LTA
Laboratory for Test & Approval Co.,Ltd.
243 Jubug-Ri,Yangji-Myeon, Yongin-Si, Gyeonggi-Do, Korea 449-822
Tel: +82-31-323-6008 Fax: +82-31-323-6010
http://www.ltalab.com

Dates of Tests: September 17~28, 2012
Test Report S/N: LR500111209L
Test Site : LTA CO., LTD.

CERTIFICATION OF COMPLIANCE

FCC ID. **Q48-AUVS-3190-D**

APPLICANT **ABCO**

Equipment Class	:	**Ultra Wideband Transmitter (UWB)**
Manufacturing Description	:	**UWB Wireless VGA dongle**
Manufacturer	:	**ABCO**
Model name	:	**AUHS-3190-D**
Variant model name	:	**WPCTVTX**
Test Device Serial No.:	:	**Identical prototype**
Rule Part(s)	:	**FCC Part 15 Subpart F ; ANSI C-63.4-2003**
Frequency Range	:	**3168MHz ~ 4752MHz**
Max. Output Power	:	**Max 78.66 dBuV - Radiated**
Data of issue	:	**September 28, 2012**

This test report is issued under the authority of:

Kyu-Hyun Lee, Manager

The test was supervised by:

Jung-Moo Her, 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

Copyright © 2012, LTA Co., Ltd.

TABLE OF CONTENTS

1. GENERAL INFORMATION'S ---------- 3

2. INFORMATION'S ABOUT TEST ITEM ---------- 4

3. TEST REPORT ---------- 5

3.1 SUMMARY OF TESTS ---------- 5

3.2 TECHNICAL CHARACTERISTICS TEST ---------- 6

3.2.1 AC CONDUCTED EMISSIONS ---------- 6

3.2.2 Operational limitations ---------- 9

3.2.3 UWB Bandwidth Measurement ---------- 10

3.2.4 Radiated Emissions Measurement ---------- 13

3.2.5 Radiated Emissions in GPS Bands Measurement ---------- 18

3.2.6 Peak Emissions within a 10MHz Bandwidth Measurement ---------- 25

APPENDIX

APPENDIX TEST EQUIPMENT USED FOR TESTS ---------- 27

Copyright © 2012, LTA Co., Ltd.

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
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	2013-09-30	ECT accredited Lab.
RRL	KOREA	KR0049	2013-04-24	EMC accredited Lab.
FCC	U.S.A	610755	2014-04-27	FCC filing
FCC	U.S.A	649054	2013-04-13	FCC CAB
VCCI	JAPAN	R2133(10m), C2307	2014-06-21	VCCI registration
VCCI	JAPAN	T-2009	2013-12-23	VCCI registration
VCCI	JAPAN	G-563	2015-05-28	VCCI registration
IC	CANADA	5799A-1	2015-06-21	IC filing

Copyright © 2012, LTA Co., Ltd.

2. Information's about test item

2-1 Client & Manufacturer

Company name	:	ABCO
Address	:	31, Dunchon-daero 388 Beon-gil, Jungwon-gu, Seongnam-si Gyeonggi-do, KOREA
Tel / Fax	:	TEL: 82-31-730-5188 / FAX: 82-31-745-8056

2-2 Equipment Under Test (EUT)

Trade name	:	BestData Product Inc
FCC ID	:	Q48-AUVS-3190-D
Model name	:	AUHS-3190-D
Serial number	:	Identical prototype
Date of receipt	:	September 17, 2012
EUT condition	:	Pre-production, not damaged
Antenna type	:	Dipole Antenna
Frequency Range	:	3168MHz ~ 4752MHz
RF output power	:	Max 78.66 dBuV - Radiated
Type of Modulation	:	MB-OFDM
Power Source	:	5.0Vdc
Firmware version	:	V1.0.1

2-3 Ancillary Equipment

Equipment	Model No.	Serial No.	Manufacturer
Notebook	PP17L	N/A	DELL
PRINTER	STYLUS C65	N/A	EPSON
TV Moniter	LE23R18(R)	63343HDP901391E	SAMSUNG

2-4 Description of Test modes

MODE	SUB-BAND	Frequency (MHZ)
1	1	3432
2	2	3960
3	3	4488

*Note: After pre-testing each mode, the 3 mode was the worst situation and only the data was presented in the following sections.
<Except for "Radiated Emission in GPS band", "UWB Bandwidth Measurement", "Peak Emission Measurement">

EUT configure mode	Applicable to					Description
	RE<1G	RE≥1G	GPS	UB	PE	Frequency (MHZ)
1	-	-	√	√	√	3432
2	-	-	√	√	√	3960
3	√	√	√	√	√	4488

Where **RE<1G**: Radiated Emission below 1GHz **RE≥1G**: Radiated Emission above 1GHz
UB:UWB Bandwidth **PE**: Peak Emission
GPS: Radiated Emissions in GPS Bands

Copyright ⓒ 2012, LTA Co., Ltd.

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	C
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.

→ Antenna Requirement

The ABCO , FCC ID: **Q48-AUVS-3190-D** unit complies with the requirement of §15.203.
The antenna is Monopole Antenna (RPSMA type)

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

Copyright © 2012, LTA Co., Ltd.

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: **Complies**

- Refer to the next page.
- No other emissions were detected at a level greater than 20dB below limit
- It gave the worse case emissions

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

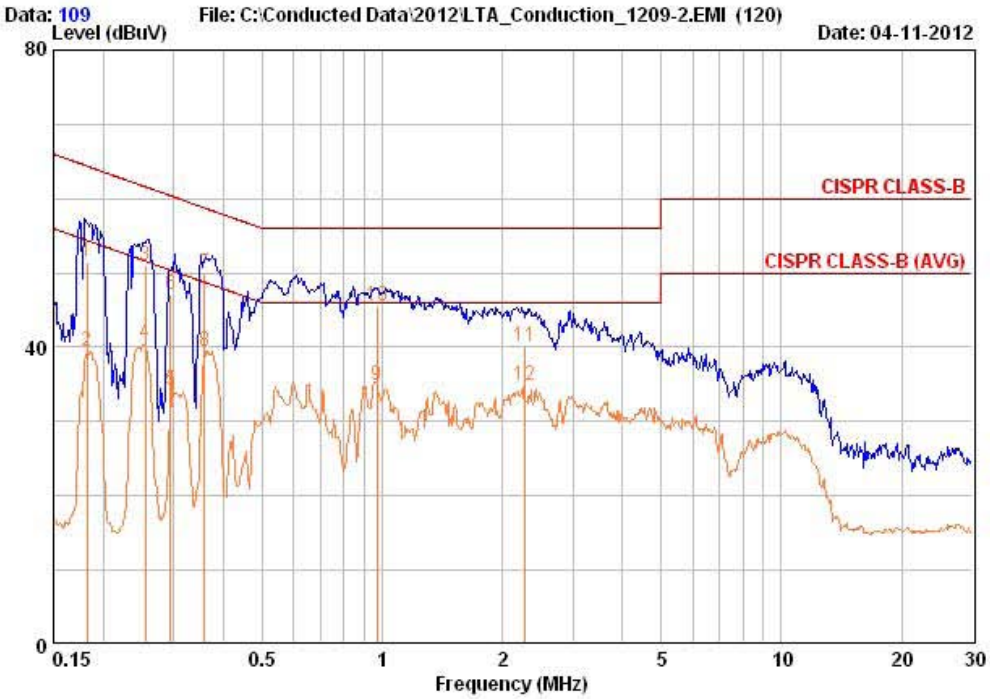
Copyright © 2012, LTA Co., Ltd.

Measurement Data: Test Data 3 is worst case (LINE)

LTA
Laboratory for Test & Approval Co.,Ltd.

243 Jubug-ri, yangji-Myeon, Youngin-si,
Gyeonggi-do 449-822 Korea
Tel :+82-31-3236008,9
Fax:+82-31-3236010

EUT / Model No.	: AUVS-3190-D	Phase	: LINE
Test Mode	: UWB mode	Test Power	: 120 / 60
Temp./Humi.	: 22 / 56	Test Engineer	: J M HER



Freq MHz	RD QP dBuV	RD AV dBuV	C.F dB	Result QP dBuV	Result AV dBuV	Limit QP dBuV	Limit AV dBuV	Margin QP dB	Margin AV dB
0.182	41.95	29.85	9.60	51.55	39.45	64.39	54.39	12.85	14.95
0.255	41.36	30.86	9.59	50.95	40.45	61.59	51.59	10.64	11.14
0.295	37.45	24.65	9.60	47.05	34.25	60.38	50.38	13.34	16.14
0.359	40.36	29.96	9.61	49.96	39.56	58.75	48.75	8.79	9.19
0.968	36.07	25.37	9.59	45.66	34.96	56.00	46.00	10.34	11.04
2.272	30.48	25.08	9.69	40.17	34.77	56.00	46.00	15.83	11.23

Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

- 1 -

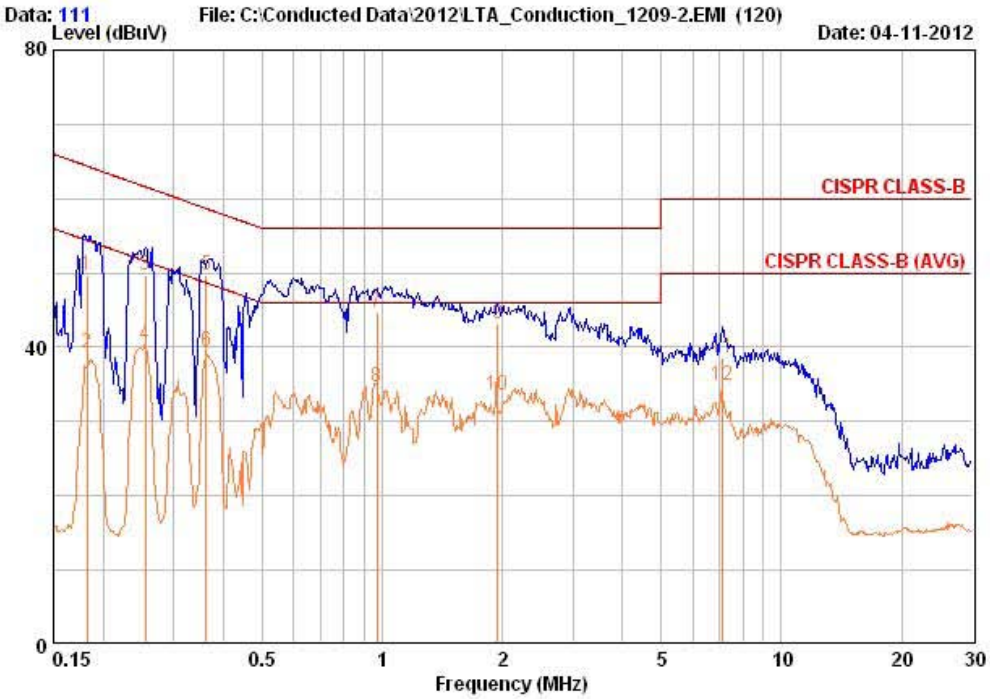
Copyright © 2012, LTA Co., Ltd.

Measurement Data: Test Data 3 is worst case (NEUTRAL)

LTA
Laboratory for Test & Approval Co.,Ltd.

243 Jubug-ri, yangji-Myeon, Youngin-si,
Gyeonggi-do 449-822 Korea
Tel :+82-31-3236008,9
Fax:+82-31-3236010

EUT / Model No.	: AUVS-3190-D	Phase	: NEUTRAL
Test Mode	: UWB mode	Test Power	: 120 / 60
Temp./Humi.	: 22 / 56	Test Engineer	: J M HER



Freq MHz	RD QP dBuV	RD AV dBuV	C.F dB	Result QP dBuV	Result AV dBuV	Limit QP dBuV	Limit AV dBuV	Margin QP dB	Margin AV dB
0.182	40.05	29.75	9.59	49.64	39.34	64.39	54.39	14.76	15.06
0.255	40.16	30.76	9.58	49.74	40.34	61.60	51.60	11.86	11.26
0.362	40.16	29.96	9.60	49.75	39.55	58.68	48.68	8.93	9.13
0.972	35.17	25.07	9.58	44.75	34.65	56.00	46.00	11.25	11.35
1.949	33.39	23.99	9.68	43.07	33.67	56.00	46.00	12.93	12.33
7.094	28.87	25.27	9.69	38.56	34.96	60.00	50.00	21.44	15.04

Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

- 1 -

Copyright © 2012, LTA Co., Ltd.

3.2.2 Operational limitations

Measurement Data:

Operation Restriction	Informed the applicant	Not applicabe	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. [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. [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. [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. [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 ≥ RBW) Sweep = auto

Trace = max hold Detector function = peak

Measurement Data:

Test mode	Frequency (MHz)	Test Results	
		limit	Result
1	3432	between 3100 MHz and 10,600 MHz	Complies
2	3960	between 3100 MHz and 10,600 MHz	Complies
3	4488	between 3100 MHz and 10,600 MHz	Complies

- See next pages for actual measured spectrum plots.

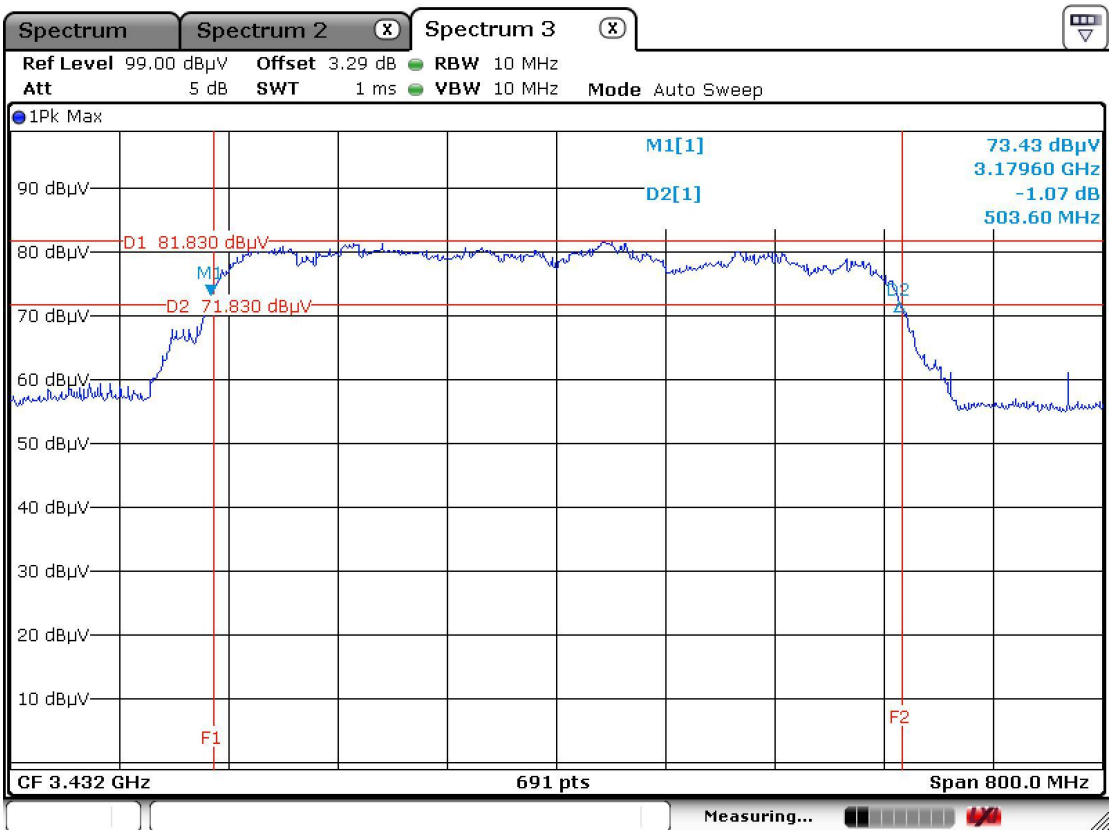
Minimum Standard:

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.

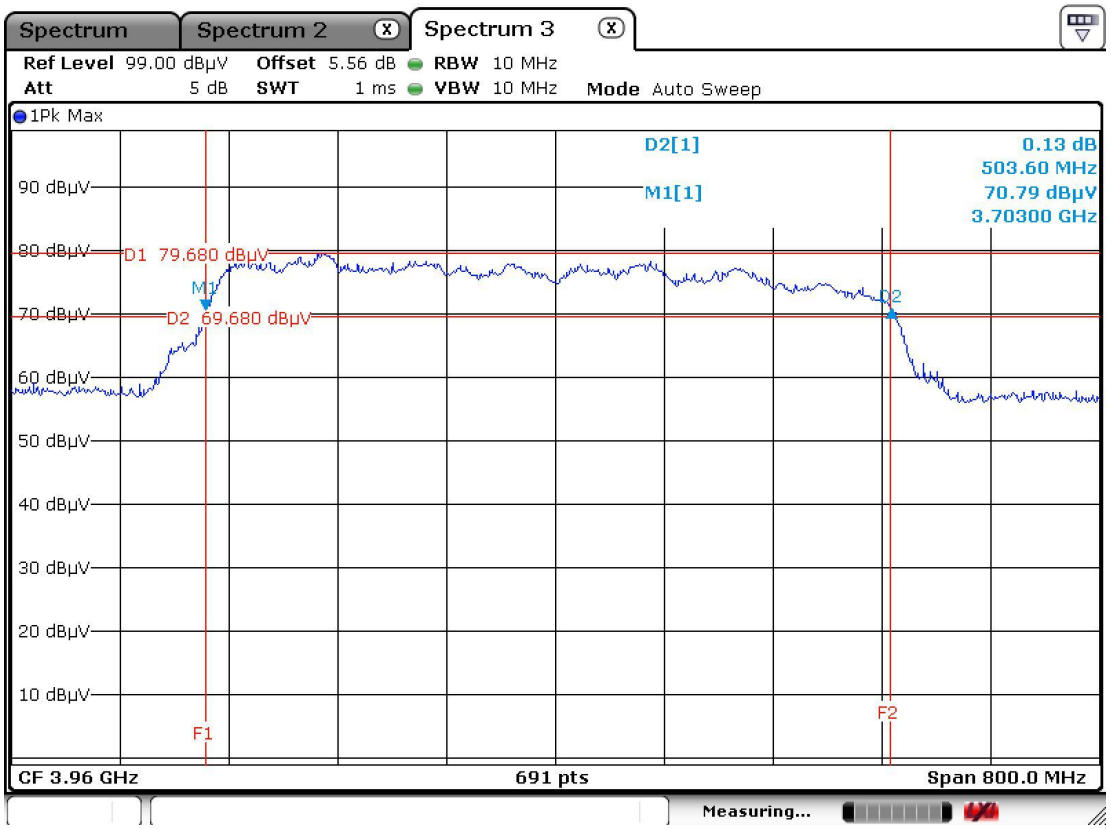
Copyright © 2012, LTA Co., Ltd.

Measurement Data:

Test mode 1

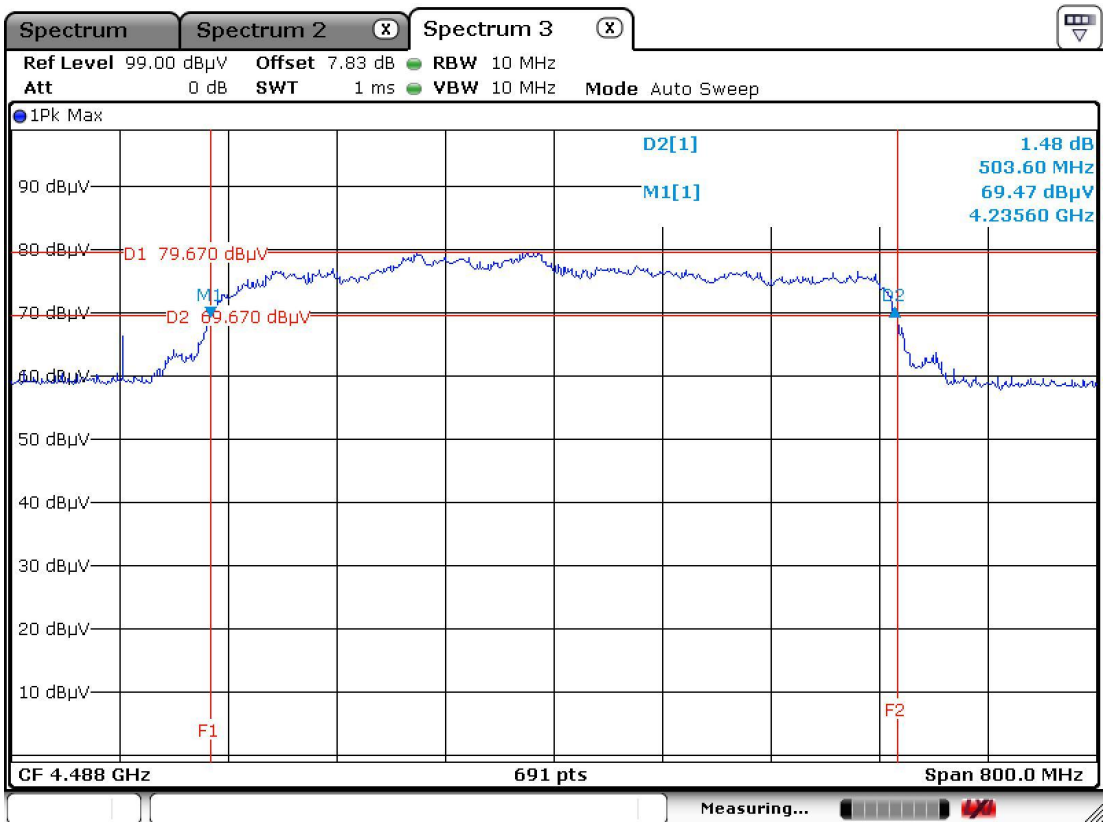


Test mode 2



Copyright © 2012, LTA Co., Ltd.

Test mode 3


Spectrum
Spectrum 2
Spectrum 3
Ref Level 99.00 dBµV
Offset 7.83 dB
RBW 10 MHz
Att 0 dB
SWT 1 ms
VBW 10 MHz
Mode Auto Sweep
1Pk Max
D2[1]
1.48 dB
503.60 MHz
69.47 dBµV
4.23560 GHz
M1[1]
90 dBµV
80 dBµV
70 dBµV
60 dBµV
50 dBµV
40 dBµV
30 dBµV
20 dBµV
10 dBµV
D1 79.670 dBµV
D2 69.670 dBµV
M1
D2
F1
F2
CF 4.488 GHz
691 pts
Span 800.0 MHz
Measuring...

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.

<u>The spectrum analyzer is set to:</u>

frequency = 1000MHz ~ 10th carrier harmonic or 40GHz

RBW = 1MHz

VBW = 3MHz (VBW ≥ RBW)

Detector function = RMS or Average

Span = auto

Sweep = 1 msec averaging time were used for these 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 (micorvolts/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(dBuV/m) = P(dBm EIRP) + 95.2 dB.

Note 2: Above 960MHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m. Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (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

Copyright © 2012, LTA Co., Ltd.

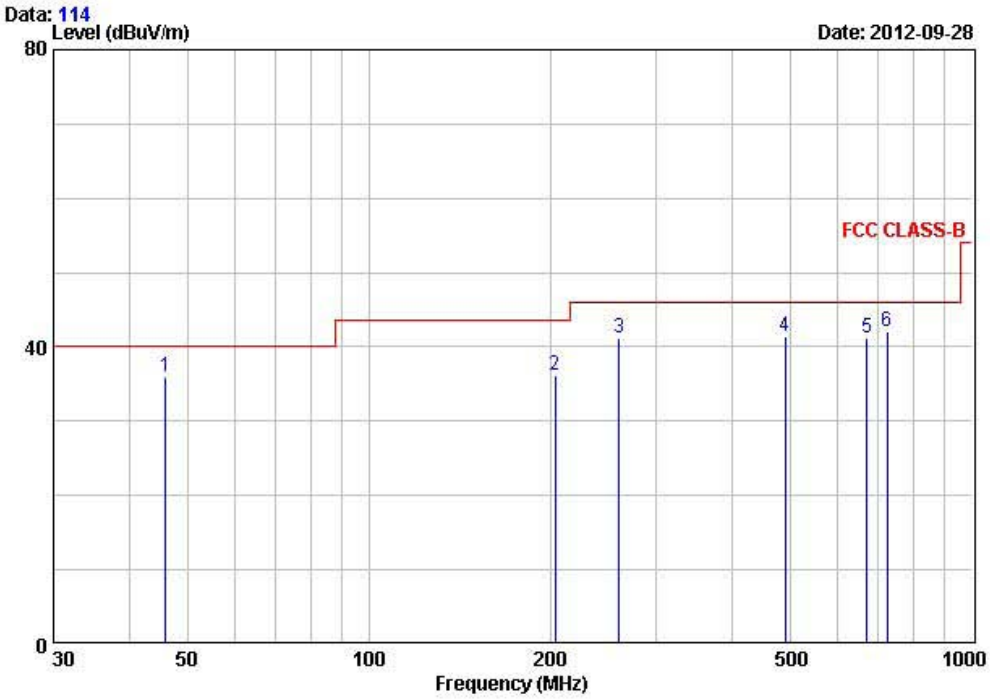
Measurement Data: Test Data 3 is worst case (f<1GHz)

LTA
Laboratory for Test & Approval Co.,Ltd.

243 Jubug-ri, yangji-Myeon, Youngin-si,
Gyeonggi-do 449-822 Korea
Tel :+82-31-3236008,9
Fax:+82-31-3236010

EUT/Model No.: AUVS-3190-D TEST MODE: UWB mode

Temp Humi : 20 / 45 Tested by: J M HER



	Freq MHz	Reading dBuV/m	C.F dB/m	Result dBuV/m	Limit QP dBuV/m	Margin dB	Height cm	Angle deg	Polarity
1	46.02	51.55	-15.50	36.05	40.00	3.95	100	125	VERTICAL
2	203.52	51.52	-15.28	36.24	43.50	7.26	205	95	HORIZONTAL
3	260.14	53.43	-12.29	41.14	46.00	4.86	120	269	VERTICAL
4	490.74	47.81	-6.49	41.32	46.00	4.68	189	251	HORIZONTAL
5	670.49	42.64	-1.45	41.19	46.00	4.81	400	316	VERTICAL
6	724.26	42.22	-0.23	41.99	46.00	4.01	253	134	HORIZONTAL

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

- 1 -

Copyright © 2012, LTA Co., Ltd.

Measurement Data: Test Data 3 is worst case (f>1GHz)

ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 1M					
Frequency [MHz]	Reading [dBuV/m]	Correction Factor [dB/m]	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
3388.00	52.70	0.21	63.54	52.91	10.63
3896.00	50.99	1.30	63.54	52.29	11.25
4267.00	53.90	3.39	63.54	57.29	6.25
-	-	-	-	-	-

ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 1M					
Frequency [MHz]	Reading [dBuV/m]	Correction Factor [dB/m]	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
3544.00	57.45	0.21	63.54	58.66	4.88
4098.00	58.88	1.30	63.54	60.18	3.36
4254.00	56.47	3.39	63.54	59.86	3.68
-	-	-	-	-	-

NOTE.

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

Copyright © 2012, LTA Co., Ltd.

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

ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 1M					
Frequency [MHz]	Reading [dBuV/m]	Correction Factor [dB/m]	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
954.00	56.22	-13.29	63.54	42.93	20.61

ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 1M					
Frequency [MHz]	Reading [dBuV/m]	Correction Factor [dB/m]	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
954.00	53.09	-13.29	63.54	39.80	23.74

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 3 is worst case (f>1GHz) for digital circuitry

ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 1M									
Frequency [MHz]	Reading [dBuV/m]		Correction Factor [dB/m]	Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
	PK	AV		PK	AV	PK	AV	PK	AV
1523.00	59.89	51.66	-9.59	83.54	63.54	50.30	42.07	33.24	21.47
-	-	-	-	-	-	-	-	-	-

ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 1M									
Frequency [MHz]	Reading [dBuV/m]		Correction Factor [dB/m]	Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
	PK	AV		PK	AV	PK	AV	PK	AV
1525.00	55.35	49.38	-9.59	83.54	63.54	45.76	39.79	37.78	23.75
-	-	--	-	-	-	-	-	-	-

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.

Copyright © 2012, LTA Co., Ltd.

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.

<u>The spectrum analyzer is set to:</u>

frequency = 1164~1240MHz / 1559~1610MHz

RBW = 10KHz

VBW = 10KHz (VBW ≥ RBW)

Detector function = RMS or Average

Span = auto

Sweep = 1 msec averaging time were used for these 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 (dBμV/m) at 3m	E- Field (dBμV/m) at 1m
1164-1240	-85.3	9.9	**19.44**
1559-1610	-85.3	9.9	**19.44**

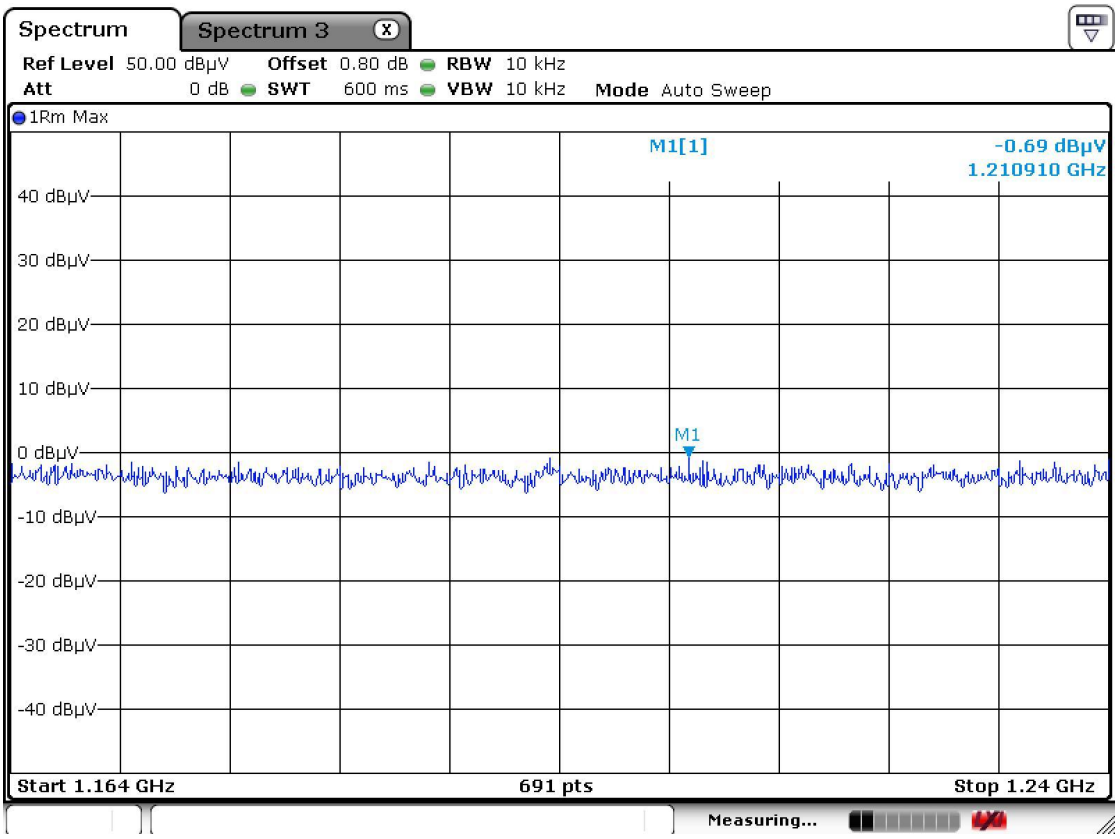
Note 1: This may be converted to a peak field strength level at 3 meters using E(dBuV/m) = P(dBm EIRP) + 95.2 dB.

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

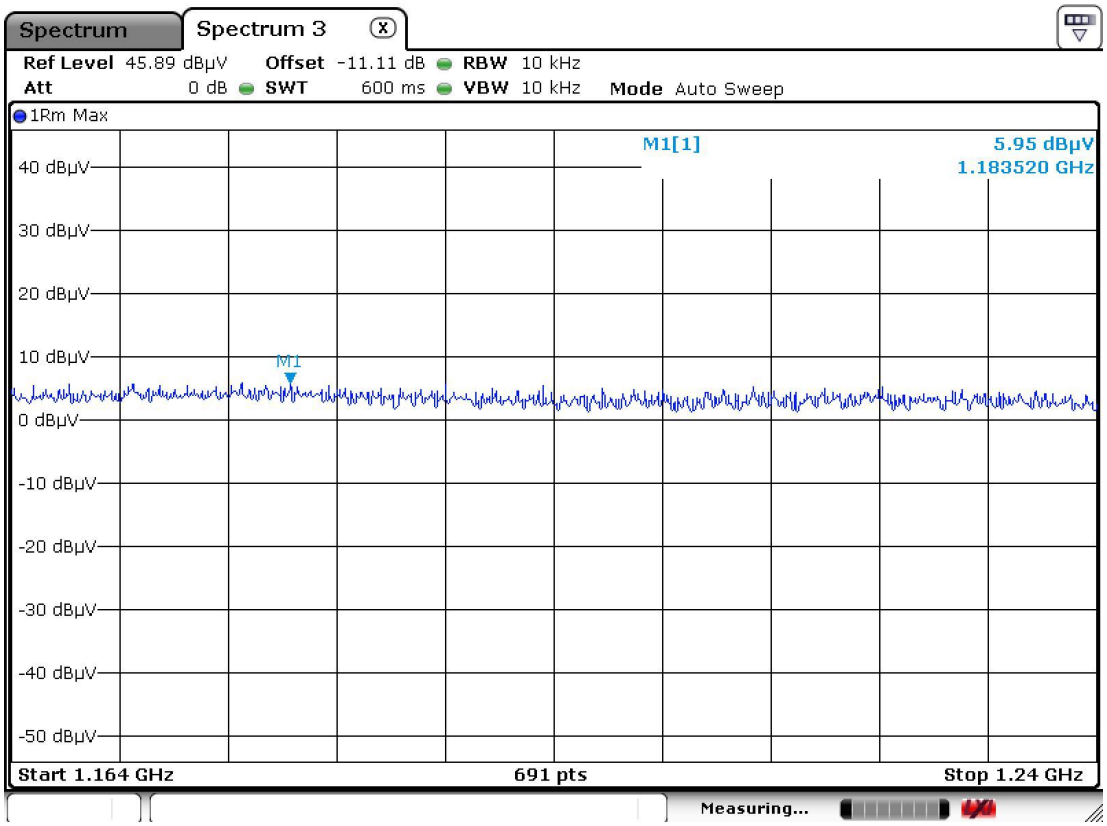
Copyright © 2012, LTA Co., Ltd.

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

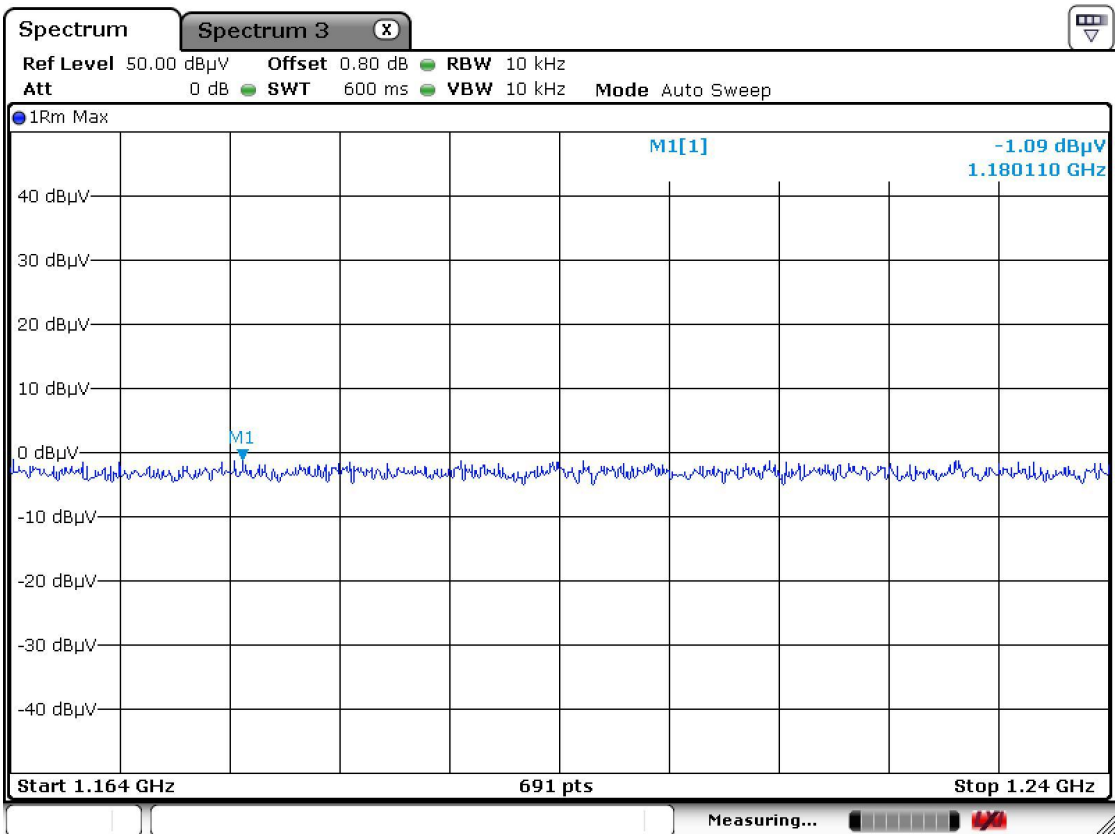
Test mode 1 for Conducted antenna port emissions in GPS band



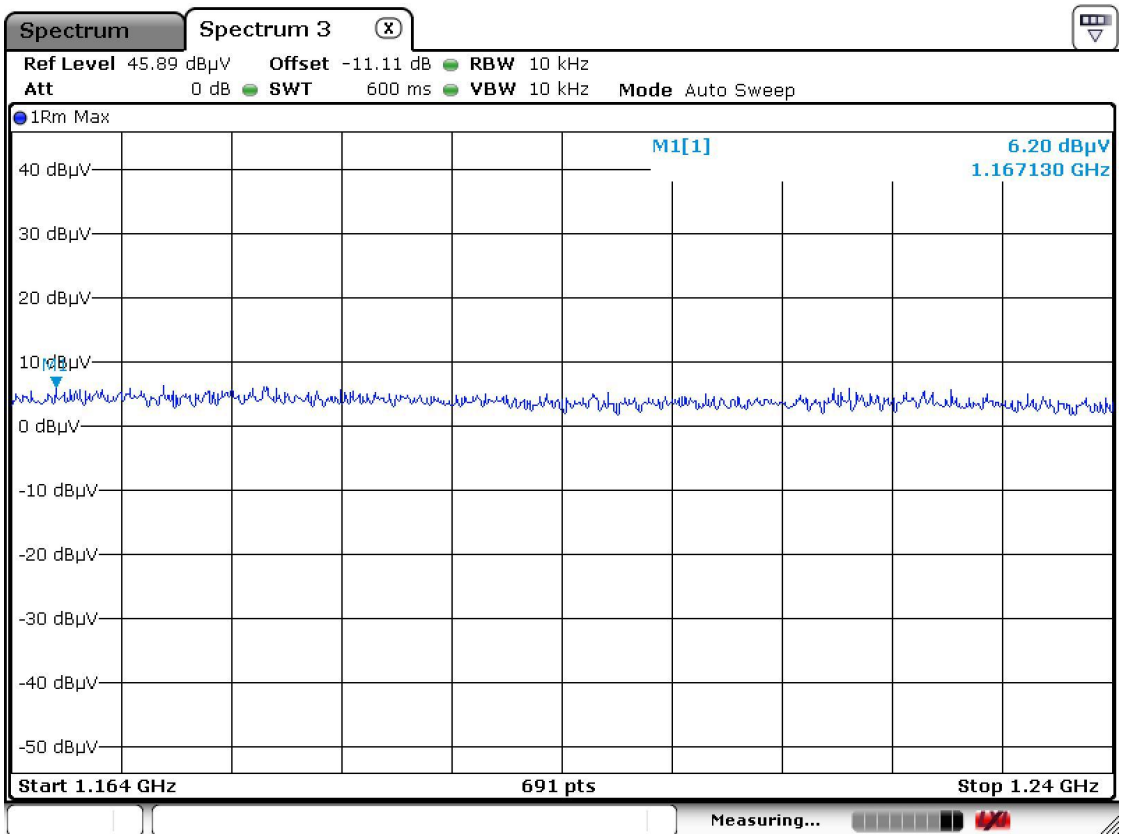
Test mode 1 for Terminated antenna port emissions in GPS band



Test mode 2 for Conducted antenna port emissions in GPS band

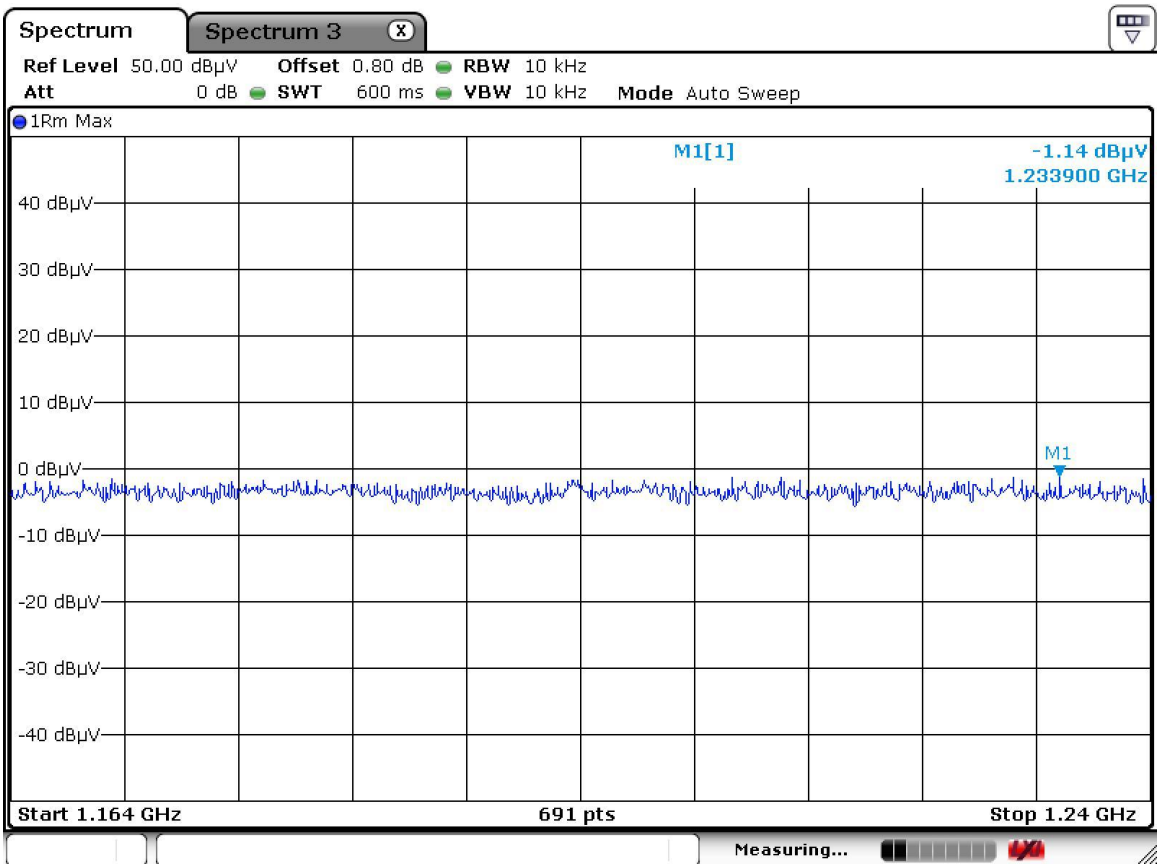


Test mode 2 for Terminated antenna port emissions in GPS band

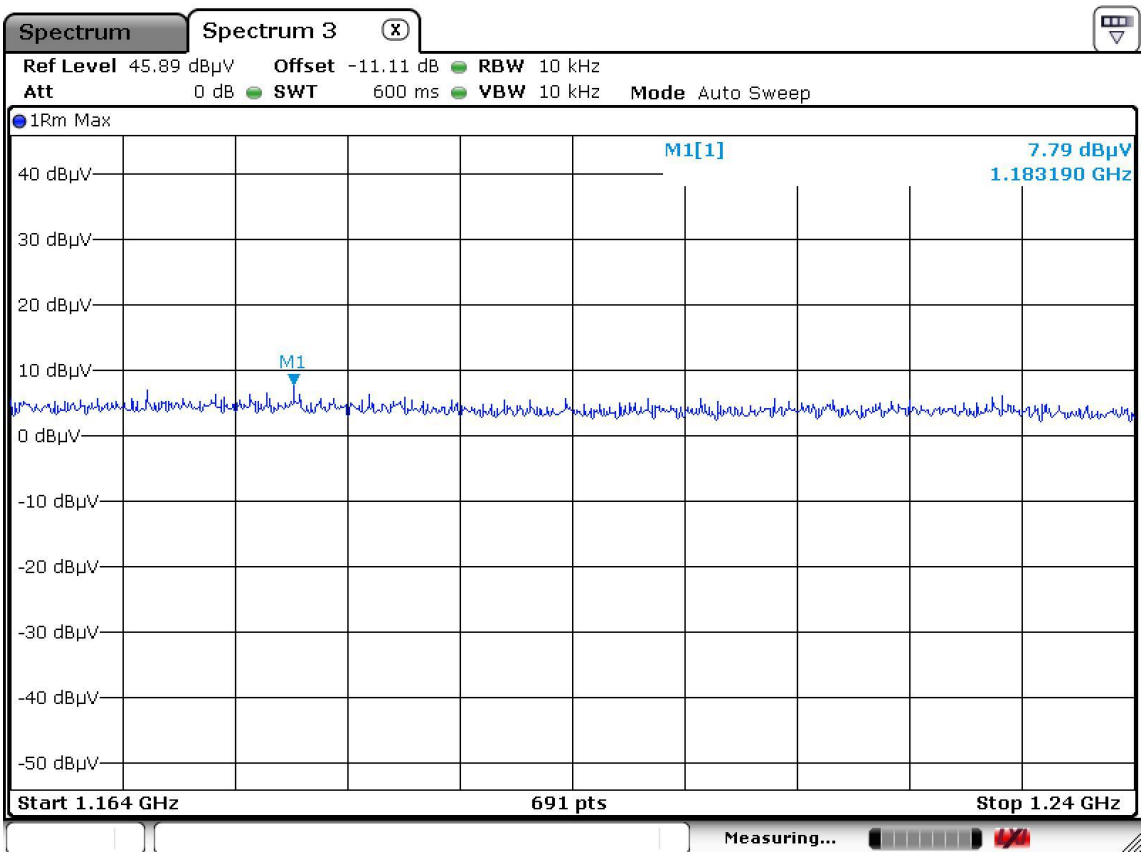


Copyright © 2012, LTA Co., Ltd.

Test mode 3 for Conducted antenna port emissions in GPS band



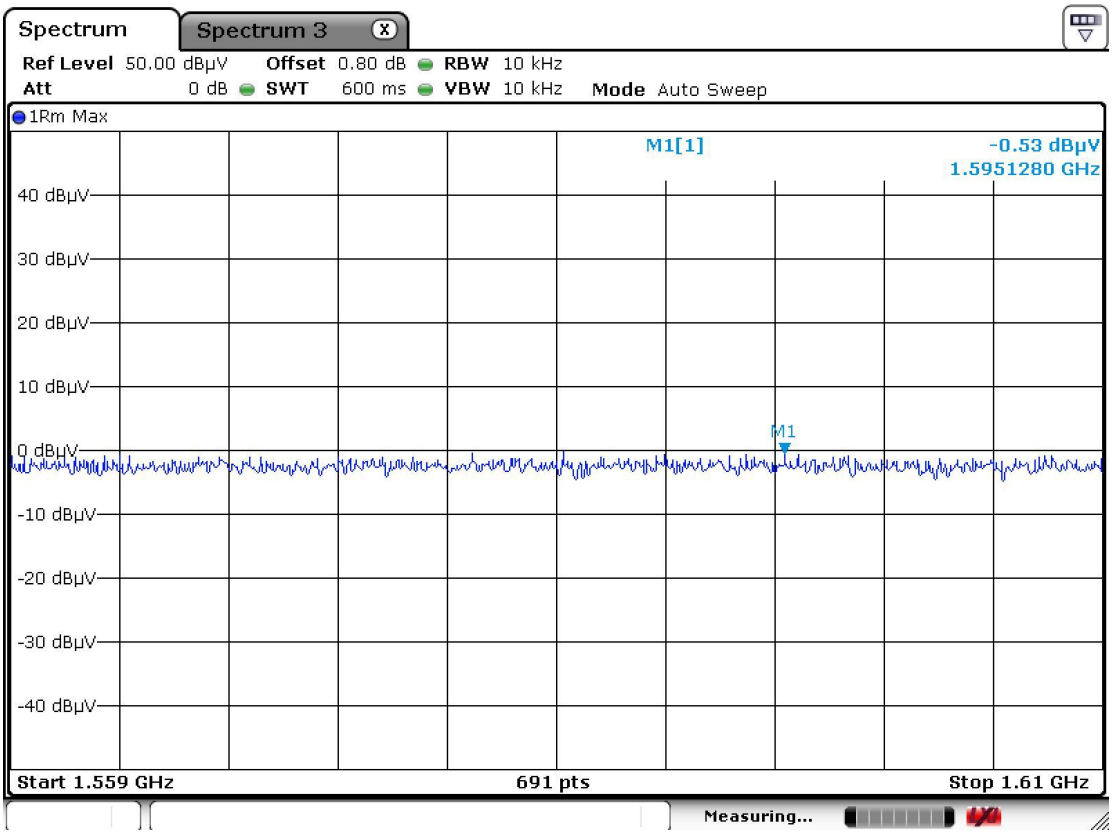
Test mode 3 for Terminated antenna port emissions in GPS band



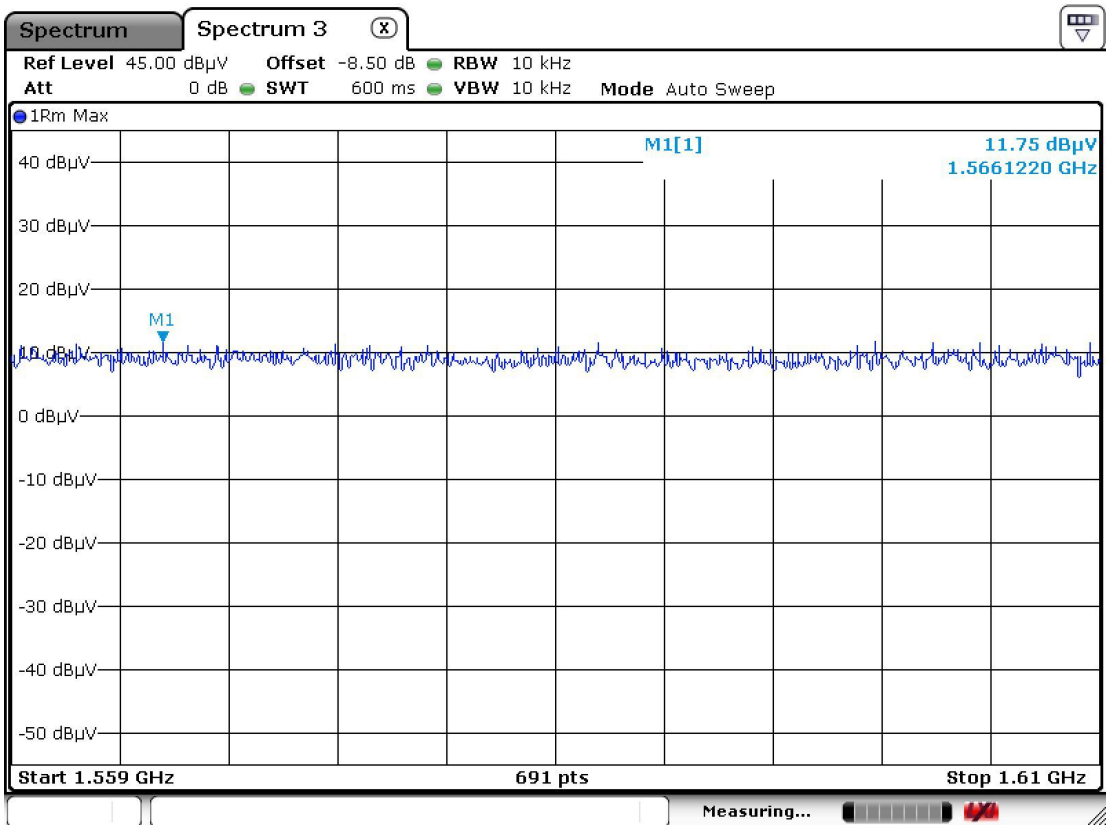
Copyright © 2012, LTA Co., Ltd.

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

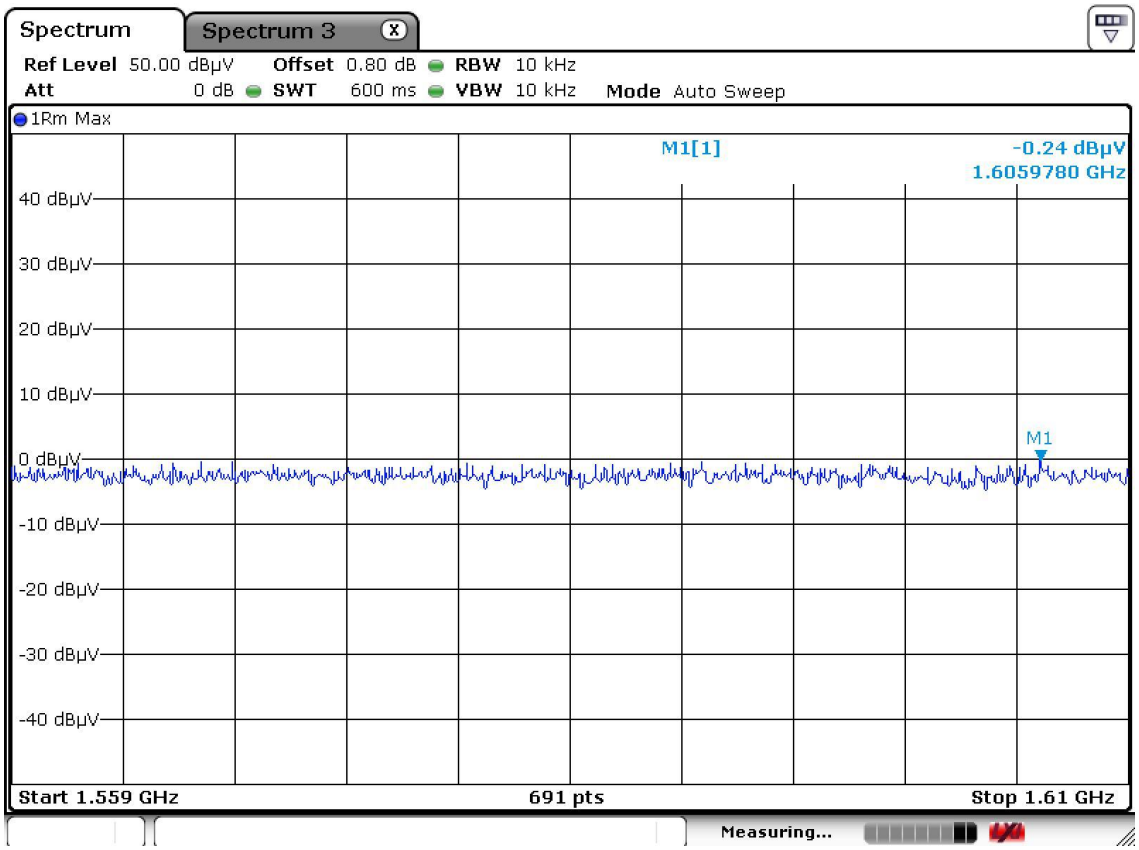
Test mode 1 for Conducted antenna port emissions in GPS band



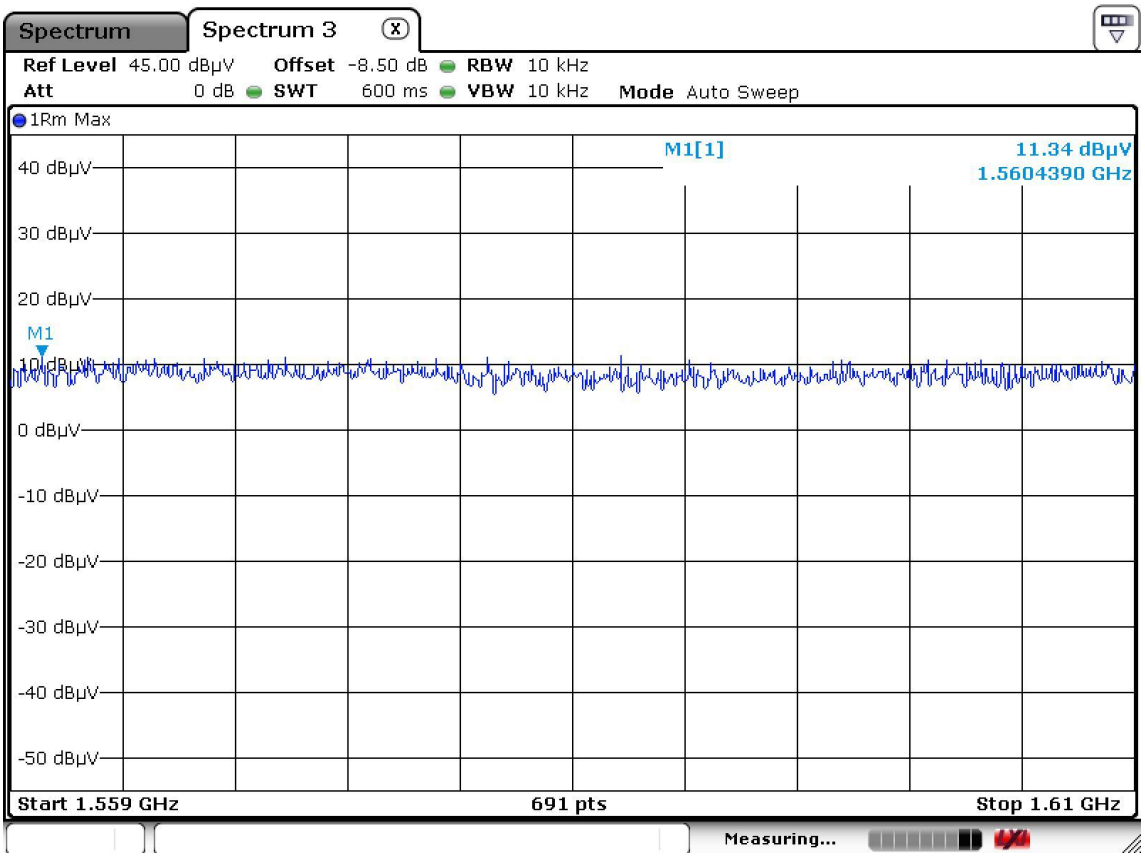
Test mode 1 for Terminated antenna port emissions in GPS band



Test mode 2 for Conducted antenna port emissions in GPS band

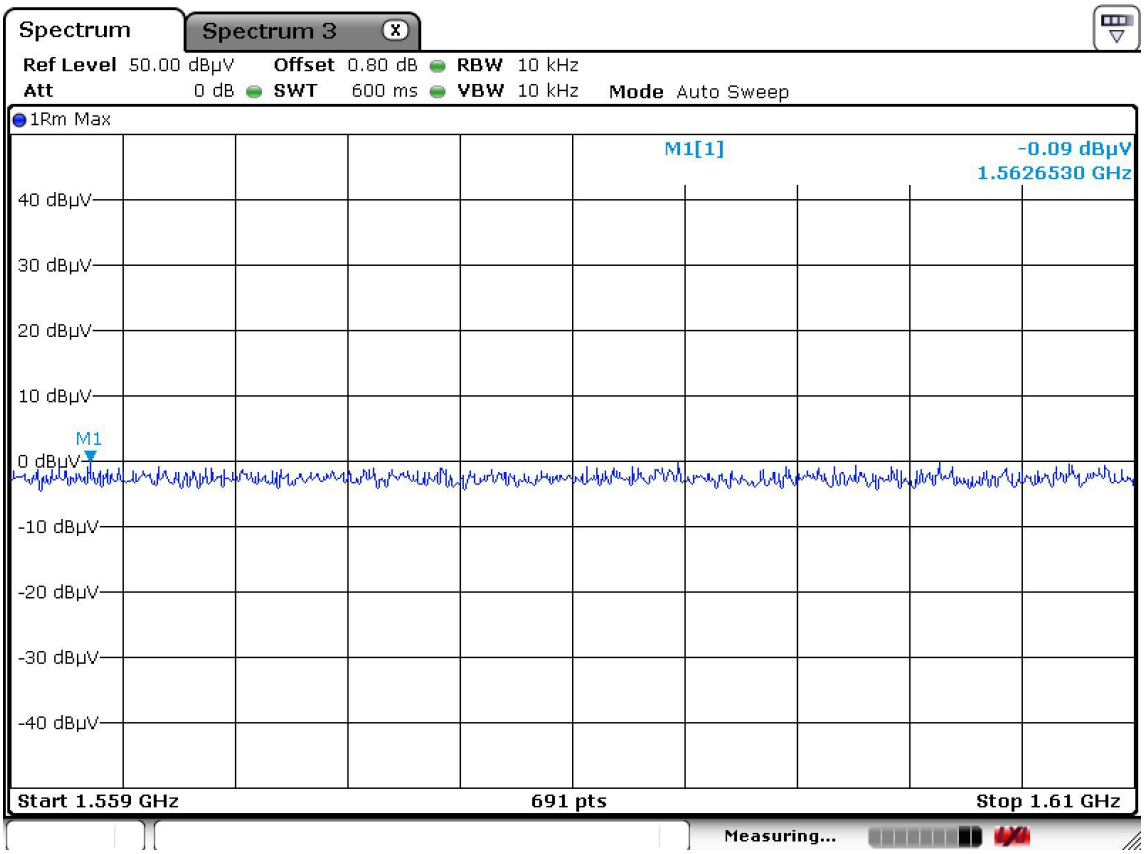


Test mode 2 for Terminated antenna port emissions in GPS band

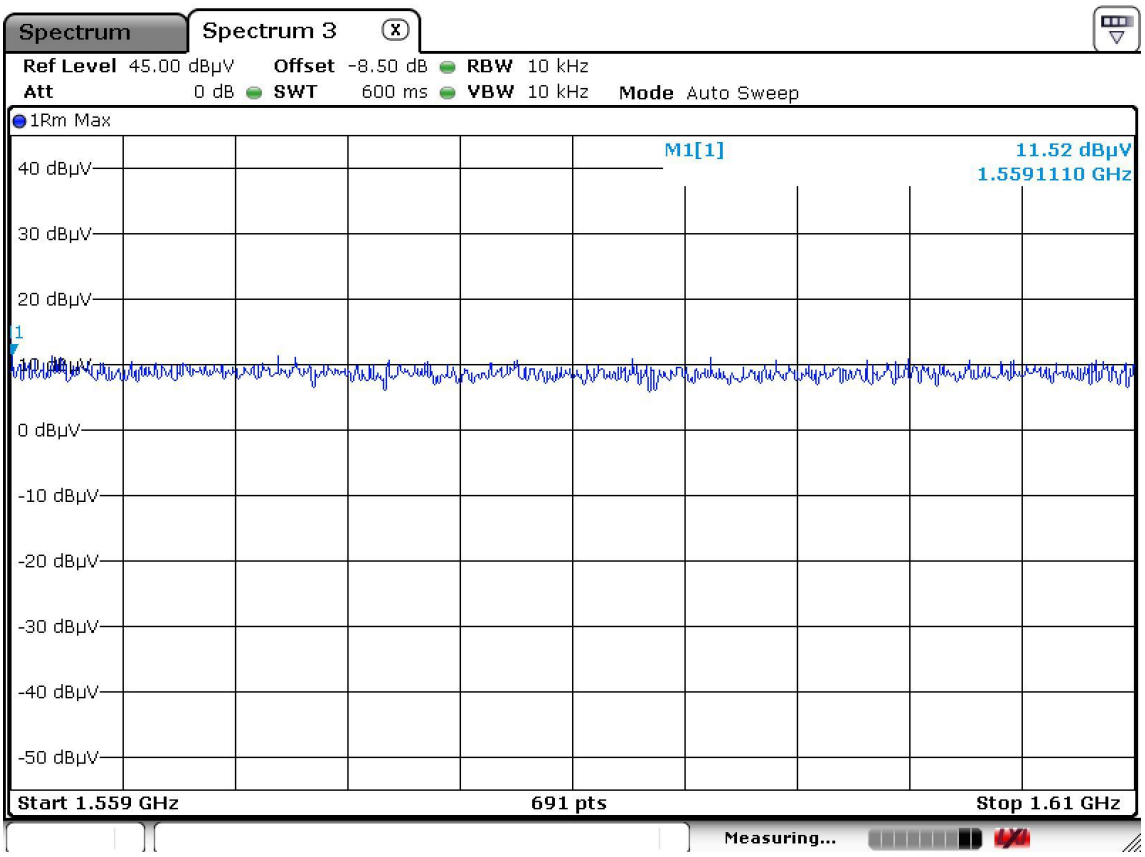


Copyright © 2012, LTA Co., Ltd.

Test mode 3 for Conducted antenna port emissions in GPS band



Test mode 3 for Terminated antenna port emissions in GPS band



Copyright © 2012, LTA Co., Ltd.

3.2.6 Peak Emissions within a 10MHz 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, fM. 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 20log(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(dBuV/m) = P(dBm EIRP) + 95.2 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 (specific distance [3m] / test distance [1m]) (dB); Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB]

Peak EIRP limit dBm (RB / VB : 50MHz)	Peak EIRP limit dBm (RB / VB: 10MHz)	E- Field (dBμV/m) at 3m (RB / VB: 10MHz)	E- Field (dBμV/m) at 1m (RB / VB: 10MHz)
0	-13.97	81.23	**90.77**

Copyright © 2012, LTA Co., Ltd.

Measurement Data:

ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 1M						
TEST MODE	Frequency [MHz]	Reading [dBuV/m]	Correction Factor [dB/m]	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
1	3458.00	76.08	0.21	90.77	76.29	14.48
2	3807.00	75.05	1.30	90.77	76.35	14.42
3	4630.00	75.27	3.39	90.77	78.66	12.11

ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 1M						
TEST MODE	Frequency [MHz]	Reading [dBuV/m]	Correction Factor [dB/m]	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
1	3433.00	65.41	0.21	90.77	65.62	25.15
2	3801.00	62.32	1.30	90.77	63.62	27.15
3	4284.00	62.74	3.39	90.77	66.13	24.64

NOTE.

- Correction Factor = Antenna + Cable - Amp. Gain

Copyright © 2012, LTA Co., Ltd.

APPENDIX

TEST EQUIPMENT USED FOR TESTS

Copyright ⓒ 2012, LTA Co., Ltd.

	Description	Model No.	Serial No.	Manufacturer	Interval	Last Cal. Date
1	Spectrum Analyzer (~30GHz)	FSV-30	100757	R&S	1 year	2012-01-10
2	Signal Generator (~3.2GHz)	8648C	3623A02597	HP	1 year	2012-03-26
3	Signal Generator (1~20GHz)	83711B	US34490456	HP	1 year	2012-03-26
4	Attenuator (3dB)	8491A	37822	HP	2 year	2012-09-22
5	Attenuator (10dB)	8491A	63196	HP	2 year	2012-09-22
6	Attenuator (30dB)	8498A	3318A10929	HP	2 year	2011-01-05
7	Test Receiver (~30MHz)	ESHS10	828404/009	R&S	1 year	2012-03-26
8	EMI Test Receiver (~1GHz)	ESCI7	100722	R&S	1 year	2011-10-07
9	RF Amplifier (~1.3GHz)	8447D	2439A09058	HP	2 year	2010-10-08
10	RF Amplifier (1~18GHz)	8449B	3008A02126	HP	2 year	2012-03-26
11	Horn Antenna (1~18GHz)	BBHA 9120D	9120D122	SCHWARZBECK	2 year	2010-12-24
12	Horn Antenna (18 ~ 40GHz)	SAS-574	154	SCHWARZBECK	2 year	2010-11-25
13	Horn Antenna (18 ~ 40GHz)	SAS-574	155	SCHWARZBECK	2 year	2010-11-25
14	TRILOG Antenna	VULB 9160	9160-3172	SCHWARZBECK	2 year	2010-10-07
15	Dipole Antenna	VHA9103	2116	SCHWARZBECK	2 year	2010-11-25
16	Dipole Antenna	VHA9103	2117	SCHWARZBECK	2 year	2010-11-25
17	Dipole Antenna	VHA9105	2261	SCHWARZBECK	2 year	2010-11-25
18	Dipole Antenna	VHA9105	2262	SCHWARZBECK	2 year	2010-11-25
19	Hygro-Thermograph	THB-36	0041557-01	ISUZU	2 year	2012-04-11
20	Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	-	-
21	Power Divider	11636A	6243	HP	2 year	2010-10-08
22	DC Power Supply	6622A	3448A03079	HP	-	-
23	Frequency Counter	5342A	2826A12411	HP	1 year	2012-03-26
24	Power Meter	EPM-441A	GB32481702	HP	1 year	2012-03-26
25	Power Sensor	8481A	US41030291	HP	1 year	2012-09-22
26	Audio Analyzer	8903B	3729A18901	HP	1 year	2012-09-22
27	Modulation Analyzer	8901B	3749A05878	HP	1 year	2012-09-22
28	TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	1 year	2012-09-22
29	Stop Watch	HS-3	601Q09R	CASIO	2 year	2012-03-26
30	LISN	ENV216	100408	R&S	1 year	2011-10-07
31	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	106243	R&S	2 year	2012-06-27
32	Highpass Filter	WHKX1.5/15G-10SS	74	Wainwright Instruments	-	-
33	Highpass Filter	WHKX3.0/18G-10SS	118	Wainwright Instruments	-	-
34	Loop Antenna	FMZB 1516	151602/94	SCHWARZBECK	2 year	2011-04-05

Copyright © 2012, LTA Co., Ltd.