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| A   |   |             |                   | 12.06.2012 | M. Reuben | S. Cohen |

**EMC Laboratory**

# **WipAir X000-4.9 GHz Part 1**

**Manufactured by  
WaveIP LTD.**

**FCC ID: QQ2-WA6049**

## **EMC Test Report**

**According to FCC CFR 47 Part 90 subpart Y  
and  
RSS-111 Issue 3**

|                     | Fonction/Title   | Name        | Signature                                                                             | Date       |
|---------------------|------------------|-------------|---------------------------------------------------------------------------------------|------------|
| <b>Prepared by:</b> | Technical Writer | M. Reuben   |  | 12.02 2012 |
| <b>Checked by:</b>  | Test Engineer    | I. Arbitman |  | 20.03.2012 |
| <b>Approved By:</b> | EMC Lab. Manager | S. Cohen    |  | 23.04 2012 |

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## 1. ADMINISTRATIVE DATA

### 1.1. Scope

This document describes the measurement procedures and tests for Radiated and conducted emission testing of the WipAir-X000 4.9 GHz manufactured by WaveIP Ltd.

## 2. GENERAL INFORMATION

### 2.1. Description of equipment Under Test

|                              |                      |
|------------------------------|----------------------|
| Equipment Under Test         | WipAir X 000-4.9 GHz |
| FCCID                        | QQ2-WA6049           |
| Manufacturer                 | WaveIP Ltd.          |
| Serial Numbers               | 0050C2AC7CAC         |
| Mode of Operation            | Tranceiver MODE      |
| Receiver operating frequency | 4949 MHz – 4990 MHz  |
| Year of Manufacture          | 2012                 |

### 2.2. Applicant Information:

|                             |                                                |
|-----------------------------|------------------------------------------------|
| Applicant                   | WaveIP Ltd                                     |
| Applicant Address           | Teradion Industrial park, Misgav 20179, Israel |
| Telephone                   | +972-4-9027000                                 |
| FAX                         | +972-4-9990324                                 |
| The testing was observed by | AMIT ARAZI                                     |

### 2.3. Test Performance:

|                              |                                                                                                                                    |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Dates of testing             | February 2012                                                                                                                      |
| Test Laboratory Location     | Elbit Systems Land and C <sup>4</sup> I Ltd., EMC LAB,<br>Hashoftim 26 Holon 58102 ISRAEL<br>Tel: 972-3-5574476 Fax: 972-3-5575320 |
| Applicable EMC Specification | Federal Communication Commission (FCC), FCC<br>CFR Part 90 subpart Y and RSS-111 Issue 3                                           |

### 3. TEST SUMMARY AND SIGNATURES.

Elbit Systems Land and C<sup>4</sup>I Ltd., EMC Laboratory has completed testing of E.U.T in accordance with the requirements of the FCC sections 90.205, 90.1215, RSS-111 section 5.3.

The E.U.T was found to comply with the requirements of the FCC Part 15 Regulations given below

| Test | Test Description                                     | Section                                                    | Pass/Fail |
|------|------------------------------------------------------|------------------------------------------------------------|-----------|
| 1    | Occupied bandwidth                                   | FCC sections 90.209, RSS-Gen section 4.6.1                 | Pass      |
| 2    | Maximum output power and Peak power spectral density | FCC sections 90.205, 90.1215, RSS-111 section 5.3, Part 15 | Pass      |
| 3    | Emission mask                                        | FCC sections 90.210(m), RSS-111 section 5.4                | Pass      |
| 4    | Conducted spurious emissions                         | FCC sections 90.210, RSS-111 section 5.4                   | Pass      |
| 5    | Receiver spurious emissions                          | RSS-111 section 5.5                                        | Pass      |
| 6    | Radiated spurious emissions                          | FCC sections 90.210, RSS-111 section 5.4                   | Pass      |

#### 3.1. Test performed by:

I. Arbitman



#### 3.2. Test Report prepared by:

M. Reuben



#### 3.3. Test Report Approved by:

Mr. Samuel Cohen EMC Lab. Manager



#### 4. E.U.T INFORMATION

##### 4.1. E.U.T description

WipAir X 000-4.9 GHz is WaveIP's wireless point-to-point and point to multi point broadband wireless communication system. The system uses dual or single radio channels, (defined by software) in the 5GHz bands, utilizing 5, 10, 20 MHz channels, OFDM modulation, and TDD Spectrum Management.

The total conducted output power is up to 1Watt (sum of both channels), with dynamic range of ~ 45 dB.

WipAir-3000 uses single RF channel (SISO)

WipAir-6000 uses two RF ports (MIMO), hence WipAir-6000 was tested.

##### EUT Technical characteristics

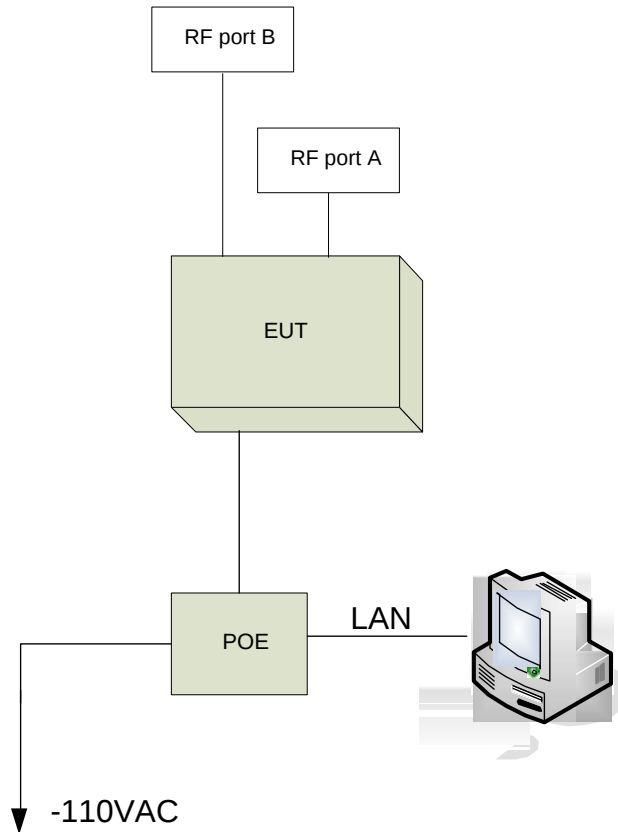
| Transmitter characteristics |                          | Notes                    |
|-----------------------------|--------------------------|--------------------------|
| Assigned frequency          | 4940-4990MHZ             |                          |
| Operating Frequency range   | 4942.5-4987.5MHZ         | 5MHz Channel             |
|                             | 4945-4985MHZ             | 10MHz Channel            |
|                             | 4950-4980MHZ             | 20MHz Channel            |
| Antenna Ports               | TNC                      | For detached option only |
| Modulations type            | QPSK, 4QAM, 16QAM, 64QAM |                          |
| Multiplexing type           | OFDM                     |                          |
| Modulating Test Signal      | PRBS                     |                          |

##### Antenna type

| Antenna Type | Model          | Gain 4.9 GHz (dBi) | Beam Width | Dimension  |
|--------------|----------------|--------------------|------------|------------|
| Flat panel   | DP-5X-230D-010 | 22                 | 10° x 10°  | 305*305*15 |
| Dish         | DP-5X-285D-005 | 27                 | 5° X 5°    | 2ft        |

#### 4.2. E.U.T Test Configuration

E.UT. test configuration is shown in figure below:



#### 4.3. E.U.T Mode of Operation description

4940 MHz – 4990 MHz TRANCEIVER

## 5. OCCUPIED BANDWIDTH

|                      |                                            |
|----------------------|--------------------------------------------|
| Equipment Under Test | WipAir X 000-4.9 GHz                       |
| Test Method          | FCC sections 90.209, RSS-Gen section 4.6.1 |
| Date                 | 12.02.2012                                 |
| Relative Humidity    | 40%                                        |
| Ambient Temperature  | 25° C                                      |
| Air Pressure         | 1010 hPa                                   |
| Test Setup           | Figure 1                                   |

Testing Engineer: I. Arbitman 

Date 08.11.2011

### 5.1. Test Results Summary & Conclusions

The E.U.T was found in compliance with Bandwidth of the emission fundamental frequency requirement.

### 5.2. Limits of bandwidth

The test unit shall meet the limits of Table 1

*Table 1: Bandwidth Limits*

| Assigned Frequency (MHz) | Channel Bandwidth (MHz) | Maximum Allowed Bandwidth (MHz) |
|--------------------------|-------------------------|---------------------------------|
| 4940-4990                | 5                       | 5                               |
|                          | 10                      | 10                              |
|                          | 20                      | 20                              |

### 5.3. Test Instrumentation and Equipment

*Table 2: Test Instrumentation and Equipment*

| Item              | Model  | Manufacturer | Next Date Calibration |
|-------------------|--------|--------------|-----------------------|
| Spectrum Analyzer | E7405A | Agilent      | 11.05.2012            |

### 5.4. Test Procedure

**As per 47 CFR, Section 2.1049**

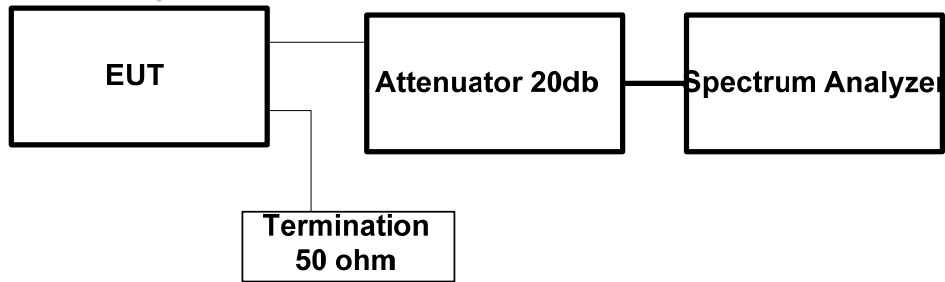
The EUT was set up as shown in Figure 1. The EUT was started and sufficient time for stabilization was allowed.

The total output power integrated over the emission bandwidth of carrier was taken as the reference level.

The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on the modulation envelope and are shown in the Tables Nos. 3, 4 & 5

5.5.

**Test Setup**



*Figure 1: Occupied Bandwidth Test Setup*

5.6.

**Results for Port A**

*Table 3: 5 MHz Bandwidth Test Result*

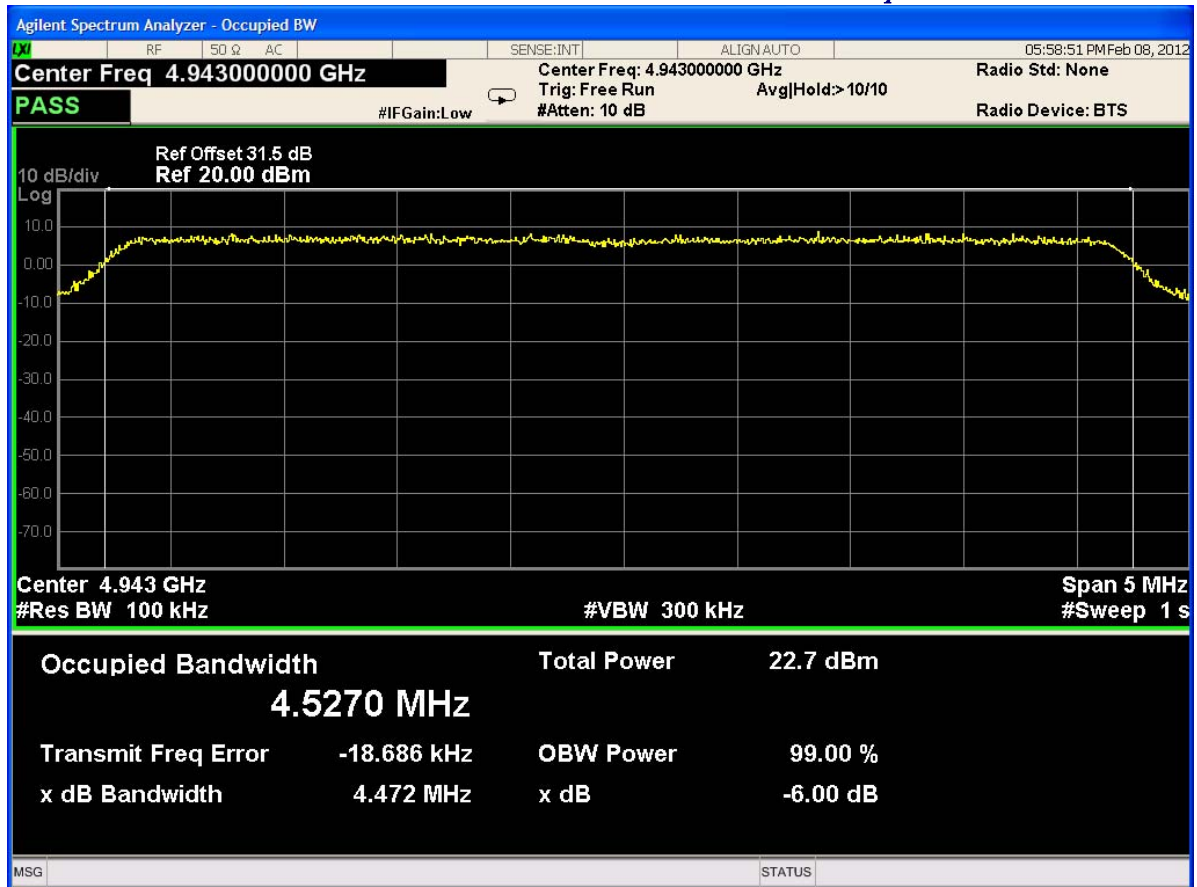
| Frequency (MHz) | Bandwidth (MHz) | Limits (MHz) | Margin (MHz) | Plot No | PASS/FAIL |
|-----------------|-----------------|--------------|--------------|---------|-----------|
| Low - 4943      | 4.5270          | 5            | -0.4730      | 1       | Pass      |
| Middle – 4963   | 4.5273          | 5            | -0.4727      | 2       | Pass      |
| High - 4987     | 4.5338          | 5            | -0.4662      | 3       | Pass      |

*Table 4: 10 MHz Bandwidth Test Result*

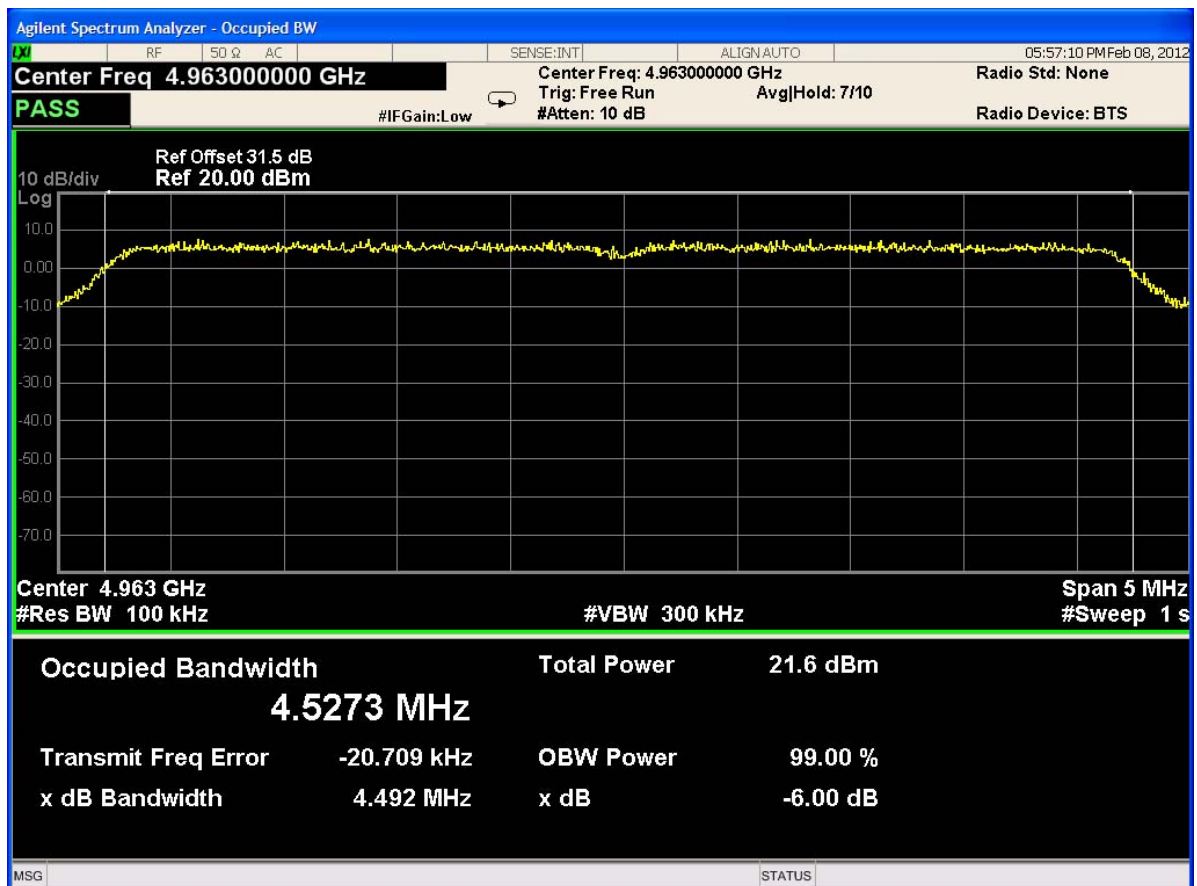
| Frequency (MHz) | Bandwidth (MHz) | Limits (MHz) | Margin (MHz) | Plot No | PASS/FAIL |
|-----------------|-----------------|--------------|--------------|---------|-----------|
| Low - 4945      | 8.9004          | 10           | -1.0996      | 4       | Pass      |
| Middle – 4963   | 8.8974          | 10           | -1.1026      | 5       | Pass      |
| High - 4985     | 8.8974          | 10           | -1.1026      | 6       | Pass      |

*Table 5: 20 MHz Bandwidth Test Result*

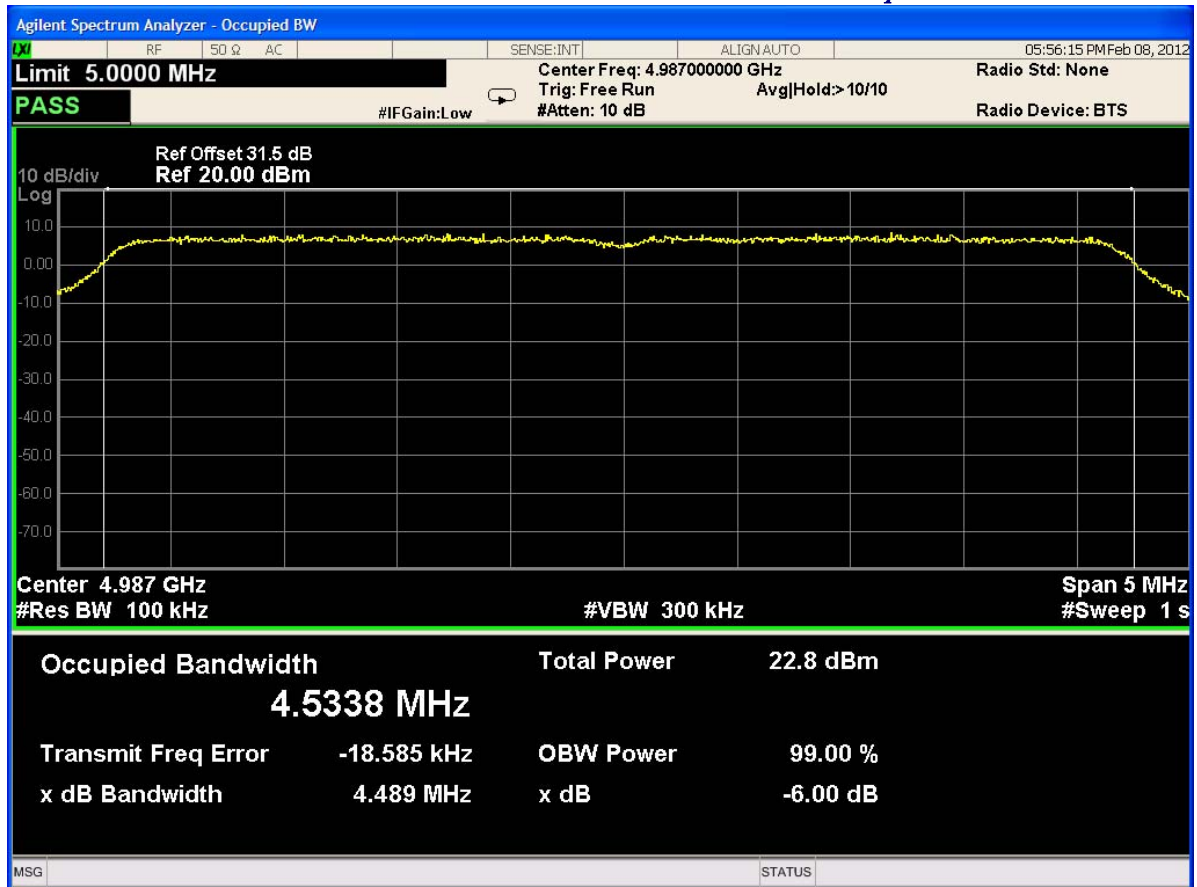
| Frequency (MHz) | Bandwidth (MHz) | Limits (MHz) | Margin (MHz) | Plot No | PASS/FAIL |
|-----------------|-----------------|--------------|--------------|---------|-----------|
| Low - 4950      | 17.680          | 20           | -2.3200      | 7       | Pass      |
| Middle – 4963   | 17.682          | 20           | -2.3180      | 8       | Pass      |
| High - 4980     | 17.681          | 20           | -2.3190      | 9       | Pass      |



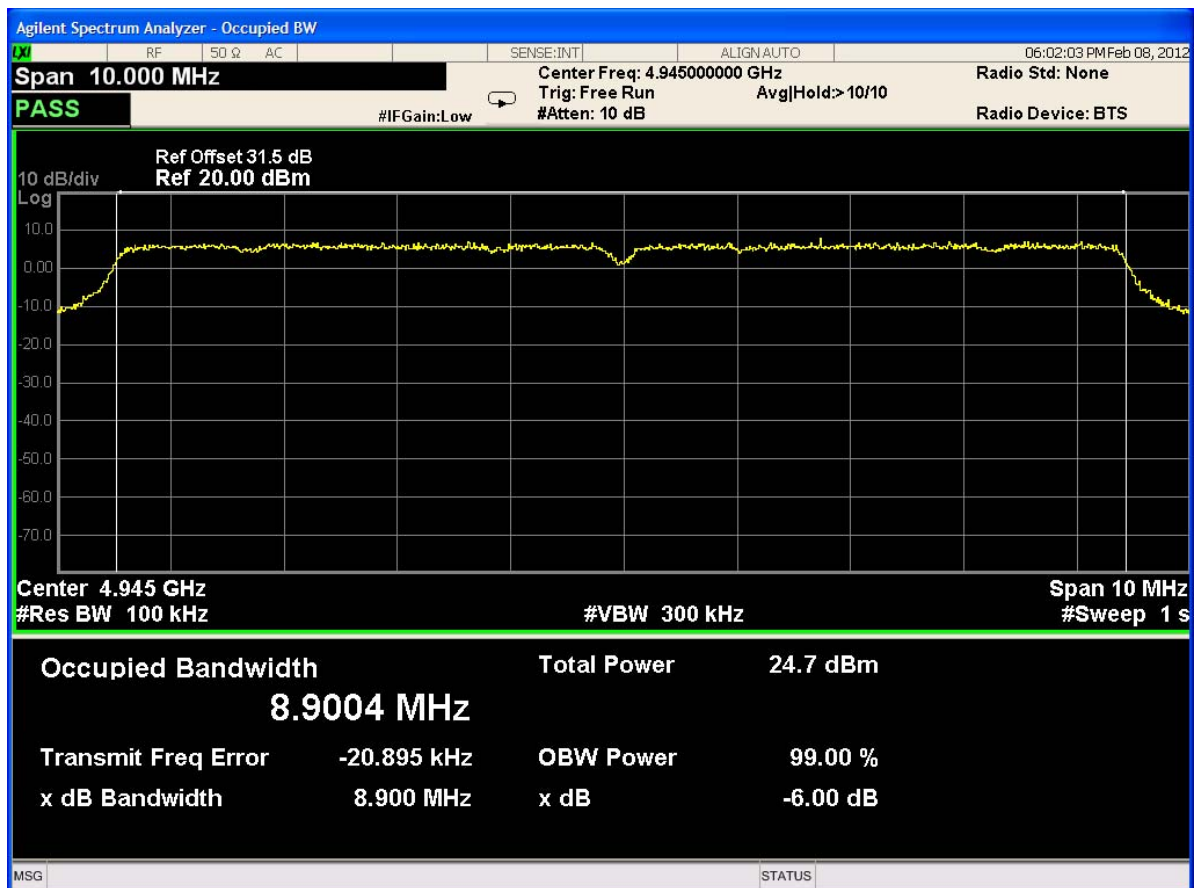
Plot Occupied BW 6dB/ 1



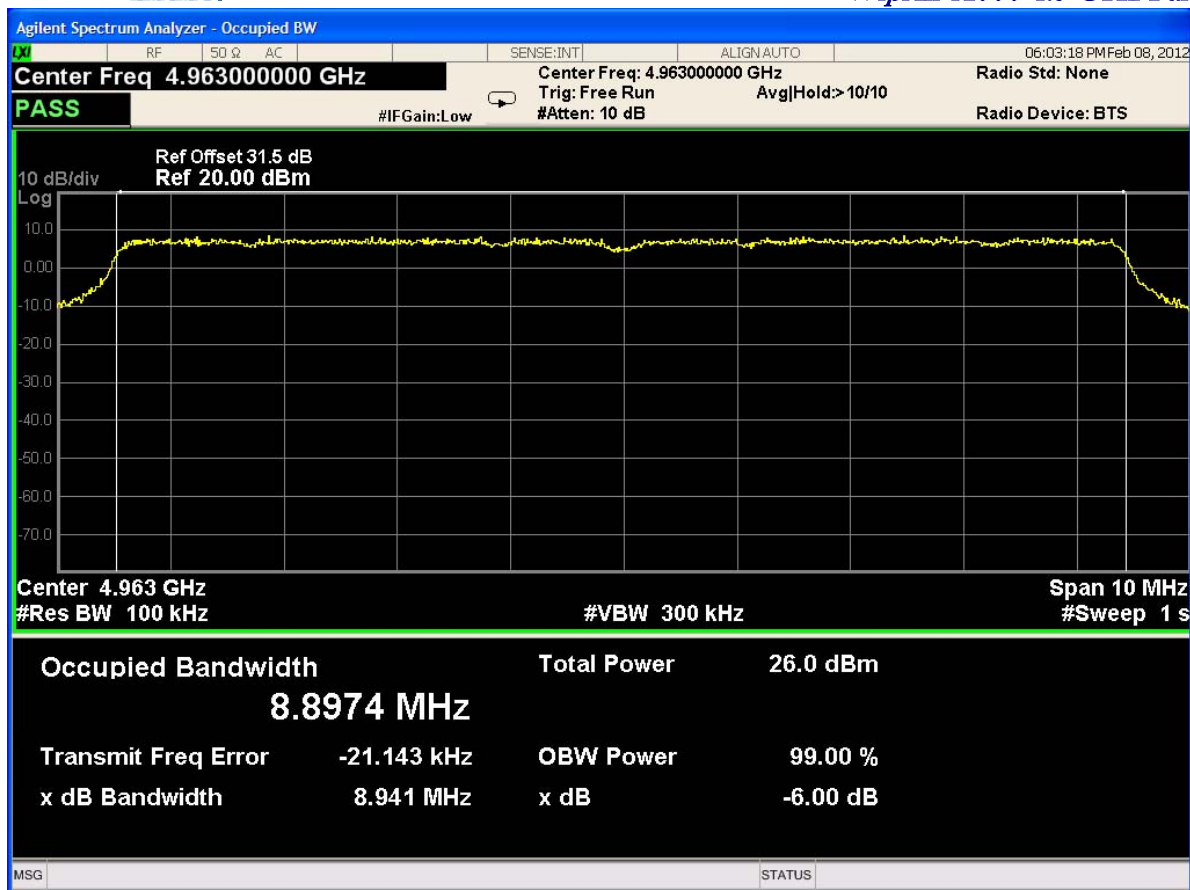
Plot Occupied BW 6dB/ 2



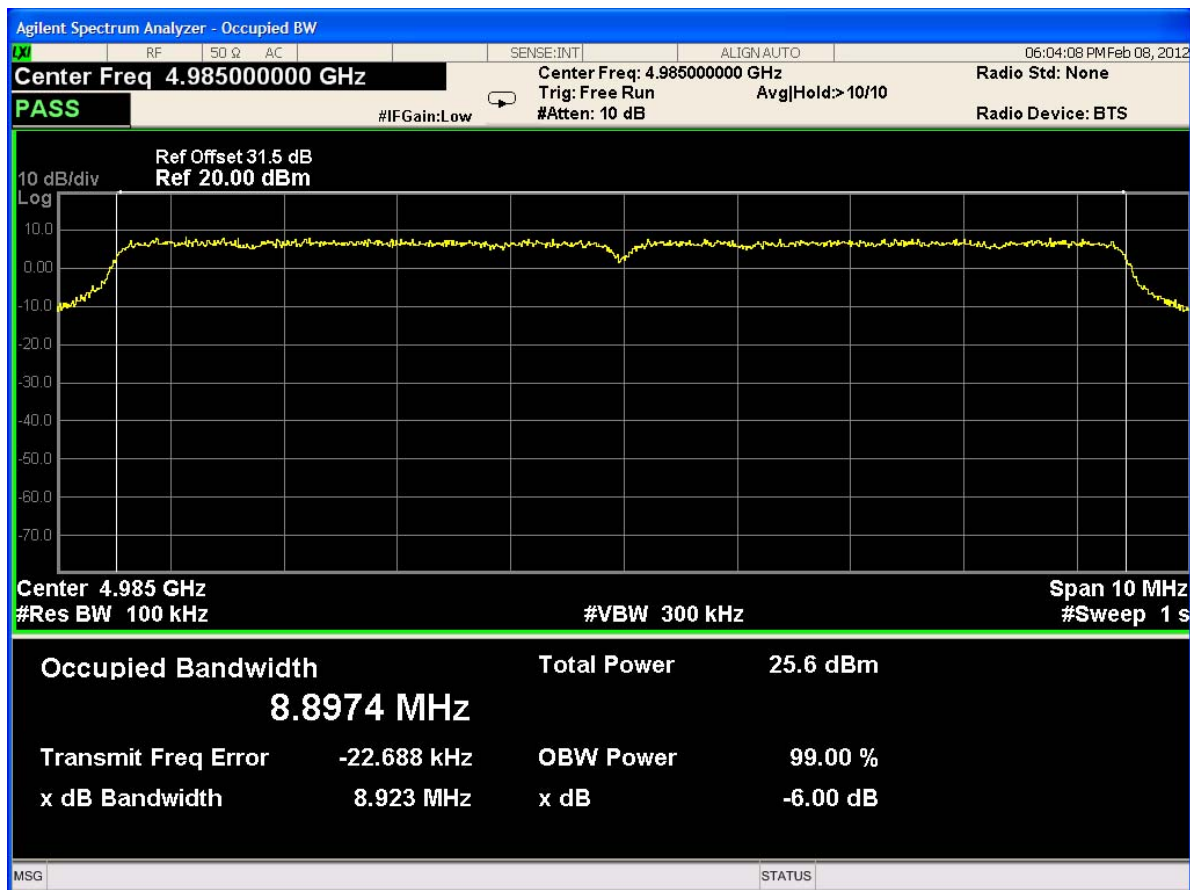
Plot Occupied BW 6dB/ 3



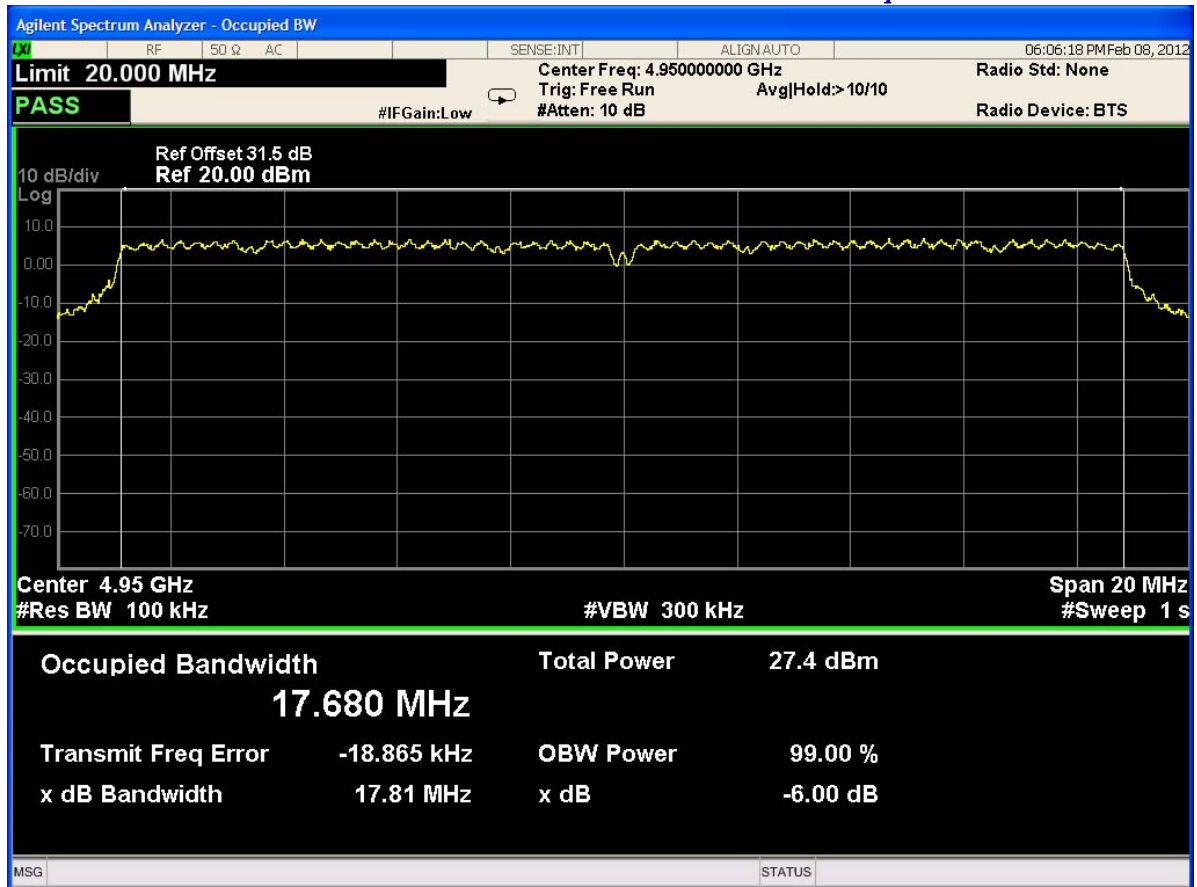
Plot Occupied BW 6dB/ 4



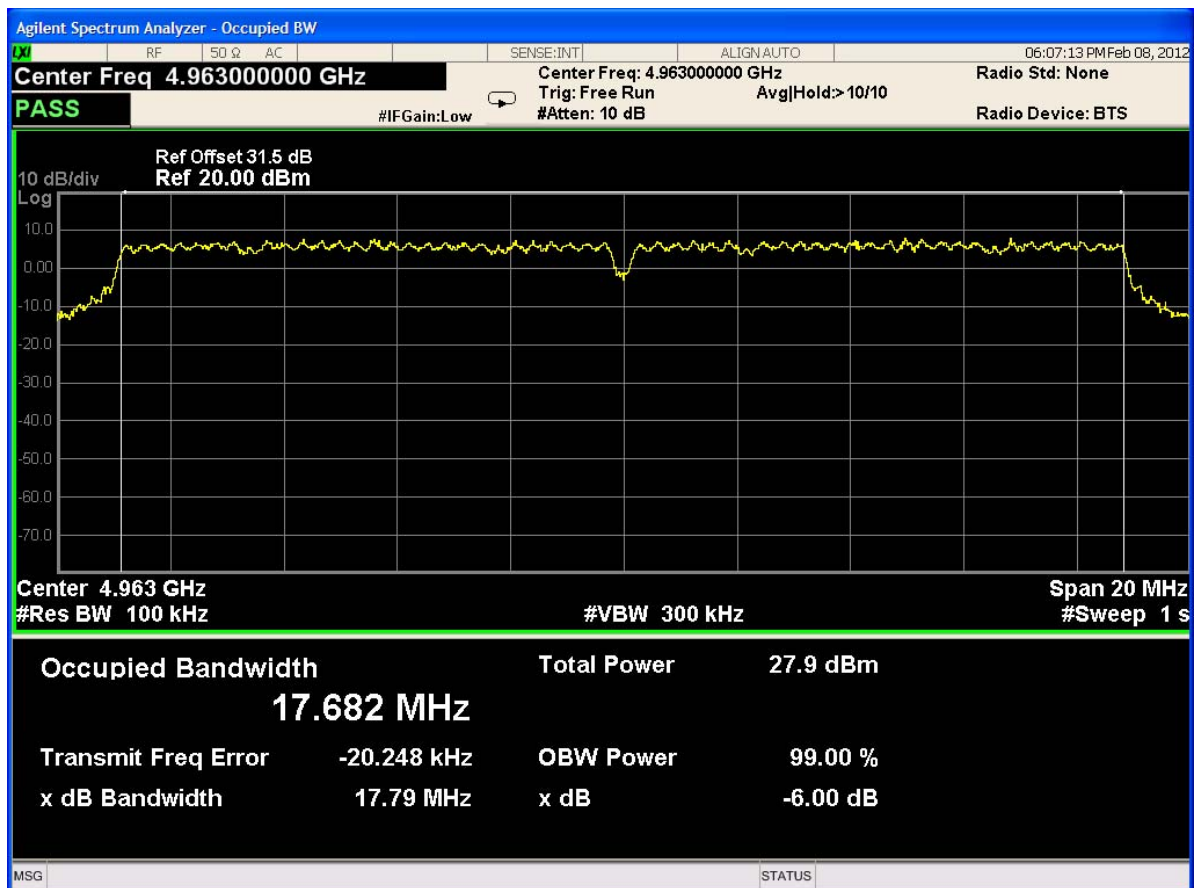
Plot Occupied BW 6dB/ 5



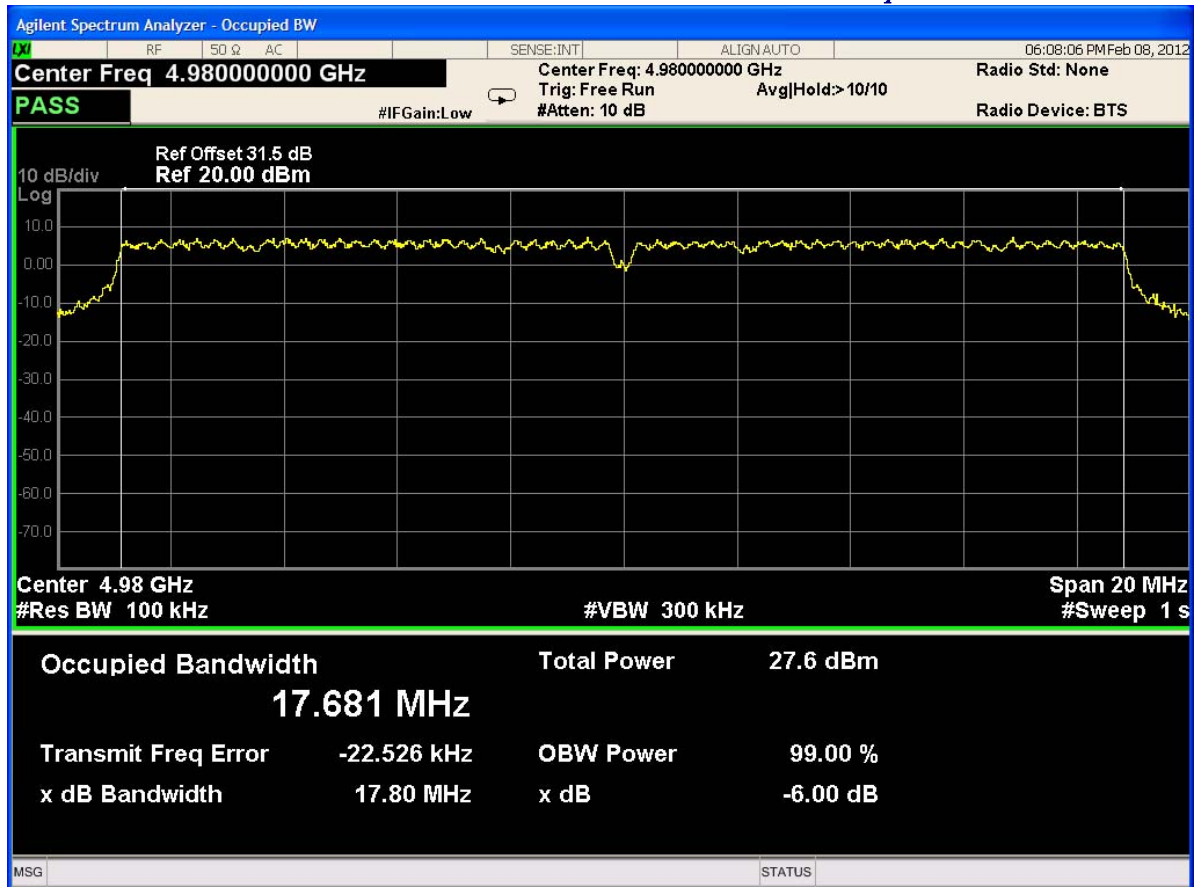
Plot Occupied BW 6dB/ 6



Plot Occupied BW 6dB/ 7



Plot Occupied BW 6dB/ 8



Plot Occupied BW 6dB/ 9

## 6. PEAK OUTPUT POWER AND POWER SPECTRAL DENSITY

|                      |                                           |
|----------------------|-------------------------------------------|
| Equipment Under Test | WipAir X 000-4.9 GHz                      |
| Test Method          | FCC sections 90.1215, RSS-111 section 5.3 |
| Date                 | 08.02.2012                                |
| Relative Humidity    | 40%                                       |
| Ambient Temperature  | 25 <sup>0</sup> C                         |
| Air Pressure         | 1010 hPa                                  |
| Test Setup           | Figure 2                                  |

Testing Engineer: I. Arbitman



Date 08.02.2012

### 6.1. Test Results Summary & Conclusions

The E.U.T was found in compliance with Peak Output Power requirements

### 6.2. Limits of Peak Output Power according to 90.1215

The tests shall meet the limits of Table 6.

**Table 6: Limits for Peak Output Power and Spectral Density**

| Assigned Frequency (MHz) | Channel Bandwidth (MHz) | Maximum Peak Output Power |      | Power Spectral Density dBm/MHz |
|--------------------------|-------------------------|---------------------------|------|--------------------------------|
|                          |                         | mW                        | dBm  |                                |
| 4940 - 4990              | 5                       | 500                       | 27.0 | 21                             |
|                          | 10                      | 1000                      | 30.0 |                                |
|                          | 20                      | 2000                      | 33.0 |                                |

\*: If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the .stated value as follows:

- By the amount in dB that the directional gain of antenna exceeds 9 dBi.
- Without any corresponding reduction for high power devices fixed-point-to-point and point-to-multipoint transmitters employing antennas with directional gain up to 26 dBi
- Corresponding reduction in the peak output power and peak power spectral density limit should be the amount in dB that the directional gain of antenna exceeds 26 dBi for high power devices.

### 6.3. Test Instrumentation and Equipment

**Table 7: Test Instrumentation and Equipment**

| Item              | Model     | Manufacturer | Next Date Calibration |
|-------------------|-----------|--------------|-----------------------|
| Spectrum Analyzer | MXA-N9020 | Agilent      | 04.04.2013            |
| 30db attenuator   | 769-30    | Narda        | 15.11.2013            |

### 6.4. Test Procedure

As per 47 CFR, Section 2.1046 TIA/EIA-603-C, Section 2.2.1

The test setup is shown in Figure 2

The EUT was set to transmit at 100% duty cycle, at highest transmitting power and sufficient time for stabilization was allowed.

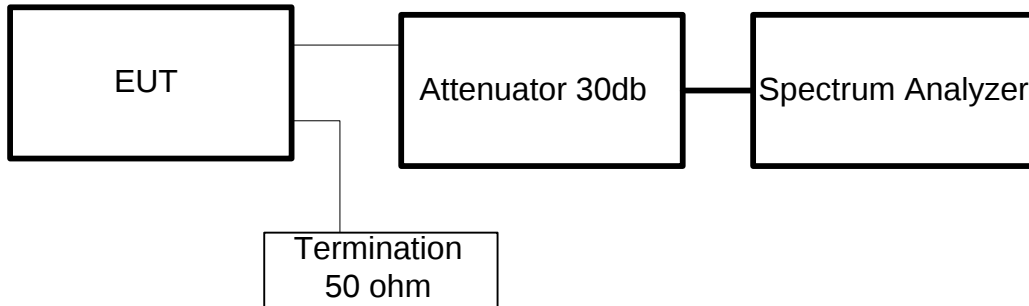
Power measurements were performed for top, middle and bottom frequencies, for each channel, BW 5, 10, and 20 MHz

The EUT was connected to the spectrum analyzer through an appropriate attenuator and accounted for cable loss in the settings.

**Note: The 30dB attenuator has been considered in the measurements results.**

Total output power was calculated as a sum of 'Peak output power Channel A + Peak output power Channel B'.

#### 6.5. Test Setup



*Figure 2: Field strength of fundamental test setup*

#### 6.6. Output Power Test Results for Port A

*Table 8: 5 MHz BW Test Results*

| Frequency (MHz) | Measured Peak Output Power (dBm) | Margin (dBm) | Limit (dBm) | Plot Reference | Pass/Fail |
|-----------------|----------------------------------|--------------|-------------|----------------|-----------|
| 4943            | 22.47                            | -4.53        | 27          | 1              | Pass      |
| 4963            | 22.52                            | -4.48        | 27          | 2              | Pass      |
| 4987            | 22.61                            | -4.39        | 27          | 3              | Pass      |

*Table 9: 10 MHz BW Test Results*

| Frequency (MHz) | Measured Peak Output Power (dBm) | Margin (dBm) | Limit (dBm) | Plot Reference | Pass/Fail |
|-----------------|----------------------------------|--------------|-------------|----------------|-----------|
| 4945            | 25.32                            | -4.68        | 30          | 4              | Pass      |
| 4963            | 25.39                            | -4.61        | 30          | 5              | Pass      |
| 4985            | 25.29                            | -4.71        | 30          | 6              | Pass      |

*Table 10: 20 MHz BW Test Results*

| Frequency (MHz) | Measured Peak Output Power (dBm) | Margin (dBm) | Limit (dBm) | Plot Reference | Pass/Fail |
|-----------------|----------------------------------|--------------|-------------|----------------|-----------|
| 4950            | 26.57                            | -6.43        | 33          | 7              | Pass      |
| 4963            | 27.00                            | -6.00        | 33          | 8              | Pass      |
| 4980            | 26.70                            | -6.30        | 33          | 9              | Pass      |

## 6.7. Output Power Test Results for Port B

**Table 11: 5 MHz BW Test Results**

| Frequency (MHz) | Measured Peak Output Power (dBm) | Margin (dBm) | Limit (dBm) | Plot Reference | Pass/Fail |
|-----------------|----------------------------------|--------------|-------------|----------------|-----------|
| 4943            | 22.44                            | -4.56        | 27          | 10             | Pass      |
| 4963            | 22.77                            | -4.23        | 27          | 11             | Pass      |
| 4987            | 22.33                            | -4.67        | 27          | 12             | Pass      |

**Table 12: 10 MHz BW Test Results**

| Frequency (MHz) | Measured Peak Output Power (dBm) | Margin (dBm) | Limit (dBm) | Plot Reference | Pass/Fail |
|-----------------|----------------------------------|--------------|-------------|----------------|-----------|
| 4945            | 25.09                            | -4.91        | 30          | 13             | Pass      |
| 4963            | 25.12                            | -4.88        | 30          | 14             | Pass      |
| 4985            | 25.08                            | -4.92        | 30          | 15             | Pass      |

**Table 13: 20 MHz BW Test Results**

| Frequency (MHz) | Measured Peak Output Power (dBm) | Margin (dBm) | Limit (dBm) | Plot Reference | Pass/Fail |
|-----------------|----------------------------------|--------------|-------------|----------------|-----------|
| 4950            | 27.05                            | -5.95        | 33          | 16             | Pass      |
| 4963            | 27.04                            | -5.96        | 33          | 17             | Pass      |
| 4980            | 26.79                            | -6.21        | 33          | 18             | Pass      |

## 6.8. Peak Output Power Calculated Results for both ports

- RF output power = SA reading at outputs summed in linear terms =  $10 \log [10^{(P_{ant1}/10)} + 10^{(P_{ant2}/10)}]$

**Table 14: 5 MHz BW Test Results**

| Frequency (MHz) | Peak Output Power (dBm) |        | Calculated Peak Output Power (dBm) | Limit (dBm) | Pass/Fail |
|-----------------|-------------------------|--------|------------------------------------|-------------|-----------|
|                 | Port A                  | Port B |                                    |             |           |
| 4943            | 22.47                   | 22.44  | 25.47                              | 27          | Pass      |
| 4963            | 22.52                   | 22.77  | 25.66                              | 27          | Pass      |
| 4987            | 22.61                   | 22.33  | 25.48                              | 27          | Pass      |

**Table 15: 10 MHz BW Test Results**

| Frequency (MHz) | Peak Output Power (dBm) |        | Calculated Peak Output Power (dBm) | Limit (dBm) | Pass/Fail |
|-----------------|-------------------------|--------|------------------------------------|-------------|-----------|
|                 | Port A                  | Port B |                                    |             |           |
| 4945            | 25.32                   | 25.09  | 28.22                              | 30          | Pass      |
| 4963            | 25.39                   | 25.12  | 28.27                              | 30          | Pass      |
| 4985            | 25.29                   | 25.08  | 28.20                              | 30          | Pass      |

**Table 16: 20 MHz BW Test Results**

| Frequency (MHz) | Peak Output Power (dBm) |        | Calculated Peak Output Power (dBm) | Limit (dBm) | Pass/Fail |
|-----------------|-------------------------|--------|------------------------------------|-------------|-----------|
|                 | Port A                  | Port B |                                    |             |           |
| 4950            | 26.57                   | 27.05  | 29.83                              | 33          | Pass      |
| 4963            | 27.00                   | 27.04  | 30.03                              | 33          | Pass      |
| 4980            | 26.70                   | 26.79  | 29.76                              | 33          | Pass      |

## 6.9. Power Spectral Density Test Results

**Table 17: 5 MHz BW Test Results**

| Frequency (MHz) | Measured Peak Output Power (dBm/Hz) |        | Integration Factor (dB) | Power Density (dBm/MHz) | Limit (dBm/MHz) | Margin (dB) | Pass/Fail |
|-----------------|-------------------------------------|--------|-------------------------|-------------------------|-----------------|-------------|-----------|
|                 | Port A                              | Port B |                         |                         |                 |             |           |
| 4943            | -44.52                              | -44.55 | 60                      | 18.48                   | 20              | -1.52       | Pass      |
| 4963            | -44.47                              | -44.22 | 60                      | 18.67                   | 20              | -1.33       | Pass      |
| 4987            | -44.38                              | -44.66 | 60                      | 18.49                   | 20              | -1.51       | Pass      |

**Table 18: 10 MHz BW Test Results**

| Frequency (MHz) | Measured Peak Output Power (dBm/Hz) |        | Integration Factor (dB) | Power Density (dBm/MHz) | Limit (dBm/MHz) | Margin (dB) | Pass/Fail |
|-----------------|-------------------------------------|--------|-------------------------|-------------------------|-----------------|-------------|-----------|
|                 | Port A                              | Port B |                         |                         |                 |             |           |
| 4945            | -44.68                              | -44.91 | 60                      | 18.22                   | 20              | -1.78       | Pass      |
| 4963            | -44.61                              | -44.88 | 60                      | 18.27                   | 20              | -1.73       | Pass      |
| 4985            | -44.71                              | -44.92 | 60                      | 18.20                   | 20              | -1.80       | Pass      |

**Table 19: 20 MHz BW Test Results**

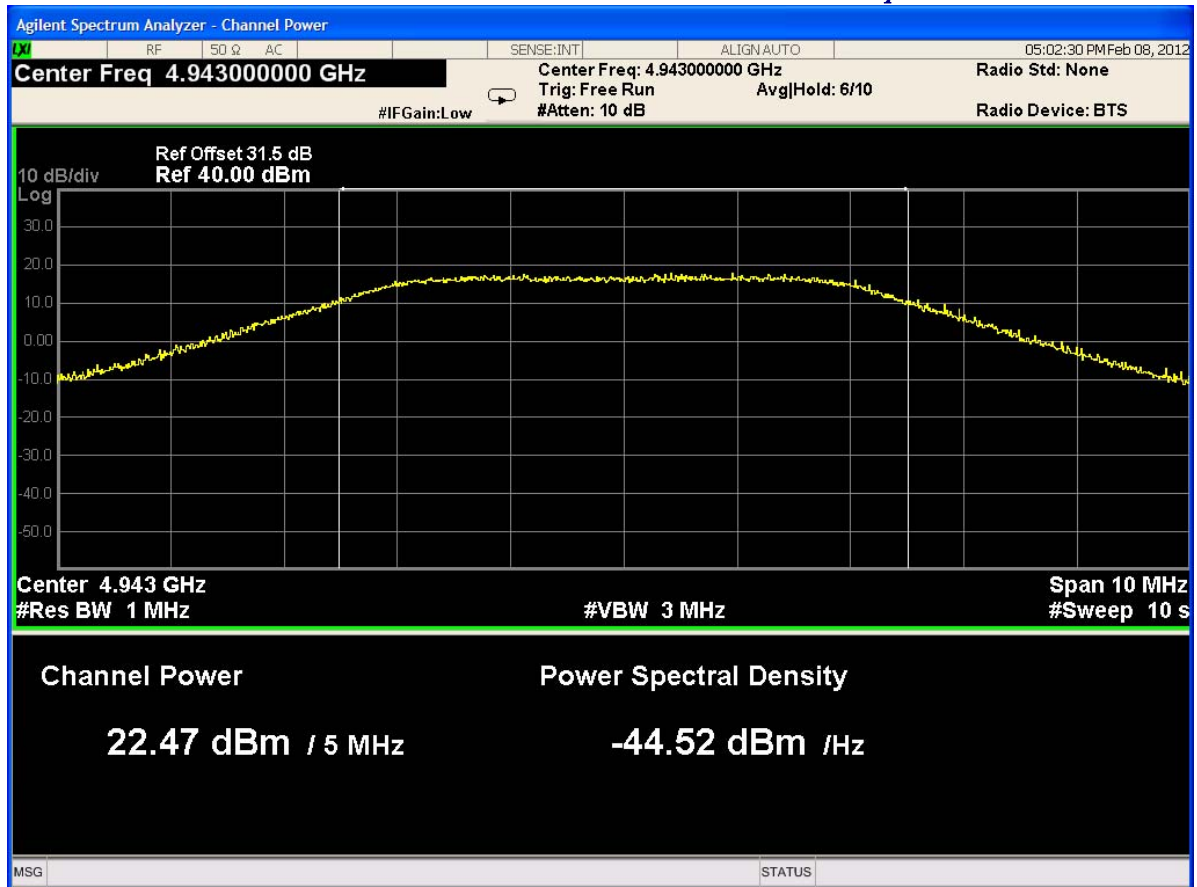
| Frequency (MHz) | Measured Peak Output Power (dBm/Hz) |        | Integration Factor (dB) | Power Density (dBm/MHz) | Limit (dBm/MHz) | Margin (dB) | Pass/Fail |
|-----------------|-------------------------------------|--------|-------------------------|-------------------------|-----------------|-------------|-----------|
|                 | Port A                              | Port B |                         |                         |                 |             |           |
| 4950            | -46.44                              | -45.96 | 60                      | 16.82                   | 20              | -3.18       | Pass      |
| 4963            | -46.01                              | -45.97 | 60                      | 17.02                   | 20              | -2.98       | Pass      |
| 4980            | -46.31                              | -46.22 | 60                      | 16.75                   | 20              | -3.25       | Pass      |

- Integration factor for Power Spectral Density =  $10 \cdot \log(\text{MHz/Hz}) = 10 \cdot \log(1000000) = 60 \text{ dB}$
- Power density SA reading at both ports are summed in linear terms as follows:  

$$PD = 10 \log [10^{\{(PSD_{ant1} + 60)/10\}} + 10^{\{(PSD_{ant2} + 60)/10\}}]$$



*Photograph for Conducted Measurement Test Setup/ 1*



Plot Peak Output Power/ 1



Plot Peak Output Power/ 2



Plot Peak Output Power/ 3



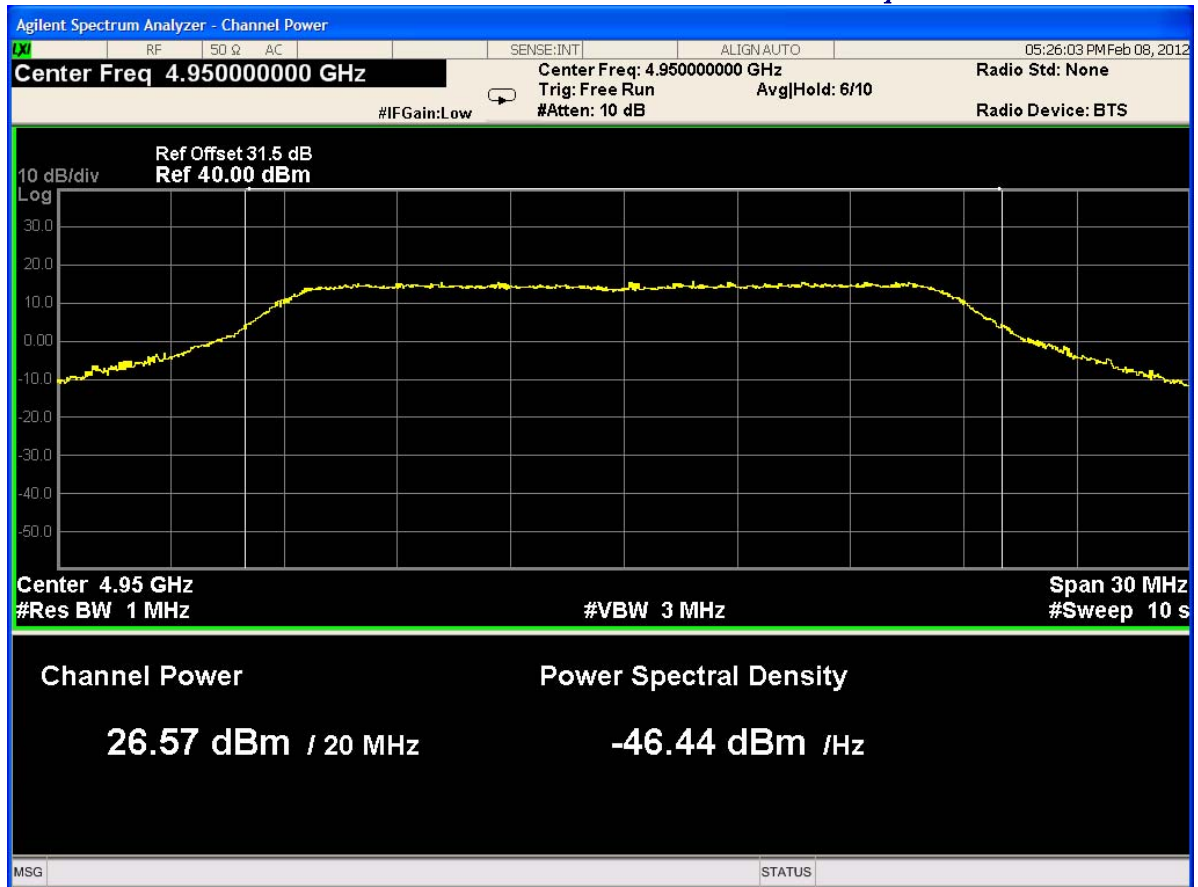
Plot Peak Output Power/ 4



Plot Peak Output Power/ 5



Plot Peak Output Power/ 6



Plot Peak Output Power/ 7



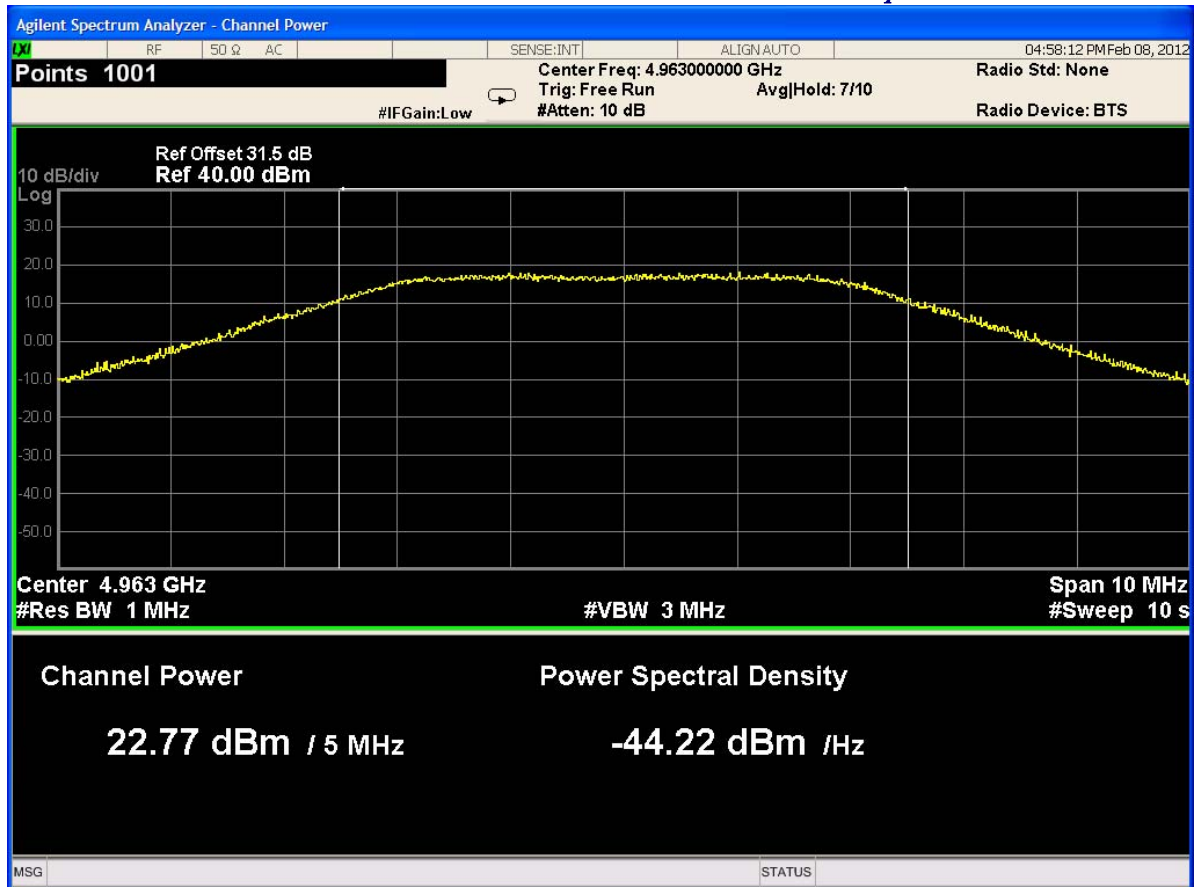
Plot Peak Output Power/ 8



Plot Peak Output Power/ 9



Plot Peak Output Power/ 10



Plot Peak Output Power/ 11



Plot Peak Output Power/ 12



Plot Peak Output Power/ 13



Plot Peak Output Power/ 14



Plot Peak Output Power/ 15



Plot Peak Output Power/ 16



Plot Peak Output Power/ 17



Plot Peak Output Power/ 18

## 7. EMISSION MASK TEST

|                      |                                             |
|----------------------|---------------------------------------------|
| Equipment Under Test | WipAir X 000-4.9 GHz                        |
| Test Method          | FCC sections 90.210(m), RSS-111 section 5.4 |
| Date                 | 22.02.2012                                  |
| Relative Humidity    | 40%                                         |
| Ambient Temperature  | 25 <sup>0</sup> C                           |
| Air Pressure         | 1010 hPa                                    |
| Test Setup           | Figure 2                                    |

Testing Engineer: I. Arbitman

Date : 22.02.2012

### 7.1. Test Results Summary & Conclusions

The E.U.T was found in compliance with 90.210(m) Emission Mask Test requirements

### 7.2. Limits of Conducted Emission at Antenna Terminals

The tests shall meet the limits of Table 20 for FCC Section 90.210(m).

**Table 20: Limits for Emission mask M for 5 MHz Bandwidth as per 90.210(m)**

| Frequency displacement from carrier (MHz) | Attenuation below carrier (dBc)                          |
|-------------------------------------------|----------------------------------------------------------|
| 0 – 2.25                                  | 0                                                        |
| 2.25 – 2.5                                | $568\log(F^*/2.25)$                                      |
| 2.5 – 2.75                                | $26+145\log(F^*/2.5)$                                    |
| 2.75 – 5.0                                | $32+31\log(F^*/2.75)$                                    |
| 5.0 – 7.5                                 | $40+57\log(F^*/5.0)$                                     |
| More than** 7.5                           | 50 or $55+10\log P(W)$ (whichever is lesser attenuation) |

\*: Frequency in MHz removed from center.

\*\*: Emission mask includes carrier modulation envelope within  $\pm 150\%$  of the authorized bandwidth; the frequency range removed beyond  $\pm 150\%$  of the authorized bandwidth from carrier was investigated as spurious emission

**Table 21: Limits for Emission mask M for 10 MHz Bandwidth as per 90.210(m)**

| Frequency displacement from carrier (MHz) | Attenuation below carrier (dBc)                          |
|-------------------------------------------|----------------------------------------------------------|
| 0 – 4.5                                   | 0                                                        |
| 4.5 – 5                                   | $568\log(F^*/4.5)$                                       |
| 5 – 5.5                                   | $26+145\log(F^*/5.0)$                                    |
| 5.5 – 10.0                                | $32+31\log(F^*/5.5)$                                     |
| 10.0 – 15                                 | $40+57\log(F^*/10.0)$                                    |
| More than** 15                            | 50 or $55+10\log P(W)$ (whichever is lesser attenuation) |

\*: Frequency in MHz removed from center.

\*\*: Emission mask includes carrier modulation envelope within  $\pm 150\%$  of the authorized bandwidth; the frequency range removed beyond  $\pm 150\%$  of the authorized bandwidth from carrier was investigated as spurious emission

Table 22: Limits for Emission mask M for 20 MHz Bandwidth as per 90.210(m)

| Frequency displacement from carrier (MHz) | Attenuation below carrier (dBc)                          |
|-------------------------------------------|----------------------------------------------------------|
| 0 – 9                                     | 0                                                        |
| 9 – 10                                    | $568\log(F^*/9.0)$                                       |
| 10 – 11                                   | $26+145\log(F^*/10.0)$                                   |
| 11 – 20                                   | $32+31\log(F^*/11.0)$                                    |
| 20 – 30                                   | $40+57\log(F^*/20.0)$                                    |
| More than** 30                            | 50 or $55+10\log P(W)$ (whichever is lesser attenuation) |

\*: Frequency in MHz removed from center.

\*\*\*: Emission mask includes carrier modulation envelope within  $\pm 150\%$  of the authorized bandwidth; the frequency range removed beyond  $\pm 150\%$  of the authorized bandwidth from carrier was investigated as spurious emission

### 7.3. Test Instrumentation and Equipment

Table 23: Test Instrumentation and Equipment

| Item              | Model  | Manufacturer | Next Date Calibration |
|-------------------|--------|--------------|-----------------------|
| Spectrum Analyzer | E7405A | Agilent      | 11.05.2012            |
| 10db attenuator   | 771-20 | Narda        | 15.05.2012            |
| 10db attenuator   | 771-20 | Narda        | 15.05.2012            |
| 10db attenuator   | 771-20 | Narda        | 15.05.2012            |
| Splitter          | 11667A | Agilent      | 22.10.2012            |

### 7.4. Test Procedure

As per 47 CFR, Section 2.1051, 2.1047 and 90.210(m); TIA/EIA-C, Section 2.2.13

The test was performed to measure the emission mask at RF antenna connector.

The EUT was set up as shown in Figure 3. The EUT was started and sufficient time for stabilization was allowed.

The emission mask was measured using the spectrum analyzer.

Measurements were done for top, middle and bottom frequencies, for each channel BW 5, 10, and 20 MHz

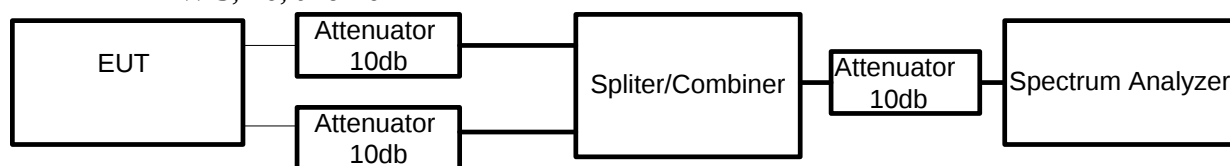


Figure 3: Test Setup for Emission Mask

**7.5. Test Results for Port A**
**Table 24: 5 MHz BW Test Results**

| Frequency (MHz) | Limit (dBc)     | Plot Reference | Pass/ Fail |
|-----------------|-----------------|----------------|------------|
| 4943            | Emission mask M | 1              | Pass       |
| 4963            |                 | 2              | Pass       |
| 4987            |                 | 3              | Pass       |

**Table 25: 10 MHz BW Test Results**

| Frequency (MHz) | Limit (dBc)     | Plot Reference | Pass/ Fail |
|-----------------|-----------------|----------------|------------|
| 4945            | Emission mask M | 4              | Pass       |
| 4965            |                 | 5              | Pass       |
| 4985            |                 | 6              | Pass       |

**Table 26: 20 MHz BW Test Results**

| Frequency (MHz) | Limit (dBc)     | Plot Reference | Pass/ Fail |
|-----------------|-----------------|----------------|------------|
| 4950            | Emission mask M | 7              | Pass       |
| 4965            |                 | 8              | Pass       |
| 4980            |                 | 9              | Pass       |

**7.6. Test Results for Port B**
**Table 27: 5 MHz BW Test Results**

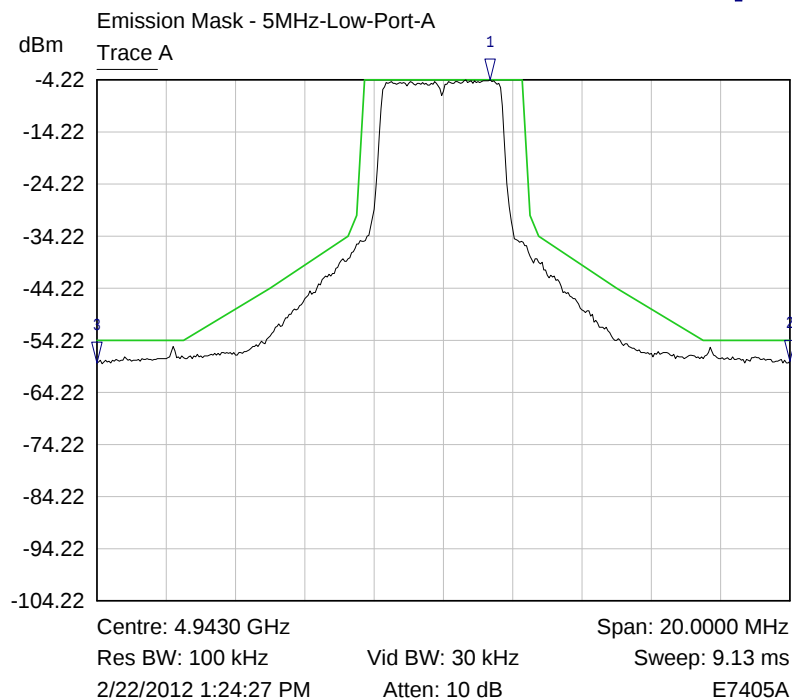
| Frequency (MHz) | Limit (dBc)     | Plot Reference | Pass/ Fail |
|-----------------|-----------------|----------------|------------|
| 4943            | Emission mask M | 10             | Pass       |
| 4963            |                 | 11             | Pass       |
| 4987            |                 | 12             | Pass       |

**Table 28: 10 MHz BW Test Results**

| Frequency (MHz) | Limit (dBc)     | Plot Reference | Pass/ Fail |
|-----------------|-----------------|----------------|------------|
| 4945            | Emission mask M | 13             | Pass       |
| 4965            |                 | 14             | Pass       |
| 4985            |                 | 15             | Pass       |

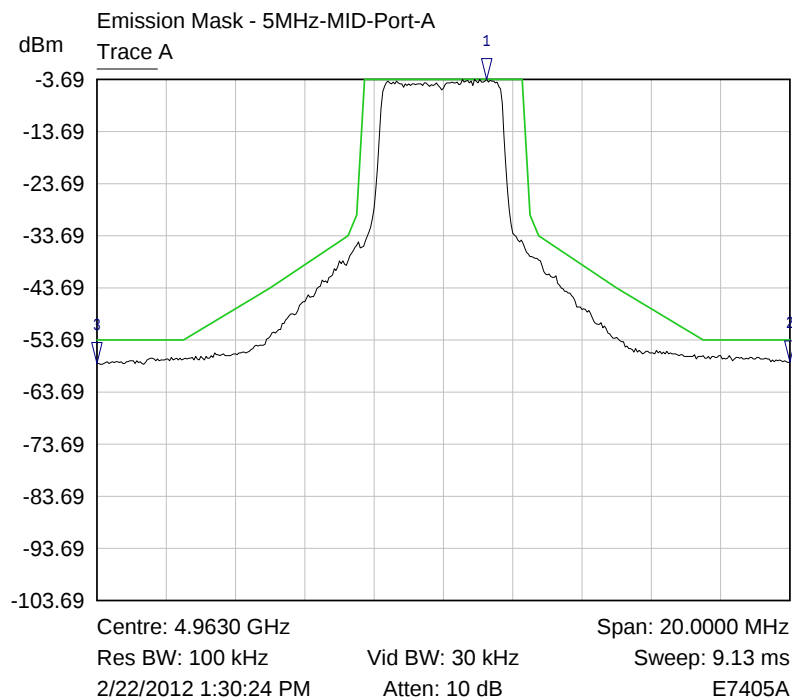
**Table 29: 20 MHz BW Test Results**

| Frequency (MHz) | Limit (dBc)     | Plot Reference | Pass/ Fail |
|-----------------|-----------------|----------------|------------|
| 4950            | Emission mask M | 16             | Pass       |
| 4965            |                 | 17             | Pass       |
| 4980            |                 | 18             | Pass       |



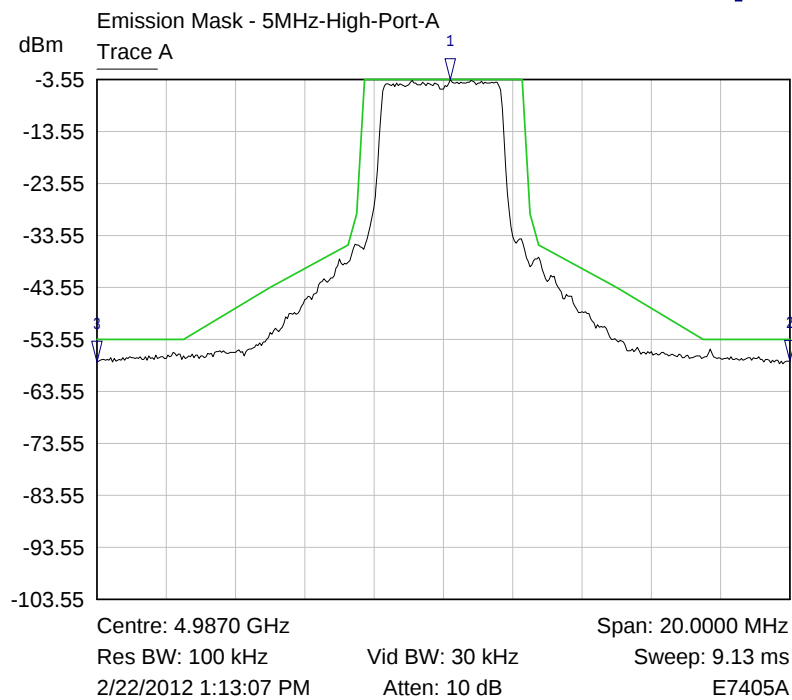
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9444 GHz | -4.22 dBm  |       |
| 2 ▽ | Trace A | 4.9530 GHz | -58.21 dBm |       |
| 3 ▽ | Trace A | 4.9330 GHz | -58.59 dBm |       |

**Plot Emission Mask/ 1**



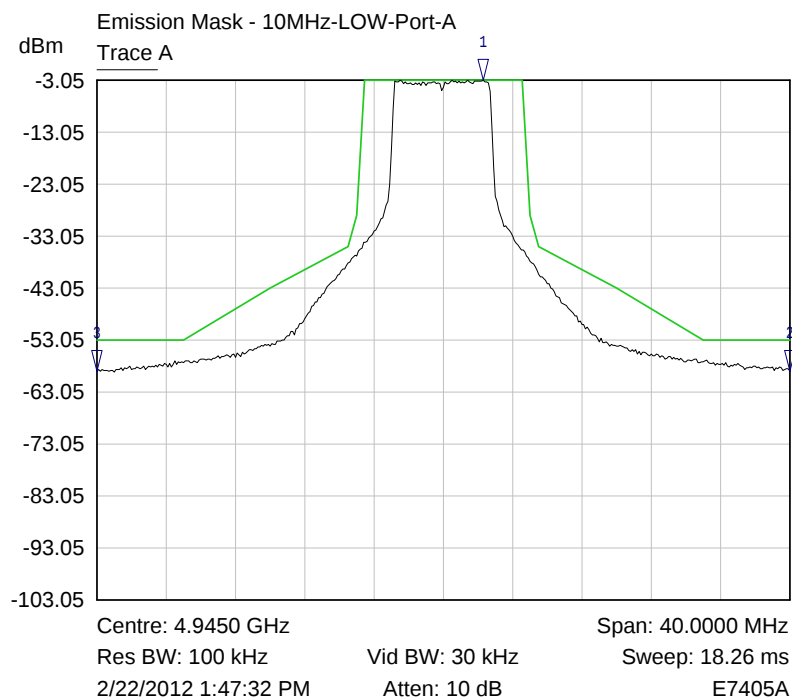
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9643 GHz | -3.69 dBm  |       |
| 2 ▽ | Trace A | 4.9730 GHz | -57.91 dBm |       |
| 3 ▽ | Trace A | 4.9530 GHz | -58.17 dBm |       |

**Plot Emission Mask/ 2**



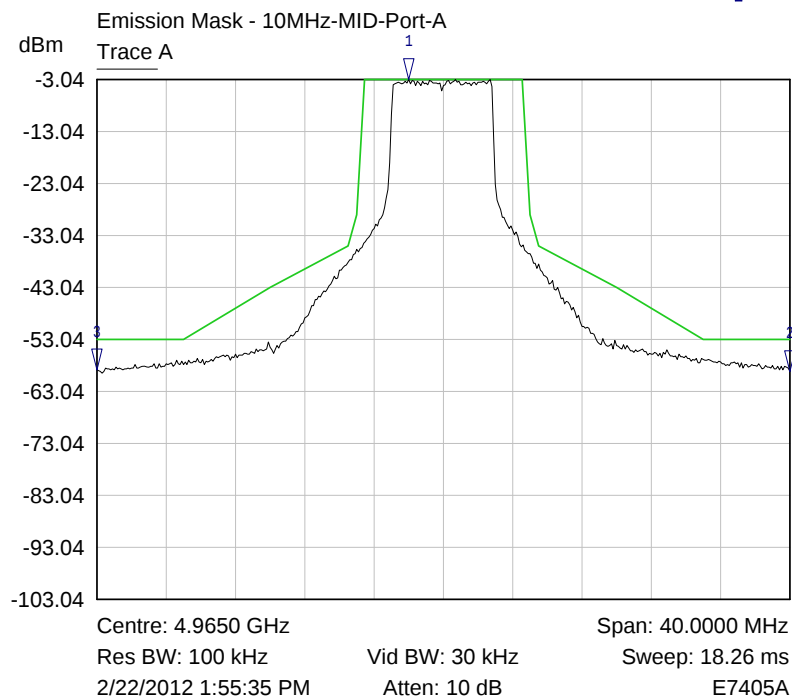
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9872 GHz | -3.55 dBm  |       |
| 2 ▽ | Trace A | 4.9970 GHz | -57.79 dBm |       |
| 3 ▽ | Trace A | 4.9770 GHz | -57.86 dBm |       |

**Plot Emission Mask/ 3**



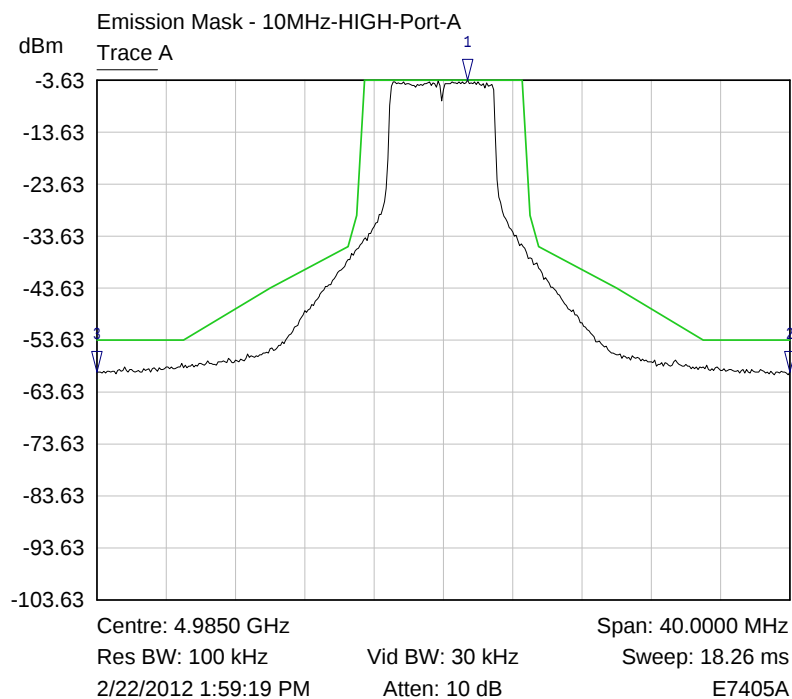
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9473 GHz | -3.05 dBm  |       |
| 2 ▽ | Trace A | 4.9650 GHz | -58.99 dBm |       |
| 3 ▽ | Trace A | 4.9250 GHz | -59.02 dBm |       |

**Plot Emission Mask/ 4**



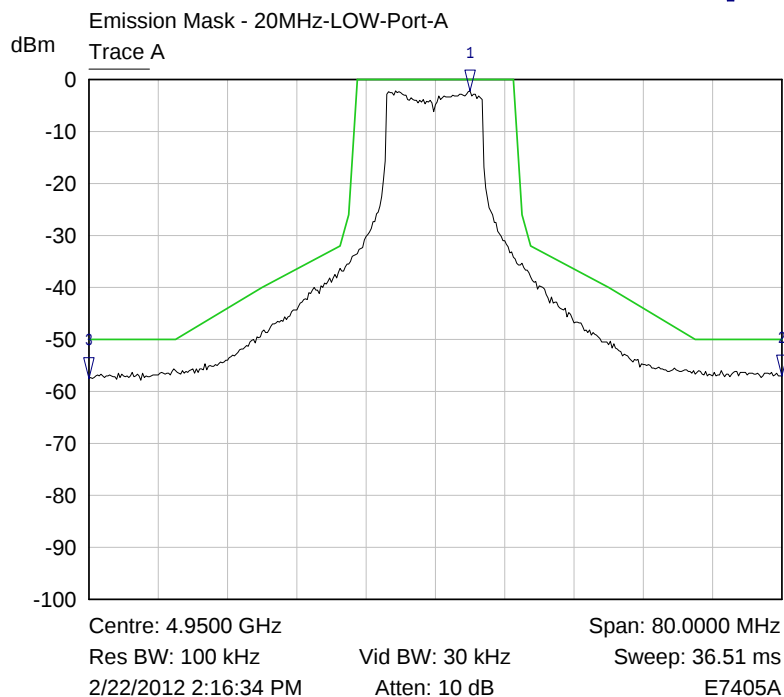
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9630 GHz | -3.04 dBm  |       |
| 2 ▽ | Trace A | 4.9850 GHz | -59.12 dBm |       |
| 3 ▽ | Trace A | 4.9450 GHz | -58.92 dBm |       |

**Plot Emission Mask/ 5**



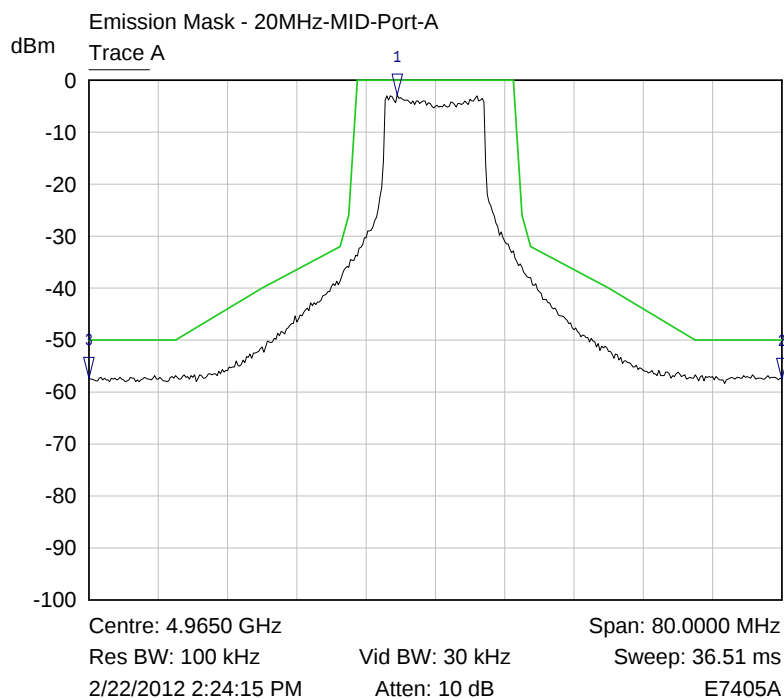
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9864 GHz | -3.63 dBm  |       |
| 2 ▽ | Trace A | 5.0050 GHz | -59.80 dBm |       |
| 3 ▽ | Trace A | 4.9650 GHz | -59.79 dBm |       |

**Plot Emission Mask/ 6**



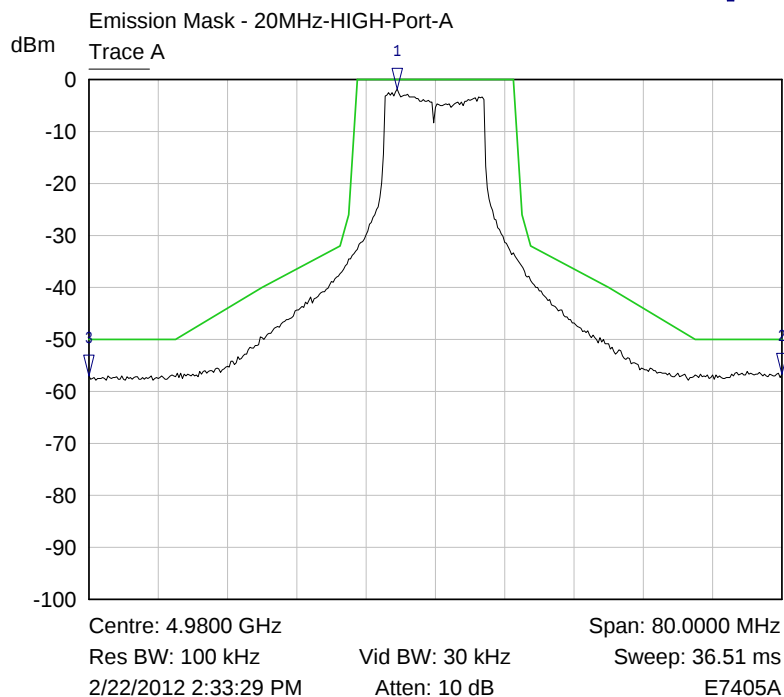
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9540 GHz | -2.12 dBm  |       |
| 2 ▽ | Trace A | 4.9900 GHz | -57.07 dBm |       |
| 3 ▽ | Trace A | 4.9100 GHz | -57.42 dBm |       |

**Plot Emission Mask/ 7**



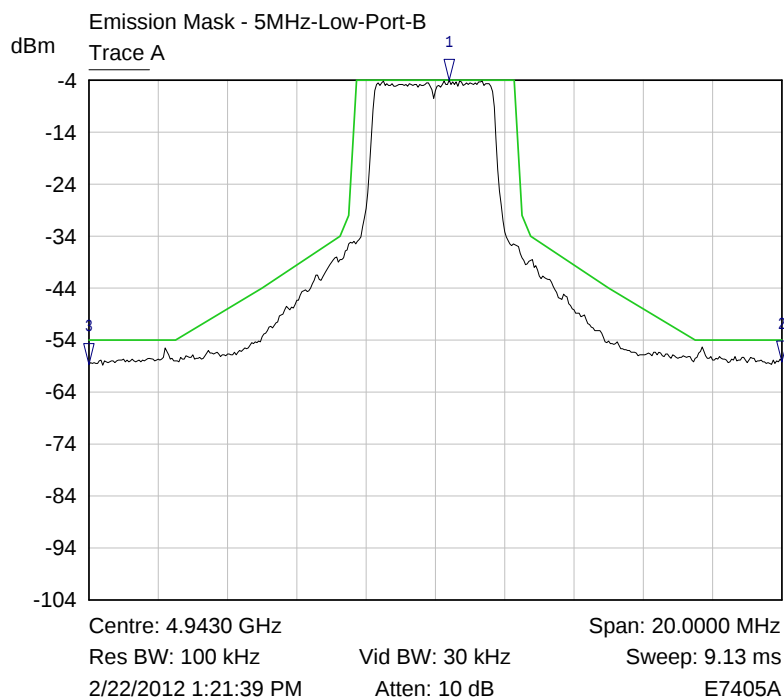
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9606 GHz | -2.87 dBm  |       |
| 2 ▽ | Trace A | 5.0050 GHz | -57.42 dBm |       |
| 3 ▽ | Trace A | 4.9250 GHz | -57.40 dBm |       |

**Plot Emission Mask/ 8**



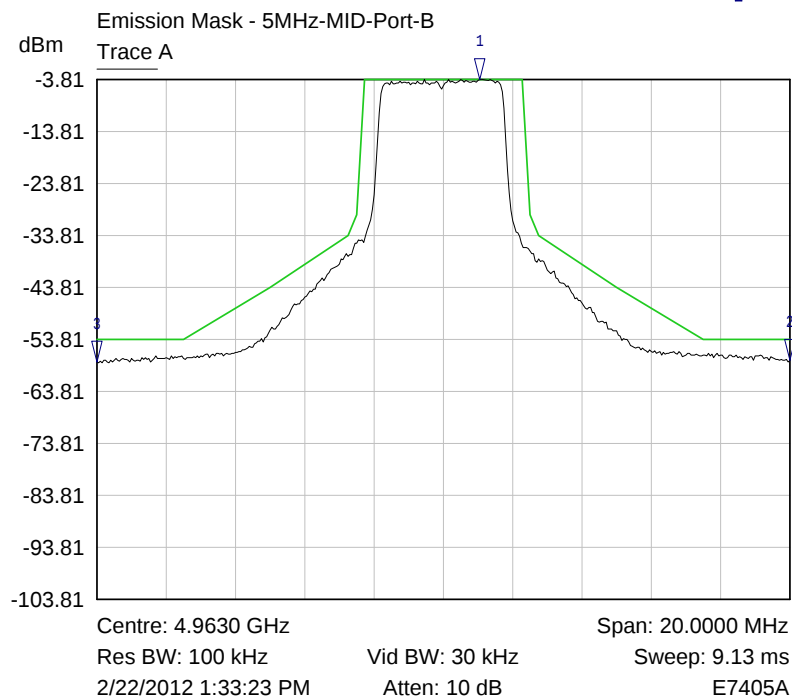
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9756 GHz | -1.89 dBm  |       |
| 2 ▽ | Trace A | 5.0200 GHz | -56.74 dBm |       |
| 3 ▽ | Trace A | 4.9400 GHz | -56.98 dBm |       |

**Plot Emission Mask/ 9**



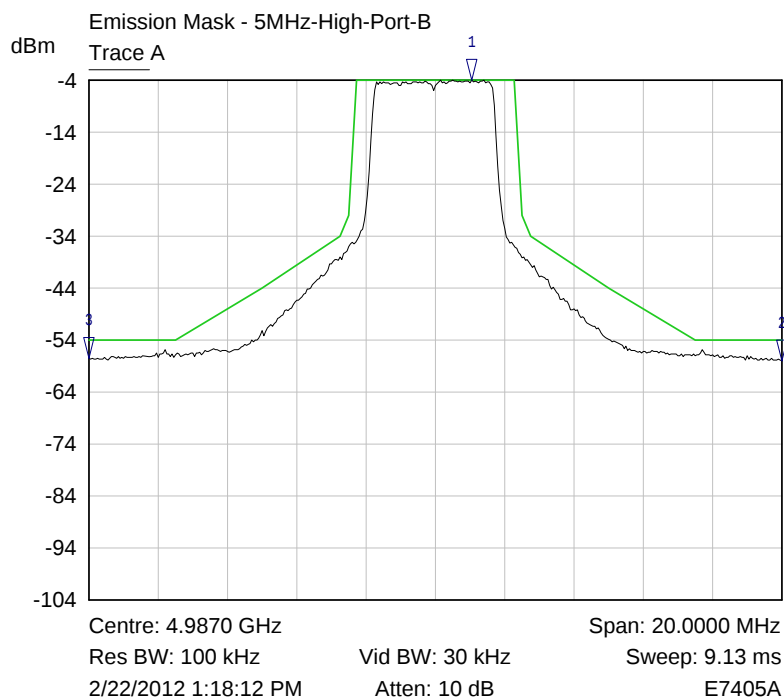
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9434 GHz | -4.00 dBm  |       |
| 2 ▽ | Trace A | 4.9530 GHz | -58.21 dBm |       |
| 3 ▽ | Trace A | 4.9330 GHz | -58.59 dBm |       |

**Plot Emission Mask/ 10**



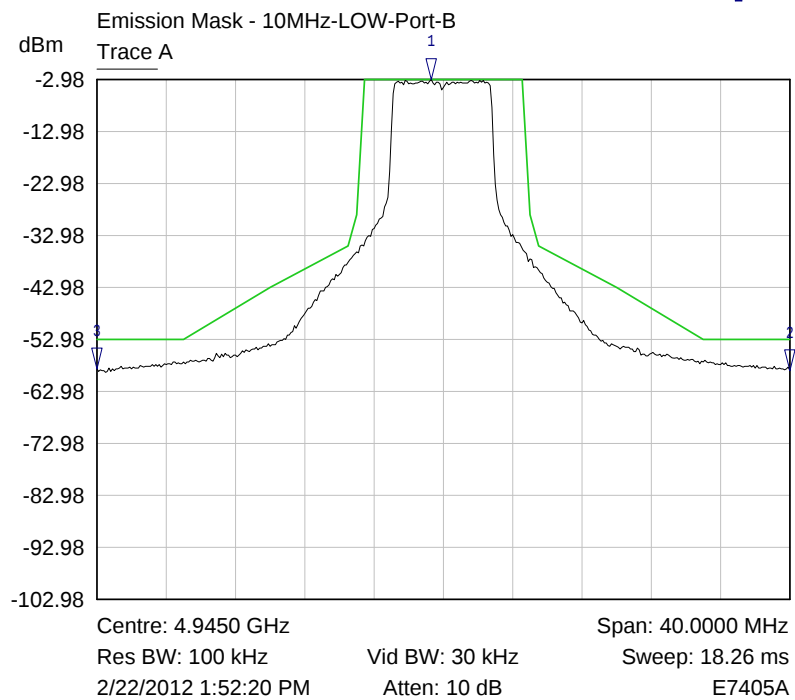
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9641 GHz | -3.81 dBm  |       |
| 2 ▽ | Trace A | 4.9730 GHz | -57.86 dBm |       |
| 3 ▽ | Trace A | 4.9530 GHz | -58.13 dBm |       |

**Plot Emission Mask/ 11**



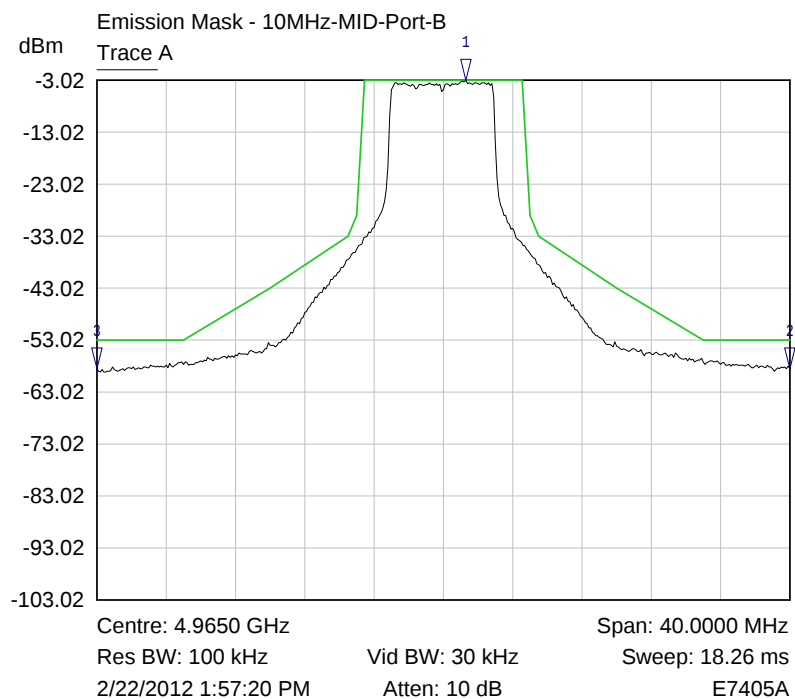
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9881 GHz | -4.00 dBm  |       |
| 2 ▽ | Trace A | 4.9970 GHz | -58.00 dBm |       |
| 3 ▽ | Trace A | 4.9770 GHz | -57.55 dBm |       |

**Plot Emission Mask/ 12**



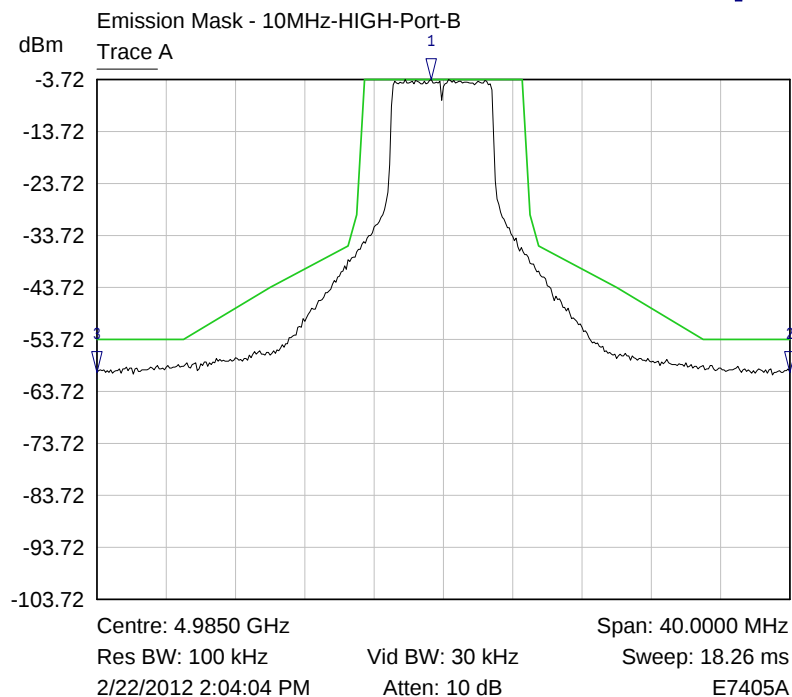
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9443 GHz | -2.98 dBm  |       |
| 2 ▽ | Trace A | 4.9650 GHz | -59.03 dBm |       |
| 3 ▽ | Trace A | 4.9250 GHz | -58.72 dBm |       |

**Plot Emission Mask/ 13**



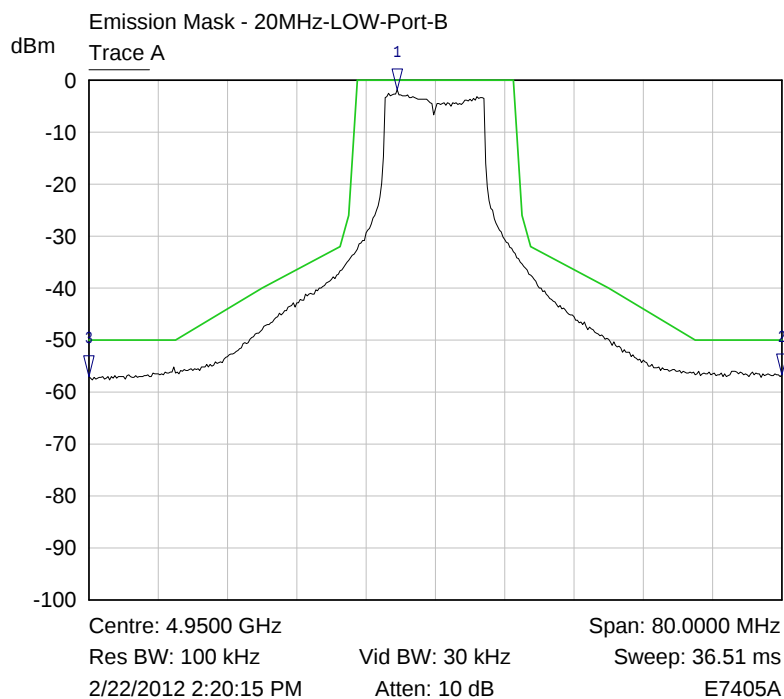
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9663 GHz | -3.02 dBm  |       |
| 2 ▽ | Trace A | 4.9850 GHz | -58.44 dBm |       |
| 3 ▽ | Trace A | 4.9450 GHz | -58.60 dBm |       |

**Plot Emission Mask/ 14**



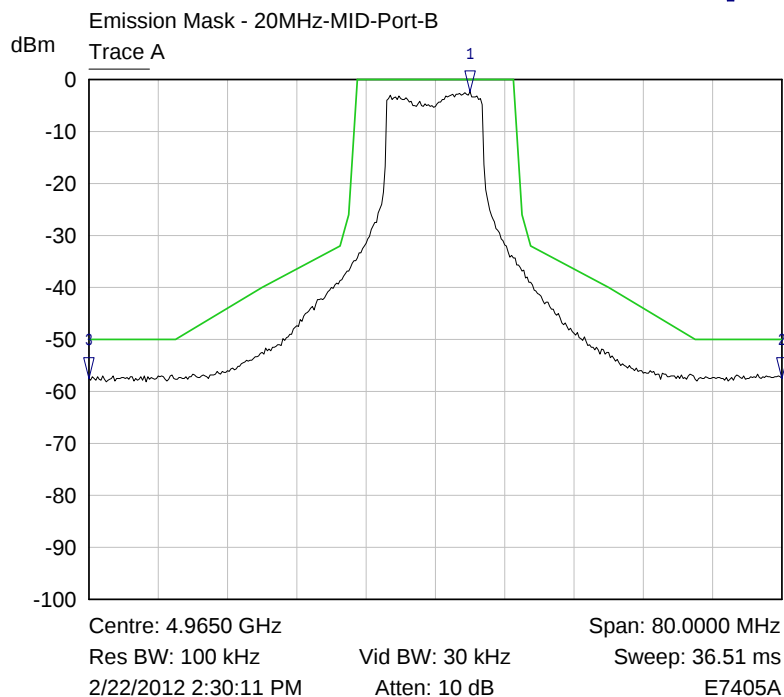
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9843 GHz | -3.72 dBm  |       |
| 2 ▽ | Trace A | 5.0050 GHz | -60.05 dBm |       |
| 3 ▽ | Trace A | 4.9650 GHz | -60.09 dBm |       |

**Plot Emission Mask/ 15**



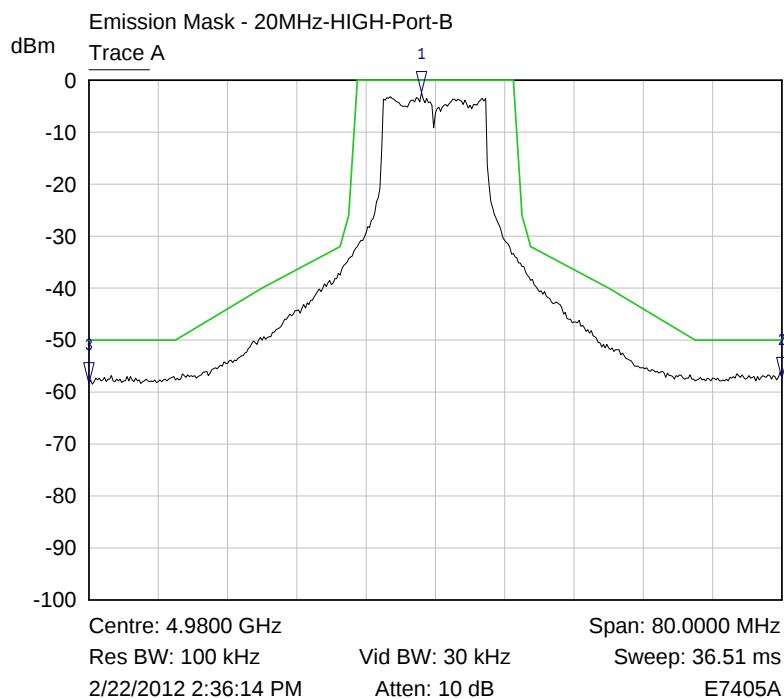
| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9456 GHz | -1.78 dBm  |       |
| 2 ▽ | Trace A | 4.9900 GHz | -56.65 dBm |       |
| 3 ▽ | Trace A | 4.9100 GHz | -56.92 dBm |       |

**Plot Emission Mask/ 16**



| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9690 GHz | -2.36 dBm  |       |
| 2 ▽ | Trace A | 5.0050 GHz | -57.54 dBm |       |
| 3 ▽ | Trace A | 4.9250 GHz | -57.58 dBm |       |

**Plot Emission Mask/ 17**



| Mkr | Trace   | X-Axis     | Value      | Notes |
|-----|---------|------------|------------|-------|
| 1 ▽ | Trace A | 4.9784 GHz | -2.27 dBm  |       |
| 2 ▽ | Trace A | 5.0200 GHz | -57.41 dBm |       |
| 3 ▽ | Trace A | 4.9400 GHz | -58.33 dBm |       |

**Plot Emission Mask/ 18**