



Dates of Tests: December 06~13, 2010

Test Report S/N: LR5001110121

Test Site : LTA CO., LTD.

## CERTIFICATION OF COMPLIANCE

FCC ID.

**A3LUM100**

APPLICANT

**Samsung Electronics Co., Ltd.**

|                           |   |                                          |
|---------------------------|---|------------------------------------------|
| Equipment Class           | : | Ultra Wideband Transmitter (UWB)         |
| Manufacturing Description | : | Wireless USB mini-card module            |
| Manufacturer              | : | Samsung Electronics Co., Ltd.            |
| Model name                | : | UM100                                    |
| Test Device Serial No.:   | : | Identical prototype                      |
| Rule Part(s)              | : | FCC Part 15 Subpart F ; ANSI C-63.4-2003 |
| Frequency Range for BG1   | : | 3168MHz ~ 4752MHz                        |
| Frequency Range for BG3   | : | 6336MHz ~ 7920MHz                        |
| Frequency Range for BG6   | : | 7392MHz ~ 8976MHz                        |
| Max. Output Power         | : | Max 86.67dBuV - Radiated                 |
| Data of issue             | : | December 13, 2010                        |

This test report is issued under the authority of:

The test was supervised by:



Kyung-Taek LEE, Technical Manager



Hyun-Chae You, Test Engineer

This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. This report must not be used by the applicant to claim product endorsement by any agency.



NVLAP LAB Code.: 200723-0

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## 1. General information's

### 1-1 Test Performed

Company name : LTA Co., Ltd.  
 Address : 243, Jubug-ri, Yangji-Myeon, Youngin-Si, Kyunggi-Do, Korea. 449-822  
 Web site : <http://www.ltalab.com>  
 E-mail : [chahn@ltalab.com](mailto:chahn@ltalab.com)  
 Telephone : +82-31-323-6008  
 Facsimile : +82-31-323-6010

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competents of calibration and testing laboratory”.

### 1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

| Agency | Country | Accreditation No. | Validity   | Reference           |
|--------|---------|-------------------|------------|---------------------|
| NVLAP  | U.S.A   | 200723-0          | 2011-09-30 | ECT accredited Lab. |
| RRL    | KOREA   | KR0049            | 2011-06-20 | EMC accredited Lab. |
| FCC    | U.S.A   | 610755            | 2011-04-22 | FCC filing          |
| VCCI   | JAPAN   | R2133, C2307      | 2011-06-21 | VCCI registration   |
| IC     | CANADA  | IC5799            | 2012-05-14 | IC filing           |

## 2. Information's about test item

### 2-1 Client & Manufacturer

Company name : Samsung Electronics Co.,Ltd.  
 Address : San #24 Nongseo-Dong, Giheung-Gu, Yongin-City,  
 Gyeonggi-Do 446-711 Korea  
 Tel / Fax : TEL +82-31-209-6546 FAX +82-31-209-3131

### 2-2 Equipment Under Test (EUT)

Trade name : Wireless USB mini-card module  
 FCC ID : A3LUM100  
 Model name : UM100  
 Serial number : Identical prototype  
 Date of receipt : December 06, 2010  
 EUT condition : Pre-production, not damaged  
 Antenna type : PCB Antenna  
 Frequency Range for BG1 : 3168MHz ~ 4752MHz  
 Frequency Range for BG3 : 6336MHz ~ 7920MHz  
 Frequency Range for BG6 : 7392MHz ~ 8976MHz  
 RF output power : Max 86.67dBuV - Radiated  
 Type of Modulation : MB-OFDM  
 Power Source : 3.3Vdc by Main system

### 2-3 Ancillary Equipment

| Equipment | Model No. | Serial No. | Manufacturer |
|-----------|-----------|------------|--------------|
| Notebook  | PP17L     | N/A        | DELL         |

**2-4 Description of Test modes**

| Band Group | MODE | SUB-BAND | Frequency (MHZ)  |
|------------|------|----------|------------------|
| 1          | 1    | 1        | 3432             |
|            | 2    | 2        | 3960             |
|            | 3    | 3        | 4488             |
|            | 4    | 1,2,3    | 3432, 3960, 4488 |
| 3          | 5    | 1        | 6600             |
|            | 6    | 2        | 7128             |
|            | 7    | 3        | 7656             |
|            | 8    | 1,2,3    | 6600, 7128, 7656 |
| 6          | 9    | 1        | 7656             |
|            | 10   | 2        | 8184             |
|            | 11   | 3        | 8712             |
|            | 12   | 1,2,3    | 7656, 8184, 8712 |

**NOTE:** After pre-testing each mode, the combination mode (band group 1, 3, 6) was the worst situation and only the data was presented in the following sections  
<Except for UWB Bandwidth Measurement and Peak Emission Measurement>.

| EUT configure mode | Applicable to |       |    |    | Description              |
|--------------------|---------------|-------|----|----|--------------------------|
|                    | RE<1G         | RE≥1G | UB | PE | Frequency (MHZ)          |
| 4                  | √             | √     | √  | √  | 3432, 3960, 4488 for BG1 |
| 8                  | √             | √     | √  | √  | 6600, 7128, 7656 for BG3 |
| 12                 | √             | √     | √  | √  | 7656, 8184, 8712 for BG6 |

Where      **RE<1G**: Radiated Emission below 1GHz      **RE≥1G**: Radiated Emission above 1GHz  
              **UB**:UBW Bandwidth                                      **PE**: Peak Emission

### 3. Test Report

#### 3.1 Summary of tests

| FCC Part Section(s) | Parameter                               | Limit                        | Test Condition | Status (note 1)     |
|---------------------|-----------------------------------------|------------------------------|----------------|---------------------|
| 15.207              | AC Conducted Emissions                  | EN 55022                     | Line Conducted | NA <sup>note3</sup> |
| 15.519(a)           | Operational Limitations                 | -                            | Radiated       | C                   |
| 15.519(b)           | UWB Bandwidth                           | between 3100MHz to 10,600MHz |                | C                   |
| 15.519(c)/ 15.209   | Radiated Emissions                      | Refer to the 3.2.4           |                | C                   |
| 15.519(d)           | Radiated Emissions in GPS Bands         | 19.44dBuV/m at 1M            |                | C                   |
| 15.519(e)           | Peak Emissions within a 50MHz Bandwidth | 90.77dBuV/m at 1M            |                | C                   |
| 15.203              | Antenna requirement                     | -                            | -              | C                   |

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

Note 3: This device is only operated by DC

#### → Antenna Requirement

The Samsung Electronics Co.,Ltd. FCC ID : A3LUM100 unit complies with the requirement of §15.203.  
The antenna type is PCB antenna. refer to the external photo.

The sample was tested according to the following specification:  
FCC Parts 15F ; ANSI C-63.4-2003

## 3.2 Technical Characteristics Test

### 3.2.1 AC Conducted Emissions

#### Procedure:

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its hopping function disabled at the middle channels in line with Section 15.31(m). Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

#### Measurement Data:

**Not Applicable** (-This product is operated by DC)

#### Minimum Standard: FCC Part 15.207(a)/EN 55022

Class B

| Frequency Range | quasi-peak | Average    |
|-----------------|------------|------------|
| 0.15 ~ 0.5      | 66 to 56 * | 56 to 46 * |
| 0.5 ~ 5         | 56         | 46         |
| 5 ~ 30          | 60         | 50         |

\* Decreases with the logarithm of the frequency

### 3.2.2 Operational limitations

#### Measurement Data:

| Operation Restriction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Informed the applicant | Not applicable | User Manual informed | Passed |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------|----------------------|--------|
| ■ 47 CFR FCC Part 15 Subpart F 15.519(a)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                        |                |                      |        |
| UWB devices operating under the provisions of this section must be hand held, i.e., they are relatively small devices that are primarily hand held while being operated and do not employ a fixed infrastructure.<br>[A transmitter that had been connected to portable device e.g. Laptop PC ...and be considered sufficient to demonstrate not a fixed infrastructure application.]                                                                                                                                                                                                              | ■                      |                |                      | ■      |
| (1) The radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |                |                      |        |
| A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.<br>[ The applicant has been informed of this requirement and instruct the caution in user manual. ] | ■                      |                | ■                    | ■      |
| (2) Outdoor mounted antennas                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |                |                      |        |
| The use of antennas mounted on outdoor structures, e.g., antennas mounted on the outside of a building or on a telephone pole, or any fixed outdoors infrastructure is prohibited. Antennas may be mounted only on the hand held UWB device.<br>[ The applicant has been informed of this requirement. ]                                                                                                                                                                                                                                                                                           | ■                      |                |                      | ■      |
| (5) Indoors or Outdoors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |                |                      |        |
| UWB devices operating under the provisions of this section may operate indoors or outdoors.<br>[The applicant has been informed of this requirement. ]                                                                                                                                                                                                                                                                                                                                                                                                                                             | ■                      |                |                      | ■      |

### 3.2.3 UWB Bandwidth Measurement

#### Test Procedure:

1. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. The horn receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
3. For maximum emission amplitude, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading and was used to determine the frequency at which the highest radiated emission occurs,  $f_m$ . Next, the points that are 10dB or more below the highest radiated emission were observed in a search from  $f_m$  in both the lower and higher frequency direction in the measured frequency EIRP graph, they are denoted as  $f_L$  and  $f_H$ , respectively. The UWB bandwidth is the difference between  $f_L$  and  $f_H$ .
4. The individual UWB bandwidths were measured for each BAND\_ID (nb) of the UWB spectrum. Both horizontal and vertical polarizations were taken into account to determine the full UWB BW on the maximized (in azimuth and elevation) signals.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 10 MHz

VBW = 10 MHz (VBW  $\geq$  RBW)

Trace = max hold

Sweep = auto

Detector function = peak

#### Measurement Data:

| Test mode | Frequency (MHz)  | Test Results                    |          |
|-----------|------------------|---------------------------------|----------|
|           |                  | limit                           | Result   |
| 4         | 3432, 3960, 4488 | between 3100 MHz and 10,600 MHz | Complies |
| 8         | 6600, 7128, 7656 | between 3100 MHz and 10,600 MHz | Complies |
| 12        | 7656, 8184, 8712 | between 3100 MHz and 10,600 MHz | Complies |

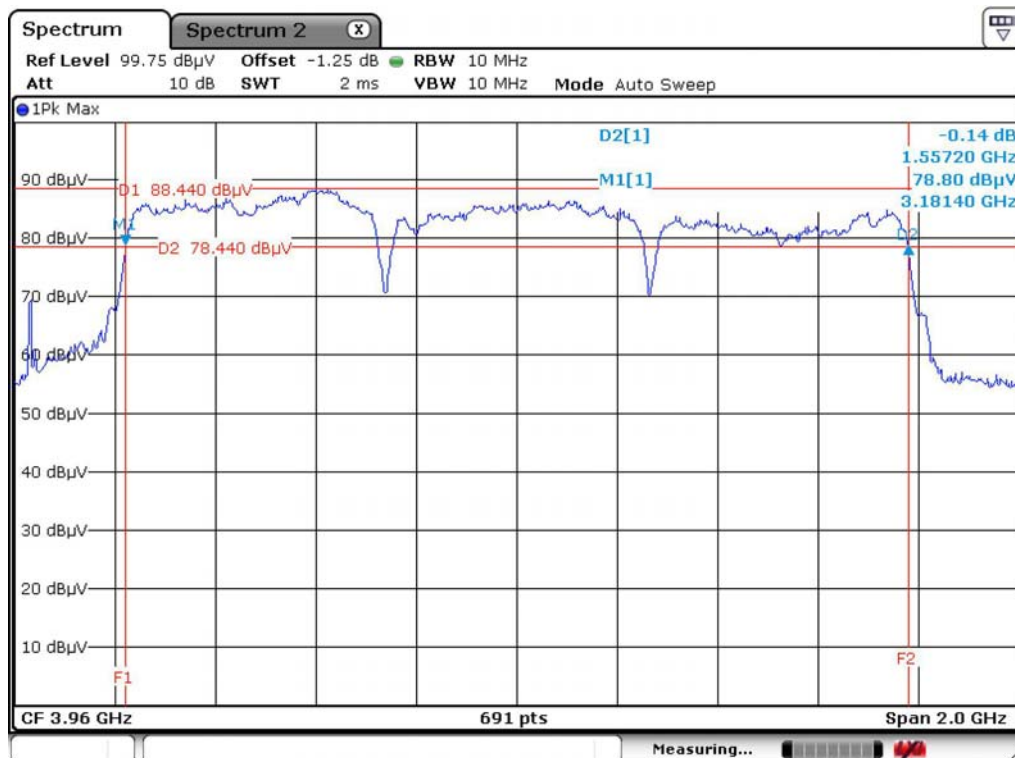
- See next pages for actual measured spectrum plots.

#### Minimum Standard:

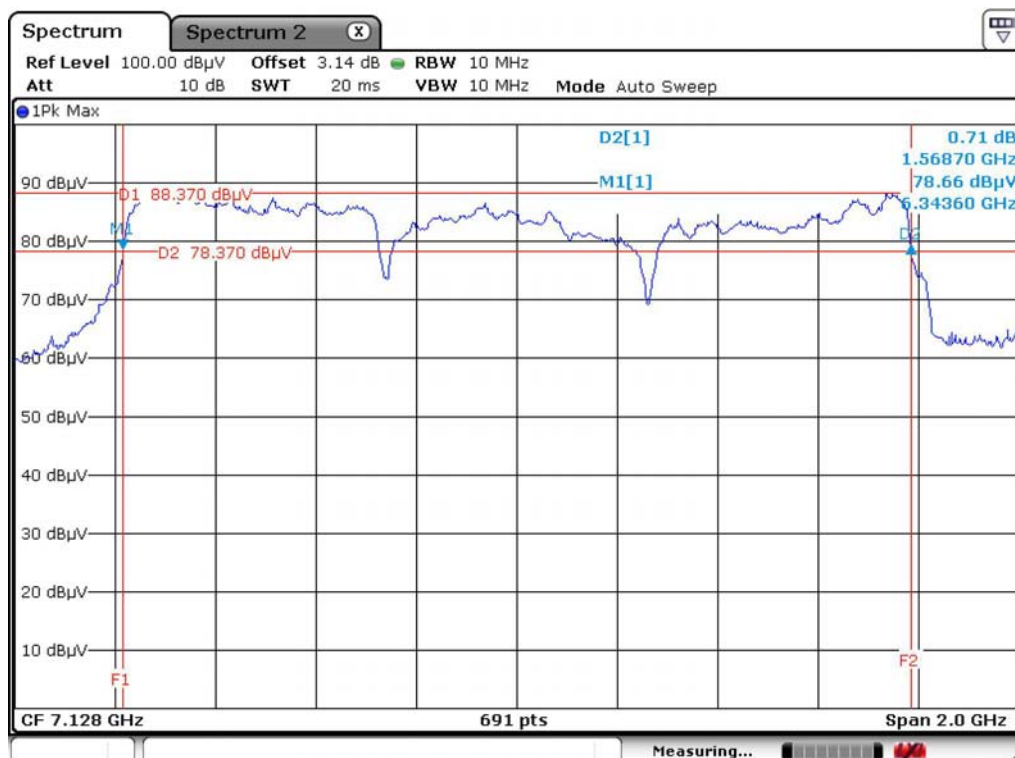
Ultra-wideband (UWB) transmitter. An intentional radiator that, at any point in time, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth. The UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated  $f_H$  and the lower boundary is designated  $f_L$ . The frequency at which the highest radiated emission occurs is designated  $f_m$ . Center frequency. The center frequency,  $f_c$ , equals  $(f_H + f_L)/2$ . Fractional bandwidth. The fractional bandwidth equals  $2(f_H - f_L)/(f_H + f_L)$ . The UWB bandwidth of a UWB system operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

## Measurement Data:

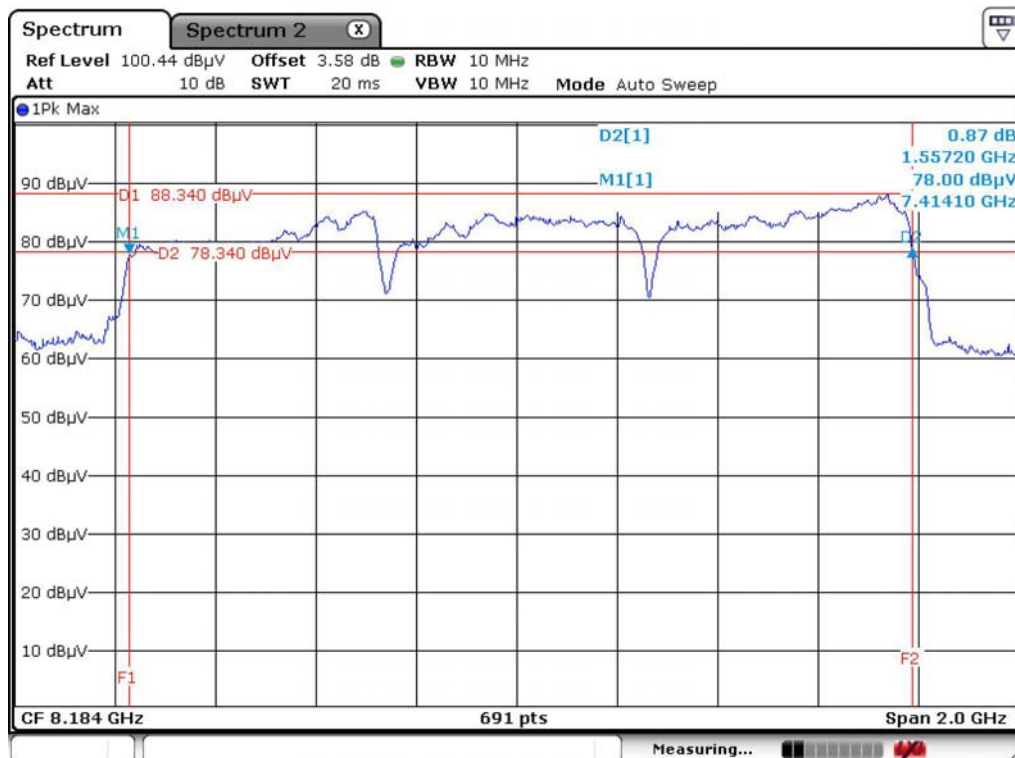
## Test mode 4



## Test mode 8



## Test mode 12



### 3.2.4 Radiated Emissions Measurement

#### Procedure:

1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable for measured the frequency range below 960 MHz and antenna tower was placed below 1 meters far away from the turntable for measured the frequency range above 960 MHz
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. The measurements made over the frequency range from 9 kHz to 960 MHz were maximized using an EMI receiver with peak detector capabilities. Measurements of the radiated field from 9 kHz to 960 MHz were made with the measurement antenna located a distance of 3 meters from the EUT. If the emissions level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
6. Measurements above 960 MHz were maximized using a spectrum analyzer with RMS detector capabilities. A spectrum analyzer was used for the final measurements utilizing an RMS detector at the frequencies with the largest amplitudes. The prescribed RBW of 1 MHz and VBW of 3 MHz, and a1 msec averaging time were used for these measurements. Measurements of the radiated field at frequencies above 960 MHz were made with the measurement antenna located a distance of below 1 meter from the EUT.
7. The spectrum between 9 kHz and 960 MHz contained no intentional radiation and lies below the limits. The spectrum from 960MHz to18GHz contained intentional UWB signals between 3100 MHz and 10600 MHz and lie below the limits. No other emissions above 10600 MHz were detected. The maximum frequency tested was 40 GHz.
8. Per 47 CFR, Part 15, Subpart F, §15.521© (§15.209) all digital emissions from the transmitter not intended to be radiated from the antenna port meet the 15.209 subpart C limits.
9. Additional measurements in the 960 MHz to 40 GHz range were performed to determine the nature of all unintentional emissions in this span. Conducted antenna port measurement and terminated antenna port measurement were done in the 960 MHz to 8 GHz range show that all noise peaks have the same frequency and polarization and are determined to be emission from the digital circuit and are not radiated from the antenna.

#### The spectrum analyzer is set to:

frequency = 1000MHz ~ 10<sup>th</sup> carrier harmonic or 40GHz

RBW = 1MHz

Span = auto

VBW = 3MHz (VBW ≥ RBW)

Sweep = 1 msec averaging time were used for these

Detector function = RMS or Average

measurement frequencies

**Minimum Standard:**

The radiated emissions at or below 960 MHz from a device shall not exceed the emission levels in section 15.209(a) limit below.

| Frequencies (MHz) | Field Strength (micровolts/meter) | Measurement Distance (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 0.009~0.490       | 2400/F(KHz)                       | 300                           |
| 0.490~1.705       | 24000/F(KHz)                      | 30                            |
| 1.705~30.0        | 30                                | 30                            |
| 30~88             | 100                               | 3                             |
| 88~216            | 150                               | 3                             |
| 216~960           | 200                               | 3                             |
| Above 960         | 500                               | 3                             |

The radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

| Freq. (MHz) | EIRP (dBm) | E- Field (dBμV/m) at 3m | E- Field (dBμV/m) at 1m |
|-------------|------------|-------------------------|-------------------------|
| 960-1610    | -75.3      | 19.9                    | 29.44                   |
| 1610-1990   | -63.3      | 31.9                    | 41.44                   |
| 1990-3100   | -61.3      | 33.9                    | 43.44                   |
| 3100-10600  | -41.3      | 53.9                    | 63.44                   |
| 10600 above | -61.3      | 33.9                    | 43.44                   |

Note 1: This may be converted to a peak field strength level at 3 meters using  $E(\text{dBuV/m}) = P(\text{dBm EIRP}) + 95.2 \text{ dB}$ .

Note 2: Above 960MHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m. Distance extrapolation factor =  $20 \log (\text{specific distance [3m]} / \text{test distance [1m]}) (\text{dB})$ ; Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

From 47 CFR Section 15.521(c): Emissions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in Section 15.209 of this chapter, rather than the limits specified in this subpart, provided it can be clearly demonstrated that those emissions from the UWB device are due solely to emissions from digital circuitry contained within the transmitter and that the emissions are not intended to be radiated from the transmitter's antenna. Emissions from associated digital devices, as defined in Section 15.3(k) of this chapter, e.g., emissions from digital circuitry used to control additional functions or capabilities other than the UWB transmission, are subject to the limits contained in Subpart B of Part 15 of this chapter.

The radiated emissions from a device operating under the provisions of this section shall not exceed the emission levels in Section 15.209.

| Freq. (MHz) | E- Field (dBμV/m) at 3m |         | E- Field (dBμV/m) at 1m |         |
|-------------|-------------------------|---------|-------------------------|---------|
|             | Quasi Peak              |         |                         |         |
| 216 ~ 960   | 46.00                   |         | 54.54                   |         |
| 960 ~ 1000  | 54.00                   |         | 63.54                   |         |
|             | Peak                    | Average | Peak                    | Average |
| Above 1000  | 74.00                   | 54.00   | 83.54                   | 63.54   |

## Measurement Data: Test Data 4 is worst case (f&lt;1GHz) for BG 1



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Gyeonggi-do 449-822 Korea  
Tel :+82-31-3236008,9  
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EUT/Model No.: CA750

TEST MODE: UWB\_BG1 mode

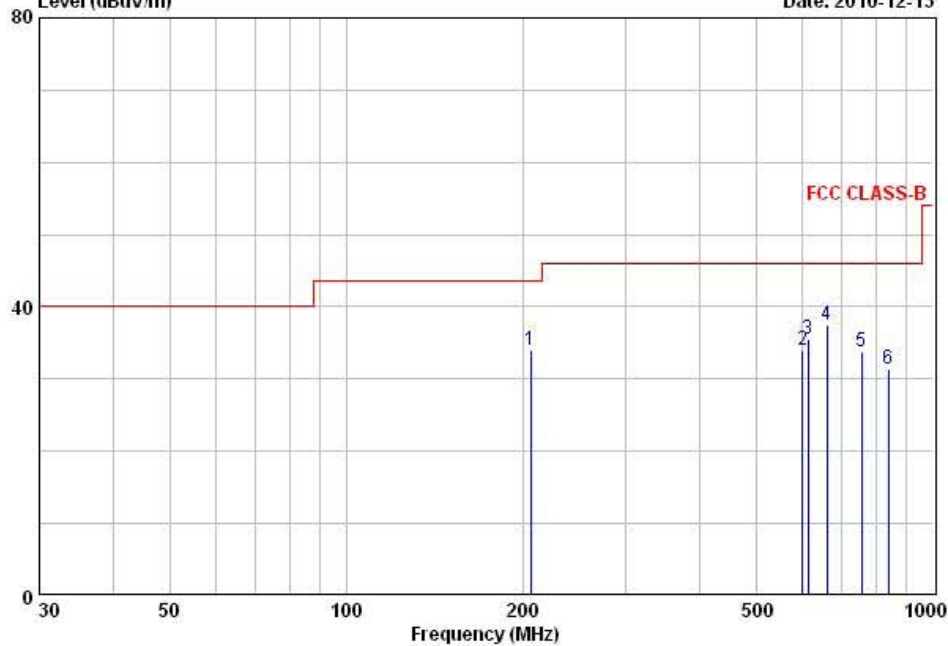
Temp Humi : 4 / 35

Tested by: PARK.H.W

Data: 21

Level (dBuV/m)

Date: 2010-12-13



| Freq | Reading | C.F   | Result | Limit  | Margin | Height | Angle | Polarity       |
|------|---------|-------|--------|--------|--------|--------|-------|----------------|
| MHz  | dBuV/m  | dB/m  | dBuV/m | dBuV/m | dB     | cm     | deg   |                |
| 1    | 206.30  | 46.10 | -12.18 | 33.92  | 43.50  | 9.58   | 100   | 132 VERTICAL   |
| 2    | 600.00  | 36.70 | -2.65  | 34.05  | 46.00  | 11.95  | 108   | 172 HORIZONTAL |
| 3    | 612.00  | 38.00 | -2.44  | 35.56  | 46.00  | 10.44  | 124   | 159 HORIZONTAL |
| 4    | 660.00  | 39.20 | -1.64  | 37.56  | 46.00  | 8.44   | 132   | 165 HORIZONTAL |
| 5    | 756.00  | 33.80 | 0.03   | 33.83  | 46.00  | 12.17  | 103   | 241 HORIZONTAL |
| 6    | 840.00  | 30.30 | 1.10   | 31.40  | 46.00  | 14.60  | 100   | 117 HORIZONTAL |

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

## Measurement Data: Test Data 8 is worst case (f&lt;1GHz) for BG 3



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Gyeonggi-do 449-822 Korea  
Tel :+82-31-3236008,9  
Fax:+82-31-3236010

EUT/Model No.: CA750

TEST MODE: UWB\_BG3 mode

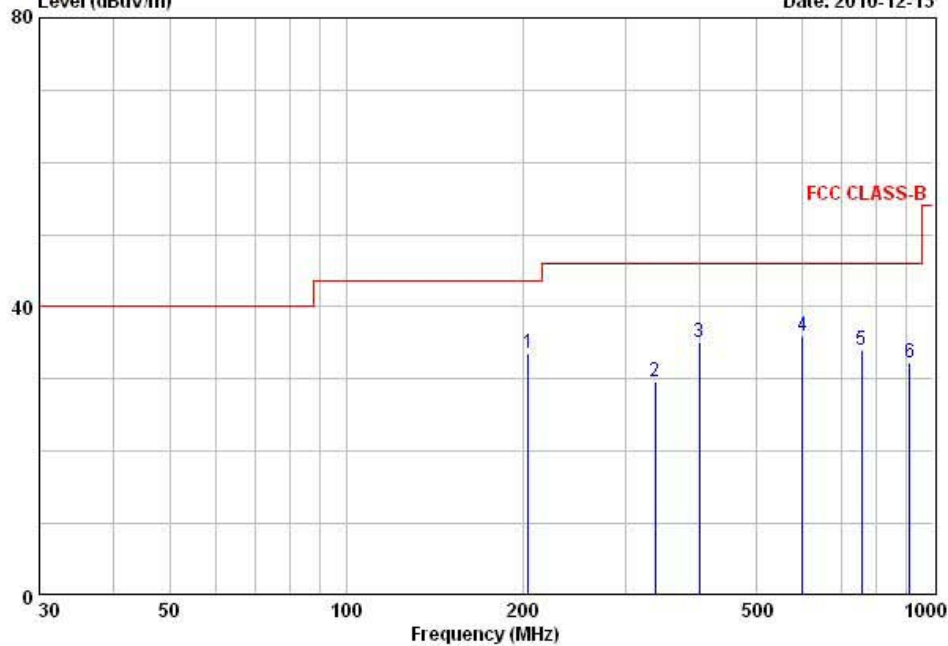
Temp Humi : 4 / 35

Tested by: PARK.H.W

Data: 22

Level (dBuV/m)

Date: 2010-12-13



|   | Freq   | Reading | C.F    | Result | Limit  | Margin | Height | Angle | Polarity   |
|---|--------|---------|--------|--------|--------|--------|--------|-------|------------|
|   | MHz    | dBuV/m  | dB/m   | dBuV/m | dBuV/m | dB     | cm     | deg   |            |
| 1 | 204.33 | 45.80   | -12.28 | 33.52  | 43.50  | 9.98   | 100    | 126   | VERTICAL   |
| 2 | 336.00 | 37.40   | -7.81  | 29.59  | 46.00  | 16.41  | 123    | 169   | VERTICAL   |
| 3 | 400.00 | 41.90   | -6.73  | 35.17  | 46.00  | 10.83  | 149    | 28    | VERTICAL   |
| 4 | 600.00 | 38.60   | -2.65  | 35.95  | 46.00  | 10.05  | 100    | 79    | VERTICAL   |
| 5 | 756.00 | 34.00   | 0.03   | 34.03  | 46.00  | 11.97  | 100    | 195   | HORIZONTAL |
| 6 | 912.00 | 30.50   | 1.72   | 32.22  | 46.00  | 13.78  | 100    | 135   | HORIZONTAL |

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

## Measurement Data: Test Data 12 is worst case (f&lt;1GHz) for BG 6



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EUT/Model No.: CA750

TEST MODE: UWB\_BG6 mode

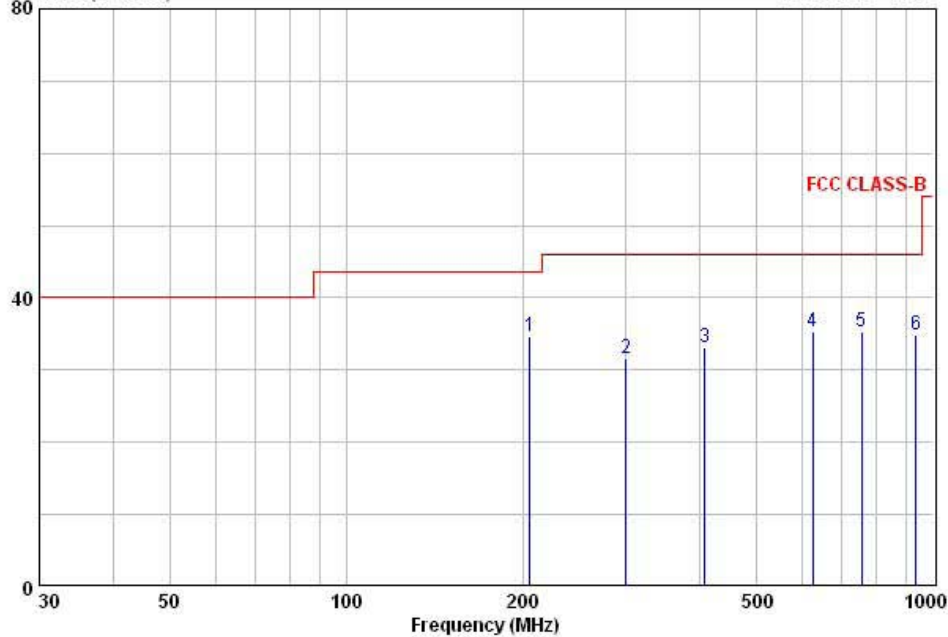
Temp Humi : 4 / 35

Tested by: PARK.H.W

Data: 23

Level (dBuV/m)

Date: 2010-12-13



| Freq     | Reading | C.F    | Result | Limit  | Margin | Height | Angle | Polarity   |
|----------|---------|--------|--------|--------|--------|--------|-------|------------|
| MHz      | dBuV/m  | dB/m   | dBuV/m | dBuV/m | dB     | cm     | deg   |            |
| 1 205.50 | 46.90   | -12.22 | 34.68  | 43.50  | 8.82   | 100    | 137   | VERTICAL   |
| 2 300.00 | 40.20   | -8.51  | 31.69  | 46.00  | 14.31  | 100    | 198   | VERTICAL   |
| 3 408.00 | 39.80   | -6.60  | 33.20  | 46.00  | 12.80  | 137    | 17    | VERTICAL   |
| 4 624.00 | 37.60   | -2.23  | 35.37  | 46.00  | 10.63  | 100    | 154   | VERTICAL   |
| 5 756.00 | 35.20   | 0.03   | 35.23  | 46.00  | 10.77  | 100    | 187   | HORIZONTAL |
| 6 936.00 | 32.80   | 2.09   | 34.89  | 46.00  | 11.11  | 100    | 167   | HORIZONTAL |

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

Measurement Data: Test Data 4 is worst case ( $f > 1\text{GHz}$ ) for BG 1

| ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 1M |                       |                               |                      |                      |                |
|-----------------------------------------------------|-----------------------|-------------------------------|----------------------|----------------------|----------------|
| Frequency<br>[MHz]                                  | Reading<br>[dBuV / m] | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] | Result<br>[dBuV / m] | Margin<br>[dB] |
| 3432.00                                             | 52.58                 | -2.67                         | 63.44                | 49.91                | 13.53          |
| 3960.00                                             | 53.25                 | -2.67                         | 63.44                | 50.58                | 12.86          |
| 4488.00                                             | 53.34                 | -2.67                         | 63.44                | 50.67                | 12.77          |
| -                                                   | -                     | -                             | -                    | -                    | -              |

| ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 1M |                       |                               |                      |                      |                |
|---------------------------------------------------|-----------------------|-------------------------------|----------------------|----------------------|----------------|
| Frequency<br>[MHz]                                | Reading<br>[dBuV / m] | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] | Result<br>[dBuV / m] | Margin<br>[dB] |
| 3432.00                                           | 63.00                 | -2.67                         | 63.44                | 60.33                | 3.11           |
| 3960.00                                           | 62.58                 | -2.67                         | 63.44                | 59.91                | 3.53           |
| 4488.00                                           | 62.76                 | -2.67                         | 63.44                | 60.09                | 3.35           |
| -                                                 | -                     | -                             | -                    | -                    | -              |

**NOTE.**

- No other emissions were detected at a level greater than 20dB below limit.
- Correction Factor = Antenna + Cable - Amp. Gain

Measurement Data: Test Data 8 is worst case ( $f > 1\text{GHz}$ ) for BG 3

| ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 1M |                       |                               |                      |                      |                |
|-----------------------------------------------------|-----------------------|-------------------------------|----------------------|----------------------|----------------|
| Frequency<br>[MHz]                                  | Reading<br>[dBuV / m] | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] | Result<br>[dBuV / m] | Margin<br>[dB] |
| 6600.00                                             | 49.52                 | 1.56                          | 63.44                | 51.08                | 12.36          |
| 7128.00                                             | 49.28                 | 1.56                          | 63.44                | 50.84                | 12.60          |
| 7656.00                                             | 49.34                 | 1.56                          | 63.44                | 50.90                | 12.54          |
| -                                                   | -                     | -                             | -                    | -                    | -              |

| ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 1M |                       |                               |                      |                      |                |
|---------------------------------------------------|-----------------------|-------------------------------|----------------------|----------------------|----------------|
| Frequency<br>[MHz]                                | Reading<br>[dBuV / m] | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] | Result<br>[dBuV / m] | Margin<br>[dB] |
| 6600.00                                           | 58.15                 | 1.56                          | 63.44                | 59.71                | 3.73           |
| 7128.00                                           | 58.88                 | 1.56                          | 63.44                | 60.44                | 3.00           |
| 7656.00                                           | 58.46                 | 1.56                          | 63.44                | 60.02                | 3.42           |
| -                                                 | -                     | -                             | -                    | -                    | -              |

**NOTE.**

- No other emissions were detected at a level greater than 20dB below limit.
- Correction Factor = Antenna + Cable - Amp. Gain

Measurement Data: Test Data 12 is worst case (f>1GHz) for BG 6

| ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 1M |                       |                               |                      |                      |                |
|-----------------------------------------------------|-----------------------|-------------------------------|----------------------|----------------------|----------------|
| Frequency<br>[MHz]                                  | Reading<br>[dBuV / m] | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] | Result<br>[dBuV / m] | Margin<br>[dB] |
| 7656.00                                             | 49.21                 | 2.81                          | 63.44                | 52.02                | 11.42          |
| 8184.00                                             | 48.75                 | 2.81                          | 63.44                | 51.56                | 11.88          |
| 8712.00                                             | 48.64                 | 2.81                          | 63.44                | 51.45                | 11.99          |
| -                                                   | -                     | -                             | -                    | -                    | -              |

| ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 1M |                       |                               |                      |                      |                |
|---------------------------------------------------|-----------------------|-------------------------------|----------------------|----------------------|----------------|
| Frequency<br>[MHz]                                | Reading<br>[dBuV / m] | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] | Result<br>[dBuV / m] | Margin<br>[dB] |
| 7656.00                                           | 57.50                 | 2.81                          | 63.44                | 60.31                | 3.13           |
| 8184.00                                           | 57.46                 | 2.81                          | 63.44                | 60.27                | 3.17           |
| 8712.00                                           | 57.51                 | 2.81                          | 63.44                | 60.32                | 3.12           |
| -                                                 | -                     | -                             | -                    | -                    | -              |

**NOTE.**

- No other emissions were detected at a level greater than 20dB below limit.
- Correction Factor = Antenna + Cable - Amp. Gain

**Measurement Data: Test Data 4 is worst case (f<1GHz) for digital circuitry for BG 1**

| ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 1M |                       |                               |                      |                      |                |
|-----------------------------------------------------|-----------------------|-------------------------------|----------------------|----------------------|----------------|
| Frequency<br>[MHz]                                  | Reading<br>[dBuV / m] | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] | Result<br>[dBuV / m] | Margin<br>[dB] |
| 984.00                                              | 54.34                 | -14.31                        | 63.54                | 40.03                | 23.51          |

| ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 1M |                       |                               |                      |                      |                |
|---------------------------------------------------|-----------------------|-------------------------------|----------------------|----------------------|----------------|
| Frequency<br>[MHz]                                | Reading<br>[dBuV / m] | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] | Result<br>[dBuV / m] | Margin<br>[dB] |
| 984.00                                            | 52.25                 | -14.31                        | 63.54                | 37.94                | 25.60          |

**NOTE.**

- No other emissions were detected at a level greater than 20dB below limit.
- Correction Factor = Antenna + Cable - Amp. Gain
- Measurements made with 1 MHz RBW/3MHz VBW (RMS detector) at 1m distance. 1 msec averaging time were used for these frequencies per bin point measurements. Emissions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in 47 CFR, Part 15, Subpart C, §15.209.

**Measurement Data: Test Data 8 is worst case (f<1GHz) for digital circuitry for BG 3**

| ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 1M |                       |                               |                      |                      |                |
|-----------------------------------------------------|-----------------------|-------------------------------|----------------------|----------------------|----------------|
| Frequency<br>[MHz]                                  | Reading<br>[dBuV / m] | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] | Result<br>[dBuV / m] | Margin<br>[dB] |
| 984.00                                              | 53.95                 | -14.31                        | 63.54                | 39.64                | 23.90          |

| ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 1M |                       |                               |                      |                      |                |
|---------------------------------------------------|-----------------------|-------------------------------|----------------------|----------------------|----------------|
| Frequency<br>[MHz]                                | Reading<br>[dBuV / m] | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] | Result<br>[dBuV / m] | Margin<br>[dB] |
| 984.00                                            | 52.28                 | -14.31                        | 63.54                | 37.97                | 25.57          |

**NOTE.**

- No other emissions were detected at a level greater than 20dB below limit.
- Correction Factor = Antenna + Cable - Amp. Gain
- Measurements made with 1 MHz RBW/3MHz VBW (RMS detector) at 1m distance. 1 msec averaging time were used for these frequencies per bin point measurements. Emissions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in 47 CFR, Part 15, Subpart C, §15.209.

**Measurement Data: Test Data 12 is worst case (f<1GHz) for digital circuitry for BG 6**

| ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 1M |                       |                               |                      |                      |                |
|-----------------------------------------------------|-----------------------|-------------------------------|----------------------|----------------------|----------------|
| Frequency<br>[MHz]                                  | Reading<br>[dBuV / m] | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] | Result<br>[dBuV / m] | Margin<br>[dB] |
| 984.00                                              | 54.58                 | -14.31                        | 63.54                | 40.27                | 23.27          |

| ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 1M |                       |                               |                      |                      |                |
|---------------------------------------------------|-----------------------|-------------------------------|----------------------|----------------------|----------------|
| Frequency<br>[MHz]                                | Reading<br>[dBuV / m] | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] | Result<br>[dBuV / m] | Margin<br>[dB] |
| 984.00                                            | 53.55                 | -14.31                        | 63.54                | 39.24                | 24.30          |

**NOTE.**

- No other emissions were detected at a level greater than 20dB below limit.
- Correction Factor = Antenna + Cable - Amp. Gain
- Measurements made with 1 MHz RBW/3MHz VBW (RMS detector) at 1m distance. 1 msec averaging time were used for these frequencies per bin point measurements. Emissions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in 47 CFR, Part 15, Subpart C, §15.209.

Measurement Data: Test Data 4 is worst case ( $f > 1\text{GHz}$ ) for digital circuitry for BG 1

| ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 1M |                       |       |                               |                      |       |                      |       |                |       |
|-----------------------------------------------------|-----------------------|-------|-------------------------------|----------------------|-------|----------------------|-------|----------------|-------|
| Frequency<br>[MHz]                                  | Reading<br>[dBuV / m] |       | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] |       | Result<br>[dBuV / m] |       | Margin<br>[dB] |       |
|                                                     | PK                    | AV    |                               | PK                   | AV    | PK                   | AV    | PK             | AV    |
| 1608.54                                             | 70.34                 | 60.25 | -9.55                         | 83.54                | 63.54 | 60.79                | 50.70 | 22.75          | 12.84 |
| 1656.30                                             | 65.56                 | 54.87 | -9.55                         | 83.54                | 63.54 | 56.01                | 45.32 | 27.53          | 18.22 |
| -                                                   | -                     | -     | -                             | -                    | -     | -                    | -     | -              | -     |
| -                                                   | -                     | -     | -                             | -                    | -     | -                    | -     | -              | -     |

| ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 1M |                       |       |                               |                      |       |                      |       |                |       |
|---------------------------------------------------|-----------------------|-------|-------------------------------|----------------------|-------|----------------------|-------|----------------|-------|
| Frequency<br>[MHz]                                | Reading<br>[dBuV / m] |       | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] |       | Result<br>[dBuV / m] |       | Margin<br>[dB] |       |
|                                                   | PK                    | AV    |                               | PK                   | AV    | PK                   | AV    | PK             | AV    |
| 1608.54                                           | 65.21                 | 55.87 | -9.55                         | 83.54                | 63.54 | 55.66                | 46.32 | 27.88          | 17.22 |
| 1656.30                                           | 60.58                 | 50.94 | -9.55                         | 83.54                | 63.54 | 51.03                | 41.39 | 32.51          | 22.15 |
| -                                                 | -                     | -     | -                             | -                    | -     | -                    | -     | -              | -     |
| -                                                 | -                     | -     | -                             | -                    | -     | -                    | -     | -              | -     |

**NOTE.**

- No other emissions were detected at a level greater than 20dB below limit.
- Correction Factor = Antenna + Cable - Amp. Gain
- Measurements made with 1 MHz RBW/3MHz VBW (RMS detector) at 1m distance. 1 msec averaging time were used for these frequencies per bin point measurements. Emissions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in 47 CFR, Part 15, Subpart C, §15.209.

**Measurement Data: Test Data 8 is worst case ( $f > 1\text{GHz}$ ) for digital circuitry for BG 3**

| ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 1M |                       |       |                               |                      |       |                      |       |                |       |
|-----------------------------------------------------|-----------------------|-------|-------------------------------|----------------------|-------|----------------------|-------|----------------|-------|
| Frequency<br>[MHz]                                  | Reading<br>[dBuV / m] |       | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] |       | Result<br>[dBuV / m] |       | Margin<br>[dB] |       |
|                                                     | PK                    | AV    |                               | PK                   | AV    | PK                   | AV    | PK             | AV    |
| 1608.54                                             | 69.58                 | 60.34 | -9.55                         | 83.54                | 63.54 | 60.03                | 50.79 | 23.51          | 12.75 |
| 1656.30                                             | 65.25                 | 55.34 | -9.55                         | 83.54                | 63.54 | 55.70                | 45.79 | 27.84          | 17.75 |
| -                                                   | -                     | -     | -                             | -                    | -     | -                    | -     | -              | -     |
| -                                                   | -                     | -     | -                             | -                    | -     | -                    | -     | -              | -     |

| ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 1M |                       |       |                               |                      |       |                      |       |                |       |
|---------------------------------------------------|-----------------------|-------|-------------------------------|----------------------|-------|----------------------|-------|----------------|-------|
| Frequency<br>[MHz]                                | Reading<br>[dBuV / m] |       | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] |       | Result<br>[dBuV / m] |       | Margin<br>[dB] |       |
|                                                   | PK                    | AV    |                               | PK                   | AV    | PK                   | AV    | PK             | AV    |
| 1608.54                                           | 65.52                 | 55.21 | -9.55                         | 83.54                | 63.54 | 55.97                | 45.66 | 27.57          | 17.88 |
| 1656.30                                           | 59.55                 | 50.25 | -9.55                         | 83.54                | 63.54 | 50.00                | 40.70 | 33.54          | 22.84 |
| -                                                 | -                     | -     | -                             | -                    | -     | -                    | -     | -              | -     |
| -                                                 | -                     | -     | -                             | -                    | -     | -                    | -     | -              | -     |

**NOTE.**

- No other emissions were detected at a level greater than 20dB below limit.
- Correction Factor = Antenna + Cable - Amp. Gain
- Measurements made with 1 MHz RBW/3MHz VBW (RMS detector) at 1m distance. 1 msec averaging time were used for these frequencies per bin point measurements. Emissions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in 47 CFR, Part 15, Subpart C, §15.209.

Measurement Data: Test Data 12 is worst case ( $f > 1\text{GHz}$ ) for digital circuitry for BG 6

| ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 1M |                       |       |                               |                      |       |                      |       |                |       |
|-----------------------------------------------------|-----------------------|-------|-------------------------------|----------------------|-------|----------------------|-------|----------------|-------|
| Frequency<br>[MHz]                                  | Reading<br>[dBuV / m] |       | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] |       | Result<br>[dBuV / m] |       | Margin<br>[dB] |       |
|                                                     | PK                    | AV    |                               | PK                   | AV    | PK                   | AV    | PK             | AV    |
| 1608.54                                             | 69.52                 | 59.15 | -9.55                         | 83.54                | 63.54 | 59.97                | 49.60 | 23.57          | 13.94 |
| 1656.30                                             | 64.85                 | 54.34 | -9.55                         | 83.54                | 63.54 | 55.30                | 44.79 | 28.24          | 18.75 |
| -                                                   | -                     | -     | -                             | -                    | -     | -                    | -     | -              | -     |
| -                                                   | -                     | -     | -                             | -                    | -     | -                    | -     | -              | -     |

| ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 1M |                       |       |                               |                      |       |                      |       |                |       |
|---------------------------------------------------|-----------------------|-------|-------------------------------|----------------------|-------|----------------------|-------|----------------|-------|
| Frequency<br>[MHz]                                | Reading<br>[dBuV / m] |       | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] |       | Result<br>[dBuV / m] |       | Margin<br>[dB] |       |
|                                                   | PK                    | AV    |                               | PK                   | AV    | PK                   | AV    | PK             | AV    |
| 1608.54                                           | 64.25                 | 54.34 | -9.55                         | 83.54                | 63.54 | 54.70                | 44.79 | 28.84          | 18.75 |
| 1656.30                                           | 58.76                 | 49.54 | -9.55                         | 83.54                | 63.54 | 49.21                | 39.99 | 34.33          | 23.55 |
| -                                                 | -                     | -     | -                             | -                    | -     | -                    | -     | -              | -     |
| -                                                 | -                     | -     | -                             | -                    | -     | -                    | -     | -              | -     |

**NOTE.**

- No other emissions were detected at a level greater than 20dB below limit.
- Correction Factor = Antenna + Cable - Amp. Gain
- Measurements made with 1 MHz RBW/3MHz VBW (RMS detector) at 1m distance. 1 msec averaging time were used for these frequencies per bin point measurements. Emissions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in 47 CFR, Part 15, Subpart C, §15.209.

### 3.2.5 Radiated Emissions in GPS Bands Measurement

#### Procedure:

1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 1 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Measurements frequencies were maximized using a spectrum analyzer with RMS detector capabilities. A spectrum analyzer was used for the final measurements utilizing an RMS detector at the frequencies with the largest amplitudes. The prescribed RBW of 10 kHz and VBW of 10 kHz, and a 1 msec averaging time were used for these measurements.
6. Per 47 CFR, Part 15, Subpart F, §15.521© (§15.209) all digital emissions from the transmitter not intended to be radiated from the antenna port meet the 15.209 subpart C limits.

The spectrum analyzer is set to:

frequency = 1164~1240MHz / 1559~1610MHz

RBW = 10KHz

Span = auto

VBW = 10KHz (VBW  $\geq$  RBW)

Sweep = 1 msec averaging time were used for these

Detector function = RMS or Average

measurement frequencies

#### Minimum Standard:

In addition to the radiated emission limits specified in the table in paragraph 4.5.1 of this report, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz.

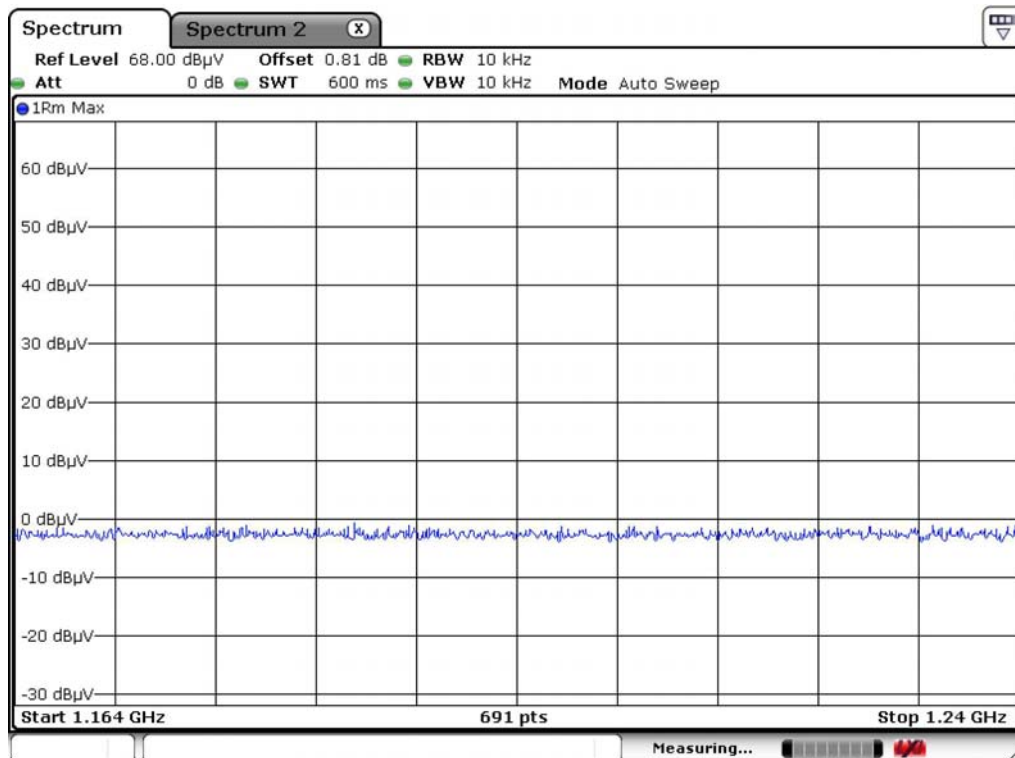
| Freq. (MHz) | EIRP (dBm) | E- Field (dB $\mu$ V/m) at 3m | E- Field (dB $\mu$ V/m) at 1m |
|-------------|------------|-------------------------------|-------------------------------|
| 1164-1240   | -85.3      | 9.9                           | <b>19.44</b>                  |
| 1559-1610   | -85.3      | 9.9                           | <b>19.44</b>                  |

Note 1: This may be converted to a peak field strength level at 3 meters using  $E(\text{dB}\mu\text{V/m}) = P(\text{dBm EIRP}) + 95.2 \text{ dB}$ .

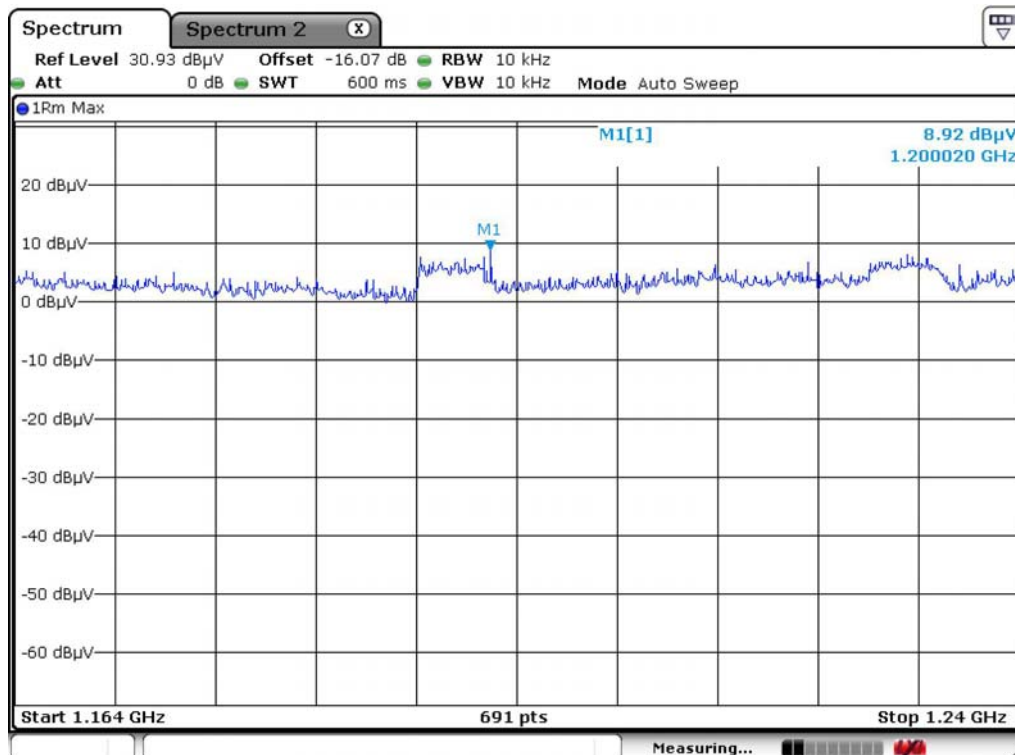
Note 2: Above 960MHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m. Distance extrapolation factor =  $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$  (dB); Limit line = specific limits (dB $\mu$ V) + distance extrapolation factor [9.54 dB].

## Measurement Data: 1164-1240MHz for VERTICAL WORST CASE at 1M

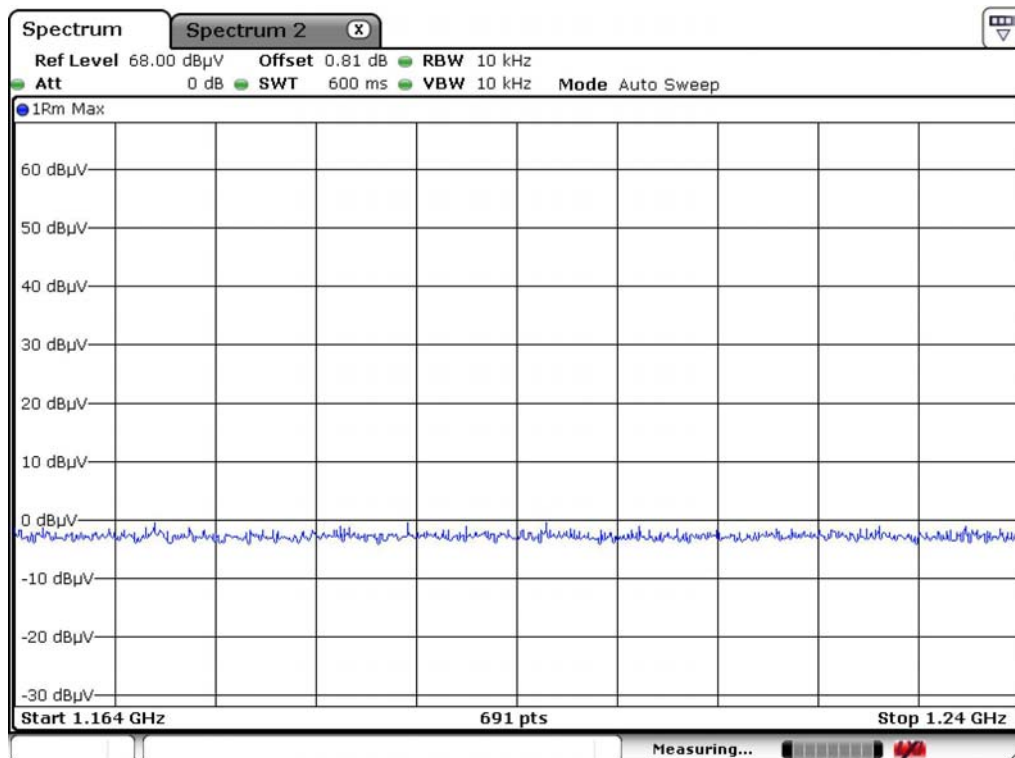
## Test mode 4 for Conducted antenna port emissions in GPS band



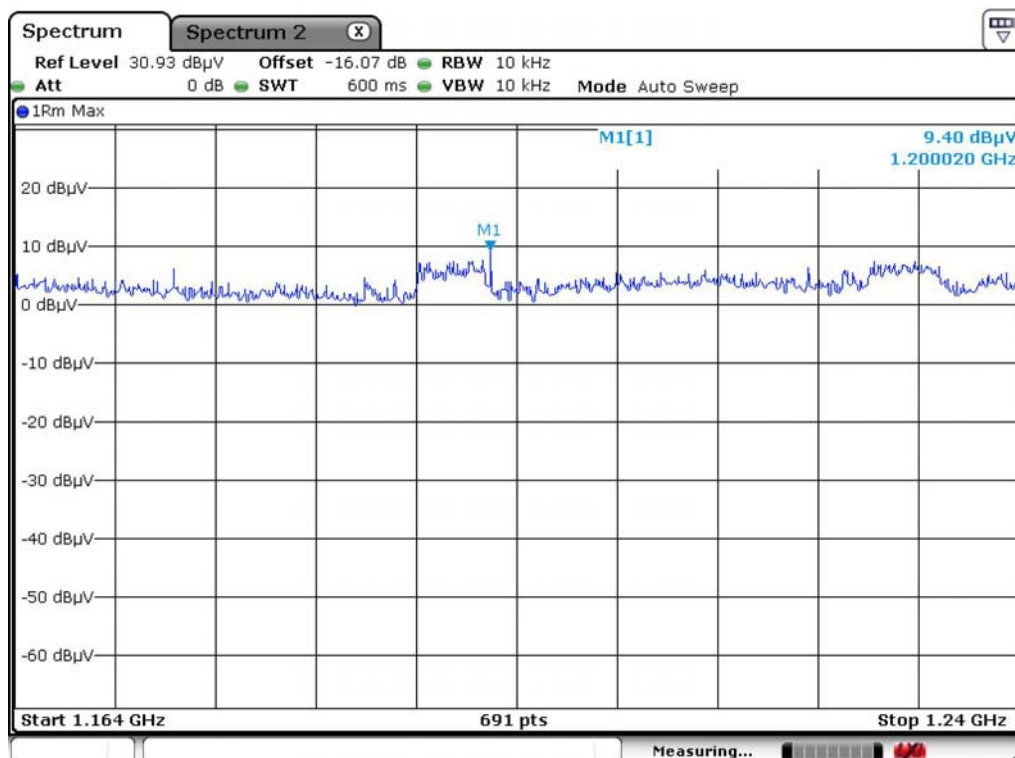
## Test mode 4 for Terminated antenna port emissions in GPS band



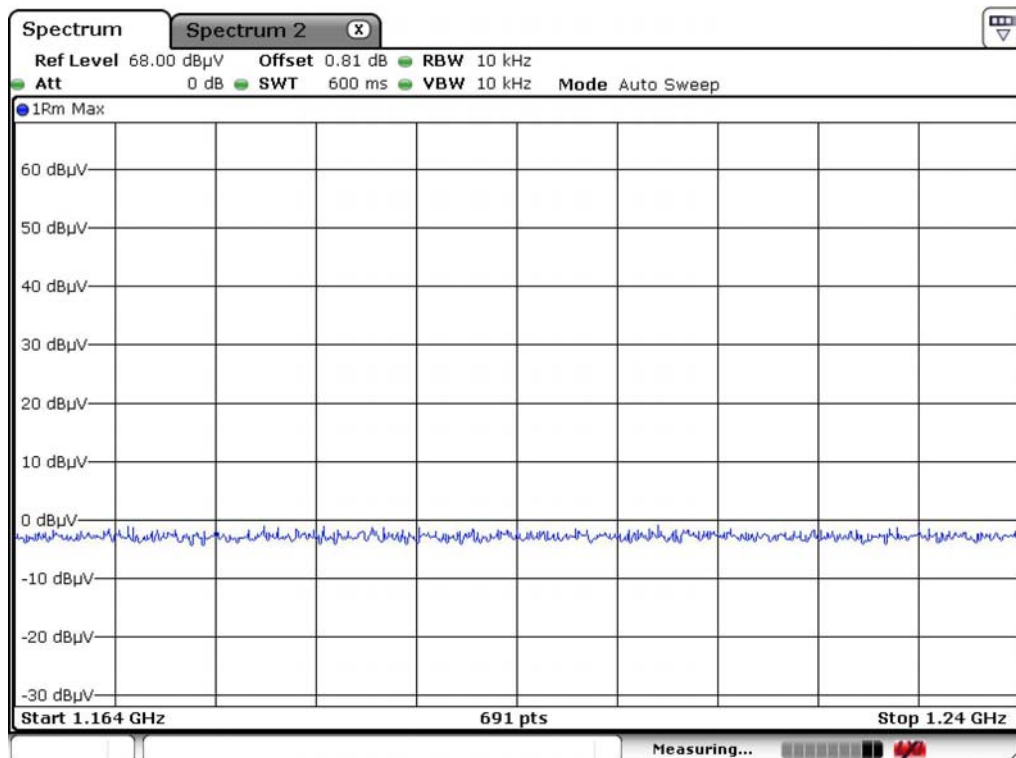
## Test mode 8 for Conducted antenna port emissions in GPS band



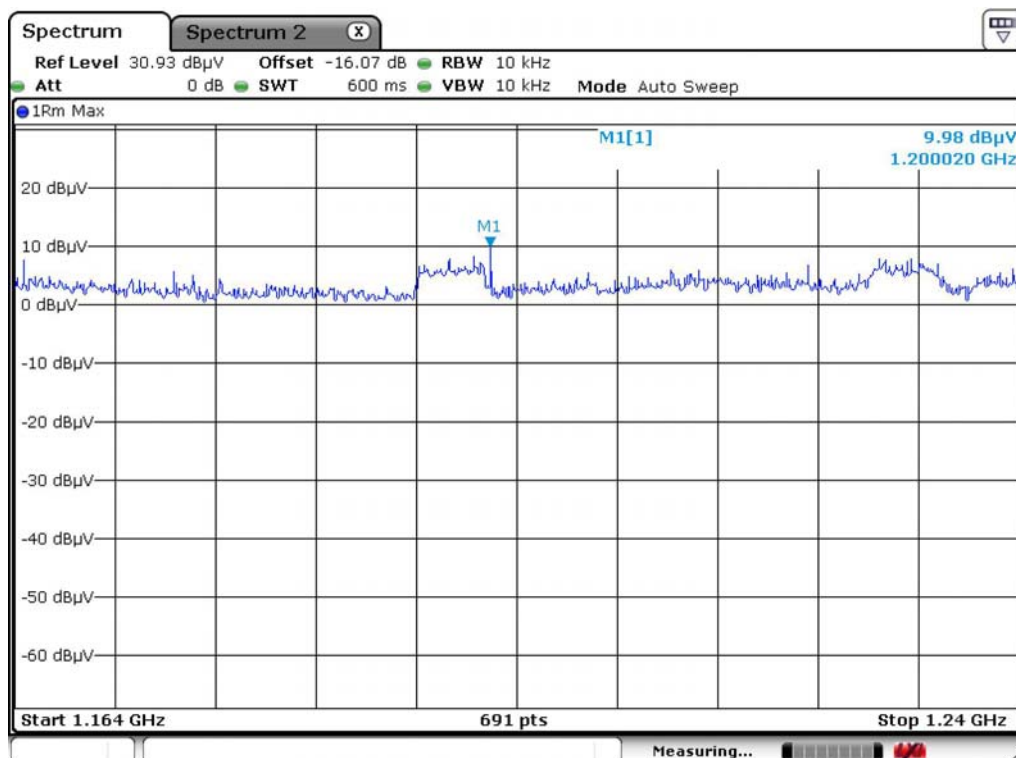
## Test mode 8 for Terminated antenna port emissions in GPS band



## Test mode 12 for Conducted antenna port emissions in GPS band

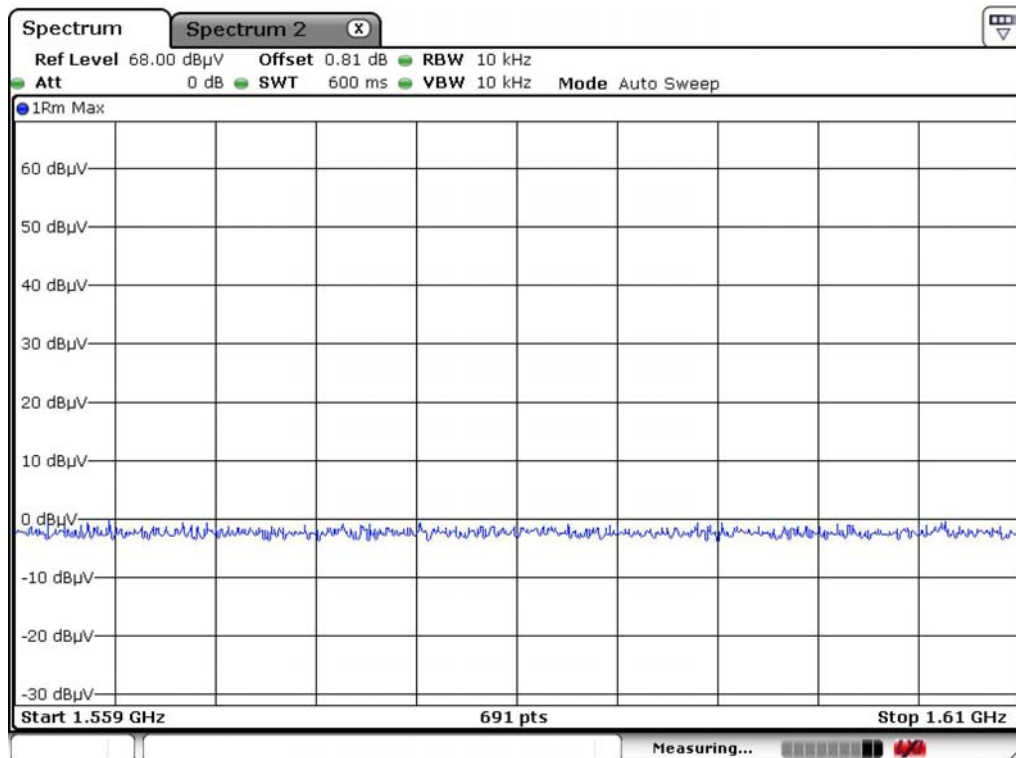


## Test mode 12 for Terminated antenna port emissions in GPS band

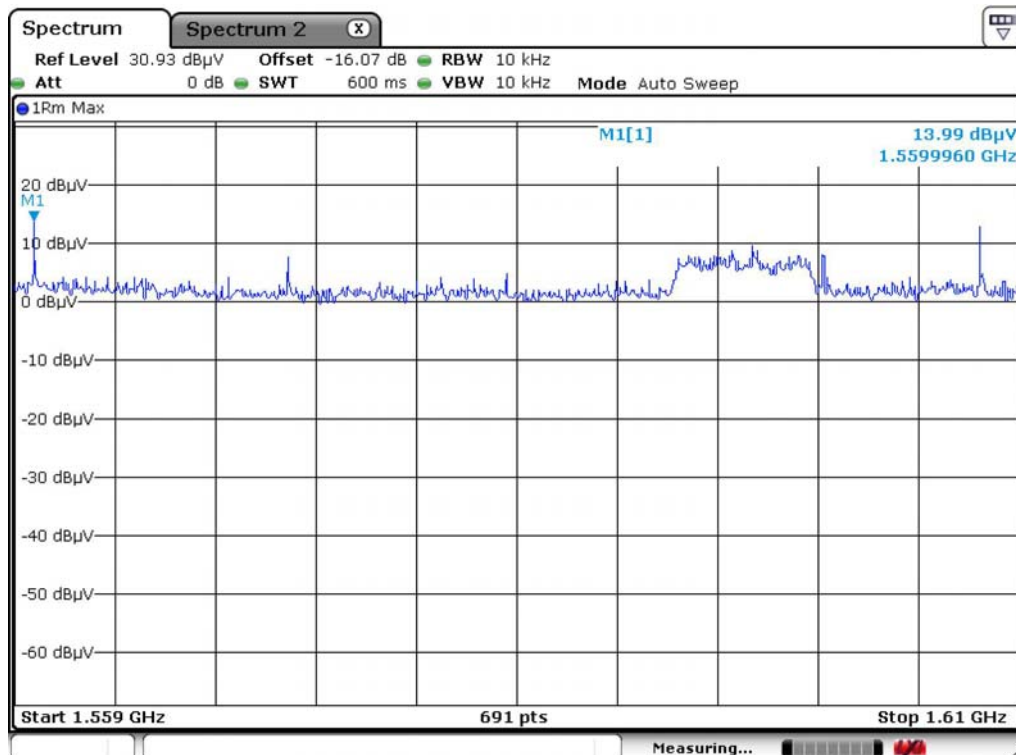


# Measurement Data: 1559-1610MHz for VERTICAL WORST CASE at 1M

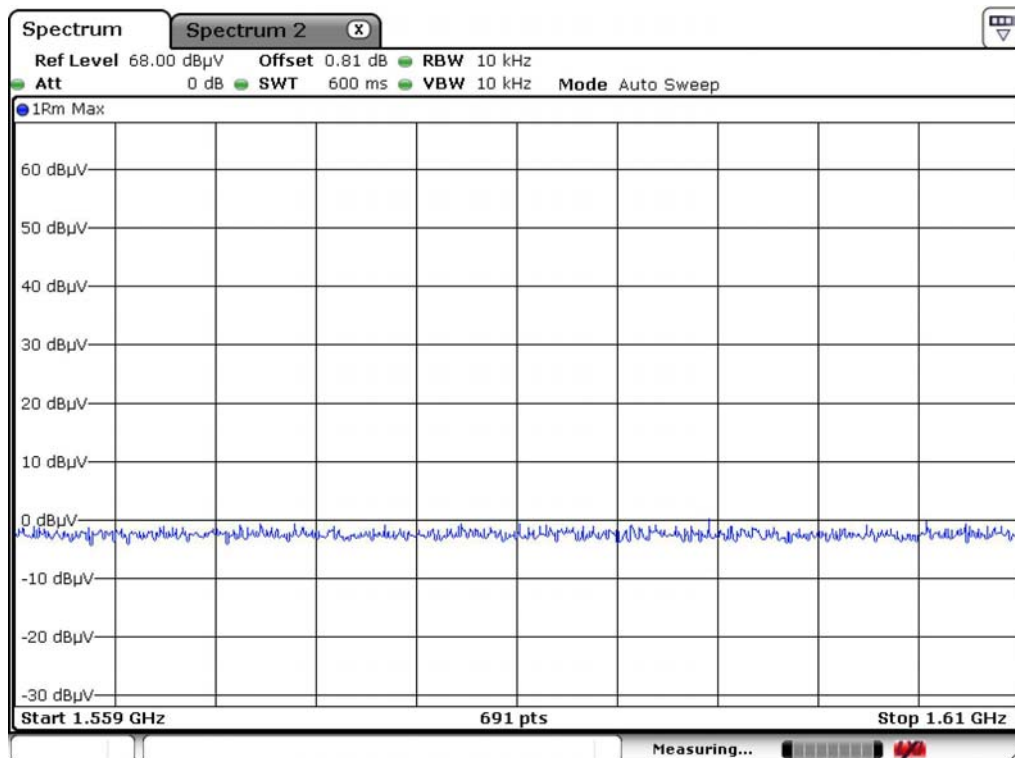
## Test mode 4 for Conducted antenna port emissions in GPS band



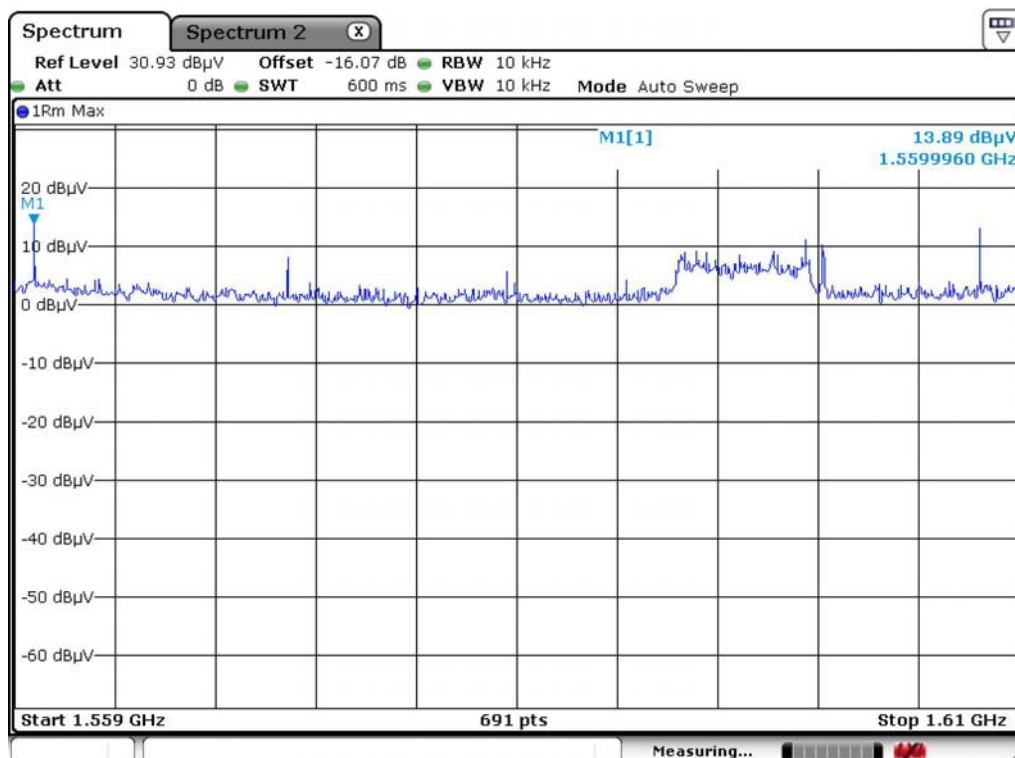
## Test mode 4 for Terminated antenna port emissions in GPS band



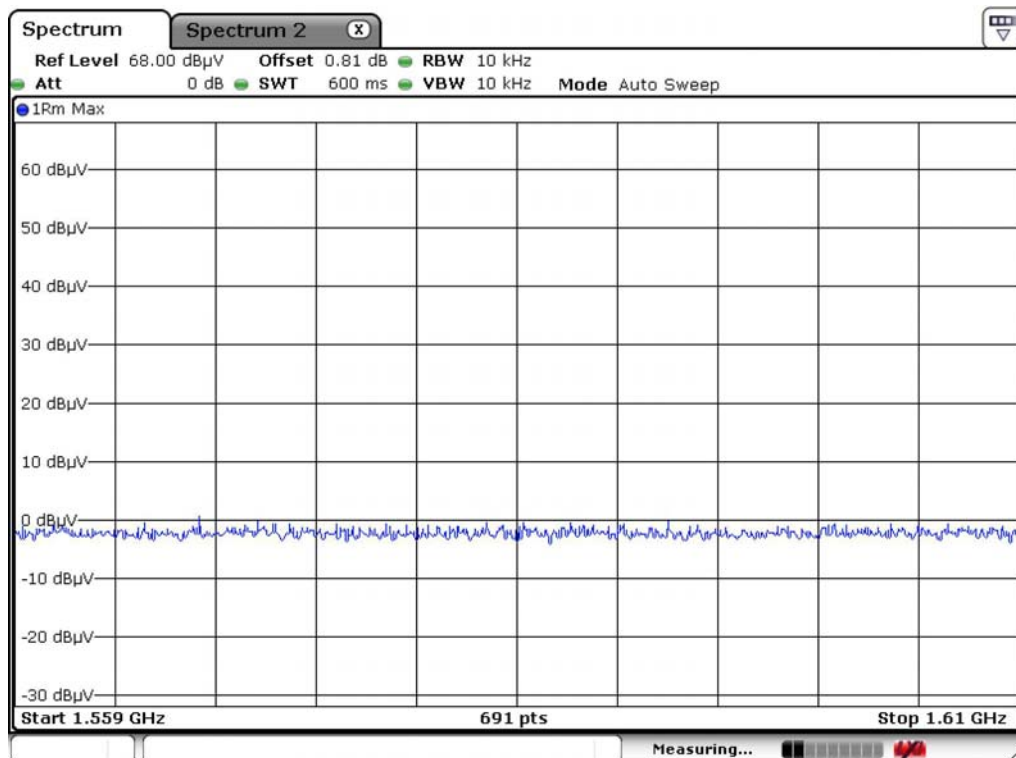
## Test mode 8 for Conducted antenna port emissions in GPS band



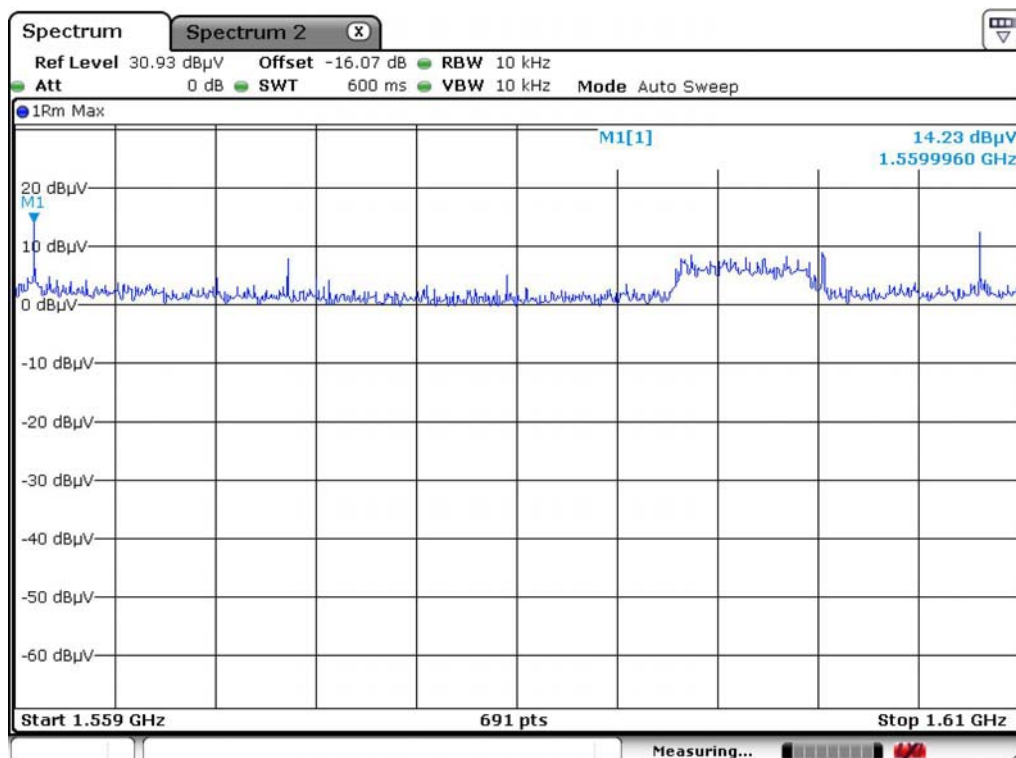
## Test mode 8 for Terminated antenna port emissions in GPS band



## Test mode 12 for Conducted antenna port emissions in GPS band



## Test mode 12 for Terminated antenna port emissions in GPS band



### 3.2.6 Peak Emissions within a 50MHz Bandwidth Measurement

#### Procedure:

1. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 1 meters far away from the turntable.
2. The horn receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
3. For maximum peak emission amplitude, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading and was used to determine the frequency at which the highest radiated emission occurs,  $f_M$ .
4. The individual UWB bandwidths were measured for each BAND\_ID (nb) of the UWB spectrum. Both horizontal and vertical polarizations were taken into account to determine the full UWB BW on the maximized (in azimuth and elevation) signals.
5. A spectrum analyzer was used for the final measurement utilizing a peak detector at the frequency with the largest amplitude. The prescribed resolution bandwidth of 50 MHz was not supported by the spectrum analyzer. However, when a peak measurement is required, The resolution bandwidth for this measurement was set to 10 MHz, and the measurement was centered on the frequency at which the highest radiated emission occurred,  $f_M$ . The video bandwidth was 10 MHz.

#### The spectrum analyzer is set to:

RBW = 10 MHz

Span = 600 MHz

VBW = 10 MHz

Sweep = auto

Detector function = peak

Trace = max hold

#### Minimum Standard:

There is a limit on the peak level of the emissions contained within a 10 MHz bandwidth centered on the frequency at which the highest radiated emission occurs,  $f_M$ . That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, EIRP limit has to be adjusted by the resolution bandwidth ratio of  $20\log(RBW/50)$  dB, where RBW is the resolution bandwidth used for the measurement expressed in MHz. In addition, This may be converted to a peak field strength level at 3 meters using  $E(\text{dB}\mu\text{V}/\text{m}) = P(\text{dBm EIRP}) + 95.2 \text{ dB}$ . And Peak emission shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m. Distance extrapolation factor =  $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$  (dB); Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB]

| Peak EIRP limit dBm<br>(RB / VB : 50MHz) | Peak EIRP limit dBm<br>(RB / VB: 10MHz) | E- Field (dB $\mu$ V/m) at 3m<br>(RB / VB: 10MHz) | E- Field (dB $\mu$ V/m) at 1m<br>(RB / VB: 10MHz) |
|------------------------------------------|-----------------------------------------|---------------------------------------------------|---------------------------------------------------|
| 0                                        | -13.97                                  | 81.23                                             | 90.77                                             |

**Measurement Data:**

| ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 1M |                    |                       |                               |                      |                      |                |
|---------------------------------------------------|--------------------|-----------------------|-------------------------------|----------------------|----------------------|----------------|
| TEST<br>MODE                                      | Frequency<br>[MHz] | Reading<br>[dBuV / m] | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] | Result<br>[dBuV / m] | Margin<br>[dB] |
| 1                                                 | 3432.00            | 88.25                 | -2.67                         | 90.77                | 85.58                | 5.19           |
| 2                                                 | 3960.00            | 88.06                 | -2.67                         | 90.77                | 85.39                | 5.38           |
| 3                                                 | 4488.00            | 88.02                 | -2.67                         | 90.77                | 85.35                | 5.42           |
| 4                                                 | 3432.00            | 88.31                 | -2.67                         | 90.77                | 85.64                | 5.13           |
| 5                                                 | 6600.00            | 84.15                 | 1.56                          | 90.77                | 85.71                | 5.06           |
| 6                                                 | 7128.00            | 84.52                 | 1.56                          | 90.77                | 86.08                | 4.69           |
| 7                                                 | 7656.00            | 83.15                 | 2.81                          | 90.77                | 85.96                | 4.81           |
| 8                                                 | 7128.00            | 85.02                 | 1.56                          | 90.77                | 86.58                | 4.19           |
| 9                                                 | 7656.00            | 82.34                 | 2.81                          | 90.77                | 85.15                | 5.62           |
| 10                                                | 8184.00            | 83.25                 | 2.81                          | 90.77                | 86.06                | 4.71           |
| 11                                                | 8712.00            | 82.00                 | 3.89                          | 90.77                | 85.89                | 4.88           |
| 12                                                | 8184.00            | 83.86                 | 2.81                          | 90.77                | 86.67                | 4.10           |

| ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 1M |                    |                       |                               |                      |                      |                |
|-----------------------------------------------------|--------------------|-----------------------|-------------------------------|----------------------|----------------------|----------------|
| TEST<br>MODE                                        | Frequency<br>[MHz] | Reading<br>[dBuV / m] | Correction Factor<br>[dB / m] | Limits<br>[dBuV / m] | Result<br>[dBuV / m] | Margin<br>[dB] |
| 1                                                   | 3432.00            | 79.25                 | -2.67                         | 90.77                | 76.58                | 14.19          |
| 2                                                   | 3960.00            | 79.06                 | -2.67                         | 90.77                | 76.39                | 14.38          |
| 3                                                   | 4488.00            | 79.11                 | -2.67                         | 90.77                | 76.44                | 14.33          |
| 4                                                   | 3432.00            | 79.58                 | -2.67                         | 90.77                | 76.91                | 13.86          |
| 5                                                   | 6600.00            | 75.11                 | 1.56                          | 90.77                | 76.67                | 14.10          |
| 6                                                   | 7128.00            | 75.64                 | 1.56                          | 90.77                | 77.20                | 13.57          |
| 7                                                   | 7656.00            | 74.05                 | 2.81                          | 90.77                | 76.86                | 13.91          |
| 8                                                   | 7128.00            | 76.21                 | 1.56                          | 90.77                | 77.77                | 13.00          |
| 9                                                   | 7656.00            | 73.38                 | 2.81                          | 90.77                | 76.19                | 14.58          |
| 10                                                  | 8184.00            | 74.55                 | 2.81                          | 90.77                | 77.36                | 13.41          |
| 11                                                  | 8712.00            | 73.25                 | 3.89                          | 90.77                | 77.14                | 13.63          |
| 12                                                  | 8184.00            | 74.64                 | 2.81                          | 90.77                | 77.45                | 13.32          |

**NOTE.**

- Correction Factor = Antenna + Cable - Amp. Gain

## APPENDIX

### TEST EQUIPMENT USED FOR TESTS

|    | Description                          | Model No.   | Serial No.    | Manufacturer  | Next Cal. Date |
|----|--------------------------------------|-------------|---------------|---------------|----------------|
| 1  | Spectrum Analyzer                    | FSV-30      | 100757        | R&S           | Feb-11         |
| 2  | Spectrum Analyzer                    | 8564E       | 3551A00410    | HP            | Oct-11         |
| 3  | Spectrum Analyzer                    | 8594E       | 3710A04074    | HP            | Oct-11         |
| 4  | Signal Generator                     | 8648C       | 3623A02597    | HP            | Mar-11         |
| 5  | Signal Generator                     | 83711B      | US34490456    | HP            | Mar-11         |
| 6  | Attenuator (3dB)                     | 8491A       | 37822         | HP            | Oct-11         |
| 7  | Attenuator (10dB)                    | 8491A       | 63196         | HP            | Oct-11         |
| 8  | EMI Test Receiver                    | ESCI7       | 100722        | R&S           | Jun-11         |
| 9  | Horn Antenna(18 ~ 40GHz)             | SAS-574     | 154           | Schwarzbeck   | Nov-12         |
| 10 | Horn Antenna(18 ~ 40GHz)             | SAS-574     | 155           | Schwarzbeck   | Nov-12         |
| 11 | RF Amplifier                         | 8447D       | 2949A02670    | HP            | Oct-11         |
| 12 | RF Amplifier                         | 8449B       | 3008A02126    | HP            | Mar-11         |
| 13 | Test Receiver                        | ESHS10      | 828404/009    | R&S           | Mar-11         |
| 14 | TRILOG Antenna                       | VULB 9160   | 9160-3212     | SCHWARZBECK   | Apr-11         |
| 15 | Log.-Per. Antenna                    | VULP 9118   | 9118 A 401    | SCHWARZBECK   | Apr-11         |
| 16 | Biconical Antenna                    | BBA 9106    | VHA 9103-2315 | SCHWARZBECK   | Apr-11         |
| 17 | Horn Antenna                         | 3115        | 00055005      | ETS LINDGREN  | Mar-11         |
| 18 | Horn Antenna                         | BBHA 9120D  | 9120D122      | SCHWARZBECK   | Dec-10         |
| 19 | Dipole Antenna                       | VHA9103     | 2116          | SCHWARZBECK   | Nov-12         |
| 20 | Dipole Antenna                       | VHA9103     | 2117          | SCHWARZBECK   | Nov-12         |
| 21 | Dipole Antenna                       | VHA9105     | 2261          | SCHWARZBECK   | Nov-12         |
| 22 | Dipole Antenna                       | VHA9105     | 2262          | SCHWARZBECK   | Nov-12         |
| 23 | Hygro-Thermograph                    | THB-36      | 0041557-01    | ISUZU         | Mar-11         |
| 24 | Splitter (SMA)                       | ZFSC-2-2500 | SF617800326   | Mini-Circuits | -              |
| 25 | RF Switch                            | MP59B       | 6200414971    | ANRITSU       | -              |
| 26 | Power Divider                        | 11636A      | 6243          | HP            | Oct-11         |
| 27 | DC Power Supply                      | 6622A       | 3448A03079    | HP            | Oct-11         |
| 28 | Frequency Counter                    | 5342A       | 2826A12411    | HP            | Mar-11         |
| 29 | Power Meter                          | EPM-441A    | GB32481702    | HP            | Mar-11         |
| 30 | Power Sensor                         | 8481A       | US41030291    | HP            | Oct-11         |
| 31 | Audio Analyzer                       | 8903B       | 3729A18901    | HP            | Oct-11         |
| 32 | Modulation Analyzer                  | 8901B       | 3749A05878    | HP            | Oct-11         |
| 33 | TEMP & HUMIDITY Chamber              | YJ-500      | LTAS06041     | JinYoung Tech | Oct-11         |
| 34 | LOOP-ANTENNA                         | FMZB 1516   | 151602/94     | SCHWARZBECK   | Mar-11         |
| 35 | Stop Watch                           | HS-3        | 601Q09R       | CASIO         | Mar-11         |
| 36 | LISN                                 | ENV216      | 100408        | R&S           | Oct-11         |
| 37 | UNIVERSAL RADIO COMMUNICATION TESTER | CMU200      | 106243        | R&S           | May-12         |