Nemko Test Report:	33241RUS1
Applicant:	Nokia Siemens Networks 6000 Connection Drive Irving, TX 75039 USA
Equipment Under Test: (E.U.T.)	EXPB
FCC ID:	VBNEXPB-01
In Accordance With:	**CFR 47, Part 24, Subpart E** Broadband PCS Base Stations
Tested By:	Nemko USA, Inc. 802 N. Kealy Lewisville, TX 75057-3136

TESTED BY: _____ **DATE:** **06 October 2009**

David Light, Senior Wireless Engineer

APPROVED BY: _____ **DATE:** **6 November 2009**

Tom Tidwell, Telecom Direct

Number of Pages: 53

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Section 1. Summary of Test Results

Manufacturer: Nokia Siemens Networks

Model No.: EXPB

Serial No.: L9093200297

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 24, Subpart E.

☒ New Submission ☒ Production Unit

☐ Class II Permissive Change ☐ Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.
See " Summary of Test Data".

NVLAP®
LAB CODE: 100426-0

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	24.232	1640 W	Complies
Occupied Bandwidth	24.238		Complies
Spurious Emissions at Antenna Terminals	24.238(a)	-13 dBm	Complies
Field Strength of Spurious Emissions	24.238(a)	-13 dBm E.I.R.P.	Complies
Frequency Stability	24.235	Must stay in block	Complies

Footnotes For N/A's:

Section 2. General Equipment Specification

Supply Voltage Input:	-48 Vdc nominal		
Frequency Band:	1930 to 1990 MHz		
Type of Modulation and Designator:	**GSM** **300KGXW**	**EDGE** **300KG7W**	
Maximum No. of Carriers:	1		
Output Impedance:	50 ohms		
RF Output (Rated):	50.0 W GMSK: Combiner Bypass 89.0 W GMSK: Double Combining 31.6 W 8PSK: Combiner Bypass 56.2 W 8PSK: Double Combining		
Band Selection:	**Software** ☒	**Duplexer** ☐	**Fullband** ☐

System Description

The EXPB is an 1900 MHz Base Station Transceiver. The configurations tested consisted of 3 modules: System Module, Dual Duplex filter module, Dual Transceiver module, and Wideband combiner module (needed for double power). Two types of RF outputs were measured: Combiner Bypass and Double Power Combining. Combiner Bypass consisted of a single carrier and Double Power Combining consisted of two carriers on the same channel combined with phase adjustment in order to increase the transmitted RF output power.

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 02 October 2009

Test Results: Complies.

Measurement Data: Refer to table on next page.

Equipment Used: 1036-1082-1055-1064-1065

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 35 %

Test Data – RF Power Output

Double Power Combining Mode

Modulation Type	Frequency (MHz)	Measured Output Power (dBm)	Measured Output Power (W)
GMSK	1930.2	32.9	1.9
GMSK	1930.4	49.1	81.3
GMSK	1960.0	49.5	89.0
GMSK	1989.6	34.0	2.5
GMSK	1989.8	48.6	72.4
8PSK	1930.2	39.6	9.1
8PSK	1930.4	47.5	56.2
8PSK	1960.0	47.5	56.2
8PSK	1989.6	37.3	5.6
8PSK	1989.8	47.4	55.0

Combiner Bypass Mode

Modulation Type	Frequency (MHz)	Measured Output Power (dBm)	Measured Output Power (W)
GMSK	1930.2	33.6	2.5
GMSK	1930.4	45.8	38.0
GMSK	1960.0	47.0	50.0
GMSK	1989.6	32.8	1.9
GMSK	1989.8	44.9	30.9
8PSK	1930.2	37.4	5.5
8PSK	1930.4	45.0	31.6
8PSK	1960.0	45.0	31.6
8PSK	1989.6	36.1	4.1
8PSK	1989.8	45.0	31.6

Note: The peak power needs to be lowered at the lowest and highest frequencies per above to ensure compliance at the band edges. Refer to plots in section 5.

Supply voltage was varied +/- 15%. No fluctuation in output power resulted.

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 02 October 2009

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1036-1055-1082-1065-1064

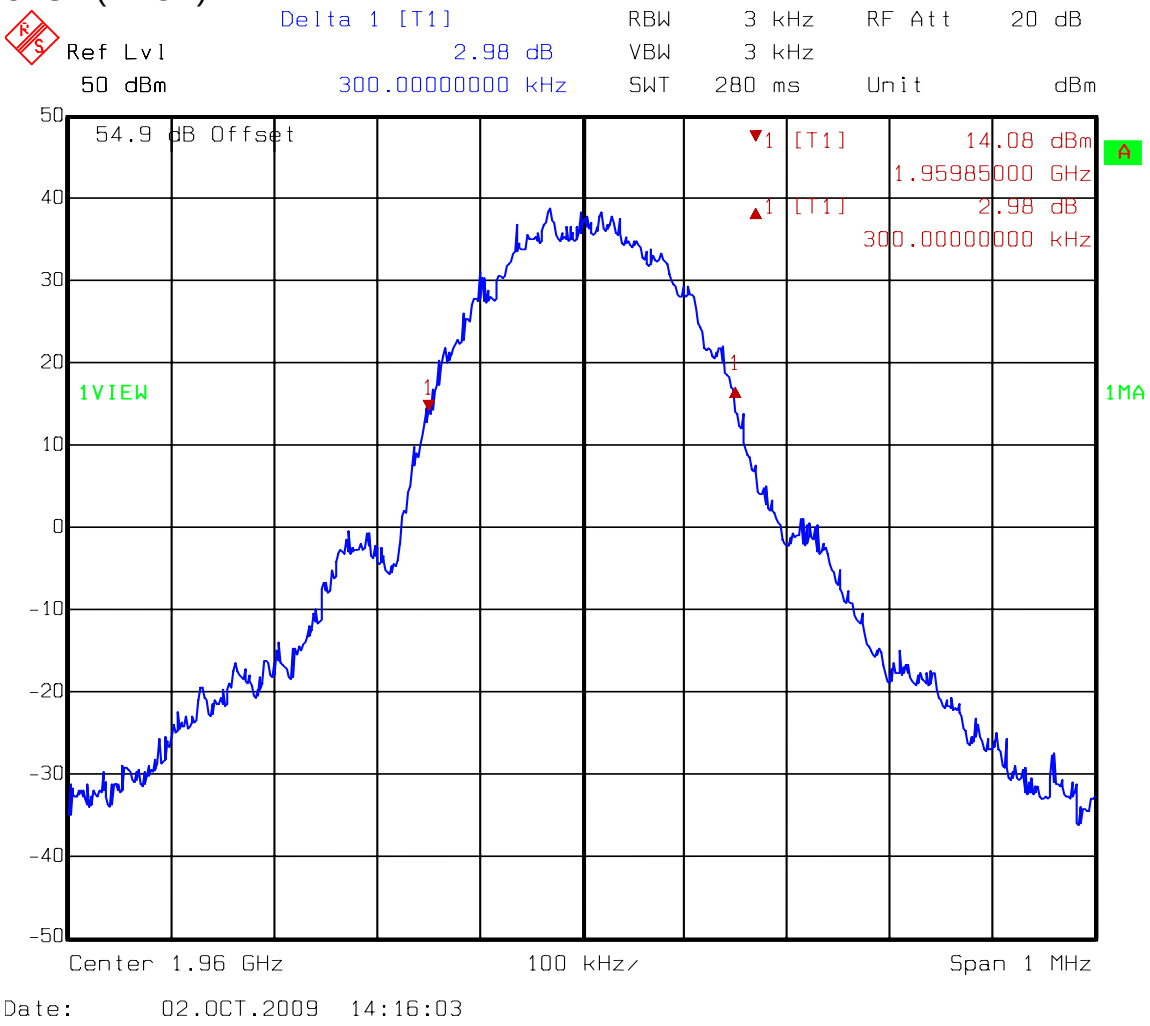
Measurement Uncertainty: +/- 1.6 dB

Temperature: 22 °C

Relative Humidity: 35 %

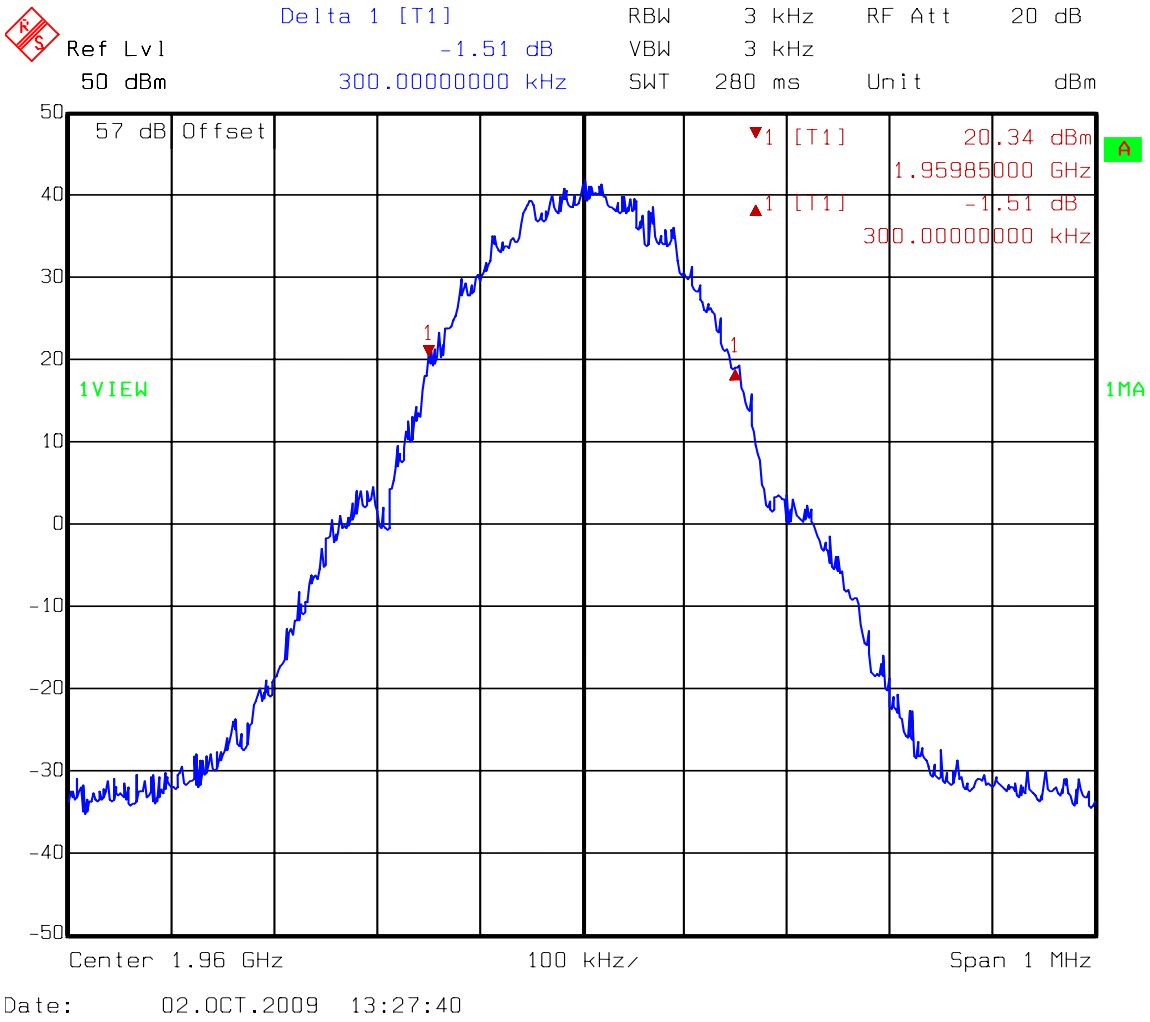
Test Data – Occupied Bandwidth

8PSK (EDGE)



Test Data – Occupied Bandwidth

GMSK (GSM))



Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 02 October 2009

Test Results: Complies.

Test Data: Refer to plots below

Equipment Used: 1036-1082-1064-1065-1055-1054-1058

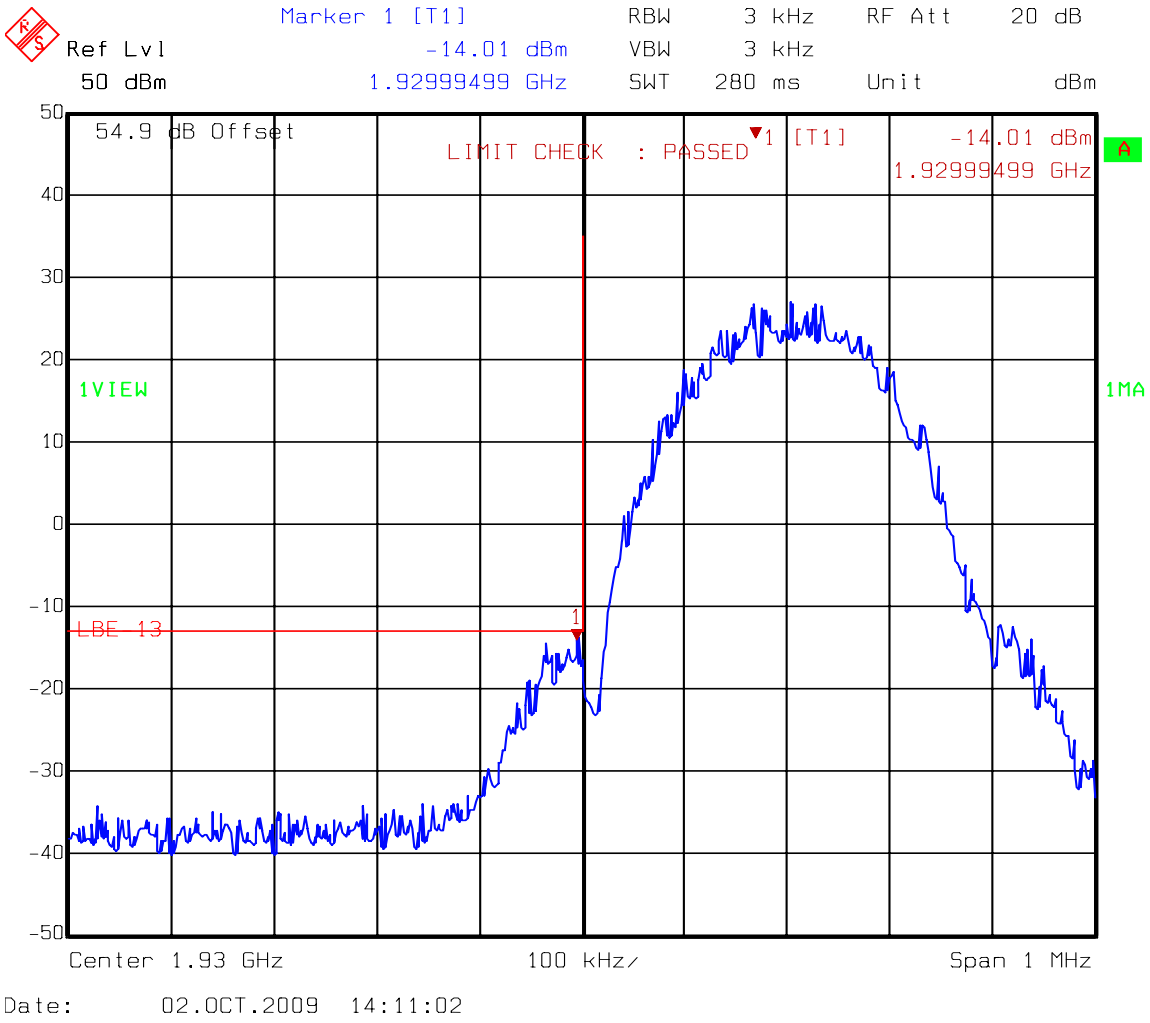
Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 35 %

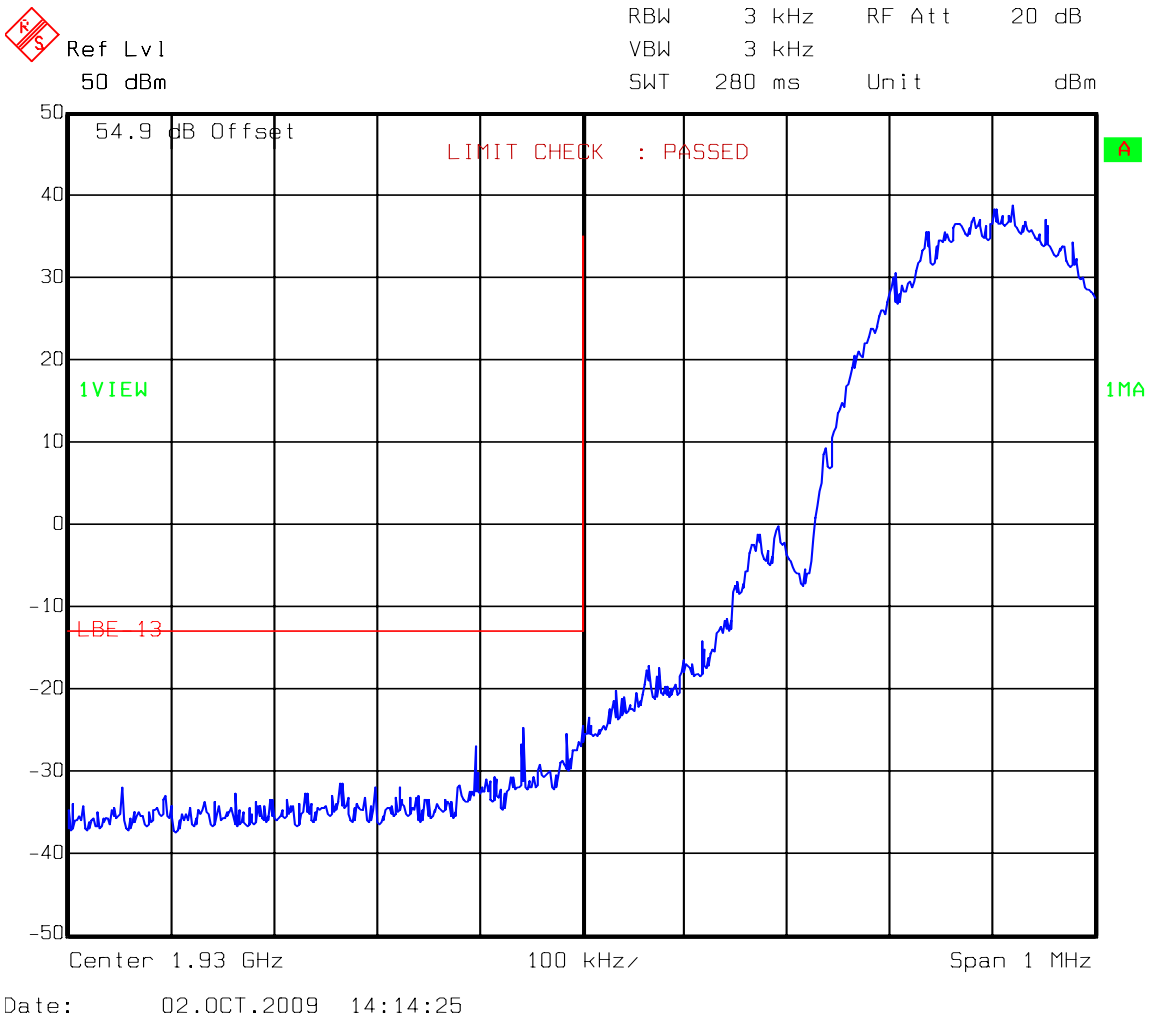
Test Data – Spurious Emissions

Low Band Edge
8PSK (EDGE)
Double Power Combining Mode
1930.2 MHz
Transmit power reduced



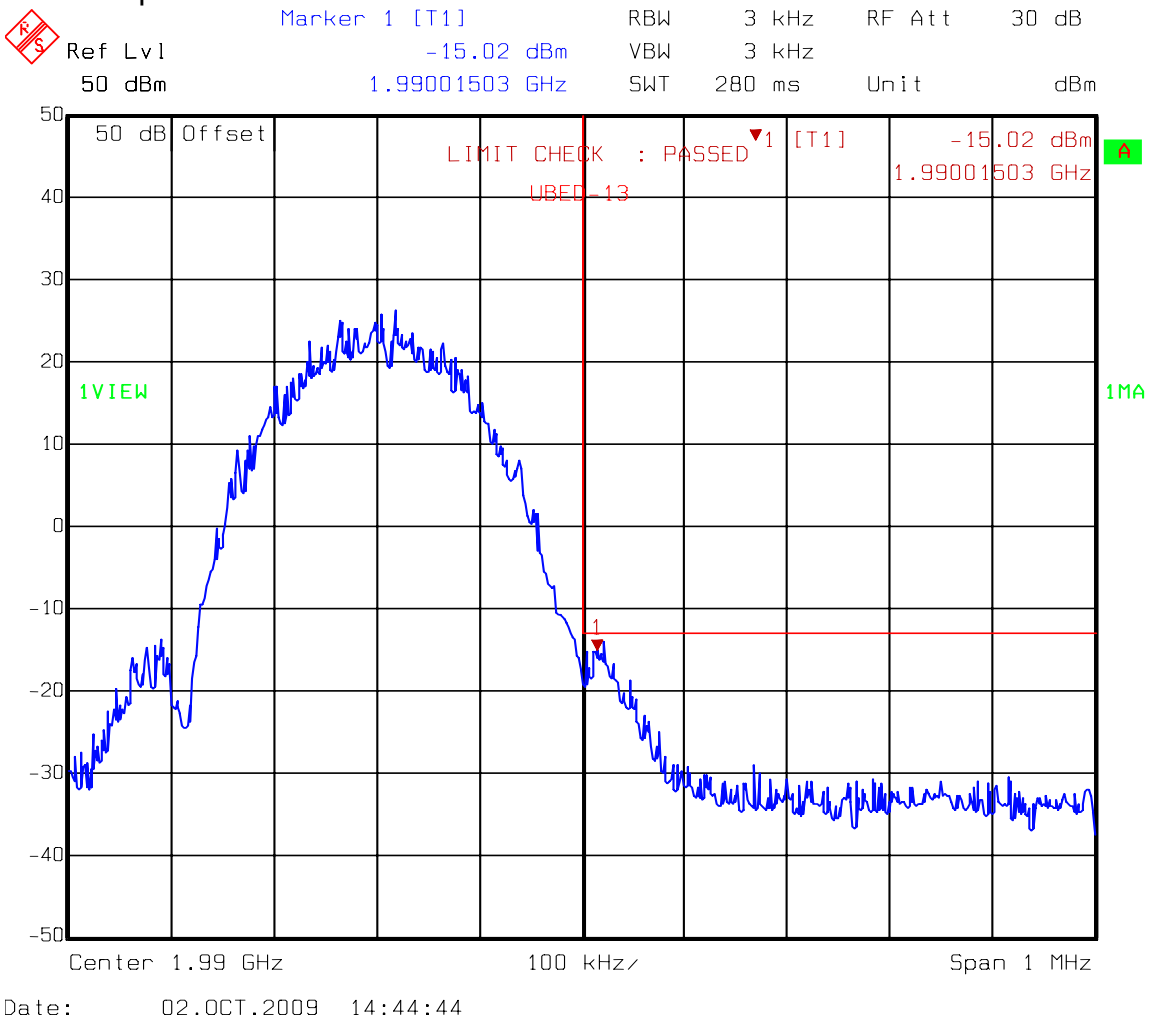
Test Data – Spurious Emissions

Low Band Edge
8PSK (EDGE)
Double Power Combining Mode
1930.4 MHz
Transmit power maximum



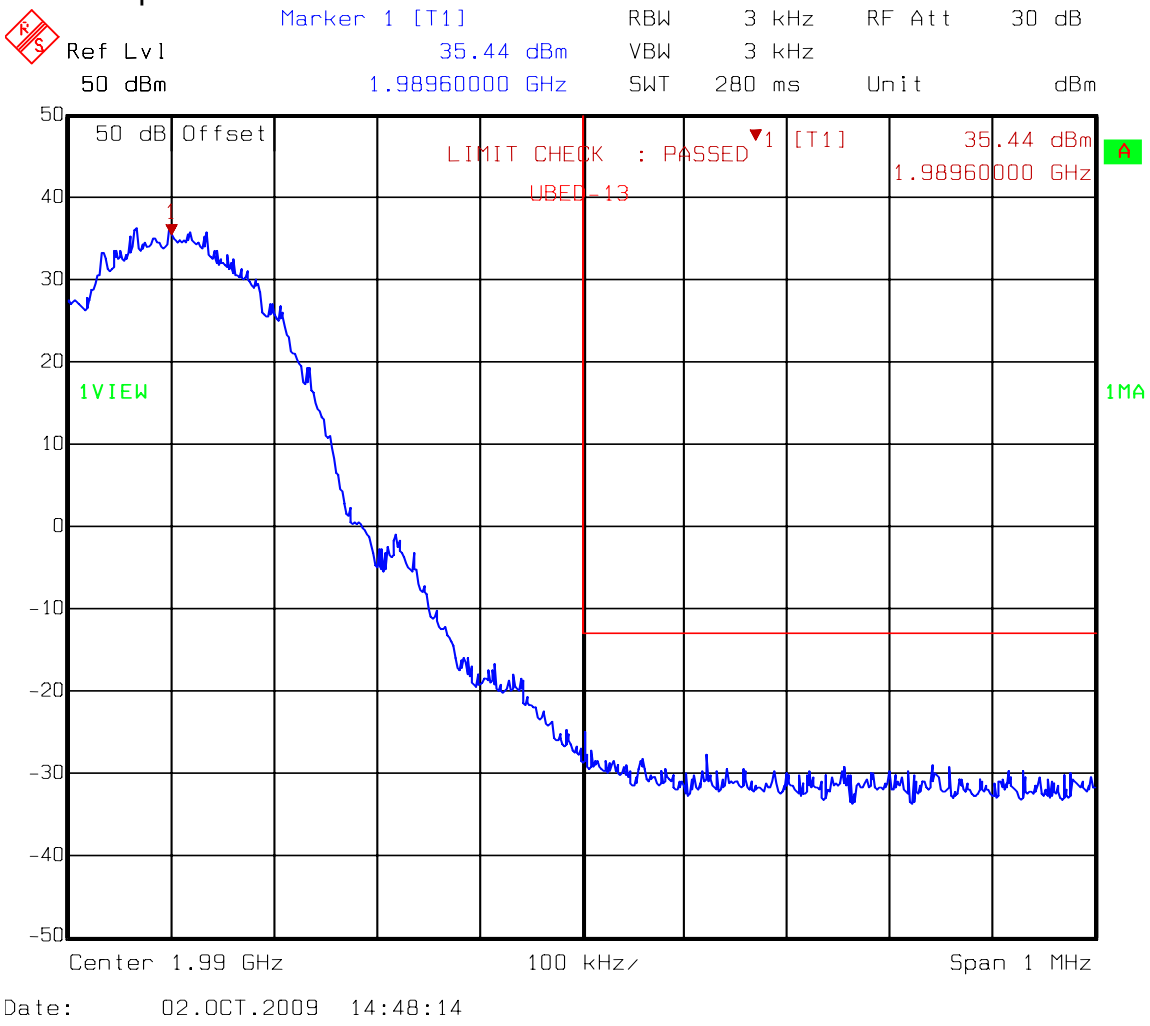
Test Data – Spurious Emissions

Upper Band Edge
8PSK (EDGE)
Double Power Combining Mode
1989.8 MHz
Transmit power reduced



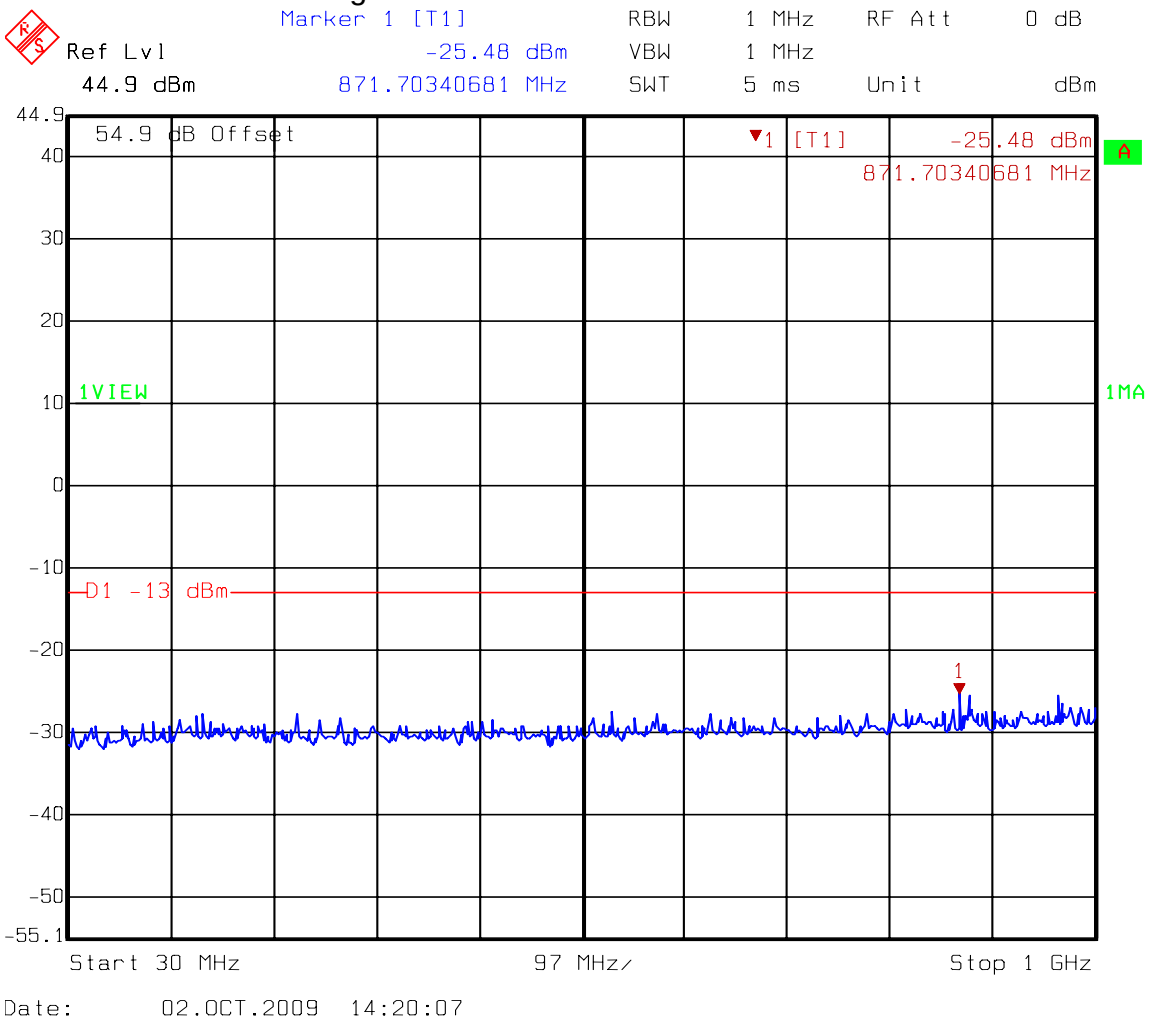
Test Data – Spurious Emissions

Upper Band Edge
8PSK (EDGE)
Double Power Combining Mode
1989.6 MHz
Transmit power maximum



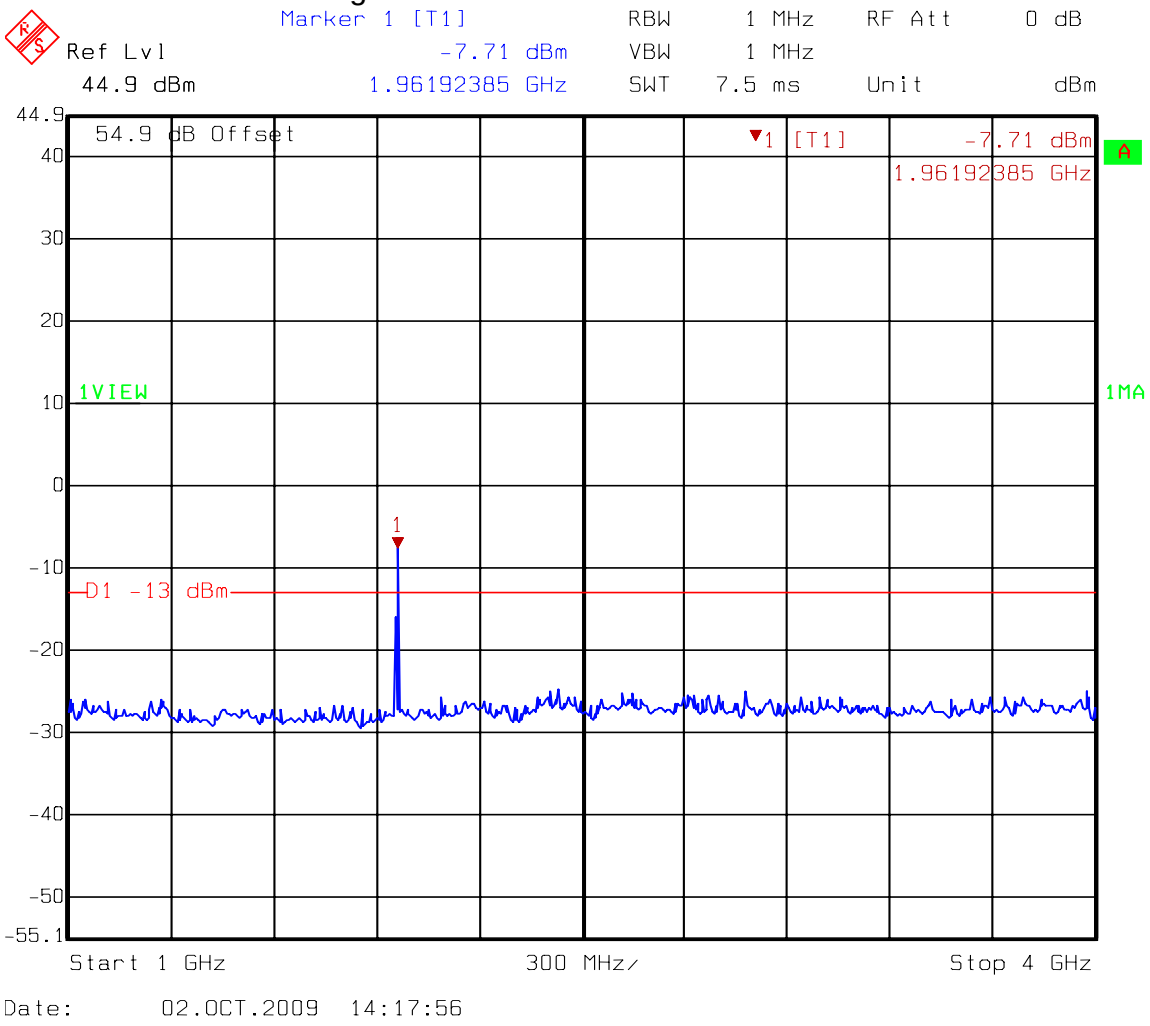
Test Data – Spurious Emissions

8PSK (EDGE)
Spurs
Double Power Combining Mode



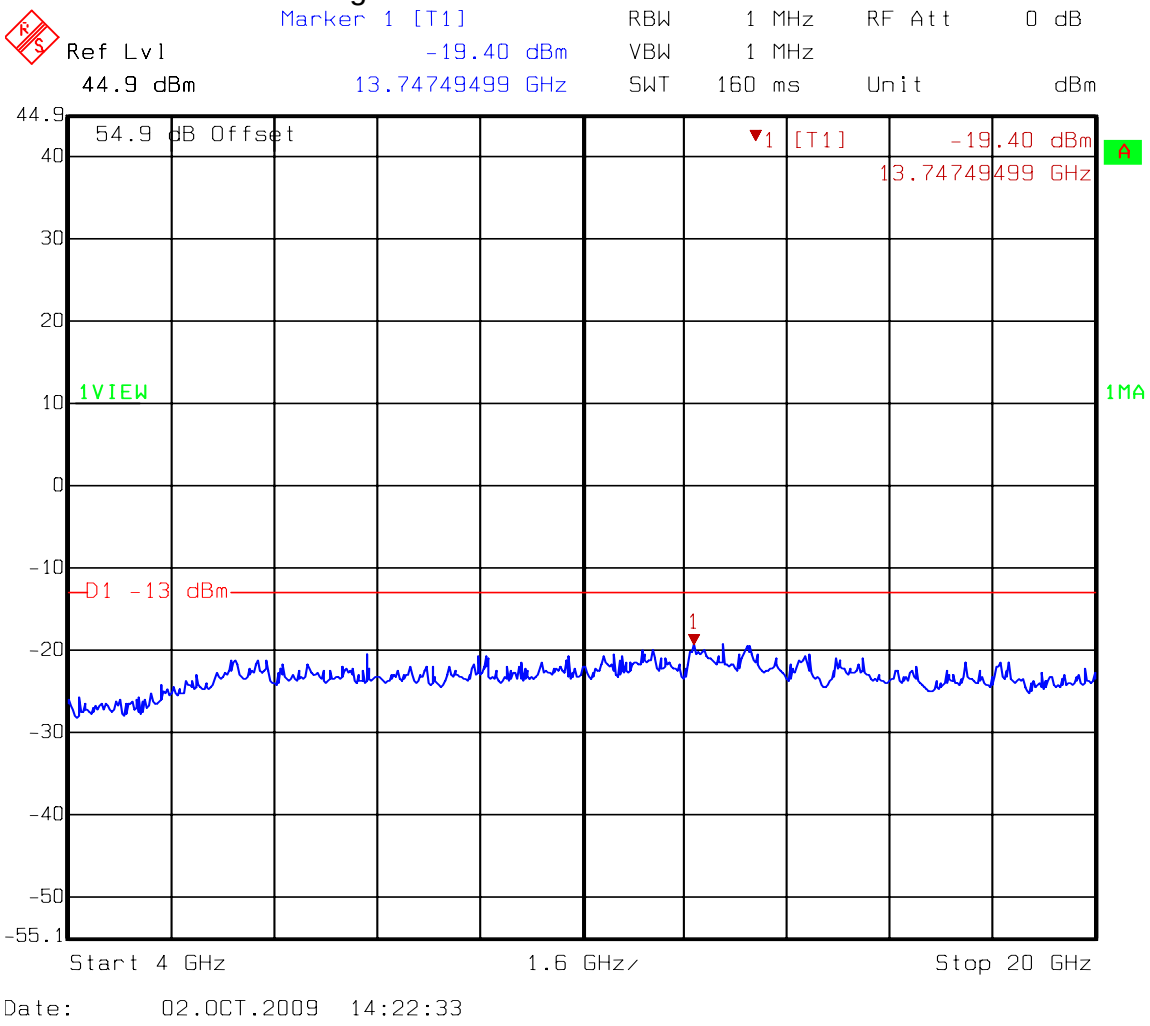
Test Data – Spurious Emissions

8PSK (EDGE)
Spurs
Double Power Combining Mode



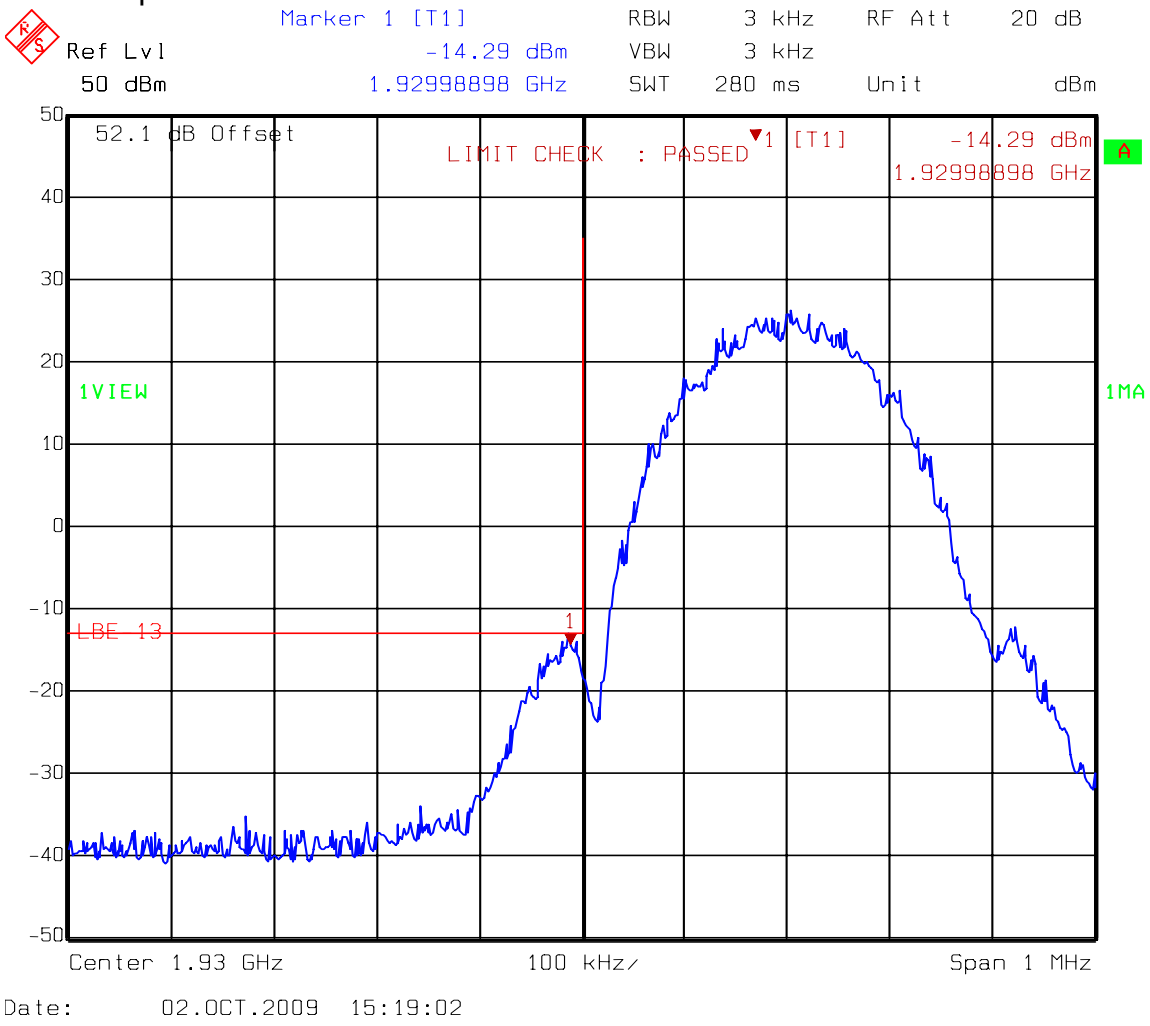
Test Data – Spurious Emissions

8PSK (EDGE)
Spurs
Double Power Combining Mode



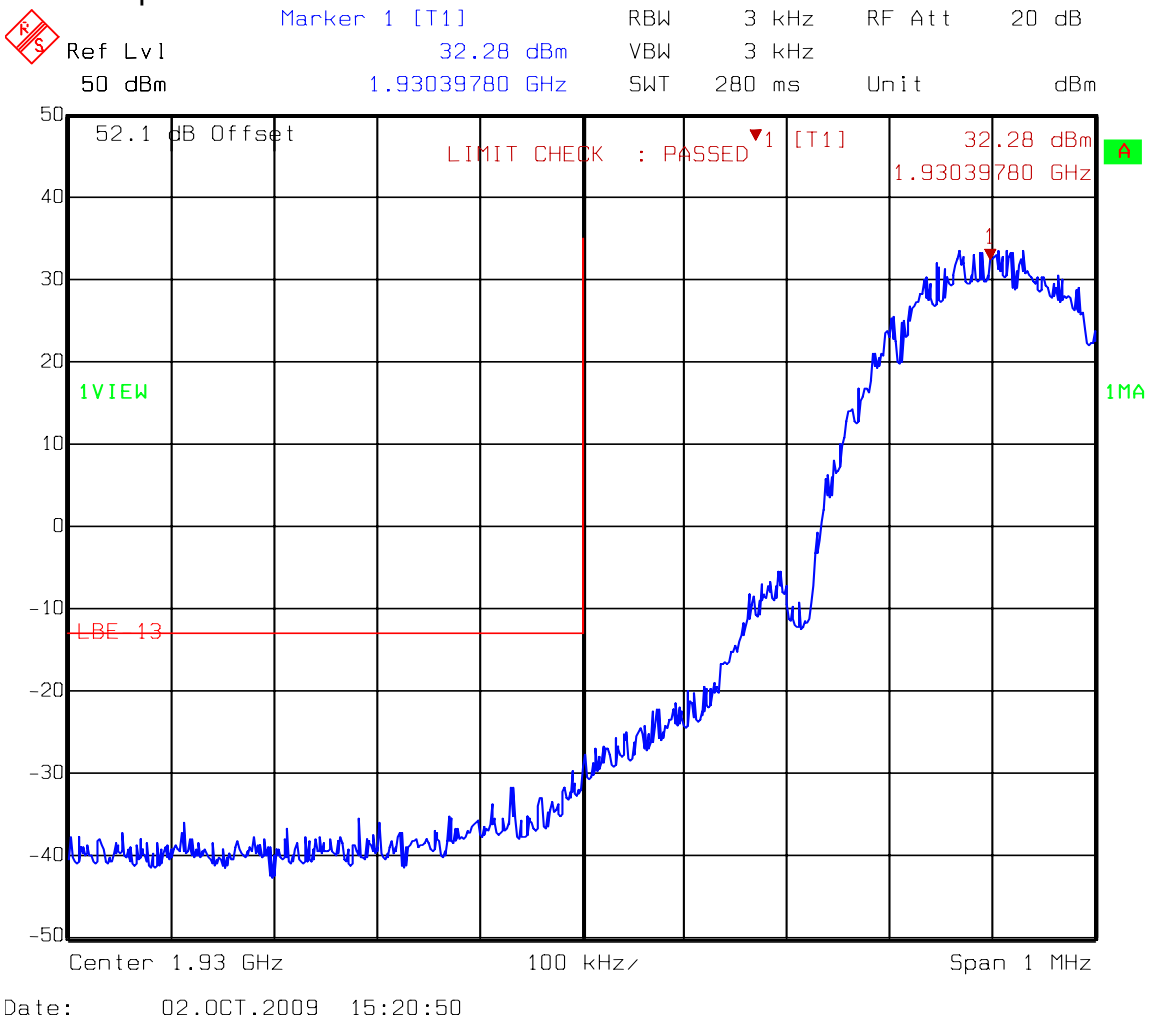
Test Data – Spurious Emissions

8PSK (EDGE)
Combiner Bypass Mode
Lower Band Edge
1930.2 MHz
Transmit power reduced



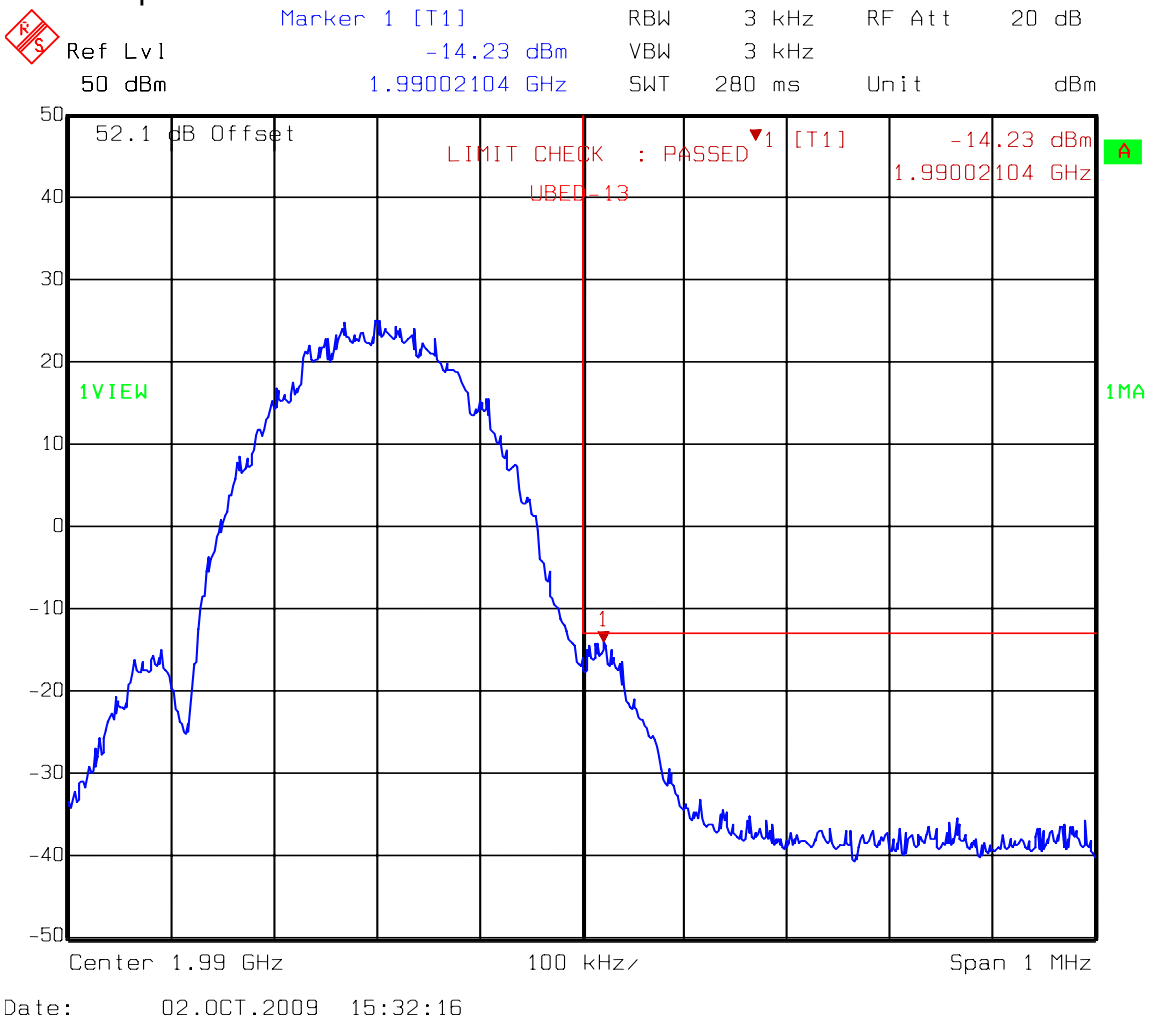
Test Data – Spurious Emissions

8PSK (EDGE)
Combiner Bypass Mode
Lower Band Edge
1930.4 MHz
Transmit power maximum



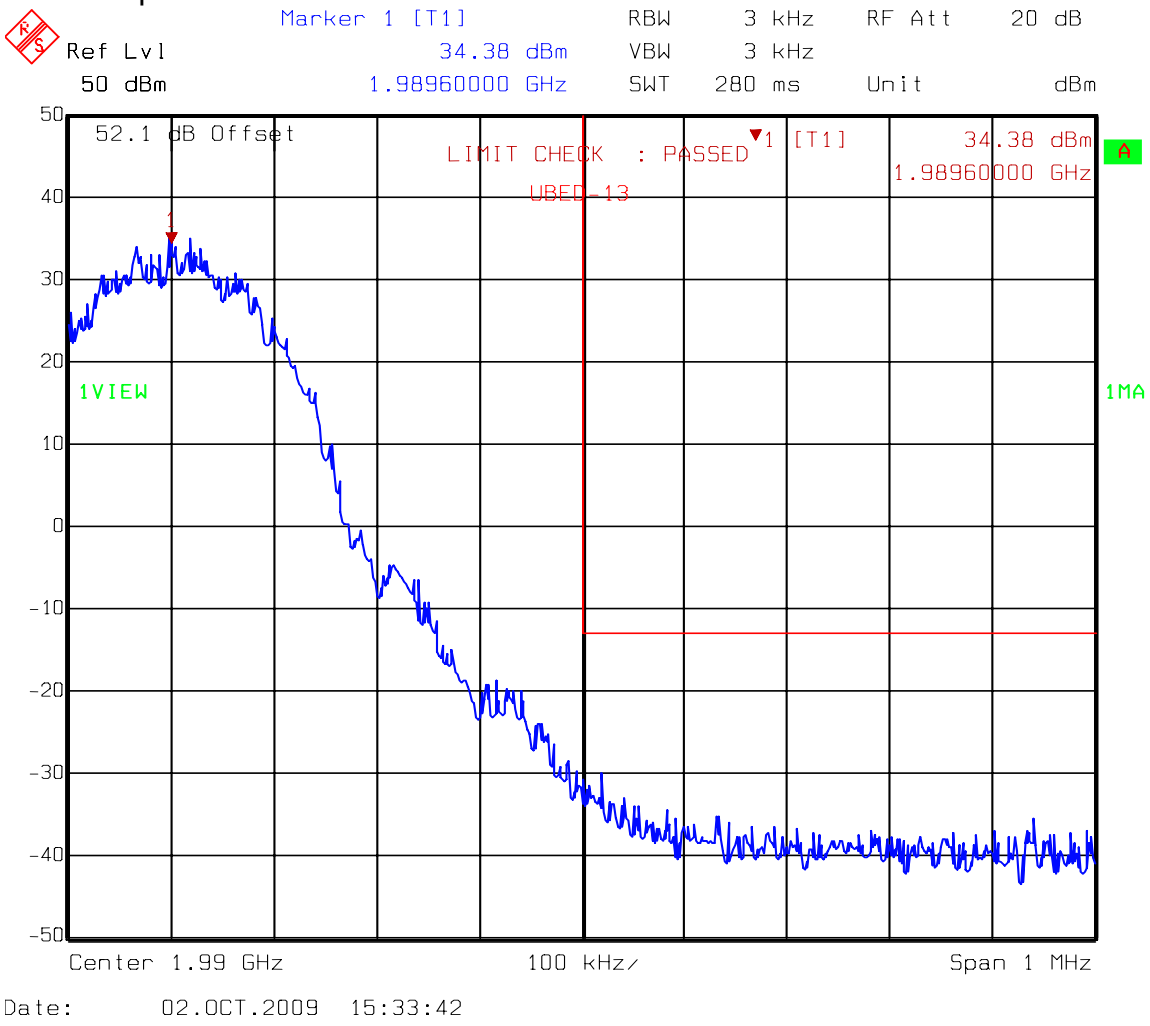
Test Data – Spurious Emissions

8PSK (EDGE)
Combiner Bypass Mode
Upper Band Edge
1989.8 MHz
Transmit power reduced



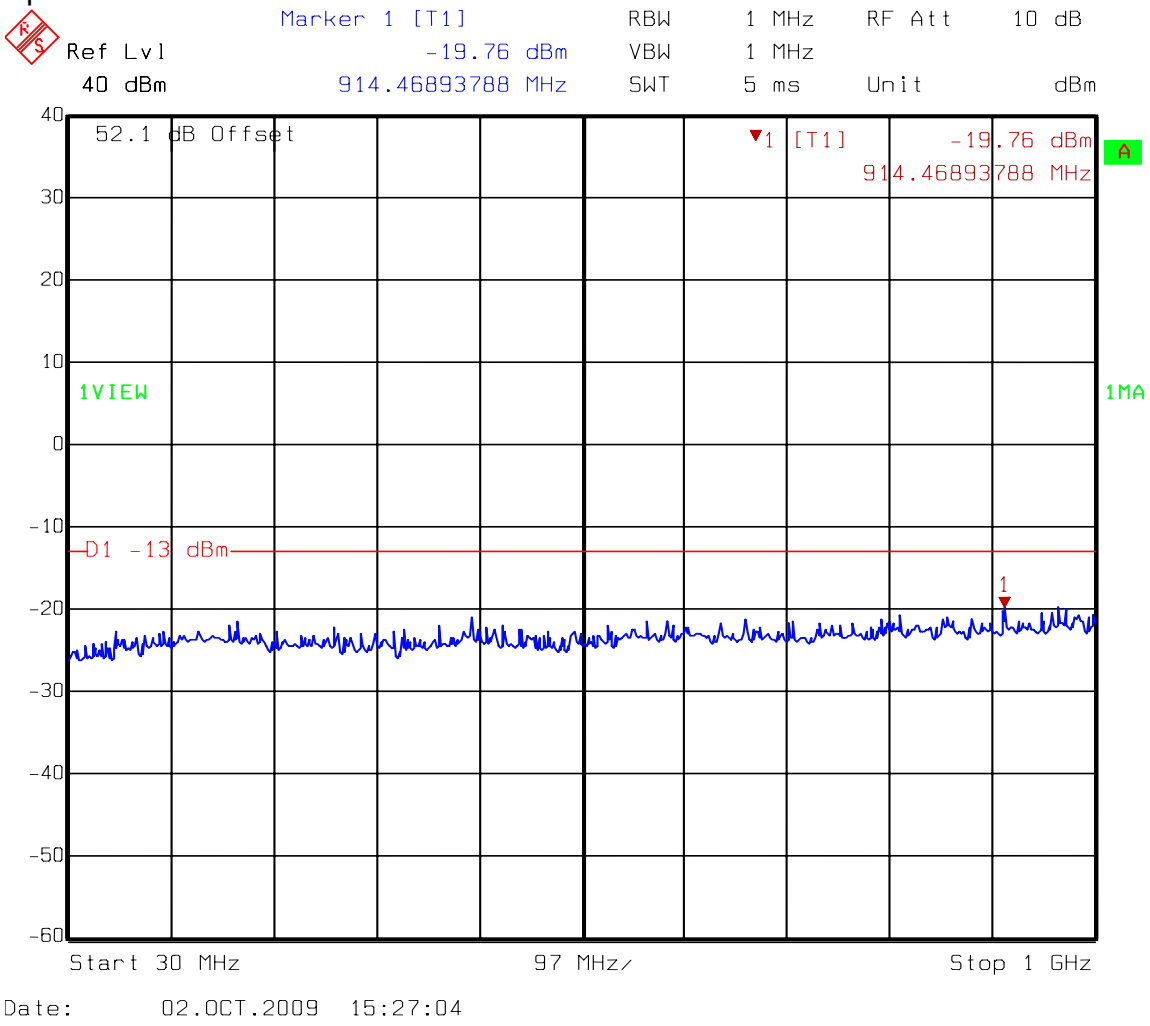
Test Data – Spurious Emissions

8PSK (EDGE)
Combiner Bypass Mode
Upper Band Edge
1989.6 MHz
Transmit power maximum



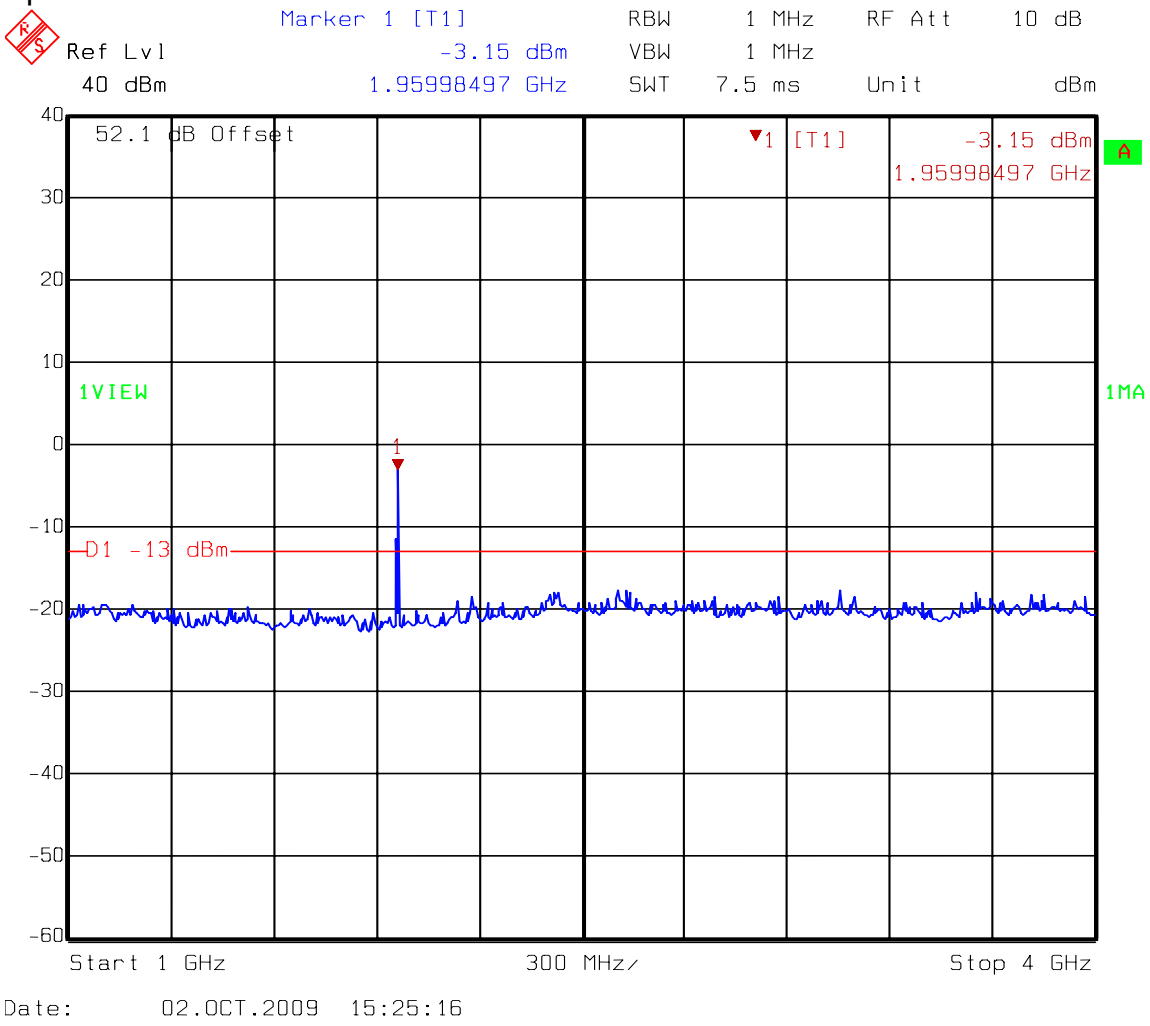
Test Data – Spurious Emissions

8PSK (EDGE)
Combiner Bypass Mode
Spurs



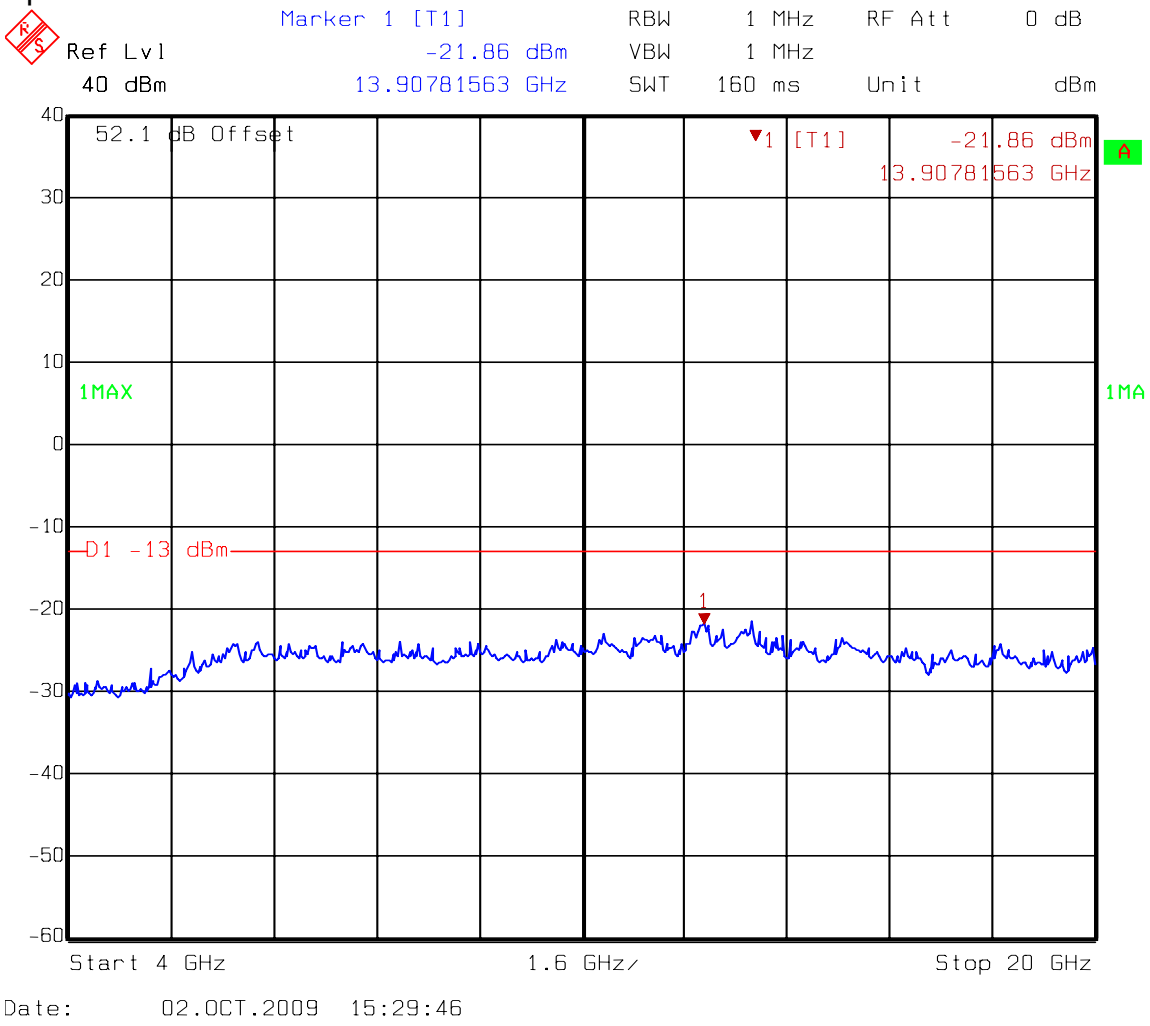
Test Data – Spurious Emissions

8PSK (EDGE)
Combiner Bypass Mode
Spurs



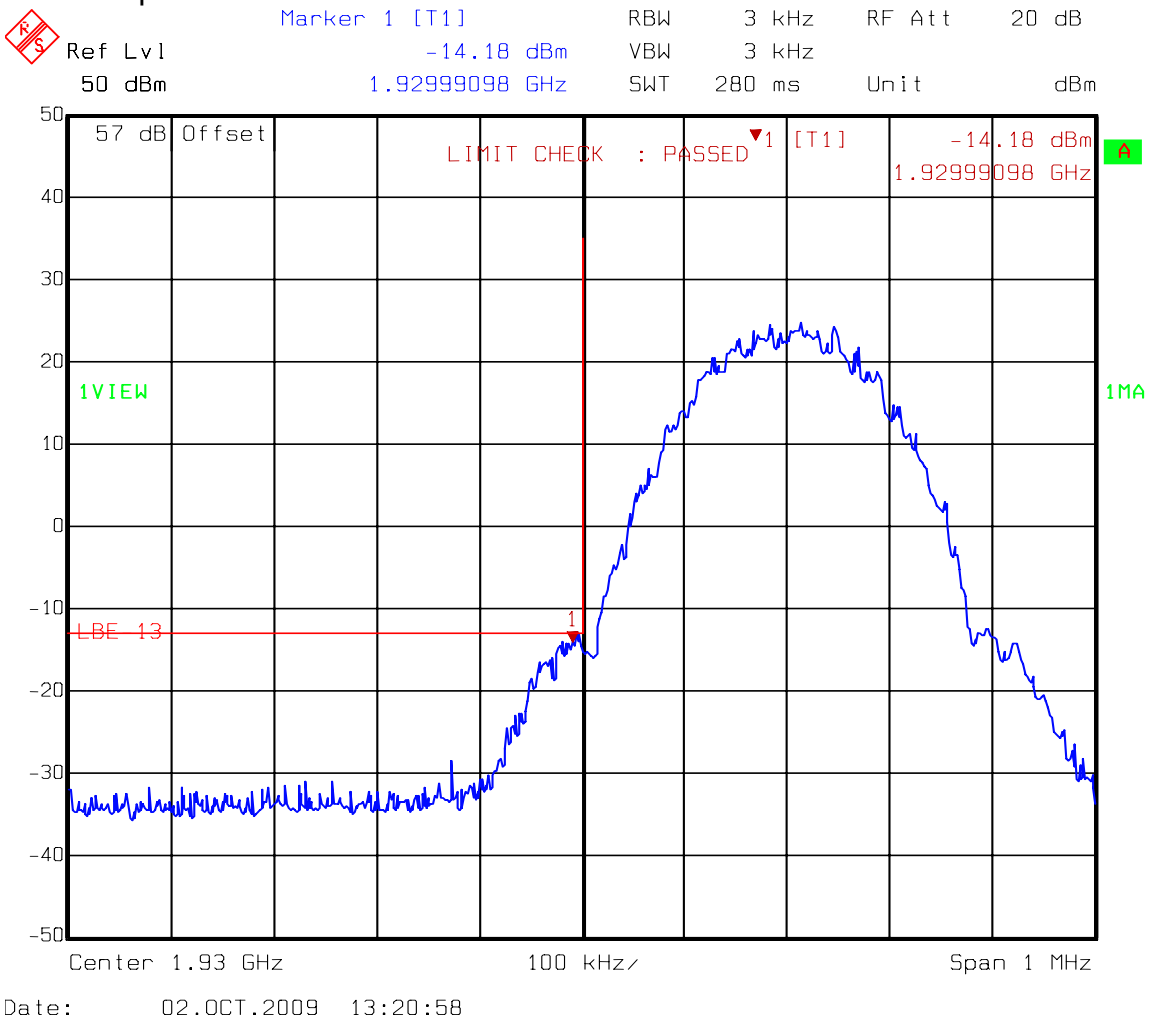
Test Data – Spurious Emissions

8PSK (EDGE)
Combiner Bypass Mode
Spurs



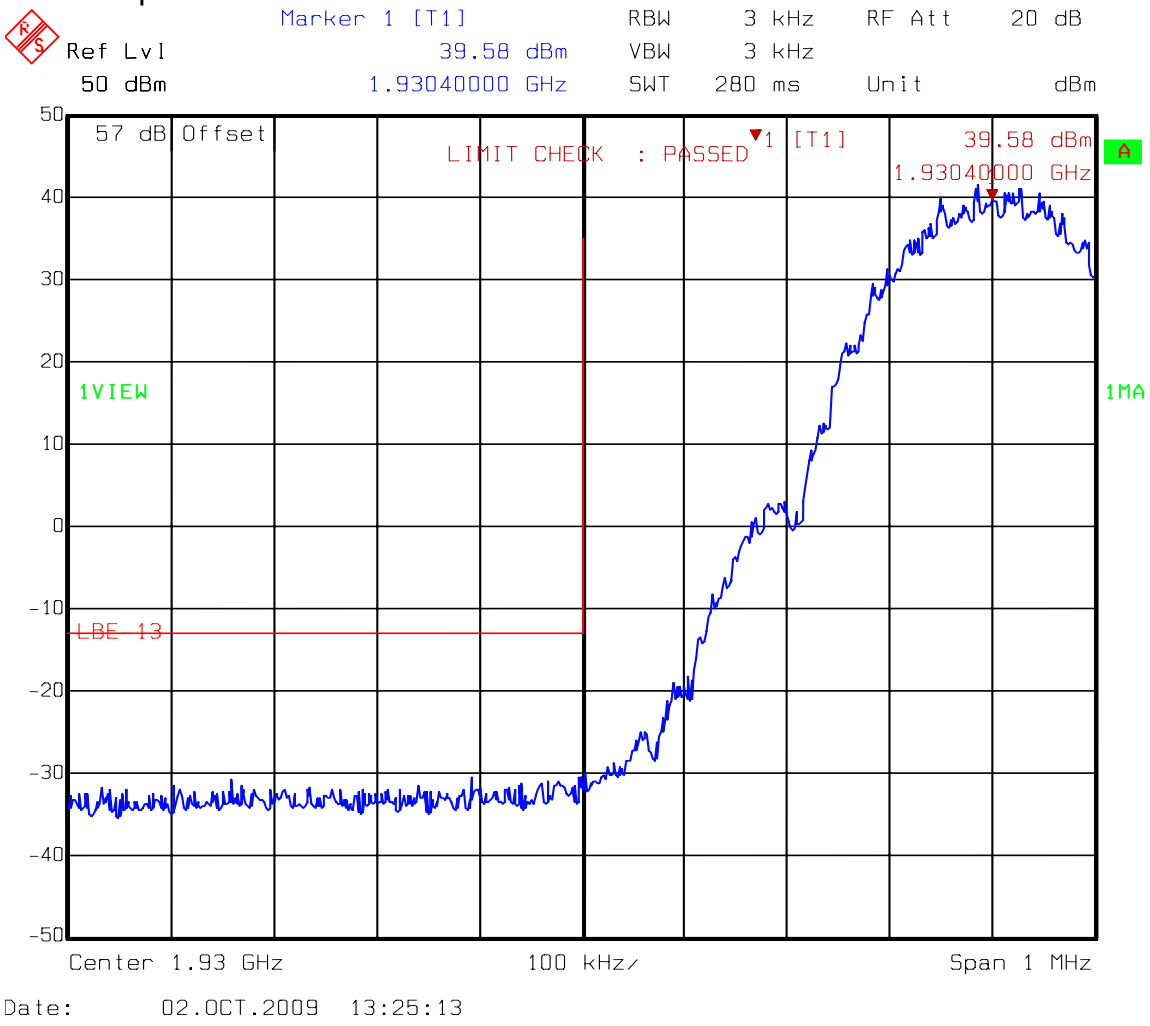
Test Data – Spurious Emissions

GMSK (GSM)
Double Power Combining Mode
Lower Band Edge
1932.2 MHz
Transmit power reduced



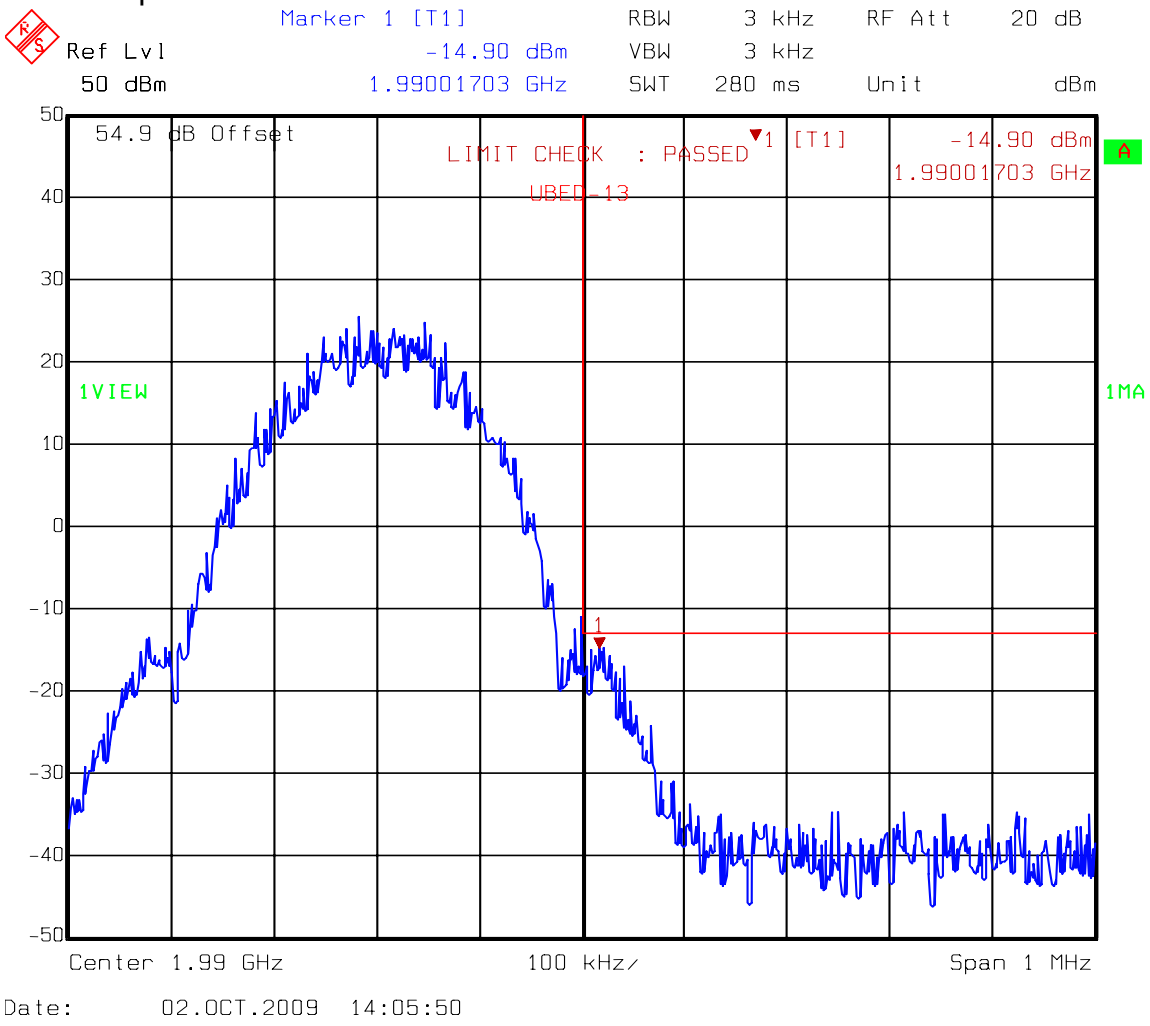
Test Data – Spurious Emissions

GMSK (GSM)
Double Power Combining Mode
Lower Band Edge
1930.4 MHz
Transmit power maximum



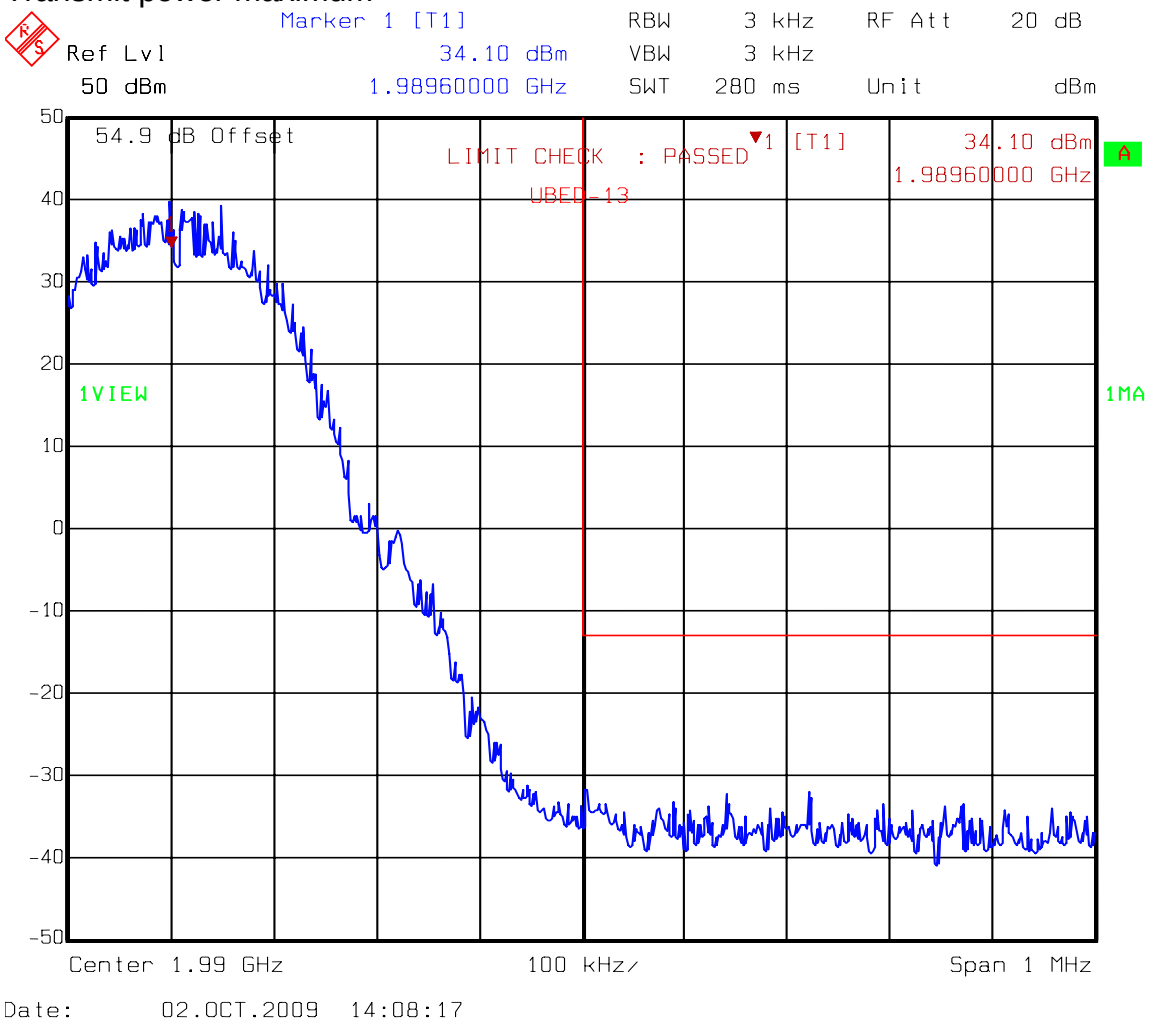
Test Data – Spurious Emissions

GMSK (GSM)
Double Power Combining Mode
Upper Band Edge
1989.8 MHz
Transmit power reduced



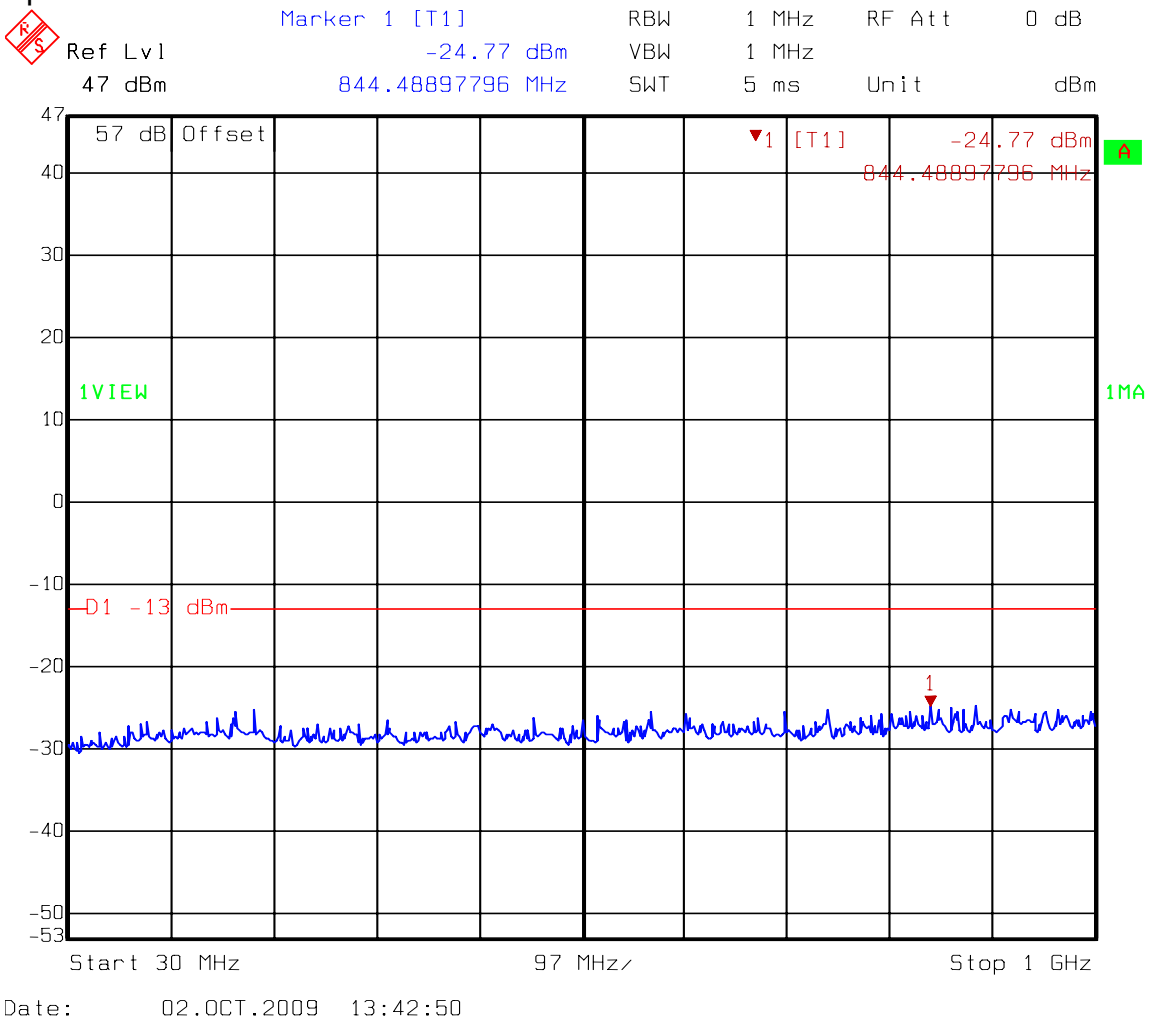
Test Data – Spurious Emissions

GMSK (GSM)
Double Power Combining Mode
1989.6 MHz
Transmit power maximum



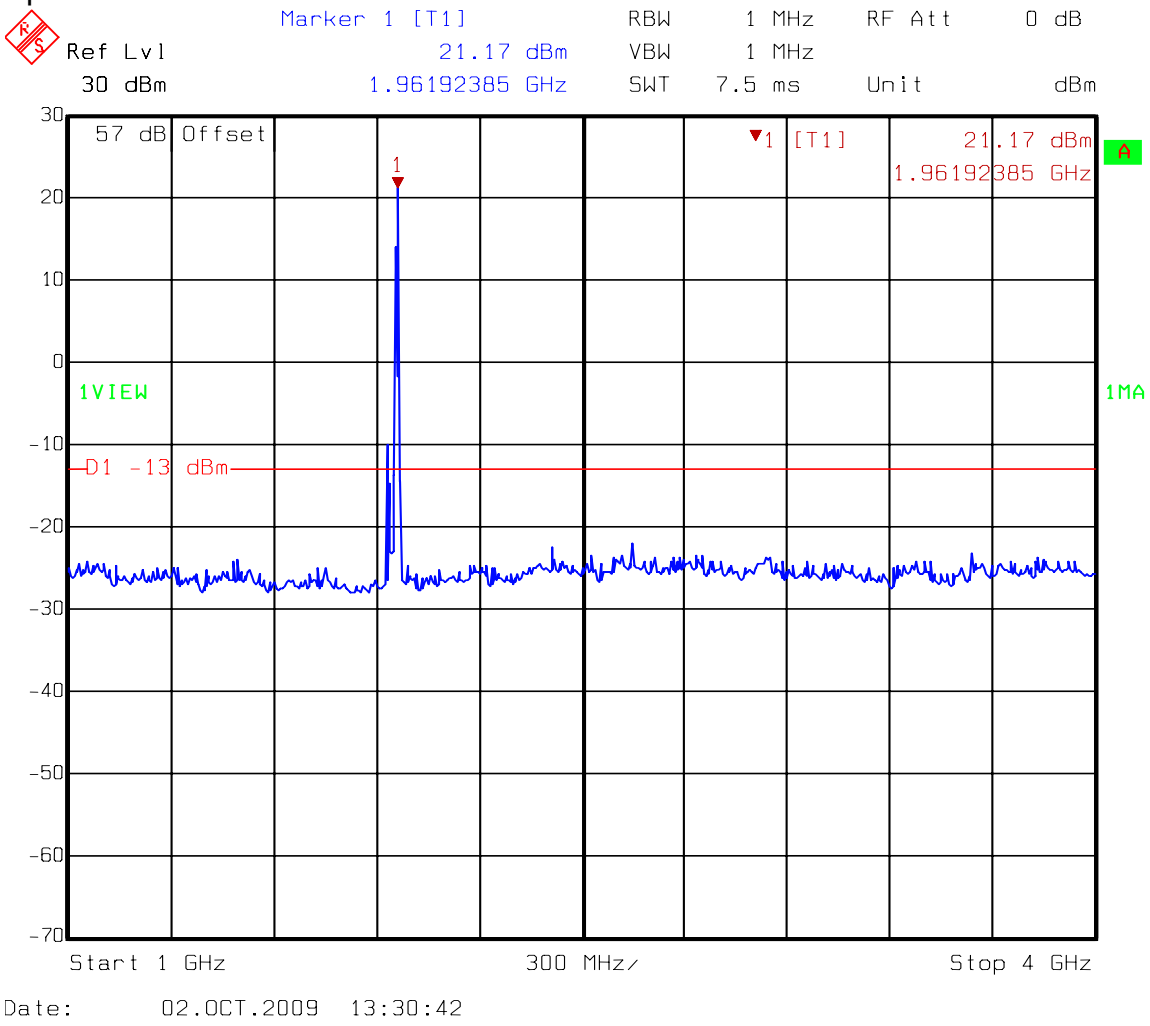
Test Data – Spurious Emissions

GMSK (GSM)
Double Power Combining Mode
Spurs



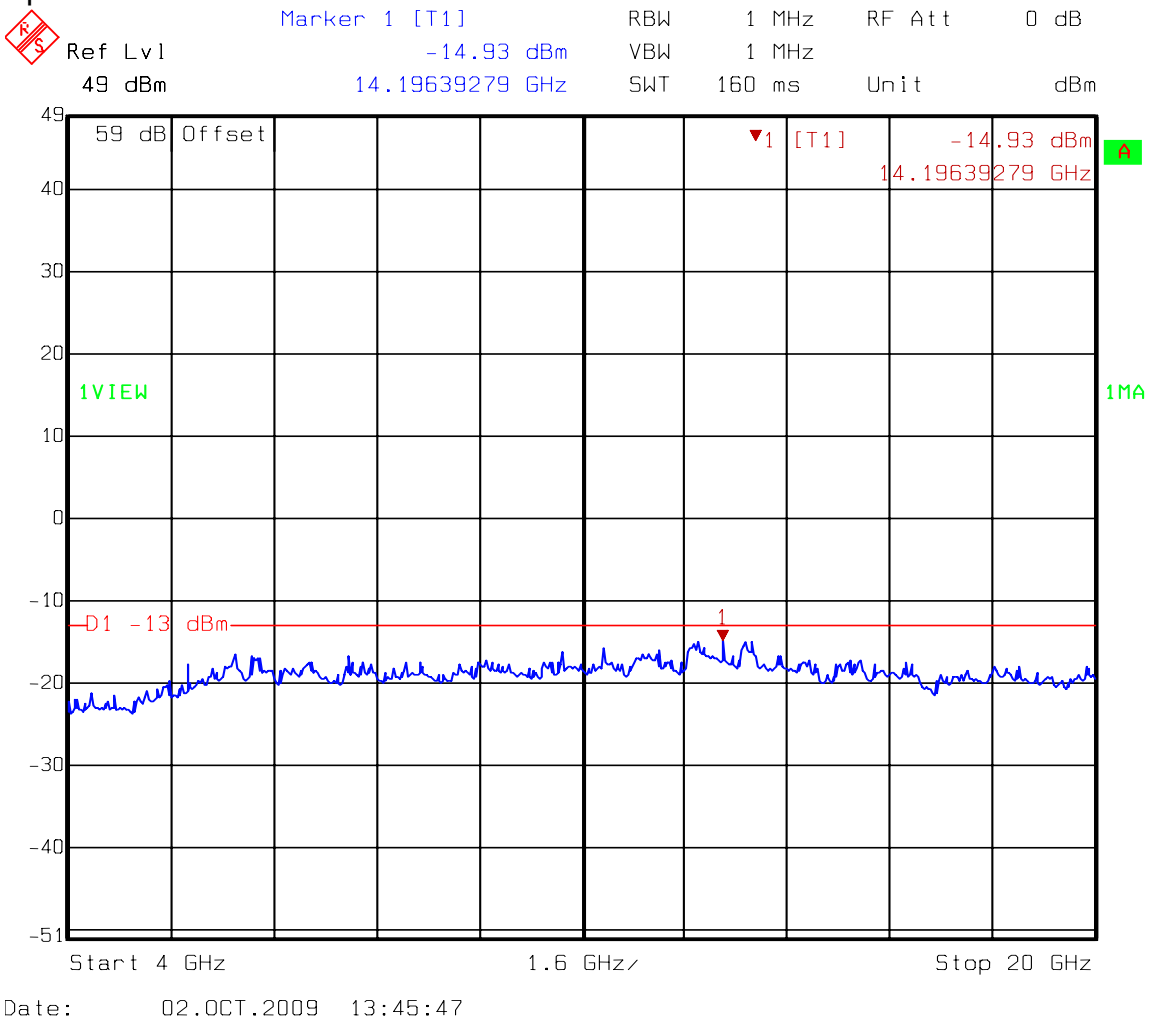
Test Data – Spurious Emissions

GMSK (GSM)
Double Power Combining Mode
Spurious



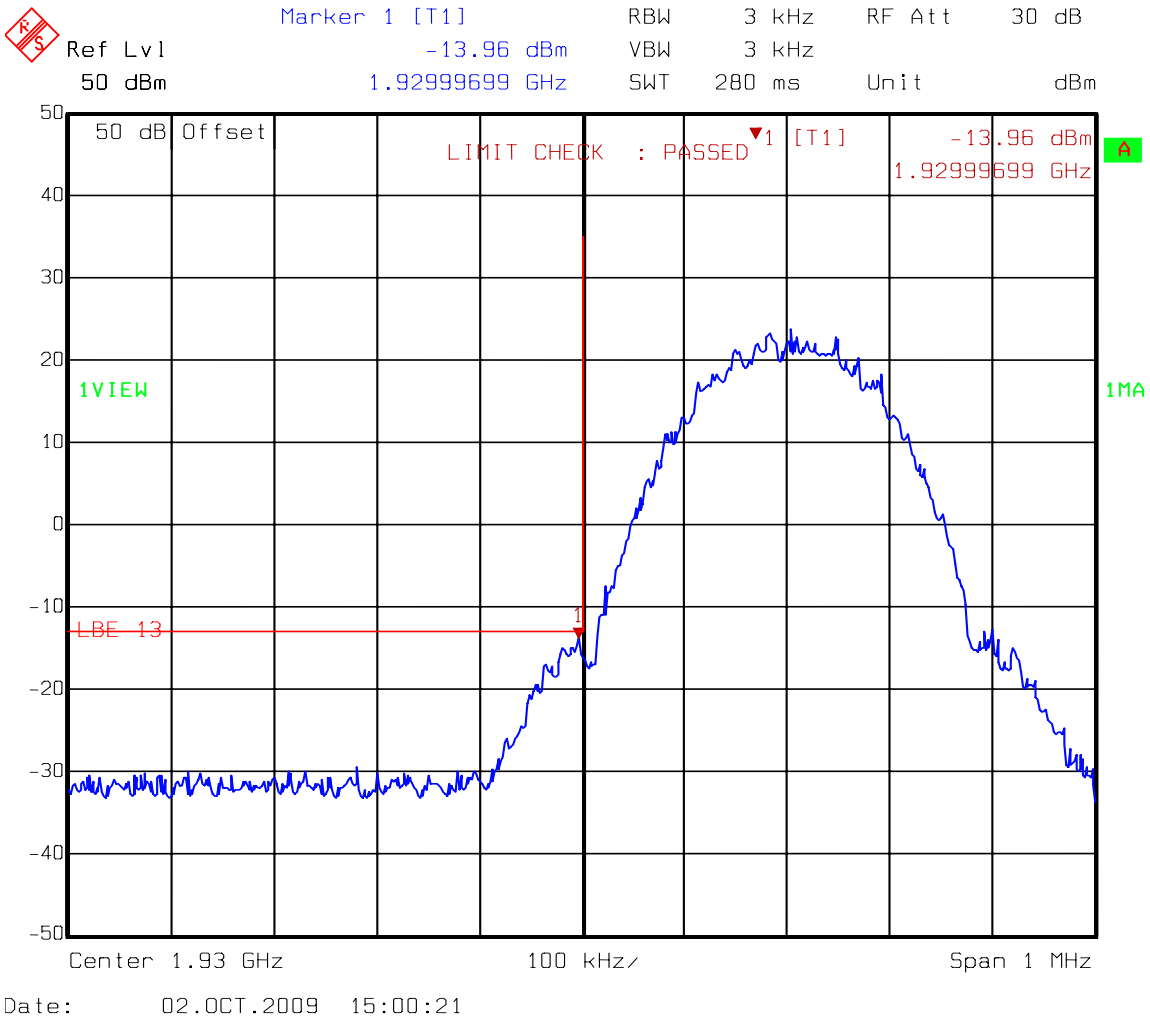
Test Data – Spurious Emissions

GMSK (GSM)
Double Power Combining Mode
Spurs



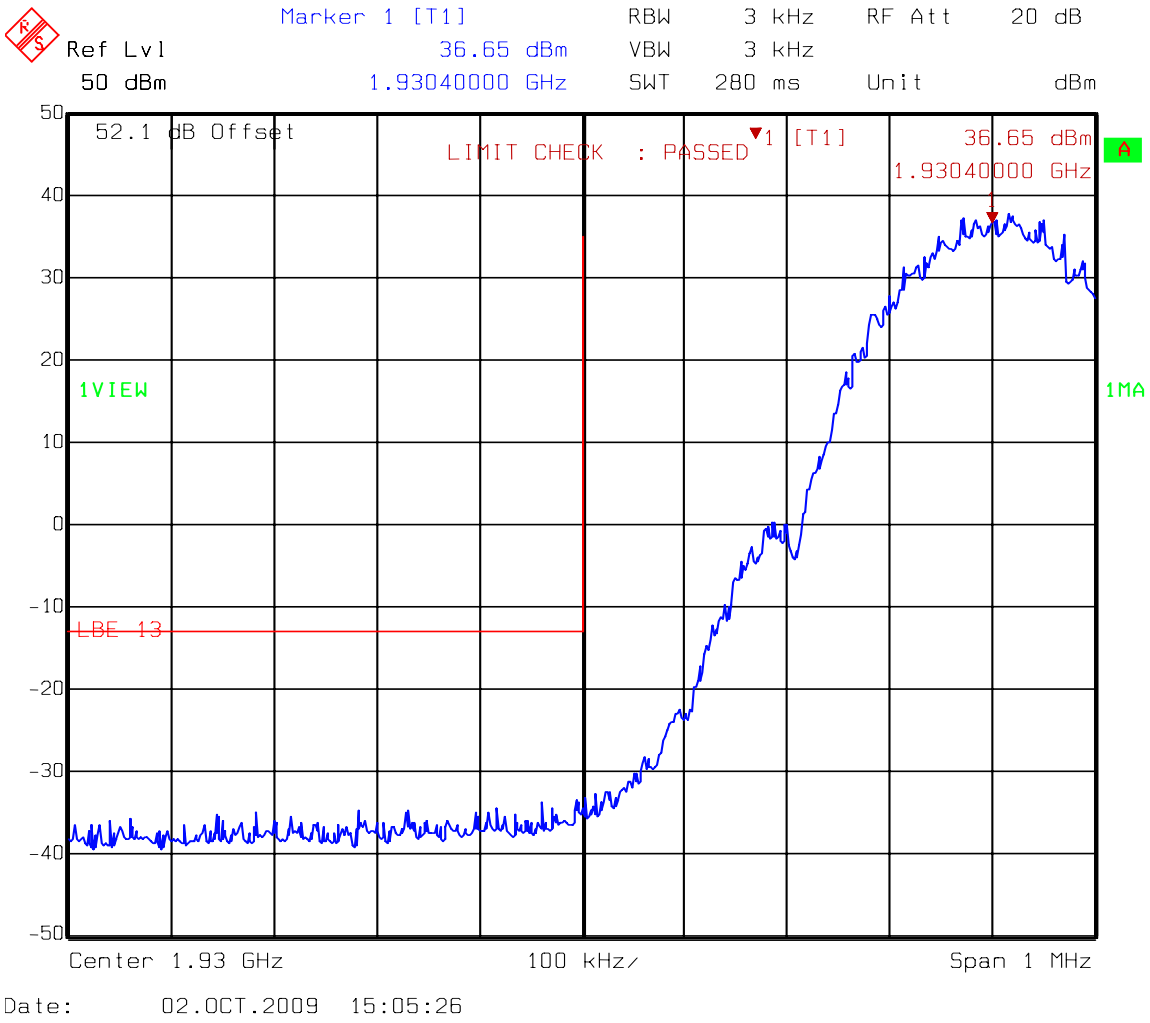
Test Data – Spurious Emissions

GMSK (GSM)
Combiner Bypass Mode
Lower band Edge
1930.2 MHz = 33.6 dBm



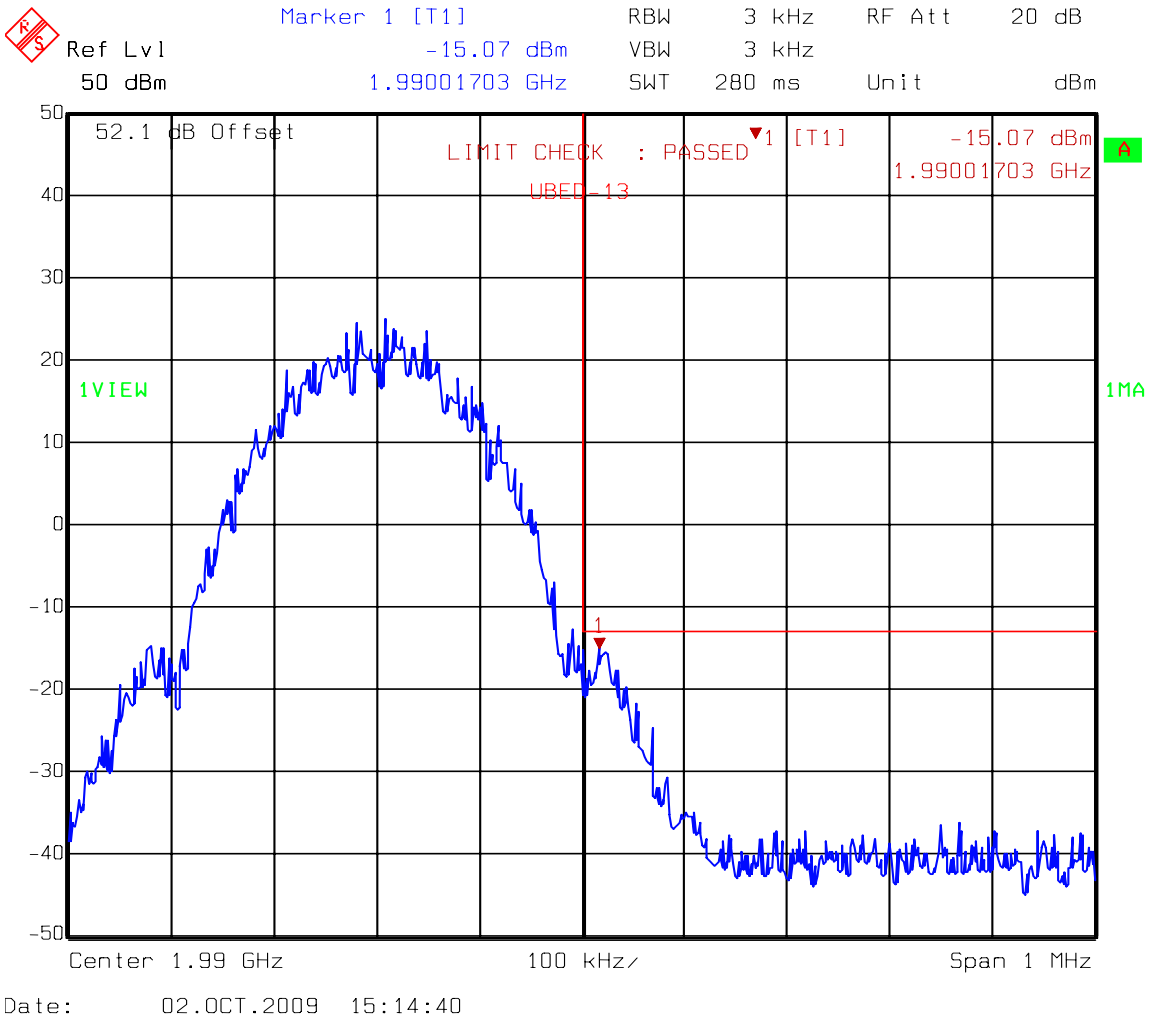
Test Data – Spurious Emissions

GMSK (GSM)
Combiner Bypass Mode
Lower Band Edge
1930.4 MHz = 45.8 dBm



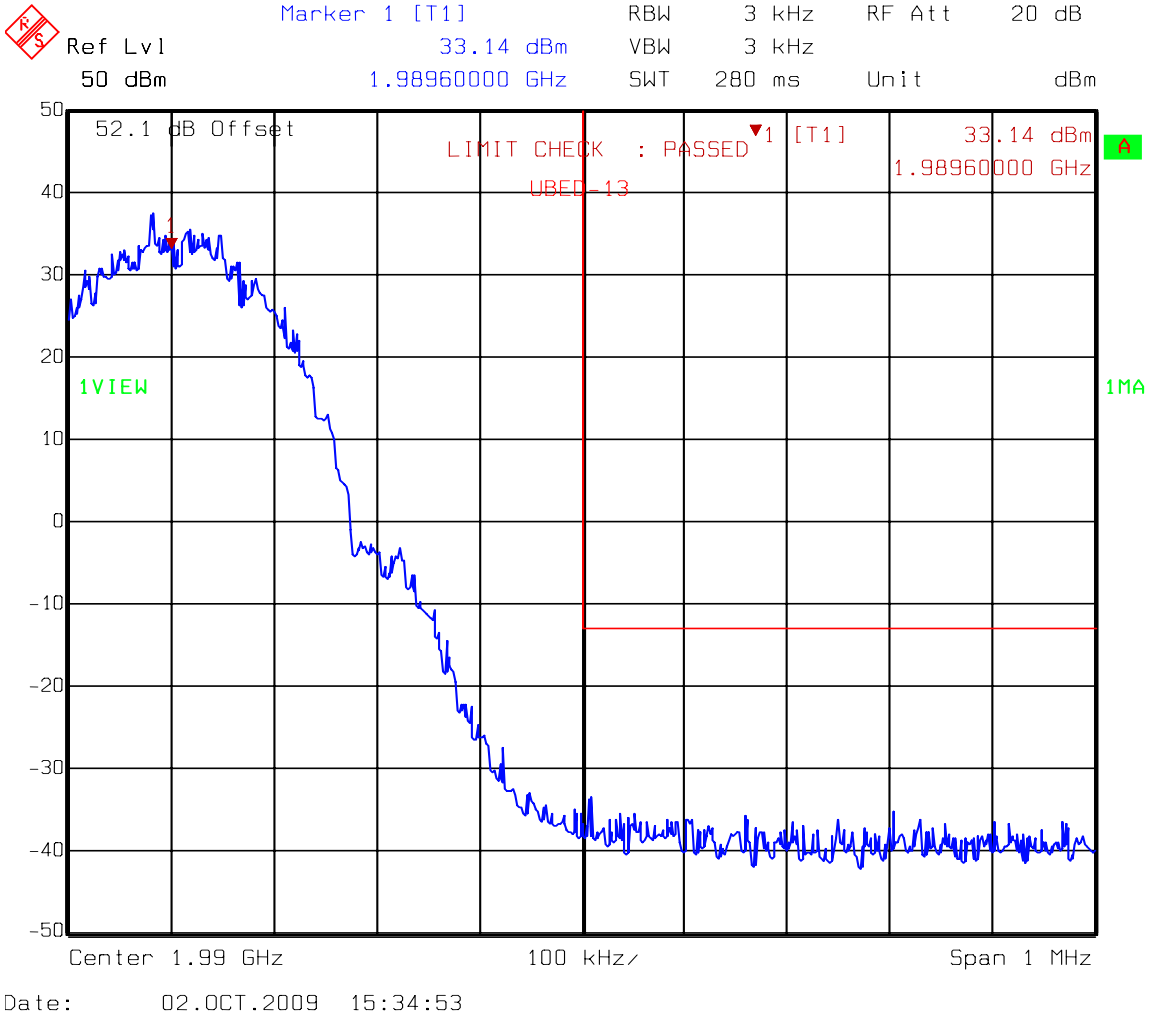
Test Data – Spurious Emissions

GMSK (GSM)
Combiner Bypass Mode
Upper Band Edge
1989.8 MHz = 32.8 MHz



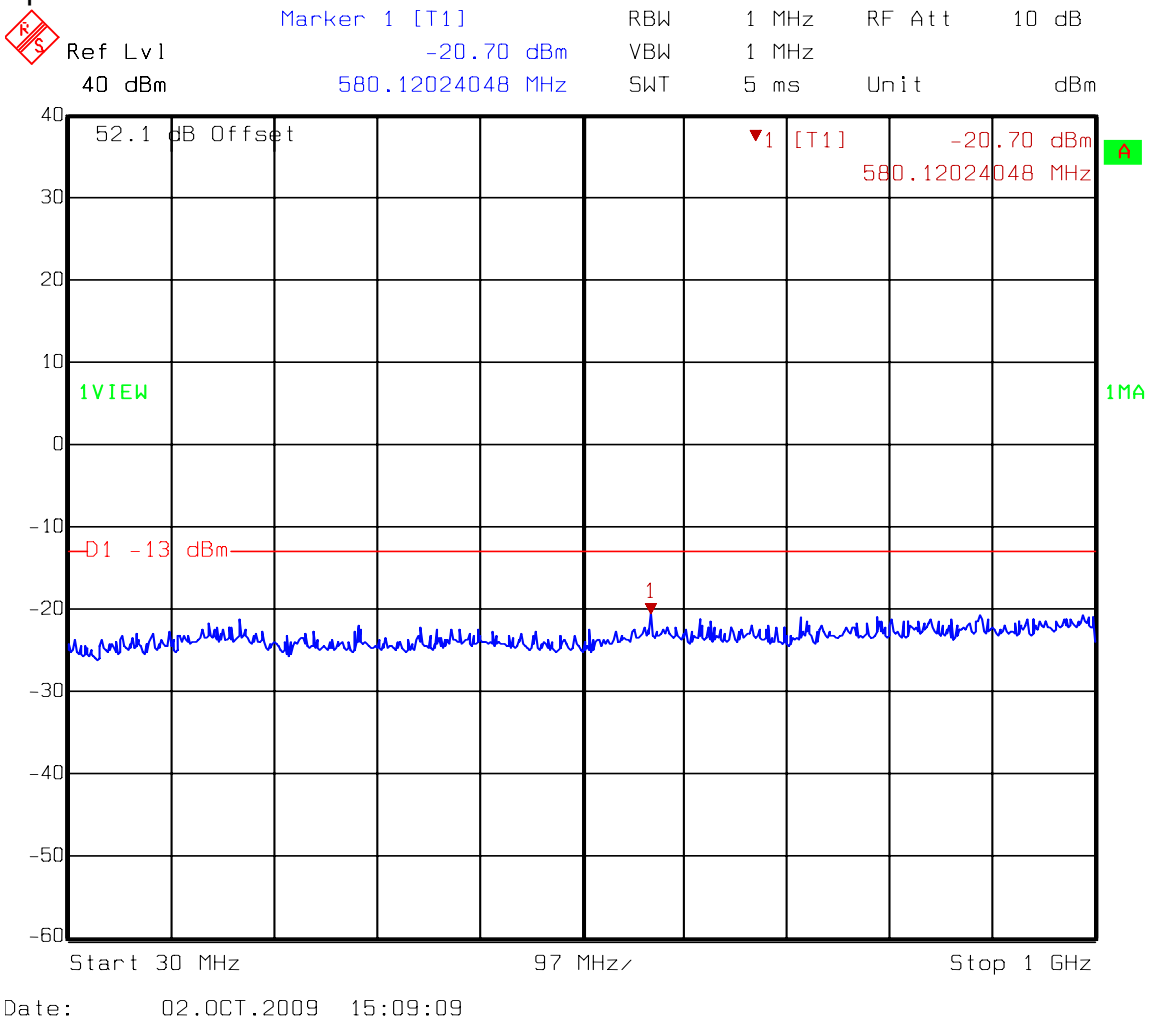
Test Data – Spurious Emissions

GMSK (GSM)
Combiner Bypass Mode
Upper Band Edge
1989.6 MHz = 44.9 dBm



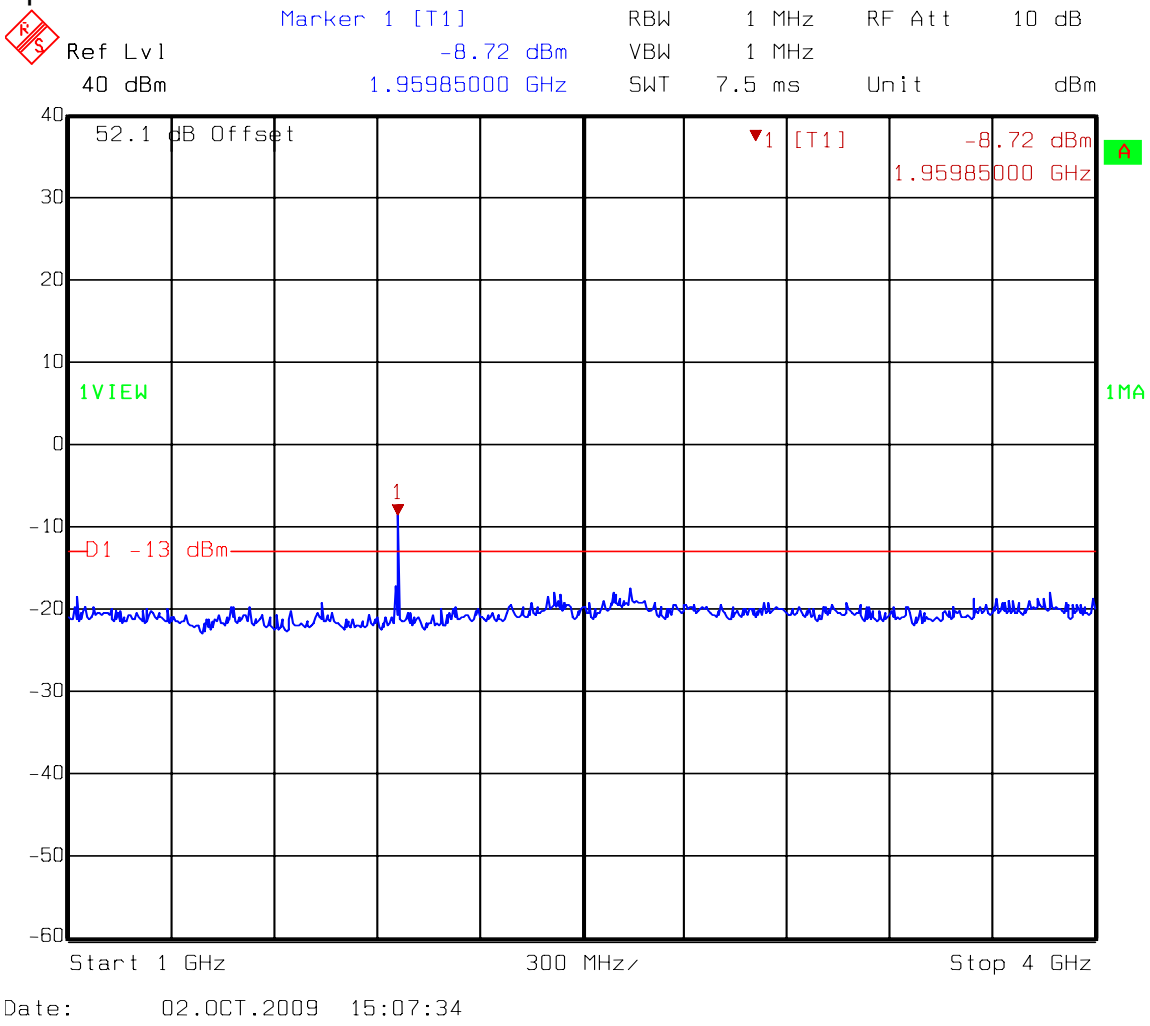
Test Data – Spurious Emissions

GMSK (GSM)
Combiner Bypass Mode
Spurs



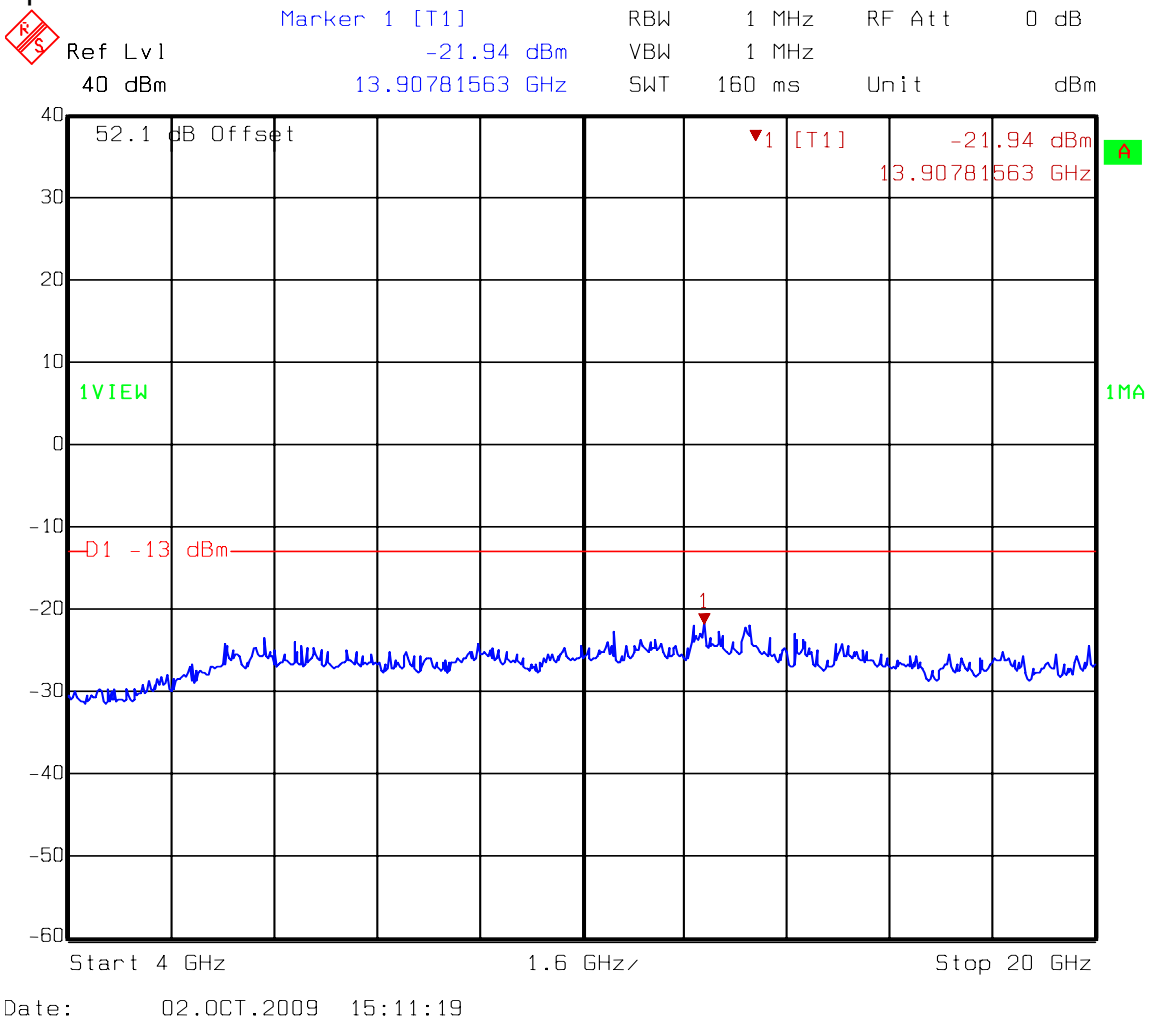
Test Data – Spurious Emissions

GMSK (GSM)
Combiner Bypass Mode
Spurs



Test Data – Spurious Emissions

GMSK (GSM)
Combiner Bypass Mode
Spurs



Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 05 October 2009

Test Results: Complies.

Test Data: The spectrum was searched from 30 MHz to the tenth harmonic of the carrier. There were no emissions detected above the noise floor which was at least 20 dB below the specification limit.

RBW/VBW=100 kHz < 1000 MHz
RBW/VBW=1 MHz > 1000 MHz
Detector = Peak
Sweep Time = Auto
.

Equipment Used: 1783-1763-791-1016-993-1767

Measurement Uncertainty: +/- 1.7 dB

Temperature: 23 °C

Relative Humidity: 40 %

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY: David Light	DATE: 05 October 2009

Test Results: Complies

Measurement Data: Standard Test Frequency: 1960 MHz
Standard Test Voltage: -48 Vdc

Equipment Used: 1036-1082-1064-1065-283

Measurement Uncertainty: +/- 1.7 dB

Temperature: 23 °C

Relative Humidity: 40 %

Test Data – Frequency Stability

Measurement Uncertainty: $1x10^{-7}$ppm

Standard Test Frequency **1960.067665** **MHz**

Temp (^{O}C)	Measured Frequency (MHz)		Test Voltage	Freqeuncy Error (Hz)	Limit (+/-Hz)	Error (ppm)	Comment
20	1960.067665		-48	0	NA	0.0	
20	1960.067665		-40.8	0	NA	0.0	
20	1960.067665		-55.2	0	NA	0.0	
50	1960.067695		-48	30	NA	0.0	
40	1960.067665		-48	0	NA	0.0	
30	1960.067695		-48	30	NA	0.0	
10	1960.067665		-48.0	0	NA	0.0	
0	1960.067665		-48.0	0	NA	0.0	
-10	1960.067695		-48.0	30	NA	0.0	
-20	1960.067675		-48	10	NA	0.0	
-30	1960.067695		-48	30	NA	0.0	

Notes:

Section 8. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	01/19/09	01/20/11
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1064	ATTENUATOR	NARDA 776B-20	NONE	CBU	N/A
1065	ATTENUATOR	NARDA 776B-10	NONE	CBU	N/A
1054	DUAL DIRECTIONAL COUPLER	NARDA 3020A	34366	CBU	N/A
1055	DUAL DIRECTIONAL COUPLER	NARDA 3022	73393	CBU	N/A
1058	DUAL DIRECTIONAL COUPLER	HEWLETT PACKARD 11692D	1212A03366	CBU	N/A
1783	Cable	Nemko? 0	0	10/02/09	10/02/10
1763	Bilog Antenna	Schaffner CBL 6111D	22926	11/04/08	11/04/09
791	PREAMP, 25dB	Nemko USA, Inc. LNA25	398	05/28/09	05/28/10
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	06/23/09	06/23/10
993	Horn antenna	A.H. Systems SAS-200/571	XXX	09/09/09	09/09/11
1767	EMI Test Receiver 20Hz - 26.5 GHz - 150 - +30 dBm LC	ROHDE & SCHWARZ ESIB26	837491/0002	10/20/07	10/20/09
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	06/07/09	06/07/10

ANNEX A - TEST DETAILS

NAME OF TEST: RF Power Output	**PARA. NO.: 2.1046**

Minimum Standard: Para. No.24.232. Base stations are limited to 1640 watts peak E.I.R.P. with an antenna height up to 300 meters HAAT. In no case may the peak output power of a base station transmitter exceed 100 watts.

Method Of Measurement:

Detachable Antenna:
The peak power at antenna terminals is measured using an in-line peak power meter or a spectrum analyzer.

Integral Antenna:
If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts
E = the maximum measured field strength in V/m
R = the measurement range (3 meters)
G = the numeric gain of the transmit antenna in relation to an isotropic radiator

NAME OF TEST: Occupied Bandwidth **PARA. NO.: 2.1049**

Minimum Standard: Para. No. 24.238(b). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB.

Method Of Measurement:

CDMA Per ANSI/J-STD-014

Spectrum analyzer settings:
RBW: 30 kHz
VBW: ≥ RBW
Span: 5 MHz
Sweep: Auto

GSM Per ANSI/J-STD-010

RBW: 3 kHz
VBW: ≥ RBW
Span: 2 MHz
Sweep: Auto

NADC Per IS-136

RBW: 1 kHz
VBW: ≥ RBW
Span: 1 MHz
Sweep: Auto

NAME OF TEST: Spurious Emission at Antenna Terminals	**PARA. NO.: 2.1051**

Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least 43 + 10 log (P) dB.

Method Of Measurement:

Spectrum analyzer settings:

CDMA Per ANSI/J-STD-014

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 30 kHz (< 1MHz from Band Edge)
VBW: ≥ RBW
Sweep: Auto
Video Avg: 6 Sweeps

GSM Per ANSI/J-STD-010

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: ≥ RBW
Sweep: Auto
Video Avg: Disabled

NADC Per IS-136

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 1 kHz (< 1 MHz from Band Edge)
VBW: ≥ RBW
Sweep: Auto
Video Avg: Disabled

To demonstrate compliance at band edges the frequency of the input signal is set to the lowest and highest assigned channel and the center frequency of the spectrum analyzer is set to the upper and lower edges of the appropriate frequency block.

NAME OF TEST: Field Strength of Spurious Radiation PARA. NO.: 2.1053

Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least 43 + 10 log (P) dB.

Calculation Of Field Strength Limit

An example of attenuation requirement of 43 + 10 Log P is equivalent to -13 dBm (5 x 10^{-5} Watts) at the antenna terminal. We determine the field strength limit by using the plane wave relation.

$GP/4\pi R^2 = E^2/120\pi$

For emissions $\leq$ 1 GHz:

G = 1.64 (Dipole Gain)
P = 10^{-5} Watts (Maximum spurious output power)
R = 3m (Measurement Distance)

$$E = \frac{\sqrt{30GP}}{R}$$

$$\mathrm{E} = \frac{\sqrt{30 \text{ x } 1.64 \text{ x } 5 \text{ x } 10^{-5}}}{3} = 0.016533 \text{ V / m} = 84.4 \text{ dB}\mu\text{V / m}$$

For emissions > 1 GHz:

G = 1 (Isotropic Gain)
P = 1 x 10^{-5} Watts (Maximum spurious output power)
R = 3m (Measurement Distance)

$$E = 84.4 - 20Log\sqrt{1.64} = 82.3dB\mu V \text{ / } m@3m$$

NAME OF TEST: Frequency Stability	**PARA. NO.: 2.1055**

Minimum Standard: Para. No. 24.235. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Method Of Measurement:

Frequency Stability With Voltage Variation

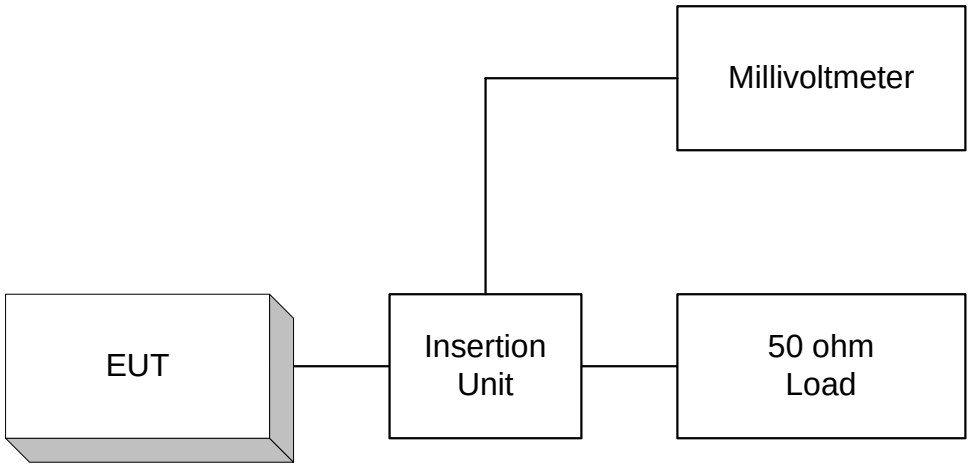
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

Frequency Stability With Temperature Variation

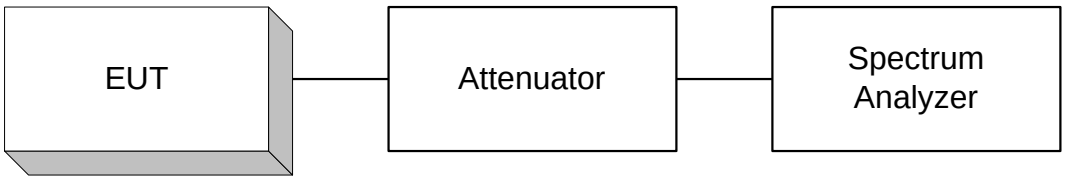
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

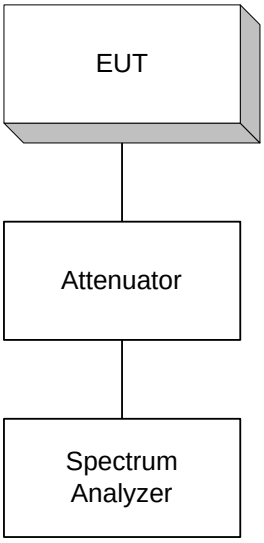
Para. No. 2.985 - R.F. Power Output



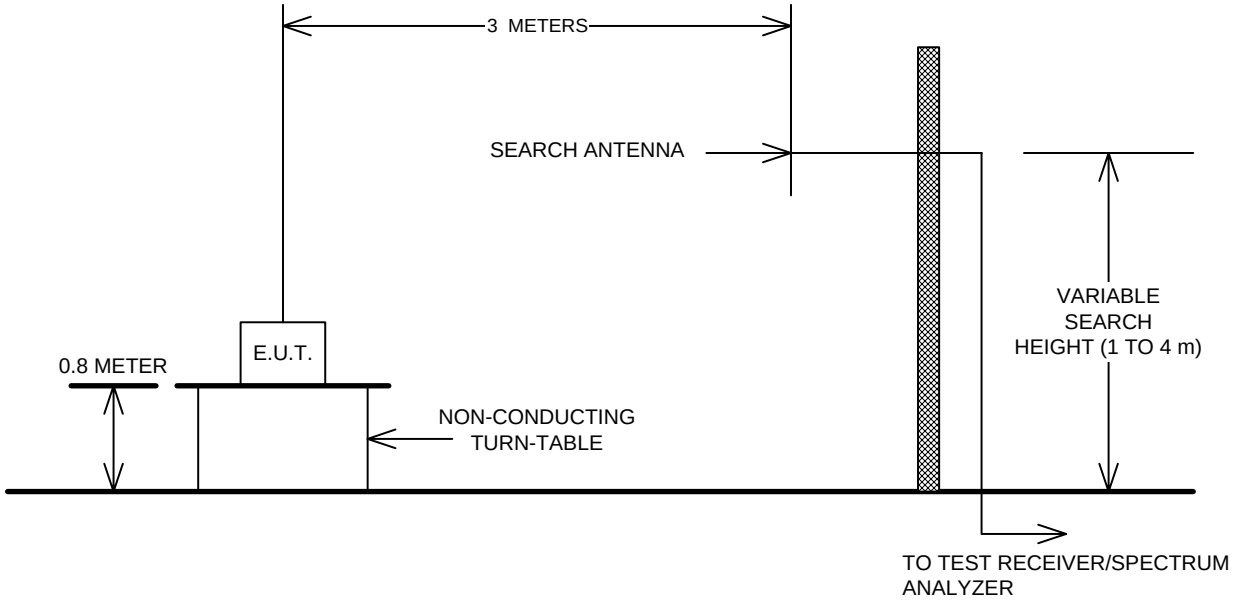
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability