# REPORT

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| Date | Reference | Page |
|---|---|---|
| 2014-10-08 | 4P06091-F27 | 1 (2) |

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## Radio measurements on RD 2242 B4 with FCC ID TA8AKRY901309-1

(9 appendices)

### Test object

Product name: RD 2242 B4
Product number: KRY 901 309/1, R1A

### Summary

See appendix 1 for general information and appendix 9 for external photos.

| Standard | | Compliant | Appendix |
|---|---|---|---|
| **FCC CFR 47** | | | |
| | | | |
| 2.1046 | RF power output conducted | Yes | 2 |
| 2.1046 | RF power output radiated | Yes | 3 |
| 2.1049 | Occupied bandwidth | Yes | 4 |
| 2.1051 | Band edge | Yes | 5 |
| 2.1051 | Spurious emission at antenna terminals | Yes | 6 |
| 2.1053 | Field strength of spurious radiation | Yes | 7 |
| 2.1055 | Frequency stability | Yes | 8 |

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## Table of contents

Appendix 1

## Description of the test object

| | |
|---|---|
| Radio equipment: | RD 2242 B4<br>Product number: KRY 901 309/1<br>FCC ID TA8AKRY901309-1 |
| Tested configuration: | LTE single RAT |
| Frequency bands: | TX: 2110 – 2155 MHz<br>RX: 1710 – 1755 MHz |
| Antenna ports: | 2 TX/RX ports, (internally connected to integrated Omni directional antenna elements) |
| RF configuration: | Single carrier, multi carrier,TX-diversity and MIMO 2x2 |
| Nominal output power per antenna port: | Single carrier: 1x 17 dBm (1 x 50mW)<br>Multi carrier: 2 x 14 dBm (2 x 25mW) |
| Antenna type: | Omni directional antenna |
| Antenna gain: | 2.3 dBi |
| Channel bandwidths: | Singel carrier: 5 MHz, 10 MHz, 15 MHz and 20 MHz<br>Multi carrier: 5 MHz, 10 MHz, 15 MHz and 20 MHz |
| Modulations: | QPSK, 16QAM and 64QAM |
| Nominal supply voltage: | -48VDC |

**Operation mode during measurements**

Measurements were performed with the test object transmitting test models as defined in 3GPP TS 36.141. Test model E-TM1.1 represent QPSK modulation, test model E-TM3.2 represent 16QAM modulation and test model E-TM3.1 represent 64QAM modulation.

The settings below were deemed representative for all traffic scenarios when settings with different modulations, channel bandwidths, number of carriers and RF configurations has been tested to find the worst case setting. All measurements were performed with the test object configured for maximum transmit power. The settings below were used for all measurements if not otherwise noted.

MIMO mode, single carrier, E-TM1.1
MIMO mode, multi carrier, 2 carriers, E-TM1.1

**Cable configurations between RD and IRU**

The cables, used during tests, correspond to minimum and maximum length, according to relevant parameters in table 2, see RDI Guidelines 56/1553-LZA 701 6009. The following cable configurations has been used:

RDI Cable 20m: total cabel length 20m patch cables included.

RDI Cable 52m: total cabel length 52m patch cables included.

RDI Cable 154m: total cabel length 154m patch cables included.

| | |
|---|---|
| Patch cable | Cat 6a Schneider Electric Actassi CL-MNC6A |
| RDI cable | Cat 6a Schneider Electric Actassi CL-MXC6A |

**Conducted measurements**

The conducted measurements were performed on RD 2242 B4 with product number KRY 901 309/1.

The test object was mounted in a fixture powered by the RDI LAN cable.
All TX parameters were measured at port RF B with port RF A terminated into 50 ohm. Complete measurements were made on RF B with additional measurements on RF A to verify that the ports are identical.

**Radiated measurements**

The test object was mounted in a fixture and powered by the RDI LAN cable. In field strength of spurios radition both RF ports were terminated into 50 ohm. For RF power output measurement the internal antenna was used.

## Purpose of test

The purpose of the tests is to verify compliance to the performance characteristics specified in applicable items of FCC CFR 47.

## References

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

ANSI 63.4-2009
ANSI/TIA/EIA-603-C-2004
3GPP TS 36.141, version 11.4.0
CFR 47 part 2, October 1st , 2013
CFR 47 part 27, October 1st, 2013

## 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.

## Delivery of test object

The test object was delivered 2014-09-15.

## Manufacturer’s representative

Christer Gustavsson, Ericsson AB.

## Test engineers

Andreas Johnson, Tomas Lennhager, Maulo Rivera, Tomas Isbring, Patric Augustsson and Jörgen Wassholm, SP.

## Test participant

Mikael Jansson, Ericsson AB.

## Measurement equipment

| | Calibration Due | SP number |
|---|---|---|
| Test site Tesla | 2017-01 | 503 881 |
| R&S ESU 26 | 2015-05 | 901 553 |
| R&S ESI 26 | 2015-07 | 503 292 |
| R&S FSQ 40 | 2015-07 | 504 143 |
| R&S FSW 43 | 2015-07 | 902 073 |
| R&S FSIQ 40 | 2015-07 | 503 738 |
| Control computer with R&S software EMC32 version 8.52.0 | - | 503 899 |
| High pass filter | 2015-01 | BX40074 |
| High pass filter | 2015-07 | 901 501 |
| High pass filter | 2015-07 | 901 502 |
| High pass filter | 2015-07 | 504 199 |
| High pass filter | 2015-07 | 901 373 |
| High pass filter | 2016-07 | 503 739 |
| High pass filter | 2015-07 | 503 740 |
| RF attenuator | 2016-07 | 503 248 |
| RF attenuator | 2016-06 | 503 249 |
| RF attenuator | 2015-08 | 504 159 |
| RF attenuator | 2015-07 | 900 233 |
| RF attenuator | 2015-06 | 901 384 |
| RF attenuator | 2014-11 | 901 508 |
| Chase Bilog Antenna CBL 6111A | 2014-10 | 503 182 |
| EMCO Horn Antenna 3115 | 2016-09 | 502 175 |
| µComp Nordic, Low Noise Amplifier | 2015-01 | 901 545 |
| Flann STD Gain Horn Antenna 16240-25 | - | 503 939 |
| Flann STD Gain Horn Antenna 18240-25 | - | 503 900 |
| Flann STD Gain Horn Antenna 20240-20 | - | 503 674 |
| Miteq, Low Noise Amplifier | 2015-08 | 503 285 |
| Schwarzbeck preamplifier BBV 9742 | 2015-01 | 504 085 |
| Temperature and humidity meter, Testo 635 | 2015-03 | 504 203 |
| Temperature and humidity meter, Testo 625 | 2015-06 | 504 188 |
| Temperature Chamber | - | 503 360 |
| Multimeter Fluke 87 | 2015-08 | 502 190 |

Appendix 1

## Test frequencies used for conducted and radiated measurements

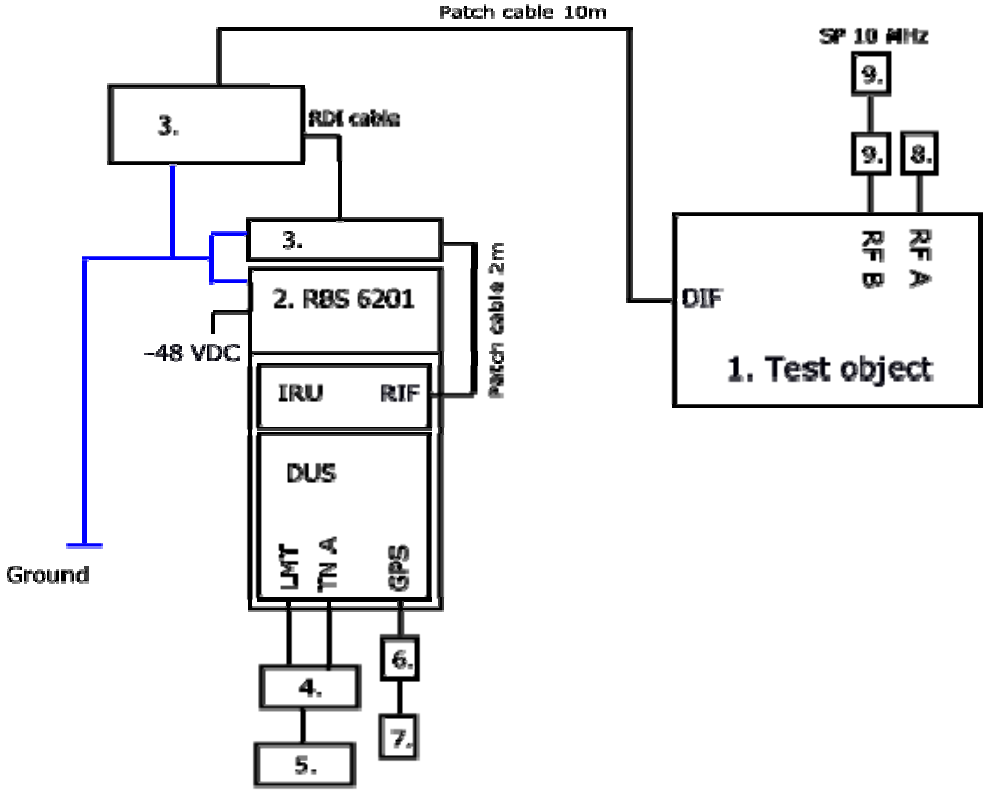
TX test frequencies

| EARFCN Downlink | Frequency [MHz] | Symbolic name | Comment |
|---|---|---|---|
| Single carrier: | | | |
| 1975 | 2112.5 | B | TX bottom frequency in 5 MHz BW configuration |
| 2000 | 2115.0 | B | TX bottom frequency in 10 MHz BW configuration |
| 2025 | 2117.5 | B | TX bottom frequency in 15 MHz BW configuration |
| 2050 | 2120.0 | B | TX bottom frequency in 20 MHz BW configuration |
| 2175 | 2132.5 | M | TX band mid frequency all BW configurations |
| 2375 | 2152.5 | T | TX top frequency in 5 MHz BW configuration |
| 2350 | 2150.0 | T | TX top frequency in 10 MHz BW configuration |
| 2325 | 2147.5 | T | TX top frequency in 15 MHz BW configuration |
| 2300 | 2145.0 | T | TX top frequency in 20 MHz BW configuration |
| Multi carrier: | | | |
| 1975<br>2025 | 2112.5<br>2117.5 | B2-5 | 2 carrier TX band bottom constellation<br>5 MHz BW configuration |
| 2000<br>2100 | 2115.0<br>2125.0 | B2-10 | 2 carrier TX band bottom constellation<br>10 MHz BW configuration |
| 2025<br>2175 | 2117.5<br>2132.5 | B2-15 | 2 carrier TX band bottom constellation<br>15 MHz BW configuration |
| 2075<br>2275 | 2122.5<br>2142.5 | B2-20 | 2 carrier TX band bottom constellation<br>20 MHz BW configuration |
| 2150<br>2200 | 2130.0<br>2135.0 | M2-5 | 2 carrier TX band mid constellation<br>5 MHz BW configuration |
| 2125<br>2225 | 2127.5<br>2137.5 | M2-10 | 2 carrier TX band mid constellation<br>10 MHz BW configuration |
| 2325<br>2375 | 2147.5<br>2152.5 | T2-5 | 2 carrier TX band top constellation<br>5 MHz BW configuration |
| 2100<br>2262 | 2125.0<br>2141.2 | Bim | 2 carrier TX band 5 MHz BW configuration |
| 2088<br>2250 | 2123.8<br>2140.0 | Tim | 2 carrier TX 5 MHz BW configuration |

All RX frequencies were configured 400 MHz below the corresponding TX frequency according the applicable duplex offset for the operating band.

Appendix 1

**Test setup conducted measurements**




**Test object**

| | |
|---|---|
| 1. | RD 2242 B4, KRY 901 309/1, revision R1A, s/n: C828247906<br>(FCC ID TA8AKRY901309-1)<br>with software: CXP 901 3268/14, revision R59BF |

**Associated equipment:**

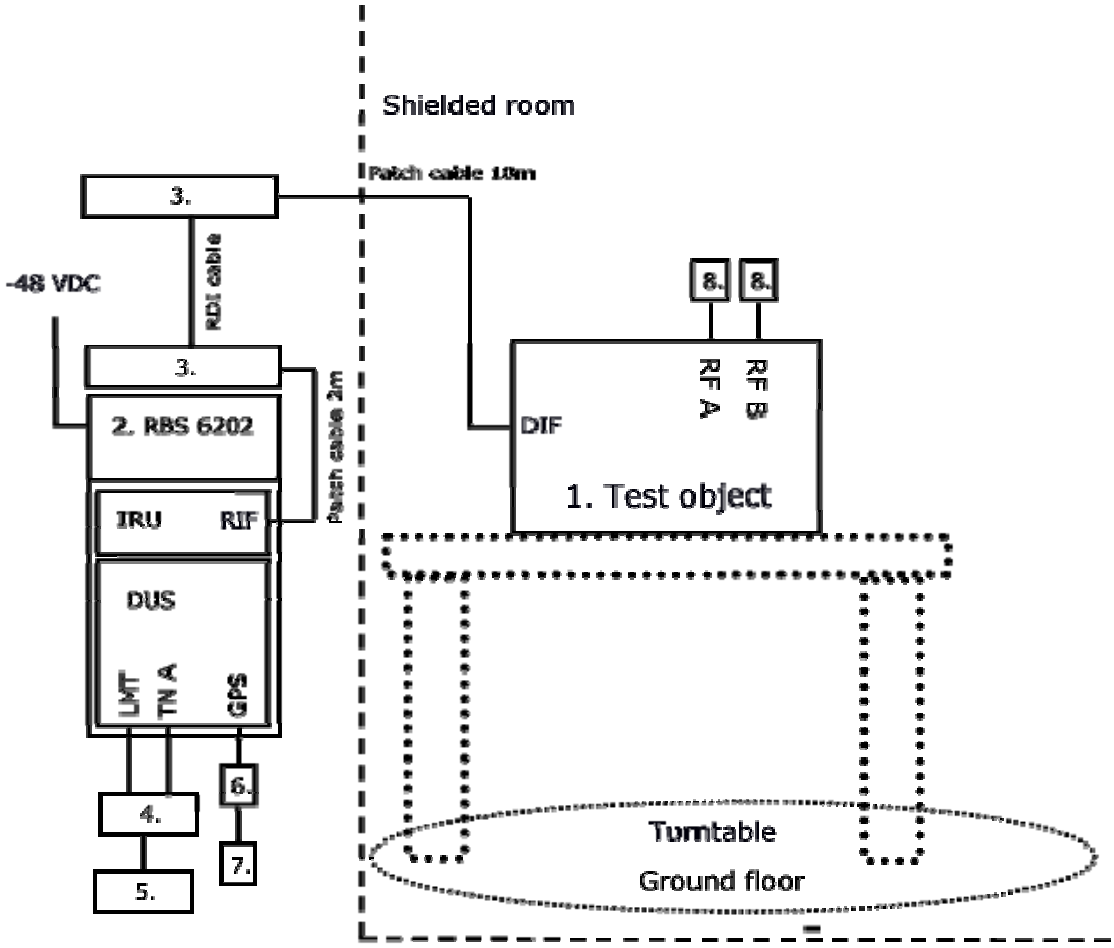
| | |
|---|---|
| 2. | RBS 6201:<br>DUS 41 01, KDU 137 624/1, revision R5A/A, s/n: D16A866441<br>IRU 2242, KRC 161 444/1, revision R1A, s/n: C828298520, Note: With the R1B version of the TRX RX VU card. |
| 3. | Patch panel, BGK 901 55/1, revision R1A, s/n: - |
| 6. | GPS 02 01, NCD 901 41/1, revision R1D, s/n: TU8K474887 |
| 7. | GPS Active Antenna, KRE 101 2082/1 |

**Functional test equipment:**

| | |
|---|---|
| 4. | Switch Netgear GSM 7224, BAMS – 1001356228 |
| 5. | Laptop EliteBook 8540w, BAMS – 1001052032 |
| 8. | Attenuator/ Terminator 50 ohm |
| 9. | SP test instrument according measurement equipment list |

Appendix 1

**Test setup radiated measurements**




**Test object:**

| | |
|---|---|
| 1. | RD 2242 B4, KRY 901 309/1, revision R1A, s/n: C828247906<br>(FCC ID TA8AKRY901309-1)<br>Software: CXP 901 3268/14, revision R59BF |

**Associated equipment:**

| | |
|---|---|
| 2. | RBS 6202:<br>DUS 41 01, KDU 137 624/1, revision R5A/A, s/n: D16E975923<br>IRU 2242, KRC 161 444/1, revision R1A, s/n: C828298523 Note: With the R1B version of the TRX RX VU card. |
| 3. | Patch panel, BGK 901 55/1, revision R1A, s/n: - |
| 6. | GPS 02 01, NCD 901 41/1, revision R1D, s/n: TU8K388084 |
| 7. | GPS Active Antenna, KRE 101 2082/1 |

**Functional test equipment:**

| | |
|---|---|
| 4. | Switch Netgear GSM 7224, BAMS – 1001356228 |
| 5. | Laptop EliteBook 8540w, BAMS – 1001052032 |
| 8. | Attenuator/ Terminator 50 ohm |

Appendix 1

| **Interfaces:** | **Type of port:** |
|---|---|
| Antenna port (A), hirose connector | Antenna (Test port) |
| Antenna port (B), hirose connector | Antenna (Test port) |
| DIF, Patch cable Cat 6a Schneider Electric Actassi CL-MNC6A | Signal |
| RDI, Cat 6a Schneider Electric Actassi CL-MXC6A | Signal |

**RBS software:**

| **Software** | **Revision** |
|---|---|
| CXP 102 051/22 | R27CY |

Appendix 2

## RF power output measurements according to CFR 47 §27.50, conducted

| Date | Temperature | Humidity |
|---|---|---|
| 2014-09-22 | 22 °C ± 3 °C | 38 % ± 5 % |
| 2014-09-23 | 23 °C ± 3 °C | 25 % ± 5 % |
| 2014-09-24 | 23 °C ± 3 °C | 41 % ± 5 % |
| 2014-10-06 | 23 °C ± 3 °C | 25 % ± 5 % |

### Test set-up and procedure

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

| Measurement equipment | SP number |
|---|---|
| R&S FSW | 902 073 |
| RF attenuator | 900 691 |
| Testo 635, temperature and humidity meter | 504 203 |

**Measurement uncertainty:** 1.1 dB

### Results

MIMO mode, single carrier

Configuration: RDI Cable 20m

Rated output power level at RF connector 1x 17 dBm.

| Carrier BW [MHz] | Symbolic name | [RMS dBm/ PAR dB] | | |
|---|---|---|---|---|
| | | Port RF A | Port RF B | Total power[1)] |
| 5 | B | 16.82/ 6.94 | 18.40/ 7.06 | 20.69 |
| 10 | B | 15.99/6.94 | 17.00/ 7.04 | 19.53 |
| 15 | B | 15.82/6.98 | 16.72/ 7.06 | 19.30 |
| 20 | B | 16.40/ 6.96 | 17.01/ 7.06 | 19.73 |
| 5 | M | 16.40/ 6.92 | 17.60/ 6.86 | 20.05 |
| 20 | M | 15.94/ 7.04 | 16.70/ 7.00 | 19.35 |
| 5 | T | 14.95/ 7.00 | 15.76/ 7.08 | 18.38 |
| 20 | T | 15.05/ 7.36 | 15.78/ 7.42 | 18.44 |

[1)]: Summed output power according to FCC KDB662911 Multiple transmitter output v02r01.

Note: The PAR value is the 0.1 % Peak to Average Ratio.

Configuration: RDI Cable 52m

Rated output power level at RF connector 1x 17 dBm.

| Carrier BW [MHz] | Symbolic name | [RMS dBm/ PAR dB] | | |
|---|---|---|---|---|
| | | Port RF A | Port RF B | Total power[1)] |
| 5 | B | 15.53/ 6.96 | 18.00/ 7.06 | 19.95 |
| 20 | B | 15.32/ 7.36 | 17.21/ 7.04 | 19.38 |
| 5 | M | 15.31/ 6.86 | 17.40/ 6.86 | 19.49 |
| 20 | M | 15.60/ 7.02 | 16.94/ 6.98 | 19.33 |
| 5 | T | 14.33/ 7.00 | 16.50/ 7.06 | 18.56 |
| 20 | T | 15.36/ 7.36 | 16.70/ 7.42 | 19.01 |

[1)]: Summed output power according to FCC KDB662911 Multiple transmitter output v02r01.

Note: The PAR value is the 0.1 % Peak to Average Ratio.

Configuration: RDI Cable 154m

Rated output power level at RF connector 1x 17 dBm.

| Carrier BW [MHz] | Symbolic name | [RMS dBm/ PAR dB] | | |
|---|---|---|---|---|
| | | Port RF A | Port RF B | Total power[1)] |
| 5 | B | 15.80/ 6.98 | 17.52/ 7.06 | 19.75 |
| 20 | B | 16.01/ 6.92 | 17.25/ 7.02 | 19.68 |
| 5 | M | 16.32/ 6.90 | 17.21/ 6.86 | 19.80 |
| 20 | M | 16.18/ 7.04 | 16.54/ 6.98 | 19.37 |
| 5 | T | 16.22/ 7.00 | 17.08/ 7.06 | 19.68 |
| 20 | T | 16.33/ 7.38 | 16.79/ 7.48 | 19.57 |

[1)]: Summed output power according to FCC KDB662911 Multiple transmitter output v02r01.

Note: The PAR value is the 0.1 % Peak to Average Ratio.

MIMO mode, multi carrier

Configuration: RDI Cable 20m

Rated output power level at RF connector 2x 14 dBm.

| Carrier BW [MHz] | Symbolic name | [RMS dBm/ PAR dB] | | |
|---|---|---|---|---|
| | | Port RF A | Port RF B | Total power[1)] |
| 5 | B2-5 | 16.28/ 6.96 | 17.34/ 7.04 | 19.67 |
| 10 | B2-10 | 15.76/ 6.96 | 16.74/ 7.04 | 19.29 |
| 15 | B2-15 | 16.15/ 7.34 | 16.49/ 7.10 | 19.33 |
| 20 | B2-20 | 15.18/ 7.68 | 16.08/ 7.68 | 18.66 |
| 5 | M2-5 | 15.78/ 6.94 | 16.11/ 6.92 | 18.43 |
| 5 | T2-5 | 14.76/ 7.16 | 15.04/ 7.22 | 17.91 |

[1)]: Summed output power according to FCC KDB662911 D01 Multiple transmitter output v02r01.

Note: The PAR value is the 0.1 % Peak to Average Ratio.

Configuration: RDI Cable 154m

Rated output power level at RF connector 2x 14 dBm.

| Carrier BW [MHz] | Symbolic name | [RMS dBm/ PAR dB] | | |
|---|---|---|---|---|
| | | Port RF A | Port RF B | Total power[1)] |
| 5 | B2-5 | 16.38/ 6.96 | 17.88/ 7.02 | 20.20 |
| 10 | B2-10 | 15.55/ 6.90 | 17.21/ 7.00 | 19.47 |
| 15 | B2-15 | 15.73/ 7.00 | 17.25/7.02 | 19.57 |
| 20 | B2-20 | 16.26/ 7.70 | 17.10/ 7.70 | 19.71 |
| 5 | M2-5 | 16.56/ 6.94 | 17.31/ 6.90 | 19.99 |
| 5 | T2-5 | 16.61/ 7.16 | 17.51/ 7.16 | 20.39 |

[1)]: Summed output power according to FCC KDB662911 D01 Multiple transmitter output v02r01.

Note: The PAR value is the 0.1 % Peak to Average Ratio.

MIMO mode, single carrier

Configuration: RDI Cable 20m

Measured output power per 1 MHz.

| Carrier BW [MHz] | Symbolic name | [RMS dBm] | | Total power[1)] [RMS dBm] |
|---|---|---|---|---|
| | | Port RF A | Port RF B | |
| 5 | B | 10.58 | 11.63 | 14.63 |
| 10 | B | 7.06 | 8.20 | 11.20 |
| 15 | B | 5.07 | 6.24 | 9.24 |
| 20 | B | 4.70 | 5.35 | 8.35 |
| 5 | M | 10.26 | 10.48 | 13.48 |
| 20 | M | 3.72 | 4.77 | 7.77 |
| 5 | T | 8.76 | 9.23 | 12.23 |
| 20 | T | 3.42 | 4.30 | 7.30 |

[1)]: Measured according to FCC KDB662911 D01 Multiple Transmitter Output v02r01. Method E), 2), c). “Measure and add 10 log($N_{Ant}$)”.

Configuration: RDI Cable 52m

Measured output power per 1 MHz.

| Carrier BW [MHz] | Symbolic name | [RMS dBm] | | Total power[1)] [RMS dBm] |
|---|---|---|---|---|
| | | Port RF A | Port RF B | |
| 5 | B | 10.46 | 11.51 | 14.51 |
| 20 | B | 3.81 | 5.53 | 8.53 |
| 5 | M | 10.12 | 10.59 | 13.59 |
| 20 | M | 3.57 | 4.95 | 7.95 |
| 5 | T | 9.54 | 9.94 | 12.94 |
| 20 | T | 3.62 | 5.26 | 8.26 |

[1)]: Measured according to FCC KDB662911 D01 Multiple Transmitter Output v02r01. Method E), 2), c). “Measure and add 10 log($N_{Ant}$)”.

Configuration: RDI Cable 54m

Measured output power per 1 MHz.

| Carrier BW [MHz] | Symbolic name | [RMS dBm] | | Total power[1)] [RMS dBm] |
|---|---|---|---|---|
| | | Port RF A | Port RF B | |
| 5 | B | 9.87 | 11.63 | 14.63 |
| 20 | B | 3.76 | 5.40 | 8.40 |
| 5 | M | 10.07 | 11.32 | 14.32 |
| 20 | M | 3.88 | 5.06 | 8.06 |
| 5 | T | 10.05 | 11.56 | 14.56 |
| 20 | T | 4.14 | 5.43 | 8.43 |

[1)]: Measured according to FCC KDB662911 D01 Multiple Transmitter Output v02r01. Method E), 2), c). "Measure and add 10 log($N_{Ant}$)".

**Limits**

§27.50:

There is no maximum output power specified for base stations transmitting in the 2110-2155 MHz band. However, a licensee operating a base or fixed station in the 2110-2155 MHz band utilizing a power greater than 1640 watts EIRP and greater than 1640 watts/MHz EIRP must coordinate such operations in advance with the parties addressed in the rules.
In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

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

Appendix 3

## RF power output measurements according to CFR 47 §27.50, radiated

| Date | Temperature | Humidity |
|---|---|---|
| 2014-09-18 | 22°C ± 3°C | 45 % ± 5 % |

### Test set-up and procedure

The measurements were performed according to ANSI C63.4-2009.

The test was performed with continuous transmission.

The test of radiated emission was performed in a semi anechoic chamber. The measurements were performed with both horizontal and vertical polarizations of the antenna. The antenna distance was 3.0 m.

The fundamental was scanned with PEAK-detector with the antenna height was varied between 1-4 m and the turntable was rotated between 0-360 degrees for maximum response. The carrier power was measured with RMS- detector activated with a RBW of 1 MHz. The output power was verified with the substitution method .The antenna distance during the measurements was 3.0 m.

### 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 |
| EMCO Horn Antenna 3115 | 502 175 |
| EMCO Horn Antenna 3115 | 902 212 |
| R&S SMB 100A | 900 120 |
| Attenuator 20 dB | BX41643 |
| Testo 635 temperature and humidity meter | 504 203 |

### Measurement uncertainty:

3.1 dB

The test set-up during the effective radiated output power measurements is shown in the picture below, side mounted.


The test set-up during the effective radiated output power measurements is shown in the picture below, upright mounted.

**Results**

Upright mounted

| Bandwidth configuration (MHz) | Tested frequency B | | Tested frequency M | | Tested frequency T | |
|---|---|---|---|---|---|---|
| | Vertical/Horizontal RMS power (EIRP) | | Vertical/Horizontal RMS power (EIRP) | | Vertical/Horizontal RMS power (EIRP) | |
| | dBm/ MHz | mW/ MHz | dBm/ MHz | mW/ MHz | dBm/ MHz | mW/ MHz |
| 5 | 5.8/ 7.9 | 3.8/ 6.2 | 7.8/ 7.1 | 6.0/ 5.1 | 7.6/ 8.5 | 5.8/ 7.1 |
| 10 | - | - | 4.8/ 4.4 | 3.0/ 2.8 | - | - |
| 15 | | | 3.8/ 2.7 | 2.4/ 1.9 | | |
| 20 | | | 2.8/ 1.7 | 1.9/ 1.5 | | |

Side mounted

| Bandwidth configuration (MHz) | Tested frequency B | | Tested frequency M | | Tested frequency T | |
|---|---|---|---|---|---|---|
| | Vertical/Horizontal RMS power (EIRP) | | Vertical/Horizontal RMS power (EIRP) | | Vertical/Horizontal RMS power (EIRP) | |
| | dBm/ MHz | mW/ MHz | dBm/ MHz | mW/ MHz | dBm/ MHz | mW/ MHz |
| 5 | 4.2/ 6.2 | 2.6/ 4.2 | 5.5/ 6.0 | 3.5/ 4.0 | 6.5/ 7.9 | 4.5/ 6.2 |
| 10 | - | - | 1.8/ 3.7 | 1.5/ 2.3 | - | - |
| 15 | | | 0.4/ 1.7 | 1.1/ 1.5 | | |
| 20 | | | -0.6/ 1.4 | 0.9/ 1.4 | | |

§27.50:

There is no maximum output power specified for base stations transmitting in the 2110-2155 MHz band. However, a licensee operating a base or fixed station in the 2110-2155 MHz band utilizing a power greater than 1640 watts EIRP and greater than 1640 watts/MHz EIRP must coordinate such operations in advance with the parties addressed in the rules.
In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

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

## Occupied bandwidth measurements according to 47 CFR 2.1049

| Date | Temperature | Humidity |
|---|---|---|
| 2014-09-24 | 23 °C ± 3 °C | 41 % ± 5 % |

### Test set-up and procedure

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

| Measurement equipment | SP number |
|---|---|
| R&S FSW 43 | 902 073 |
| RF attenuator | 900 691 |
| Testo 635, temperature and humidity meter | 504 203 |

Measurement uncertainty: 3.7 dB

### Results

Configuration: RDI Cable 20m

MIMO mode, single carrier

| Diagram | BW configuration | Tested frequency | Tested Port | Occupied BW (99%) [MHz] |
|---|---|---|---|---|
| 1 | 5 MHz | B | RF B | 4.48 |
| 2 | 20 MHz | B | RF B | 17.85 |
| 3 | 5 MHz | M | RF B | 4.48 |
| 4 | 5 MHz | M | RF A | 4.48 |
| 5 | 10 MHz | M | RF B | 8.93 |
| 6 | 15 MHz | M | RF B | 13.41 |
| 7 | 20 MHz | M | RF B | 17.86 |
| 8 | 20 MHz | M | RF A | 17.85 |
| 9 | 5 MHz | T | RF B | 4.47 |
| 10 | 20 MHz | T | RF B | 17.81 |

Configuration: RDI Cable 154m

MIMO mode, single carrier

| Diagram | BW configuration | Tested frequency | Tested Port | Occupied BW (99%) [MHz] |
|---|---|---|---|---|
| 11 | 5 MHz | B | RF B | 4.48 |
| 12 | 20 MHz | B | RF B | 17.86 |
| 13 | 5 MHz | M | RF B | 4.48 |
| 14 | 5 MHz | M | RF A | 4.48 |
| 15 | 10 MHz | M | RF B | 8.93 |
| 16 | 15 MHz | M | RF B | 13.42 |
| 17 | 20 MHz | M | RF B | 17.87 |
| 18 | 20 MHz | M | RF A | 17.86 |
| 19 | 5 MHz | T | RF B | 4.47 |
| 20 | 20 MHz | T | RF B | 17.82 |

Appendix 4

Diagram 1:

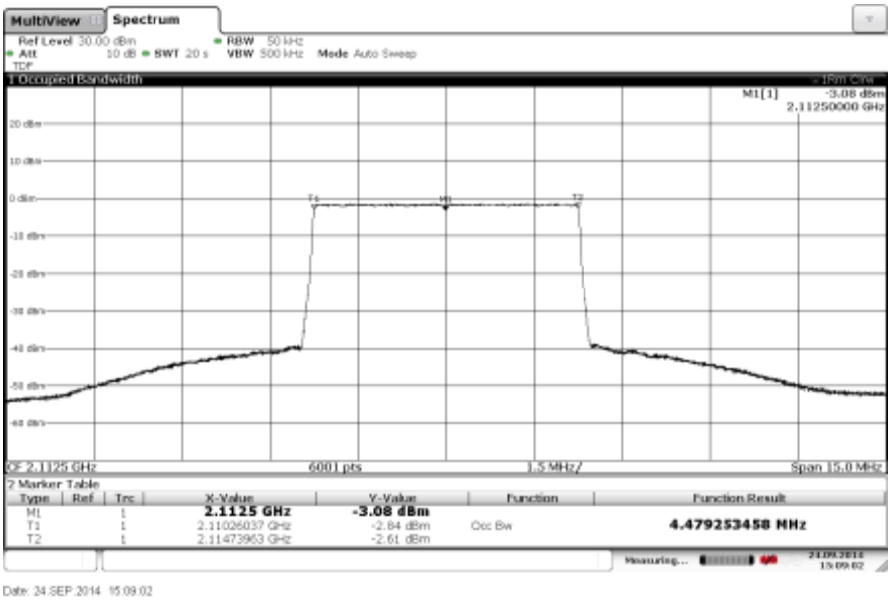



Diagram 2:

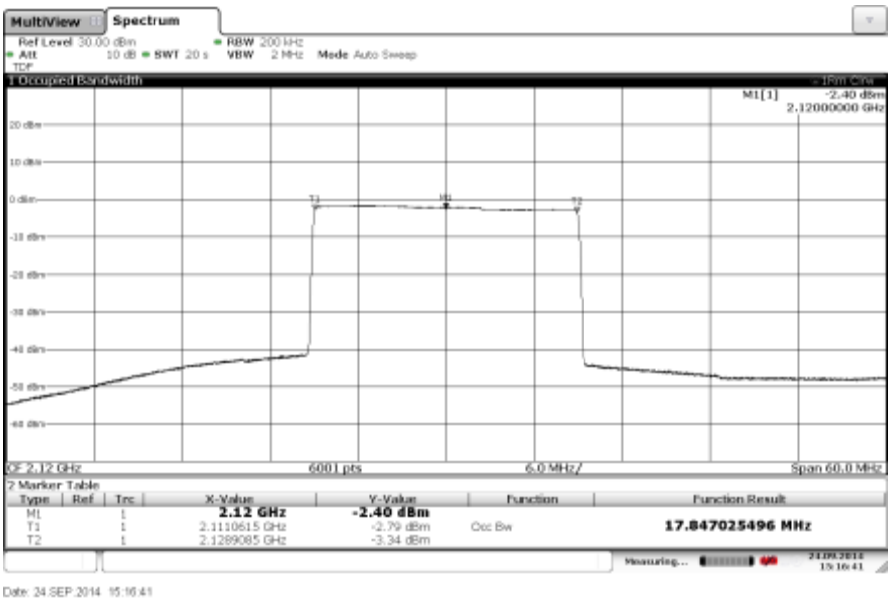


Diagram 3:

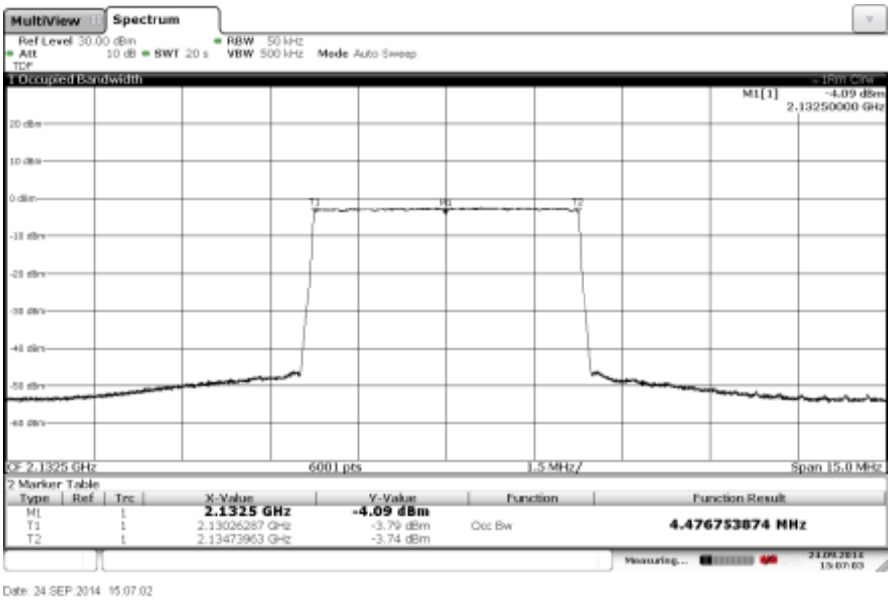



Diagram 4:

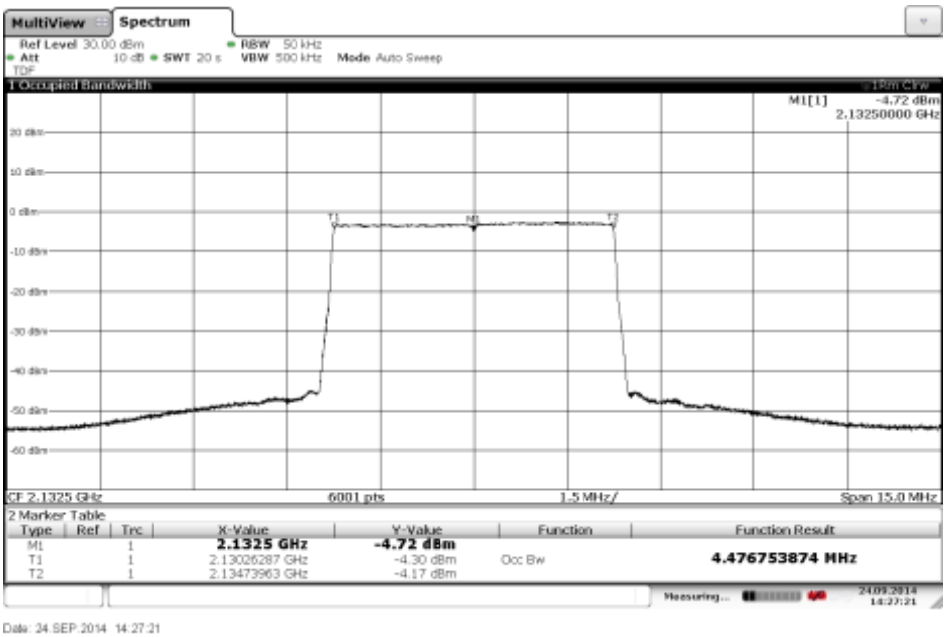


Diagram 5:

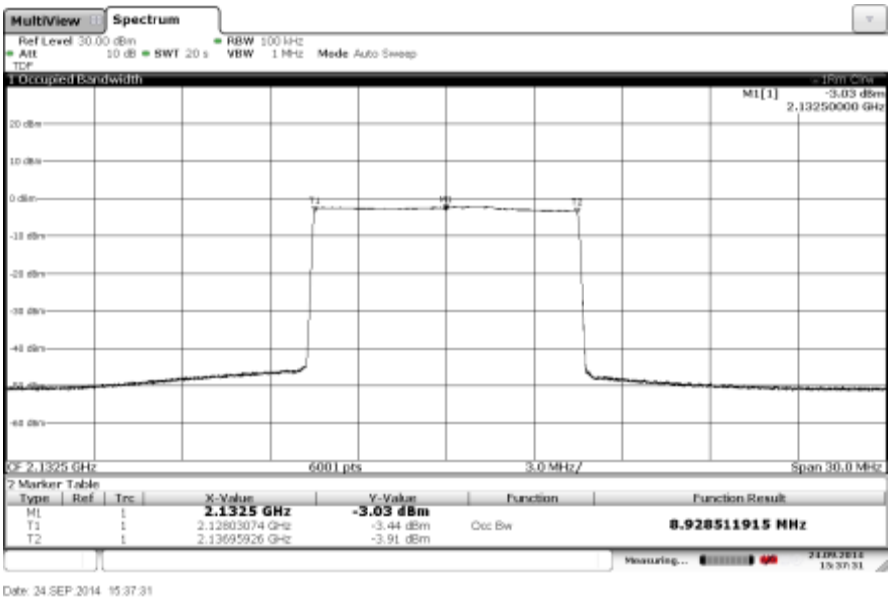



Diagram 6:

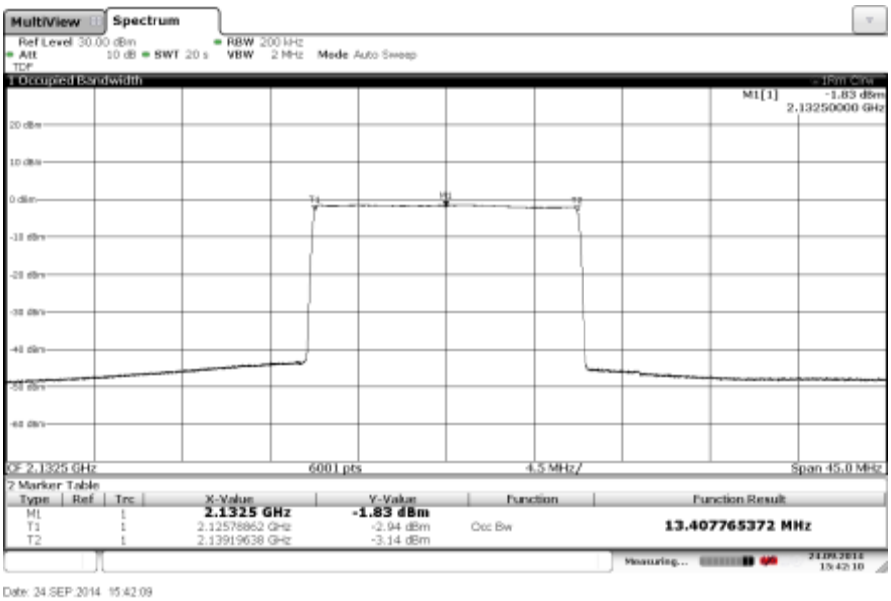


Diagram 7:

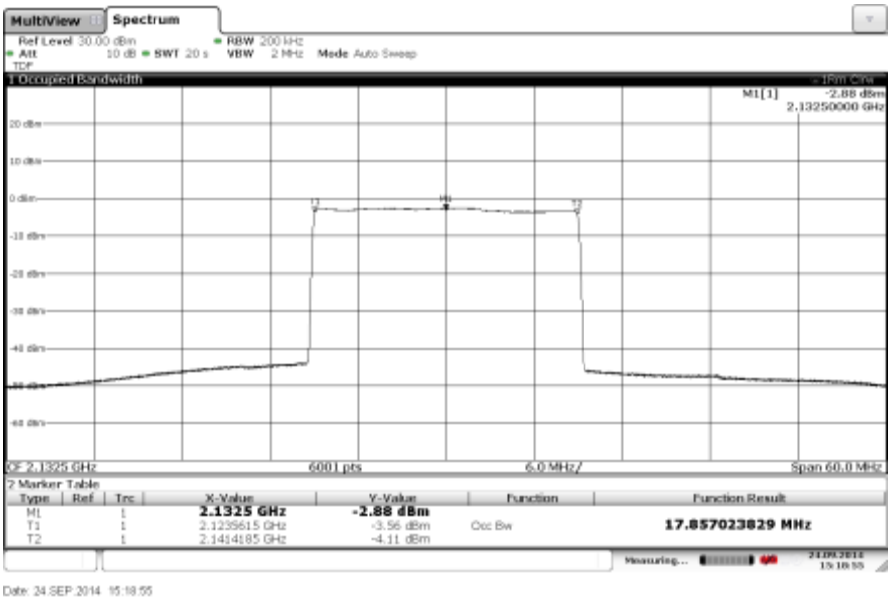
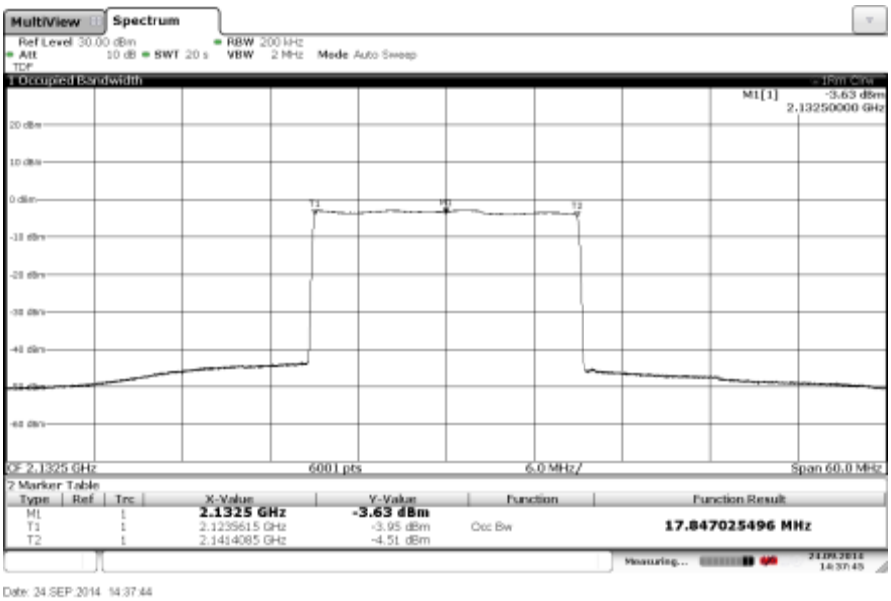



Diagram 8:



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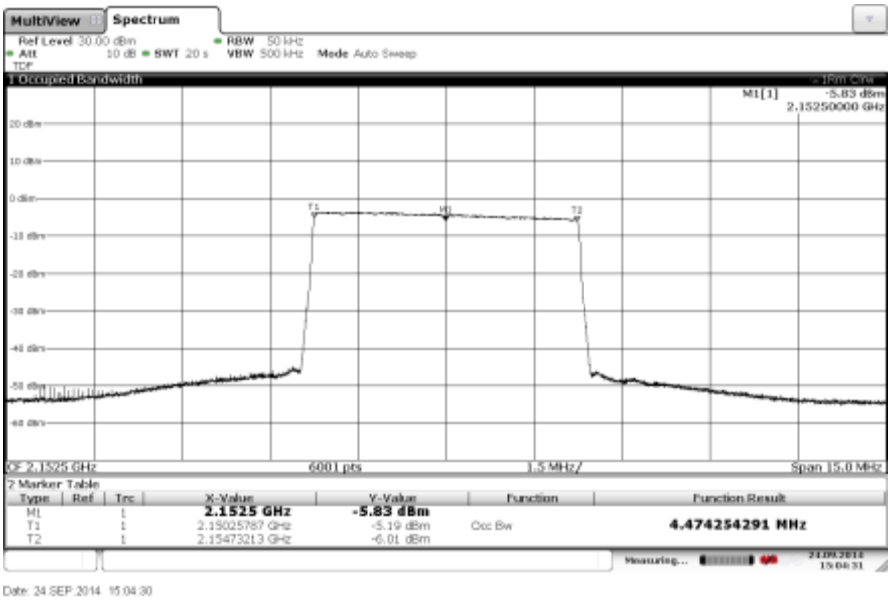



Diagram 10:

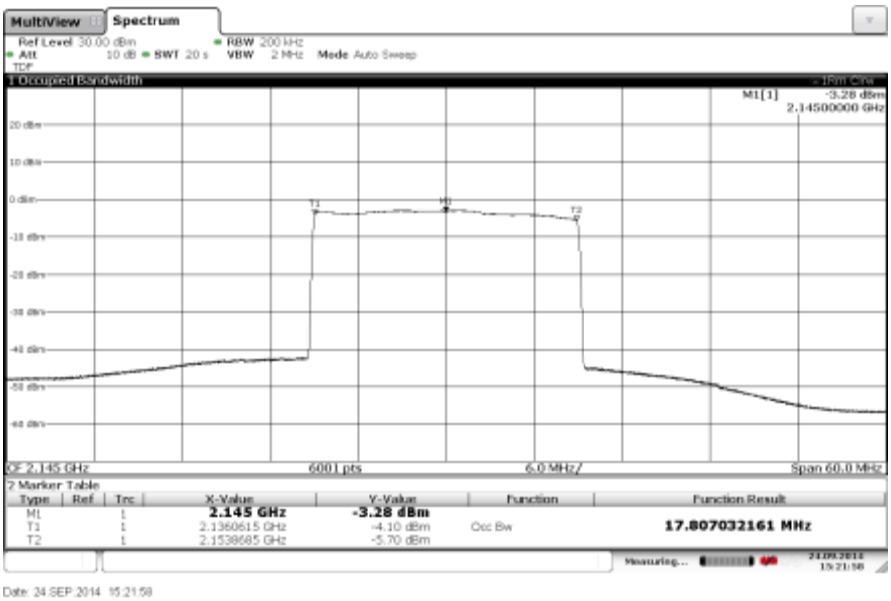


Diagram 11:

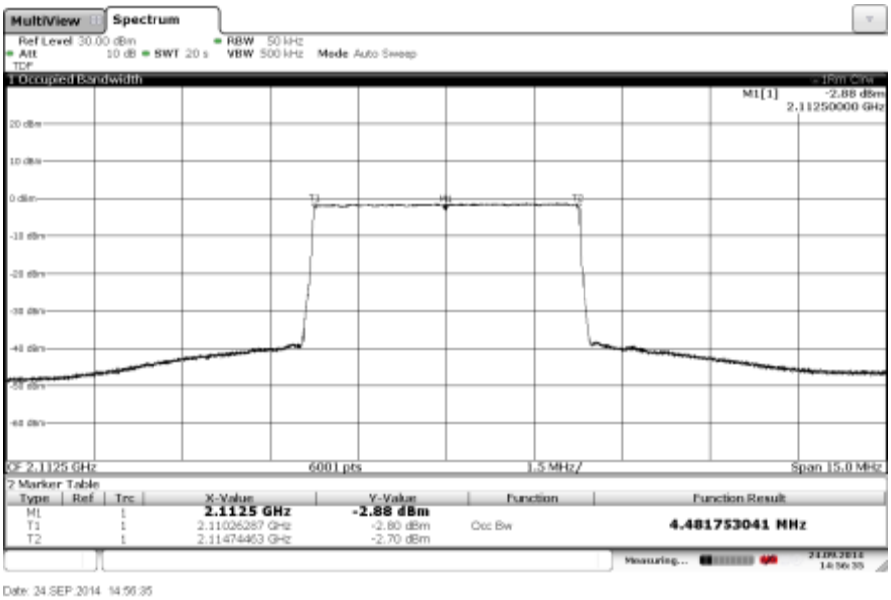
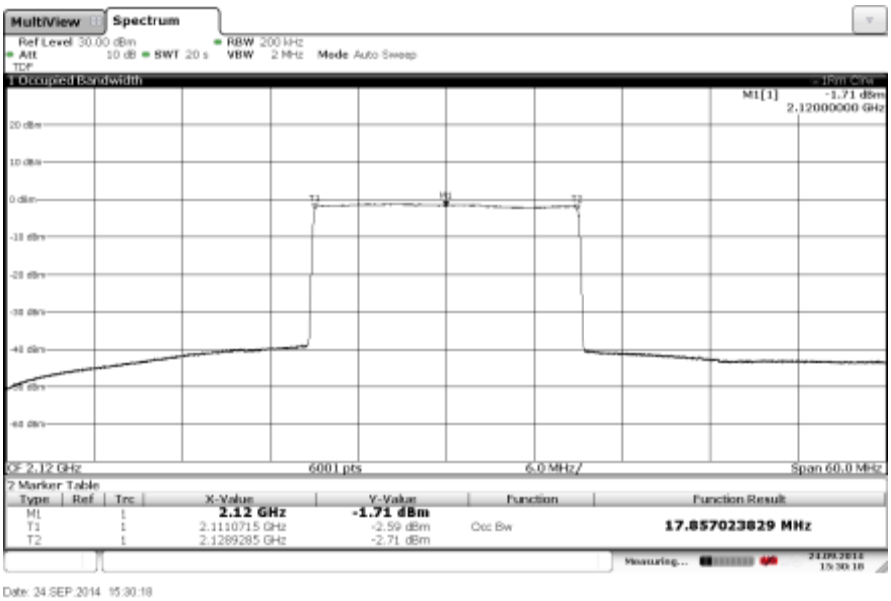



Diagram 12:



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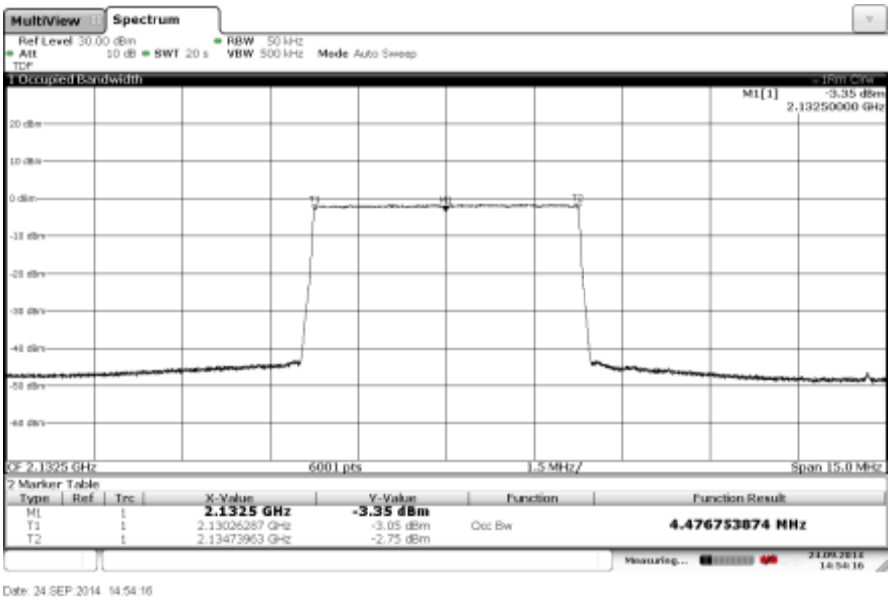



Diagram 14:

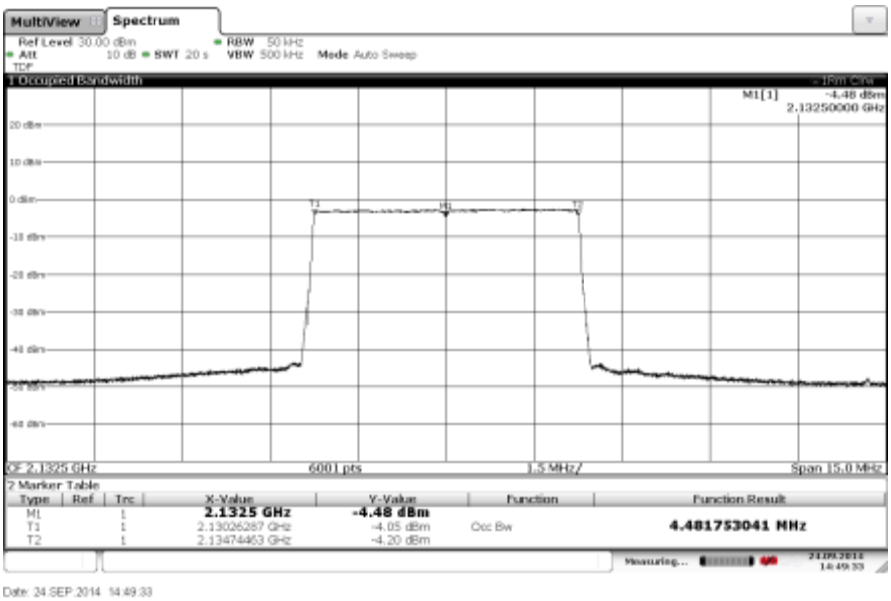


Diagram 15:

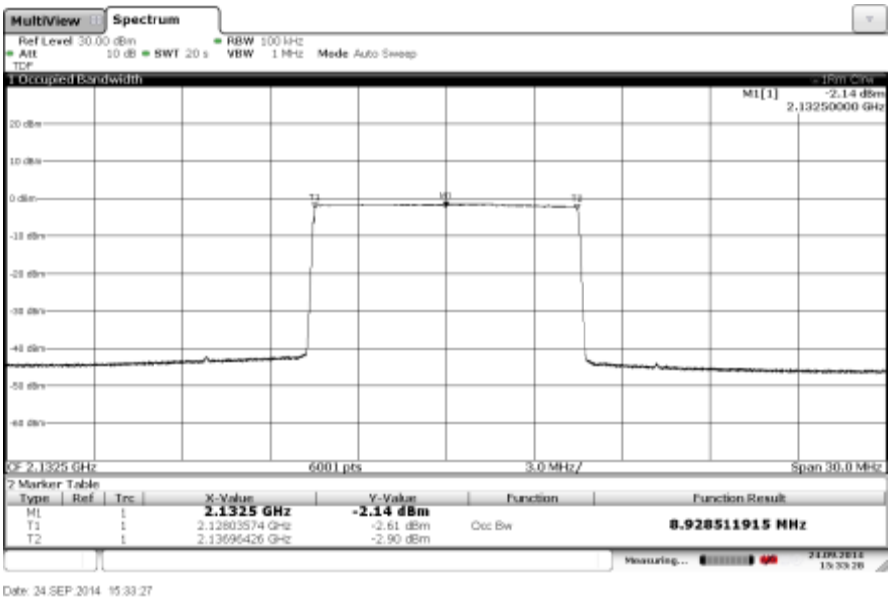



Diagram 16:

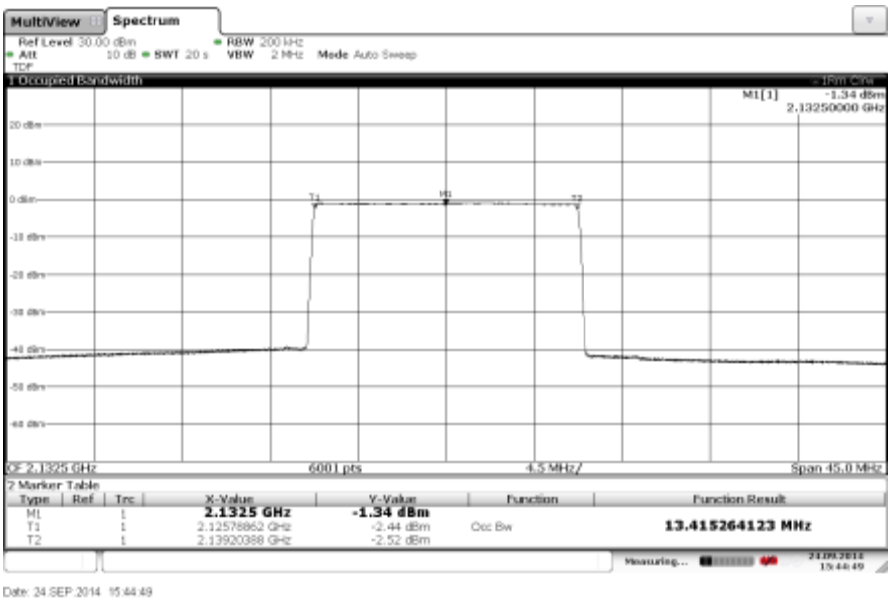
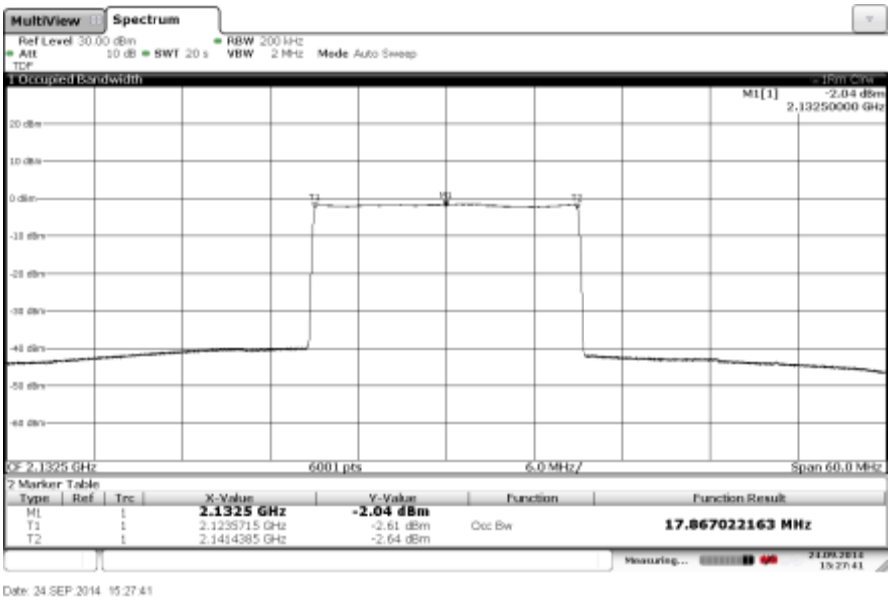


Diagram 17:

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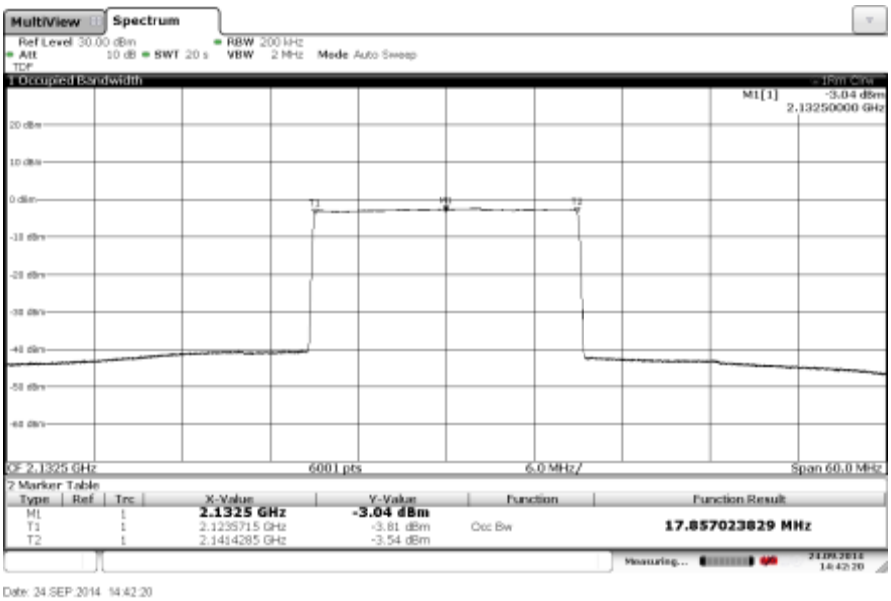


Appendix 4

Diagram 19:

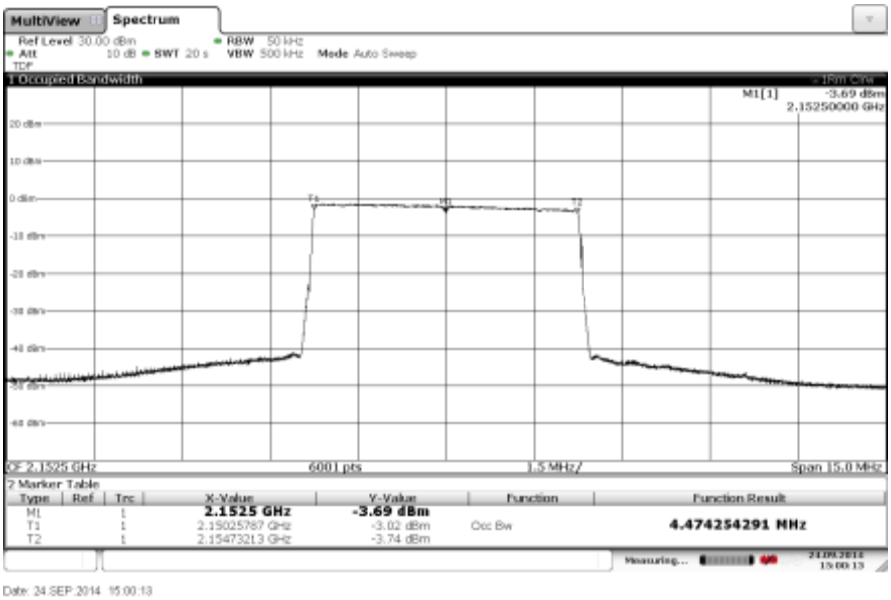
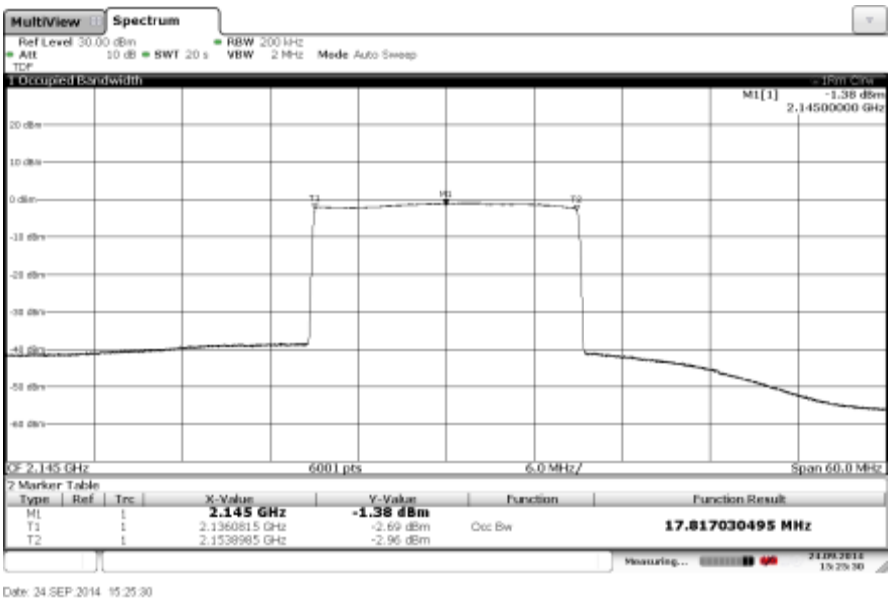



Diagram 20:



## Band edge measurements according to CFR 47 §27.53(h)

| Date | Temperature | Humidity |
|---|---|---|
| 2014-09-25 | 22 °C ± 3 °C | 40 % ± 5 % |

### Test set-up and procedure

The measurements were made per definition in §27.53(h). The test object was connected to a spectrum analyser with the RMS detector activated. The spectrum analyser was connected to an external 10 MHz reference standard during the measurements.

Beyond the 1st MHz off the band edges the limit was adjusted to compensate for reduced measurement bandwidths pursuant to the FCC rules, specifying a RBW of at least 1% of the fundamental emission bandwidth up to 1 MHz away from the band edges and a RBW of 1 MHz for measurements of emissions more than 1 MHz away from the band edges.

A resolution bandwidth of 100 kHz was used 1 MHz to 6 MHz away from the band edges, to compensate for the reduced resolution bandwidth the limit was adjusted by 10 dB to -23 dBm.

Before comparing the results to the limit, 3 dB [10 log (2)] should be added according to method E), 3), a), (iii ) Measure and add 10 log($N_{ANT}$)" of FCC KDB662911 D01 Multiple Transmitter Output v02r01.

| Measurement equipment | SP number |
|---|---|
| R&S FSW 43 | 902 073 |
| RF attenuator | 900 691 |
| Testo 635, temperature and humidity meter | 504 203 |

Measurement uncertainty: 3.7 dB

**Results**

Configuration: RDI Cable 20m

MIMO mode, single carrier

| Diagram | BW configuration | Tested frequency | Tested Port |
|---|---|---|---|
| 1 a-c | 5 MHz | B | RF B |
| 2 a-c | 5 MHz | B | RF A |
| 3 a-c | 10 MHz | B | RF B |
| 4 a-c | 15 MHz | B | RF B |
| 5 a-c | 20 MHz | B | RF B |
| 6 a-c | 5 MHz | T | RF B |
| 7 a-c | 5 MHz | T | RF A |
| 8 a-c | 10 MHz | T | RF B |
| 9 a-c | 15 MHz | T | RF B |
| 10 a-c | 20 MHz | T | RF B |

MIMO mode, multi carrier

| Diagram | BW configuration | Testedfrequency | Tested Port |
|---|---|---|---|
| 11 a-c | 5 MHz | B2-5 | RF B |
| 12 a-c | 5 MHz | T2-5 | RF B |

Configuration: RDI Cable 154m

MIMO mode, single carrier

| Diagram | BW configuration | Tested frequency | Tested Port |
|---|---|---|---|
| 13 a-c | 5 MHz | B | RF B |
| 14 a-c | 5 MHz | B | RF A |
| 15 a-c | 10 MHz | B | RF B |
| 16 a-c | 15 MHz | B | RF B |
| 17 a-c | 20 MHz | B | RF B |
| 18 a-c | 5 MHz | T | RF B |
| 19 a-c | 5 MHz | T | RF A |
| 20 a-c | 10 MHz | T | RF B |
| 21 a-c | 15 MHz | T | RF B |
| 22 a-c | 20 MHz | T | RF B |

MIMO mode, multi carrier

| Diagram | BW configuration | Testedfrequency | Tested Port |
|---|---|---|---|
| 23 a-c | 5 MHz | B2-5 | RF B |
| 24 a-c | 5 MHz | T2-5 | RF B |

**Limits**

CFR 47 §27.53(h)
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.

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

Appendix 5

Diagram 1 a:

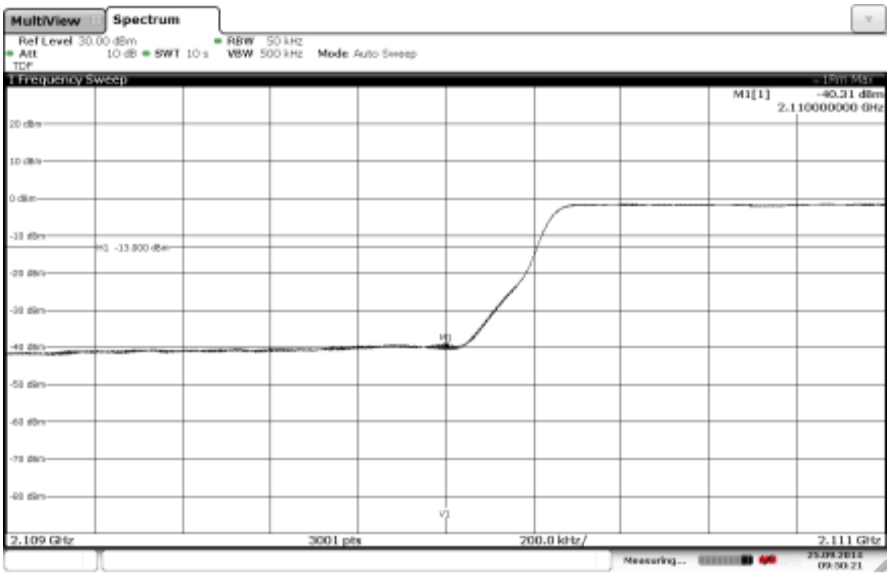


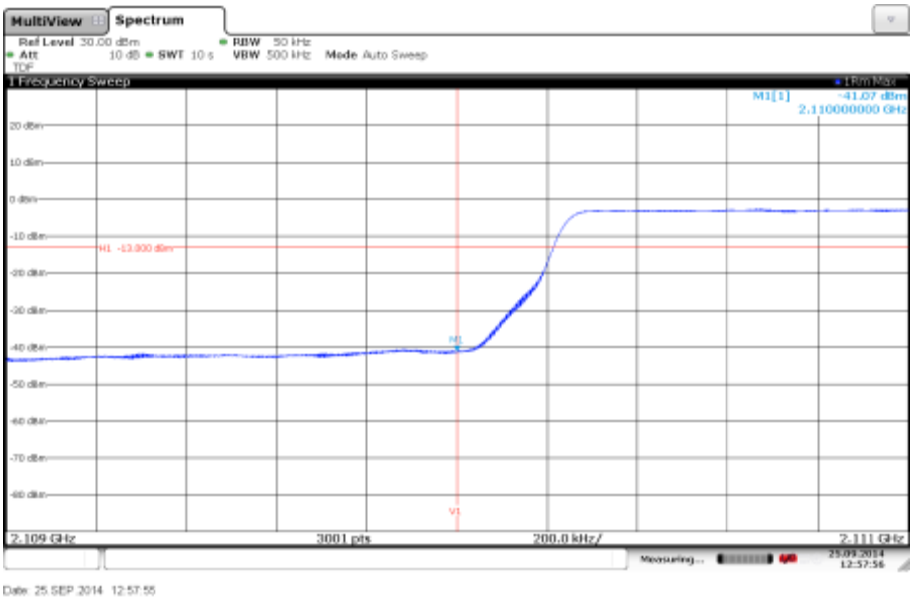

Diagram 1 b:

Appendix 5

Diagram 1 c:

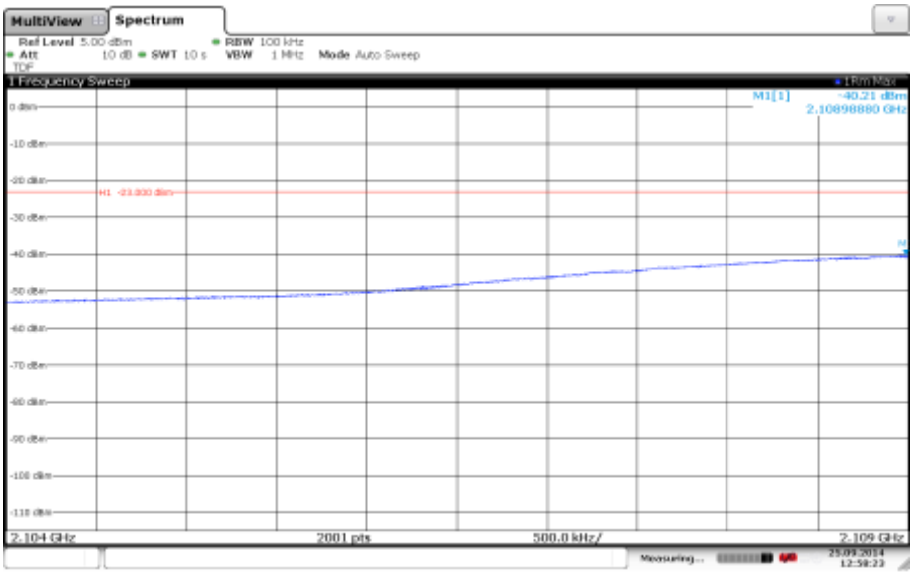
Appendix 5

Diagram 2 a:




Date: 25.SEP.2014 12:57:55

Diagram 2 b:

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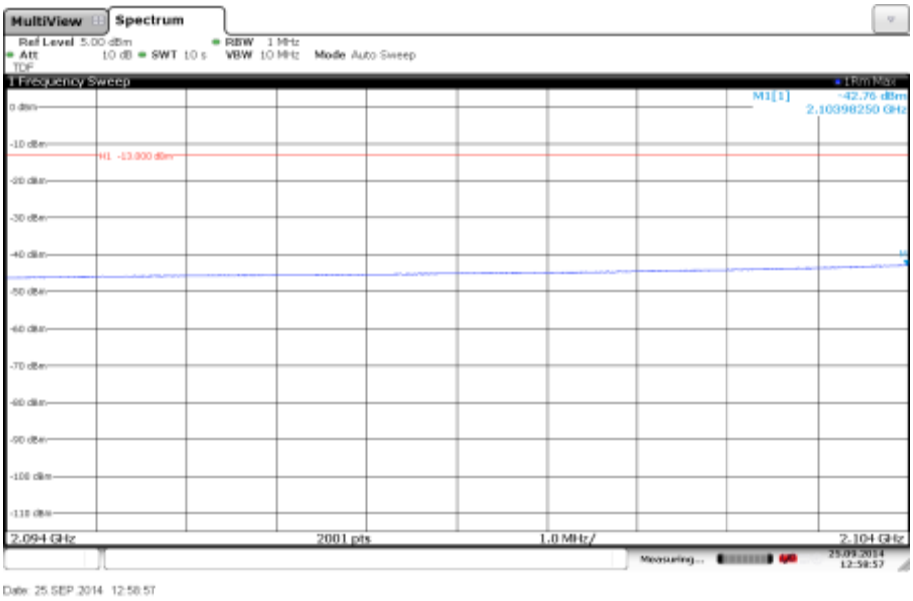
Appendix 5

Diagram 2c:



Appendix 5

Diagram 3 a:

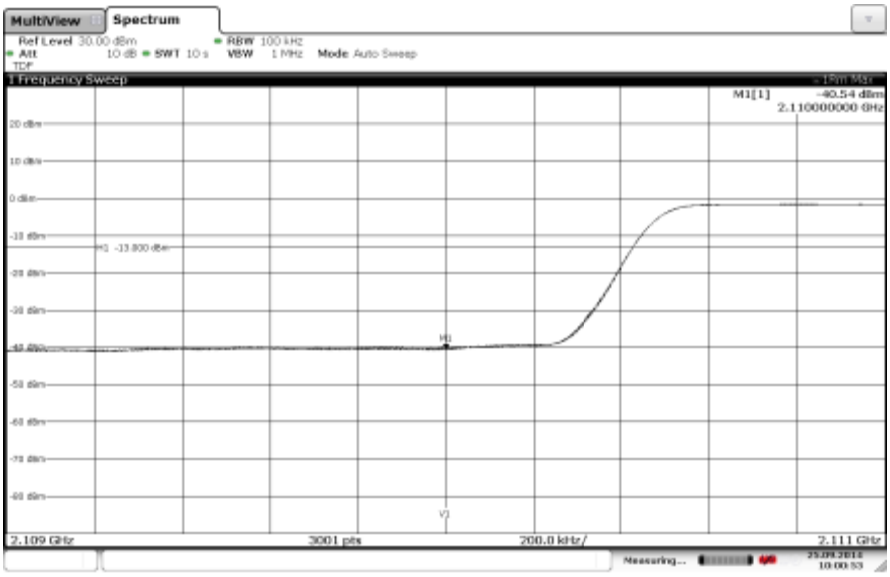



Diagram 3 b:

Appendix 5

Diagram 3 c:

Appendix 5

Diagram 4 a:

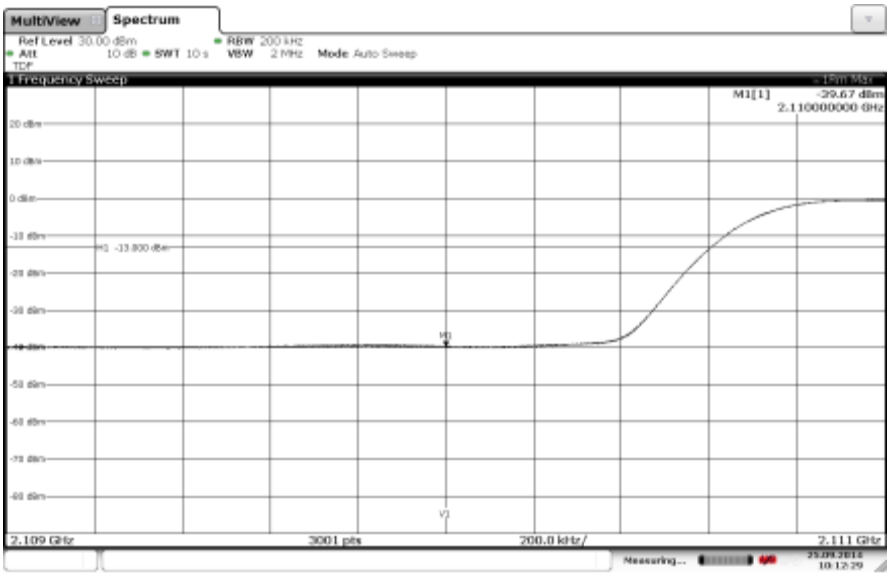
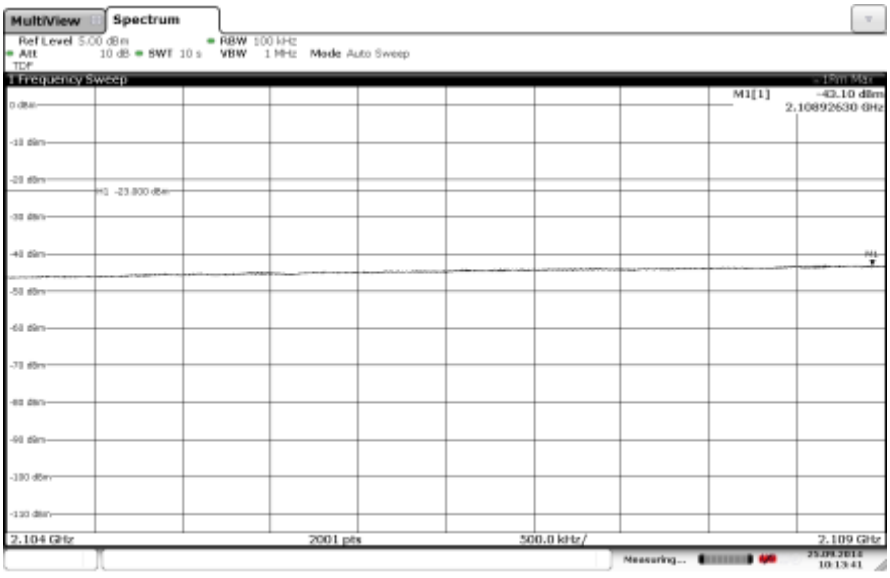



Diagram 4 b:

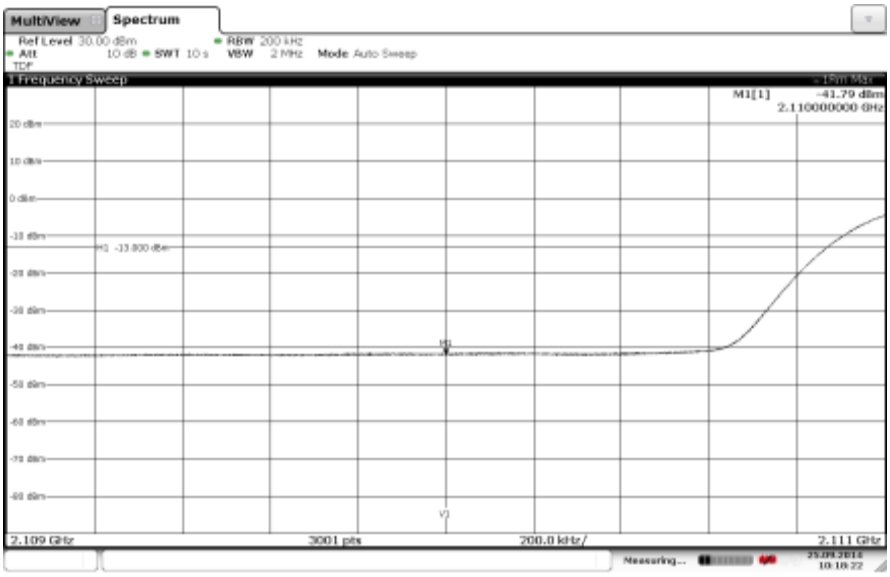


Appendix 5

Diagram 4 c:

Appendix 5

Diagram 5 a:

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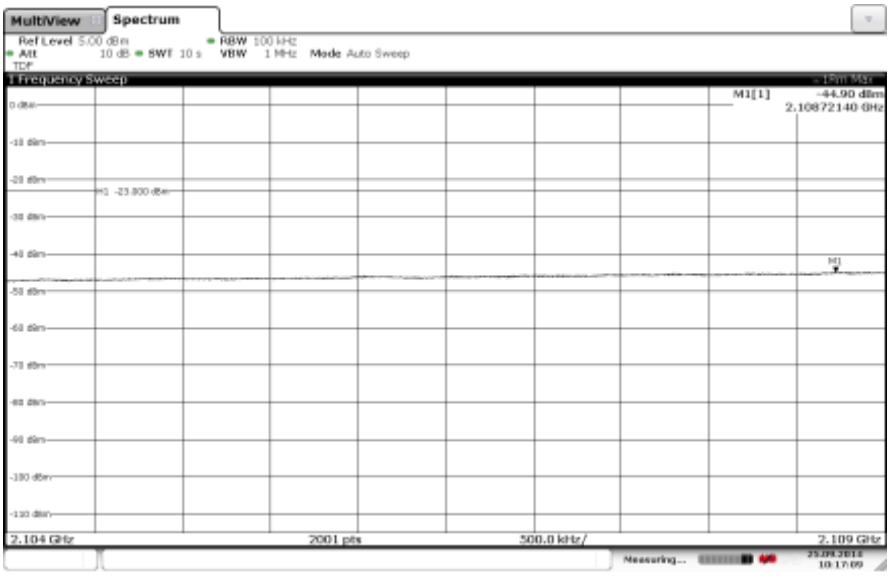

Appendix 5

Diagram 5 c

Appendix 5

Diagram 6 a:

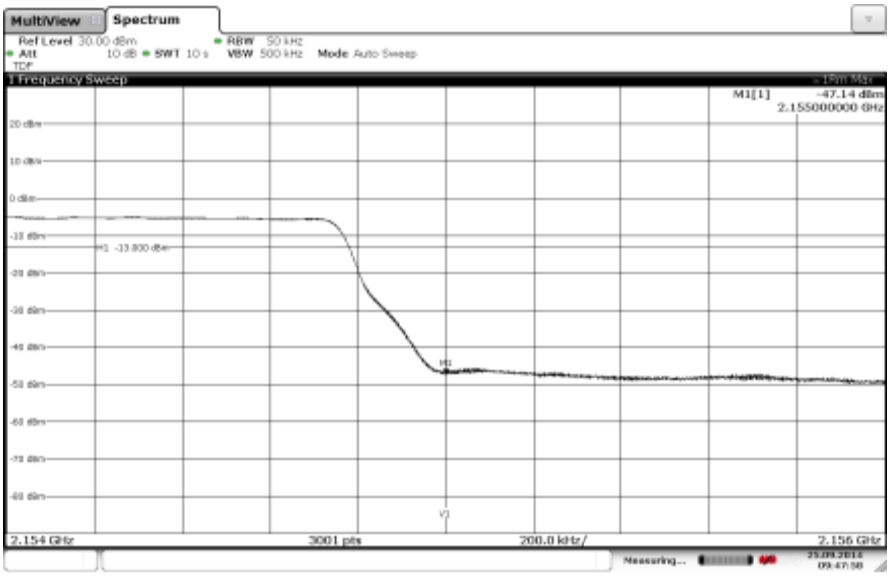


Diagram 6 b:

Appendix 5

Diagram 6 c:

Diagram 7 a:

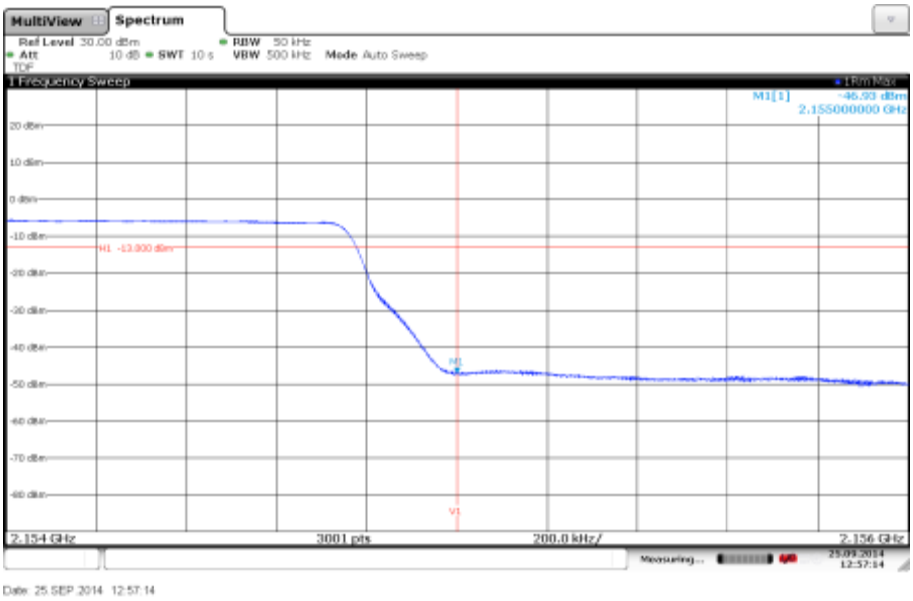


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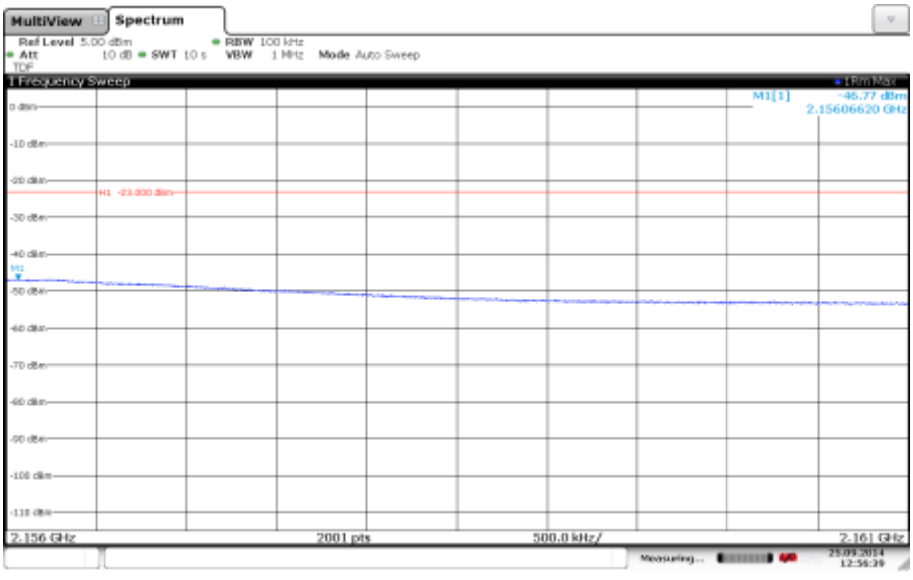
Diagram 7 b:

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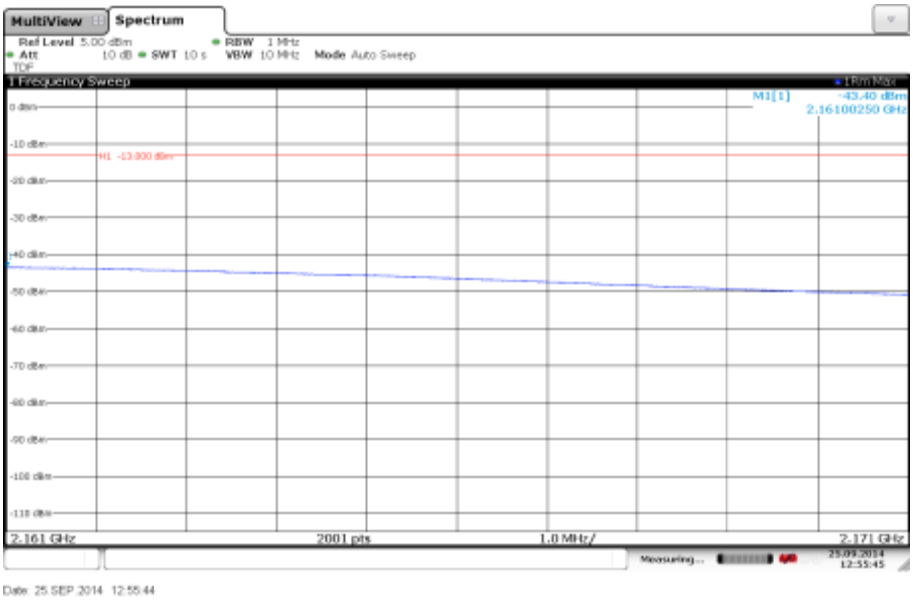
Appendix 5

Diagram 7 c:



Appendix 5

Diagram 8 a:

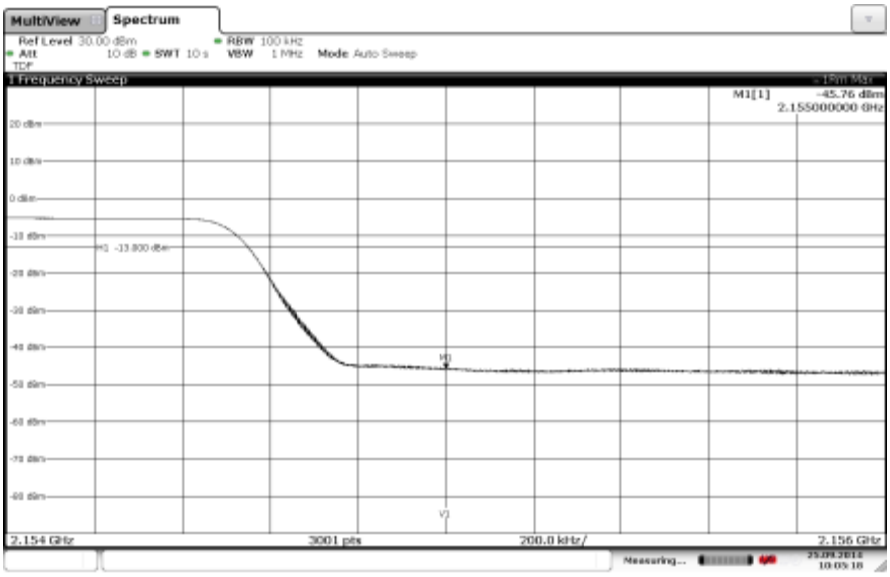



Diagram 8 b:

Appendix 5

Diagram 8 c:

Appendix 5

Diagram 9 a:

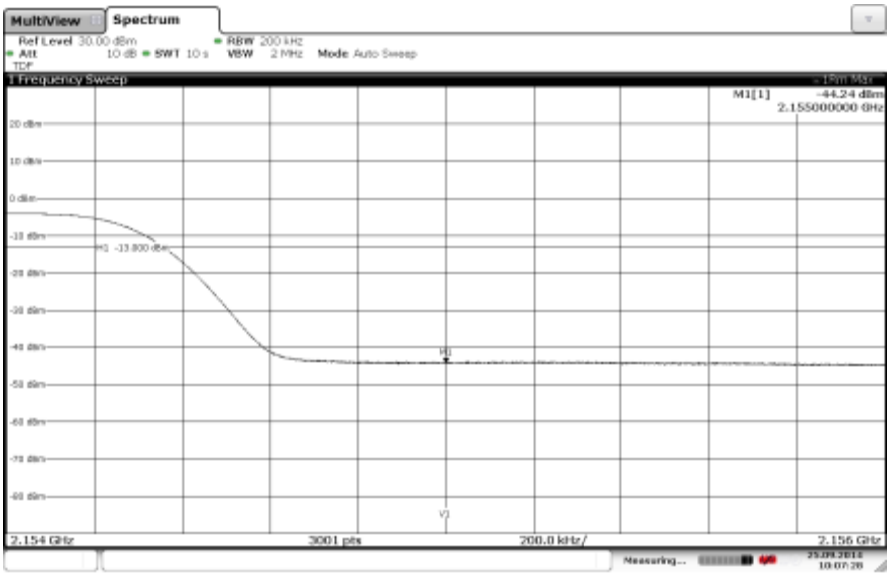



Diagram 9 b:

Appendix 5

Diagram 9 c:

Appendix 5

Diagram 10 a:

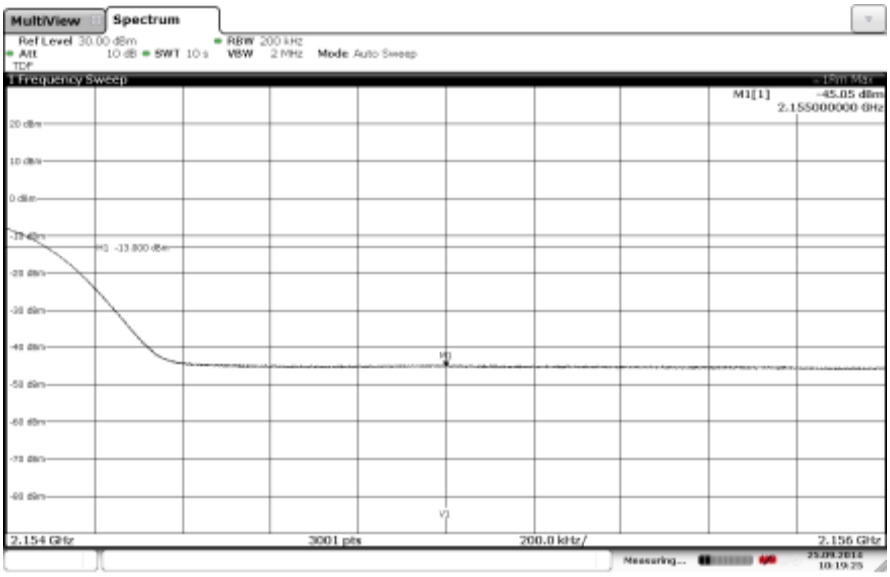



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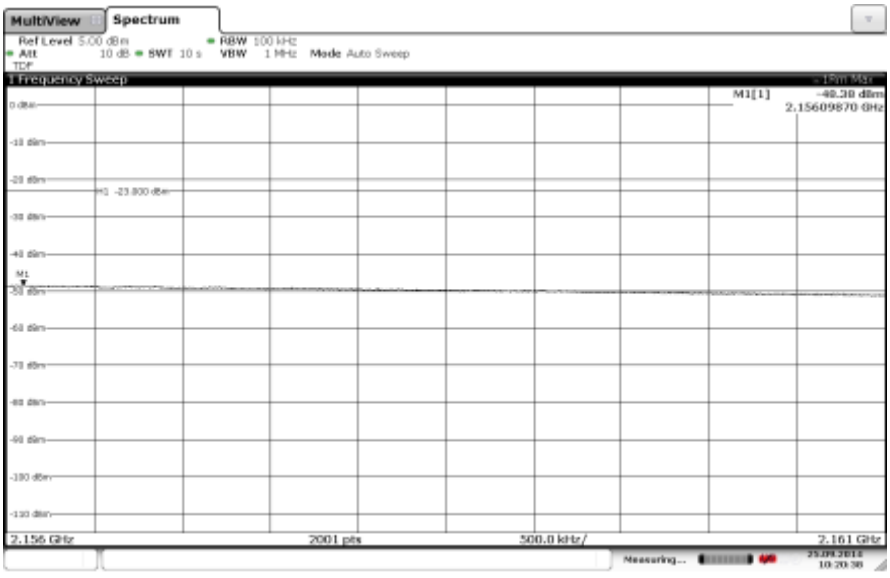
Diagram 10 b:

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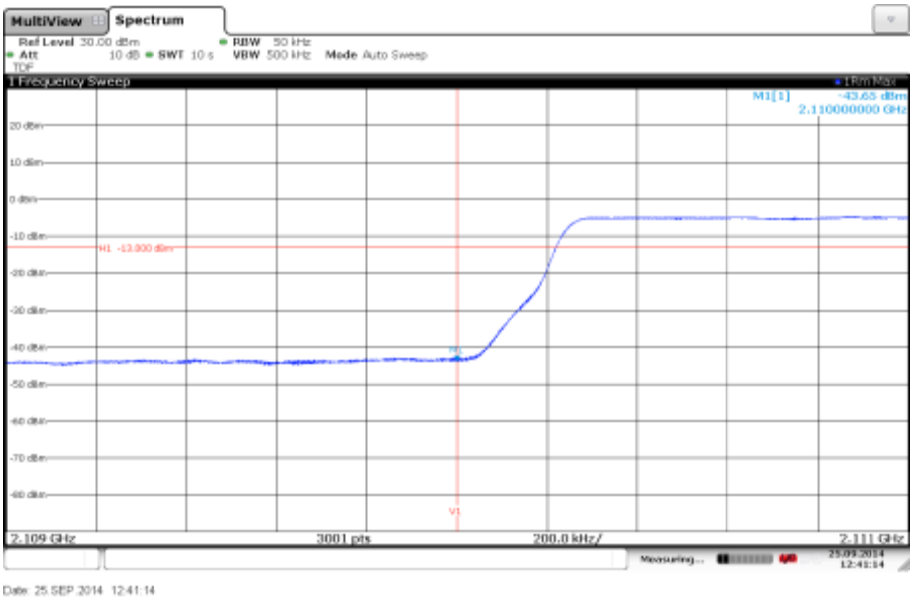
Appendix 5

Diagram 10 c:

Appendix 5

Diagram 11a:

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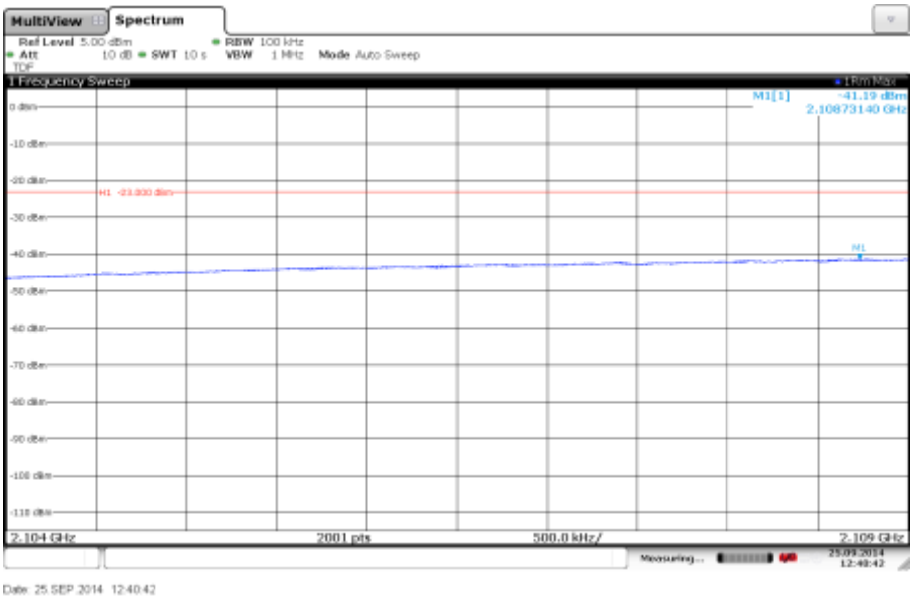
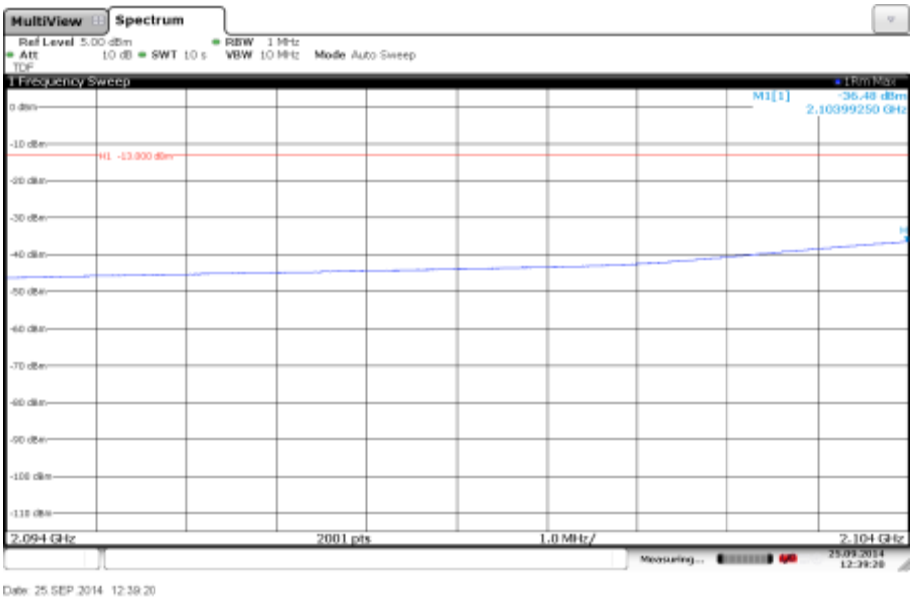


Appendix 5

Diagram 11 c:



Appendix 5

Diagram 12 a:

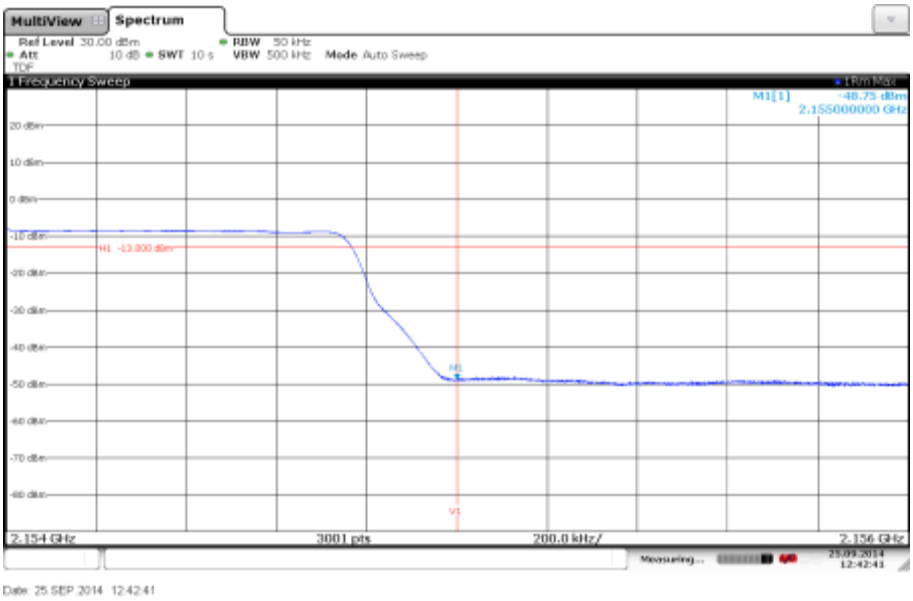



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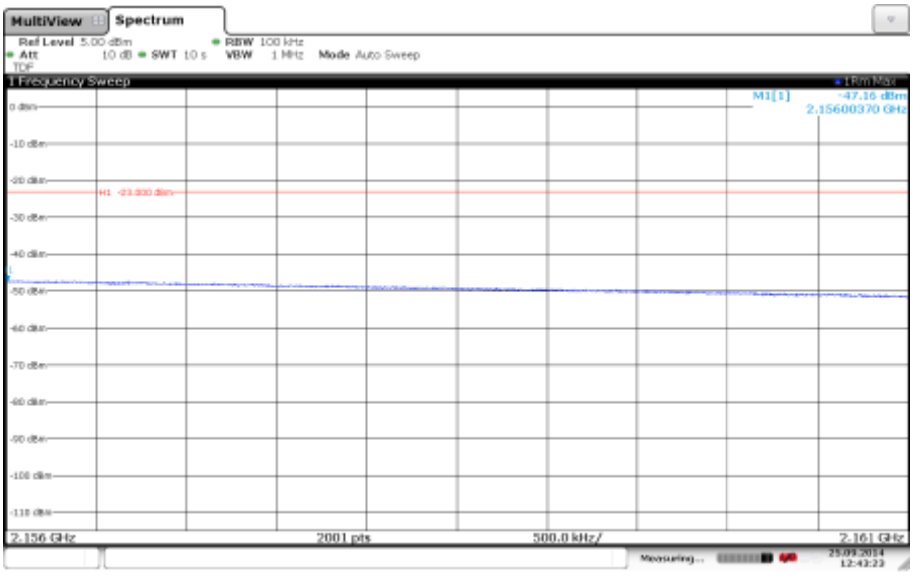
Diagram 12 b:

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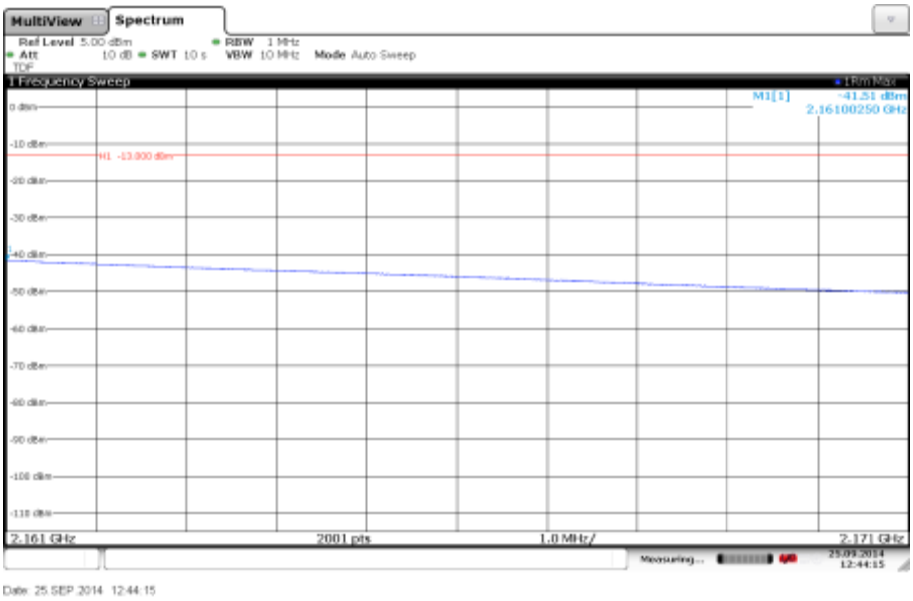
Appendix 5

Diagram 12 c:



Appendix 5

Diagram 13a:

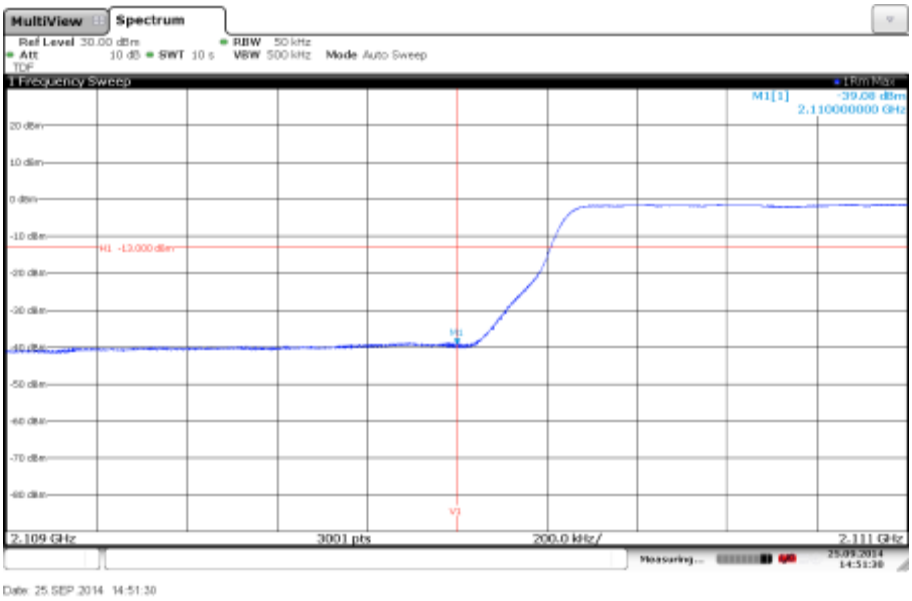



Diagram 13 b:

Appendix 5

Diagram 13 c:

Appendix 5

Diagram 14 a:

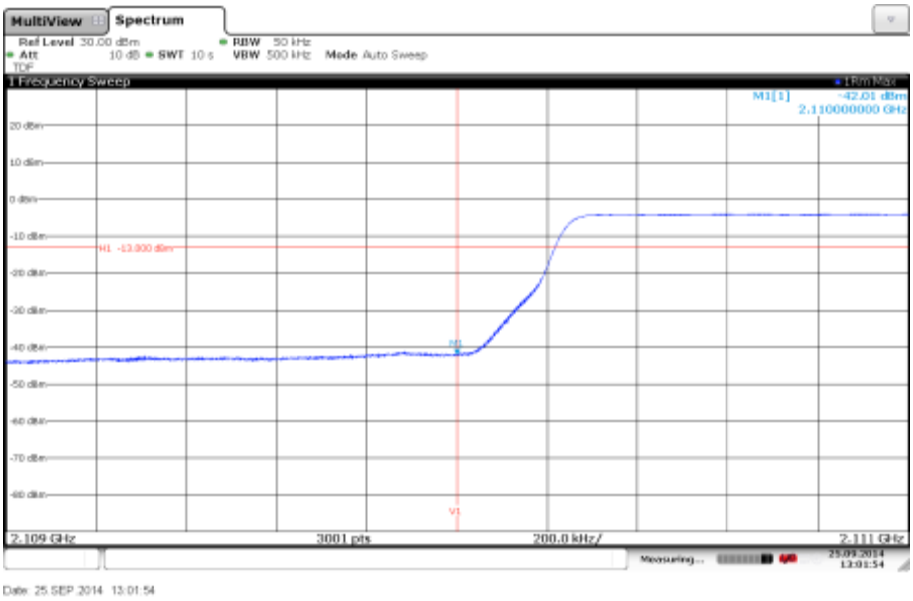



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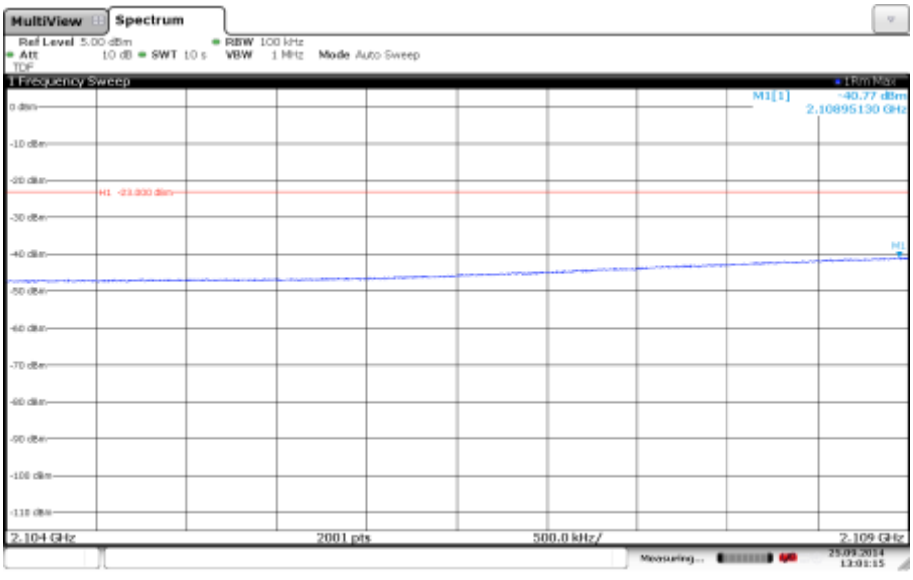
Diagram 14 b:

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Appendix 5

Diagram 14 c:

Appendix 5

Diagram 15 a:

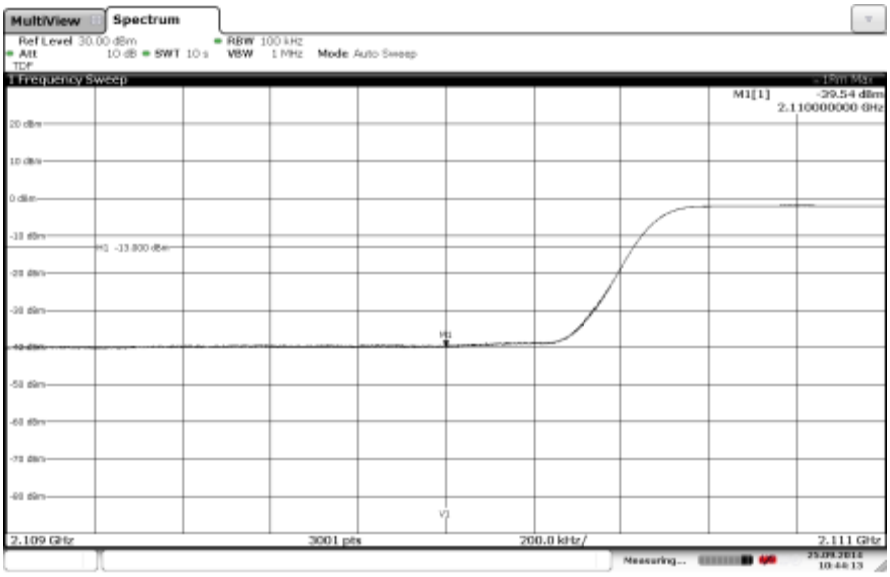
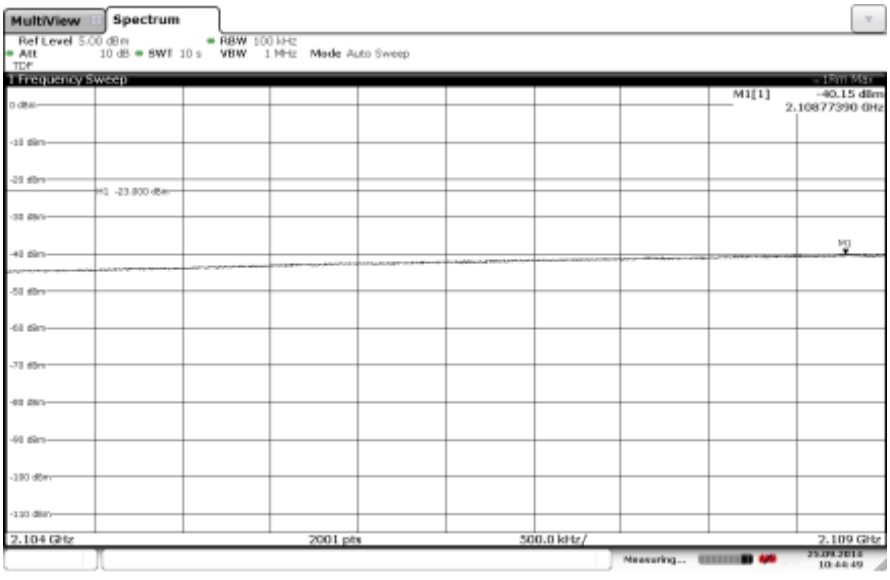
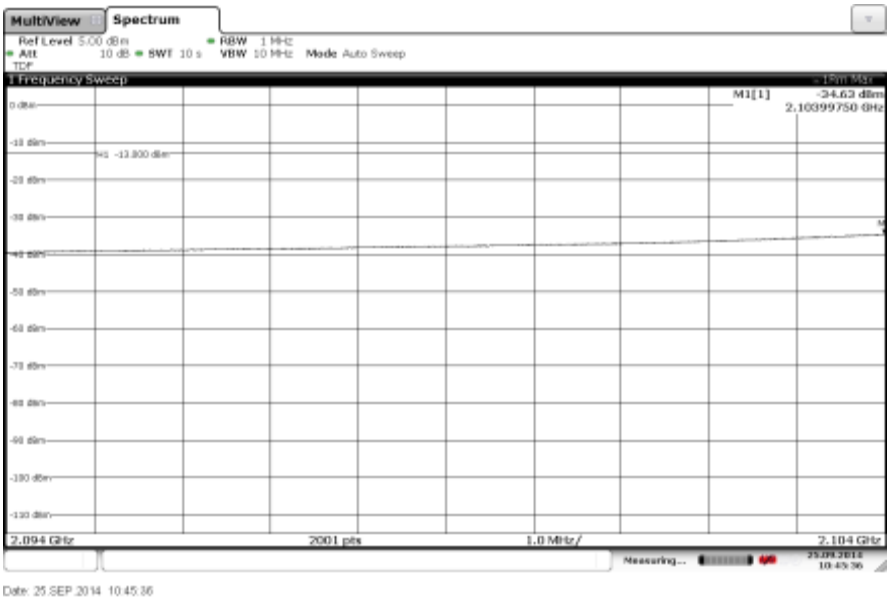



Diagram 15 b:



Appendix 5

Diagram 15 c:



Appendix 5

Diagram 16 a:

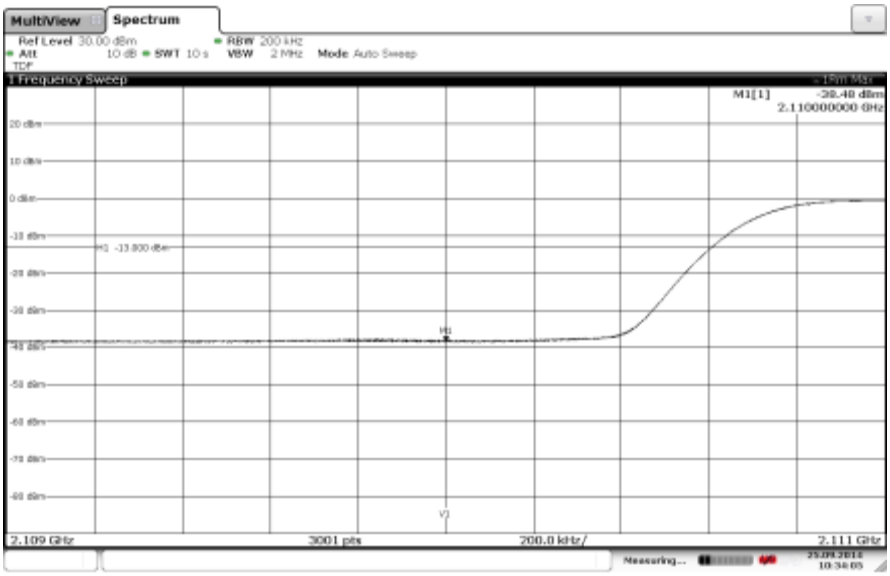
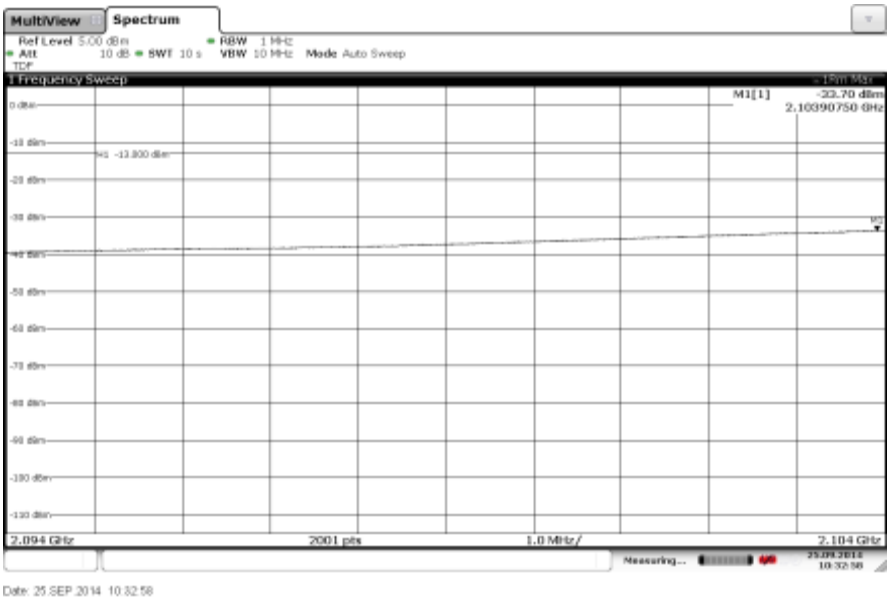



Diagram 16 b:

Appendix 5

Diagram 16 c:



Appendix 5

Diagram 17 a:

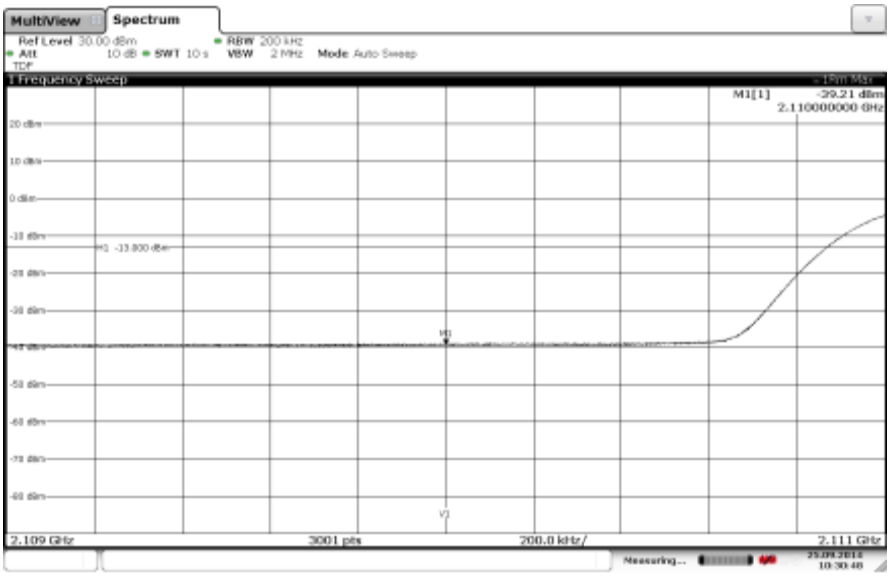



Diagram 17 b:

Appendix 5

Diagram 17 c:

Appendix 5

Diagram 18 a:

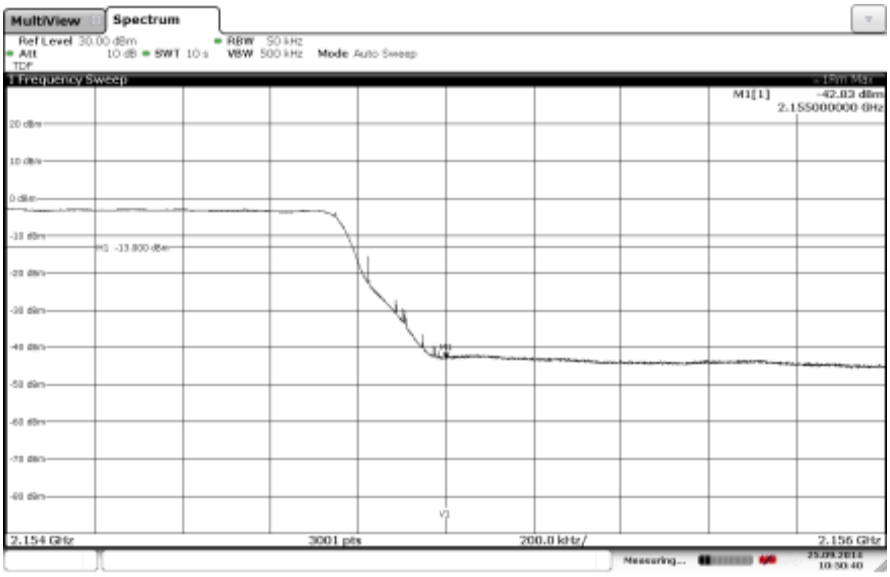
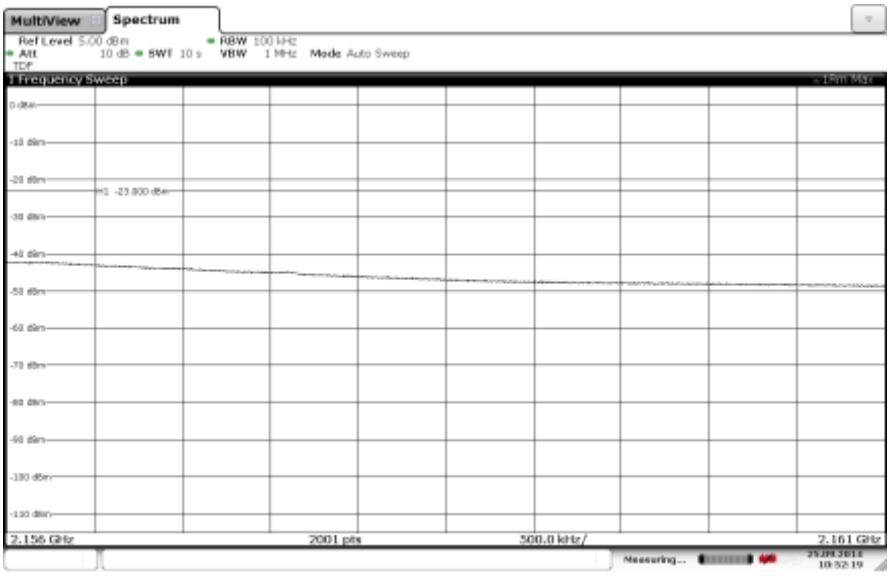
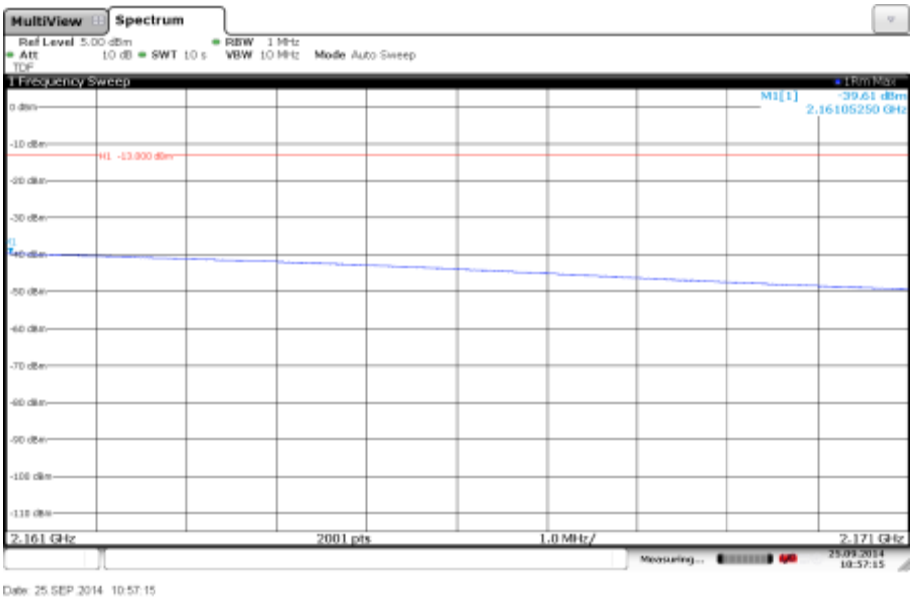



Diagram 18 b:



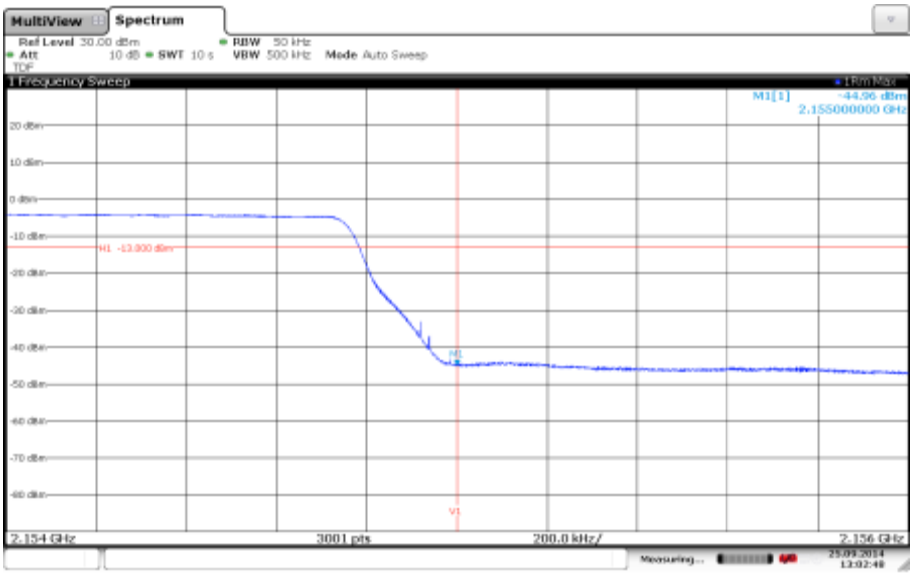
Appendix 5

Diagram 18 c:



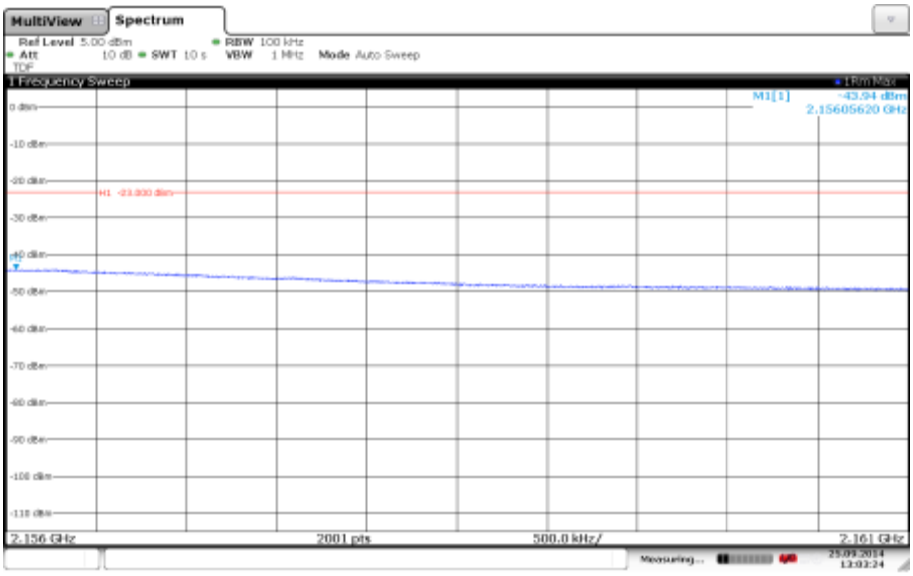
Appendix 5

Diagram 19 a:




Date: 25.SEP.2014 13:02:49

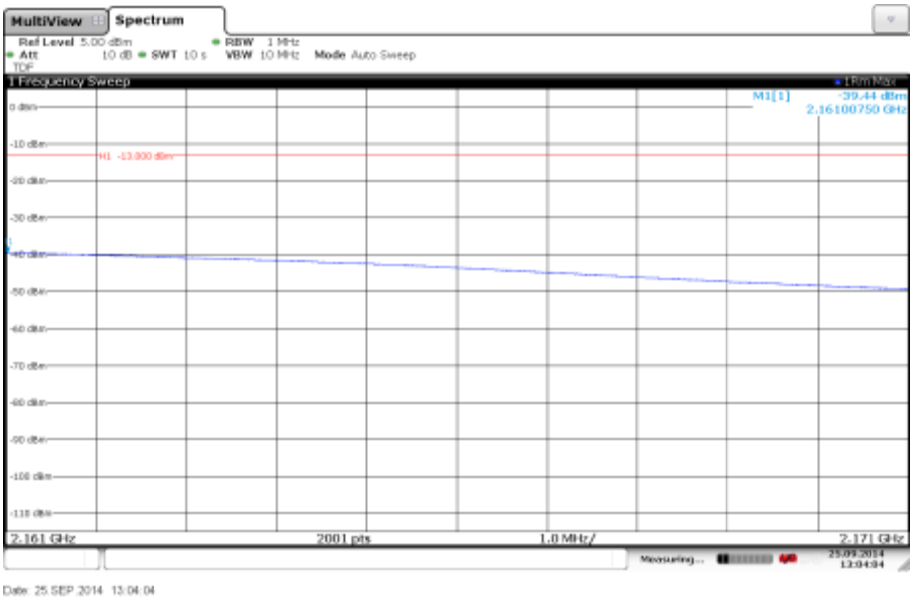
Diagram 19 b:




Date: 25.SEP.2014 13:03:24

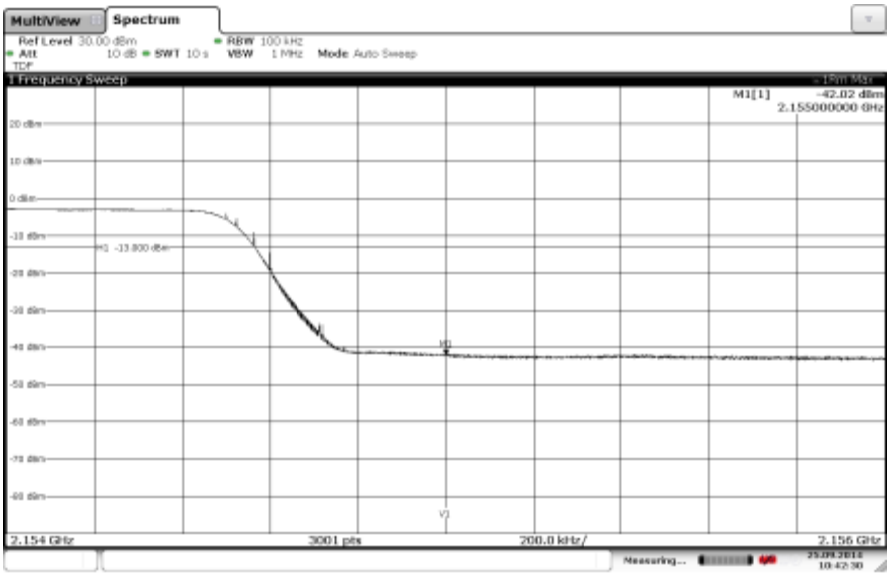
Appendix 5

Diagram 19 c:



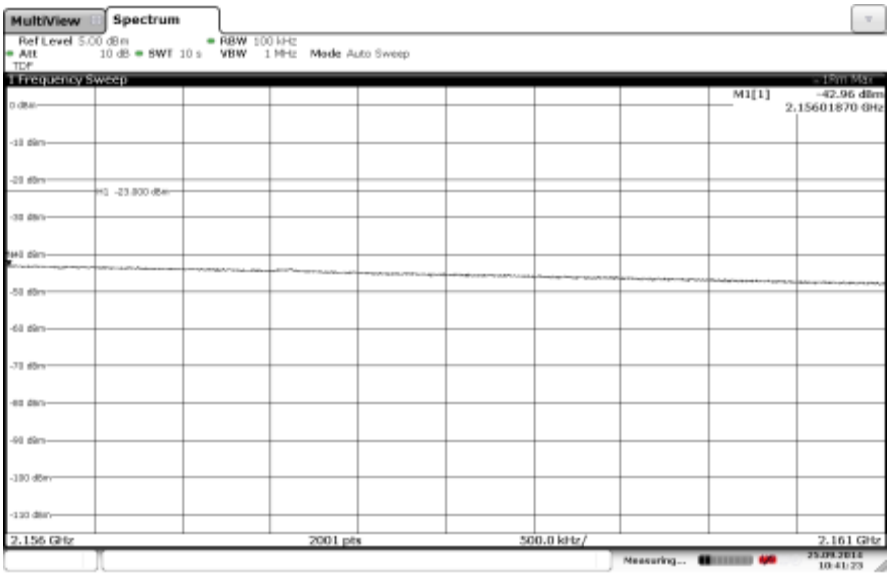
Appendix 5

Diagram 20 a:




Date: 25.SEP.2014 10:42:30

Diagram 20 b:



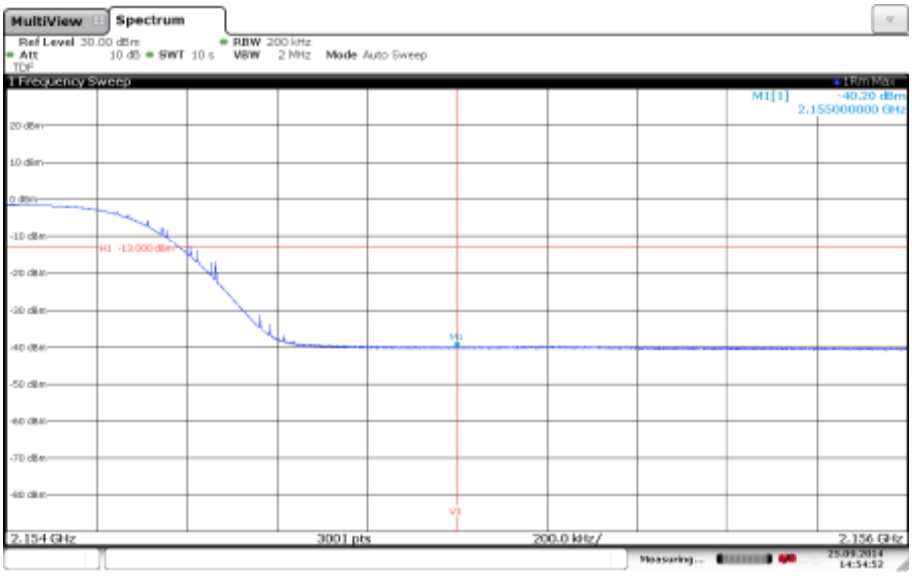

Date: 25.SEP.2014 10:41:23

Appendix 5

Diagram 20 c:

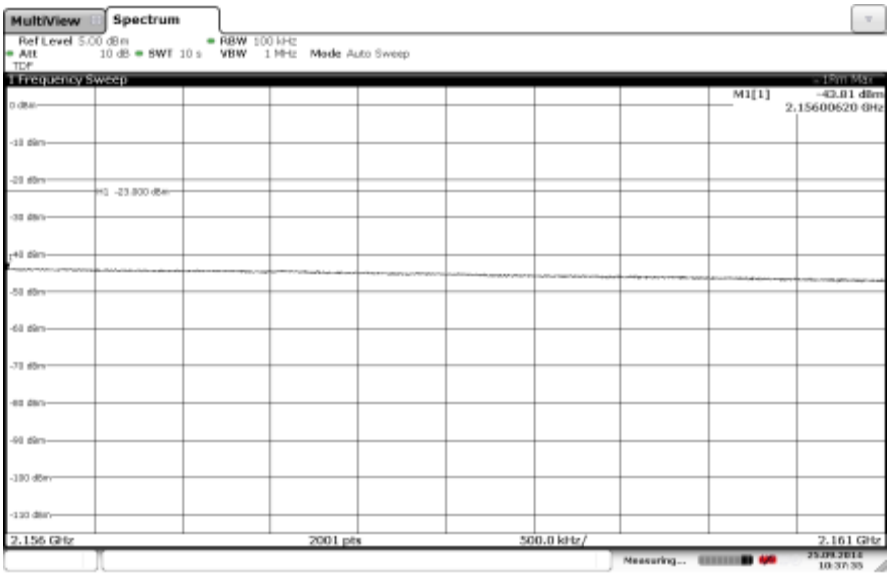
Appendix 5

Diagram 21 a:




Date: 25.SEP.2014 14:54:52

Diagram 21 b:




Date: 25.SEP.2014 10:37:35

Diagram 21 c:


MultiView
Spectrum
Ref Level 5.00 dBm
RBW 1 MHz
Att 10 dB SWT 10 s VBW 10 MHz Mode Auto Sweep
1 Frequency Sweep
M1[1] -37.25 dBm
2.16100250 GHz
2.161 GHz
2001 pts
1.0 MHz/
2.171 GHz
Measuring...
Date: 25.SEP.2014 10:38:18

Appendix 5

Diagram 22 a:

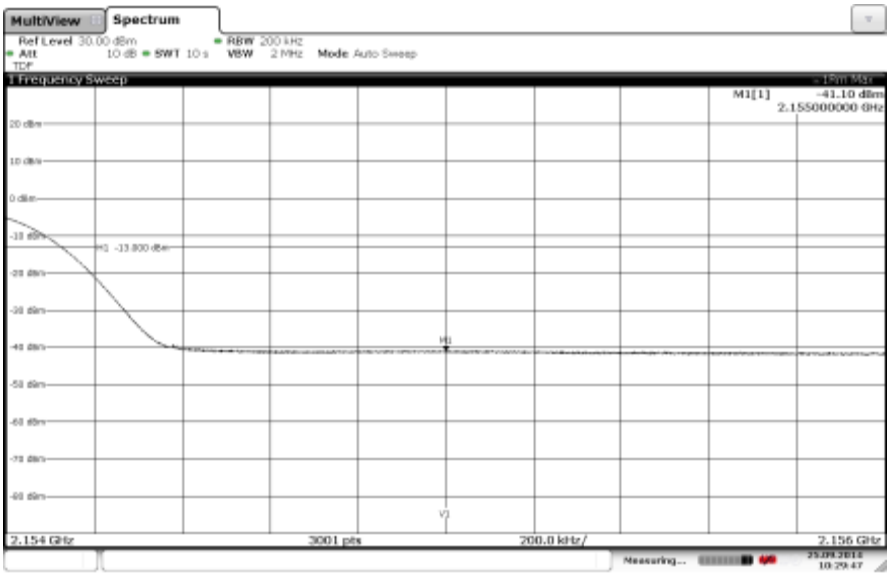
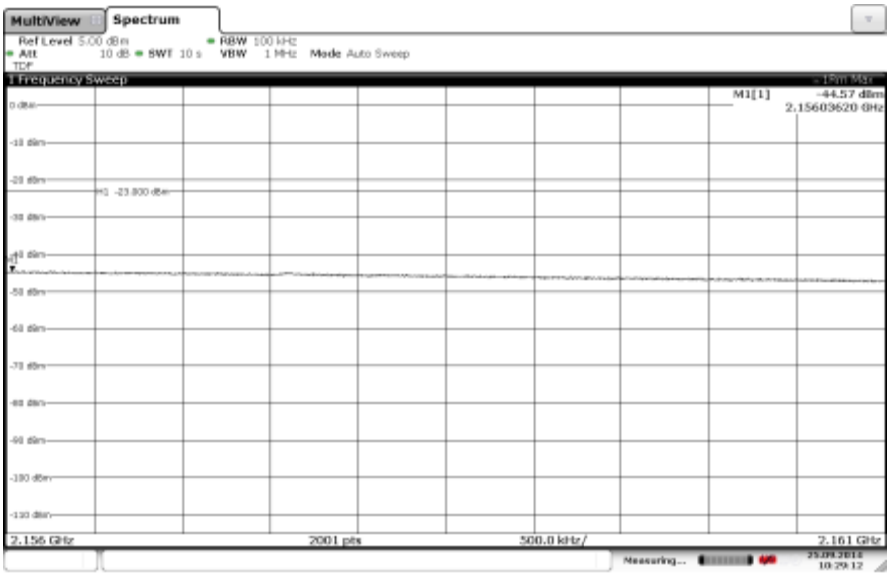



Diagram 22 b:

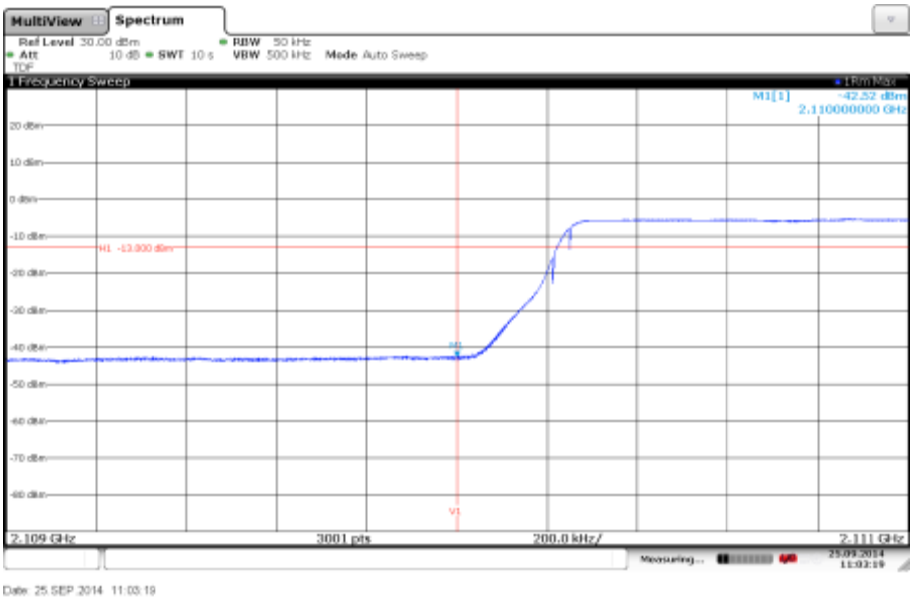


Appendix 5

Diagram 22 c:

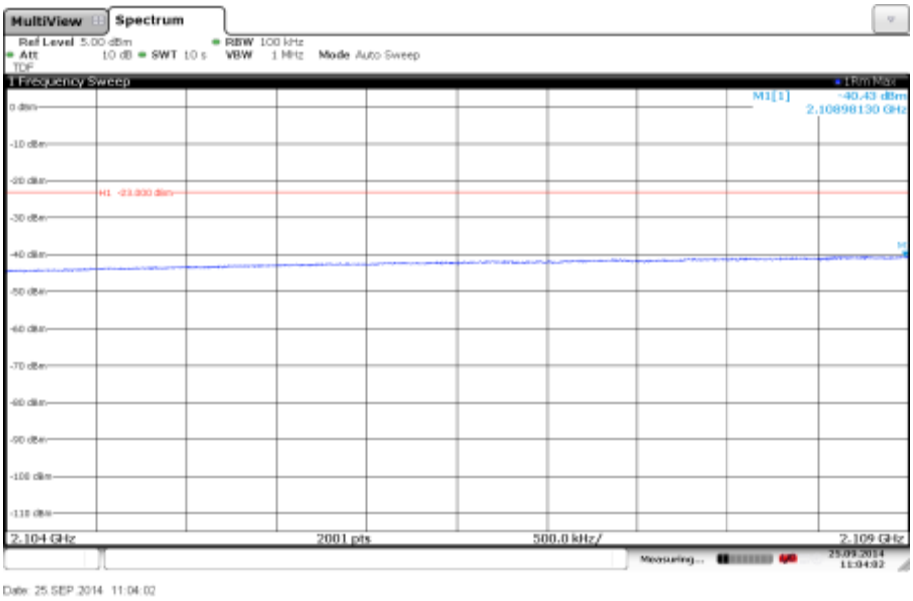
Appendix 5

Diagram 23 a:




Date: 25.SEP.2014 11:03:19

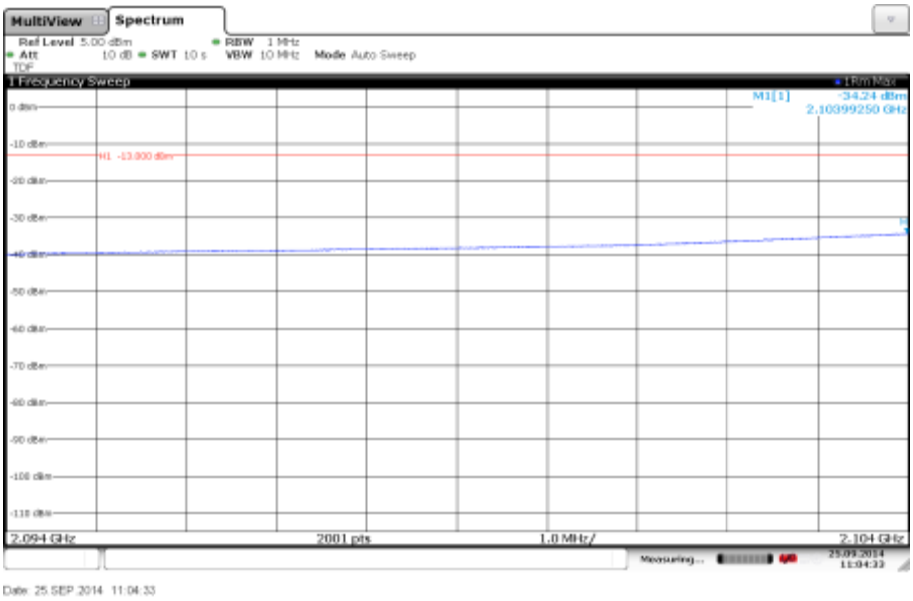
Diagram 23 b:




Date: 25.SEP.2014 11:04:02

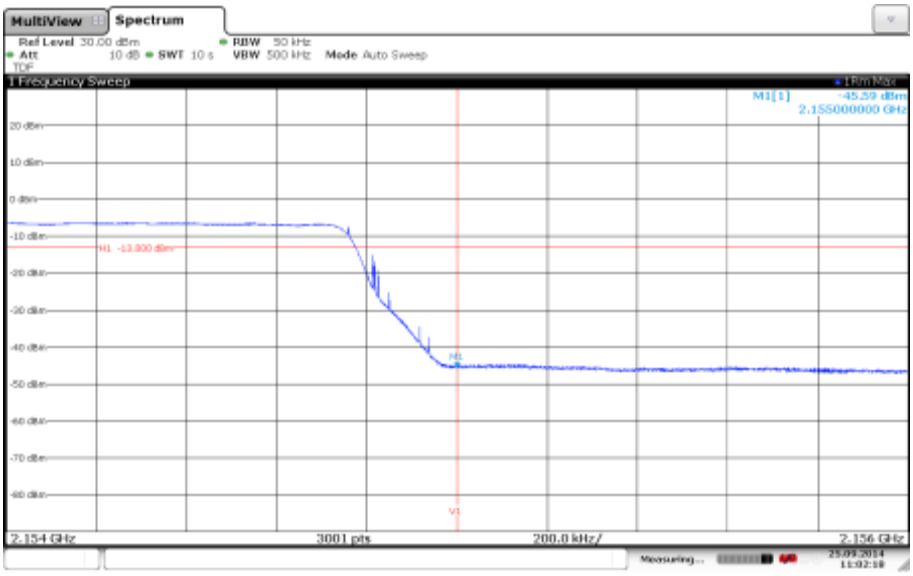
Appendix 5

Diagram 23 c:



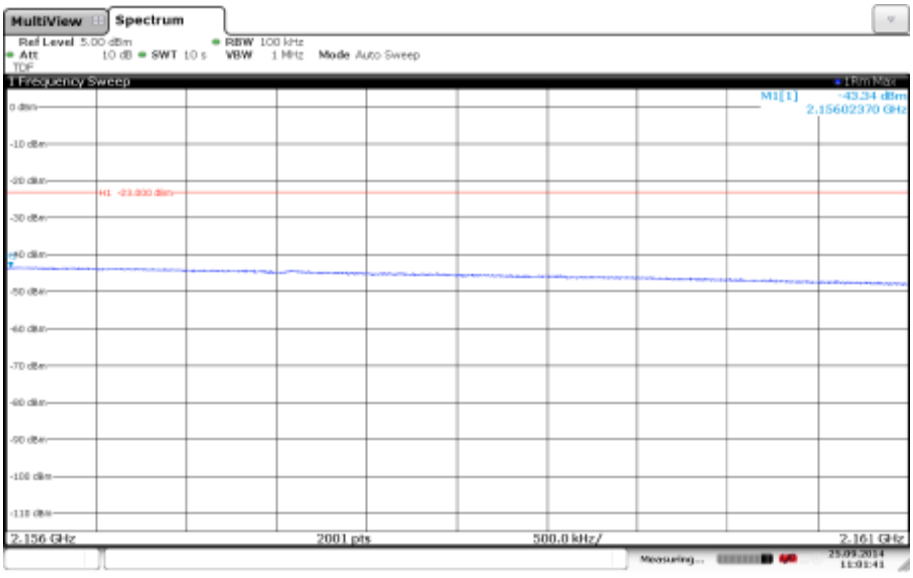
Appendix 5

Diagram 24 a:




Date: 25.SEP.2014 11:02:18

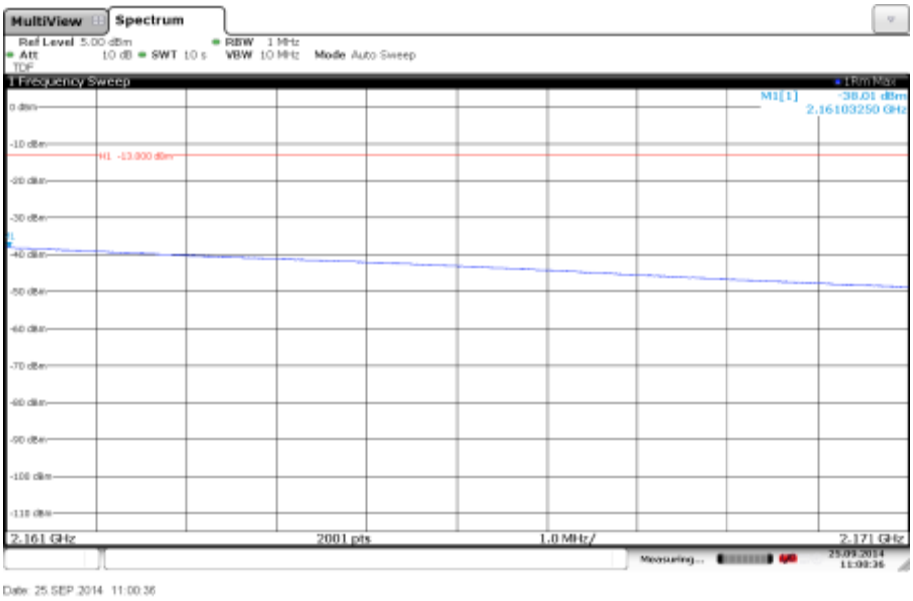
Diagram 24 b:




Date: 25.SEP.2014 11:01:42

Appendix 5

Diagram 24 c:



Appendix 6

## Conducted spurious emission measurements according to CFR 47 §27.53(h)

| Date | Temperature | Humidity |
|---|---|---|
| 2014-09-25 | 22 °C ± 3 °C | 40 % ± 5 % |
| 2014-09-26 | 23 °C ± 3 °C | 44 % ± 5 % |

### Test set-up and procedure

The measurements were made per definition in §27.53(h). The output was connected to a spectrum analyser with a RBW setting of 1 MHz and RMS detector activated. The spectrum analyser was connected to an external 10 MHz reference standard during the measurements.

Before comparing the results to the limit, 3 dB [10 log (2)] should be added according to method E), 3), (iii) “measure and add 10 log($N_{ANT}$)” of FCC KDB662911 D01 Multiple Transmitter Output v02r01.

| Measurement equipment | SP number |
|---|---|
| R&S FSW 43 | 902 073 |
| RF attenuator | 900 691 |
| HP filter | BX40074 |
| Testo 635, temperature and humidity meter | 504 203 |

Measurement uncertainty: 3.7 dB

**Results**

Configuration: RDI Cable 20m

MIMO mode, single carrier

| Diagram | BW configuration / [MHz] | Symbolic name | Tested Port |
|---|---|---|---|
| 1 a+b+c+d | 5 MHz | B | RF B |
| 2 a+b+c+d | 20 MHz | B | RF B |
| 3 a+b+c+d | 5 MHz | M | RF A |
| 4 a+b+c+d | 5 MHz | M | RF B |
| 5 a+b+c+d | 10 MHz | M | RF B |
| 6 a+b+c+d | 15 MHz | M | RF B |
| 7 a+b+c+d | 20 MHz | M | RF B |
| 8 a+b+c+d | 20 MHz | M | RF A |
| 9 a+b+c+d | 5 MHz | T | RF B |
| 10 a+b+c+d | 20 MHz | T | RF B |

MIMO mode, multi carrier

| Diagram | BW configuration | Symbolic name | Tested Port |
|---|---|---|---|
| 11 a+b+c+d+e | 5 MHz | Bim | RF B |
| 12 a+b+c+d+e | 5 MHz | M2-5 | RF B |
| 13 a+b+c+d+e | 5 MHz | Tim | RF B |

Note: Measurements were limited to port RF B due to the measurement result in single carrier mode that shows that the ports are electrical identical as declared by the client.

Configuration: RDI Cable 154m

MIMO mode, single carrier

| Diagram | BW configuration / [MHz] | Symbolic name | Tested Port |
|---|---|---|---|
| 14 a+b+c+d | 5 MHz | B | RF B |
| 15 a+b+c+d | 20 MHz | B | RF B |
| 16 a+b+c+d | 5 MHz | M | RF A |
| 17 a+b+c+d | 5 MHz | M | RF B |
| 18 a+b+c+d | 10 MHz | M | RF B |
| 19 a+b+c+d | 15 MHz | M | RF B |
| 20 a+b+c+d | 20 MHz | M | RF B |
| 21 a+b+c+d | 20 MHz | M | RF A |
| 22 a+b+c+d | 5 MHz | T | RF B |
| 23 a+b+c+d | 20 MHz | T | RF B |

MIMO mode, multi carrier

| Diagram | BW configuration | Symbolic name | Tested Port |
|---|---|---|---|
| 24 a+b+c+d+e | 5 MHz | Bim | RF B |
| 25 a+b+c+d+e | 5 MHz | M2-5 | RF B |
| 26 a+b+c+d+e | 5 MHz | Tim | RF B |

Note: Measurements were limited to port RF B due to the measurement result in single carrier mode that shows that the ports are electrical identical as declared by the client.

**Remark**

The emission at 9 kHz on 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 highest fundamental frequency is 2.155 GHz. The measurements were made up to 22 GHz (10x2.155 GHz = 21.55 GHz).

**Limits**

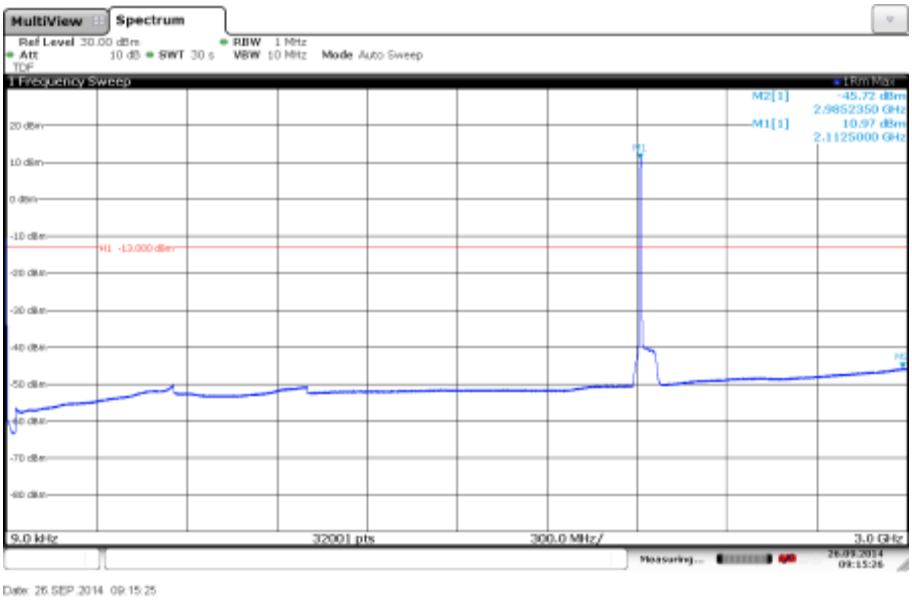
§27.53(h)

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 1 MHz RBW.

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

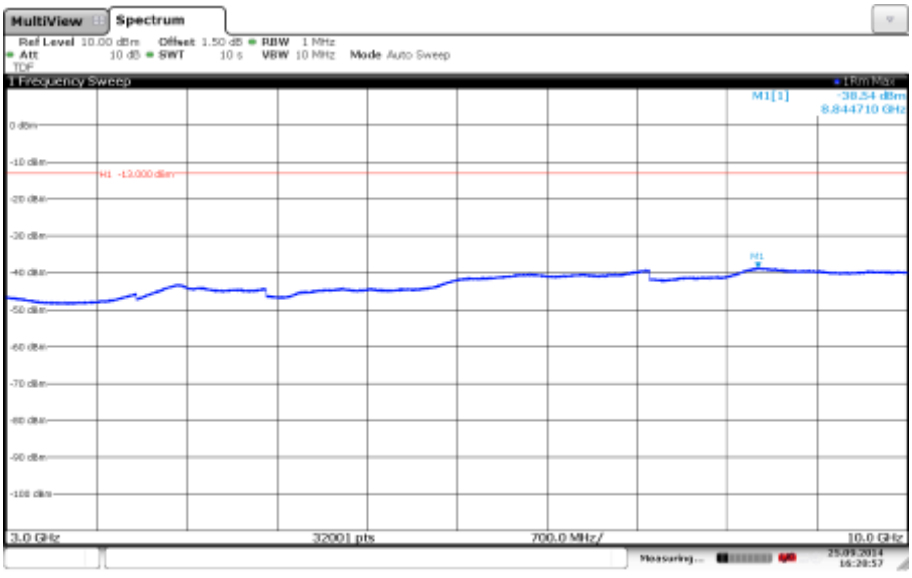
Appendix 6

Diagram 1 a:




Date: 26.SEP.2014 09:15:25

Diagram 1 b:




Date: 25.SEP.2014 16:20:57

Appendix 6

Diagram 1 c:

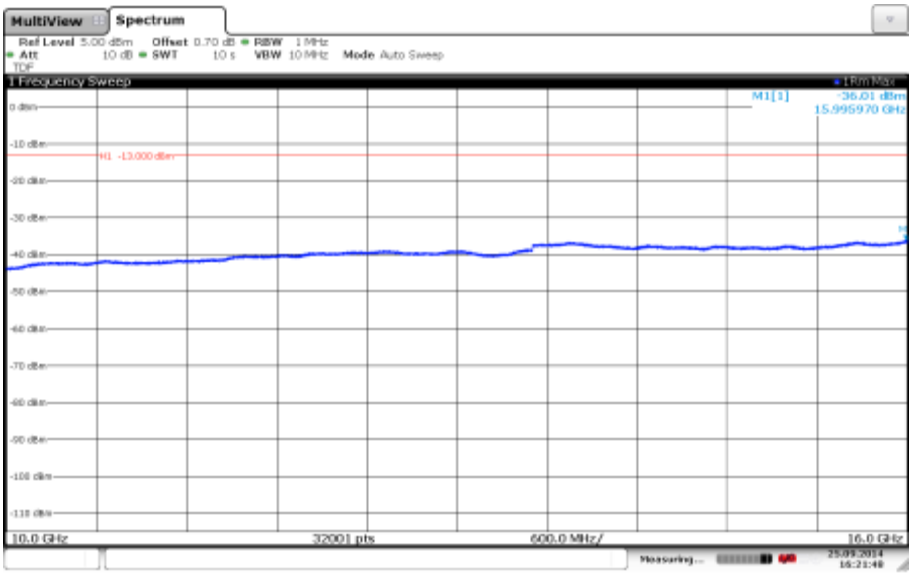
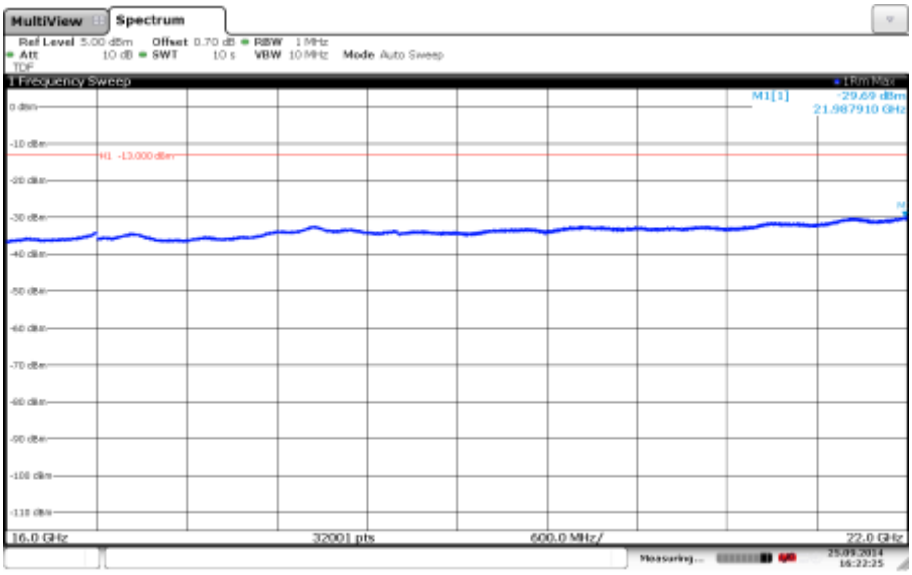
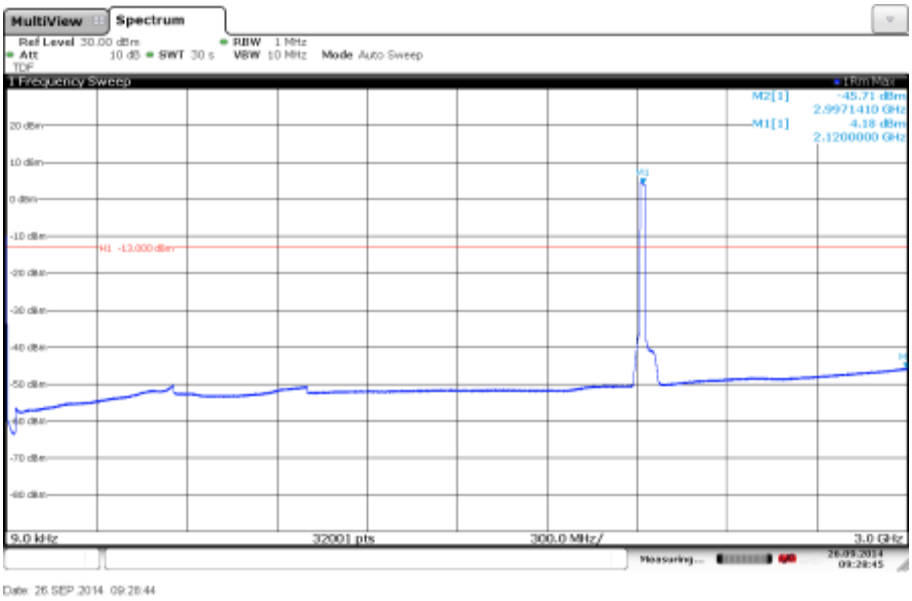



Diagram 1 d:



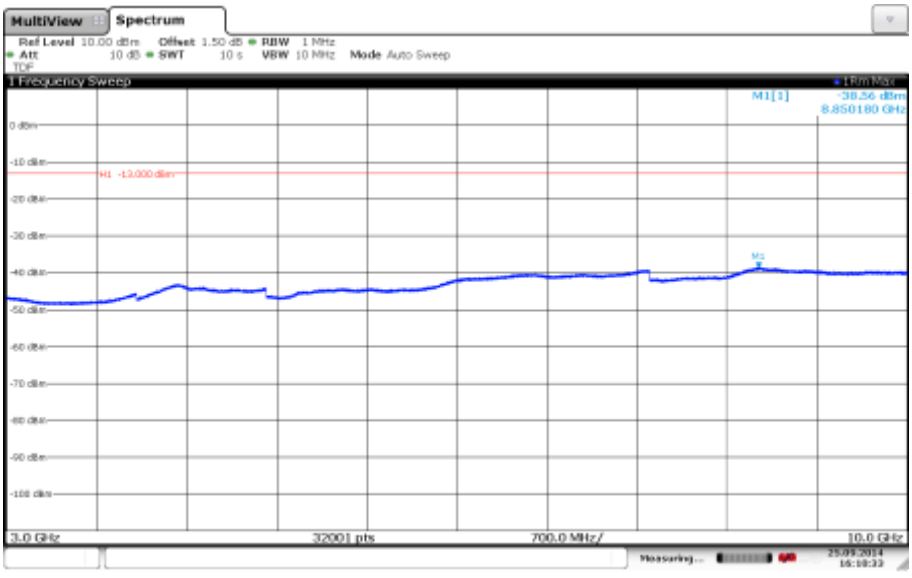
Appendix 6

Diagram 2 a:




Date: 26.SEP.2014 09:28:44

Diagram 2 b:




Date: 25.SEP.2014 16:10:33

Appendix 6

Diagram 2 c:

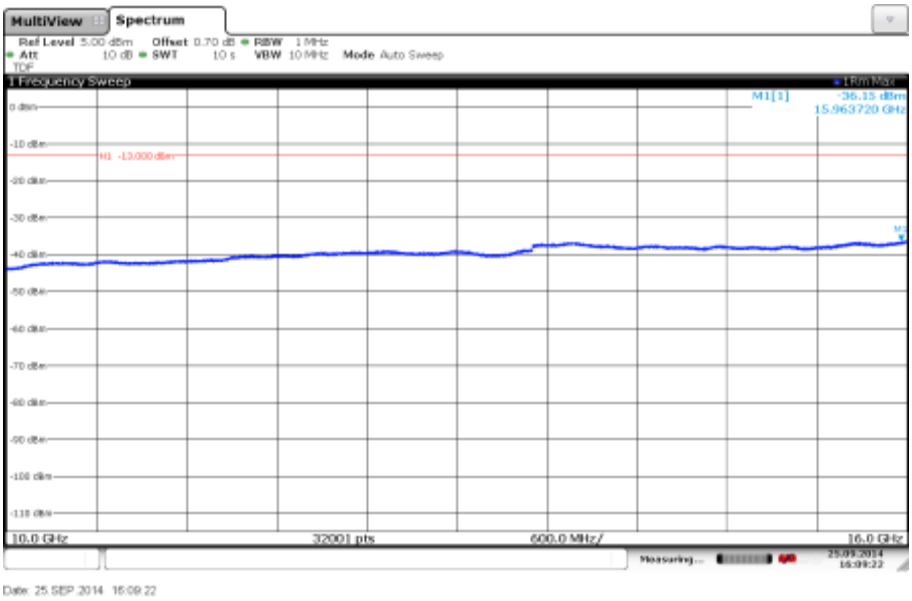
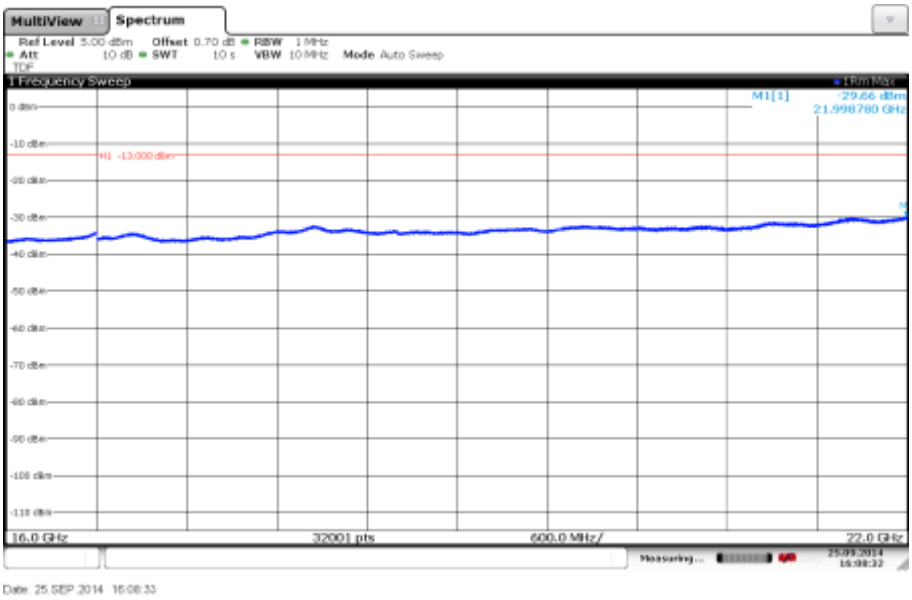
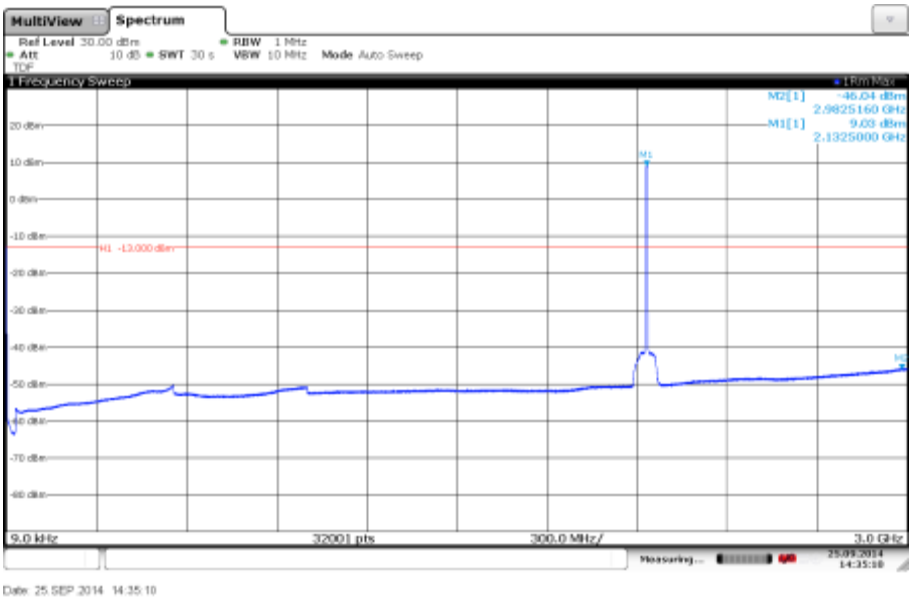



Diagram 2 d:



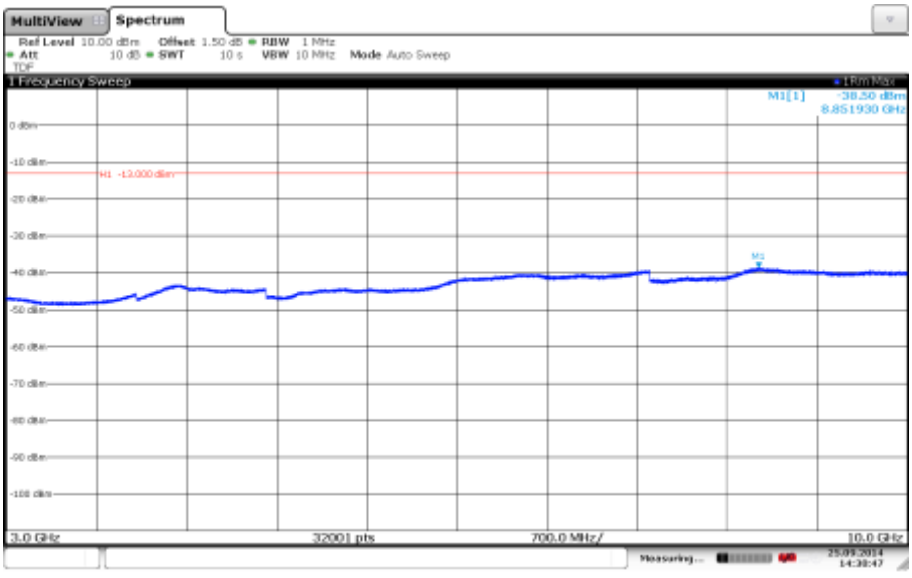
Appendix 6

Diagram 3 a:




Date: 25.SEP.2014 14:35:10

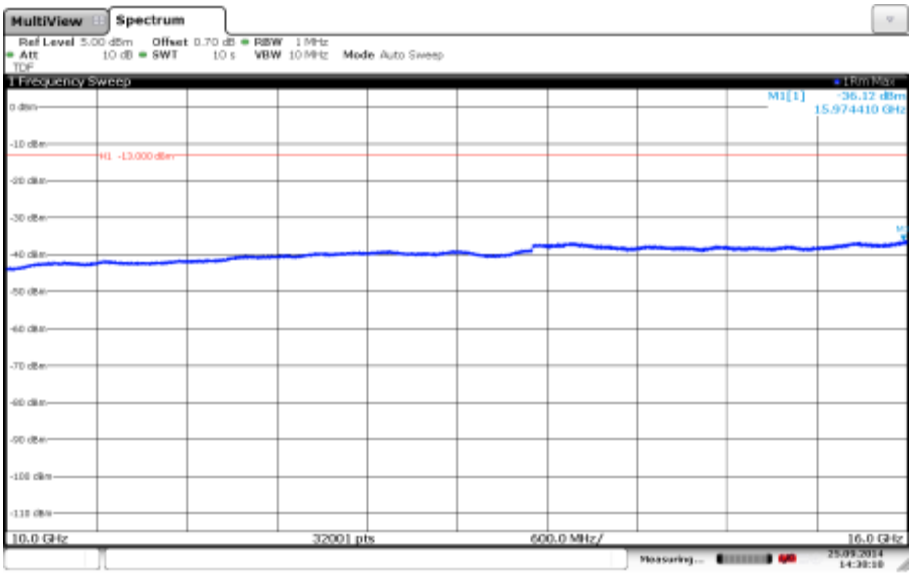
Diagram 3 b:




Date: 25.SEP.2014 14:30:47

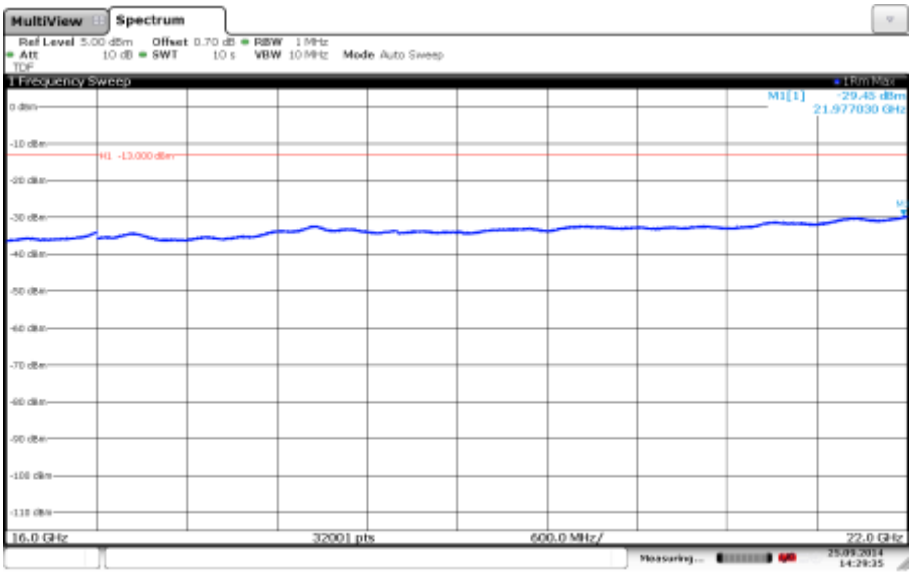
Appendix 6

Diagram 3 c:



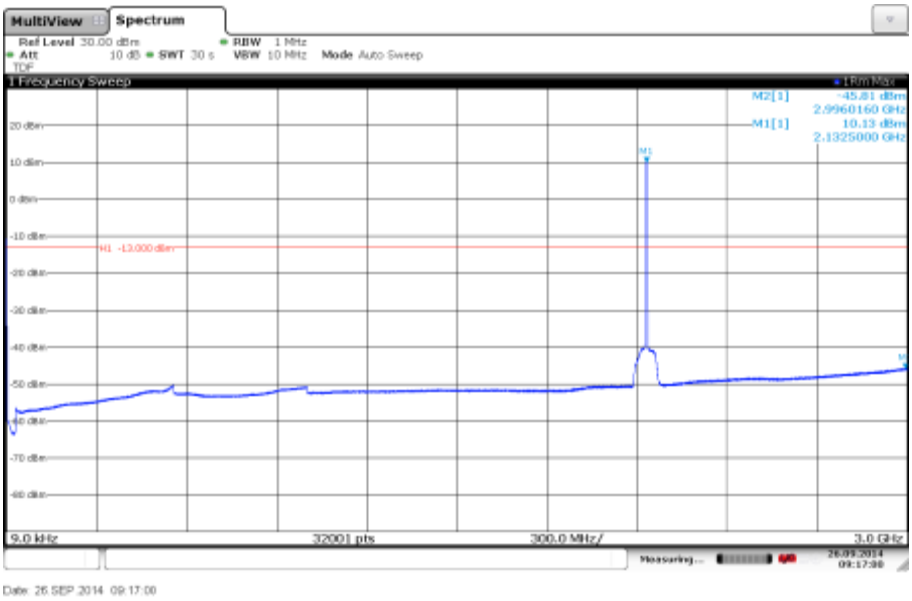

Date: 25.SEP.2014 14:30:10

Diagram 3 d:



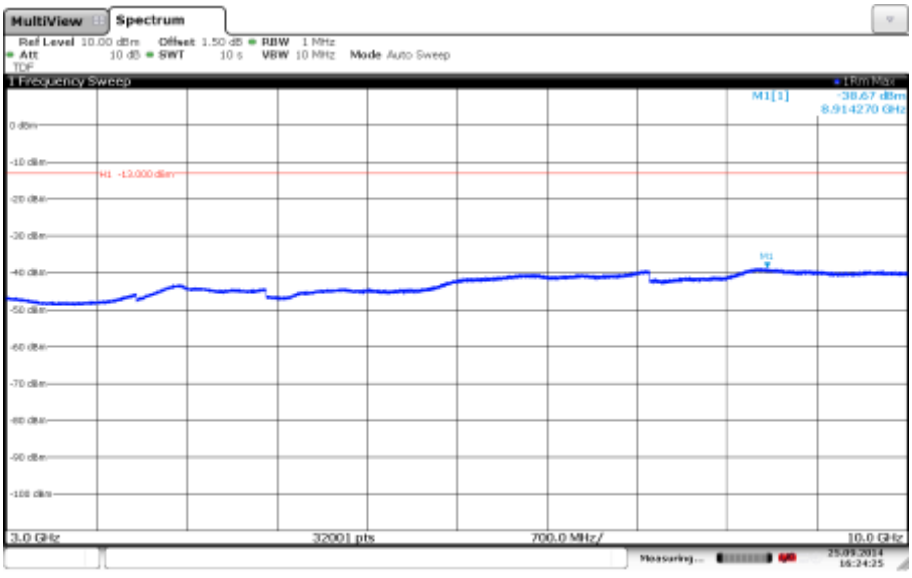

Date: 25.SEP.2014 14:29:35

Diagram 4 a:



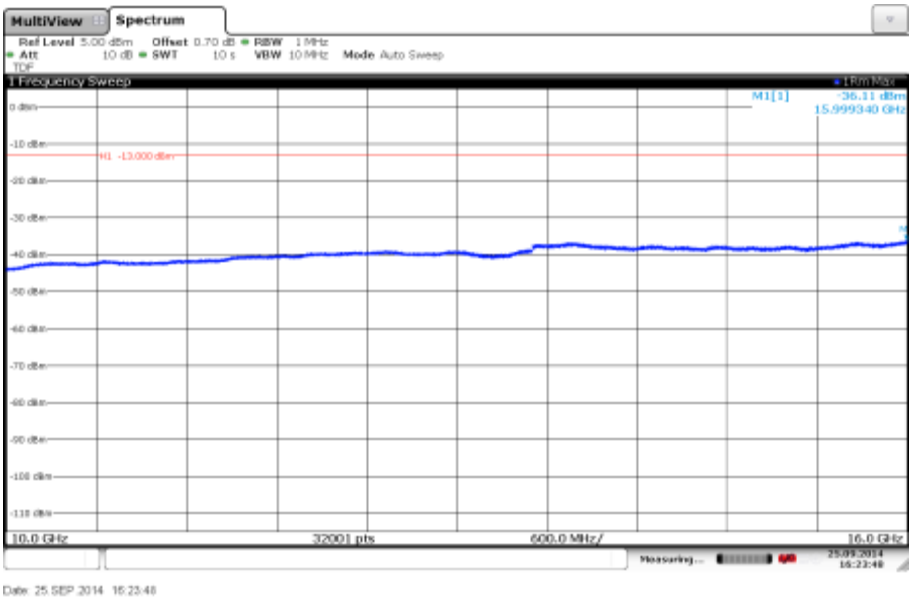

Date: 26.SEP.2014 09:17:00

Diagram 4 b:



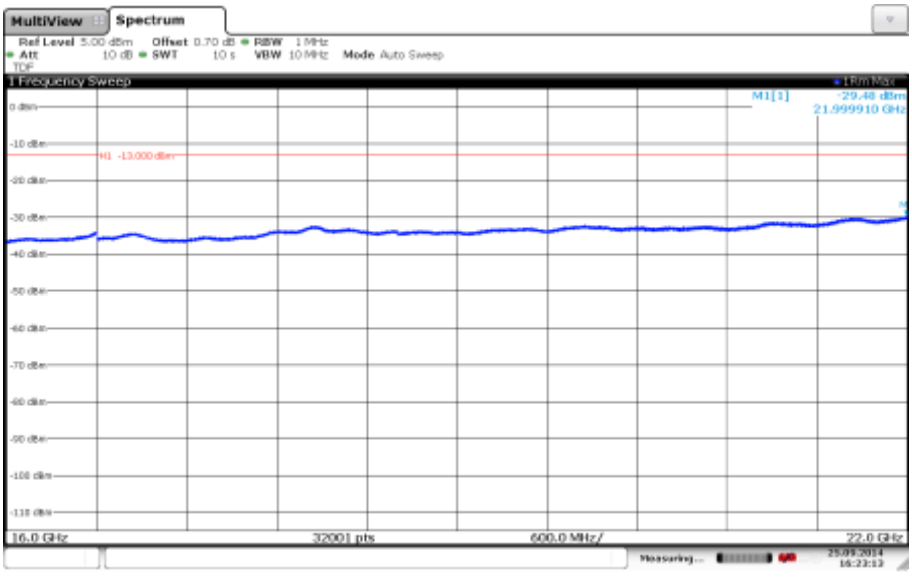

Date: 25.SEP.2014 16:24:24

Diagram 4 c:




Date: 25.SEP.2014 16:23:48

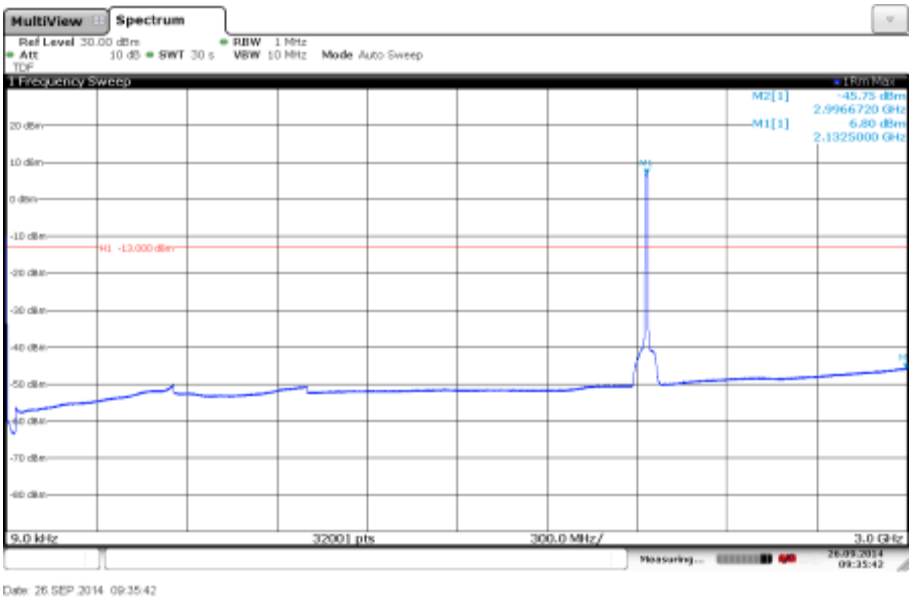
Diagram 4 d:




Date: 25.SEP.2014 16:23:12

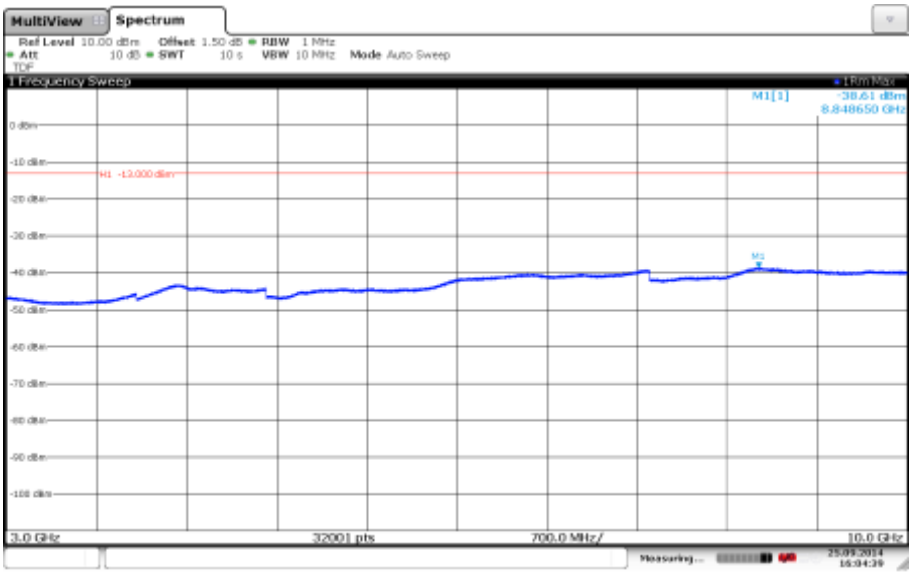
Appendix 6

Diagram 5 a:




Date: 26.SEP.2014 09:35:42

Diagram 5 b:




Date: 25.SEP.2014 16:04:39

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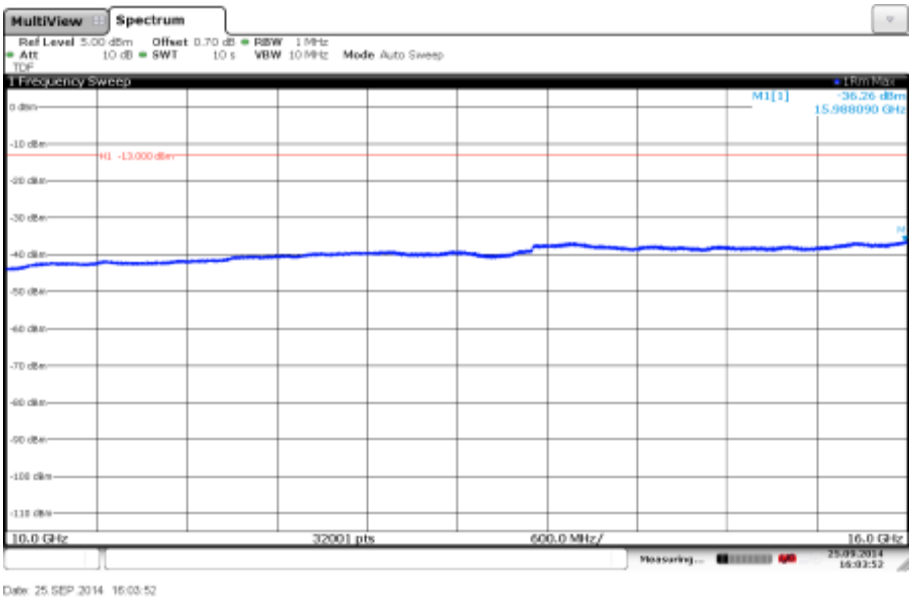
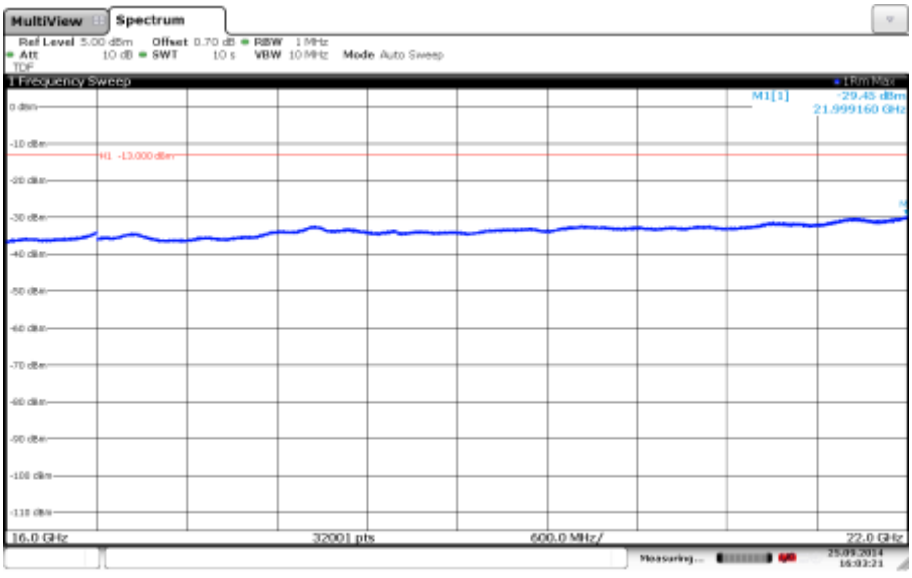



Date: 25.SEP.2014 16:03:52

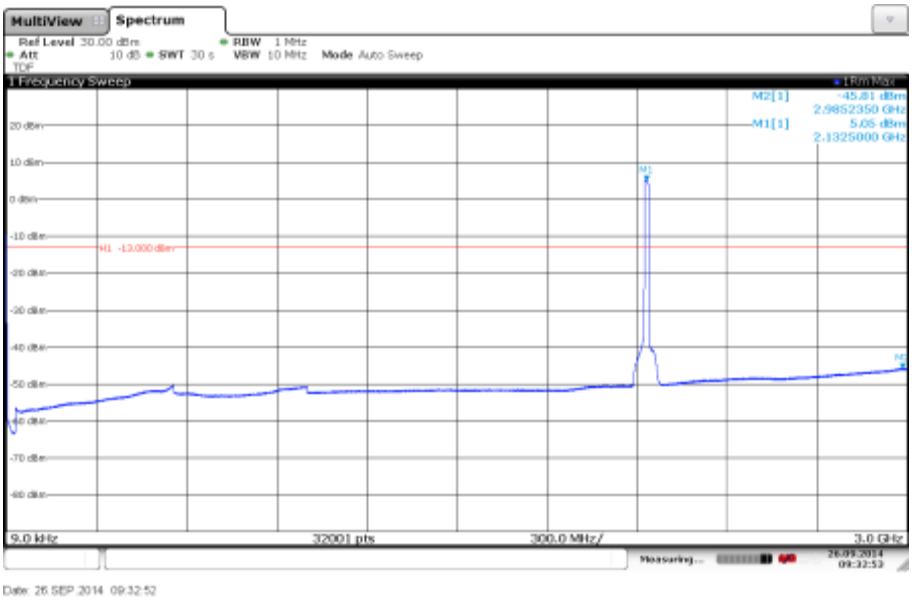
Diagram 5 d:




Date: 25.SEP.2014 16:03:21

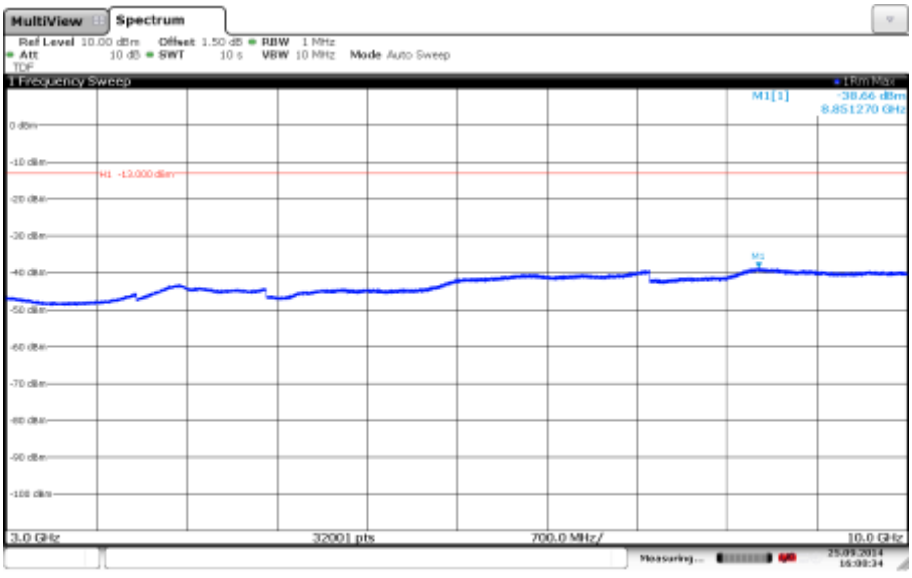
Appendix 6

Diagram 6 a:




Date: 26.SEP.2014 09:32:52

Diagram 6 b:




Date: 25.SEP.2014 16:00:34

Appendix 6

Diagram 6 c:

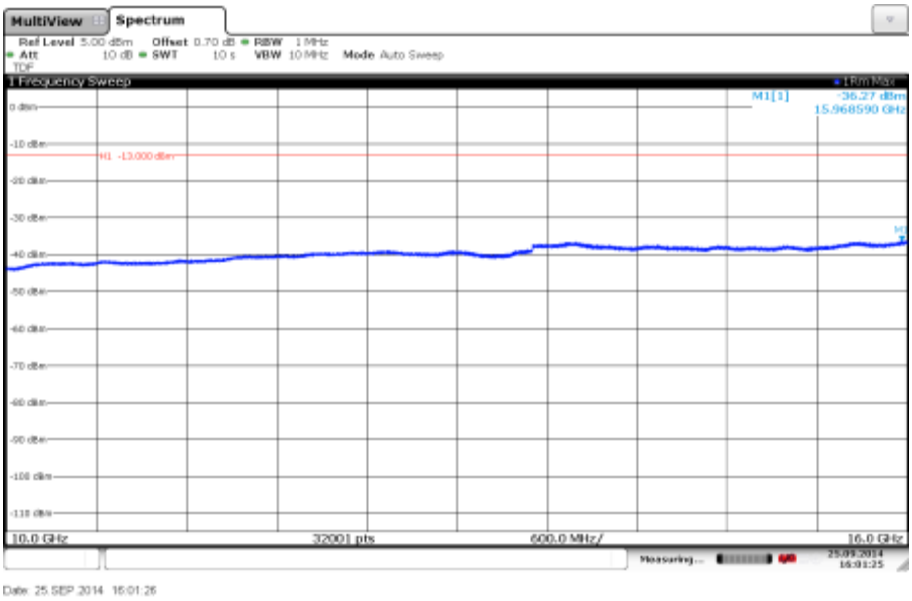
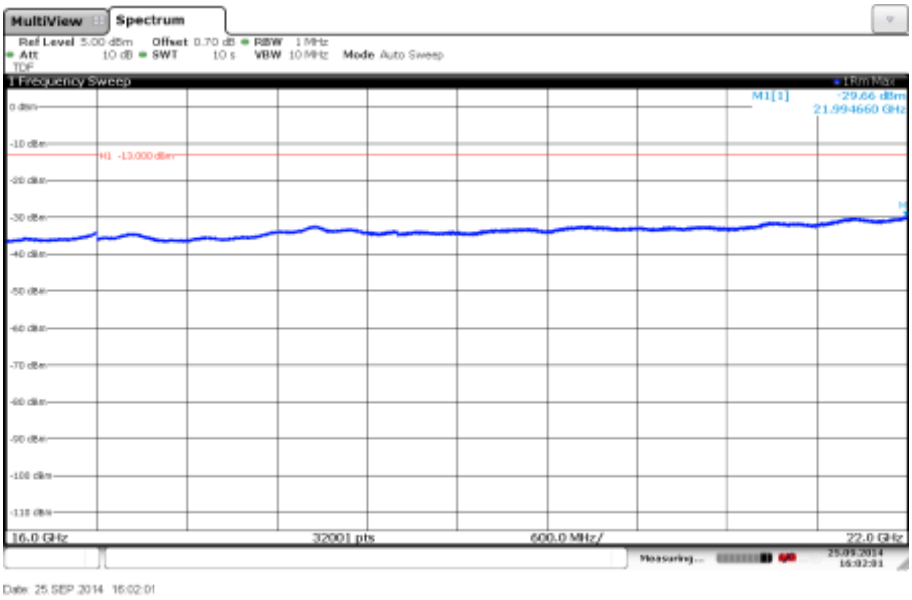



Diagram 6 d:



Appendix 6

Diagram 7 a:

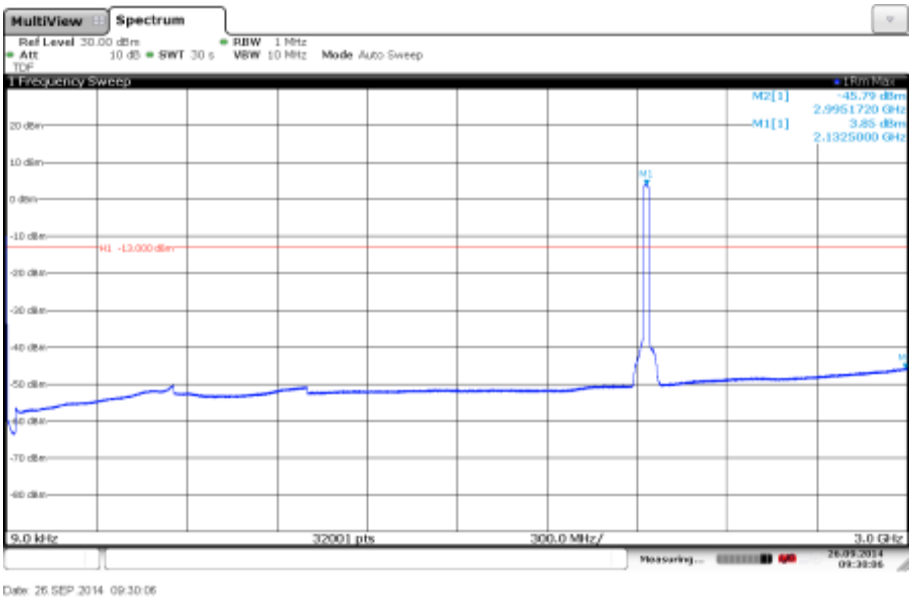



Diagram 7 b:

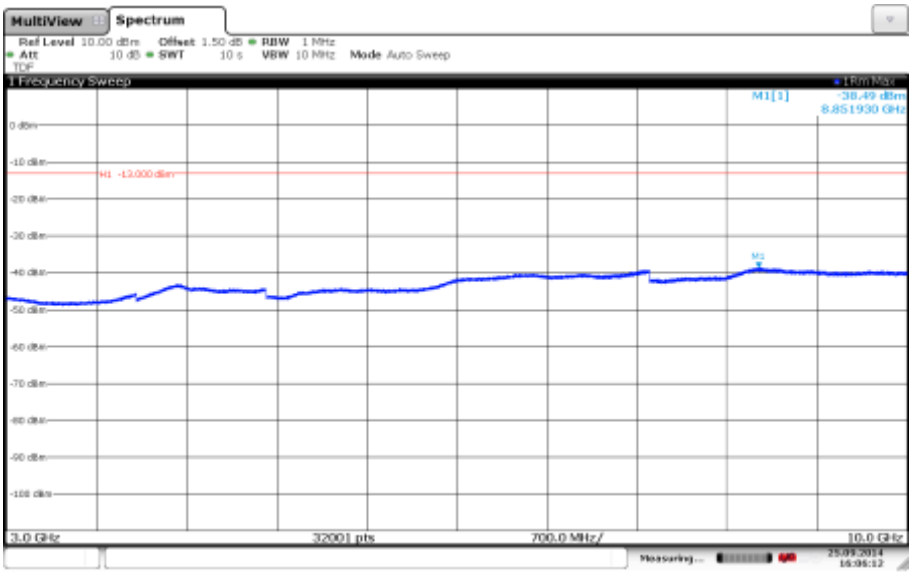
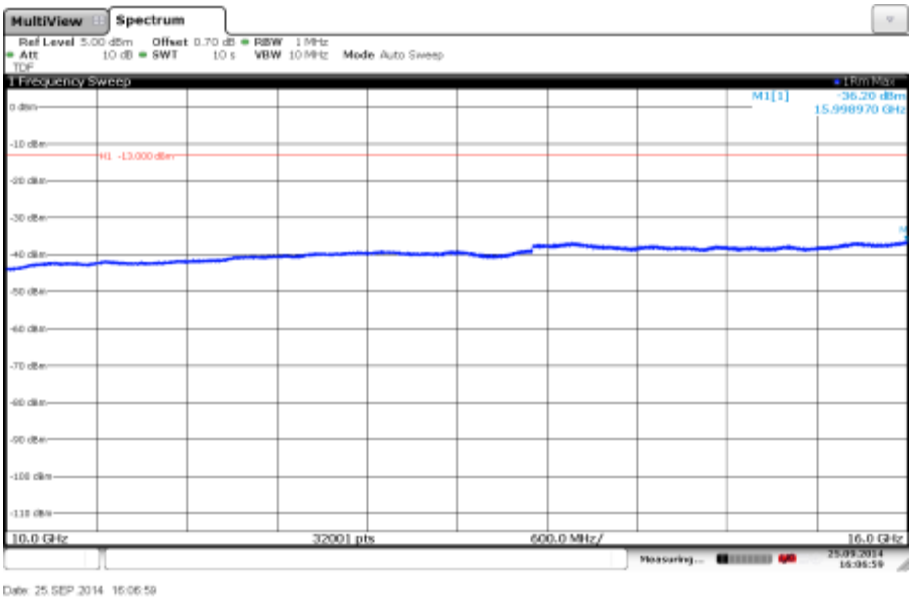
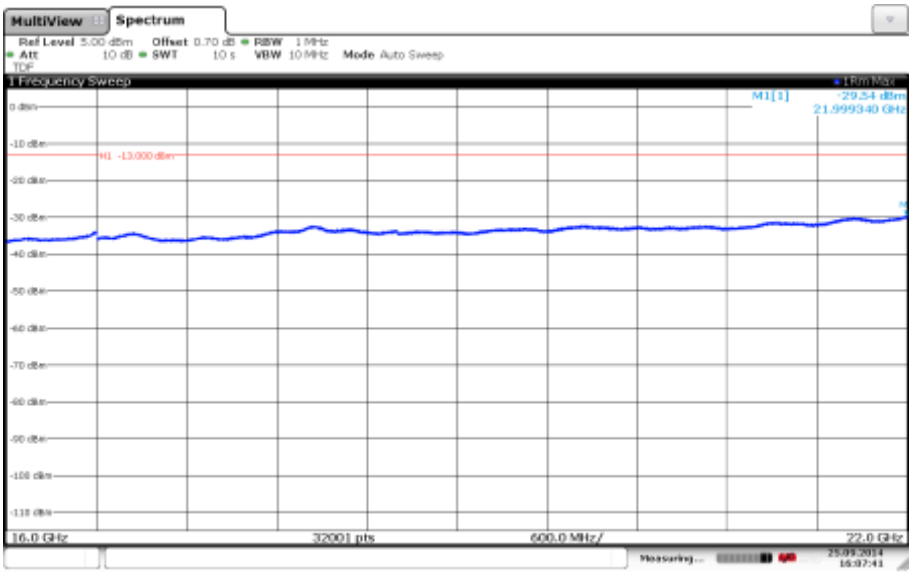


Diagram 7 c:




Date: 25.SEP.2014 16:06:59

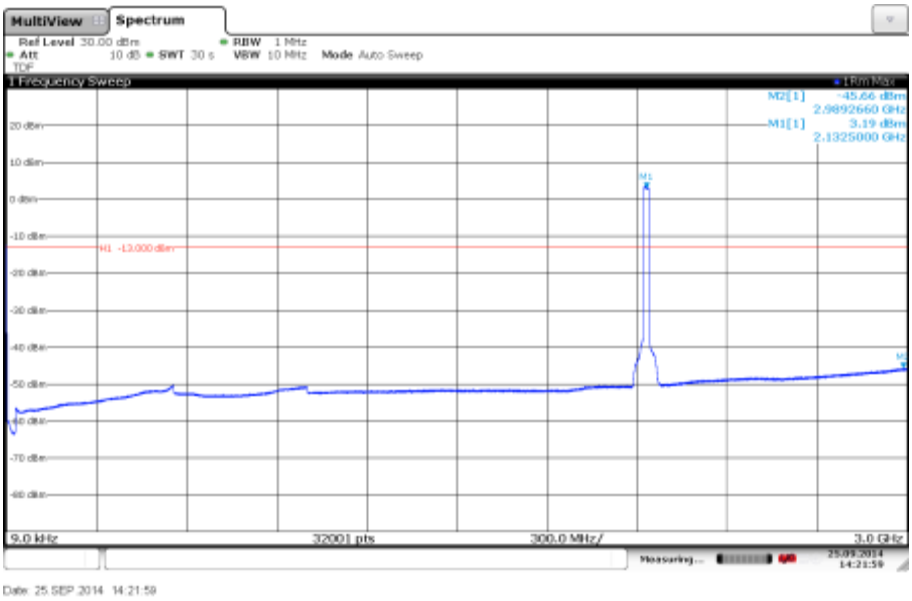
Diagram 7 d:




Date: 25.SEP.2014 16:07:41

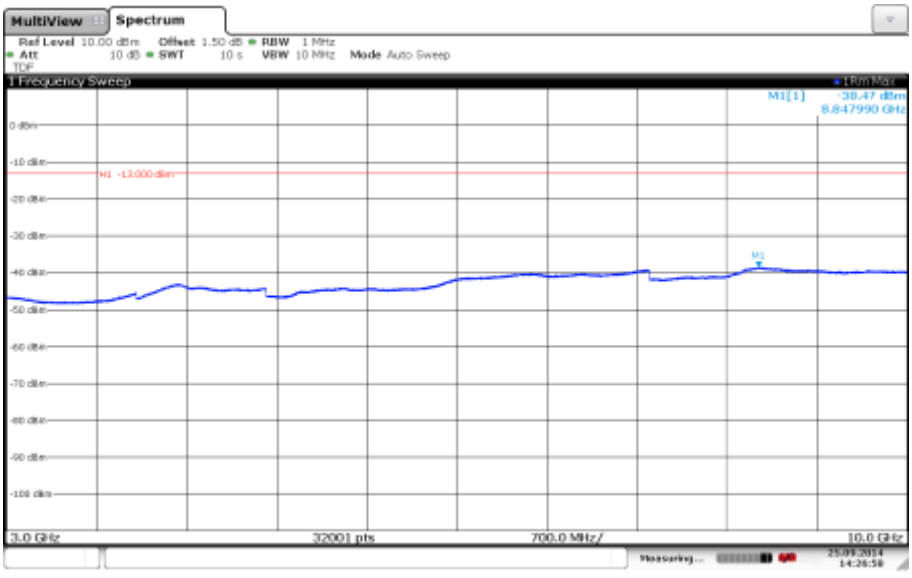
Appendix 6

Diagram 8 a:



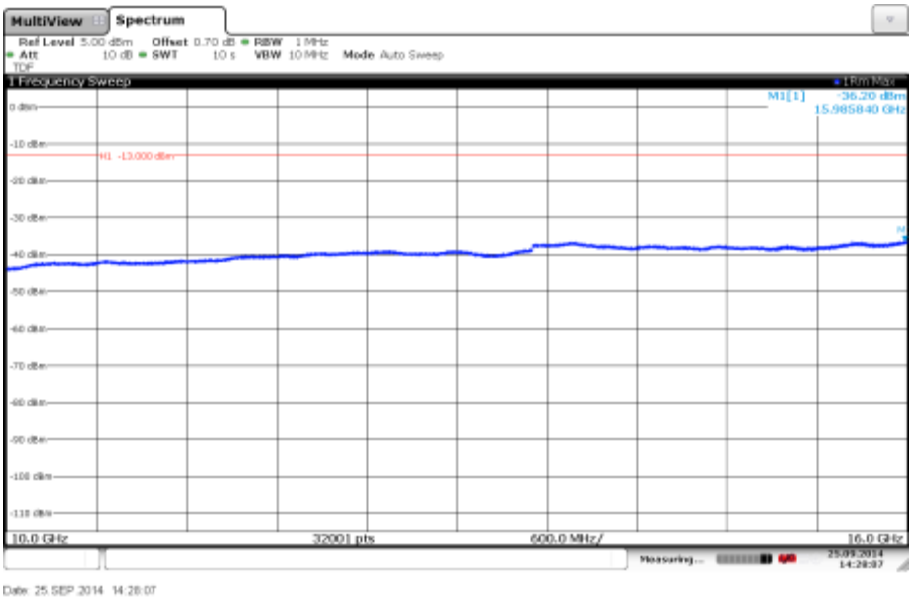

Date: 25.SEP.2014 14:21:59

Diagram 8 b:



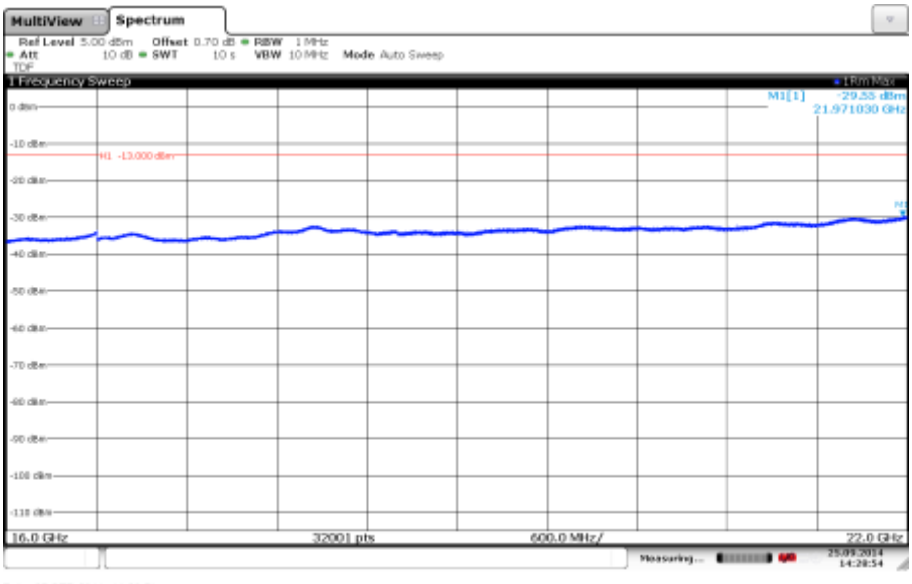

Date: 25.SEP.2014 14:26:58

Diagram 8 c:



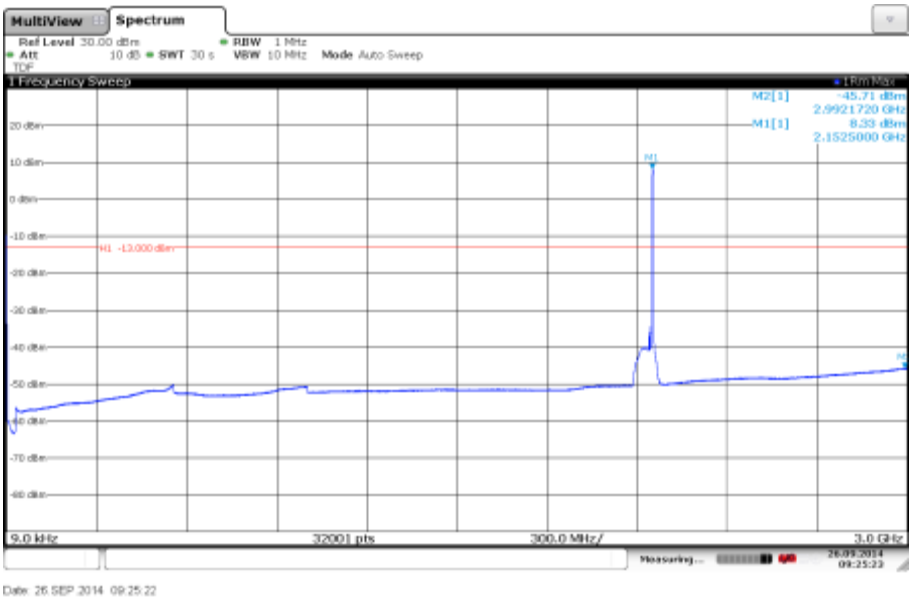

Date: 25.SEP.2014 14:28:07

Diagram 8 d:



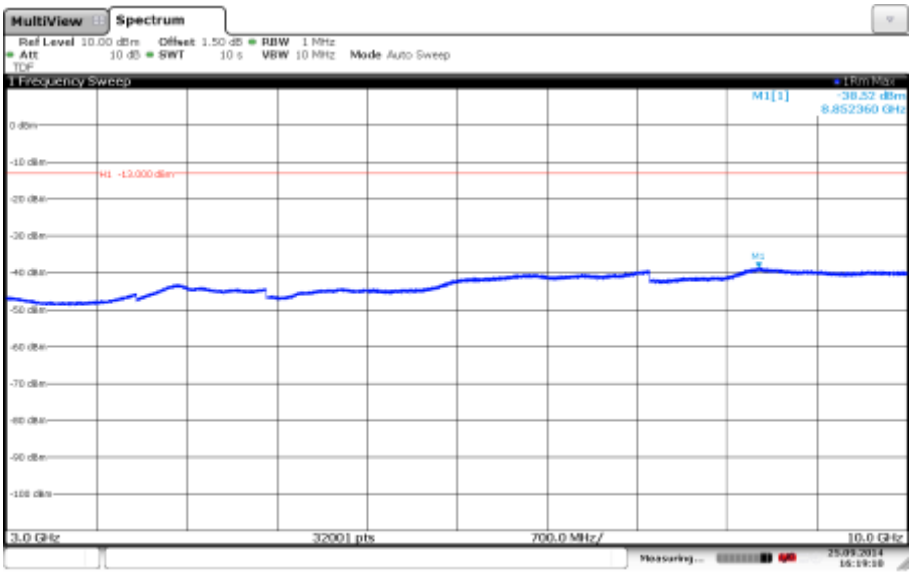

Date: 25.SEP.2014 14:28:54

Diagram 9 a:




Date: 26.SEP.2014 09:25:22

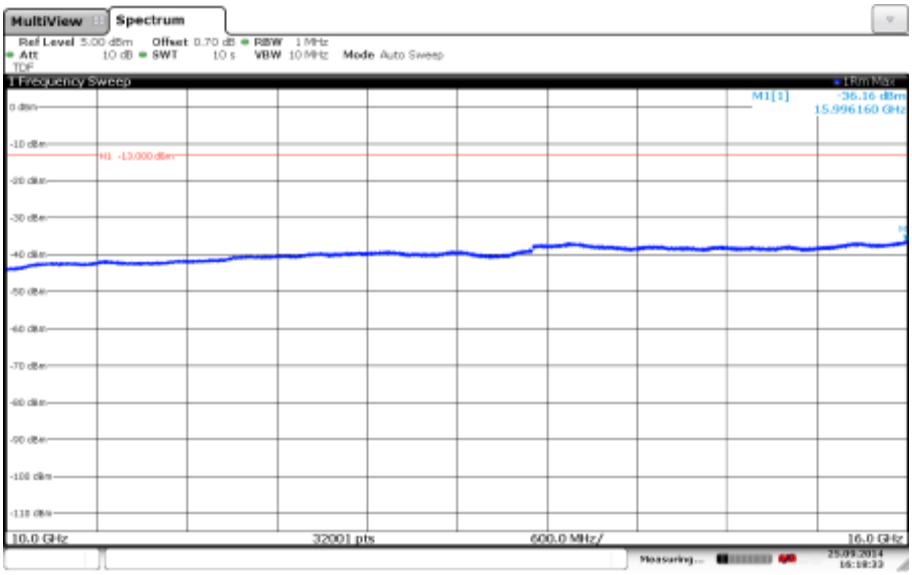
Diagram 9 b:




Date: 25.SEP.2014 16:19:10

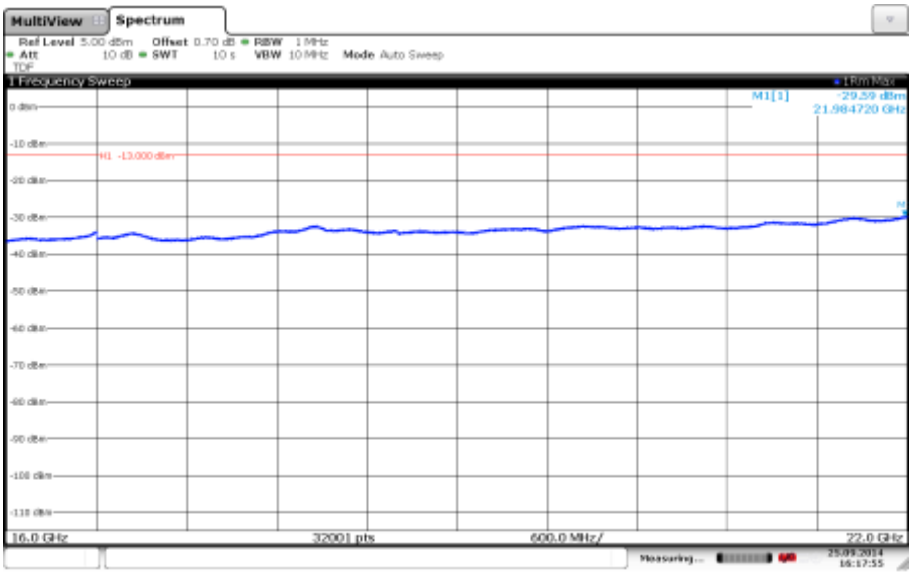
Appendix 6

Diagram 9 c:




Date: 25.SEP.2014 16:18:32

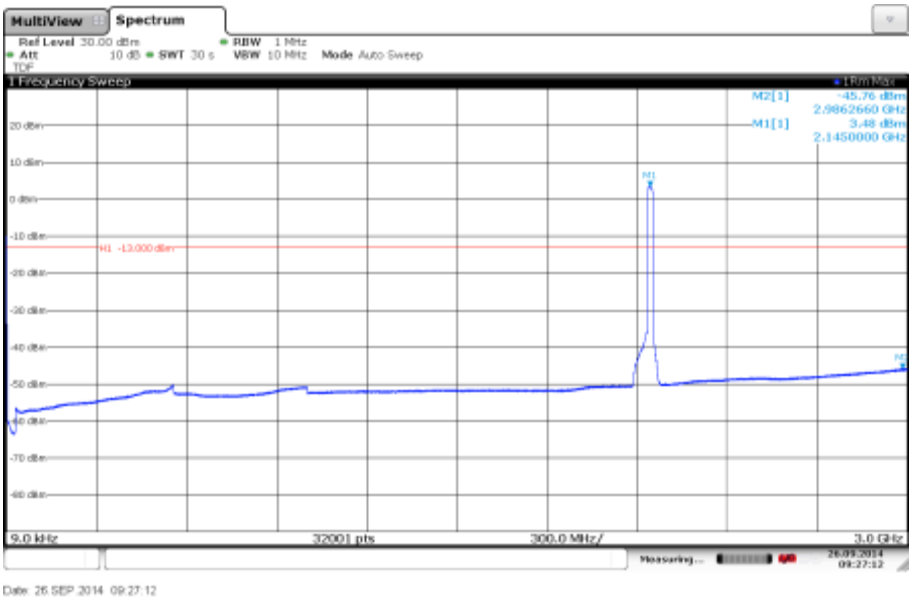
Diagram 9 d:




Date: 25.SEP.2014 16:17:55

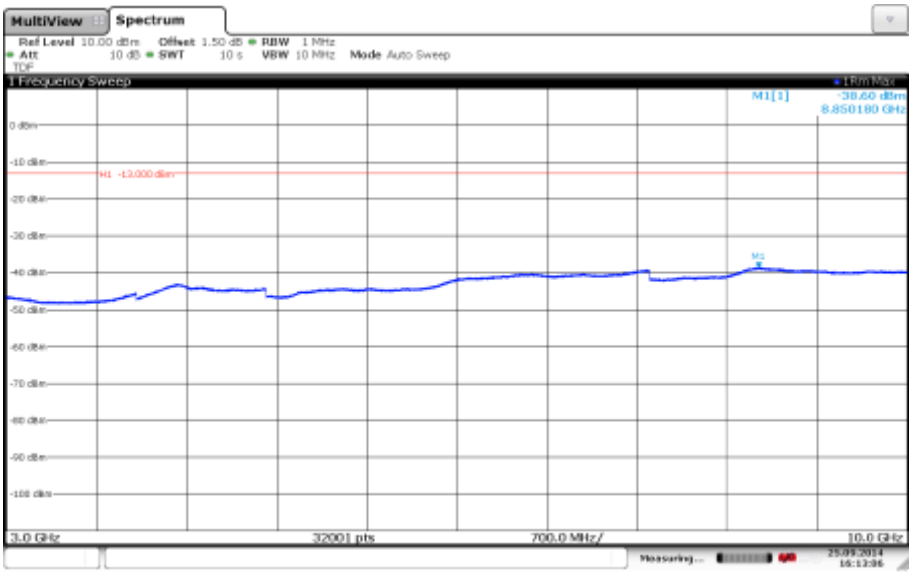
Appendix 6

Diagram 10 a:




Date: 26.SEP.2014 09:27:12

Diagram 10 b:




Date: 25.SEP.2014 16:13:07

Diagram 10 c:

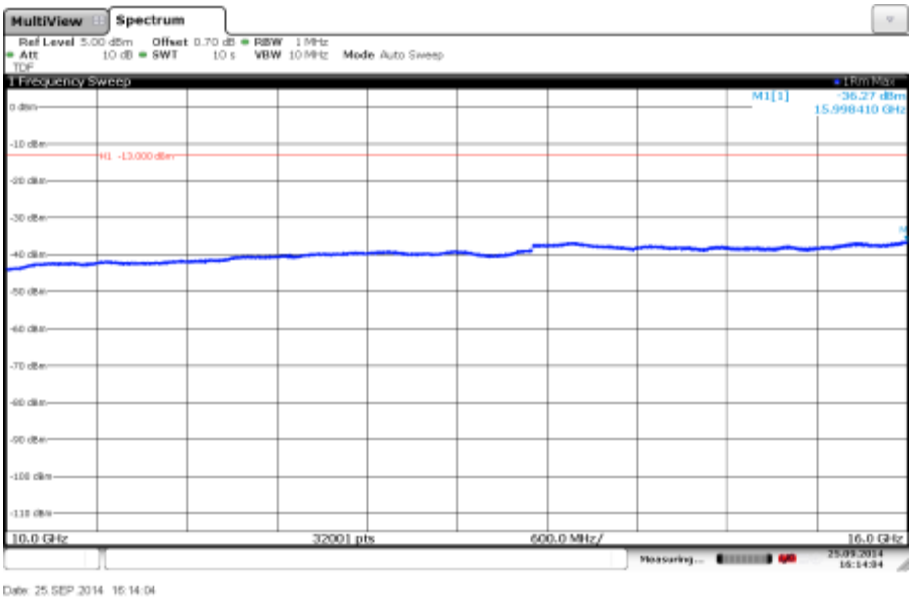
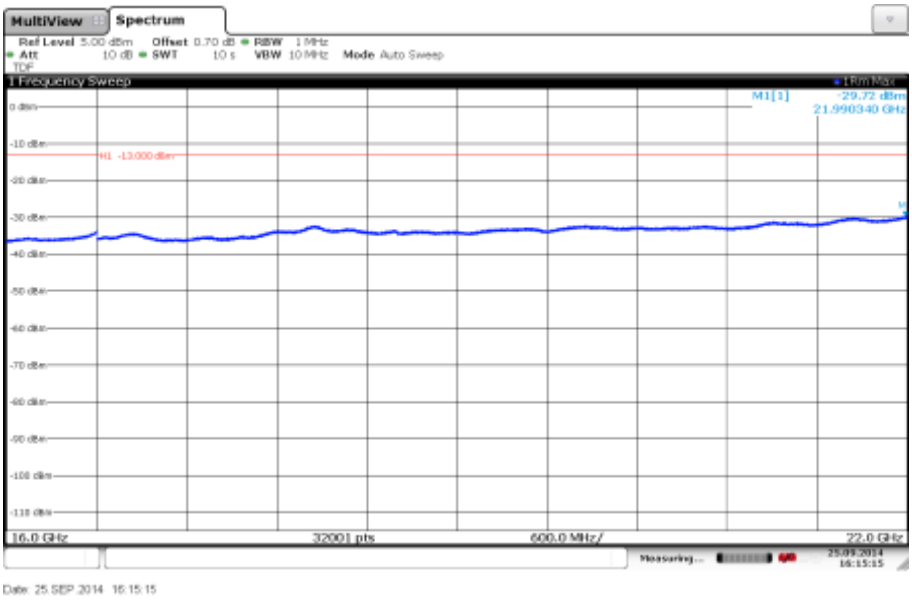
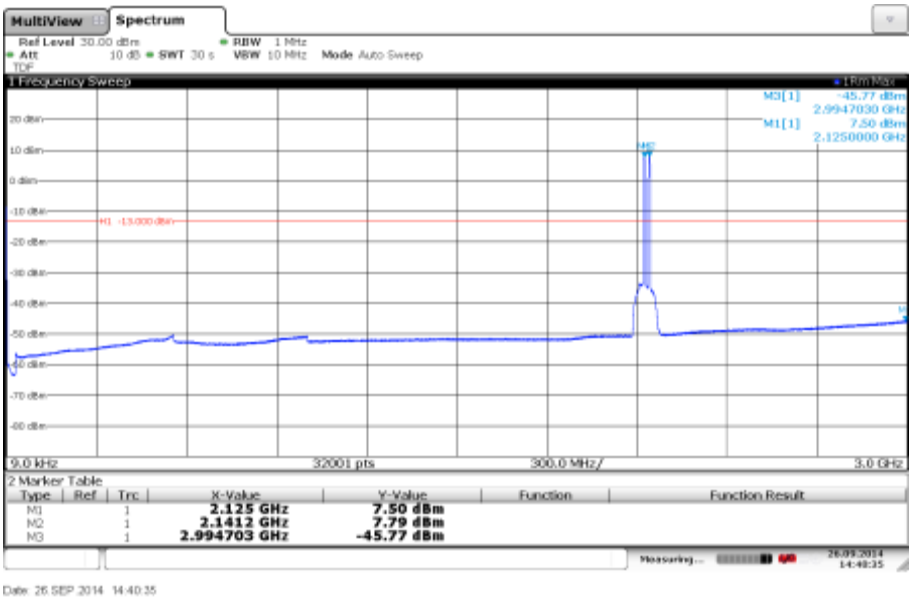



Diagram 10 d:



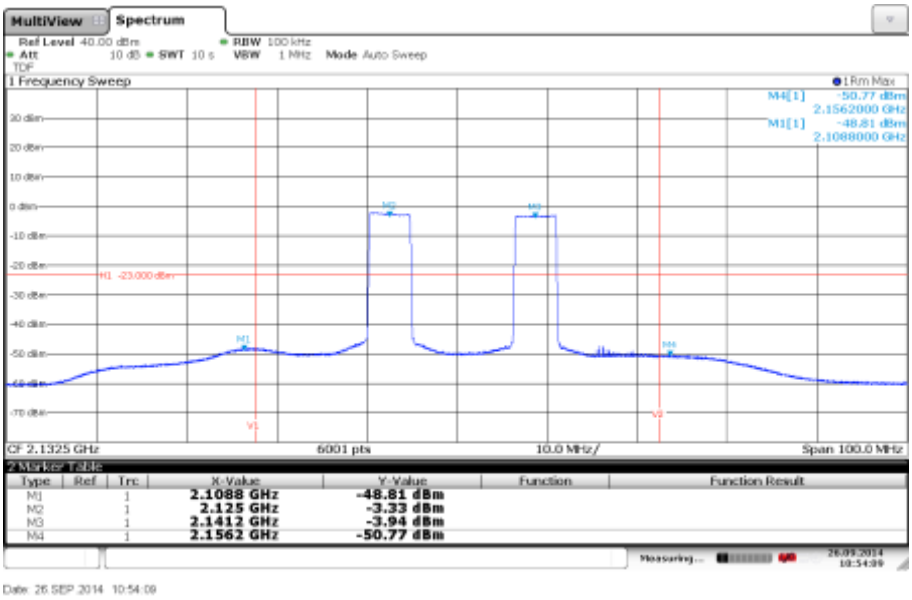
Appendix 6

Diagram 11 a:




Date: 26.SEP.2014 14:40:35

Diagram 11 b:




Date: 26.SEP.2014 10:54:09

Diagram 11 c:

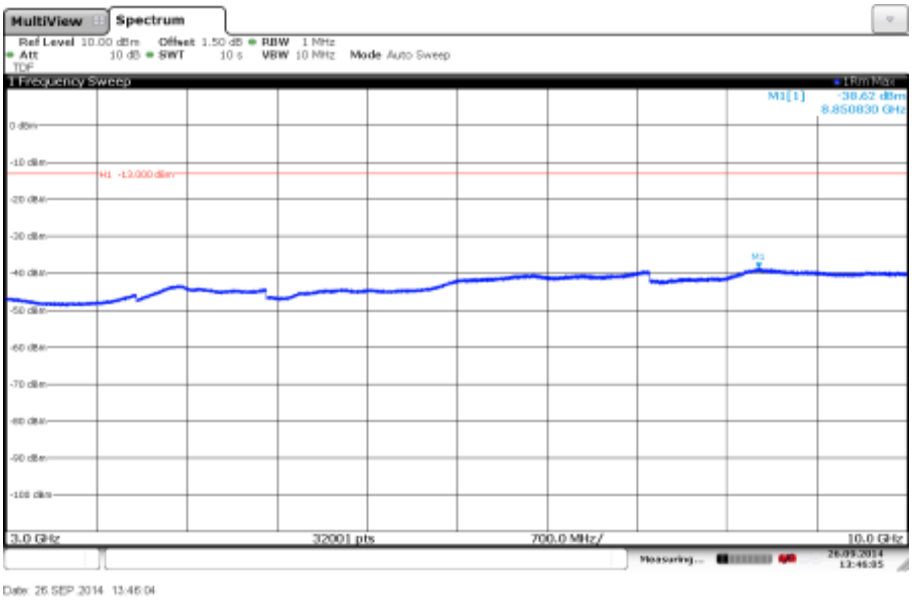



Diagram 11 d:

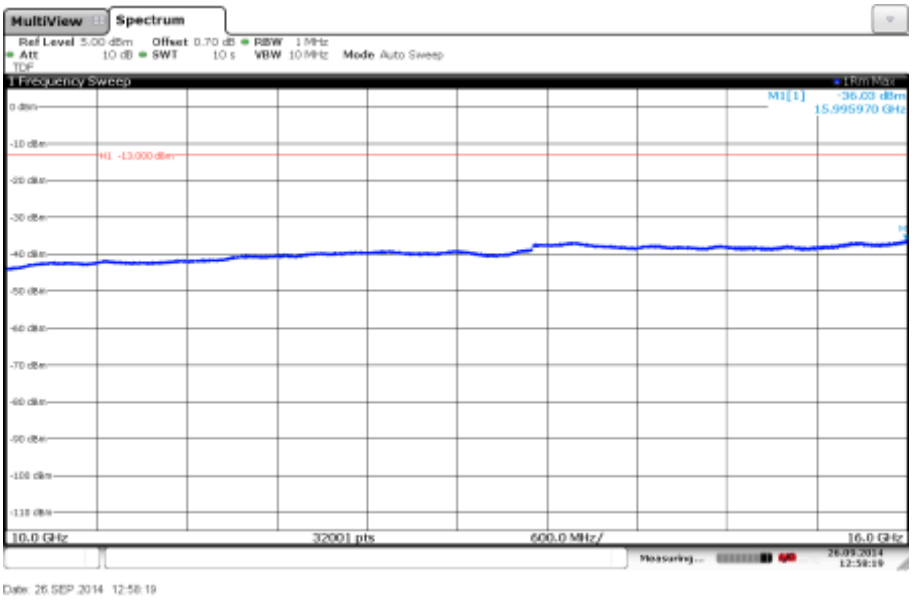
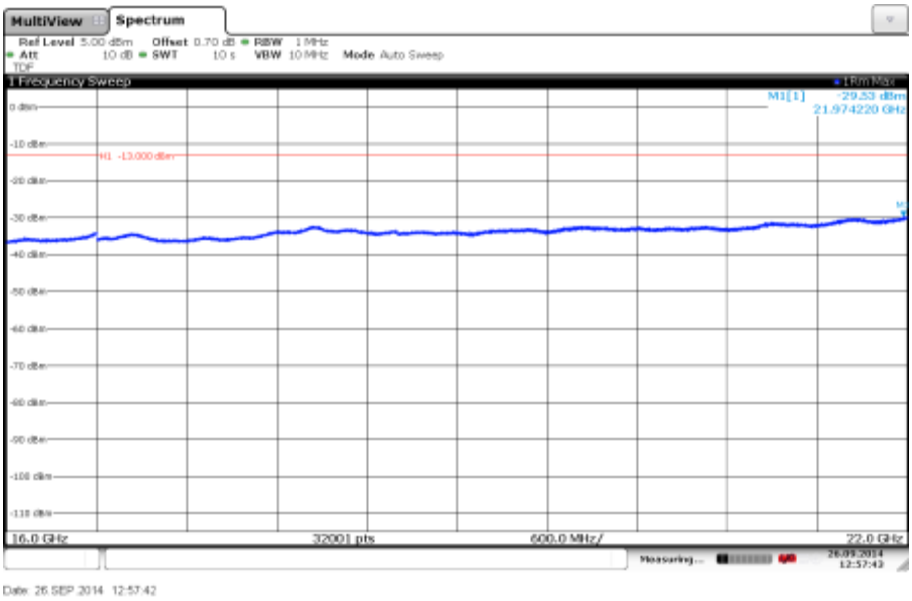
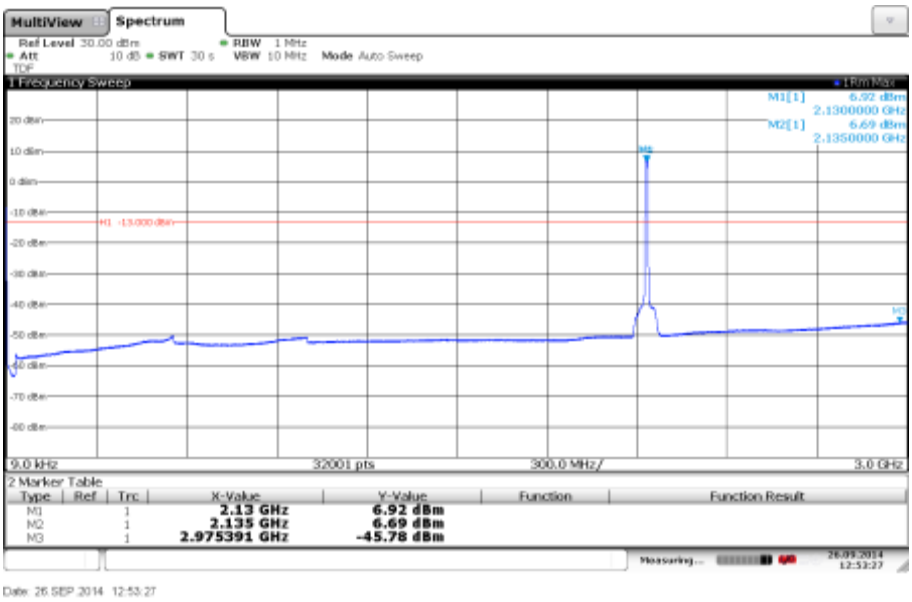


Diagram 11 e:


MultiView
Spectrum
Ref Level 5.00 dBm Offset 0.70 dB RBW 1 MHz
Att 10 dB SWT 10 s VBW 10 MHz Mode Auto Sweep
1 Frequency Sweep
1Rm Max
M1[1] -29.53 dBm
21.974220 GHz
H1 -13.000 dBm
16.0 GHz
3200 pts
600.0 MHz/
22.0 GHz
Measuring...
26.09.2014
12:57:42
Date: 26.SEP.2014 12:57:42

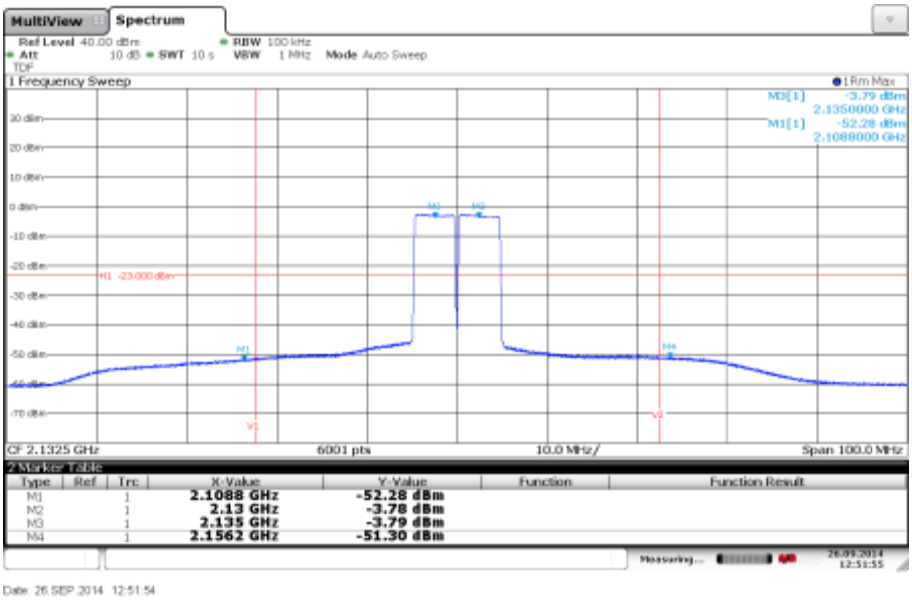
Appendix 6

Diagram 12 a:



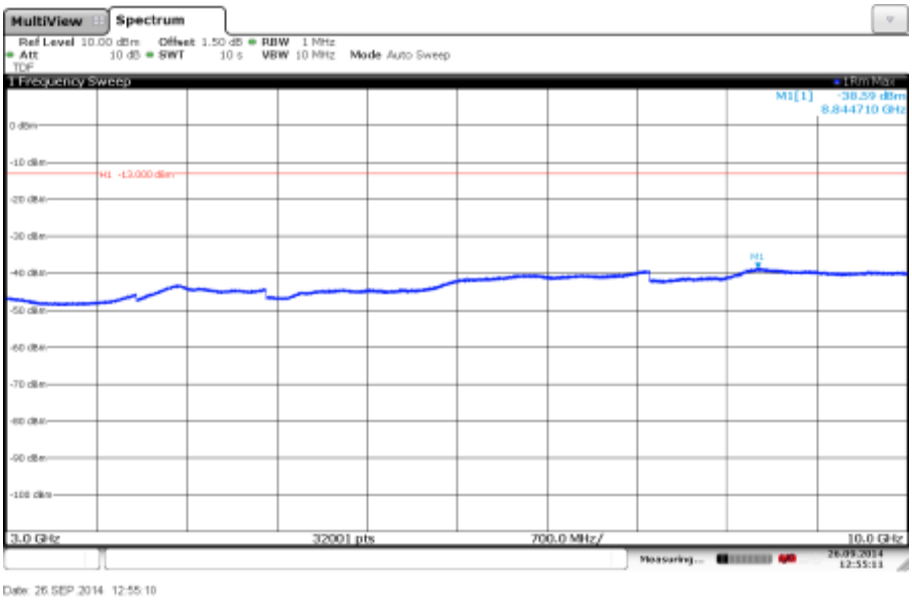

Date: 26.SEP.2014 12:53:27

Diagram 12 b:



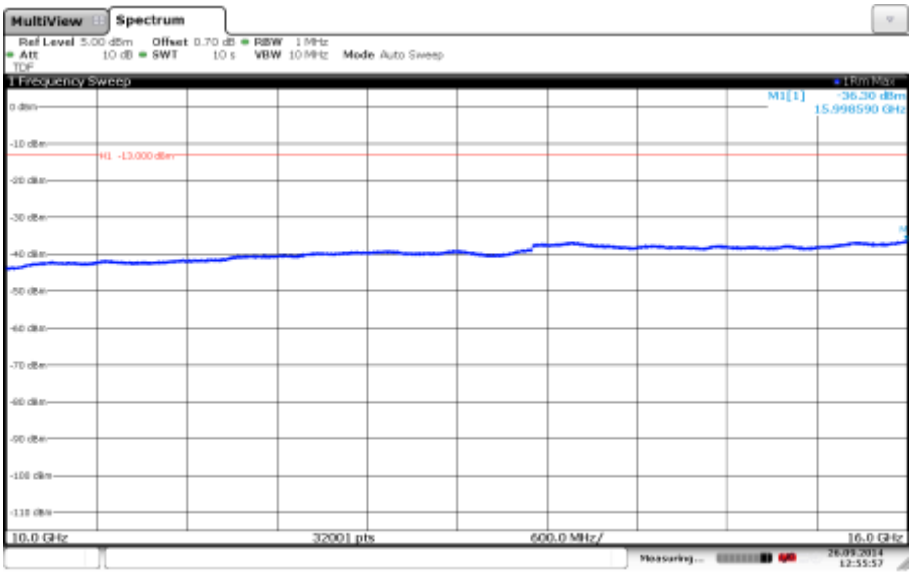

Date: 26.SEP.2014 12:51:54

Diagram 12 c:




Date: 26.SEP.2014 12:55:10

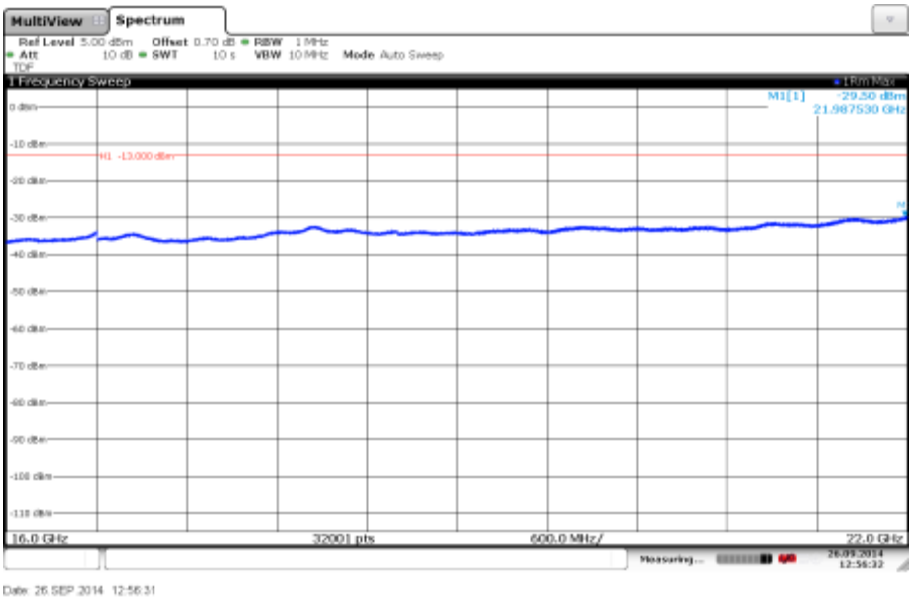
Diagram 12 d:




Date: 26.SEP.2014 12:55:57

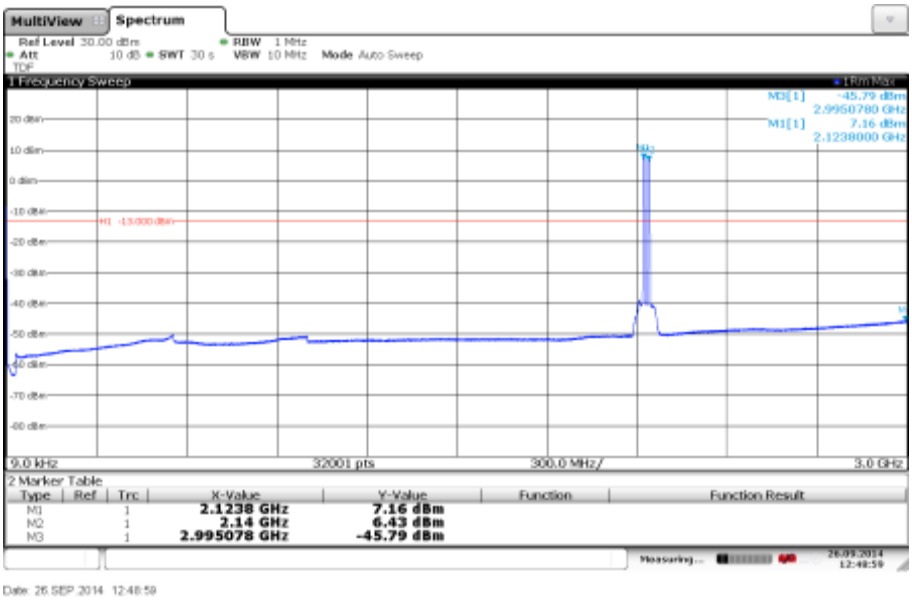
Appendix 6

Diagram 12 e:



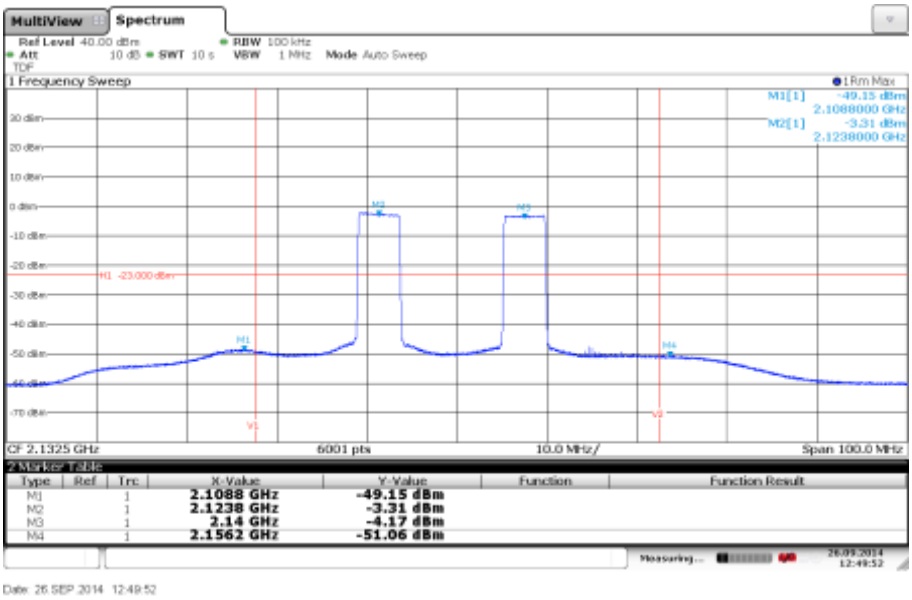
Appendix 6

Diagram 13 a:



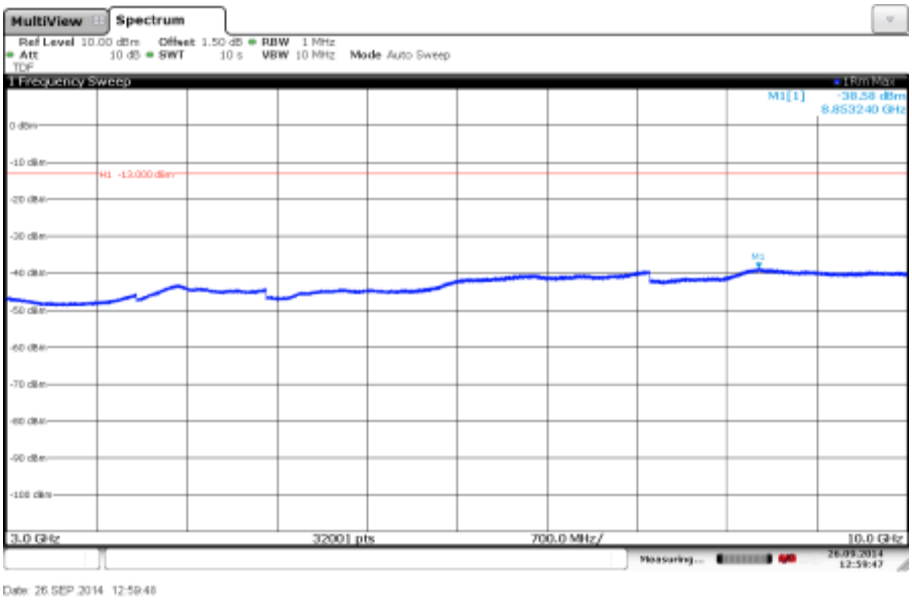

Date: 26.SEP.2014 12:48:59

Diagram 13 b:



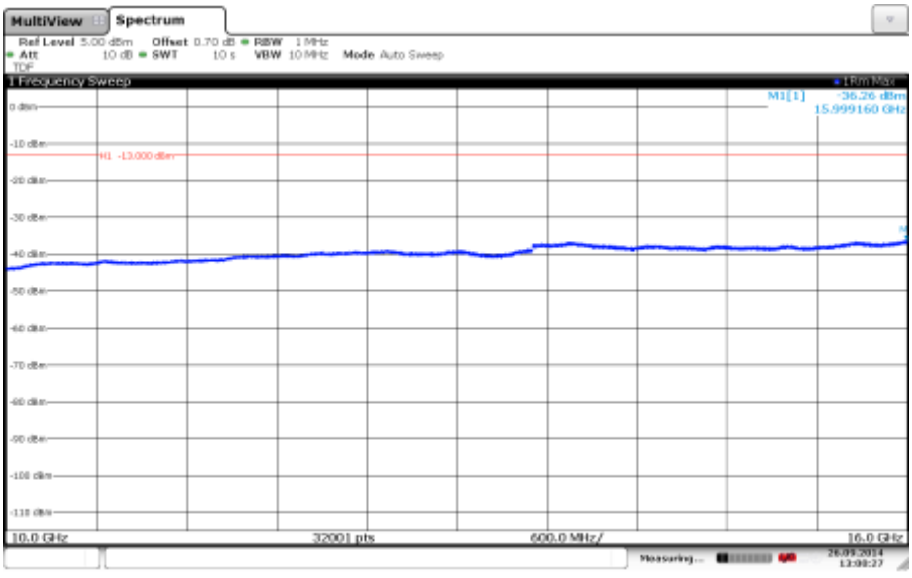

Date: 26.SEP.2014 12:49:52

Diagram 13 c:



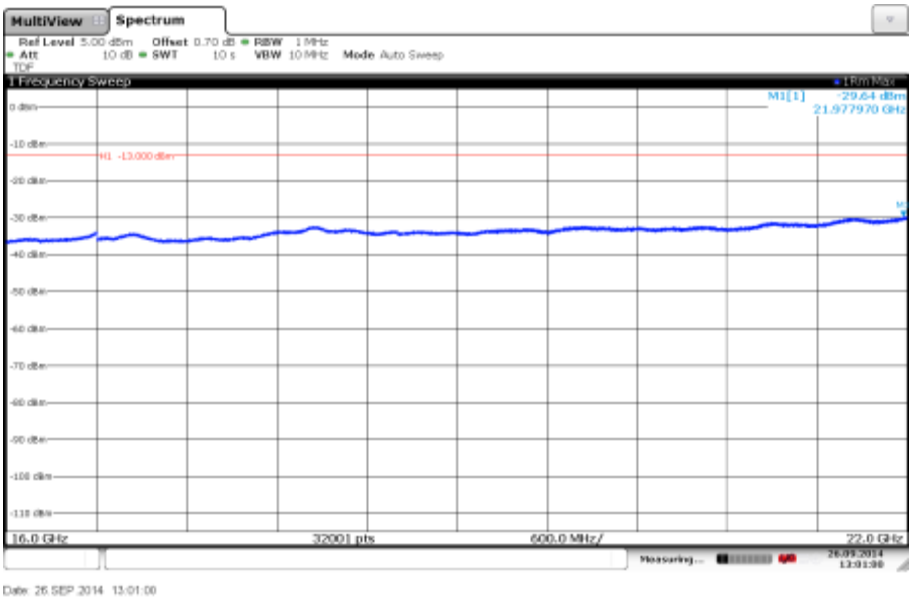

Date: 26.SEP.2014 12:59:48

Diagram 13 d:




Date: 26.SEP.2014 13:00:26

Diagram 13 e:


MultiView
Spectrum
Ref Level 5.00 dBm Offset 0.70 dB RBW 1 MHz
Att 10 dB SWT 10 s VBW 10 MHz Mode Auto Sweep
1 Frequency Sweep
1Rm Max
M1[1] -29.64 dBm
21.977970 GHz
H1 -13.000 dBm
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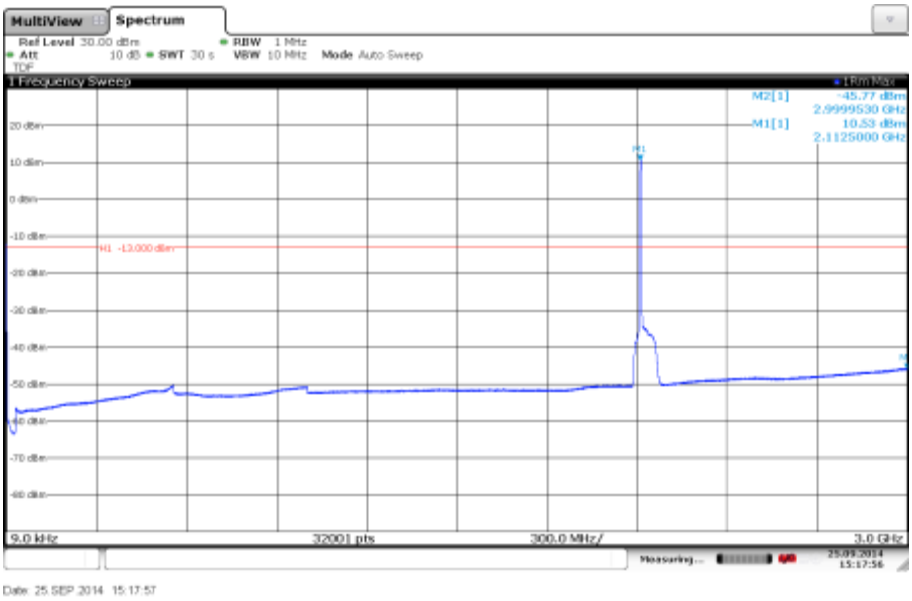
600.0 MHz/
22.0 GHz
Measuring...
Date: 26.SEP.2014 13:01:00

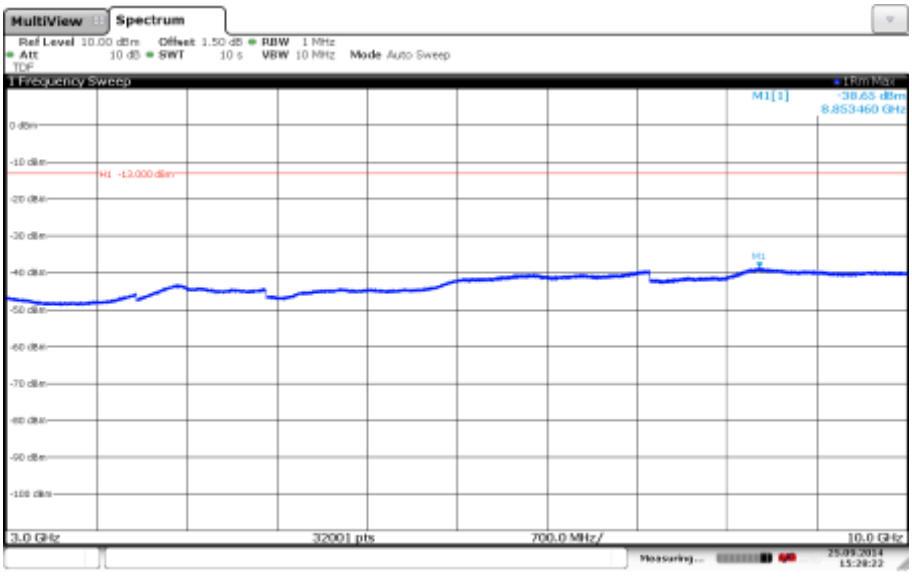
Appendix 6

Diagram 14 a:




Date: 25.SEP.2014 15:17:57

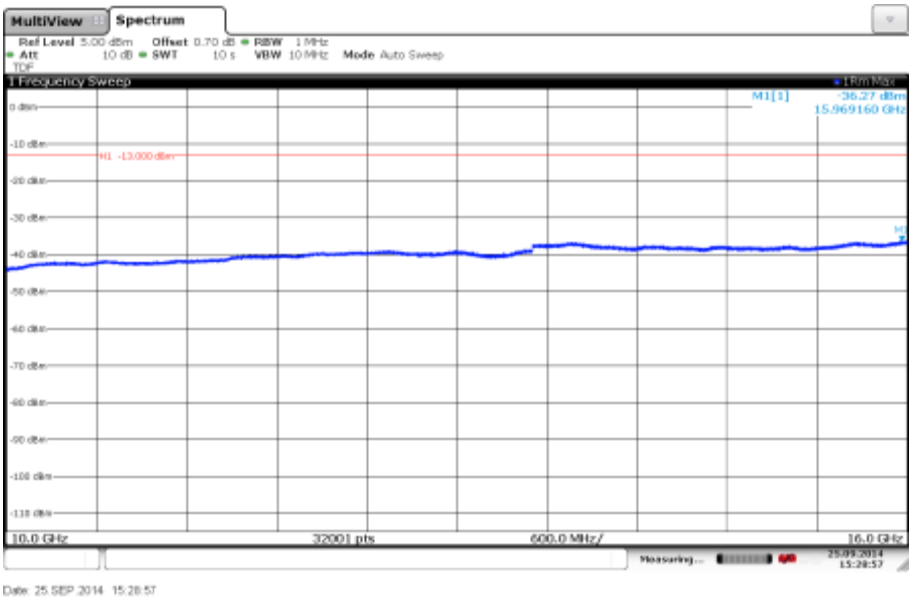
Diagram 14 b:




Date: 25.SEP.2014 15:28:22

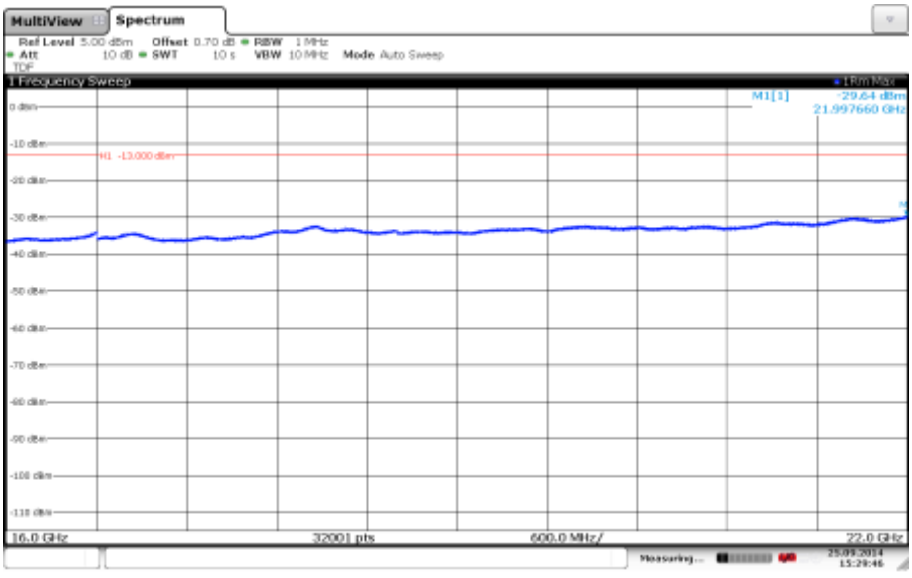
Appendix 6

Diagram 14 c:



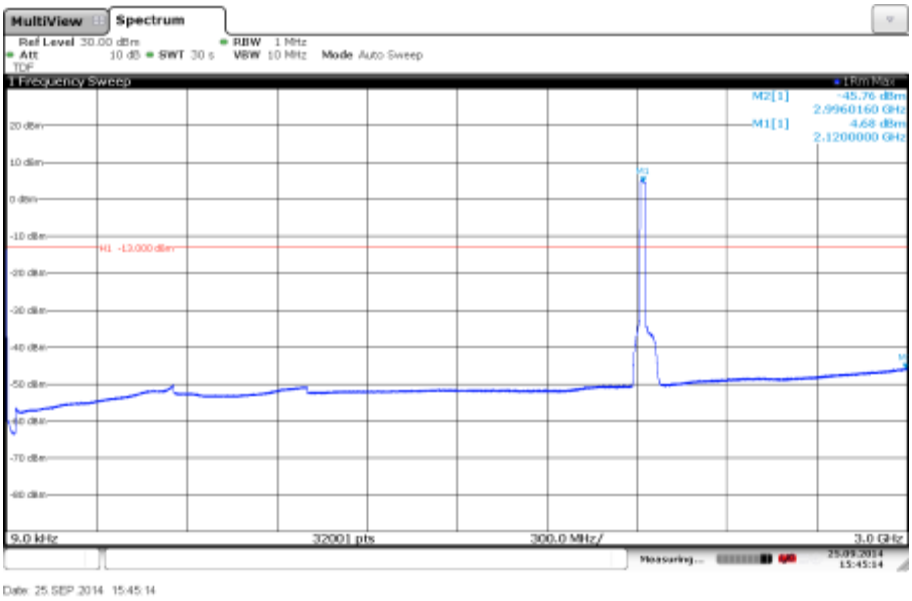

Date: 25.SEP.2014 15:28:57

Diagram 14 d:



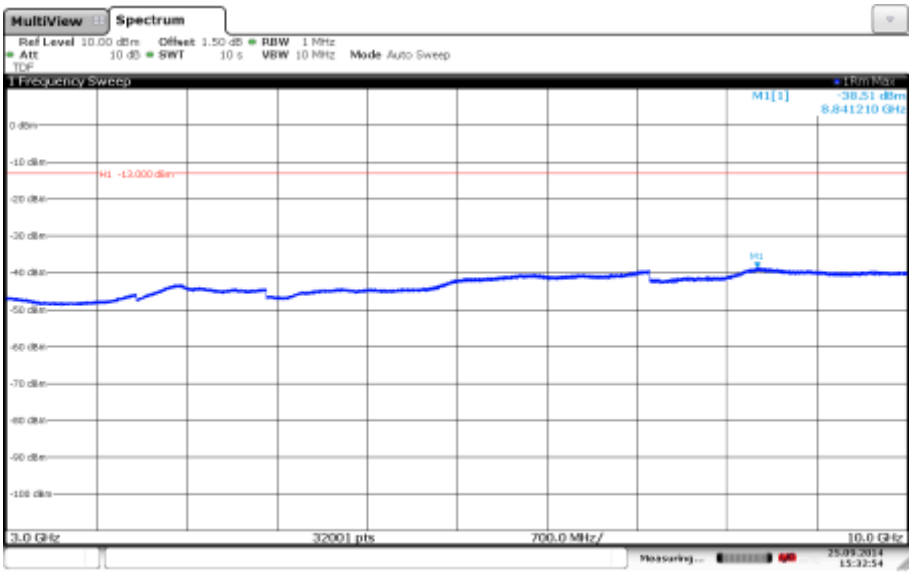

Date: 25.SEP.2014 15:29:47

Diagram 15 a:



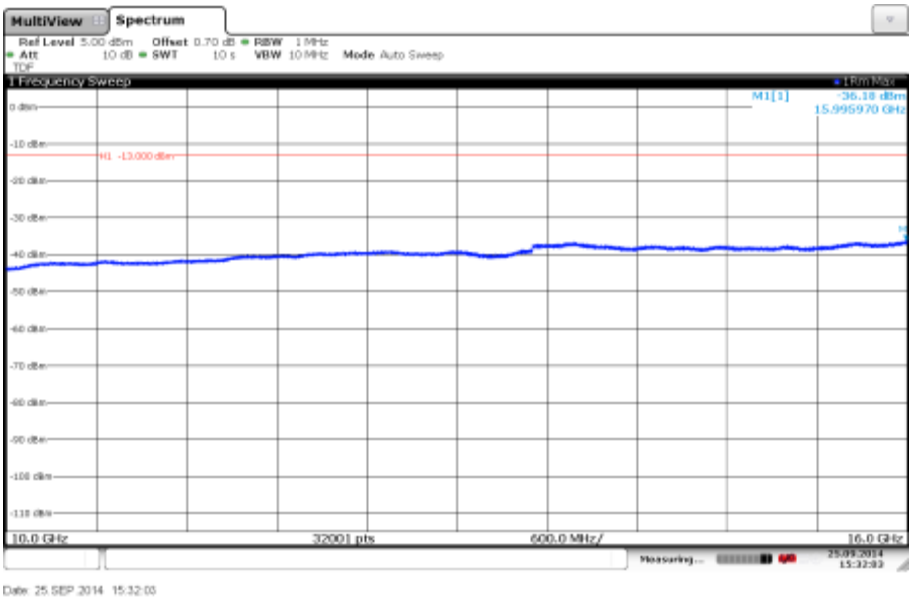

Date: 25.SEP.2014 15:45:14

Diagram 15 b:



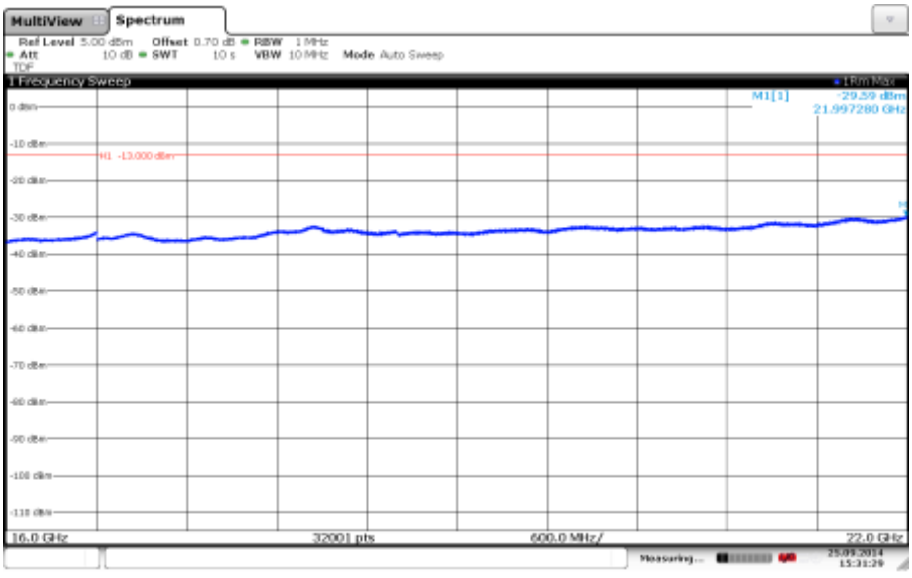

Date: 25.SEP.2014 15:32:53

Diagram 15 c:




Date: 25.SEP.2014 15:32:03

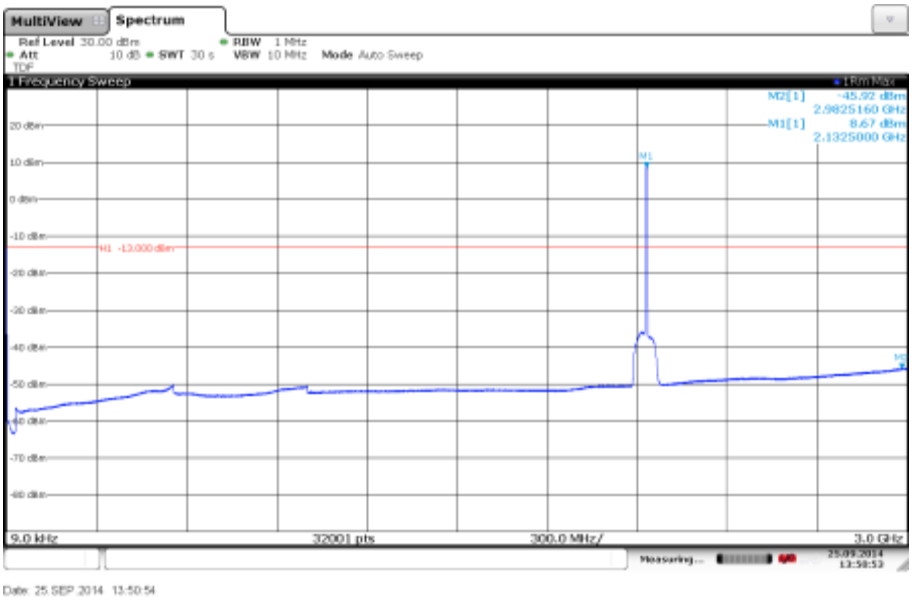
Diagram 15 d:




Date: 25.SEP.2014 15:31:29

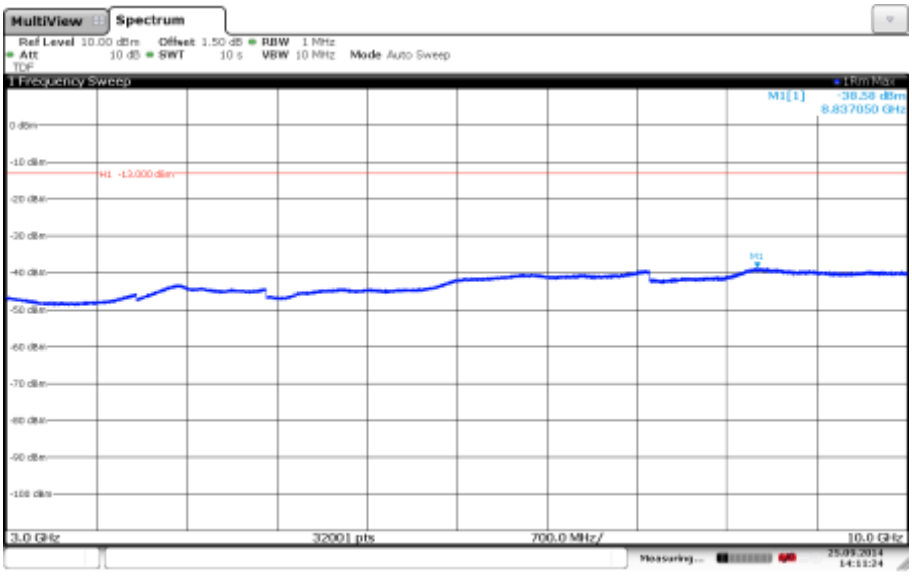
Appendix 6

Diagram 16 a:



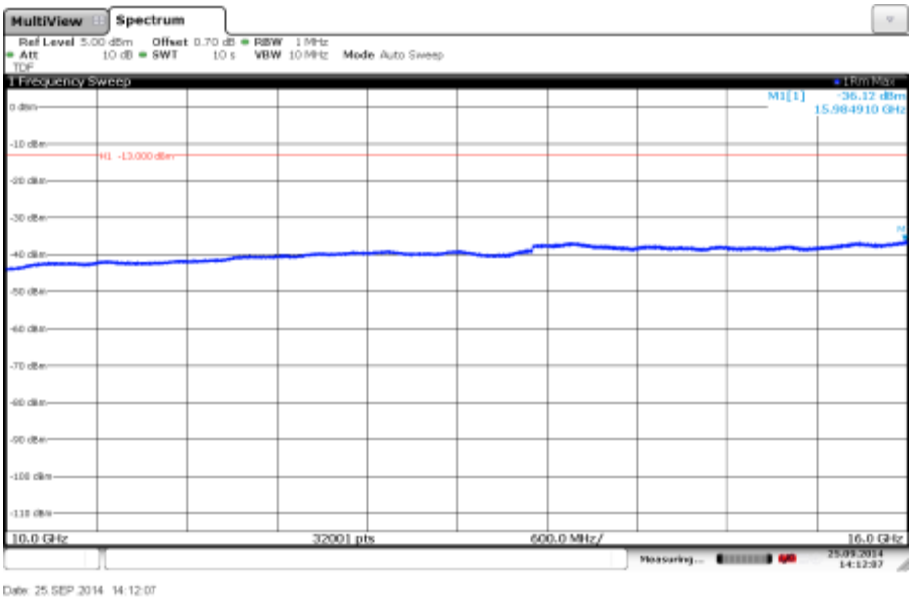

Date: 25.SEP.2014 13:50:54

Diagram 16 b:



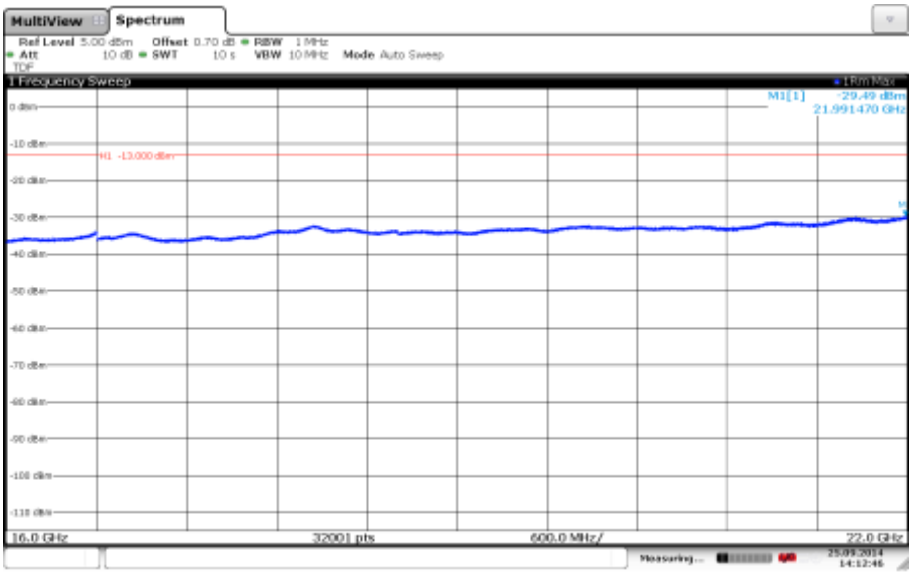

Date: 25.SEP.2014 14:11:25

Diagram 16 c:



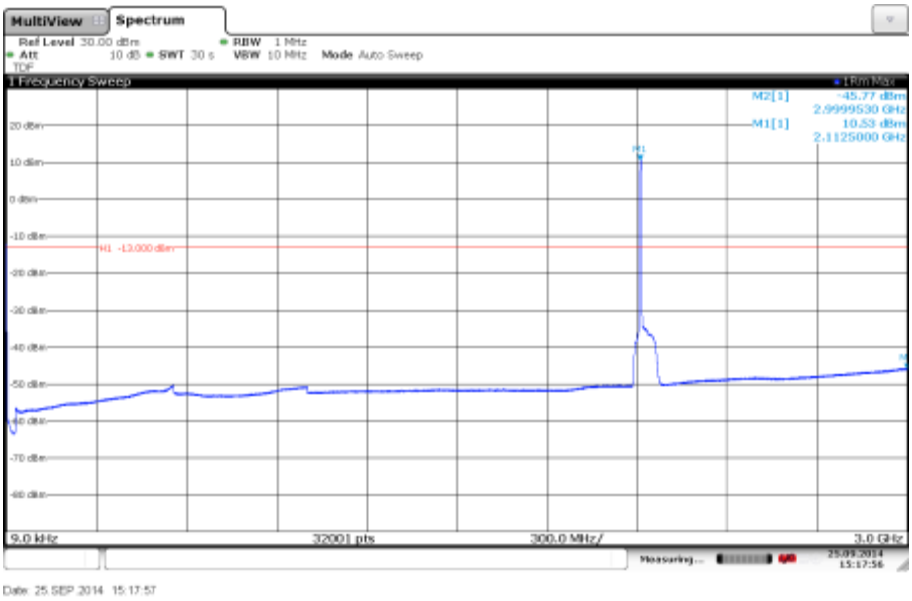

Date: 25.SEP.2014 14:12:07

Diagram 16 d:



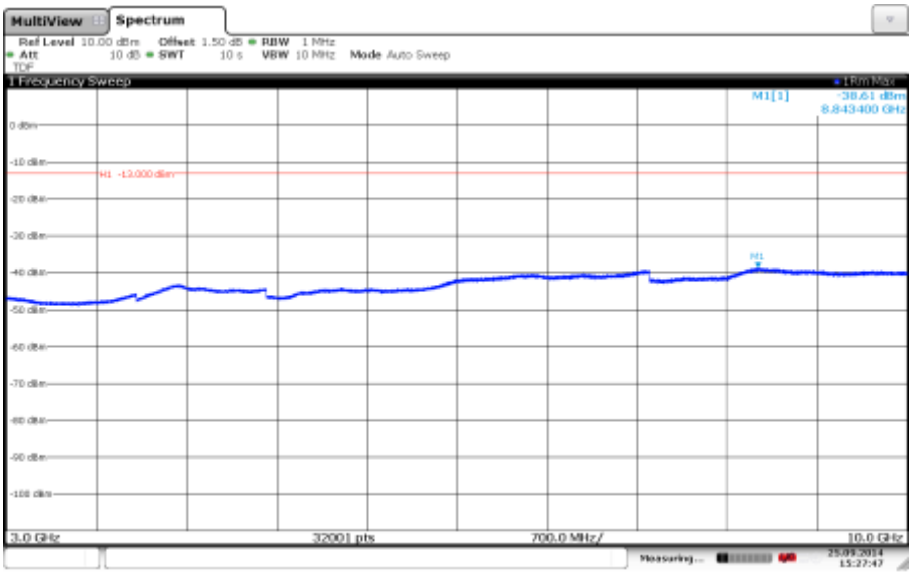

Date: 25.SEP.2014 14:12:46

Diagram 17 a:



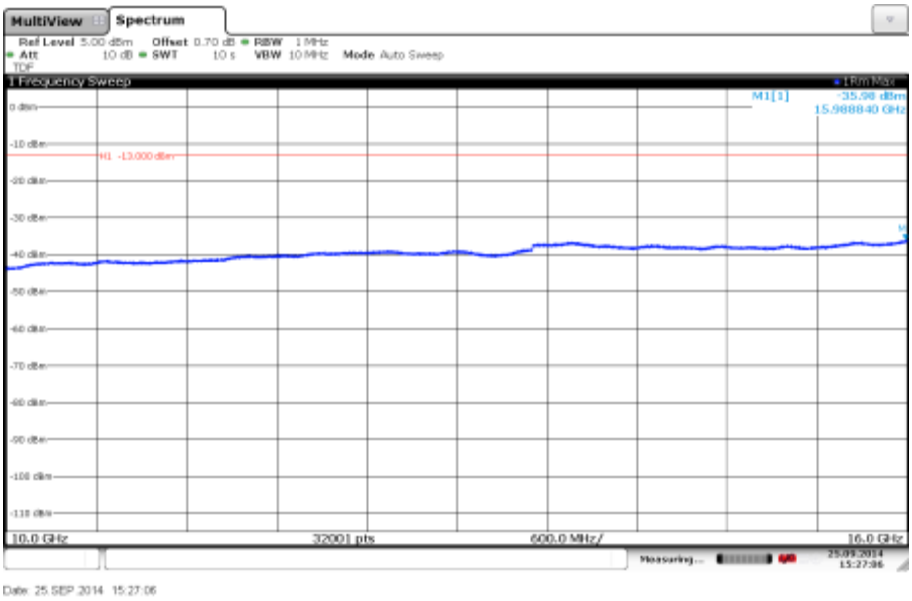

Date: 25.SEP.2014 15:17:57

Diagram 17 b:



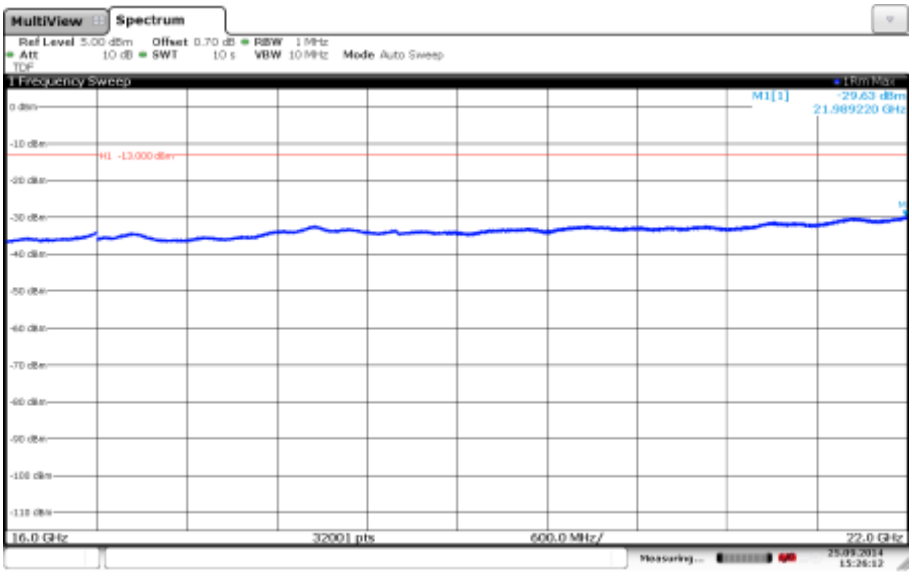

Date: 25.SEP.2014 15:27:47

Diagram 17 c:



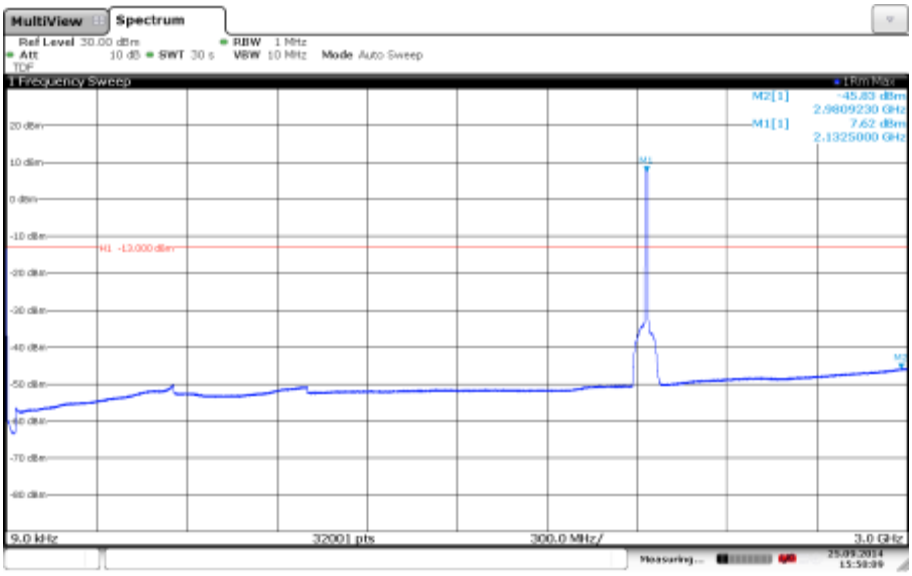

Date: 25.SEP.2014 15:27:06

Diagram 17 d:



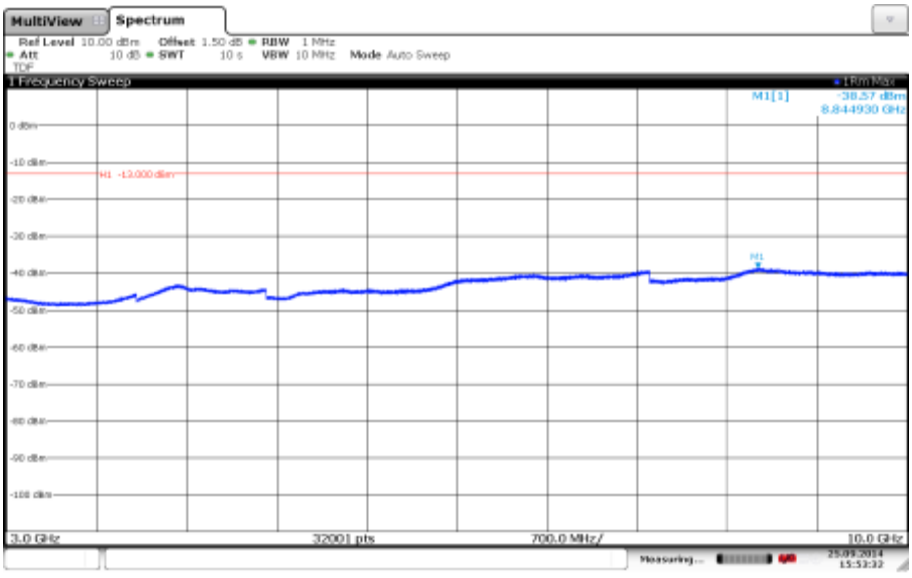

Date: 25.SEP.2014 15:26:11

Diagram 18 a:



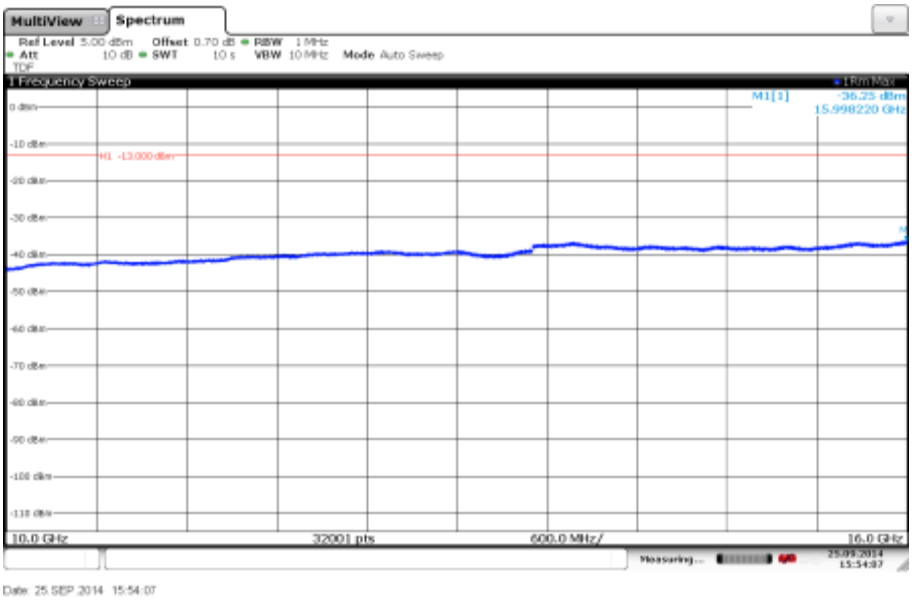

Date: 25.SEP.2014 15:50:09

Diagram 18 b:



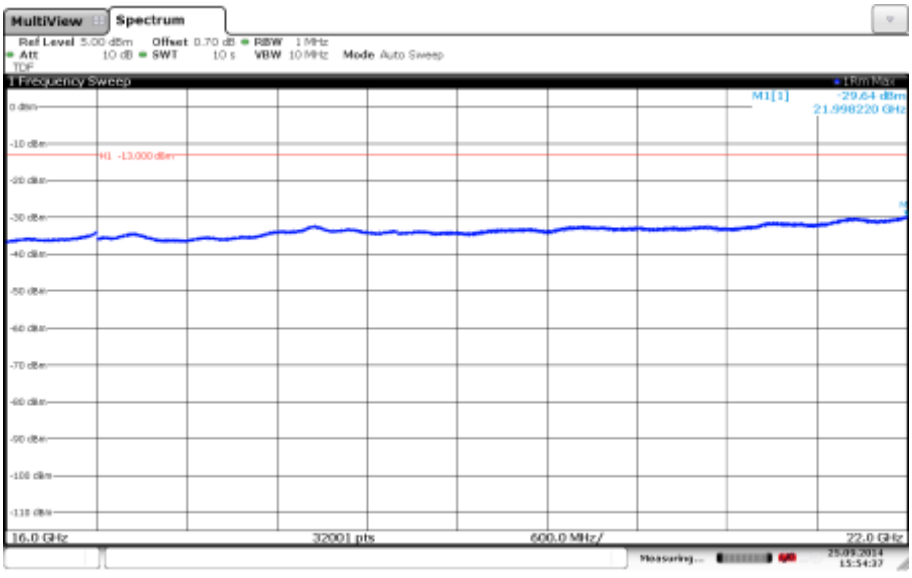

Date: 25.SEP.2014 15:53:32

Diagram 18 c:



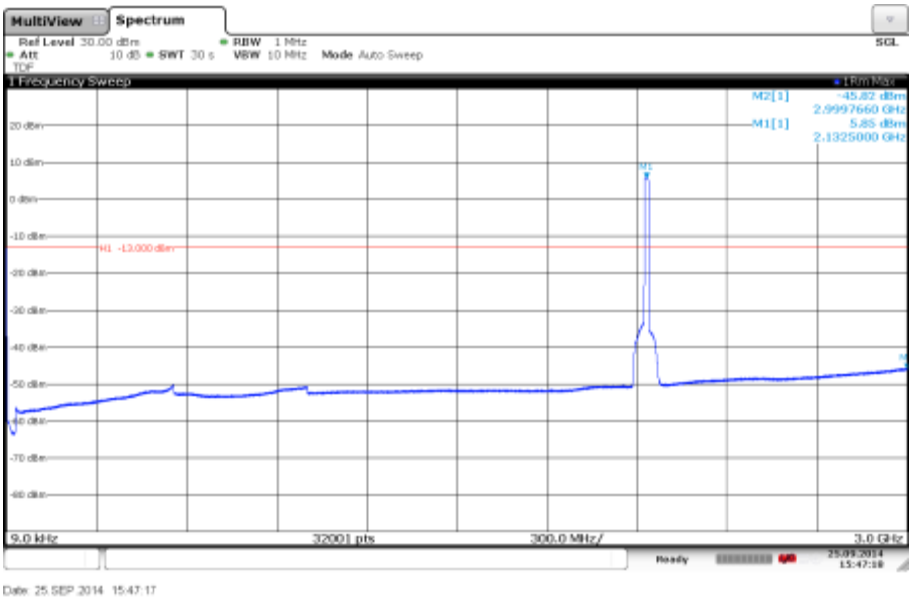

Date: 25.SEP.2014 15:54:07

Diagram 18 d:



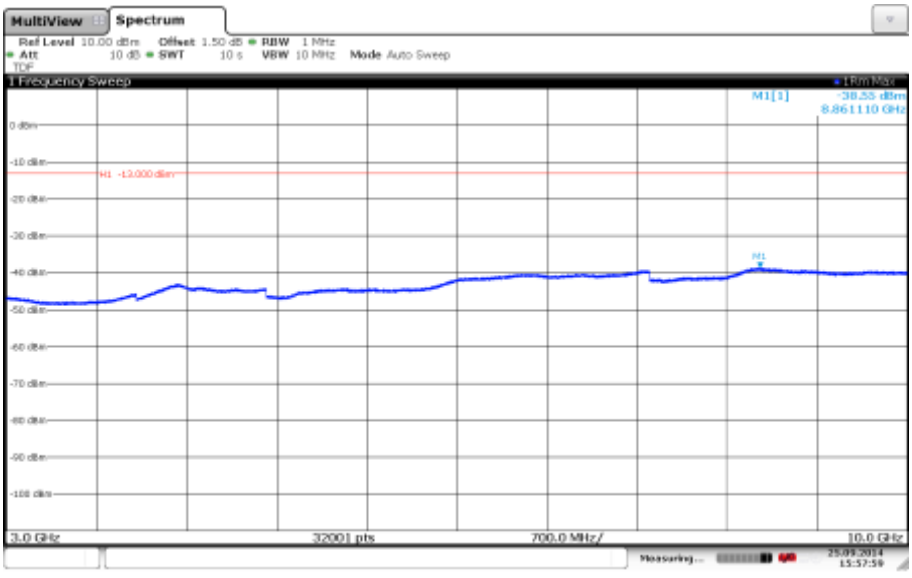

Date: 25.SEP.2014 15:54:37

Diagram 19 a:




Date: 25.SEP.2014 15:47:17

Diagram 19 b:




Date: 25.SEP.2014 15:57:59

Diagram 19 c:

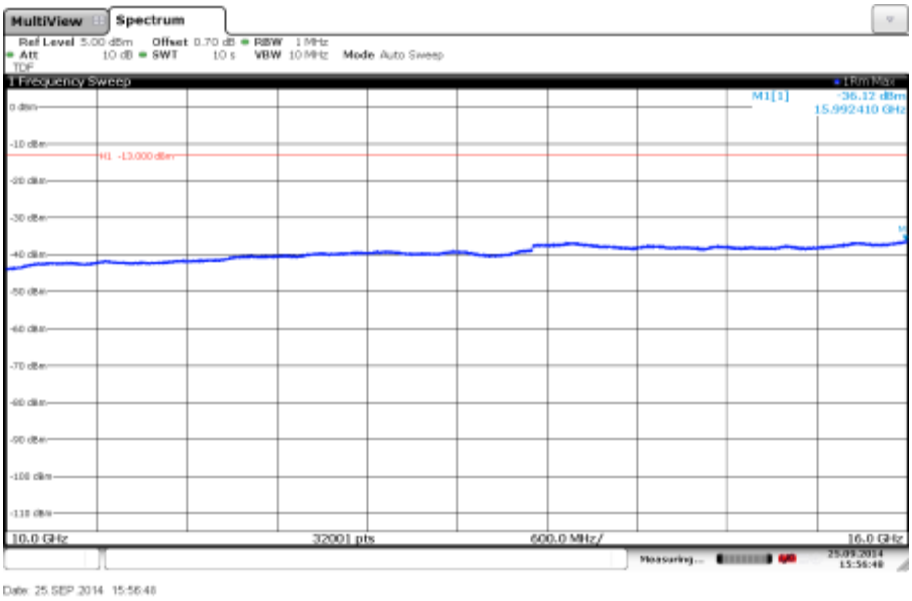



Diagram 19 d:

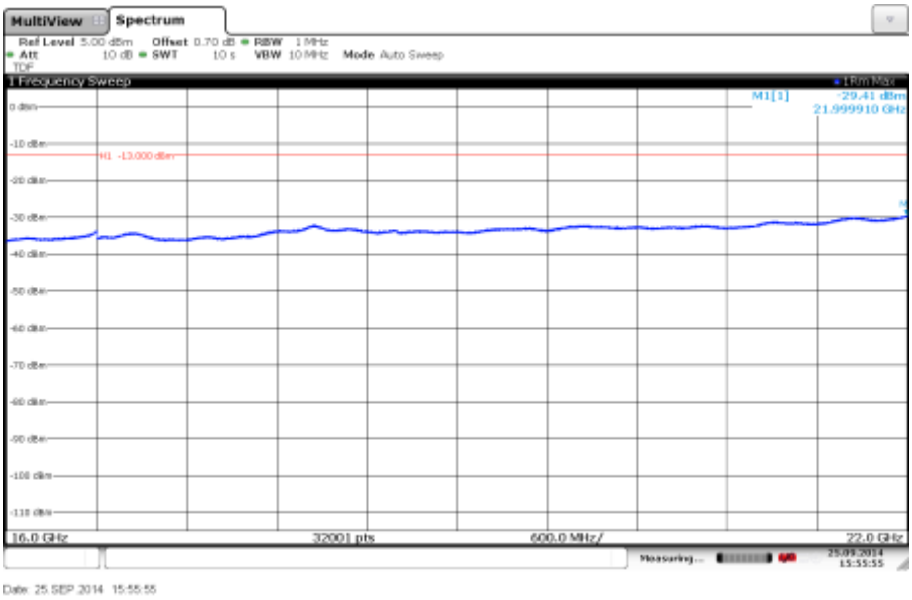


Diagram 20 a:

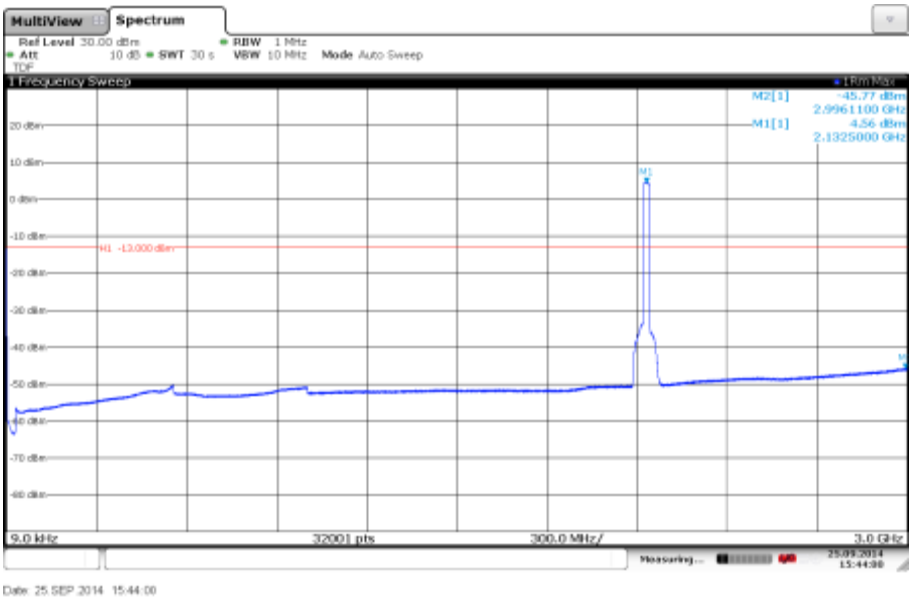



Diagram 20 b:

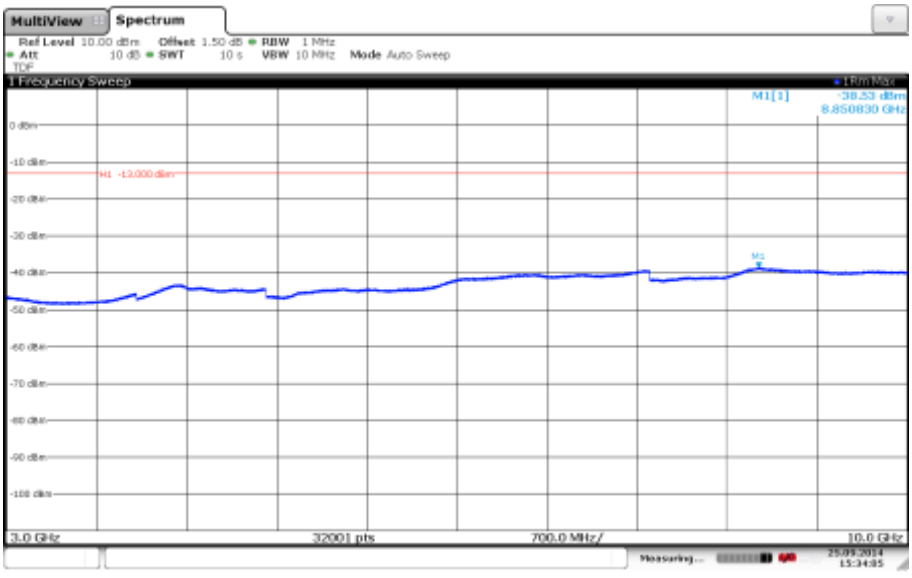
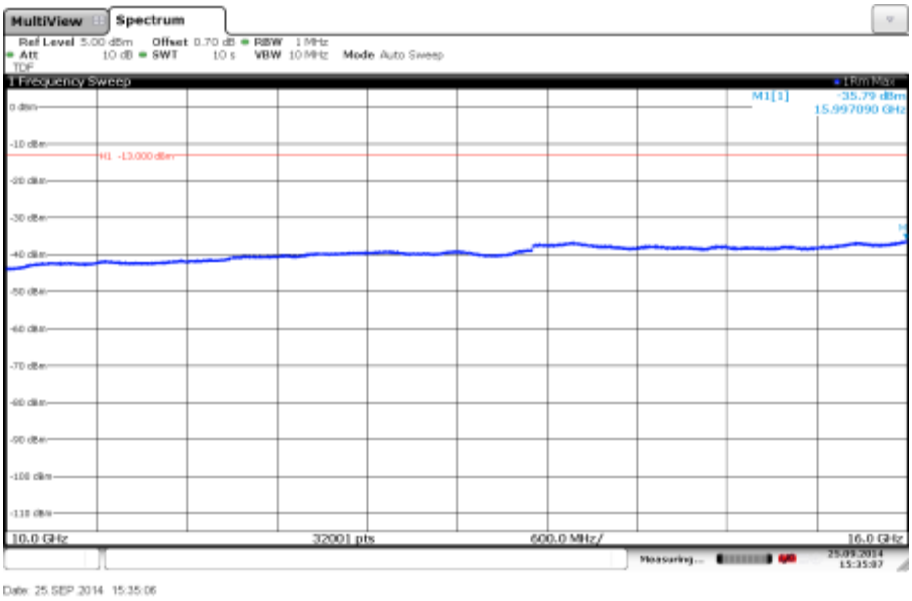
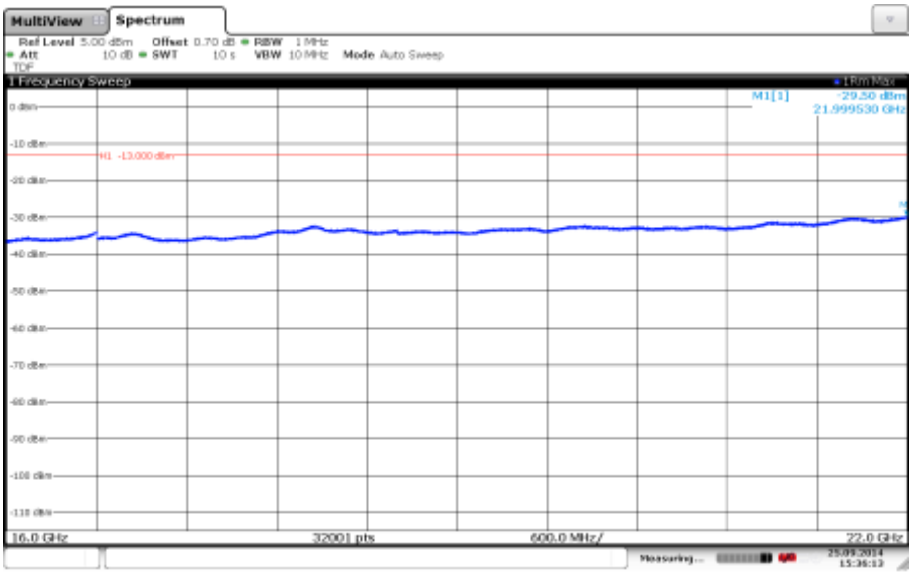


Diagram 20 c:




Date: 25.SEP.2014 15:35:06

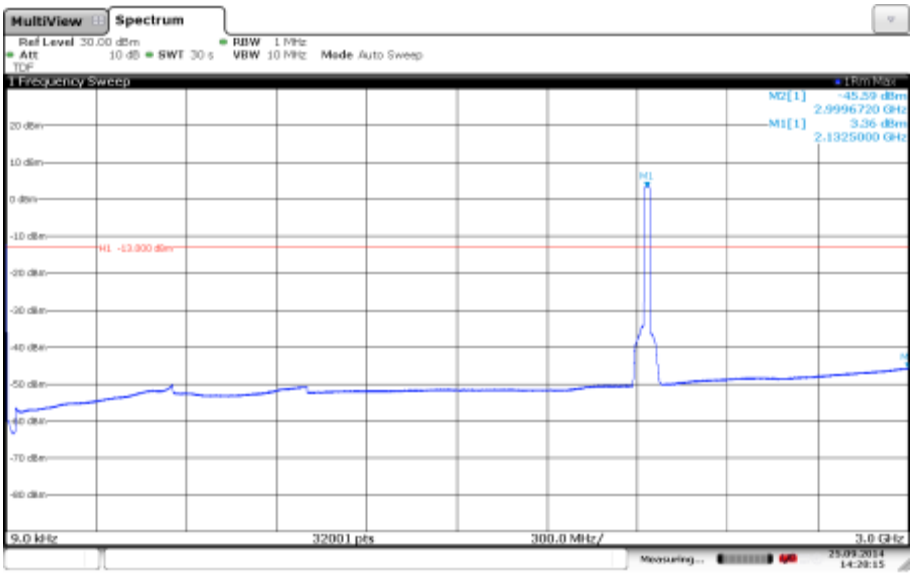
Diagram 20 d:




Date: 25.SEP.2014 15:36:13

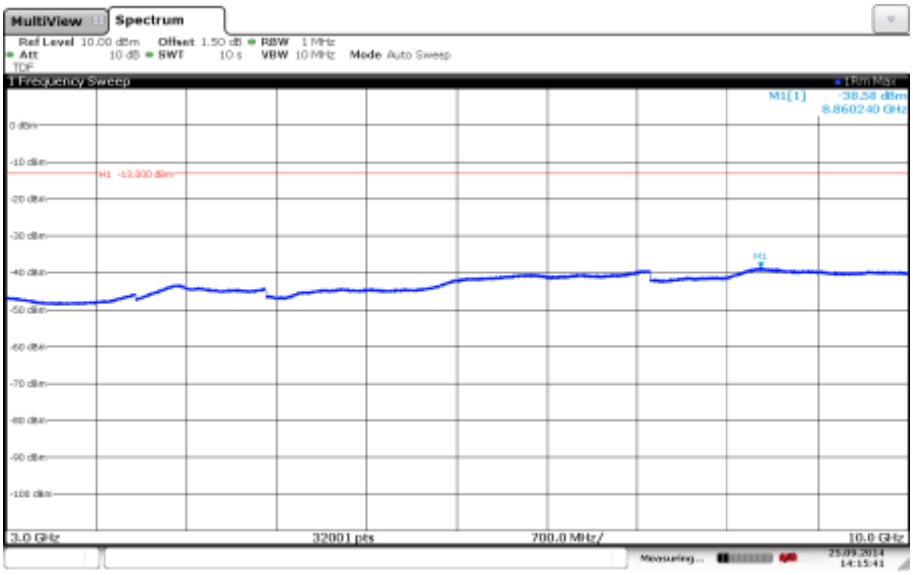
Appendix 6

Diagram 21 a:



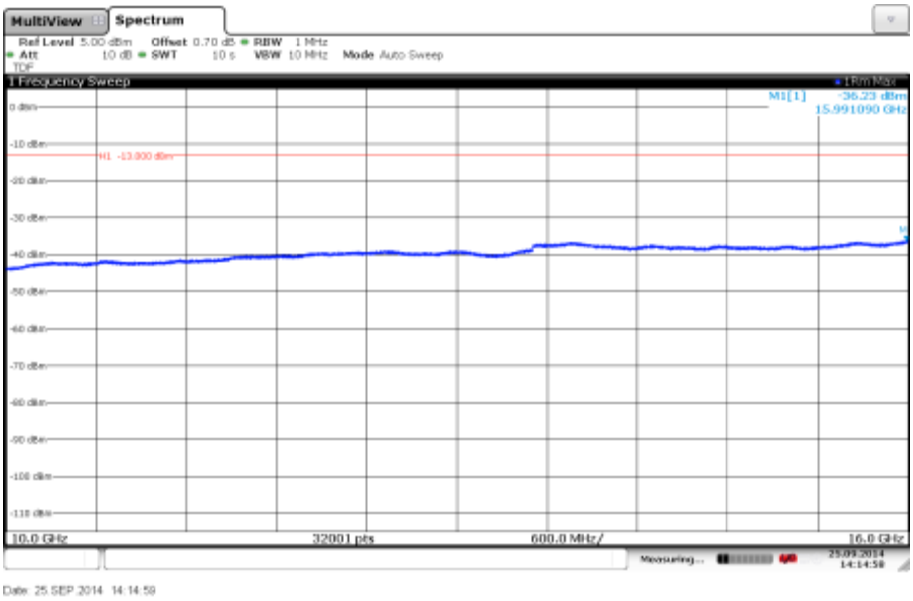

Date: 25.SEP.2014 14:20:15

Diagram 21 b:



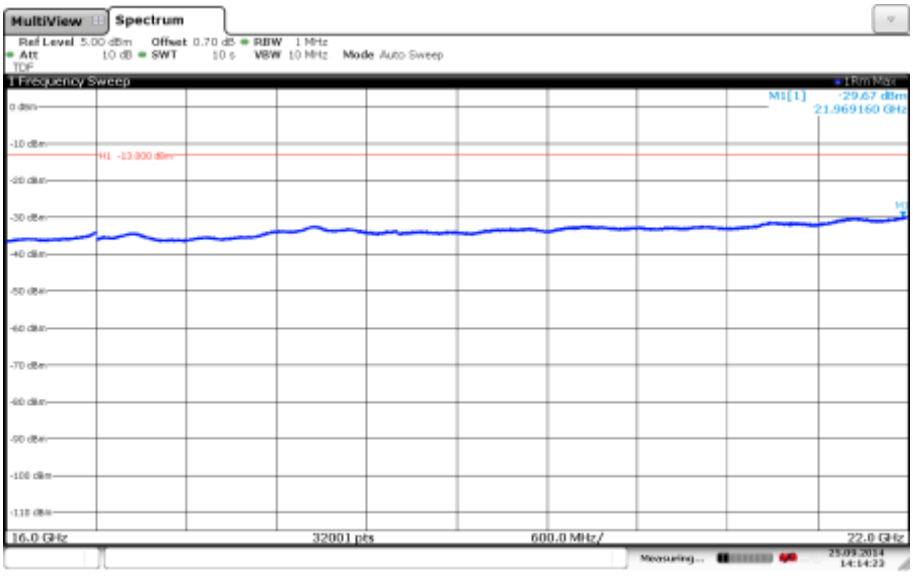

Date: 25.SEP.2014 14:15:41

Diagram 21 c:



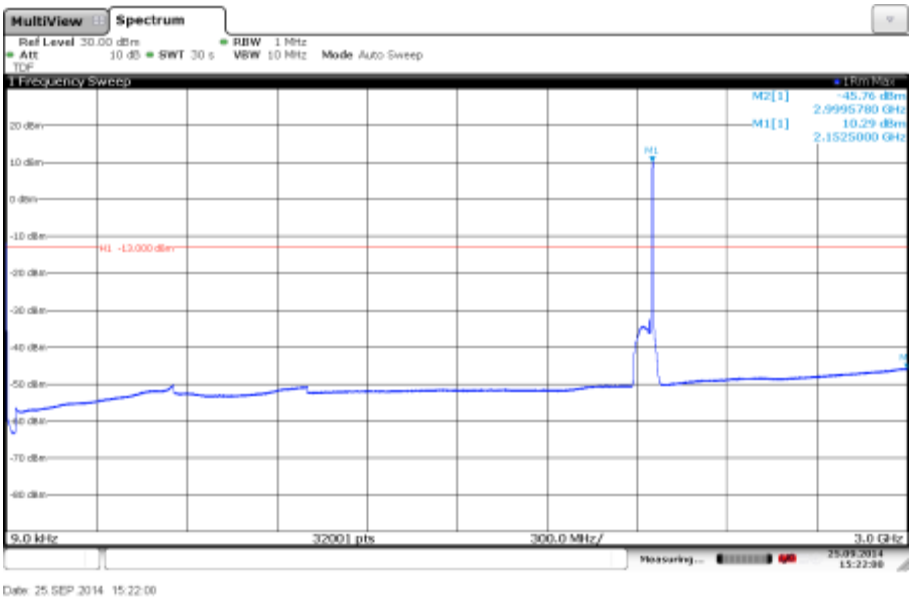

Date: 25.SEP.2014 14:14:59

Diagram 21 d:



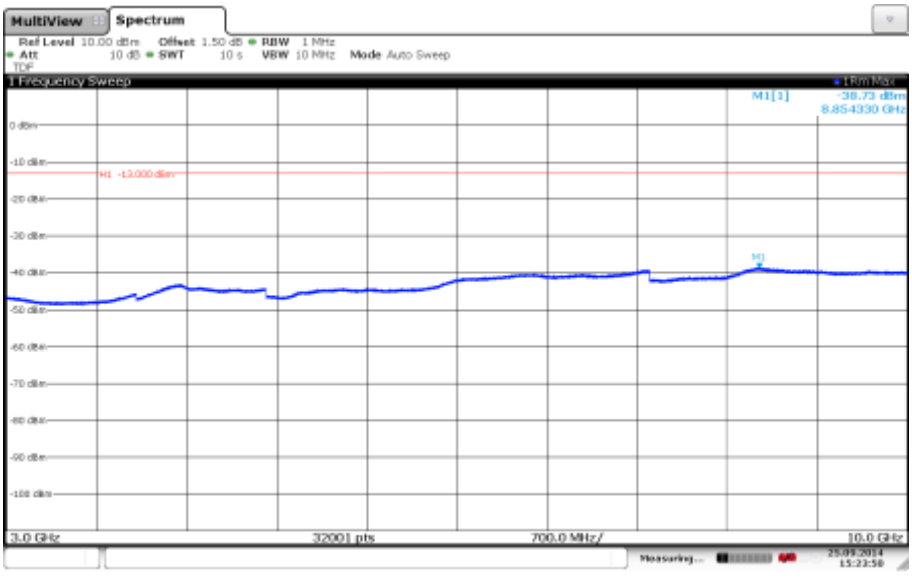

Date: 25.SEP.2014 14:14:22

Diagram 22 a:



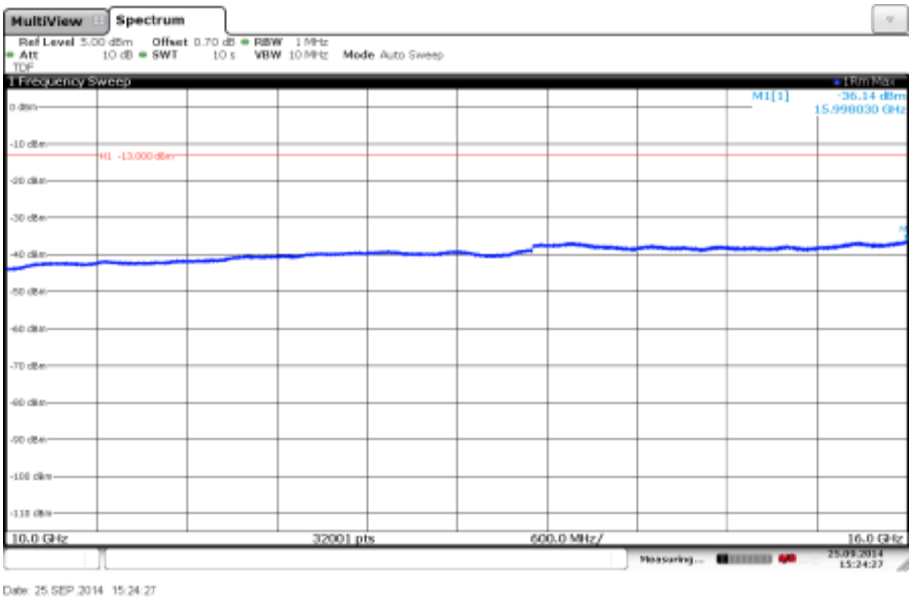

Date: 25.SEP.2014 15:22:00

Diagram 22 b:



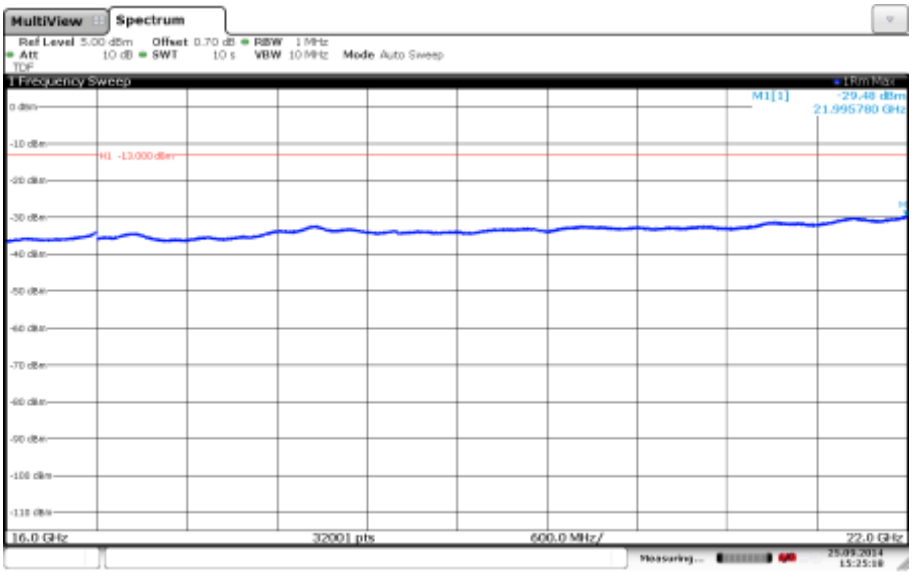

Date: 25.SEP.2014 15:23:50

Diagram 22 c:




Date: 25.SEP.2014 15:24:27

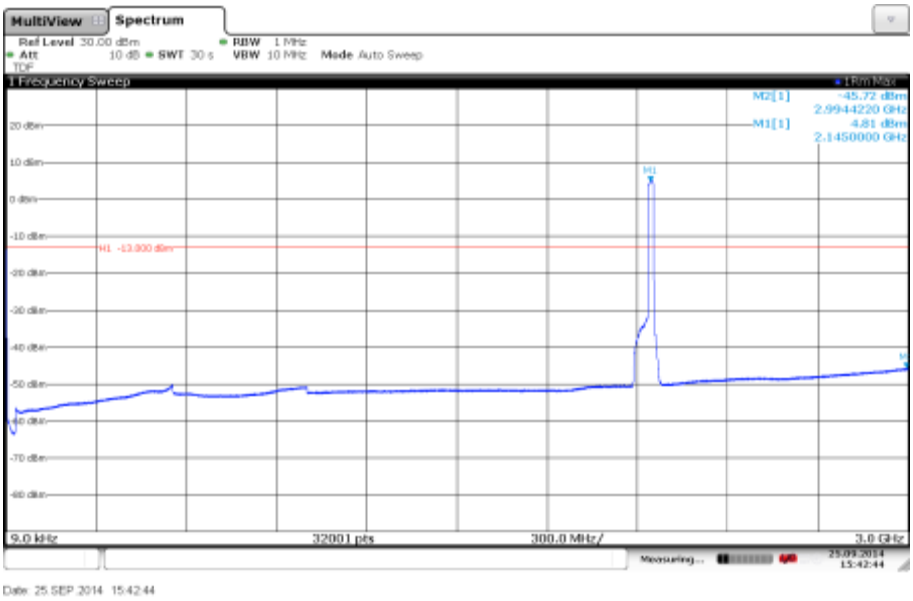
Diagram 22 d:




Date: 25.SEP.2014 15:25:17

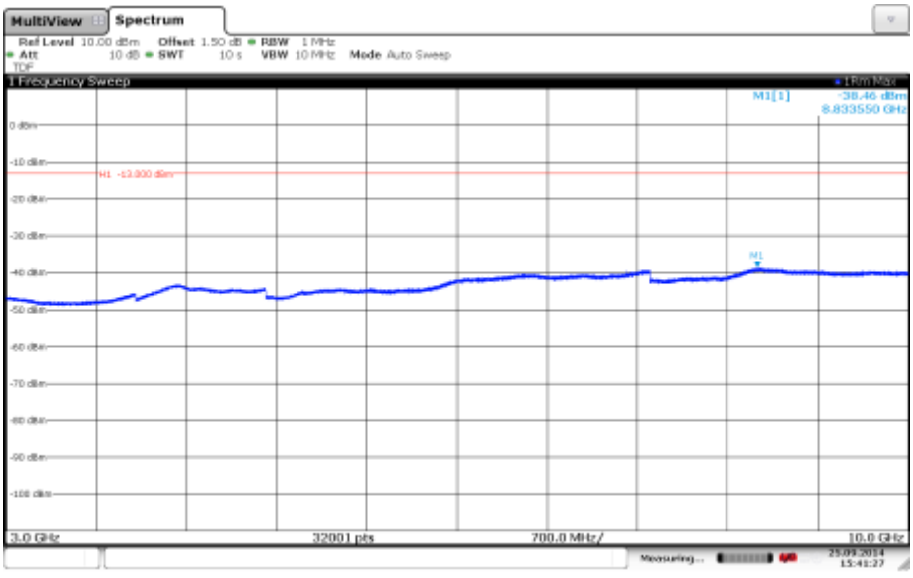
Appendix 6

Diagram 23 a:



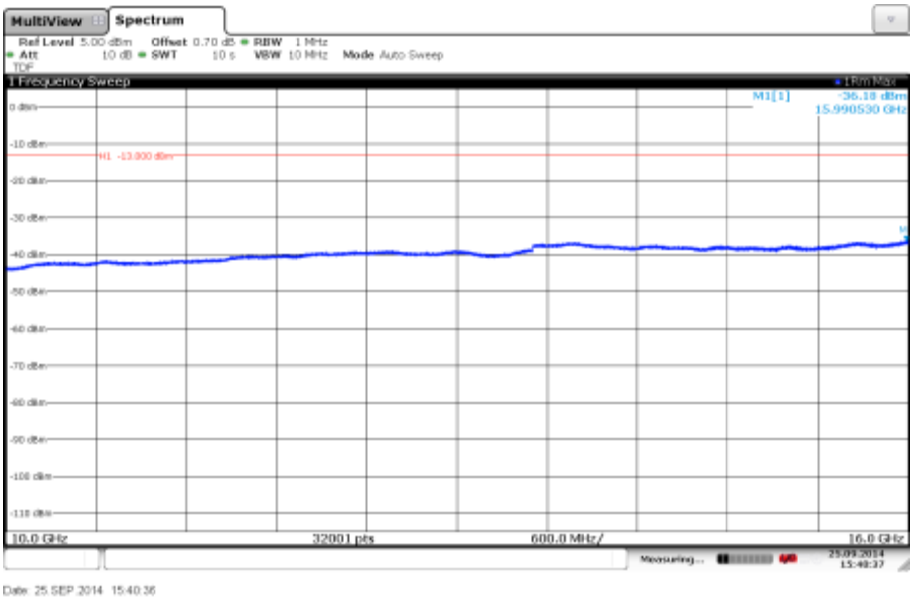

Date: 25.SEP.2014 15:42:44

Diagram 23 b:



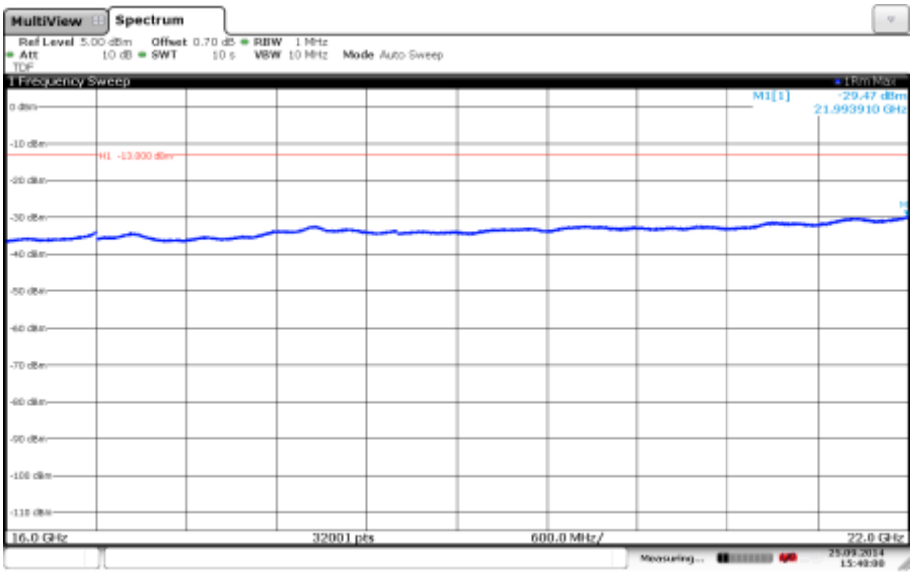

Date: 25.SEP.2014 15:41:27

Diagram 23 c:




Date: 25.SEP.2014 15:40:36

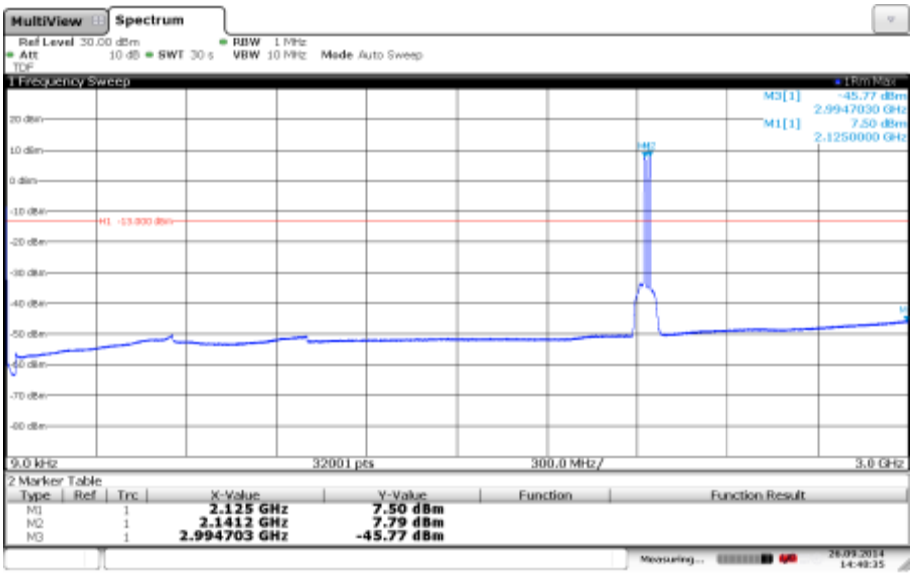
Diagram 23 d:




Date: 25.SEP.2014 15:39:59

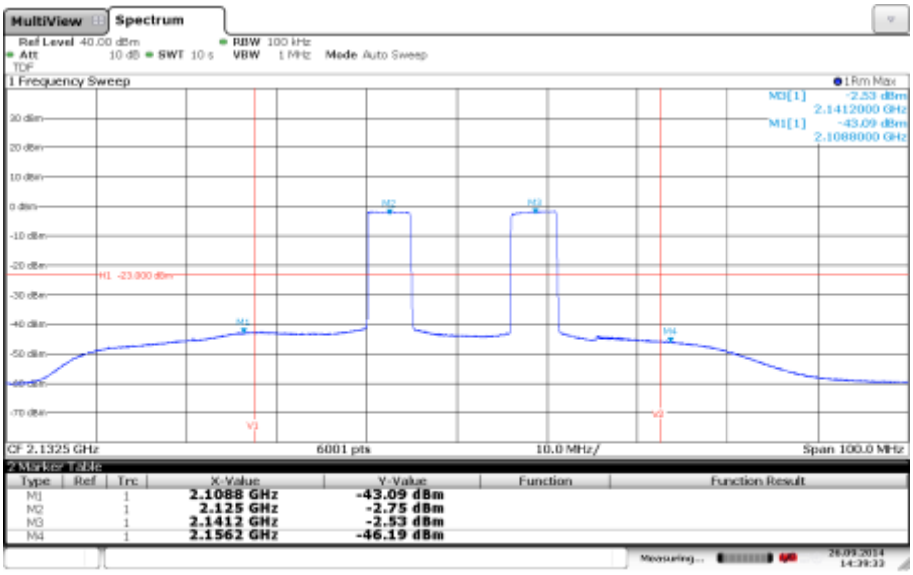
Appendix 6

Diagram 24 a:




Date: 26.SEP.2014 14:40:35

Diagram 24 b:




Date: 26.SEP.2014 14:39:33

Diagram 24 c:

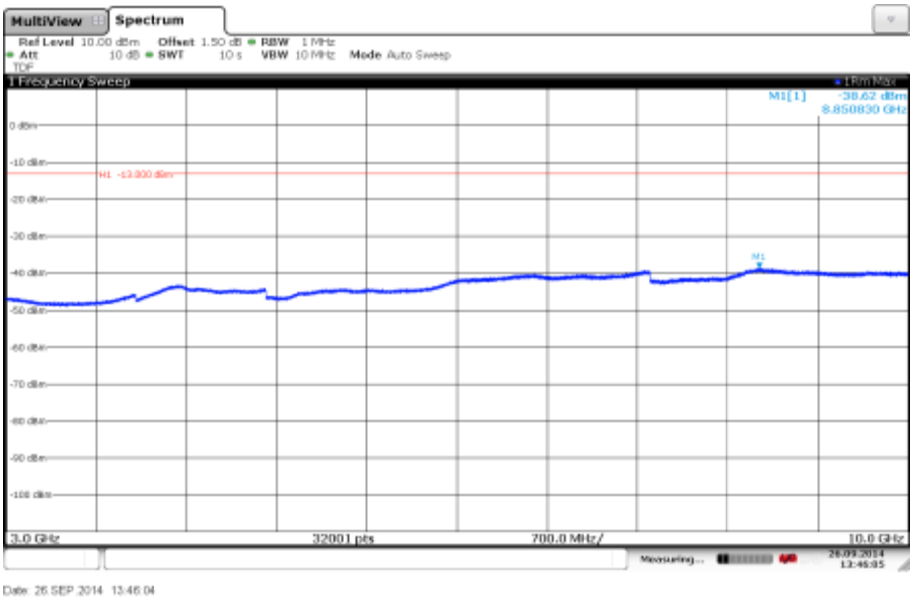



Diagram 24 d:

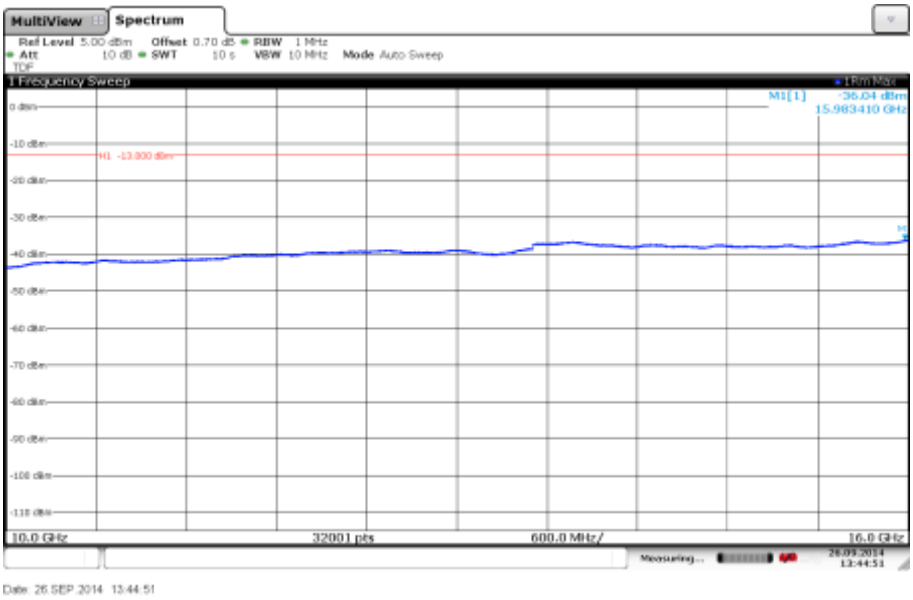
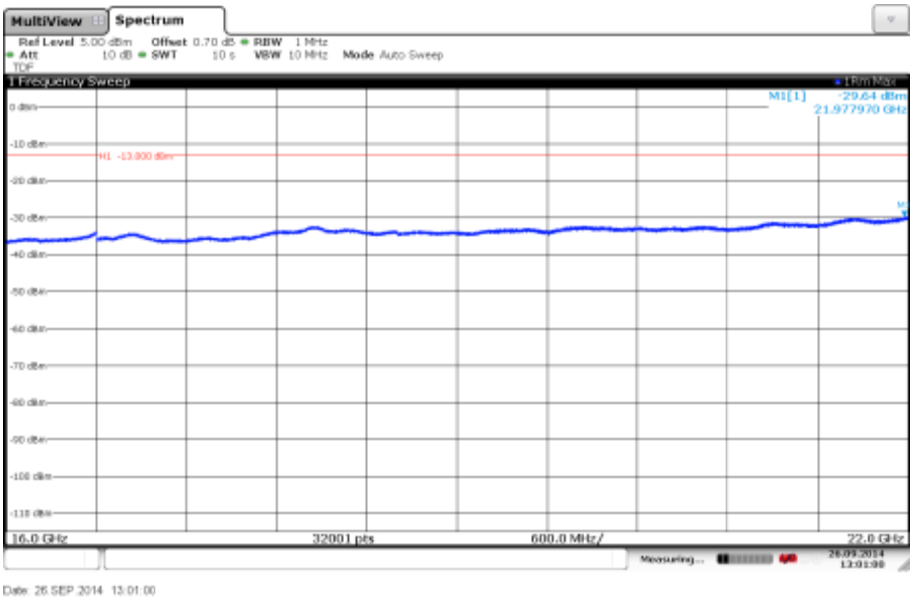
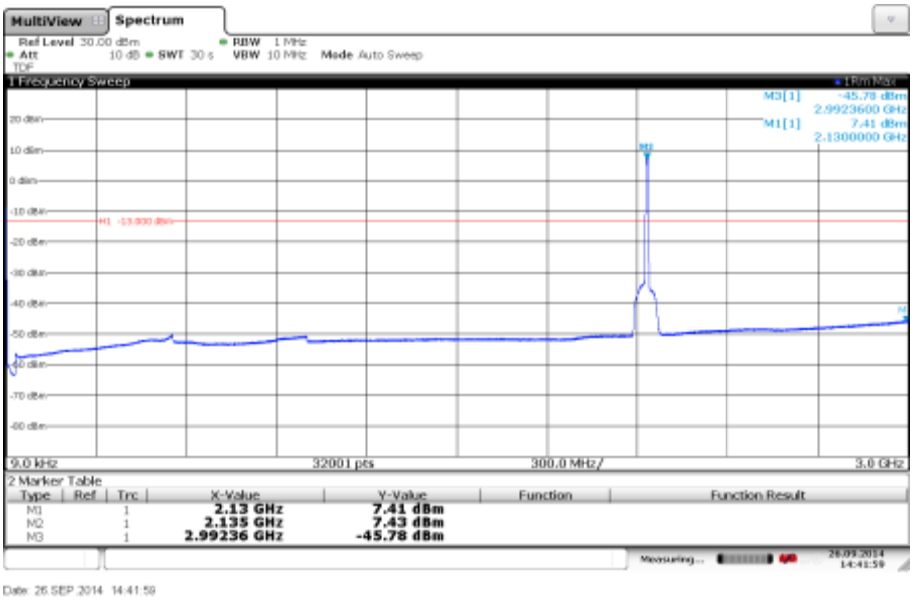


Diagram 24 e:


MultiView
Spectrum
Ref Level 5.00 dBm Offset 0.70 dB RBW 1 MHz
Att 10 dB SWT 10 s VBW 10 MHz Mode Auto Sweep
1 Frequency Sweep
1Rm Max
M1[1] -29.64 dBm
21.977970 GHz
16.0 GHz
32001 pts
600.0 MHz/
22.0 GHz
Date: 26.SEP.2014 13:01:00

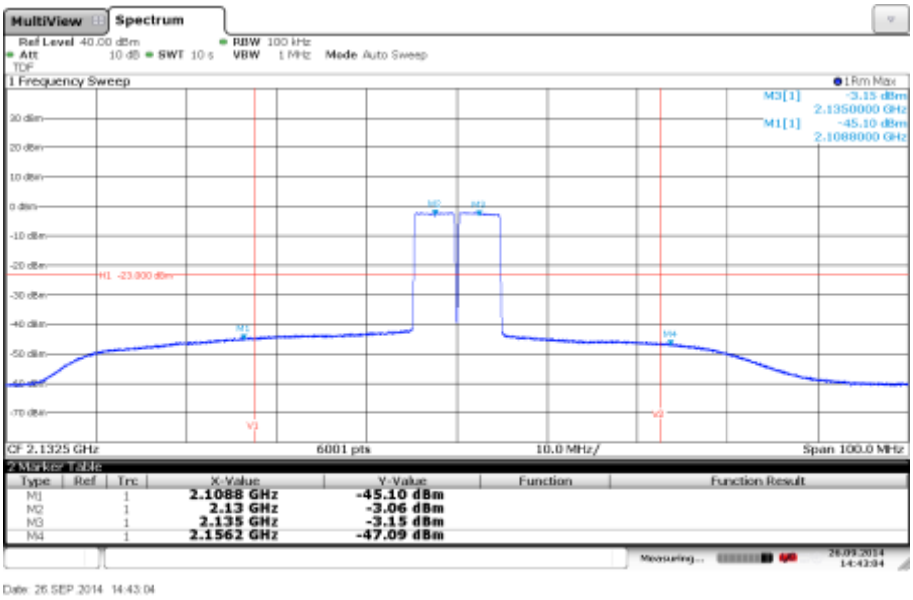
Appendix 6

Diagram 25 a:



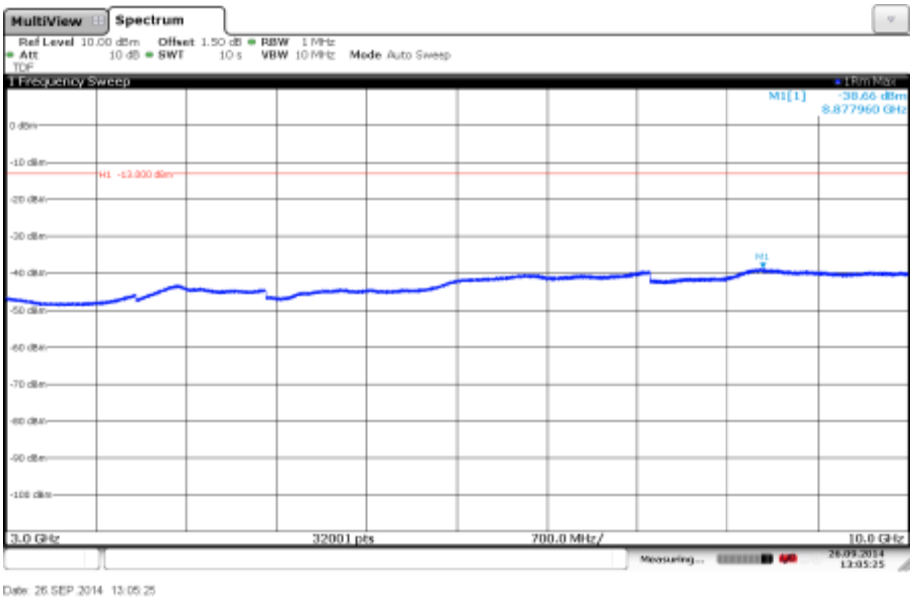

Date: 26.SEP.2014 14:41:59

Diagram 25 b:



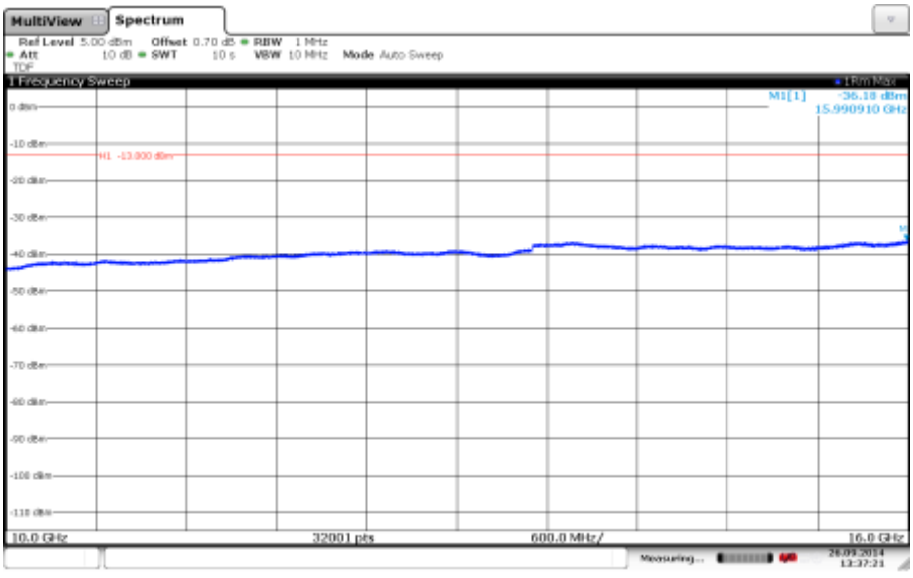

Date: 26.SEP.2014 14:43:04

Diagram 25 c:




Date: 26.SEP.2014 13:05:25

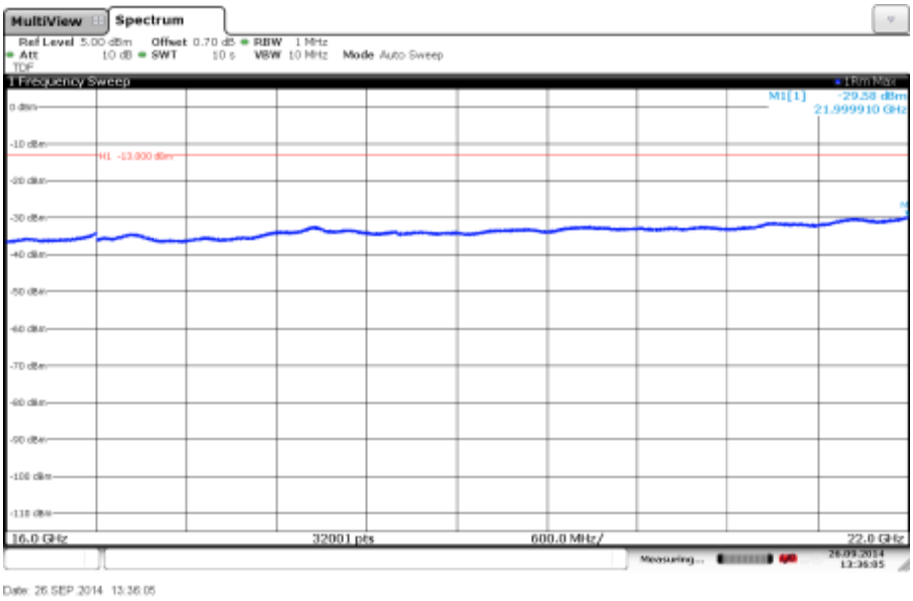
Diagram 25 d:




Date: 26.SEP.2014 13:37:20

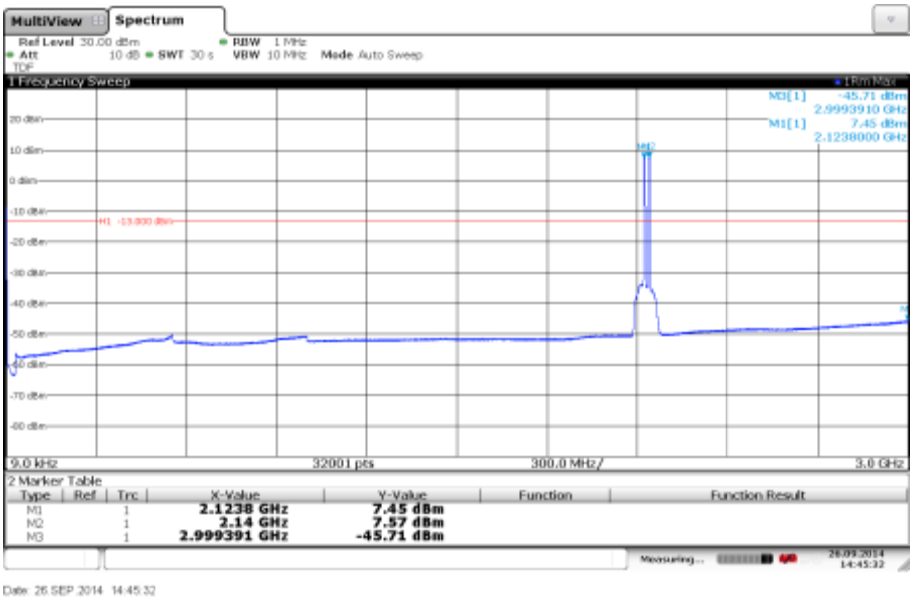
Appendix 6

Diagram 25 e:



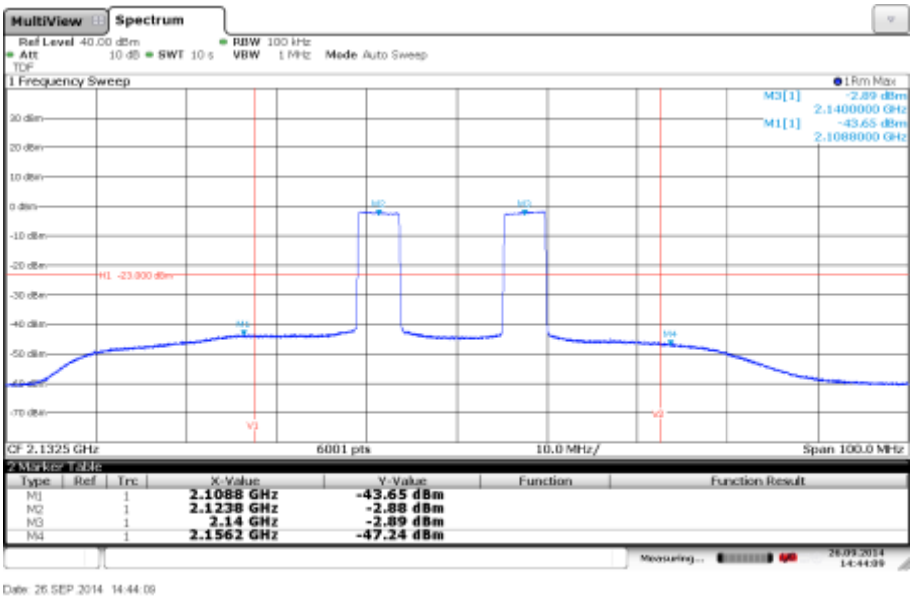
Appendix 6

Diagram 26 a:



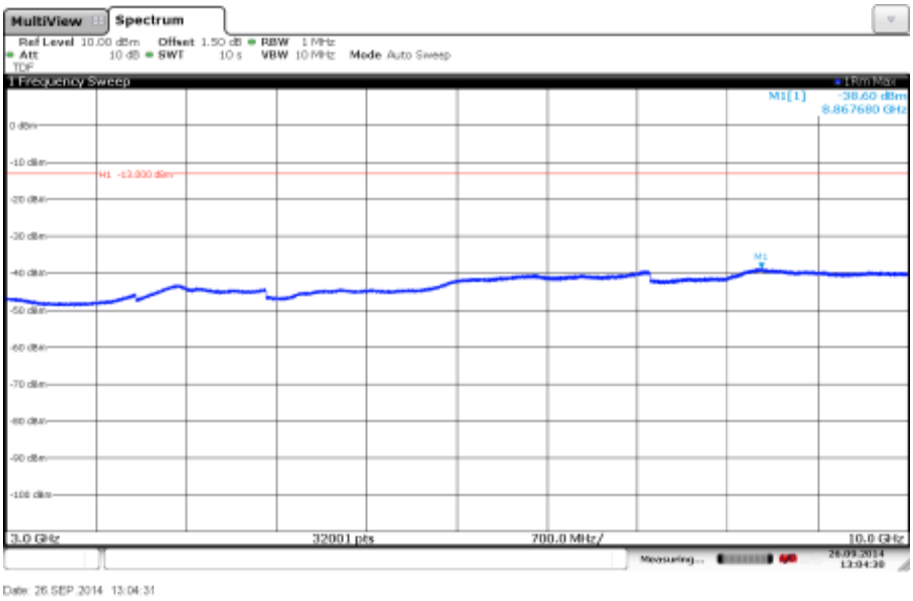

Date: 26.SEP.2014 14:45:32

Diagram 26 b:



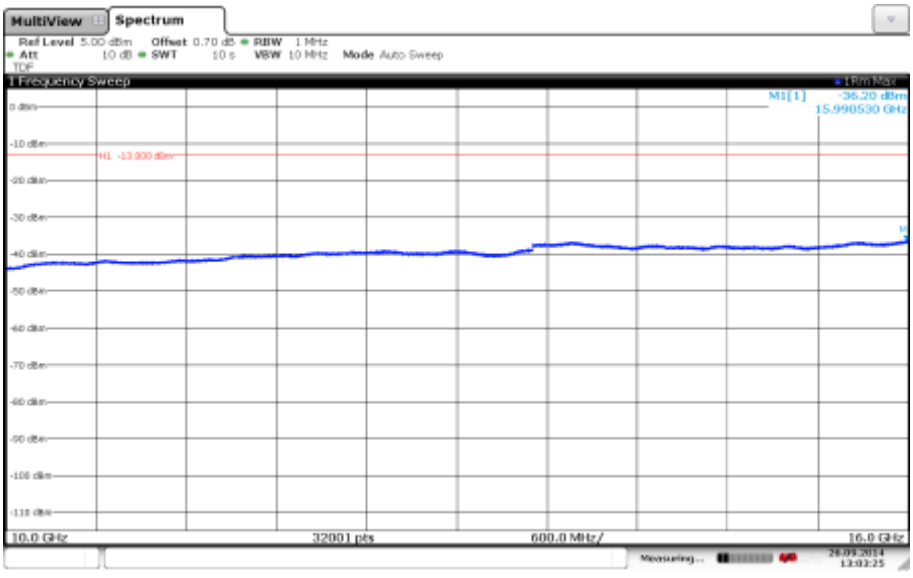

Date: 26.SEP.2014 14:44:09

Diagram 26 c:



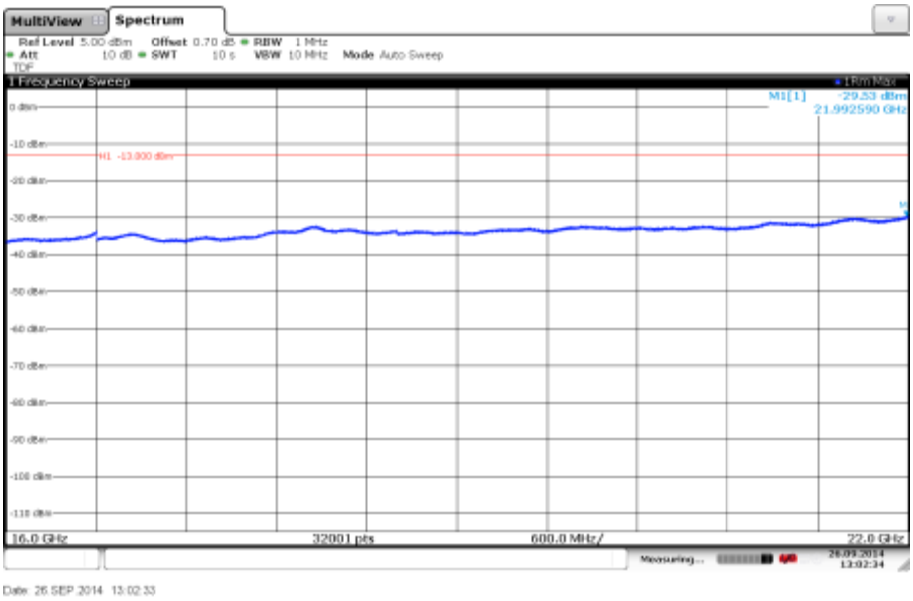

Date: 26.SEP.2014 13:04:31

Diagram 26 d:




Date: 26.SEP.2014 13:03:25

Diagram 26 e:


MultiView
Spectrum
Ref Level 5.00 dBm Offset 0.70 dB RBW 1 MHz
Att 10 dB SWT 10 s VBW 10 MHz Mode Auto Sweep
1 Frequency Sweep
1Rm Max
M1[1] -29.53 dBm
21.992590 GHz
16.0 GHz
32001 pts
600.0 MHz/
22.0 GHz
Date: 26.SEP.2014 13:02:33

Appendix 7

## Field strength of spurious radiation measurements according to 47 CFR 27.53 (h)

| Date | Temperature | Humidity |
|---|---|---|
| 2014-09-17 | 23°C ± 3°C | 41 % ± 5 % |
| 2014-09-18 | 22°C ± 3°C | 45 % ± 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 – 18 GHz and 1m in the frequency range 18 – 22 GHz.

In the frequency range 30 MHz – 22 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 $\gamma = 20\log\left(\frac{4\pi D}{\lambda}\right)$, $\gamma$ is the propagation loss and $D$ is the antenna distance.

The measurement procedure was as the following:

1. The pre-measurement was first performed with peak detector. The EUT 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.

The test set-up during the spurious radiation measurements is shown in the picture below:


**Measurement equipment**

| Measurement equipment | SP number |
|---|---|
| Semi anechoic chamber | 503 881 |
| R&S ESU 26 | 901 553 |
| R&S FSIQ 40 | 503 738 |
| EMC 32 ver. 8.52.0 | 503 899 |
| Chase Bilog Antenna CBL 6111A | 502 182 |
| EMCO Horn Antenna 3115 | 502 175 |
| Flann STD Gain Horn Antenna 20240-20 | 503 674 |
| FLANN Std gain horn antenna 18-240 | 503 900 |
| FLANN Std gain horn antenna 16-240 | 503 939 |
| High pass filter, RLC Electronics | 503 739 |
| Miteq, Low Noise Amplifier | 503 285 |
| Schwarzbeck preamplifier BBV 9742 | 504 085 |
| µComp Nordic, Low Noise Amplifier | 901 545 |
| Temperature and humidity meter, Testo 625 | 504 188 |

Tested configurations

Configuration: RDI Cable 154m

| Symbolic name | Bandwidth (MHz) |
|---|---|
| B | 10 |
| M | 5,10,15 and 20 |
| T | 10 |
| M2 | 10+10 |

**Results,** representing worst case

M, BW: 10 MHz Diagram 1 a-d

| Frequency (MHz) | Spurious emission level (dBm) | |
|---|---|---|
| | Vertical | Horizontal |
| 30-22 000 | All emission > 20 dB below limit | All emission > 20 dB below limit |

**Measurement uncertainty:**

3.2 dB up to 18 GHz, 3.6 dB above 18 GHz

**Limits**

§27.53(h)

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 1 MHz RBW.

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

Appendix 7

Diagram 1 a:

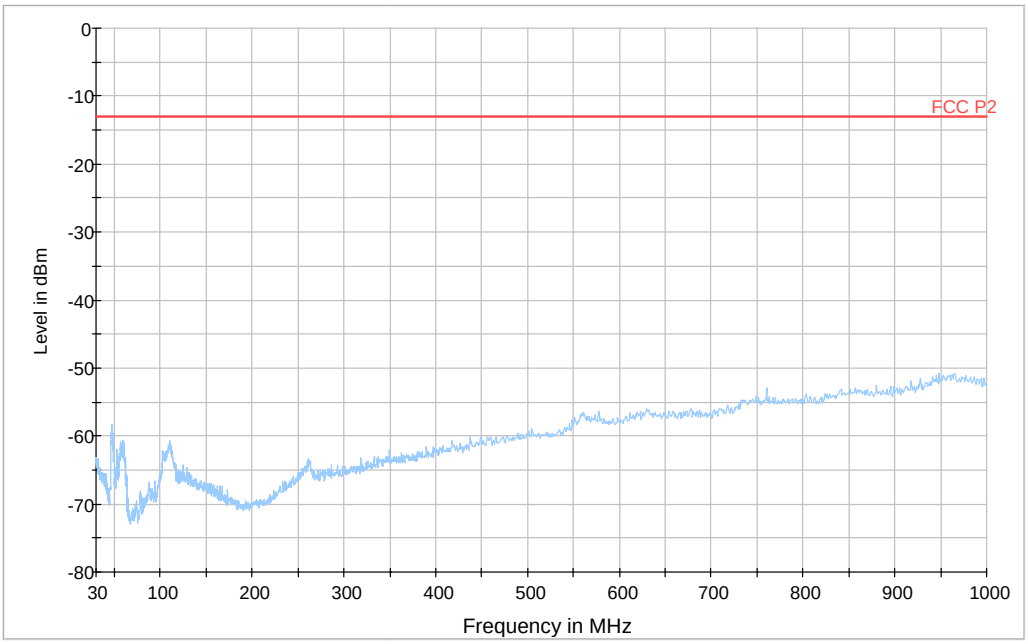
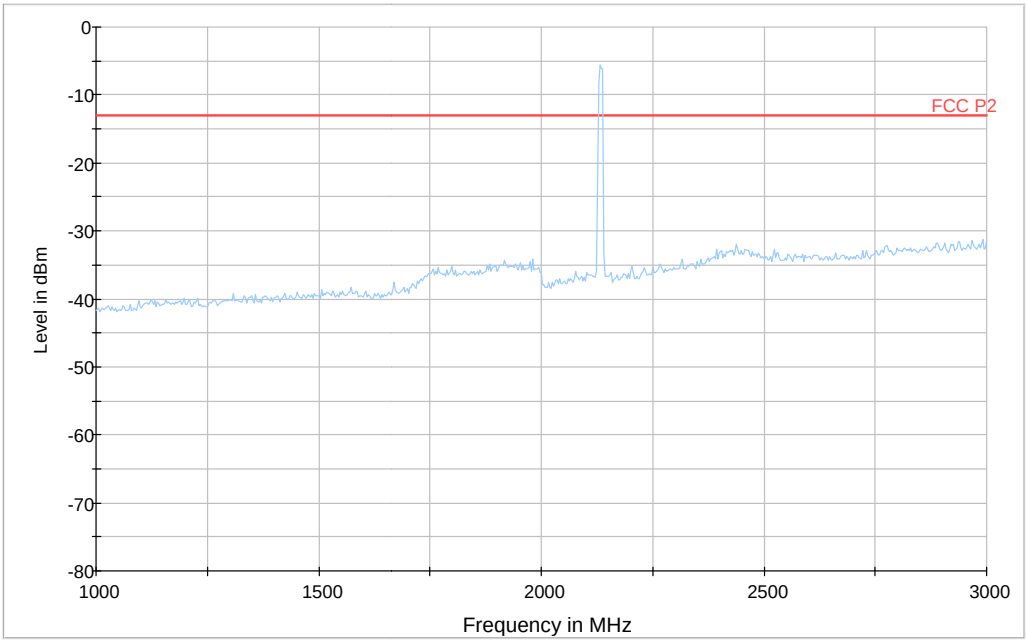



Diagram 1 b:




Note: The emission at 2132.5 MHz is the carrier frequency and shall be ignored in the context.

Appendix 7

Diagram 1 c:

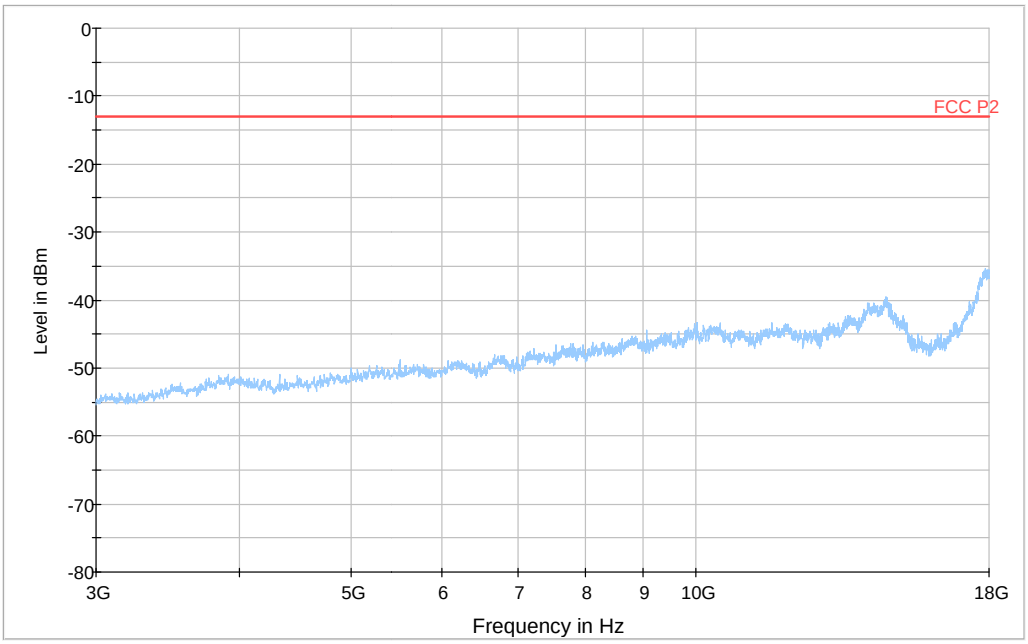
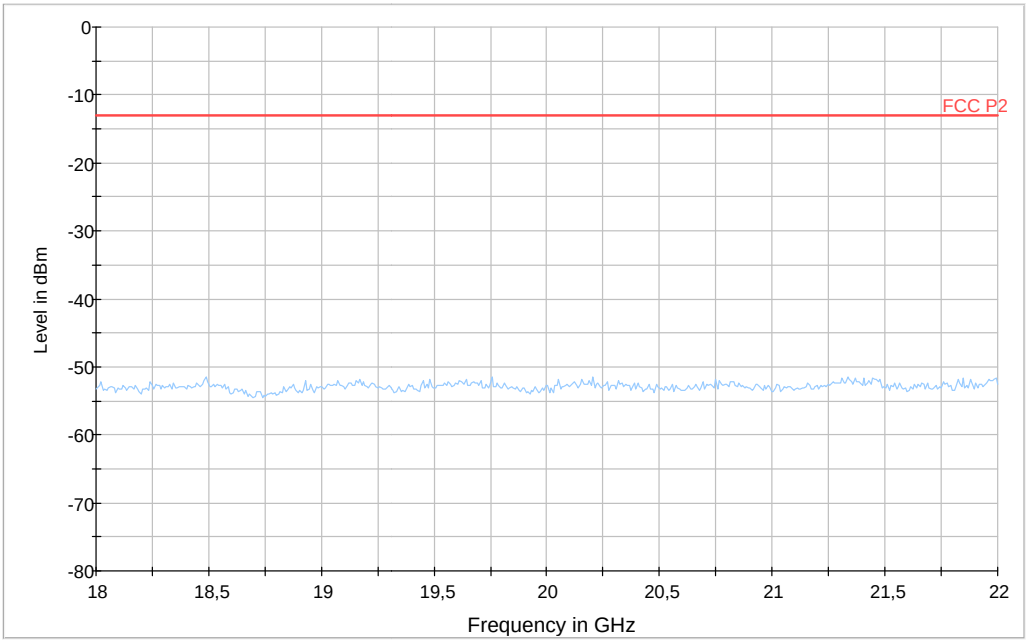



Diagram 1 d:



## Frequency stability measurements according to CFR 47 §27.54

| Date | Temperature (test equipment) | Humidity (test equipment) |
|---|---|---|
| 2014-09-26 to 2014-09-30 | 22-23 °C ± 3 °C | 25-41 % ± 5 % |

### Test set-up and procedure

The measurement was made per 3GPP TS 36.141. The output was connected to a spectrum analyser. The spectrum analyser was connected to an external 10 MHz reference standard during the measurements.

The measurement was also made using a resolution bandwidth of 1% of the emission bandwidth, a reference point at the unwanted emission level which complies with the attenuation of 43 + 10 log10 p (watts) (i.e. -13dBm) (for MIMO -16dBm) at the band edge of the lowest and highest channel was selected, and the frequency at these points was recorded as fL and fH respectively.

| Measurement equipment | SP number |
|---|---|
| Rohde & Schwarz signal analyzer FSQ40 | 504 143 |
| R&S FSW 43 | 902 073 |
| RF attenuator | 900 691 |
| Testo 635, Temperature and humidity meter | 504 203 |
| Temperature cabinet | 503 360 |

**Results**

Nominal transmitter frequency was 2132.5 MHz (M) with a bandwidth of 5 MHz. Rated output power level at connector RF A (maximum): 17 dBm.

Configuration: RDI Cable 154m

| Test conditions | | Frequency error (Hz) |
|---|---|---|
| Supply voltage DC (V) | Temp. (°C) | |
| -48.0 | +20 | -215 |
| -55.2 | +20 | -232 |
| -40.8 | +20 | -450 |
| -48.0 | +30 | -127 |
| -48.0 | +40 | -305 |
| -48.0 | +50 | -238 |
| -48.0 | +10 | -60 |
| -48.0 | 0 | -67 |
| -48.0 | -10 | -38 |
| -48.0 | -20 | -45 |
| -48.0 | -30 | -46 |
| Maximum freq. error (Hz) | | -450 |
| Measurement uncertainty | | $< \pm 1 \times 10^{-7}$ |

Configuration: RDI Cable 20m

| Test conditions | | Frequency error (Hz) |
|---|---|---|
| Supply voltage DC (V) | Temp. (°C) | |
| -48.0 | +20 | -24 |
| -55.2 | +20 | -27 |
| -40.8 | +20 | -29 |

Configuration: RDI Cable 20m

| Test conditions | | | Frequency margin to band edge at -16dBm | | | |
|---|---|---|---|---|---|---|
| Supply voltage DC [V] | Temp [°C]. | Carrier Bandwidth [MHz] | Test frequency Symbolic name Bottom | | Test frequency Symbolic name Top | |
| | | | fL [MHz] | Offset to lower band edge (>2110 MHz) [kHz] | fH [MHz] | Offset to upper band edge (<2155 MHz) [kHz] |
| -48.0 | +20 | 5 | 2110.196 | 196.24 | 2154.79 | 209.32 |
| -48.0 | +20 | 20 | 2110.838 | 838.89 | 2154.13 | 871.55 |

Configuration: RDI Cable 154m

| Test conditions | | | Frequency margin to band edge at -16dBm | | | |
|---|---|---|---|---|---|---|
| Supply voltage DC [V] | Temp [°C]. | Carrier Bandwidth [MHz] | Test frequency Symbolic name Bottom | | Test frequency Symbolic name Top | |
| | | | fL [MHz] | Offset to lower band edge (>2110 MHz) [kHz] | fH [MHz] | Offset to upper band edge (<2155 MHz) [kHz] |
| -48.0 | +20 | 5 | 2110.197 | 197.19 | 2154.846 | 153.95 |
| -48.0 | +20 | 20 | 2110.839 | 839.23 | 2154.19 | 812.47 |

The frequency error results clearly shows that the frequency stability is good enough to ensure that the transmitted carrier stay within the operating band.

**Remark**

It was deemed sufficient to test one combination of TX frequency, channel bandwidth configuration and test model (modulation), as all combinations share a common internal reference to derive the TX frequency from.

**Limits**

§27.54:
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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

Appendix 9

## External photos

Top side


Bottom side

Side

Label