Center for Quality Engineering

Test Report No.: B08B0003

Order No.: B08B **Pages:** 48 **Munich,** Apr 30, 2008

Client:	Rohde & Schwarz GmbH & Co. KG
Equipment Under Test:	XU-4200 VHF Transceiver No. 6144.7400.02 S/N VDR 100001
Manufacturer:	Rohde & Schwarz
Task:	Conformance test according to the test specifications mentioned below
Test Specification(s): [covered by accreditation]	47 CFR Part 2, §2.1046, §2.1047, §2.1049, §2.1051, §2.1055, §2.1057
Test Specification(s): [not covered by accreditation]	47 CFR Part 87, §87.131, §87.133, §87.135, §87.137, §87.139, §87.141
Result:	The EUT complies with the requirements of the test specifications.

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

approved by:	**Date**	**Signature**
Neuhäusler Manager Radio System Qualification	Apr 30, 2008	

This document was signed electronically.

Nokia Siemens Networks GmbH & Co. KG, COO RTP CQE, Hofmannstr. 51, D-81379 München, Phone +49 89-722-48793, Fax +49 89-722-22648, Internet www.cqe-testlab.com

Translation

DATech Deutsche Akkreditierungsstelle Technik GmbH
Signatory of the Multilateral Agreement of EA and ILAC for the mutual recognition

represented in the

Deutschen AkkreditierungsRat

Accreditation

The **DATech German Accreditation Body Technology GmbH** confirms that the Testing Laboratory

Nokia Siemens Networks GmbH & Co. KG
Center for Quality Engineering
Hofmannstraße 51

D- 81359 München

is competent under the terms of DIN EN ISO/IEC 17025 to carry out testing in the fields of

Mobile Radio Communication (base stations), Signaling System No. 7, Signaling Voice over IP, Interfaces of Telecommunication Equipment, Electromagnetical Compatibility (EMC), Safety of Electrical Appliances, Electromechanical Components, Passive Fiber Optic Components, Low-voltage Switchgear and Controlgear Assemblies, Basic Environmental Testing Procedures

according to the annexed list of standards and specifications.

The accreditation is valid until: **December 14th, 2009**

The annex is deemed part of this certificate and comprises **49** pages.

DAR-Registration No.: **DAT-P-002/91-02**

Frankfurt/Main, June 25th, 2007

Dipl.-Ing. (FH) R. Egner
Head of the Accreditation Body

Member in EA, ILAC, IAF

Translation for information purposes only. The German Accreditation Certificate is authoritative. See notes overleaf

CONTENTS

1 Summary

The measurements described in this report were conducted pursuant to 47 CFR § 2.947. All applicable paragraphs of the 47 CFR parts 2 and 87 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:

Table 1.1: Results – Summary

Test No.	Measurement	FCC Rule	Page Number of this Report	Result
1	RF Power Output	§ 2.1046 § 87.131	12	compliant
2	Modulation Characteristics	§ 2.1047 § 87.141	14	compliant
3	Occupied Bandwidth	§ 2.1049 § 87.135, § 87.137	16	compliant
4	Spurious Emissions at Antenna Terminals	§ 2.1051, § 2.1057, § 87.139	18	compliant
5	Frequency Stability	§ 2.1055 § 87.133	25	compliant

2 References

2.1 Specifications

[1]	47 CFR	Code of federal regulations Title 47 - Telecommunication	2007-10

3 General Information

3.1 Identification of Client

Rohde & Schwarz GmbH & Co. KG
Mühldorfstraße 15
81671 München
Reiner Hausdorf

3.2 Test Laboratory

Center for Quality Engineering
Nokia Siemens Networks GmbH & Co. KG
Hofmannstraße 51
81379 München

3.3 Time Schedule

Delivery of EUT:	Mar 26, 2008
Start of test:	Mar 28, 2008
End of test:	Apr 03, 2008

3.4 Participants

Name	Function
Jaroslav Weiter	Setup of EUT
Martin Mlaskac	Setup of EUT
Michael Sperling	Accredited testing, Editor

4 Equipment Under Test

4.1 Description of EUT

The EUT XU 4200 VHF Transceiver is a radio communications device used for Air Traffic Control (ATC). The EUT covers the Receiver EU4200 and Transmitter SU4200 version and represents the worst case configuration of XU4200, EU4200 and SU4200 with respect to the performed tests.

An example of the EUT is shown in the figure below.

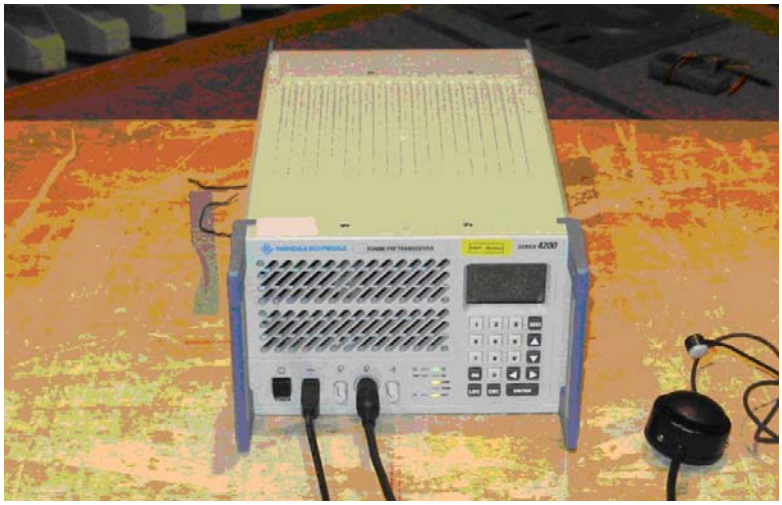

Figure 4.1: Front view of XU-4200

4.2 Configuration of EUT

Table 4.1: Configuration of EUT

Name	PN	Serial number
Radio XU4200	6144.7400.02	100001
Modules		
RX VHF EU4250	6144.7274.02	100001
TX VHF VU4250	6144.7280.02	100001
KK4250	6144.7268.02	100001
PSU 400W	6133.8522.02	100983
BackPlane	6144.7722.02	100011
FrontCover	6144.7297.02	100001
MMI board	6144.7745.02	100003
FrontPanel	3569.8862.02	100875
Keypad	3569.8856.02	

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

A complete description of the transceiver's calibration/tuning procedure is included in the Parts

List and Tune-Up exhibit section of this application.

5 Measurements

5.1 General description

5.1.1 Operating conditions

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

For detailed test system equipment configuration please refer to Fig. 1 on page 11.

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

The settings in the EUT were controlled by the testing software ATON Host v5.46.

5.1.2 Selected carrier test frequencies

The measurements were performed at 3 selected carrier frequencies, according to the following table:

Table 5.1: Carrier Frequencies

Modulation / Frequency	A3E	A2D / G1D
Lowest possible carrier frequency [MHz]	112.000	118.000
Frequency at the middle of the band [MHz]	134.000	127.500
Highest possible carrier frequency [MHz]	155.975	136.975

5.1.3 Modulation characteristics

The EUT supports AM A3E, AMMSK A2D and D8PSK G1D modulation. The modulation characteristic of the AMMSK and the 8-PSK modulation are defined in ARINC618-6.

During the measurements for data transmission (A2D and G1D), a pseudo random sequence was applied to the digital modulator to ensure that the emission characteristics of the transmitter are pursuant to § 2.1049.
For 8PSK the first 17 symbols are generated using specificaion ICAO, Annex 10, Vol III, Part I, chapter 6, other symbols are random.

5.1.4 Measurement test configuration

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

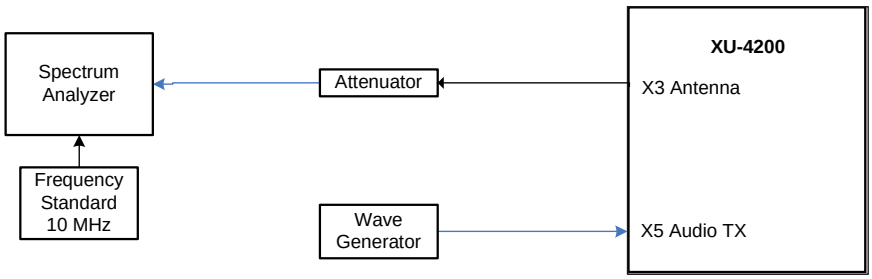

Fig. 1 – Measurement Test Configuration

The RF output of the XU-4200 is connected to a spectrum analyzer (FSIQ26, Rohde&Schwarz) via a high power 30 dB attenuator. The attenuator is used to protect the input of the spectrum analyzer from high RF power levels. A description of the analyzer settings is given in each of the sections describing the measurements.
A complete list of the measurement equipment is included on page 27 of this measurement report.

5.1.5 Calibration of the measurement equipment

All relevant test equipment has a valid calibration from an external calibration laboratory. Additionally the spectrum 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.

5.2 Test No. 1: RF power output (§ 2.1046)

5.2.1 Purpose

The RF power output measurements were performed pursuant to § 2.1046 in order to determine the RF output power of the EUT.

5.2.2 EUT operation condition

The EUT was configured and operating as described in section 5.1.1. The RF output power was determined at three selected carrier test frequencies according to section 5.1.2 of this application.

5.2.3 Test configuration

The test configuration used is described in section 5.1.4. See page 11 (Fig. 1) for a block diagram.

5.2.4 Measurement procedure

Using a spectrum analyzer the RF power is measured with a frequency sweep across the carrier (see screenshots). The carrier power of the digital modulated signal is the maximum indicated power level. For AM modulated signals the mean power is determined.
The XU-4200 output power is the sum of the measured carrier power and the external attenuation (cable loss of the test set up).
The RBW setting of the spectrum analyzer was increased until the measured power reached a stable upper limit (RBW = 1MHz).

5.2.5 Measurement results

The following table shows the measured output powers at the RF output terminal. Spectral plots are included on pages 28 – 33 of this report.

Note:
The offset value indicated on the spectral plots represents the external attenuation value that includes the fixed attenuator plus the cable loss.

Table 5.2: Results – RF power output (A3E modulation)

Carrier Frequency [MHz]	Measured Carrier Power [dBm]	External Attenuation [dB]	Transmitter Output Power	Result
112.000	16.7	31.1	47.8 dBm = 60.3 W	compliant
134.000	16.5	31.1	47.6 dBm = 57.5 W	compliant
155.975	16.7	31.1	47.8 dBm = 60.3 W	compliant

Table 5.3: Results – RF power output (A2D modulation)

Carrier Frequency [MHz]	Measured Carrier Power [dBm]	External Attenuation [dB]	Transmitter Output Power	Result
118.000	14.5	31.1	45.6 dBm = 36.3 W	compliant
127.500	13.9	31.1	45.0 dBm = 31.6 W	compliant
136.975	13.5	31.1	44.6 dBm = 28.8 W	compliant

Table 5.4: Results – RF power output (G1D modulation)

Carrier Frequency [MHz]	Measured Carrier Power [dBm]	External Attenuation [dB]	Maximum Output Power	Result
118.000	19.7	31.1	50.8 dBm = 120.2 W	compliant
127.500	19.8	31.1	50.9 dBm = 123.0 W	compliant
136.975	20.0	31.1	51.1 dBm = 128.8 W	compliant

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

5.3 Test No. 2: Modulation characteristics (§ 2.1047)

5.3.1 Purpose

The modulation characteristics measurements were performed pursuant to § 2.1047(a) in order to verify the requirements given by § 87.141(a).

5.3.2 EUT operation condition

The EUT was configured and operating as described in section 5.1.1. The frequency response and the modulation limiting were determined at the frequency at the middle of the band (134.0 MHz).

5.3.3 Test configuration

Except for the measurement of the frequency response the test configuration used is described in section 5.1.4. See page 11 for a block diagram (Fig. 1).

The following measurement configuration was used to perform the measurement of the frequency response (see figure below):

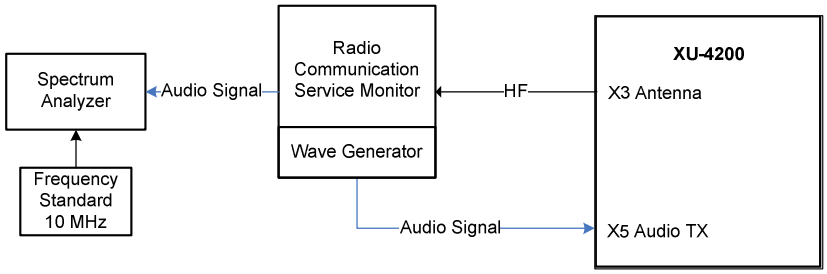

Fig. 2 – Measurement Test Configuration

5.3.4 Measurement procedure

Using a spectrum analyzer the power of the demodulated RF signal was measured to determine the frequency response. The radio communication service monitor was used to demodulate the RF output of the EUT. The percentage of modulation was detected using a spectrum analyzer. Therefore the audio signal was provided by a function generator.

5.3.5 Measurement results

The occupied bandwidth was measured to be 7.32 kHz for A3E modulation, 4.46 kHz for A2D modulation and 12.7 kHz for G1D modulation. This represents the 99% power bandwidth (refer to the spectral plots included on pages 36 – 41 and the following section). Three carrier test frequencies were investigated for each modulation. Therefore, the modulation characteristic of the transceiver is 7K32A3E, 4K46A2D and 12K7G1D.
In case of A2D and G1D modulation no measurements are required here other than the occupied bandwidth.

A curve showing the frequency response of the audio modulating circuit over a range of 100 Hz to 5 kHz is required for the transmission of A3E modulation (refer to the modulation limiting plot on page 34).

A plot for modulation limiting is required for voice modulated communication equipment. For transmitting A3E modulation, curves are provided for audio input frequencies of 300 Hz, 1 kHz and 3.53 kHz (refer to the modulation limiting plot on page 34).

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

5.4 Test No. 3: Occupied bandwidth (§ 2.1049)

5.4.1 Purpose

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

5.4.2 EUT operation condition

The EUT was set up according to section 5.1.1 of this test report. For the test of the audio transmission A3E the audio generator was set to 3.53 kHz, which was identified as the frequency of maximum response. For the test of the data transmission (A2D and G1D), the EUT applied an internally created pseudo random bit pattern to the modulator. Therefore the EUT was operated to its maximum extend.

5.4.3 Test configuration

The test configuration used is described in section 5.1.4. See page 11 (Fig. 1) for a block diagram.

5.4.4 Measurement procedure and results

The occupied bandwidth was determined for each of the test frequencies listed in the table below. See the spectral plots included on pages 35 – 40 for details. The 99% power bandwidth was determined with the spectrum analyzer. The following table summarizes the measurement results:

A3E modulation:

Carrier Test Frequency [MHz]	Occupied Bandwidth [kHz]	Authorized Bandwidth for 6K00A3E [kHz]	Results
112.000	7.24	50	compliant
134.000	7.32	50	compliant
155.975	7.32	50	compliant

A2D modulation:

Carrier Test Frequency [MHz]	Occupied Bandwidth [kHz]	Authorized Bandwidth for 13K0A2D [kHz]	Results
118.000	4.38	25	compliant
127.500	4.29	25	compliant
136.975	4.46	25	compliant

G1D modulation:

Carrier Test Frequency [MHz]	Occupied Bandwidth [kHz]	Authorized Bandwidth for 14K0G1D [kHz]	Results
118.000	12.3	25	compliant
127.500	12.7	25	compliant
136.975	12.3	25	compliant

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

5.5 Test No. 4: Spurious emissions at antenna terminals (§ 2.1051, § 2.1057, § 87.139)

5.5.1 Purpose

The measurements of the spurious emissions at the equipment output terminals were performed pursuant to § 2.1051 in order to verify that any emissions are below the limits given by § 87.139.

5.5.2 Limits

Compliance with § 87.139 requires that any emission removed from the assigned frequency by more then 50 % and up to 100 % of the authorized bandwidth shall be attenuated below 25 dBc. Emissions removed from the assigned frequency by more then 100 % and up to 250 % of the authorized bandwidth shall be attenuated below 35 dBc.

Compliance with § 87.139 requires that any emission removed from the assigned frequency by more then 250 % of the authorized bandwidth be attenuated below the transmitter power by at least $43 + 10 \log_{10} pY$ (pY = transmitter mean power in Watts).

The compliance limit was calculated as per the following table:

A3E modulation:

Rated mean transmitter output power	58.88W (=47.7 dBm)
Required attenuation	$43 + 10 \log_{10} 58.88 = 60.7$ dB
Rated mean transmitter output power – required attenuation = compliance limit	47.7 dBm – 60.7 dB = –13 dBm

A2D modulation:

Rated mean transmitter output power	32.36W (=45.1 dBm)
Required attenuation	$43 + 10 \log_{10} 32.36 = 58.1$ dB
Rated mean transmitter output power – required attenuation = compliance limit	45.1 dBm – 58.1 dB = –13 dBm

G1D modulation:

Rated mean transmitter output power	50.12W (=47.0 dBm)
Required attenuation	$43 + 10 \log_{10} 50.12 = 60.0$ dB
Rated mean transmitter output power – required attenuation = compliance limit	47.0 dBm – 60.0 dB = –13 dBm

5.5.3 EUT operation condition

The standard setup procedure as described in section 5.1.1 of this report was used.

5.5.4 Test configuration

The test configuration used is described in section 5.1.4. See page 11 (Fig. 1) for a block diagram.

For measurements near the carrier a notch filter was used additionally.

5.5.5 Measurement procedure and results

The measurements were performed at all 3 selected carrier test frequencies. Refer to section 5.1.2 of this test report.

For emission measurements removed from the assigned frequency by less then 250 % of the authorized bandwidth refer to the plots on pages 41 - 46.

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

The following tables summarize the worst case detected emission levels:

A3E modulation, carrier frequency = 112.0 MHz

Frequency Marker Indication [MHz]	Indicated Power Level [dBm]	External Attn. [dB]	Worst Case Emission Level [dBm]	Compliance Limit [dBm]	Results
0.0177	-95.6	31.1	-64.5	-13.0	compliant
0.150	-94.9	31.1	-63.8	-13.0	compliant
111.0	-65.7	31.1	-34.6	-13.0	compliant
111.9	-65.9	31.1	-34.8	-13.0	compliant
112.1	-63.1	31.1	-32.0	-13.0	compliant
180.5	-71.7	31.1	-40.6	-13.0	compliant
223.4	-79.6	31.1	-48.5	-13.0	compliant
6900.0	-76.9	31.1	-45.8	-13.0	compliant

A3E modulation, carrier frequency = 134.0 MHz

Frequency Marker Indication [MHz]	Indicated Power Level [dBm]	External Attn. [dB]	Worst Case Emission Level [dBm]	Compliance Limit [dBm]	Results
0.0177	-95.6	31.1	-64.5	-13.0	compliant
0.150	-94.9	31.1	-63.8	-13.0	compliant
91.1	-74.9	31.1	-43.8	-13.0	compliant
133.9	-70.2	31.1	-39.1	-13.0	compliant
134.1	-69.9	31.1	-38.8	-13.0	compliant
195.9	-71.6	31.1	-40.5	-13.0	compliant
224.0	-88.2	31.1	-57.1	-13.0	compliant
6573.1	-76.9	31.1	-45.8	-13.0	compliant

A3E modulation, carrier frequency = 155.975 MHz

Frequency Marker Indication [MHz]	Indicated Power Level [dBm]	External Attn. [dB]	Worst Case Emission Level [dBm]	Compliance Limit [dBm]	Results
0.0177	-95.6	31.1	-64.5	-13.0	compliant
0.150k	-94.9	31.1	-63.8	-13.0	compliant
98.3	-75.7	31.1	-44.6	-13.0	compliant
155.875	-53.5	31.1	-22.4	-13.0	compliant
156.15	-66.1	31.1	-35.0	-13.0	compliant
157.1	-66.9	31.1	-35.8	-13.0	compliant
219.2	-87.9	31.1	-56.8	-13.0	compliant
6544.1	-78	31.1	-46.9	-13.0	compliant

A2D modulation, carrier frequency = 118.0 MHz

Frequency Marker Indication [MHz]	Indicated Power Level [dBm]	External Attn. [dB]	Worst Case Emission Level [dBm]	Compliance Limit [dBm]	Results
0.0098	-77	31.1	-45.9	-13.0	compliant
0.209	-94.7	31.1	-63.6	-13.0	compliant
117.0	-64.8	31.1	-33.7	-13.0	compliant
117.7	-70.8	31.1	-39.7	-13.0	compliant
118.1	-73.7	31.1	-42.6	-13.0	compliant
165.2	-72.4	31.1	-41.3	-13.0	compliant
443.5	-82.2	31.1	-51.1	-13.0	compliant
6573.2	-76.1	31.1	-45.0	-13.0	compliant

A2D modulation, carrier frequency = 127.5 MHz

Frequency Marker Indication [MHz]	Indicated Power Level [dBm]	External Attn. [dB]	Worst Case Emission Level [dBm]	Compliance Limit [dBm]	Results
0.0135	-86.2	31.1	-55.1	-13.0	compliant
0.150	-92.8	31.1	-61.7	-13.0	compliant
84.6	-75.6	31.1	-44.5	-13.0	compliant
127.3	-65	31.1	-33.9	-13.0	compliant
127.6	-66.5	31.1	-35.4	-13.0	compliant
181.3	-71.5	31.1	-40.4	-13.0	compliant
382.2	-82.7	31.1	-51.6	-13.0	compliant
6631.3	-77	31.1	-45.9	-13.0	compliant

A2D modulation, carrier frequency = 136.975 MHz

Frequency Marker Indication [MHz]	Indicated Power Level [dBm]	External Attn. [dB]	Worst Case Emission Level [dBm]	Compliance Limit [dBm]	Results
0.0124	-85.2	31.1	-54.1	-13.0	compliant
0.2696	-91.6	31.1	-60.5	-13.0	compliant
94.1	-77.9	31.1	-46.8	-13.0	compliant
136.8	-68.4	31.1	-37.3	-13.0	compliant
137.1	-64.1	31.1	-33.0	-13.0	compliant
138.0	-67.6	31.1	-36.5	-13.0	compliant
411.0	-83	31.1	-51.9	-13.0	compliant
6950.9	-76.6	31.1	-45.5	-13.0	compliant

G1D modulation, carrier frequency = 118.0 MHz

Frequency Marker Indication [MHz]	Indicated Power Level [dBm]	External Attn. [dB]	Worst Case Emission Level [dBm]	Compliance Limit [dBm]	Results
0.0104	-76.3	31.1	-45.2	-13.0	compliant
0.210	-93.2	31.1	-62.1	-13.0	compliant
75.2	-76.2	31.1	-45.1	-13.0	compliant
117.9	-68.4	31.1	-37.3	-13.0	compliant
118.1	-73.6	31.1	-42.5	-13.0	compliant
149.8	-79.6	31.1	-48.5	-13.0	compliant
429.1	-81.8	31.1	-50.7	-13.0	compliant
6573.1	-76.3	31.1	-45.2	-13.0	compliant

G1D modulation, carrier frequency = 127.5 MHz

Frequency Marker Indication [MHz]	Indicated Power Level [dBm]	External Attn. [dB]	Worst Case Emission Level [dBm]	Compliance Limit [dBm]	Results
0.0138	-85	31.1	-53.9	-13.0	compliant
0.2098	-92.2	31.1	-61.1	-13.0	compliant
107.9	-80.4	31.1	-49.3	-13.0	compliant
127.4	-73.1	31.1	-42.0	-13.0	compliant
127.6	-73.1	31.1	-42.0	-13.0	compliant
186.7	-80.2	31.1	-49.1	-13.0	compliant
405.0	-85.4	31.1	-54.3	-13.0	compliant
1255.9	-78.1	31.1	-47.0	-13.0	compliant

G1D modulation, carrier frequency = 136.975 MHz

Frequency Marker Indication [MHz]	Indicated Power Level [dBm]	External Attn. [dB]	Worst Case Emission Level [dBm]	Compliance Limit [dBm]	Results
0.0107	-75	31.1	-43.9	-13.0	compliant
0.2696	-93.3	31.1	-62.2	-13.0	compliant
94.1	-76.2	31.1	-45.1	-13.0	compliant
136.0	-66.1	31.1	-35.0	-13.0	compliant
137.0	-60.1	31.1	-29.0	-13.0	compliant
138.1	-67.1	31.1	-36.0	-13.0	compliant
398.4	-84	31.1	-52.9	-13.0	compliant
6950.9	-76.2	31.1	-45.1	-13.0	compliant

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

5.6 Test No. 5: Frequency stability (§ 2.1055, § 87.133)

5.6.1 Purpose

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

5.6.2 Limits

According to § 87.133(a), the carrier frequency must be maintained within following tolerances, independent of the ambient temperature:

Modulation	Tolerance [ppm]
A3E	20
A2D	20
G1D	2

5.6.3 EUT operation condition

The standard setup procedure as described in section 5.1.1 of this report is used. The EUT was operated and tested in a climatic chamber. The device was supplied by nominal voltage 115 V AC and at 20 °C also by 28 V DC voltage. The variation of AC and DC between 85% and 115% of the nominal value has no impact on the main frequency.

5.6.4 Test configuration

The following measurement configuration was used to perform the measurement of the frequency stability (see figure below):

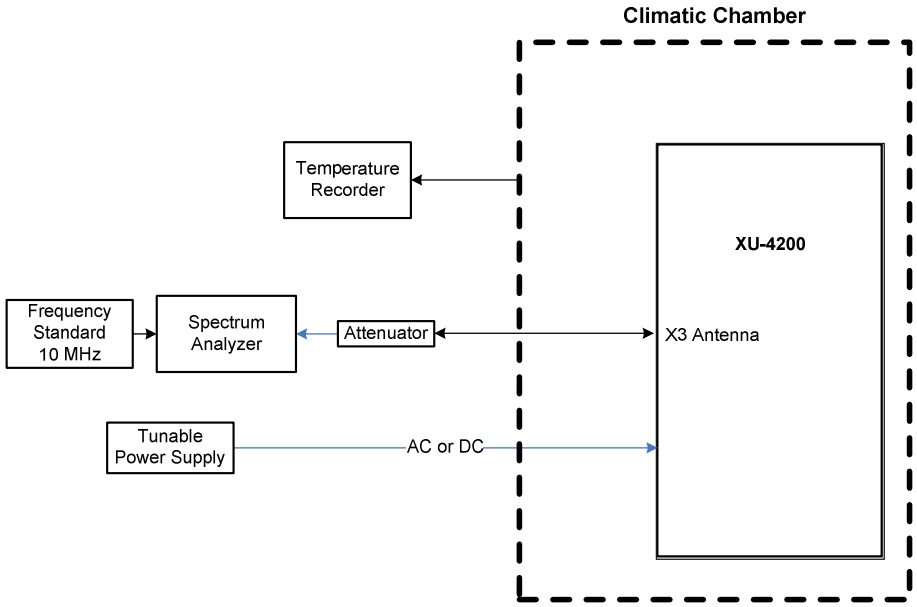

Fig. 3 – Measurement Test Configuration

5.6.5 Measurement procedure

The center frequency deviation of the highest, middle and lowest test frequency was measured at ambient temperature levels from -30°C to +50°C in intervals of not more than 10°C.
At each temperature level, the frequency was measured over a certain time period, taking five measurement values. Worst-case measurement data is reported.

5.6.6 Measurement results

The following table includes the worst case detected frequency deviations. For complete measurement data see plots on pages 47 – 48.

Frequency Deviation (nominal supply voltage, 115 V AC)

Ambient Temp. [°C]	Maximum Frequency Deviation [ppm] (tested with TCXO)	Manufacturer's Specification [ppm]		Results
		with TCXO	with OCXO (not tested)	
-30*	0.45*	±1.00*	±0.3*	compliant*
-20	-0.17	±1.00	±0.3	compliant
-10	0.01	±1.00	±0.3	compliant
0	-0.07	±1.00	±0.3	compliant
+10	0.13	±1.00	±0.3	compliant
+20	0.09	±1.00	±0.3	compliant
+30	-0.10	±1.00	±0.3	compliant
+40	-0.15	±1.00	±0.3	compliant
+50	0.05	±1.00	±0.3	compliant

*) Temperature -30°C is outside the manufacturer declared range of operation

Frequency Deviation (variation of supply voltage, ±15 %, at 20 °C)

Supply Voltage	Maximum Frequency Deviation at 20 °C [ppm]	Manufacturer's Specification [ppm]		Results
		with TCXO	with OCXO (not tested)	
97.7 VAC	0.09	±1.00	±0.3	compliant
115.0 VAC	0.09	±1.00	±0.3	compliant
133.0 VAC	0.09	±1.00	±0.3	compliant
23.8 VDC	0.10	±1.00	±0.3	compliant
28.0 VDC	0.10	±1.00	±0.3	compliant
32.2 VDC	0.11	±1.00	±0.3	compliant

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

6 Measurement data and spectral plots

6.1 Part list of the measurement test equipment

Table 6.1: Measuring Equipment for Climatic Tests

Measuring Instrument	Type	Manufacturer	Identification-No.	Calibration date	Calibration due
Climatic chamber	VC7033	Vötsch	S1391	05/2007 chk*)	05/2008 chk*)
Datalogger	MA2590-9	Almemo	S3319	ind*)	ind*)

chk*) checked against a calibrated reference, ind*) for indication only

Table 6.2: Measuring Equipment for Functional Tests

Measuring Instrument	Type	Manufacturer	Identification-No.	Calibration date	Calibration due
Multimeter	B1028	Siemens	O0123	03/2008	03/2009
DC-Power Supply	3254.1	Statron Gerätetechnik GmbH	SNr. 0308003	ind*)	ind*)
Variable transformer	-	Philips	O0252	ind*)	ind*)
Attenuator	RBU30 100W	Rohde&Schwarz	SNr. 100.8654.37	cnn*)	cnn*)
Tunable Notch Filter	3012	Emco	P0208	cnn*)	cnn*)
Spectrum Analyzer	FSIQ26	Rohde&Schwarz	F0089	04/2007	08/2009
Spectrum Analyzer	FSU	Rohde&Schwarz	F0356	02/2006	02/2009
Frequency Standard	Rubi Source 2000	Datum GmbH	F0077	07/2007	07/2010
Frequency Standard	-	Symmetricom GmbH	F0851	08/2007	08/2009
Function Generator	Model 25	Wave	P0229	03/2008	03/2009
Radio Communication Service Monitor	CMS-54	Rohde&Schwarz	SNr. 100687	ind*)	ind*)

cnn *) Calibration not necessary, ind *) for indication only

6.2 Spectral plots

Test No. 1: RF Power Output (AM A3E modulation)

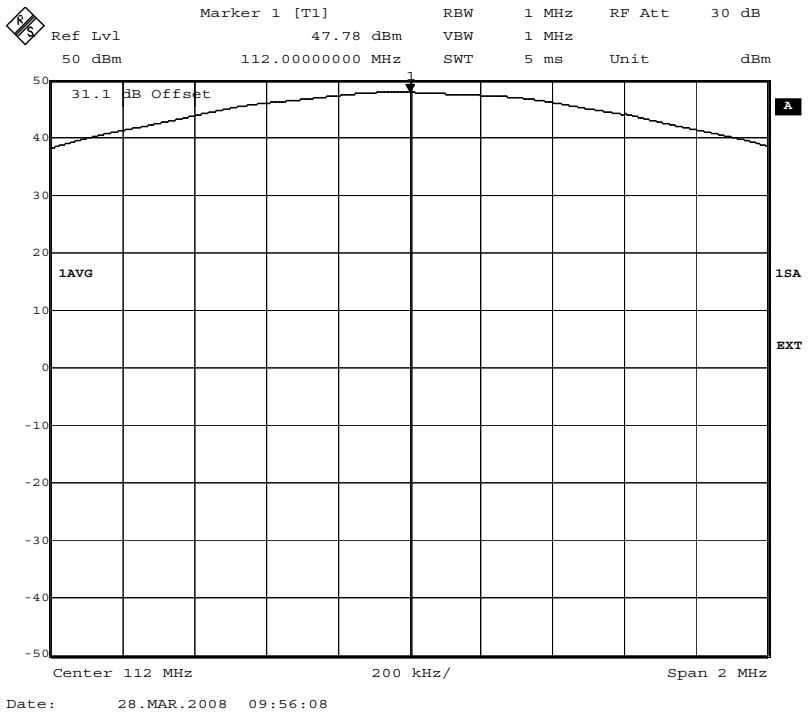

Fig. 4 –Output Power at the Antenna Connector (112.0 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuation and the cable loss during testing.

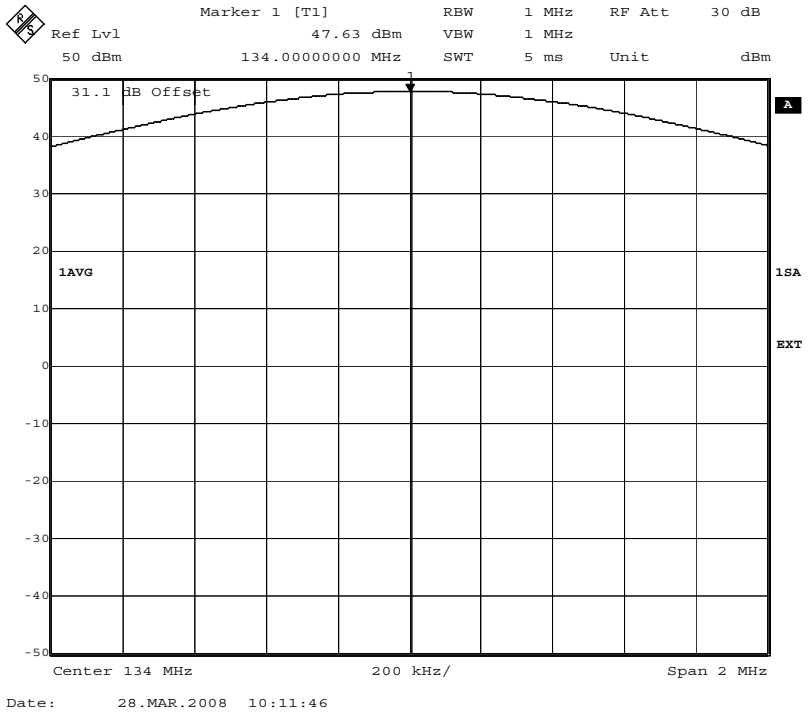

Fig. 5 –Output Power at the Antenna Connector (134.0 MHz)

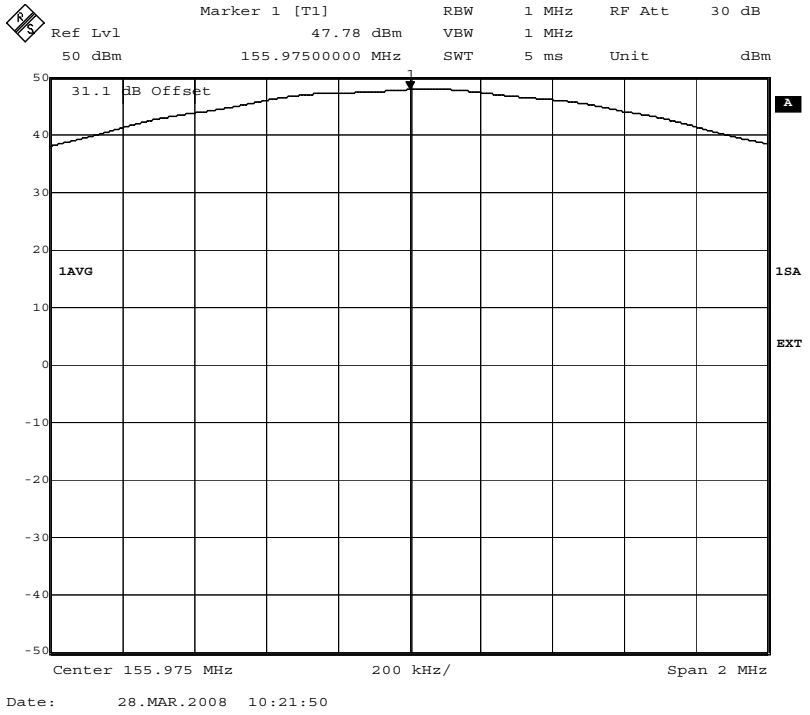

Fig. 6 – Output Power at the Antenna Connector (155.975 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuation and the cable loss during testing.

Test No. 1: RF Power Output (AMMSK A2D modulation)

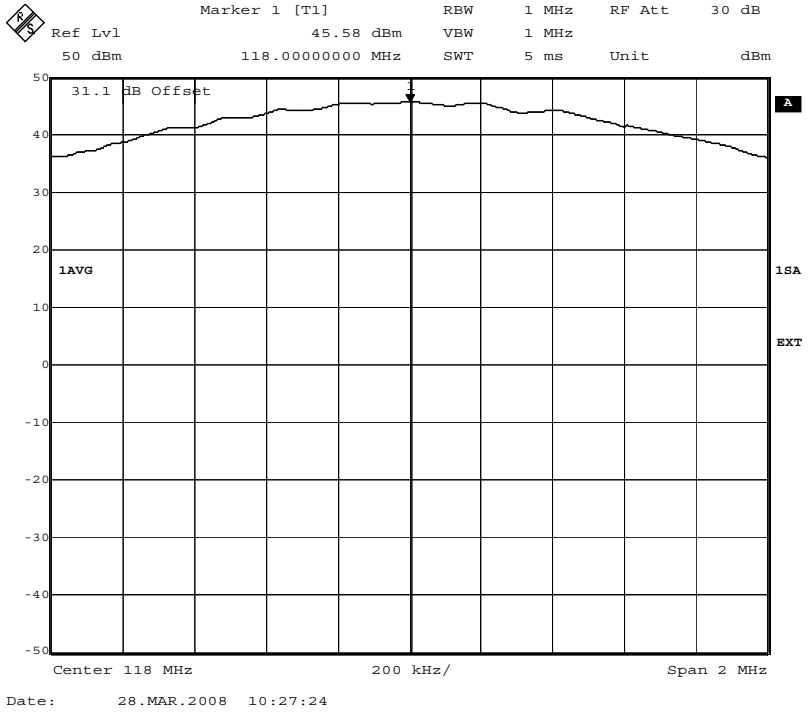

Fig. 7 – Output Power at the Antenna Connector (118.0 MHz)

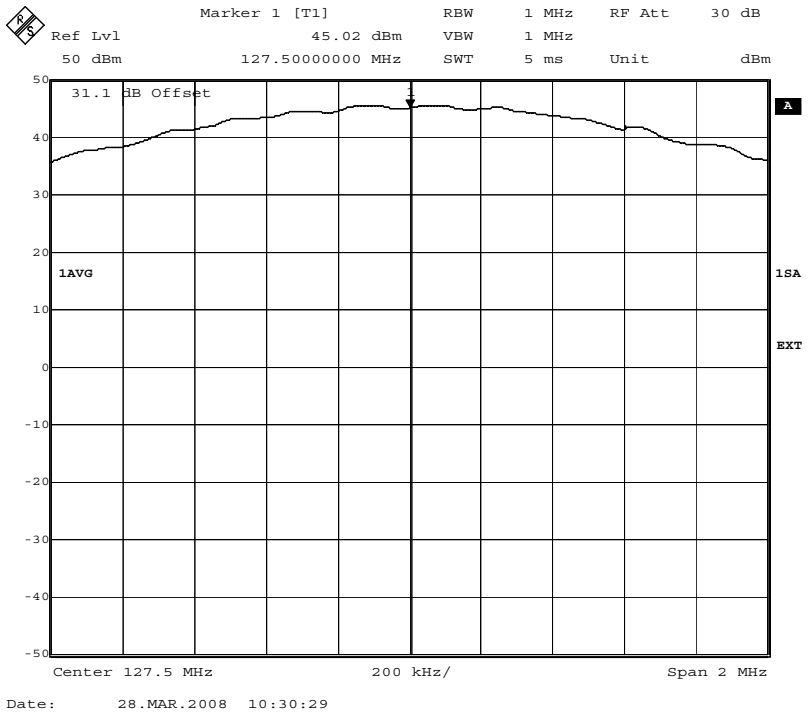

Fig. 8 – Output Power at the Antenna Connector (127.5 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuation and the cable loss during testing.

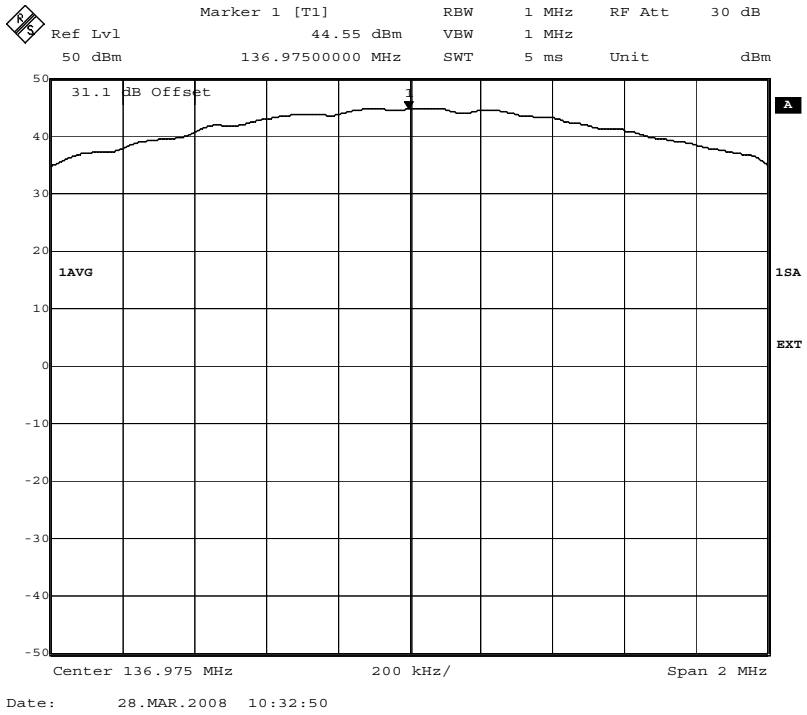

Fig. 9 – Output Power at the Antenna Connector (136.975 MHz)

Test No. 1: RF Power Output (D 8-PSK G1D modulation)

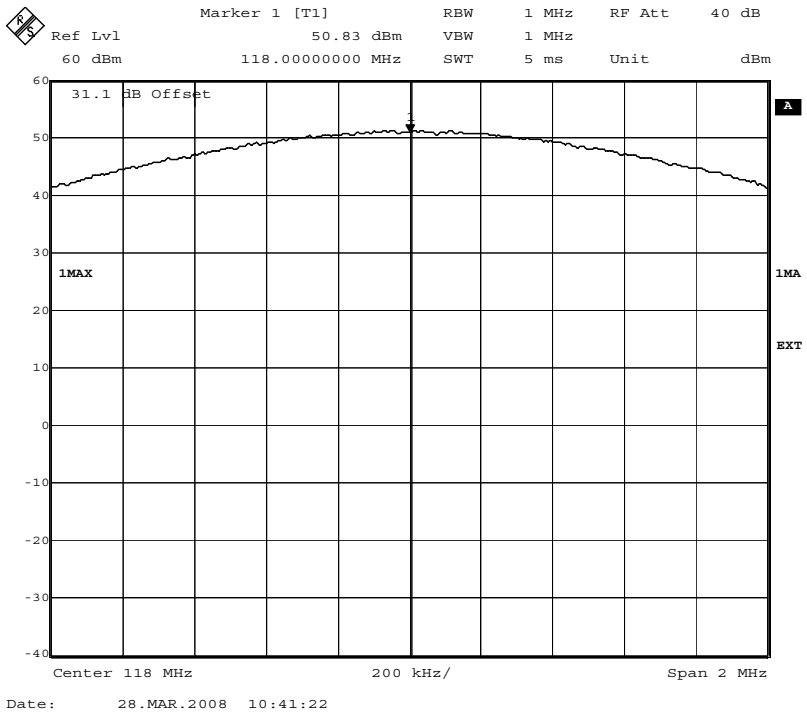

Fig. 10 – Output Power at the Antenna Connector (118.0 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuation and the cable loss during testing.

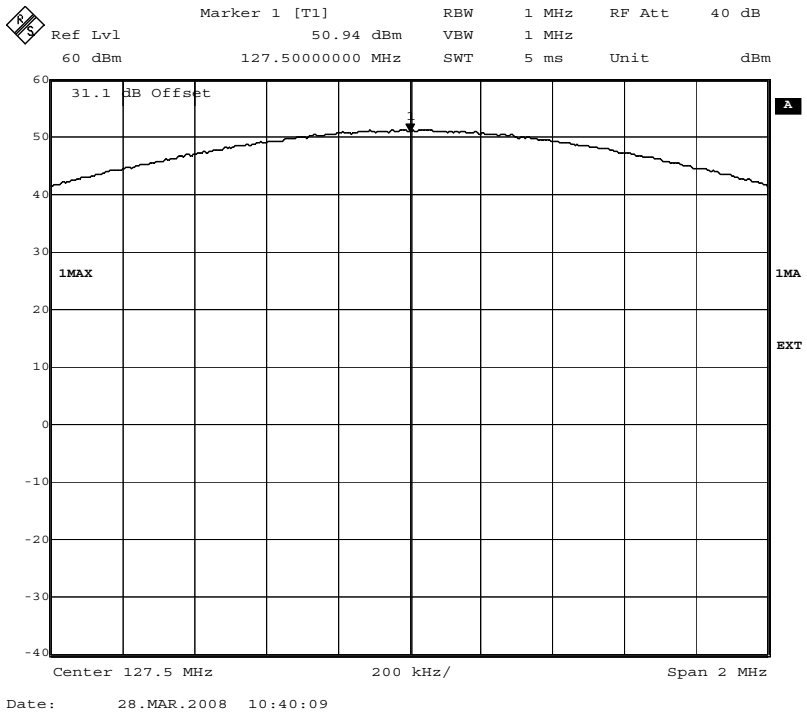

Fig. 11 – Output Power at the Antenna Connector (127.5 MHz)

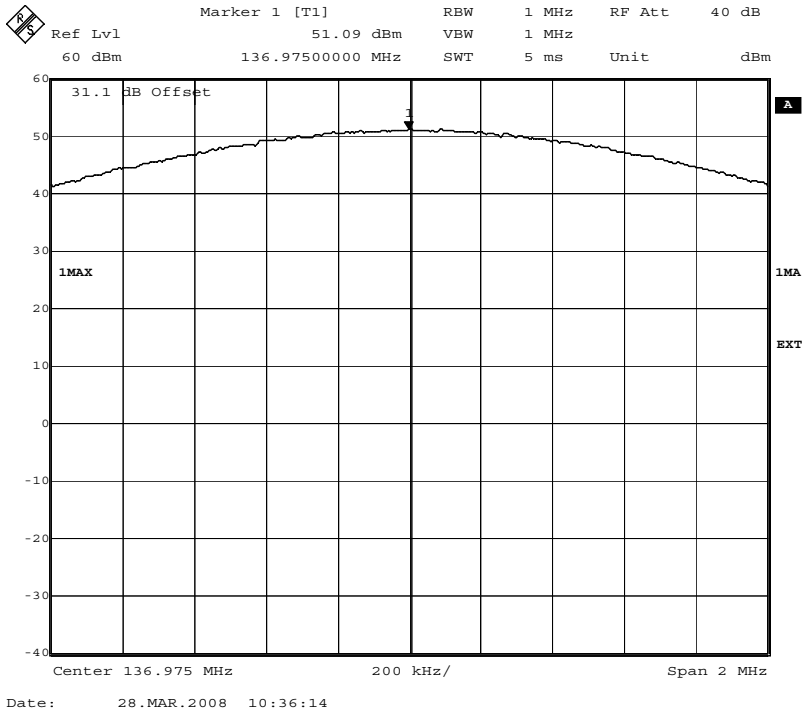

Fig. 12 – Output Power at the Antenna Connector (136.975 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuation and the cable loss during testing.

Test No. 2: Modulation Characteristics

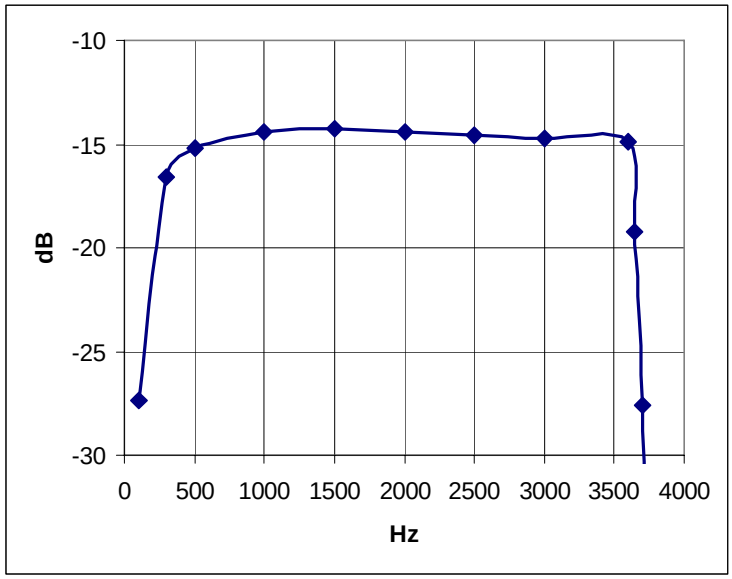

Fig. 13 – Audio Frequency Response Plot

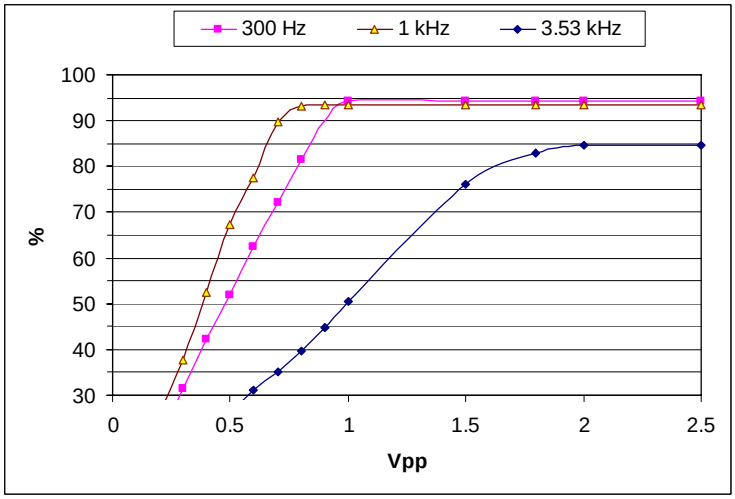

Fig. 14 – Modulation Limiting Plot

In case of A2D and G1D modulation no additional measurements are required for the modulation characteristics. Please refer to test no. 3, occupied bandwidth on page 16.

Test No. 3: Occupied Bandwidth (A3E modulation)

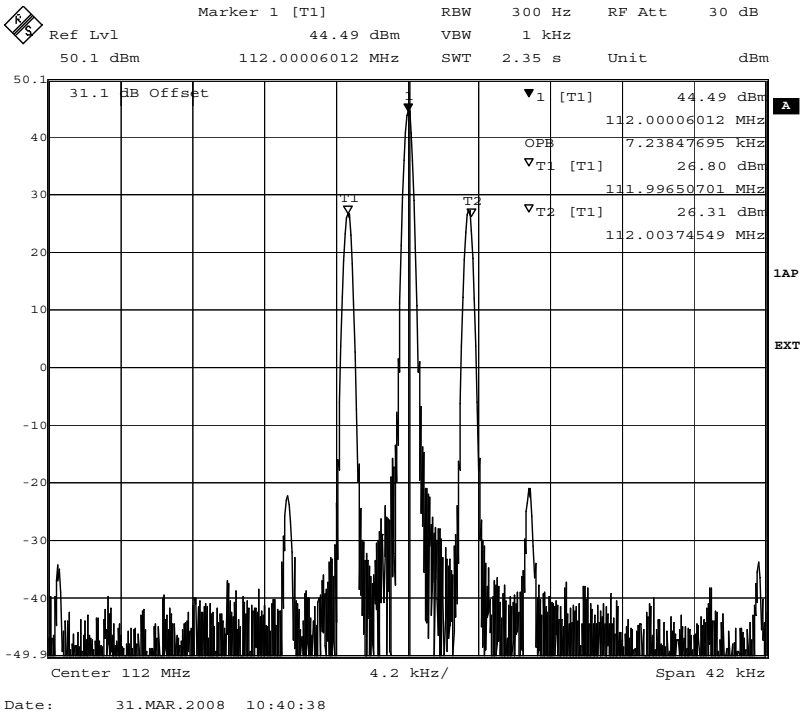

Fig. 15 – Occupied bandwidth (112.0 MHz)

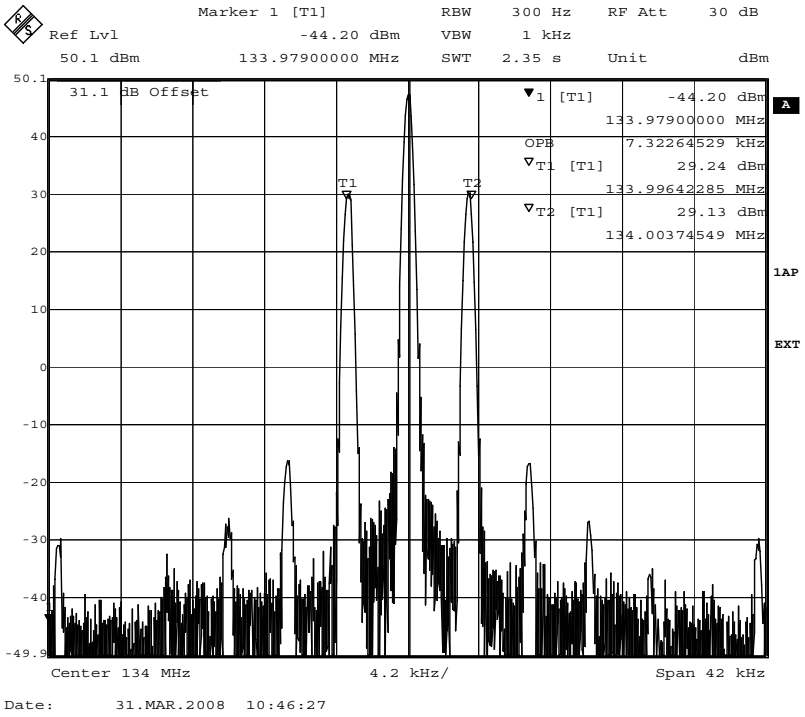

Fig. 16 – Occupied bandwidth (134.0 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuator and the cable loss during the testing.

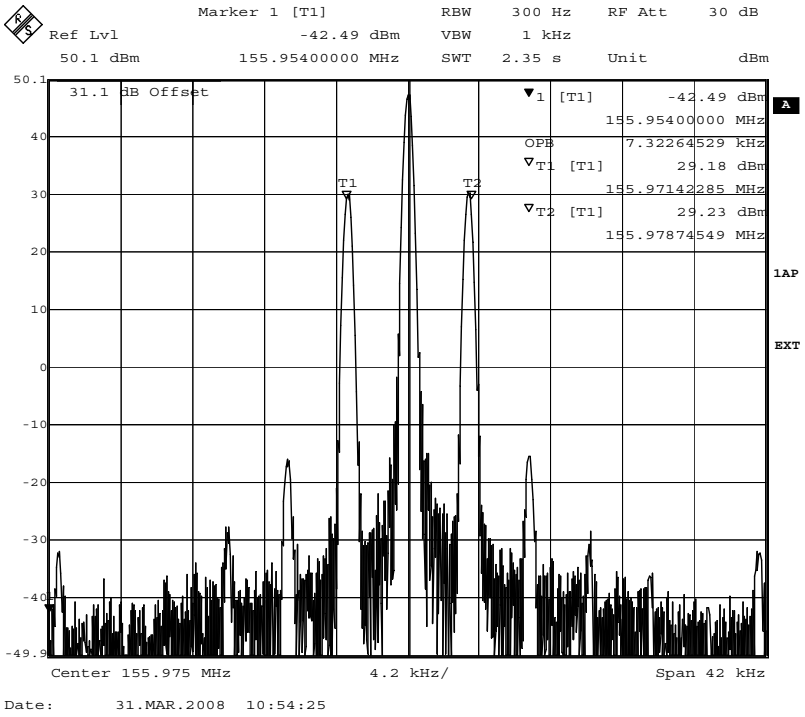

Fig. 17 – Occupied bandwidth (155.975 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuator and the cable loss during the testing.

Test No. 3: Occupied Bandwidth (A2D modulation)

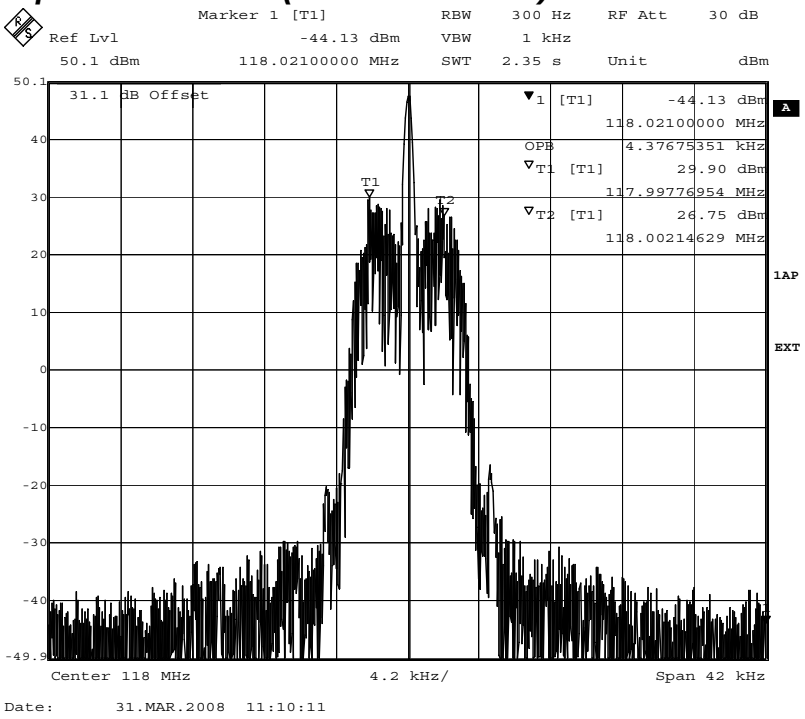

Fig. 18 – Occupied bandwidth (118.0 MHz)

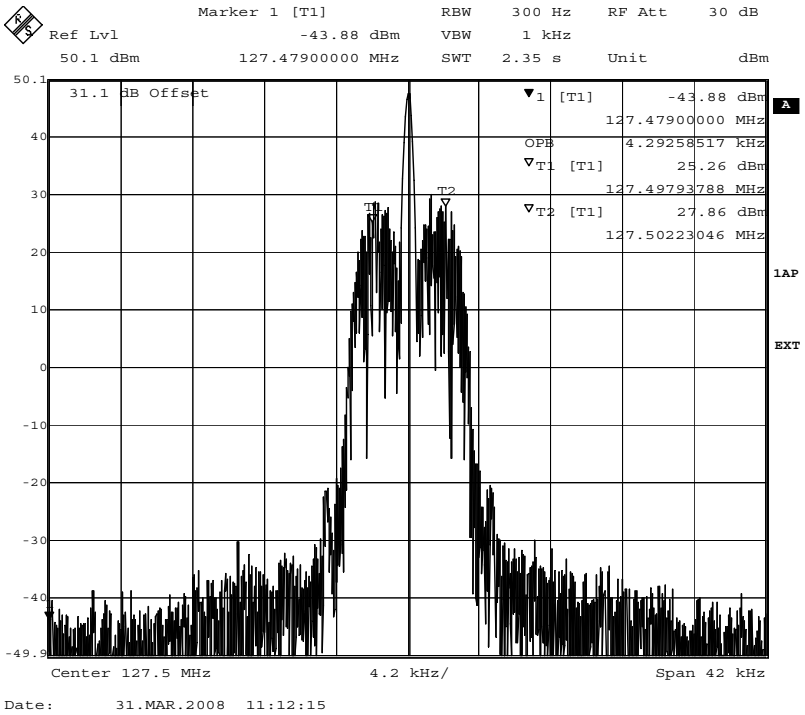

Fig. 19 – Occupied bandwidth (127.5 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuator and the cable loss during the testing.

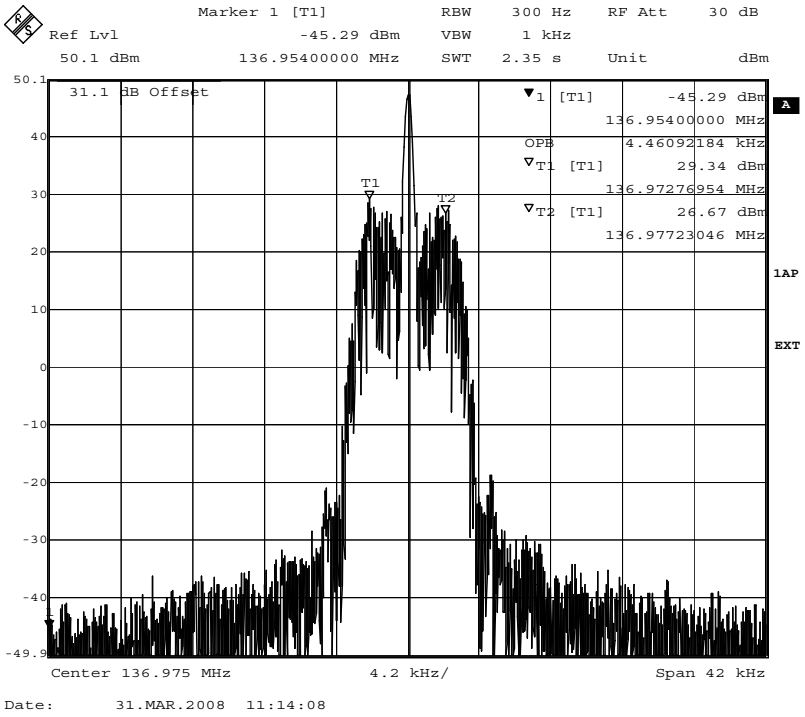

Fig. 20 – Occupied bandwidth (136.975 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuator and the cable loss during the testing.

Test No. 3: Occupied Bandwidth (G1D modulation)

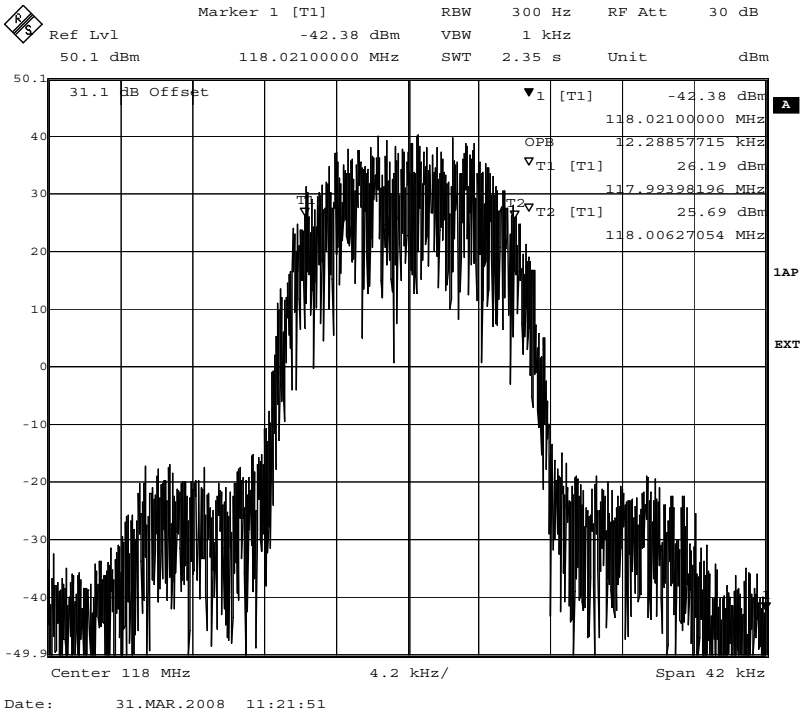

Fig. 21 – Occupied bandwidth (118.0 MHz)

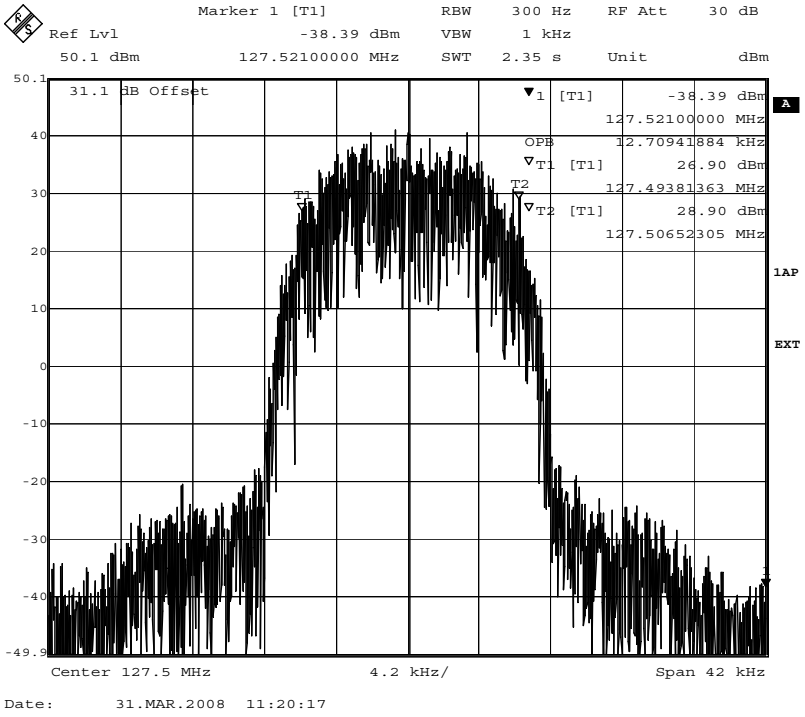

Fig. 22 – Occupied bandwidth (127.5 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuator and the cable loss during the testing.

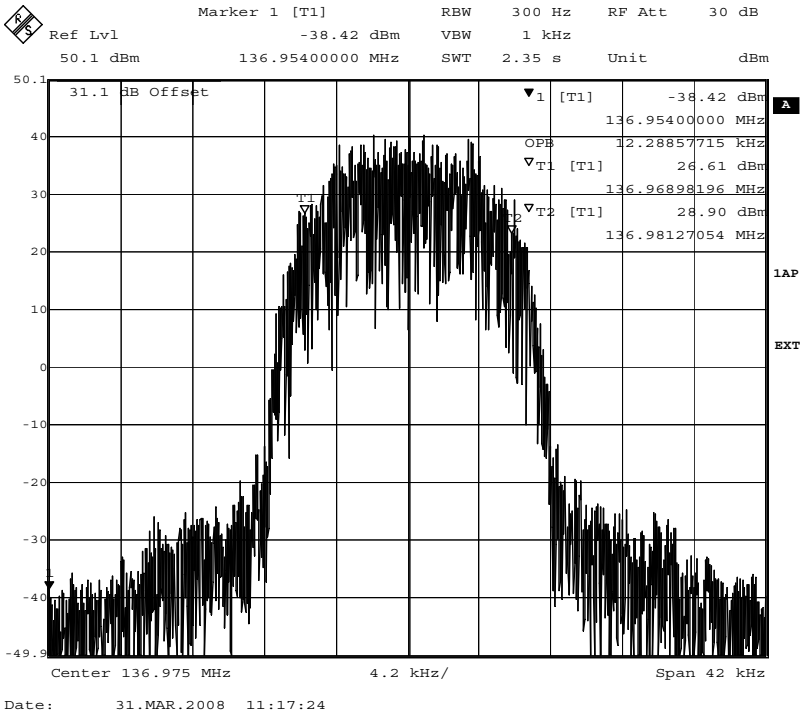

Fig. 23 – Occupied bandwidth (136.975 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuator and the cable loss during the testing.

Test No. 4: Spurious Emissions at the Antenna Terminals (A3E modulation)

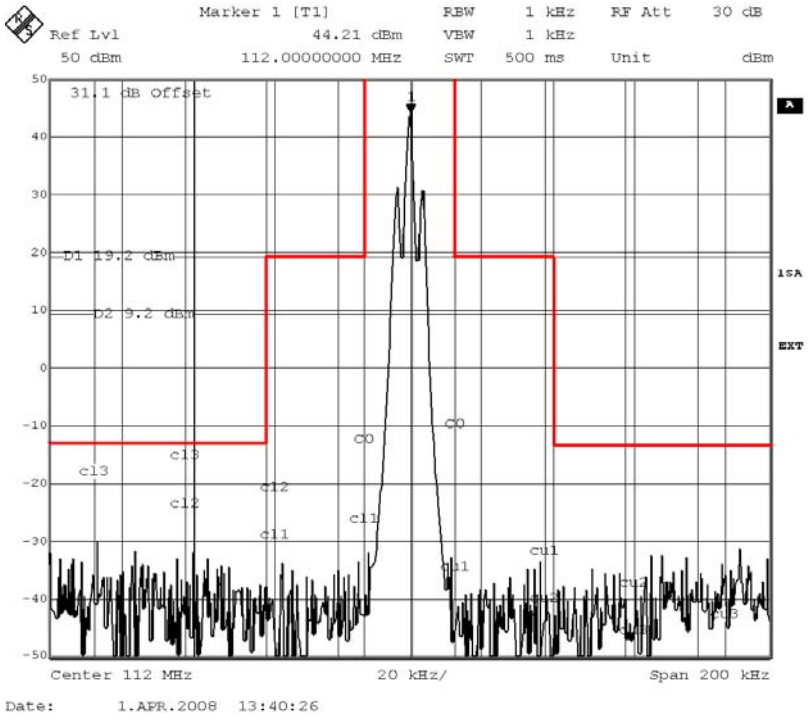

Fig. 24 – Spurious Emissions (112.0 MHz)

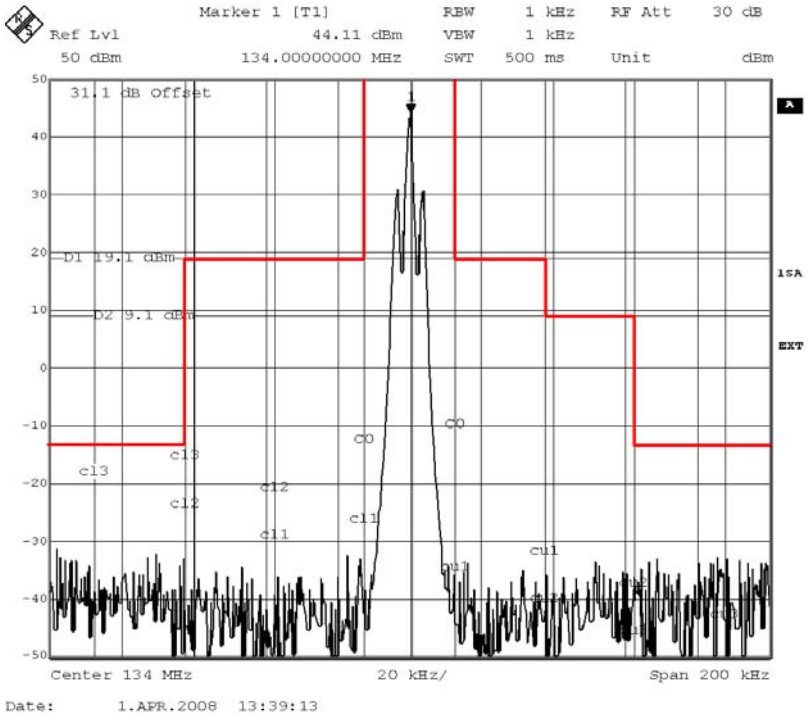

Fig. 25 – Spurious Emissions (134.0 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuator and the cable loss during the testing.

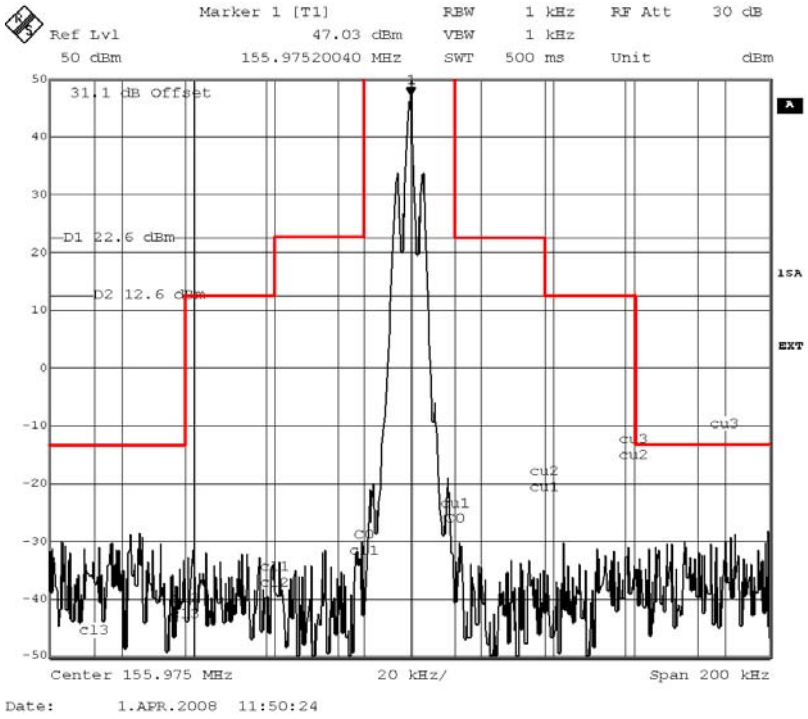

Fig. 26 – Spurious Emissions (155.975 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuator and the cable loss during the testing.

Test No. 4: Spurious Emissions at the Antenna Terminals (A2D modulation)

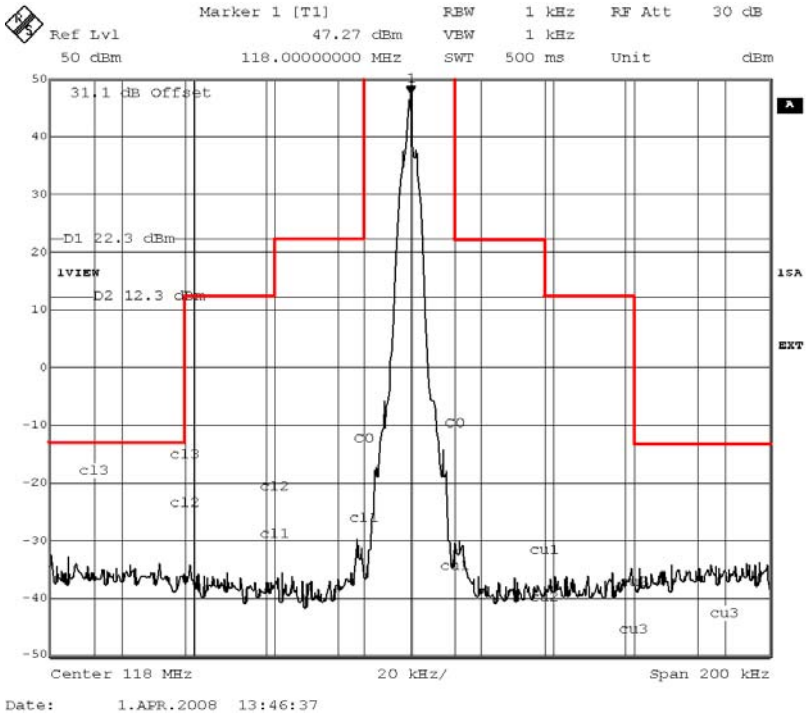

Fig. 27 – Spurious Emissions (118.0 MHz)

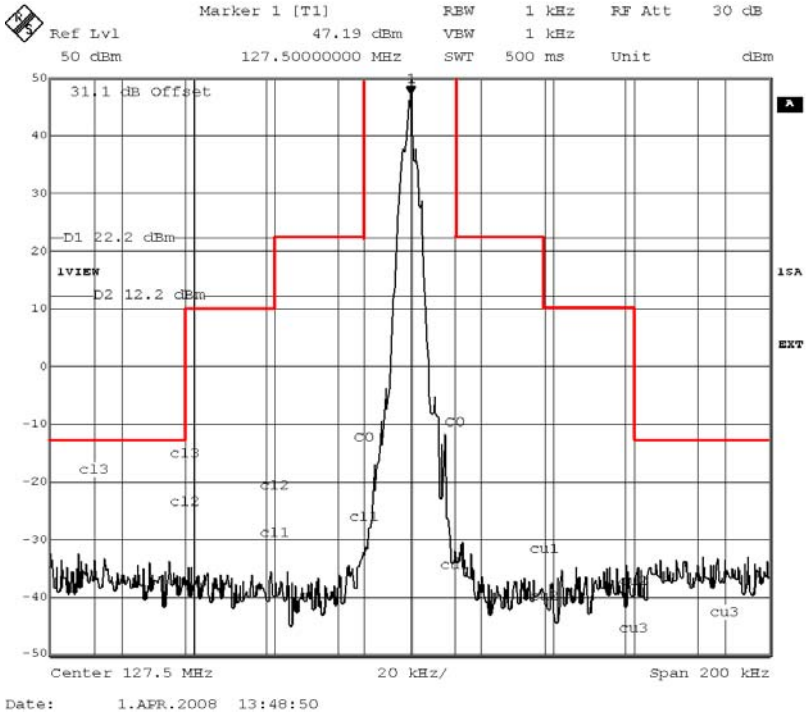

Fig. 28 – Spurious Emissions (127.5 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuator and the cable loss during the testing.

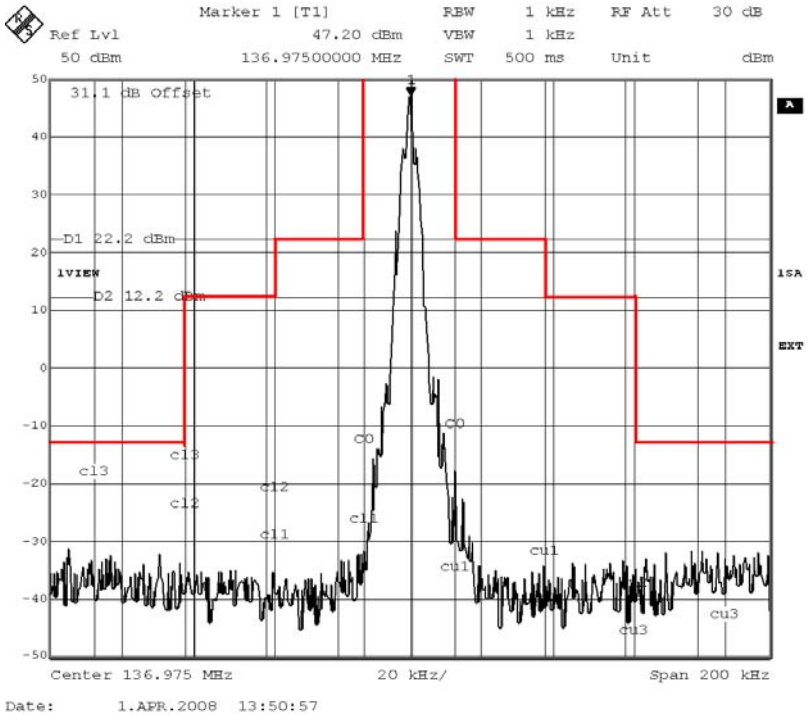

Fig. 29 – Spurious Emissions (136.975 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuator and the cable loss during the testing.

Test No. 4: Spurious Emissions at the Antenna Terminals (G1D modulation)

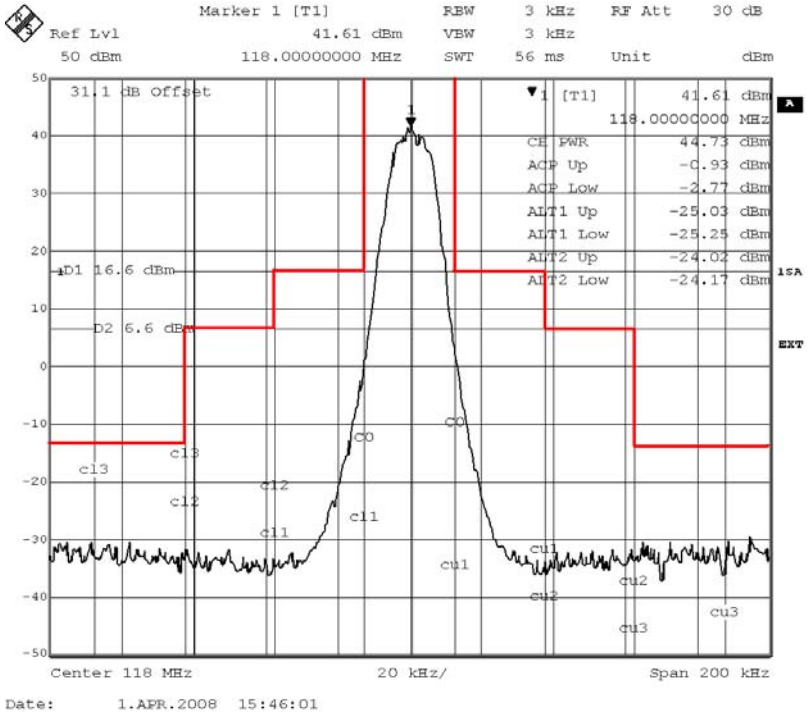

Fig. 30 – Spurious Emissions (118.0 MHz)

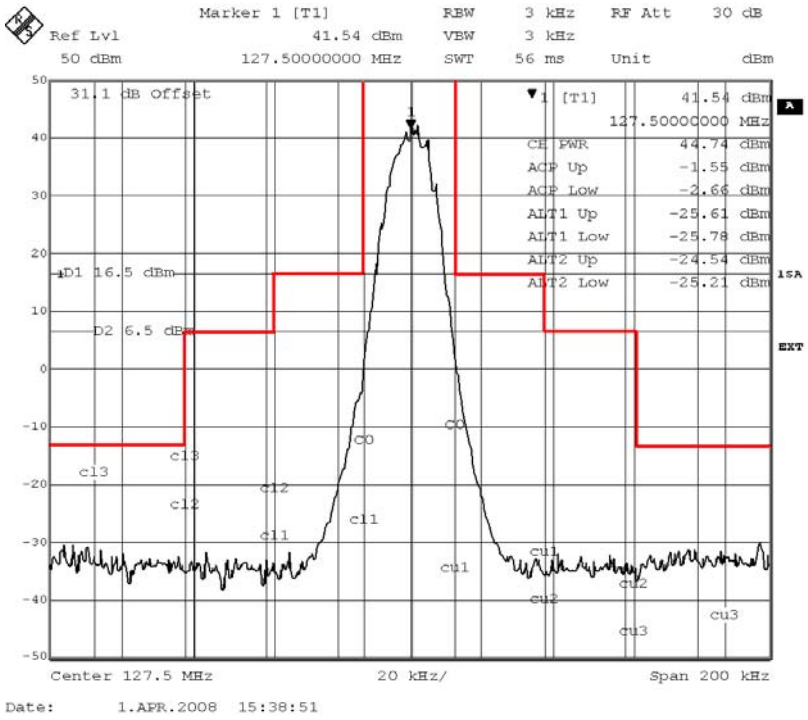

Fig. 31 – Spurious Emissions (127.5 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuator and the cable loss during the testing.

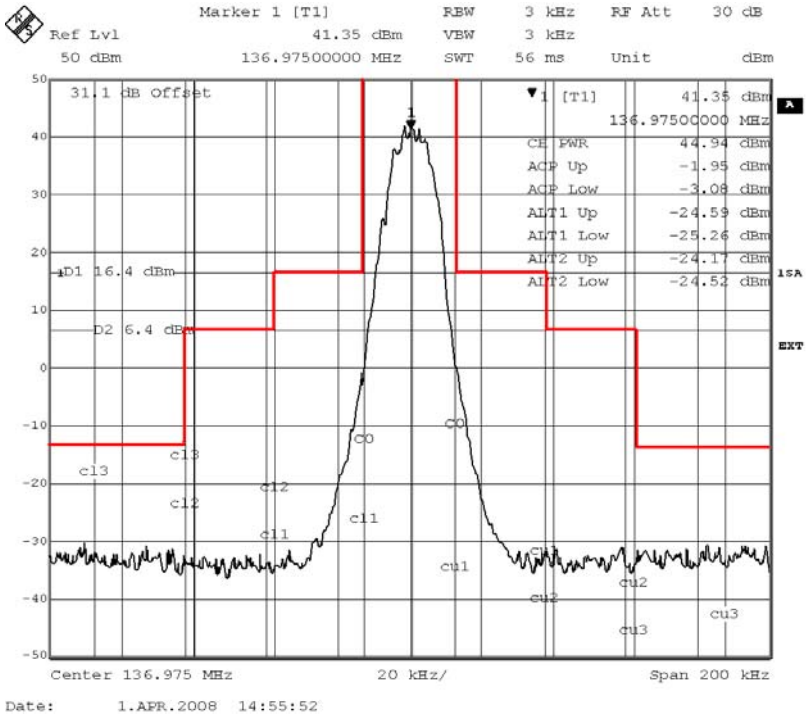

Fig. 32 – Spurious Emissions (136.975 MHz)

Note: The external attenuation of 31.1 dB is included in the spectral plot. This accounts for the external attenuator and the cable loss during the testing.

Test No. 5: Frequency Stability

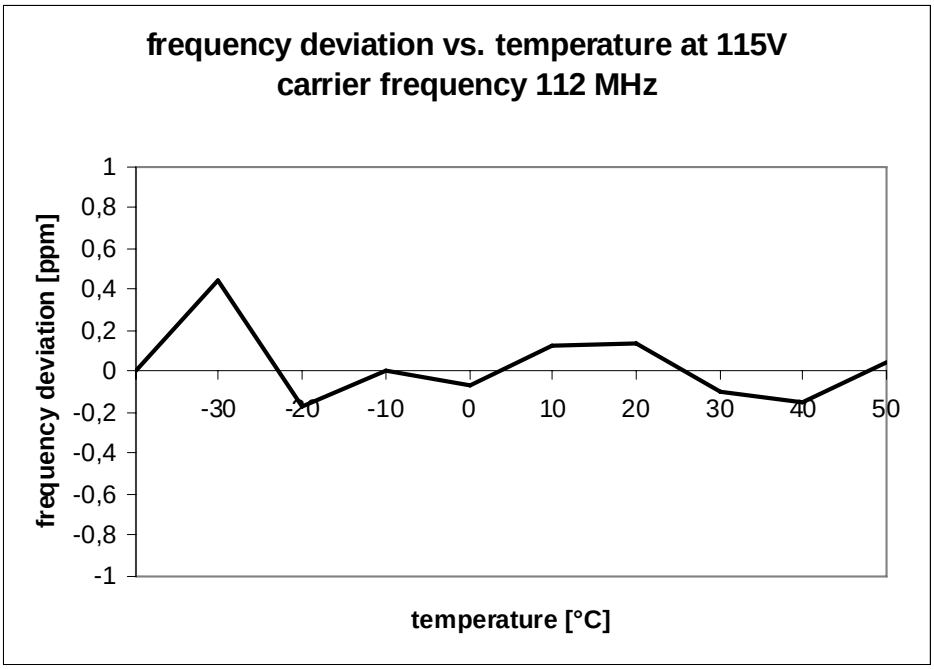

Fig. 33 – Frequency deviation vs. temperature (115V, 112 MHz, A3E modulation)

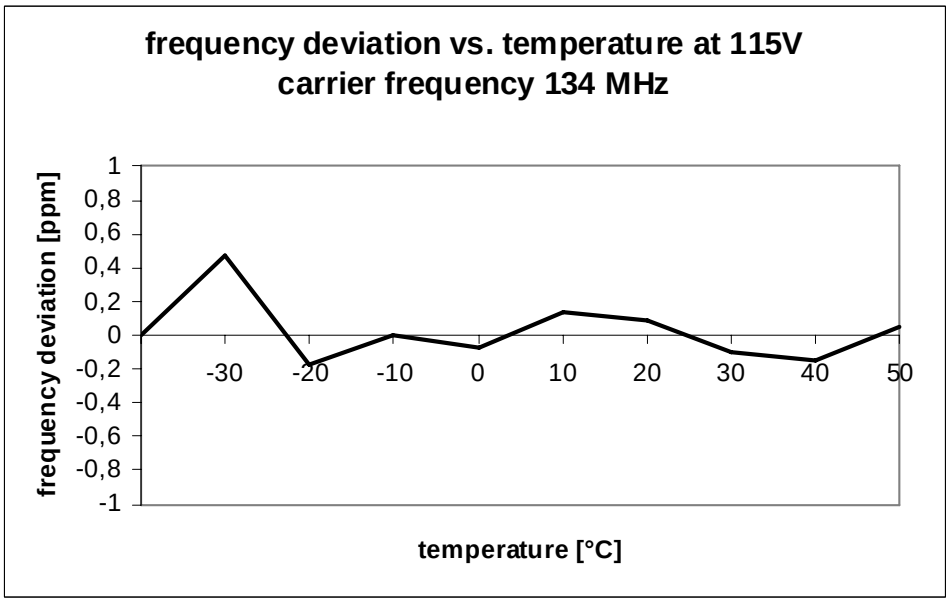

Fig. 34 – Frequency deviation vs. temperature (115V, 134 MHz, A3E modulation)

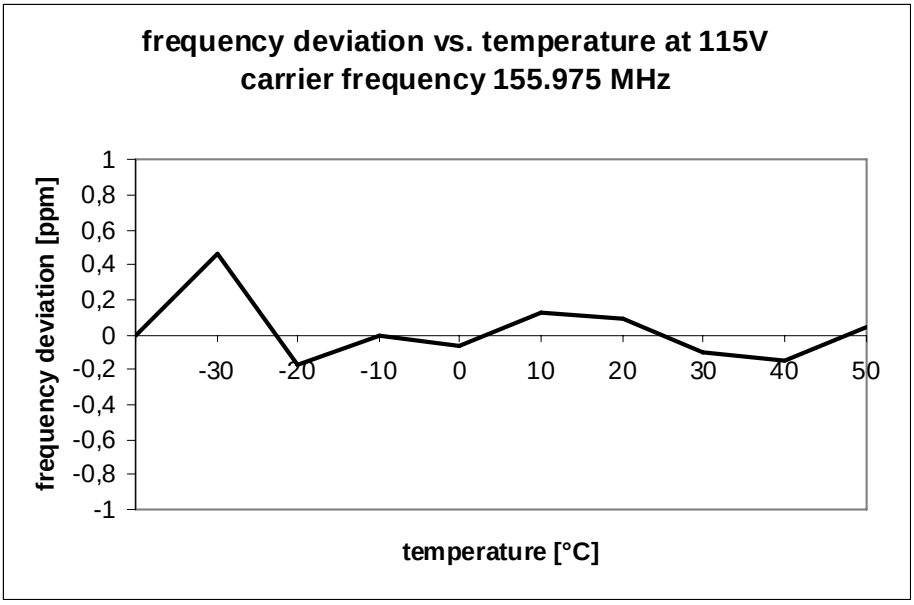

Fig. 35 – Frequency deviation vs. temp. (115V, 155.975 MHz, A3E modulation)

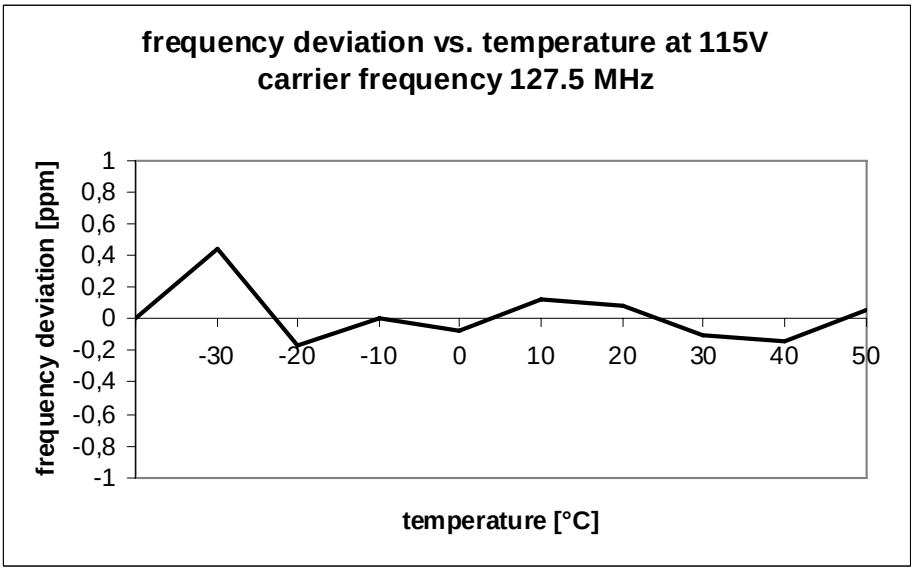

Fig. 36 – Frequency deviation vs. temp. (115V, 127.5MHz, A2D/G1D modulation)