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Compliance test report ID

217190-1TRFWL

Date of issue
August 15, 2012

FCC 47 CFR Part 90, Boosters

Private Land Mobile Radio Service

Applicant **G-Way Microwave**
Product **Remote Unit-Dual RF Bi-Directional Amplifier**
Model **RHBDA-PS8-0.1/25W-55-A**
FCC ID **Q8KPS825W60R**

Nemko Canada Inc., a testing
laboratory, is accredited by the
Standards Council of Canada. The
tests included in this report are within
the scope of this accreditation



Test location

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Tested by Kevin Rose, Wireless/EMC Specialist

Reviewed by _____ **Date** August 15, 2012
Andrey Adelberg, Senior Wireless/EMC Specialist

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Section 1: Report summary

1.1 Applicant and manufacturer

G-Way Microwave
38 Leuning Street
South Hackensack NJ 07606
United States

1.2 Test specifications

FCC 47 CFR 90, Boosters
Private Land Mobile Radio Services

1.3 Statement of compliance

In the configuration tested the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See *"Summary of test results"* for full details.

1.4 Exclusions

None

1.5 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued

Section 2: Summary of test results

2.1 FCC Part 90 test results

Part	Test description	Verdict
90.219	Output power	Pass
90.210	Conducted and radiated spurious emissions	Pass
90.213	Frequency stability	Not applicable
90.219	Use of boosters	Pass
2-11-04/EAB/RF	Occupied bandwidth	Pass
2-11-04/EAB/RF	Out of band rejection	Pass
Notes: The EUT doesn't change the frequency.		

Section 3: Equipment under test (EUT) details

3.1 Sample information

Receipt date August 3, 2012
Nemko sample ID number 1

3.2 EUT information

Product name G-Wave PBS Booster
Model RHBDA-PS8-0.1/25W-55-A
Serial number 12071001

3.3 Technical information

Operating band Uplink: 806–824 MHz Downlink: 851–869 MHz
Modulation type F3E
Emission designator F3E
Power requirements 120 V_{AC} 60 Hz
Antenna information The EUT is professionally installed.

3.4 Product description and theory of operation

Dual RF Bi-Directional Amplifier.

3.5 EUT exercise details

Downlink input to the Mobile output and the Mobile input to the Uplink output.

3.6 EUT setup diagram

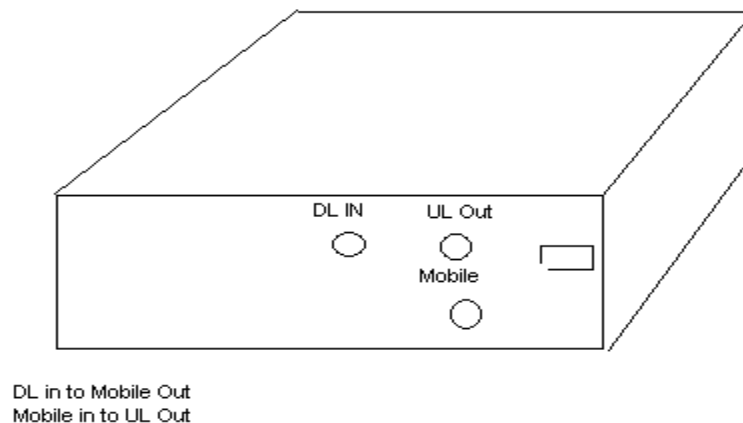


Diagram 3.6-1: Setup diagram

Section 4: Engineering considerations

1.4 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

1.5 Technical judgment

None

1.6 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5: Test conditions

5.1 Atmospheric conditions

Temperature: 15–30 °C
Relative humidity: 20–75 %
Air pressure: 86–106 kPa

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ± 5 %, for which the equipment was designed.

Section 6: Measurement uncertainty

6.1 Uncertainty of measurement

Nemko Canada Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 "Uncertainty in EMC measurements." Measurement uncertainty was calculated using the methods described in CISPR 16-4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC measurements; as well as described in UKAS LAB34: The expression of Uncertainty in EMC Testing. Measurement uncertainty calculations assume a coverage factor of $K=2$ with 95% certainty.

Section 7: Test equipment

7.1 Test equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Mar. 09/13
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	May 16/13
Spectrum analyzer	Rohde & Schwarz	FSP	FA001920	1 year	June 14/13
Horn antenna #2	EMCO	3115	FA000825	1 year	Feb. 24/13
Bilog antenna	Sunol	JB3	FA002108	1 year	Feb. 07/13
1–18 GHz pre-amplifier	JCA	JCA118-503	FA002091	1 year	July 03/13
Signal generator	Rohde & Schwarz	SMIQ03E	FA001269	1 year	Jan 10/13
Signal generator	Rohde & Schwarz	SMIQ06B	FA001878	1 year	Jan. 09/13
Note: NCR - no calibration required					

Section 8: Testing data

8.1 Clause 2-11-04/EAB/RF Occupied bandwidth

The spectral shape of the output should look similar to the input for all modulations.

8.1.1 Test summary

Test date	August 8, 2012	Test engineer	Kevin Rose	Verdict	Pass
Temperature	22 °C	Air pressure	1001 mbar	Relative humidity	40 %

8.1.2 Observations/special notes

The EUT was set up as tabletop configuration.

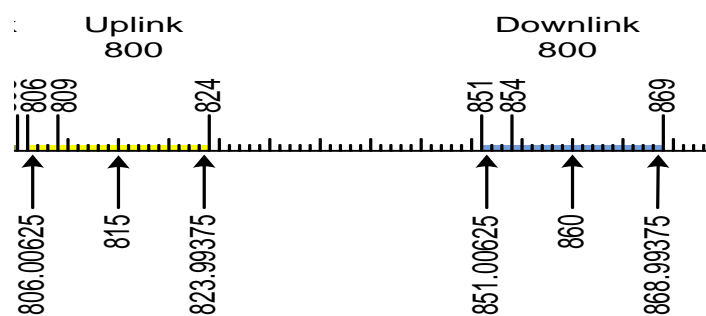
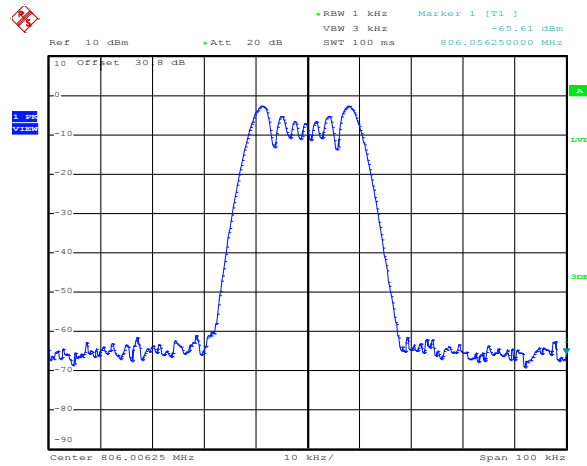


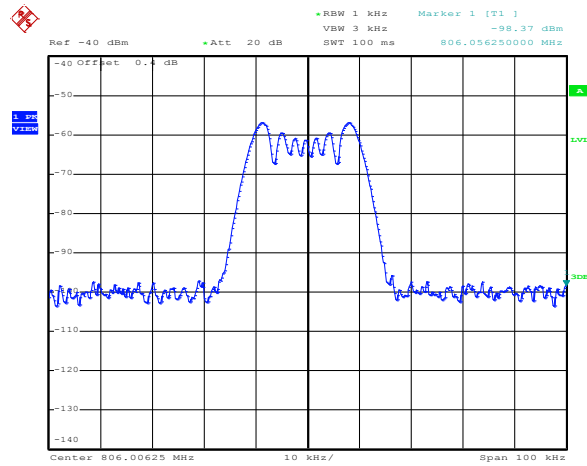
Diagram 8.1-1: OBW test frequencies

8.1.3 Test data



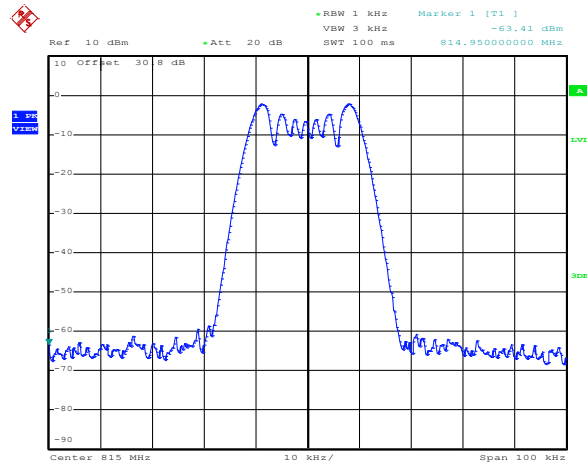
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Plot 8.1-1: Occupied bandwidth at the output
Uplink 806.00625 MHz



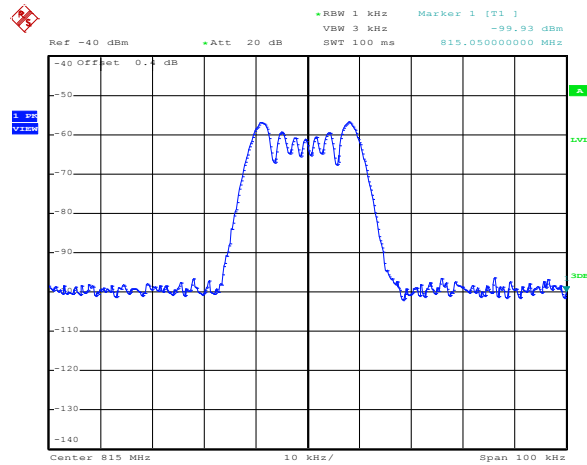
Date: 8.AUG.2012 15:10:35

Plot 8.1-2: Occupied bandwidth at the input
Uplink 806.00625 MHz



Date: 8.AUG.2012 15:06:39

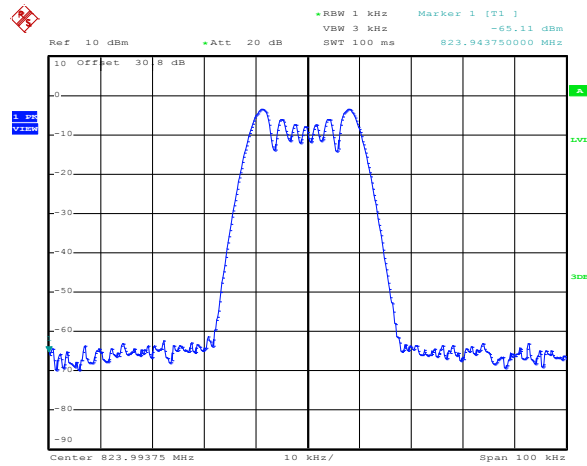
Plot 8.1-3: Occupied bandwidth at the output
Uplink 815 MHz



Date: 8.AUG.2012 15:09:39

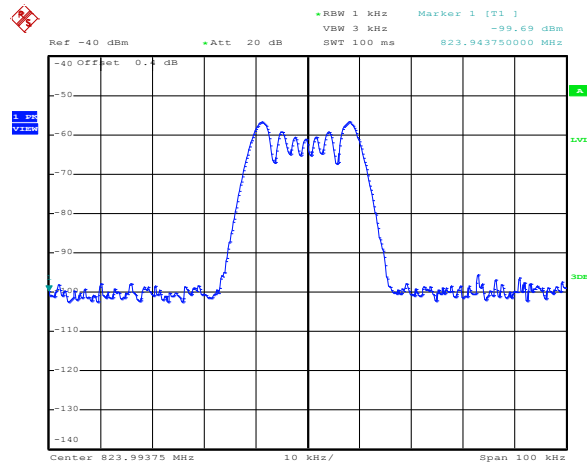
Plot 8.1-4: Occupied bandwidth at the input
Uplink 815 MHz

8.1.3 Test data continued



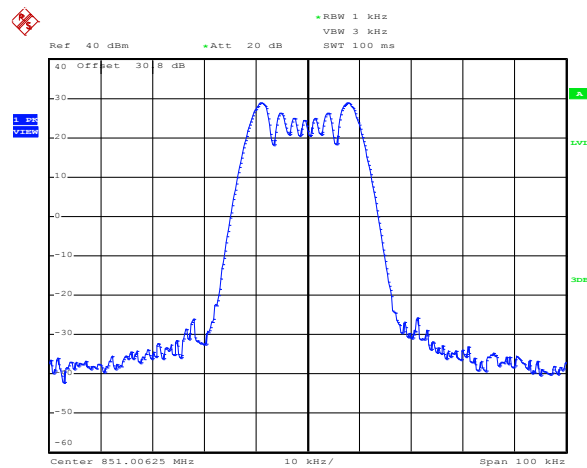
Date: 8.AUG.2012 15:07:25

Plot 8.1-5: Occupied bandwidth at the output
Uplink 823.99375 MHz



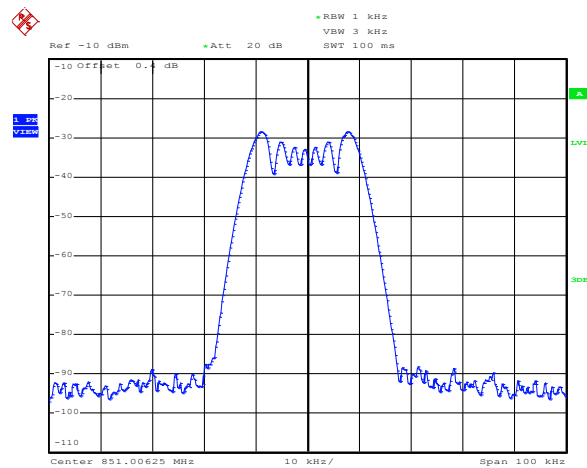
Date: 8.AUG.2012 15:09:04

Plot 8.1-6: Occupied bandwidth at the input
Uplink 823.99375 MHz



Date: 8.AUG.2012 14:43:29

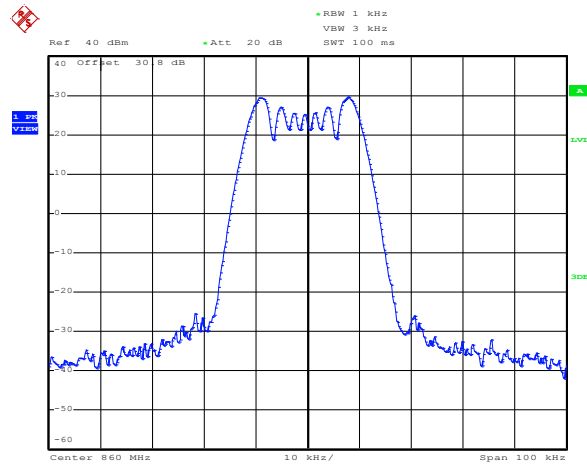
Plot 8.1-7: Occupied bandwidth at the output
Downlink 851.00625 MHz



Date: 8.AUG.2012 14:46:55

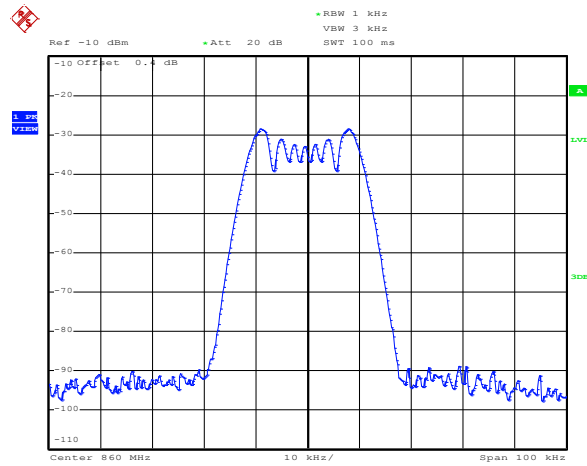
Plot 8.1-8: Occupied bandwidth at the input
Downlink 851.00625 MHz

8.1.3 Test data continued



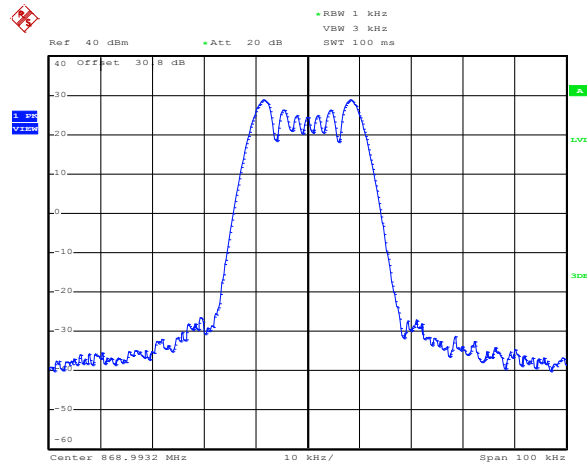
Date: 8.AUG.2012 14:44:16

Plot 8.1-9: Occupied bandwidth at the output
Downlink 860 MHz



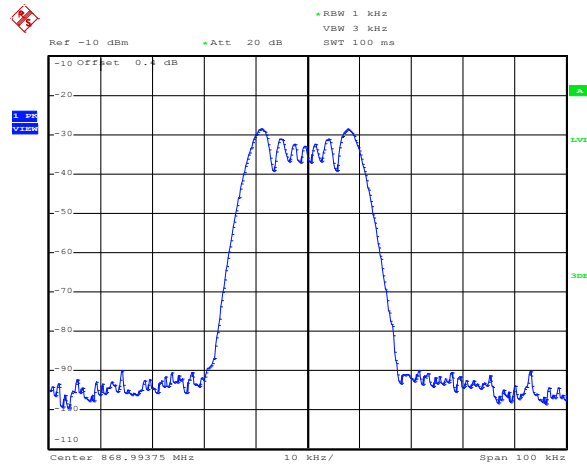
Date: 8.AUG.2012 14:45:50

Plot 8.1-10: Occupied bandwidth at the input
Downlink 860 MHz



Date: 8.AUG.2012 14:41:45

Plot 8.1-11: Occupied bandwidth at the output
Downlink 868.99375 MHz



Date: 8.AUG.2012 14:47:40

Plot 8.1-12: Occupied bandwidth at the input
Downlink 868.99375 MHz

8.2 Clause 90.205 Output power

Applicants for licenses must request and use no more power than the actual power necessary for satisfactory operation. Except where otherwise specifically provided for, the maximum power that will be authorized for new stations authorized after August 16, 1995 is as follows in FCC Part 90.205(a) through (r).

8.2.1 Test summary

Test date	August 8, 2012	Test engineer	Kevin Rose	Verdict	Pass
Temperature	22 °C	Air pressure	1001 mbar	Relative humidity	40 %

8.2.2 Observations/special notes

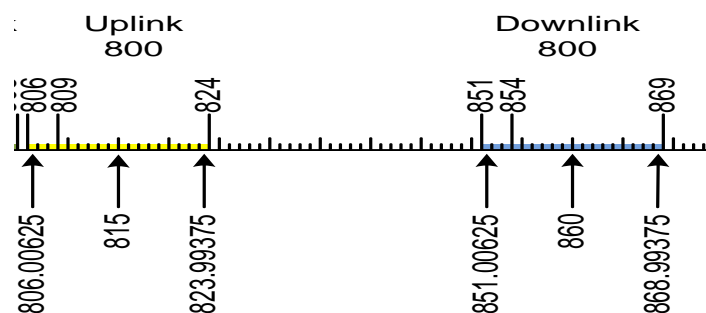


Diagram 8.2-1: Output power test frequencies

8.2.3 Test data

Table 8.2-1: Output power results for CW

Band	Frequency	Power dBm
Uplink 800	806.00625	5.22
	815.00000	5.25
	823.99375	5.48
Downlink 800	851.00625	35.78
	860.00000	36.36
	868.99375	35.78

Table 8.2-2: Maximum output power results

Uplink / Downlink	Maximum output power, dBm	ERP limit, dBm	Margin, dB
Downlink	36.36	37.00	0.64
Uplink	5.48	37.00	31.52

The ERP (effective radiated power) from the booster system must not exceed +37 dBm (5 Watts) in order to remain compliant with FCC regulations, therefore maximum antenna gain for the Downlink chain should be no more than 0.64 dBd and maximum antenna gain for the Uplink chain should be no more than 31.52 dBd. If antennas with higher gains than specified above are used the conducted output power from shall be reduced below the stated values in the table above by the amount in dB that the directional gain of the antenna exceeds the recommended gains.

8.3 Clause 2-11-04/EAB/RF Out of band rejection

Plots showing the filter frequency response.

8.3.1 Test summary

Test date	August 8, 2012	Test engineer	Kevin Rose	Verdict	Pass
Temperature	22 °C	Air pressure	1001 mbar	Relative humidity	40 %

8.3.2 Observations/special notes

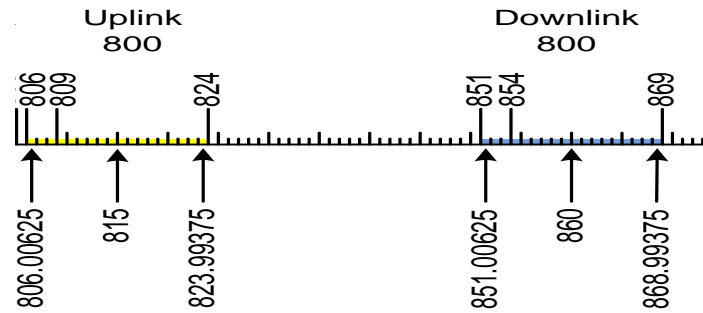
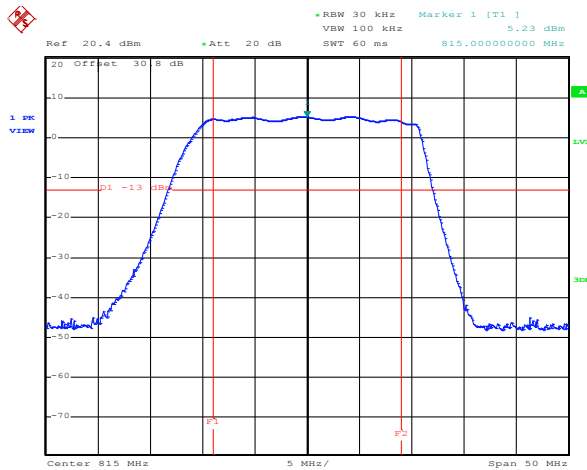


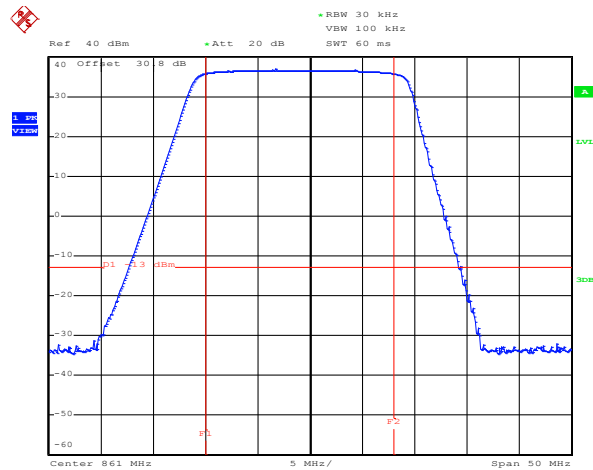
Diagram 8.3-1: Out of band rejection test frequencies

8.3.3 Test data



Date: 8.AUG.2012 15:03:39

Plot 8.3-1: Out of band rejection Uplink 800 MHz



Date: 7.AUG.2012 19:47:25

Plot 8.3-2: Out of band rejection Downlink 800 MHz

8.4 Clause 90.210 Conducted and radiated spurious emissions

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere, the Table below specifies the emission masks for equipment operating in the frequency bands governed under this part.

8.4.1 Test summary

Test date	August 8, 2012	Test engineer	Kevin Rose	Verdict	Pass
Temperature	22 °C	Air pressure	1001 mbar	Relative humidity	40 %

8.4.2 Observations/special notes

Emission Mask G. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

- (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin kHz) of more than 10 kHz, but no more than 250 percent of the authorized bandwidth: At least $116 \log (fd/6.1)$ dB, or $50 + 10 \log (P)$ dB, or 70 dB, whichever is the lesser attenuation;
- (2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

Emission Mask H. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

- (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin kHz) of 4 kHz or less: Zero dB.
- (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin kHz) of more than 4 kHz, but no more than 8.5 kHz: At least $107 \log (fd/4)$ dB;
- (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin kHz) of more than 8.5 kHz, but no more than 15 kHz: At least $40.5 \log (fd/1.16)$ dB;
- (4) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin kHz) of more than 15 kHz, but no more than 25 kHz: At least $116 \log (fd/6.1)$ dB;
- (5) On any frequency removed from the center of the authorized bandwidth by more than 25 kHz: At least $43 + \log (P)$ dB.

All radiated measurements were performed using a Peak Detector with 100 kHz RBW below 1 GHz and a 1 MHz RBW above 1 GHz at a distance of 3 meters. The spectrum was swept from 30 MHz up to the 9 GHz.

Radiated Spurious emissions were tested with -80 dBm CW at the input of the EUT and 50 Ω termination at the output.

Theoretical field strength limit equivalent to -20 dBm is 75.23 dB μ V/m.

No emissions were found within 20 dB below the limit.

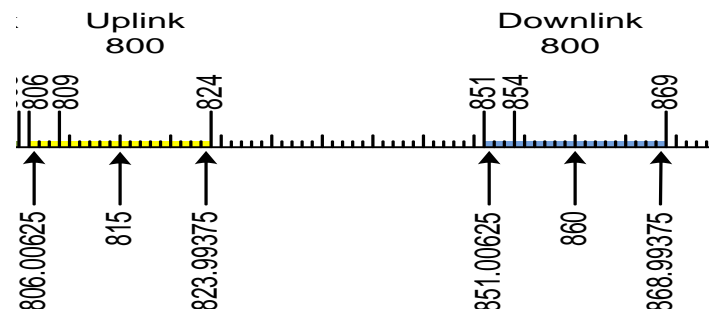
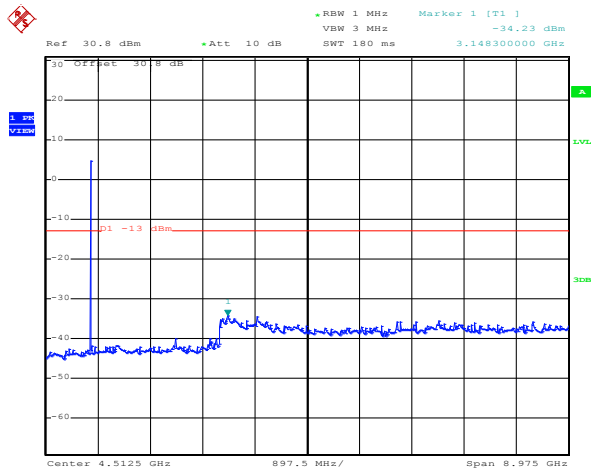


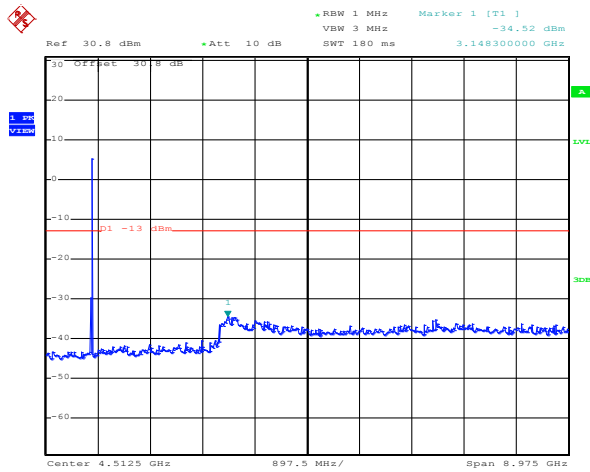
Diagram 8.4-1: : Conducted and radiated spurious emissions test frequencies

8.4.3 Test data



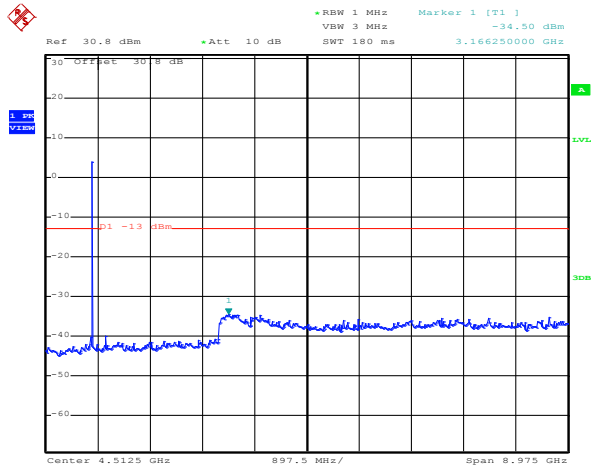
Date: 7.AUG.2012 21:39:10

Plot 8.4-1: Conducted Spurious emissions
Uplink 806.00625 MHz



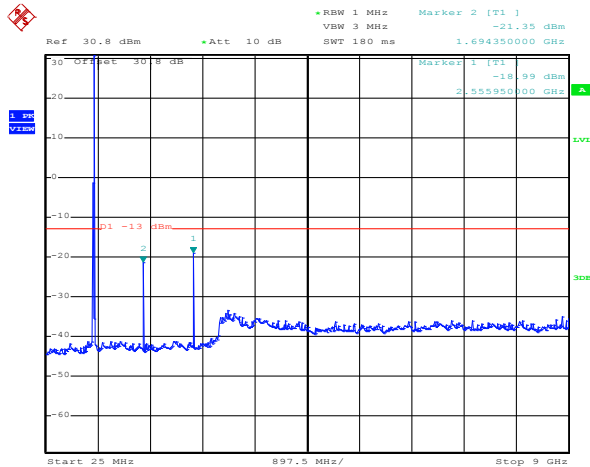
Date: 7.AUG.2012 21:38:15

Plot 8.4-2: Conducted Spurious emissions
Uplink 815 MHz



Date: 7.AUG.2012 21:40:00

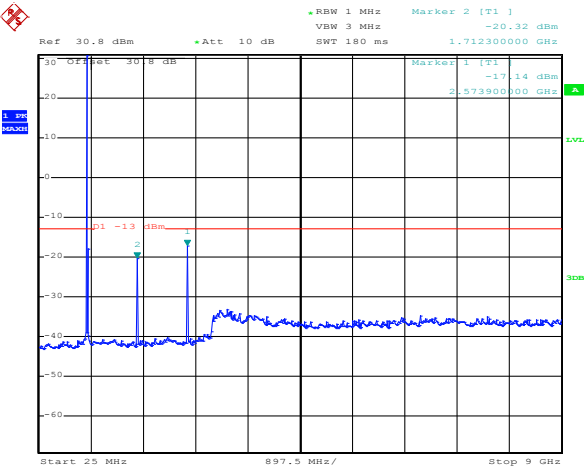
Plot 8.4-3: Conducted Spurious emissions
Uplink 823.99375 MHz



Date: 7.AUG.2012 21:26:44

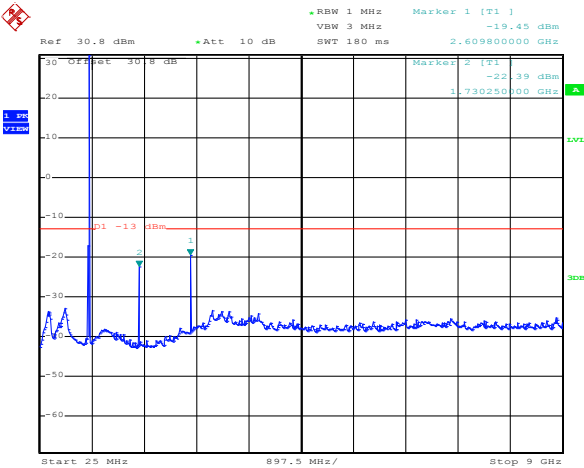
Plot 8.4-4: Conducted Spurious emissions
Downlink 851.00625 MHz

8.4.3 Test data continued



Date: 7.AUG.2012 21:25:00

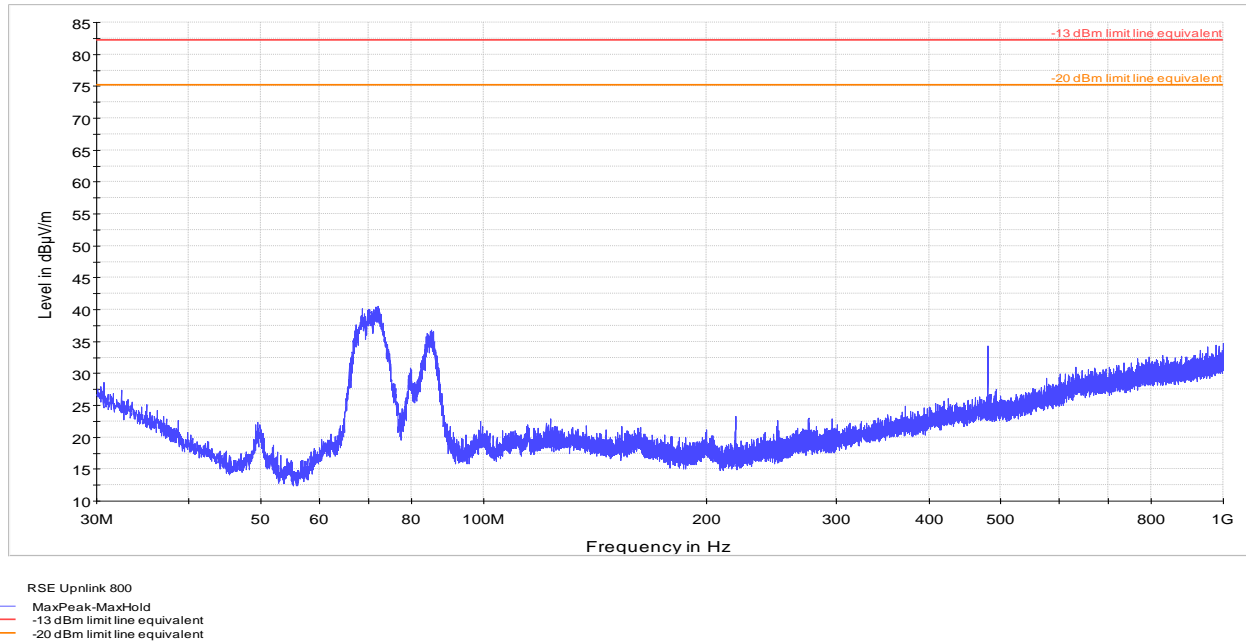
Plot 8.4-5: Conducted Spurious emissions
Downlink 860 MHz



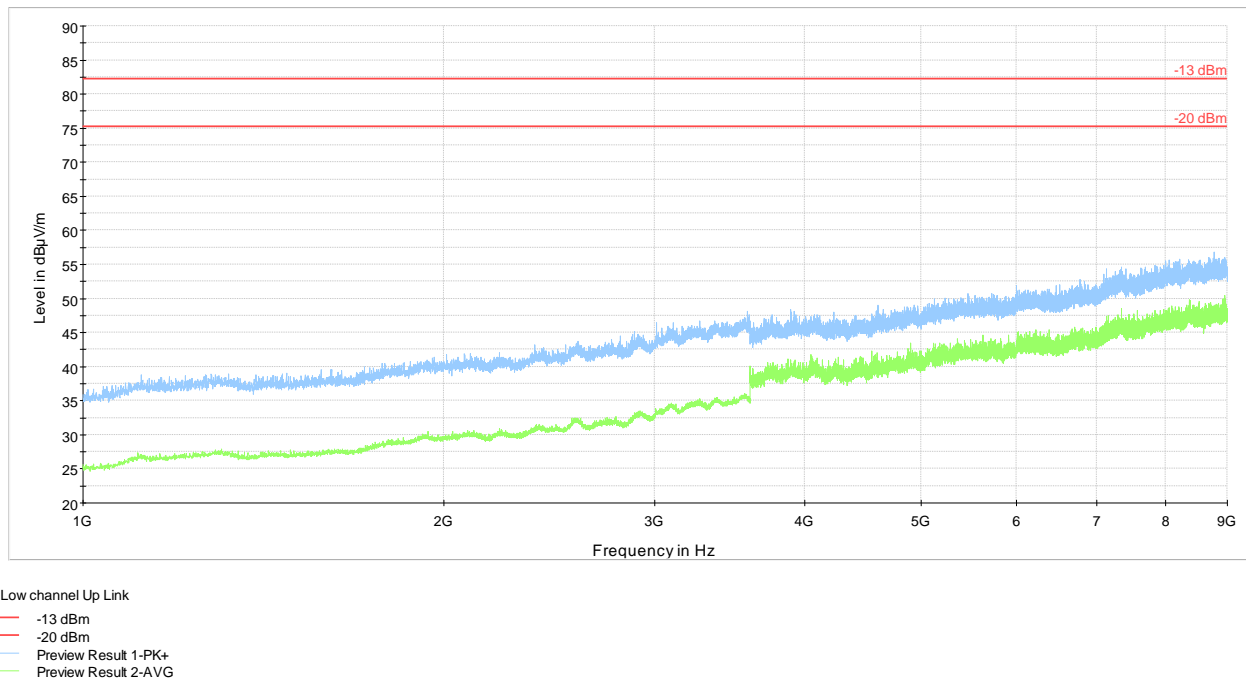
Date: 7.AUG.2012 21:23:39

Plot 8.4-6: Conducted Spurious emissions
Downlink 868.99375 MHz

8.4.3 Test data continued

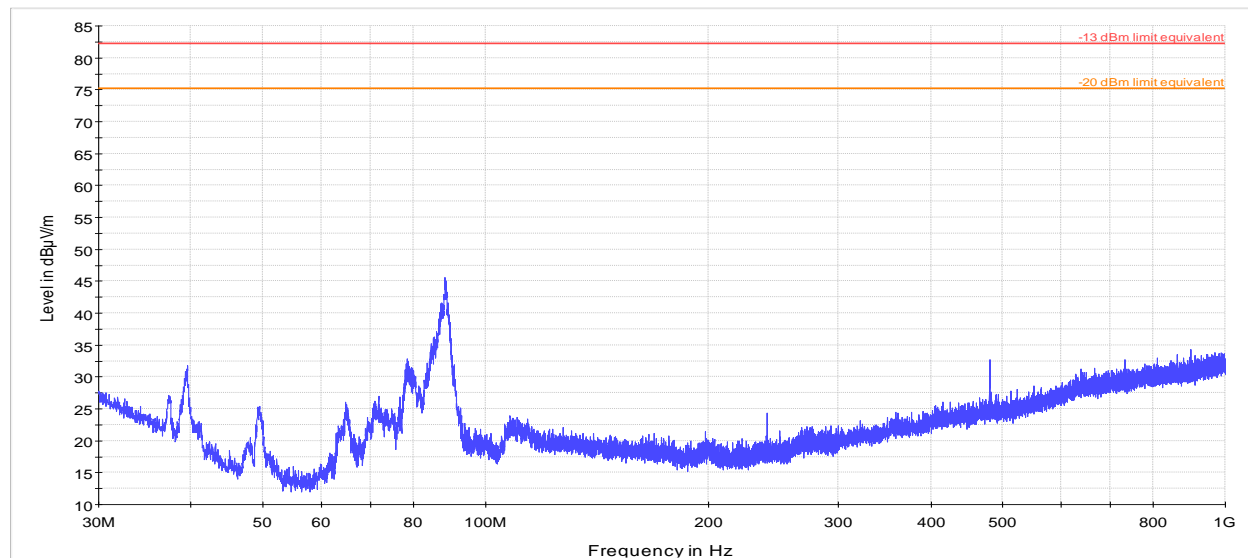


Plot 8.4-7: Radiated spurious emissions
Uplink 806.00625 MHz



Plot 8.4-8: Radiated spurious emissions
Uplink 806.00625 MHz

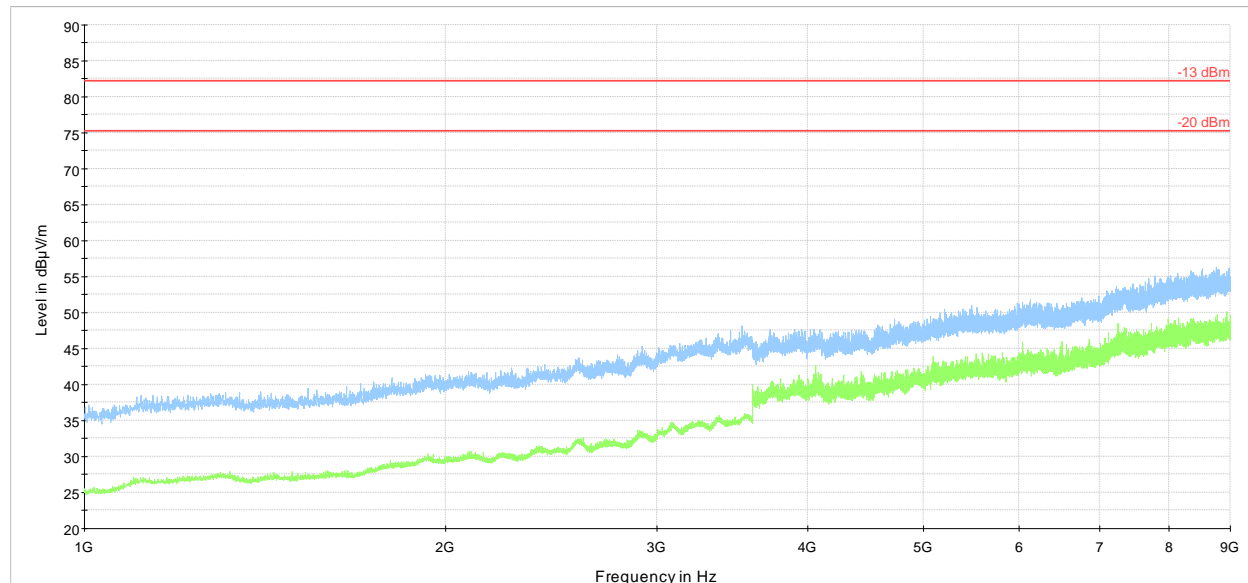
8.4.3 Test data continued



RSE HP Downlink 800

— MaxPeak-MaxHold
— -13 dBm limit equivalent
— -20 dBm limit equivalent

Plot 8.4-9: Radiated spurious emissions
Uplink 815 MHz

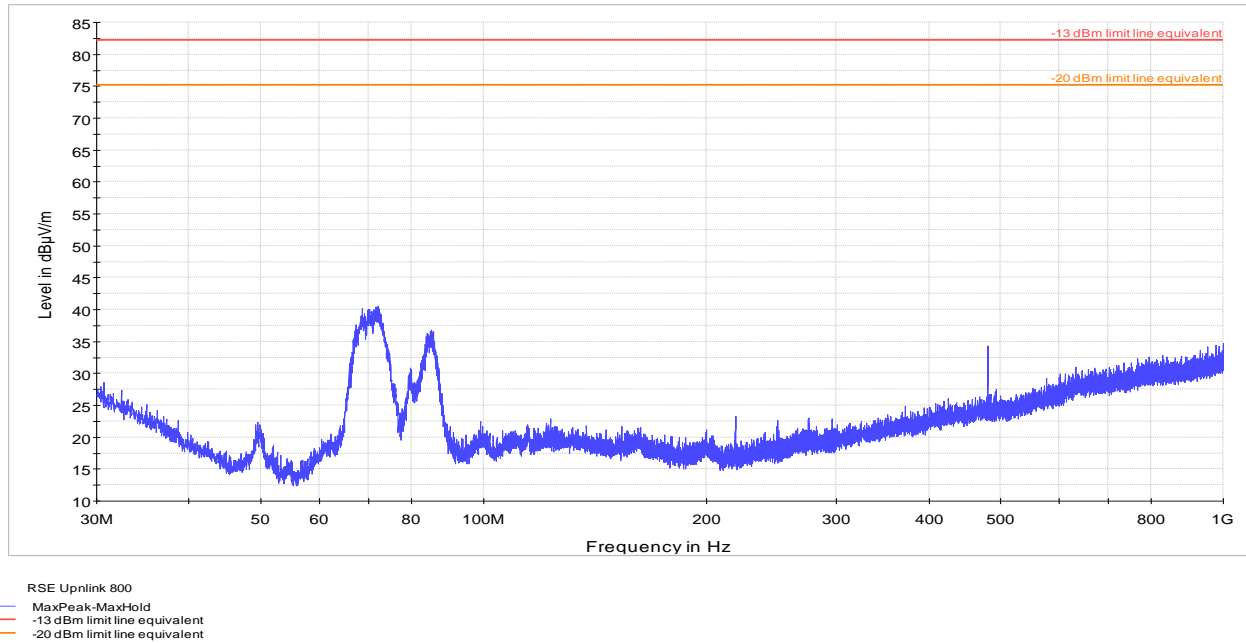


mid channel Up Link

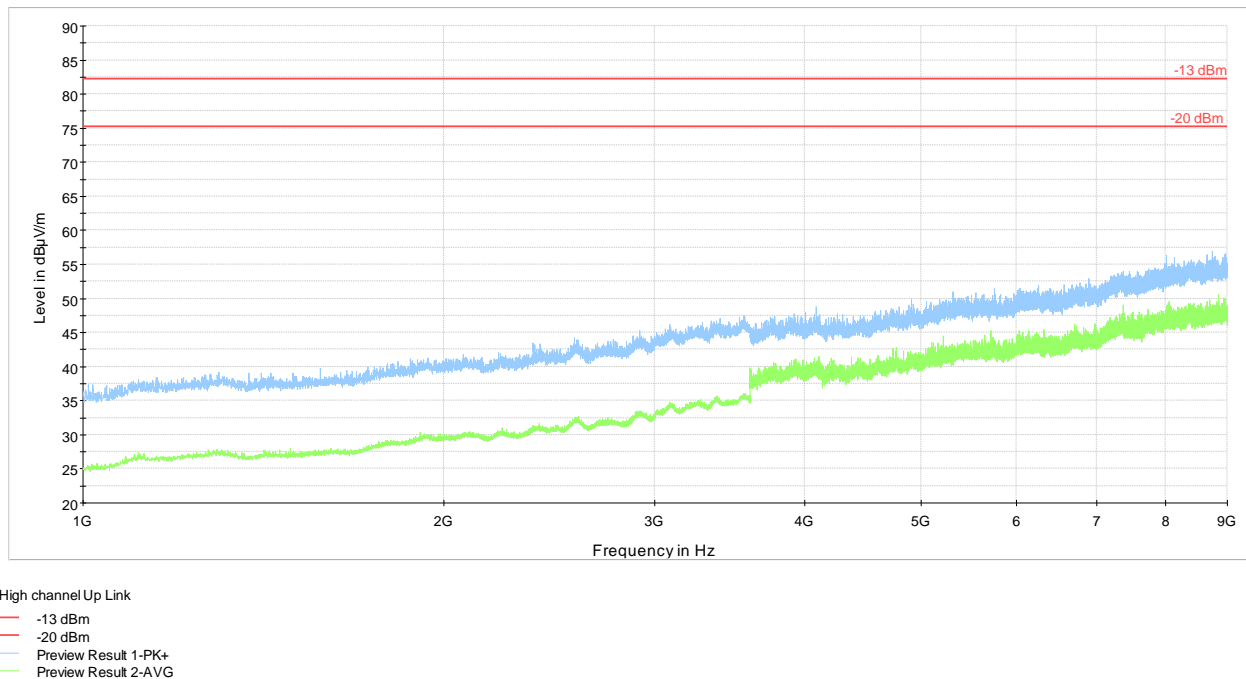
— -13 dBm
— -20 dBm
— Preview Result 1-PK+
— Preview Result 2-AVG

Plot 8.4-10: Radiated spurious emissions
Uplink 815 MHz

8.4.3 Test data continued

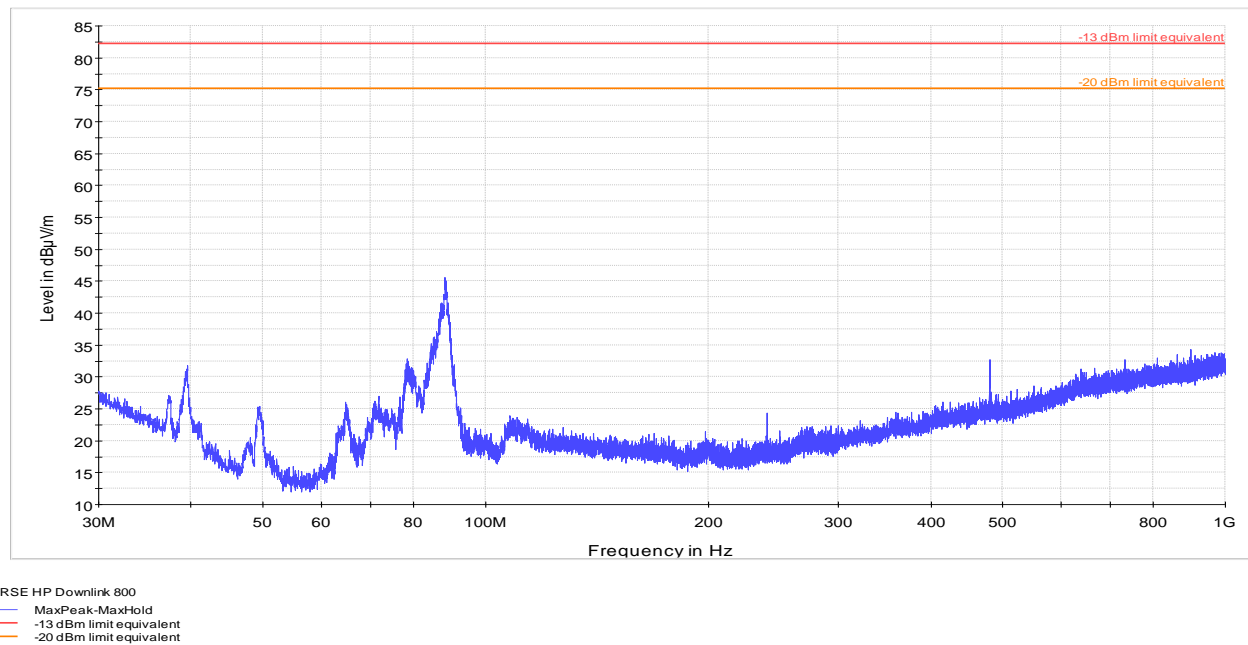


Plot 8.4-11: Radiated spurious emissions
Uplink 823.99375 MHz

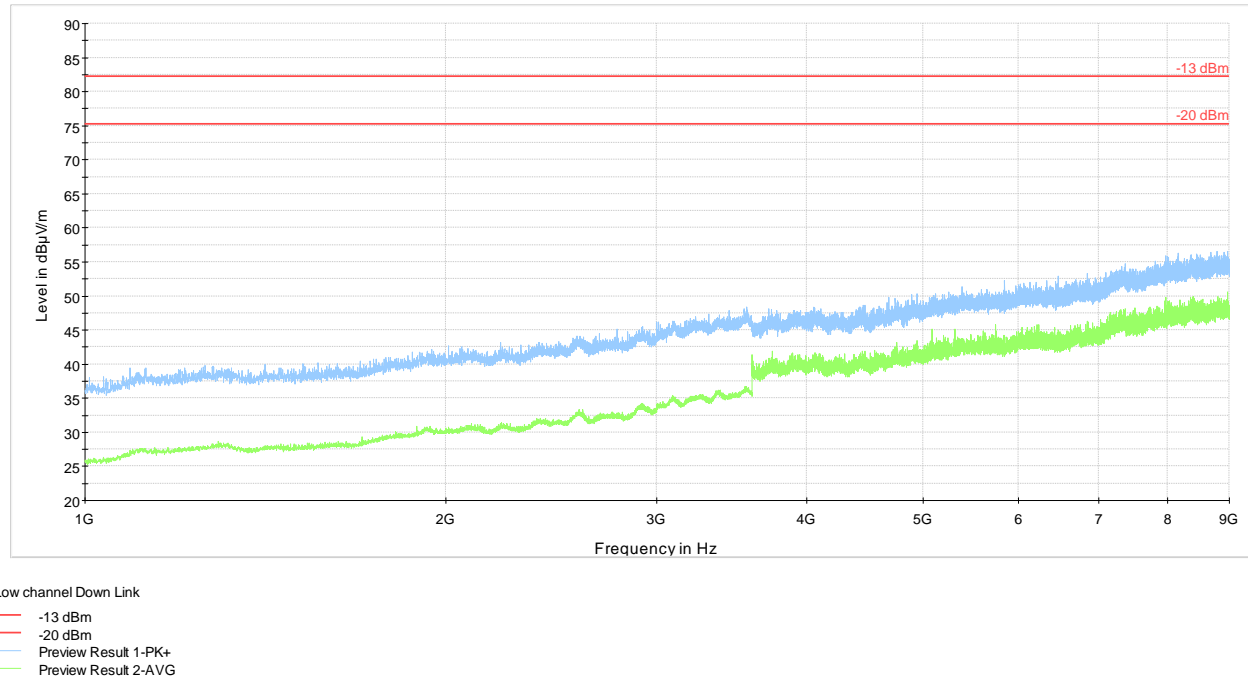


Plot 8.4-12: Radiated spurious emissions
Uplink 823.99375 MHz

8.4.3 Test data continued

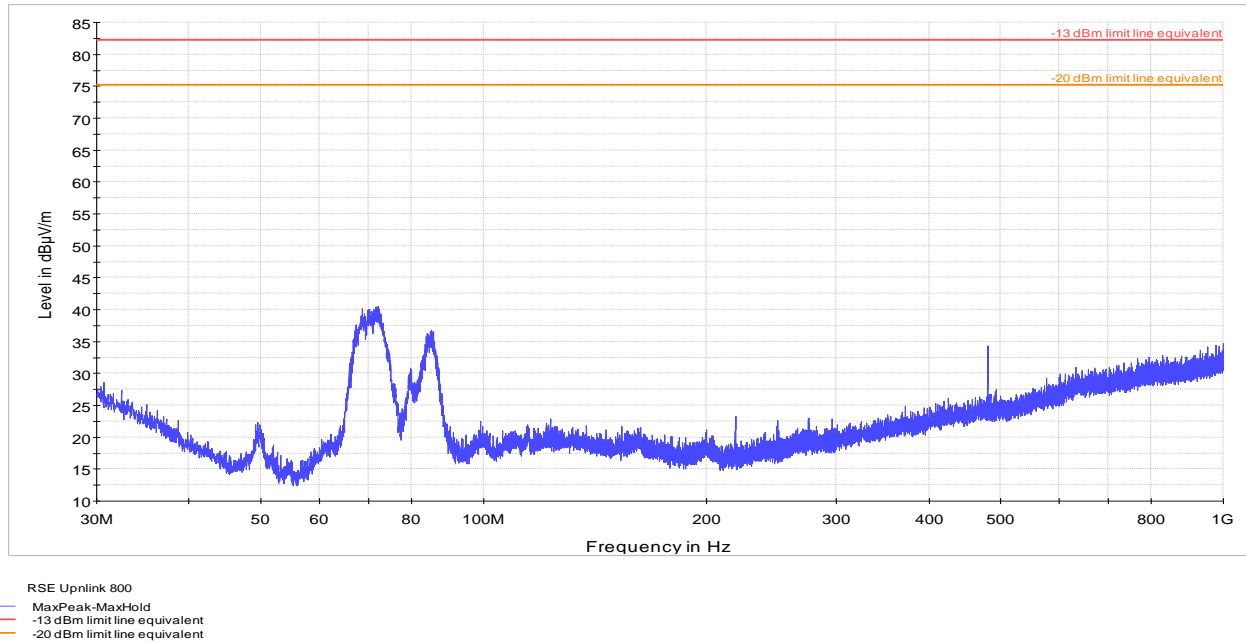


Plot 8.4-13: Radiated spurious emissions
Downlink 851.00625 MHz

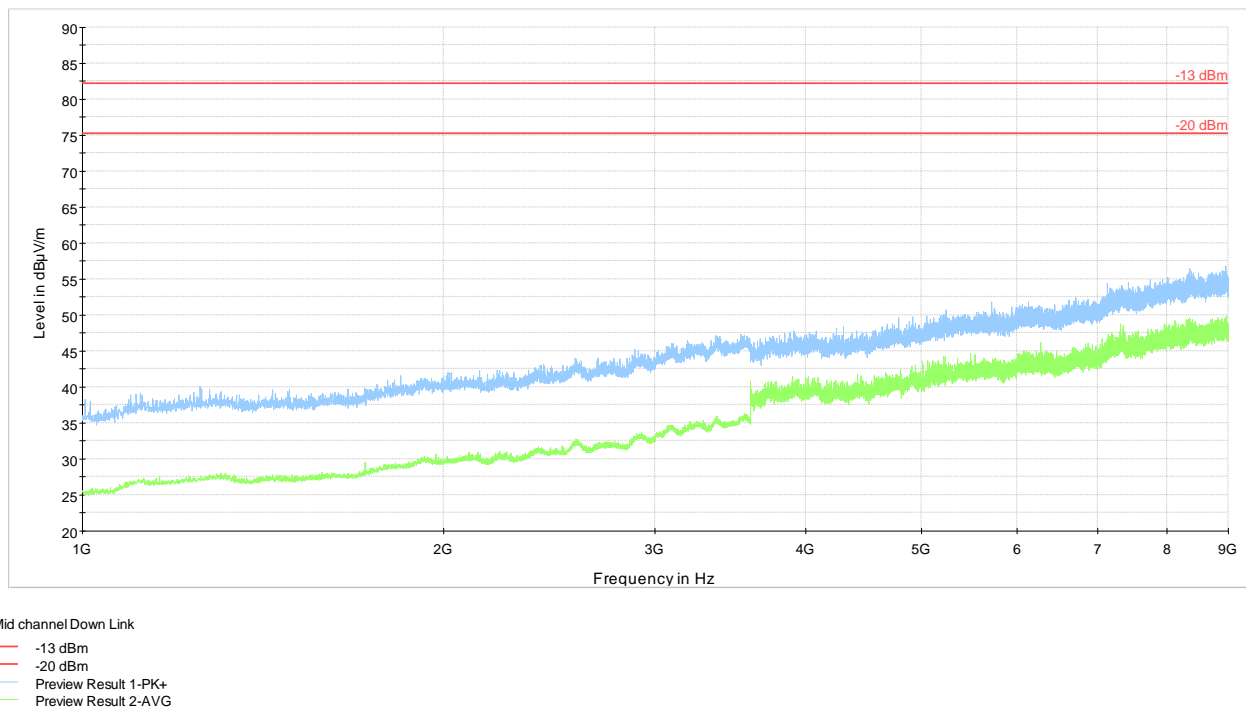


Plot 8.4-14: Radiated spurious emissions
Downlink 851.00625 MHz

8.4.3 Test data continued

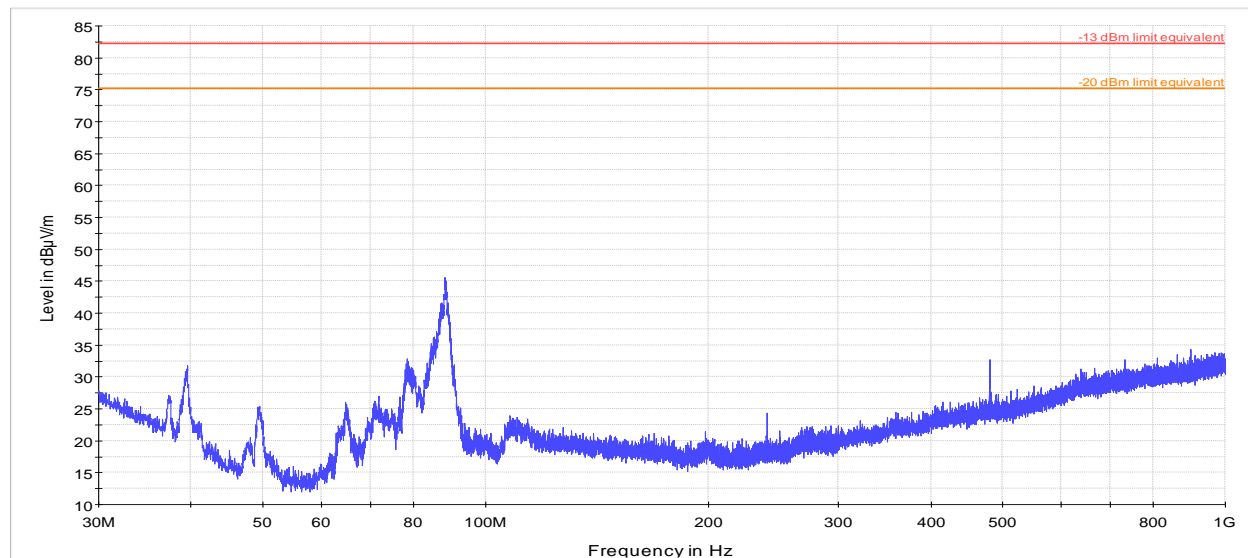


Plot 8.4-15: Radiated spurious emissions
Uplink 860 MHz



Plot 8.4-16: Radiated spurious emissions
Downlink 860 MHz

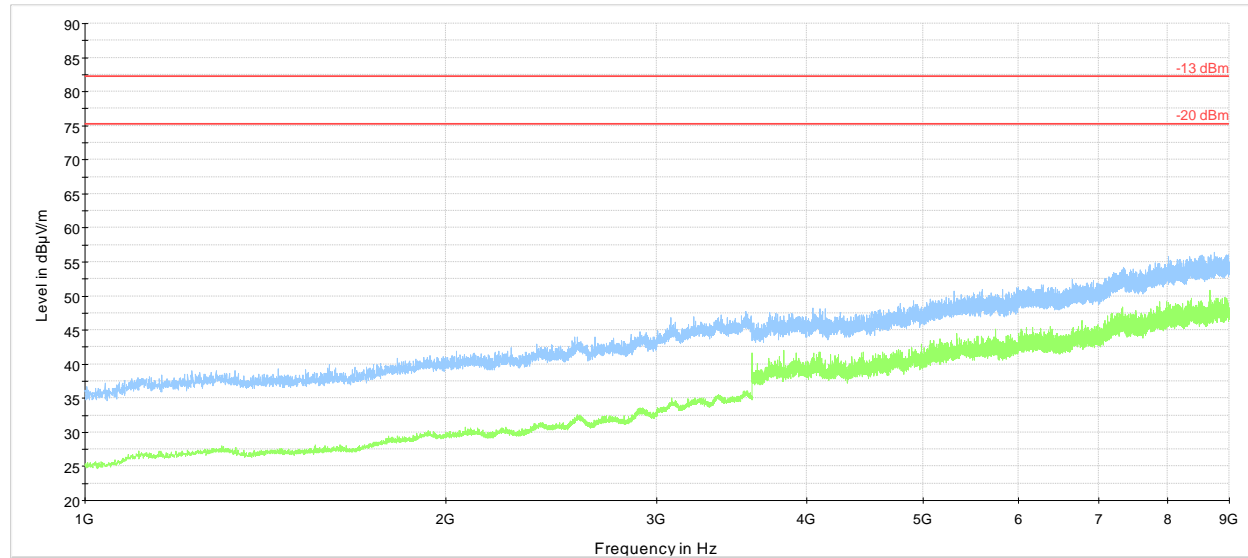
8.4.3 Test data continued



RSE HP Downlink 800

MaxPeak-MaxHold
-13 dBm limit equivalent
-20 dBm limit equivalent

Plot 8.4-17: Radiated spurious emissions
Downlink 868.99375 MHz



High channel Down Link

-13 dBm
-20 dBm
Preview Result 1-PK+
Preview Result 2-AVG

Plot 8.4-18: Radiated spurious emissions
Downlink 868.99375 MHz

8.5 Intermodulation

The test was performed when at the input of the EUT were 2 CW signals at two adjacent channels.

8.5.1 Test summary

Test date	August 8, 2012	Test engineer	Kevin Rose	Verdict	Pass
Temperature	22 °C	Air pressure	1001 mbar	Relative humidity	40 %

8.5.2 Observations/special notes

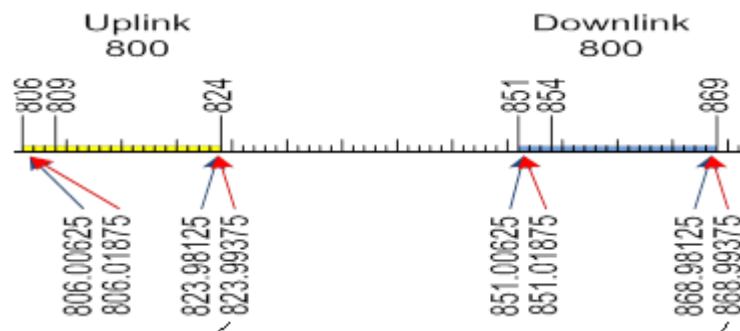
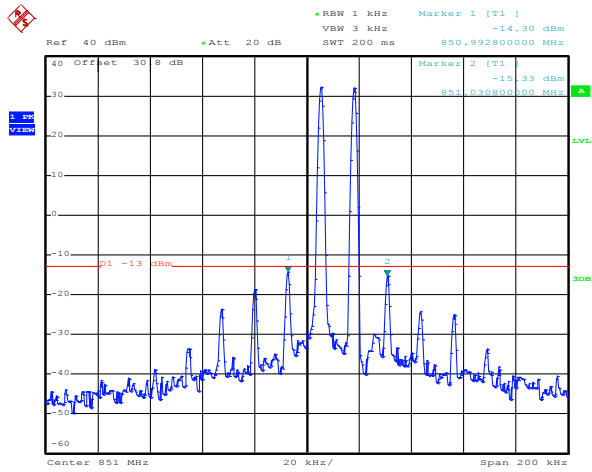


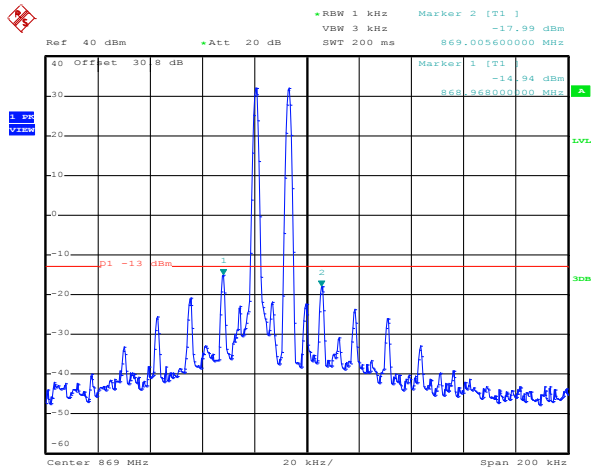
Diagram 8.5-1: Intermodulation channels

8.5.3 Test data



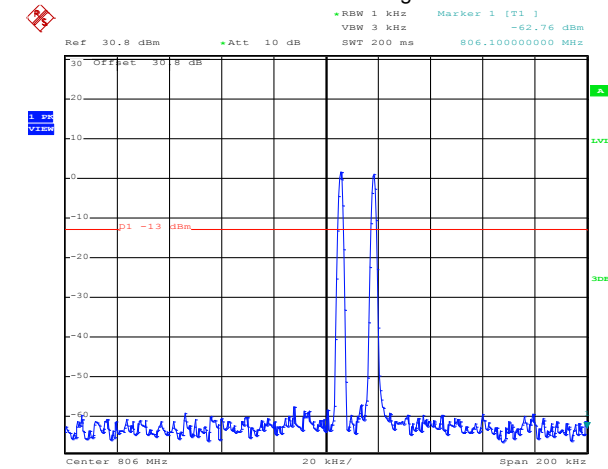
Date: 8.AUG.2012 14:34:06

Plot 8.5-1: 3rd order intermodulation
Downlink 800 MHz
Lower band edge



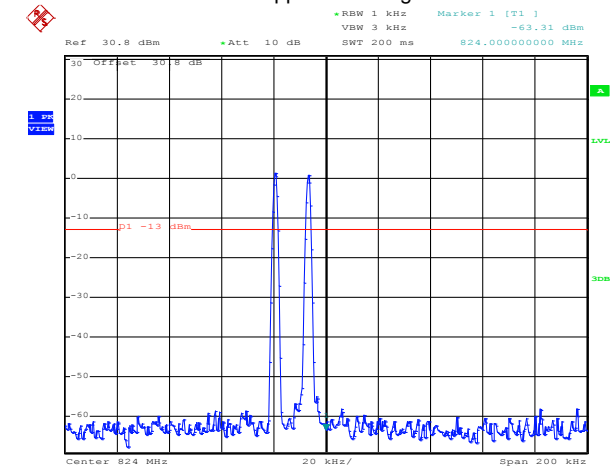
Date: 8.AUG.2012 14:37:07

Plot 8.5-2: 3rd order intermodulation
Downlink 800 MHz
Upper band edge



Date: 7.AUG.2012 21:45:59

Plot 8.5-3: 3rd order intermodulation
Uplink 800 MHz
Lower band edge

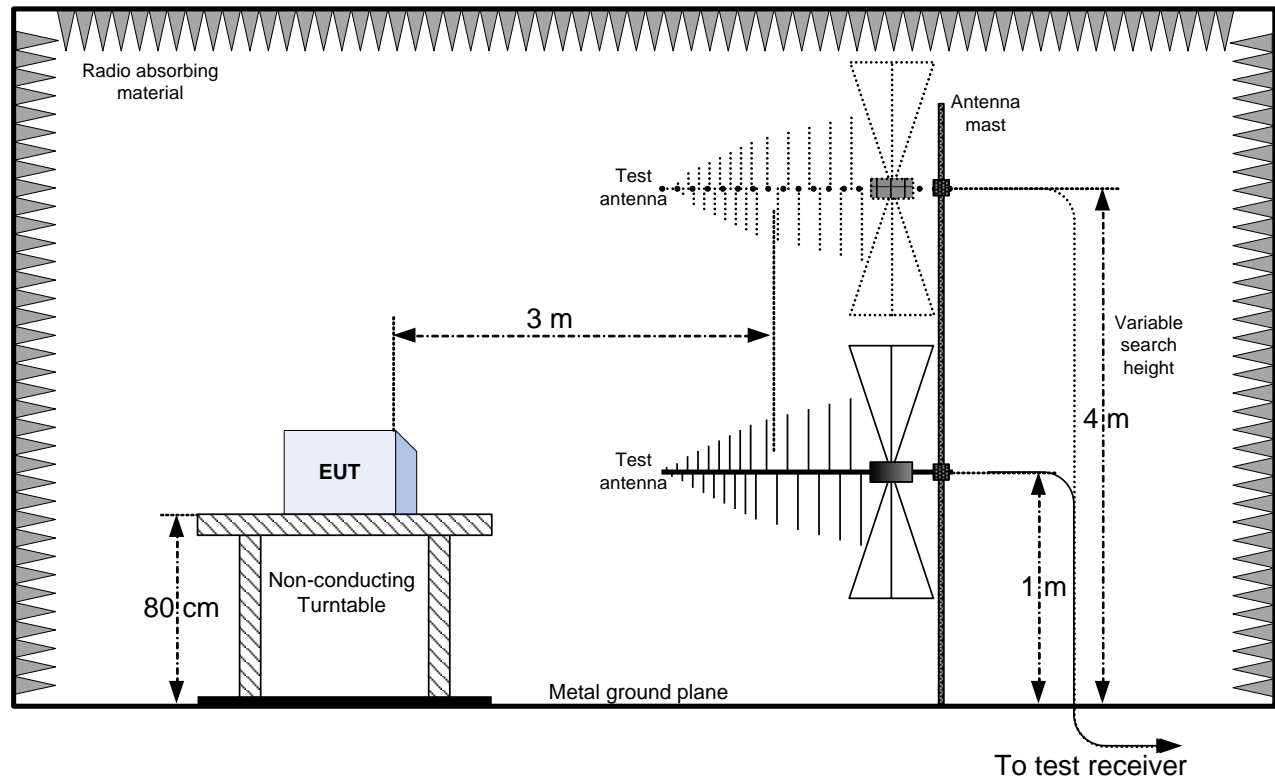


Date: 7.AUG.2012 21:44:49

Plot 8.5-4: 3rd order intermodulation
Uplink 800 MHz
Upper band edge

Section 9: Block diagrams of test set-ups

9.1 Radiated emissions set-up

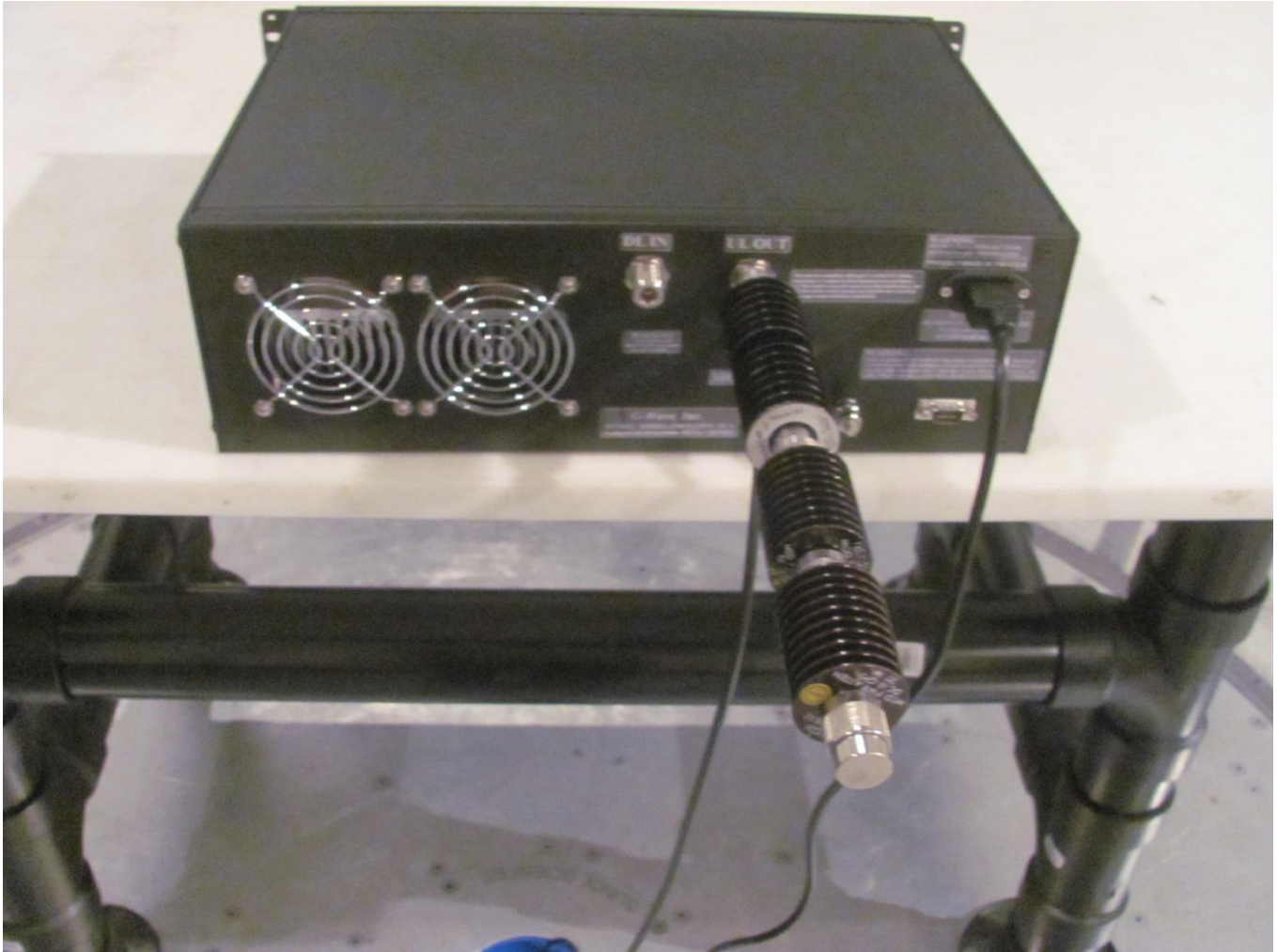


Section 10: EUT photos

10.1 EUT front view



10.2 EUT rear view



10.3 EUT left side view



10.4 EUT right side view

