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Electrical

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## **RADIO TEST REPORT**

according to 47CFR Part 15, §15.247 and subpart B  
for

**Airspan Networks (Israel) Ltd.**

EQUIPMENT UNDER TEST:

**Base station radio unit**

**Model: BSR 900 MHz**

This report is in conformity with ISO/IEC 17025. The A2LA logo endorsement applies only to the test methods and the standards that are listed in the scope of Hermon Laboratories accreditation.  
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## 1 Project information

### EUT attributes

|                    |                         |
|--------------------|-------------------------|
| Test item          | Base station radio unit |
| Type (Model)       | BSR 900 MHz             |
| Serial number      | 0001                    |
| Equipment FCC code | DSS                     |

### Applicant information

|                                |                                              |
|--------------------------------|----------------------------------------------|
| Applicant's responsible person | Mr. Zion Levi, compliance & testing engineer |
| Applicant/Manufacturer         | Airspan Networks (Israel) Ltd.               |
| Address                        | 1, Harava street, "Unitronics" building      |
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### Test details

|                     |                                                                            |
|---------------------|----------------------------------------------------------------------------|
| Project number      | 15694                                                                      |
| Location            | Hermon Laboratories                                                        |
| Test started        | October 2, 2003                                                            |
| Test completed      | October 19, 2003                                                           |
| Purpose of test     | Apparatus compliance verification in accordance with emission requirements |
| Test specifications | 47CFR Part 15, §15.247 and subpart B                                       |



## 2 Summary of tests and signatures

The tests listed in the table below were performed.  
The EUT was found complying with the limits of 47CFR Part 15, §15.247 and subpart B.

| Test description                                                      | Specification reference | Tested by                        | Date tested      | Test report paragraph | Verdict |
|-----------------------------------------------------------------------|-------------------------|----------------------------------|------------------|-----------------------|---------|
| <b>Hybrid system</b>                                                  |                         |                                  |                  |                       |         |
| Peak power spectral density at frequency hopping operation turned off | 15.247(f)               | Mr. I. Fershtater, test engineer | October 2, 2003  | 4.1                   | Pass    |
| Average time of occupancy at frequency hopping operation turned on    | 15.247(f)               | Mr. Y. Neuman, test engineer     | October 15, 2003 | 4.2                   | Pass    |
| Maximum peak output power at frequency hopping operation turned off   | 15.247(b)(3)            | Mr. I. Fershtater, test engineer | October 26, 2003 | 4.3                   | Pass    |
| Minimum channel separation                                            | 15.247(a)(1)            | Manufacturer statement           | NA               | 4.4                   | Pass    |
| 6 dB bandwidth                                                        | 15.247(a)(2)            | Mr. I. Fershtater, test engineer | October 2, 2003  | 4.4                   | Pass    |
| Spurious emissions (conducted)                                        | 15.247(c)               | Mr. I. Fershtater, test engineer | October 14, 2003 | 4.5                   | Pass    |
| Spurious emissions (radiated) in restricted bands                     | 15.209(a), 15.205(a, c) | Mr. Y. Neuman, test engineer     | October 15, 2003 | 4.6                   | Pass    |
| <b>Unintentional radiation</b>                                        |                         |                                  |                  |                       |         |
| Conducted emissions                                                   | 15.207, 15.107          | Mr. Y. Neuman, test engineer     | October 19, 2003 | 4.7                   | Pass    |
| Radiated emissions                                                    | 15.109                  | Mr. I. Fershtater, test engineer | October 15, 2003 | 4.8                   | Pass    |

**Test report prepared by:**

Mrs. M. Cherniavsky, MScEE, certification engineer

**Test report approved by:**

Mr. Michael Nikishin, MScEE, group leader

Mr. Edward Usoskin, PhD, C.E.O.



## 3 EUT description

### 3.1 General description

A base station radio, BSR 900 MHz, is a part of a WipLL broadband fixed cellular wireless access system. The system provides a radio link between an end-user (a subscriber) and a network itself to give high-speed data access. The EUT is a hybrid system transceiver (8FSK digital modulation with frequency hopping, data rate 3 Mbps and 4 Mbps), operating in 903 MHz to 927 MHz range, equipped with an 11 dBi gain omnidirectional or 15.5 dBi gain (dual polarization or vertical polarization) external antenna. It is installed outside the base station site and typically is mounted on a pole.

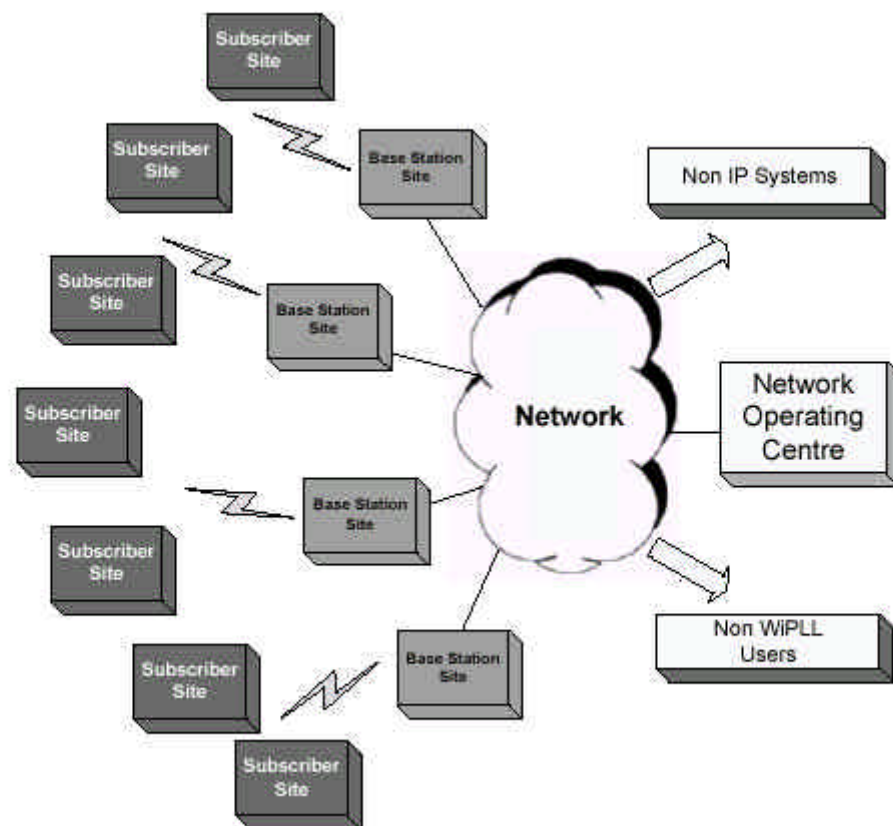
The BSR is powered via a subscriber data adapter (SDA), which provides 48 V DC power.

### 3.2 EUT test configuration

Throughout testing the communication link with IDR subscriber unit was established. The EUT operating frequencies generated by clocks and oscillators: 350 MHz - first IF, 6 MHz – second IF.

The WipLL system architecture is shown in Figure 3.2.1.

Figure 3.2.1  
WipLL system architecture





## 4 Test results

### 4.1 Peak power spectral density of a hybrid system according to § 15.247(f),(d)

|                            |                                |
|----------------------------|--------------------------------|
| METHOD OF MEASUREMENTS     | FCC Docket No.96-8; FCC 97-114 |
| DATE of TEST:              | October 2, 2003                |
| AMBIENT TEMPERATURE:       | 23°C                           |
| RELATIVE HUMIDITY:         | 46 %                           |
| AIR PRESSURE:              | 1012 hPa                       |
| RATED OUTPUT POWER:        | 18 dBm                         |
| OPERATING FREQUENCY RANGE: | 903 - 927 MHz                  |
| MEASUREMENT UNCERTAINTY:   | ± 3.5 dB                       |

Frequency hopping function was turned off.

| Carrier frequency,<br>MHz | Data<br>transmission rate,<br>Mbit/s | Peak power spectral density,<br>dBm |       | Verdict | Reference to<br>Plots in Appendix<br>A |
|---------------------------|--------------------------------------|-------------------------------------|-------|---------|----------------------------------------|
|                           |                                      | Measured                            | Limit |         |                                        |
| 903                       | 4                                    | 7.67                                | 8     | Pass    | A1                                     |
| 903                       | 3                                    | 7.00                                |       | Pass    | A2                                     |
| 915                       | 4                                    | 7.17                                |       | Pass    | A3                                     |
| 915                       | 3                                    | 8.00                                |       | Pass    | A4                                     |
| 927                       | 4                                    | 7.67                                |       | Pass    | A5                                     |
| 927                       | 3                                    | 7.00                                |       | Pass    | A6                                     |

#### LIMIT

The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

#### TEST PROCEDURE

The EUT RF output was connected via attenuator to the spectrum analyzer; the settings are shown in the plots. Spectrum analyzer readings were corrected for external attenuation and cable loss. The measurements were performed in continuous transmission mode of operation for carrier (channel) frequency modulated with PRBS at low and high edges and at the middle of the range according to method #1 for peak power spectral density.

#### TEST EQUIPMENT USED:

|         |         |         |  |  |  |  |
|---------|---------|---------|--|--|--|--|
| HL 1097 | HL 1424 | HL 2399 |  |  |  |  |
|---------|---------|---------|--|--|--|--|



## 4.2 Average time of hopping frequency occupancy according to § 15.247(f), (a)(1)

METHOD OF MEASUREMENT: ANSI 63.4 §13.1.7  
DATE of TEST: October 15, 2003  
AMBIENT TEMPERATURE: 23°C  
RELATIVE HUMIDITY: 44 %  
AIR PRESSURE: 1012 hPa  
OPERATING FREQUENCY RANGE: 903 - 927 MHz  
MEASUREMENT UNCERTAINTY: ± 1%

Frequency hopping function was turned on.

| Carrier frequency,<br>MHz | Quantity of transmissions at one frequency | Tx ON of 1 transmission at one frequency,<br>ms | Average time of occupancy during 10 s period,<br>ms | Verdict | Reference to Plots in Appendix A |
|---------------------------|--------------------------------------------|-------------------------------------------------|-----------------------------------------------------|---------|----------------------------------|
| 903                       | 8                                          | 25.583                                          | 204.664                                             | Pass    | A7, A8                           |

Average factor calculation according to §15.35(c):  
 $20 \log (25.583/100) = -11.84 \text{ dB}$

### LIMIT

| Operating mode | Limit                                                                                                                                                                                                                                                       |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hybrid         | With the hopping system operation turned on, an average time of occupancy on any frequency shall not exceed 0.4 s within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4: $25 \times 0.4 = 10 \text{ (sec)}$ |

### TEST PROCEDURE

The EUT RF output was connected via attenuator to spectrum analyzer, which settings are shown in the plots. Spectrum analyzer readings were corrected for external attenuation and cable loss.

### TEST EQUIPMENT USED:

|         |         |         |  |  |  |  |
|---------|---------|---------|--|--|--|--|
| HL 1097 | HL 1424 | HL 2399 |  |  |  |  |
|---------|---------|---------|--|--|--|--|



### 4.3 Maximum peak output power test according to §15.247(b)(3)

METHOD OF MEASUREMENTS: ANSI 63.4 §13.1.4  
DATE of TEST: October 2, 2003  
AMBIENT TEMPERATURE: 23°C  
RELATIVE HUMIDITY: 46 %  
AIR PRESSURE: 1012 hPa  
OPERATING FREQUENCY RANGE: 903 -927 MHz  
MEASUREMENT UNCERTAINTY: ± 3.5 dB

| Carrier frequency, MHz | Data rate, Mbit/s | Peak output power, dBm | Limit, dBm | Margin, dB | Verdict | Reference to Plots in Appendix A |
|------------------------|-------------------|------------------------|------------|------------|---------|----------------------------------|
| 903                    | 4                 | 18.00                  | 20.5       | 2.5        | Pass    | A9                               |
| 903                    | 3                 | 14.83                  | 20.5       | 5.67       | Pass    | A10                              |
| 915                    | 4                 | 17.83                  | 20.5       | 2.67       | Pass    | A11                              |
| 915                    | 3                 | 15.33                  | 20.5       | 5.17       | Pass    | A12                              |
| 927                    | 4                 | 17.50                  | 20.5       | 3.0        | Pass    | A13                              |
| 927                    | 3                 | 15.67                  | 20.5       | 4.83       | Pass    | A14                              |

#### LIMIT

| Operating frequency range, MHz | Number of hopping channels | Maximum peak output power*, W |
|--------------------------------|----------------------------|-------------------------------|
| Hybrid                         | any admissible             | 1                             |

#### \* Notes to table

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced below the stated values by the amount in dB that the directional gain of the antenna exceeds 6 dBi.  
Antenna gain is 15.5 dBi, peak output power limit is 20.5 dBm.

#### TEST PROCEDURE

The EUT RF output was connected via attenuator to spectrum analyzer, which settings are shown in the plots. Spectrum analyzer readings were corrected for external attenuation and cable loss.

#### TEST EQUIPMENT USED:

|         |         |         |  |  |  |  |
|---------|---------|---------|--|--|--|--|
| HL 1097 | HL 1424 | HL 2399 |  |  |  |  |
|---------|---------|---------|--|--|--|--|



#### 4.4 Minimum channel separation and occupied bandwidth according to § 15.247(a)(1), (2)

METHOD OF MEASUREMENTS: ANSI 63.4 §13.1.7  
DATE of TEST: October 2, 2003  
AMBIENT TEMPERATURE: 23°C  
RELATIVE HUMIDITY: 46 %  
AIR PRESSURE: 1012 hPa  
OPERATING FREQUENCY RANGE: 903 -927 MHz  
MEASUREMENT UNCERTAINTY:  $\pm 2.3$  dB

According to applicant statement the minimum channel separation is 1 MHz.

| Carrier frequency, MHz | Data rate, Mbit/s | 6 dB bandwidth, kHz |       | Verdict | Reference to Plots in Appendix A |
|------------------------|-------------------|---------------------|-------|---------|----------------------------------|
|                        |                   | Measured            | Limit |         |                                  |
| 903                    | 4                 | 808                 | 500   | Pass    | A15                              |
| 903                    | 3                 | 525                 | 500   | Pass    | A16                              |
| 915                    | 4                 | 808                 | 500   | Pass    | A17                              |
| 915                    | 3                 | 515                 | 500   | Pass    | A18                              |
| 927                    | 4                 | 800                 | 500   | Pass    | A19                              |
| 927                    | 3                 | 515                 | 500   | Pass    | A20                              |

#### LIMIT

| Operating frequency range, MHz | Allowed bandwidth | Channel carrier frequency separation (minimum) |
|--------------------------------|-------------------|------------------------------------------------|
| Hybrid                         | any admissible    | 25 kHz or 20 dB bandwidth, which is greater    |

#### TEST PROCEDURE

The EUT RF output was connected to the spectrum analyzer, which settings are shown in the plots. Spectrum analyzer readings were corrected for external attenuation and cable loss.

#### TEST EQUIPMENT USED:

|         |         |         |  |  |  |  |
|---------|---------|---------|--|--|--|--|
| HL 1097 | HL 1424 | HL 2399 |  |  |  |  |
|---------|---------|---------|--|--|--|--|



## 4.5 Out of band conducted emissions test according to §15.247(c)

|                            |                   |
|----------------------------|-------------------|
| METHOD OF MEASUREMENTS:    | ANSI 63.4 §13.1.5 |
| DATE of TEST:              | October 2, 2003   |
| AMBIENT TEMPERATURE:       | 23°C              |
| RELATIVE HUMIDITY:         | 46 %              |
| AIR PRESSURE:              | 1012 hPa          |
| OPERATING FREQUENCY RANGE: | 903 -927 MHz      |
| RATED RF OUTPUT POWER:     | 18 dBm            |
| MODULATION TECHNIQUE:      | hybrid            |
| FREQUENCY RANGE:           | 6 MHz – 9.3 GHz   |
| MEASUREMENT UNCERTAINTY:   | ± 4.3 dB          |

\* The frequency spectrum was investigated from the lowest radio frequency signal generated in the equipment (6 MHz) up to 10<sup>th</sup> harmonic, 9.3 GHz.

All measured emissions were found below specified limit. Test results are shown in Plots A25 to A36.

No effect of the data rate was observed therefore only 4 Mbit/s rate was used for measurements.

Emissions at the lower band edge and at the higher band edge were tested and provided in Plots A21 to A24.

### LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

### TEST PROCEDURE

The EUT RF output was connected via attenuator to spectrum analyzer, which settings are shown in the plots. Spectrum analyzer readings were corrected for external attenuation and cable loss. Spurious emission measurements were performed at the lowest (903 MHz), the highest (927 MHz) and one of the middle channel (915 MHz) frequencies.

### TEST EQUIPMENT USED:

|         |         |         |  |  |  |  |
|---------|---------|---------|--|--|--|--|
| HL 1424 | HL 1651 | HL 2399 |  |  |  |  |
|---------|---------|---------|--|--|--|--|



#### 4.6 Radiated emissions which fall in restricted bands test according to §15.247(c) and § 15.205, §15.209(a)

|                            |                            |
|----------------------------|----------------------------|
| METHOD OF MEASUREMENTS:    | ANSI 63.4 §13.1.4/ §13.1.5 |
| TEST PERFORMED IN:         | Anechoic chamber, OATS     |
| DATE of TEST:              | October 14, 15, 2003       |
| AMBIENT TEMPERATURE:       | 24°C                       |
| RELATIVE HUMIDITY:         | 38 %                       |
| AIR PRESSURE:              | 1012 hPa                   |
| OPERATING FREQUENCY RANGE: | 903 -927 MHz               |
| RATED RF OUTPUT POWER:     | 18 dBm                     |
| ANTENNA GAIN:              | 15.5 dBi                   |
| TEST DISTANCE              | 3 m                        |
| FREQUENCY RANGE:           | 150 kHz to 9.3 GHz         |
| MEASUREMENT UNCERTAINTY:   | ± 4.3 dB                   |

\* The frequency spectrum was investigated from 150 kHz to the tenth harmonic of the highest fundamental frequency. All emissions were found below the specified limit. For test results refer to Plots A37 – A81.

#### LIMIT

Radiated emissions, which fall in the restricted bands, must comply with §15.209(a) limits.

#### TEST PROCEDURE

The test was performed with transmitter operating at 3 carrier frequencies  $F_{min} = 903$  MHz,  $F_{middle} = 915$  MHz,  $F_{max} = 927$  MHz. The measurements were performed at 3 m test distance from 150 kHz to 9.3 GHz. The EUT was placed on a wooden 80 cm height turntable.

**150 kHz – 30 MHz frequency range.** The loop antenna was positioned with its plane vertical. The loop center was 1 meter above the ground plane. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated about its vertical axis.

**30 MHz – 9.3 GHz frequency range.** To find maximum radiation the turntable was rotated 360°, measuring antenna height was changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal.

#### Quasi-peak detector

| Frequency,<br>MHz | Antenna type | Antenna<br>height,<br>m | Turntable<br>position,<br>° | Radiated<br>emissions,<br>dB (mV/m) | Limit,<br>dB (mV/m) | Margin,<br>dB | Reference<br>to Plots in<br>Appendix A |
|-------------------|--------------|-------------------------|-----------------------------|-------------------------------------|---------------------|---------------|----------------------------------------|
| 110.0             | Biconilog    | 1.0                     | 0                           | 30.65                               | 43.50               | 12.85         | A38                                    |
| 240.0             | Biconilog    | 1.02                    | 51                          | 38.03                               | 46.00               | 7.97          | A38                                    |
| 972.0             | Biconilog    | 1.87                    | 128                         | 43.10                               | 54.00               | 10.90         | A39                                    |
| 985.0             | Biconilog    | 1.84                    | 118                         | 40.91                               | 54.00               | 13.09         | A56                                    |

The recorded test results were obtained through measurements with antennas in vertical polarization.  
Turntable position: 0° = EUT front panel faces the receiving antenna

**Peak value**

| Frequency, MHz | Antenna polarization | Antenna height, m | Turntable position, ° | Radiated emissions, dB (mV/m) | Limit, dB (mV/m) | Margin, dB | Reference to Plots in Appendix A |
|----------------|----------------------|-------------------|-----------------------|-------------------------------|------------------|------------|----------------------------------|
| 1000.8         | Vertical             | 1.68              | 141                   | 48.82                         | 74               | 25.18      | A74                              |
| 1392.0         | Vertical             | 1.50              | 7                     | 46.59                         | 74               | 27.41      | A42                              |
| 2710.0         | Vertical             | 1.60              | 352                   | 50.37                         | 74               | 23.63      | A43                              |
| 2745.0         | Vertical             | 1.60              | 344                   | 49.40                         | 74               | 24.60      | A61                              |
| 2848.0         | Vertical             | 1.00              | 351                   | 54.46                         | 74               | 19.54      | A45                              |
| 5012.0         | Horizontal           | 1.00              | 0                     | 53.67                         | 74               | 20.33      | A48                              |
| 5060.0         | Horizontal           | 1.00              | 0                     | 51.67                         | 74               | 22.33      | A65                              |
| 7518.0         | Vertical             | 1.00              | 0                     | 53.67                         | 74               | 20.33      | A51                              |
| 7590.0         | Vertical             | 1.00              | 0                     | 53.67                         | 74               | 20.33      | A68                              |

**Average value**

| Frequency, MHz | Antenna polarization | Antenna height, m | Turntable position, ° | Radiated emissions, dB (mV/m) | Limit, dB (mV/m) | Margin, dB | Reference to Plots in Appendix A |
|----------------|----------------------|-------------------|-----------------------|-------------------------------|------------------|------------|----------------------------------|
| 1000.8         | Vertical             | 1.68              | 141                   | 35.57                         | 54               | 18.43      | A74                              |
| 1392.0         | Vertical             | 1.50              | 7                     | 35.78                         | 54               | 18.22      | A42                              |
| 2710.0         | Vertical             | 1.60              | 352                   | 26.31                         | 54               | 27.69      | A44                              |
| 2745.0         | Vertical             | 1.60              | 344                   | 25.73                         | 54               | 28.27      | A62                              |
| 2848.0         | Vertical             | 1.00              | 351                   | 49.26                         | 54               | 4.74       | A45                              |
| 5012.0         | Horizontal           | 1.00              | 0                     | 39.83                         | 54               | 14.17      | A49                              |
| 5060.0         | Horizontal           | 1.00              | 0                     | 36.33                         | 54               | 17.67      | A66                              |
| 7518.0         | Vertical             | 1.00              | 0                     | 32.83                         | 54               | 21.17      | A52                              |
| 7590.0         | Vertical             | 1.00              | 0                     | 33.83                         | 54               | 20.17      | A69                              |

The recorded test results were obtained through measurements with double ridged guide antenna.

**Table abbreviations:**

Margin = dB below (negative if above) specification limit.

Turntable position: 0° = EUT front panel faces the receiving antenna

**TEST EQUIPMENT USED AT OATS:**

|         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|
| HL 0038 | HL 0091 | HL 0287 | HL 1200 | HL 1365 | HL 1424 | HL 1430 |
| HL 1942 | HL 1947 | HL 1984 | HL 2254 | HL 2259 |         |         |

**TEST EQUIPMENT USED IN ANECHOIC CHAMBER:**

|         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|
| HL 0446 | HL 0465 | HL 0521 | HL 0589 | HL 0592 | HL 0593 | HL 0594 |
| HL 0604 | HL 1004 | HL 1947 | HL 1984 | HL 2009 |         |         |



#### 4.7 Conducted emissions test according to §15.107, 15.207

METHOD OF MEASUREMENTS: ANSI 63.4 §13.1.3  
DATE of TEST: October 19, 2003  
AMBIENT TEMPERATURE: 22°C  
RELATIVE HUMIDITY: 44 %  
AIR PRESSURE: 1008 hPa  
FREQUENCY RANGE: 150 kHz – 30 MHz  
OPERATION MODE: Transmit, receive  
RESOLUTION BANDWIDTH: 9 kHz  
MEASUREMENT UNCERTAINTY, dB  
± 3.9 dB in 9 – 150 kHz  
± 3.8 dB in 150 kHz – 30 MHz

##### Quasi-peak detector

| Frequency,<br>MHz | Line<br>identification | Measured<br>emissions,<br>dB (mV) | Specification<br>QP limit,<br>dB (mV) | Margin,<br>dB | Verdict | Reference to<br>Plots in<br>Appendix A |
|-------------------|------------------------|-----------------------------------|---------------------------------------|---------------|---------|----------------------------------------|
| 0.347355          | Line 2                 | 44.55                             | 59.09                                 | 14.54         | Pass    | A86, A88                               |
| 1.239205          | Line 1                 | 40.92                             | 56.00                                 | 15.08         | Pass    | A85, A87                               |
| 1.638965          | Line 2                 | 41.47                             | 56.00                                 | 14.53         | Pass    | A86, A88                               |
| 2.629685          | Line 1                 | 43.13                             | 56.00                                 | 12.87         | Pass    | A85, A87                               |
| 2.925295          | Line 2                 | 43.45                             | 56.00                                 | 12.55         | Pass    | A86, A88                               |
| 4.959983          | Line 2                 | 48.81                             | 56.00                                 | 7.19          | Pass    | A86, A88                               |

##### Average detector

| Frequency,<br>MHz | Line<br>identification | Measured<br>emissions,<br>dB (mV) | Specification<br>AVRG limit,<br>dB (mV) | Margin,<br>dB | Verdict | Reference to<br>Plots in<br>Appendix A |
|-------------------|------------------------|-----------------------------------|-----------------------------------------|---------------|---------|----------------------------------------|
| 0.347355          | Line 2                 | 37.95                             | 49.09                                   | 11.14         | Pass    | A86, A88                               |
| 1.239205          | Line 1                 | 35.18                             | 46.00                                   | 10.82         | Pass    | A85, A87                               |
| 1.638965          | Line 2                 | 33.13                             | 46.00                                   | 12.87         | Pass    | A86, A88                               |
| 2.629685          | Line 1                 | 32.50                             | 46.00                                   | 13.50         | Pass    | A85, A87                               |
| 2.925295          | Line 2                 | 32.07                             | 46.00                                   | 13.93         | Pass    | A86, A88                               |
| 4.959983          | Line 2                 | 44.23                             | 46.00                                   | 1.77          | Pass    | A86, A88                               |

**Limit**

| Frequency,<br>MHz | Class B equipment, dB(mV) |          |
|-------------------|---------------------------|----------|
|                   | QP                        | AVRG     |
| 0.15 - 0.5        | 66 - 56*                  | 56 - 46* |
| 0.5 - 5           | 56                        | 46       |
| 5 - 30            | 60                        | 50       |

\*The limit decreases linearly with the logarithm of frequency.

**TEST PROCEDURE**

The measurements were performed at mains terminals by means of LISN, connected to spectrum analyzer in the frequency range as referred to in the table above. The unused coaxial connector of the LISN was terminated with 50  $\Omega$ . The measurements were made with quasi-peak and average detectors as referred to in the tables. The position of the EUT cables was varied to determine maximum emission level.

**TEST EQUIPMENT USED:**

|         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|
| HL 0447 | HL 0466 | HL 0521 | HL 0787 | HL 1003 | HL 1205 | HL 1503 |
|---------|---------|---------|---------|---------|---------|---------|



#### 4.8 Unintentional radiated emissions test according to §15.109

METHOD OF MEASUREMENT: ANSI 63.4 §11.6 / ANSI 63.4 §12.1.4  
DATE of TEST: October 14, 2003  
AMBIENT TEMPERATURE: 24°C  
RELATIVE HUMIDITY: 38 %  
AIR PRESSURE: 1012 hPa  
DISTANCE BETWEEN ANTENNA AND EUT: 3 m  
THE EUT WAS TESTED AS: TABLE-TOP  
FREQUENCY RANGE: 30 MHz – 6.5 GHz  
RESOLUTION BANDWIDTH: Shown in the plots A82 to A84

| Frequency,<br>MHz | Detector<br>type | Antenna<br>type        | Antenna<br>height,<br>cm | Turntable<br>position,<br>(°) | Radiated<br>emissions,<br>dB (mV/m) | Limit,<br>dB (mV/m) | Margin,<br>dB | Verdict |
|-------------------|------------------|------------------------|--------------------------|-------------------------------|-------------------------------------|---------------------|---------------|---------|
| 110.0             | Quai-peak        | Biconilog              | 100                      | 0                             | 30.65                               | 43.50               | 12.85         | Pass    |
| 125.0             | Quai-peak        | Biconilog              | 100                      | 4                             | 29.02                               | 43.50               | 14.48         | Pass    |
| 240.0             | Quai-peak        | Biconilog              | 102                      | 51                            | 38.03                               | 46.00               | 7.97          | Pass    |
| 288.0             | Quai-peak        | Biconilog              | 100                      | 194                           | 31.50                               | 46.00               | 14.50         | Pass    |
| 528.0             | Quai-peak        | Biconilog              | 100                      | 0                             | 33.60                               | 46.00               | 12.40         | Pass    |
| 960.0             | Quai-peak        | Biconilog              | 143                      | 3                             | 32.97                               | 46.00               | 13.03         | Pass    |
| 1392.0            | Average          | Double<br>ridged guide | 150                      | 7                             | 36.13                               | 54.00               | 17.87         | Pass    |
| 1824.3            | Average          | Double<br>ridged guide | 170                      | 13                            | 39.39                               | 54.00               | 14.61         | Pass    |
| 2848.0            | Average          | Double<br>ridged guide | 100                      | 351                           | 49.50                               | 54.00               | 4.50          | Pass    |

The test results recorded in the table were obtained throughout measurements with antennas in vertical polarization.

**Table abbreviations:**

Turntable position: 0° = EUT front panel faces the receiving antenna

|   | The EUT highest used frequency<br>(not including operating frequency),<br>MHz | Upper frequency of measurement range,<br>MHz      |
|---|-------------------------------------------------------------------------------|---------------------------------------------------|
|   | Below 1.705                                                                   | 30                                                |
|   | 1.705 – 108                                                                   | 1000                                              |
| X | 108 – 500                                                                     | 2000                                              |
|   | 500 – 1000                                                                    | 5000                                              |
|   | Above 1000                                                                    | 5 <sup>th</sup> harmonic of the highest frequency |

**LIMIT (§ 15.109)**

| Frequency,<br>MHz | Class B equipment @ 3 m<br>dB(mV/m) |
|-------------------|-------------------------------------|
| 30 - 88           | 40                                  |
| 88 - 216          | 43.5                                |
| 216 - 960         | 46                                  |
| 960 - 5000        | 54                                  |

**TEST PROCEDURE**

The test was performed in anechoic chamber in 30 MHz – 1 GHz range and at OATS in 1 GHz – 6.5 GHz. The EUT was placed on a wooden 80 cm height turntable. To find maximum radiation the turntable was rotated 360°, measuring antenna height was changed from 1 to 4 m, and the antenna polarization was changed from vertical to horizontal.

**TEST EQUIPMENT USED IN ANECHOIC CHAMBER:**

|         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|
| HL 0465 | HL 0521 | HL 0589 | HL 0592 | HL 0593 | HL 0594 | HL 0604 |
| HL 1004 | HL 1947 | HL 1984 | HL 2009 |         |         |         |

**TEST EQUIPMENT USED AT OATS:**

|         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|
| HL 0038 | HL 0091 | HL 0287 | HL 1365 | HL 1430 | HL 1947 | HL 1984 |
|         |         |         |         |         |         |         |

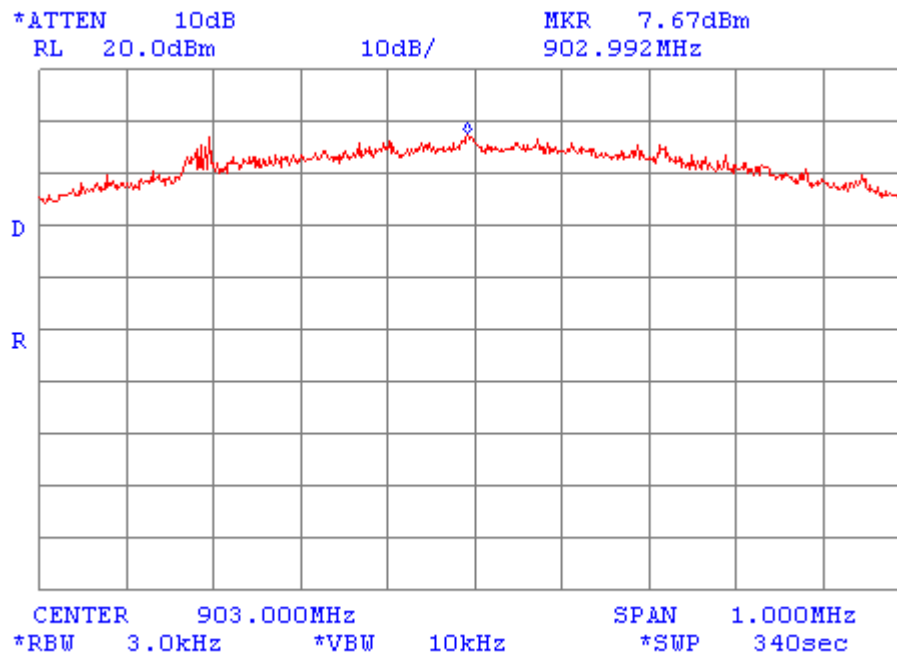


## Appendix A Plots

Plot A1

### Power density measurements

Mode: Hybrid  
F<sub>Low</sub>: 903 MHz  
Bit rate: 4 Mbit/s

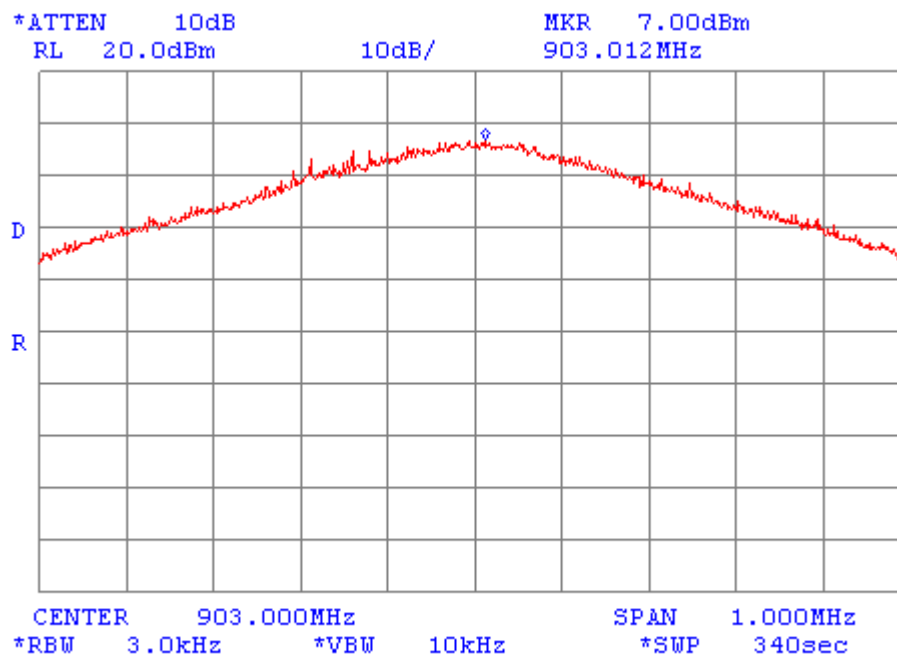




Plot A2

Power density measurements

Mode: Hybrid  
F<sub>LOW</sub>: 903 MHz  
Bit rate: 3 Mbit/s

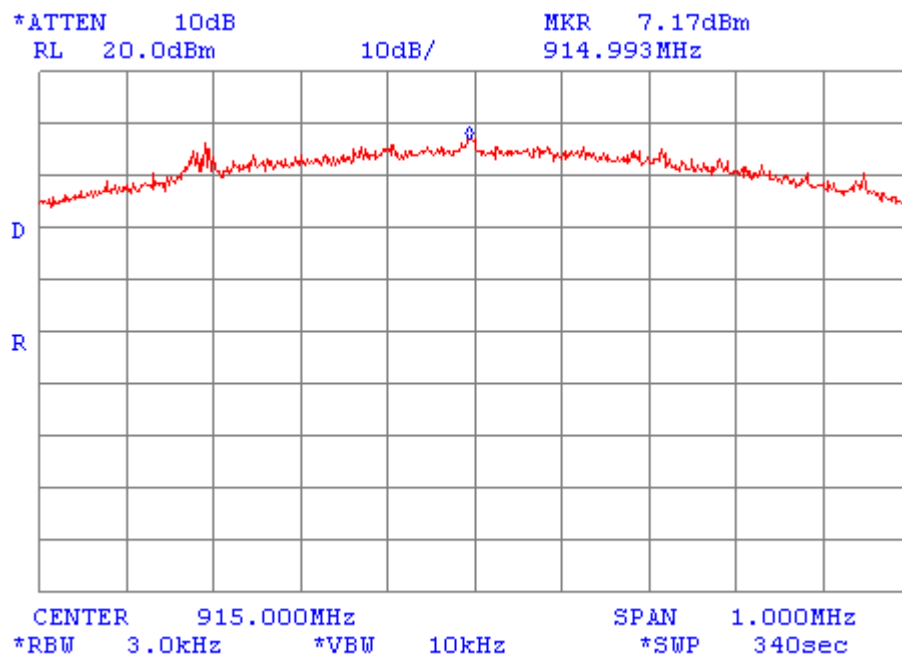




### Plot A3

#### Power density measurements

Mode: Hybrid  
F<sub>MIDDLE</sub>: 915 MHz  
Bit rate: 4 Mbit/s

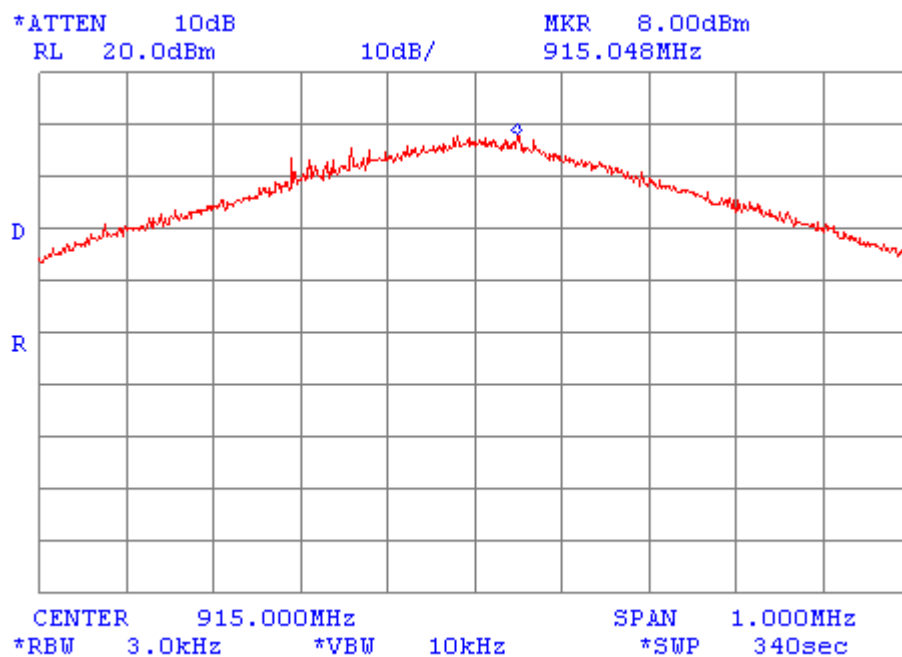




### Plot A4

#### Power density measurements

Mode: Hybrid  
F<sub>MIDDLE</sub>: 915 MHz  
Bit rate: 3 Mbit/s

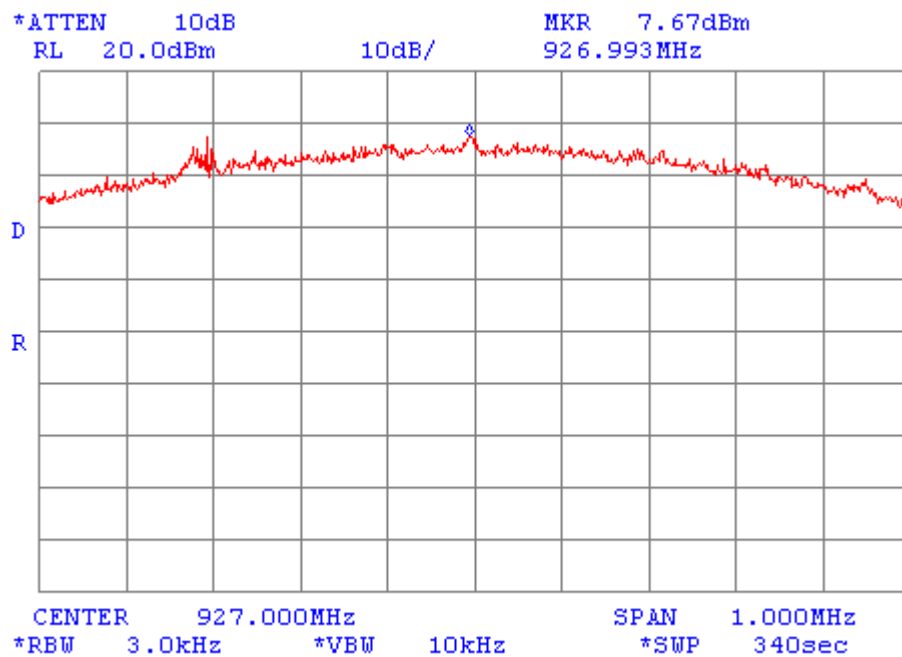




Plot A5

Power density measurements

Mode: Hybrid  
F<sub>HIGH</sub>: 927 MHz  
Bit rate: 4 Mbit/s

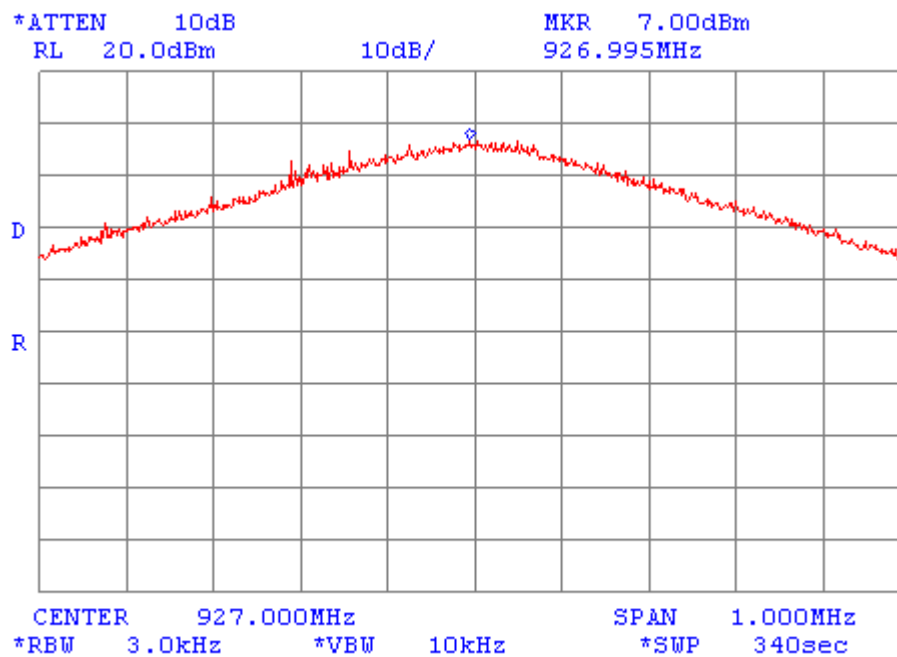




Plot A6

Power density measurements

Mode: Hybrid  
F<sub>HIGH</sub>: 927 MHz  
Bit rate: 3 Mbit/s

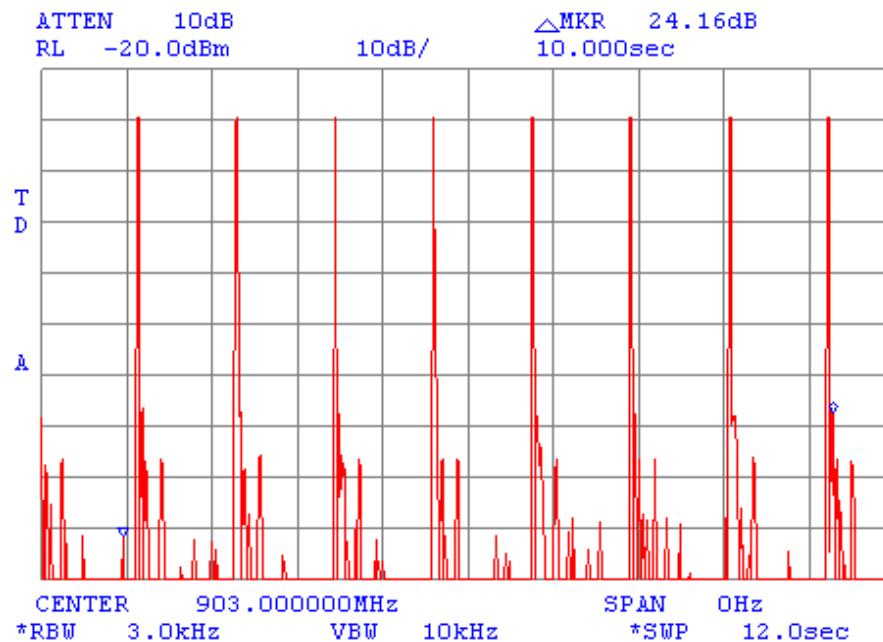




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### Average time of occupancy

Mode: Hopping turned on



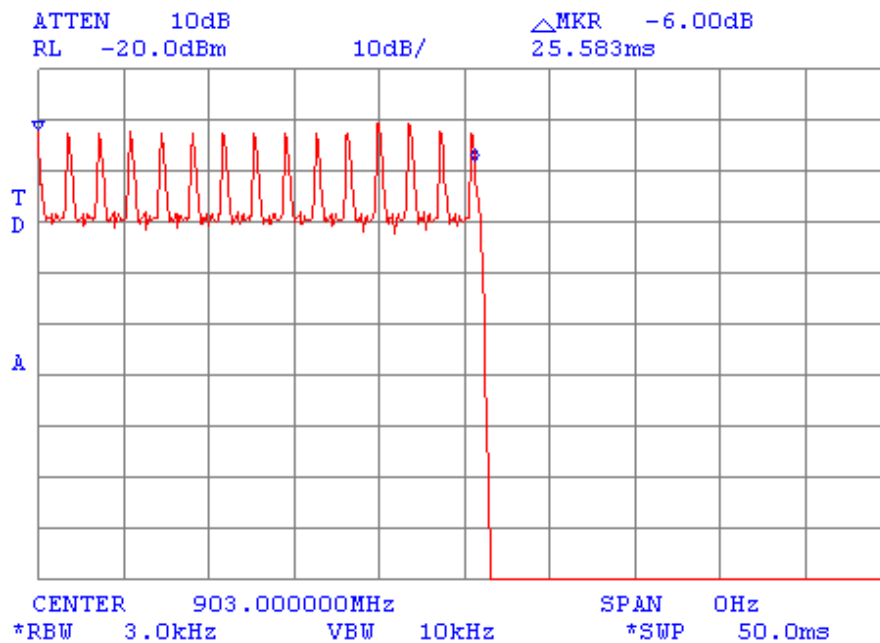
8 transmissions within 10 sec interval



### Plot A8

#### Average time of occupancy

Mode: Hopping turned on



Average time of occupancy calculation:

25.583 ms x 8 times=204.664 ms

204.664 ms <400 ms

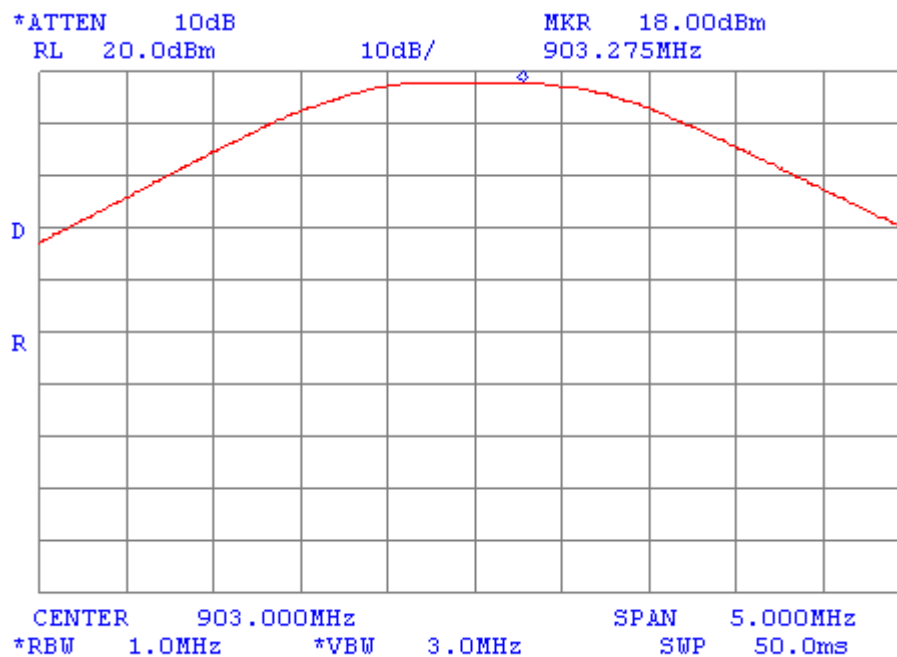
Verdict: PASS



### Plot A9

#### Peak output power

Mode: Hybrid  
F<sub>LOW</sub>: 903 MHz  
Bit rate: 4 Mbit/s

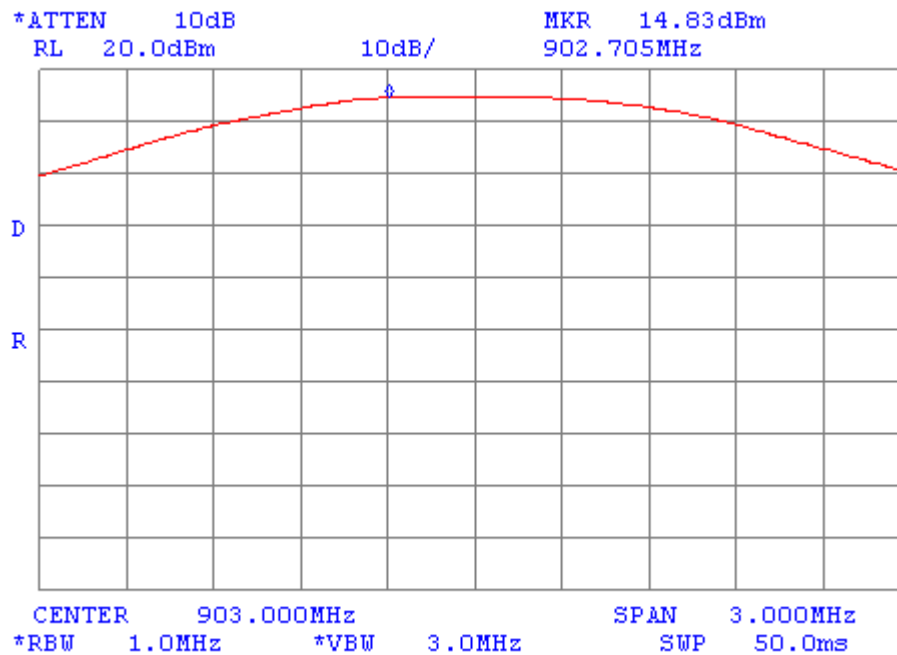




Plot A10

Peak output power

Mode: Hybrid  
F<sub>LOW</sub>: 903 MHz  
Bit rate: 3 Mbit/s

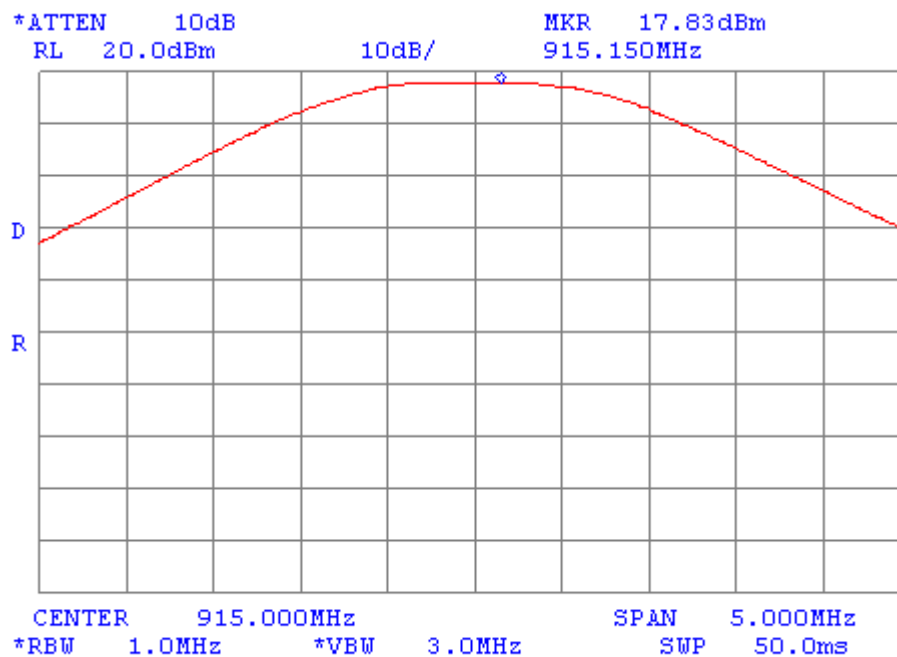




### Plot A11

#### Peak output power

Mode: Hybrid  
F<sub>MIDDLE</sub>: 915 MHz  
Bit rate: 4 Mbit/s

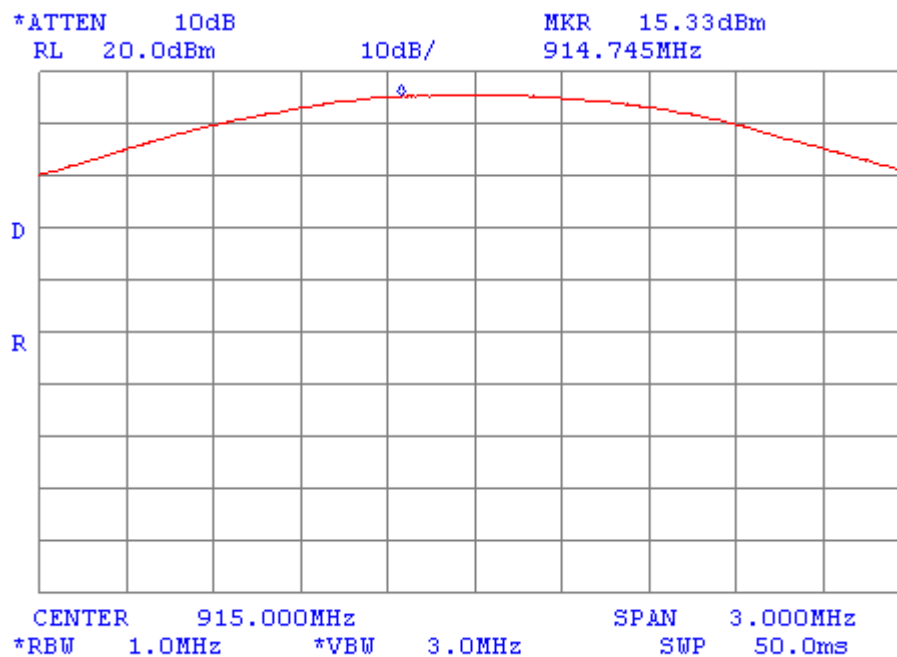




Plot A12

Peak output power

Mode: Hybrid  
F<sub>MIDDLE</sub>: 915 MHz  
Bit rate: 3 Mbit/s

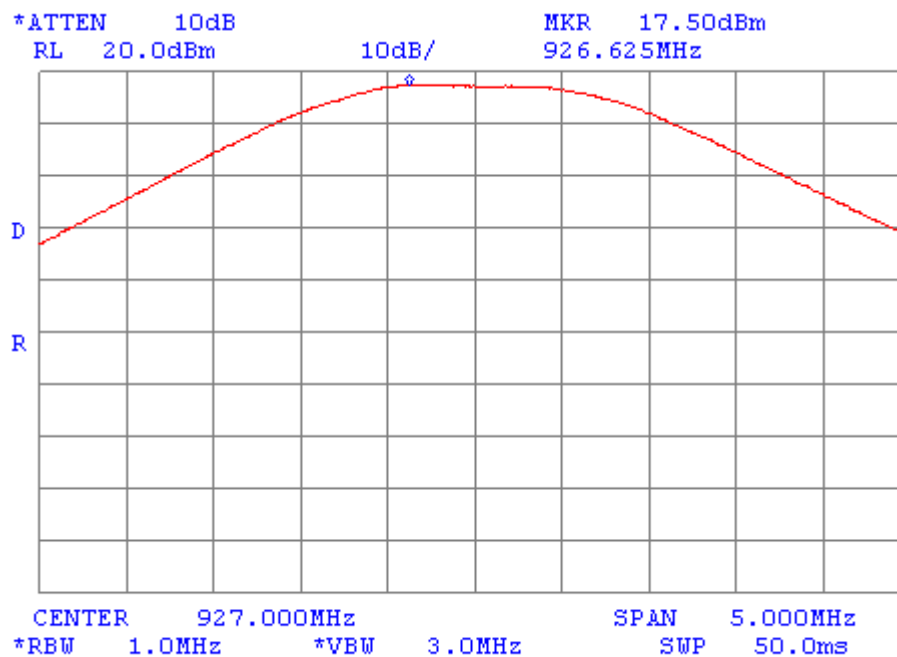




Plot A13

Peak output power

Mode: Hybrid  
F<sub>HIGH</sub>: 927 MHz  
Bit rate: 4 Mbit/s

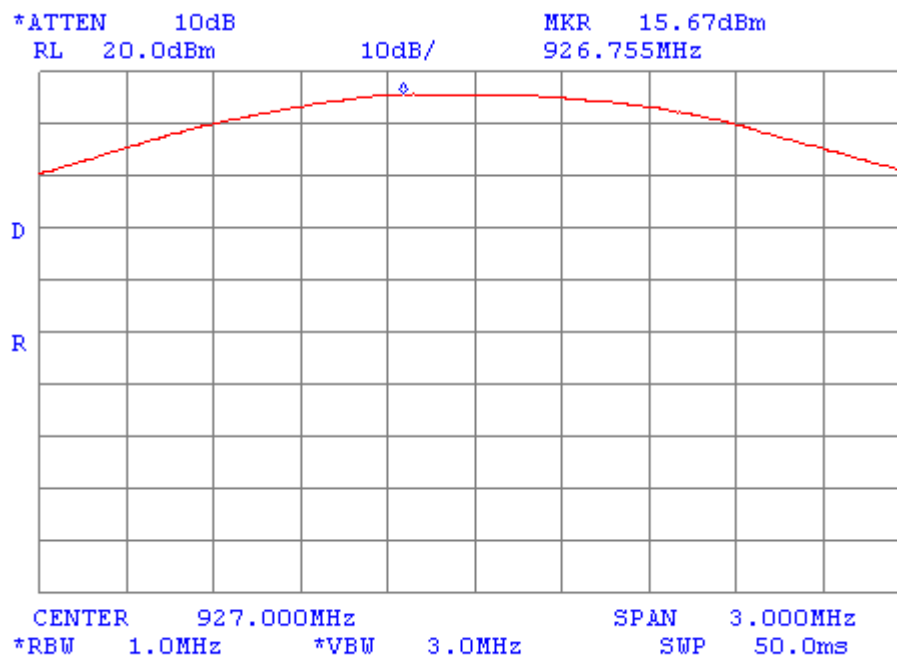




Plot A14

Peak output power

Mode: Hybrid  
F<sub>HIGH</sub>: 927 MHz  
Bit rate: 3 Mbit/s

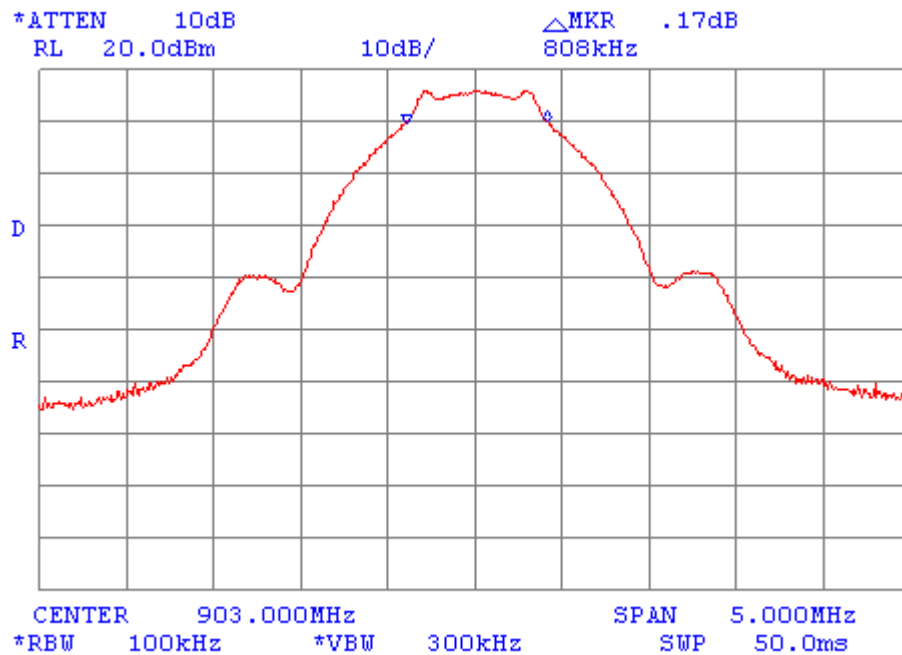




Plot A15

6 dB bandwidth

Mode: Hybrid  
F<sub>LOW</sub>: 903 MHz  
Bit rate: 4 Mbit/s

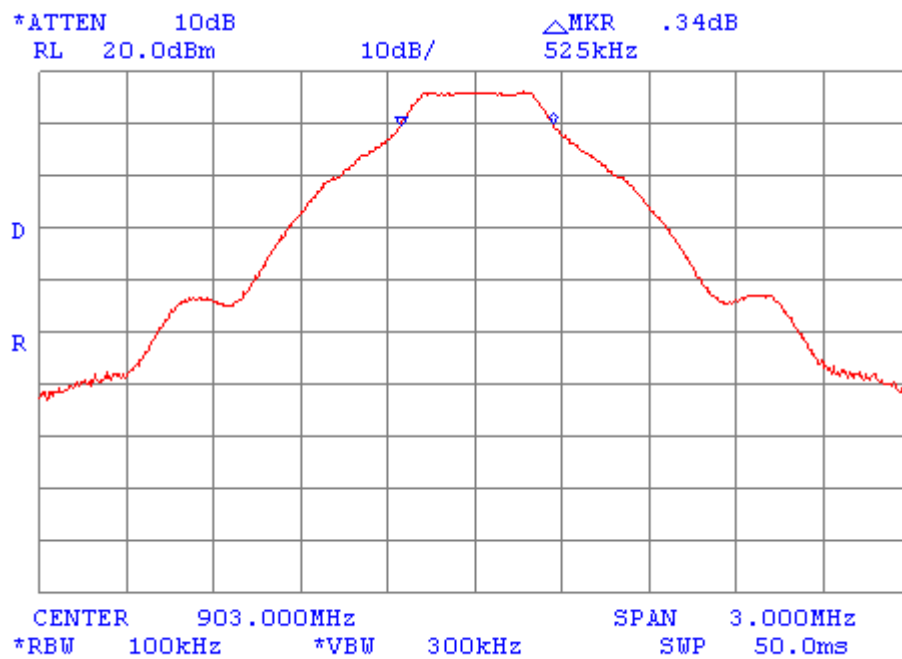




Plot A16

6 dB bandwidth

Mode: Hybrid  
F<sub>LOW</sub>: 903 MHz  
Bit rate: 3 Mbit/s

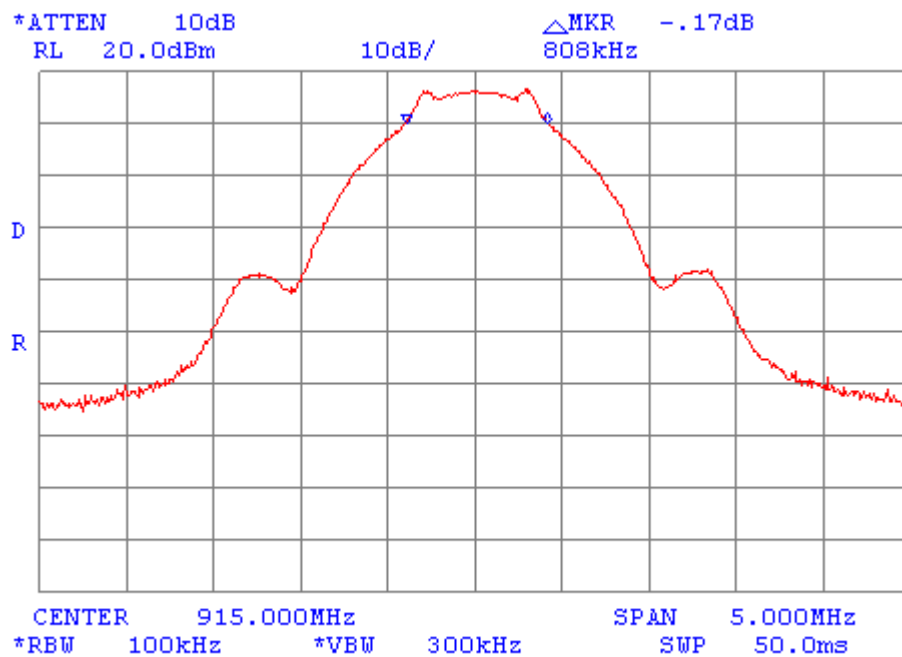




Plot A17

6 dB bandwidth

Mode: Hybrid  
F<sub>MIDDLE</sub>: 915 MHz  
Bit rate: 4 Mbit/s

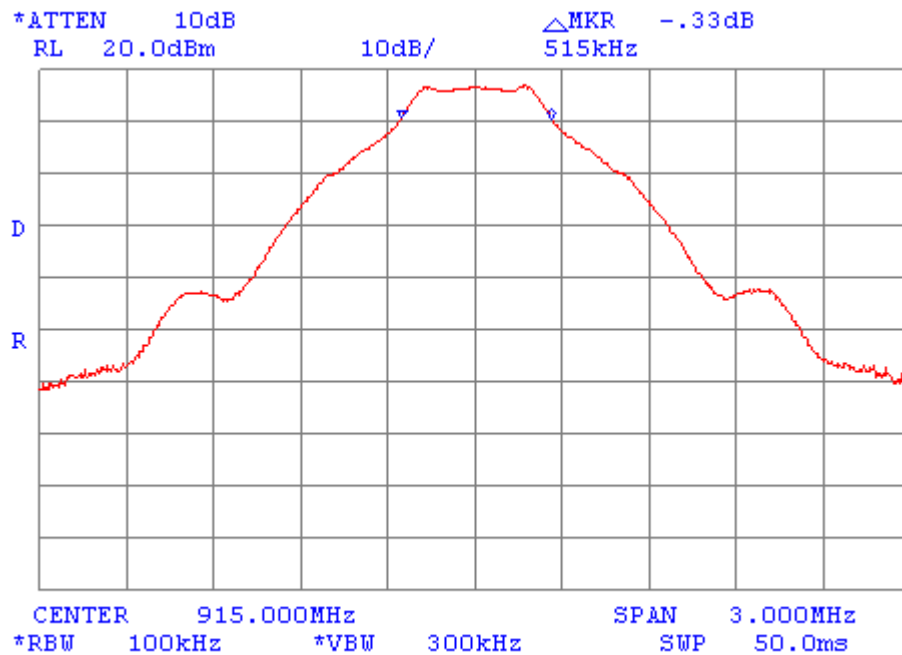




Plot A18

6 dB bandwidth

Mode: Hybrid  
F<sub>MIDDLE</sub>: 915 MHz  
Bit rate: 3 Mbit/s

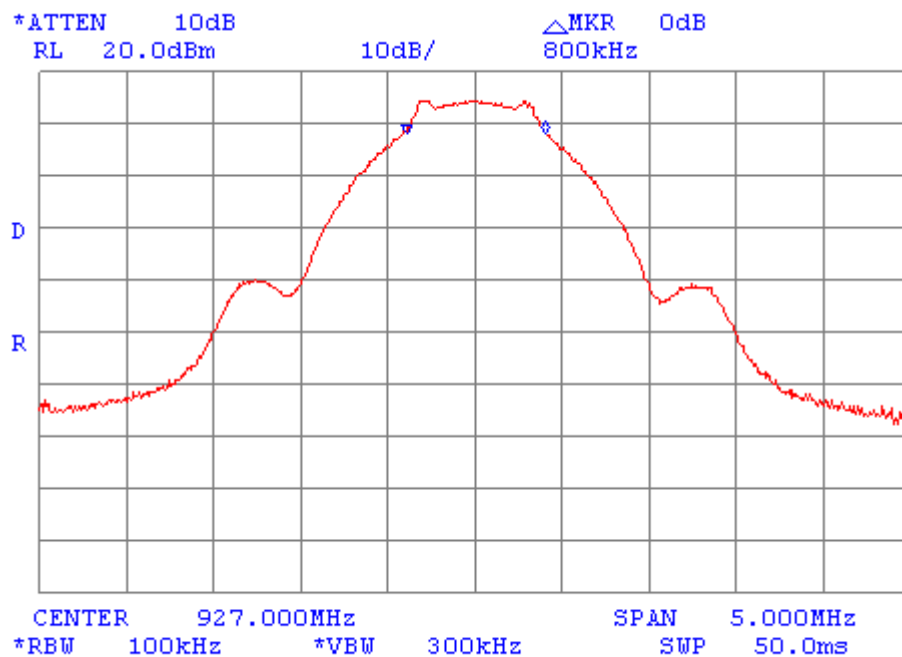




Plot A19

6 dB bandwidth

Mode: Hybrid  
F<sub>HIGH</sub>: 927 MHz  
Bit rate: 4 Mbit/s

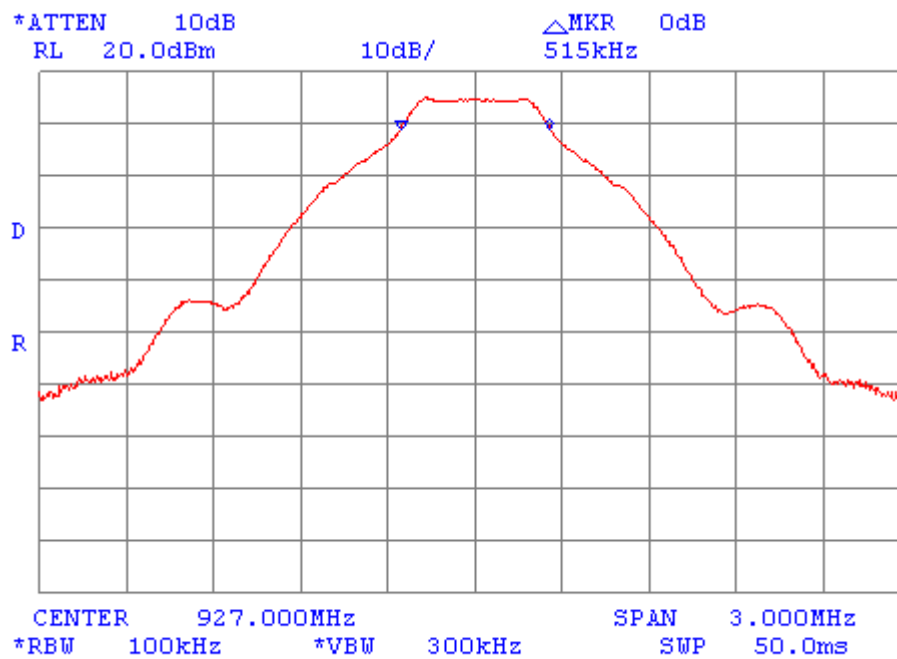




Plot A20

6 dB bandwidth

Mode: Hybrid  
F<sub>HIGH</sub>: 927 MHz  
Bit rate: 3 Mbit/s



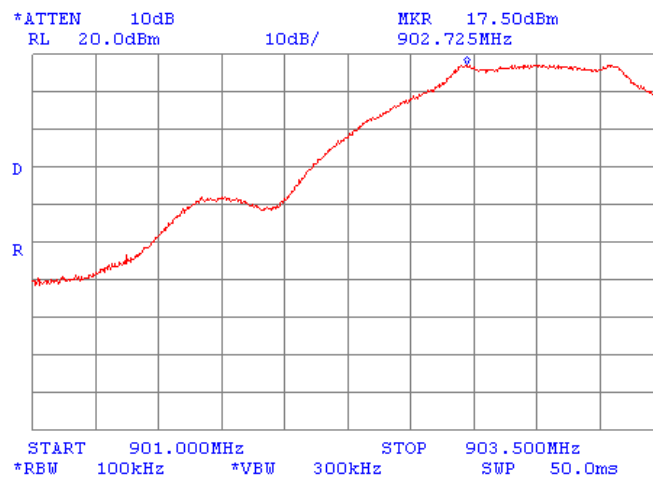


### Plot A21

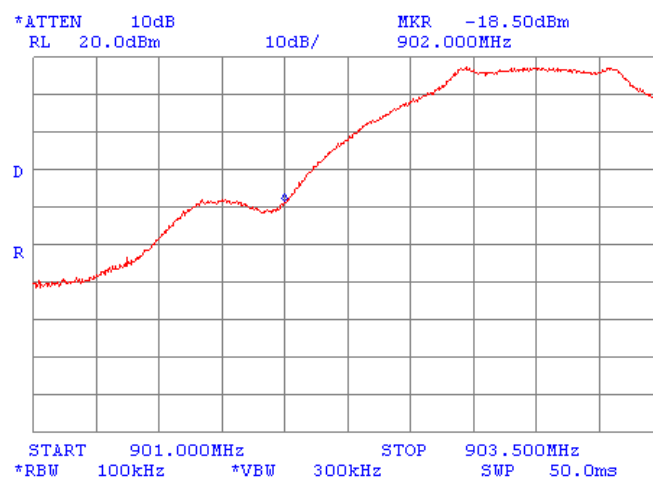
#### Conducted spurious emission measurements at low band edge

Mode: Hybrid  
F<sub>LOW</sub>: 903 MHz  
Bit rate: 4 Mbit/s

(a)



(b)

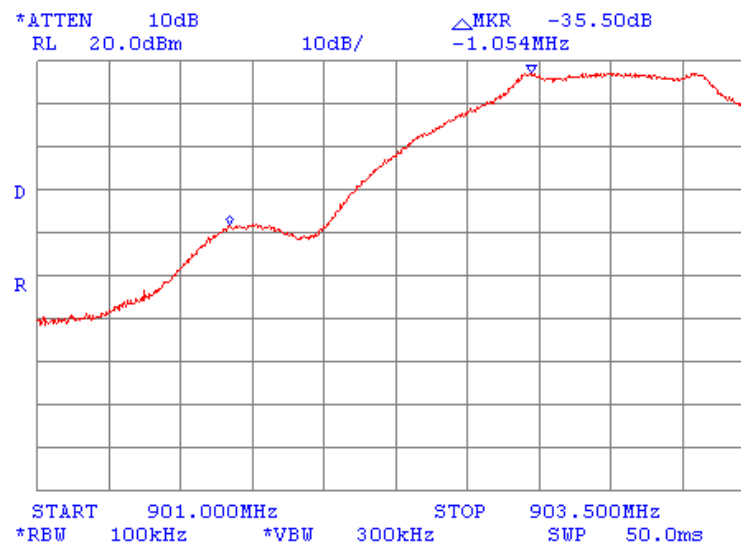




## Plot A22

### Conducted spurious emission measurements at low band edge

Mode: Hybrid  
F<sub>LOW</sub>: 903 MHz  
Bit rate: 4 Mbit/s



**Result:** 35.5 dB below carrier

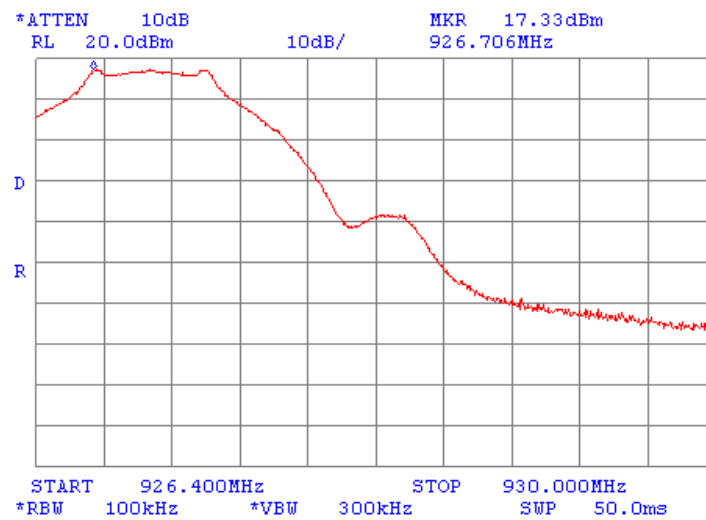


Plot A23

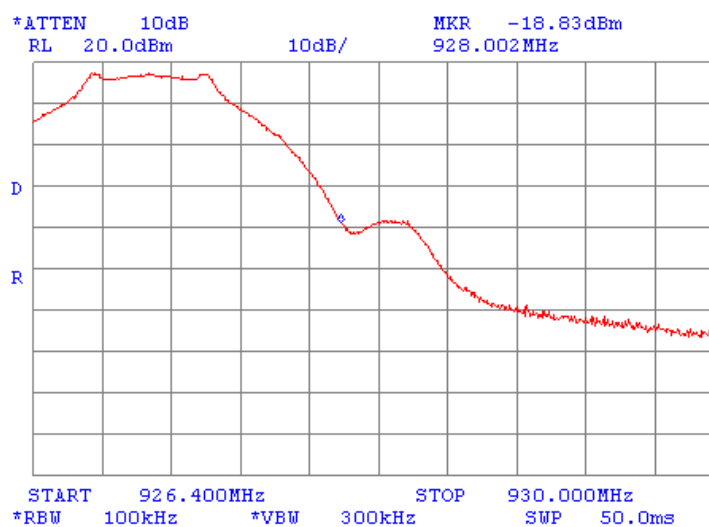
Conducted spurious emission measurements at high band edge

Mode: Hybrid  
F<sub>HIGH</sub>: 927 MHz  
Bit rate: 4 Mbit/s

(a)



(b)

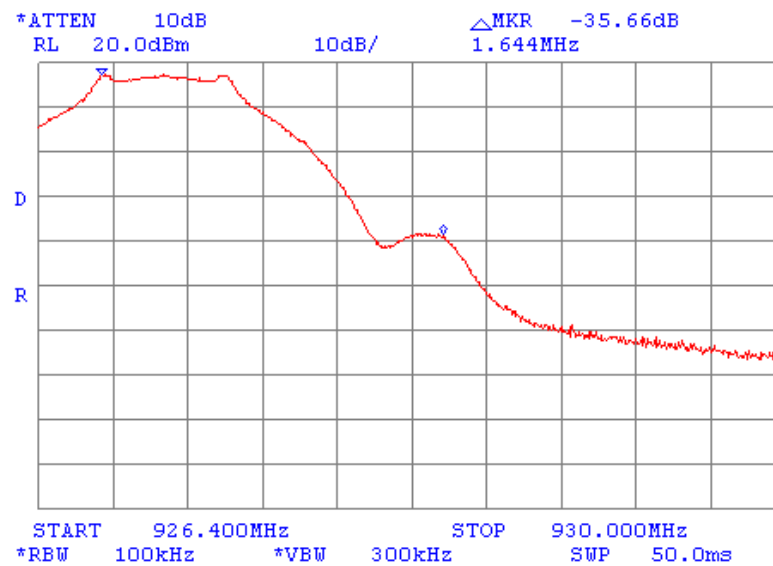




### Plot A24

#### Conducted spurious emission measurements at high band edge

Mode: Hybrid  
F<sub>HIGH</sub>: 927 MHz  
Bit rate: 4 Mbit/s



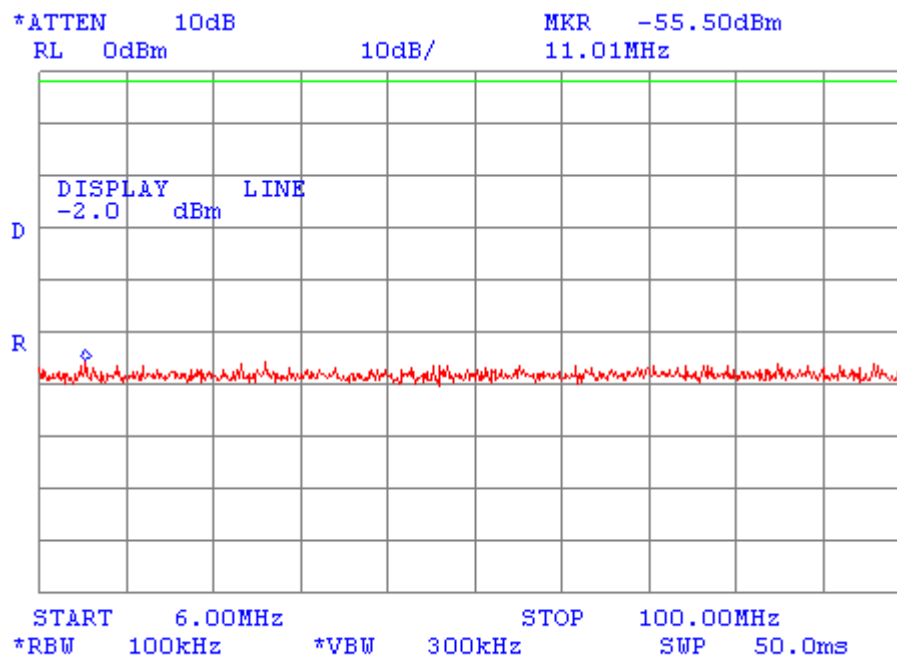
**Result:** 35.66 dB below carrier



### Plot A25

#### Conducted spurious emission measurements

Mode: Hybrid  
F<sub>LOW</sub>: 903 MHz  
Bit rate: 4 Mbit/s  
Frequency range: 6 – 100 MHz



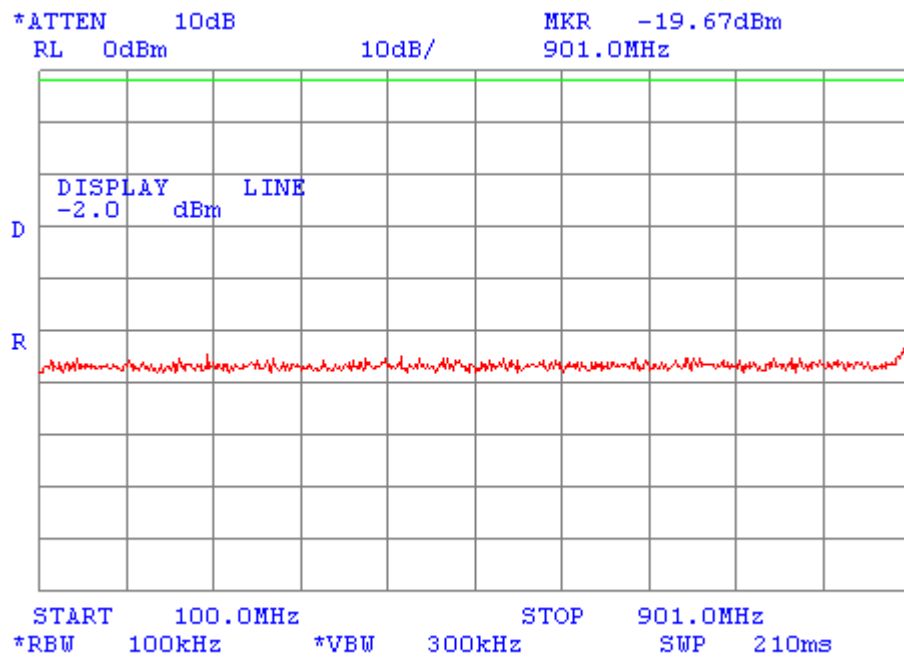
Limit for spurious emissions = 18 dBm - 20 dB = -2 dBm  
No spurious emissions were found



### Plot A26

#### Conducted spurious emission measurements

Mode: Hybrid  
F<sub>LOW</sub>: 903 MHz  
Bit rate: 4 Mbit/s  
Frequency range: 100 - 901MHz



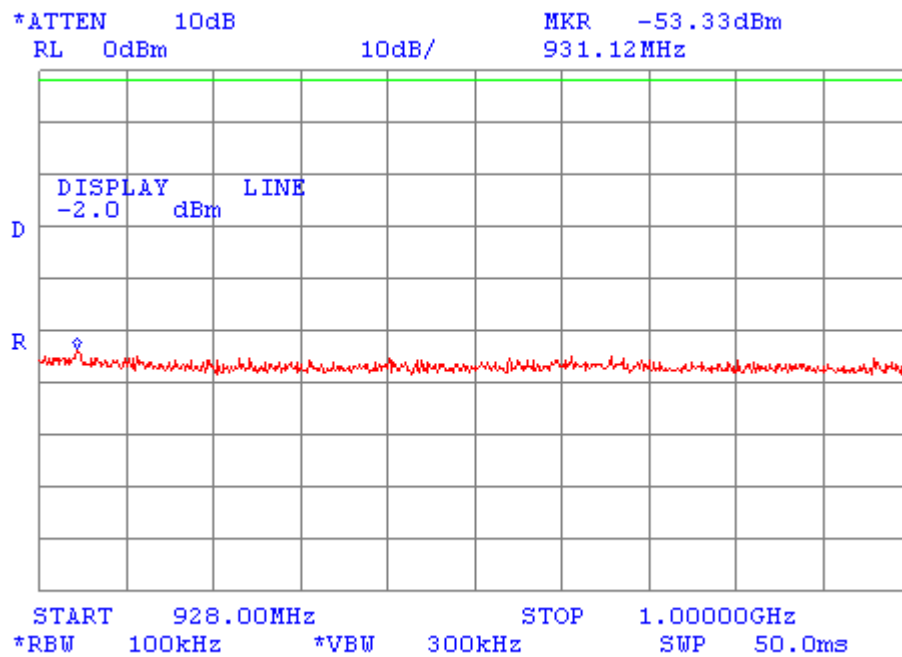
No spurious emissions were found



Plot A27

Conducted spurious emission measurements

Mode: Hybrid  
F<sub>LOW</sub>: 903 MHz  
Bit rate: 4 Mbit/s  
Frequency range: 928 MHz - 1 GHz



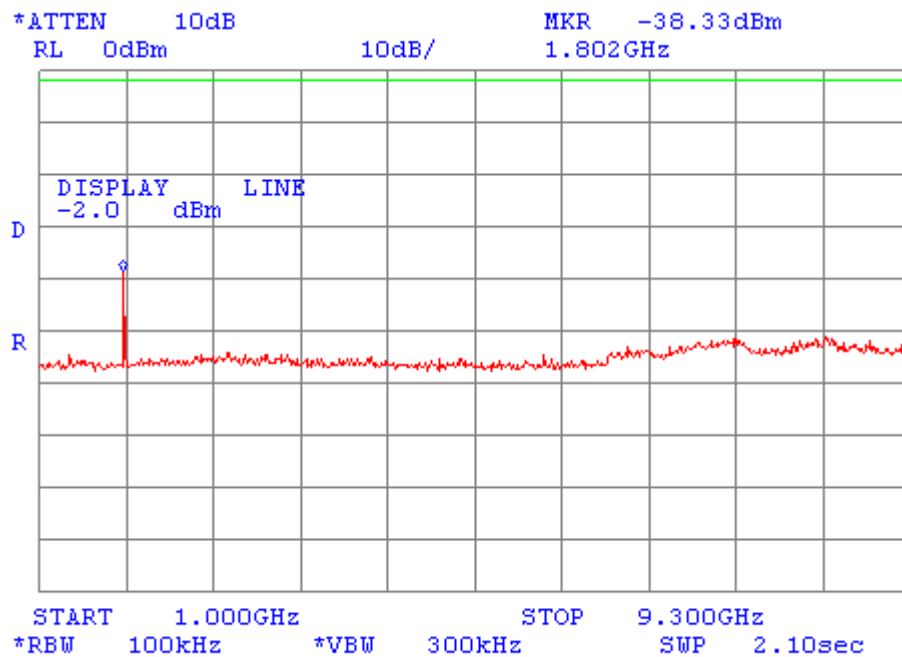
No spurious emissions were found



### Plot A28

#### Conducted spurious emission measurements

Mode: Hybrid  
F<sub>LOW</sub>: 903 MHz  
Bit rate: 4 Mbit/s  
Frequency range: 1 – 9.3 GHz

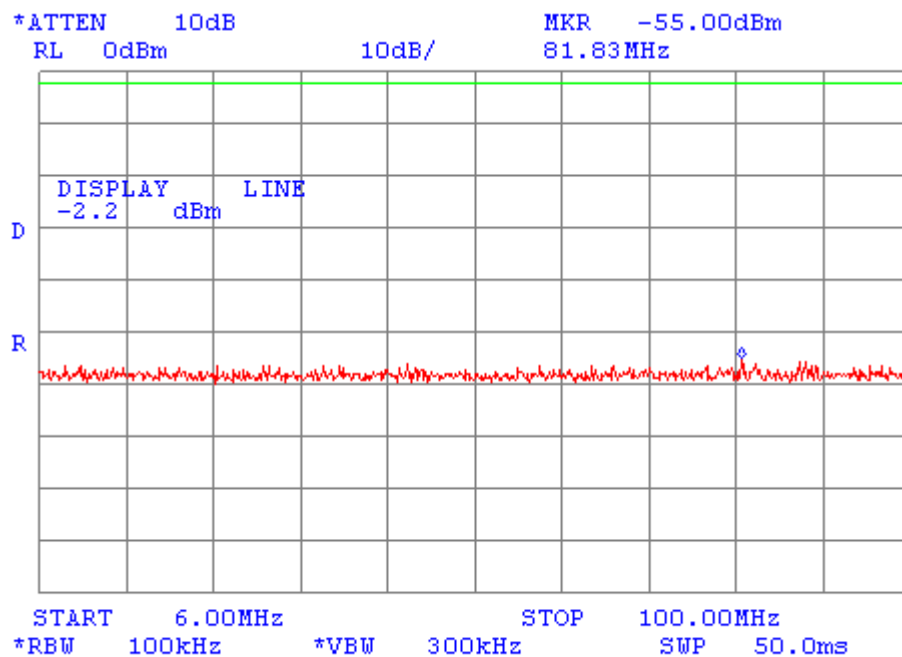




Plot A29

Conducted spurious emission measurements

Mode: Hybrid  
F<sub>MIDDLE</sub>: 915 MHz  
Bit rate: 4 Mbit/s  
Frequency range: 6 – 100 MHz



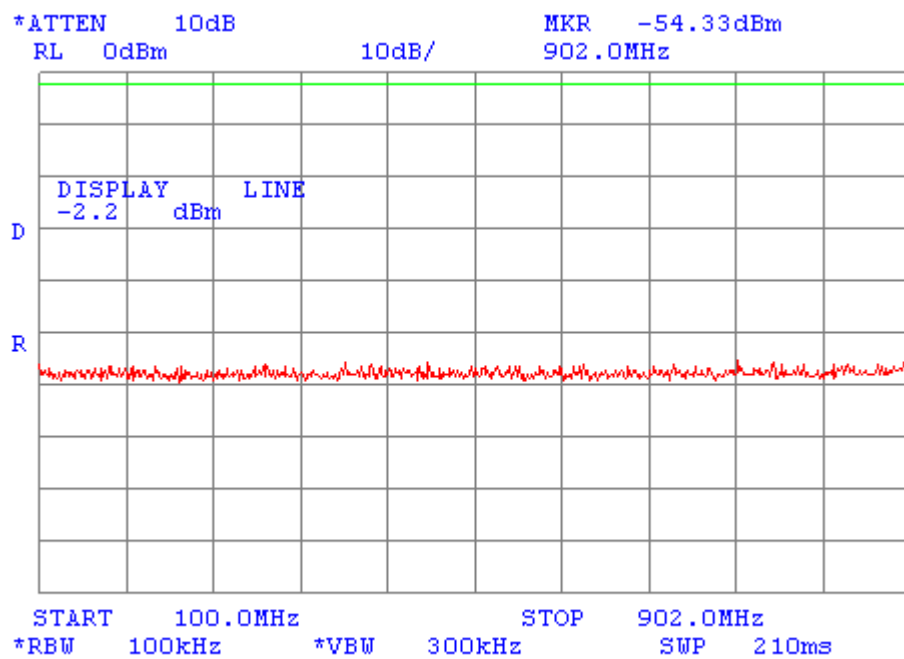
Limit for spurious emissions = 17.83 dBm - 20 dB = -2.17 dBm  
No spurious emissions were found



### Plot A30

#### Conducted spurious emission measurements

Mode: Hybrid  
F<sub>MIDDLE</sub>: 915 MHz  
Bit rate: 4 Mbit/s  
Frequency range: 100 – 902 MHz



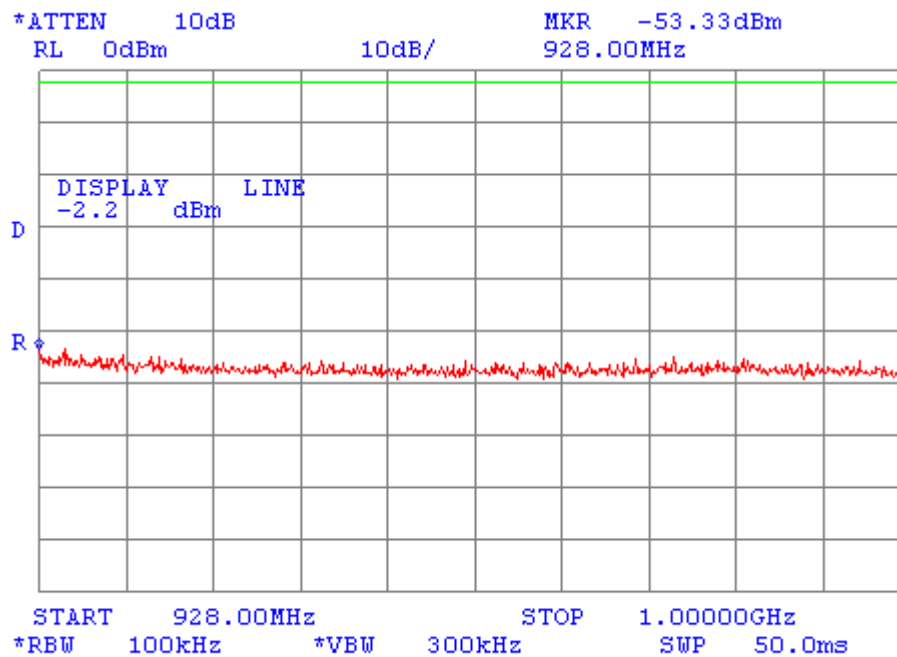
No spurious emissions were found



**Plot A31**

**Conducted spurious emission measurements**

Mode: Hybrid  
F<sub>MIDDLE</sub>: 915 MHz  
Bit rate: 4 Mbit/s  
Frequency range: 928 MHz – 1 GHz



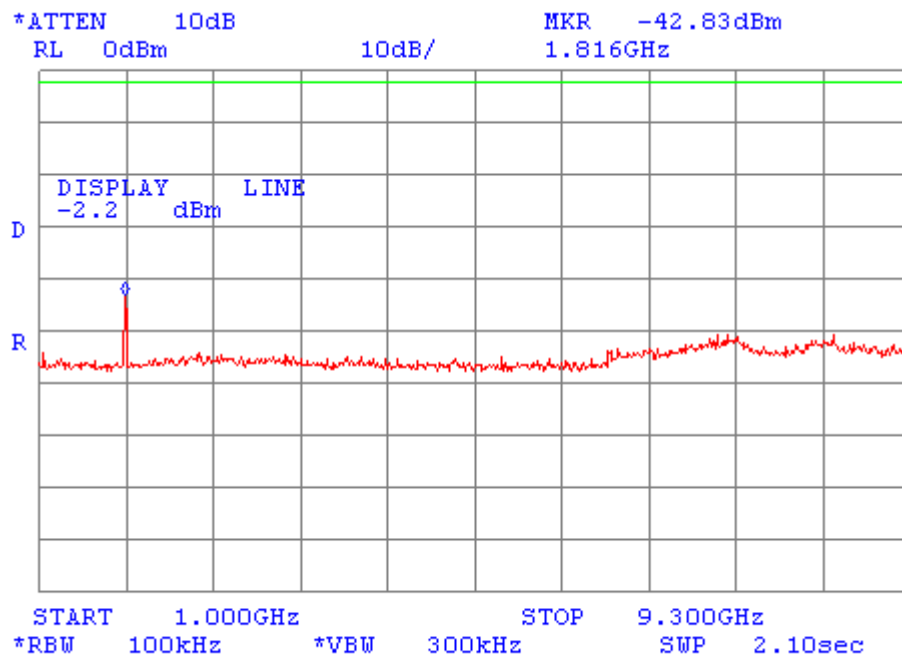
No spurious emissions were found



### Plot A32

#### Conducted spurious emission measurements

Mode: Hybrid  
F<sub>MIDDLE</sub>: 915 MHz  
Bit rate: 4 Mbit/s  
Frequency range: 1 – 9.3 GHz



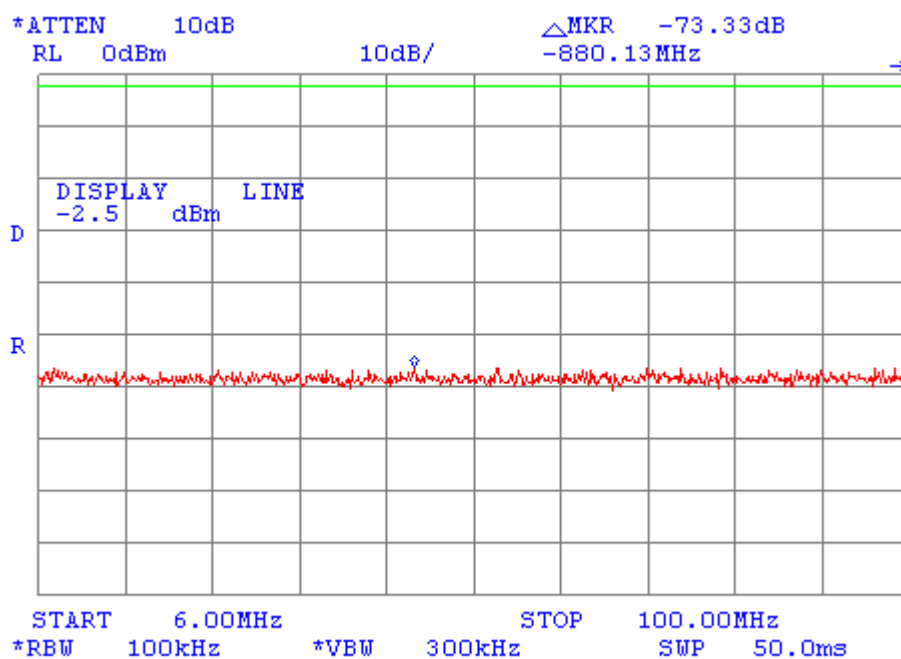
No spurious emissions were found



### Plot A33

#### Conducted spurious emission measurements

Mode: Hybrid  
F<sub>HIGH</sub>: 927 MHz  
Bit rate: 4 Mbit/s  
Frequency range: 6 – 100 MHz



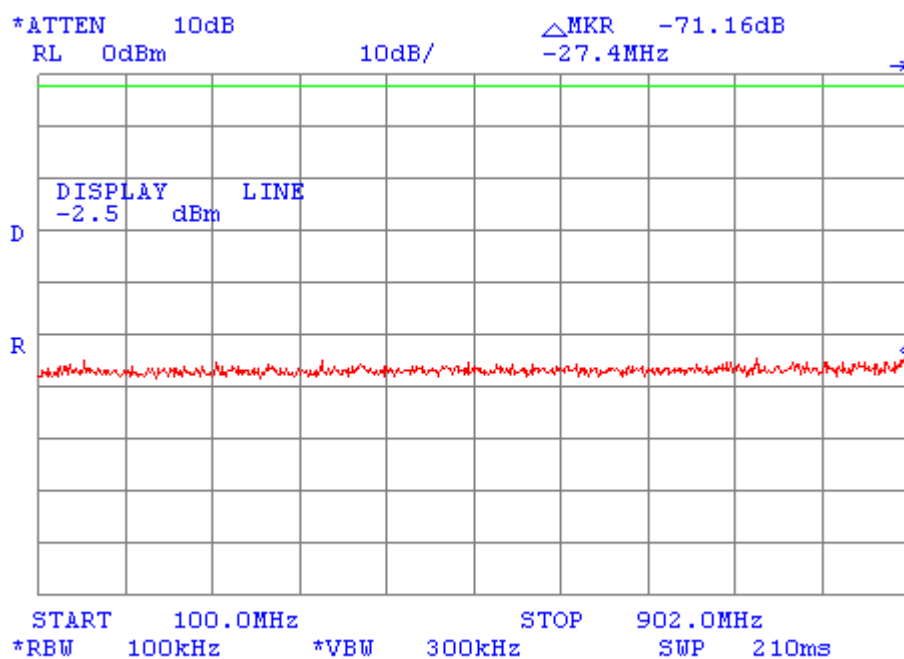
Limit for spurious emissions = 17.50 dBm – 20 dB = –2.5 dBm  
No spurious emissions were found



### Plot A34

#### Conducted spurious emission measurements

Mode: Hybrid  
F<sub>HIGH</sub>: 927 MHz  
Bit rate: 4 Mbit/s  
Frequency range: 100 – 902 MHz



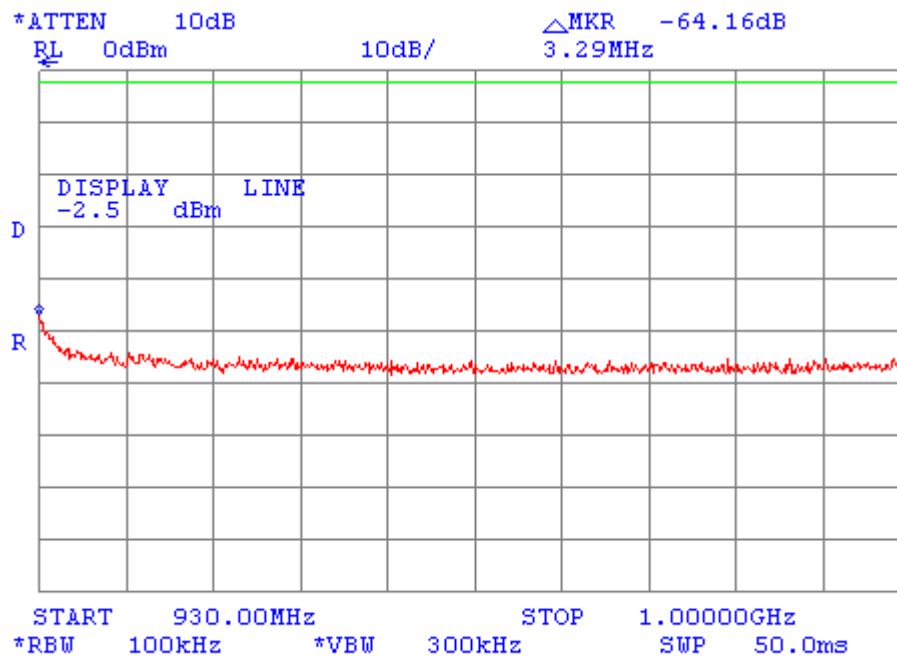
No spurious emissions were found



### Plot A35

#### Conducted spurious emission measurements

Mode: Hybrid  
F<sub>HIGH</sub>: 927 MHz  
Bit rate: 4 Mbit/s  
Frequency range: 930 – 1000 MHz



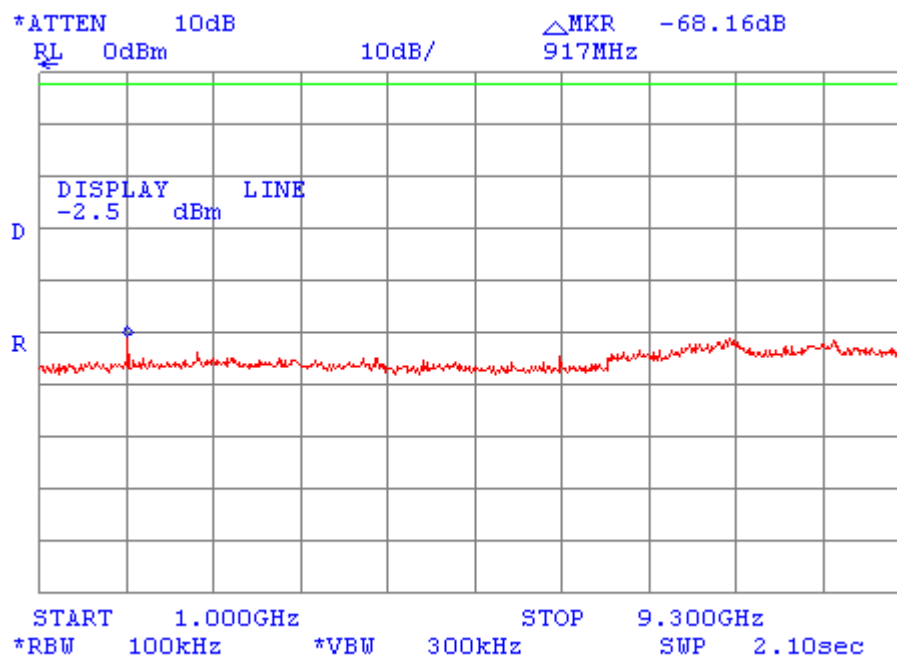
No spurious emissions were found



### Plot A36

#### Conducted spurious emission measurements

Mode: Hybrid  
F<sub>HIGH</sub>: 927 MHz  
Bit rate: 4 Mbit/s  
Frequency range: 1 – 9.3 GHz



No spurious emissions were found

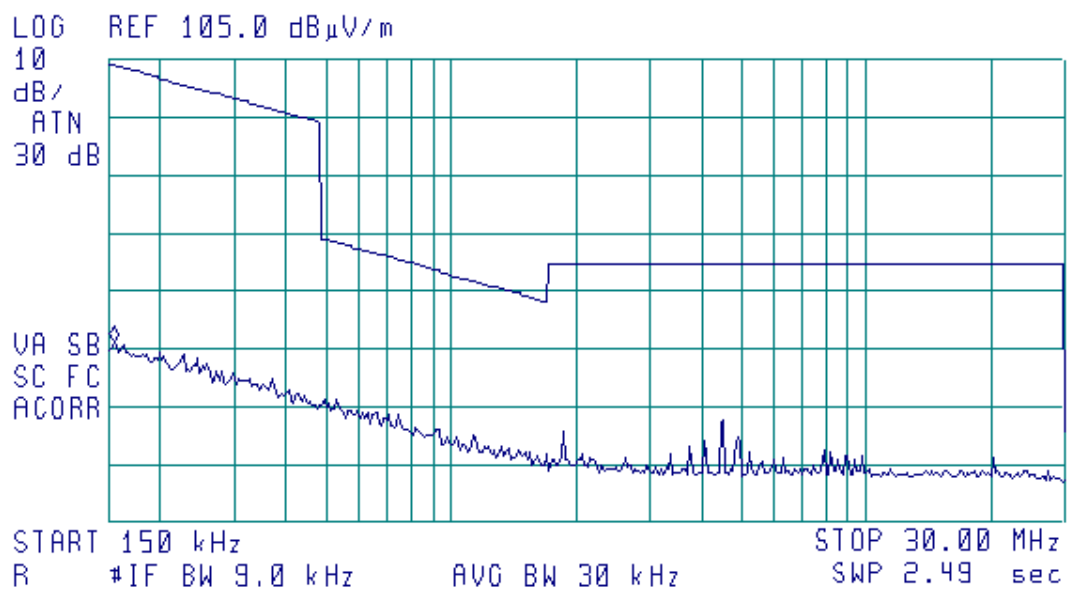


Plot A37

Radiated spurious emission measurements in the anechoic chamber from 150 kHz to 30 MHz,  
carrier frequency 903 MHz

16:44:28 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 150 kHz  
56.14 dB $\mu$ V/m



No spurious emissions were found

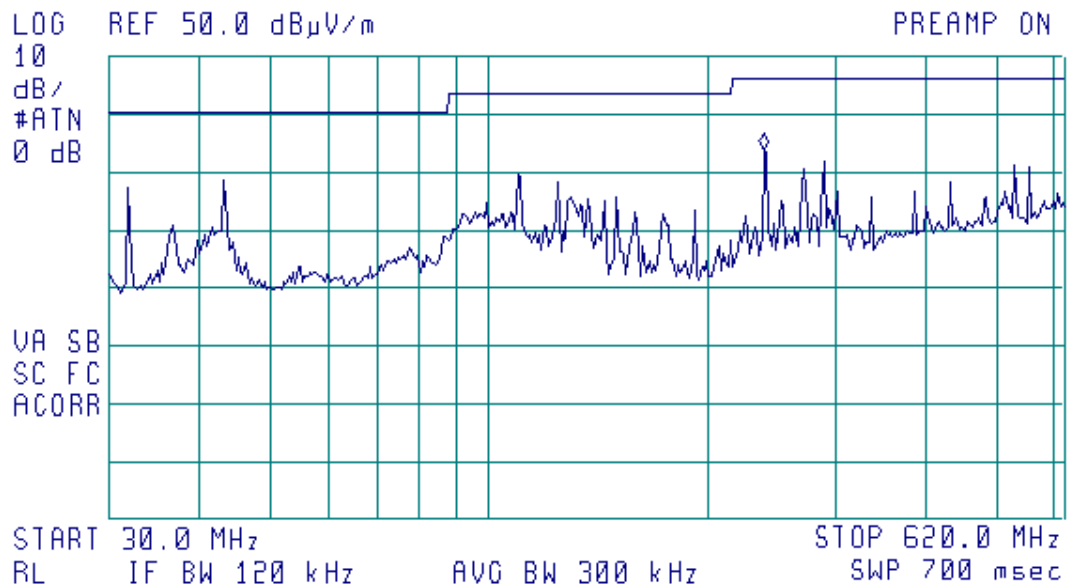


Plot A38

Radiated spurious emission measurements in the anechoic chamber in restricted bands,  
carrier frequency 903 MHz

 11:24:20 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 239.3 MHz  
33.79 dB $\mu$ V/m



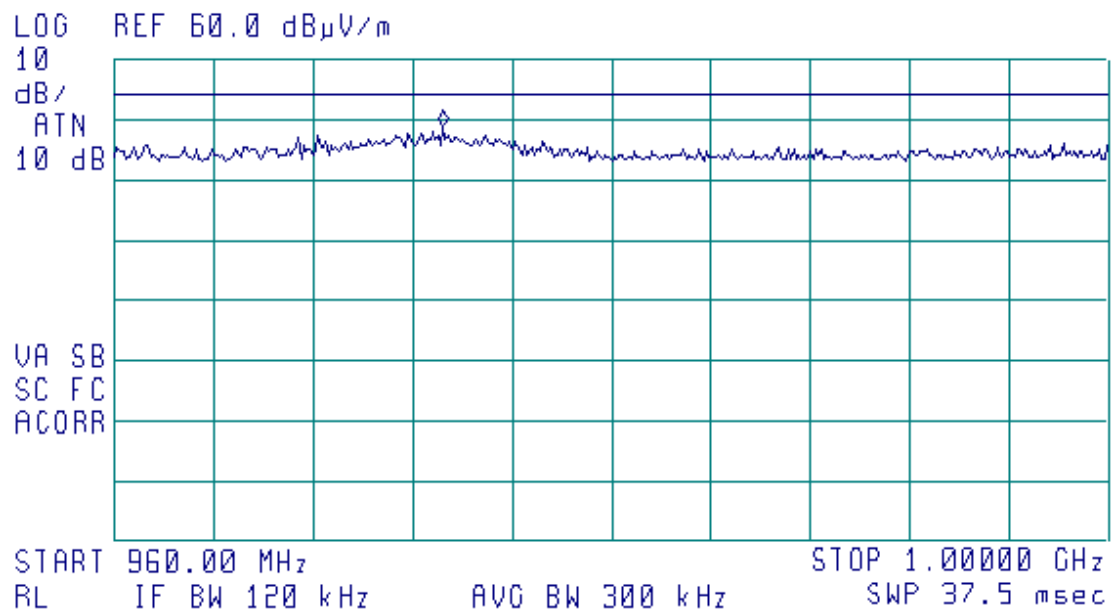


Plot A39

Radiated spurious emission measurements in the anechoic chamber in restricted bands,  
carrier frequency 903 MHz

10:43:28 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 973.20 MHz  
48.68 dB $\mu$ V/m





Plot A40

Radiated spurious emission measurements in the anechoic chamber in restricted bands,  
carrier frequency 903 MHz

16:24:20 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 1.3915 GHz  
48.88 dB $\mu$ V/m

LOG REF 60.0 dB $\mu$ V/m

10  
dB/  
#ATN  
0 dB

VA SB  
SC FC  
ACORR

START 1.0000 GHz

RL #IF BW 1.0 MHz

AVG BW 3 MHz

STOP 1.7250 GHz

SWP 20.0 msec



Plot A41

Radiated spurious emission measurements in the anechoic chamber in restricted bands,  
carrier frequency 903 MHz

16:27:18 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 2.8493 GHz  
48.96 dB $\mu$ V/m

LOG REF 60.0 dB $\mu$ V/m

10  
dB/  
#ATN  
0 dB

VA SB  
SC FC  
ACORR

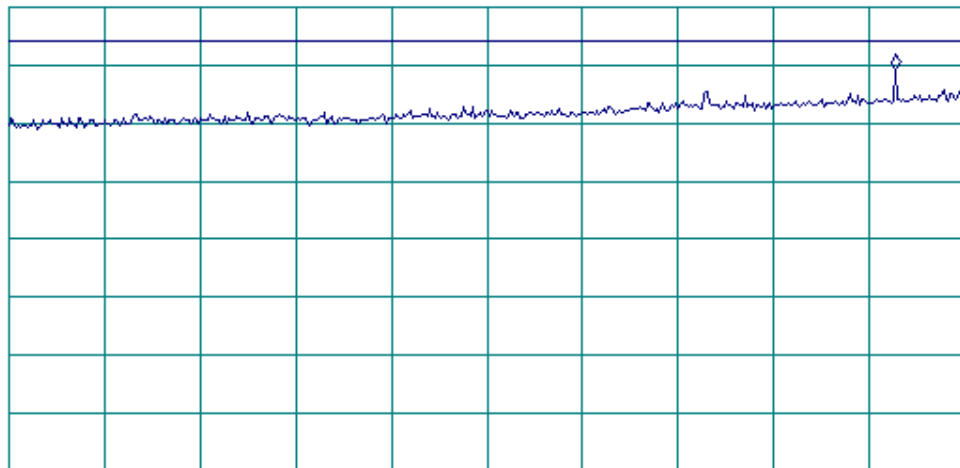
START 2.2000 GHz

RL #IF BW 100 kHz

AVG BW 300 kHz

STOP 2.9000 GHz

SWP 210 msec



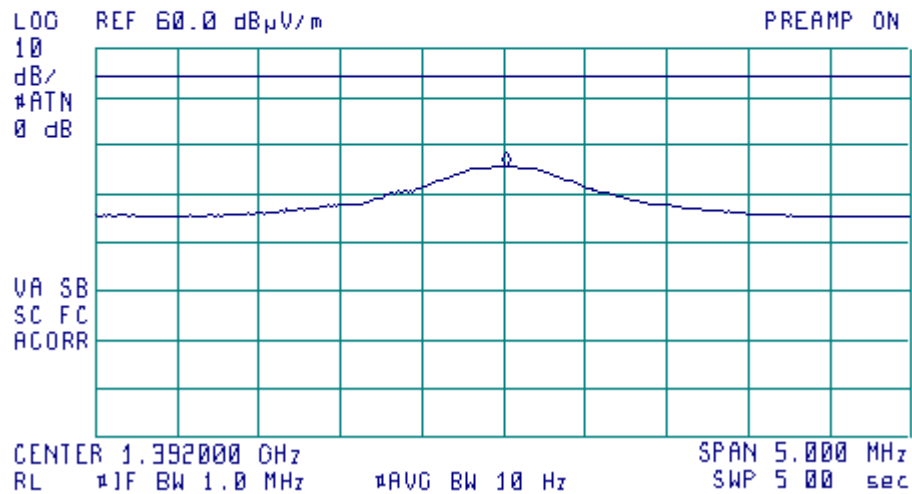


Plot A42

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 903 MHz

11:32:09 OCT 15, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
Mkr 1.392013 GHz  
35.78 dB $\mu$ V/m



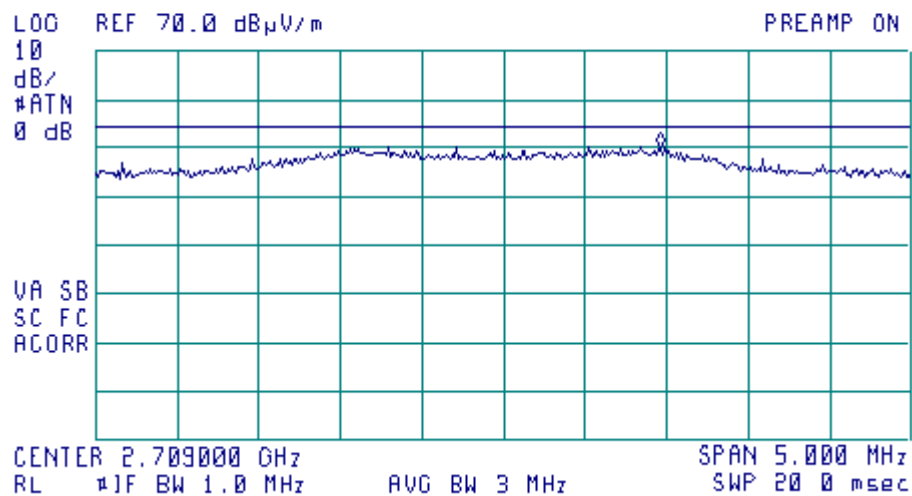


Plot A43

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 903 MHz

12:12:12 OCT 15, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 2.709963 GHz  
50 37 dB $\mu$ V/m



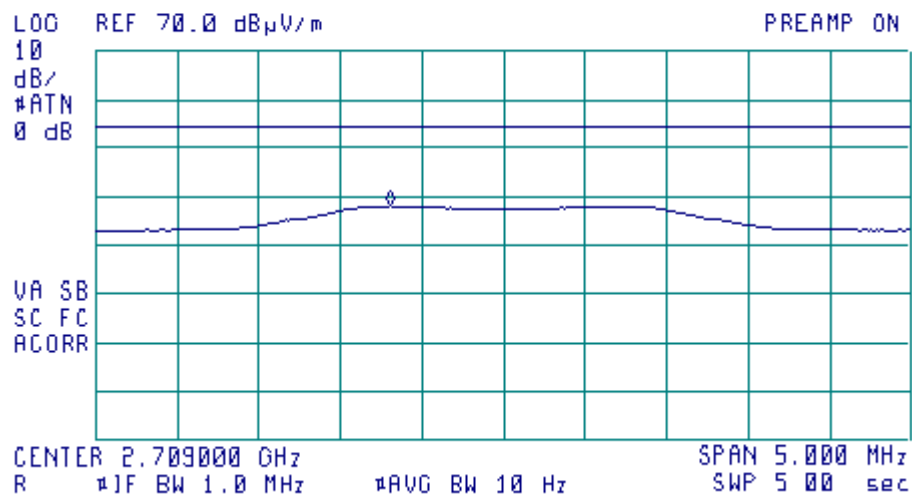


Plot A44

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 903 MHz

12:14:36 OCT 15, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 2.708300 GHz  
38.15 dB $\mu$ V/m



Test result: measured value + average factor = 38.15 dB( $\mu$ V/m) – 11.84 dB = 26.31 dB( $\mu$ V/m)

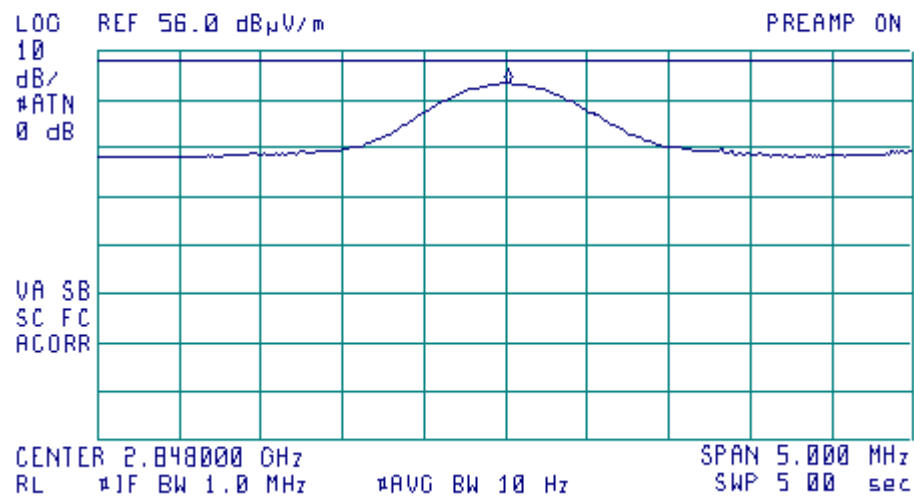


Plot A45

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 903 MHz

11:07:55 OCT 15, 2003

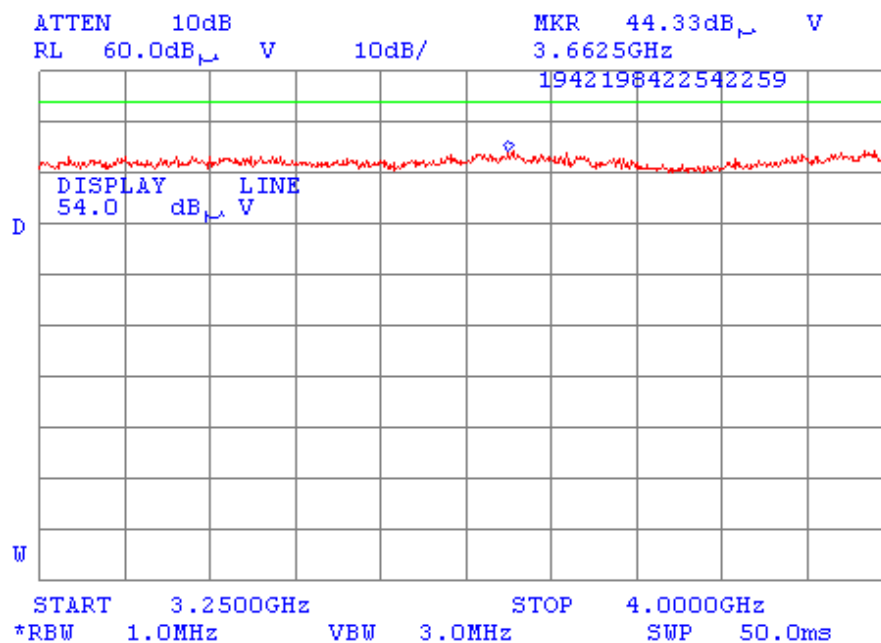
ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 2.848013 GHz  
49.26 dB $\mu$ V/m





Plot A46

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 903 MHz

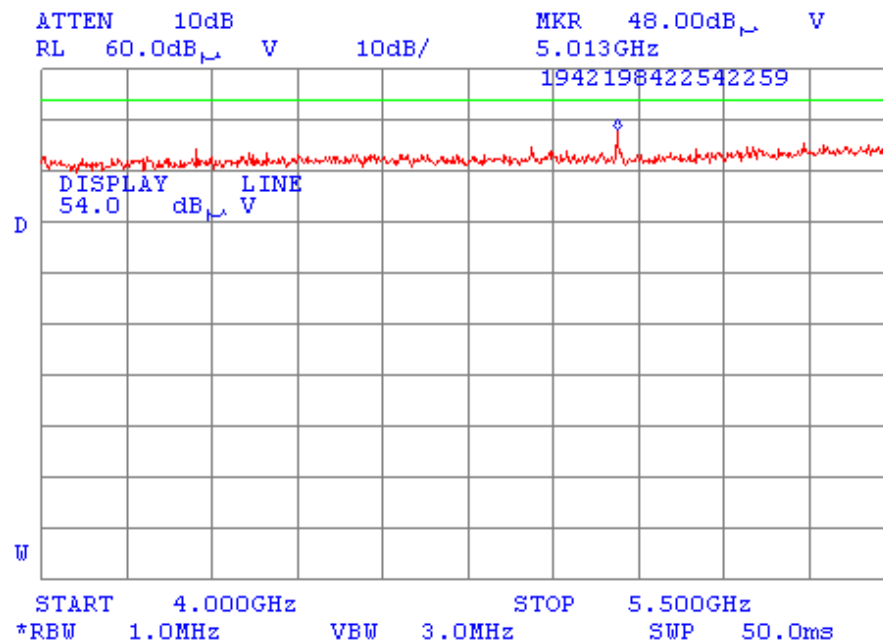


No spurious emissions were found.



Plot A47

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 903 MHz

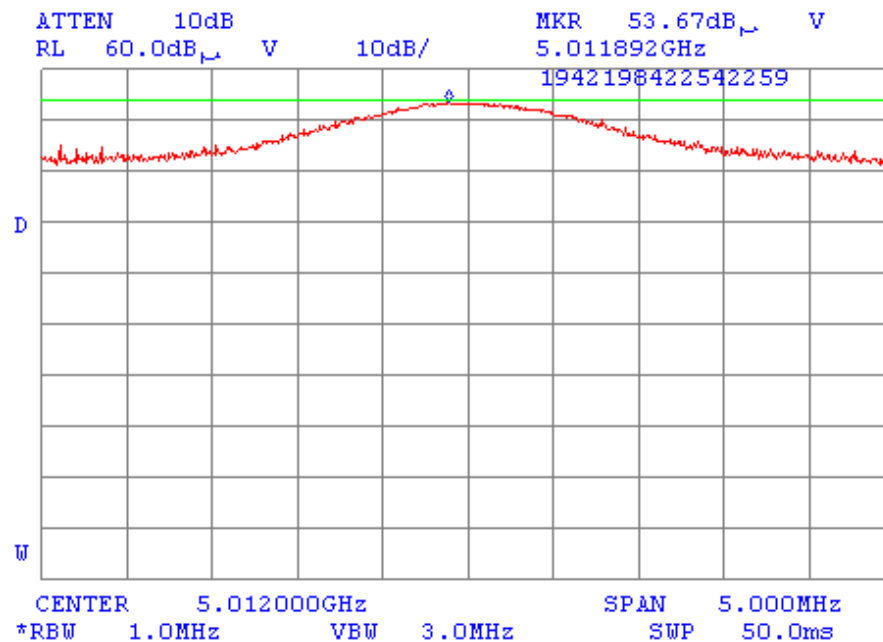


No other spurious except the 4<sup>th</sup> harmonic of the LO.



Plot A48

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 903 MHz

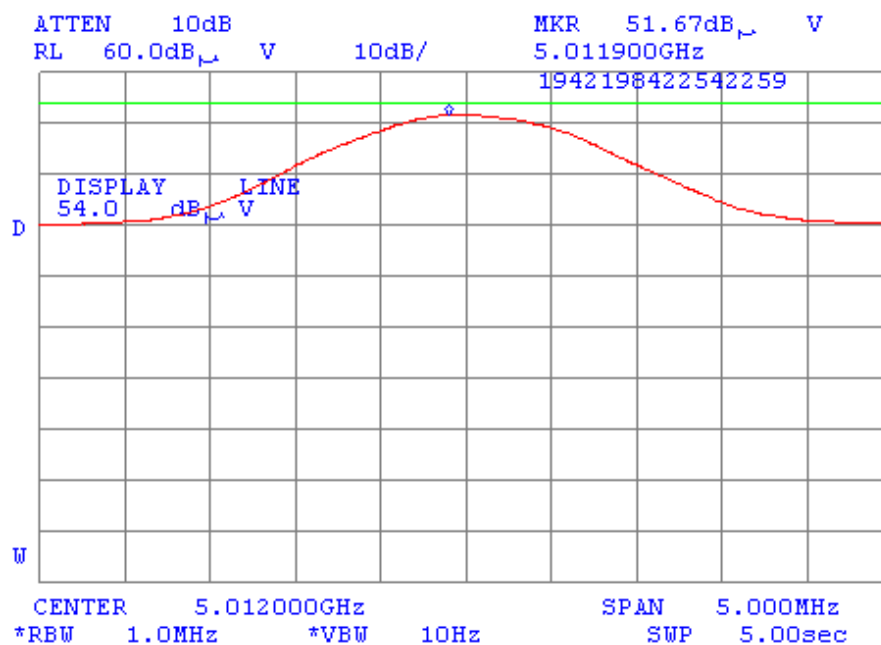


The 4<sup>th</sup> harmonic of the LO (903+350=1253 MHz)  
Peak value.  
Horizontal polarization



Plot A49

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 903 MHz



The 4<sup>th</sup> harmonic of the LO (903+350=1253 MHz)

Average value.

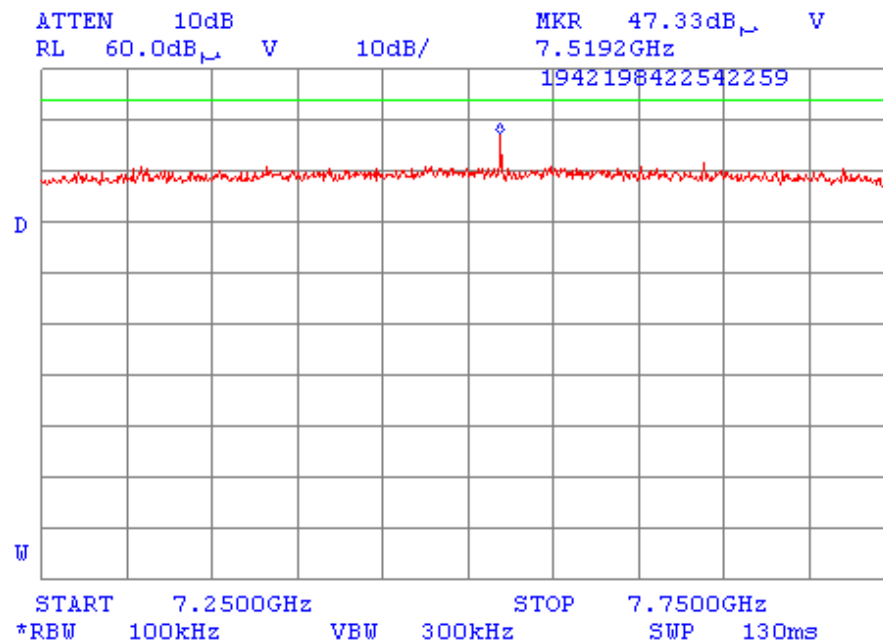
Horizontal polarization

Test result: measured value + average factor = 51.67 dB(μV/m) – 11.84 dB = 26.31 dB(μV/m)



Plot A50

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 903 MHz

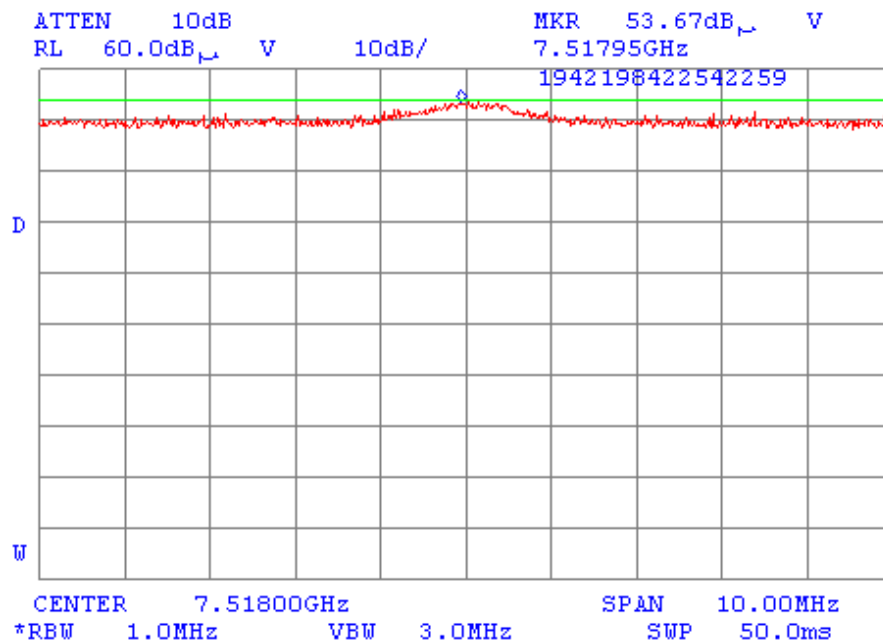


No other spurious except the 6<sup>th</sup> harmonic of the LO.



Plot A51

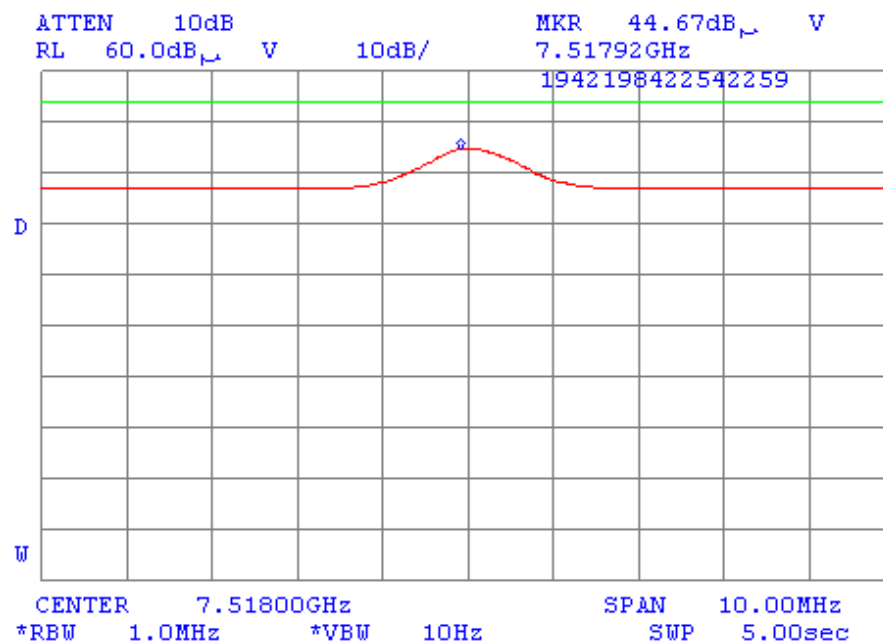
Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 903 MHz





Plot A52

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 903 MHz

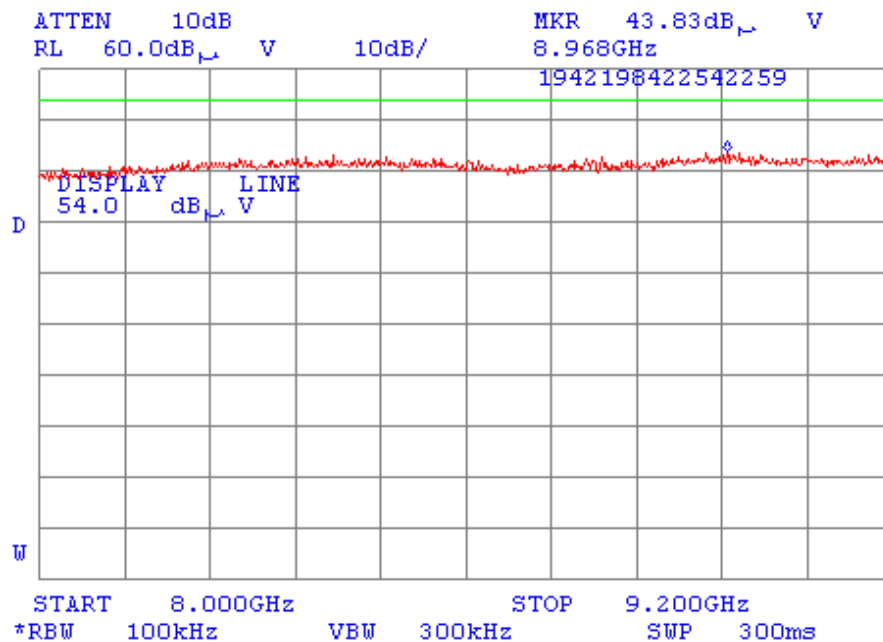


Test result: measured value + average factor = 44.67 dB( $\mu$ V/m) – 11.84 dB = 32.83 dB( $\mu$ V/m)



Plot A53

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 903 MHz



No spurious emissions were found.

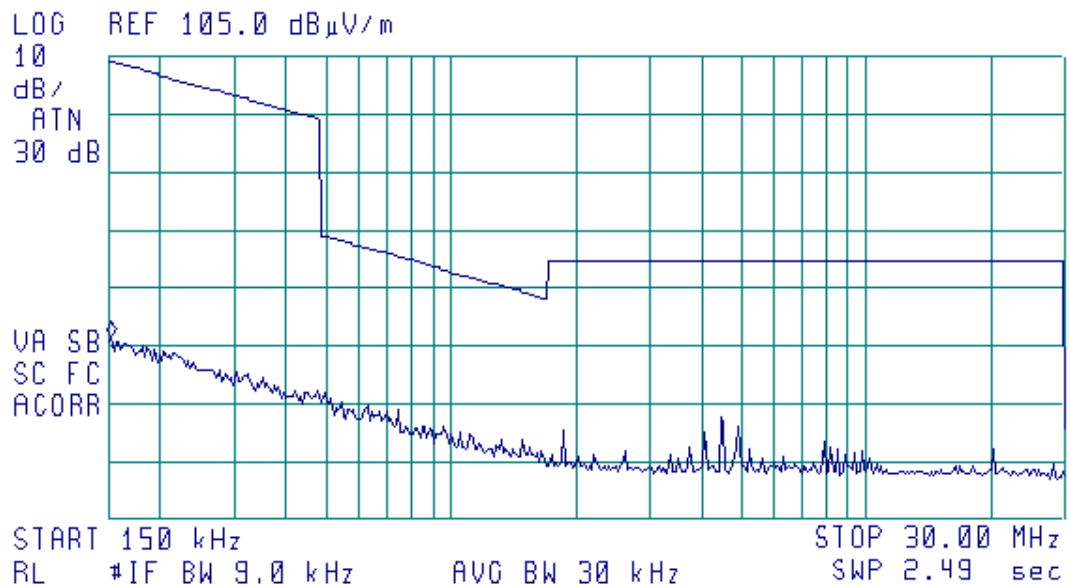


Plot A54

Radiated spurious emission measurements in the anechoic chamber from 150 kHz to 30 MHz,  
carrier frequency 915 MHz

(hp) 16:46:49 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 150 kHz  
56.26 dB $\mu$ V/m



No spurious emissions were found

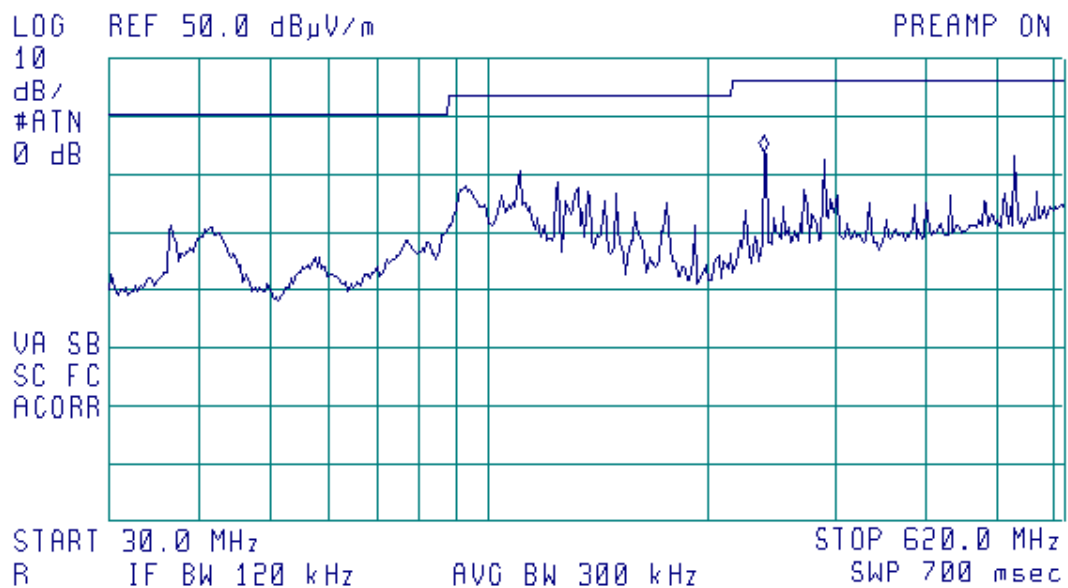


Plot A55

Radiated spurious emission measurements in the anechoic chamber in restricted bands,  
carrier frequency 915 MHz

12:37:46 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 239.3 MHz  
33.75 dB $\mu$ V/m





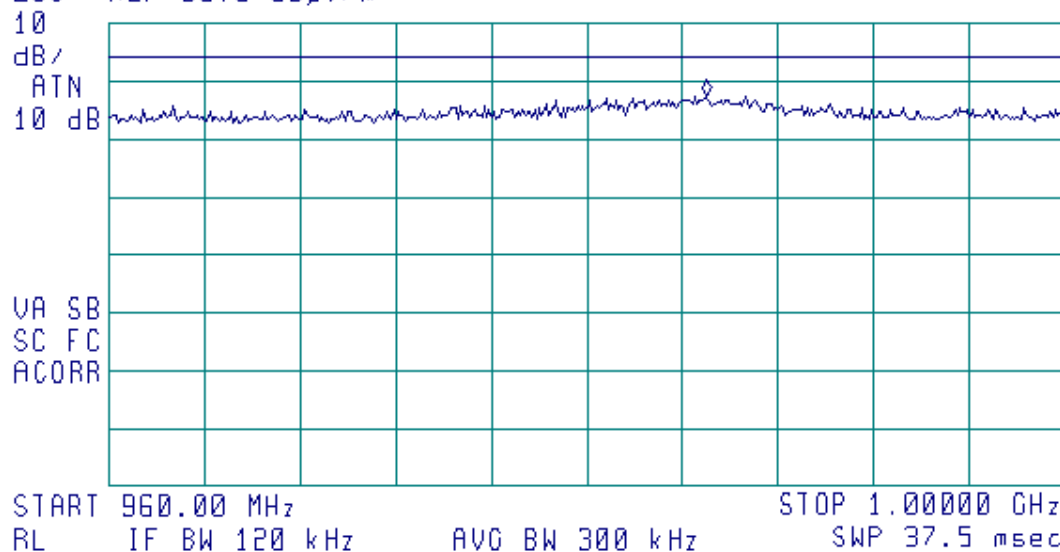
Plot A56

Radiated spurious emission measurements in the anechoic chamber in restricted bands,  
carrier frequency 915 MHz

12:48:42 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 985.00 MHz  
47.38 dB $\mu$ V/m

LOG REF 60.0 dB $\mu$ V/m





Plot A57

Radiated spurious emission measurements in the anechoic chamber in restricted bands,  
carrier frequency 915 MHz

16:15:18 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 1.3915 GHz  
48.90 dB $\mu$ V/m

LOG REF 60.0 dB $\mu$ V/m

10  
dB/  
#ATN  
0 dB

VA SB  
SC FC  
ACORR

START 1.0000 GHz

RL #IF BW 1.0 MHz

AVG BW 3 MHz

STOP 1.7250 GHz

SWP 20.0 msec



Plot A58

Radiated spurious emission measurements in the anechoic chamber in restricted bands,  
carrier frequency 915 MHz

16:09:56 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 2.8493 GHz  
47.34 dB $\mu$ V/m

LOG REF 60.0 dB $\mu$ V/m

10  
dB/  
#ATN  
0 dB

VA SB  
SC FC  
ACORR

START 2.2000 GHz

RL #IF BW 100 kHz

AVG BW 300 kHz

STOP 2.9000 GHz

SWP 210 msec

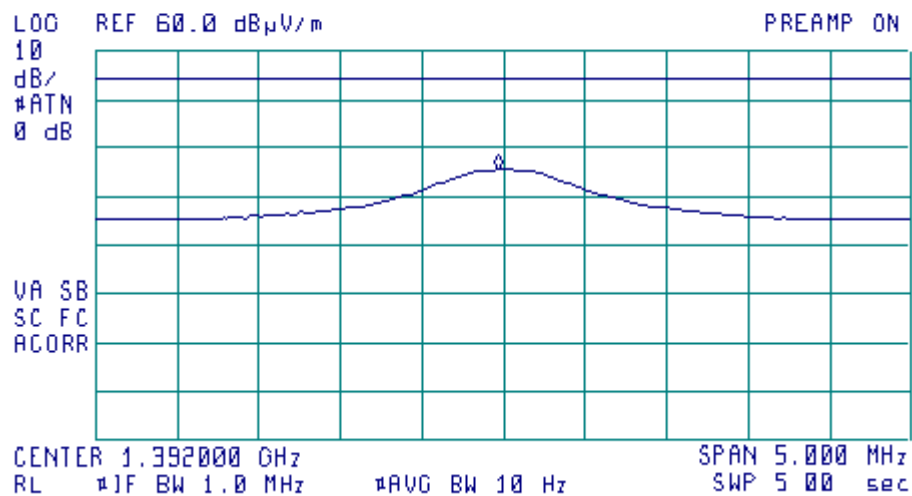


Plot A59

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 915 MHz

11:28:57 OCT 15, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 1.391963 GHz  
35.64 dB $\mu$ V/m



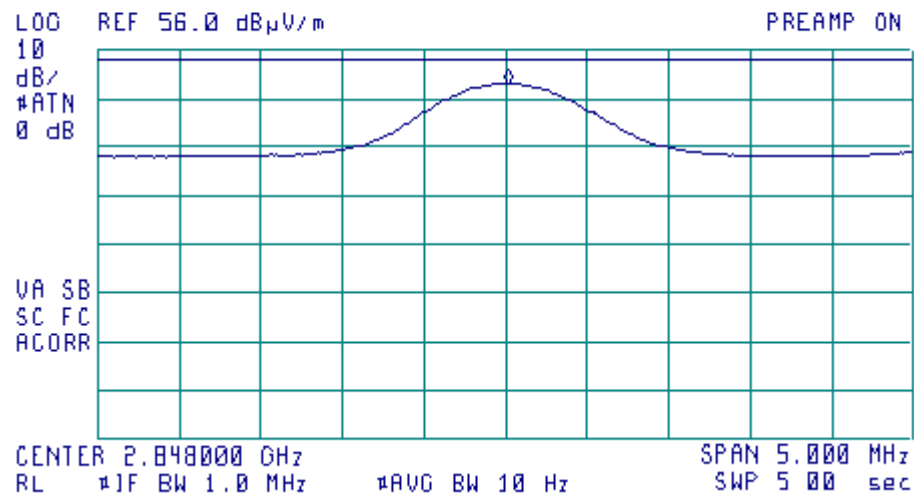


Plot A60

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 915 MHz

11:11:34 OCT 15, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 2.848013 GHz  
49.05 dB $\mu$ V/m



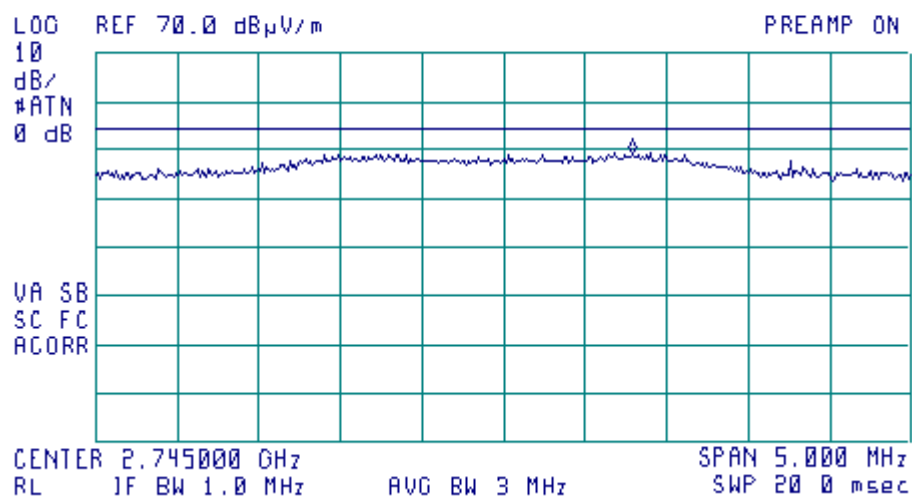


Plot A61

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 915 MHz

12:19:41 OCT 15, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 2.745700 GHz  
49.40 dB $\mu$ V/m



The 3<sup>rd</sup> harmonic, peak value

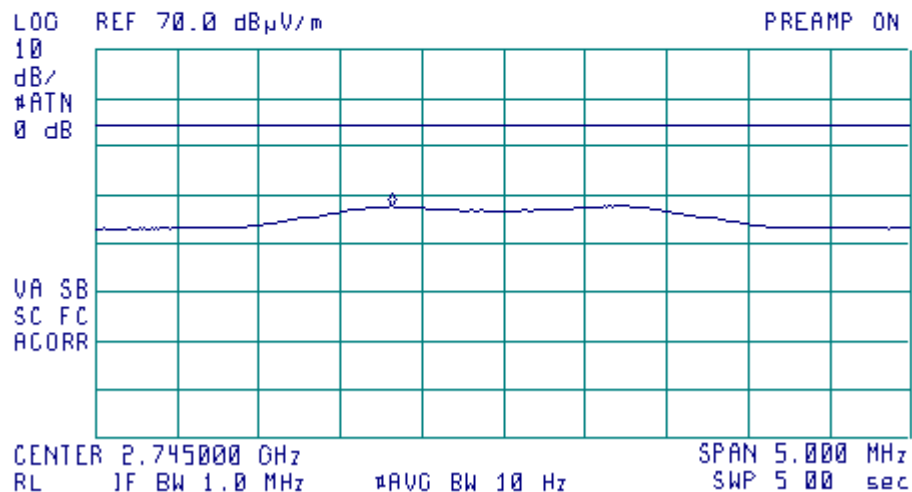


Plot A62

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 915 MHz

12:21:13 OCT 15, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 2.744313 GHz  
37.57 dB $\mu$ V/m



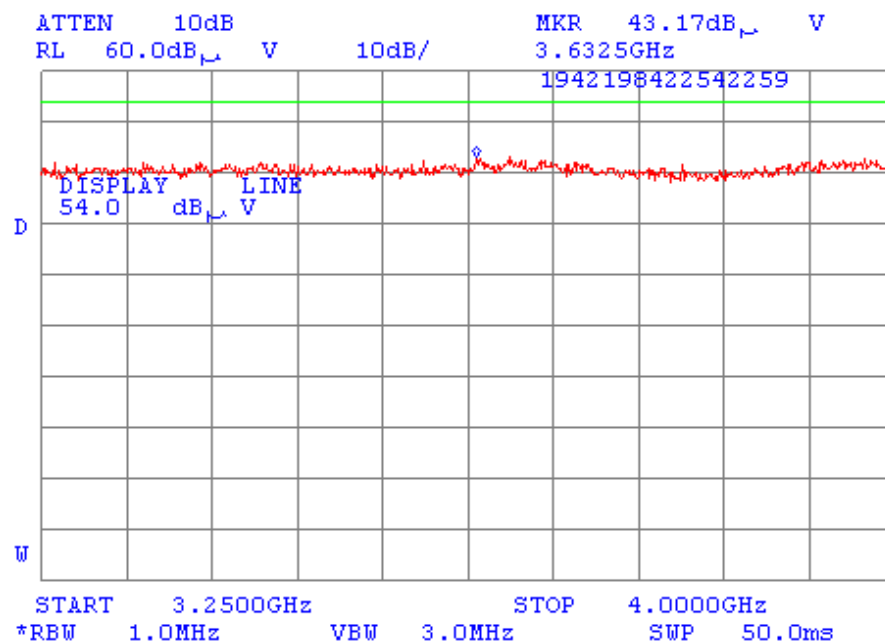
The 3<sup>rd</sup> harmonic, average value

Test result: measured value + average factor = 37.57 dB( $\mu$ V/m) – 11.84 dB = 25.73dB( $\mu$ V/m)



Plot A63

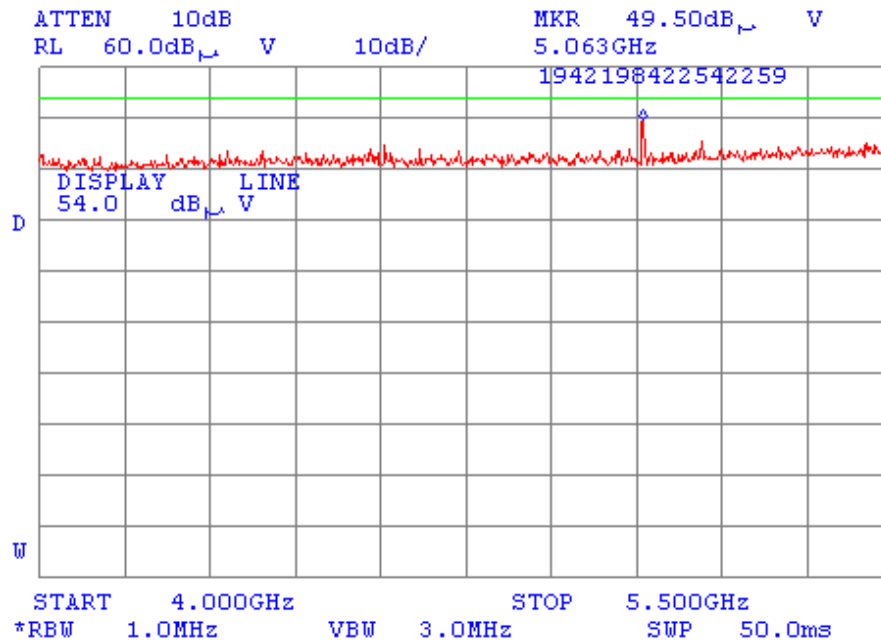
Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 915 MHz





Plot A64

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 915 MHz

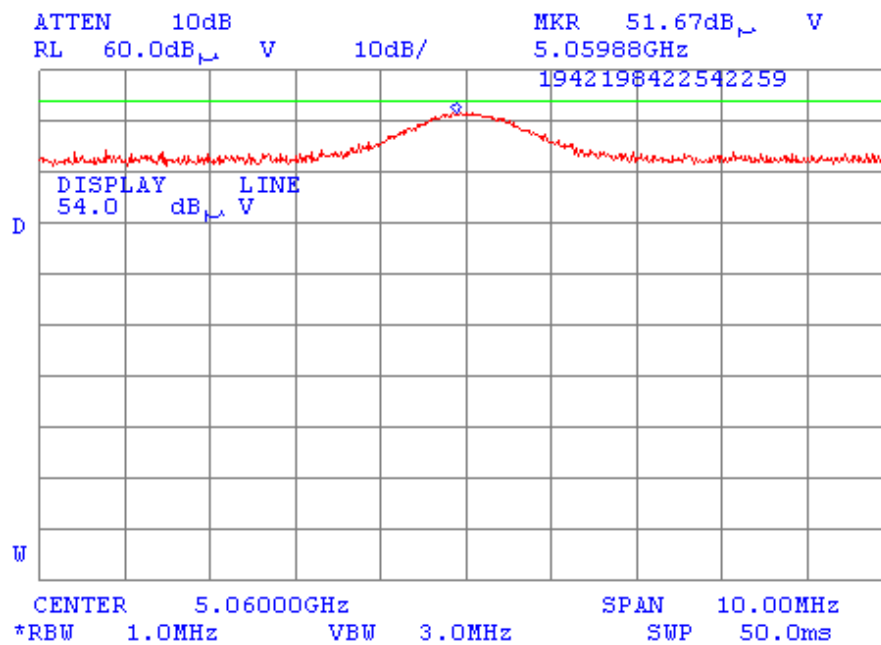


No other spurious except of the 4<sup>th</sup> harmonic of the LO.



Plot A65

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 915 MHz

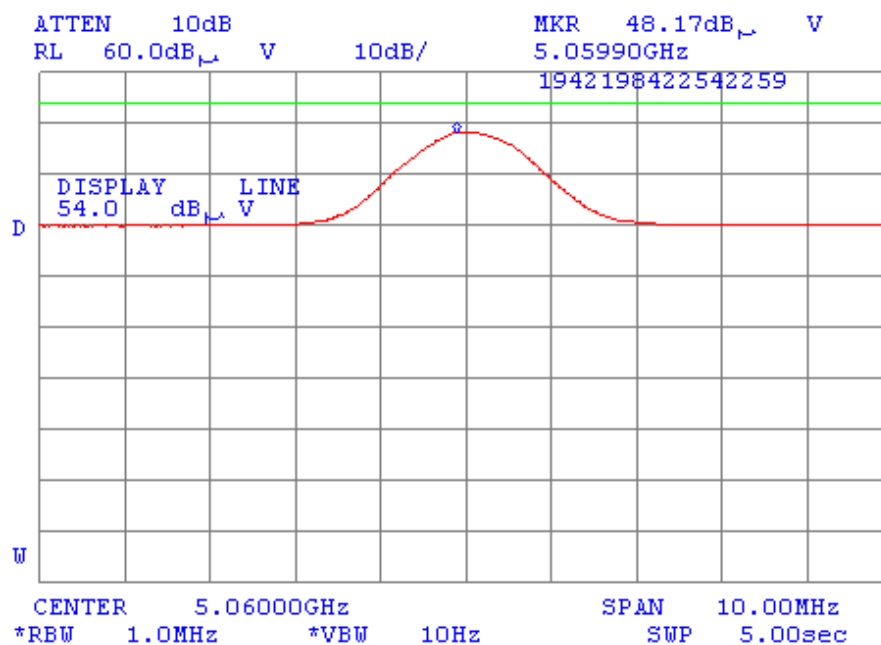


The 4<sup>th</sup> harmonic of the LO (915+350=1265 MHz)  
Peak value.  
Horizontal polarization



Plot A66

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 915 MHz



The 4<sup>th</sup> harmonic of the LO (915+350=1265 MHz)

Average value.

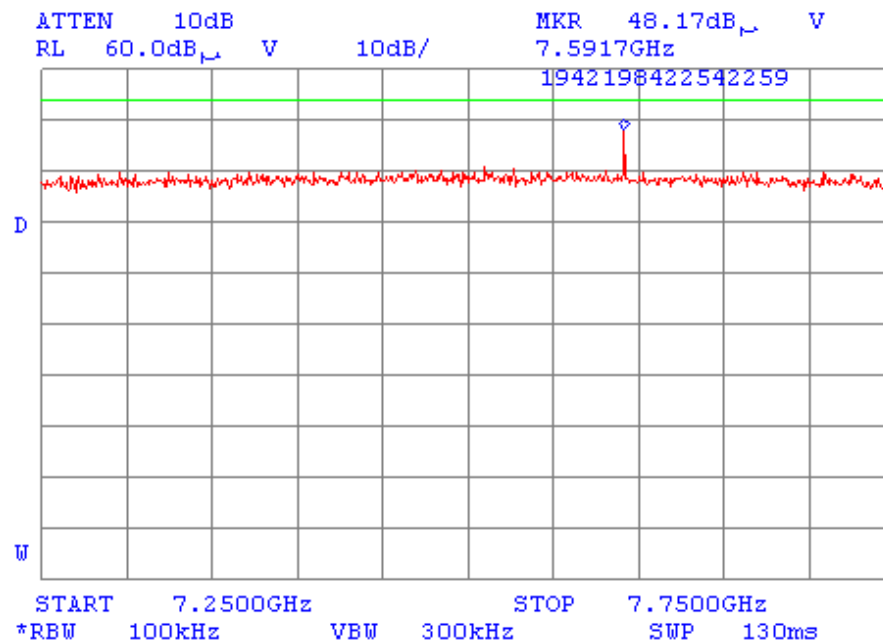
Horizontal polarization

Test result: measured value + average factor = 48.17 dB(μV/m) – 11.84 dB = 36.33 dB(μV/m)



Plot A67

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 915 MHz

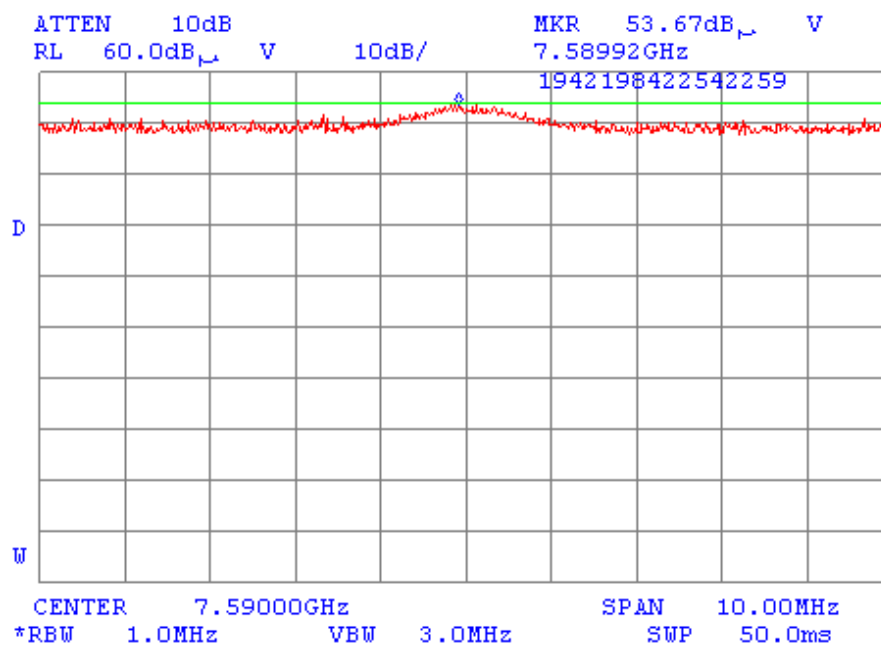


No other spurious except the 6<sup>th</sup> harmonic of the LO.



Plot A68

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 915 MHz

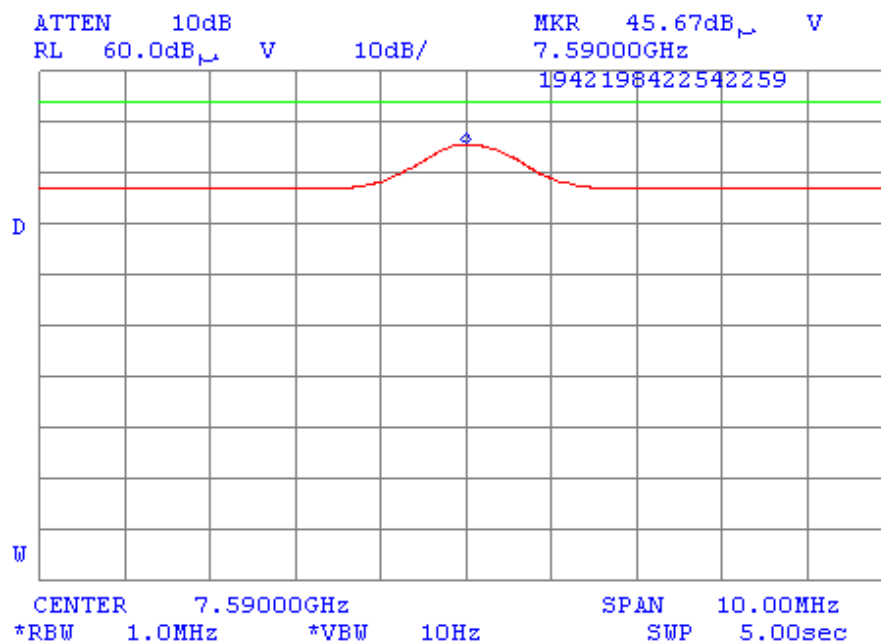


The 6<sup>th</sup> harmonic of the LO (915+350=1265 MHz)  
Peak value.  
Vertical polarization



Plot A69

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 915 MHz



The 6<sup>th</sup> harmonic of the LO (915+350=1265 MHz)

Average value.

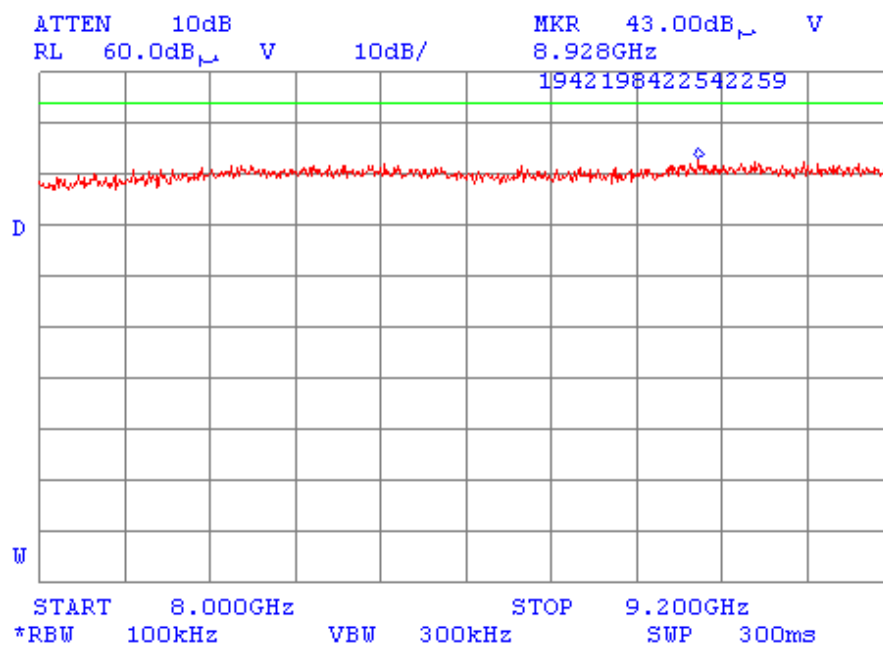
Vertical polarization

Test result: measured value + average factor = 45.67 dB(μV/m) – 11.84 dB = 33.83 dB(μV/m)



Plot A70

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 915 MHz



No spurious emissions were found.

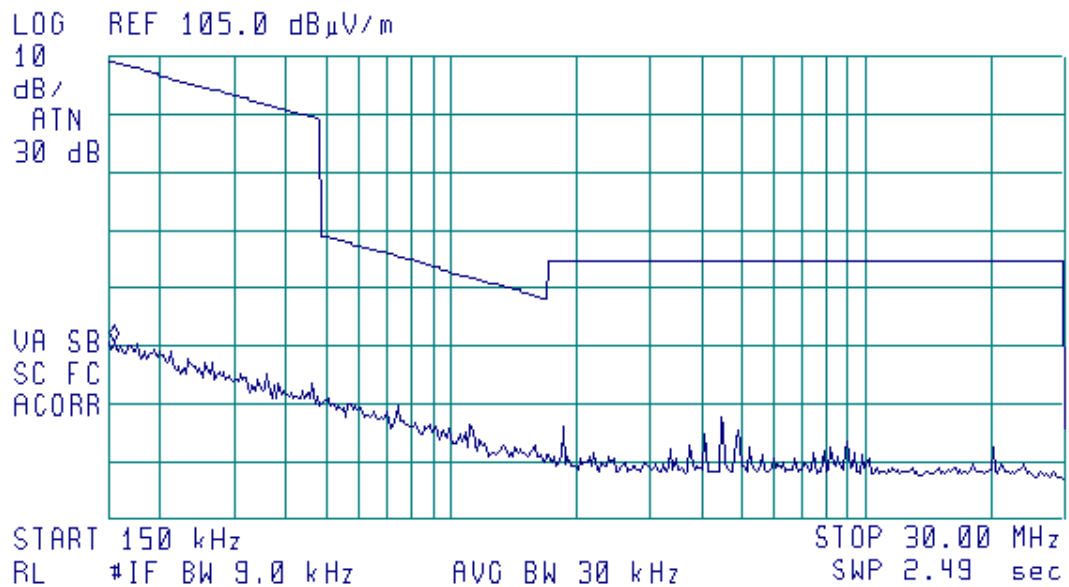


Plot A71

Radiated spurious emission measurements in the anechoic chamber from 150 kHz to 30 MHz,  
carrier frequency 927 MHz

(hp) 16:50:13 OCT 14, 2003

ACTU DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 150 kHz  
55.67 dB $\mu$ V/m



No spurious emissions were found

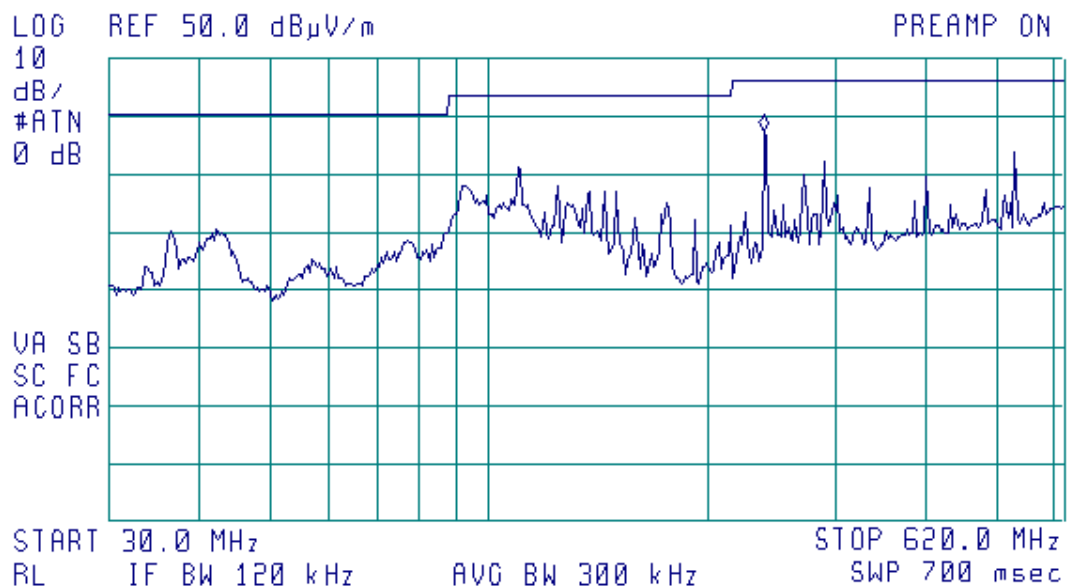


Plot A72

Radiated spurious emission measurements in the anechoic chamber in restricted bands,  
carrier frequency 927 MHz

13:23:50 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 239.3 MHz  
37.31 dB $\mu$ V/m





Plot A73

Radiated spurious emission measurements in the anechoic chamber in restricted bands,  
carrier frequency 927 MHz

13:07:01 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 995.50 MHz  
46.59 dB $\mu$ V/m

LOG REF 60.0 dB $\mu$ V/m

10

dB/

ATN

10 dB

VA SB

SC FC

ACORR

START 960.00 MHz

RL IF BW 120 kHz

AVG BW 300 kHz

STOP 1.00000 GHz

SWP 37.5 msec

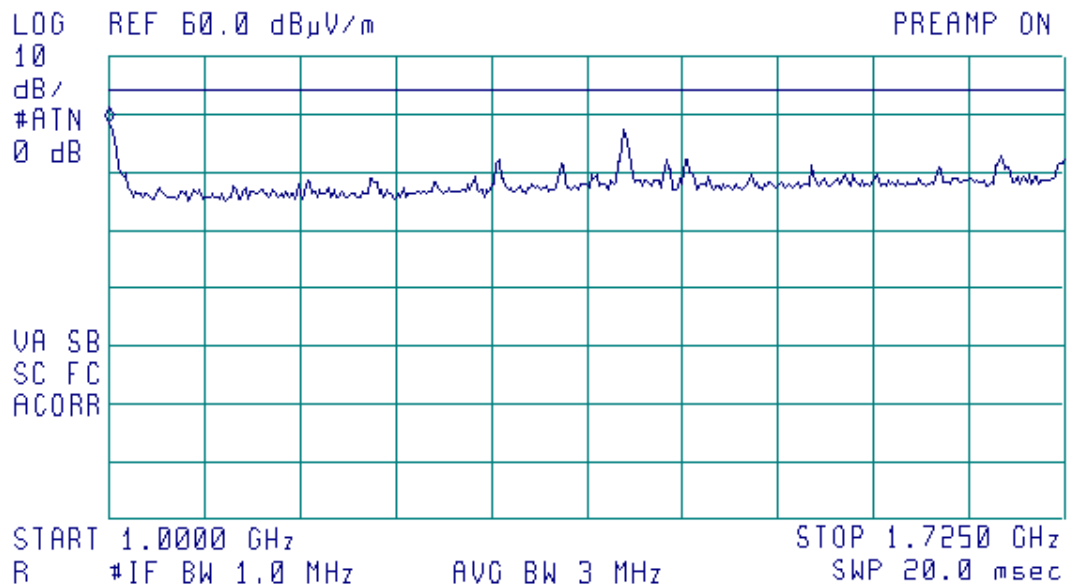


Plot A74

Radiated spurious emission measurements in the anechoic chamber in restricted bands,  
carrier frequency 927 MHz

15:51:25 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 1.0000 GHz  
48.23 dB $\mu$ V/m





Plot A75

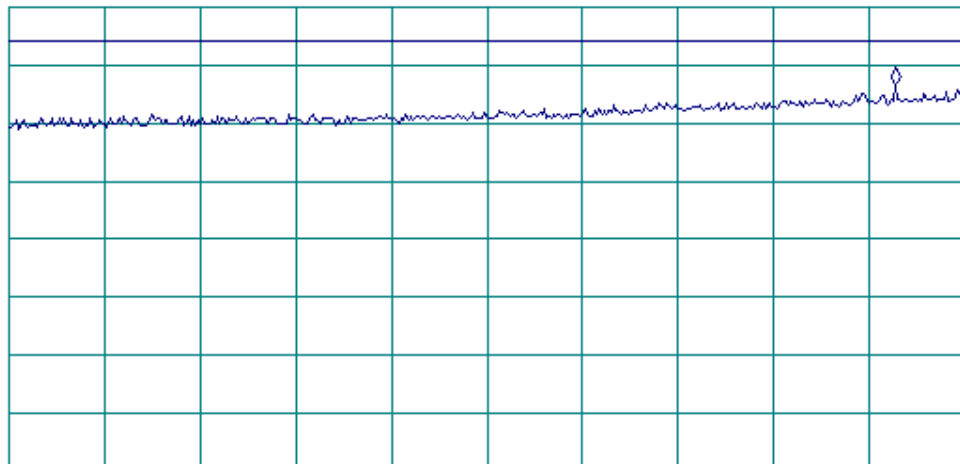
Radiated spurious emission measurements in the anechoic chamber in restricted bands,  
carrier frequency 927 MHz

16:05:15 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 2.8493 GHz  
46.57 dB $\mu$ V/m

LOG REF 60.0 dB $\mu$ V/m

10  
dB/  
#ATN  
0 dB



START 2.2000 GHz

R #IF BW 100 kHz

AVG BW 300 kHz

STOP 2.9000 GHz

SWP 210 msec

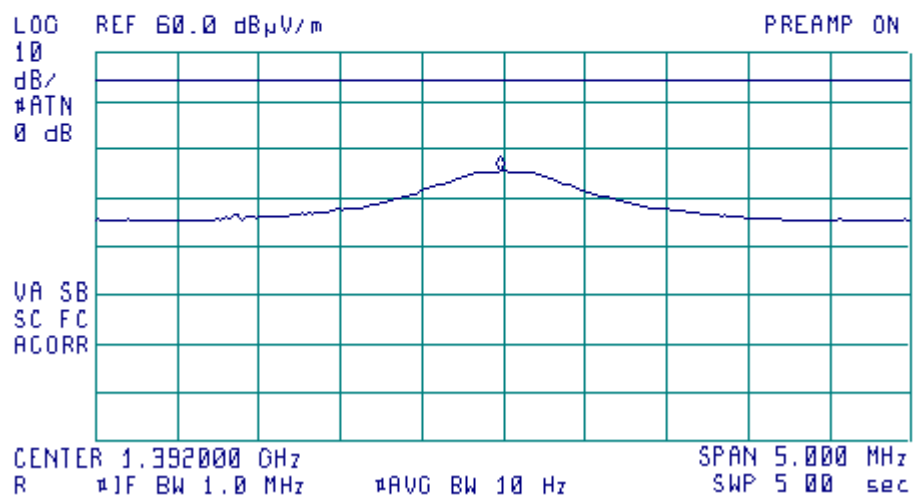


Plot A76

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 927 MHz

11:25:07 OCT 15, 2003

ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 1.391975 GHz  
35.57 dB $\mu$ V/m



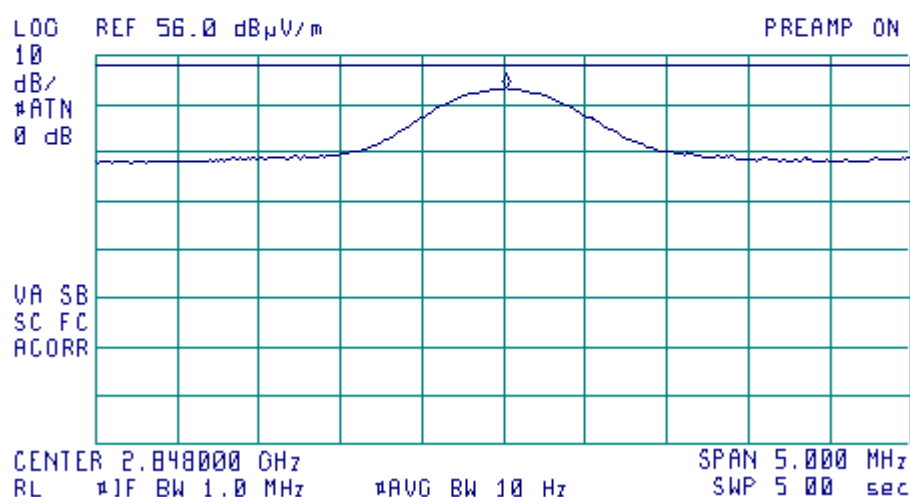


Plot A77

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 927 MHz

11:19:05 OCT 15, 2003

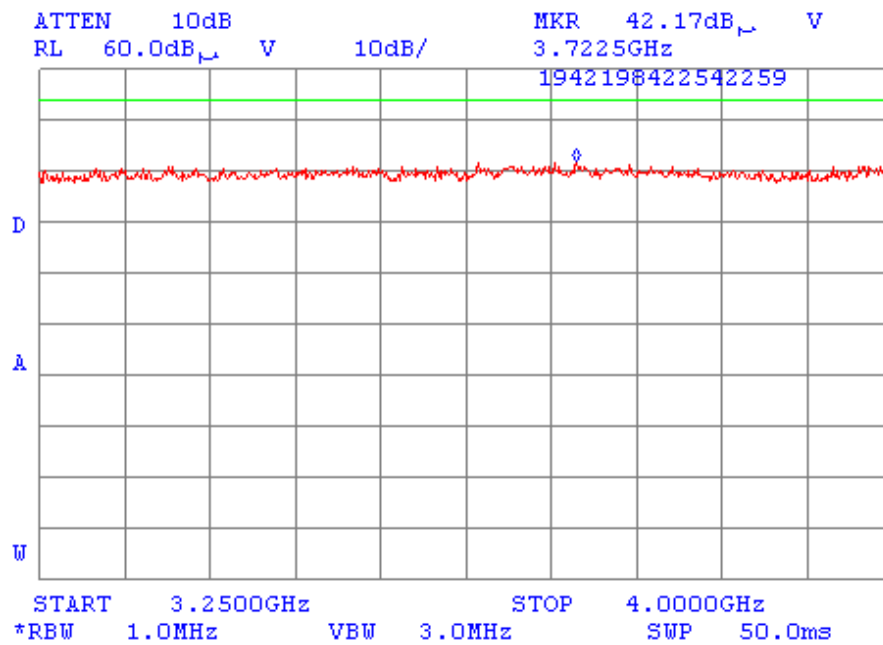
ACTV DET: PEAK  
MEAS DET: PEAK OP AVG  
MKR 2.848013 GHz  
49.12 dB $\mu$ V/m





Plot A78

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 927 MHz

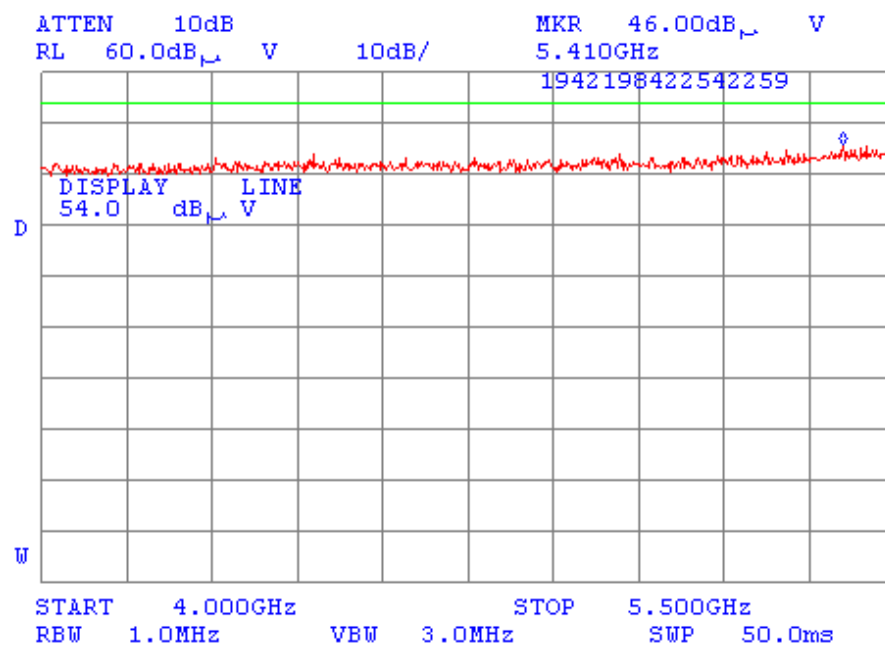


No spurious emissions were found.



Plot A79

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 927 MHz

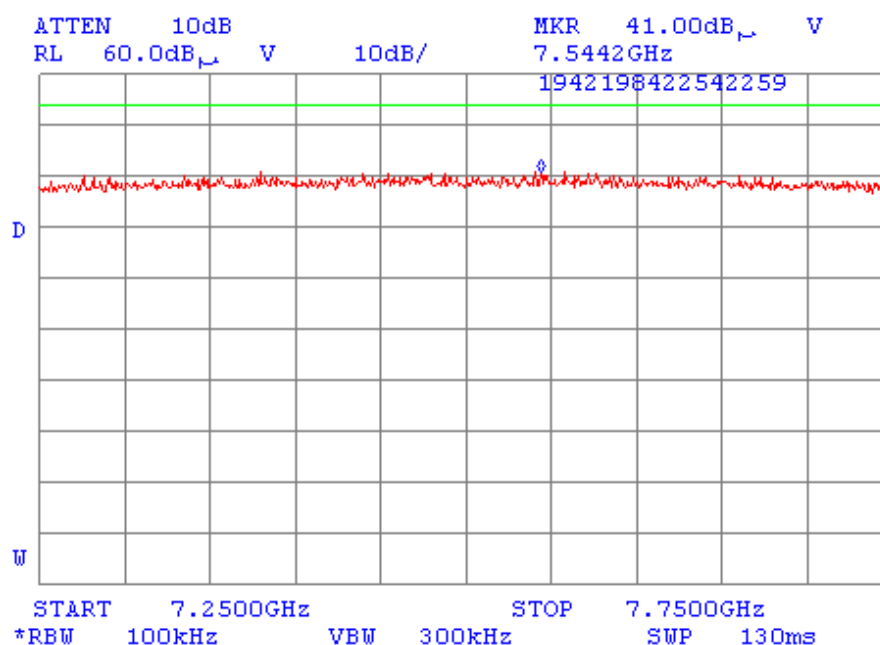


No spurious emissions were found.



Plot A80

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 927 MHz

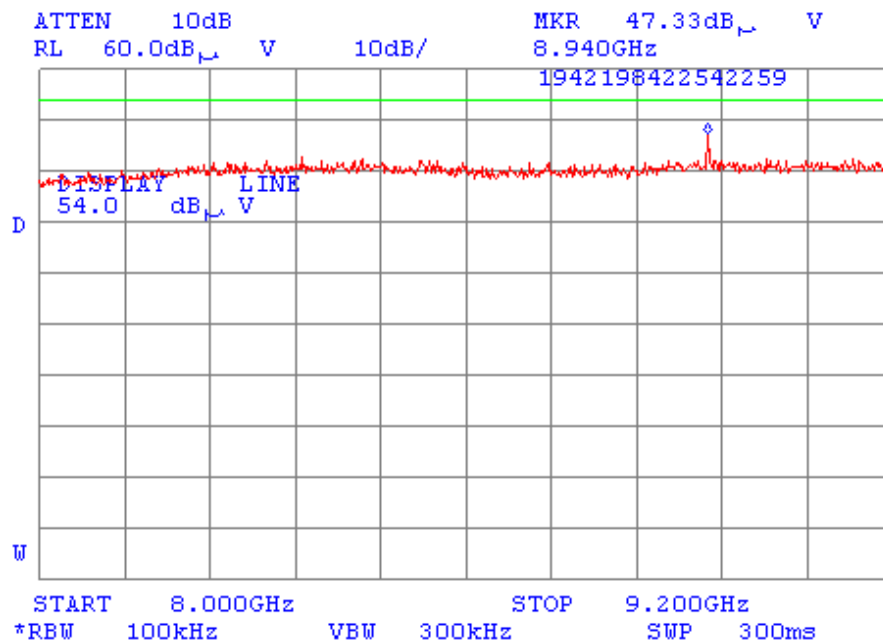


No spurious emissions were found.



Plot A81

Radiated spurious emission measurements at the OATS in restricted bands,  
carrier frequency 927 MHz



The 7<sup>th</sup> harmonic of the LO-not restricted band  
LO: 927 + 350 = 1277 (MHz)  
1277 x 7 = 8939 (MHz)

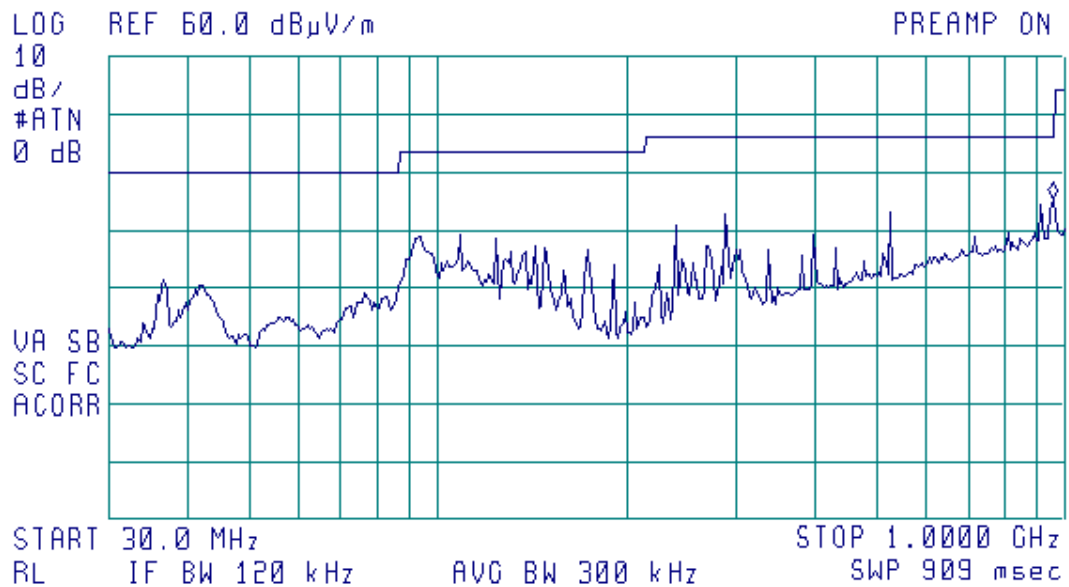


Plot A82

Radiated emission measurements in the anechoic chamber in receive mode

14:10:27 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 952.3 MHz  
35.32 dB $\mu$ V/m



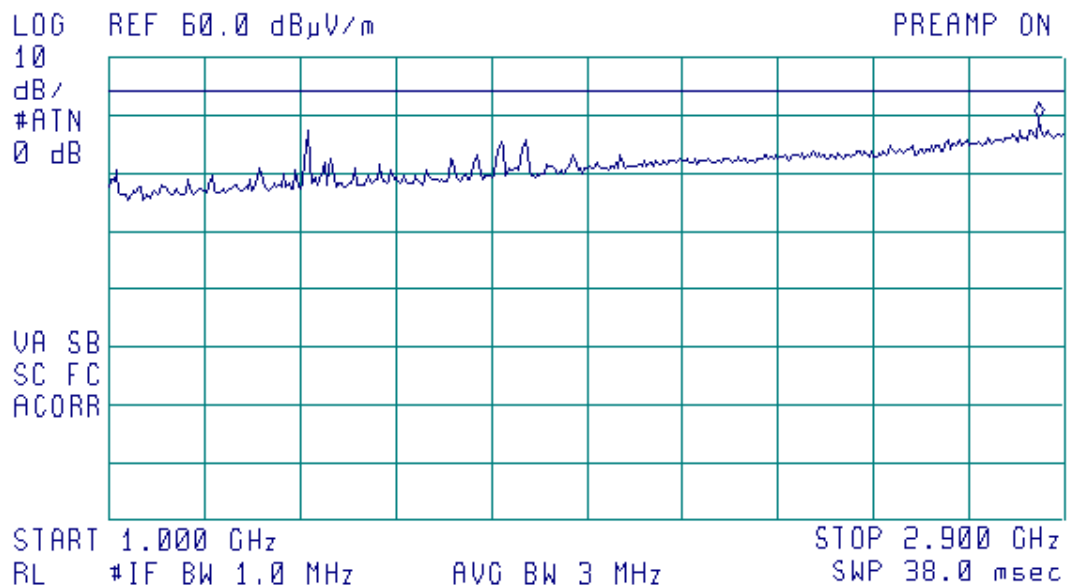


Plot A83

Radiated emission measurements in the anechoic chamber in receive mode

15:11:57 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 2.848 GHz  
49.43 dB $\mu$ V/m



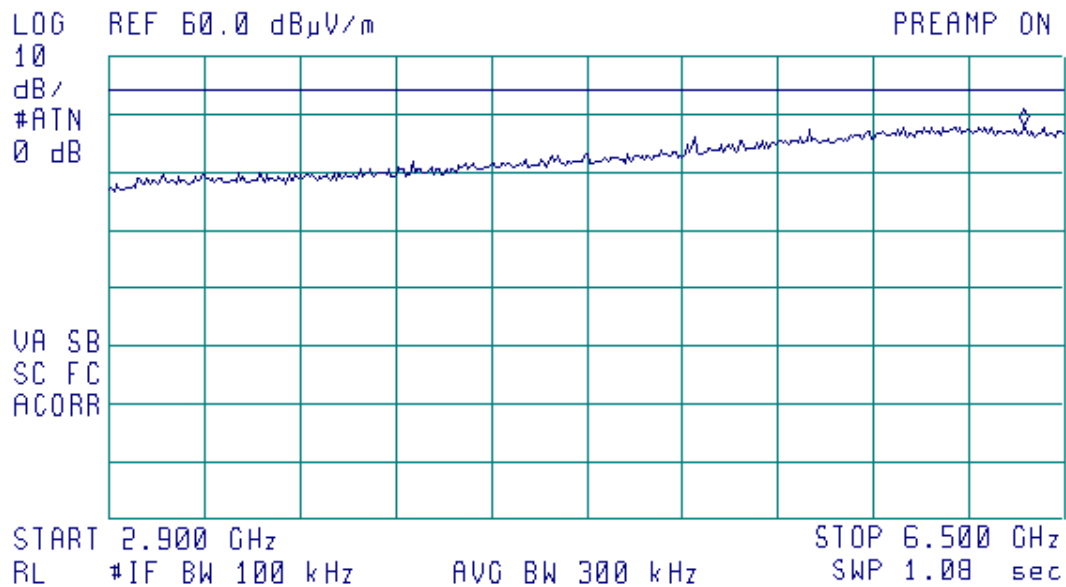


Plot A84

Radiated emission measurements in the anechoic chamber in receive mode

15:39:17 OCT 14, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 6.347 GHz  
47.87 dB $\mu$ V/m





Plot A85

Conducted emission measurements at AC power line in receive mode

Line identification: Line 1  
Limit: Quasi-peak, average

12:05:41 OCT 19, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 5.04 MHz  
45.62 dB $\mu$ V/m

LOG REF 70.4 dB $\mu$ V/m

10  
dB/  
ATN  
10 dB

PASS LIMIT

VA SB  
SC FC  
ACORR

START 150 kHz

R #IF BW 9.0 kHz

AVG BW 30 kHz

STOP 30.00 MHz

SWP 2.49 sec



Plot A86

Conducted emission measurements at AC power line in receive mode

Line identification: Line 2  
Limit: Quasi-peak, average

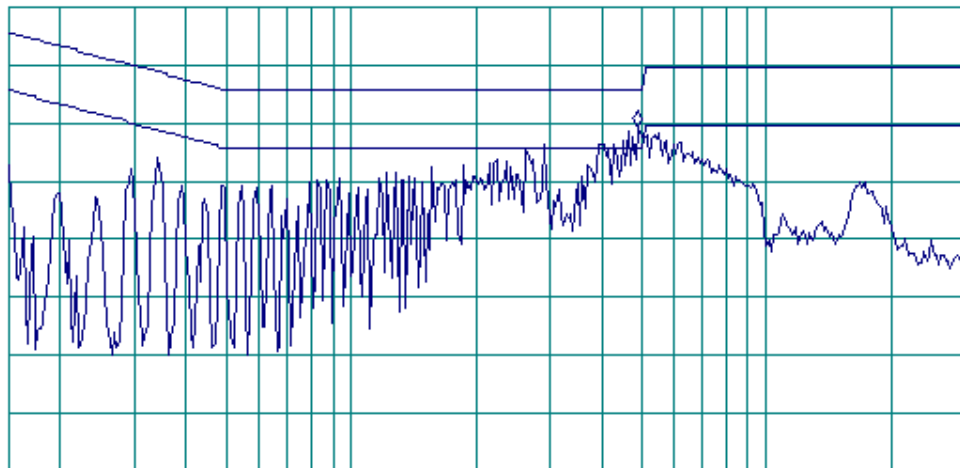
12:22:42 OCT 19, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 4.88 MHz  
49.67 dB $\mu$ V

LOG REF 70.4 dB $\mu$ V

10  
dB/  
ATN  
10 dB

VA SB  
SC FC  
ACORR



START 150 kHz

RL #IF BW 9.0 kHz

AVG BW 30 kHz

STOP 30.00 MHz

SWP 2.49 sec



Plot A87

Conducted emission measurements at AC power line in transmit mode

Line identification: Line 1  
Limit: Quasi-peak, average

12:45:12 OCT 19, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 4.88 MHz  
49.57 dB $\mu$ V

LOG REF 70.4 dB $\mu$ V

10  
dB/  
ATN  
10 dB

VA SB  
SC FC  
ACORR

START 150 kHz STOP 30.00 MHz  
RL IF BW 9.0 kHz AVG BW 30 kHz SWP 2.49 sec



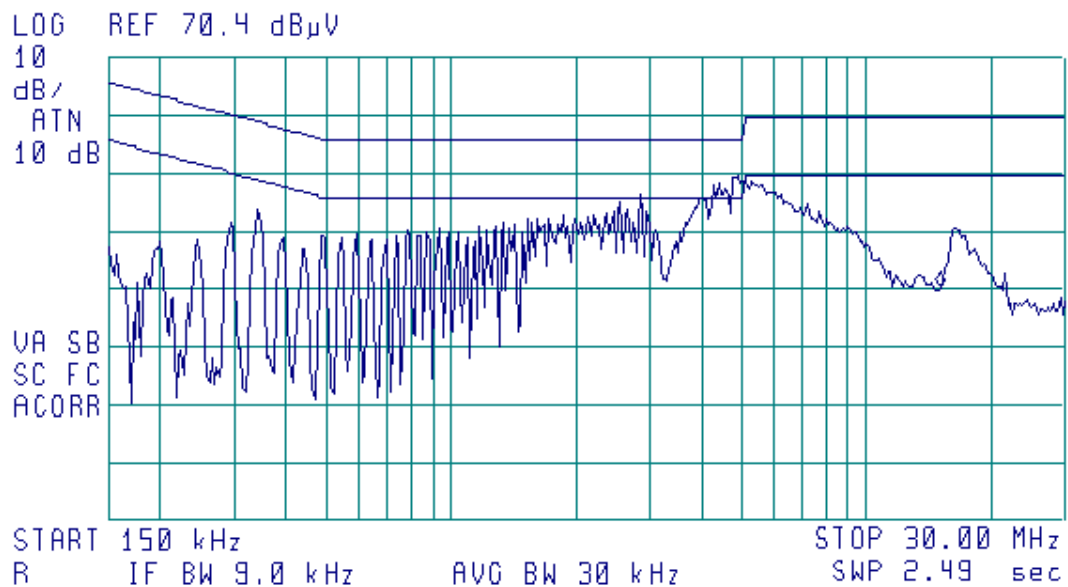
Plot A88

Conducted emission measurements at AC power line in transmit mode

Line identification: Line 2  
Limit: Quasi-peak, average

12:37:15 OCT 19, 2003

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 14.99 MHz  
30.55 dB $\mu$ V





## Appendix B Test equipment used for tests

| HL<br>Serial<br>No. | Description                                                                | Manufacturer information |                   |            | Due<br>calibration<br>Month/ year |
|---------------------|----------------------------------------------------------------------------|--------------------------|-------------------|------------|-----------------------------------|
|                     |                                                                            | Name                     | Model No.         | Serial No. |                                   |
| 0038                | Antenna Mast, 1-4 m                                                        | Hermon Labs              | AM-1              | 028        | 2/04<br>check                     |
| 0091                | Position controller for antenna mast +<br>turntable, OFTS                  | Hermon Labs              | CRL-2             | NA         | 4/04<br>check                     |
| 0287                | Turntable, motorized diameter, 2 m                                         | Hermon Labs              | TMD-2             | 042        | 11/04<br>check                    |
| 0446                | Active loop antenna 10 kHz-30 MHz                                          | Electro-Mechanics        | 6502              | 2857       | 10/04                             |
| 0447                | LISN, 16/2, 300 V RMS                                                      | Hermon Labs              | LISN 16-1         | 447        | 11/04                             |
| 0465                | Anechoic chamber<br>9 (L) x 6.5 (W) x 5.5 (H) m                            | Hermon Labs              | AC-1              | 023        | 10/04                             |
| 0466                | Shielded room<br>3 (L) x 3 (W) x 2.4 (H) m                                 | Hermon Labs              | SR-1              | 024        | 11/04<br>check                    |
| 0521                | Spectrum analyzer with RF filter section<br>(EMI receiver 9 kHz - 6.5 GHz) | Hewlett Packard          | 8546A             | 0319       | 7/04                              |
| 0589                | Cable coaxial, GORE A2POL118.2, 3m                                         | Hermon Labs              | GORE-3            | 589        | 11/04                             |
| 0592                | Position controller                                                        | Hermon Labs              | L2-SR3000         | 100        | 5/04<br>check                     |
| 0593                | Antenna Mast, 1-4 m/<br>1-6 m Pneumatic                                    | Hermon Labs              | AM-F1             | 101        | 2/04<br>check                     |
| 0594                | Turntable for Anechoic Chamber, flush<br>mounted, d=1.2 m, pneumatic       | Hermon Labs              | WDC1              | 102        | 1/04<br>check                     |
| 0604                | Antenna biconilog log-periodic/T bow-<br>tie, 26 - 2000 MHz                | EMCO                     | 3141              | 9611-1011  | 1/04                              |
| 0787                | Transient limiter                                                          | Hewlett Packard          | 11947A-8ZE        | 3107A01877 | 11/04                             |
| 1003                | Cable coaxial, M17/164, 10 m                                               | Hermon Labs              | C17164-10         | 161        | 11/04                             |
| 1004                | Cable coaxial, ANDREW PSWJ4, 6 m                                           | Hermon Labs              | ANDREW-6          | 163        | 12/03                             |
| 1097                | Attenuator, 50 Ohm, 2 W, DC to 8 GHz,<br>20 dB                             | Midwest Microwave        | 0793-20-NN-<br>07 | 1097       | 1/04                              |
| 1200                | Quadruplexer                                                               | Electronica              | UE 84             | 0240       | 4/04<br>check                     |
| 1205                | One phase voltage regulator, 2kVA, 0-<br>250V                              | Hermon Labs              | TDGC-2            | 109        | 6/04<br>check                     |
| 1365                | Cable coaxial, RG-214, 5 m                                                 | Hermon Labs              | C214-5            | 1365       | 4/04                              |
| 1424                | Spectrum analyzer, 30 Hz - 40 GHz                                          | Agilent Technologies     | 8564EC            | 3946A00219 | 8/04                              |
| 1430                | EMI receiver system, 9 kHz - 2.9 GHz                                       | Agilent Technologies     | 8542E             | 3807A00262 | 9/04                              |



| HL<br>Serial<br>No. | Description                                                      | Manufacturer information      |                        |            | Due<br>calibration<br>Month/ year |
|---------------------|------------------------------------------------------------------|-------------------------------|------------------------|------------|-----------------------------------|
|                     |                                                                  | Name                          | Model No.              | Serial No. |                                   |
| 1503                | Cable RF, 6 m                                                    | Belden                        | M17/167<br>MIL-C-17    | NA         | 9/04<br>check                     |
| 1651                | Attenuators set (2, 3, 5, 20 dB),<br>DC – 18 GHz                 | M/A –COM                      | 2082                   | 1651       | 3/04                              |
| 1942                | Cable 18 GHz, 4 m, blue                                          | Rhophase Microwave<br>Ltd     | SPS-1803A-<br>4000-NPS | T4658      | 10/04                             |
| 1947                | Cable 18 GHz, 6.5 m, blue                                        | Rhophase Microwave<br>Ltd     | NPS-1803A-<br>6500-NPS | T4974      | 10/04                             |
| 1984                | Antenna, double ridged waveguide<br>horn, 1-18 GHz, 300W, N-type | EMC Test Systems              | 3115                   | 9911-5964  | 3/04                              |
| 2009                | Cable RF, 8 m                                                    | Alpha Wire                    | RG-214                 | 2009       | 12/03                             |
| 2254                | Cable 40GHz, 0.8 m, blue                                         | Rhophase Microwave<br>Limited | KPS-1503A-<br>800-KPS  | W4907      | 11/04                             |
| 2259                | Amplifier low noise 2-20 GHz                                     | Sophia Wireless               | LNA0220-C              | 0223       | 11/04                             |
| 2399                | Cable 40 GHz, 1.5 m, blue                                        | Rhophase Microwave<br>Ltd.    | KPS-1503A-<br>1500-KPS | X2945      | 6/04                              |



## Appendix C Test equipment correction factors

**Antenna factor  
Active Loop Antenna  
Model 6502  
S/N 2857**

| Frequency,<br>MHz | Magnetic antenna factor,<br>dB | Electric antenna factor,<br>dB |
|-------------------|--------------------------------|--------------------------------|
| 0.009             | -32.8                          | 18.7                           |
| 0.010             | -33.8                          | 17.7                           |
| 0.020             | -38.3                          | 13.2                           |
| 0.050             | -41.1                          | 10.4                           |
| 0.075             | -41.3                          | 10.2                           |
| 0.100             | -41.6                          | 9.9                            |
| 0.150             | -41.7                          | 9.8                            |
| 0.250             | -41.6                          | 9.9                            |
| 0.500             | -41.8                          | 9.8                            |
| 0.750             | -41.9                          | 9.7                            |
| 1.000             | -41.4                          | 10.1                           |
| 2.000             | -41.5                          | 10.0                           |
| 3.000             | -41.4                          | 10.2                           |
| 4.000             | -41.4                          | 10.1                           |
| 5.000             | -41.5                          | 10.1                           |
| 10.000            | -41.9                          | 9.6                            |
| 15.000            | -41.9                          | 9.6                            |
| 20.000            | -42.2                          | 9.3                            |
| 25.000            | -42.8                          | 8.7                            |
| 30.000            | -44.0                          | 7.5                            |

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field intensity in dB( $\mu$ V/m).



**Antenna factor,  
biconilog antenna EMCO, model 3141,  
serial number1011 (HL 0604)**

| Frequency,<br>MHz | Antenna factor,<br>dB(1/m) |
|-------------------|----------------------------|
| 26                | 7.8                        |
| 28                | 7.8                        |
| 30                | 7.8                        |
| 40                | 7.2                        |
| 60                | 7.1                        |
| 70                | 8.5                        |
| 80                | 9.4                        |
| 90                | 9.8                        |
| 100               | 9.7                        |
| 110               | 9.3                        |
| 120               | 8.8                        |
| 130               | 8.7                        |
| 140               | 9.2                        |
| 150               | 9.8                        |
| 160               | 10.2                       |
| 170               | 10.4                       |
| 180               | 10.4                       |
| 190               | 10.3                       |
| 200               | 10.6                       |
| 220               | 11.6                       |
| 240               | 12.4                       |
| 260               | 12.8                       |
| 280               | 13.7                       |
| 300               | 14.7                       |
| 320               | 15.2                       |
| 340               | 15.4                       |
| 360               | 16.1                       |
| 380               | 16.4                       |
| 400               | 16.6                       |
| 420               | 16.7                       |
| 440               | 17.0                       |
| 460               | 17.7                       |
| 480               | 18.1                       |
| 500               | 18.5                       |
| 520               | 19.1                       |
| 540               | 19.5                       |
| 560               | 19.8                       |
| 580               | 20.6                       |
| 600               | 21.3                       |
| 620               | 21.5                       |
| 640               | 21.2                       |
| 660               | 21.4                       |
| 680               | 21.9                       |
| 700               | 22.2                       |
| 720               | 22.2                       |
| 740               | 22.1                       |
| 760               | 22.3                       |
| 780               | 22.6                       |
| 800               | 22.7                       |
| 820               | 22.9                       |
| 840               | 23.1                       |
| 860               | 23.4                       |
| 880               | 23.8                       |
| 900               | 24.1                       |
| 920               | 24.1                       |

| Frequency,<br>MHz | Antenna factor,<br>dB(1/m) |
|-------------------|----------------------------|
| 940               | 24.0                       |
| 960               | 24.1                       |
| 980               | 24.5                       |
| 1000              | 24.9                       |
| 1020              | 25.0                       |
| 1040              | 25.2                       |
| 1060              | 25.4                       |
| 1080              | 25.6                       |
| 1100              | 25.7                       |
| 1120              | 26.0                       |
| 1140              | 26.4                       |
| 1160              | 27.0                       |
| 1180              | 27.0                       |
| 1200              | 26.7                       |
| 1220              | 26.5                       |
| 1240              | 26.5                       |
| 1260              | 26.5                       |
| 1280              | 26.6                       |
| 1300              | 27.0                       |
| 1320              | 27.8                       |
| 1340              | 28.3                       |
| 1360              | 28.2                       |
| 1380              | 27.9                       |
| 1400              | 27.9                       |
| 1420              | 27.9                       |
| 1440              | 27.8                       |
| 1460              | 27.8                       |
| 1480              | 28.0                       |
| 1500              | 28.5                       |
| 1520              | 28.9                       |
| 1540              | 29.6                       |
| 1560              | 29.8                       |
| 1580              | 29.6                       |
| 1600              | 29.5                       |
| 1620              | 29.3                       |
| 1640              | 29.2                       |
| 1660              | 29.4                       |
| 1680              | 29.6                       |
| 1700              | 29.8                       |
| 1720              | 30.3                       |
| 1740              | 30.8                       |
| 1760              | 31.1                       |
| 1780              | 31.0                       |
| 1800              | 30.9                       |
| 1820              | 30.7                       |
| 1840              | 30.6                       |
| 1860              | 30.6                       |
| 1880              | 30.6                       |
| 1900              | 30.6                       |
| 1920              | 30.7                       |
| 1940              | 30.9                       |
| 1960              | 31.2                       |
| 1980              | 31.6                       |
| 2000              | 32.0                       |

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field intensity in dB( $\mu$ V/m).



**Antenna factor**  
**Double-ridged wave guide horn antenna**  
**Model 3115, S/N 9911-5964, HL1984**

| Frequency,<br>MHz | Antenna factor,<br>dB(1/m) |
|-------------------|----------------------------|
| 1000.0            | 24.7                       |
| 1500.0            | 25.7                       |
| 2000.0            | 27.6                       |
| 2500.0            | 28.9                       |
| 3000.0            | 31.2                       |
| 3500.0            | 32.0                       |
| 4000.0            | 32.5                       |
| 4500.0            | 32.7                       |
| 5000.0            | 33.6                       |
| 5500.0            | 35.1                       |
| 6000.0            | 35.4                       |
| 6500.0            | 34.9                       |
| 7000.0            | 36.1                       |
| 7500.0            | 37.8                       |
| 8000.0            | 38.0                       |
| 8500.0            | 38.1                       |
| 9000.0            | 39.1                       |
| 9500.0            | 38.3                       |
| 10000.0           | 38.6                       |
| 10500.0           | 38.2                       |
| 11000.0           | 38.7                       |
| 11500.0           | 39.5                       |
| 12000.0           | 40.0                       |
| 12500.0           | 40.4                       |
| 13000.0           | 40.5                       |
| 13500.0           | 41.1                       |
| 14000.0           | 41.6                       |
| 14500.0           | 41.7                       |
| 15000.0           | 38.7                       |
| 15500.0           | 38.2                       |
| 16000.0           | 38.8                       |
| 16500.0           | 40.5                       |
| 17000.0           | 42.5                       |
| 17500.0           | 45.9                       |
| 18000.0           | 49.4                       |

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB( $\mu$ V) to convert it into field intensity in dB( $\mu$ V/m).



**Correction factor**  
**Line impedance stabilization network**  
**Model LISN 16 - 1**  
**Hermon Laboratories**

| Frequency, kHz | Correction factor, dB |
|----------------|-----------------------|
| 10             | 4.9                   |
| 15             | 2.86                  |
| 20             | 1.83                  |
| 25             | 1.25                  |
| 30             | 0.91                  |
| 35             | 0.69                  |
| 40             | 0.53                  |
| 50             | 0.35                  |
| 60             | 0.25                  |
| 70             | 0.18                  |
| 80             | 0.14                  |
| 90             | 0.11                  |
| 100            | 0.09                  |
| 125            | 0.06                  |
| 150            | 0.04                  |

The correction factor in dB is to be added to meter readings of an interference analyzer or a spectrum analyzer.

**Cable loss**

Cable Coaxial, GORE A2P01POL118, 2.3 m, model:GORE-3, HL 0589  
+ Cable Coaxial, ANDREW PSWJ4, 6m, model: ANDREW-6, HL 1004

| No. | Frequency,<br>MHz | Cable loss,<br>dB | Tolerance<br>(Specification),<br>dB | Measurement<br>uncertainty,<br>dB |
|-----|-------------------|-------------------|-------------------------------------|-----------------------------------|
| 1   | 30                | 0.33              | 6.5                                 | ±0.12                             |
| 2   | 50                | 0.40              |                                     |                                   |
| 3   | 100               | 0.57              |                                     |                                   |
| 4   | 300               | 0.97              |                                     |                                   |
| 5   | 500               | 1.25              |                                     |                                   |
| 6   | 800               | 1.59              |                                     |                                   |
| 7   | 1000              | 1.81              |                                     |                                   |
| 8   | 1200              | 1.97              |                                     |                                   |
| 9   | 1400              | 2.15              |                                     |                                   |
| 10  | 1600              | 2.28              |                                     |                                   |
| 11  | 1800              | 2.43              |                                     |                                   |
| 12  | 2000              | 2.61              |                                     |                                   |
| 13  | 2200              | 2.75              |                                     |                                   |
| 14  | 2400              | 2.89              |                                     |                                   |
| 15  | 2600              | 2.97              |                                     |                                   |
| 16  | 2800              | 3.21              | 6.5                                 | ±0.12                             |
| 17  | 3000              | 3.32              |                                     |                                   |
| 18  | 3300              | 3.47              |                                     |                                   |
| 19  | 3600              | 3.62              |                                     |                                   |
| 20  | 3900              | 3.84              |                                     |                                   |
| 21  | 4200              | 3.92              |                                     | ±0.17                             |
| 22  | 4500              | 4.07              |                                     |                                   |
| 23  | 4800              | 4.36              |                                     |                                   |
| 24  | 5100              | 4.62              |                                     |                                   |
| 25  | 5400              | 4.78              |                                     |                                   |
| 26  | 5700              | 5.16              |                                     |                                   |
| 27  | 6000              | 5.67              |                                     |                                   |
| 28  | 6500              | 5.99              |                                     |                                   |



**Cable loss**  
**Cable coaxial, M17/164, model: C17164-10, s/n 161, HL 1003**

| No. | Frequency,<br>MHz | Cable loss,<br>dB | Tolerance,<br>dB | Measurement uncertainty,<br>dB |
|-----|-------------------|-------------------|------------------|--------------------------------|
| 1   | 30                | 0.41              | 12.5             | ±0.12                          |
| 2   | 50                | 0.52              |                  |                                |
| 3   | 100               | 0.75              |                  |                                |
| 4   | 300               | 1.45              |                  |                                |
| 5   | 500               | 2.01              |                  |                                |
| 6   | 800               | 2.71              |                  |                                |
| 7   | 1000              | 3.14              |                  |                                |
| 8   | 1200              | 3.56              |                  |                                |
| 9   | 1400              | 3.93              |                  |                                |
| 10  | 1600              | 4.31              |                  |                                |
| 11  | 1800              | 4.63              |                  |                                |
| 12  | 2000              | 4.97              |                  |                                |
| 13  | 2200              | 5.32              |                  |                                |
| 14  | 2400              | 5.65              |                  |                                |
| 15  | 2600              | 6.01              | 12.5             | ±0.12                          |
| 16  | 2800              | 6.42              |                  |                                |
| 17  | 3000              | 6.76              |                  |                                |
| 18  | 3300              | 7.12              |                  |                                |
| 19  | 3600              | 7.53              |                  |                                |
| 20  | 3900              | 7.95              |                  | ±0.17                          |
| 21  | 4200              | 8.32              |                  |                                |
| 22  | 4500              | 8.72              |                  |                                |
| 23  | 4800              | 9.14              |                  |                                |
| 24  | 5100              | 9.59              |                  |                                |
| 25  | 5400              | 10.00             |                  |                                |
| 26  | 5700              | 10.49             |                  |                                |
| 27  | 6000              | 11.07             |                  |                                |
| 28  | 6500              | 11.80             |                  |                                |



**Cable loss**  
**Cable coaxial, RG-214, 5m, model: C214-5, s/n 1365 (HL 1365)**

| No. | Set,<br>MHz | Measured,<br>dB | Deviation,<br>dB | Measured<br>uncertainty<br>dB |
|-----|-------------|-----------------|------------------|-------------------------------|
| 1   | 1000        | 0.41            | -                | ±0.12                         |
| 2   | 1200        | 0.44            | -                |                               |
| 3   | 1400        | 0.48            | -                |                               |
| 4   | 1600        | 0.52            | -                |                               |
| 5   | 1800        | 0.55            | -                |                               |
| 6   | 2000        | 0.58            | -                |                               |
| 7   | 2200        | 0.61            | -                |                               |
| 8   | 2400        | 0.64            | -                | ±0.17                         |
| 9   | 2600        | 0.67            | -                |                               |
| 10  | 2800        | 0.7             | -                |                               |
| 11  | 3000        | 0.73            | -                |                               |
| 12  | 3300        | 0.79            | -                |                               |
| 13  | 3600        | 0.84            | -                |                               |
| 14  | 3900        | 0.94            | -                |                               |
| 15  | 4200        | 1.22            | -                |                               |



**Cable loss**  
**Cable coaxial, 6 m, model: M17/167 MIL-C-17, HL 1503**

| <b>Frequency,<br/>MHz</b> | <b>Cable loss,<br/>dB</b> |
|---------------------------|---------------------------|
| 0.1                       | 0.02                      |
| 1                         | 0.07                      |
| 3                         | 0.15                      |
| 5                         | 0.17                      |
| 10                        | 0.26                      |
| 30                        | 0.43                      |
| 50                        | 0.57                      |
| 80                        | 0.72                      |
| 100                       | 0.81                      |
| 300                       | 1.48                      |
| 500                       | 2.00                      |
| 800                       | 2.70                      |
| 1000                      | 3.09                      |

**Cable loss****Cable 18 GHz, 4 m, blue, model: SPS-1803A-4000-NPS, S/N T4658, HL 1942**

| Frequency,<br>GHz | Cable loss,<br>dB |
|-------------------|-------------------|
| 0.03              | 0.21              |
| 0.05              | 0.26              |
| 0.10              | 0.36              |
| 0.20              | 0.50              |
| 0.30              | 0.61              |
| 0.40              | 0.70              |
| 0.50              | 0.78              |
| 0.60              | 0.85              |
| 0.70              | 0.93              |
| 0.80              | 0.99              |
| 0.90              | 1.04              |
| 1.00              | 1.10              |
| 1.10              | 1.16              |
| 1.20              | 1.22              |
| 1.30              | 1.26              |
| 1.40              | 1.31              |
| 1.50              | 1.35              |
| 1.60              | 1.41              |
| 1.70              | 1.45              |
| 1.80              | 1.49              |
| 1.90              | 1.53              |
| 2.00              | 1.57              |
| 2.10              | 1.61              |
| 2.20              | 1.65              |
| 2.30              | 1.69              |
| 2.40              | 1.72              |
| 2.50              | 1.76              |
| 2.60              | 1.79              |
| 2.70              | 1.83              |
| 2.80              | 1.87              |
| 2.90              | 1.90              |
| 3.10              | 1.97              |
| 3.30              | 2.04              |
| 3.50              | 2.11              |
| 3.70              | 2.18              |
| 3.90              | 2.24              |
| 4.10              | 2.31              |
| 4.30              | 2.38              |
| 4.50              | 2.43              |
| 4.70              | 2.53              |
| 4.90              | 2.53              |
| 5.10              | 2.63              |
| 5.30              | 2.65              |
| 5.50              | 2.72              |
| 5.70              | 2.76              |
| 5.90              | 2.79              |

| Frequency,<br>GHz | Cable loss,<br>dB |
|-------------------|-------------------|
| 6.10              | 2.88              |
| 6.30              | 2.90              |
| 6.50              | 2.97              |
| 6.70              | 3.02              |
| 6.90              | 3.04              |
| 7.10              | 3.07              |
| 7.30              | 3.12              |
| 7.50              | 3.13              |
| 7.70              | 3.19              |
| 7.90              | 3.24              |
| 8.10              | 3.30              |
| 8.30              | 3.36              |
| 8.50              | 3.45              |
| 8.70              | 3.41              |
| 8.90              | 3.45              |
| 9.10              | 3.42              |
| 9.30              | 3.55              |
| 9.50              | 3.48              |
| 9.70              | 3.58              |
| 9.90              | 3.61              |
| 10.10             | 3.66              |
| 10.30             | 3.68              |
| 10.50             | 3.70              |
| 10.70             | 3.70              |
| 10.90             | 3.75              |
| 11.10             | 3.78              |
| 11.30             | 3.86              |
| 11.50             | 3.98              |
| 11.70             | 4.10              |
| 11.90             | 4.12              |
| 12.10             | 4.09              |
| 12.40             | 4.13              |
| 13.00             | 4.23              |
| 13.50             | 4.35              |
| 14.00             | 4.40              |
| 14.50             | 4.44              |
| 15.00             | 4.57              |
| 15.50             | 4.66              |
| 16.00             | 4.64              |
| 16.50             | 4.66              |
| 17.00             | 4.75              |
| 17.50             | 4.85              |
| 18.00             | 4.93              |

**Cable loss****Cable 18 GHz, 6.5 m, blue, model: NPS-1803A-6500-NPS, S/N T4974, HL 1947**

| Frequency,<br>GHz | Cable loss,<br>dB |
|-------------------|-------------------|
| 0.03              | 0.30              |
| 0.05              | 0.38              |
| 0.10              | 0.53              |
| 0.20              | 0.74              |
| 0.30              | 0.91              |
| 0.40              | 1.05              |
| 0.50              | 1.18              |
| 0.60              | 1.29              |
| 0.70              | 1.40              |
| 0.80              | 1.50              |
| 0.90              | 1.59              |
| 1.00              | 1.68              |
| 1.10              | 1.77              |
| 1.20              | 1.86              |
| 1.30              | 1.94              |
| 1.40              | 2.01              |
| 1.50              | 2.08              |
| 1.60              | 2.16              |
| 1.70              | 2.22              |
| 1.80              | 2.29              |
| 1.90              | 2.36              |
| 2.00              | 2.42              |
| 2.10              | 2.48              |
| 2.20              | 2.54              |
| 2.30              | 2.60              |
| 2.40              | 2.66              |
| 2.50              | 2.71              |
| 2.60              | 2.77              |
| 2.70              | 2.83              |
| 2.80              | 2.89              |
| 2.90              | 2.95              |
| 3.10              | 3.06              |
| 3.30              | 3.17              |
| 3.50              | 3.28              |
| 3.70              | 3.39              |
| 3.90              | 3.51              |
| 4.10              | 3.62              |
| 4.30              | 3.76              |
| 4.50              | 3.87              |
| 4.70              | 4.01              |
| 4.90              | 4.10              |
| 5.10              | 4.21              |
| 5.30              | 4.31              |
| 5.50              | 4.43              |
| 5.70              | 4.56              |
| 5.90              | 4.71              |

| Frequency,<br>GHz | Cable loss,<br>dB |
|-------------------|-------------------|
| 6.10              | 4.87              |
| 6.30              | 4.95              |
| 6.50              | 4.94              |
| 6.70              | 4.88              |
| 6.90              | 4.87              |
| 7.10              | 4.83              |
| 7.30              | 4.85              |
| 7.50              | 4.86              |
| 7.70              | 4.91              |
| 7.90              | 4.96              |
| 8.10              | 5.03              |
| 8.30              | 5.08              |
| 8.50              | 5.13              |
| 8.70              | 5.21              |
| 8.90              | 5.22              |
| 9.10              | 5.34              |
| 9.30              | 5.35              |
| 9.50              | 5.52              |
| 9.70              | 5.51              |
| 9.90              | 5.66              |
| 10.10             | 5.70              |
| 10.30             | 5.78              |
| 10.50             | 5.79              |
| 10.70             | 5.82              |
| 10.90             | 5.86              |
| 11.10             | 5.94              |
| 11.30             | 6.06              |
| 11.50             | 6.21              |
| 11.70             | 6.44              |
| 11.90             | 6.61              |
| 12.10             | 6.76              |
| 12.40             | 6.68              |
| 13.00             | 6.66              |
| 13.50             | 6.81              |
| 14.00             | 6.90              |
| 14.50             | 6.90              |
| 15.00             | 6.97              |
| 15.50             | 7.17              |
| 16.00             | 7.28              |
| 16.50             | 7.27              |
| 17.00             | 7.38              |
| 17.50             | 7.68              |
| 18.00             | 7.92              |



**Cable loss**  
**RF cable 8 m, model RG-214, HL 2009**

| No. | Frequency,<br>MHz | Cable loss,<br>dB | Tolerance (Specification),<br>dB | Measurement uncertainty,<br>dB |
|-----|-------------------|-------------------|----------------------------------|--------------------------------|
| 1   | 1                 | 0.10              | NA                               | ±0.12                          |
| 2   | 10                | 0.14              |                                  |                                |
| 3   | 30                | 0.25              |                                  |                                |
| 4   | 50                | 0.34              |                                  |                                |
| 5   | 100               | 0.53              |                                  |                                |
| 6   | 300               | 0.99              |                                  |                                |
| 7   | 500               | 1.31              |                                  |                                |
| 8   | 800               | 1.73              |                                  |                                |
| 9   | 1000              | 1.98              |                                  |                                |
| 10  | 1100              | 2.11              |                                  |                                |
| 11  | 1200              | 2.21              |                                  |                                |
| 12  | 1300              | 2.35              |                                  |                                |
| 13  | 1400              | 2.46              |                                  |                                |
| 14  | 1500              | 2.55              |                                  |                                |
| 15  | 1600              | 2.68              |                                  |                                |
| 16  | 1700              | 2.78              |                                  |                                |
| 17  | 1800              | 2.88              |                                  |                                |
| 18  | 1900              | 2.98              |                                  |                                |
| 19  | 2000              | 3.09              |                                  |                                |



**Cable loss**  
**Cable 40 GHz, 0.8 m, blue, model: KPS-1503A-800-KPS, serial number W4907 (HL 2254)**

| Frequency,<br>GHz | Cable loss,<br>dB | Frequency,<br>GHz | Cable loss,<br>dB | Frequency,<br>GHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 0.03              | 0.04              | 5.10              | 0.80              | 15.00             | 1.49              |
| 0.05              | 0.07              | 5.30              | 0.83              | 15.50             | 1.49              |
| 0.10              | 0.09              | 5.50              | 0.83              | 16.00             | 1.46              |
| 0.20              | 0.15              | 5.70              | 0.84              | 16.50             | 1.47              |
| 0.30              | 0.19              | 5.90              | 0.87              | 17.00             | 1.50              |
| 0.40              | 0.25              | 6.10              | 0.86              | 17.50             | 1.57              |
| 0.50              | 0.29              | 6.30              | 0.89              | 18.00             | 1.63              |
| 0.60              | 0.33              | 6.50              | 0.90              | 18.50             | 1.57              |
| 0.70              | 0.37              | 6.70              | 0.89              | 19.00             | 1.63              |
| 0.80              | 0.41              | 6.90              | 0.93              | 19.50             | 1.65              |
| 0.90              | 0.44              | 7.10              | 0.92              | 20.00             | 1.64              |
| 1.00              | 0.45              | 7.30              | 0.95              | 20.50             | 1.75              |
| 1.10              | 0.48              | 7.50              | 0.96              | 21.00             | 1.72              |
| 1.20              | 0.51              | 7.70              | 0.97              | 21.50             | 1.78              |
| 1.30              | 0.53              | 7.90              | 1.01              | 22.00             | 1.76              |
| 1.40              | 0.54              | 8.10              | 1.00              | 22.50             | 1.72              |
| 1.50              | 0.57              | 8.30              | 1.05              | 23.00             | 1.83              |
| 1.60              | 0.59              | 8.50              | 1.04              | 23.50             | 1.80              |
| 1.70              | 0.04              | 8.70              | 1.07              | 24.00             | 1.90              |
| 1.80              | 0.07              | 8.90              | 1.11              | 24.50             | 1.81              |
| 1.90              | 0.09              | 9.10              | 1.09              | 25.00             | 1.98              |
| 2.00              | 0.15              | 9.30              | 1.14              | 25.50             | 1.91              |
| 2.10              | 0.19              | 9.50              | 1.12              | 26.00             | 2.02              |
| 2.20              | 0.25              | 9.70              | 1.15              | 26.50             | 1.92              |
| 2.30              | 0.29              | 9.90              | 1.16              | 27.00             | 1.97              |
| 2.40              | 0.33              | 10.10             | 1.16              | 28.00             | 2.02              |
| 2.50              | 0.37              | 10.30             | 1.19              | 29.00             | 1.95              |
| 2.60              | 0.41              | 10.50             | 1.14              | 30.00             | 1.94              |
| 2.70              | 0.44              | 10.70             | 1.19              | 31.00             | 2.11              |
| 2.80              | 0.45              | 10.90             | 1.17              | 32.00             | 2.17              |
| 2.90              | 0.48              | 11.10             | 1.13              | 33.00             | 2.27              |
| 3.10              | 0.61              | 11.30             | 1.20              | 34.00             | 2.27              |
| 3.30              | 0.64              | 11.50             | 1.13              | 35.00             | 2.29              |
| 3.50              | 0.65              | 11.70             | 1.20              | 36.00             | 2.35              |
| 3.70              | 0.68              | 11.90             | 1.18              | 37.00             | 2.37              |
| 3.90              | 0.69              | 12.10             | 1.14              | 38.00             | 2.40              |
| 4.10              | 0.71              | 12.40             | 1.19              | 39.00             | 2.57              |
| 4.30              | 0.73              | 13.00             | 1.34              | 40.00             | 2.36              |
| 4.50              | 0.75              | 13.50             | 1.33              |                   |                   |
| 4.70              | 0.77              | 14.00             | 1.48              |                   |                   |
| 4.90              | 0.79              | 14.50             | 1.45              |                   |                   |



**Cable loss**  
**Cable coaxial, 40GHz, 1.5 m, Blue, Rhopase Microwave Limited, model: KPS-1503A-1500-KPS,**  
**HL 2399**

| Frequency,<br>GHz | Cable loss,<br>dB | Frequency,<br>GHz | Cable loss,<br>dB | Frequency,<br>GHz | Cable loss,<br>dB |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 0.03              | 0.07              | 6.5               | 1.57              | 15.50             | 2.50              |
| 0.05              | 0.10              | 6.7               | 1.60              | 16.00             | 2.51              |
| 0.1               | 0.16              | 6.9               | 1.55              | 16.50             | 2.58              |
| 0.2               | 0.26              | 7.1               | 1.65              | 17.00             | 2.65              |
| 0.3               | 0.33              | 7.3               | 1.65              | 17.50             | 2.73              |
| 0.5               | 0.38              | 7.5               | 1.70              | 18.00             | 2.74              |
| 0.7               | 0.41              | 7.7               | 1.71              | 18.50             | 2.67              |
| 0.9               | 0.58              | 7.9               | 1.73              | 19.00             | 2.67              |
| 1.1               | 0.64              | 8.1               | 1.79              | 19.50             | 2.74              |
| 1.3               | 0.70              | 8.3               | 1.81              | 20.00             | 2.69              |
| 1.5               | 0.75              | 8.5               | 1.84              | 20.50             | 2.80              |
| 1.7               | 0.79              | 8.7               | 1.85              | 21.00             | 2.82              |
| 1.9               | 0.83              | 8.9               | 1.90              | 21.50             | 2.87              |
| 2.1               | 0.88              | 9.1               | 1.95              | 22.00             | 2.87              |
| 2.3               | 0.93              | 9.3               | 1.93              | 22.50             | 2.92              |
| 2.5               | 0.97              | 9.5               | 1.98              | 23.50             | 3.04              |
| 2.7               | 1.01              | 9.7               | 1.96              | 24.00             | 3.05              |
| 2.9               | 1.04              | 9.9               | 2.03              | 24.50             | 3.03              |
| 3.1               | 1.08              | 10.1              | 1.99              | 25.00             | 3.11              |
| 3.3               | 1.14              | 10.30             | 2.02              | 25.50             | 3.10              |
| 3.5               | 1.17              | 10.50             | 2.02              | 26.00             | 3.17              |
| 3.7               | 1.21              | 10.70             | 2.02              | 26.50             | 3.11              |
| 3.9               | 1.24              | 10.90             | 2.08              | 27.00             | 3.16              |
| 4.1               | 1.26              | 11.10             | 2.02              | 28.00             | 3.19              |
| 4.3               | 1.26              | 11.30             | 2.09              | 29.00             | 3.19              |
| 4.5               | 1.29              | 11.50             | 2.05              | 30.00             | 3.30              |
| 4.7               | 1.34              | 11.70             | 2.11              | 31.00             | 3.31              |
| 4.9               | 1.34              | 11.90             | 2.11              | 32.00             | 3.35              |
| 5.1               | 1.40              | 12.10             | 2.12              | 33.00             | 3.46              |
| 5.3               | 1.43              | 12.40             | 2.17              | 34.00             | 3.45              |
| 5.5               | 1.45              | 13.00             | 2.29              | 35.00             | 3.49              |
| 5.7               | 1.47              | 13.50             | 2.31              | 36.00             | 3.54              |
| 5.9               | 1.40              | 14.00             | 2.43              | 37.00             | 3.62              |
| 6.1               | 1.53              | 14.50             | 2.43              | 39.00             | 3.69              |
| 6.3               | 1.55              | 15.00             | 2.46              | 40.00             | 3.75              |



## Appendix D General information

### Test facility description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility. Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47) and by Industry Canada for electromagnetic emissions (file numbers IC 2186-1 for OATS and IC 2186-2 for anechoic chamber), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, C-845 for conducted emissions site), assessed by TNO Certification EP&S (Netherlands) for a number of EMC, telecommunications, environmental, safety standards, and by AMTAC (UK) for safety of medical devices. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01).

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### Abbreviations and acronyms

The following abbreviations and acronyms are applicable to this test report:

|                |                                             |
|----------------|---------------------------------------------|
| AC             | alternating current                         |
| cm             | centimeter                                  |
| dB             | decibel                                     |
| dBm            | decibel referred to one milliwatt           |
| dB( $\mu$ V)   | decibel referred to one microvolt           |
| dB( $\mu$ V/m) | decibel referred to one microvolt per meter |
| DSS            | Part 15 spread spectrum transmitter         |
| EMC            | electromagnetic compatibility               |
| EUT            | equipment under test                        |
| GHz            | gigahertz                                   |
| H              | height                                      |
| Hz             | hertz                                       |
| kHz            | kilohertz                                   |
| kV             | kilovolt                                    |
| L              | length                                      |
| LISN           | line impedance stabilization network        |
| m              | meter                                       |
| MHz            | megahertz                                   |
| NA             | not applicable                              |
| QP             | quasi-peak                                  |
| RF             | radio frequency                             |
| RE             | radiated emission                           |
| rms            | root mean square                            |
| s              | second                                      |
| V              | volt                                        |
| W              | width                                       |

### Specification references

|                     |                                                                                                                                                                      |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 47CFR part 15: 2003 | Radio Frequency Devices                                                                                                                                              |
| ANSI C63.2: 1996    | American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.                                            |
| ANSI C63.4: 2001    | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. |