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## Class II permissive change measurements on RUS 01 B5 850 MHz radio equipment with FCC IDTA8AKRC118643 and IC287AB-AS118643 (7 appendices)

### Test object

RUS 01 B5, KRC 118 64/3, rev. R1E

### Summary

See appendix 1 for general information and appendix 7 for external photos.

| Standard                                                    | Compliant | Appendix |
|-------------------------------------------------------------|-----------|----------|
| <b>FCC CFR 47 / IC RSS-132</b>                              |           |          |
| 2.1046 / RSS-132 5.4 RF power output                        | Yes       | 2        |
| 2.1049 / RSS-Gen 4.6.1 Occupied bandwidth                   | Yes       | 3        |
| 2.1051 / RSS-132 5.5 Band edge                              | Yes       | 4        |
| 2.1051 / RSS-132 5.5 Spurious emission at antenna terminals | Yes       | 5        |
| 2.1053 / RSS-132 5.5 Field strength of spurious radiation   | Yes       | 6        |

Note: 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.

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## Appendix 1

**Description of the test object**

|                          |                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Equipment:               | Radio equipment RUS 01 B5                                                                                                                                                                                                                                                                                                                                           |
| Operating bands:         | TX: 869 - 894 MHz<br>RX: 824 - 849 MHz                                                                                                                                                                                                                                                                                                                              |
| Antenna ports:           | 1 TX/RX port and 1 RX port                                                                                                                                                                                                                                                                                                                                          |
| Nominal RF output power: | Single carrier: 1x 49.0 dBm (1 x 80.0W)<br>Multi carrier: 2x 46.0 dBm (2 x 40.0W)<br>3x 44.2 dBm (3 x 26.6W)<br>4x 43.0 dBm (4 x 20W)<br>In WCDMA MIMO configuration the maximum nominal output power is limited to 1 x 47 dBm (1 x 50W) per carrier and port.<br>In GSM single carrier configuration maximum nominal output power is limited to 1x47.8 dBm (1x60W) |
| LTE supports             |                                                                                                                                                                                                                                                                                                                                                                     |
| Modulations (payload):   | QPSK, 16QAM and 64QAM                                                                                                                                                                                                                                                                                                                                               |
| Channel bandwidths:      | 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz                                                                                                                                                                                                                                                                                                                    |
| Carrier constellations   | Single & multi carrier in conventional and 2x2 MIMO mode                                                                                                                                                                                                                                                                                                            |
| WCDMA supports           |                                                                                                                                                                                                                                                                                                                                                                     |
| Modulations:             | QPSK, 16QAM and 64QAM                                                                                                                                                                                                                                                                                                                                               |
| Channel bandwidths:      | 4.2 to 5 MHz (configurable in steps of 100/200 kHz)                                                                                                                                                                                                                                                                                                                 |
| Channel spacings:        | 4.4 to 5 MHz (configurable in steps of 100/200 kHz)                                                                                                                                                                                                                                                                                                                 |
| Carrier constellations   | Single & multi carrier in conventional and 2x2 MIMO mode                                                                                                                                                                                                                                                                                                            |
| GSM supports             |                                                                                                                                                                                                                                                                                                                                                                     |
| Modulations (payload):   | GMSK, 16QAM, 32QAM, AQPSK and 8PSK                                                                                                                                                                                                                                                                                                                                  |
| Carrier constellations   | Single & multi carrier in conventional mode                                                                                                                                                                                                                                                                                                                         |
| Nominal supply voltage:  | -48V DC                                                                                                                                                                                                                                                                                                                                                             |

**Purpose of test**

The purpose of this test is to justify a Class II Permissive Change, adding MIMO and multi-carrier mode for LTE and MIMO for WCDMA and to verify maintained compliance for the performance characteristics specified in applicable items of FCC CFR 47 and Industry Canada RSS-132 and RSS-Gen with updated hardware.

## Appendix 1

**Operation modes during measurements****LTE single RAT**

Measurements in MIMO mode single carrier configuration were performed with the test object transmitting test model E-TM1.1 defined in 3GPP TS 36.141.

Complete measurements were made on RUS 1 port RF A in primary mode and additional measurements on port RF A RUS 1 in secondary mode to verify that the ports were identical, as declared by the client.

**WCDMA single RAT**

Measurements in conventional mode were performed with the test object transmitting test model 1 (TM1) with 64 DPCH:s at 30 ksps (SF=128) according 3GPP TS 25.141.

Measurements in MIMO mode were performed with the test object transmitting test model TM5 with 30 DPCH:s at 30 ksps and 8 HS-PDSCH (SF=128) according 3GPP TS 25.141.

Channel Bandwidth 5MHz.

Complete measurements were made on RUS 1 port RF A in primary mode and additional measurements on port RF A RUS 1 in secondary mode to verify that the ports were identical, as declared by the client.

**GSM single RAT**

All measurements were performed with the test object transmitting with GMSK modulation. Where specified, additional measurements were performed with the testobject transmitting AQPSK, 8-PSK, 16QAM and 32QAM.

**MSR, WCDMA + GSM**

The test object supports MSR with WCDMA + GSM access techniques in conventional mode. Measurements were performed with one WCDMA carrier transmitting TM1 with 64 DPCH:s at 30 ksps (SF=128) and two GSM carriers in GMSK modulation mode.

WCDMA channel bandwidth 5MHz

The test object was supplied with -48 VDC by an external power supply. Additional connections are documented in the set-up drawings below. Measurements were performed with the test object configured for the maximum transmit power applicable for the tested configuration.

For the purpose of this report the selected test scope was deemed representative for a worst case based on the guidelines applied in above mentioned 3GPP standards and prior experience from comparative tests with different modulations on similar products.

## Appendix 1

### Test frequencies during measurements

#### LTE single RAT TX test frequencies

| EARFCN Downlink | Frequency [MHz] | Symbolic name | Comment                                         |
|-----------------|-----------------|---------------|-------------------------------------------------|
| 2407            | 869.7           | B             | TX bottom frequency in 1.4 MHz BW configuration |
| 2407            | 869.7           | B2            | 2 carrier TX band bottom constellation          |
| 2426            | 871.6           |               | 1.4 MHz BW configuration                        |
| 2407            | 869.7           | B3            | 2 carrier TX band bottom constellation          |
| 2421            | 871.1           |               | 1.4 MHz BW configuration                        |
| 2415            | 870.5           | B             | TX bottom frequency in 3 MHz BW configuration   |
| 2425            | 871.5           | B             | TX bottom frequency in 5 MHz BW configuration   |
| 2450            | 874.0           | B             | TX bottom frequency in 10 MHz BW configuration  |
| 2475            | 876.5           | B             | TX bottom frequency in 15 MHz BW configuration  |
| 2500            | 879.0           | B             | TX bottom frequency in 20 MHz BW configuration  |
| 2525            | 881.5           | M             | TX band mid frequency all BW configurations     |
| 2482            | 877.2           | M2            | 2 carrier TX band mid constellation             |
| 2575            | 886.5           |               | 1.4 MHz BW configuration                        |
| 2643            | 893.3           | T             | TX bottom frequency in 1.4 MHz BW configuration |
| 2624            | 891.4           | T2            | 2 carrier TX band mid constellation             |
| 2643            | 893.3           |               | 1.4 MHz BW configuration                        |
| 2635            | 892.5           | T             | TX bottom frequency in 3 MHz BW configuration   |
| 2625            | 891.5           | T             | TX bottom frequency in 5 MHz BW configuration   |
| 2600            | 889.0           | T             | TX bottom frequency in 10 MHz BW configuration  |
| 2575            | 886.5           | T             | TX bottom frequency in 15 MHz BW configuration  |
| 2550            | 884.0           | T             | TX bottom frequency in 20 MHz BW configuration  |

#### WCDMA single RAT TX test frequencies

| UARFCN Downlink | Frequency [MHz] | Symbolic name | Comment                                |
|-----------------|-----------------|---------------|----------------------------------------|
| 4357            | 871.4           | B             | Single carrier TX bottom frequency     |
| 4357            | 871.4           | B2            | 2 carrier TX band bottom constellation |
| 4382            | 876.4           |               |                                        |
| 4408            | 881.6           | M             | Single carrier TX band mid frequency   |
| 4385            | 877.0           | M2            | 2 carrier TX band mid constellation    |
| 4431            | 886.2           |               |                                        |
| 4458            | 891.6           | T             | Single carrier TX top frequency        |
| 4433            | 886.6           | T2            | 2 carrier TX band top constellation    |
| 4458            | 891.6           |               |                                        |

## Appendix 1

### GSM single RAT TX test frequencies

| ARFCN<br>Downlink | Frequency<br>[MHz] | Symbolic<br>name  | Comment                                |
|-------------------|--------------------|-------------------|----------------------------------------|
| 129               | 869.4              | B                 | Single carrier TX bottom frequency     |
| 129<br>132        | 869.4<br>870.0     | B2                | 2 carrier TX band bottom constellation |
| 190               | 881.6              | M                 | Single carrier TX band mid frequency   |
| 190<br>193        | 881.6<br>882.2     | M2                | 2 carrier TX band mid constellation    |
| 250               | 893.6              | T                 | Single carrier TX top frequency        |
| 247<br>250        | 893.0<br>893.6     | T2                | 2 carrier TX band top constellation    |
| 185<br>250        | 880.6<br>893.6     | B <sub>im 1</sub> | 2 carrier TX band bottom constellation |
| 153<br>185        | 874.2<br>880.6     | B <sub>im 2</sub> | 2 carrier TX band mid constellation    |
| 129<br>137        | 869.4<br>871.0     | B <sub>im 3</sub> | 2 carrier TX band top constellation    |
| 129<br>194        | 869.4<br>882.4     | T <sub>im 1</sub> | 2 carrier TX band bottom constellation |
| 194<br>226        | 882.4<br>888.8     | T <sub>im 2</sub> | 2 carrier TX band mid constellation    |
| 242<br>250        | 892.0<br>893.6     | T <sub>im 3</sub> | 2 carrier TX band top constellation    |

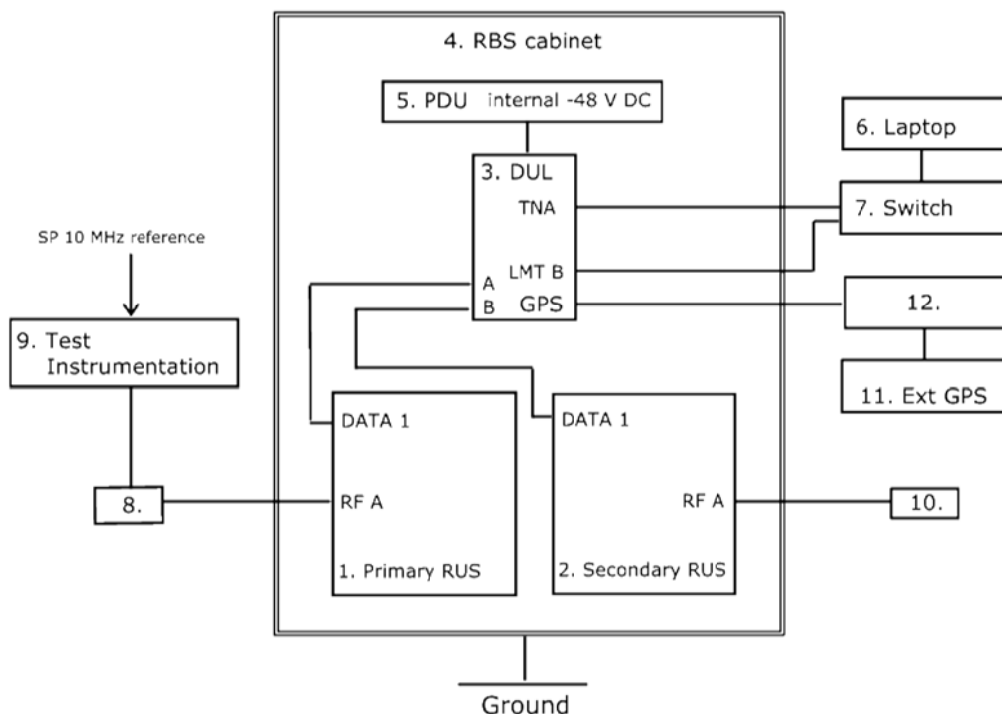
### MSR WCDMA & GSM TX test frequencies

| WCDMA 1x20W        |                    |             | GSM 2x30W         |                    |                    | Symbolic<br>name |
|--------------------|--------------------|-------------|-------------------|--------------------|--------------------|------------------|
| UARFCN<br>Downlink | Frequency<br>[MHz] | BW<br>[MHz] | ARFCN<br>Downlink | Carrier 1<br>[MHz] | Carrier 2<br>[MHz] |                  |
| 4420               | 884.0              | 5           | 129/137           | 869.4              | 871.0              | Config 1         |
| 4369               | 873.8              | 5           | 129/137           | 869.4              | 871.0              | Config 2         |
| 4403               | 880.6              | 5           | 242/250           | 892.0              | 893.6              | Config 3         |
| 4427               | 885.4              | 5           | 180/239           | 879.6              | 891.4              | Config 4         |
| 4387               | 877.5              | 5           | 140/199           | 871.6              | 883.4              | Config 5         |

All RX frequencies were configured 45 MHz below the corresponding TX frequency according the applicable duplex offset for the operating band.

## Appendix 1

### Test set-up conducted measurements LTE MIMO



Note: Picture above shows LTE MIMO setup, during conventional mode the secondary test object was not used. Unconnected interfaces were omitted in the picture for simplicity, but are listed in the interface table on page 13.

#### Test object:

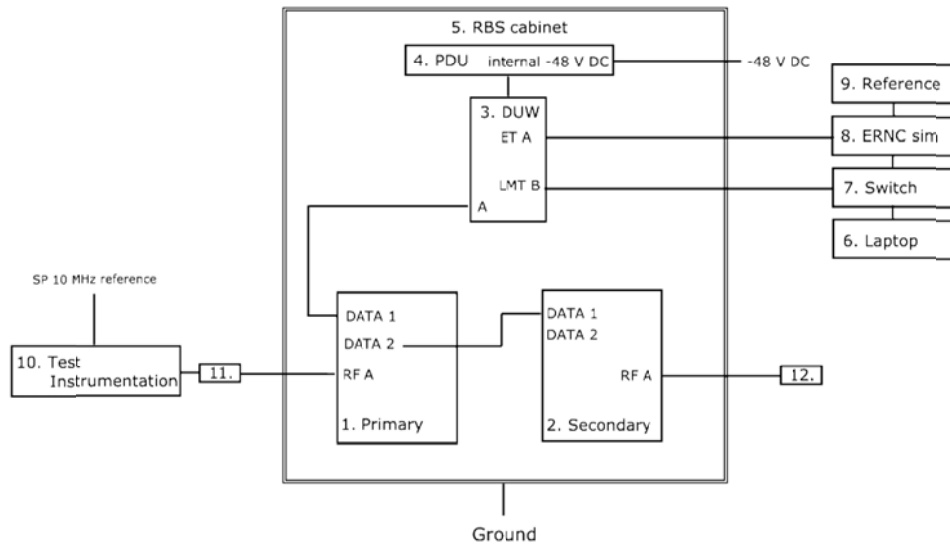
|    |                                                                                                                                                                                                                        |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | RUS 01 B5, KRC 118 64/3, revision R1E, s/n: C826643265 primary                                                                                                                                                         |
| 2. | RUS 01 B5, KRC 118 64/3, revision R1E, s/n C826643256 secondary with PIS software CXP 901 7316/1, Rev. R39UL and unlocked working software CXP 901 3268/6, Rev. R49AF<br>FCC ID: TA8AKRC11864-3 and IC: 287AB-AS118643 |

#### Functional test equipment:

|     |                                                                                           |
|-----|-------------------------------------------------------------------------------------------|
| 3.  | DUL 20 01 KDU 137 533/4, rev: R1F s/n: TU8X857127                                         |
| 4.  | RBS 6201 cabinet, BAMS 1000778792.                                                        |
| 5.  | PDU 02 01, BMG 980 336/4, rev: R2A, s/n: BJ31528316                                       |
| 6.  | Controlling laptop HP Elitebook 8540w, BAMS 1001052043 running on software MOSHELL V9.0n. |
| 7.  | Fast Ethernet switch, Netgear FS726T                                                      |
| 8.  | Attenuator, filter, according respective appendix                                         |
| 9.  | SP test instrument according measurement equipment list                                   |
| 10. | Termination 50 ohm                                                                        |
| 11. | GPS Active Antenna, KRE 101 2082/1                                                        |
| 12. | GPS 02 01 NCD 901 41/1, rev: R1D s/n: TU8K356436                                          |

## Appendix 1

### Test set-up conducted measurements WCDMA MIMO and conventional mode



Note: Picture above shows WCDMA MIMO setup, during conventional mode the secondary test object was not used. Unconnected interfaces were omitted in the picture for simplicity, but are listed in the interface table on page 13.

#### Test object:

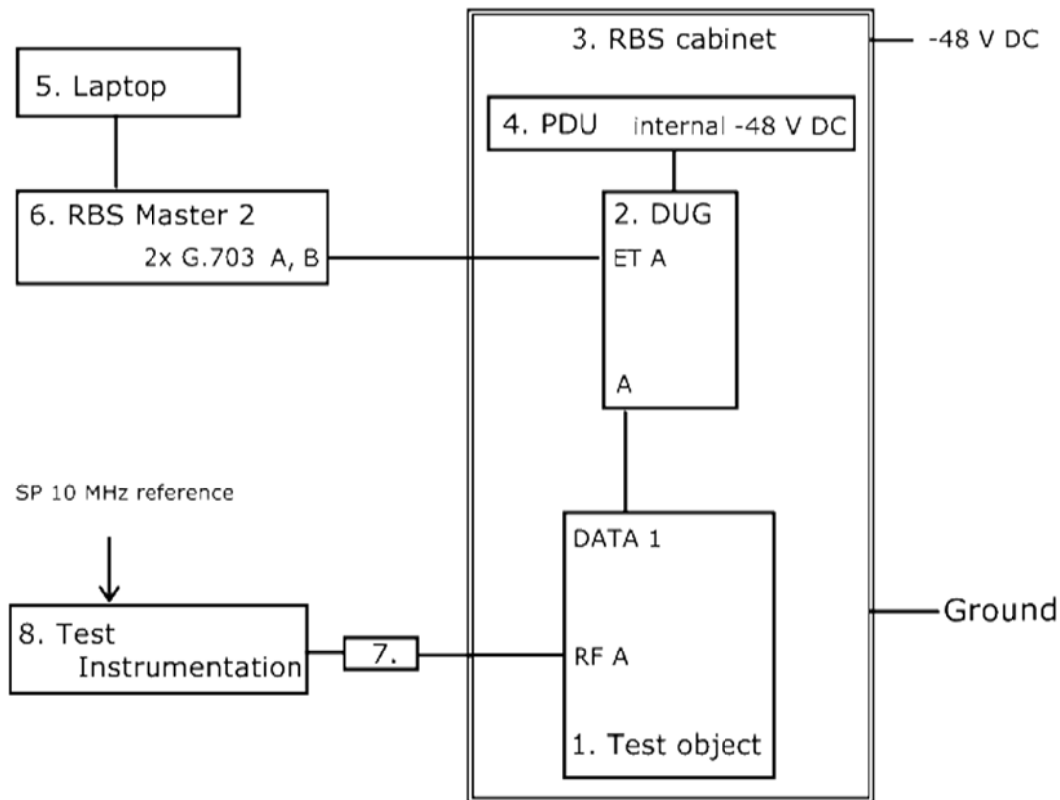
|    |                                                                                                                                                                                                                              |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | RUS 01 B5, KRC 118 64/1, revision R1E, s/n: C826643265 primary                                                                                                                                                               |
| 2. | RUS 01 B5, KRC 118 64/1, revision R1E, s/n C826643256 secondary<br>with PIS software CXP 901 7316/1, Rev. R39UL and unlocked working software<br>CXP 901 3268/6, Rev. R49AF<br>FCC ID: TA8AKRC11864-3 and IC: 287AB-AS118643 |

#### Functional test equipment:

|     |                                                                                              |
|-----|----------------------------------------------------------------------------------------------|
| 3.  | DUW 30 01, KDU 127 161/3, revision R4C s/n: C824673232                                       |
| 4.  | PDU 02 01, BMG 980 336/4, rev: R2A, s/n: BJ31528316                                          |
| 5.  | RBS 6201 cabinet, BAMS 1000778792.                                                           |
| 6.  | Controlling laptop HP Elitebook 8540w, BAMS 1001052043<br>running on software MOSHELL V9.0n. |
| 7.  | Fast Ethernet switch, Netgear FS726T                                                         |
| 8.  | ERNC Sim 130 BAMS 1000660991                                                                 |
| 9.  | Symmetricon 8040, BAMS 1000714189 reference                                                  |
| 10. | SP test instrument according measurement equipment list                                      |
| 11. | Attenuator, filter, according respective appendix                                            |
| 12. | Termination 50 ohm                                                                           |

## Appendix 1

### Test set-up conducted measurements GSM



Note: Unconnected interfaces were omitted in the picture for simplicity, but are listed in the interface table on page 13.

#### Test object:

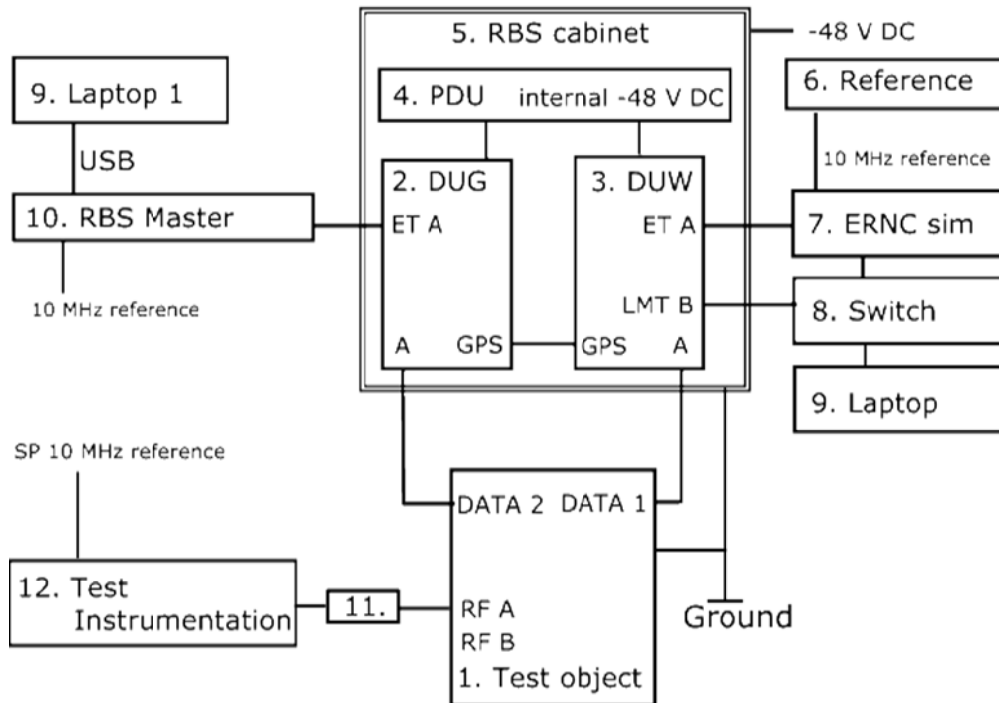
|    |                                                                                                                                                                                                                     |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | RUS 01 B5, KRC 118 64/1, revision R1E, s/n: C826643265<br>with PIS software CXP 901 7316/1, Rev. R39UL and unlocked working software<br>CXP 901 3268/6, Rev. R49AF<br>FCC ID: TA8AKRC11864-3 and IC: 287AB-AS118643 |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### Functional test equipment:

|    |                                                                                              |
|----|----------------------------------------------------------------------------------------------|
| 2. | DUG KDU 137 569/1 R2A C823721034                                                             |
| 3. | RBS 6201 cabinet, BAMS 1000778792.                                                           |
| 4. | PDU 02 01, BMG 980 336/4, rev: R2A, s/n: BJ31528316                                          |
| 5. | Controlling laptop HP Elitebook 8540w, BAMS 1001052043<br>running on software MOSHELL V9.0n. |
| 6. | RBS Master LPY 107 1007/3, rev R1C, BAMS 1001052043                                          |
| 7. | Attenuator, filter, according respective appendix                                            |
| 8. | SP test instrument according measurement equipment list                                      |

## Appendix 1

### Test set-up conducted measurements MSR



Note: Unconnected interfaces were omitted in the picture for simplicity, but are listed in the interface table on page 13.

#### Test object:

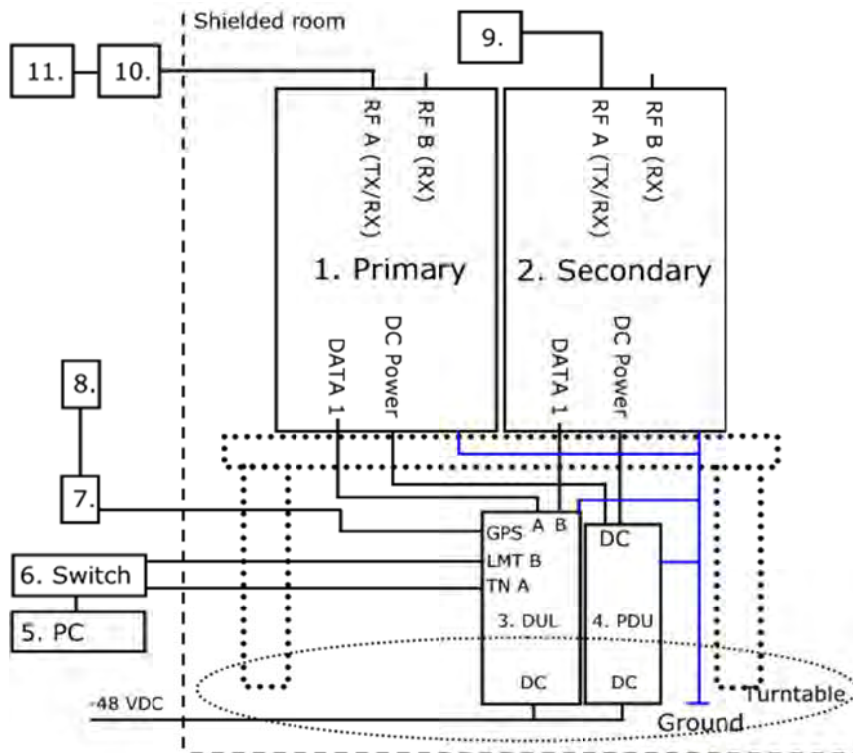
|    |                                                                                                                                                                                                               |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | RUS 01 B5, KRC 118 64/1, revision R1E, s/n: C826643265 with PIS software CXP 901 7316/1, Rev. R39UL and unlocked working software CXP 901 3268/6, Rev. R49AF<br>FCC ID: TA8AKRC11864-3 and IC: 287AB-AS118643 |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### Functional test equipment:

|     |                                                                                           |
|-----|-------------------------------------------------------------------------------------------|
| 2.  | DUG KDU 137 569/1 R2A C823721034                                                          |
| 3.  | DUW 30 01, KDU 127 161/3, revision R4C s/n: C824673232                                    |
| 4.  | PDU 02 01, BMG 980 336/4, rev: R2A, s/n: BJ31528316                                       |
| 5.  | RBS 6201 cabinet, BAMS 1000778792.                                                        |
| 6.  | Symmetricon 8040, BAMS 1000714189 reference                                               |
| 7.  | ERNC Sim 130 BAMS 1000660991                                                              |
| 8.  | Fast Ethernet switch, Netgear FS726T                                                      |
| 9.  | Controlling laptop HP Elitebook 8540w, BAMS 1001052043 running on software MOSHELL V9.0n. |
| 10. | RBS Master LPY 107 1007/3, rev R1C, BAMS 1001052043                                       |
| 11. | Attenuator, filter, according respective appendix                                         |
| 12. | SP test instrument according measurement equipment list                                   |

## Appendix 1

## Test setup radiated measurements single RAT LTE, MIMO mode



**Test object:**

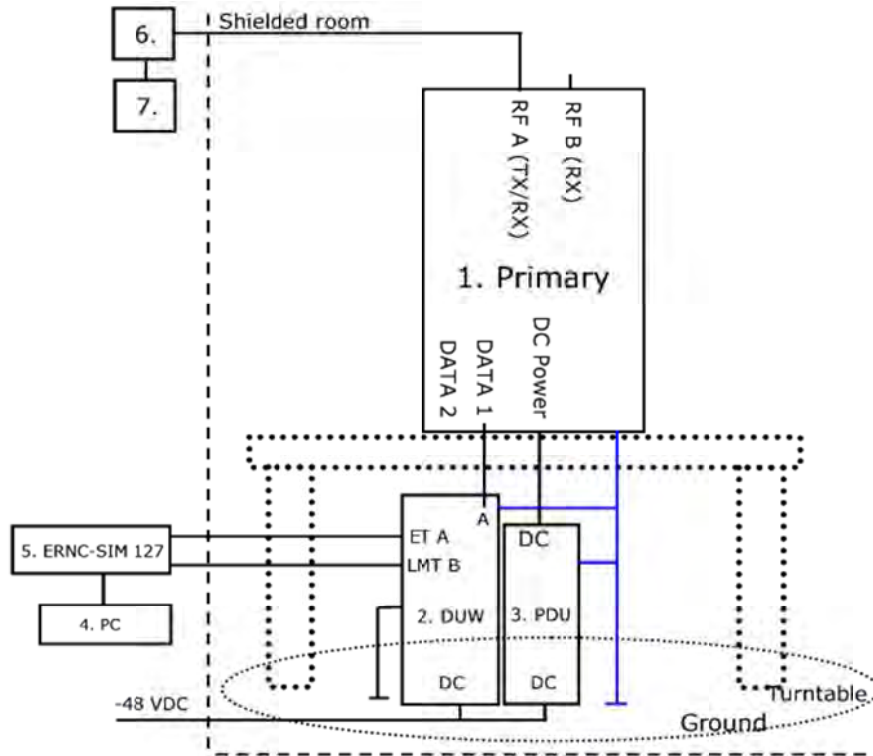
|    |                                                                                                                                                                    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | RUS 1: RUS 01 B5, KRC 118 64/3, rev. R1E, s/n: C826643263<br>with PIS software CXP 901 7316/1, Rev. R39UL,<br>unlocked working software CXP 901 3268/6, Rev. R49AF |
| 2. | RUS 2: RUS 01 B5, KRC 118 64/3, rev. R1E, s/n: C826643261<br>with PIS software CXP 901 7316/1, Rev. R39UL,<br>unlocked working software CXP 901 3268/6, Rev. R49AF |

### Functional test equipment:

|     |                                                                                                                                                                                                                                                                                                                    |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.  | DUL 20 01 KDU 137 533/4 R1F, s/n: TU8X856717,<br>hosted in SUP 6601 1/BFL 901 009/4, rev. R1D, s/n. BW98450216                                                                                                                                                                                                     |
| 4.  | Power Subrack:<br>PDU 01 01, BMG 980 336/2, R4F, BJ31532384<br>PDU 01 01, BMG 980 336/2, R4F, BJ31532382<br>SHU 01 01, BGK 901 18/1, R3C, BJ31446269<br>PFU 01 01, KFE 101 1162/1, R1B, BR80910495<br>PCF 02 01, KFE 101 1157/1, R1C, BW95301450<br>DUMMY x3, SXK 109 8257/1, R1D<br>DUMMY x1, SXK 109 8257/1, R1F |
| 5.  | Computer HP Elitebook 8540w, BAMS – 1001052032                                                                                                                                                                                                                                                                     |
| 6.  | Fast Ethernet switch, Netgear FS726T                                                                                                                                                                                                                                                                               |
| 7.  | GPS 02 01, NCD 901 41/1, rev. R1D, s/n: TU8K357393                                                                                                                                                                                                                                                                 |
| 8.  | GPS Active Antenna, KRE 101 2082/1                                                                                                                                                                                                                                                                                 |
| 9.  | Terminator                                                                                                                                                                                                                                                                                                         |
| 10. | Attenuator                                                                                                                                                                                                                                                                                                         |
| 11. | ESI 26, SP number: 503 292, for supervision purpose only                                                                                                                                                                                                                                                           |

## Appendix 1

### Test setup radiated measurements single RAT WCDMA, conventional mode



#### Test object:

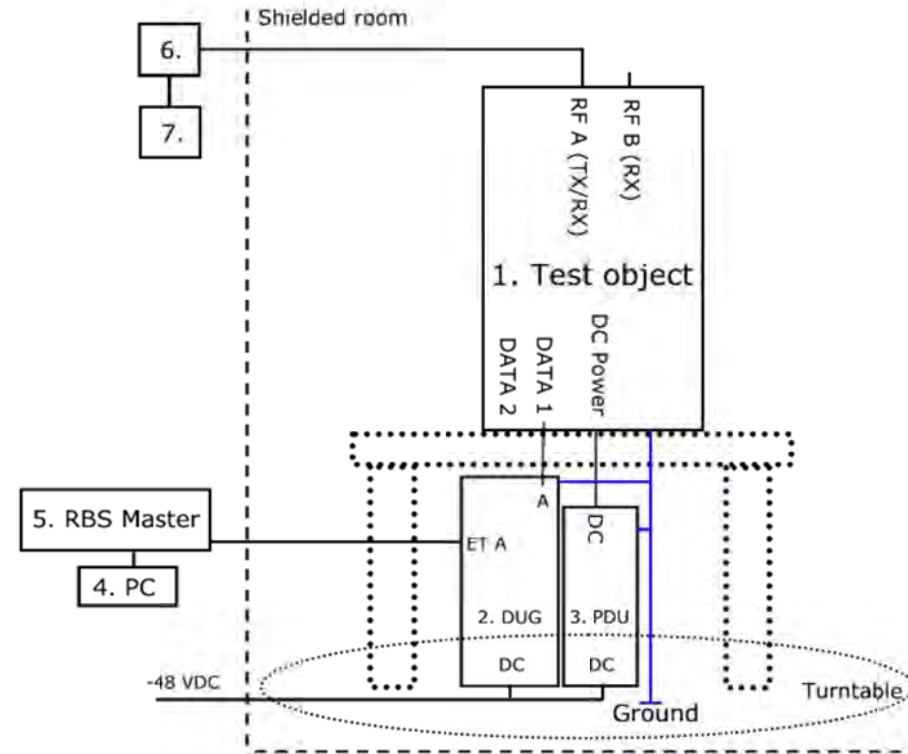
|    |                                                                                                                                                                    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | RUS 1: RUS 01 B5, KRC 118 64/3, rev. R1E, s/n: C826643261<br>with PIS software CXP 901 7316/1, Rev. R39UL,<br>unlocked working software CXP 901 3268/6, Rev. R49AL |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### Functional test equipment:

|    |                                                                                                                                                                                                                                                                                                                    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2. | DUW 30 01 KDU 127 161/3 R4C, s/n: C825194294, hosted in<br>SUP 6601 1/BFL 901 009/4, rev. R1D, s/n. BW98450216                                                                                                                                                                                                     |
| 3. | Power Subrack:<br>PDU 01 01, BMG 980 336/2, R4F, BJ31532384<br>PDU 01 01, BMG 980 336/2, R4F, BJ31532382<br>SHU 01 01, BGK 901 18/1, R3C, BJ31446269<br>PFU 01 01, KFE 101 1162/1, R1B, BR80910495<br>PCF 02 01, KFE 101 1157/1, R1C, BW95301450<br>DUMMY x3, SXX 109 8257/1, R1D<br>DUMMY x1, SXX 109 8257/1, R1F |
| 4. | Computer HP Elitebook 8540w, BAMS – 1001052032                                                                                                                                                                                                                                                                     |
| 5. | ERNC-SIM 127, BAMS – 1000660988                                                                                                                                                                                                                                                                                    |
| 6. | Attenuator                                                                                                                                                                                                                                                                                                         |
| 7. | ESI 26, SP number: 503 292, for supervision purpose only                                                                                                                                                                                                                                                           |

## Appendix 1

### Test setup radiated measurements single RAT GSM, conventional mode



#### Test object:

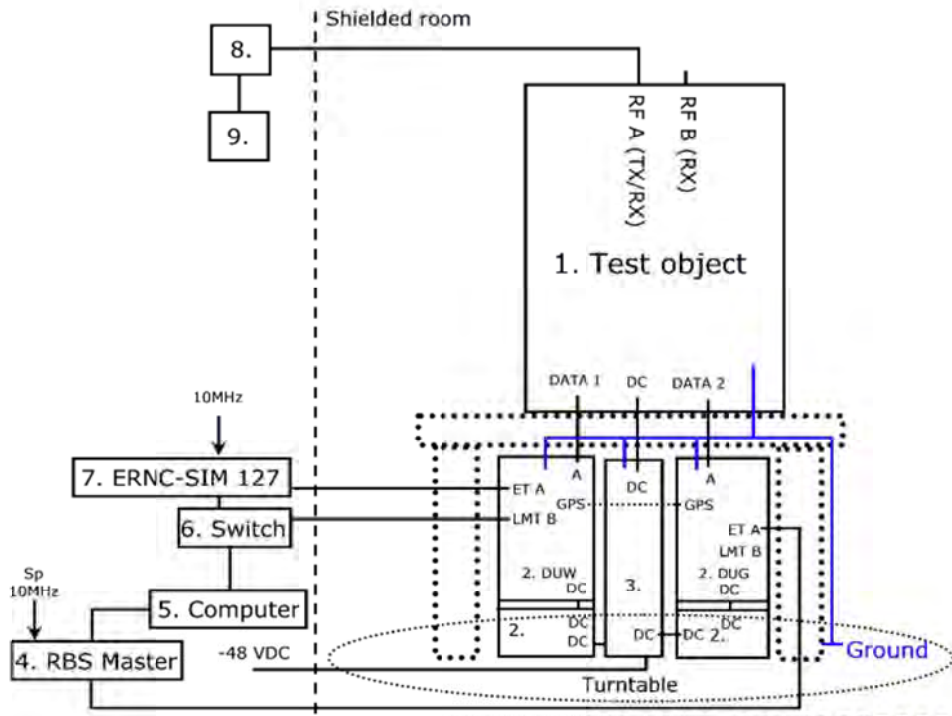
|    |                                                                                                                                                             |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | RUS 01 B5, KRC 118 64/3, rev. R1E, s/n: C826643261<br>with PIS software CXP 901 7316/1, Rev. R39UL,<br>unlocked working software CXP 901 3268/6, Rev. R49AL |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### Functional test equipment:

|    |                                                                                                                                                                                                                                                                                                                    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2. | DUG 30 01 KDU 127 161/3, rev. R4C, s/n: C825194294,<br>hosted in SUP 6601 1/BFL 901 009/4, rev. R1D, s/n. BW98450216                                                                                                                                                                                               |
| 3. | Power Subrack:<br>PDU 01 01, BMG 980 336/2, R4F, BJ31532384<br>PDU 01 01, BMG 980 336/2, R4F, BJ31532382<br>SHU 01 01, BGK 901 18/1, R3C, BJ31446269<br>PFU 01 01, KFE 101 1162/1, R1B, BR80910495<br>PCF 02 01, KFE 101 1157/1, R1C, BW95301450<br>DUMMY x3, SXX 109 8257/1, R1D<br>DUMMY x1, SXX 109 8257/1, R1F |
| 4. | Computer HP Elitebook 8540w, BAMS – 1001052032                                                                                                                                                                                                                                                                     |
| 5. | RBS Master 2E, LPY 107 1007/3, rev. R1C, BAMS – 1001195171                                                                                                                                                                                                                                                         |
| 6. | Attenuator                                                                                                                                                                                                                                                                                                         |
| 7. | ESI 26, SP number: 503 292, for supervision purpose only                                                                                                                                                                                                                                                           |

## Appendix 1

### Test setup radiated measurements MSR WCDMA + GSM



#### Test object:

|    |                                                                                                                                                                    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | RUS 1: RUS 01 B5, KRC 118 64/3, rev. R1E, s/n: C826643261<br>with PIS software CXP 901 7316/1, Rev. R39UL,<br>unlocked working software CXP 901 3268/6, Rev. R49AL |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### Functional test equipment:

|    |                                                                                                                                                                                                                                                                                                                    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2. | DUW 30 01, KDU 127 161/3, rev. R4C, s/n: C825194294,<br>hosted in SUP 6601 1/BFL 901 009/4, rev. R1E, s/n. BR82081105<br>DUG 20 01, KDU 137 569/1, rev. R3A, s/n: C826351565<br>hosted in SUP 6601 1/BFL 901 009/4, rev. R1D, s/n. BW98450216                                                                      |
| 3. | Power Subrack:<br>PDU 01 01, BMG 980 336/2, R4F, BJ31532384<br>PDU 01 01, BMG 980 336/2, R4F, BJ31532382<br>SHU 01 01, BGK 901 18/1, R3C, BJ31446269<br>PFU 01 01, KFE 101 1162/1, R1B, BR80910495<br>PCF 02 01, KFE 101 1157/1, R1C, BW95301450<br>DUMMY x3, SXK 109 8257/1, R1D<br>DUMMY x1, SXK 109 8257/1, R1F |
| 4. | RBS Master 2E, LPY 107 1007/3, rev. R1C, BAMS – 1001195171                                                                                                                                                                                                                                                         |
| 5. | Computer HP Elitebook 8540w, BAMS – 1001052032                                                                                                                                                                                                                                                                     |
| 6. | Fast Ethernet switch, Netgear FS726T                                                                                                                                                                                                                                                                               |
| 7. | ERNC-SIM 127, BAMS – 1000660988                                                                                                                                                                                                                                                                                    |
| 8. | Attenuator                                                                                                                                                                                                                                                                                                         |
| 9. | ESI 26, SP number: 503 292, for supervision purpose only                                                                                                                                                                                                                                                           |

## Appendix 1

**Interfaces:**
**Type of port:**

|                                                  |          |
|--------------------------------------------------|----------|
| Supply power -48 VDC                             | DC Power |
| Antenna port (A), 7/16 connector, combined TX/RX | Antenna  |
| Antenna port (B), 7/16 connector, only RX        | Antenna  |
| Data 1, electrical interface                     | Signal   |
| Data 2, electrical interface                     | Signal   |
| RX A Out, unused                                 | Antenna  |
| RX A I/O, unused                                 | Antenna  |
| RX B I/O, unused                                 | Antenna  |
| Ground wire                                      | Ground   |

**RBS Software**
**Single RAT, GSM**

| Software | Revision |
|----------|----------|
| DXPR71HZ | R49BS    |

**Single RAT, WCDMA**

| Software       | Revision |
|----------------|----------|
| CXP 901 8350/1 | R11B08   |

**Single RAT, LTE:**

| Software       | Revision |
|----------------|----------|
| CXP 102 051/16 | R23BV    |

**MSR WCDMA:**

| Software       | Revision |
|----------------|----------|
| CXP 901 8350/1 | R11B08   |

**MSR GSM:**

| Software | Revision |
|----------|----------|
| DXPP4BCZ | P49L     |

## Appendix 1

### References

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

ANSI 63.4-2009

ANSI/TIA/EIA-603-C-2004

CFR 47 part 2, October 1<sup>st</sup>, 2012

CFR 47 part 22, October 1<sup>st</sup>, 2012

3GPP TS 25.141, version 8.9.0

3GPP TS 36.141, version 8.4.0

3GPP TS 37.141, version 10.8.0

RSS-Gen Issue 3

RSS-132 Issue 3

### Measurement equipment

|                                                            | Calibration Due | SP number |
|------------------------------------------------------------|-----------------|-----------|
| Test site Tesla                                            | 2014-01         | 503 881   |
| R&S FSIQ 40                                                | 2013-07         | 503 738   |
| R&S FSQ 40                                                 | 2013-05         | 504 143   |
| R&S ESU 26                                                 | 2013-09         | 901 553   |
| Control computer with<br>R&S software EMC32 version 8.52.0 | -               | 503 479   |
| High pass filter                                           | 2013-07         | 901 501   |
| High pass filter                                           | 2013-08         | 901 373   |
| RF attenuator                                              | 2013-07         | 504 159   |
| RF attenuator                                              | 2014-12         | 901 508   |
| RF attenuator                                              | 2013-09         | 900 233   |
| RF attenuator                                              | 2013-06         | 901 384   |
| Directional coupler                                        | 2013-07         | 901 496   |
| Chase Bilog Antenna CBL 6111A                              | 2014-10         | 503 182   |
| EMCO Horn Antenna 3115                                     | 2014-01         | 502 175   |
| µComp Nordic, Low Noise Amplifier                          | 2013-03         | 901 545   |
| MITEQ Low Noise Amplifier                                  | 2013-08         | 503 285   |
| Testo 635 Temperature and humidity meter                   | 2013-06         | 504 203   |
| Testo 625 Temperature and humidity meter                   | 2013-06         | 504 188   |

### 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). Compliance evaluation is based on a shared risk principle with respect to the measurement uncertainty.

### Reservation

The test results in this report apply only to the particular test object as declared in the report.

## Appendix 1

### **Delivery of test object**

The test object was delivered 2013-01-28.

### **Manufacturer's representative**

Christer Gustavsson, Ericsson AB

### **Test engineers**

Andreas Johnson, Tomas Lennhager, Tomas Isbring, Jörgen Wassholm and Martin Theorin, SP

### **Test participants**

Adam Skoglund, Ericsson AB (partially during radiated tests)

## Appendix 2

### RF power output measurements according to CFR 47 2.1046 / IC RSS-132 5.4

| Date       | Temperature  | Humidity   |
|------------|--------------|------------|
| 2013-01-22 | 21 °C ± 3 °C | 13 % ± 5 % |
| 2013-01-23 | 23 °C ± 3 °C | 11 % ± 5 % |
| 2013-01-24 | 22 °C ± 3 °C | 10 % ± 5 % |
| 2013-01-25 | 22 °C ± 3 °C | 12 % ± 5 % |
| 2013-01-28 | 22 °C ± 3 °C | 22 % ± 5 % |
| 2013-01-29 | 22 °C ± 3 °C | 23 % ± 5 % |
| 2013-02-18 | 20 °C ± 3 °C | 24 % ± 5 % |

The test object was connected to a signal analyzer measuring peak and RMS output power in CDF mode. A RBW of 50 MHz was used.

| Measurement equipment                    | SP number |
|------------------------------------------|-----------|
| Rohde & Schwarz signal analyzer FSQ40    | 504 143   |
| RF attenuator                            | 504 159   |
| RF attenuator                            | 901 508   |
| Testo 635 temperature and humidity meter | 504 203   |

**Measurement uncertainty:** 1.1 dB

### Results

LTE single RAT, single carrier.

Rated output power 1x 49 dBm

| Tested configuration<br>BW and frequency | Transmitter power<br>RMS (dBm) |
|------------------------------------------|--------------------------------|
|                                          | Port RFA                       |
| 1.4 MHz, M                               | 48.59<br>(Diagram 1)           |
| 5 MHz, M                                 | 48.67<br>(Diagram 2)           |
| 20 MHz, M                                | 48.60<br>(Diagram 3)           |

Note: The diagrams are shown on the following pages and provide Peak to Average Ratio (PAPR). The highest single carrier PAPR measured was 7.88 dB (0.1%). For multi-carrier constellations the measured “PAPR” is informative only as to the definition of Peak to Average Ratio per carrier.

## Appendix 2

LTE single Carrier MIMO mode.

Rated output power 1x 49 dBm per RF port. Total nominal RF power 52 dBm.

| Tested configuration<br>BW and frequency | Transmitter power<br>RMS (dBm) |                            |                           |
|------------------------------------------|--------------------------------|----------------------------|---------------------------|
|                                          | Port RFA<br>Primary mode       | Port RFA<br>Secondary mode | Total power <sup>1)</sup> |
| 1.4 MHz, B                               | 48.49<br>(Diagram 4)           | 48.58<br>(Diagram 5)       | 51.55                     |
| 20 MHz, B                                | 48.69<br>(Diagram 6)           | 48.63<br>(Diagram 7)       | 51.67                     |
| 1.4 MHz, M                               | 48.65<br>(Diagram 8)           | 48.63<br>(Diagram 9)       | 51.65                     |
| 3 MHz, M                                 | 48.74<br>(Diagram 10)          | 48.70<br>(Diagram 11)      | 51.71                     |
| 5 MHz, M                                 | 48.74<br>(Diagram 12)          | 48.74<br>(Diagram 13)      | 51.75                     |
| 10 MHz, M                                | 48.70<br>(Diagram 14)          | 48.75<br>(Diagram 15)      | 51.74                     |
| 15 MHz, M                                | 48.69<br>(Diagram 16)          | 48.77<br>(Diagram 17)      | 51.74                     |
| 20 MHz, M                                | 48.66<br>(Diagram 18)          | 48.67<br>(Diagram 19)      | 51.68                     |
| 1.4 MHz, T                               | 48.37<br>(Diagram 20)          | 48.38<br>(Diagram 21)      | 51.39                     |
| 20 MHz, T                                | 48.72<br>(Diagram 22)          | 48.66<br>(Diagram 23)      | 51.70                     |

<sup>1)</sup>: summed output power according to FCC KDB662911 Multiple transmitter output v01r02

## Appendix 2

LTE multi Carrier MIMO mode.

Rated output power 2 x 46 dBm per RF port. Total nominal RF power 52 dBm

| Tested configuration<br>BW and frequency | Transmitter power<br>RMS (dBm) |                            |                           |
|------------------------------------------|--------------------------------|----------------------------|---------------------------|
|                                          | Port RFA<br>Primary mode       | Port RFA<br>Secondary mode | Total power <sup>1)</sup> |
| 1.4 MHz, B                               | 48.59<br>(Diagram 24)          | Not tested <sup>2)</sup>   | 51.59                     |
| 1.4 MHz, M                               | 48.66<br>(Diagram 25)          | Not tested <sup>2)</sup>   | 51.66                     |
| 1.4 MHz, T                               | 48.64<br>(Diagram 26)          | Not tested <sup>2)</sup>   | 51.64                     |

<sup>1)</sup>: Summed output power according to FCC KDB662911 Multiple transmitter output v01r02

<sup>2)</sup>: Measurements were made on RUS 1 port RF A in primary mode only due to the measurement result in LTE single carrier MIMO mode that shows that the ports are identical, as declared by the client.

WCDMA single RAT, single carrier, MIMO mode

Rated output power 1x 47 dBm per RF port. Total nominal RF power 50 dBm.

| Tested configuration<br>BW and frequency | Transmitter power<br>RMS (dBm) |                             |                           |
|------------------------------------------|--------------------------------|-----------------------------|---------------------------|
|                                          | Port RFA<br>Primary mode       | Port RF A<br>Secondary mode | Total power <sup>1)</sup> |
| 5 MHz, B                                 | 46.86<br>(Diagram 27)          | 46.88<br>(Diagram 28)       | 49.88                     |
| 5 MHz, M                                 | 46.94<br>(Diagram 29)          | 46.94<br>(Diagram 30)       | 49.95                     |
| 5 MHz, T                                 | 46.77<br>(Diagram 31)          | 46.81<br>(Diagram 32)       | 49.80                     |

<sup>1)</sup>: summed output power according to FCC KDB662911 Multiple transmitter output v01r02

## Appendix 2

WCDMA multi carrier, MIMO mode

Rated output power 2 x 46 dBm per RF port. Total nominal RF power 52 dBm

| Tested configuration<br>Bandwidth and frequency | Transmitter power<br>RMS (dBm) |                             |                           |
|-------------------------------------------------|--------------------------------|-----------------------------|---------------------------|
|                                                 | Port RF A<br>Primary mode      | Port RF A<br>Secondary mode | Total power <sup>1)</sup> |
| 5 MHz, B2                                       | 48.84<br>(Diagram 33)          | Not tested <sup>2)</sup>    | 51.90                     |
| 5 MHz, M2                                       | 48.90<br>(Diagram 34)          | Not tested <sup>2)</sup>    | 51.90                     |
| 5 MHz, T2                                       | 48.83<br>(Diagram 35)          | Not tested <sup>2)</sup>    | 51.86                     |

<sup>1)</sup>: Summed output power according to FCC KDB662911 Multiple transmitter output v01r02

<sup>2)</sup>: Measurements were made on RUS 1 port RF A in primary mode only due to the measurement result in WCDMA single carrier MIMO mode that shows that the ports are identical, as declared by the client.

WCDMA single RAT, single carrier, conventional mode

Rated output power 1x 49 dBm.

| Tested configuration<br>Bandwidth and frequency | Transmitter power<br>RMS (dBm) |
|-------------------------------------------------|--------------------------------|
|                                                 | Port RF A                      |
| 5 MHz, B                                        | 48.91<br>(Diagram 36)          |
| 5 MHz, M                                        | 48.94<br>(Diagram 37)          |
| 5 MHz, T                                        | 48.83<br>(Diagram 38)          |

## Appendix 2

GSM single RAT, single carrier, conventional mode

Rated output power 1x 47.8dBm.

| Tested configuration<br>Modulation and frequency | Transmitter power<br>RMS (dBm) |
|--------------------------------------------------|--------------------------------|
|                                                  | Port RF A                      |
| GMSK / B                                         | 47.29<br>(Diagram 39)          |
| GMSK / M                                         | 47.68<br>(Diagram 40)          |
| 8PSK / M                                         | 47.39<br>(Diagram 41)          |
| 16QAM / M                                        | 47.30<br>(Diagram 42)          |
| 32QAM / M                                        | 47.46<br>(Diagram 43)          |
| AQPSK / M                                        | 47.44<br>(Diagram 44)          |
| GMSK / T                                         | 47.33<br>(Diagram 45)          |

GSM single RAT, multi carrier, conventional mode

Rated output power 2x 46 dBm per RF port. Total nominal RF power 49 dBm.

| Tested configuration<br>Modulation and frequency | Transmitter power<br>RMS (dBm) |
|--------------------------------------------------|--------------------------------|
|                                                  | Port RF A                      |
| GMSK / B2                                        | 48.63<br>(Diagram 46)          |
| GMSK / M2                                        | 48.85<br>(Diagram 47)          |
| 16QAM / M2                                       | 48.55<br>(Diagram 48)          |
| GMSK / T2                                        | 48.44<br>(Diagram 49)          |

## Appendix 2

MSR: WCDMA & GSM MSR, conventional mode

Rated output power 49 dBm.

| Tested configuration | BW configuration WCDMA | Transmitter power RMS (dBm) |
|----------------------|------------------------|-----------------------------|
|                      |                        | Port RF A                   |
| Config 1             | 5 MHz                  | 48.48<br>(Diagram 50)       |
| Config 2             | 5 MHz                  | 48.61<br>(Diagram 51)       |
| Config 3             | 5 MHz                  | 48.52<br>(Diagram 52)       |
| Config 4             | 5 MHz                  | 48.65<br>(Diagram 53)       |
| Config 5             | 5 MHz                  | 48.57<br>(Diagram 54)       |

The diagrams are shown on the following pages.

### Limits

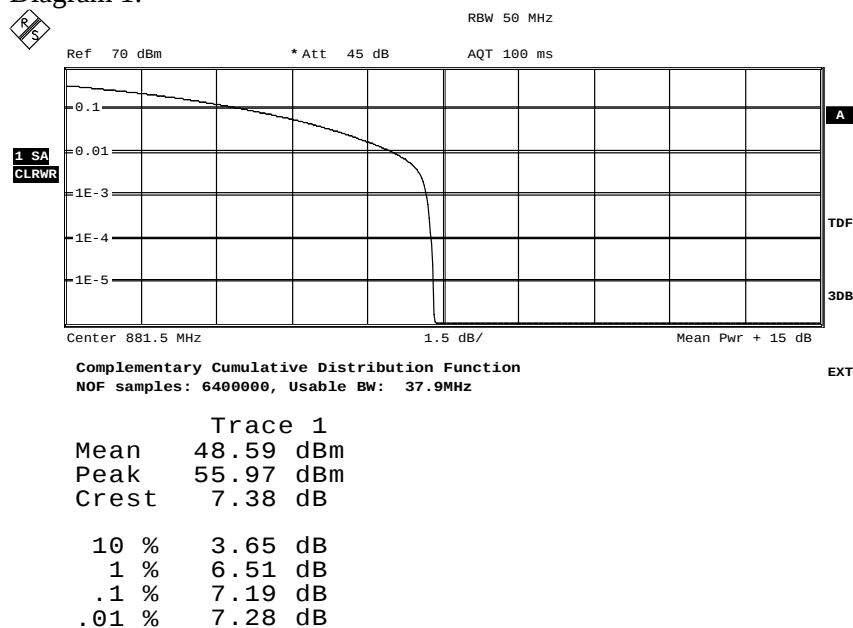
CFR47 § 22.913: The effective radiated power ERP shall not exceed 1000 W.

RSS-132 5.4: The average equivalent isotropically radiated power (e.i.r.p.) limits in SRSP-503 apply, resulting in a maximum EIRP of 1640 W.

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

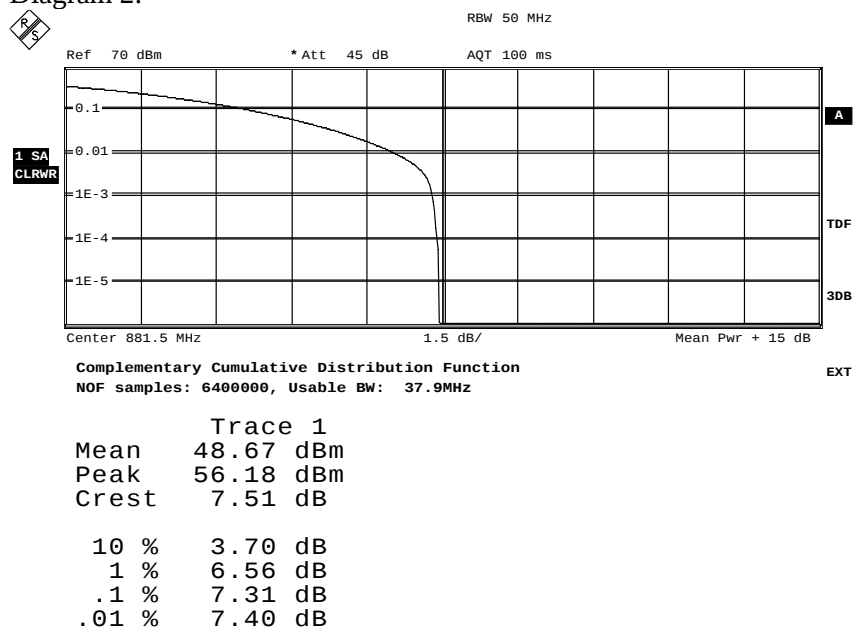
## Appendix 2

Diagram 1:



Date: 22.JAN.2013 14:33:46

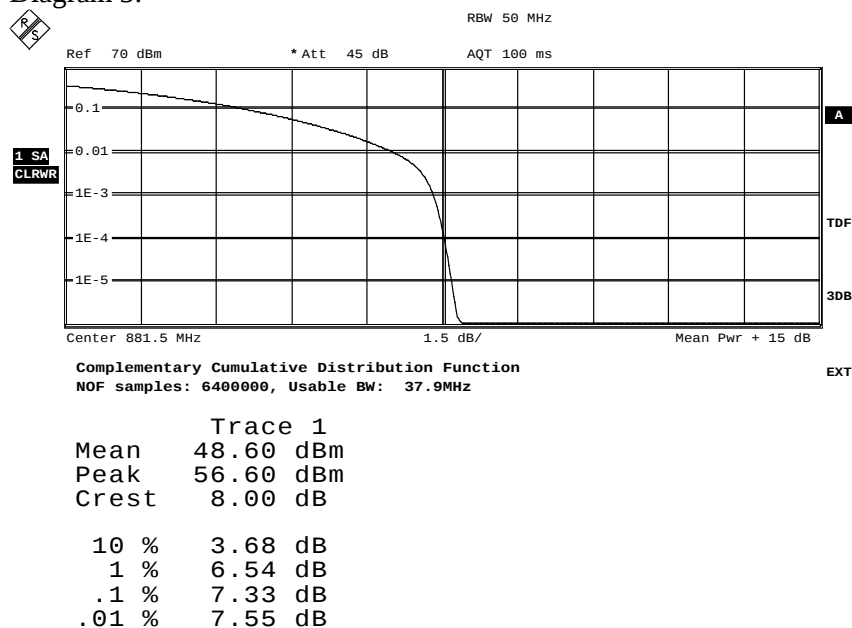
Diagram 2:



Date: 22.JAN.2013 14:25:02

## Appendix 2

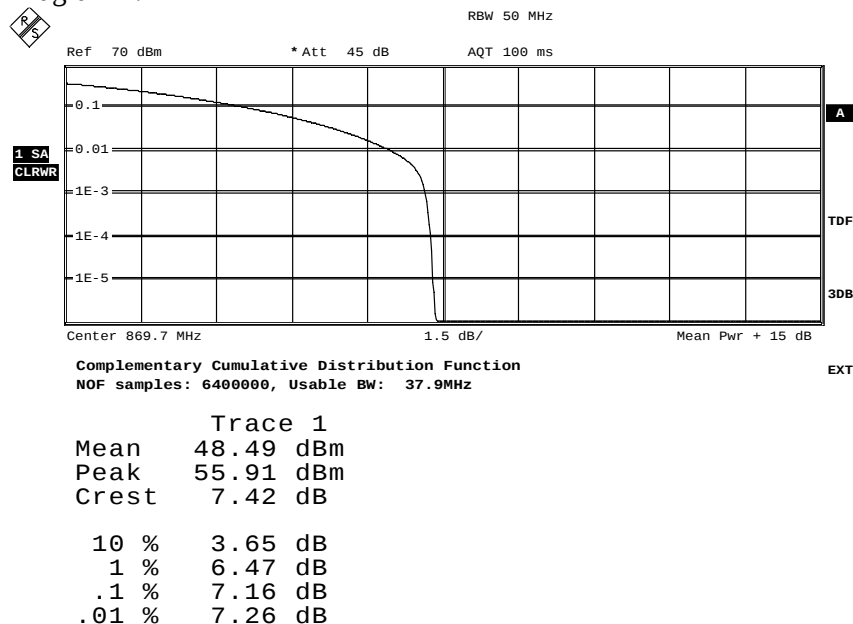
Diagram 3:



Date: 22.JAN.2013 14:47:15

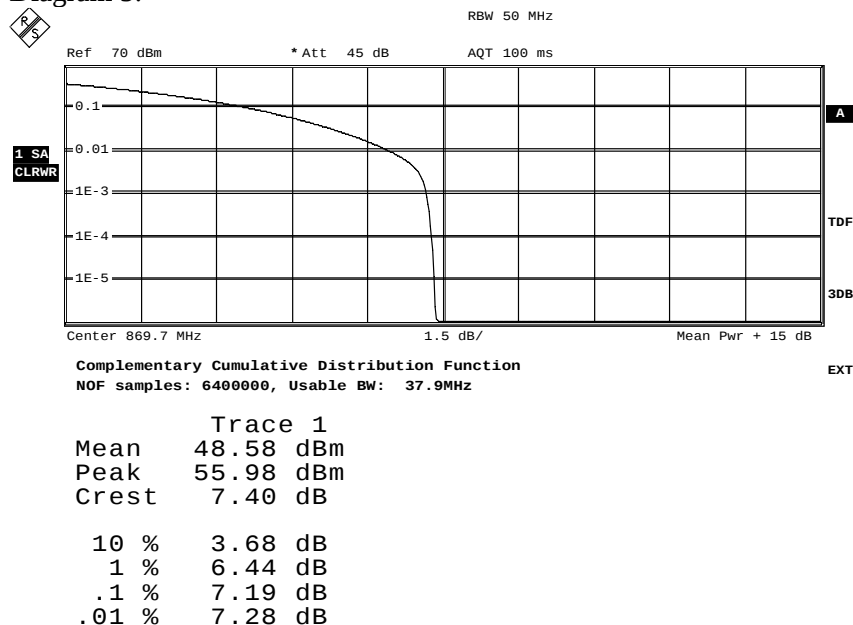
## Appendix 2

Diagram 4:



Date: 23.JAN.2013 09:39:09

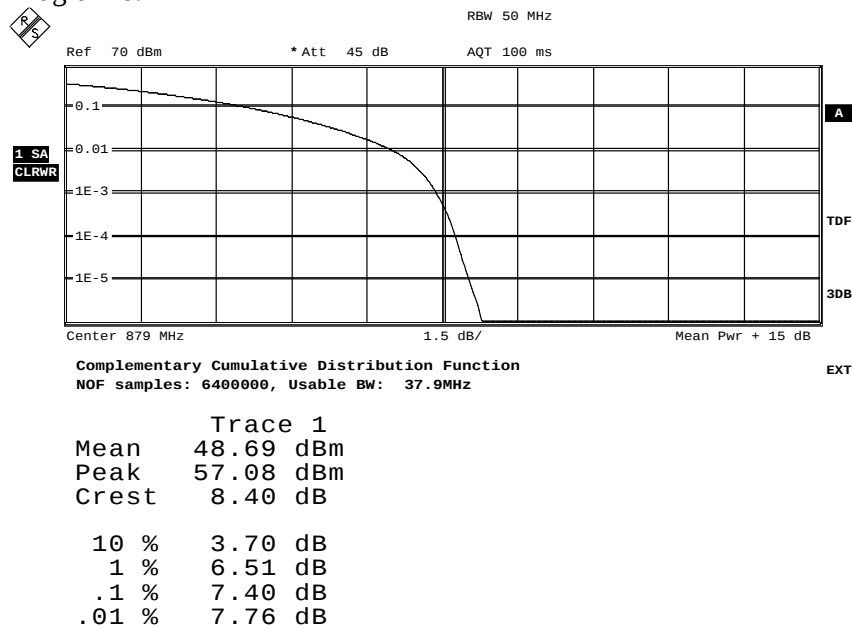
Diagram 5:



Date: 23.JAN.2013 08:06:02

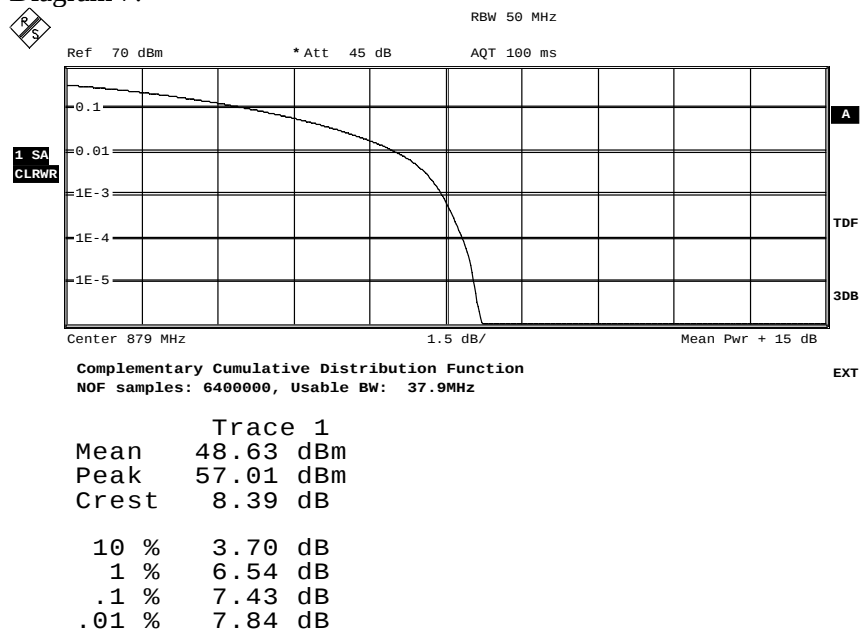
## Appendix 2

Diagram 6:



Date: 23.JAN.2013 09:07:36

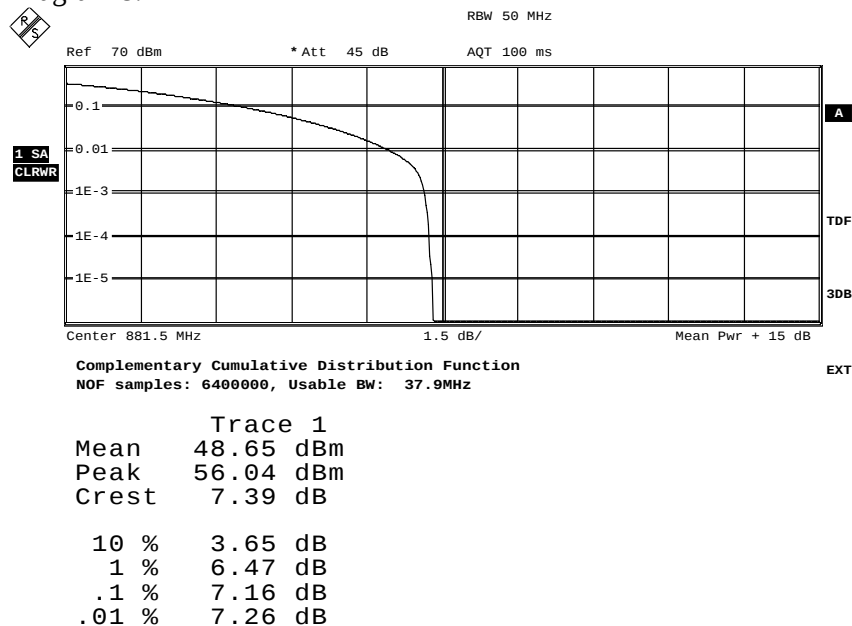
Diagram 7:



Date: 23.JAN.2013 08:58:29

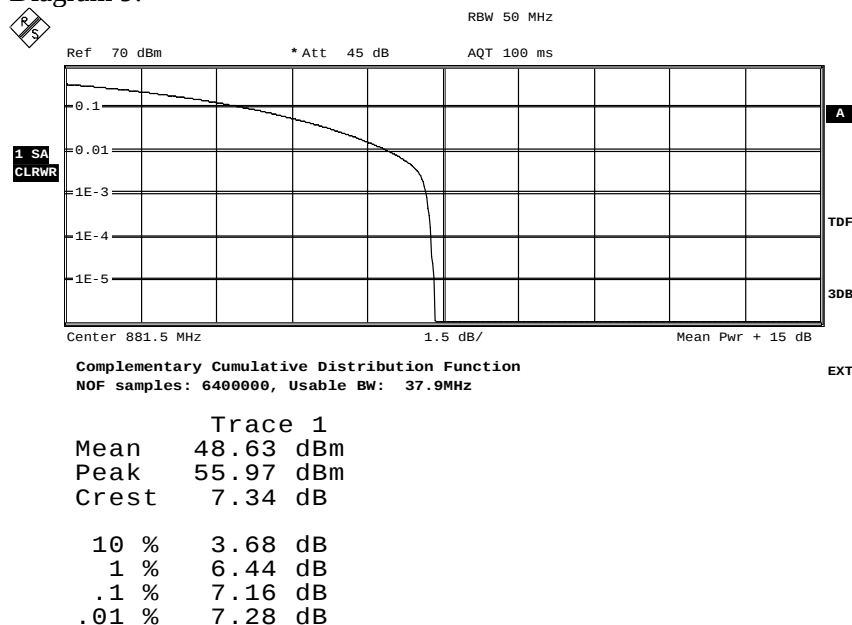
## Appendix 2

Diagram 8:



Date: 22.JAN.2013 15:38:58

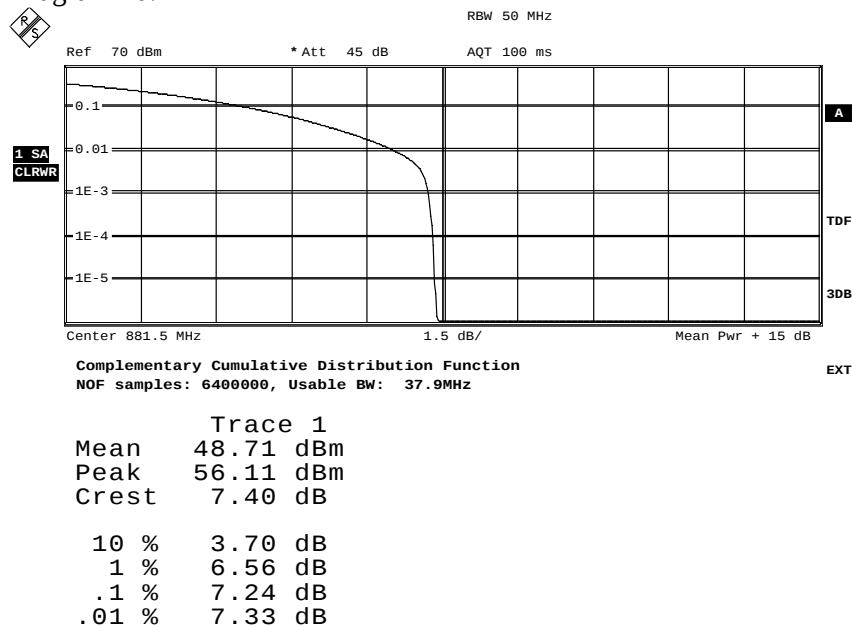
Diagram 9:



Date: 23.JAN.2013 07:34:40

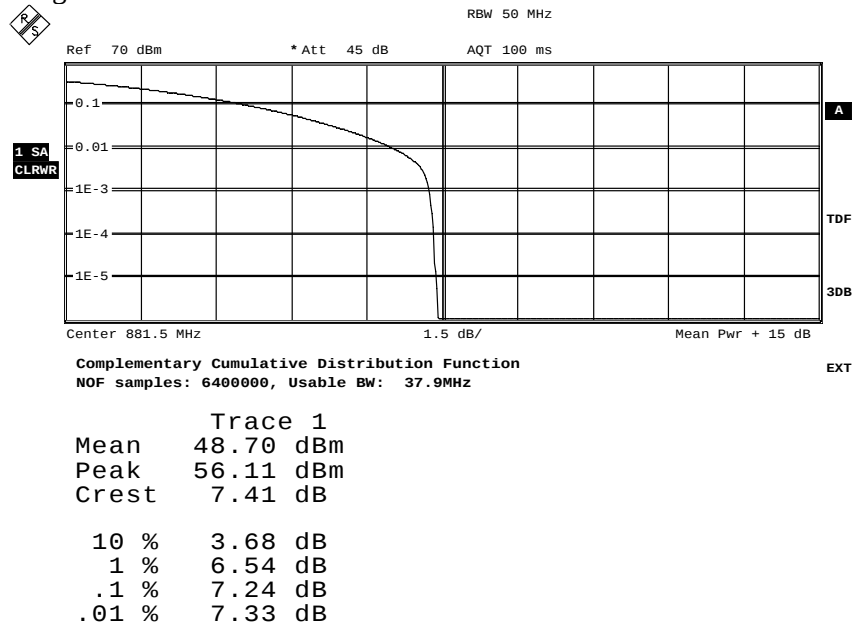
## Appendix 2

Diagram 10:



Date: 22.JAN.2013 15:40:30

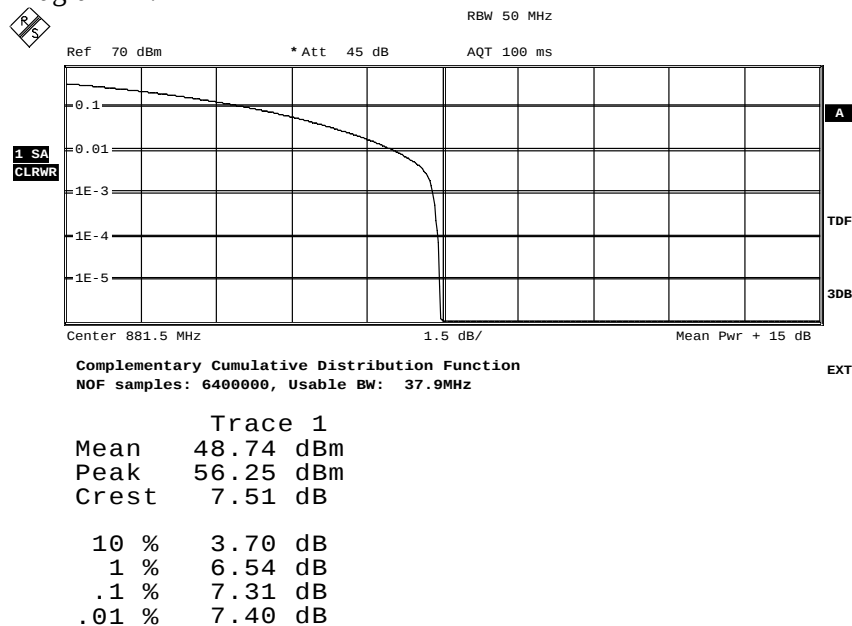
Diagram 11:



Date: 23.JAN.2013 12:06:05

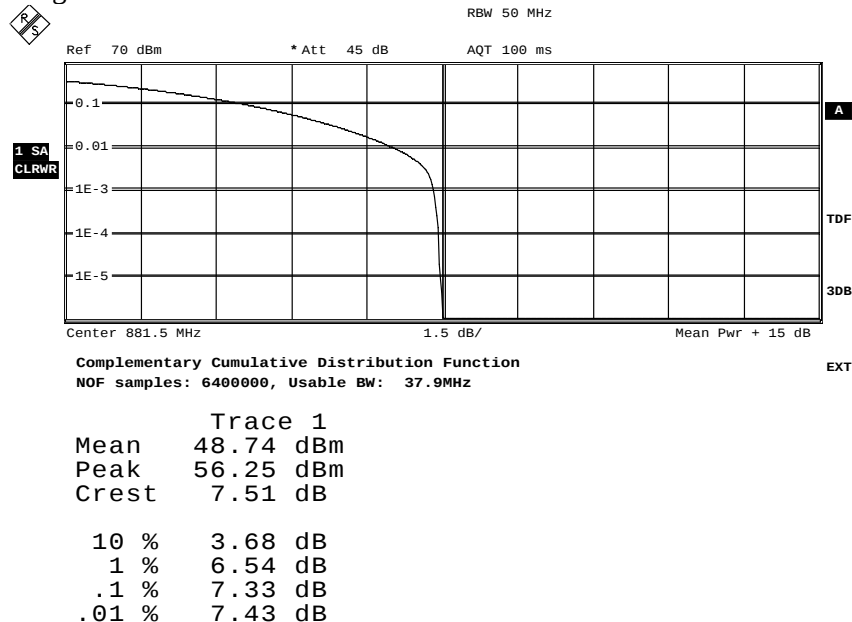
## Appendix 2

Diagram 12:



Date: 22.JAN.2013 15:14:22

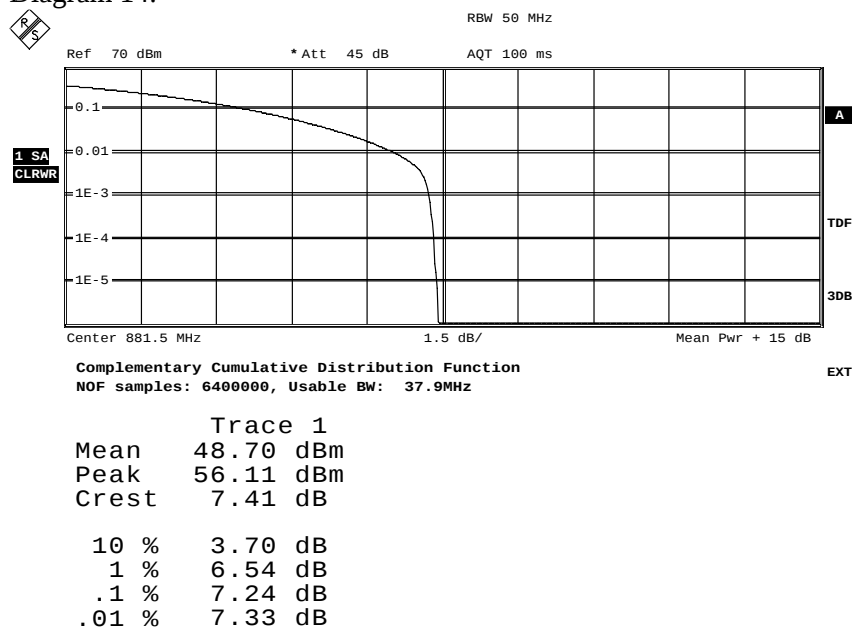
Diagram 13:



Date: 23.JAN.2013 12:00:45

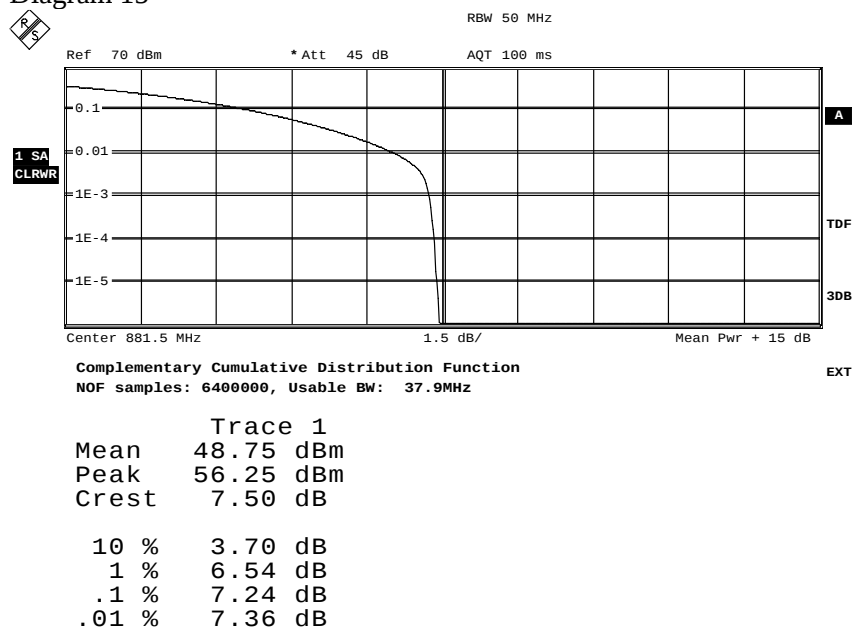
## Appendix 2

Diagram 14:



Date: 22.JAN.2013 15:19:53

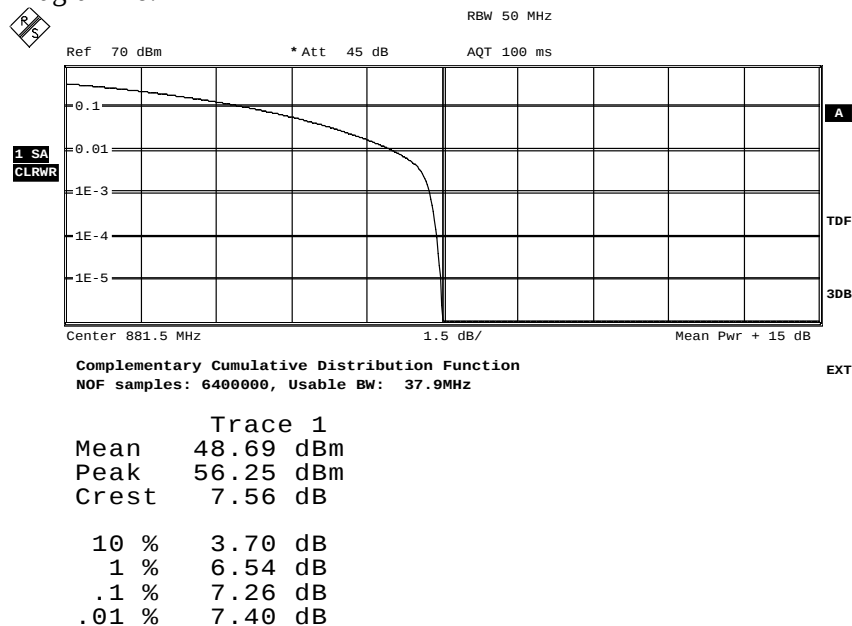
Diagram 15



Date: 23.JAN.2013 11:57:43

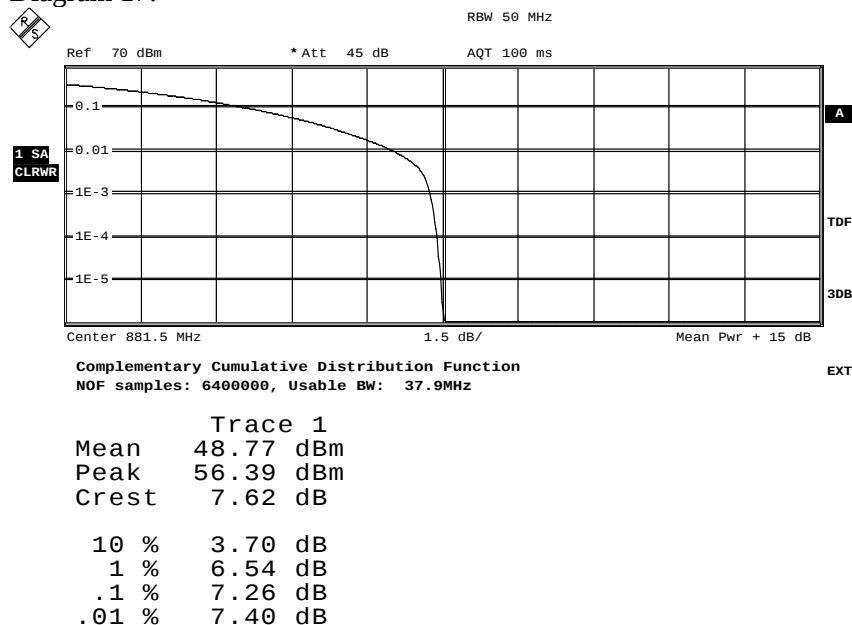
## Appendix 2

Diagram 16:



Date: 22.JAN.2013 15:21:30

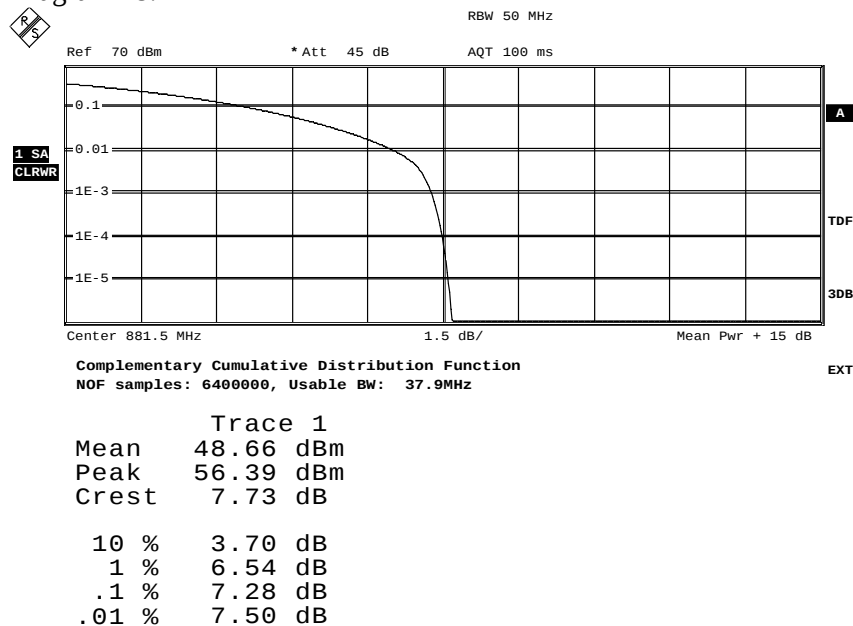
Diagram 17:



Date: 23.JAN.2013 11:47:48

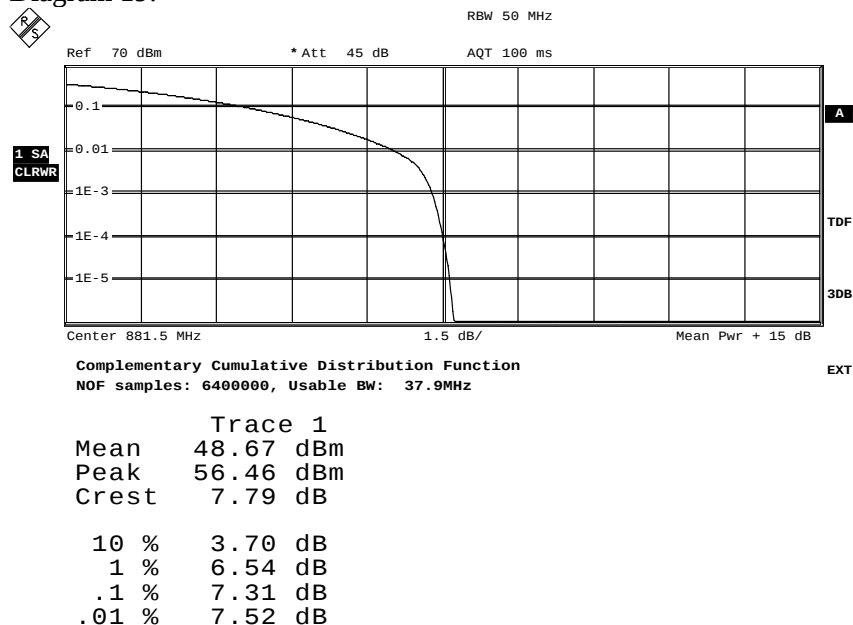
## Appendix 2

Diagram 18:



Date: 22.JAN.2013 15:25:03

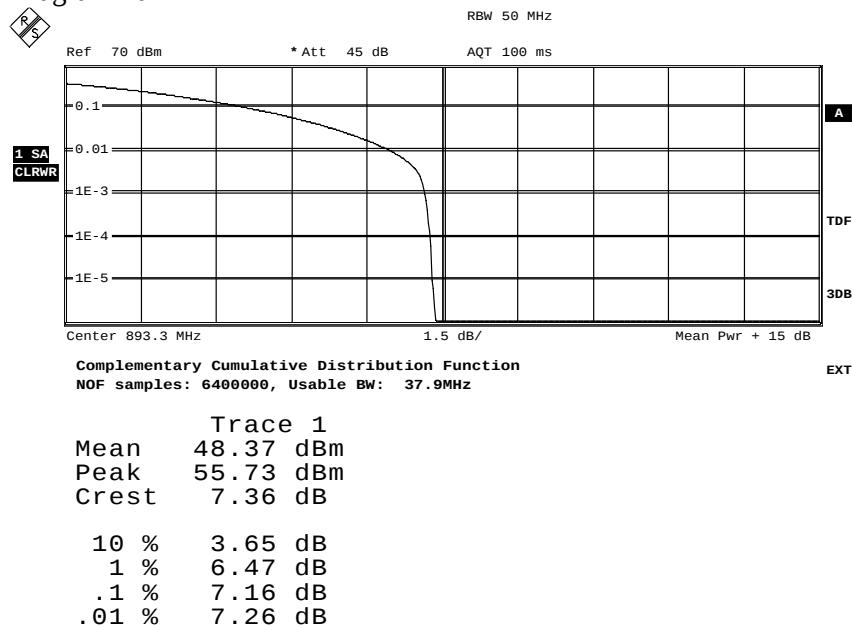
Diagram 19:



Date: 23.JAN.2013 07:43:09

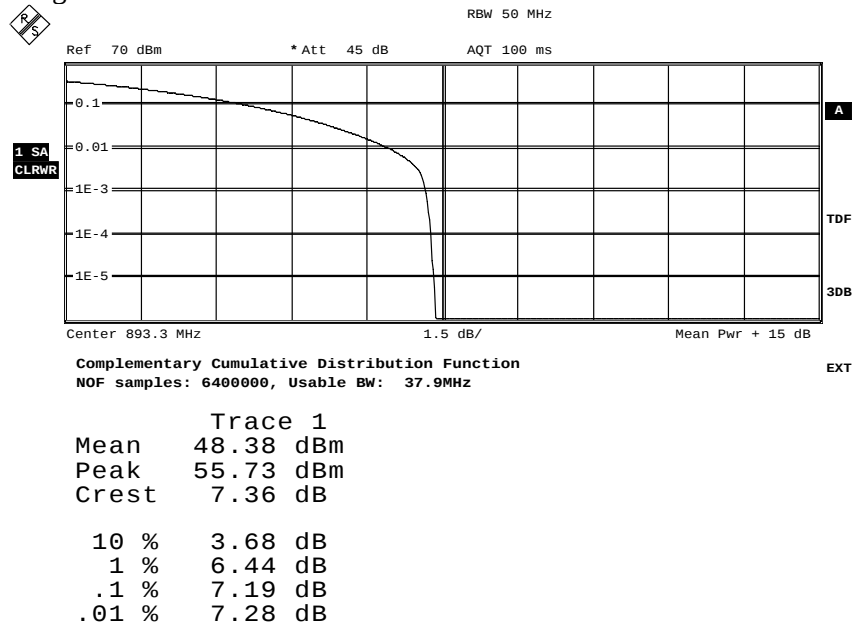
## Appendix 2

Diagram 20



Date: 23.JAN.2013 13:44:24

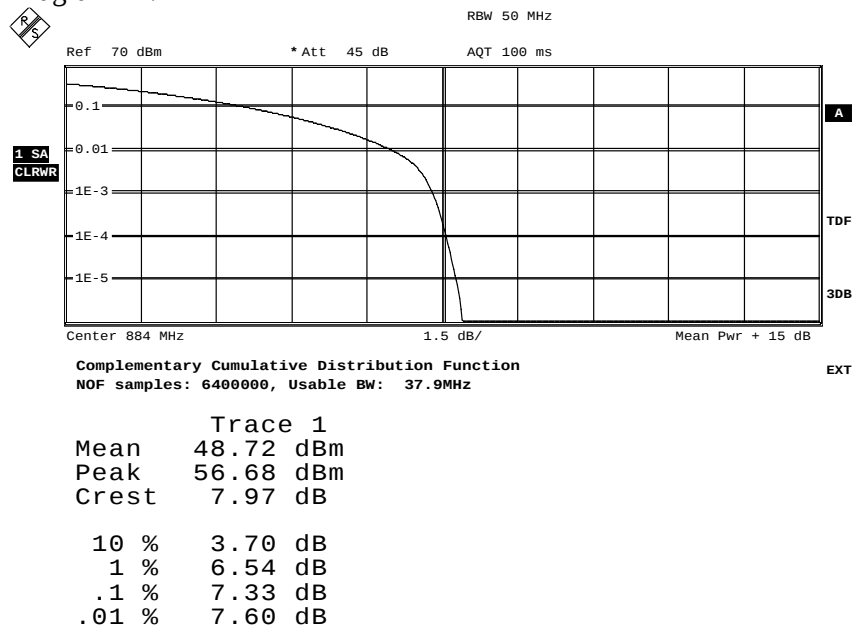
Diagram 21:



Date: 23.JAN.2013 12:28:07

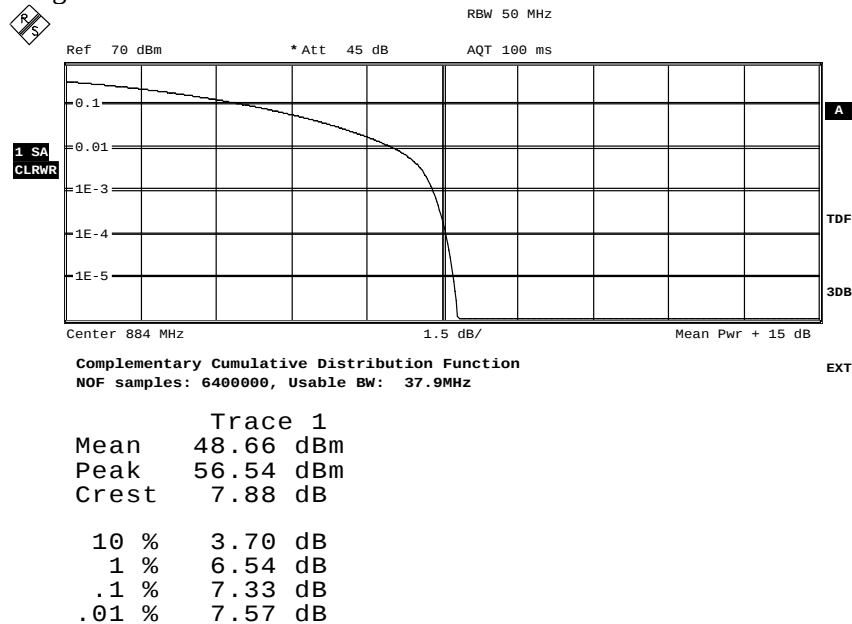
## Appendix 2

Diagram 22:



Date: 23.JAN.2013 12:56:06

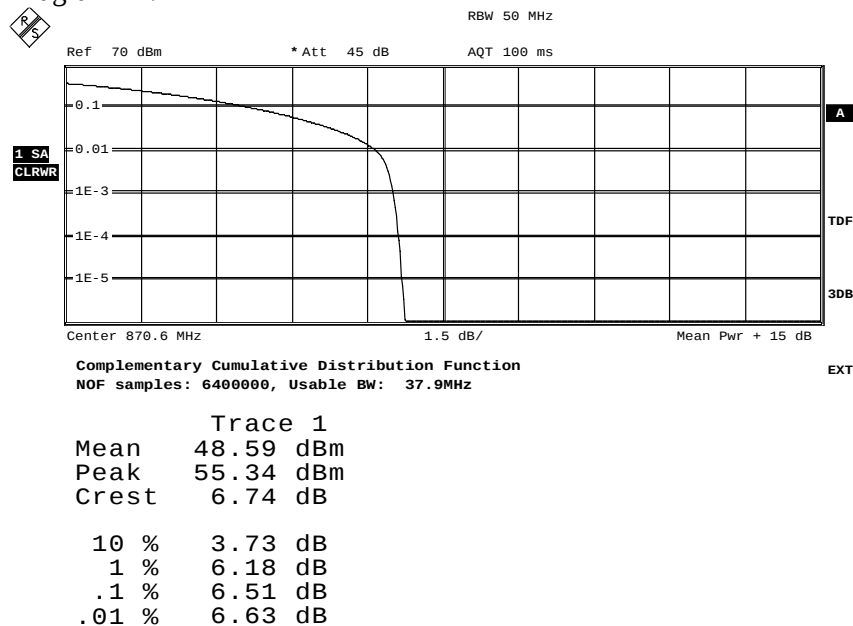
Diagram 23:



Date: 23.JAN.2013 12:46:49

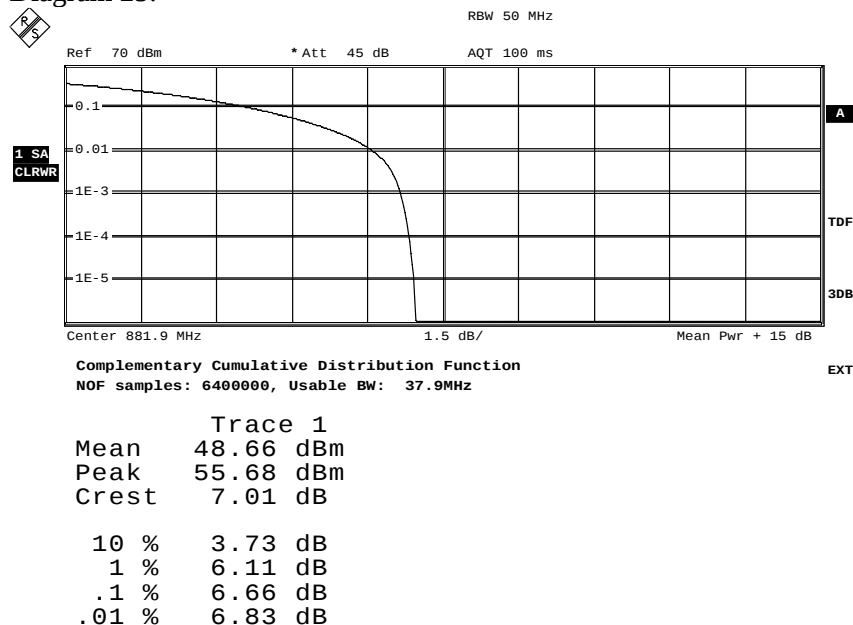
## Appendix 2

Diagram 24:



Date: 14.FEB.2013 10:53:39

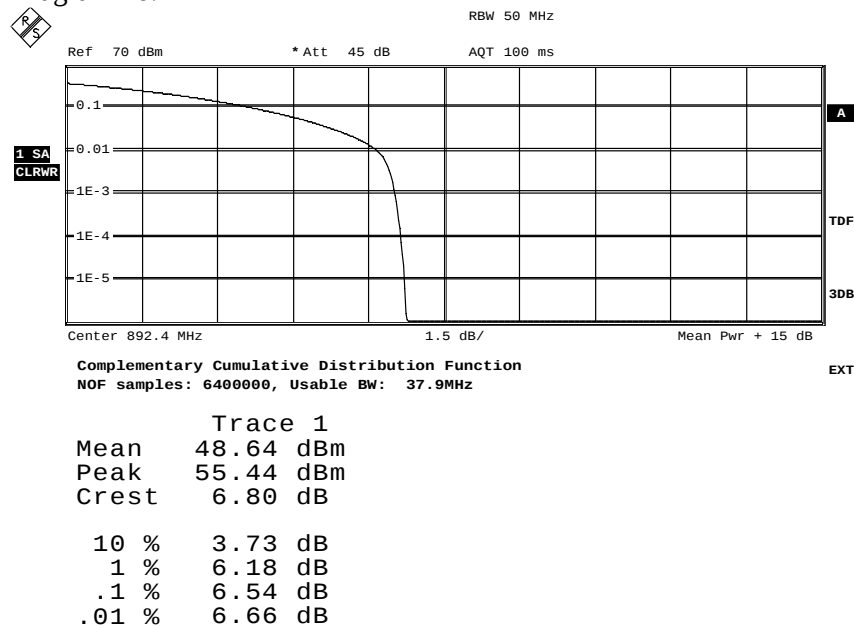
Diagram 25:



Date: 14.FEB.2013 11:55:30

## Appendix 2

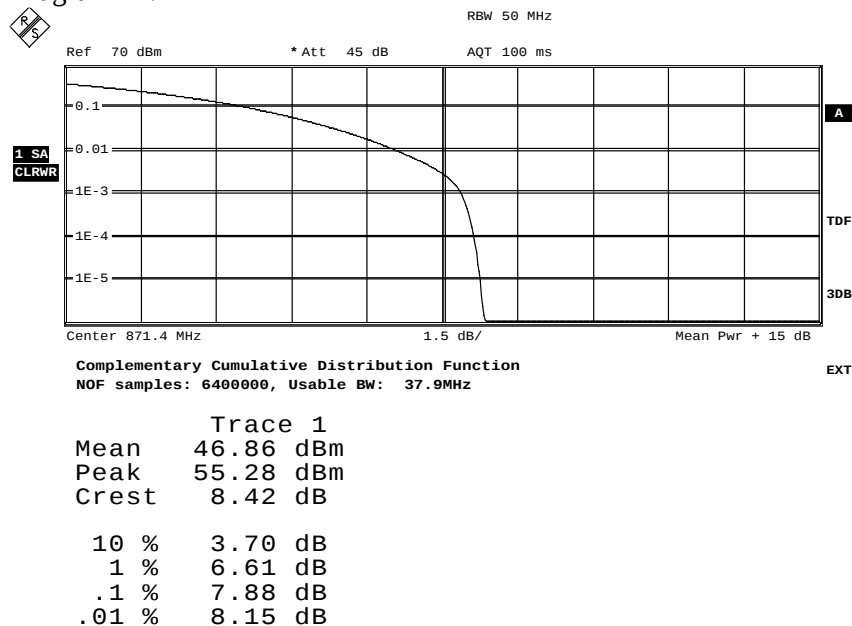
Diagram 26:



Date: 14.FEB.2013 12:40:01

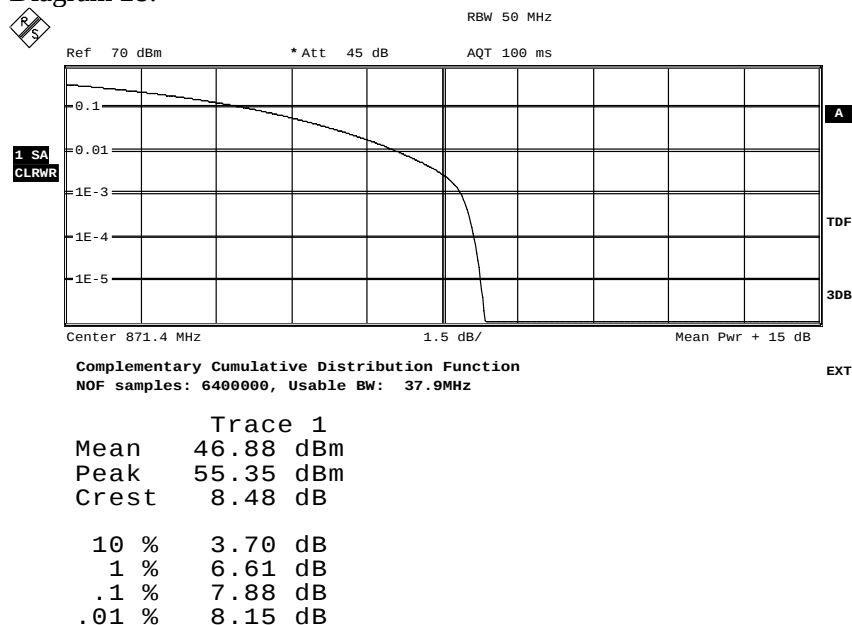
## Appendix 2

Diagram 27:



Date: 24.JAN.2013 15:16:01

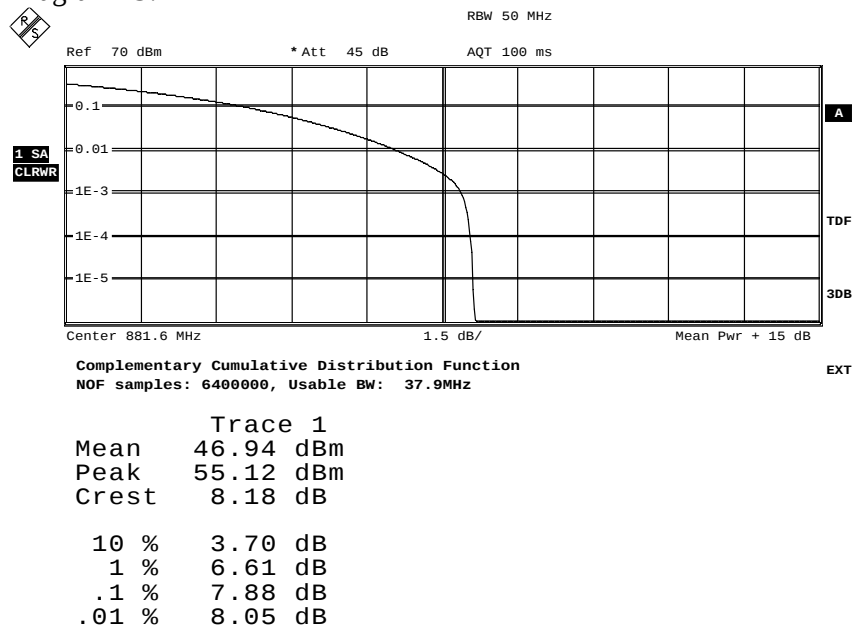
Diagram 28:



Date: 24.JAN.2013 13:02:25

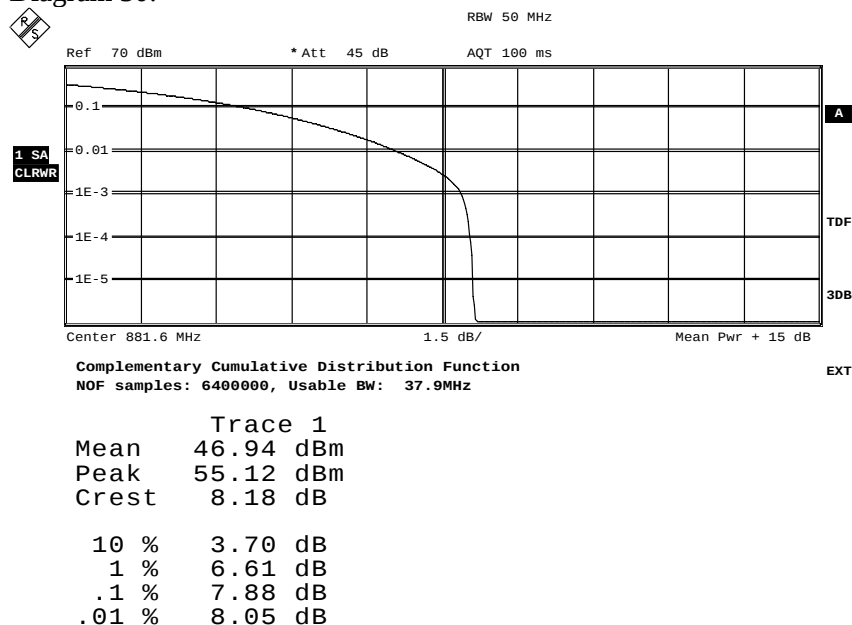
## Appendix 2

Diagram 29:



Date: 24.JAN.2013 15:01:15

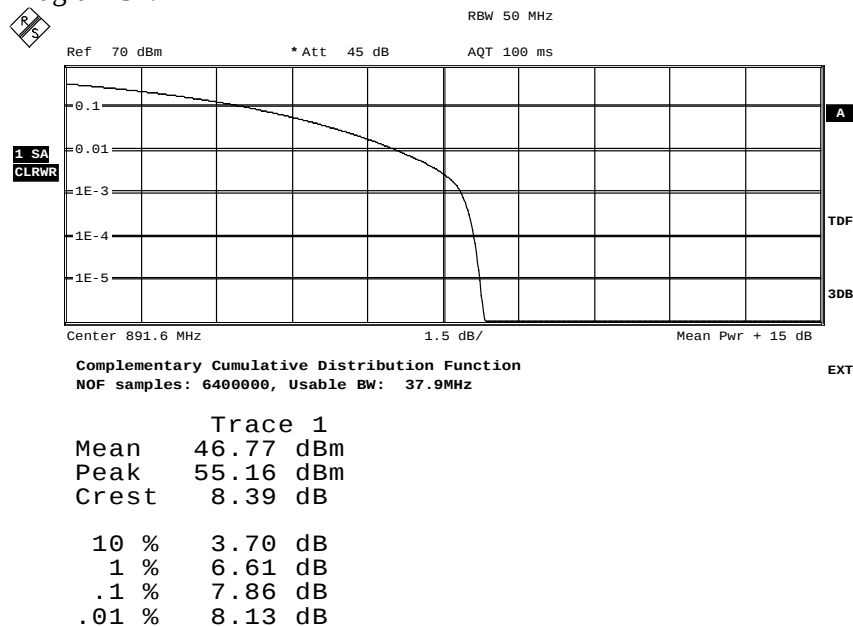
Diagram 30:



Date: 24.JAN.2013 12:48:28

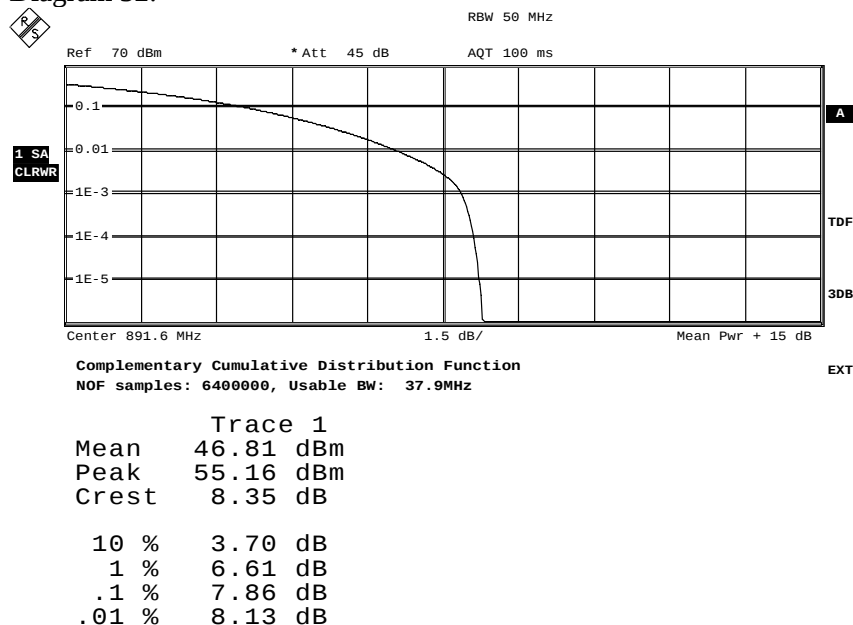
## Appendix 2

Diagram 31:



Date: 24.JAN.2013 14:54:31

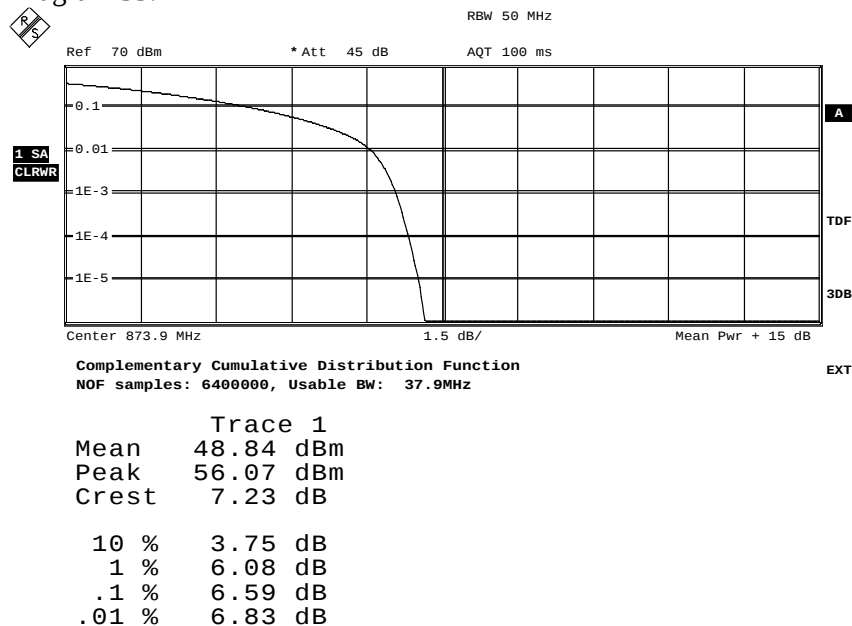
Diagram 32:



Date: 24.JAN.2013 13:17:13

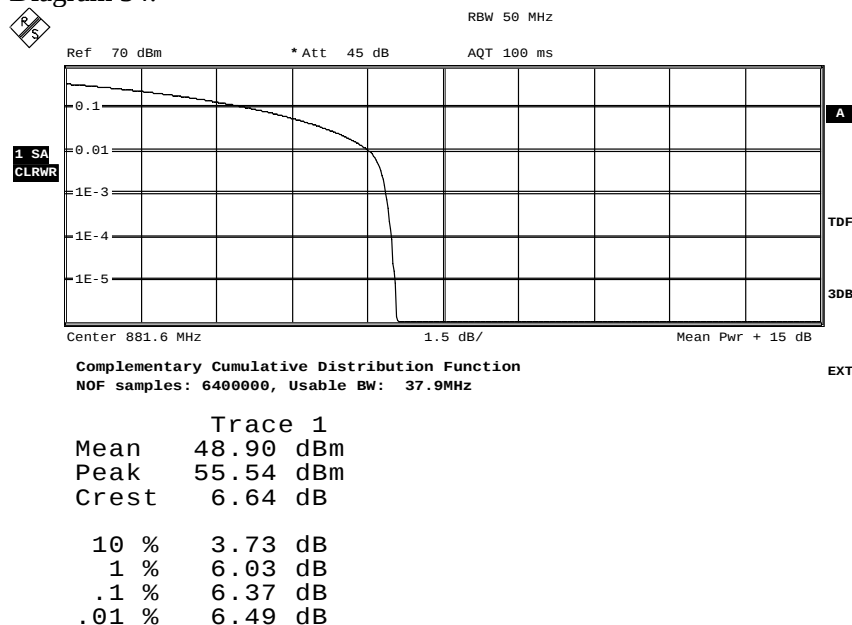
## Appendix 2

Diagram 33:



Date: 24.JAN.2013 10:34:18

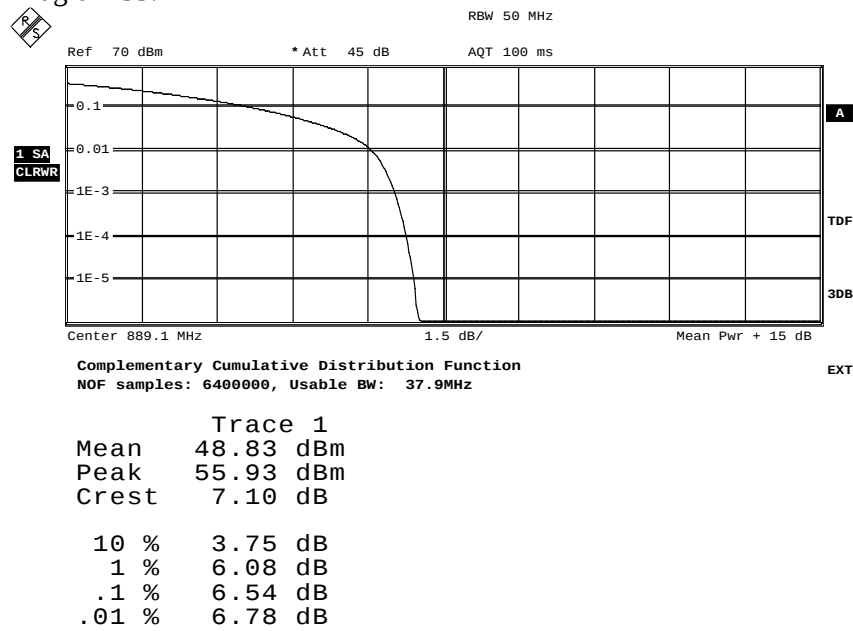
Diagram 34:



Date: 24.JAN.2013 11:03:38

## Appendix 2

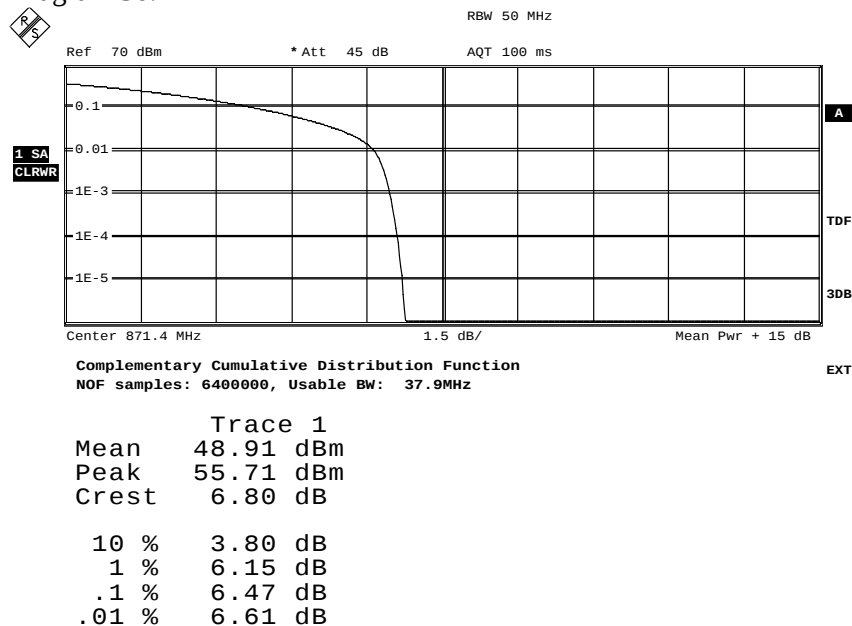
Diagram 35:



Date: 24.JAN.2013 11:34:17

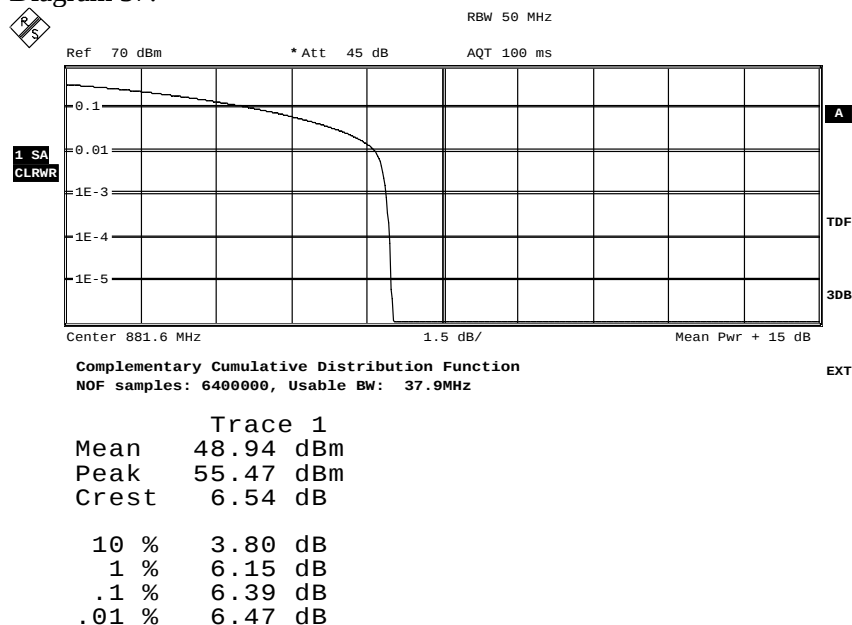
## Appendix 2

Diagram 36:



Date: 25.JAN.2013 07:47:32

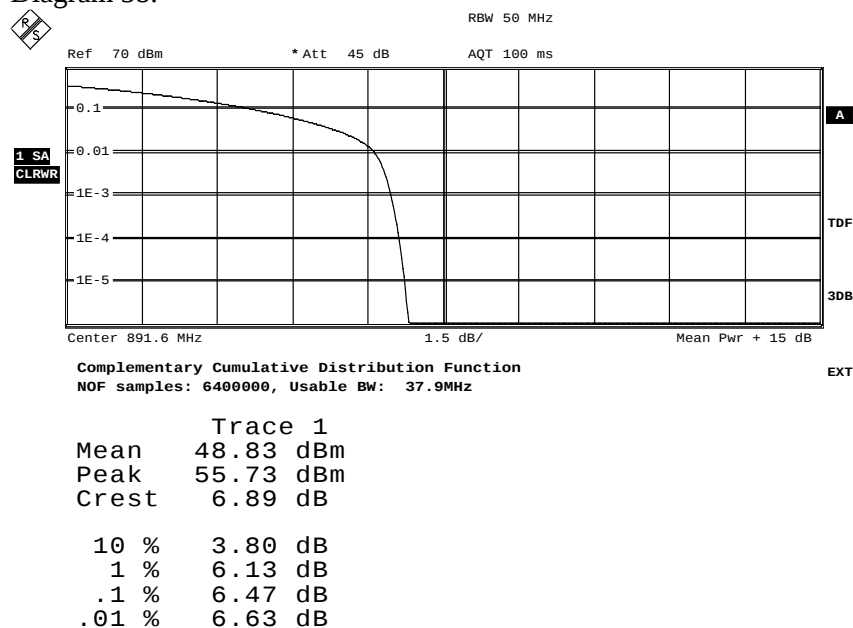
Diagram 37:



Date: 25.JAN.2013 07:31:38

## Appendix 2

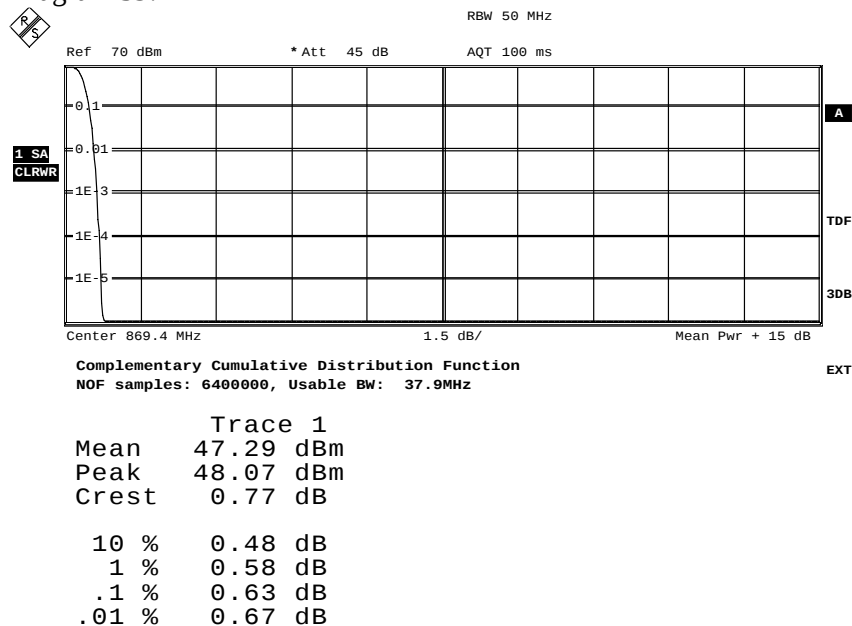
Diagram 38:



Date: 25.JAN.2013 08:03:36

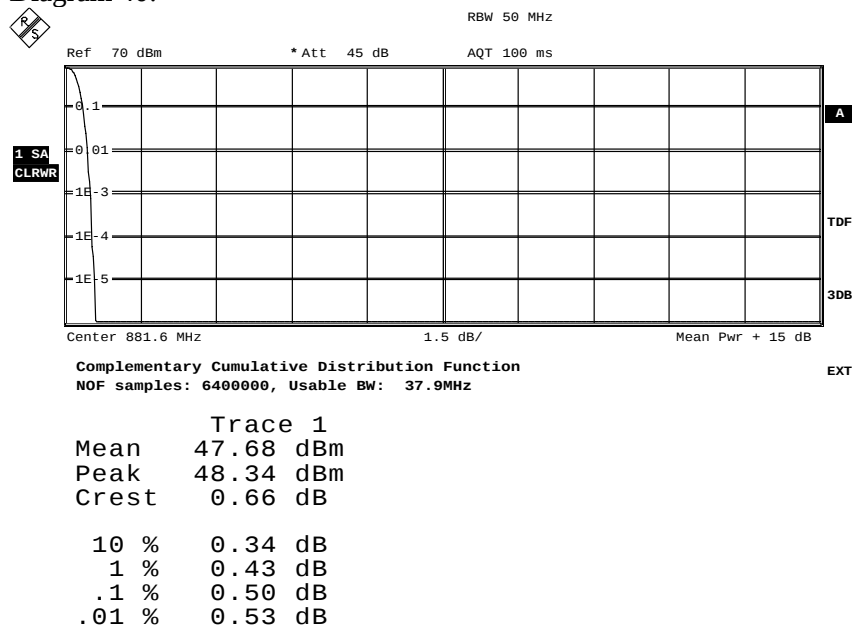
## Appendix 2

Diagram 39:



Date: 18.FEB.2013 12:24:41

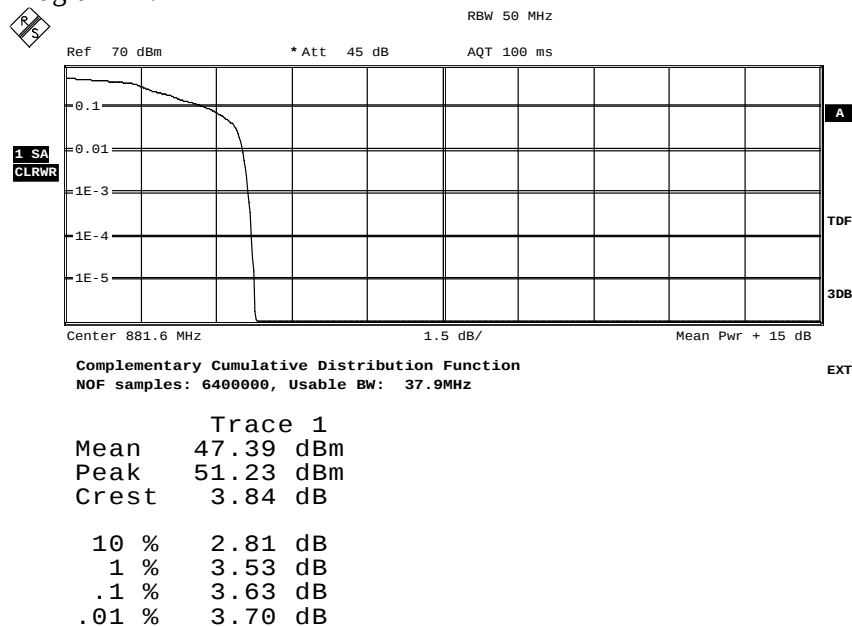
Diagram 40:



Date: 18.FEB.2013 10:24:32

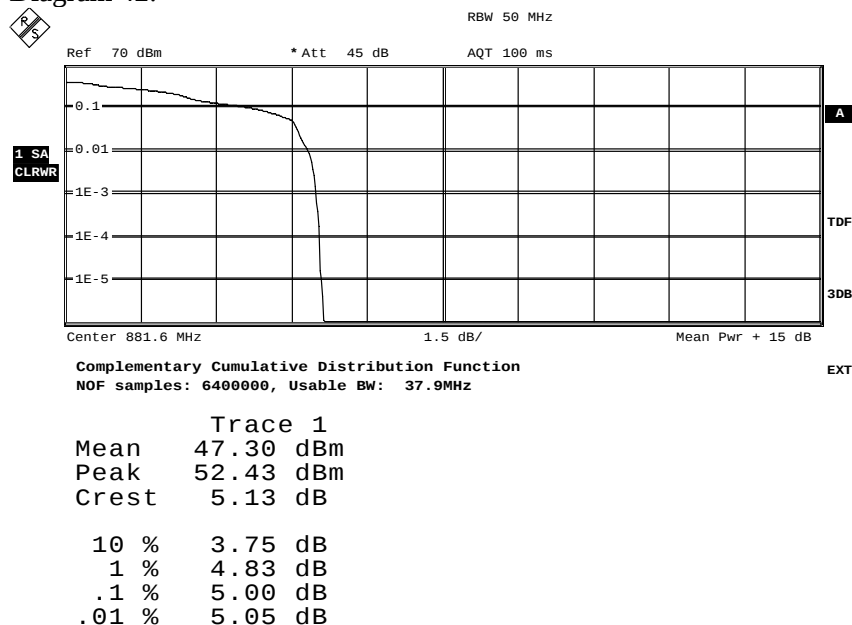
## Appendix 2

Diagram 41:



Date: 18.FEB.2013 10:33:50

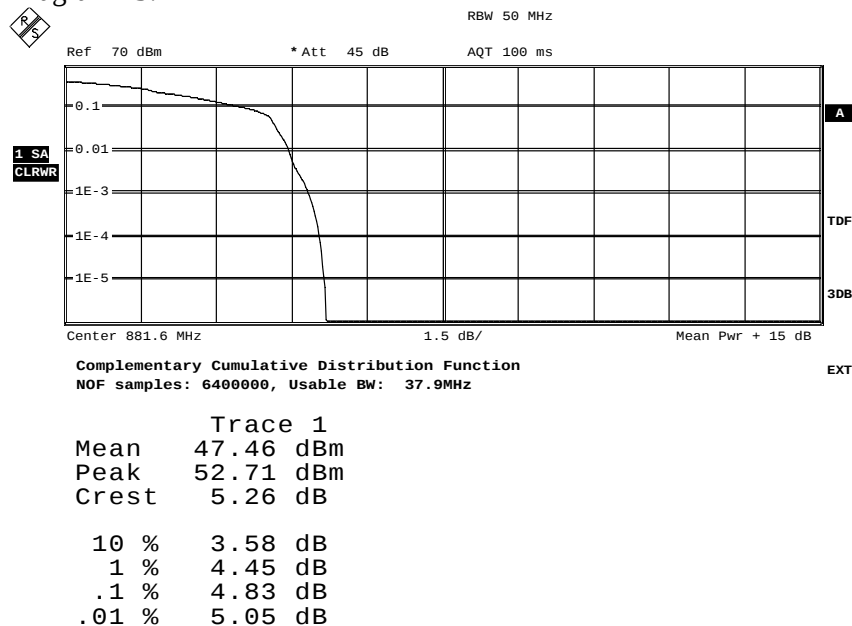
Diagram 42:



Date: 18.FEB.2013 11:28:03

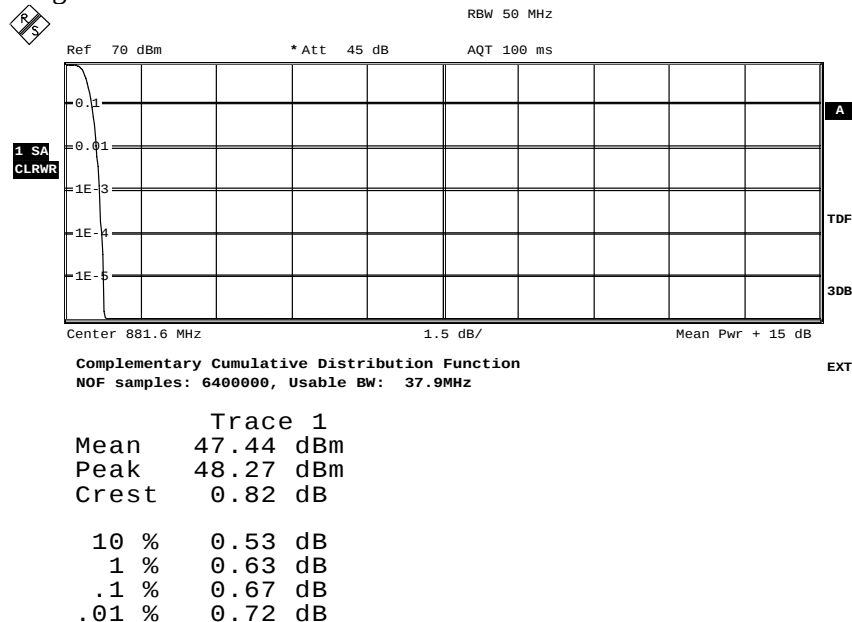
## Appendix 2

Diagram 43:



Date: 18.FEB.2013 11:32:08

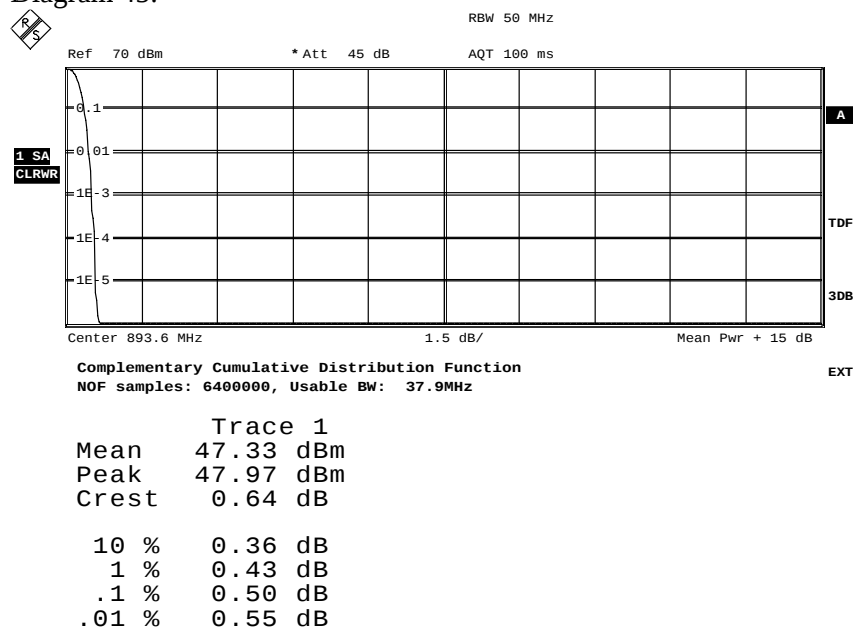
Diagram 44:



Date: 18.FEB.2013 11:41:52

## Appendix 2

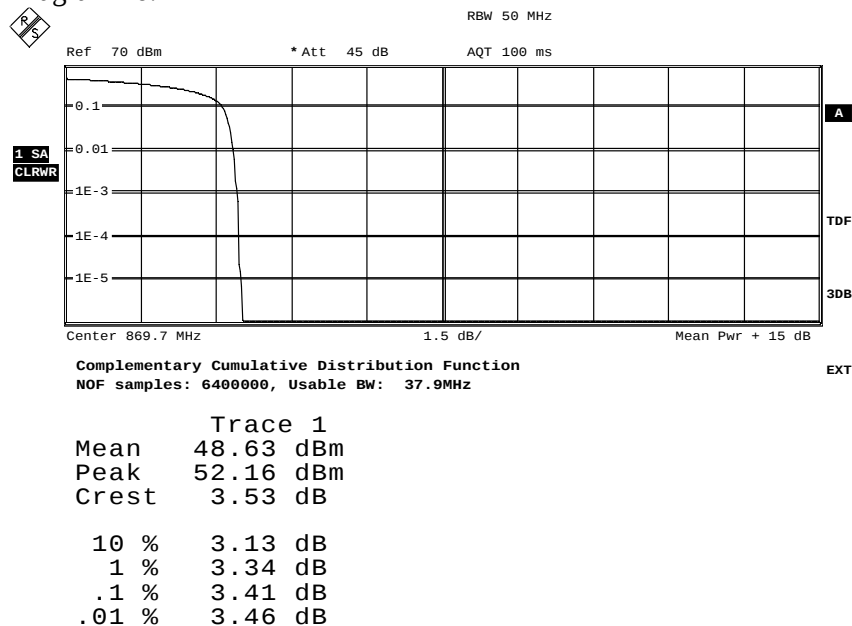
Diagram 45:



Date: 18.FEB.2013 12:12:32

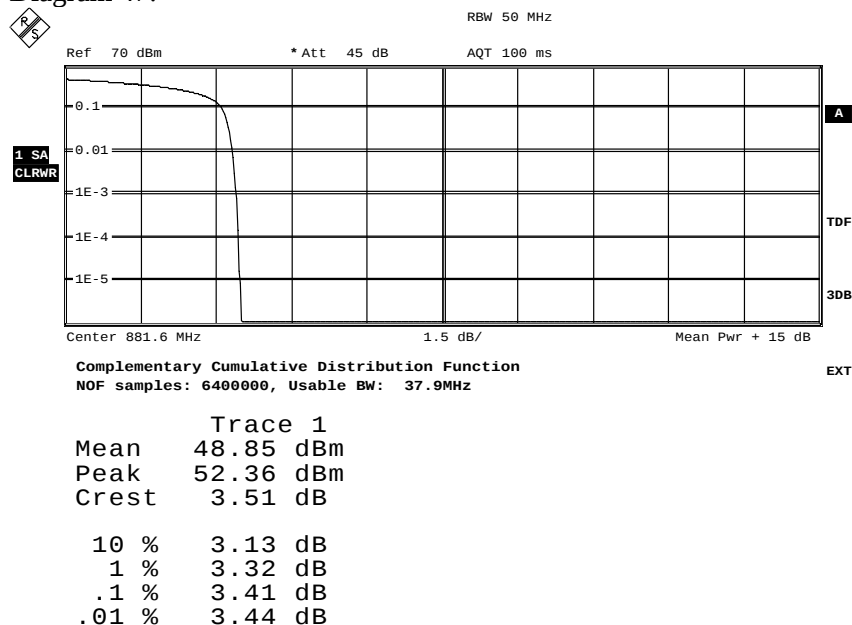
## Appendix 2

Diagram 46:



Date: 18.FEB.2013 12:46:24

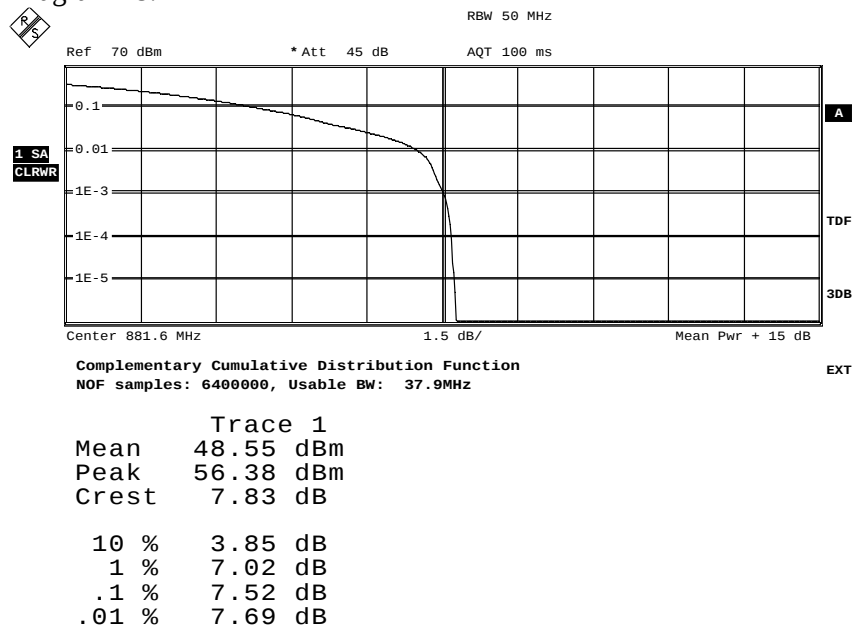
Diagram 47:



Date: 18.FEB.2013 12:35:10

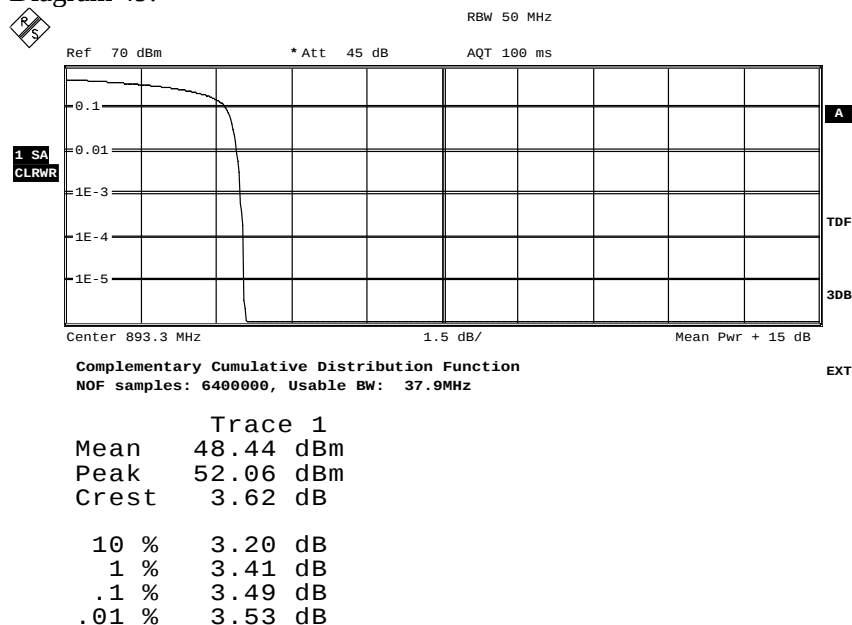
## Appendix 2

Diagram 48:



Date: 18.FEB.2013 12:38:41

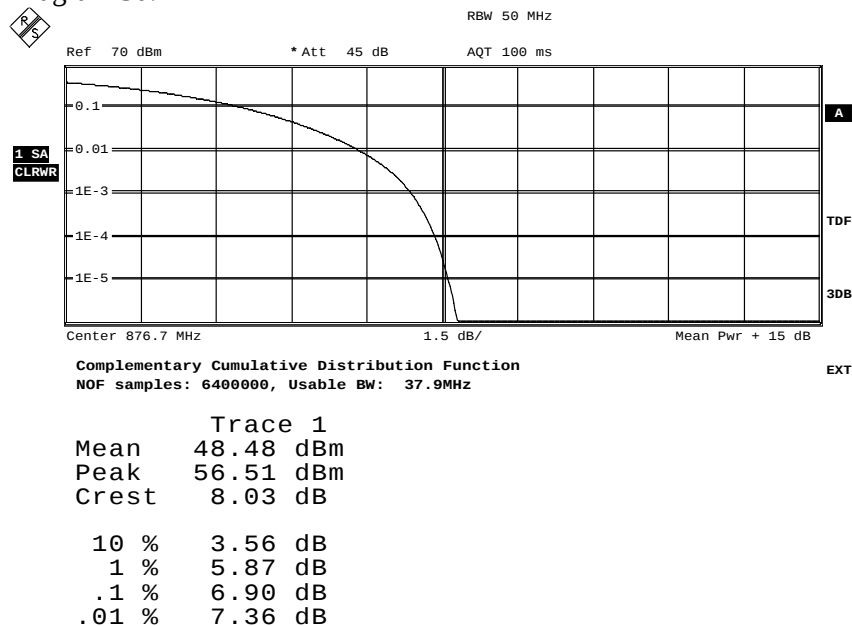
Diagram 49:



Date: 18.FEB.2013 12:49:55

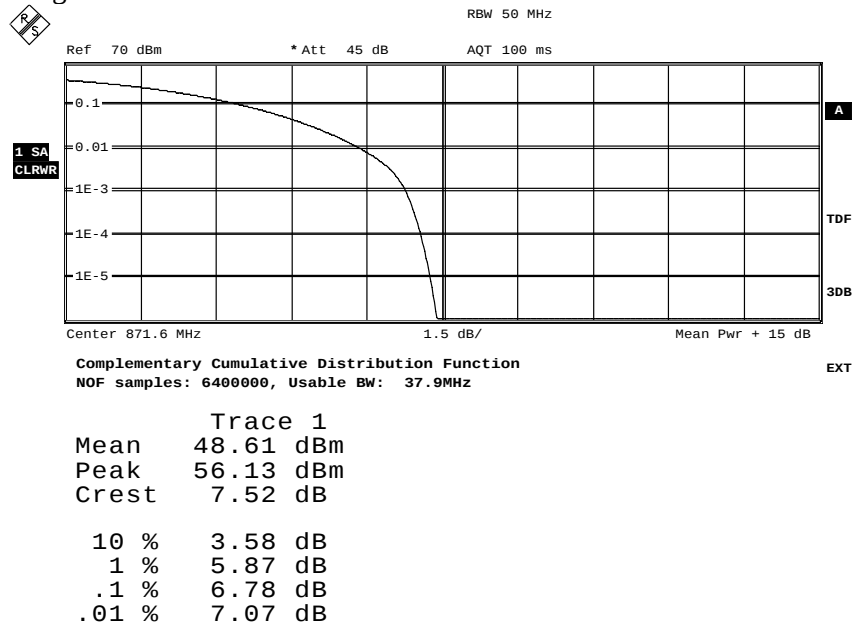
## Appendix 2

Diagram 50:



Date: 28.JAN.2013 14:27:44

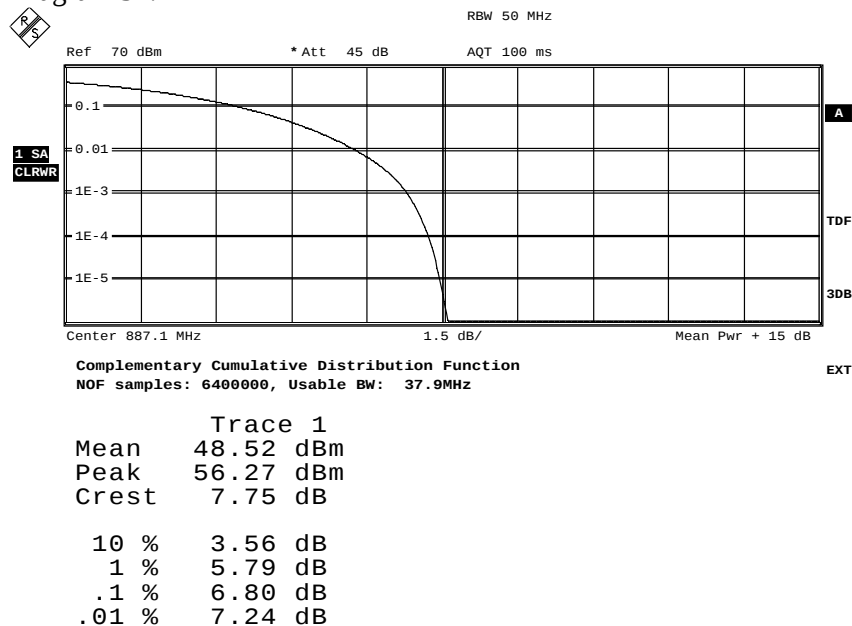
Diagram 51:



Date: 28.JAN.2013 15:10:19

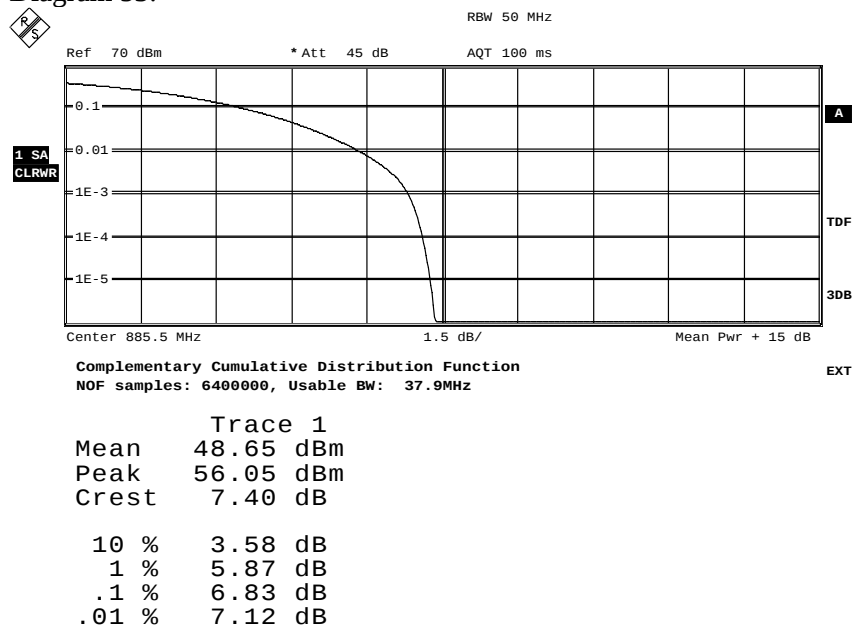
## Appendix 2

Diagram 52:



Date: 28.JAN.2013 15:41:17

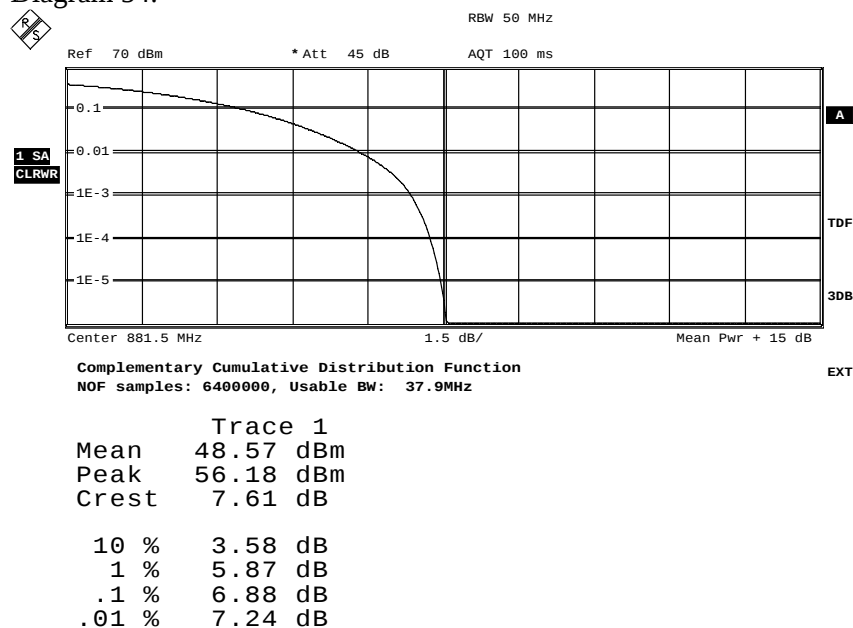
Diagram 53:



Date: 29.JAN.2013 08:33:21

## Appendix 2

Diagram 54:



Date: 29.JAN.2013 14:20:58

### Appendix 3

#### Occupied bandwidth measurements according to CFR47 2.1049 / RSS-Gen 4.6.1

| Date       | Temperature  | Humidity   |
|------------|--------------|------------|
| 2013-01-22 | 21 °C ± 3 °C | 13 % ± 5 % |
| 2013-01-23 | 23 °C ± 3 °C | 11 % ± 5 % |
| 2013-01-24 | 22 °C ± 3 °C | 10 % ± 5 % |
| 2013-01-25 | 22 °C ± 3 °C | 12 % ± 5 % |
| 2013-02-18 | 20 °C ± 3 °C | 24 % ± 5 % |

#### Test set-up and procedure

The measurements were made per definition in § 2.1049. The output was connected to a signal analyzer with the RMS detector activated. The signal analyzer was connected to an external 10 MHz reference standard during the measurements.

| Measurement equipment                    | SP number |
|------------------------------------------|-----------|
| Rohde & Schwarz signal analyzer FSQ40    | 504 143   |
| RF attenuator                            | 504 159   |
| RF attenuator                            | 901 508   |
| Testo 635 temperature and humidity meter | 504 203   |

**Measurement uncertainty:** 3.7 dB

#### Results

LTE single RAT, Single carrier

| Diagram | BW configuration | Tested frequency | Tested Port | Occupied BW (99%) [MHz] |
|---------|------------------|------------------|-------------|-------------------------|
| 1       | 1.4 MHz          | M                | RF A        | 1.09                    |
| 2       | 5 MHz            | M                | RF A        | 4.48                    |
| 3       | 20 MHz           | M                | RF A        | 17.86                   |

### Appendix 3

#### LTE single RAT, MIMO mode

| Diagram | BW configuration | Tested frequency | Tested Port<br>RF A | Occupied BW<br>(99%)<br>[MHz] |
|---------|------------------|------------------|---------------------|-------------------------------|
| 4       | 1.4 MHz          | M                | Primary mode        | 1.09                          |
| 5       | 1.4 MHz          | M                | Secondary mode      | 1.09                          |
| 6       | 3 MHz            | M                | Primary mode        | 2.69                          |
| 7       | 5 MHz            | M                | Primary mode        | 4.48                          |
| 8       | 10 MHz           | M                | Primary mode        | 8.94                          |
| 9       | 15 MHz           | M                | Primary mode        | 13.42                         |
| 10      | 20 MHz           | M                | Primary mode        | 17.86                         |
| 11      | 20 MHz           | M                | Secondary mode      | 17.86                         |

#### WCDMA single RAT, MIMO mode

| Diagram | BW configuration | Tested frequency | Tested Port<br>RF A | Occupied BW<br>(99%)<br>[MHz] |
|---------|------------------|------------------|---------------------|-------------------------------|
| 12      | 5 MHz            | M                | Primary mode        | 4.16                          |
| 13      | 5 MHz            | M                | Secondary mode      | 4.16                          |

#### WCDMA, single RAT, conventional mode

| Diagram | BW configuration | Tested frequency | Tested Port | Occupied BW<br>(99%)<br>[MHz] |
|---------|------------------|------------------|-------------|-------------------------------|
| 14      | 5 MHz            | M                | RF A        | 4.18                          |

### Appendix 3

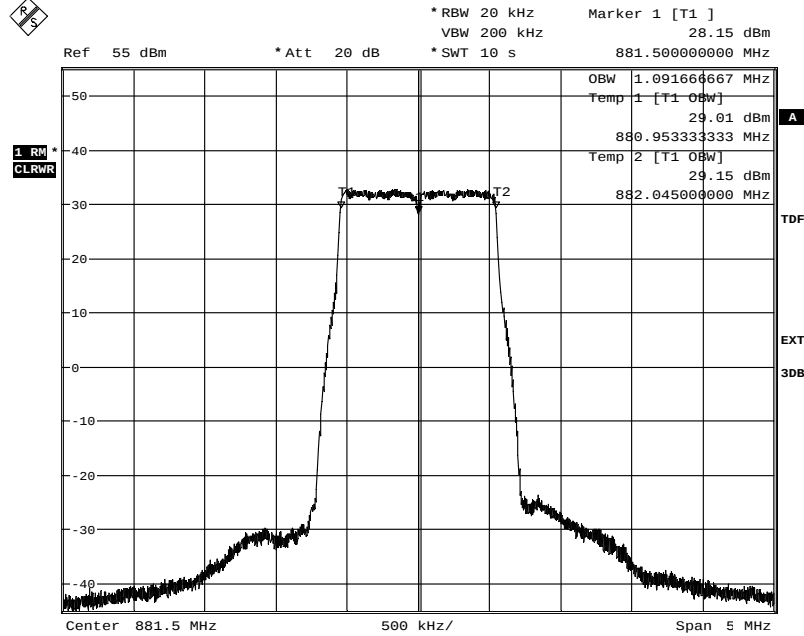
GSM single RAT, conventional mode.

| Diagram | Modulation | Tested frequency | Tested Port | Occupied BW (99%) [MHz] |
|---------|------------|------------------|-------------|-------------------------|
| 15      | GMSK       | B                | RFA         | 241                     |
| 16      | GMSK       | M                | RFA         | 241                     |
| 17      | 8 PSK      | M                | RFA         | 239                     |
| 18      | 16 QAM     | M                | RFA         | 241                     |
| 19      | 32 QAM     | M                | RFA         | 240                     |
| 20      | AQPSK      | M                | RFA         | 239                     |
| 21      | GMSK       | T                | RFA         | 241                     |

The diagrams are shown on the following pages.

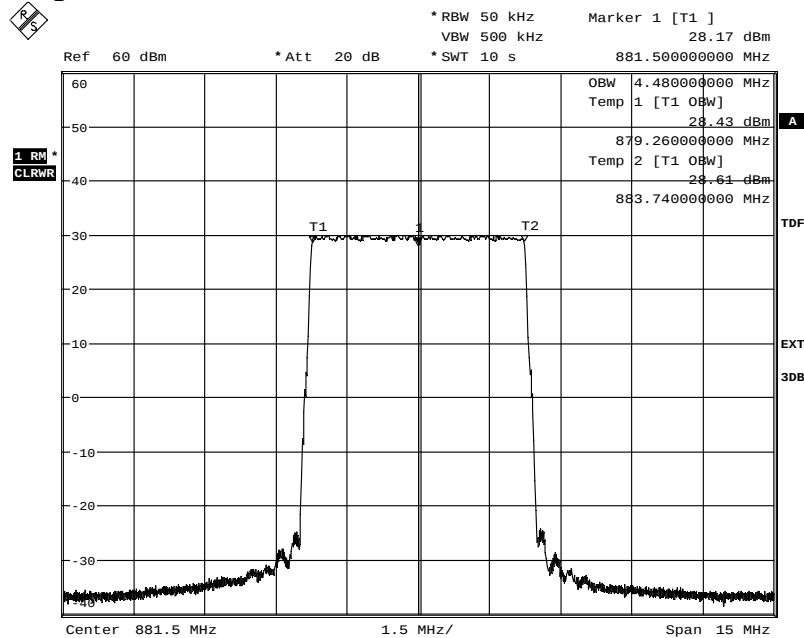
## Appendix 3

Diagram 1:



Date: 22.JAN.2013 14:32:28

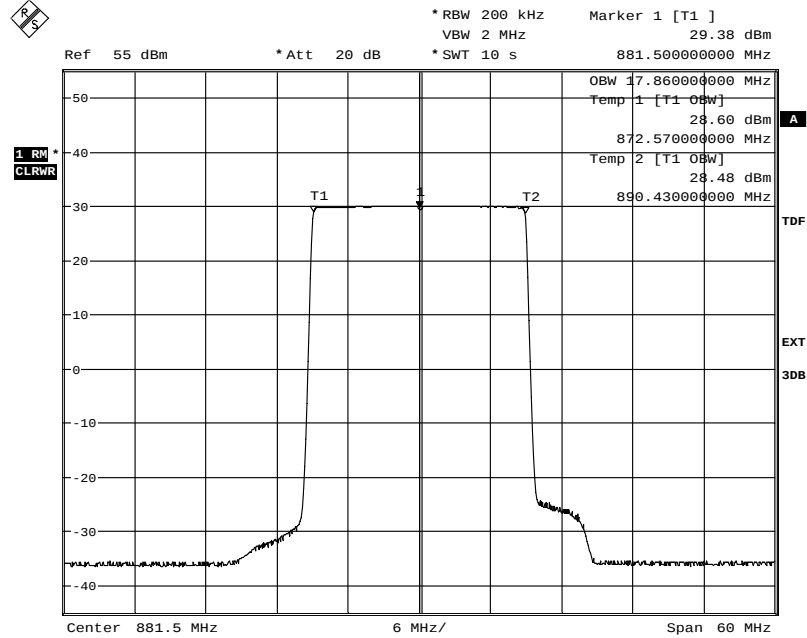
Diagram 2:



Date: 22.JAN.2013 14:22:49

### Appendix 3

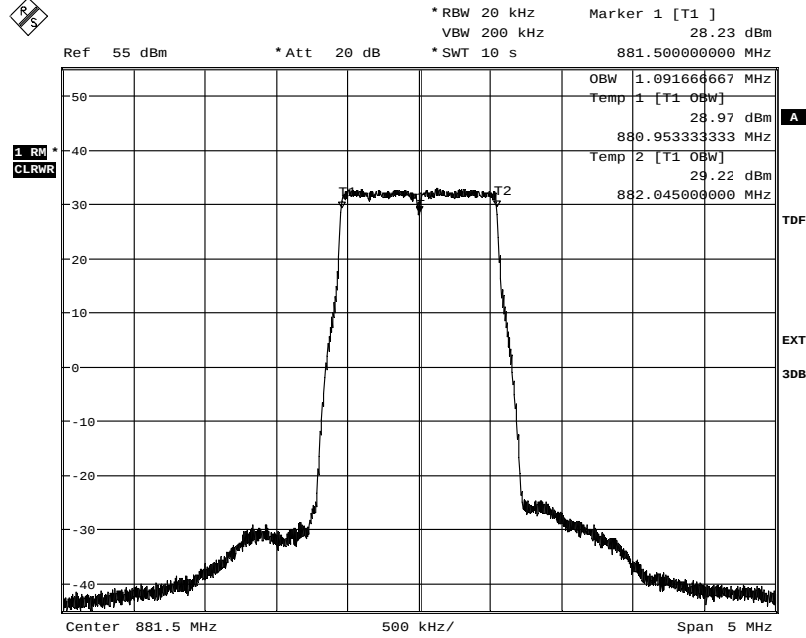
Diagram 3:



Date: 22.JAN.2013 14:44:56

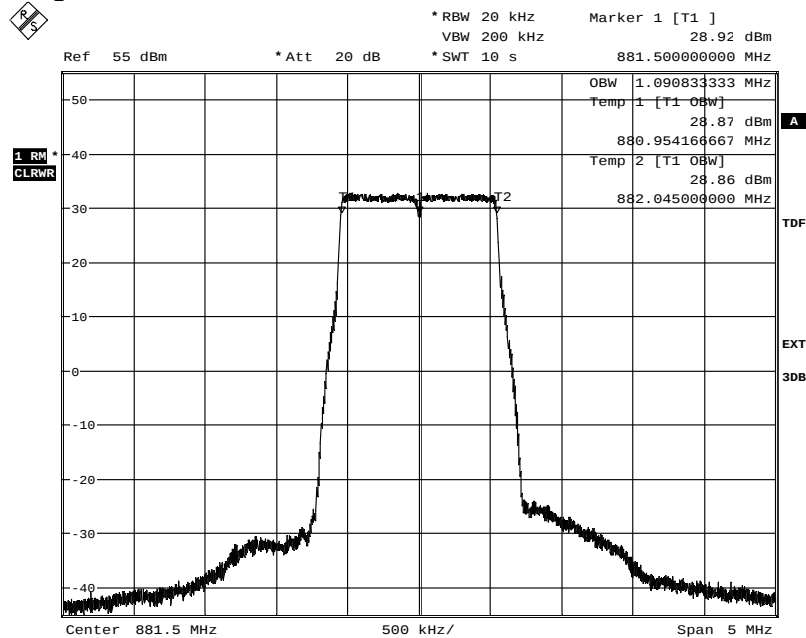
## Appendix 3

Diagram 4:



Date: 22.JAN.2013 15:37:47

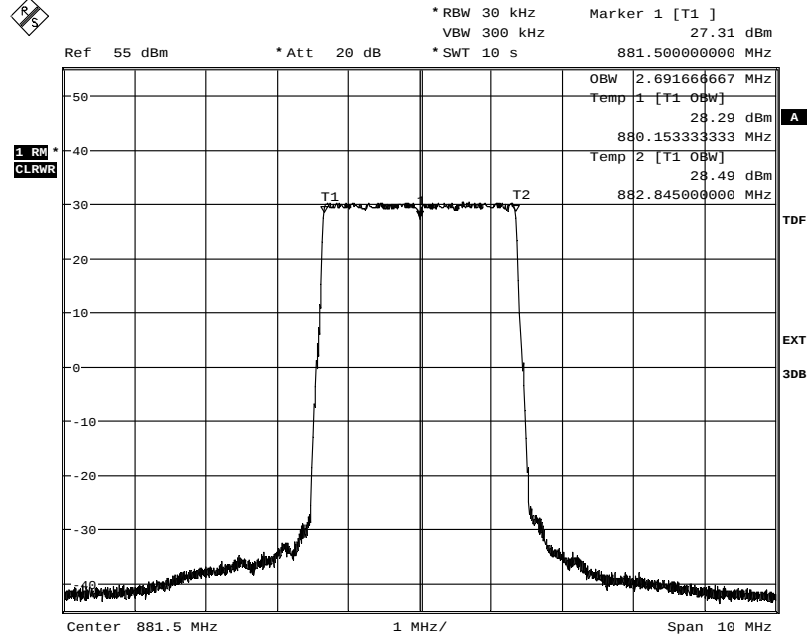
Diagram 5:



Date: 23.JAN.2013 07:31:59

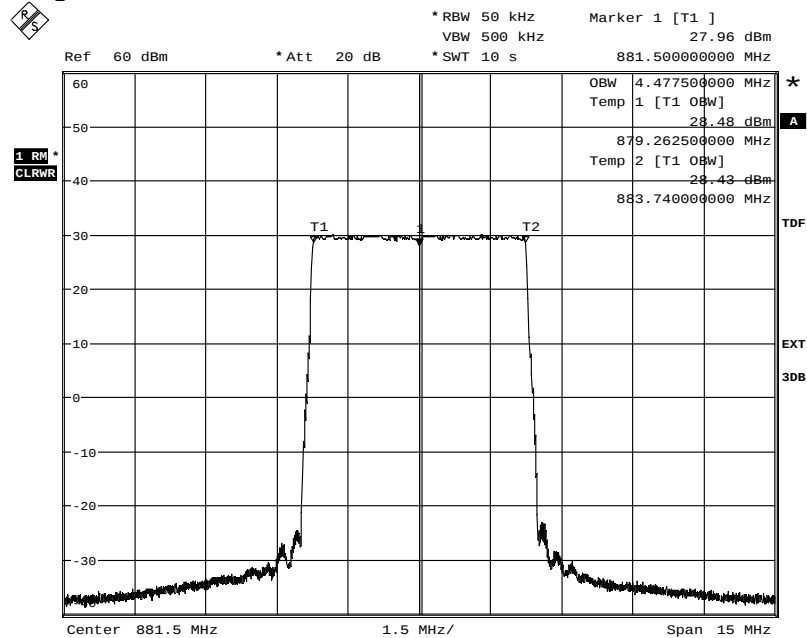
## Appendix 3

Diagram 6:



Date: 22.JAN.2013 15:42:49

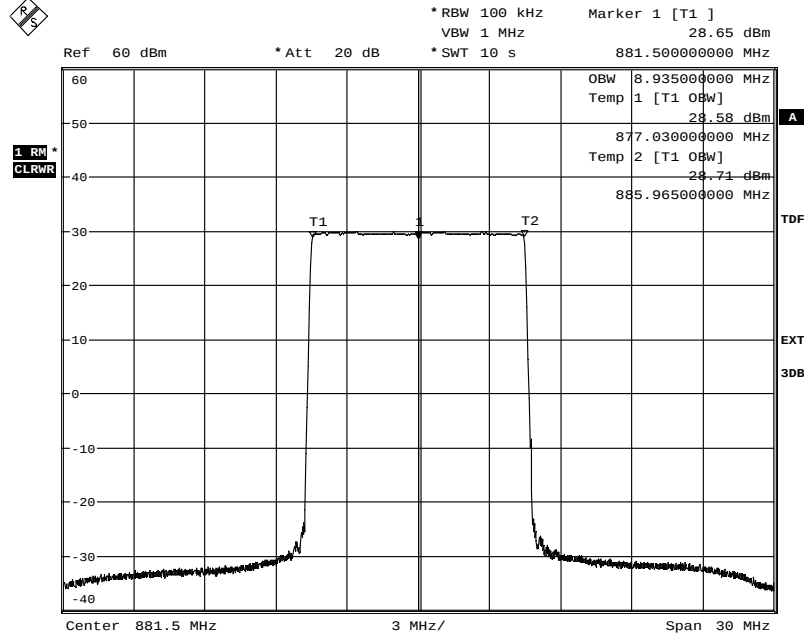
Diagram 7:



Date: 22.JAN.2013 15:15:49

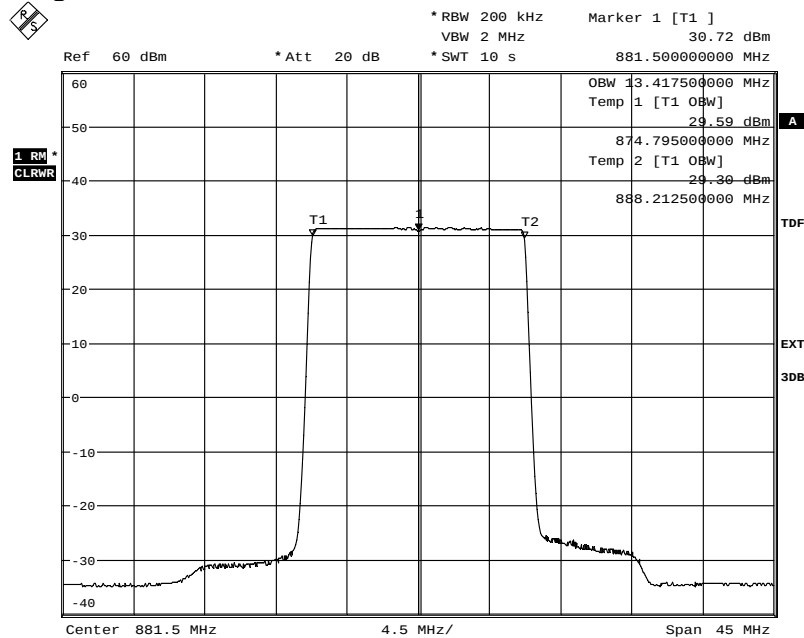
### Appendix 3

Diagram 8:



Date: 22.JAN.2013 15:19:09

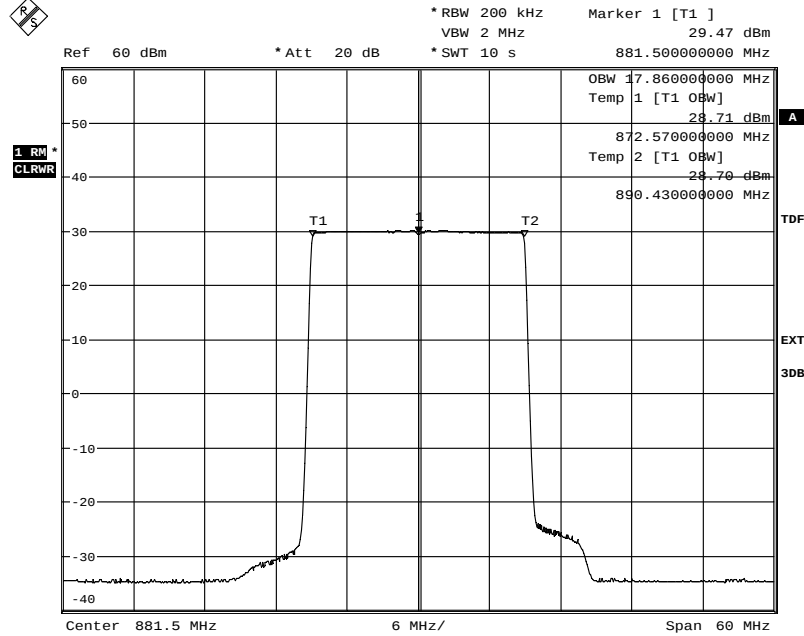
Diagram 9:



Date: 22.JAN.2013 15:22:17

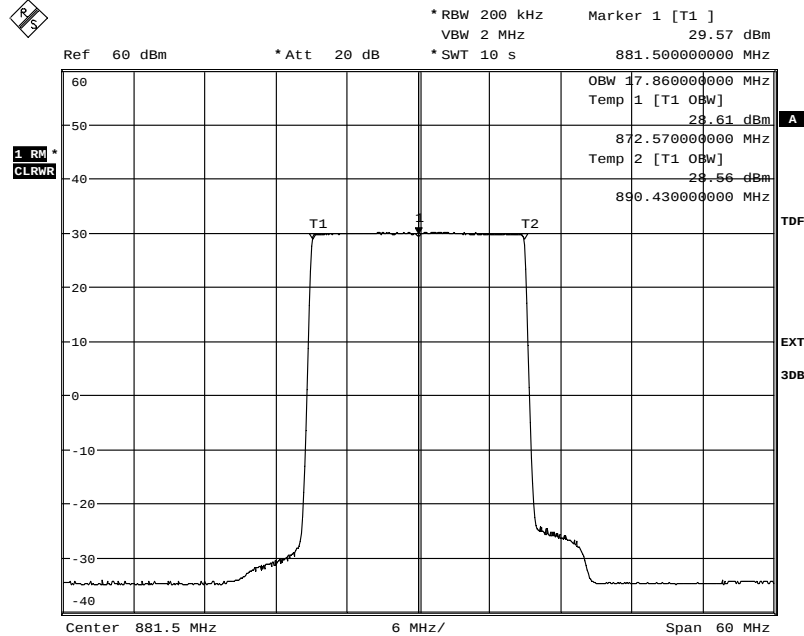
### Appendix 3

Diagram 10:



Date: 22.JAN.2013 15:23:55

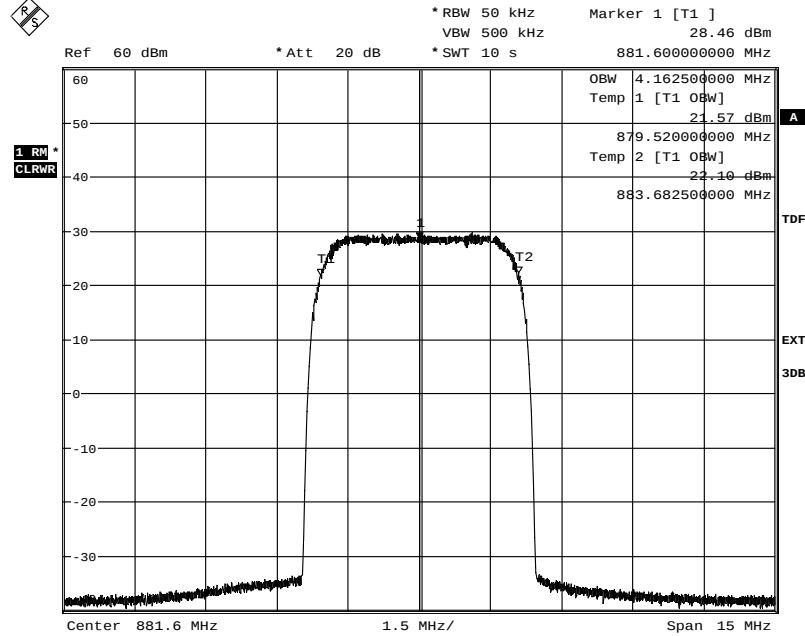
Diagram 11:



Date: 23.JAN.2013 07:44:51

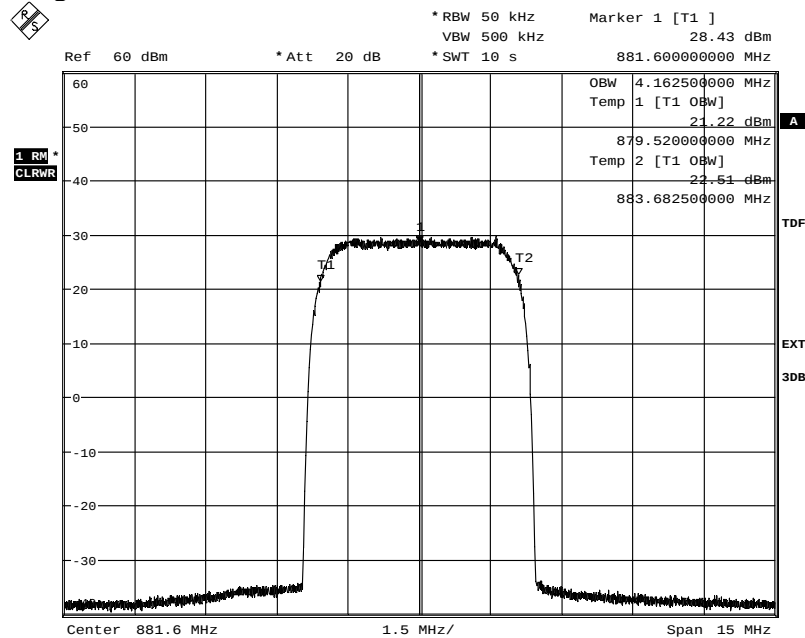
### Appendix 3

Diagram 12:



Date: 24.JAN.2013 15:03:07

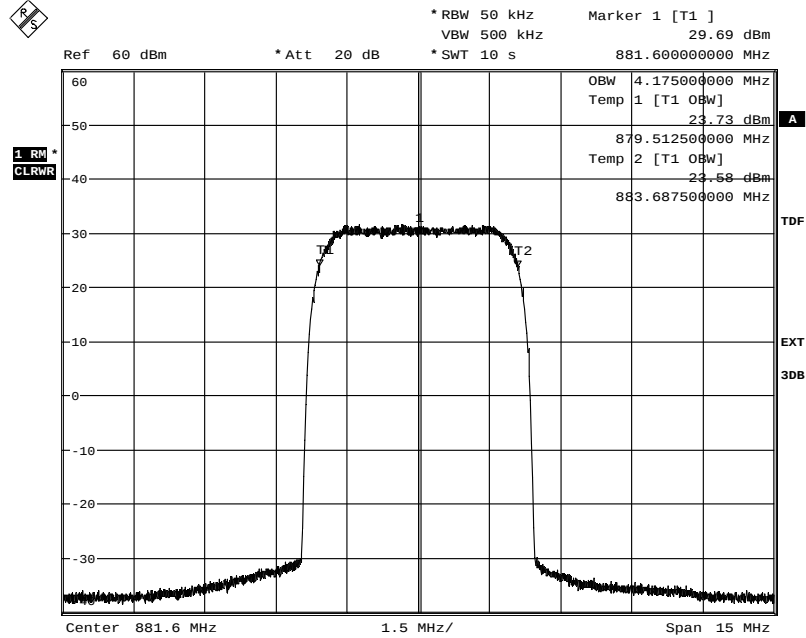
Diagram 13:



Date: 24.JAN.2013 12:50:39

## Appendix 3

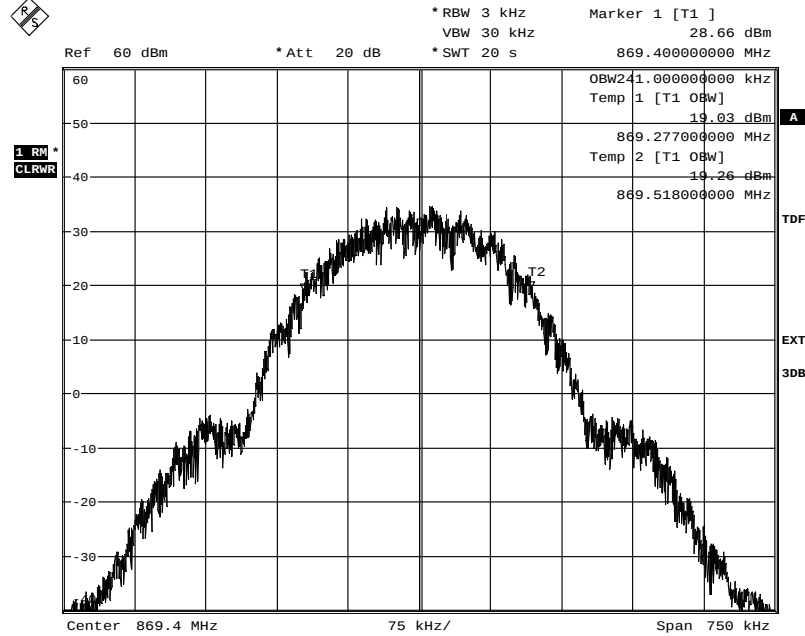
Diagram 14:



Date: 25.JAN.2013 07:27:56

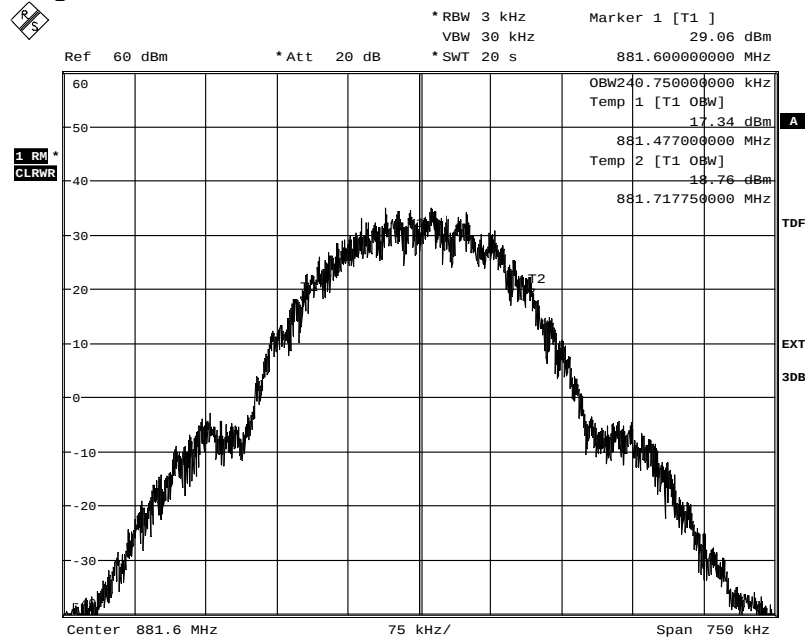
### Appendix 3

Diagram 15:



Date: 18.FEB.2013 11:48:09

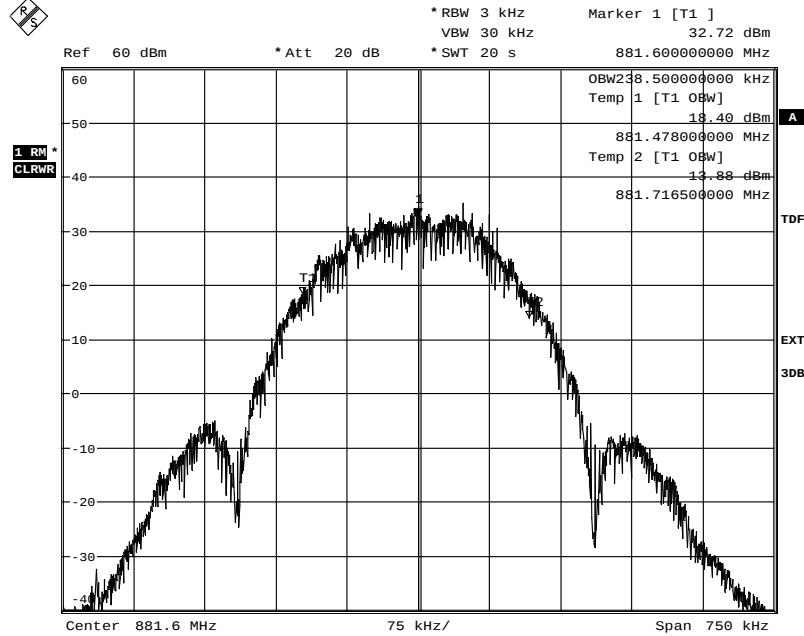
Diagram 16:



Date: 18.FEB.2013 10:27:32

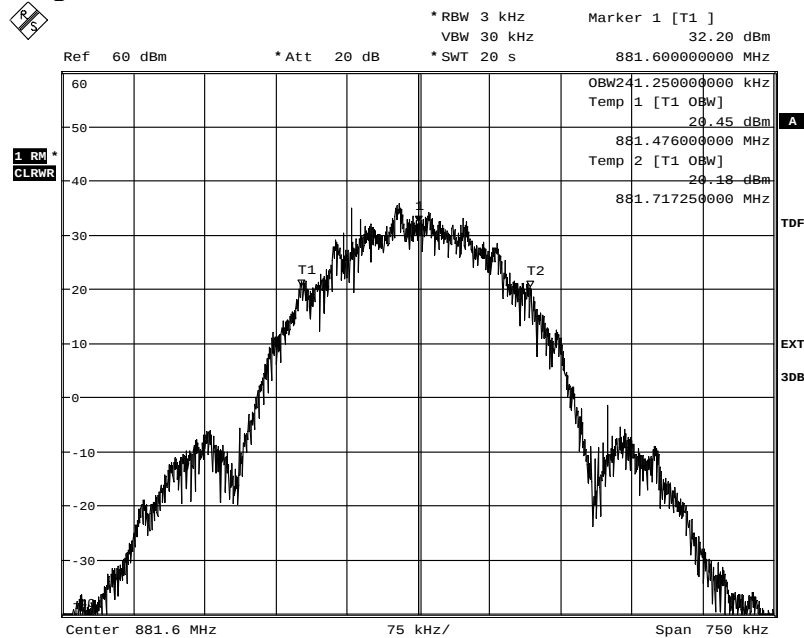
### Appendix 3

Diagram 17:



Date: 18.FEB.2013 10:35:12

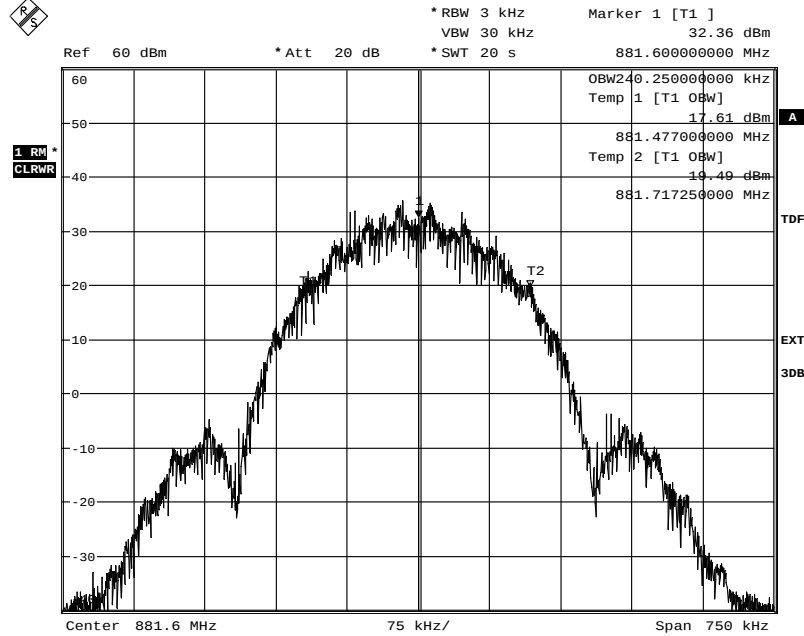
Diagram 18:



Date: 18.FEB.2013 11:29:21

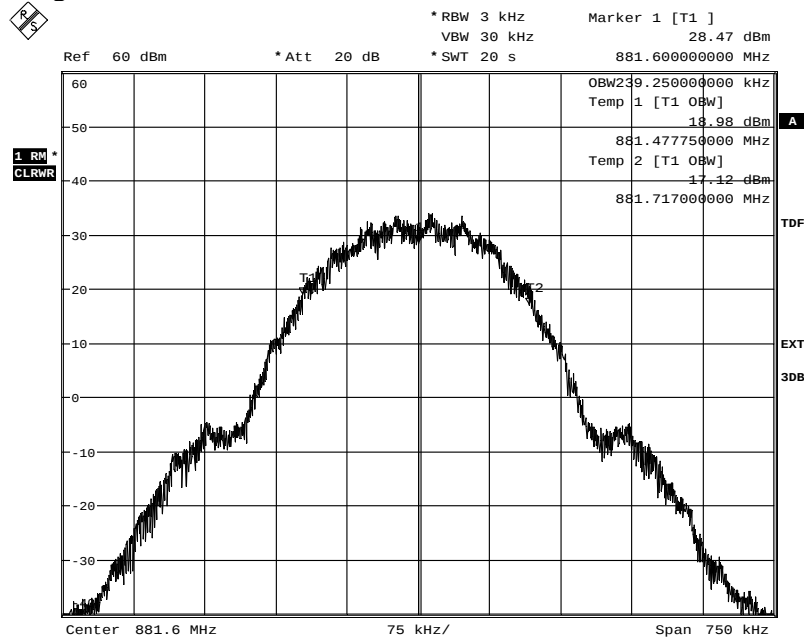
### Appendix 3

Diagram 19:



Date: 18.FEB.2013 11:33:57

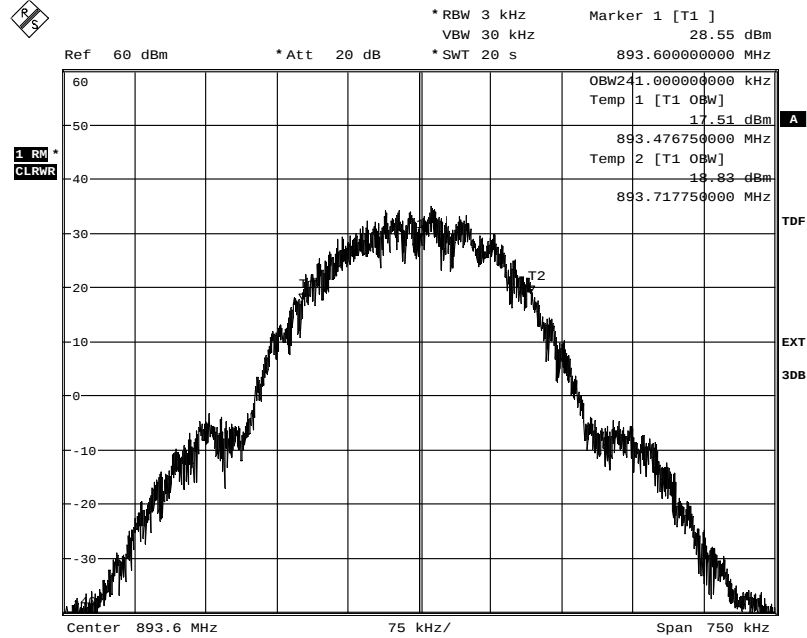
Diagram 20:



Date: 18.FEB.2013 11:39:36

## Appendix 3

Diagram 21:



Date: 18.FEB.2013 12:15:46

## Appendix 4

### Band edge measurements according to CFR 47 §2.1051 / IC RSS-132 5.5

| Date       | Temperature  | Humidity   |
|------------|--------------|------------|
| 2013-01-23 | 23 °C ± 3 °C | 11 % ± 5 % |
| 2013-01-24 | 22 °C ± 3 °C | 10 % ± 5 % |
| 2013-01-25 | 22 °C ± 3 °C | 12 % ± 5 % |
| 2013-02-18 | 20 °C ± 3 °C | 24 % ± 5 % |

### Test set-up and procedure

The measurements were made per definition in § 22.917. The test object was 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.

FCC rules specify a RBW of at least 1% of the fundamental emission bandwidth (EBW) for offsets up to 1 MHz from the band edge and a RBW of 100 kHz for larger frequency offsets. Where a smaller RBW was used as compared to the rules the limit in the plot is adjusted by  $10 \cdot \log(\text{RBW}_{\text{used}}/\text{RBW}_{1\% \text{EBW}})$  [dB].

LTE:

| BW configuration | Emission BW [MHz] | RBW used | Adjusted limit [dBm] |
|------------------|-------------------|----------|----------------------|
| 1.4 MHz          | 1.12              | 10 kHz   | -13.50               |
| 3 MHz            | 2.73              | 10 kHz   | -17.40               |

WCDMA:

| BW configuration | Emission BW [MHz] | RBW used | Adjusted limit [dBm] |
|------------------|-------------------|----------|----------------------|
| 5 MHz            | 4.37              | 20 kHz   | -16.40               |

For MIMO mode configurations with up to 2 TX antennas an additional 3 dB  $[10 \log(2)]$  margin shall be added to the trace values shown prior to comparing to the limit, according to method 2 “measure and add  $10 \log(N_{\text{ANT}})$ ” of FCC KDB662911 D01 Multiple Transmitter Output v01r02.

| Measurement equipment                    | SP number |
|------------------------------------------|-----------|
| Rohde & Schwarz signal analyzer FSQ40    | 504 143   |
| RF attenuator                            | 504 159   |
| RF attenuator                            | 901 508   |
| Testo 635 temperature and humidity meter | 504 203   |

Measurement uncertainty: 3.7 dB

## Appendix 4

### Results

#### LTE single RAT, MIMO mode

| Diagram | BW configuration | Tested frequency | Tested Port<br>RF A |
|---------|------------------|------------------|---------------------|
| 1 a-c   | 1.4 MHz          | B                | Primary mode        |
| 2 a-c   | 1.4 MHz          | B                | Secondary mode      |
| 3 a-c   | 3 MHz            | B                | Primary mode        |
| 4 a-c   | 5 MHz            | B                | Primary mode        |
| 5 a-c   | 10 MHz           | B                | Primary mode        |
| 6 a-c   | 15 MHz           | B                | Primary mode        |
| 7 a-c   | 20 MHz           | B                | Primary mode        |
| 8 a-c   | 20 MHz           | B                | Secondary mode      |
| 9 a-c   | 1.4 MHz          | T                | Primary mode        |
| 10 a-c  | 1.4 MHz          | T                | Secondary mode      |
| 11 a-c  | 3 MHz            | T                | Primary mode        |
| 12 a-c  | 5 MHz            | T                | Primary mode        |
| 13 a-c  | 10 MHz           | T                | Primary mode        |
| 14 a-c  | 15 MHz           | T                | Primary mode        |
| 15 a-c  | 20 MHz           | T                | Primary mode        |
| 16 a-c  | 20 MHz           | T                | Secondary mode      |

#### WCDMA single RAT, MIMO mode

| Diagram | BW configuration | Tested frequency | Tested Port<br>RF A |
|---------|------------------|------------------|---------------------|
| 17 a-c  | 5 MHz            | B                | Primary mode        |
| 18 a-c  | 5 MHz            | B                | Secondary mode      |
| 19 a-c  | 5 MHz            | T                | Primary mode        |
| 20 a-c  | 5 MHz            | T                | Secondary mode      |

#### WCDMA single RAT, conventional mode

| Diagram | BW configuration | Tested frequency | Tested Port |
|---------|------------------|------------------|-------------|
| 21 a-c  | 5 MHz            | B                | RFA         |
| 22 a-c  | 5 MHz            | T                | RFA         |

#### GSM single RAT, conventional mode

| Diagram | BW configuration | Tested frequency | Tested Port |
|---------|------------------|------------------|-------------|
| 23 a-b  | GMSK             | B                | RFA         |
| 24 a-b  | 16 QAM           | B                | RFA         |
| 25 a-b  | GMSK             | T                | RFA         |
| 26 a-b  | 16 QAM           | T                | RFA         |

The diagrams are shown on the following pages.

## Appendix 4

**Remark**

As the test started before the new version of RSS-132 came into force some plots have a limit of -23 dBm to compensate for the reduced measurement bandwidth at the time of testing. With the revised requirement in RSS-132 Issue 3 all measurements were performed with at least the specified measurement bandwidth and no compensation of limit is needed.

**Limits**

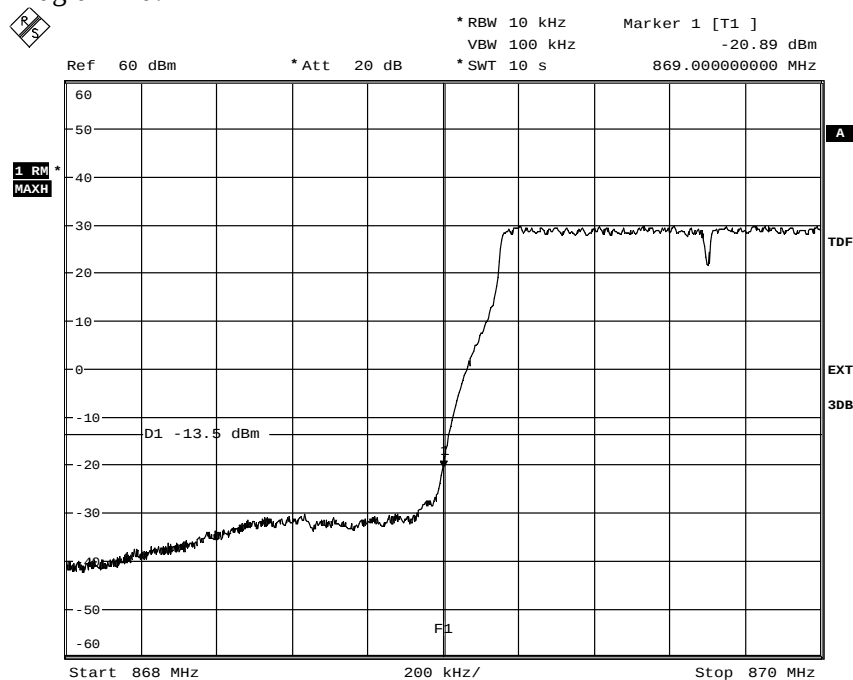
CFR 47 § 22.917: Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB, resulting in a limit of -13 dBm per 100 kHz RBW.

IC RSS-132 5.5.1.2 issue 3: Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB per any 100 kHz RBW.

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

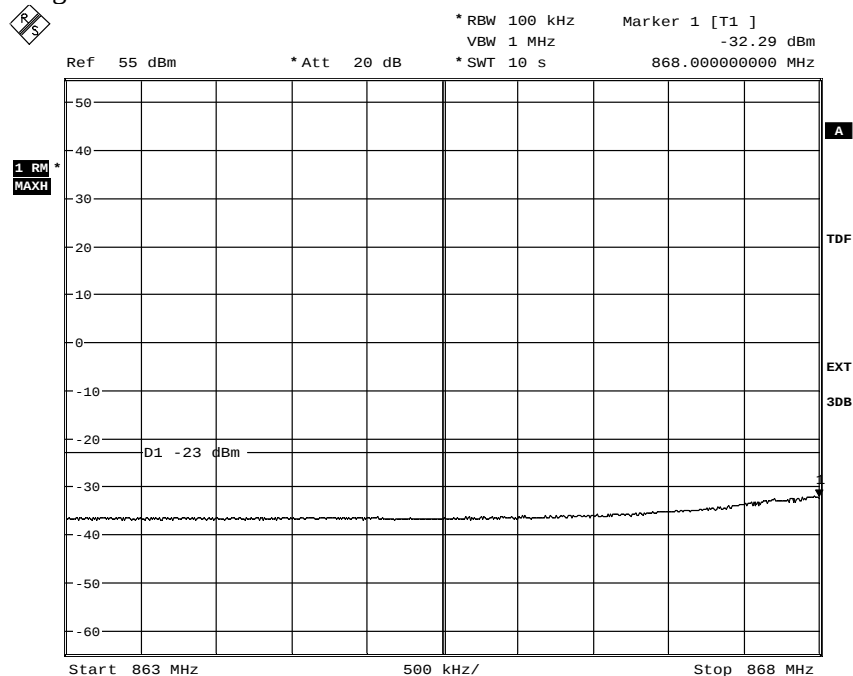
## Appendix 4

Diagram 1 a:



Date: 23.JAN.2013 09:36:44

Diagram 1 b:

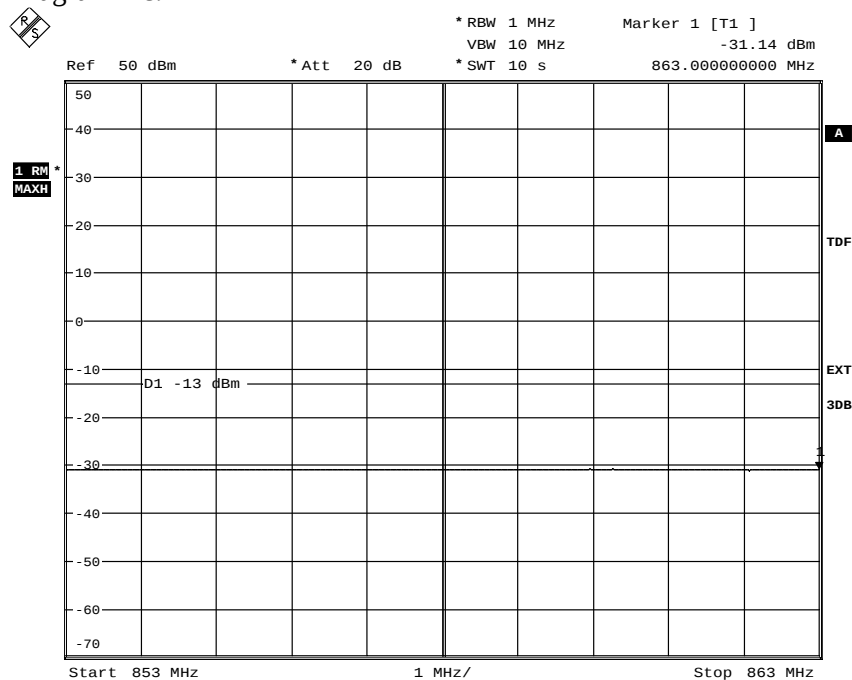


Date: 23.JAN.2013 09:27:56



## Appendix 4

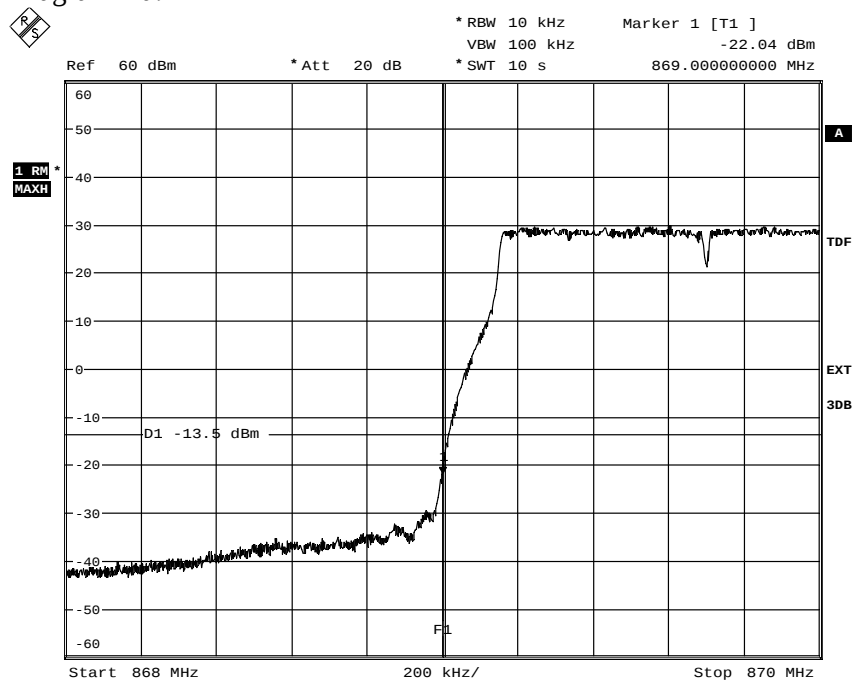
Diagram 1 c:



Date: 23.JAN.2013 09:26:06

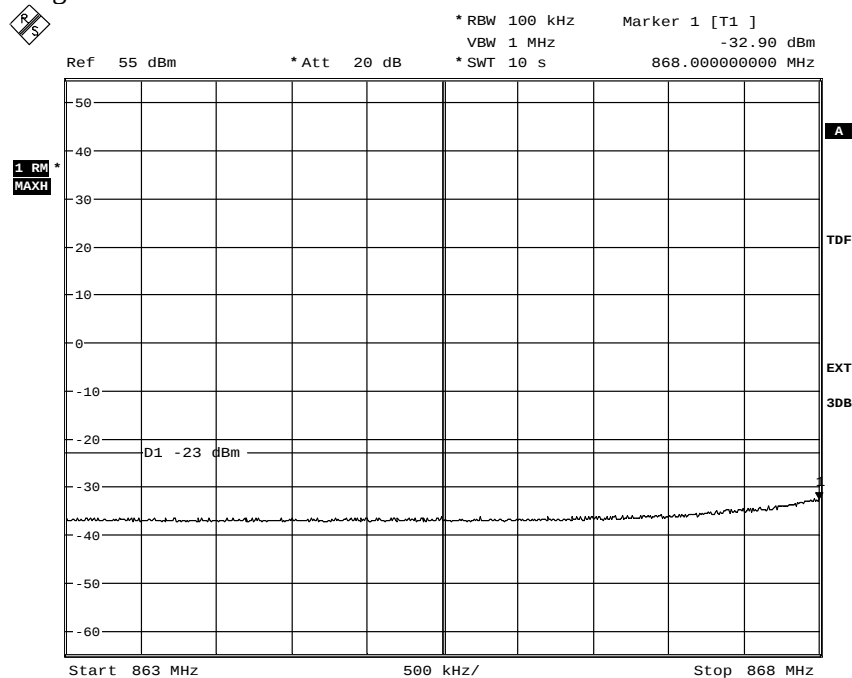
## Appendix 4

Diagram 2 a:



Date: 23.JAN.2013 08:29:18

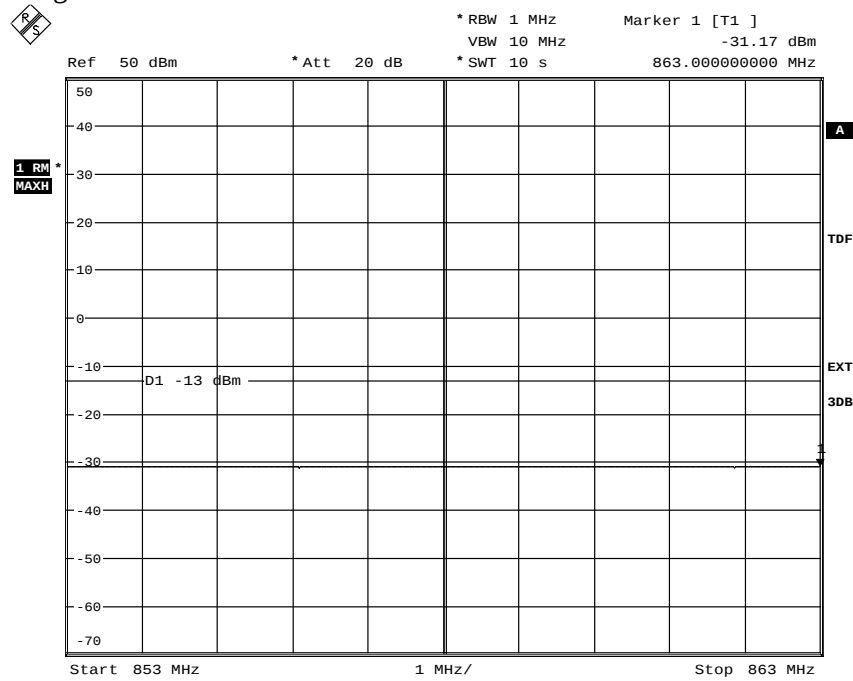
Diagram 2 b:



Date: 23.JAN.2013 08:31:26

## Appendix 4

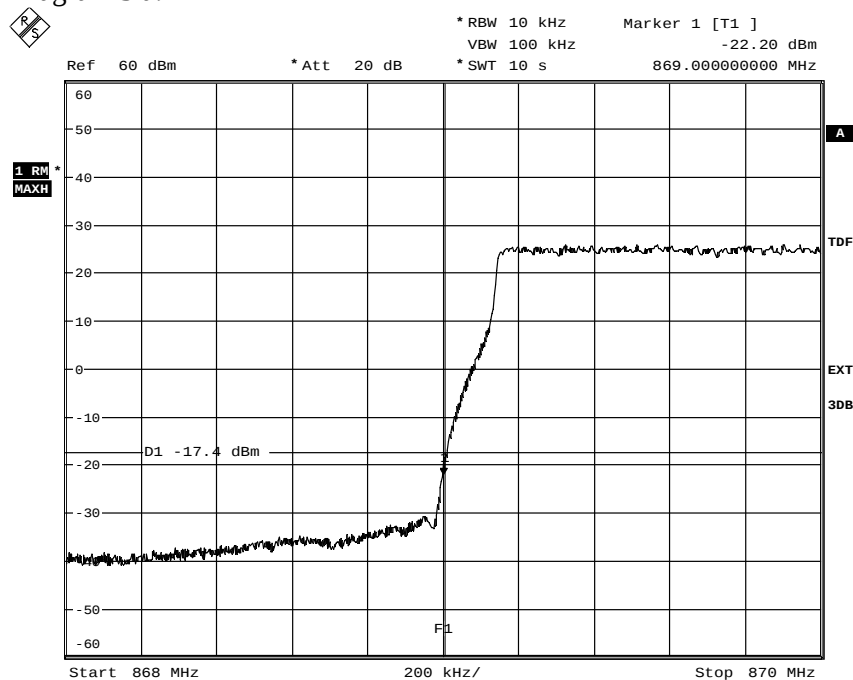
Diagram 2 c:



Date: 23.JAN.2013 08:33:45

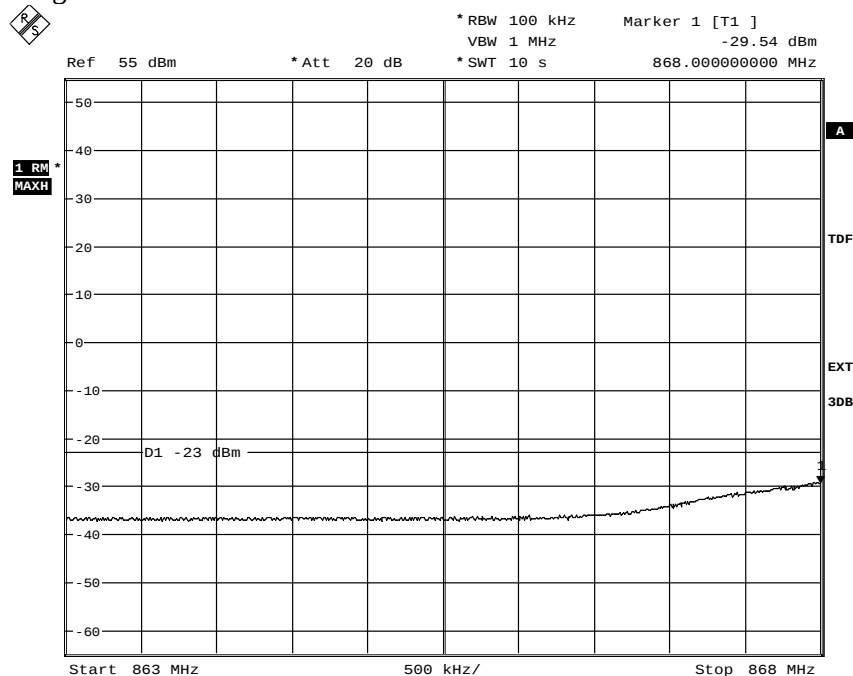
## Appendix 4

Diagram 3 a:



Date: 23.JAN.2013 09:55:40

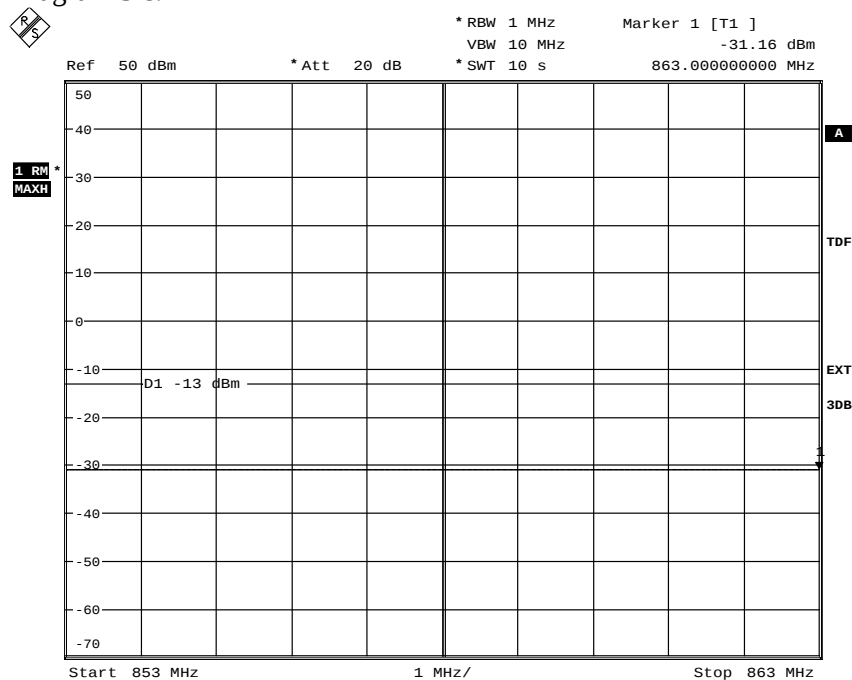
Diagram 3 b:



Date: 23.JAN.2013 09:56:57

## Appendix 4

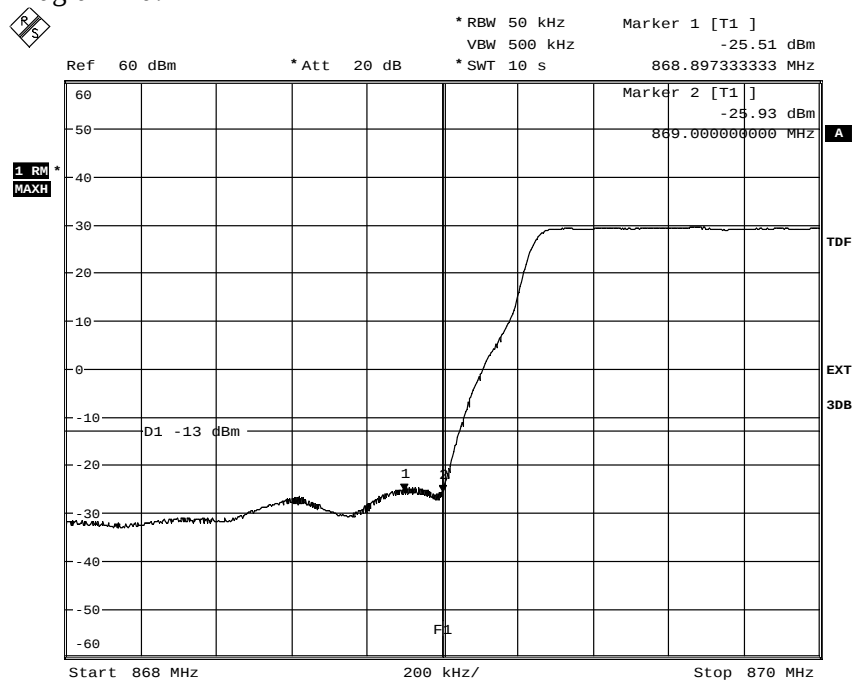
Diagram 3 c:



Date: 23.JAN.2013 09:58:14

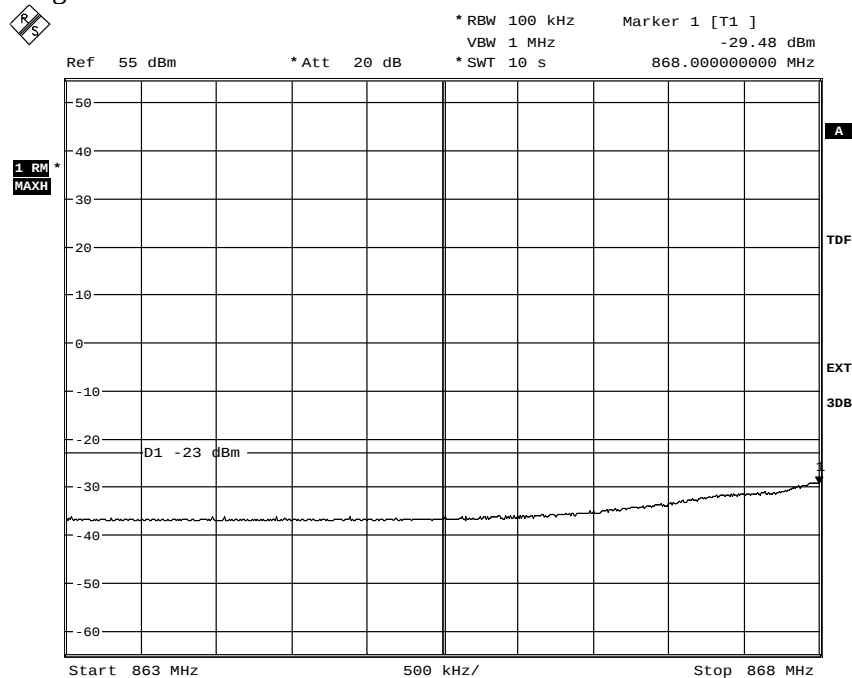
## Appendix 4

Diagram 4 a:



Date: 23.JAN.2013 10:04:32

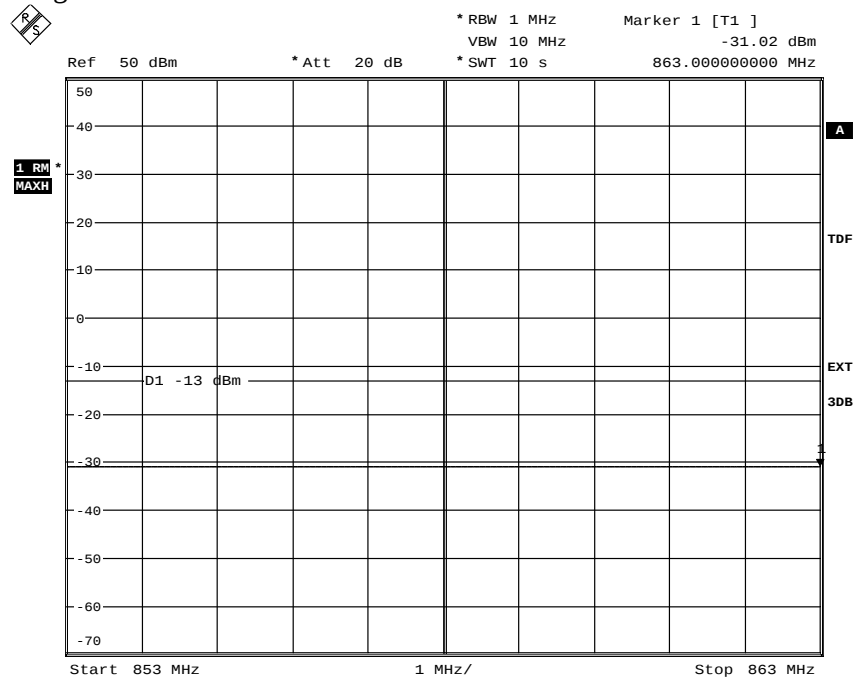
Diagram 4 b:



Date: 23.JAN.2013 10:02:03

## Appendix 4

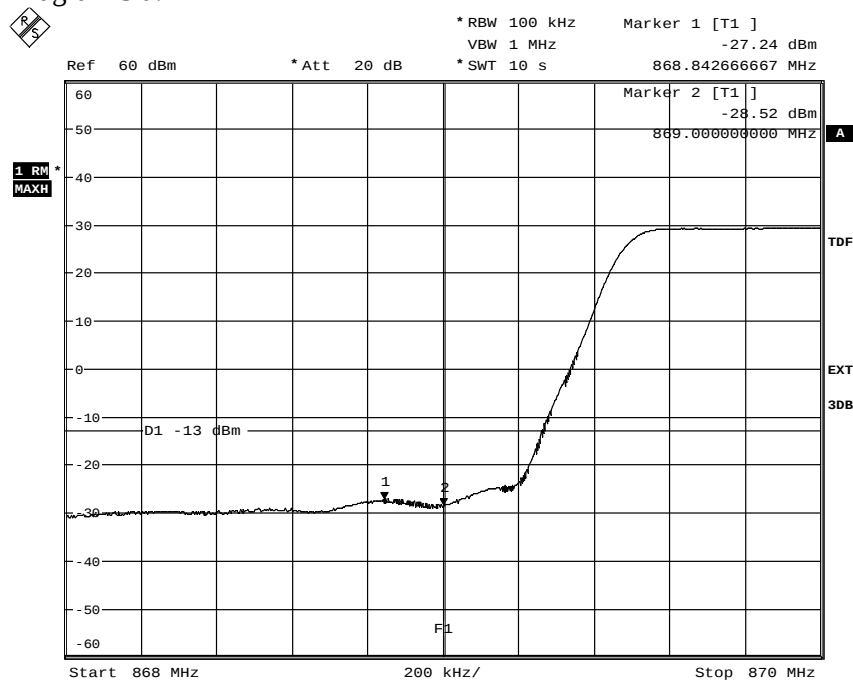
Diagram 4 c:



Date: 23.JAN.2013 10:00:49

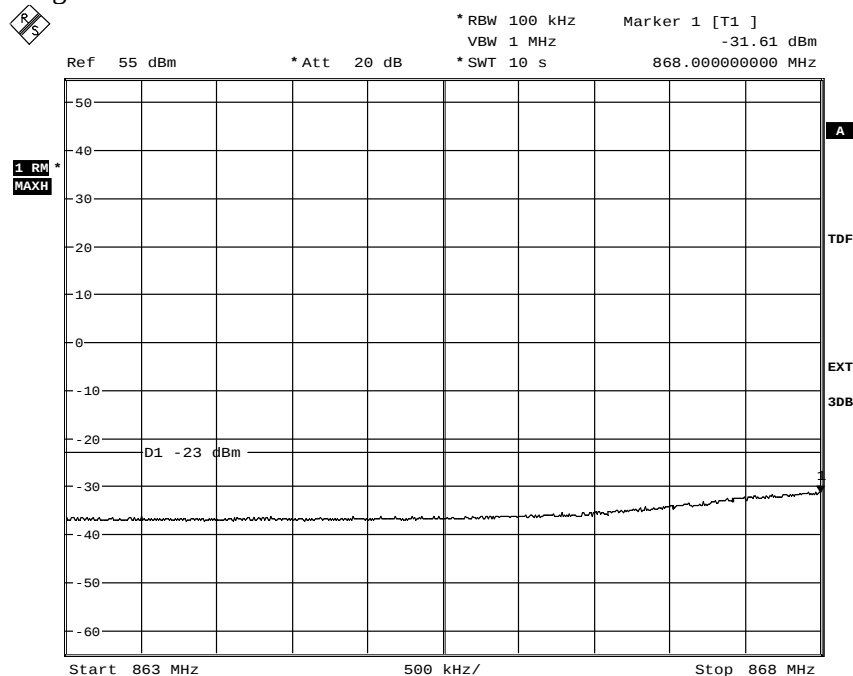
## Appendix 4

Diagram 5 a:



Date: 23.JAN.2013 10:21:22

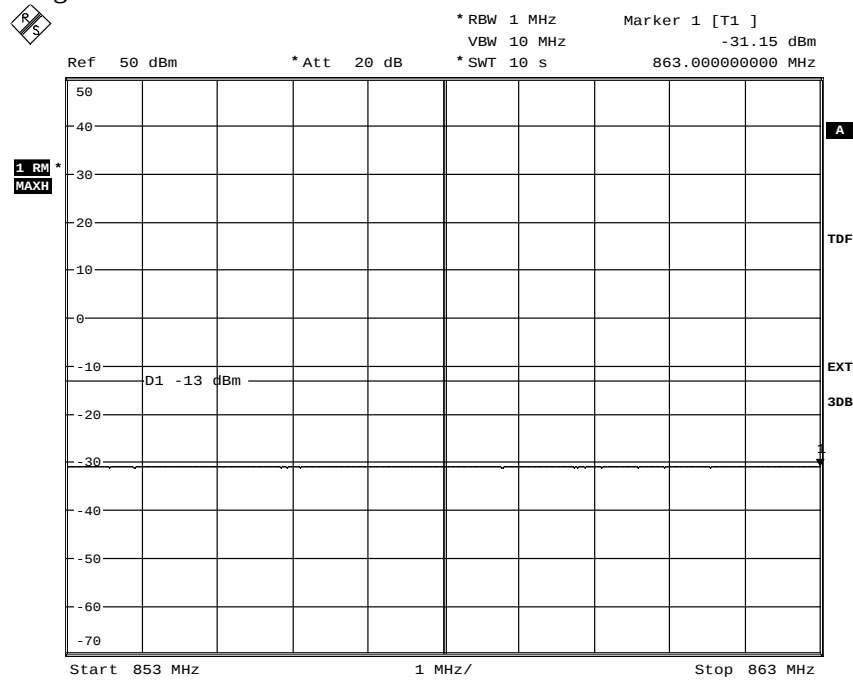
Diagram 5 b:



Date: 23.JAN.2013 10:22:56

## Appendix 4

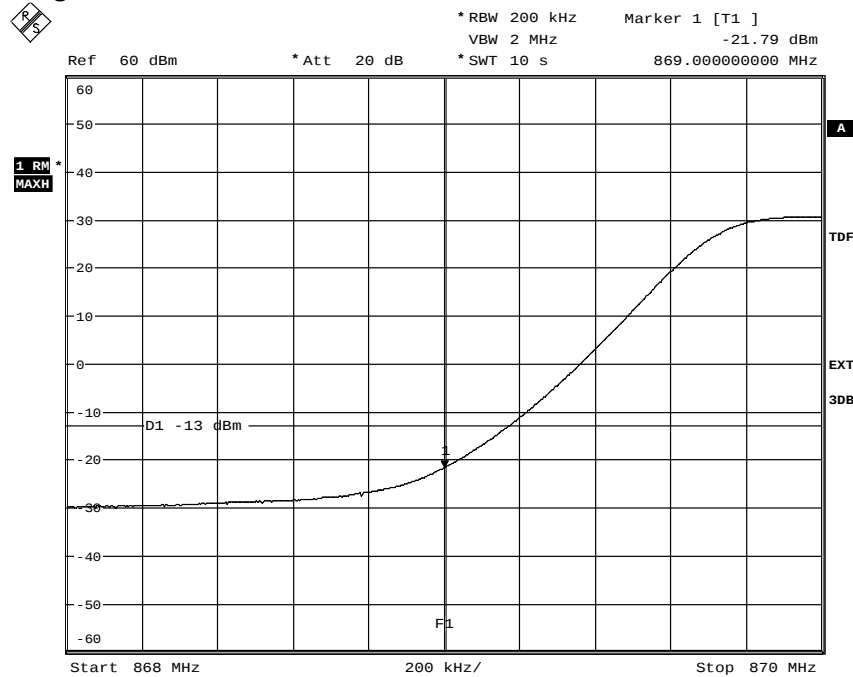
Diagram 5 c:



Date: 23.JAN.2013 10:24:25

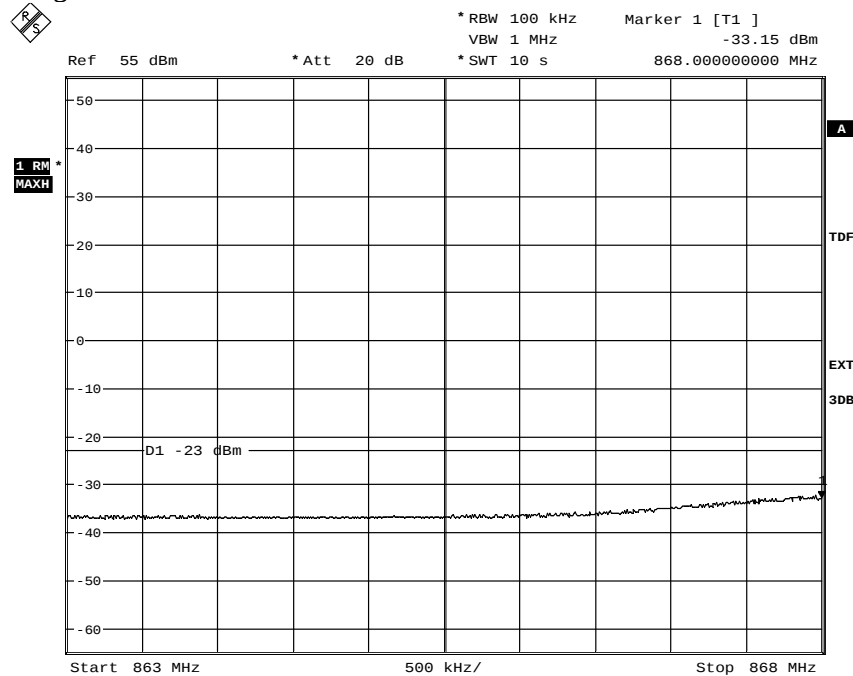
## Appendix 4

Diagram 6 a:



Date: 23.JAN.2013 10:29:33

Diagram 6 b:

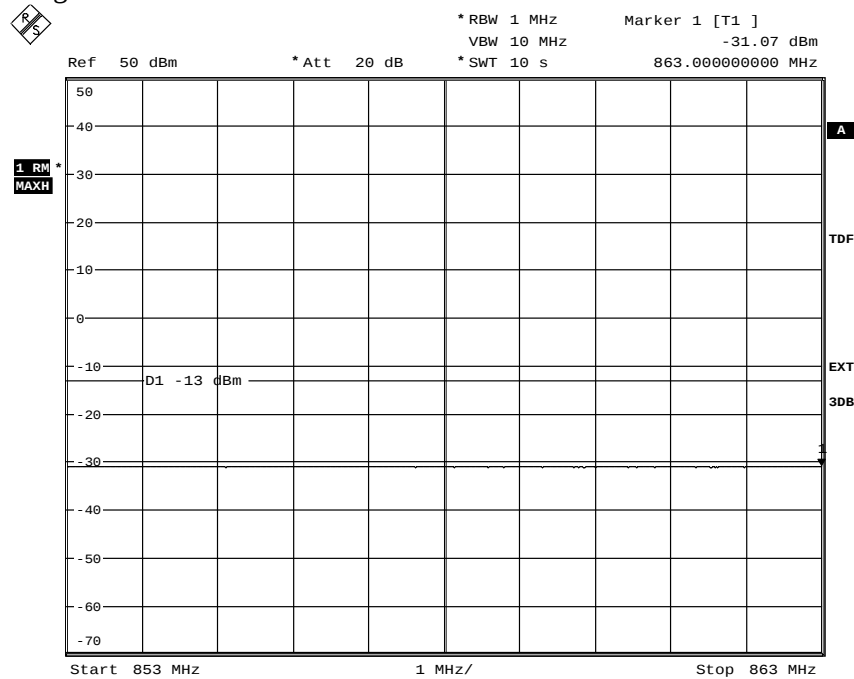


Date: 23.JAN.2013 10:28:20



## Appendix 4

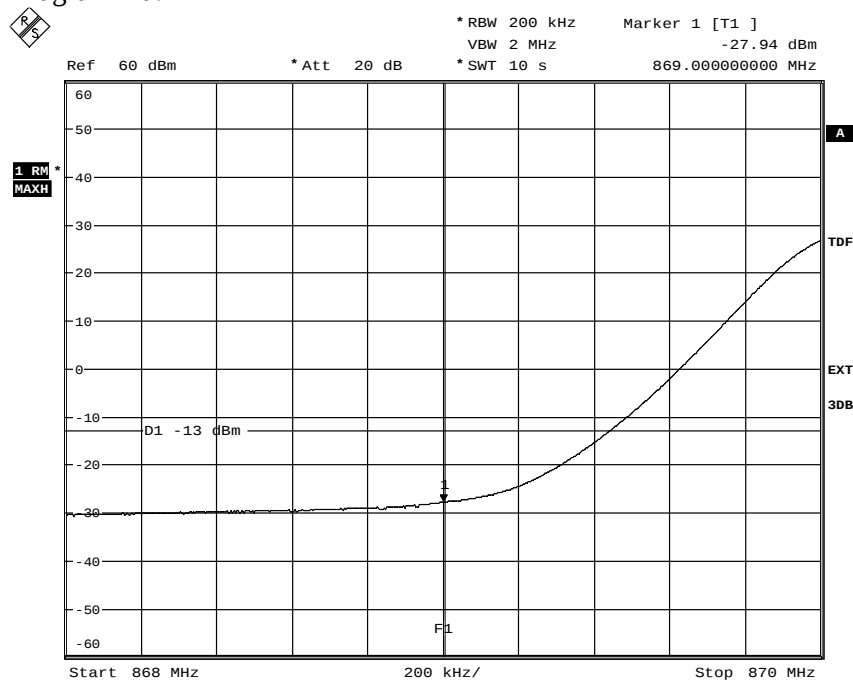
Diagram 6 c:



Date: 23.JAN.2013 10:27:14

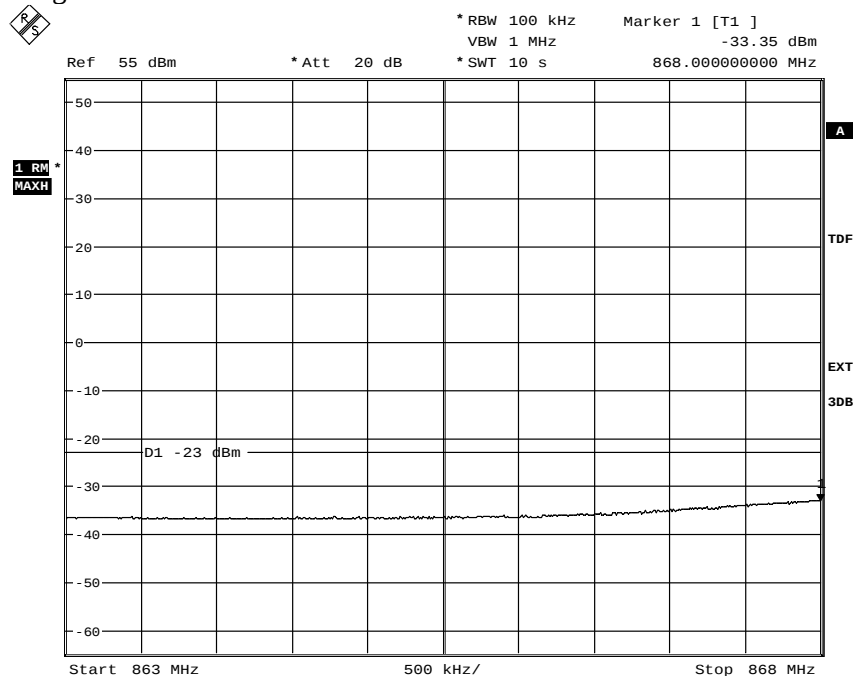
## Appendix 4

Diagram 7 a:



Date: 23.JAN.2013 09:09:44

Diagram 7 b:

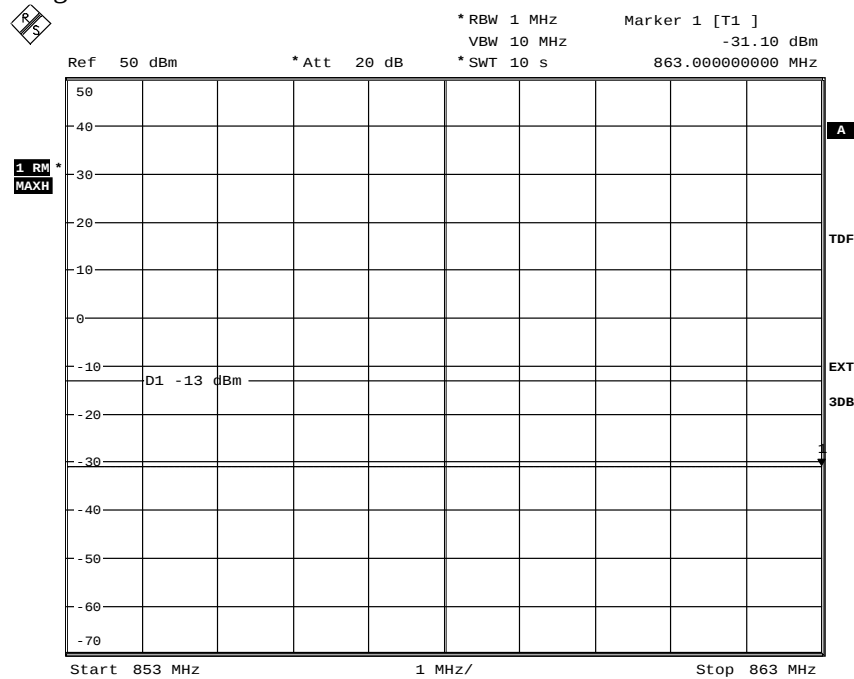


Date: 23.JAN.2013 09:13:39



## Appendix 4

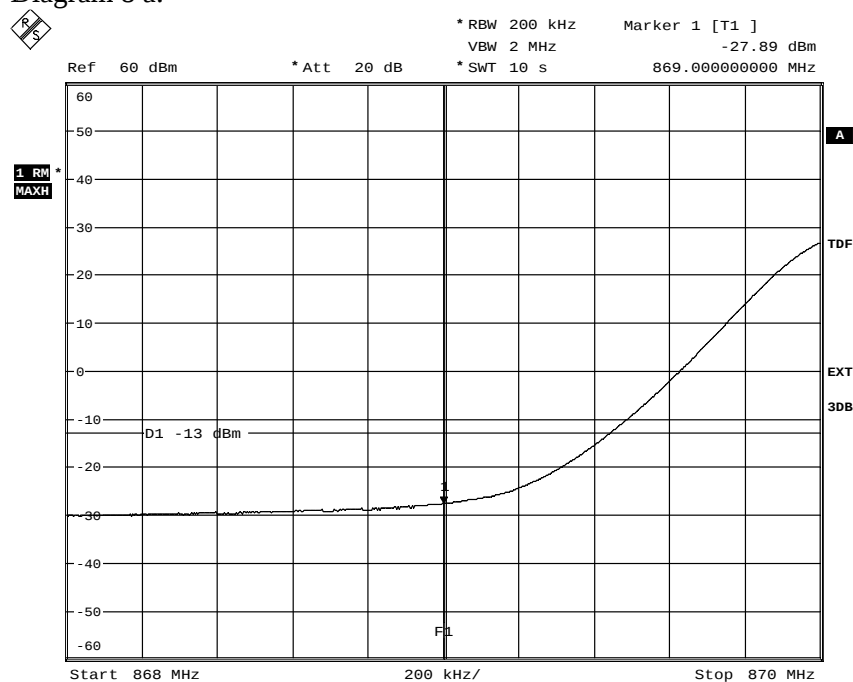
Diagram 7 c:



Date: 23.JAN.2013 09:15:52

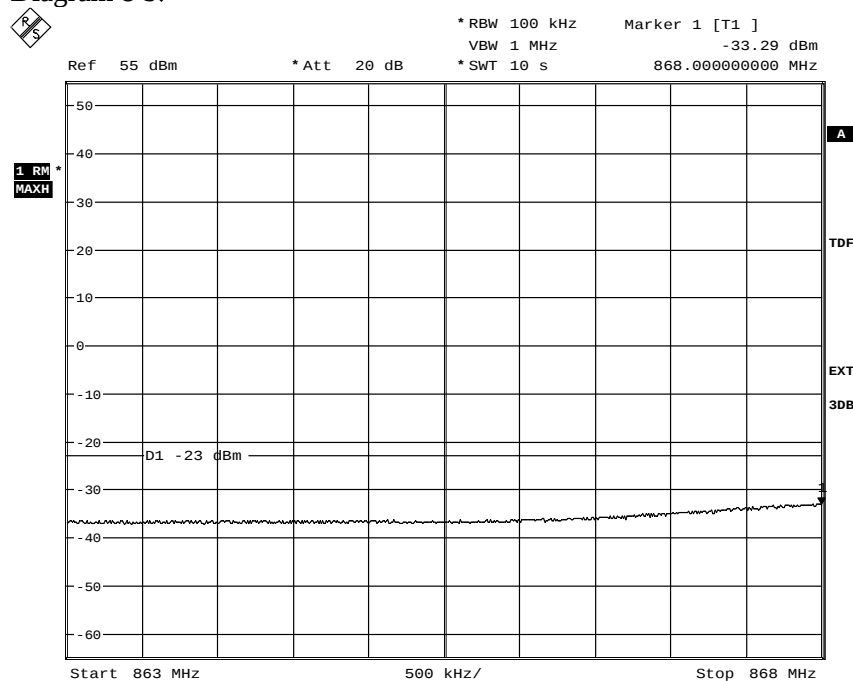
## Appendix 4

Diagram 8 a:



Date: 23.JAN.2013 08:54:42

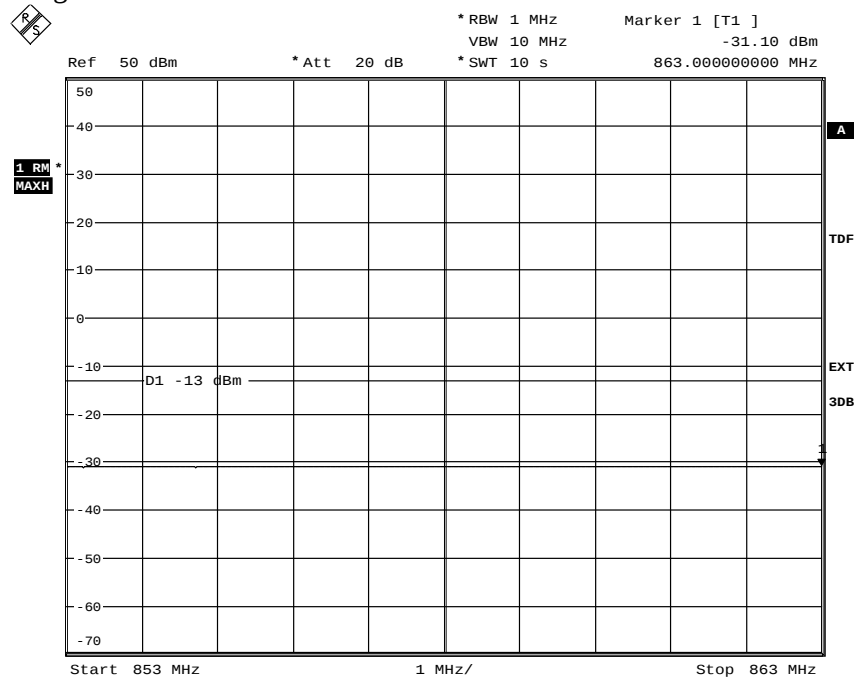
Diagram 8 b:



Date: 23.JAN.2013 08:50:59

## Appendix 4

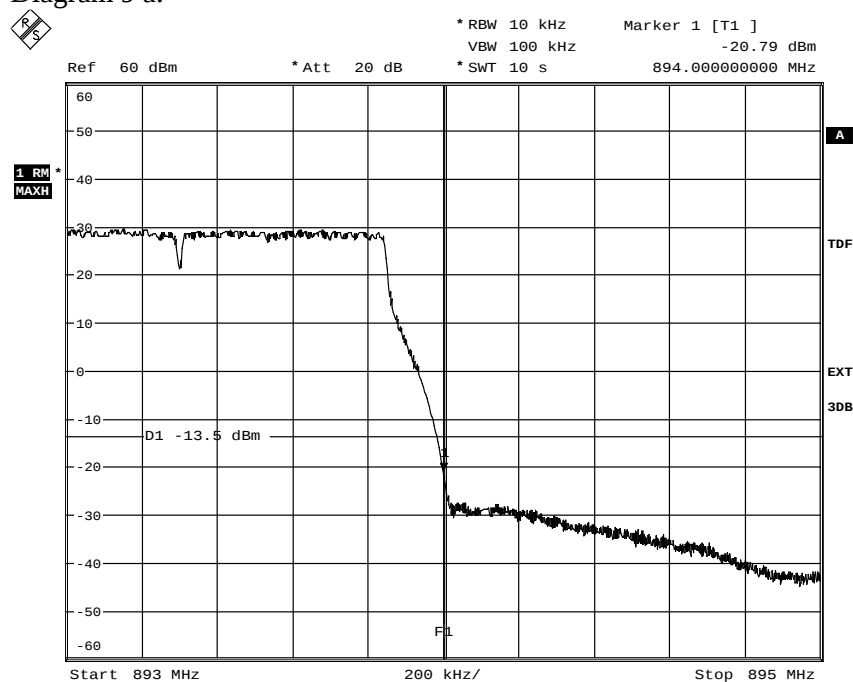
Diagram 8 c:



Date: 23.JAN.2013 08:49:17

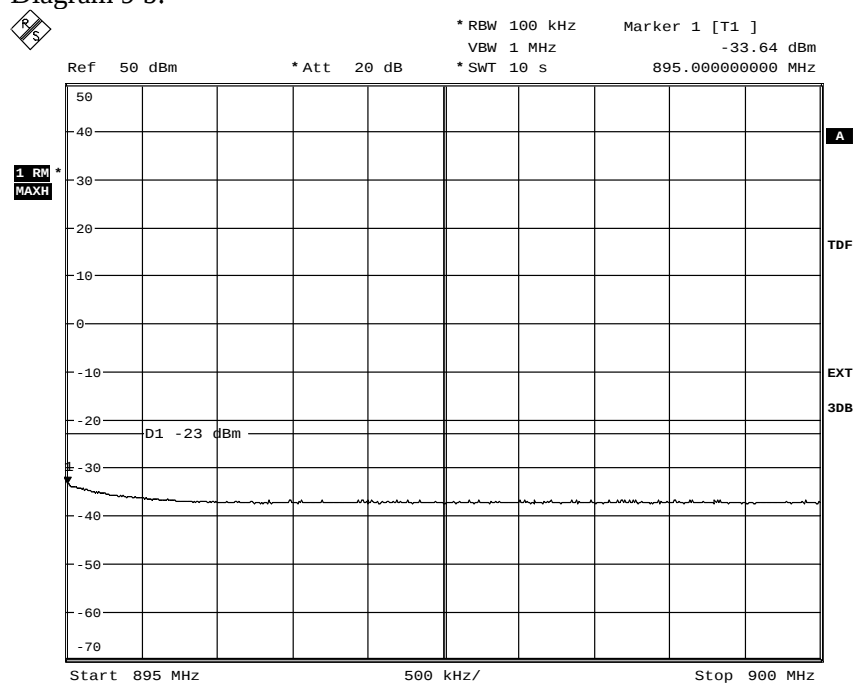
## Appendix 4

Diagram 9 a:



Date: 23.JAN.2013 13:40:46

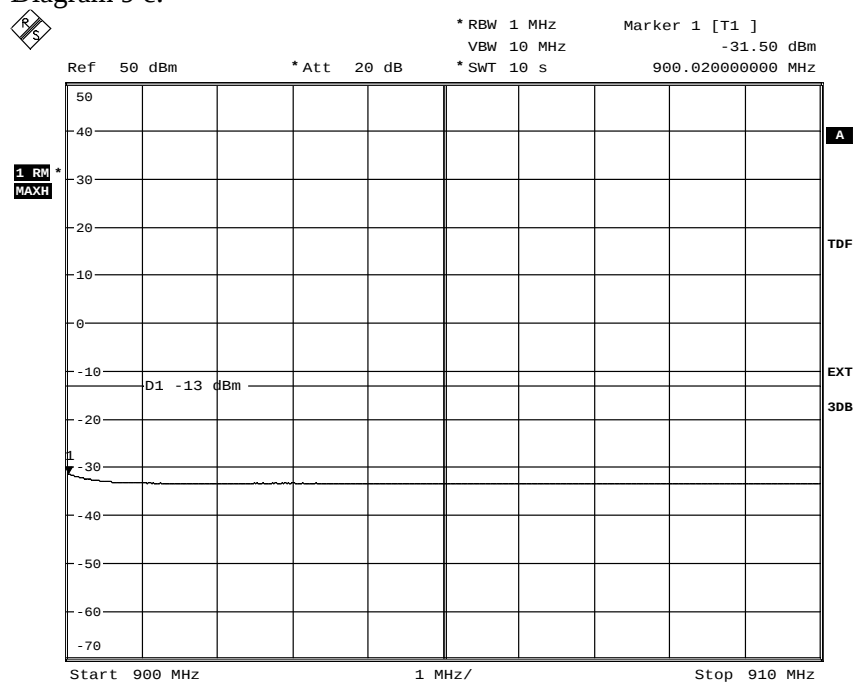
Diagram 9 b:



Date: 23.JAN.2013 13:41:58

## Appendix 4

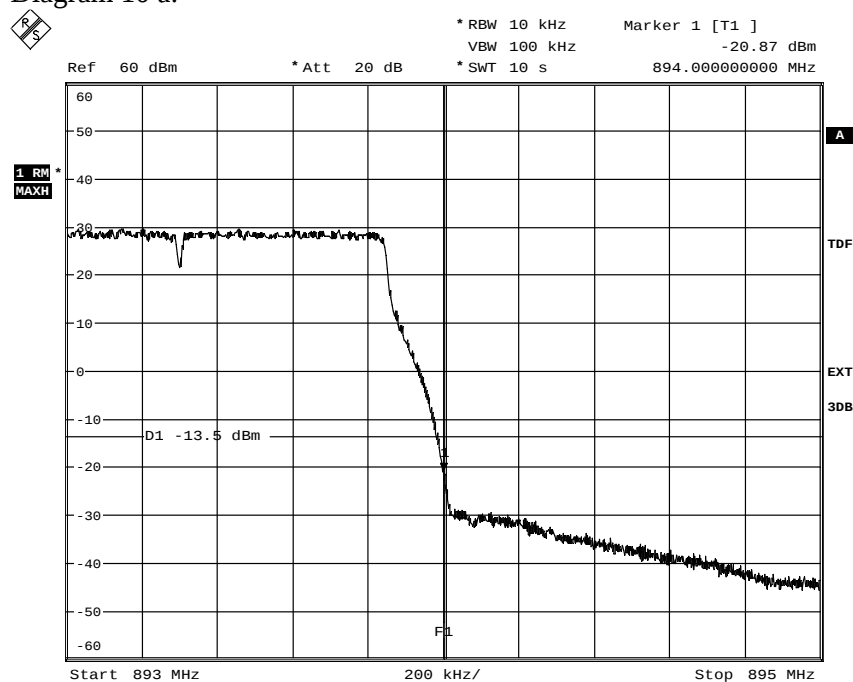
Diagram 9 c:



Date: 23.JAN.2013 13:43:06

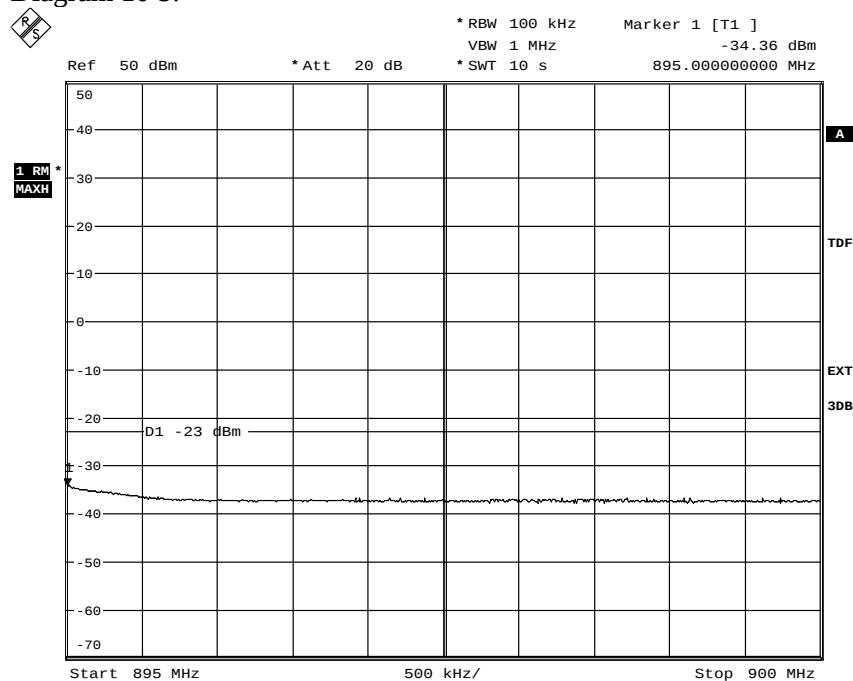
## Appendix 4

Diagram 10 a:



Date: 23.JAN.2013 12:32:44

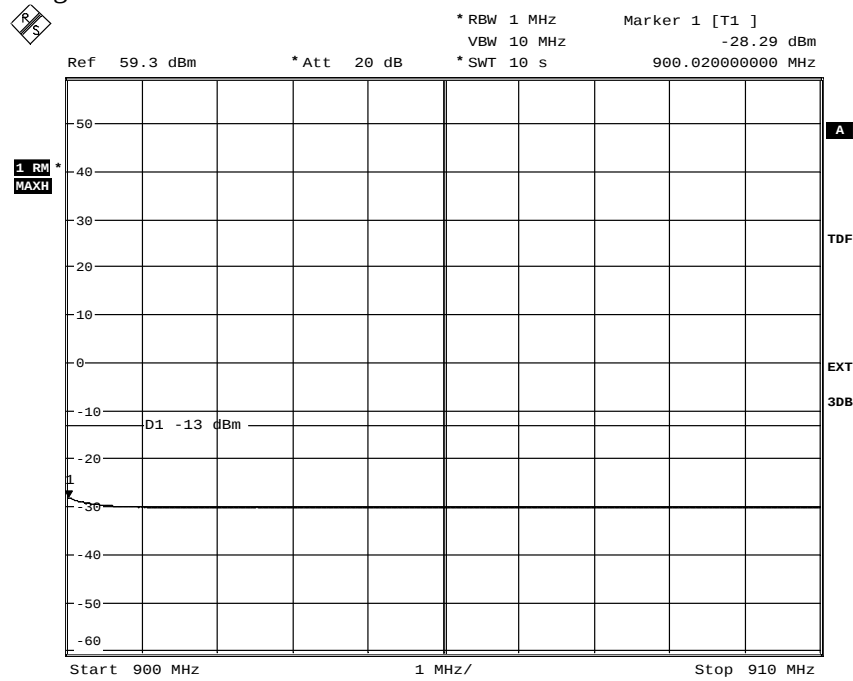
Diagram 10 b:



Date: 23.JAN.2013 12:34:44

## Appendix 4

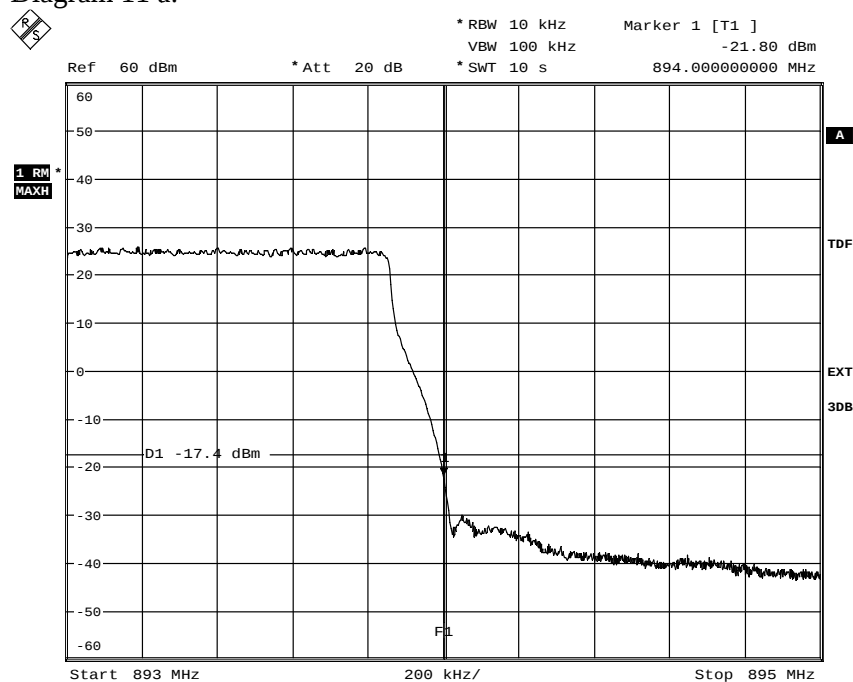
Diagram 10 c:



Date: 23.JAN.2013 12:37:10

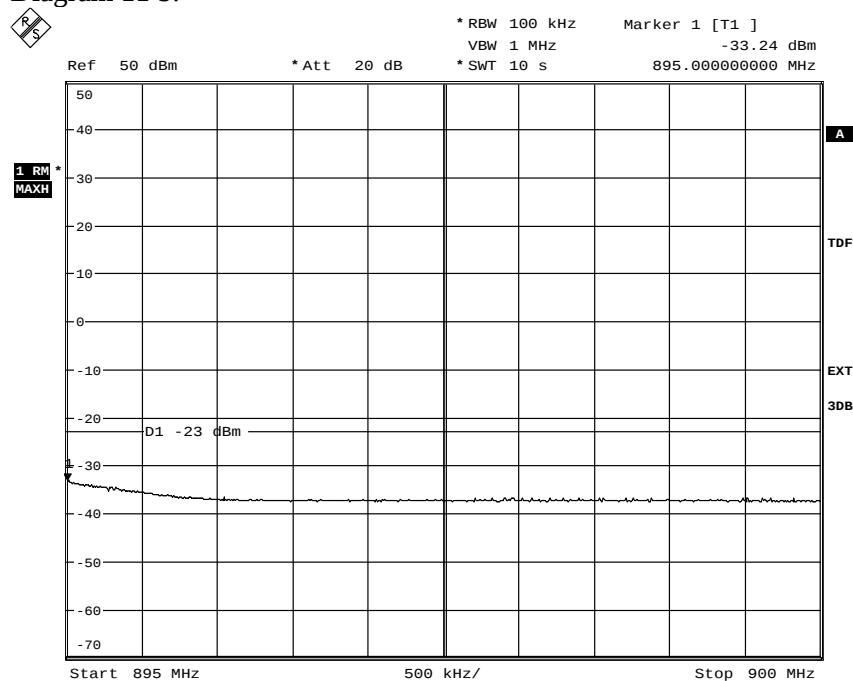
## Appendix 4

Diagram 11 a:



Date: 23.JAN.2013 13:32:58

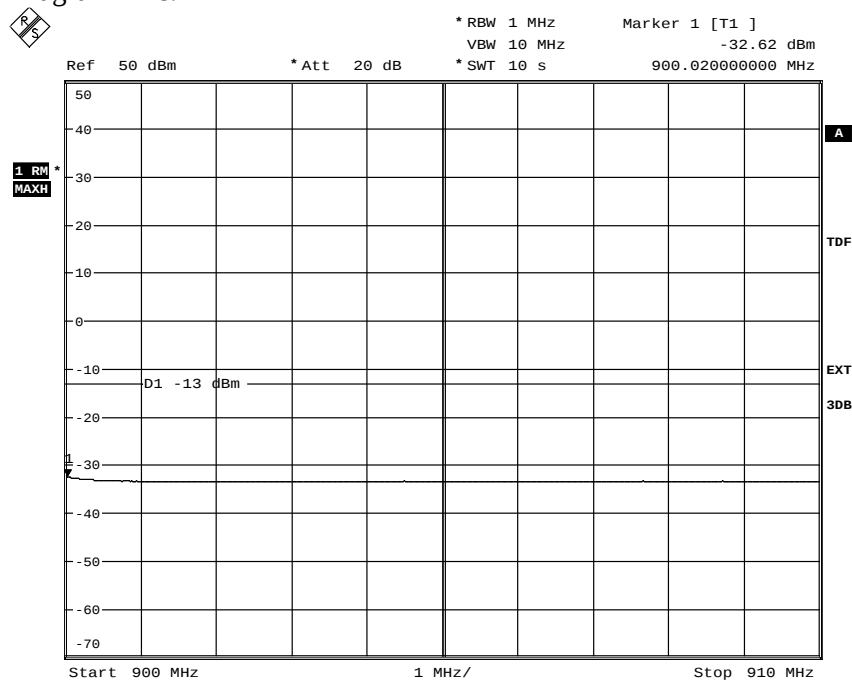
Diagram 11 b:



Date: 23.JAN.2013 13:34:06

## Appendix 4

Diagram 11 c:

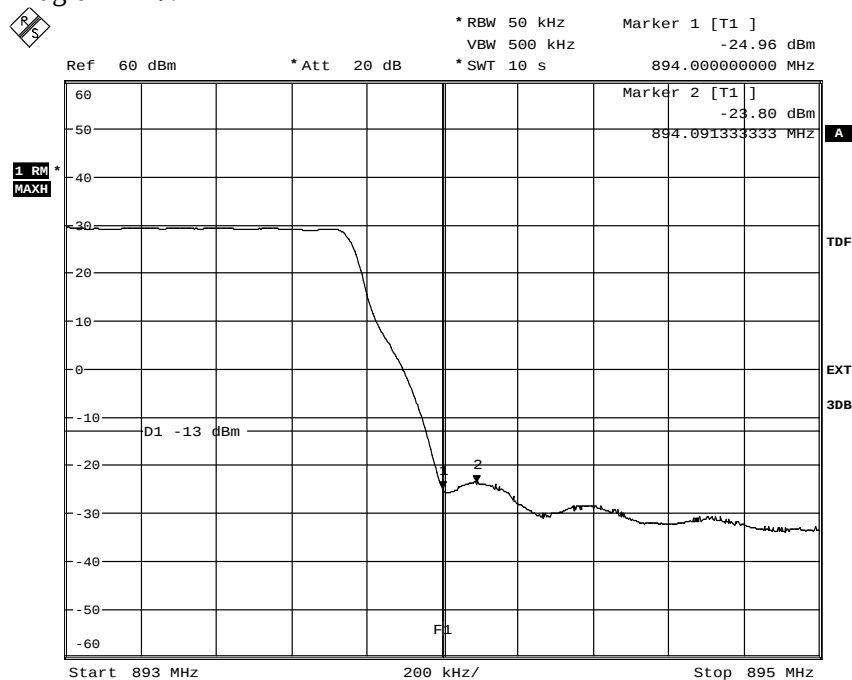


Date: 23.JAN.2013 13:36:15



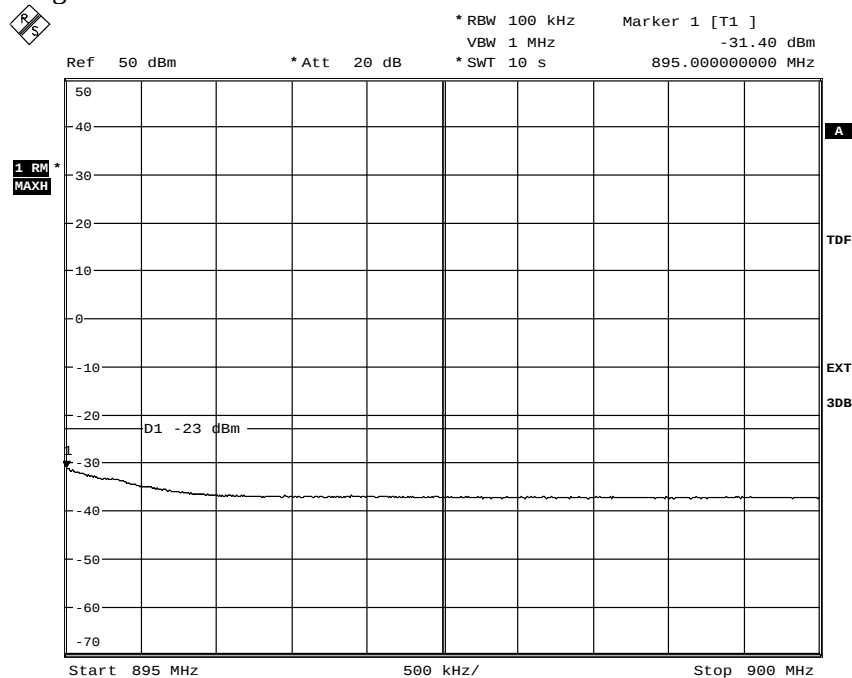
## Appendix 4

Diagram 12 a:



Date: 23.JAN.2013 13:22:25

Diagram 12 b:

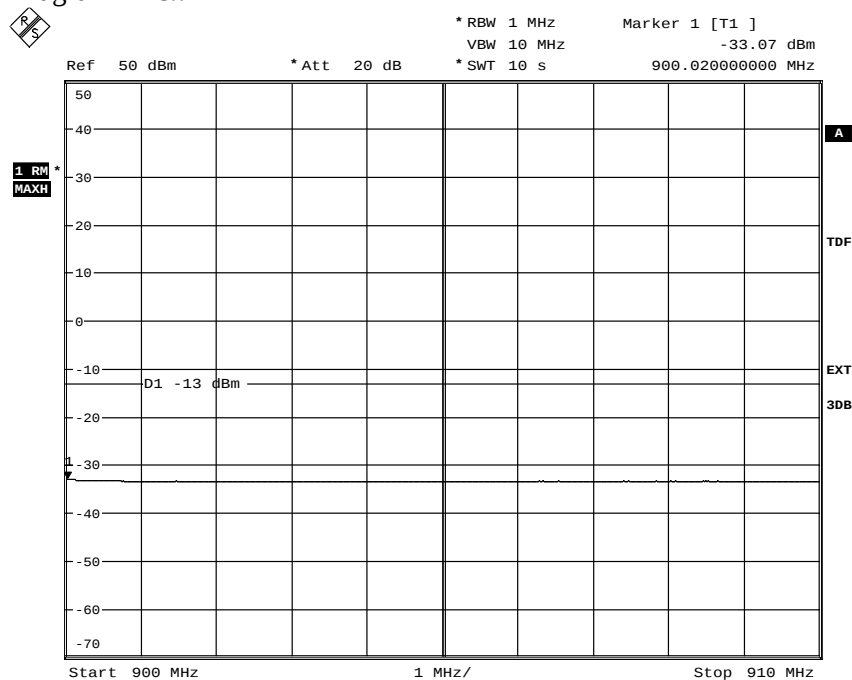


Date: 23.JAN.2013 13:24:54



## Appendix 4

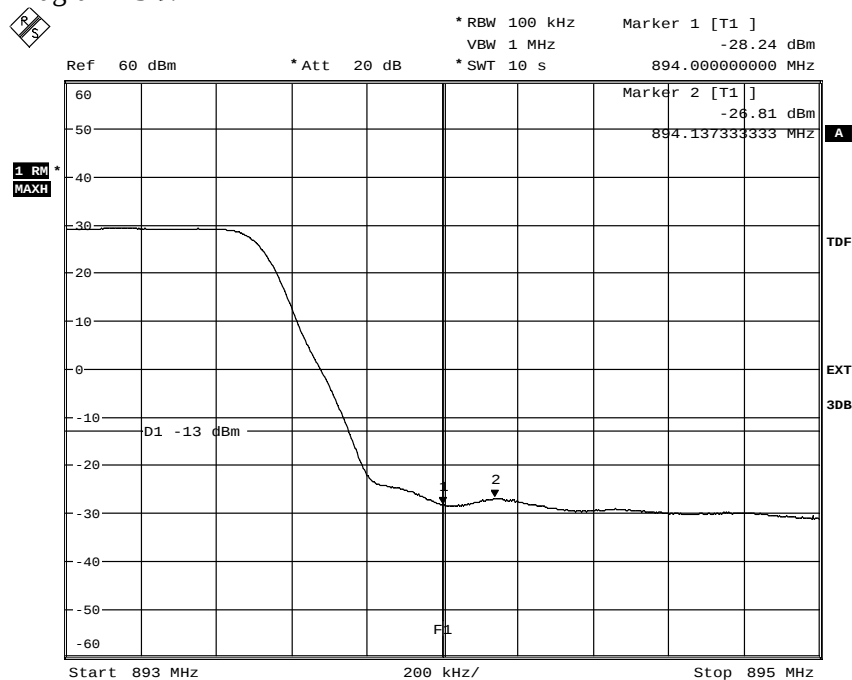
Diagram 12 c::



Date: 23.JAN.2013 13:27:11

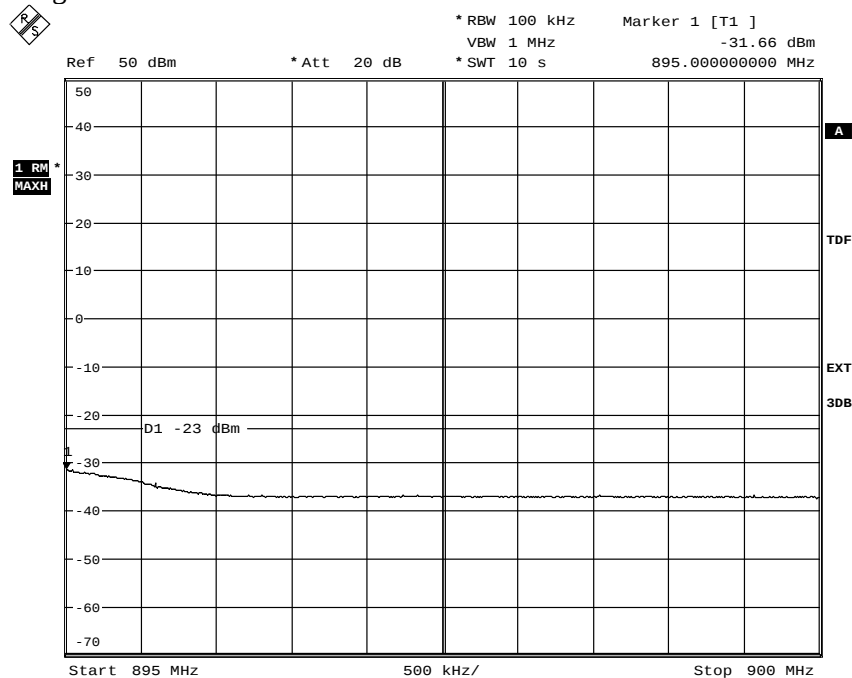
## Appendix 4

Diagram 13 a:



Date: 23.JAN.2013 13:18:05

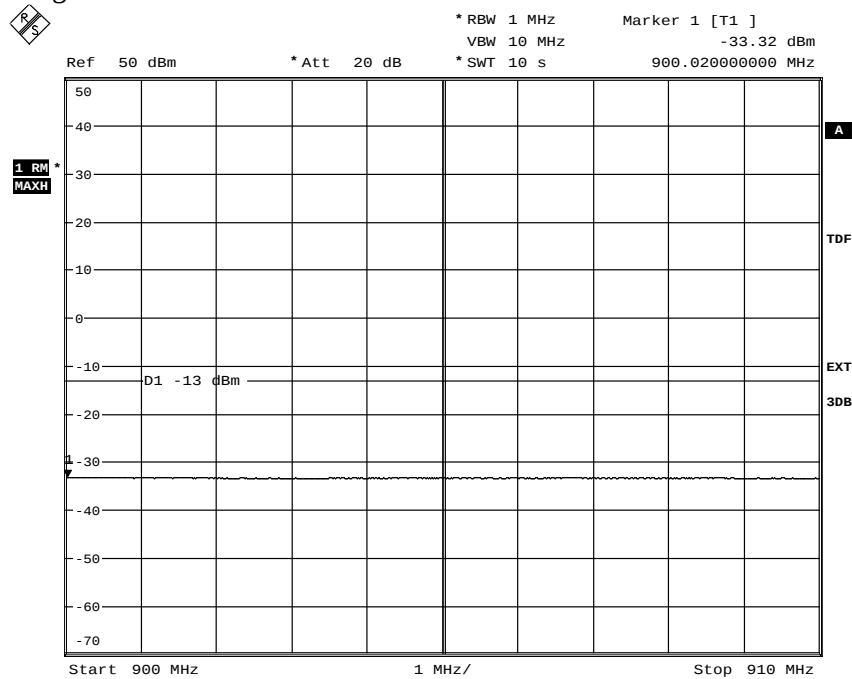
Diagram 13 b:



Date: 23.JAN.2013 13:16:03

## Appendix 4

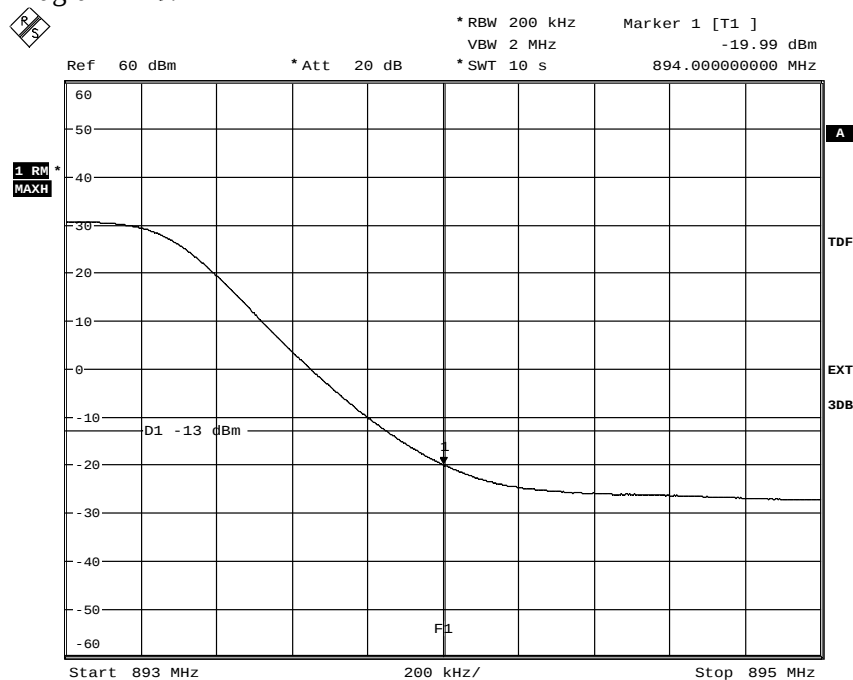
Diagram 13 c:



Date: 23.JAN.2013 13:13:50

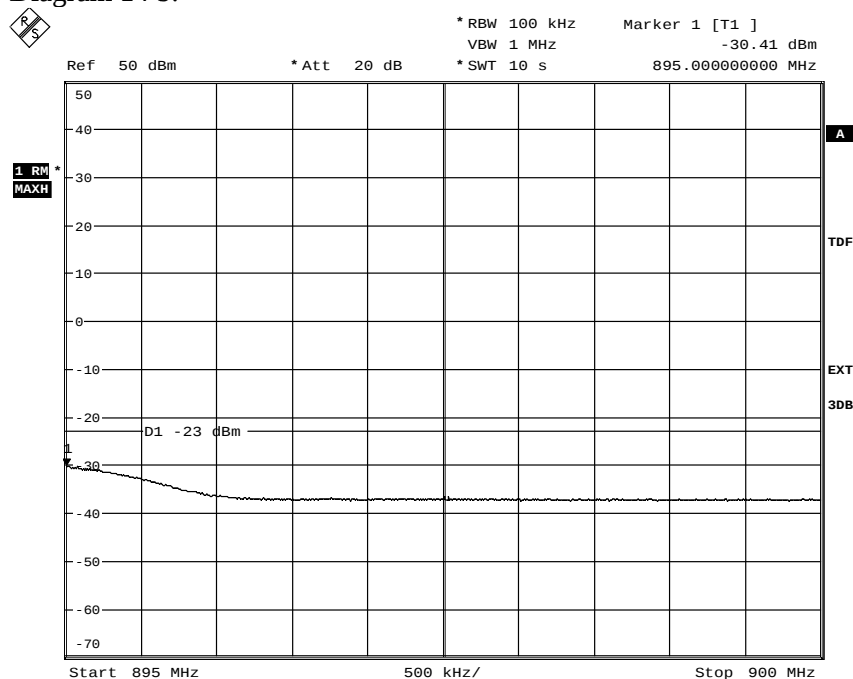
## Appendix 4

Diagram 14 a:



Date: 23.JAN.2013 13:06:38

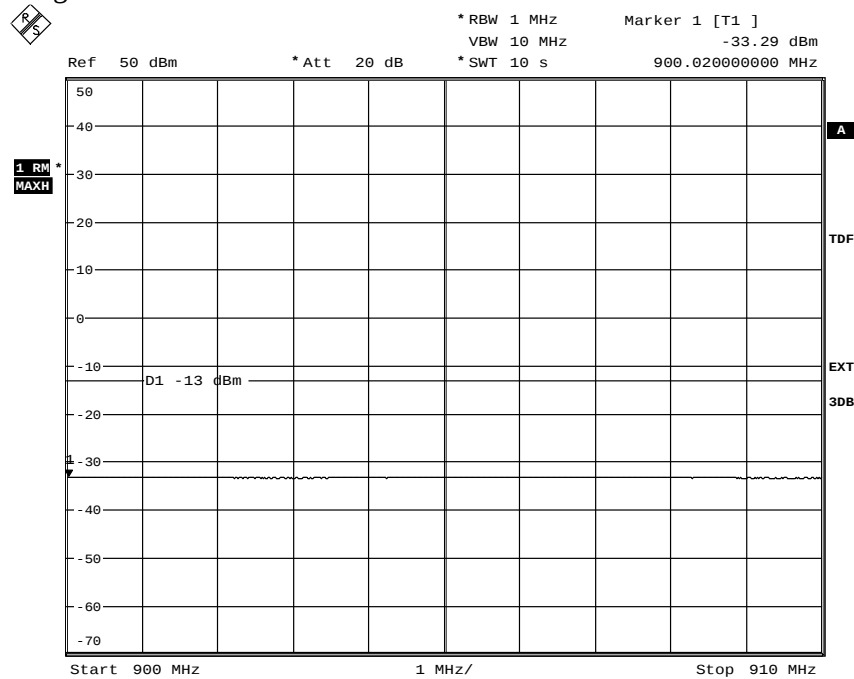
Diagram 14 b:



Date: 23.JAN.2013 13:08:00

## Appendix 4

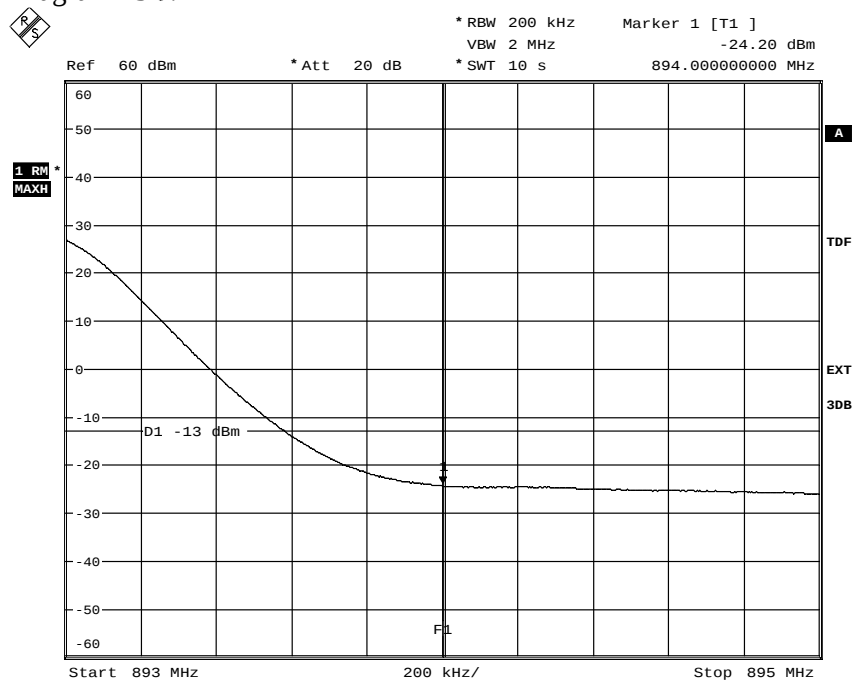
Diagram 14 c:



Date: 23.JAN.2013 13:50:02

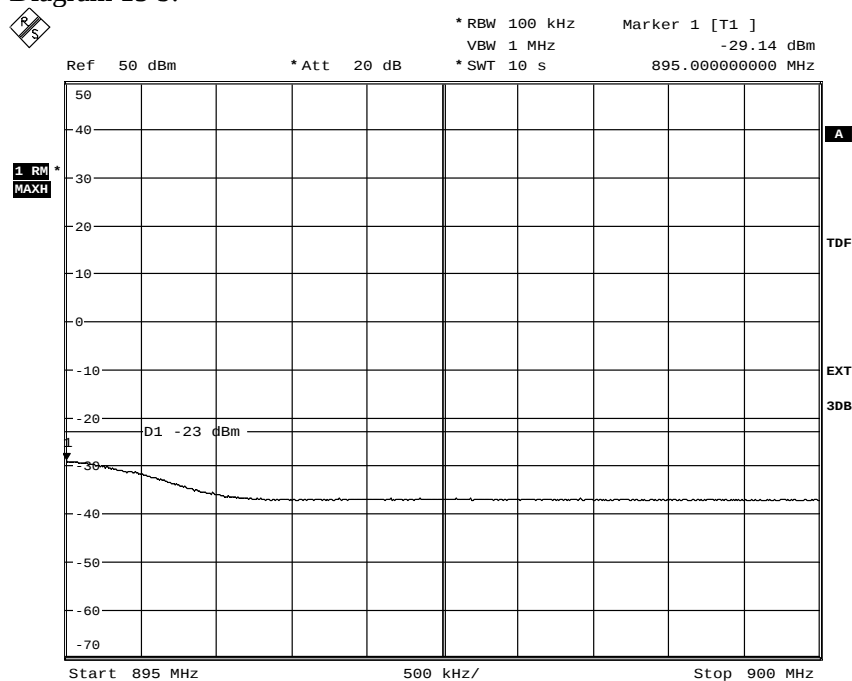
## Appendix 4

Diagram 15 a:



Date: 23.JAN.2013 12:57:41

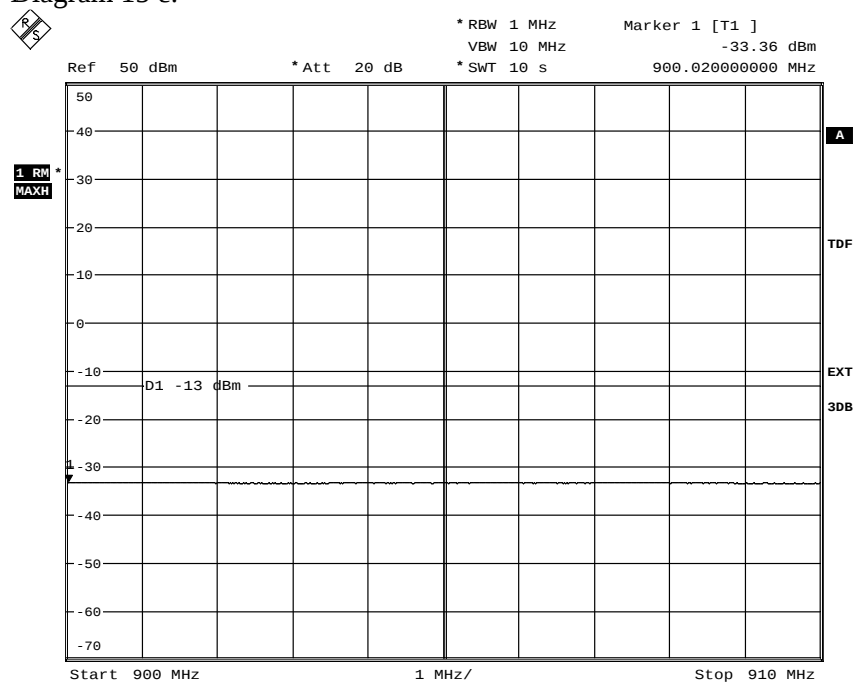
Diagram 15 b:



Date: 23.JAN.2013 12:59:07

## Appendix 4

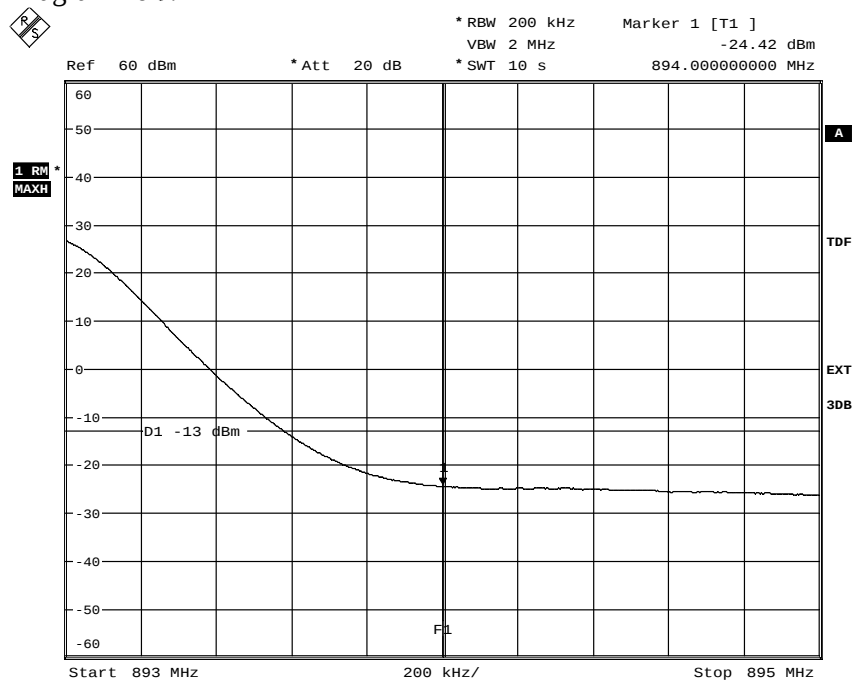
Diagram 15 c:



Date: 23.JAN.2013 13:47:37

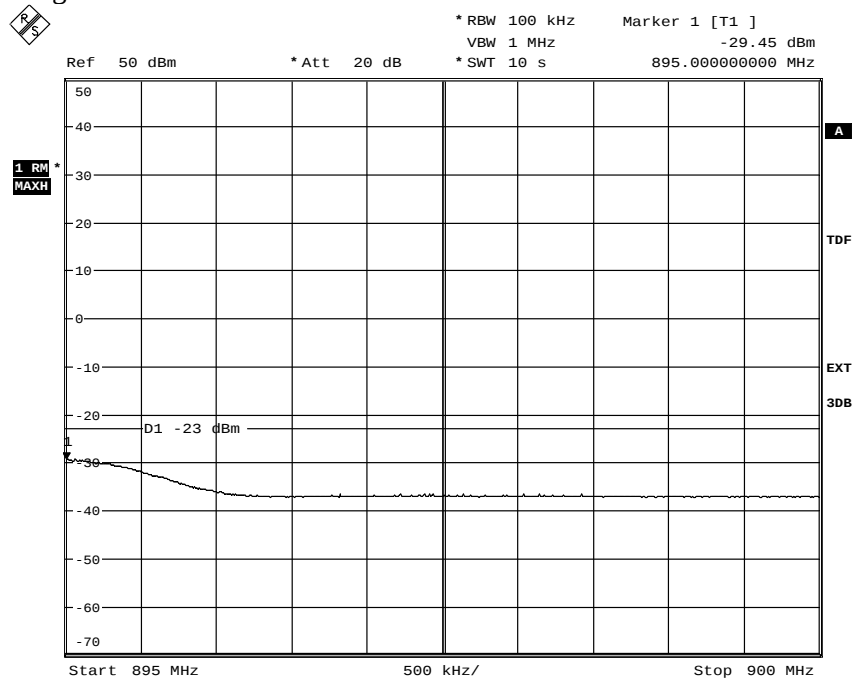
## Appendix 4

Diagram 16 a:



Date: 23.JAN.2013 12:44:23

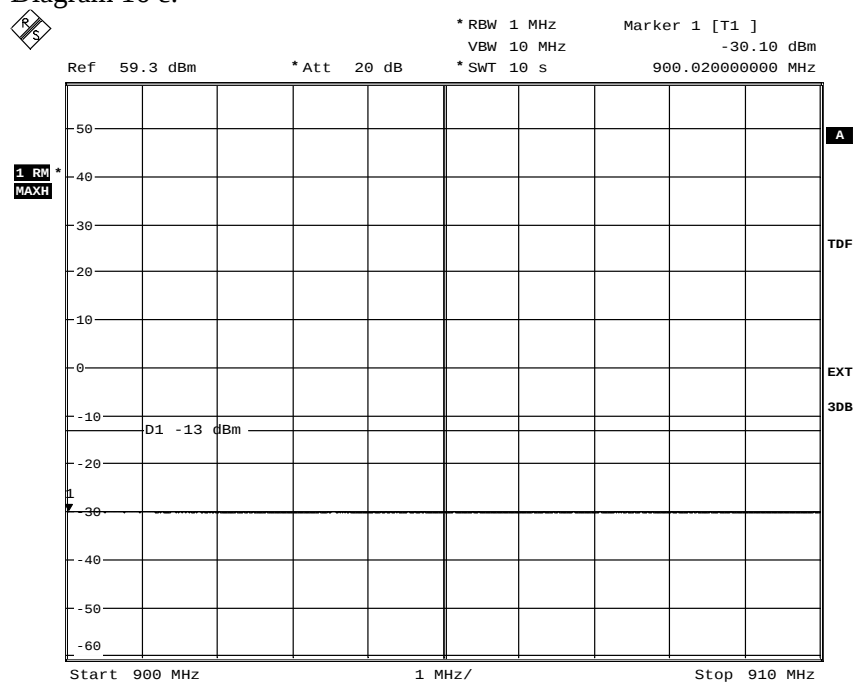
Diagram 16 b:



Date: 23.JAN.2013 12:42:24

## Appendix 4

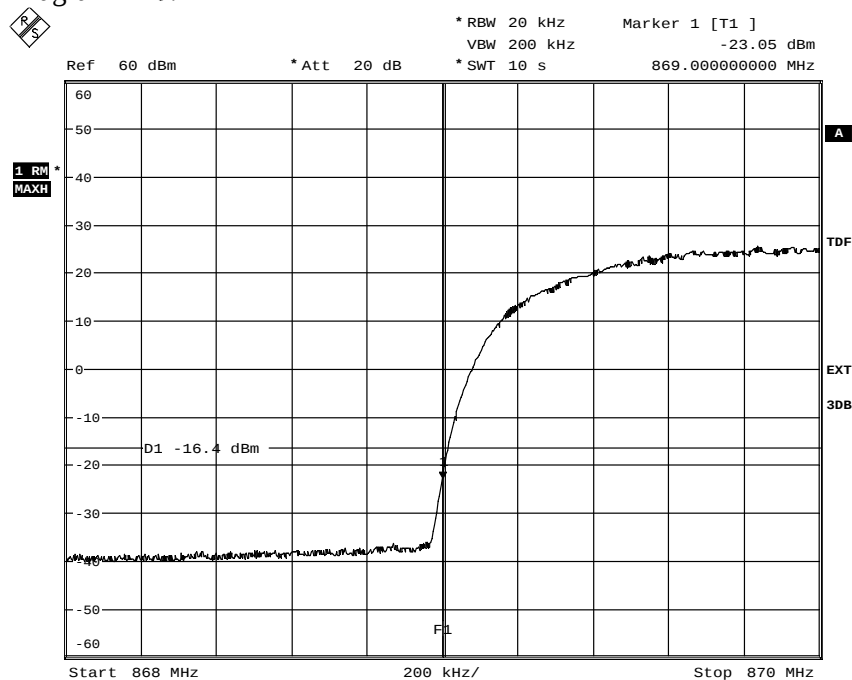
Diagram 16 c:



Date: 23.JAN.2013 12:40:26

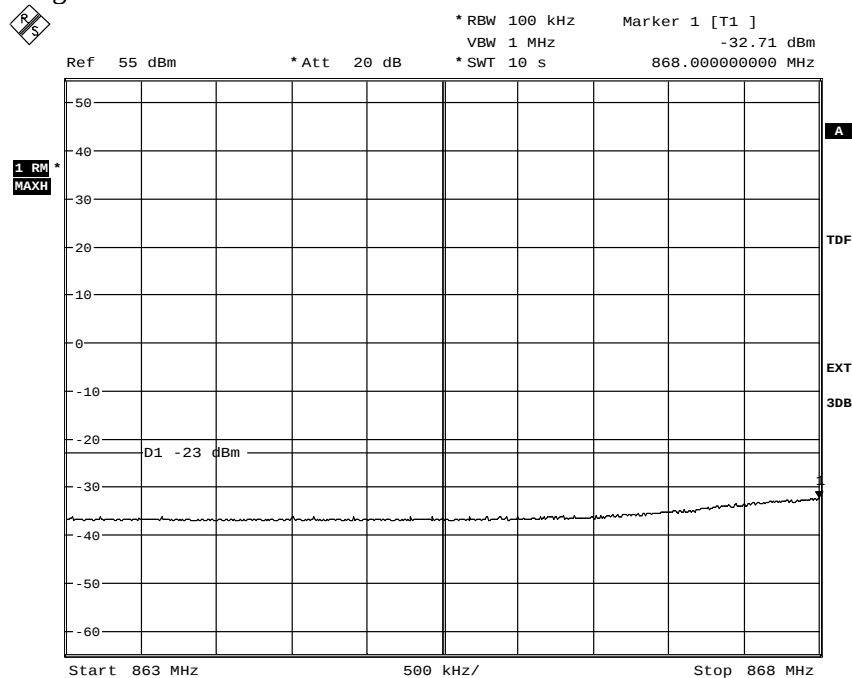
## Appendix 4

Diagram 17 a:



Date: 24.JAN.2013 15:17:35

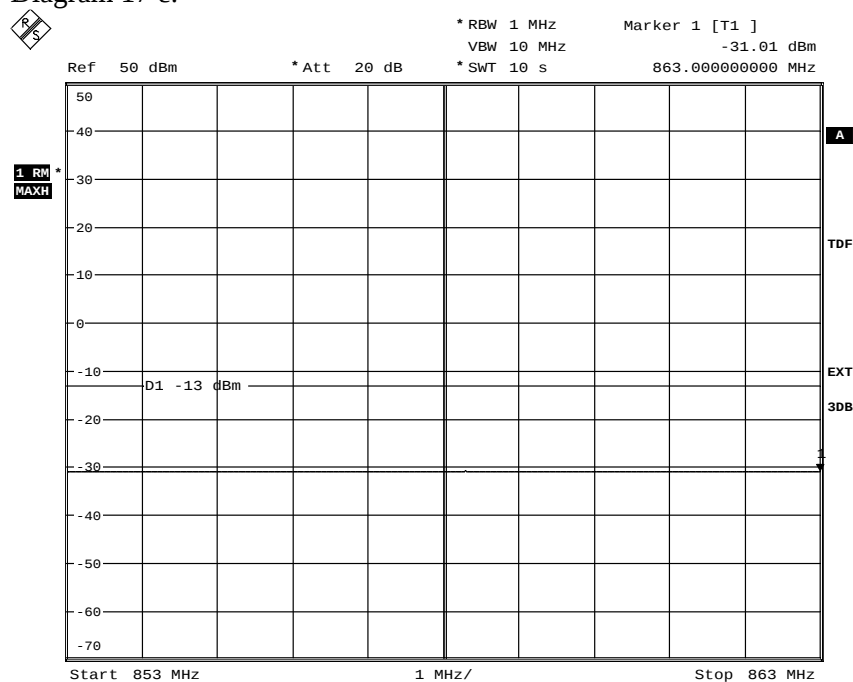
Diagram 17 b:



Date: 24.JAN.2013 15:18:42

## Appendix 4

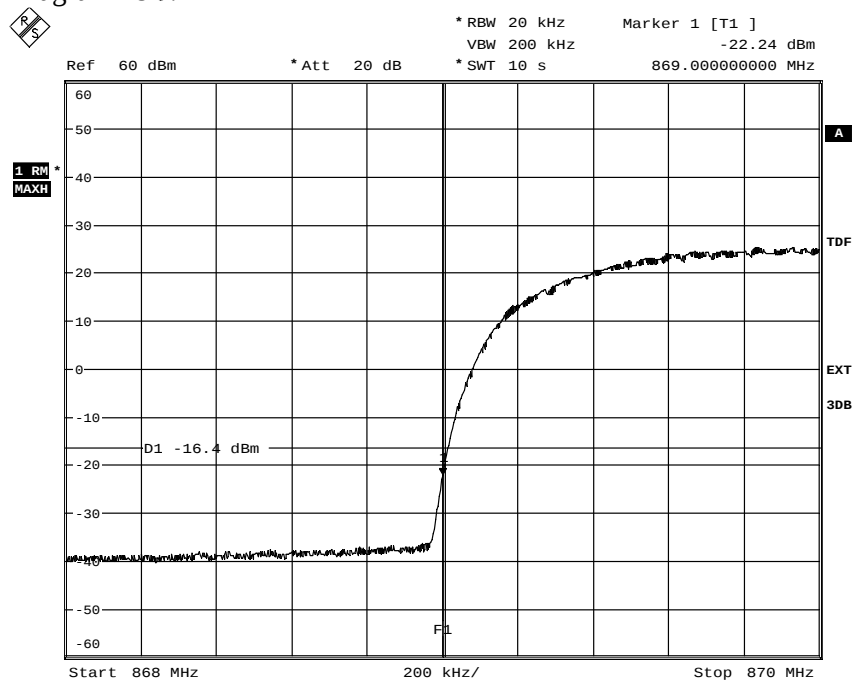
Diagram 17 c:



Date: 24.JAN.2013 15:19:34

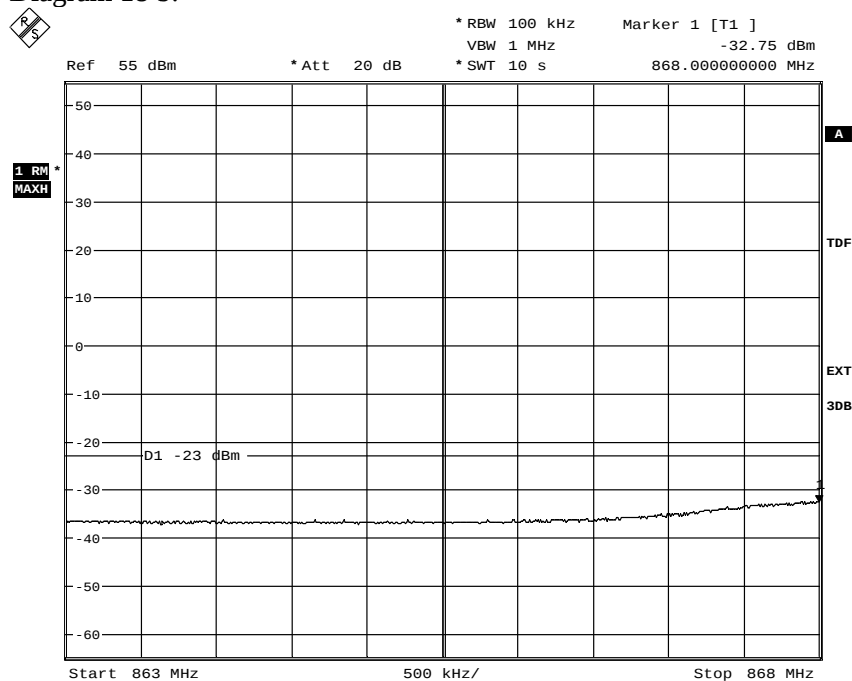
## Appendix 4

Diagram 18 a:



Date: 24.JAN.2013 13:08:23

Diagram 18 b:

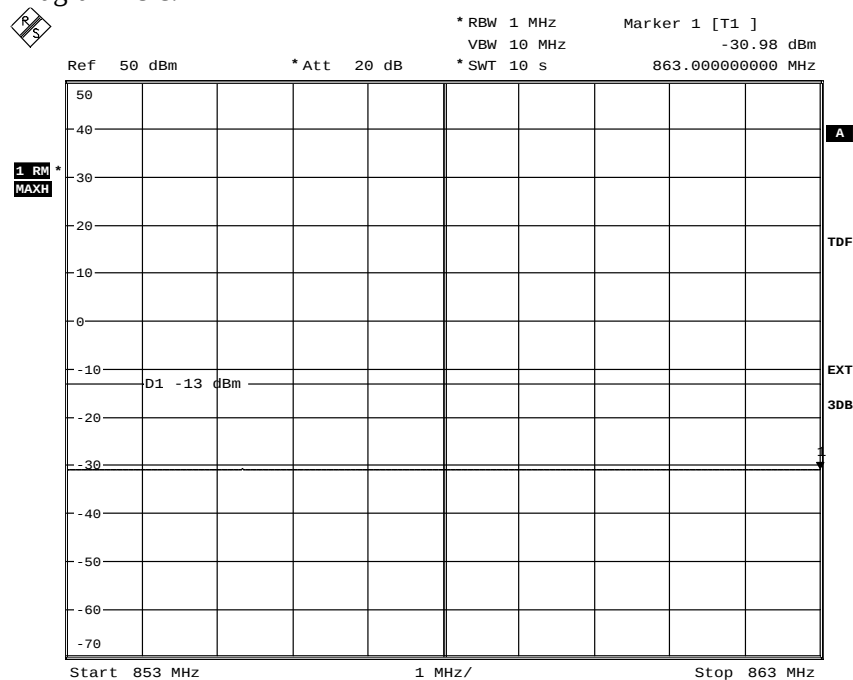


Date: 24.JAN.2013 13:09:17



## Appendix 4

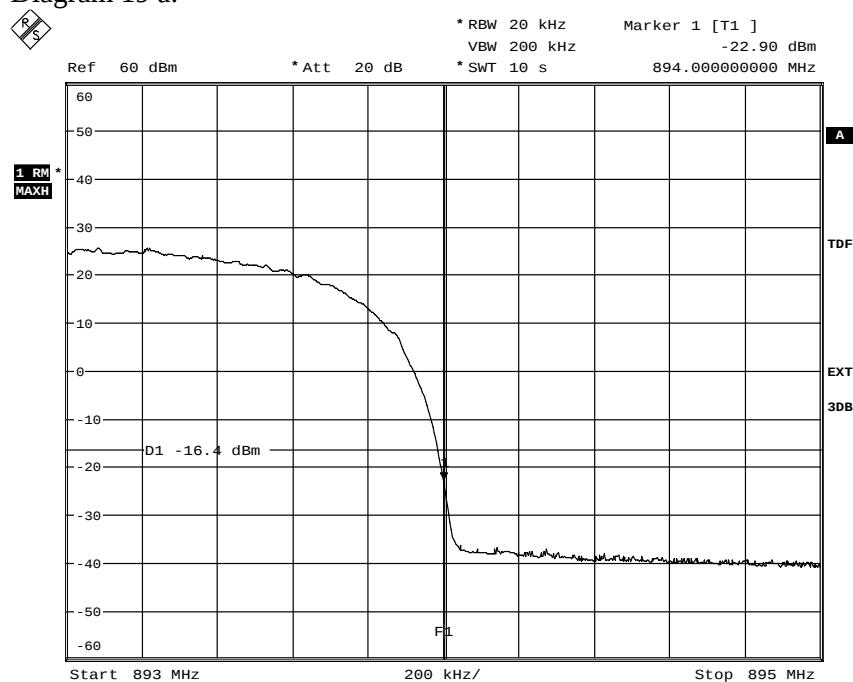
Diagram 18 c:



Date: 24.JAN.2013 13:10:15

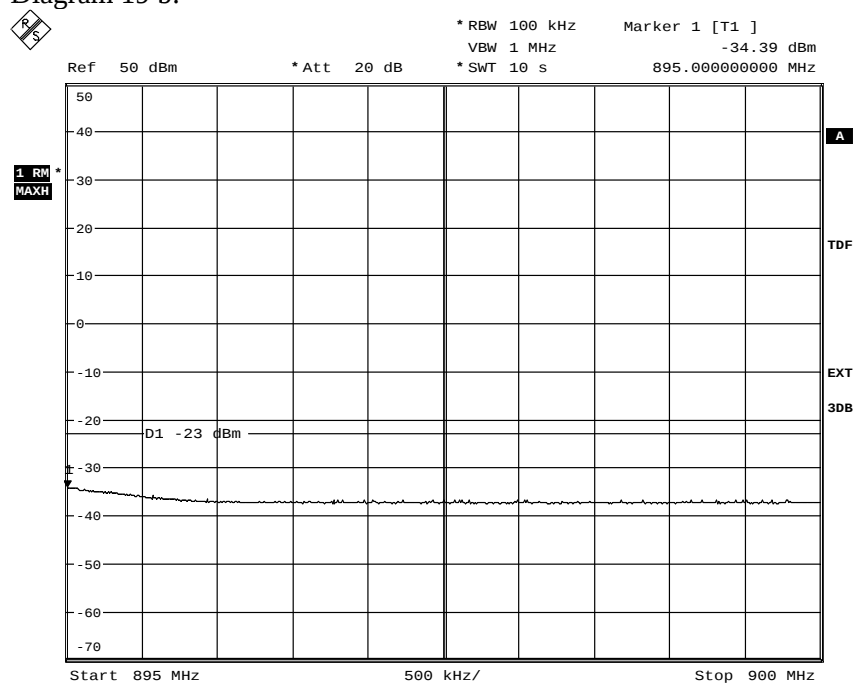
## Appendix 4

Diagram 19 a:



Date: 24.JAN.2013 14:46:37

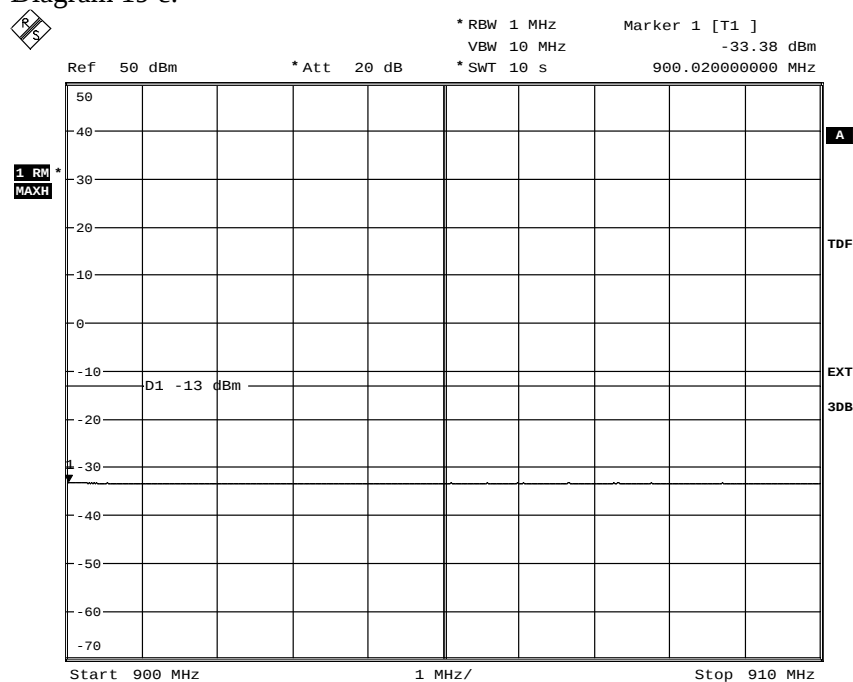
Diagram 19 b:



Date: 24.JAN.2013 14:47:39

## Appendix 4

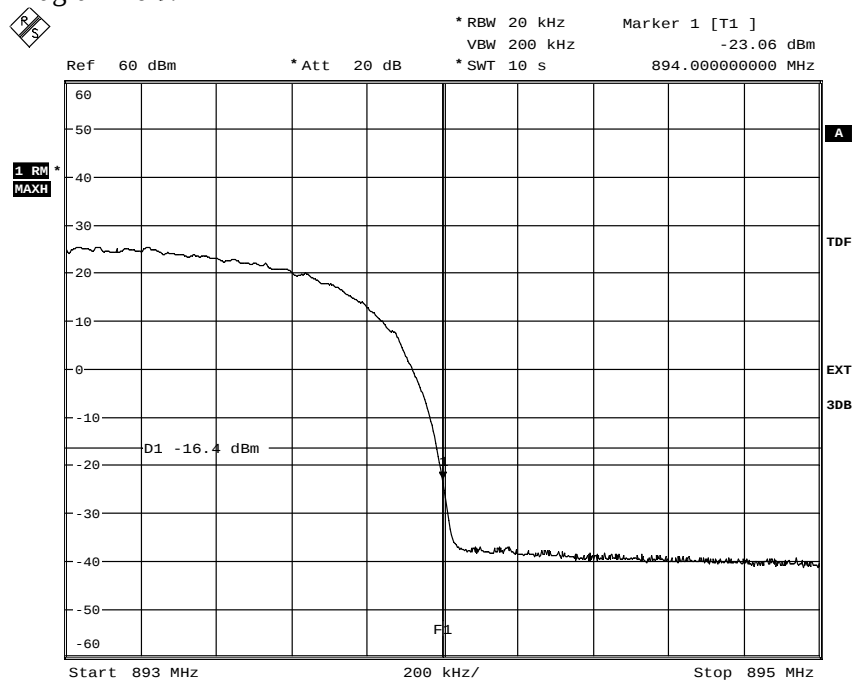
Diagram 19 c:



Date: 24.JAN.2013 14:49:58

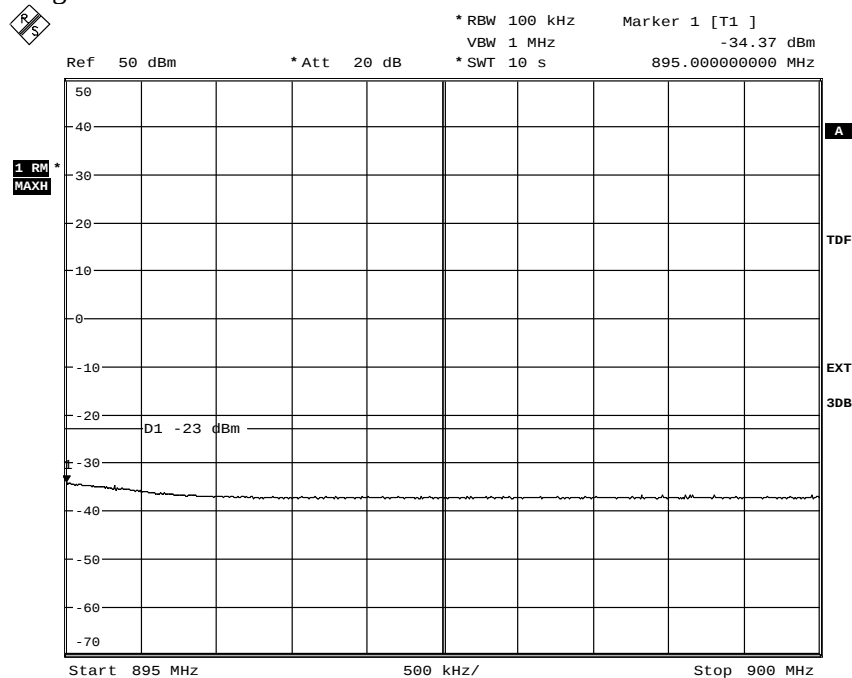
## Appendix 4

Diagram 20 a:



Date: 24.JAN.2013 13:19:19

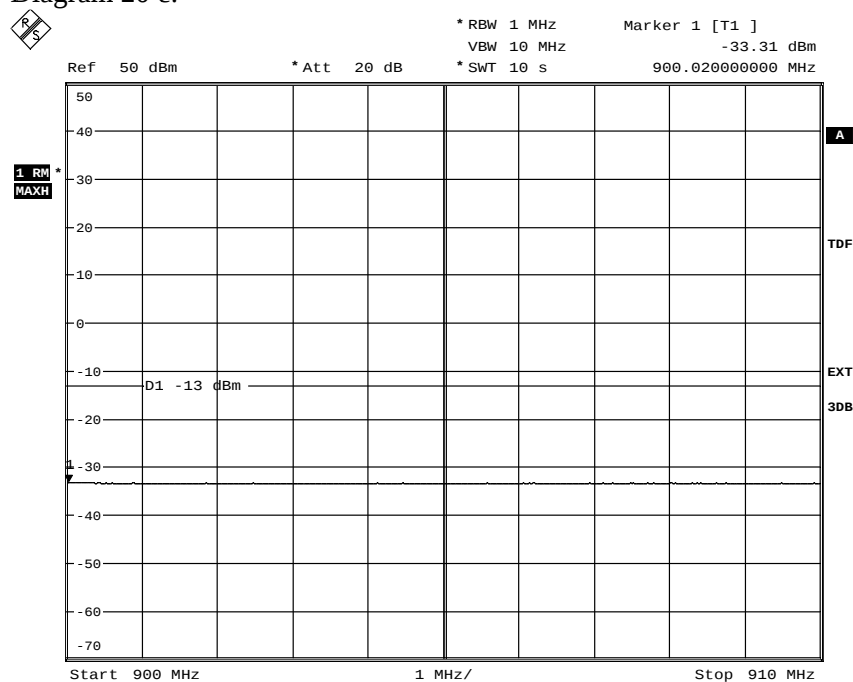
Diagram 20 b:



Date: 24.JAN.2013 13:20:23

## Appendix 4

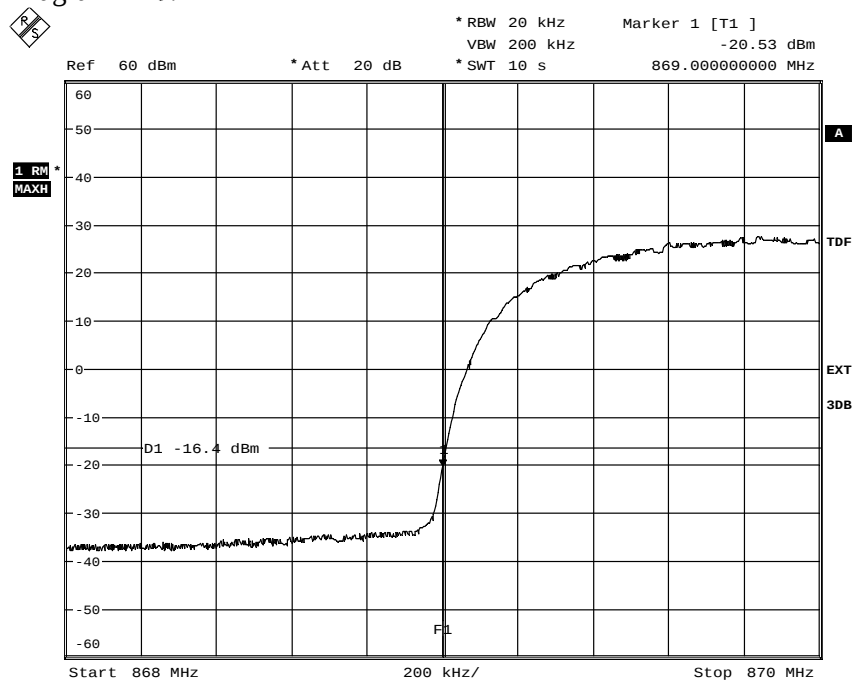
Diagram 20 c:



Date: 24.JAN.2013 13:21:10

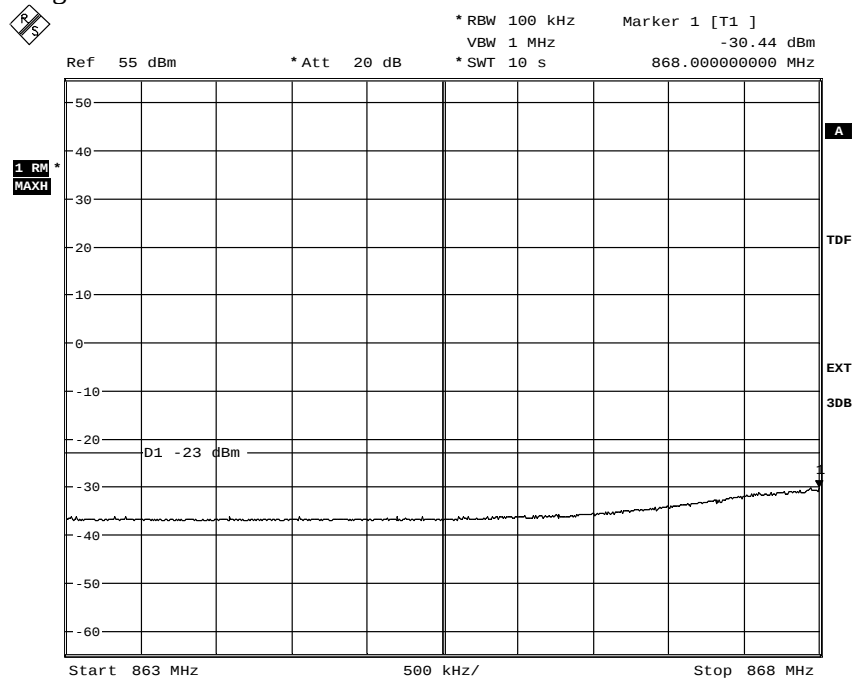
## Appendix 4

Diagram 21 a:



Date: 25.JAN.2013 07:50:15

Diagram 21 b:

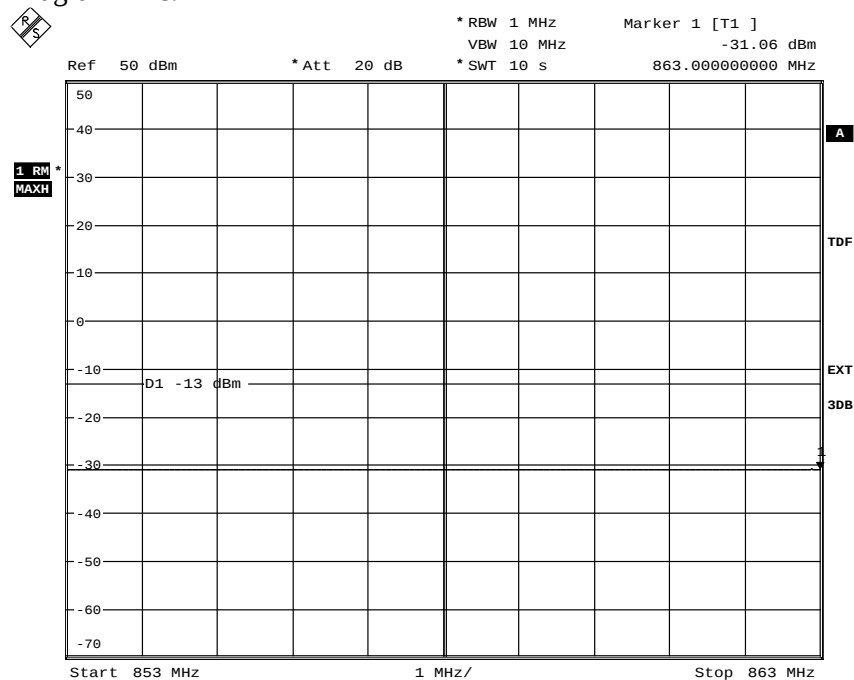


Date: 25.JAN.2013 07:51:28



## Appendix 4

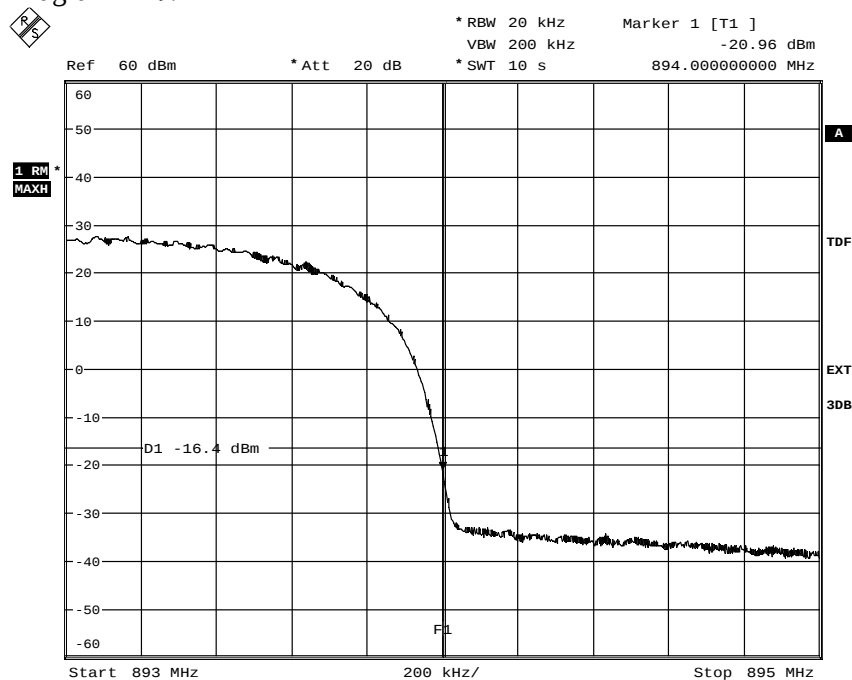
Diagram 21 c:



Date: 25.JAN.2013 07:52:17

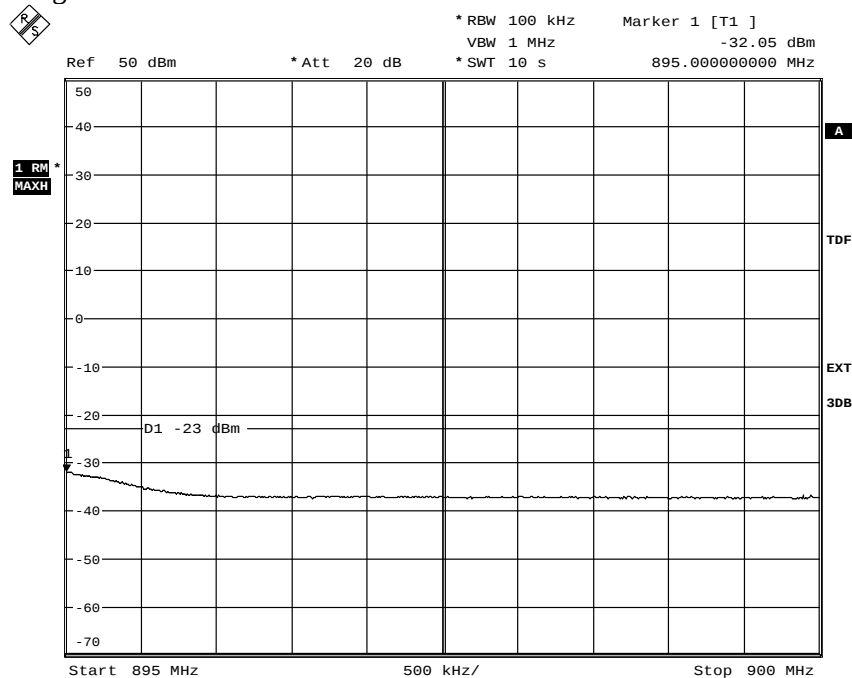
## Appendix 4

Diagram 22 a:



Date: 25.JAN.2013 08:00:10

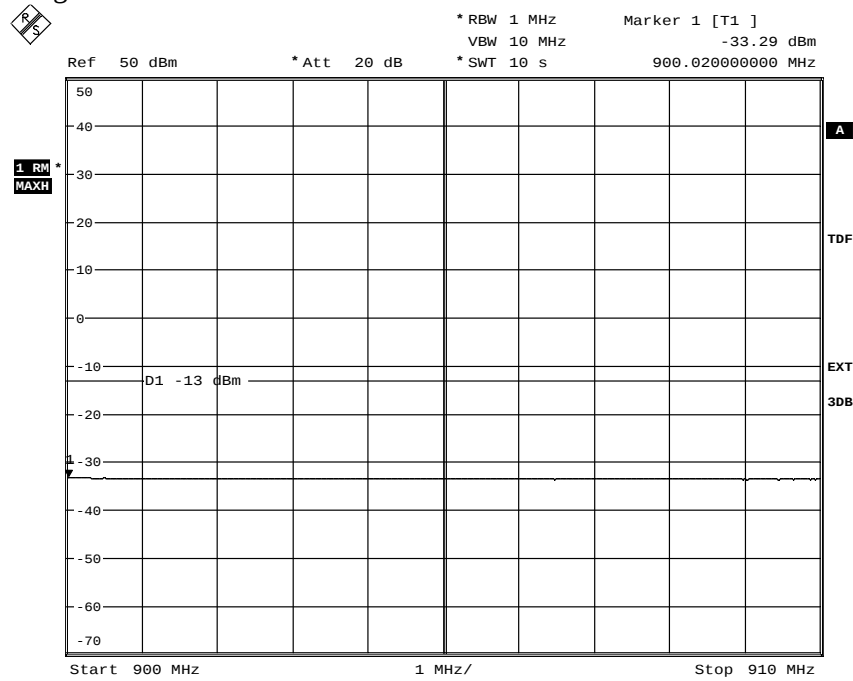
Diagram 22 b:



Date: 25.JAN.2013 08:01:29

## Appendix 4

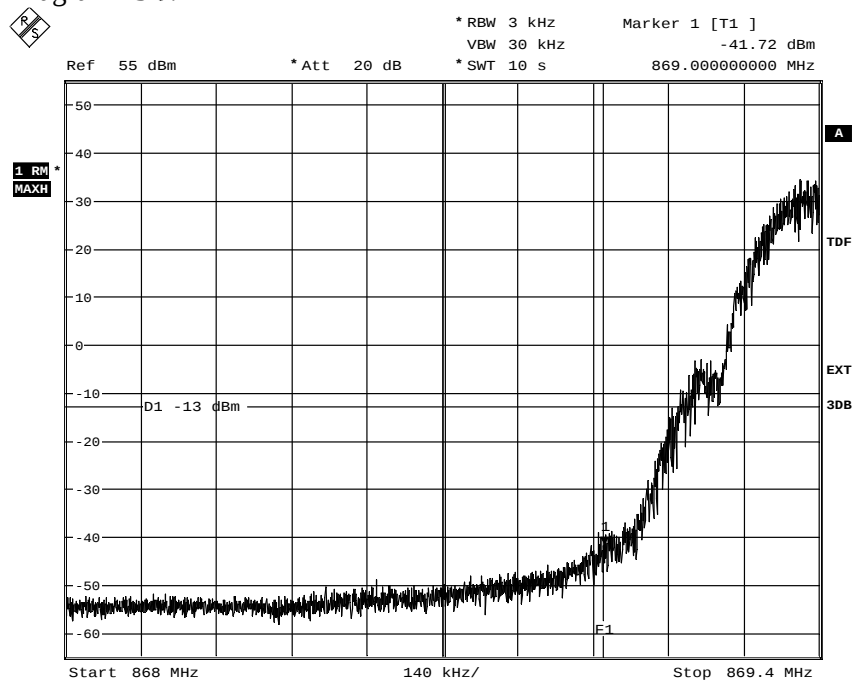
Diagram 22 c:



Date: 25.JAN.2013 08:02:20

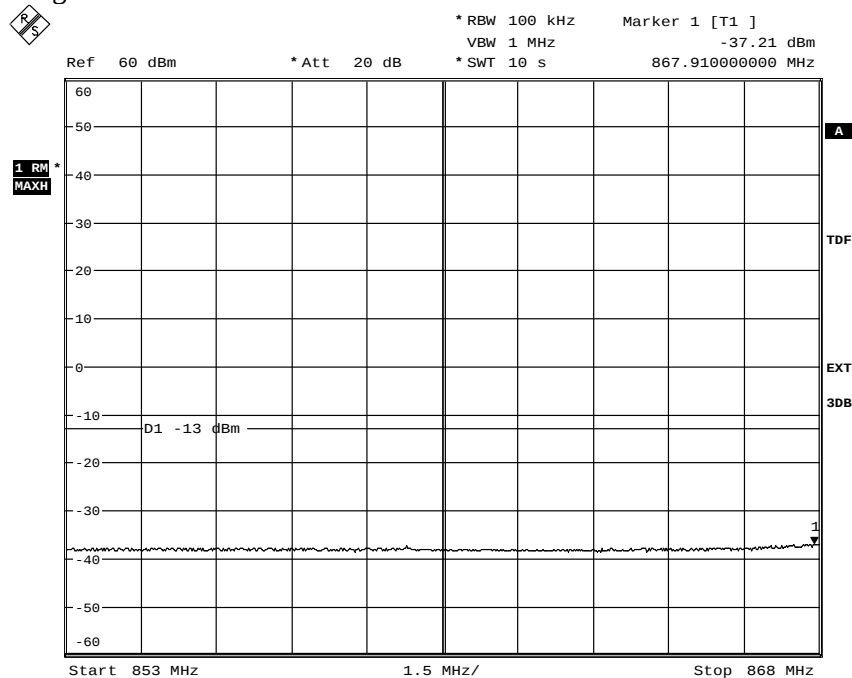
## Appendix 4

Diagram 23 a:



Date: 18.FEB.2013 11:58:43

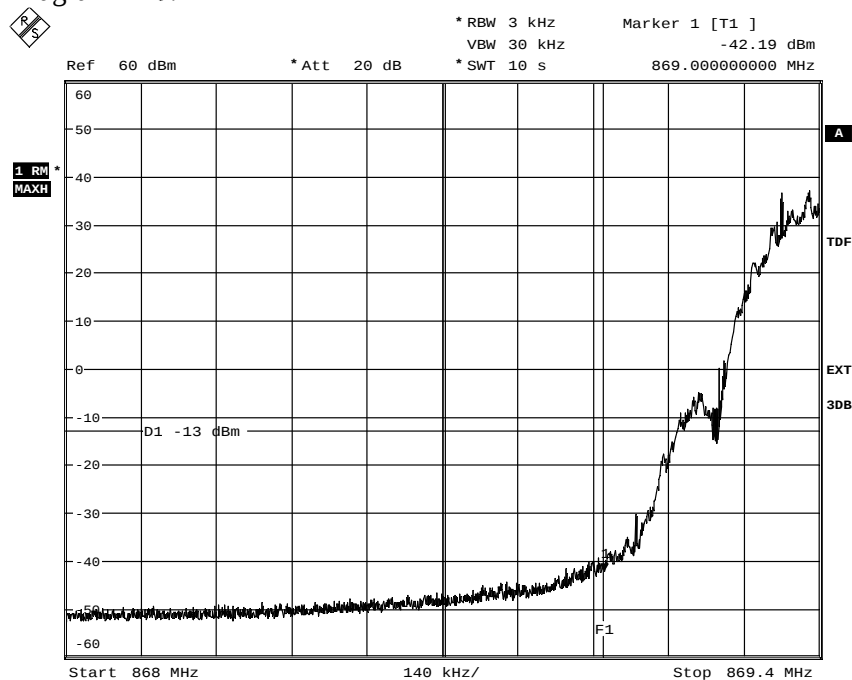
Diagram 23 b:



Date: 18.FEB.2013 11:59:43

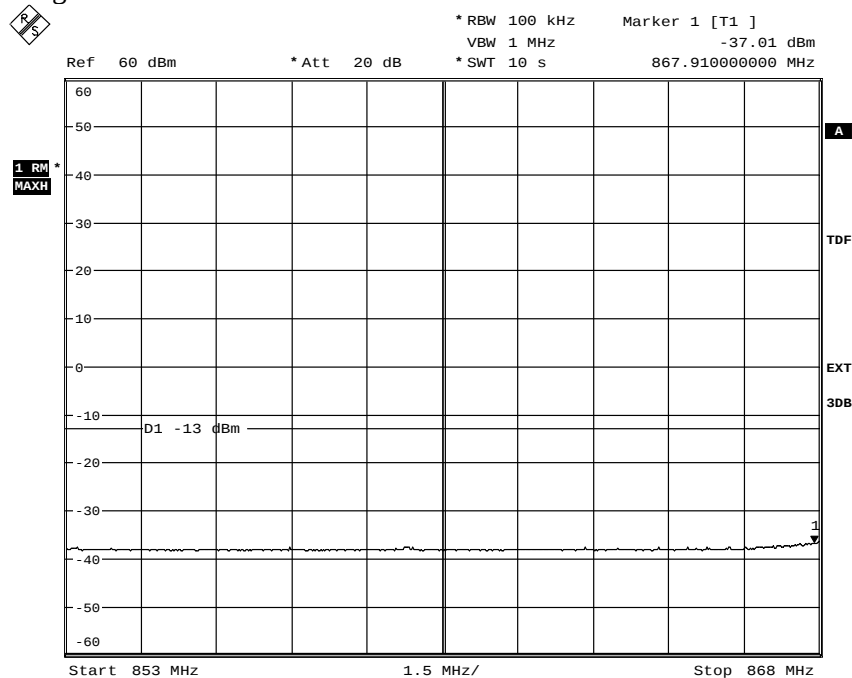
## Appendix 4

Diagram 24 a:



Date: 19.FEB.2013 09:44:53

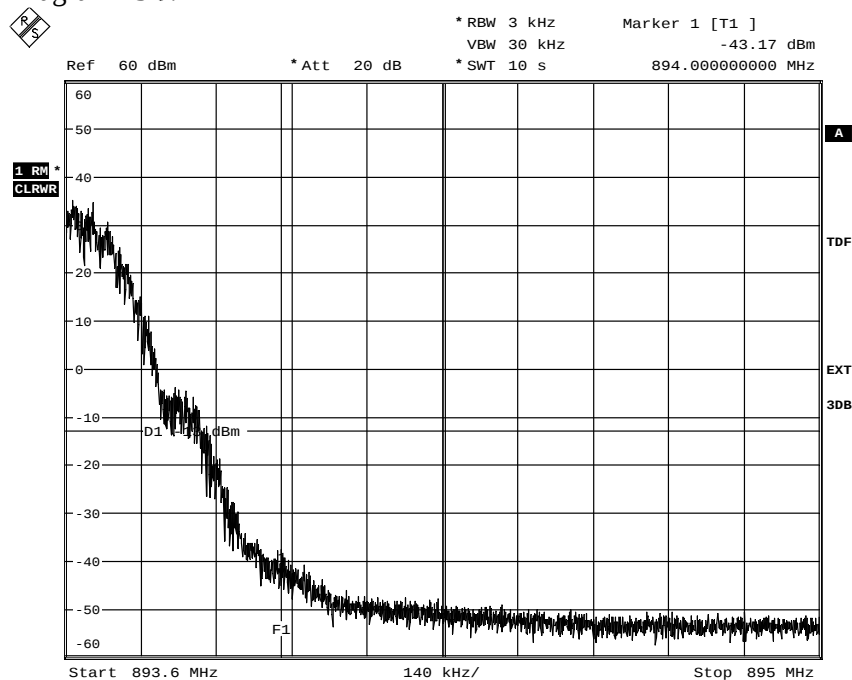
Diagram 24 b:



Date: 19.FEB.2013 09:46:36

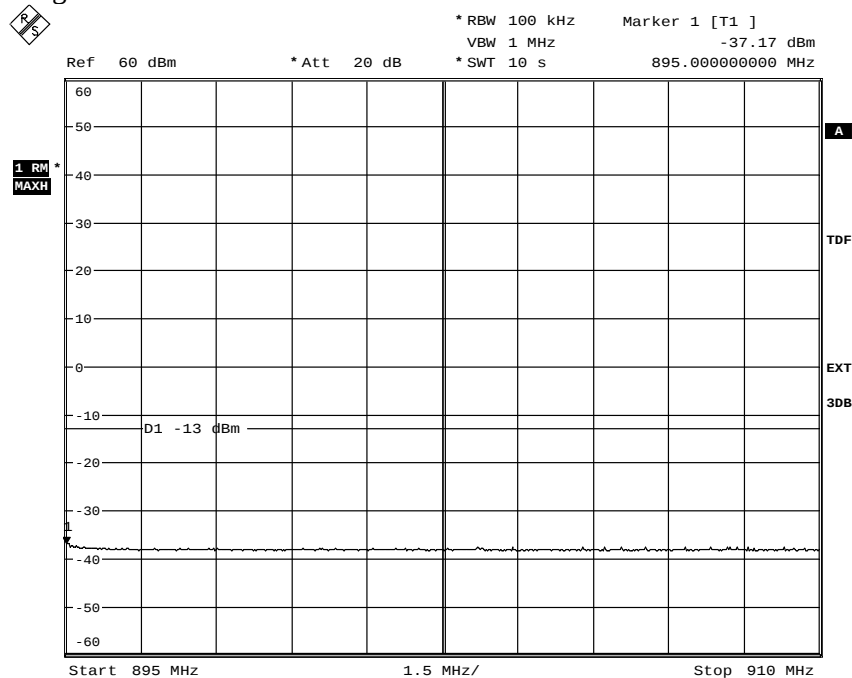
## Appendix 4

Diagram 25 a:



Date: 18.FEB.2013 12:17:59

Diagram 25 b:

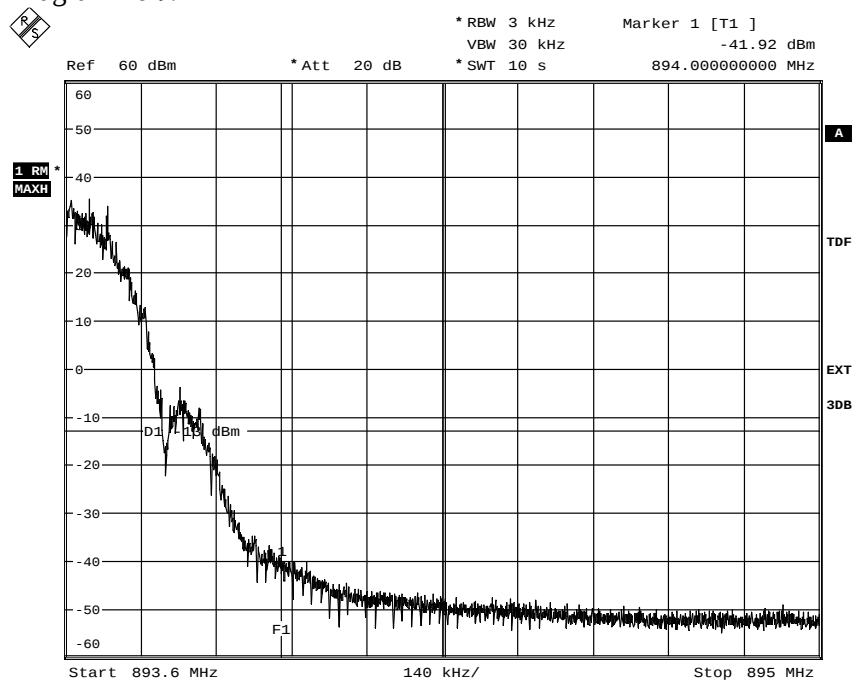


Date: 18.FEB.2013 12:19:03



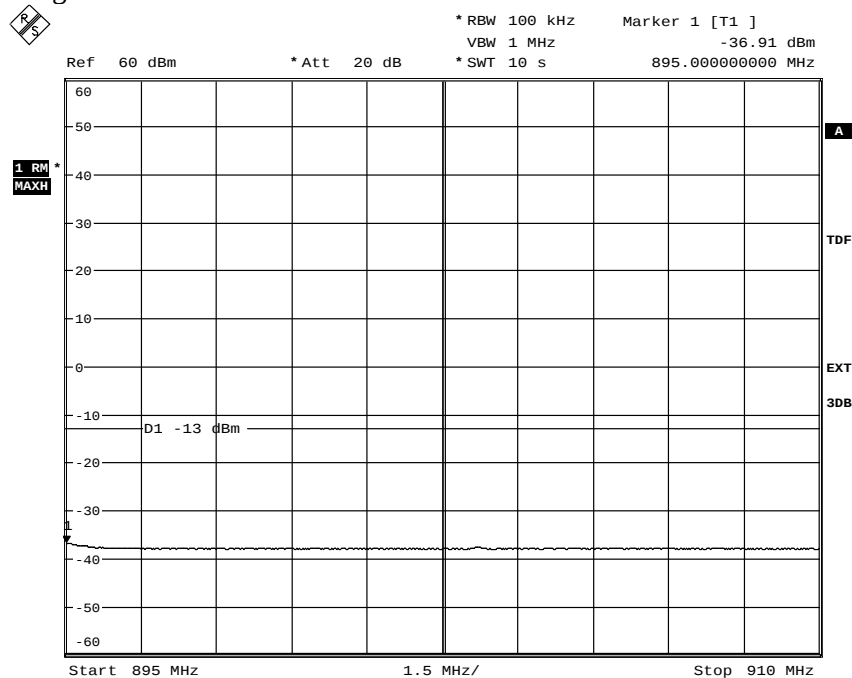
## Appendix 4

Diagram 26 a:



Date: 19.FEB.2013 09:36:11

Diagram 26 b:



Date: 19.FEB.2013 09:39:32

## Appendix 5

### Conducted spurious emission measurements according to CFR 47 2.1051 / IC RSS-132 5.5

| Date       | Temperature  | Humidity   |
|------------|--------------|------------|
| 2013-01-22 | 21 °C ± 3 °C | 13 % ± 5 % |
| 2013-01-23 | 23 °C ± 3 °C | 11 % ± 5 % |
| 2013-01-24 | 22 °C ± 3 °C | 10 % ± 5 % |
| 2013-01-25 | 22 °C ± 3 °C | 12 % ± 5 % |
| 2013-01-28 | 22 °C ± 3 °C | 22 % ± 5 % |
| 2013-01-29 | 22 °C ± 3 °C | 23 % ± 5 % |
| 2013-02-18 | 20 °C ± 3 °C | 24 % ± 5 % |
| 2013-02-19 | 23 °C ± 3 °C | 20 % ± 5 % |

#### Test set-up and procedure

The measurements were made per definition in § 22.917, but with a conservative 1 MHz RBW to cover both FCC and IC requirements. The output was 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.

For MIMO mode configurations with up to 2 TX antennas an additional 3 dB  $[10 \log (2)]$  margin shall be added to trace values shown according to method 2 “measure and add 10  $\log(N_{\text{ANT}})$ ” of FCC KDB662911 D01 Multiple Transmitter Output v01r02 before comparing the results to the limit.

| Measurement equipment                    | SP number |
|------------------------------------------|-----------|
| Rohde & Schwarz signal analyzer FSQ40    | 504 143   |
| RF attenuator                            | 504 159   |
| RF attenuator                            | 901 508   |
| High pass filter                         | 901 501   |
| Testo 635 temperature and humidity meter | 504 203   |

Measurement uncertainty: 3.7 dB

## Appendix 5

### Results

#### LTE single RAT, MIMO mode, single carrier

| Diagram | BW configuration | Tested frequency | Tested Port RF A |
|---------|------------------|------------------|------------------|
| 1 a+b   | 1.4 MHz          | M                | Primary mode     |
| 2 a+b   | 1.4 MHz          | M                | Secondary mode   |
| 3 a+b   | 20 MHz           | M                | Primary mode     |
| 4 a+b   | 20 MHz           | M                | Secondary mode   |

#### LTE single RAT, MIMO mode, 2 carrier

| Diagram | BW configuration | Tested frequency | Tested Port RF A |
|---------|------------------|------------------|------------------|
| 5 a+b+c | 1.4 MHz          | B2               | Primary mode     |
| 6 a+b+c | 1.4 MHz          | M2               | Primary mode     |
| 7 a+b+c | 1.4 MHz          | T2               | Primary mode     |

Note: The measurements were limited to RUS 1 port RF A in primary mode only due to the measurement result in LTE single carrier MIMO mode that shows that the ports are identical, as declared by the client.

## Appendix 5

### WCDMA single RAT, MIMO mode, single carrier

| Diagram | BW configuration | Tested frequency | Tested Port<br>RF At |
|---------|------------------|------------------|----------------------|
| 8 a+b   | 5 MHz            | B                | Primary mode         |
| 9 a+b   | 5 MHz            | B                | Secondary mode       |
| 10 a+b  | 5 MHz            | M                | Primary mode         |
| 11 a+b  | 5 MHz            | M                | Secondary mode       |
| 12 a+b  | 5 MHz            | T                | Primary mode         |
| 13 a+b  | 5 MHz            | T                | Secondary mode       |

### WCDMA single RAT, MIMO mode, 2 carrier

| Diagram  | BW configuration | Tested frequency | Tested Port<br>RF A |
|----------|------------------|------------------|---------------------|
| 14 a+b   | 5 MHz            | B2               | Primary mode        |
| 15 a+b   | 5 MHz            | B2               | Secondary mode      |
| 16 a+b+c | 5 MHz            | M2               | Primary mode        |
| 17 a+b+c | 5 MHz            | M2               | Secondary mode      |
| 18 a+b   | 5 MHz            | T2               | Primary mode        |
| 19 a+b   | 5 MHz            | T2               | Secondary mode      |

Note: Test of 2 carriers was deemed sufficient to represent worst-case multi-carrier scenarios.

### WCDMA single RAT, conventional mode, single carrier

| Diagram | BW configuration | Tested frequency | Tested Port |
|---------|------------------|------------------|-------------|
| 20 a+b  | 5 MHz            | B                | RFA         |
| 21 a+b  | 5 MHz            | M                | RFA         |
| 22 a+b  | 5 MHz            | T                | RFA         |

## Appendix 5

### GSM single RAT, conventional mode, single carrier

| Diagram | Modulation | Tested frequency | Tested Port |
|---------|------------|------------------|-------------|
| 23 a+b  | GMSK       | B                | RFA         |
| 24 a+b  | GMSK       | M                | RFA         |
| 25 a+b  | GMSK       | T                | RFA         |

### GSM single RAT, conventional mode, multi carrier

| Diagram  | Modulation | Tested frequency | Tested Port |
|----------|------------|------------------|-------------|
| 26 a+b+c | GMSK       | $B_{im\ 1}$      | RFA         |
| 27 a+b+c | 16 QAM     | $B_{im\ 1}$      | RFA         |
| 28 a+b+c | GMSK       | $B_{im\ 2}$      | RFA         |
| 29 a+b+c | 16 QAM     | $B_{im\ 2}$      | RFA         |
| 30 a+b+c | GMSK       | $B_{im\ 3}$      | RFA         |
| 31 a+b+c | 16 QAM     | $B_{im\ 3}$      | RFA         |
| 32 a+b+c | GMSK       | $T_{im\ 1}$      | RFA         |
| 33 a+b+c | 16 QAM     | $T_{im\ 1}$      | RFA         |
| 34 a+b+c | GMSK       | $T_{im\ 2}$      | RFA         |
| 35 a+b+c | 16 QAM     | $T_{im\ 2}$      | RFA         |
| 36 a+b+c | GMSK       | $T_{im\ 3}$      | RFA         |
| 37 a+b+c | 16 QAM     | $T_{im\ 3}$      | RFA         |

## Appendix 5

### MSR WCDMA+GSM, conventional mode

| Diagram  | Tested configuration | Tested Port |
|----------|----------------------|-------------|
| 38 a+b+c | Config 1             | RF A        |
| 39 a+b+c | Config 2             | RF A        |
| 40 a+b+c | Config 3             | RF A        |
| 41 a+b+c | Config 4             | RF A        |
| 42 a+b+c | Config 5             | RF A        |

### Remarks

The emission at 9 kHz on some of the 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 upper frequency boundary covers 10x the highest TX fundamental frequency.

As the test started before the new version of RSS-132 came into force some plots have a limit of -23 dBm to compensate for the reduced measurement bandwidth at the time of testing. With the revised requirement in RSS-132 Issue 3 all measurements were performed with at least the specified measurement bandwidth and no compensation of limit is needed.

### Limits

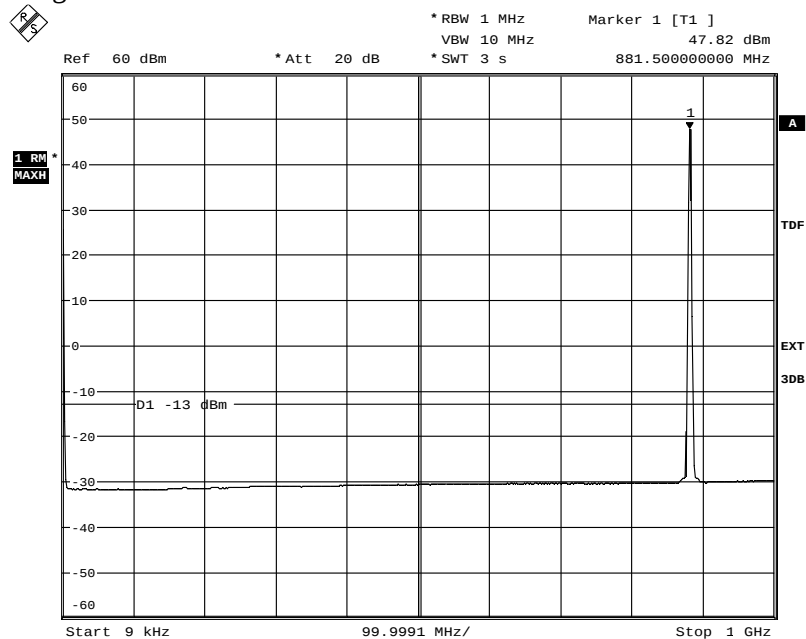
CFR 47 § 22.917: Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB, resulting in a limit of -13 dBm per 100 kHz RBW.

IC RSS-132 5.5.1.2: issue 3: Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB per any 100 kHz RBW.

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

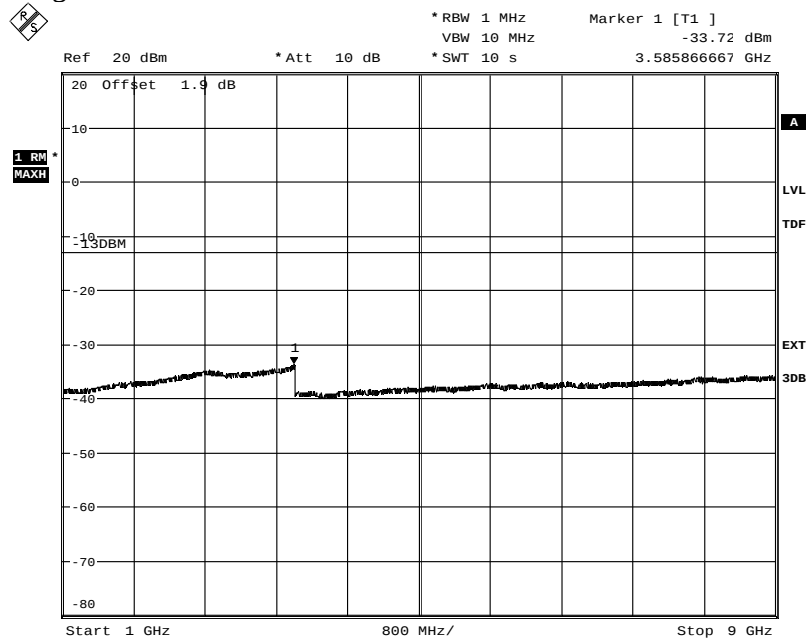
## Appendix 5

Diagram 1 a:



Date: 22.JAN.2013 15:36:35

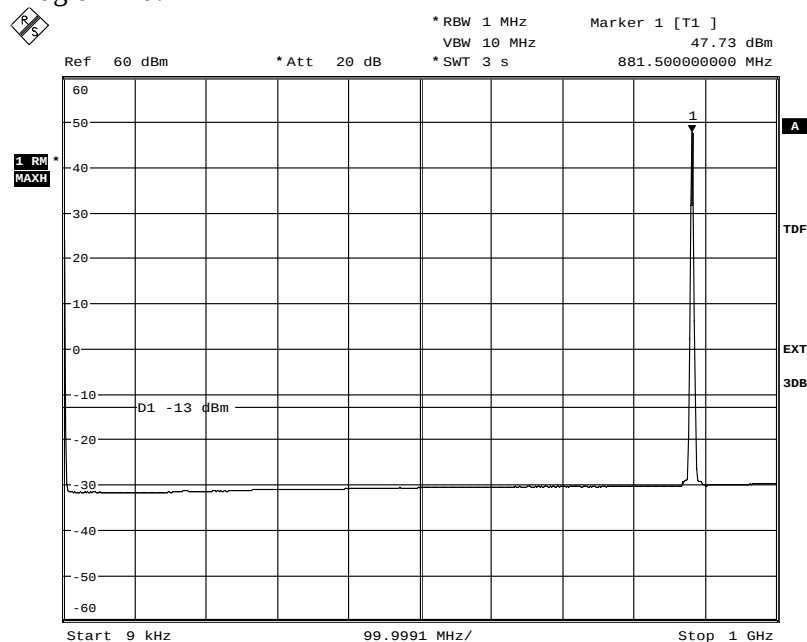
Diagram 1 b:



Date: 22.JAN.2013 15:35:20

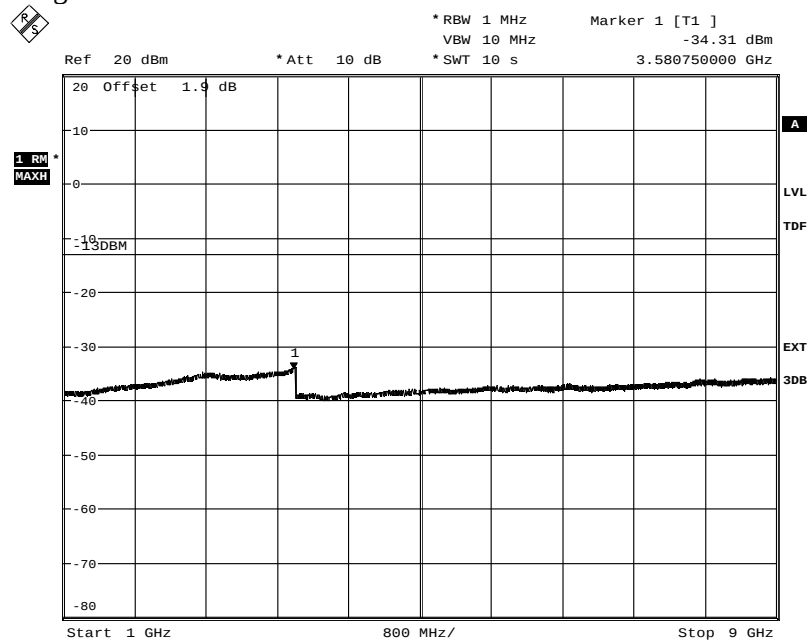
## Appendix 5

Diagram 2 a:



Date: 23.JAN.2013 07:36:18

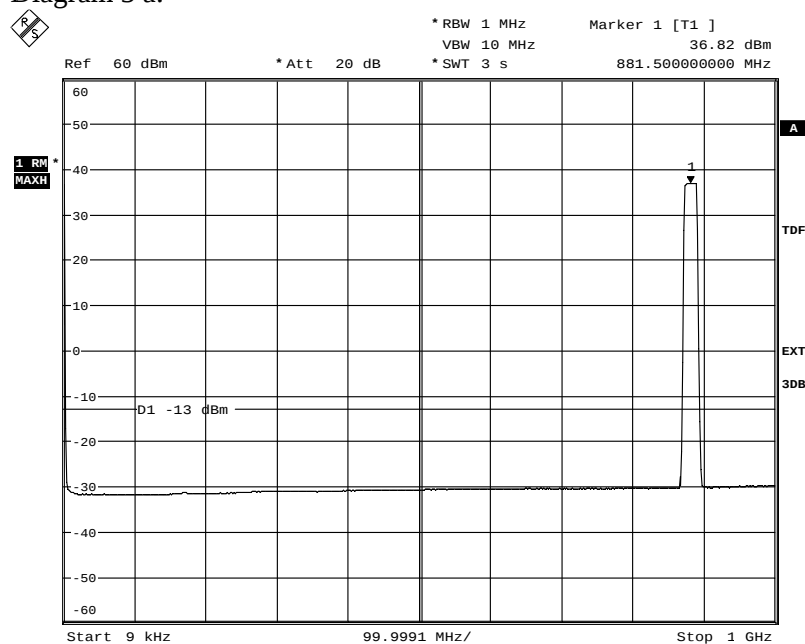
Diagram 2 b:



Date: 23.JAN.2013 07:38:10

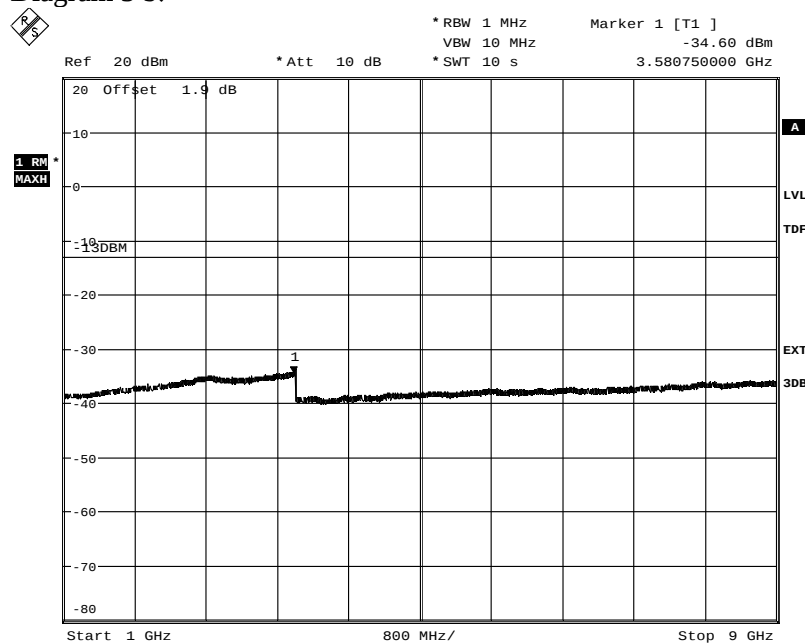
## Appendix 5

Diagram 3 a:



Date: 22.JAN.2013 15:26:49

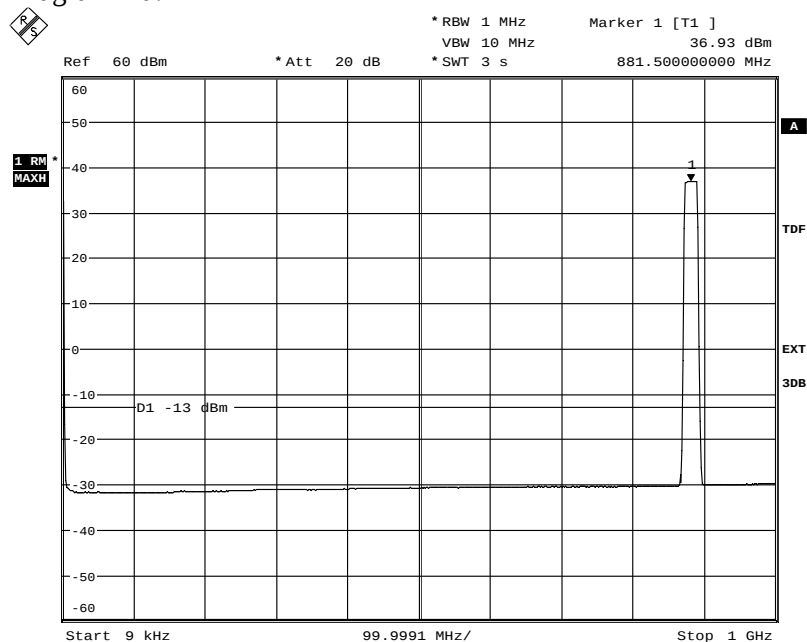
Diagram 3 b:



Date: 22.JAN.2013 15:32:39

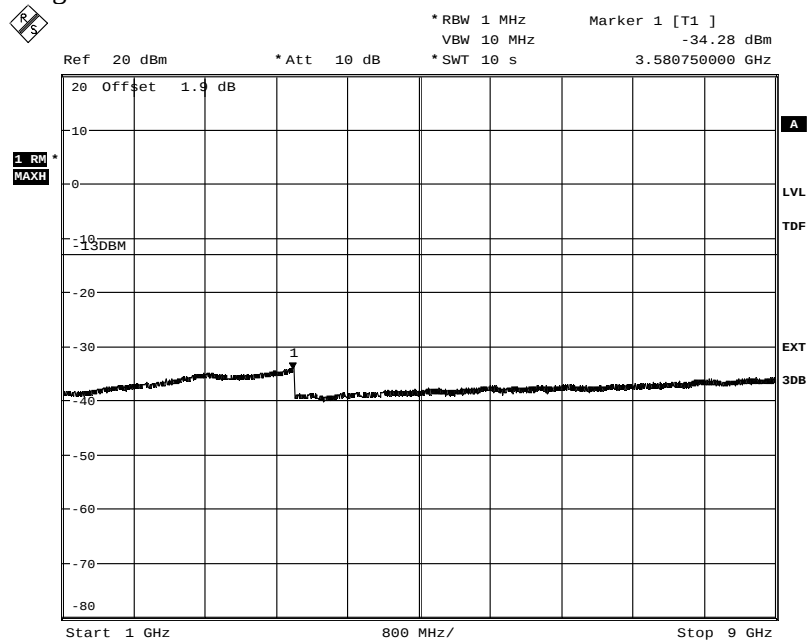
## Appendix 5

Diagram 4 a:



Date: 23.JAN.2013 07:41:57

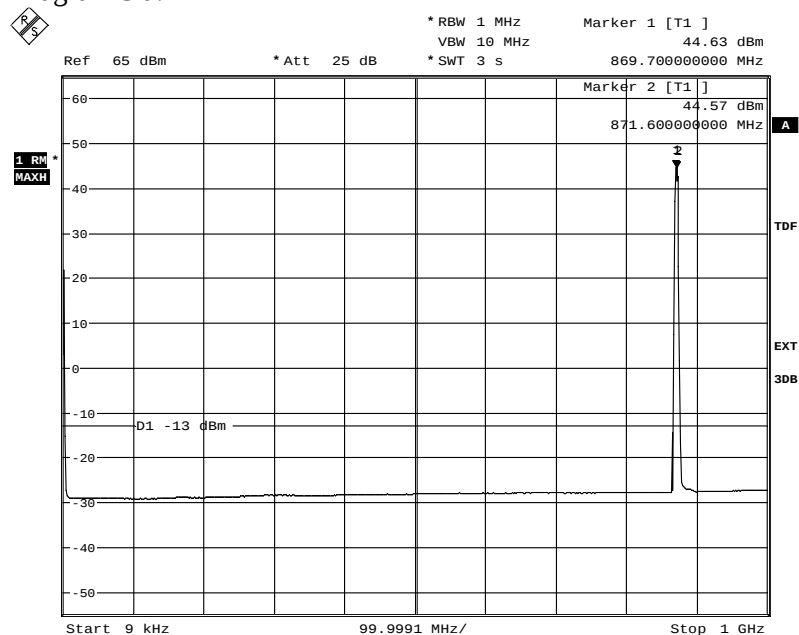
Diagram 4 b:



Date: 23.JAN.2013 07:40:25

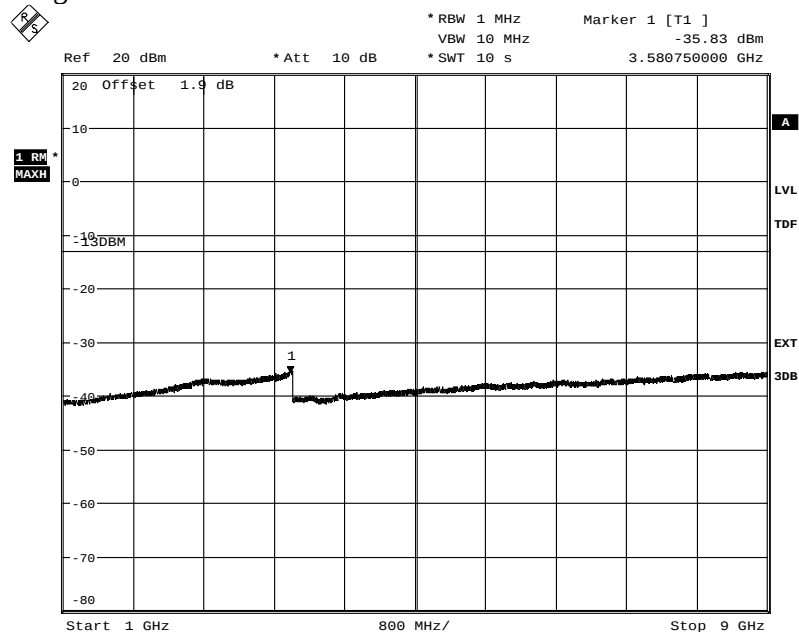
## Appendix 5

Diagram 5 a:



Date: 14.FEB.2013 10:54:59

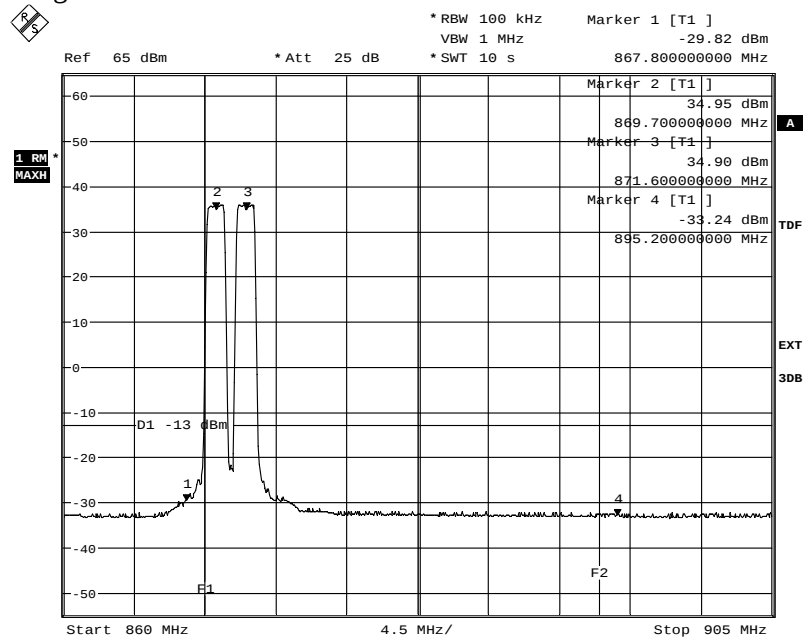
Diagram 5 b:



Date: 14.FEB.2013 10:56:36

## Appendix 5

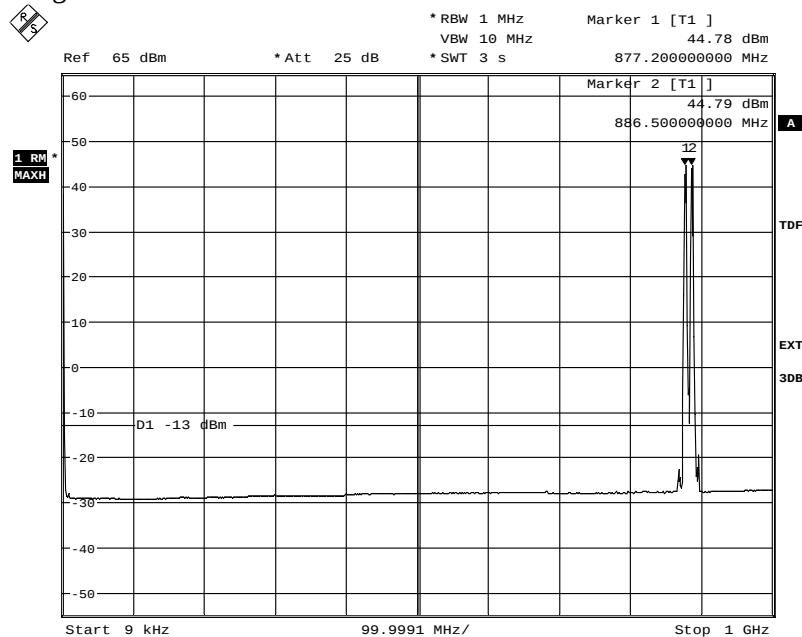
Diagram 5 c:



Date: 14.FEB.2013 10:48:59

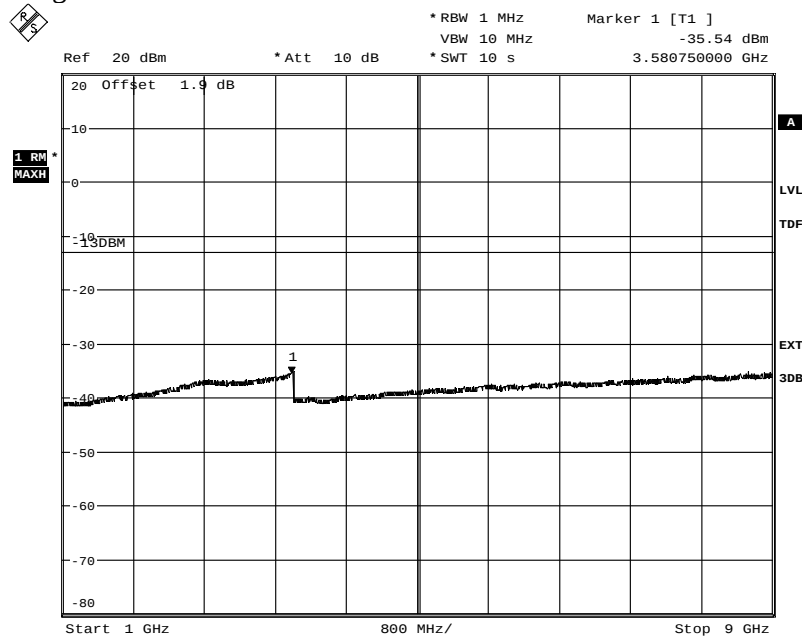
## Appendix 5

Diagram 6 a:



Date: 14.FEB.2013 11:50:12

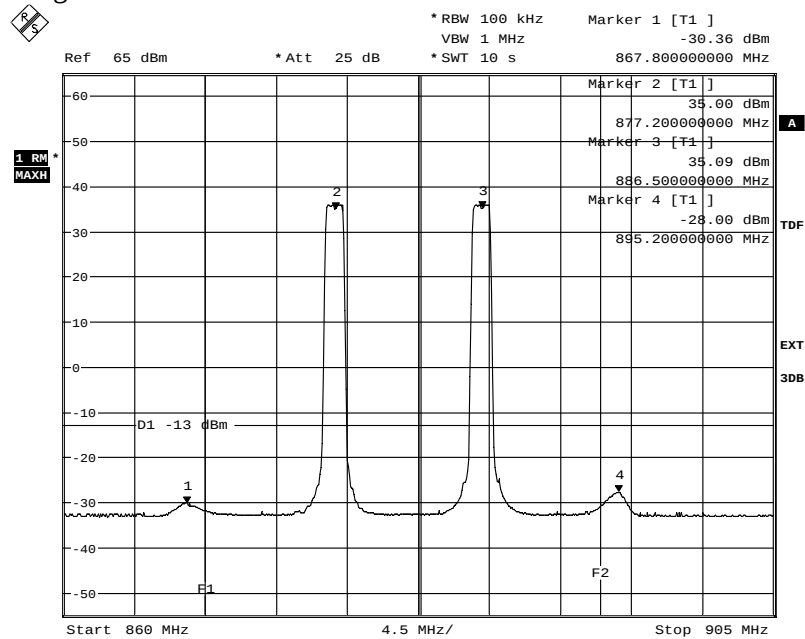
Diagram 6 b:



Date: 14.FEB.2013 11:47:24

## Appendix 5

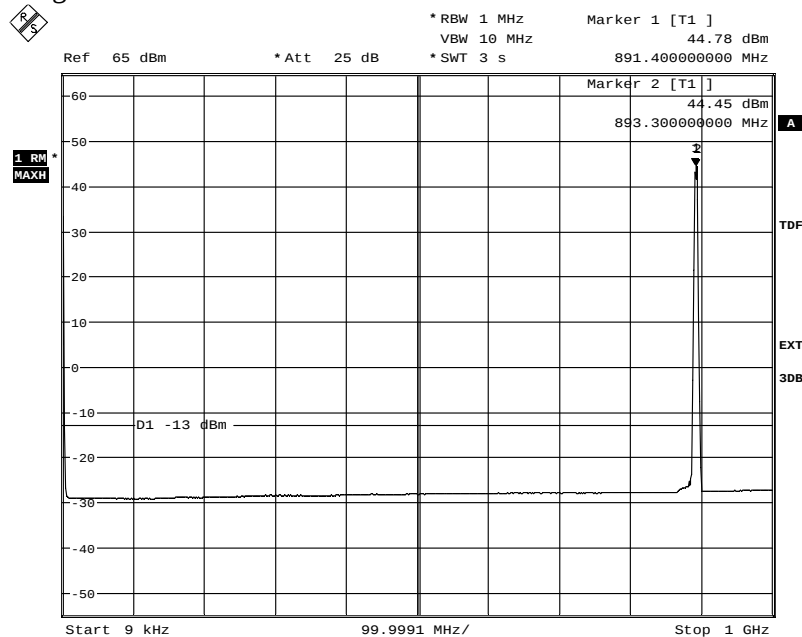
Diagram 6 c:



Date: 14.FEB.2013 11:52:35

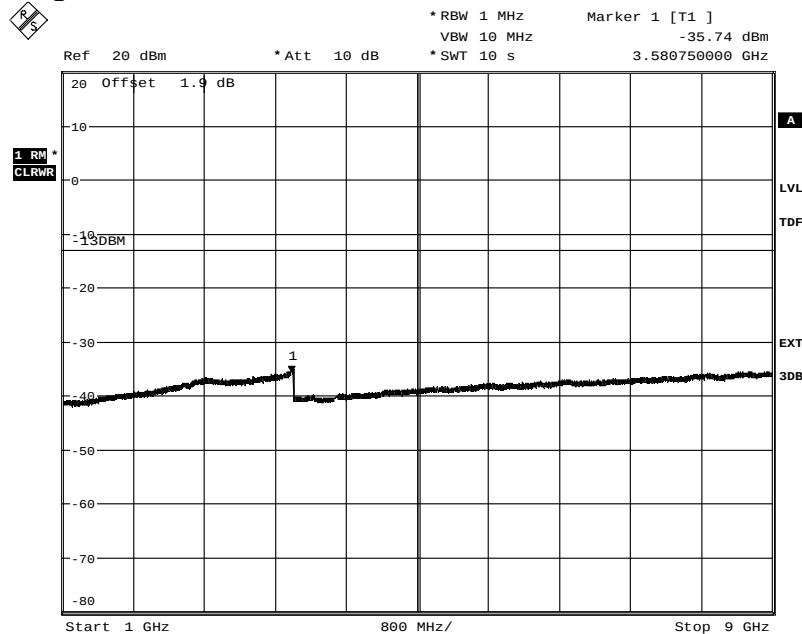
## Appendix 5

Diagram 7 a:



Date: 14.FEB.2013 12:42:43

Diagram 7 b:

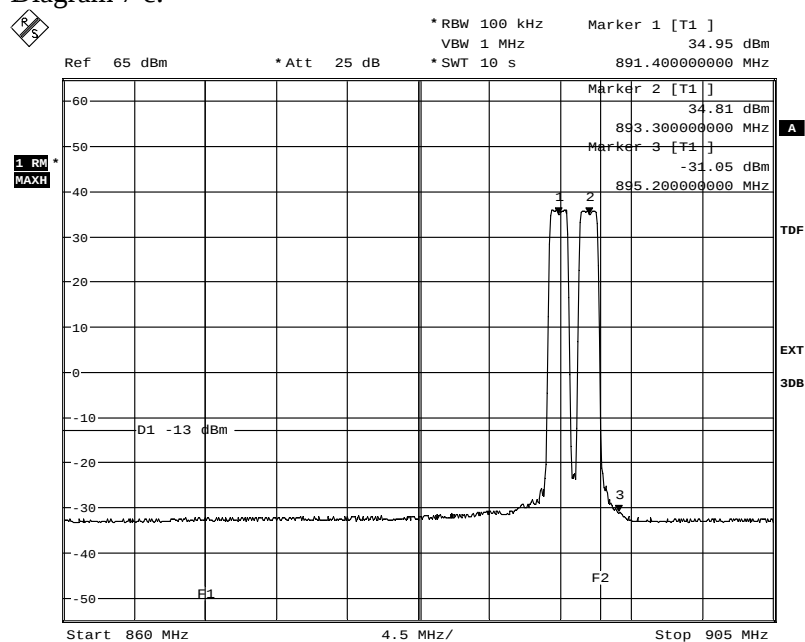


Date: 14.FEB.2013 12:46:04



## Appendix 5

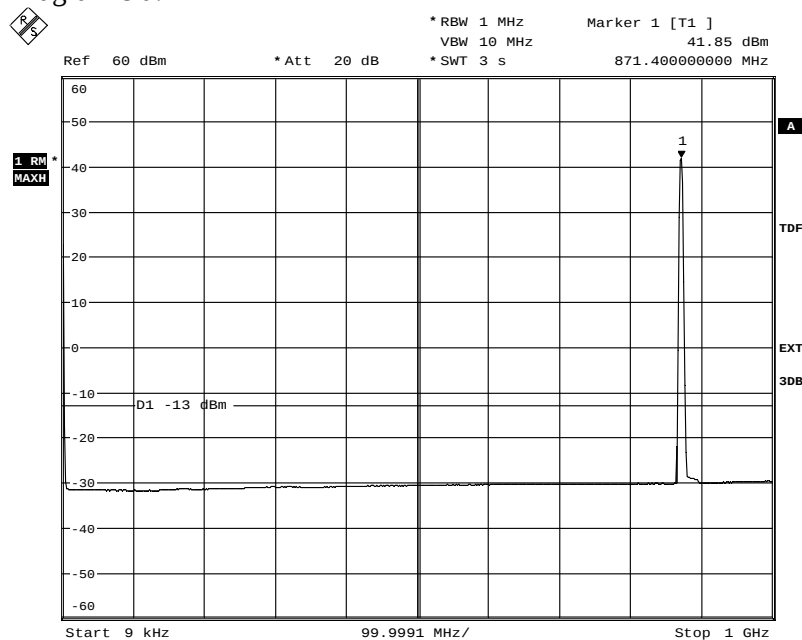
Diagram 7 c:



Date: 14.FEB.2013 12:44:21

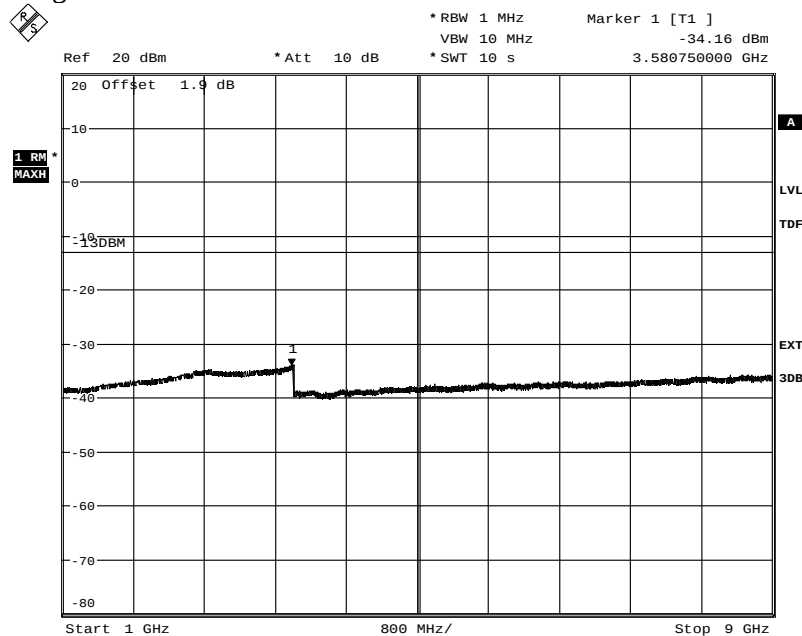
## Appendix 5

Diagram 8 a:



Date: 24.JAN.2013 15:13:51

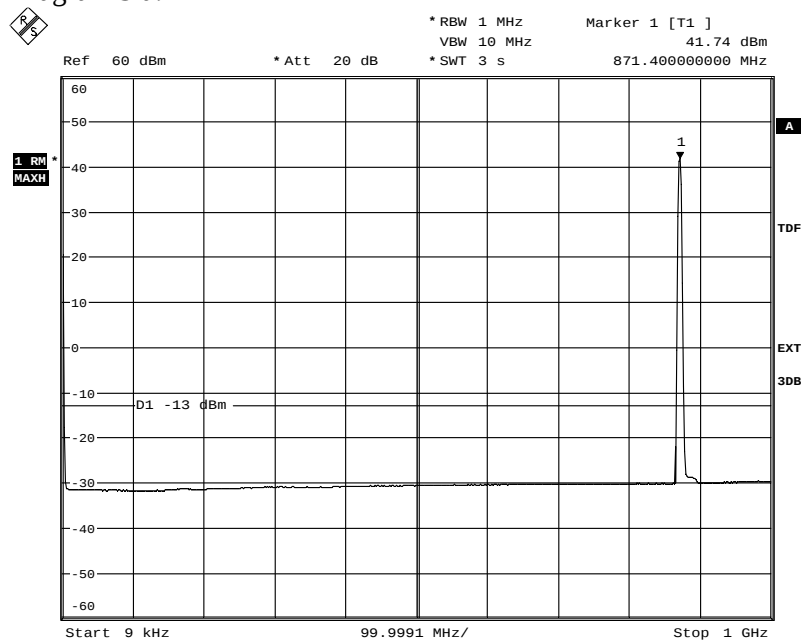
Diagram 8 b:



Date: 24.JAN.2013 15:12:22

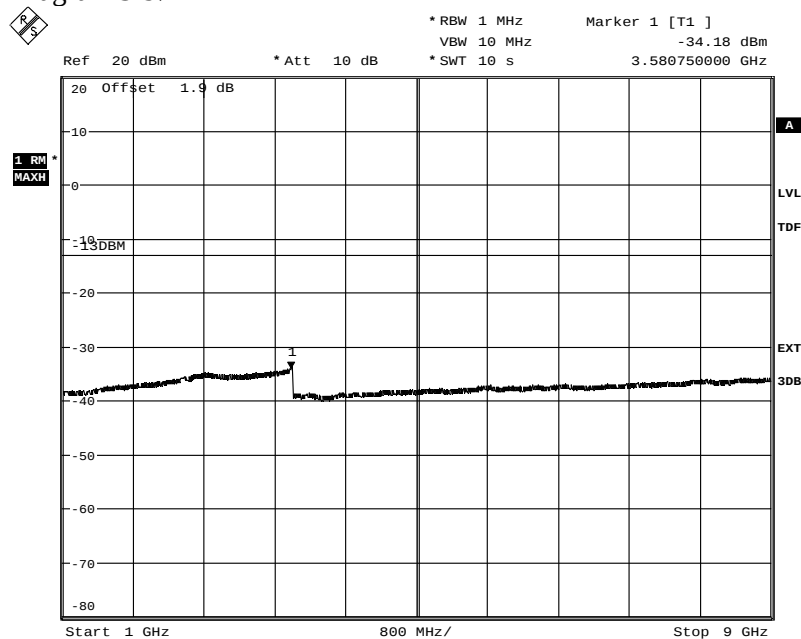
## Appendix 5

Diagram 9 a:



Date: 24.JAN.2013 13:03:16

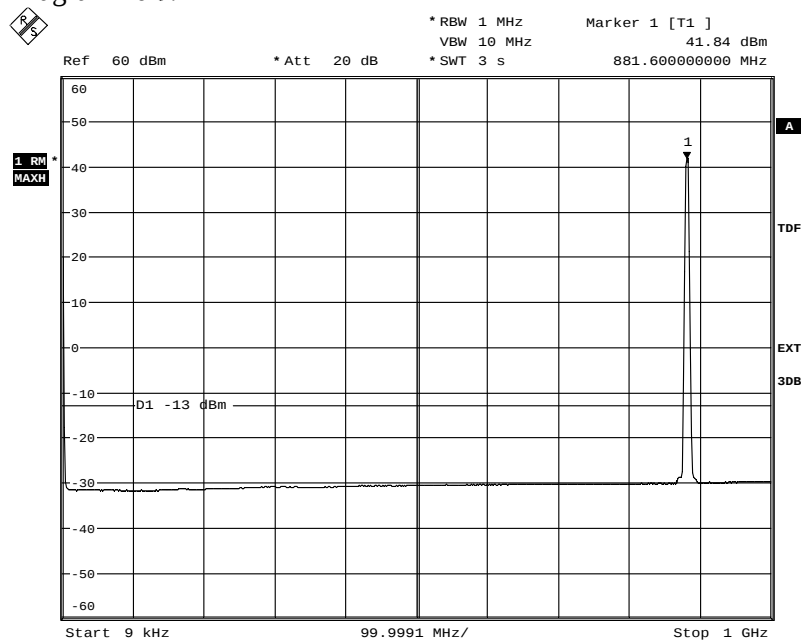
Diagram 9 b:



Date: 24.JAN.2013 13:00:54

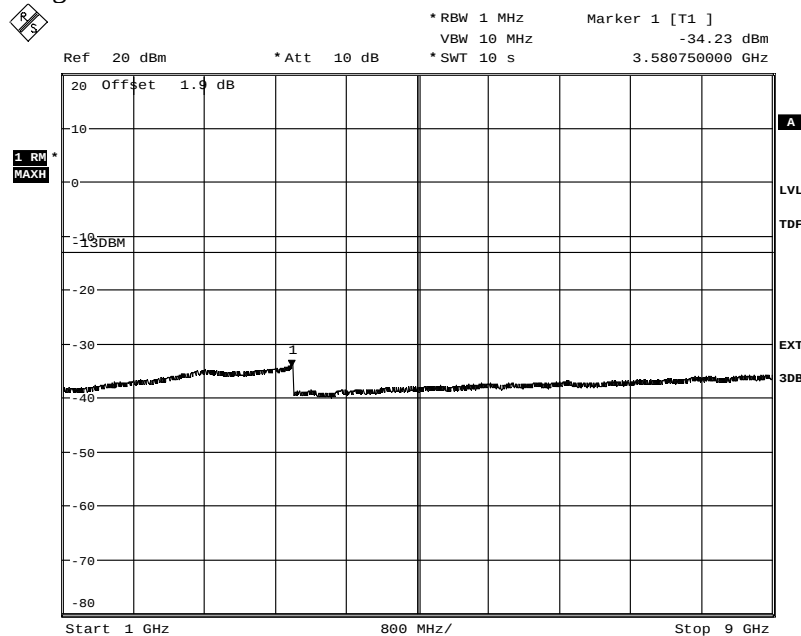
## Appendix 5

Diagram 10 a:



Date: 24.JAN.2013 15:04:21

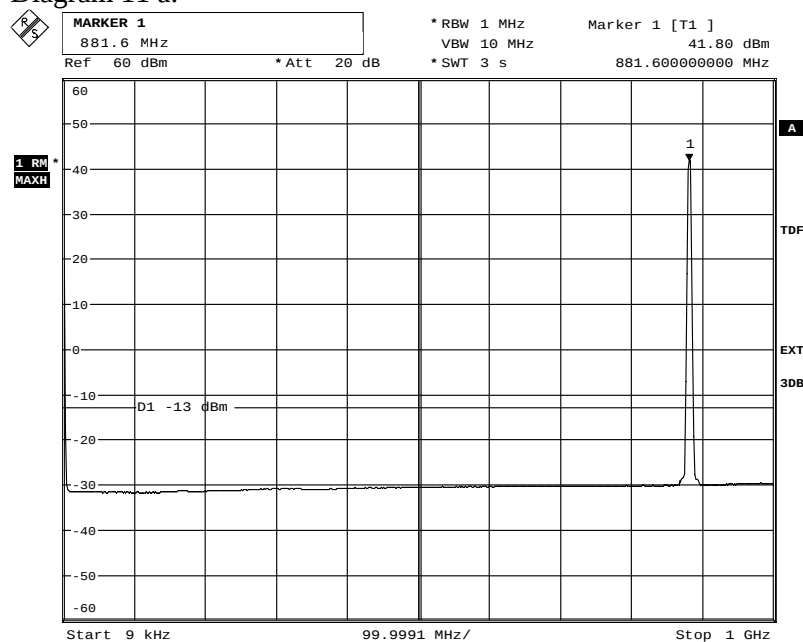
Diagram 10 b:



Date: 24.JAN.2013 15:05:30

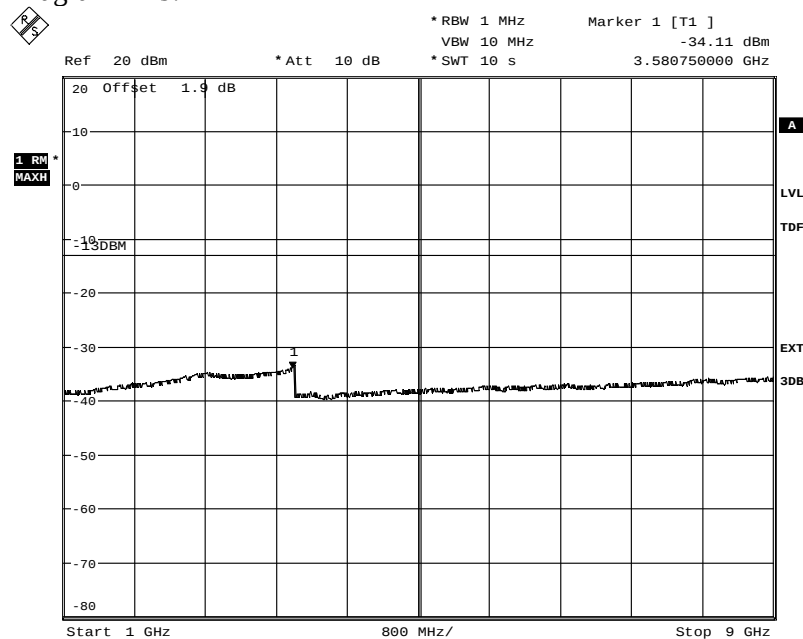
## Appendix 5

Diagram 11 a:



Date: 24.JAN.2013 12:52:43

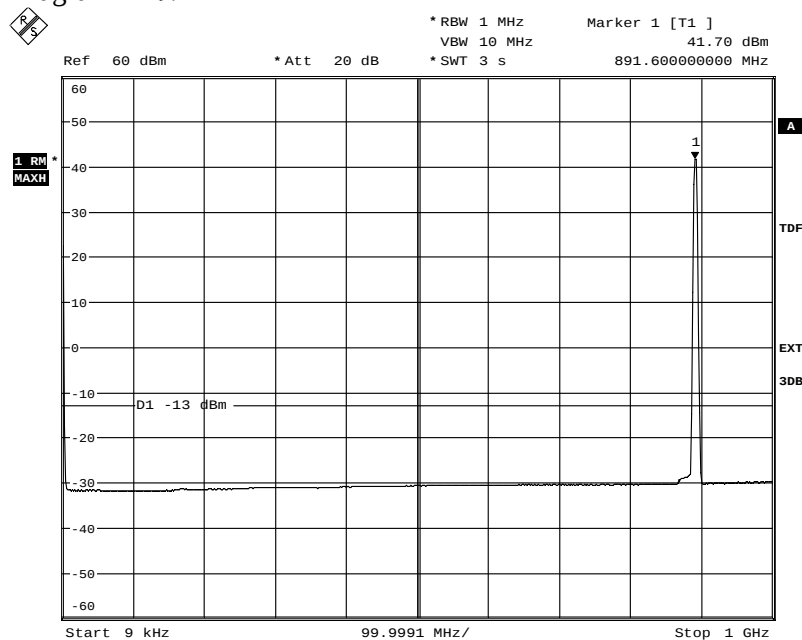
Diagram 11 b:



Date: 24.JAN.2013 12:54:40

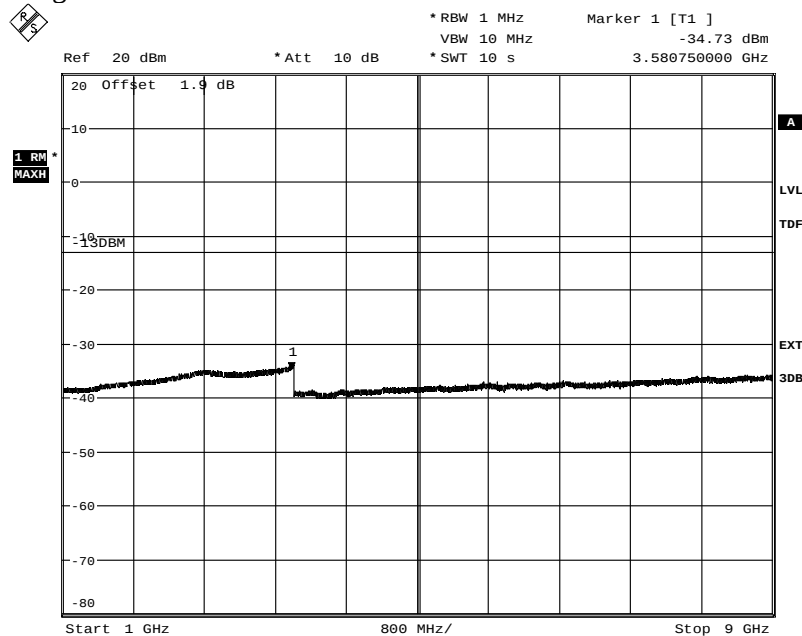
## Appendix 5

Diagram 12 a:



Date: 24.JAN.2013 14:53:27

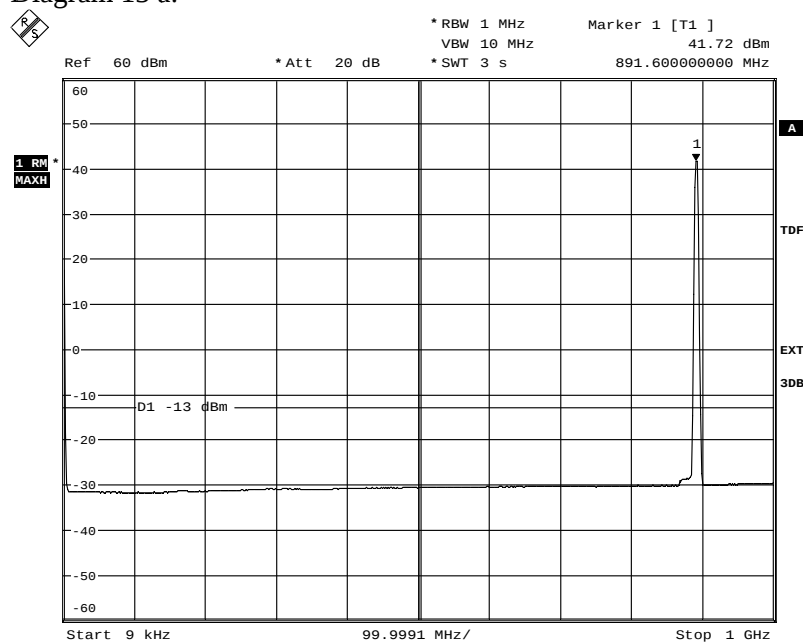
Diagram 12 b:



Date: 24.JAN.2013 14:42:31

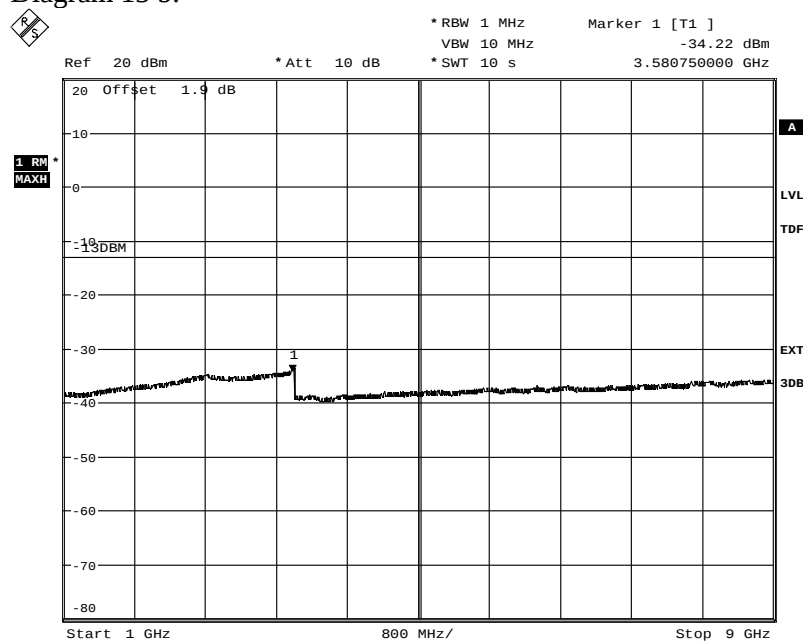
## Appendix 5

Diagram 13 a:



Date: 24.JAN.2013 13:22:19

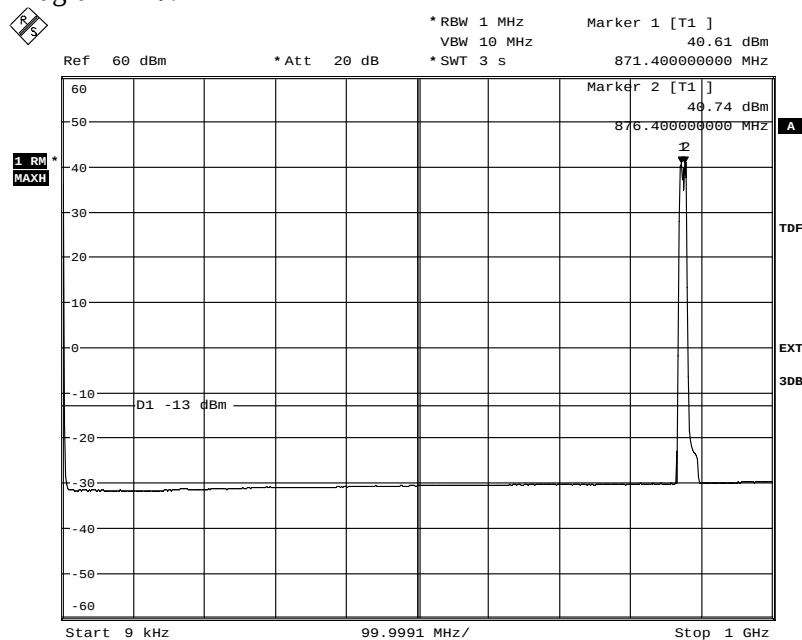
Diagram 13 b:



Date: 24.JAN.2013 13:23:43

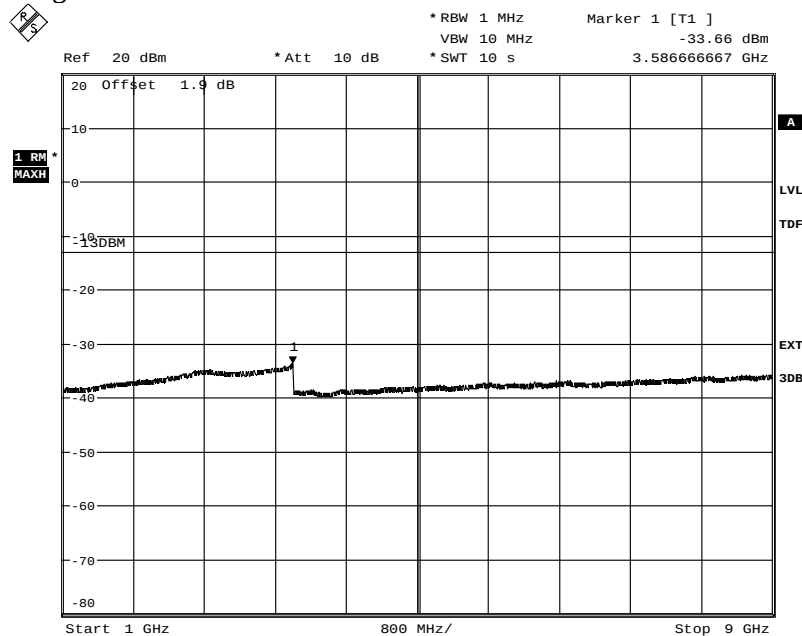
## Appendix 5

Diagram 14 a:



Date: 24.JAN.2013 10:36:59

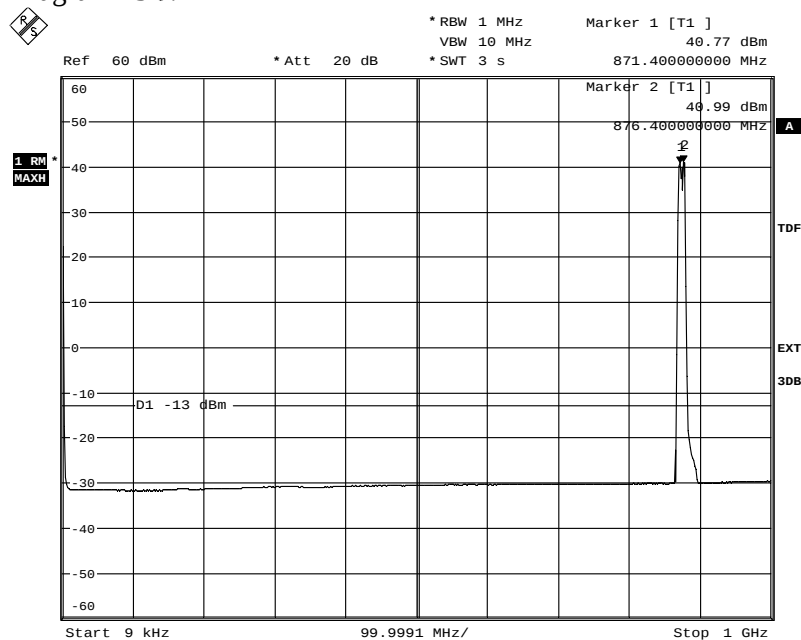
Diagram 14 b:



Date: 24.JAN.2013 10:39:37

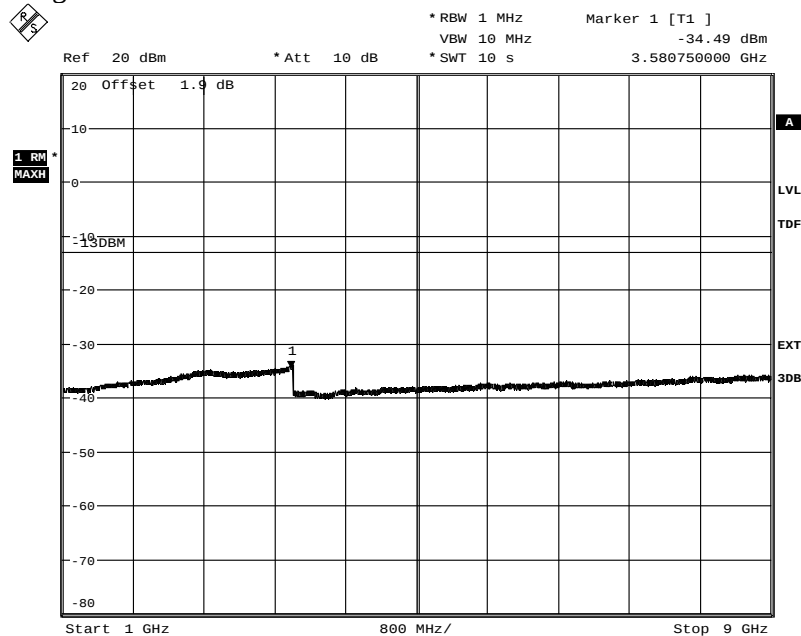
## Appendix 5

Diagram 15 a:



Date: 24.JAN.2013 12:23:38

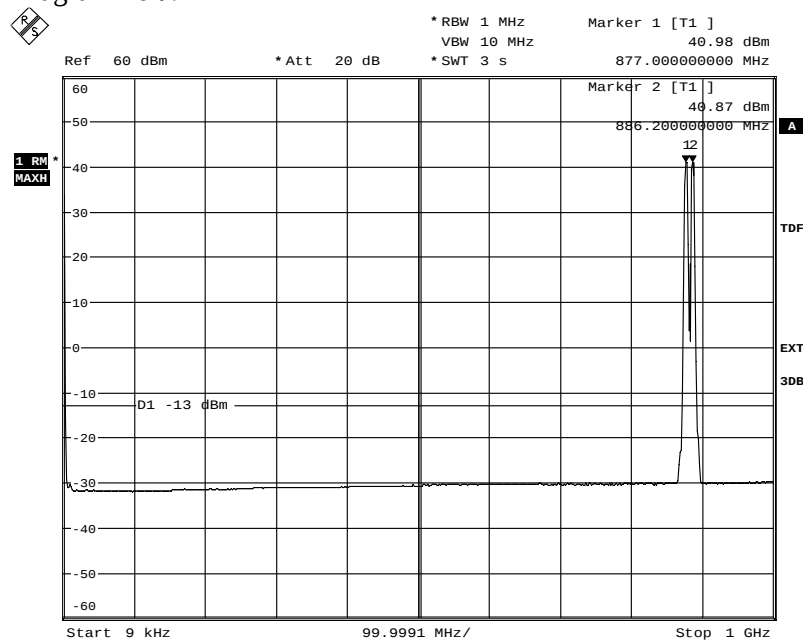
Diagram 15 b:



Date: 24.JAN.2013 12:21:05

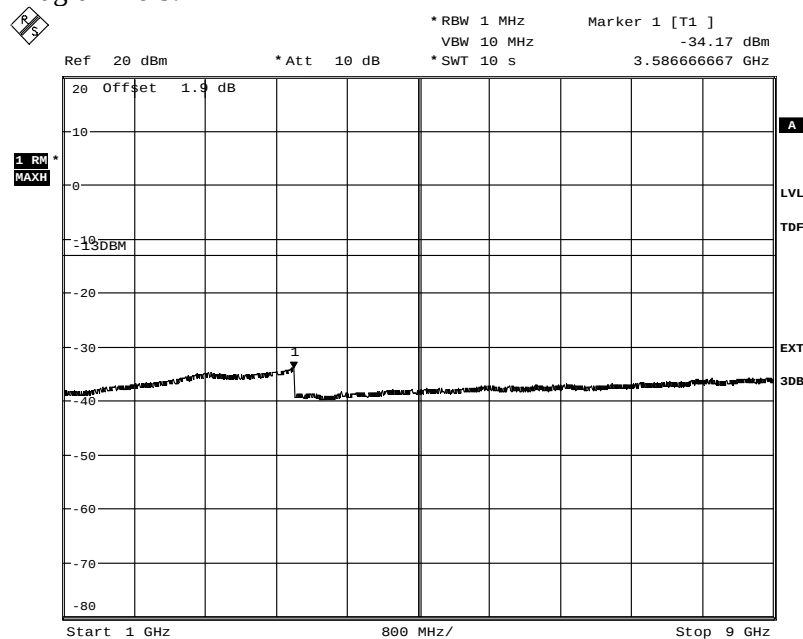
## Appendix 5

Diagram 16 a:



Date: 24.JAN.2013 11:02:21

Diagram 16 b:

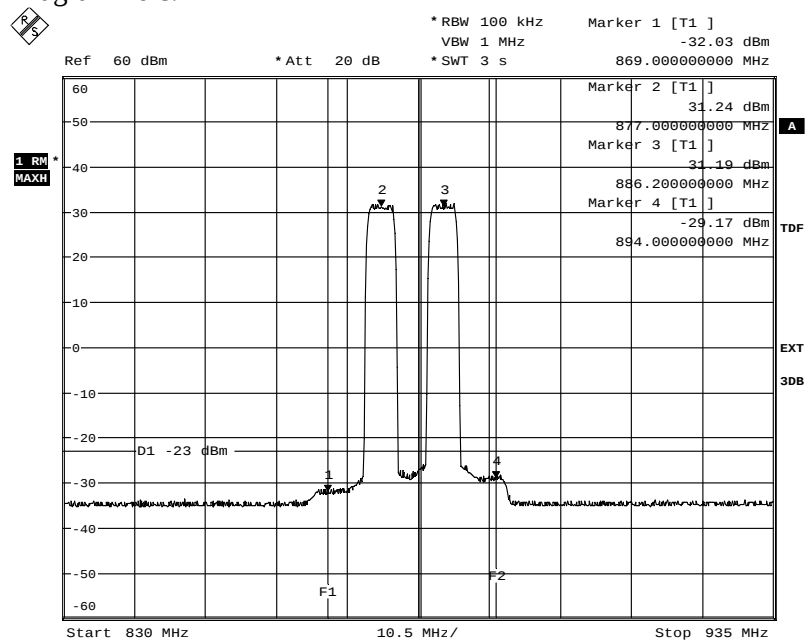


Date: 24.JAN.2013 10:59:58



## Appendix 5

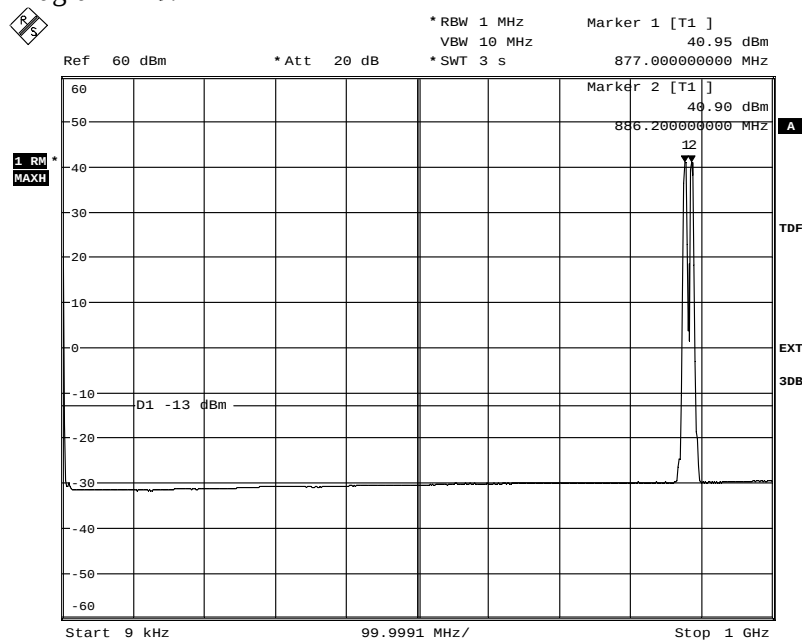
Diagram 16 c:



Date: 24.JAN.2013 11:23:58

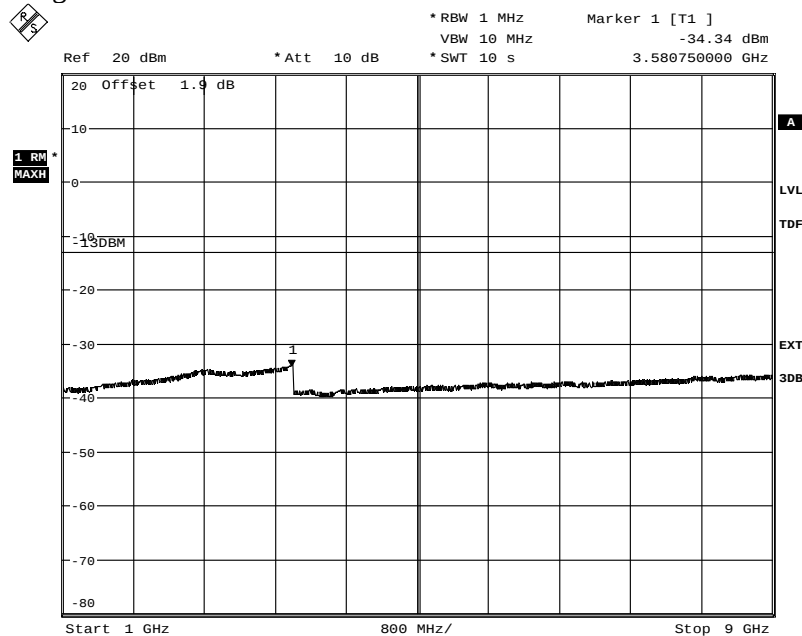
## Appendix 5

Diagram 17 a:



Date: 24.JAN.2013 12:10:07

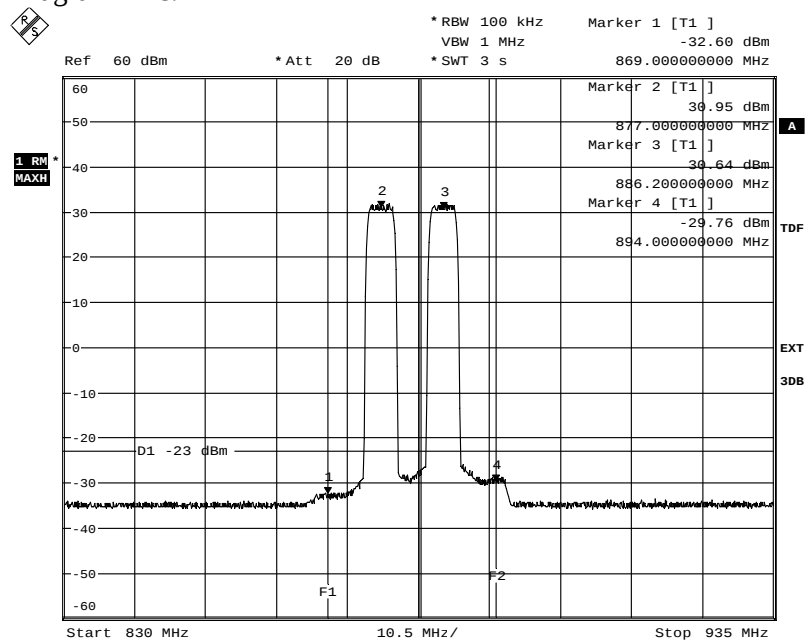
Diagram 17 b:



Date: 24.JAN.2013 12:11:19

## Appendix 5

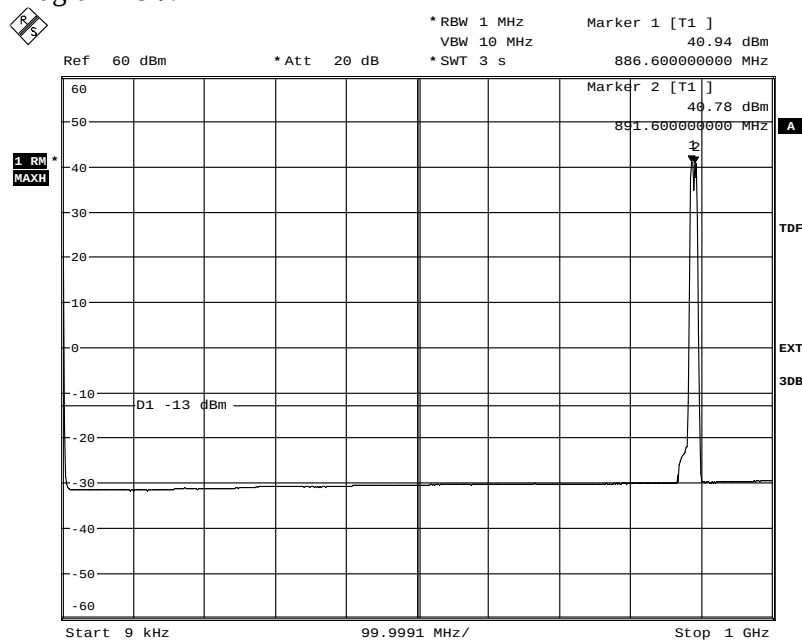
Diagram 17 c:



Date: 24.JAN.2013 15:31:58

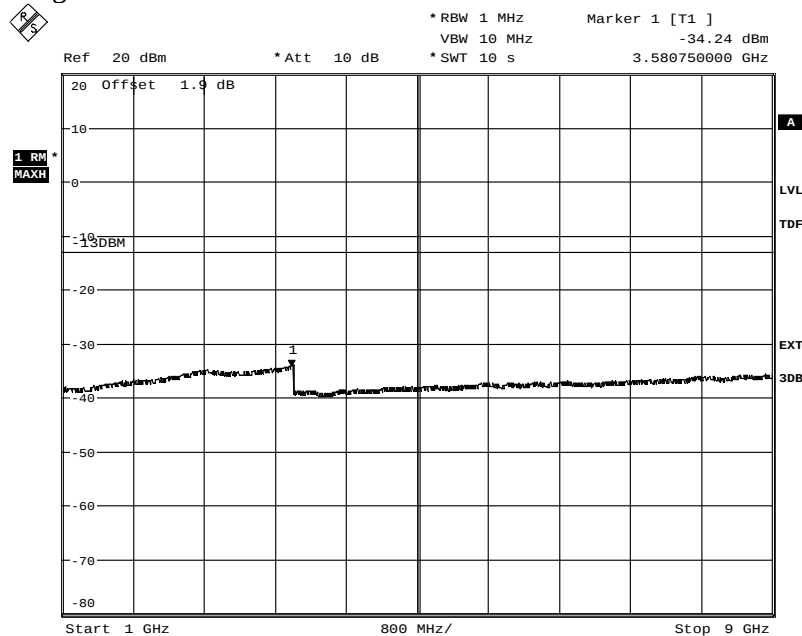
## Appendix 5

Diagram 18 a:



Date: 24.JAN.2013 11:37:13

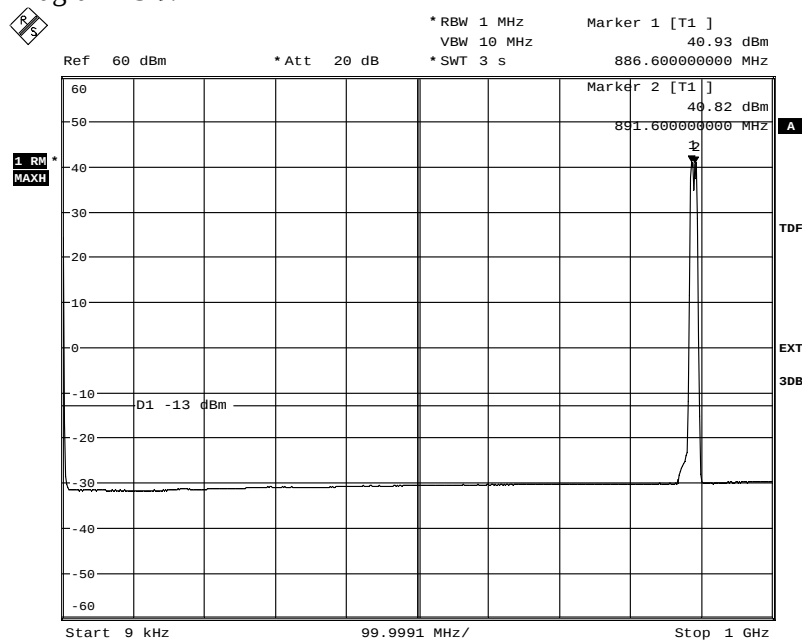
Diagram 18 b:



Date: 24.JAN.2013 11:39:29

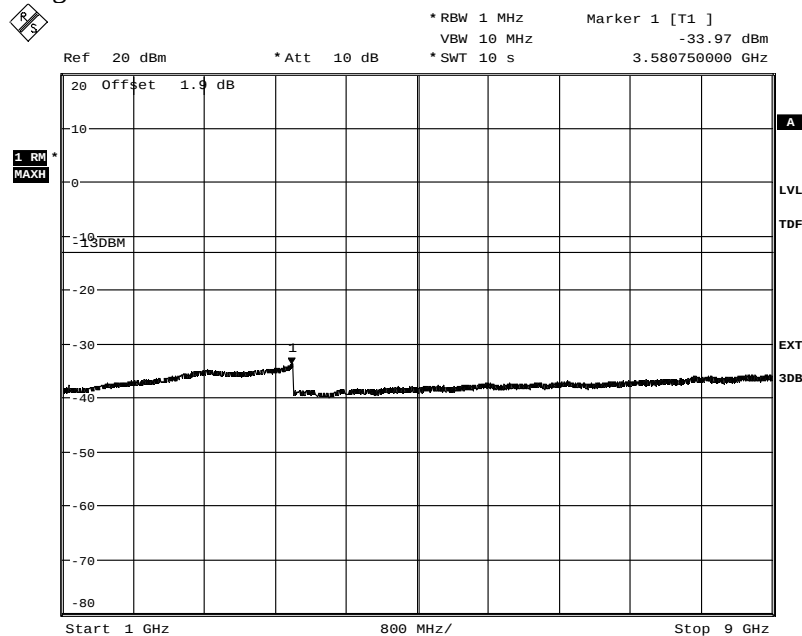
## Appendix 5

Diagram 19 a:



Date: 24.JAN.2013 11:54:00

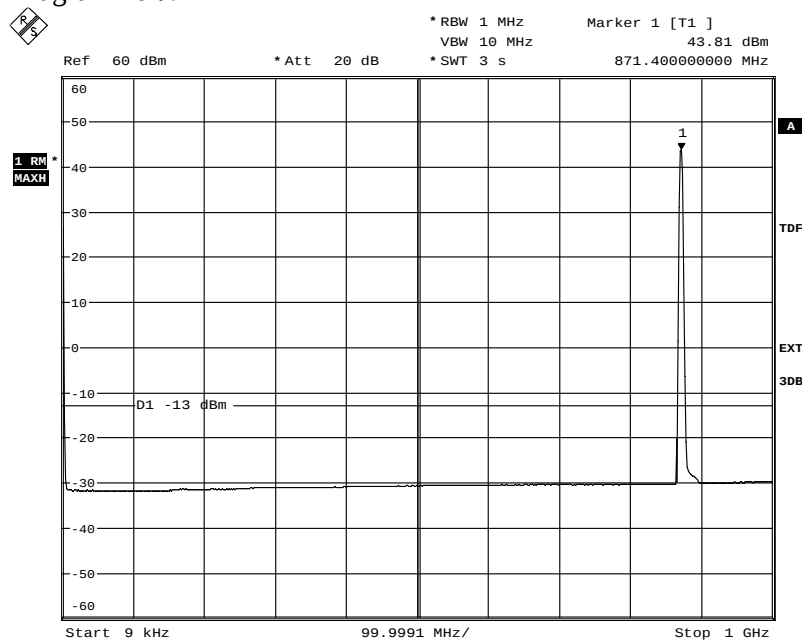
Diagram 19 b:



Date: 24.JAN.2013 11:51:52

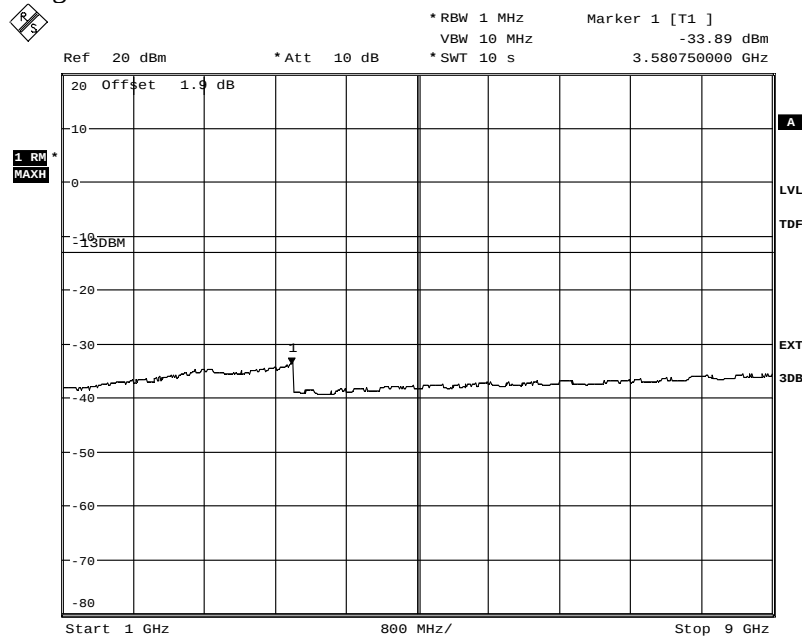
## Appendix 5

Diagram 20 a:



Date: 25.JAN.2013 07:48:34

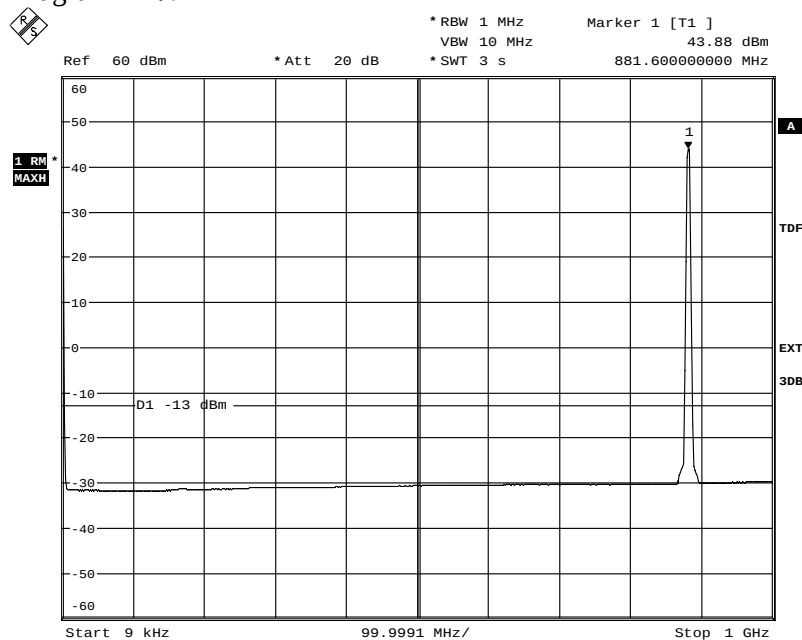
Diagram 20 b:



Date: 25.JAN.2013 07:46:15

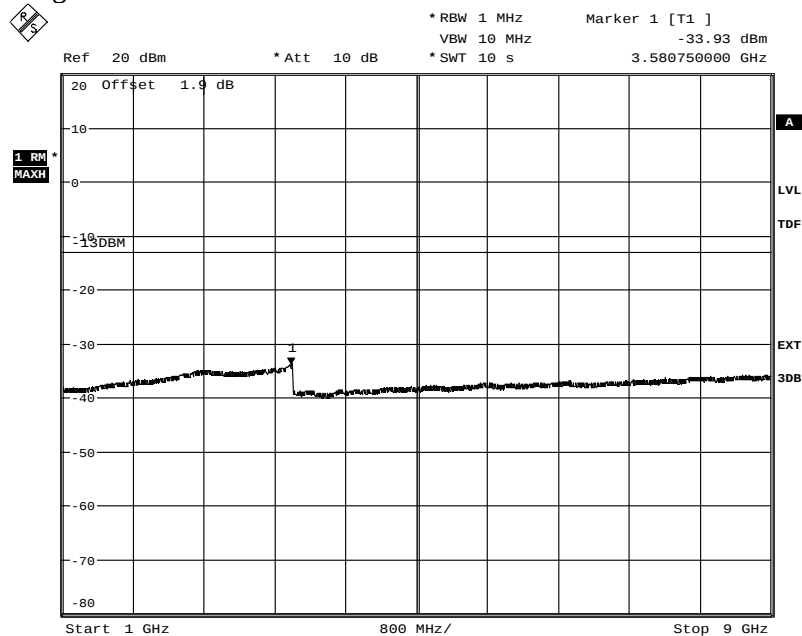
## Appendix 5

Diagram 21 a:



Date: 25.JAN.2013 07:29:04

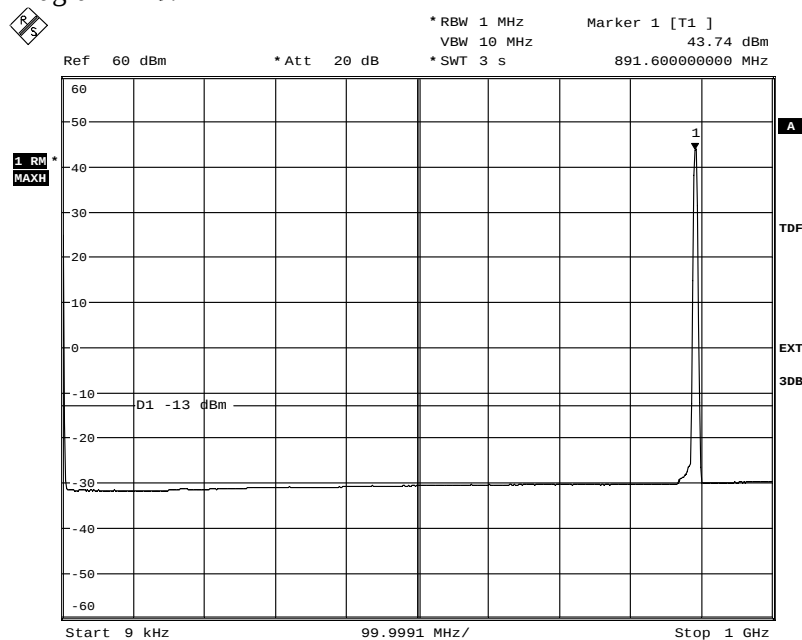
Diagram 21 b:



Date: 25.JAN.2013 07:34:50

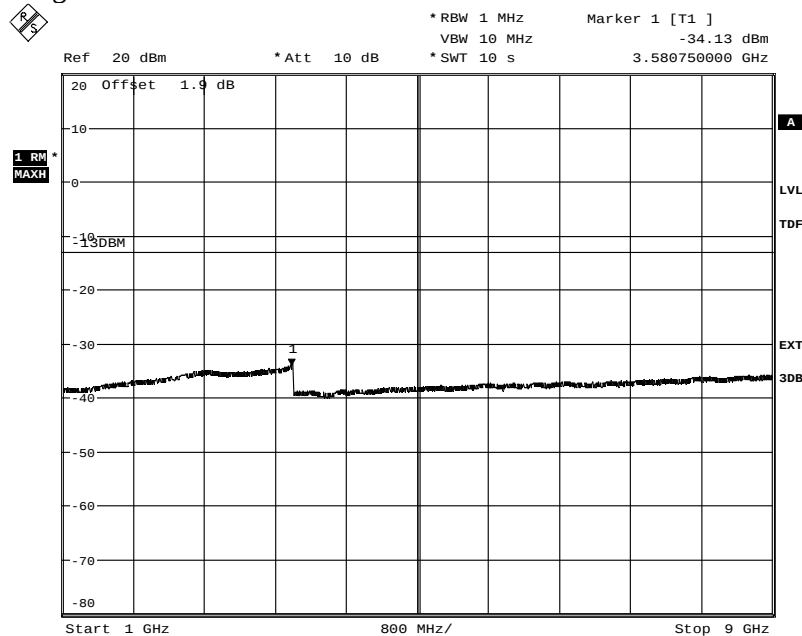
## Appendix 5

Diagram 22 a:



Date: 25.JAN.2013 08:04:39

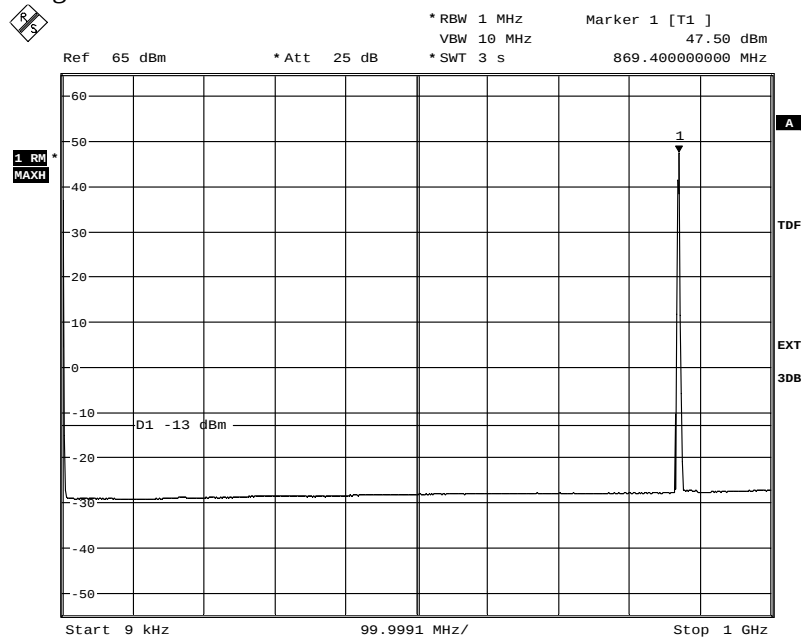
Diagram 22 b:



Date: 25.JAN.2013 08:07:53

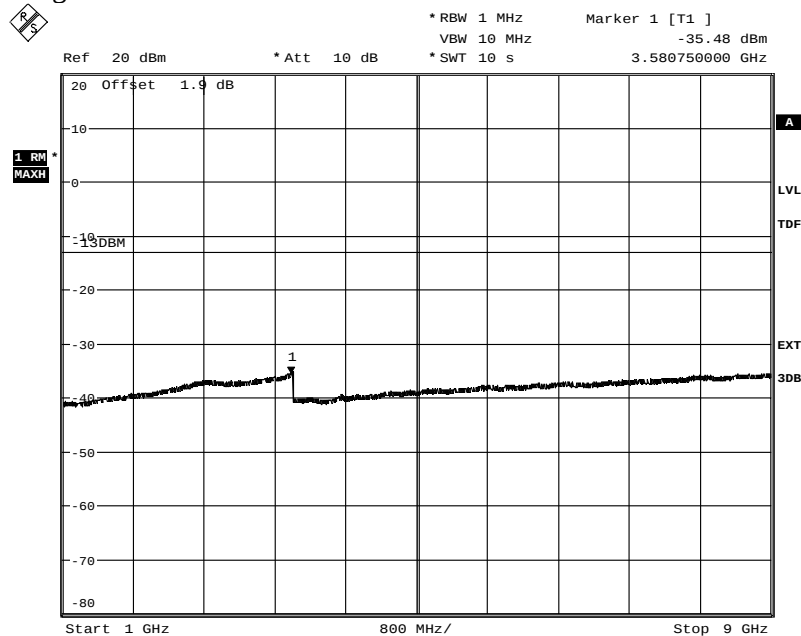
## Appendix 5

Diagram 23 a:



Date: 18.FEB.2013 11:52:41

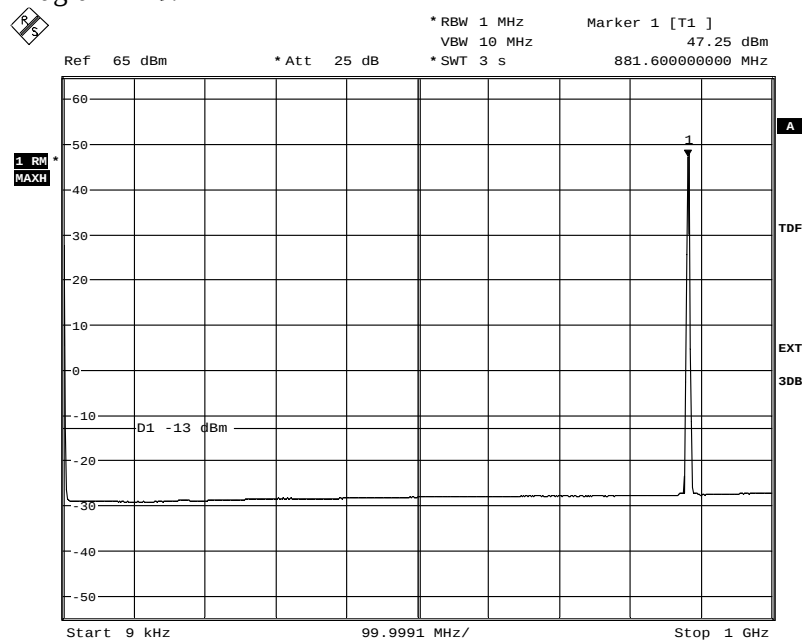
Diagram 23 b:



Date: 18.FEB.2013 12:01:23

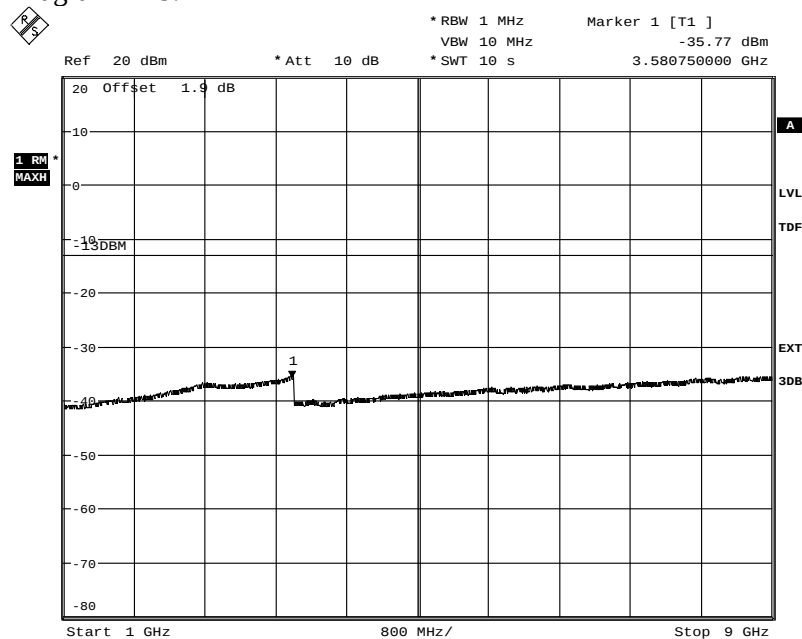
## Appendix 5

Diagram 24 a:



Date: 18.FEB.2013 10:29:45

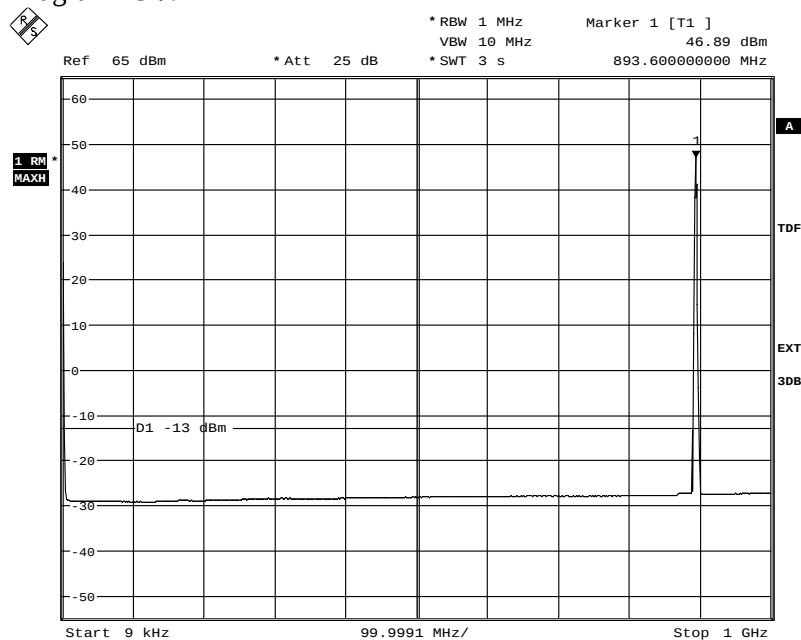
Diagram 24 b:



Date: 18.FEB.2013 10:31:28

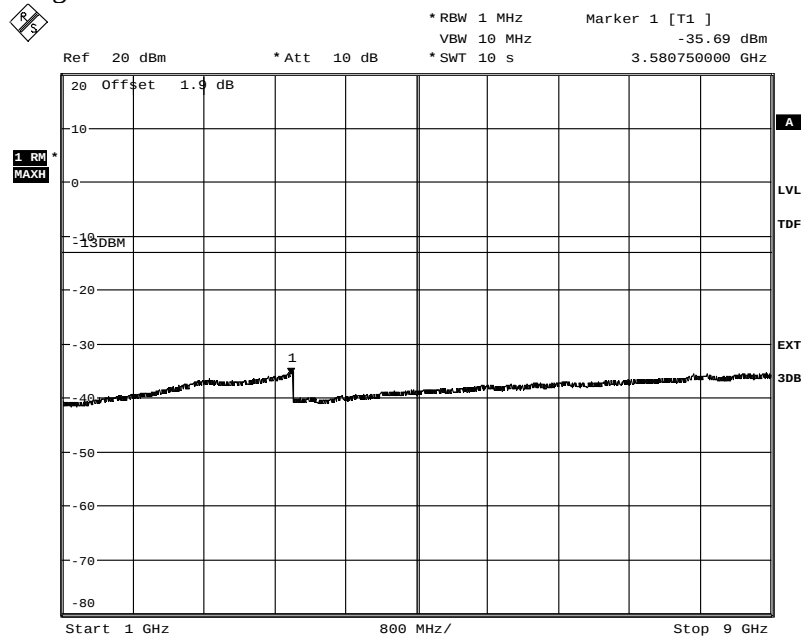
## Appendix 5

Diagram 25 a:



Date: 18.FEB.2013 12:13:58

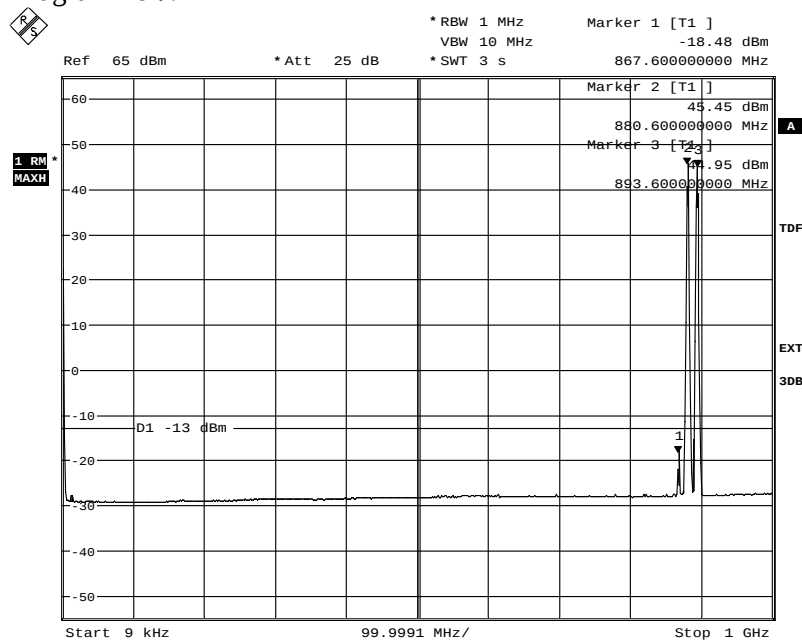
Diagram 25 b:



Date: 18.FEB.2013 12:20:23

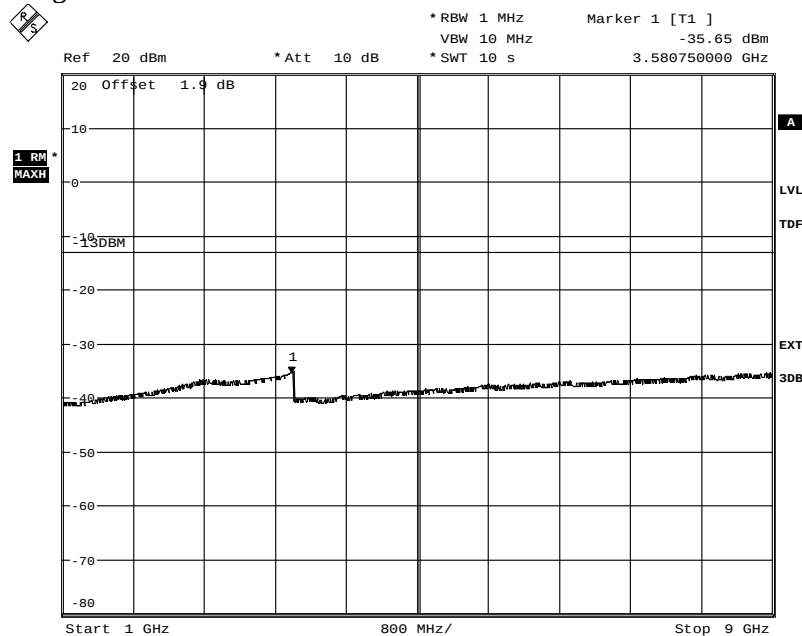
## Appendix 5

Diagram 26 a:



Date: 18.FEB.2013 14:17:35

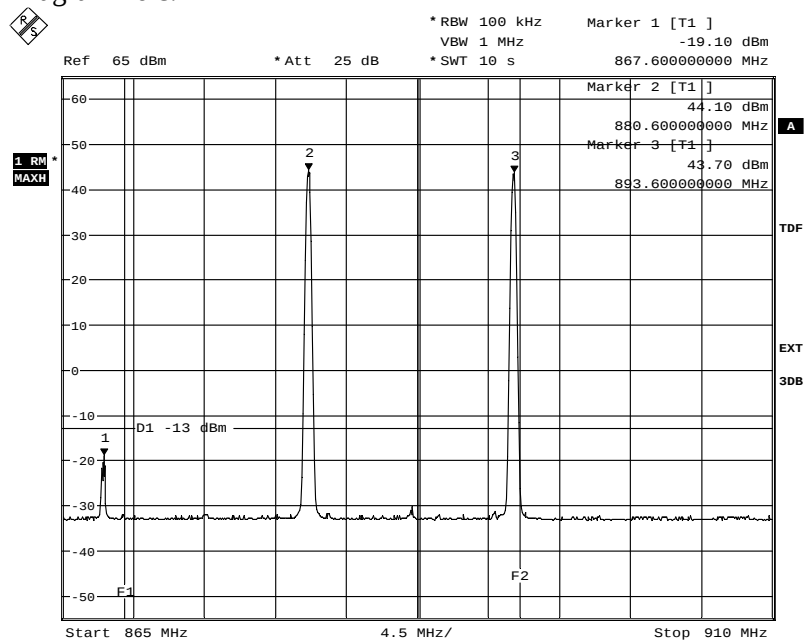
Diagram 26 b:



Date: 18.FEB.2013 14:30:20

## Appendix 5

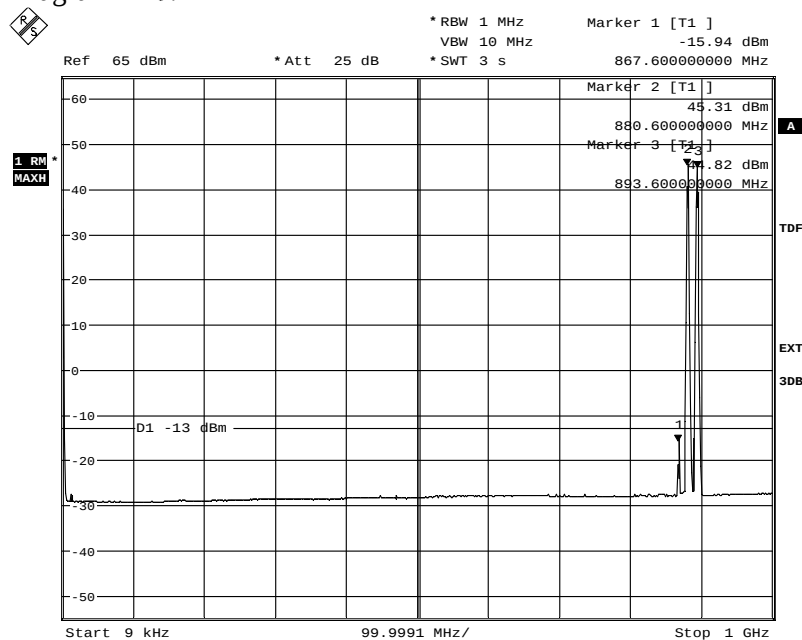
Diagram 26 c:



Date: 18.FEB.2013 14:42:49

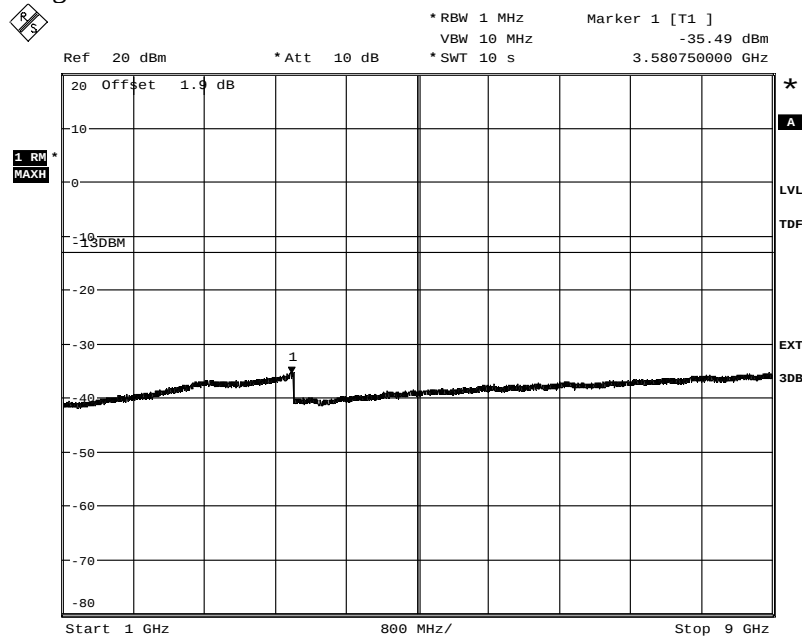
## Appendix 5

Diagram 27 a:



Date: 18.FEB.2013 14:39:15

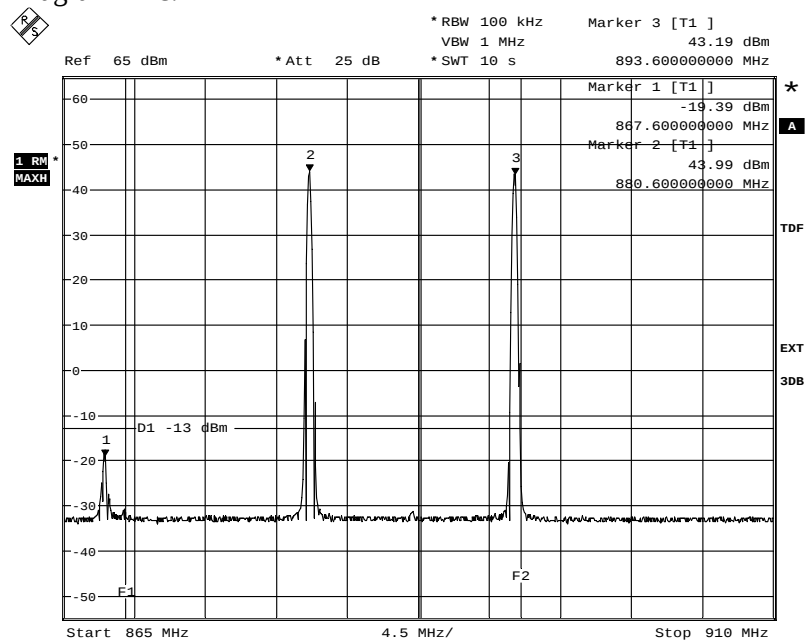
Diagram 27 b:



Date: 18.FEB.2013 14:34:00

## Appendix 5

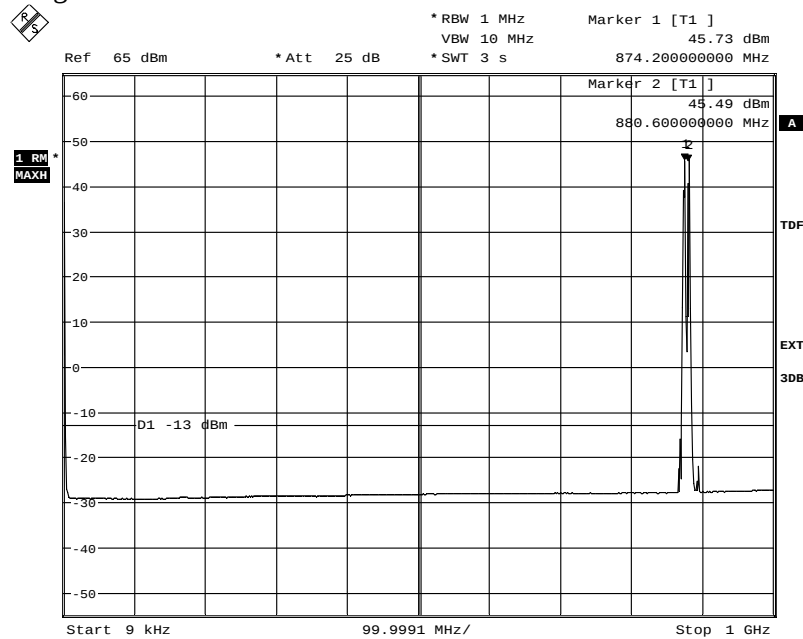
Diagram 27 c:



Date: 18.FEB.2013 14:37:21

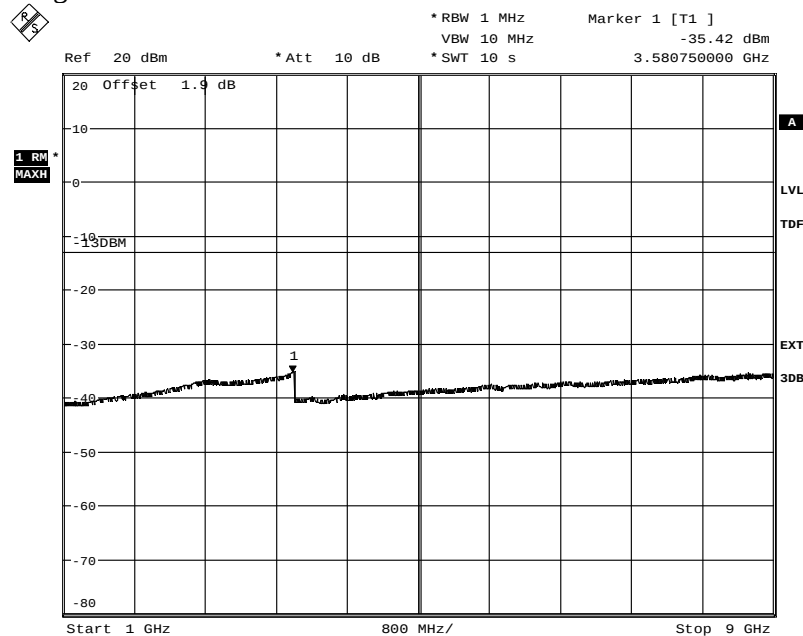
## Appendix 5

Diagram 28 a:



Date: 18.FEB.2013 14:51:58

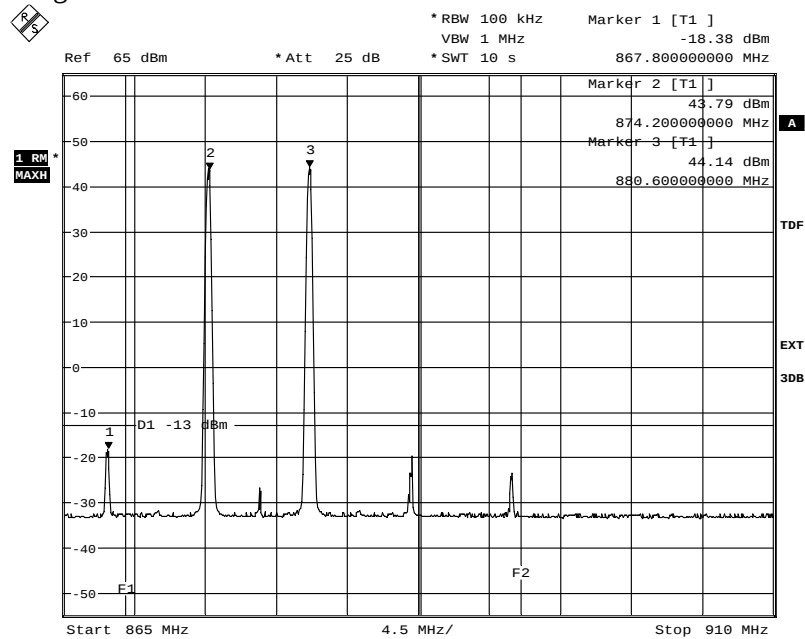
Diagram 28 b:



Date: 18.FEB.2013 14:53:37

## Appendix 5

Diagram 28 c:

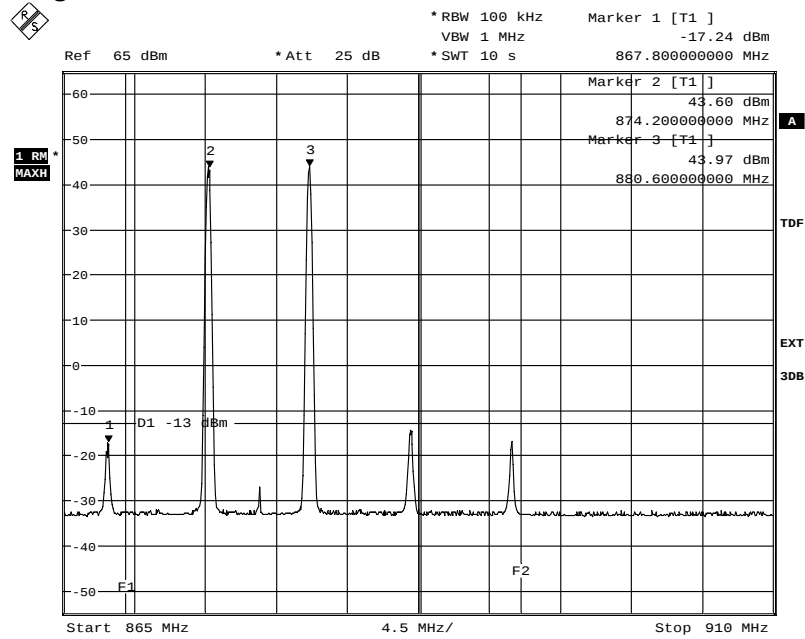


Date: 18.FEB.2013 14:49:50



## Appendix 5

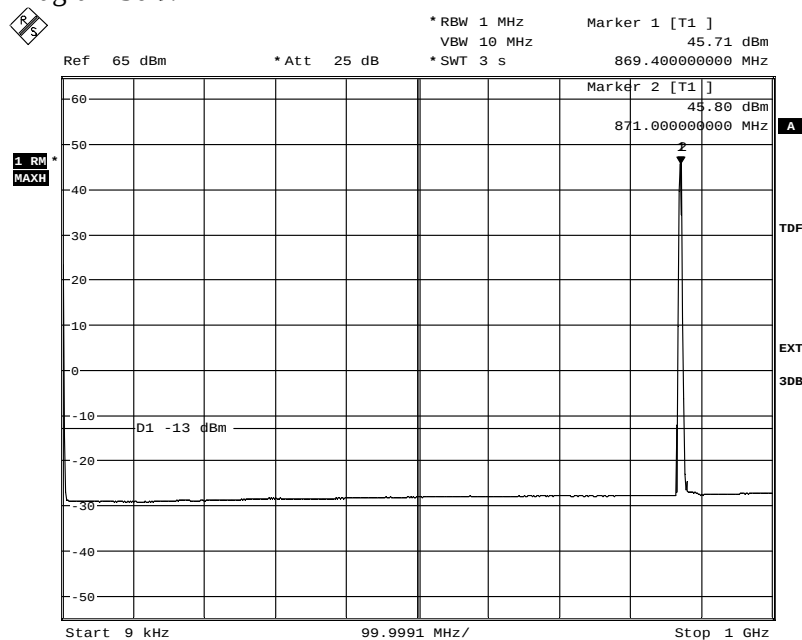
Diagram 29 c:



Date: 18.FEB.2013 14:59:00

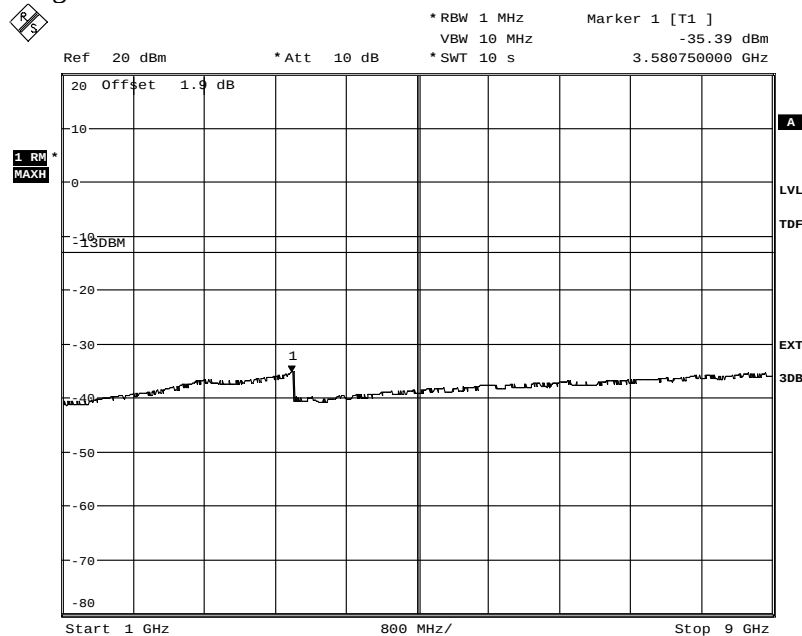
## Appendix 5

Diagram 30 a:



Date: 18.FEB.2013 15:09:21

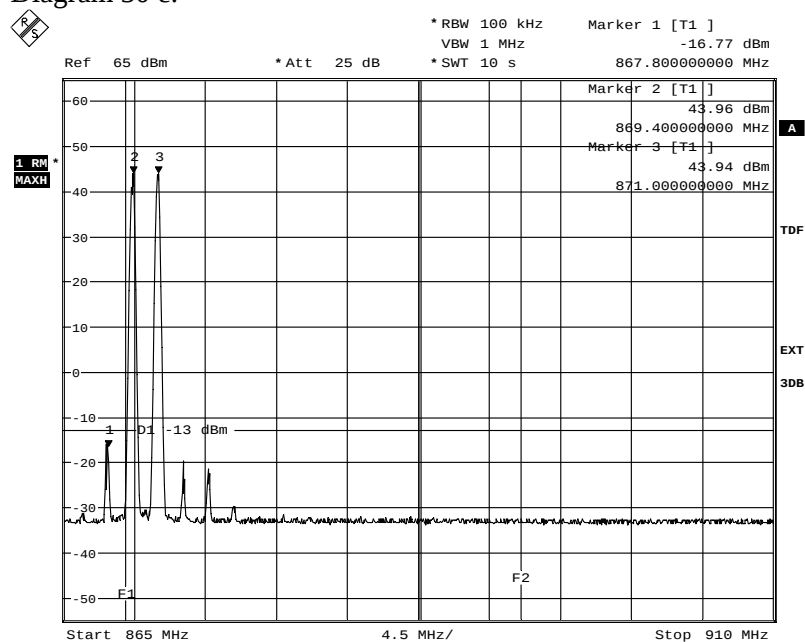
Diagram 30 b:



Date: 18.FEB.2013 15:07:23

## Appendix 5

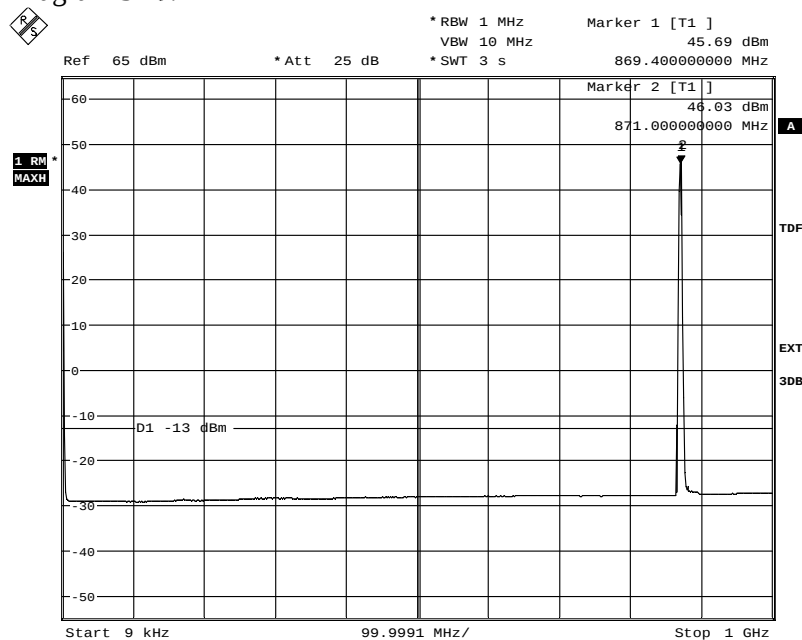
Diagram 30 c:



Date: 18.FEB.2013 15:14:20

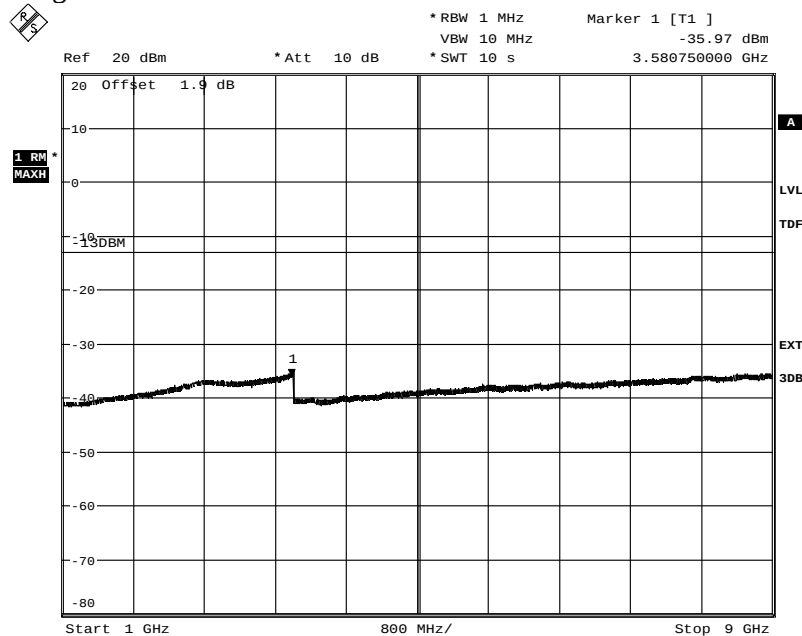
## Appendix 5

Diagram 31 a:



Date: 19.FEB.2013 07:02:17

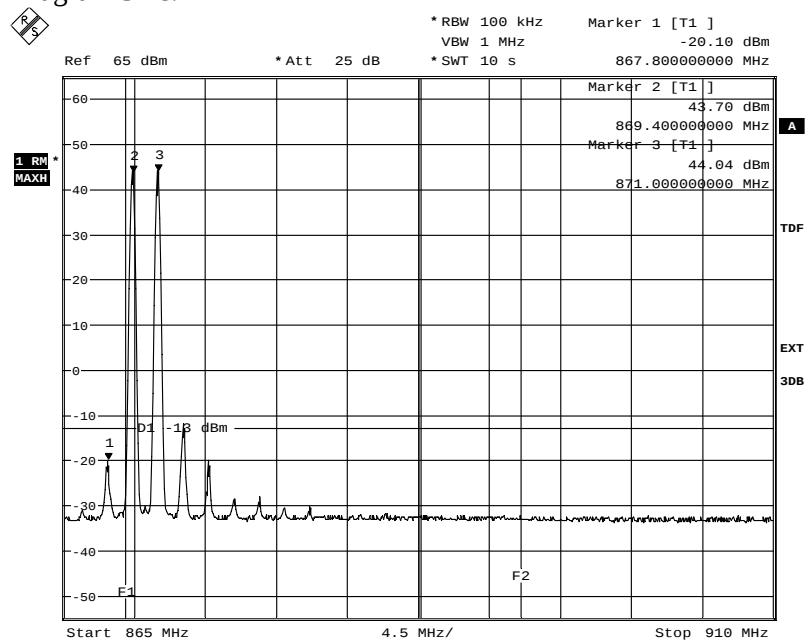
Diagram 31 b:



Date: 19.FEB.2013 07:03:35

## Appendix 5

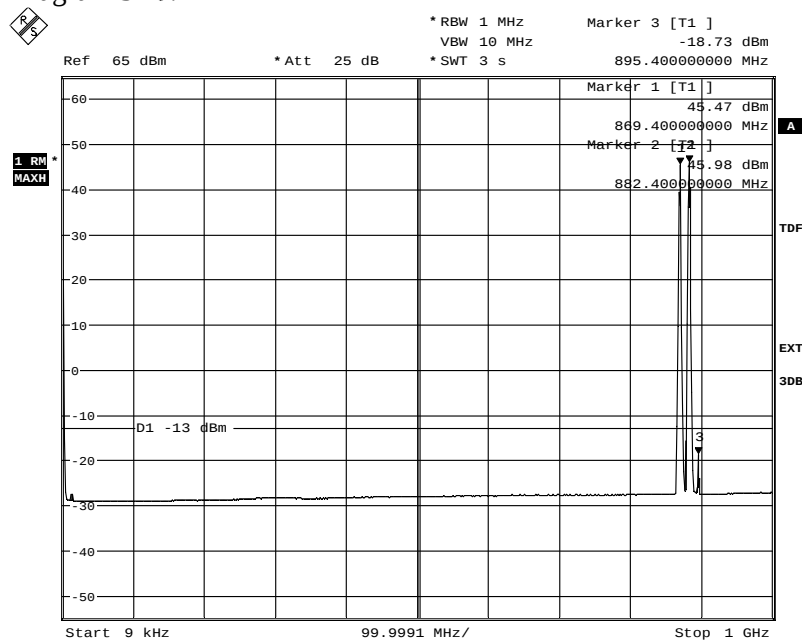
Diagram 31 c:



Date: 19.FEB.2013 07:01:04

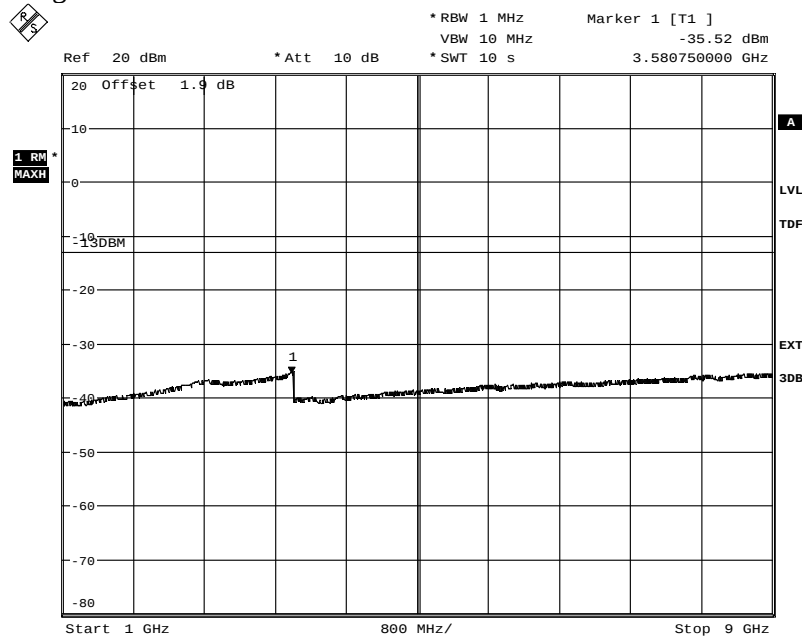
## Appendix 5

Diagram 32 a:



Date: 19.FEB.2013 07:44:42

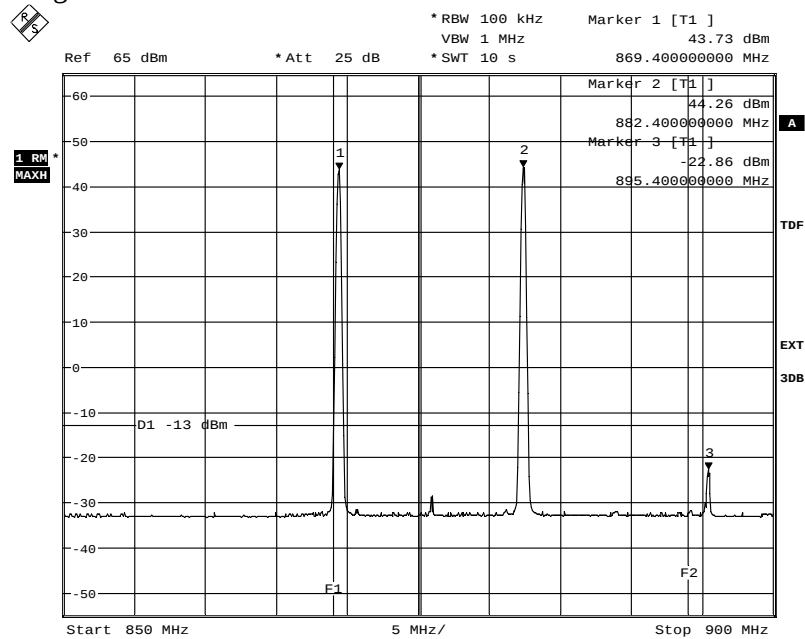
Diagram 32 b:



Date: 19.FEB.2013 07:46:24

## Appendix 5

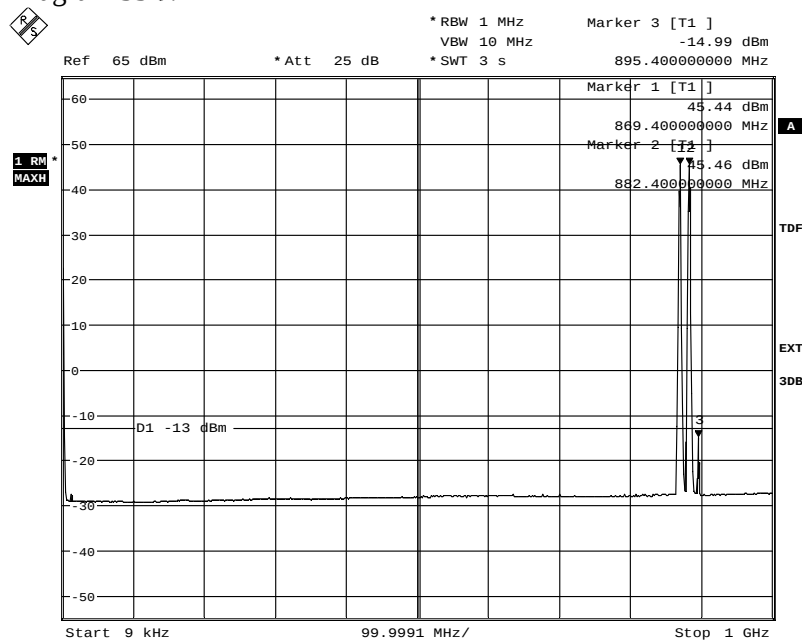
Diagram 32 c:



Date: 19.FEB.2013 07:41:57

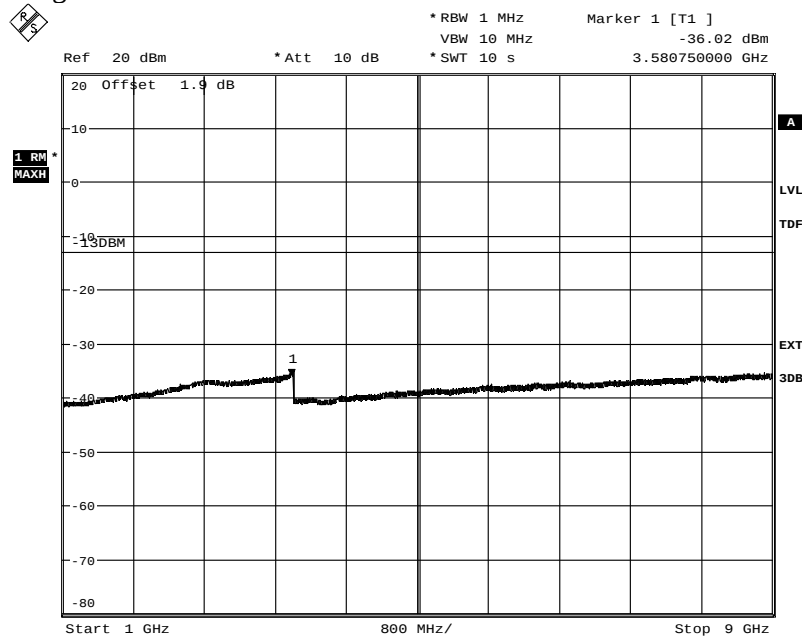
## Appendix 5

Diagram 33 a:



Date: 19.FEB.2013 07:20:09

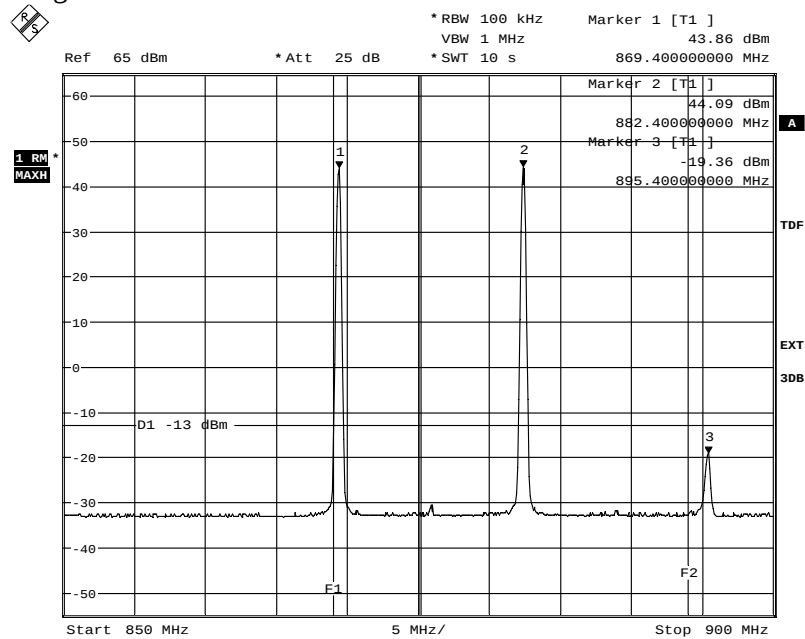
Diagram 33 b:



Date: 19.FEB.2013 07:09:10

## Appendix 5

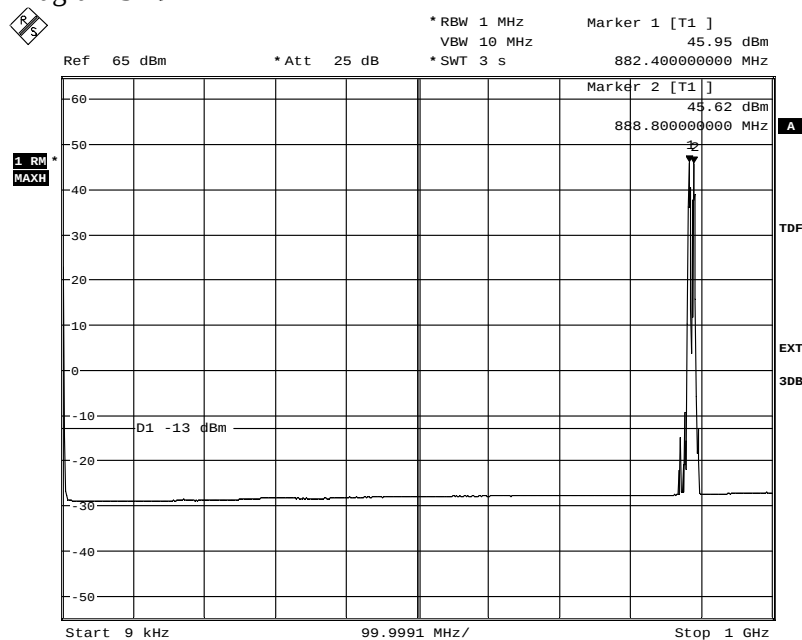
Diagram 33 c:



Date: 19.FEB.2013 07:38:47

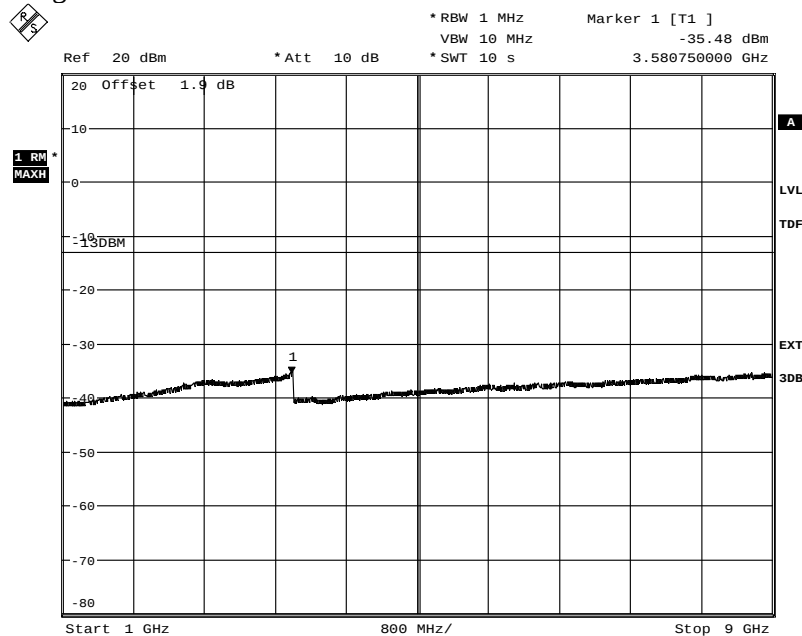
## Appendix 5

Diagram 34 a



Date: 19.FEB.2013 07:57:36

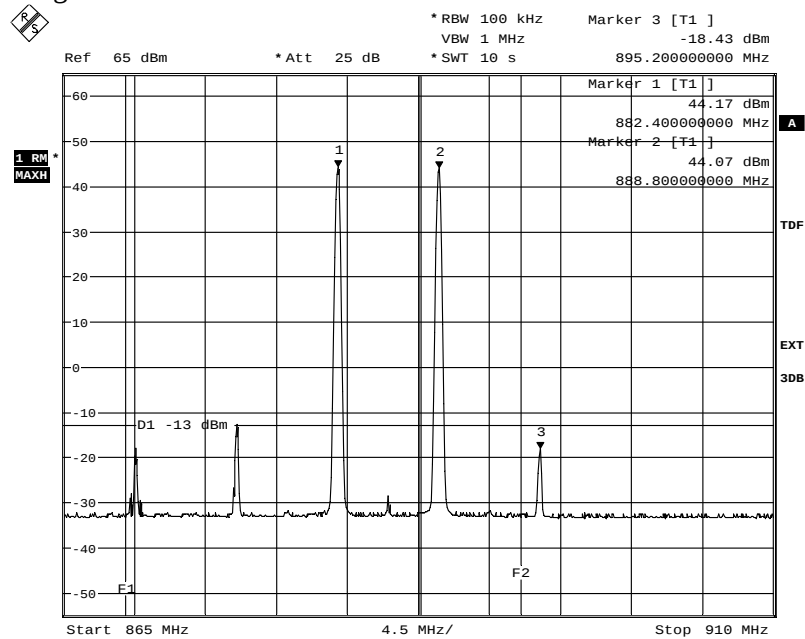
Diagram 34 b:



Date: 19.FEB.2013 07:54:11

## Appendix 5

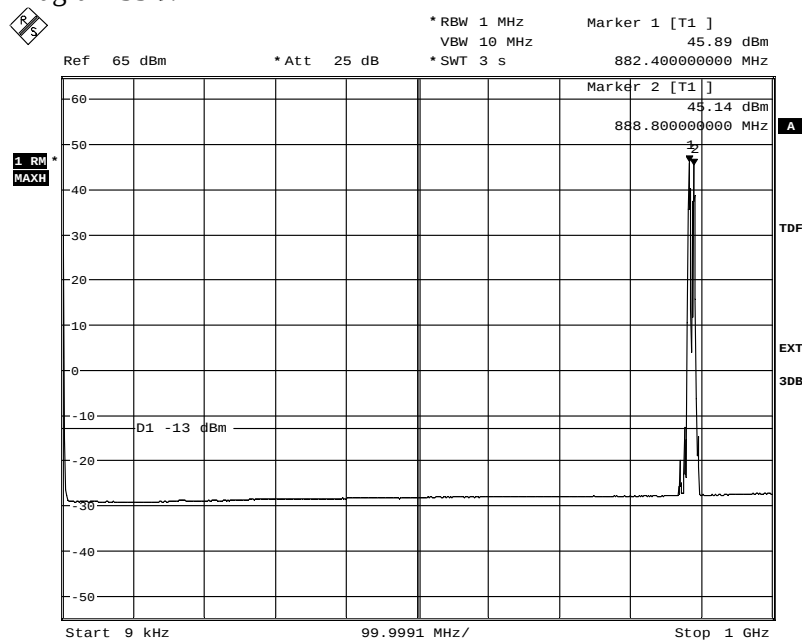
Diagram 34 c:



Date: 19.FEB.2013 07:59:29

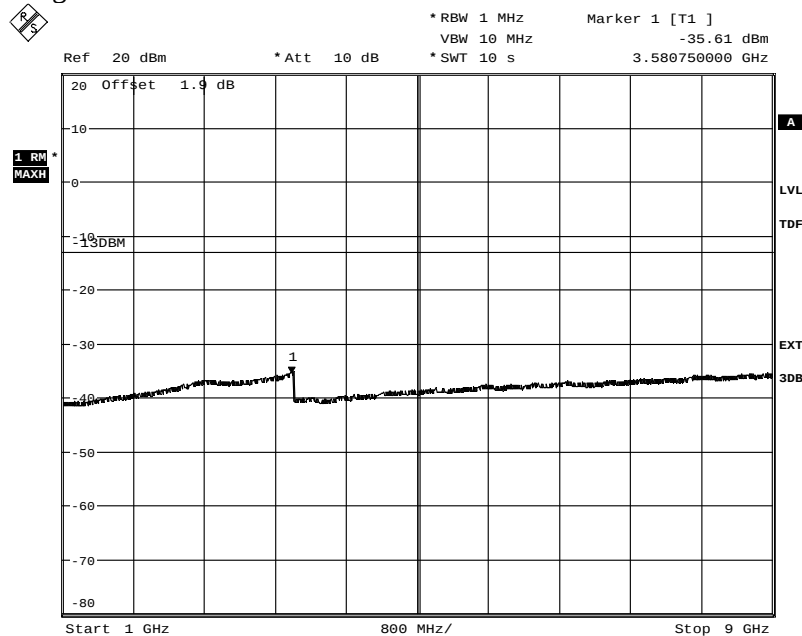
## Appendix 5

Diagram 35 a:



Date: 19.FEB.2013 08:03:12

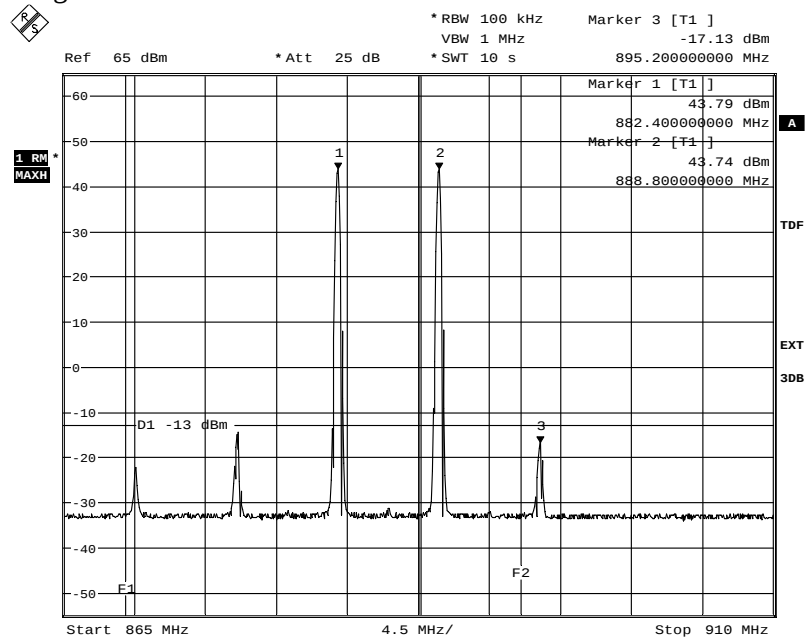
Diagram 35 b:



Date: 19.FEB.2013 08:04:30

## Appendix 5

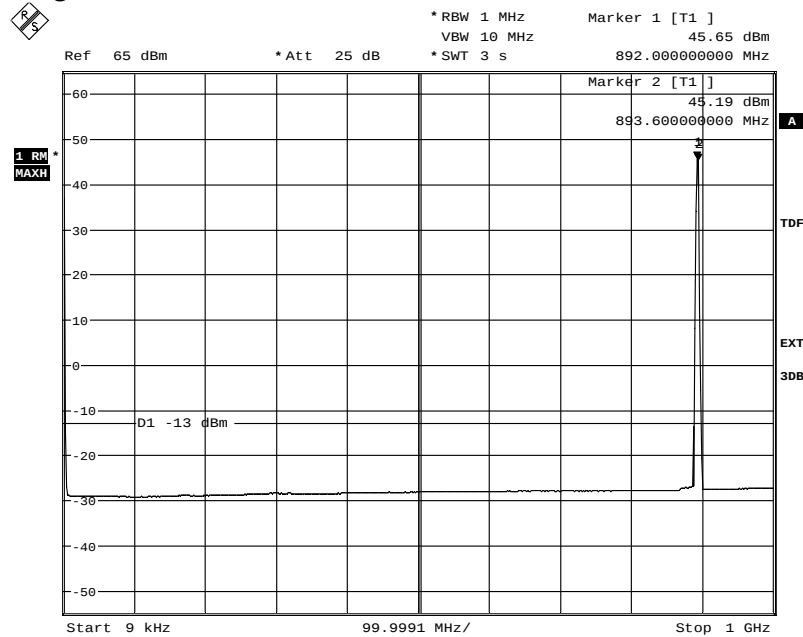
Diagram 35 c:



Date: 19.FEB.2013 08:01:50

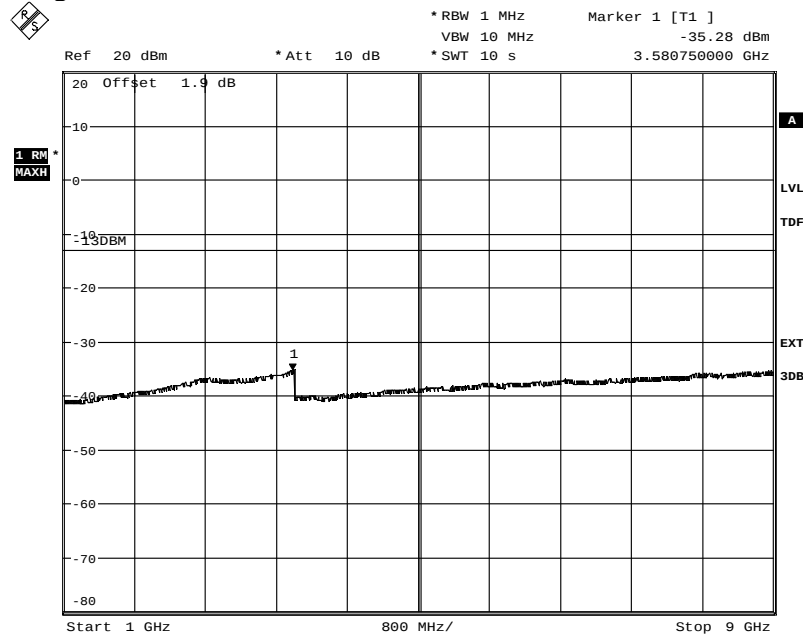
## Appendix 5

Diagram 36 a:



Date: 19.FEB.2013 08:17:01

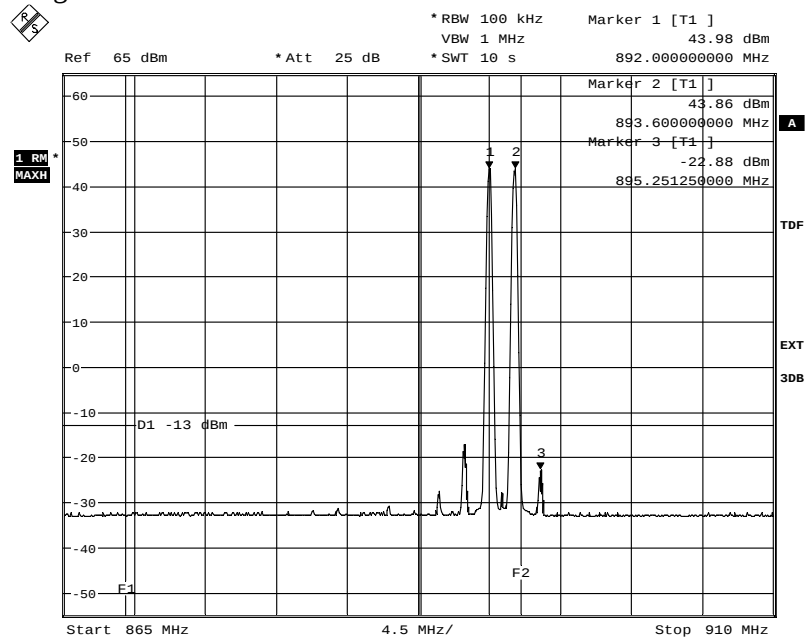
Diagram 36 b:



Date: 19.FEB.2013 11:13:17

## Appendix 5

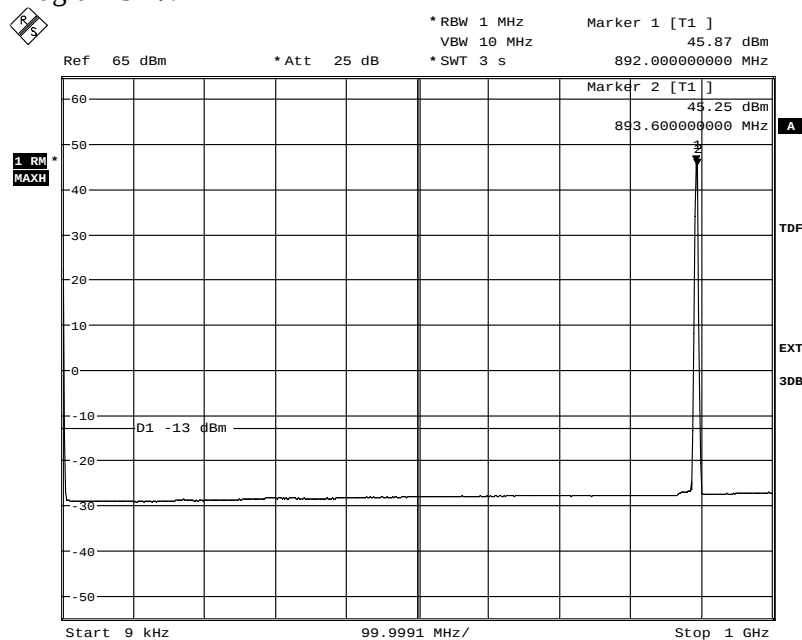
Diagram 36 c:



Date: 19.FEB.2013 08:19:48

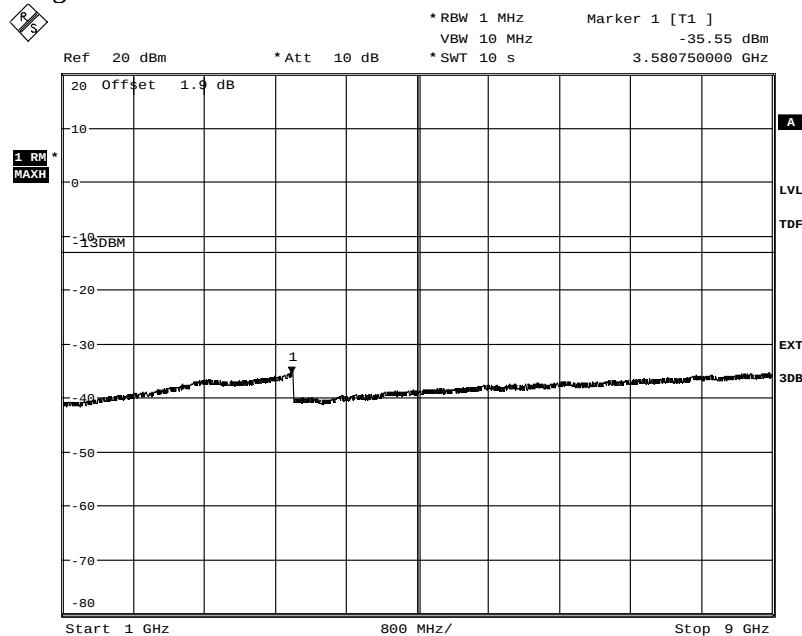
## Appendix 5

Diagram 37 a:



Date: 19.FEB.2013 08:15:13

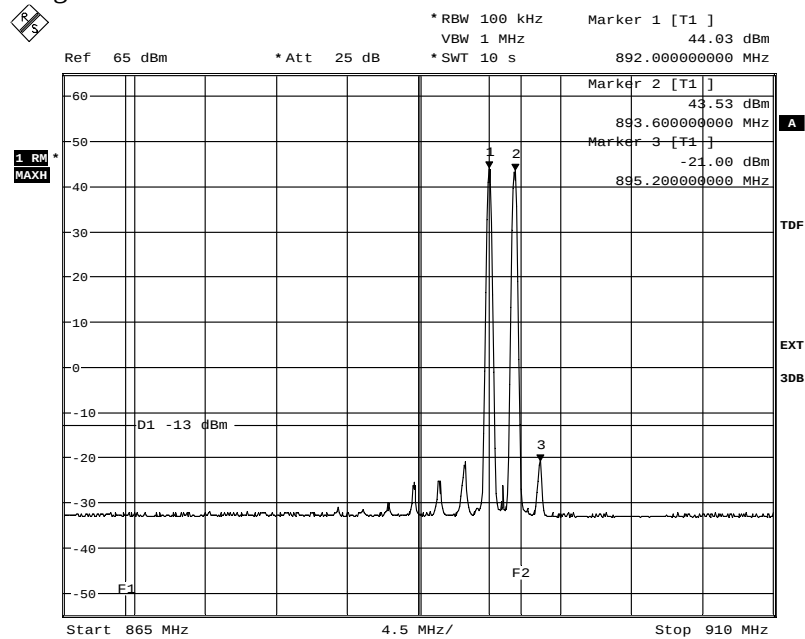
Diagram 37 b:



Date: 19.FEB.2013 08:10:51

## Appendix 5

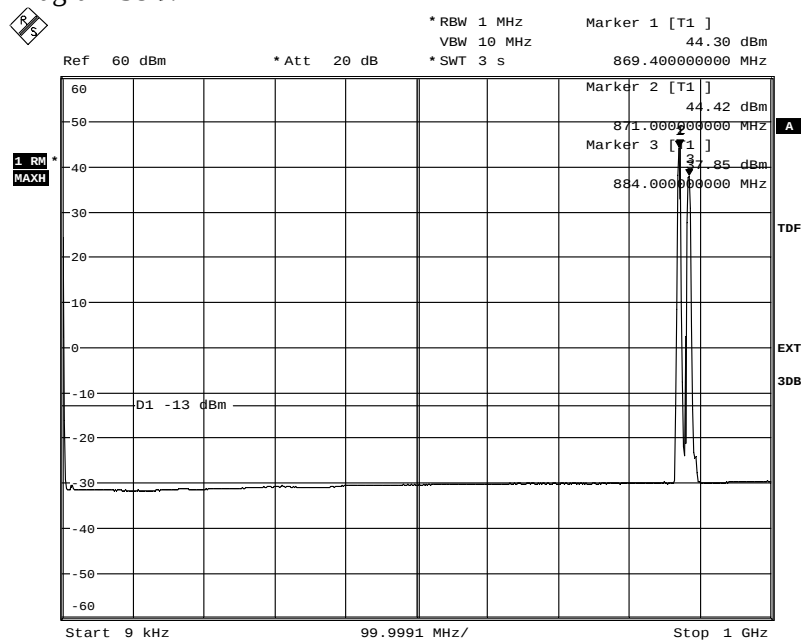
Diagram 37 c:



Date: 19.FEB.2013 08:13:43

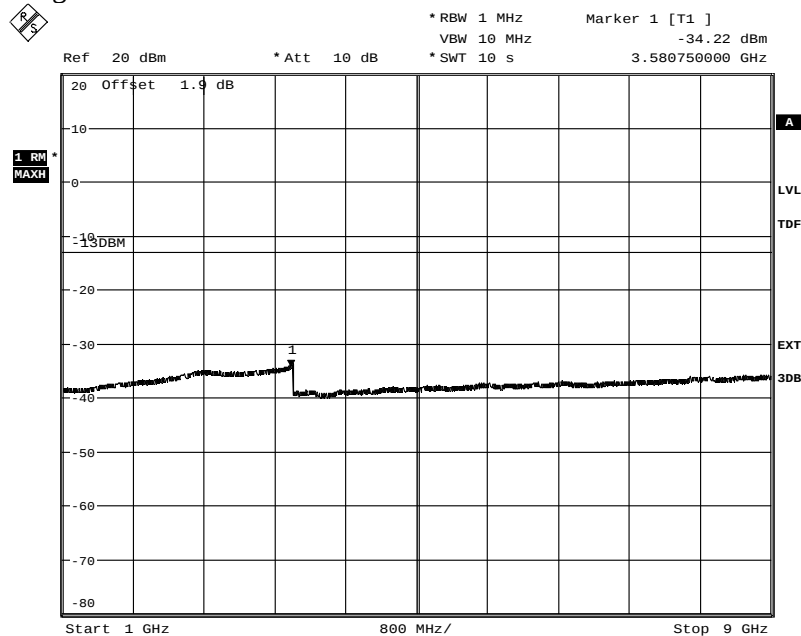
## Appendix 5

Diagram 38 a:



Date: 28.JAN.2013 14:07:22

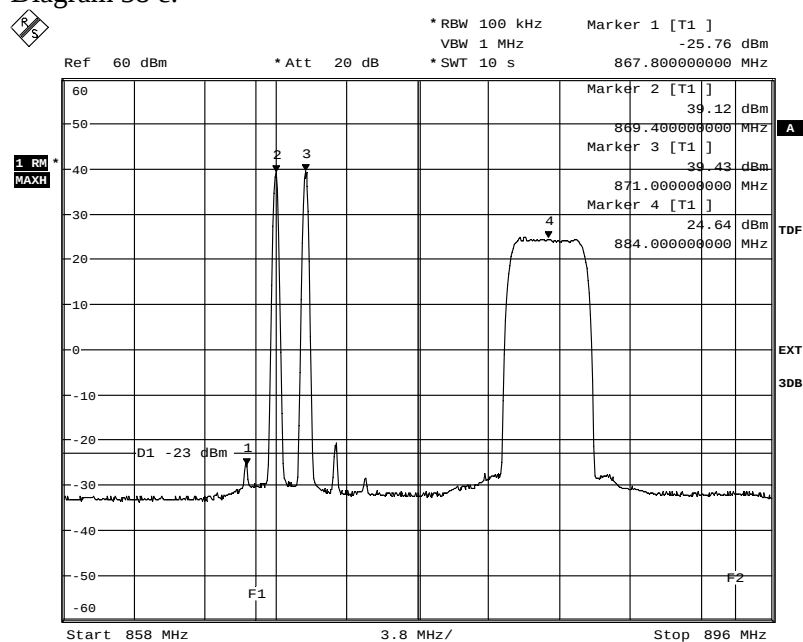
Diagram 38 b:



Date: 28.JAN.2013 14:18:02

## Appendix 5

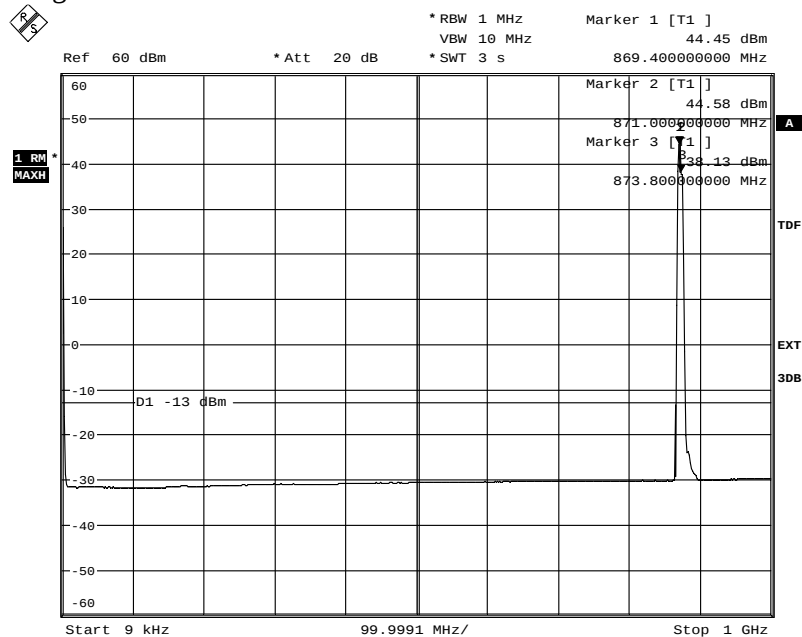
Diagram 38 c:



Date: 28.JAN.2013 14:15:22

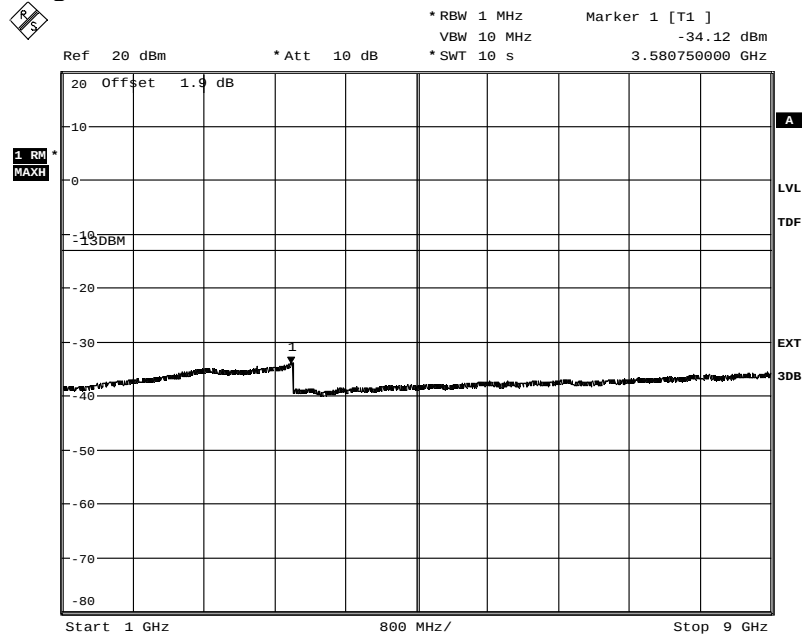
## Appendix 5

Diagram 39 a:



Date: 28.JAN.2013 15:15:32

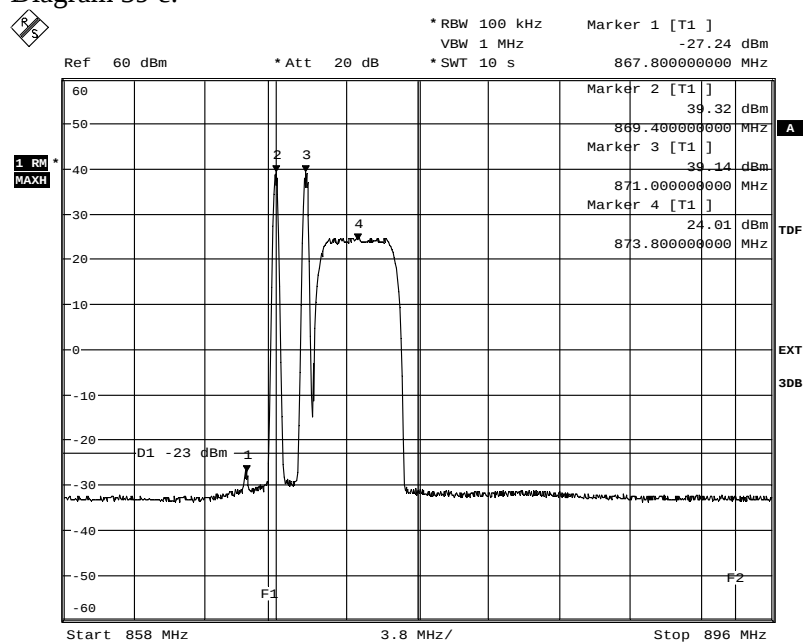
Diagram 39 b:



Date: 28.JAN.2013 15:17:40

## Appendix 5

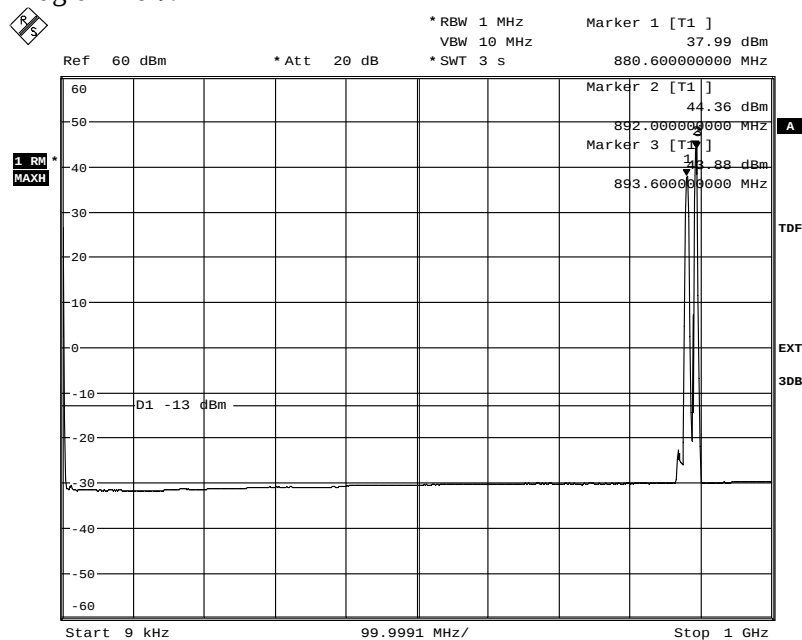
Diagram 39 c:



Date: 28.JAN.2013 15:11:46

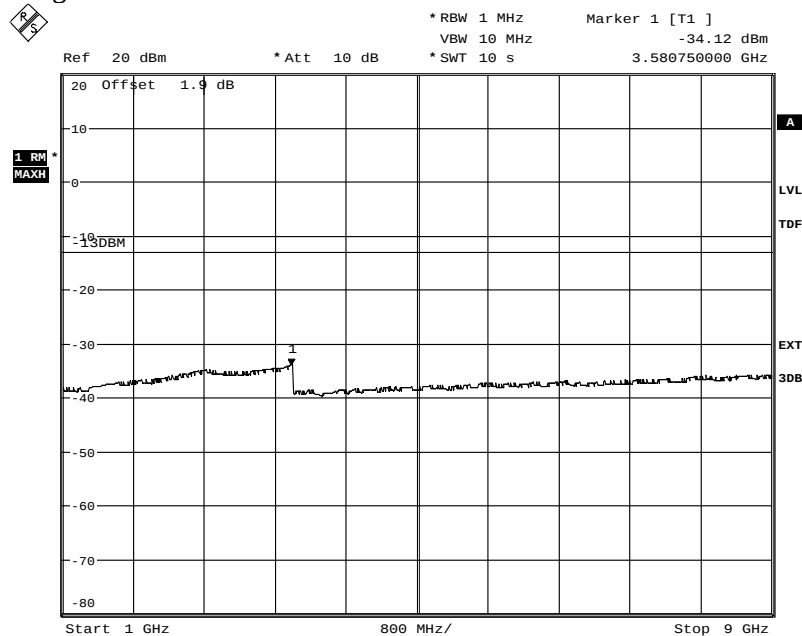
## Appendix 5

Diagram 40 a:



Date: 28.JAN.2013 15:37:54

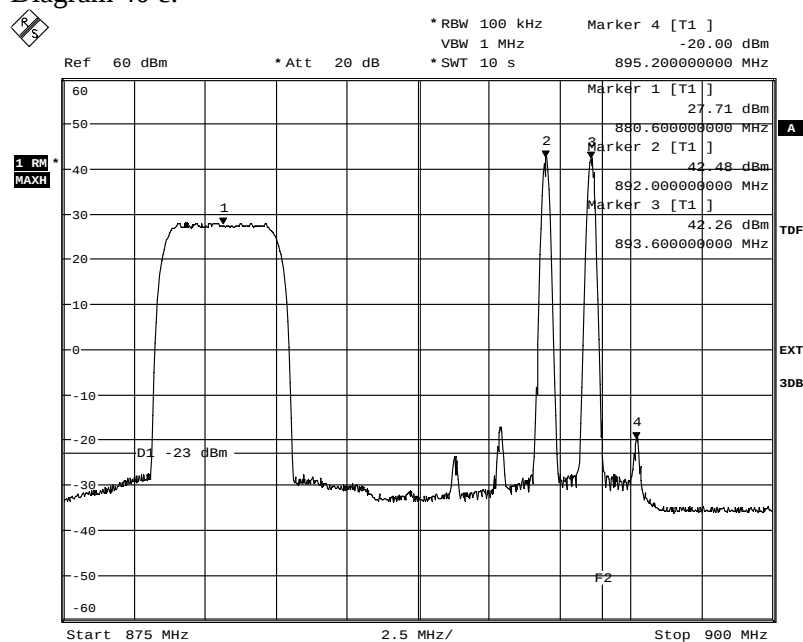
Diagram 40 b:



Date: 28.JAN.2013 15:49:08

## Appendix 5

Diagram 40 c:

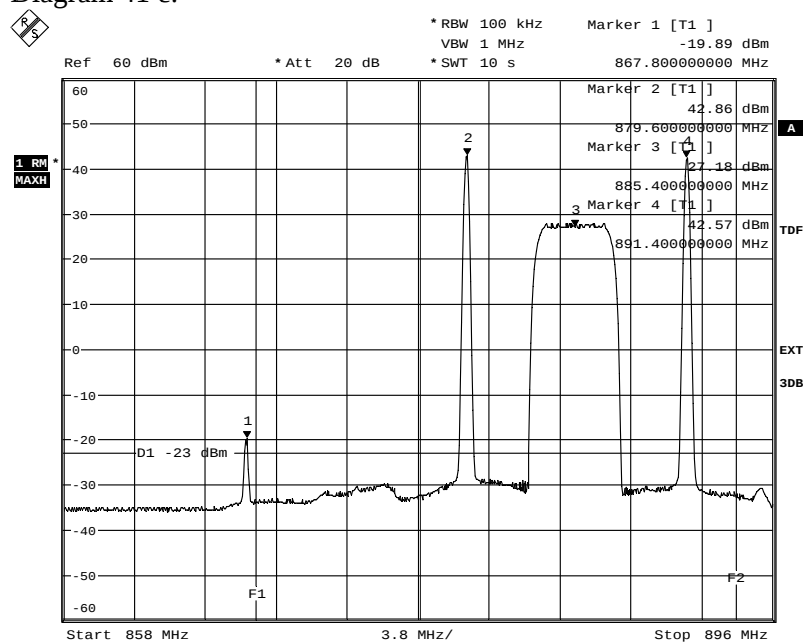


Date: 28.JAN.2013 15:34:22



## Appendix 5

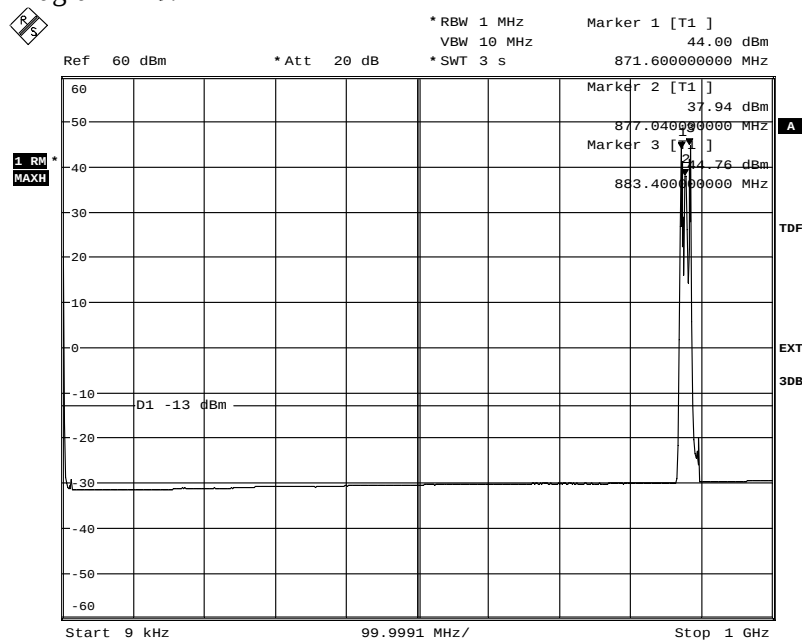
Diagram 41 c:



Date: 29.JAN.2013 08:51:00

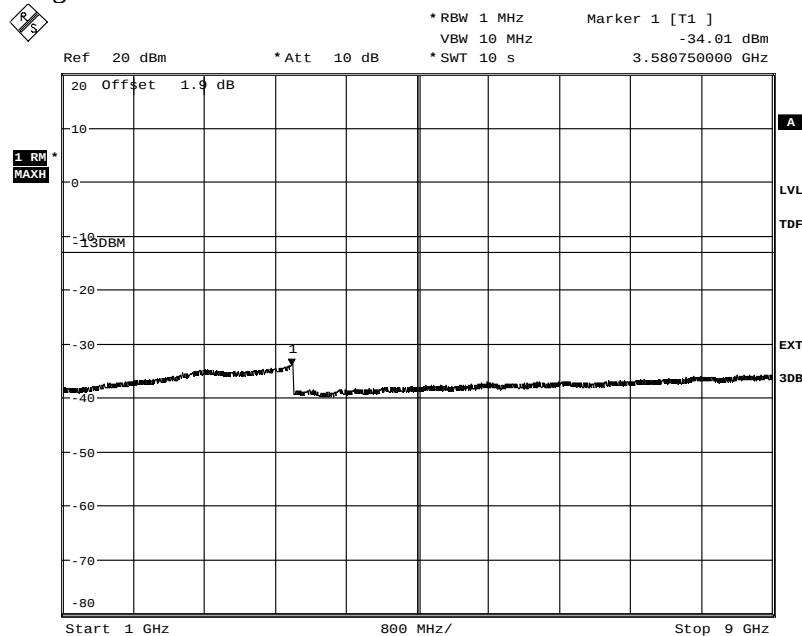
## Appendix 5

Diagram 42 a:



Date: 29.JAN.2013 14:25:29

Diagram 42 b:

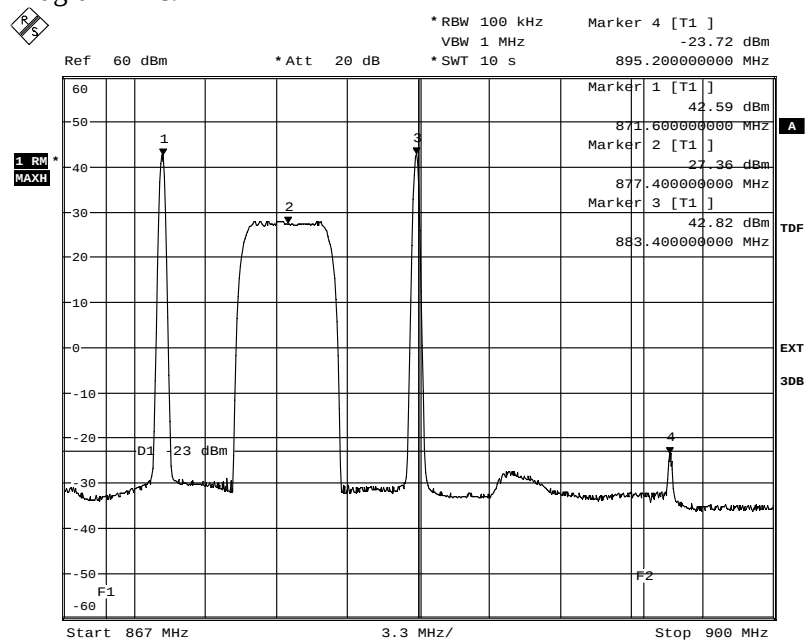


Date: 29.JAN.2013 14:33:21



## Appendix 5

Diagram 42 c:



Date: 29.JAN.2013 14:31:23

## Appendix 6

### Field strength of spurious radiation measurements according to 47 CFR 2.1053 / IC RSS-132 4.5

|                                 |                                |                             |
|---------------------------------|--------------------------------|-----------------------------|
| Date<br>2013-01-28 – 2013-02-07 | Temperature<br>22 - 24°C ± 3°C | Humidity<br>17 - 26 % ± 5 % |
|---------------------------------|--------------------------------|-----------------------------|

#### Test set-up and procedure

The test sites are listed at FCC, Columbia with registration number: 93866. The test site complies with RSS-Gen, Industry Canada file no. 3482A-1.

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 – 9 GHz. The upper frequency boundary was chosen to comprise 10x the highest fundamental TX frequency.

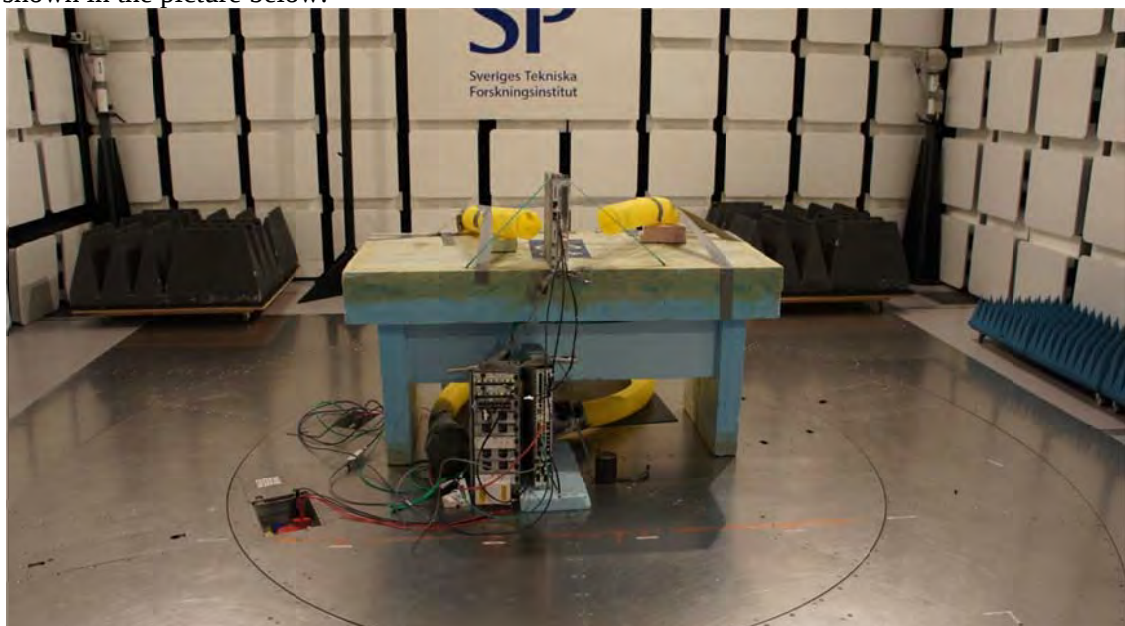
In the frequency range 30 MHz - 9 GHz the measurement was performed in power with a RBW of 1 MHz. A propagation loss in free space was calculated. The used formula was

$$\gamma = 20 \log \left( \frac{4\pi D}{\lambda} \right), \gamma \text{ is the propagation loss and } D \text{ is the antenna distance.}$$

The measurement procedure was as the following:

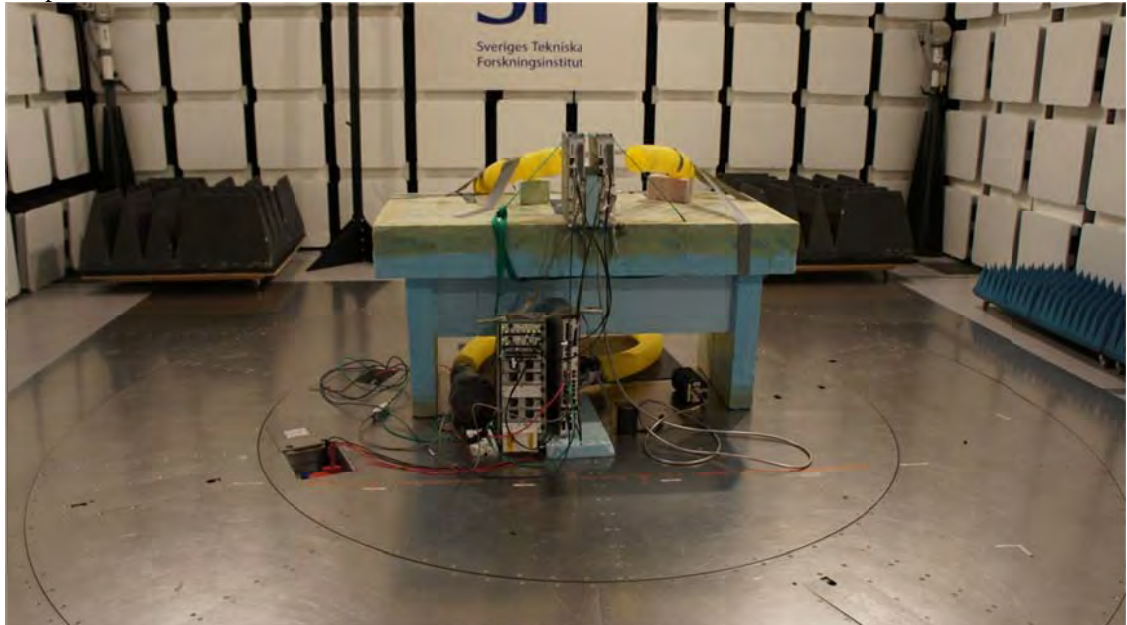
1. A pre-measurement was first performed with peak detector. The test object was measured in eight directions and with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m.
2. Spurious radiation on frequencies closer than 20 dB to the limit in the pre-measurement is scanned 0-360 degrees and the antenna is scanned 1- 4 m for maximum response. The emission is then measured with the RMS detector and the RMS value is reported. Frequencies closer than 10 dB to the limit when measured with the RMS detector were measured with the substitution method according to the standard.

Representative test set-up for Single mode during the spurious radiation measurements is shown in the picture below:

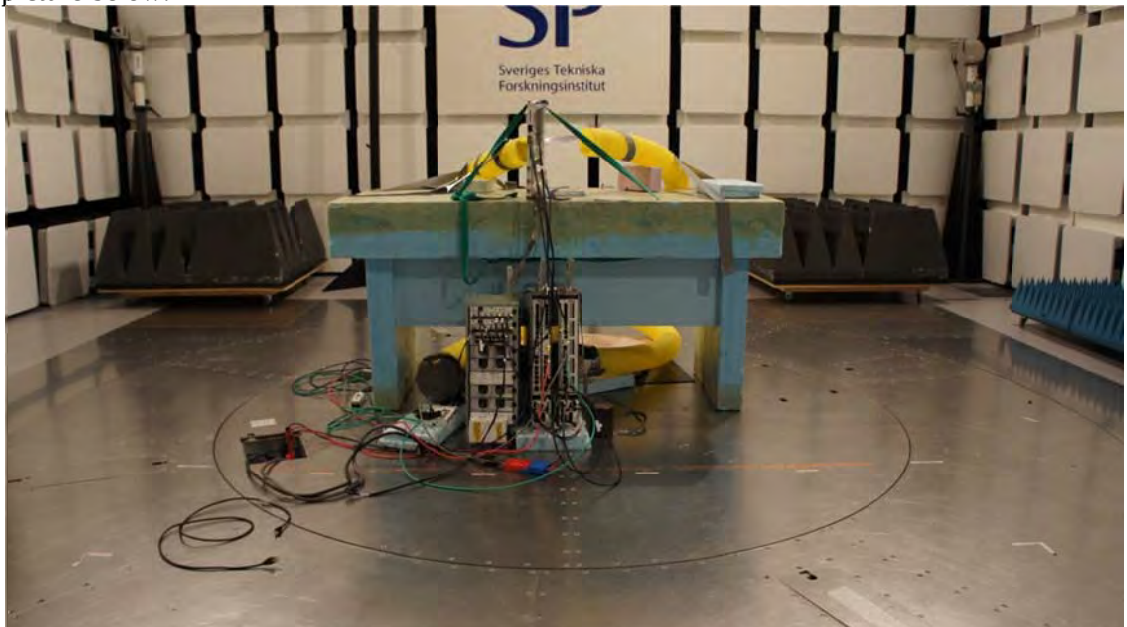


## Appendix 6

Representative test set-up for MIMO during the spurious radiation measurements is shown in the picture below:



Representative test set-up for MSR during the spurious radiation measurements is shown in the picture below:



## Appendix 6

### Measurement equipment

| Measurement equipment                    | SP number |
|------------------------------------------|-----------|
| Semi anechoic chamber                    | 503 881   |
| R&S ESU 26                               | 901 553   |
| EMC 32 ver. 8.52.0                       | 503 745   |
| Chase Bilog Antenna CBL 6111A            | 503 182   |
| EMCO Horn Antenna 3115                   | 502 175   |
| High pass filter, RLC Electronics        | 901 373   |
| µComp Nordic, Low Noise Amplifier        | 901 545   |
| Testo 625 temperature and humidity meter | 504 188   |

### Test frequencies

LTE single RAT, single carrier conventional mode:  
M, BW 1.4 MHz

LTE single RAT, single carrier MIMO mode:  
B, BW 1.4 MHz  
M, BW 1.4, 3, 5, 10, 15, 20 MHz  
T, BW 1.4MHz

LTE single RAT, multi carrier MIMO mode:  
B3, BW 1.4MHz

WCDMA single RAT, single carrier conventional mode:  
B, BW 5MHz  
M, BW 5MHz  
T, BW 5MHz

WCDMA single RAT, multi carrier MIMO mode:  
B2, BW 5MHz  
M2, BW 5MHz  
T2, BW 5MHz

GSM single RAT, single carrier:  
B, GMSK

GSM single RAT, multi carrier:  
B2, GMSK  
M2, GMSK  
T2, GMSK

MSR, WCDMA + GSM:  
Config 3  
Config 4

See appendix 1 for all frequency settings during radiated measurements.

## Appendix 6

### Results

Measured worst case emission results are presented on the following pages.

Diagram 1 a-b: LTE single RAT, MIMO mode, frequency B, single carrier, BW 1.4 MHz

Diagram 2 a-b: WCDMA single RAT, conventional mode, frequency B, BW 5 MHz

Diagram 3 a-b: GSM single RAT, multi carrier, frequency B2

Diagram 4 a-b: MSR, WCDMA +GSM conventional mode, Configuration 4

| Frequency<br>(MHz) | Spurious emission level (dBm)     |                                   |
|--------------------|-----------------------------------|-----------------------------------|
|                    | Vertical                          | Horizontal                        |
| 30 - 9 000         | All emissions > 20 dB below limit | All emissions > 20 dB below limit |

**Measurement uncertainty:** 3.2 dB

### Remarks

The upper frequency bound for verification was chosen as 9 GHz in order to cover 10 x the maximum fundamental test object TX frequency.

A RBW of 1 MHz was chosen to embrace both FCC and IC requirements. Where different limits apply the most restrictive limit was applied for compliance assessment.

### Limits

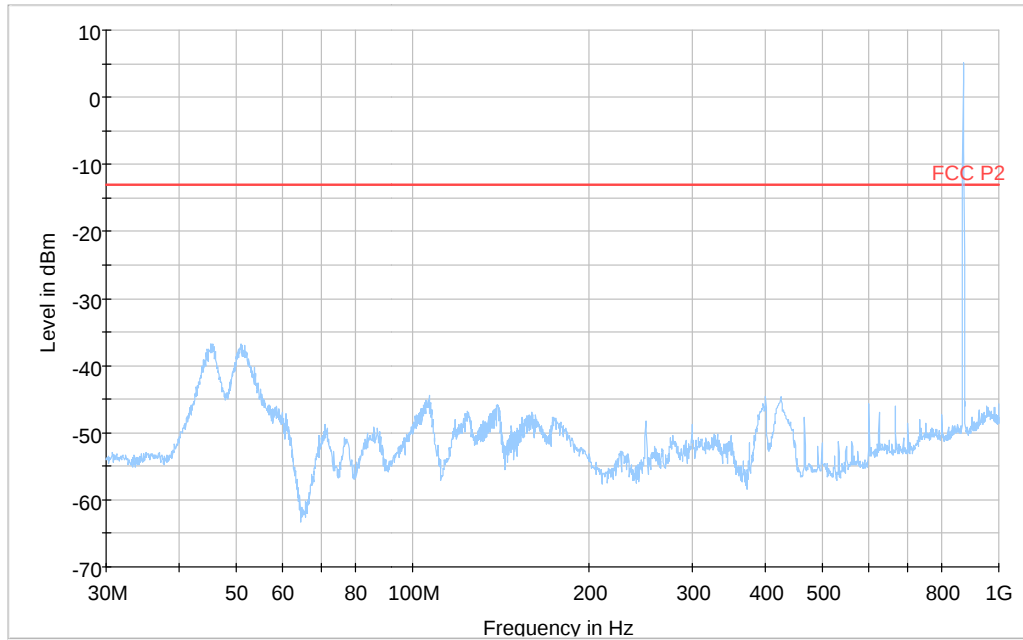
CFR 47 § 22.917 and IC RSS-132 5.5

Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB, resulting in a limit of -13 dBm per any 100 kHz bandwidth.

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

## Appendix 6

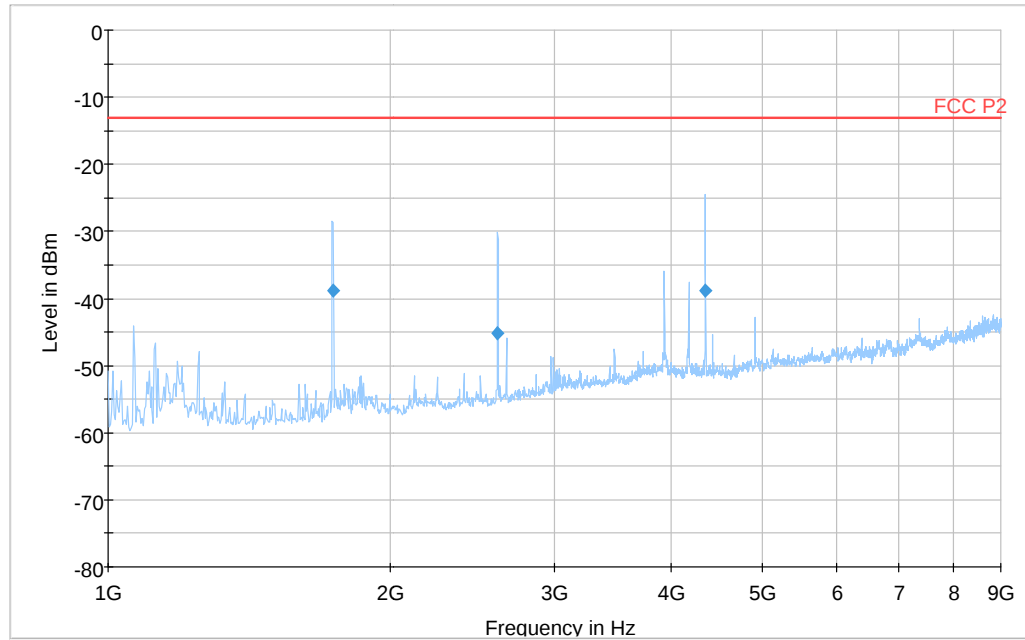
Diagram 1 a:



Note: The emission at 869.7 MHz is the carrier frequency and shall be ignored in this context.

## Appendix 6

Diagram 1 b:

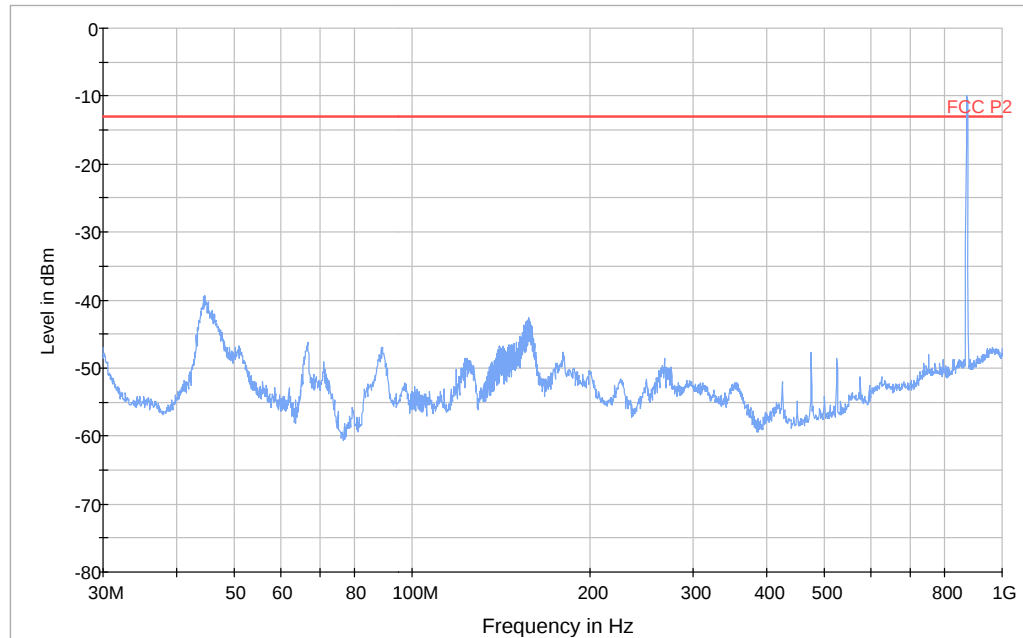


## Final RMS Result

| Frequency (MHz) | RMS (dBm) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBm) |
|-----------------|-----------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|-------------|
| 1739.072        | -38.8     | 5000.0          | 1000.000        | 121.0       | H            | 139.0         | -111.8     | 25.8        | -13.0       |
| 2608.765        | -45.2     | 5000.0          | 1000.000        | 108.0       | H            | 17.0          | -109.4     | 32.2        | -13.0       |
| 4347.791        | -38.8     | 5000.0          | 1000.000        | 140.0       | V            | 72.0          | -103.7     | 25.8        | -13.0       |

## Appendix 6

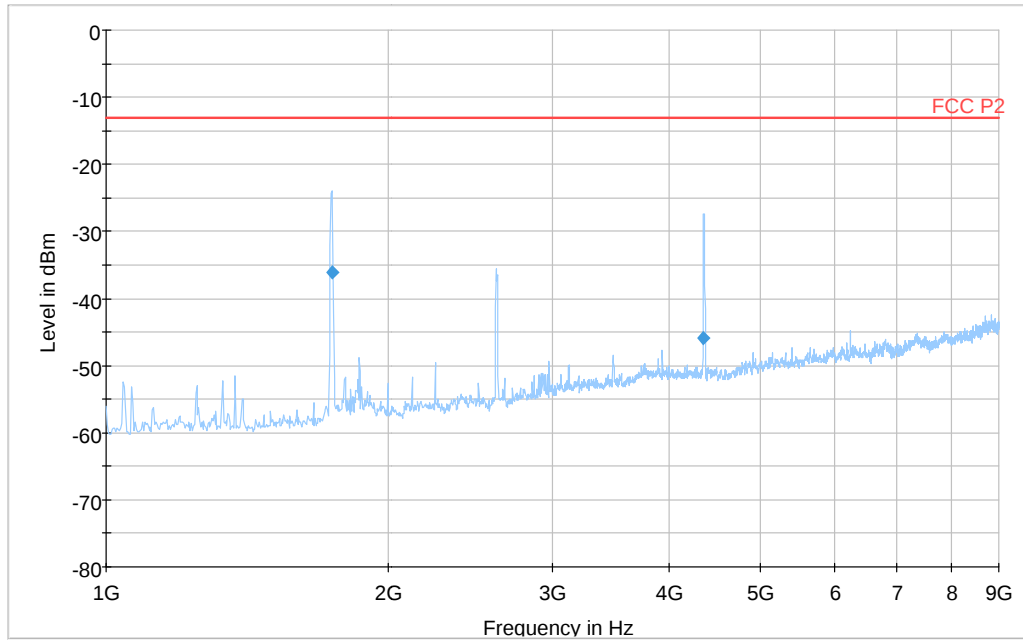
Diagram 2 a:



Note: The emission at 869.4 MHz is the carrier frequency and shall be ignored in the context.

## Appendix 6

Diagram 2 b:

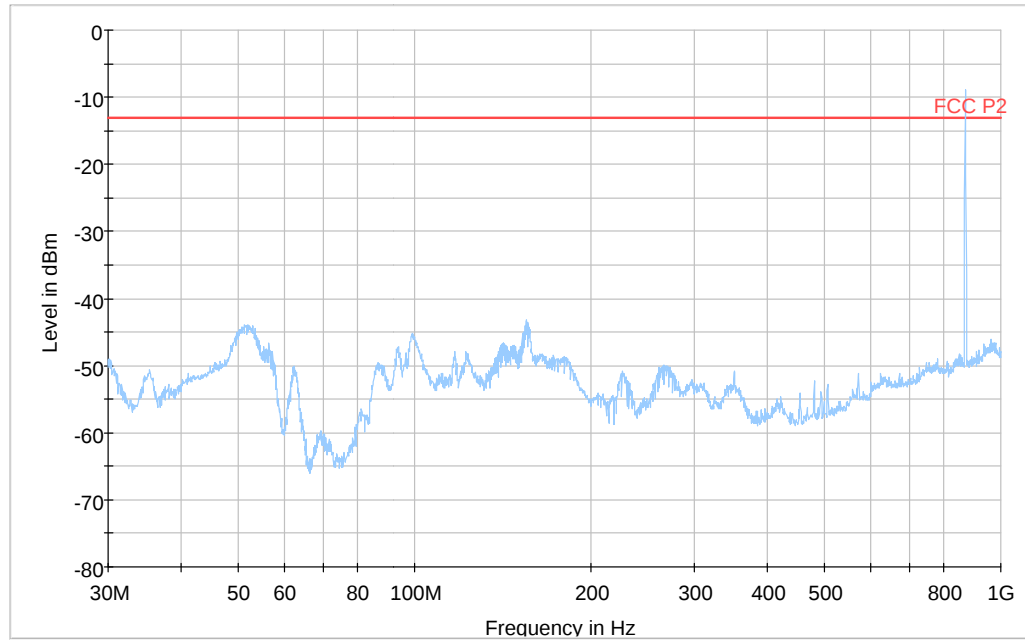


## Final RMS Result

| Frequency (MHz) | RMS (dBm) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBm) |
|-----------------|-----------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|-------------|
| 1744.986        | -36.2     | 5000.0          | 1000.000        | 160.0       | V            | 133.0         | -111.6     | 23.2        | -13.0       |
| 4352.458        | -46.0     | 5000.0          | 1000.000        | 132.0       | V            | 78.0          | -103.7     | 33.0        | -13.0       |

## Appendix 6

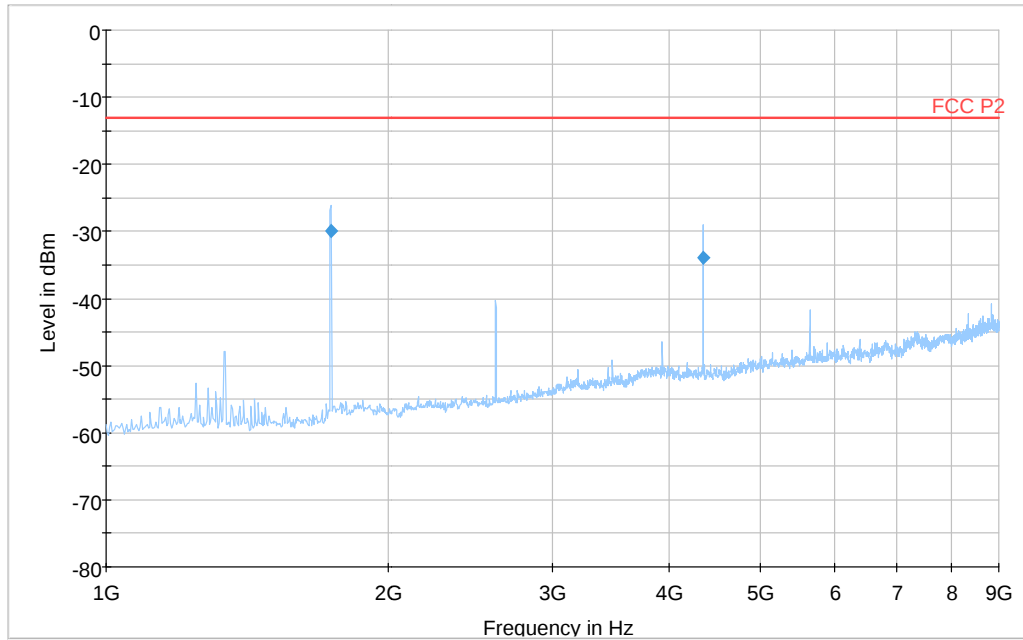
Diagram 3 a:



Note: The emissions between 869 MHz and 870 MHz are the carrier frequencies and shall be ignored in this context.

## Appendix 6

Diagram 3 b:

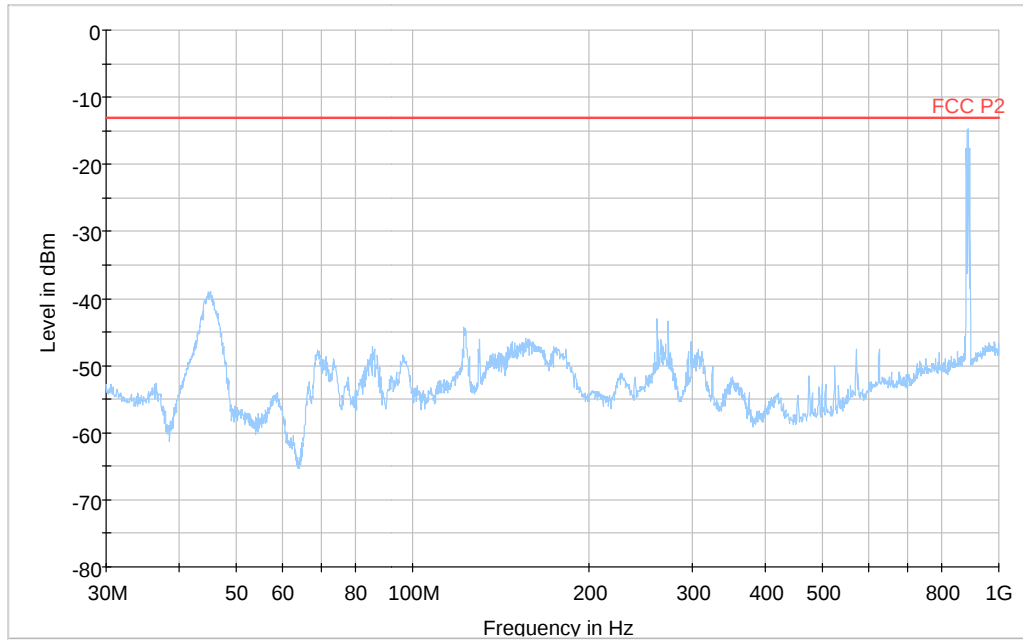


### Final RMS Result

| Frequency (MHz) | RMS (dBm) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBm) |
|-----------------|-----------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|-------------|
| 1739.436        | -30.0     | 5000.0          | 1000.000        | 200.0       | V            | 132.0         | -111.8     | 17.0        | -13.0       |
| 4348.627        | -33.8     | 5000.0          | 1000.000        | 142.0       | V            | 90.0          | -103.7     | 20.8        | -13.0       |

## Appendix 6

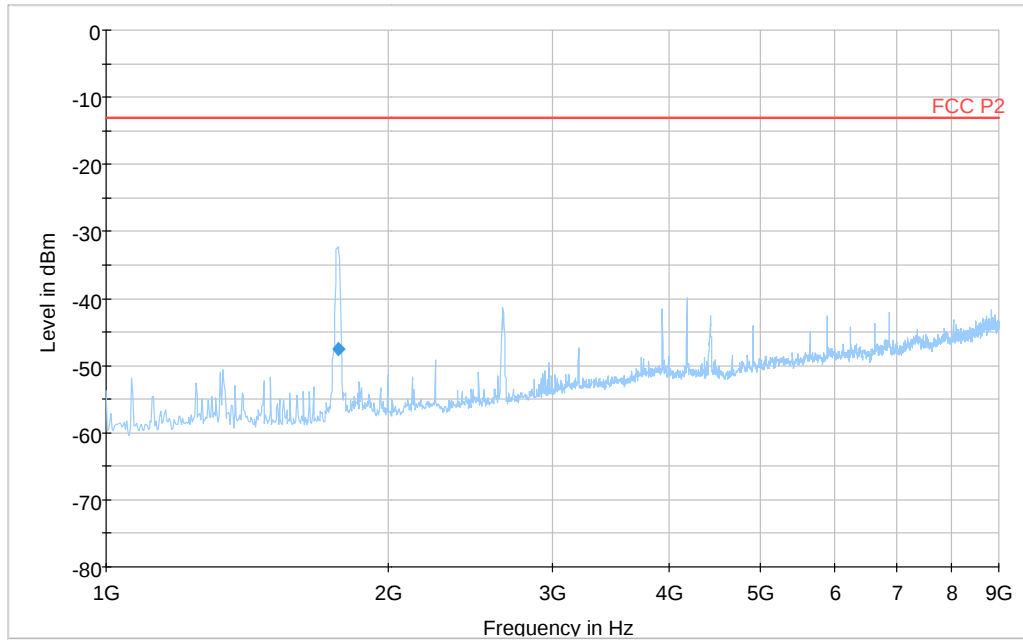
Diagram 4 a:



Note: The emission between 897 MHz and 892 MHz are the carrier frequencies and shall be ignored in this context.

## Appendix 6

Diagram 4 b:



### Final RMS Result

| Frequency (MHz) | RMS (dBm) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin (dB) | Limit (dBm) |
|-----------------|-----------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------|-------------|
| 1770.166        | -47.5     | 5000.0          | 1000.000        | 200.0       | V            | 130.0         | -111.4     | 34.5        | -13.0       |

## Appendix 7

### External photos

Front side:



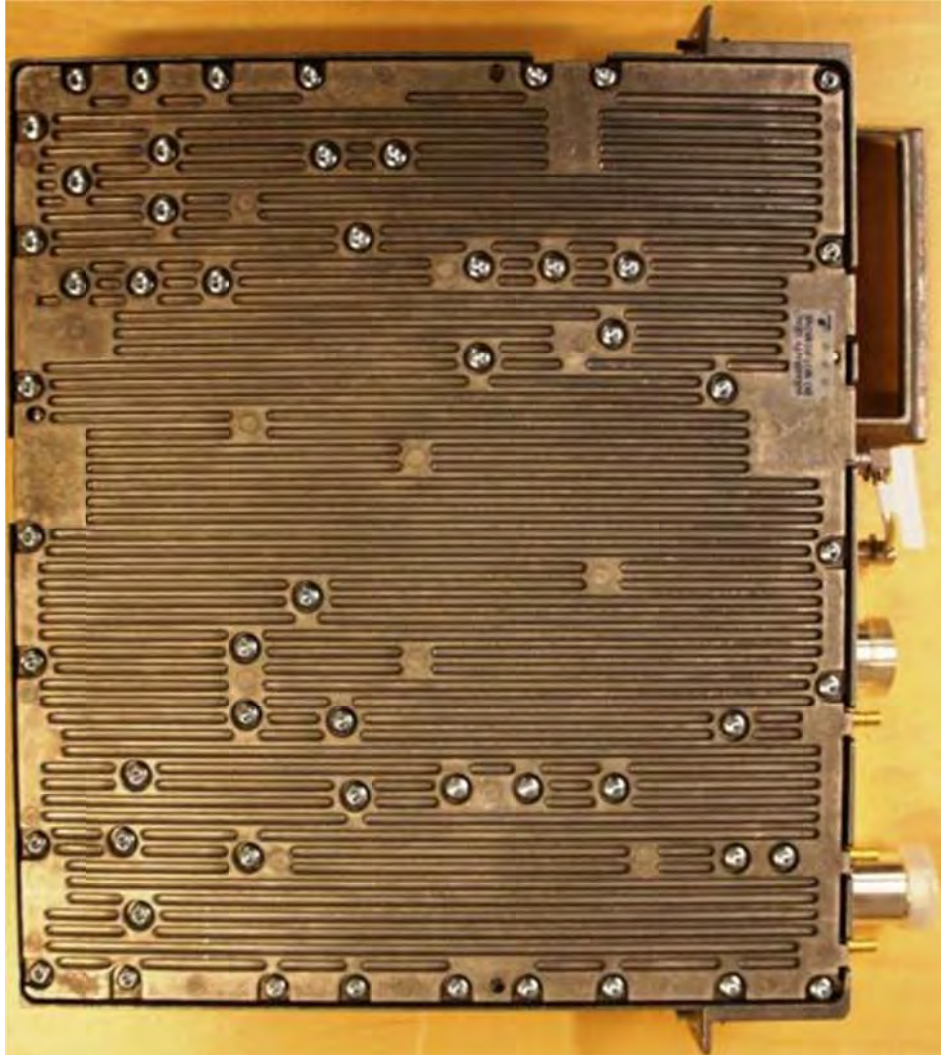
Rear side



FCC ID: TA8AKRC11864-3  
IC: 287AB-AS118643  
IC MODEL NO: AS118643

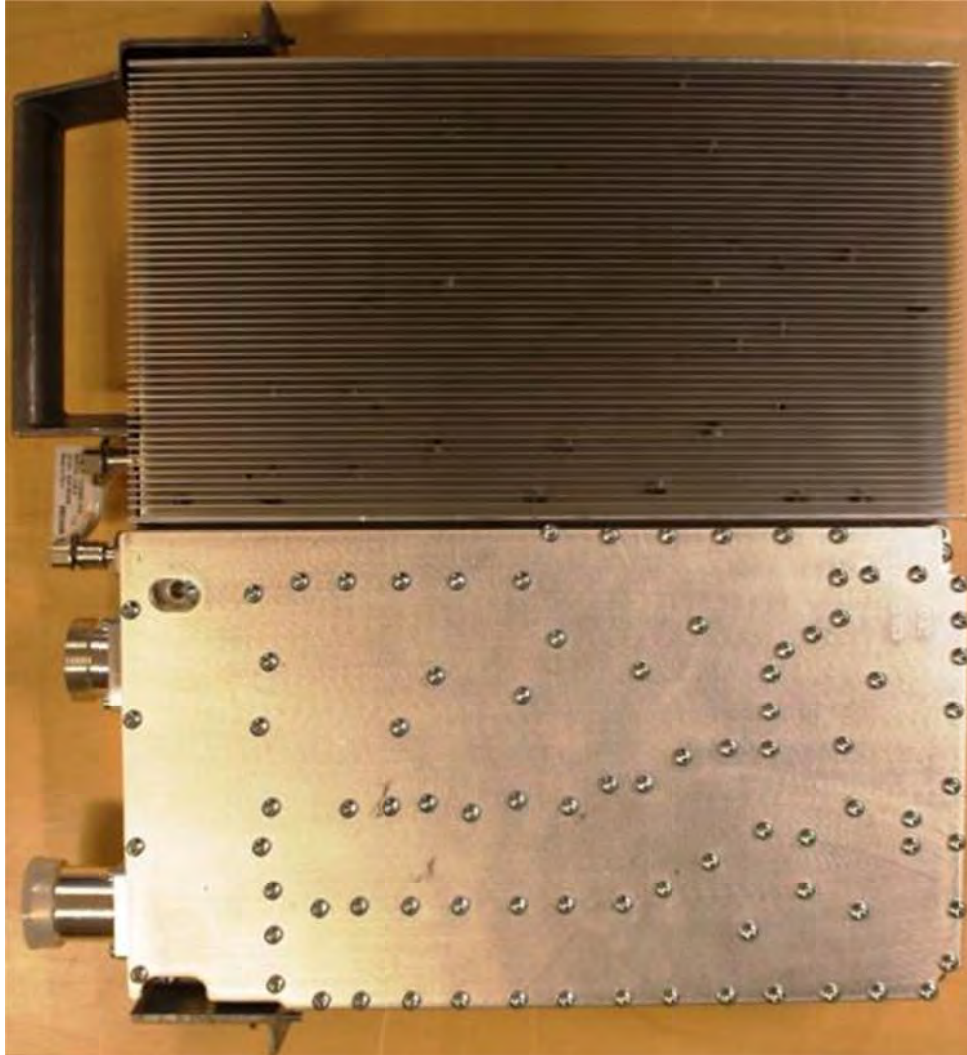
## Appendix 7

Left side



## Appendix 7

Right side



## Appendix 7

Top side



Bottom side

