

EMC EMISSION - TEST REPORT

Test Report No. **B006001** Issue Date 24 March 2000

Model / Serial No. FA-5230 / 1

Product Type Battery Powered Transmitter

Client Inovonics Corporation

Manufacturer Inovonics Corporation

License holder Inovonics Corporation

Address 2100 Central Avenue
Boulder, CO 80301

Test Criteria Applied **FCC Part 15** **15.247C**

Test Start Date: 13 March 2000

Test End Date: 13 March 2000

Test Result **■ PASS** **□ FAIL**

Test Report Project No. **BC1G952601**

Total Pages including
Appendices 29



Reviewed By : Felix J. Chavez



Reviewed By : Shawn Singh

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EMISSIONS TEST REGULATIONS :

The tests were performed according to following regulations :

- | | | |
|---|--|---|
| ☒ - Federal Communication Commission part 15 | ☐ - Class A | ☒ - Class B |
| ☒ - Federal Communication Commission part 15, Subpart C | ☒ - 15.209 | ☒ - 15.247 |

All tests performed according to ANSI C63.4.

Emission Test Results:

Conducted emissions 450 kHz - 30 MHz

Test Result ☒ - PASS ☐ - FAIL ☒ - Not Applicable

Passing Margin _____ dB at _____ MHz

Remarks: EUT is battery operated.

Radiated emissions (electric field) 30 MHz - 1000 MHz (Unintentional Radiator)

Test Result ☒ - PASS ☐ - FAIL ☐ - Not Applicable

Passing Margin 22.6 dB at 800 MHz

Remarks: _____

Radiated emissions (electric field) 906 MHz - 9200 MHz (Intentional Radiator)

Test Result ☒ - PASS ☐ - FAIL ☐ - Not Applicable

Passing Margin 15.8 dB at 4561.2 MHz

Remarks: _____

GENERAL REMARKS:

Modifications required to pass: None

Test Specification Deviations: Additions to or Exclusions from: None

Test-setup photo(s)
Radiated Emissions



Test-setup photo(s):
Conducted Emissions



Test Not Applicable

Test Equipment Used



Equipment Report

13-Mar-2000

Project Number: B0060
Company Name: Inovonics

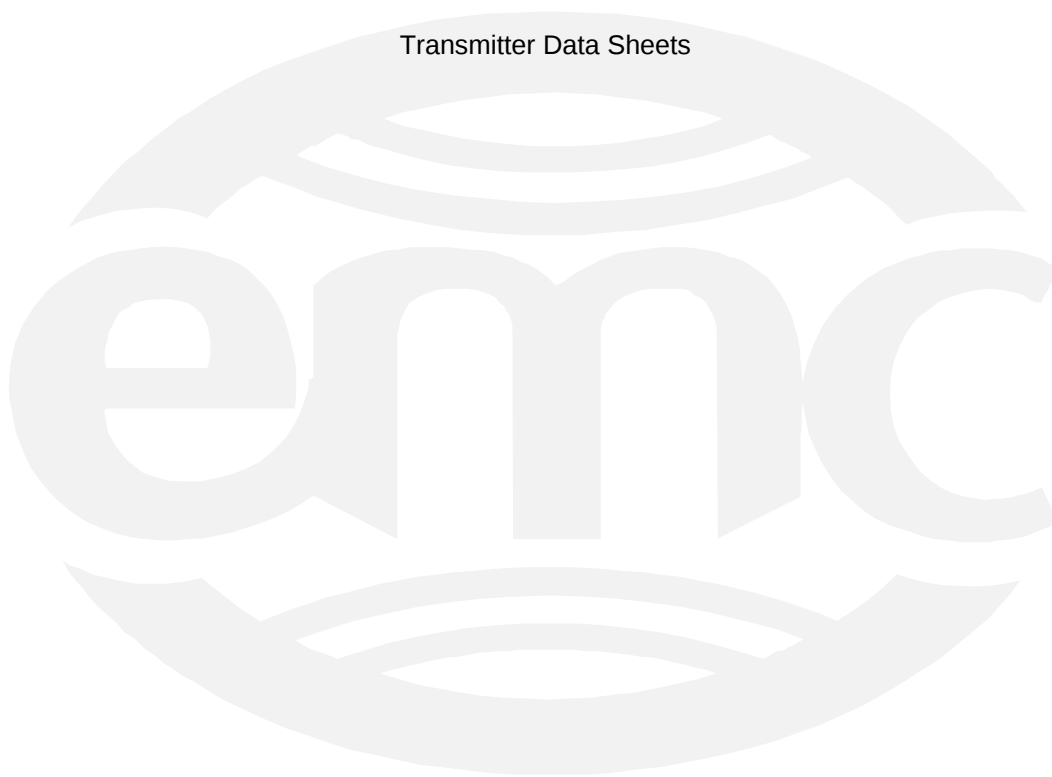
Project Date: 13-Mar-2000

Equip ID	Manufacturer	Model Number	Serial Number	Description	Date	Calibration Interval	Due	Cal Code
<u>Test Performed R</u>		<u>Radiated Emissions</u>						
7514	A.H.SYSTEMS	SAS-200/512	104	Log Periodic Antenna (200-1500 MHz)	28-Jul-1999	12	27-Jul-2000	G
8041	Mini Circuits	ZHL-1042J-SMA	D052699-4	Amplifier	23-Jul-1999	12	23-Jul-2000	G
8179	EMCO	3108	2149	Biconical Dipole Antenna (30-300 MHz)	28-Jun-1999	12	27-Jun-2000	G
8207	AVANTEK	AWT-18037	1002	RF Pre-Amplifier (8-18 GHz)	02-Dec-1999	12	01-Dec-2000	G
8208	AVANTEK	AFT97-8434	1007	RF Pre-Amplifier (4-8 GHz)	02-Dec-1999	12	01-Dec-2000	G
8213	HEWLETT PACKARD	8566B	2410A00154	Spectrum Analyzer (dc-22 GHz)	15-Apr-1999	12	14-Apr-2000	G
8214	HEWLETT PACKARD	85662A	2403A08749	Display Section	15-Apr-1999	12	14-Apr-2000	G
8219	HEWLETT PACKARD	8445B	2034A03223	Pre-Selector	24-Jun-1999	12	23-Jun-2000	G
8264	EMCO	3115	9205-3886	Horn Antenna	05-Apr-1999	12	04-Apr-2000	G

Cal Code Legend: G=Out Source, Y=No Cal required, R=Out of Service, B=In-House Verification Required 1 of 1

Appendix A

Transmitter Data Sheets



15.247 SPREAD SPECTRUM INTENTIONAL RADIATOR DATA

Date: 13-Mar-00	Measured @
EUT: FA-5230	Low Freq.: 906.32 MHz
Customer: Donald J. Hume	Mid Freq: 912.32 MHz
	High Freq: 919.96 MHz

Tx Mode: Radiated Measurements

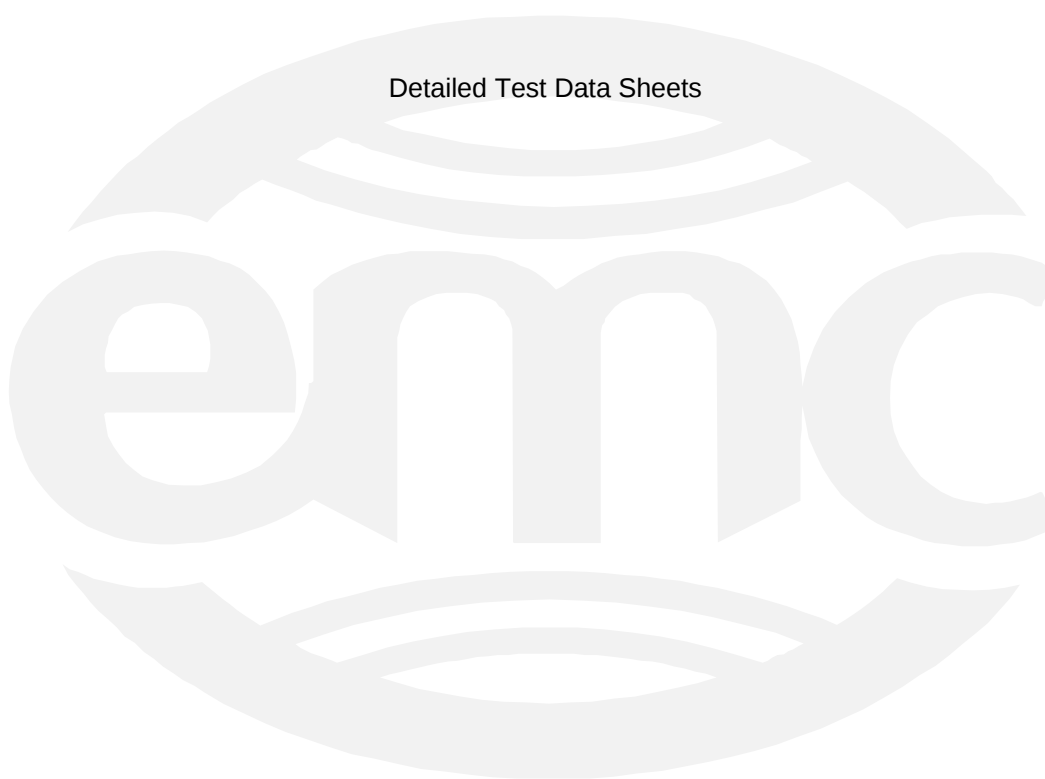
Calculated Averaging Factor: -33 dB (20*Log(duty cycle))
Max Averaging Factor Allowed: -20 dB
Averaging Factor Applied: -20 dB
Fundamental Field Strength: 100.5 dBuV/m

Range	Specification	Peak Measurement dBuV/m @ MHz		Average Measurement dBuV/m @ MHz		Delta dB
2nd harmonic (1812-1840 MHz)	20 dB down	48.7	1824.4	28.7	1824.4	-31.8
3rd harmonic (2718-2760 MHz)	54 dBuV/m	57.9	2718.6	37.9	2718.6	-16.1
4th harmonic (3624-3680 MHz)	54 dBuV/m	54.8	3624.6	34.8	3624.6	-19.2
5th harmonic (4530-4600 MHz)	54 dBuV/m	58.2	4561.2	38.2	4561.2	-15.8
6th harmonic (5436-5520 MHz)	54 dBuV/m	54	5437.4	34.0	5437.4	-20.0
7th harmonic (6342-6440 MHz)	20 dB down	No emissions found above the receiver's noise floor				
8th harmonic (7248-7360 MHz)	54 dBuV/m	to 10th harmonic.				
9th harmonic (8154-8280 MHz)	54 dBuV/m					
10th harmonic (9060-9200 MHz)	54 dBuV/m					

Minumum Passing Margin: -15.8 dB

Appendix B

Detailed Test Data Sheets



Radiated Electromagnetic Emissions



Test Report #:	B0060 Run 02	Test Area:	Pinewood Site 1 (3m)	
Test Method:	15.247C	Test Date:	13-Mar-2000	
EUT Model #:	FA-5230	EUT Power:	3VDC	
EUT Serial #:	1			Temperature: 22 °C
Manufacturer:	Inovonics			Relative Humidity: <18 %
EUT Description:	Battery Powered Transmitter			Air Pressure: 80 kPa
Notes:				Page: 1 of 3

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV)	POL / HGT / AZ (m) (DEG)	DELTA1 N/A	DELTA2 N/A
EUT in worst case position with meter facing up						
906.32	75.5 Pk	2.0 / 22.8 / 0.0	100.3	V / 1.2 / 126.0	N/A	N/A
912.32	75.7 Pk	2.0 / 22.8 / 0.0	100.5	V / 1.2 / 129.0	N/A	N/A
919.96	76.0 Pk	2.0 / 22.8 / 0.0	100.8	V / 1.2 / 90.0	N/A	N/A
919.96	72.2 Pk	2.0 / 22.8 / 0.0	97.0	H / 1.1 / 118.0	N/A	N/A
912.29	73.4 Pk	2.0 / 22.8 / 0.0	98.2	H / 1.0 / 119.0	N/A	N/A
906.27	74.5 Pk	2.0 / 22.8 / 0.0	99.3	H / 1.0 / 122.0	N/A	N/A
1812.58	46.7 Pk	2.8 / 27.8 / 29.4	47.9	V / 1.3 / 110.0	N/A	N/A
1824.63	46.7 Pk	2.8 / 27.8 / 29.4	48.0	V / 1.1 / 148.0	N/A	N/A
1839.87	47.3 Pk	2.8 / 27.9 / 29.4	48.6	V / 1.5 / 181.0	N/A	N/A
2736.69	51.5 Pk	3.6 / 31.7 / 29.5	57.2	V / 1.6 / 305.0	N/A	N/A
2759.93	50.1 Pk	3.6 / 31.7 / 29.6	55.9	V / 1.6 / 300.0	N/A	N/A
2718.76	52.0 Pk	3.6 / 31.6 / 29.5	57.6	V / 1.4 / 283.0	N/A	N/A
3624.84	45.6 Pk	4.1 / 33.5 / 29.7	53.5	V / 1.6 / 203.0	N/A	N/A
3649.24	45.2 Pk	4.1 / 33.6 / 29.8	53.1	V / 1.5 / 217.0	N/A	N/A
3679.84	45.7 Pk	4.1 / 33.6 / 29.9	53.6	V / 1.4 / 232.0	N/A	N/A
1812.38	47.4 Pk	2.8 / 27.8 / 29.3	48.6	H / 1.6 / 198.0	N/A	N/A
1824.41	47.5 Pk	2.8 / 27.8 / 29.4	48.7	H / 1.7 / 235.0	N/A	N/A
1839.80	46.1 Pk	2.8 / 27.9 / 29.4	47.5	H / 1.8 / 244.0	N/A	N/A
2718.61	52.3 Pk	3.6 / 31.6 / 29.5	57.9	H / 1.5 / 229.0	N/A	N/A
2736.82	51.2 Pk	3.6 / 31.7 / 29.5	56.9	H / 1.5 / 213.0	N/A	N/A

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Reviewed by: Felix J. Chavez Signature

Radiated Electromagnetic Emissions



Test Report #:	B0060 Run 02	Test Area:	Pinewood Site 1 (3m)		
Test Method:	15.247C	Test Date:	13-Mar-2000		
EUT Model #:	FA-5230	EUT Power:	3VDC		
EUT Serial #:	1			Temperature:	22 °C
Manufacturer:	Inovonics			Relative Humidity:	<18 %
EUT Description:	Battery Powered Transmitter			Air Pressure:	80 kPa
Notes:				Page:	2 of 3

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV)	POL / HGT / AZ (m) (DEG)	DELTA1 N/A	DELTA2 N/A
2759.88	51.0 Pk	3.6 / 31.7 / 29.6	56.8	H / 1.7 / 213.0	N/A	N/A
3624.63	46.9 Pk	4.1 / 33.5 / 29.7	54.8	H / 1.6 / 117.0	N/A	N/A
3649.16	45.6 Pk	4.1 / 33.6 / 29.8	53.5	H / 1.7 / 133.0	N/A	N/A
3679.39	45.4 Pk	4.1 / 33.6 / 29.9	53.2	H / 1.7 / 110.0	N/A	N/A
4531.13	60.5 Pk	4.8 / 33.4 / 40.9	57.7	H / 1.6 / 200.0	N/A	N/A
4561.15	60.9 Pk	4.8 / 33.5 / 40.9	58.2	H / 1.6 / 218.0	N/A	N/A
4599.87	57.2 Pk	4.8 / 33.7 / 41.0	54.8	H / 1.6 / 189.0	N/A	N/A
4531.16	60.6 Pk	4.8 / 33.4 / 40.9	57.8	V / 1.7 / 73.0	N/A	N/A
4561.43	59.4 Pk	4.8 / 33.5 / 40.9	56.7	V / 1.4 / 64.0	N/A	N/A
4600.27	56.9 Pk	4.8 / 33.7 / 41.0	54.4	V / 1.4 / 196.0	N/A	N/A
5437.39	52.8 Pk	5.2 / 36.8 / 40.8	54.0	V / 1.5 / 157.0	N/A	N/A
5473.73	52.1 Pk	5.2 / 36.8 / 40.7	53.5	V / 1.3 / 150.0	N/A	N/A
5520.32	50.9 Pk	5.2 / 36.9 / 40.7	52.3	V / 1.3 / 149.0	N/A	N/A
No emissions were found above the receivers noise floor from the 6th to 10th Harmonics in the Horizontal polarization.						
No emissions were found above the receivers noise floor from the 7th to 10th Harmonics in the Vertical polarization						

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Radiated Electromagnetic Emissions



Test Report #:	B0060 Run 02	Test Area:	Pinewood Site 1 (3m)	
Test Method:	15.247C	Test Date:	13-Mar-2000	
EUT Model #:	FA-5230	EUT Power:	3VDC	
EUT Serial #:	1			Temperature: 22 °C
Manufacturer:	Inovonics			Relative Humidity: <18 %
EUT Description:	Battery Powered Transmitter			Air Pressure: 80 kPa
Notes:				Page: 3 of 3

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV)	POL / HGT / AZ (m) (DEG)	DELTA1 N/A	DELTA2 N/A
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***** MEASUREMENT SUMMARY *****						
906.32	75.5 Pk	2.0 / 22.8 / 0.0	100.3	V / 1.2 / 126.0	N/A	N/A
912.32	75.7 Pk	2.0 / 22.8 / 0.0	100.5	V / 1.2 / 129.0	N/A	N/A
919.96	76.0 Pk	2.0 / 22.8 / 0.0	100.8	V / 1.2 / 90.0	N/A	N/A
1812.38	47.4 Pk	2.8 / 27.8 / 29.3	48.6	H / 1.6 / 198.0	N/A	N/A
1824.41	47.5 Pk	2.8 / 27.8 / 29.4	48.7	H / 1.7 / 235.0	N/A	N/A
1839.87	47.3 Pk	2.8 / 27.9 / 29.4	48.6	V / 1.5 / 181.0	N/A	N/A
2718.61	52.3 Pk	3.6 / 31.6 / 29.5	57.9	H / 1.5 / 229.0	N/A	N/A
2736.69	51.5 Pk	3.6 / 31.7 / 29.5	57.2	V / 1.6 / 305.0	N/A	N/A
2759.88	51.0 Pk	3.6 / 31.7 / 29.6	56.8	H / 1.7 / 213.0	N/A	N/A
3624.63	46.9 Pk	4.1 / 33.5 / 29.7	54.8	H / 1.6 / 117.0	N/A	N/A
3649.16	45.6 Pk	4.1 / 33.6 / 29.8	53.5	H / 1.7 / 133.0	N/A	N/A
3679.84	45.7 Pk	4.1 / 33.6 / 29.9	53.6	V / 1.4 / 232.0	N/A	N/A
4531.16	60.6 Pk	4.8 / 33.4 / 40.9	57.8	V / 1.7 / 73.0	N/A	N/A
4561.15	60.9 Pk	4.8 / 33.5 / 40.9	58.2	H / 1.6 / 218.0	N/A	N/A
4599.87	57.2 Pk	4.8 / 33.7 / 41.0	54.8	H / 1.6 / 189.0	N/A	N/A
5437.39	52.8 Pk	5.2 / 36.8 / 40.8	54.0	V / 1.5 / 157.0	N/A	N/A
5473.73	52.1 Pk	5.2 / 36.8 / 40.7	53.5	V / 1.3 / 150.0	N/A	N/A
5520.32	50.9 Pk	5.2 / 36.9 / 40.7	52.3	V / 1.3 / 149.0	N/A	N/A

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Radiated Electromagnetic Emissions



Test Report #:	B0060 Run 03	Test Area:	Pinewood Site 1 (3m)	
Test Method:	FCC Part 15	Test Date:	13-Mar-2000	
EUT Model #:	FA-5230	EUT Power:	3VDC	
EUT Serial #:	1	Temperature:	22	°C
Manufacturer:	Inovonics	Relative Humidity:	<18	%
EUT Description:	Battery Powered Transmitter	Air Pressure:	80	kPa
Notes:			Page:	1 of 4

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 FCC B (< 1GHz)	DELTA2 N/A
Log/Vertical						
No emissions found at 0 deg						
No emissions found at 90 deg						
No emissions found at 180 deg						
No emissions found at 270 deg						
Log/Horizontal						
No emissions found at 0 deg						
No emissions found at 90 deg						
No emissions found at 180 deg						
No emissions found at 270 deg						
The following are noise floor measurements.						
200.00	30.0 Qp	0.8 / 12.2 / 28.8	14.2	H / 1.2 / 270.0	-29.3	N/A
300.00	29.8 Qp	1.0 / 13.7 / 29.4	15.1	H / 1.2 / 270.0	-30.9	N/A
400.00	29.8 Qp	1.2 / 16.9 / 29.8	18.1	H / 1.2 / 270.0	-27.9	N/A
500.00	29.8 Qp	1.3 / 17.5 / 29.8	18.8	H / 1.2 / 270.0	-27.2	N/A
700.00	29.6 Qp	1.6 / 20.8 / 29.8	22.2	H / 1.2 / 270.0	-23.8	N/A
800.00	29.3 Qp	1.8 / 21.9 / 29.6	23.4	H / 1.2 / 270.0	-22.6	N/A

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Radiated Electromagnetic Emissions



Test Report #:	B0060 Run 03	Test Area:	Pinewood Site 1 (3m)	
Test Method:	FCC Part 15	Test Date:	13-Mar-2000	
EUT Model #:	FA-5230	EUT Power:	3VDC	
EUT Serial #:	1	Temperature:	22	°C
Manufacturer:	Inovonics	Relative Humidity:	<18	%
EUT Description:	Battery Powered Transmitter	Air Pressure:	80	kPa
Notes:			Page:	2 of 4

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 FCC B (< 1GHz)	DELTA2 N/A
Bicon/Vertical						
No emissions were found at 0 deg						
No emissions were found at 90 deg						
No emissions were found at 180 deg						
No emissions were found at 270 deg						
Bicon/Horizontal						
No emissions were found at 0 deg						
No emissions were found at 90 deg						
No emissions were found at 180 deg						
No emissions were found at 270 deg						
The following are noise floor measurements.						
41.00	33.0 Qp	0.4 / 12.0 / 28.8	16.6	H / 1.2 / 270.0	-23.4	N/A
51.00	33.0 Qp	0.5 / 10.7 / 28.8	15.3	H / 1.2 / 270.0	-24.7	N/A
61.00	32.0 Qp	0.5 / 9.3 / 28.7	13.2	H / 1.2 / 270.0	-26.8	N/A
81.00	31.2 Qp	0.5 / 7.9 / 28.7	10.8	H / 1.2 / 270.0	-29.2	N/A
140.00	29.9 Qp	0.7 / 12.0 / 28.9	13.8	H / 1.2 / 270.0	-29.7	N/A

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Radiated Electromagnetic Emissions



Test Report #: **B0060 Run 03** Test Area: Pinewood Site 1 (3m)
Test Method: FCC Part 15 Test Date: 13-Mar-2000
EUT Model #: FA-5230 EUT Power: 3VDC
EUT Serial #: 1 Temperature: 22 °C
Manufacturer: Inovonics Relative Humidity: <18 %
EUT Description: Battery Powered Transmitter Air Pressure: 80 kPa
Notes: Page: 3 of 4

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 FCC B (< 1GHz)	DELTA2 N/A
190.00	30.0 Qp	0.8 / 13.2 / 28.8	15.2	H / 1.2 / 270.0	-28.3	N/A

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Radiated Electromagnetic Emissions



Test Report #:	B0060 Run 03	Test Area:	Pinewood Site 1 (3m)	
Test Method:	FCC Part 15	Test Date:	13-Mar-2000	
EUT Model #:	FA-5230	EUT Power:	3VDC	
EUT Serial #:	1			Temperature: 22 °C
Manufacturer:	Inovonics			Relative Humidity: <18 %
EUT Description:	Battery Powered Transmitter			Air Pressure: 80 kPa
Notes:				Page: 4 of 4

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 FCC B (< 1GHz)	DELTA2 N/A
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***** MEASUREMENT SUMMARY *****						
800.00	29.3 Qp	1.8 / 21.9 / 29.6	23.4	H / 1.2 / 270.0	-22.6	N/A
41.00	33.0 Qp	0.4 / 12.0 / 28.8	16.6	H / 1.2 / 270.0	-23.4	N/A
700.00	29.6 Qp	1.6 / 20.8 / 29.8	22.2	H / 1.2 / 270.0	-23.8	N/A
51.00	33.0 Qp	0.5 / 10.7 / 28.8	15.3	H / 1.2 / 270.0	-24.7	N/A
61.00	32.0 Qp	0.5 / 9.3 / 28.7	13.2	H / 1.2 / 270.0	-26.8	N/A
500.00	29.8 Qp	1.3 / 17.5 / 29.8	18.8	H / 1.2 / 270.0	-27.2	N/A
400.00	29.8 Qp	1.2 / 16.9 / 29.8	18.1	H / 1.2 / 270.0	-27.9	N/A
190.00	30.0 Qp	0.8 / 13.2 / 28.8	15.2	H / 1.2 / 270.0	-28.3	N/A
81.00	31.2 Qp	0.5 / 7.9 / 28.7	10.8	H / 1.2 / 270.0	-29.2	N/A
200.00	30.0 Qp	0.8 / 12.2 / 28.8	14.2	H / 1.2 / 270.0	-29.3	N/A
140.00	29.9 Qp	0.7 / 12.0 / 28.9	13.8	H / 1.2 / 270.0	-29.7	N/A
300.00	29.8 Qp	1.0 / 13.7 / 29.4	15.1	H / 1.2 / 270.0	-30.9	N/A

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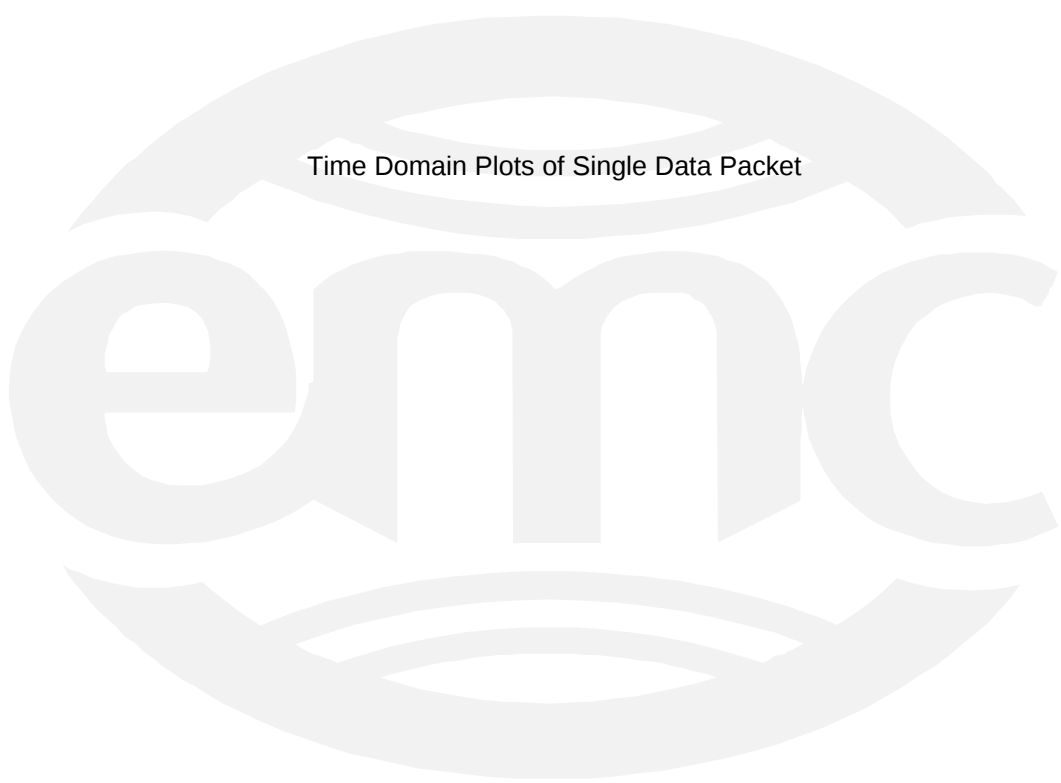
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Appendix C

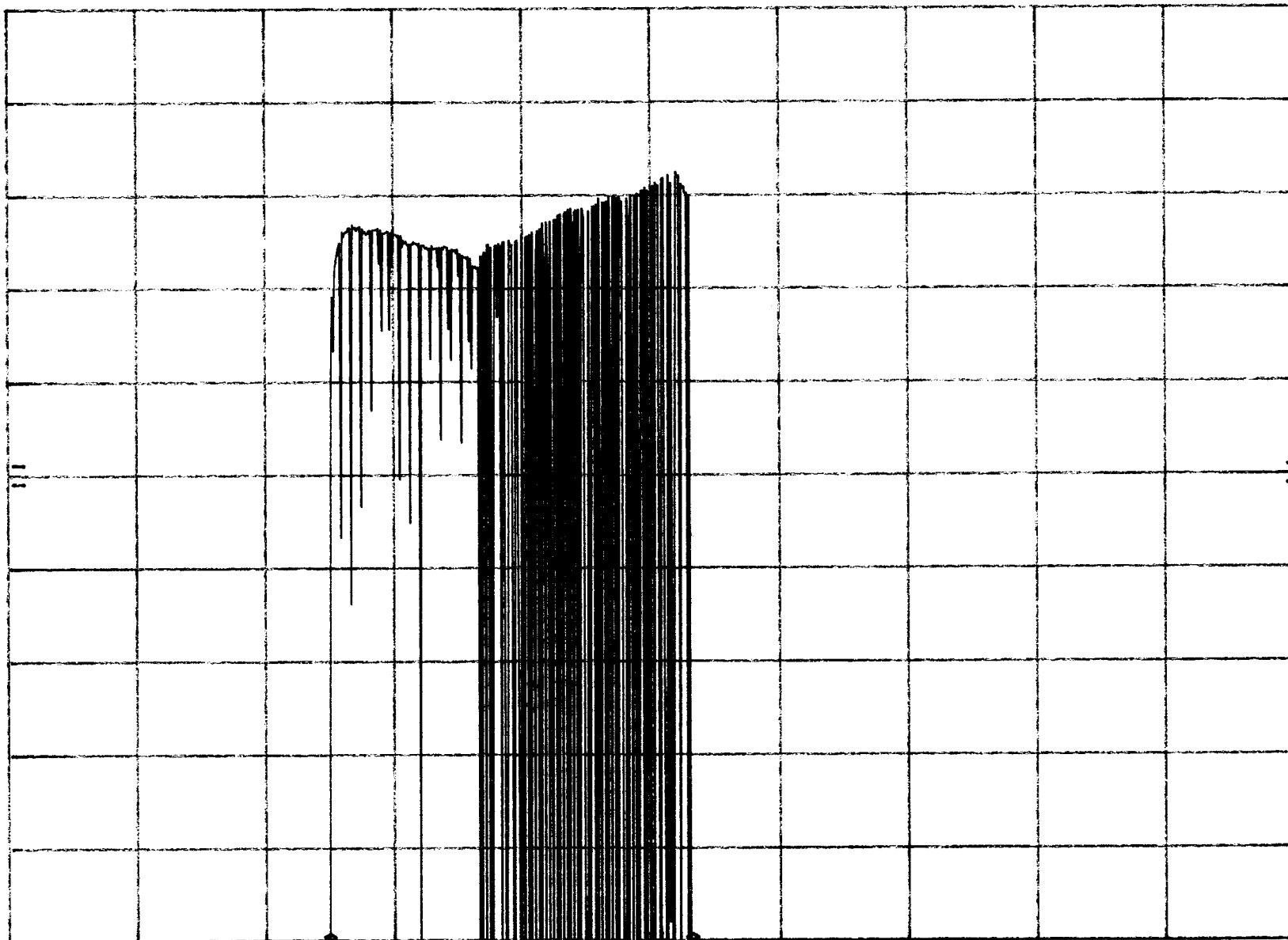
Time Domain Plots of Single Data Packet



INOVONICS B0060 ABB TRANSMITTER
REF -35.0 dBm ATTEN 0 dB

MKR Δ 28.20 msec
.00 dB

hp
5 dB/



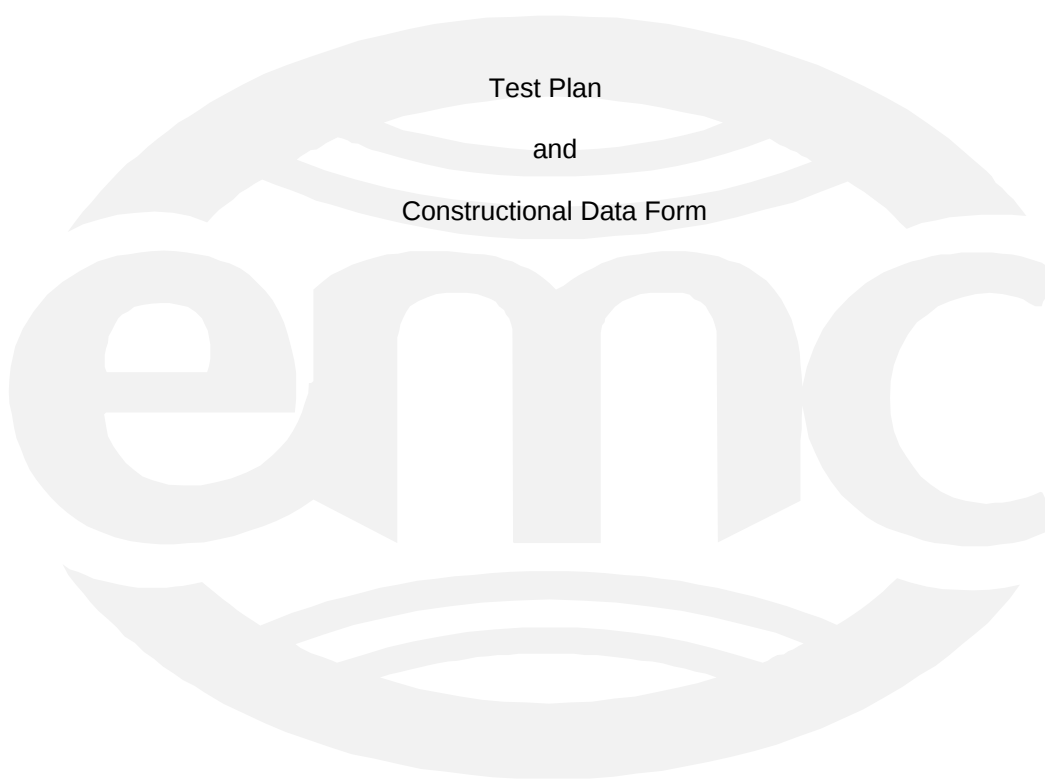
CENTER 911.6640 MHz
RES BW 30 KHz

VBW 30 KHz

SPAN 0 Hz
SWP 100 msec

Appendix D

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: Inovonics Corporation

Address: 2100 Central Avenue
Boulder, Colorado
80301

Contact: Lindy Beane Position: Documentation controller

Phone: 303-939-9336 ex113 Fax: 303-939-8977

E-mail Address: lindy@inovonics.com

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

EUT Description Battery Powered Transmitter

EUT Name HCQ3B6ABB

Model No.: FA5230 Serial No.: 1

Product Options: N/A

Configurations to be tested: Transmit

Test Objective

- | | |
|--|--|
| ☐ EMC Directive 89/336/EEC (EMC) | ☒ FCC: Class ☐ A ☒ B Part <u>15</u> |
| Std: _____ | ☐ VCCI: Class ☐ A ☐ B |
| ☐ Machinery Directive 89/392/EEC (EMC) | ☐ BCIQ: Class ☐ A ☐ B |
| Std: _____ | ☐ Canada: Class ☐ A ☐ B |
| ☐ Medical Device Directive 93/42/EEC (EMC) | ☐ Australia: Class ☐ A ☐ B |
| Std: _____ | ☒ Other: <u>FCC Part 15.247C</u> |
| ☐ Vehicle Directive 72/245/EEC (EMC) | |
| Std: _____ | |
| ☐ FDA Reviewers Guidance for Premarket Notification Submissions (EMC) | |

TÜV Product Service Certification Requested

- | | |
|--|---|
| ☐ Attestation of Conformity (AoC) | ☐ International EMC Mark (IEM) |
| ☐ Certificate of Conformity (CoC) | ☐ Compliance Document |
| Protection Class (N/A for vehicles) | ☐ Class I ☐ Class II ☐ 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

EMC Test Plan and Constructional Data Form**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 RequirementsLength: 2.9" Width: 2.4" Height: .8" Weight: .6 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: 3V Battery (If battery powered, make sure battery life is sufficient to complete testing.)

of Phases: _____

Current (Amps/phase(max)): _____ Current (Amps/phase(nominal)): _____

Other _____

Other Special Requirements

N/A

Typical Installation and/or Operating Environment(ie. Hospital, Small Business, Industrial/Factory, etc.)
Small business**EUT Power Cable**

- ☐ Permanent OR ☐ Removable Length (in meters): _____
- ☐ Shielded OR ☐ Unshielded
- ☒ Not Applicable

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EUT Interface Ports and Cables												
Interface			Shielding									
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable	Permanent
EXAMPLE:												
RS232	☐	☒	2	☒	☐	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	☒	☐
N/A	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐

EMC Test Plan and Constructional Data Form**EUT Software.**

Revision Level: PMTV131

Description: N/A

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. Hopping mode- low, medium, high
- 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 #

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**Support Equipment** -- 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>
N/A			

Oscillator Frequencies

<i>Frequency</i>	<i>Derived Frequency</i>	<i>Component # / Location</i>	<i>Description of Use</i>
2MHz		Y1 on PCB	

Power Supply

<i>Manufacturer</i>	<i>Model #</i>	<i>Serial #</i>	<i>Type</i>
N/A			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters

<i>Manufacturer</i>	<i>Model #</i>	<i>Location in EUT</i>
N/A		

Form

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Critical EMI Components (Capacitors, ferrites, etc.)

Description	Manufacturer	Part # or Value	Qty	Component # / Location
N/A				

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

(PLEASE INSERT "ELECTRONIC SIGNATURE" BELOW IF POSSIBLE)

Authorization Signatures

Customer authorization to perform tests
according to this test plan.

Date

Test Plan/CDF Prepared By (please print)

Shawn Singh

Date

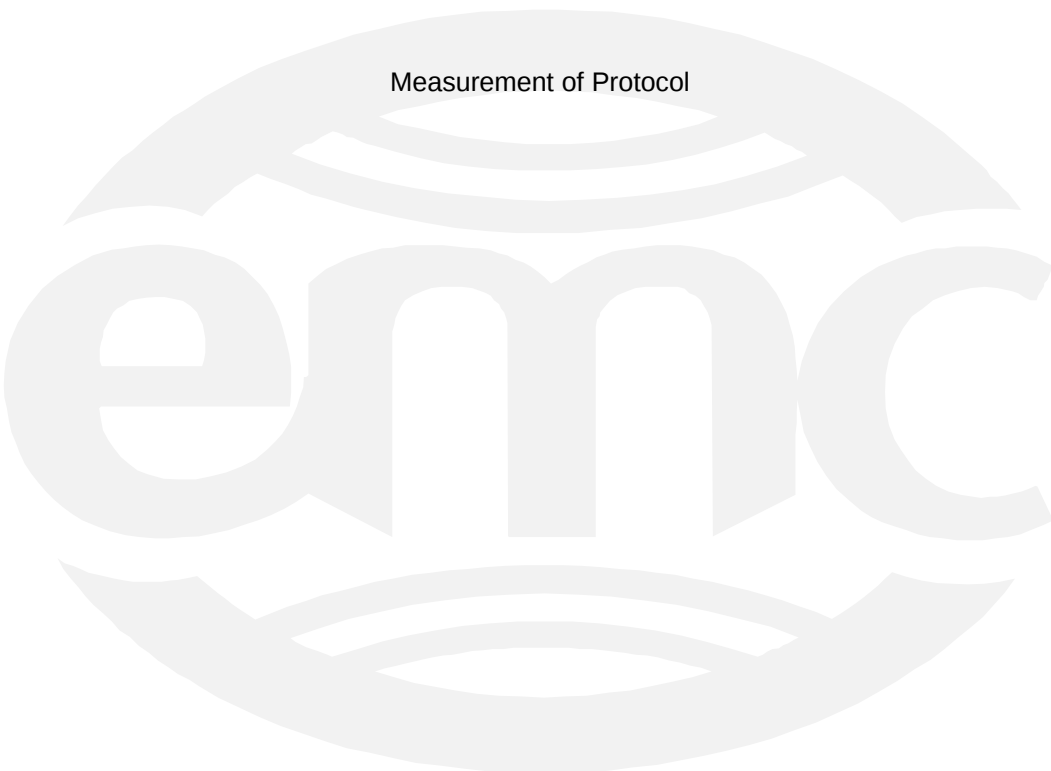
03/29/2000

Reviewed by TÜV Product Service Associate

Date

Appendix E

Measurement of Protocol



MEASUREMENT PROTOCOL FOR FCC

GENERAL INFORMATION

Measurement Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. These test systems have a measurement uncertainty of ± 4.5 dB. The equipment comprising the test systems are calibrated on an annual basis.

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 μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit.

To convert between dB μ V and μ 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 μ V/m, is arrived at by taking the reading from the spectrum analyzer (Level dB μ V) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has the FCC 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:

Frequency (MHz)	Level (dB μ V)	+	Factor & Cable (dB)	=	Final (dB μ V/m)	-	FCC B Limit (dB μ V/m)	=	Delta FCC B (dB)
32.21	13.9	+	16.3	=	30.2	-	40.0	=	-9.8

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 60 Hz power interface of the EUT are measured in the frequency range of 450 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 Ω /50 μ 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 9200 MHz 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. Average field strength levels were computed from peak readings and duty cycle of the transmitter. 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 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. Intentional radiators are rotated through three orthogonal axes to determine the attitude that maximizes the emissions.