

**FCC CLASS II PERMISSIVE CHANGE  
TEST REPORT OF 2.4 GHz RADIOLAN  
TRANSCIVERS, BRAND NO WIRES NEEDED  
IN CONFORMITY WITH  
FCC PART 15 AND ANSI C63.4-1992;  
-MODEL WB-S1100; WIRELESS BRIDGE SERVER,  
-MODEL WB-C1100; WIRELESS BRIDGE CLIENT**

FCC report layout endorsed by the FCC by Public  
Notice of March 11, 1992.

|                       |   |  |
|-----------------------|---|--|
| Accredited by         | : | STERLAB accreditation number L029<br>D.A.R., TTI-P-G.127/96-00                   |
| Competent body        | : | Article 10-2 EMC Directive   |
| Notified body         | : | Article 10-5 EMC Directive<br>Low Voltage Directive<br>Number 0122 TTE Directive |
| Designated laboratory | : | TTE Directive  |
| Notified test service | : | Automotive Directive   |
| FCC listed            | : | 31040/SIT  |
| VCCI listed           | : | R 592 and C 507  |
| Certification body    | : | Electrical Products Safety<br>Regulation Hong Kong                               |

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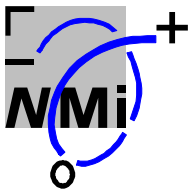
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FCC CLASS II PERMISSIVE CHANGE
MEASUREMENT / TECHNICAL REPORT

NoWiresNeeded B.V.

Model Numbers : WB-S1100, WB-C1100

FCC ID: OGD 10310308

March 27, 2001

Table with 3 columns: This report concerns (check one), Original grant, Class II change. Rows include: Equipment type: Direct Sequence Spread Spectrum Transceiver; Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes no; Transition Rules Request per 15.37 yes no; Report prepared by: Name: O.H. Hoekstra, Company name: NMI Certin B.V., Address: Smidshornerweg 18, Telephone number: + 31-59450-50 05, Telefax number: + 31-59450-48 04, Mailing address: P.O. Box 15, City/Place/Postal code: 9822 ZG NIEKERK, Country: The Netherlands.

The data taken for this test and report herein was done in accordance with FCC Part 15 and measurement Procedures of ANSI C63.4-1992.. NMI Certin B.V. at Niekerk, The Netherlands, certifies that the data is accurate and contains a true representation of the emission-profile of the Equipment Under Test (EUT) on the date of the test noted in the test report. I have reviewed the test report and find it to be an accurate description of the test(s) performed and the EUT so tested.

Date: March 27, 2001

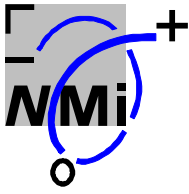
Signature: P. de Beer



Department EMC and Telecommunication

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# 1 General

## 1.1 Permissive change request

This test report is issued in support of the Class II Permissive Change request for NoWiresNeeded models WB-S1100 and WB-C1100 RLAN Transceivers. This report addendum will add three new antennas to the current FCC grant. For this purpose the Radiated emission test were repeated for each antenna configuration to demonstrate continued compliance.

The following antennas are to be added:

| Model number    | Gain, description  |
|-----------------|--|
| Turbowave QUAD3 | 3dBi, circular polarization, Quadrifilar Helix Antenna                 |
| Turbowave SLH10 | 10dBi, circular polarization, Patented Stub Loaded Helix Smart Antenna |
| Turbowave SLH12 | 12dBi, circular polarization, Stub Loaded Helix Antenna with Reflector |

These antennas can only be connected to the Transceiver by means of non-standard antenna connector.

## 1.2 Tested system Details

The FCC ID's for all equipment, plus descriptions of all cables used in the tested system (included inserted cards, which have Grants) are:

| Model                             | Serial #       | FCC ID       | Description                         | Cable Descriptions  |
|-----------------------------------|----------------|--------------|-------------------------------------|---|
| <b>EUT:</b><br>WB-S1100           | -              | OGD 10310308 | 2.4 GHz RLAN Wireless Bridge Server | - unshielded connection with adapter  |
| Fujitsu Lifebook 780 Tx laptop PC | S/N R8600528   | n.a.         | Laptop PC                           | - unshielded power cord to adapter  |
| Sunpower MA 15-090                | n.a.           | n.a.         | AC Mains Adapter for WB-S1100       | - permanently attached unshielded power cord to WB-S1100<br>- * direct connection to AC Mains     |
| HP Deskjet 500                    | 3228S37407     | B94C2106X    | Printer                             | - printer cable to Laptop PC<br>- power cord to adapter   |
| 3CCFE574BT,                       | S/N HHL19C1ACA | -            | Ethernet PC card (10/100mbps)       | - Cross UTP cable connected to LAN PC Card<br>- Cross UTP connection to EUT with unshielded cable |
| Microsoft Mouse                   | n.a.           | C3K7PN9937   | Mouse                               | - mouse cable to laptop PC  |

### 1.3 Test methodology

The test methodology used has been based on the requirements of FCC Part 15 (10-1-97 Edition), relevant clauses 15.109, 15.203, 15.205, 15.207, 15.209 and 15.247. The used measuring methods are based on the ANSI C63.4-1992 document. Radiated tests above 30 MHz were performed at a distance of 3 meter. Below 30 MHz the measurement was carried out on a distance of 10 meter. The eventual found results will be calculated to values for the required measuring distance of 30/300 meter. Field strength measurements on frequencies above 1 GHz were measured with appropriate pre-amplifiers, antennas and a spectrum analyzer. On found frequencies the actual level at the input of the pre-amplifier was generated with the aid of a signal generator. The output level of the signal generator was increased with the antenna-factor to obtain the field strength.

### 1.4 Test Facility

The FCC has per Public Notice declared that the measurement facilities located at the NMI Certin B.V. Testsite Niekerk, Smidshornerweg 18, The Netherlands, has been reviewed and found to be in compliance with the requirements of section 2.948 (previously section 15.38) of the FCC rules per August 2, 1994.

The description of the measuring facilities have been filed with reference 31040/SIT, 1300B3 at the FCC's Offices.

### 1.5 List of measurement equipment.

| NMI number | Description                        | Brand    | Type           |
|------------|------------------------------------|----------|----------------|
| 12471      | Biconical antenna 20MHz-200MHz     | EATON    | 94455-1        |
| 12473      | Log-per antenna 200-1000MHz        | EATON    | 96005          |
| 12475      | Loop antenna                       | EMCO     | 6502/2         |
| 12476      | Antenna mast                       | EMCO     | TR3            |
| 12477      | Antenna mast 1-4 mtr               | Poelstra | --             |
| 12478      | Control unit / portable turn table | NMI      | DFO            |
| 12483      | Guidehorn                          | EMCO     | 3115           |
| 12484      | Guidehorn                          | EMCO     | 3115           |
| 12486      | Spectrum analyzer                  | Anritsu  | MS2601A        |
| 12488      | Guidehorn 18-26.5 GHz              | EMCO     | RA42-K-F-4B-C  |
| 12491      | Measuring receiver 0.01Mhz-30MHz   | R&S      | ESH3           |
| 12492      | Measuring receiver 20MHz-1300MHz   | R&S      | ESVP-          |
| 12493      | EZM Spectrum Monitor               | R&S      | EZM            |
| 12494      | Measuring receiver 20MHz-1000 MHz  | R&S      | ESV-           |
| 12497      | Spectrum analyzer                  | HP       | 8592A          |
| 12498      | Rejectfilter                       | K&L      | 3TNF-100/200-N |
| 12499      | Rejectfilter                       | K&L      | 3TNF-50/100-N  |
| 12500      | Rejectfilter                       | K&L      | 3TNF-250/500-N |
| 12501      | Rejectfilter                       | K&L      | 3TNF-25/50-N   |
| 12507      | Artificial mains network 3-phase   | R&S      | ESH2-Z5        |
| 12516      | Signalgenerator 100kHz-1000MHz     | R&S      | SMX            |
| 12519      | RF amplifier                       | ENI      | 603L           |
| 12524      | Signalgenerator                    | R&S      | SMHU           |
| 12525      | POCSAG generator                   | NMI      | SMF-3          |
| 12527      | Signalgenerator 100kHz-1000 MHz    | R&S      | SMG            |
| 12528      | ERMES generator                    | NMI      | --             |

|       |                                     |                 |                 |
|-------|-------------------------------------|-----------------|-----------------|
| 12533 | Signalgenerator                     | MARCONI         | 2032            |
| 12538 | Attenuator 100W/20dB                | Bird electronic | 8340-200        |
| 12545 | Directional coupler                 | HP              | HP778D          |
| 12546 | Measuring cable to plateau          | --              | RG 213          |
| 12548 | Meas.cable 2 metre, color:green     | Radiall         | R287571005      |
| 12549 | Oscilloscope 20 MHz                 | KENWOOD         | CS-8010         |
| 12553 | Communication Analyzer              | R&S             | CMTA 84         |
| 12558 | Communication Analyzer              | R&S             | CMTA 54         |
| 12559 | Digital storage oscilloscope        | Le Croy         | 9310M           |
| 12560 | DC Power Supply 20A/60V             | DELTA           | SM6020          |
| 12561 | DC Power Supply 20A/70V             | DELTA           | SM7020D         |
| 12567 | Plotter                             | HP              | 7440A           |
| 12605 | calibrated dipole 28MHz-1GHz        | Emco            | 3121c           |
| 12607 | Calibrated attenuator set           | HP              | HP11581a        |
| 12608 | HF milliwattmeter                   | HP              | HP435a          |
| 12609 | Power sensor 10MHz-18GHz            | HP              | HP8481A         |
| 12620 | Spectrum analyzer                   | Advantest       | R4131B          |
| 12635 | Measurement platform                | WOLFF           | --              |
| 12636 | Plastic measurement room            | Polyforce       | --              |
| 12640 | Temperature chamber                 | Heraeus         | VEM03/500       |
| 13078 | Wideband Pre-Amplifier (1GHz-5GHz)  | Miteq           | AMF3D0100503010 |
| 13313 | Impuls limiter                      | R&S             | ESH3Z2.357...   |
| 13452 | Digital multi meter                 | HP              | 34401A          |
| 13664 | Spectrum analyzer                   | HP              | HP8593E         |
| 13886 | Open Area Test Site                 | Comtest         | --              |
| 14051 | Anechoic room                       | Comtest         | --              |
| 14277 | Antennamast 4m                      | Heinrich Deisel | HD100           |
| 14278 | Controller OATS                     | Heinrich Deisel | MA240           |
| 14340 | Biconilog antenna 20MHz - 1100MHz   | EMCO            | 3143            |
| 14351 | Biconilog                           | EMCO            | 9143            |
| 14450 | 2.4 GHz bandrejectfilter            | BSc             | xn-1783         |
| 14987 | Stripline cell                      | Marconi         | TC5010          |
| 15232 | Tektronics storage scope            | Tektronics      | --              |
| 15453 | Magnetic loop                       | Chase           | --              |
| 15633 | Biconilog Testantenna               | Chase           | CBL 6111B       |
| 15667 | Measuring receiver 9kHz - 2750MHz   | R&S             | ESCS30          |
| 99012 | ITU-R recomm. 559-2 noise generator | NMI             | --              |
| 99040 | Attenuator 25W/20dB                 | Bird electronic | 8340-200        |
| 99041 | Attenuator 25W/10dB                 | BIRD            | 8340-100        |
| 99042 | Attenuator 10W/3dB                  | Bird electronic | 8304-030-N      |
| 99043 | Attenuator 25W/20dB                 | Bird electronic | 8340-200        |
| 99044 | Attenuator 10W/3dB                  | Bird electronic | 8304-030-N      |
| 99045 | DC Power Supply 3A/30V              | DELTA           | E030/3          |
| 99046 | Fluke Multimeter                    | John Fluke      | 12              |
| 99050 | Wideband Pre-Amplifier (5GHz-10GHz) | Miteq           | AMF3D0501004010 |
| 99055 | Non-conducting support              | NMI             | --              |
| 99056 | Isolating transformer 1:1           | NMI             | --              |
| 99061 | Non-conducting support 150cm        | NMI             | --              |
| 99068 | Detector N-F/BNC-F                  | Radiall         | R451576000      |
| 99069 | Cable 5m RG214                      | NMI             | --              |
| 99070 | Cable 15m RG214                     | NMI             | --              |
| 99071 | Cable 10m RG214                     | NMI             | --              |
| 99076 | Bandpassfilter 4-10GHz              | Reactel         | 7AS-7G-6G-511   |
| 99077 | Regulating trafo                    | RFT             | LTS006          |
| 99079 | RF Combiner                         | R&S             | DVU 4           |
| 99108 | Turntable OATS                      | Heinrich Deisel | HD050           |
| 99111 | magnetic loop power supply          | Chase           | --              |
| 99112 | Tripod                              | Chase           | --              |
| 99115 | Voltage probe                       | Schwarzbeck     | TK9416          |

## 1.6 Bandwidth and antenna factors.

The utilized measuring equipment is stated in § 1.6. The bandwidth of the receiver switches automatically to the right bandwidth in accordance with CISPR 16. This is implemented in the receiver. Also the antenna factors are included in the test receiver. The receiver automatically calculates the appropriate correction factor for the utilized antenna and also the appropriate correction factor for the cable loss. The total correction is automatically added to the measured value.



## 2 System test configuration

### 2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it).

The justification of cables and equipment has been carried out as prescribed in the ANSI C63.4-1992 document.

Unless otherwise stated, the measurements were performed on the lowest-, center- and highest operating frequency (resp. channel 1: 2412 MHz, channel 6: 2437 MHz and channel 11: 2462 MHz) at 1 Mbps and 11 Mbps.

### 2.2 Operating frequencies and rated output power levels

| channel | operating frequencies (MHz) | Rated RF output power (dBm) at antenna connector | test performed |
|---------|-----------------------------|--|----------------|
| 1       | 2412                        | <20  | yes            |
| 2       | 2417                        | <20  | no             |
| 3       | 2422                        | <20  | no             |
| 4       | 2427                        | <20  | no             |
| 5       | 2432                        | <20  | no             |
| 6       | 2437                        | <20  | yes            |
| 7       | 2442                        | <20  | no             |
| 8       | 2447                        | <20  | no             |
| 9       | 2452                        | <20  | no             |
| 10      | 2457                        | <20  | no             |
| 11      | 2462                        | <20  | yes            |

Table 2.1: Operating frequencies and rated RF output power levels

To complete the configuration required by the FCC, the transmitter was tested with a laptop PC as network server.

### 2.3 EUT exercise software

The EUT was enabled to continuously transmit, which was verified by a receiving unit during testing. The carrier was also checked to verify that the information was being transmitted.

### 3 Transmitter radiated emission data (< 1 GHz)

The following data lists the significant emission frequencies (worst case), measured levels in accordance with FCC 15.109 and 15.209. Photographs of test set ups used are included in an annex attached to this report.

#### 3.1 Test configuration: WB-S1100 connected to Turbo wave SLH10 antenna

| Vertical polarization |                        |           |            |
|-----------------------|------------------------|-----------|------------|
| Frequency             | Measured Value QP (3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                 | dBuV/m    | dB         |
| 64.0                  | 38.1                   | 40.0      | -1.9       |
| 96.0                  | 34.9                   | 43.5      | -8.6       |
| 128.0                 | 37.2                   | 43.5      | -6.3       |
| 160.0                 | 42.6                   | 43.5      | -0.9       |
| 192.0                 | 35.4                   | 43.5      | -8.1       |
| 224.0                 | 37.7                   | 46.0      | -8.3       |
| 288.0                 | 37.8                   | 46.0      | -8.2       |
| 320.0                 | 38.7                   | 46.0      | -7.3       |
| 540.0                 | 37.8                   | 46.0      | -8.2       |
| 620.0                 | 42.5                   | 46.0      | -3.5       |
| 640.0                 | 39.9                   | 46.0      | -6.1       |

Table 3.1.1: Radiated emissions with WB-S1100 connected to Turbo wave SLH10 antenna

| Horizontal polarization |                        |           |            |
|-------------------------|------------------------|-----------|------------|
| Frequency               | Measured Value QP (3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                 | dBuV/m    | dB         |
| 64.0                    | 26.9                   | 40.0      | -13.1      |
| 96.0                    | 23.8                   | 43.5      | -19.7      |
| 128.0                   | 37.5                   | 43.5      | -6.0       |
| 160.0                   | 38.3                   | 43.5      | -5.2       |
| 192.0                   | 36.0                   | 43.5      | -7.5       |
| 224.0                   | 37.0                   | 46.0      | -9.0       |
| 288.0                   | 41.4                   | 46.0      | -4.6       |
| 320.0                   | 42.1                   | 46.0      | -3.9       |
| 540.0                   | 45.3                   | 46.0      | -0.7       |
| 620.0                   | 45.1                   | 46.0      | -0.9       |
| 640.0                   | 43.9                   | 46.0      | -2.1       |

Table 3.1.2: Radiated emissions with WB-S1100 connected to Turbo wave SLH10 antenna

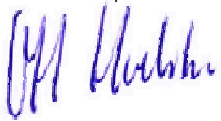
Notes:

All measured levels in quasi-peak (QP) mode, polarization refers to measuring antenna, negative margin means it is below the limit.

Above measurement results are valid for channels 1, 6 and 11 for both 1.0 Mbps and 11.0 Mbps, as the emission levels are not operating frequency and not bit rate dependent.

The radiated emission measurement has been carried out with AC supply voltage of 120 V.

Test personnel:

Date : March 27, 2001  
 Tester signature :   
 Name : Onno H. Hoekstra

### 3.2 Test configuration: WB-S1100 connected to Turbo wave SLH12 antenna

| Vertical polarization |                        |           |            |
|-----------------------|------------------------|-----------|------------|
| Frequency             | Measured Value QP (3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                 | dBuV/m    | dB         |
| 64.0                  | 36.6                   | 40.0      | -3.4       |
| 96.0                  | 33.2                   | 43.5      | -10.3      |
| 128.0                 | 34.1                   | 43.5      | -9.4       |
| 160.0                 | 40.7                   | 43.5      | -2.8       |
| 192.0                 | 32.6                   | 43.5      | -10.9      |
| 224.0                 | 33.7                   | 46.0      | -12.3      |
| 288.0                 | 35.2                   | 46.0      | -10.8      |
| 320.0                 | 38.9                   | 46.0      | -7.1       |
| 540.0                 | 40.0                   | 46.0      | -6.0       |
| 620.0                 | 42.9                   | 46.0      | -3.1       |
| 640.0                 | 39.9                   | 46.0      | -6.1       |

Table 3.2.1: Radiated emissions with WB-S1100 connected to Turbo wave SLH12 antenna

| Horizontal polarization |                        |           |            |
|-------------------------|------------------------|-----------|------------|
| Frequency               | Measured Value QP (3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                 | dBuV/m    | dB         |
| 64.0                    | 26.5                   | 40.0      | -13.5      |
| 96.0                    | 33.2                   | 43.5      | -10.3      |
| 128.0                   | 34.7                   | 43.5      | -8.8       |
| 160.0                   | 34.7                   | 43.5      | -8.8       |
| 192.0                   | 35.4                   | 43.5      | -8.1       |
| 224.0                   | 37.5                   | 46.0      | -8.5       |
| 288.0                   | 37.2                   | 46.0      | -8.8       |
| 320.0                   | 42.4                   | 46.0      | -3.6       |
| 540.0                   | 43.0                   | 46.0      | -3.0       |
| 620.0                   | 45.8                   | 46.0      | -0.2       |
| 640.0                   | 45.0                   | 46.0      | -1.0       |

Table 3.2.2: Radiated emissions with WB-S1100 connected to Turbo wave SLH12 antenna

Notes:

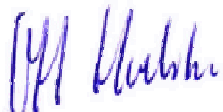
All measured levels in quasi-peak (QP) mode, polarization refers to measuring antenna, negative margin means it is below the limit.

Above measurement results are valid for channels 1, 6 and 11 for both 1.0 Mbps and 11.0 Mbps, as the emission levels are not operating frequency nor bit rate dependent.

The radiated emission measurement has been carried out with AC supply voltage of 120 V.

Test personnel:

Date : March 27, 2001

Tester signature : 

Name : Onno H. Hoekstra

### 3.3 Test configuration: WB-S1100 connected to Turbo wave QUAD3 antenna

| Vertical polarization |                        |           |            |
|-----------------------|------------------------|-----------|------------|
| Frequency             | Measured Value QP (3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                 | dBuV/m    | dB         |
| 64.0                  | 38.0                   | 40.0      | -2.0       |
| 96.0                  | 35.9                   | 43.5      | -7.6       |
| 128.0                 | 33.8                   | 43.5      | -9.7       |
| 160.0                 | 42.9                   | 43.5      | -0.6       |
| 192.0                 | 36.0                   | 43.5      | -7.5       |
| 224.0                 | 33.8                   | 46.0      | -12.2      |
| 288.0                 | 33.9                   | 46.0      | -12.1      |
| 320.0                 | 36.4                   | 46.0      | -9.6       |
| 540.0                 | 39.9                   | 46.0      | -6.1       |
| 620.0                 | 42.7                   | 46.0      | -3.3       |
| 640.0                 | 38.0                   | 46.0      | -8.0       |

Table 3.3.1: Radiated emissions with WB-S1100 connected to Turbo wave QUAD3 antenna

| Horizontal polarization |                        |           |            |
|-------------------------|------------------------|-----------|------------|
| Frequency               | Measured Value QP (3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                 | dBuV/m    | dB         |
| 64.0                    | 32.9                   | 40.0      | -7.1       |
| 96.0                    | 33.9                   | 43.5      | -9.6       |
| 128.0                   | 31.0                   | 43.5      | -12.5      |
| 160.0                   | 40.9                   | 43.5      | -2.6       |
| 192.0                   | 36.4                   | 43.5      | -7.1       |
| 224.0                   | 38.0                   | 46.0      | -8.0       |
| 288.0                   | 39.4                   | 46.0      | -6.6       |
| 320.0                   | 41.8                   | 46.0      | -4.2       |
| 540.0                   | 40.4                   | 46.0      | -5.6       |
| 620.0                   | 45.5                   | 46.0      | -0.5       |
| 640.0                   | 45.6                   | 46.0      | -0.4       |

Table 3.3.2: Radiated emissions with WB-S1100 connected to Turbo wave QUAD3 antenna

Notes:


All measured levels in quasi-peak (QP) mode, polarization refers to measuring antenna, negative margin means it is below the limit.

Above measurement results are valid for channels 1, 6 and 11 for both 1.0 Mbps and 11.0 Mbps, as the emission levels are not operating frequency nor bit rate dependent.

The radiated emission measurement has been carried out with AC supply voltage of 120 V.

Test personnel:

Date : March 27, 2001

Tester signature : 

Name : Onno H. Hoekstra

## 4 Transmitter radiated emission data ( $\geq 1$ GHz)

The following data lists the significant emission frequencies (worst case), measured levels in accordance with FCC 15.109 and 15.209. Photographs of test set ups used are included in an annex attached to this report.

### 4.1 Test configuration: WB-S1100 connected to Turbo wave SLH10 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 4.1.1: Radiated emissions with WB-S1100 on ch 1 connected to Turbo wave SLH10 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 4.1.2: Radiated emissions with WB-S1100 on ch 1 connected to Turbo wave SLH10 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 4.1.3: Radiated emissions with WB-S1100 on ch 6 connected to Turbo wave SLH10 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 4.1.4: Radiated emissions with WB-S1100 on ch 6 connected to Turbo wave SLH10 antenna



| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 4.1.5: Radiated emissions with WB-S1100 on ch 11 connected to Turbo wave SLH10 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 4.1.6: Radiated emissions with WB-S1100 on ch 11 connected to Turbo wave SLH10 antenna

Notes:

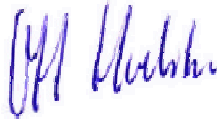
Emission values above 1 GHz are measured with the Peak detector. All radiated harmonic emissions were found to be more than 10dB below the limits. Polarization refers to measuring antenna, negative margin means it is below the limit. The radiated emission measurement has been carried out with AC supply voltage of 120 V.

Above measurement results are valid for both 1.0 Mbps and 11.0 Mbps, as the emission levels are not bit rate dependent.

Test personnel:

Date : March 27, 2001

Tester signature :



Name : Onno H. Hoekstra

## 4.2 Test configuration: WB-S1100 connected to Turbo wave SLH12 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 4.2.1: Radiated emissions with WB-S1100 on ch 1 connected to Turbo wave SLH12 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 4.2.2: Radiated emissions with WB-S1100 on ch 1 connected to Turbo wave SLH12 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 4.2.3: Radiated emissions with WB-S1100 on ch 6 connected to Turbo wave SLH12 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 4.2.4: Radiated emissions with WB-S1100 on ch 6 connected to Turbo wave SLH12 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 4.2.5: Radiated emissions with WB-S1100 on ch 11 connected to Turbo wave SLH12 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 4.2.6: Radiated emissions with WB-S1100 on ch 11 connected to Turbo wave SLH12 antenna

Notes:

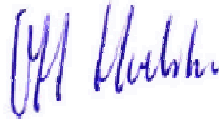
Emission values above 1 GHz are measured with the Peak detector. All radiated harmonic emissions were found to be more than 10dB below the limits. Polarization refers to measuring antenna, negative margin means it is below the limit. The radiated emission measurement has been carried out with AC supply voltage of 120 V.

Above measurement results are valid for both 1.0 Mbps and 11.0 Mbps, as the emission levels are not bit rate dependent.

Test personnel:

Date : March 27, 2001

Tester signature :



Name : Onno H. Hoekstra

### 4.3 Test configuration: WB-S1100 connected to Turbo wave QUAD3 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 4.3.1: Radiated emissions with WB-S1100 on ch 1 connected to Turbo wave QUAD3 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 4.3.2: Radiated emissions with WB-S1100 on ch 1 connected to Turbo wave QUAD3 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 4.3.3: Radiated emissions with WB-S1100 on ch 6 connected to Turbo wave QUAD3 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 4.3.4: Radiated emissions with WB-S1100 on ch 6 connected to Turbo wave QUAD3 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 4.3.5: Radiated emissions with WB-S1100 on ch 11 connected to Turbo wave QUAD3 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 4.3.6: Radiated emissions with WB-S1100 on ch 11 connected to Turbo wave QUAD3 antenna

Notes:

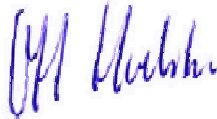
Emission values above 1 GHz are measured with the Peak detector. All radiated harmonic emissions were found to be more than 10dB below the limits. Polarization refers to measuring antenna, negative margin means it is below the limit. The radiated emission measurement has been carried out with AC supply voltage of 120 V.

Above measurement results are valid for both 1.0 Mbps and 11.0 Mbps, as the emission levels are not bit rate dependent.

Test personnel:

Date : March 27, 2001

Tester signature :

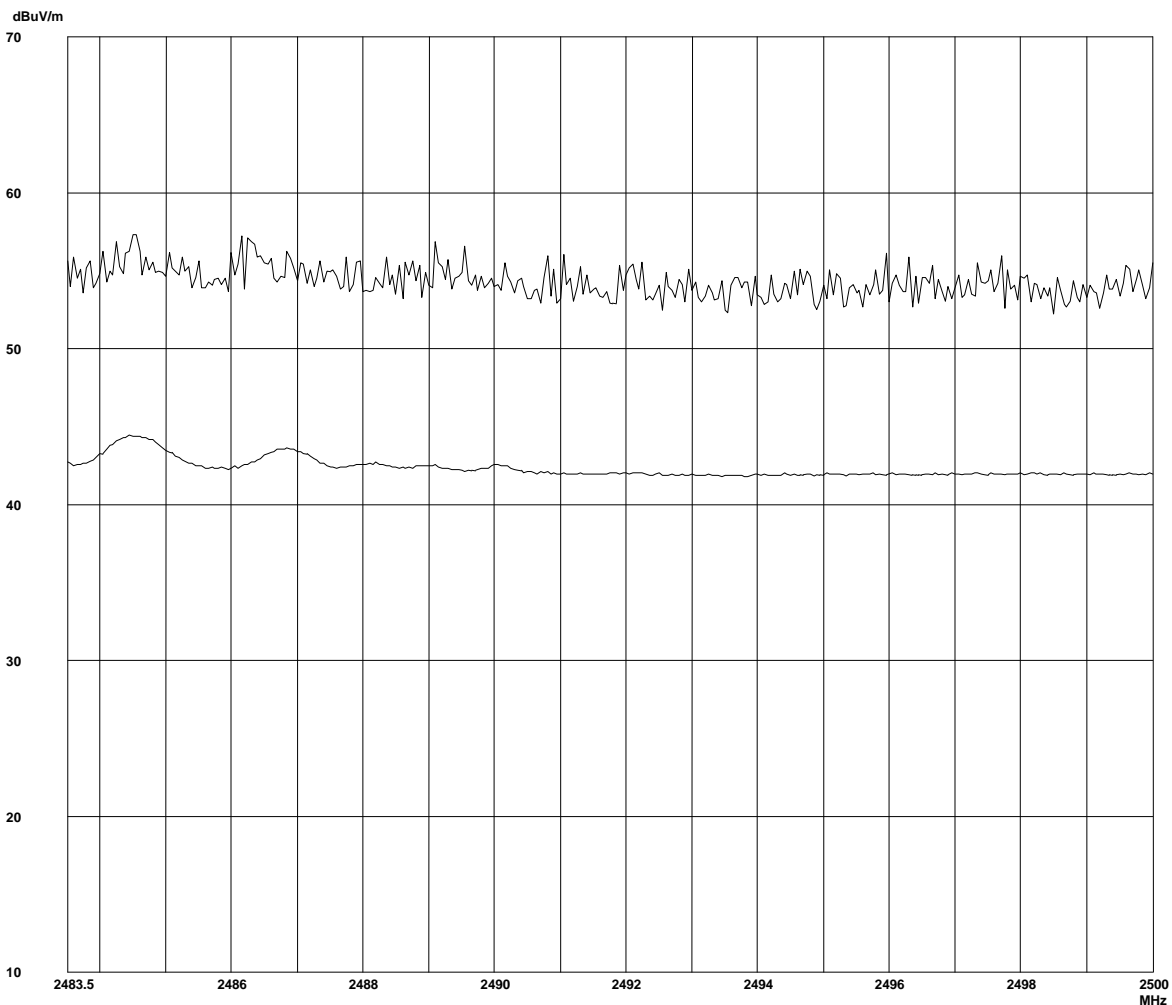


Name : Onno H. Hoekstra

## 5 Restricted bands of operation

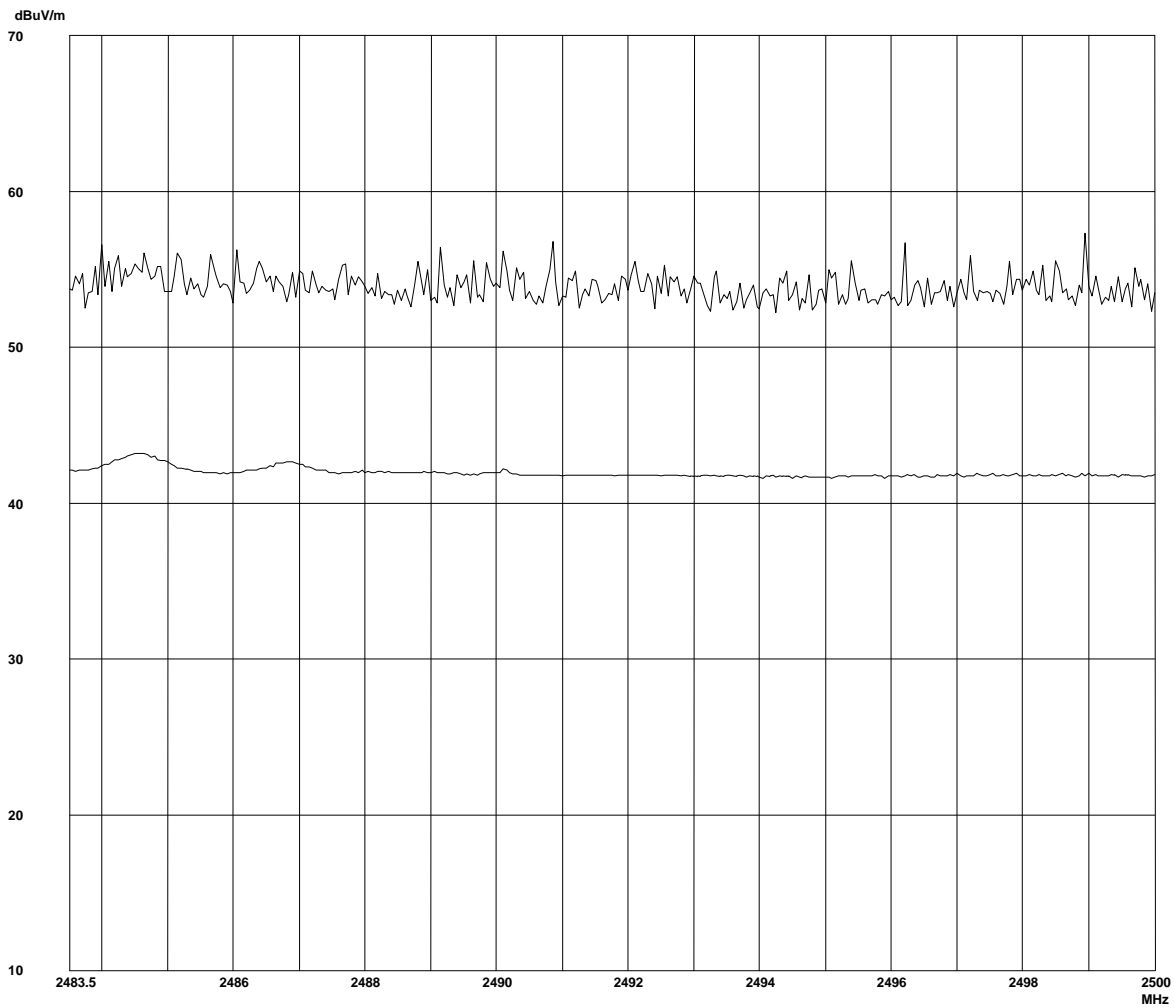
The following plots show the maximum emissions at the band edges. The measurement was performed in accordance with FCC 15.247 (a)

### 5.1 Test configuration: WB-S1100 connected to Turbo wave SLH10 antenna



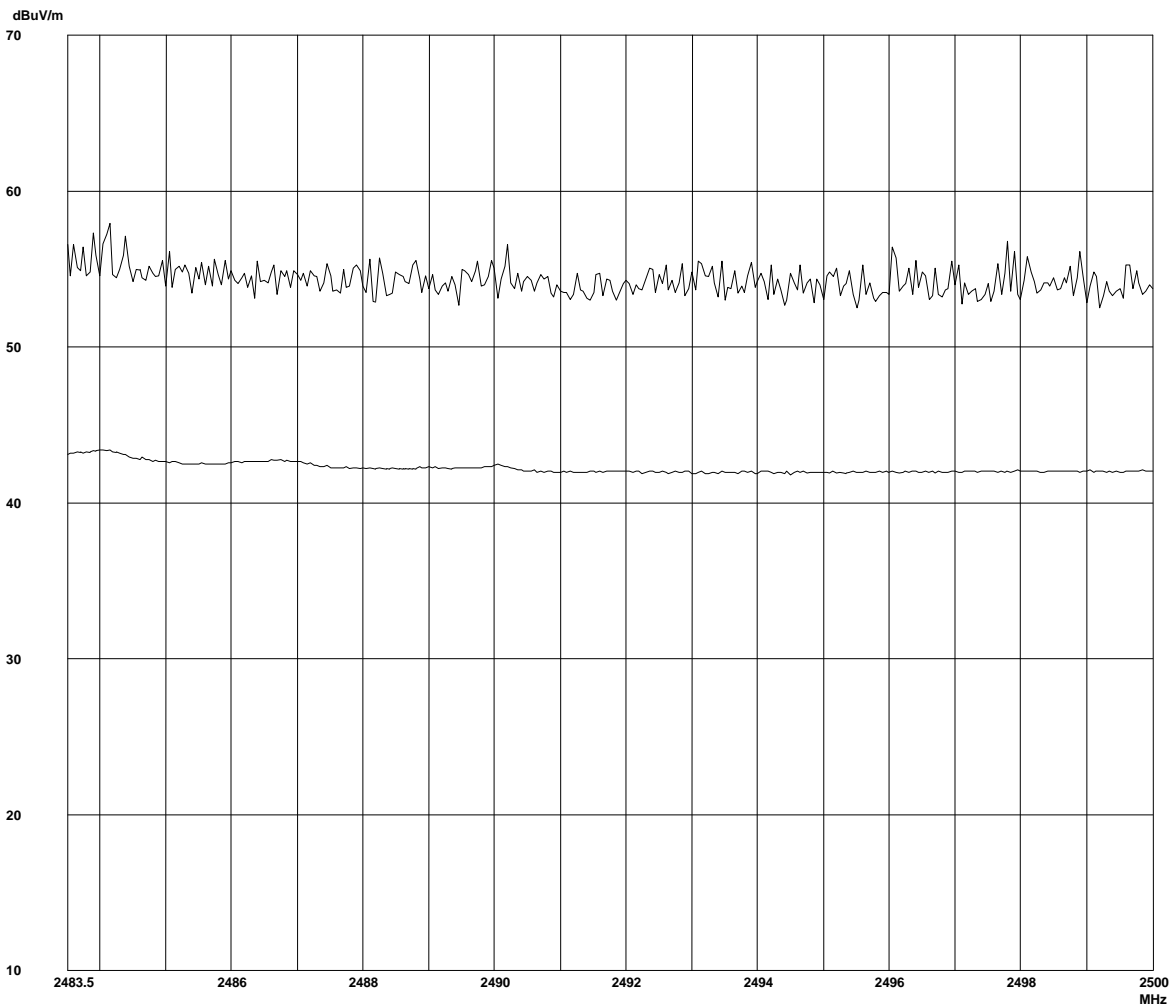
Plot 5.1.1: Vertical polarization Emissions at 2483.5MHz to 2500MHz at 1 Mbps

Note: Upper trace are Peak values, lower trace are Average values.



Plot 5.1.2: Horizontal polarization Emissions at 2483.5MHz to 2500MHz at 1 Mbps

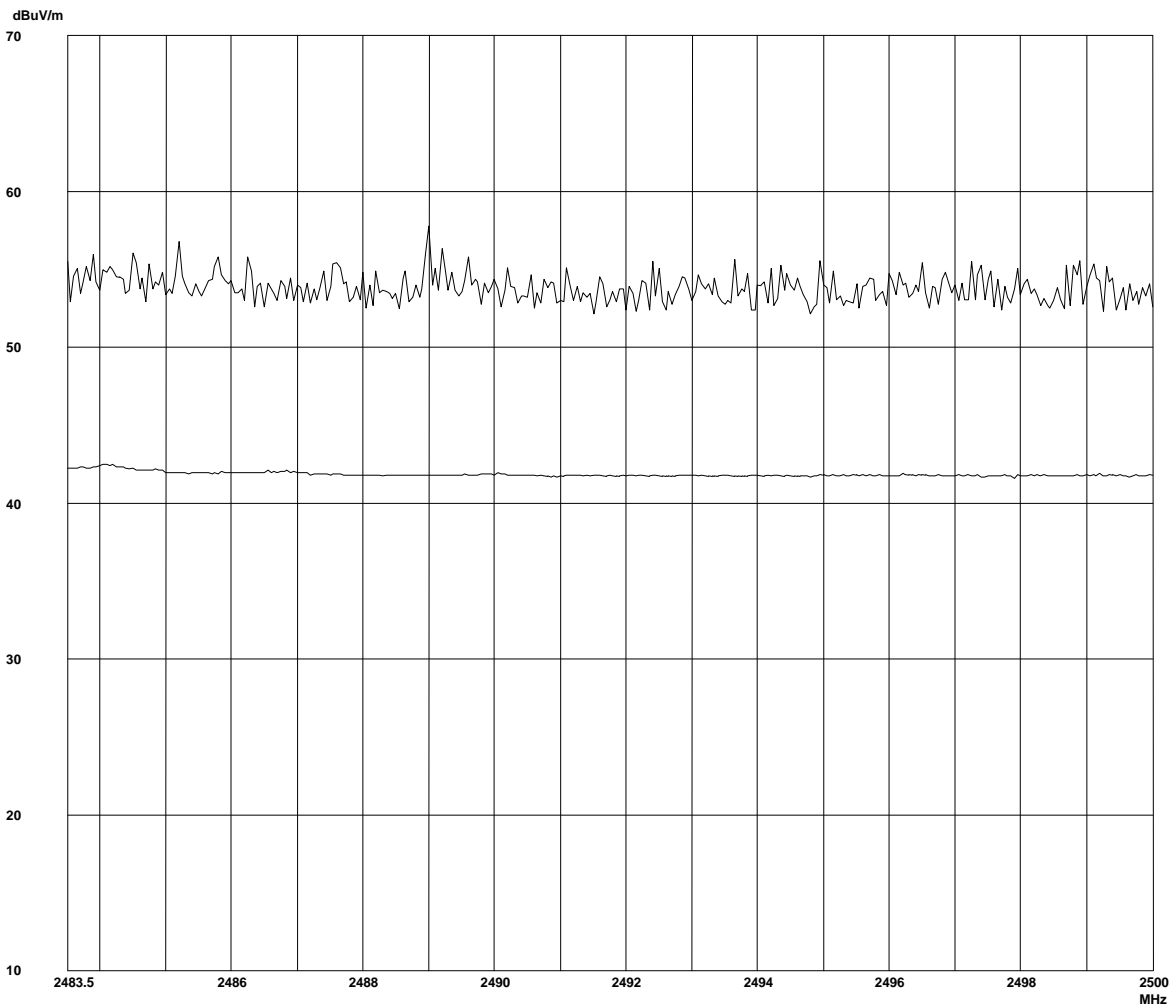
Note: Upper trace are Peak values, lower trace are Average values.



Plot 5.1.3: Vertical polarization Emissions at 2483.5MHz to 2500MHz at 11 Mbps

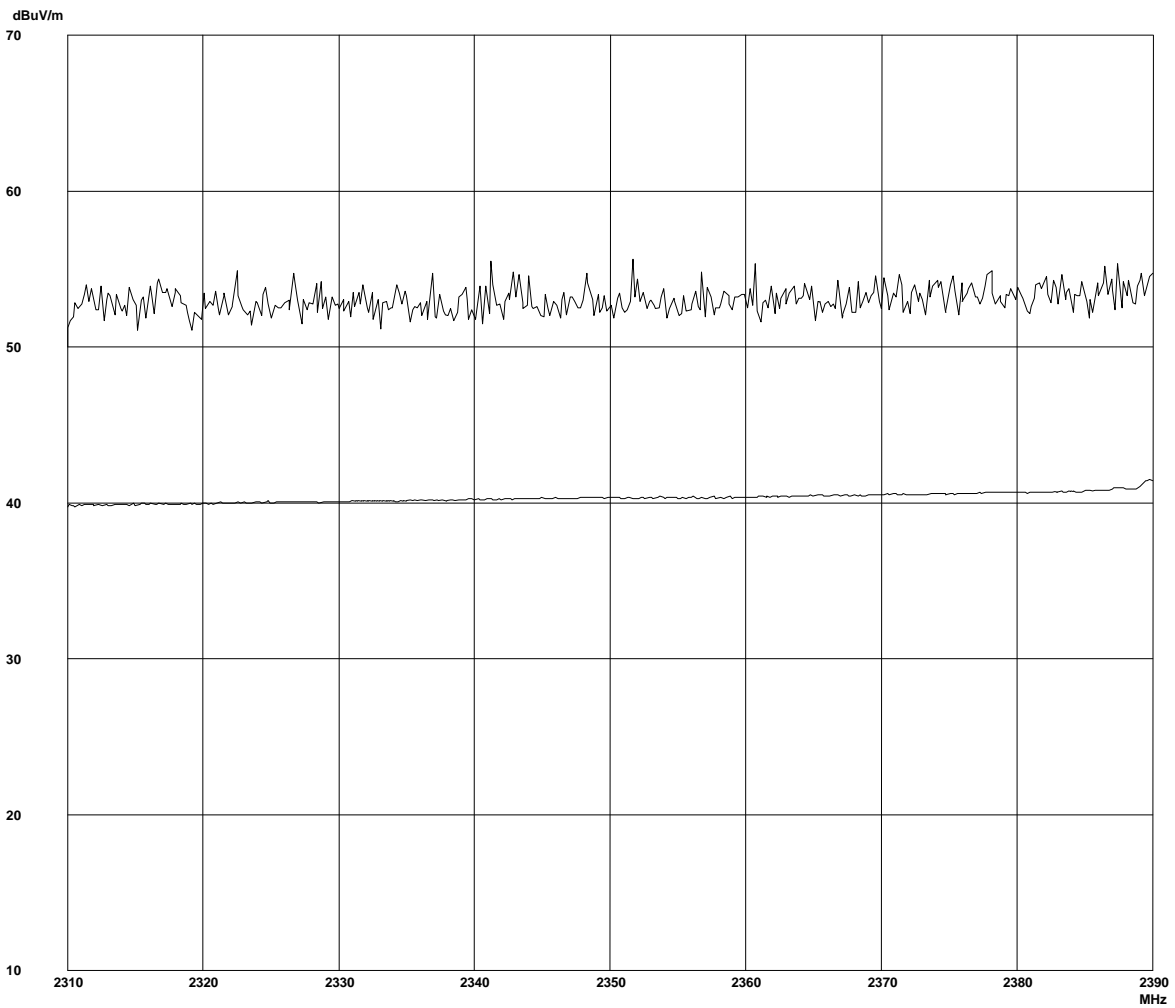
Note: Upper trace are Peak values, lower trace are Average values.





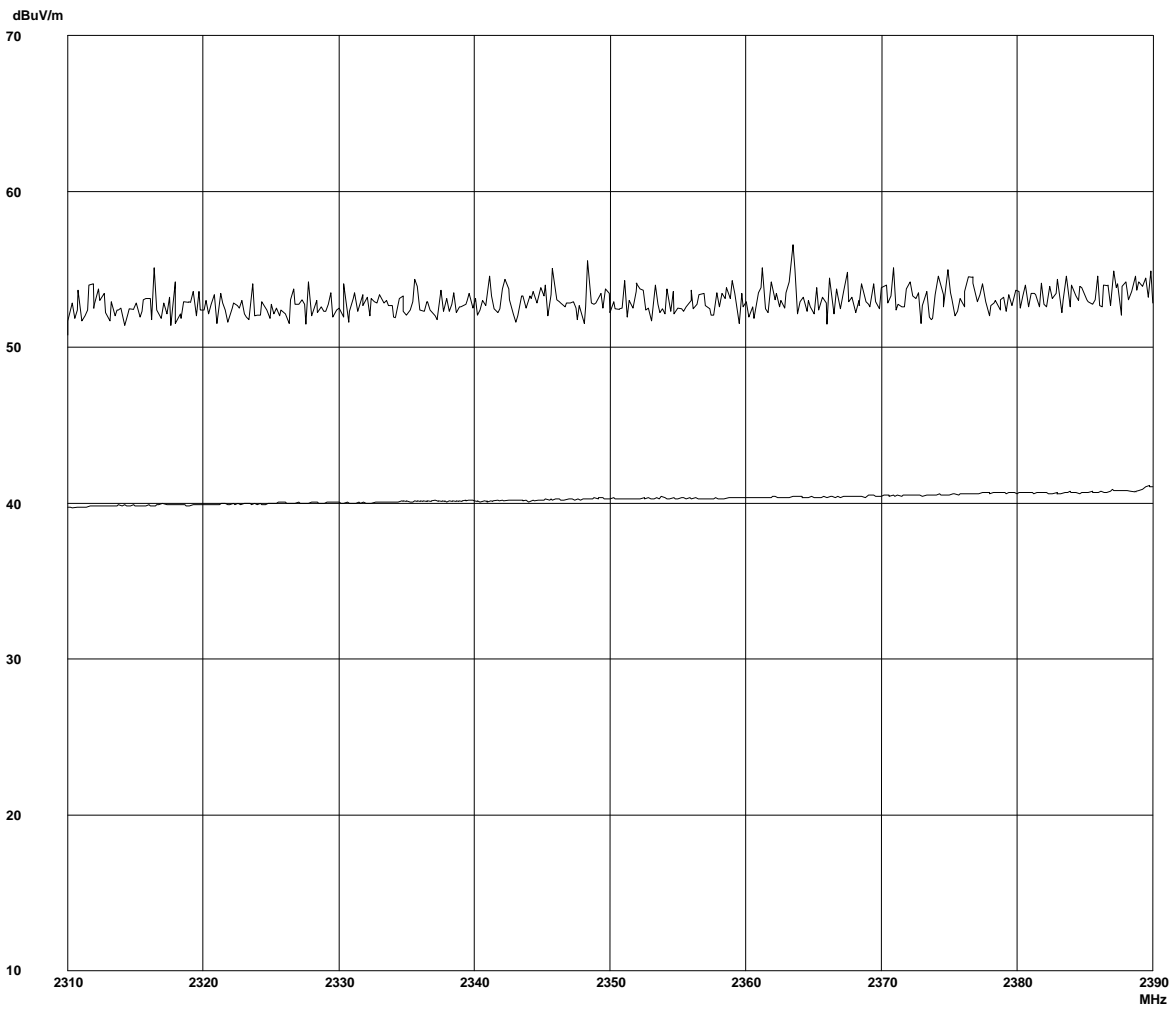
Plot 5.1.4: Horizontal polarization Emissions at 2483.5MHz to 2500MHz at 11 Mbps

Note: Upper trace are Peak values, lower trace are Average values.



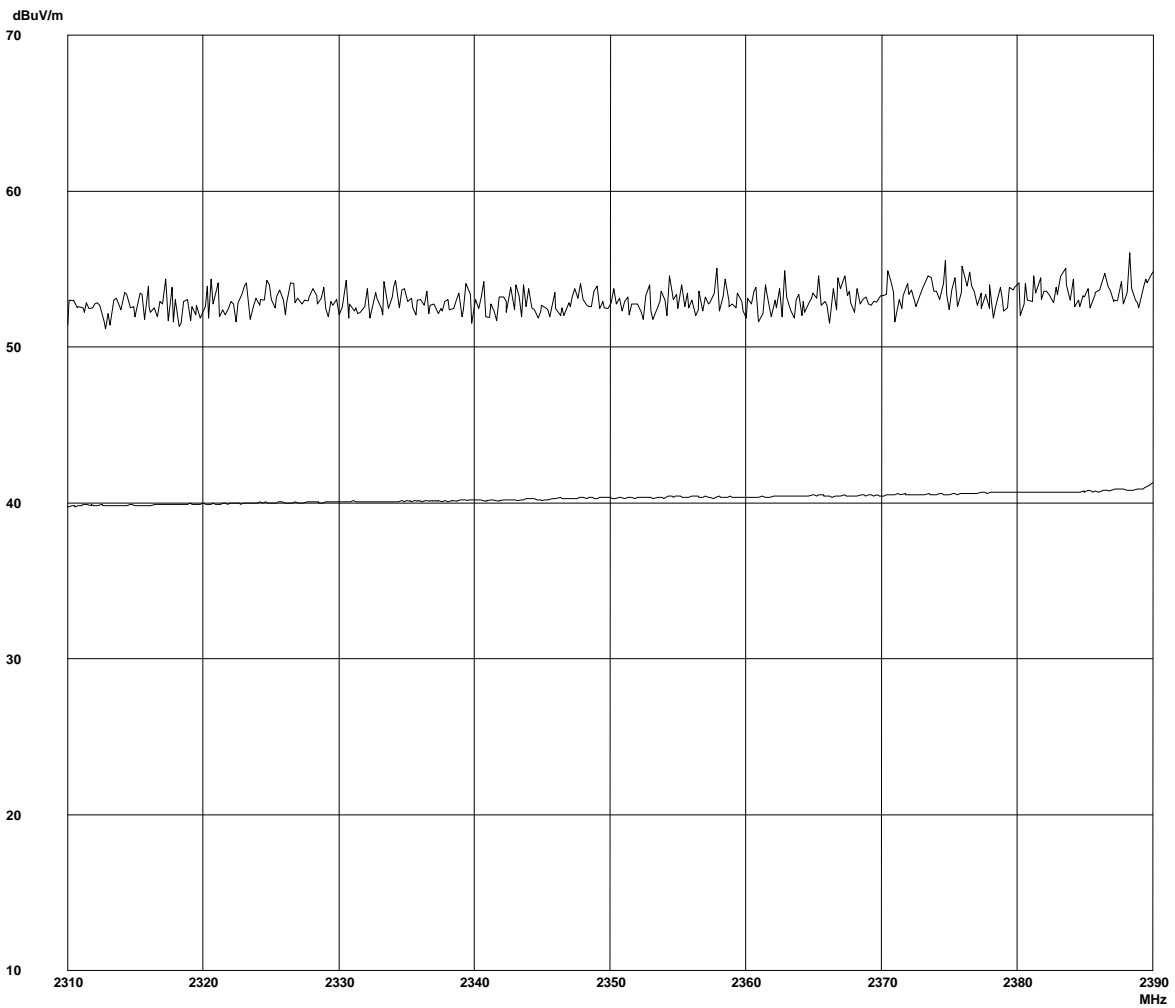
Plot 5.1.5: Vertical polarization Emissions at 2310MHz to 2390MHz at 1Mbps

Note: Upper trace are Peak values, lower trace are Average values.



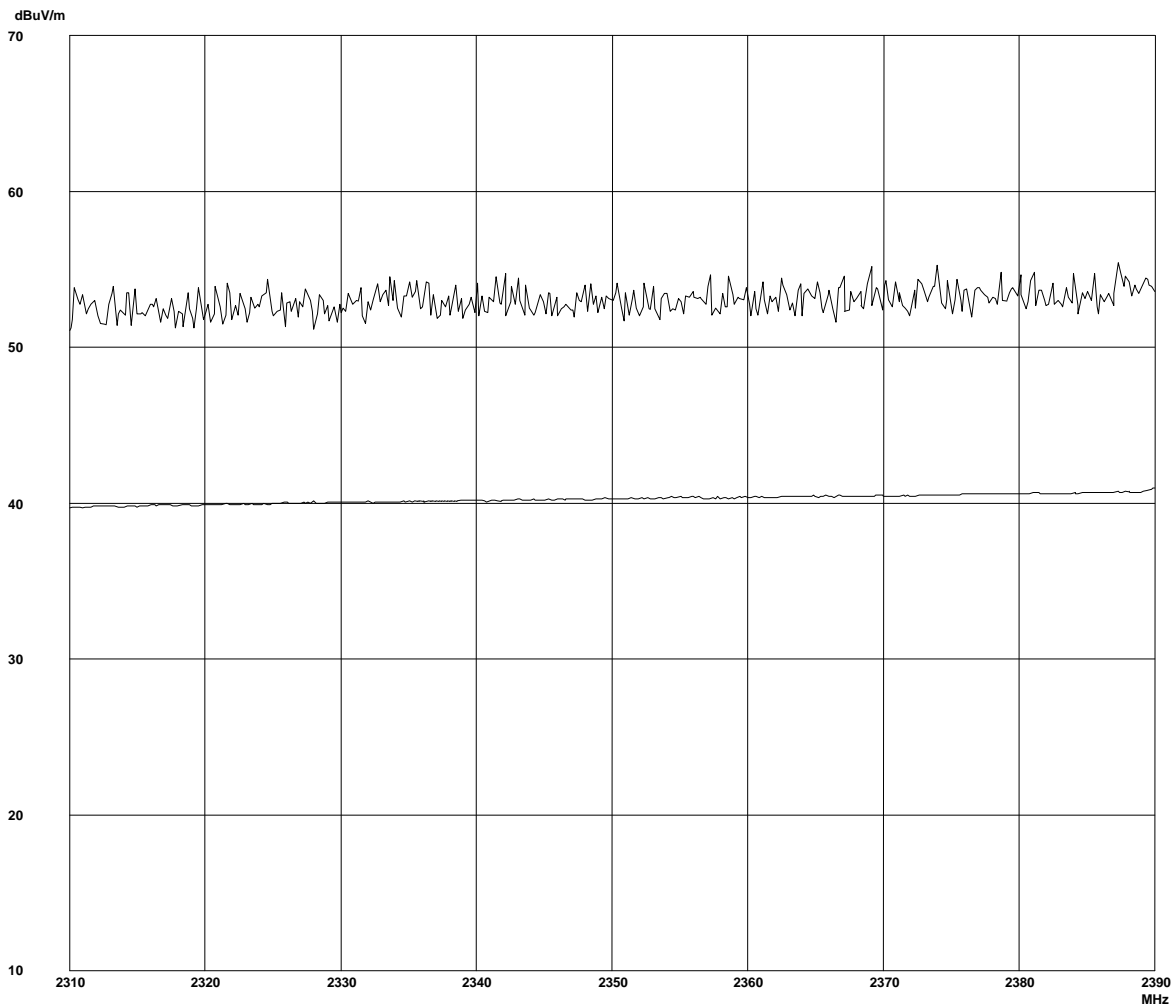
Plot 5.1.6: Horizontal polarization Emissions at 2310MHz to 2390MHz at 1Mbps

Note: Upper trace are Peak values, lower trace are Average values.



Plot 5.1.7: Vertical polarization Emissions at 2310MHz to 2390MHz at 11 Mbps

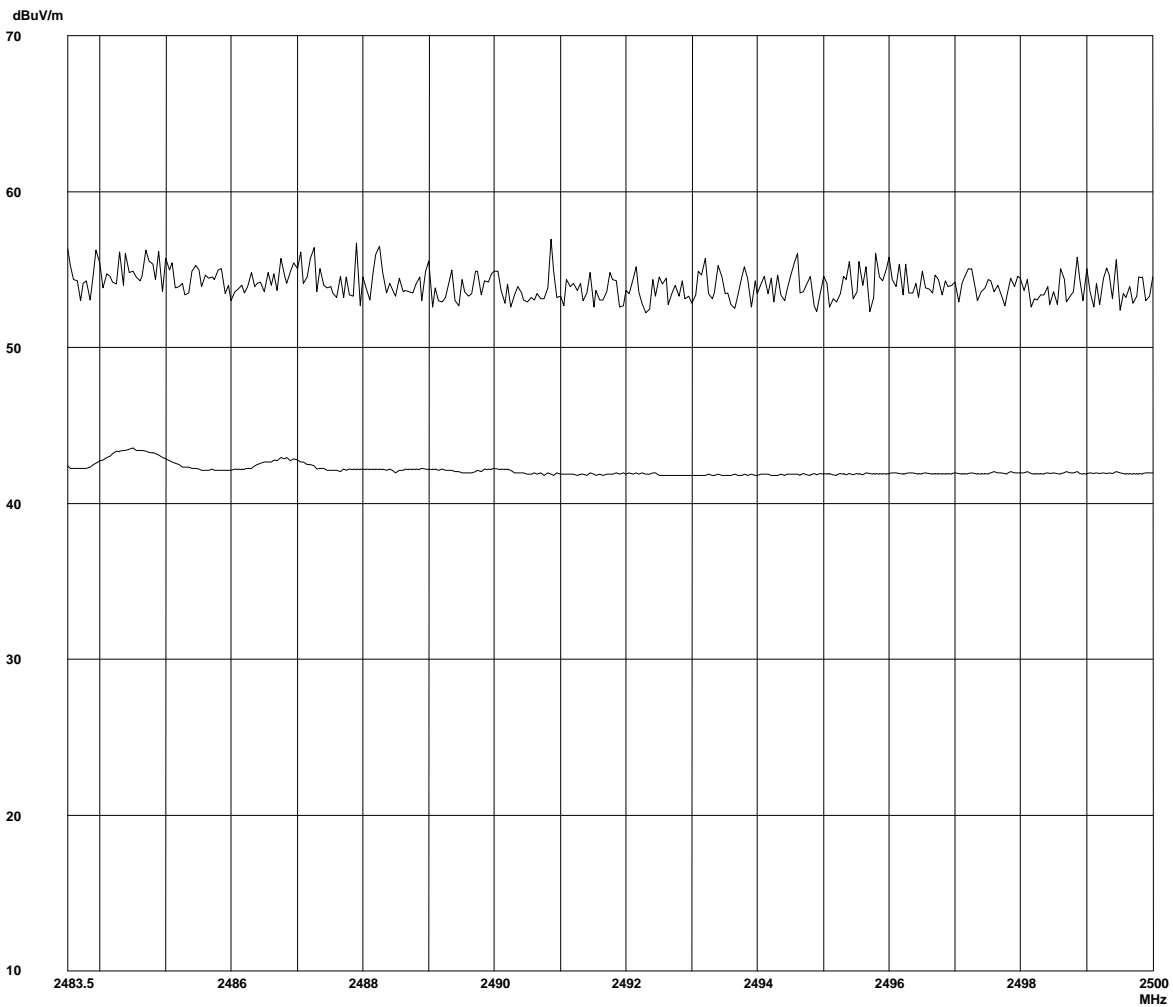
Note: Upper trace are Peak values, lower trace are Average values.



Plot 5.1.8: Horizontal polarization Emissions at 2310MHz to 2390MHz at 11 Mbps

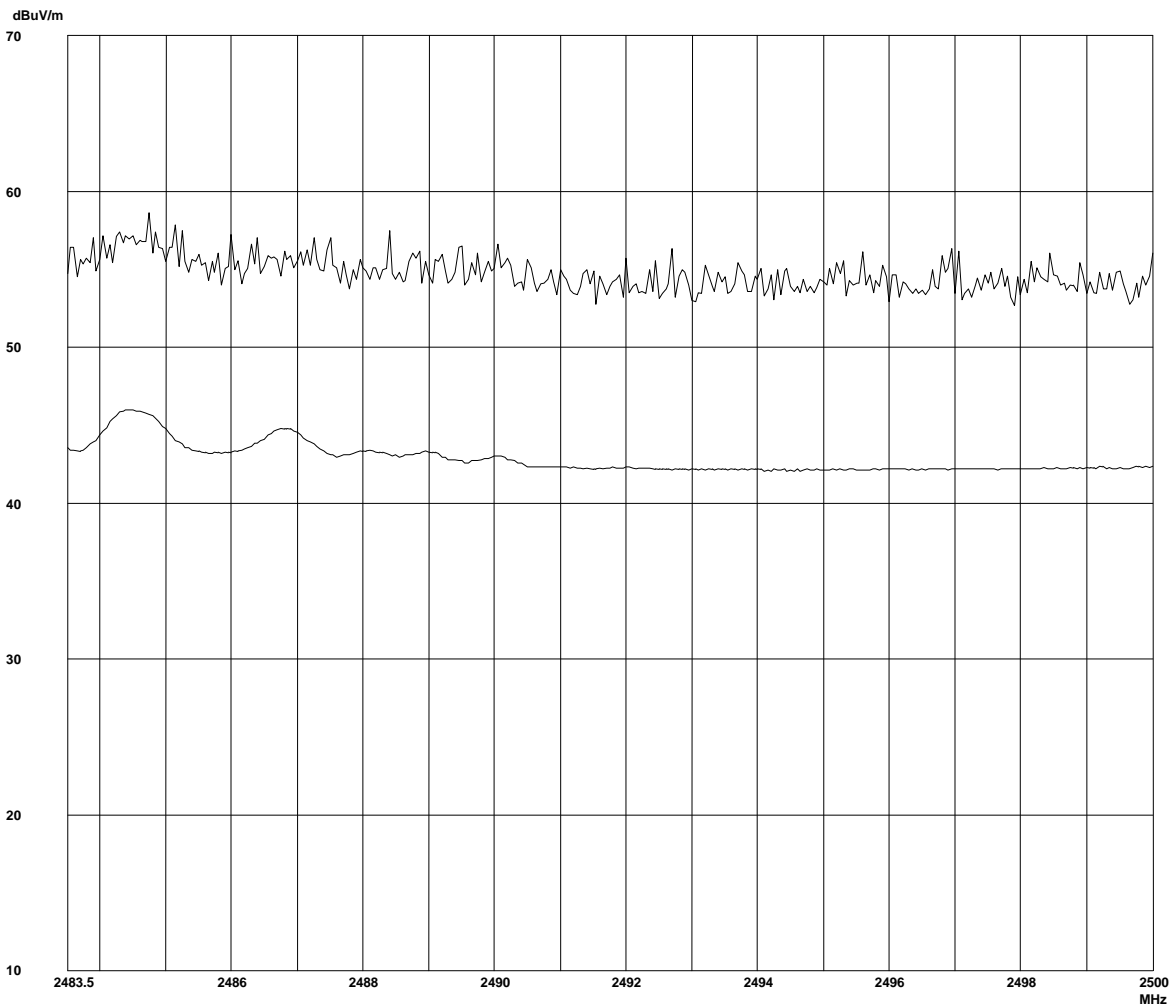
Note: Upper trace are Peak values, lower trace are Average values.

## 5.2 Test configuration: WB-S1100 connected to Turbo wave SLH12 antenna



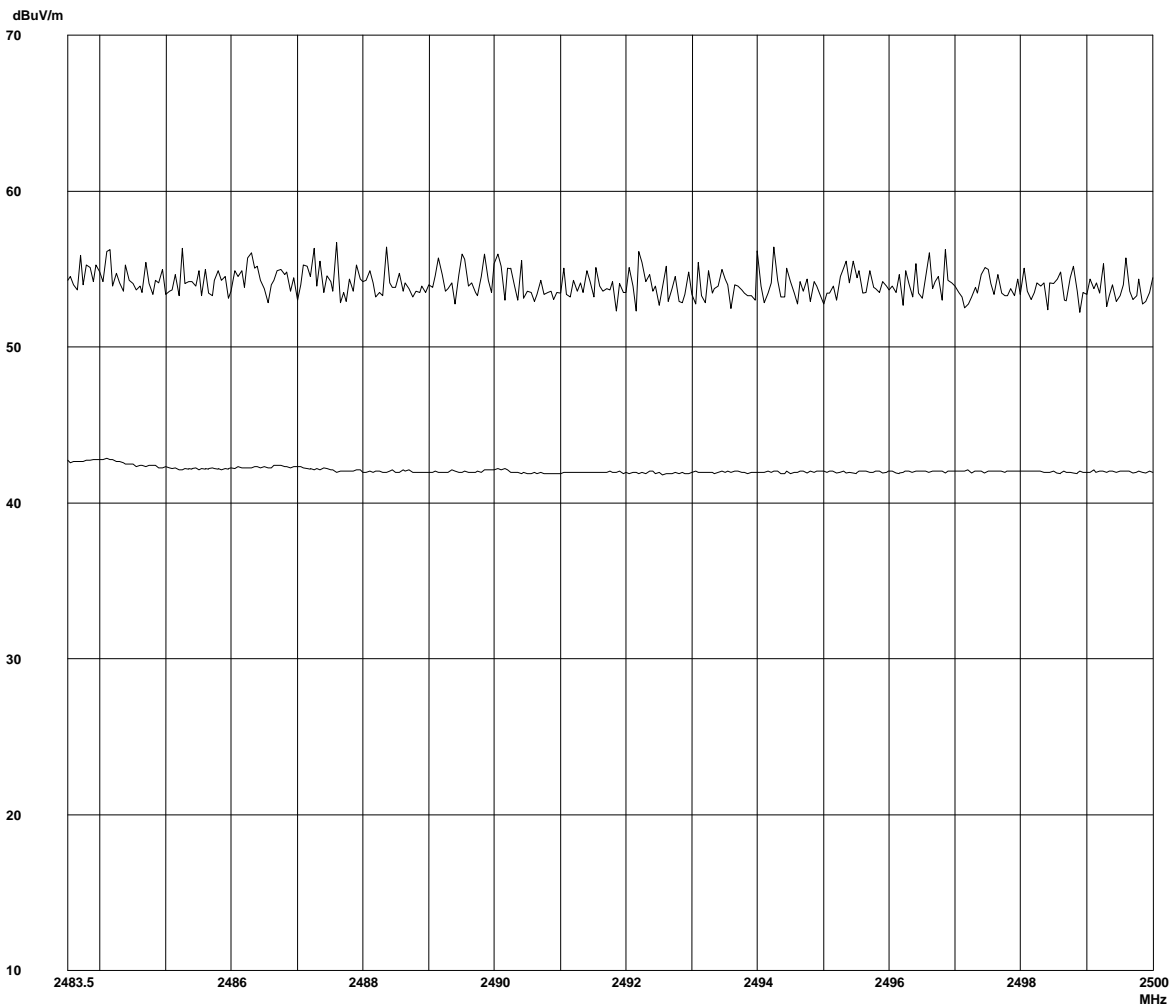
Plot 5.2.1: Vertical polarization Emissions at 2483.5MHz to 2500MHz at 1 Mbps

Note: Upper trace are Peak values, lower trace are Average values.



Plot 5.2.2: Horizontal polarization Emissions at 2483.5MHz to 2500MHz at 1 Mbps

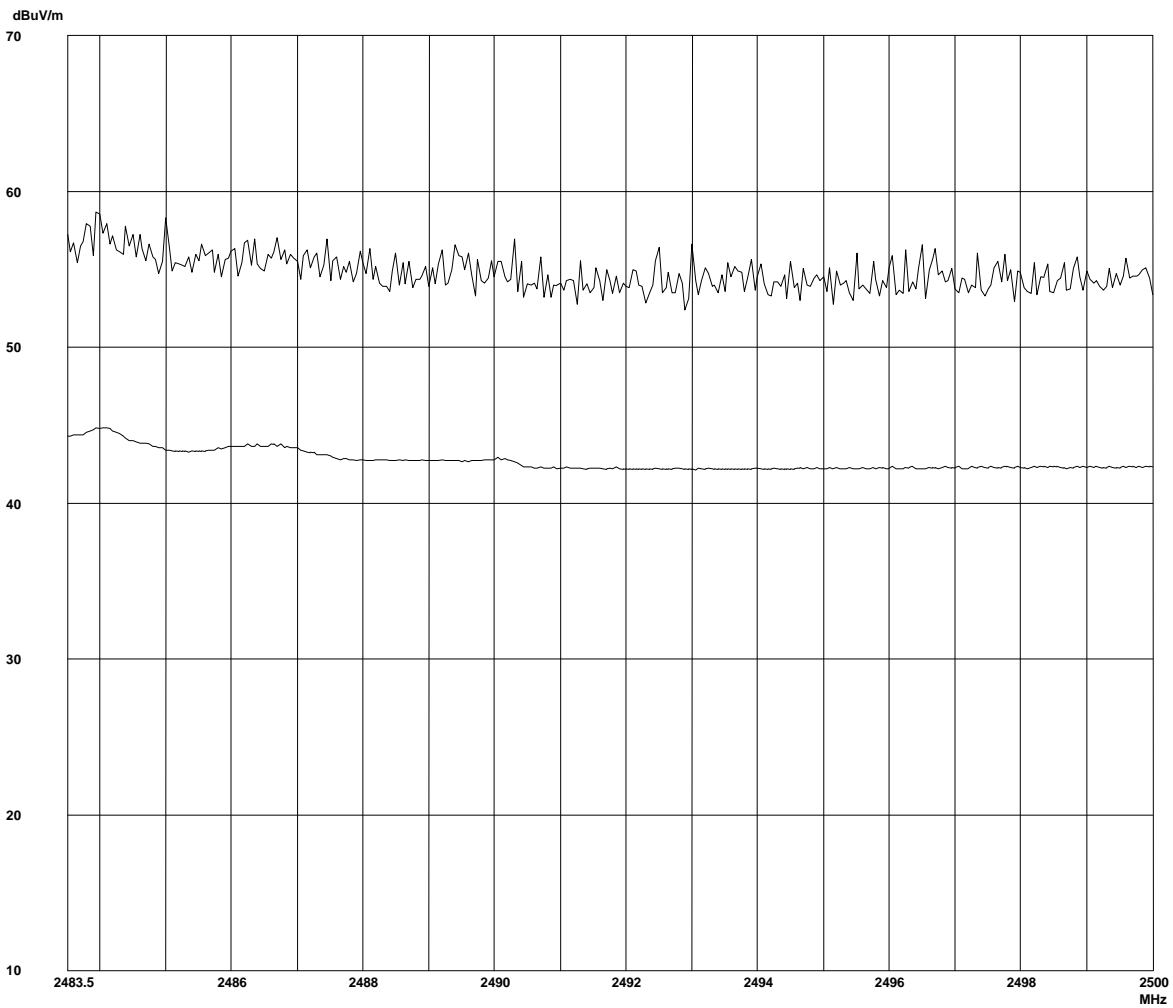
Note: Upper trace are Peak values, lower trace are Average values.



Plot 5.2.3: Vertical polarization Emissions at 2483.5MHz to 2500MHz at 11 Mbps

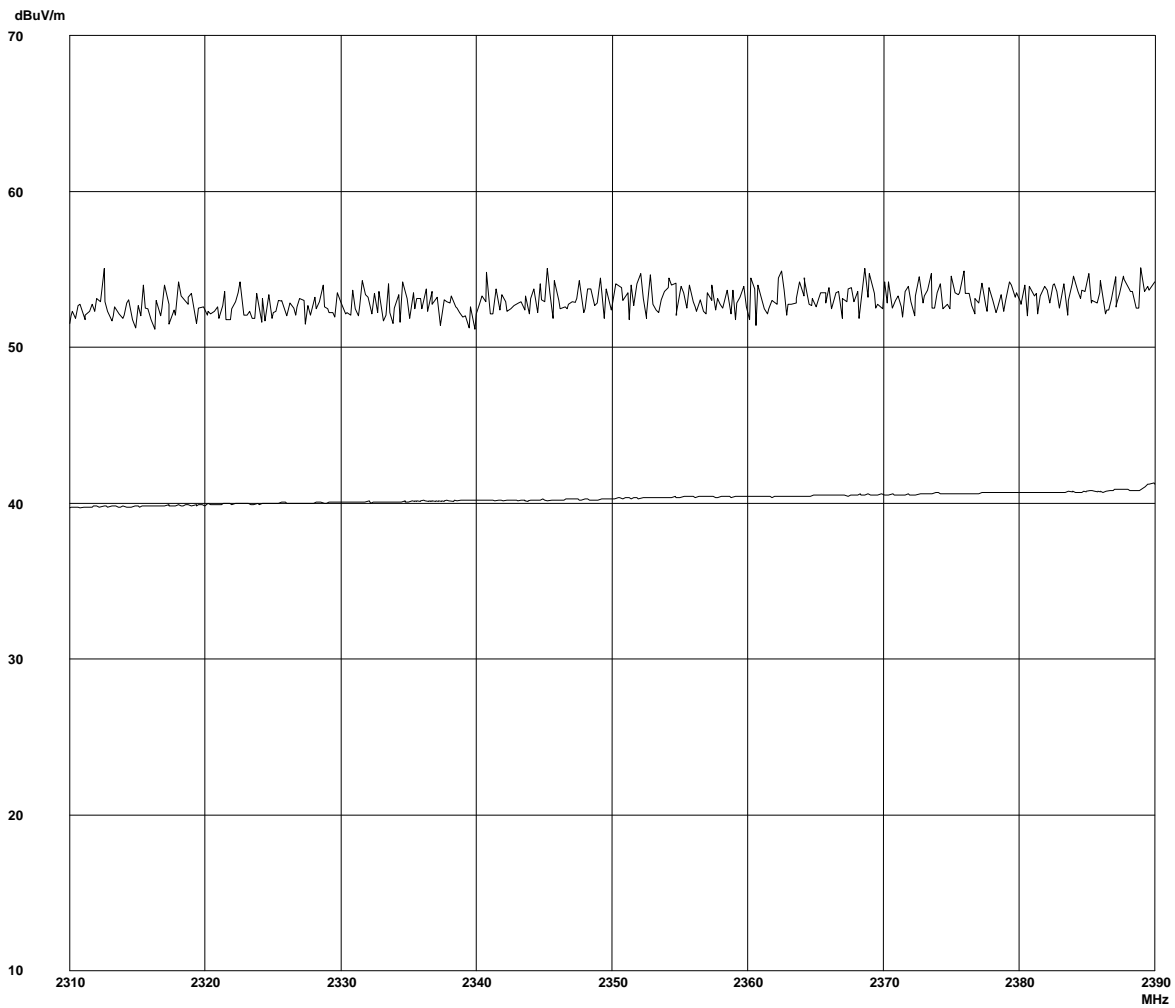
Note: Upper trace are Peak values, lower trace are Average values.





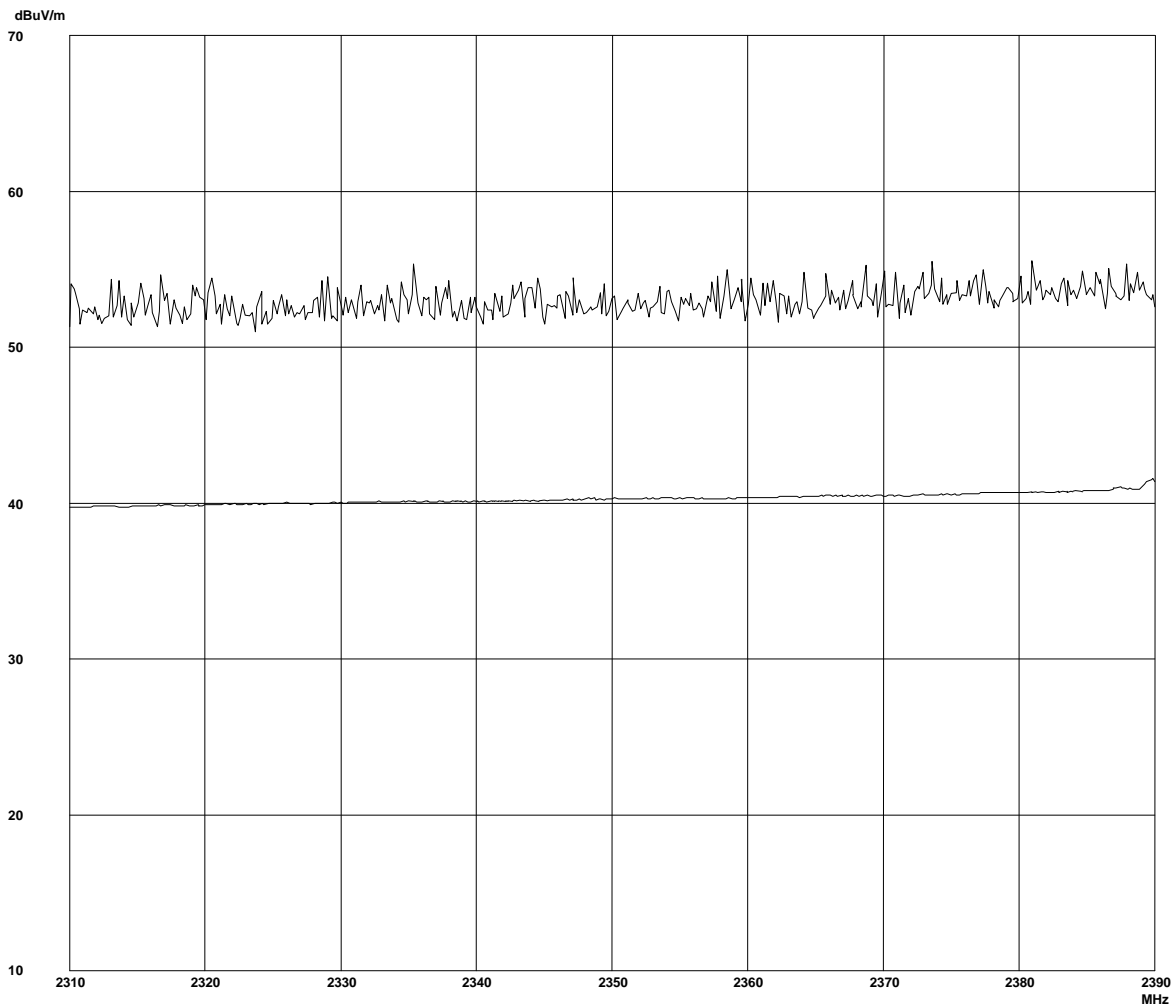
Plot 5.2.4: Horizontal polarization Emissions at 2483.5MHz to 2500MHz at 11 Mbps

Note: Upper trace are Peak values, lower trace are Average values.



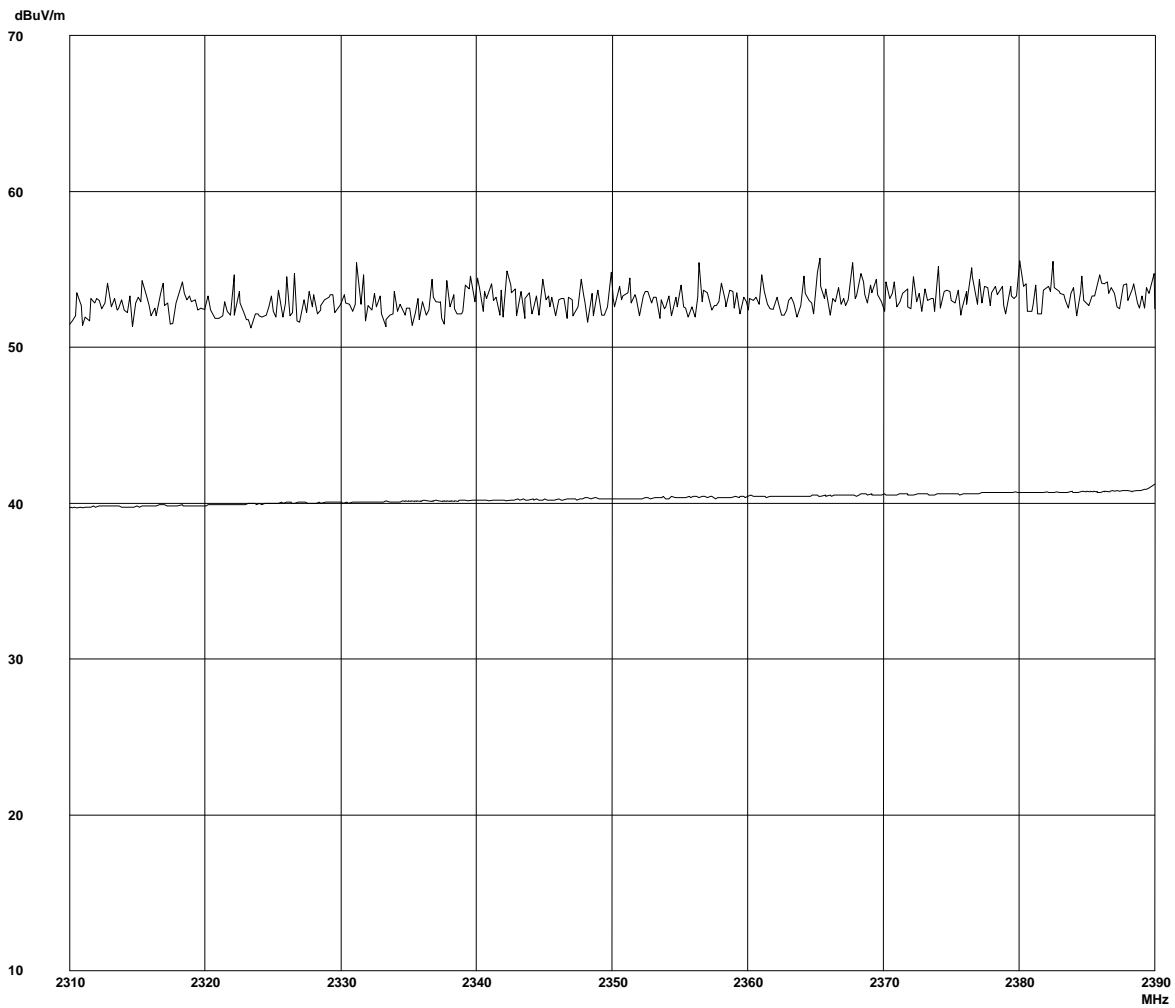
Plot 5.2.5: Vertical polarization Emissions at 2310MHz to 2390MHz at 1Mbps

Note: Upper trace are Peak values, lower trace are Average values.



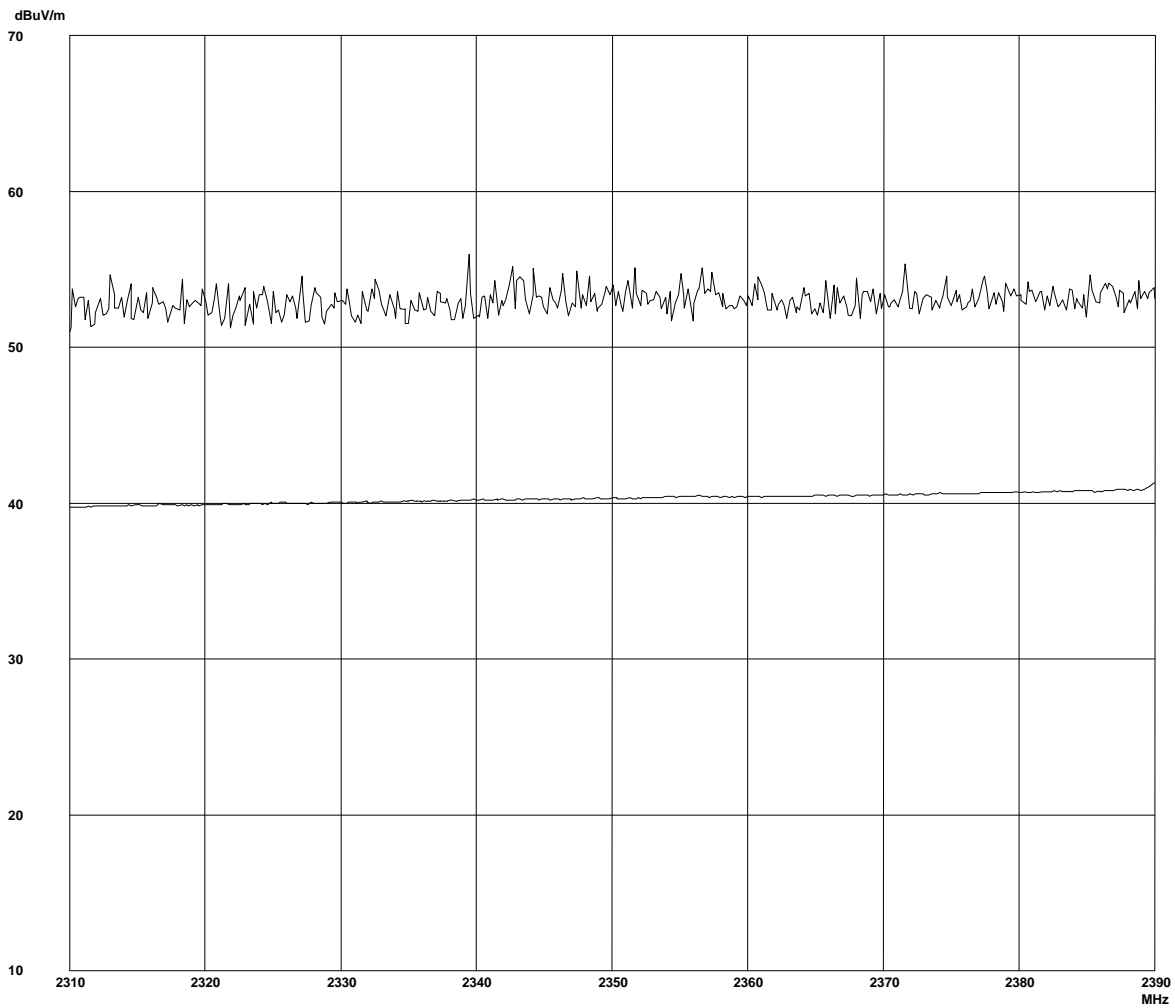
Note: Upper trace are Peak values, lower trace are Average values.

Plot 5.2.6: Horizontal polarization Emissions at 2310MHz to 2390MHz at 1Mbps



Note: Upper trace are Peak values, lower trace are Average values.

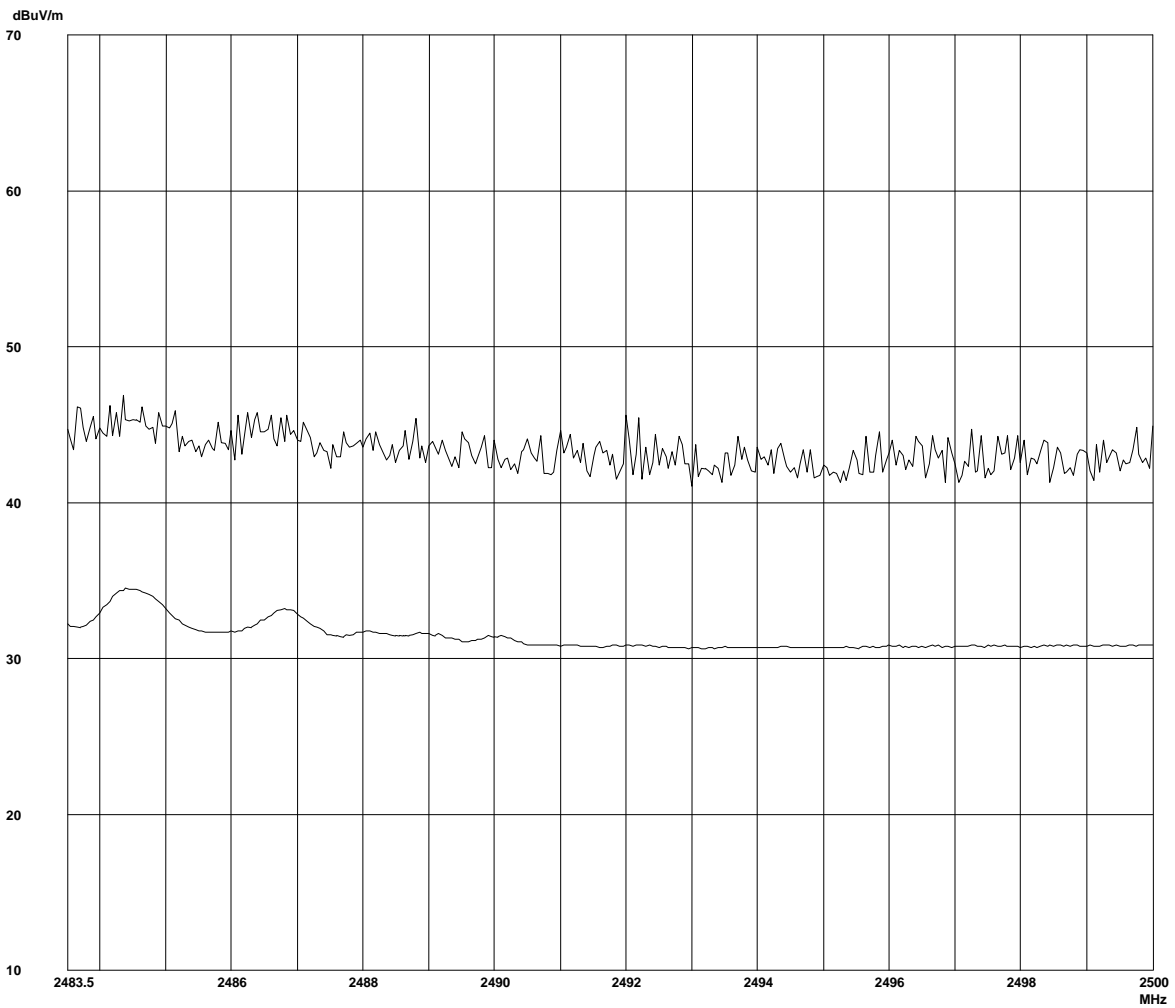
Plot 5.2.7: Vertical polarization Emissions at 2310MHz to 2390MHz at 11 Mbps



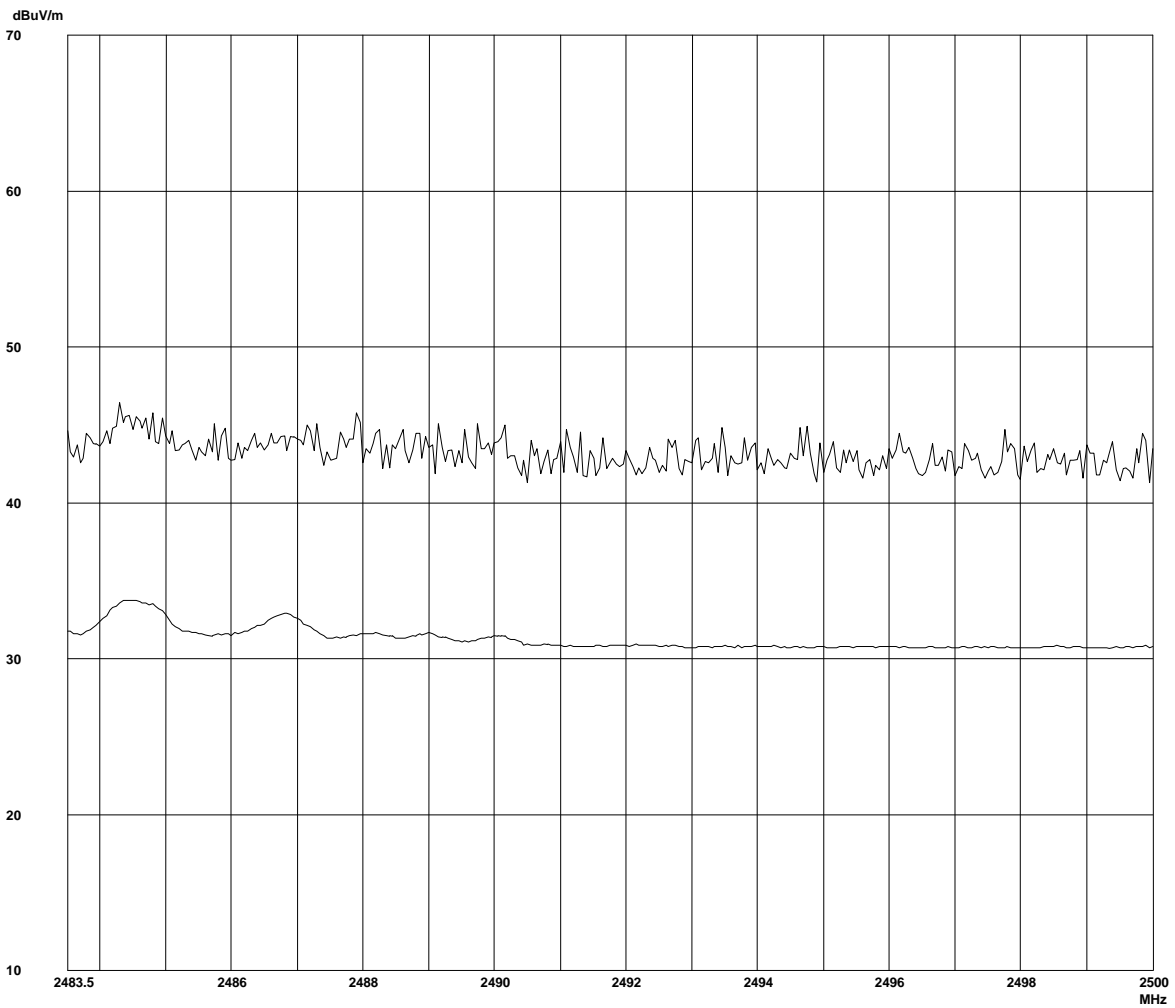
Plot 5.2.8: Horizontal polarization Emissions at 2310MHz to 2390MHz at 11 Mbps

Note: Upper trace are Peak values, lower trace are Average values.

### 5.3 Test configuration: WB-S1100 connected to Turbo wave QUAD3 antenna

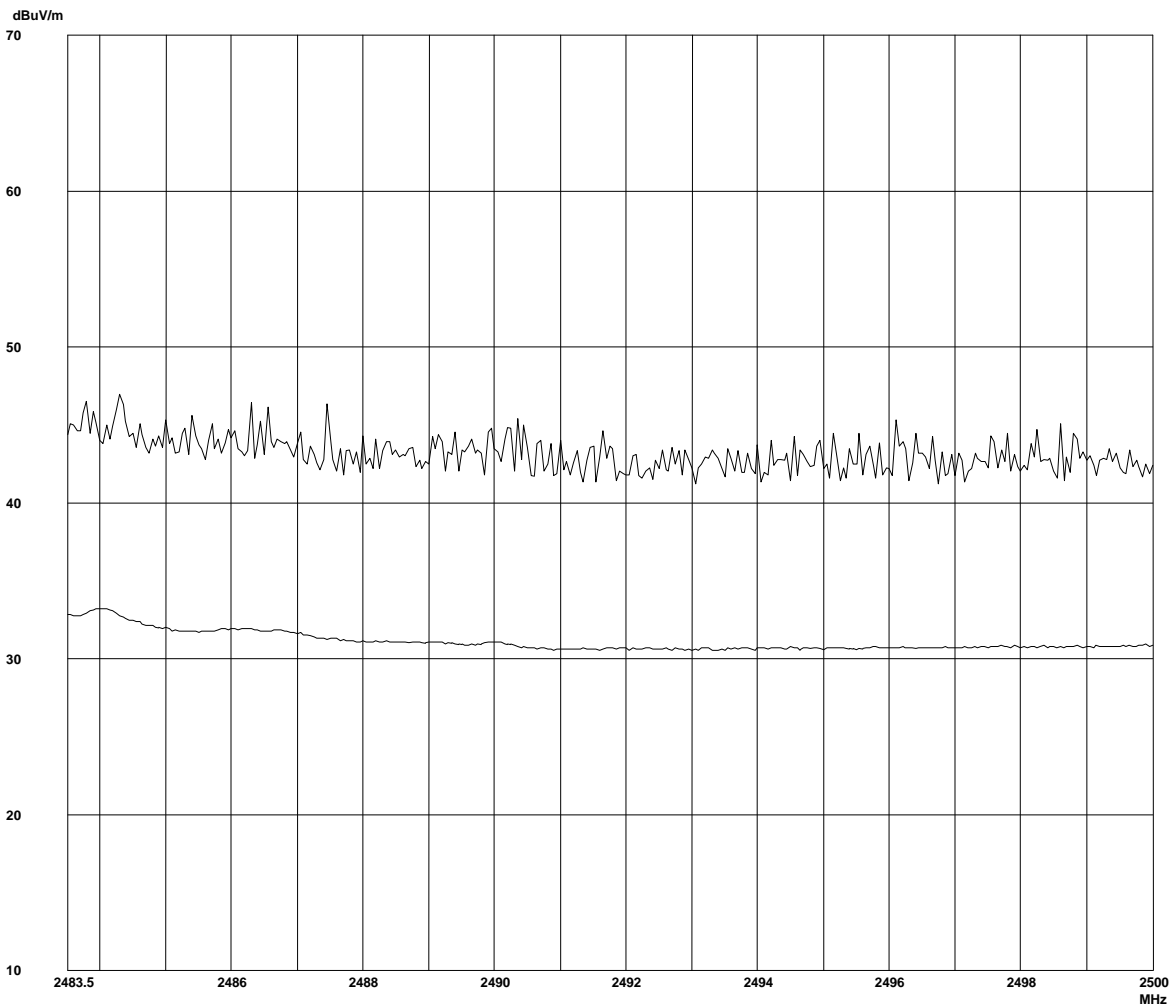


Plot 5.3.1: Vertical polarization Emissions at 2483.5MHz to 2500MHz at 1 Mbps



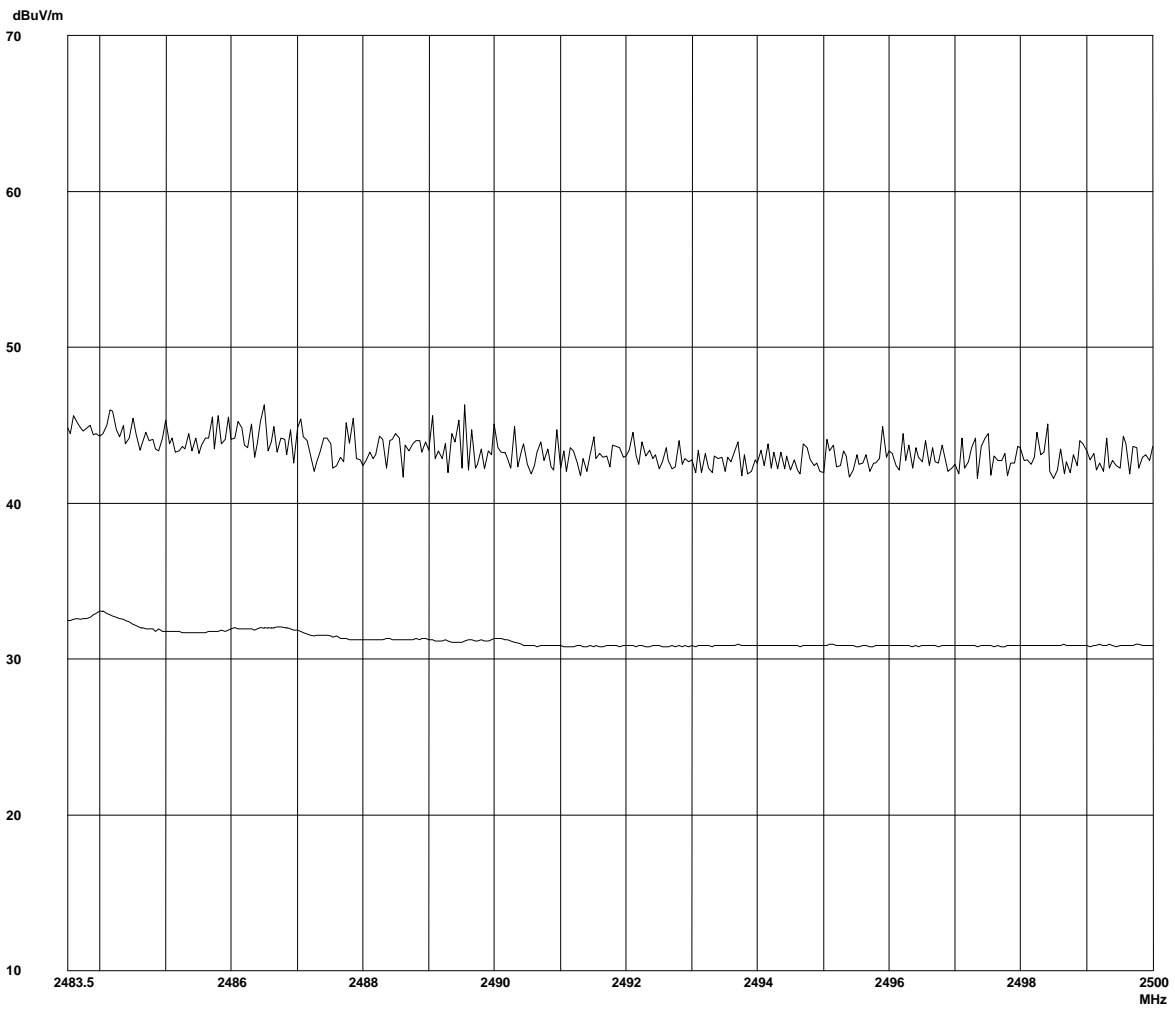
Plot 5.3.2: Horizontal polarization Emissions at 2483.5MHz to 2500MHz at 1 Mbps

Note: Upper trace are Peak values, lower trace are Average values.



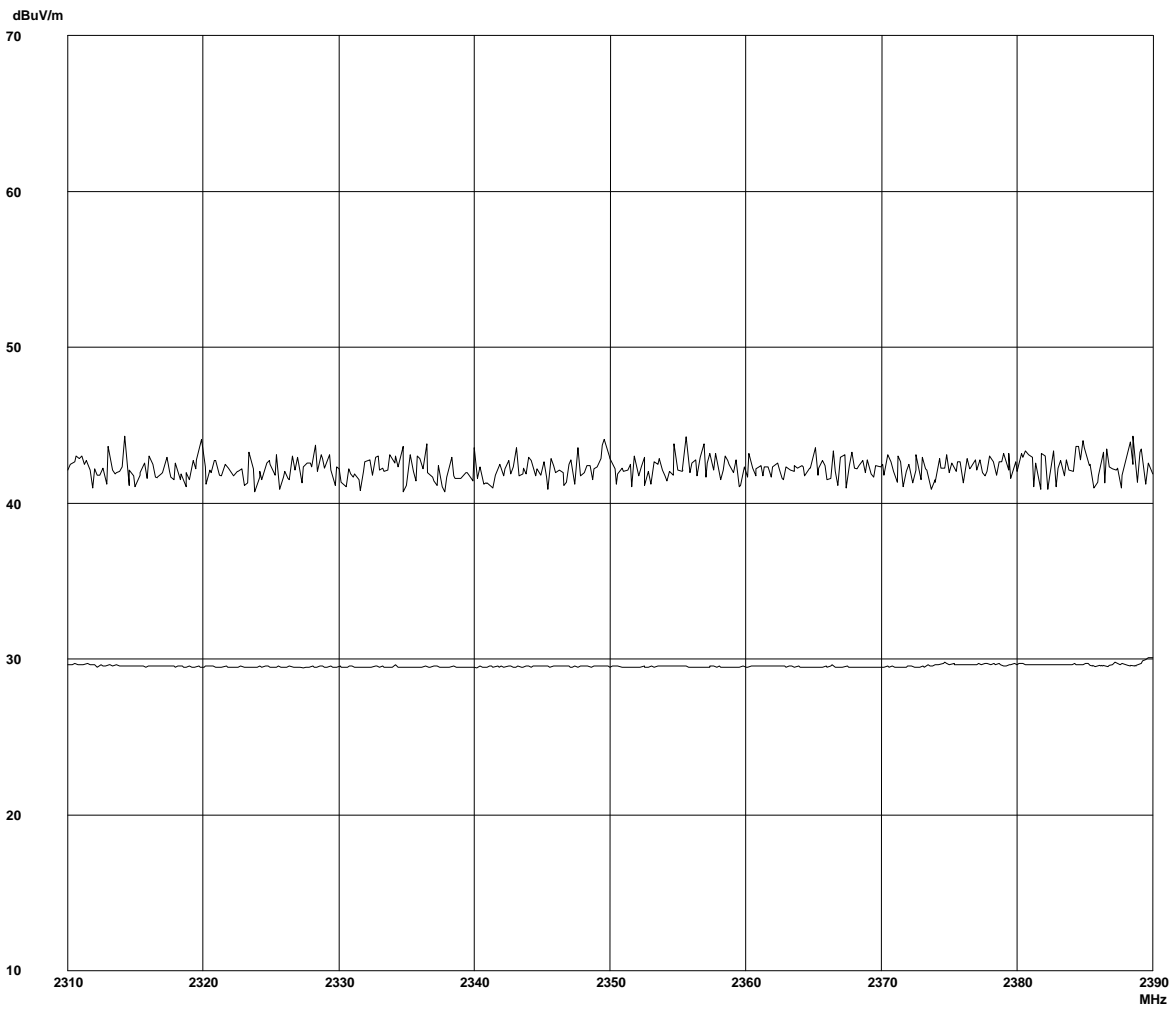
Plot 5.3.3: Vertical polarization Emissions at 2483.5MHz to 2500MHz at 11 Mbps



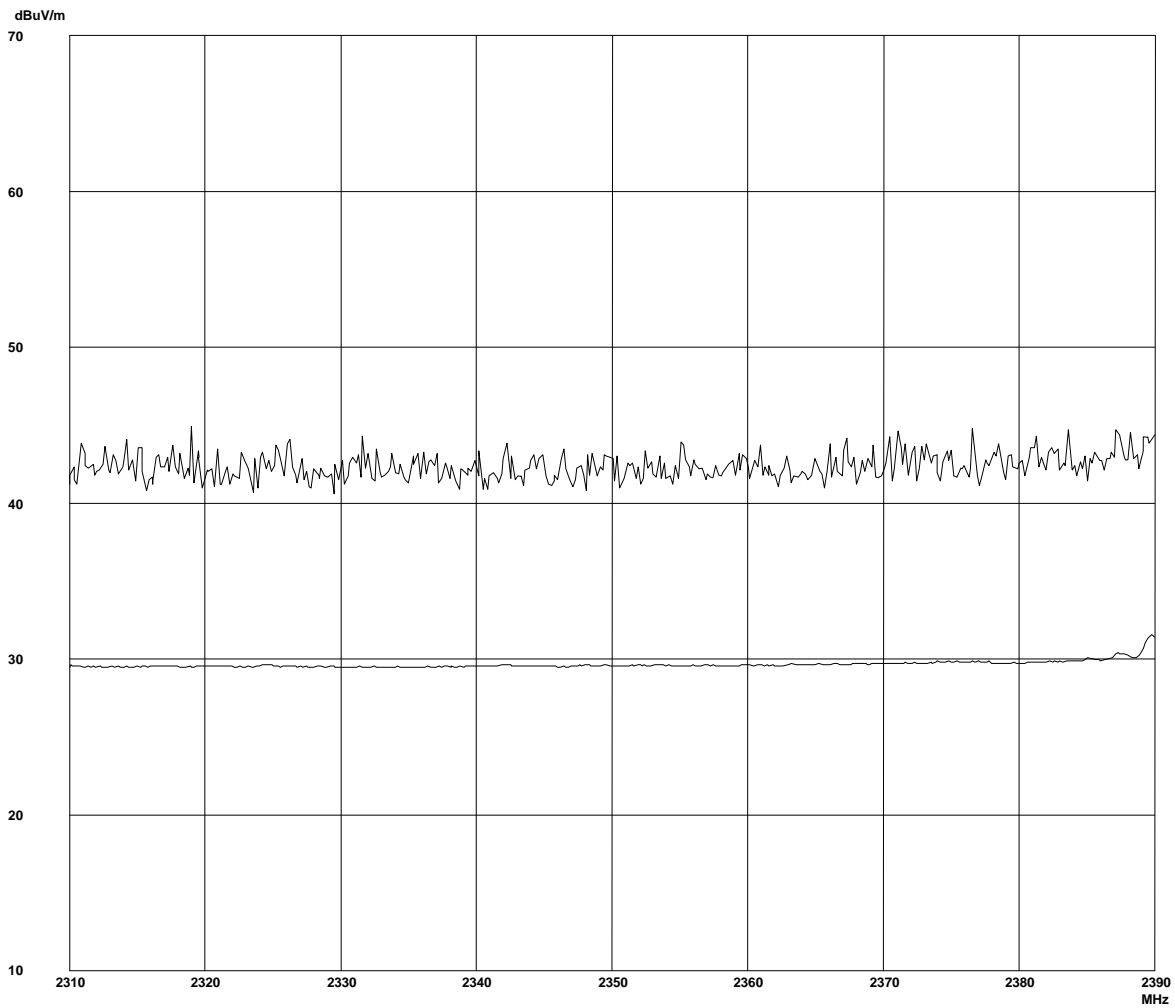


Plot 5.3.4: Horizontal polarization Emissions at 2483.5MHz to 2500MHz at 11 Mbps

Note: Upper trace are Peak values, lower trace are Average values.

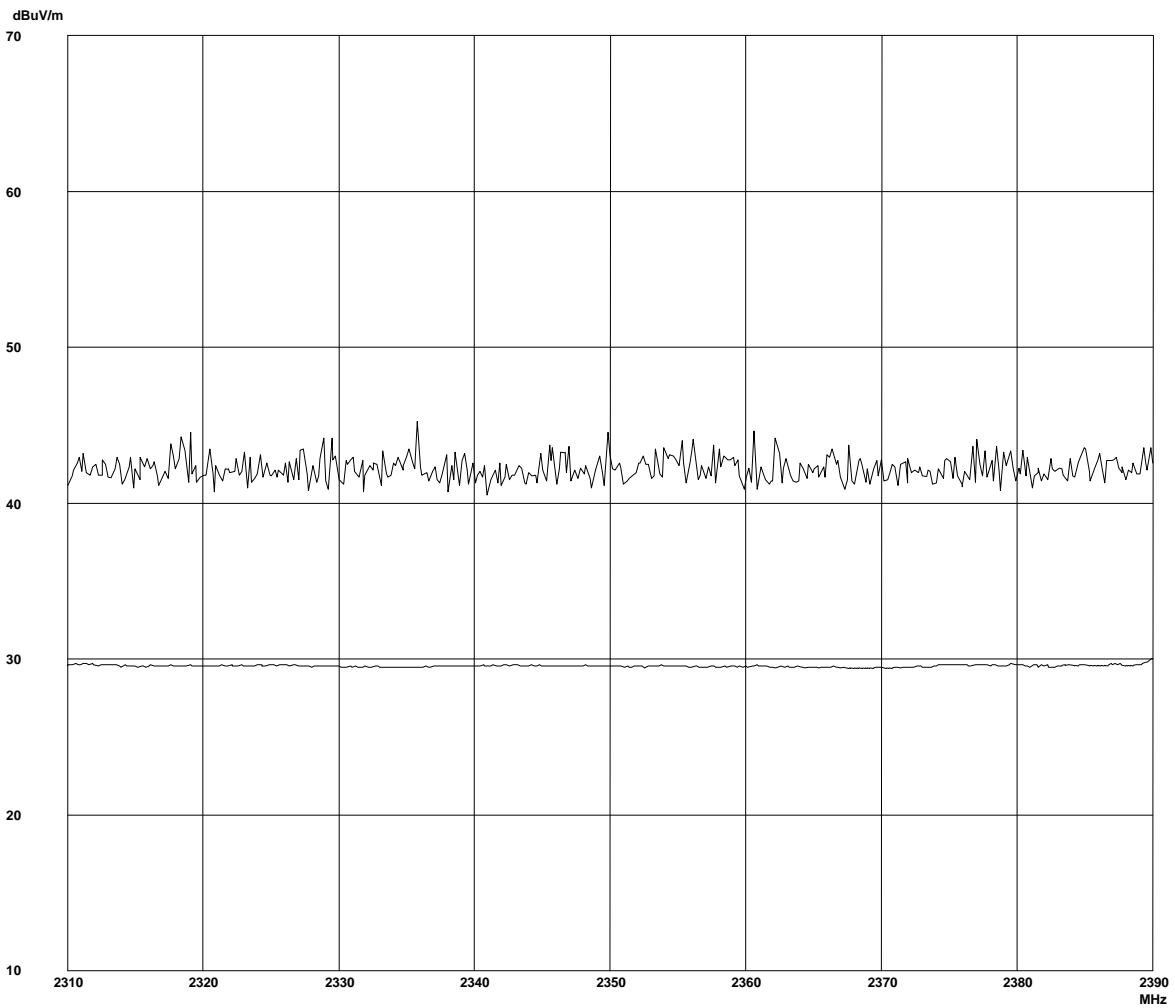


Plot 5.3.5: Vertical polarization Emissions at 2310MHz to 2390MHz at 1Mbps



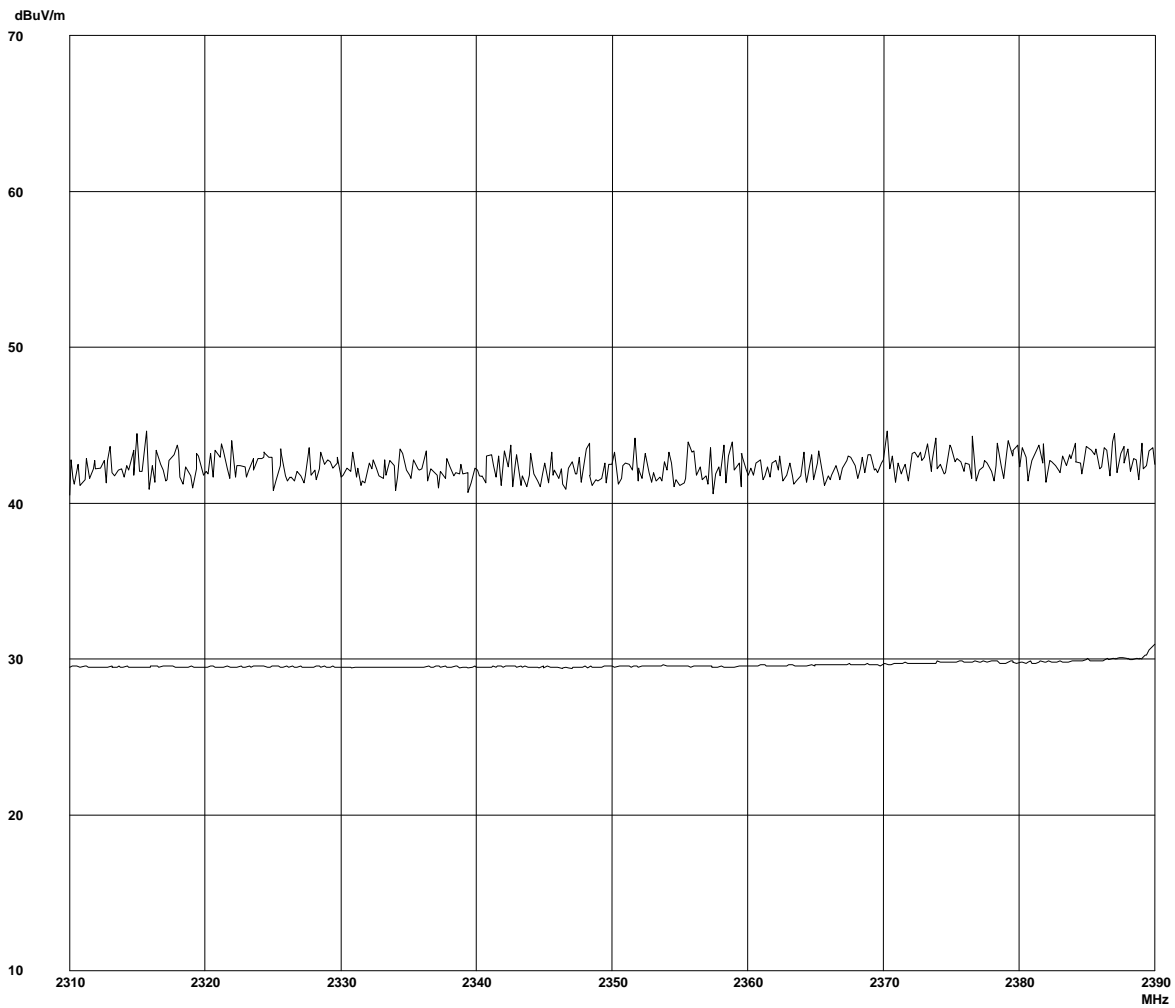
Plot 5.3.6: Horizontal polarization Emissions at 2310MHz to 2390MHz at 1Mbps

Note: Upper trace are Peak values, lower trace are Average values.



Plot 5.3.7: Vertical polarization Emissions at 2310MHz to 2390MHz at 11 Mbps

Note: Upper trace are Peak values, lower trace are Average values.



Plot 5.3.8: Horizontal polarization Emissions at 2310MHz to 2390MHz at 11 Mbps

Note: Upper trace are Peak values, lower trace are Average values.

## 6 Receiver radiated emission data (<1 GHz)

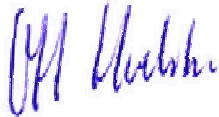
The transmitter radiated emission measurement results listed in paragraph 3 are also valid for Receive mode for channels 1, 6 and 11 for both 1.0 Mbps and 11.0 Mbps, as the emission levels are not operating frequency nor bit rate dependent.

The radiated emission measurement has been carried out with AC supply voltage of 120 V.

Test personnel:

Date : March 27, 2001

Tester signature :

A handwritten signature in blue ink, appearing to read 'O.H. Hoekstra', is written over the colon following the 'Tester signature' label.

Name : Onno H. Hoekstra

## 7 Receiver radiated emission data ( $\geq 1\text{GHz}$ )

The following data lists the significant emission frequencies (worst case), measured levels in accordance with FCC 15.109 and 15.209. Photographs of test set ups used are included in annex attached to this report.

### 7.1 Test configuration: WB-S1100 connected to Turbo wave SLH10 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 7.1.1: Radiated emissions with WB-S1100 on ch 1 connected to Turbo wave SLH10 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 7.1.2: Radiated emissions with WB-S1100 on ch 1 connected to Turbo wave SLH10 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 7.1.3: Radiated emissions with WB-S1100 on ch 6 connected to Turbo wave SLH10 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 7.1.4: Radiated emissions with WB-S1100 on ch 6 connected to Turbo wave SLH10 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 7.1.5: Radiated emissions with WB-S1100 on ch 11 connected to Turbo wave SLH10 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 7.1.6: Radiated emissions with WB-S1100 on ch 11 connected to Turbo wave SLH10 antenna

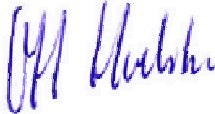
Notes:

Emission values above 1 GHz are measured with the Peak detector. Polarization refers to measuring antenna, negative margin means it is below the limit. The radiated emission measurement has been carried out with AC supply voltage of 120 V.

Above measurement results are valid for both 1.0 Mbps and 11.0 Mbps, as the emission levels are not bit rate dependent.

Test personnel:

Date : March 27, 2001

Tester signature : 

Name : Onno H. Hoekstra



## 7.2 Test configuration: WB-S1100 connected to Turbo wave SLH12 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 7.2.1: Radiated emissions with WB-S1100 on ch 1 connected to Turbo wave SLH12 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 7.2.2: Radiated emissions with WB-S1100 on ch 1 connected to Turbo wave SLH12 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 7.2.3: Radiated emissions with WB-S1100 on ch 6 connected to Turbo wave SLH12 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 7.2.4: Radiated emissions with WB-S1100 on ch 6 connected to Turbo wave SLH12 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 7.2.5: Radiated emissions with WB-S1100 on ch 11 connected to Turbo wave SLH12 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 7.2.6: Radiated emissions with WB-S1100 on ch 11 connected to Turbo wave SLH12 antenna

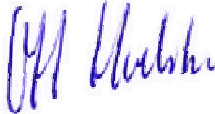
Notes:

Emission values above 1 GHz are measured in Peak mode. Polarization refers to measuring antenna, negative margin means it is below the limit. The radiated emission measurement has been carried out with AC supply voltage of 120 V.

Above measurement results are valid for both 1.0 Mbps and 11.0 Mbps, as the emission levels are not bit rate dependent.

Test personnel:

Date : March 27, 2001

Tester signature : 

Name : Onno H. Hoekstra

### 7.3 Test configuration: WB-S1100 connected to Turbo wave QUAD3 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 7.3.1: Radiated emissions with WB-S1100 on ch 1 connected to Turbo wave QUAD3 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 7.3.2: Radiated emissions with WB-S1100 on ch 1 connected to Turbo wave QUAD3 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 7.3.3: Radiated emissions with WB-S1100 on ch 6 connected to Turbo wave QUAD3 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 7.3.4: Radiated emissions with WB-S1100 on ch 6 connected to Turbo wave QUAD3 antenna

| Vertical polarization |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Frequency             | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                   | dBuV/m                  | dBuV/m    | dB         |
| >1000                 | <44.0                   | 54.0      | <-10.0     |

Table 7.3.5: Radiated emissions with WB-S1100 on ch 11 connected to Turbo wave QUAD3 antenna

| Horizontal polarization |                         |           |            |
|-------------------------|-------------------------|-----------|------------|
| Frequency               | Measured Value Peak(3m) | FCC limit | FCC margin |
| MHz                     | dBuV/m                  | dBuV/m    | dB         |
| >1000                   | <44.0                   | 54.0      | <-10.0     |

Table 7.3.6: Radiated emissions with WB-S1100 on ch 11 connected to Turbo wave QUAD3 antenna

Notes:

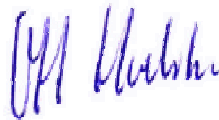
Emission values above 1 GHz are measured with the Peak detector. Polarization refers to measuring antenna, negative margin means it is below the limit. The radiated emission measurement has been carried out with AC supply voltage of 120 V.

Above measurement results are valid for both 1.0 Mbps and 11.0 Mbps, as the emission levels are not bit rate dependent.

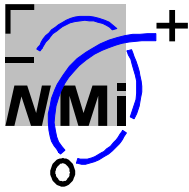
Test personnel:

Date : March 27, 2001

Tester signature :



Name : Onno H. Hoekstra



## 8 Antenna requirement

All antennas use a unique non-standard coupling for the connection to the intentional radiator. This shall be considered sufficient to comply with the provisions of Section 15.203.

Test personnel:

Date : March 27, 2001

Tester signature :

Name : Onno H. Hoekstra