EMISSIONS TEST REPORT

Report Number: 3196868BOX-001a
Project Number: 3196868

Report Issue Date: 06/07/2010

Product Designation: **Gigasense Anti-Collision System**

Standards: **CFR47 "Telecommunications" FCC Part 15 Subpart C "Intentional Radiators" 15.245 "Operation within the bands 902–928 MHz, 2435–2465 MHz, 5785–5815 MHz, 10500–10550 MHz, and 24075–24175 MHz"**
Industry Canada's RSS-210 Issue 7 June 2007 Annex 7 "Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment" – "Field Disturbance Sensors Operating in the Bands 902-928 MHz, 2435-2465 MHz, 5785-5815 MHz, 10.5-10.55 GHz and 24.075-24.175 GHz"

Tested by:
Intertek Testing Services NA, Inc.
70 Codman Hill Road
Boxborough, MA 01719

Client:
Gigasense AB
BOX 123
SE-184 22 Åkersberga, Sweden

Report prepared by

Nicholas Abbondante, Senior Project Engineer

Report reviewed by

Michael F. Murphy / Staff Engineer, EMC

1 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 verbatim 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 Test Summary

Section	Test full name	Result
4	Description of Equipment Under Test	
5	System setup including cable interconnection details, support equipment and simplified block diagram	
6	Occupied Bandwidth (CFR47 Part 15.215, IC RSS-Gen 4.6.1)	Pass
7	Radiated Emissions (CFR47 Parts 15.209 and 15.245, IC RSS-Gen Sections 6.0 & 7.2.3, IC RSS-210 Annex 7)	Pass
8	AC Mains Conducted Emissions (CFR47 Part 15.207, IC RSS-Gen Section 7.2.2)	Pass
9	Revision History	

3 Client Information

This EUT was tested at the request of:

Company: Gigasense AB
BOX 123
SE-184 22 Åkersberga, Sweden
Contact: Mr. Ivar Horst
Telephone: +46(0)8-540 839 00
Fax: +46-(0)8-540 213 64
Email: info@gigasense.se

4 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Gigasense Anti-Collision Transmitter B	Gigasense Force Measurement	Gigasense Anti-Collision System	4112
Relay Box	Gigasense Force Measurement	Gigasense Anti-Collision System	4112
Gigasense Anti-Collision Transmitter A	Gigasense Force Measurement	Gigasense Anti-Collision System	4113
Relay Box	Gigasense Force Measurement	Gigasense Anti-Collision System	4113

Receive Date:	12/14/2009
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)

The Gigasense Anti-Collision System is a 10.5 GHz radar system used on cranes to detect the proximity of an obstacle or another crane. It operates at 10.521 GHz or at 10.539 GHz. The receiver is on at all times, and was tested simultaneously with the transmitter. The antenna is an integral waveguide antenna with a parabolic dish reflector.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
120VAC	0.08 A	50/60 Hz	1

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	During testing, the EUT was transmitting continuously and was receiving
2	

5 System setup including cable interconnection details, support equipment and simplified block diagram

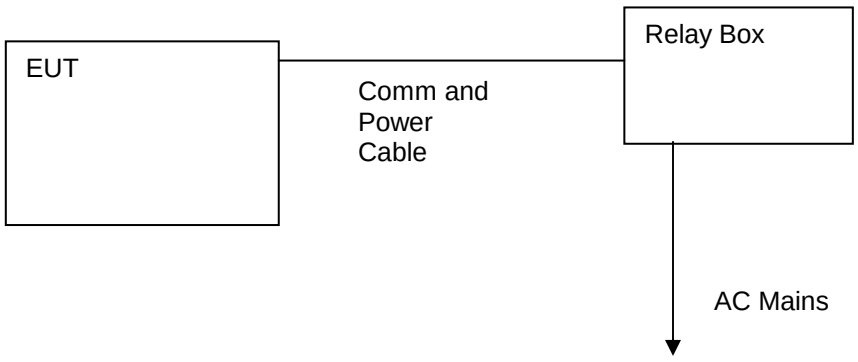
Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
	Comm and Power Cable	~1.8	Braid	None	Metal/360
	AC Mains	~1.8	None	None	Plastic/Wire

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
None			

5.1 Method:

Configuration as required by ANSI C63.4:2003 and RSS-Gen Issue 2 June 2007.

5.2 EUT Block Diagram:



6 Occupied Bandwidth

6.1 Method

Tests are performed in accordance with ANSI C63.4:2003, CFR47 Part 15.215, and IC RSS-Gen 4.6.1.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A wooden table 80 cm high is used for table-top equipment.

Measurement Uncertainty

For radiated emissions, U_{lab} (4.9 dB at 3m and 4.2 dB at 10m) < U_{CISPR} (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
Horn2	HORN ANTENNA	EMCO	3115	9602-4675	09/24/2009	09/24/2010
DAV004	Weather Station	Davis Instruments	7400	PE80529A61A	06/10/2009	06/10/2010
145128	EMI Test Receiver (20Hz - 40GHz)	Rohde & Schwarz	ESI	837771/027	02/22/2010	02/22/2011
145403	Cable	Huber and Suhner	Sucoflex 106	233089 004	04/16/2009	06/30/2010
145400	Cable	Huber and Suhner	Sucoflex 106	233096 002	04/16/2009	06/30/2010
145406	Cable	Huber and Suhner	Sucoflex 106	233089 001	04/16/2009	06/30/2010
145407	Cable	Huber and Suhner	Sucoflex 106	233089 002	04/16/2009	06/30/2010
145405	Cable	Huber and Suhner	Sucoflex 106	145405	04/16/2009	06/30/2010
145414	Emissions Cable	H&S	None	None	05/01/2009	06/30/2010
145014	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	01/05/2010	01/05/2011

Software Utilized:

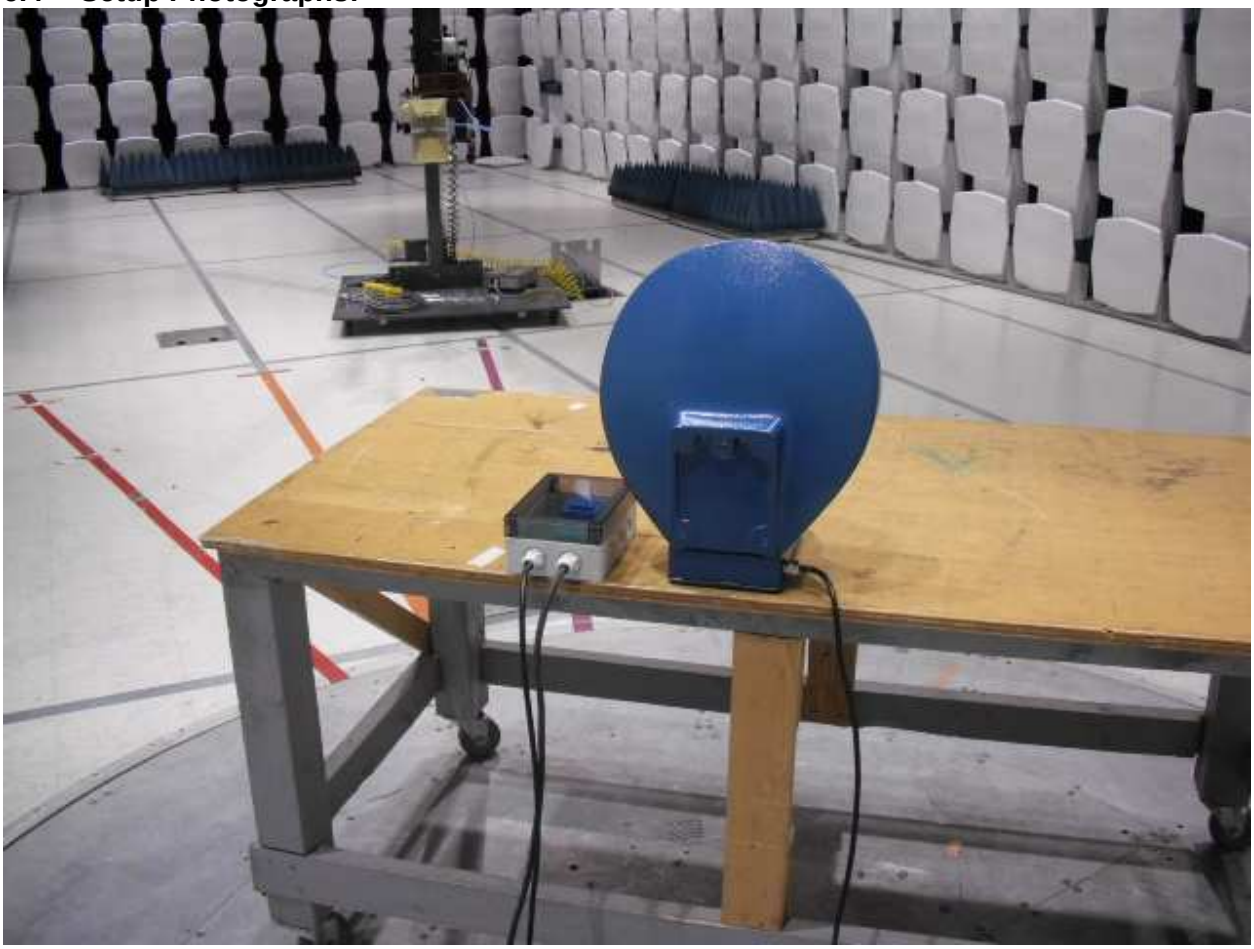
Name	Manufacturer	Version
None		

6.3 Results:

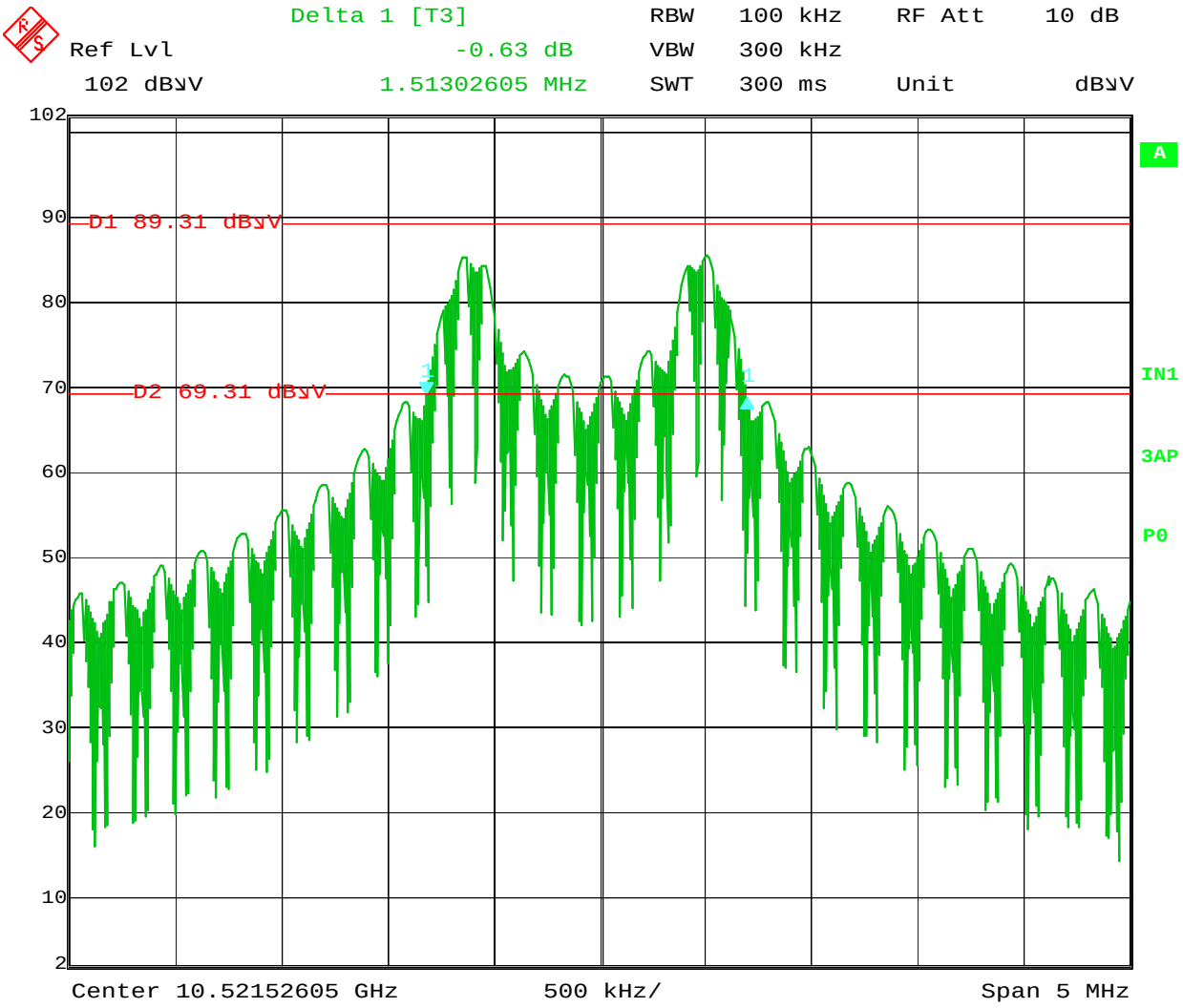
The fundamental frequency must stay within the assigned band.

The sample tested was found to comply. The 20 dB bandwidth was measured to be 1.533 MHz.

6.4 Setup Photographs:

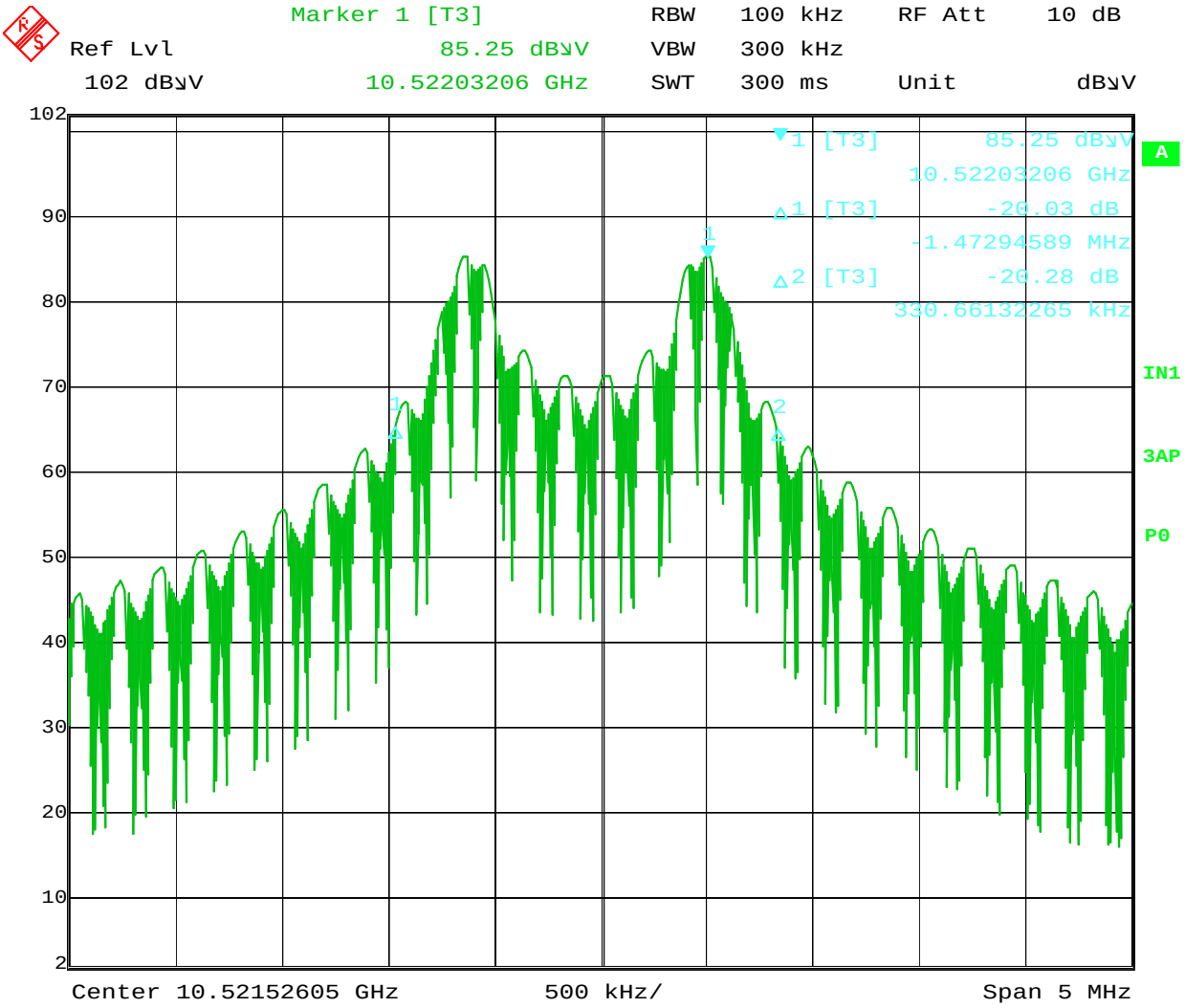


6.5 Plots:

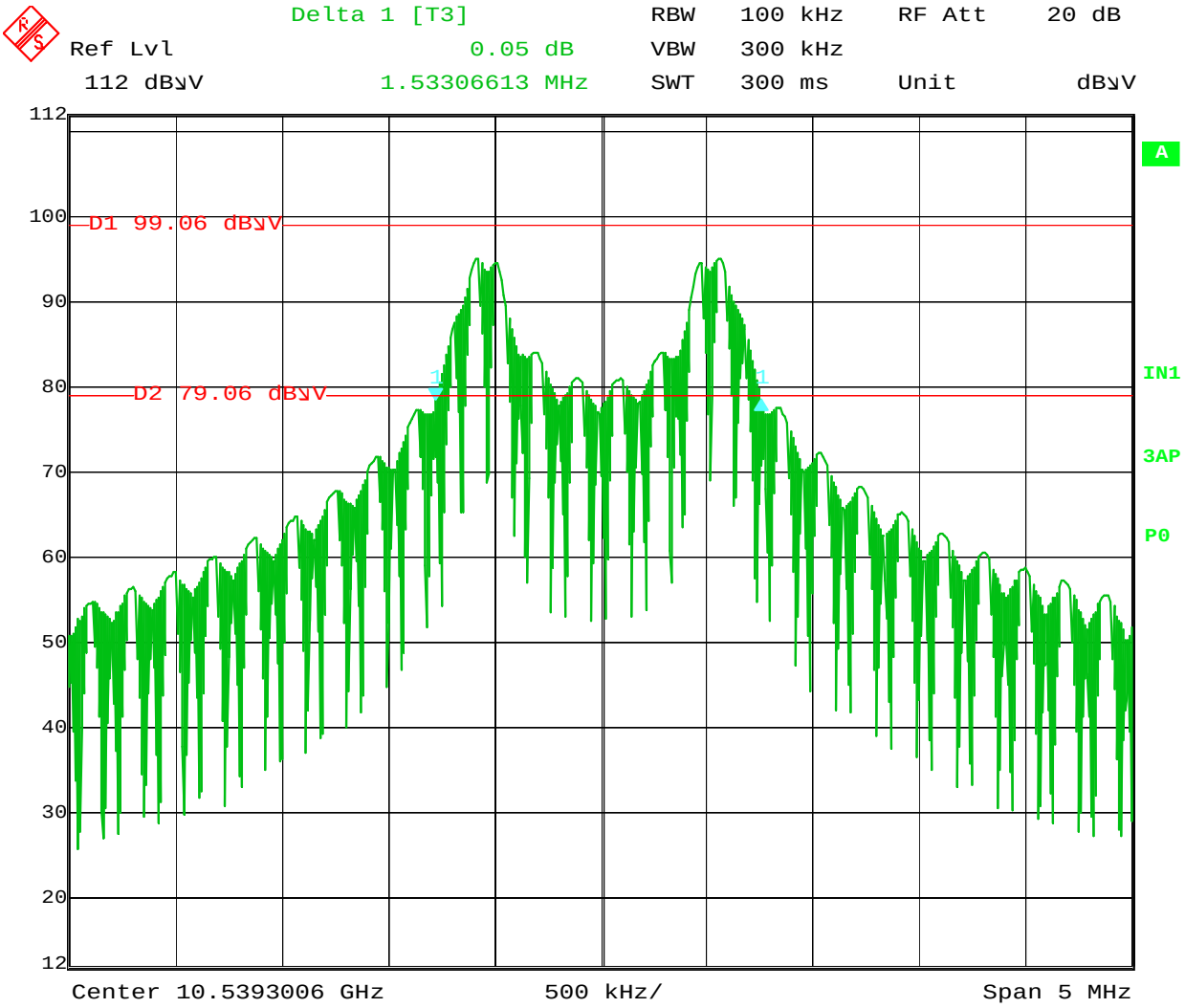


Date: 6.JUN.2010 13:20:14

20 dB Bandwidth, 10.521 GHz Channel, Referenced to full power, 1.513 MHz

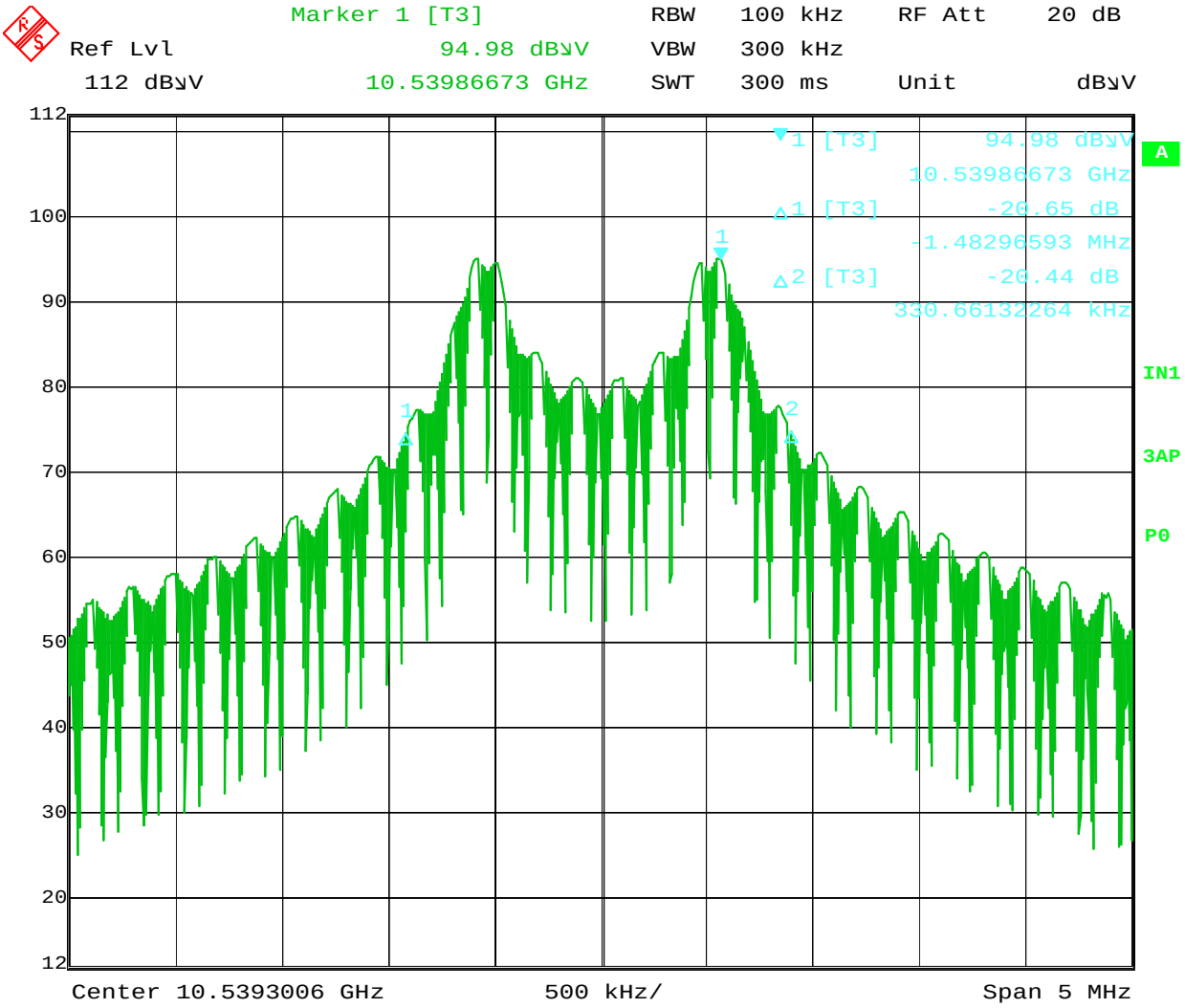


20 dB Bandwidth, 10.521 GHz Channel, Unreferenced to full power, 1.804 MHz



Date: 6.JUN.2010 17:06:50

20 dB Bandwidth, 10.539 GHz Channel, Referenced to full power, 1.533 MHz



Date: 6.JUN.2010 17:07:43

20 dB Bandwidth, 10.539 GHz Channel, Unreferenced to full power, 1.813 MHz

6.6 Test Data:

Test Personnel:	Nicholas Abbondante	Test Date:	06/07/2010
Product Standard:	FCC Part 15 Subpart C 15.245	Test Levels:	Emission must stay within the assigned frequency band.
Input Voltage:	120VAC/60Hz		
		Ambient Temperature:	20 ºC
Pretest Verification w/ BB Source:	**No**	Relative Humidity:	56 %
		Atmospheric Pressure:	998 mbars

Deviations, Additions, or Exclusions: None

7 Radiated Emissions

7.1 Method

Tests are performed in accordance with ANSI C63.4:2003, CFR47 Parts 15.209 and 15.245, IC RSS-Gen Sections 6.0 & 7.2.3, and IC RSS-210 Annex 7.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A wooden table 80 cm high is used for table-top equipment.

Measurement Uncertainty

For radiated emissions, U_{lab} (4.9 dB at 3m and 4.2 dB at 10m) < U_{CISPR} (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
ROS001	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	12/04/2009	12/04/2010
PRE9	100MHz-40GHz Preamp	MITEQ	NSP4000-NFG	1260417	04/19/2010	04/19/2011
REA006	18GHz High Pass Filter	Reactel, Inc	7HS-18G/40G K11	(06)1	04/19/2010	04/19/2011
REA004	3GHz High Pass Filter	Reactel, Inc	7HSX-3G/18G-S11	06-1	10/26/2009	10/26/2010
CBL027	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	58014001001	05/21/2009	05/21/2010*
CBL030	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL030	01/04/2010	01/04/2011
EMC04	ANTENNA, RIDGED GUIDE, 18-40 GHZ	EMCO	3116	2090	02/04/2010	02/04/2011
OML4	Mixer / Antenna	Oleson Microwave Lab	M19HWA	U21011-1	01/01/2002	Verified
145415	Bilog Antenna	Chase	CBL6140A	4195	06/12/2009	06/12/2010
145003	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2443A04077	01/05/2009	09/06/2010
145128	EMI Test Receiver (20Hz - 40GHz)	Rohde & Schwarz	ESI	837771/027	02/22/2010	02/22/2011
145403	Cable	Huber and Suhner	Sucoflex 106	233089 004	04/16/2009	06/30/2010
145400	Cable	Huber and Suhner	Sucoflex 106	233096 002	04/16/2009	06/30/2010
145406	Cable	Huber and Suhner	Sucoflex 106	233089 001	04/16/2009	06/30/2010
145407	Cable	Huber and Suhner	Sucoflex 106	233089 002	04/16/2009	06/30/2010
145405	Cable	Huber and Suhner	Sucoflex 106	145405	04/16/2009	06/30/2010
145414	Emissions Cable	H&S	None	None	05/01/2009	06/30/2010
Horn2	HORN ANTENNA	EMCO	3115	9602-4675	09/24/2009	09/24/2010
145014	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	01/05/2010	01/05/2011
MEG005	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	8148601-001	01/04/2010	01/04/2011
DAV004	Weather Station	Davis Instruments	7400	PE80529A61A	06/10/2009	06/10/2010

* - used only for testing on 03/16-17/2010

Software Utilized:

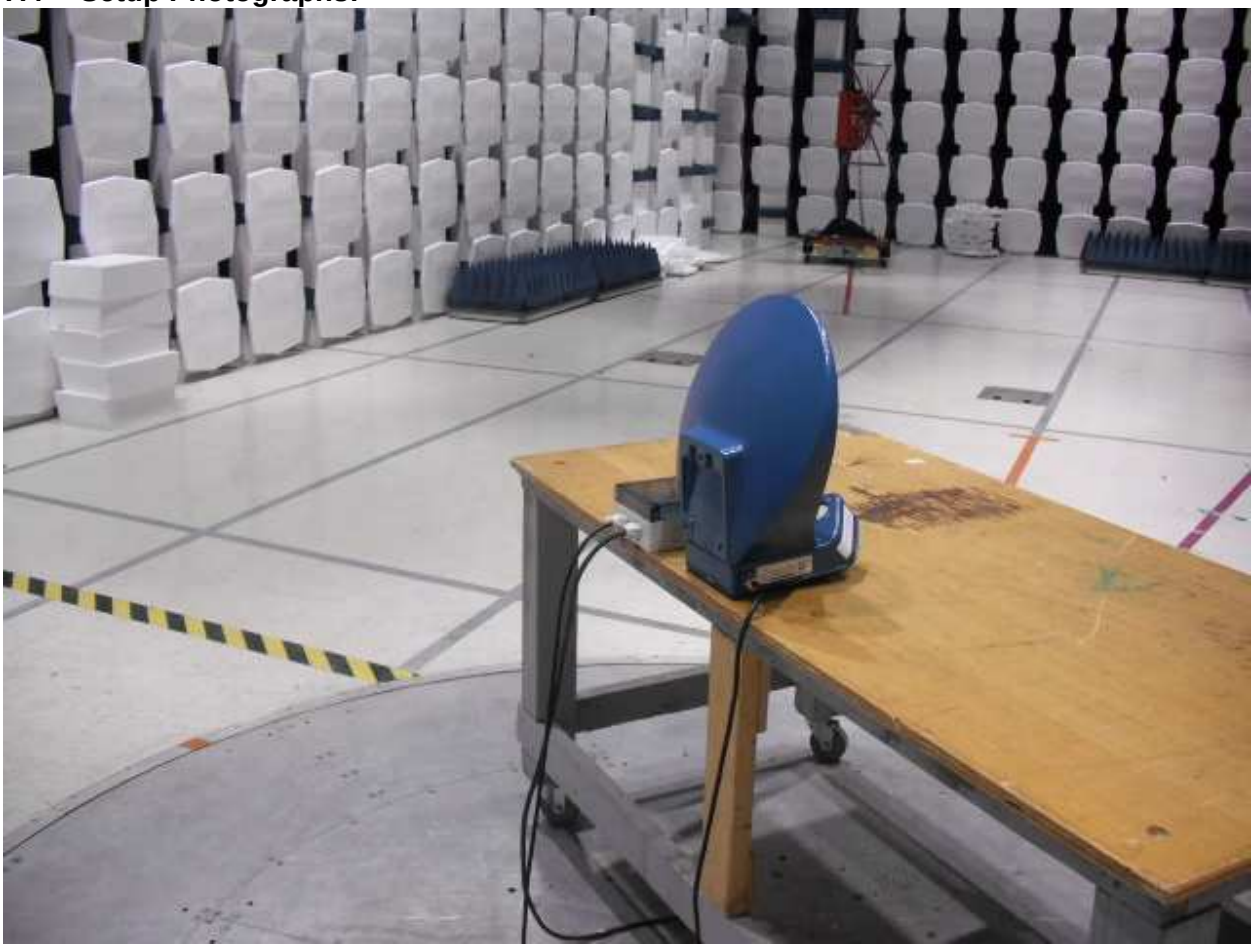
Name	Manufacturer	Version
C5	Teseq	Rev 1.0
Excel 2003	Microsoft	(11.5612.5606) SP3
EMI Boxborough.xls	Intertek	4/17/09

7.3 Results:

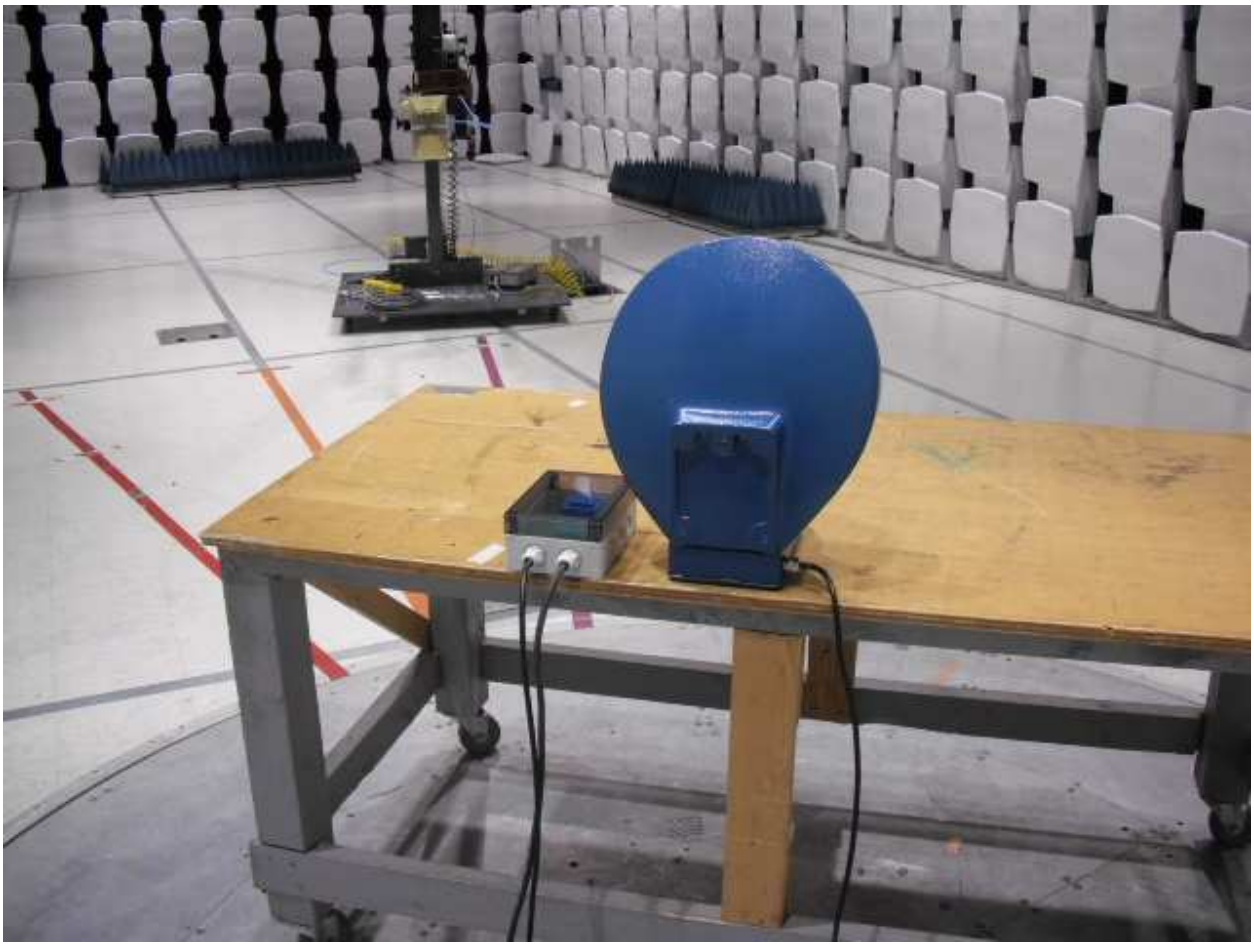
The fundamental field strength must not exceed 2500 mV/m (128 dBuV/m) at a distance of 3 meters using an average detector. The Harmonic emissions must not exceed 7.5 mV/m (77.5 dBuV/m), and non-harmonic spurious emissions must be at least 50 dB down from the fundamental field strength or must meet the general limits of 15.209 or RSS-210 Table 2, whichever is the lesser attenuation. All limits are specified at a distance of 3 meters, using an average detector. Peak emissions must meet a limit that is 20 dB higher than the average limit. Receiver spurious emissions must meet the requirements of IC RSS-Gen Table 1.

The sample tested was found to Comply. Note that the receiver was tested simultaneously with the transmitter, and all spurs except the fundamental frequency and harmonics meet the receiver spurious emissions limits.

7.4 Setup Photographs:

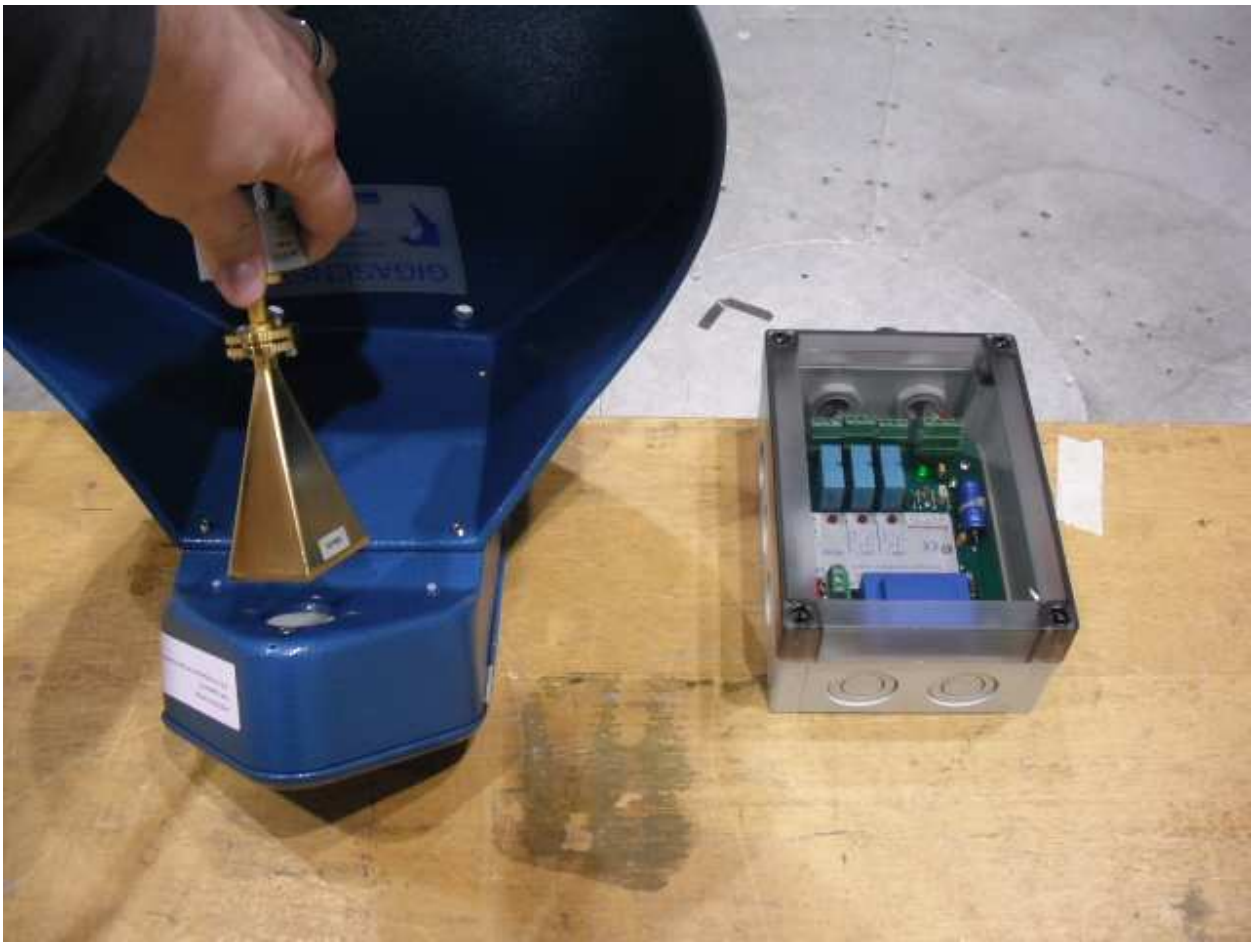


30-1000 MHz



1-15 GHz

18-40 GHz



40-53 GHz

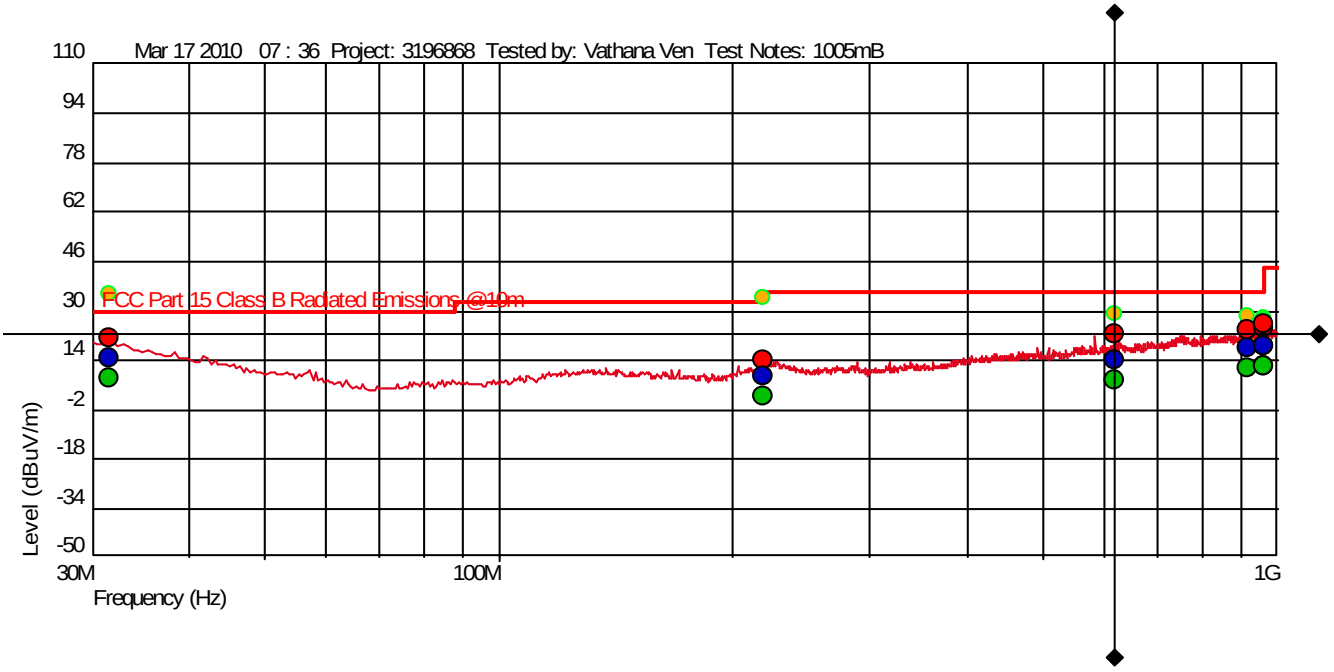
7.5 Test Data:

Test Personnel:	Nicholas Abbondante	Test Date:	03/16-17/2010, 06/06/2010
	FCC Part 15 Subpart C	Test Levels:	See section 7.3
Product Standard:	15.245		
Input Voltage:	120VAC/60Hz		
		Ambient Temperature:	22, 20 ºC
Pretest Verification w/ BB Source:	**No**	Relative Humidity:	26, 56 %
		Atmospheric Pressure:	1005, 998 mbars

Deviations, Additions, or Exclusions: None

10.539 GHz Channel:

Test Information	
Test Details	User Input
Project:	3196868
Test Notes:	1005mB
Temperature:	21
Humidity:	26
Tested by:	Vathana Ven
Test Started:	Mar 17 2010 07 : 36



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

Level (dBuV/m) = AF + CL + PA + Raw

AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

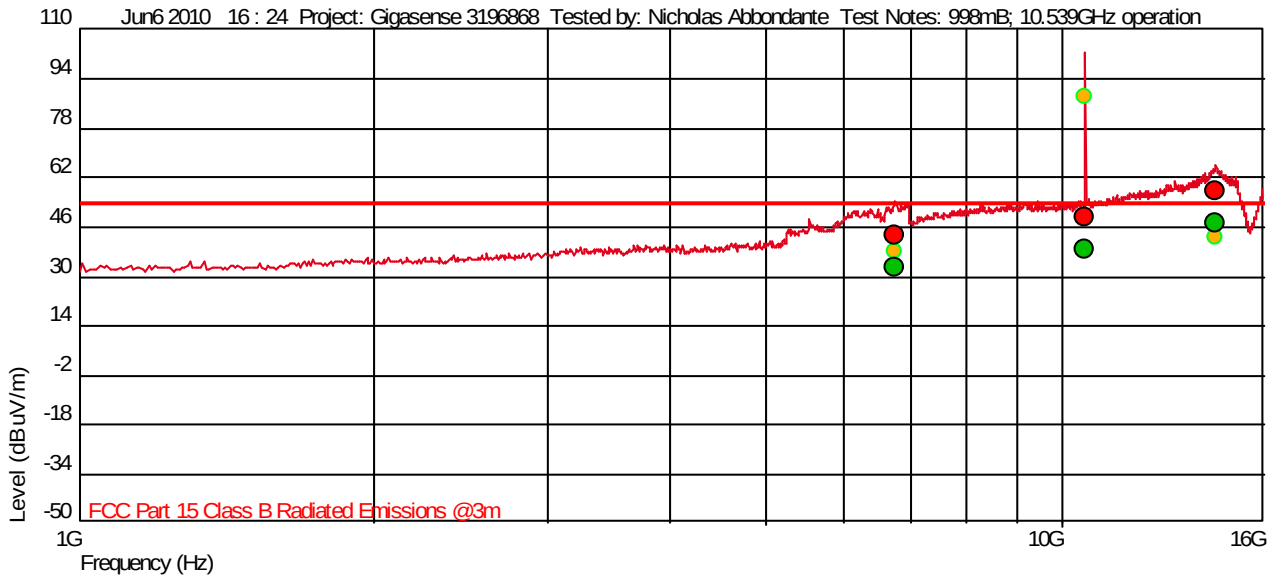
10.539 GHz Channel:

Measured: QP

Frequency(Hz)	Level*(dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin(dBuV/m)	Hor (--), Ver (|)	Angle(Deg)	Mast Height(m)	Detector	RBW(Hz)
31.54885 M	14.96	21.226	-26.434	29.54	-14.58	|	39	3.25	QP	120 k
218.478757 M	8.56	12.717	-24.605	35.54	-26.98	|	90	1.85	QP	120 k
619.49389 M	14.16	20.400	-25.094	35.54	-21.38	|	113	2.09	QP	120 k
916.105811 M	17.88	23.644	-23.564	35.54	-17.66	|	69	1.37	QP	120 k
963.108456 M	18.50	24.187	-23.358	43.54	-25.04	|	321	3.10	QP	120 k
963.525638 M	18.53	24.212	-23.356	43.54	-25.01	|	67	2.26	QP	120 k

10.539 GHz Channel:

Test Information	
Test Details	User Input
Project:	Gigasense 3196868
Test Notes:	998mB; 10.539GHz operation
Temperature:	20c
Humidity:	56%
Tested by:	Nicholas Abbondante
Test Started:	Jun6 2010 16 : 24



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

Level (dBuV/m) = AF + CL + PA + Raw

AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

10.539 GHz Channel:

Both vertical and horizontal were tested, and horizontal was found to be worst-case.

Measured: PEAK

Frequency(Hz)	Level*(dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin(dBuV/m)	Hor (--), Ver (|)	Angle(Deg)	Mast Height(m)	Detector	RBW(Hz)
6.759 G	43.27	34.603	-27.418	74.00	-30.73	--	83	1.31	PEAK	1 M
10.539 G	114.03	37.682	-23.568	148.00	-33.97	--	266	1.25	PEAK	1 M
14.275 G	60.39	41.968	-19.879	74.00	-13.61	--	182	1.31	PEAK	1 M

Measured: AVERAGE

Frequency(Hz)	Level*(dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin(dBuV/m)	Hor (--), Ver (|)	Angle(Deg)	Mast Height(m)	Detector	RBW(Hz)
6.759 G	33.01	34.603	-27.418	54.00	-20.99	--	83	1.31	AVERAGE	1 M
10.539 G	108.84	37.682	-23.568	128.00	-19.16	--	266	1.25	AVERAGE	1 M
14.275 G	51.59	41.968	-19.879	54.00	-2.41	--	182	1.31	AVERAGE	1 M

10.539 GHz Channel:

Intertek

Special Radiated Emissions

Company: Gigasense Force Measurement — Antenna & Cables: HF — Bands: N, LF, HF, SHF
Model #: Gigasense Microwave Anti-Collision System — Antenna: HORN2 V3m 09-24-2010.txt — HORN2 H3m 09-24-2010.txt
Serial #: 4112 — Cable(s): CBL027 05-21-10.txt — CBL030 01-04-2011.txt
Engineers: Nicholas Abbondante — Location: 10m Chamber — Barometer: DAV004 — Filter: REA004
Project #: 3196868 — Date(s): 03/16/10
Standard: FCC Part 15 Subpart C 15.245 — Temp/Humidity/Pressure: 22c — 26% — 1005mB
Receiver: R&S FSEK-30 (ROS001) 12-04-2010 — Limit Distance (m): 3
PreAmp: PRE9 04-03-10.txt — Test Distance (m): 1
PreAmp Used? (Y or N): Y — Voltage/Frequency: 120VAC/60Hz — Frequency Range: 15-18 GHz
Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: No emissions detected, measurements are of instrumentation noise floor													
PK	V	15000.000	34.44	39.51	13.20	26.40	9.54	51.21	74.00	-22.79	1/3 MHz		
AVG	V	15000.000	22.32	39.51	13.20	26.40	9.54	39.09	54.00	-14.91	1/3 MHz		
PK	V	18000.000	34.59	47.10	15.02	27.78	9.54	59.39	74.00	-14.61	1/3 MHz	RB	RB
AVG	V	18000.000	23.48	47.10	15.02	27.78	9.54	48.28	54.00	-5.72	1/3 MHz	RB	RB

10.539 GHz Channel:

Intertek

Special Radiated Emissions

Company: Gigasense Force Measurement
Model #: Gigasense Microwave Anti-Collision System
Serial #: 4112
Engineers: Nicholas Abbondante
Project #: 3196868
Standard: FCC Part 15 Subpart C 15.245
Receiver: R&S FSEK-30 (ROS001) 12-04-2010
PreAmp: PRE9 04-03-10.txt
Date(s): 03/16/10
Location: 10m Chamber
Limit Distance (m): 3
Test Distance (m): 0.1
PreAmp Used? (Y or N): Y
Voltage/Frequency: 120VAC/60Hz
Antenna & Cables: SHF
Antenna: EMC04_1M_Vert_2-4-2011.txt
Cable(s): CBL027 05-21-10.txt
Barometer: DAV004
Temp/Humidity/Pressure: 22c
Bands: N, LF, HF, SHF
EMC04_1M_H_2-4-2011.txt
CBL030 01-04-2011.txt
Filter: REA006
26%
1005mB
Frequency Range: 18-40 GHz

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC	Harmonic?
No emissions detected except for 21080 MHz harmonic, measurements are of instrumentation noise floor, 1m distance														
PK	V	18000.000	34.66	44.91	15.02	27.78	9.54	57.27	74.00	-16.73	1/3 MHz	RB	RB	
AVG	V	18000.000	23.03	44.91	15.02	27.78	9.54	45.64	54.00	-8.36	1/3 MHz	RB	RB	
PK	H	21080.000	40.80	44.76	17.10	28.93	9.54	64.19	97.50	-33.31	1/3 MHz	RB	RB	Harm
AVG	H	21080.000	33.98	44.76	17.10	28.93	9.54	57.37	77.50	-20.13	1/3 MHz	RB	RB	Harm
0.1 m test distance														
PK	H	31620.000	42.01	46.96	23.22	25.47	29.54	57.17	97.50	-40.33	1/3 MHz	RB	RB	Harm
AVG	H	31620.000	33.91	46.96	23.22	25.47	29.54	49.07	77.50	-28.43	1/3 MHz	RB	RB	Harm
PK	V	38000.000	44.42	44.96	26.84	25.74	29.54	60.94	74.00	-13.06	1/3 MHz			
AVG	V	38000.000	32.65	44.96	26.84	25.74	29.54	49.17	54.00	-4.83	1/3 MHz			

10.539 GHz Channel:

Intertek

Radiated Emissions

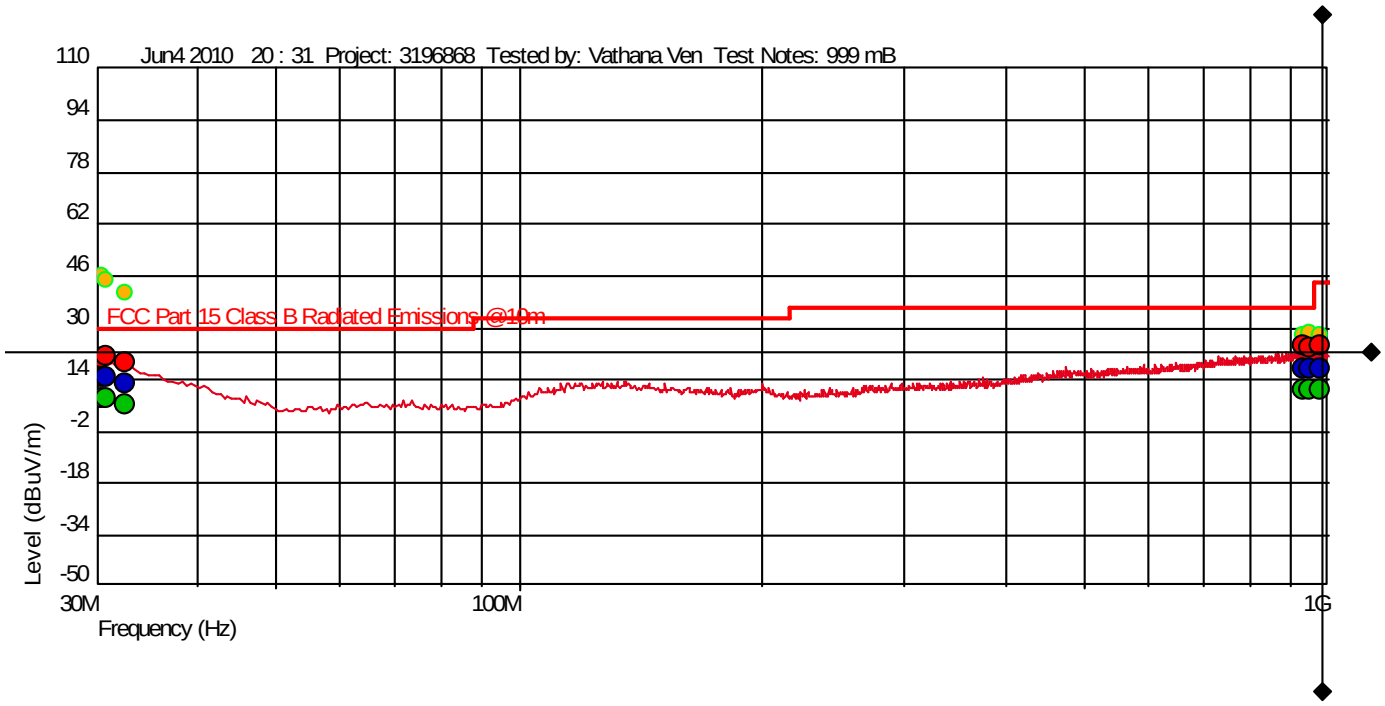
Company: Gigasense Force Measurement — Antenna & Cables: N — Bands: N, LF, HF, SHF
Model #: Gigasense Microwave Anti-Collision System — Antenna: OML4 02-22-2011 — NONE.
Serial #: 4112 — Cable(s): CBL030 — NONE.
Engineers: Nicholas Abbondante — Location: 10m Chamber — Barometer: DAV004 — Filter: NONE
Project #: 3196868 — Date(s): 03/16/10
Standard: FCC Part 15 Subpart C 15.245 — Temp/Humidity/Pressure: 22c — 26% — 1005mB
Receiver: R&S FSEK-30 (ROS001) 12-04-2010 — Limit Distance (m): 3
PreAmp: PRE9 04-03-10.txt — Test Distance (m): 0.05
PreAmp Used? (Y or N): N — Voltage/Frequency: 120VAC/60Hz — Frequency Range: 40-53 GHz
Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC	Harmonic?
Note: 40-53 GHz range using mixer OML4														
PK	V	40000.000	45.31	38.24	0.61	0.00	35.56	48.60	74.00	-25.40	1/3 MHz	RB	RB	
AVG	V	40000.000	33.58	38.24	0.61	0.00	35.56	36.87	54.00	-17.13	1/3 MHz	RB	RB	
PK	V	42160.000	45.55	38.69	0.61	0.00	35.56	49.29	97.50	-48.21	1/3 MHz	RB		Harm
AVG	V	42160.000	33.32	38.69	0.61	0.00	35.56	37.06	77.50	-40.44	1/3 MHz	RB		Harm
PK	V	52700.000	46.59	40.63	0.61	0.00	35.56	52.27	97.50	-45.23	1/3 MHz	RB		Harm
AVG	V	52700.000	34.69	40.63	0.61	0.00	35.56	40.37	77.50	-37.13	1/3 MHz	RB		Harm
PK	V	53000.000	47.50	40.68	0.61	0.00	35.56	53.23	74.00	-20.77	1/3 MHz	RB		
AVG	V	53000.000	34.78	40.68	0.61	0.00	35.56	40.51	54.00	-13.49	1/3 MHz	RB		

10.521 GHz Channel:

Test Information

Test Details	User Input
Project:	3196868
Test Notes:	999 mB
Temperature:	25 deg C
Humidity:	33%
Tested by:	Vathana Ven
Test Started:	Jun4 2010 20 : 31



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

Level (dBuV/m) = AF + CL + PA + Raw

AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

10.521 GHz Channel:

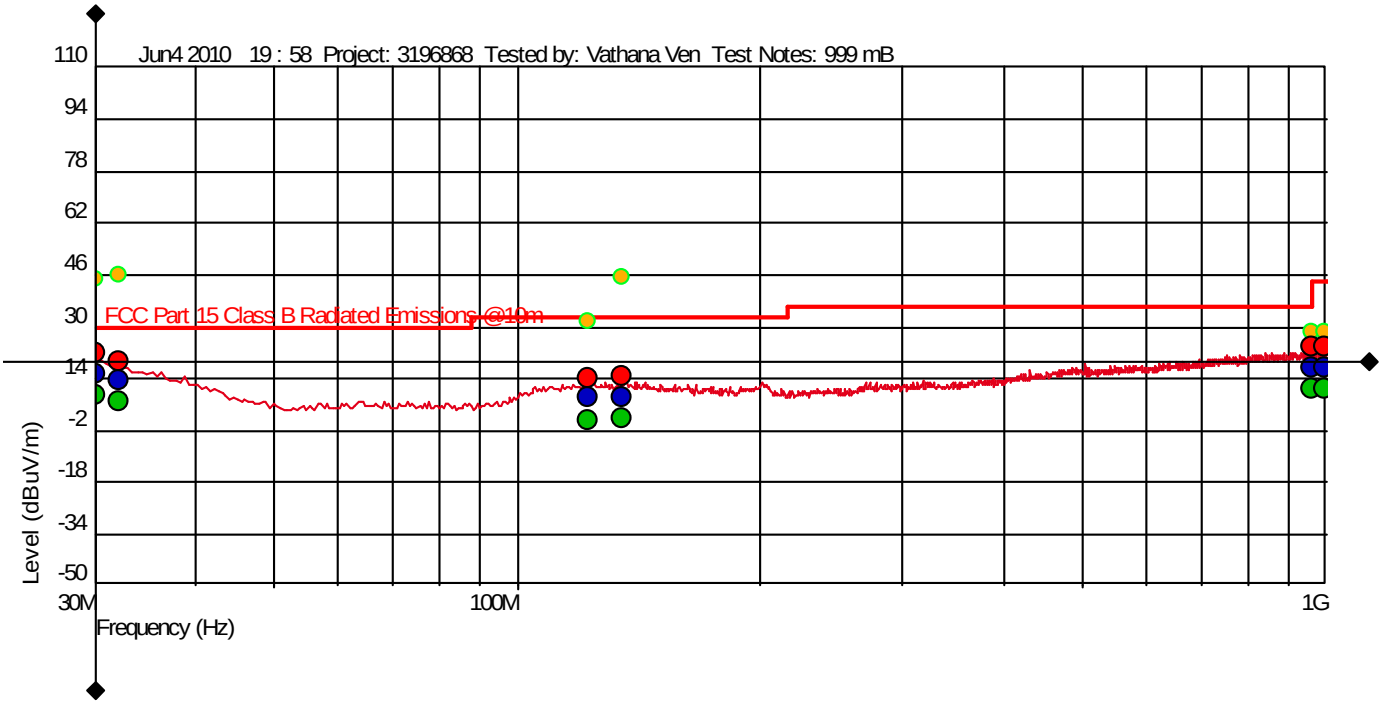
Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--)	Angle (Deg)	Mast Height (m)	RBW (Hz)
30.379M	14.93	20.835	-26.440	30.00	-15.07	--	234	3.92	120 k
30.794M	14.69	20.544	-26.438	30.00	-15.31	--	320	2.90	120 k
32.574M	13.08	19.213	-26.430	30.00	-16.92	--	150	3.52	120 k
935.499M	17.17	22.500	-23.478	36.00	-18.83	--	272	1.59	120 k
951.775M	17.17	22.535	-23.407	36.00	-18.83	--	44	3.31	120 k
979.266M	17.44	22.800	-23.288	44.00	-26.56	--	217	2.69	120 k

10.521 GHz Channel:

Test Information

Test Details	User Input
Project:	3196868
Test Notes:	999 mB
Temperature:	25 deg C
Humidity:	33%
Tested by:	Vathana Ven
Test Started:	Jun4 2010 19 : 58



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

Level (dBuV/m) = AF + CL + PA + Raw

AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

10.521 GHz Channel:

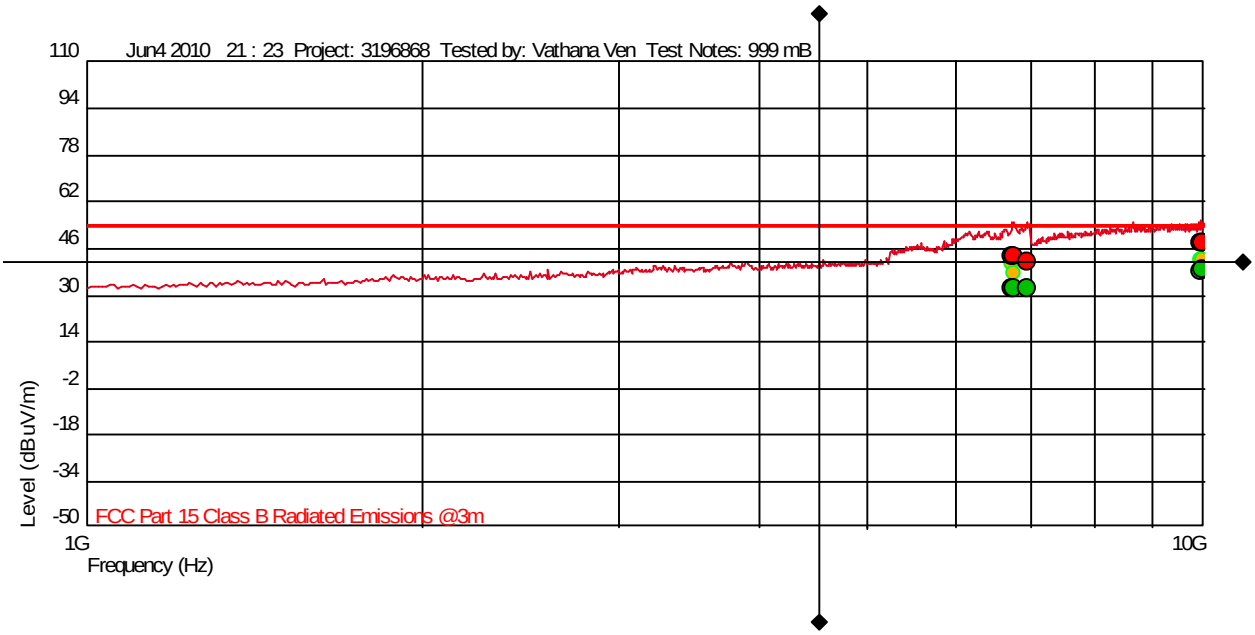
Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Ver (|)	Angle (Deg)	Mast Height (m)	RBW (Hz)
30.076M	15.04	21.047	-26.441	30.00	-14.96	| 282	2.77		120 k
32.197M	13.36	19.402	-26.431	30.00	-16.64	| 216	3.35		120 k
122.046M	8.03	13.941	-25.295	33.00	-24.97	| 265	3.36		120 k
134.745M	8.42	13.805	-25.133	33.00	-24.58	| 222	3.96		120 k
960.862M	17.32	22.700	-23.368	44.00	-26.68	| 156	1.73		120 k
994.445M	17.51	22.800	-23.224	44.00	-26.49	| 140	1.88		120 k

10.521 GHz Channel:

Test Information

Test Details	User Input
Project:	3196868
Test Notes:	999 mB
Temperature:	25 deg C
Humidity:	33%
Tested by:	Vathana Ven
Test Started:	Jun4 2010 21 : 23



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable
Level (dBuV/m) = AF + CL + PA + Raw
AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

10.521 GHz Channel:

Measured: PEAK

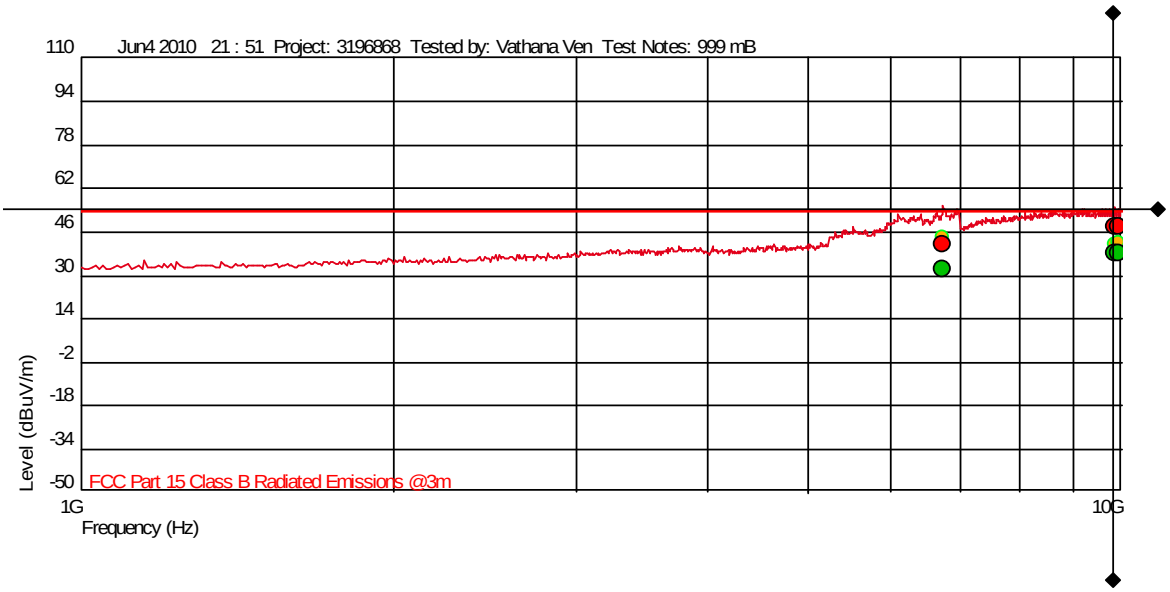
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)		Hor (--)	Angle (Deg)	Mast Height (m)	RBW (Hz)
6.742G	43.23	34.521	-27.377	74.00	-30.77	--	88	1.79		1 M
6.763G	43.24	34.583	-27.424	74.00	-30.76	--	312	2.86		1 M
6.958G	41.40	34.818	-27.246	74.00	-32.60	--	270	2.03		1 M
9.947G	47.97	37.832	-24.215	74.00	-26.03	--	103	3.10		1 M
9.971G	48.14	37.853	-24.209	74.00	-25.86	--	141	2.29		1 M

Measured: AVERAGE

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)		Hor (--)	Angle (Deg)	Mast Height (m)	RBW (Hz)
6.742G	32.43	34.521	-27.377	54.00	-21.57	--	88	1.79		1 M
6.763G	32.57	34.583	-27.424	54.00	-21.43	--	312	2.86		1 M
6.958G	32.16	34.818	-27.246	54.00	-21.84	--	270	2.03		1 M
9.947G	38.13	37.832	-24.215	54.00	-15.87	--	103	3.10		1 M
9.971G	38.71	37.853	-24.209	54.00	-15.29	--	141	2.29		1 M

10.521 GHz Channel:

Test Information	
Test Details	User Input
Project:	3196868
Test Notes:	999 mB
Temperature:	25 deg C
Humidity:	33%
Tested by:	Vathana Ven
Test Started:	Jun4 2010 21 : 51



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

Level (dBuV/m) = AF + CL + PA + Raw

AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

10.521 GHz Channel:

Measured: PEAK

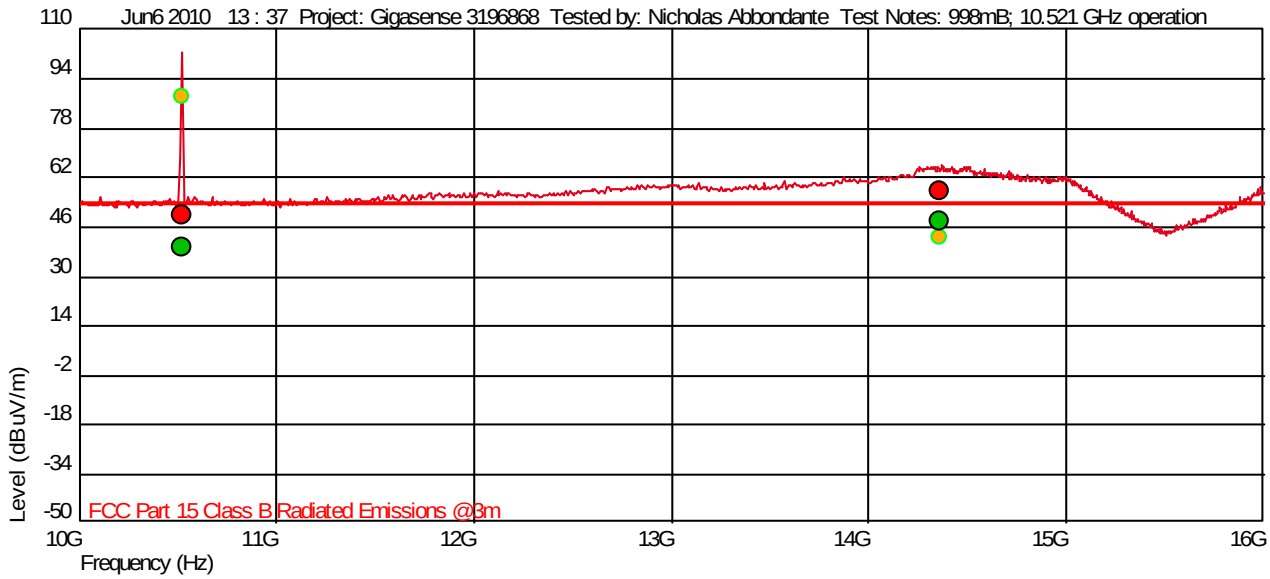
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)		Ver (|)	Angle (Deg)	Mast Height (m)	RBW (Hz)
6.744G	41.53	34.555	-27.382	74.00	-32.47	|	183	1.59		1 M
9.868G	48.02	37.504	-24.238	74.00	-25.98	|	164	2.29		1 M
9.953G	47.67	37.524	-24.214	74.00	-26.33	|	223	2.69		1 M

Measured: AVERAGE

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)		Ver (|)	Angle (Deg)	Mast Height (m)	RBW (Hz)
6.744G	32.21	34.555	-27.382	54.00	-21.79	|	183	1.59		1 M
9.868G	37.96	37.504	-24.238	54.00	-16.04	|	164	2.29		1 M
9.953G	38.30	37.524	-24.214	54.00	-15.70	|	223	2.69		1 M

10.521 GHz Channel:

Test Information	
Test Details	User Input
Project:	Gigasense 3196868
Test Notes:	998mB; 10.521 GHz operation
Temperature:	20c
Humidity:	56%
Tested by:	Nicholas Abbondante
Test Started:	Jun6 2010 13 : 37



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

Level (dBuV/m) = AF + CL + PA + Raw

AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

10.521 GHz Channel:

Measured: PEAK

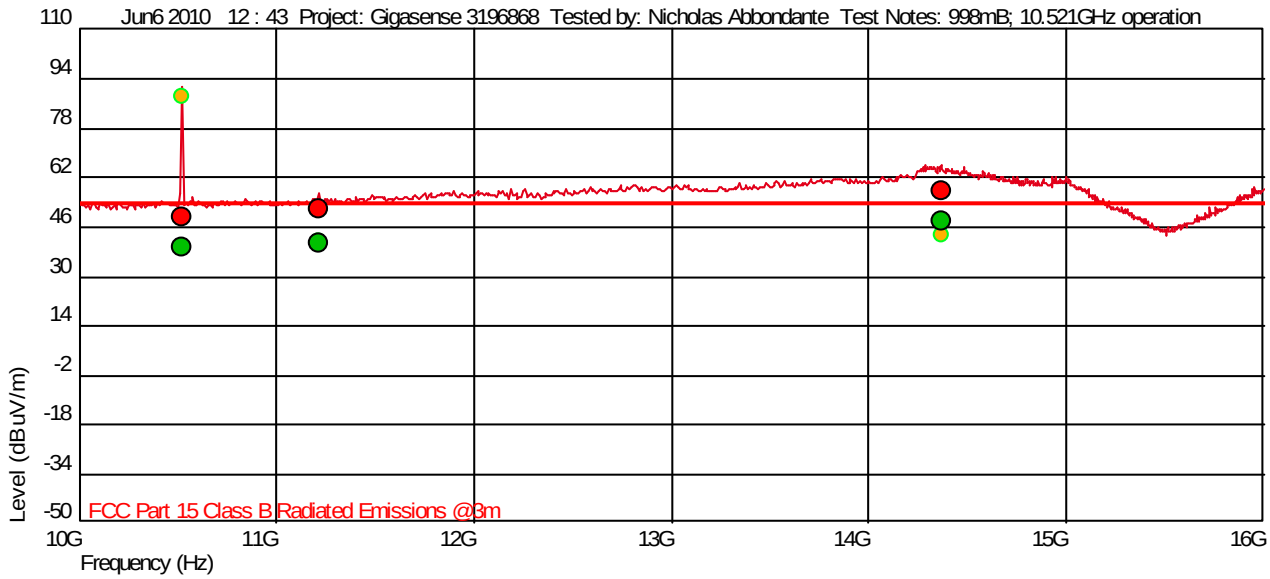
Frequency(Hz)	Level*(dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin(dBuV/m)	Hor (--), Ver (|)	Angle (Deg)	Mast Height(m)	Detector	RBW(Hz)
10.520 G	106.22	38.000	-23.595	148.00	-41.78	--	269	1.29	PEAK	1 M
14.363 G	61.45	42.138	-19.793	74.00	-12.55	--	355	3.31	PEAK	1 M

Measured: AVERAGE

Frequency(Hz)	Level*(dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Angle(Deg)	Mast Height(m)	Detector	RBW(Hz)
10.520 G	100.51	38.000	-23.595	128.00	-27.49	--	269	1.29	AVERAGE	1 M
14.363 G	51.85	42.138	-19.793	54.00	-2.15	--	355	3.31	AVERAGE	1 M

10.521 GHz Channel:

Test Information	
Test Details	User Input
Project:	Gigasense 3196868
Test Notes:	998mB; 10.521GHz operation
Temperature:	20c
Humidity:	56%
Tested by:	Nicholas Abbondante
Test Started:	Jun6 2010 12 : 43



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

Level (dBuV/m) = AF + CL + PA + Raw

AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

Measured: PEAK

Frequency(Hz)	Level*(dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin(dBuV/m)	Hor (--), Ver (|)	Angle (Deg)	Mast Height(m)	Detector	RBW(Hz)
10.522 G	104.42	37.676	-23.593	148.00	-43.58	|	260	1.26	PEAK	1 M
11.217 G	52.65	38.234	-22.585	74.00	-21.35	|	0	2.56	PEAK	1 M
14.366 G	60.61	42.148	-19.790	74.00	-13.39	|	207	3.33	PEAK	1 M

Measured: AVERAGE

Frequency (Hz)	Level *(dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Angle(Deg)	Mast Height(m)	Detector	RBW(Hz)
10.522 G	99.08	37.676	-23.593	128.00	-28.92	|	260	1.26	AVERAGE	1 M
11.217 G	43.69	38.234	-22.585	54.00	-10.31	|	0	2.56	AVERAGE	1 M
14.366 G	52.47	42.148	-19.790	54.00	-1.53	|	207	3.33	AVERAGE	1 M

10.521 GHz Channel:

Intertek

Radiated Emissions

Company: Gigasense Force Measurement — Antenna & Cables: HF — Bands: N, LF, HF, SHF
Model #: Gigasense Microwave Anti-Collision System — Antenna: HORN2 V3m 09-24-2010.txt — HORN2 H3m 09-24-2010.txt
Serial #: 4113 — Cable(s): MEG005 01-04-2011.txt — CBL030 01-04-2011.txt
Engineers: Nicholas Abbondante — Location: 10m Chamber — Barometer: DAV004 — Filter: REA004
Project #: 3196868 — Date(s): 06/06/10
Standard: FCC Part 15 Subpart C 15.245 — Temp/Humidity/Pressure: 20c — 56% — 998mB
Receiver: R&S FSEK-30 (ROS001) 12-04-2010 — Limit Distance (m): 3
PreAmp: PRE9 04-19-2011.txt — Test Distance (m): 1
PreAmp Used? (Y or N): Y — Voltage/Frequency: 120VAC/60Hz — Frequency Range: 15-18 GHz
Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC	Harmonic?
Note: no emissions detected, measurements are of instrumentation noise floor														
PK	V	15000.000	36.64	39.51	12.71	26.40	9.54	52.92	74.00	-21.08	1/3 MHz			
AVG	V	15000.000	22.26	39.51	12.71	26.40	9.54	38.54	54.00	-15.46	1/3 MHz			
PK	V	18000.000	34.80	47.10	14.34	27.84	9.54	58.86	74.00	-15.14	1/3 MHz	RB	RB	
AVG	V	18000.000	23.02	47.10	14.34	27.84	9.54	47.08	54.00	-6.92	1/3 MHz	RB	RB	

10.521 GHz Channel:

Intertek

Special Radiated Emissions

Company: Gigasense Force Measurement — Antenna & Cables: SHF — Bands: N, LF, HF, SHF
Model #: Gigasense Microwave Anti-Collision System — Antenna: EMC04_1M_Vert_2-4-2011.txt — EMC04_1M_H_2-4-2011.txt
Serial #: 4113 — Cable(s): MEG005 01-04-2011.txt — CBL030 01-04-2011.txt
Engineers: Nicholas Abbondante — Location: 10m Chamber — Barometer: DAV004 — Filter: REA006
Project #: 3196868 — Date(s): 06/06/10
Standard: FCC Part 15 Subpart C 15.245 — Temp/Humidity/Pressure: 20c — 56% — 998mB
Receiver: R&S FSEK-30 (ROS001) 12-04-2010 — Limit Distance (m): 3
PreAmp: PRE9 04-19-2011.txt — Test Distance (m): 0.1
PreAmp Used? (Y or N): Y — Voltage/Frequency: 120VAC/60Hz — Frequency Range: 18-40 GHz
Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC	Harmonic?
No emissions detected except for 21080MHz harmonic; measurements are of instrumentation noise floor, 1m distance														
PK	V	18000.000	35.24	44.91	14.34	27.84	9.54	57.11	74.00	-16.89	1/3 MHz	RB	RB	
AVG	V	18000.000	22.26	44.91	14.34	27.84	9.54	44.13	54.00	-9.87	1/3 MHz	RB	RB	
PK	V	21047.000	38.28	45.16	15.86	29.01	9.54	60.75	97.50	-36.75	1/3 MHz	RB	RB	Harm
AVG	V	21047.000	29.73	45.16	15.86	29.01	9.54	52.20	77.50	-25.30	1/3 MHz	RB	RB	Harm
Note: 0.1m test distance														
PK	V	31563.000	41.61	47.26	22.05	25.36	29.54	56.01	97.50	-41.49	1/3 MHz	RB	RB	Harm
AVG	V	31563.000	31.30	47.26	22.05	25.36	29.54	45.70	77.50	-31.80	1/3 MHz	RB	RB	Harm
PK	V	38000.000	45.18	44.96	29.47	26.00	29.54	64.07	74.00	-9.93	1/3 MHz			
AVG	V	38000.000	34.30	44.96	29.47	26.00	29.54	53.19	54.00	-0.81	1/3 MHz			

10.521 GHz Channel:

Intertek

Special Radiated Emissions

Company: Gigasense Force Measurement — Antenna & Cables: N — Bands: N, LF, HF, SHF
Model #: Gigasense Microwave Anti-Collision System — Antenna: OML4 02-22-2011 — NONE.
Serial #: 4113 — Cable(s): CBL030 01-04-2011.txt — NONE.
Engineers: Nicholas Abbondante — Location: 10m Chamber — Barometer: DAV004 — Filter: NONE
Project #: 3196868 — Date(s): 06/06/10
Standard: FCC Part 15 Subpart C 15.245 — Temp/Humidity/Pressure: 20c — 56% — 998mB
Receiver: R&S FSEK-30 (ROS001) 12-04-2010 — Limit Distance (m): 3
PreAmp: PRE9 04-19-2011.txt — Test Distance (m): 0.05
PreAmp Used? (Y or N): N — Voltage/Frequency: 120VAC/60Hz — Frequency Range: 40-53GHz
Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC	Harmonic?
Note: 40-53 GHz range using mixer OML4														
PK	V	40000.000	43.26	38.24	0.61	0.00	35.56	46.55	74.00	-27.45	1/3 MHz	RB	RB	
AVG	V	40000.000	33.58	38.24	0.61	0.00	35.56	36.87	54.00	-17.13	1/3 MHz	RB	RB	
PK	V	42084.000	44.50	38.69	0.61	0.00	35.56	48.24	97.50	-49.26	1/3 MHz	RB		Harm
AVG	V	42084.000	33.32	38.69	0.61	0.00	35.56	37.06	77.50	-40.44	1/3 MHz	RB		Harm
PK	V	52605.000	44.47	40.63	0.61	0.00	35.56	50.15	97.50	-47.35	1/3 MHz	RB		Harm
AVG	V	52605.000	34.57	40.63	0.61	0.00	35.56	40.25	77.50	-37.25	1/3 MHz	RB		Harm
PK	V	53000.000	44.69	40.68	0.61	0.00	35.56	50.42	74.00	-23.58	1/3 MHz	RB		
AVG	V	53000.000	34.55	40.68	0.61	0.00	35.56	40.28	54.00	-13.72	1/3 MHz	RB		

8 AC Mains Conducted Emissions

8.1 Method

Tests are performed in accordance with ANSI C63.4:2003, CFR47 Part 15.207, IC RSS-Gen Section 7.2.2.

TEST SITE: AMAP Building

The AMAP Building and Lab includes general lab space that can be used for testing where a shielded/enclosed environment is not required.

Measurement Uncertainty

For conducted emissions, U_{lab} (3.2 dB in worst case) < U_{CISPR} (3.6 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

8.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004	Weather Station	Davis Instruments	7400	PE80529A61A	06/10/2009	06/10/2010
LISN12	LISN, 50uH, .01 - 50MHz, 24A	Solar Electronics	9252-50-R-24-BNC	941714	11/03/2009	11/03/2010
145108	EMI Test Receiver (20Hz - 40GHz)	Rohde & Schwarz	ESIB40	100209	02/26/2010	02/26/2011
DS20	Attenuator, 20dB	Mini Circuits	20dB, 50 ohm	DS20	06/03/2009	06/03/2010
N/A	BNC Cable	N/L	N/L	N/L	03/17/2010	03/17/2011

Software Utilized:

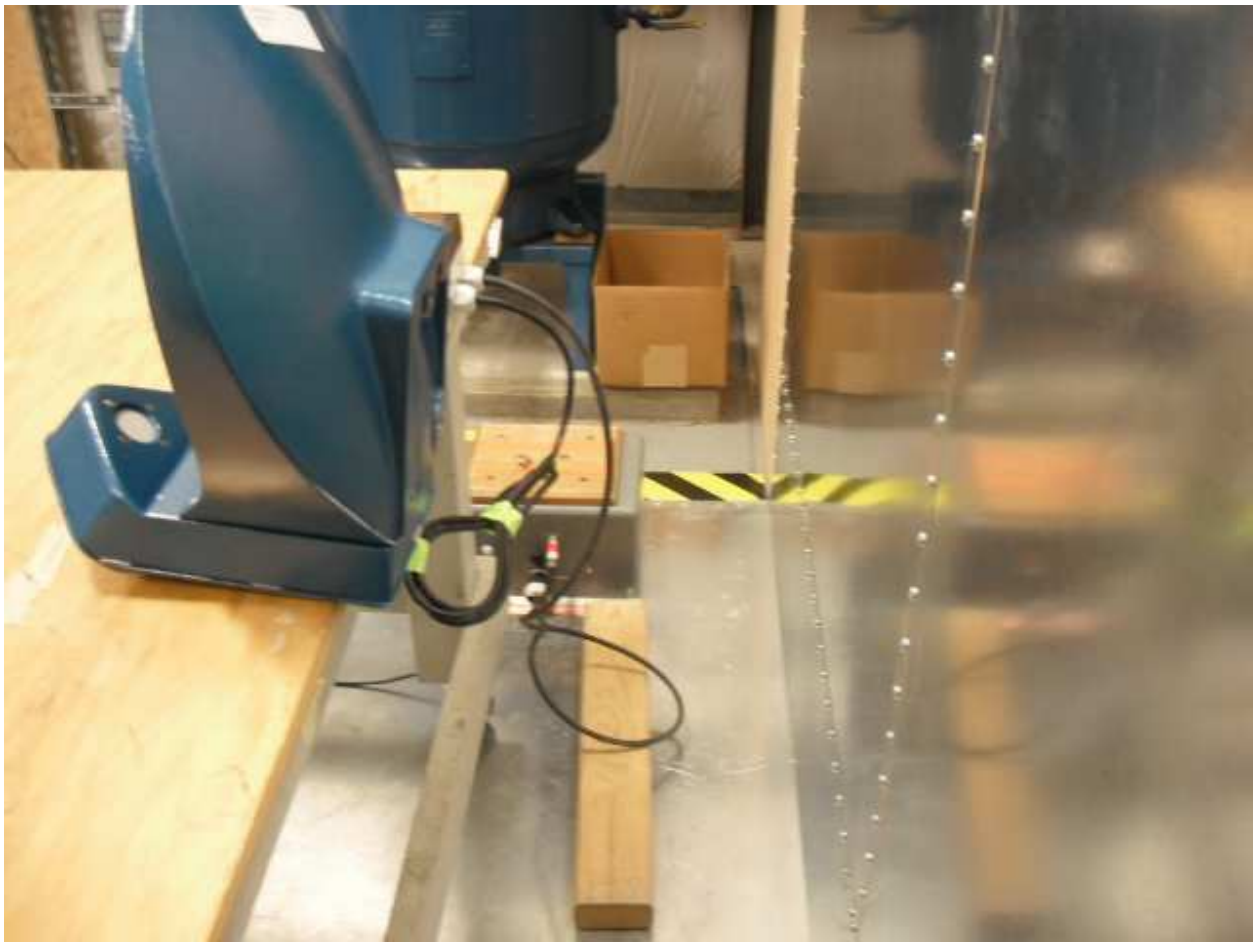
Name	Manufacturer	Version
Excel 2003	Microsoft	(11.5612.5606) SP3
EMI Boxborough.xls	Intertek	4/17/09

8.3 Results:

Emissions must be below the 15.207 and RSS-Gen Table 2 limits.

The sample tested was found to comply.

8.4 Setup Photographs:



8.5 Plots:

Not available

8.6 Data:

Intertek

Conducted Emissions

Company: Gigasense Force Measurement
Model #: Gigasense Anti-Collision System
Serial #: 4112
Engineer(s): Nicholas Abbondante
Project #: 3196868
Standard: FCC Part 15 Subpart C 15.245
Barometer: DAV004 Temp/Humidity/Pressure: 23c 30% 1007mB
Voltage/Frequency: 120V/60Hz
Location: AMAP Bldg
Date: 03/22/10

Receiver: R&S ESIB 40 (145-108) 2-26-2011
Cable: CBLBNC 03-17-11.txt
LISN 1: LISN12 [1] 11-03-10.txt
LISN 2: LISN12 [2] 11-03-10.txt
LISN 3: NONE.
LISN 4: NONE.
Attenuator: DS20 06-03-10.txt
Frequency Range: 150 kHz - 30 MHz

Net is the sum of worst-case lisn, cable, & attenuator losses, and initial reading, factors are not shown
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor; Bandwidth denoted as RBW/VBW

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	QP Limit dB(uV)	Margin dB	Bandwidth
QP	0.223	28.42	30.95			51.02	62.70	-11.68	9/30 kHz
QP	0.528	21.90	20.15			42.27	56.00	-13.73	9/30 kHz
QP	0.835	13.19	11.63			33.53	56.00	-22.47	9/30 kHz
QP	1.609	9.48	6.63			29.90	56.00	-26.10	9/30 kHz
QP	2.002	10.35	10.94			31.40	56.00	-24.60	9/30 kHz
QP	2.531	7.99	7.04			28.45	56.00	-27.55	9/30 kHz
QP	30.000	-6.38	-6.29			14.45	60.00	-45.55	9/30 kHz

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	Average Limit dB(uV)	Margin dB	Bandwidth
AVG	0.223	2.70	3.95			24.02	52.70	-28.68	9/30 kHz
AVG	0.528	-3.09	-4.35			17.28	46.00	-28.72	9/30 kHz
AVG	0.835	-2.64	-4.05			17.70	46.00	-28.30	9/30 kHz
AVG	1.609	-10.15	-10.76			10.27	46.00	-35.73	9/30 kHz
AVG	2.002	-9.72	-9.72			10.74	46.00	-35.26	9/30 kHz
AVG	2.531	-10.30	-10.45			10.16	46.00	-35.84	9/30 kHz
AVG	30.000	-11.76	-11.76			9.07	50.00	-40.93	9/30 kHz

Test Personnel:	Nicholas Abbondante
Product Standard:	FCC Part 15 Subpart C 15.245
Input Voltage:	120VAC/60Hz
Pretest Verification w/ BB Source:	**No**

Test Date:	03/22/2010
Test Levels:	Emissions must be below the 15.207 limits
Ambient Temperature:	23 ºC
Relative Humidity:	30 %
Atmospheric Pressure:	1007 mbars

Deviations, Additions, or Exclusions: None

9 Revision History

Revision Level	Date	Report Number	Notes
0	06/07/2010	3196868BOX-001a	Original Issue