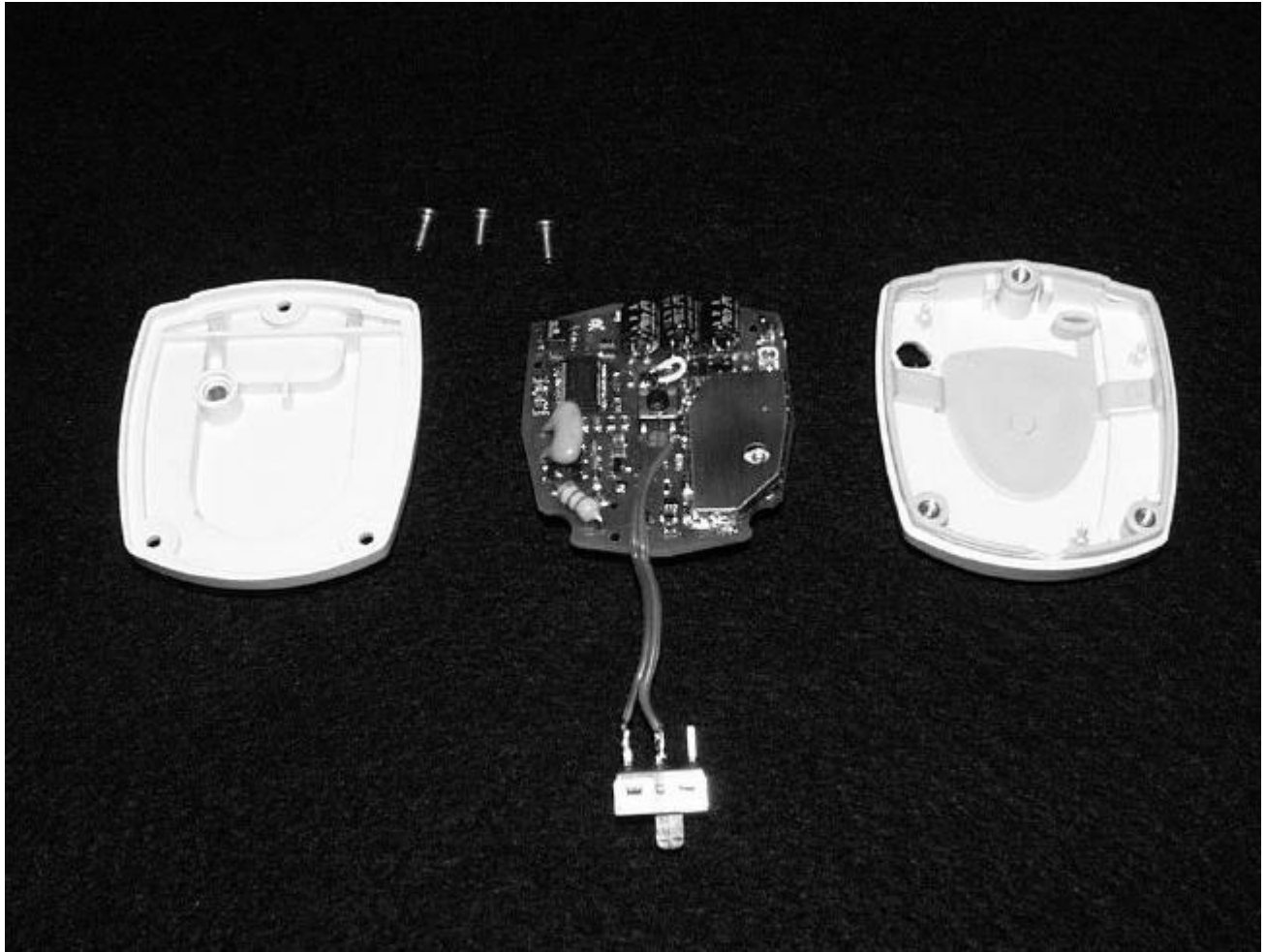
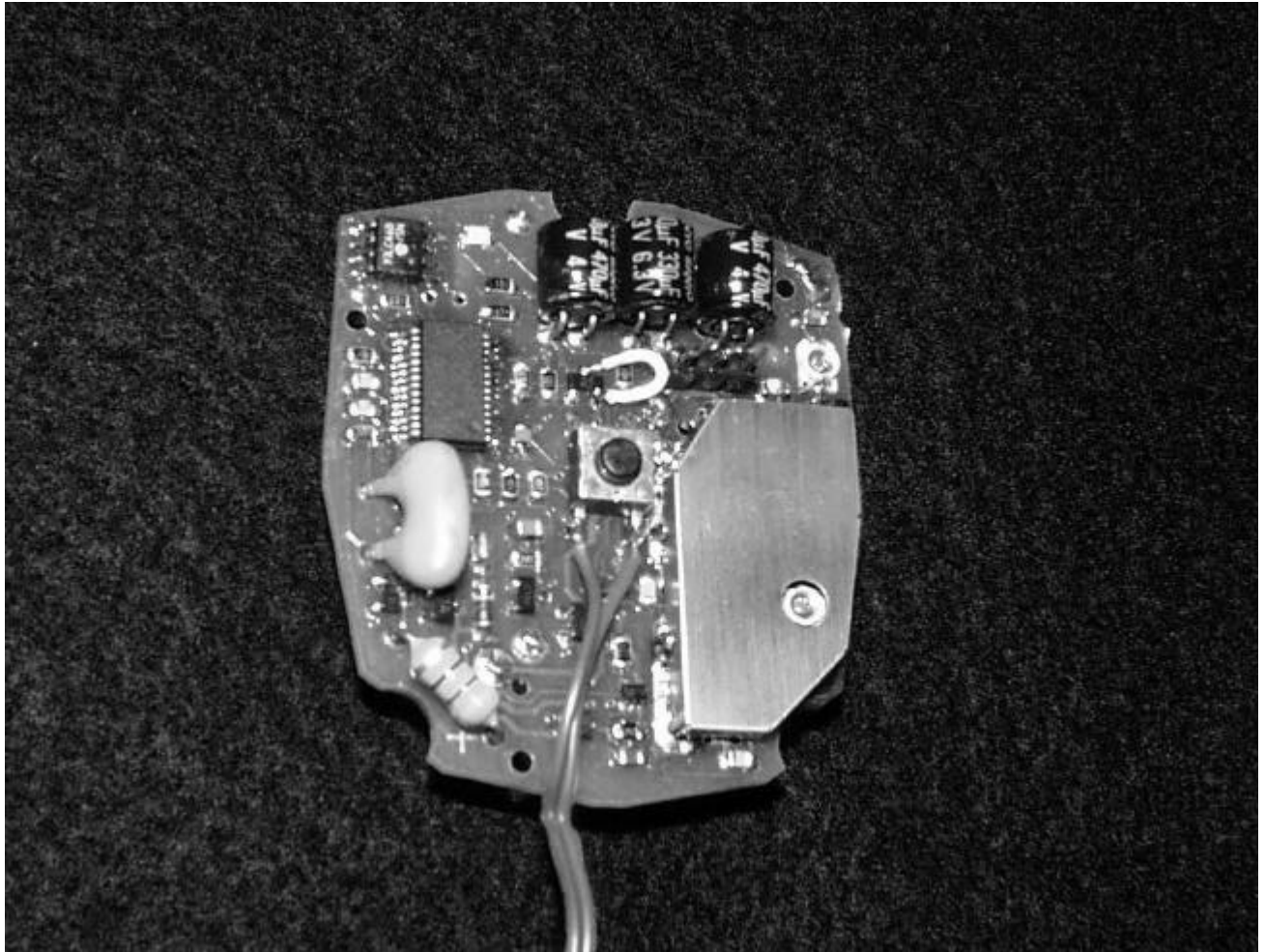


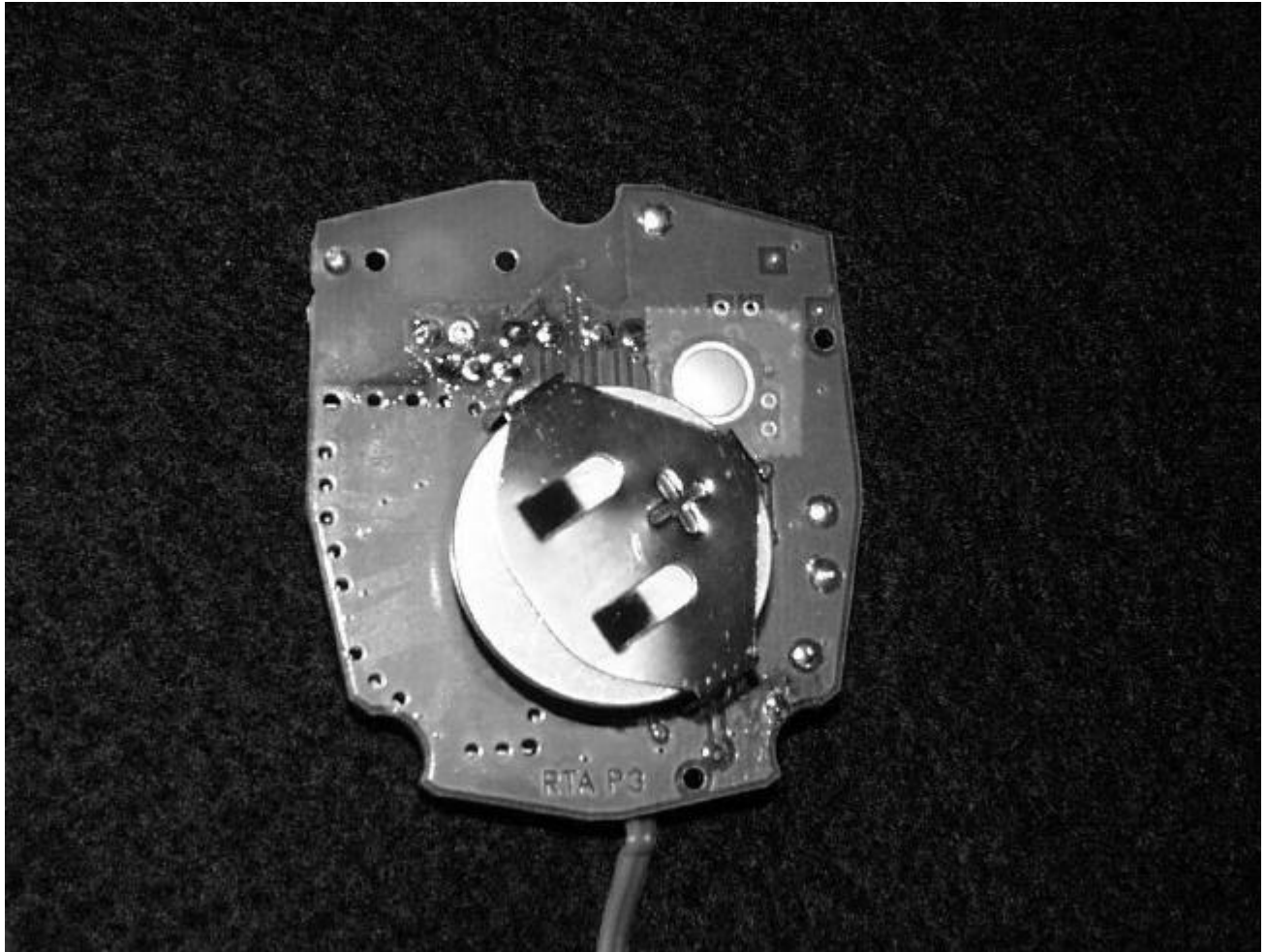
Part 3.10 FA223, Inside Top View



Part 3.11 FA223, PWB Component Side



Part 3.12 FA223, PWB Foil Side and Battery Compartment



Section 4 Original Test Data / Plots

Radiated Emissions

Part 4.1 Radiated Emissions Data, 30 MHz to 1000 MHz**Notes:**

The third column below contains alpha characters which pertain to the type of measurements made. The following are the definitions for those characters: q = Quasi Peak, m = Maximized (cable, rotation and antenna height), s = scanned but no data taken, and a = average. For the first character in column four, a '-' indicates that value is below the limit while an '*' indicates that value is above the limit

If the list is sorted using "I-sort", then quasi-peak and average levels are weighted higher than peak levels and are moved to the front of the scan list.

The following keys help to better understand the data:

TT: Turntable position in degrees

Hght: Height of antenna in centimeters

Az: Azimuth, V = Vertical, H= Horizontal

Criterion Technology

Wed Jul 21 18:40:05 1999

EUT: Model: FA223, Serial: #1

Manufacturer: Inovonics, inc.

Tester: MEM

Special ID: INO Q940 9907_1502

EUT Level: Pre-production

EUT Information: Battery Powered EUT on Tabletop

Test information: Three freq hop sequence (lo mid high), 10m, battery powered, FCC 15.247

Table 1: Scan List, sorted by margin to limit FCC-A, -30.0dB filter

<u>Freq, MHz</u>	<u>Value</u>	<u>Sts</u>	<u>FCC-A</u>	<u>TT</u>	<u>Hght</u>	<u>Az</u>	<u>Comment</u>
919.0332	85.19	m	38.75	280	194	V	fo high
911.3228	80.58	m	34.14	9	164	V	fo mid
906.3560	79.41	m	32.97	2	172	V	fo low
901.9500	39.13	m	-7.31	267	220	V	band edge measurement
928.0500	28.16	m	-18.28	263	105	V	band edge measurement

Table 2: Scan List for FCC-A, sorted by Frequency, -30.0dB filter

<u>Freq, MHz</u>	<u>Value</u>	<u>Sts</u>	<u>FCC-A</u>	<u>TT</u>	<u>Hght</u>	<u>Az</u>	<u>Comment</u>
901.9500	39.13	m	-7.31	267	220	V	band edge measurement
906.3560	79.41	m	32.97	2	172	V	fo low
911.3228	80.58	m	34.14	9	164	V	fo mid
919.0332	85.19	m	38.75	280	194	V	fo high
928.0500	28.16	m	-18.28	263	105	V	band edge measurement

Table 3: Complete Scan List Sorted by Frequency

Freq, MHz	I-val	Final	Sts	TT	Hght	Az	Time	Comment
901.9500	32.82	39.13	m	267	220	V	Wed Jul 21 18:01:44 1999	band edge measurement
906.3560	73.01	79.41	m	2	172	V	Wed Jul 21 18:10:26 1999	fo low
911.3228	74.05	80.58	m	9	164	V	Wed Jul 21 18:28:13 1999	fo mid
919.0332	78.40	85.19	m	280	194	V	Wed Jul 21 18:31:24 1999	fo high
928.0500	20.98	28.16	m	263	105	V	Wed Jul 21 18:33:41 1999	band edge measurement

Part 4.2 Radiated Emissions Data, 1 GHz to 10 GHz

level 1.5 compatible file

Model: FA223, Serial: #1

Inovonics, inc.

MEM

INO Q940

Pre-production

Battery Powered EUT on Tabletop, Orientation 1

Three freq hop sequence (lo mid high), 3m, battery powered, FCC 15.247

Frequency (MHz)	IVal (pk) (dBuV/m)	FVal (pk) (dBuV/m)	Fval (avg) (dBuV/m)	Turntable (deg)	Mast Ht (m)	Polarization	Comments
1812.71	55.90	51.95	31.95	63	1.01	H	2 x f o low
1822.65	57.95	54.06	34.06	62	1.03	H	2 x f o mid
1838.07	60.40	56.59	36.59	73	1.00	H	2 x f o high
2719.07	32.00	31.61	11.61				3 x f o low noise flr
2733.98	36.40	35.94	15.94				3 x f o mid noise flr
2757.11	34.80	34.26	14.26				3 x f o high noise flr
3625.42	31.50	32.83	12.83				4 x f o low noise flr
3645.30	33.45	34.87	14.87				4 x f o mid noise flr
3676.14	36.50	37.90	17.90	140	1.00	V	4 x f o high
4531.78	52.95	56.05	36.05	225	1.08	V	5 x f o low
4556.63	52.50	55.76	35.76	224	1.39	V	5 x f o mid
4595.18	52.75	56.45	36.45	221	1.07	V	5 x f o high
5438.13	32.05	39.34	19.34	219	1.01	V	6 x f o low
5467.95	30.45	37.93	17.93	221	1.00	V	6 x f o mid
5514.21	30.55	38.21	18.21	223	1.52	V	6 x f o high
6344.49	47.65	56.61	36.61	213	1.03	V	7 x f o low
6379.28	50.60	59.62	39.62	213	1.01	V	7 x f o mid
6433.25	50.10	59.39	39.39	215	1.12	V	7 x f o high
7250.84	31.85	43.46	23.46				8 x f o low noise flr
7290.60	32.10	43.80	23.80				8 x f o mid noise flr
7352.28	35.05	47.64	27.64				8 x f o high noise flr
8157.20	32.10	43.91	23.91				9 x f o low noise flr
8201.93	31.40	42.86	22.86				9 x f o mid noise flr
8271.32	34.45	46.74	26.74				9 x f o high noise flr
9063.55	31.10	46.62	26.62				10 x f o low noise flr
9113.25	31.65	47.07	27.07				10 x f o mid noise flr
9190.35	33.40	49.21	29.21				10 x f o high noise flr

TEST REPORT

Inovonics, inc.

MEM

INO Q940

Pre-production

Battery Powered EUT on Tabletop, Orientation 2

Three freq hop sequence (lo mid high), 3m, battery powered, FCC 15.247

Frequency (MHz)	IVal (pk) (dBuV/m)	FVal (pk) (dBuV/m)	Fval (avg) (dBuV/m)	Turntable (deg)	Mast Ht (m)	Polarization	Comments
1812.71	61.85	57.90	37.90	60	1.00	V	2 x f o low
1822.65	58.55	54.66	34.66	57	1.00	V	2 x f o mid
1838.07	61.00	57.19	37.19	59	1.00	V	2 x f o high
2719.07	34.00	33.61	13.61				3 x f o low noise flr
2733.98	35.65	35.19	15.19				3 x f o mid noise flr
2757.11	36.75	36.21	16.21				3 x f o high noise flr
3625.42	36.45	37.78	17.78	106	1.10	V	4 x f o low
3645.30	33.15	34.57	14.57				4 x f o mid noise flr
3676.14	34.50	35.90	15.90	222	1.00	V	4 x f o high
4531.78	47.85	50.95	30.95	346	1.45	V	5 x f o low
4556.63	50.00	53.26	33.26	342	1.44	V	5 x f o mid
4595.18	51.75	55.45	35.45	334	1.43	V	5 x f o high
5438.13	27.05	34.34	14.34				6 x f o low noise flr
5467.95	26.85	34.33	14.33	343	1.43	V	6 x f o mid
5514.21	26.35	34.01	14.01				6 x f o high noise flr
6344.49	48.30	57.26	37.26	245	1.29	H	7 x f o low
6379.28	47.00	56.02	36.02	239	1.20	H	7 x f o mid
6433.25	49.20	58.49	38.49	235	1.07	H	7 x f o high
7250.84	32.55	44.16	24.16				8 x f o low noise flr
7290.60	32.40	44.10	24.10				8 x f o mid noise flr
7352.28	32.35	44.94	24.94				8 x f o high noise flr
8157.20	31.75	43.56	23.56				9 x f o low noise flr
8201.93	32.85	44.31	24.31				9 x f o mid noise flr
8271.32	32.75	45.04	25.04				9 x f o high noise flr
9063.55	31.50	47.02	27.02				10 x f o low noise flr
9113.25	31.95	47.37	27.37				10 x f o mid noise flr
9190.35	31.35	47.16	27.16				10 x f o high noise flr

INO Q940

Pre-production

Battery Powered EUT on Tabletop, Orientation 3

Three freq hop sequence (lo mid high), 3m, battery powered, FCC 15.247

Frequency (MHz)	IVal (pk) (dBuV/m)	FVal (pk) (dBuV/m)	Fval (avg) (dBuV/m)	Turntable (deg)	Mast Ht (m)	Polarization	Comments
1812.71	58.40	54.45	34.45	175	1.15	H	2 x f o low
1822.65	57.45	53.56	33.56	200	1.05	H	2 x f o mid
1838.07	60.40	56.59	36.59	200	1.10	H	2 x f o high
2719.07	34.65	34.26	14.26				3 x f o low noise flr
2733.98	35.65	35.19	15.19				3 x f o mid noise flr
2757.11	34.85	34.31	14.31				3 x f o high noise flr
3625.42	35.00	36.33	16.33	159	1.08	V	4 x f o low
3645.30	36.60	38.02	18.02	168	1.00	V	4 x f o mid
3676.14	34.05	35.45	15.45	172	1.08	V	4 x f o high
4531.78	52.20	55.30	35.30	170	1.07	V	5 x f o low
4556.63	52.95	56.21	36.21	162	1.06	V	5 x f o mid
4595.18	53.15	56.85	36.85	174	1.01	V	5 x f o high
5438.13	27.35	34.64	14.64				6 x f o low noise flr
5467.95	26.20	33.68	13.68				6 x f o mid noise flr
5514.21	24.40	32.06	12.06				6 x f o high noise flr
6344.49	47.90	56.86	36.86	160	1.07	V	7 x f o low
6379.28	49.35	58.37	38.37	148	1.04	V	7 x f o mid
6433.25	50.45	59.74	39.74	144	1.03	V	7 x f o high
7250.84	31.65	43.26	23.26				8 x f o low noise flr
7290.60	32.35	44.05	24.05				8 x f o mid noise flr
7352.28	32.60	45.19	25.19				8 x f o high noise flr
8157.20	32.00	43.81	23.81				9 x f o low noise flr
8201.93	31.50	42.96	22.96				9 x f o mid noise flr
8271.32	32.35	44.64	24.64				9 x f o high noise flr
9063.55	31.40	46.92	26.92				10 x f o low noise flr
9113.25	31.15	46.57	26.57				10 x f o mid noise flr
9190.35	30.70	46.51	26.51				10 x f o high noise flr

Part 4.3 Radiated Emissions, Intentional Radiator Data**Intentional Radiator, Margin to Limit Calculation**

INO 9907 1502

7/21/99

Frequency (MHz)	Level (dBuV/m)	Duty Cycle (dB)	Calc. Avg. (dBuV/m)	Spec. Limit (dBuV/m)	Spec. Margin (dB)	Comments	
901.95	39.13	NA	NA	65.19	26.06	Band edge	Low
928.05	28.16	NA	NA	65.19	37.03	Band edge	High
1812.71	57.90	20.00	37.90	54.00	16.10	2 x f o low	Orient. 2
1822.65	54.66	20.00	34.66	54.00	19.34	2 x f o mid	Orient. 2
1838.07	57.19	20.00	37.19	54.00	16.81	2 x f o high	Orient. 2
3625.42	37.78	20.00	17.78	54.00	36.22	4 x f o low	Orient. 2
3645.30	38.02	20.00	18.02	54.00	35.98	4 x f o mid	Orient. 3
3676.14	37.90	20.00	17.90	54.00	36.10	4 x f o high	Orient. 1
4531.78	56.05	20.00	36.05	54.00	17.95	5 x f o low	Orient. 1
4556.63	56.21	20.00	36.21	54.00	17.79	5 x f o mid	Orient. 3
4595.18	56.85	20.00	36.85	54.00	17.15	5 x f o high	Orient. 3
5438.13	39.34	20.00	19.34	54.00	34.66	6 x f o low	Orient. 1
5467.95	37.93	20.00	17.93	54.00	36.07	6 x f o mid	Orient. 1
5514.21	38.21	20.00	18.21	54.00	35.79	6 x f o high	Orient. 1
6344.49	57.26	20.00	37.26	54.00	16.74	7 x f o low	Orient. 2
6379.28	59.62	20.00	39.62	54.00	14.38	7 x f o mid	Orient. 1
6433.25	59.74	20.00	39.74	54.00	14.26	7 x f o high	Orient. 3

Note: Emissions below 1 GHz were measured with a CISPR quasi peak detector. Emissions above 1 GHz were measured with a peak detector and average levels were calculated per Appendix I of ANSI C63.4 1992.

Because the fundamental frequency levels were not measured with a peak detector, it was not possible to calculate the out-of-band limit for spurious emissions above 1 GHz per CFR 47 Part 15.247 (c). Limits were taken from Part 15.209(a) as the worse case requirements.

Part 4.4 Radiated Emissions Plot, 30 MHz to 1000 MHz

Date: Wed Jul 21 16:39:45 1999

IntelliStar OATS

EUT: Model: FA223, Serial: #1

Manufacturer: Inovonics, Inc.

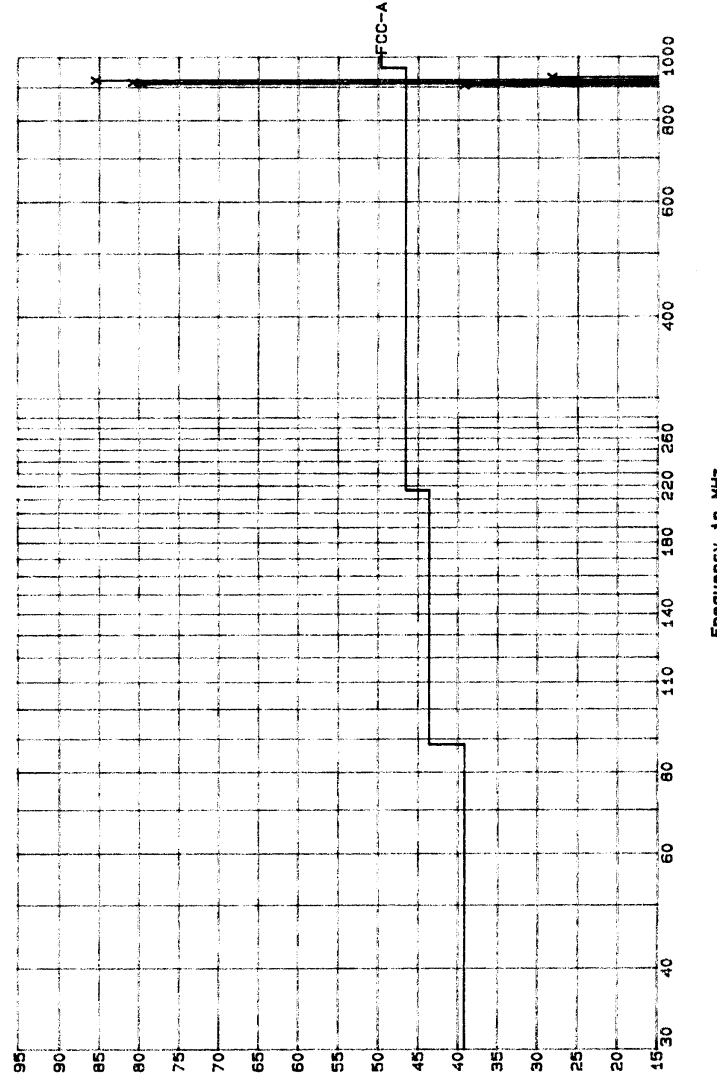
Tester: MEM SPID: INO 9940 9907_1502

EUT Level: Pre-production

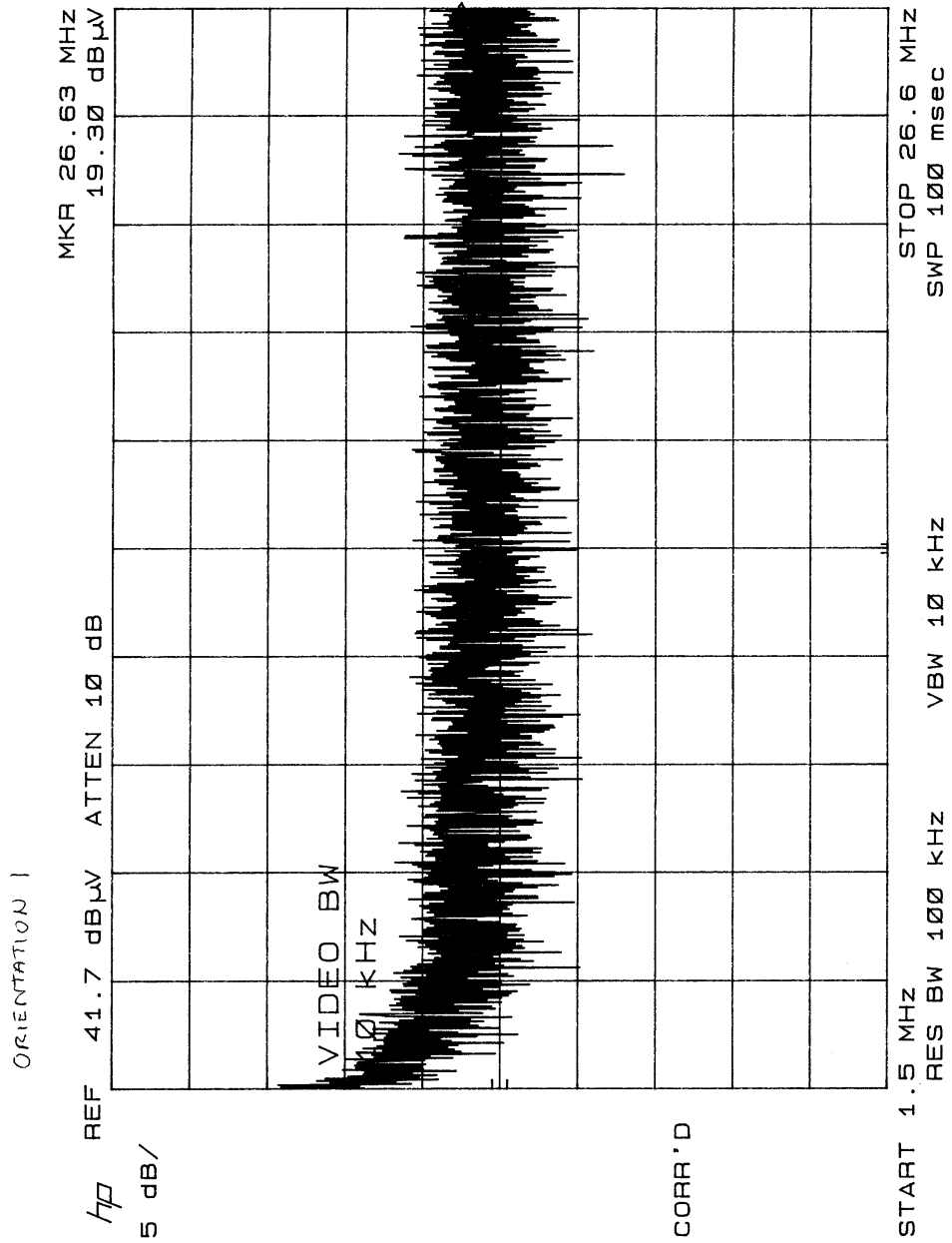
EUT Information: Battery Powered EUT on Tabletop, Orientation 1

Test Information: Three freq hop sequence (10 mid high), 10m, battery powered, FCC 15.247

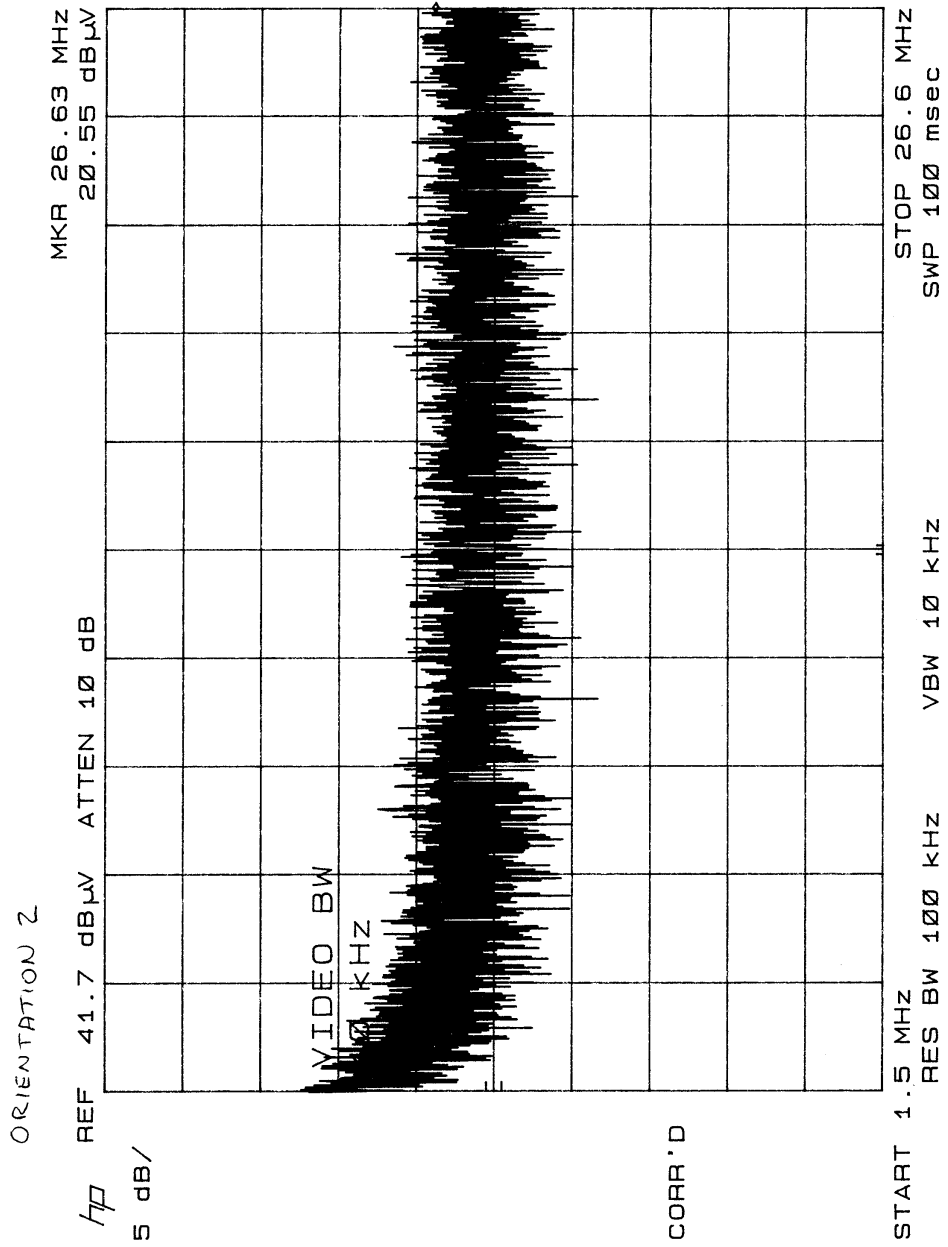
Test Results (in dBuV/m)



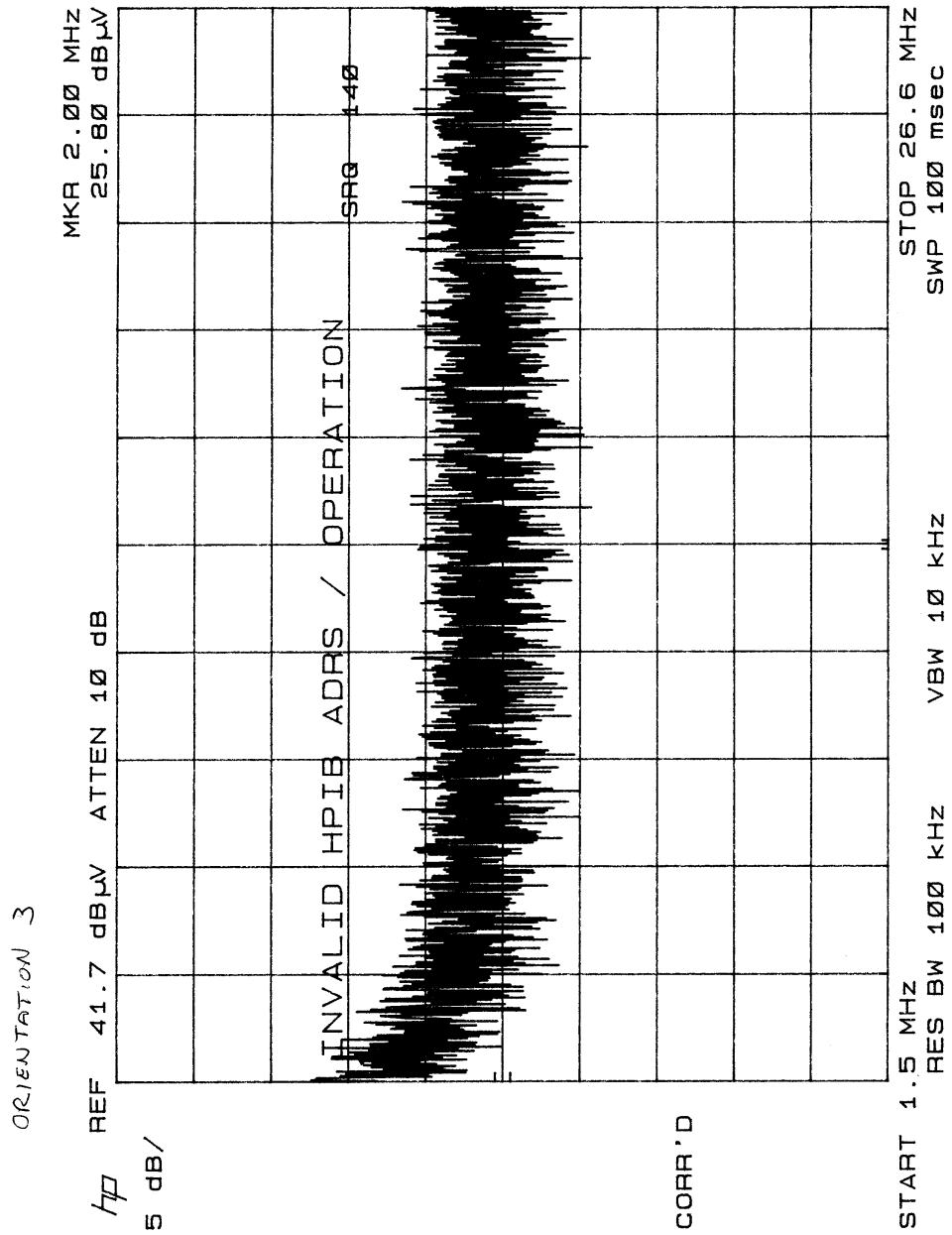
Part 4.5 Radiated Emissions Prescan Plot, 1.5 MHz to 30 MHz, Orientation 1



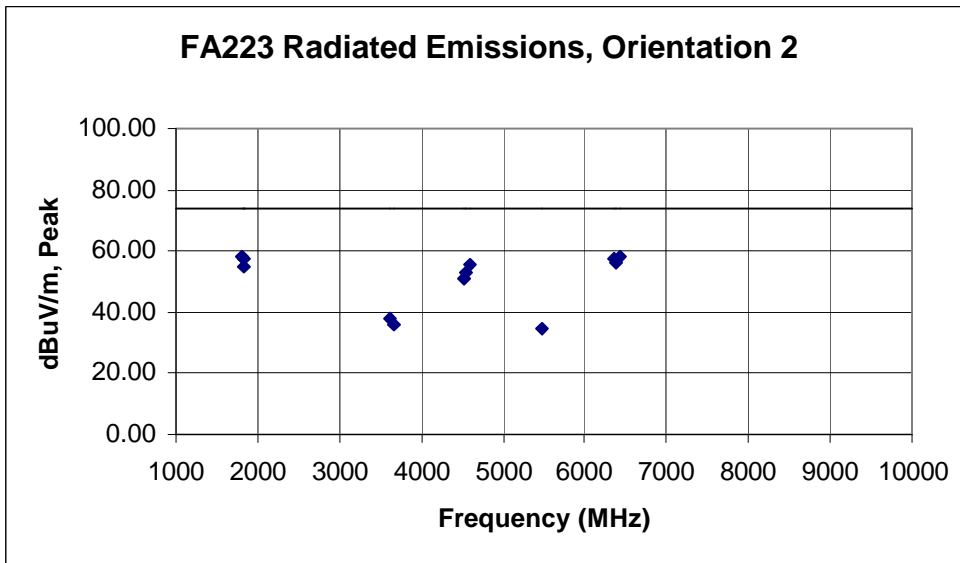
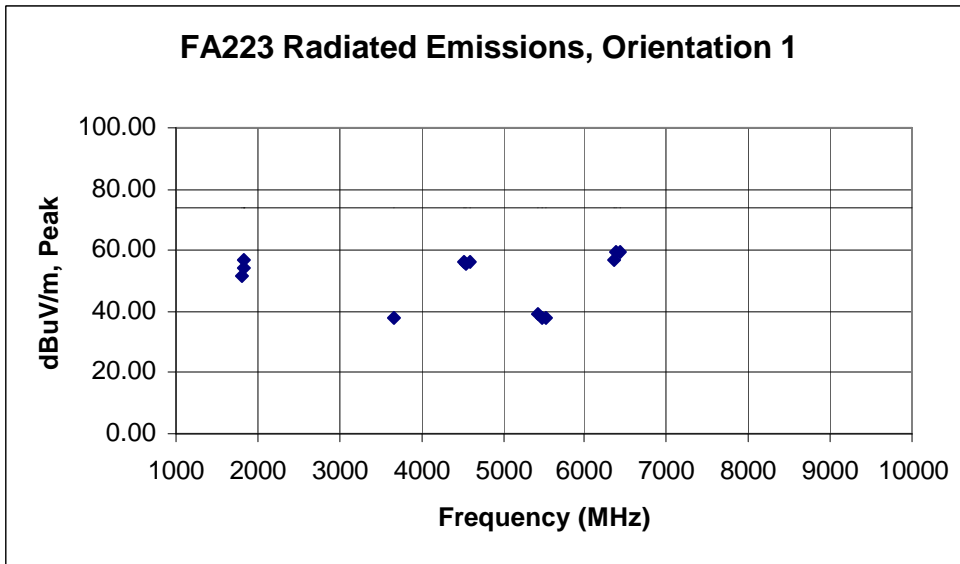
Part 4.6 Radiated Emissions Prescan Plot, 1.5 MHz to 30 MHz, Orientation 2

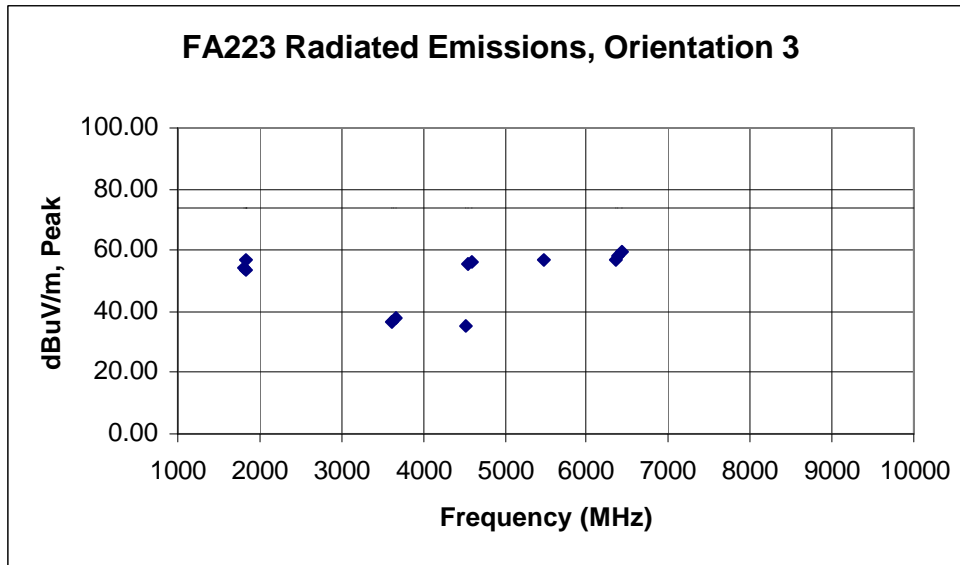


Part 4.7 Radiated Emissions Prescan Plot, 1.5 MHz to 30 MHz, Orientation 3

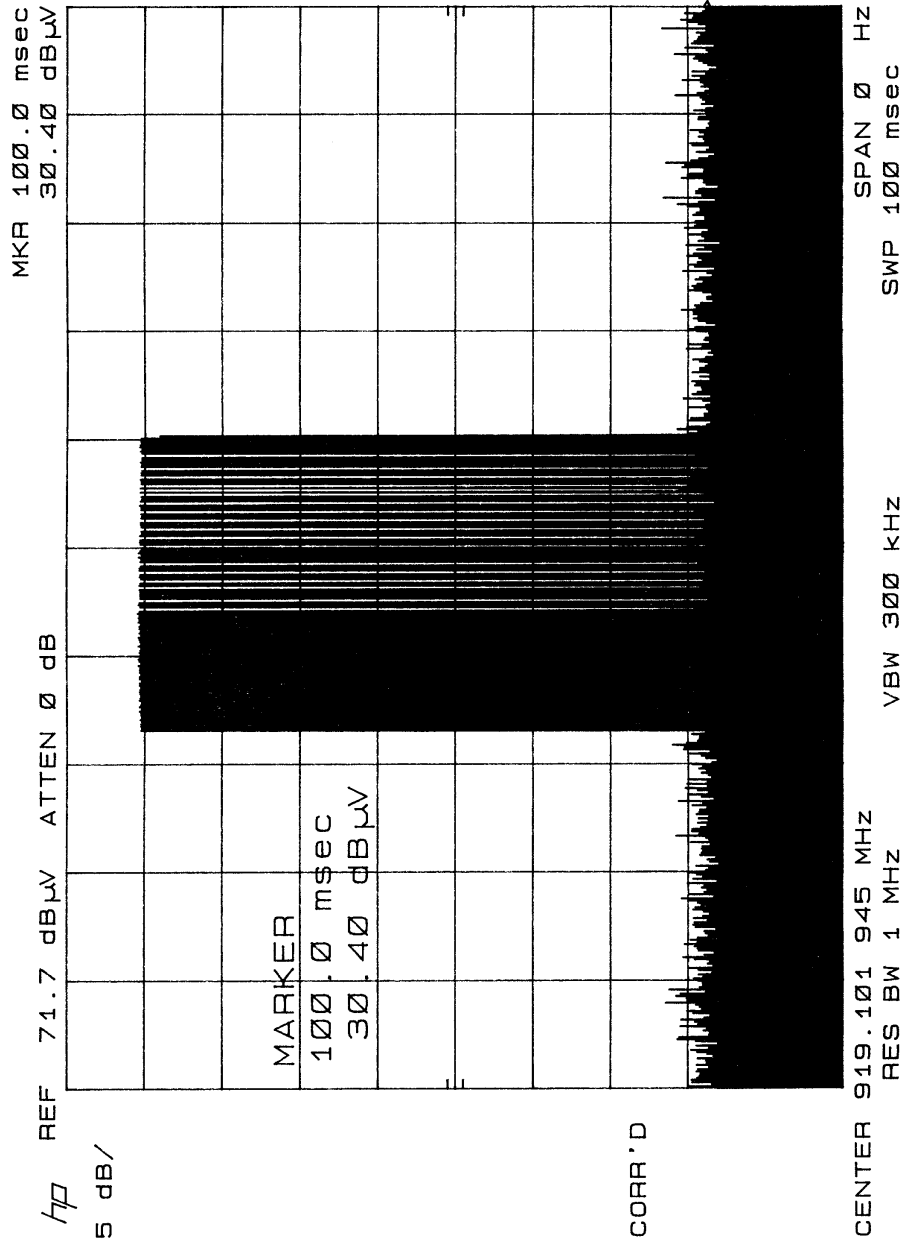


Part 4.8 Radiated Emissions Plots, 1 GHz to 10 GHz

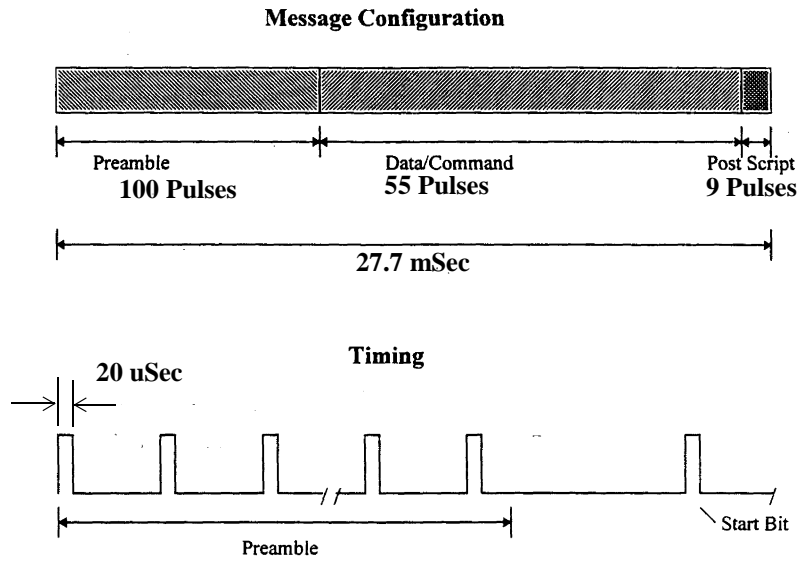




Part 4.9 Pulse Train Timing Plot



Part 4.10 Pulse Train Timing Diagram



Duty Cycle Calculation:

Total Number of Pulses = 164

Pulse Width = 20 uSec

Pulse Train Duration (including blanking intervals) > 100 mSec

$$\text{Duty Cycle} = \frac{164 * 0.02}{100} = 0.032 = 3.2\%$$

Average Power Correction Factor = $20 * \text{Log} (0.032) = -29.7 \text{ dB}$
 maximum correction allowed = -20 dB

Section 5 Product Information Forms

CRITERION PRODUCT INFORMATION FORM

Date: 7-21-99

General Information

Company Name: Inovonics Corporation
Company Address: 2100 Central Avenue
Company Address: Boulder, CO 80301
Customer Contacts (and phone numbers):
Compliance Eng.
Design Engineer: Don Hume

General Instrument Information

Model/s: FA223
Serial Number: #1

Test Facility

Name: Criterion Technology
Location: Rollinsville, Colorado 80474

TEST DESCRIPTION: Development Initial Design Verification
Design Change Production Model
Applicable Standards (FCC 15, 24, ETSI, etc) FCC Part 15

CIRCUIT BOARD

Oscillator Frequency:
Oscillator Manufacturer/s:
Clock Frequency: 2.0 MHz ceramic resonator
Other:

POWER

Power Supply Topology: Battery Powered Device, 3.0 v lithium battery
Switching Frequency:
Power supply Primary Frequency and Voltage:
Number of Input Phases:
Current Draw:
Manufacturer:
Model Number:

INTENTIONAL RADIATOR PRODUCTS

Fundamental Frequency(ies) : 906.3 MHz, 911.4 MHz, 919.0 MHz (transmit low, mid, high band)
Output Power Levels: less than 1 watt
Modulation Techniques (AM, FM, Pulsed, Spread Spectrum, etc): Spread Spectrum
Frequency Band: 902 - 928 MHz
Frequency Range: multiple hop frequencies from 906 to 919 MHz
Support Equipment Required: None

RECEIVER PRODUCTS

Receiver Type (Superregen., Superheterodyne, etc): NA
Source Type (battery or AC PS): NA
Detector Techniques (AM, FM, Pulsed, Spread Specturm, etc): NA
Frequency Band: NA
Additional Interfaces: NA
Support Equipment Required: NA

SETUP AND OPERATIONAL MODES FOR EMISSIONS TESTING

Compliance Directive/Standard/s: CFR 47 Part 15 Criteria: NA
Test Level/s: Subparts A, B Radiated Emissions and C Intentional Radiators (15.247 (c))

Conducted And Radiated Emissions Testing:

Test Setup:

The EUT was tested in three orientations as shown in the test setup photos.