

 **IAL** | INTERNATIONAL APPROVALS
LABORATORIES
EMC EMISSIONS - TEST REPORT (In Part)

Test Report No. **BC205957** Issue Date: **Tue 04/Mar/2003**

Model / Serial No. **FA7236SO / SN: 02**

Product Type **Radio Transmitter**

Client **Inovonics Wireless Corporation**

Manufacturer **Inovonics Wireless Corporation**

License holder **Inovonics Wireless Corporation**

Address **315 CTC Boulevard**
Louisville, CO 80027

Test Criteria Applied **FCC CFR47 Part 15.247**

Test Result **PASS**

Test Project Number **BC205957** Title 47 CFR 15: RADIO FREQUENCY DEVICES (Frequency Hopping Devices)

References **25**

Total Pages Including Appendices:

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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: 26-Nov-2002

Testing Start Date: 26-Nov-2002

Testing End Date: 26-Nov-2003

The tests were performed according to following regulations :

1. FCC CFR47 Part 15.247 (In Part)

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) - 15.209

Test Result

Minimum limit margin -10.9 dB at 8216.16MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

GENERAL REMARKS:

Testing was performed in accordance to Public Notice DA 00-705: Released March 30, 2000.

Modifications required to pass:

Test Specification Deviations: Additions to or Exclusions from:

Test-setup photo(s):
Radiated Emissions



Test-setup photo(s):
Radiated Emissions



Appendix A

Test Data Sheets
and
Test Equipment Used

Radiated Electromagnetic Emissions

Test Report #: **BC205957 Run 1** Test Area: Pinewood Site 1 (3m)
 Test Method: FCC CFR47 Part 15.247 Test Date: 26-Nov-2002
 EUT Model #: FA7236SO EUT Power: 12 VDC
 EUT Serial #: 02
 Manufacturer: Inovonics
 EUT Description: RF Transmitter
 Notes: FCC CFR47 Part 15.205

Temperature: 24.8 °C
 Relative Humidity: <26 %
 Air Pressure: 80 kPa
 Page: 1 of 4

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

(MHz)	(dBuV)	CABLE / ANT / PREAMP			FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB)	DELTA2 (dB)
		(dB)	(dB/m)	(dB)			FCC B (< 1GHz)	N/A
912.91	98.1 Qp	5.6 / 22.9 / 26.8			99.8	V / 1.0 / 0.0	53.8 *	N/A
912.91 MHz is the fundamental transmit frequency and was deleted from the summary.								
No other emissions found 0 Deg, vertical								
No other emissions found: 90 Deg, vertical								
No other emissions found: 180 Deg, vertical								
No other emissions found: 270 Deg, vertical								
No emissions found: 200 - 1000 MHz, vertical								
The following are noise floor readings.								
200.00	32.5 Qp	10.7 / 11.4 / 28.2			26.4	V / 1.0 / 270.0	-17.1	N/A
300.00	31.8 Qp	4.5 / 13.8 / 28.1			21.9	V / 1.0 / 270.0	-24.1	N/A
400.00	31.7 Qp	4.9 / 15.0 / 27.9			23.7	V / 1.0 / 270.0	-22.3	N/A
500.00	31.7 Qp	4.9 / 18.4 / 27.8			27.2	V / 1.0 / 270.0	-18.8	N/A
800.00	31.7 Qp	5.2 / 21.2 / 27.6			30.4	V / 1.0 / 270.0	-15.6	N/A
1000.00	31.5 Qp	6.0 / 24.0 / 26.4			35.0	V / 1.0 / 270.0	-19.0	N/A
912.89	85.9 Qp	5.6 / 22.9 / 26.8			87.6	H / 2.0 / 0.0	41.6 *	N/A
912.89 MHz is the fundamental transmit frequency and was deleted from the summary.								

Radiated Electromagnetic Emissions

Test Report #: **BC205957 Run 1**
 Test Method: FCC CFR47 Part 15.247
 EUT Model #: FA7236SO
 EUT Serial #: 02
 Manufacturer: Inovonics
 EUT Description: RF Transmitter
 Notes: FCC CFR47 Part 15.205

Test Area: Pinewood Site 1 (3m)
 Test Date: 26-Nov-2002
 EUT Power: 12 VDC

Temperature: 24.8 °C
 Relative Humidity: <26 %
 Air Pressure: 80 kPa
 Page: 2 of 4

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) N/A
No other 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: 30 - 200 MHz, vertical						
No emissions found: 0 Deg, horizontal						
No emissions found: 90 Deg, horizontal						

Radiated Electromagnetic Emissions

Test Report #: BC205957 Run 1	Test Area: Pinewood Site 1 (3m)	Temperature: 24.8 °C
Test Method: FCC CFR47 Part 15.247	Test Date: 26-Nov-2002	Relative Humidity: <26 %
EUT Model #: FA7236SO	EUT Power: 12 VDC	Air Pressure: 80 kPa
EUT Serial #: 02		Page: 3 of 4
Manufacturer: Inovonics		
EUT Description: RF Transmitter		
Notes: FCC CFR47 Part 15.205		

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

		CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV/m)	(m) (DEG)	FCC B (< 1GHz)	N/A
No emissions found: 180 Deg, horizontal						
No emissions found: 270 Deg, horizontal						
No emissions found: 30 - 200 MHz, horizontal, nothing maximized						
The following are noise floor reading between 30 and 200 MHz						
30.66	20.3 Qp	1.0 / 13.6 / 22.4	12.5	H / 2.0 / 270.0	-27.5	N/A
43.30	23.9 Qp	6.6 / 12.0 / 22.4	20.2	H / 2.0 / 270.0	-19.8	N/A
111.22	22.0 Qp	8.2 / 10.7 / 23.1	17.9	H / 2.0 / 270.0	-25.6	N/A
196.96	21.9 Qp	10.7 / 13.6 / 28.0	18.3	H / 2.0 / 270.0	-25.2	N/A
200.02	21.2 Qp	10.7 / 13.7 / 28.1	17.4	H / 2.0 / 270.0	-26.1	N/A

Radiated Electromagnetic Emissions

Test Report #: **BC205957 Run 1** Test Area: Pinewood Site 1 (3m)
 Test Method: FCC CFR47 Part 15.247 Test Date: 26-Nov-2002
 EUT Model #: FA7236SO EUT Power: 12 VDC
 EUT Serial #: 02
 Manufacturer: Inovonics
 EUT Description: RF Transmitter
 Notes: FCC CFR47 Part 15.205

Temperature: 24.8 °C
 Relative Humidity: <26 %
 Air Pressure: 80 kPa
 Page: 4 of 4

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

		CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV/m)	(m) (DEG)	FCC B (< 1GHz)	N/A
***** Measurement Summary *****						
800.00	31.7 Qp	5.2 / 21.2 / 27.6	30.4	V / 1.0 / 270.0	-15.6	N/A
200.00	32.5 Qp	10.7 / 11.4 / 28.2	26.4	V / 1.0 / 270.0	-17.1	N/A
500.00	31.7 Qp	4.9 / 18.4 / 27.8	27.2	V / 1.0 / 270.0	-18.8	N/A
1000.00	31.5 Qp	6.0 / 24.0 / 26.4	35.0	V / 1.0 / 270.0	-19.0	N/A
43.30	23.9 Qp	6.6 / 12.0 / 22.4	20.2	H / 2.0 / 270.0	-19.8	N/A
400.00	31.7 Qp	4.9 / 15.0 / 27.9	23.7	V / 1.0 / 270.0	-22.3	N/A
300.00	31.8 Qp	4.5 / 13.8 / 28.1	21.9	V / 1.0 / 270.0	-24.1	N/A
196.96	21.9 Qp	10.7 / 13.6 / 28.0	18.3	H / 2.0 / 270.0	-25.2	N/A
111.22	22.0 Qp	8.2 / 10.7 / 23.1	17.9	H / 2.0 / 270.0	-25.6	N/A
30.66	20.3 Qp	1.0 / 13.6 / 22.4	12.5	H / 2.0 / 270.0	-27.5	N/A

Radiated Electromagnetic Emissions

Test Report #: **BC205957 Run 2** Test Area: Pinewood Site 1 (3m)
 Test Method: FCC CFR47 Part 15.247 Test Date: 26-Nov-2002
 EUT Model #: FA7236SO EUT Power: 12 VDC
 EUT Serial #: 02
 Manufacturer: Inovonics
 EUT Description: RF Transmitter
 Notes: FCC CFR47 Part 15.205

Temperature: 24.8 °C
 Relative Humidity: <26 %
 Air Pressure: 80 kPa
 Page: 1 of 4

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

(MHz)	(dBuV)	CABLE / ANT / PREAMP			FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
		(dB)	(dB/m)	(dB)	(dBuV/m)	(m) (DEG)	FCC B (> 1GHz)	N/A
1031.07	37.6 Av	2.3	25.9	36.3	29.5	V / 1.0 / 0.0	-24.5	N/A
1097.38	37.6 Av	2.4	26.1	37.2	28.9	V / 1.0 / 0.0	-25.1	N/A
1825.92	40.3 Av	3.4	28.4	37.4	34.6	V / 1.0 / 0.0	-19.4	N/A
2270.12	37.8 Av	4.0	30.0	36.9	34.8	V / 1.0 / 0.0	-19.2	N/A
2326.19	38.4 Av	4.0	30.1	36.9	35.6	V / 1.0 / 0.0	-18.4	N/A
2758.09	39.5 Av	4.0	31.1	36.8	37.7	V / 1.0 / 0.0	-16.3	N/A
1097.38	37.5 Av	2.4	26.1	37.2	28.7	V / 1.0 / 90.0	-25.3	N/A
3627.24	37.7 Av	4.5	33.2	38.1	37.3	V / 1.0 / 90.0	-16.7	N/A
No higher emissions found: 180 Deg, vertical								
No higher emissions found: 270 Deg, vertical								
No emissions found within 15 dB of the limit, nothing maximized								
1 - 4 GHz, vertical								
No higher emissions found: 0 Deg, horizontal								
No higher emissions found: 90 Deg, horizontal								
No higher emissions found: 180 Deg, horizontal								
No higher emissions found: 270 Deg, horizontal								

Radiated Electromagnetic Emissions

Test Report #: **BC205957 Run 2** Test Area: Pinewood Site 1 (3m)
 Test Method: FCC CFR47 Part 15.247 Test Date: 26-Nov-2002
 EUT Model #: FA7236SO EUT Power: 12 VDC
 EUT Serial #: 02
 Manufacturer: Inovonics
 EUT Description: RF Transmitter
 Notes: FCC CFR47 Part 15.205

Temperature: 24.8 °C
 Relative Humidity: <26 %
 Air Pressure: 80 kPa
 Page: 2 of 4

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

(MHz)	(dBuV)	CABLE / ANT / PREAMP			FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
		(dB)	(dB/m)	(dB)	(dBuV/m)	(m) (DEG)	FCC B (> 1GHz)	N/A
No emissions found within 15 dB of the limit, 1 - 4 GHz, nothing maximized								
4534.19	37.1 Av	5.5 / 33.6 / 40.7			35.5	V / 1.0 / 0.0	-18.5	N/A
4564.61	37.1 Av	5.5 / 33.7 / 40.7			35.7	V / 1.0 / 0.0	-18.3	N/A
5477.70	36.1 Av	6.5 / 35.9 / 40.1			38.3	V / 1.0 / 0.0	-15.7	N/A
No higher emissions found: 90 Deg, vertical								
No higher emissions found: 180 Deg, vertical								
No higher emissions found: 270 Deg, vertical								
No emissions found within 15 dB of the limit, nothing maximized 4 - 8 GHz, vertical								
No higher emissions found: 0 Deg, horizontal								
No higher emissions found: 90 Deg, horizontal								
No higher emissions found: 180 Deg, horizontal								
No higher emissions found: 270 Deg, horizontal								
No emissions found within 15 dB of the limit, 4 - 8 GHz, nothing maximized								

Radiated Electromagnetic Emissions

Test Report #: **BC205957 Run 2** Test Area: Pinewood Site 1 (3m)
 Test Method: FCC CFR47 Part 15.247 Test Date: 26-Nov-2002
 EUT Model #: FA7236SO EUT Power: 12 VDC
 EUT Serial #: 02
 Manufacturer: Inovonics
 EUT Description: RF Transmitter
 Notes: FCC CFR47 Part 15.205

Temperature: 24.8 °C
 Relative Humidity: <26 %
 Air Pressure: 80 kPa
 Page: 3 of 4

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

(MHz)	(dBuV)	CABLE / ANT / PREAMP			FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
		(dB)	(dB/m)	(dB)	(dBuV/m)	(m) (DEG)	FCC B (> 1GHz)	N/A
8216.16	45.0 Av	8.7	37.8	48.4	43.1	V / 1.0 / 0.0	-10.9	N/A
9129.10	44.6 Av	8.3	39.6	50.0	42.5	V / 1.0 / 0.0	-11.5	N/A
8216.16 and 9129.1 MHz are harmonics of the fundamental								
No higher emissions found: 90 Deg, vertical								
No higher emissions found: 180 Deg, vertical								
No higher emissions found: 270 Deg, vertical								
No emissions found 8 - 10 GHz, vertical except the harmonics								
Nothing maximized								
No other emissions found 8 - 10 GHz, horizontal								
Rotated table 360 Deg.								

Radiated Electromagnetic Emissions

Test Report #: **BC205957 Run 2** Test Area: Pinewood Site 1 (3m)
 Test Method: FCC CFR47 Part 15.247 Test Date: 26-Nov-2002
 EUT Model #: FA7236SO EUT Power: 12 VDC
 EUT Serial #: 02
 Manufacturer: Inovonics
 EUT Description: RF Transmitter
 Notes: FCC CFR47 Part 15.205

Temperature: 24.8 °C
 Relative Humidity: <26 %
 Air Pressure: 80 kPa
 Page: 4 of 4

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

		CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV/m)	(m) (DEG)	FCC B (> 1GHz)	N/A
***** Measurement Summary *****						
8216.16	45.0 Av	8.7 / 37.8 / 48.4	43.1	V / 1.0 / 0.0	-10.9	N/A
9129.10	44.6 Av	8.3 / 39.6 / 50.0	42.5	V / 1.0 / 0.0	-11.5	N/A
5477.70	36.1 Av	6.5 / 35.9 / 40.1	38.3	V / 1.0 / 0.0	-15.7	N/A
2758.09	39.5 Av	4.0 / 31.1 / 36.8	37.7	V / 1.0 / 0.0	-16.3	N/A
3627.24	37.7 Av	4.5 / 33.2 / 38.1	37.3	V / 1.0 / 90.0	-16.7	N/A
4564.61	37.1 Av	5.5 / 33.7 / 40.7	35.7	V / 1.0 / 0.0	-18.3	N/A
2326.19	38.4 Av	4.0 / 30.1 / 36.9	35.6	V / 1.0 / 0.0	-18.4	N/A
4534.19	37.1 Av	5.5 / 33.6 / 40.7	35.5	V / 1.0 / 0.0	-18.5	N/A
2270.12	37.8 Av	4.0 / 30.0 / 36.9	34.8	V / 1.0 / 0.0	-19.2	N/A
1825.92	40.3 Av	3.4 / 28.4 / 37.4	34.6	V / 1.0 / 0.0	-19.4	N/A
1031.07	37.6 Av	2.3 / 25.9 / 36.3	29.5	V / 1.0 / 0.0	-24.5	N/A
1097.38	37.6 Av	2.4 / 26.1 / 37.2	28.9	V / 1.0 / 0.0	-25.1	N/A

Radiated Electromagnetic Emissions

Test Report #: **BC205957 Run 3**
 Test Method: **FCC CFR47 Part 15.247**
 EUT Model #: **FA7236SO**
 EUT Serial #: **02**
 Manufacturer: **Inovonics**
 EUT Description: **RF Transmitter**
 Notes: **Spurious Radiated Emissions**

Test Area: **Pinewood Site 1 (3m)**
 Test Date: **26-Nov-2002**
 EUT Power: **12 VDC**

Temperature: **24.8 °C**
 Relative Humidity: **<26 %**
 Air Pressure: **80 kPa**

Page: 1 of 4

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)	Corrected Duty Cycle CF	DELTA1 (dB) Margin from 15.209
Low frequency						
1813.62	83.4 Pk	3.3 / 28.3 / 37.6	77.4	V / 1.0 / 0.0	53.3176003	N/A
2720.50	68.4 Pk	4.1 / 31.0 / 36.8	66.6	V / 1.0 / 0.0	42.5176003	-11.4623997
3626.95	59.8 Pk	4.5 / 33.2 / 38.1	59.4	V / 1.0 / 0.0	35.3176003	-18.6623997
Mid frequency						
1825.82	78.8 Pk	3.4 / 28.4 / 37.4	73.1	V / 1.0 / 0.0	49.0176003	N/A
2738.73	66.8 Pk	4.0 / 31.0 / 36.8	65.0	V / 1.0 / 0.0	40.9176003	-13.0623997
3651.72	58.9 Pk	4.5 / 33.3 / 38.0	58.7	V / 1.0 / 0.0	34.6176003	-19.3623997
High frequency						
1838.65	77.5 Pk	3.4 / 28.5 / 37.2	72.2	V / 1.0 / 0.0	48.1176003	N/A
2758.19	66.5 Pk	4.0 / 31.1 / 36.8	64.8	V / 1.0 / 0.0	40.7176003	-13.2623997
3677.49	53.1 Pk	4.6 / 33.4 / 38.0	53.1	V / 1.0 / 0.0	29.0176003	-24.9623997
Low frequency						
4534.16	56.5 Pk	5.5 / 33.6 / 40.7	54.9	V / 1.0 / 0.0	30.8176003	-23.1623997
5440.93	67.5 Pk	6.4 / 35.8 / 40.1	69.7	V / 1.0 / 0.0	45.6176003	-8.36239965
6346.82	49.4 Pk	7.4 / 36.5 / 40.6	52.6	V / 1.0 / 0.0	28.5176003	-25.4623997
7254.40	53.1 Pk	8.4 / 37.5 / 40.5	58.5	V / 1.0 / 0.0	34.4176003	-19.5623997
Mid frequency						
4564.80	57.3 Pk	5.5 / 33.7 / 40.7	55.9	V / 1.0 / 0.0	31.8176003	-22.1623997
5478.69	66.1 Pk	6.5 / 35.9 / 40.1	68.3	V / 1.0 / 0.0	44.2176003	-9.76239965
6390.55	46.9 Pk	7.5 / 36.4 / 40.5	50.3	V / 1.0 / 0.0	26.2176003	-27.7623997

Radiated Electromagnetic Emissions

Test Report #: **BC205957 Run 3**
 Test Method: **FCC CFR47 Part 15.247**
 EUT Model #: **FA7236SO**
 EUT Serial #: **02**
 Manufacturer: **Inovonics**
 EUT Description: **RF Transmitter**
 Notes: **Spurious Radiated Emissions**

Test Area: **Pinewood Site 1 (3m)**
 Test Date: **26-Nov-2002**
 EUT Power: **12 VDC**

Temperature: **24.8 °C**
 Relative Humidity: **<26 %**
 Air Pressure: **80 kPa**
 Page: **2 of 4**

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

(MHz)	(dBuV)	CABLE / ANT / PREAMP (dB) (dB/m) (dB)	FINAL (dBuV)	POL / HGT / AZ (m) (DEG)	Corrected Duty Cycle CF	DELTA1 (dB) Margin from 15.209
7303.75	56.0 Pk	8.5 / 37.6 / 40.7	61.3	V / 1.0 / 0.0	37.2176003	-16.7623997
High frequency						
4597.20	58.4 Pk	5.6 / 33.8 / 40.6	57.1	V / 1.0 / 0.0	33.0176003	-20.9623997
5516.06	68.0 Pk	6.5 / 35.9 / 40.1	70.3	V / 1.0 / 0.0	46.2176003	-7.76239965
6435.41	39.4 Pk	7.5 / 36.4 / 40.4	42.9	V / 1.0 / 0.0	18.8176003	-35.1623997
7355.86	56.6 Pk	8.5 / 37.7 / 41.0	61.9	V / 1.0 / 0.0	37.8176003	-16.1623997
Low frequency						
8160.81	52.8 Pk	8.8 / 37.7 / 48.4	50.8	V / 1.0 / 0.0	26.7176003	-27.2623997
9068.70	51.2 Pk	8.3 / 39.7 / 50.2	49.1	V / 1.0 / 0.0	25.0176003	-28.9623997
Mid frequency						
8216.59	56.4 Pk	8.7 / 37.8 / 48.4	54.5	V / 1.0 / 0.0	30.4176003	-23.5623997
9129.56	49.1 Pk	8.3 / 39.6 / 50.0	46.9	V / 1.0 / 0.0	22.8176003	-31.1623997
High frequency						
8274.91	61.5 Pk	8.7 / 37.9 / 48.5	59.6	V / 1.0 / 0.0	35.5176003	-18.4623997
9193.71	50.8 Pk	8.2 / 39.5 / 49.9	48.6	V / 1.0 / 0.0	24.5176003	-29.4623997
9194.62	58.2 Pk	8.2 / 39.5 / 49.9	56.1	H / 1.0 / 0.0	32.0176003	-21.9623997
8274.68	68.3 Pk	8.7 / 37.9 / 48.5	66.4	H / 1.0 / 0.0	42.3176003	-11.6623997
Mid frequency						
9129.57	60.3 Pk	8.3 / 39.6 / 50.0	58.1	H / 1.0 / 0.0	34.0176003	-19.9623997
8216.59	68.7 Pk	8.7 / 37.8 / 48.4	66.8	H / 1.0 / 0.0	42.7176003	-11.2623997

Radiated Electromagnetic Emissions

Test Report #: BC205957 Run 3	Test Area: Pinewood Site 1 (3m)	Temperature: 24.8 °C
Test Method: FCC CFR47 Part 15.247	Test Date: 26-Nov-2002	Relative Humidity: <26 %
EUT Model #: FA7236SO	EUT Power: 12 VDC	Air Pressure: 80 kPa
EUT Serial #: 02		Page: 3 of 4
Manufacturer: Inovonics		
EUT Description: RF Transmitter		
Notes: Spurious Radiated Emissions		

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)	Corrected Duty Cycle CF	DELTA1 (dB) Margin from 15.209
Low frequency						
9068.53	60.5 Pk	8.3 / 39.7 / 50.2	58.3	H / 1.0 / 0.0	34.2176003	-19.7623997
8161.19	68.1 Pk	8.8 / 37.7 / 48.4	66.2	H / 1.0 / 0.0	42.1176003	-11.8623997
Mid frequency						
7254.62	65.1 Pk	8.4 / 37.5 / 40.5	70.5	H / 1.0 / 0.0	46.4176003	-7.56239965
6348.13	60.1 Pk	7.4 / 36.5 / 40.6	63.3	H / 1.0 / 0.0	39.2176003	-14.7623997
5440.32	61.5 Pk	6.4 / 35.8 / 40.1	63.7	H / 1.0 / 0.0	39.6176003	-14.3623997
4534.04	68.9 Pk	5.5 / 33.6 / 40.7	67.2	H / 1.0 / 0.0	43.1176003	-10.8623997
High frequency						
7303.79	64.5 Pk	8.5 / 37.6 / 40.7	69.8	H / 1.0 / 0.0	45.7176003	-8.26239965
6390.90	61.0 Pk	7.5 / 36.4 / 40.5	64.4	H / 1.0 / 0.0	40.3176003	-13.6623997
5477.80	64.0 Pk	6.5 / 35.9 / 40.1	66.2	H / 1.0 / 0.0	42.1176003	-11.8623997
4564.93	70.2 Pk	5.5 / 33.7 / 40.7	68.8	H / 1.0 / 0.0	44.7176003	-9.26239965
High frequency						
7355.44	63.9 Pk	8.5 / 37.7 / 41.0	69.1	H / 1.0 / 0.0	45.0176003	-8.96239965
6435.60	63.0 Pk	7.5 / 36.4 / 40.4	66.5	H / 1.0 / 0.0	42.4176003	-11.5623997
5516.31	64.8 Pk	6.5 / 35.9 / 40.1	67.1	H / 1.0 / 0.0	43.0176003	-10.9623997
4596.86	71.7 Pk	5.6 / 33.8 / 40.6	70.4	H / 1.0 / 0.0	46.3176003	-7.66239965
High frequency						
3677.82	67.2 Pk	4.6 / 33.4 / 38.0	67.2	H / 1.0 / 0.0	43.1176003	-10.8623997
2758.10	64.4 Pk	4.0 / 31.1 / 36.8	62.7	H / 1.0 / 0.0	38.6176003	-15.3623997
1838.89	64.7 Pk	3.4 / 28.5 / 37.2	59.4	H / 1.0 / 0.0	35.3176003	N/A

Radiated Electromagnetic Emissions

Test Report #: BC205957 Run 3	Test Area: Pinewood Site 1 (3m)	Temperature: 24.8 °C
Test Method: FCC CFR47 Part 15.247	Test Date: 26-Nov-2002	Relative Humidity: <26 %
EUT Model #: FA7236SO	EUT Power: 12 VDC	Air Pressure: 80 kPa
EUT Serial #: 02		Page: 4 of 4
Manufacturer: Inovonics		
EUT Description: RF Transmitter		
Notes: Spurious Radiated Emissions		

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

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	Corrected	DELTA1 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV)	(m) (DEG)	Duty Cycle CF	Margin from 15.209
Mid frequency						
3651.96	67.6 Pk	4.5 / 33.3 / 38.0	67.4	H / 1.0 / 0.0	43.3176003	-10.6623997
2738.90	65.7 Pk	4.0 / 31.0 / 36.8	63.9	H / 1.0 / 0.0	39.8176003	-14.1623997
1825.94	70.5 Pk	3.4 / 28.4 / 37.4	64.9	H / 1.0 / 0.0	40.8176003	N/A
Low frequency						
3627.39	68.3 Pk	4.5 / 33.2 / 38.1	67.9	H / 1.0 / 0.0	43.8176003	-10.1623997
2720.63	65.9 Pk	4.1 / 31.0 / 36.8	64.1	H / 1.0 / 0.0	40.0176003	-13.9623997
1813.77	71.4 Pk	3.3 / 28.3 / 37.6	65.4	H / 1.0 / 0.0	41.3176003	N/A

Equipment Report

26-Nov-2002

Project Number: BC205957

Project Date: 26-Nov-2002

Company Name: Inovonics

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	05-May-2002	12	05-May-2003	G
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	G
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 (to be supplied by client)

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 μ 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 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 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 μ V:

Measured Level		Transducer & Cable Loss factor		Corrected Reading	Specification Limit		Corrected Reading		Delta Specification
(dB μ V)	+	(dB)	=	(dB μ V/m)	(dB μ V/m)	-	(dB μ V/m)	=	
14.0		14.9		28.9	40.0		28.9		-11.1

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."

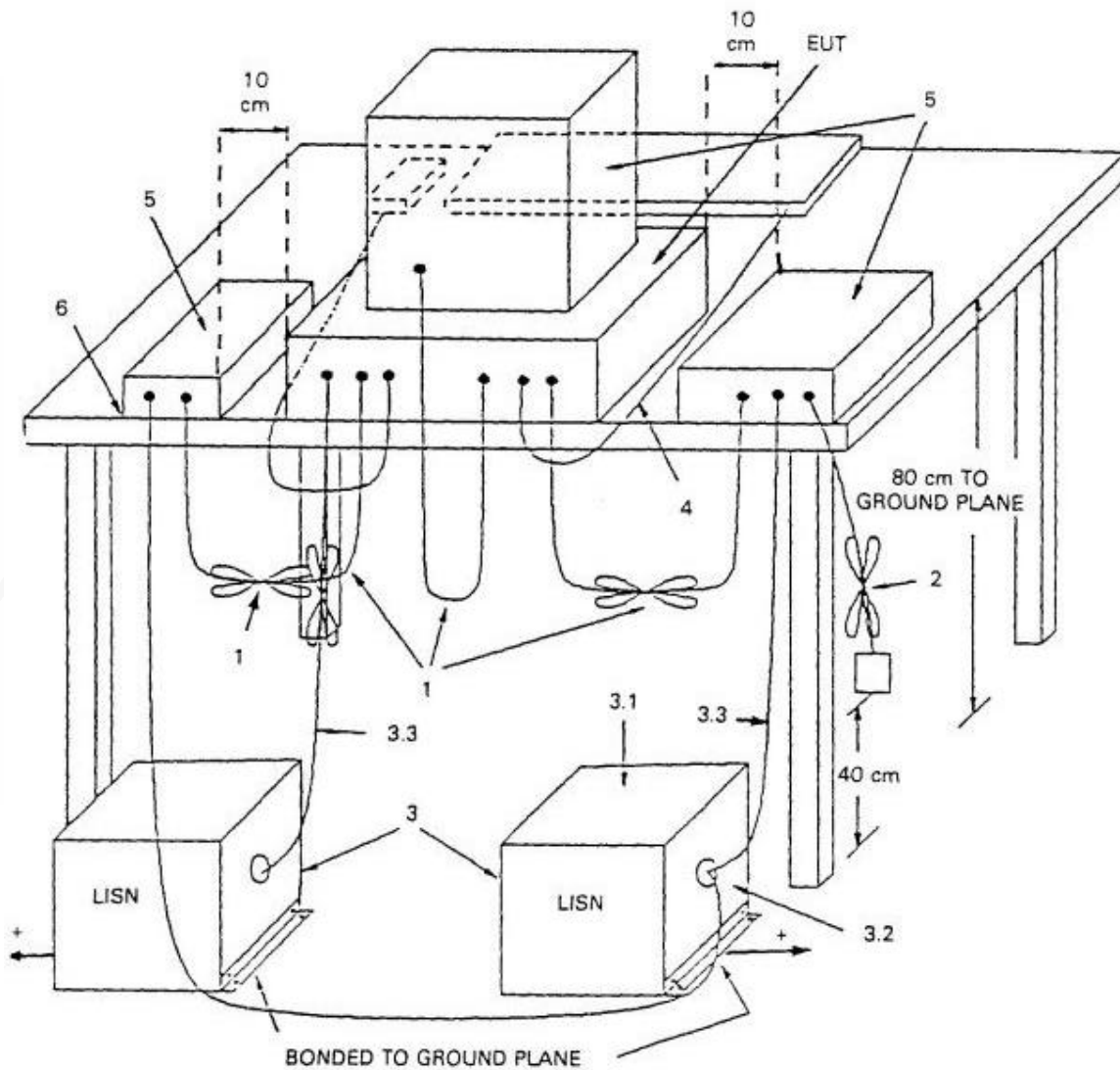
Conducted Emissions

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 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 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:

