# REPORT

issued by an Accredited Testing Laboratory, FCC listed with Reg. no. 93866 and IC recognized pursuant IC file no. 3482A

SWEDAC ACKREDITERING 1002 ISO/IEC 17025

Contact person
Reinhold Reul
Electronics
+46 10 516 55 84
Reinhold.Reul@sp.se

| Date | Reference | Page |
|---|---|---|
| 2012-02-29 | FX108941-22 | 1 (2) |

Ericsson (China) Communications Company Ltd
Att. Hua Yang
Ericsson Tower
No. 5 Lize East Street
Chaoyang District, Beijing 100102
P. R. China

## Class II permissive change measurements on RRUS 01 B5 850 MHz cellular equipment with FCC ID: TA8AKRC11870-2 and IC: 287AB-AS118702

(7 appendices)

### Test object

RRUS 01 B5, product KRC 118 70/2, revision R1B

### Summary

| Standard | | Compliant | Appendix |
|---|---|---|---|
| **FCC CFR 47 / IC RSS-132** | | | |
| 2.1046 / RSS-132 4.4 | RF power output | Yes | 2 |
| 2.1049 / RSS-Gen 4.6.1 | Occupied bandwidth | Yes | 3 |
| 2.1051 / RSS-132 4.5 | Band edge | Yes | 4 |
| 2.1051 / RSS-132 4.5 | Spurious emission at antenna terminals | Yes | 5 |
| 2.1053 / RSS-132 4.5 | Field strength of spurious radiation | Yes | 6 |

Note 1: Above RSS-132 items are given as cross-reference only. Measurements were performed according to ANSI procedures referenced by FCC and covered by SP's accreditation.

**SP Technical Research Institute of Sweden**
**Electronics - EMC**

Performed by

Reinhold Reul

Examined by

Christer Karlsson



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## Table of contents

## Description - Equipment Under Test (EUT)

| | |
|---|---|
| Equipment: | RUS 01 B5 radio equipment 850 MHz<br>single and multi-carrier, operating in GSM mode. |
| TX frequency band: | 869 – 894 MHz |
| Modulations: | GMSK, 8PSK, 16QAM, 32QAM and AQPSK |

Nominal maximum output power: Per configuration and modulation, RMS value in [dBm]

| | GMSK | 8PSK | 16QAM | 32QAM | AQPSK |
|---|---|---|---|---|---|
| Mode: Single carrier, 1 x | 47.8 | 47.8 | 47.8 | 47.8 | 47.8 |
| Mode: Multi carrier, 2 x | 44.8 | 44.8 | 44.5 | 44.1 | 44.8 |
| Mode: Multi carrier, 3 x | 43.0 | 42.4 | 41.0 | 40.6 | 42.3 |
| Mode: Multi carrier, 4 x | 41.8 | 39.9 | 38.5 | 38.1 | 39.8 |

Nominal supply voltage: -48 V DC

## Purpose of test

The purpose of this test is to justify a Class II Permissive Change of the test object to include the use of the modulations 16QAM, 32QAM and AQSPK in SCPIR 0 dB. This report verifies maintained performance characteristics of affected items by re-testing the updated equipment and comparing results for GMSK modulation with results for the new modulations.

## Tested configurations and set-ups

Single and multi-carrier modes were used as documented in the respective appendix. The EUT was activated at the maximum nominal RF output power per activated carrier and random data was transmitted in all time slots, with the various modulations being tested one at a time. Connections and reference points for measurements are shown in the set-ups below.

### Test frequencies used

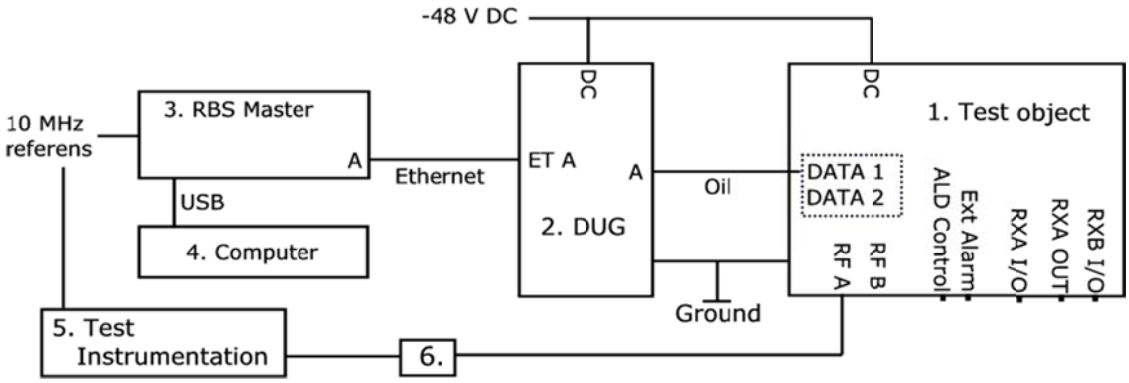
In single carrier mode:

| Channel | ARFCN | Frequency | Comment |
|---|---|---|---|
| B | 128 | 869.2 MHz | TX band lowest possible frequency |
| B+1 | 129 | 869.4 MHz | TX alternate low frequency, one channel into band |
| M | 190 | 881.6 MHz | TX band center frequency |
| T-1 | 250 | 893.6 MHz | TX alternate high frequency, one channel into band |
| T | 251 | 893.8 MHz | TX band highest possible frequency |

In multi-carrier mode:

| Channel | ARFCN | Frequency | Comment |
|---|---|---|---|
| B+1 | 129 | 869.4 MHz | TX low multi-carrier bottom frequency used |
| B+9 | 137 | 871.0 MHz | TX high multi-carrier bottom frequency used |
| M-4 | 186 | 880.8 MHz | TX low multi-carrier mid frequency used |
| M+4 | 194 | 882.4 MHz | TX high multi-carrier mid frequency used |
| T-9 | 242 | 892.0 MHz | TX low multi-carrier top frequency used |
| T-1 | 250 | 893.6 MHz | TX high multi-carrier top frequency used |

**Test set-up, conducted measurements**



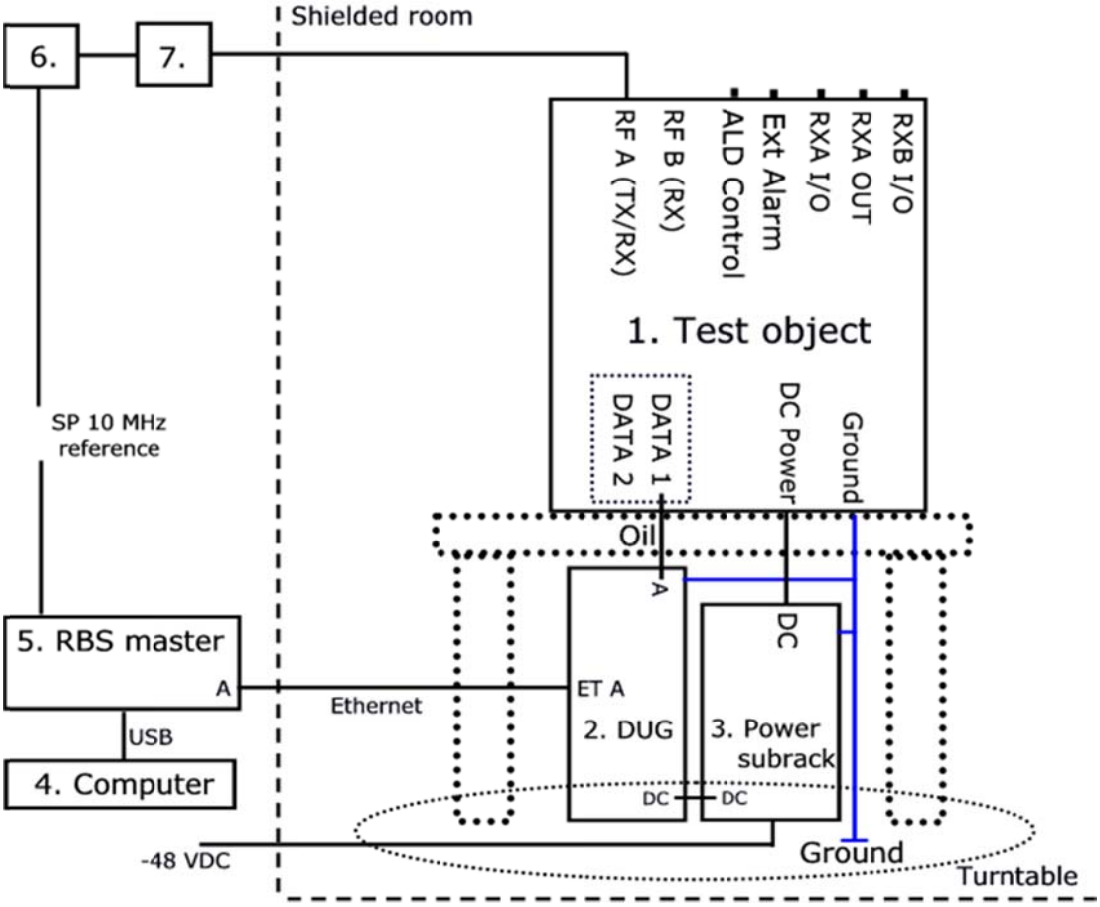

**Test object**

1. RRUS 01 B5, product KRC 118 70/2, revision R1B, SN C823826176 with FCC ID: TA8AKRC11870-2 and IC: 287AB-AS118702

**Functional test equipment**

2. Digital unit DUG 20 01,
   product KDU 137 569/1, revision R2A, SN C823667528
3. RBS Master 2E hardware,
   product LPY 107 1007/3, revision R1C/A, SN T01E6555543, BAMS 1000878432
4. Laptop Compaq nc6220, S/N: CNU54722NZ, BAMS 1000208319,
   with RBS Master 2E control software
5. Measurement equipment specified in respective appendix or
   client supplied Agilent MXA Signal Analyser model N9020A 20 Hz – 3.6 GHz,
   BAMS 1000785533 used to verify the modulation schemes
6. Attenuator / filter listed under test equipment in respective appendix

**Test set-up, radiated emission**




**Test object**

1. RRUS 01 B5, product KRC 118 70/2, revision R1B, SN C823826176 with FCC ID: TA8AKRC11870-2 and IC: 287AB-AS118702

**Functional test equipment**

2. Digital unit DUG 20 01, product KDU 137 569/1, revision R2A, SN C823667528
3. Power sub-rack, details see below
4. Laptop Compaq nc6220, S/N: CNU54722NZ, BAMS 1000208319, with software RBS Master 2E control software
5. RBS Master 2E hardware, product LPY 107 1007/3, revision R1C/A, SN T01E6555543, BAMS 1000878432, using shielded Ethernet multi-wire with RJ-45 connectors and transmission mode E1 to DUG port ET A
6. Rohde & Schwarz ESI40 (SP 503 125) for signal monitoring or 50 ohm termination
7. Attenuator 30 dB, SP 900229

## Test object connections

| Interface | Type of port |
|---|---|
| -48.0 V DC | DC power |
| Ground strap connected to grounding screw on bottom side | Ground |
| RF A, 7/16” female RF connector | RF/Antenna |
| RF B, 7/16” female RF connector, unconnected | RF/Antenna |
| 3 x feed-through for optical fibre connections, | |
| 1x fibre connected to internal Data 1 port, | Signal |
| remaining unconnected, covered by rubber plugs | |
| RXA I/O, SMA female, unconnected, covered by metal protection cap | Signal |
| RXA OUT, SMA female, unconnected, covered by metal protection cap | Signal |
| RXB I/O, SMA female, unconnected, covered by metal protection cap | Signal |
| ALD control, unconnected, covered by metal protection cap | Signal |
| Ext Alarm, unconnected, covered by metal protection cap | Signal |

Note: A bottom view photo of the EUT ports is included in appendix 7.

**Power sub-rack used during radiated test:**

| Pos. | Unit | Product Number | Revision | Serial Number |
|---|---|---|---|---|
| | Power subrack | SXK 109 8115/1 | R2A | - |
| 1 | PDU 01 01 | BMG 980 336/2 | R4F | BJ31532384 |
| 2 | PDU 01 01 | BMG 980 336/2 | R4F | BJ31532382 |
| 3 | SHU 01 01 | BGK 901 18/1 | R3C | BJ31446269 |
| 4 | DUMMY | SXK 109 8257/1 | R1F | - |
| 5 | DUMMY | SXK 109 8257/1 | R1F | - |
| 6 | PFU | KFE 101 11621 | R1B | BR80910495 |
| 7 | DUMMY | SXK 109 8257/1 | R1F | - |
| 8 | DUMMY | SXK 109 8257/1 | R1F | - |
| 9 | PCF 02 01 | KFE 101 1157/1 | R1C | BW95301450 |

## Test object software

| Software | Revision |
|---|---|
| CXP 104 0013/07 | R65F |

## References

Measurements were done according to relevant parts of the following standards:

ANSI C63.4-2009
ANSI/TIA/EIA-603-C-2004
ANSI/TIA/EIA 136-280-D-2002
CFR 47 part 2, October 1st, 2010
CFR 47 part 22, October 1st, 2010
RSS-Gen, Issue 3
RSS-132, Issue 2

## Reservation

The test results in this report apply only to the particular Equipment Under Test (EUT) as declared in the report.

## Delivery of test object

The test object was delivered: 2011-12-07

## Test equipment

| Measurement equipment | Calibration Due | SP number |
|---|---|---|
| Anechoic chamber, Hertz | 2013-10 | 15:116 |
| Boonton 4500A RF Peak power meter/analyser | 2012-11 | 503 144 |
| Boonton Power sensor 56518-S/4 | 2012-11 | 503 146 |
| Rohde & Schwarz FSQ40 | 2012-07 | 504 143 |
| Rohde & Schwarz FSIQ40 | 2012-07 | 503 738 |
| Rohde & Schwarz ESI40 | 2012-07 | 503 125 |
| Rohde & Schwarz Vector Network Analyser | 2012-07 | 503 687 |
| Chase bilog antenna CBL 6121A | 2014-10 | 502 460 |
| Schaffner Reference Dipole BSRD6500 | 2012-03 | 502 181 |
| EMCO Horn Antenna 3115 | 2014-01 | 502 175 |
| EMCO Horn Antenna 3115 | 2014-01 | 501 548 |
| MITEQ Low Noise Amplifier | 2012-08 | 503 277 |
| Flann Std gain horn 20240-20 | 2014-03 | 503 674 |
| Attenuator 40 dB | 2012-08 | 504 159 |
| Attenuator 30 dB | 2012-08 | 900 229 |
| Attenuator 30 dB | 2012-05 | 503 870 |
| Attenuator 10 dB | 2012-08 | 900 118 |
| High pass filter | 2012-08 | 504 199 |
| High pass filter | 2012-08 | 504 200 |
| High pass filter | 2012-08 | 502 758 |
| High pass filter | 2012-10 | 503 740 |
| Multimeter Fluke 87 | 2012-05 | 502 190 |
| Testo 615 temperature and humidity meter | 2012-03 | 503 498 |
| Testo 635 temperature and humidity meter | 2013-05 | 504 203 |

## Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation ”SP-QD 10885”. The uncertainties are calculated with a coverage factor k=2 (95% level of confidence).

## Test engineers

Jörgen Wassholm, Martin Nilsson, Martin Forsberg and Reinhold Reul, SP

## Manufacturer’s representative

Hua Yang, Ericsson (China) Communications Company Ltd

## RF Power output measurements according to CFR 47 2.1046

| Date | Temperature | Humidity |
|---|---|---|
| 2011-12-13 | 22 °C ± 3 °C | 23 % ± 5 % |

### Test set-up and procedure

Measurements were made at connector RF A. The output was connected to a peak power analyser via a 50 ohm attenuator.

| Measurement equipment | SP number |
|---|---|
| Boonton 4500A RF Peak power meter/analyzer | 503 144 |
| Boonton Power sensor 56518-S/4 | 503 146 |
| Attenuator | 504 159 |
| Multimeter Fluke 87 | 502 190 |
| Testo 635 temperature and humidity meter | 504 203 |

**Measurement uncertainty**: 0.7 dB

**Results**

Single carrier 1x47.8 dBm, RBS master 2E setting 48

| Transmitter power (dBm)<br>Peak / RMS | |
|---|---|
| Channel:<br>Modulation: | M |
| GMSK | 48.3 / 47.3 |
| 16QAM | 52.4 / 47.3 |
| 32QAM | 52.6 / 47.2 |
| AQPSK | 51.4 / 47.4 |

Multi carrier, 2 x 44.8 dBm, RBS master 2E setting 45 (per carrier), channels M-4 and M+4

| Aggregated transmitter power (dBm)<br>Peak / RMS | |
|---|---|
| Channel:<br>Modulation: | (M-4) & (M+4) |
| GMSK | 51.0 / 47.3 |
| 16QAM | 54.9 / 46.9 |
| 32QAM | 54.5 / 46.5 |
| AQPSK | 54.1 / 47.3 |

The theoretical RMS power per carrier is 3 dB below the aggregated measured RMS values.

**Limits**

CFR 47 § 22.913: 500 W ERP shall not be exceeded.

| | |
|---|---|
| Complies? | Yes |

## Occupied bandwidth measurements according to 47CFR 2.1049

| Date | Temperature | Humidity |
|---|---|---|
| 2011-12-13 | 22 °C ± 3 °C | 23 % ± 5 % |

### Test set-up and procedure

Measurements were made at connector RF A. The output was connected to a spectrum analyser with the RMS detector activated. The spectrum analyser was connected to an external 10 MHz reference standard during the measurements.

| Measurement equipment | SP number |
|---|---|
| Rohde & Schwarz FSIQ40 | 503 738 |
| Attenuator | 504 159 |
| Multimeter Fluke 87 | 502 190 |
| Testo 635 temperature and humidity meter | 504 203 |

**Measurement uncertainty:** 3.7 dB

### Results

Configuration: Single carrier, RBS master 2E setting 48

| Diagram | Channel (Frequency) | Modulation | OBW | |
|---|---|---|---|---|
| 1. | M (881.6 MHz) | GMSK | 241 | kHz |
| 2: | M (881.6 MHz) | 16QAM | 240 | kHz |
| 3: | M (881.6 MHz) | 32QAM | 240 | kHz |
| 4. | M (881.6 MHz) | AQPSK | 238 | kHz |

The diagrams are shown on the following pages.

**Diagram 1:**

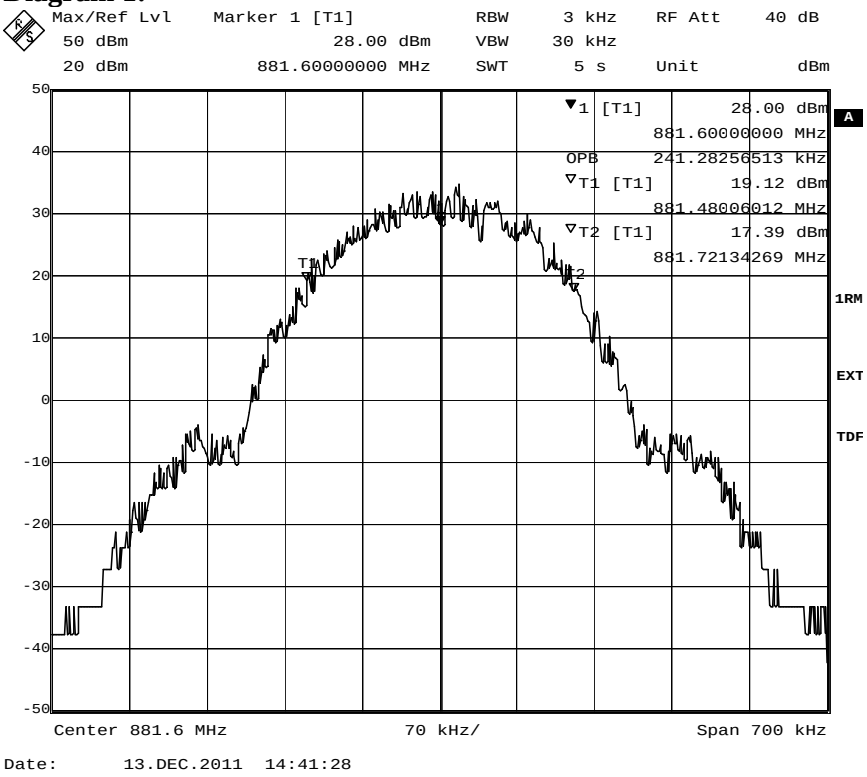
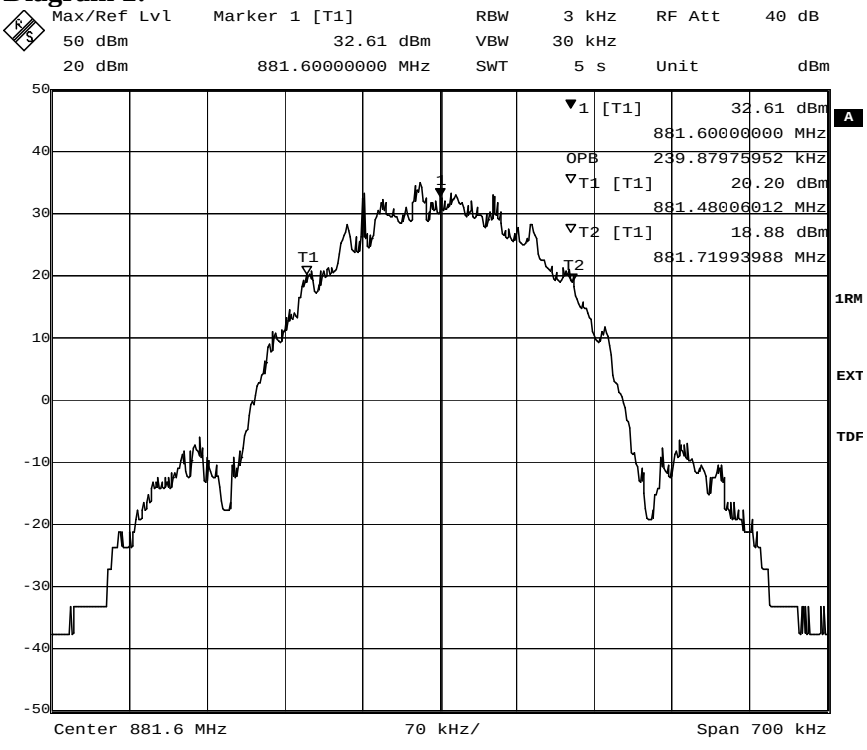
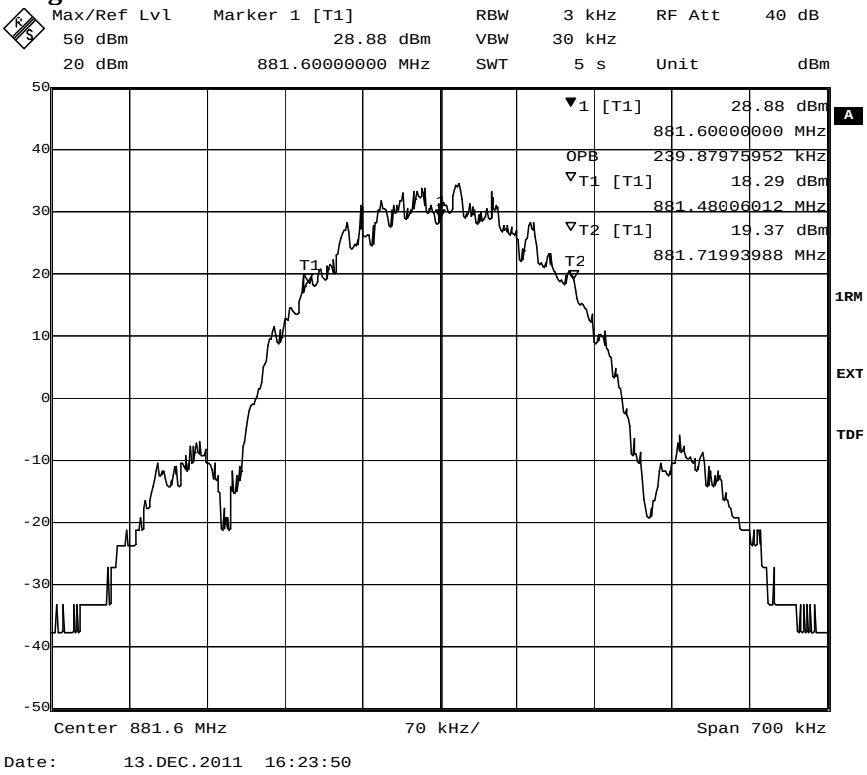


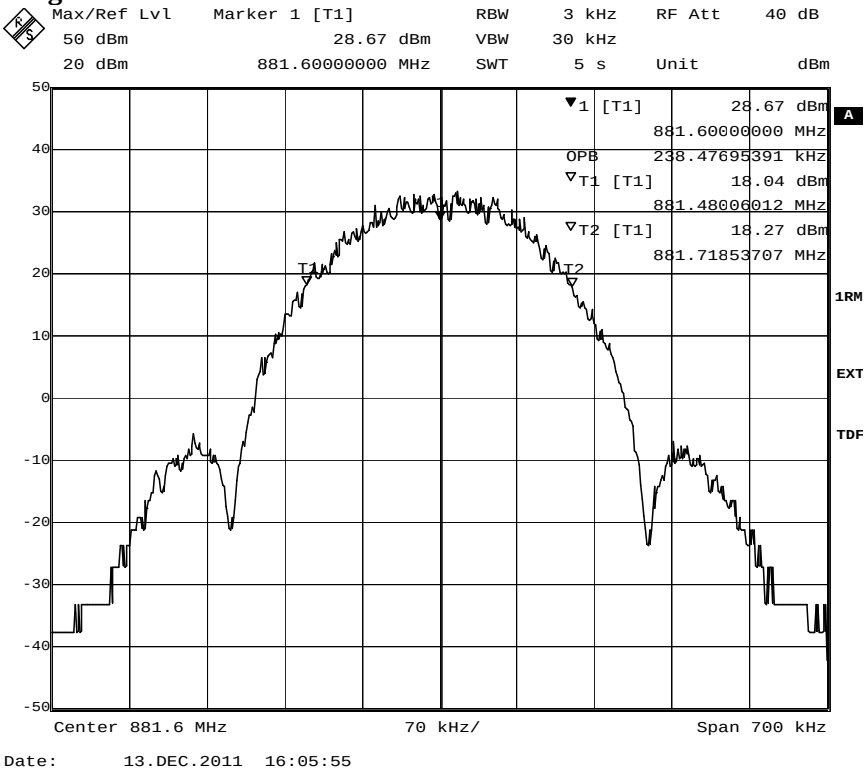

**Diagram 2:**



## Diagram 3:




## Diagram 4:



## Band edge measurements according to 47CFR 2.1051

| Date | Temperature | Humidity |
|---|---|---|
| 2011-12-13 | 22 °C ± 3 °C | 23 % ± 5 % |
| 2011-12-14 | 22 °C ± 3 °C | 30 % ± 5 % |

### Test set-up and procedure

The measurements were made per definition in §22.917, with the EUT port RF A via an attenuator connected to a spectrum analyzer with the RMS detector activated. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements.

| Measurement equipment | SP number |
|---|---|
| Rohde & Schwarz FSIQ40 | 503 738 |
| Attenuator | 504 159 |
| Multimeter Fluke 87 | 502 190 |
| Testo 635 temperature and humidity meter | 504 203 |

**Measurement uncertainty:** 3.7 dB

### Results

Configuration: Single carrier

Modulation 16QAM:

| Diagram | Channel | Power setting | RMS power measured |
|---|---|---|---|
| 1 a, b, c | B | 40 | 39.2 dBm |
| 2 a, b, c | B+1 | 48 | 47.3 dBm |
| 3 a, b, c | T-1 | 48 | 46.9 dBm |
| 4 a, b, c | T | 40 | 39.1 dBm |

Modulation 32QAM:

| Diagram | Channel | Power setting | RMS power measured |
|---|---|---|---|
| 5 a, b, c | B | 40 | 39.3 dBm |
| 6 a, b, c | B+1 | 48 | 47.1 dBm |
| 7 a, b, c | T-1 | 48 | 46.9 dBm |
| 8 a, b, c | T | 40 | 39.1 dBm |

Modulation AQPSK:

| Diagram | Channel | Power setting | RMS power measured |
|---|---|---|---|
| 9 a, b, c | B | 40 | 39.4 dBm |
| 10 a, b, c | B+1 | 48 | 47.2 dBm |
| 11 a, b, c | T-1 | 48 | 46.9 dBm |
| 12 a, b, c | T | 40 | 39.2 dBm |

The diagrams are shown on the following pages.

### Remark

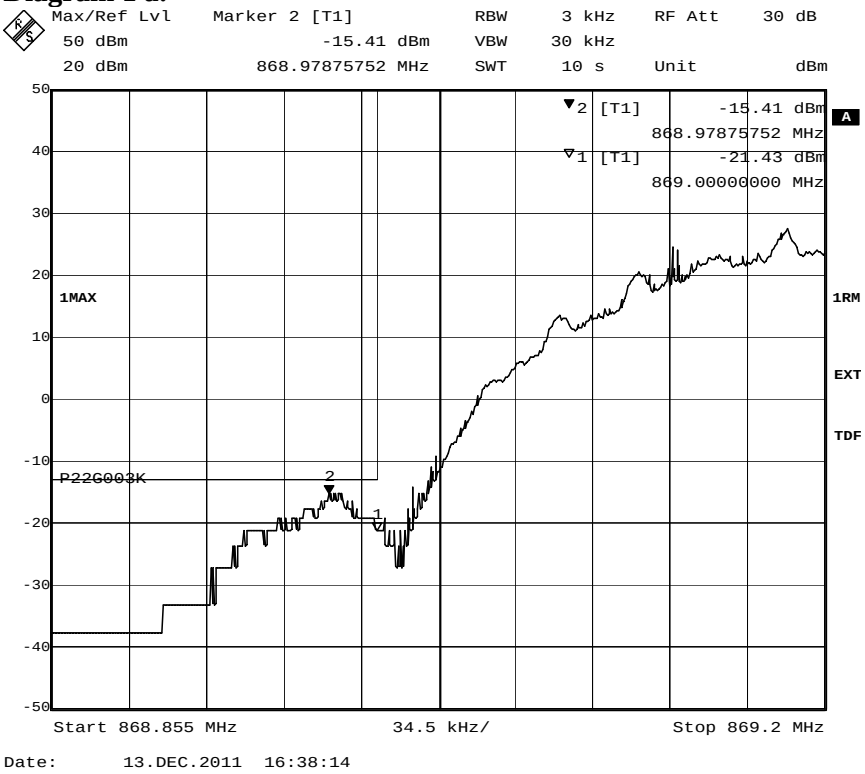
Above given measured RMS values for the channels adjacent to the frequency band edges B and T are the maximum RF output power that can be used on the respective channel to meet band-edge requirements.

**Limits**

The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least 43 + 10 log P dB.

| | |
|---|---|
| Complies? | Yes |

## Diagram 1 a:




## Diagram 1 b:

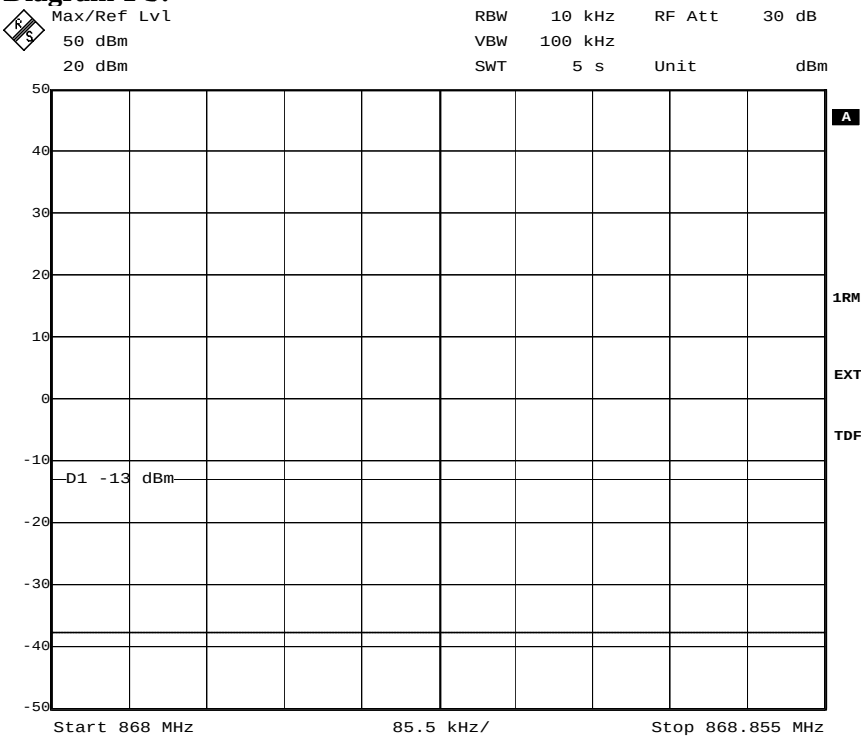


**Diagram 1 c:**

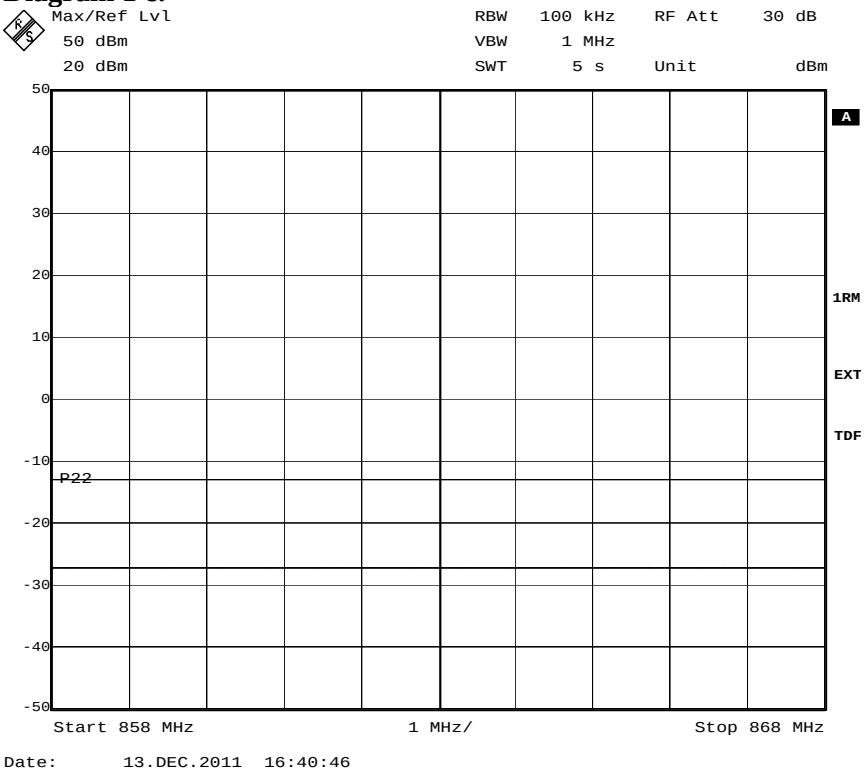
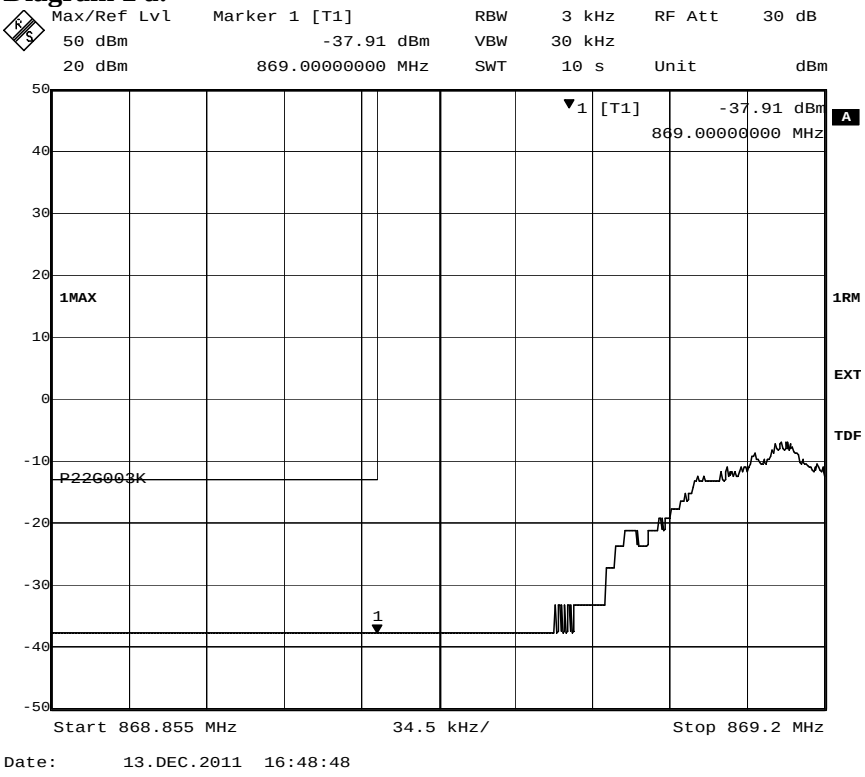
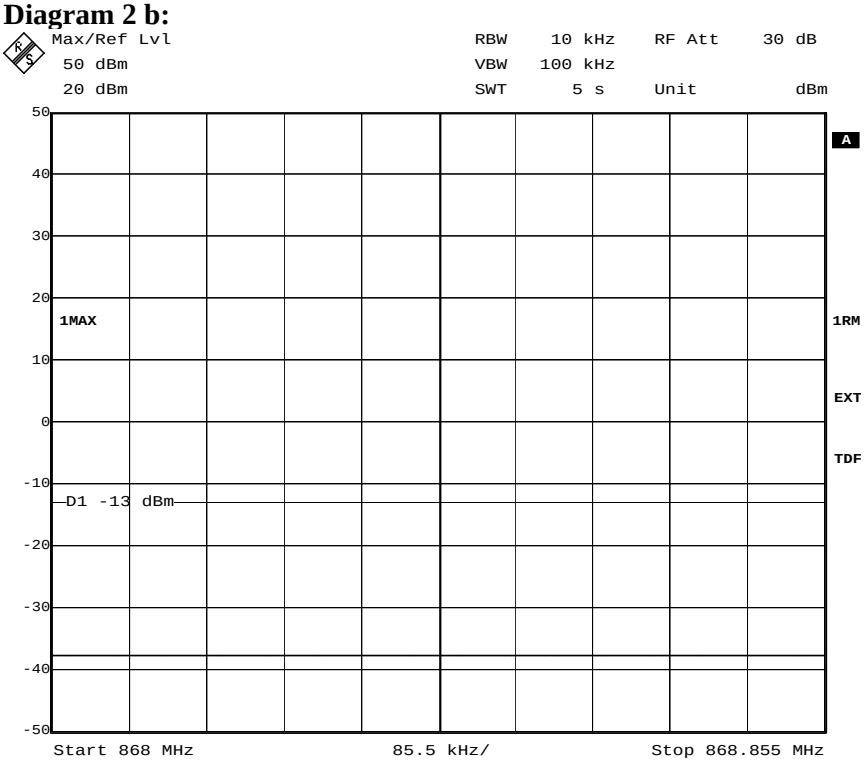

Max/Ref Lvl
50 dBm
20 dBm
RBW 100 kHz
VBW 1 MHz
SWT 5 s
RF Att 30 dB
Unit dBm
50
40
30
20
10
0
-10
-20
-30
-40
-50
A
1RM
EXT
TDF
P22
Start 858 MHz
1 MHz/
Stop 868 MHz
Date: 13.DEC.2011 16:40:46

**Diagram 2 a:**




Date: 13.DEC.2011 16:48:48

**Diagram 2 b:**




Date: 13.DEC.2011 16:52:38

**Diagram 2 c:**

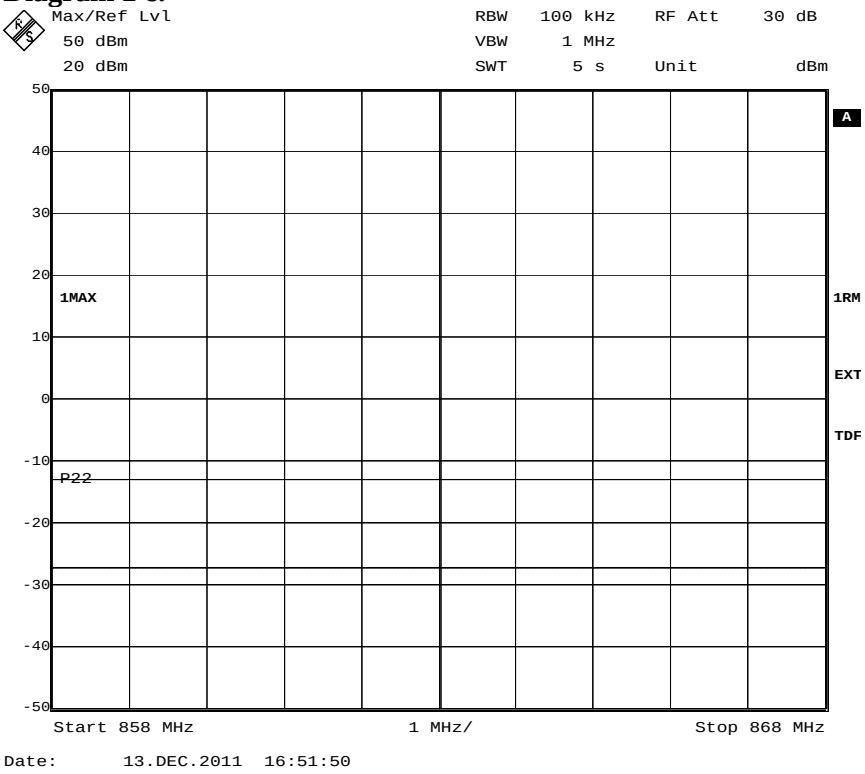
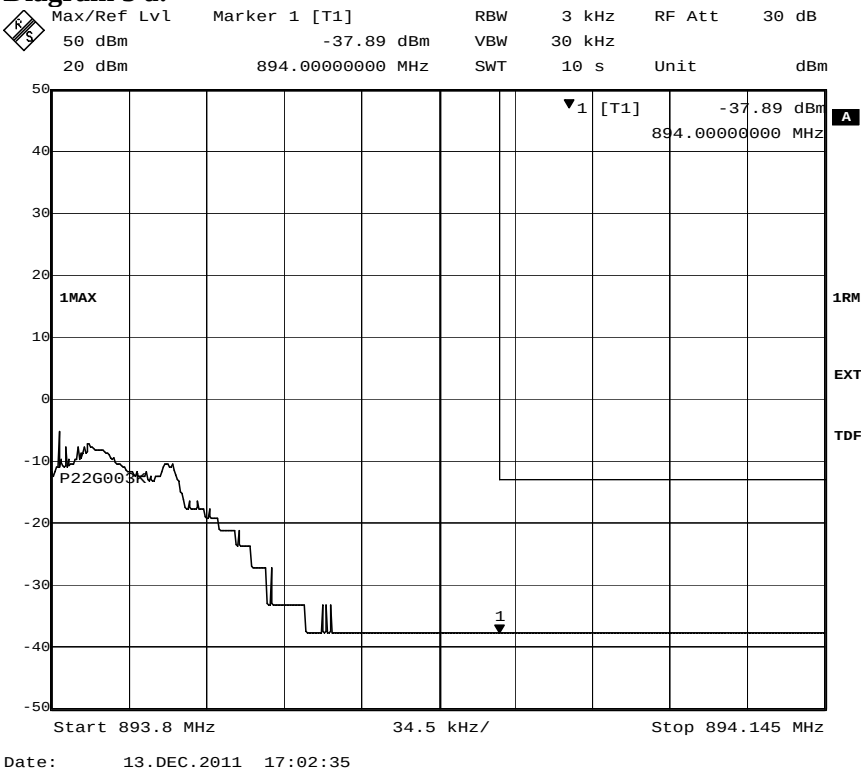
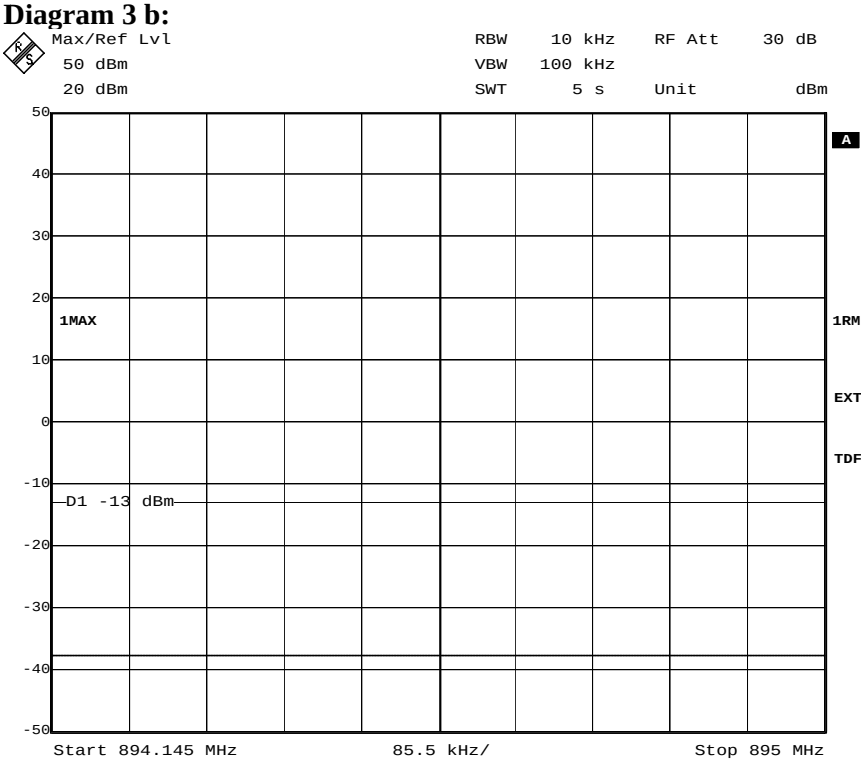

Max/Ref Lvl
50 dBm
20 dBm
RBW 100 kHz
VBW 1 MHz
SWT 5 s
RF Att 30 dB
Unit dBm
50
40
30
20
10
0
-10
-20
-30
-40
-50
1MAX
P22
A
1RM
EXT
TDF
Start 858 MHz
1 MHz/
Stop 868 MHz
Date: 13.DEC.2011 16:51:50

**Diagram 3 a:**



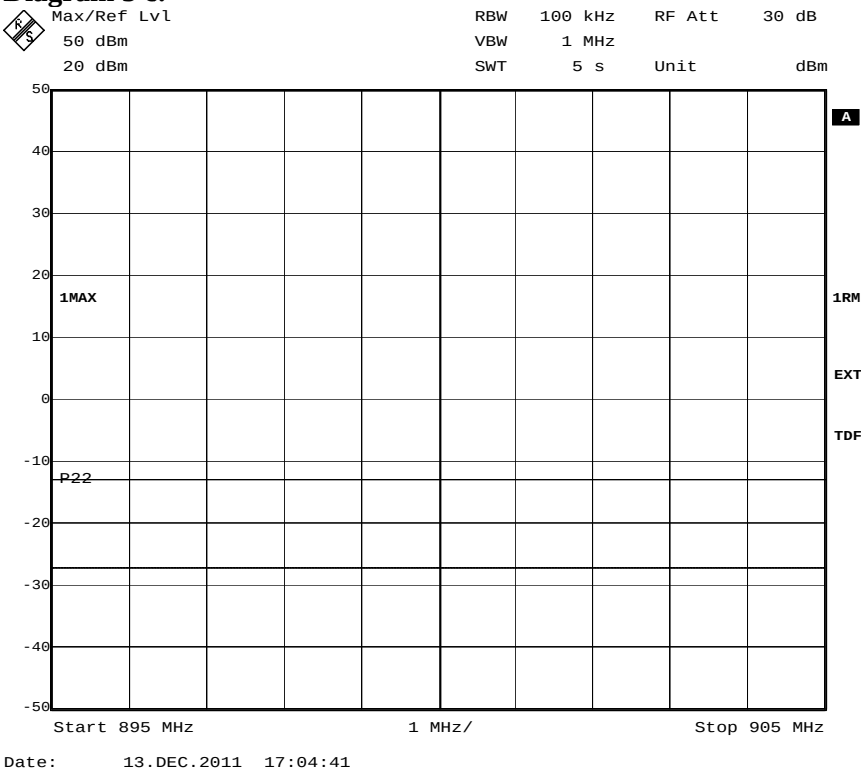

Date: 13.DEC.2011 17:02:35

**Diagram 3 b:**

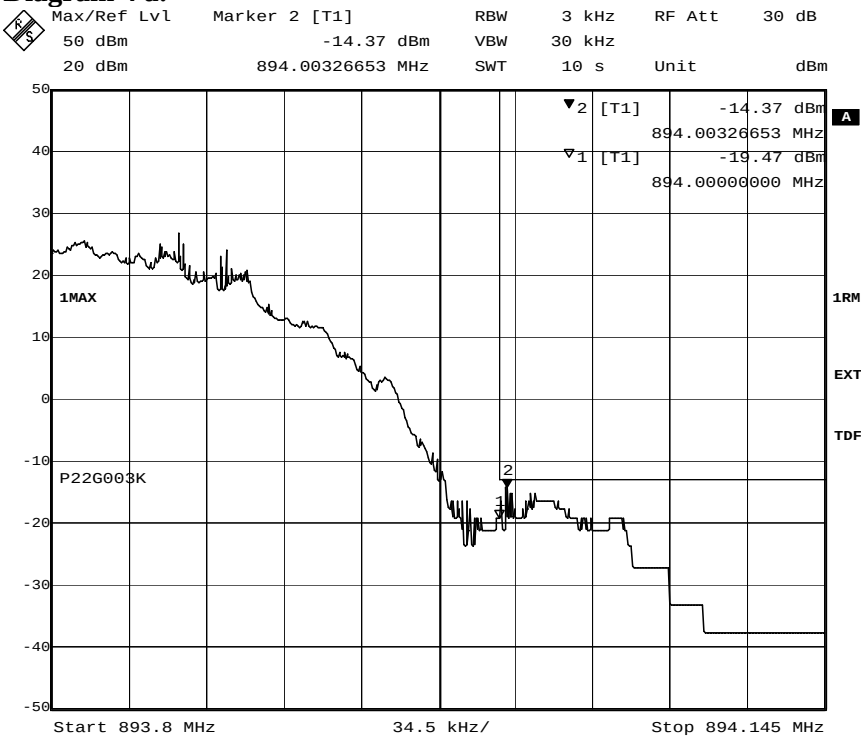



Date: 13.DEC.2011 17:03:56

**Diagram 3 c:**


Max/Ref Lvl
50 dBm
20 dBm
RBW 100 kHz
VBW 1 MHz
SWT 5 s
RF Att 30 dB
Unit dBm
50
40
30
20
10
0
-10
-20
-30
-40
-50
1MAX
P22
A
1RM
EXT
TDF
Start 895 MHz
1 MHz/
Stop 905 MHz
Date: 13.DEC.2011 17:04:41

## Diagram 4 a:




## Diagram 4 b:

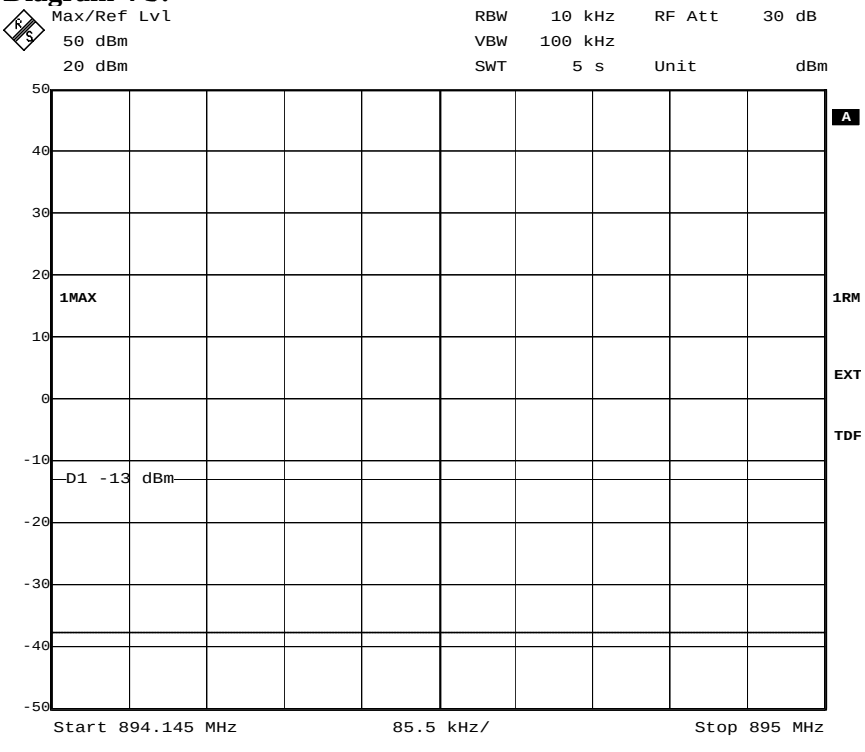


**Diagram 4 c:**

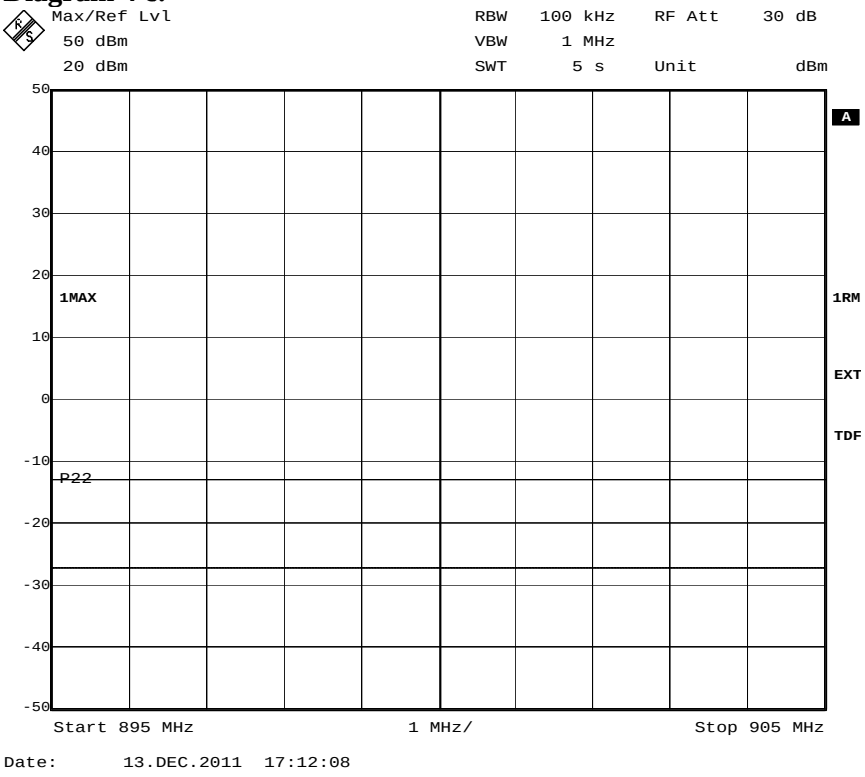

Max/Ref Lvl
50 dBm
20 dBm
RBW 100 kHz
VBW 1 MHz
SWT 5 s
RF Att 30 dB
Unit dBm
50
40
30
20
10
0
-10
-20
-30
-40
-50
1MAX
P22
A
1RM
EXT
TDF
Start 895 MHz
1 MHz/
Stop 905 MHz
Date: 13.DEC.2011 17:12:08

**Diagram 5 a:**

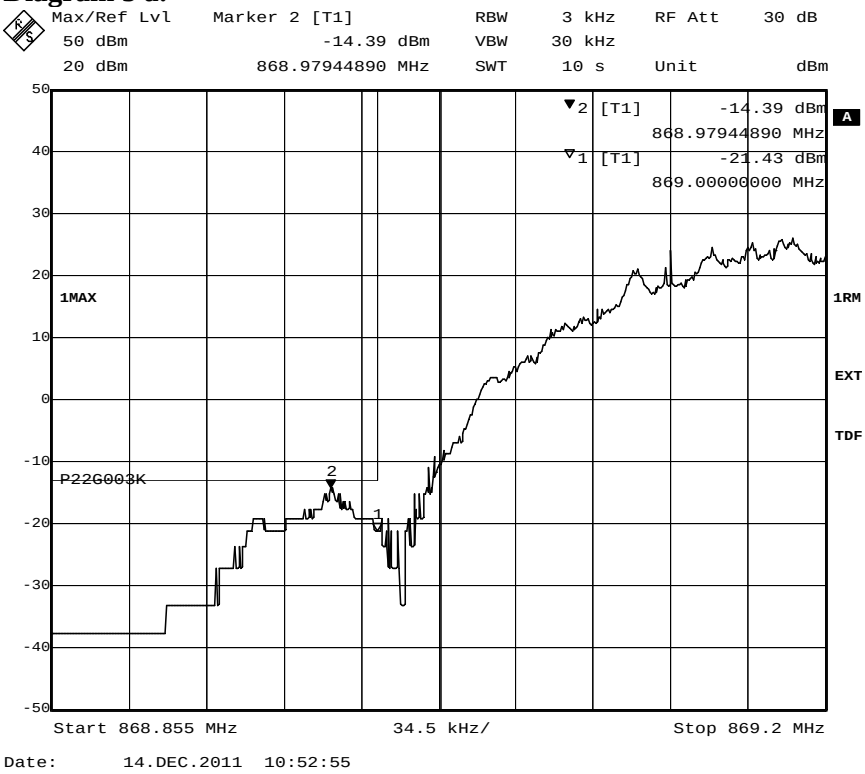



**Diagram 5 b:**

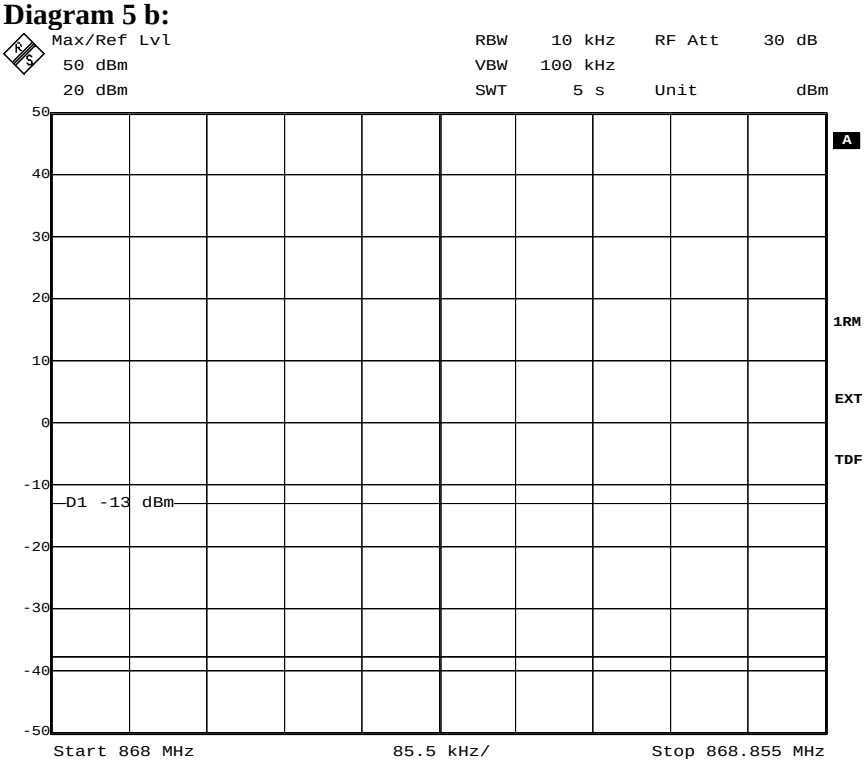


**Diagram 5 c:**

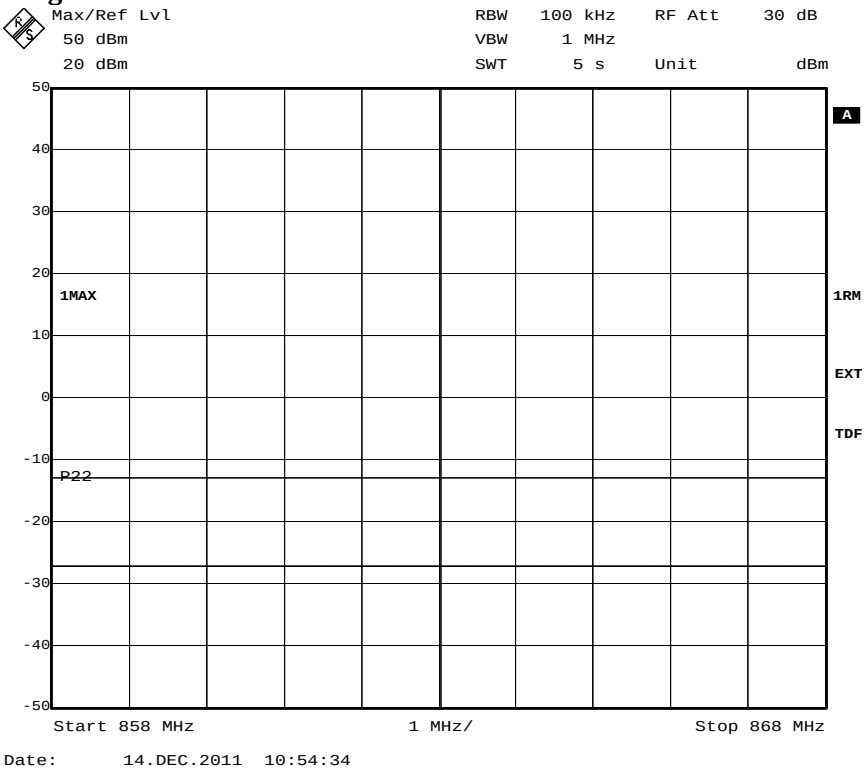
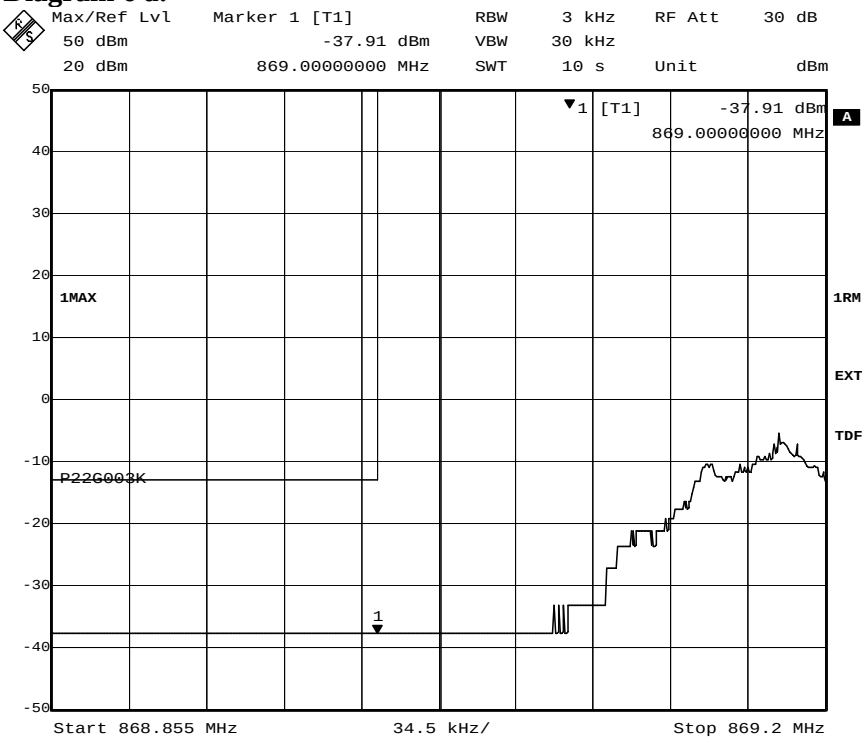
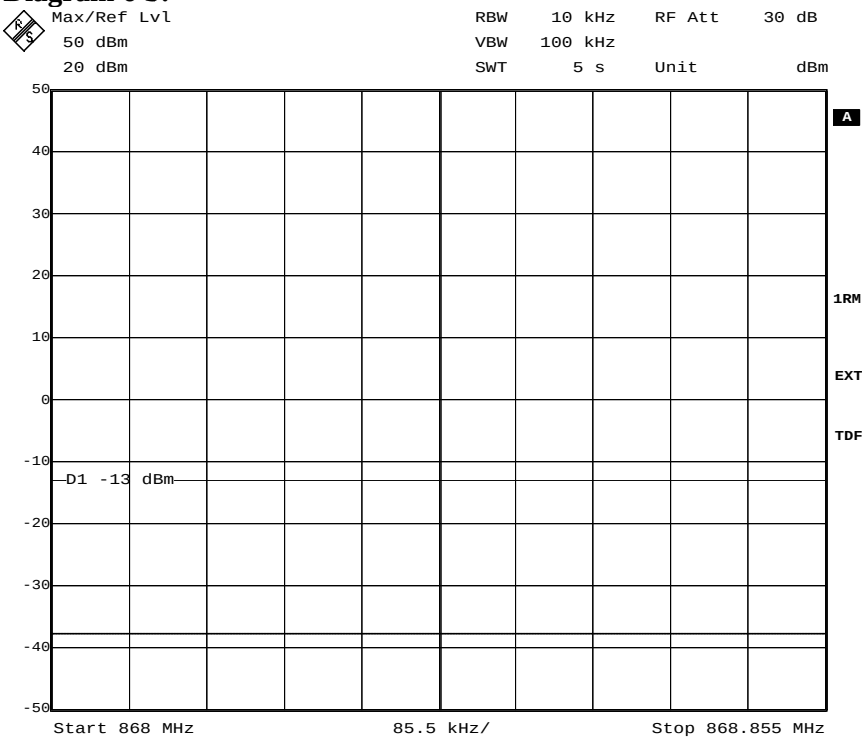

Max/Ref Lvl
50 dBm
20 dBm
RBW 100 kHz
VBW 1 MHz
SWT 5 s
RF Att 30 dB
Unit dBm
50
40
30
20
10
0
-10
-20
-30
-40
-50
1MAX
P22
A
1RM
EXT
TDF
Start 858 MHz
1 MHz/
Stop 868 MHz
Date: 14.DEC.2011 10:54:34

**Diagram 6 a:**




Date: 14.DEC.2011 10:46:06

**Diagram 6 b:**




Date: 14.DEC.2011 10:47:19

**Diagram 6 c:**

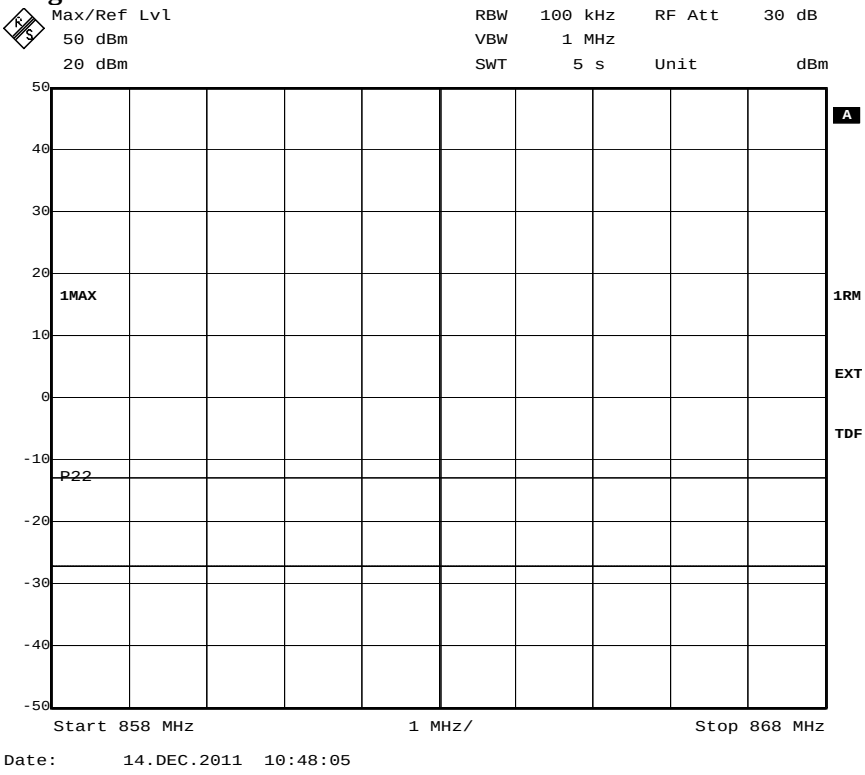

Max/Ref Lvl
50 dBm
20 dBm
RBW 100 kHz
VBW 1 MHz
SWT 5 s
RF Att 30 dB
Unit dBm
50
40
30
20
10
0
-10
-20
-30
-40
-50
1MAX
P22
A
1RM
EXT
TDF
Start 858 MHz
1 MHz/
Stop 868 MHz
Date: 14.DEC.2011 10:48:05

**Diagram 7 a:**

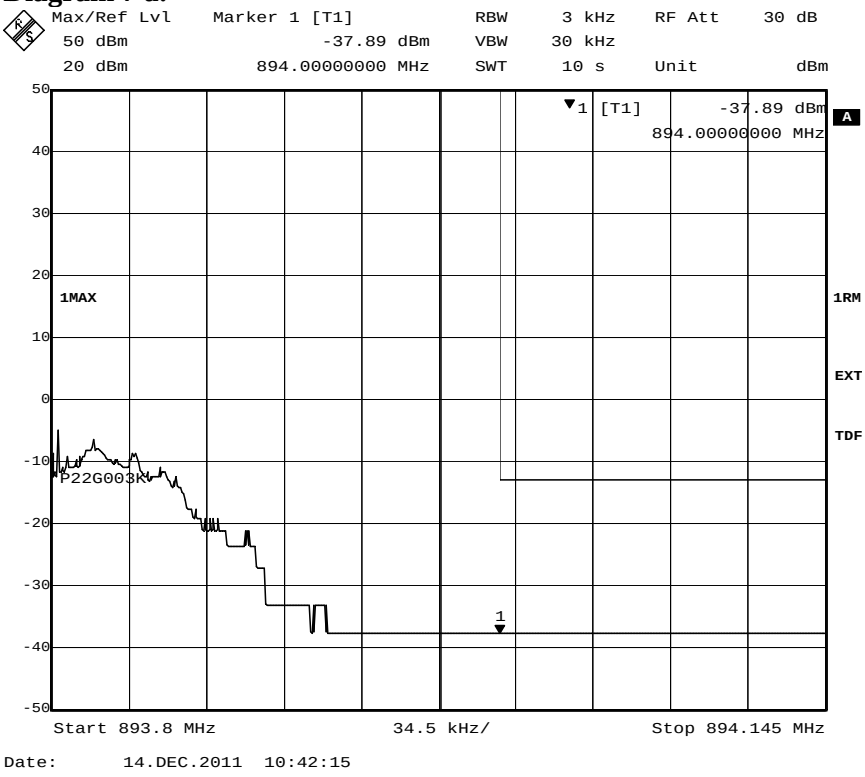



**Diagram 7 b:**

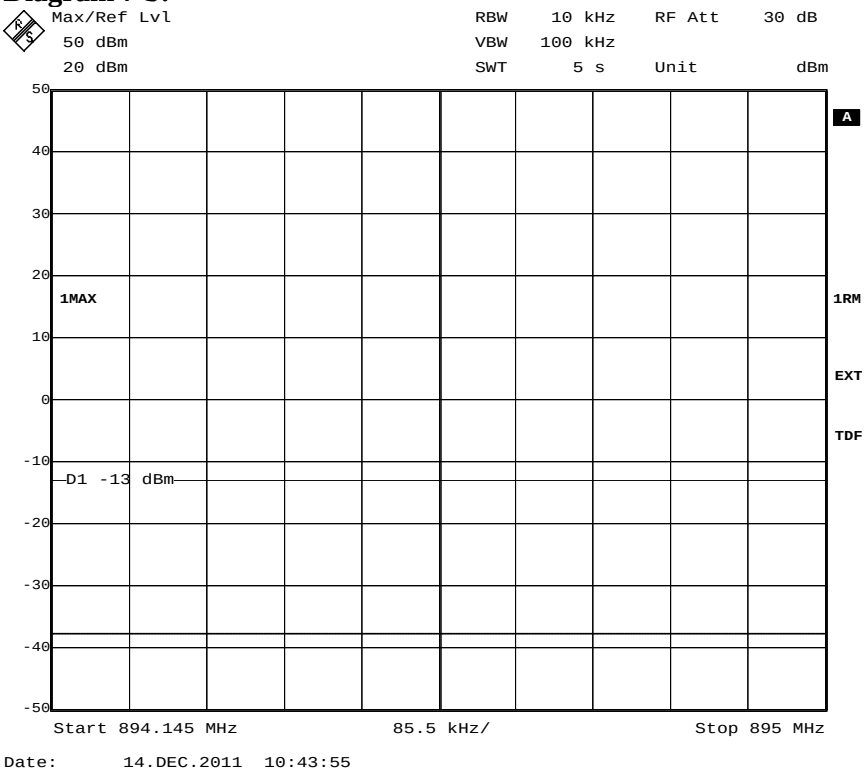


**Diagram 7 c:**

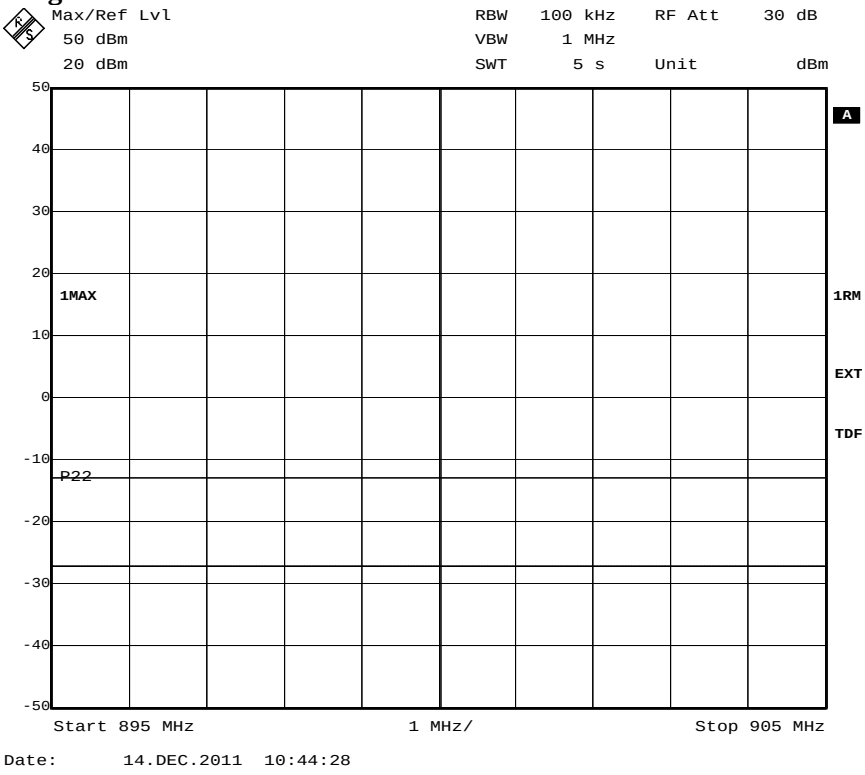

Max/Ref Lvl
50 dBm
20 dBm
RBW 100 kHz
VBW 1 MHz
SWT 5 s
RF Att 30 dB
Unit dBm
50
40
30
20
10
0
-10
-20
-30
-40
-50
1MAX
P22
A
1RM
EXT
TDF
Start 895 MHz
1 MHz/
Stop 905 MHz
Date: 14.DEC.2011 10:44:28

**Diagram 8 a:**

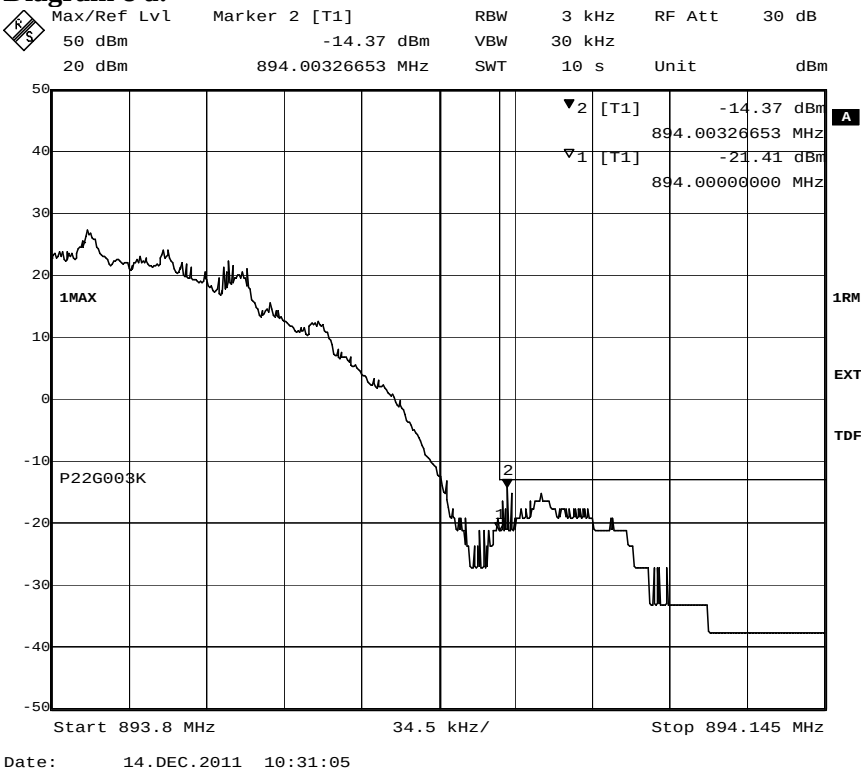



**Diagram 8 b:**

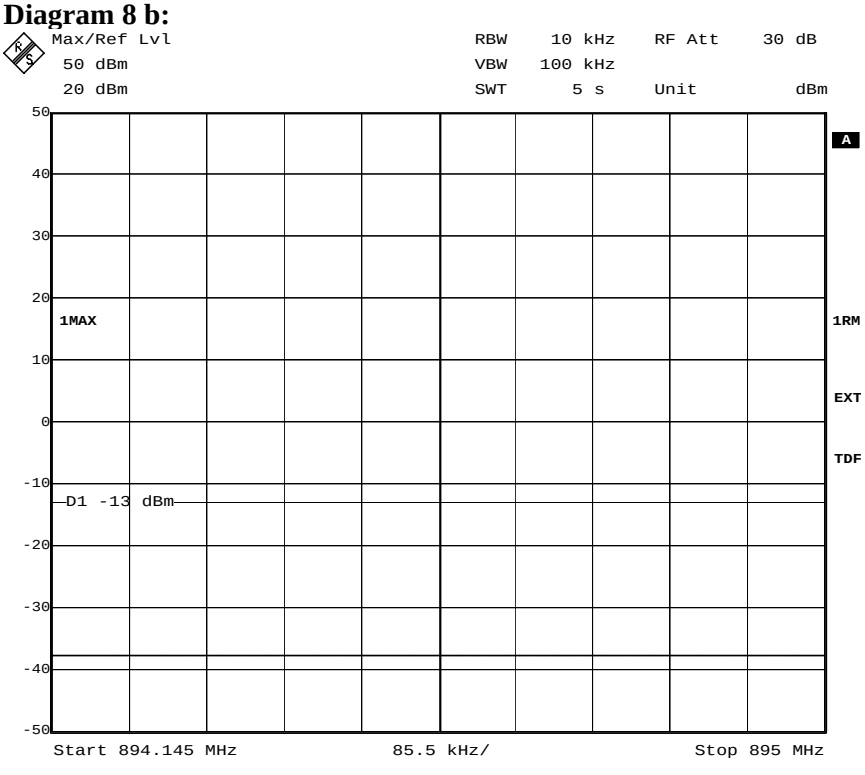


**Diagram 8 c:**

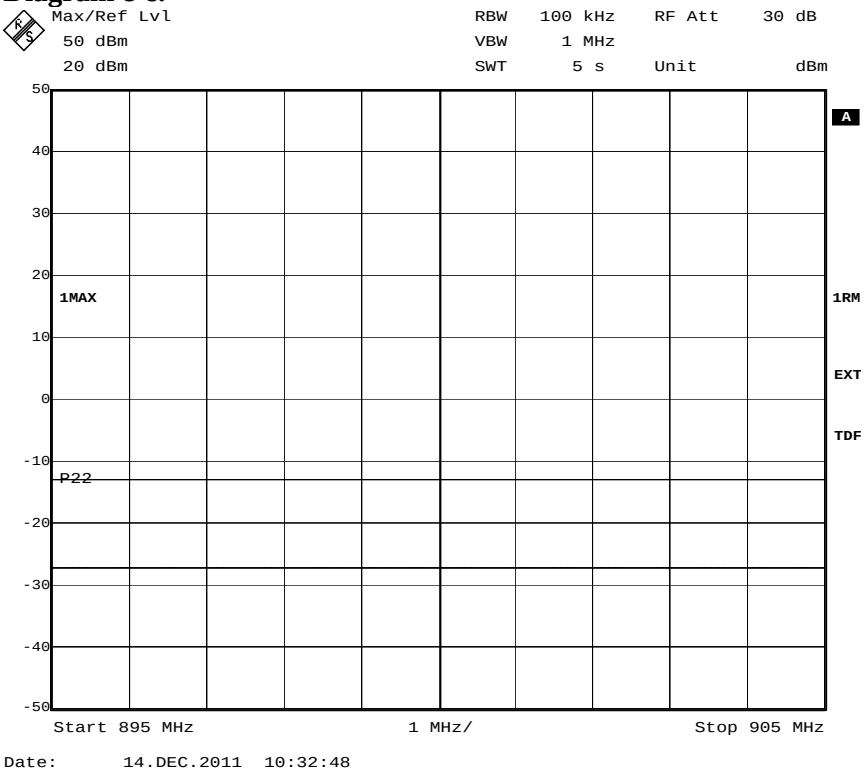

Max/Ref Lvl
50 dBm
20 dBm
RBW 100 kHz
VBW 1 MHz
SWT 5 s
RF Att 30 dB
Unit dBm
50
40
30
20
10
0
-10
-20
-30
-40
-50
1MAX
P22
A
1RM
EXT
TDF
Start 895 MHz
1 MHz/
Stop 905 MHz
Date: 14.DEC.2011 10:32:48

**Diagram 9 a:**

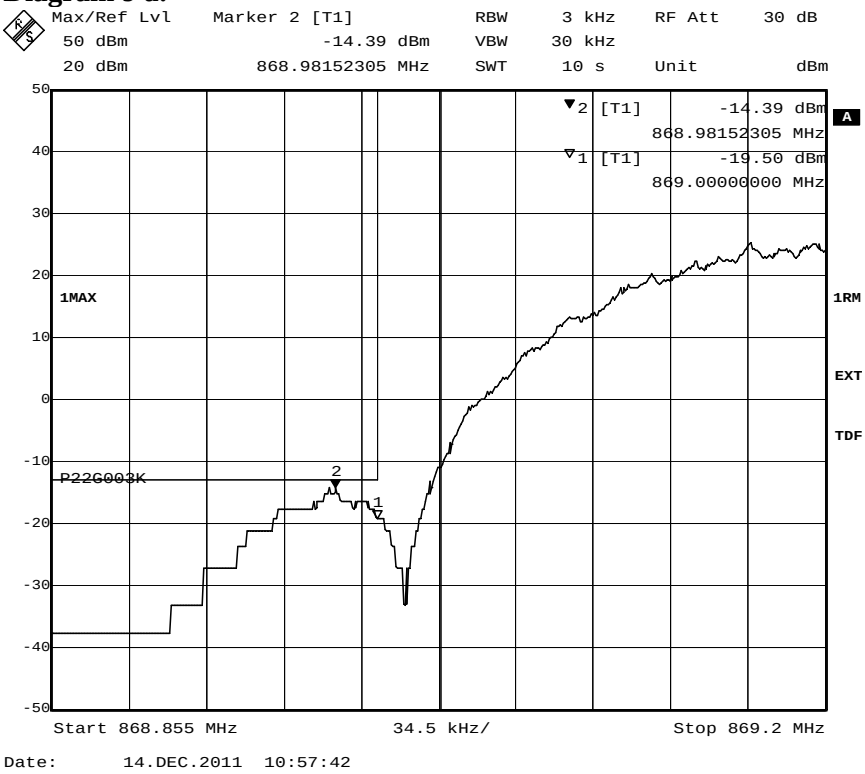



**Diagram 9 b:**

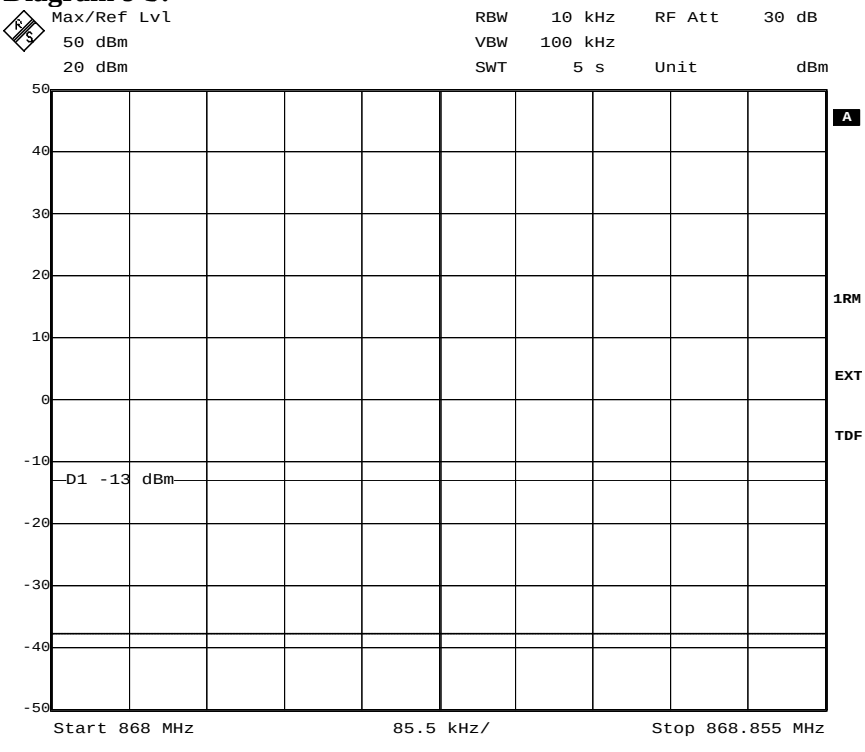


**Diagram 9 c:**

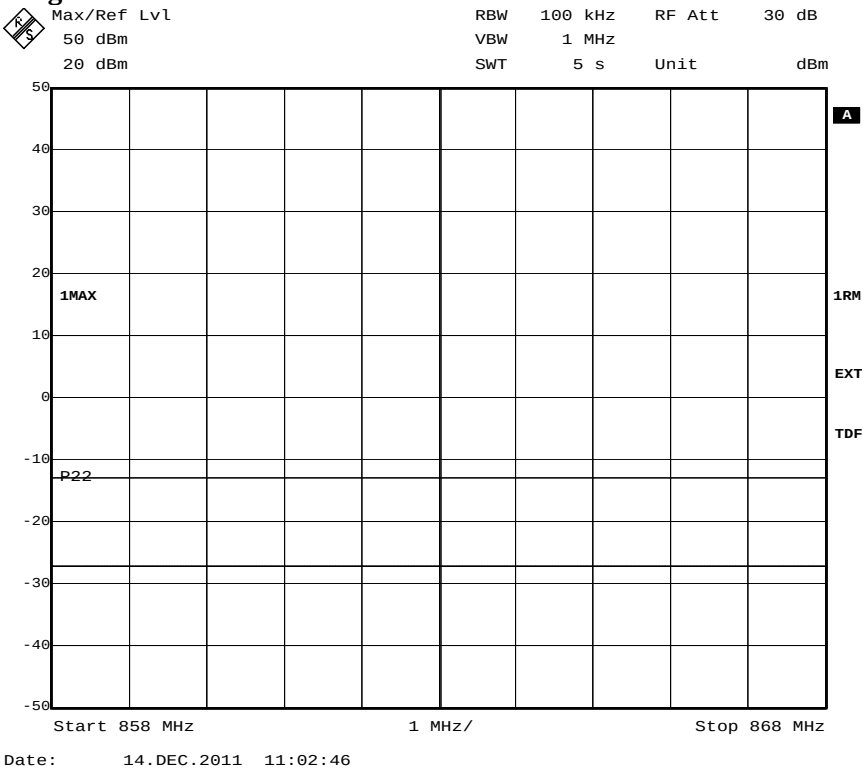
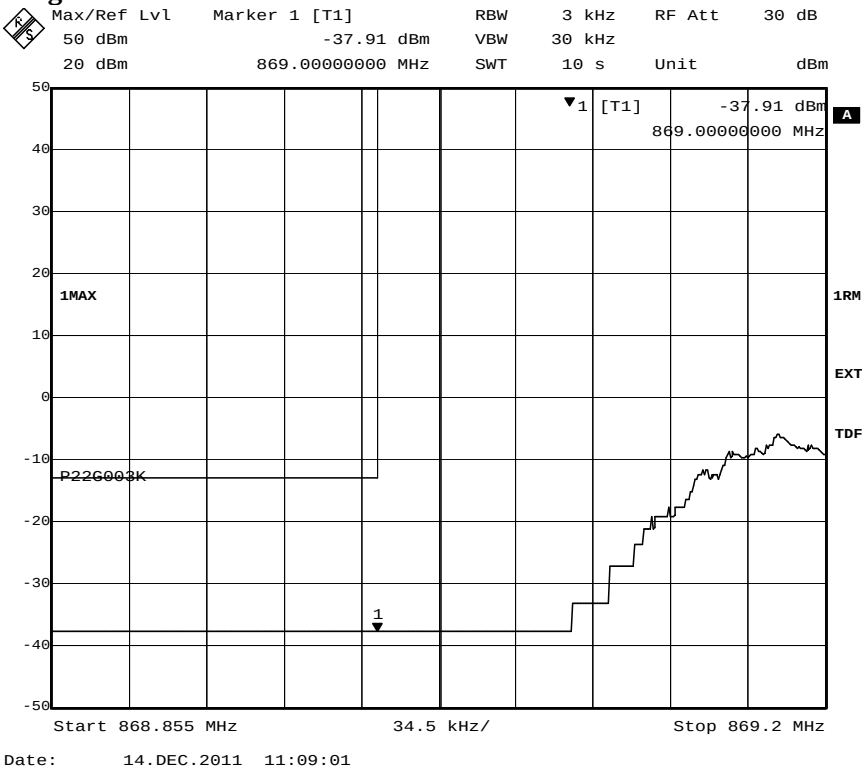
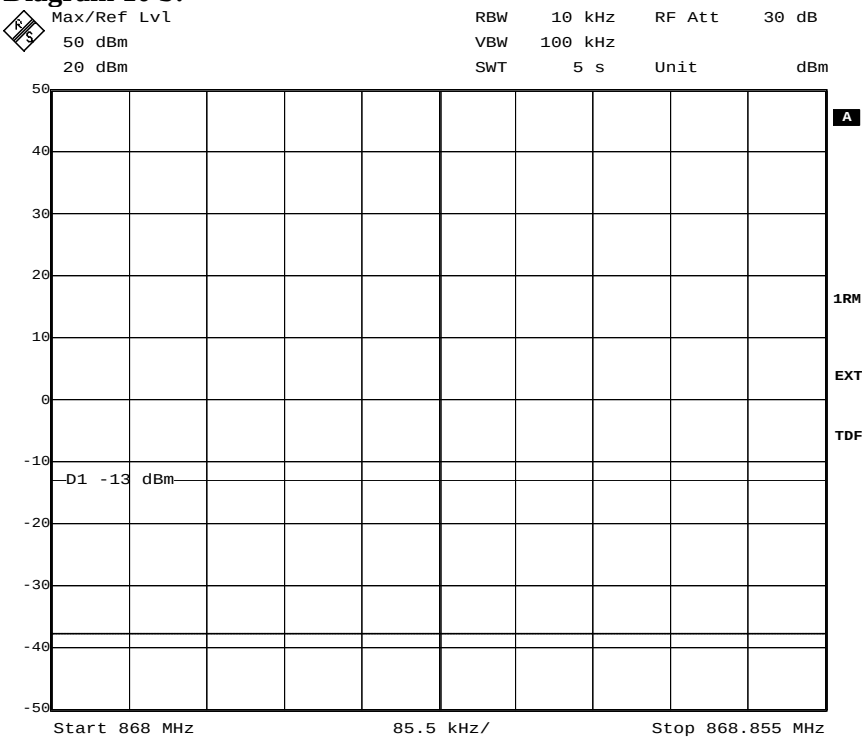

Max/Ref Lvl
50 dBm
20 dBm
RBW 100 kHz
VBW 1 MHz
SWT 5 s
RF Att 30 dB
Unit dBm
50
40
30
20
10
0
-10
-20
-30
-40
-50
1MAX
P22
A
1RM
EXT
TDF
Start 858 MHz
1 MHz/
Stop 868 MHz
Date: 14.DEC.2011 11:02:46

**Diagram 10 a:**




Date: 14.DEC.2011 11:09:01

**Diagram 10 b:**




Date: 14.DEC.2011 11:09:56

**Diagram 10 c:**

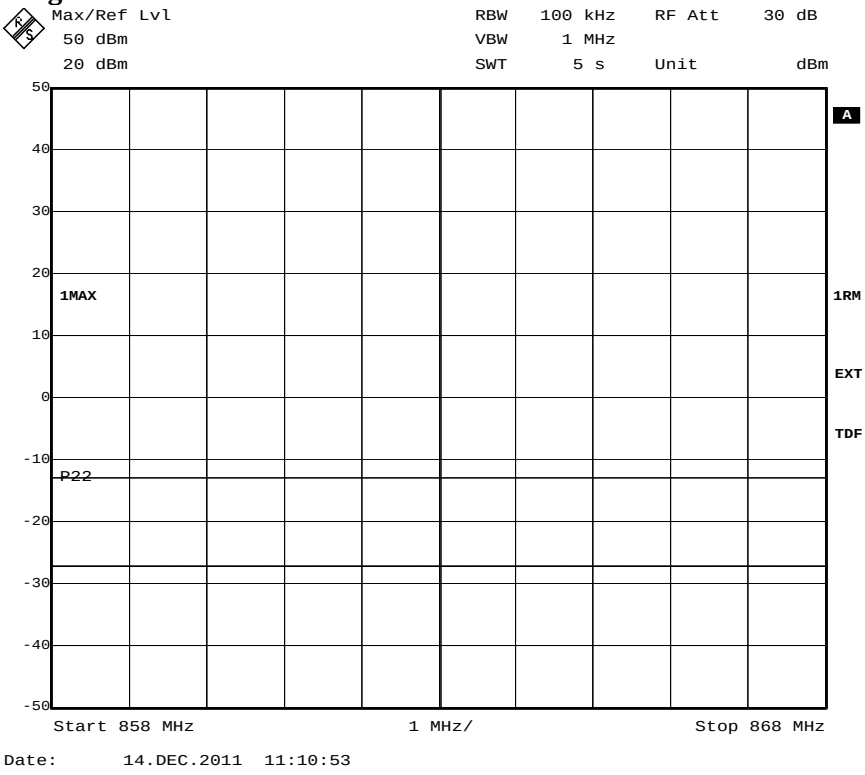
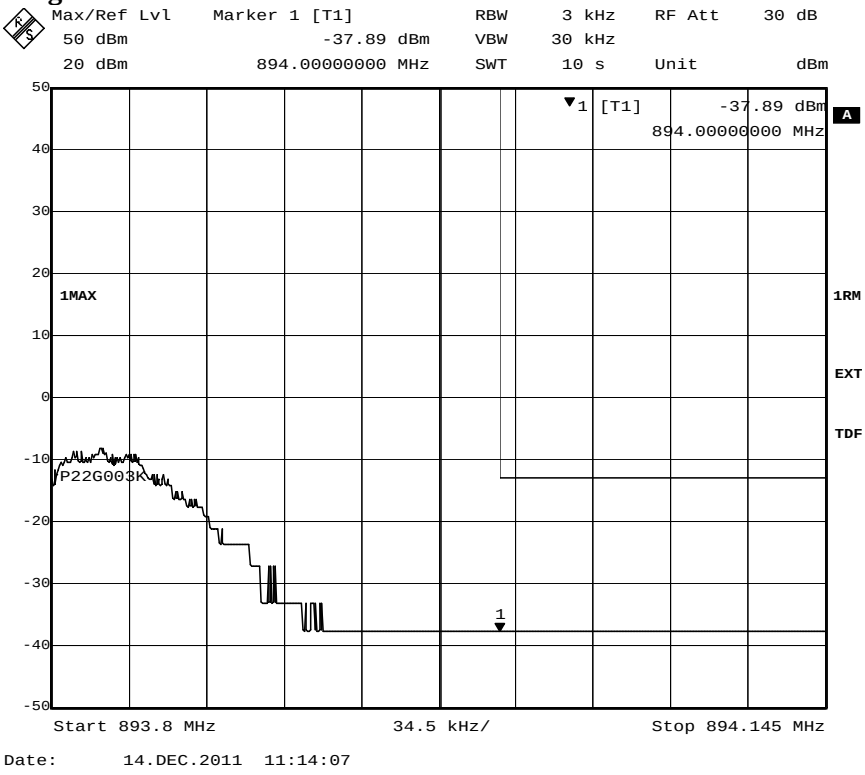
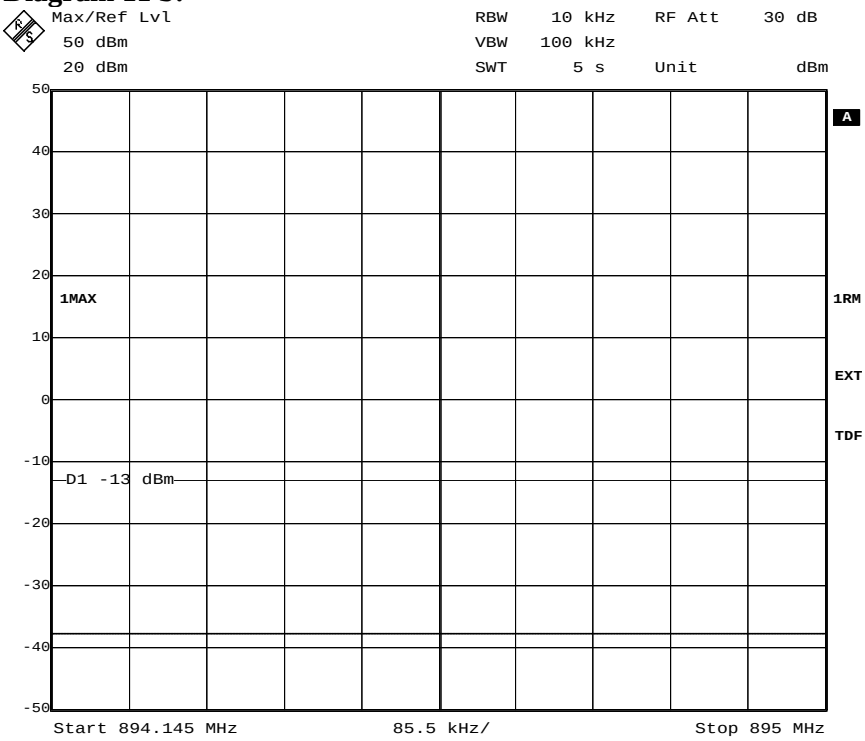

Max/Ref Lvl
50 dBm
20 dBm
RBW 100 kHz
VBW 1 MHz
SWT 5 s
RF Att 30 dB
Unit dBm
50
40
30
20
10
0
-10
-20
-30
-40
-50
1MAX
P22
A
1RM
EXT
TDF
Start 858 MHz
1 MHz/
Stop 868 MHz
Date: 14.DEC.2011 11:10:53

**Diagram 11 a:**



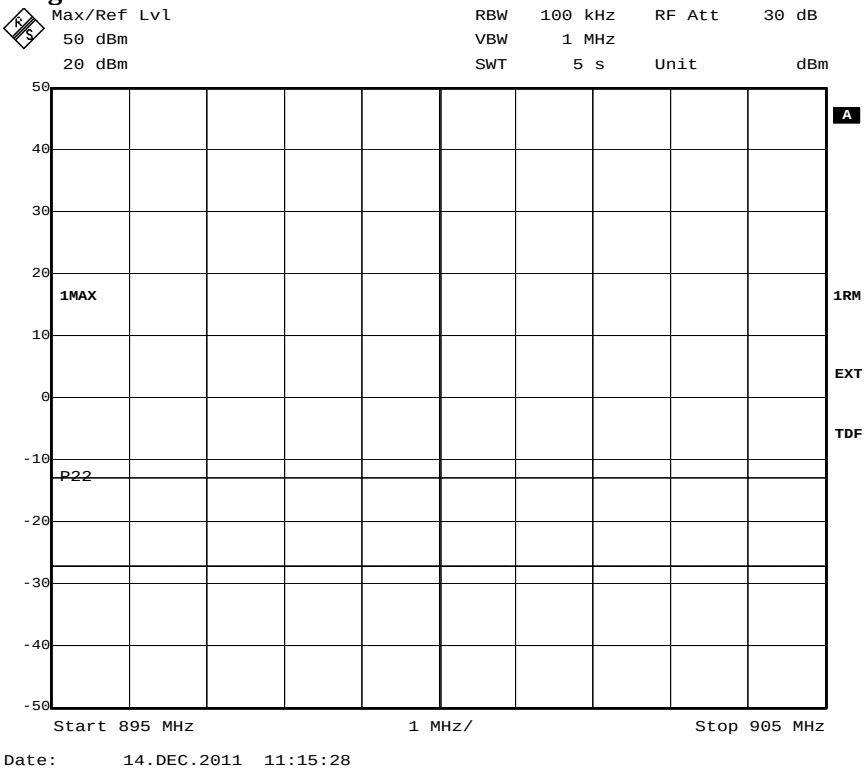

Date: 14.DEC.2011 11:14:07

**Diagram 11 b:**




Date: 14.DEC.2011 11:14:53

**Diagram 11 c:**


Max/Ref Lvl
50 dBm
20 dBm
RBW 100 kHz
VBW 1 MHz
SWT 5 s
RF Att 30 dB
Unit dBm
50
40
30
20
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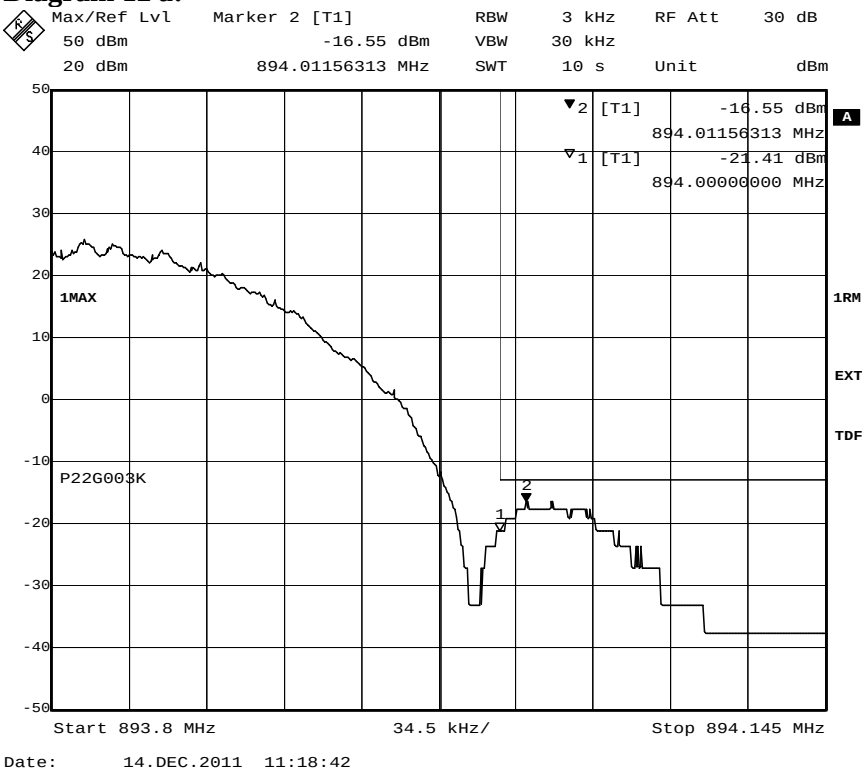
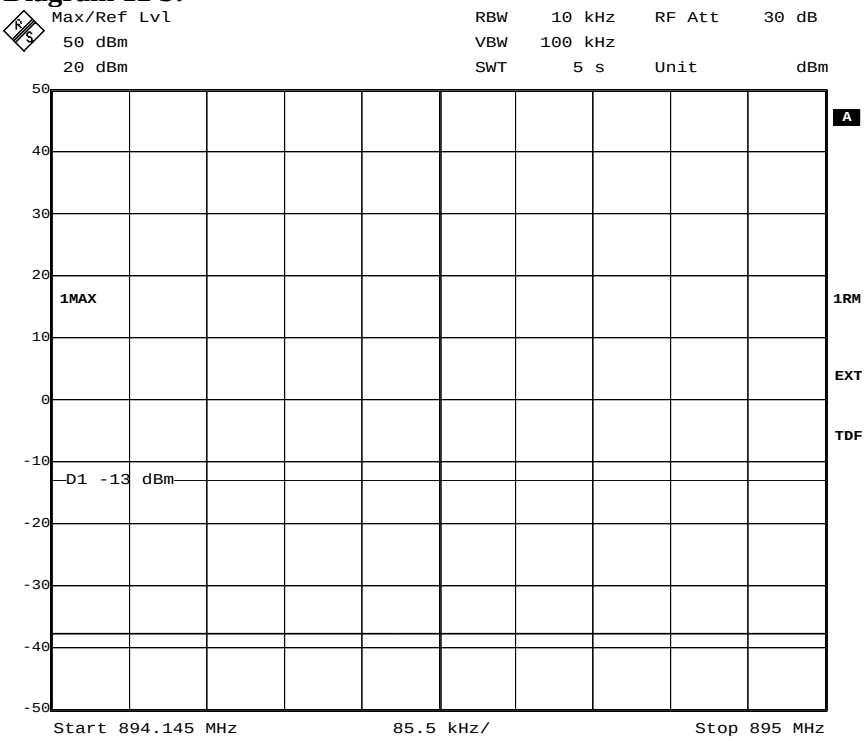
0
-10
-20
-30
-40
-50
1MAX
P22
A
1RM
EXT
TDF
Start 895 MHz
1 MHz/
Stop 905 MHz
Date: 14.DEC.2011 11:15:28

**Diagram 12 a:**



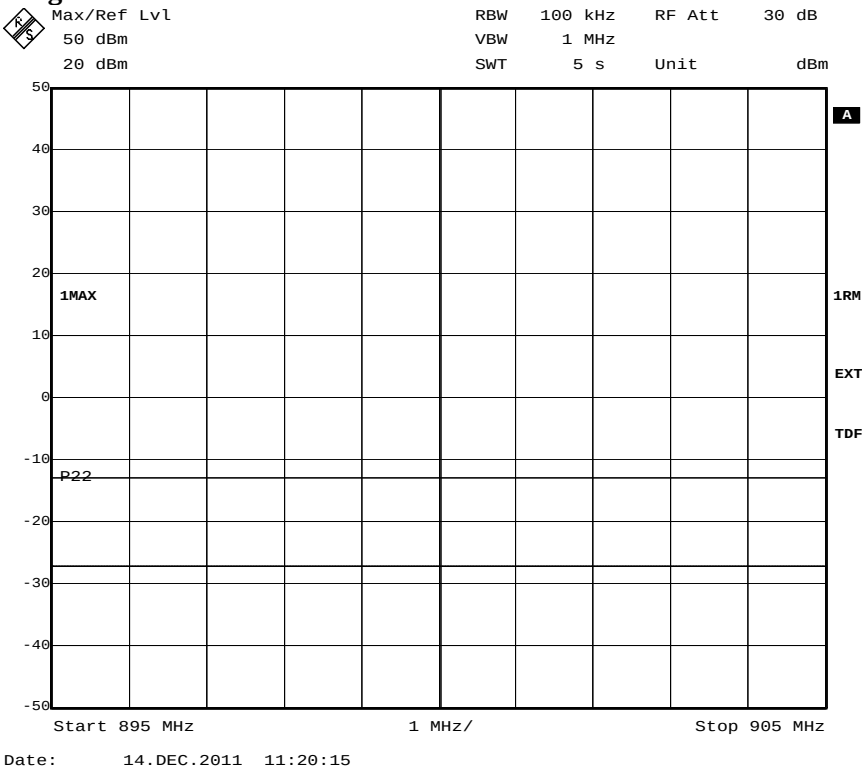

Date: 14.DEC.2011 11:18:42

**Diagram 12 b:**




Date: 14.DEC.2011 11:19:30

**Diagram 12 c:**


Max/Ref Lvl
50 dBm
20 dBm
RBW 100 kHz
VBW 1 MHz
SWT 5 s
RF Att 30 dB
Unit dBm
50
40
30
20
10
0
-10
-20
-30
-40
-50
1MAX
P22
A
1RM
EXT
TDF
Start 895 MHz
1 MHz/
Stop 905 MHz
Date: 14.DEC.2011 11:20:15

## Conducted spurious emission measurements according to 47CFR 2.1051

| Date | Temperature | Humidity |
|---|---|---|
| 2011-12-13 | 22 °C ± 3 °C | 23 % ± 5 % |
| 2011-12-15 | 22 °C ± 3 °C | 27 % ± 5 % |
| 2011-12-19 | 22 °C ± 3 °C | 20 % ± 5 % |

### Test set-up and procedure

The measurements were made with port RF A via attenuators connected to a spectrum analyser. A pre-measurement was performed with the PEAK detector activated. Emission close to or above the limit with the PEAK detector is measured with the RMS detector activated. The spectrum analyser was connected to an external 10 MHz reference standard during the measurements.

| Measurement equipment | SP number |
|---|---|
| R&S FSIQ | 503 738 |
| R&S FSQ | 504 143 |
| Attenuator | 504 159 |
| Attenuator | 503 870 |
| Attenuator | 900 118 |
| High pass filter | 504 199 |
| Multimeter Fluke 87 | 502 190 |
| Testo 635 temperature and humidity meter | 504 203 |

**Measurement uncertainty:** 3.7 dB

### Results

Single carrier 1 x 47.8 dBm, RBS master 2E setting 48

| Diagram | Channel (Frequency) | Modulation | Measured range |
|---|---|---|---|
| 1 a, b | B (869.2 MHz) | 16QAM | 9 kHz – 15 GHz |
| 2 a, b | M (881.6 MHz) | GMSK | 9 kHz – 15 GHz |
| 3 a, b | M (881.6 MHz) | 16QAM | 9 kHz – 15 GHz |
| 4 a, b | M (881.6 MHz) | 32QAM | 9 kHz – 15 GHz |
| 5 a, b | M (881.6 MHz) | AQPSK | 9 kHz – 15 GHz |
| 6 a, b | T (893.8 MHz) | 16QAM | 9 kHz – 15 GHz |

Multi carrier 2 x 44.8 dBm, RBS master 2E setting 45

| Diagram | Channels | Modulation | Measured range |
|---|---|---|---|
| 7 a, b, c | (B+1) + (B+9) | 16QAM | 9 kHz – 15 GHz |
| 8 a, b, c | (T-1) + (T-9) | 16QAM | 9 kHz – 15 GHz |
| 9 a, b, c | (B+1) + (B+9) | 32QAM | 9 kHz – 15 GHz |
| 10 a, b, c | (T-1) + (T-9) | 32QAM | 9 kHz – 15 GHz |
| 11 a, b, c | (B+1) + (B+9) | AQPSK | 9 kHz – 15 GHz |
| 12 a, b, c | (T-1) + (T-9) | AQPSK | 9 kHz – 15 GHz |

The diagrams are shown on the following pages.

**Remarks**

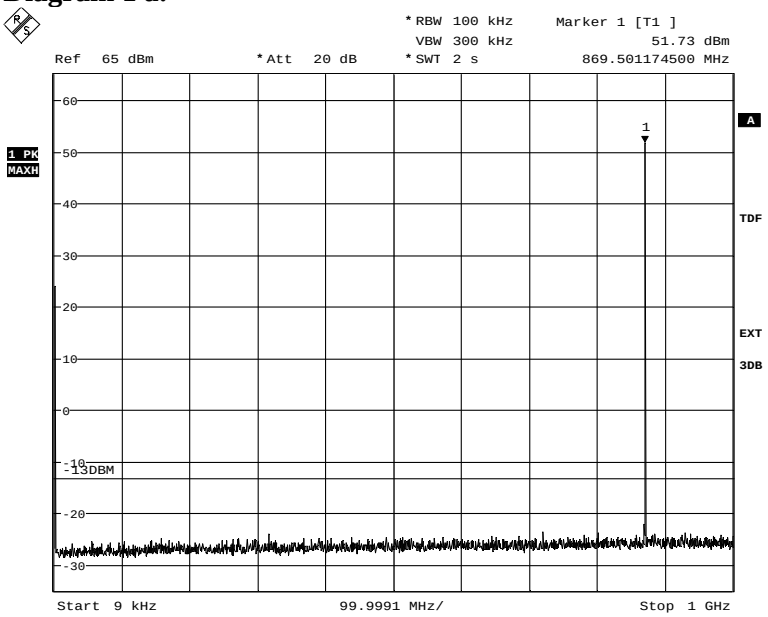
The emission at 9 kHz on some plots was not generated by the test object. A complementary measurement with a smaller RBW showed that it was related to the LO feed-through. The highest internal frequency as declared by the client was 1.4576 GHz, thus the upper frequency boundary for emission measurements was set to cover 10 x1.5 GHz = 15 GHz.

**Limits**

The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least 43 + 10 log P dB.

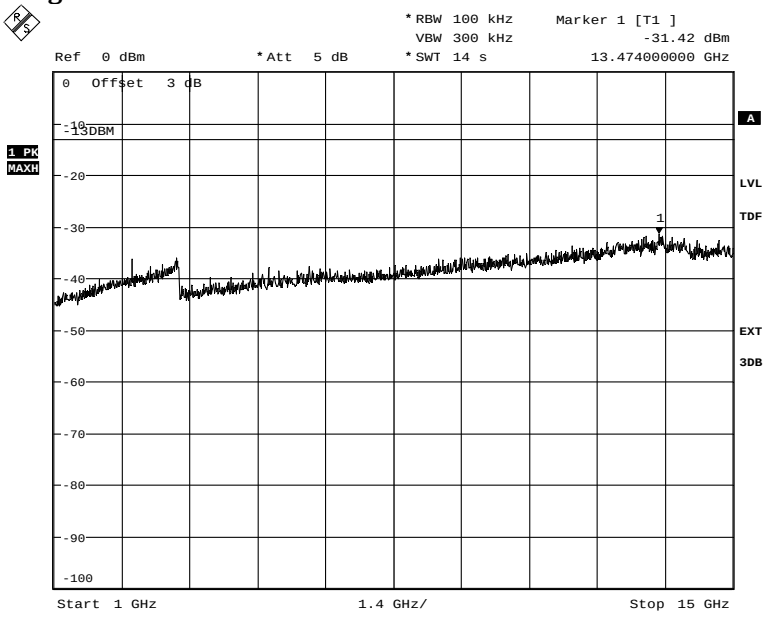
| | |
|---|---|
| Complies? | Yes |

## Diagram 1 a:



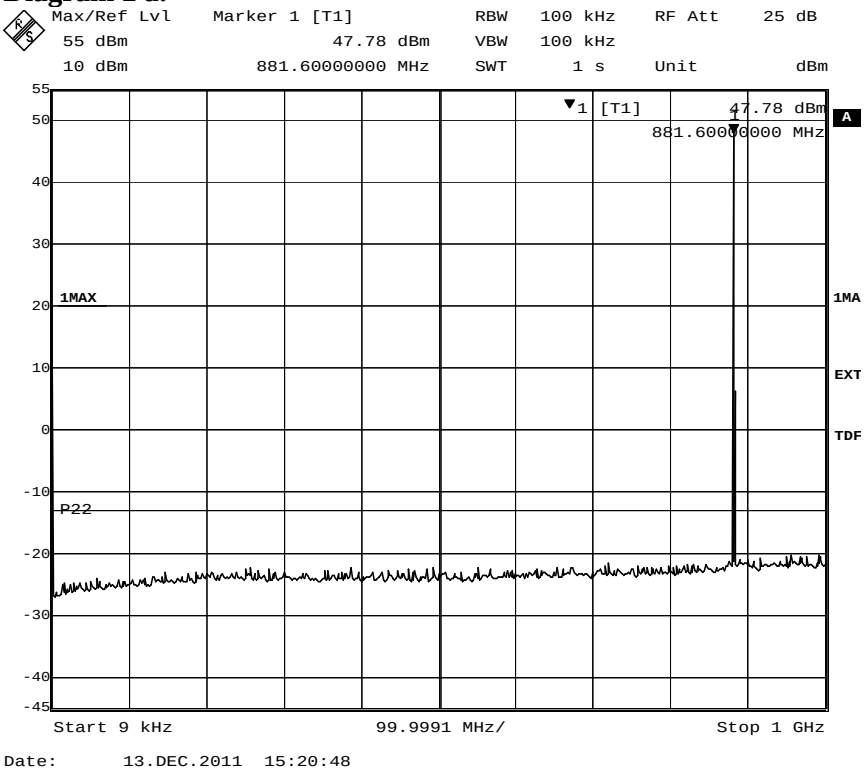

Date: 19.DEC.2011 17:14:30

## Diagram 1 b:



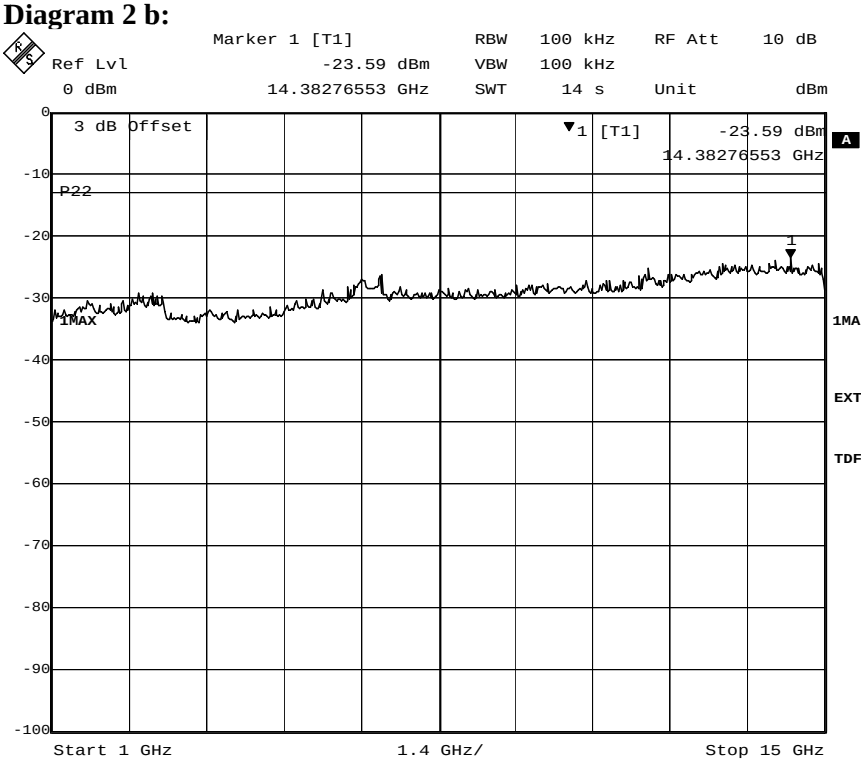

Date: 19.DEC.2011 17:17:18

**Diagram 2 a:**




Date: 13.DEC.2011 15:20:48

**Diagram 2 b:**




Date: 13.DEC.2011 15:52:51

**Diagram 3 a:**

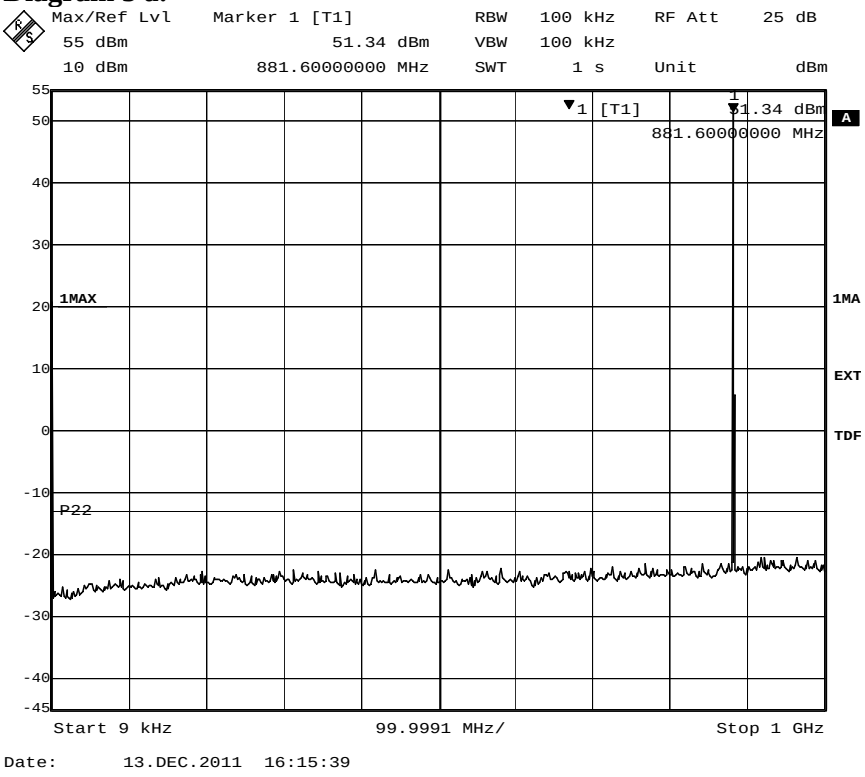



**Diagram 3 b:**

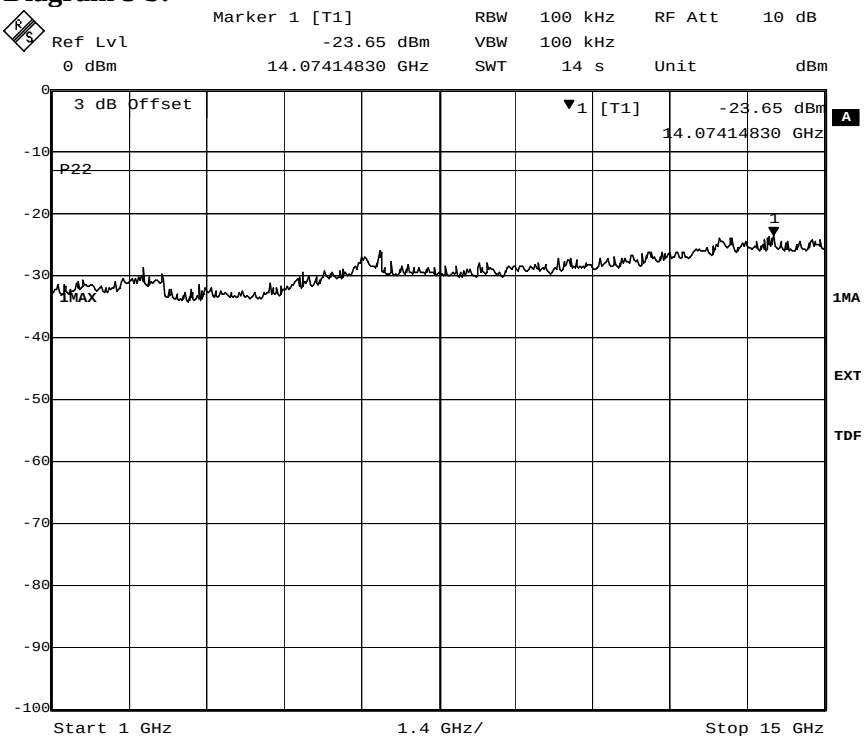
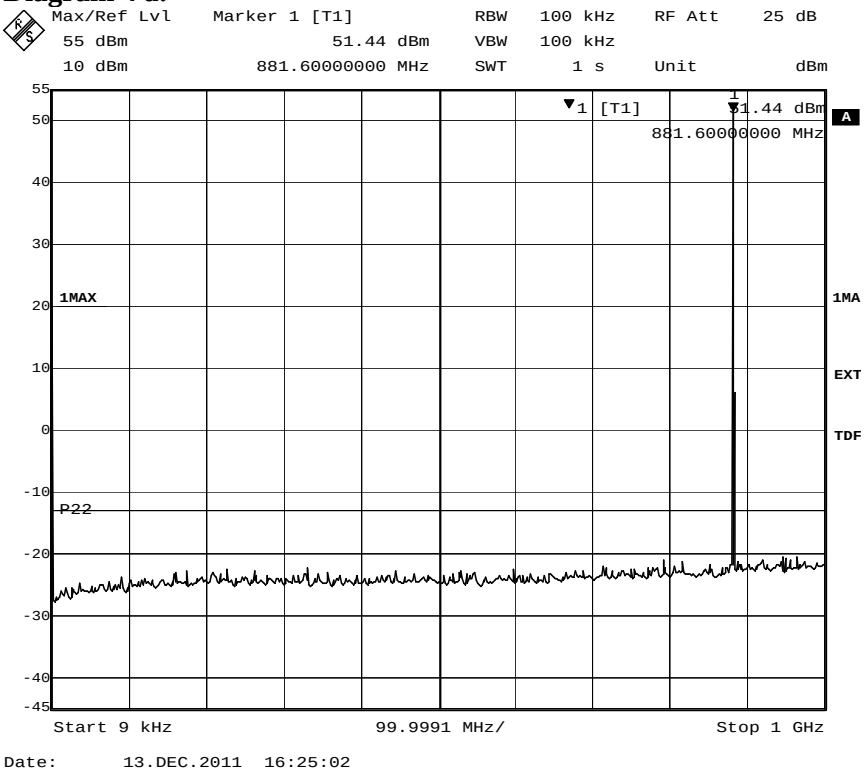
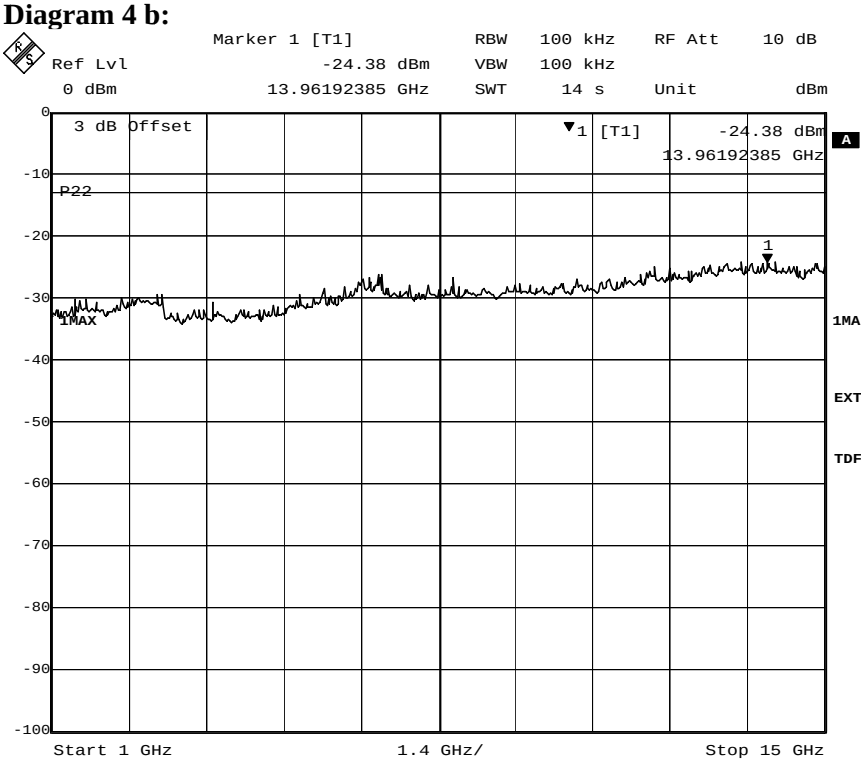


**Diagram 4 a:**



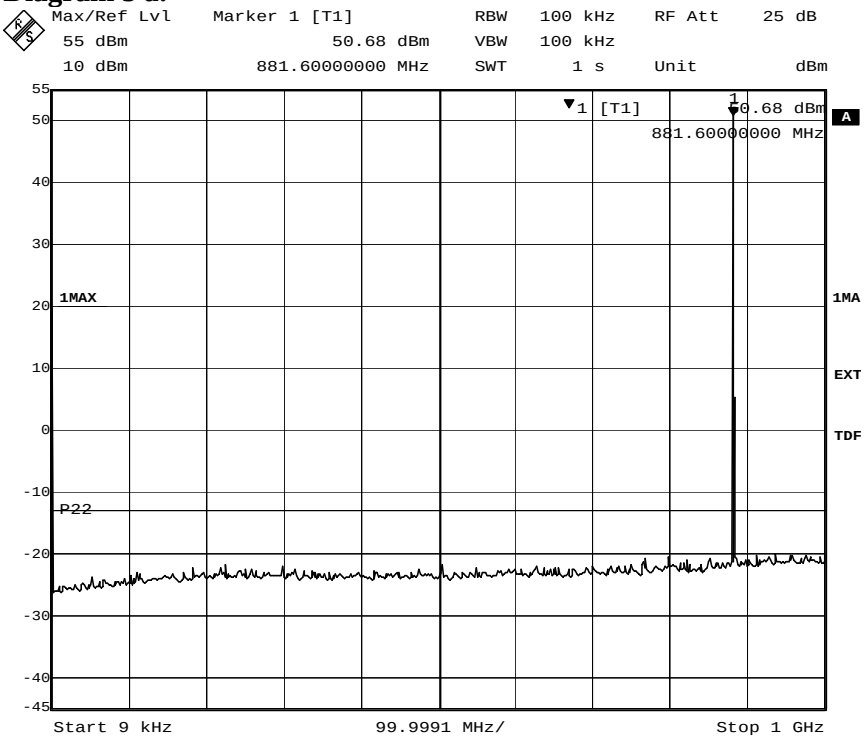

Date: 13.DEC.2011 16:25:02

**Diagram 4 b:**



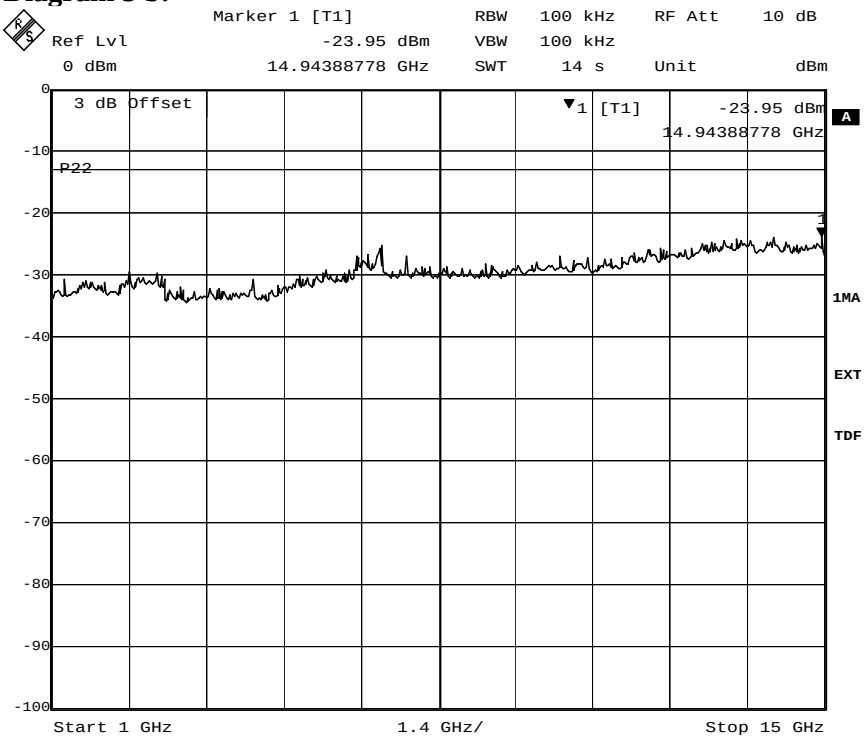

Date: 13.DEC.2011 16:27:57

## Diagram 5 a:



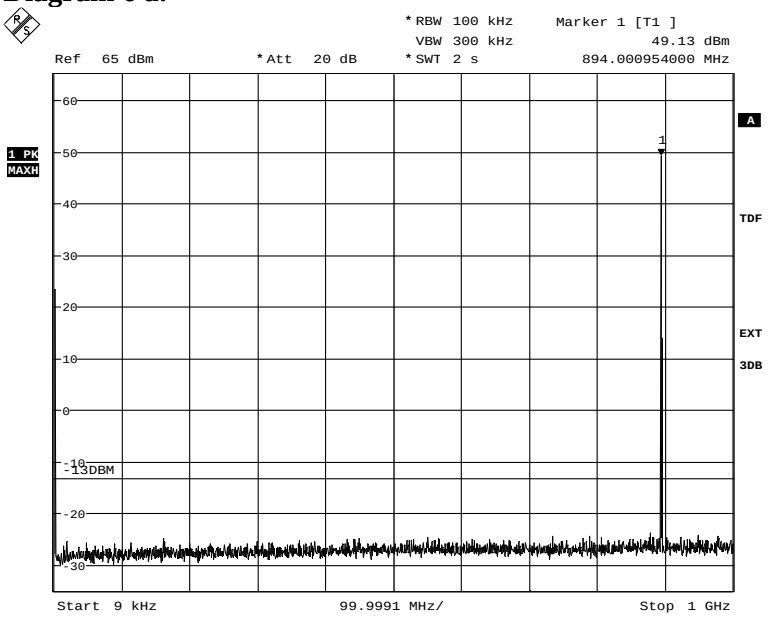

Date: 13.DEC.2011 16:07:55

## Diagram 5 b:



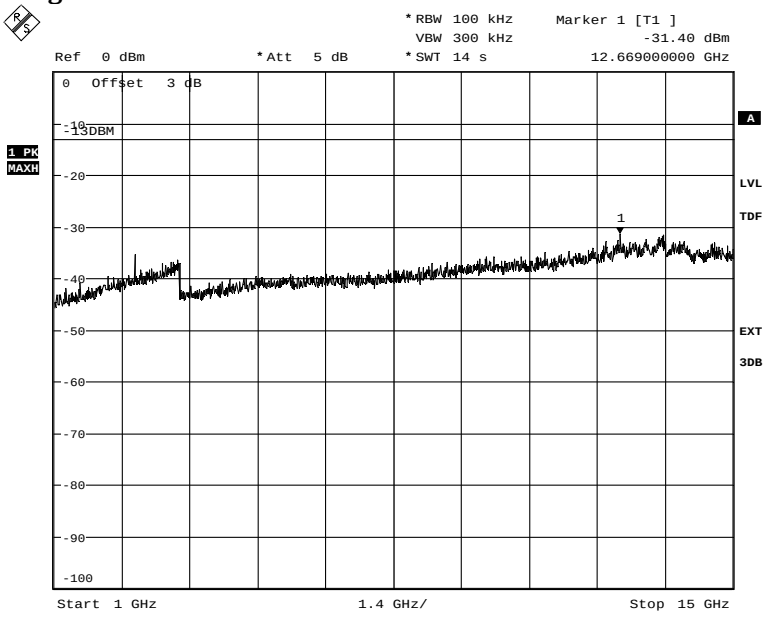

Date: 13.DEC.2011 16:10:23

## Diagram 6 a:



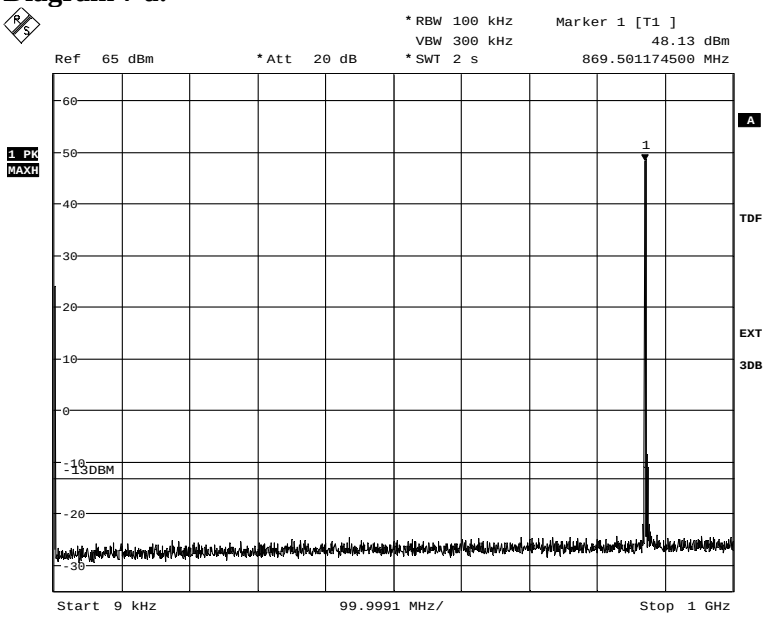

Date: 19.DEC.2011 17:22:20

## Diagram 6 b:



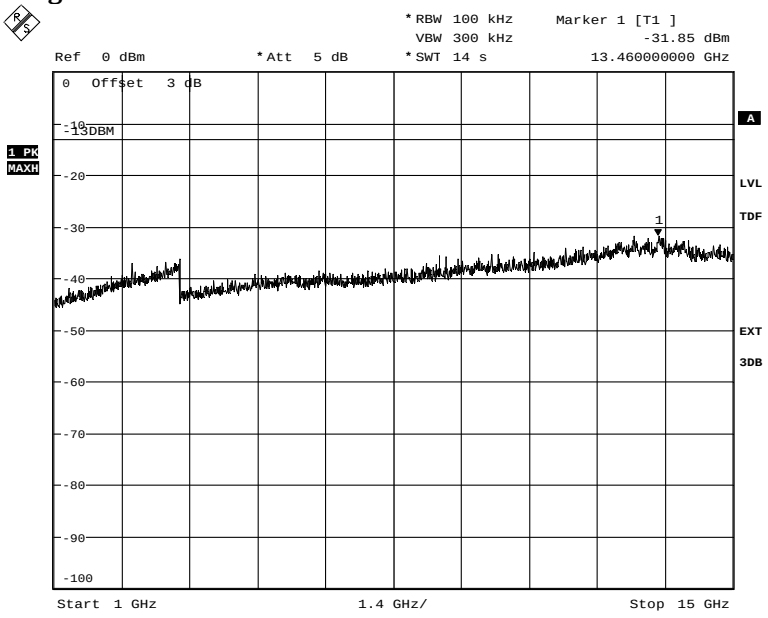

Date: 19.DEC.2011 17:19:54

## Diagram 7 a:



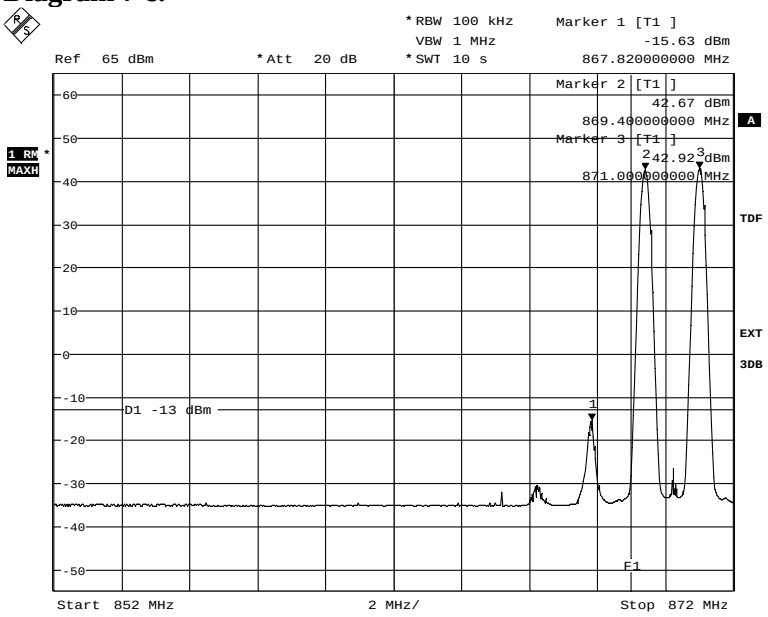

Date: 19.DEC.2011 15:55:42

## Diagram 7 b:




Date: 19.DEC.2011 15:57:36

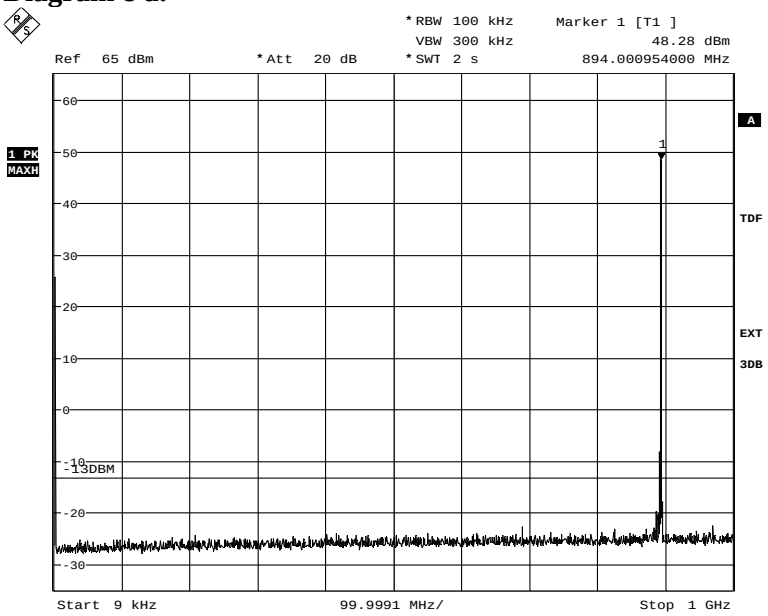
**Diagram 7 c:**




Date: 19.DEC.2011 15:50:13

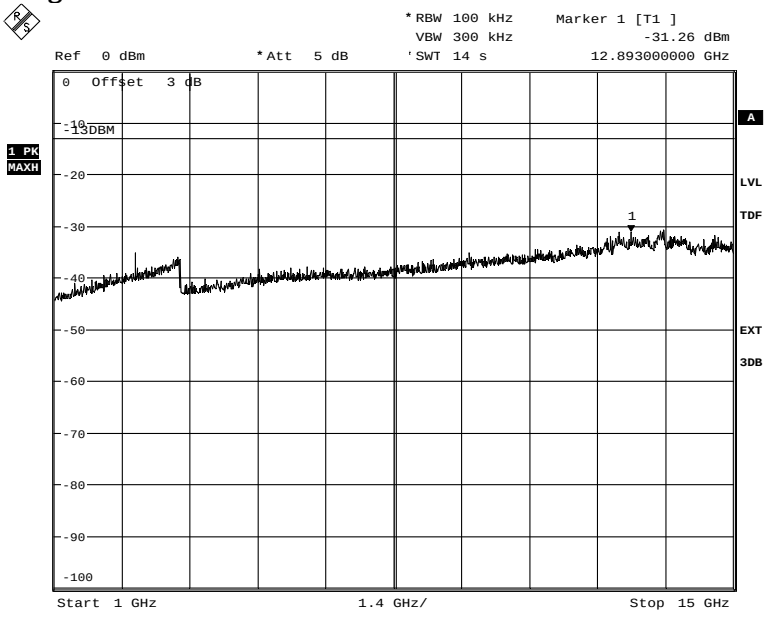
Note: Close-in on the IM-product out-of-band (marker 1). Above measurement is not intended to evaluate band-edge performance.

## Diagram 8 a:



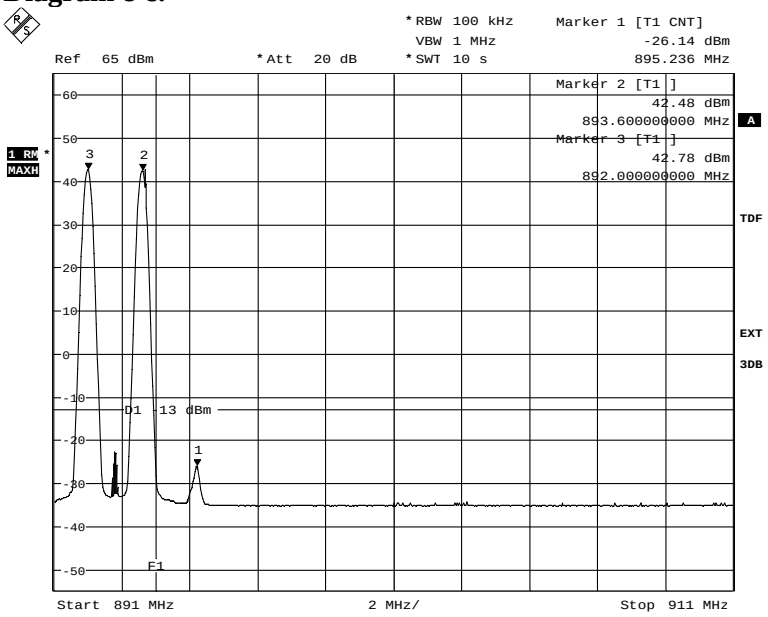

Date: 19.DEC.2011 13:30:27

## Diagram 8 b:




Date: 19.DEC.2011 13:55:24

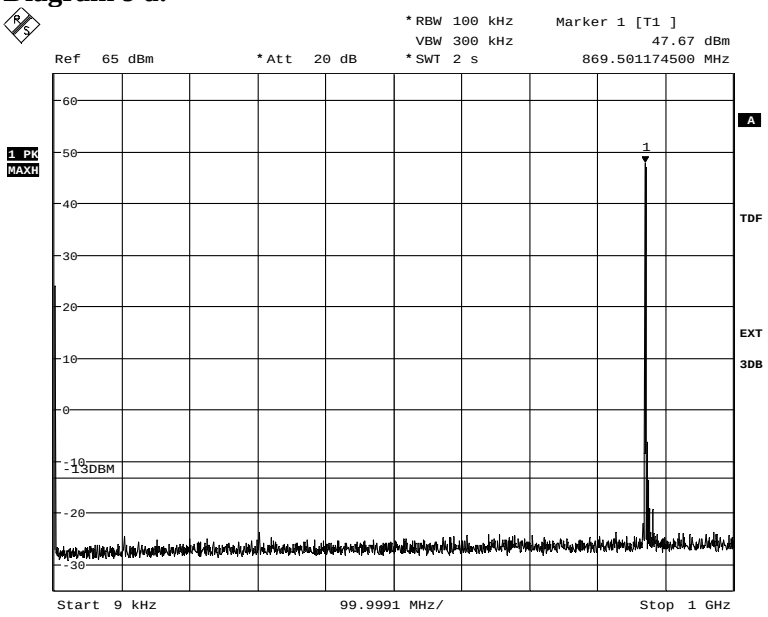
**Diagram 8 c:**




Date: 19.DEC.2011 13:09:28

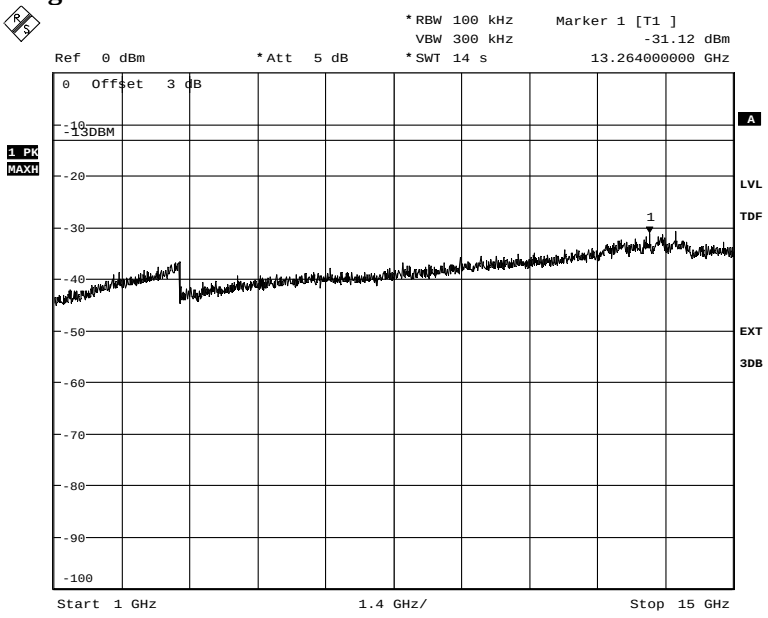
Note: Close-in on the IM-product out-of-band (marker 1). Above measurement is not intended to evaluate band-edge performance.

## Diagram 9 a:



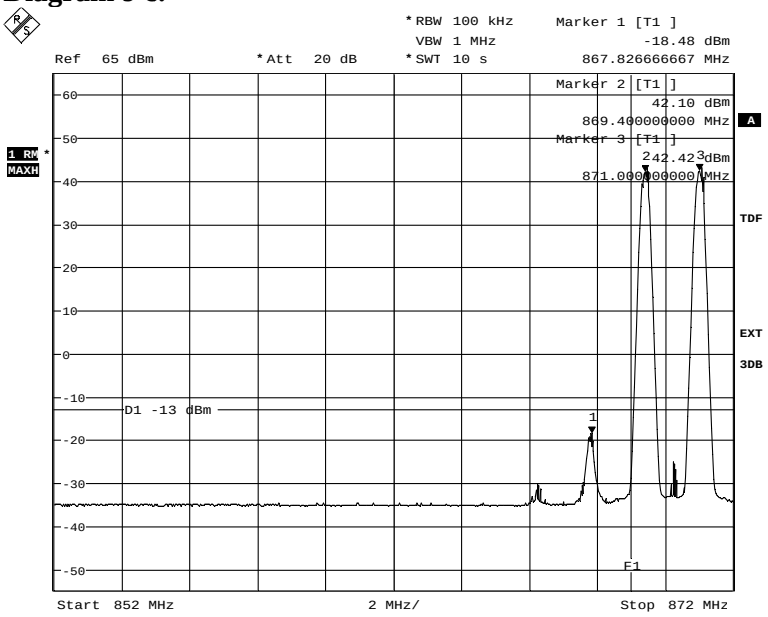

Date: 19.DEC.2011 15:41:29

## Diagram 9 b:




Date: 19.DEC.2011 15:44:48

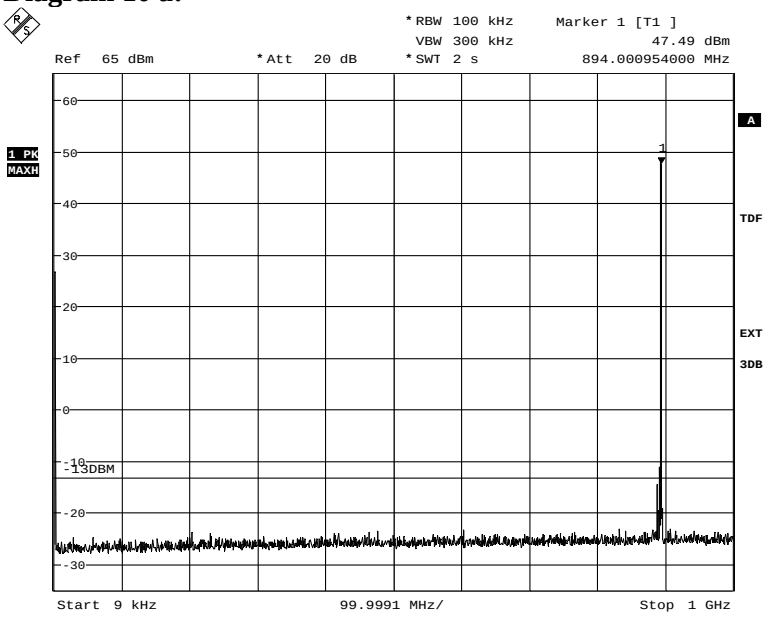
**Diagram 9 c:**




Date: 19.DEC.2011 15:39:43

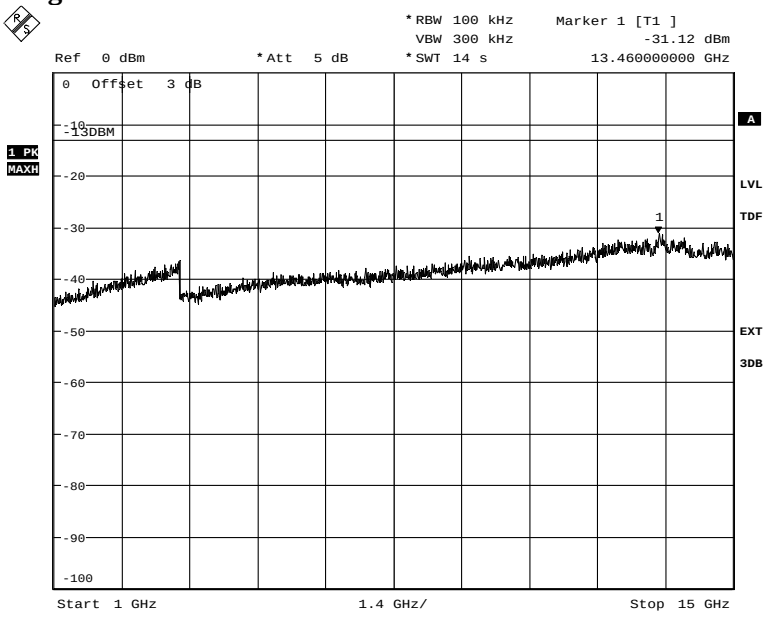
Note: Close-in on the IM-product out-of-band (marker 1). Above measurement is not intended to evaluate band-edge performance.

## Diagram 10 a:



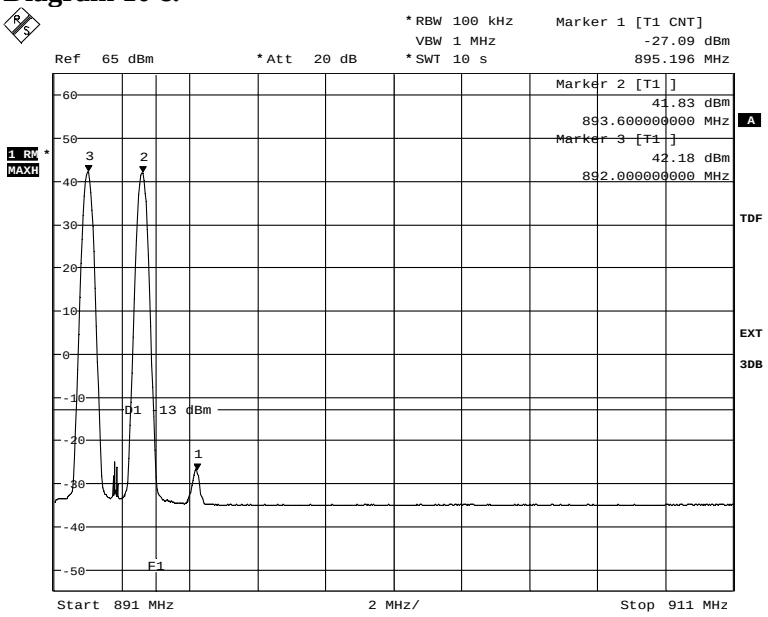

Date: 19.DEC.2011 14:26:45

## Diagram 10 b:




Date: 19.DEC.2011 14:28:49

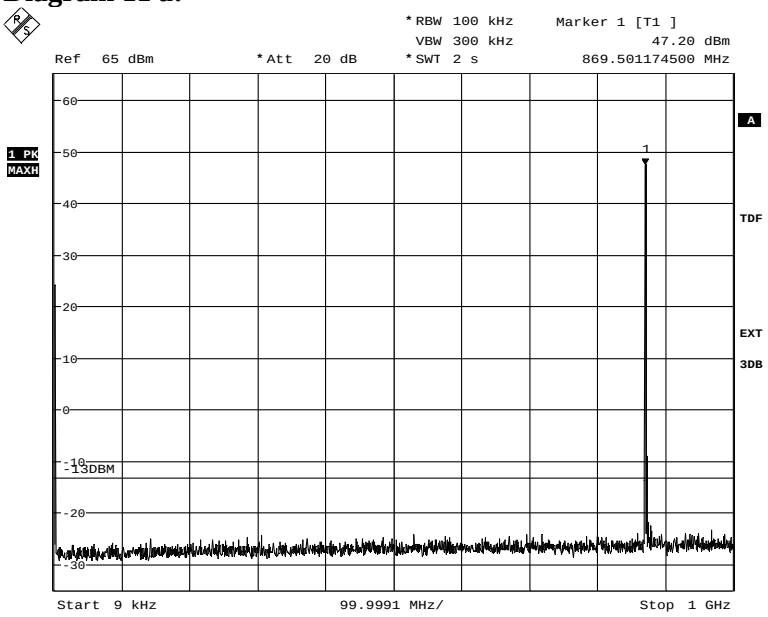
**Diagram 10 c:**




Date: 19.DEC.2011 14:07:43

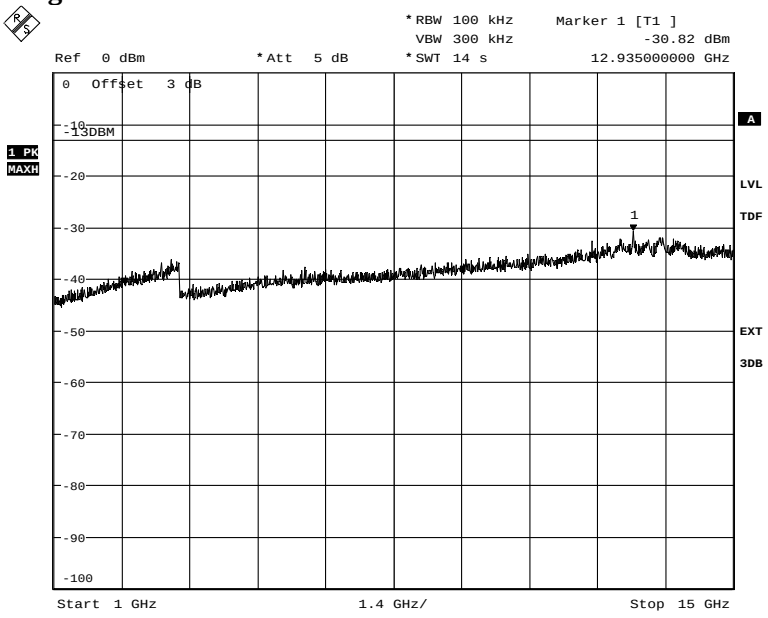
Note: Close-in on the IM-product out-of-band (marker 1). Above measurement is not intended to evaluate band-edge performance.

## Diagram 11 a:



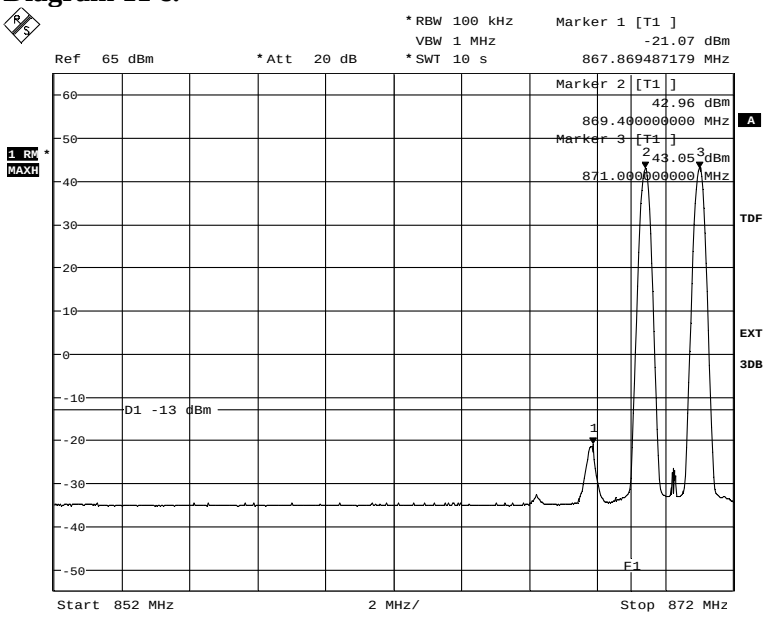

Date: 19.DEC.2011 15:31:31

## Diagram 11 b:




Date: 19.DEC.2011 15:33:44

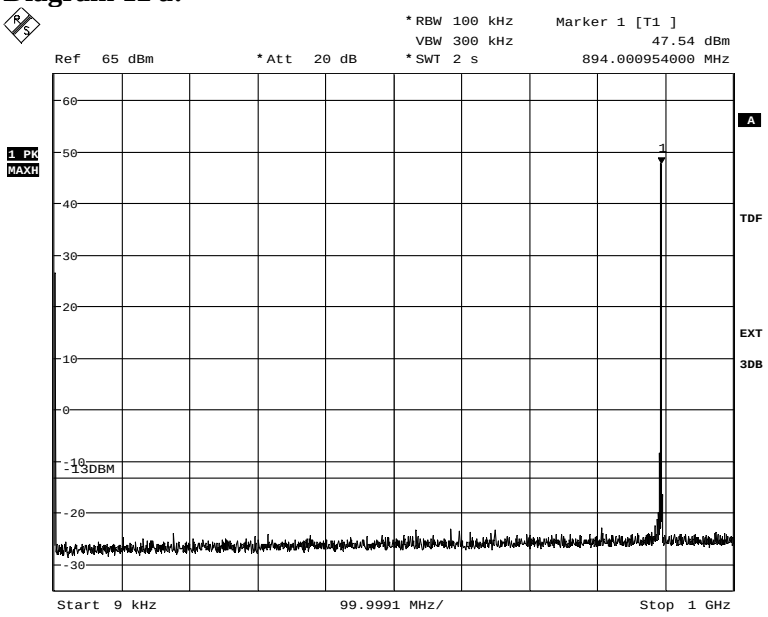
**Diagram 11 c:**




Date: 19.DEC.2011 15:29:40

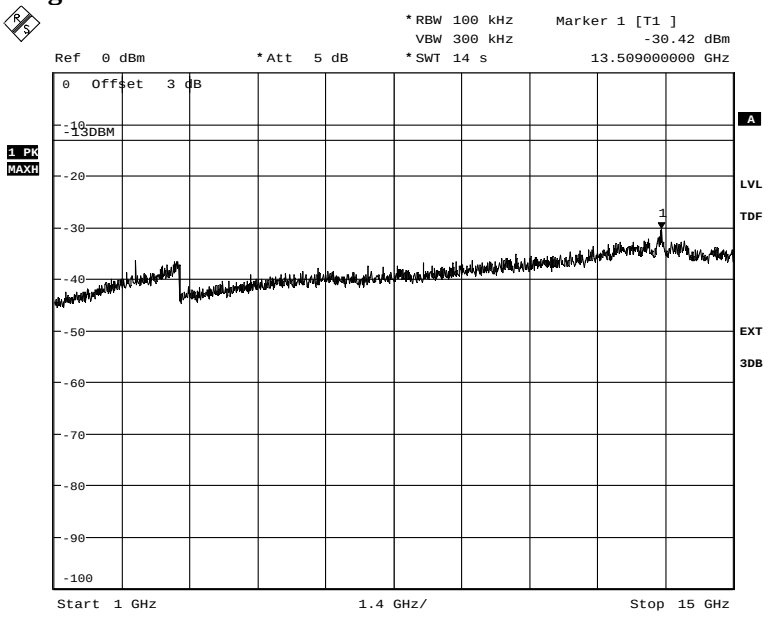
Note: Close-in on the IM-product out-of-band (marker 1). Above measurement is not intended to evaluate band-edge performance.

## Diagram 12 a:



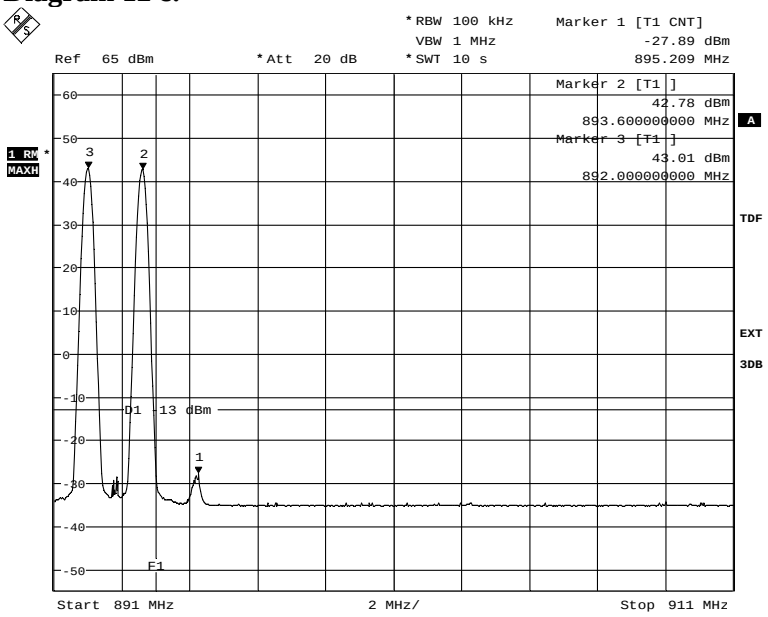

Date: 19.DEC.2011 14:43:57

## Diagram 12 b:




Date: 19.DEC.2011 14:46:29

**Diagram 12 c:**




Date: 19.DEC.2011 14:36:47

Note: Close-in on the IM-product out-of-band (marker 1). Above measurement is not intended to evaluate band-edge performance.

## Field strength of spurious radiation measurements according to 47CFR 2.1053

| Date | Temperature | Humidity |
|---|---|---|
| 2012-01-09 | 22 °C ± 3 °C | 18 % ± 5 % |
| 2012-01-10 | 23 °C ± 3 °C | 20 % ± 5 % |

### Test set-up and procedure

The measurements were performed with both horizontal and vertical polarization of the antenna. The antenna distance was 3 m in the frequency range 30 MHz – 15 GHz.
The measurements were performed in Effective Radiated Power (ERP). A fully anechoic chamber was used during the measurements. The chamber is regularly calibrated with the substitution method and from that calibration an ERP correction factor is derived. The correction factor was used as a transducer to get the readings in ERP.

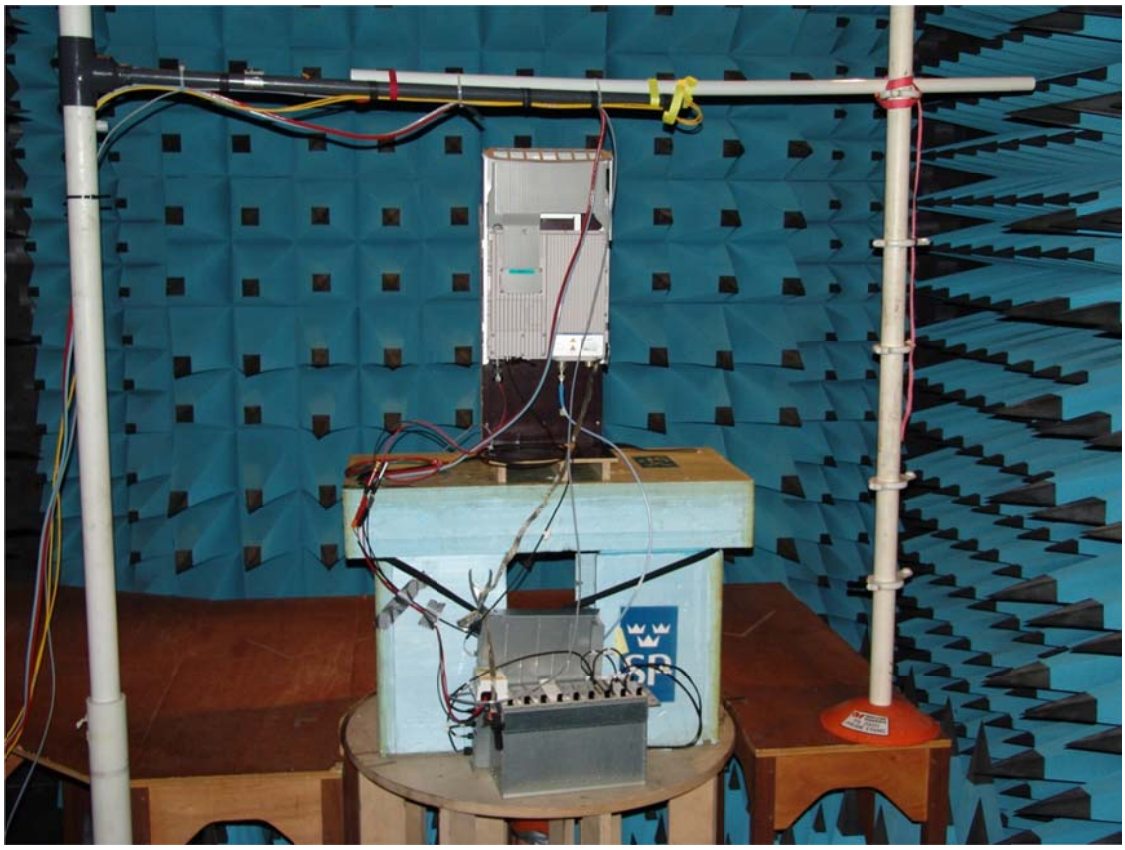
The measurement procedure was as the following:

1. A pre-measurement was first performed with peak detector. The EUT was continuously measured in 360 degrees.
2. Spurious radiation on frequencies closer than 6 dB to the limit was re-measured with RMS detector and with the substitution method according to the standard.

When comparing the new modulations (16QAM, 32QAM and AQPSK in SCPIR 0 dB) to GMSK modulation on the mid channel M, it was found that 16QAM represented a new worst-case modulation from a radiated emission perspective. Therefore additional measurements with 16QAM on channels B and T were performed.

| Measurement equipment | SP number |
|---|---|
| Anechoic chamber, Hertz | 15:116 |
| R&S EMI Test Receiver ESI40 | 503 125 |
| Chase bilog antenna CBL 6121A | 502 460 |
| Schaffner Reference Dipole BSRD6500 | 503 649 |
| EMCO Horn Antenna 3115 | 502 175 |
| EMCO Horn Antenna 3115 | 501 548 |
| MITEQ Low Noise Amplifier | 503 277 |
| R&S Vector Network Analyser | 503 687 |
| Highpass filter | 502 758 |
| Testo 615 temperature and humidity meter | 503 498 |

The test set-up is shown in the picture below:



**Results**

Channel B, ARFCN 128 (869.2 MHz), modulation 16QAM

| Frequency (MHz) | Spurious emission level (dBm) | |
|---|---|---|
| | Vertical | Horizontal |
| 30-15 000 | All emission > 20 dB below limit | All emission > 20 dB below limit |

Channel M, ARFCN 190 (881.6 MHz), modulation 16QAM

| Frequency (MHz) | Spurious emission level (dBm) | |
|---|---|---|
| | Vertical | Horizontal |
| 30-15 000 | All emission > 20 dB below limit | All emission > 20 dB below limit |

Channel T, ARFCN 251 (893.8 MHz), modulation 16QAM

| Frequency (MHz) | Spurious emission level (dBm) | |
|---|---|---|
| | Vertical | Horizontal |
| 30-15 000 | All emission > 20 dB below limit | All emission > 20 dB below limit |

**Measurement uncertainty:** 3.1 dB

**Limits**

The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least 43 + 10 log P dB.

| | |
|---|---|
| Complies? | Yes |

## Photos of the test object

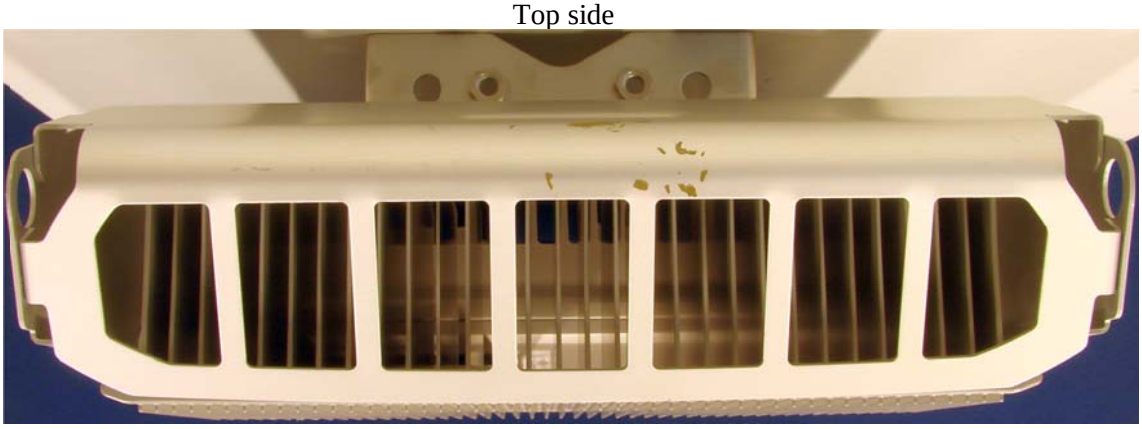
Front side

Rear side

Left side

Right side

Top side



Bottom side