Center for Quality Engineering

Test Report No.: C12N0014

FCC ID: VBNFRIE-01

Order No.: C12N **Pages:** 104 **Munich,** Dec 18, 2009

Client:	Nokia Siemens Networks Oy
Equipment Under Test:	Flexi LTE RF Module 1.7/2.1GHz
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 18, 2009	
Bauer Manager EMC	Dec 18, 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	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	23	compliant
6	Frequency Stability	§ 2.1055, § 27.54	25	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*.

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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: Miscelleanous 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
P.O. Box 319,
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

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3.3 Time Schedule

Test No.:	1, 2, 3, 4, 6	5
Start of Test:	Dec 07, 2009	Dec 03, 2009
End of Test:	Dec 11, 2009	Dec 04, 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

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 refered 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 1.7GHz/2.1GHz	
Frequency Bands	**Uplink**	**Downlink**
Block A:	1710 – 1720 MHz	2110 – 2120 MHz
Block B:	1720 – 1730 MHz	2120 – 2130 MHz
Block C:	1730 – 1735 MHz	2130 – 2135 MHz
Block D:	1735 – 1740 MHz	2135 – 2140 MHz
Block E:	1740 – 1745 MHz	2140 – 2145 MHz
Block F:	1745 – 1755 MHz	2145 – 2155 MHz
	Single Carrier	
Rated Output Power (Prat)	60 W	
Channel Bandwidth	5MHz (Config. A), 10 MHz (Config. B)	
	RX	**TX**
Number of Antenna Ports	6	6
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.**
FRIE	L9094500658	RF module	A, B
FRIE	L9094500657	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.

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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 (E-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 NodeB 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.

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5 General Description of Tests

5.1 Tested Carrier Frequencies

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

Config A:

Channel Bandwith: 5MHz	
Frequency [MHz]	**Remark**
2112.5	lowest possible carrier frequency
2132.5	frequency at the middle of the band
2152.4	highest possible carrier frequency

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

Config B:

Channel Bandwith: 10MHz	
Frequency [MHz]	**Remark**
2115.0	lowest possible carrier frequency
2132.5	frequency at the middle of the band
2149.9	highest possible carrier frequency

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

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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).

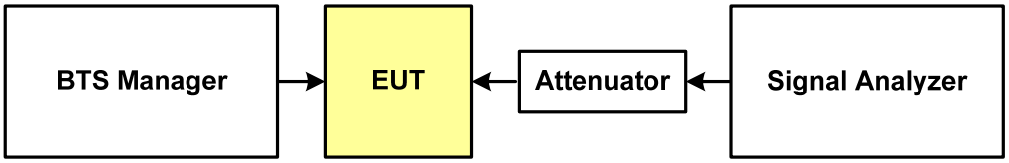

Figure 5-1: Test Configuration

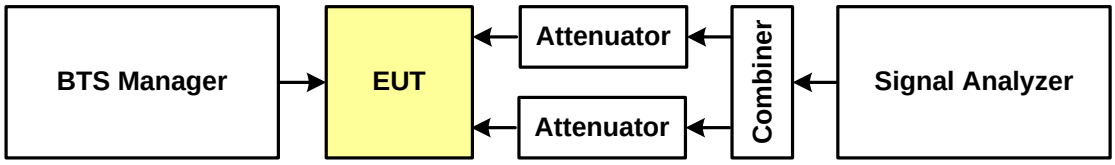

Figure 5-2: Test Configuration combined output

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 32 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.

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6 Test Results

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

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 of the EUT.

6.1.2 Limits

According to § 27.50, base stations are limited to an EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz

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 33 onwords of this report.

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Config A TX1:

Carrier Frequency	RF Power Output		Result
[MHz]	[dBm]	[W]	
QPSK-Modulation			
2112.5	47.24	52.97	compliant
2132.5	47.52	56.49	compliant
2152.4	47.65	58.21	compliant
16QAM-Modulation			
2112.5	47.23	52.84	compliant
2132.5	47.47	55.85	compliant
2152.4	47.67	58.48	compliant
64QAM-Modulation			
2112.5	47.19	52.36	compliant
2132.5	47.51	56.36	compliant
2152.4	47.68	58.61	compliant
Measurement Uncertainty:		±0.4dB	

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

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Config A TX2:

Carrier Frequency	RF Power Output		Result
[MHz]	[dBm]	[W]	
QPSK-Modulation			
2112.5	47.33	54.08	compliant
2132.5	47.49	56.10	compliant
2152.4	47.55	56.89	compliant
16QAM-Modulation			
2112.5	47.28	53.46	compliant
2132.5	47.53	56.62	compliant
2152.4	47.53	56.62	compliant
64QAM-Modulation			
2112.5	47.32	53.95	compliant
2132.5	47.50	56.23	compliant
2152.4	47.55	56.89	compliant
Measurement Uncertainty:		±0.4dB	

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

Config A TX1+TX2 (mathematically combined power):

Carrier Frequency	RF Power Output		Result
[MHz]	[dBm]	[W]	
QPSK-Modulation			
2112.5	50.30	107.05	compliant
2132.5	50.51	112.59	compliant
2152.4	50.61	115.10	compliant
16QAM-Modulation			
2112.5	50.27	106.30	compliant
2132.5	50.51	112.47	compliant
2152.4	50.61	115.10	compliant
64QAM-Modulation			
2112.5	50.27	106.31	compliant
2132.5	50.51	112.59	compliant
2152.4	50.63	115.50	compliant
Measurement Uncertainty:		±0.4dB	

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

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Config B TX1:

Carrier Frequency	RF Power Output		Result
[MHz]	[dBm]	[W]	
QPSK-Modulation			
2115.0	47.33	54.08	compliant
2132.5	47.51	56.36	compliant
2149.9	47.67	58.48	compliant
16QAM-Modulation			
2115.0	47.26	53.21	compliant
2132.5	47.54	56.75	compliant
2149.9	47.65	58.21	compliant
64QAM-Modulation			
2115.0	47.28	53.46	compliant
2132.5	47.50	56.23	compliant
2149.9	47.67	58.48	compliant
Measurement Uncertainty:		±0.4dB	

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

Config B TX2:

Carrier Frequency	RF Power Output		Result
[MHz]	[dBm]	[W]	
QPSK-Modulation			
2115.0	47.40	54.95	compliant
2132.5	47.50	56.23	compliant
2149.9	47.57	57.15	compliant
16QAM-Modulation			
2115.0	47.39	54.83	compliant
2132.5	47.48	55.98	compliant
2149.9	47.57	57.15	compliant
64QAM-Modulation			
2115.0	47.41	55.08	compliant
2132.5	47.51	56.36	compliant
2149.9	47.56	57.02	compliant
Measurement Uncertainty:		±0.4dB	

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

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Config B TX1+TX2 (mathematically combined power):

Carrier Frequency	RF Power Output		Result
[MHz]	[dBm]	[W]	
QPSK-Modulation			
2115.0	50.38	109.03	compliant
2132.5	50.51	112.59	compliant
2149.9	50.63	115.63	compliant
16QAM-Modulation			
2115.0	50.34	108.04	compliant
2132.5	50.52	112.73	compliant
2149.9	50.62	115.36	compliant
64QAM-Modulation			
2115.0	50.36	108.54	compliant
2132.5	50.51	112.59	compliant
2149.9	50.63	115.50	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.

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 40). 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.

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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 page 40 for details). The following table summarizes the results:

Config A TX1:

Carrier Frequency [MHz]	Occupied Bandwidth [MHz]	Result
QPSK-Modulation		
2112.5	4.4788	compliant
2132.5	4.4788	compliant
2152.4	4.4788	compliant
16QAM-Modulation		
2112.5	4.4706	compliant
2132.5	4.4706	compliant
2152.4	4.4706	compliant
64QAM-Modulation		
2112.5	4.4788	compliant
2132.5	4.4788	compliant
2152.4	4.4788	compliant
Measurement Uncertainty:		±48 kHz

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

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Config A TX2:

Carrier Frequency [MHz]	Occupied Bandwidth [MHz]	Result
QPSK-Modulation		
2112.5	4.4788	compliant
2132.5	4.4788	compliant
2152.4	4.4788	compliant
16QAM-Modulation		
2112.5	4.4706	compliant
2132.5	4.4706	compliant
2152.4	4.4706	compliant
64QAM-Modulation		
2112.5	4.4788	compliant
2132.5	4.4788	compliant
2152.4	4.4788	compliant
Measurement Uncertainty:		±48 kHz

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

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Config B TX1:

Carrier Frequency [MHz]	Occupied Bandwidth [MHz]	Result
QPSK-Modulation		
2115.0	8.9346	compliant
2132.5	8.9346	compliant
2149.9	8.9346	compliant
16QAM-Modulation		
2115.0	8.9346	compliant
2132.5	8.9346	compliant
2149.9	8.9346	compliant
64QAM-Modulation		
2115.0	8.9346	compliant
2132.5	8.9346	compliant
2149.9	8.9346	compliant
Measurement Uncertainty:		±48 kHz

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

Config B TX2:

Carrier Frequency [MHz]	Occupied Bandwidth [MHz]	Result
QPSK-Modulation		
2115.0	8.9346	compliant
2132.5	8.9346	compliant
2149.9	8.9346	compliant
16QAM-Modulation		
2115.0	8.9346	compliant
2132.5	8.9346	compliant
2149.9	8.9346	compliant
64QAM-Modulation		
2115.0	8.9346	compliant
2132.5	8.9346	compliant
2149.9	8.9346	compliant
Measurement Uncertainty:		±48 kHz

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 be attenuated below the transmitter power by at least 43 + 10 $\log_{10}$ P (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) = -13 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 (the one immediately below and the one immediately above the carrier frequency block) a 1 MHz resolution bandwidth was used for the measurements.
In the 1 MHz 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.

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The following tables summarize the worst case detected emission levels (see screenshots on pages 46 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: 2112.5 MHz			
Frequency Range [MHz]	**Emission Frequency [MHz]**	**Maximum Emission Level [dBm]**	**Result**
QPSK-Modulation			
TX1	2110.0	-15.45	compliant
TX2	2110.0	-15.12	compliant
TX1 + TX2	2110.0	-14.46	compliant
16QAM-Modulation			
TX1	2110.0	-15.99	compliant
TX2	2110.0	-15.73	compliant
TX1 + TX2	2110.0	-15.09	compliant
64QAM-Modulation			
TX1	2110.0	-15.57	compliant
TX2	2110.0	-15.93	compliant
TX1 + TX2	2110.0	-15.21	compliant
Measurement Uncertainty:			f < 1.0GHz: ±1.1dB 1.0GHz ≤ f <3.6GHz: ±1.2dB 3.6GHz ≤ f <8.0GHz: ±1.6dB 8.0GHz ≤ f: ±1.9dB

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

Config A Upper band edge:

Carrier Frequency: 2152.4 MHz			
Frequency Range [MHz]	**Emission Frequency [MHz]**	**Maximum Emission Level [dBm]**	**Result**
QPSK-Modulation			
TX1	2155.0	-22.79	compliant
TX2	2155.0	-22.68	compliant
TX1 + TX2	2155.0	-20.48	compliant
16QAM-Modulation			
TX1	2155.0	-23.00	compliant
TX2	2155.0	-23.46	compliant
TX1 + TX2	2155.0	-19.93	compliant
64QAM-Modulation			
TX1	2155.0	-22.88	compliant
TX2	2155.0	-22.69	compliant
TX1 + TX2	2155.0	-20.14	compliant
Measurement Uncertainty:			f < 1.0GHz: ±1.1dB 1.0GHz ≤ f <3.6GHz: ±1.2dB 3.6GHz ≤ f <8.0GHz: ±1.6dB 8.0GHz ≤ f: ±1.9dB

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

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Config A Spurious emissions:

Carrier Frequency: 2132.5 MHz			
Frequency Range [MHz]	**Emission Frequency [MHz]**	**Maximum Emission Level [dBm]**	**Result**
QPSK-Modulation			
TX1	2980.961	-31.99	compliant
TX2	2980.961	-31.99	compliant
TX1 + TX2	2942.884	-28.66	compliant
16QAM-Modulation			
TX1	2980.961	-31.97	compliant
TX2	2980.961	-31.89	compliant
TX1 + TX2	2985.721	-28.65	compliant
64QAM-Modulation			
TX1	2980.961	-32.02	compliant
TX2	2980.961	-31.98	compliant
TX1 + TX2	2980.961	-28.68	compliant
Measurement Uncertainty:			f < 1.0GHz: ±1.1dB 1.0GHz ≤ f <3.6GHz: ±1.2dB 3.6GHz ≤ f <8.0GHz: ±1.6dB 8.0GHz ≤ f: ±1.9dB

Table 6-13: Results - Spurious Emissions (5 MHz Channel BW)

Config B Lower band edge:

Carrier Frequency: 2115.0 MHz			
Frequency Range [MHz]	**Emission Frequency [MHz]**	**Maximum Emission Level [dBm]**	**Result**
QPSK-Modulation			
TX1	2110.0	-19.03	compliant
TX2	2110.0	-18.11	compliant
TX1 + TX2	2110.0	-14.02	compliant
16QAM-Modulation			
TX1	2110.0	-19.84	compliant
TX2	2110.0	-18.89	compliant
TX1 + TX2	2110.0	-14.57	compliant
64QAM-Modulation			
TX1	2110.0	-19.62	compliant
TX2	2110.0	-18.43	compliant
TX1 + TX2	2110.0	-14.39	compliant
Measurement Uncertainty:			f < 1.0GHz: ±1.1dB 1.0GHz ≤ f <3.6GHz: ±1.2dB 3.6GHz ≤ f <8.0GHz: ±1.6dB 8.0GHz ≤ f: ±1.9dB

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

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Config B Upper band edge:

Carrier Frequency: 2149.9 MHz			
Frequency Range [MHz]	**Emission Frequency [MHz]**	**Maximum Emission Level [dBm]**	**Result**
QPSK-Modulation			
TX1	2155.0	-25.70	compliant
TX2	2155.0	-24.41	compliant
TX1 + TX2	2155.0	-20.94	compliant
16QAM-Modulation			
TX1	2155.0	-25.97	compliant
TX2	2155.0	-24.61	compliant
TX1 + TX2	2155.0	-20.69	compliant
64QAM-Modulation			
TX1	2155.0	-25.72	compliant
TX2	2155.0	-24.95	compliant
TX1 + TX2	2155.0	-20.95	compliant
Measurement Uncertainty:			f < 1.0GHz: ±1.1dB 1.0GHz ≤ f <3.6GHz: ±1.2dB 3.6GHz ≤ f <8.0GHz: ±1.6dB 8.0GHz ≤ f: ±1.9dB

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

Config B Spurious emissions:

Carrier Frequency: 2132.5 MHz			
Frequency Range [MHz]	**Emission Frequency [MHz]**	**Maximum Emission Level [dBm]**	**Result**
QPSK-Modulation			
TX1	2942.884	-33.08	compliant
TX2	2971.442	-33.11	compliant
TX1 + TX2	2980.961	-28.59	compliant
16QAM-Modulation			
TX1	2942.884	-33.15	compliant
TX2	2942.884	-33.07	compliant
TX1 + TX2	2980.961	-28.72	compliant
64QAM-Modulation			
TX1	2942.884	-33.11	compliant
TX2	2942.884	-33.02	compliant
TX1 + TX2	2980.961	-28.69	compliant
Measurement Uncertainty:			f < 1.0GHz: ±1.1dB 1.0GHz ≤ f <3.6GHz: ±1.2dB 3.6GHz ≤ f <8.0GHz: ±1.6dB 8.0GHz ≤ f: ±1.9dB

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 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:	60.0 W (= 47.8 dBm)
Required attenuation:	43 + 10 $\log_{10}$ 60.0 = **60.8 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.

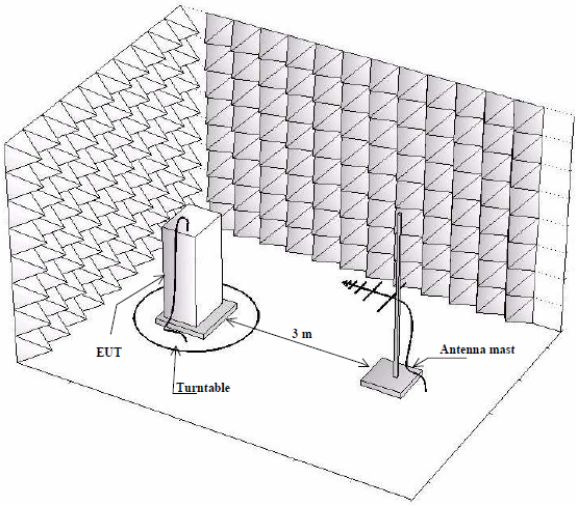

Figure 6-1: Test Configuration

Photographs of the EUT in the anechoic chamber are shown on page 101 of this measurement report.

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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 – 26500 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 – 26500 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.

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

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6.5.6 Test Results & Limits

Worst case detected emission levels are reported in the following table (refer to spectral plots included on pages 101 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 (-30°C to +50 °C) and supply voltage conditions 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 and the supply voltage.

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

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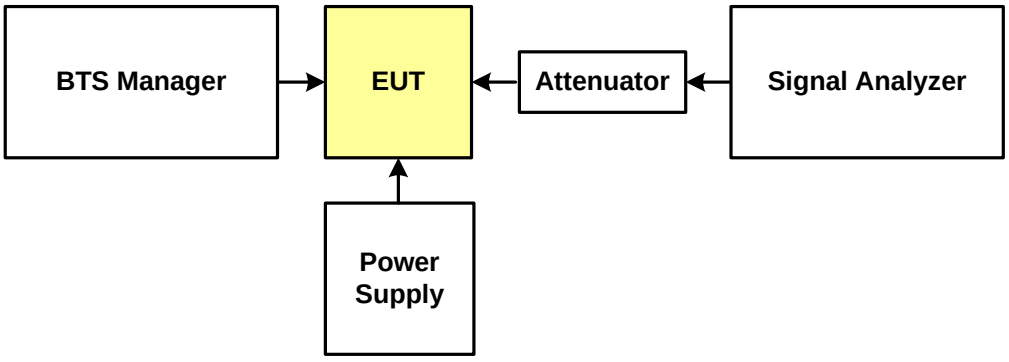

Figure 6-2: Test Configuration for frequency stability with voltage variation

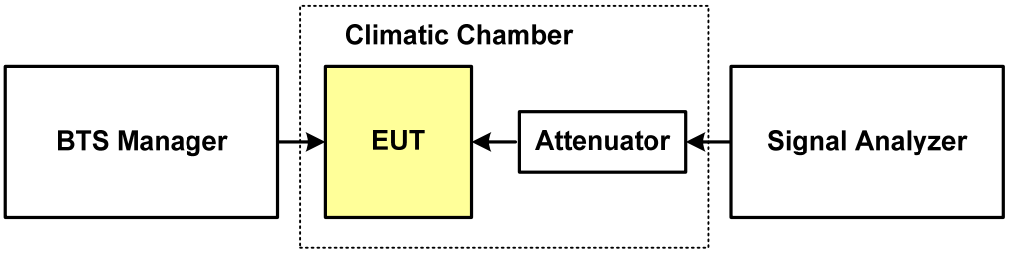

Figure 6-3: Test Configuration for frequency stability with temperature variation

A complete list of the measurement equipment is included on page 32 of this measurement report.

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: 2132.5 MHz						
Supply Voltage (DC)	**Ambient Temperature**	**Frequency Deviation [ppm]**		**Manufacturer's Specification**		**Result**
[V]	**[°C]**	**[Hz]**	**[ppm]**	**[Hz]**	**[ppm]**	
QPSK Modulation						
-48.0	-30	22.33	0.0105	106	0.05	compliant
-48.0	-20	19.55	0.0092	106	0.05	compliant
-48.0	-10	18.41	0.0086	106	0.05	compliant
-48.0	0	14.91	0.0070	106	0.05	compliant
-48.0	+10	15.90	0.0075	106	0.05	compliant
-48.0	+30	1.78	0.0008	106	0.05	compliant
-48.0	+40	-8.65	-0.0041	106	0.05	compliant
-48.0	+50	-23.31	-0.0109	106	0.05	compliant
16QAM Modulation						
-48.0	-30	19.37	0.0091	106	0.05	compliant
-48.0	-20	18.76	0.0088	106	0.05	compliant
-48.0	-10	19.10	0.0090	106	0.05	compliant
-48.0	0	15.71	0.0074	106	0.05	compliant
-48.0	+10	14.44	0.0068	106	0.05	compliant
-48.0	+30	-0.75	-0.0004	106	0.05	compliant
-48.0	+40	-6.76	-0.0032	106	0.05	compliant
-48.0	+50	-22.46	-0.0105	106	0.05	compliant
64QAM Modulation						
-48.0	-30	18.15	0.0071	106	0.05	compliant
-48.0	-20	19.41	0.0091	106	0.05	compliant
-48.0	-10	19.59	0.0092	106	0.05	compliant
-48.0	0	16.71	0.0078	106	0.05	compliant
-48.0	+10	16.72	0.0078	106	0.05	compliant
-48.0	+30	4.85	0.0023	106	0.05	compliant
-48.0	+40	-7.72	-0.0036	106	0.05	compliant
-48.0	+50	-21.17	-0.0099	106	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: 2132.5 MHz						
Supply Voltage (DC)	**Ambient Temperature**	**Frequency Deviation [ppm]**		**Manufacturer's Specification**		**Result**
[V]	**[°C]**	**[Hz]**	**[ppm]**	**[Hz]**	**[ppm]**	
QPSK Modulation						
-48.0	-30	16.37	0.0077	106	0.05	compliant
-48.0	-20	16.99	0.0080	106	0.05	compliant
-48.0	-10	17.49	0.0082	106	0.05	compliant
-48.0	0	16.75	0.0079	106	0.05	compliant
-48.0	+10	12.66	0,0059	106	0.05	compliant
-48.0	+30	-0.60	-0.0003	106	0.05	compliant
-48.0	+40	-8.65	-0.0041	106	0.05	compliant
-48.0	+50	-18.66	-0.0088	106	0.05	compliant
16QAM Modulation						
-48.0	-30	18.53	0.0087	106	0.05	compliant
-48.0	-20	19.00	0.0089	106	0.05	compliant
-48.0	-10	18.00	0.0084	106	0.05	compliant
-48.0	0	16.42	0.0077	106	0.05	compliant
-48.0	+10	14.38	0.0067	106	0.05	compliant
-48.0	+30	0.22	0.0001	106	0.05	compliant
-48.0	+40	-7.61	-0.0036	106	0.05	compliant
-48.0	+50	-20.79	-0.0097	106	0.05	compliant
64QAM Modulation						
-48.0	-30	18.87	0.0088	106	0.05	compliant
-48.0	-20	18.28	0.0086	106	0.05	compliant
-48.0	-10	17.71	0.0083	106	0.05	compliant
-48.0	0	18.82	0.0088	106	0.05	compliant
-48.0	+10	14.66	0.0069	106	0.05	compliant
-48.0	+30	0.54	0.0003	106	0.05	compliant
-48.0	+40	-7.36	-0.0035	106	0.05	compliant
-48.0	+50	-20.06	-0.0094	106	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: 2132.5 MHz						
Supply Voltage (DC)	**Ambient Temperature**	**Frequency Deviation [ppm]**		**Manufacturer's Specification**		**Result**
[V]	**[°C]**	**[Hz]**	**[ppm]**	**[Hz]**	**[ppm]**	
QPSK Modulation						
-48.0	-30	16.55	0.0225	106	0.05	compliant
-48.0	-20	18.00	0.0244	106	0.05	compliant
-48.0	-10	17.49	0.0237	106	0.05	compliant
-48.0	0	20.95	0.0284	106	0.05	compliant
-48.0	+10	14.57	0.0198	106	0.05	compliant
-48.0	+30	-0.23	-0.0003	106	0.05	compliant
-48.0	+40	-8.86	-0.0120	106	0.05	compliant
-48.0	+50	-20.26	-0.0275	106	0.05	compliant
16QAM Modulation						
-48.0	-30	15.11	0.0205	106	0.05	compliant
-48.0	-20	18.43	0.0250	106	0.05	compliant
-48.0	-10	16.45	0.0223	106	0.05	compliant
-48.0	0	18.20	0.0247	106	0.05	compliant
-48.0	+10	15.34	0.0208	106	0.05	compliant
-48.0	+30	3.20	0.0043	106	0.05	compliant
-48.0	+40	-8.10	-0.0110	106	0.05	compliant
-48.0	+50	-18.05	-0.0245	106	0.05	compliant
64QAM Modulation						
-48.0	-30	17.91	0.0243	106	0.05	compliant
-48.0	-20	17.10	0.0232	106	0.05	compliant
-48.0	-10	16.06	0.0218	106	0.05	compliant
-48.0	0	16.97	0.0230	106	0.05	compliant
-48.0	+10	14.42	0.0196	106	0.05	compliant
-48.0	+30	1.58	0.0021	106	0.05	compliant
-48.0	+40	-10.03	-0.0136	106	0.05	compliant
-48.0	+50	-22.24	-0.0302	106	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: 2132.5 MHz						
Supply Voltage (DC)	**Ambient Temperature**	**Frequency Deviation [ppm]**		**Manufacturer's Specification**		**Result**
[V]	**[°C]**	**[Hz]**	**[ppm]**	**[Hz]**	**[ppm]**	
QPSK Modulation						
-48.0	-30	14.32	0.0194	106	0.05	compliant
-48.0	-20	20.34	0.0276	106	0.05	compliant
-48.0	-10	18.56	0.0252	106	0.05	compliant
-48.0	0	15.26	0.0207	106	0.05	compliant
-48.0	+10	13.76	0.0187	106	0.05	compliant
-48.0	+30	2.76	0.0037	106	0.05	compliant
-48.0	+40	-10.45	-0.0142	106	0.05	compliant
-48.0	+50	-22.14	-0.0300	106	0.05	compliant
16QAM Modulation						
-48.0	-30	16.06	0.0218	106	0.05	compliant
-48.0	-20	17.72	0.0240	106	0.05	compliant
-48.0	-10	19.14	0.0260	106	0.05	compliant
-48.0	0	16.90	0.0229	106	0.05	compliant
-48.0	+10	14.79	0.0201	106	0.05	compliant
-48.0	+30	0.13	0.0002	106	0.05	compliant
-48.0	+40	-7.23	-0.0098	106	0.05	compliant
-48.0	+50	-20.57	-0.0279	106	0.05	compliant
64QAM Modulation						
-48.0	-30	16.16	0.0219	106	0.05	compliant
-48.0	-20	17.13	0.0232	106	0.05	compliant
-48.0	-10	17.47	0.0237	106	0.05	compliant
-48.0	0	16.50	0.0224	106	0.05	compliant
-48.0	+10	15.06	0.0204	106	0.05	compliant
-48.0	+30	0.92	0.0012	106	0.05	compliant
-48.0	+40	-10.14	-0.0138	106	0.05	compliant
-48.0	+50	-22.05	-0.0299	106	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 15 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: 2132.5 MHz						
Supply Voltage (DC)	**Ambient Temperature**	**Frequency Deviation [ppm]**		**Manufacturer's Specification**		**Result**
[V]	**[°C]**	**[Hz]**	**[ppm]**	**[Hz]**	**[ppm]**	
QPSK Modulation						
-40.8	+20	7.79	0.0106	106	0.05	compliant
-48.0	+20	10.93	0.0148	106	0.05	compliant
-55.2	+20	10.43	0.0142	106	0.05	compliant
16QAM Modulation						
-40.8	+20	8.74	0.0119	106	0.05	compliant
-48.0	+20	9.37	0.0127	106	0.05	compliant
-55.2	+20	10.86	0.0147	106	0.05	compliant
64QAM Modulation						
-40.8	+20	8.74	0.0119	106	0.05	compliant
-48.0	+20	13.95	0.0189	106	0.05	compliant
-55.2	+20	12.91	0.0175	106	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: 2132.5 MHz						
Supply Voltage (DC)	**Ambient Temperature**	**Frequency Deviation [ppm]**		**Manufacturer's Specification**		**Result**
[V]	**[°C]**	**[Hz]**	**[ppm]**	**[Hz]**	**[ppm]**	
QPSK Modulation						
-40.8	+20	9.08	0.0123	106	0.05	compliant
-48.0	+20	9.76	0.0132	106	0.05	compliant
-55.2	+20	10.07	0.0137	106	0.05	compliant
16QAM Modulation						
-40.8	+20	9.81	0.0133	106	0.05	compliant
-48.0	+20	12.60	0.0171	106	0.05	compliant
-55.2	+20	8.65	0.0117	106	0.05	compliant
64QAM Modulation						
-40.8	+20	7.94	0.0108	106	0.05	compliant
-48.0	+20	10.70	0.0145	106	0.05	compliant
-55.2	+20	11.21	0.0152	106	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: 2132.5 MHz						
Supply Voltage (DC)	**Ambient Temperature**	**Frequency Deviation [ppm]**		**Manufacturer's Specification**		**Result**
[V]	**[°C]**	**[Hz]**	**[ppm]**	**[Hz]**	**[ppm]**	
QPSK Modulation						
-40.8	+20	9.96	0.0135	106	0.05	compliant
-48.0	+20	8.44	0.0120	106	0.05	compliant
-55.2	+20	8.61	0.0117	106	0.05	compliant
16QAM Modulation						
-40.8	+20	8.66	0.0118	106	0.05	compliant
-48.0	+20	7.35	0.0100	106	0.05	compliant
-55.2	+20	8.86	0.0120	106	0.05	compliant
64QAM Modulation						
-40.8	+20	9.86	0.0134	106	0.05	compliant
-48.0	+20	9.43	0.0128	106	0.05	compliant
-55.2	+20	9.98	0.0135	106	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: 2132.5 MHz						
Supply Voltage (DC)	**Ambient Temperature**	**Frequency Deviation [ppm]**		**Manufacturer's Specification**		**Result**
[V]	**[°C]**	**[Hz]**	**[ppm]**	**[Hz]**	**[ppm]**	
QPSK Modulation						
-40.8	+20	8.52	0.0116	106	0.05	compliant
-48.0	+20	7.87	0.0107	106	0.05	compliant
-55.2	+20	8.34	0.0113	106	0.05	compliant
16QAM Modulation						
-40.8	+20	10.04	0.0136	106	0.05	compliant
-48.0	+20	7.08	0.0096	106	0.05	compliant
-55.2	+20	6.99	0.0095	106	0.05	compliant
64QAM Modulation						
-40.8	+20	8.25	0.0112	106	0.05	compliant
-48.0	+20	10.34	0.0140	106	0.05	compliant
-55.2	+20	8.82	0.0120	106	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.

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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	Signal Generator	Rohde & Schwarz: SMP 04	845401/001	07/2009	07/2011	1, 2, 3, 4, 6
5	DC power	Sörensen: DHP series	9950C0085	cnn	-	1, 2, 3, 4, 6
6	Signal Analyzer	Rohde & Schwarz: FSQ 26	100364	12/2008	12/2009	1, 2, 3, 4, 6
7	Frequency Standard	Datum 8040	0023006282	01/2009	01/2010	6
8	Temperature/ humidity meter	VAISALA: HMI 31	P3730008	01/2009	01/2010	1, 2, 3, 4, 5, 6
9	Enviromental chamber	Weiss technick	592260123200 10	05/2009	05/2010	6
10	Attenuator	Narda: 769-30	08413	cnn	-	1, 2, 3, 4, 6
11	Attenuator	Narda: 769-30	07580	cnn	-	4
12	Attenuator	Weinschel: 67-20-33	BM0633	cnn	-	4
13	Attenuator	Weinschel: 47-10-34	BG6557	cnn	-	4
14	Attenuator	Weinschel: 66-10-34	BK1136	cnn	-	4
15	High pass filter	Reactel: 9HSX-3/20-S11	0531	cnn	-	4
16	Combiner	Weinschel: 1870A	6275	cnn	-	4
17	Semianechoic chamber	Siemens Matsushita 9m × 5m × 6m (room 0039)	Product No S&M B83317-C6019-T232	08/2008	08/2011	5
18	EMI Test Receiver	R&S ESIB 26	100335	07/2009	07/2010	5
19	Horn Antenna	Emco 3115	00075697	06/2009	06/2010	5
20	Bilog Antenna	Chase CBL6112B	2694	06/2009	06/2010	5
21	Signal Generator	R&S SMR 20	1715	07/2009	07/2010	5
22	Amplifier	Miteq AFSX4	791117	cnn	-	5
23	Antenna Mast	Deisel HD240	2401323194	cnn	-	5
24	Mast Controller	Deisel HD100	1001331	cnn	-	5
25	Amplifier	HP 83017A	3123A00444	cnn	-	5

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

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

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:

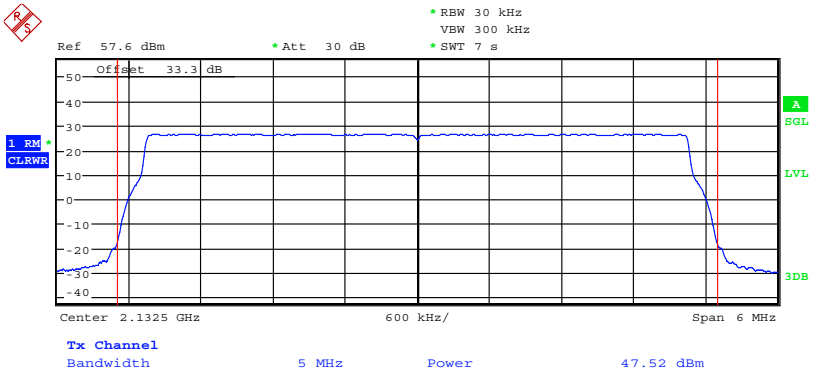


Figure 7-1: RF Power Output – QPSK (2132.5 MHz) (5MHz Channel BW)

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

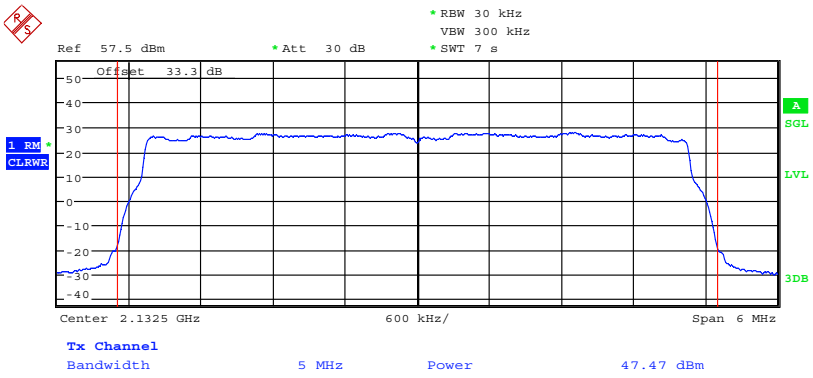


Figure 7-2: RF Power Output – 16QAM (2132.5 MHz) (5MHz Channel BW)

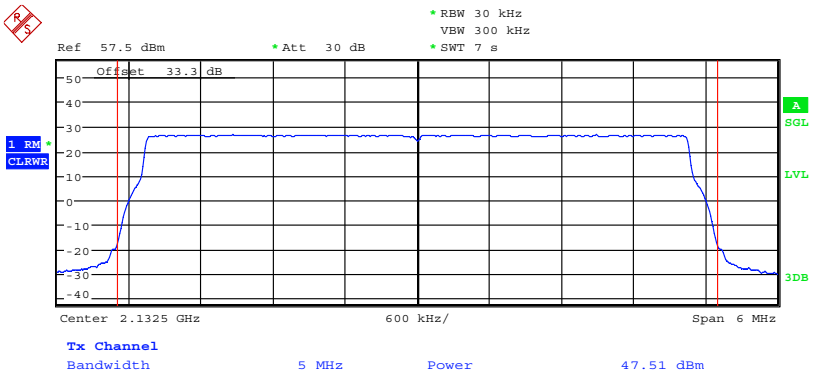


Figure 7-3: RF Power Output – 64QAM (2132.5 MHz) (5MHz Channel BW)

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

Config A TX2:

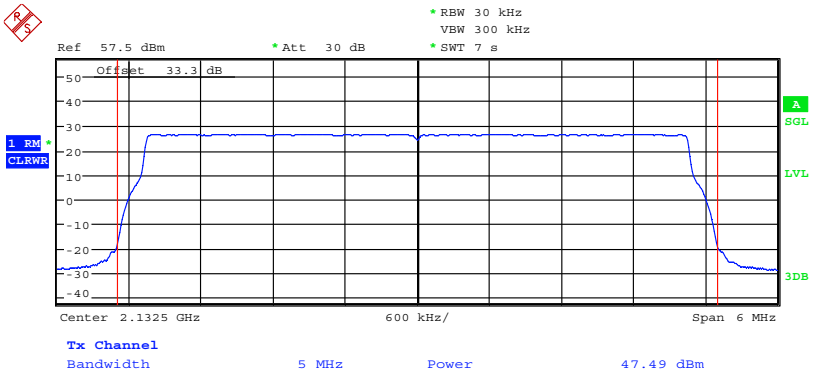


Figure 7-4: RF Power Output – QPSK (2132.5 MHz) (5MHz Channel BW)

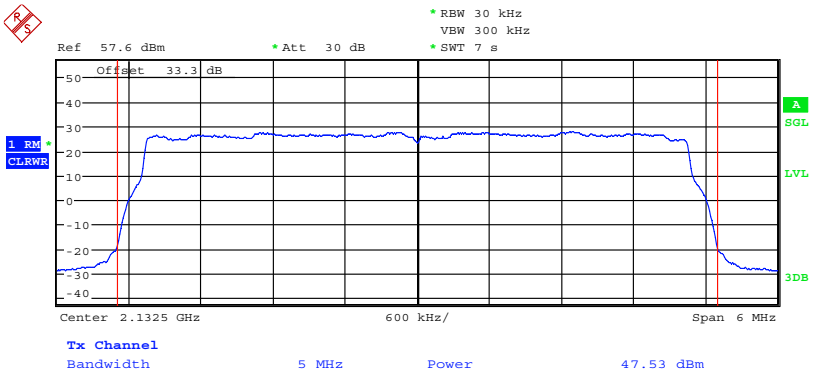


Figure 7-5: RF Power Output – 16QAM (2132.5 MHz) (5MHz Channel BW)

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

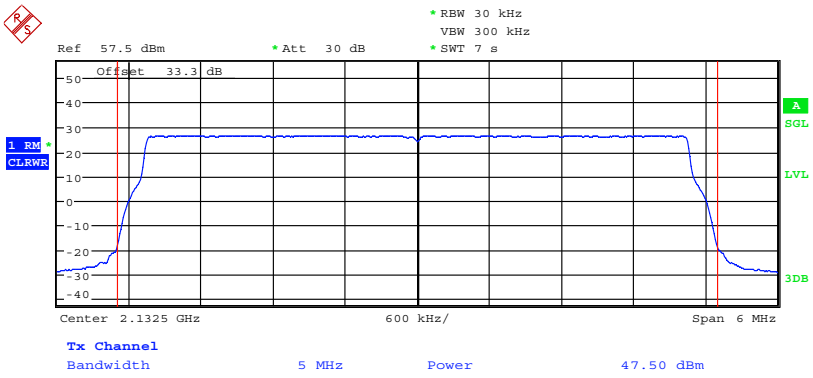


Figure 7-6: RF Power Output – 64QAM (2132.5 MHz) (5MHz Channel BW)

Config B TX1:

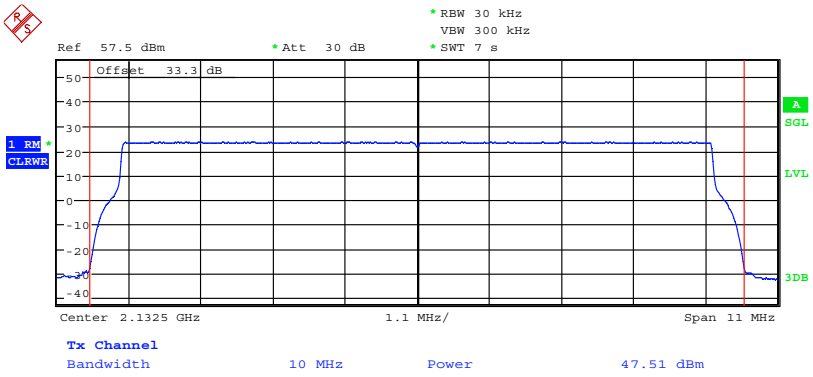


Figure 7-7: RF Power Output – QPSK (2132.5 MHz) (10MHz Channel BW)

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

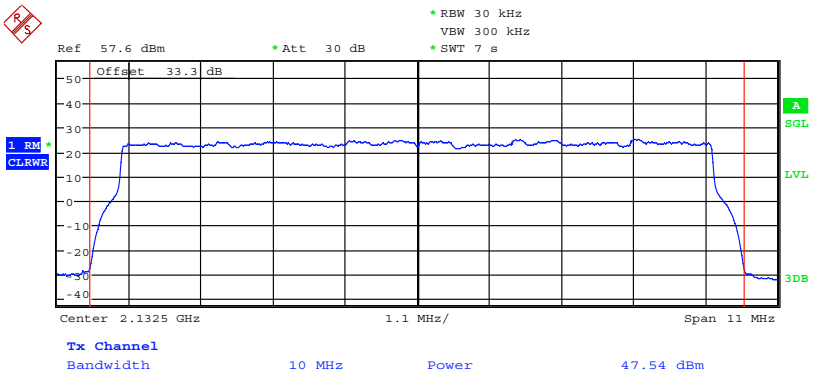


Figure 7-8: RF Power Output – 16QAM (2132.5 MHz) (10MHz Channel BW)

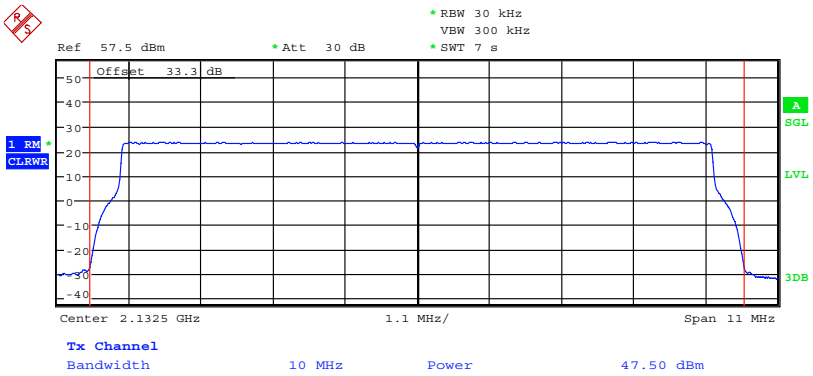


Figure 7-9: RF Power Output – 64QAM (2132.5 MHz) (10MHz Channel BW)

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

Config B TX2:

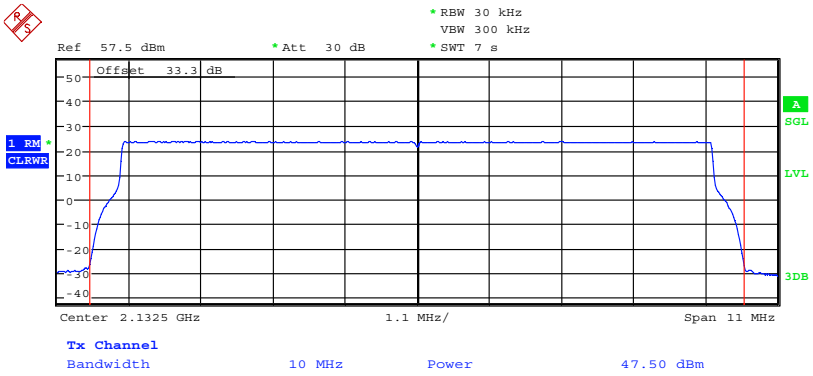


Figure 7-10: RF Power Output – QPSK (2132.5 MHz) (10MHz Channel BW)

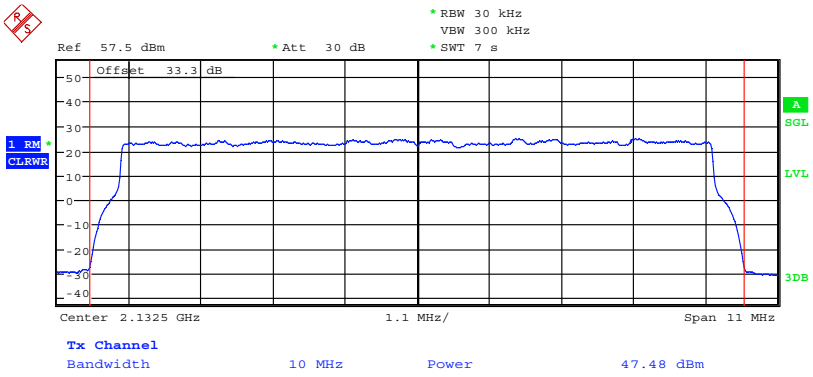


Figure 7-11: RF Power Output – 16QAM (2132.5 MHz) (10MHz Channel BW)

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

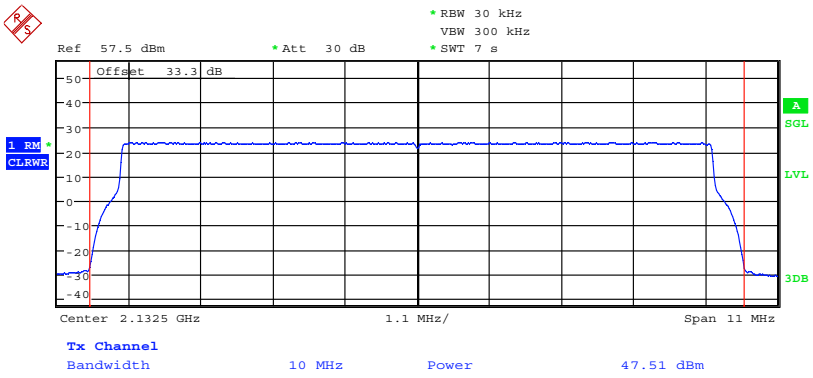


Figure 7-12: RF Power Output – 64QAM (2132.5 MHz) (10MHz Channel BW)

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

7.2.2 Test No. 3: Occupied Bandwidth

The value ‘OPB’ is the measured occupied bandwidth.

Config A TX1:

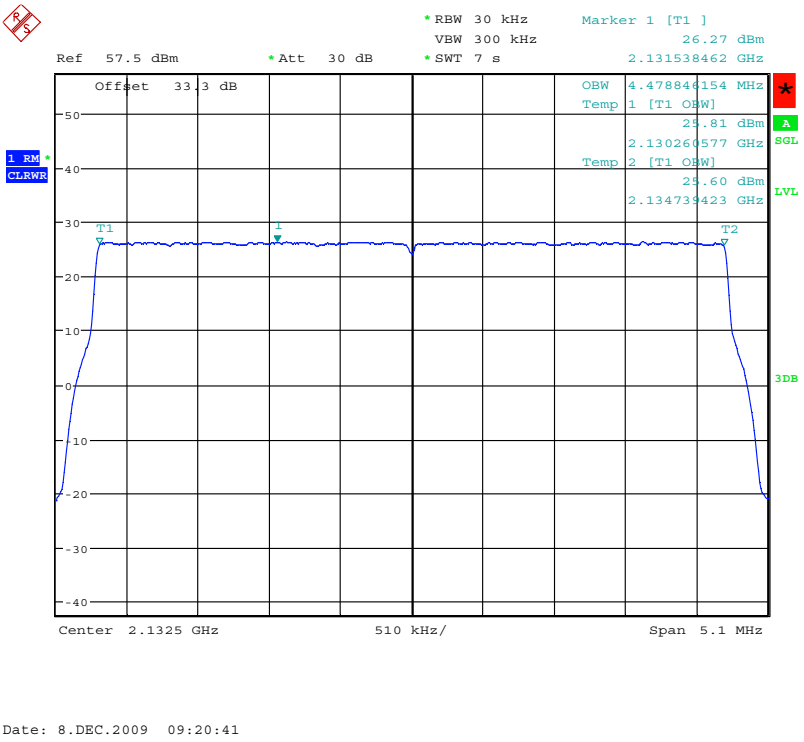


Figure 7-13: Occupied Bandwidth – QPSK (2132.5 MHz) (5MHz Channel BW)

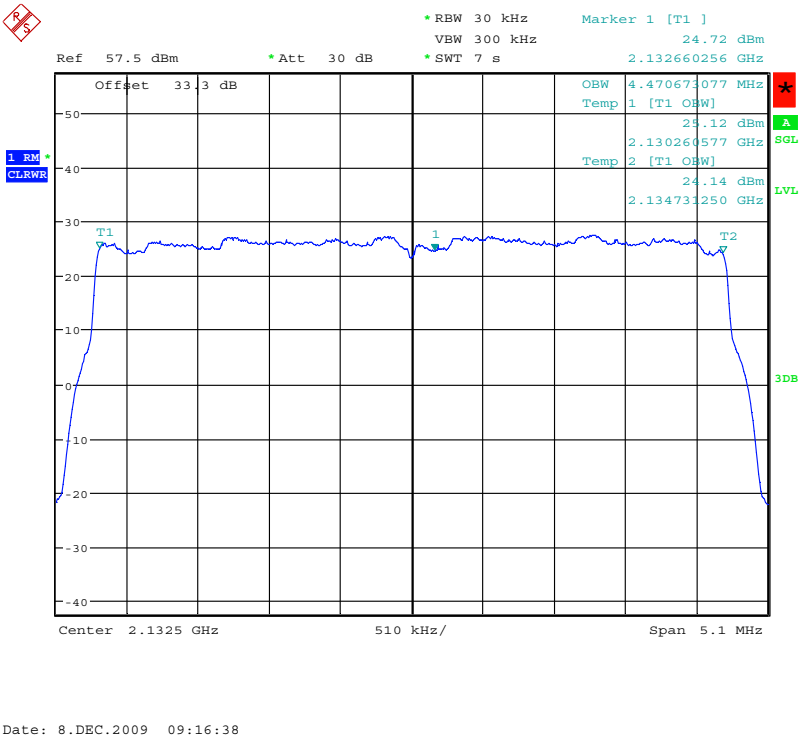


Figure 7-14: Occupied Bandwidth – 16QAM (2132.5 MHz) (5MHz Channel BW)

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

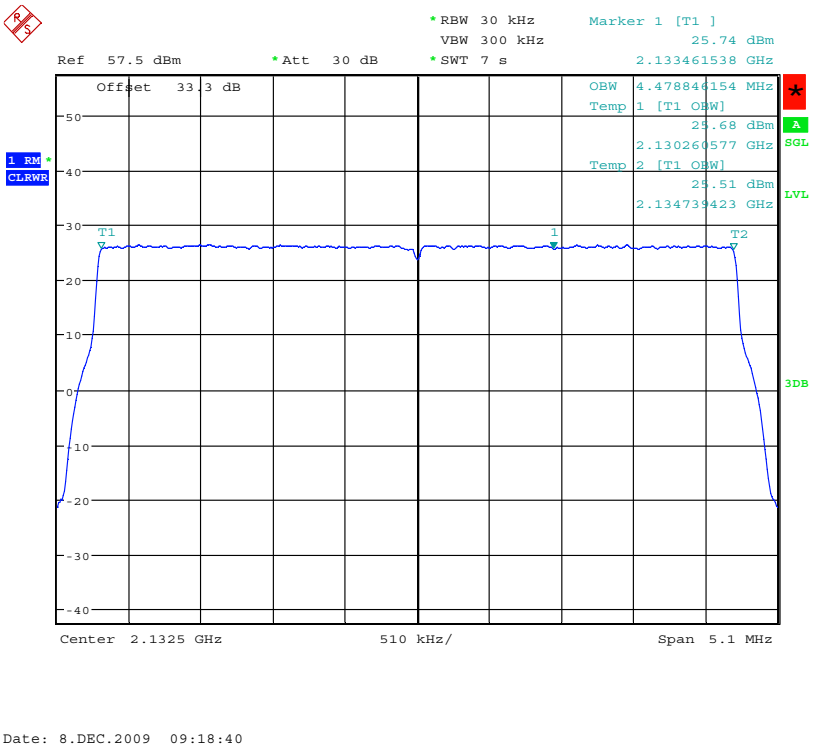


Figure 7-15: Occupied Bandwidth – 64QAM (2132.5 MHz) (5MHz Channel BW)

Config A TX2:

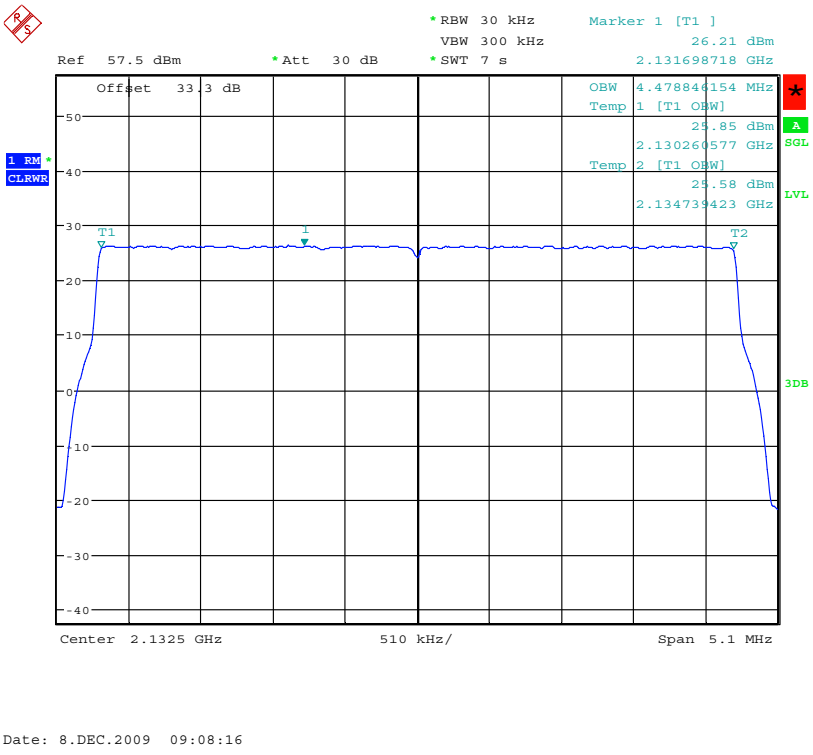


Figure 7-16: Occupied Bandwidth – QPSK (2132.5 MHz) (5MHz Channel BW)

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

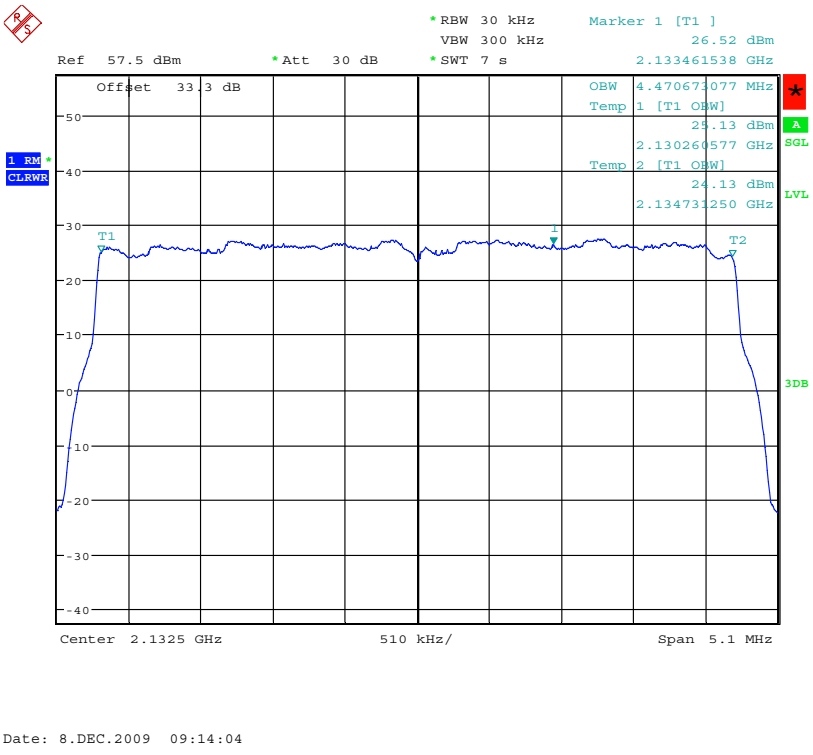


Figure 7-17: Occupied Bandwidth – 16QAM (2132.5 MHz) (5MHz Channel BW)

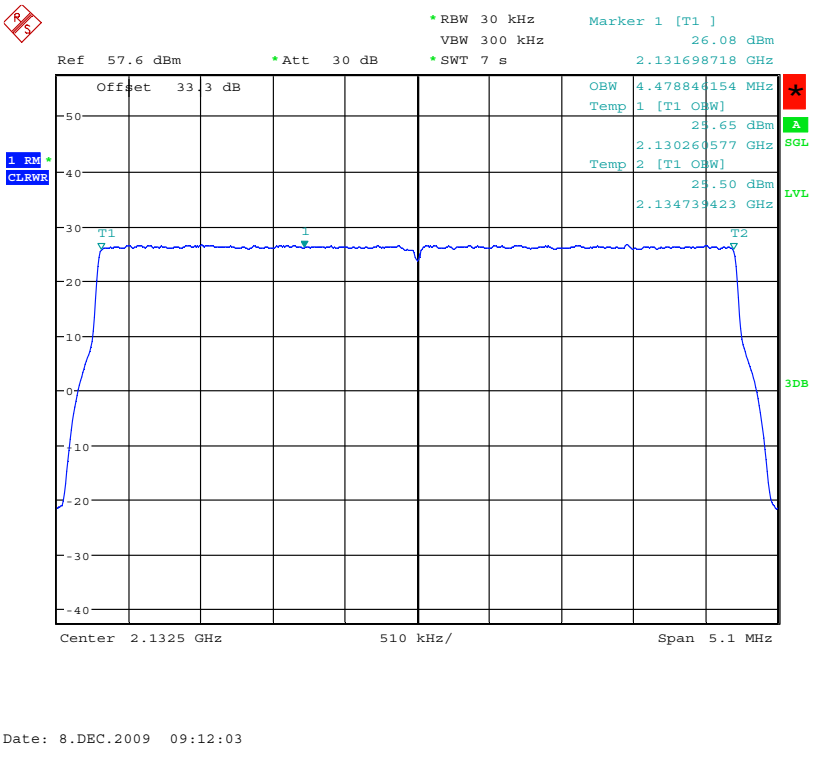


Figure 7-18: Occupied Bandwidth – 64QAM (2132.5 MHz) (5MHz Channel BW)

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

Config B TX1:

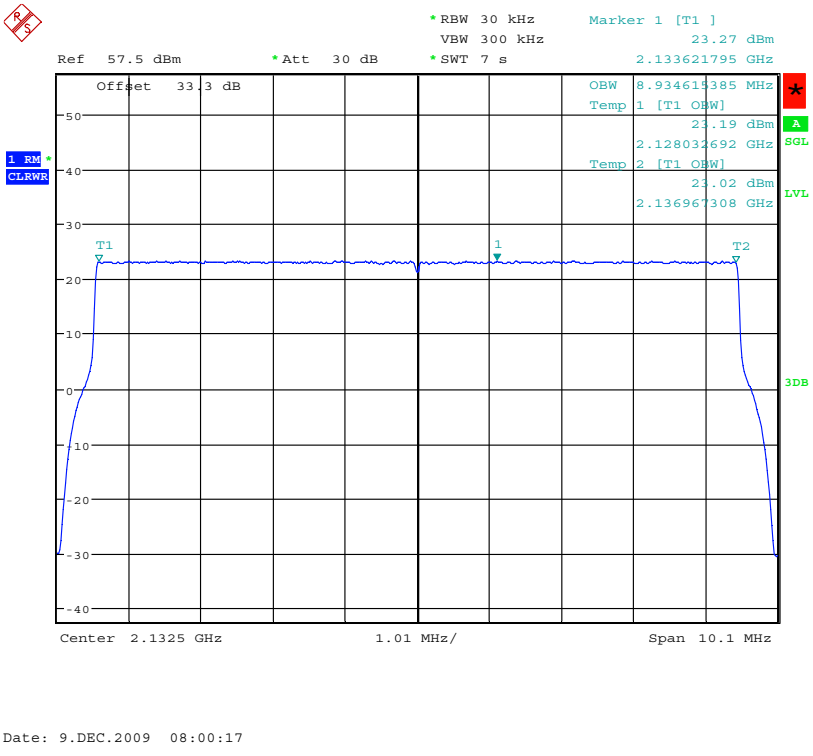


Figure 7-19: Occupied Bandwidth – QPSK (2132.5 MHz) (10MHz Channel BW)

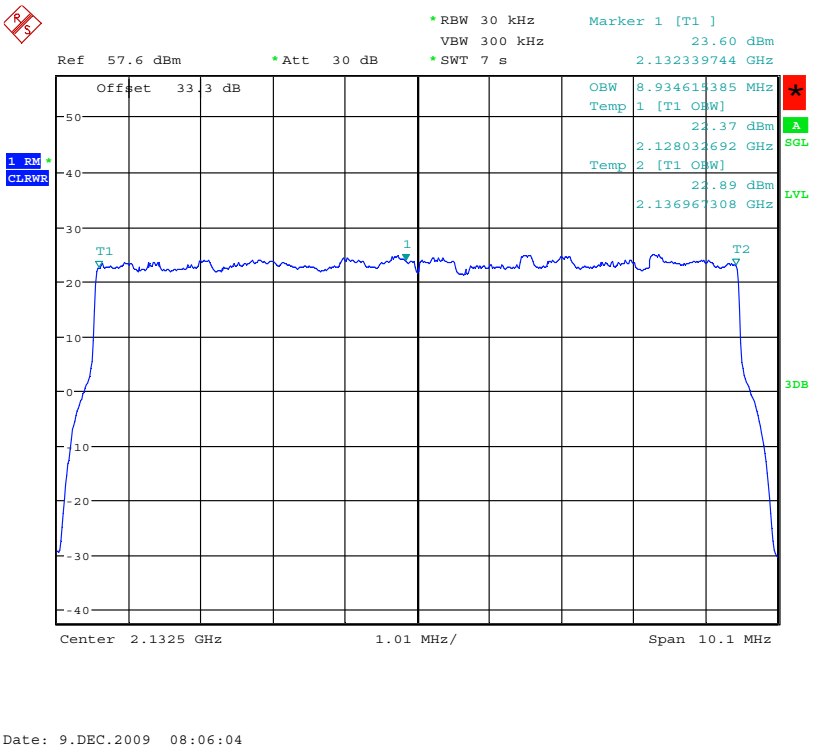


Figure 7-20: Occupied Bandwidth – 16QAM (2132.5 MHz) (10MHz Channel BW)

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

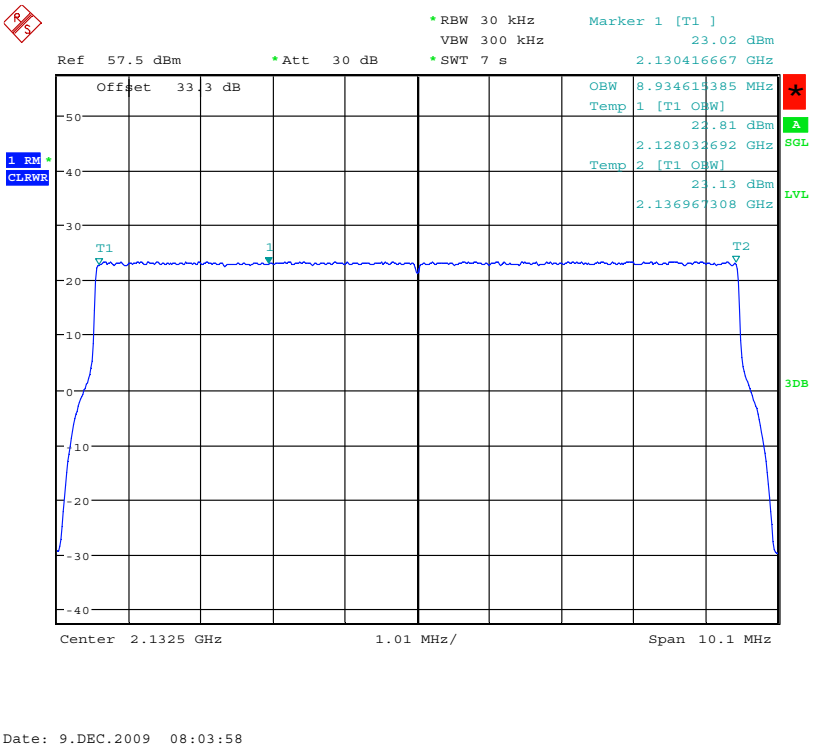


Figure 7-21: Occupied Bandwidth – 64QAM (2132.5 MHz) (10MHz Channel BW)

Config B TX2:

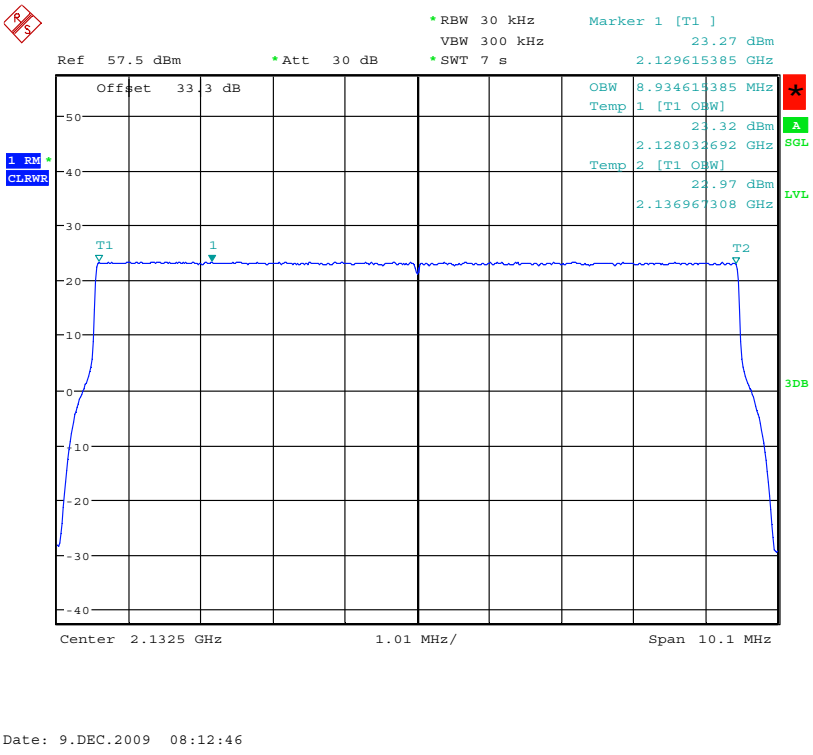


Figure 7-22: Occupied Bandwidth – QPSK (2132.5 MHz) (10MHz Channel BW)

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

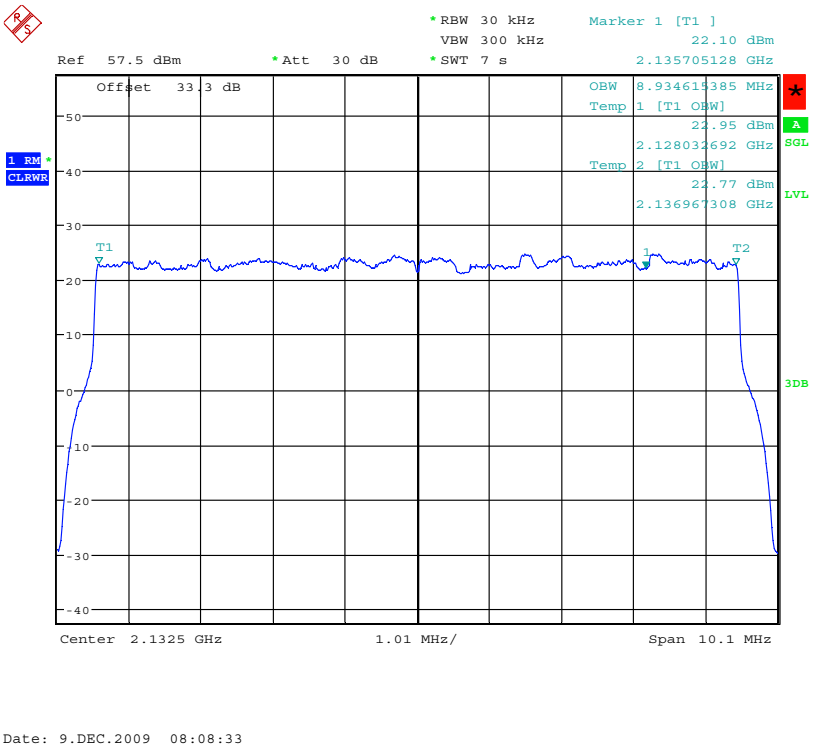


Figure 7-23: Occupied Bandwidth – 16QAM (2132.5 MHz) (10MHz Channel BW)

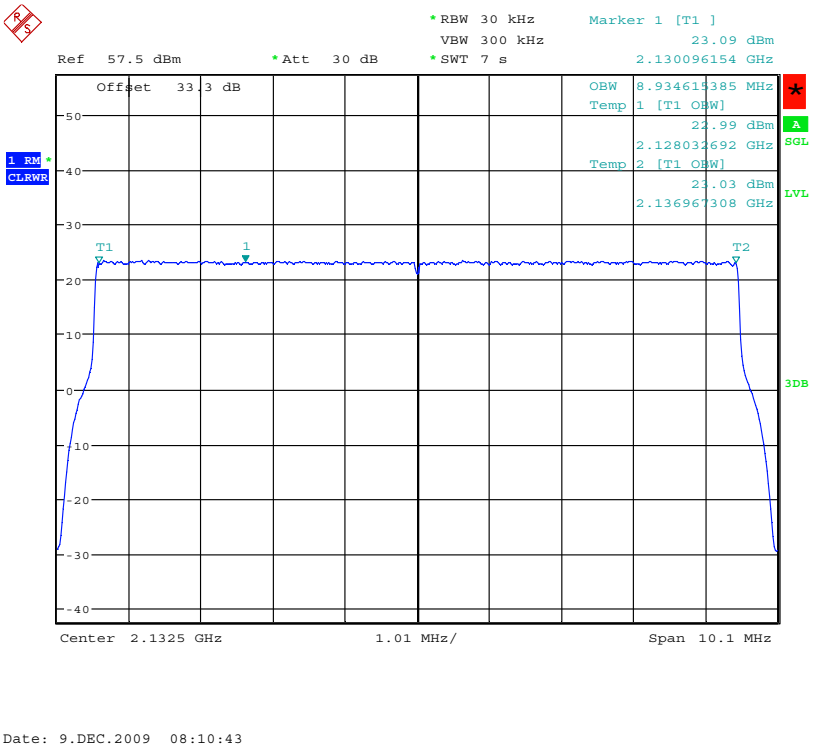


Figure 7-24: Occupied Bandwidth – 64QAM (2132.5 MHz) (10MHz Channel BW)

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

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:

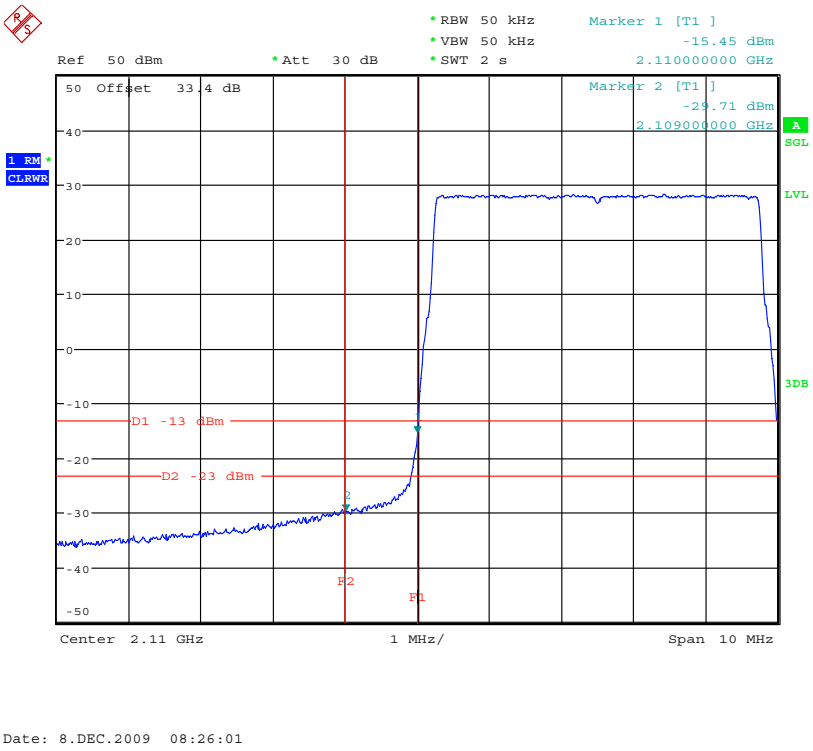


Figure 7-25: Spurious Emissions (Lower band edge) – QPSK (2112.5 MHz) (5MHz Channel BW)

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

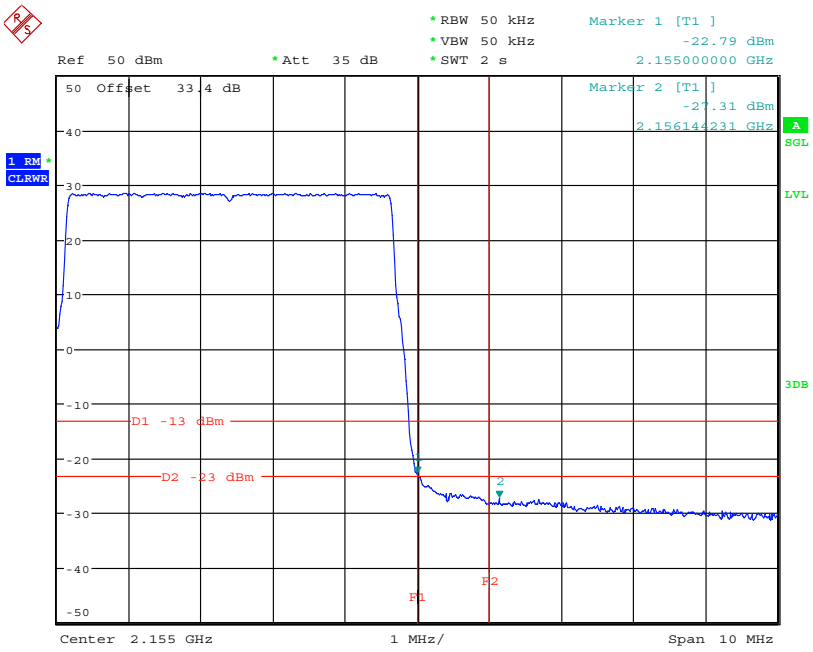


Figure 7-26: Spurious Emissions (Upper band edge) – QPSK (2152.4 MHz) (5MHz Channel BW)

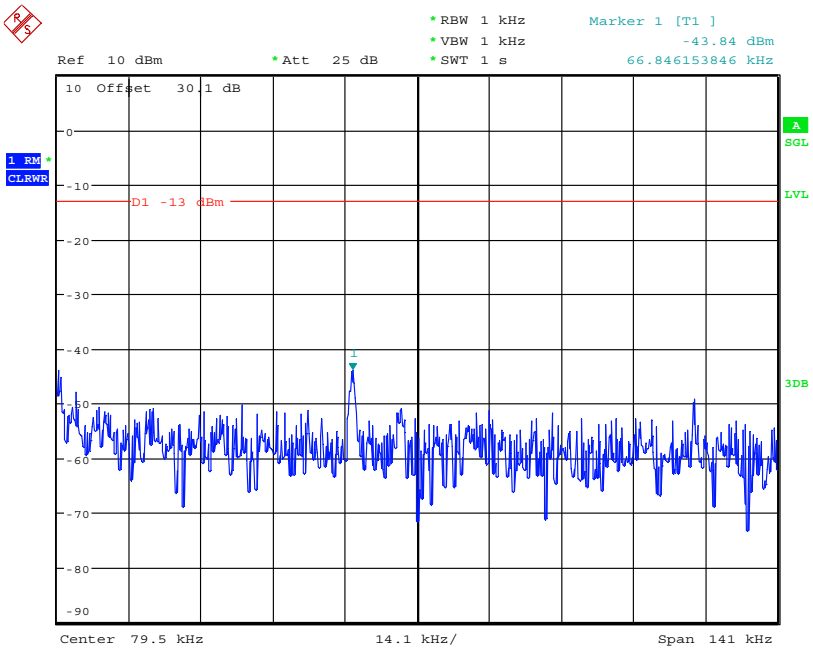


Figure 7-27: Spurious Emissions (9kHz-150kHz) – QPSK (2132.5 MHz) (5MHz Channel BW)

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

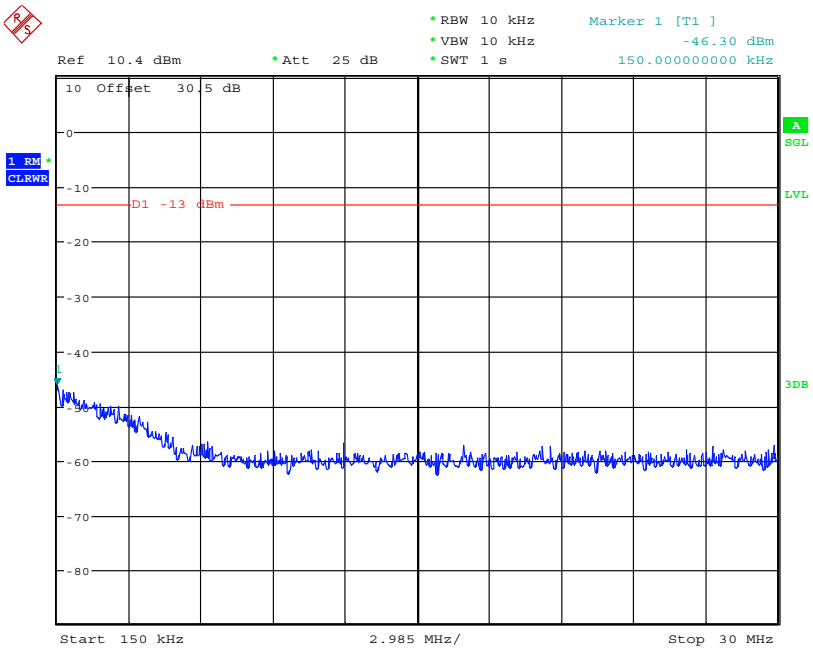


Figure 7-28: Spurious Emissions (150kHz-30MHz) – QPSK (2132.5 MHz) (5MHz Channel BW)

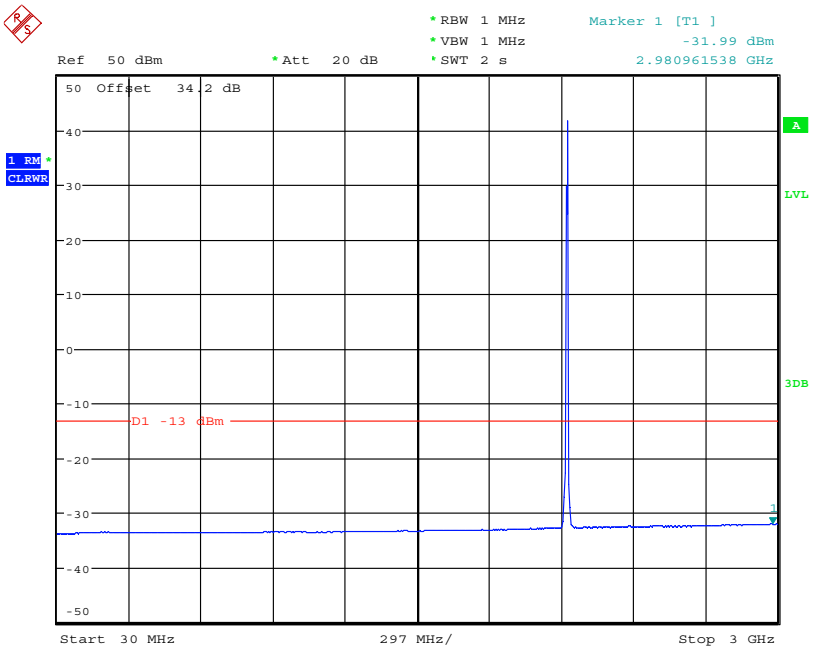


Figure 7-29: Spurious Emissions (30MHz-3GHz) – QPSK (2132.5 MHz) (5MHz Channel BW)

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

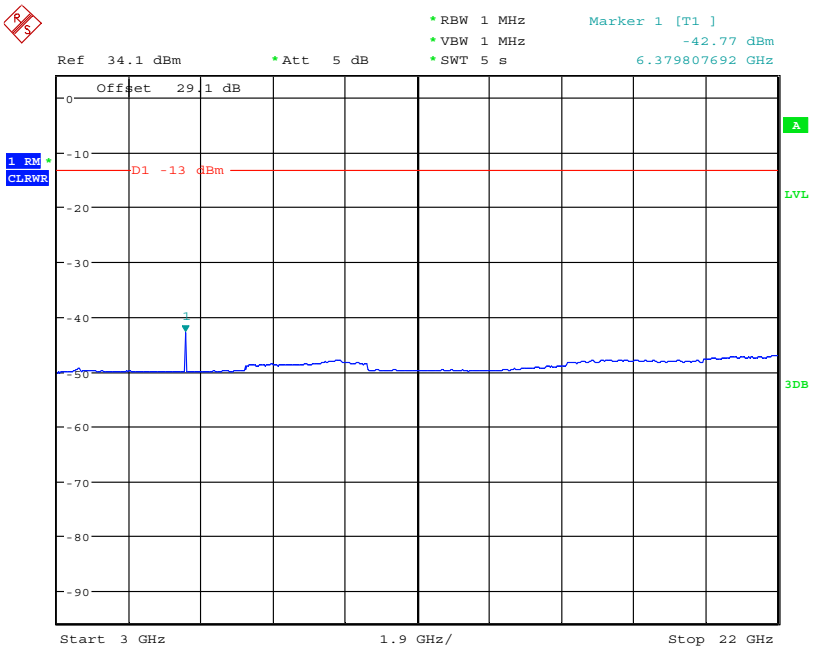


Figure 7-30: Spurious Emissions (3GHz-22GHz) – QPSK (2132.5 MHz) (5MHz Channel BW)

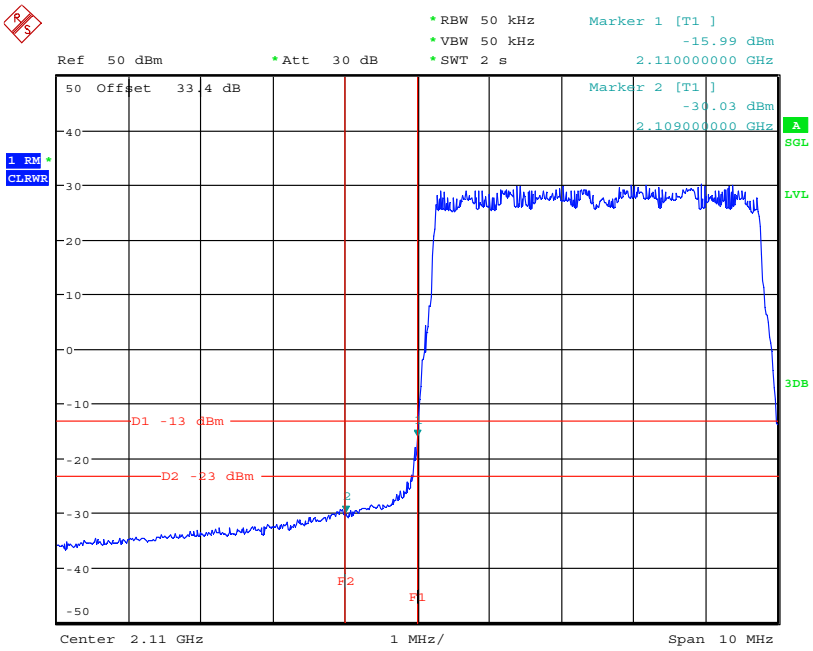


Figure 7-31: Spurious Emissions (Lower band edge) – 16QAM (2112.5 MHz) (5MHz Channel BW)

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

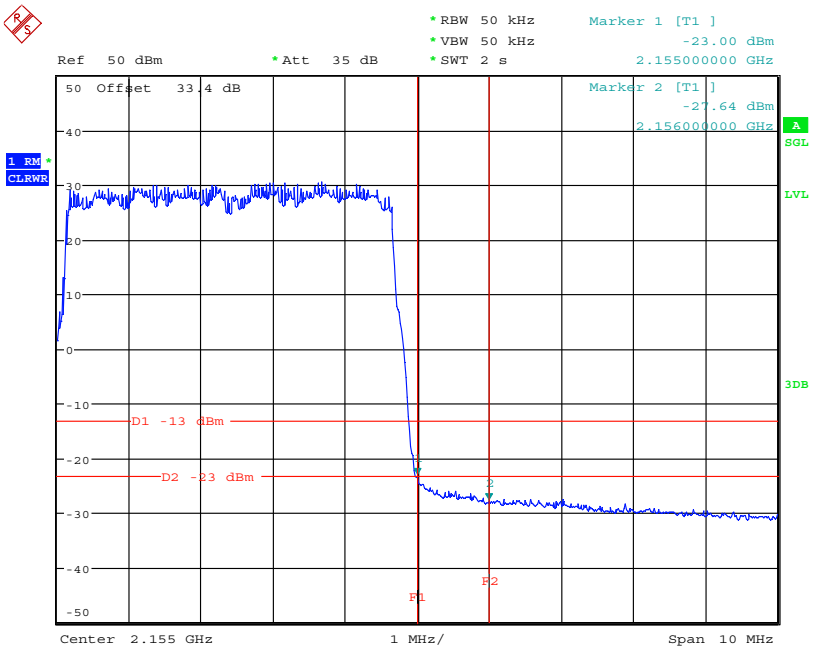


Figure 7-32: Spurious Emissions (Upper band edge) – 16QAM (2152.4 MHz) (5MHz Channel BW)

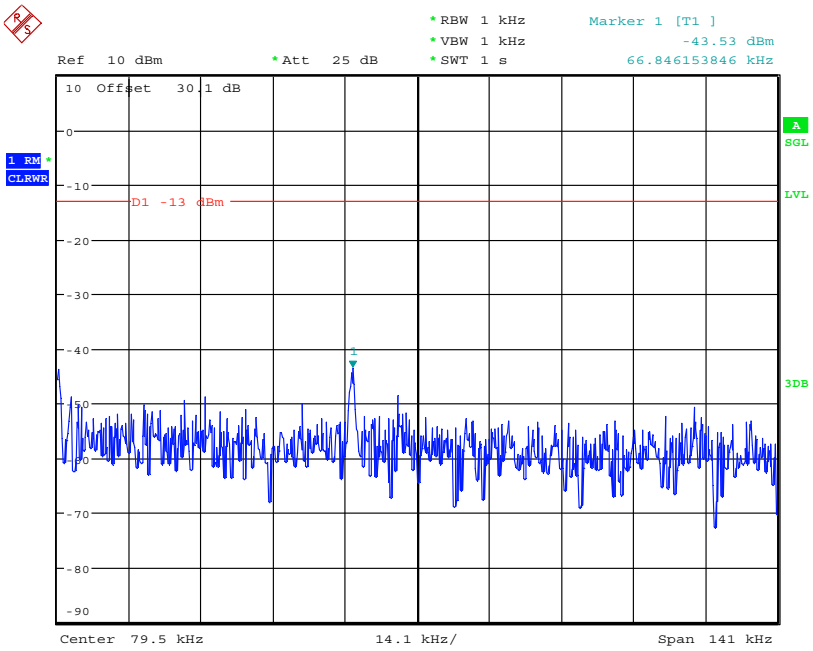


Figure 7-33: Spurious Emissions (9kHz-150kHz) – 16QAM (2132.5 MHz) (5MHz Channel BW)

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

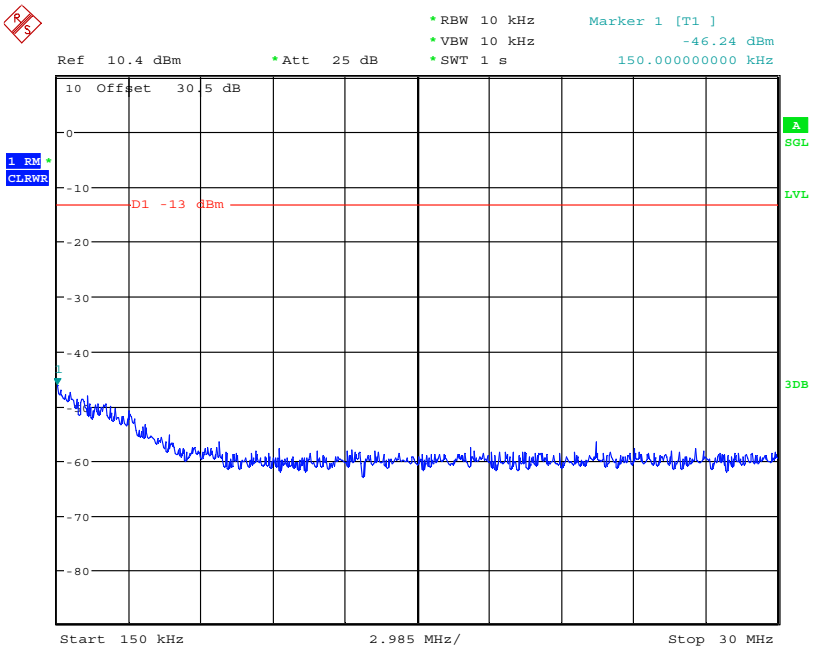


Figure 7-34: Spurious Emissions (150kHz-30MHz) – 16QAM (2132.5 MHz) (5MHz Channel BW)

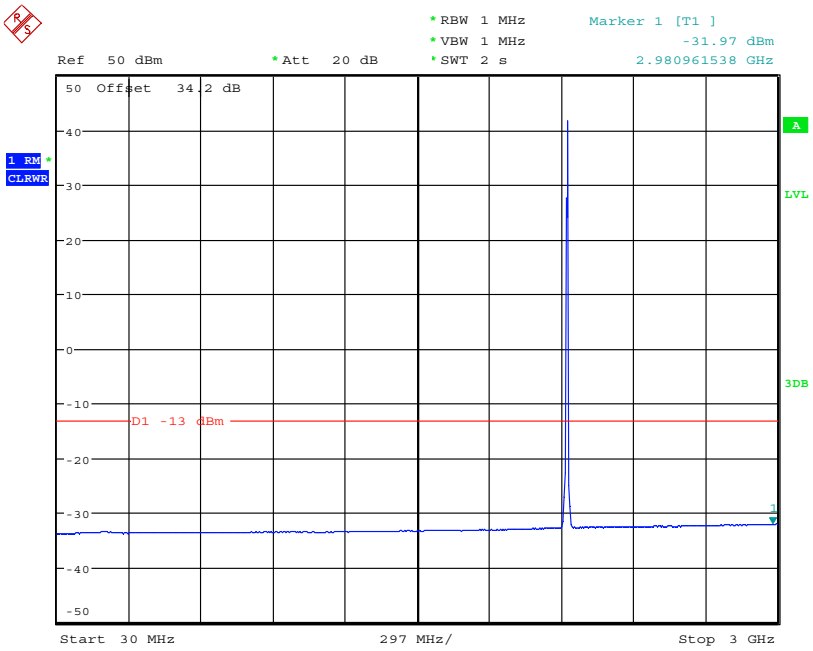


Figure 7-35: Spurious Emissions (30MHz-3GHz) – 16QAM (2132.5 MHz) (5MHz Channel BW)

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

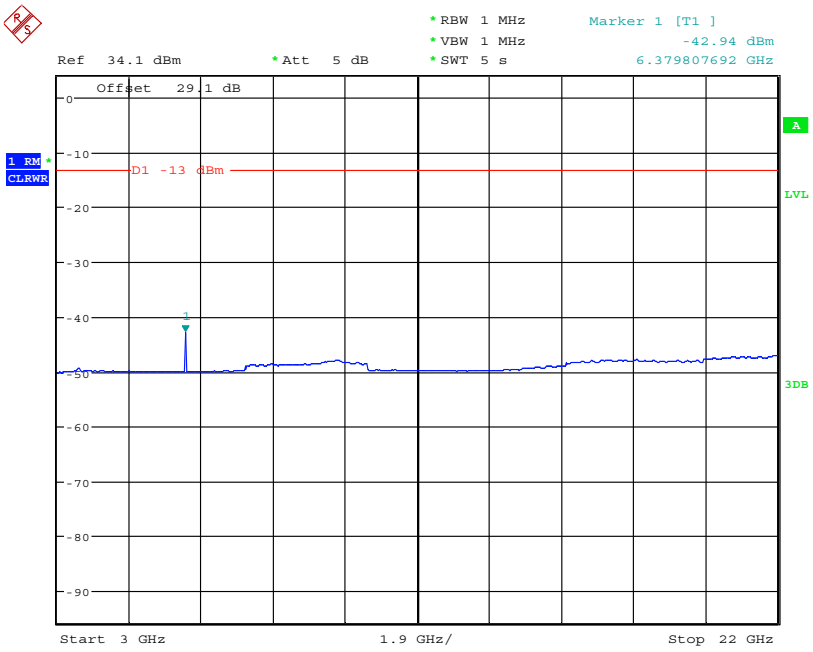


Figure 7-36: Spurious Emissions (3GHz-22GHz) – 16QAM (2132.5 MHz) (5MHz Channel BW)

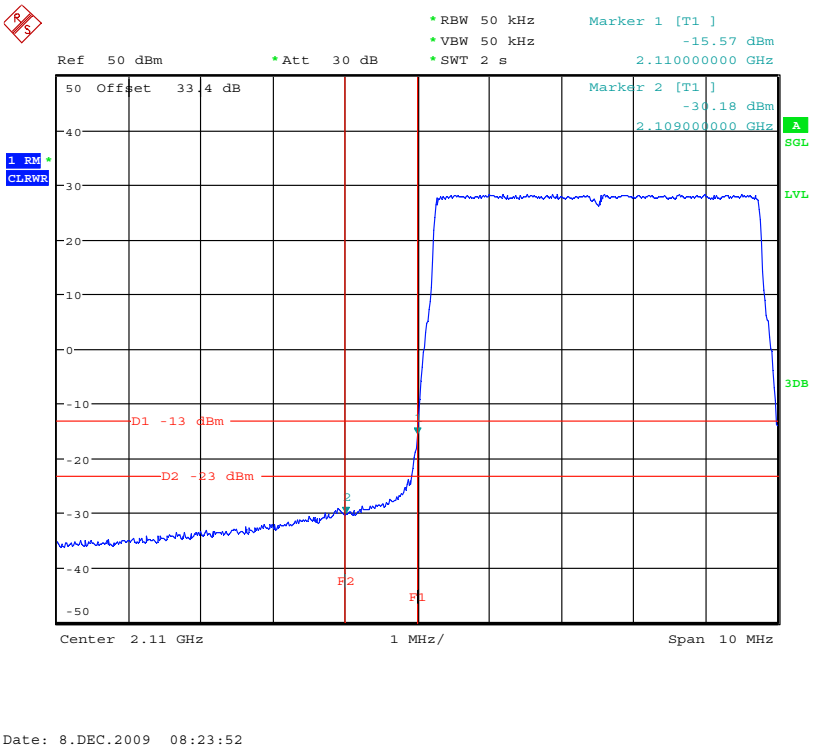


Figure 7-37: Spurious Emissions (Lower band edge) – 64QAM (2112.5 MHz) (5MHz Channel BW)

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

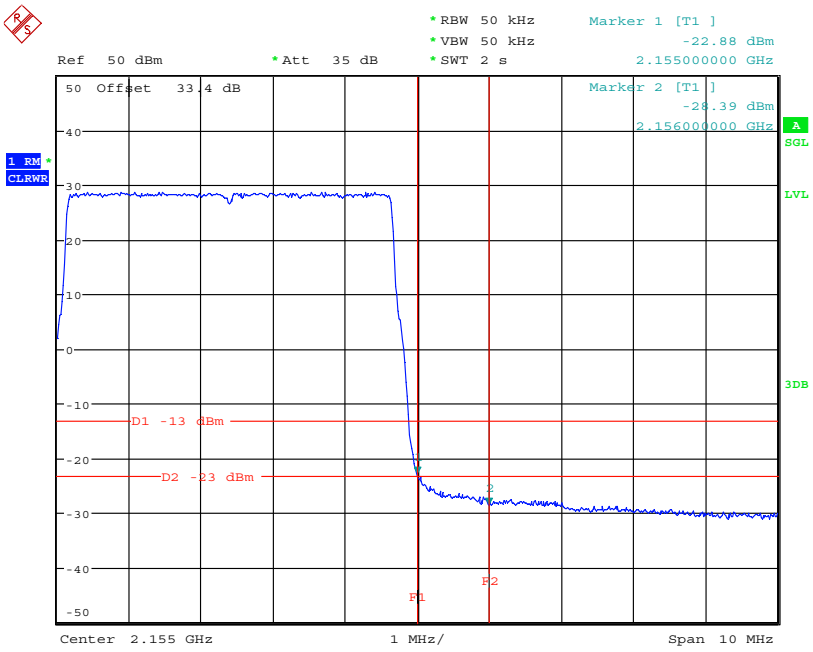


Figure 7-38: Spurious Emissions (Upper band edge) – 64QAM (2152.4 MHz) (5MHz Channel BW)

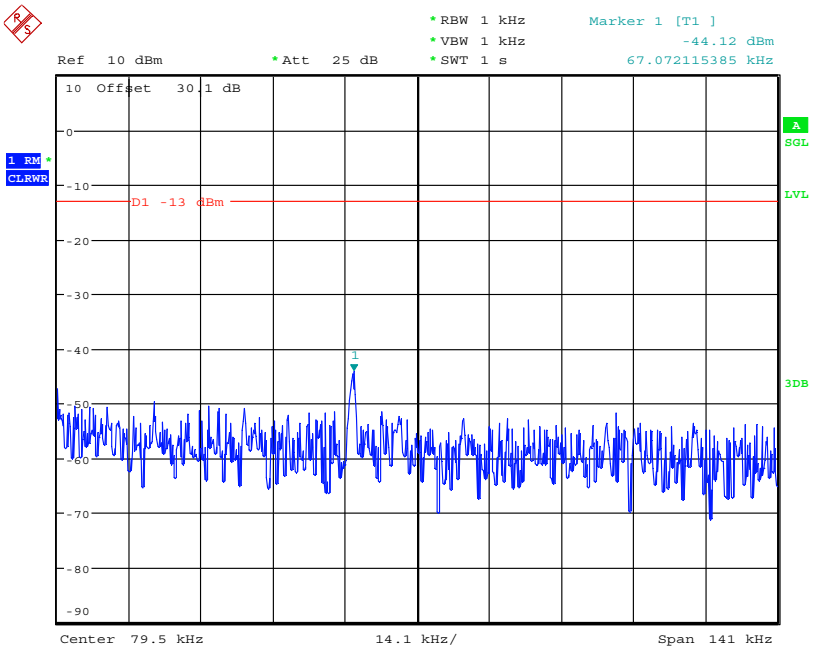


Figure 7-39: Spurious Emissions (9kHz-150kHz) – 64QAM (2132.5 MHz) (5MHz Channel BW)

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

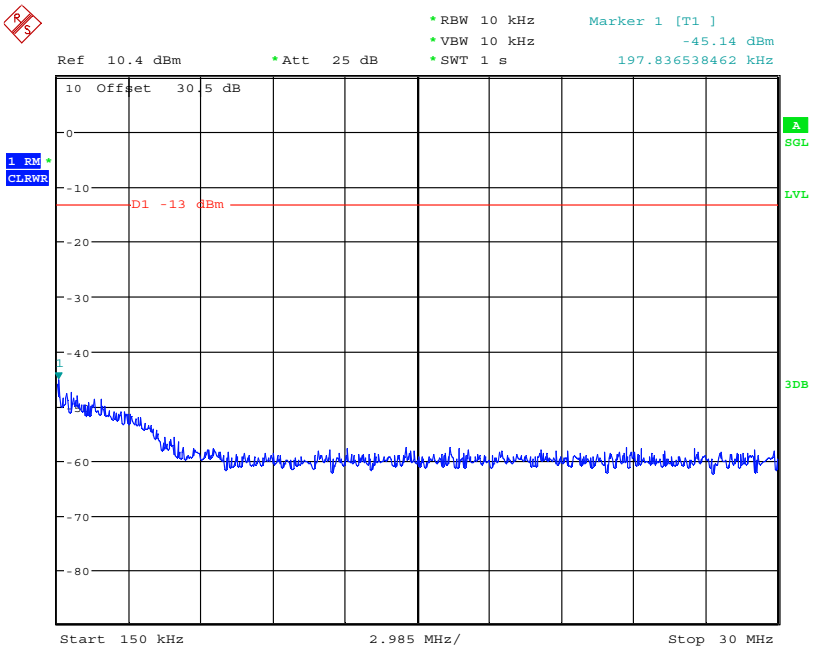


Figure 7-40: Spurious Emissions (150kHz-30MHz) – 64QAM (2132.5 MHz) (5MHz Channel BW)

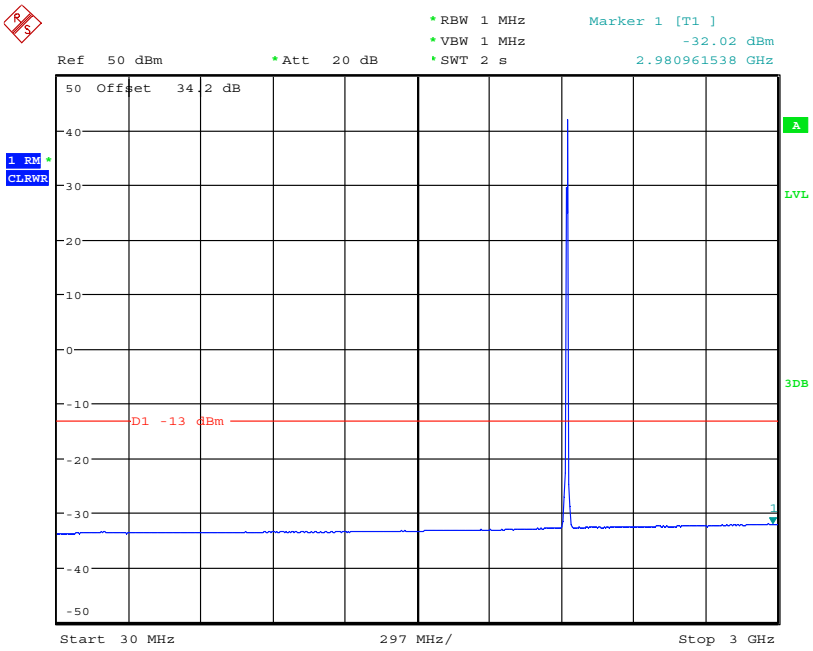


Figure 7-41: Spurious Emissions (30MHz-3GHz) – 64QAM (2132.5 MHz) (5MHz Channel BW)

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

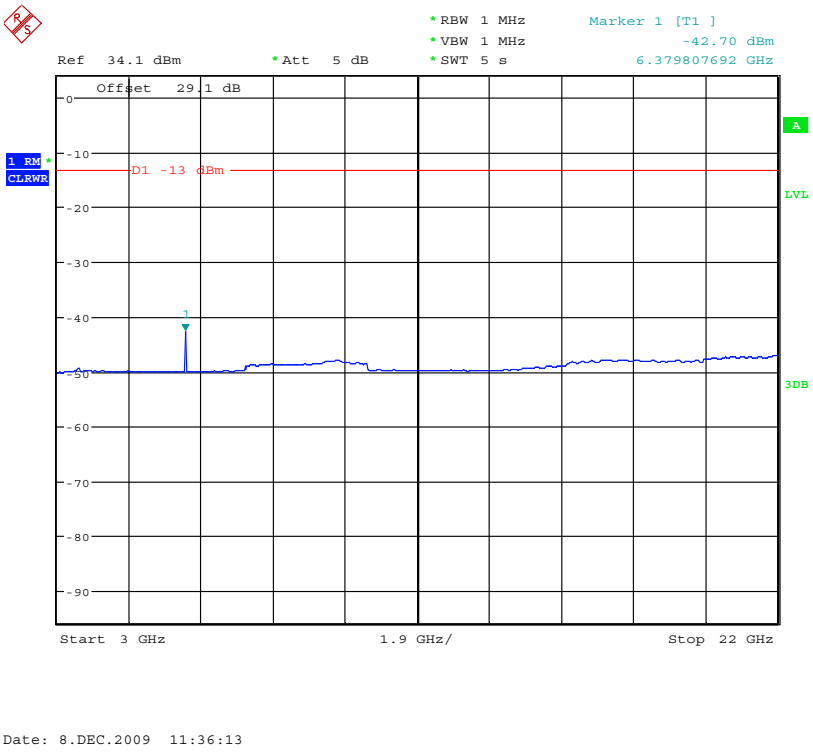


Figure 7-42: Spurious Emissions (3GHz-22GHz) – 64QAM (2132.5 MHz) (5MHz Channel BW)

Config A TX2:

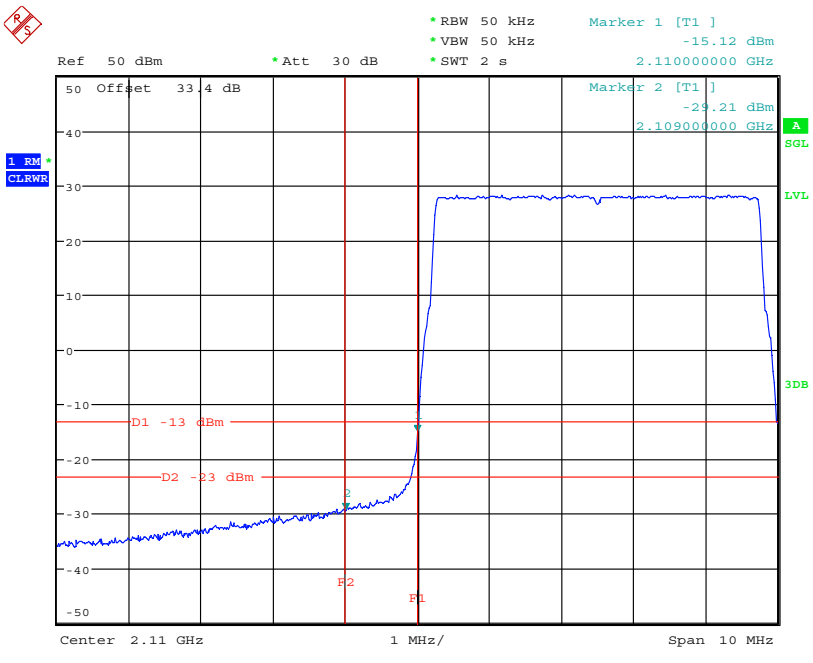


Figure 7-43: Spurious Emissions (Lower band edge) – QPSK (2112.5 MHz) (5MHz Channel BW)

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

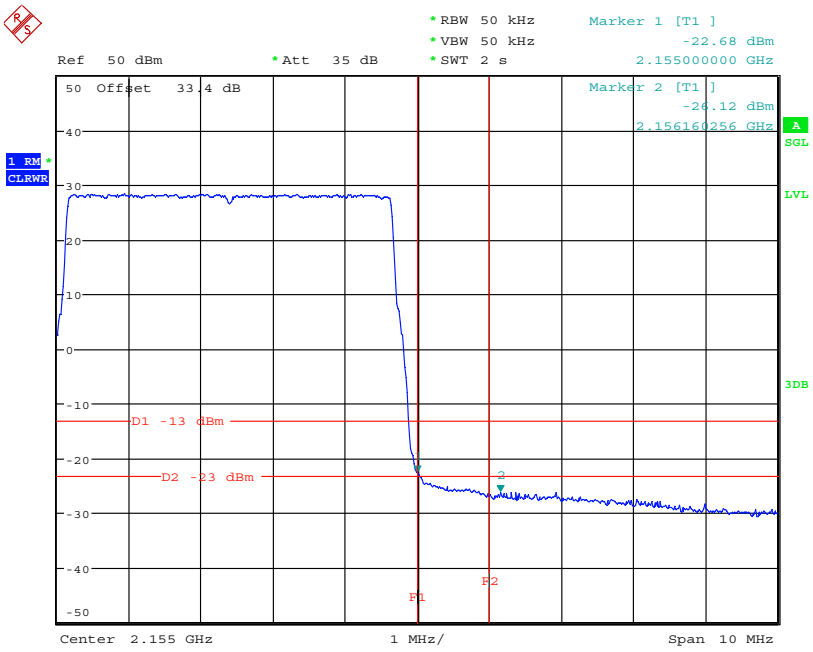


Figure 7-44: Spurious Emissions (Upper band edge) – QPSK (2152.4 MHz) (5MHz Channel BW)

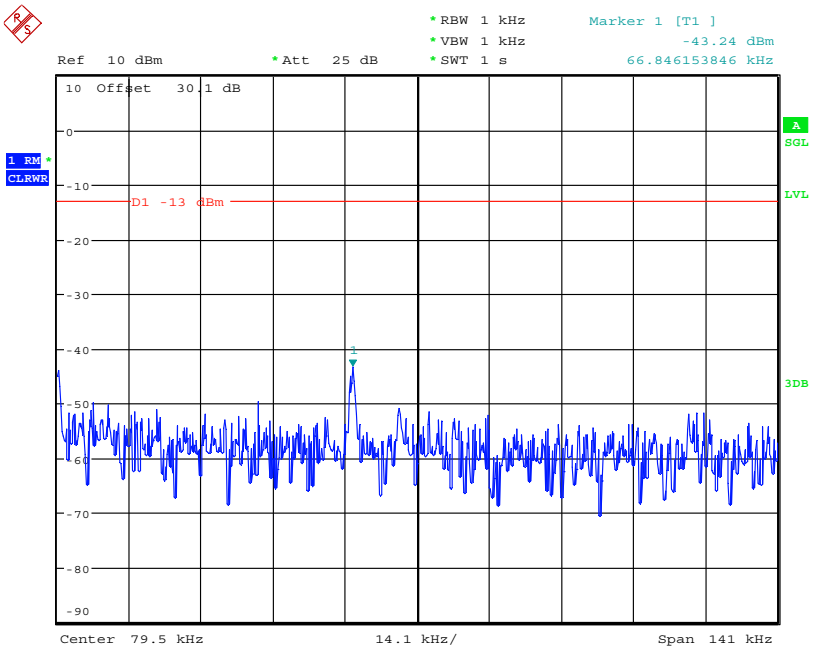


Figure 7-45: Spurious Emissions (9kHz-150kHz) – QPSK (2132.5 MHz) (5MHz Channel BW)

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

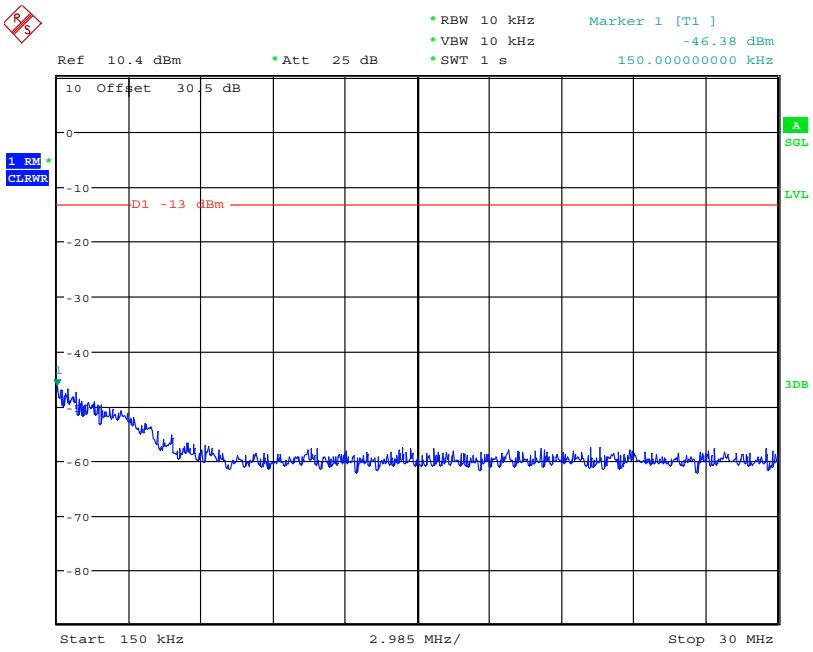


Figure 7-46: Spurious Emissions (150kHz-30MHz) – QPSK (2132.5 MHz) (5MHz Channel BW)

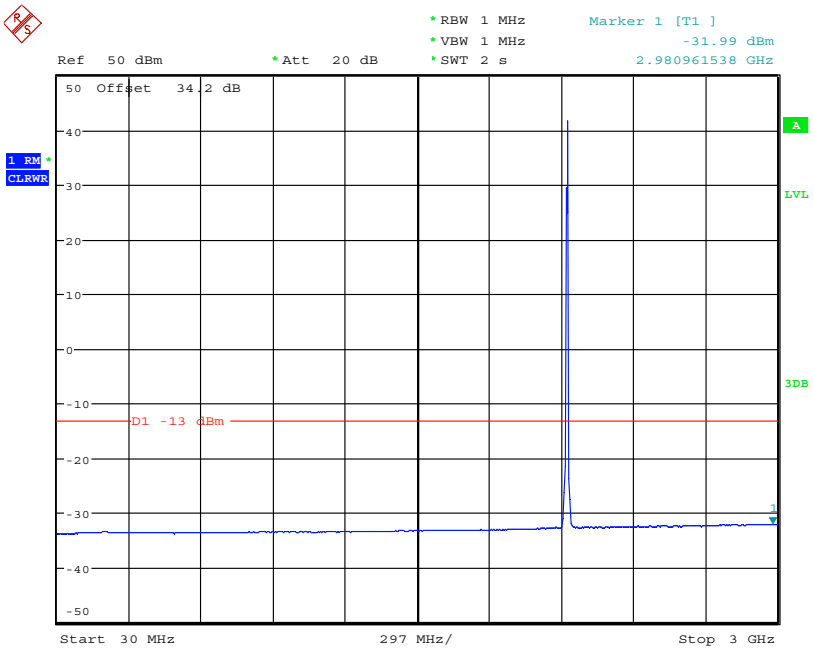


Figure 7-47: Spurious Emissions (30MHz-3GHz) – QPSK (2132.5 MHz) (5MHz Channel BW)

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

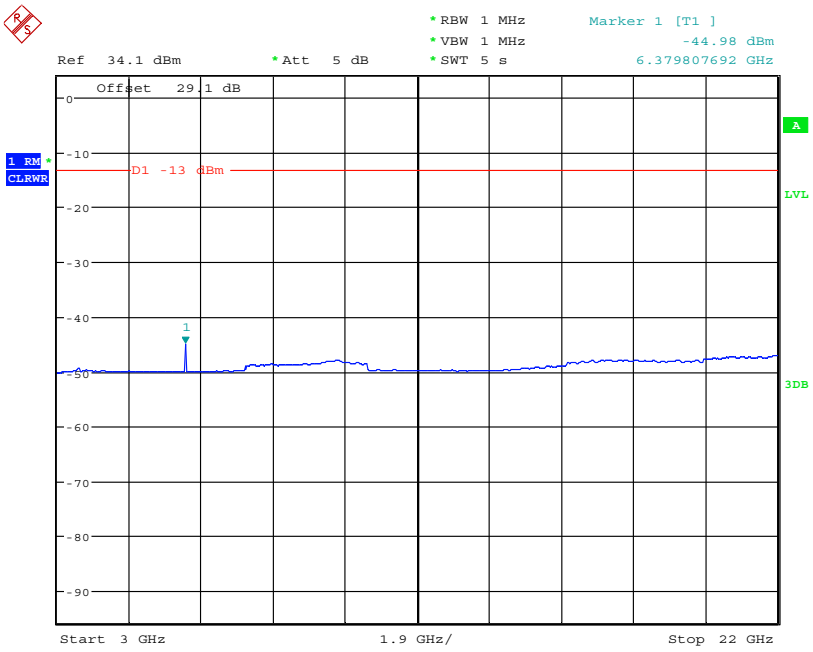


Figure 7-48: Spurious Emissions (3GHz-22GHz) – QPSK (2132.5 MHz) (5MHz Channel BW)

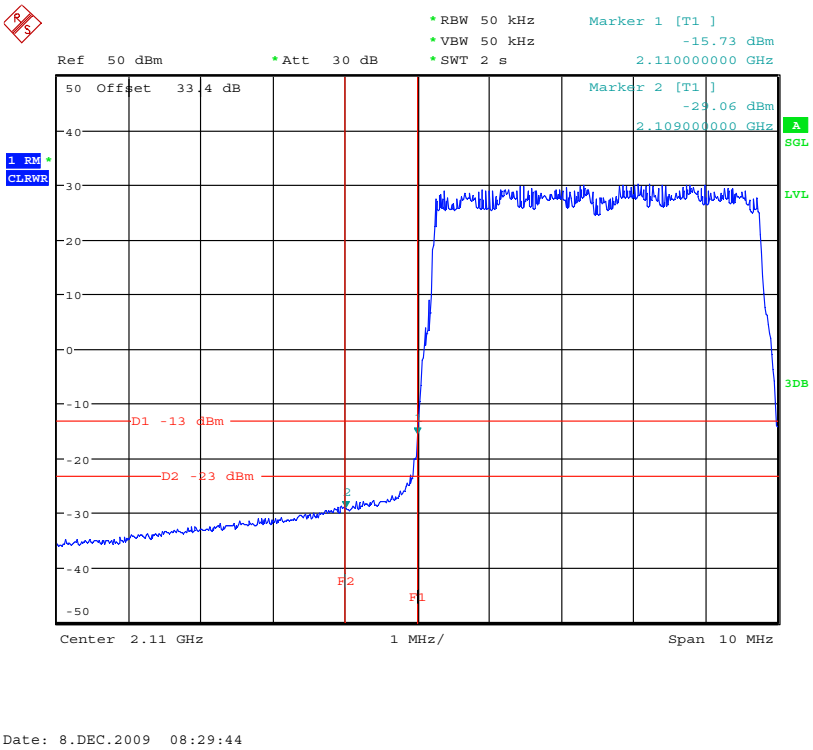


Figure 7-49: Spurious Emissions (Lower band edge) – 16QAM (2112.5 MHz) (5MHz Channel BW)

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

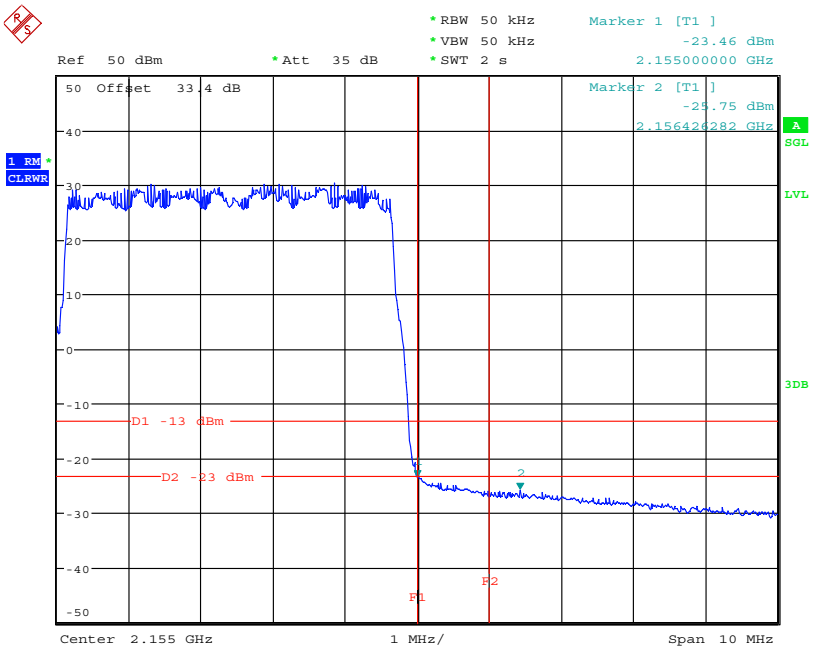


Figure 7-50: Spurious Emissions (Upper band edge) – 16QAM (2152.4 MHz) (5MHz Channel BW)

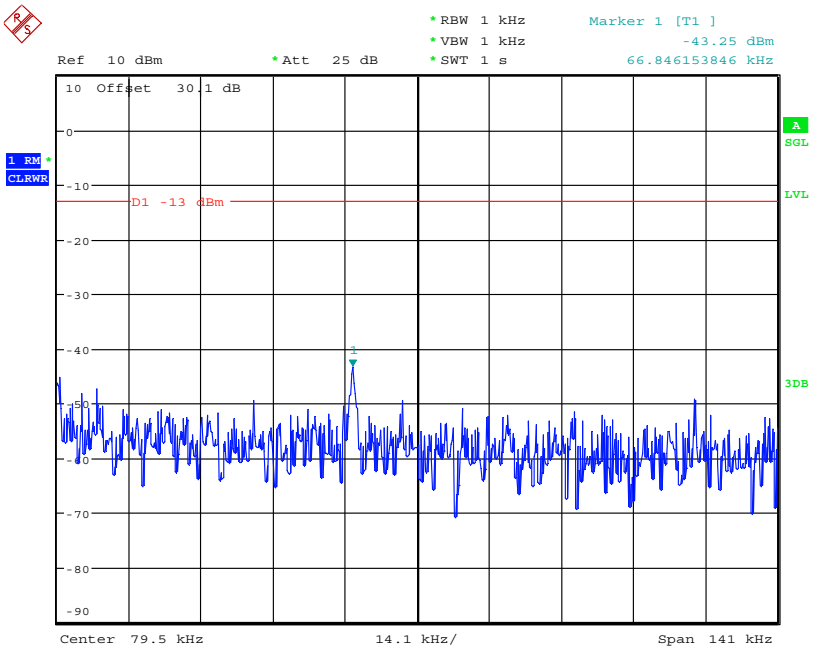


Figure 7-51: Spurious Emissions (9kHz-150kHz) – 16QAM (2132.5 MHz) (5MHz Channel BW)

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

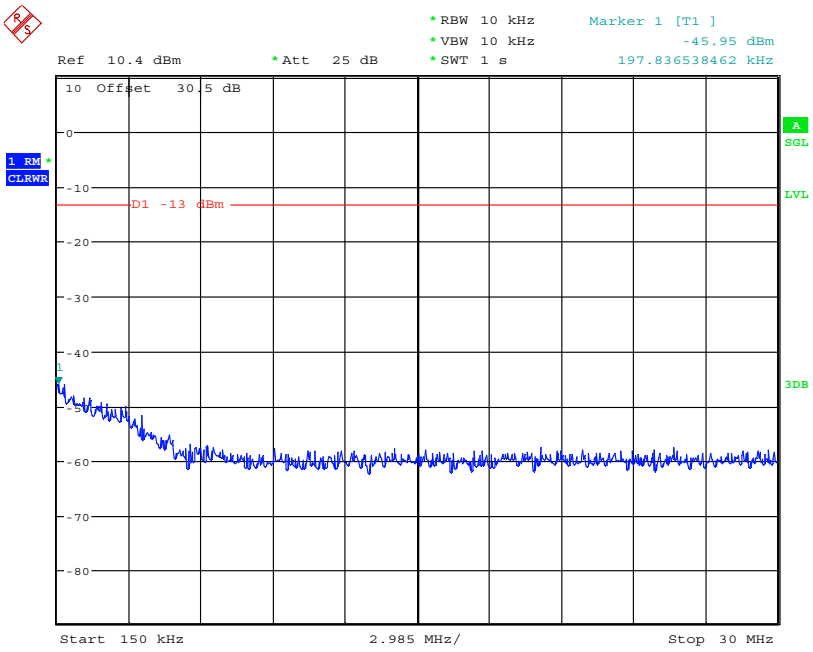


Figure 7-52: Spurious Emissions (150kHz-30MHz) – 16QAM (2132.5 MHz) (5MHz Channel BW)

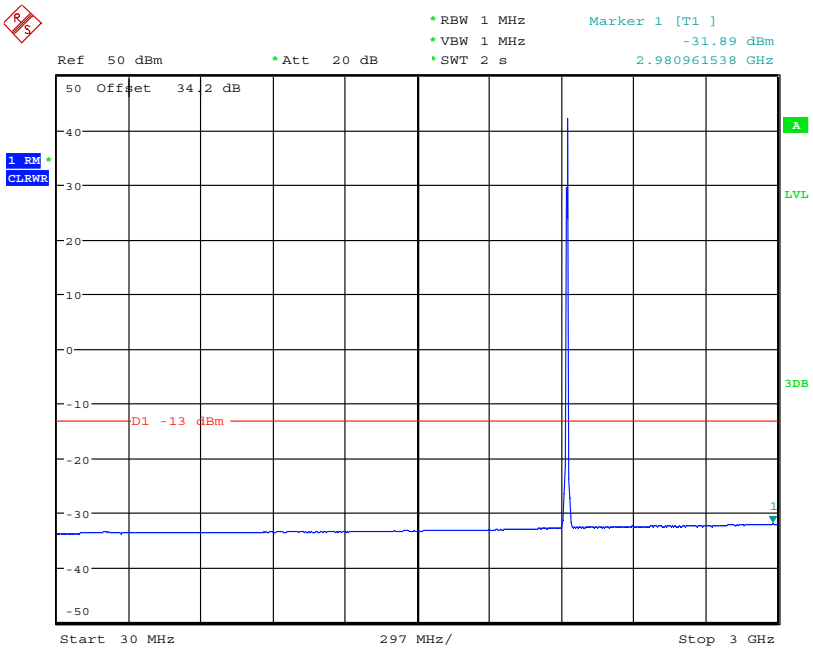


Figure 7-53: Spurious Emissions (30MHz-3GHz) – 16QAM (2132.5 MHz) (5MHz Channel BW)

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

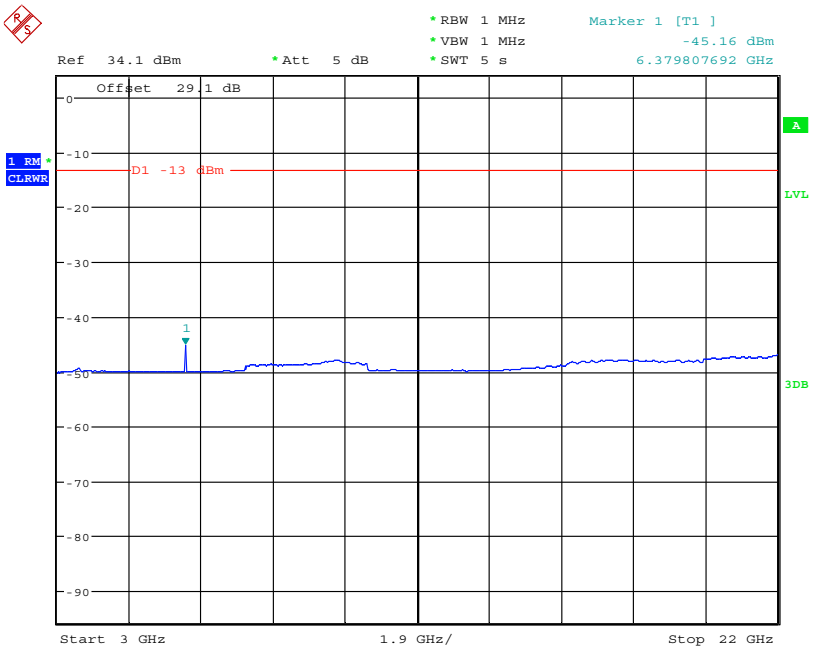


Figure 7-54: Spurious Emissions (3GHz-22GHz) – 16QAM (2132.5 MHz) (5MHz Channel BW)

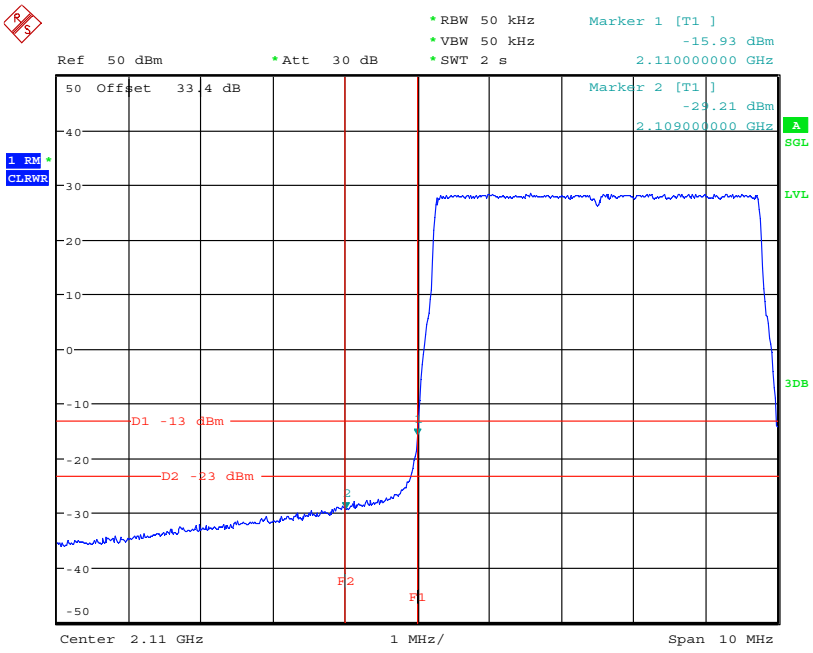


Figure 7-55: Spurious Emissions (Lower band edge) – 64QAM (2112.5 MHz) (5MHz Channel BW)

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

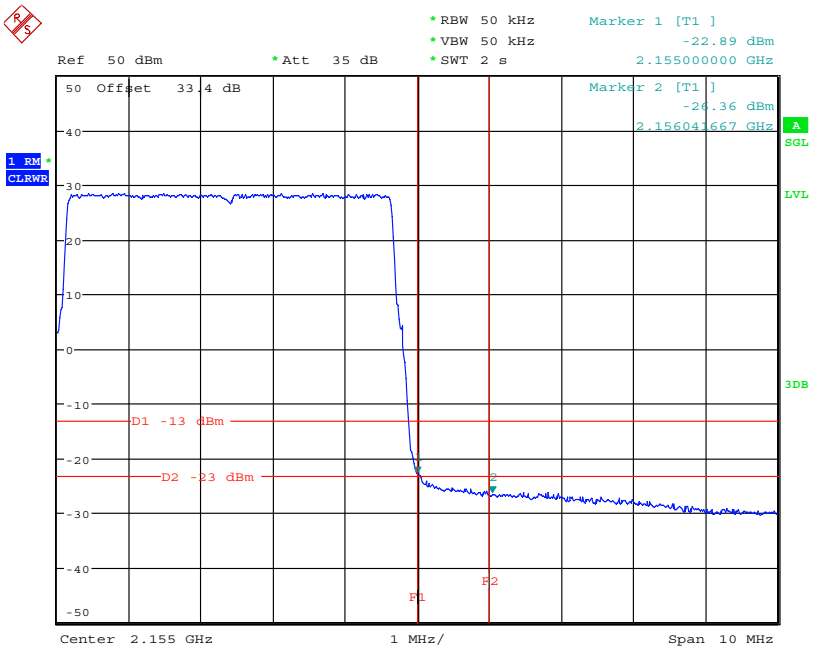


Figure 7-56: Spurious Emissions (Upper band edge) – 64QAM (2152.4 MHz) (5MHz Channel BW)

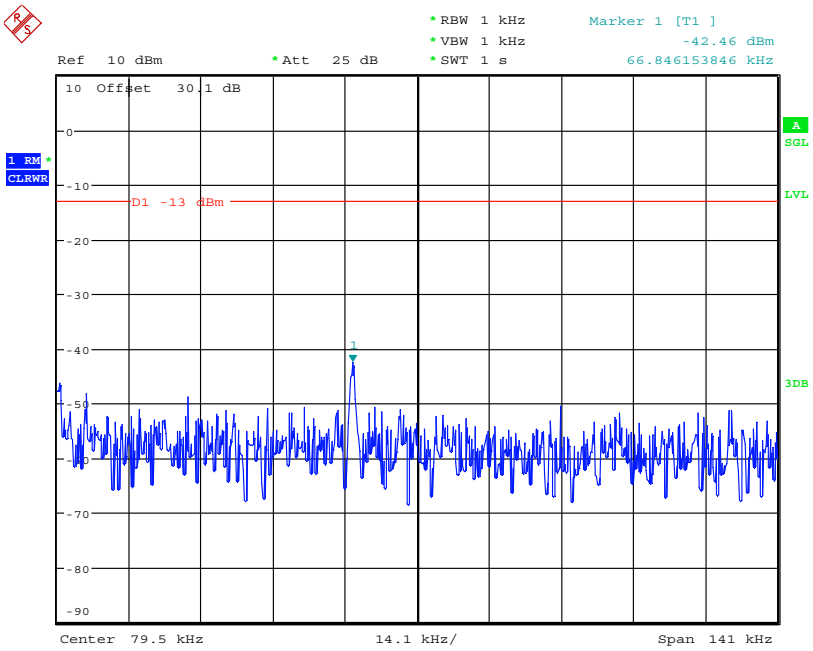


Figure 7-57: Spurious Emissions (9kHz-150kHz) – 64QAM (2132.5 MHz) (5MHz Channel BW)

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

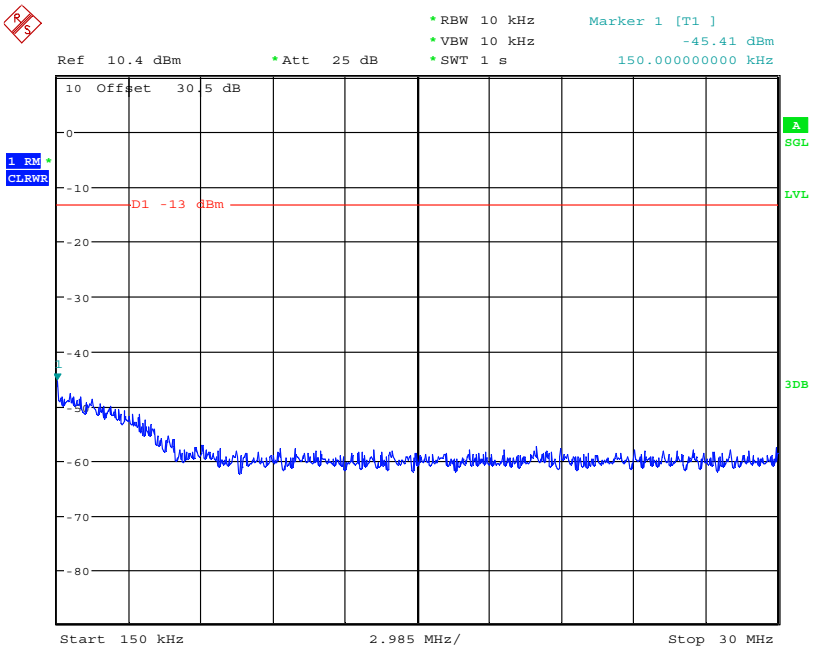


Figure 7-58: Spurious Emissions (150kHz-30MHz) – 64QAM (2132.5 MHz) (5MHz Channel BW)

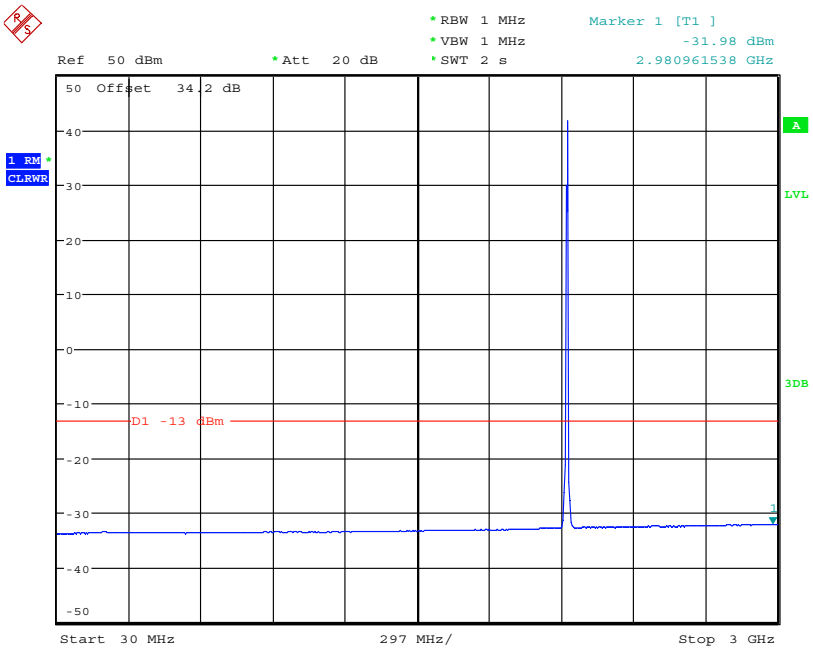


Figure 7-59: Spurious Emissions (30MHz-3GHz) – 64QAM (2132.5 MHz) (5MHz Channel BW)

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

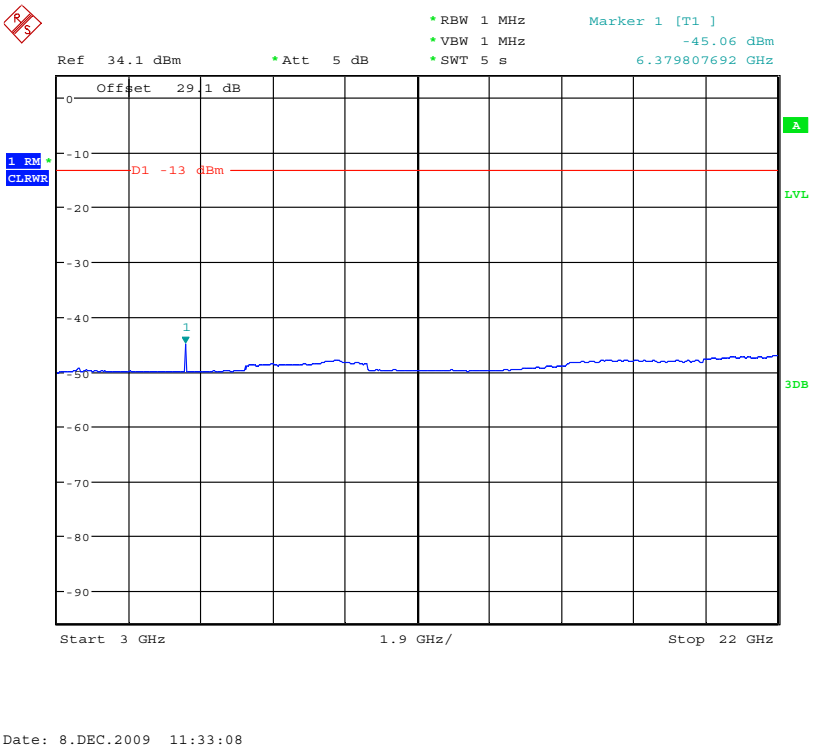


Figure 7-60: Spurious Emissions (3GHz-22GHz) – 64QAM (2132.5 MHz) (5MHz Channel BW)

Config A TX1+TX2:

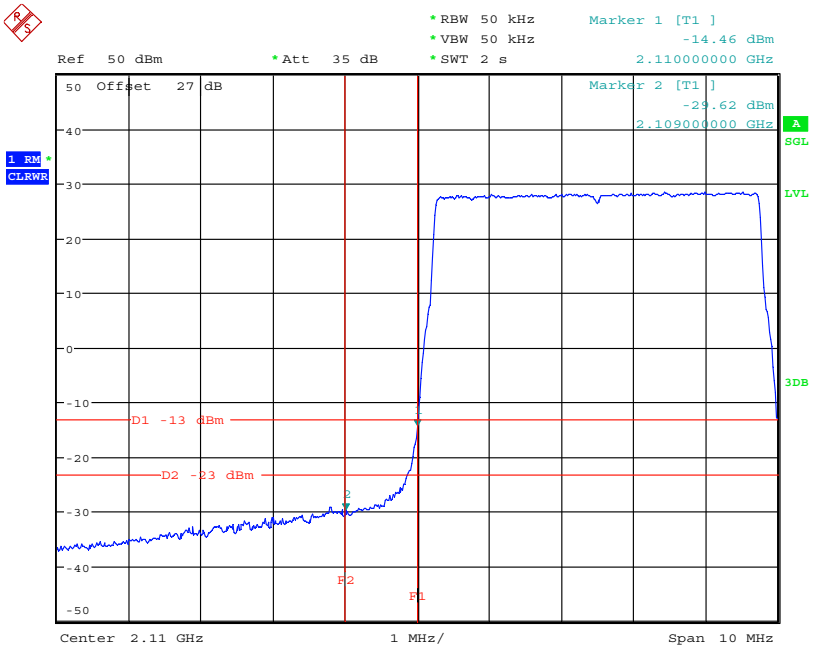
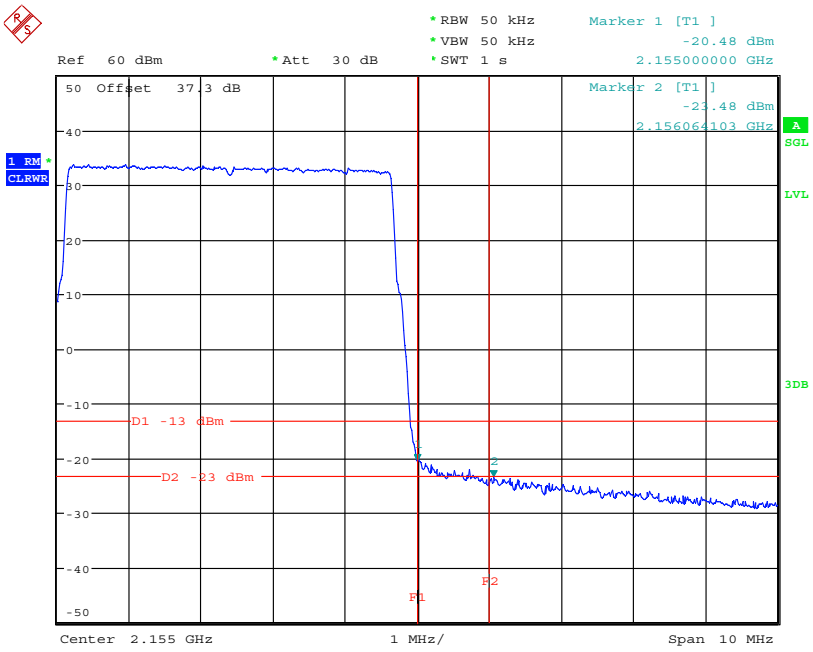


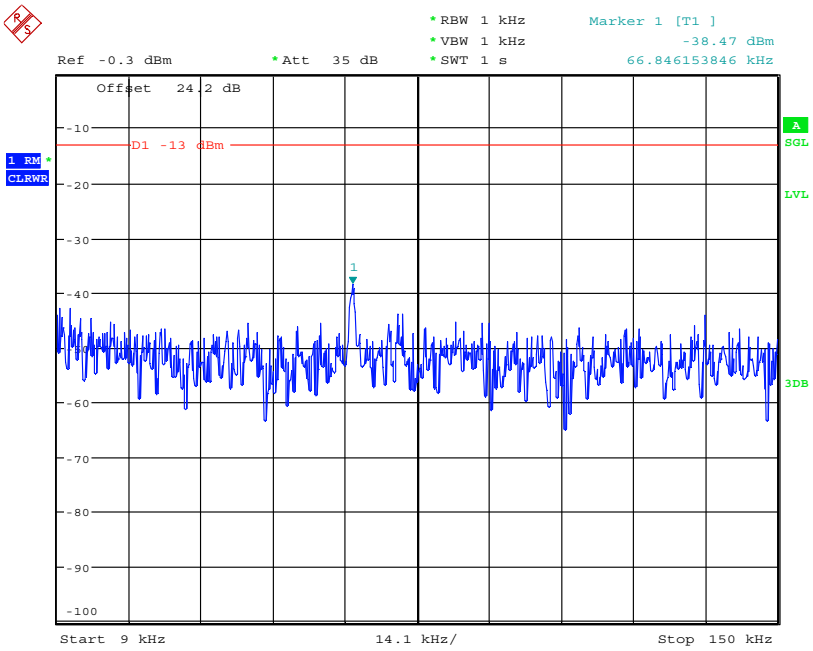
Figure 7-61: Spurious Emissions (Lower band edge) – QPSK (2112.5 MHz) (5MHz Channel BW)

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



Date: 10.DEC.2009 07:32:09

Figure 7-62: Spurious Emissions (Upper band edge) – QPSK (2152.4 MHz) (5MHz Channel BW)



Date: 9.DEC.2009 11:16:37

Figure 7-63: Spurious Emissions (9kHz-150kHz) – QPSK (2132.5 MHz) (5MHz Channel BW)

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

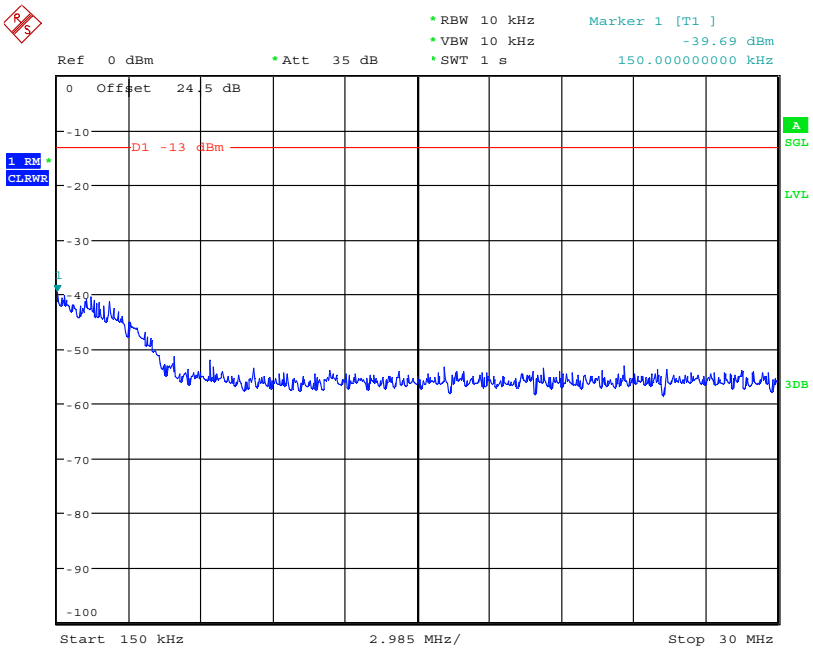


Figure 7-64: Spurious Emissions (150kHz-30MHz) – QPSK (2132.5 MHz) (5MHz Channel BW)

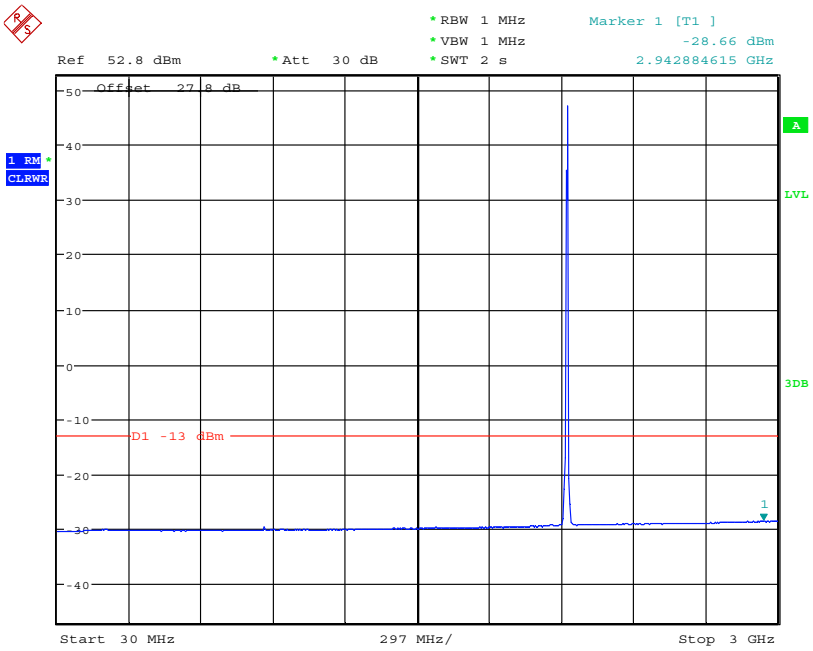


Figure 7-65: Spurious Emissions (30MHz-3GHz) – QPSK (2132.5 MHz) (5MHz Channel BW)

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

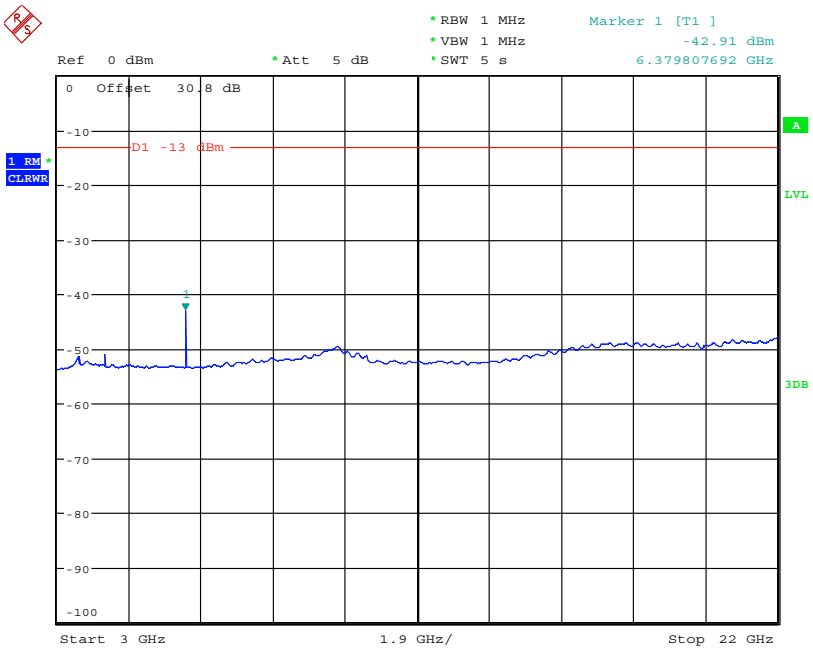


Figure 7-66: Spurious Emissions (3GHz-22GHz) – QPSK (2132.5 MHz) (5MHz Channel BW)

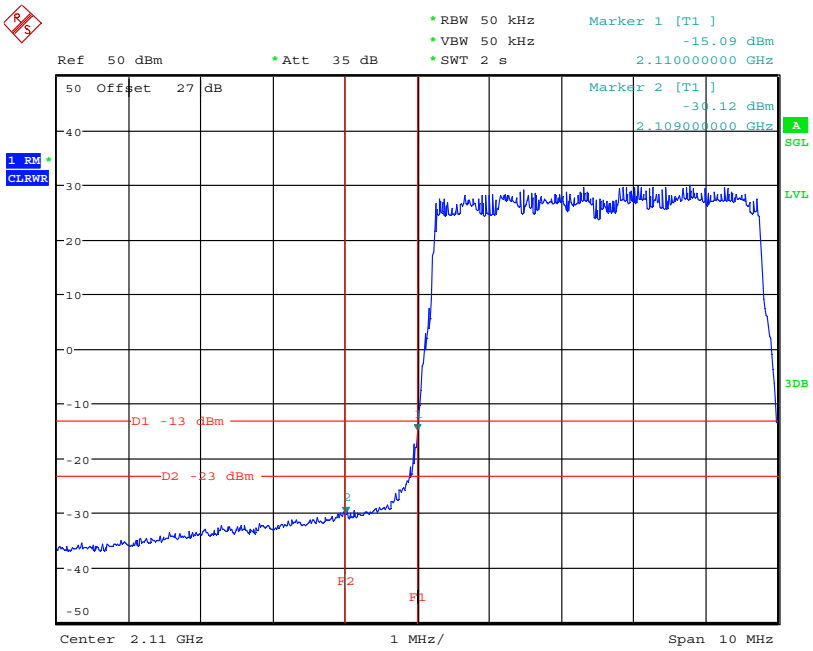


Figure 7-67: Spurious Emissions (Lower band edge) – 16QAM (2112.5 MHz) (5MHz Channel BW)

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

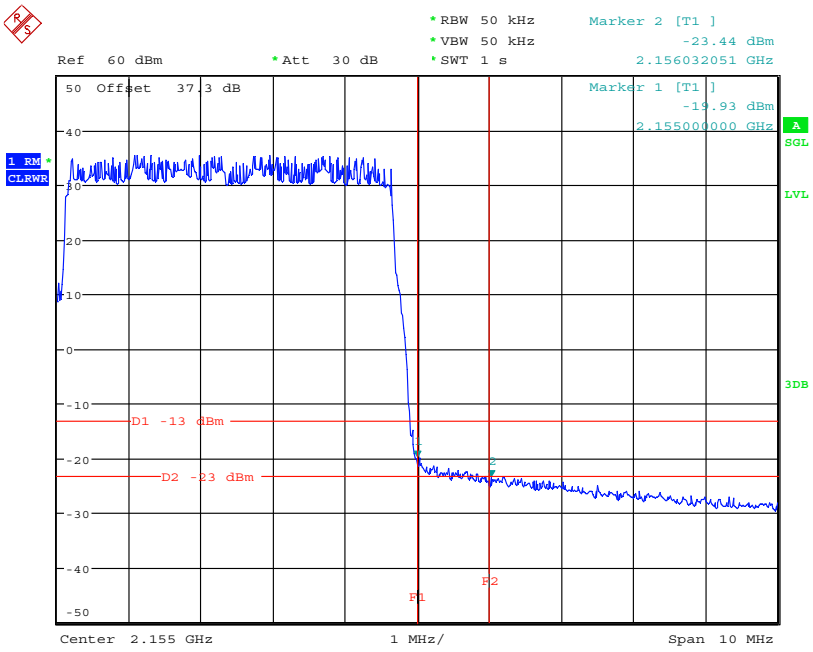


Figure 7-68: Spurious Emissions (Upper band edge) – 16QAM (2152.4 MHz) (5MHz Channel BW)

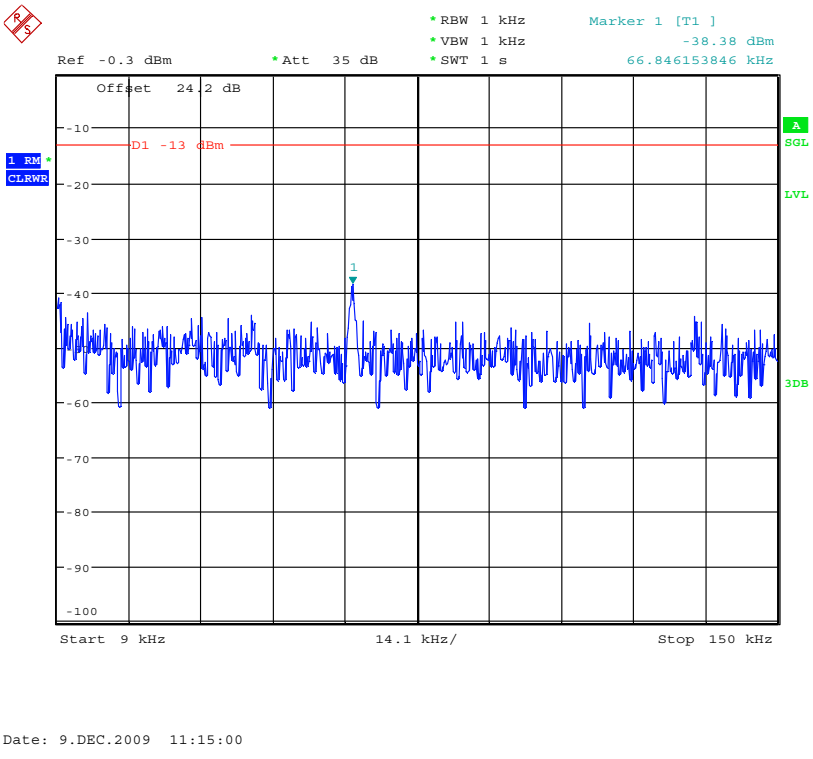


Figure 7-69: Spurious Emissions (9kHz-150kHz) – 16QAM (2132.5 MHz) (5MHz Channel BW)

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

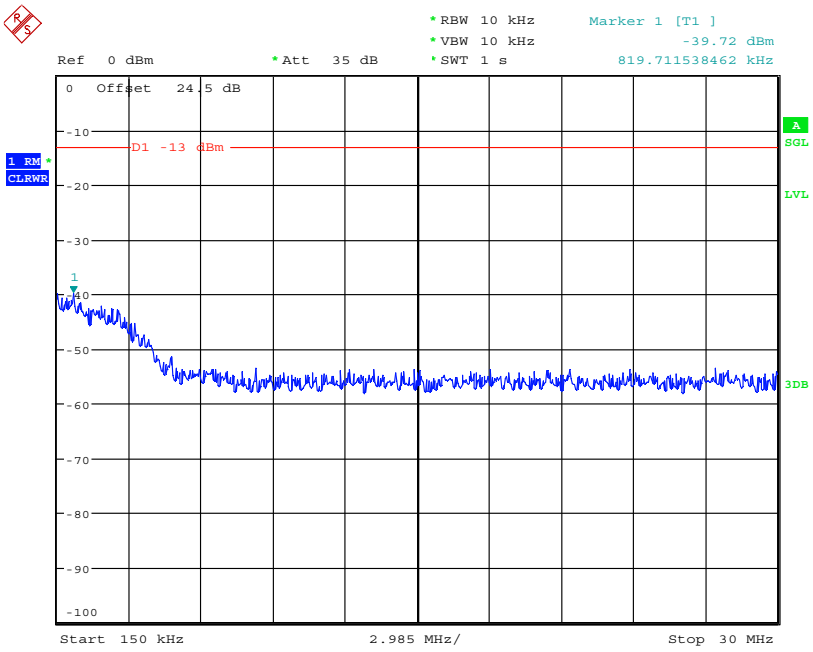


Figure 7-70: Spurious Emissions (150kHz-30MHz) – 16QAM (2132.5 MHz) (5MHz Channel BW)

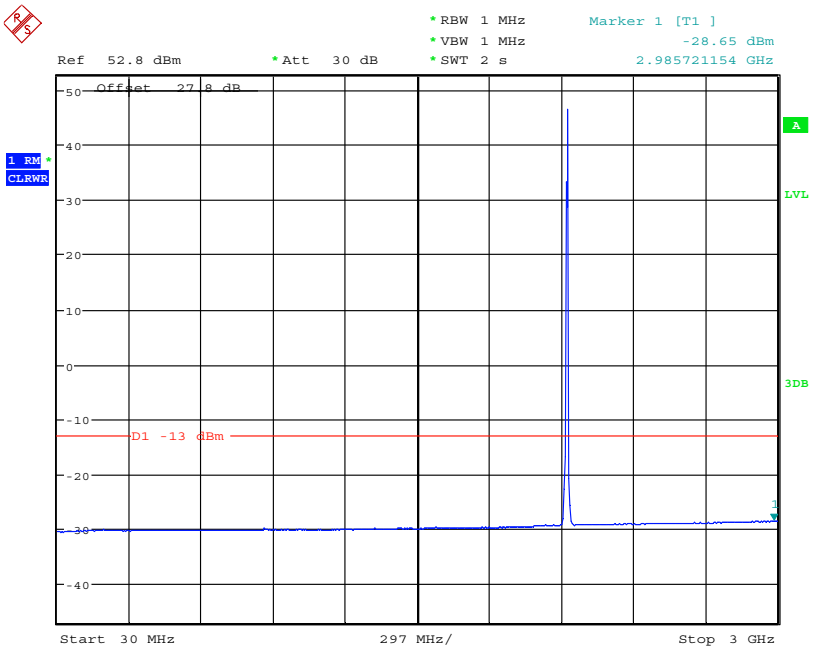


Figure 7-71: Spurious Emissions (30MHz-3GHz) – 16QAM (2132.5 MHz) (5MHz Channel BW)

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

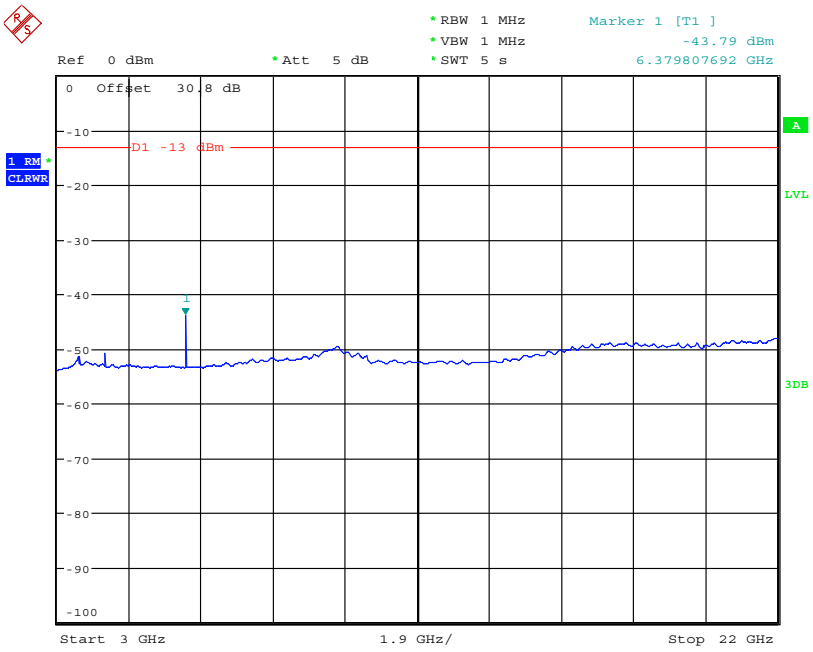


Figure 7-72: Spurious Emissions (3GHz-22GHz) – 16QAM (2132.5 MHz) (5MHz Channel BW)

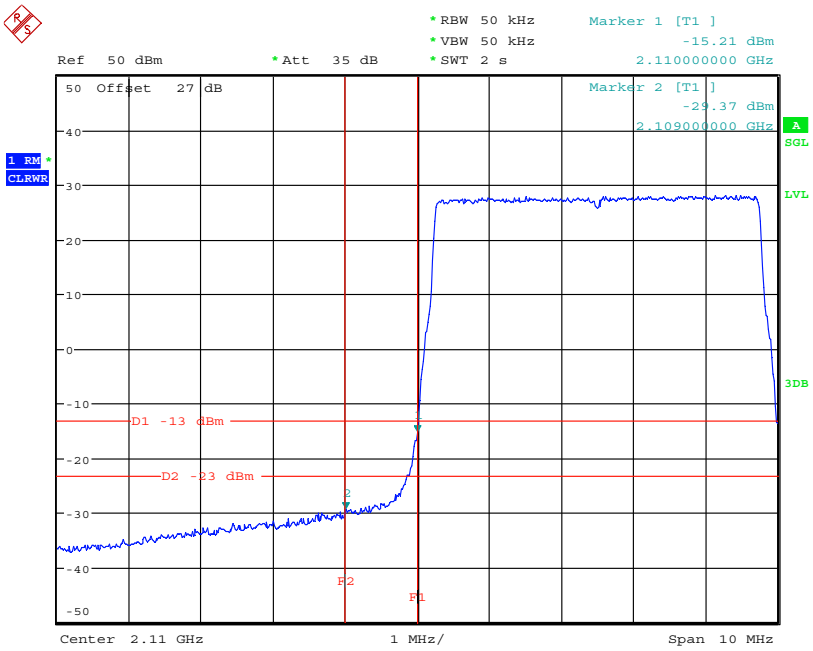


Figure 7-73: Spurious Emissions (Lower band edge) – 64QAM (2112.5 MHz) (5MHz Channel BW)

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

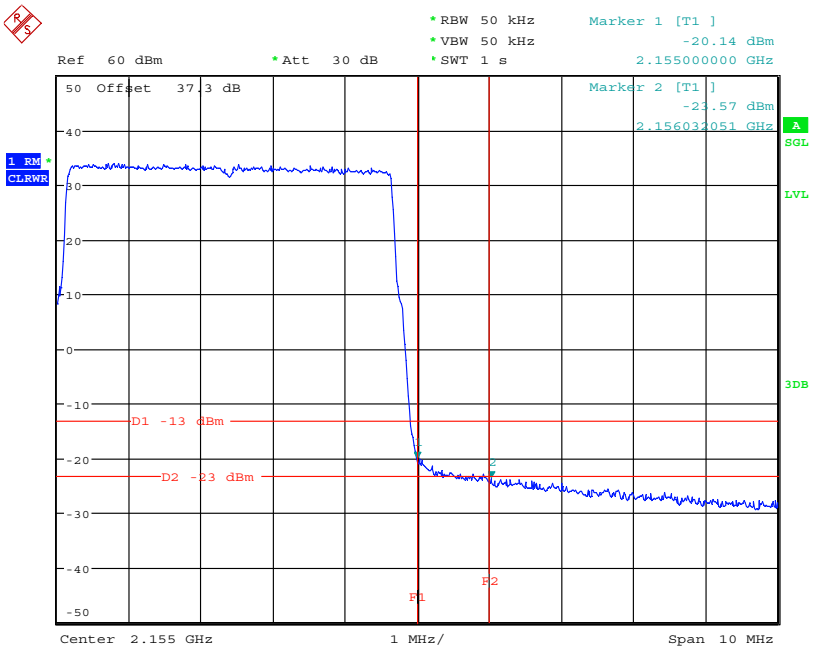


Figure 7-74: Spurious Emissions (Upper band edge) – 64QAM (2152.4 MHz) (5MHz Channel BW)

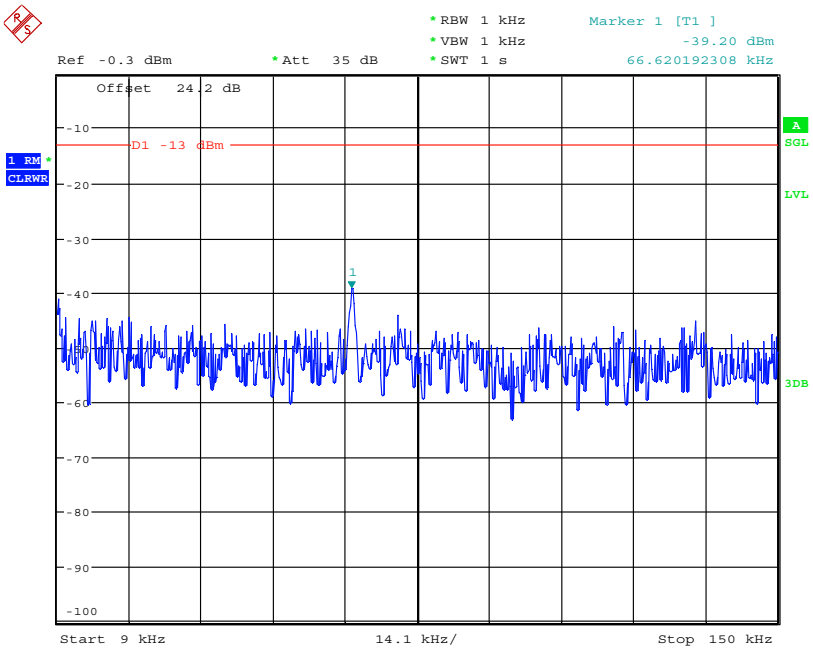


Figure 7-75: Spurious Emissions (9kHz-150kHz) – 64QAM (2132.5 MHz) (5MHz Channel BW)

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

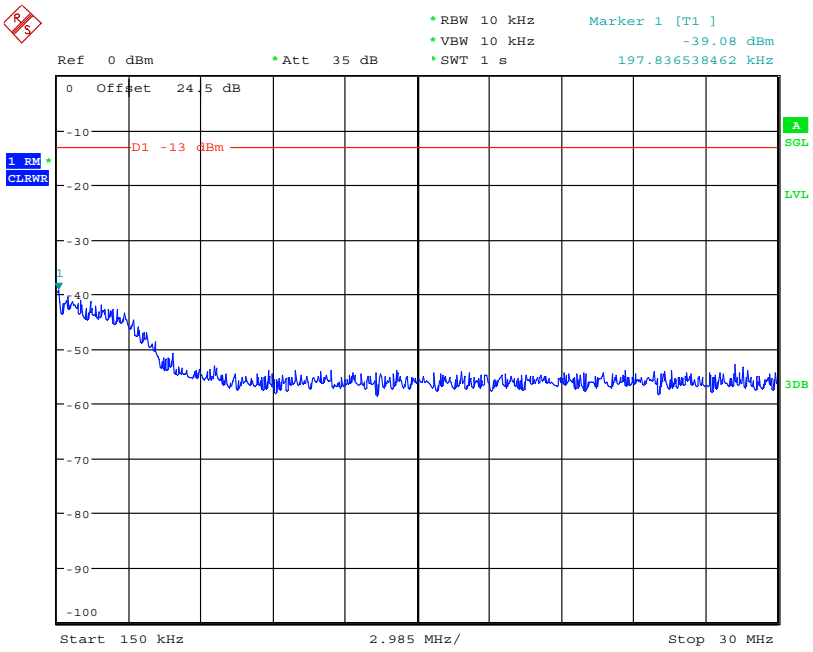


Figure 7-76: Spurious Emissions (150kHz-30MHz) – 64QAM (2132.5 MHz) (5MHz Channel BW)

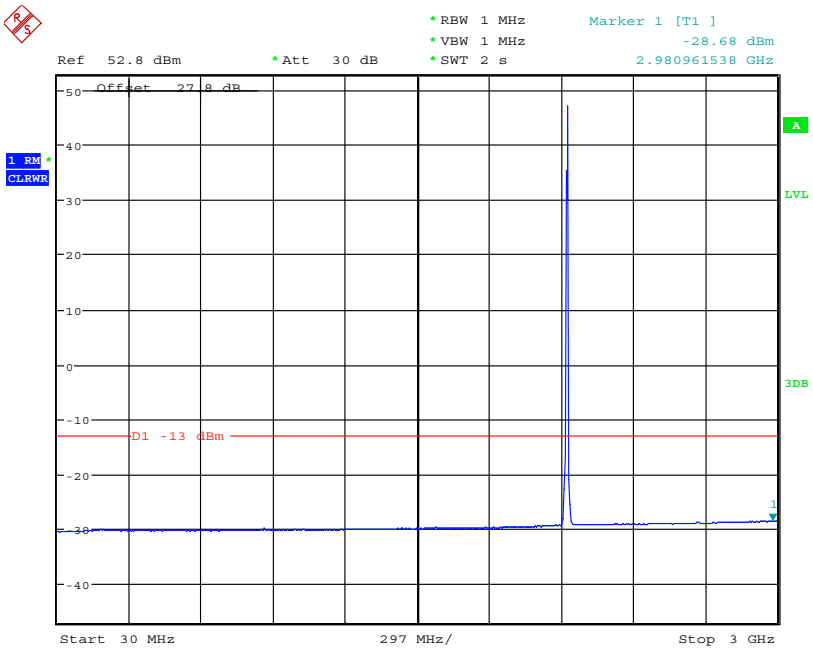


Figure 7-77: Spurious Emissions (30MHz-3GHz) – 64QAM (2132.5 MHz) (5MHz Channel BW)

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

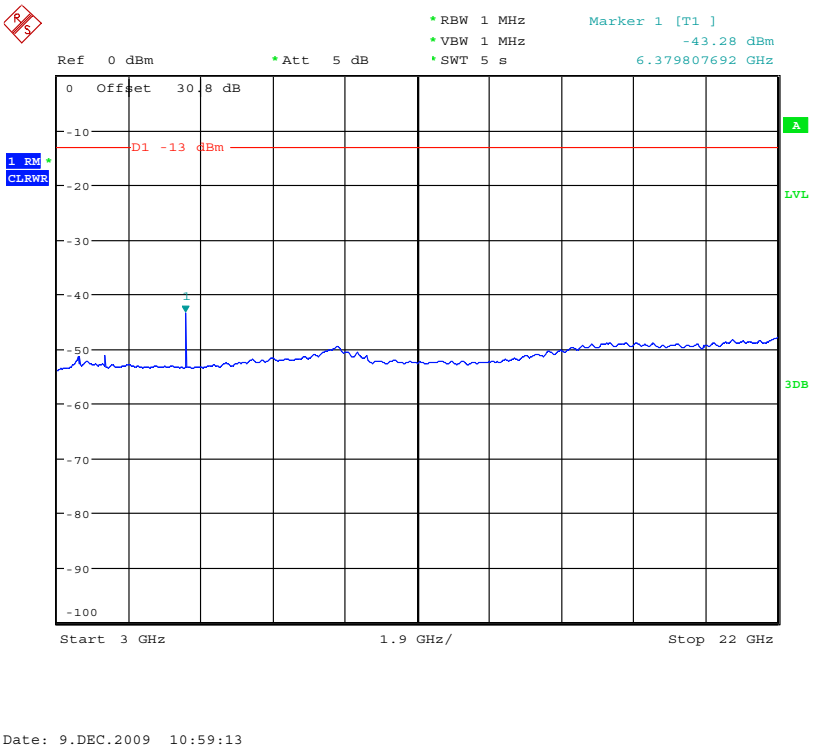


Figure 7-78: Spurious Emissions (3GHz-22GHz) – 64QAM (2132.5 MHz) (5MHz Channel BW)

Config B TX1:

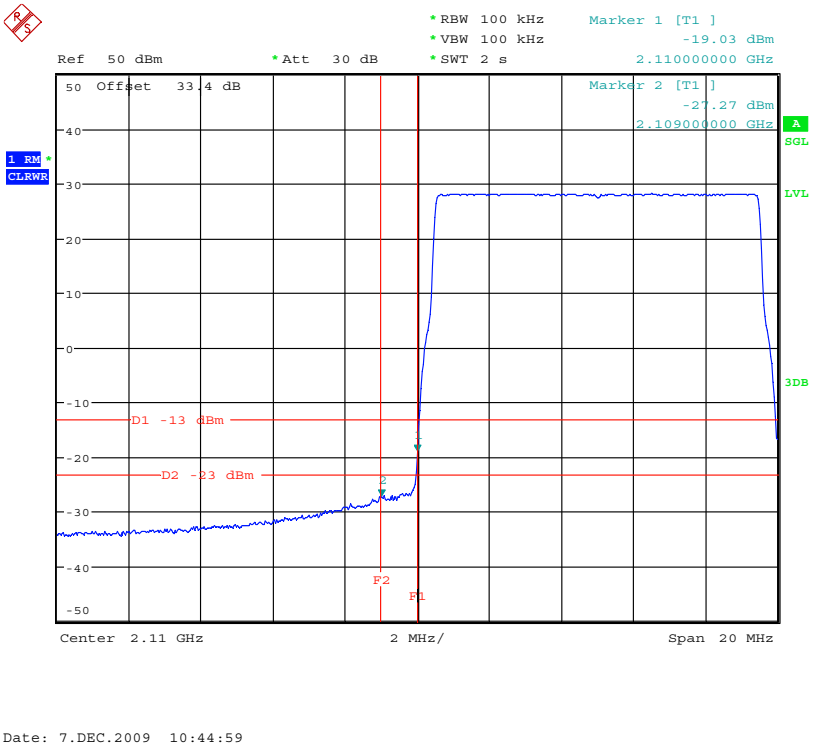


Figure 7-79: Spurious Emissions (Lower band edge) – QPSK (2115.0 MHz) (10MHz Channel BW)

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

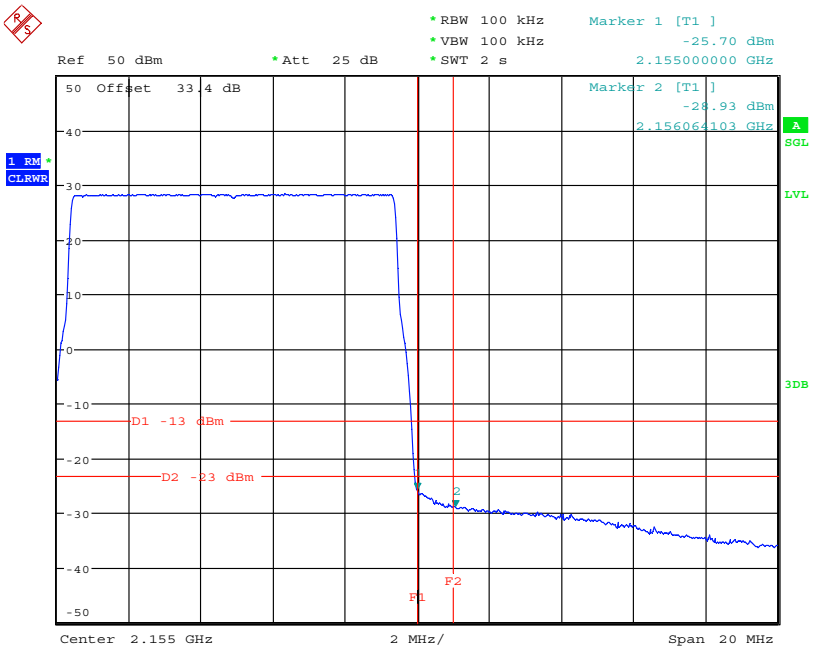


Figure 7-80: Spurious Emissions (Upper band edge) – QPSK (2149.9 MHz) (10MHz Channel BW)

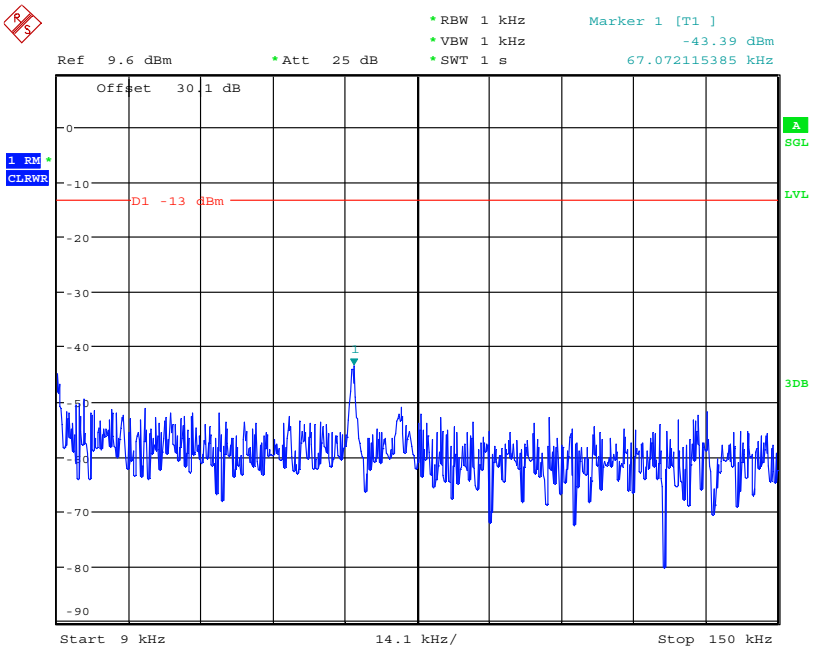


Figure 7-81: Spurious Emissions (9kHz-150kHz) – QPSK (2132.5 MHz) (10MHz Channel BW)

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

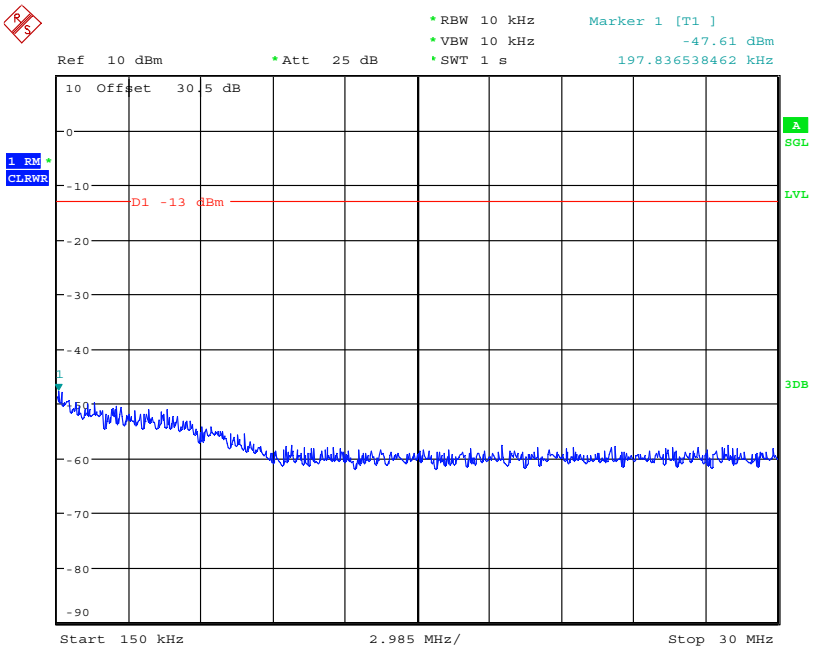


Figure 7-82: Spurious Emissions (150kHz-30MHz) – QPSK (2132.5 MHz) (10MHz Channel BW)

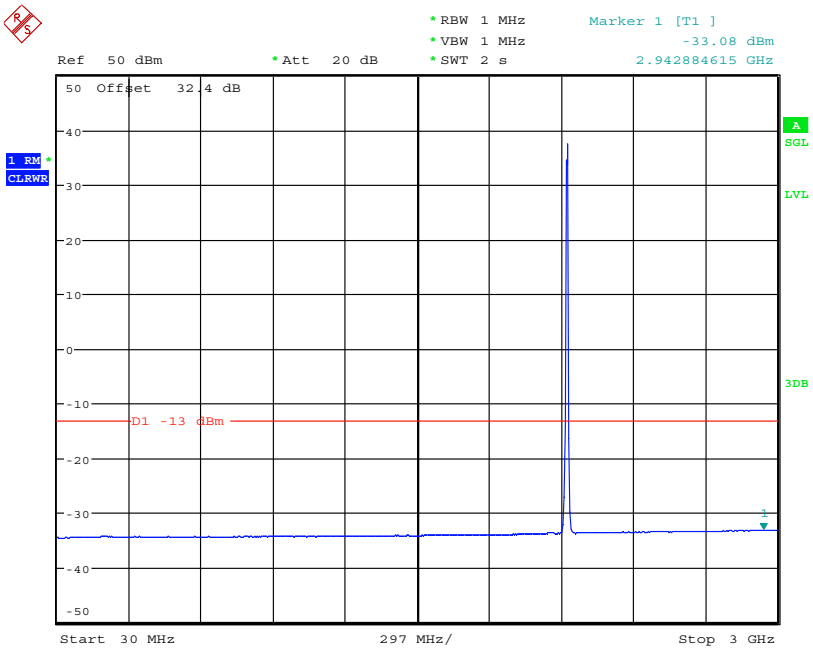


Figure 7-83: Spurious Emissions (30MHz-3GHz) – QPSK (2132.5 MHz) (10MHz Channel BW)

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

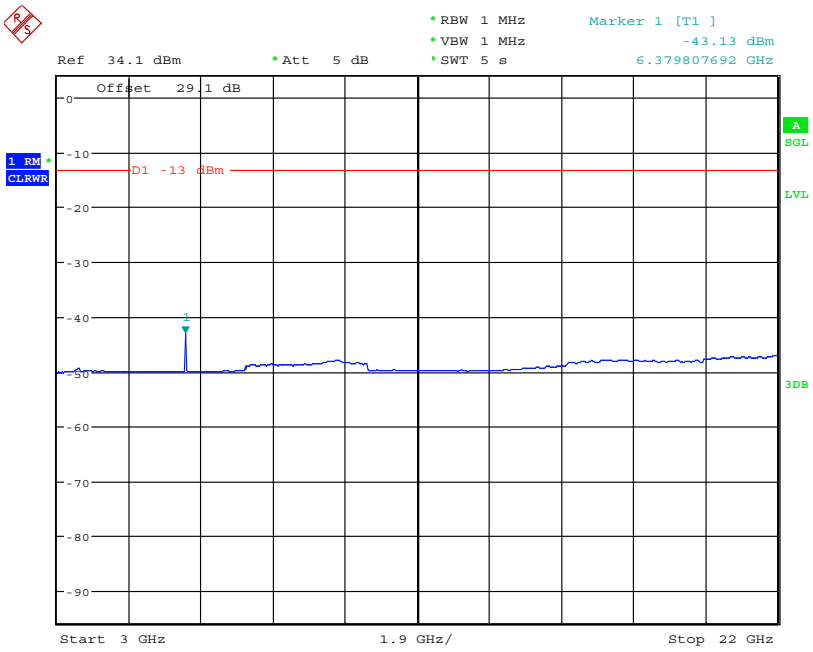


Figure 7-84: Spurious Emissions (3GHz-22GHz) – QPSK (2132.5 MHz) (10MHz Channel BW)

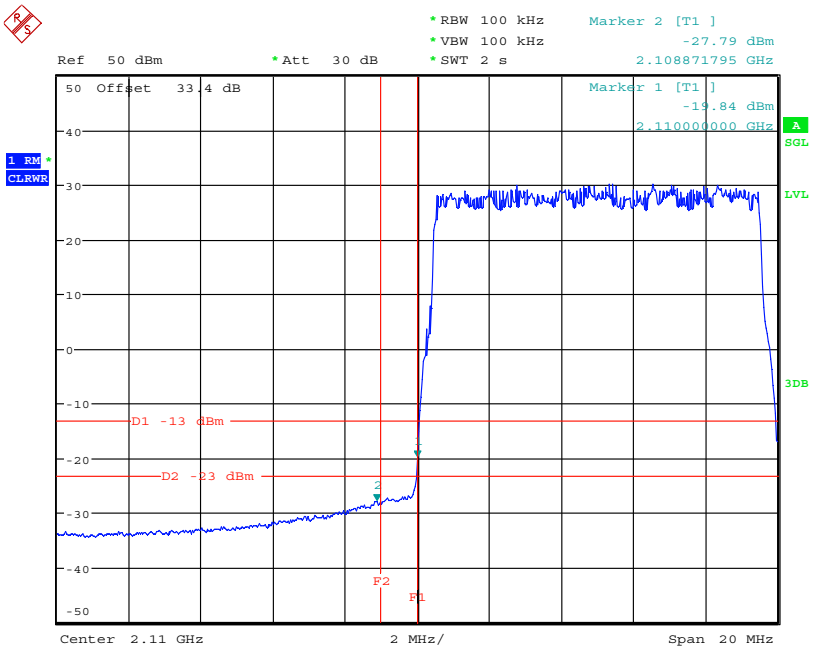


Figure 7-85: Spurious Emissions (Lower band edge) – 16QAM (2115.0 MHz) (10MHz Channel BW)

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

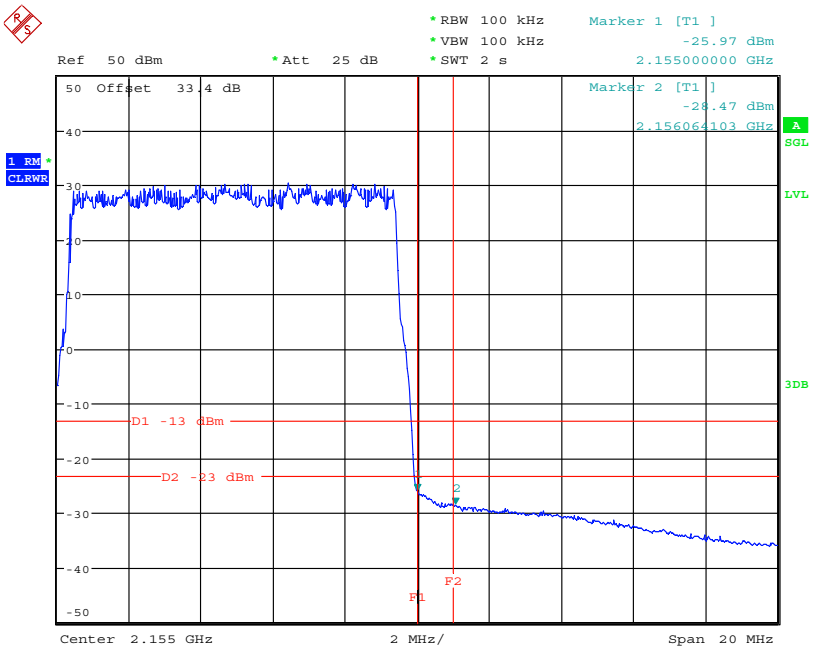


Figure 7-86: Spurious Emissions (Upper band edge) – 16QAM (2149.9 MHz) (10MHz Channel BW)

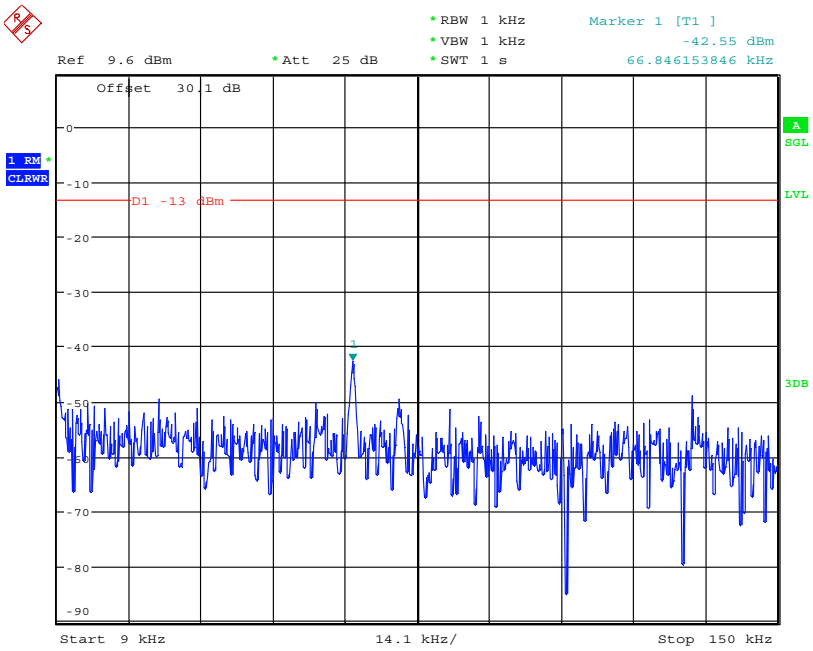


Figure 7-87: Spurious Emissions (9kHz-150kHz) – 16QAM (2132.5 MHz) (10MHz Channel BW)

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

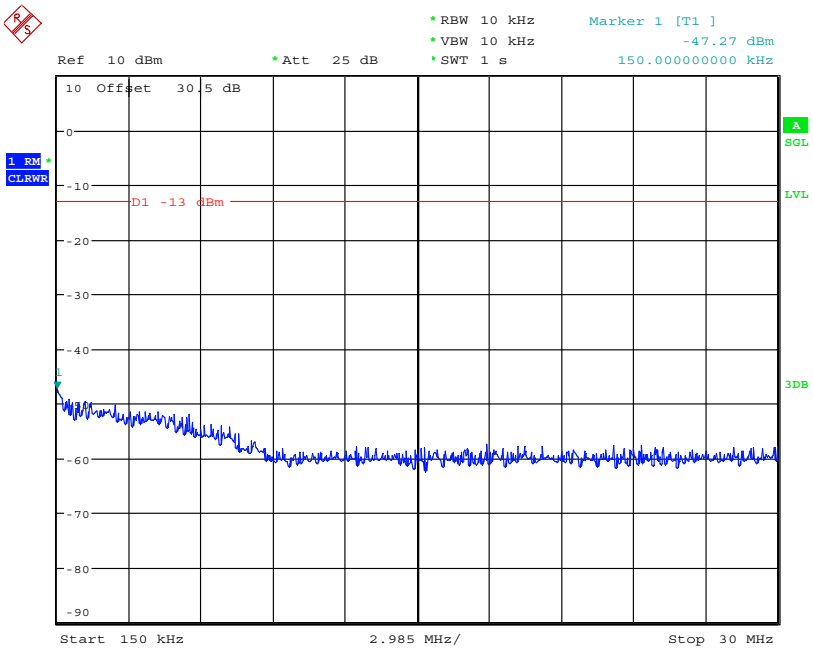


Figure 7-88: Spurious Emissions (150kHz-30MHz) – 16QAM (2132.5 MHz) (10MHz Channel BW)

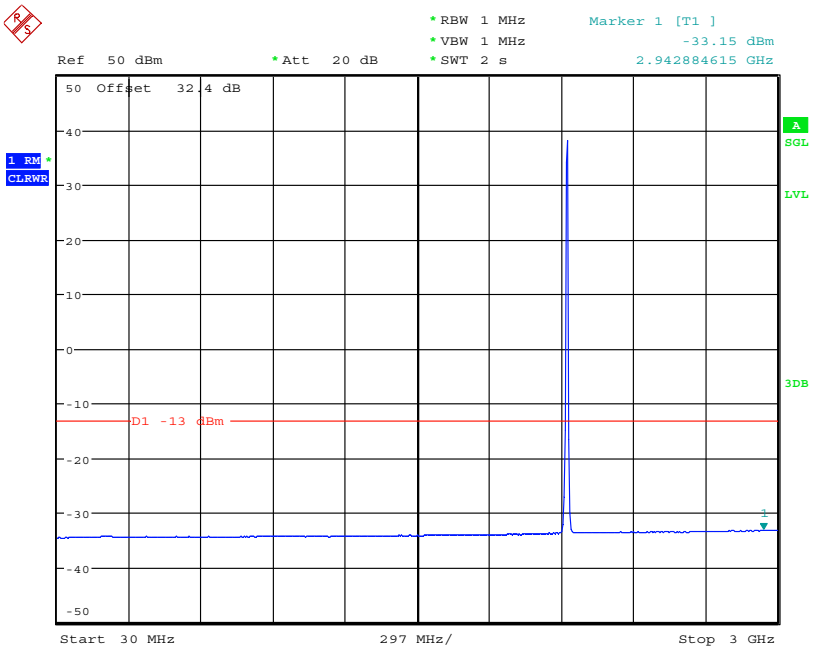


Figure 7-89: Spurious Emissions (30MHz-3GHz) – 16QAM (2132.5 MHz) (10MHz Channel BW)

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

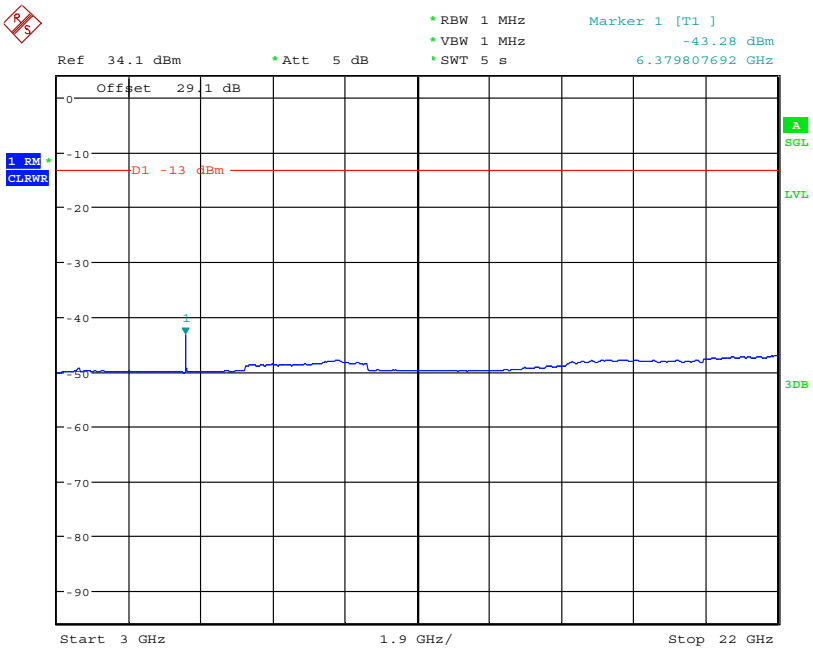


Figure 7-90: Spurious Emissions (3GHz-22GHz) – 16QAM (2132.5 MHz) (10MHz Channel BW)

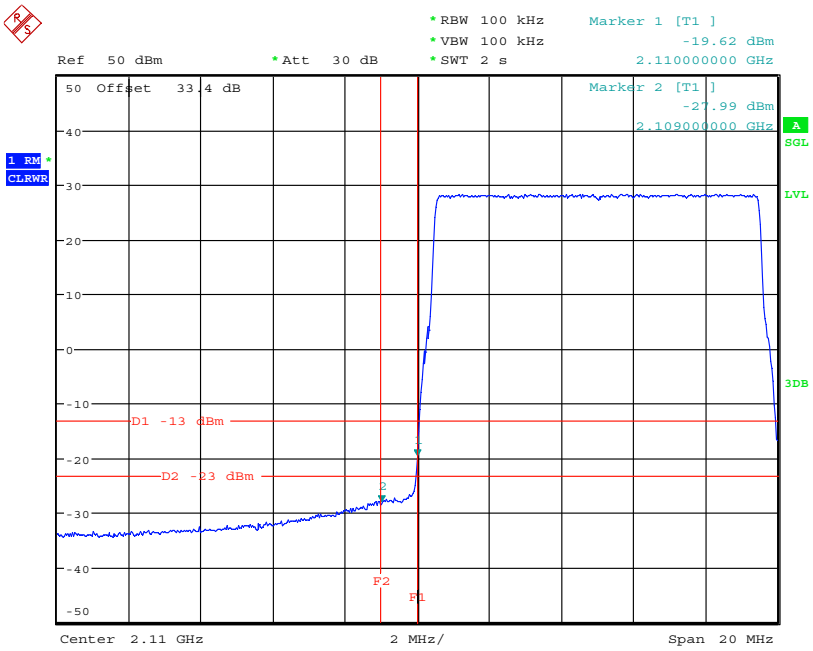


Figure 7-91: Spurious Emissions (Lower band edge) – 64QAM (2115.0 MHz) (10MHz Channel BW)

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

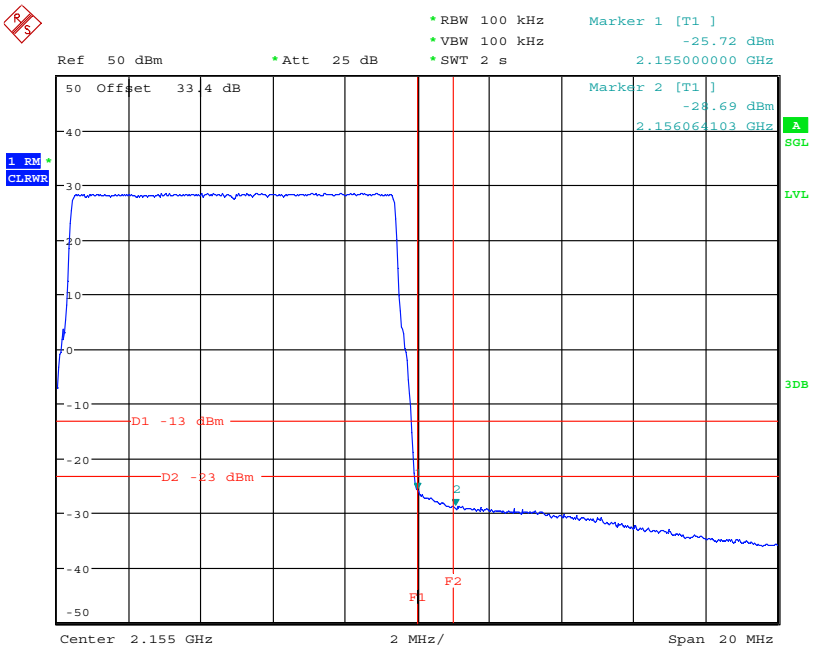


Figure 7-92: Spurious Emissions (Upper band edge) – 64QAM (2149.9 MHz) (10MHz Channel BW)

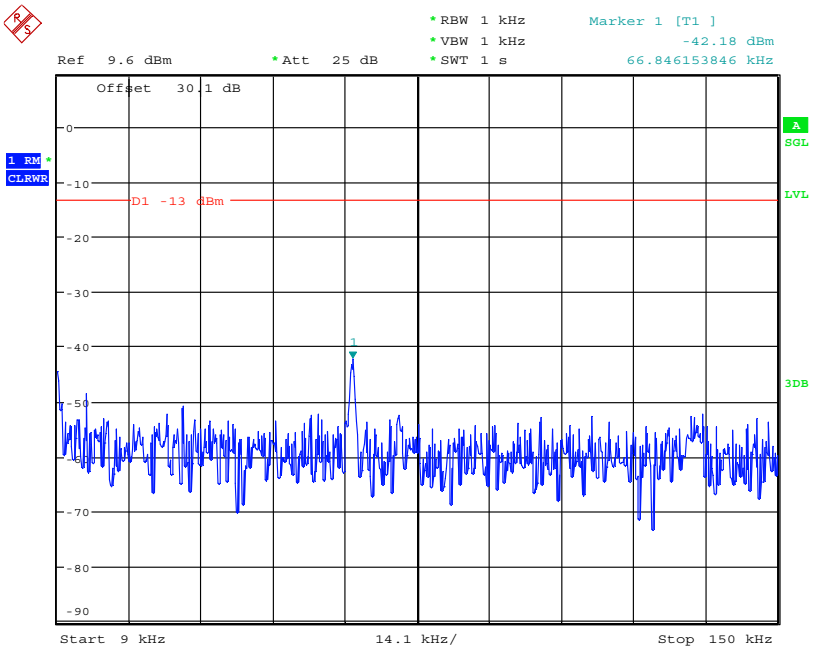


Figure 7-93: Spurious Emissions (9kHz-150kHz) – 64QAM (2132.5 MHz) (10MHz Channel BW)

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

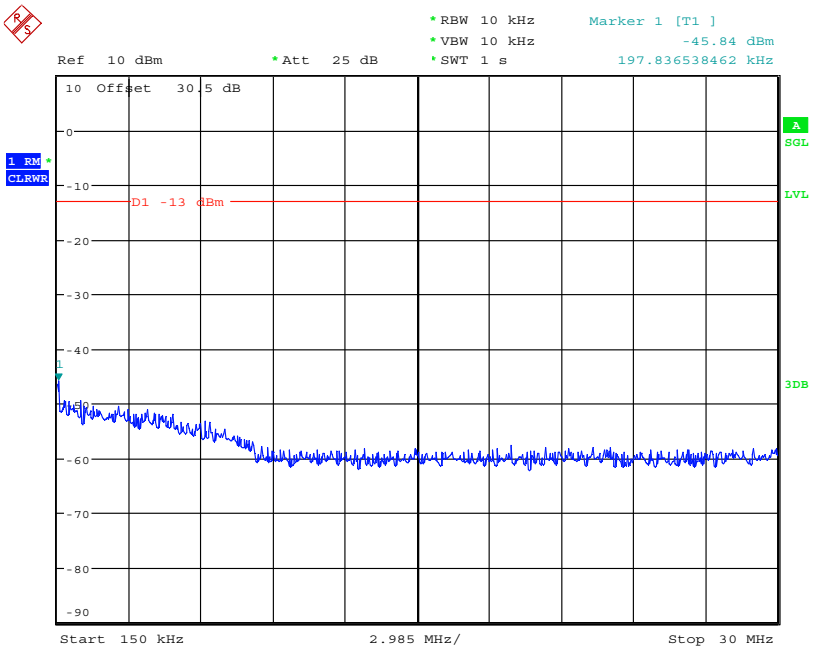


Figure 7-94: Spurious Emissions (150kHz-30MHz) – 64QAM (2132.5 MHz) (10MHz Channel BW)

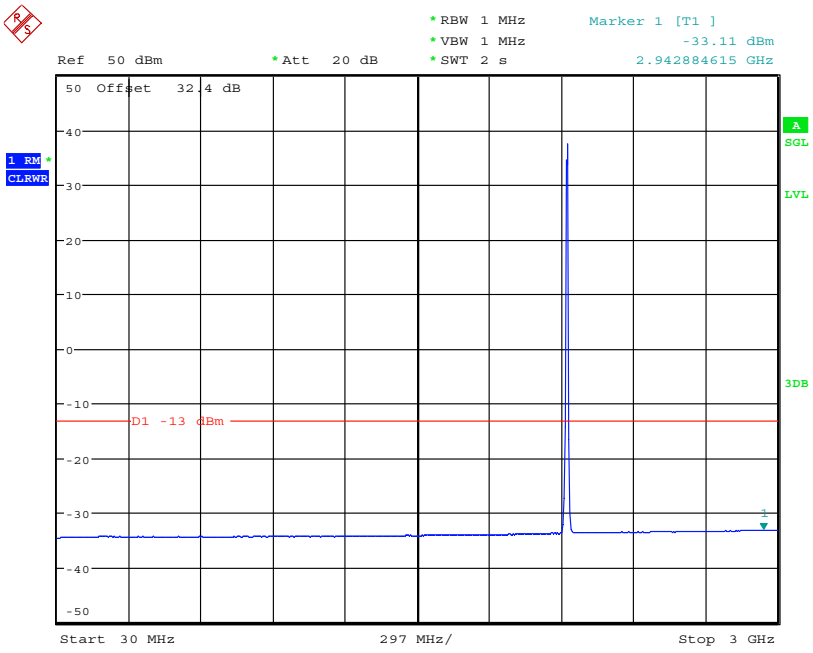


Figure 7-95: Spurious Emissions (30MHz-3GHz) – 64QAM (2132.5 MHz) (10MHz Channel BW)

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

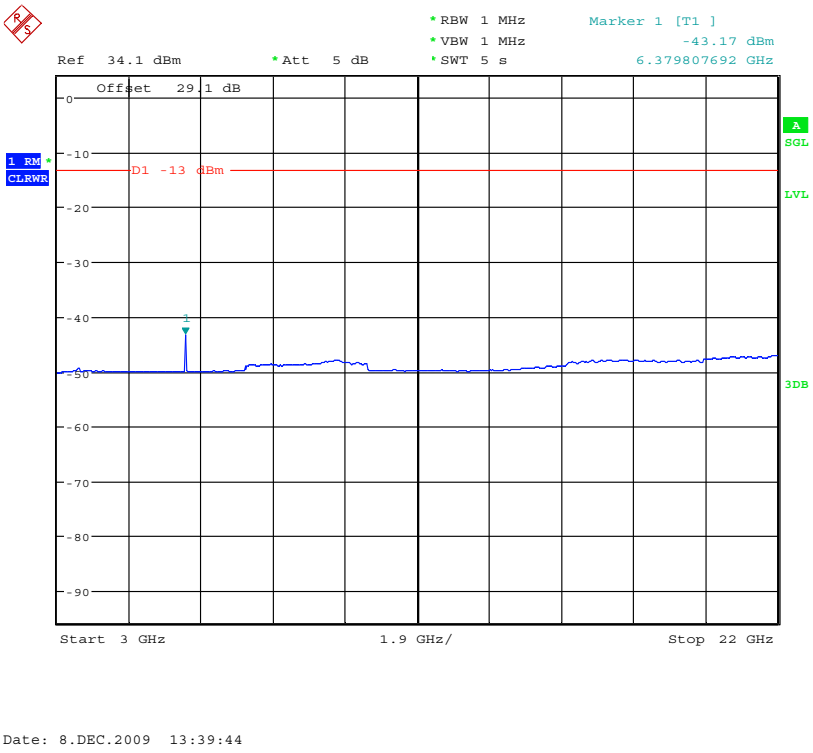


Figure 7-96: Spurious Emissions (3GHz-22GHz) – 64QAM (2132.5 MHz) (10MHz Channel BW)

Config B TX2:

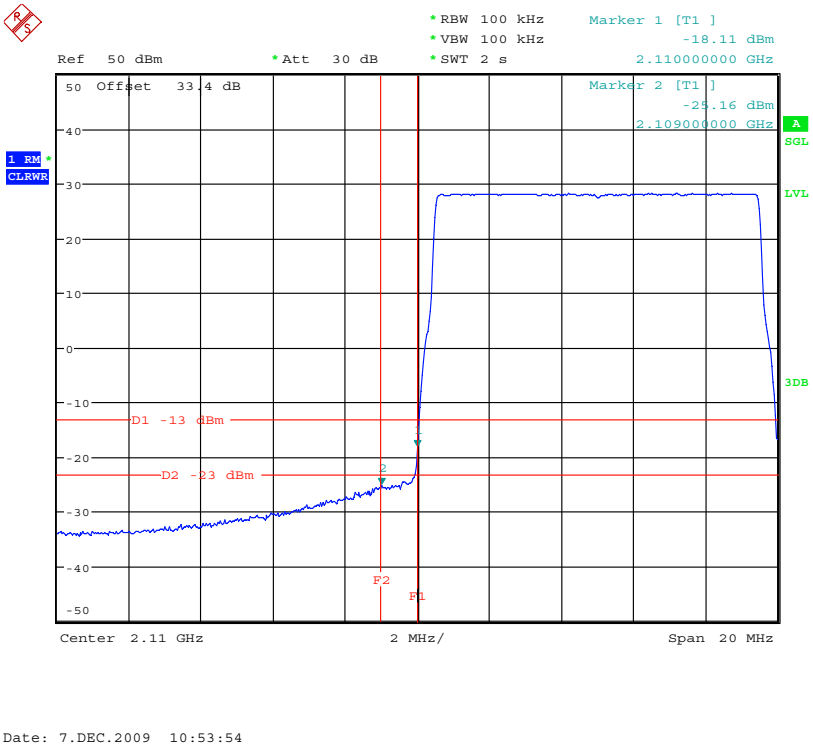


Figure 7-97: Spurious Emissions (Lower band edge) – QPSK (2115.0 MHz) (10MHz Channel BW)

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

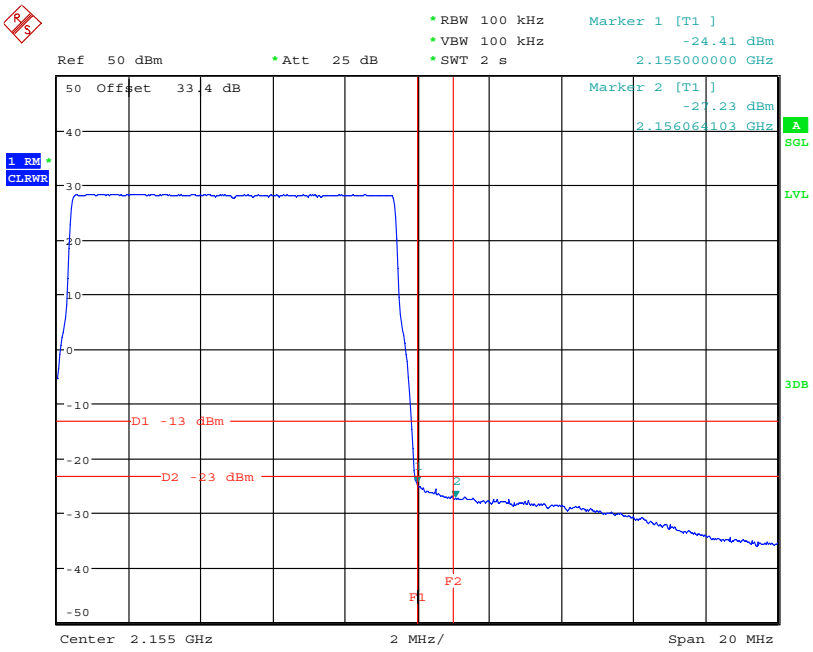


Figure 7-98: Spurious Emissions (Upper band edge) – QPSK (2149.9 MHz) (10MHz Channel BW)

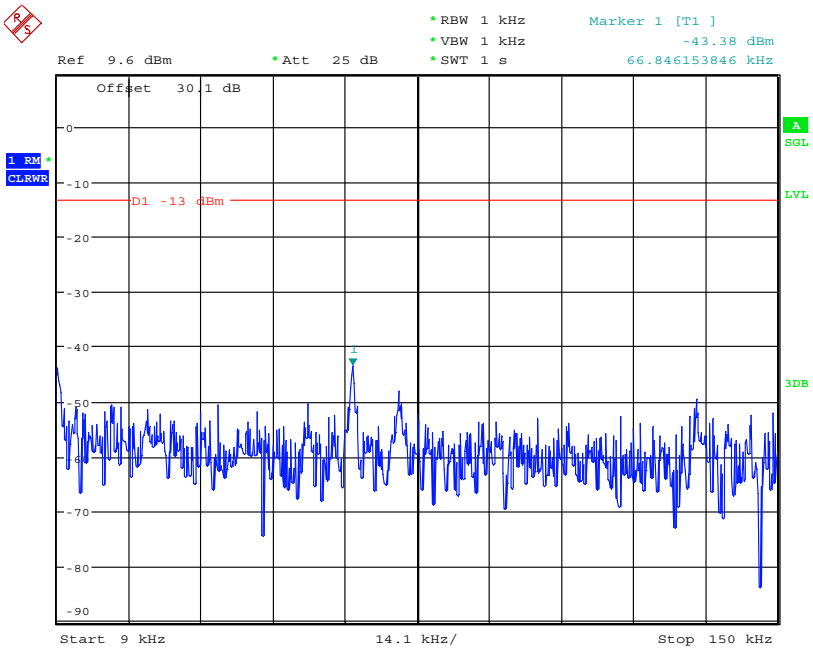


Figure 7-99: Spurious Emissions (9kHz-150kHz) – QPSK (2132.5 MHz) (10MHz Channel BW)

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

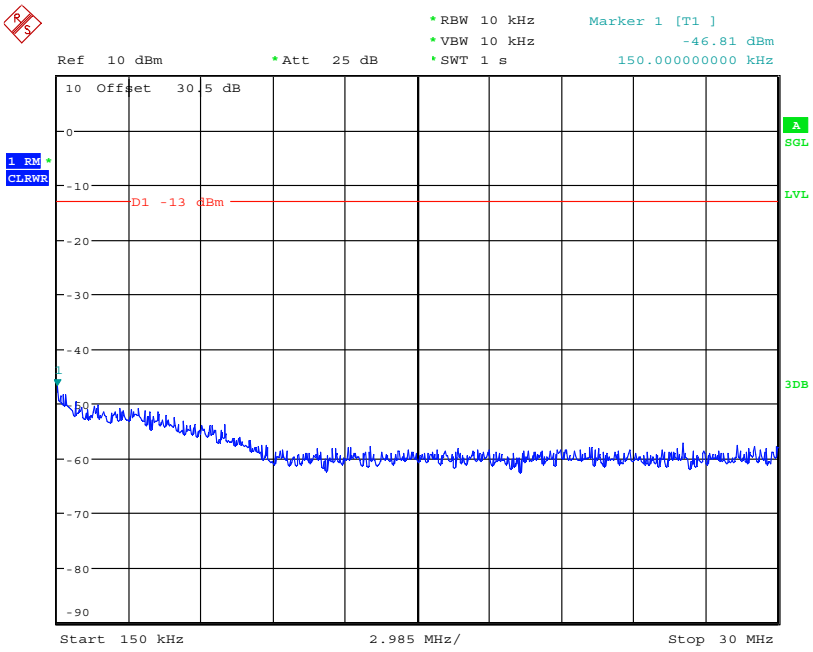


Figure 7-100: Spurious Emissions (150kHz-30MHz) – QPSK (2132.5 MHz) (10MHz Channel BW)

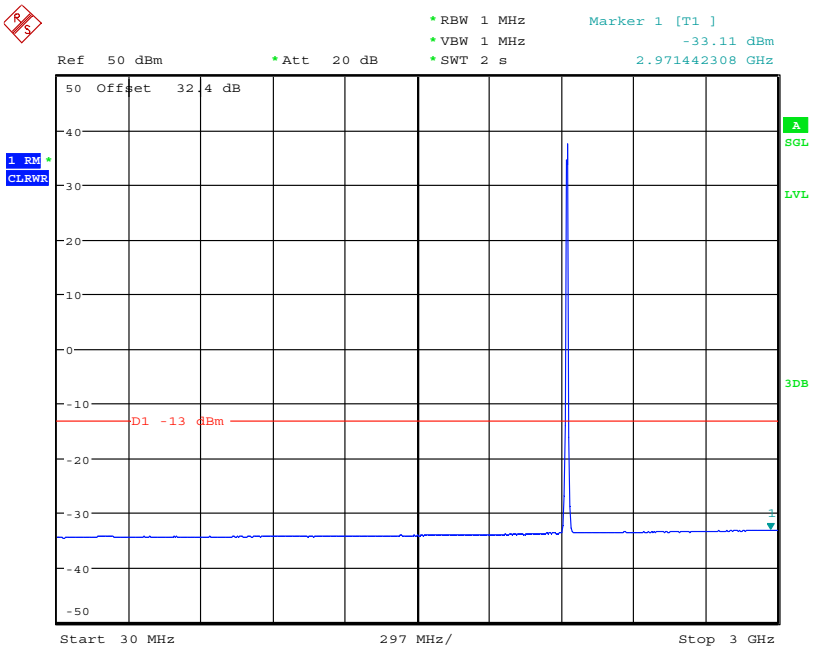


Figure 7-101: Spurious Emissions (30MHz-3GHz) – QPSK (2132.5 MHz) (10MHz Channel BW)

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

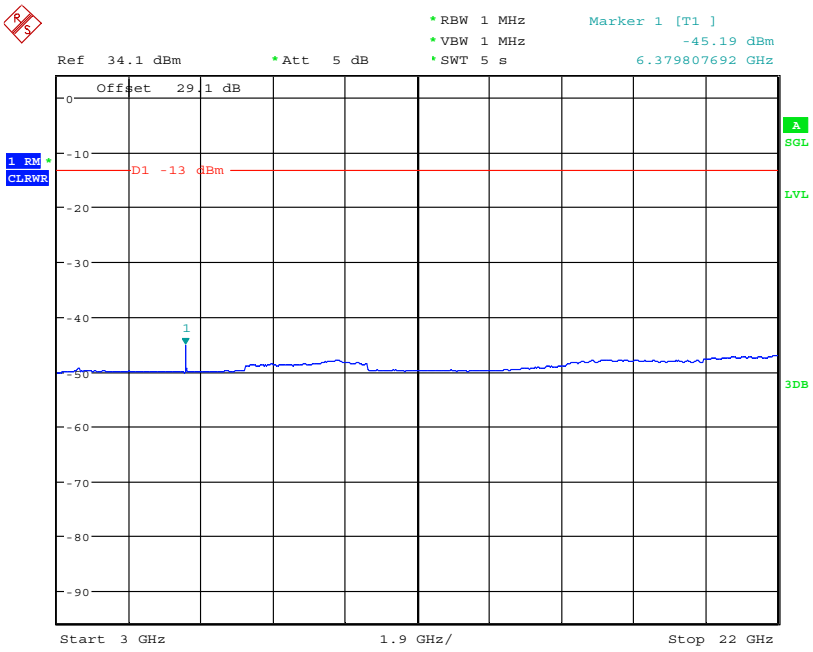


Figure 7-102: Spurious Emissions (3GHz-22GHz) – QPSK (2132.5 MHz) (10MHz Channel BW)

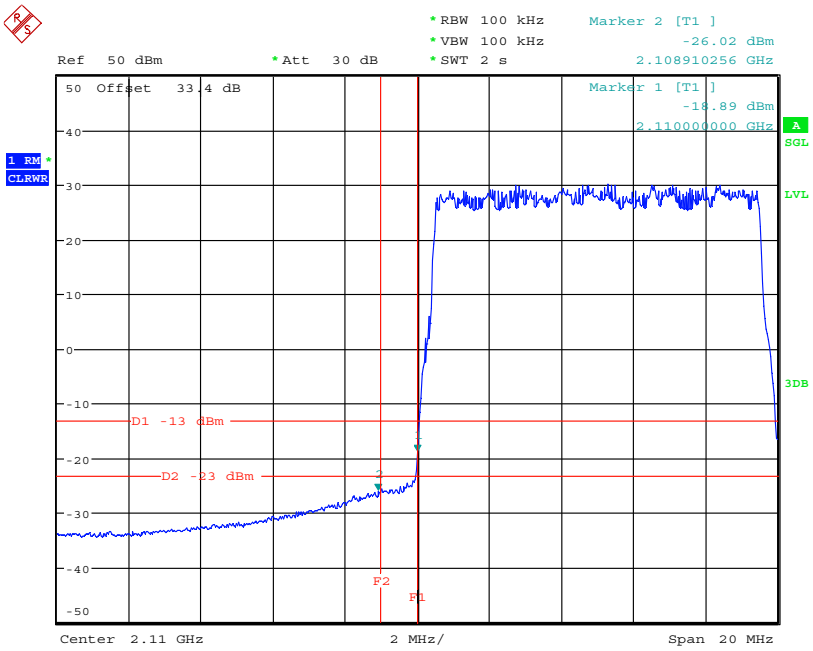


Figure 7-103: Spurious Emissions (Lower band edge) – 16QAM (2115.0 MHz) (10MHz Channel BW)

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

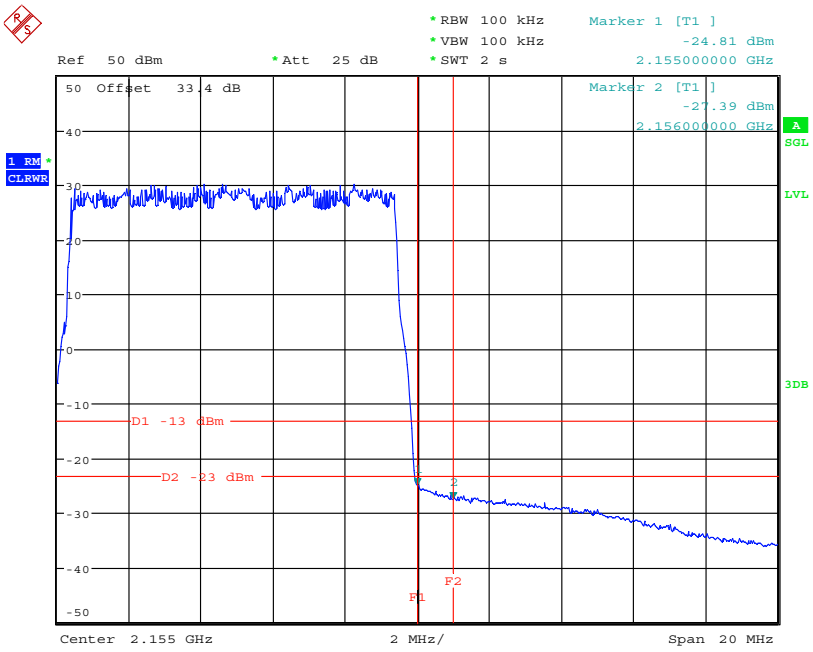


Figure 7-104: Spurious Emissions (Upper band edge) – 16QAM (2149.9 MHz) (10MHz Channel BW)

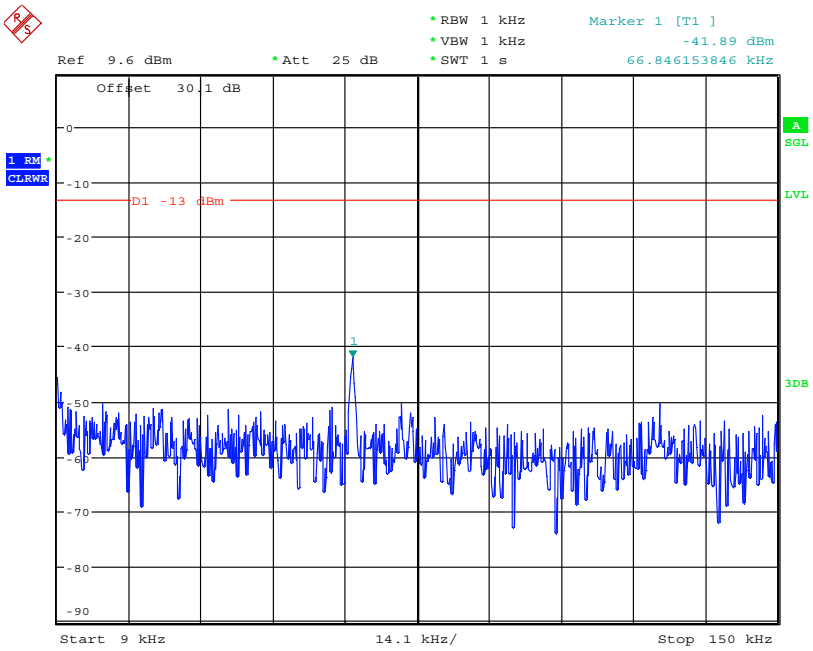


Figure 7-105: Spurious Emissions (9kHz-150kHz) – 16QAM (2132.5 MHz) (10MHz Channel BW)

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

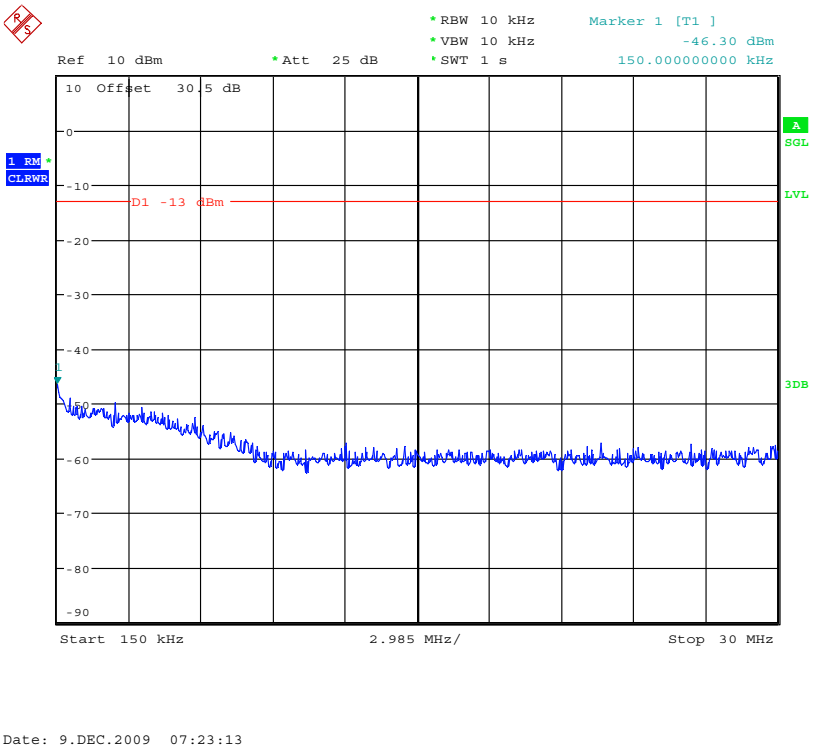


Figure 7-106: Spurious Emissions (150kHz-30MHz) – 16QAM (2132.5 MHz) (10MHz Channel BW)

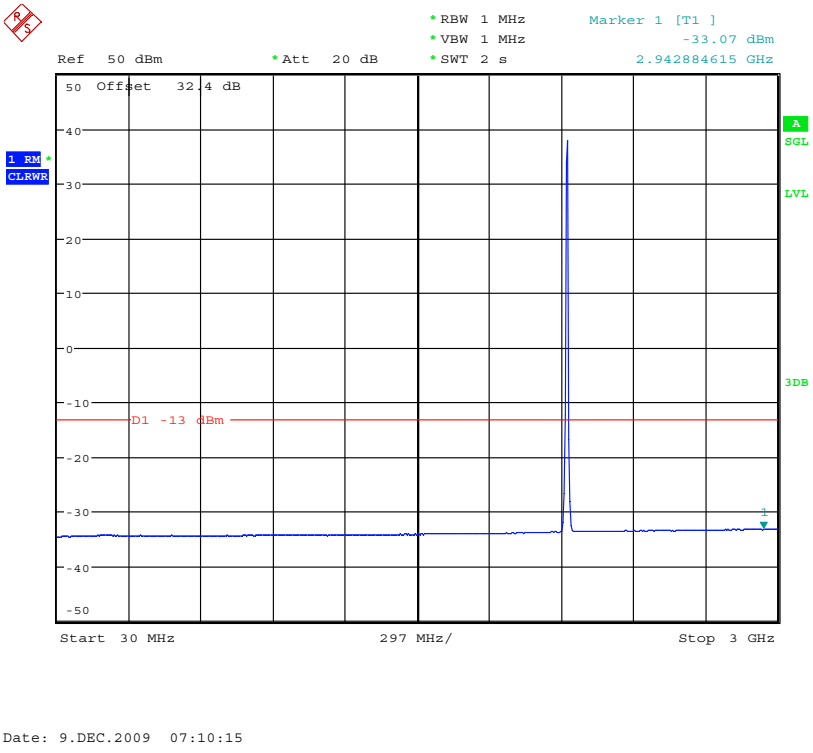


Figure 7-107: Spurious Emissions (30MHz-3GHz) – 16QAM (2132.5 MHz) (10MHz Channel BW)

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

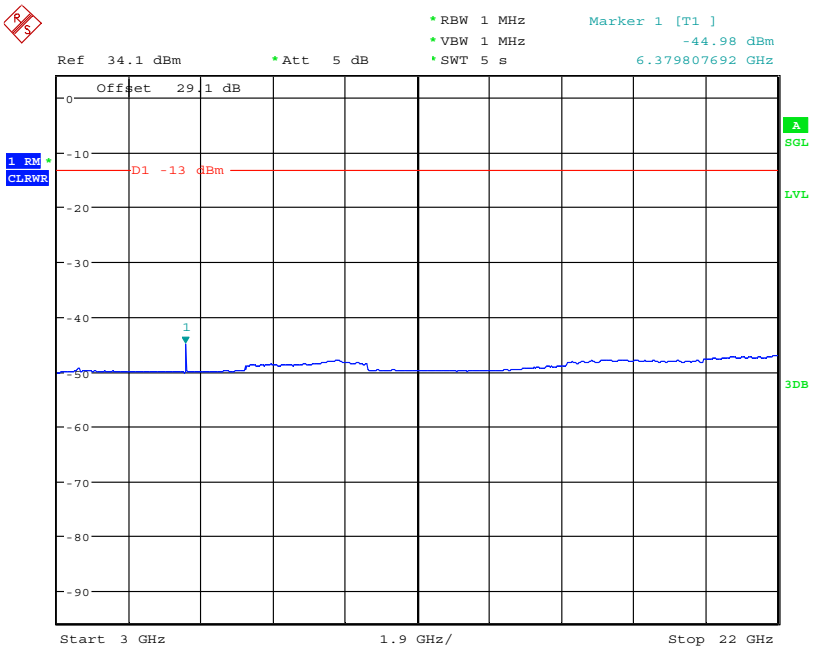


Figure 7-108: Spurious Emissions (3GHz-22GHz) – 16QAM (2132.5 MHz) (10MHz Channel BW)

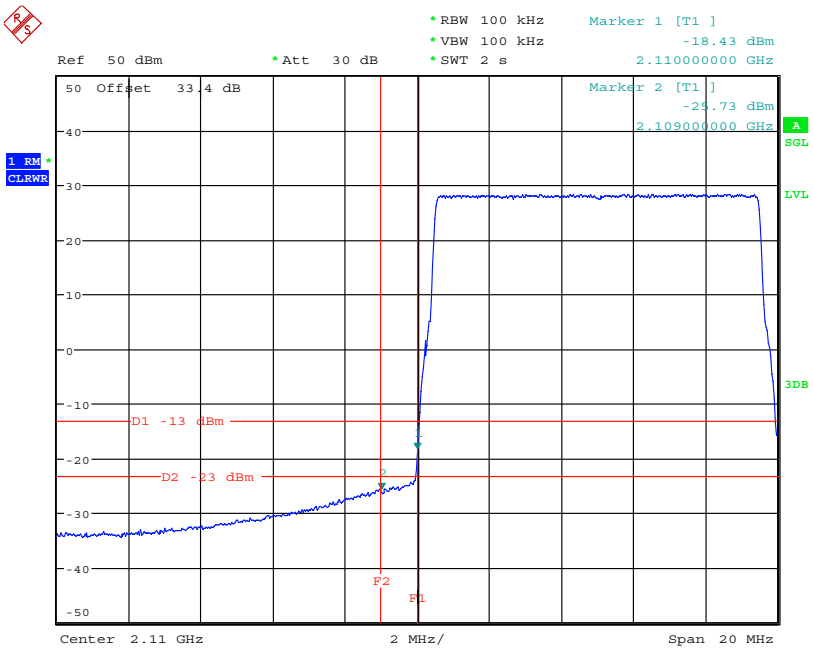


Figure 7-109: Spurious Emissions (Lower band edge) – 64QAM (2115.0 MHz) (10MHz Channel BW)

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

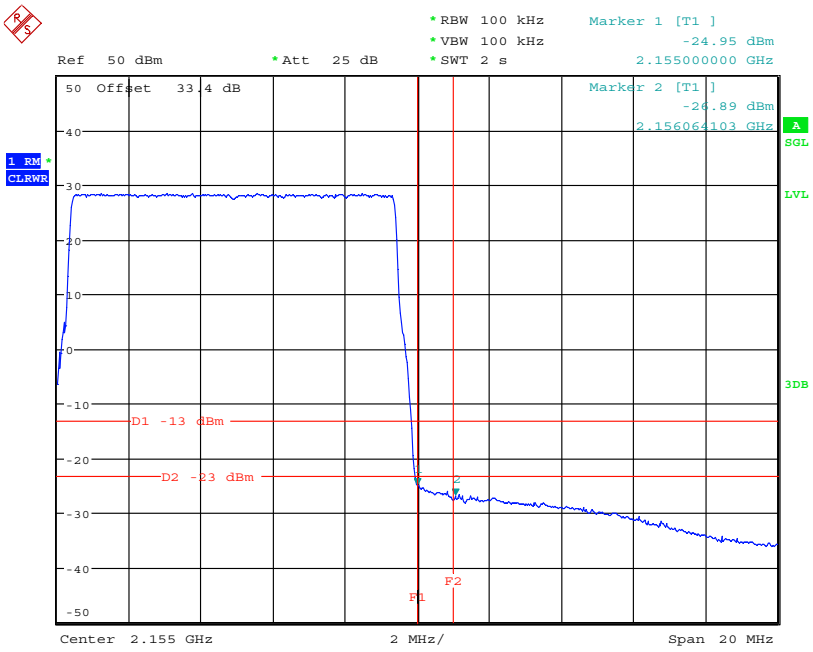


Figure 7-110: Spurious Emissions (Upper band edge) – 64QAM (2149.9 MHz) (10MHz Channel BW)

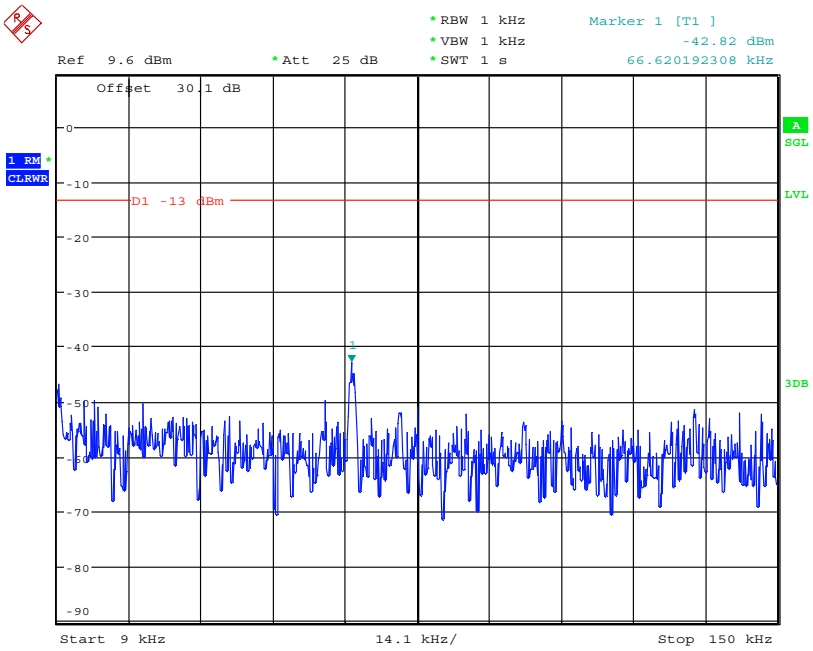


Figure 7-111: Spurious Emissions (9kHz-150kHz) – 64QAM (2132.5 MHz) (10MHz Channel BW)

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

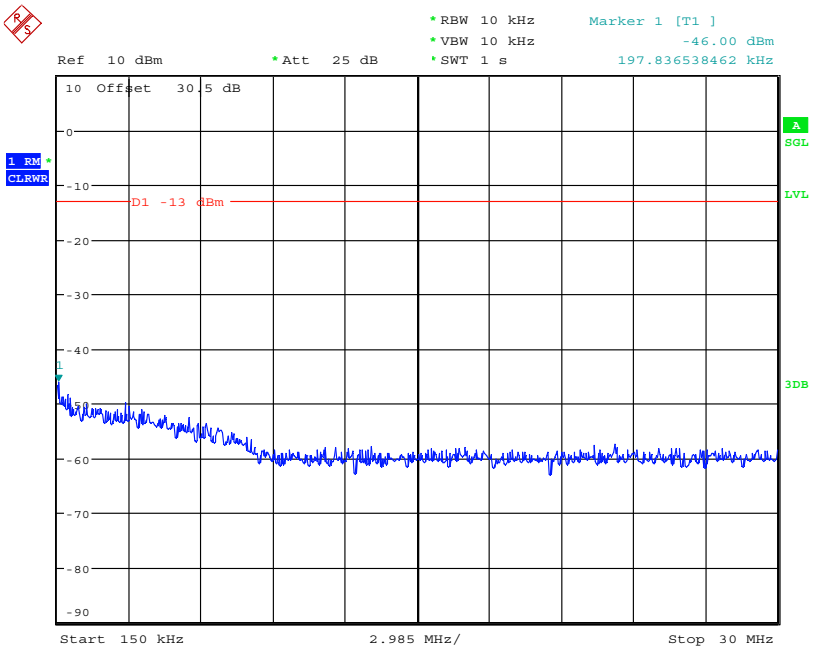


Figure 7-112: Spurious Emissions (150kHz-30MHz) – 64QAM (2132.5 MHz) (10MHz Channel BW)

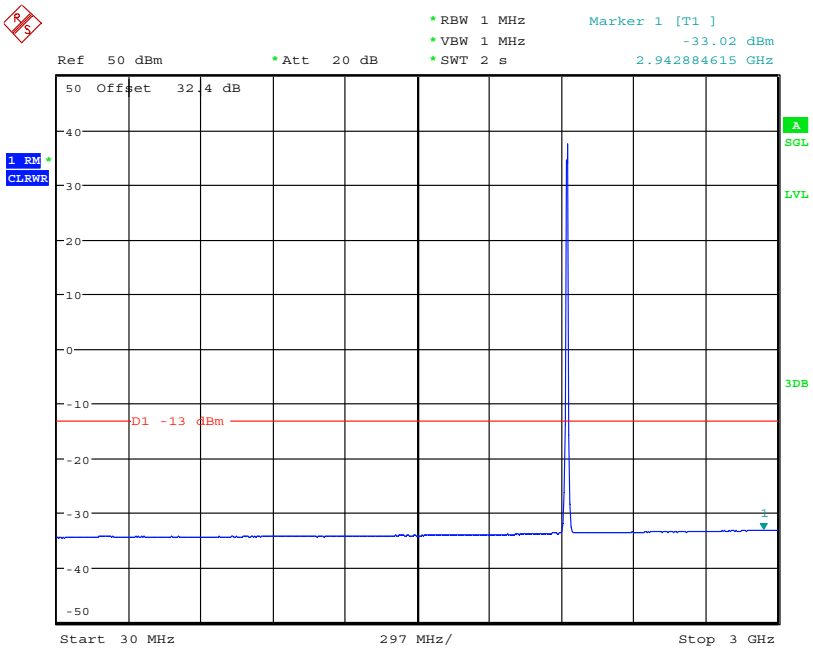


Figure 7-113: Spurious Emissions (30MHz-3GHz) – 64QAM (2132.5 MHz) (10MHz Channel BW)

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

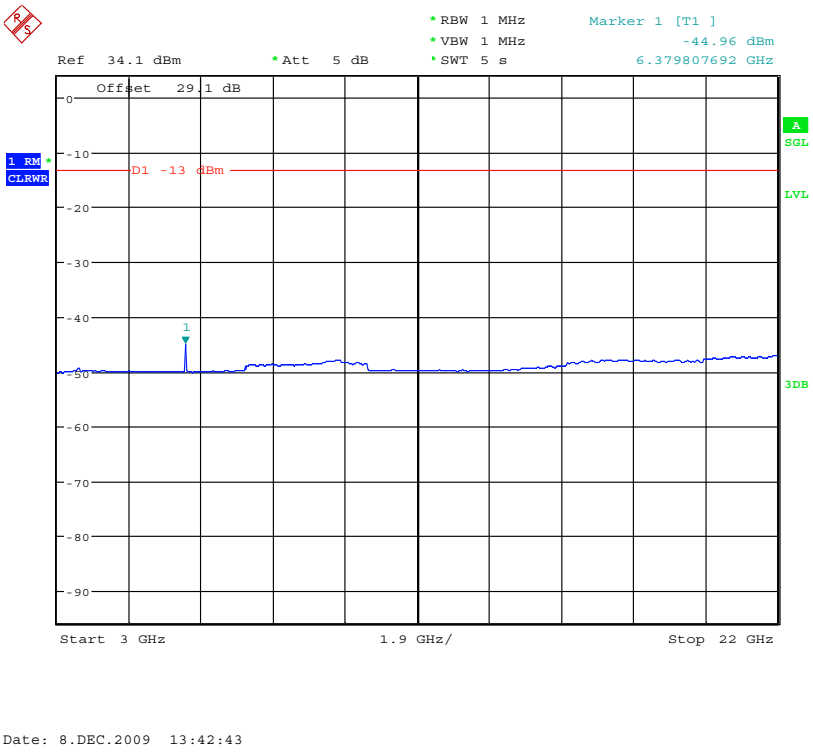


Figure 7-114: Spurious Emissions (3GHz-22GHz) – 64QAM (2132.5 MHz) (10MHz Channel BW)

Config B TX1+TX2:

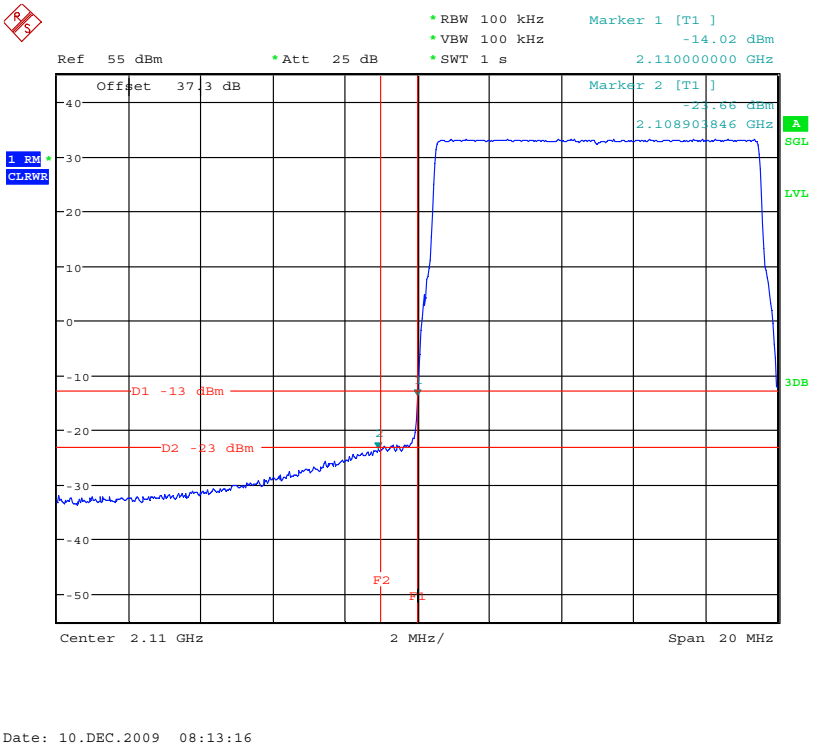


Figure 7-115: Spurious Emissions (Lower band edge) – QPSK (2115.0 MHz) (10MHz Channel BW)

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

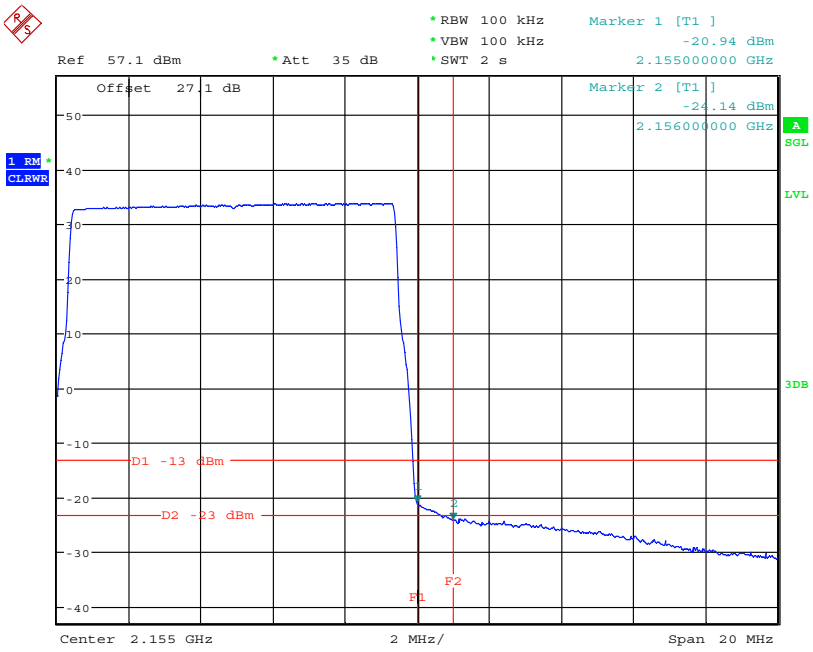


Figure 7-116: Spurious Emissions (Upper band edge) – QPSK (2149.9 MHz) (10MHz Channel BW)

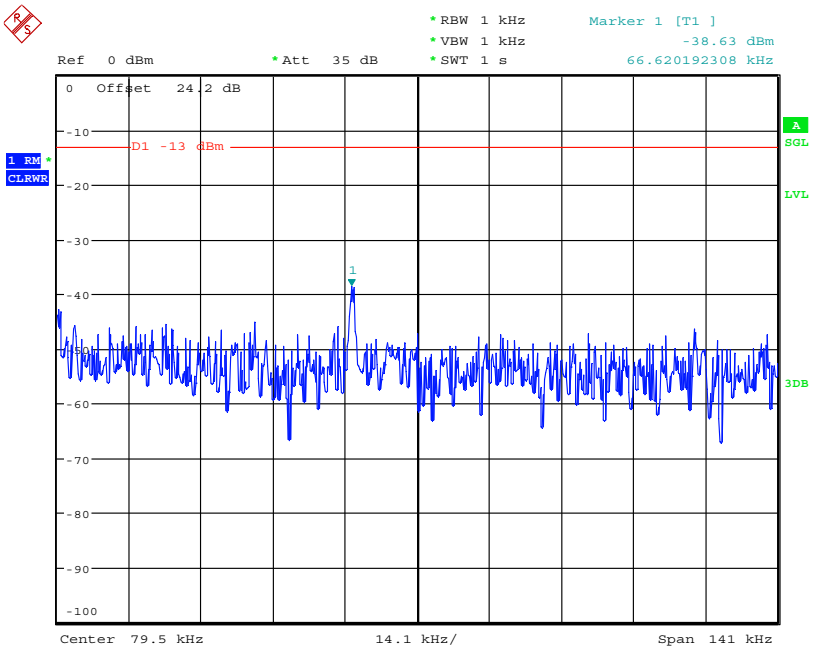


Figure 7-117: Spurious Emissions (9kHz-150kHz) – QPSK (2132.5 MHz) (10MHz Channel BW)

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

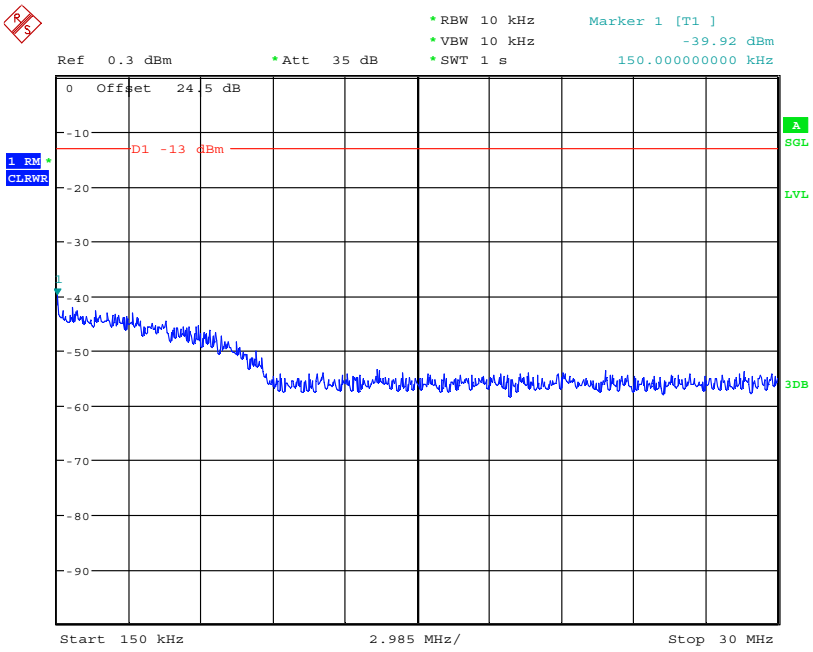


Figure 7-118: Spurious Emissions (150kHz-30MHz) – QPSK (2132.5 MHz) (10MHz Channel BW)

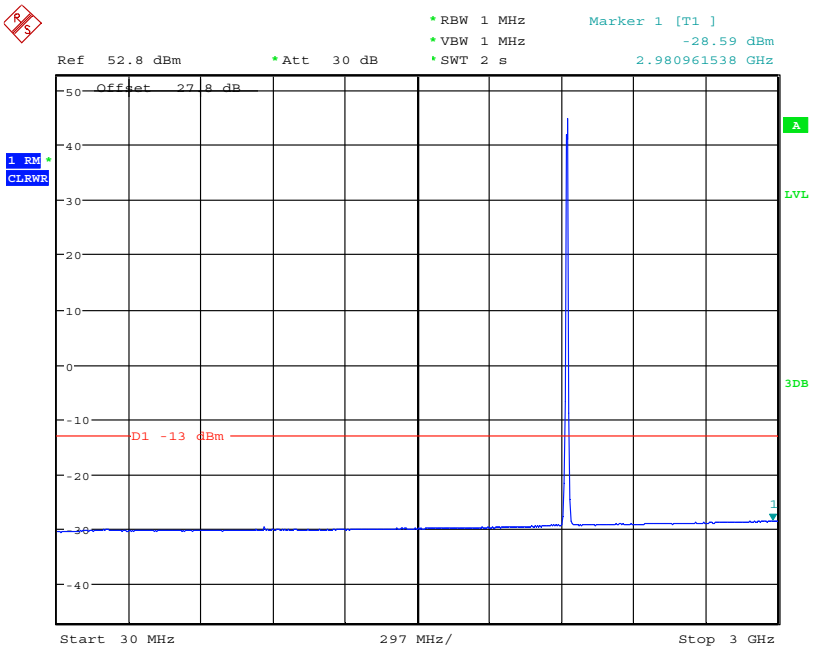


Figure 7-119: Spurious Emissions (30MHz-3GHz) – QPSK (2132.5 MHz) (10MHz Channel BW)

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

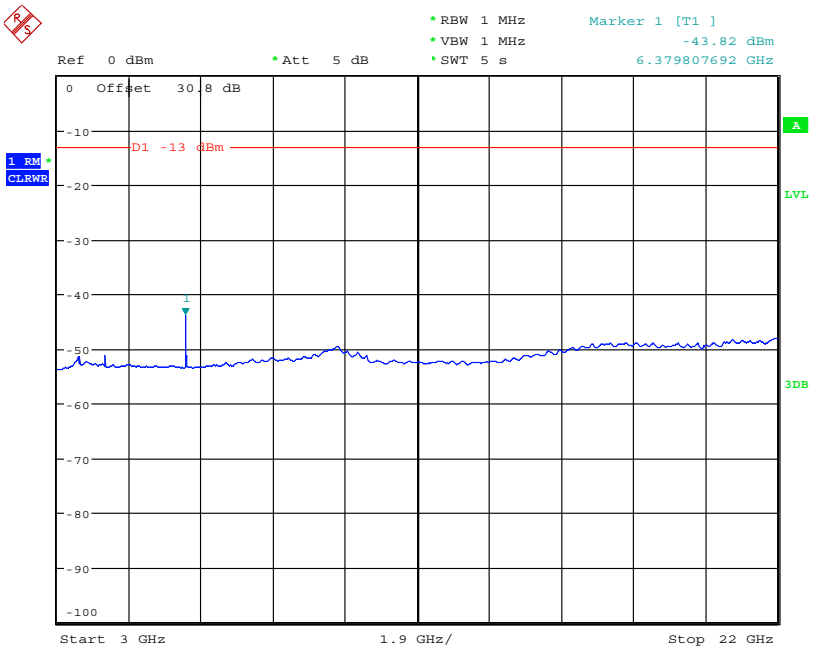


Figure 7-120: Spurious Emissions (3GHz-22GHz) – QPSK (2132.5 MHz) (10MHz Channel BW)

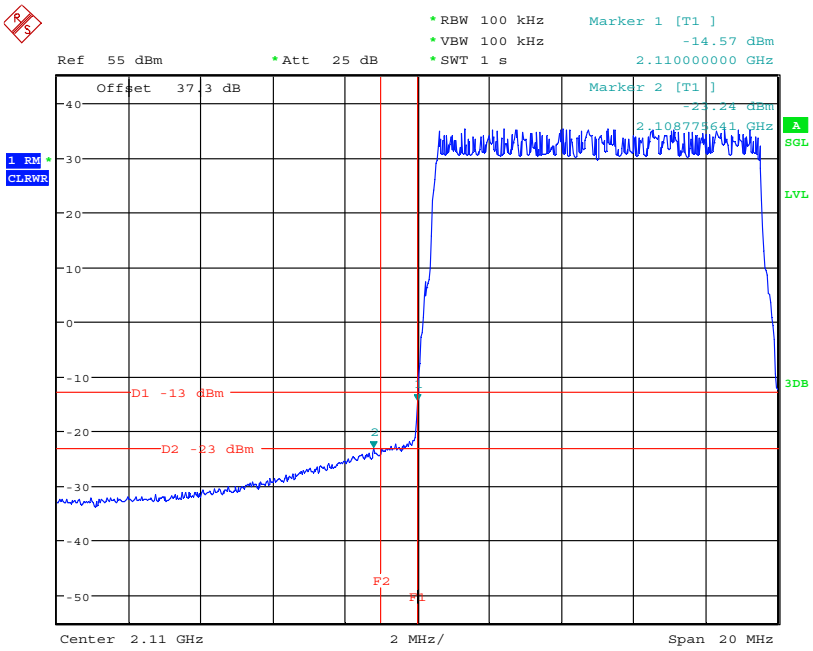


Figure 7-121: Spurious Emissions (Lower band edge) – 16QAM (2115.0 MHz) (10MHz Channel BW)

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

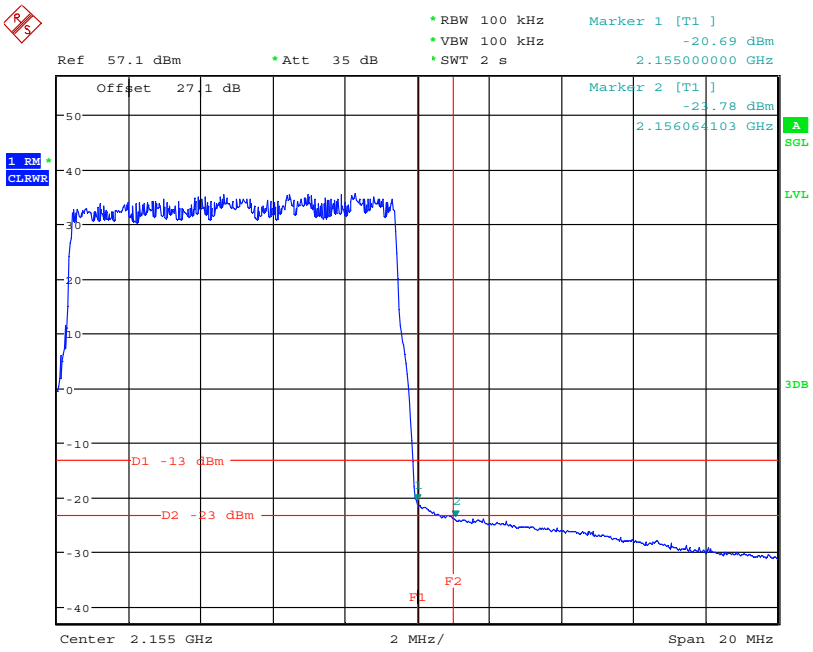


Figure 7-122: Spurious Emissions (Upper band edge) – 16QAM (2149.9 MHz) (10MHz Channel BW)

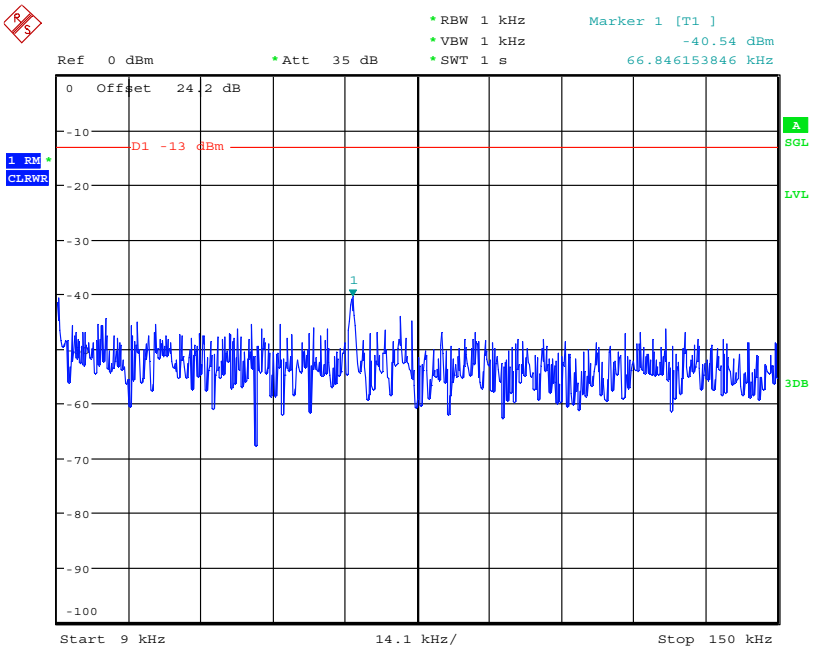


Figure 7-123: Spurious Emissions (9kHz-150kHz) – 16QAM (2132.5 MHz) (10MHz Channel BW)

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

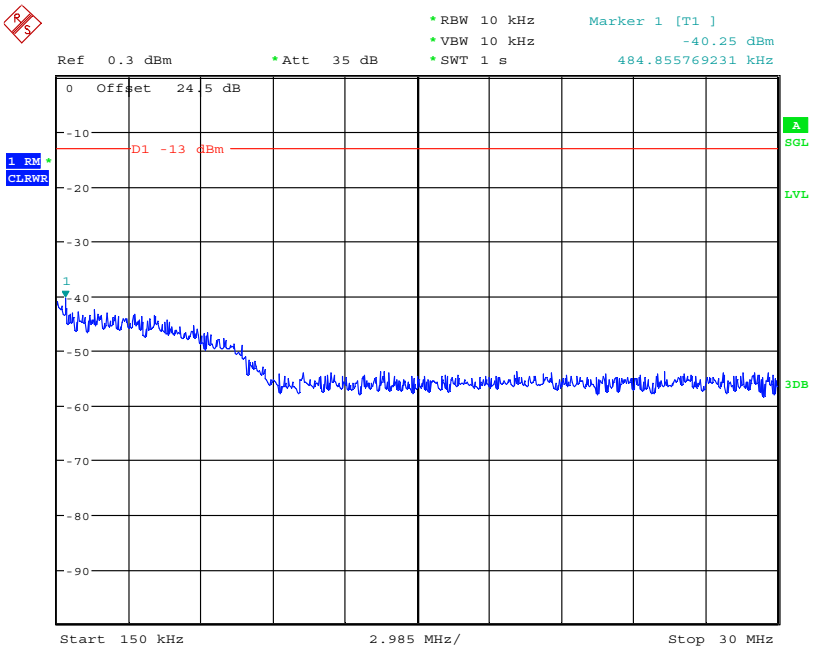


Figure 7-124: Spurious Emissions (150kHz-30MHz) – 16QAM (2132.5 MHz) (10MHz Channel BW)

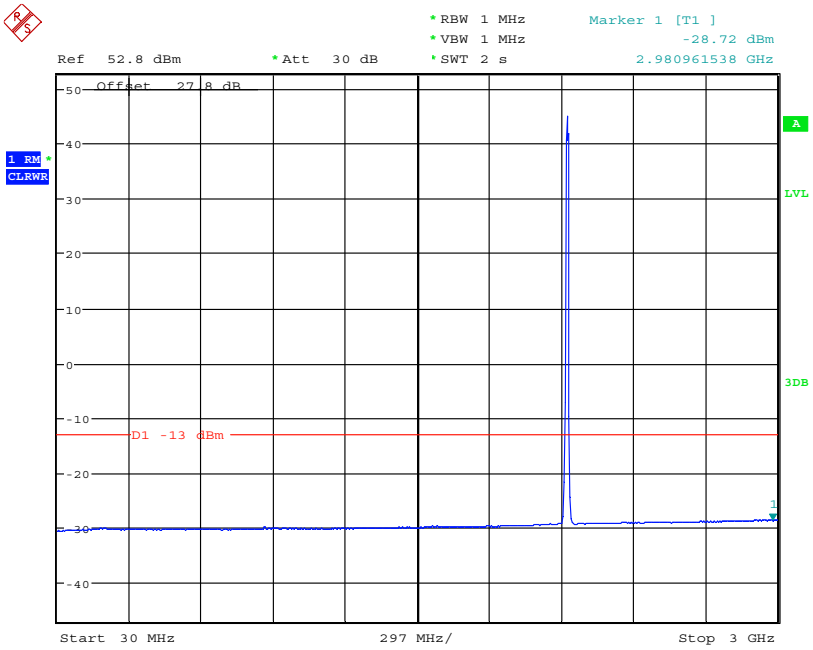


Figure 7-125: Spurious Emissions (30MHz-3GHz) – 16QAM (2132.5 MHz) (10MHz Channel BW)

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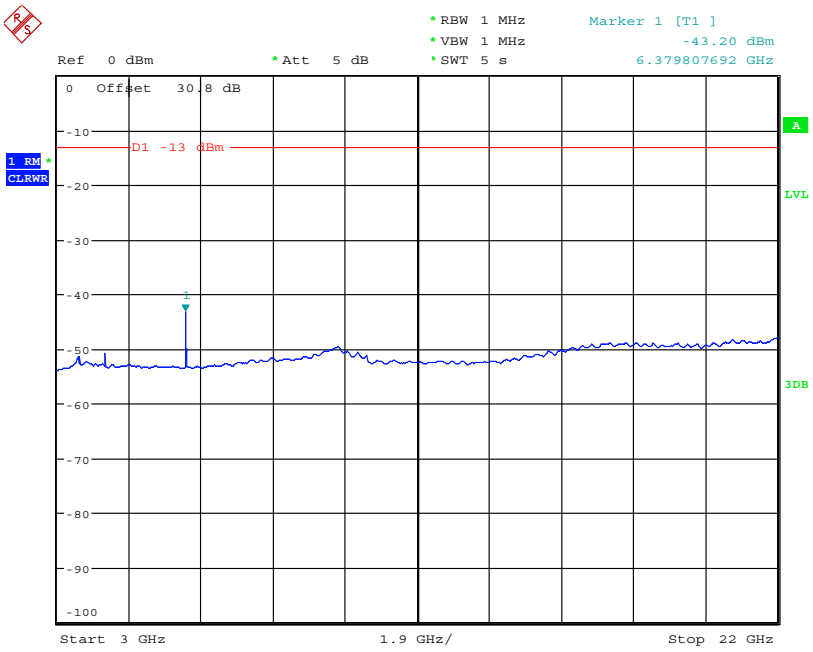

Figure 7-126: Spurious Emissions (3GHz-22GHz) – 16QAM (2132.5 MHz) (10MHz Channel BW)

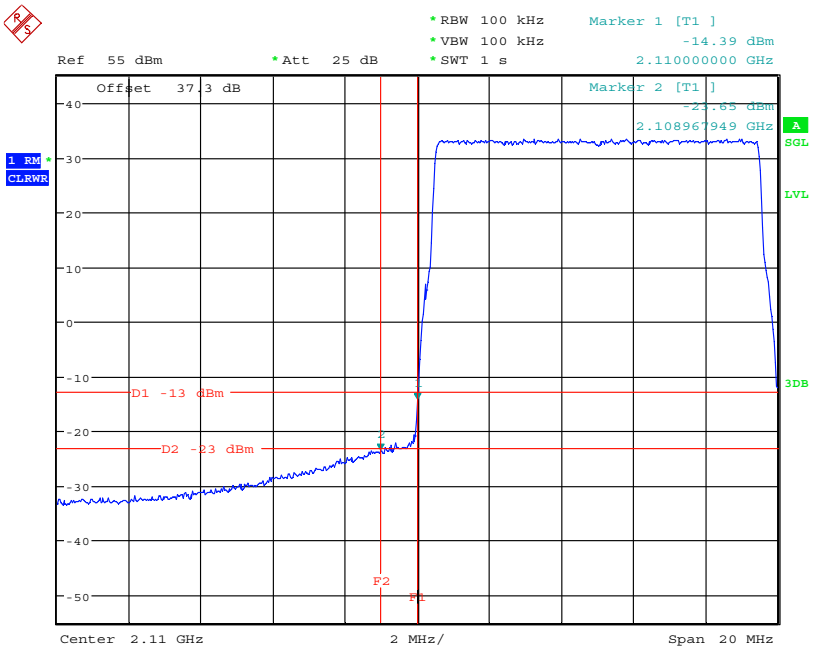

Figure 7-127: Spurious Emissions (Lower band edge) – 64QAM (2115.0 MHz) (10MHz Channel BW)

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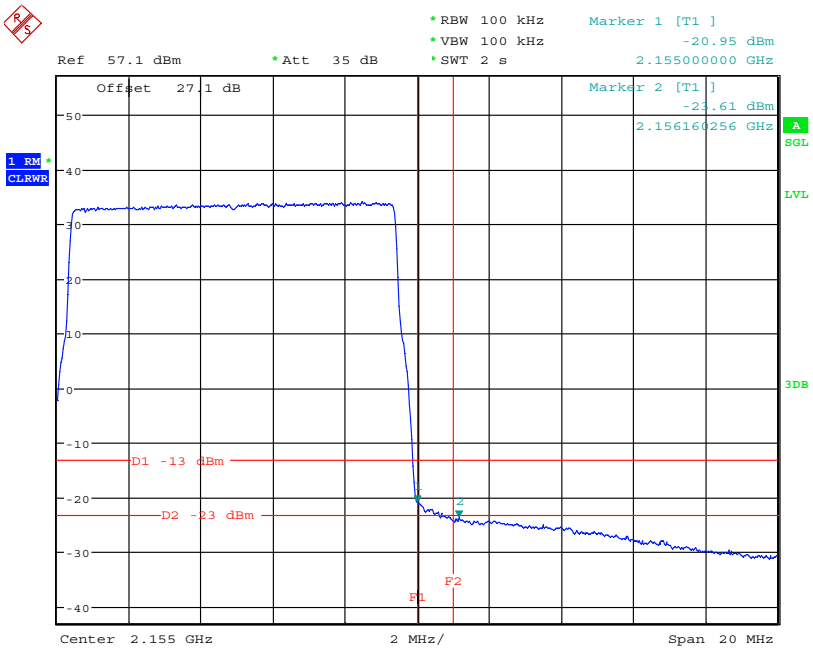

Figure 7-128: Spurious Emissions (Upper band edge) – 64QAM (2149.9 MHz) (10MHz Channel BW)

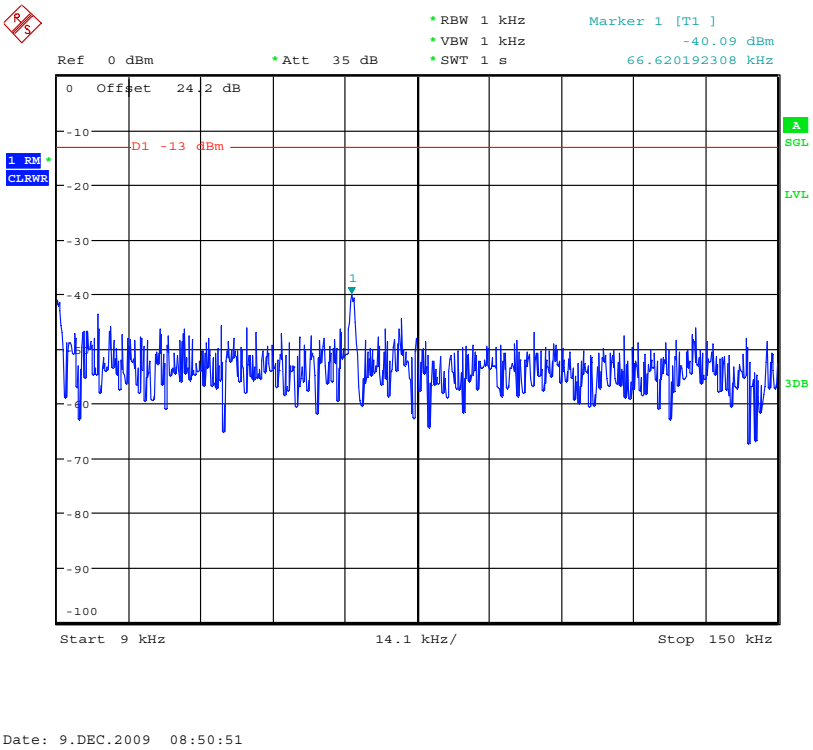

Figure 7-129: Spurious Emissions (9kHz-150kHz) – 64QAM (2132.5 MHz) (10MHz Channel BW)

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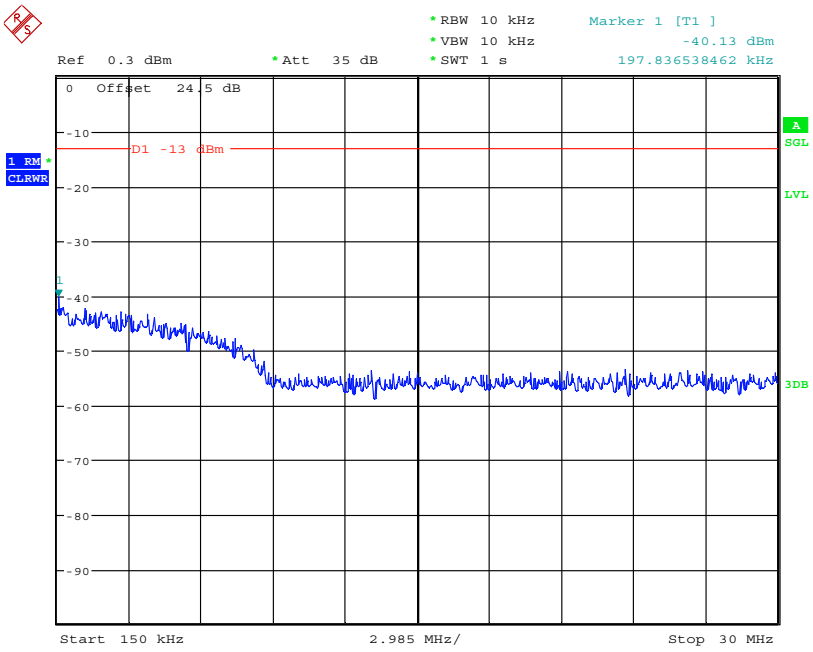

Figure 7-130: Spurious Emissions (150kHz-30MHz) – 64QAM (2132.5 MHz) (10MHz Channel BW)

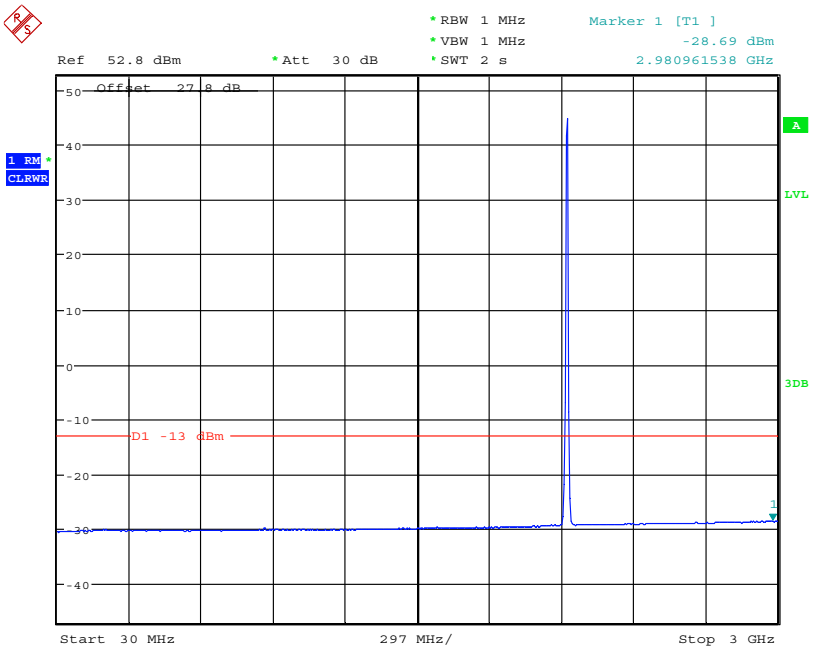

Figure 7-131: Spurious Emissions (30MHz-3GHz) – 64QAM (2132.5 MHz) (10MHz Channel BW)

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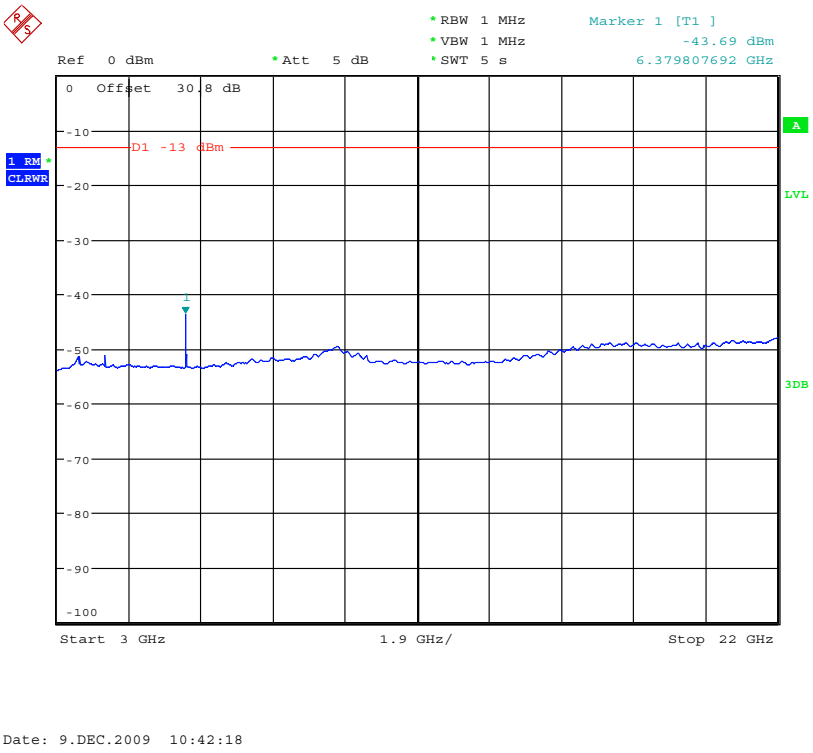

Figure 7-132: Spurious Emissions (3GHz-22GHz) – 64QAM (2132.5 MHz) (10MHz Channel BW)

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7.2.4 Test No. 5: Field Strength of Spurious Radiation

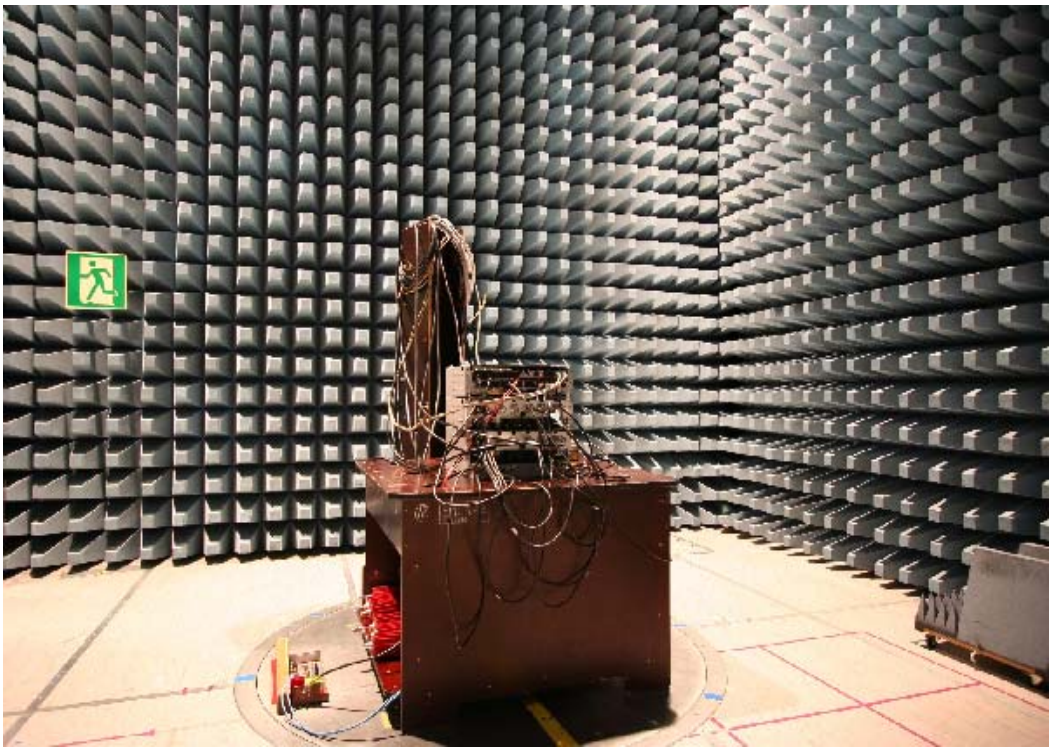

Figure 7-133: Photograph of the anechoic chamber with the EUT

Config A:

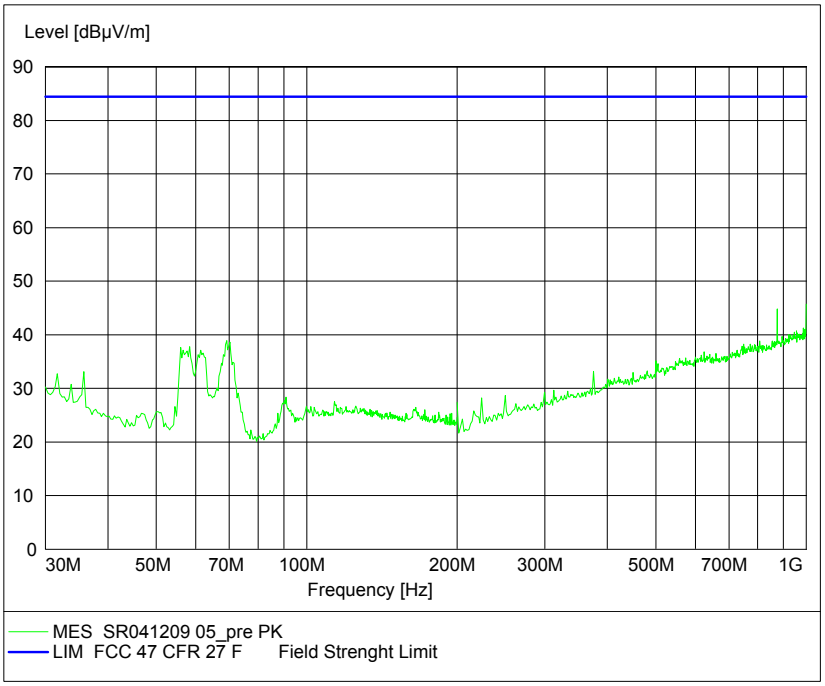

Figure 7-134: Radiated Emission 30 MHz – 1 GHz (5MHz Channel BW)

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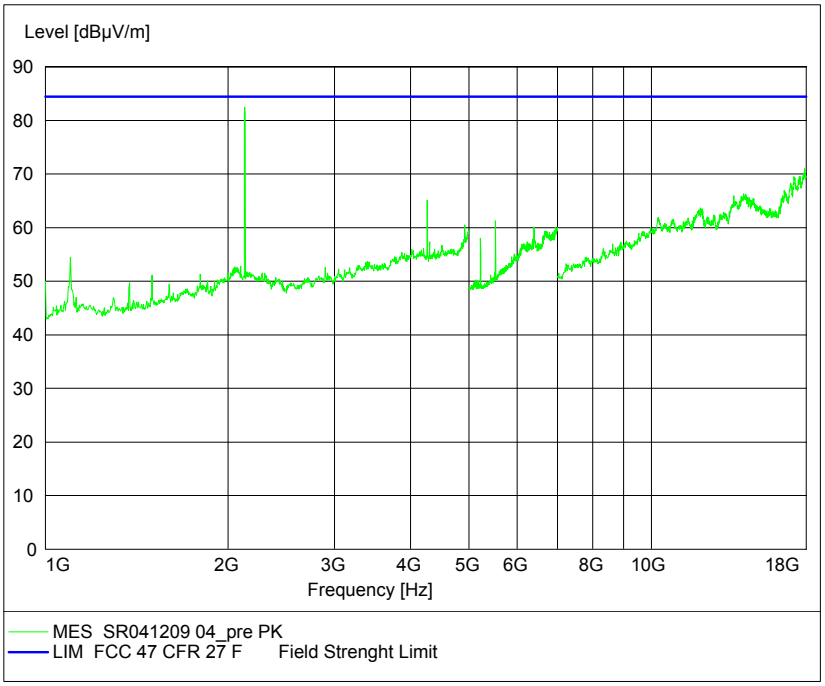

Figure 7-135: Radiated Emission 1 GHz – 18 GHz (5MHz Channel BW)

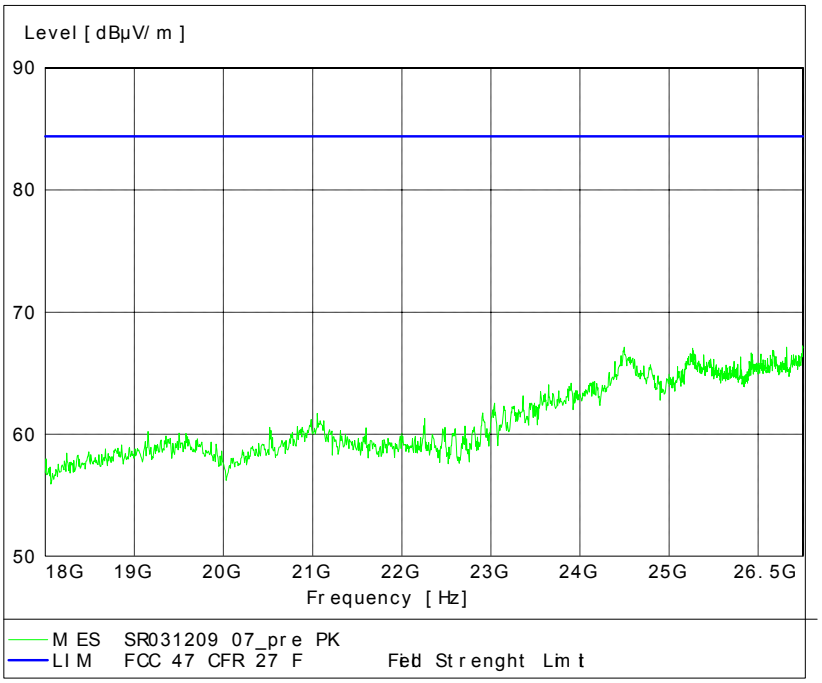

Figure 7-136: Radiated Emission 18 GHz – 26.5 GHz (5MHz Channel BW)

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Config B:

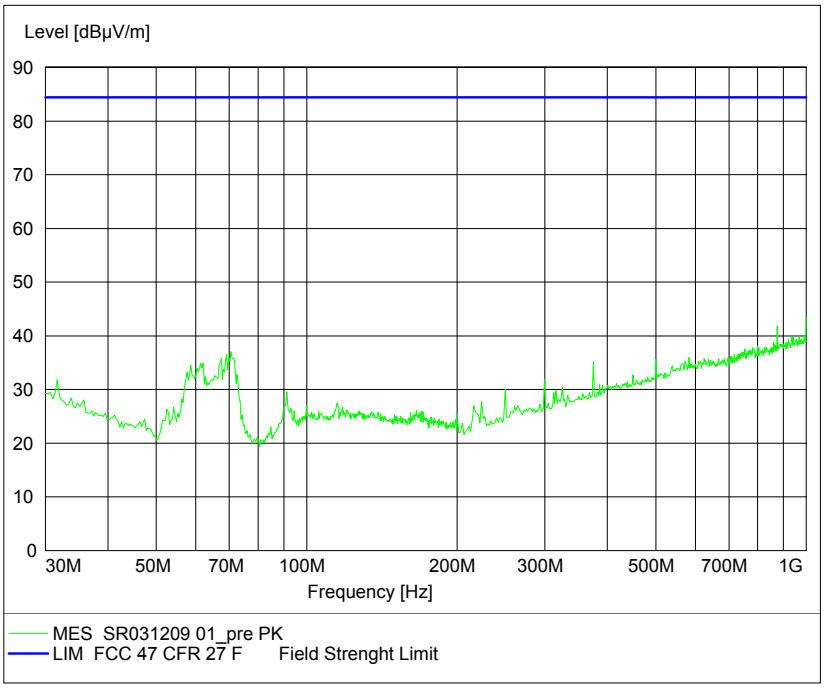

Figure 7-137: Radiated Emission 30 MHz – 1 GHz (10MHz Channel BW)

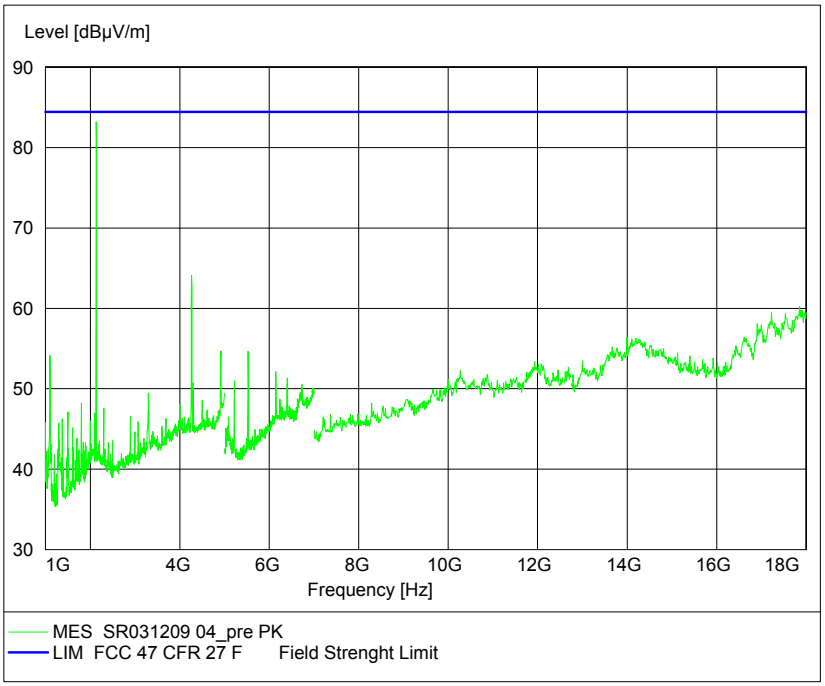

Figure 7-138: Radiated Emission 1 GHz – 18 GHz (10MHz Channel BW)

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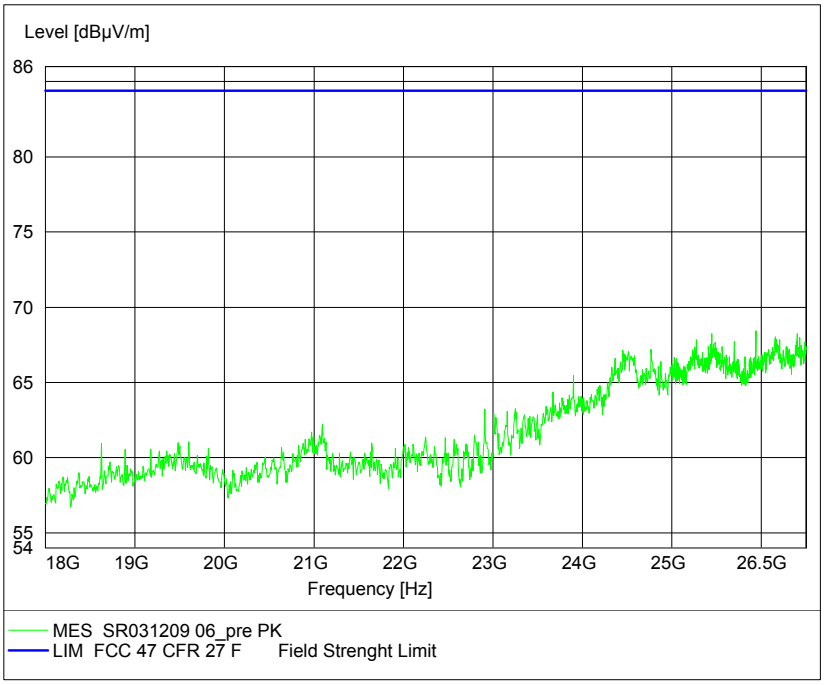

Figure 7-139: Radiated Emission 18 GHz – 26.5 GHz (10MHz Channel BW)

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