0 MHz) (5MHz Channel BW)**



Date: 2.DEC.2009 13:33:40

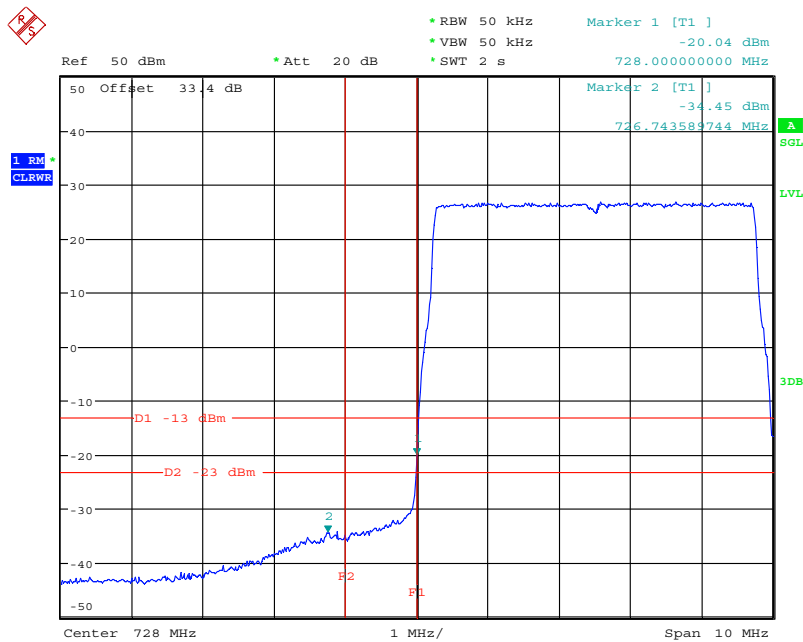
**Figure 7-35: Spurious Emissions (30MHz-1GHz)
- 16QAM (737.0 MHz) (5MHz Channel BW)**

The test report shall not be reproduced except in full without the written approval of the testing laboratory



Date: 2.DEC.2009 14:01:57

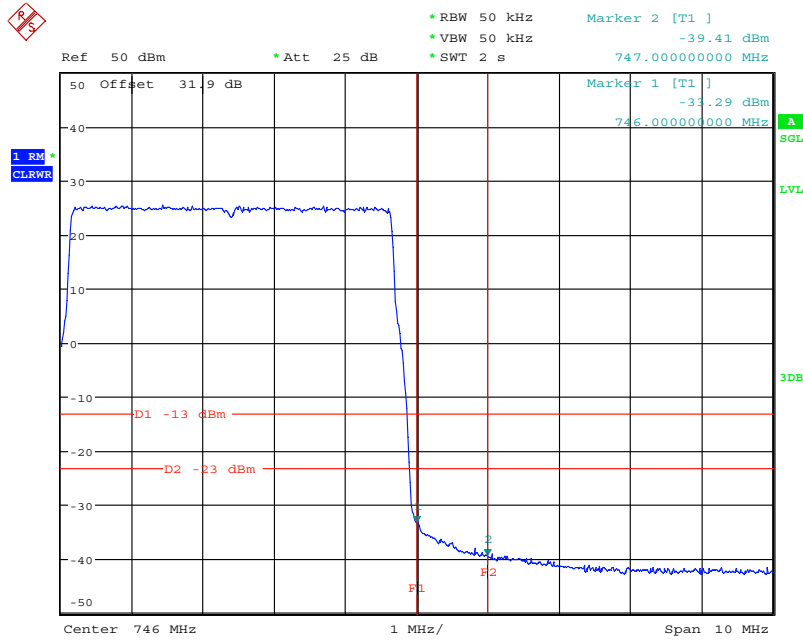
**Figure 7-36: Spurious Emissions (1GHz-8GHz)
- 16QAM (737.0 MHz) (5MHz Channel BW)**



Date: 8.DEC.2009 12:45:43

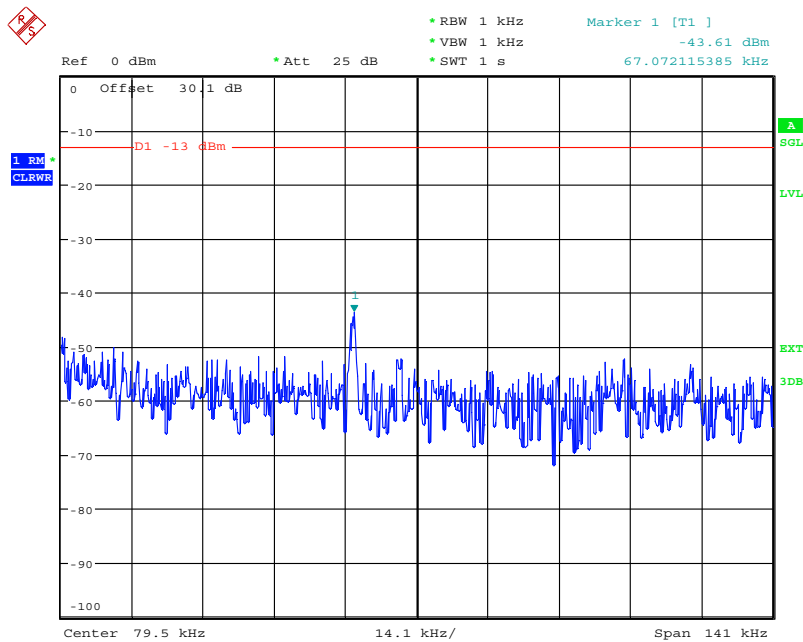
**Figure 7-37: Spurious Emissions (Lower band edge)
- 64QAM (730.5 MHz) (5MHz Channel BW)**

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Date: 1.DEC.2009 09:09:14

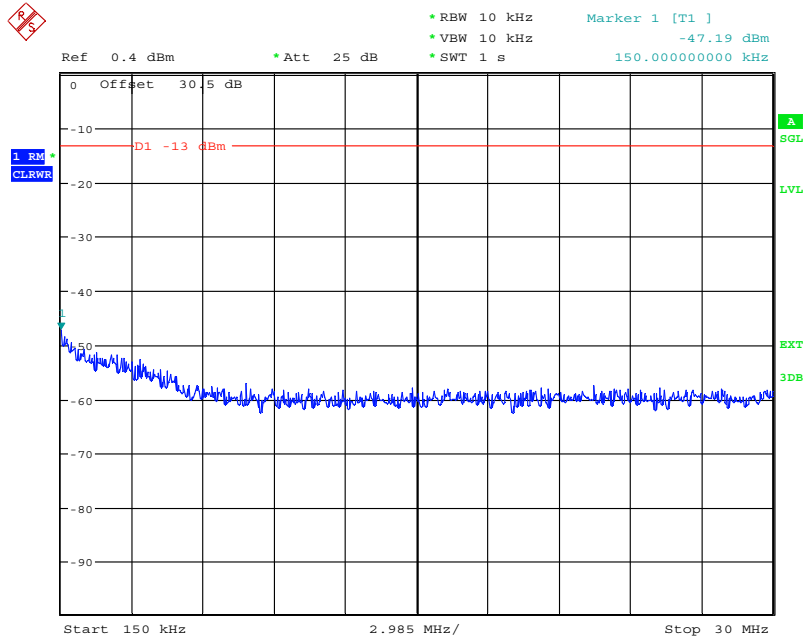
Figure 7-38: Spurious Emissions (Upper band edge) – 64QAM (743.4 MHz) (5MHz Channel BW)



Date: 2.DEC.2009 11:30:45

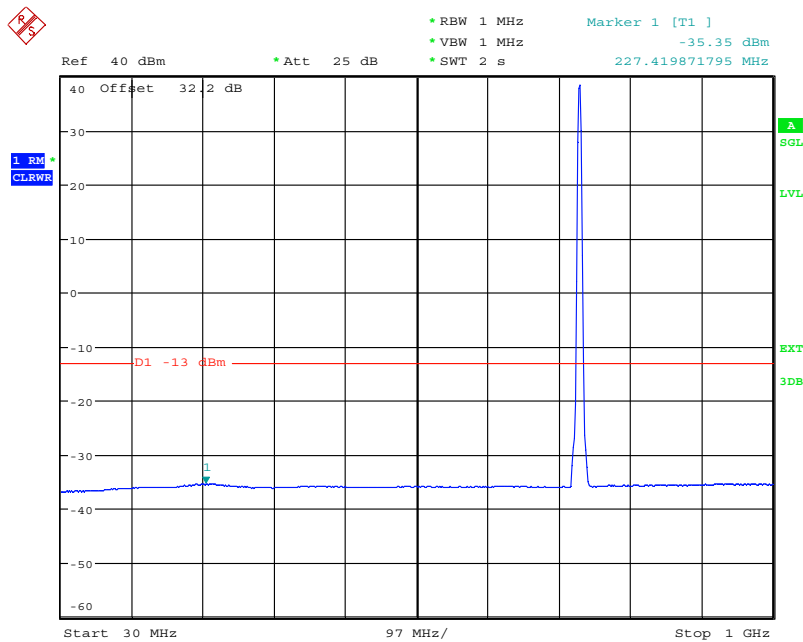
Figure 7-39: Spurious Emissions (9kHz-150kHz) – 64QAM (737.0 MHz) (5MHz Channel BW)

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Date: 2.DEC.2009 11:42:51

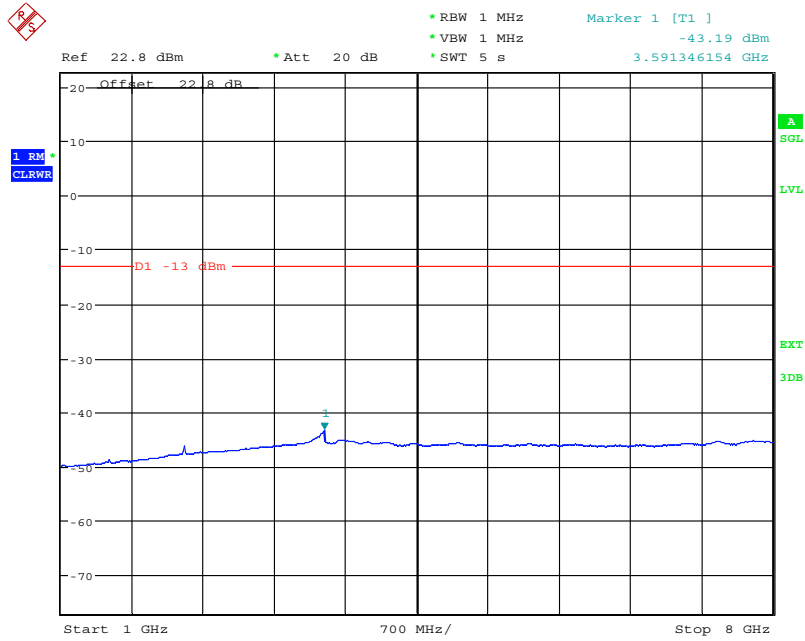
**Figure 7-40: Spurious Emissions (150kHz-30MHz)
– 64QAM (737.0 MHz) (5MHz Channel BW)**



Date: 2.DEC.2009 13:34:31

**Figure 7-41: Spurious Emissions (30MHz-1GHz)
– 64QAM (737.0 MHz) (5MHz Channel BW)**

The test report shall not be reproduced except in full without the written approval of the testing laboratory

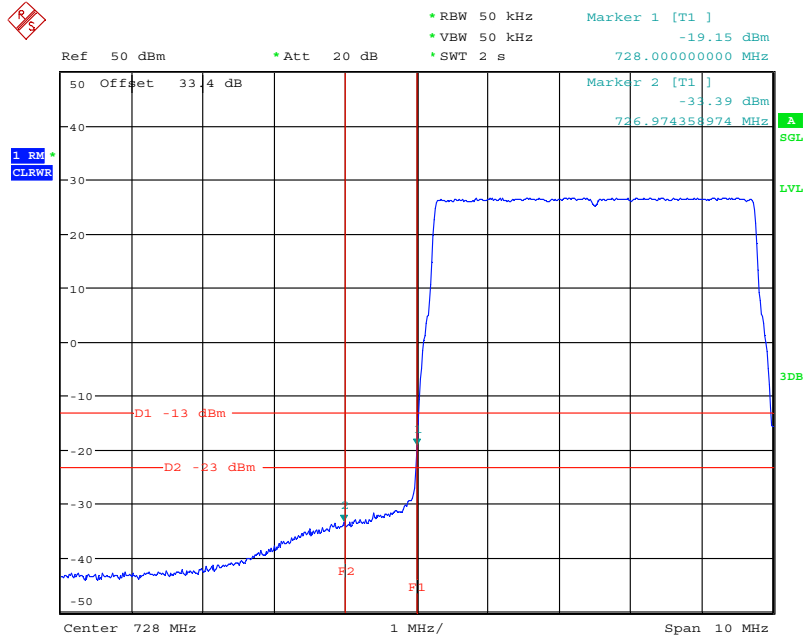


Date: 2.DEC.2009 14:01:05

**Figure 7-42: Spurious Emissions (1GHz-8GHz)
- 64QAM (737.0 MHz) (5MHz Channel BW)**

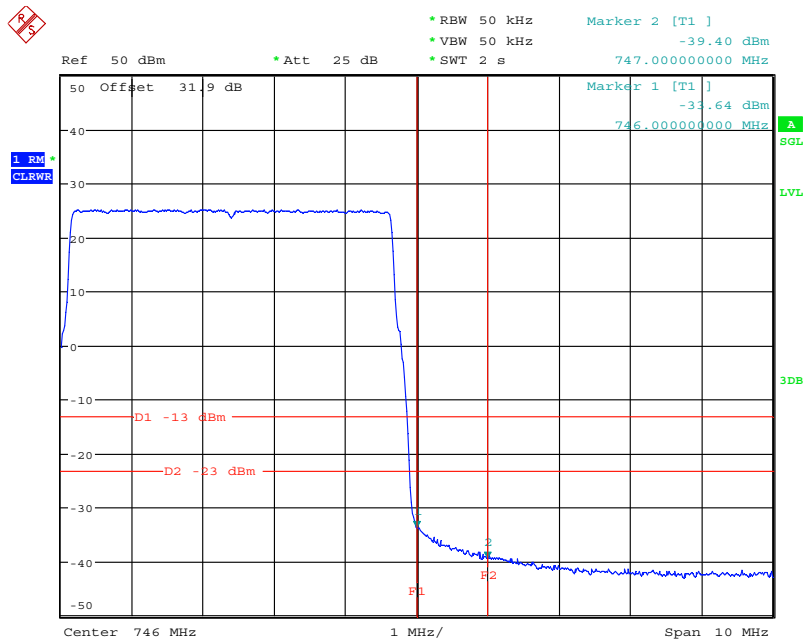
The test report shall not be reproduced except in full without the written approval of the testing laboratory

Config A TX2:



Date: 8.DEC.2009 12:50:29

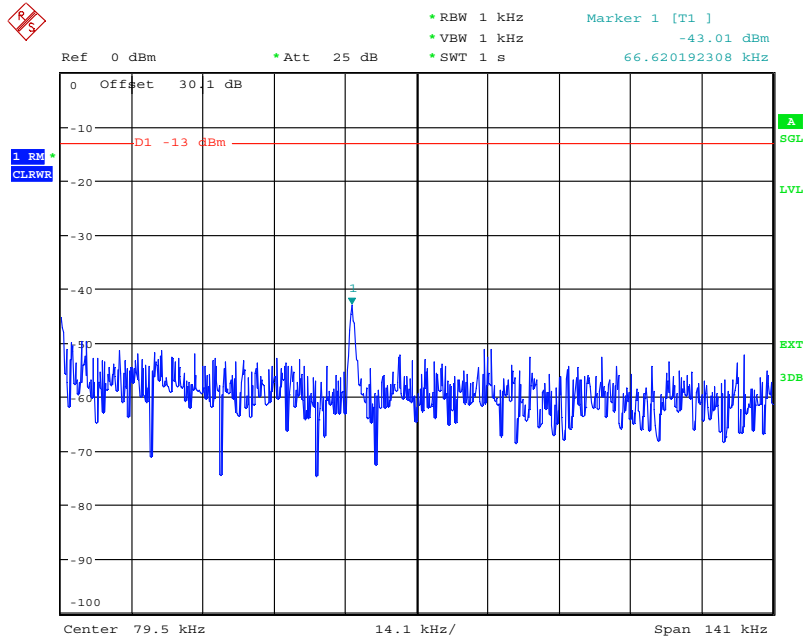
**Figure 7-43: Spurious Emissions (Lower band edge)
– QPSK (730.5 MHz) (5MHz Channel BW)**



Date: 1.DEC.2009 09:12:32

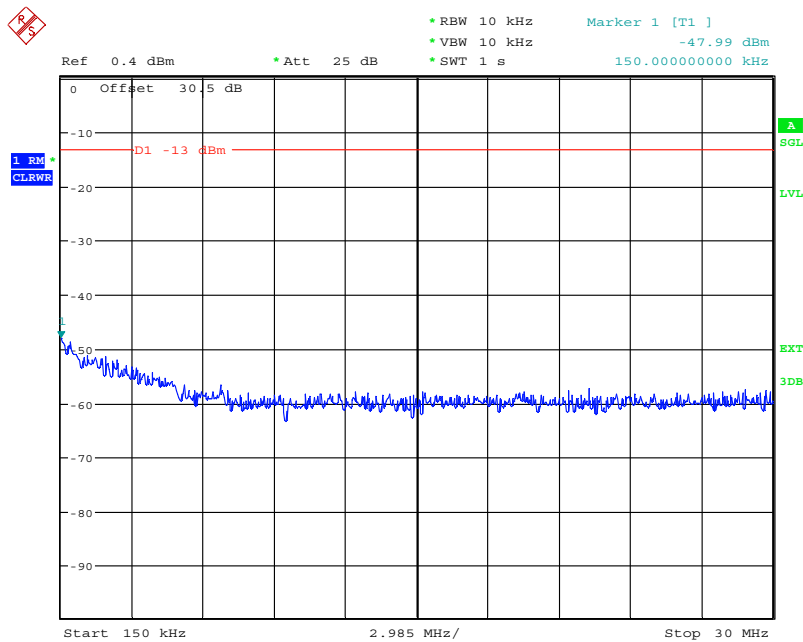
**Figure 7-44: Spurious Emissions (Upper band edge)
– QPSK (743.4 MHz) (5MHz Channel BW)**

The test report shall not be reproduced except in full without the written approval of the testing laboratory



Date: 2.DEC.2009 11:22:06

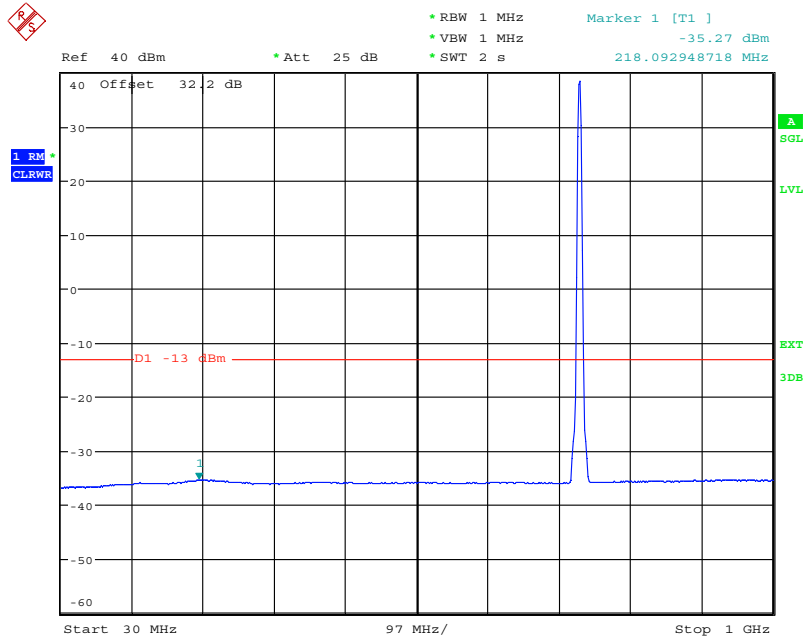
**Figure 7-45: Spurious Emissions (9kHz-150kHz)
– QPSK (737.0 MHz) (5MHz Channel BW)**



Date: 2.DEC.2009 11:49:39

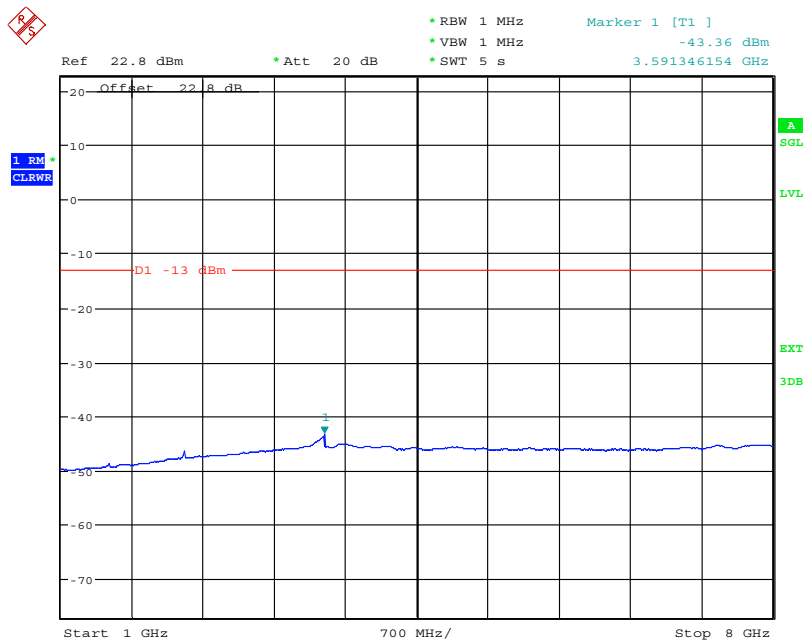
**Figure 7-46: Spurious Emissions (150kHz-30MHz)
– QPSK (737.0 MHz) (5MHz Channel BW)**

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Date: 2.DEC.2009 13:28:55

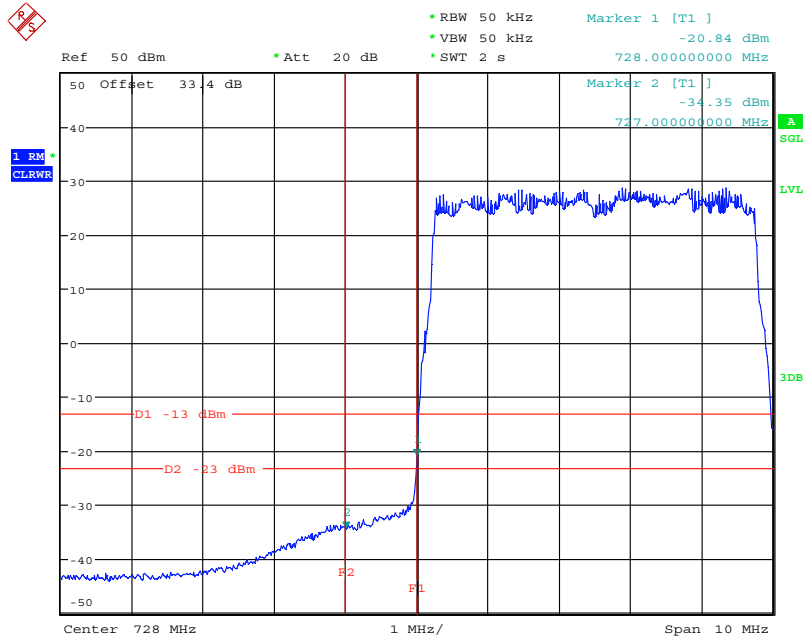
**Figure 7-47: Spurious Emissions (30MHz-1GHz)
– QPSK (737.0 MHz) (5MHz Channel BW)**



Date: 2.DEC.2009 14:15:41

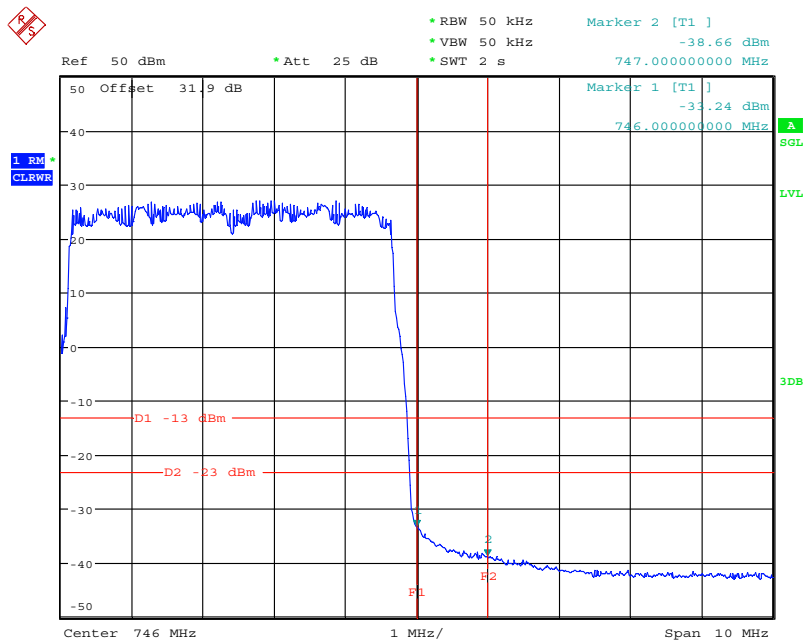
**Figure 7-48: Spurious Emissions (1GHz-8GHz)
– QPSK (737.0 MHz) (5MHz Channel BW)**

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Date: 8.DEC.2009 12:48:10

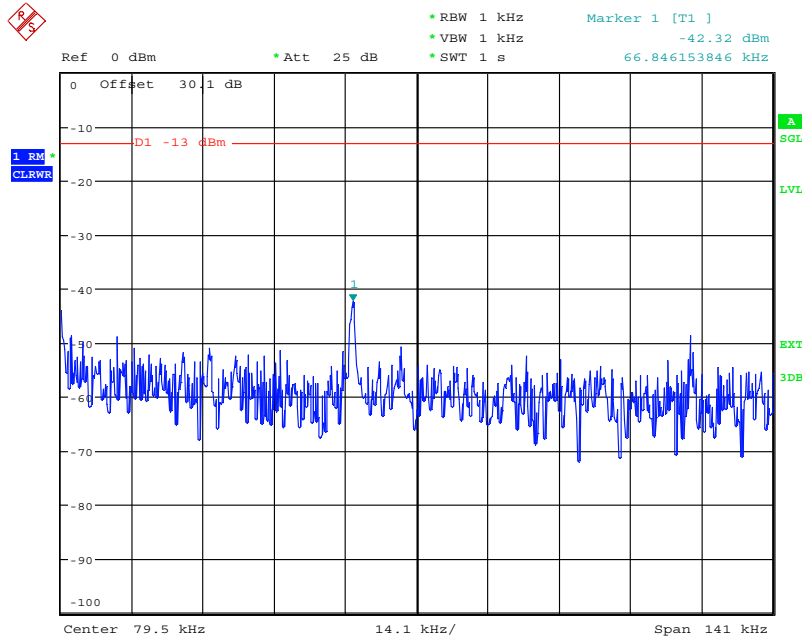
Figure 7-49: Spurious Emissions (Lower band edge) – 16QAM (730.5 MHz) (5MHz Channel BW)



Date: 1.DEC.2009 09:05:24

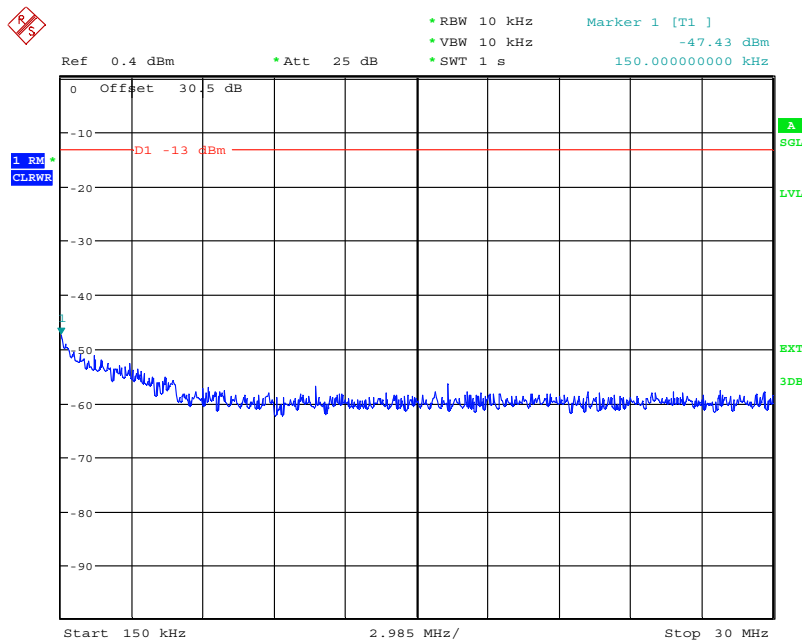
Figure 7-50: Spurious Emissions (Upper band edge) – 16QAM (743.4 MHz) (5MHz Channel BW)

The test report shall not be reproduced except in full without the written approval of the testing laboratory



Date: 2.DEC.2009 11:27:44

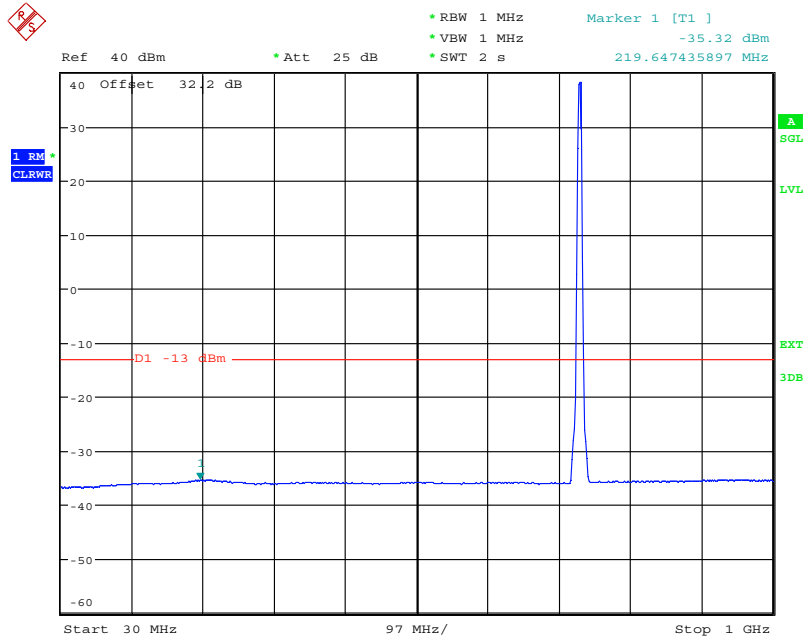
**Figure 7-51: Spurious Emissions (9kHz-150kHz)
– 16QAM (737.0 MHz) (5MHz Channel BW)**



Date: 2.DEC.2009 11:47:38

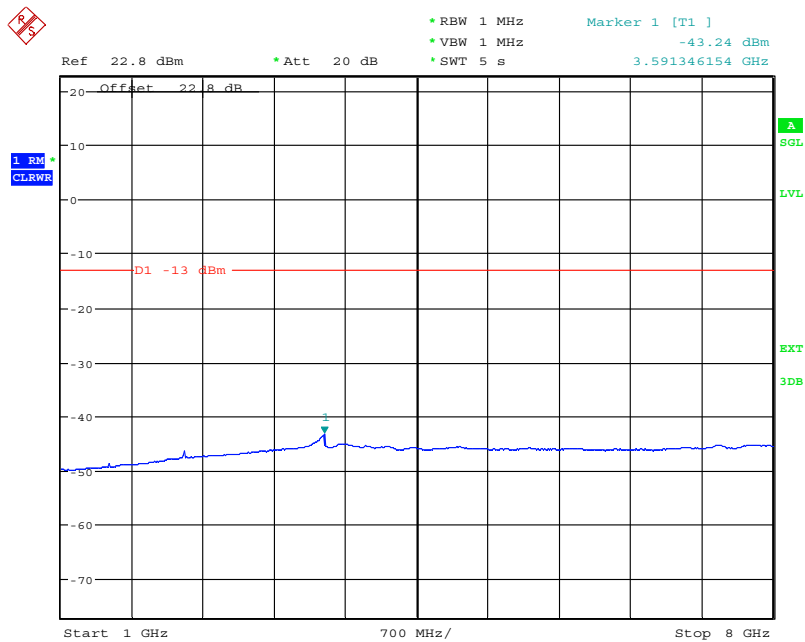
**Figure 7-52: Spurious Emissions (150kHz-30MHz)
– 16QAM (737.0 MHz) (5MHz Channel BW)**

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Date: 2.DEC.2009 13:32:06

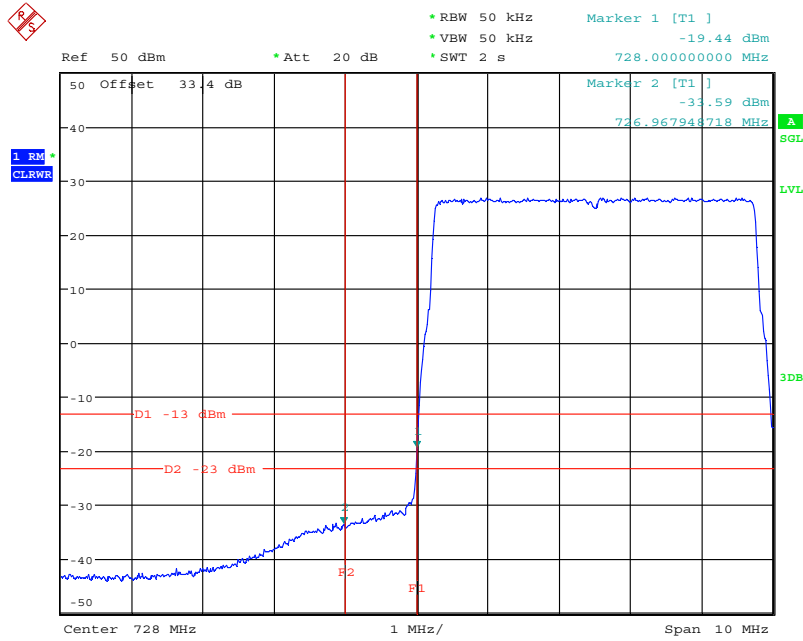
**Figure 7-53: Spurious Emissions (30MHz-1GHz)
- 16QAM (737.0 MHz) (5MHz Channel BW)**



Date: 2.DEC.2009 14:03:28

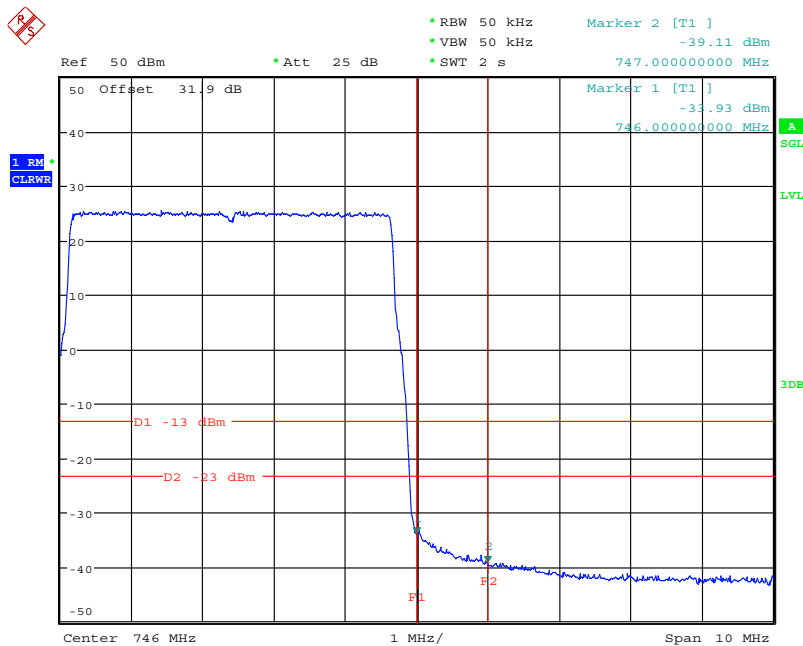
**Figure 7-54: Spurious Emissions (1GHz-8GHz)
- 16QAM (737.0 MHz) (5MHz Channel BW)**

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Date: 8.DEC.2009 12:48:58

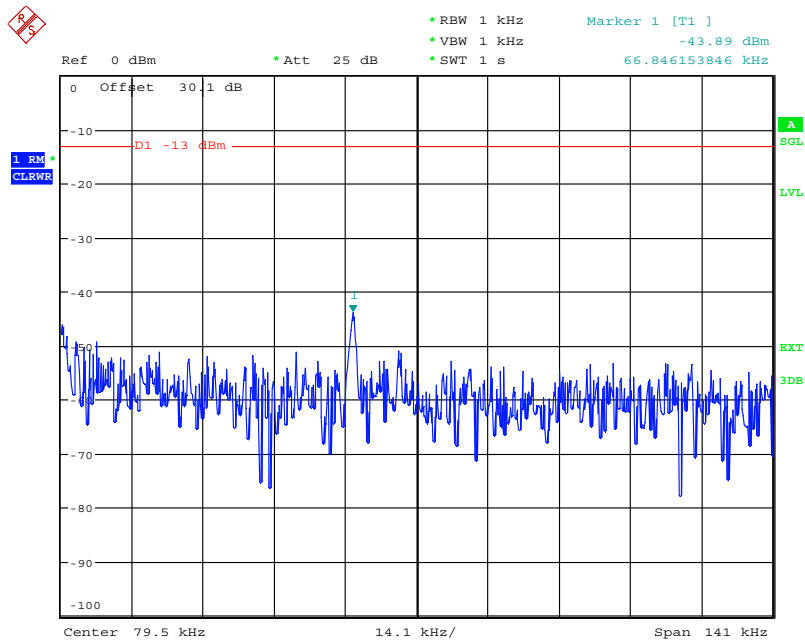
**Figure 7-55: Spurious Emissions (Lower band edge)
– 64QAM (730.5 MHz) (5MHz Channel BW)**



Date: 1.DEC.2009 09:14:22

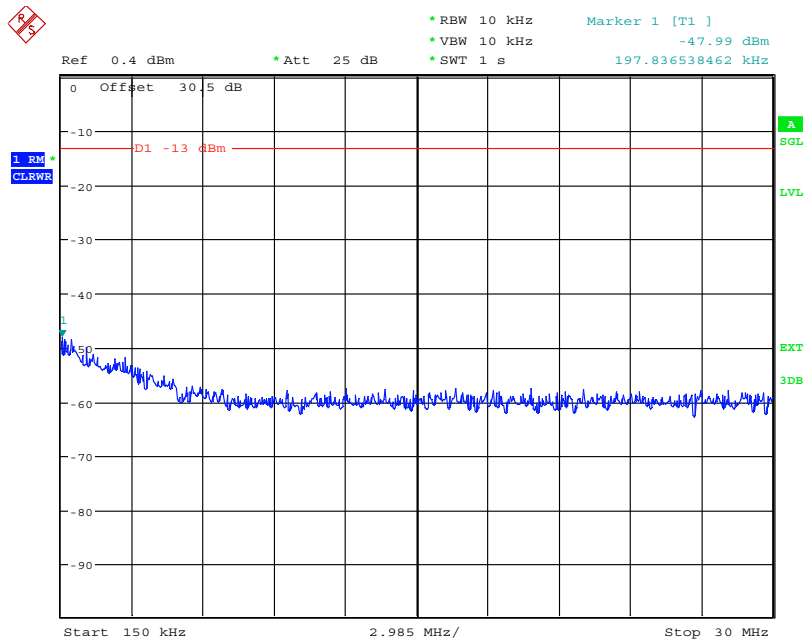
**Figure 7-56: Spurious Emissions (Upper band edge)
– 64QAM (743.4 MHz) (5MHz Channel BW)**

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Date: 2.DEC.2009 11:26:39

**Figure 7-57: Spurious Emissions (9kHz-150kHz)
Single Carrier – 64QAM (737.0 MHz) (5MHz Channel BW)**

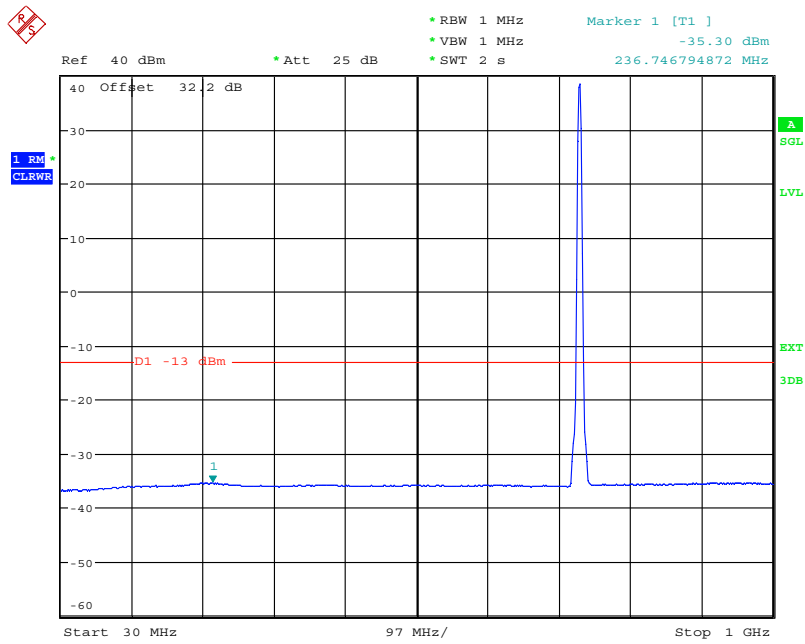


Date: 2.DEC.2009 11:48:14

**Figure 7-58: Spurious Emissions (150kHz-30MHz)
– 64QAM (737.0 MHz) (5MHz Channel BW)**

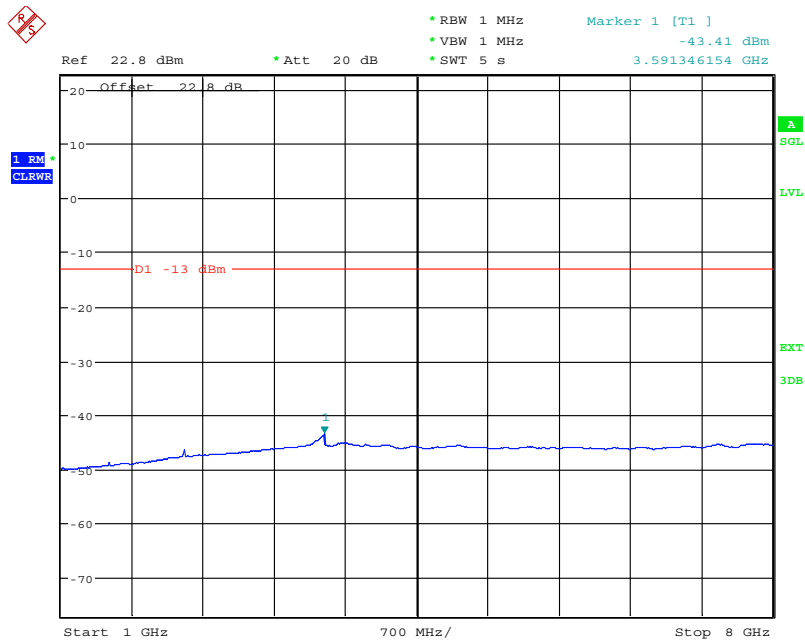
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Date: 2.DEC.2009 13:31:11

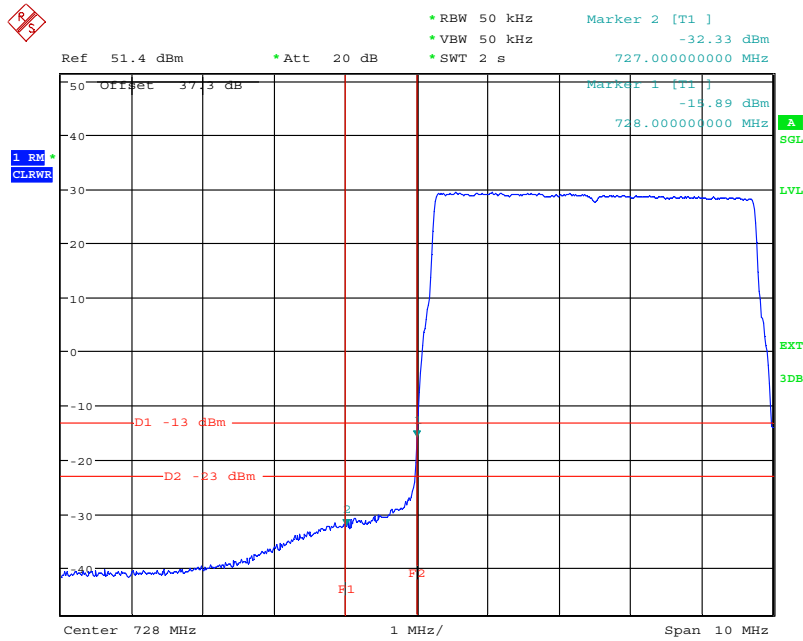
**Figure 7-59: Spurious Emissions (30MHz-1GHz)
- 64QAM (737.0 MHz) (5MHz Channel BW)**



Date: 2.DEC.2009 14:12:31

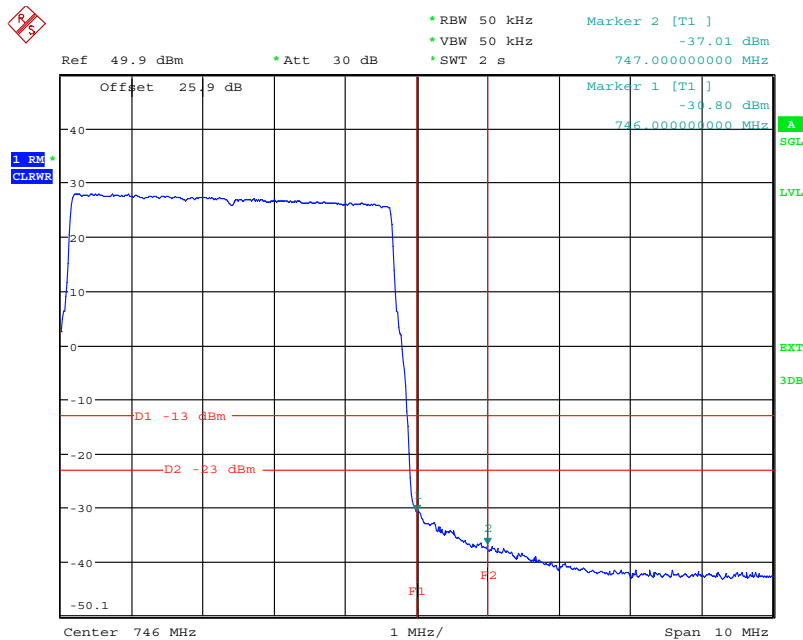
**Figure 7-60: Spurious Emissions (1GHz-8GHz)
- 64QAM (737.0 MHz) (5MHz Channel BW)**

Config A TX1+TX2:



Date: 4.DEC.2009 11:12:07

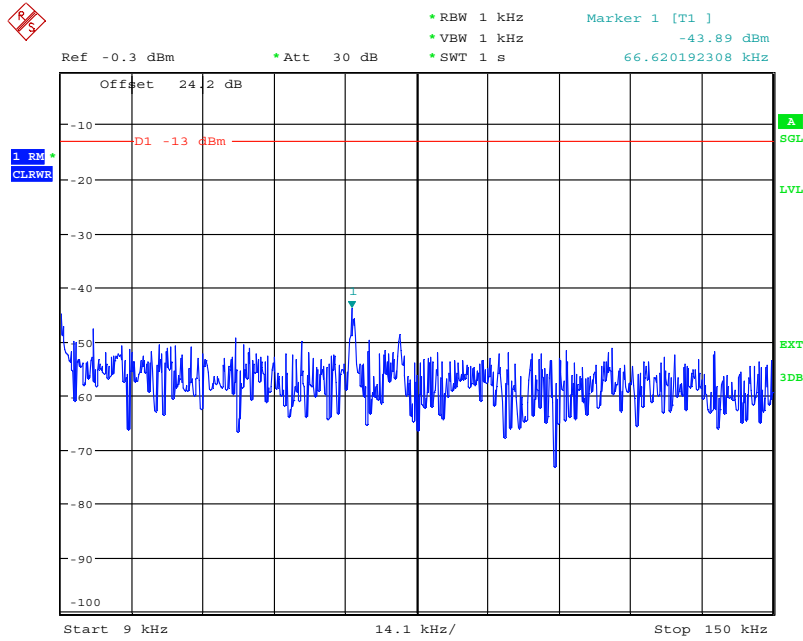
**Figure 7-61: Spurious Emissions (Lower band edge)
– QPSK (730.5 MHz) (5MHz Channel BW)**



Date: 4.DEC.2009 12:39:18

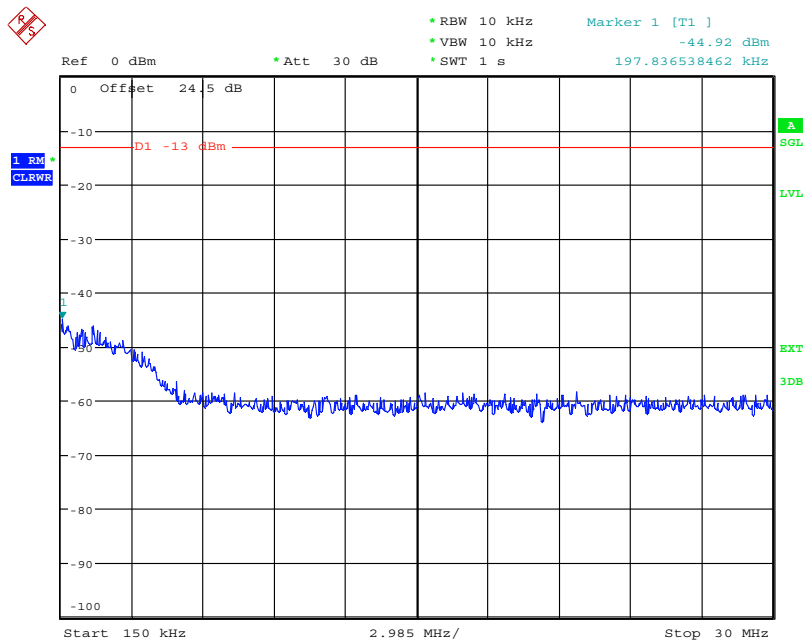
**Figure 7-62: Spurious Emissions (Upper band edge)
– QPSK (743.4 MHz) (5MHz Channel BW)**

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Date: 4.DEC.2009 09:07:33

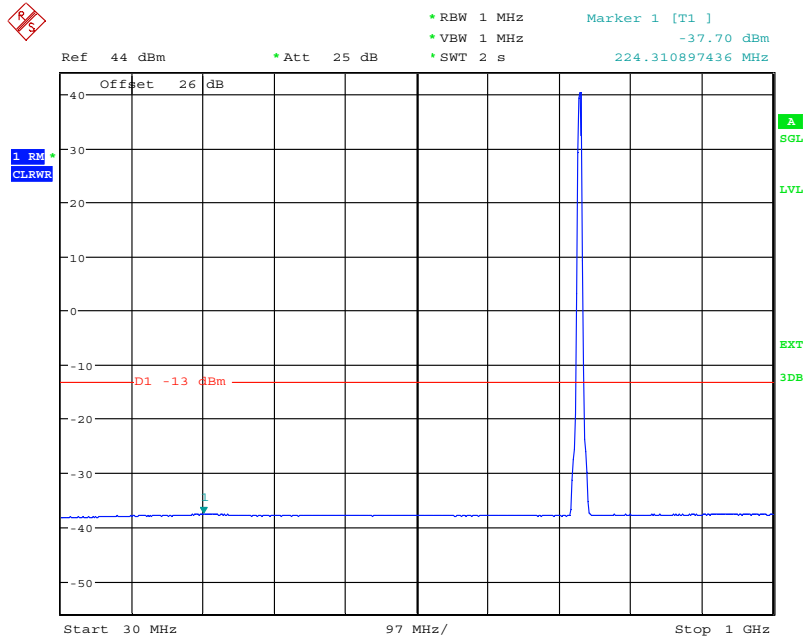
**Figure 7-63: Spurious Emissions (9kHz-150kHz)
– QPSK (737.0 MHz) (5MHz Channel BW)**



Date: 4.DEC.2009 09:02:29

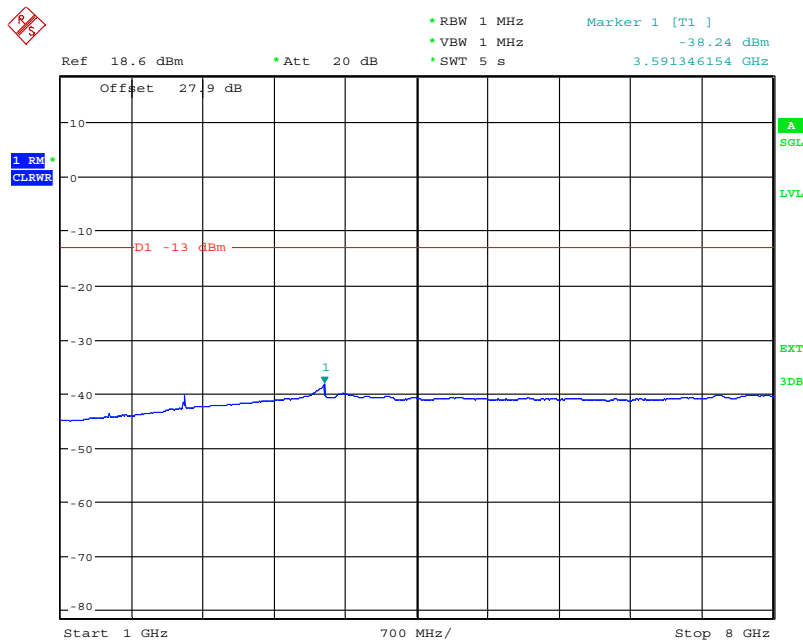
**Figure 7-64: Spurious Emissions (150kHz-30MHz)
– QPSK (737.0 MHz) (5MHz Channel BW)**

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Date: 4.DEC.2009 09:00:08

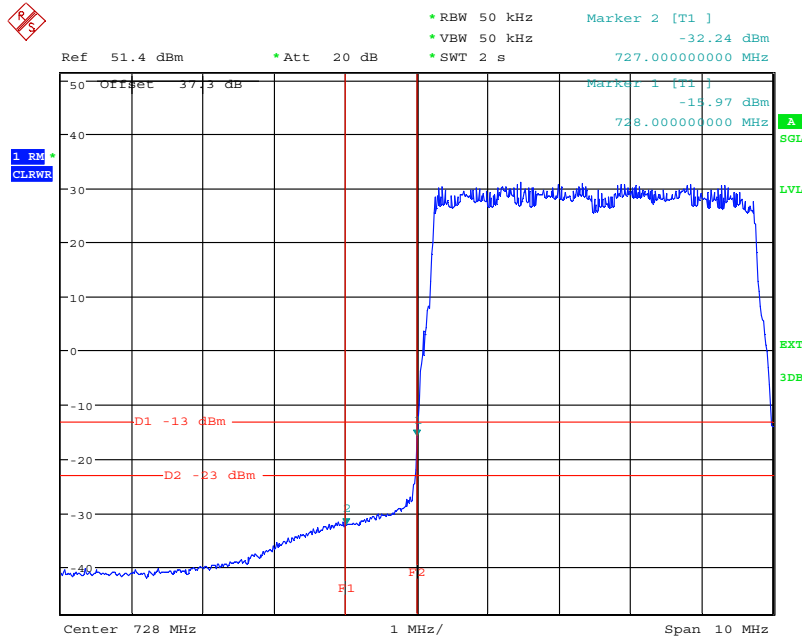
**Figure 7-65: Spurious Emissions (30MHz-1GHz)
– QPSK (737.0 MHz) (5MHz Channel BW)**



Date: 4.DEC.2009 08:53:00

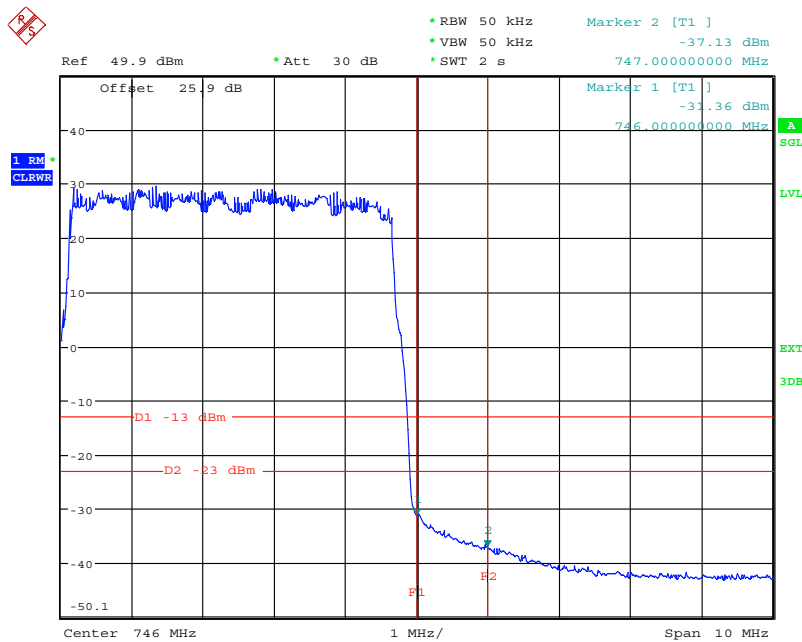
**Figure 7-66: Spurious Emissions (1GHz-8GHz)
– QPSK (737.0 MHz) (5MHz Channel BW)**

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Date: 4.DEC.2009 11:14:13

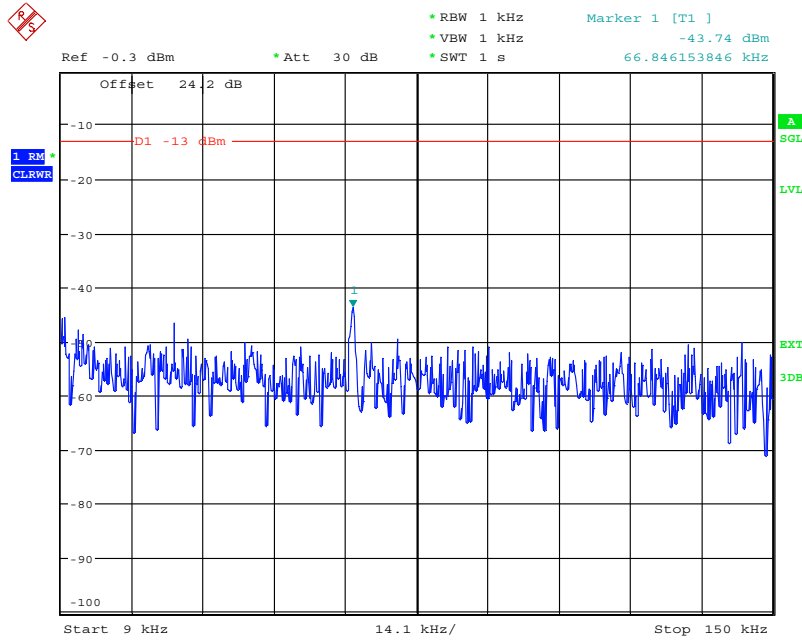
Figure 7-67: Spurious Emissions (Lower band edge) – 16QAM (730.5 MHz) (5MHz Channel BW)



Date: 4.DEC.2009 12:41:12

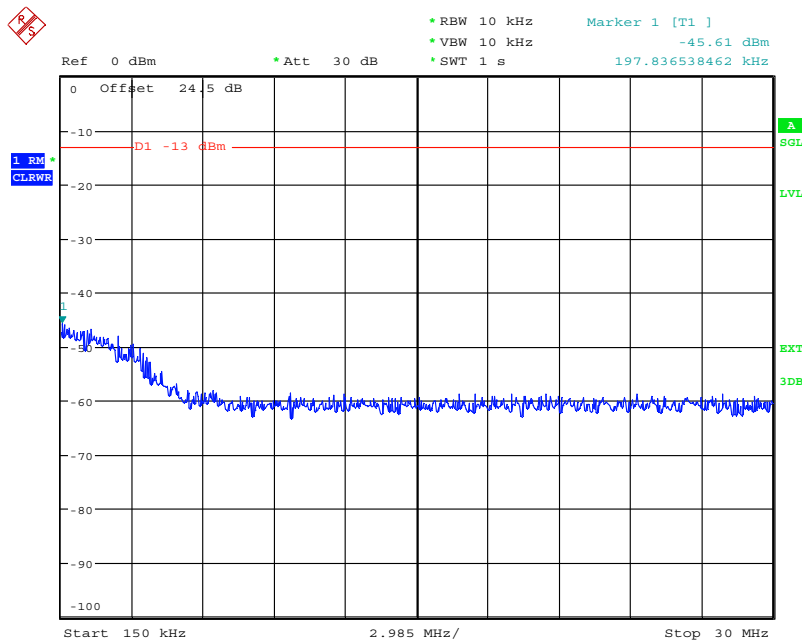
Figure 7-68: Spurious Emissions (Upper band edge) – 16QAM (743.4 MHz) (5MHz Channel BW)

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Date: 4.DEC.2009 09:05:47

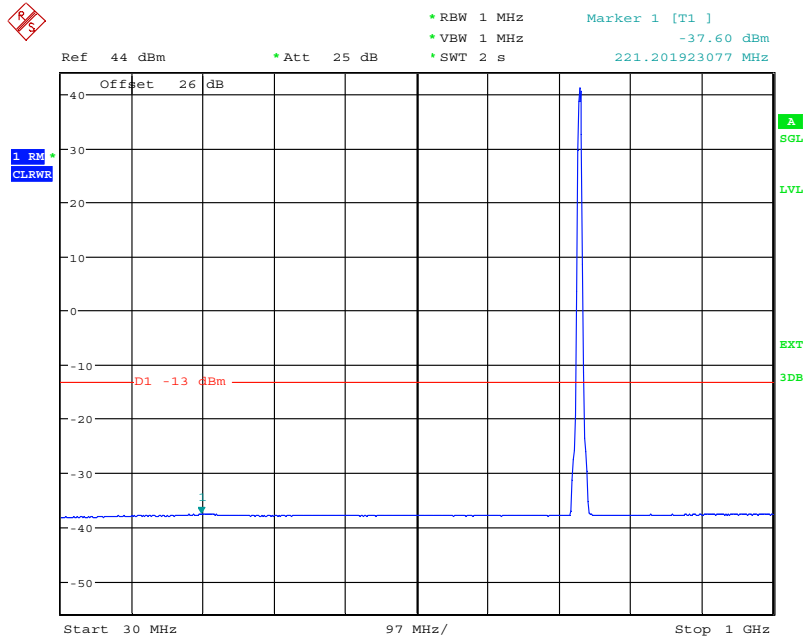
**Figure 7-69: Spurious Emissions (9kHz-150kHz)
- 16QAM (737.0 MHz) (5MHz Channel BW)**



Date: 4.DEC.2009 09:04:26

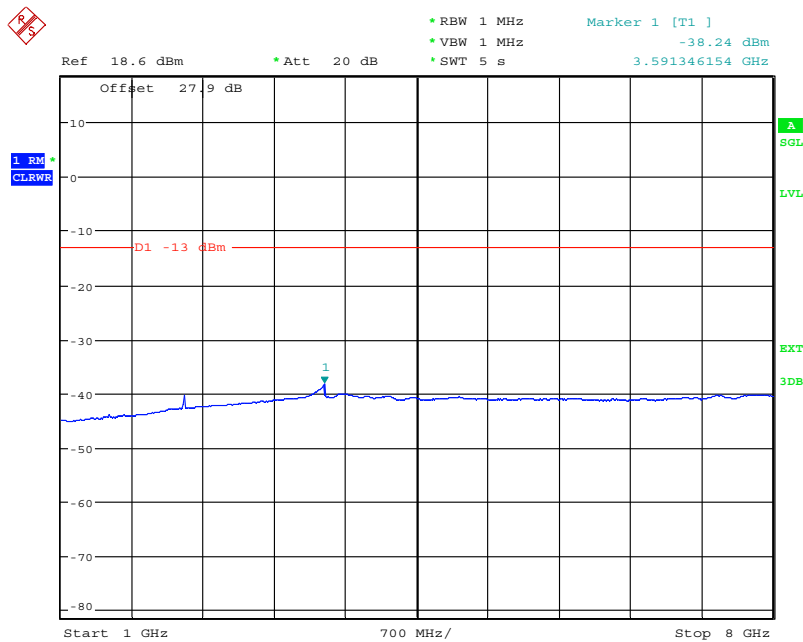
**Figure 7-70: Spurious Emissions (150kHz-30MHz)
- 16QAM (737.0 MHz) (5MHz Channel BW)**

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Date: 4.DEC.2009 08:57:57

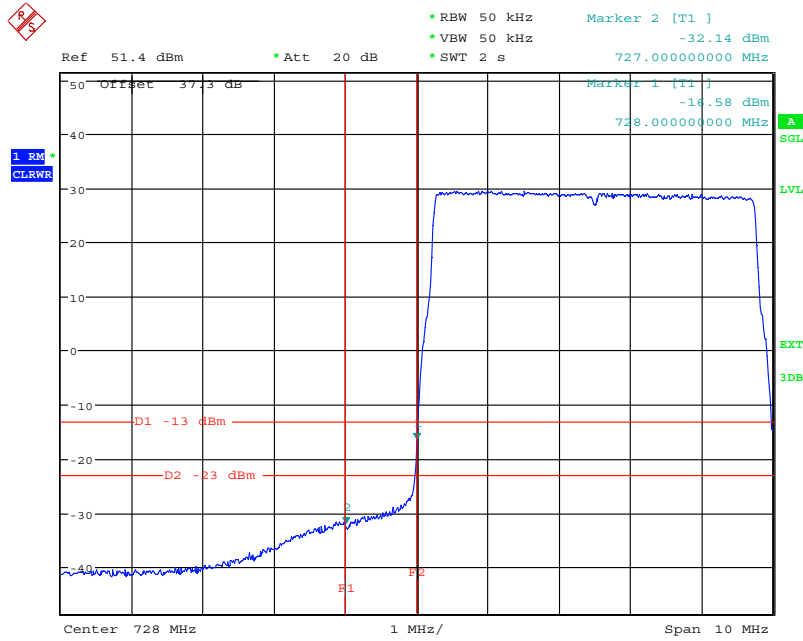
**Figure 7-71: Spurious Emissions (30MHz-1GHz)
- 16QAM (737.0 MHz) (5MHz Channel BW)**



Date: 4.DEC.2009 08:54:51

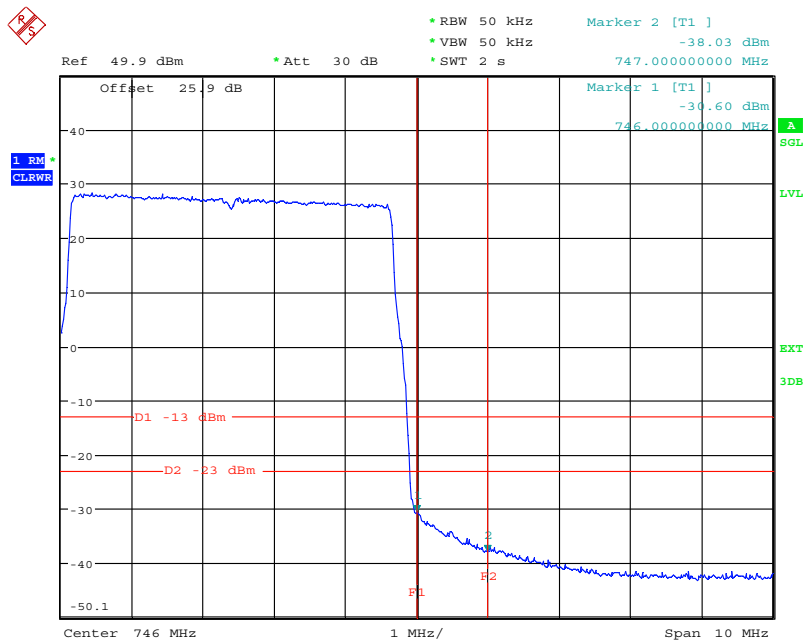
**Figure 7-72: Spurious Emissions (1GHz-8GHz)
- 16QAM (737.0 MHz) (5MHz Channel BW)**

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Date: 4.DEC.2009 11:13:36

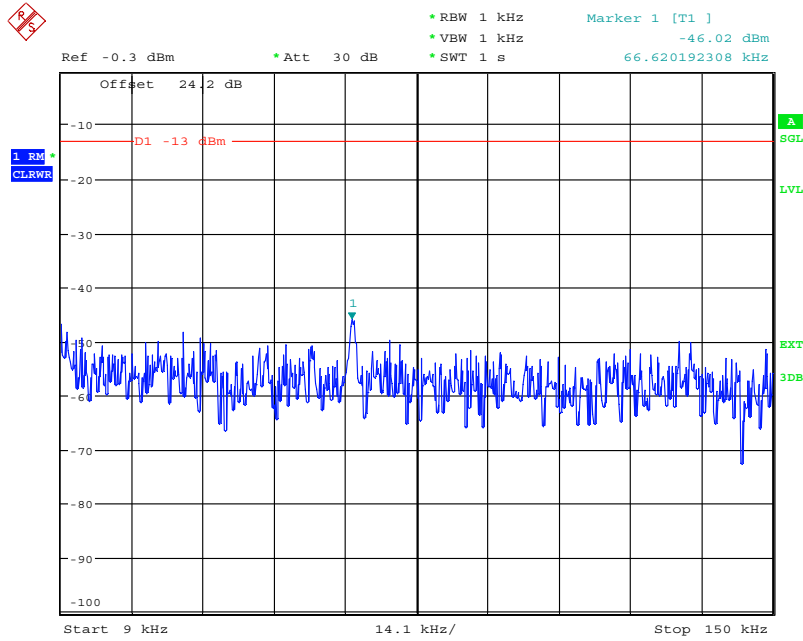
Figure 7-73: Spurious Emissions (Lower band edge) – 64QAM (730.5 MHz) (5MHz Channel BW)



Date: 4.DEC.2009 12:40:34

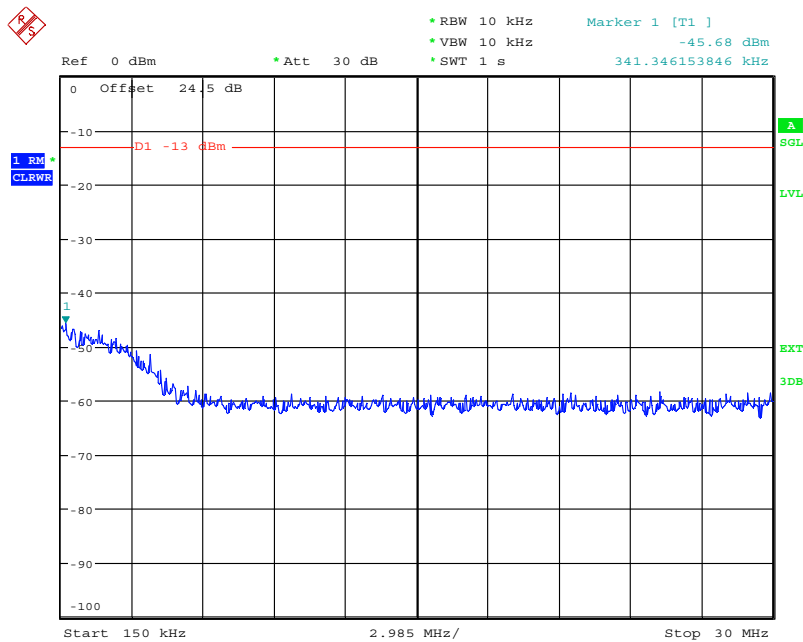
Figure 7-74: Spurious Emissions (Upper band edge) – 64QAM (743.4 MHz) (5MHz Channel BW)

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Date: 4.DEC.2009 09:06:20

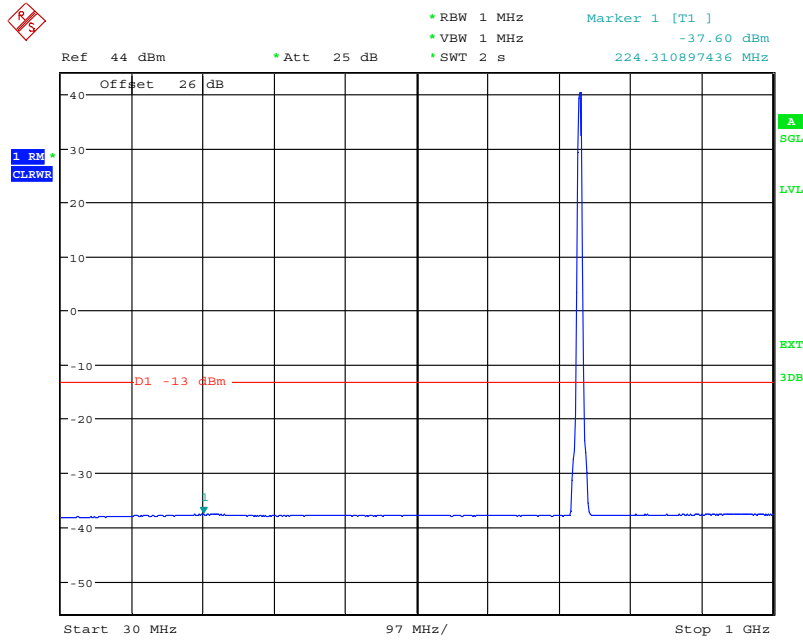
**Figure 7-75: Spurious Emissions (9kHz-150kHz)
– 64QAM (737.0 MHz) (5MHz Channel BW)**



Date: 4.DEC.2009 09:03:44

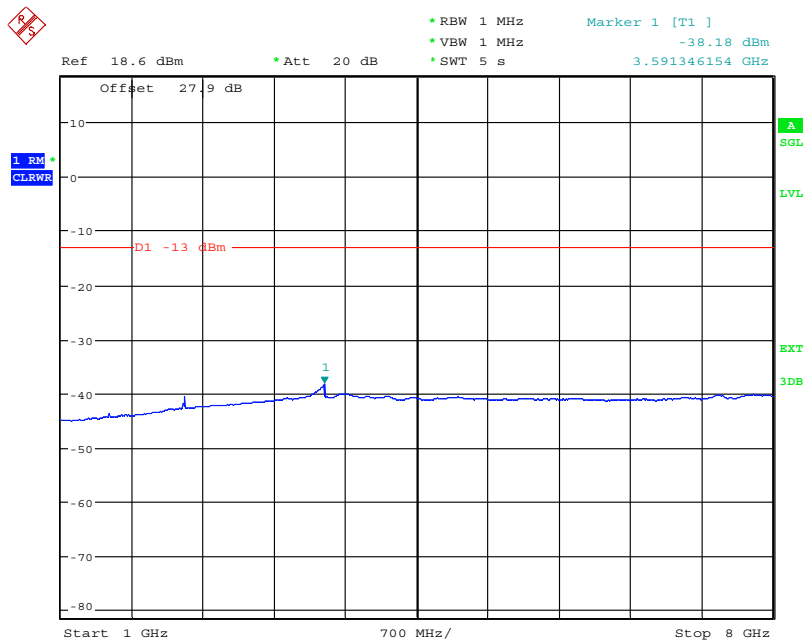
**Figure 7-76: Spurious Emissions (150kHz-30MHz)
– 64QAM (737.0 MHz) (5MHz Channel BW)**

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Date: 4.DEC.2009 08:58:43

**Figure 7-77: Spurious Emissions (30MHz-1GHz)
- 64QAM (737.0 MHz) (5MHz Channel BW)**

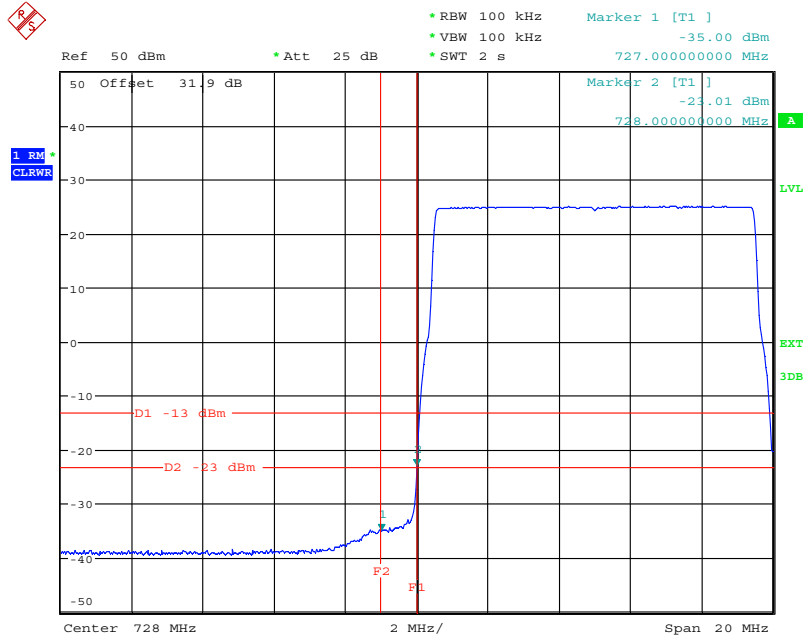


Date: 4.DEC.2009 08:54:14

**Figure 7-78: Spurious Emissions (1GHz-8GHz)
- 64QAM (737.0 MHz) (5MHz Channel BW)**

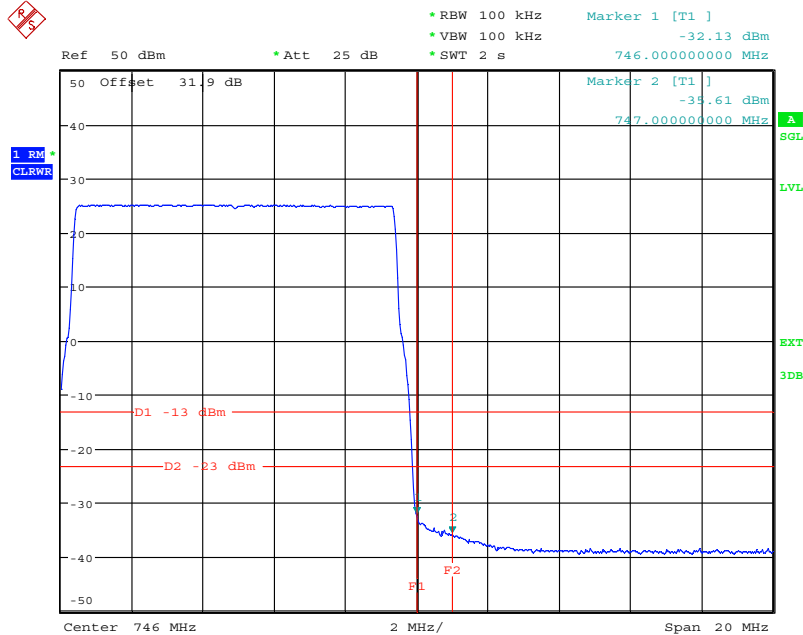
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Config B TX1:



Date: 1.DEC.2009 13:33:33

Figure 7-79: Spurious Emissions (Lower band edge) – QPSK (733.0 MHz) (10MHz Channel BW)

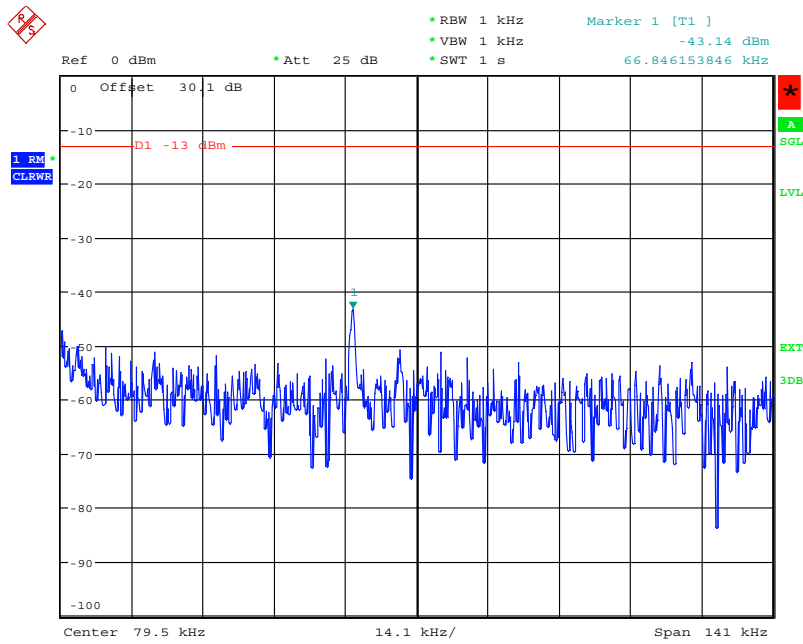


Date: 1.DEC.2009 12:55:27

Figure 7-80: Spurious Emissions (Upper band edge) – QPSK (740.9 MHz) (10MHz Channel BW)

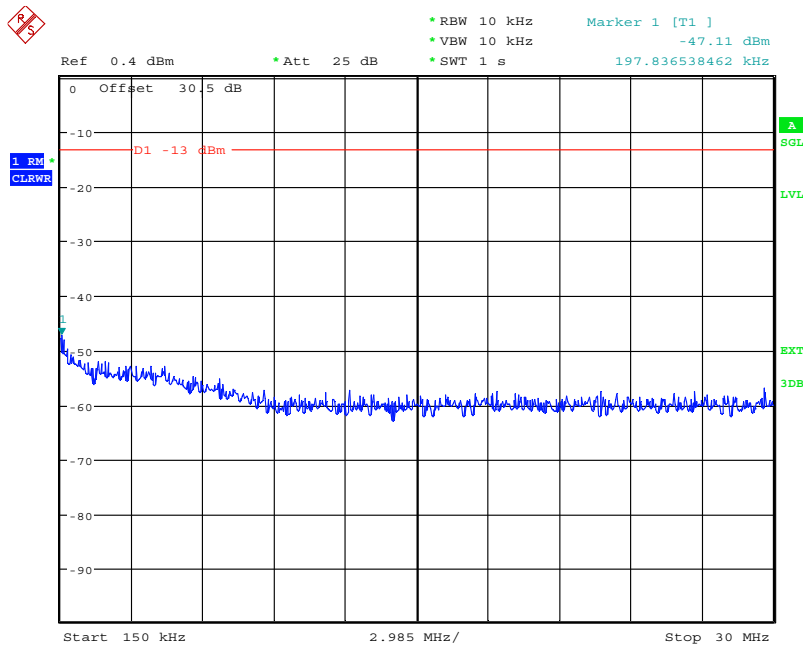
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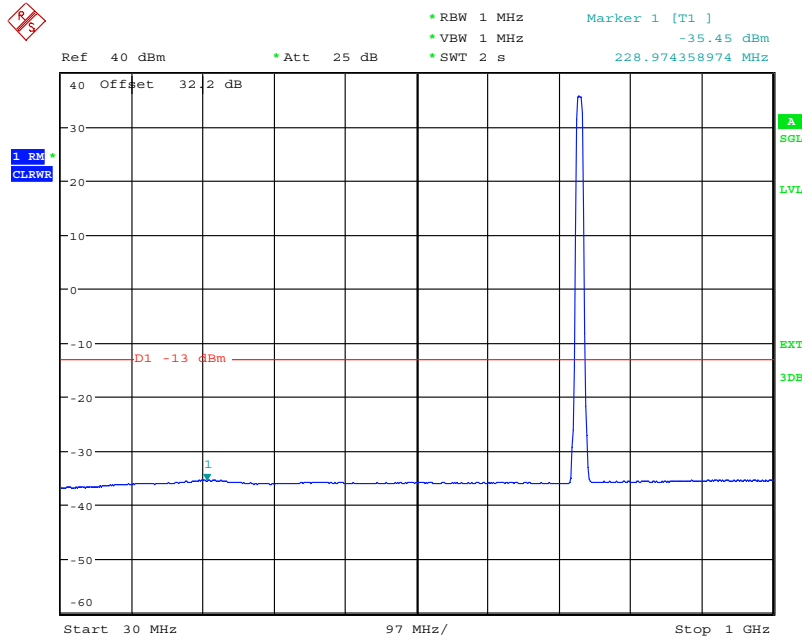
Date: 2.DEC.2009 10:50:46

**Figure 7-81: Spurious Emissions (9kHz-150kHz)
– QPSK (737.0 MHz) (10MHz Channel BW)**



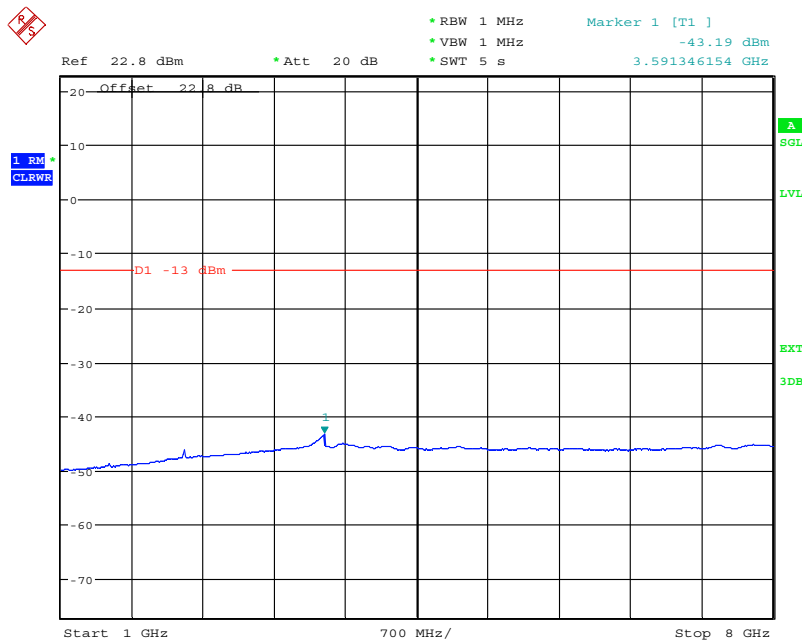
Date: 2.DEC.2009 12:51:43

**Figure 7-82: Spurious Emissions (150kHz-30MHz)
– QPSK (737.0 MHz) (10MHz Channel BW)**



Date: 2.DEC.2009 12:59:39

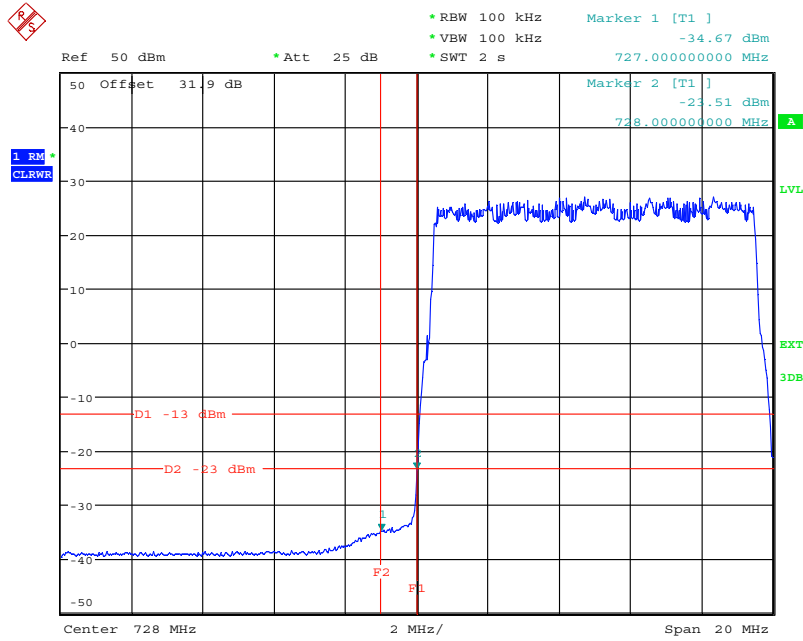
**Figure 7-83: Spurious Emissions (30MHz-1GHz)
– QPSK (737.0 MHz) (10MHz Channel BW)**



Date: 2.DEC.2009 14:36:31

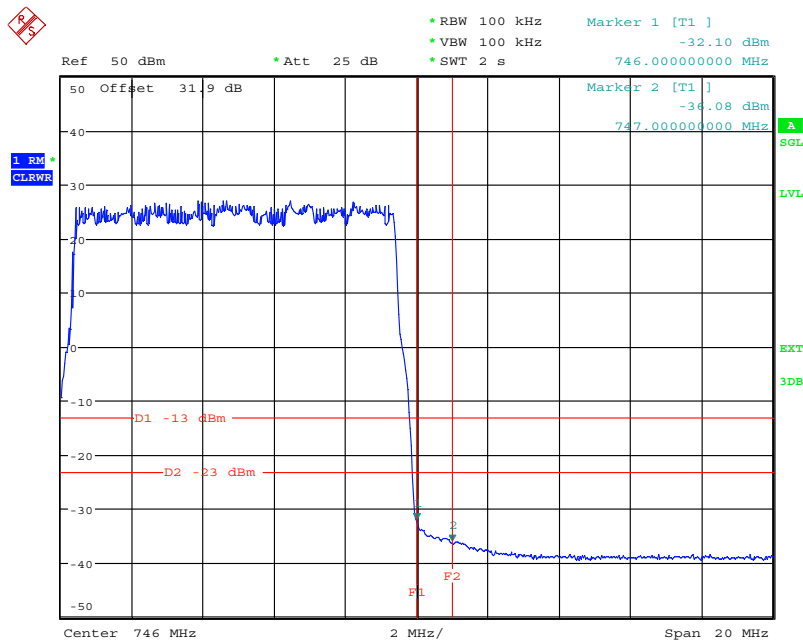
**Figure 7-84: Spurious Emissions (1GHz-8GHz)
– QPSK (737.0 MHz) (10MHz Channel BW)**

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Date: 1.DEC.2009 13:30:05

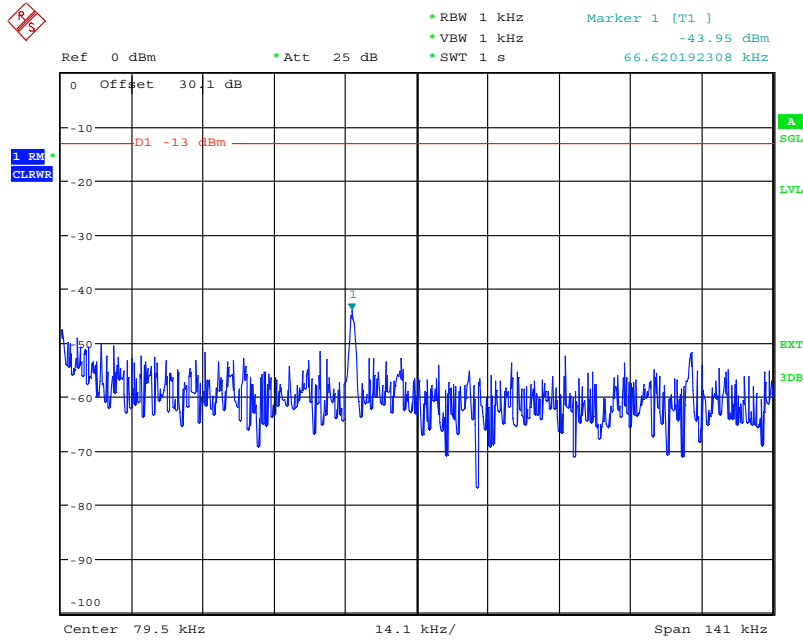
**Figure 7-85: Spurious Emissions (Lower band edge)
– 16QAM (733.0 MHz) (10MHz Channel BW)**



Date: 1.DEC.2009 12:59:23

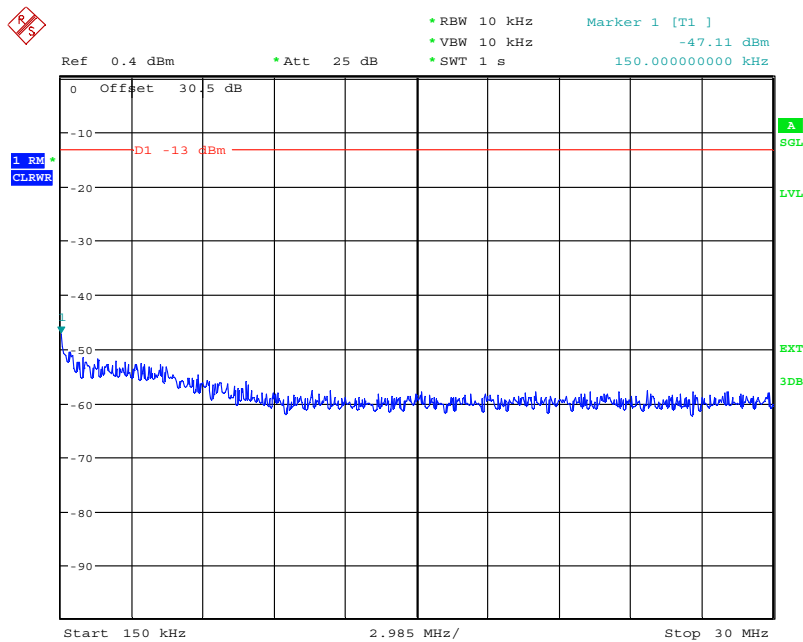
**Figure 7-86: Spurious Emissions (Upper band edge)
– 16QAM (740.9 MHz) (10MHz Channel BW)**

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Date: 2.DEC.2009 11:02:34

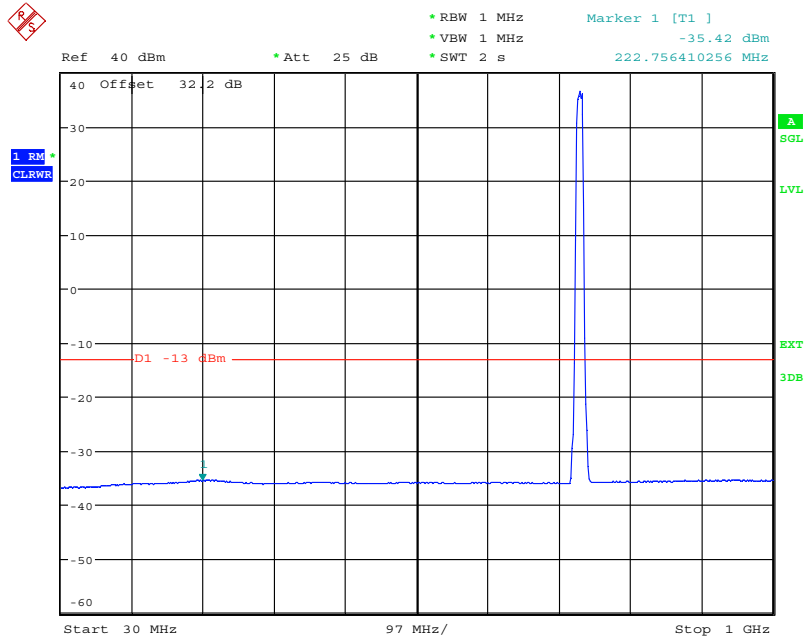
**Figure 7-87: Spurious Emissions (9kHz-150kHz)
– 16QAM (737.0 MHz) (10MHz Channel BW)**



Date: 2.DEC.2009 12:49:30

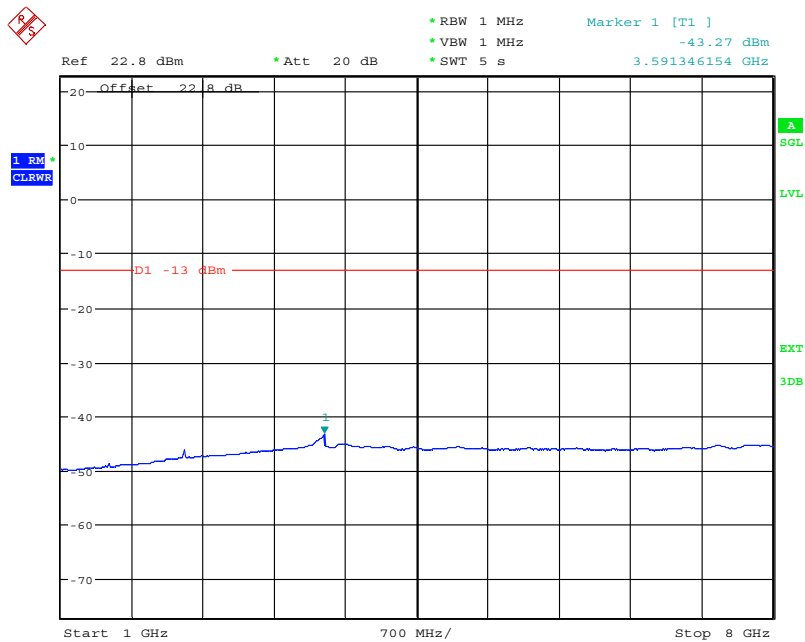
**Figure 7-88: Spurious Emissions (150kHz-30MHz)
– 16QAM (737.0 MHz) (10MHz Channel BW)**

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Date: 2.DEC.2009 13:02:47

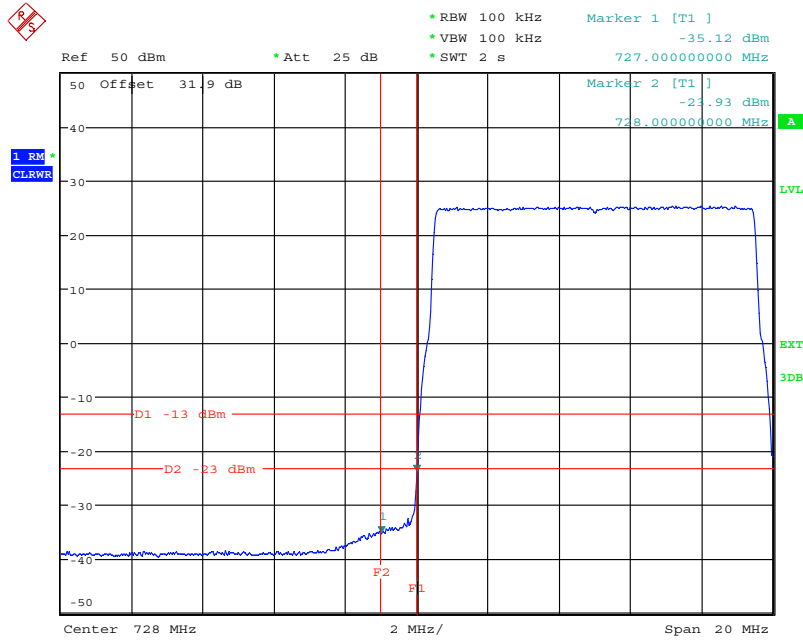
**Figure 7-89: Spurious Emissions (30MHz-1GHz)
– 16QAM (737.0 MHz) (10MHz Channel BW)**



Date: 2.DEC.2009 14:33:49

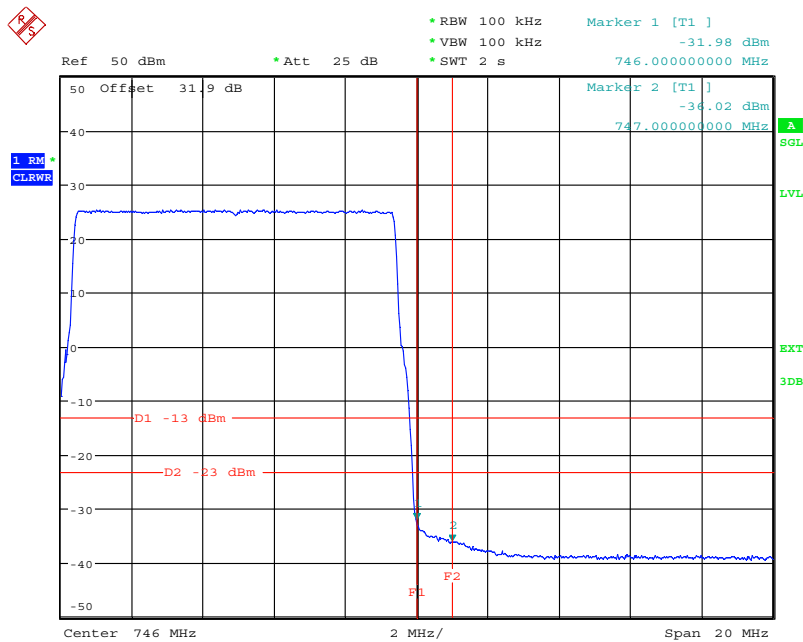
**Figure 7-90: Spurious Emissions (1GHz-8GHz)
– 16QAM (737.0 MHz) (10MHz Channel BW)**

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Date: 1.DEC.2009 13:31:11

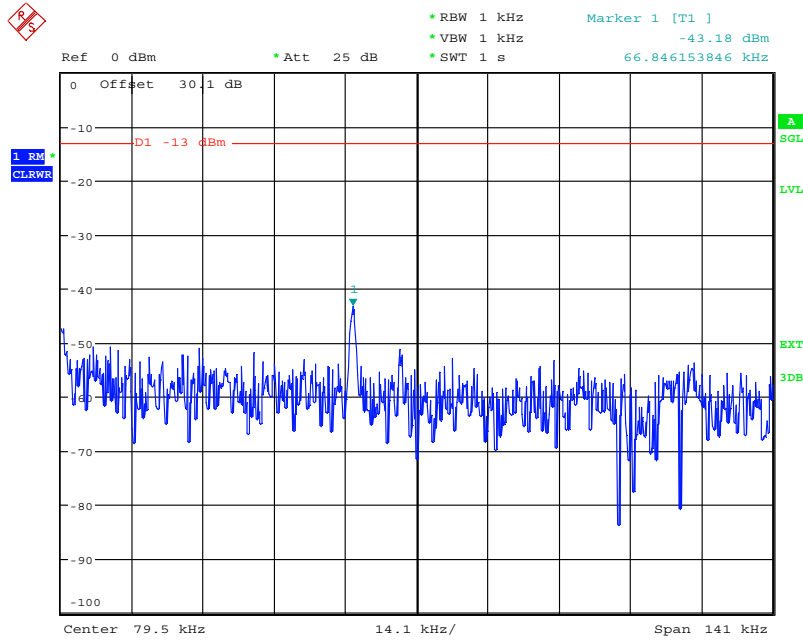
**Figure 7-91: Spurious Emissions (Lower band edge)
– 64QAM (733.0 MHz) (10MHz Channel BW)**



Date: 1.DEC.2009 12:58:08

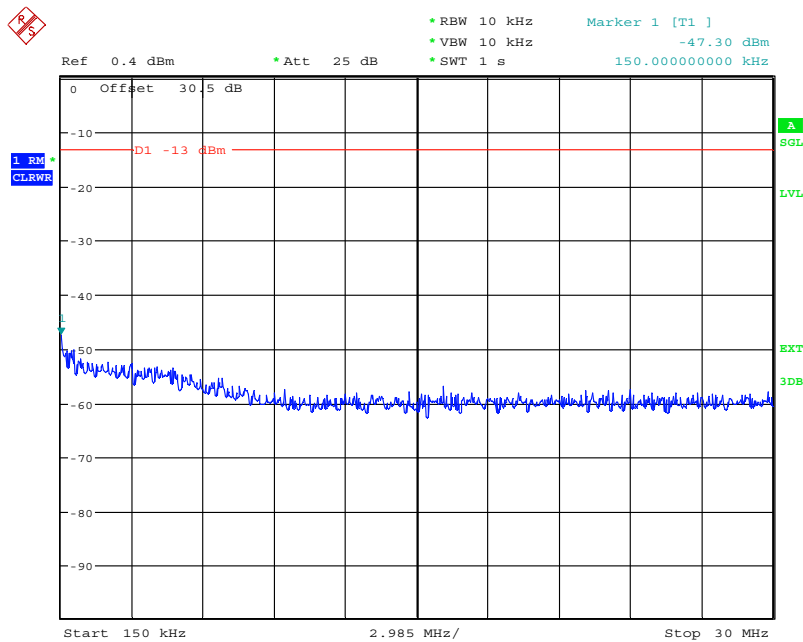
**Figure 7-92: Spurious Emissions (Upper band edge)
– 64QAM (740.9 MHz) (10MHz Channel BW)**

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Date: 2.DEC.2009 10:59:21

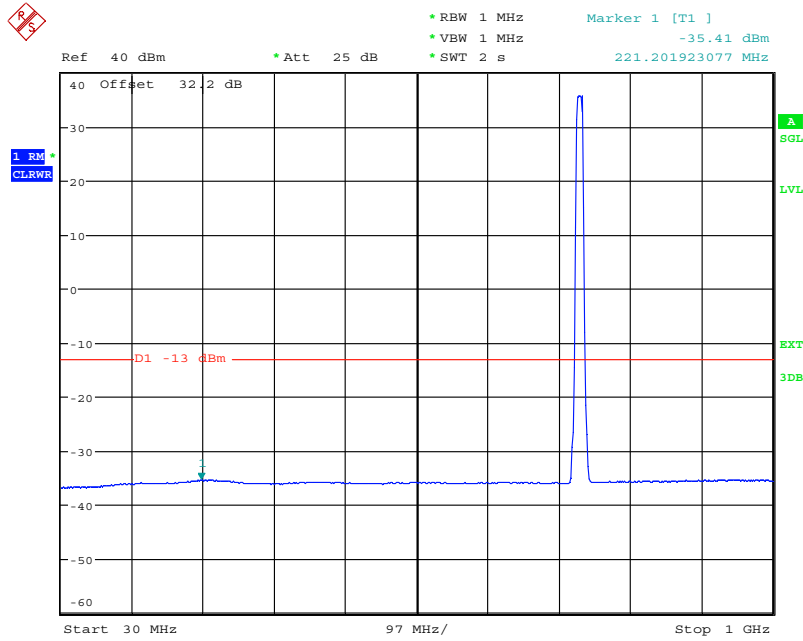
**Figure 7-93: Spurious Emissions (9kHz-150kHz)
– 64QAM (737.0 MHz) (10MHz Channel BW)**



Date: 2.DEC.2009 12:50:20

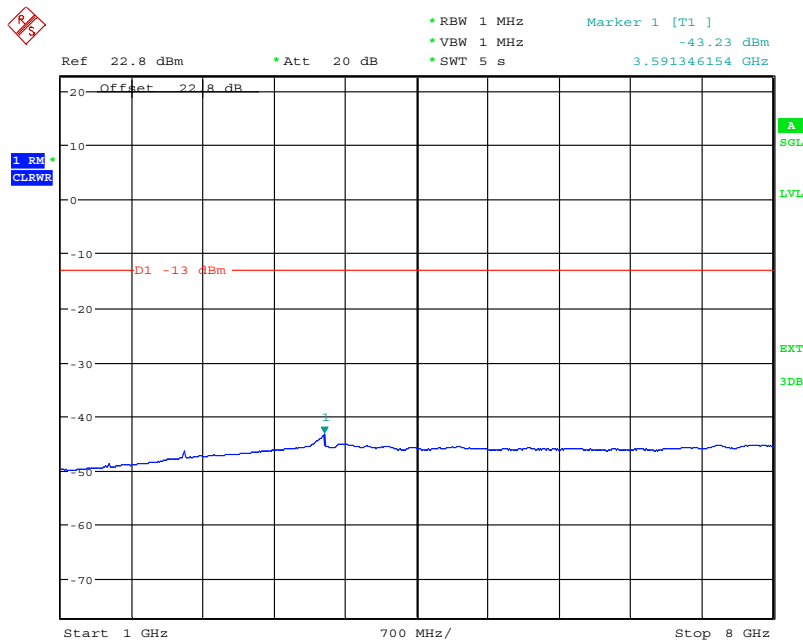
**Figure 7-94: Spurious Emissions (150kHz-30MHz)
– 64QAM (737.0 MHz) (10MHz Channel BW)**

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Date: 2.DEC.2009 13:01:57

**Figure 7-95: Spurious Emissions (30MHz-1GHz)
– 64QAM (737.0 MHz) (10MHz Channel BW)**

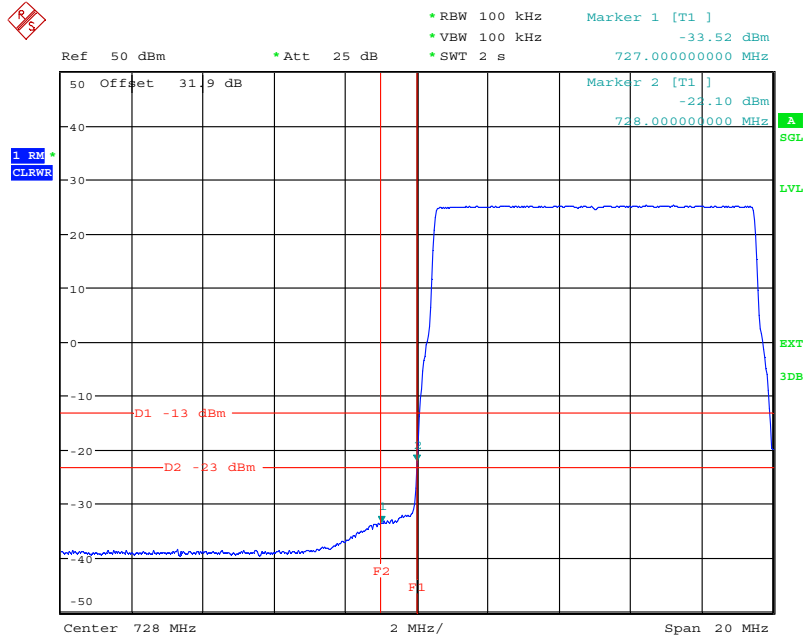


Date: 2.DEC.2009 14:34:56

**Figure 7-96: Spurious Emissions (1GHz-8GHz)
– 64QAM (737.0 MHz) (10MHz Channel BW)**

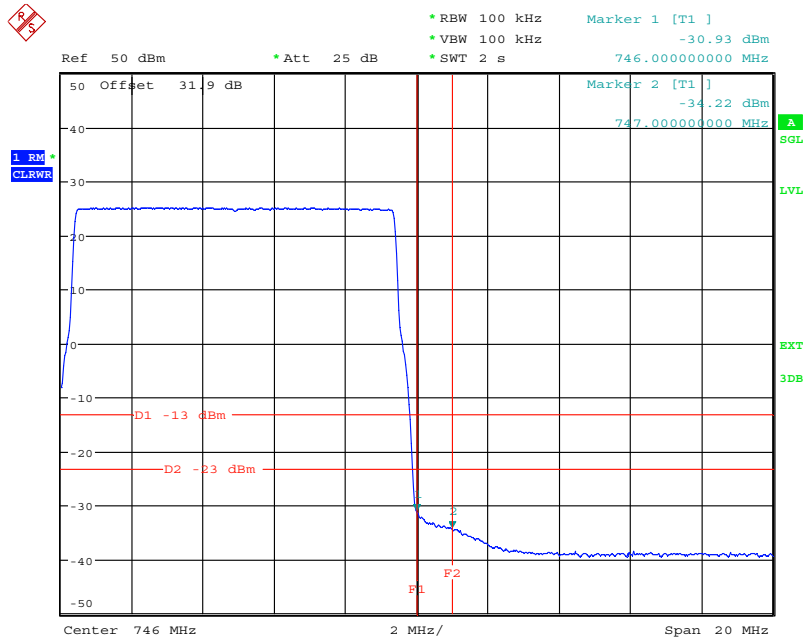
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Config B TX2:



Date: 1.DEC.2009 13:25:03

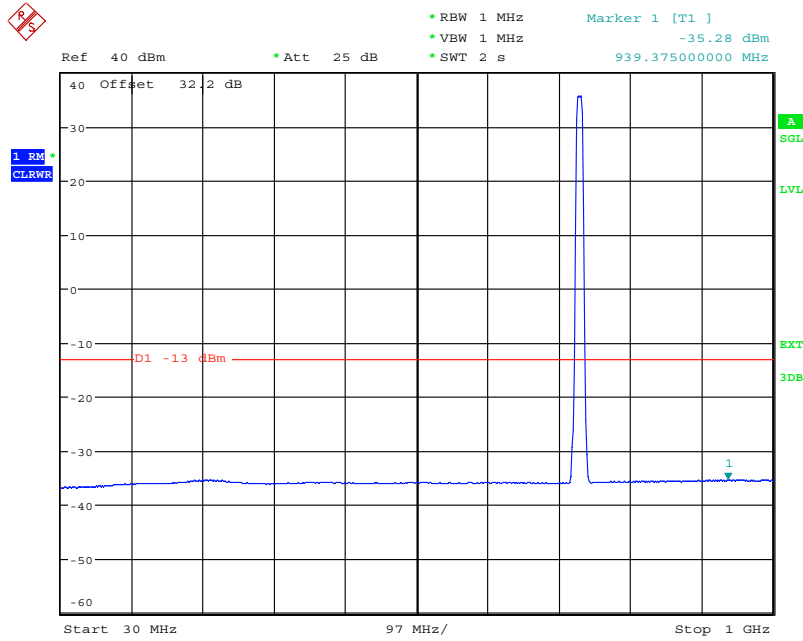
**Figure 7-97: Spurious Emissions (Lower band edge)
– QPSK (733.0 MHz) (10MHz Channel BW)**



Date: 1.DEC.2009 13:06:13

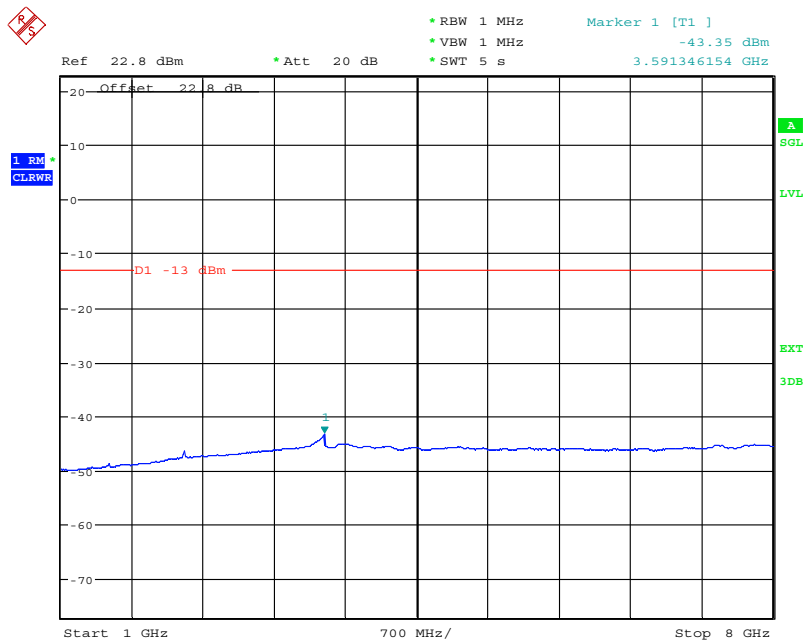
**Figure 7-98: Spurious Emissions (Upper band edge)
– QPSK (740.9 MHz) (10MHz Channel BW)**

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Date: 2.DEC.2009 13:07:11

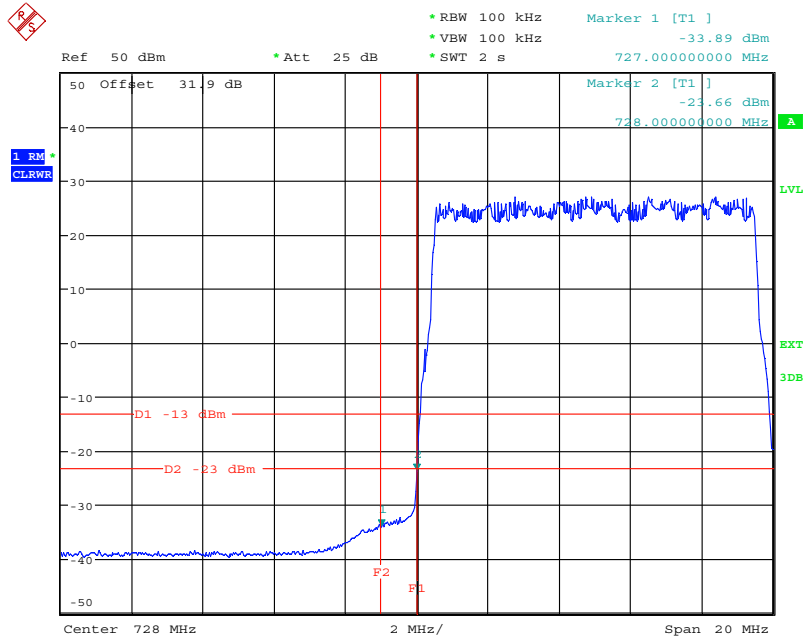
**Figure 7-101: Spurious Emissions (30MHz-1GHz)
- QPSK (737.0 MHz) (10MHz Channel BW)**



Date: 2.DEC.2009 14:29:19

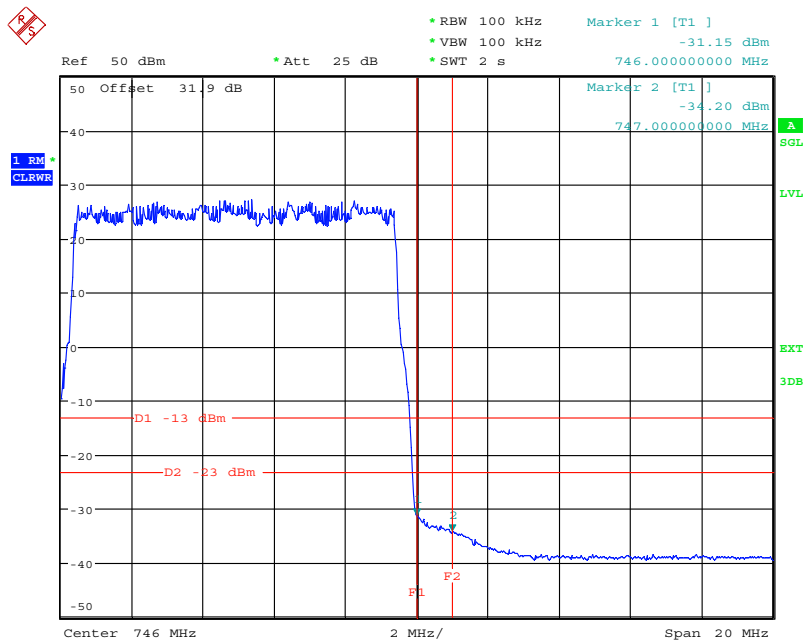
**Figure 7-102: Spurious Emissions (1GHz-8GHz)
- QPSK (737.0 MHz) (10MHz Channel BW)**

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Date: 1.DEC.2009 13:28:14

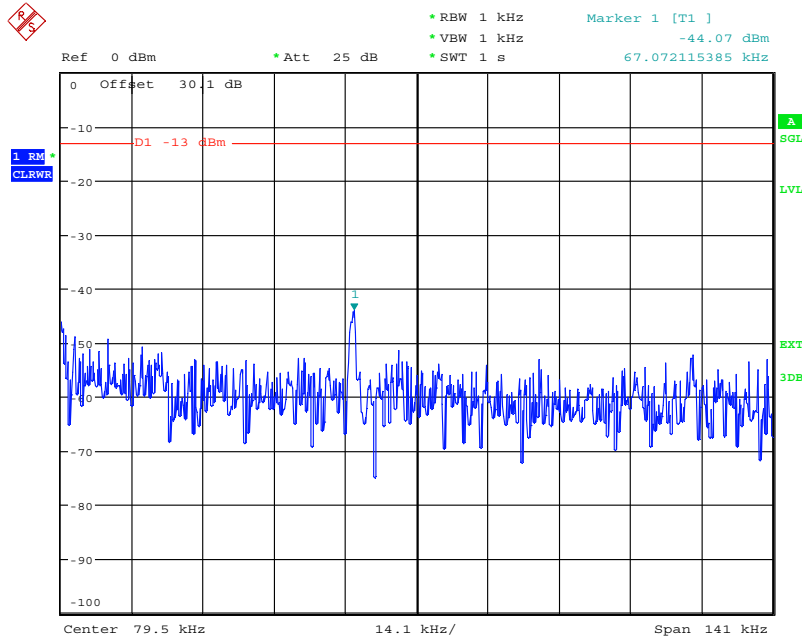
Figure 7-103: Spurious Emissions (Lower band edge) – 16QAM (733.0 MHz) (10MHz Channel BW)



Date: 1.DEC.2009 13:02:44

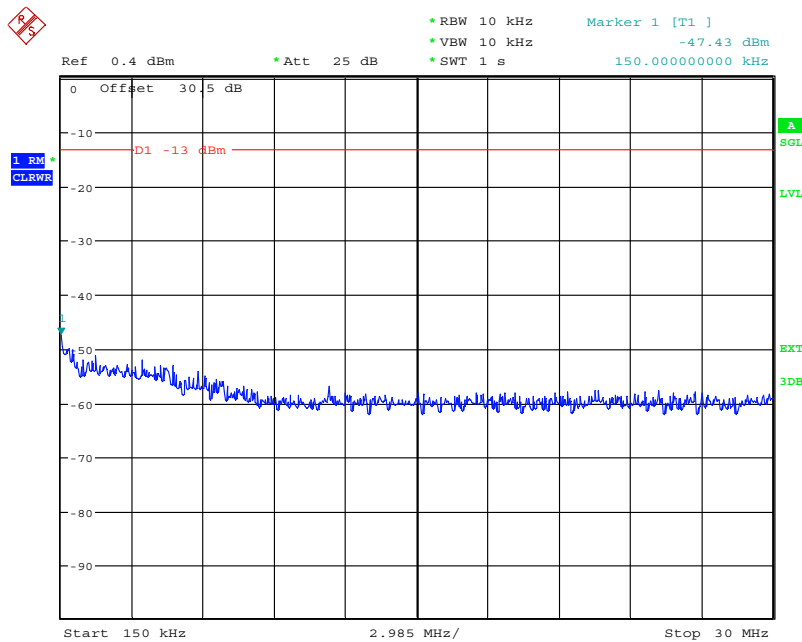
Figure 7-104: Spurious Emissions (Upper band edge) – 16QAM (740.9 MHz) (10MHz Channel BW)

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Date: 2.DEC.2009 11:07:30

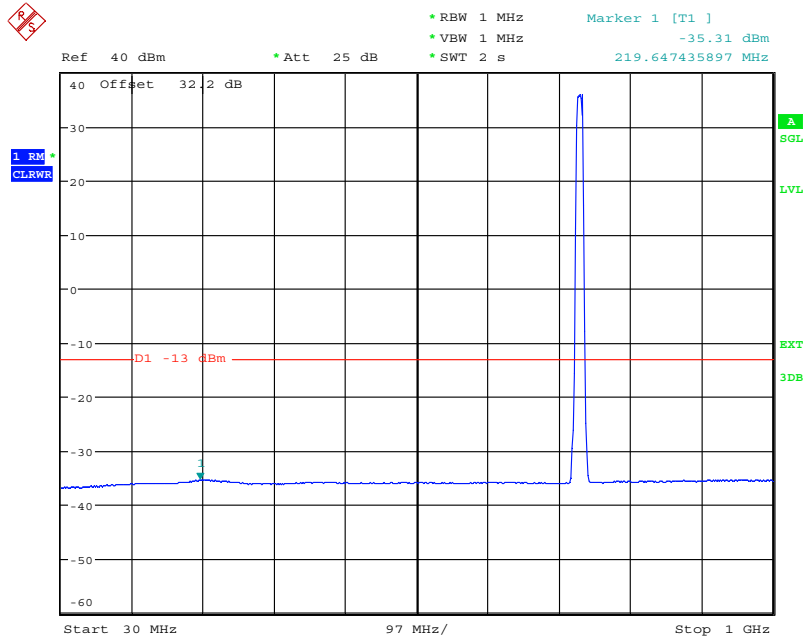
**Figure 7-105: Spurious Emissions (9kHz-150kHz)
– 16QAM (737.0 MHz) (10MHz Channel BW)**



Date: 2.DEC.2009 12:48:15

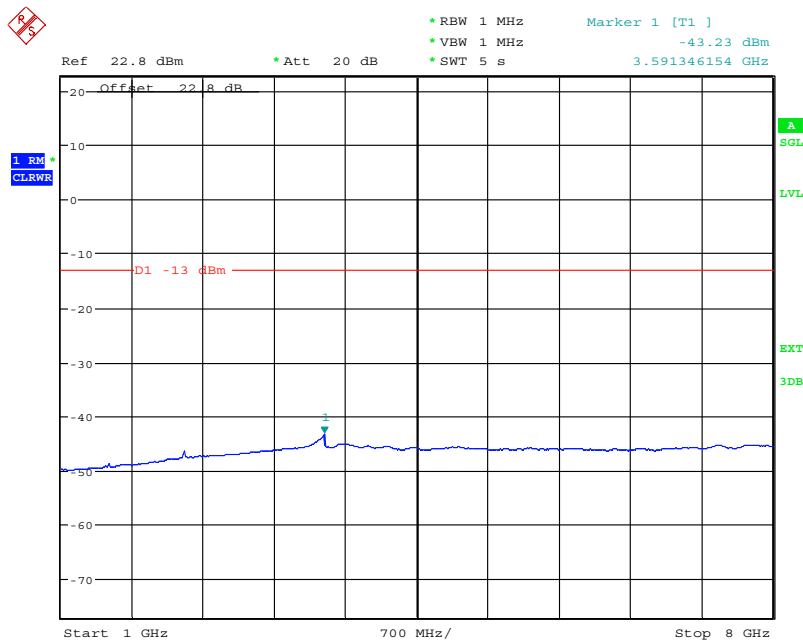
**Figure 7-106: Spurious Emissions (150kHz-30MHz)
– 16QAM (737.0 MHz) (10MHz Channel BW)**

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Date: 2.DEC.2009 13:04:34

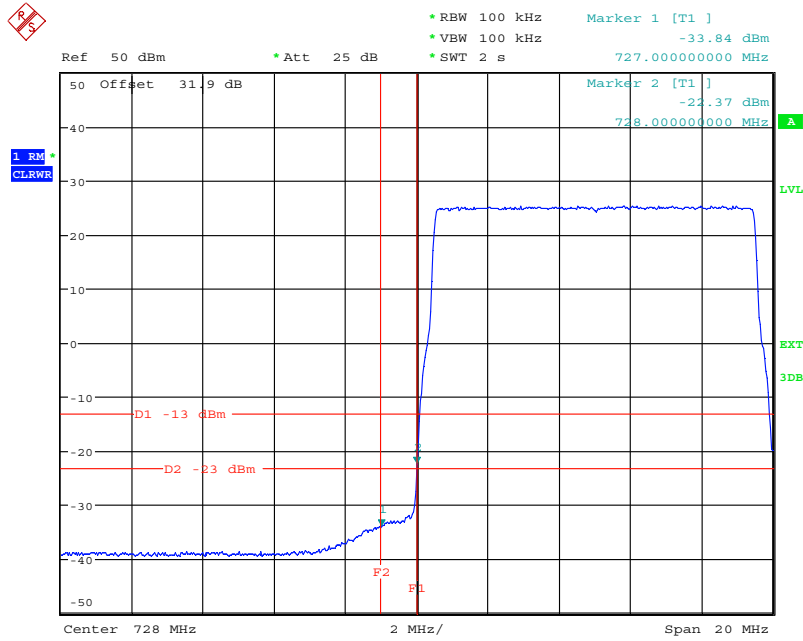
**Figure 7-107: Spurious Emissions (30MHz-1GHz)
– 16QAM (737.0 MHz) (10MHz Channel BW)**



Date: 2.DEC.2009 14:32:01

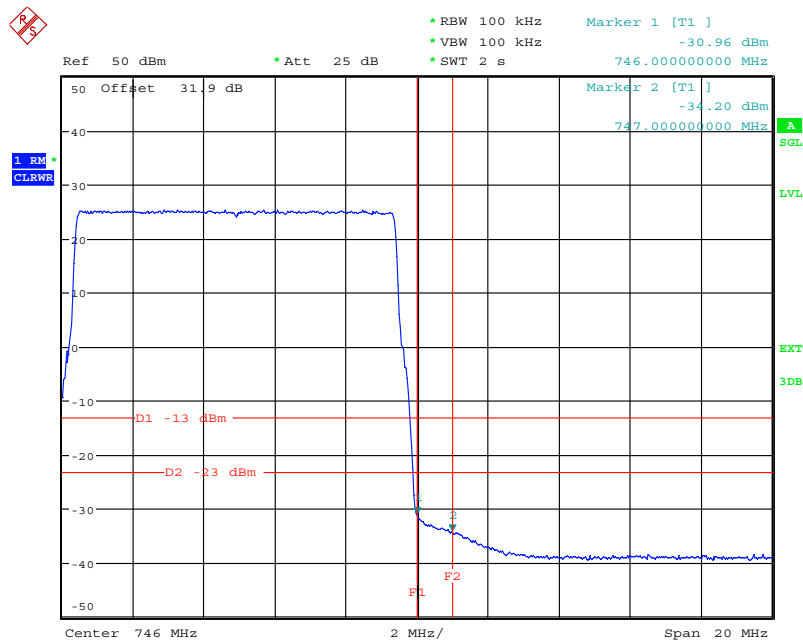
**Figure 7-108: Spurious Emissions (1GHz-8GHz)
– 16QAM (737.0 MHz) (10MHz Channel BW)**

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Date: 1.DEC.2009 13:27:23

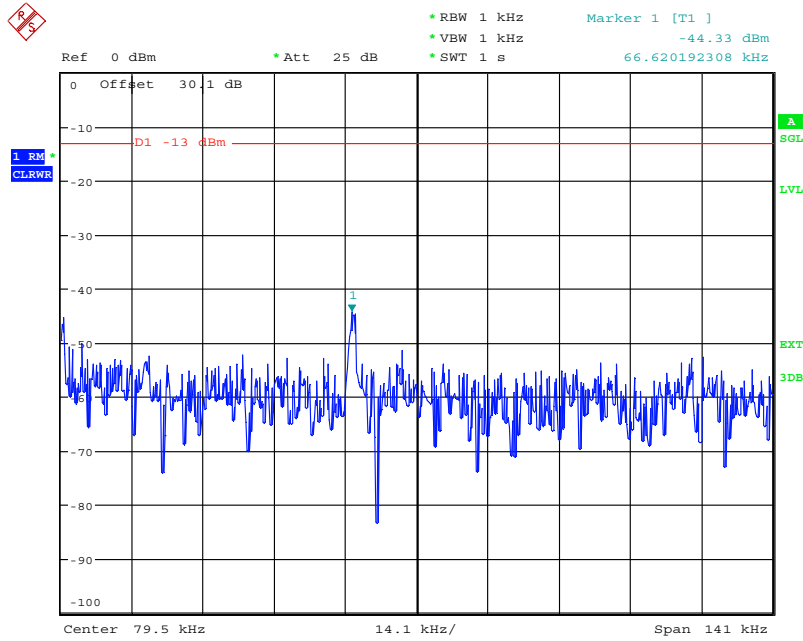
**Figure 7-109: Spurious Emissions (Lower band edge)
– 64QAM (733.0 MHz) (10MHz Channel BW)**



Date: 1.DEC.2009 13:03:51

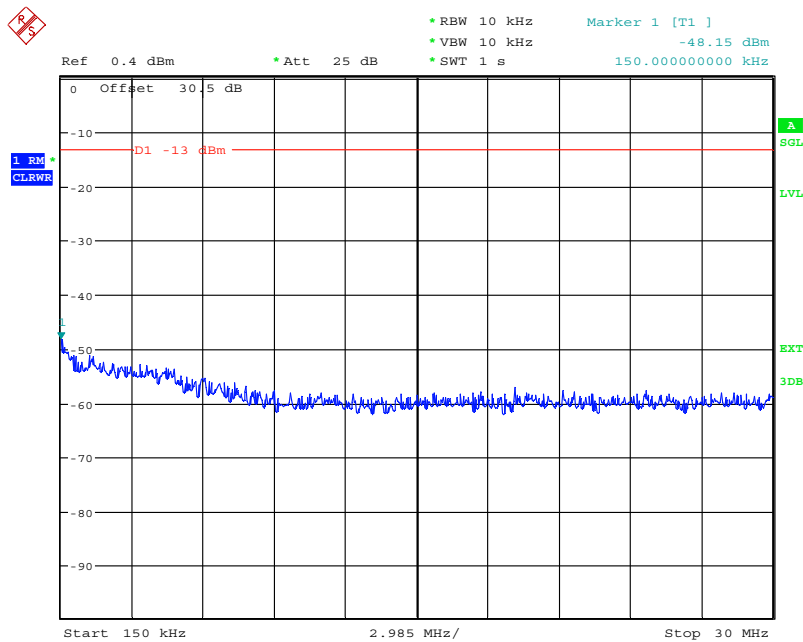
**Figure 7-110: Spurious Emissions (Upper band edge)
– 64QAM (740.9 MHz) (10MHz Channel BW)**

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Date: 2.DEC.2009 11:06:24

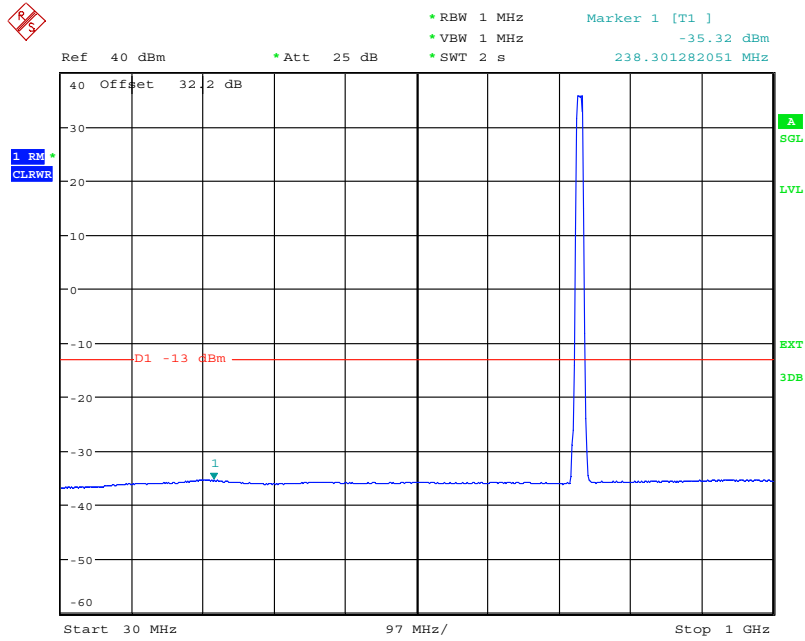
**Figure 7-111: Spurious Emissions (9kHz-150kHz)
64QAM (737.0 MHz) (10MHz Channel BW)**



Date: 2.DEC.2009 12:47:32

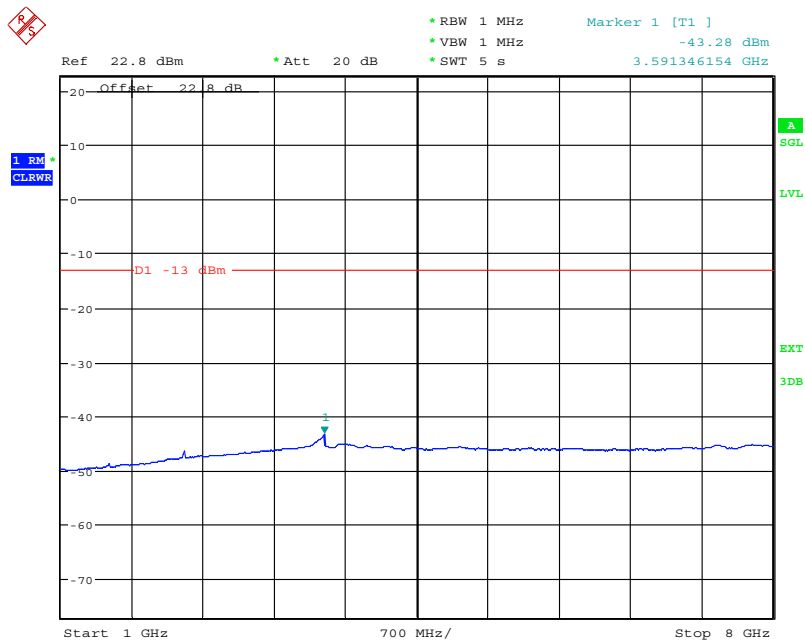
**Figure 7-112: Spurious Emissions (150kHz-30MHz)
– 64QAM (737.0 MHz) (10MHz Channel BW)**

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Date: 2.DEC.2009 13:05:23

**Figure 7-113: Spurious Emissions (30MHz-1GHz)
– 64QAM (737.0 MHz) (10MHz Channel BW)**

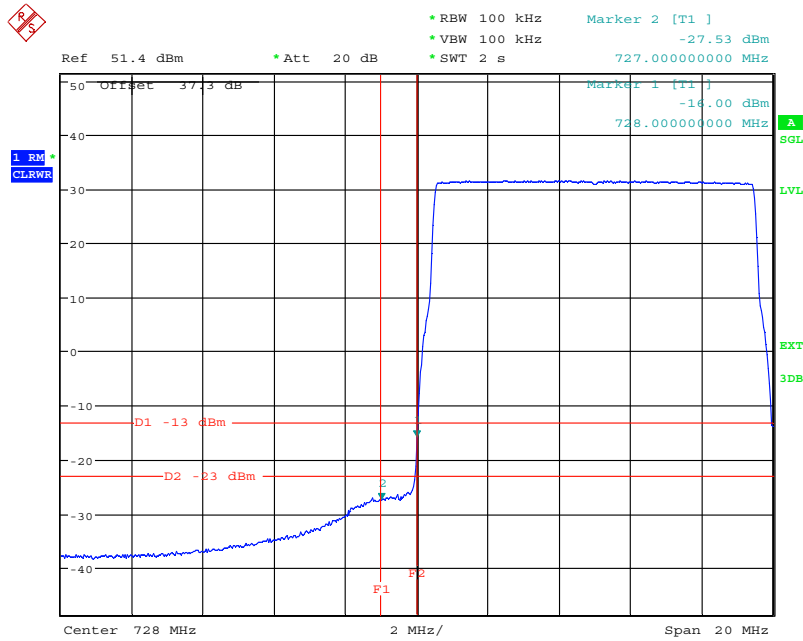


Date: 2.DEC.2009 14:31:04

**Figure 7-114: Spurious Emissions (1GHz-8GHz)
– 64QAM (737.0 MHz) (10MHz Channel BW)**

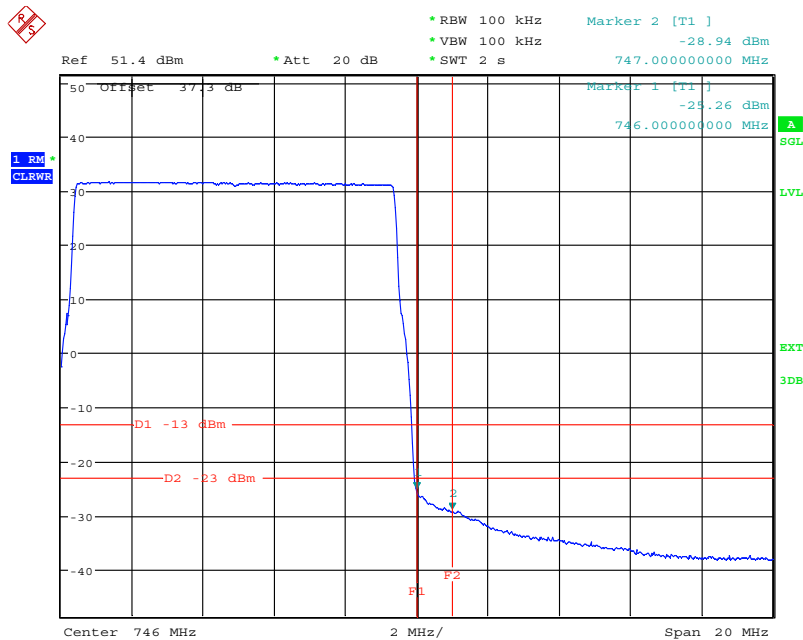
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Config B TX1+TX2:



Date: 4.DEC.2009 11:35:54

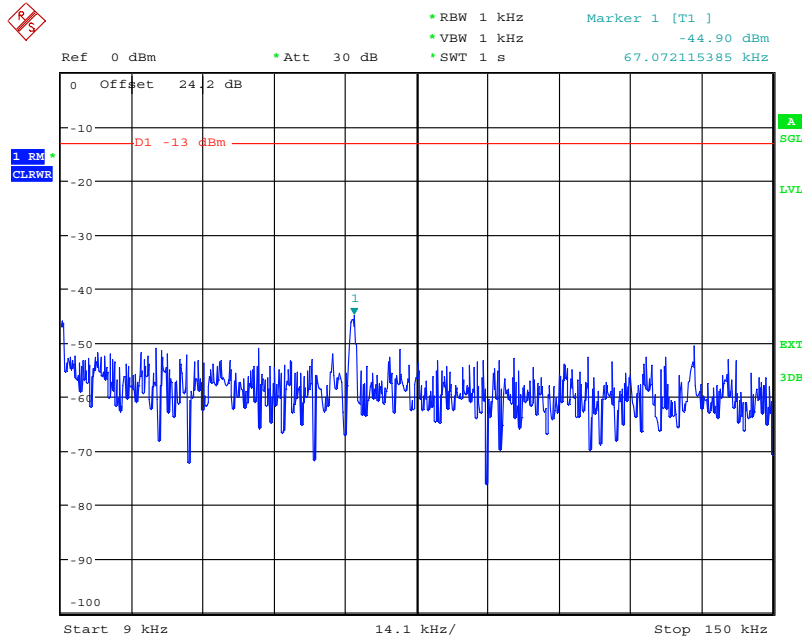
**Figure 7-115: Spurious Emissions (Lower band edge)
- QPSK (733.0 MHz) (10MHz Channel BW)**



Date: 4.DEC.2009 11:49:48

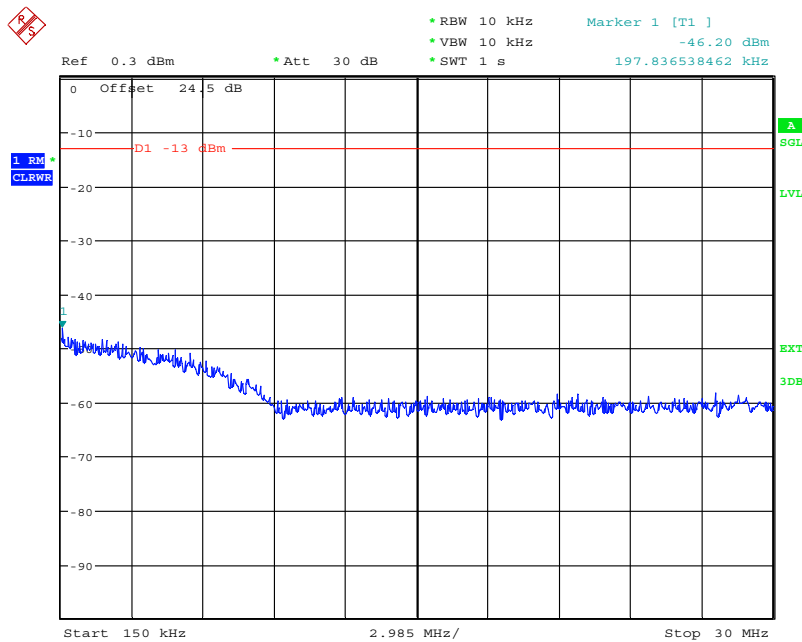
**Figure 7-116: Spurious Emissions (Upper band edge)
- QPSK (740.9 MHz) (10MHz Channel BW)**

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Date: 4.DEC.2009 08:17:16

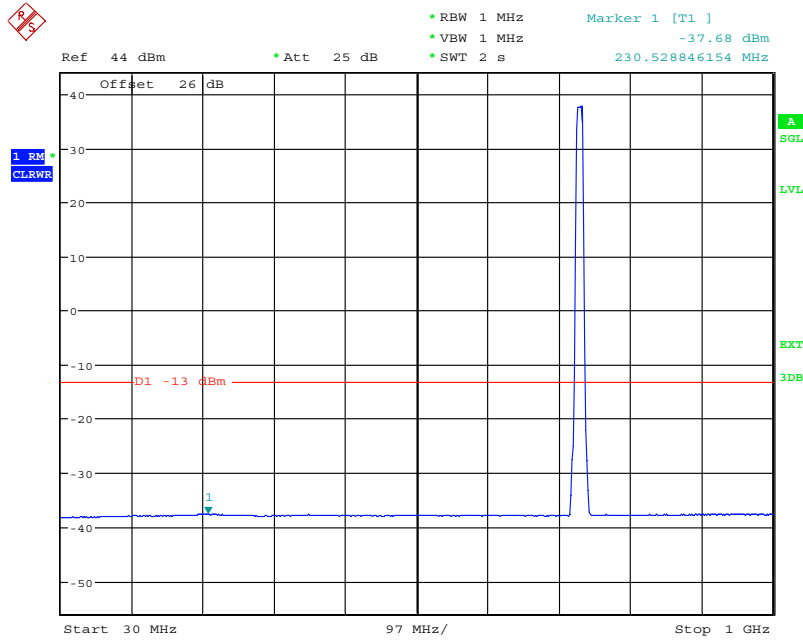
Figure 7-117: Spurious Emissions (9kHz-150kHz) – QPSK (737.0 MHz) (10MHz Channel BW)



Date: 4.DEC.2009 08:22:34

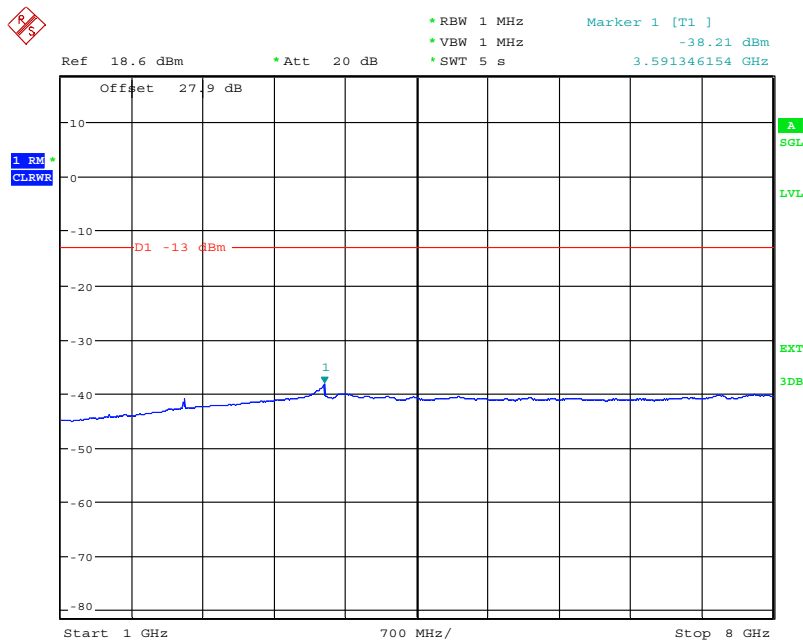
Figure 7-118: Spurious Emissions (150kHz-30MHz) – QPSK (737.0 MHz) (10MHz Channel BW)

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Date: 4.DEC.2009 08:01:35

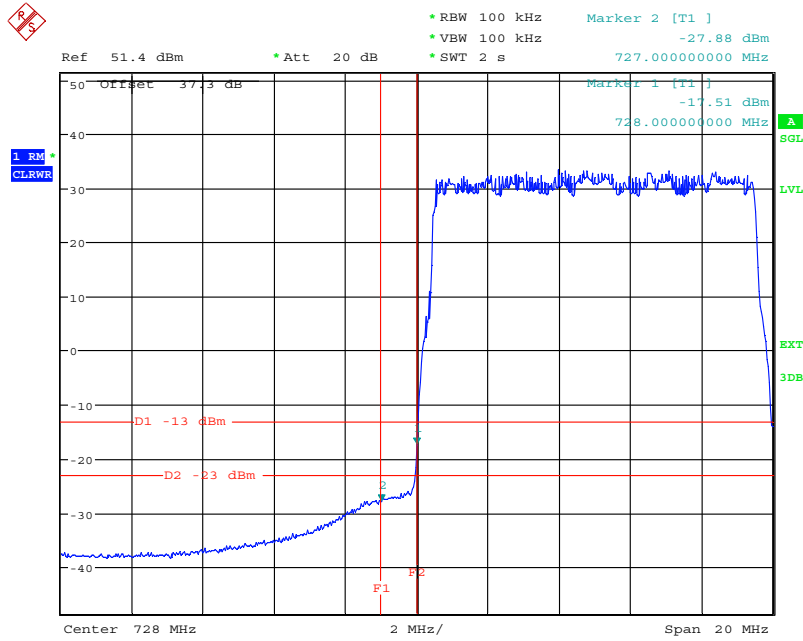
**Figure 7-119: Spurious Emissions (30MHz-1GHz)
– QPSK (737.0 MHz) (10MHz Channel BW)**



Date: 4.DEC.2009 08:40:09

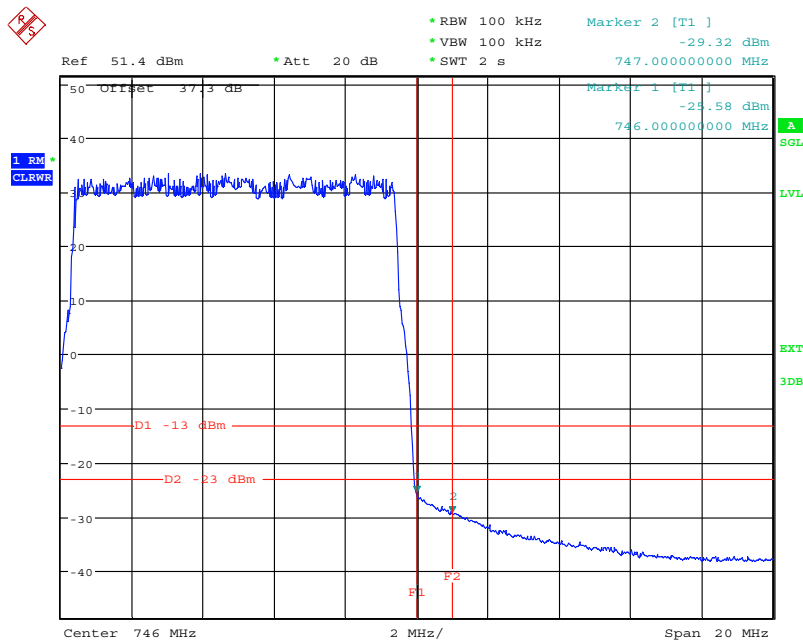
**Figure 7-120: Spurious Emissions (1GHz-8GHz)
– QPSK (737.0 MHz) (10MHz Channel BW)**

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Date: 4.DEC.2009 11:38:23

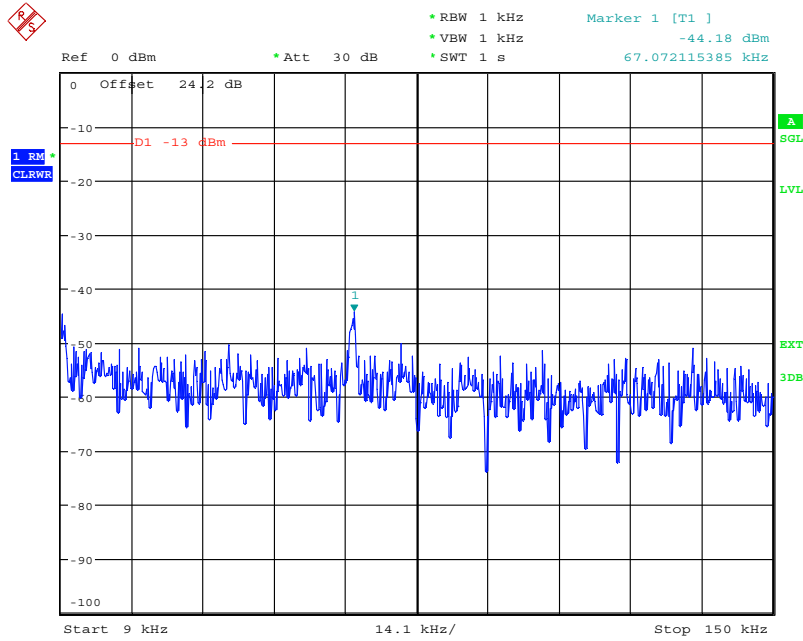
**Figure 7-121: Spurious Emissions (Lower band edge)
– 16QAM (733.0 MHz) (10MHz Channel BW)**



Date: 4.DEC.2009 11:51:55

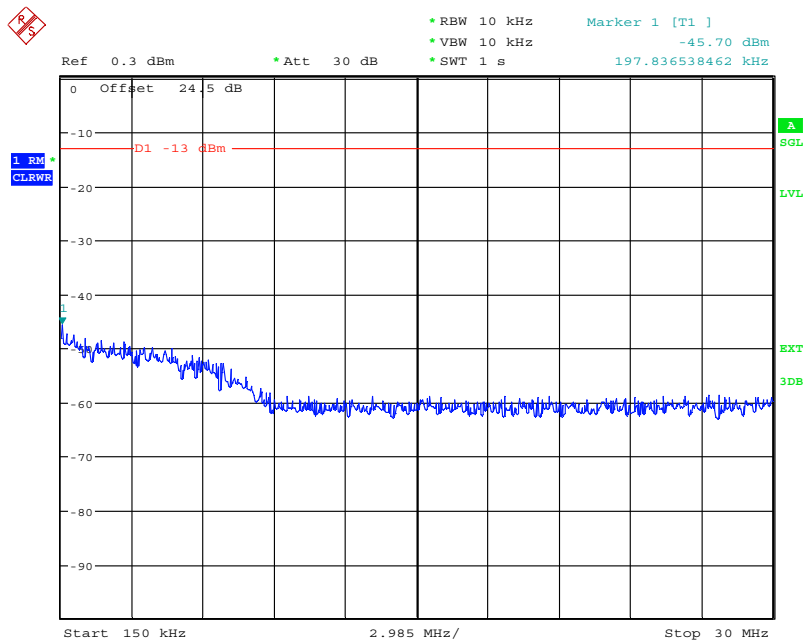
**Figure 7-122: Spurious Emissions (Upper band edge)
– 16QAM (740.9 MHz) (10MHz Channel BW)**

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Date: 4.DEC.2009 08:15:21

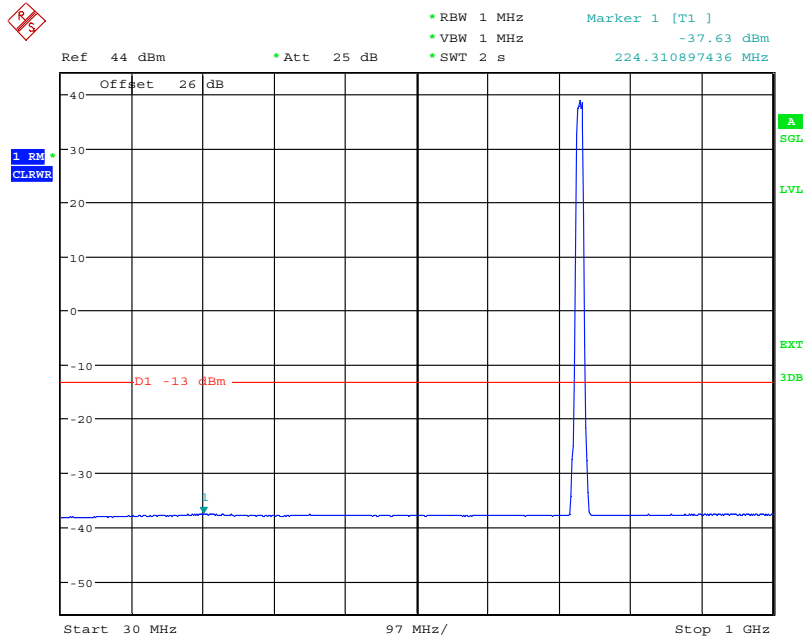
**Figure 7-123: Spurious Emissions (9kHz-150kHz)
– 16QAM (737.0 MHz) (10MHz Channel BW)**



Date: 4.DEC.2009 08:24:22

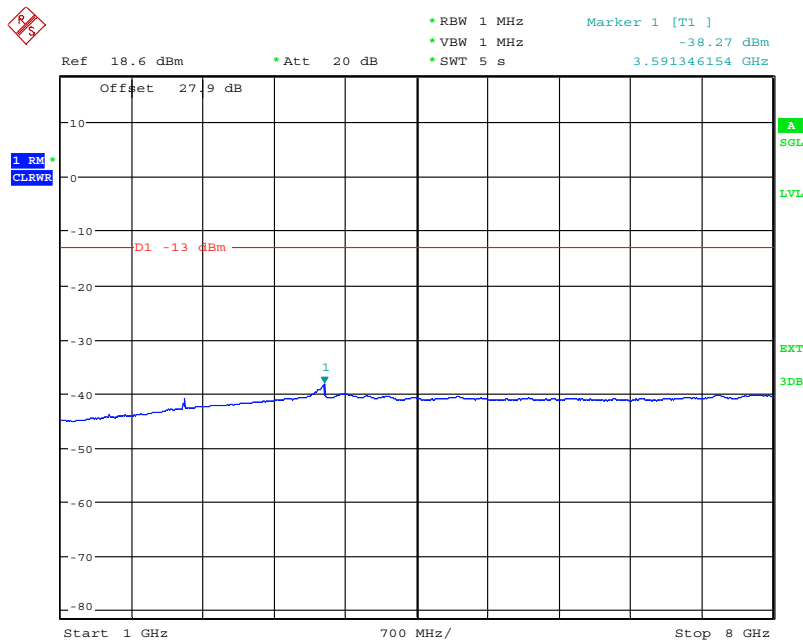
**Figure 7-124: Spurious Emissions (150kHz-30MHz)
– 16QAM (737.0 MHz) (10MHz Channel BW)**

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Date: 4.DEC.2009 08:05:50

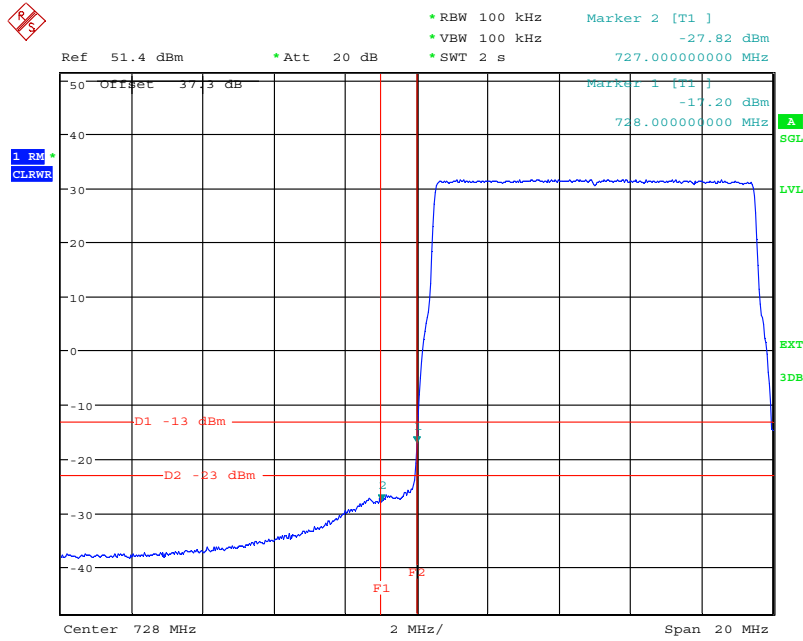
**Figure 7-125: Spurious Emissions (30MHz-1GHz)
– 16QAM (737.0 MHz) (10MHz Channel BW)**



Date: 4.DEC.2009 08:36:57

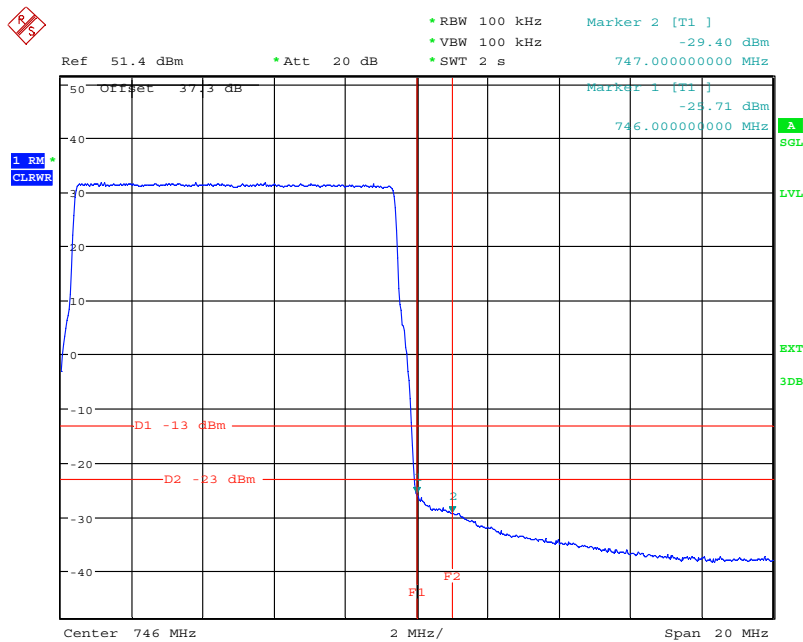
**Figure 7-126: Spurious Emissions (1GHz-8GHz)
– 16QAM (737.0 MHz) (10MHz Channel BW)**

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Date: 4.DEC.2009 11:37:28

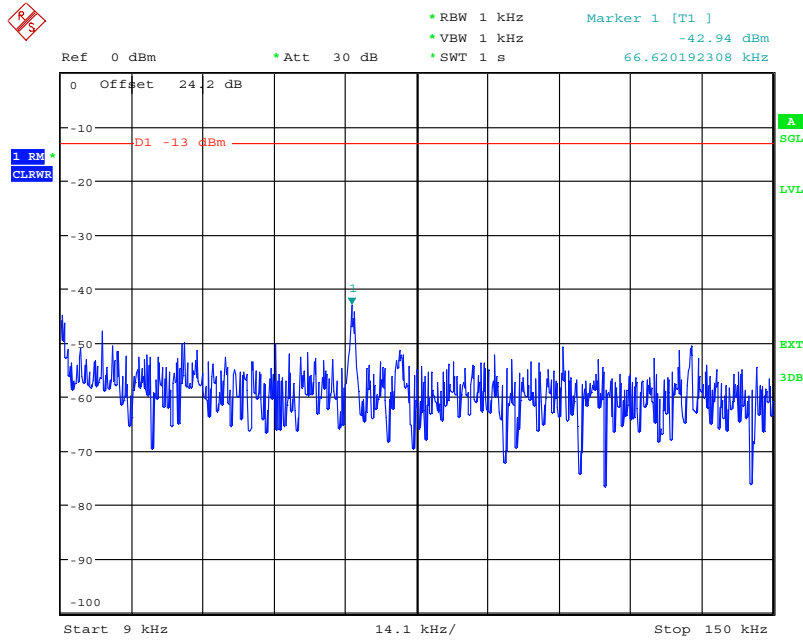
**Figure 7-127: Spurious Emissions (Lower band edge)
- 64QAM (733.0 MHz) (10MHz Channel BW)**



Date: 4.DEC.2009 11:51:16

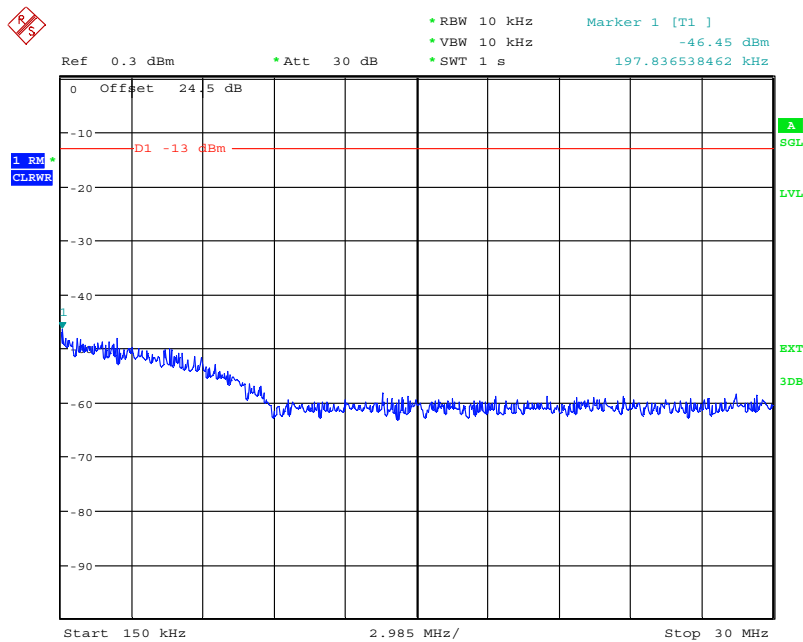
**Figure 7-128: Spurious Emissions (Upper band edge)
- 64QAM (740.9 MHz) (10MHz Channel BW)**

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Date: 4.DEC.2009 08:16:02

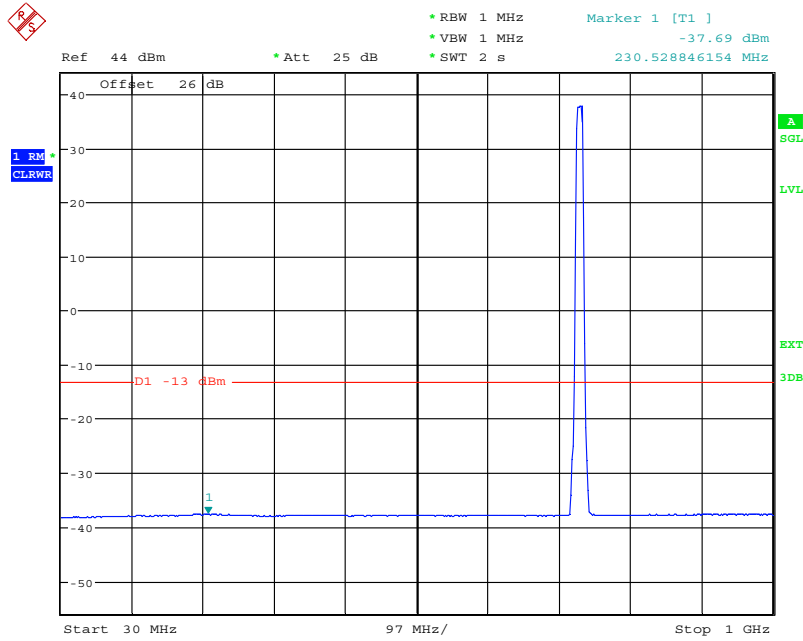
**Figure 7-129: Spurious Emissions (9kHz-150kHz)
– 64QAM (737.0 MHz) (10MHz Channel BW)**



Date: 4.DEC.2009 08:23:44

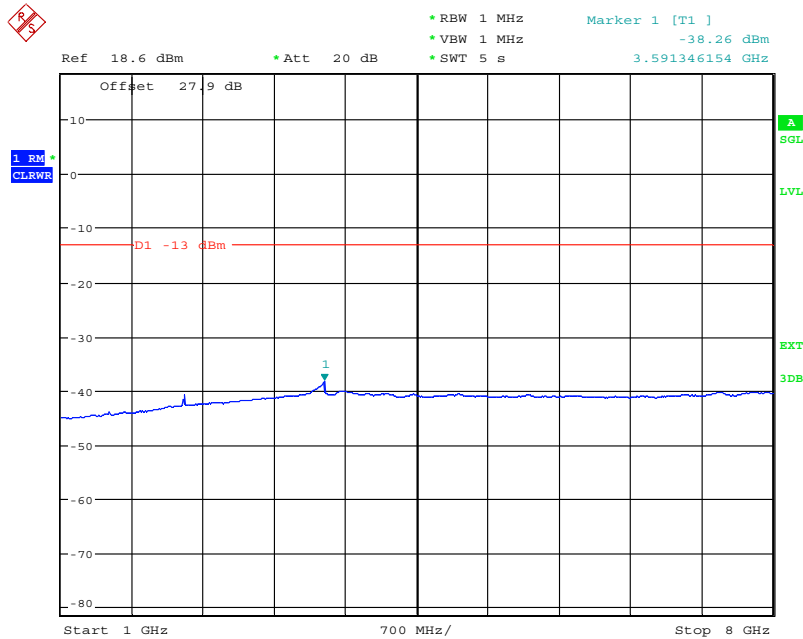
**Figure 7-130: Spurious Emissions (150kHz-30MHz)
– 64QAM (737.0 MHz) (10MHz Channel BW)**

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Date: 4.DEC.2009 08:04:58

**Figure 7-131: Spurious Emissions (30MHz-1GHz)
– 64QAM (737.0 MHz) (10MHz Channel BW)**



Date: 4.DEC.2009 08:37:40

**Figure 7-132: Spurious Emissions (1GHz-8GHz)
– 64QAM (737.0 MHz) (10MHz Channel BW)**

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7.2.4 Test No. 5: Field Strength of Spurious Radiation

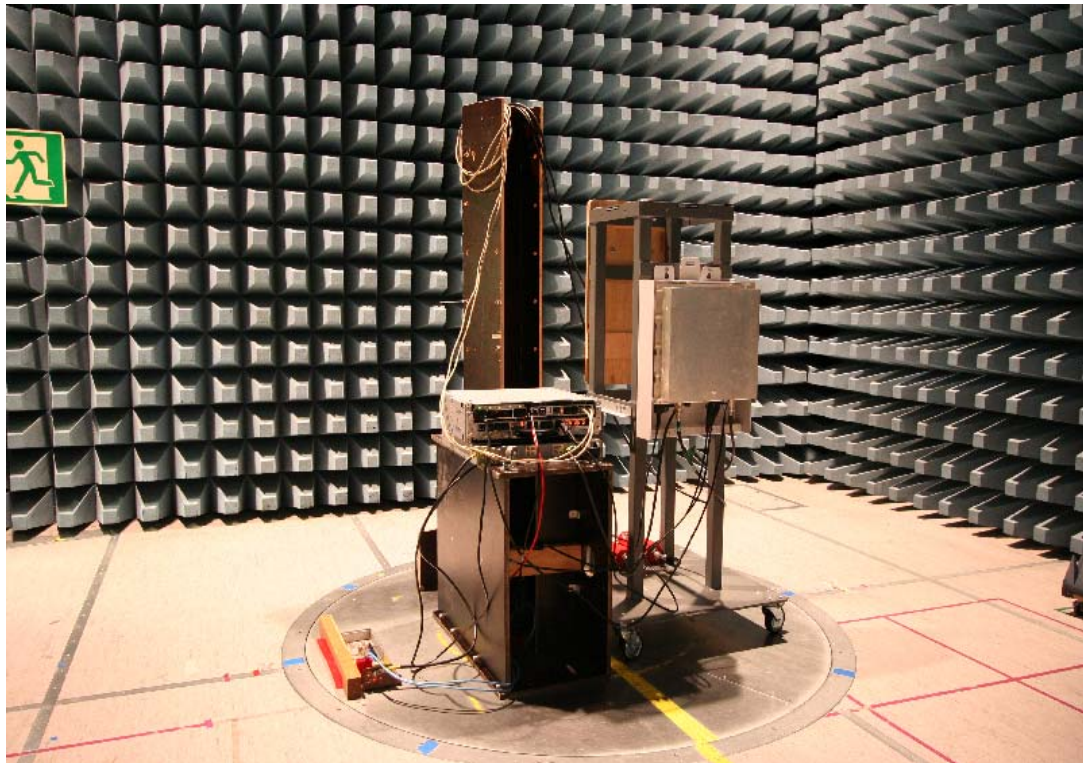


Figure 7-133: Photograph of the anechoic chamber with the EUT

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Config A:

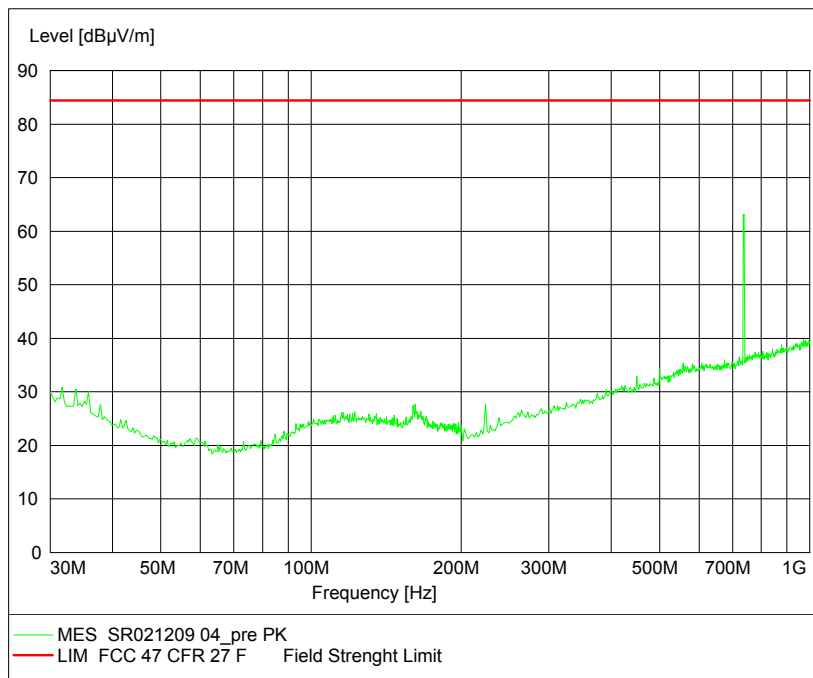


Figure 7-134: Radiated Emission 30 MHz – 1 GHz (5MHz Channel BW)

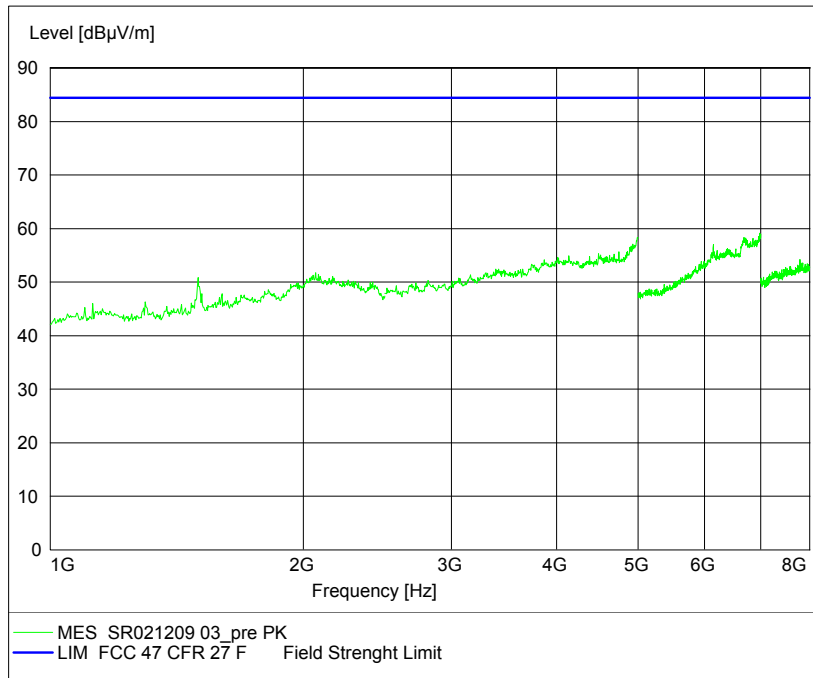


Figure 7-135: Radiated Emission 1 GHz – 8 GHz (5MHz Channel BW)

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Config B:

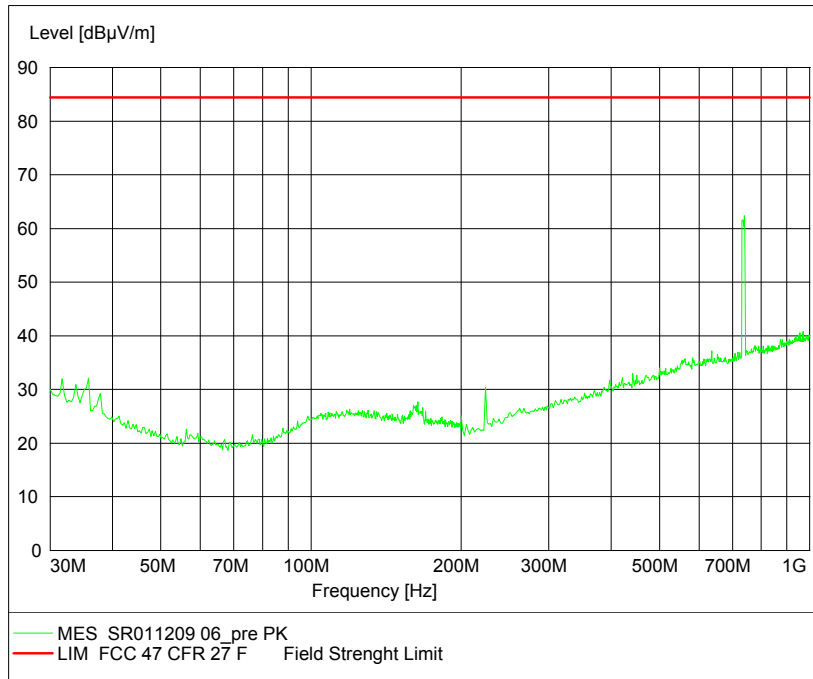


Figure 7-136: Radiated Emission 30 MHz – 1 GHz (10MHz Channel BW)

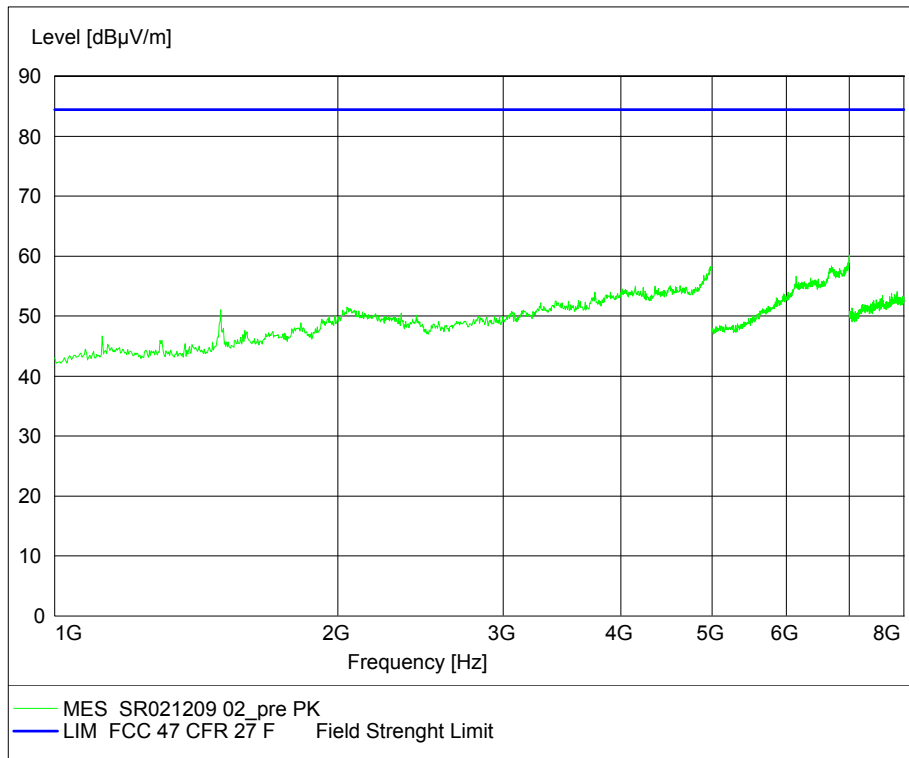


Figure 7-137: Radiated Emission 1 GHz – 8 GHz (10MHz Channel BW)

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