TEST REPORT

Report Number: 3159782ATL-001

August 29, 2008

Product Designation: PLUS Badge Tag

Standard: FCC Part 15.250 - Operation of wideband systems within the band 5925 to 7250 MHz

Tested by:
Intertek Testing Services NA Inc.
1950 Evergreen Blvd., Suite 100
Duluth, GA 30096

Client:
Time Domain Corporation
7057 Old Madison Pike
Huntsville, AL 35806
Contact: Keven Trach
Phone: 256.428.6317
Fax: 256.922.0387

Tests performed by:

Richard C. Bianco
EMC Project Engineer

Report reviewed by:

David J. Schramm
Assistant Chief Engineer - EMC

1.0 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatum text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complies with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

2.0 Test Summary

Section	Test Full Name	Test Date	Result
4.0	System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)		
5.0	15.250(a) and 15.250(b): -10 dB Bandwidth requireqments (Bandwidth)	08/26/2008	PASS
6.0	15.250(d)(1) Radiated power (EIRP) density (EIRP power density)	08/26/2008	PASS
7.0	Peak Power in a 50 MHz bandwidth (Peak Power per 50 MHz)	08/26/2008	PASS
8.0	Radiated emissions below 960 MHz (Radiated Emissions (<960 MHz))	08/26/2008	PASS
9.0	15.250(d)(2) Radiated power (EIRP) density in GPS receive bands (EIRP power density (GPS))	08/26/2008	PASS

3.0 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
RF Tag	Time Domain	PLUS Badge Tag	NA

EUT receive date:	08/26/2008
EUT receive condition:	Good

Description of EUT provided by Client:
The PLUS Badge Tag is a simple UWB transmit-only device for RFID (Radio Frequency Identification), which sends out very short packets at predetermined transmission rates. These very short packets (less than 100 microseconds) allows for several thousand tags to be tracked in the same area. The data in the tag packet includes the tags ID, a packet number, battery status, and a received signal strength indicator. The PLUS Badge Tag is intended to be body worn on a lapel or lanyard.

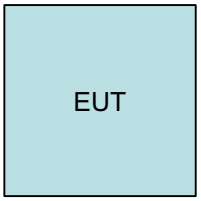
Description of EUT exercising:
The Tag was tested in a normal operating condition except the pulse rate was increased from 4Hz to 33Hz to aid the test procedure.

4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)

Method:

Record the details of EUTcabling, document the support equipment, and show the interconnections in a block diagram.

Drawing:



System Block Diagram

4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)

Data:

EUT Cabling						
					Connection	
ID	Description	Length	Shielding	Ferrites	From	To
No Cabling Required						

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
No Support Equipment Required			

5.0 15.250(a) and 15.250(b): -10 dB Bandwidth requireqments (Bandwidth)

Method:

The -10 dB bandwidth of a device operating under the provisions of this section must be contained within the 5925–7250 MHz band under all conditions of operation including the effects from stepped frequency, frequency hopping or other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

The -10 dB bandwidth of the fundamental emission shall be at least 50 MHz. For transmitters that employ frequency hopping, stepped frequency or similar modulation types, measurement of the -10 dB minimum bandwidth specified in this paragraph shall be made with the frequency hop or step function disabled and with the transmitter operating continuously at a fundamental frequency following the provisions of §15.31(m).

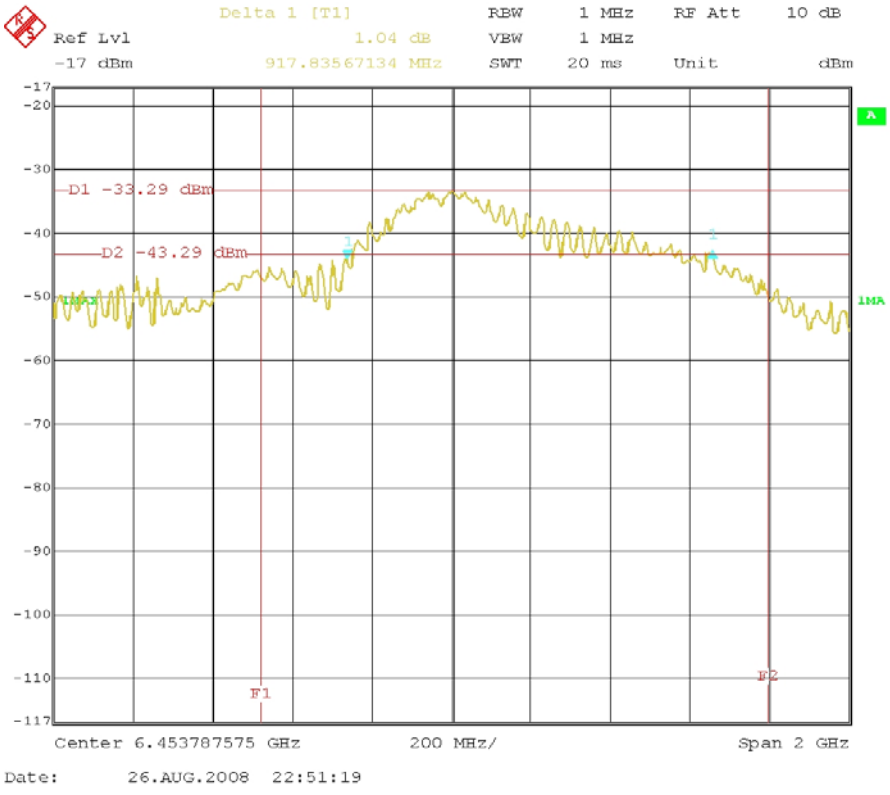
The -10 dB bandwidth is based on measurement using a peak detector, a 1 MHz resolution bandwidth, and a video bandwidth greater than or equal to the resolution bandwidth.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, Horn, <18 GHz	EMCO	3115	213061	04/18/2008	04/18/2009
Cable E05, <18GHz	Huber-Suhner	Sucoflex 104PEA	E05	05/05/2008	05/05/2009
Cable ST1, 7m, N-N, 18 GHz	Storm Products Co.	PR90-206-7MTR	ST1	01/16/2008	01/16/2009
Preamplifier, 20 MHz to 18 GHz, 40 dB	A.H. Systems	PAM-0118	200108	03/27/2008	03/27/2009
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	03/19/2008	03/19/2009

Results: The sample tested was found to Comply.

Plot:



-10dB Bandwidth

5.0 15.250(a) and 15.250(b): -10 dB Bandwidth requireqments (Bandwidth)

Data:

	Frequency MHz	Requirement	Compliant?	RBW	VBW
-10dB Level below center:	6191	> 5925 MHz	yes	1 MHz	1 MHz
-10dB Level above center:	7109	< 7250 MHz	yes	1 MHz	1 MHz
Bandwidth:	918	< 500 MHz	yes	1 MHz	1 MHz

6.0 15.250(d)(1) Radiated power (EIRP) density (EIRP power density)

Method:

(d) Emissions from a transmitter operating under this section shall not exceed the equivalent isotropically radiated power (EIRP) density levels:

(1) The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the RMS average limits based on measurements using a 1 MHz resolution bandwidth.

Emissions from digital circuitry used to enable the operation of the transmitter may comply with the limits in §15.209 provided it can be clearly demonstrated that those emissions are due solely to emissions from digital circuitry contained within the transmitter and the emissions are not intended to be radiated from the transmitter's antenna. Emissions from associated digital devices, as defined in §15.3(k), e.g., emissions from digital circuitry used to control additional functions or capabilities other than the operation of the transmitter, are subject to the limits contained in subpart B of this part. Emissisons from these digital circuits shall not be employed in determining the -10 dB bandwidth of the fundamental emission or the frequency at which the highest emission level occurs.

Measurement procedures:
All emissions at and below 960 MHz are based on measurements employing a CISPR quasi-peak detector. Unless otherwise specified, all RMS average emission levels specified in this section are to be measured utilizing a 1 MHz resolution bandwidth with a one millisecond dwell over each 1 MHz segment. The frequency span of the analyzer should equal the number of sampling bins times 1 MHz and the sweep rate of the analyzer should equal the number of sampling bins times one millisecond. The provision in §15.35(c) that allows emissions to be averaged over a 100 millisecond period does not apply to devices operating under this section. The video bandwidth of the measurement instrument shall not be less than the resolution bandwidth and trace averaging shall not be employed. The RMS average emission measurement is to be repeated over multiple sweeps with the analyzer set for maximum hold until the amplitude stabilizes.

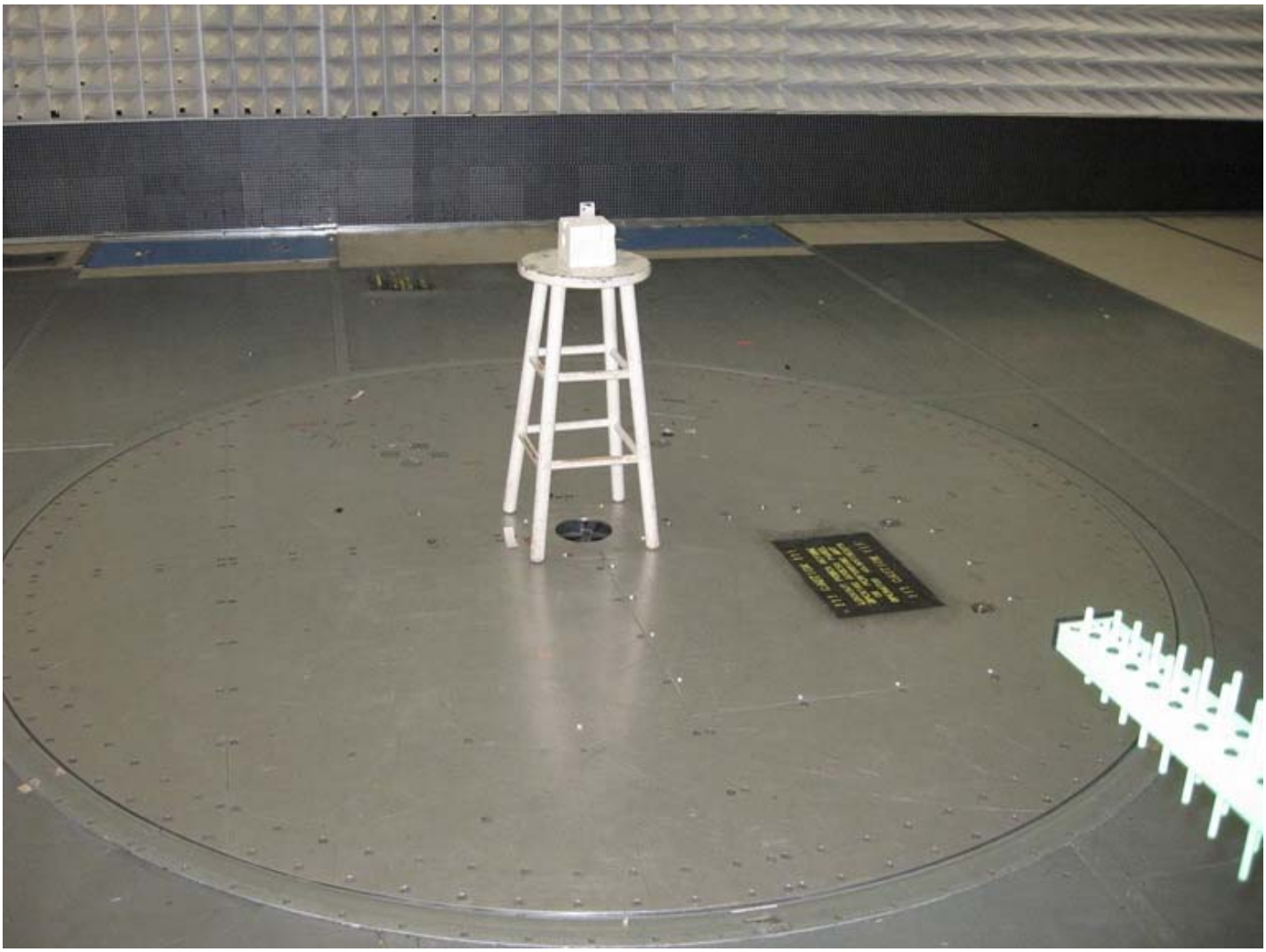
Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, Horn, <18 GHz	EMCO	3115	213061	04/18/2008	04/18/2009
Cable ST1, 7m, N-N, 18 GHz	Storm Products Co.	PR90-206-7MTR	ST1	01/16/2008	01/16/2009
Preamplifier, 20 MHz to 18 GHz, 40 dB	A.H. Systems	PAM-0118	200108	03/27/2008	03/27/2009
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	03/19/2008	03/19/2009

Results: The sample tested was found to Comply.

6.0 15.250(d)(1) Radiated power (EIRP) density (EIRP power density)

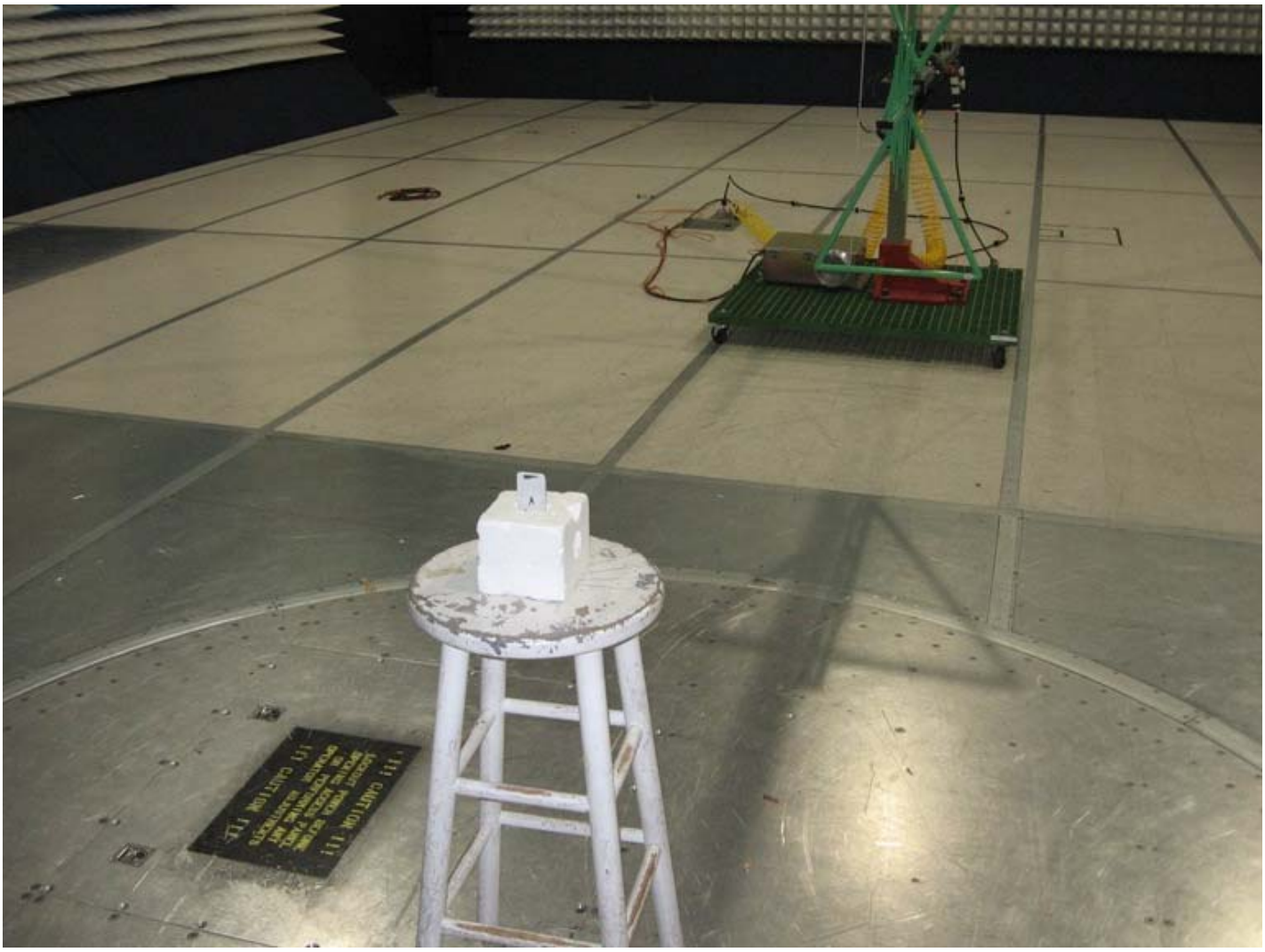
Photo:



Test Setup - Front view

6.0 15.250(d)(1) Radiated power (EIRP) density (EIRP power density)

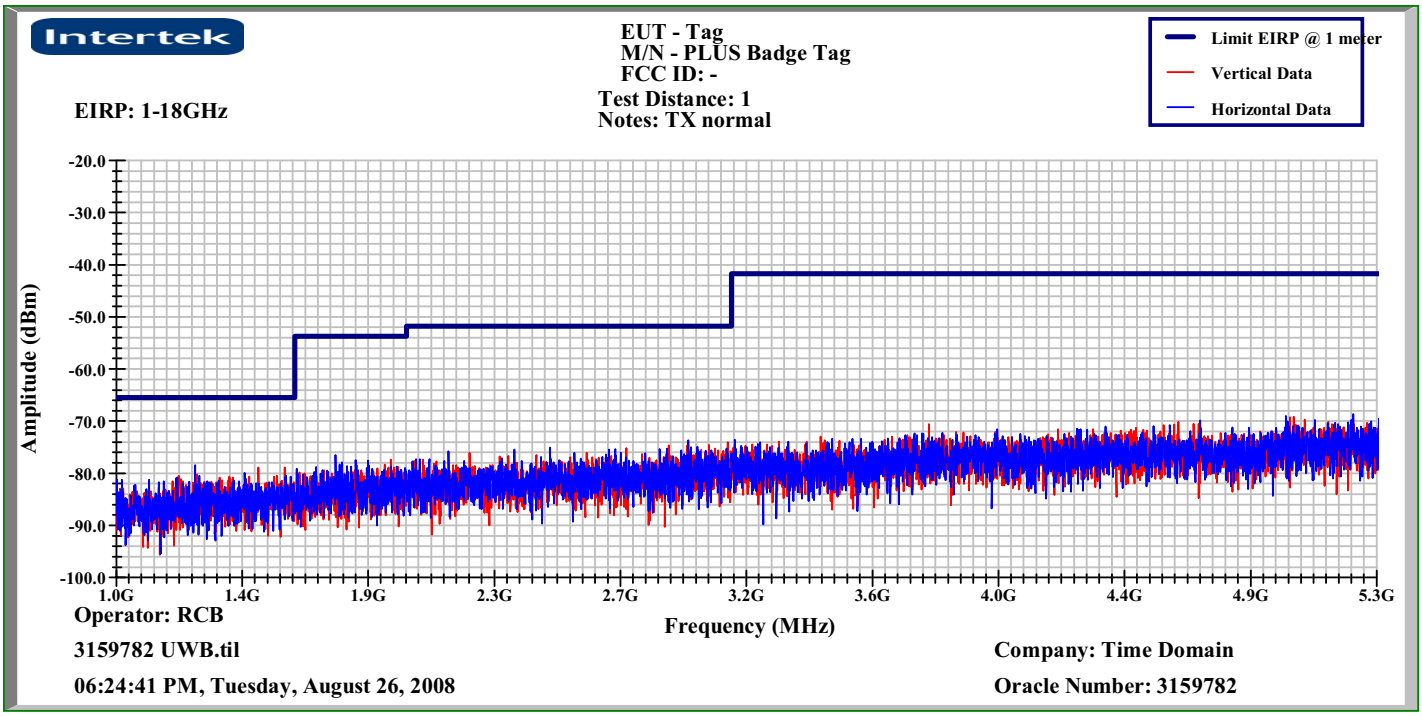
Photo:



Test Setup - Rear View

6.0 15.250(d)(1) Radiated power (EIRP) density (EIRP power density)

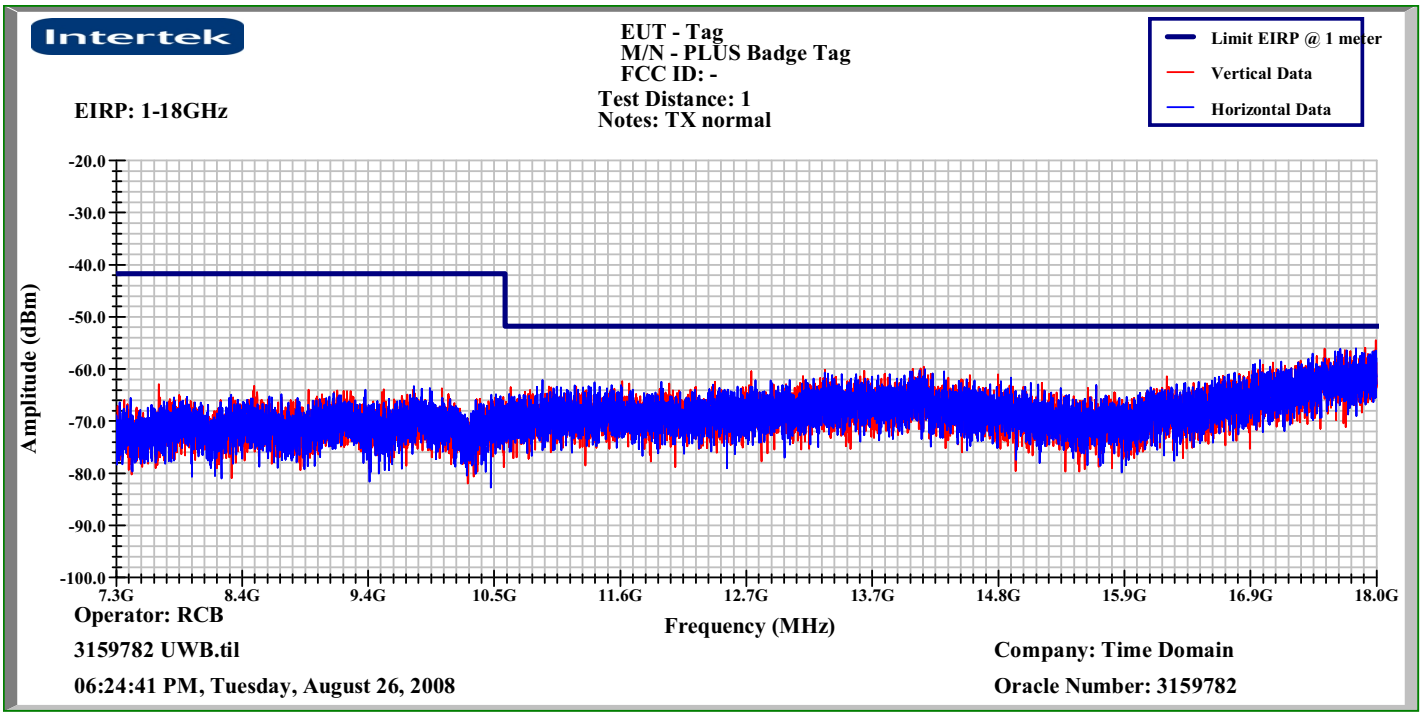
Plot:



1000MHz-5300MHz

6.0 15.250(d)(1) Radiated power (EIRP) density (EIRP power density)

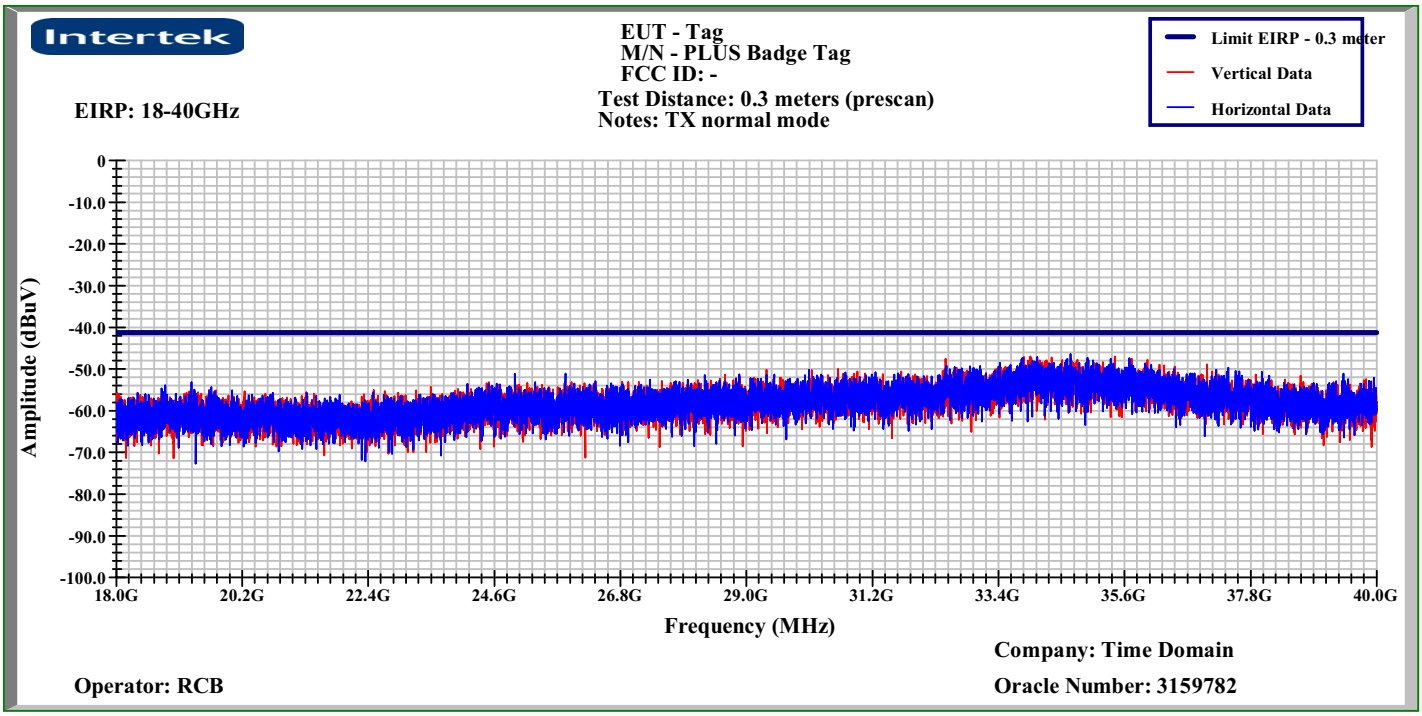
Plot:



5300MHz-18000MHz

6.0 15.250(d)(1) Radiated power (EIRP) density (EIRP power density)

Plot:



18000MHz-40000MHz

7.0 Peak Power in a 50 MHz bandwidth (Peak Power per 50 MHz)

Method:

(3) 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 and this 50 MHz bandwidth must be contained within the 5925–7250 MHz band. The peak EIRP limit is 20 log (RBW/50) dBm where RBW is the resolution bandwidth in megahertz that is employed by the measurement instrument. RBW shall not be lower than 1 MHz or greater than 50 MHz. The video bandwidth of the measurement instrument shall not be less than RBW. If RBW is greater than 3 MHz, the application for certification filed with the Commission shall contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, Horn, <18 GHz	EMCO	3115	213061	04/18/2008	04/18/2009
Cable ST1, 7m, N-N, 18 GHz	Storm Products Co.	PR90-206-7MTR	ST1	01/16/2008	01/16/2009
Preamplifier, 20 MHz to 18 GHz, 40 dB	A.H. Systems	PAM-0118	200108	03/27/2008	03/27/2009
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	03/19/2008	03/19/2009

Results: The sample tested was found to Comply.

7.0 Peak Power in a 50 MHz bandwidth (Peak Power per 50 MHz)

Data:

Frequency Range (MHz): 5925 to 7250 MHz **Test Distance (m):** 1

Input power: battery powered (fully charged) **Limit:** 15.250 at 1 m

Modifications for compliance (y/n): n

A	B	C	D	E	F
Ant. Pol. (V/H)	**Frequency MHz**	**EIRP RBW: 1MHz dBm**	**1 MHz Limit dBm**	**Margin dB**	**Detectors / Bandwidths Det/RBW/VBW**
V	6600.000	-41.2	-34.0	-7.2	Pk / 1M / 3M
Calculations		E=C-D			

Limit = 20*log(RBW/50) = 20*log(1/50) = -34 dBm

EIPR Peak Limits

7.0 Peak Power in a 50 MHz bandwidth (Peak Power per 50 MHz)

Data:

Frequency Range (MHz): 1000-40000 **Test Distance (m):** 1

Input power: battery **Limit:** 15_250d1-1m

Modifications for compliance (y/n): n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	**Frequency MHz**	**Reading dB(uV)**	**Antenna Factor dB(1/m)**	**Cable Loss dB**	**Pre-amp Factor dB**	**Net dB(uV/m)**	**1m Limit dB(uV/m)**	**Margin dB**	**Detectors / Bandwidths Det/RBW/VBW**
V	6585.000	60.6	35.3	5.3	39.9	61.4	63.4	-2.0	RMS/1M/3M
Calculations		G=C+D+E-F		I=G-H					

There were no measurable emissions above 6.6 GHz

EIPR RMS Limits

8.0 Radiated emissions below 960 MHz (Radiated Emissions (<960 MHz))

Method:

Radiated emissions at or below 960 MHz shall not exceed the emission levels in §15.209.

Measurements in the frequency range of 30 MHz to 1000 MHz shall be performed with a quasi-peak detector instrument that meets the requirements of Section One of CISPR 16.

Bandwidths:
30 MHz to 1000 MHz: 120 kHz RBW and 1 MHz VBW

Measurements of the radiated field are made with the antenna located at a distance of 3 or 10 meters from the EUT. The limit applied to the measurement shall be appropriate for the test distance. The test distance shall be indicated in the results section.

The EUT shall be arranged and connected with cables terminated in accordance with the product specification.

Exploratory tests should be carried out while varying the cable positions to determine the maximum or near-maximum emission level. During manipulation, cables shall not be placed under or on top of the system test components unless such placement is required by the inherent equipment design.

The antenna shall be adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth shall be varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) shall be varied during the measurements to find the maximum field-strength readings.

If the EUT is intended for tabletop use, it shall be placed on a table whose top is 0.8m above the ground plane. The table shall be constructed of non-conductive materials. Its dimensions are at least 1m by 1.5m, but may be extended for larger EUT.

If EUT is floor standing, the EUT was placed on a horizontal metal ground plane and isolated from the ground plane by up to 12 mm of insulating material.

Equipment setup for radiated disturbance tests shall follow the guidelines of ANSI C63.4:2003.

TEST SITE
The test site for radiated emissions is located at 1950 Evergreen Blvd, Suite 100, Duluth, Georgia 30096.

MEASUREMENT UNCERTAINTY
Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of k=2.
30 MHz to 1000 MHz at 3 meters: +/- 3.9 dB
30 MHz to 1000 MHz at 10 meters: +/- 3.6 dB
1 GHz to 18 GHz at 3 meters: +/- 4.2 dB

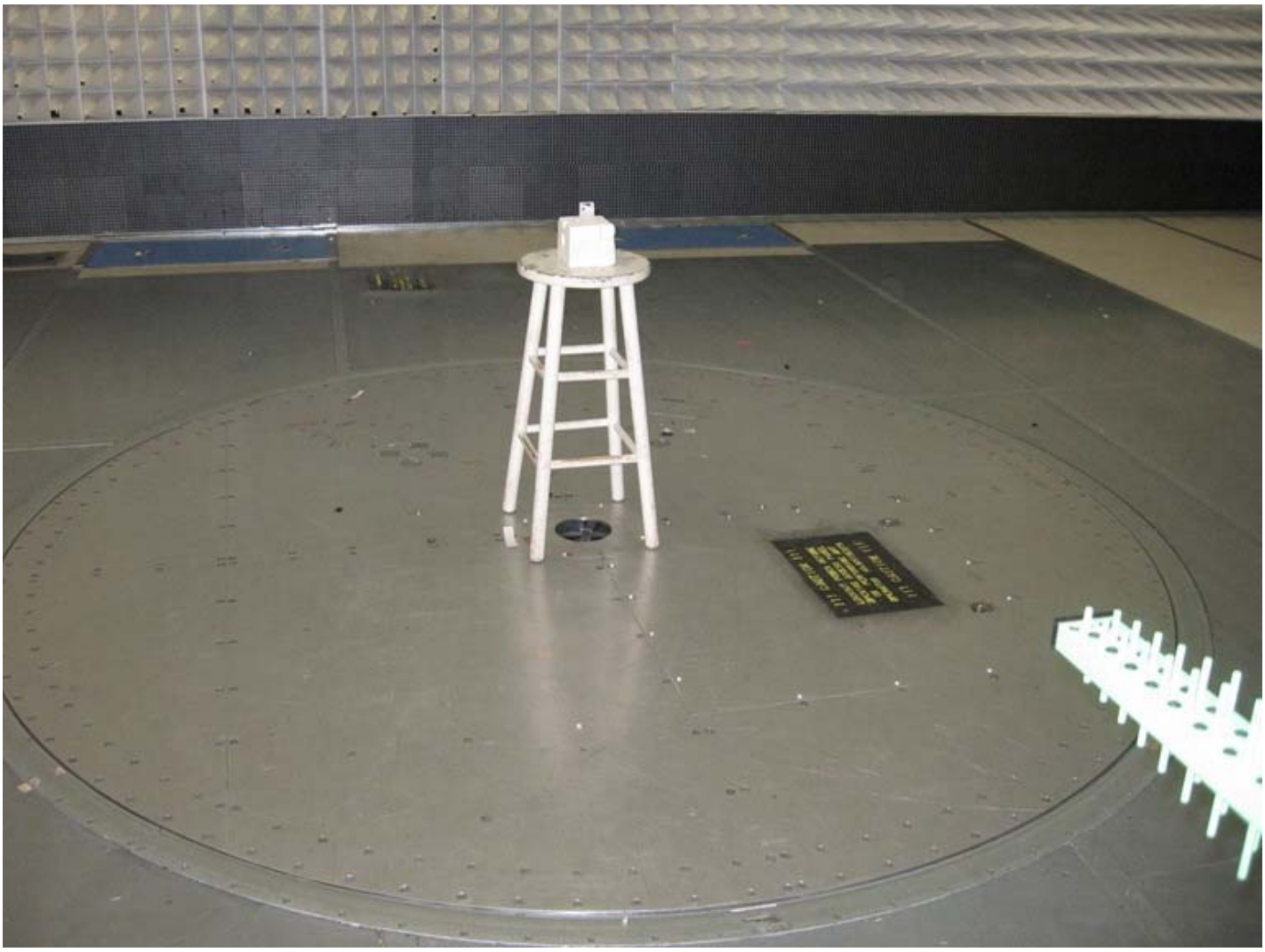
Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, BiLog, 20-2000MHz	Chase	CBL6112B	211386	09/07/2007	09/07/2008
Cable E01, <18GHz	Pasternack	RG214/U	E01	05/05/2008	05/05/2009
Cable E05, <18GHz	Huber-Suhner	Sucoflex 104PEA	E05	05/05/2008	05/05/2009
Cable E201, 18 GHz, N, 3m	Megaphase	TM18 NKNK 118	E201	01/16/2008	01/16/2009
Cable MP3, 18 GHz, N, 10m	Megaphase	G919-NKNK-394	MP3	05/05/2008	05/05/2009
EMI Receiver	Hewlett Packard	8546A	213109	09/10/2007	09/10/2008
EMI Receiver, Preselector section	Hewlett Packard	85460A	213108	09/10/2007	09/10/2008
Preamplifier, 10 MHz to 2000 MHz, 30 dB gain	Mini-Circuits	ZKL-2	200069	09/18/2007	09/18/2008
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	03/19/2008	03/19/2009

Results: The sample tested was found to Comply.

8.0 Radiated emissions below 960 MHz (Radiated Emissions (<960 MHz))

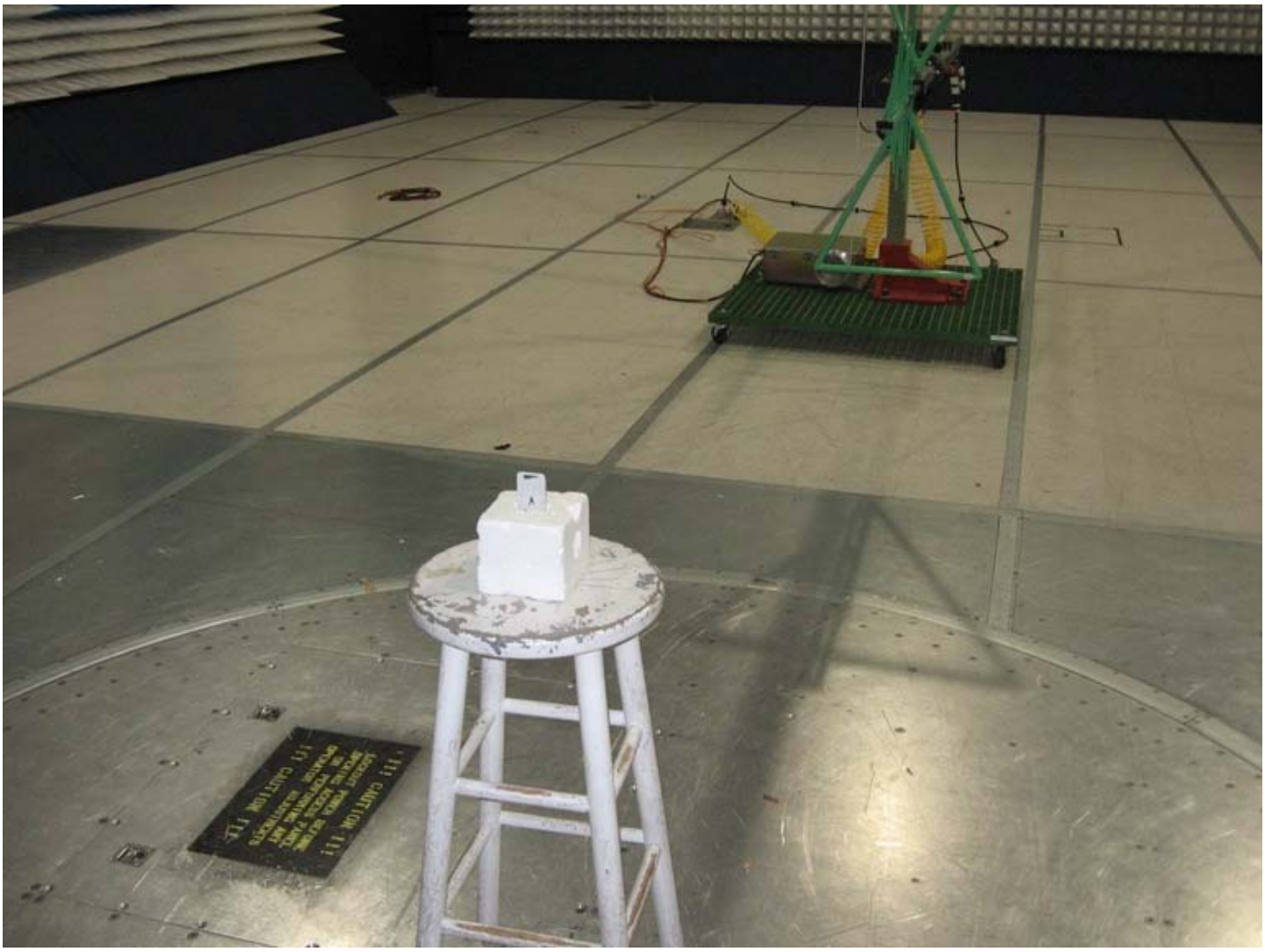
Photo:



Test Setup - Front view

8.0 Radiated emissions below 960 MHz (Radiated Emissions (<960 MHz))

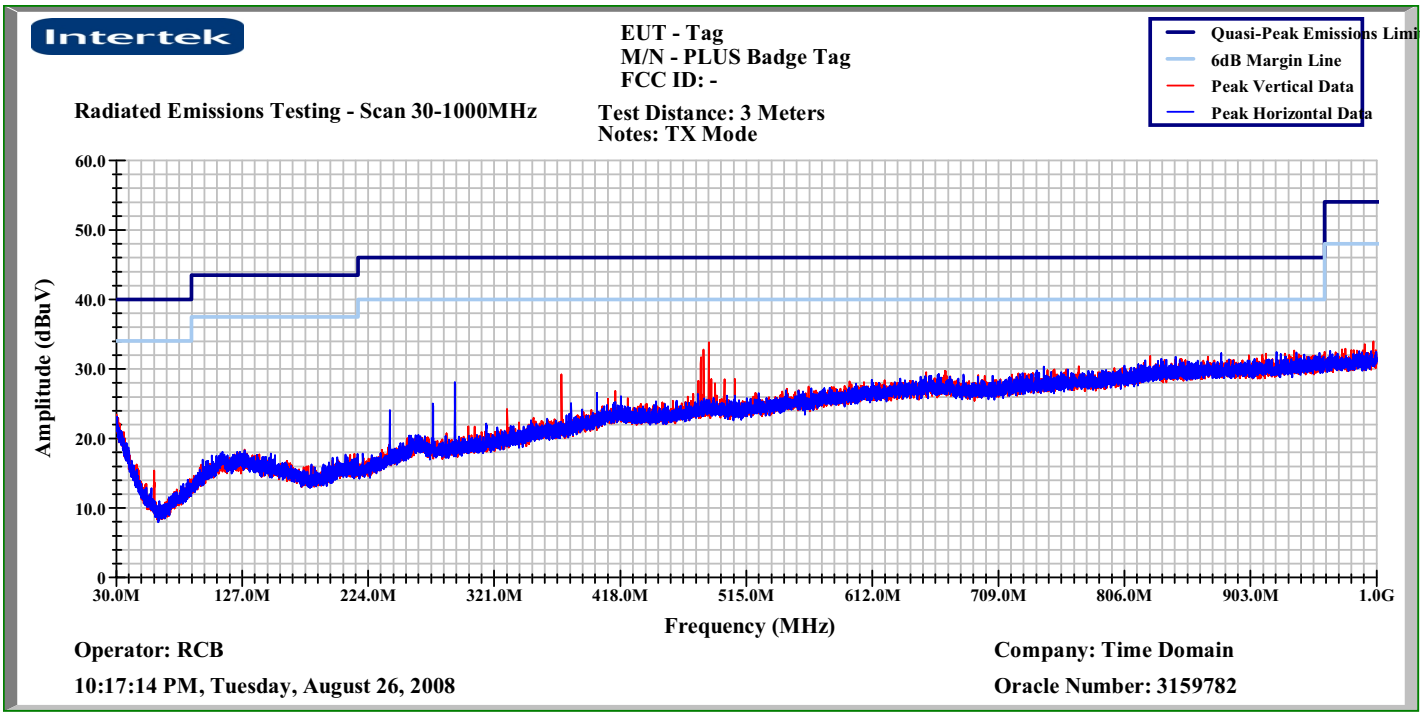
Photo:



Test Setup - Rear View

8.0 Radiated emissions below 960 MHz (Radiated Emissions (<960 MHz))

Plot:



30MHz-1000MHz

8.0 Radiated emissions below 960 MHz (Radiated Emissions (<960 MHz))

Data:

Frequency Range (MHz): 30-1000 **Test Distance (m):** 3

Input power: Battery **Limit:** FCC15 Class B-3m

Modifications for compliance (y/n): n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	**Frequency MHz**	**Reading dB(uV)**	**Antenna Factor dB(1/m)**	**Cable Loss dB**	**Pre-amp Factor dB**	**Net dB(uV/m)**	**3m Limit dB(uV/m)**	**Margin dB**	**Detectors / Bandwidths Det/RBW/VBW**
H	273.760	36.5	14.3	3.0	27.8	25.9	46.0	-20.1	Pk/120k/300k
H	290.675	38.4	14.2	3.0	27.8	27.7	46.0	-18.3	Pk/120k/300k
V	372.707	36.7	15.7	3.5	27.8	28.1	46.0	-17.9	Pk/120k/300k
V	480.012	38.0	17.5	4.2	27.7	31.9	46.0	-14.1	Pk/120k/300k
V	482.051	39.1	17.5	4.2	27.7	33.0	46.0	-13.0	Pk/120k/300k
V	486.036	40.2	17.7	4.2	27.7	34.4	46.0	-11.7	Pk/120k/300k
Calculations		G=C+D+E-F		I=G-H					

9.0 15.250(d)(2) Radiated power (EIRP) density in GPS receive bands (EIRP power density (GPS))

Method:

(d) Emissions from a transmitter operating under this section shall not exceed the equivalent isotropically radiated power (EIRP) density levels:

Transmitters operating under the provisions of this section shall not exceed the RMS average limits when measured using a resolution bandwidth of no less than 1 kHz.

Emissions from digital circuitry used to enable the operation of the transmitter may comply with the limits in §15.209 provided it can be clearly demonstrated that those emissions are due solely to emissions from digital circuitry contained within the transmitter and the emissions are not intended to be radiated from the transmitter's antenna. Emissions from associated digital devices, as defined in §15.3(k), e.g., emissions from digital circuitry used to control additional functions or capabilities other than the operation of the transmitter, are subject to the limits contained in subpart B of this part. Emissisons from these digital circuits shall not be employed in determining the -10 dB bandwidth of the fundamental emission or the frequency at which the highest emission level occurs.

Measurement procedures:
All emissions at and below 960 MHz are based on measurements employing a CISPR quasi-peak detector. Unless otherwise specified, all RMS average emission levels specified in this section are to be measured utilizing a resolution bandwidth greater than with a one millisecond dwell over each segment (equal to the RBW). The frequency span of the analyzer should equal the number of sampling bins times RBW and the sweep rate of the analyzer should equal the number of sampling bins times one millisecond. The provision in §15.35(c) that allows emissions to be averaged over a 100 millisecond period does not apply to devices operating under this section. The video bandwidth of the measurement instrument shall not be less than the resolution bandwidth and trace averaging shall not be employed. The RMS average emission measurement is to be repeated over multiple sweeps with the analyzer set for maximum hold until the amplitude stabilizes.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
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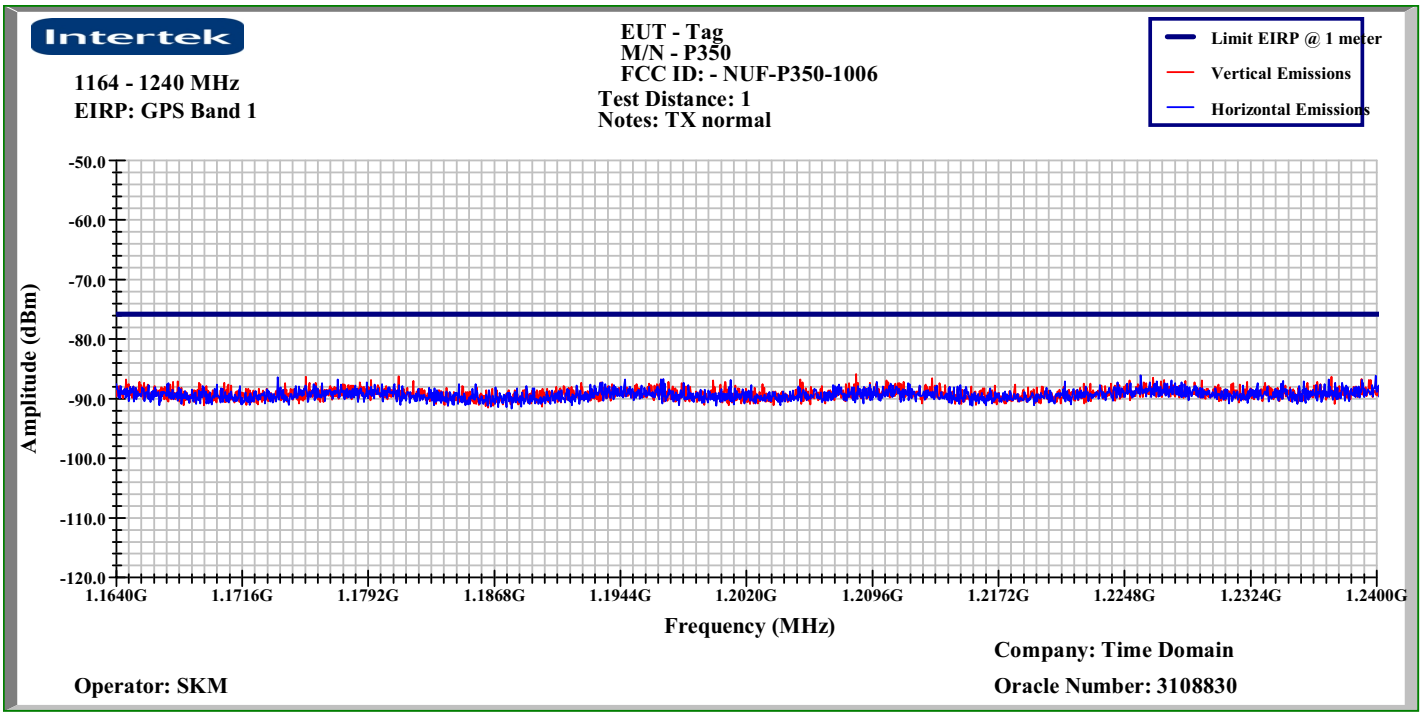
Cable ST1, 7m, N-N, 18 GHz	Storm Products Co.	PR90-206-7MTR	ST1	01/16/2008	01/16/2009
Preamplifier, 20 MHz to 18 GHz, 40 dB	A.H. Systems	PAM-0118	200108	03/27/2008	03/27/2009
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	03/19/2008	03/19/2009

Results: The sample tested was found to Comply.

9.0 15.250(d)(2) Radiated power (EIRP) density in GPS receive bands (EIRP power density (GPS))

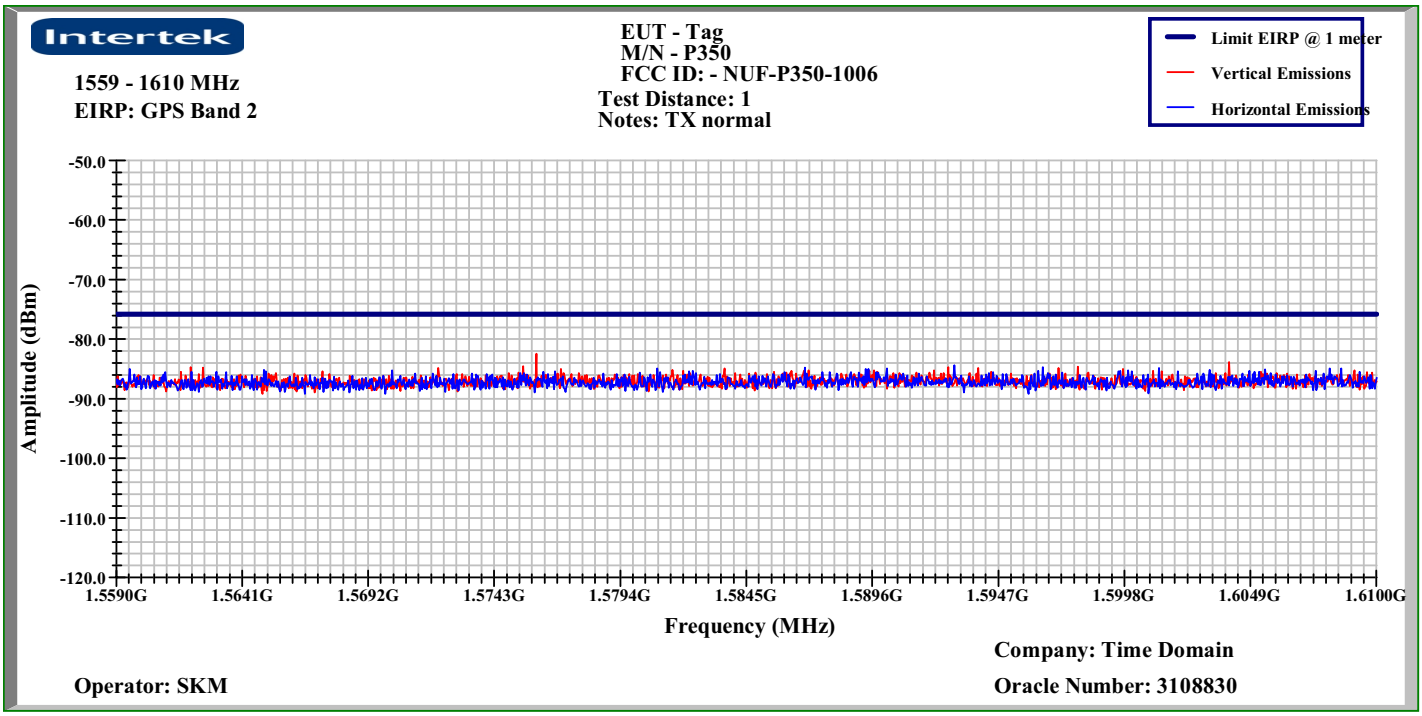
Plot:



GSM Band 1

9.0 15.250(d)(2) Radiated power (EIRP) density in GPS receive bands (EIRP power density (GPS))

Plot:



GSM Band 2