FCC PART 15, SUBPART F
IC RSS-220, ISSUE 1, MARCH 2009

TEST AND MEASUREMENT REPORT

For

Siemens Medical Solution USA Inc.

5168 Campus Drive,

Plymouth Meeting, PA 19462, USA

FCC ID: XSB2300B
IC: 267FA-2300B

Report Type:	**Product Type:**
Original Report	Diagnostic Ultrasound System

Prepared By:	Jason Qian Test Engineer
Report Number:	R1602221-519
Report Date:	2016-06-22
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* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "*"

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1602221-519	Original Report	2016-06-22

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report has been compiled on behalf of *Siemens Medical Solution USA, Inc*., and their product: *ACUSON Freestyle Ultrasound System*. Console Model number: ACUSON Freestyle, Handheld probe model: L8-3, L13-5, and C5-2 or *FCC ID: XSB2300B; IC: 267FA-2300,* which henceforth is referred to as the EUT (Equipment Under Test.). The EUT is handheld probe, a UWB 7.8 GHz radio transmitter.

1.2 Mechanical Description of EUT

The EUT measures approximately 38mm (L) x 36.3 mm (W) x 38 mm (H) and weighs approximately 100 g with battery.

The data gathered are from a typical production sample provided by the manufacturer with serial number: PP2069 and PP2074, assigned by Client.

1.3 Objective

This report is prepared on behalf of *Siemens Medical Solution USA, Inc.,* in accordance with Part 15, Subparts F and C of the Federal Communication Commission's rules and IC RSS-220 Issue 1, March 2009.

The objective is to determine compliance with FCC Part 15.519 and ICRSS-220 rules for Peak Power, Antenna Requirements, Radiated Spurious Emissions, UWB Bandwidth, Operational Bandwidth, GPS Bands and Turn off Time.

1.4 Related Submittal(s)/Grant(s)

N/A

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR16-4-2:2011, The Treatment of Uncertainty in EMC Measurements, the values ranging from $\pm$2.0 dB for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

1.7 Test Facility

Bay area compliance Laboratories Corp. (BACL) is:
1- An independent Commercial Test Laboratory accredited to ISO 17025: 2005 by A2LA, in the fields of: Electromagnetic Compatibility & Telecommunications covering Emissions, Immunity, Radio, RF Exposure, Safety and Telecom. This includes NEBS (Network Equipment Building System), Wireless RF, Telecommunications Terminal Equipment (TTE); Network Equipment; Information Technology Equipment (ITE); Medical Electrical Equipment; Industrial, Commercial, and Medical Test Equipment; Professional Audio and Video Equipment; Electronic (Digital) Products; Industrial and Scientific Instruments; Cabled Distribution Systems and Energy Efficiency Lighting.

2- An ENERGY STAR Recognized Laboratory, for the LM80 Testing, a wide variety of Luminares and Computers.

3- A NIST Designated Phase-I and Phase-II CAB including: ACMA (Australian Communication and Media Authority), BSMI (Bureau of Standards, Metrology and Inspection of Taiwan), IDA (Infocomm Development Authority of Singapore), IC(Industry Canada), Korea (Ministry of Communications Radio Research Laboratory), NCC (Formerly DGT; Directorate General of Telecommunication of Chinese Taipei) OFTA (Office of the Telecommunications Authority of Hong Kong), Vietnam, VCCI – Voluntary Control Council for Interference of Japan and a designated EU CAB (Conformity Assessment Body) (Notified Body) for the EMC and R&TTE Directives.

4- A Product Certification Body accredited to **ISO Guide 65: 1996** by **A2LA** to certify:
2. Radio Standards Specifications (RSS) in the Category I Equipment Standards List and All Broadcasting Technical Standards (BETS) in Category I Equipment Standards List for Industry Canada.
3. Radio Communication Equipment for Singapore.
4. Radio Equipment Specifications, GMDSS Marine Radio Equipment Specifications, and Fixed Network Equipment Specifications for Hong Kong.
5. Japan MIC Telecommunication Business Law (A1, A2) and Radio Law (B1, B2 and B3).
6. Audio/Video, Battery Charging Systems, Computers, Displays, Enterprise Servers, Imaging Equipment, Set-Top Boxes, Telephony, Televisions, Ceiling Fans, CFLs (Including GU24s),Decorative Light Strings, Integral LED Lamps, Luminaires, Residential Ventilating Fans.

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2014, ANSI C63.10-2013, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b

2 System Test Configuration

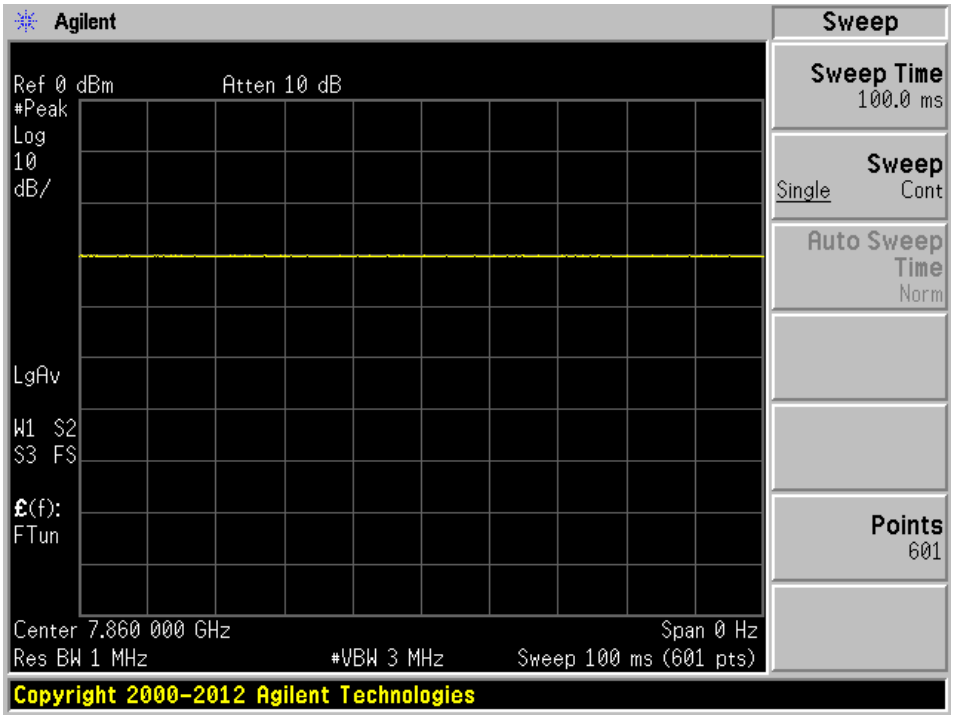
2.1 Justification

The EUT was configured for testing according to ANSI C63.4-2014 and ANSI C63.10-2013.

The EUT was tested in a testing mode to represent worst-case results during the final qualification test.

Duty Cycle: 100%

7.86 GHz



2.2 EUT Exercise Software

N/A

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Local Support Equipment

N/A

2.5 EUT Internal Configuration Details

Manufacturer	Description	Type	Serial Number
Siemens	Base Unit/Display	Freestyle S/N 000111	-
Siemens	L13-5 probe	L13-5 S/N PP2069	-
Siemens	L8-3 probe	L8-3 S/N PP2061	-
Siemens	C5-2 probe	C5-2 S/N PP2072	-

2.6 Power Supply and Line Filters

N/A

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
RF Cable	< 1 m	EUT	PSA

3 Summary of Test Results

Results reported relate only to the product tested.

FCC & IC Rules	Description of Test	Results
FCC §2.1093 IC RSS-102	RF Exposure	Compliant
FCC §15.203, §15.519(a)(2) RSS-Gen §8.3	Antenna Requirement	Compliant
FCC §15.503(d), §15.519(b) RSS-220 §6.5.1(a)	UWB Operation Bandwidth	Compliant
FCC §15.519(a)(1) RSS-220 §6.5.1(b)	Turn off Time	Compliant
FCC §15.519(c)(d)(e) FCC §15.209 RSS-220 §6.5.1(c)(d)	Radiated Emissions	Compliant
FCC §15.519(e) RSS-220 §6.5.1(g)	Peak Output Power	Compliant

4 FCC §15.247(i), §2.1093 & IC RSS-102 – RF Exposure

4.1 Applicable Standards

According to FCC KDB 447498 D01 General RF Exposure Guidance: §4.3.1. Standalone SAR test exclusion considerations.

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

§4.3.2. Simultaneous transmission SAR test exclusion considerations

(Max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm; where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR

According to IC RSS-102 §2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- Below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- At or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 4.49/f0.5 W (adjusted for tune-up tolerance), where f is in MHz;
- At or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- At or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10-2 f0.6834 W (adjusted for tune-up tolerance), where f is in MHz;
- At or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

4.2 Evaluation Result

For FCC:

UWB:

Maximum output power is -25.85 dBm/50 MHz (0.0026mW)

Based on below equation

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

(0.0026/5)*(√7.8) =0.00145 which is less than 7.5

Bluetooth (from FCC ID: ED9LMX9838)

Maximum output power is -2.11 dBm (1.626 mW)

Based on below equation

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

(1.626/5)*(√2.48) =0.512 which is less than 7.5

So this device meets the SAR exclusion condition.

For IC:

This device operates at 7.8 GHz and the EIRP less than 5W, so this device meets the exemption limits for SAR evaluation.

This device operates at 2.4GHz and the EIRP less than 1.31 x 10-2 f 0.6834=5.47 Watt, so this device meets the exemption limits for SAR evaluation.

5 FCC §15.203, §15.519(a)(2) & IC RSS-Gen §8.3 – Antenna Requirements

5.1 Applicable Standards

According to FCC §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

According to FCC §15.519 (a) (2):

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.

According to IC RSS-Gen §8.3: Transmitter Antenna

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. 9 When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi)

5.2 Antenna Description

Antenna Location	Antenna Gain (dBi)
Internal X 6	-4.37

The Highest Gain is -4.37 dBi, and the antenna consists of non-standard (UFL) connectors; Antenna gain that exceeds 6 dBi was added to RF measurement therefore, it complies with the antenna requirement. Please refer to the internal photos.

The Antenna is only use on the hand held UWB device. Total 6 antennas are inside the unit.

6 FCC §15.503(d), §15.519(b) & IC RSS-220 §6.5.1(a) - UWB Bandwidth

6.1 Applicable Standards

For FCC §15.503, UWB bandwidth. For the purpose of this subpart, 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.

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.

For FCC §15.519(b), The UWB bandwidth of a device operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz
For IC RSS-220 §6.5.1(a), The -10 dB UWB bandwidth of a medical radar imaging device shall be totally contained in the band 3.1-10.6 GHz.

6.2 Measurement Procedure

The frequency at which the maximum power level is measured with the peak detector is designated f_M. The peak power measurements shall be made using a spectrum analyzer or EMI receiver with a 1 MHz resolution bandwidth and a video bandwidth of 1 MHz or greater. The instrument shall be set to peak detection using the maximum-hold trace mode. The outermost 1 MHz segments above and below f_M, where the peak power falls by 10 dB relative to the level at f_M, are designated as f_H and f_L, respectively:
a) For the lowest frequency bound f_L, the emission is searched from a frequency lower than f_M that has, by inspection, a peak power much lower than 10 dB less than the power at f_M and increased toward f_M until the peak power indicates 10 dB less than the power at f_M. The frequency of that segment is recorded.
b) This process is repeated for the highest frequency bound f_H, beginning at a frequency higher than f_M that has, by inspection, a peak power much lower than 10 dB below the power at f_M. The frequency of that segment is recorded.
c) The two recorded frequencies represent the highest fH and lowest fL bounds of the UWB transmission, and the −10 dB bandwidth (B − 10) is defined as $(f_H - f_L)$. The center frequency (f_c) is mathematically determined from $(f_H - f_L) / 2$.
d) The fractional bandwidth is defined as $2(f_H - f_L) / (f_H + f_L)$.
e) Determine whether the −10 dB bandwidth $(f_H - f_L)$ is ≥500 MHz, or whether the fractional bandwidth $2(f_H - f_L) / (f_H + f_L)$ is ≥0.2.

6.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2015-06-23	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

6.4 Test Environmental Conditions

Temperature:	22º C
Relative Humidity:	35%
ATM Pressure:	101.5 KPa

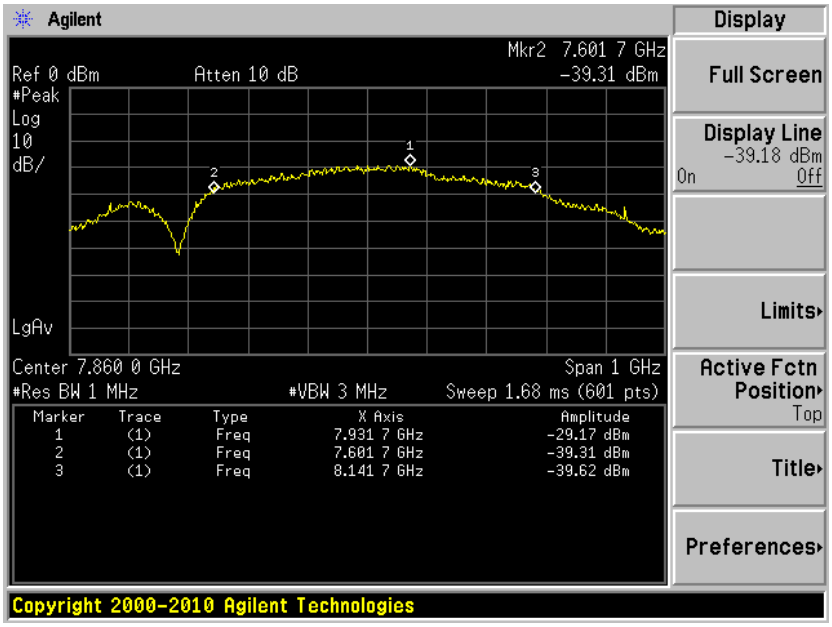
The testing was performed by Jason Qian on 2015-06-2 at RF site.

6.5 Test Results

The bandwidth of the EUT was found to comply with the requirement of 15.519(b) and the minimum bandwidth as defined in 15.503.

Please refer to following table and plot of Bandwidth.

Measurement	Frequency (MHz)	Result
f_L	7601.7	Compliant
f_H	8141.7	Compliant
f_M	7931.7	Compliant
Measured Bandwidth $=f_H-f_L$	540.0	Compliant
Center Frequency $=(f_H+f_L)/2$	7871.7	Compliant
Fractional Bandwidth $=2(f_H-f_L)/(f_H+f_L)$	0.0686	Compliant



7 FCC §15.519(c) & IC RSS-220 §6.5.1(b) - Turn off Time

7.1 Applicable Standards

As per FCC §15.519(a)(1): 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.

As per IC RSS-220 §6.5.1(b): A medical radar imaging device shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. It is permissible to operate an imaging device by remote control provided that the imaging device ceases transmission within 10 seconds of the remote switch being released by the operator.

7.2 Measurement Procedure

The UWB transmitter is controlled via a Bluetooth link to the base station. Transmission will cease within 10 seconds of a loss of control from the base station.

7.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2015-06-23	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

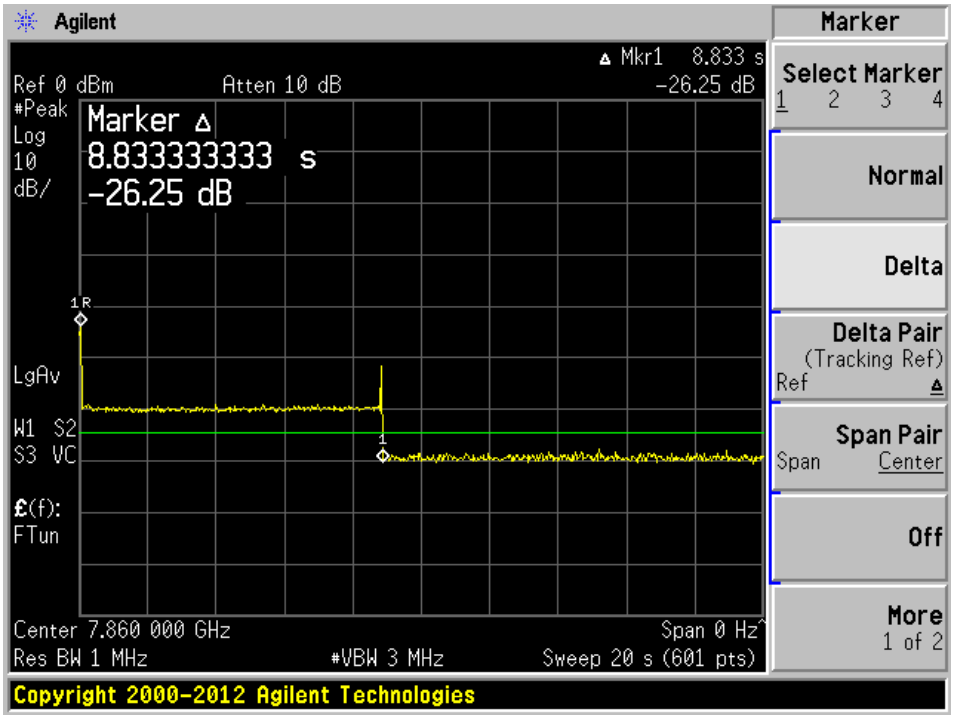
7.4 Test Environmental Conditions

Temperature:	22º C
Relative Humidity:	35%
ATM Pressure:	101.5 KPa

The testing was performed by Jason Qian on 2016-03-02 at RF site.

7.5 Test Results

The following plot shows the time to turn off is 8.83 seconds once the UWB transmitter lost control from the base station.



8 FCC §15.519(c)(d)(e) & IC RSS-220 §6.5.1(c)(d)(e) - Radiated Emissions

8.1 Applicable Standards

As per FCC §15.519(e): There is a limit on the peak level of the emissions contained within a 50 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, following the procedures described in §15.521.

As per FCC §15.519(c): The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency (MHz)	EIRP in dBm
960-1610	-75.3
1610-1990	-63.3
1990-3100	-61.3
3100-10600	-41.3
Above 10600	-61.3

As per FCC §15.209: the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/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

**Except as provided in paragraph 15.209(g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §15.231 and §15.241.

As per RSS-220 §6.5.1(d): Radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

Frequency (MHz)	EIRP in dBm
960-1610	-65.3
1610-1990	-53.3
1990-3100	-51.3
3100-10600	-41.3
Above 10600	-51.3

As per RSS Radiated emissions at or below 960 MHz for all subclasses of UWB device shall not exceed the following limits. Measurements of radiated emissions at and below 960 MHz are to be made using a CISPR quasi-peak detector. CISPR measurement bandwidth specifications are to be used.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)	EIRP (dBmW)
0.009-0.490	2400/F(kHz)	300	10 log (17.28 / F2)
0.490-1.705	24000/F(kHz)	30	10 log (17.28 / F2)
1.705-30.0	30	30	-45.7
30-88	100	3	-55.2
88-216	150	3	-51.7
216-960	200	3	-49.2

Note: The emission limits for the bands 9-90 kHz and 110-490 kHz are based on measurements employing an average emissions detector.

As per FCC §15.519(d): in addition to the radiated emission limits specified in the table in paragraph (c) of this section, 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:

Frequency in MHz	EIRP in dBm
1164-1240	−85.3
1559-1610	−85.3

As per RSS-220.6.5.1(e): In addition to the limits specified in paragraph (d) of this section, radiated emissions shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz. The measurements shall demonstrate compliance with the stated limits at whatever resolution bandwidth is used.

Frequency in MHz	EIRP in dBm
1164-1240	−75.3
1559-1610	−75.3

8.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.10-2013. The specification used was the FCC 15 Subpart F and IC RSS-220 limits.

The spacing between the peripherals was 10 centimeters.
External I/O cables were draped along the edge of the test table and bundle when necessary.

8.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter above ground plane for below 1GHz and 1.5 meter above ground plane for above 1GHz, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

RBW = 100 kHz / VBW = 300 kHz

Above 1000 MHz:

RBW = 1MHz / VBW = 1MHz

For radiated emissions fall in 1164-1240 MHz and 1559-1610 MHz bands, the spectrum analyzer or receiver is set as: RBW = 1 kHz

8.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

For example, a corrected amplitude of 40.3 dBm = Indicated Reading (32.5 dBm) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude – Limit

8.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100338	2016-01-20	2 year
Agilent	Spectrum Analyzer	E4440A	MY44303352	2015-06-22	1 year
Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/R
Sunol Sciences	Antenna, Biconi-Log	JB1	A013105-3	2015-07-11	2 year
A.R.A	Antenna, Horn	DRG-118/A	1132	2015-09-21	2 year
HP	Pre-Amplifier	8447D	2944A06639	2015-06-08	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	2015-11-05	1 year
-	SMA cable	-	C0001	Each time[1]	N/A
IW Microwave	High Frequency Cable	DC-1531	KPS-1501A3960KPS	2015-08-10	1 year
Agilent	Pre-Amplifier	8449B	3008A01978	2015-09-02	1 year
Wisewave	Antenna, Horn	ARH-4223-02	10555-01	2015-10-22	2 year
Wisewave	Antenna, Horn	ARH-4223-02	10555-02	2013-09-20	3 year
Wisewave	Antenna, Horn	ARH-2823-02	10555-01	2015-09-01	2 year

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL *attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.*

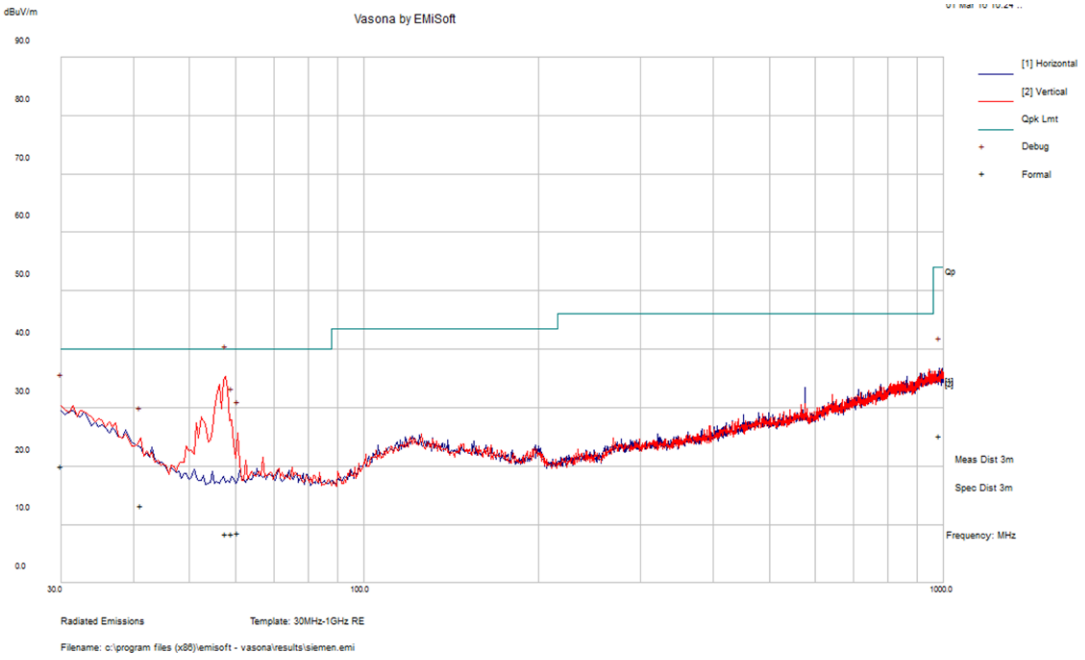
8.6 Test Environmental Conditions

Temperature:	23 ºC
Relative Humidity:	33 %
ATM Pressure:	102.1 kPa

The testing was performed by Jason Qian on 2016-03-03 in 5m chamber3.

8.7 Radiated Emissions Test Data and Plots

1) 30 MHz - 1 GHz



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
57.80925	8.47	294	V	18	40	-31.53	QP
30.00059	20.04	297	V	100	40	-19.96	QP
59.27775	8.41	154	V	171	40	-31.59	QP
60.55975	8.6	266	V	202	40	-31.4	QP
41.194	13.33	137	V	87	40	-26.67	QP
983.1338	25.16	290	H	168	54	-28.84	QP

2) 960 MHz - 40 GHz

Frequency (MHz)	S.A. Reading (dBuv/m)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Reading (dBuv/m)	EIRP (dBm)	FCC/IC	
			Height (cm)	Pol. (H/V)	Factor (dB)					Limit (dBm)	Margin (dB)
1651.1	35.78	0	150	V	25.214	4.071	34.16	30.905	-64.395	-63.3	-1.095
1630.9	35.41	0	150	H	25.214	4.071	34.16	30.535	-64.765	-63.3	-1.465
2204.6	34.39	0	150	V	27.714	4.673	33.66	33.117	-62.183	-61.3	-0.883
2021.44	34.56	0	150	H	27.8	4.943	33.67	33.633	-61.667	-61.3	-0.367
3100	33.9	0	150	V	30.345	5.947	33.59	36.602	-58.698	-41.3	-17.398
3100	33.87	0	150	H	30.345	5.947	33.59	36.572	-58.728	-41.3	-17.428
8306	32.44	0	150	V	37.622	10.486	34.05	46.498	-48.802	-41.3	-7.502
8141	32.79	0	150	H	37.041	10.31	34.05	46.091	-49.209	-41.3	-7.909

Note1: FCC limit is lower than IC limit, therefore, the FCC limit was applied to the result table above.
Note2: Based on ANSI 63.10 and FCC 15.519 (e), the limit for fundamental signal is 0dBm EIRP, with 1MHz RBW convert to 50MHz RBW, the factor is -34 dBm, therefore, the limit for fundamental signal is -34dBm.
Note3: According to ANSI 63.10 section 10.3.9, Field strength convert to EIRP at 3 meter distance, the equation is listed below.

EIRP (dBm) = E (dBµV/m) - 95.3 dB

3) Radiated Emission fall in 1164-1240 MHz and 1559-1610 MHz

Frequency (MHz)	S.A. Reading (dBuv/m)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBuv/m)	EIRP value (dBm)	FCC	
			Height (cm)	Polarity (H/V)	Factor (dB)					Limit (dBm)	Margin (dB)
1237.85	13.45	0	150	V	25.324	3.18	33.94	8.014	-87.286	-85.3	-1.986
1225.05	13.41	0	150	H	25.262	3.18	33.94	7.912	-87.388	-85.3	-2.088
1600.14	13.59	0	150	V	25.741	4	33.85	9.481	-85.819	-85.3	-0.519
1606.86	13.61	0	150	H	25.718	4	33.85	9.478	-85.822	-85.3	-0.522

Frequency (MHz)	S.A. Reading (dBuv/m)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp (dB)	Cord. Reading (dBuv/m)	EIRP value (dBm)	IC	
			Height (cm)	Polarity (H/V)	Factor (dB)					Limit (dBm)	Margin (dB)
1237.85	13.45	0	150	V	25.324	3.18	33.94	8.014	-87.286	-75.3	-11.986
1225.05	13.41	0	150	H	25.262	3.18	33.94	7.912	-87.388	-75.3	-12.088
1600.14	13.59	0	150	V	25.741	4	33.85	9.481	-85.819	-75.3	-10.519
1606.86	13.61	0	150	H	25.718	4	33.85	9.478	-85.822	-75.3	-10.522

9 FCC§15.519(e) & RSS-220 §6.5.1 (g) - Peak Output Power

9.1 Applicable Standards

According to FCC §15.519(e): There is a limit on the peak level of the emissions contained within a 50 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, following the procedures described in §15.521.

According to RSS-220 §6.5.1(g): The peak level of the transmissions shall not exceed the peak equivalent of the average limit contained within any 50 MHz bandwidth, as defined in section 4 of the Annex.

9.2 Measurement Procedure

According to ANSI C63.10 the spectral characterization of a UWB device shall begin with a peak-detected radiated measurement because the results obtained from this measurement could preclude the need for subsequent average measurements. For example, if the data collected from the peak-power measurement show that the radiated emissions levels are equal to, or less than, the applicable emissions limit, then these data are adequate to determine compliance. This is predicated on the fact that the average levels are always less than, or equal to, the peak signal level.

The peak detector of the instrument is selected and the maximum hold feature activated. The RBW is set to 1 MHz and the VBW is set to at least 1 MHz (3 MHz is recommended).
It is acceptable to employ an RBW of less than 50 MHz (but no less than 1 MHz) when performing the required peak power measurements. When this approach is employed, the peak emissions EIRP limit (0 dBm / 50 MHz) is converted to a limit commensurate with the RBW by employing a [20 log (RBW/50 MHz)] relationship. For example, the peak power limit could be expressed in a 1 MHz bandwidth as follows in Equation:
$EIRP_{1MHz} = EIRP_{50MHz} + 20\log(1MHz/50\ MHz) = 0\ dBm + (-34\ dB) = -34\ dBm$
When a resolution bandwidth of less than 50 MHz is used, this measurement shall be performed over a 50 MHz span centered on the frequency associated with the highest detected average emission level.

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
R & S	Spectrum Analyzer	FSQ	1155.5001.26	2015-03-09	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

9.4 Test Environmental Conditions

Temperature:	22 ºC
Relative Humidity:	35%
ATM Pressure:	101.5 KPa

The testing was performed by Jason Qian on 2016-03-04 at RF site.

9.5 Test Result

Frequency (MHz)	Reading Level (dBm/8 MHz)	Corrected Level (dBm/50 MHz)	Antenna Gain (dBi)	EIRP (dBm/50 MHz)	Limit (dBm/50 MHz)	Margin (dB)	Results
7860	-17.89	-25.85	-4.37	-30.22	0	-30.22	Pass

Note: Based on ANSI 63.10 and FCC 15.519 (e), with 8MHz RBW convert to 50MHz RBW, the factor is -7.96 dBm

Please refer to the following plots for detailed test results