



# PCTEST ENGINEERING LABORATORY, INC.

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<http://www.pctestlab.com>



## MEASUREMENT REPORT FCC PART 15F ULTRA WIDEBAND

**Applicant Name:**

TDC Acquisition Holdings Inc.  
4955 Corporate Dr NW  
Huntsville, AL 35805  
USA

**Date of Testing:**

11/17 - 11/18/2014

**Test Site/Location:**

PCTEST Lab, Columbia, MD, USA

**Test Report Serial No.:**

0Y1411202135.NUF

**FCC ID:** NUF-PSP400-A

**APPLICANT:** TDC Acquisition Holdings Inc.

**Application Type:** Certification

**Model:** PSP400

**EUT Type:** UWB Radar Surveillance System

**Frequency Range:** 3082 – 4139 MHz

**FCC Classification:** Ultra Wideband (UWB)

**FCC Rule Part(s):** Part 15, Subpart F (15.511, 15.521)

**Test Procedure(s):** ANSI C63.10-2009, KDB 393764

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2009. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

  
\_\_\_\_\_  
Randy Ortanez  
President



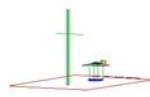
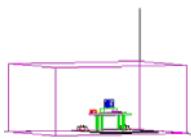
FCC ID: NUF-PSP400-A	FCC Pt. 15F ULTRA WIDEBAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1411202135.NUF	Test Dates: 11/17 - 11/18/2014	EUT Type: UWB Radar Surveillance System	Page 1 of 36

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## MEASUREMENT REPORT

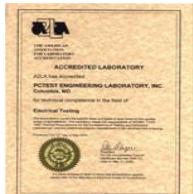
### FCC Part 15F

#### § 2.1033 General Information

**APPLICANT:** TDC Acquisition Holdings Inc.  
**APPLICANT ADDRESS:** 4955 Corporate Dr NW  
 Huntsville, AL 35805, USA  
**TEST SITE:** PCTEST ENGINEERING LABORATORY, INC.  
**TEST SITE ADDRESS:** 7185 Oakland Mills Road, Columbia, MD 21046 USA  
**FCC RULE PART(S):** Part 15F  
**BASE MODEL:** PSP400  
**FCC ID:** NUF-PSP400-A  
**FCC CLASSIFICATION:** Ultra Wideband (UWB)  
**Test Device Serial No.:** N/A  Production  Pre-Production  Engineering  
**DATE(S) OF TEST:** 11/17 - 11/18/2014  
**TEST REPORT S/N:** 0Y1411202135.NUF

#### Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.



- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (2451B-1).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (2451B-1) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.



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## 1.0 INTRODUCTION

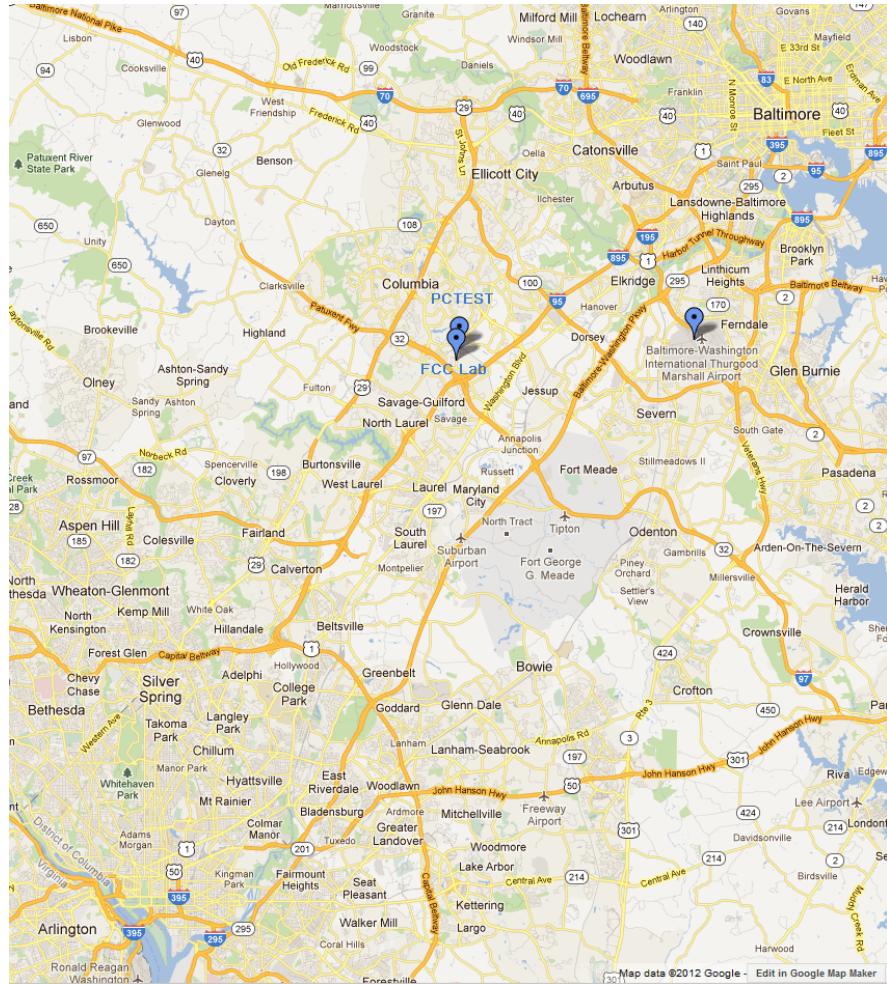
## 1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

## 1.2 PCTEST Test Location

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity area, the Baltimore-Washington Intern'l (BWI) airport, the city of Baltimore and the Washington, DC area. (See *Figure 1-1*).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The site coordinates are 39° 10'23" N latitude and 76° 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on February 15, 2012.



**Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area**

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<b>Test Report S/N:</b> 0Y1411202135.NUF	<b>Test Dates:</b> 11/17 - 11/18/2014	<b>EUT Type:</b> UWB Radar Surveillance System			Page 4 of 36

## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **TDC UWB Radar Surveillance System FCC ID: NUF-PSP400-A**. The EUT is an approximately 10.5' tall pole containing three radar devices, two of which are terminated in  $50\Omega$  and one of which is connected to an antenna, as shown in the diagram below.

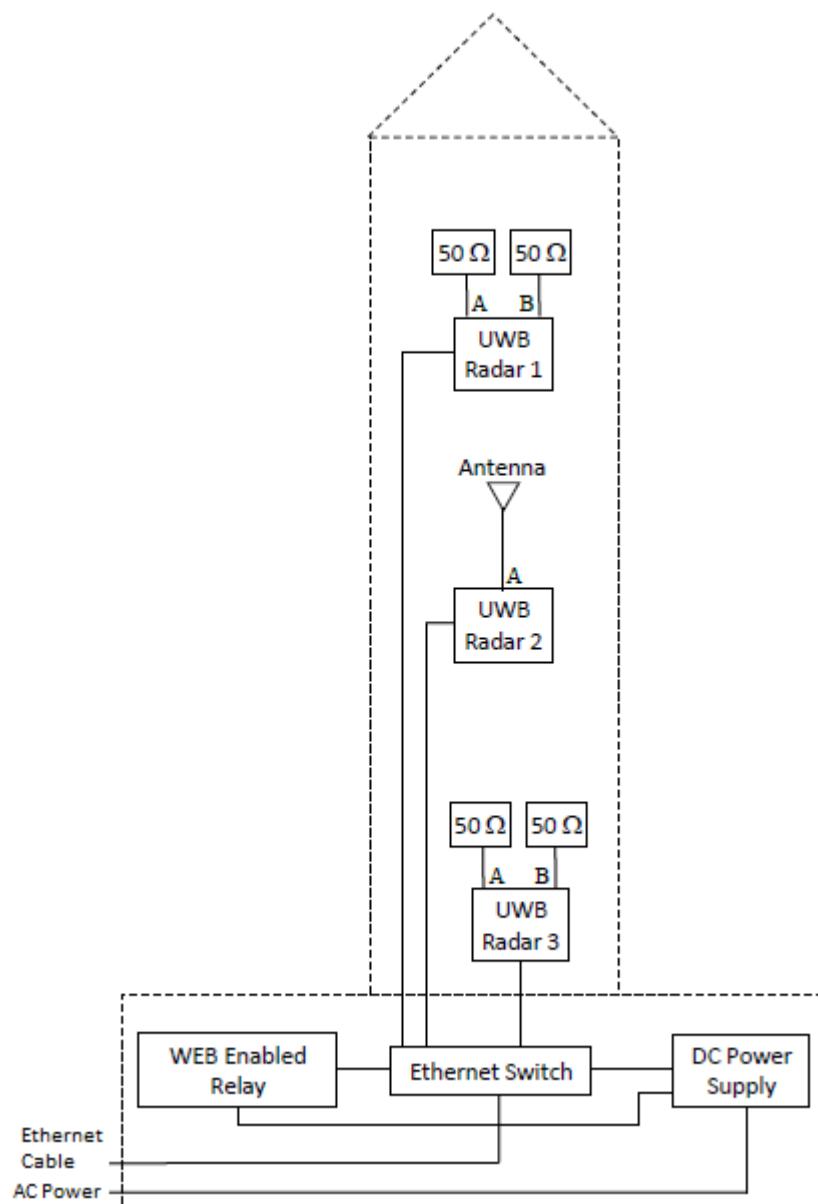


Figure 2-1. UWB Surveillance Pole Configuration for Intentional Emission Measurements

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## 2.2 Test Configurations

The TDC UWB Radar Surveillance System FCC ID: NUF-PSP400-A was tested per the guidance of Section 7.10 of ANSI C63.10-2009. The EUT setup procedures of ANSI C63.10-2009 were used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing of floor-standing equipment. See Sections 3.2 for AC line conducted emissions test setups, 3.3 for radiated emissions test setups, and 6.0 for test results.

Intentional spurious emissions measurements were performed in the configuration shown in Figure 2-1. Additional configurations were investigated for unintentional emissions, as shown in the table below.

Operating Modes per Radar ID	Emissions	Polarization
Receive/1, 2, 3	Unintentional	Vertical
Receive/1, 2, 3	Unintentional	Horizontal
(Transmit/1, 3) & (Idle/2)	Unintentional	Vertical
(Transmit/1, 3) & (Idle/2)	Unintentional	Horizontal
Idle/1, 2, 3	Unintentional	Vertical
Idle/1, 2, 3	Unintentional	Horizontal
(Monostatic Radar/1, 3) & (Idle/2)	Unintentional	Vertical
(Monostatic Radar/1, 3) & (Idle/2)	Unintentional	Horizontal
(Monostatic Radar/2) & (Idle/1, 3)	Intentional	Vertical
(Monostatic Radar/2) & (Idle/1, 3)	Intentional	Horizontal
(Monostatic Radar/2) & (Idle/1, 3)	Peak Intentional	Vertical
(Monostatic Radar/2) & (Idle/1, 3)	Peak Intentional	Horizontal

Table 2-1. Test Configurations

## 2.3 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

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## 3.0 DESCRIPTION OF TEST

### 3.1 Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2009) and the “FCC Alternate Procedure for Measuring Conducted and Radiated Emissions of Pulse Gated UWB Radar Surveillance Systems”, written by TDC Acquisition Holdings Inc., were used in the measurement of the **TDC UWB Radar Surveillance System FCC ID: NUF-PSP400-A**.

**Deviation from measurement procedure.....**None

### 3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 12'x12'x12' shielded enclosure. The shielded enclosure is manufactured by ETS Lindgren RF Enclosures. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. The floor-standing EUT is placed 80cm away from the vertical wall and sidewall and 80cm away from the Line-Impedance Stabilization Network (LISN). A 10kHz-30MHz, 50Ω/50µH LISN is bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is an ETS Lindgren Model LPRX-4X30 (100dB Attenuation, 14kHz-18GHz) and the two EMI/RFI filters are ETS Lindgren Model LRW-2030-S1 (100dB Minimum Insertion Loss, 14kHz – 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from the LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion). Sufficient time for the EUT and test equipment was allowed in order for them to warm up to their normal operating condition. Each emission was also maximized by varying the mode of operation in order to insure worst-case emissions. Once the worst case emissions have been identified, the emissions are used for final measurements on the same test site.

Line conducted emissions test results are shown in Section 6.7. Automated test software was used to perform the AC line conducted emissions testing using an Agilent MXE Receiver.

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### 3.3 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Clause 5, Figure 5.7 of ANSI C63.4-2009. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. An ETS Lindgren Model 2188 raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane.

For all unintentional emissions measurements, the spectrum was scanned through from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For all intentional emissions measurements, the spectrum was scanned up to 40GHz. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The EUT was placed directly on top of the raised turntable. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. In a typical installation, the EUT is placed upright, so this is the only orientation of the EUT in which testing was performed.

### 3.4 Environmental Conditions

The temperature is controlled within range of 15°C to 35°C. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

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## 4.0 ANTENNA REQUIREMENTS

### Excerpt from §15.203 of the FCC Rules/Regulations:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 antenna(s) of the UWB Radar Surveillance System are **permanently attached**.
- There are no provisions for connection to an external antenna.

### Conclusion:

The **TDC UWB Radar Surveillance System FCC ID: NUF-PSP400-A** unit complies with the requirement of §15.203.

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## 5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	5/29/2014	Annual	5/29/2015	N/A
Agilent	8447D	Broadband Amplifier	6/2/2014	Annual	6/2/2015	1937A03348
Agilent	N9030A	PXA Signal Analyzer (44GHz)	1/17/2014	Annual	1/17/2015	MY52350166
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	6/26/2013	Biennial	6/26/2015	121034
Emco	3115	Horn Antenna (1-18GHz)	1/30/2014	Biennial	1/30/2016	9704-5182
ETS Lindgren	3160-09	18-26.5 GHz Standard Gain Horn	6/17/2014	Biennial	6/17/2016	135427
ETS Lindgren	3160-10	26.5-40 GHz Standard Gain Horn	6/17/2014	Biennial	6/17/2016	130993
ETS-Lindgren	3816-2NM	Line Impedance Stabilization Network	10/20/2014	Biennial	10/20/2016	114452
Huber+Suhner	Sucoflex 102A	40GHz Radiated Cable	1/30/2014	Annual	1/30/2015	251425001
K & L	11SH10-6000/T18000	High Pass Filter	2/7/2014	Annual	2/7/2015	1
Pasternack	NMLC-1	Line Conducted Emissions Cable (NM)	1/28/2014	Annual	1/28/2015	N/A
Rohde & Schwarz	TS-PR18	1-18 GHz Pre-Amplifier	3/5/2014	Annual	3/5/2015	100071
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	3/12/2014	Annual	3/12/2015	100040
Rohde & Schwarz	TS-PR40	26.5-40 GHz Pre-Amplifier	5/15/2014	Annual	5/15/2015	100037
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	1/27/2014	Annual	1/27/2015	100342
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/18/2014	Biennial	3/18/2016	N/A
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	1/28/2014	Biennial	1/28/2016	A051107

**Table 5-1. Annual Test Equipment Calibration Schedule**

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## 6.0 TEST RESULTS

### 6.1 Summary

Company Name: TDC Acquisition Holdings Inc.

FCC ID: NUF-PSP400-A

FCC Classification: Ultra Wideband (UWB)

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
<b>TRANSMITTER MODE (TX)</b>					
15.511(a)	10dB Bandwidth	Emission must remain within the 1990 – 10,600MHz band and must have a fractional bandwidth $\geq 0.2$	RADIATED	PASS	Section 6.3
15.511(e), 15.521(g)	Maximum Peak Power Spectral Density	< 0dBm EIRP in 50MHz BW		PASS	Sections Error! Reference source not found.
15.511(c)	Radiated Emissions Above 960MHz	See table in 15.511(c) for details		PASS	Section 6.5
15.511(d)	Radiated Emissions in the 1164 – 1240MHz and 1559 – 1610MHz GPS Bands	See table in 15.511(d) for details		PASS	Section 6.5
15.109, 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		PASS	Section 6.6
15.207, 15.521(j)	AC Line Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits	LINE CONDUCTED	PASS	Section 6.7

**Table 6-1. Summary of Test Results**

#### Notes:

1. All modes of operation and transmitter configurations were investigated. The test results shown in the following sections represent the worst case emissions.
2. All measurements were performed at a 1 meter test distance to allow for enough SNR to make accurate measurements above the noise floor. In these cases, since all measurements were performed in the far field, a distance correction of -9.54dB was applied to the 1 meter measurements to extrapolate them back to 3 meters.
3. Per 15.521(g), all EIRP levels were calculated from the measured field strength levels using the following relationship: EIRP (dBm) = E (dB $\mu$ V/m) – 95.2.

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## 6.2 Timing Measurements

### Test Overview and Limit

Measurements of the transmitters burst interval and burst period were recorded in order to understand the timing properties of the EUT.

### Test Settings

1. RBW = 1MHz
2. VBW = 3MHz
3. Detector = Peak
4. Zero span mode was set to view the signal in the time domain
5. A trigger was set to trigger on the rise of the first burst
6. Trace mode = clear write
7. Sweep was set large enough to view two bursts

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

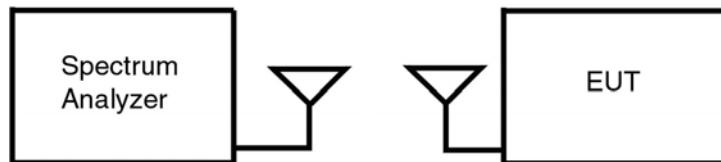


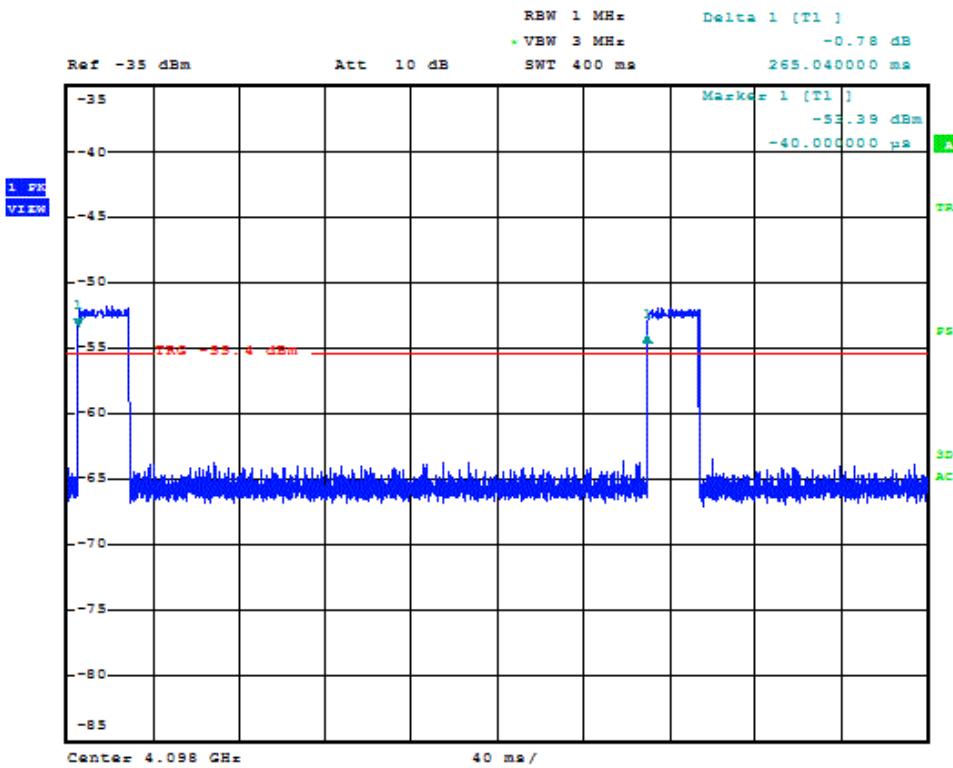
Figure 6-1. Test Instrument & Measurement Setup

### Test Notes

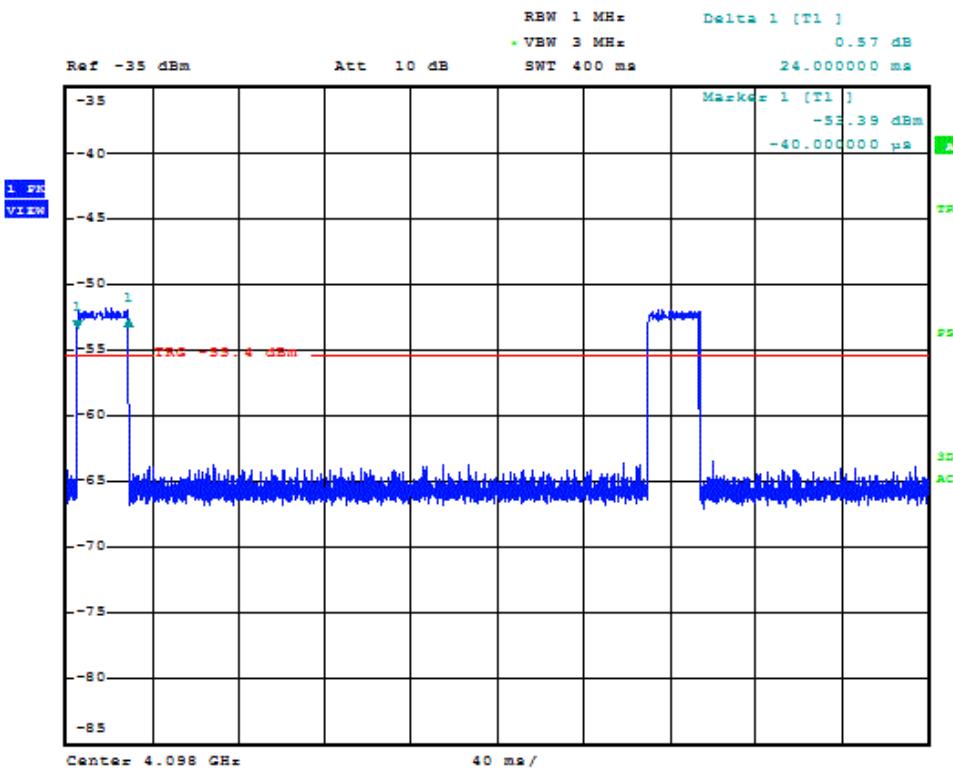
The burst interval was determined to be 265ms and one burst width was determined to be 24ms.

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## Timing Measurements (Cont'd)



Plot 6-1. Burst Interval Measurement



Plot 6-2. Burst Width Measurement

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## 6.3 10dB Bandwidth Measurement

§15.511(a)

### Test Overview and Limit

Per the definition of 15.503, 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 fH and the lower boundary is designated fL.

***The 10dB bandwidth of the UWB signal must remain fully within the 1990 – 10,600MHz band. The fractional bandwidth must also be greater than or equal to 0.20.***

### Test Procedure Used

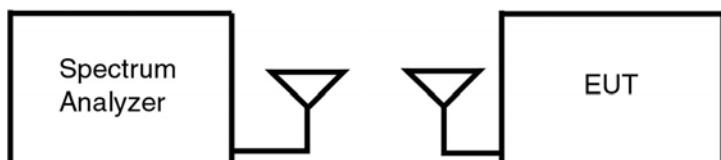
ANSI C63.10-2009 – Section 7.10.1

### Test Settings

8. RBW = 3MHz
9. VBW = 3MHz
10. Detector = Peak
11. Span was set wide enough to capture the 10dB points of the signal
12. Trace mode = max hold
13. Sweep = auto couple
14. The trace was allowed to stabilize

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



**Figure 6-2. Test Instrument & Measurement Setup**

### Test Notes

The bandwidth measurement was performed with the antenna factor, cable loss, and pre-amplifier gain correction factors loaded into the analyzer.

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## 10dB Bandwidth Measurement (Cont'd)

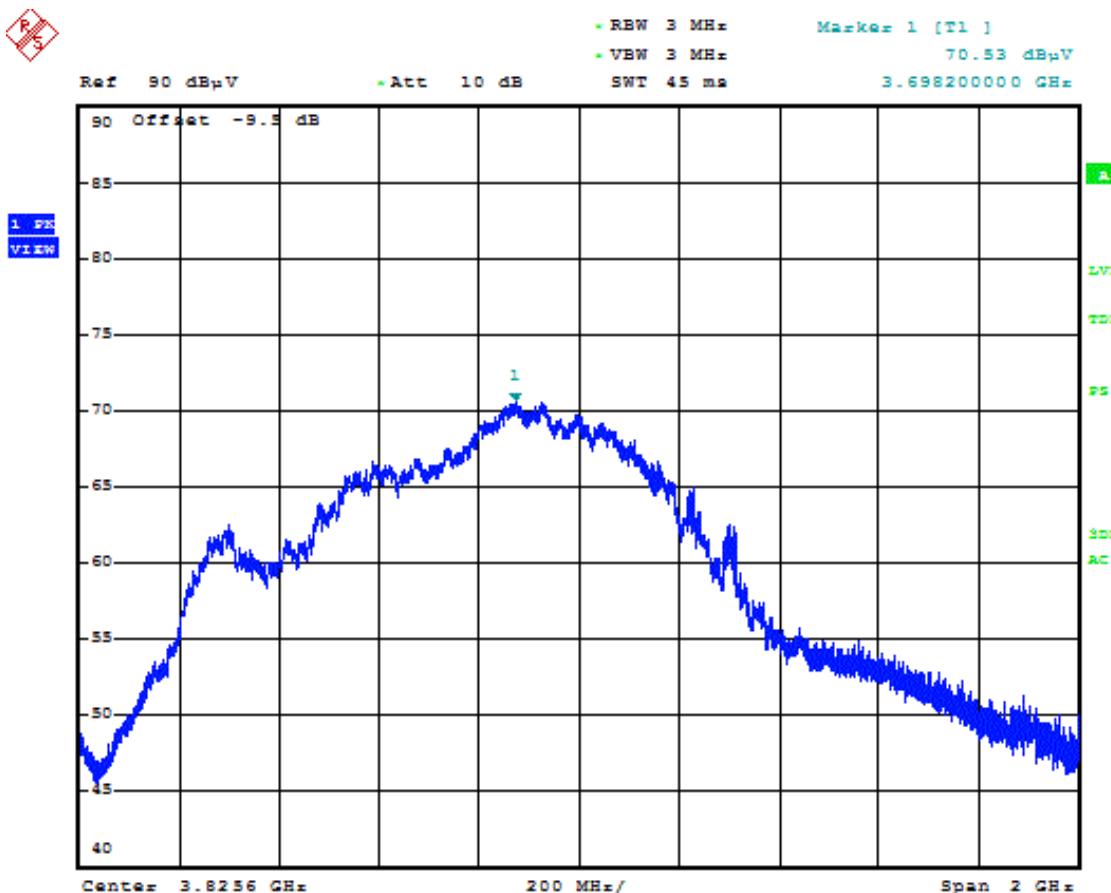
§15.511(a)

fM (MHz)	fL (MHz)	fH (MHz)	10dB BW (MHz)	Pass / Fail
3698.20	3082.25	4138.84	1056.59	Pass

Table 6-2. UWB 10dB Bandwidth

### Fractional Bandwidth Calculation

The fractional bandwidth, per 15.503(c), is equal to  $2(f_H - f_L) / (f_H + f_L) = 0.293$  and, thus, complies with the limit.



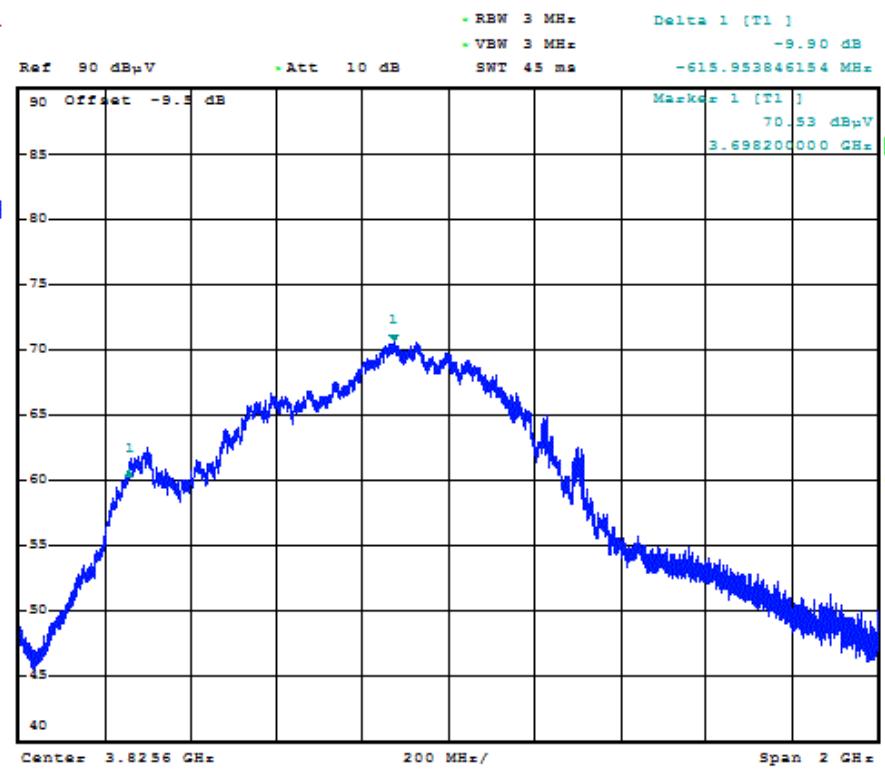
Plot 6-3. Measurement of Peak Frequency, fM

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## 10dB Bandwidth Measurement (Cont'd)

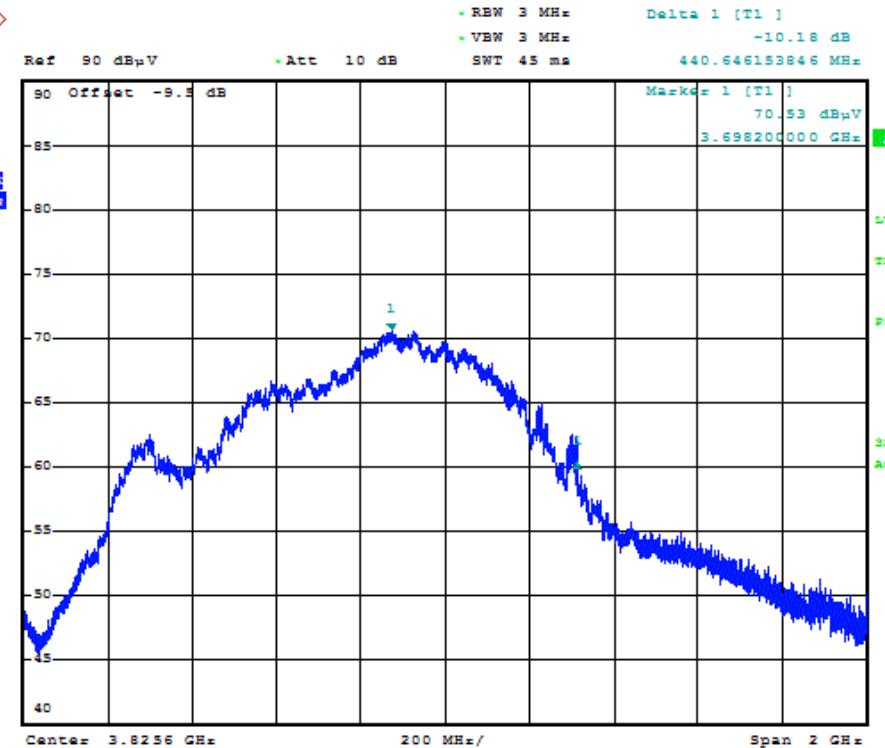
§15.511(a)

R  
S



Plot 6-4. Measurement of Lower 10dB Frequency, fL

R  
S



Plot 6-5. Measurement of Upper 10dB Frequency, fH

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## 6.4 Peak Power Within 50MHz Bandwidth

§15.511(e), 15.521(g)

### Test Overview and Limits

The transmitter is maximized to determine the highest power spectral density level and frequency,  $f_M$ , contained within a 50MHz bandwidth. Since a 50MHz bandwidth could not be realized with the test equipment, a 3MHz bandwidth was used instead and the limit was adjusted accordingly.

***The maximum permissible peak power spectral density within a 3MHz bandwidth is  $20\log_{10}(RBW/50)$  or -24.22dBm.***

### Test Procedure Used

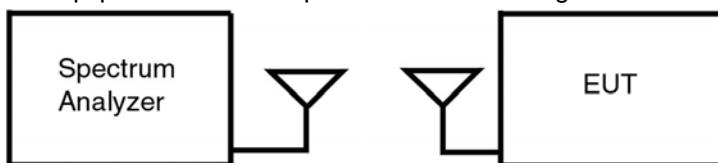
ANSI C63.10-2009 – Section 7.10.3.4

### Test Settings

1. RBW = 3MHz
2. VBW = 3MHz
3. Span was set wide enough to capture the 10dB points of the signal
4. Sweep = auto couple
5. Detector = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



**Figure 6-3. Test Instrument & Measurement Setup**

### Test Notes

Since the measurement was made over a large bandwidth, the number of sweep points was increased to 5001 in order to exceed the minimum  $2 \times \text{span (MHz)}/\text{RBW (MHz)}$  that ensures a proper bin-to-bin spacing such that narrowband signals are not lost between frequency bins.

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## Maximum Peak Power Spectral Density (Cont'd)

§15.511(e), 15.521(g)

Frequency [MHz]	Field Strength [dBuV/m]	EIRP [dBm]	Limit [dBm]	Margin [dB]
3698.2	70.53	-24.67	-24.44	-0.23

**Table 6-3. Peak Power Spectral Density Measurement**

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## 6.5 Radiated Emissions Above 960MHz

§15.511(c)(d)

### Test Overview and Limit

Radiated emissions were investigated above 960MHz up to 40GHz. All measurements were recorded as average powers.

*The maximum permissible radiated emission levels, expressed as EIRP, are as follows:*

Frequency in MHz	EIRP in dBm
960-1610	-53.3
1610-1990	-51.3
1990-10600	-41.3
Above 10600	-51.3

*The maximum permissible radiated emission levels, expressed as EIRP, in the 1164 – 1240MHz and 1559 – 1610MHz GPS bands are as follows:*

Frequency in MHz	EIRP in dBm
1164 – 1240	-63.3
1559 – 1610	-63.3

### Test Procedure Used

ANSI C63.10-2009 – Section 7.10.3.6

### Test Settings

1. Measurements were performed using triggering and gating to allow for measurements to be made only during the on-time of a burst
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = RMS
5. Sweep time = auto couple
6. Trace mode = trace averaging
7. Trace was allowed to stabilize

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## Radiated Emissions Above 960MHz (Cont'd)

§15.511(c)(d)

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

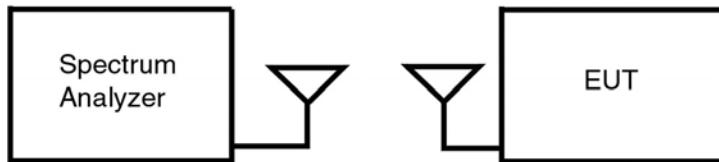
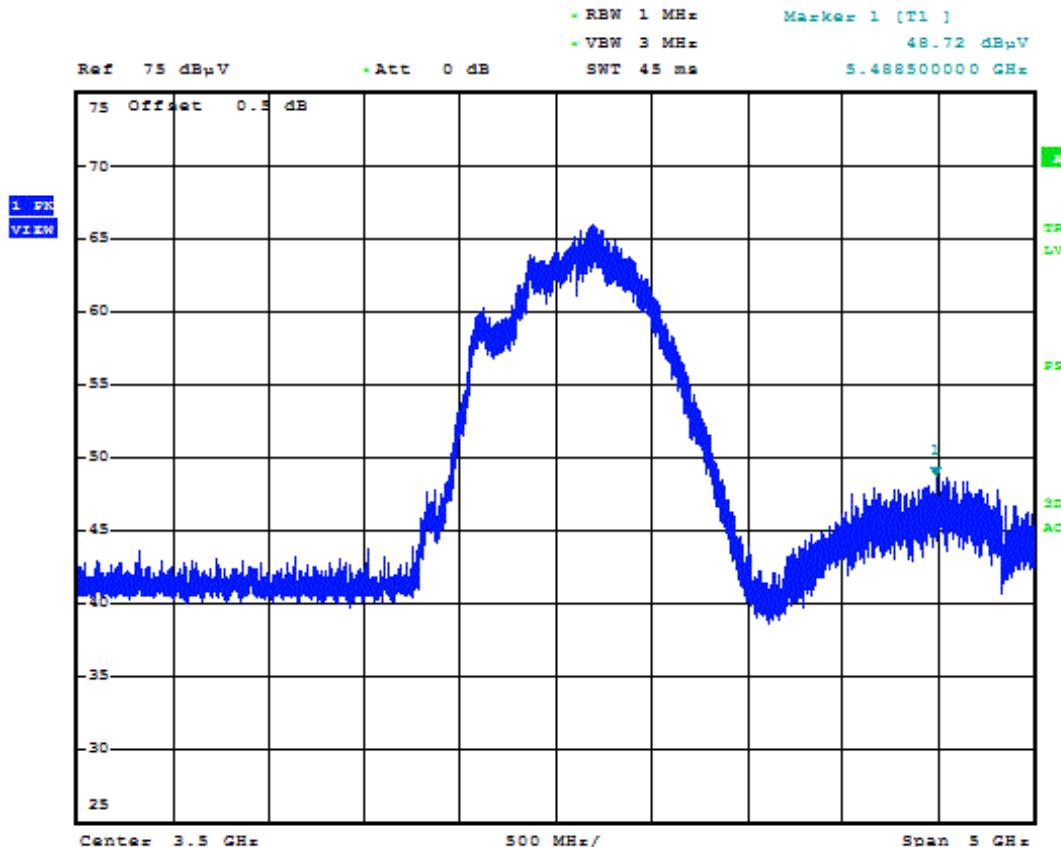


Figure 6-4. Test Instrument & Measurement Setup

### Test Notes

1. The RBW for measurements in the GPS bands was maintained at 1MHz since compliance was shown without the need to reduce the RBW down to the 1kHz minimum.
2. Pre-scan plots that are included are not corrected for antenna factors, cable losses, or pre-amplifier gains. The plots are only used for spurious emission identification. Pre-scans are performed using a peak detector and the final measurements are performed using an RMS detector.
3. Pre-scan plots are only included for the vertical polarization since they were determined to be the worst case.
4. Only vertical polarization measurements were recorded since it was determined that the EUT's antenna was vertically polarized and will remain as such after installation.

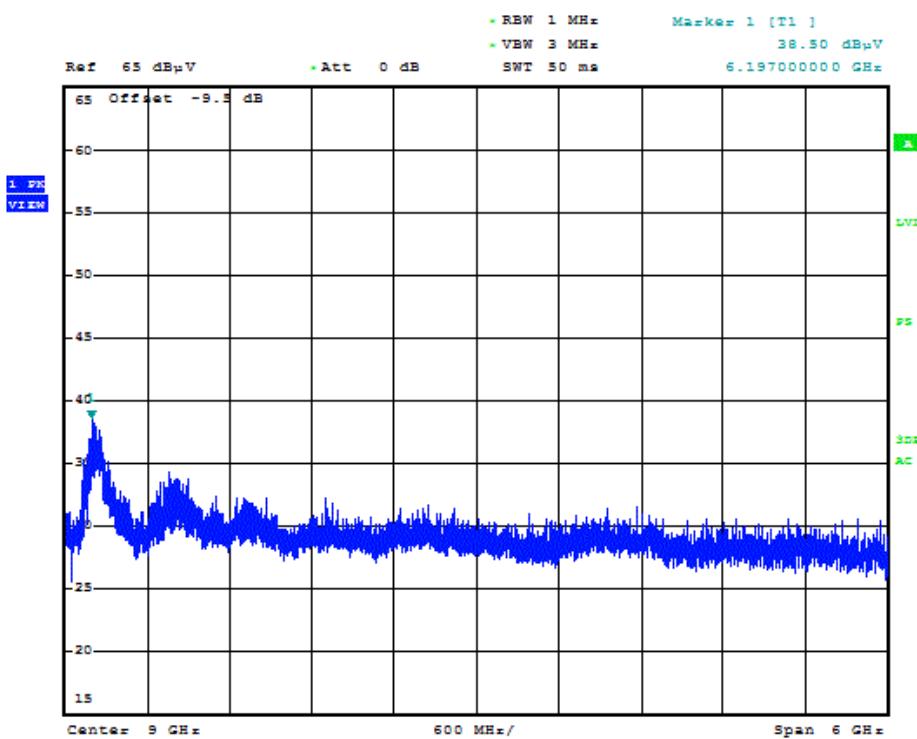


Plot 6-6. Pre-Scan Plot from 960MHz – 6GHz in Vertical Polarization

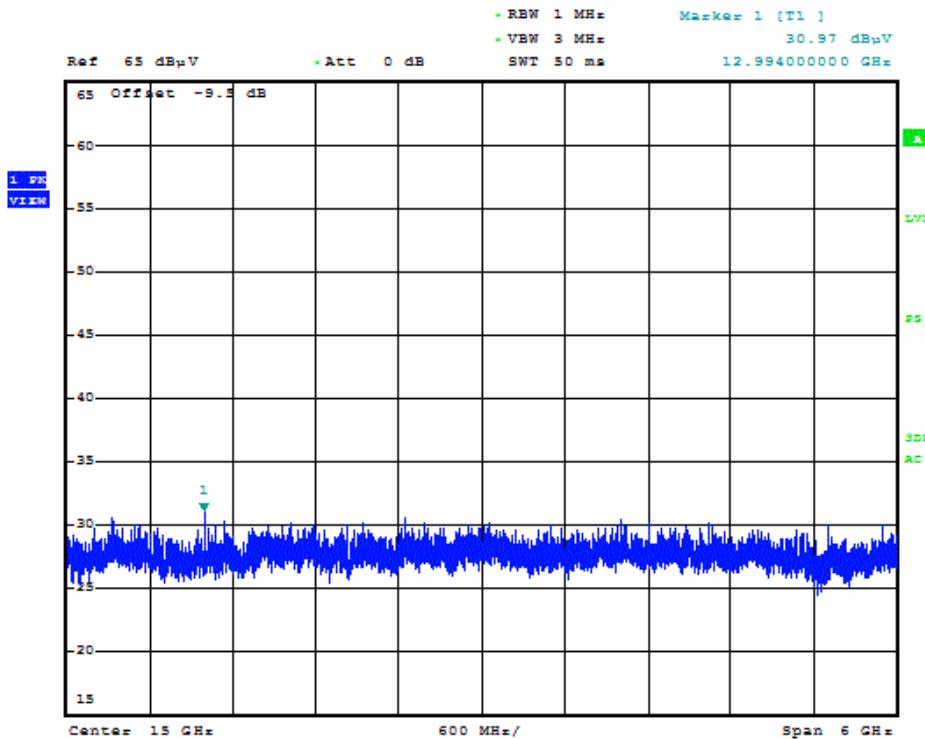
FCC ID: NUF-PSP400-A		FCC Pt. 15F ULTRA WIDEBAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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## Radiated Emissions Above 960MHz (Cont'd)

§15.511(c)(d)



Plot 6-7. Pre-Scan Plot from 6GHz – 12GHz in Vertical Polarization

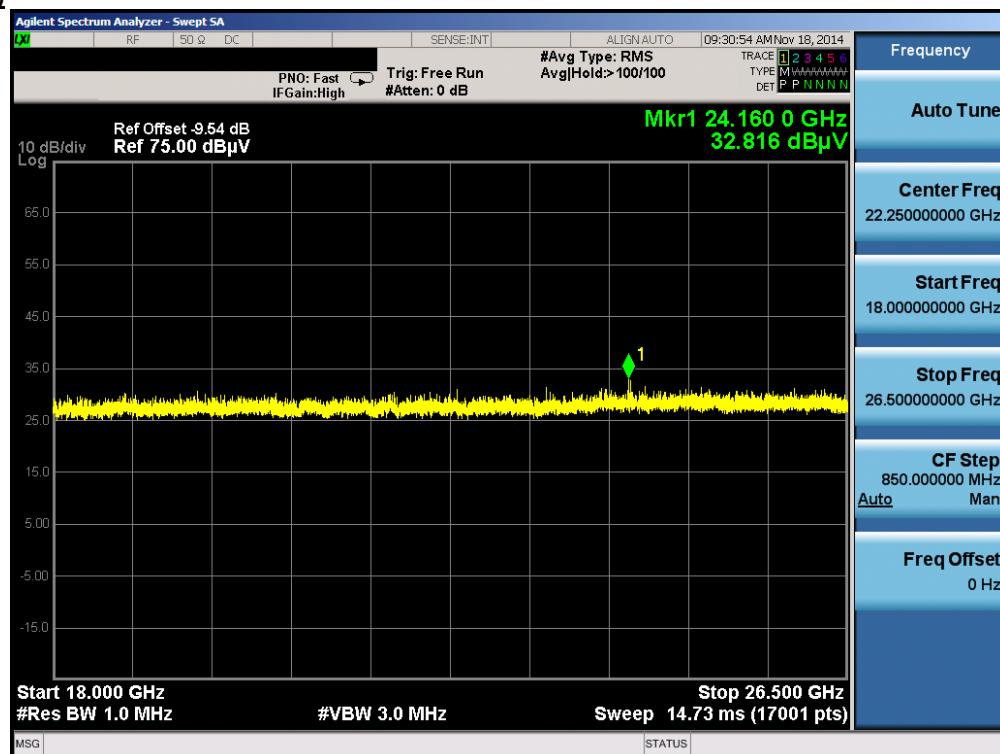


Plot 6-8. Pre-Scan Plot from 12GHz – 18GHz in Vertical Polarization

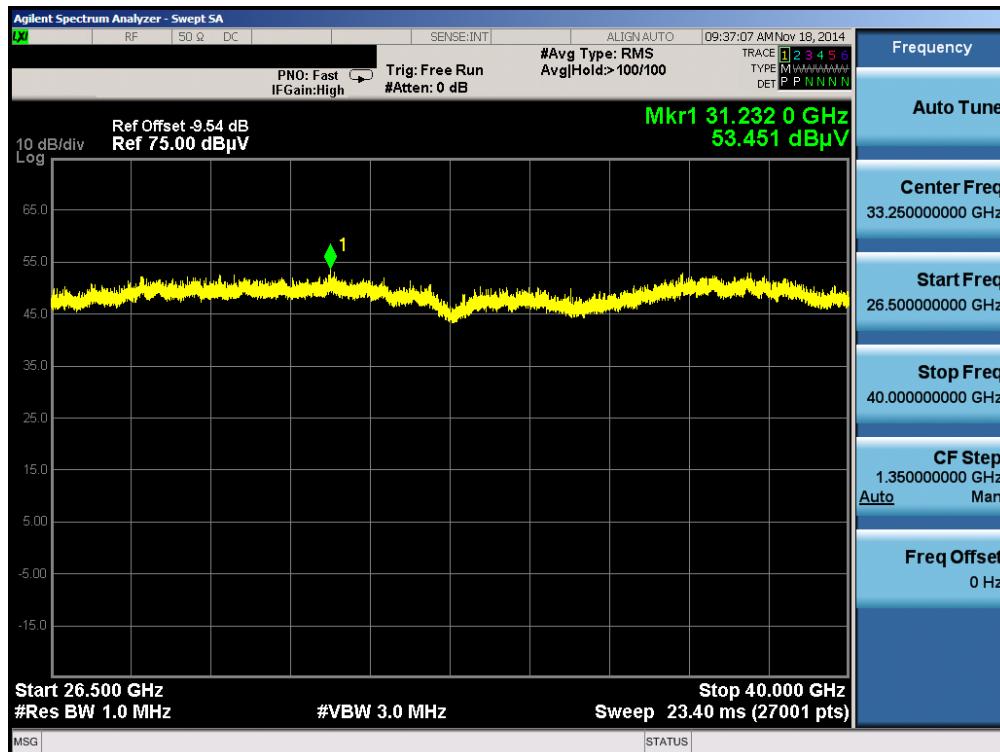
FCC ID: NUF-PSP400-A	FCC Pt. 15F ULTRA WIDEBAND TEST REPORT (CERTIFICATION)			Reviewed by: Quality Manager
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## Radiated Emissions Above 960MHz (Cont'd)

§15.511(c)(d)



Plot 6-9. Pre-Scan Plot from 18GHz – 26.5GHz in Vertical Polarization



Plot 6-10. Pre-Scan Plot from 26.5GHz – 40GHz in Vertical Polarization

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## Radiated Emissions Above 960MHz (Cont'd)

§15.511(c)(d)

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB]	Field Strength [dB $\mu$ V/m]	EIRP [dBm]	Limit [dBm]	Margin [dB]
2866.00	-94.96	RMS	V	33.06	45.10	-50.10	-41.30	-8.80
5488.50	-95.36	RMS	V	39.88	51.52	-43.68	-41.30	-2.38
6239.58	-104.67	RMS	V	42.87	45.20	-50.00	-41.30	-8.70
6822.00	-110.86	RMS	V	41.99	38.13	-57.07	-41.30	-15.77
11084.00	-116.21	RMS	V	46.91	37.70	-57.50	-51.30	-6.20
13106.50	-116.50	RMS	V	49.85	40.35	-54.85	-51.30	-3.55
24174.00	-109.26	RMS	V	44.43	42.18	-53.02	-51.30	-1.72
31232.00	-113.70	RMS	V	48.34	41.64	-53.56	-51.30	-2.26

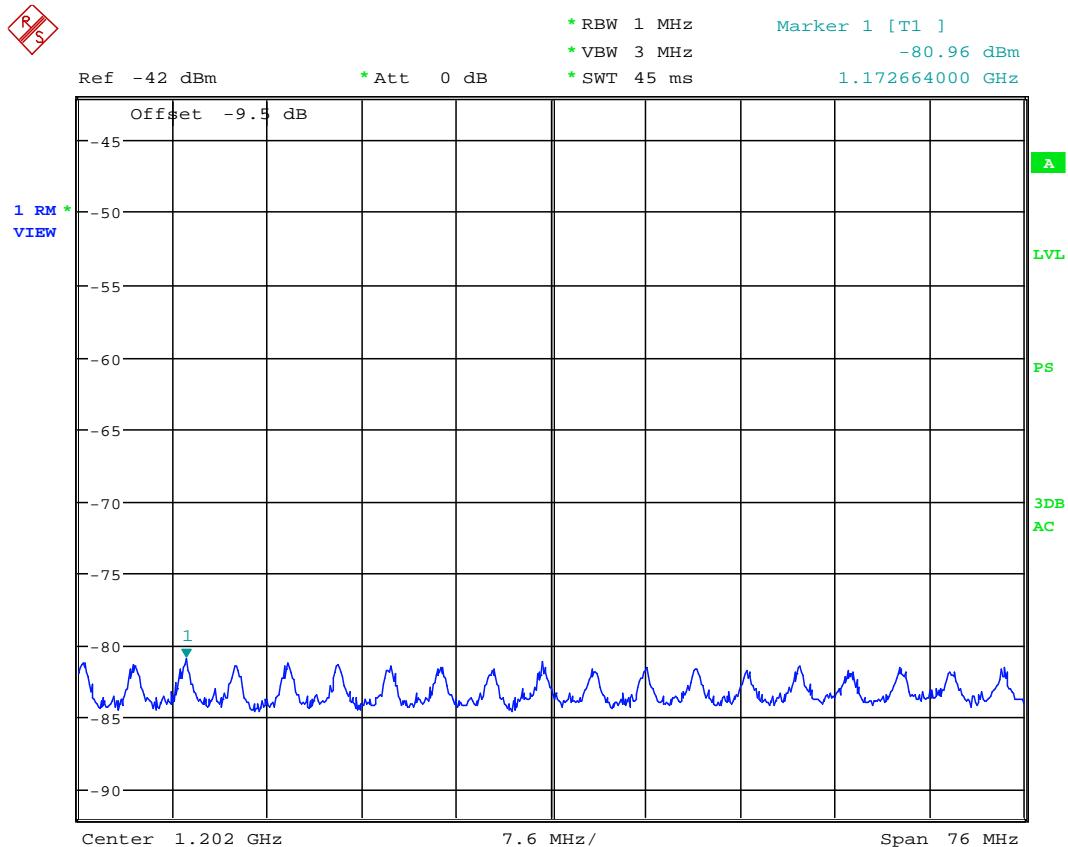
Table 6-4. Average EIRP Emissions Measurements

FCC ID: NUF-PSP400-A		FCC Pt. 15F ULTRA WIDEBAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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## Radiated Emissions Above 960MHz (Cont'd)

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### Radiated Emissions in the 1164 – 1240MHz GPS Band



Date: 17.NOV.2014 17:41:16

**Plot 6-11. Pre-Scan Plot of 1164 – 1240MHz GPS Band**

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB]	Field Strength [dB $\mu$ V/m]	EIRP [dBm]	Limit [dBm]	Margin [dB]
1172.66	-111.42	RMS	V	27.49	23.07	-72.13	-63.30	-8.83

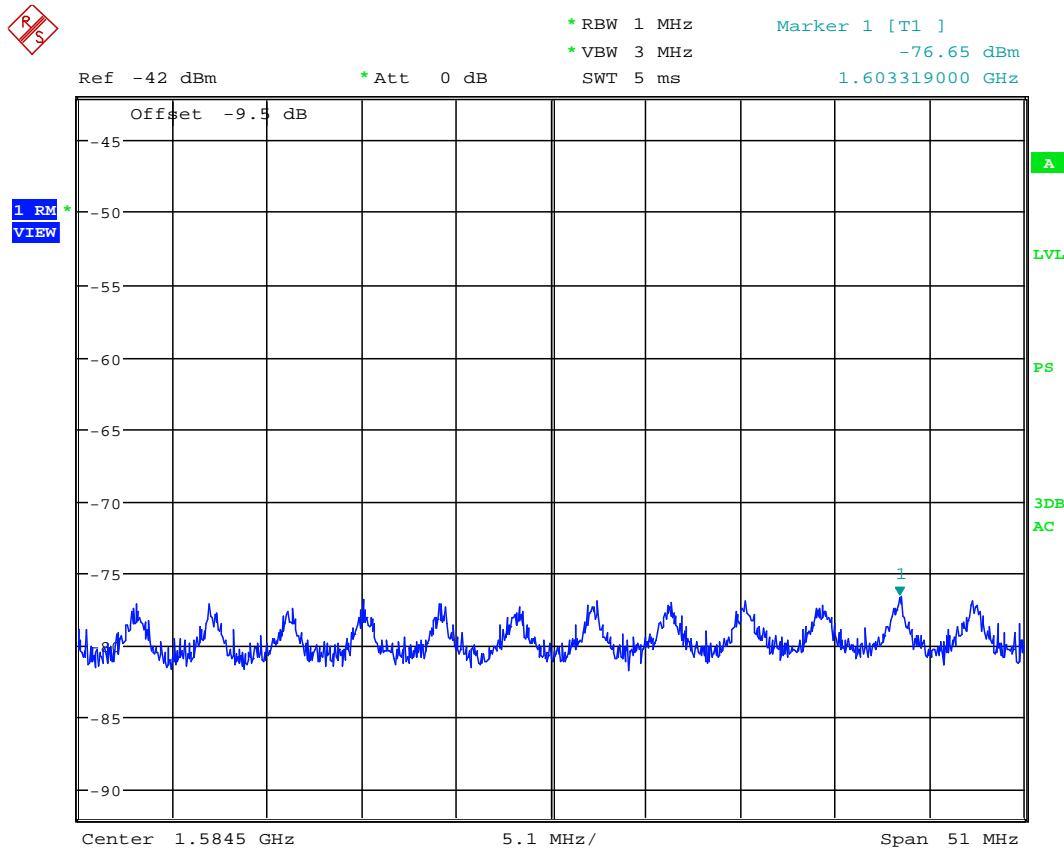
**Table 6-5. Average EIRP in 1164 – 1240MHz Band**

FCC ID: NUF-PSP400-A	FCC Pt. 15F ULTRA WIDEBAND TEST REPORT (CERTIFICATION)			Reviewed by: Quality Manager
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## Radiated Emissions Above 960MHz (Cont'd)

§15.511(c)(d)

### Radiated Emissions in the 1559 – 1610MHz GPS Band



Date: 17.NOV.2014 17:47:43

**Plot 6-12. Pre-Scan Plot of 1559 – 1610MHz GPS Band**

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB]	Field Strength [dB $\mu$ V/m]	EIRP [dBm]	Limit [dBm]	Margin [dB]
1603.32	-107.91	RMS	V	28.42	27.51	-67.69	-63.30	-4.39

**Table 6-6. Average EIRP in 1559 – 1610MHz Band**

FCC ID: NUF-PSP400-A	FCC Pt. 15F ULTRA WIDEBAND TEST REPORT (CERTIFICATION)			Reviewed by: Quality Manager
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## 6.6 Radiated Emissions Below 960MHz

§15.109, 15.209

### Test Overview and Limits

Radiated emissions were investigated up to 960MHz. All pre-scan measurements were recorded as peak field strengths while the final measurements were recorded as quasi-peak field strengths to compare with the limits of 15.109 and 15.209. The device was configured to operate in four different modes, as shown in the table below:

Configuration	Antenna 1 (terminated)	Antenna 2	Antenna 3 (terminated)
1	Idle	Idle	Idle
2	Monostatic*	Idle	Monostatic*
3	Rx	Rx	Rx
4	Tx	Rx	Tx

***The maximum permissible field strength limits for emissions below 960MHz are as follows:***

Frequency	Field Strength [ $\mu$ V/m]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3

**Table 6-7. Radiated Limits for Emissions Below 960MHz**

### Test Procedure Used

ANSI C63.10-2009 – Section 7.10.2

### Test Settings

1. RBW = 120kHz
2. VBW = 3MHz
3. Analyzer was set to zero span mode using a quasi-peak adapter once the frequency of the emission in question has been identified
4. Sweep = auto couple
5. Detector = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

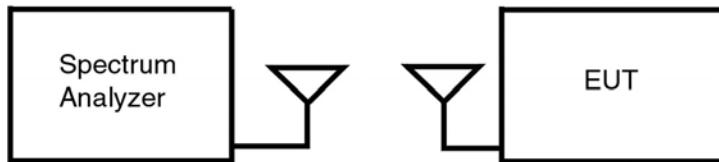
FCC ID: NUF-PSP400-A		FCC Pt. 15F ULTRA WIDEBAND TEST REPORT (CERTIFICATION)	Reviewed by: Quality Manager
Test Report S/N: 0Y1411202135.NUF	Test Dates: 11/17 - 11/18/2014	EUT Type: UWB Radar Surveillance System	Page 26 of 36

## Radiated Emissions Below 960MHz (Cont'd)

§15.109, 15.209

### Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



**Figure 6-5. Test Instrument & Measurement Setup**

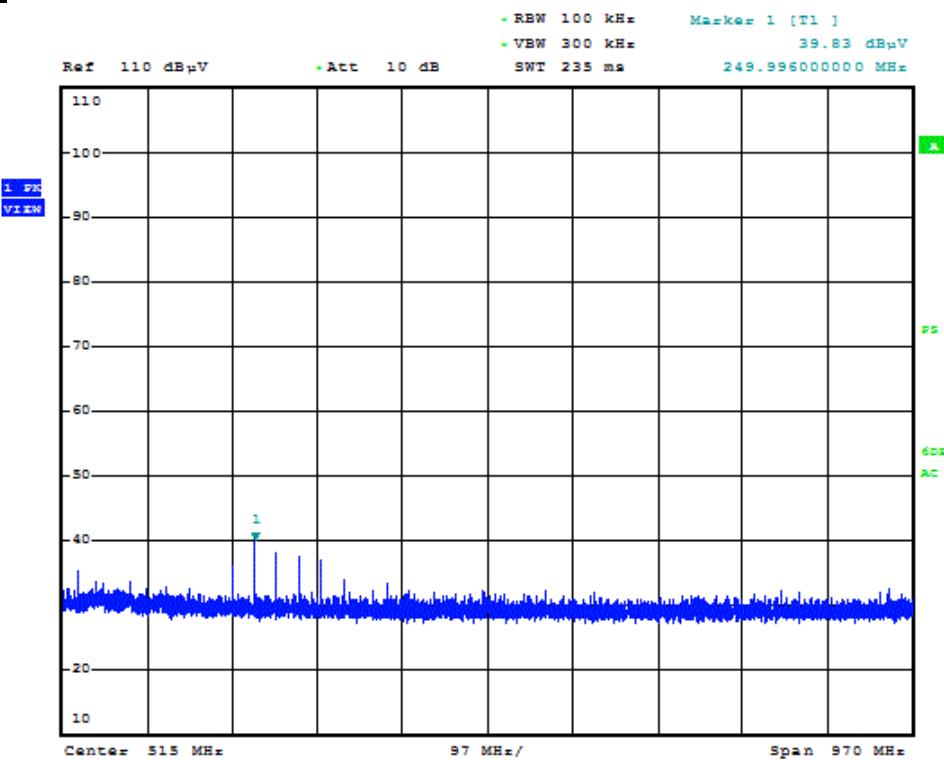
### Test Notes

1. "Monostatic" mode is mode in which the pulses within each 24ms burst alternate between transmit and receive.
2. Emissions below 30MHz were investigated only in the mode that produced the worst case emissions above 30MHz. No emissions below 30MHz were found to be within 20dB of the limit.

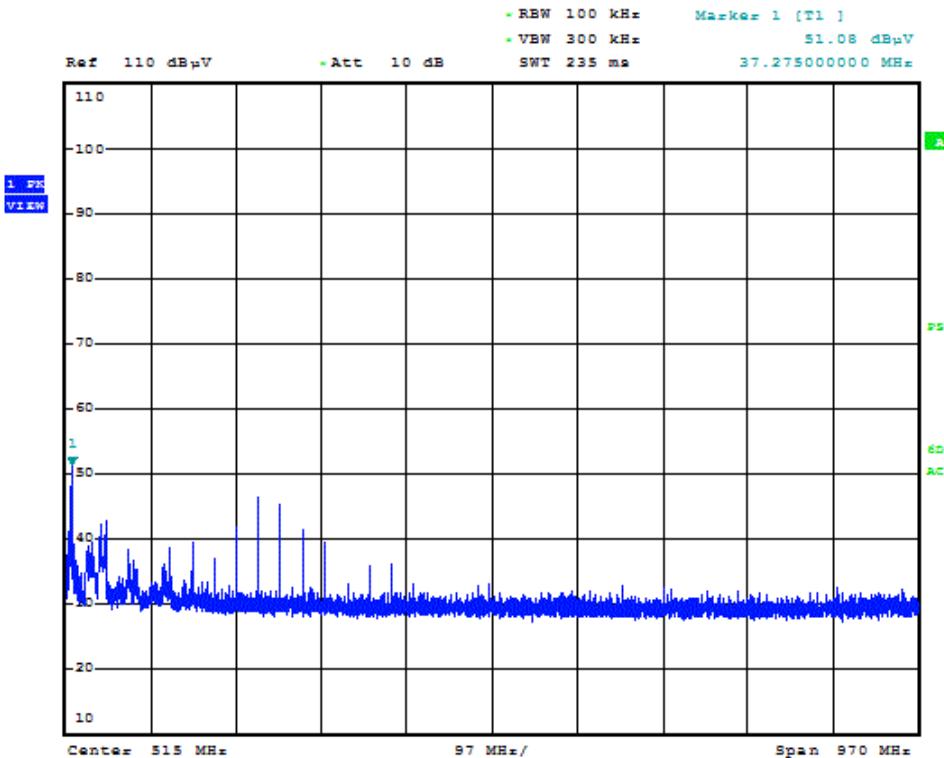
FCC ID: NUF-PSP400-A	 PCTEST	FCC Pt. 15F ULTRA WIDEBAND TEST REPORT (CERTIFICATION)	Reviewed by: Quality Manager
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## Radiated Emissions Below 960MHz (Cont'd)

§15.109, 15.209



Plot 6-13. Pre-Scan Plot in Configuration #1 (Horizontal Polarization)

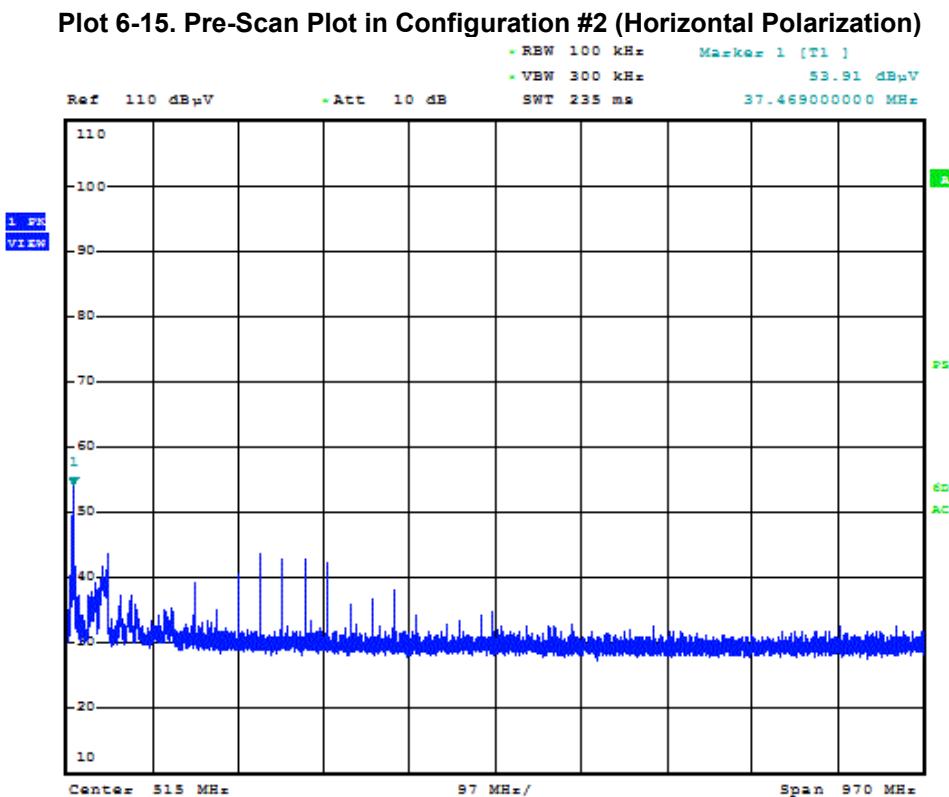
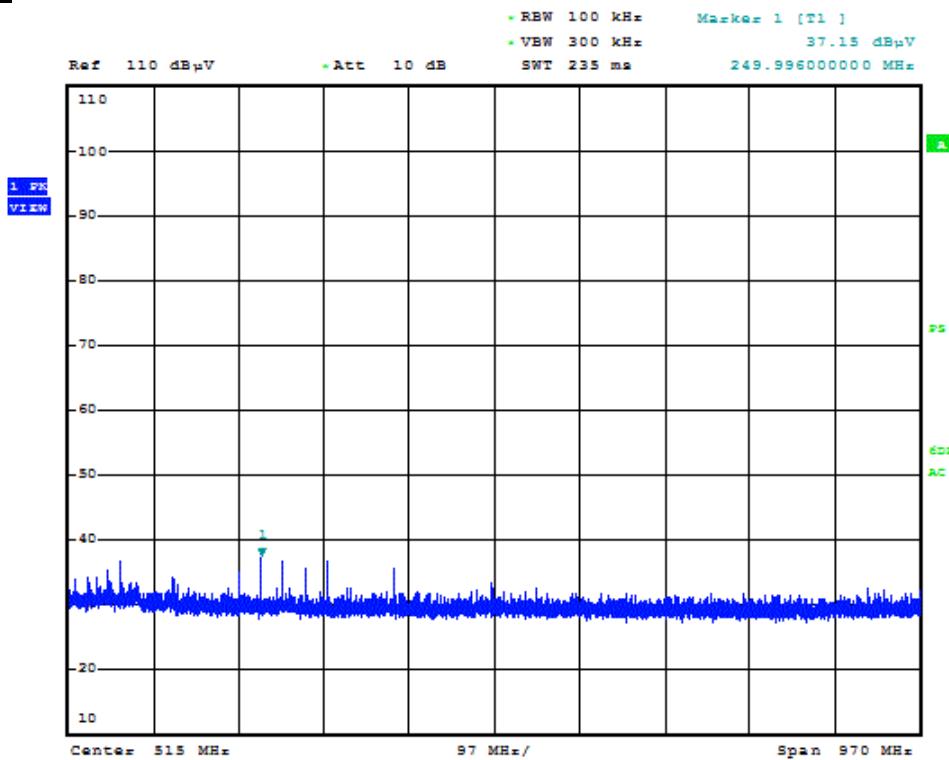


Plot 6-14. Pre-Scan Plot in Configuration #1 (Vertical Polarization)

FCC ID: NUF-PSP400-A	FCC Pt. 15F ULTRA WIDEBAND TEST REPORT (CERTIFICATION)			Reviewed by: Quality Manager
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## Radiated Emissions Below 960MHz (Cont'd)

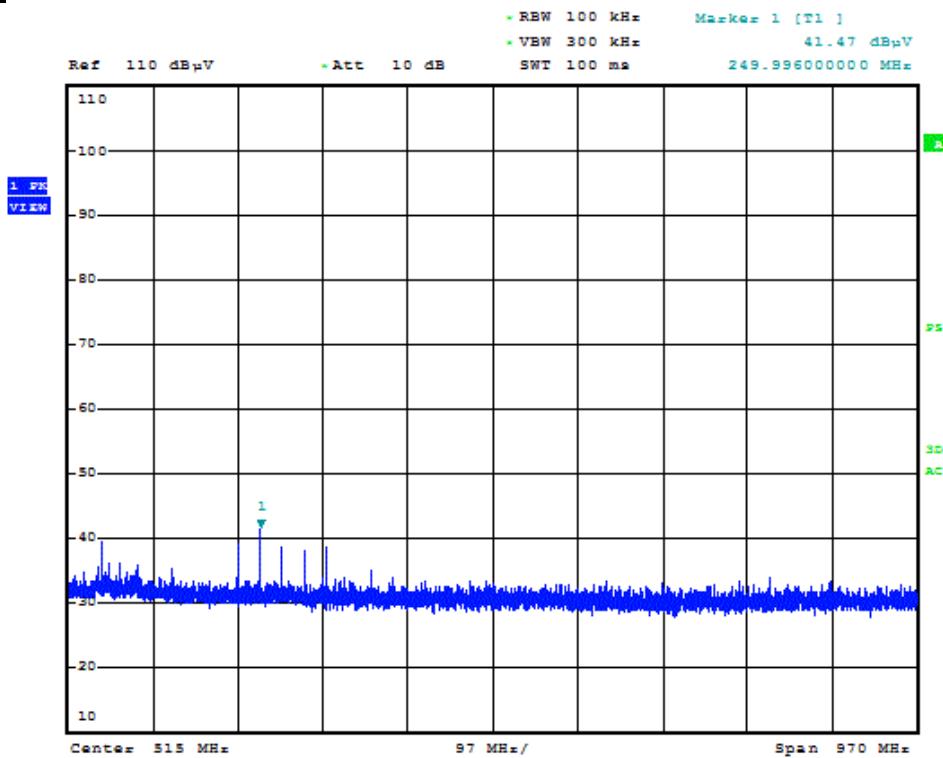
§15.109, 15.209



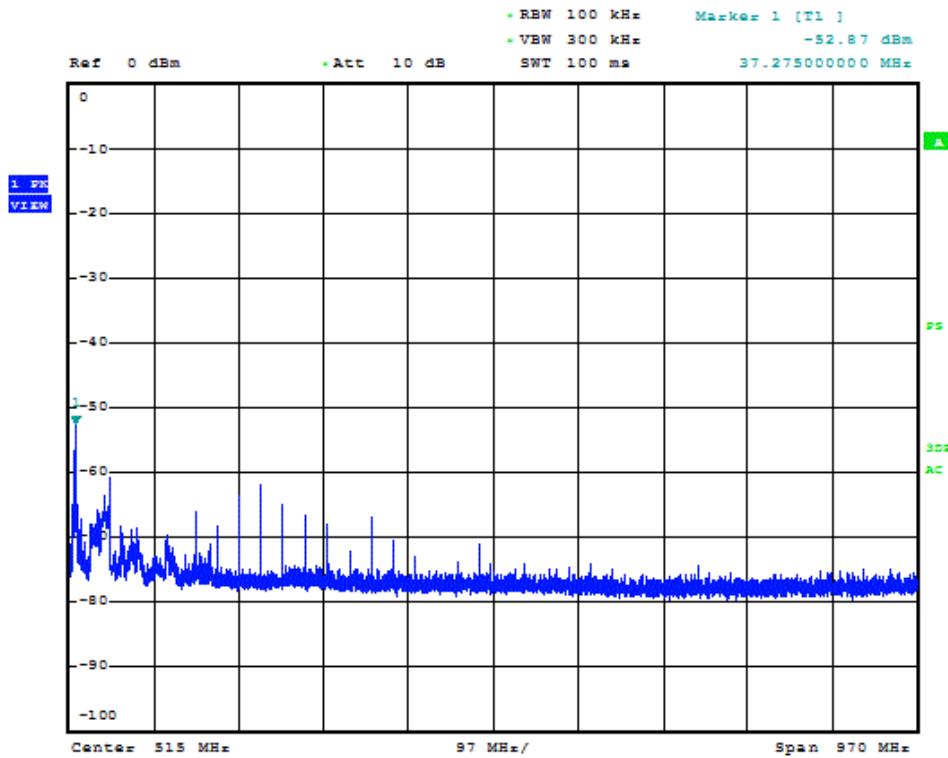
FCC ID: NUF-PSP400-A	FCC Pt. 15F ULTRA WIDEBAND TEST REPORT (CERTIFICATION)			Reviewed by: Quality Manager
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## Radiated Emissions Below 960MHz (Cont'd)

§15.109, 15.209



Plot 6-17. Pre-Scan Plot in Configuration #3 (Horizontal Polarization)

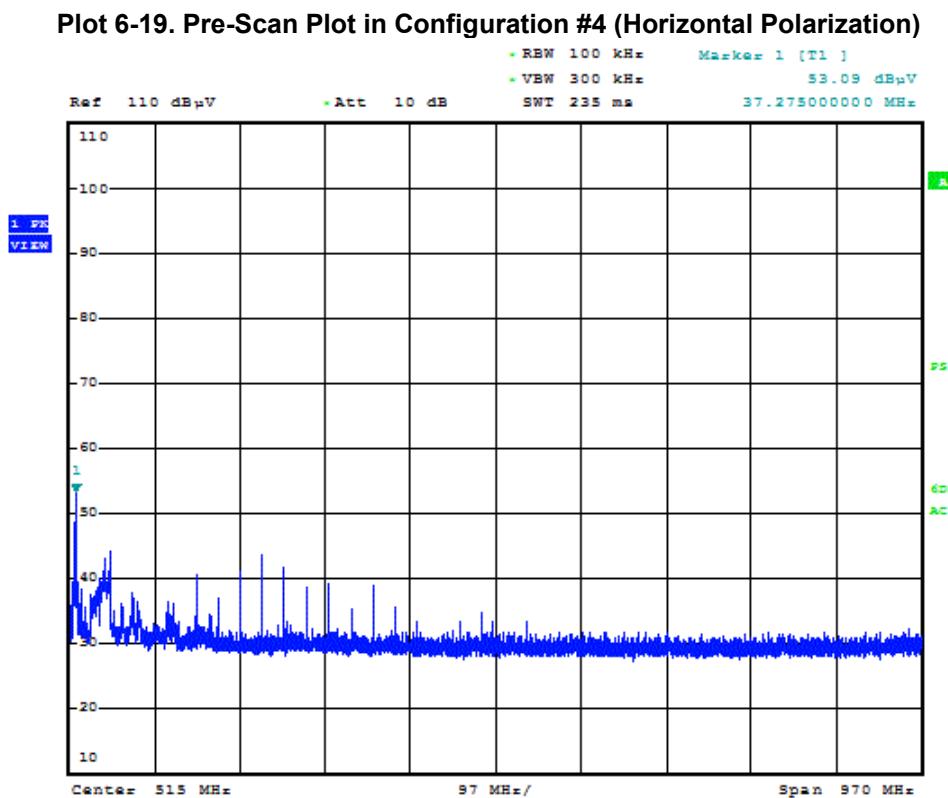
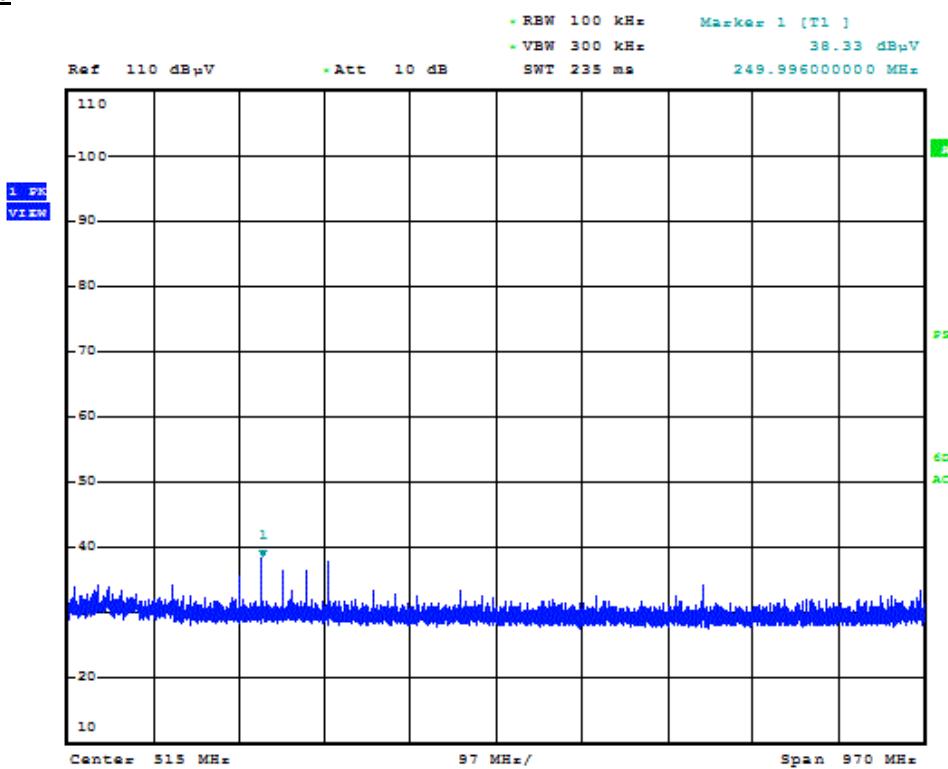


Plot 6-18. Pre-Scan Plot in Configuration #3 (Vertical Polarization)

FCC ID: NUF-PSP400-A		FCC Pt. 15F ULTRA WIDEBAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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## Radiated Emissions Below 960MHz (Cont'd)

§15.109, 15.209



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## Radiated Emissions Below 960MHz (Cont'd)

§15.109, 15.209

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]
37.28	-84.72	Quasi-Peak	V	15.83	38.11	40.00	-1.89
76.46	-86.21	Quasi-Peak	V	8.56	29.35	40.00	-10.65
224.97	-86.80	Quasi-Peak	V	12.72	32.92	46.02	-13.10
250.00	-82.65	Quasi-Peak	V	13.66	38.02	46.02	-8.00
275.02	-83.62	Quasi-Peak	V	14.82	38.20	46.02	-7.82
299.95	-87.42	Quasi-Peak	V	15.17	34.75	46.02	-11.27

Table 6-8. Radiated Spurious Emissions in Idle Mode (Configuration #1)

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]
37.47	-84.71	Quasi-Peak	V	15.70	37.99	40.00	-2.01
76.56	-85.41	Quasi-Peak	V	8.55	30.14	40.00	-9.86
250.00	-85.39	Quasi-Peak	V	13.66	35.28	46.02	-10.74
275.02	-86.05	Quasi-Peak	V	14.82	35.77	46.02	-10.25
299.95	-86.12	Quasi-Peak	V	15.17	36.05	46.02	-9.97
324.98	-86.66	Quasi-Peak	V	15.72	36.06	46.02	-9.96

Table 6-9. Radiated Spurious Emissions in Monostatic Mode (Configuration #2)

FCC ID: NUF-PSP400-A		FCC Pt. 15F ULTRA WIDEBAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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## Radiated Emissions Below 960MHz (Cont'd)

§15.109, 15.209

Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]
37.28	-85.73	Quasi-Peak	V	15.83	37.10	40.00	-2.90
76.27	-85.87	Quasi-Peak	V	8.58	29.71	40.00	-10.29
224.97	-86.71	Quasi-Peak	V	12.72	33.01	46.02	-13.01
250.00	-85.44	Quasi-Peak	V	13.66	35.23	46.02	-10.79
275.02	-86.05	Quasi-Peak	V	14.82	35.77	46.02	-10.25
299.95	-88.32	Quasi-Peak	V	15.17	33.85	46.02	-12.17

Table 6-10. Radiated Spurious Emissions in Receive Mode (Configuration #3)

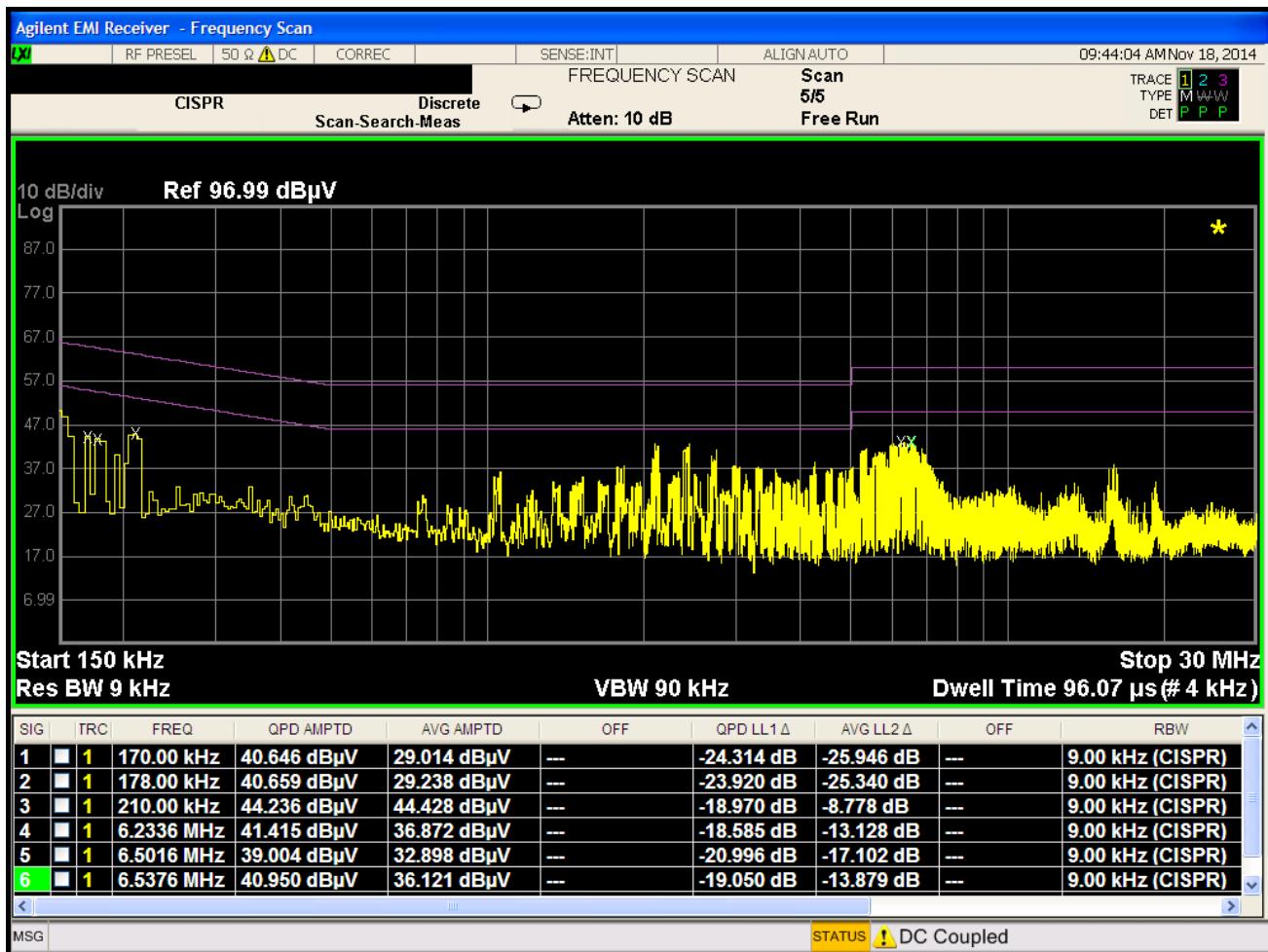
Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]
37.28	-87.09	Quasi-Peak	V	15.83	35.74	40.00	-4.26
76.56	-90.98	Quasi-Peak	V	8.55	24.57	40.00	-15.43
175.02	-94.45	Quasi-Peak	V	12.83	25.38	43.52	-18.14
224.97	-94.03	Quasi-Peak	V	12.72	25.69	46.02	-20.33
250.00	-91.41	Quasi-Peak	V	13.66	29.26	46.02	-16.76
275.02	-93.24	Quasi-Peak	V	14.82	28.58	46.02	-17.44

Table 6-11. Radiated Spurious Emissions in Transmit Mode (Configuration #4)

FCC ID: NUF-PSP400-A		FCC Pt. 15F ULTRA WIDEBAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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## 6.7 Line-Conducted Test Data

§15.207, 15.521(j)



Plot 6-21. Line Conducted Plot with Configuration #2 (L1)

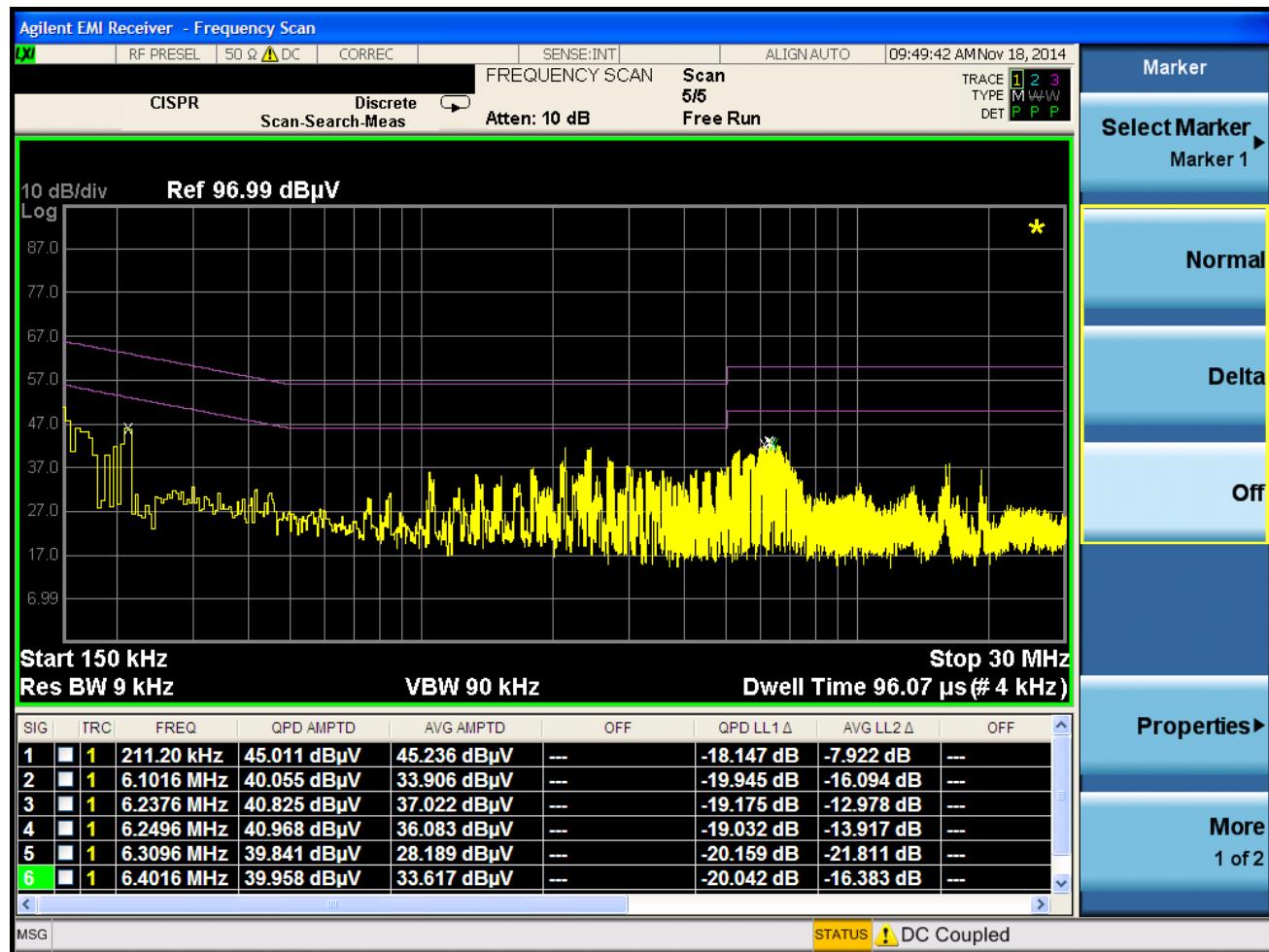
**Notes:**

1. All modes of operation were investigated and the worst-case emissions are reported with the EUT operating in monostatic mode (configuration #2).
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dB $\mu$ V) = QP/AV Analyzer/Receiver Level (dB $\mu$ V) + Corr. (dB)
5. Margin (dB) = QP/AV Level (dB $\mu$ V) - QP/AV Limit (dB $\mu$ V)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

FCC ID: NUF-PSP400-A	FCC Pt. 15F ULTRA WIDEBAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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## Line-Conducted Test Data (Cont'd)

§15.207, 15.521(j)



Plot 6-22. Line Conducted Plot with Configuration #2 (N)

### Notes:

1. All modes of operation were investigated and the worst-case emissions are reported with the EUT operating in monostatic mode (configuration #2).
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dB $\mu$ V) = QP/AV Analyzer/Receiver Level (dB $\mu$ V) + Corr. (dB)
5. Margin (dB) = QP/AV Level (dB $\mu$ V) - QP/AV Limit (dB $\mu$ V)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

FCC ID: NUF-PSP400-A		FCC Pt. 15F ULTRA WIDEBAND TEST REPORT (CERTIFICATION)	Reviewed by: Quality Manager
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## 7.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **TDC UWB Radar Surveillance System** **FCC ID: NUF-PSP400-A** is in compliance with Part 15F of the FCC Rules.

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