

Compliance test report ID **207659-3TRFWL**

Date of issue
July 5, 2012

FCC 47 CFR Part 15 Subpart E, §15.407

Unlicensed National Information Infrastructure Devices

Applicant **Redline Communications**
Product **Broad-band wireless infrastructure product**
Model **RDL-3000-RMA**
FCC ID **QC8-RDL3000RMA**

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Test location

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July 5, 2012

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Date

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

Redline Communications
302 Town Center Blvd.
Markham, Ontario,
Canada, L3R 0E8

1.2 Test specifications

FCC 47 CFR Part 15, Subpart E, Chapter 15.407
Unlicensed National Information Infrastructure Devices

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 15 Subpart C – general requirements, test results

| Part | Test description | Verdict |
|------------|---------------------------------|-------------------|
| §15.207(a) | Conducted limits | Pass |
| §15.31(e) | Variation of power source | Pass ¹ |
| §15.31(m) | Number of operating frequencies | Pass ² |
| §15.203 | Antenna requirement | Pass ³ |

Notes:

¹ Measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, was performed with the supply voltage varied between 85 % and 115 % of the nominal rated supply voltage. No noticeable output power variation was observed

² Since the frequency band was wider than 10 MHz, three channels (1 near top, 1 near middle and 1 near bottom) were selected for the testing.

³ The antenna used with this EUT is non-detachable.

2.2 FCC Part 15 Subpart E, test results

| Part | Test description | Verdict |
|--------------|---|---------|
| 15.403(i) | Emission bandwidth | Pass |
| 15.407(a)(2) | Maximum conducted transmit output power | Pass |
| 15.407(a)(2) | Peak power spectral density | Pass |
| 15.407(a)(6) | Peak excursion measurement | Pass |
| 15.407(b) | Spurious emissions | Pass |
| 15.407(g) | Frequency stability | Pass |

Section 3 Equipment under test (EUT) details

3.1 Sample information

Receipt date January 17, 2012
Nemko sample ID number 3

3.2 EUT information

Product name Broad-band wireless infrastructure product
Model RDL-3000-RMA
Serial number 117PC11510007

3.3 Technical information

Operating band 5470–5725 MHz (excluding 5600–5650 MHz)
 5 MHz Channel: 5472.5–5722.5 MHz
Operating frequency 10 MHz Channel: 5475–5720 MHz
 20 MHz Channel: 5480–5715 MHz
Modulation type OFDM using 64-QAM, 16-QAM, QPSK and BPSK modulation for sub-carriers
Occupied bandwidth 5, 10 and 20 MHz
Emission designator W7D
Power requirements 48 V_{DC} PoE via 120 V_{AC}, 60 Hz
Antenna information Redline 4.9–6.1 GHz Dual Polarization/ Dual Slant Subscriber Antenna, 19 dBi, M/N: 30-00328-00
 L-Com 5.1–5.8 GHz Dual Polarization, Omnidirectional Antenna, 10 dBi, M/N: HG5158DP-10U

3.4 Product description and theory of operation

The EUT is a 2x2 MIMO point-to-point (PTP) carrier grade broadband wireless infrastructure product, designed to operate in the 5470–5725 MHz band.

3.5 EUT exercise details

The EUT was in a continuous transmitting mode with random data frames. The modulation, channel bandwidth and channel frequency was changed using a Web-based interface of the Ethernet port.

3.6 EUT setup diagram

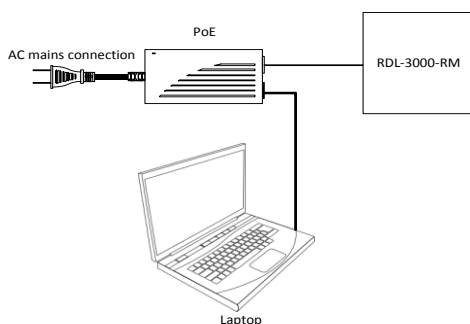


Diagram 3.6-1: Setup diagram

3.7 Support equipment

| Description | Brand name | Model/Part number | Serial number | Rev. |
|-------------|------------------------|-------------------|---------------|------|
| PoE | Cincon Electronics Co. | TRG60A-POE-L | 1127 | - |

Section 4 Engineering considerations

4.1 Modifications incorporated in the EUT

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

4.2 Technical judgment

None

4.3 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 $\pm 5\%$, 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 |
| Power Source | California Instruments | 5001ix | FA001770 | 1 year | May 03/13 |
| Receiver/spectrum analyzer | Rohde & Schwarz | ESU 26 | FA002043 | 1 year | April 27/13 |
| Biconical antenna | Sunol | BC2 | FA002078 | 1 year | Jan. 04/13 |
| Log periodic antenna | Sunol | LP5 | FA002077 | 1 year | Dec. 28/12 |
| Horn antenna #1 | EMCO | 3115 | FA000649 | 1 year | Mar. 08/13 |
| 1–18 GHz pre-amplifier | JCA | JCA118-503 | FA002091 | 1 year | Aug. 15/12 |
| Horn antenna 18–26.5 GHz | Electro-metrics | SH-50/60-1 | FA000479 | — | VOU |
| 18–26 GHz pre-amplifier | Narda | BBS-1826N612 | FA001550 | — | VOU |
| Temperature chamber | Thermotron | SM-16C | FA001030 | 1 year | NCR |
| 18.0 – 40.0 GHz Horn Antenna | EMCO | 3116 | FA001847 | 1 year | May 20/13 |
| 26 – 40.0 GHz Amplifier | NARDA | DBL-2640N610 | FA001556 | — | VOU |
| LISN | Rohde & Schwarz | ENV216 | FA002023 | 1 year | Nov. 18/12 |
| Receiver/spectrum analyzer | Rohde & Schwarz | ESU 40 | FA002071 | 1 year | Feb. 09/13 |
| Note: NCR - no calibration required, VOU - verify on use | | | | | |

Section 8 Testing data

8.1 Clause 15.207(a) Conducted limits

8.1.1 Definitions and limits

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Table 8.1-1: Conducted emissions limit

| Frequency of emission (MHz) | Conducted limit (dB μ V) | |
|-----------------------------|------------------------------|-----------|
| | Quasi-peak | Average |
| 0.15–0.5 | 66 to 56* | 56 to 46* |
| 0.5–5 | 56 | 46 |
| 5–30 | 60 | 50 |

* - Decreases with the logarithm of the frequency.

8.1.2 Test summary

| | | | | | |
|--------------------|------------------|----------------------|-----------------|--------------------------|------|
| Test date | February 2, 2012 | Test engineer | Andrey Adelberg | Verdict | Pass |
| Temperature | 24 °C | Air pressure | 1002 mbar | Relative humidity | 32 % |

8.1.3 Observations/special notes

The EUT was set up as tabletop configuration.

The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

Receiver/spectrum analyzer settings Preview measurements – Receiver:
 Peak and Average detector (Max hold), RBW = 9 kHz, VBW = 30 kHz, Measurement time = 100 ms
 Final measurements – Receiver:
 Q-Peak and Average detector, RBW = 9 kHz, VBW = 30 kHz, Measurement time = 100 ms

Measurement details A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement. The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

8.1.4 Test data

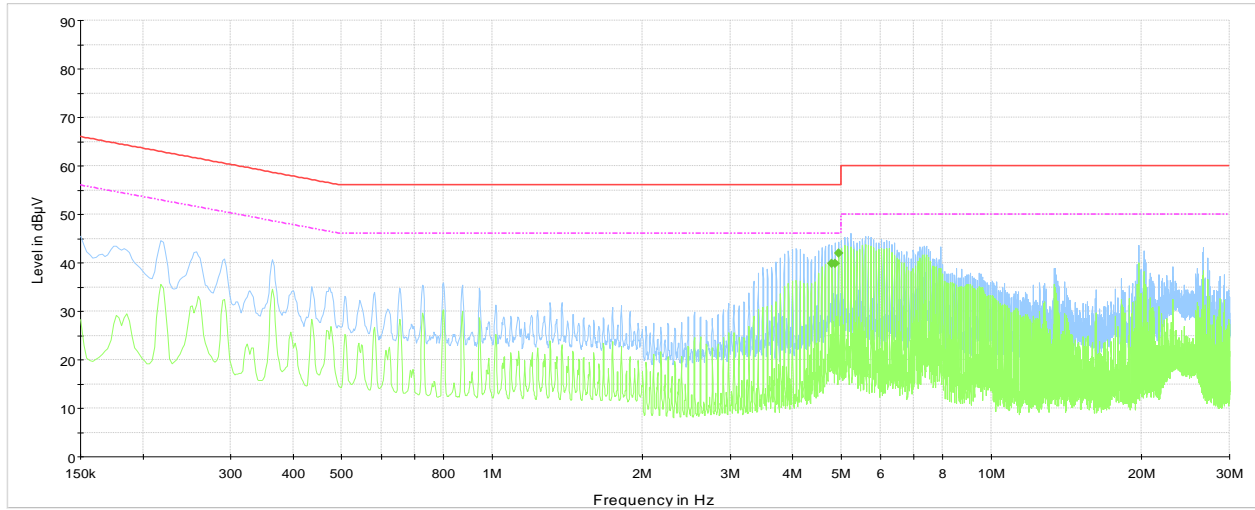
Table 8.1-2: Average conducted emissions results

| Frequency (MHz) | Average result (dB μ V) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Conductor | Correction (dB) | Margin (dB) | Limit (dB μ V) |
|-----------------|-----------------------------|-----------------|-----------------|--------|-----------|-----------------|-------------|--------------------|
| 4.796250 | 39.9 | 100.0 | 9.000 | On | L1 | 10.3 | 6.1 | 46.0 |
| 4.868250 | 39.9 | 100.0 | 9.000 | On | L1 | 10.3 | 6.1 | 46.0 |
| 4.942500 | 41.9 | 100.0 | 9.000 | On | L1 | 10.2 | 4.1 | 46.0 |

Sample calculation:
 Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + attenuator (dB)
 Result (dB μ V) = XX dB μ V (reading from receiver) + XX dB (Correction factor)

Example:
 43.5 dB μ V = 23.2 dB μ V (receiver reading) + 10.1 dB (LISN factor IL) + 0.2 dB (cable loss) + 10 dB (attenuator)

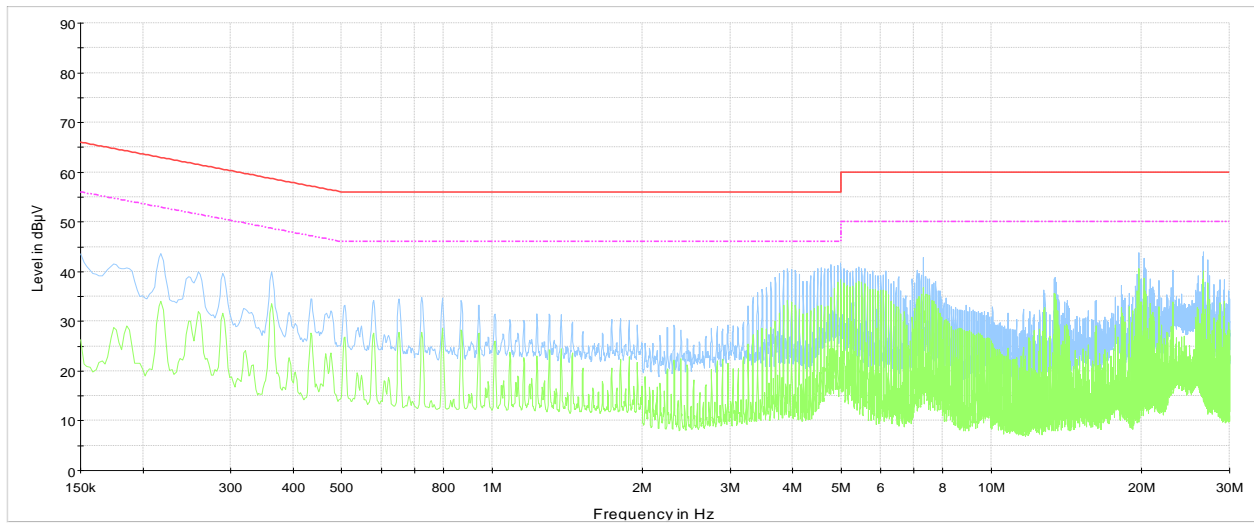
8.1.4 Test data



120 VAC, 60 Hz conducted emissions on phase line

- CISPR 22 Mains QP Class B.LimitLine
- - - CISPR 22 Mains AV Class B.LimitLine
- Preview Result 1-PK+
- Preview Result 2-AVG
- ◆ Final Result 2-AVG

Plot 8.1-1: Conducted emissions on phase line



120 VAC, 60 Hz conducted emissions on neutral line

- CISPR 22 Mains QP Class B.LimitLine
- - - CISPR 22 Mains AV Class B.LimitLine
- Preview Result 1-PK+
- Preview Result 2-AVG

Plot 8.1-2: Conducted emissions on neutral line

8.2 Clause 15.403(i) Emission bandwidth

8.2.1 Definitions and limits

The emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement

8.2.2 Test summary

| | | | | | |
|--------------------|------------------|----------------------|-----------------|--------------------------|------|
| Test date | February 7, 2012 | Test engineer | Andrey Adelberg | Verdict | Pass |
| Temperature | 22 °C | Air pressure | 1002 mbar | Relative humidity | 31 % |

8.2.3 Observations/special notes

5 MHz and 10 MHz channel measurements were performed with peak detector using 100 kHz RBW. VBW was set wider than RBW. 20 MHz channel measurements were performed with peak detector using 300 kHz RBW. VBW was set wider than RBW. The measurement performed using max-hold function turned on.

8.2.4 Test data

Table 8.2-1: 26 dB bandwidth results for 5 MHz channel

| Frequency (MHz) | 26 dB bandwidth (MHz) |
|-----------------|-----------------------|
| 5472.5 | 4.77 |
| 5570.0 | 4.84 |
| 5722.5 | 4.82 |

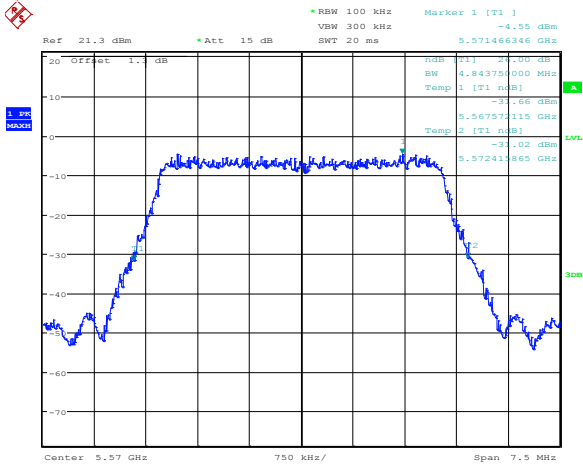
Table 8.2-2: 26 dB bandwidth results for 10 MHz channel

| Frequency (MHz) | 26 dB bandwidth (MHz) |
|-----------------|-----------------------|
| 5475.0 | 9.64 |
| 5570.0 | 9.59 |
| 5720.0 | 9.46 |

Table 8.2-3: 26 dB bandwidth results for 20 MHz channel

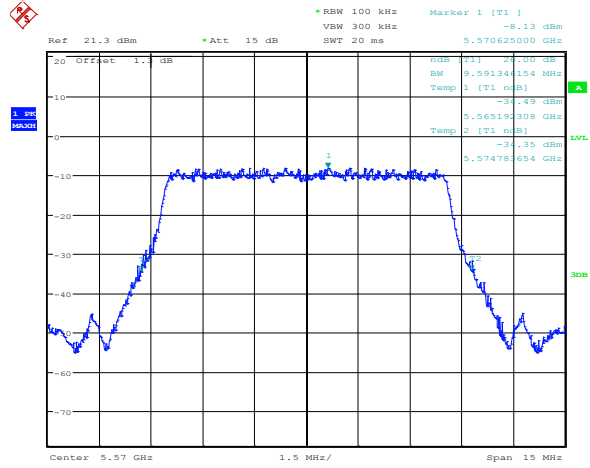
| Frequency (MHz) | 26 dB bandwidth (MHz) |
|-----------------|-----------------------|
| 5480.0 | 18.90 |
| 5570.0 | 18.79 |
| 5715.0 | 18.90 |

8.2.4 Test data, continued



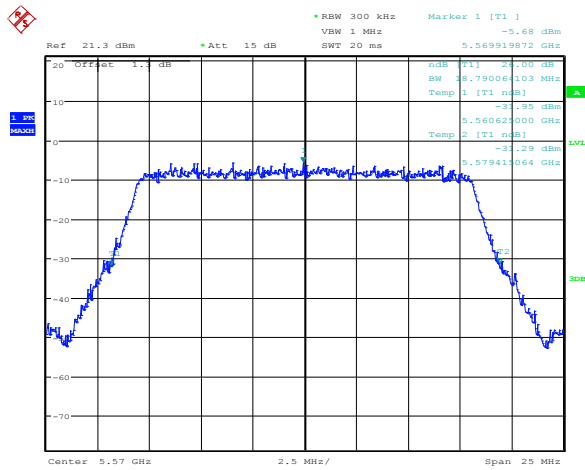
Date: 27.JUN.2012 11:19:39

Plot 8.2-1: Sample plot of 26 dB bandwidth, 5 MHz channel



Date: 27.JUN.2012 11:20:46

Plot 8.2-2: Sample plot of 26 dB bandwidth, 10 MHz channel



Date: 27.JUN.2012 11:21:22

Plot 8.2-3: Sample plot of 26 dB bandwidth, 20 MHz channel

8.3 Clause 15.407(a)(2) Maximum conducted output power and PPSD limits

8.3.1 Definitions and limits

For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW (24 dBm) or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

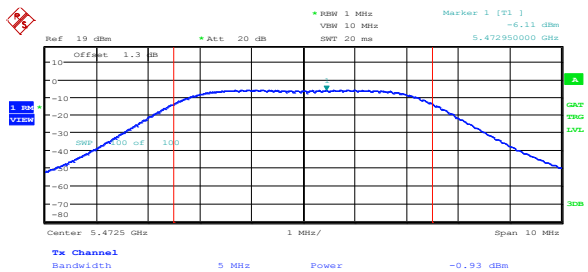
8.3.2 Test summary

| | | | | | |
|--------------------|-----------------------------------|----------------------|-----------------|--------------------------|---------------|
| Test date | February 3, 2012 and May 18, 2012 | Test engineer | Andrey Adelberg | Verdict | Pass |
| Temperature | 23 °C and 22 °C | Air pressure | 1002 mbar | Relative humidity | 31 % and 32 % |

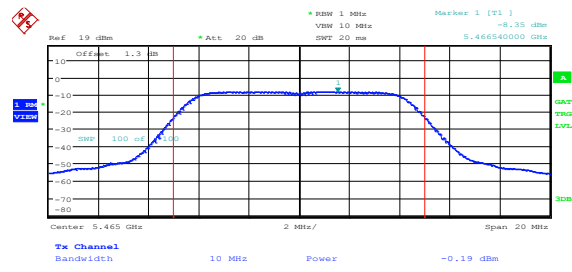
8.3.3 Observations/special notes

Measurement procedure Method SA-2 of 789033 D01 UNII Test Procedures v01 was used for average power measurements. Test duty cycle was 100 % therefore no corrections were applied.

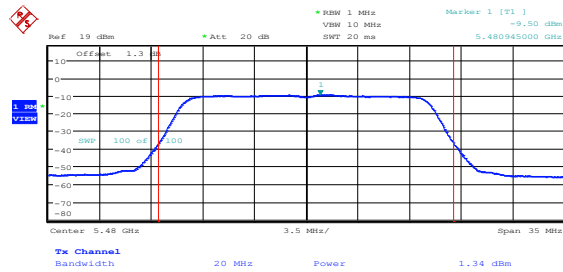
8.3.4 Test data



Plot 8.3-1: Sample plot for output power on 5 MHz channel



Plot 8.3-2: Sample plot for output power on 10 MHz channel



Plot 8.3-3: Sample plot for output power on 20 MHz channel

8.3.4 Test data, continued

Table 8.3-1: Output power and EIRP results for 5 MHz channel

| Modulation | Frequency (MHz) | Conducted power, port 1 (dBm) | Conducted power, port 2 (dBm) | Combined power (dBm) | Conducted power limit (dBm) | Margin (dB) | Antenna gain (dBi) | EIRP (dBm) | EIRP limit (dBm) | Margin (dBm) |
|------------|-----------------|-------------------------------|-------------------------------|----------------------|-----------------------------|-------------|--------------------|------------|------------------|--------------|
| BPSK | 5472.5 | 8.28 | 7.68 | 11.00 | 13.83 | 2.83 | 10.00 | 21.00 | 23.83 | 2.83 |
| | 5570.0 | 8.41 | 9.20 | 11.83 | 13.83 | 2.00 | 10.00 | 21.83 | 23.83 | 2.00 |
| | 5722.5 | 6.52 | 6.89 | 9.72 | 13.83 | 4.11 | 10.00 | 19.72 | 23.83 | 4.11 |
| QPSK | 5472.5 | 8.27 | 7.59 | 10.95 | 13.83 | 2.88 | 10.00 | 20.95 | 23.83 | 2.88 |
| | 5570.0 | 8.44 | 9.23 | 11.86 | 13.83 | 1.97 | 10.00 | 21.86 | 23.83 | 1.97 |
| | 5722.5 | 6.55 | 6.89 | 9.73 | 13.83 | 4.10 | 10.00 | 19.73 | 23.83 | 4.10 |
| 16-QAM | 5472.5 | 8.29 | 7.61 | 10.97 | 13.83 | 2.86 | 10.00 | 20.97 | 23.83 | 2.86 |
| | 5570.0 | 8.38 | 9.27 | 11.86 | 13.83 | 1.97 | 10.00 | 21.86 | 23.83 | 1.97 |
| | 5722.5 | 6.54 | 6.89 | 9.73 | 13.83 | 4.10 | 10.00 | 19.73 | 23.83 | 4.10 |
| 64-QAM | 5472.5 | 8.29 | 7.66 | 11.00 | 13.83 | 2.83 | 10.00 | 21.00 | 23.83 | 2.83 |
| | 5570.0 | 8.43 | 9.24 | 11.86 | 13.83 | 1.97 | 10.00 | 21.86 | 23.83 | 1.97 |
| | 5722.5 | 6.55 | 6.89 | 9.73 | 13.83 | 4.10 | 10.00 | 19.73 | 23.83 | 4.10 |
| BPSK | 5472.5 | -1.13 | -0.93 | 1.98 | 4.83 | 2.85 | 19.00 | 20.98 | 23.83 | 2.85 |
| | 5570.0 | -0.46 | 0.13 | 2.86 | 4.83 | 1.97 | 19.00 | 21.86 | 23.83 | 1.97 |
| | 5722.5 | -1.53 | -1.37 | 1.56 | 4.83 | 3.27 | 19.00 | 20.56 | 23.83 | 3.27 |
| QPSK | 5472.5 | -1.09 | -0.95 | 1.99 | 4.83 | 2.84 | 19.00 | 20.99 | 23.83 | 2.84 |
| | 5570.0 | -0.48 | 0.12 | 2.84 | 4.83 | 1.99 | 19.00 | 21.84 | 23.83 | 1.99 |
| | 5722.5 | -1.57 | -1.34 | 1.56 | 4.83 | 3.27 | 19.00 | 20.56 | 23.83 | 3.27 |
| 16-QAM | 5472.5 | -1.06 | -0.97 | 2.00 | 4.83 | 2.83 | 19.00 | 21.00 | 23.83 | 2.83 |
| | 5570.0 | -0.48 | 0.15 | 2.86 | 4.83 | 1.97 | 19.00 | 21.86 | 23.83 | 1.97 |
| | 5722.5 | -1.68 | -1.30 | 1.52 | 4.83 | 3.31 | 19.00 | 20.52 | 23.83 | 3.31 |
| 64-QAM | 5472.5 | -0.81 | -0.96 | 2.13 | 4.83 | 2.70 | 19.00 | 21.13 | 23.83 | 2.70 |
| | 5570.0 | -0.49 | 0.32 | 2.94 | 4.83 | 1.89 | 19.00 | 21.94 | 23.83 | 1.89 |
| | 5722.5 | -1.70 | -1.33 | 1.50 | 4.83 | 3.33 | 19.00 | 20.50 | 23.83 | 3.33 |

Conducted output power for 10 dBi antenna = $11 + 10 \times \log_{10}(4.82) - (10 - 6) = 13.83$ dBm
 Conducted output power for 19 dBi antenna = $11 + 10 \times \log_{10}(4.82) - (19 - 6) = 4.83$ dBm

8.3.4 Test data, continued

Table 8.3-2: Output power and EIRP results for 10 MHz channel

| Modulation | Frequency (MHz) | Conducted power, port 1 (dBm) | Conducted power, port 2 (dBm) | Combined power (dBm) | Conducted power limit (dBm) | Margin (dB) | Antenna gain (dBi) | EIRP (dBm) | EIRP limit (dBm) | Margin (dBm) |
|------------|-----------------|-------------------------------|-------------------------------|----------------------|-----------------------------|-------------|--------------------|------------|------------------|--------------|
| BPSK | 5475.0 | 9.14 | 8.54 | 11.86 | 16.84 | 4.98 | 10.00 | 21.86 | 26.84 | 4.98 |
| | 5570.0 | 12.03 | 11.21 | 14.65 | 16.84 | 2.19 | 10.00 | 24.65 | 26.84 | 2.19 |
| | 5720.0 | 8.64 | 8.67 | 11.67 | 16.84 | 5.17 | 10.00 | 21.67 | 26.84 | 5.17 |
| QPSK | 5475.0 | 9.19 | 8.58 | 11.91 | 16.84 | 4.93 | 10.00 | 21.91 | 26.84 | 4.93 |
| | 5570.0 | 11.98 | 11.19 | 14.61 | 16.84 | 2.23 | 10.00 | 24.61 | 26.84 | 2.23 |
| | 5720.0 | 8.67 | 8.65 | 11.67 | 16.84 | 5.17 | 10.00 | 21.67 | 26.84 | 5.17 |
| 16-QAM | 5475.0 | 9.15 | 8.56 | 11.88 | 16.84 | 4.96 | 10.00 | 21.88 | 26.84 | 4.96 |
| | 5570.0 | 12.00 | 11.11 | 14.59 | 16.84 | 2.25 | 10.00 | 24.59 | 26.84 | 2.25 |
| | 5720.0 | 8.66 | 8.59 | 11.64 | 16.84 | 5.20 | 10.00 | 21.64 | 26.84 | 5.20 |
| 64-QAM | 5475.0 | 9.13 | 8.57 | 11.87 | 16.84 | 4.97 | 10.00 | 21.87 | 26.84 | 4.97 |
| | 5570.0 | 11.99 | 11.11 | 14.58 | 16.84 | 2.26 | 10.00 | 24.58 | 26.84 | 2.26 |
| | 5720.0 | 8.66 | 8.66 | 11.67 | 16.84 | 5.17 | 10.00 | 21.67 | 26.84 | 5.17 |
| BPSK | 5475.0 | -0.19 | -0.19 | 2.82 | 7.84 | 5.02 | 19.00 | 21.82 | 26.84 | 5.02 |
| | 5570.0 | 2.98 | 2.17 | 5.60 | 7.84 | 2.24 | 19.00 | 24.60 | 26.84 | 2.24 |
| | 5720.0 | -0.56 | -0.99 | 2.24 | 7.84 | 5.60 | 19.00 | 21.24 | 26.84 | 5.60 |
| QPSK | 5475.0 | -0.24 | -0.17 | 2.81 | 7.84 | 5.03 | 19.00 | 21.81 | 26.84 | 5.03 |
| | 5570.0 | 2.99 | 2.15 | 5.60 | 7.84 | 2.24 | 19.00 | 24.60 | 26.84 | 2.24 |
| | 5720.0 | -0.52 | -0.35 | 2.58 | 7.84 | 5.26 | 19.00 | 21.58 | 26.84 | 5.26 |
| 16-QAM | 5475.0 | -0.24 | -0.16 | 2.81 | 7.84 | 5.03 | 19.00 | 21.81 | 26.84 | 5.03 |
| | 5570.0 | 3.05 | 2.14 | 5.63 | 7.84 | 2.21 | 19.00 | 24.63 | 26.84 | 2.21 |
| | 5720.0 | -0.55 | -0.45 | 2.51 | 7.84 | 5.33 | 19.00 | 21.51 | 26.84 | 5.33 |
| 64-QAM | 5475.0 | -0.24 | -0.01 | 2.89 | 7.84 | 4.95 | 19.00 | 21.89 | 26.84 | 4.95 |
| | 5570.0 | 3.14 | 2.15 | 5.68 | 7.84 | 2.16 | 19.00 | 24.68 | 26.84 | 2.16 |
| | 5720.0 | -0.54 | -0.51 | 2.49 | 7.84 | 5.35 | 19.00 | 21.49 | 26.84 | 5.35 |

Conducted output power for 10 dBi antenna = $11 + 10 \times \log_{10}(9.64) - (10 - 6) = 16.84$ dBm
 Conducted output power for 19 dBi antenna = $11 + 10 \times \log_{10}(9.64) - (19 - 6) = 7.84$ dBm

8.3.4 Test data, continued

Table 8.3-3: Output power and EIRP results for 20 MHz channel

| Modulation | Frequency (MHz) | Conducted power, port 1 (dBm) | Conducted power, port 2 (dBm) | Combined power (dBm) | Conducted power limit (dBm) | Margin (dB) | Antenna gain (dBi) | EIRP (dBm) | EIRP limit (dBm) | Margin (dBm) |
|------------|-----------------|-------------------------------|-------------------------------|----------------------|-----------------------------|-------------|--------------------|------------|------------------|--------------|
| BPSK | 5480.0 | 9.93 | 10.79 | 13.39 | 19.76 | 6.37 | 10.00 | 23.39 | 29.76 | 6.37 |
| | 5570.0 | 14.20 | 14.36 | 17.29 | 19.76 | 2.47 | 10.00 | 27.29 | 29.76 | 2.47 |
| | 5715.0 | 10.30 | 10.39 | 13.36 | 19.76 | 6.40 | 10.00 | 23.36 | 29.76 | 6.40 |
| QPSK | 5480.0 | 9.92 | 10.85 | 13.42 | 19.76 | 6.34 | 10.00 | 23.42 | 29.76 | 6.34 |
| | 5570.0 | 14.31 | 14.35 | 17.34 | 19.76 | 2.42 | 10.00 | 27.34 | 29.76 | 2.42 |
| | 5715.0 | 10.41 | 10.42 | 13.43 | 19.76 | 6.33 | 10.00 | 23.43 | 29.76 | 6.33 |
| 16-QAM | 5480.0 | 9.97 | 10.70 | 13.36 | 19.76 | 6.40 | 10.00 | 23.36 | 29.76 | 6.40 |
| | 5570.0 | 14.29 | 14.37 | 17.34 | 19.76 | 2.42 | 10.00 | 27.34 | 29.76 | 2.42 |
| | 5715.0 | 10.32 | 10.41 | 13.38 | 19.76 | 6.38 | 10.00 | 23.38 | 29.76 | 6.38 |
| 64-QAM | 5480.0 | 9.95 | 10.76 | 13.38 | 19.76 | 6.38 | 10.00 | 23.38 | 29.76 | 6.38 |
| | 5570.0 | 14.21 | 14.35 | 17.29 | 19.76 | 2.47 | 10.00 | 27.29 | 29.76 | 2.47 |
| | 5715.0 | 10.39 | 10.38 | 13.40 | 19.76 | 6.36 | 10.00 | 23.40 | 29.76 | 6.36 |
| BPSK | 5480.0 | 1.34 | 1.82 | 4.60 | 10.76 | 6.17 | 19.00 | 23.60 | 29.76 | 6.16 |
| | 5570.0 | 6.07 | 5.18 | 8.66 | 10.76 | 2.11 | 19.00 | 27.66 | 29.76 | 2.10 |
| | 5715.0 | 0.86 | 0.70 | 3.79 | 10.76 | 6.97 | 19.00 | 22.79 | 29.76 | 6.97 |
| QPSK | 5480.0 | 1.30 | 1.82 | 4.58 | 10.76 | 6.19 | 19.00 | 23.58 | 29.76 | 6.18 |
| | 5570.0 | 6.09 | 5.20 | 8.68 | 10.76 | 2.09 | 19.00 | 27.68 | 29.76 | 2.08 |
| | 5715.0 | 0.84 | 0.74 | 3.80 | 10.76 | 6.96 | 19.00 | 22.80 | 29.76 | 6.96 |
| 16-QAM | 5480.0 | 1.27 | 1.85 | 4.58 | 10.76 | 6.18 | 19.00 | 23.58 | 29.76 | 6.18 |
| | 5570.0 | 6.14 | 5.18 | 8.70 | 10.76 | 2.07 | 19.00 | 27.70 | 29.76 | 2.06 |
| | 5715.0 | 0.88 | 0.71 | 3.81 | 10.76 | 6.96 | 19.00 | 22.81 | 29.76 | 6.95 |
| 64-QAM | 5480.0 | 1.30 | 1.99 | 4.67 | 10.76 | 6.10 | 19.00 | 23.67 | 29.76 | 6.09 |
| | 5570.0 | 6.17 | 5.19 | 8.72 | 10.76 | 2.05 | 19.00 | 27.72 | 29.76 | 2.04 |
| | 5715.0 | 0.87 | 0.80 | 3.85 | 10.76 | 6.92 | 19.00 | 22.85 | 29.76 | 6.91 |

Conducted output power for 10 dBi antenna = $11 + 10 \times \log_{10}(18.9) - (10 - 6) = 19.76$ dBm
 Conducted output power for 19 dBi antenna = $11 + 10 \times \log_{10}(18.9) - (19 - 6) = 10.76$ dBm

8.3.4 Test data, continued

Table 8.3-4: PPSD results for 5 MHz channel

| Modulation | Frequency (MHz) | Conducted PPSD, port 1 (dBm/MHz) | Conducted PPSD, port 2 (dBm/MHz) | Combined PPSD (dBm/MHz) | PPSD limit (dBm/MHz) | Margin (dB) | Antenna gain (dBi) | PPSD EIRP (dBm/MHz) | Limit (dBm/MHz) | Margin (dB) |
|------------|-----------------|----------------------------------|----------------------------------|-------------------------|----------------------|-------------|--------------------|---------------------|-----------------|-------------|
| BPSK | 5472.5 | 3.04 | 2.40 | 5.74 | 7.00 | 1.26 | 10.00 | 15.74 | 17.00 | 1.26 |
| | 5570.0 | 3.33 | 3.99 | 6.68 | 7.00 | 0.32 | 10.00 | 16.68 | 17.00 | 0.32 |
| | 5722.5 | 1.45 | 1.74 | 4.61 | 7.00 | 2.39 | 10.00 | 14.61 | 17.00 | 2.39 |
| QPSK | 5472.5 | 3.02 | 2.47 | 5.76 | 7.00 | 1.24 | 10.00 | 15.76 | 17.00 | 1.24 |
| | 5570.0 | 3.25 | 4.01 | 6.66 | 7.00 | 0.34 | 10.00 | 16.66 | 17.00 | 0.34 |
| | 5722.5 | 1.51 | 1.72 | 4.63 | 7.00 | 2.37 | 10.00 | 14.63 | 17.00 | 2.37 |
| 16-QAM | 5472.5 | 3.06 | 2.45 | 5.78 | 7.00 | 1.22 | 10.00 | 15.78 | 17.00 | 1.22 |
| | 5570.0 | 3.33 | 3.97 | 6.67 | 7.00 | 0.33 | 10.00 | 16.67 | 17.00 | 0.33 |
| | 5722.5 | 1.25 | 1.77 | 4.53 | 7.00 | 2.47 | 10.00 | 14.53 | 17.00 | 2.47 |
| 64-QAM | 5472.5 | 3.07 | 2.43 | 5.77 | 7.00 | 1.23 | 10.00 | 15.77 | 17.00 | 1.23 |
| | 5570.0 | 3.34 | 3.96 | 6.67 | 7.00 | 0.33 | 10.00 | 16.67 | 17.00 | 0.33 |
| | 5722.5 | 1.38 | 1.74 | 4.57 | 7.00 | 2.43 | 10.00 | 14.57 | 17.00 | 2.43 |
| BPSK | 5472.5 | -6.31 | -6.11 | -3.20 | -2.00 | 1.20 | 19.00 | 15.80 | 17.00 | 1.20 |
| | 5570.0 | -5.66 | -5.04 | -2.33 | -2.00 | 0.33 | 19.00 | 16.67 | 17.00 | 0.33 |
| | 5722.5 | -6.72 | -6.56 | -3.63 | -2.00 | 1.63 | 19.00 | 15.37 | 17.00 | 1.63 |
| QPSK | 5472.5 | -6.27 | -6.15 | -3.20 | -2.00 | 1.20 | 19.00 | 15.80 | 17.00 | 1.20 |
| | 5570.0 | -5.68 | -5.01 | -2.32 | -2.00 | 0.32 | 19.00 | 16.68 | 17.00 | 0.32 |
| | 5722.5 | -6.77 | -6.54 | -3.64 | -2.00 | 1.64 | 19.00 | 15.36 | 17.00 | 1.64 |
| 16-QAM | 5472.5 | -6.22 | -6.12 | -3.16 | -2.00 | 1.16 | 19.00 | 15.84 | 17.00 | 1.16 |
| | 5570.0 | -5.68 | -5.02 | -2.33 | -2.00 | 0.33 | 19.00 | 16.67 | 17.00 | 0.33 |
| | 5722.5 | -6.85 | -6.45 | -3.64 | -2.00 | 1.64 | 19.00 | 15.36 | 17.00 | 1.64 |
| 64-QAM | 5472.5 | -6.04 | -6.15 | -3.08 | -2.00 | 1.08 | 19.00 | 15.92 | 17.00 | 1.08 |
| | 5570.0 | -5.69 | -4.75 | -2.18 | -2.00 | 0.18 | 19.00 | 16.82 | 17.00 | 0.18 |
| | 5722.5 | -6.85 | -6.52 | -3.67 | -2.00 | 1.67 | 19.00 | 15.33 | 17.00 | 1.67 |

PPSD limit for 10 dBi antenna = 11 - (10 - 6) = 7 dBm/MHz
 PPSD limit for 19 dBi antenna = 11 - (19 - 6) = -2 dBm/MHz

8.3.4 Test data, continued

Table 8.3-5: PPSD results for 10 MHz channel

| Modulation | Frequency (MHz) | Conducted PPSD, port 1 (dBm/MHz) | Conducted PPSD, port 2 (dBm/MHz) | Combined PPSD (dBm/MHz) | PPSD limit (dBm/MHz) | Margin (dB) | Antenna gain (dBi) | PPSD EIRP (dBm/MHz) | Limit (dBm/MHz) | Margin (dB) |
|------------|-----------------|----------------------------------|----------------------------------|-------------------------|----------------------|-------------|--------------------|---------------------|-----------------|-------------|
| BPSK | 5475.0 | 1.26 | 0.77 | 4.03 | 7.00 | 2.97 | 10.00 | 14.03 | 17.00 | 2.97 |
| | 5570.0 | 4.15 | 3.12 | 6.68 | 7.00 | 0.32 | 10.00 | 16.68 | 17.00 | 0.32 |
| | 5720.0 | 1.03 | 0.89 | 3.97 | 7.00 | 3.03 | 10.00 | 13.97 | 17.00 | 3.03 |
| QPSK | 5475.0 | 1.35 | 0.79 | 4.09 | 7.00 | 2.91 | 10.00 | 14.09 | 17.00 | 2.91 |
| | 5570.0 | 4.00 | 3.17 | 6.62 | 7.00 | 0.38 | 10.00 | 16.62 | 17.00 | 0.38 |
| | 5720.0 | 1.01 | 0.84 | 3.94 | 7.00 | 3.06 | 10.00 | 13.94 | 17.00 | 3.06 |
| 16-QAM | 5475.0 | 1.21 | 0.70 | 3.97 | 7.00 | 3.03 | 10.00 | 13.97 | 17.00 | 3.03 |
| | 5570.0 | 4.01 | 3.14 | 6.61 | 7.00 | 0.39 | 10.00 | 16.61 | 17.00 | 0.39 |
| | 5720.0 | 0.86 | 0.81 | 3.85 | 7.00 | 3.15 | 10.00 | 13.85 | 17.00 | 3.15 |
| 64-QAM | 5475.0 | 1.29 | 0.70 | 4.02 | 7.00 | 2.98 | 10.00 | 14.02 | 17.00 | 2.98 |
| | 5570.0 | 4.05 | 3.15 | 6.63 | 7.00 | 0.37 | 10.00 | 16.63 | 17.00 | 0.37 |
| | 5720.0 | 0.88 | 0.89 | 3.90 | 7.00 | 3.10 | 10.00 | 13.90 | 17.00 | 3.10 |
| BPSK | 5475.0 | -8.35 | -8.27 | -5.30 | -2.00 | 3.30 | 19.00 | 13.70 | 17.00 | 3.30 |
| | 5570.0 | -5.11 | -5.88 | -2.47 | -2.00 | 0.47 | 19.00 | 16.53 | 17.00 | 0.47 |
| | 5720.0 | -8.59 | -9.04 | -5.80 | -2.00 | 3.80 | 19.00 | 13.20 | 17.00 | 3.80 |
| QPSK | 5475.0 | -8.37 | -8.28 | -5.31 | -2.00 | 3.31 | 19.00 | 13.69 | 17.00 | 3.31 |
| | 5570.0 | -5.10 | -5.99 | -2.51 | -2.00 | 0.51 | 19.00 | 16.49 | 17.00 | 0.51 |
| | 5720.0 | -8.57 | -8.41 | -5.48 | -2.00 | 3.48 | 19.00 | 13.52 | 17.00 | 3.48 |
| 16-QAM | 5475.0 | -8.37 | -8.31 | -5.33 | -2.00 | 3.33 | 19.00 | 13.67 | 17.00 | 3.33 |
| | 5570.0 | -5.03 | -5.95 | -2.46 | -2.00 | 0.46 | 19.00 | 16.54 | 17.00 | 0.46 |
| | 5720.0 | -8.66 | -8.42 | -5.53 | -2.00 | 3.53 | 19.00 | 13.47 | 17.00 | 3.53 |
| 64-QAM | 5475.0 | -8.36 | -8.11 | -5.22 | -2.00 | 3.22 | 19.00 | 13.78 | 17.00 | 3.22 |
| | 5570.0 | -4.95 | -5.93 | -2.40 | -2.00 | 0.40 | 19.00 | 16.60 | 17.00 | 0.40 |
| | 5720.0 | -8.64 | -8.60 | -5.61 | -2.00 | 3.61 | 19.00 | 13.39 | 17.00 | 3.61 |

PPSD limit for 10 dBi antenna = 11 - (10 - 6) = 7 dBm/MHz
 PPSD limit for 19 dBi antenna = 11 - (19 - 6) = -2 dBm/MHz

8.3.4 Test data, continued

Table 8.3-6: PPSD results for 20 MHz channel

| Modulation | Frequency (MHz) | Conducted PPSD, port 1 (dBm/MHz) | Conducted PPSD, port 2 (dBm/MHz) | Combined PPSD (dBm/MHz) | PPSD limit (dBm/MHz) | Margin (dB) | Antenna gain (dBi) | PPSD EIRP (dBm/MHz) | Limit (dBm/MHz) | Margin (dB) |
|------------|-----------------|----------------------------------|----------------------------------|-------------------------|----------------------|-------------|--------------------|---------------------|-----------------|-------------|
| BPSK | 5480.0 | -0.41 | 0.17 | 2.90 | 7.00 | 4.10 | 10.00 | 12.90 | 17.00 | 4.10 |
| | 5570.0 | 3.50 | 3.61 | 6.57 | 7.00 | 0.43 | 10.00 | 16.57 | 17.00 | 0.43 |
| | 5715.0 | -0.21 | -0.20 | 2.81 | 7.00 | 4.19 | 10.00 | 12.81 | 17.00 | 4.19 |
| QPSK | 5480.0 | -0.52 | 0.21 | 2.87 | 7.00 | 4.13 | 10.00 | 12.87 | 17.00 | 4.13 |
| | 5570.0 | 3.47 | 3.66 | 6.58 | 7.00 | 0.42 | 10.00 | 16.58 | 17.00 | 0.42 |
| | 5715.0 | -0.22 | -0.27 | 2.77 | 7.00 | 4.23 | 10.00 | 12.77 | 17.00 | 4.23 |
| 16-QAM | 5480.0 | -0.54 | 0.27 | 2.89 | 7.00 | 4.11 | 10.00 | 12.89 | 17.00 | 4.11 |
| | 5570.0 | 3.48 | 3.55 | 6.53 | 7.00 | 0.47 | 10.00 | 16.53 | 17.00 | 0.47 |
| | 5715.0 | -0.14 | -0.23 | 2.83 | 7.00 | 4.17 | 10.00 | 12.83 | 17.00 | 4.17 |
| 64-QAM | 5480.0 | -0.51 | 0.22 | 2.88 | 7.00 | 4.12 | 10.00 | 12.88 | 17.00 | 4.12 |
| | 5570.0 | 3.51 | 3.65 | 6.59 | 7.00 | 0.41 | 10.00 | 16.59 | 17.00 | 0.41 |
| | 5715.0 | -0.24 | -0.22 | 2.78 | 7.00 | 4.22 | 10.00 | 12.78 | 17.00 | 4.22 |
| BPSK | 5480.0 | -9.50 | -9.00 | -6.23 | -2.00 | 4.23 | 19.00 | 12.77 | 17.00 | 4.23 |
| | 5570.0 | -4.77 | -5.69 | -2.20 | -2.00 | 0.20 | 19.00 | 16.80 | 17.00 | 0.20 |
| | 5715.0 | -9.88 | -10.05 | -6.95 | -2.00 | 4.95 | 19.00 | 12.05 | 17.00 | 4.95 |
| QPSK | 5480.0 | -9.53 | -9.03 | -6.26 | -2.00 | 4.26 | 19.00 | 12.74 | 17.00 | 4.26 |
| | 5570.0 | -4.76 | -5.62 | -2.16 | -2.00 | 0.16 | 19.00 | 16.84 | 17.00 | 0.16 |
| | 5715.0 | -9.91 | -9.95 | -6.92 | -2.00 | 4.92 | 19.00 | 12.08 | 17.00 | 4.92 |
| 16-QAM | 5480.0 | -9.54 | -8.97 | -6.24 | -2.00 | 4.24 | 19.00 | 12.76 | 17.00 | 4.24 |
| | 5570.0 | -4.67 | -5.61 | -2.10 | -2.00 | 0.10 | 19.00 | 16.90 | 17.00 | 0.10 |
| | 5715.0 | -9.85 | -10.00 | -6.91 | -2.00 | 4.91 | 19.00 | 12.09 | 17.00 | 4.91 |
| 64-QAM | 5480.0 | -9.57 | -8.84 | -6.18 | -2.00 | 4.18 | 19.00 | 12.82 | 17.00 | 4.18 |
| | 5570.0 | -4.67 | -5.66 | -2.13 | -2.00 | 0.13 | 19.00 | 16.87 | 17.00 | 0.13 |
| | 5715.0 | -9.85 | -9.91 | -6.87 | -2.00 | 4.87 | 19.00 | 12.13 | 17.00 | 4.87 |

PPSD limit for 10 dBi antenna = $11 - (10 - 6) = 7$ dBm/MHz
 PPSD limit for 19 dBi antenna = $11 - (19 - 6) = -2$ dBm/MHz

8.4 Clause 15.407(b)(3) Undesirable emission limits for transmitters in the 5.47–5.725 GHz band

8.4.1 Definitions and limits

For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of –27 dBm/MHz. The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

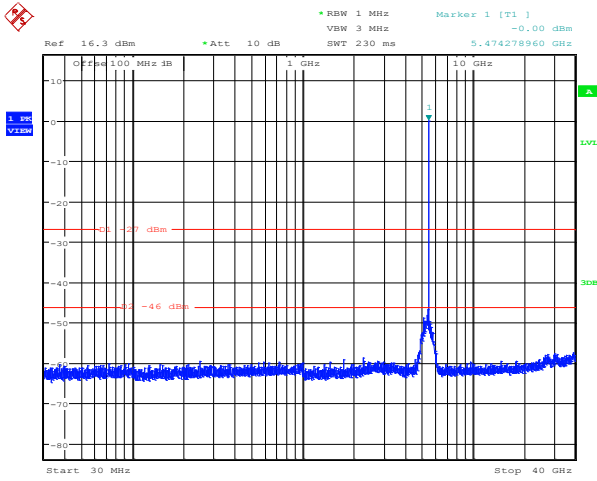
8.4.2 Test summary

| | | | | | |
|--------------------|-----------------------------------|----------------------|-----------------|--------------------------|---------------|
| Test date | February 6, 2012 and May 18, 2012 | Test engineer | Andrey Adelberg | Verdict | Pass |
| Temperature | 23 °C and 22 °C | Air pressure | 1002 mbar | Relative humidity | 33 % and 32 % |

8.4.3 Observations/special notes

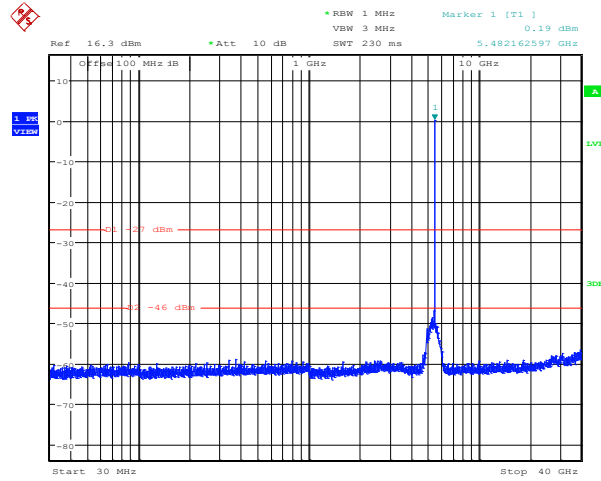
- The spectrum was searched from 30 MHz to the 40 GHz.
- All radiated measurements were performed at a distance of 3 m, no spurious emissions were detected more than 10 dB below the limit.
- All measurements were performed:
 - within 30–1000 MHz range: using a peak detector with 100 kHz/300 kHz RBW/VBW,
 - above 1 GHz: using peak detector with 1 MHz/3 MHz RBW/VBW for peak results
 - and using peak detector with 1 MHz/10 Hz RBW/VBW for average results.
- Conducted spurious emissions were performed according to 789033 D01 General UNII Test Procedures v01r01.
- The measurements were performed using max-hold function turned on.

8.4.4 Test data



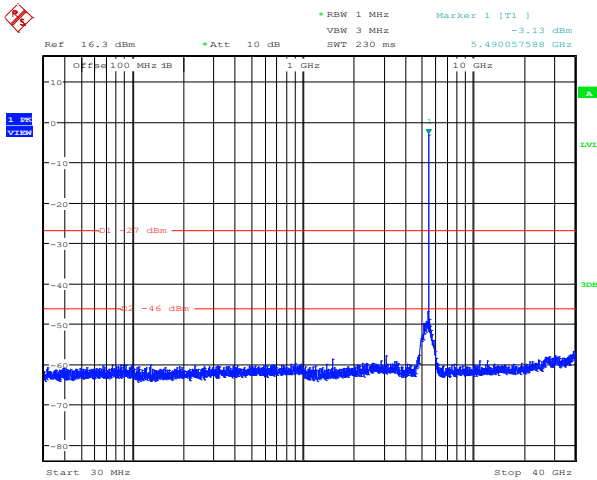
Date: 14.FEB.2012 17:29:21

Plot 8.4-1: Conducted spurious emissions at the antenna port 1, 5 MHz channel, low frequency, for 19 dBi antenna settings



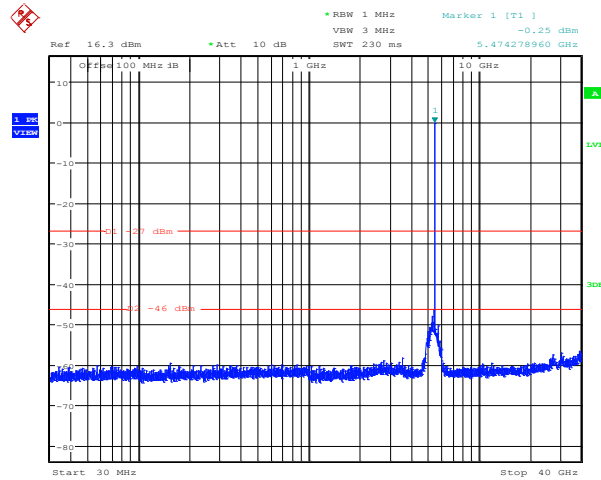
Date: 14.FEB.2012 17:28:09

Plot 8.4-2: Conducted spurious emissions at the antenna port 1, 10 MHz channel, low frequency, for 19 dBi antenna settings



Date: 14.FEB.2012 17:17:44

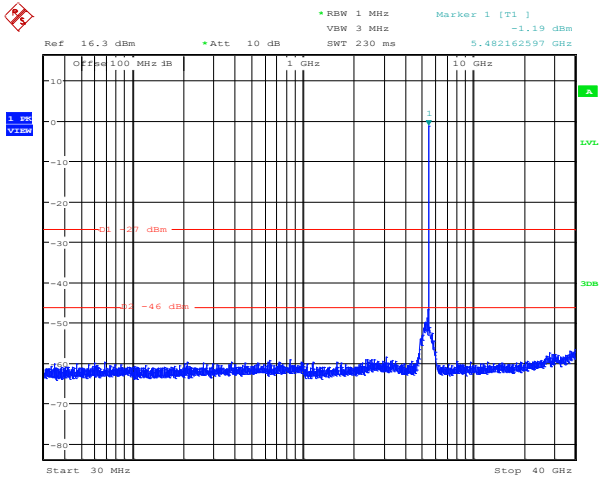
Plot 8.4-3: Conducted spurious emissions at the antenna port 1, 20 MHz channel, low frequency, for 19 dBi antenna settings



Date: 14.FEB.2012 17:32:59

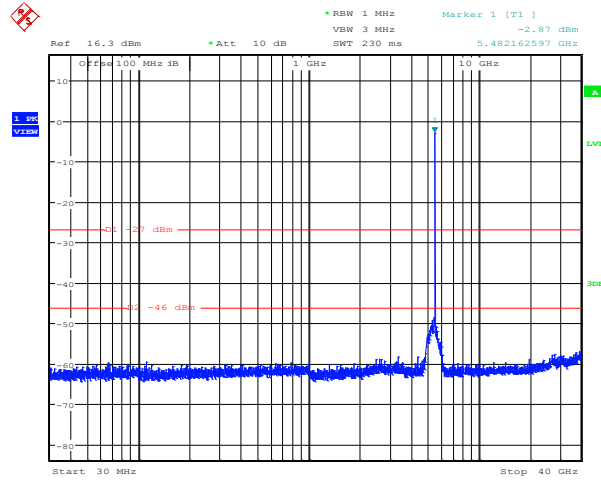
Plot 8.4-4: Conducted spurious emissions at the antenna port 2, 5 MHz channel, low frequency, for 19 dBi antenna settings

8.4.4 Test data, continued



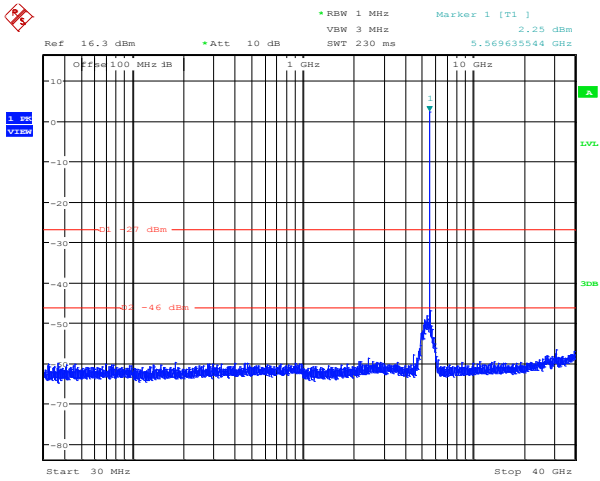
Date: 14.FEB.2012 17:21:56

Plot 8.4-5: Conducted spurious emissions at the antenna port 2, 10 MHz channel, low frequency, for 19 dBi antenna settings



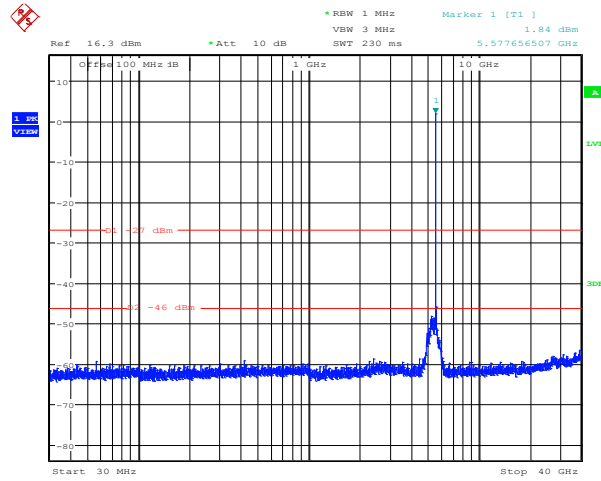
Date: 14.FEB.2012 17:18:42

Plot 8.4-6: Conducted spurious emissions at the antenna port 2, 20 MHz channel, low frequency, for 19 dBi antenna settings



Date: 14.FEB.2012 17:29:59

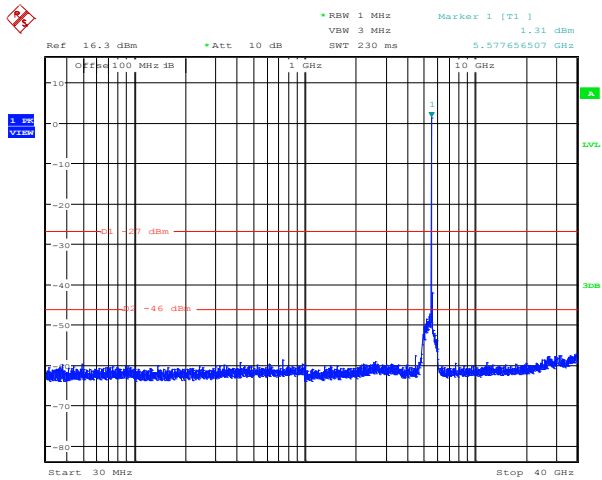
Plot 8.4-7: Conducted spurious emissions at the antenna port 1, 5 MHz channel, mid frequency, for 19 dBi antenna settings



Date: 14.FEB.2012 17:27:05

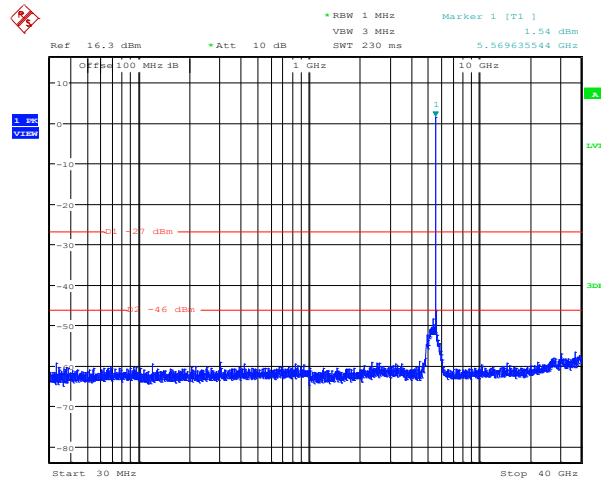
Plot 8.4-8: Conducted spurious emissions at the antenna port 1, 10 MHz channel, mid frequency, for 19 dBi antenna settings

8.4.4 Test data, continued



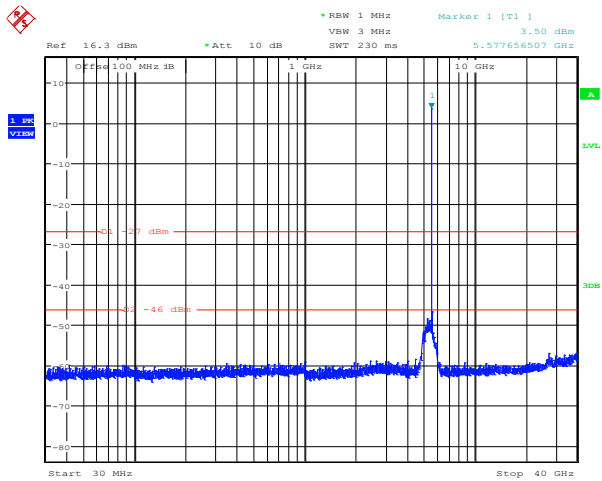
Date: 14.FEB.2012 17:17:06

Plot 8.4-9: Conducted spurious emissions at the antenna port 1, 20 MHz channel, mid frequency, for 19 dBi antenna settings



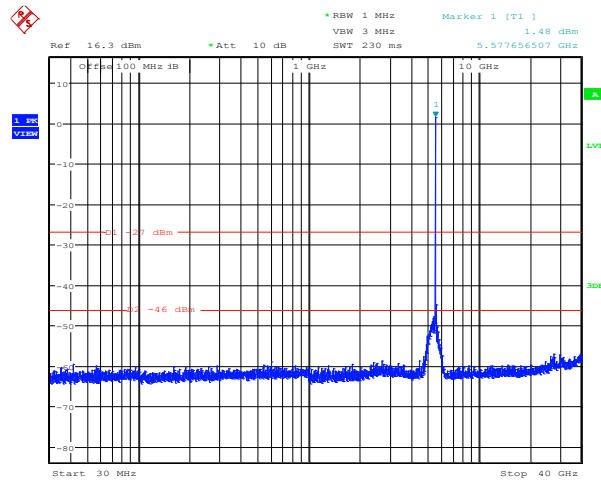
Date: 14.FEB.2012 17:32:22

Plot 8.4-10: Conducted spurious emissions at the antenna port 2, 5 MHz channel, mid frequency, for 19 dBi antenna settings



Date: 14.FEB.2012 17:22:59

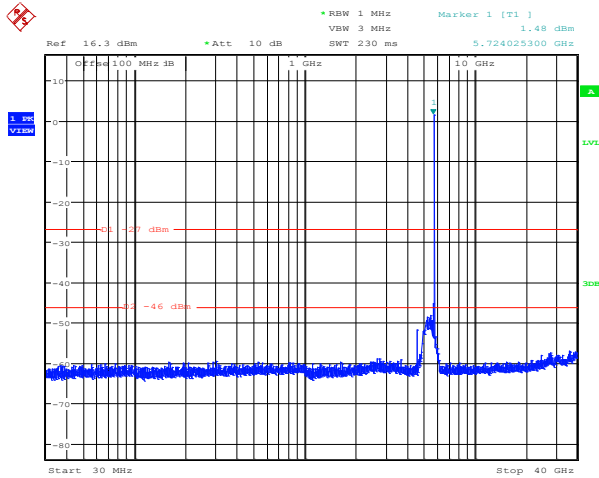
Plot 8.4-11: Conducted spurious emissions at the antenna port 2, 10 MHz channel, mid frequency, for 19 dBi antenna settings



Date: 14.FEB.2012 17:19:36

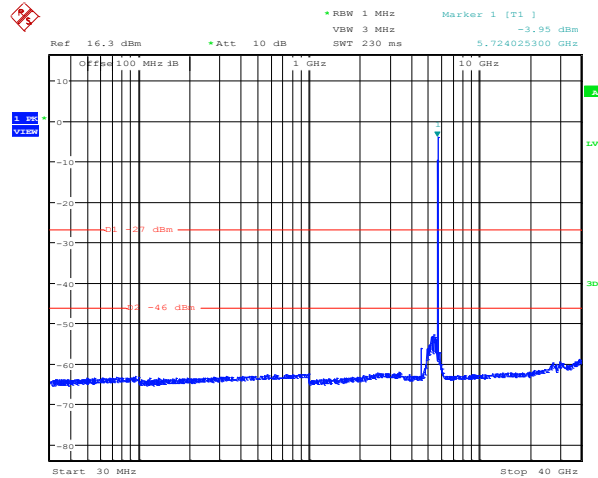
Plot 8.4-12: Conducted spurious emissions at the antenna port 2, 20 MHz channel, mid frequency, for 19 dBi antenna settings

8.4.4 Test data, continued



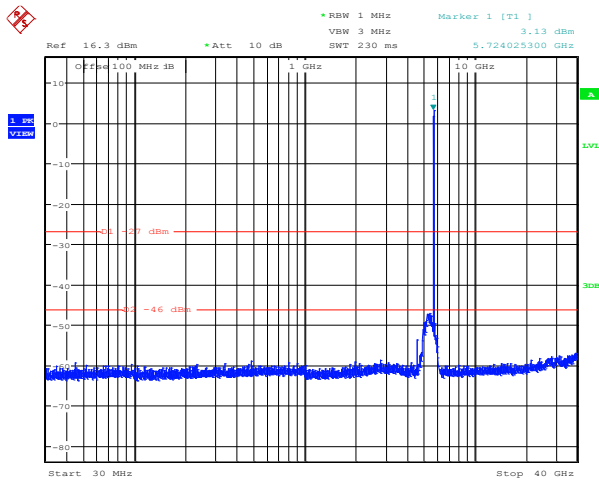
Date: 14.FEB.2012 17:30:43

Plot 8.4-13: Conducted spurious emissions at the antenna port 1, 5 MHz channel, high frequency, for 19 dBi antenna settings



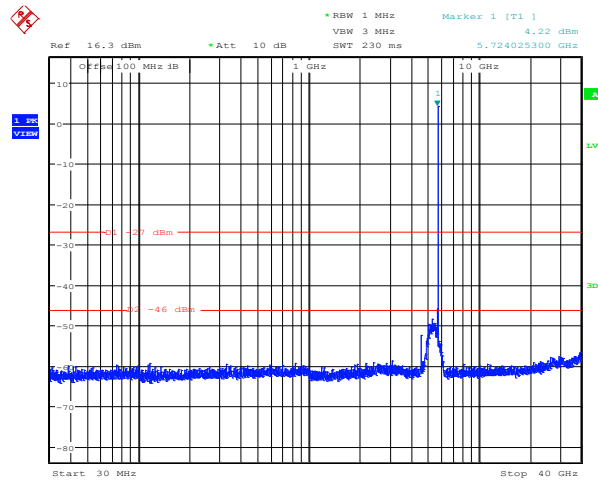
Date: 14.FEB.2012 17:25:30

Plot 8.4-14: Conducted spurious emissions at the antenna port 1, 10 MHz channel, high frequency, for 19 dBi antenna settings



Date: 14.FEB.2012 17:16:09

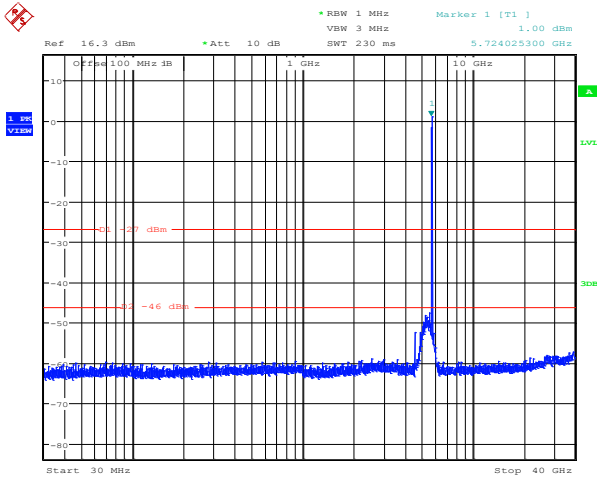
Plot 8.4-15: Conducted spurious emissions at the antenna port 1, 20 MHz channel, high frequency, for 19 dBi antenna settings



Date: 14.FEB.2012 17:31:46

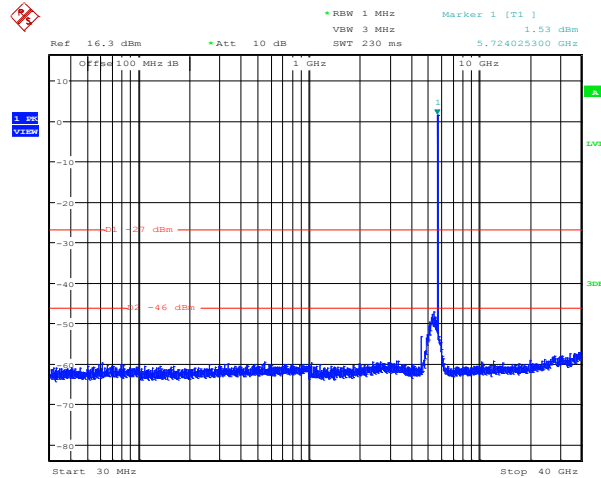
Plot 8.4-16: Conducted spurious emissions at the antenna port 2, 5 MHz channel, high frequency, for 19 dBi antenna settings

8.4.4 Test data, continued



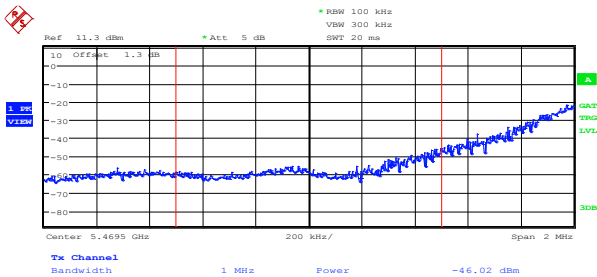
Date: 14.FEB.2012 17:23:47

Plot 8.4-17: Conducted spurious emissions at the antenna port 2, 10 MHz channel, high frequency, for 19 dBi antenna settings

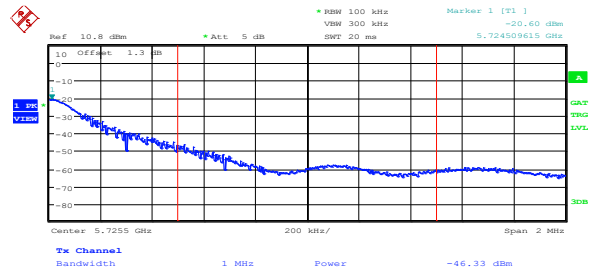


Date: 14.FEB.2012 17:20:18

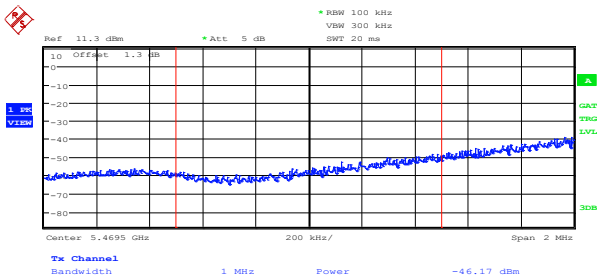
Plot 8.4-18: Conducted spurious emissions at the antenna port 2, 10 MHz channel, high frequency, for 19 dBi antenna settings



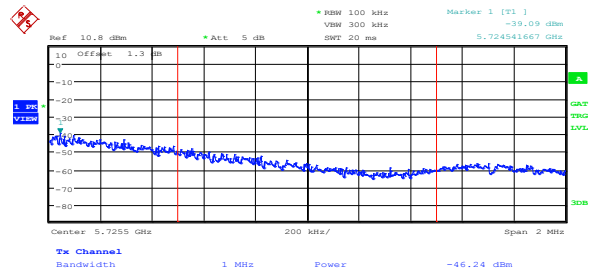
Plot 8.4-19: Conducted lower band edge at the antenna port 1, 5 MHz channel, for 19 dBi antenna settings



Plot 8.4-20: Conducted upper band edge at the antenna port 1, 5 MHz channel, for 19 dBi antenna settings



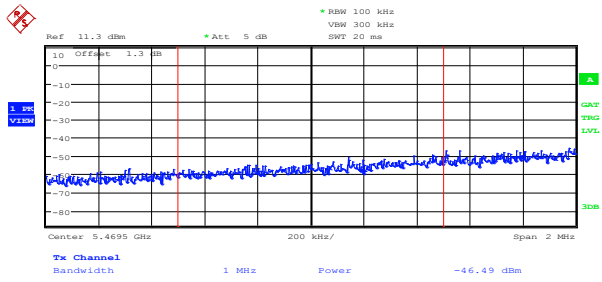
Plot 8.4-21: Conducted lower band edge at the antenna port 1, 10 MHz channel, for 19 dBi antenna settings



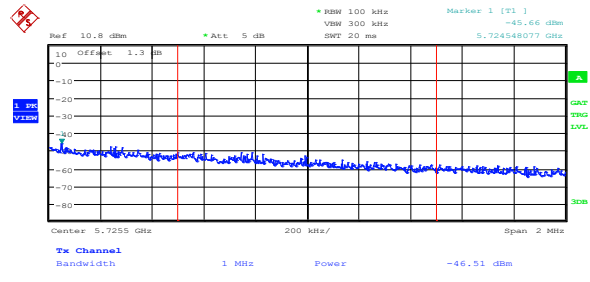
Plot 8.4-22: Conducted upper band edge at the antenna port 1, 10 MHz channel, for 19 dBi antenna settings

Note: band edge limit is -27 dBm/MHz EIRP. Considering the fact that antenna gain is 19 dBi, maximum conducted band edge level should be -46 dBm/MHz

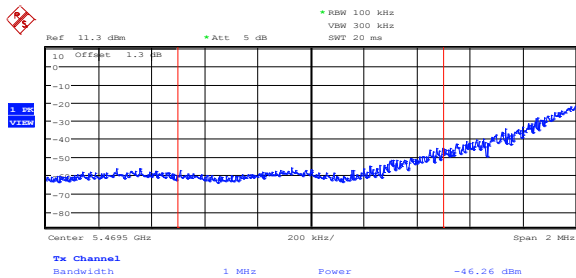
8.4.4 Test data, continued



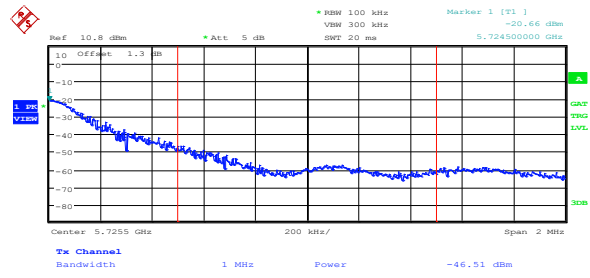
Plot 8.4-23: Conducted lower band edge at the antenna port 1, 20 MHz channel, for 19 dBi antenna settings



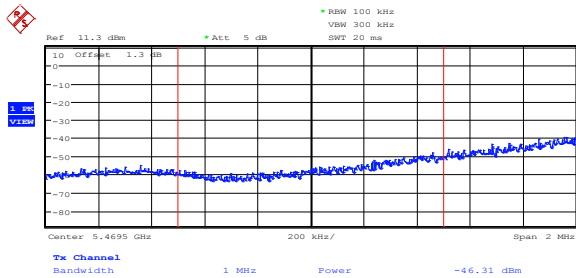
Plot 8.4-24: Conducted upper band edge at the antenna port 1, 20 MHz channel, for 19 dBi antenna settings



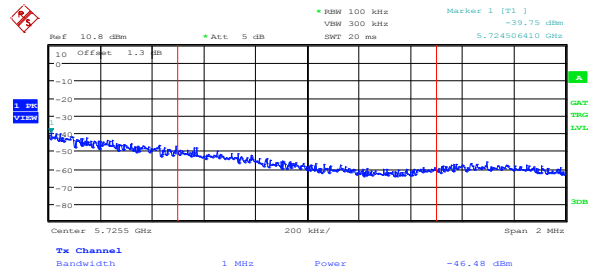
Plot 8.4-25: Conducted lower band edge at the antenna port 2, 5 MHz channel, for 19 dBi antenna settings



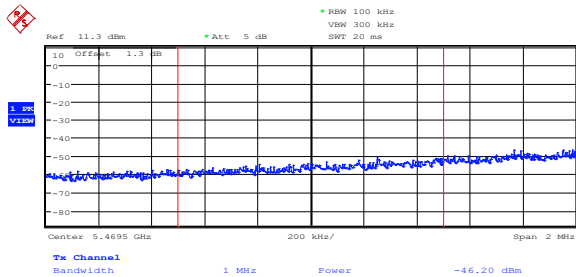
Plot 8.4-26: Conducted upper band edge at the antenna port 2, 5 MHz channel, for 19 dBi antenna settings



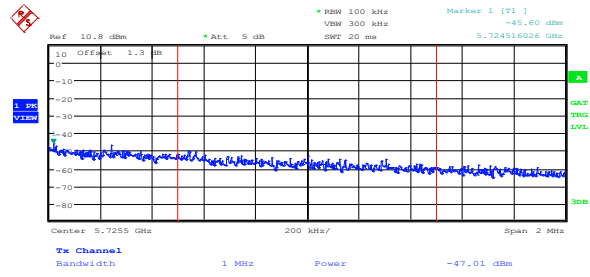
Plot 8.4-27: Conducted lower band edge at the antenna port 2, 10 MHz channel, for 19 dBi antenna settings



Plot 8.4-28: Conducted upper band edge at the antenna port 2, 10 MHz channel, for 19 dBi antenna settings



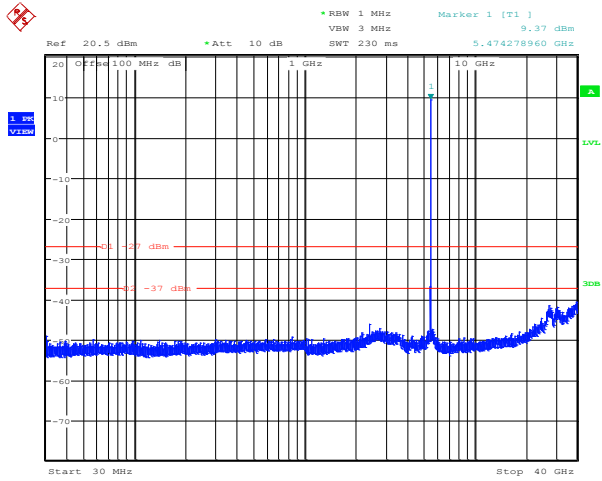
Plot 8.4-29: Conducted lower band edge at the antenna port 2, 20 MHz channel, for 19 dBi antenna settings



Plot 8.4-30: Conducted upper band edge at the antenna port 2, 20 MHz channel, for 19 dBi antenna settings

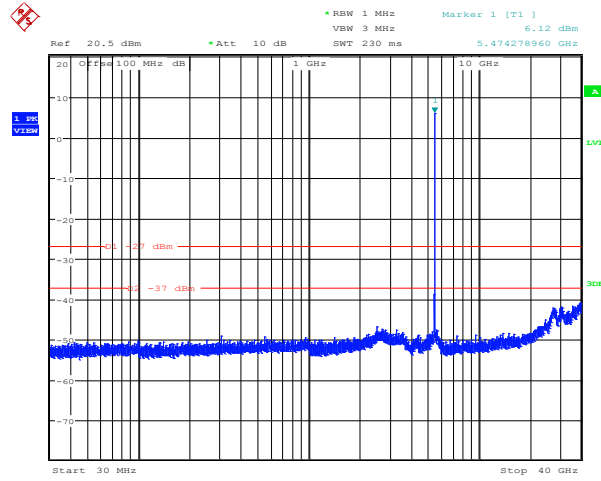
Note: band edge limit is -27 dBm/MHz EIRP . Considering the fact that antenna gain is 19 dBi, maximum conducted band edge level should be -46 dBm/MHz

8.4.4 Test data, continued



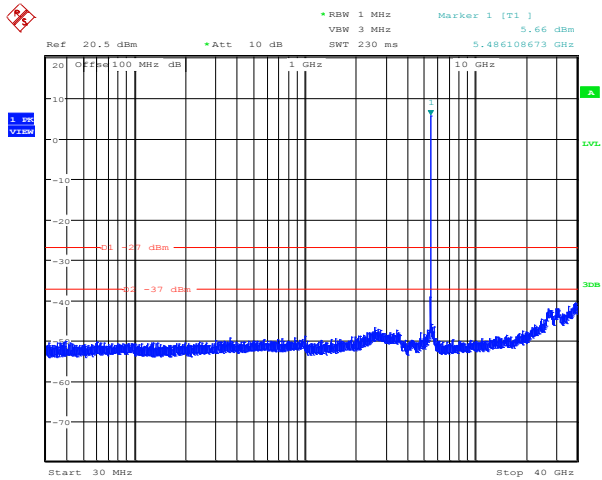
Date: 18.MAY.2012 16:26:41

Plot 8.4-31: Conducted spurious emissions at the antenna port 1, 5 MHz channel, low frequency, for 10 dBi antenna settings



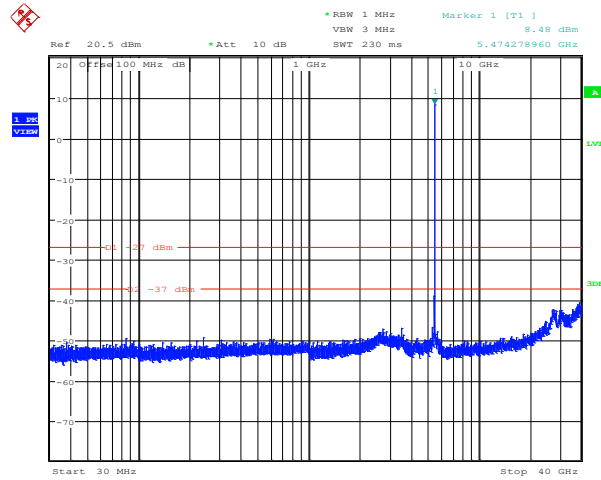
Date: 18.MAY.2012 16:40:15

Plot 8.4-32: Conducted spurious emissions at the antenna port 1, 10 MHz channel, low frequency, for 10 dBi antenna settings



Date: 18.MAY.2012 16:50:10

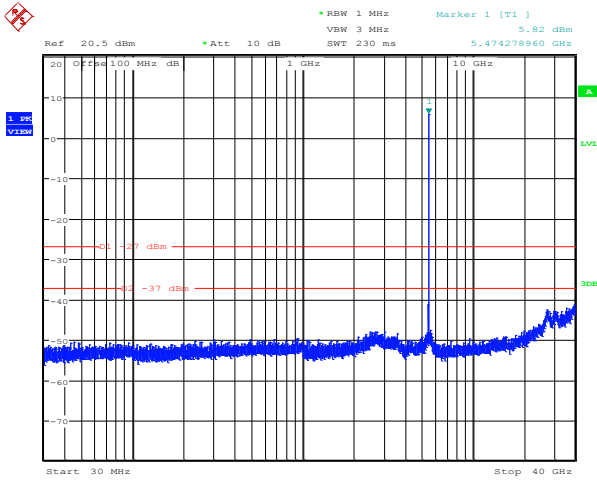
Plot 8.4-33: Conducted spurious emissions at the antenna port 1, 20 MHz channel, low frequency, for 10 dBi antenna settings



Date: 18.MAY.2012 16:27:52

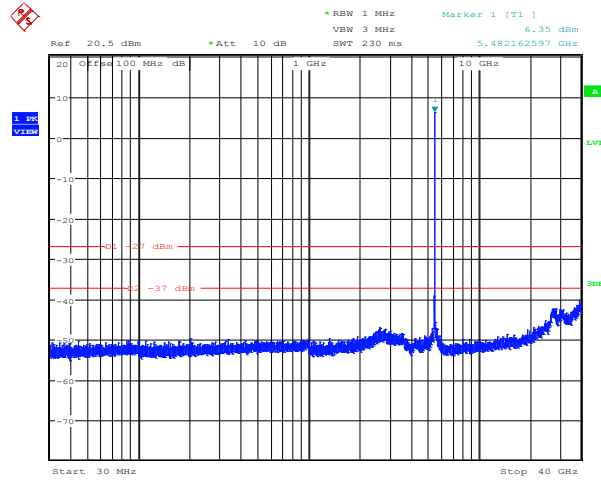
Plot 8.4-34: Conducted spurious emissions at the antenna port 2, 5 MHz channel, low frequency, for 10 dBi antenna settings

8.4.4 Test data, continued



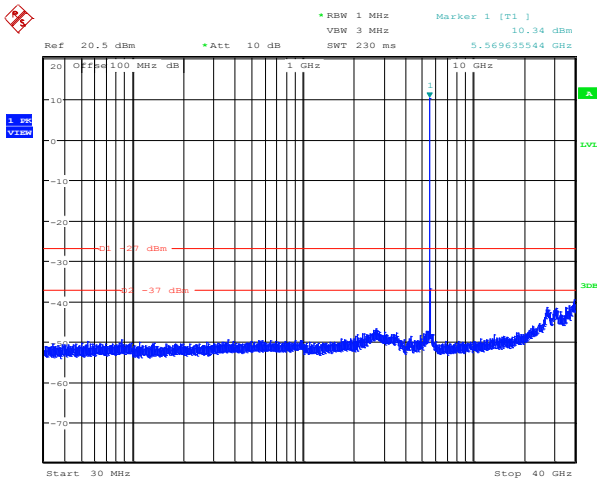
Date: 18.MAY.2012 16:44:53

Plot 8.4-35: Conducted spurious emissions at the antenna port 2, 10 MHz channel, low frequency, for 10 dBi antenna settings



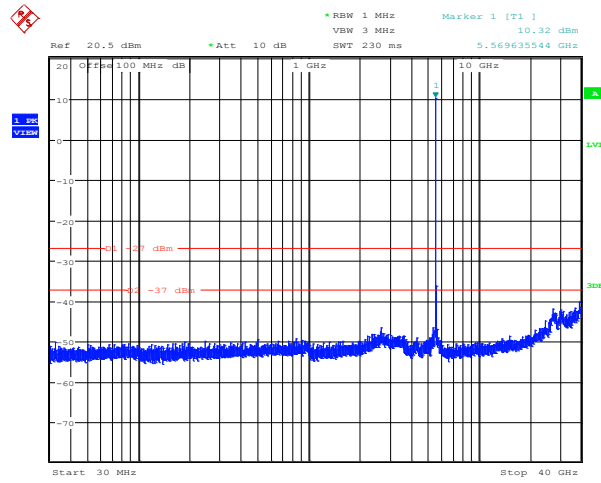
Date: 18.MAY.2012 16:53:24

Plot 8.4-36: Conducted spurious emissions at the antenna port 2, 10 MHz channel, low frequency, for 10 dBi antenna settings



Date: 18.MAY.2012 16:31:22

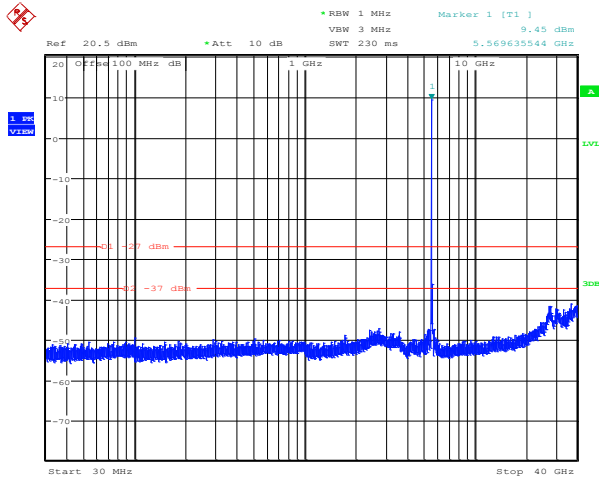
Plot 8.4-37: Conducted spurious emissions at the antenna port 1, 5 MHz channel, mid frequency, for 10 dBi antenna settings



Date: 18.MAY.2012 16:46:28

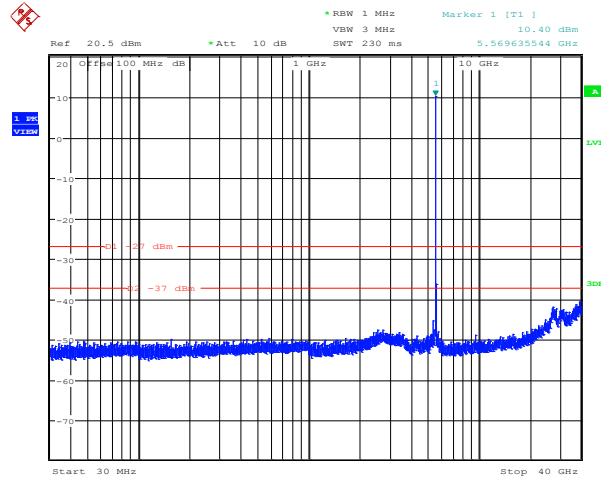
Plot 8.4-38: Conducted spurious emissions at the antenna port 1, 10 MHz channel, mid frequency, for 10 dBi antenna settings

8.4.4 Test data, continued



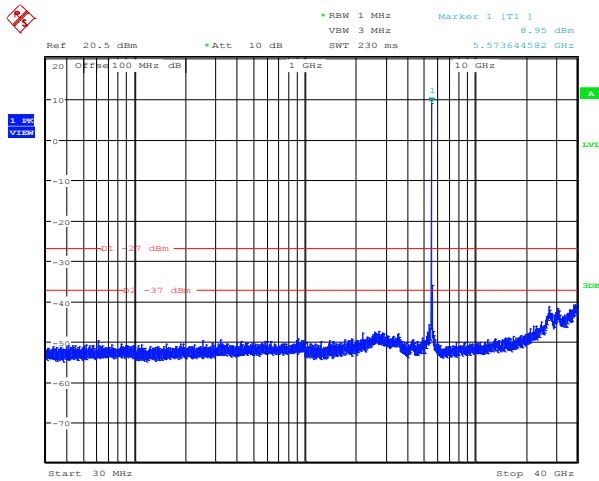
Date: 18.MAY.2012 16:55:15

Plot 8.4-39: Conducted spurious emissions at the antenna port 1, 20 MHz channel, mid frequency, for 10 dBi antenna settings



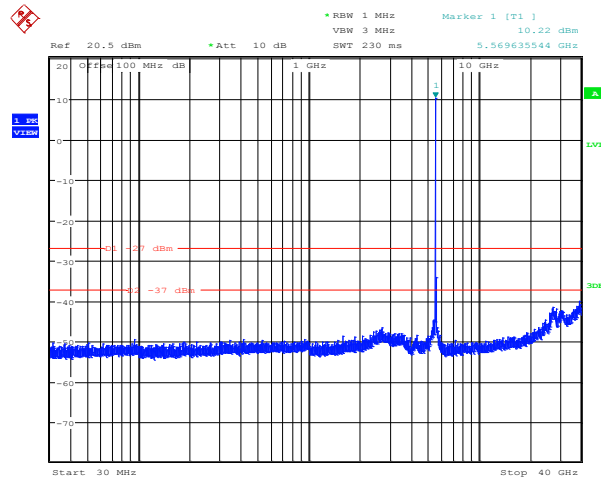
Date: 18.MAY.2012 16:28:46

Plot 8.4-40: Conducted spurious emissions at the antenna port 2, 5 MHz channel, mid frequency, for 10 dBi antenna settings



Date: 18.MAY.2012 16:45:49

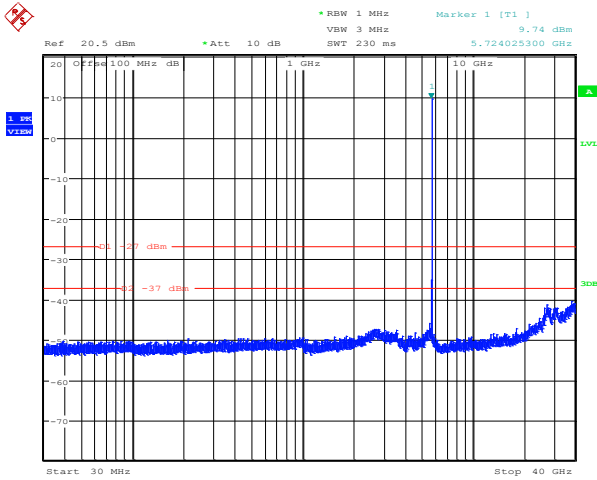
Plot 8.4-41: Conducted spurious emissions at the antenna port 2, 10 MHz channel, mid frequency, for 10 dBi antenna settings



Date: 18.MAY.2012 16:54:43

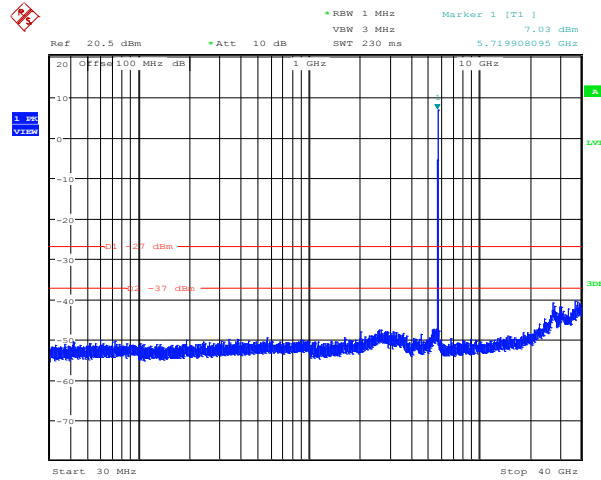
Plot 8.4-42: Conducted spurious emissions at the antenna port 2, 20 MHz channel, mid frequency, for 10 dBi antenna settings

8.4.4 Test data, continued



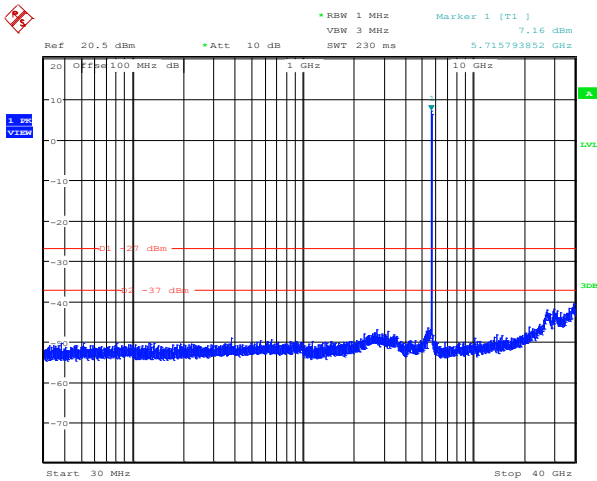
Date: 18.MAY.2012 16:37:12

Plot 8.4-43: Conducted spurious emissions at the antenna port 1, 5 MHz channel, high frequency, for 10 dBi antenna settings



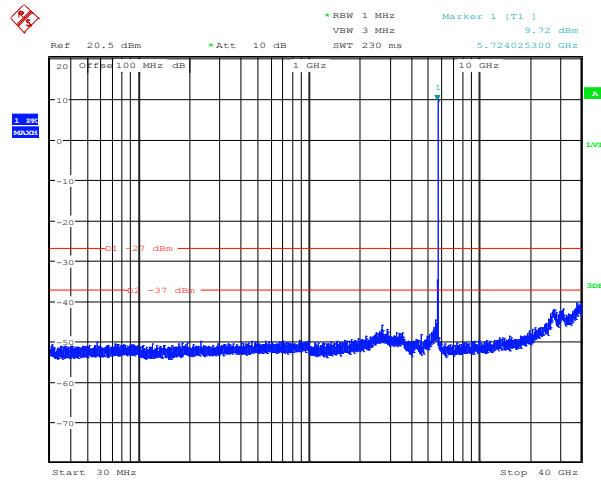
Date: 18.MAY.2012 16:47:13

Plot 8.4-44: Conducted spurious emissions at the antenna port 1, 10 MHz channel, high frequency, for 10 dBi antenna settings



Date: 18.MAY.2012 16:56:18

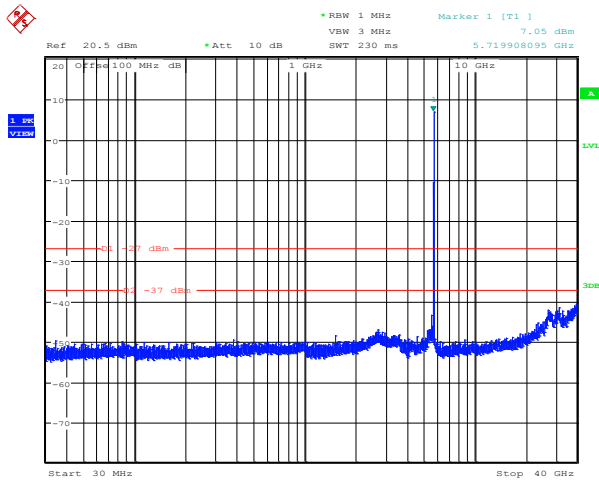
Plot 8.4-45: Conducted spurious emissions at the antenna port 1, 20 MHz channel, high frequency, for 10 dBi antenna settings



Date: 18.MAY.2012 16:38:09

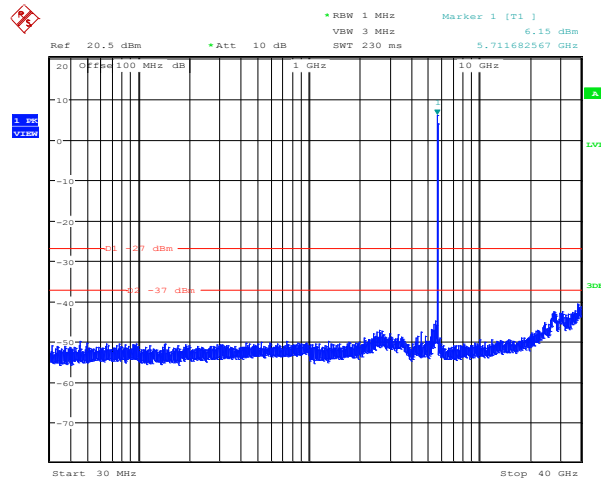
Plot 8.4-46: Conducted spurious emissions at the antenna port 2, 5 MHz channel, high frequency, for 10 dBi antenna settings

8.4.4 Test data, continued



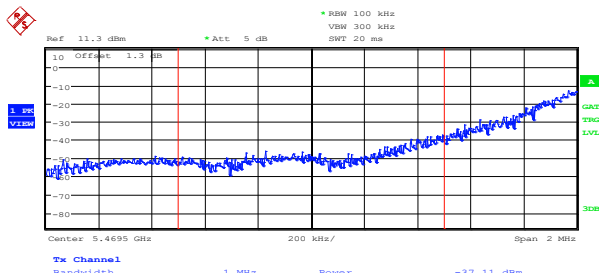
Date: 18.MAY.2012 16:48:13

Plot 8.4-47: Conducted spurious emissions at the antenna port 2, 10 MHz channel, high frequency, for 10 dBi antenna settings

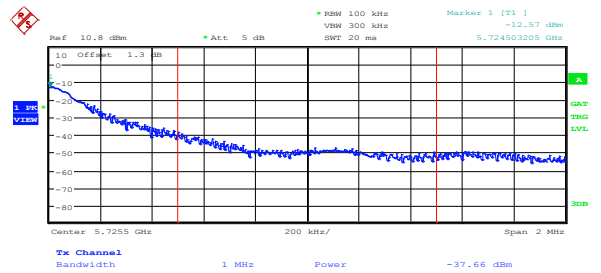


Date: 18.MAY.2012 16:57:07

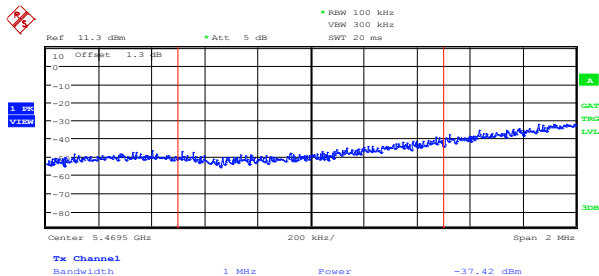
Plot 8.4-48: Conducted spurious emissions at the antenna port 2, 10 MHz channel, high frequency, for 10 dBi antenna settings



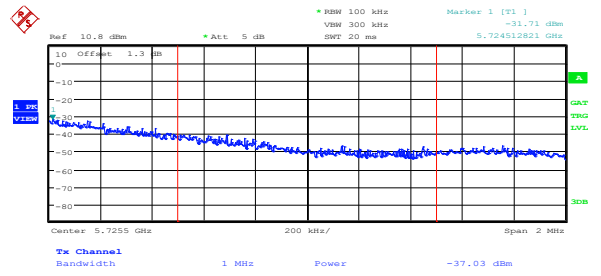
Plot 8.4-49: Conducted lower band edge at the antenna port 1, 5 MHz channel, for 10 dBi antenna settings



Plot 8.4-50: Conducted upper band edge at the antenna port 1, 5 MHz channel, for 10 dBi antenna settings



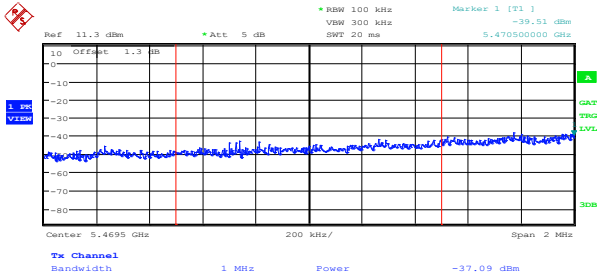
Plot 8.4-51: Conducted lower band edge at the antenna port 1, 10 MHz channel, for 10 dBi antenna settings



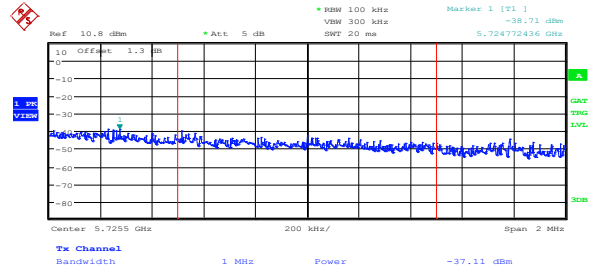
Plot 8.4-52: Conducted upper band edge at the antenna port 1, 10 MHz channel, for 10 dBi antenna settings

Note: band edge limit is -27 dBm/MHz EIRP . Considering the fact that antenna gain is 10 dBi, maximum conducted band edge level should be -37 dBm/MHz

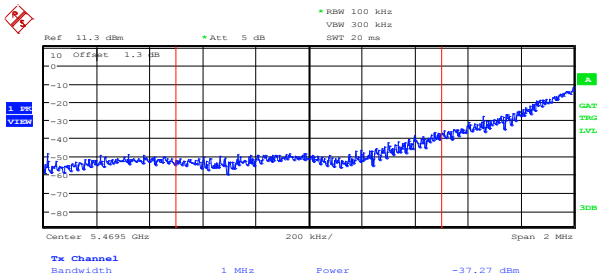
8.4.4 Test data, continued



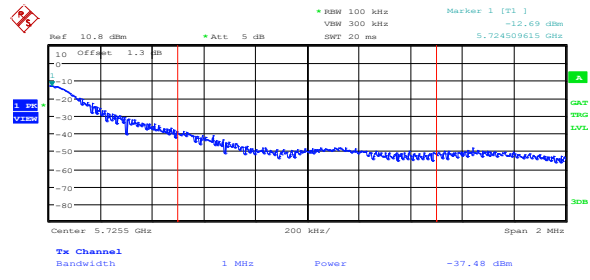
Plot 8.4-53: Conducted lower band edge at the antenna port 1, 20 MHz channel, for 10 dBi antenna settings



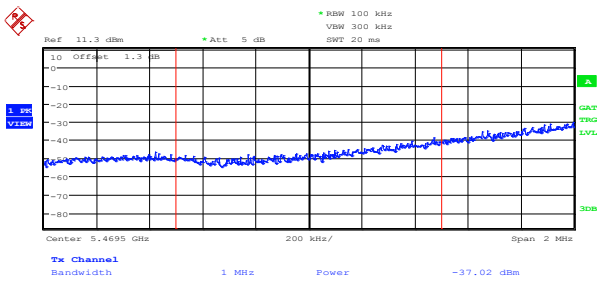
Plot 8.4-54: Conducted upper band edge at the antenna port 1, 20 MHz channel, for 10 dBi antenna settings



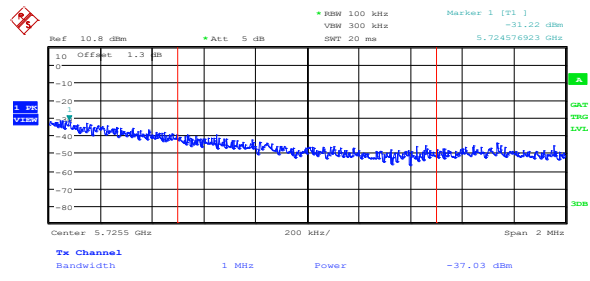
Plot 8.4-55: Conducted lower band edge at the antenna port 2, 5 MHz channel, for 10 dBi antenna settings



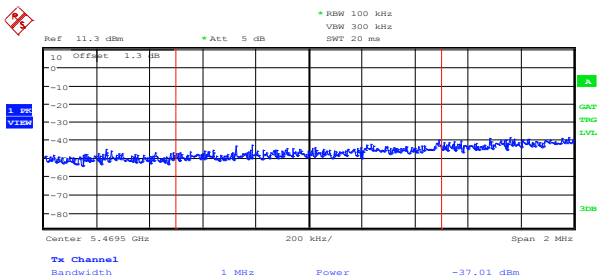
Plot 8.4-56: Conducted upper band edge at the antenna port 2, 5 MHz channel, for 10 dBi antenna settings



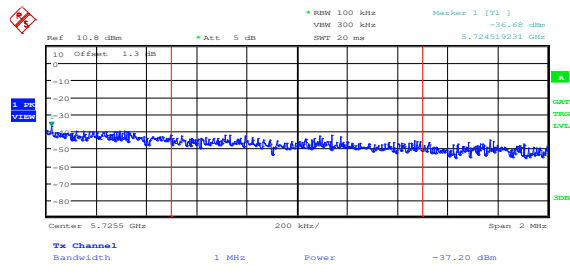
Plot 8.4-57: Conducted lower band edge at the antenna port 2, 10 MHz channel, for 10 dBi antenna settings



Plot 8.4-58: Conducted upper band edge at the antenna port 2, 10 MHz channel, for 10 dBi antenna settings



Plot 8.4-59: Conducted lower band edge at the antenna port 2, 20 MHz channel, for 10 dBi antenna settings



Plot 8.4-60: Conducted upper band edge at the antenna port 2, 20 MHz channel, for 10 dBi antenna settings

Note: band edge limit is -27 dBm/MHz EIRP. Considering the fact that antenna gain is 10 dBi, maximum conducted band edge level should be -37 dBm/MHz

8.5 Clause 15.407(b)(6) Unwanted emissions below 1 GHz

8.5.1 Definitions and limits

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

8.5.2 Test summary

| | | | | | |
|--------------------|-----------------------------------|----------------------|-----------------|--------------------------|---------------|
| Test date | February 6, 2012 and May 18, 2012 | Test engineer | Andrey Adelberg | Verdict | Pass |
| Temperature | 23 °C and 22 °C | Air pressure | 1002 mbar | Relative humidity | 33 % and 32 % |

8.5.3 Observations/special notes and test data

The spectrum was searched from 30 MHz to 1 GHz for low mid and high channels. All unwanted emissions measurements were performed using a Peak Detector with 100 kHz RBW below 1 GHz at a distance of 3 m.

No spurious emissions originating from RF board were detected.

8.6 Clause 15.407(a)(6) The ratio of the peak excursion of the modulation envelope

8.6.1 Definitions and limits

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

8.6.2 Test summary

| | | | | | |
|--------------------|------------------|----------------------|-----------------|--------------------------|------|
| Test date | February 7, 2012 | Test engineer | Andrey Adelberg | Verdict | Pass |
| Temperature | 22 °C | Air pressure | 1002 mbar | Relative humidity | 31 % |

8.6.3 Observations/special notes

The measurements were performed with peak detector using 1 MHz RBW. VBW was set wider than RBW.

8.6.4 Test data

Table 8.6-1: Peak excursion results for 5 MHz channel

| Frequency (MHz) | Peak measurement at antenna 1 (dBm/MHz) | Peak measurement at antenna 2 (dBm/MHz) | Combined peak (dBm/MHz) | Combined PSD (dBm/MHz) | Delta (dB) | Limit (dB) | Margin (dB) |
|-----------------|---|---|-------------------------|------------------------|------------|------------|-------------|
| 5472.5 | 5.25 | 4.94 | 8.11 | 5.77 | 2.34 | 13.00 | 10.66 |
| 5570.0 | 5.49 | 6.23 | 8.89 | 6.67 | 2.21 | 13.00 | 10.79 |
| 5722.5 | 4.13 | 4.50 | 7.33 | 4.56 | 2.77 | 13.00 | 10.23 |

Table 8.6-2: Peak excursion results for 10 MHz channel

| Frequency (MHz) | Peak measurement at antenna 1 (dBm/MHz) | Peak measurement at antenna 2 (dBm/MHz) | Combined peak (dBm/MHz) | Combined PSD (dBm/MHz) | Delta (dB) | Limit (dB) | Margin (dB) |
|-----------------|---|---|-------------------------|------------------------|------------|------------|-------------|
| 5475.0 | 2.38 | 2.25 | 5.33 | 4.02 | 1.31 | 13.00 | 11.69 |
| 5570.0 | 5.64 | 5.00 | 8.34 | 6.63 | 1.71 | 13.00 | 11.29 |
| 5720.0 | 2.31 | 2.02 | 5.18 | 3.86 | 1.32 | 13.00 | 11.68 |

Table 8.6-3: Peak excursion results for 20 MHz channel

| Frequency (MHz) | Peak measurement at antenna 1 (dBm/MHz) | Peak measurement at antenna 2 (dBm/MHz) | Combined peak (dBm/MHz) | Combined PSD (dBm/MHz) | Delta (dB) | Limit (dB) | Margin (dB) |
|-----------------|---|---|-------------------------|------------------------|------------|------------|-------------|
| 5480.0 | -0.81 | -0.41 | 2.40 | 2.91 | 0.50 | 13.00 | 12.50 |
| 5570.0 | 3.89 | 2.92 | 6.44 | 6.59 | 0.15 | 13.00 | 12.85 |
| 5715.0 | -1.34 | -1.56 | 1.56 | 2.78 | 1.21 | 13.00 | 11.79 |

8.7 Clause 15.407(g) Frequency stability

8.7.1 Definitions and limits

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

8.7.2 Test summary

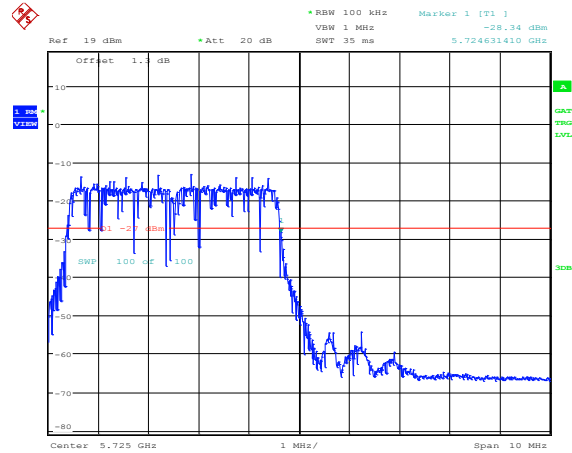
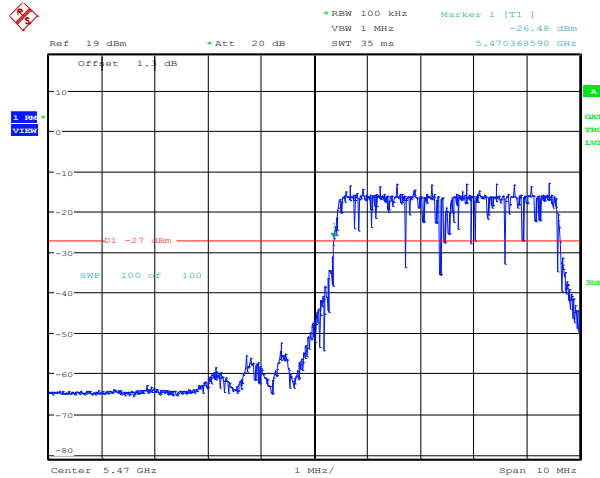
| | | | | | |
|--------------------|------------------|----------------------|-----------------|--------------------------|------|
| Test date | February 6, 2012 | Test engineer | Andrey Adelberg | Verdict | Pass |
| Temperature | 23 °C | Air pressure | 1002 mbar | Relative humidity | 31 % |

8.7.3 Observations/special notes

The frequency stability test was performed in the -40 to +60 °C temperature range at 5.25–5.35 GHz frequency range. The input voltage was varied $\pm 15\%$ at the room temperature.

All modulations and both antenna ports were investigated, only the worst-case results were presented.

8.7.4 Test data



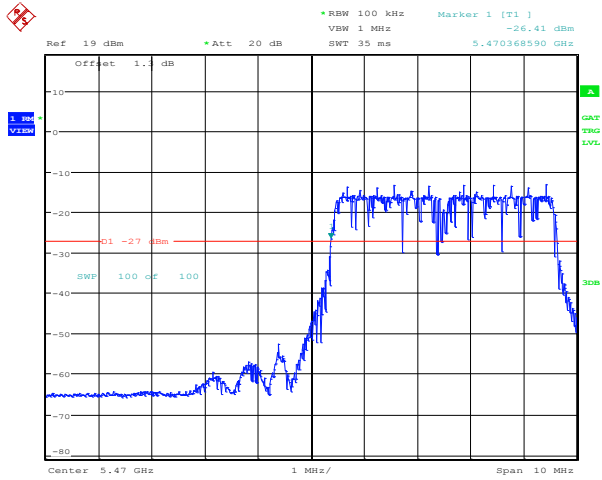
Date: 14.FEB.2012 21:16:07

Date: 14.FEB.2012 21:14:40

Plot 8.7-1: Lower band edge at the antenna port 1, 5 MHz channel

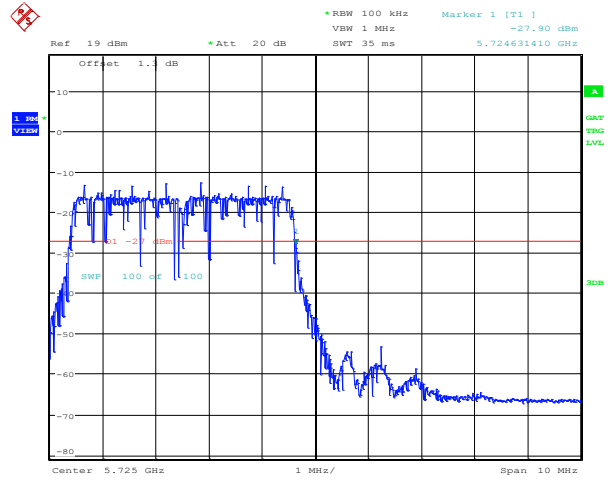
Plot 8.7-2: Upper band edge at the antenna port 1, 5 MHz channel

8.7.4 Test data, continued



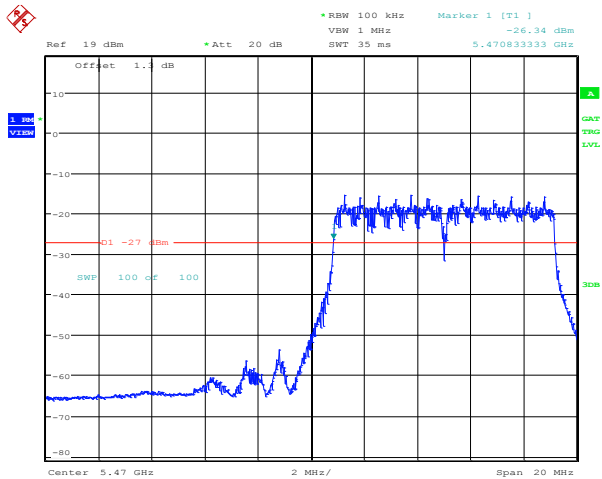
Date: 14.FEB.2012 21:13:47

Plot 8.7-3: Lower band edge at the antenna port 2, 5 MHz channel



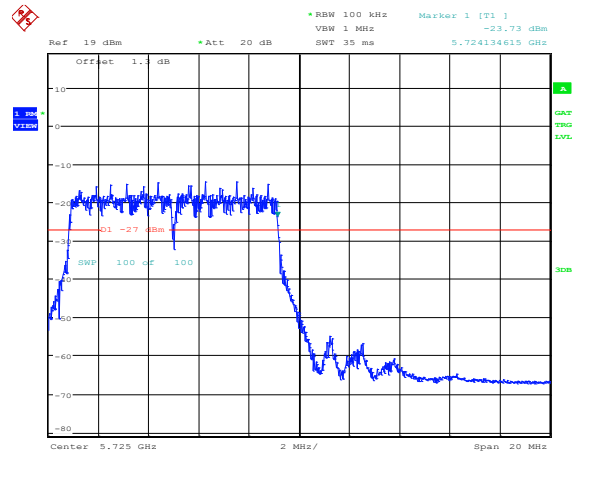
Date: 14.FEB.2012 21:16:55

Plot 8.7-4: Upper band edge at the antenna port 2, 5 MHz channel



Date: 14.FEB.2012 21:11:51

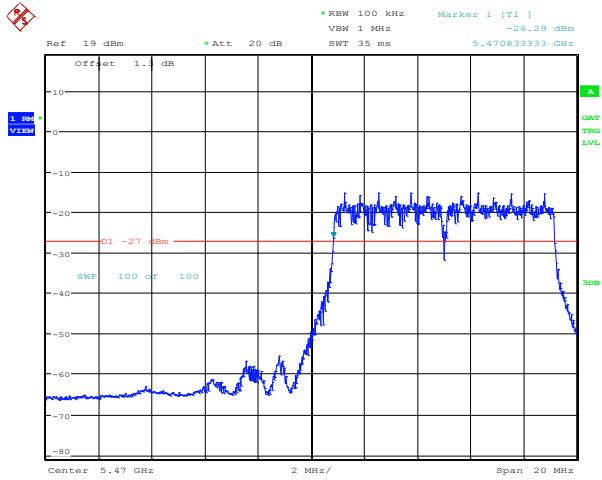
Plot 8.7-5: Lower band edge at the antenna port 1, 10 MHz channel



Date: 14.FEB.2012 21:10:21

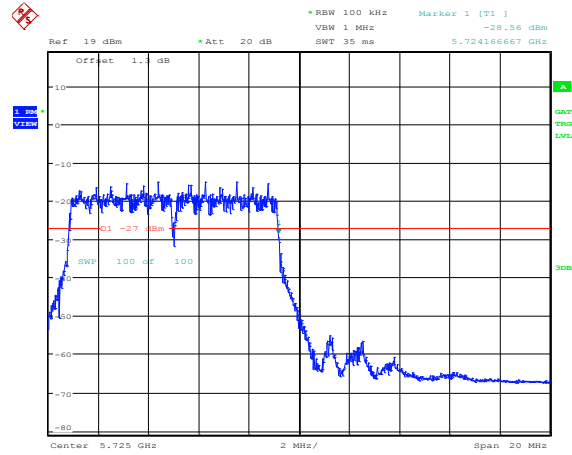
Plot 8.7-6: Upper band edge at the antenna port 1, 10 MHz channel

8.7.4 Test data, continued



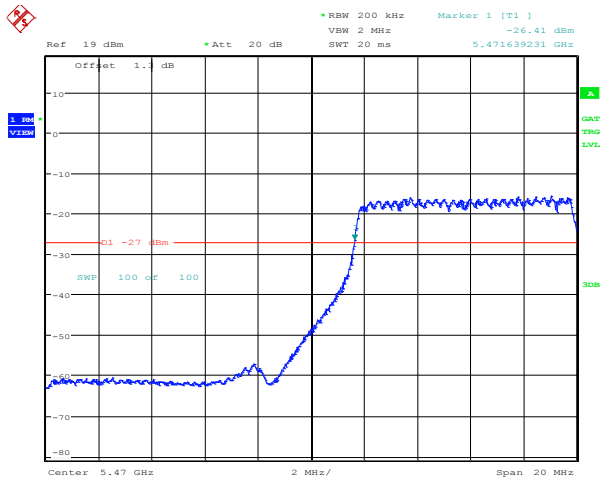
Date: 14.FEB.2012 21:12:32

Plot 8.7-7: Lower band edge at the antenna port 2, 10 MHz channel



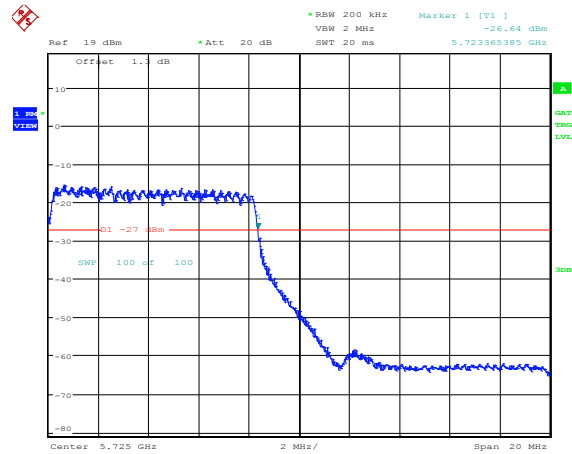
Date: 14.FEB.2012 21:09:43

Plot 8.7-8: Upper band edge at the antenna port 2, 10 MHz channel



Date: 14.FEB.2012 21:19:34

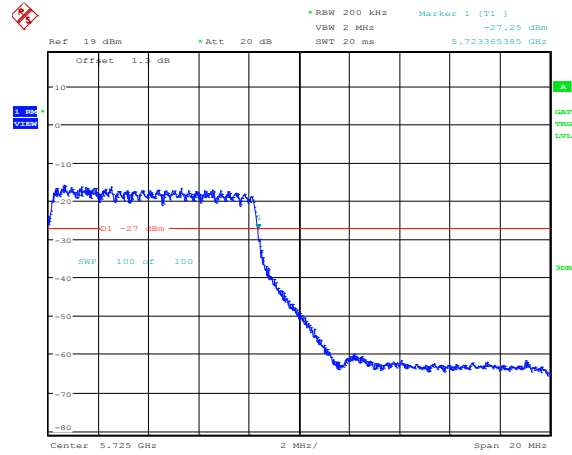
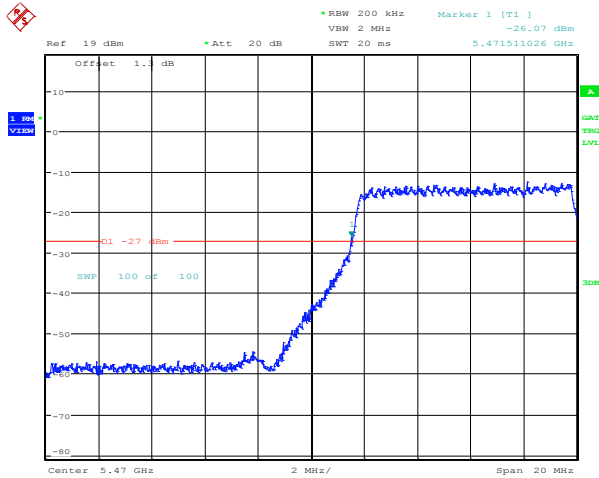
Plot 8.7-9: Lower band edge at the antenna port 1, 20 MHz channel



Date: 14.FEB.2012 21:18:49

Plot 8.7-10: Upper band edge at the antenna port 1, 20 MHz channel

8.7.4 Test data, continued



Date: 14.FEB.2012 21:18:17

Date: 14.FEB.2012 21:20:09

Plot 8.7-11: Lower band edge at the antenna port 2, 20 MHz channel

Plot 8.7-12: Upper band edge at the antenna port 2, 20 MHz channel

Table 8.7-1: Frequency offset measurement

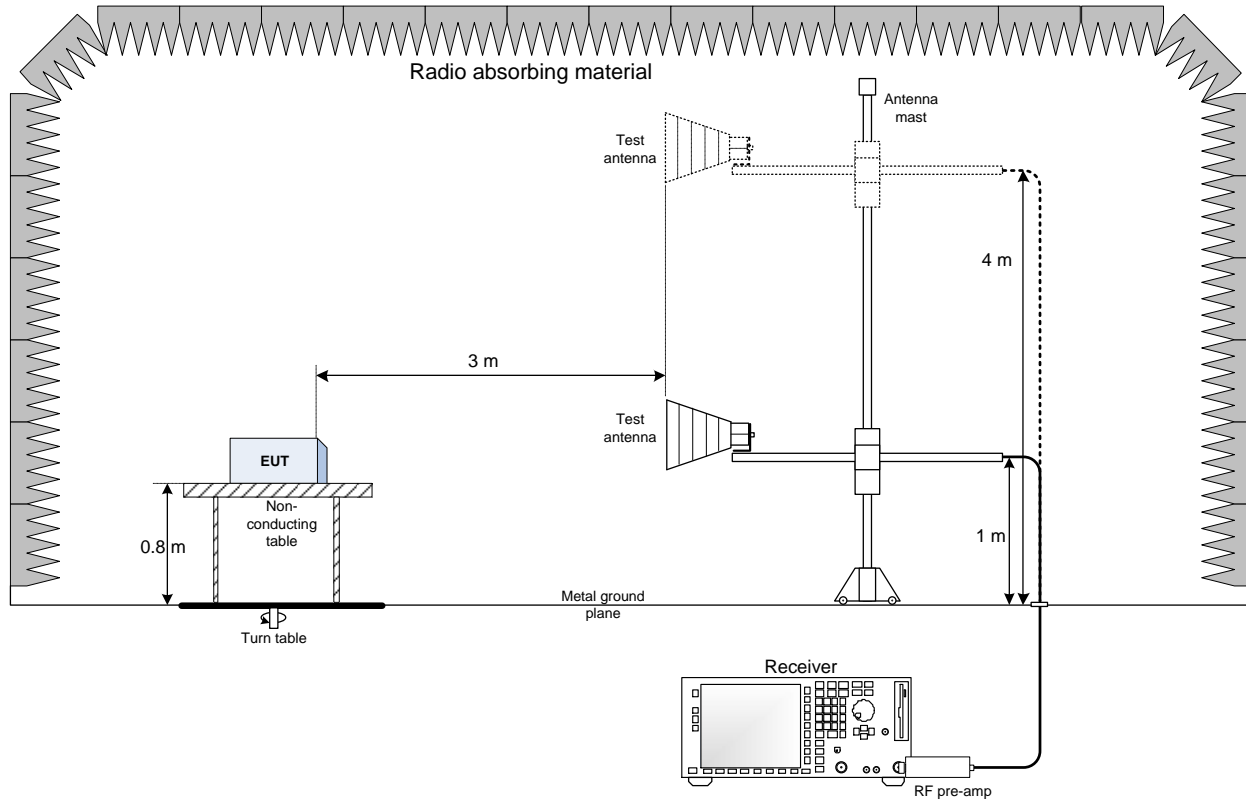
| Condition | F _{measured} (GHz) | Offset (Hz) | Offset (ppm) |
|------------------------------|-----------------------------|-------------|--------------|
| +60 °C, Nominal Voltage | 5.568335452 | 1665 | -0.55 |
| +50 °C, Nominal Voltage | 5.566172890 | 3827 | -1.71 |
| +40 °C, Nominal Voltage | 5.570941941 | -942 | -1.11 |
| +30 °C, Nominal Voltage | 5.572366842 | -2367 | -1.06 |
| +20 °C, +15% Nominal Voltage | 5.567417136 | 2583 | 0.97 |
| +20 °C, Nominal Voltage | 5.570000000 | Reference | |
| +20 °C, -15% Nominal Voltage | 5.569282236 | 718 | 0.39 |
| +10 °C, Nominal Voltage | 5.573034545 | -3035 | 0.29 |
| 0 °C, Nominal Voltage | 5.566091670 | 3908 | 0.88 |
| -10 °C, Nominal Voltage | 5.568057273 | 1943 | -1.33 |
| -20 °C, Nominal Voltage | 5.571279291 | -1279 | -1.22 |
| -30 °C, Nominal Voltage | 5.574123295 | -4123 | -1.17 |
| -40 °C, Nominal Voltage | 5.569267591 | 732 | -1.67 |

Table 8.7-2: Frequency stability calculation

| Channel BW (MHz) | Antenna port | f _H & f _L (Hz) | Max offset (Hz) | Drifted f _H & f _L (Hz) | Limit (Hz) | Margin (kHz) |
|------------------|--------------|--------------------------------------|-----------------|--|------------|--------------|
| 5 | 1 | 5470368590 | -4123 | 5470364467 | 5470000000 | 364.467 |
| | | 5724631410 | 3908 | 5724635318 | 5725000000 | 364.682 |
| | 2 | 5470368590 | -4123 | 5470364467 | 5470000000 | 364.467 |
| | | 5724631410 | 3908 | 5724635318 | 5725000000 | 364.682 |
| 10 | 1 | 5470833333 | -4123 | 5470829210 | 5470000000 | 829.210 |
| | | 5724134615 | 3908 | 5724138523 | 5725000000 | 861.477 |
| | 2 | 5470833333 | -4123 | 5470829210 | 5470000000 | 829.210 |
| | | 5724166667 | 3908 | 5724170575 | 5725000000 | 829.425 |
| 20 | 1 | 5471639231 | -4123 | 5471635108 | 5470000000 | 1635.108 |
| | | 5723365385 | 3908 | 5723369293 | 5725000000 | 1630.707 |
| | 2 | 5471511026 | -4123 | 5471506903 | 5470000000 | 1506.903 |
| | | 5723365385 | 3908 | 5723369293 | 5725000000 | 1630.707 |

Section 9 Block diagrams of test set-ups

9.1 Radiated emissions set-up



9.2 Conducted emissions set-up

