

# EMC EMISSIONS - TEST REPORT (Full)



Test Report No. **BC206230** Issue Date: **Mon 23/Dec/2002**

Model / Serial No. **HG200C / SN: 9369113**

Product Type **HG200C Standard Transmitter**

Client **BI Incorporated**

Manufacturer **BI Incorporated**

License holder **BI Incorporated**

Address **6400 Lookout Road**  
**Boulder, Co 80301**

Test Criteria Applied  
Test Result

**FCC part 15.231 Class B**

**PASS**

Test Project Number  
References  
Total Pages  
Including  
Appendices:

**BC206230**

**29**

Title 47 CFR 15: Radio Frequency  
Devices

*Todd Seeley*

Reviewed By : Todd Seeley

*Robert Cresswell*

Approved By : Robert Cresswell

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NVLAP Lab code 100271-1



<b>Documentation</b>	<b>Page(s)</b>
Test report	<u>1 – 22</u>
Directory	<u>2</u>
Test Regulations	<u>3</u>
General Remarks	<u>3</u>
Test-setup Photographs	<u>4 - 6</u>
 <b>Appendix A</b>	
Test Data Sheets and Test Equipment Used	<u>7 - 16</u>
 <b>Appendix B</b>	
Test Plan/Constructional Data Form	<u>17 - 24</u>
 <b>Appendix C</b>	
Measurement Protocol/Test Procedures	<u>25 - 29</u>

**STATEMENT OF MEASUREMENT UNCERTAINTY**

The data and results referenced in this document are true and accurate. The measurement uncertainty for Conducted Emissions in the frequency range of 150kHz – 30MHz is calculated to be  $\pm 2.30\text{dB}$  and for Radiated Emissions is calculated to be  $\pm 3.60\text{dB}$  in the frequency range of 30MHz – 200MHz and  $\pm 3.38\text{dB}$  in the frequency range of 200MHz – 1000MHz.

EUT Received Date: 20-Dec-2002

Testing Start Date: 20-Dec-2002

Testing End Date: 20-Dec-2002

**The tests were performed according to following regulations :**

1. FCC Part 15:2001

**Emission Test Results:**

**Conducted Emissions, Powerline - N/A**

**Test Result**

Minimum limit margin \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Maximum limit exceeding \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Remarks: \_\_\_\_\_

**Conducted Emissions, Data I/O (Ethernet, RJ11, etc.) - N/A**

**Test Result**

Minimum limit margin \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Maximum limit exceeding \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Remarks: \_\_\_\_\_

**Radiated Emissions (Electric Field) -**

**Test Result**

Minimum limit margin \_\_\_\_\_ -13.3 dB at \_\_\_\_\_ 46.5 MHz

Maximum limit exceeding \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Remarks: \_\_\_\_\_

**GENERAL REMARKS:**

**DUTY CYCLE:**

**Duty cycle declared to be worst case is 7.14 msec/pulse, with 1 pulse per 14.5 to 29 seconds. So duty cycle calculation is  $20 \log(7.14 \text{ msec}/100 \text{ msec})$  or 22 dB, with 20 dB being used in the calculation to demonstrate peak compliance as well. See page A7.**

**SIGNAL DEACTIVATION per CFR47 FCC Part 15.231(e):**

**The transmitter sends one command pseudorandomly every 14.5 to 29 seconds. Each command has a total on time of 7.14 msec. The duration of the transmission is less than 1 second; the silent period between transmissions is greater than 10 seconds.**

Modifications required to pass:

Test Specification Deviations: Additions to or Exclusions from:

**Appendix A**

Test Data Sheets  
and  
Test Equipment Used

# Radiated Electromagnetic Emissions



Test Report #: **BC206230 Run 02**  
 Test Method: FCC Part 15  
 EUT Model #: HG200C  
 EUT Serial #: 9369113  
 Manufacturer: BI  
 EUT Description: HG200C Standard Transmitter  
 Notes:

Test Area: Pinewood Site 1 (3m)  
 Test Date: 20-Dec-2002  
 EUT Power: 3.6 VDC

Temperature: 20.4 °C  
 Relative Humidity: 34 %  
 Air Pressure: 80 kPa  
 Page: 1 of 1

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB/m) (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) FCC B (< 1GHz)	DELTA2 (dB) FCC B (> 1GHz)
No emissions found: 0 Deg, horizontal						
No emissions found: 90 Deg, horizontal						
No emissions found: 180 Deg, horizontal						
No emissions found: 270 Deg, horizontal						
No emissions found 200 - 1000 MHz, horizontal, nothing maximized						
No emissions found: 0 Deg, vertical						
No emissions found: 90 Deg, vertical						
No emissions found: 180 Deg, vertical						
No emissions found: 270 Deg, vertical						
No emissions found 200 - 1000 MHz, nothing maximized						
The following are noise floor readings between 200 and 1000 MHz						
200.29	23.3 Qp	10.7 / 11.4 / 28.1	17.2	V / 1.0 / 270.0	-26.3	N/A
239.35	23.9 Qp	4.9 / 11.3 / 28.1	12.0	V / 1.0 / 270.0	-34.0	N/A
385.16	20.9 Qp	4.9 / 15.1 / 27.9	13.0	V / 1.0 / 270.0	-33.0	N/A
798.86	18.5 Qp	5.1 / 21.2 / 27.7	17.2	V / 1.0 / 270.0	-28.8	N/A
896.06	23.1 Qp	5.5 / 23.0 / 26.9	24.8	V / 1.0 / 270.0	-21.2	N/A
999.56	17.9 Qp	2.3 / 24.0 / 26.5	17.7	V / 1.0 / 270.0	-36.3	N/A

Tested by: **Dan Dillon**  
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 Printed

\_\_\_\_\_  
 Signature

Reviewed by: **Todd Seeley**  
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 Printed

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 Signature

# Radiated Electromagnetic Emissions



Test Report #: BC206230 Run 02      Test Area: Pinewood Site 1 (3m)  
 Test Method: FCC Part 15      Test Date: 20-Dec-2002  
 EUT Model #: HG200C      EUT Power: 3.6 VDC  
 EUT Serial #: 9369113  
 Manufacturer: BI  
 EUT Description: HG200C Standard Transmitter  
 Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Temperature: 20.4 °C  
 Relative Humidity: 34 %  
 Air Pressure: 80 kPa  
 Page: 2 of 2

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB/m) (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) FCC B (< 1GHz)	DELTA2 (dB) FCC B (> 1GHz)
No emissions found: 0 Deg, vertical						
No emissions found: 90 Deg, vertical						
No emissions found: 180 Deg, vertical						
No emissions found: 270 Deg, vertical						
No emissions found: 0 Deg, horizontal						
No emissions found: 90 Deg, horizontal						
No emissions found: 180 Deg, horizontal						
No emissions found: 270 Dg, horizontal						
No emissioins found 30 - 200 MHz, nothing maximized						
The following are noise floor readings between 30 and 200 MHz						
36.30	26.7 Qp	7.1 / 12.9 / 22.4	24.3	H / 1.0 / 270.0	-15.7	N/A
46.05	30.7 Qp	6.8 / 11.6 / 22.3	26.7	H / 1.0 / 270.0	-13.3	N/A
74.25	25.2 Qp	7.5 / 8.5 / 21.9	19.3	H / 1.0 / 270.0	-20.7	N/A
118.39	21.9 Qp	8.4 / 11.5 / 23.5	18.2	H / 1.0 / 270.0	-25.3	N/A
168.79	23.4 Qp	9.6 / 12.4 / 26.4	19.0	H / 1.0 / 270.0	-24.5	N/A
208.99	21.9 Qp	3.9 / 14.2 / 28.1	11.8	H / 1.0 / 270.0	-31.7	N/A
No emissions found 1 - 3.2 GHz, vertical						

Tested by: Dan Dillon  
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 Signature

Reviewed by: Todd Seeley  
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 Signature

# Radiated Electromagnetic Emissions



Test Report #: BC206230 Run 02      Test Area: Pinewood Site 1 (3m)  
 Test Method: FCC Part 15      Test Date: 20-Dec-2002  
 EUT Model #: HG200C      EUT Power: 3.6 VDC  
 EUT Serial #: 9369113  
 Manufacturer: BI  
 EUT Description: HG200C Standard Transmitter  
 Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Temperature: 20.4 °C  
 Relative Humidity: 34 %  
 Air Pressure: 80 kPa  
 Page: 3 of 3

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV/m)	(m) (DEG)	FCC B (< 1GHz)	FCC B (> 1GHz)
Rotated table 360 Deg.						
No emissions found: 1 - 3.2 GHz, horizontal						
Rotated table 360 Deg.						
The following are noise floor readings between 1 - 3.2 GHz.						
1000.07	35.1 Av	2.3 / 25.9 / 35.9	27.3	H / 1.0 / 0.0	N/A	-26.7
1200.00	35.5 Av	2.5 / 26.2 / 38.5	25.8	H / 1.0 / 0.0	N/A	-28.2
1842.60	35.6 Av	3.4 / 28.5 / 37.1	30.3	H / 1.0 / 0.0	N/A	-23.7
2108.40	34.1 Av	3.7 / 29.6 / 37.4	30.0	H / 1.0 / 0.0	N/A	-24.0
2571.30	35.7 Av	4.2 / 30.7 / 36.9	33.8	H / 1.0 / 0.0	N/A	-20.2
3056.71	36.4 Av	3.8 / 31.6 / 36.9	34.9	H / 1.0 / 0.0	N/A	-19.1

Tested by: Dan Dillon  
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 Printed

  
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 Signature

Reviewed by: Todd Seeley  
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 Printed

  
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 Signature





# Radiated Electromagnetic Emissions



Test Report #: **BC206230 Run 1**  
 Test Method: N/A  
 EUT Model #: HG200C  
 EUT Serial #: 9369113  
 Manufacturer: BI  
 EUT Description: HG200C Standard Transmitter  
 Notes:

Test Area: Pinewood Site 1 (3m)  
 Test Date: 20-Dec-2002  
 EUT Power: 3.6 VDC

Temperature: 20.4 °C  
 Relative Humidity: 34 %  
 Air Pressure: 80 kPa  
 Page: 1 of 1

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB/m) (dB)	FINAL (dBuV)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) N/A	DELTA2 (dB) N/A
All readings are maximized						
314.21	67.2 Pk	4.7 / 15.0 / 0.0	86.8	H / 1.0 / 270.0	N/A	N/A
628.39	36.0 Pk	5.0 / 18.9 / 0.0	59.9	H / 1.0 / 90.0	N/A	N/A
942.79	28.1 Pk	4.1 / 23.9 / 0.0	56.1	H / 1.0 / 206.0	N/A	N/A
314.21	56.8 Pk	4.7 / 15.0 / 0.0	76.4	V / 1.0 / 0.0	N/A	N/A
628.52	40.1 Pk	5.0 / 19.0 / 0.0	64.0	V / 1.0 / 0.0	N/A	N/A
942.77	28.8 Pk	4.1 / 23.9 / 0.0	56.7	V / 1.0 / 0.0	N/A	N/A
1256.99	58.2 Pk	2.6 / 26.3 / 37.3	49.8	V / 1.0 / 0.0	N/A	N/A
1570.86	62.3 Pk	3.1 / 27.1 / 36.3	56.1	V / 1.0 / 0.0	N/A	N/A
1885.03	53.7 Pk	3.4 / 28.7 / 36.3	49.5	V / 1.0 / 0.0	N/A	N/A
2199.70	54.9 Pk	3.8 / 29.8 / 36.9	51.7	V / 1.0 / 0.0	N/A	N/A
2513.34	49.5 Pk	4.3 / 30.6 / 36.9	47.5	V / 1.0 / 0.0	N/A	N/A
2828.18	45.4 Pk	3.9 / 31.2 / 36.8	43.8	V / 1.0 / 0.0	N/A	N/A
3142.38	49.2 Pk	3.9 / 31.9 / 37.2	47.8	V / 1.0 / 0.0	N/A	N/A

Tested by: **Dan Dillon**  
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 Signature

Reviewed by: **Todd Seeley**  
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 Printed

  
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 Signature

# Radiated Electromagnetic Emissions



Test Report #: BC206230 Run 1      Test Area: Pinewood Site 1 (3m)  
 Test Method: N/A      Test Date: 20-Dec-2002  
 EUT Model #: HG200C      EUT Power: 3.6 VDC  
 EUT Serial #: 9369113  
 Manufacturer: BI  
 EUT Description: HG200C Standard Transmitter  
 Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Temperature: 20.4 °C  
 Relative Humidity: 34 %  
 Air Pressure: 80 kPa  
 Page: 2 of 2

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV)	(m) (DEG)	N/A	N/A
1256.71	63.2 Pk	2.6 / 26.3 / 37.3	54.9	H / 1.0 / 0.0	N/A	N/A
1571.23	70.7 Pk	3.1 / 27.1 / 36.3	64.5	H / 1.0 / 0.0	N/A	N/A
1885.01	56.0 Pk	3.4 / 28.7 / 36.3	51.8	H / 1.0 / 0.0	N/A	N/A
2199.71	59.7 Pk	3.8 / 29.8 / 36.9	56.5	H / 1.0 / 0.0	N/A	N/A
2513.33	51.6 Pk	4.3 / 30.6 / 36.9	49.6	H / 1.0 / 0.0	N/A	N/A
2828.18	44.7 Pk	3.9 / 31.2 / 36.8	43.1	H / 1.0 / 0.0	N/A	N/A
3142.40	52.5 Pk	3.9 / 31.9 / 37.2	51.1	H / 1.0 / 0.0	N/A	N/A

Tested by: Dan Dillon  
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 Printed

  
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 Signature

Reviewed by: Todd Seeley  
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 Printed

  
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 Signature

# Radiated Electromagnetic Emissions



Test Report #: BC206230 Run 1      Test Area: Pinewood Site 1 (3m)  
 Test Method: N/A      Test Date: 20-Dec-2002  
 EUT Model #: HG200C      EUT Power: 3.6 VDC  
 EUT Serial #: 9369113  
 Manufacturer: BI  
 EUT Description: HG200C Standard Transmitter  
 Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Temperature: 20.4 °C  
 Relative Humidity: 34 %  
 Air Pressure: 80 kPa  
 Page: 3 of 3

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

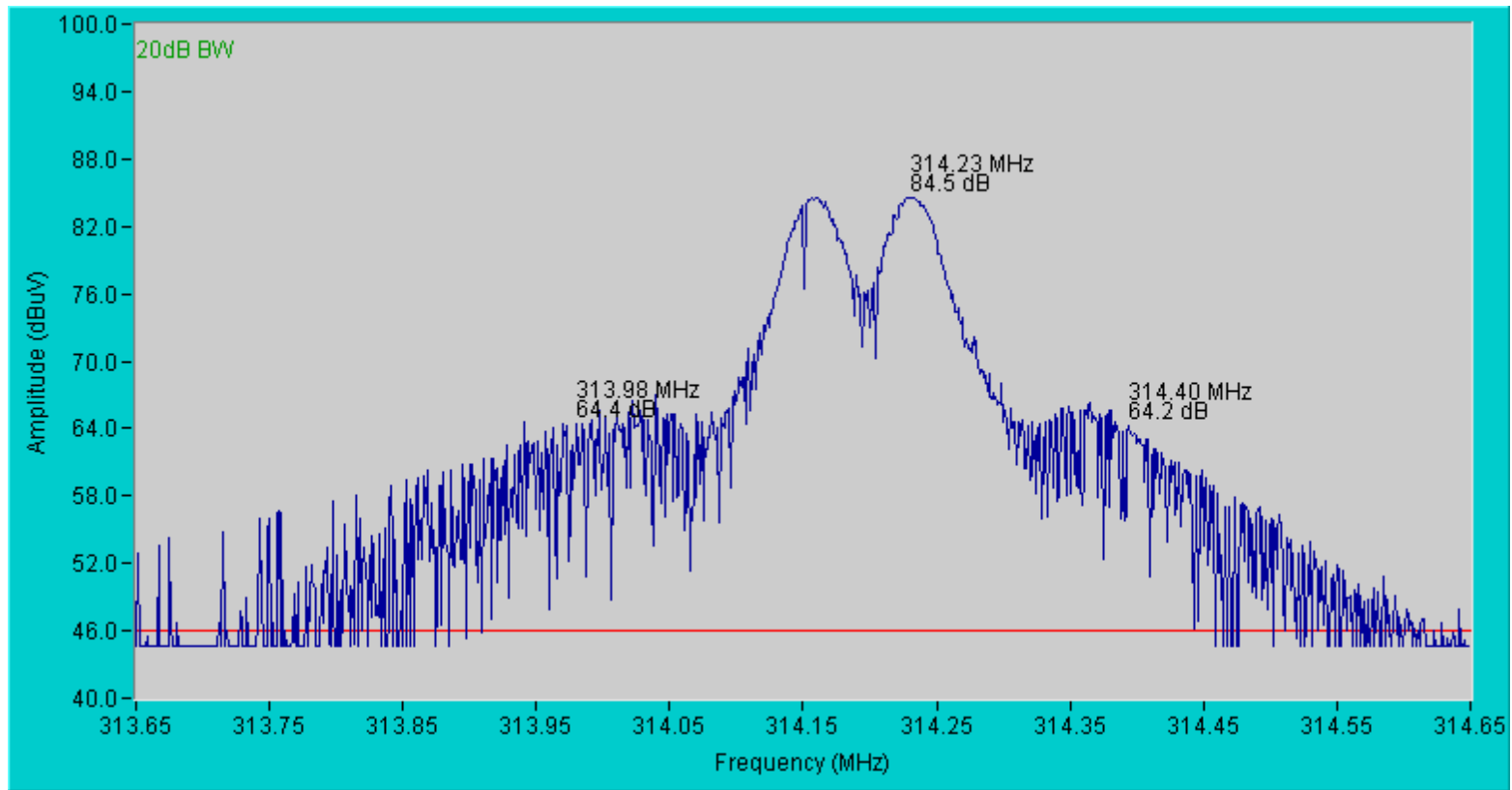
FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV)	(m) (DEG)	N/A	N/A
<b>***** Measurement Summary *****</b>						
314.21	67.2 Pk	4.7 / 15.0 / 0.0	86.8	H / 1.0 / 270.0	N/A	N/A
628.39	36.0 Pk	5.0 / 18.9 / 0.0	59.9	H / 1.0 / 90.0	N/A	N/A
628.52	40.1 Pk	5.0 / 19.0 / 0.0	64.0	V / 1.0 / 0.0	N/A	N/A
942.77	28.8 Pk	4.1 / 23.9 / 0.0	56.7	V / 1.0 / 0.0	N/A	N/A
1256.71	63.2 Pk	2.6 / 26.3 / 37.3	54.9	H / 1.0 / 0.0	N/A	N/A
1571.23	70.7 Pk	3.1 / 27.1 / 36.3	64.5	H / 1.0 / 0.0	N/A	N/A
1885.01	56.0 Pk	3.4 / 28.7 / 36.3	51.8	H / 1.0 / 0.0	N/A	N/A
2199.71	59.7 Pk	3.8 / 29.8 / 36.9	56.5	H / 1.0 / 0.0	N/A	N/A
2513.33	51.6 Pk	4.3 / 30.6 / 36.9	49.6	H / 1.0 / 0.0	N/A	N/A
2828.18	45.4 Pk	3.9 / 31.2 / 36.8	43.8	V / 1.0 / 0.0	N/A	N/A
3142.40	52.5 Pk	3.9 / 31.9 / 37.2	51.1	H / 1.0 / 0.0	N/A	N/A

Tested by: Dan Dillon  
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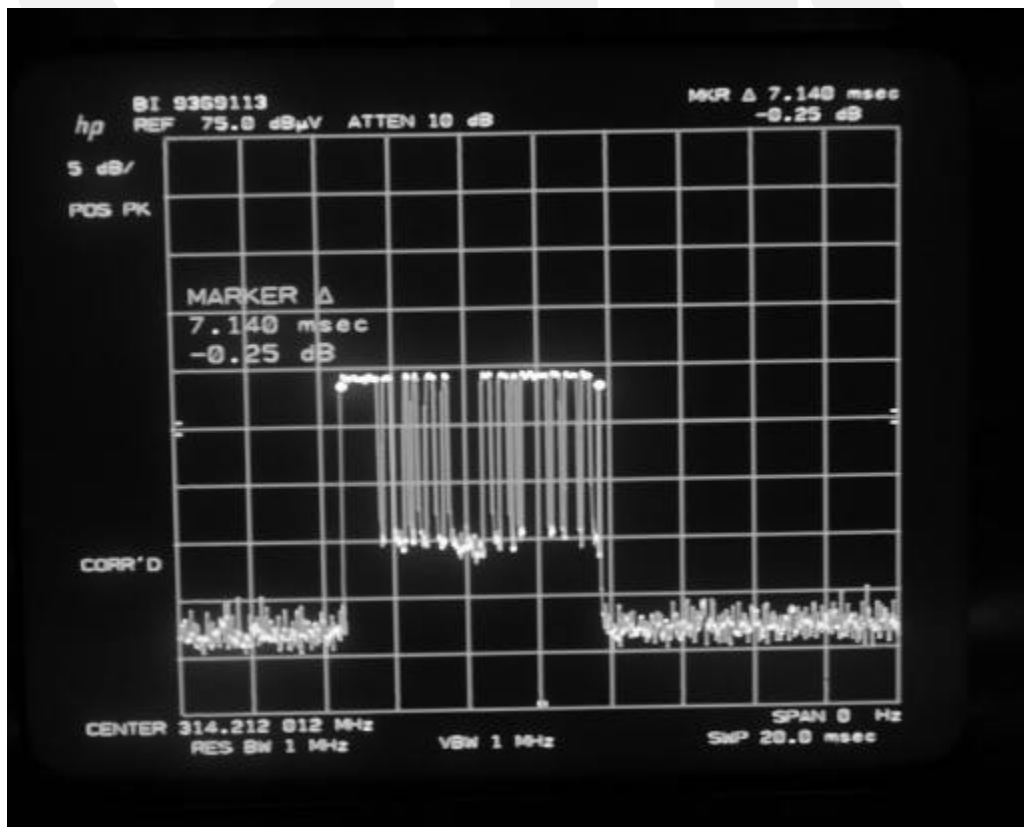
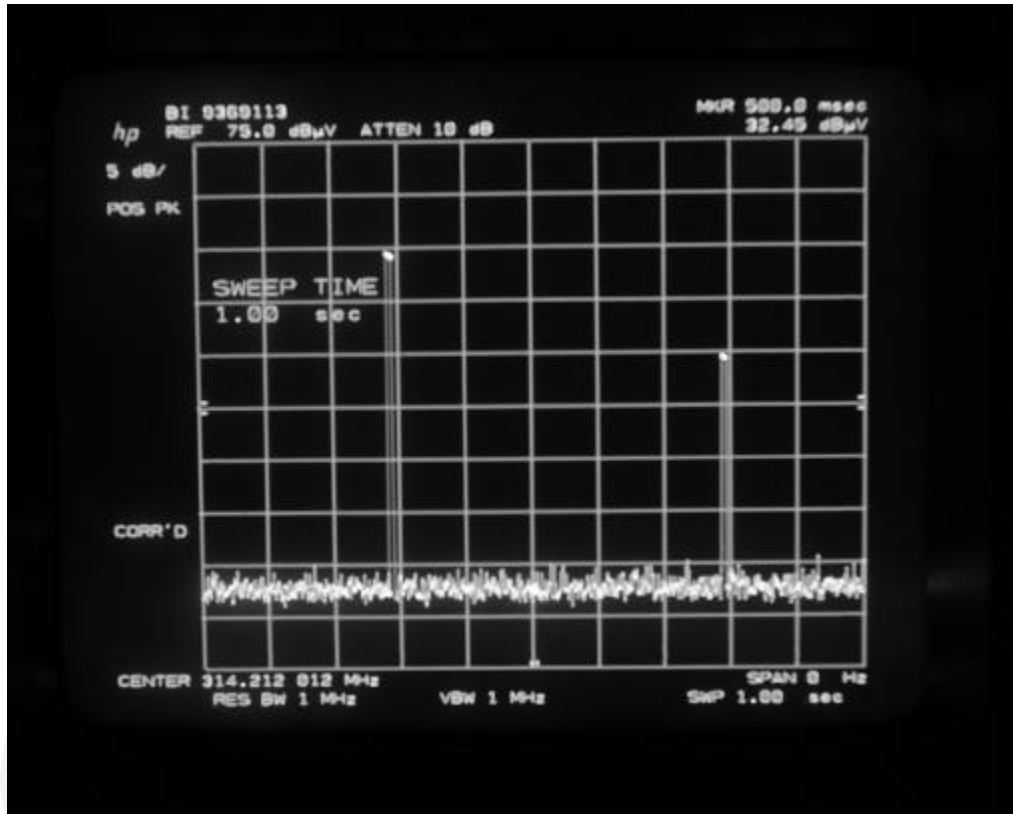
  
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 Signature

Reviewed by: Todd Seeley  
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 Printed

  
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 Signature



Duty Cycle & Deactivation



# Equipment Report

23-Dec-2002

Project Number: BC206230

Project Date: 23-Dec-2002

Company Name: BI

Equip ID	Manufacturer	Model Number	Serial Number	Description	Date	Calibration Interval	Due	Cal Code
	<u>Test Performed</u>		<u>Radiated Emissions</u>					
7617	MINI-CIRCUITS LAB	ZHL-42	N052792-2	Amplifier		0		Y
7637	MITEQ	AM-2A-000110-N	848495	Amplifier	05-May-2002	12	05-May-2003	G
8014	EMCO	3146	9203-3376	Log Periodic Antenna	11-Sep-2002	12	11-Sep-2003	G
8213	HEWLETT PACKARD	8566B	2410A00154	Spectrum Analyzer (dc-22 GHz)	21-Oct-2002	12	21-Oct-2003	G
8214	HEWLETT PACKARD	85662A	2403A08749	Display Section	21-Oct-2002	12	21-Oct-2003	G
8215	HEWLETT PACKARD	85650A	2043A00256	Quasi Peak Adapter (set 1)	17-Sep-2002	12	17-Sep-2003	G
8252	EMC TEST SYSTEMS	3109	3142	Biconical Antenna	30-Sep-2002	12	30-Sep-2003	Y
8264	EMCO	3115	9205-3886	Horn Antenna	01-Aug-2002	12	01-Aug-2003	G

Cal Code Legend: G=Out Source, Y=No Cal required, R=Out of Service, B=In-House Verification Required

1 of 1

**Appendix B**

Test Plan  
and  
Constructional Data Form

# EMC Test Plan and Constructional Data Form

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE.

**Applicant -- NOTE: This information will be input into your test report as shown below.**  
**Press the F1 key at any time to get HELP for the current field selected.**

Company: BI Inc.

Address: 6400 Lookout Rd.  
Boulder CO

Contact: Don Melton Position: Principal Electrical Engineer

Phone: 303-218-1031 Fax: 303-218-1250

E-mail Address: don.melton@bi.com

**General Equipment Description -- NOTE: This information will be input into your test report as shown below.**

EUT Description Low power RF transmitter for Electronic House Arrest Monitoring

EUT Name HomeGuard Standard Transmitter

Model No.: HG200C Serial No.: 9369113

Product Options: N/A

Configurations to be tested: N/A

**Test Objective**

- |  |  |
|--|--|
| <input type="checkbox"/> EMC Directive 89/336/EEC (EMC)                                      | <input type="checkbox"/> FCC: Class <input type="checkbox"/> A <input type="checkbox"/> B Part           |
| Std: _____   | <input type="checkbox"/> VCCI: Class <input type="checkbox"/> A <input type="checkbox"/> B               |
| <input type="checkbox"/> Machinery Directive 89/392/EEC (EMC)                                | <input type="checkbox"/> BCIQ: Class <input type="checkbox"/> A <input type="checkbox"/> B               |
| Std: _____   | <input type="checkbox"/> Canada: Class <input type="checkbox"/> A <input type="checkbox"/> B             |
| <input type="checkbox"/> Medical Device Directive 93/42/EEC (EMC)                            | <input type="checkbox"/> Australia: Class <input type="checkbox"/> A <input type="checkbox"/> B          |
| Std: _____   | <input type="checkbox"/> Other: (1) FCC Part 15, para 15.231 (e)<br>(2) Industry Canada RSS210, 6.1.1(e) |
| <input type="checkbox"/> Vehicle Directive 72/245/EEC (EMC)                                  |  |
| Std: _____   |  |
| <input type="checkbox"/> FDA Reviewers Guidance for Premarket Notification Submissions (EMC) |  |



## EMC Test Plan and Constructional Data Form

**TÜV Product Service Certification Requested**

- |  |   |
|--|---|
| <input type="checkbox"/> Attestation of Conformity (AoC) | <input type="checkbox"/> International EMC Mark (IEM)   |
| <input type="checkbox"/> Certificate of Conformity (CoC) | <input type="checkbox"/> Compliance Document  |
| Protection Class (N/A for vehicles)                      | <input type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III |
- (Press **F1** when field is selected to show additional information on Protection Class.)

**Attendance**

Test will be:     Attended by the customer     Unattended by the customer

**Failure - Complete this section if testing will not be attended by the customer.**

- If a failure occurs, TÜV Product Service should:
- Call contact listed above, if not available then stop testing. (After hrs phone): \_\_\_\_\_
  - Continue testing to complete test series.
  - Continue testing to define corrective action.
  - Stop testing.

**EUT Specifications and Requirements**

Length: 2"      Width: .75"      Height: 2.5"      Weight: 3 oz

**Power Requirements**

*Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)*

Voltage:      N/A      (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases:      \_\_\_\_\_

Current (Amps/phase(max)):      \_\_\_\_\_      Current (Amps/phase(nominal)):      \_\_\_\_\_

Other      Lithium thionyl chloride primary cell, 3.6 VDC/750 mahr

**Other Special Requirements**

N/A

**Typical Installation and/or Operating Environment**

(ie. Hospital, Small Business, Industrial/Factory, etc.)  
 Typical installation, EUT is attached with a companion strap to the ankle of a person on Electronic House Arrest. Unit is waterproof, is worn 24 hours a day, and can operate between 0 and 50 degrees C.



**EMC Test Plan and Constructional Data Form**

**EUT Power Cable**

- Permanent    OR     Removable                      Length (in meters): \_\_\_\_\_
- Shielded        OR     Unshielded
- Not Applicable

# EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables												
Interface			Shielding									
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable	Permanent
<b>EXAMPLE:</b> RS232	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>

## EMC Test Plan and Constructional Data Form

**EUT Software.**

Revision Level: N/A

Description: Firmware engineering level 6

**EUT Operating Modes to be Tested** -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. EUT operating in Fast Turbo mode (normal mode is transmit in a pseudorandom time interval of 14.5 to 29 seconds. Fast turbo mode transmits the same data but at a rate of once every 0.5 second for test purposes).
- 2.
- 3.

**EUT System Components** -- List and describe all components which are part of the EUT. For FCC testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc.)

Description	Model #	Serial #	FCC ID #
EUT Transmitter	HG200C	9369113	EUT

## EMC Test Plan and Constructional Data Form

<b>Support Equipment</b> -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)			
<i>Description</i>	<i>Model #</i>	<i>Serial #</i>	<i>FCC ID #</i>
None			

<b>Oscillator Frequencies</b>			
<i>Frequency</i>	<i>Derived Frequency</i>	<i>Component # / Location</i>	<i>Description of Use</i>
33.333 kHz	continuous	Y3	.5sec wakeup; 120us bit width
9.818750 MHz (Xtal)	intermittent	Y4	X32 to generate 314.2MHz
314.2 MHz (PLL/VCO)	intermittent	U1	Carrier; from 9.818750 MHz
2MHz (RC)	intermittent	R14-C29-U3	uP clock

<b>Power Supply</b>			
<i>Manufacturer</i>	<i>Model #</i>	<i>Serial #</i>	<i>Type</i>
Eagle-Picher	Custom Battery		<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input checked="" type="checkbox"/> Other: <u>3.6V/750ma LiSO2</u>
			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____

<b>Power Line Filters</b>		
<i>Manufacturer</i>	<i>Model #</i>	<i>Location in EUT</i>
N/A		

**EMC Test Plan and Constructional Data Form**

<b>Critical EMI Components (Capacitors, ferrites, etc.)</b>				
<i>Description</i>	<i>Manufacturer</i>	<i>Part # or Value</i>	<i>Qty</i>	<i>Component # / Location</i>
N/A				

**EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.**

N/A

(PLEASE INSERT "ELECTRONIC SIGNATURE" BELOW IF POSSIBLE)

**Authorization Signatures**

Donald A. Melton	12/20/02
_____	_____
Customer authorization to perform tests according to this test plan.	Date
Donald A. Melton	
_____	_____
Test Plan/CDF Prepared By (please print)	Date
Todd Seeley	12/29/02
_____	_____
Reviewed by TÜV Product Service Associate	Date

**Appendix C**

Measurement Protocol

And

Test Procedures

## MEASUREMENT PROTOCOL

### GENERAL INFORMATION

#### Test Methodology

Conducted and radiated emission testing is performed according to the procedures in ANSI C63.4 & CNS13438.

#### Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

### CONDUCTED EMISSIONS

The final level, expressed in dB $\mu$ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the applicable limit.

To convert between dB $\mu$ V and  $\mu$ V, the following conversions apply:

- $\text{dB}\mu\text{V} = 20(\log \mu\text{V})$
- $\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$

### RADIATED EMISSIONS

The final level, expressed in dB $\mu$ V/m, is arrived at by taking the reading from the spectrum analyzer (Level dB $\mu$ V) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has the applicable limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in Attachment B. The amplifier gain is automatically accounted for by using an analyzer offset.

*Example: At a Test Frequency of 30 MHz, with a peak reading on the spectrum analyzer or measuring receiver of 14 dB $\mu$ V:*

Measured Level	+	Transducer & Cable Loss factor	=	Corrected Reading	Specification Limit	-	Corrected Reading	=	Delta Specification
(dB $\mu$ V)		(dB)		(dB $\mu$ V/m)	(dB $\mu$ V/m)		(dB $\mu$ V/m)		
<b>14.0</b>		<b>14.9</b>		<b>28.9</b>	<b>40.0</b>		<b>28.9</b>		<b>-11.1</b>



## DETAILS OF TEST PROCEDURES

### *General Standard Information*

The test methods used comply with ANSI C63.4-1992 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

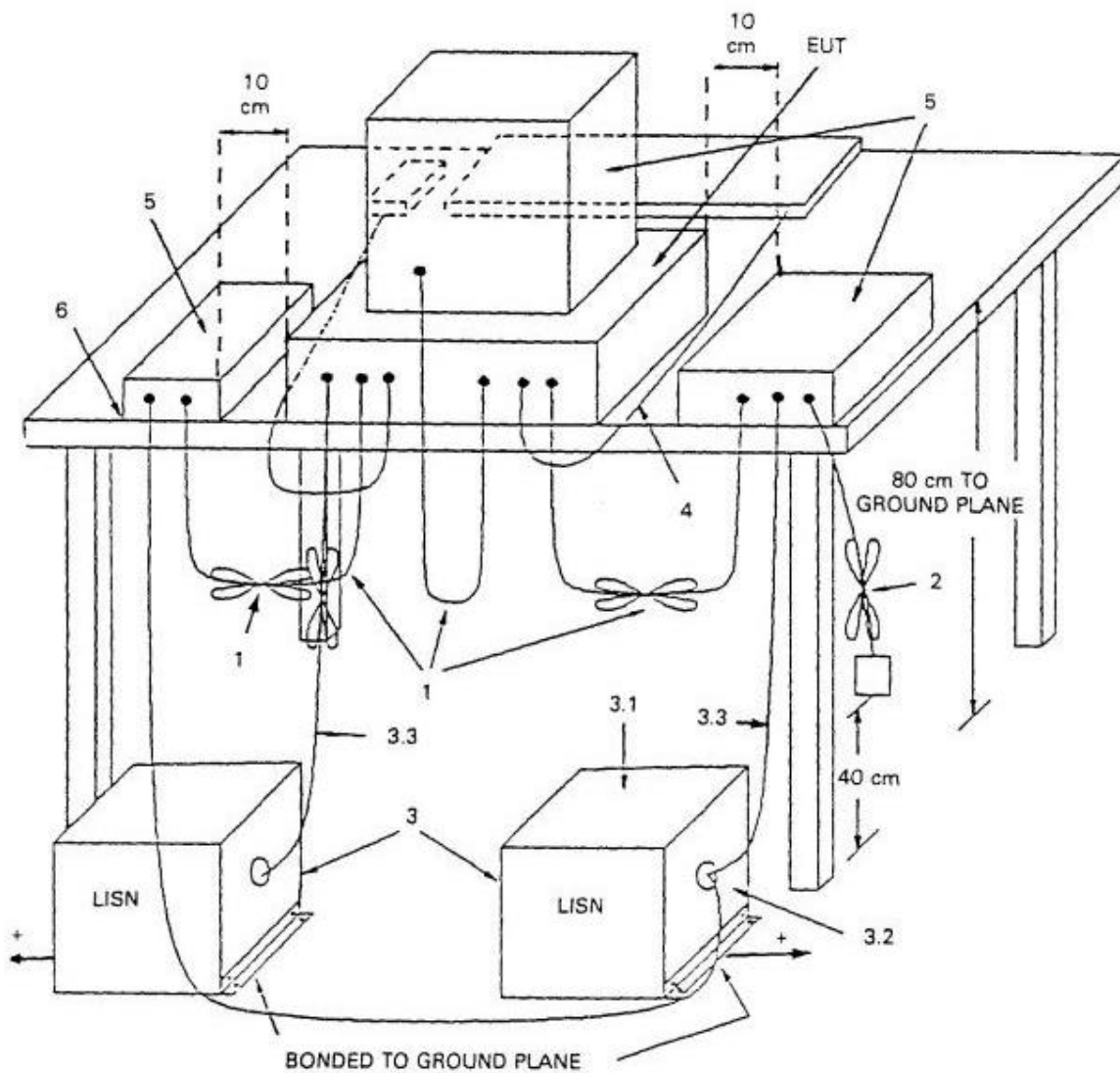
### **Conducted Emissions**

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50  $\Omega$ /50  $\mu$ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

### **Radiated Emissions**

Radiated emissions from the EUT are measured in the frequency range of 30 to 22GHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3, 10 or 30 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees.

**Conducted Emissions Diagram:**



**Radiated Emissions Diagram:**

