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RSC-Laboratory



Recognized by the
Federal Communications Commission
**Anechoic chamber registration no.: 90462 (FCC)**
**Anechoic chamber registration no.: IC 3463A-1**
TCB ID: DE 0001

Accredited by the
German Accreditation Council
DAR–Registration Number
DAT-P-176/94-D1

# Accredited Bluetooth® Test Facility (BQTF)

| | | |
|---|---|---|
| **Test report No.** | **:** | **4-2601-02-02/07** |
| **Applicant** | **:** | **RADIO FREQUENCY SYSTEMS** |
| **Type** | **:** | **L-RU700-2 (L-MU1(2)(4))** |
| **Test Standard** | **:** | **FCC Part 90** |
| | | **RSS-131 Issue 2** |
| **FCC ID** | **:** | **IWD-W1000197** |
| **Certification No. IC** | **:** | **1634B-W1000197** |

# Table of contents

# 1 General information

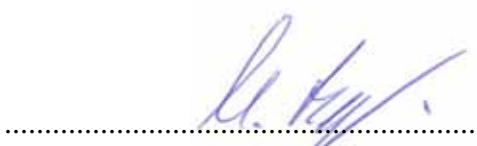
## 1.1. Administrative data of the test facility

### 1.1.1 Identification of the testing laboratory

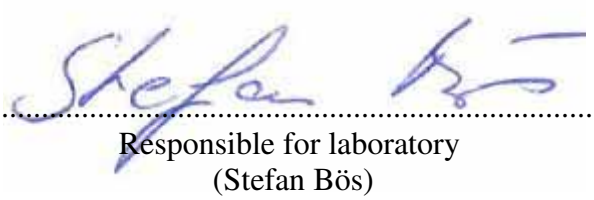
| | |
|---|---|
| Company name: | Cetecom ICT Services GmbH |
| Address: | Untertürkheimerstr. 6-10<br>D-66117 Saarbruecken<br>Germany |
| Laboratory accreditation: | DAR-Registration No. DAT-P-176/94-D1<br>Bluetooth Qualification Test Facility (BQTF)<br>Federal Communications Commission (FCC)<br>Identification/Registration No : 90462 |
| Responsible for testing laboratory: | Stefan Bös<br>Phone: +49 681 598 0<br>Fax: +49 681 598 9075<br>email: info@ict.cetecom.de |

## 1.2. Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.



.....
Responsible for testing
(Michael Berg)



.....
Responsible for laboratory
(Stefan Bös)

## 1.3 Details of Applicant

| | | |
|---|---|---|
| Name | : | RADIO FREQUENCY SYSTEMS |
| Address | : | Kabelkamp 20 |
| City | : | D-30179 Hannover |
| Country | : | Germany |
| Phone | : | +49 511 676 00 |
| Fax | : | +49 511 676 2188 |
| Contact | : | Mr. Axel Schröder |
| Phone | : | +49 511 676 2390 |
| Fax | : | +49 511 676 2188 |
| e-mail | : | axel.schroeder@rfsworld.com |

## 1.4 Application Details

| | | |
|---|---|---|
| Date of receipt of application | : | 2009-01-19 |
| Date of receipt of test item | : | 2009-01-19 |
| Date(s) of test | : | 2009-01-19 to 2009-01-20 |
| Date of report | : | 2009-01-20 |

## 1.5 Additional EUT information for IC Canada (appendix 2)

| | | |
|---|---|---|
| Type of equipment | : | Fiber Fed Remote Unit |
| Type name | : | L-RU700-2 (L-MU1(2)(4)) |
| Manufacturer | : | RADIO FREQUENCY SYSTEMS |
| Address | : | Kabelkamp 20 |
| City | : | D-30179 Hannover |
| Country | : | Germany |
| | | |
| Frequency | : | Down link 793 to 805 MHz |
| Type of modulation | : | GXW (P-25 Public Safety Radio) |
| Number of channels | : | -.- |
| Antenna Type | : | N female connector ( SMA female connector) |
| Power supply (normal) | : | 115V AC |
| | | Single Channel / Multi Channel (3) |
| Output power Down link: | | cond : 27.8 dBm Peak / 23.4 dBm Peak |
| | | |
| Transmitter Spurious (worst case) | | 0.1 µW / -40dBm |
| Receiver Spurious (worst case) | | 200 µV/m @ 3 m (Noise floor) |
| | | |
| FCC ID | : | IWD-W1000197 |
| Certification No. IC | : | 1634B-W1000197 |
| Open Area Test Site IC No. | : | IC 3463A-1 |
| IC Standards | : | RSS131, Issue 2, |

**ATTESTATION:**
**DECLARATION OF COMPLIANCE:**
I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

**Laboratory Manager :**

| | | |
|---|---|---|
| 2009-01-20 | Michael Berg |  |
| Date | Name | Signature |

## 1.6 Test Setup

| | | |
|---|---|---|
| Hardware | : | L-RU700-2 (L-MU1(2)(4)) |
| Software | : | - |

## Equipment Under Test:

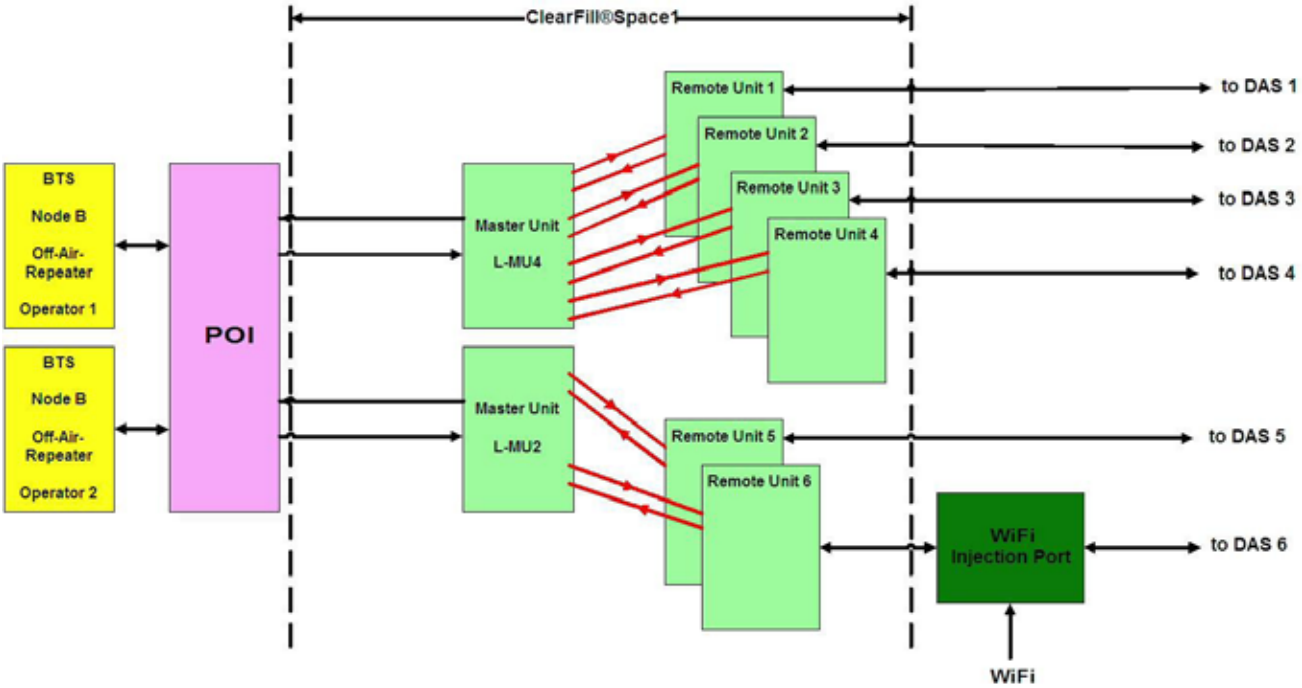
L-MU, L-RU

**Description of the system :**

ClearFill®Space1 is a modular RF-over-fiber distribution system that provides reliable and highest quality indoor coverage wireless services in airports, hospitals, campus, enterprises, convention centers, high-rise buildings and tunnels. The system is operated at a multi-operator and multi-carrier status.
The system contains following units:

| | |
|---|---|
| L-MU | Optical Master Unit with 1, 2 or 4 optical ports (here measured the 4-port part) |
| L-RU | Optical Remote Unit |

**Example of ClearFill®Space1 System Topology**




Both devices (L-MU and L-RU) include an automatic level control (ALC) in uplink and downlink that eliminates system gain variation, regardless of optical loss guarantying optimised system performance under minimised installation effort.

### 1.7 Test Standards

| | |
|---|---|
| **FCC:** | **FCC 2-11-04/EAB/RF Amplifier, Booster and Repeater Reminder Sheet** |
| **IC:** | **RSS 131, Issue 2** |

## 2 Statement of Compliance

No deviations from the technical specification(s) were ascertained in the course of the tests performed.

### 2.1 Summary of Measurement Results

| Section in this Report | Test Name | Verdict |
|---|---|---|
| 3.1 | RF Exposure FCC §1.1307, §2.1091 | pass |
| 3.2 | RF Power Output FCC §90.205 (a) | pass |
| 3.3 | Radiated Emissions FCC § 2.1053, §90.210 | pass |
| 3.4 | Conducted Spurious Emissions FCC § 2.1051 | pass |
| 3.5 | Block Edge Compliance FCC §2.1051, | pass |
| 3.6 | Occupied Bandwidth FCC §90.210 | pass |
| 3.7 | Intermodulation Tests FCC § 2.1051, FCC 2-11-04/EAB/RF Amplifier, Booster and Repeater Reminder Sheet, IC RSS-131 §6.3 | pass |
| 3.8 | Out of Band Rejection | pass |
| 3.9 | Conducted Emissions <30 MHz FCC§15.107 | pass |

# 3 Measurements and results

## 3.1 RF Exposure

| | |
|---|---|
| FCC: | FCC §1.1307, §2.1091 |
| IC: | RSS-131 §5.5 |

**MPE calculation**

These equations are generally accurate in the far field of an antenna but will over predict power density in the near field, where they could be used for making a "worst case" prediction.

$$S = PG/4\pi R^2$$

where S = power density ( in appropriate units, e.g. $mW/cm^2$)
P = power input to the antenna (in appropriate units e.g. mW)
G = power gain of the antenna in the direction of interest relative to the isotropic radiator
R = distance to the center of radiation of the antenna (appropriate units e.g. cm)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density ($mW/cm^2$) | Averaging time (minutes) |
|---|---|---|---|---|
| **(A) Limits for Occupational/Controlled Exposures** | | | | |
| 0.3–3.0 | 614 | 1.63 | *(100) | 6 |
| 3.0–30 | 1842/f | 4.89/f | *(900/$f^2$) | 6 |
| 30–300 | 61.4 | 0.163 | 1.0 | 6 |
| 300–1500 | | | f/300 | 6 |
| 1500–100,000 | | | 5 | 6 |
| **(B) Limits for General Population/Uncontrolled Exposure** | | | | |
| 0.3–1.34 | 614 | 1.63 | *(100) | 30 |
| 1.34–30 | 824/f | 2.19/f | *(180/$f^2$) | 30 |
| 30–300 | 27.5 | 0.073 | 0.2 | 30 |
| 300–1500 | | | f/1500 | 30 |
| 1500–100,000 | | | 1.0 | 30 |

f = frequency in MHz
* = Plane-wave equivalent power density
NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

**Antenna gain Worst case calculations: ($G=S*4\pi R^2 / P$)**

**Downlink:**
Maximum peak output power at antenna input terminal (dBm): 27.8
Maximum peak output power at antenna input terminal (mW): 603
Prediction distance (cm): 20
Prediction frequency (MHz): 803.975
MPE limit for uncontrolled exposure at predication frequency (mW/cm ): 0.466
Maximum Antenna Gain (numeric): 3.9
Antenna Gain, typical (dBi): 5.9

## Test result:

The device is compliant with the requirement MPE limit for uncontrolled exposure at predication frequency 0.466 mW/cm. The maximum allowed antenna gain for a distance of 20 cm is 5.9 dBi .
requirement.

## 3.2 RF Power Output

**Reference**

| | |
|---|---|
| FCC: | CFR Part 90.205, 2.1046 |
| IC: | RSS 131, Issue 2, Section 4.3 and 6.2 |

**Method of Measurements:**

The booster was set up for the max. output power with pseudo random data modulation.
The power was measured with R&S Signal Analyzer FSIQ 26
This measurements were done at 3 frequencies (bottom, middle and top of operational frequency range).in downlink and with one and two carriers.

**Limits:**

| | Nominal Peak Output Power (dBm) | Tolerance (dB) |
|---|---|---|
| | +30 | ± 2 |

**Test Results: Output Power (conducted)**
**The maximum gain is DL 17 dB, (Limit : nominal + 1 dB)**

Downlink

| Homeland Security (dBm) | | | | |
|---|---|---|---|---|
| Channel | Frequency | Modulation | Output Power Single Channel | Output Power 3 Channels |
| Low | 793.025 | GXW | 26.6 | 22.5 |
| Middle | 799.000 | | 27.0 | 23.4 |
| High | 804.975 | | 27.8 | 23.4 |

## 3.3 Radiated Emissions

**Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method**

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:
Center Frequency : equal to the signal source
Resolution BW : 10 kHz
Video BW : same
Detector Mode : positive
Average : off
Span : 3 x the signal bandwidth
(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)
(c) Select the frequency and E-field levels for ERP/EIRP measurements.
(d) Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):
DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz }.
(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.
(f) Use one of the following antenna as a receiving antenna: .DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz }.
(g) If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.
(i) Tune the EMI Receivers to the test frequency.
(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(k) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:
P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1
EIRP = P + G1 = P3 + L2 - L1 + A + G1
ERP = EIRP – 2.15 dB
Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1
Where: P: Actual RF Power fed into the substitution antenna port after corrected.
P1: Power output from the signal generator
P2: Power measured at attenuator A input
P3: Power reading on the Average Power Meter
EIRP: EIRP after correction
ERP: ERP after correction
(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
(p) Repeat step (d) to (o) for different test frequency
(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

**Sample calculation:**

| Freg | SA Reading | SG Setting | Ant. gain | Dipol gain | Cable loss | ERP | Substitution Antenna |
|---|---|---|---|---|---|---|---|
| MHz | dBµV | dBm | dBi | dBd | dB | dBm | |
| 848.8 | 123.9 | 38.57 | | -10.50 | 1.67 | 26.4 | UHAP Schwarzbeck S/N 460 |

ERP = SG (dBm) - Cable Loss (dB) + Ant. gain (dB)
*ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.1dBi

**Reference**

| | |
|---|---|
| FCC: | CFR Part 90.210, 2.1053 |
| IC: | RSS 131, Issue 2, Section 4.4 and 6.4 |

**Measurement Procedure:**

**All spurious emissions tests were measured with the two-tone method**

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4:2003 requirements and is recognized by the FCC to be in compliance for a 3 and a10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency, which is the transmitted carrier that can be as high as 806 MHz. This was rounded up to 12 GHz. The resolution bandwidth is set as outlined in Part 90.210. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the CELLULAR SERVICE band.

The final open field emission ( here 10m semi-anechoic chamber listed by FCC) test procedure is as follows:

a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
b) The antenna output was terminated in a 50 ohm load.
c) A double ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and I MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters using the equation shown below:
e)Now each detected emissions were substituted by the Substitution method, in accordance with the TIA/EIA 603 .

**Measurement Limit:**

Sec. 90.210 Emission Limits.
(a) On any frequency outside a licensee' s frequency block within the CELLULAR SERVICE spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB.
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

**Measurement Results: Radiated Emissions**

**Measurement Results:**

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the CELLULAR SERVICE band. It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the CELLULAR SERVICE band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

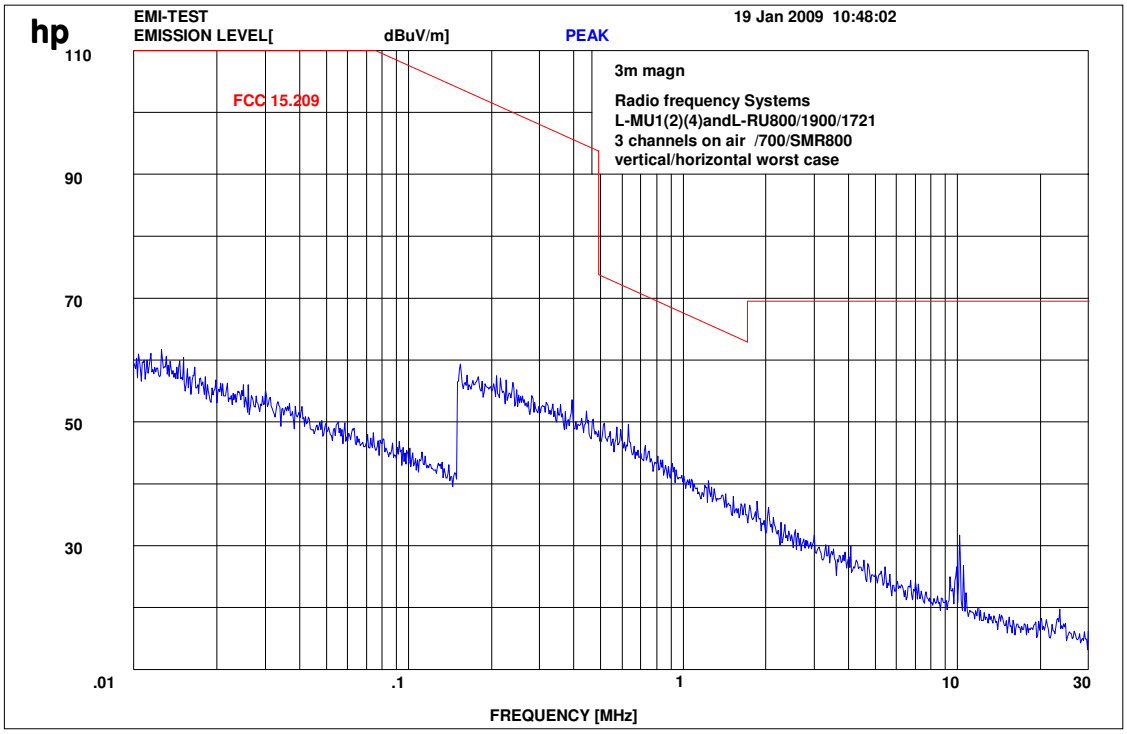
The final open field radiated levels are presented on the next pages.
All measurements were done in horizontal and vertical polarization, the plots shows the worst case.
As can be seen from this data, the emissions from the test item were within the specification limit.

Downlink

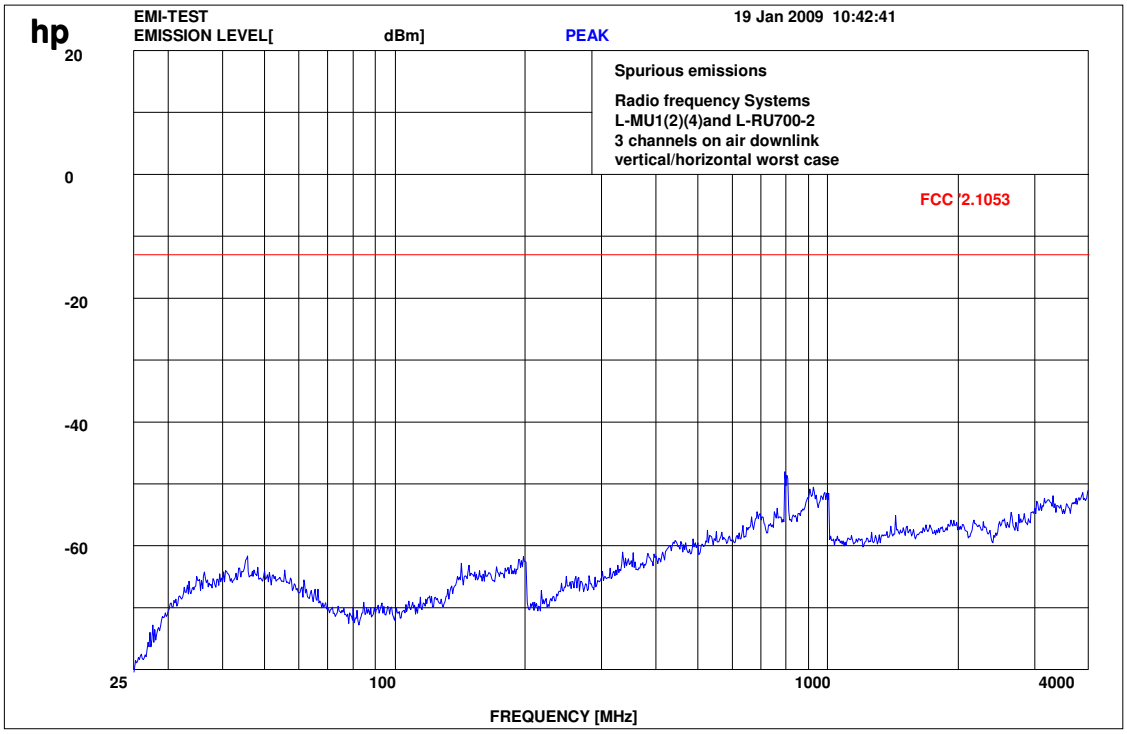
| Harmonic | Low channel. (MHz) | Level (dBm) | Middle channel. (MHz) | Level (dBm) | High channel (MHz) | Level (dBm) |
|---|---|---|---|---|---|---|
| 2 | 793,025 | - | 799 | - | 804,975 | - |
| 3 | 1586,05 | - | 1598 | - | 1609,95 | - |
| 4 | 2379,075 | - | 2397 | - | 2414,925 | - |
| 5 | 3172,1 | - | 3196 | - | 3219,9 | - |
| 6 | 3965,125 | - | 3995 | - | 4024,875 | - |
| 7 | 4758,15 | - | 4794 | - | 4829,85 | - |
| 8 | 5551,175 | - | 5593 | - | 5634,825 | - |
| 9 | 6344,2 | - | 6392 | - | 6439,8 | - |
| 10 | 7137,225 | - | 7191 | - | 7244,775 | - |

**No peaks found < 20 dB below limit.**

**Downlink up to 30 MHz (Valid for all 3 channels)**

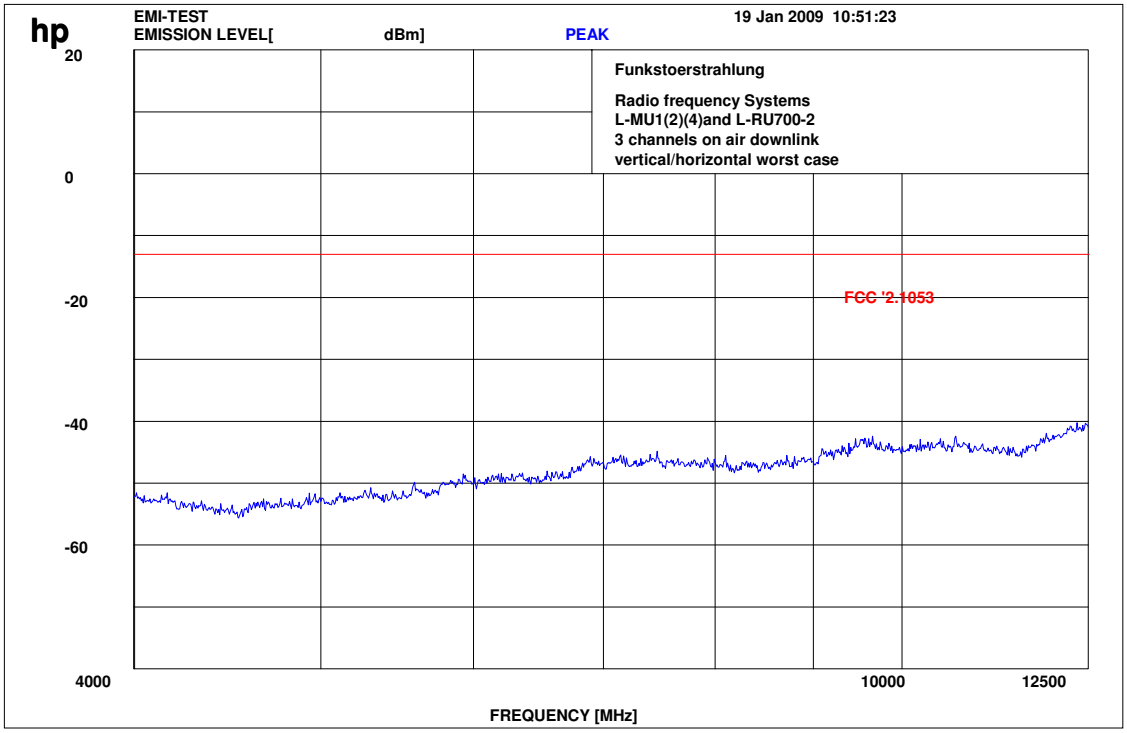


**Downlink (30 MHz - 4 GHz)**




f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

**Downlink (4 GHz – 12.5 GHz)**




f ≥ 1GHz : RBW / VBW 1 MHz

## 3.4 Conducted Spurious Emissions

**Reference**

| | |
|---|---|
| FCC: | CFR Part 2.1051 |
| IC: | RSS 131, Issue 2, Section 4.4 and 6.4 |

**Measurement Procedure**

The following steps outline the procedure used to measure the conducted emissions from the mobile station.
1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the booster equipment tested, this equates to a frequency range of 13 MHz to 9 GHz, data taken from 10 MHz to 12.5 GHz.
2. Determine mobile station transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

**Measurement Limit:**

(a) On any frequency outside frequency band of the CELLULAR SERVICE spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

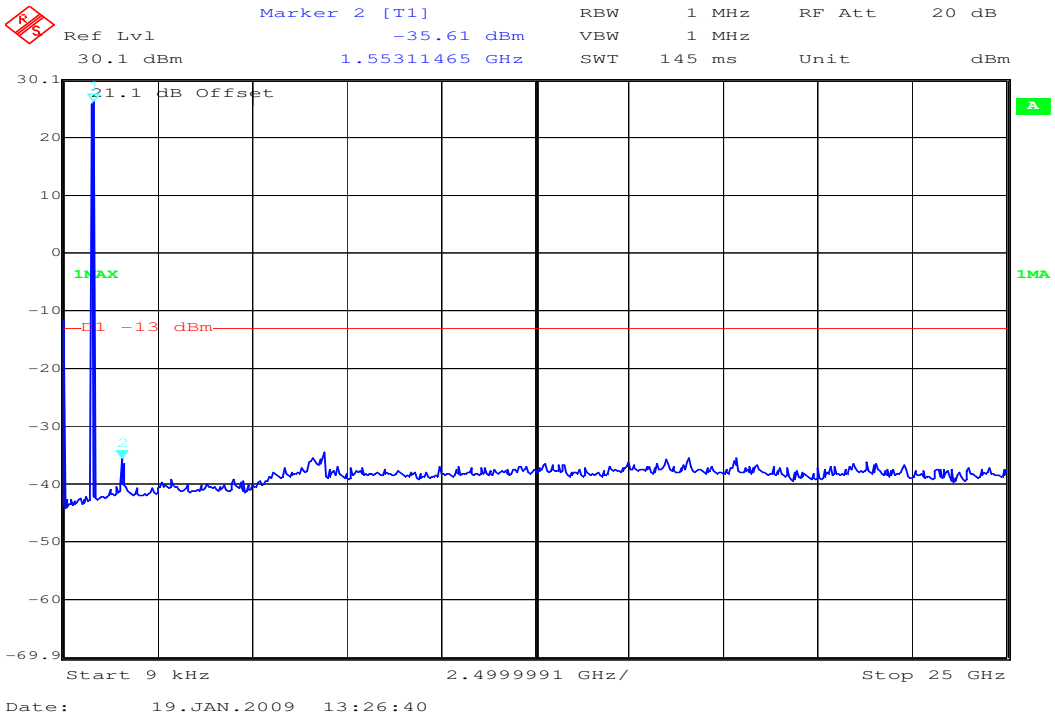
**Measurement Results:**

Downlink

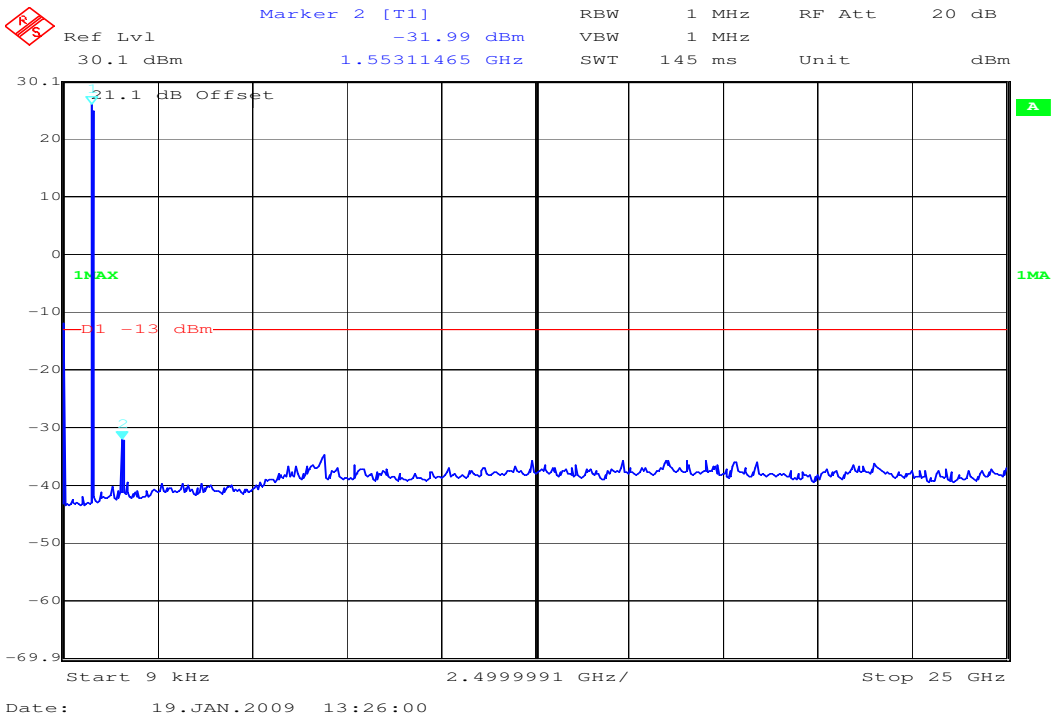
| Harmonic | Low channel. (MHz) | Level (dBm) | Middle channel. (MHz) | Level (dBm) | High channel (MHz) | Level (dBm) |
|---|---|---|---|---|---|---|
| 2 | 793,025 | - | 799 | - | 804,975 | - |
| 3 | 1586,05 | - | 1598 | - | 1609,95 | - |
| 4 | 2379,075 | - | 2397 | - | 2414,925 | - |
| 5 | 3172,1 | - | 3196 | - | 3219,9 | - |
| 6 | 3965,125 | - | 3995 | - | 4024,875 | - |
| 7 | 4758,15 | - | 4794 | - | 4829,85 | - |
| 8 | 5551,175 | - | 5593 | - | 5634,825 | - |
| 9 | 6344,2 | - | 6392 | - | 6439,8 | - |
| 10 | 7137,225 | - | 7191 | - | 7244,775 | - |

**No peaks found < 20 dB below limit.**

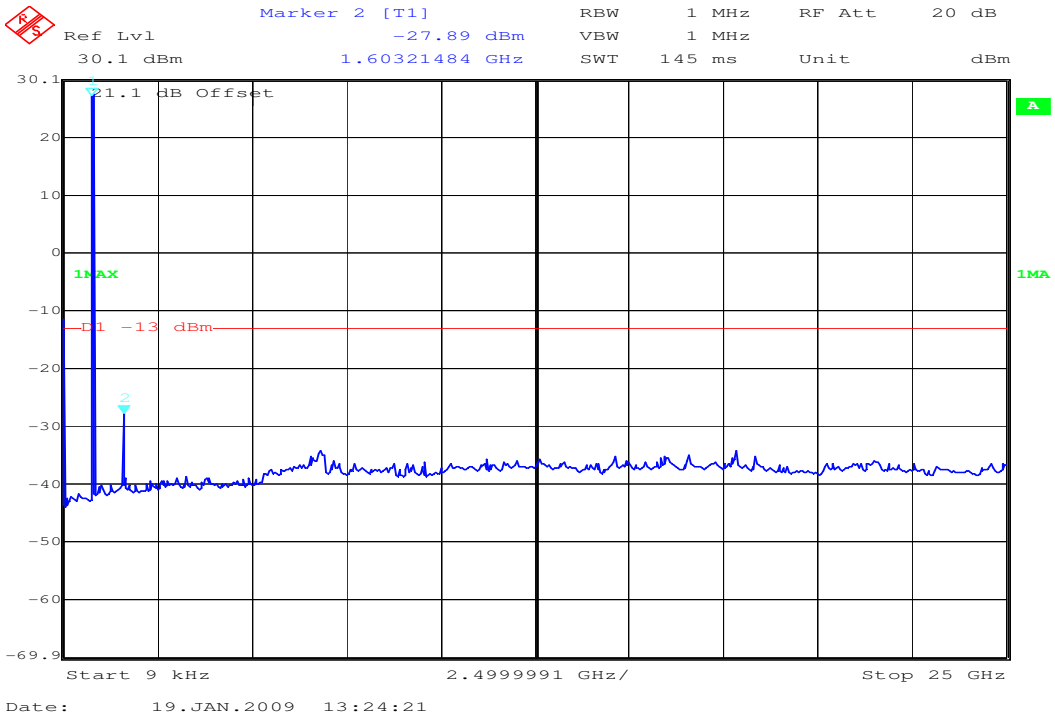
## Downlink Low Channel




## Downlink Middle Channel



## Downlink High Channel



## 3.5 Block Edge Compliance

**Reference**

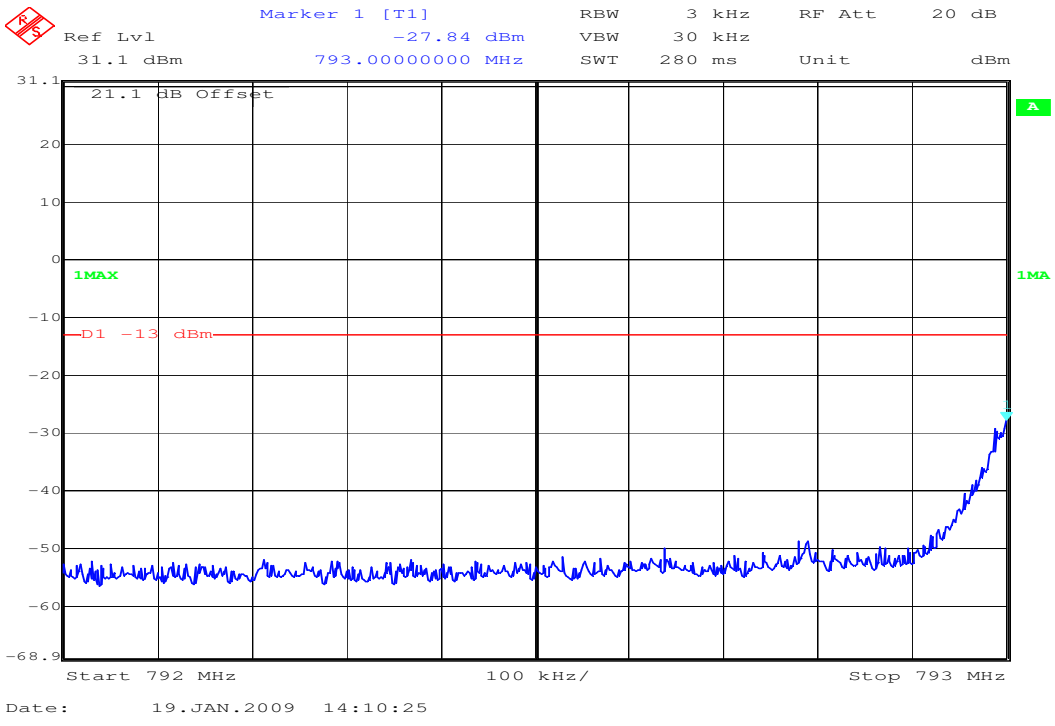
| | |
|---|---|
| FCC: | CFR Part 2.1051 |
| IC: | RSS 131, Issue 2, Section 4.4 and 6.4 |

**Measurement Limit:**

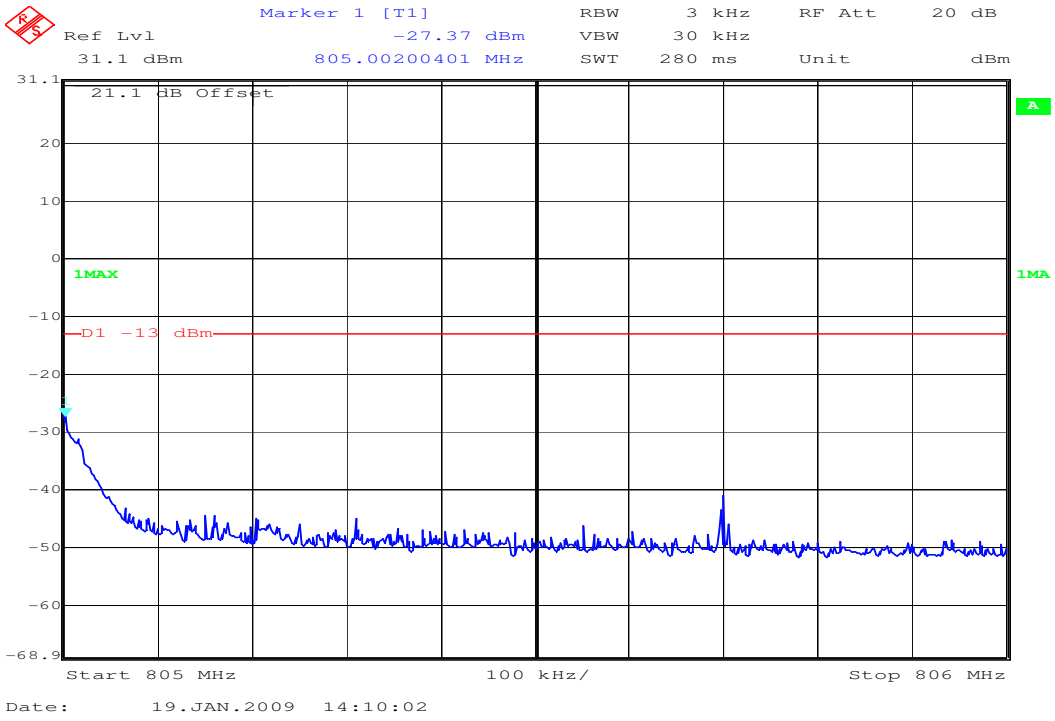
Sec.90.210) Emission Limits.
(a) On any frequency outside frequency band of the CELLULAR SERVICE spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. For all power levels +33 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

## Downlink

## Lower Block Edge



## Upper Block Edge



## 3.6 Occupied Bandwidth

**Reference**

| | |
|---|---|
| FCC: | CFR Part 90.210, 2.1049 |
| IC: | RSS 131, Issue 2, Section 4.2 |

**Occupied Bandwidth Results**

Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the frequency band. Table 8.2 below lists the measured 99% occupied bandwidths. Spectrum analyzer plots are included on the following pages.

Analyzer Settings:
GXW: RBW 3 kHz VBW 30 KHz Span : 100 kHz

**Test results OBW Input / Output**

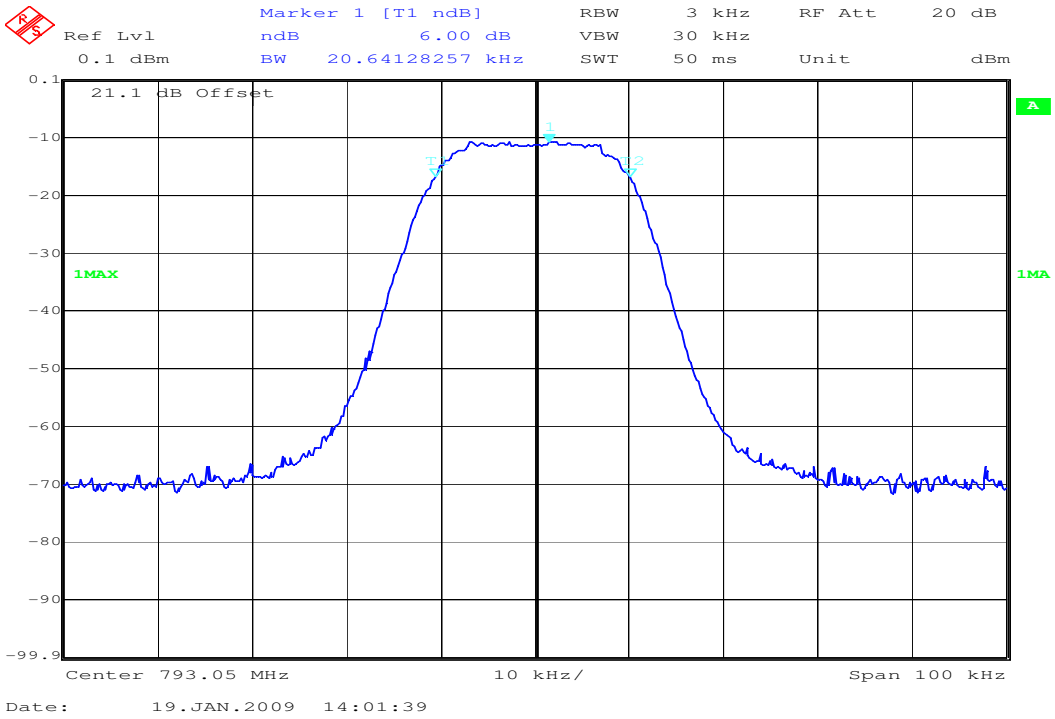
Downlink

| Homeland Security (kHz) | | | | |
|---|---|---|---|---|
| Channel | Frequency | Modulation | Input | Output |
| Low | 793.025 | GXW | 20.7 | 20.7 |
| Middle | 799.000 | | 20.8 | 20.7 |
| High | 804.975 | | 20.7 | 20.7 |

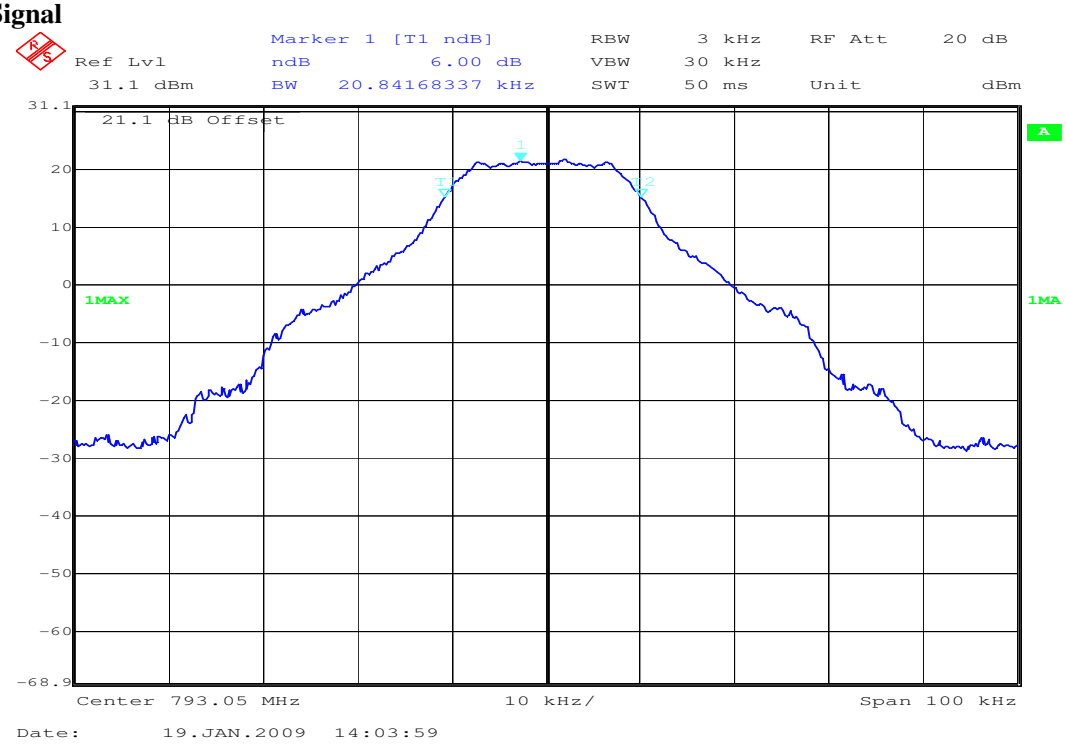
## Plots of measurement

## Downlink Low Channel

### Input Signal

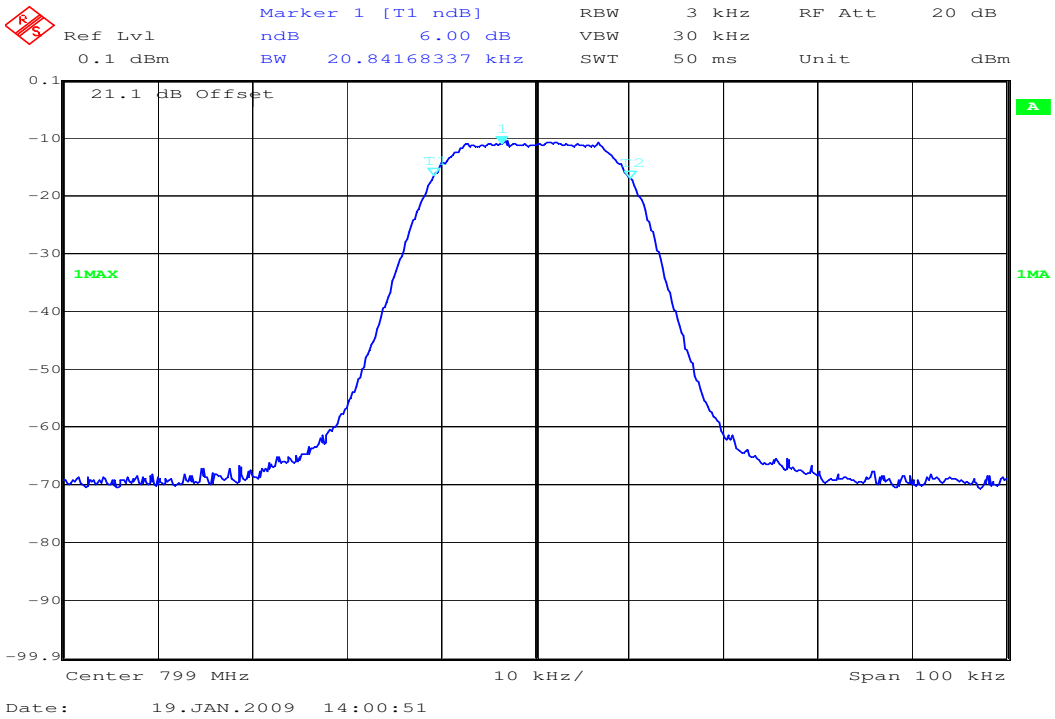



### Output Signal

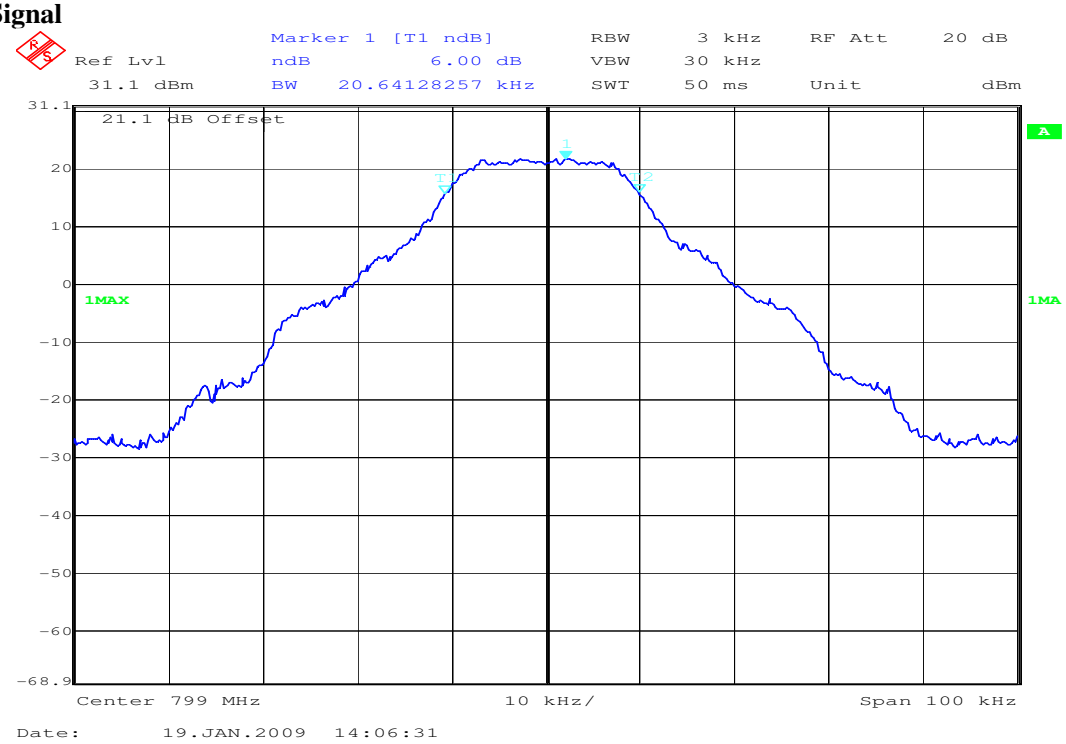


## Downlink Middle Channel

### Input Signal

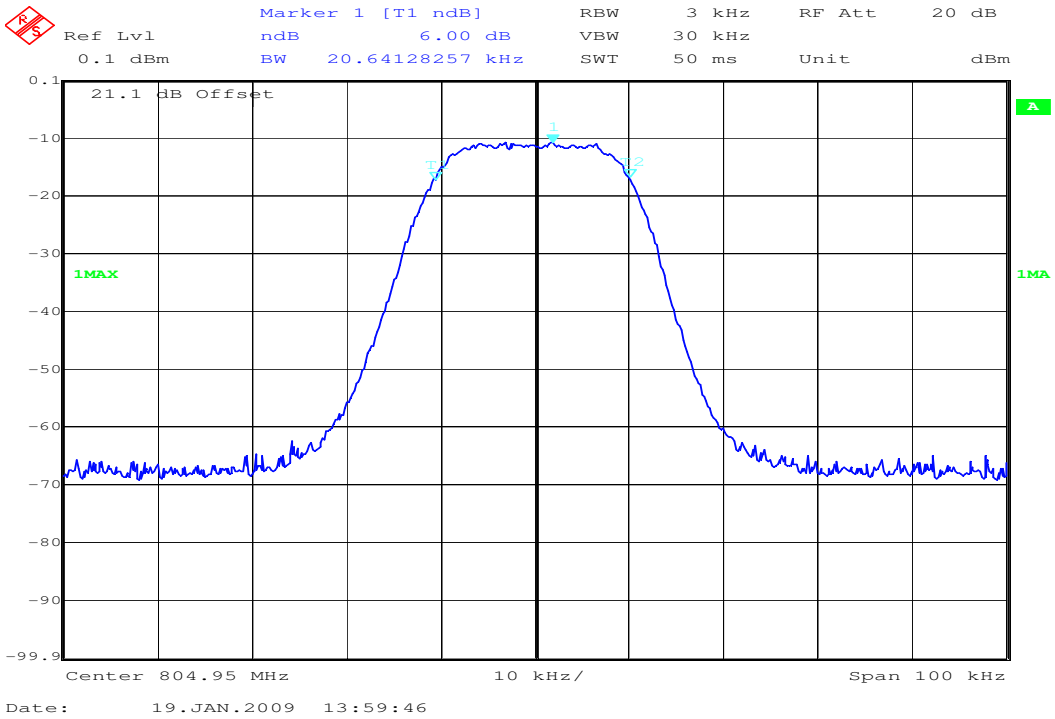



### Output Signal

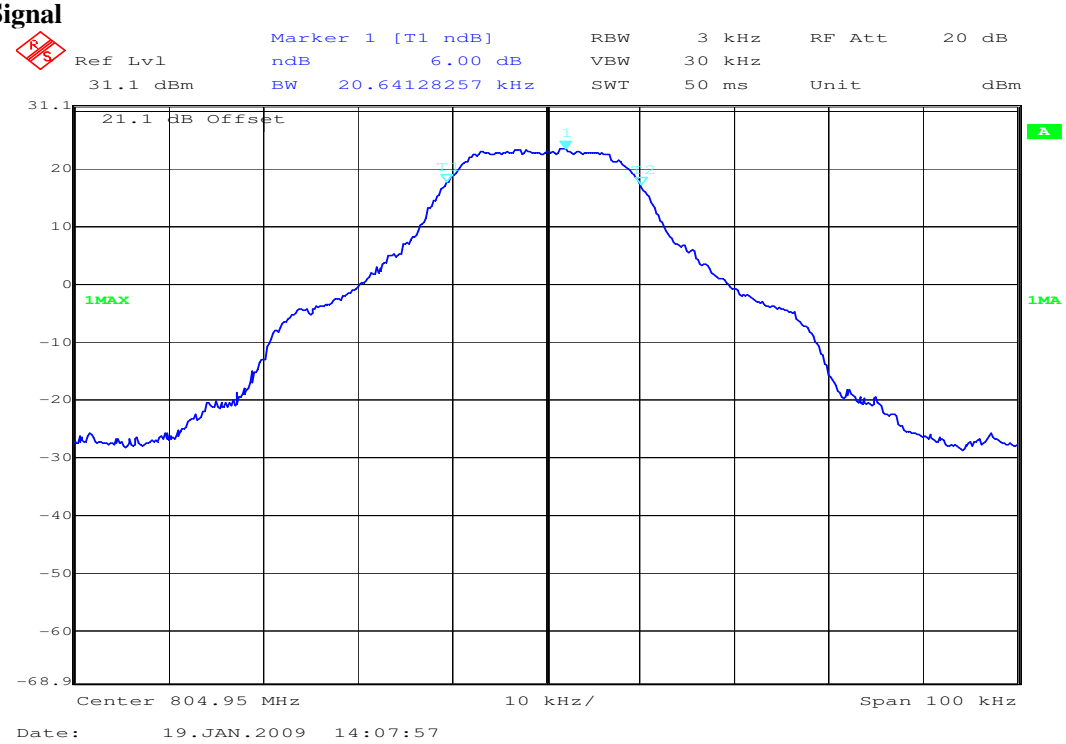


## Downlink High Channel

### Input Signal




### Output Signal



## 3.7 Intermodulation Tests

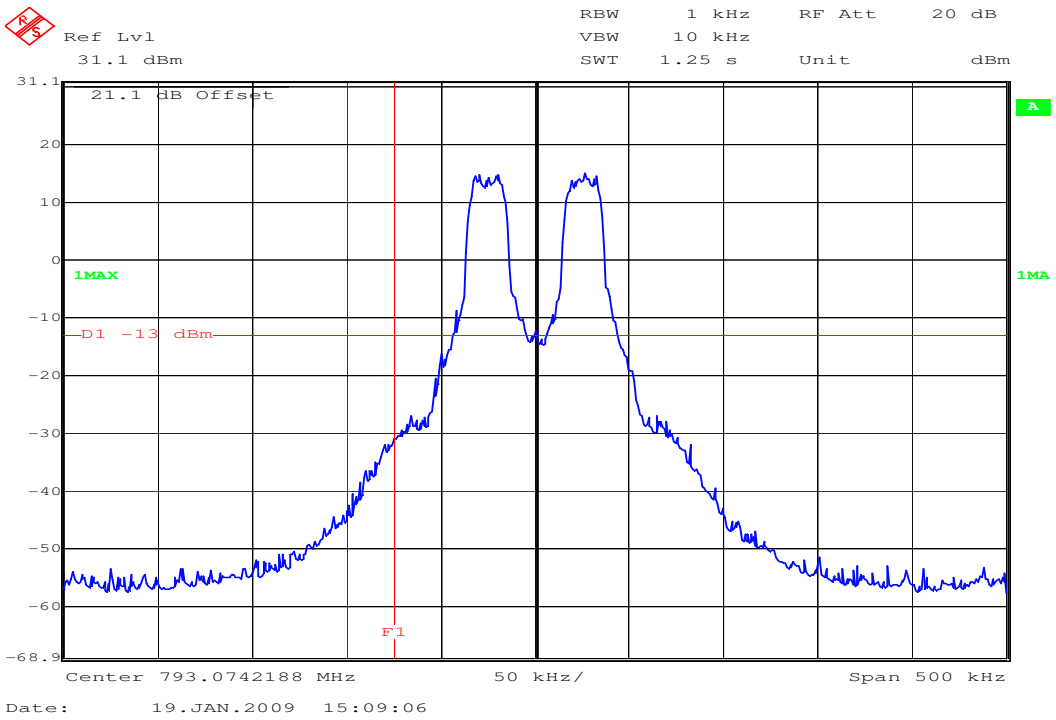
**Reference**

| | |
|---|---|
| FCC: | FCC § 2.1051, |
| IC: | IC RSS-131 §6.3 |

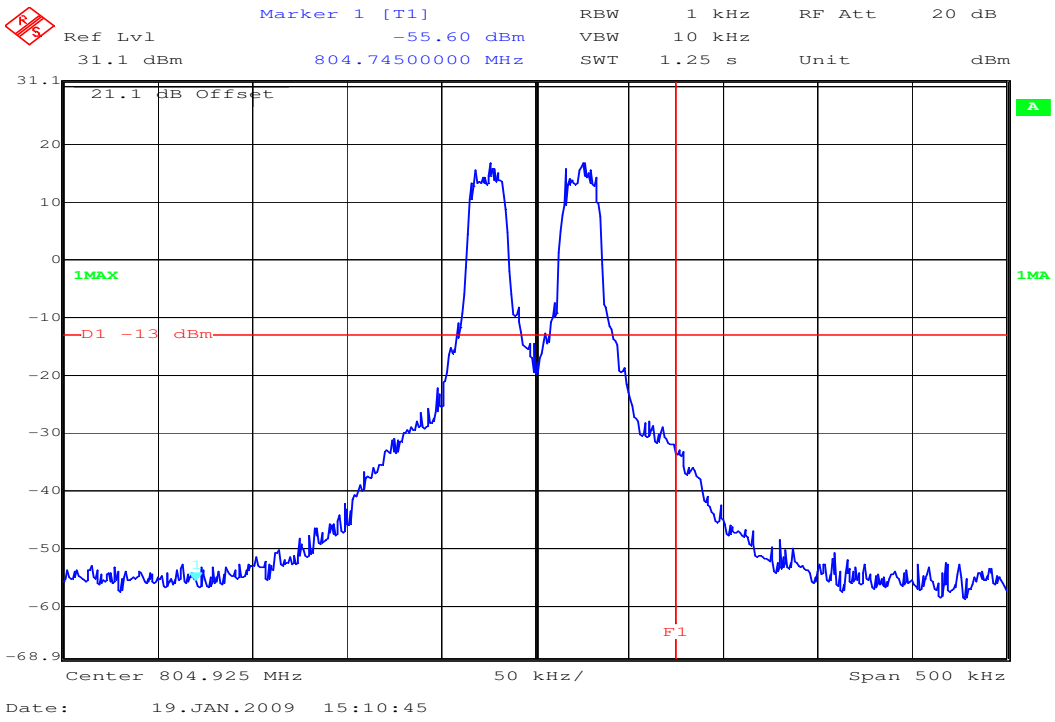
**Method of Measurement:**
Two RF signals set as inputs. The frequencies of both RF signals shall be within the repeater's operating band. The spacing between both RF signals shall be the minimum possible spacing applied in a network. The level of both RF input signals shall be increased, until the maximum rated output power per channel, as declared by the manufacturer, is reached.

**Downlink**

**Lower Band Edge**

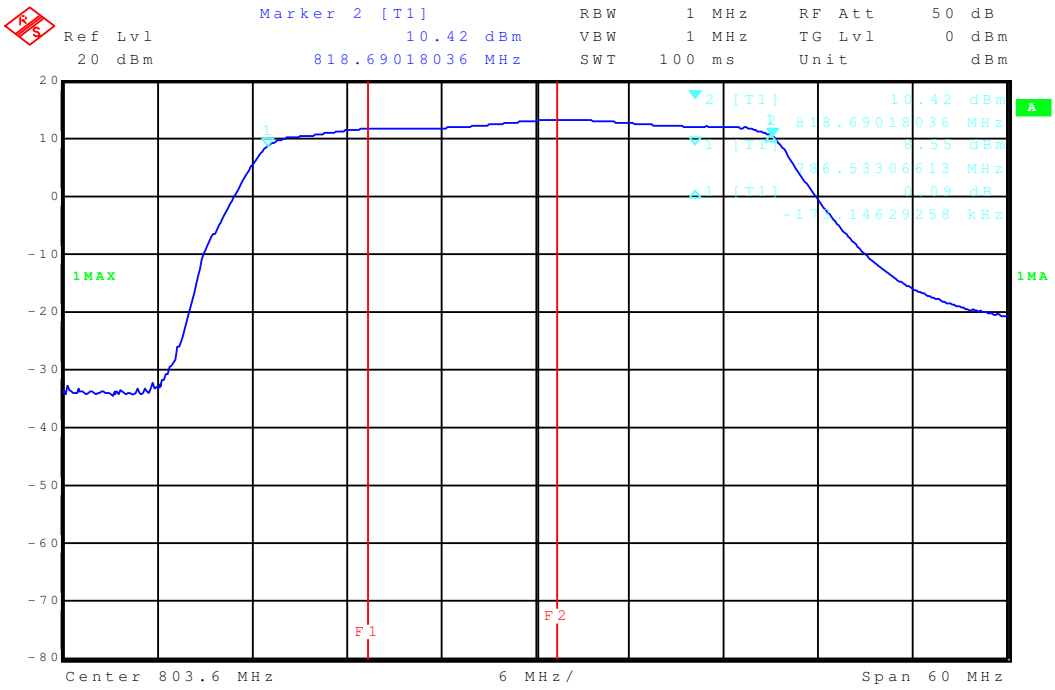


## Upper Band Edge



## 3.8 Out of Band Rejection

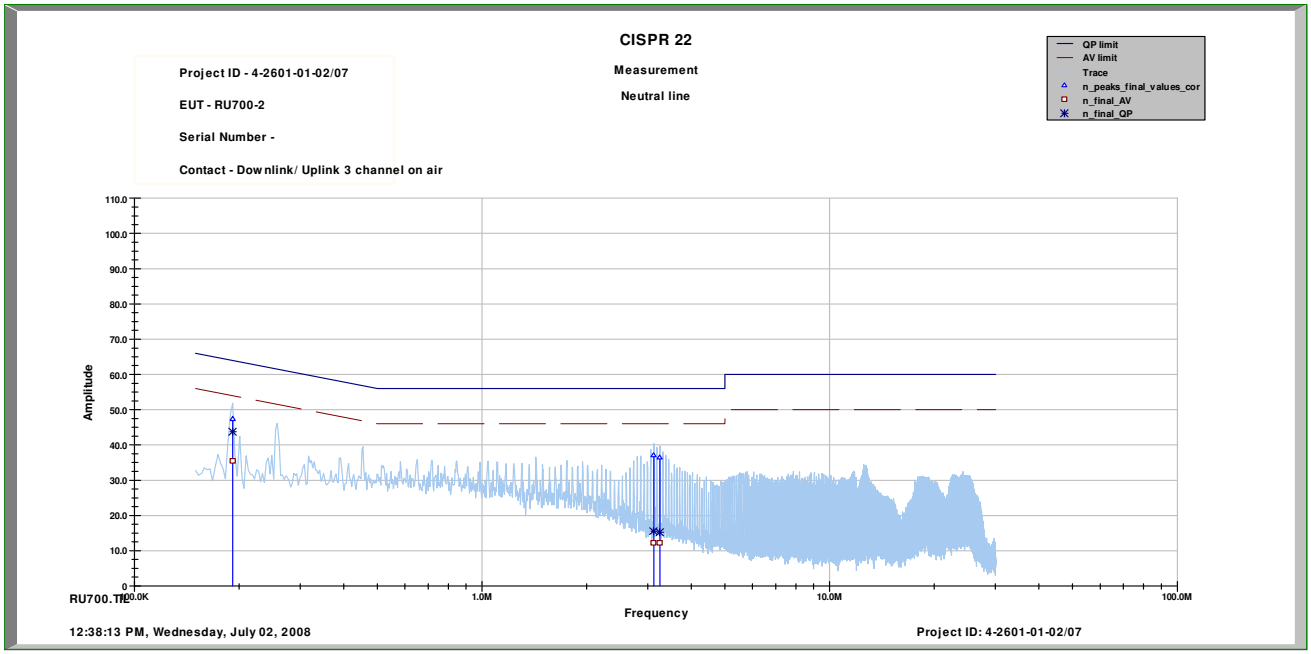
### Down link Band Pass



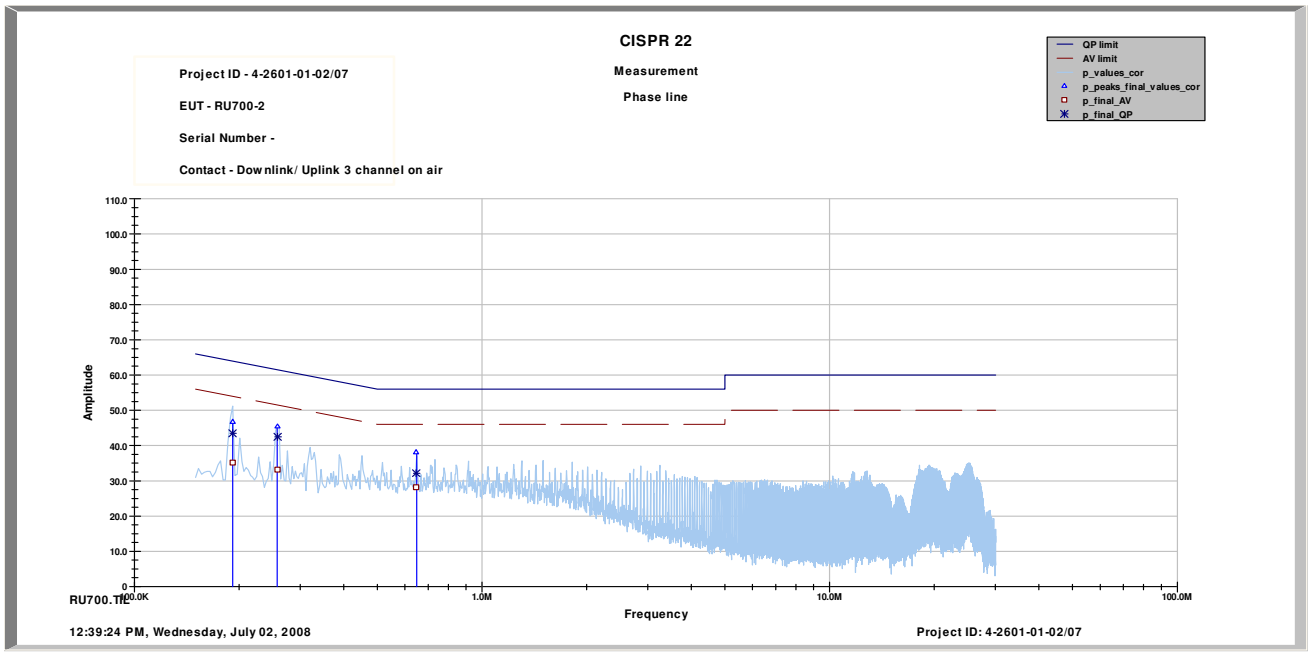
## 3.9 Conducted Emissions <30 MHz §15.107/207

### Normal operating mode (up- and downlink)

**L-RU700-2**
Neutral Line




Phase Line




We measured L1 and N floating and grounded, max value was hold.

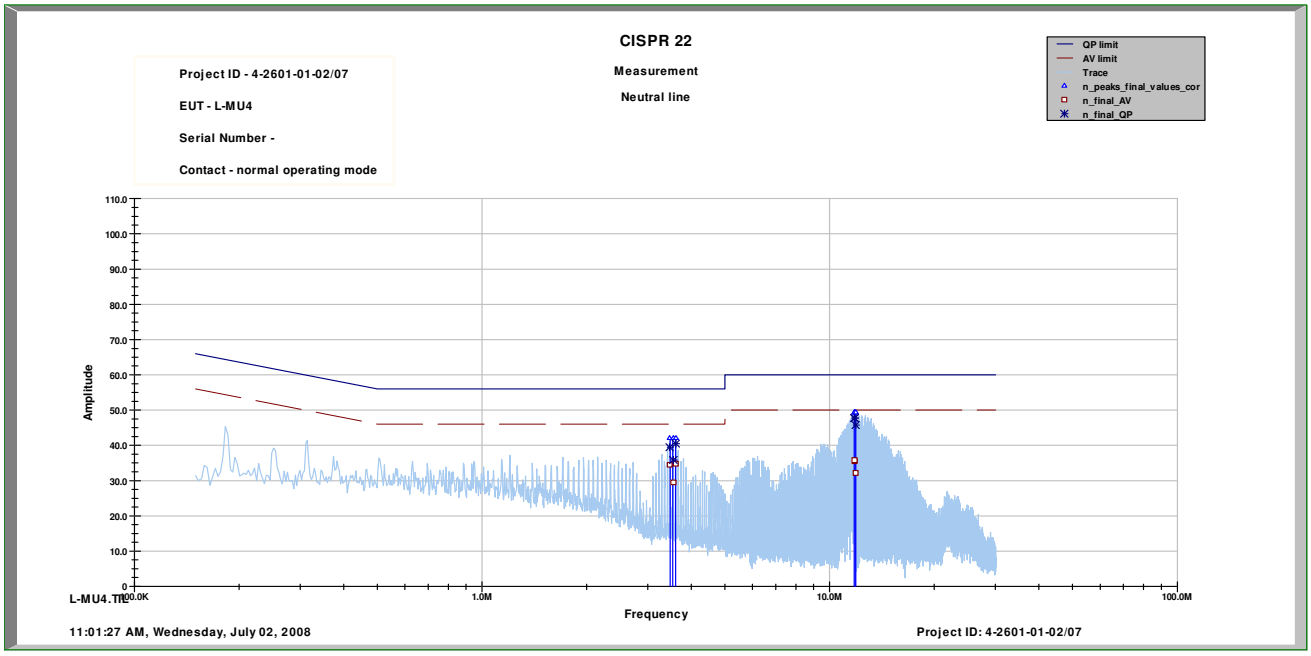
Results:

| Frequency | Quasi Peak (dBµV/m) | Margin QP (dBµV/m) | Avergae (dBµV/m) | Margin AV (dBµV/m) |
|---|---|---|---|---|
| Phase Line | | | | |
| 191.790 kHz | 43.6 | -21.2 | 35.1 | -19.7 |
| 257.460 kHz | 42.5 | -20.4 | 33.1 | -19.8 |
| 648.495 kHz | 32.0 | -24.0 | 28.3 | -17.7 |
| | | | | |
| Neutral Line | | | | |
| 193.790 kHz | 42.9 | -20.9 | 35.4 | -19.4 |
| 3.120 MHz | 15.5 | -40.5 | 12.3 | -33.7 |
| 3.245 MHz | 15.2 | -40.8 | 12.1 | -33.9 |
| | | | | |
| | | | | |

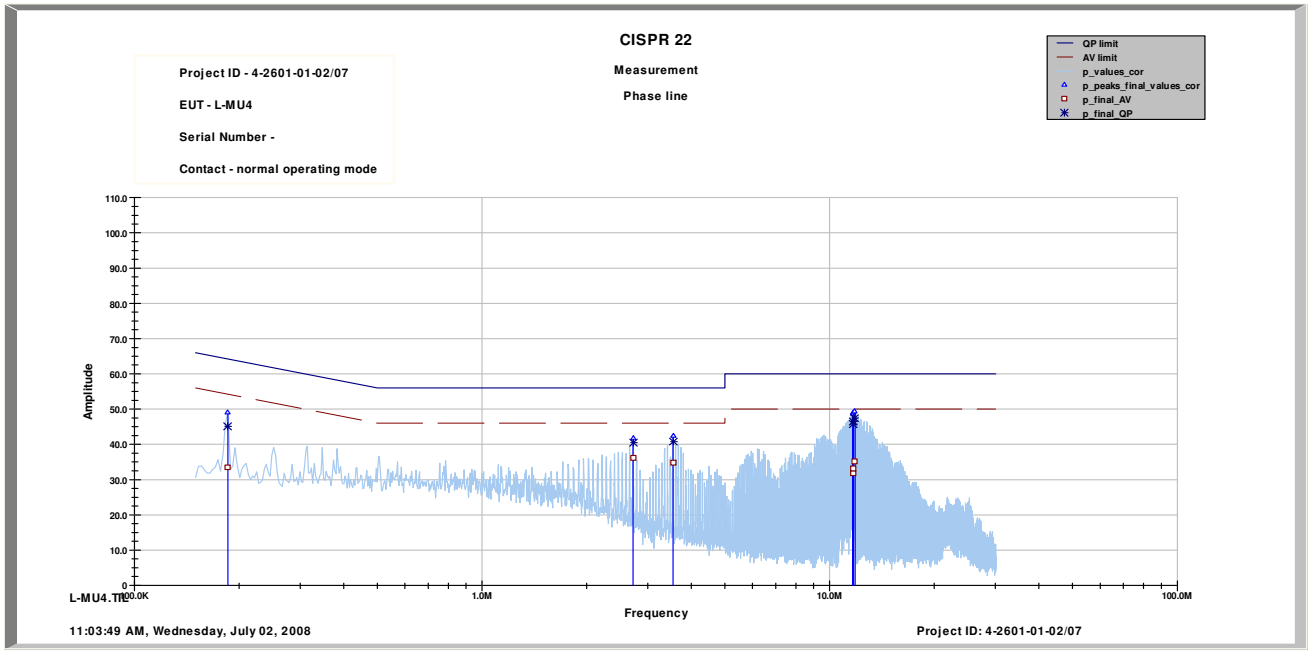
Limits :

| | |
|---|---|
| Under normal test conditions only | 0.15 to 0.5 MHz, 66-56 dbµV QP, 56-46 dBµV AV<br>0.5 to 5.0 MHz, 56 dBµV QP, 46 dBµV AV<br>5.0 to 30 MHz, 60 dBµV QP, 50 dBµV AV |

**L-MU4**
Neutral Line



Phase Line




We measured L1 and N floating and grounded, max value was hold.

Results:

| Frequency | Quasi Peak (dBµV/m) | Margin QP (dBµV/m) | Avergae (dBµV/m) | Margin AV (dBµV/m) |
|---|---|---|---|---|
| Phase Line | | | | |
| 185.82 KHz | 45.239 | -19.738 | 33.609 | -21.368 |
| 2.7201 MHz | 40.414 | -15.586 | 35.978 | -10.022 |
| 3.541 MHz | 40.876 | -15.124 | 34.857 | -11.143 |
| 11.642 MHz | 45.905 | -14.095 | 31.821 | -18.179 |
| 11.705 MHz | 46.309 | -13.691 | 33.304 | -16.696 |
| 11.83 MHz | 47.281 | -12.719 | 35.162 | -14.838 |
| Neutral Line | | | | |
| 3.4783 MHz | 39.601 | -16.399 | 34.314 | -11.686 |
| 3.538 MHz | 35.762 | -20.238 | 29.635 | -16.365 |
| 3.6066 MHz | 40.461 | -15.539 | 34.722 | -11.278 |
| 11.768 MHz | 47.863 | -12.137 | 35.345 | -14.655 |
| 11.827 MHz | 47.741 | -12.259 | 35.813 | -14.187 |
| 11.896 MHz | 45.865 | -14.135 | 32.042 | -17.958 |

Limits :

| | |
|---|---|
| Under normal test conditions only | 0.15 to 0.5 MHz, 66-56 dbµV QP, 56-46 dBµV AV<br>0.5 to 5.0 MHz, 56 dBµV QP, 46 dBµV AV<br>5.0 to 30 MHz, 60 dBµV QP, 50 dBµV AV |

# 4 Used Test Equipment

To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

All reported calibration intervals are calibrations according to the EN/ISO/IEC 17025 standard. These calibrations were performed from an accredited external calibration laboratory. Additional to these calibrations the laboratory performed comparison measurements with other calibrated systems and performed a weekly chamber inspection.
All used devices are connected with a 10 MHz external reference. According to the manufacturers' instruction is it possible to establish a calibration interval for the FSP unit of 24 month, if the device has an external 10 MHz reference.

***Anechoic chamber C:***

| No | Equipment/Type | Manuf. | Serial Nr. | Inv. No. Cetecom | Last Calibration | Frequency (months) | Next Calibration |
|---|---|---|---|---|---|---|---|
| 1 | Anechoic chamber | MWB | 87400/02 | 300000996 | Monthly verification | | |
| 2 | System-Rack 85900 | HP I.V. | * | 300000222 | n.a. | | |
| 3 | Measurement System 1 | | | | | | |
| 4 | Spektrum Analyzer 8566B | HP | 3138A07614 | 300001207 | 13.12.2007 | 24 | 13.12.2009 |
| 5 | Spektrum Analyzer Display 85662A | HP | 3144A28627 | 300001208 | 13.12.2007 | 24 | 13.12.2009 |
| 6 | Quasi-Peak-Adapter 85650A | HP | 2811A01204 | 300002308 | 13.12.2007 | 24 | 13.12.2009 |
| 7 | RF-Preselector 85685A | HP | 2837A00778 | 300002448 | 13.12.2007 | 24 | 13.12.2009 |
| 8 | PC Vectra VL | HP | | 300001688 | n.a. | | |
| 9 | Software EMI | HP | | 300000983 | n.a. | | |
| 10 | Measurement System 2 | | | | | | |
| 11 | FSP 30 | R&S | 100886 | 300003575 | 25.08.2008 | 24 | 25.08.2010 |
| 12 | PC | F+W | | | n.a. | | |
| 13 | TILE | TILE | | | n.a. | | |
| 14 | Biconical antenna | EMCO | S/N: 860 942/003 | | Monthly verification (System cal.) | | |
| 15 | Log. Period. Antenna 3146 | EMCO | 2130 | 300001603 | Monthly verification (System cal.) | | |
| 16 | Double Ridged Antenna HP 3115P | EMCO | 3088 | 300001032 | Monthly verification (System cal.) | | |
| 17 | Active Loop Antenna 6502 | EMCO | 2210 | 300001015 | Monthly verification (System cal.) | | |
| 18 | Power Supply 6032A | HP | 2818A03450 | 300001040 | 12.05.2007 | 36 | 12.05.2010 |
| 19 | Busisolator | Kontron | | 300001056 | n.a. | | |
| 20 | Leitungsteiler 11850C | HP | | 300000997 | Monthly verification (System cal.) | | |
| 21 | Power attenuator 8325 | Byrd | 1530 | 300001595 | Monthly verification (System cal.) | | |
| 22 | Band reject filter WRCG1855/1910 | Wainwright | 7 | 300003350 | Monthly verification (System cal.) | | |
| 23 | Band reject filter WRCG2400/2483 | Wainwright | 11 | 300003351 | Monthly verification (System cal.) | | |

***Signalling Units:***

| No | Equipment/Type | Manuf. | Serial Nr. | Inv. No. Cetecom | Last Calibration | Frequency (months) | Next Calibration |
|---|---|---|---|---|---|---|---|
| 1 | CBT | R&S | 100313 | 300003516 | 03.09.2008 | 24 | 03.09.2010 |
| 2 | CBT | R&S | 100185 | 300003416 | 27.08.2008 | 24 | 27.08.2010 |
| 3 | CMU-200 | R&S | 103992 | 300003231 | 04.06.2008 | 12 | 04.06.2009 |
| 4 | CMU-200 | R&S | 106240 | 300003321 | 27.08.2008 | 24 | 27.08.2010 |
| 5 | CMU-200 | R&S | 832221/0055 | 300002862 | 20.03.2008 | 24 | 20.03.2010 |

***Climatic Box:***

| No | Equipment/Type | Manuf. | Serial Nr. | Inv. No. Cetecom | Last Calibration | Frequency (months) | Next Calibration |
|---|---|---|---|---|---|---|---|
| 1 | Climatic box VT 4002 | Heraeus Vötsch | 58566046820010 | 300003019 | 11.05.2007 | 24 | 11.05.2009 |
| 2 | Climatic box CTS T-40/50 | CTS | 064023 | 300003540 | 03.01.2007 | 24 | 03.01.2009 |

***SRD Laboratory Room 002:***

| No | Equipment/Type | Manuf. | Serial Nr. | Inv. No. Cetecom | Last Calibration | Frequency (months) | Next Calibration |
|---|---|---|---|---|---|---|---|
| 1 | System Controller PSM 12 | R&S | 835259/007 | 3000002681-00xx | n.a. | | |
| 2 | Memory Extension PSM-K10 | R&S | To 1 | 3000002681 | n.a. | | |
| 3 | Operating Software PSM-B2 | R&S | To 1 | 3000002681 | n.a. | | |
| 4 | 19'' Monitor | | 22759020-ED | 3000002681 | n.a. | | |
| 5 | Mouse | | LZE 0095/6639 | 3000002681 | n.a. | | |
| 6 | Keyboard | | G00013834L461 | 3000002681 | n.a. | | |
| 7 | Spectrum Analyser FSIQ 26 | R&S | 835540/018 | 3000002681-0005 | 10.01.2008 | 24 | 10.01.2010 |
| 8 | Tracking Generator FSIQ-B10 | R&S | 835107/015 | 3000002681 | s.No.7 | | |
| 10 | RF-Generator SMIQ03 (B1 Signal) | R&S | 835541/056 | 3000002681-0002 | 26.08.2008 | 36 | 26.08.2011 |
| 11 | Modulation Coder SMIQ-B20 | R&S | To 10 | 3000002681 | s.No.10 | | |
| 12 | Data Generator SMIQ-B11 | R&S | To 10 | 3000002681 | s.No.10 | | |
| 13 | RF Rear Connection SMIQ-B19 | R&S | To 10 | 3000002681 | s.No.10 | | |
| 14 | Broadband horn antenna (1-18 GHz) | EMCO | 9107-3696 | 300001604 | 16.04.2008 | 24 | 16.04.2010 |
| 15 | Broadband horn antenna (1-18 GHz) | EMCO | 9107-3697 | 300001605 | 21.08.2008 | 24 | 21.08.2010 |
| 16 | Std gain horn antenna (18-26.5 GHz) | Narda | Model no. 638 | 3000000486 | n.a. | | |
| 17 | Std gain horn antenna (18-26.5 GHz) | Narda | Model no. 638 | 3000000487 | n.a. | | |
| 18 | Sleeve dipole antenna Model 3126-880 | ETS-Lindgren | 00040887 | 3000000 | n.a. | | |
| 19 | Fast CPU SM-B50 | R&S | To 10 | 3000002681 | s.No.10 | | |
| 20 | FM Modulator SM-B5 | R&S | 835676/033 | 3000002681 | s.No.10 | | |
| 21 | RF-Generator SMIQ03 (B2 Signal) | R&S | 835541/055 | 3000002681-0001 | 25.08.2008 | 36 | 25.08.2011 |
| 22 | Modulation Coder SMIQ-B20 | R&S | To 16 | 3000002681 | s.No.16 | | |
| 23 | Data Generator SMIQ-B11 | R&S | To 16 | 3000002681 | s.No.16 | | |
| 24 | RF Rear Connection SMIQ-B19 | R&S | To 16 | 3000002681 | s.No.16 | | |
| 25 | Fast CPU SM-B50 | R&S | To 16 | 3000002681 | s.No.16 | | |
| 26 | FM Modulator SM-B5 | R&S | 836061/022 | 3000002681 | s.No.16 | | |
| 27 | RF-Generator SMP03 (B3 Signal) | R&S | 835133/011 | 3000002681-0003 | 26.08.2008 | 36 | 26.08.2011 |
| 28 | Attenuator SMP-B15 | R&S | 835136/014 | 3000002681 | S.No.22 | | |
| 29 | RF Rear Connection SMP-B19 | R&S | 834745/007 | 3000002681 | S.No.22 | | |
| 30 | Power Meter NRVD | R&S | 835430/044 | 3000002681-0004 | 26.08.2008 | 24 | 26.08.2010 |
| 31 | Power Sensor NRVD-Z1 | R&S | 833894/012 | 3000002681-0013 | 26.08.2008 | 24 | 26.08.2010 |
| 32 | Power Sensor NRVD-Z1 | R&S | 833894/011 | 3000002681-0010 | 26.08.2008 | 24 | 26.08.2010 |
| 33 | Rubidium Standard RUB | R&S | | 3000002681-0009 | 27.08.2008 | 24 | 27.08.2010 |
| 34 | Switching and Signal Conditioning Unit SSCU | R&S | 338864/003 | 3000002681-0006 | Verified with path compensation | | |
| 35 | Laser Printer HP Deskjet 2100 | HP | N/A | 3000002681-0011 | n.a. | | |
| 36 | 19'' Rack | R&S | 11138363000004 | 3000002681 | n.a. | | |
| 37 | RF-cable set | R&S | N/A | 3000002681 | n.a. | | |
| 39 | IEEE-cables | R&S | N/A | 3000002681 | n.a. | | |
| 40 | Sampling System FSIQ-B70 | R&S | 835355/009 | 3000002681 | s.No.7 | | |
| 41 | RSP programmable attenuator | R&S | 834500/010 | 3000002681-0007 | 26.08.2008 | 24 | 26.08.2010 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 42 | Signalling Unit | R&S | 838312/011 | 3000002681 | n.a. | | |
| 43 | NGPE programmable Power Supply for EUT | R&S | 192.033.41 | 3000002681 | | | |
| 44 | Power Splitter 6005-3 | Inmet Corp. | none | 300002841 | 23.12.2006 | 24 | 23.12.2008 |
| 45 | SMA Cables SPS-1151-985-SPS | Insulated Wire | different | different | n.a. | | |
| 46 | CBT32 with EDR Signaling Unit | R&S | | | | | |
| 47 | Coupling unit | Narda | N/A | -- | n.a. | | |
| 48 | 2xSwitch Matrix PSU | R&S | 872584/021 | 300001329 | n.a. | | |
| 49 | RF-cable set | R&S | N/A | different | n.a. | | |
| 50 | IEEE-cables | R&S | N/A | -- | n.a. | | |

Note: 3000002681-00xx inventoried as a system

***Anechoic chamber F:***

| No | Equipment/Type | Manuf. | Serial Nr. | Inv. No. Cetecom | Last Calibration | Frequency (months) | Next Calibration |
|---|---|---|---|---|---|---|---|
| 1 | Control Computer | F+W | FW0502032 | 300003303 | -/- | -/- | -/- |
| 2 | Trilog Antenna | 9163-295 | -/- | -/- | 30.04.2008 | 24 | 30.04.2010 |
| 3 | Amplifier - 0518C-138 | Veritech Micro-wave Inc. | -/- | -/- | -/- | -/- | -/- |
| 4 | Switch - 3488A | HP | | 300000368 | -/- | -/- | -/- |
| 5 | EMI Test receiver - ESCI | R&S | 100083 | 300003312 | 31.01.2007 | 24 | 31.01.2009 |
| 6 | Turntable Controller - 1061 3M | EMCO | 1218 | 300000661 | -/- | -/- | -/- |
| 7 | Tower Controller 1051 Controller | EMCO | 1262 | 300000625 | -/- | -/- | -/- |
| 8 | Tower - 1051 | EMCO | 1262 | 300000625 | -/- | -/- | -/- |
| 10 | Ultra Notch-Filter Rejected band Ch. 62 | WRCD | **9** | **-/-** | **-/-** | **-/-** | **-/-** |

# 5 Photographs of Test Set-up

Photo 1: Radiated Emissions

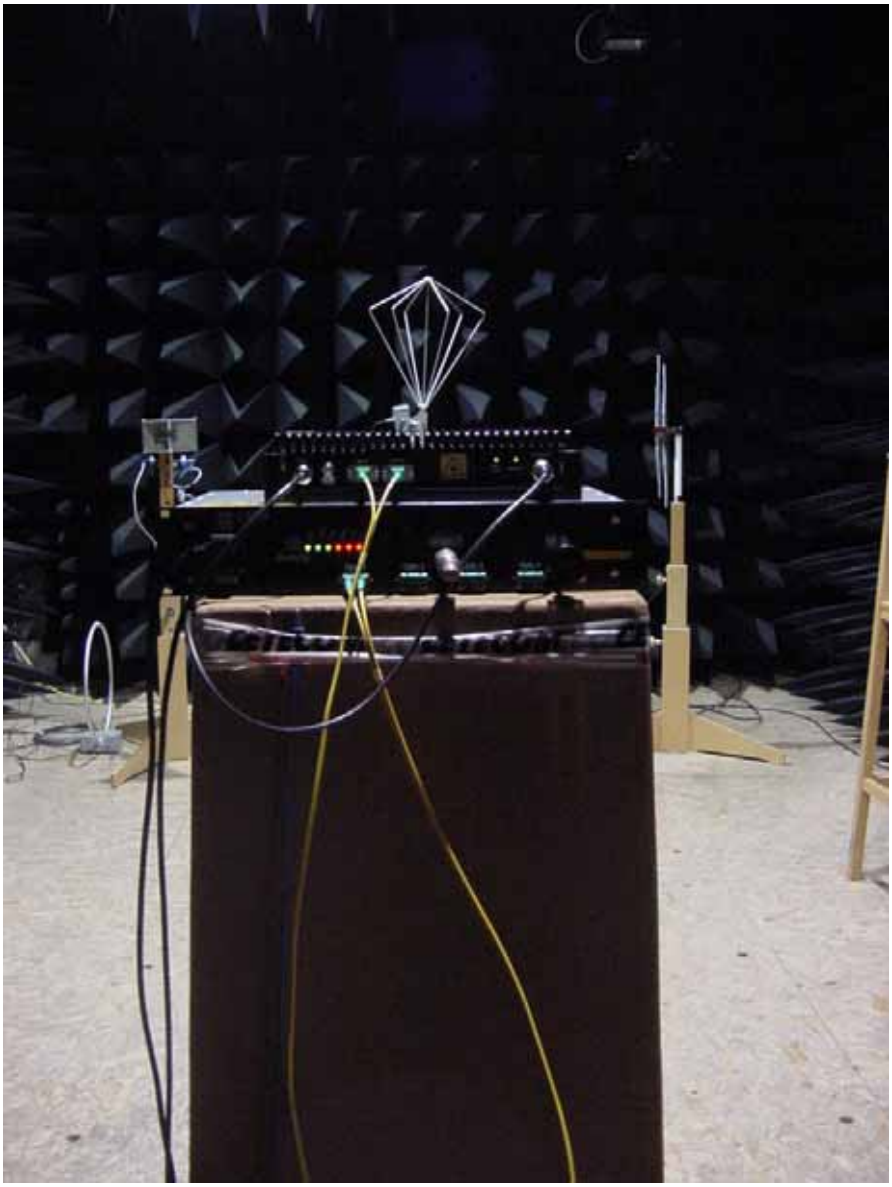


Photo 2: Radiated Emissions

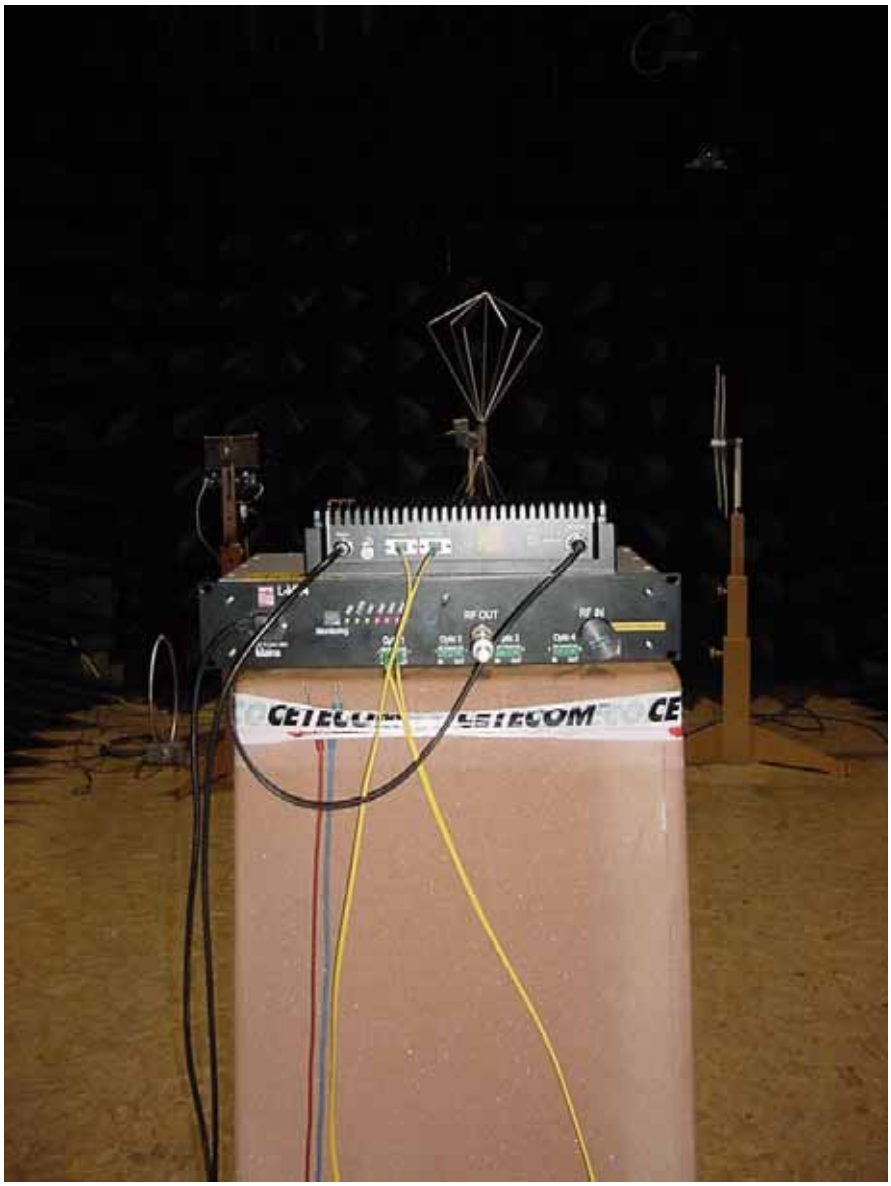


Photo 3: Conducted Emissions L-MU

Photo 3: Conducted Emissions L-RU

# 6 Photographs of EUT

**L-MU**
Photo 1:

Photograph No.: 2

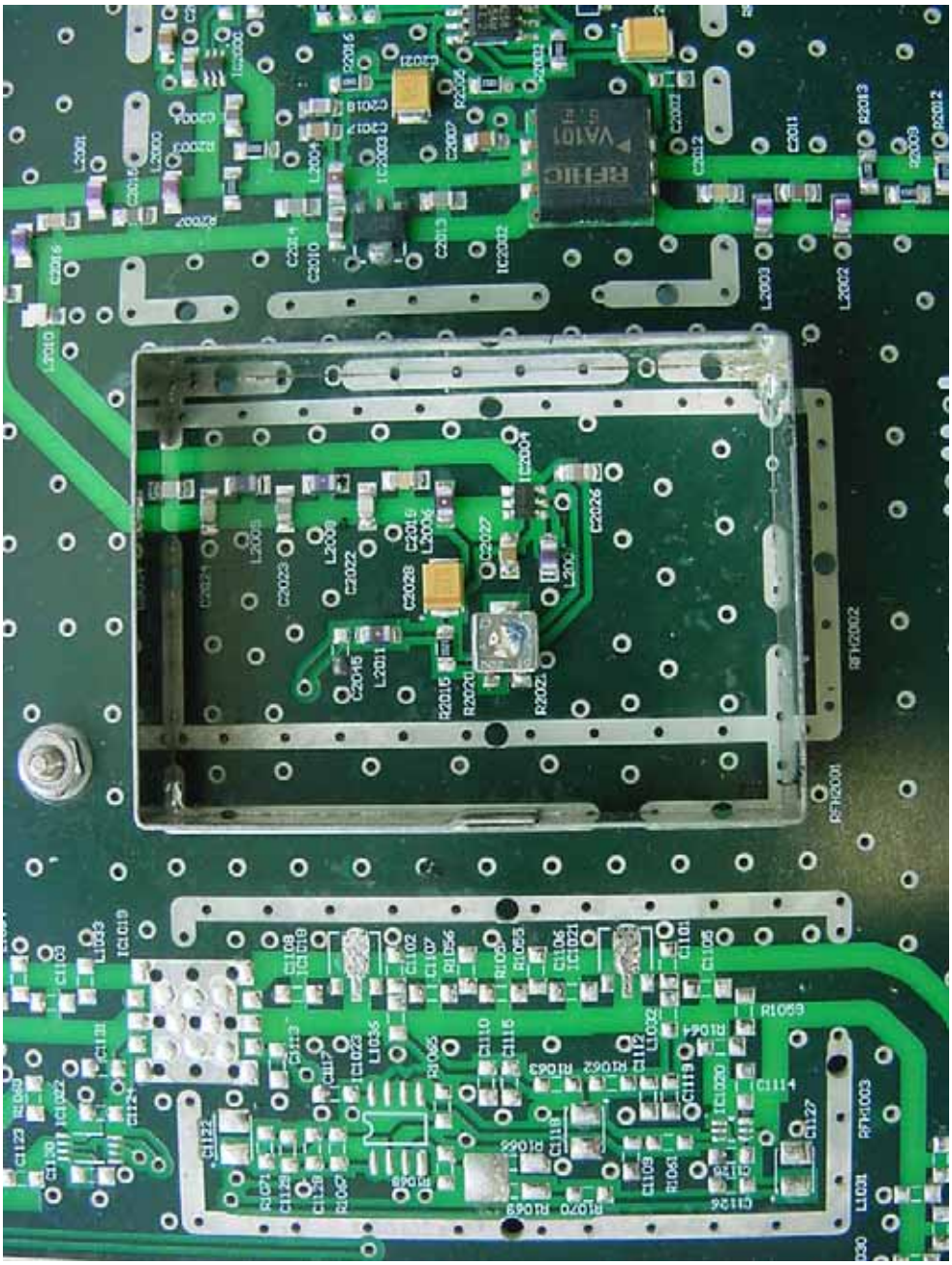
Photograph No.: 3

Photograph No.: 4 L-MU4

Photograph No.: 5

Photograph No.: 6 L-MU2

Photograph No.: 7



Photograph No.: 8 L-MU1

L-RU700-2

Photo 1:

Photo 2:


L-RU700-2
FCC Grantee code: XXXL-RU700-2
115 - 240 V 0.5A 50/60HZ 50 W MAX
Ser.-No.:080400201 Manufactured: 2008-04-14
Part.-No.:16501016
RFS

Photo 3:

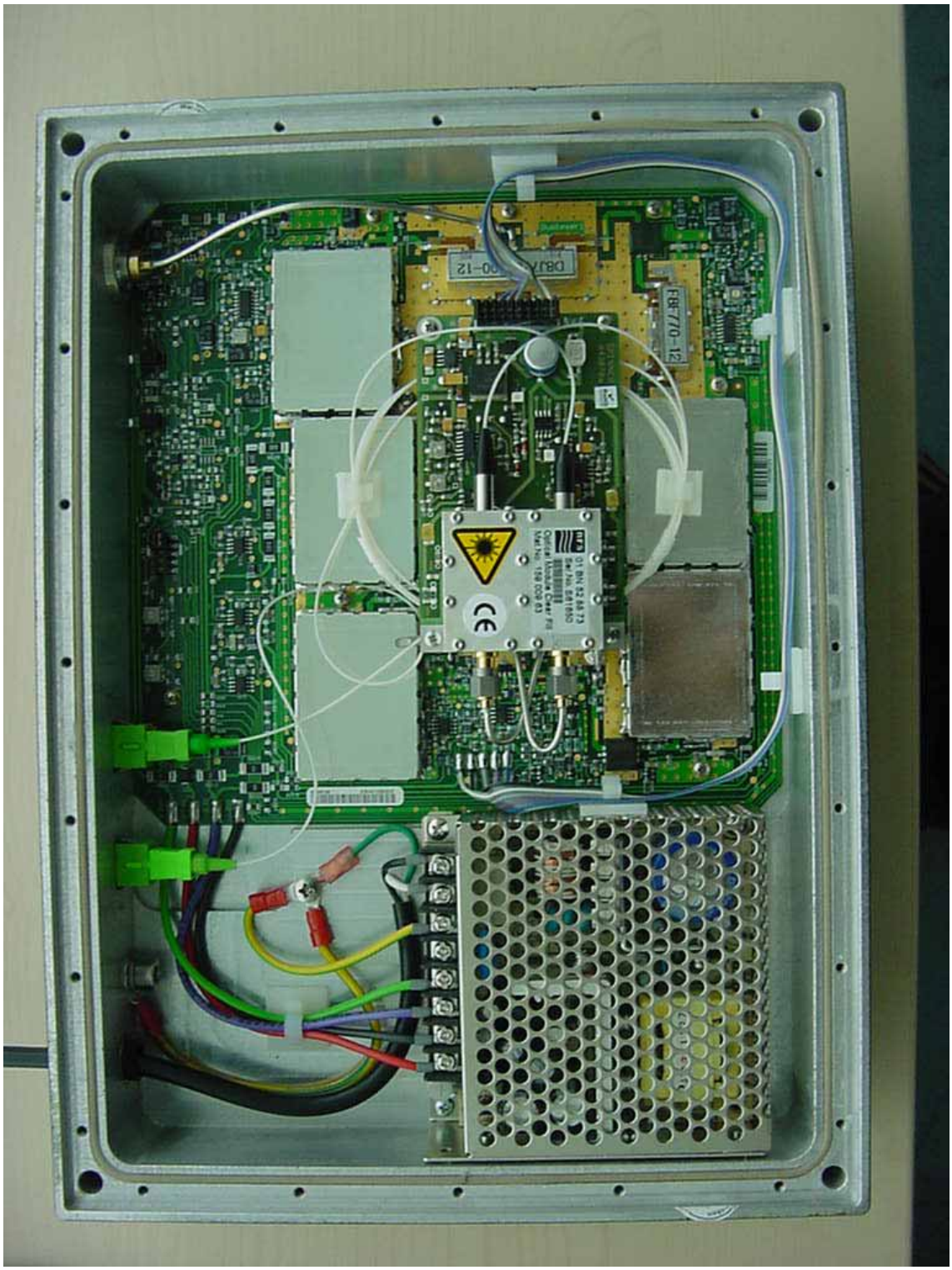


Photo 4:

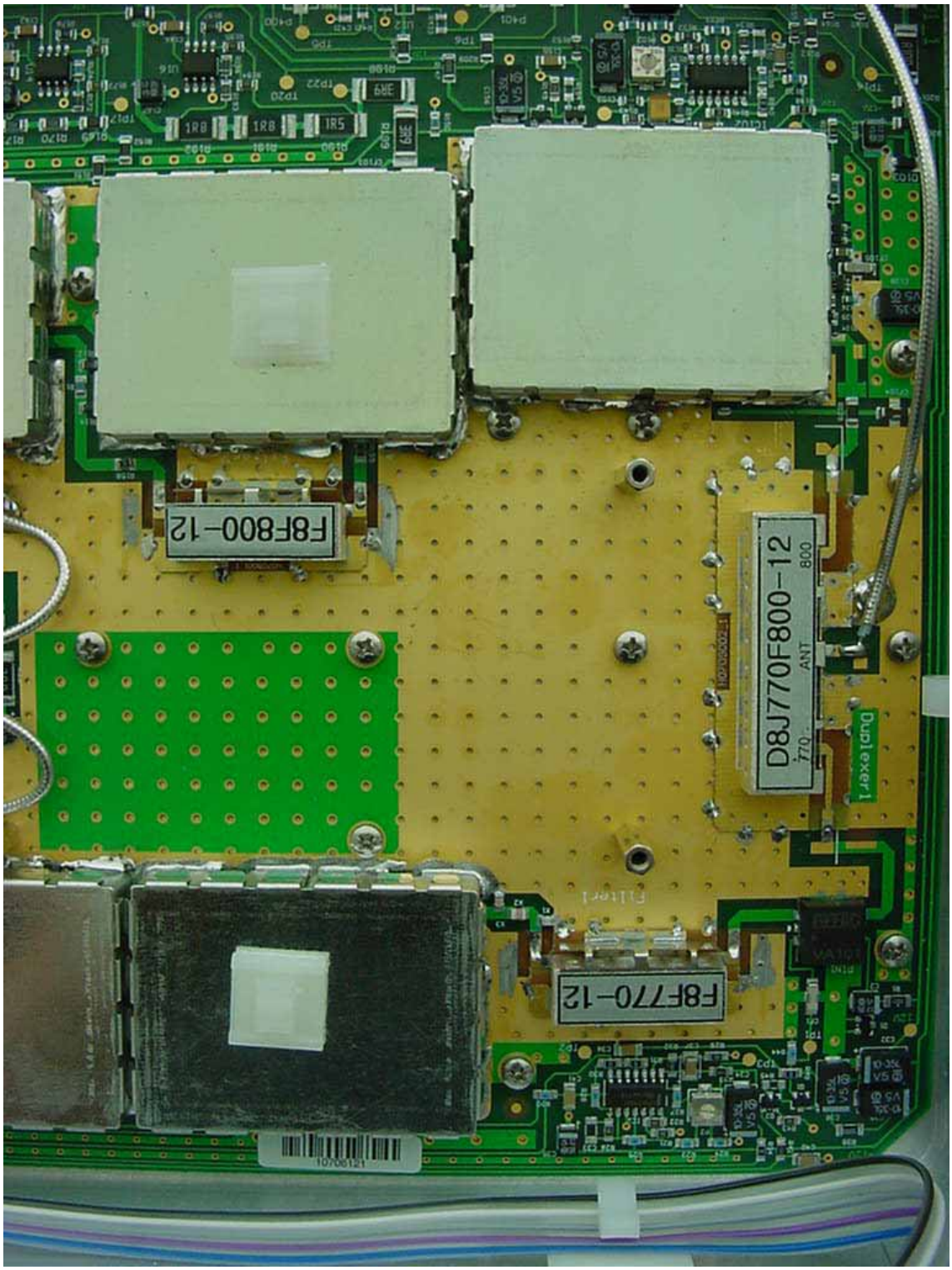


Photo 5:

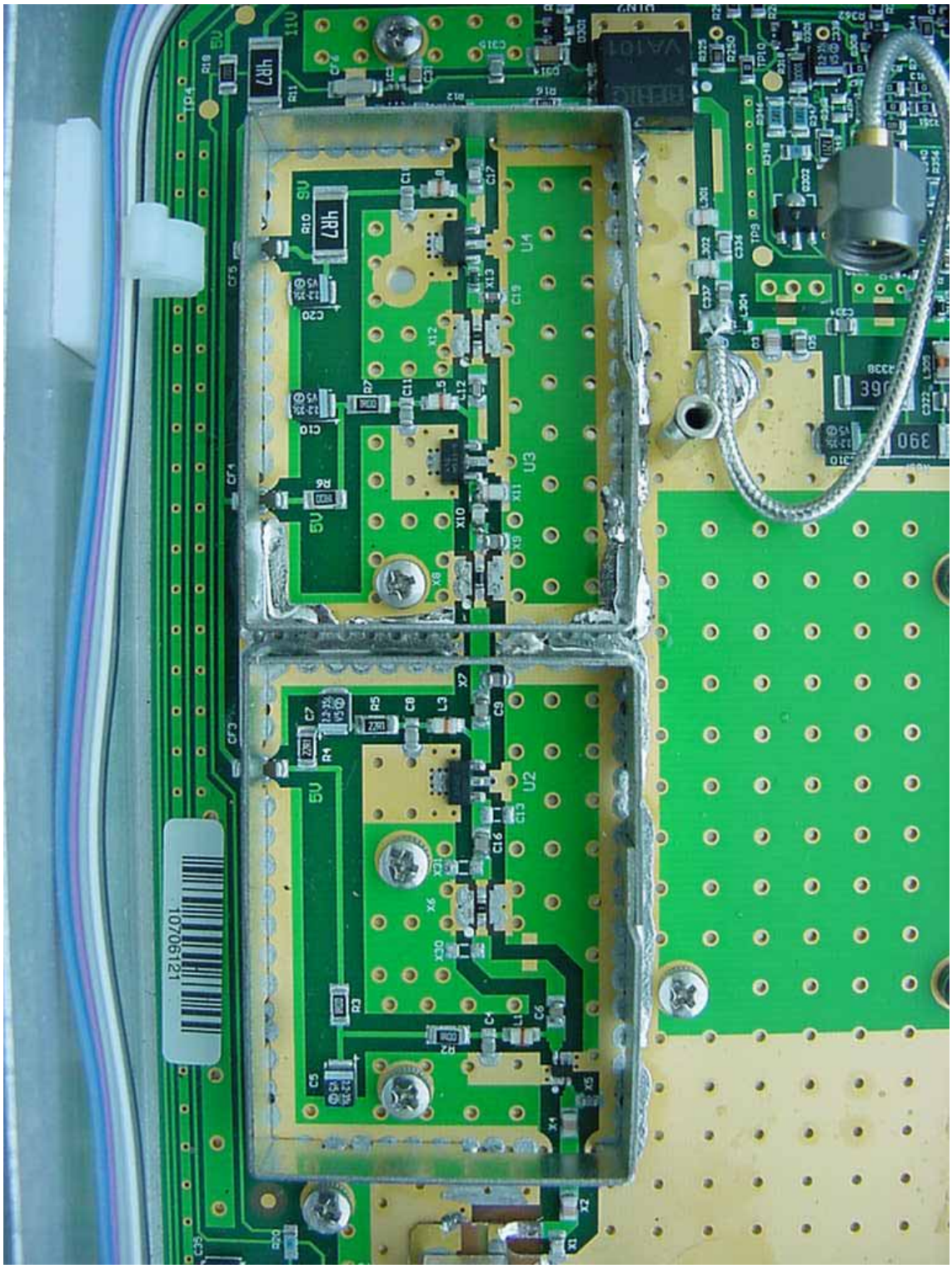


Photo 6: